1965

COMET, FALCON, FAIRLANE and MUSTANG

SHOP MANUAL

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SERVICE DEPARTMENT
FORD DIVISION
Ford MOTOR COMPANY

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SPECIFICATIONS AND SPECIAL SERVICE TOOLS AT END OF EACH GROUP

FOREWORD

This shop manual provides the Service Technician with complete information for the proper servicing of the 1965 Comet, Falcon, Fairlane and Mustang cars.

The information is grouped according to the type of work being performed, such as diagnosis and testing, frequently performed adjustments and repairs, in-vehicle adjustments, overhaul, etc. Specifications and recommended special tools are included.

Refer to the opposite page for important vehicle identification data.

The descriptions and specifications in this manual were in effect at the time this manual was approved for printing. The Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring obligation.

SERVICE DEPARTMENT

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VEHICLE IDENTIFICATION

GROUP 1

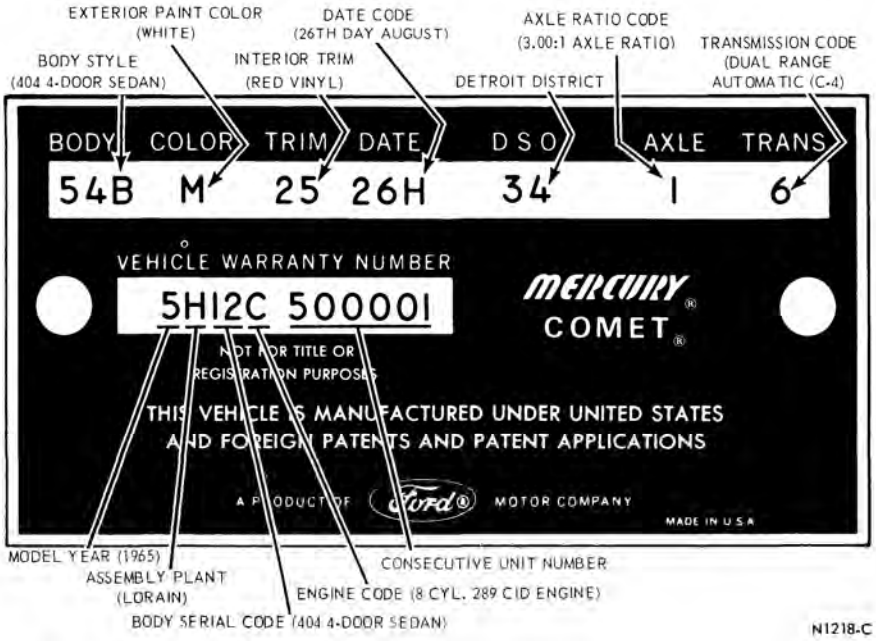


FIG. 1—Comet Warranty Plate

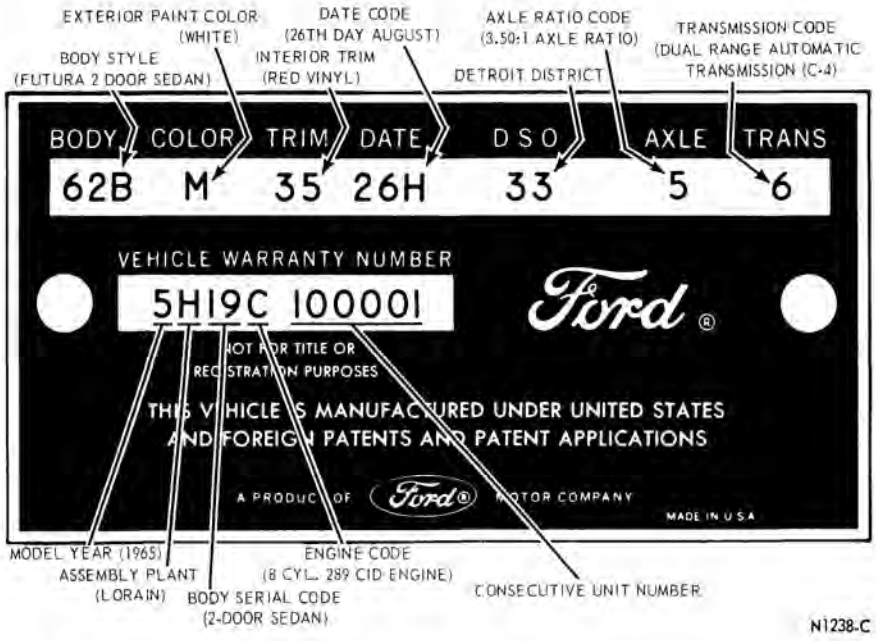


FIG. 2—Falcon Warranty Plate

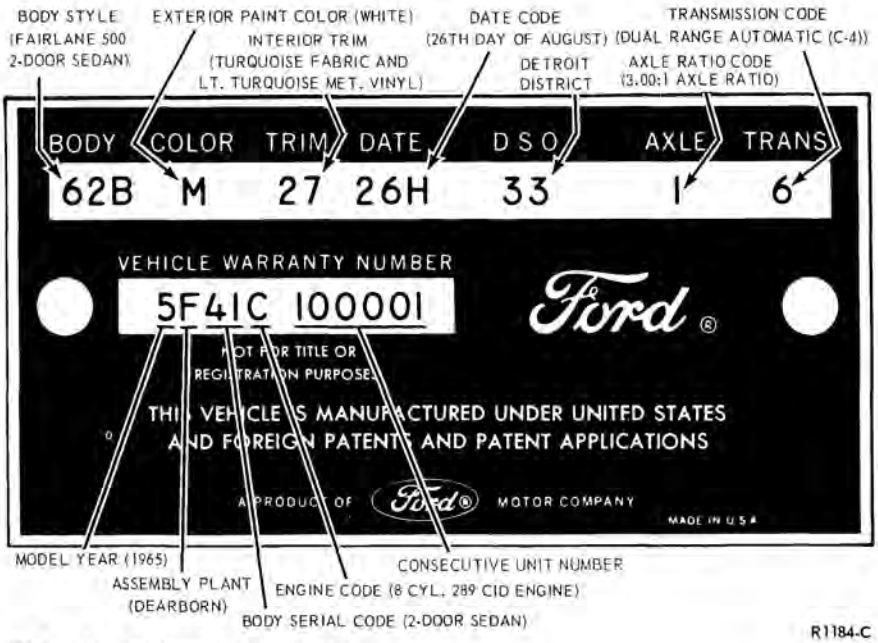


FIG. 3—Fairlane Warranty Plate

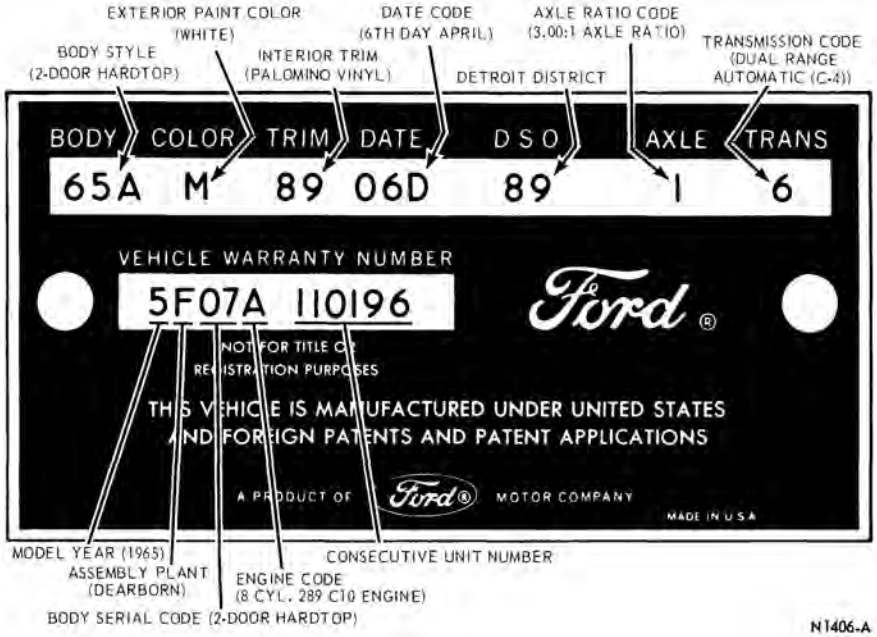


FIG. 4—Mustang Warranty Plate



FIG. 5—Vehicle Identification Number Location—Comet, Falcon and Mustang



FIG. 6—Vehicle Identification Number Location—Fairlane

Figures 1, 2, 3 and 4 illustrate the Comet, Falcon, Fairlane and Mustang Warranty Plates. The warranty plate is located on the rear face (lock face) of the left front door.

The official Vehicle Identification Number, for title and registration purposes, is stamped on the top upper flange of the left front fender apron for Falcon, Comet and Mustang (Fig. 5C) and on the vertical face of the left front fender apron near the top for the Fairlane (Fig. 6C). Do not use the Vehicle Warranty Number, which appears on the warranty plate, for title or registration purposes.

VEHICLE DATA

The vehicle data appears in a line across the top of the warranty plate (Figs. 1, 2, 3 and 4). The first two letters and a number identify the Body Style. The following one or two letters identify the Exterior Paint Color. The next code consisting of two numbers, or a letter and a number, identifies the Interior Trim. The Date Code showing the date the car was manufactured, follows the Trim Code and consists of two numbers and a letter. The next code gives the district in which the car was ordered and consists of two numbers. The next to the last code is the Axle Ratio Code and is designated by a number for a conventional axle or a letter for an Equa-Lock axle. The last code in the vehicle data is the Transmission Code and consists of one number. The charts that follow, list in detail the various vehicle data codes.

VEHICLE WARRANTY NUMBER

The vehicle warranty number is the second line of numbers and letters appearing on the Warranty Plate (Figs. 1, 2, 3 and 4). The first number indicates the model year. The letter following the model year indicates the assembly plant at which the car was manufactured. The next two numbers designate the Body Serial Code. The letter following the Body Serial Code designates the Engine Code. The remaining numbers indicate the Consecutive Unit Number. The charts that follow, list the various Vehicle Warranty Number codes.

BODY SERIAL AND STYLE CODES

The two-digit numeral which follows the assembly plant code identifies the body series. This two-digit number is used in conjunction with the Body Style Code, in the Vehicle Data, which consists of a two-digit number with a letter Suffix. The following chart lists the Body Serial Codes, Body Style Codes and the Model.

COMET

Body Serial Code	Body Style Code	Body Type	Series
02	54A	4-Door Sedan*	Comet
01	62A	2-Door Sedan*	202
32	71A	4-Door Wagon*	
12	54B	4-Door Sedan*	
11	62B	2-Door Sedan*	
11	62C	2-Door Sedan†	Comet
34	71B	4-Door Wagon*	404
36	71C	4-Door (Villager) Wagon*	
22	54C	4-Door Sedan†	
22	54D	4-Door Sedan*	
23	63C	2-Door Hardtop† (Fastback)	Comet
23	63D	2-Door Hardtop* (Fastback)	Caliente
25	76B	2-Door Convertible†	
25	76D	2-Door Convertible*	
23	63E	2-Door Hardtop† (Fastback)	Cyclone

*Bench Seat
†Bucket Seats

FALCON

Body Serial Code	Body Style Code	Body Type	Model
02	54A	4-Door Sedan	
02	54D	4-Door Sedan (RPO)	Standard
01	62A	2-Door Sedan	Sedan
01	62D	2-Door Sedan (RPO)	
16	54B	4-Door Sedan (Bench)	
19	62B	2-Door Sedan (Bench)	
17	63B	2-Door Hardtop (Bench)	
11	63C	2-Door Hardtop (RPO Bucket)	Futura
17	63H	2-Door Hardtop Bucket (Less Console)	
15	76A	Convertible (Bench)	
12	76B	Convertible (RPO Bucket)	
21	59A	2-Door Wagon	
22	71A	4-Door Wagon	Station
24	71B	4-Door Wagon Deluxe	Wagons
26	71C	4-Door Squire	
27	66A	2-Door Standard Ranchero	Ranchero
27	66B	2-Door Deluxe Ranchero	
27	66G	2-Door Standard (RPO Bucket W/Console)	
27	66H	2-Door Standard (RPO Bucket W/Console)	
29	78A	Standard Sedan Delivery	Sedan
29	78B	Deluxe Sedan Delivery	Delivery

FAIRLANE

Body Serial Code	Body Style Code	Body Type	Model
31	62A	2-Door Sedan	Fairlane
32	54A	4-Door Sedan	
41	62B	2-Door Sedan	Fairlane
42	54B	4-Door Sedan	500
43	65A	2-Door Hardtop	
47	65B	2-Door Hardtop*	Sport Coupe
38	71D	4-Door Ranch Wagon	Station
48	71B	4-Door Custom Ranch Wagon	Wagons

*Bucket Seats

MUSTANG

Body Serial Code	Body Style Code	Body Type	Model
09	63A	2-Door Fastback	
07	65A	2-Door Hardtop	Mustang
08	76A	2-Door Convertible	

EXTERIOR PAINT COLOR CODES

A single letter code designates a solid body color and two letters denote a two-tone—the first letter, the lower color and the second letter, the upper color.

Code	M-30J/ M-32-J#	Color
A	1724-A	Black
C	1736-A	Med. Ivy Gold Met.
D	1625-A	Med. Turq. Met.
H	1544-A	Dk. Blue Met.
I	1737-A	Lt. Beige Met.
J	1515-A	Red
K	1621-A	Med. Gray Met.
M	1619-A	White
O	1732-A	Lt. Peacock
P	1738-A	Palomino Met.
R	1879-A	Dk. Ivy Green Met.
V	1729-A	Yellow
X	1632-A	Maroon Met.
Y	1269-A	Med. Blue Met.
5	1731-A	Dk. Turq. Met.

INTERIOR TRIM CODES

Code	Trim Codes
04	Beige Vinyl
12	Med. Blue and Lt. Blue Met. Fabric and Vinyl
15	Red Fabric and Vinyl
16	Black Fabric and Vinyl
17	Med. Turq. and Lt. Turq. Met. Fabric and Vinyl
19	Palomino and Med. Palomino Fabric and Vinyl
22	Med. and Lt. Blue Met. Vinyl (Comet), Fabric and Vinyl (Except Comet)
25	Red Vinyl (Comet), Fabric and Vinyl (Except Comet)
26	Black Vinyl
27	Med. and Lt. Turquoise Met. Vinyl (Comet), Fabric and Vinyl (Except Comet)
28	Ivy Gold and Lt. Ivy Gold D/L Fabric and Vinyl
29	Palomino Vinyl (Comet), Fabric and Vinyl (Except Comet)
32	Med. Blue and Lt. Blue Met. Fabric and Vinyl (Comet) Vinyl (Except Comet)
35	Red Fabric and Vinyl (Comet) Vinyl (Except Comet)
36	Black Fabric and Vinyl (Comet) Vinyl (Except Comet)
37	Med. Turquoise and Lt. Turq. Met. Fabric and Vinyl (Comet) Vinyl (Except Comet)
38	Ivy Gold Fabric and Vinyl (Comet) Vinyl (Except Comet)
39	Palomino and Med. Palomino Fabric and Vinyl (Comet) Vinyl (Except Comet)
42	White and Blue Vinyl
45	White and Red Vinyl
46	White and Black Vinyl
48	White and Ivy Gold Vinyl
49	Med. Palomino Vinyl
52	Med. Blue and Lt. Blue Met. Fabric and Vinyl (Comet), Vinyl (Except Comet)
55	Red Fabric and Vinyl (Comet), Vinyl (Except Comet)
56	Black Fabric and Vinyl (Comet), Vinyl (Except Comet)
59	Palomino and Med. Palomino Fabric and Vinyl (Comet), Vinyl (Except Comet)
F2	White Pearl (W/Red) Fabric and Vinyl
F5	White Pearl (W/Black) Fabric and Vinyl
F6	White Pearl (W/Turquoise) Fabric and Vinyl
F8	White Pearl (W/Gold) Fabric and Vinyl
F9	White Pearl (W/Palomino) Fabric and Vinyl
62	Lt. Blue Met. Vinyl
65	Red Vinyl
66	Black Vinyl
67	Turquoise Vinyl
68	Ivy Gold Met. and D/L Vinyl
69	Med. Palomino Vinyl
G2	White Pearl (W/Blue) Vinyl
G5	White Pearl (W/Red) Vinyl
G6	White Pearl (W/Black) Vinyl
G7	White Pearl (W/Turquoise) Vinyl
G8	White Pearl (W/Gold) Vinyl
G9	White Pearl (W/Palomino) Vinyl
72	Lt. Blue Met. Vinyl
75	Red Vinyl
76	Black Vinyl
77	Lt. Turq. Met. Vinyl
78	Ivy Gold D/L Vinyl
79	Med. Palomino Vinyl
H2	White (W/Blue) Vinyl
H5	White (W/Red) Vinyl
H6	White (W/Black) Vinyl
H7	White (W/Turquoise) Vinyl
H8	White (W/Gold) Vinyl
H9	White (W/Palomino) Vinyl
82	Lt. and Med. Blue Met. Vinyl
85	Red Vinyl
86	Black Vinyl
87	Lt. Turq. Met. Vinyl
88	Lt. Ivy Gold Met. Vinyl
89	Med. Palomino Vinyl
92	Blue Vinyl
95	Red Vinyl
96	Black Vinyl (Except Fairlane) Fabric and Vinyl (Fairlane)
99	Palomino Vinyl (Except Fairlane) Fabric and Vinyl (Fairlane)

DATE CODES

A number signifying the date precedes the month code letter. A second-year code letter will be used if the model exceeds exceeds 12 months.

Month	Code First Year	Code Second Year
January	A	N
February	B	P
March	C	Q
April	D	R
May	E	S
June	F	T
July	G	U
August	H	V
September	J	W
October	K	X
November	L	Y
December	M	Z

DISTRICT CODES (DSO)

Units built on a Domestic Special Order, Foreign Special Order, or other special orders will have the complete order number in this space. Also to appear in this space is the two-digit code number of the District which ordered the unit. If the unit is a regular production unit, only the District code number will appear.

COMET

Code	District	Code	District
11	Boston	34	Detroit
16	Philadelphia	41	Chicago
15	New York	42	St. Louis
14	Washington	45	Twin Cities
21	Atlanta	51	Denver
22	Dallas	52	Los Angeles
23	Jacksonville	53	Oakland
26	Memphis	54	Seattle
31	Buffalo	81	Ford of Canada
32	Cincinnati	84	Home Office Reserve
33	Cleveland	90-99	Export

FALCON, FAIRLANE AND MUSTANG

Code	District	Code	District
11	Boston	45	Davenport
12	Buffalo	51	Denver
13	New York	52	Des Moines
14	Pittsburgh	53	Kansas City
15	Newark	54	Omaha
21	Atlanta	55	St. Louis
22	Charlotte	61	Dallas
23	Philadelphia	62	Houston
24	Jacksonville	63	Memphis
25	Richmond	64	New Orleans
26	Washington	65	Oklahoma City
31	Cincinnati	71	Los Angeles
32	Cleveland	72	San Jose
33	Detroit	73	Salt Lake City
34	Indianapolis	74	Seattle
35	Lansing	81	Ford of Canada
36	Louisville	83	Government
41	Chicago	84	Home Office Reserve
42	Fargo	85	American Red Cross
43	Rockford	89	Transportation Services
44	Twin Cities	90-99	Export

REAR AXLE RATIO CODES

A number designates a conventional axle, while a letter designates an Equa-Lock differential.

Code	Ratio	Code	Ratio
1	3.00:1	A	3.00:1
3	3.20:1	C	3.20:1
4	3.25:1	D	3.25:1
5	3.50:1	E	3.50:1
6	2.80:1	F	2.80:1
7	3.80:1	G	3.80:1
8	3.89:1	H	3.89:1
9	4.11:1	I	4.11:1

TRANSMISSION CODES

Code	Type
1	3-Speed Manual
2	3-Speed Manual W/Overdrive
5	4-Speed Manual
6	Dual Range Automatic (C-4)

MODEL YEAR CODE

The number 5 designates 1965.

ASSEMBLY PLANT CODES

Code Letter	Assembly Plant	Code Letter	Assembly Plant
A	Atlanta	N	Norfolk
D	Dallas	P	Twin Cities
E	Mahwah	R	San Jose
F	Dearborn	S	Pilot Plant
G	Chicago	T	Metuchen
H	Lorain	U	Louisville
J	Los Angeles	W	Wayne
K	Kansas City	Y	Wixom
L	Michigan Truck	Z	St. Louis

ENGINE CODES

A	8 Cyl. 289 Cu. In. (4V Prem.)
C	8 Cyl. 289 Cu. In. (2V)
K	8 Cyl. 289 Cu. In. (4V Hi-Perf.)
T	6 Cyl. 200 Cu. In. (1V)
U	6 Cyl. 170 Cu. In. (1V)
2	6 Cyl. *200 Cu. In. (1V)
3	8 Cyl. *289 Cu. In. (2V)
4	6 Cyl. *170 Cu. In. (1V)

CONSECUTIVE UNIT NUMBER

Each model year, each assembly plant begins production with the number 100001 (Falcon, Fairlane or Mustang) or 500001 (Comet) and continues on for each unit built.

BRAKES

GROUP 2

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GENERAL BRAKE SERVICE 2-1
PART 2-2
BRAKE SYSTEM 2-8
PART 2-3 PAGE
SPECIFICATIONS 2-39

PART 2-1 GENERAL BRAKE SERVICE

Section Page
1 Diagnosis and Testing 2-1
2 Common Adjustments and Repairs 2-4
3 Cleaning and Inspection 2-6

1 DIAGNOSIS AND TESTING

PRELIMINARY TESTS

FLUID LEVEL

Check the fluid in the master cylinder, and add FoMoCo heavy-duty brake fluid.

AUTOMATIC ADJUSTERS

Push the brake pedal down as far as it will go while the car is standing. If the car is equipped with power brakes, the engine should be running while making this test. If the brake pedal travels more than half-way between the released position and the floor, check the automatic adjusters for being inoperative. To check adjuster operation, inspect the brake shoes and the adjuster components for binding or improper installation and follow the procedure described under "Brake Shoe Adjustments" in Part 2-2, Section 2.

Make several reverse stops to ensure uniform adjustment at all wheels.

HYDRAULIC SYSTEM

If the car is equipped with power brakes, shut off the engine and exhaust all vacuum from the booster system before performing this test.

Depress the brake pedal and hold it in the applied position. If the pedal gradually falls away under this pressure, the hydraulic system is leaking. Check all tubing hoses, and connections for leaks.

If the brake pedal movement feels spongy, bleed the hydraulic system to remove air from the lines and cylinder. See "Hydraulic System Bleeding", Section 2. Also, check for leaks or insufficient fluid.

BOOSTER

With the transmission in neutral, stop the engine and apply the parking brake. Depress the service brake pedal several times to exhaust all vacuum in the system. Then, depress the pedal and hold it in the applied position. Start the engine. If the vacuum system is operating, the pedal will tend to fall away under foot pressure and less pressure will be required to hold the pedal in the applied position. If no action is felt, the vacuum booster system is not functioning. Follow the procedures in the "Booster Diagnosis Guide."

For booster removal and installation procedures, refer to Part 2-2, Section 3. For disassembly and assembly procedures, refer to Part 2-2, Section 4. For cleaning and inspection refer to Part 2-1, Section 3.

LOCKED BRAKES

Should one of the brakes be locked and the car must be moved, open the brake cylinder bleeder screw long enough to let out a few drops of brake fluid. **This bleeding operation will release the brakes, but it will not correct the cause of the trouble.**

ROAD TEST

The car should be road tested only if the brakes will safely stop the car. Apply the brakes at a speed of 25-30 mph to check for the existence of the trouble symptoms listed in Table 1, with the exception of those resolved in the preliminary tests and brake chatter. For each of the symptoms encountered, check and eliminate the causes which are also listed in Table 1. To check for brake chatter or surge, apply the brakes lightly from approximately 50 mph.

TABLE 1—Disc Brake Trouble Symptoms and Possible Causes—Mustang 8 Cyl.

Possible Causes of Trouble Symptoms	Trouble Symptoms								
	Excessive Pedal Travel	Brake Roughness or Chatter (Pedal Pumping)	Excessive Pedal Effort	Pull	Rattle	Brakes Heat Up During Driving and Fail to Release	Leaky Wheel Cylinder	Grabbing or Uneven Braking Action	No Braking Effect When Pedal is Depressed
Shoe and Lining Knock-back after violent cornering or rough road travel	X								
Piston and Shoe and Lining Assembly Not Properly Seated or Positioned	X								X
Air Leak or Insufficient Fluid in System or Caliper	X								X
Loose Wheel Bearing Adjustment	X								
Damaged or Worn Caliper Piston Seal	X						X		X
Excessive Lateral Run-out of Rotor		X							
Rotor Excessively Out of Parallel		X							
Frozen or Seized Pistons			X	X		X		X	
Brake Fluid, Oil or Grease on Linings			X	X				X	
Shoe and Lining Worn Below Specifications			X						
Proportioning Valve Malfunction			X					X	
Caliper Out of Alignment with Rotor				X				X	
Loose Caliper Attachment				X				X	
Excessive Clearance Between Shoe and Caliper or Between Shoe and Splash Shield					X				
Shoe Hold-Down Clips Missing or Improperly Positioned					X				
Operator Riding Brake Pedal						X			
Scores in the Cylinder Bore							X		
Corrosion Build-up in the Cylinder Bore or on the Piston Surface							X		
Bleeder Screw Still Open									X
Caliper Out of Parallel with Rotor				X					

BOOSTER DIAGNOSIS GUIDE—FALCON, COMET, MUSTANG

BOOSTER INOPERATIVE—HARD PEDAL	If the preliminary tests show that the booster is inoperative or if a hard pedal condition still exists after eliminating the causes of "Excessive Pedal Effort" or "Hard Pedal" listed in Tables 1 and 2, the trouble may be caused by vacuum leakage. Disconnect the vacuum line at the booster, remove the vacuum manifold and check valve assembly, and look for a sticking or faulty check valve. Check all vacuum connections for leakage or obstruction. Check all hoses for a leaking or collapsed condition. Repair or replace parts as necessary. If the foregoing procedure does not eliminate the trouble, remove the booster from the car. Separate the front shell from the rear shell, and check the valve and rod assembly reaction disc, diaphragm plate, and diaphragm assembly for damage that would cause leaks. When assembling, be sure that the diaphragm assembly is properly positioned. Improper location could cause leakage between the vacuum and atmospheric sides of the diaphragm.

CONTINUED ON NEXT PAGE

TABLE 2—Drum Brake Trouble Symptoms and Possible Causes

Possible Causes of Trouble Symptoms	Trouble Symptoms												
	One Brake Drags	All Brakes Drag	Hard Pedal	Spongy Pedal	Car Pulls to One Side	One Wheel Locks	Brakes Chatter	Excessive Pedal Travel	Pedal Gradually Goes to Floor	Brakes Uneven	Shoe Click Release	Noisy or Grabbing Brakes	Brakes Do Not Apply
Mechanical Resistance at Pedal or Shoes Damaged Linkage		X	X										
Brake Line Restricted	X	X	X		X								
Leaks or Insufficient Fluid				X				X	X				X
Improper Tire Pressure					X					X			
Improperly Adjusted or Worn Wheel Bearing	X				X								
Distorted or Improperly Adjusted Brake Shoe	X	X	X		X	X		X				X	
Faulty Retracting Spring	X				X								
Drum Out of Round	X				X		X						
Linings Glazed or Worn			X		X	X	X	X				X	X
Oil or Grease ln Lining			X		X	X	X			X		X	X
Loose Carrier Plate	X					X	X						
Loose Lining					X		X						
Scored Drum										X		X	
Dirt on Drum-Lining Surface												X	
Faulty Wheel Cylinder	X				X	X						X	
Dirty Brake Fluid	X	X								X			X
Faulty Master Cylinder		X						X	X				X
Air in Hydraulic System	X			X				X					X
Self Adjusters Not Operating					X			X			X		
Insufficient Shoe-to-Carrier Plate Lubrication	X										X		
Tire Tread Worn						X							
Poor Lining to Drum Contact							X						
Loose Front Suspension							X						
"Threads" Left by Drum Turning Tool Pull Shoes Sideways											X		
Cracked Drum								X					
Sticking Booster Control Valve		X										X	

BOOSTER DIAGNOSIS GUIDE—FALCON, COMET, MUSTANG (Continued)

BRAKES DRAG OR GRAB	If the brakes still drag or grab after eliminating the causes listed in Tables 1 and 2, the condition is probably caused by a sticking valve plunger assembly. Remove and disassemble the booster. Clean, inspect, and replace parts as necessary.
SELF APPLICATION OF BRAKES WHEN ENGINE STARTS	Remove and disassemble the booster. Check for a leak in the rear shell. Check the diaphragm for being out of locating radii in the housing. Check for a sticking or unseated valve poppet. Clean, inspect, and replace parts as necessary. Be sure that the diaphragm is properly located when assembling.

CONTINUED ON NEXT PAGE

BRAKE BOOSTER TROUBLE DIAGNOSIS GUIDE—FAIRLANE

BOOSTER INOPERATIVE—HARD PEDAL	If the preliminary tests show that the booster is inoperative or if a hard pedal condition still exists after eliminating the causes of "Hard Pedal" listed in Table 2, the trouble may be caused by vacuum leakage. Disconnect the vacuum line (two lines if equipped with an automatic transmission) at the booster, remove the vacuum manifold and check valve assembly, and look for a sticking or faulty check valve. Check all vacuum connections for leakage or obstruction. Check all hoses for a leaking or collapsed condition. Repair or replace parts as necessary. If the foregoing procedure does not eliminate the trouble, remove the booster from the car. Separate the booster body from the end plate, and check the bellows, booster body, and diaphragm assembly for damage that would cause leaks. When assembling, be sure that the diaphragm assembly is properly positioned. Improper location could cause leakage between the vacuum and atmospheric sides of the diaphragm.
BRAKES DRAG OR GRAB	If the brakes still drag or grab after eliminating the causes listed in Table 1, the condition is probably caused by a sticking valve plunger assembly. Remove and disassemble the booster. Clean, inspect, and replace parts as necessary.
SELF APPLICATION OF BRAKES WHEN ENGINE STARTS	Remove and disassemble the booster. Check the diaphragm for being out of locating radii in the housing. Check for a sticking or unseated atmospheric valve. Clean, inspect, and replace parts as necessary. Be sure that the diaphragm is properly located when assembling.

2 COMMON ADJUSTMENTS AND REPAIRS

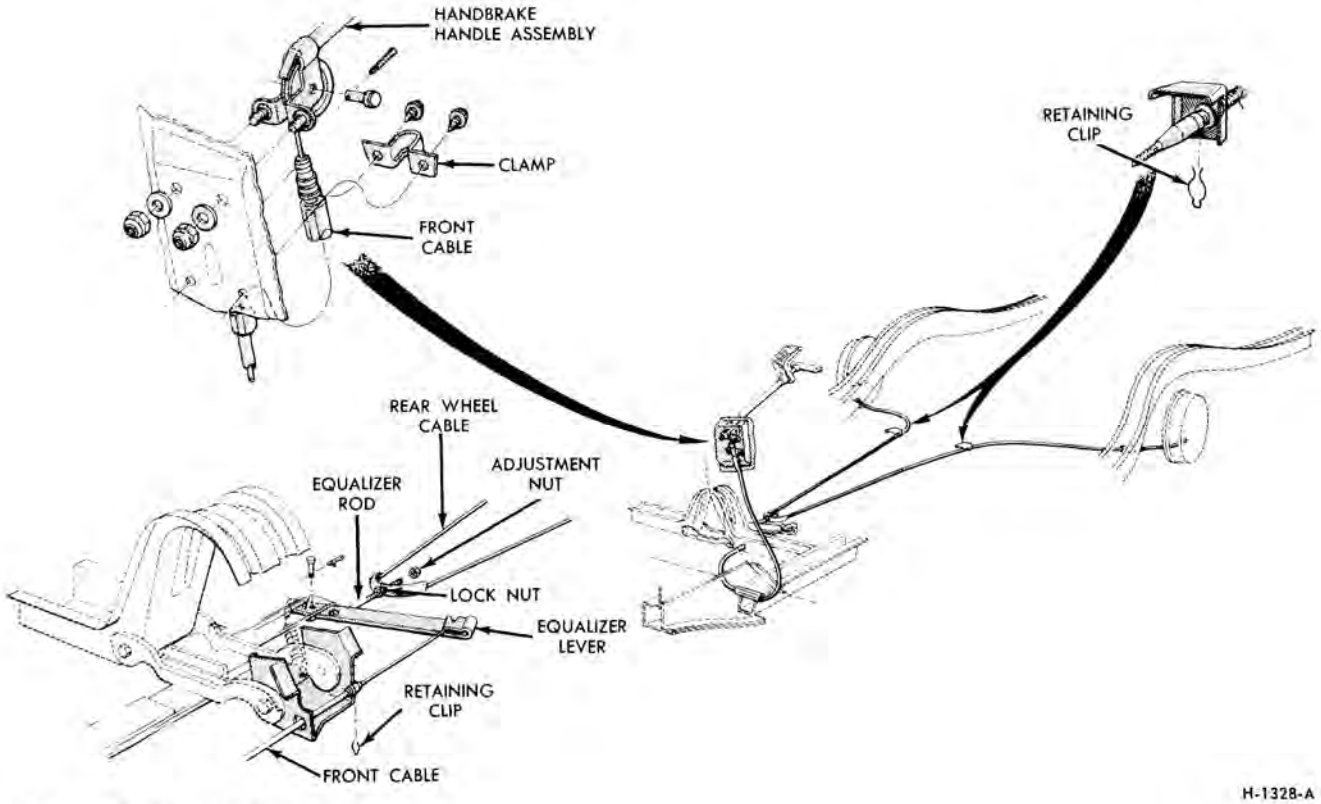


FIG. 1—Parking Brake Linkage

PARKING BRAKE LINKAGE ADJUSTMENT

Check the parking brake cables when the brakes are fully released. If the cables are loose, adjust them as follows:

1. Fully release the parking brake by turning the handle counterclockwise and pushing it inward.

2. Pull the parking brake handle outward to the third notch from its normal released position.

3. Raise the car.

4. On a Falcon, Comet or Fairlane, turn the lock nut in front of the equalizer (Fig. 1) several turns forward.

5. On all cars, turn the adjustment nut forward against the equalizer until a moderate drag is felt when turning the rear wheels in the direction of forward rotation.

6. When the cables are properly adjusted on a Falcon, Comet or Fairlane, tighten the lock nut against the equalizer.

7. Release the parking brake, and make sure that the brake shoes return to the fully released position and no drag is felt when turning the rear wheels.

POWER BRAKE MASTER CYLINDER PUSH ROD ADJUSTMENT—COMET AND MUSTANG

The push rod is provided with an adjustment screw to maintain the correct relationship between the booster control valve plunger and the master cylinder piston. Failure to maintain this relationship will prevent the master cylinder piston from completely releasing hydraulic pressure and can cause the brakes to drag, or cause excessive brake pedal travel.

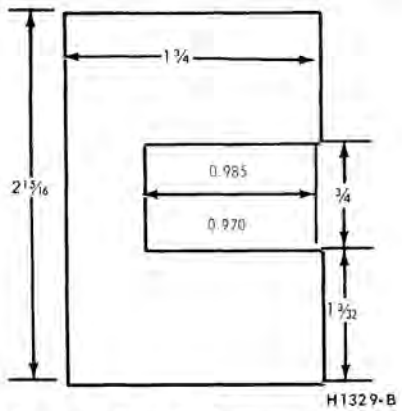


FIG. 2—Push Rod Gauge Dimensions

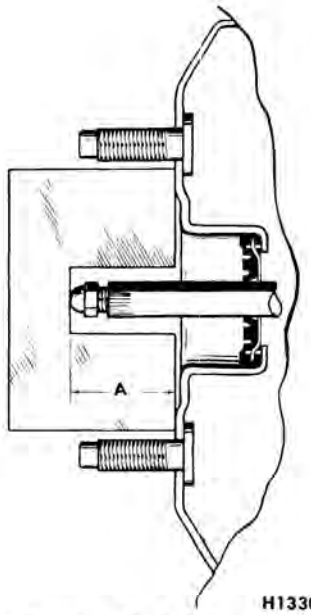


FIG. 3—Push Rod Adjustment

To check the adjustment of the screw, fabricate a gauge of the dimension shown in Fig. 2. Then place the gauge against the master cylinder mounting surface of the booster body as shown in Fig. 3. The push rod screw should be adjusted so that the end of the screw just touches the inner edge of the slot in the gauge. Do not set up side forces on the push rod. Side forces may break the valve plunger.

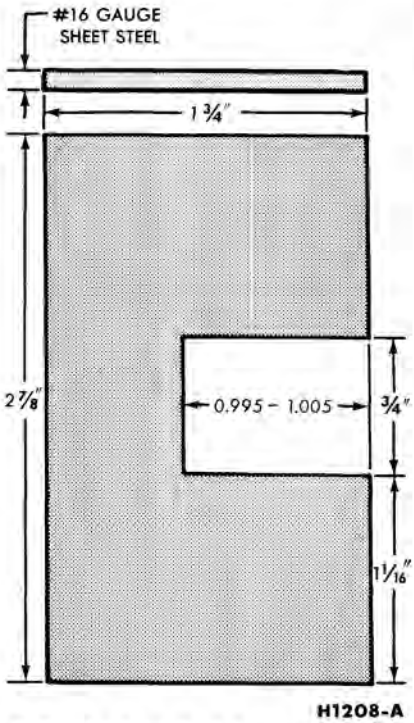


FIG. 4—Push Rod Gauge Dimensions—Fairlane

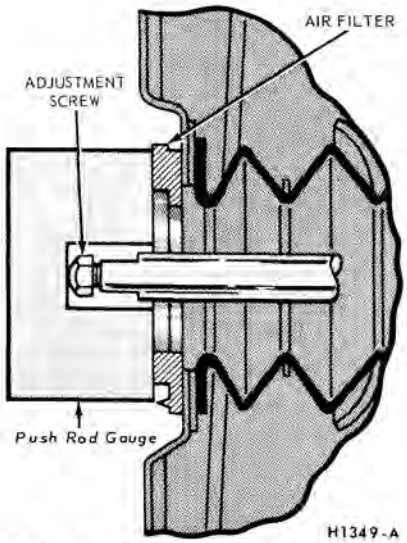


FIG. 5—Push Rod Adjustment —Fairlane

This is an approximate adjustment only. The master cylinder piston should not move more than 0.015 inch as it contacts the push rod. No movement (exact contact) is ideal.

POWER BRAKE MASTER CYLINDER PUSH ROD ADJUSTMENT—FAIRLANE

The push rod is provided with an adjustment screw to maintain the correct relationship between the booster control valve plunger and the master cylinder piston. Failure to maintain this relationship will prevent the master cylinder piston from completely releasing hydraulic pressure and can cause the brakes to drag.

To check the adjustment of the screw, fabricate a gauge of the dimensions shown in Fig. 4. Remove the air filter assembly and push the bellows back into the booster body. Re-install the air filter directly against the booster body, and then place the gauge against the master cylinder mounting surface of the air filter assembly as shown in Fig. 5. The push rod screw should be adjusted so that the end of the screw just touches the inner edge of the slot in the gauge. Do not set up side forces on the push rod as it may break the valve plunger.

This is an approximate adjustment only. To verify the adjustment, look

through the make-up (rear) port when installing the master cylinder to the booster. The master cylinder piston should not move more than 0.015 inch as it contacts the push rod. No movement (exact contact) is ideal.

HYDRAULIC SYSTEM BLEEDING

When any part of the hydraulic system has been disconnected for repair or replacement, air may get into the lines and cause spongy pedal action. Bleed the hydraulic system after it has been properly connected to be sure that all air is expelled from the brake cylinders or disc brake calipers, and lines.

The hydraulic system can be bled manually or with pressure bleeding equipment.

With disc brakes, more pumping of the pedal is required and more frequent checking of the master cylinder may be necessary while bleeding.

On a Mustang with disc brakes, remove the front wheel and tire assemblies in order to gain access to the bleeder fitting on the disc brake calipers.

MANUAL BLEEDING

Bleed the longest lines first. Keep the master cylinder reservoir filled with new SAE 70R3-Wagner 21B (301) brake fluid during the bleeding operation.

Never use brake fluid which has been drained from the hydraulic system.

1. Position a bent ⅜-inch box wrench on the bleeder fitting on the right rear brake wheel cylinder (Fig. 6). Attach a rubber drain tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

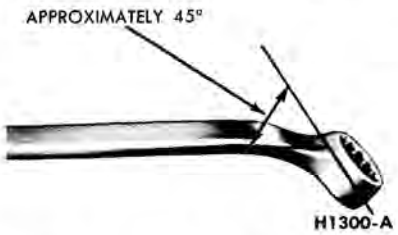


FIG. 6—Brake Bleeder Wrench

2. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting approximately ¾ turn.

3. Push the brake pedal down slowly through its full travel. Close the bleeder fitting, then return the pedal to the fully-released position. Repeat this operation until air bubbles cease to appear at the submerged end of the tube.

4. When the fluid is completely free of air bubbles, close the bleeder fitting and remove the drain tube.

5. Repeat this procedure on the brake cylinders or disc calipers at each wheel in order: left rear, right front, and left front. Refill the master cylinder reservoir after each brake cylinder is bled and when the bleeding operation is completed. The fluid level should be within ⅜ inch of the top of the reservoir. The diaphragm-type gasket should be properly positioned in the reservoir cap before the cap is installed.

6. On a Mustang with disc brakes, be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated.

7. Before driving the car, check the operation of the brakes and be sure that a firm pedal is obtained.

PRESSURE BLEEDING

Bleed the longest lines first. **Never use brake fluid which has been drained from the hydraulic system.**

The bleeder tank should contain enough new heavy-duty brake fluid to complete the bleeding operation, and it should be charged with 10-30 pounds of air pressure.

1. Clean all dirt from the master cylinder reservoir cap.

2. Remove the master cylinder reservoir cap, install an adapter cap to the reservoir, and attach the bleeder tank hose to the fitting on the adapter cap.

An adapter cap can be fabricated by cutting a hole in the center of a reservoir cap and soldering a fitting at the hole. The adapter cap must be securely seated and completely sealed on the master cylinder or leakage will occur.

3. Position a ⅜-inch box wrench on the bleeder fitting on the right rear brake wheel cylinder (Fig. 6). Attach a rubber drain tube to the bleeder fitting. **The end of the tube should fit snugly around the bleeder fitting.**

4. Open the valve on the bleeder tank to admit pressurized brake fluid to the master cylinder reservoir.

5. Submerge the free end of the tube in a container partially filled with clean brake fluid, and loosen the bleeder fitting.

6. When air bubbles cease to appear in the fluid at the submerged end of the drain tube, close the bleeder fitting and remove the tube.

7. Repeat this procedure on the brake cylinder or disc caliper at each wheel in order: left rear, right front, and left front. Refill the master cylinder reservoir after each brake cylinder is bled.

8. When the bleeding operation is completed, close the bleeder tank valve and remove the tank hose from the adapter fitting.

9. Remove the adapter cap, refill the master cylinder reservoir to within ⅜-inch from the top of the reservoir. Be sure that the diaphragm-type gasket is properly positioned in the reservoir cap, and then install the cap.

10. On a Mustang with disc brakes, be sure that the front brake pistons are returned to their normal positions and that the shoe and lining assemblies are properly seated.

11. Before driving the car, check the operation of the brakes and be sure that a firm pedal is obtained.

3 CLEANING AND INSPECTION

DISC BRAKES

1. Remove the wheel and tire assembly, caliper splash shield, and the shoe and lining assemblies as outlined in Part 2-2, Section 2.

2. Make three thickness measurements with a micrometer across the middle section of the shoe and lining. Take one reading at each side and one in the center. If the assembly has worn to a thickness of 0.195-inch (shoe and lining together) or 0.030 -inch (lining material only) at any one of the three measuring locations, replace all (4) shoe and lining assemblies on both front wheels.

3. With the shoe and lining assem-

blies installed, insert a feeler gauge between the lining and rotor. If the clearance is not within 0.002-0.010-inch, check for shoe and lining assemblies not being properly seated on the caliper bridges, for a piston pushed back in the cylinder bore, for a seized piston, or for malfunction of a piston seal.

Ordinarily, the clearance should be 0.002-0.010-inch. However, if the vehicle was stopped by a brake application just prior to checking the clearance, the brakes may drag slightly.

4. To check rotor runout, first eliminate the wheel bearing end play by tightening the adjusting nut. After tightening the nut check to see that the rotor can still be rotated.

5. Clamp a dial indicator to the caliper housing so that the stylus contacts the rotor at a point approximately 1-inch from the outer edge. Rotate the rotor and take an indicator reading. If the reading exceeds 0.002-inch total indicator runout, replace the rotor. **Do not attempt to refinish a rotor that indicates runout in excess of specification.** When the runout check is finished be sure to adjust the bearings as outlined in Group 3, in order to prevent bearing failure.

6. Check the rotor for scoring. Minor scores can be removed with a fine emery cloth. If the rotor is excessively scored, replace it.

7. Visually check the caliper. If it is cracked or if excess leakage is evident, it should be replaced. Slight leakage or seized pistons indicate removal and disassembly.

8. If upon disassembly the caliper is found to be distorted or damaged, or if the cylinder bores are scored or excessively worn, replace the assembly.

The two halves of the caliper assembly should never be separated. Damage or failure of one requires replacement of both as a unit.

DRUM BRAKES

1. Remove the wheel from the drum, and remove the drum as outlined in Part 2-2, Section 2. Wash all the parts except the brake shoes in a cleaning fluid and dry with compressed air.

2. Brush all dust from the carrier plate and interior of the brake drum.

3. Inspect the brake shoes for excessive lining wear or shoe damage. If the lining is worn to within 1/32-inch of the rivet heads or if the shoes are damaged, they must be replaced. Replace any lining that has been oil saturated. Replace the lining in axle sets. Prior to replacement of the lining, the drum diameter should be checked to determine if oversize linings must be installed.

4. Check the condition of the brake shoes, retracting springs, and drum for signs of overheating. If the shoes have a slight blue coloring, or if the springs show a change in free length, indicating overheating, replacement of the retracting and hold down springs is necessary. **Overheated springs lose their pull and could cause the new lining to wear prematurely if they are not replaced.**

5. If the car has 30,000 or more miles of operation on the brake linings, or signs of overheating are present when relining brakes, the wheel cylinders should be disassembled and inspected for wear and dirt in the cylinder. The cylinder cups and other parts contained in the overhaul kit should be replaced, thus avoiding future problems.

6. Inspect all other brake parts and replace any that are worn or damaged.

7. Inspect the brake drums and, if necessary, refinish. Refer to Part 2-2, Section 4 for refinishing.

BOOSTER UNIT—COMET

A disassembled view of the brake booster is shown in Fig. 41, Part 2-2.

After disassembly, immerse all metal parts in cleaning solvent. Clean the plastic parts in alcohol **only**, taking care to avoid chipping or damage. Replace all rubber parts. Use an air hose to blow out dirt and cleaning solvent from recesses and internal passages. When overhauling a vacuum booster, use all parts furnished in the repair kit.

BOOSTER UNIT—FAIRLANE

A disassembled view of the brake booster is shown in Fig. 50, Part 2-2.

After disassembly, immerse all metal parts in a suitable solvent. Use only alcohol on rubber parts or parts containing rubber. After the parts have been thoroughly cleaned and rinsed in cleaning solvent, the metal parts which come in contact with hydraulic brake fluid or rubber parts should be rewashed in clean alcohol before assembly. Use an air hose to blow dirt and cleaning fluid from the recesses and internal passages. When overhauling a power booster, use all parts furnished in the repair kit. **Discard all old rubber parts.**

Inspect all other parts for damage or excessive wear. Replace damaged or excessively worn parts. If the inside of the booster body is rusted or corroded, polish it with steel wool or fine emery cloth.

PART 2-2 BRAKE SYSTEM

Section		Page
1	Description and Operation	2- 8
2	In-Car Adjustments and Repairs	2-16
3	Removal and Installation	2-23
4	Major Repair Operations	2-31

1 DESCRIPTION AND OPERATION

Disc brakes are available as optional equipment for the front wheels on Mustang 8-cylinder cars. The hydraulic brake system employs single anchor, internal expanding and self-adjusting drum brake assemblies on the rear wheels of cars with disc brakes, and of front and rear wheels of all others.

A vacuum booster is available as optional equipment on Comet and Mustang models with an automatic transmission and on all Fairlane models.

A booster unit is not available on Mustang models equipped with disc brakes.

The master cylinder converts physical force from the brake pedal (and booster if so equipped) into hydraulic pressure against the pistons in the calipers (disc brakes) or in the wheel cylinders (drum brakes). The pistons in turn convert hydraulic pressure back into physical force at the brake shoes.

SELF ADJUSTING DRUM BRAKE ASSEMBLIES

The self-adjusting brake mechanism consists of a cable, cable guide, adjusting lever, and adjuster spring (Fig. 1 and 2). The cable is hooked over the anchor pin at the top and is connected to the lever at the bottom. The cable is connected to the secondary brake shoe by means of the cable guide. The adjuster spring is hooked to the primary brake shoe and to the lever. The automatic adjuster operates only when the brakes are applied while the car is moving rearward and only when the secondary shoe is free to move toward the drum beyond a predetermined point.

With the car moving rearward and the brakes applied, the "wrap-around" action of the shoes following the drum forces the upper end of the primary shoe against the anchor pin. The action of the wheel cylinder moves the upper end of the secondary shoe away from the anchor pin. The movement of the secondary shoe causes the cable to pull the adjusting lever upward and against the end of a tooth on the adjusting screw star-wheel. The upward travel of the lever increases as lining wear increases. When the lever can move upward far enough, it passes over the end of the tooth and engages the tooth. When the brakes are released, the adjusting spring pulls the lever downward causing the star-wheel to turn and expand the shoes. The star-wheel is turned one tooth at a time as the linings progressively wear.

With the car moving forward and the brakes applied, the secondary shoe is against the anchor pin and the primary shoe is moved toward the drum. Therefore, the adjuster does not operate.

The rear brake assembly is basically the same as the front brake. The conventional parking brake lever, link, and spring are used in the rear brake.

The anchor pins on all brakes are fixed and are non-adjustable.

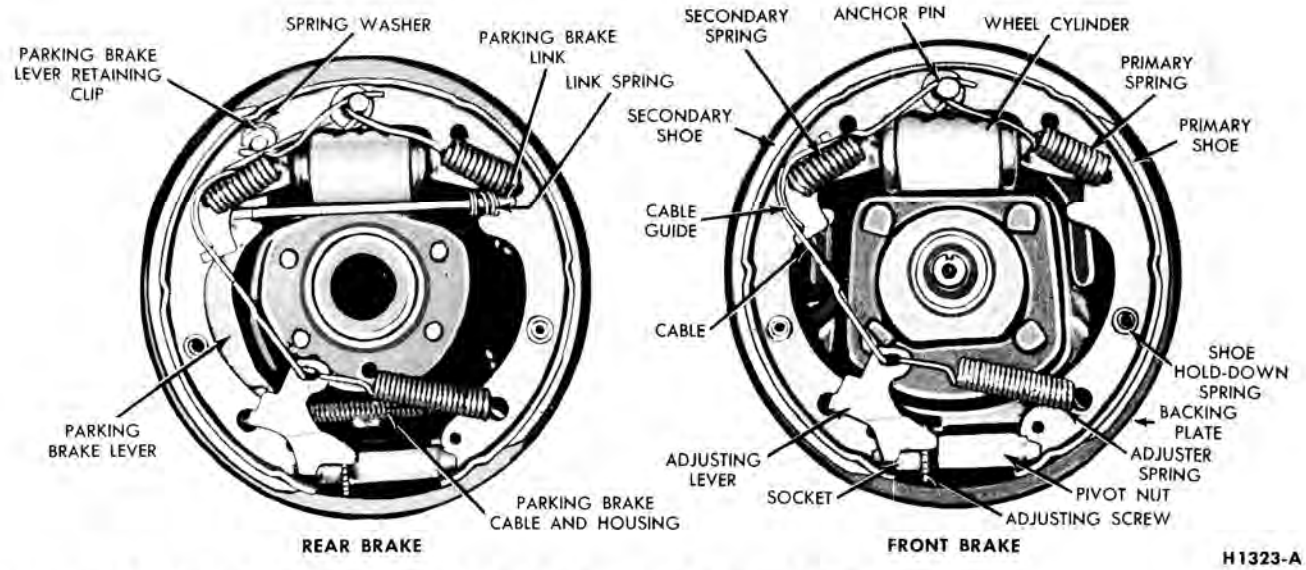


FIG. 1—Self Adjusting Brake Assemblies—Comet, Falcon, and Mustang 6-Cylinder Cars

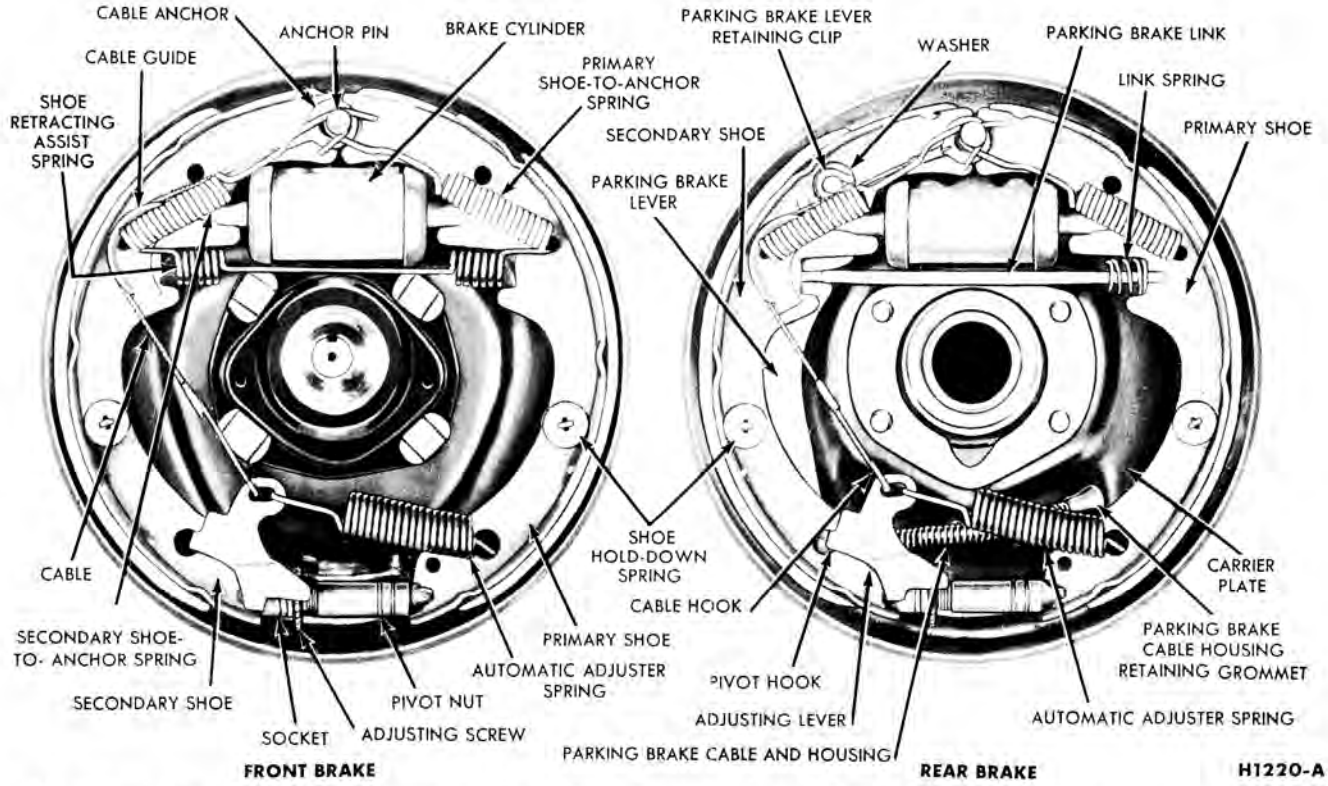


FIG. 2—Self Adjusting Brake Assemblies—All Fairlane & Falcon, Comet & Mustang—8-Cylinder Cars

DISC BRAKE ASSEMBLIES

RELATION AND FUNCTION OF COMPONENT PARTS

The disc brake is a fixed caliper, opposed piston, non-energized, ventilated disc type, actuated by a hydraulic system (Fig. 3). There is no lateral movement of either the disc (rotor) or the caliper. The caliper assembly consists of two caliper housings bolted together with each half containing two cylinder bores of 1-15/16" diameter. Each cylinder bore contains a piston with an attached molded rubber dust boot to seal the cylinder bore from contamination. (Fig. 4). Square-section rubber piston seals are positioned in grooves in the cylinder bores.

The piston seals perform three important tasks:

1. They provide hydraulic sealing between the cylinders and pistons.

2. They return the pistons to released position, when hydraulic pressure is released.

3. They maintain the shoes in correct adjustment at all times (comparable to the automatic adjusters in drum-type brakes).

The cylinders are connected hydraulically by means of internal passages in the caliper housing and an external transfer tube between the two halves of the caliper assembly. One bleeder screw and fluid inlet fitting is provided on each caliper assembly.

The shoe and lining assemblies are located in between parallel machined



FIG. 3—Mustang Disc Brake Assembly

abutments within the caliper, and are supported radially by tabs on the outer ends of the shoe assemblies (Fig. 36). The shoes slide axially in the caliper abutments by means of the tabs which ride on machined ledges (bridges) when hydraulic pressure is applied to the piston (Fig. 18). A shoe and lining assembly consists of friction material bonded to a metal plate called the shoe. It is replaced as a unit. Brake torque is absorbed by the mating of the shoe end against the caliper abutments (Fig. 36). A splash shield is attached to the top of the caliper to retain the shoe and lining assemblies and reduce contamination. The caliper assembly is mounted to a bracket located between the spindle and rotor splash shield, to the front of the wheel vertical centerline.

The cast iron disc is of the ventilated rotor type incorporating forty fins and is staked to, and rotates with, the wheel hub. The outside diameter of the rotor is 11.375 inches and the inside diameter is 7.375 inches. This type of design increases cooling area and permits circulation of air through the rotor resulting in more rapid cooling of the brake. A splash shield bolted to the spindle is used primarily to pre-

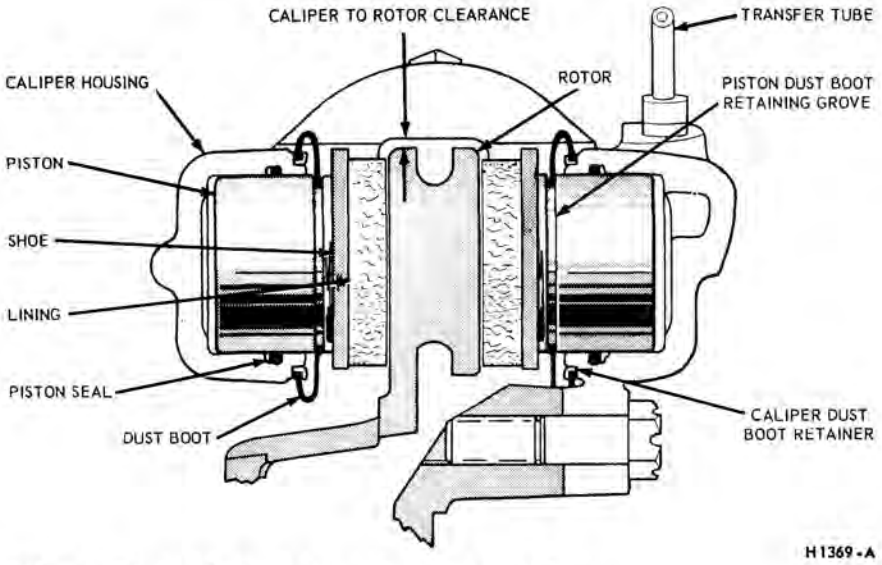


FIG. 4—Typical Caliper Assembly—Sectional View

vent road contaminants from contacting the inboard rotor and lining surfaces (Fig. 19). The wheel provides protection for the outboard surface of the rotor.

OPERATION

As the brake pedal is depressed, hydraulic pressure from the master cylinder forces the pistons out of the caliper bores against their respective shoe and lining assemblies. The force of the pistons against the shoes moves the linings against both sides of the revolving rotor to effect braking action.

During brake application, the rubber seal on each piston stretches as the piston moves against the shoe (Fig. 5). When the hydraulic pressure against the piston is released, the seal relaxes or rolls back. This roll-back action pulls the piston away from the shoe approximately 0.005-inch to relieve the force of the lining against the rotor and, thereby, provide the required running clearance. Also, inherent rotor runout contributes to the maintenance of running clearance. Automatic adjustment is achieved by the pistons sliding in the seals outward from the cylinder bores. The piston gradually changes its position relative to the seal as the lining wears and, thus, maintains the correct adjustment location at all times.

When the brakes are in the unapplied position, there is no hydraulic pressure to the calipers because the fluid source at the master cylinder by-passes the residual check valve.

A warning sound feature is incorporated in the design of the brake shoes. Metal tabs on the ends of the shoes create an audible metallic, scraping noise, when the linings become worn enough to allow the tabs to contact the rotor. This metal-to-metal contact warns the driver that the shoes need replacing and is not detrimental to the function of the disc brake.

A proportioning valve located between the master cylinder and the rear brake wheel cylinders provides balanced braking action between the front and the rear brakes under a wide range of braking conditions. (Fig. 22). By regulating the hydraulic pressure applied to the rear wheel cylinders, the valve limits rear braking action when high pressures are required at the front brakes. In this manner, premature rear wheel skid is prevented. The proportioning valve is serviced as an assembly and is never adjusted or overhauled.

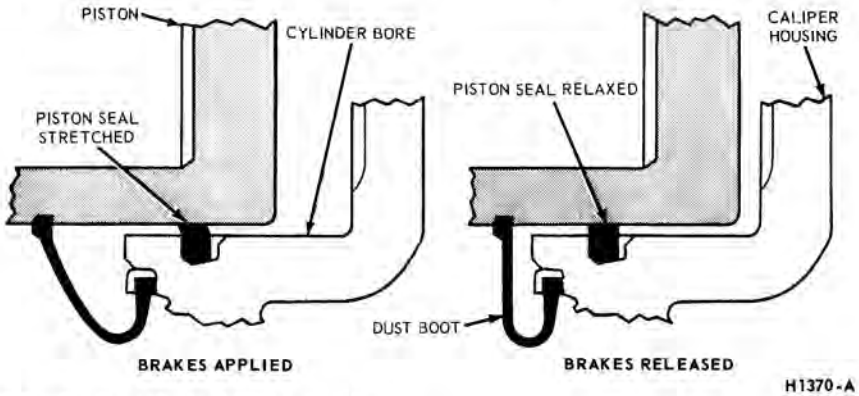


FIG. 5—Function of Piston Seal

BOOSTER SYSTEM—COMET

The diaphragm type brake booster (optional on Comet and Mustang models) is a self contained vacuum-hydraulic braking unit mounted on the engine side of the dash panel.

The vacuum power chamber consists of a front and rear shell locked together. Within the vacuum chamber are the rubber diaphragm and the integral valve hub and diaphragm plate. The rubber diaphragm fits over the plate, and the outer bead of the diaphragm is locked between the front and rear shells (Fig. 6). The diaphragm return spring is located between the diaphragm plate and the front shell.

The valve hub section of the diaphragm plate protrudes from the rear shell. A synthetic rubber seal is used between the valve hub and the rear shell. The seal and the valve hub are protected from dirt by a rubber guard connected between the air filter at the end of the hub and a flange on the rear shell. The control valve assembly fits into the hub and is connected to the brake pedal by the valve operating rod. The control valve assembly consists of a plunger, a valve body which supports a single poppet of flexible rubber, and two return springs. When the brake pedal is in the released position the valve return spring holds the valve assembly and operating rod away from the diaphragm plate. In this position, the poppet on the valve body is off the vacuum port seat which is a part of the diaphragm plate. The poppet return spring likewise holds the poppet against the atmospheric port seat which is a part of the plunger.

The hydraulic master cylinder which contains all of the components of the conventional master cylinder is bolted to the booster front shell.

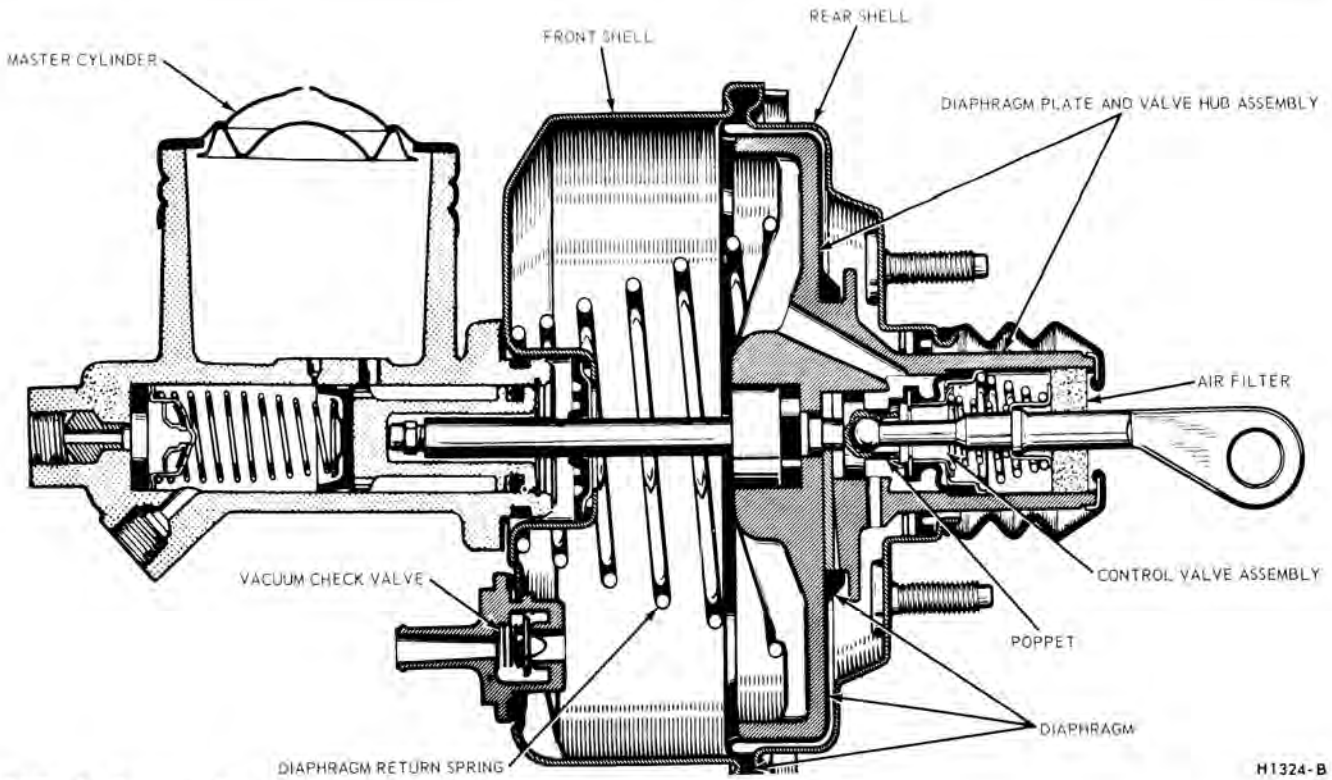


FIG. 6–Cutaway View of Vacuum Booster

The hydraulic push rod forms the link between the master cylinder piston and the vacuum power diaphragm assembly. The end of the push rod, that enters the master cylinder piston, is equipped with a self-locking adjusting screw. The opposite end has a piston head which enters the diaphragm plate. A seal, located in the front shell, seals the opening between the hydraulic push rod and the shell.

Engine manifold vacuum is supplied to the booster through a vacuum check valve located in the front shell. Air is admitted through the air filter located at the end of the valve hub. The hydraulic push rod is actuated by pedal pressure assisted by the diaphragm, which derives power from the pressure differential existing between the vacuum on its front side and atmospheric pressure on its rear side. A passage in the diaphragm plate permits vacuum to pass from the front to the rear side of the diaphragm when the vacuum port opens as the brakes are released.

RELEASED POSITION

With the engine running and the brakes released (Fig. 7), vacuum from the intake manifold is admitted through the check valve to the front (constant vacuum) chamber of the power unit. In the released position (no pressure applied to the brake pedal), the valve operating rod and valve plunger are held to the rear in the valve hub by the valve return spring to CLOSE the atmospheric port and OPEN the vacuum port. With the valve in this position, the rear (control vacuum) chamber is also open to vacuum through the porting in the diaphragm and valve hub assembly. The diaphragm is then "balanced" or suspended in vacuum, since vacuum is present on both sides of the power diaphragm. With the power diaphragm balanced in vacuum, the diaphragm return spring holds the diaphragm and hydraulic push rod in the fully released position. With the hydraulic push rod in this position, the hydraulic compensating port in the hydraulic master cylinder is OPEN . The open port permits brake fluid to either return from the brake system to the fluid reservoir or enter the brake system from the fluid reservoir to compensate for any gain or loss in fluid volume.

APPLIED POSITION

When the brakes are applied (Fig. 8), the valve operating rod and valve plunger move forward in the valve hub section of the diaphragm plate to compress the valve return spring and force the poppet against the vacuum valve seat in the diaphragm plate to "CLOSE" the vacuum port. Any additional movement of the valve operating rod in the applied direction moves the valve plunger away from the poppet valve to "OPEN" the atmospheric port and admit atmosphere through the air cleaner and passages in the diaphragm plate to the rear side of the power chamber. With vacuum present on the front side of the diaphragm and valve housing and atmospheric pressure present on the rear side of the diaphragm, a force is developed to move the vacuum power diaphragm assembly, hydraulic push rod and master cylinder piston forward to close the compensating port and force hydraulic fluid under pressure through the residual check valve and brake tubes into the brake wheel cylinders. As hydraulic pressure is developed in the brake master cylinder, a counter force (to the rear) acting through the hydraulic push rod, sets up a reaction force against the power diaphragm assembly and valve plunger through the rubber reaction disc (located at the end of the hydraulic push rod). The rubber reaction disc acts similar to a column of fluid to

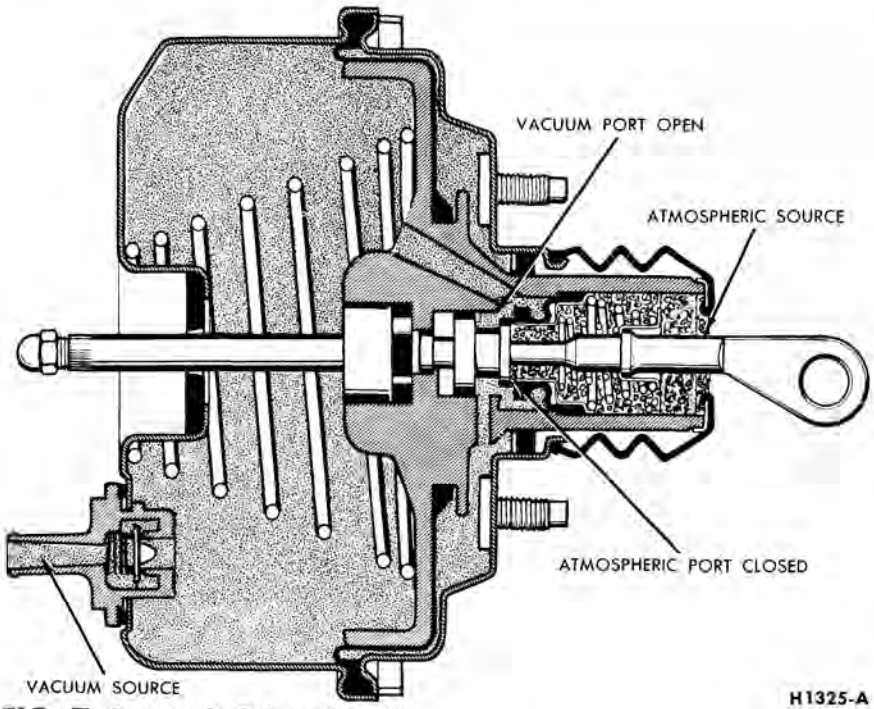


FIG. 7—Booster in Released Position

distribute the pressure between the vacuum power diaphragm assembly and the valve plunger in proportion to their respective contact areas. The pressure acting against the valve plunger and valve operating rod tends to move the valve plunger slightly to the rear in relation to the diaphragm and valve hub assembly to close off the atmospheric port. The driver is thus assured a "feel" of the brake, since part of the counter force reacts through the valve plunger, valve operating rod, and pedal linkage against the driver's foot. This reaction force is in direct proportion to the hydraulic pressure developed within the brake system.

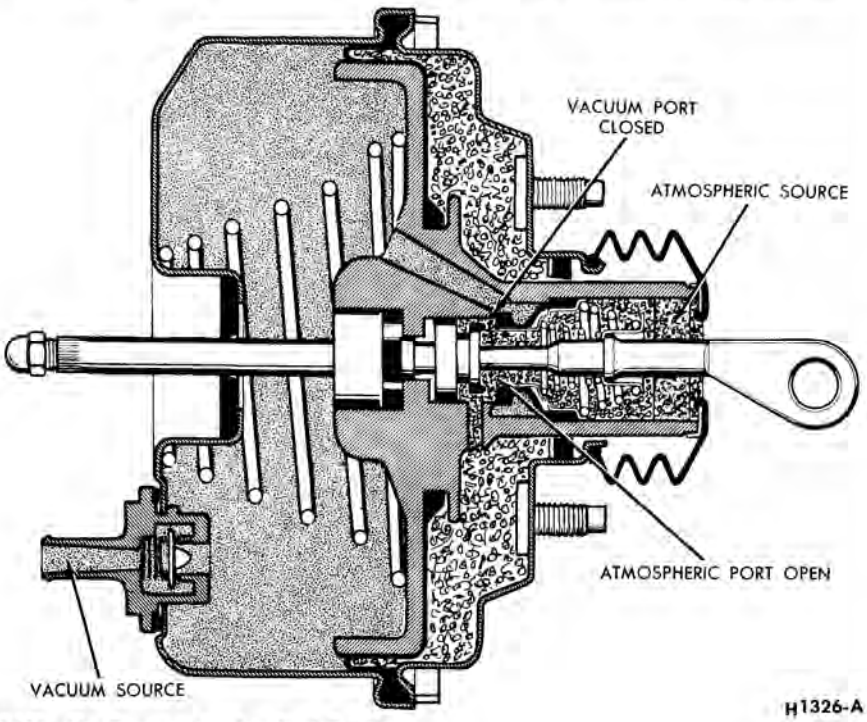


FIG. 8—Booster in Applied Position

HOLDING POSITION

During brake application, the "reaction" force which opposes the force applied by the driver, tends to close the atmospheric port. When both atmospheric and vacuum ports are CLOSED, the booster is said to be in the holding position (Fig. 9). With both valves closed, any degree of brake application attained will be held until either the atmospheric port is **reopened** by an increase in pedal pressure to further increase the brake application or by a decrease in pedal pressure to **reopen** the vacuum port to decrease the brake application. Whenever the pressure applied to the brake pedal is held constant for a moment, the valve returns to its holding position. However, upon reaching the fully applied position the force applied to the brake pedal overrules the reaction force. In this position the valve plunger and atmospheric valve seat are held away from the valve poppet to admit maximum atmospheric pressure to the rear chamber. With the front chamber open to manifold vacuum, full power application is attained which is referred to as the "run-out" of the power unit. Any increase in hydraulic pressure beyond this point must be supplied by physical effort of the driver.

NO POWER CONDITION

It should be noted that in case of engine failure and consequent loss of engine vacuum, at least one full power brake application may be made from the vacuum in the booster. With the engine off and no vacuum in the power system, the brakes can be applied in the conventional manner by applying more physical effort to the brake pedal.

BOOSTER SYSTEM—FAIRLANE

The optional power brake booster is installed on the engine side of the dash panel and is connected to the brake pedal through a lever assembly and push rod link.

The booster consists of a vacuum chamber, atmospheric valve, control valve plunger assembly, diaphragm, and an atmospheric chamber (Figs. 10, 11 and 12).

Atmospheric pressure is present at all times in the atmospheric chamber at the front side of the atmospheric valve. The air intake to the atmospheric chamber is protected by an air filter. The atmospheric chamber is separated from the vacuum

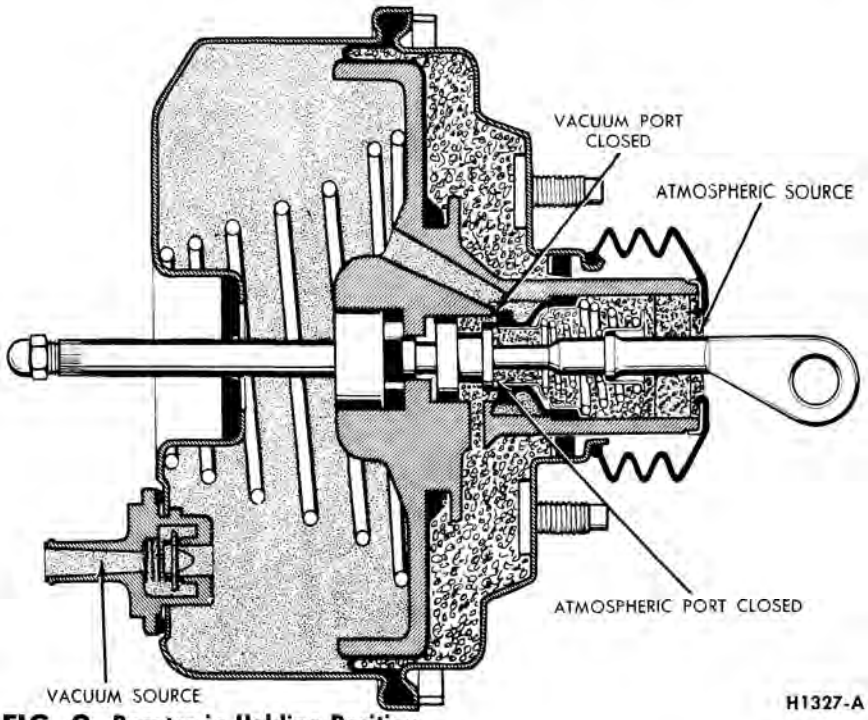


FIG. 9—Booster in Holding Position

chamber by the bellows assembly within the vacuum chamber.

Vacuum is present at all times in that area of the vacuum chamber forward of the diaphragm. Vacuum is supplied through a hose from the intake manifold to the vacuum manifold and check valve on the booster body. With this integral check valve and vacuum chamber, it is possible to obtain several power assisted brake applications with the engine shut off. This arrangement makes a vacuum reservoir unnecessary.

Either vacuum from the forward side of the diaphragm or air from the bellows (atmospheric chamber) can be connected to the rear side of the diaphragm through porting in the control valve hub and the plunger assembly.

APPLYING POSITION

As the brake pedal is depressed, the valve operating rod and valve plunger assembly move forward compressing the plunger return spring (Fig. 10). The initial movement of the plunger closes the porting from the vacuum chamber preventing further evacuation of the area back of the diaphragm. Further movement of the plunger forces the atmospheric valve off its seat so that atmospheric pressure from the bellows can enter the hub porting that leads to the rear side of the diaphragm.

With vacuum on the front side of the diaphragm and atmospheric pressure on the back side of the diaphragm, a force is developed to move the diaphragm, push rod and master cylinder piston forward to close the compensating port and force hydraulic fluid under pressure through the residual pressure check valve and brake tubes to the wheel brakes. As hydraulic pressure is developed in the hydraulic system, a reaction counter-force acts against the reaction lever and ring assembly. This reaction lever and ring assembly is designed to transmit the reaction forces back through the actuating control valve assembly to the brake pedal and provide the driver with a resistance that is in proportion to the brake hydraulic apply forces. This is the means of providing the proper "driver feel" to the power brake unit.

HOLDING POSITION

When the forward motion of the brake pedal is stopped and held, the valve operating rod ceases to move the control valve plunger forward. However, the unbalanced forces of atmospheric pressure and vacuum on each side of the diaphragm will continue to move the outer sleeve of the control valve plunger forward keeping the vacuum porting closed. At the same time, the reaction force acting through the reaction ring and lever assembly will tend to move the atmospheric valve to the closed position (Fig. 11). When these combined forces balance, the porting to the vacuum supply will remain closed and the atmospheric valve will cut off any further passage of atmospheric pressure to the area behind the diaphragm. Therefore, the power assist force acting on the master cylinder piston will stabilize and the hydraulic force applying the brakes will be maintained at a constant level.

RELEASED POSITION

When the pedal pressure is released from the valve operating rod and plunger assembly, the plunger return spring moves the plunger away from the atmospheric valve allowing the valve to seat against the hub (Fig. 12). This seating of the valve closes off the bellows chamber from the hub porting that connects to the rear side of the diaphragm. At the same time, the rearward movement of the plunger opens the porting from the vacuum chamber and draws out the air from the rear side of the power diaphragm. With vacuum on both sides of the diaphragm, the assist force against the master cylinder push rod is eliminated.

Also, a pressure differential is created by the presence of vacuum on the rear (small diameter) side of the valve hub and atmospheric (bellows) pressure on the front (large diameter) side. This pressure differential moves the valve hub and, with it, the valve plunger and diaphragm assembly back to the released position. This releasing action permits the brake shoe retracting springs, acting

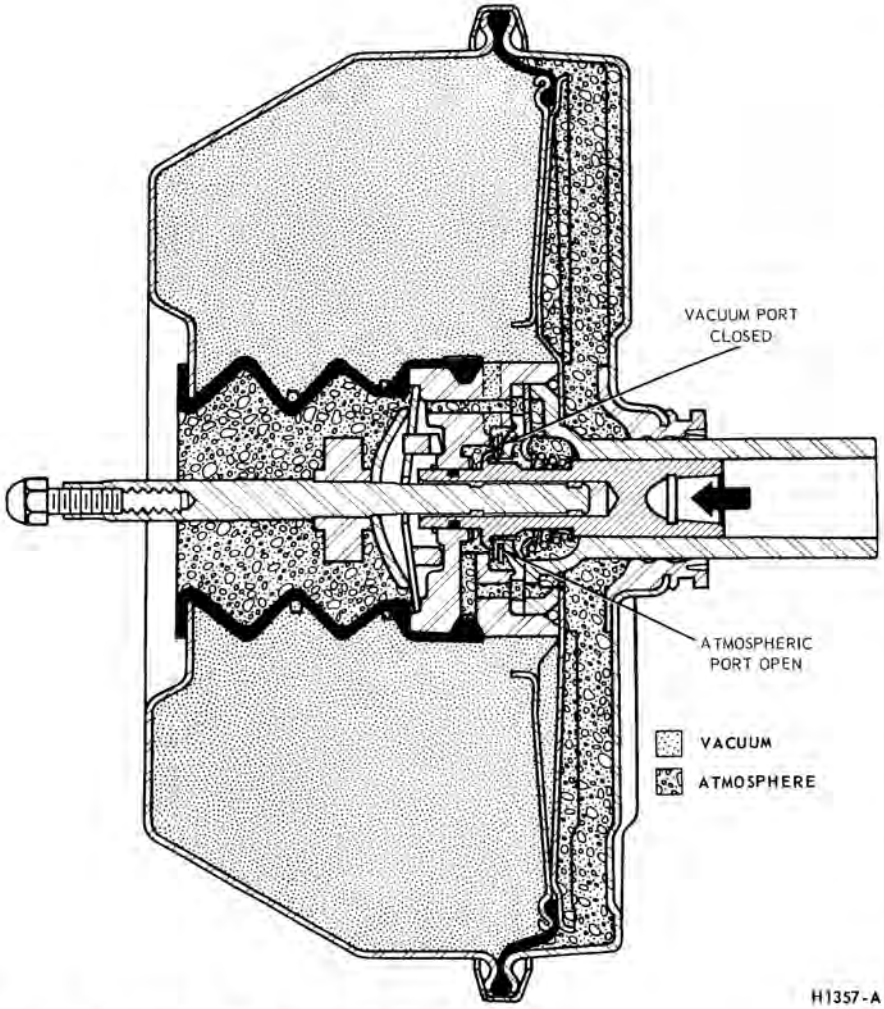


FIG. 10–Booster in Applying Position

through the wheel cylinder pistons and the hydraulic fluid, to return the master cylinder piston and push rod to the released position.

With the piston and push rod in the released position, the hydraulic compensating port in the master cylinder is open. The open port permits fluid to either return from the brake system to the fluid reservoir, or enter the brake system from the reservoir.

PARKING BRAKES

An independent hand - operated parking brake control actuates the rear wheel brake shoes through a cable linkage. The operating cable is routed from the parking brake control assembly to the equalizer lever which is attached to the equalizer assembly. The rear brake cables connect the equalizer assembly to the parking brake lever at each rear secondary shoe as shown in Figs. 1 and 2.

When the handle is pulled the primary and secondary brake shoes are forced against the rear brake drums. The handle is held in the applied position by the engagement of a spring loaded pawl with a ratchet. Turning the handle counterclockwise disengages the pawl from the ratchet to release the brakes.

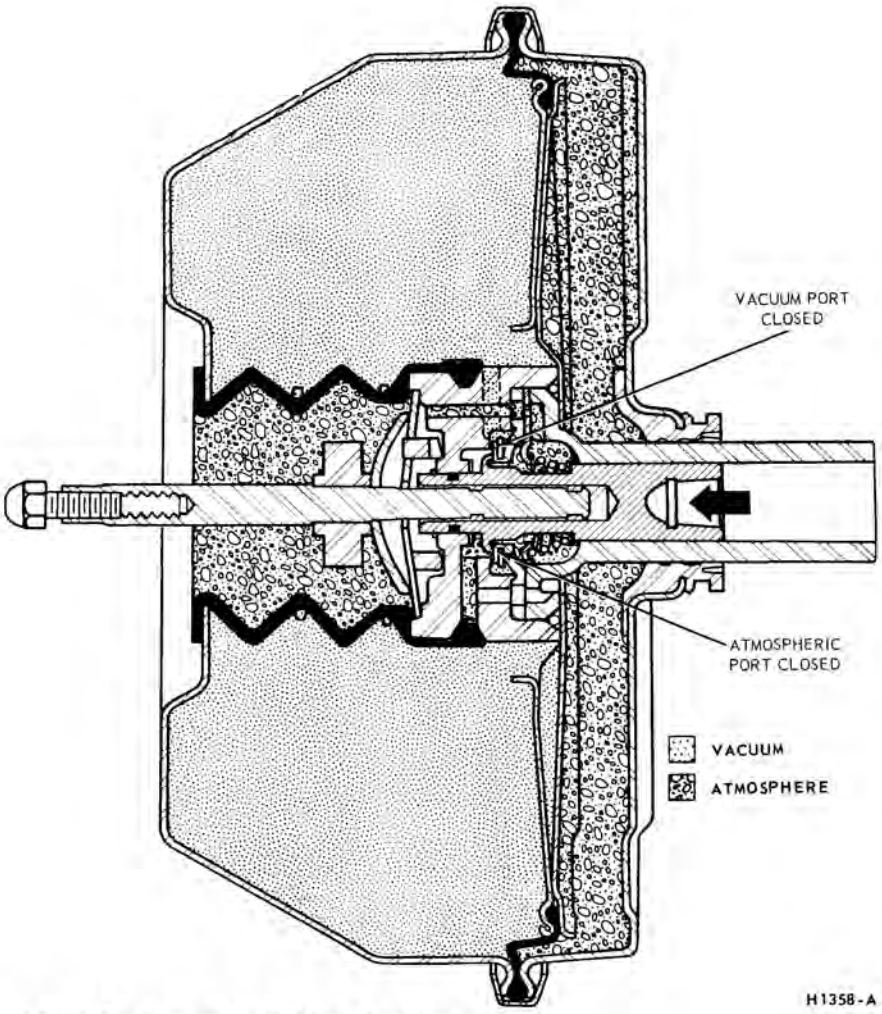


FIG. 11—Booster in Holding Position

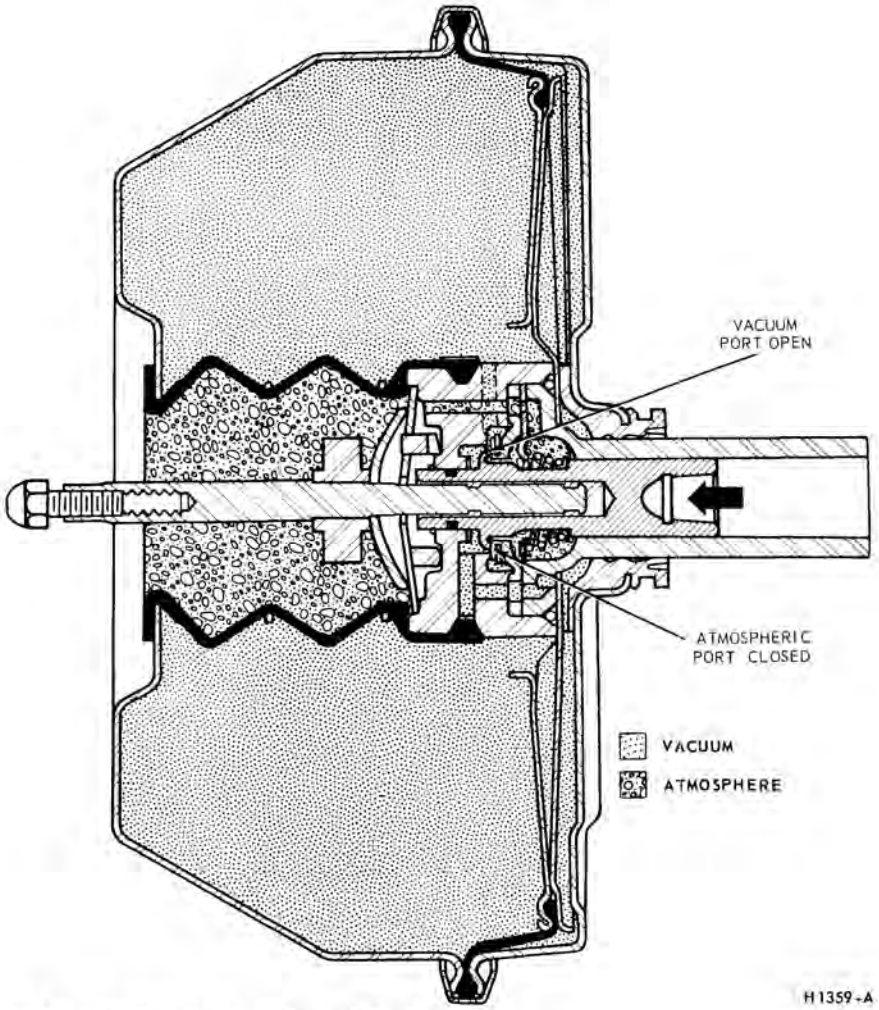


FIG. 12—Booster in Released Position

2 IN-CAR ADJUSTMENTS AND REPAIRS

BRAKE SHOE ADJUSTMENTS

The car should be in a raised position with the wheels off the floor.

The hydraulic service brakes are self-adjusting and require a manual adjustment only after the brake shoes have been relined, replaced, or when the length of the adjusting screw has been changed while performing some other service operation.

The brake drums should be at normal room temperature when adjusting the brake shoes. If the shoes are adjusted when the drums are hot and expanded, the shoes may drag when the drums are cool and contracted.

1. After the shoes have been installed or the adjusting screw has been turned, install the drum. Be sure that all excess grease, oil, and other foreign material are wiped off the backing plate and drum.

Before installing the brake drum on the front wheel spindle, wipe the spindle completely free of grease. Install the drum carefully so that the grease seal retainers within the hub will not be damaged.

2. Remove the adjusting hole cover from the backing plate. Working from the backing plate side, turn the adjusting screw upward to expand the shoes (Fig. 13). Expand the shoes until a drag is felt when the drum is rotated.

3. Remove the drum. Mark the tooth on the star-wheel where the adjusting lever contacts it. While



Brake Shoe Adjusting Tool **H1122-A**

FIG. 13—Expanding Brake Shoes

holding the adjusting lever out of engagement with the adjusting screw, back off the adjusting screw ¾ of a turn with the fingers. If finger movement will not turn the screw, free it up; otherwise, the self-adjusting lever will not turn the screw. Lubricate the screw with a thin uniform coating of CIAZ-19590-B grease.

Any other adjustment procedure may cause damage to the adjusting screw with consequent self-adjuster problems.

4. Apply a small quantity of high-temperature grease to the points where the shoes contact the backing plate, being careful not to get the lubricant on the linings. Install the drum.

On front wheels, install the wheel outer bearing, washer, and adjusting nut, then adjust the wheel bearings as outlined in Part 3-4, Section 2.

On the rear wheels, install the three Tinnerman nuts and tighten securely.

5. Install the wheel on the drum and tighten the mounting nuts to specification.

6. Install the adjusting hole cover on the brake backing plate.

7. When adjusting the rear brake shoes, check the parking brake cables for proper adjustment. Make sure that the equalizer lever operates freely.

8. After the brake shoes have been properly adjusted, check the operation of the brakes.

FRONT BRAKE DRUM

REMOVAL

1. Raise the car until the wheel and tire clear the floor. Remove the wheel cover or hub cap, and remove the wheel and tire assembly from the drum.

2. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone.

3. Pull the hub and drum assembly off the spindle.

If the brake drum will not come off easily, insert a narrow screwdriver through the brake adjusting hole in the backing plate, and disengage the adjusting lever from the adjusting screw. While thus holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool shown in Fig. 14. **Back off the adjustment only if the drum cannot be removed. Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise, the self-adjusting mechanism will not function properly.** If the adjustment was backed off, make sure that the adjuster lever is properly seated in the shoe web.

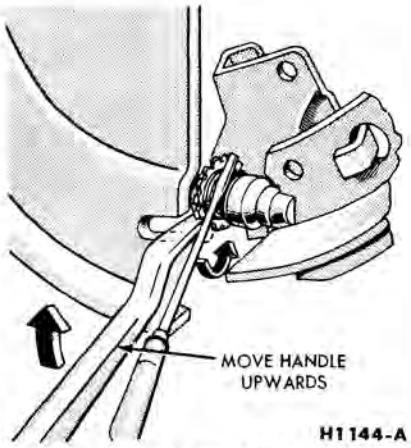


FIG. 14—Backing Off Brake Adjustment

INSTALLATION

1. If the drum is being replaced, remove the protective coating from the new drum with carburetor degreaser. Install new bearings and grease retainer. Soak the new grease retainer in light engine oil at least 30 minutes before installation. Pack the wheel bearings, install the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer. See Part 3-4, Section 4.

If the original drum is being installed, make sure that the grease in the hub is clean and adequate.

2. Install the drum assembly, outer wheel bearing, washer and the adjusting nut.

3. Adjust the wheel bearing as outlined in Part 3-1, Section 2. Install the nut lock and cotter pin. Then install the grease cap.

4. Install the wheel and hub cap. If the adjustment was backed off, adjust the brake as outlined under "Brake Shoe Adjustments."

REAR BRAKE DRUM

REMOVAL

1. Raise the car so that the wheel is clear of the floor.

2. Remove the hub cap and wheel. Remove the three Tinnerman nuts and remove the brake drum.

If the brake drum will not come off, insert a narrow screwdriver through the brake adjusting hole in the backing plate, to disengage the adjusting lever from the adjusting screw. While holding the adjusting lever away from the adjusting screw, back off the adjusting screw with the brake adjusting tool (Fig. 14). **Back off the adjustment only if the drum cannot be removed easily. Be very careful not to burr, chip, or damage the notches in the adjusting screw which may cause malfunction in the self-adjusting mechanism.** If the adjustment was backed off, make sure that the adjuster lever is properly seated in the shoe web.

INSTALLATION

1. Remove the protective coating from a new drum with carburetor degreaser.

2. Place the drum over the brake assembly and into position. Adjust the brakes as outlined under "Brake Shoe Adjustments" in this section.

3. Install the three Tinnerman nuts and tighten them securely. Install the wheel on the axle shaft flange studs against the drum, and tighten the retaining nuts to specifications.

BRAKE SHOES AND ADJUSTING SCREW

REMOVAL

1. With the wheel and drum removed, install a clamp over the ends of the wheel cylinder as shown in Fig. 15.

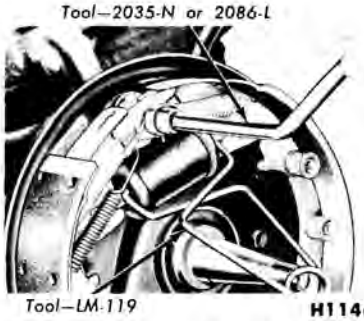


FIG. 15—Retracting Spring Removal—Typical

2. Contract the shoes as follows:
   a. Disengage the adjusting lever from the adjusting screw by pulling backward on the adjusting lever (Figs. 1 and 2).
   b. Move the outboard side of the adjusting screw upward and back off the pivot nut as far as it will go.

3. Pull the adjusting lever, cable and automatic adjuster spring down and toward the rear to unhook the pivot hook from the large hole in the secondary shoe web. **Do not attempt to pry the pivot hook out of the hole.**

4. Remove the automatic adjuster spring and adjusting lever (Figs. 1 and 2).

5. On cars equipped with a 6-cylinder engine, remove the secondary shoe to anchor spring with the tool shown in Fig. 15. Unhook the cable eye from the anchor pin. With the same tool, remove the primary shoe to anchor spring. On cars equipped with an 8-cylinder engine, unhook the secondary and the primary shoe to anchor springs. Unhook the cable eye from the anchor pin.

6. Remove the cable guide from the secondary shoe (Figs. 1 and 2).

7. Remove the shoe hold-down springs, shoes, adjusting screw, pivot nut, and socket.

8. On rear brakes, remove the parking brake link and spring. Disconnect the parking brake cable from the parking brake lever.

9. After removing the rear brake secondary shoe, disassemble the parking brake lever from the shoe by removing the retaining clip and spring washer (Figs. 1 and 2).

INSTALLATION

1. Before installing the rear brake shoes, assemble the parking brake lever to the secondary shoe and secure it with the spring washer and retaining clip.

2. Apply a light coating of high-temperature grease at the points where the brake shoes contact the backing plate.

3. Position the brake shoes on the backing plate and secure them with the hold down springs. On the rear brake, install the parking brake link and spring. Connect the parking brake cable to the parking brake lever.

4. On all Fairlanes and on Falcon, Comet and Mustang models equipped with an 8-cylinder engine, position the adjuster cable eye over the anchor pin with the crimped side toward the backing plate.

Install the cable guide on the secondary shoe web with the flanged hole properly fitted into the hole in the secondary shoe web. Install the secondary shoe to anchor spring. Install the primary shoe to anchor spring.

5. On a Falcon, Comet or Mustang car equipped with a 6-cylinder engine, install the cable guide on the secondary shoe web with the flanged hole properly fitted into the hole in the secondary shoe web. Install the secondary shoe to anchor spring (Figs. 1 and 2)

Place the cable eye over the anchor pin with the crimped side toward the backing plate. Install the primary shoe to anchor spring with the tool shown in Fig. 16.

6. Thread the cable around the cable guide groove.

It is imperative that the cable be positioned in this groove and not between the guide and the shoe web. Be certain that the cable eye is not cocked or binding on the anchor pin when installed. All parts should be flat on the anchor pin. Remove the brake cylinder clamp.

7. Apply high-temperature grease to the threads and the socket end of the adjusting screw. Turn the adjusting screw into the adjusting pivot nut to the limit of the threads and then back off ½ turn.

Interchanging the brake shoe adjusting screw assemblies from one side of the car to the other would cause the brake shoes to retract rather than expand each time the automatic adjusting mechansim operated. To prevent accidental installation of the adjusting screw on the wrong side of the car the socket end

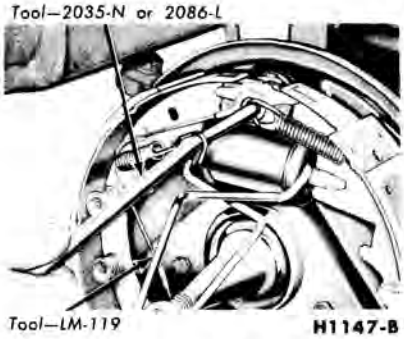


FIG. 16—Retracting Spring Installation—Typical

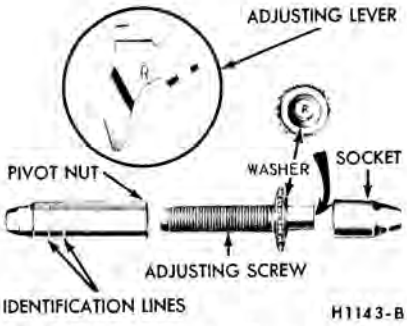


FIG. 17—Adjusting Screw and Lever Identification

of the adjusting screw is stamped with an R or L (Fig. 17). The adjusting pivot nuts can be distinguished by the number of grooves machined around the body of the nut. Two grooves indicate a right-hand nut: one grove indicates a left-hand nut.

8. Place the adjusting socket on the screw and install this assembly between the shoe ends with the adjusting screw toothed wheel nearest the secondary shoe.

9. Hook the cable hook into the hole in the adjusting lever. The adjusting levers are stamped with an R or L to indicate their installation on a right-or left-hand brake assembly (Fig. 17).

10. Position the hooked end of the adjuster spring completely into the large hole in the primary shoe web. The last coil of the spring should be at the edge of the hole. Connect the loop end of the spring to the adjuster lever hole (Figs. 1 and 2).

11. Pull the adjuster lever, cable and automatic adjuster spring down and toward the rear to engage the pivot hook in the large hole in the secondary shoe web.

12. After installation, check the action of the adjuster by pulling the section of the cable between the cable guide and the adjusting lever toward the secondary shoe web far enough to lift the lever past a tooth on the adjusting screw wheel. The lever should snap into position behind the next tooth, and release of the cable should cause the adjuster spring to return the lever to its original position. This return action of the lever will turn the adjusting screw one tooth.

If pulling the cable does not produce the action described, or if the lever action is sluggish instead of positive and sharp, check the posi-

tion of the lever on the adjusting screw toothed wheel. With the brake in a vertical position (anchor at the top), the lever should contact the adjusting wheel 3/16 inch (plus or minus 1/32 inch) above the centerline of the screw. If the contact point is below this centerline, the lever will not lock on the teeth in the adjusting screw wheel, and the screw will not be turned as the lever is actuated by the cable.

To determine the cause of this condition:

a. Check the cable end fittings. The cable should completely fill or extend slightly beyond the crimped section of the fittings. If it does not meet this specification, possible damage is indicated and the cable assembly should be replaced.

b. Check the cable length. The cable should measure 8 3/16 inches on 6-cylinder models or 10 1/8 inches on 8-cylinder models from the end of the cable anchor to the end of the cable hook.

c. Check the cable guide for damage. The cable groove should be parallel to the shoe web, and the body of the guide should lie flat against the web. Replace the guide if it shows damage.

d. Check the pivot hook on the lever. The hook surfaces should be square with the body of the lever for proper pivoting. Replace the lever if the hook shows damage.

e. See that the adjusting screw socket is properly seated in the notch in the shoe web.

DISC BRAKE SHOE AND LINING REPLACEMENT

After any brake service work, obtain a firm brake pedal before moving the car. Riding the brake pedal (common on left foot applications) should be avoided when driving the car.

REMOVAL

1. Remove the wheel and tire assembly from the hub and rotor assembly. **Be careful to avoid damage or interference with the caliper splash shield, bleeder screw fitting or transfer tube.**

2. Remove the two bolts that retain the caliper splash shield, and remove the shield (Fig. 3).

3. To facilitate removal and installation of the shoe and lining assemblies, the pistons must be pushed into their bores. Apply a steady inward pressure against each shoe and lining assembly toward its respective caliper housing on each side of the rotor (Fig. 4). Maintain the pressure for at least a minute. If the pistons will not go in easily, force them in with water pump pliers.

4. Grasp the metal flange on the outer end of the shoe with two pairs of pliers and pull the shoe out of the caliper (Fig. 18).

CLEANING AND INSPECTION

When the shoe and lining assemblies are replaced, remove the dust boots from the pistons. Check the condition of the boots, and inspect each piston surface for damage or corrosion. Thoroughly clean each dust boot and surrounding area before installing.

INSTALLATION

1. Position a new shoe and lining assembly on each side of the rotor so that the lining faces the rotor. Be sure that the tabs on the shoe flanges seat fully against the caliper bridges (Fig. 18).

2. Install the caliper splash shield and secure the shield to the caliper with two retaining bolts (Fig. 3).

3. Pump the brake pedal several times until a firm pedal is obtained and the shoe and lining assemblies are properly seated.

4. Install the wheel and tire assembly on the hub and rotor assembly.

5. Check and refill the master cylinder reservoir with specified brake fluid as required.

6. Road test the car.

It should not be necessary to bleed the system after a shoe and lining replacement.

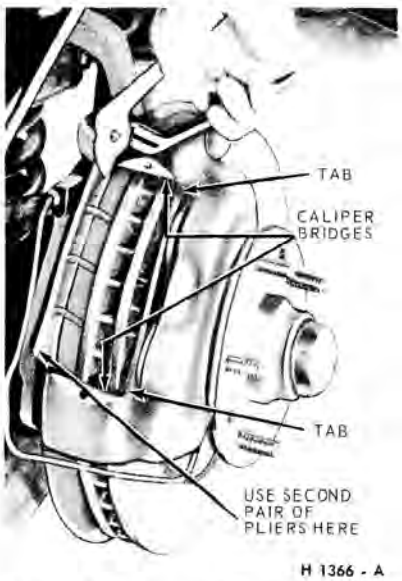


FIG. 18—Removing Disc Brake Shoe & Lining Assembly—Typical

DISC BRAKE CALIPER ASSEMBLY

REMOVAL

1. Remove the wheel and tire assembly from the hub and rotor assembly. **Be careful to avoid damage or interference with the caliper splash shield, bleeder screw fitting or transfer tube.**

2. Disconnect the front brake flexible hose from the brake tube at the bracket on the frame (Fig. 22).

3. Remove the two bolts that retain the caliper to the mounting bracket.

Take care to avoid loosening the bridge bolts that hold the two halves of the caliper together.

4. Lift the caliper assembly off the rotor.

INSTALLATION

1. Position the caliper assembly on the rotor, and mate the mounting bolt holes in the caliper with those in the spindle. It may be necessary to push the caliper pistons into the cylinder bores to obtain clearance between the shoe and lining assemblies and the rotor. The shoe and lining assemblies should be seated properly on the bridges.

2. Install the caliper to mounting bracket retaining bolts and torque to specification. Check to insure that the rotor runs squarely and centrally between the two halves of the caliper. There should be approximately 0.090-0.120 inch clearance between the caliper and the rotor outside diameter (Fig. 4).

3. Connect the front wheel brake flexible hose to the brake tube at the bracket on the frame (Fig. 22). The hose should be checked for correct routing.

4. Bleed the brake system as outlined in Section 2-1. Check the master cylinder fluid level, and the specified brake fluid as required.

5. Pump the brake pedal several times to actuate the piston seals and to position the shoe and lining assemblies.

6. Install the wheel and tire assembly.

7. Road test the car.

FRONT WHEEL HUB AND ROTOR ASSEMBLY—DISC BRAKES

REMOVAL

1. Remove the wheel and tire assembly from the hub and rotor assembly (Fig. 19). **Be careful to avoid damage or interference with the caliper splash shield, bleeder screw fitting or transfer tube.**

2. Remove the caliper assembly from the spindle and the rotor. If the caliper does not require servicing, it is not necessary to disconnect the brake hose or remove the caliper from the car. Position the caliper out of the way, and support it with a wire to avoid damaging the caliper or stretching the hose. Insert a **clean** cardboard spacer between the linings to prevent the pistons from coming out of the cylinder bores while the caliper is removed.

Handle the rotor and caliper assemblies in such a way as to avoid deformation of the rotor and nicking or scratching of the brake linings.

3. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly.

4. Remove the hub and rotor assembly from the spindle.

INSTALLATION

1. If the rotor is being replaced, remove the protective coating from the new rotor with carburetor degreaser. Pack a new set of bearings with specified grease, and install the inner bearing cone and roller assembly in the inner cup. Pack grease lightly between the lips of a new grease retainer and install the retainer (Fig. 19).

If the original rotor is being installed, make sure that the grease in the hub is clean and adequate, that the inner bearing and grease retainer are lubricated and in good condition, and that the rotor braking surfaces are clean.

2. Install the hub and rotor assembly on the spindle.

3. Lubricate and install the outer wheel bearing, washer and adjusting nut.

4. Adjust the wheel bearings to specification, and then install the nut lock, cotter pin, and grease cap. **The wheel bearing adjustment is especially important with disc brakes.**

5. Mount the caliper assembly on the mounting bracket and torque the two mounting bolts to specification. If necessary, push the caliper pistons into the cylinder bores to obtain clearance between the shoe and lining assemblies and the rotor. Be sure that the shoe and lining assemblies are seated on the bridges. Check the flexible hose for correct routing.

6. Install the wheel and tire on the hub and rotor assembly.

DISC BRAKE ROTOR SPLASH SHIELD

REMOVAL

1. Remove the caliper and the hub and rotor assembly as outlined under "Removal" in the foregoing procedure.

2. Remove the four nuts that retain the splash shield to the mounting bracket and remove the shield (Fig. 19).

3. Remove the gasket.

INSTALLATION

1. Install the gasket.

2. If the shield is bent, straighten it out before installation. Position the shield to the mounting bracket, install the retaining nuts, and torque to specification (Fig. 19).

3. Install the hub and rotor assembly and the caliper as outlined under "Installation" in the foregoing procedure.

PROPORTIONING VALVE

The proportioning valve is serv-

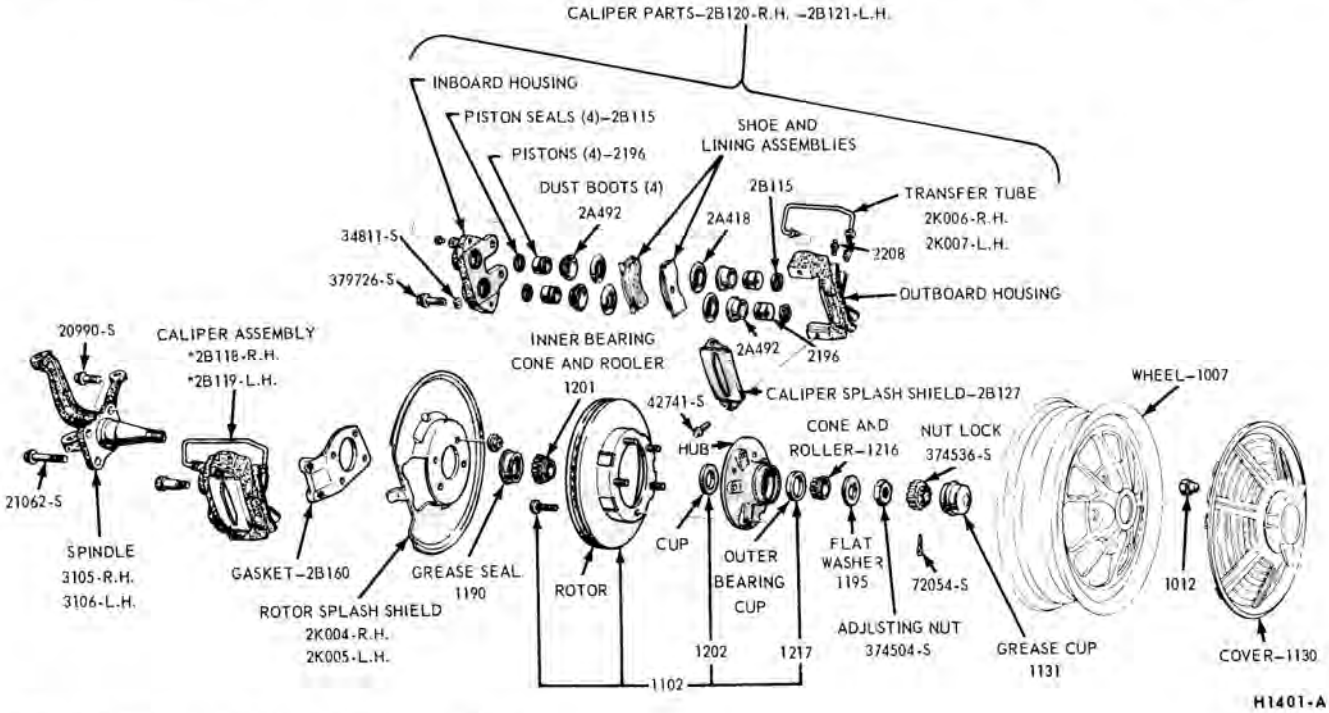


FIG. 19—Mustang Disc Brake Disassembled

iced as an assembly and is never adjusted or overhauled.

REMOVAL

1. Disconnect and remove the master cylinder - to - proportioning valve brake tube (Fig. 22).

2. Disconnect the front-to-rear brake tube from the proportioning valve.

3. Working underneath the left fender, remove the bolt that retains the proportioning valve to the fender apron and remove the valve through the access hole (Fig. 20).

INSTALLATION

1. From underneath the left fender, install the proportioning valve through the access hole in the fender apron. Position the valve to the apron so that the mounting tang extends through the hole in the fender apron as shown in Fig. 20. Install the retaining bolt.

2. Connect the front-to-rear brake tube to the valve (Fig. 22).

3. Position and connect the master cylinder-to-proportioning valve brake tube.

4. Bleed the brake system.

WHEEL CYLINDER REPAIR

It is not necessary to remove the wheel cylinder from the backing plate to disassemble, inspect, or hone and overhaul it. Removal is necessary only when the cylinder is damaged or scored beyond repair.

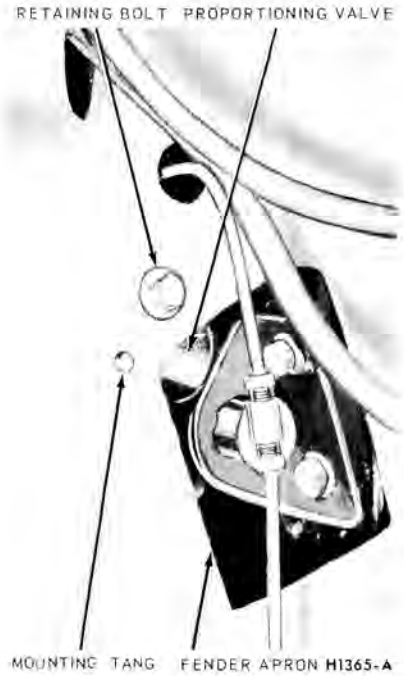


FIG. 20—Removing or Installing the Proportioning Valve

DIASSEMBLY

1. With the wheel in a raised position, remove the wheel and the drum.

2. Place a clamp over the ends of the brake cylinder as shown in Fig. 8.

3. Remove the brake shoe assemblies following procedures outlined in this section.

4. The 6-cylinder Falcon, Comet and Mustang models are not provided with links. Remove the rubber boots from the ends of the piston.

On 8-cylinder models and on all Fairlanes, remove the links and rubber boots from the ends of the piston. Remove the pistons, cups, and return spring from the cylinder bore (Fig. 21).

5. Remove the bleeder screw from the cylinder.

INSPECTION

1. Wash all parts in clean denatured alcohol. If alcohol is not available, use specified brake fluid. Dry with compressed air.

2. Check all the internal parts for excessive wear or damage. **If any of the internal parts require replacing, all should be replaced.**

3. Inspect the cylinder bore for score marks or rust. If either condition is present, the cylinder bore must be honed. **However, the cylinder should not be honed more than 0.003 inch beyond its original diameter.** A baffle in the front wheel cylinder of the 6-cylinder models prevents honing; therefore, the cylinder must be replaced.

4. Check the bleeder hole to be sure that it is open.

ASSEMBLY

1. Apply a coating of heavy-duty brake fluid to all internal parts.

2. Thread the bleeder screw into the cylinder and tighten securely.

3. Insert the return spring, cups, and pistons into their respective positions in the cylinder bore (Fig. 21). Place a boot over each end of the cylinder. On 8-cylinder models, install the links in the ends of the brake cylinders.

4. Install the shoe and adjuster assemblies, then adjust the shoes as outlined in this section.

5. Install the brake drum and wheel, then bleed the brakes as outlined in this section.

WHEEL CYLINDER REPLACEMENT

REMOVAL

1. With the wheel in a raised position, remove the wheel and the drum.

2. Place a clamp over the ends of the wheel cylinder as shown in Fig. 16.

3. Remove the brake shoe assemblies, following procedures outlined in this section.

4. Disconnect the brake line from the brake cylinder. **On a car with a vacuum brake booster, be sure the engine is stopped and there is no vacuum in the booster system**

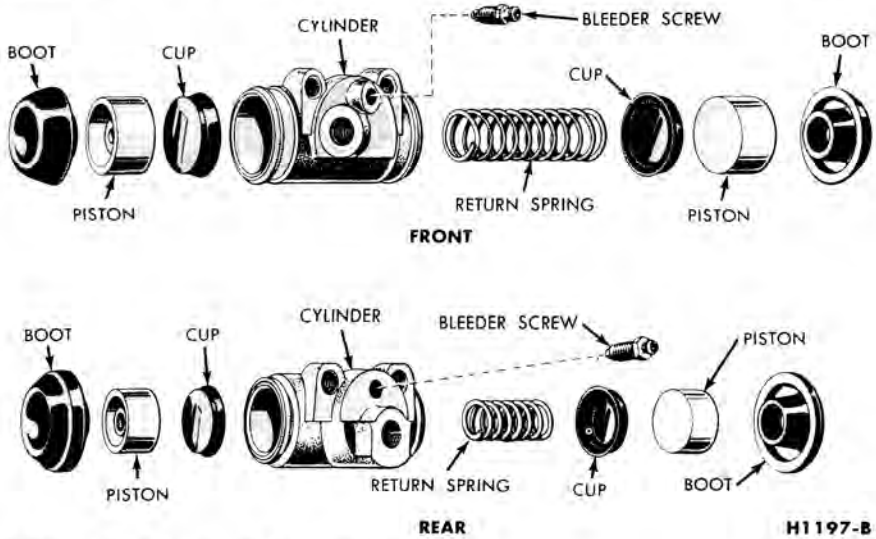


FIG. 21—Front and Rear Wheel Cylinders

before disconnecting the hydraulic lines.

To disconnect the hose at a front cylinder, loosen the tube fitting that connects the opposite end of the hose to the brake tube at a bracket on the frame. Remove the horseshoe-type retaining clip from the hose and bracket, disengage the hose from the bracket, then unscrew the entire hose assembly from the front wheel cylinder.

At a rear cylinder, unscrew the tube fitting that connects the tube to the cylinder. **Do no pull the metal tube away from the cylinder. Pulling the tube out of the cylinder connection will bend the metal tube and make installation difficult.** The tube will separate from the cylinder when the cylinder is removed from the carrier plate.

5. Remove the wheel cylinder attaching bolts and lock washers and remove the cylinder.

INSTALLATION

Wipe the end(s) of the hydraulic line to remove any foreign matter before making connections.

1. To install a front cylinder:

a. Position the cylinder in place against the carrier plate. Install the two lock washers and attaching bolts. Torque them to specifications.

b. Install a new copper gasket over the hose fitting. Thread the hose assembly into the cylinder and tighten it securely.

c. Engage the opposite end of the hose to the bracket on the frame, install the horseshoe-type retaining clip, and connect the brake tube to the hose with the tube fitting nut. Tighten the nut to specifications.

2. To install a rear cylinder:

a. Position the rear wheel cylinder in place against the carrier plate. Enter the tubing into the cylinder, and start the tube fitting nut into the threads of the cylinder.

b. Secure the cylinder to the carrier plate with the attaching bolts and lock washers.

c. Tighten the tube fitting nut to specifications.

3. Install the links in the ends of the wheel cylinder (8-cylinder models only on Falcon, Comet, Mustang –both 6 and 8-cylinder on Fairlane).

4. Install the brake shoes as detailed in this section.

5. Install the brake drums and wheels.

6. Bleed the brakes as detailed in Part 2-1, Section 2.

7. Adjust the brakes as detailed in Part 2-2, Section 2.

BRAKE CARRIER PLATE REPLACEMENT

REMOVAL

1. Remove the wheel and brake drum. Disconnect the brake line from the brake cylinder.

2. Remove the brake shoe and adjuster assemblies and the wheel cylinder as outlined in this section. On the rear wheels, disconnect the parking brake lever from the cable.

3. If the rear carrier plate is being replaced, rotate the axle shaft so that the hole in the axle shaft flange lines up with the carrier plate retaining nuts and remove the nuts. Pull the axle shaft assembly out of the housing with tool #4235-C and a slide hammer (Part 4-2), then remove the carrier plate.

If the front carrier plate is being replaced, remove the bolts and nuts that secure the plate to the front wheel spindle and remove the plate.

INSTALLATION

1. Position a new **rear** carrier plate on the retaining bolts in the axle housing flange. Insert the axle shaft into the housing so that the splines engage the differential side gear with the bearing retainer sliding onto the retaining bolts and against the carrier plate. Install the retaining nuts through the access hole in the axle shaft flange.

Position a new **front** carrier plate to the wheel spindle and install the retaining bolts and nuts.

2. Install the wheel cylinder and connect the brake line as outlined in this section.

3. Install the brake shoe and adjuster assemblies as outlined in this section. On a rear brake, connect the parking brake cable to the lever. Install the brake drum and wheel.

4. Adjust the brake shoes (Section 2), and bleed the brake system as outlined in Part 2-1, Section 2.

HYDRAULIC LINES

Steel tubing is used throughout the brake system with the exception of the flexible hoses at the front wheels and at the rear axle housing brake tube connector (Fig. 22).

Always bleed the entire hydraulic system after any hose or line replacement.

BRAKE TUBE REPLACEMENT

If a section of the brake tubing becomes damaged, the entire section should be replaced with tubing of the same type, size, shape and length. **Copper tubing should not be used in a hydraulic system.** When bending brake tubing to fit underbody or rear axle contours, be careful not to kink or crack the tube.

All brake tubing should be flared properly to provide good leak-proof connections. Clean the brake tubing by flushing with clean denatured alcohol, before installation.

When connecting a tube to a hose, tube connector, disc caliper, or brake cylinder, tighten the tube fitting nut to specified torque with Milbar tool 1112-144 or equivalent.

BRAKE HOSE REPLACEMENT

A flexible brake hose should be replaced if it shows signs of softening, cracking, or other damage.

When installing a new front brake hose, position the hose to avoid contact with other chassis parts. Place a new copper gasket over the hose fitting and screw the hose assembly into the front brake cylinder. Engage the opposite end of the hose to the bracket on the frame. Install the horseshoe-type retaining clip, and connect the tube to the hose with the tube fitting nut.

A rear brake hose should be installed so that it does not touch the muffler outlet pipe or shock absorber.

Since the rear brake hose on the Mustang is integral with the rear brake tube connector, the entire hose and connector is replaced as an assembly. Mount the connector to the rear axle housing with the retaining bolt and lock washer. Connect the two rear wheel brake tubes to the connector.

On the Falcon, Comet and Fairlane, place a new gasket over the rear hose fitting and screw the hose assembly into the rear brake tube connector. On all cars, engage the front end of the hose to the bracket on the frame. Install the horseshoe-type retaining clip, and connect the tube to the hose with the tube fitting nut.

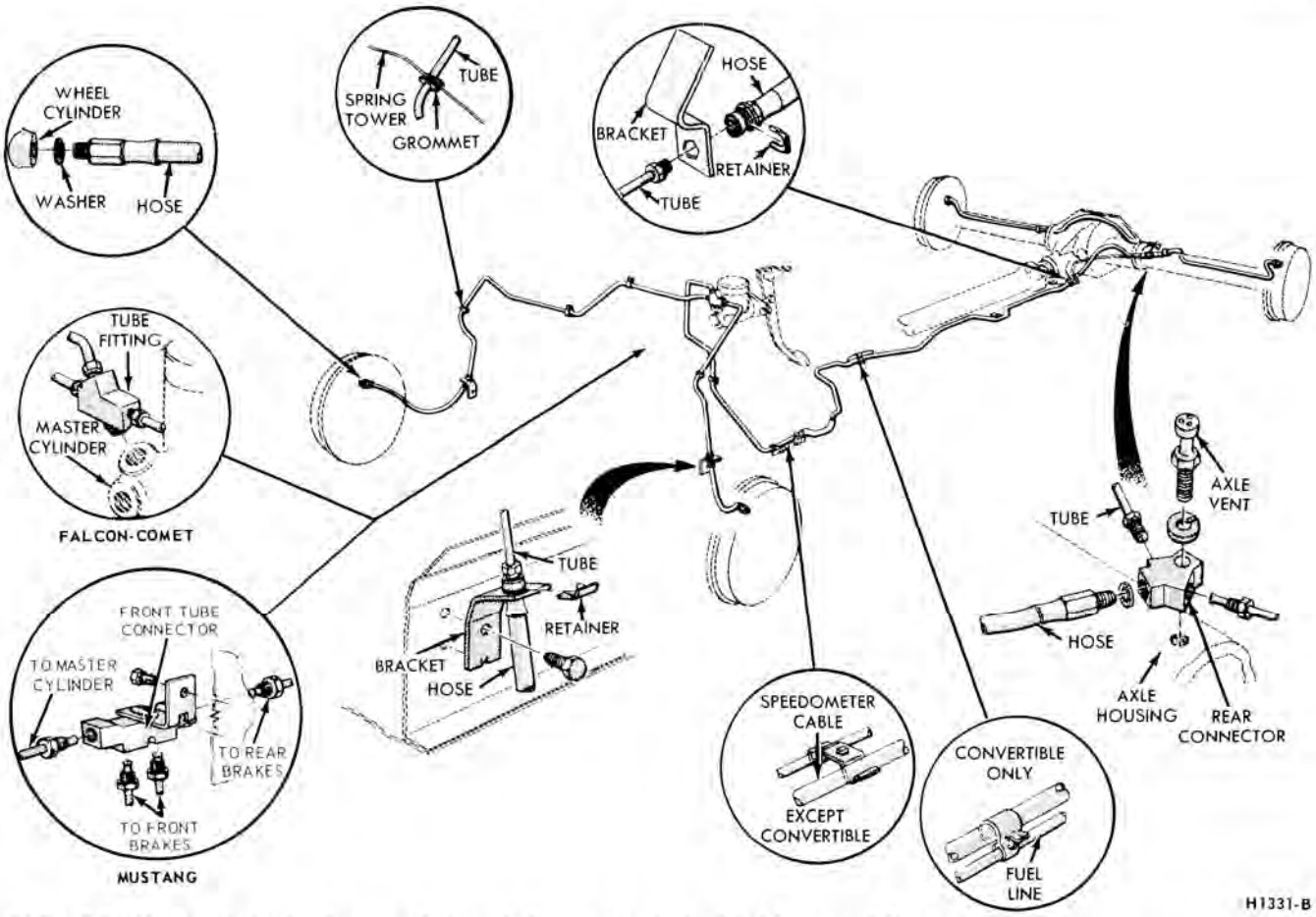


FIG. 22—Hydraulic Brake System—Falcon & Comet—Typical of Fairlane and Mustang

3 REMOVAL AND INSTALLATION

MASTER CYLINDER—STANDARD BRAKES

REMOVAL

1. Disconnect the rubber boot from the rear end of the master cylinder in the passenger compartment.

2. Disconnect the brake line from the master cylinder (Fig. 26).

3. Remove the bolts that secure the master cylinder to the dash panel and lift the cylinder out and away from the push rod. Remove the rubber boot from the push rod.

INSTALLATION

1. With the rubber boot on the push rod, guide the master cylinder over the end of the push rod, and position the cylinder against the dash panel.

2. Install and torque the mounting bolts to specification.

3. Connect the brake line to the master cylinder fitting, but leave the brake line fitting loose.

4. Fill the master cylinder reservoir with heavy-duty brake fluid to within ⅜ inch of the top. Install and tighten the filler cap.

5. Bleed the master cylinder to let air escape from the cylinder at the brake line fitting. Then tighten the fitting.

6. Remove the filler cap and fill the reservoir to the level specified. Be sure that the diaphragm type gasket is properly seated in the cap. Install the cap and wipe off any fluid from the cylinder.

7. Connect the rubber boot to the master cylinder.

MASTER CYLINDER—POWER BRAKES—COMET

REMOVAL

1. Disconnect the hydraulic line from the master cylinder and from the multiple fitting on the bridge (Fig. 23). Disconnect the three remaining lines from the fitting.

2. Remove the two nuts and lock washers that attach the master cylinder to the booster.

3. Remove the bridge and the master cylinder from the vacuum booster.

INSTALLATION

1. Before installing the master cylinder, check the distance from the outer end of the push rod to the master cylinder mounting surface at the end of the vacuum cylinder (Fig. 3, Part 2-1). If the push rod dimension is not correct, see "Master Cylinder Push Rod Adjustment," Part 2-1, Section 2.

2. Position the master cylinder over the push rod onto the two studs that are integral with the booster body.

3. Position the bridge and the tail

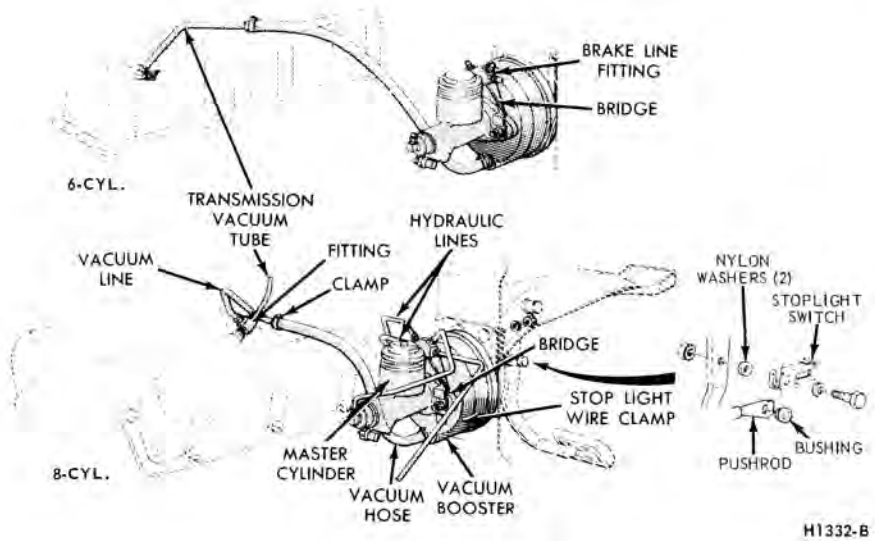


FIG. 23—Vacuum Booster Installation—Comet

light wire clip (Fig. 26) on the studs. Install, but do not tighten the attaching nuts and lock washers.

4. Connect the hydraulic lines to the multiple fitting.

5. Connect the line from the cylinder to the multiple fitting.

6. Tighten the two master cylinder attaching nuts.

7. Tighten all hydraulic line fittings.

8. Bleed the brake system. Fill the master cylinder to ⅜ inch from the top of the filler opening. Be sure that the diaphragm type gasket is properly seated in the reservoir cap, and install the cap.

MASTER CYLINDER—POWER BRAKES—MUSTANG, FAIRLANE

REMOVAL

1. Disconnect the brake line from the master cylinder.

2. Remove the attaching nuts and then remove the master cylinder from the booster.

INSTALLATION

1. Before installing the master cylinder, check the distance from the outer end of the push rod to the master cylinder mounting surface. For a Mustang, refer to Fig. 3, Part 2-1. For a Fairlane, refer to Fig. 5, Part 2-1. If the push rod dimension is not correct, see "Master Cylinder Push Rod Adjustment," Part 2-1, Section 2.

2. Position the master cylinder over the push rod onto the two mounting studs on the booster, and install the attaching nuts.

3. Connect the brake line to the master cylinder.

4. Bleed the brake system. Fill the master cylinder to ⅜ inch from the top of the filler opening. Be sure that the diaphragm gasket is properly seated in the reservoir cap and install the cap.

VACUUM BOOSTER—COMET

REMOVAL

1. Remove the hood left spring for clearance.

2. Disconnect all the brake lines from the multiple fitting except the line between the fitting and the master cylinder (Fig. 23).

3. Remove the two attaching nuts and remove the master cylinder with the fitting and brake line.

4. Remove the hydraulic push rod and seal from the booster.

5. Disconnect the vacuum line from the booster.

6. Remove the connecting bolt and nut, and disassemble the nylon washers, the bushing, the stoplight switch and the booster valve actuating rod from the brake pedal (Fig. 23).

7. Remove the nuts and washers that retain the booster mounting plate to the dash panel, and separate the assembly from the dash panel.

8. Remove the speed nuts that retain the mounting plate to the booster and remove the mounting plate.

9. Turn the booster around so that the push rod faces upward, and lift the booster upward between the suspension brace and the fender apron as shown in Fig. 24. **The hood must be lowered slightly to obtain clearance as the booster is removed.**

INSTALLATION

1. Lower the hood slightly for clearance and manipulate the booster into the engine compartment between the suspension brace and fender apron (Fig. 24).

2. Install the mounting plate to the booster and secure with two speed nuts.

3. Position the booster and mounting plate assembly so that the mounting studs enter the holes in the dash panel.

4. Working inside the car below the instrument panel, install the nuts and washers on the booster mounting studs at the dash panel. Do not tighten.

5. Install the bushing in the push rod, position the stop light switch so that it straddles the push rod, and then secure the switch, push rod, and nylon washers to the brake pedal with the connecting bolt and nut (Fig. 23).

6. While pulling back on the brake pedal to hold the booster tight against the dash panel, tighten the mounting nuts.

7. Connect the vacuum line to the booster.



FIG. 24—Removing or Installing the Comet Booster

8. Install the push rod and seal in the front of the booster. Be sure the seal is secured against the face of the booster.

9. Install the master cylinder and bridge assembly to the booster and install the two mounting nuts and washers.

10. Connect the three brake lines to the multiple fitting.

11. Install the hood left spring.

12. Bleed the brake system.

BRAKE BOOSTER—MUSTANG AND FAIRLANE

REMOVAL

1. Working inside the car below the instrument panel, disconnect the stop light switch wires at the connector.

2. Remove the hairpin type retainer. Slide the stop light switch off the brake pedal pin **just far enough for the switch outer hole to clear the pin,** and then lower the switch away from the pin. Slide the master cylinder push rod link and the nylon washers and bushing off from the brake pedal pin (Fig. 25).

3. Working in the engine compartment, disconnect the brake line from the brake master cylinder.

4. Loosen the hose clamp, and disconnect the vacuum hose from the booster at the check valve.

5. Remove the four mounting bracket - to - dash panel retaining bolts.

6. Remove the booster and bracket assembly from the dash panel, sliding the push rod link out from the engine side of the dash panel.

7. Remove the retaining nuts, and remove the master cylinder from the booster assembly.

INSTALLATION

1. Position the brake master cylinder to the booster assembly and install the retaining nuts.

2. Mount the booster and bracket assembly to the dash panel by sliding the push rod link in through the hole in the dash panel. Install the four retaining bolts.

3. Connect the vacuum hose to the booster at the check valve, and tighten the hose clamp.

4. Connect the brake line to the brake master cylinder.

5. Working inside the car, install the inner nylon washer, the master cylinder push rod link, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the outer nylon washer as shown in Fig. 25. Secure these parts to the pin with the hairpin type retainer.

6. Connect the stop light switch wires to the connector, and install the wires in the retaining clip.

BRAKE PEDAL—MANUAL SHIFT TRANSMISSION

REMOVAL

On a Falcon, Comet or Fairlane, back off the clutch pedal assist spring adjusting nut to the last few threads (Fig. 26).

On a Mustang, remove the pedal bumper and bracket assembly from the pedal support bracket to relieve the tension on the assist spring, and then remove the spring.

2. Disconnect the clutch pedal-to-equalizer rod at the clutch pedal by removing the hairpin type retainer and spring washers (Falcon and Comet) or bushing (Mustang and Fairlane).

3. On a Falcon, Comet, or Fairlane, remove the clutch pedal bumper bracket from the pedal support bracket. Remove the assist spring adjusting nut, and disconnect the retainer and spring from the pedal support bracket. Remove the spring.

4. Disconnect the stop light switch wires at the connector.

5. Remove the retainer (c-clip type on Falcon, Comet, and Mustang — hairpin type on Fairlane). Slide the stop light switch off the brake pedal pin just far enough for the switch outer hole to clear the pin, and then, lower the switch away from the pin. Slide the master cylinder push rod and the nylon washers and bushing off from the brake pedal pin (Fig. 26).

6. Remove the hairpin type retainer and spring washer from the clutch and brake pedal shaft, then remove the clutch pedal and shaft assembly, the brake pedal assembly, and the bushings from the pedal support bracket (Fig. 26).

INSTALLATION

1. Apply a coating of Lubriplate to the bushings and locate all bushings in their proper places on the clutch and brake pedal assemblies.

2. Position the brake pedal to the support bracket, then install the clutch pedal and shaft assembly through the support bracket and brake pedal assembly. Install the spring washer and retainer. (Fig. 26).

3. Install the split bushing in the spring groove of the clutch pedal. Hook the clutch assist spring to the groove and to the spring retainer. On a Falcon, Comet or Fairlane, connect the retainer to the pedal support bracket with the adjusting nut (Fig. 26).

4. Mount the clutch pedal bumper bracket to the pedal support bracket (Fig. 26). Adjust the bumper for clutch total travel.

5. Connect the clutch pedal-to-equalizer rod to the clutch pedal assembly with the spring washers (Falcon and Comet) or bushing

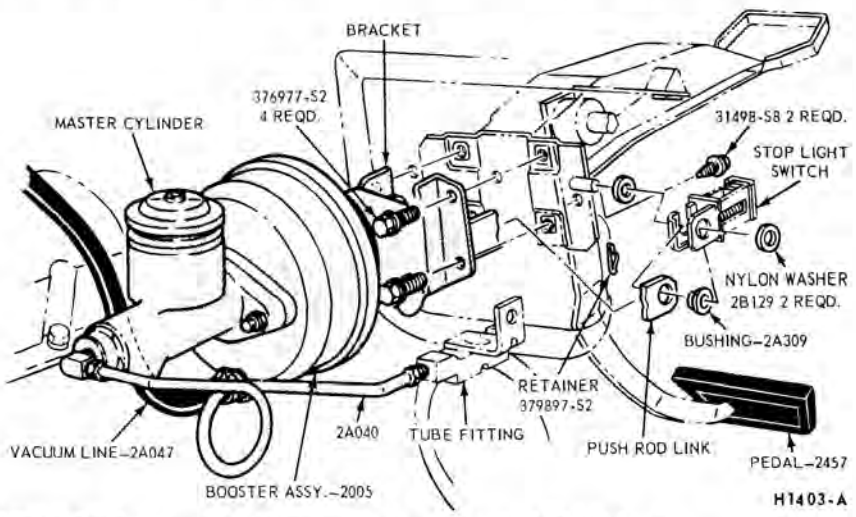


FIG. 25—Booster Installation—Mustang, Typical of Fairlane

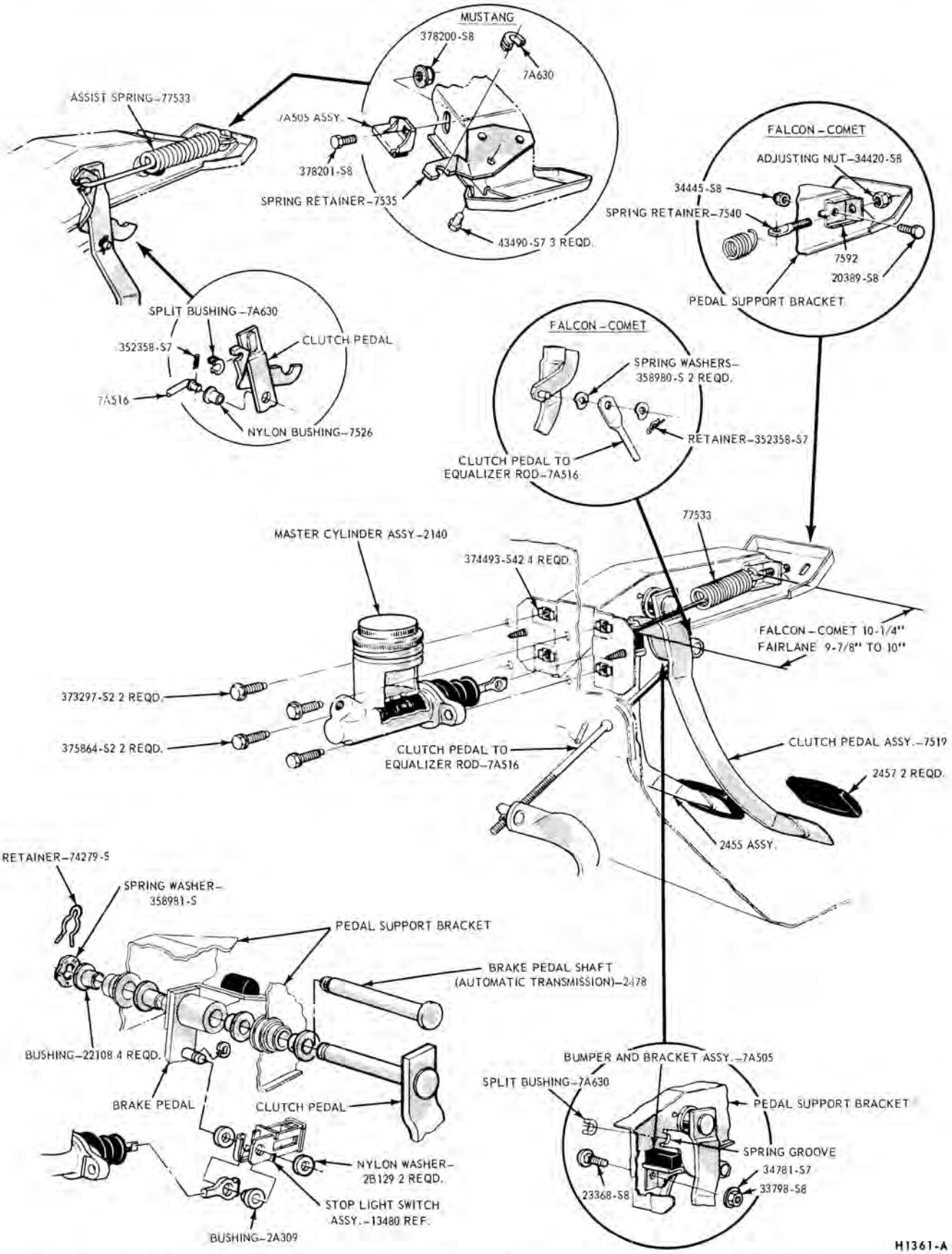


FIG. 26–Master Cylinder, Brake Pedal and Related Parts–Falcon, Comet, Mustang–Typical of Fairlane

(Mustang and Fairlane) and the hairpin retainer. Apply Lubriplate to the bushing. Adjust clutch pedal free play to specification as outlined in Group 5.

6. On a Falcon, Comet or Fairlane, adjust the clutch lever assist spring to the dimension shown in Fig. 26 by loosening or tightening the adjusting nut on the retainer at the pedal support bracket.

On a Mustang, this adjustment is not applicable.

7. Install the inner nylon washer, the master cylinder push rod, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the outer nylon washer as shown in Fig. 26. Secure these parts to the pin with the hairpin type retainer (on Fairlane)–c-clip type retainer (on Falcon, Comet or Mustang).

8. Connect the stop light switch wires to the connector, and install the wires to the retaining clip.

BRAKE PEDAL— AUTOMATIC TRANSMISSION

REMOVAL

1. Disconnect the stop light switch wires at the connector.

2. Remove the retainer (c-clip type on Falcon, Comet and Mustang–hairpin type on Fairlane). Slide the stop light switch off the brake pedal pin **just far enough for the switch outer hole to clear the pin,** and then lower the switch away from the pin. Slide the master cylinder push rod and the nylon washers and bushing off from the brake pedal pin (Fig. 26).

3. Remove the hairpin type retainer and spring washer from the brake pedal shaft, then remove the shaft, the brake pedal assembly and the bushings from the pedal support bracket.

INSTALLATION

1. Apply a coating of Lubriplate to the bushings and locate all the bushings in their proper places on the pedal assembly and pedal support bracket. (Fig. 26).

2. Position the brake pedal assembly to the support bracket, then install the pedal shaft through the support bracket and brake pedal assembly. Install the spring washer and retainer.

3. Install the inner nylon washer, the master cylinder push rod, and the bushing on the brake pedal pin. Position the switch so that it straddles the push rod with the switch slot on the pedal pin, and the switch outer hole just clearing the pin. Slide the switch completely onto the pin, and install the outer nylon washer as shown in Fig. 26. Secure these parts to the pin with the hairpin type retainer (on Fairlane) – C-clip type retainer (on Falcon, Comet or Mustang).

4. Connect the stop light switch wires to the connector, and install the wires in the retaining clip.

PARKING BRAKE HANDLE— FALCON, COMET, MUSTANG

REMOVAL

1. Remove the two screws that hold the handle bracket on the instrument panel. On a Falcon or Comet, remove the two screws that secure the cable clamp to the dash panel (Fig. 1, Part 2-1). On a Mustang, remove the attaching screws and the insulator bracket (Fig. 27).

2. Remove the two nuts and lock washers that secure the control to the dash panel.

3. Remove the clevis pin that secures the pulley to the control handle assembly.

4. Disengage the locking rod and remove the ball on the cable from the slot in the control assembly.

INSTALLATION

1. Disengage the locking rod and connect the ball end of the cable to the slot on the control assembly.

2. Assemble the pulley to the control handle and the clevis pin.

3. Position the assembly against the dash panel and instrument panel. Secure the assembly to the instrument panel with the two screws.

4. On a Falcon or Comet, secure the cable and clamp to the dash panel with two screws (Fig. 1, Part 2-1). On a Mustang, install the insulator bracket with the attaching screws (Fig. 27).

5. Working from under the left front fender, install the two lock washers and attaching nuts.

PARKING BRAKE HANDLE— FAIRLANE

REMOVAL

1. Remove the cotter pin and the clevis pin, then remove the cable pulley from the control housing (Fig. 28).

2. Remove the hair pin retainer, and disconnect the cable housing from the forward bracket.

3. Push the locking pawl against the spring to disengage the pawl from the ratchet groove in the handle, then push the handle all the way in. Rotate the handle counterclockwise, then disengage the cable ball from the slot in the handle.

4. From underneath the left fender, remove the retaining nuts from the forward bracket-to-dash panel mounting studs.

5. Remove the 2 upper bracket-to-instrument panel bolts, and remove the control assembly from the car.

INSTALLATION

1. Position the control assembly so that the forward bracket mounting studs enter the holes in the dash panel, and the upper bracket is aligned with the mounting holes in the instrument panel (Fig. 28).

2. From underneath the left front fender, install the retaining nuts to the forward bracket mounting studs.

3. Install the upper bracket-to-instrument panel mounting bolts.

4. Engage the cable ball with the slot in the handle, turn the handle clockwise, then pull the handle back until the pawl engages the first ratchet groove.

5. Connect the cable housing to the forward bracket with the hair pin retainer.

6. Install the pulley to the cable and the control housing, and secure in place with the clevis pin and cotter pin.

PARKING BRAKE EQUALIZER TO HANDLE CABLE—FALCON, COMET

REMOVAL

1. Remove the two screws that attach the cable clamp to the dash panel (Fig. 1, Part 2-1).

2. Remove the parking brake handle assembly.

3. Disengage the locking rod and remove the ball on the cable from the slot in the control assembly.

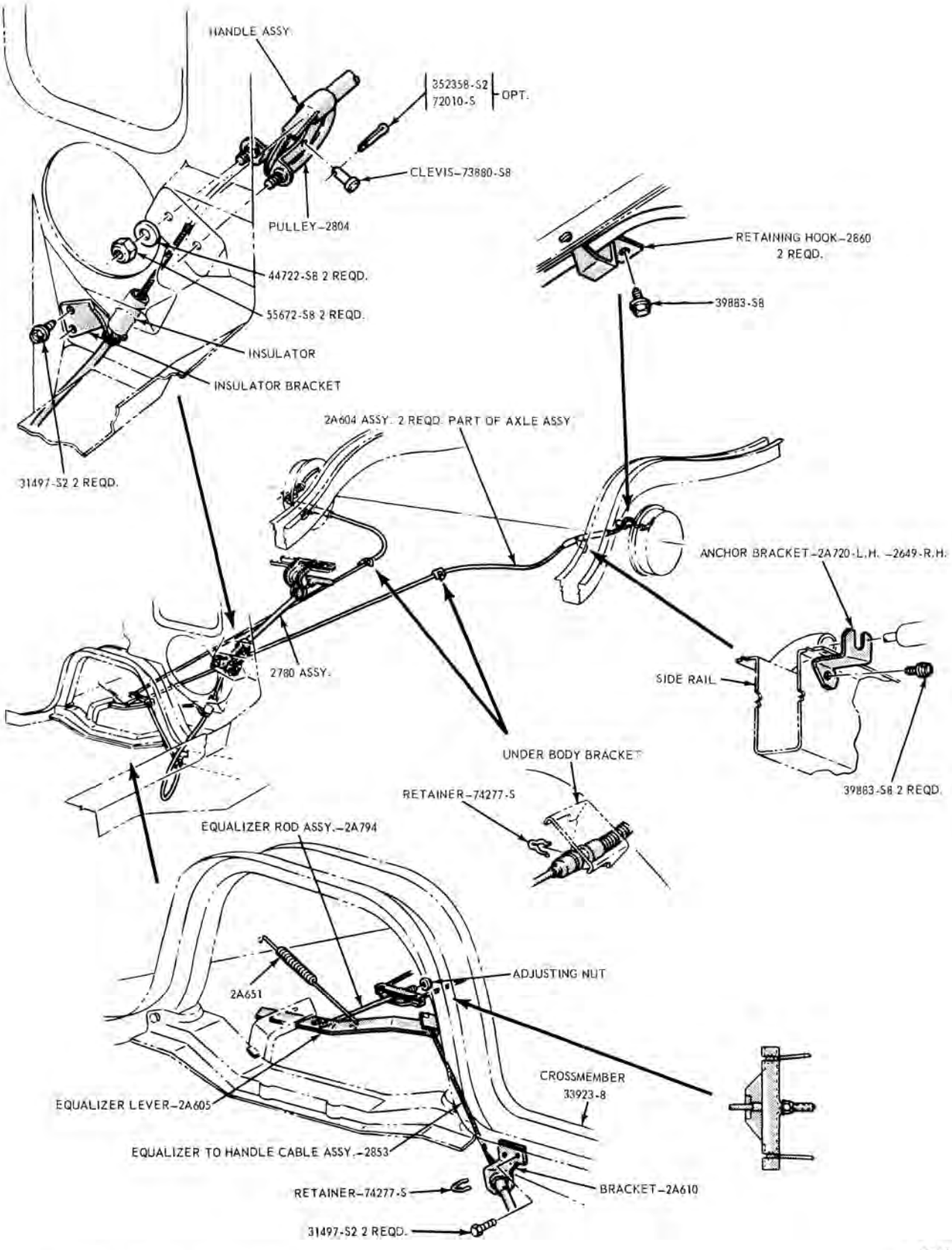


FIG. 27–Parking Brake Linkage–Mustang

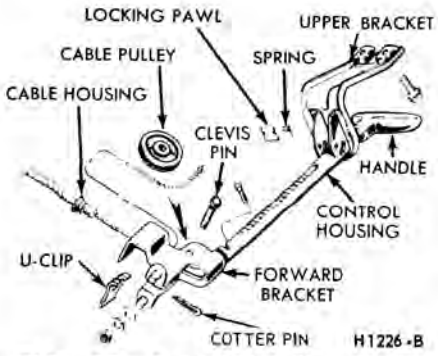


FIG. 28—Control Handle Assembly—Fairlane

4. Push the cable down through the hole in the dash panel.

5. From the underside of the car, remove the cable and housing from the holes in the left front side member. If working on a convertible remove the cable from the holes in the crossmember and torque box.

6. Remove the hair pin-type clip and remove the cable from the hole in the frame crossmember, or torque box on convertibles.

7. Disengage the cable rear ball from the equalizer lever and remove the cable from the car.

INSTALLATION

1. Thread the cable through the crossmember or torque box on convertibles and install the hairpin clip. Attach the rear ball of the cable to the equalizer lever.

2. Thread the forward end of the cable and housing through the two holes in the left front side member or bracket on convertibles.

3. Insert the cable and housing through the hole in the dash panel.

4. Disengage the locking rod and connect the ball end of the cable to the slot in the control assembly.

5. Install the two screws that retain the cable clamp to the dash panel and tighten.

6. Install the parking brake handle.

7. Adjust the parking brake at one notch to stop the forward rotation of the rear wheels.

8. Release the handle.

PARKING BRAKE EQUALIZER TO HANDLE CABLE—MUSTANG

REMOVAL

1. Remove the attaching screws and insulator bracket from the dash panel (Fig. 27).

2. Remove the parking brake handle assembly and disengage the cable from the handle as outlined in this section.

3. Pull the cable down through the hole in the dash panel.

4. Remove the hairpin retainer, and disengage the cable and housing from the bracket on the crossmember.

5. Disconnect the cable ball from the equalizer lever, and remove the cable from the car.

INSTALLATION

1. Connect the cable lower ball to the equalizer lever (Fig. 27).

2. Engage the cable and housing to the bracket on the crossmember and secure with the hairpin retainer.

3. Push the upper end of the cable up through the hole in the dash panel.

4. Connect the cable upper ball to the parking brake handle, and install the handle assembly as outlined in this section.

5. Install the insulator bracket to the dash panel and secure with the two attaching screws.

PARKING BRAKE EQUALIZER TO HANDLE CABLE—FAIRLANE

REMOVAL

1. Remove the cotter pin and clevis pin, then remove the cable pulley from the control housing (Fig. 28).

2. Remove the U-clip and disconnect the cable housing from the forward bracket.

3. Push the locking pawl against the spring to disengage the pawl from the ratchet groove in the handle, then push the handle all the way in. Rotate the handle counterclockwise, then disengage the cable ball from the slot in the handle.

4. Push the cable and housing down through the hole in the dash panel.

5. From the underside of the car, remove the hairpin retainer that retains the cable housing to the bracket on the crossmember (Fig. 29). Disengage the cable housing from the bracket.

6. Disengage the cable rear ball from the equalizer lever, and remove the cable from the car.

INSTALLATION

1. Attach the rear end of the cable housing to the bracket with the hairpin retainer (Fig. 29).

2. Attach the cable rear ball to the equalizer lever (Part 2-1, Fig. 1).

3. Insert the forward end of the cable and housing through the hole in the dash panel so that the rubber insulator encases the housing at the point where it goes through the hole (Fig. 29).

4. Working inside the car, engage the cable ball with the slot in the control handle, turn the handle clockwise, then pull the handle back until the pawl engages the first ratchet groove.

5. Connect the forward end of the cable housing to the control assembly forward bracket. Secure with the U-clip.

6. Install the pulley to the cable and to the control housing, and secure in place with the clevis pin and retainer (Fig. 28).

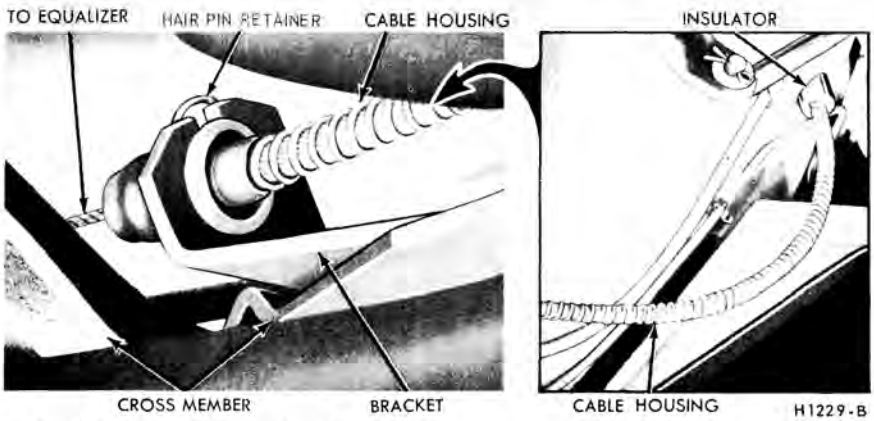


FIG. 29—Equalizer-to-Handle Cable

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE—FALCON, COMET

REMOVAL

1. Disconnect the parking brake equalizer rod from the equalizer lever.
2. Remove the retaining clips from the cable guide brackets on the floor pan.
3. Back off the adjustments on the rear brake shoes.
4. Remove both rear hub caps, wheel and tire assemblies, and the rear brake drums.
5. At each rear brake, disconnect the parking brake cable from the parking brake lever (Figs 1 or 2). Disengage the cable housing retaining grommet from the carrier plate, and withdraw the cable and housing from the inboard side of the carrier plate.
6. Remove the cable equalizer and the equalizer rod from the parking brake cable.

INSTALLATION

1. Install the cable equalizer and the equalizer rod on the cable.
2. At each rear brake, insert the rear end of the cable and housing through the hole in the carrier plate from the inboard side.
3. Connect the end of the cable to the parking brake lever at each secondary brake shoe (Figs. 1 or 2).
4. Install the rear drums, wheel and tire assemblies, and hub caps.
5. Install the cable in the guide brackets on the floor pan and insert the retaining clips.
6. Attach the parking brake equalizer rod to the equalizer lever.
7. Adjust the rear brake shoes, and then adjust the parking brake linkage as outlined in Part 2-1, Section 2.

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE—MUSTANG

REMOVAL

1. Loosen the adjusting nut at the equalizer and disengage the cable ball from the equalizer (Fig. 27).
2. Remove the hairpin retainer and disengage the cable rear housing from the bracket on the underbody.
3. Remove the wheel and tire assembly and the rear brake drum as outlined in Section 2.
4. Disconnect the rear end of the cable from the parking brake lever on the brake shoe. Disengage the cable housing retaining grommet from the carrier plate and withdraw the cable and housing from the inboard side of the carrier plate.
5. Disengage the cable and housing from the retaining hook and the anchor bracket at the side rail. (Fig. 27).

INSTALLATION

1. Insert the rear end of the cable and housing through the hole in the carrier plate from the inboard side.
2. Connect the rear end of the cable to the parking brake lever on the brake shoe, and engage the cable housing retaining grommet to the carrier plate (Fig. 2).
3. Engage the cable housing to the retaining hook and the anchor bracket at the side rail (Fig. 27).
4. Engage the cable rear housing to the bracket on the underbody and secure with the hairpin retainer.
5. Install the rear brake drum and the wheel and tire assembly.
6. Engage the cable forward ball to the equalizer and adjust the parking brake linkage as outlined in Part 2-1, Section 2.

PARKING BRAKE EQUALIZER TO REAR WHEEL CABLE—FAIRLANE

REMOVAL

1. Remove the adjustment nut from the equalizer rod, then slide the equalizer and cable assembly from the rod (Part 2-1, Fig. 1).
2. Remove the hairpin retainers and disengage the cable rear housings from the brackets on the underbody (Fig. 30).
3. Remove the wheel and tire assemblies and the 2 rear brake drums as outlined in Section 2.
4. At each rear spring, disconnect the small coil spring that retains the

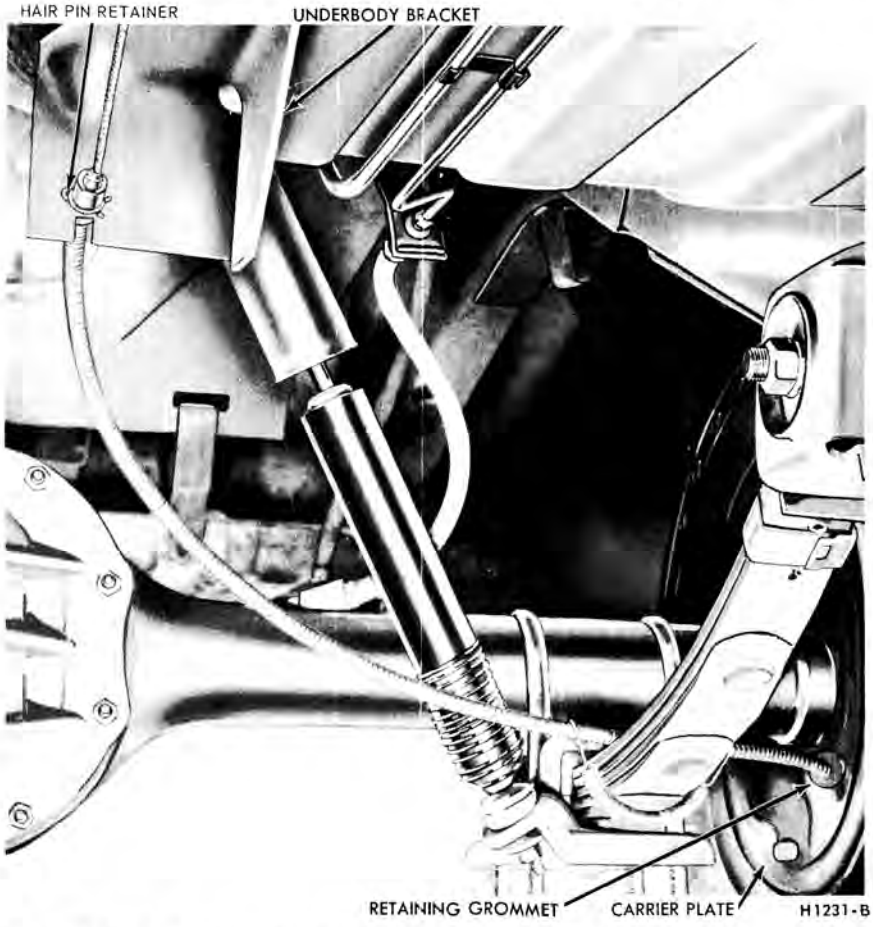


FIG. 30—Cable Rear Housing Connections

parking brake cable housing to the rear spring.

5. At each rear brake, disconnect the parking brake cable from the parking brake lever (Fig. 2). Disengage the cable housing retaining grommet from the carrier plate, and withdraw the cable and housing from the inboard side of the carrier plate.

INSTALLATION

1. At each rear brake, insert the rear end of the cable and housing through the hole in the carrier plate from the inboard side. **Be sure that the cable assembly runs over the top of the suspension rear spring.**

2. Connect the cable to the parking brake lever, then engage the cable housing retaining grommet to the carrier plate (Fig. 2).

3. At each suspension rear spring, secure the parking brake cable housing to the rear spring with the small coil type retaining spring.

4. Engage the forward ends of the cable housings to the brackets on the underbody, and secure with hairpin retainers (Fig. 30).

5. Assemble the equalizer rod to the equalizer lever, slide the equalizer and cable assembly on the rod, and secure with the adjustment nut (Part 2-1, Fig. 1).

6. Install the rear brake drums and adjust the brake shoes as outlined in Section 2. Install the wheel and tire assemblies.

7. Adjust the brake cable as outlined in Part 2-1, Section 2.

4 MAJOR REPAIR OPERATIONS

BRAKE DRUM REFINISHING

The 6-cylinder models are equipped with 9-inch brake drums and the 8-cylinder are equipped with 10-inch drums.

Minor scores on a brake drum can be removed with a fine emery cloth. A drum that is excessively scored or shows a total indicator runout of over 0.007 inch should be turned down. Remove only enough stock to eliminate the scores and true up the drum. The refinished diameter must not exceed 0.060 inch oversize.

If the drum diameter is less than 0.030 inch oversize (9.030 inches 6-cylinder, or 10.030 inches 8-cylinder) after refinishing, standard lining may be installed. If the drum diameter is more than 9.030 inches or 10.030 inches, oversize linings must be installed.

After a drum is turned down, wipe the refinished surface with a cloth soaked in clean denatured alcohol. If one drum is turned down, the opposite drum on the same axle should also be cut down to the same size.

BRAKE SHOE RELINING

Brake linings that are worn to within 1/32 inch of any rivet or have been saturated with grease or oil should be replaced. Failure to replace worn linings will result in a scored drum. **When it is necessary to replace linings, they must also be replaced on the wheel on the opposite side of the car.**

Inspect brake shoes for distortion, cracks, or looseness. If this condition exists, the shoe should be discarded. **Do not repair a defective brake shoe.**

1. Wash the brake shoes thoroughly in a clean solvent. Remove all burrs or rough spots from the shoes.

2. Check the inside diameter of the brake drum. If the diameter is less than 9.030 or 10.030 inches, standard lining may be installed. If the diameter is 9.030 to 9.060 or 10.030 to 10.060 inches, oversize lining should be installed.

3. Position the new lining on the shoe. Starting in the center, insert and secure the rivets, working alternately towards each end. Install all parts supplied in the kit. **Genuine replacement linings are ground and no further grinding is required.**

4. Check the clearance between the shoe and lining. The lining must seat tightly against the shoe with not more than .005 inch clearance between any two rivets.

MASTER CYLINDER— EXCEPT CARS WITH DISC BRAKES

DISASSEMBLY

1. Clean the outside of the cylinder, and remove the filler cap and gasket. Pour out any brake fluid that may remain in the cylinder or reservoir.

2. Remove the snap ring from the bore at the rear of the cylinder with tool 33621 (Fig. 33).

3. When disassembling a master cylinder used with the standard brake system, remove the piston assembly, cup, spring, check valve, and valve seat from the cylinder bore (Fig. 31).

When disassembling a master cylinder used with a booster, remove the piston assembly, cup, and the spring and check valve assembly from the cylinder bore. Remove the O-ring from the piston (Fig. 32).

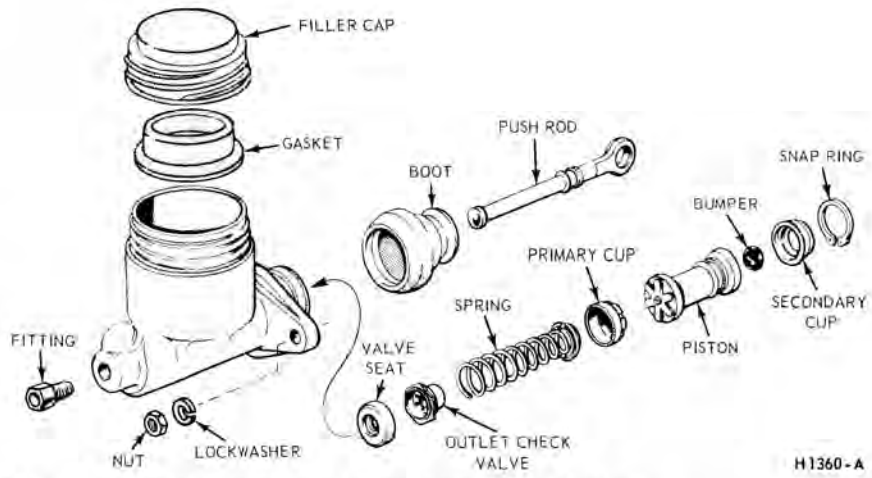


FIG. 31—Master Cylinder with Standard Brake System

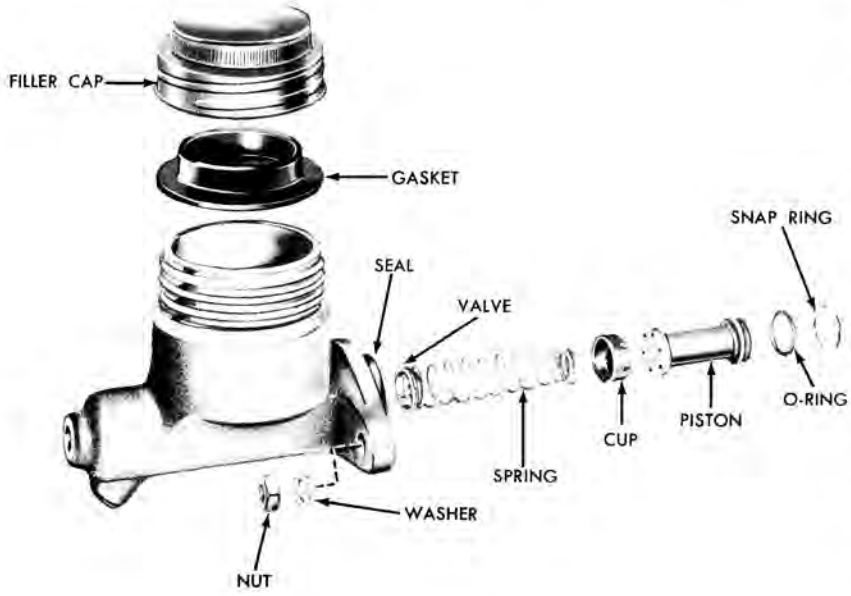


FIG. 32—Master Cylinder with Booster

ASSEMBLY

1. Dip all parts except the master cylinder body in clean FoMoCo **heavy-duty brake fluid.**

2. Install the brake line fitting and the stop light switch on the cylinder and tighten them securely.

3. When assembling a master cylinder used with the standard brake system, install the valve seat, check valve, spring, cup, and piston assembly in the cylinder bore (Fig. 31).

When assembling a master cylinder used with a booster, install the O-ring on the piston. Install the spring and check valve assembly, cup, and piston in the cylinder bore (Fig. 32).

4. Install the snap ring in the back of the bore (Fig. 33).

MASTER CYLINDER—WITH DISC BRAKES

DISASSEMBLY

1. Press in against the piston while removing the snap ring retainer, and then remove the piston assembly, cup, spring, residual check valve and seat. (Fig. 34).

2. Remove secondary cup from the piston. Remove the cover by releasing the spring clips on the sides, and remove the diaphragm.

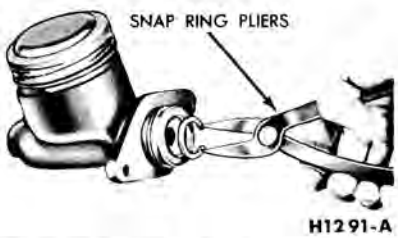


FIG. 33—Removing Snap Ring from Master Cylinder—Typical

ASSEMBLY

1. Clamp the master cylinder housing in a vise. Dip the hydraulic cylinder parts in brake fluid and assemble the check valve seal, residual check valve, and piston return spring in the bore of the cylinder in the order shown in Fig. 34.

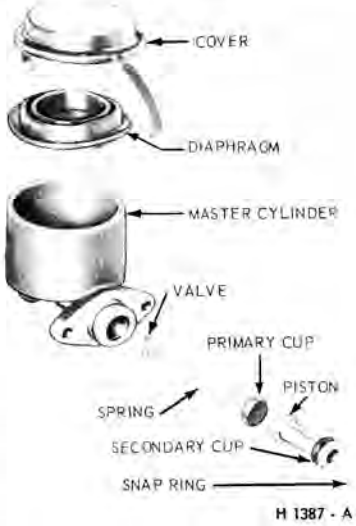


FIG. 34—Master Cylinder Used with Disc Brakes Disassembled

2. If the secondary piston cup was removed from the piston, dip the cup in brake fluid and assemble the cup in the groove of the piston with the lip of the cup as shown.

3. Place the primary cup on the end of the piston assembly, and guide it into the cylinder bore.

4. Press in against the piston to compress the spring while seating the snap ring in the groove in the cylinder bore.

5. Install a new diaphragm (only if the old one is defective in the cover, and attach the cover to the cylinder with the spring clips.

MASTER CYLINDER CLEANING AND INSPECTION

1. Clean all master cylinder parts in clean denatured alcohol, and inspect the parts for wear or damage, replacing them as required. **When using a master cylinder repair kit, install all of the parts supplied.**

2. Check the ports and vents in the master cylinder to make sure that all are open and free of foreign matter. Check the condition of the diaphragm type gasket.

3. A leaf-type valve is riveted to the front end of the piston in a master cylinder used with the standard brake system (Fig. 31). If this valve is loose or has moved so that the piston ports are open, replace the piston.

When inspecting a master cylinder used with a booster, check the ports in the piston to make sure that they are open and free of foreign material (Fig. 32).

4. Inspect the cylinder walls for scores or rust, and recondition them if necessary. **Hone the cylinder walls no more than necessary (0.003 inch maximum). Oversize pistons and cups are not available for excessively honed cylinders.**

5. Remove any burrs or loose metal that may have resulted from the honing operation, and clean the cylinder with denatured alcohol.

DISC BRAKE CALIPER

DISASSEMBLY

Do not remove the bridge bolts that hold the two halves of the caliper together. The two caliper housings are shown separated in Fig. 36 for illustration purposes only.

1. Remove the caliper assembly from the car as outlined in Section 2.

2. Remove the two retaining bolts and the caliper splash shield Fig. 36).

3. Remove the two shoe and lining assemblies.

4. Remove the flexible brake hose from the caliper.

5. Remove the external transfer tube.

6. Remove the four dust boots from the caliper housings and piston grooves.

7. Clamp the caliper in a vise and secure it by the mounting flanges on the inboard housing (Fig. 35).

8. Remove the four pistons from the cylinder bores with the special tool shown in Fig. 35. To prevent cocking with consequent damage to the piston or bore, rotate the piston with the tool while pulling it outward at the same time. **Be careful to avoid scratching or damaging the outside diameter surface or dust boot retaining groove of the piston. Such damage causes poor sealing.**

If a piston is so completely seized in the cylinder bore that it can not be removed with the special tool, force the cylinder out of the bore by positioning two screwdrivers in the piston dust boot retaining groove and prying outward. To prevent cocking, tap the end of the piston lightly around the circumference with a hammer, while the prying force is being applied. Be careful to avoid damaging the dust boot retainer in the caliper housing (Fig. 36). If this method of removal is used, the pistons must be replaced.

If the caliper dust boot retainer or retaining groove is damaged or scratched, pry the retainer out of the caliper housing with screwdrivers.

9. Remove the rubber piston seals from the grooves in the cylinder bores by carefully inserting the point of a small knife or other pointed instrument under the seal and raising the seal up far enough to be pulled out with the fingers.

CLEANING AND INSPECTION

Clean all metal parts with alcohol or a suitable solvent (Fig. 36). Use clean, dry, compressed air to clean out and dry the grooves and passageways. Be sure that the caliper bore and component parts are completely free of any foreign material.

Check the cylinder bores and pistons for damage or excessive wear. Replace the piston if it is pitted, scored, or the chrome plating is worn off. Check the caliper dust boot retainer for wear or damage.

ASSEMBLY

1. Clamp the caliper in a vise and secure it by the mounting flange on the inboard housing.

2. If a new caliper dust boot retainer is to be installed, thoroughly clean the contact area on the caliper housing and apply Loctite Sealant, Grade H to the retainer surface that seats in the housing. Install the retainer in the caliper housing.

3. Apply a film of clean brake fluid to **new** caliper piston seals and install them in the grooves of the cylinder bore. The seal should be positioned at one area in the groove and gently worked around. **Do not use the old seals.**

4. Coat the outside diameter of the pistons with brake fluid and install them in the cylinder bores so that the open end of the piston and the boot retaining groove face out of the bore. To avoid cocking, locate the piston squarely in the bore and apply a slow, steady pressure. If a piston will not easily go all the way into the bore, remove it and thoroughly inspect the cylinder bore, the piston seal and the installation of the seal. If the piston still will not go in with bore in good condition and the piston seal properly installed, use the tool shown in Fig. 35. Rotate the piston with the tool while pushing it inward at he same ime.

5. Carefully install four **new** dust boots on the caliper housings and pistons. Be sure that each boot is fully seated in the groove of its respective

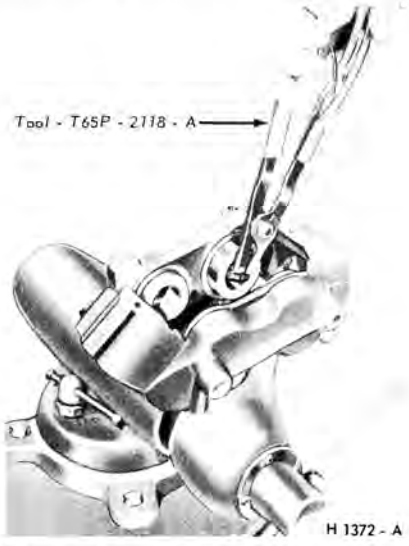


FIG. 35—Removing or Installing Pistons

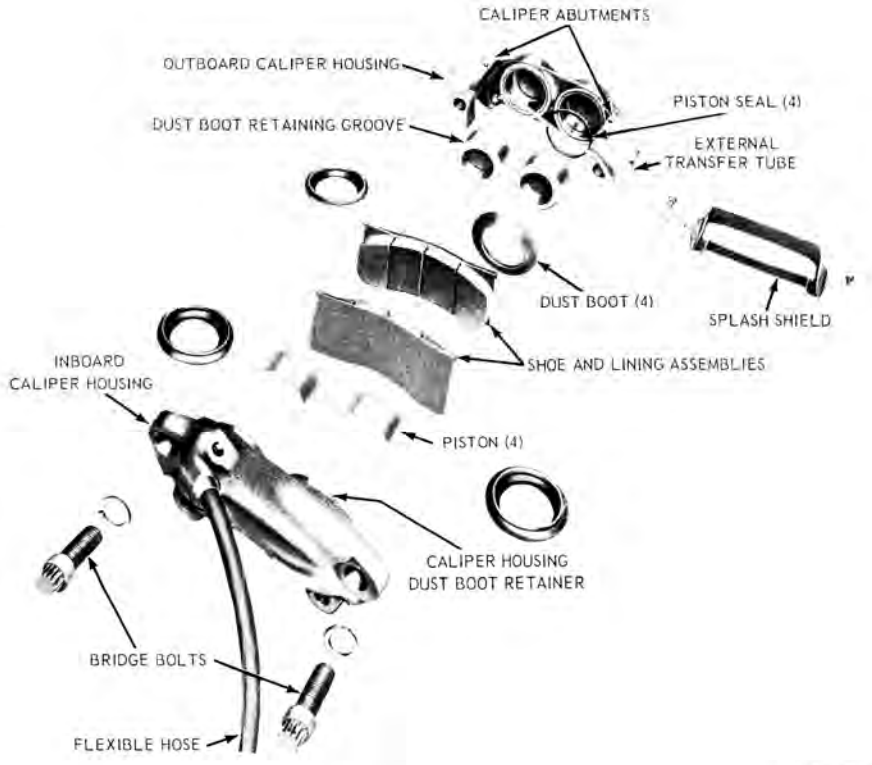


FIG. 36—Caliper Assembly—Disassembled

caliper housing and piston (Fig. 36). **Do not use the old dust boots.**

6. Install the external transfer tube.

7. Install the flexible brake hose to the caliper.

8. Install the caliper assembly on the spindle, and install the shoe and lining assemblies and the splash shield as outlined in Section 2.

9. Check the caliper for fluid leaks under maximum pedal pressures. **Do not move the car until a firm brake pedal is obtained.**

DISASSEMBLY OF BOOSTER—COMET AND MUSTANG

1. On a Comet, remove the speed nuts that attach the mounting plate to the rear shell and remove the plate.

On a Mustang, remove the retaining nuts and lockwashers and remove the mounting brackets from the rear shell (Fig. 41).

2. Pull the hydraulic push rod and front seal (Fig. 37) from the front shell.

3. Scribe an index mark across the front and rear shells.



FIG. 37—Removing Front Seal and Push Rod

4. Place the booster in a vise as shown in Fig. 38. Press downward on the rear shell and at the same time, turn it counterclockwise with a flat bar to release it from the front shell. Release the pressure on the rear shell slowly to prevent the diaphragm plate return spring from flying out.

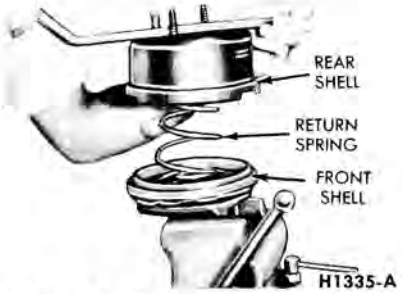


FIG. 38—Separating Booster Shells

5. Separate the two shells and remove the return spring.

6. Withdraw the diaphragm plate and diaphragm from the rear shell. Remove the dust shield.

7. Remove the diaphragm from the diaphragm plate as shown in Fig. 39.

8. Pry the filter retainer off the diaphragm plate being careful not to chip or damage the plate.

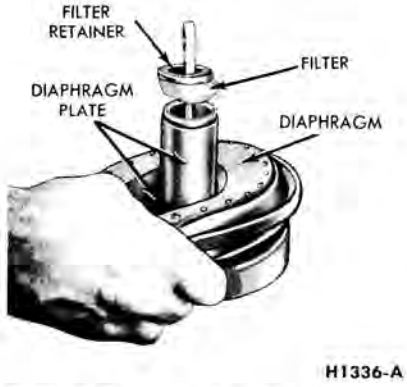


FIG. 39—Removing Diaphragm

9. Hold the diaphragm plate so that the valve retainer is facing downward. Press the valve push rod inward to release the tension on the retainer and allow it to drop out of the plate (Fig. 40).

10. Withdraw the valve and rod from the plate.

11. Press the reaction disc out of the diaphragm plate.

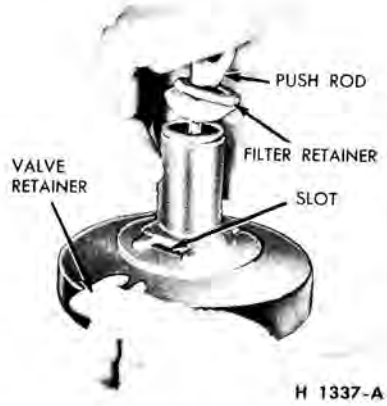


FIG. 40—Removing or Installing Valve Retainer

12. Drive the seal out of the rear shell with a punch or screwdriver. (Fig. 41). Discard the seal.

13. Working from the inside of the front shell, cut the bead off the check valve grommet. Remove the check valve.

ASSEMBLY OF BOOSTER—COMET AND MUSTANG

1. Place the rear shell on two wood blocks as shown in Fig. 42. Press a new seal, plastic side first, into the recess on the inside of the shell to a depth of ¼ inch.

2. Dip a new check valve grommet (Fig. 41) in alcohol and install it in the front shell making sure that the beveled edge is toward the inside. Make sure that the grommet is seated. Dip the shoulder of the check valve in alcohol and install it in the grommet. Press the check valve into the grommet until the flange contacts the grommet.

3. Apply silicone grease to the outer surface of the diaphragm plate hub and to the bearing and rubber surfaces of the valve.

4. Insert the valve and rod into the hub of the diaphragm plate. Push the rod inward until the retaining groove is aligned with the slot, and then slide the retainer into the groove (Fig. 40).

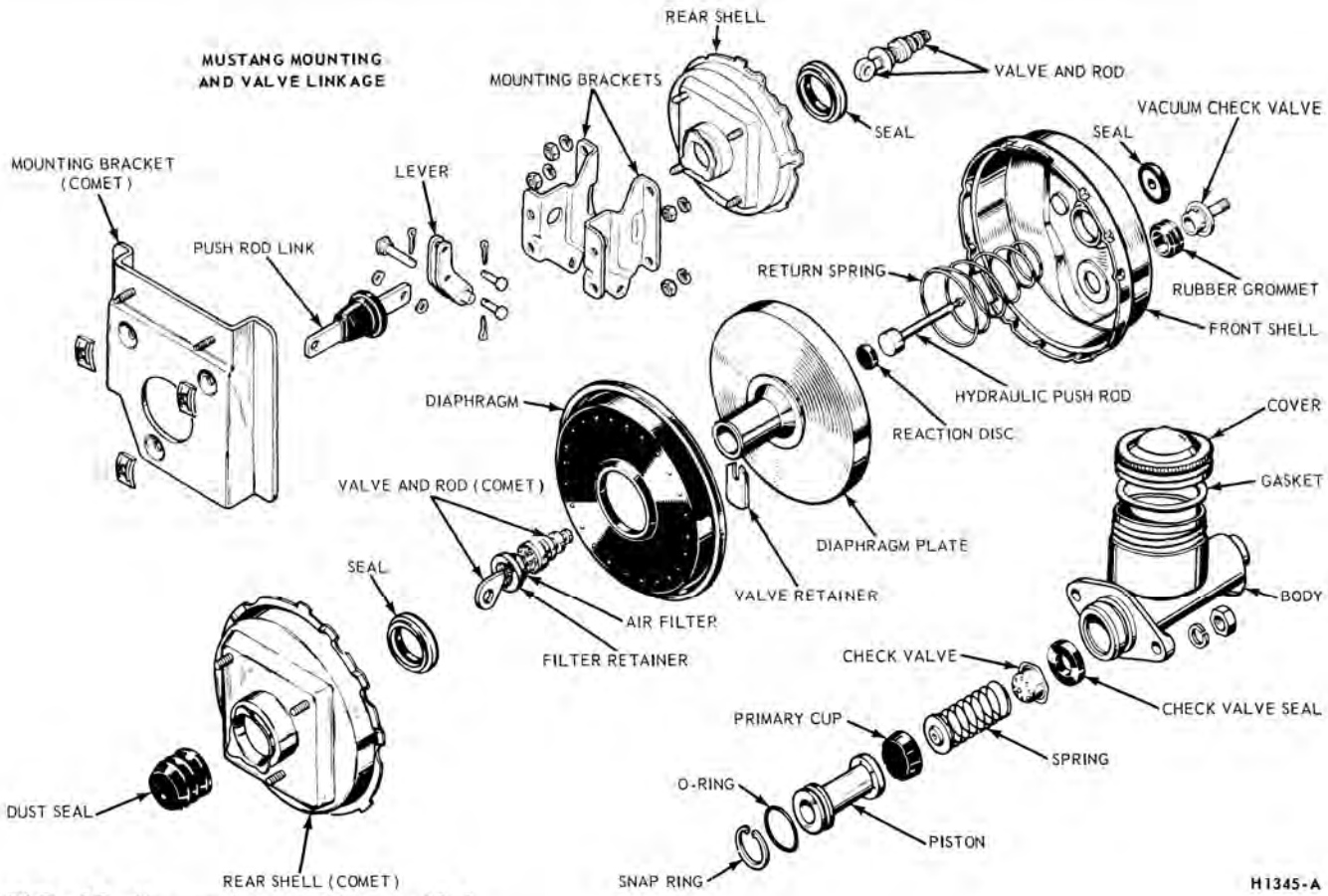


FIG. 41—Vacuum Booster Disassembled

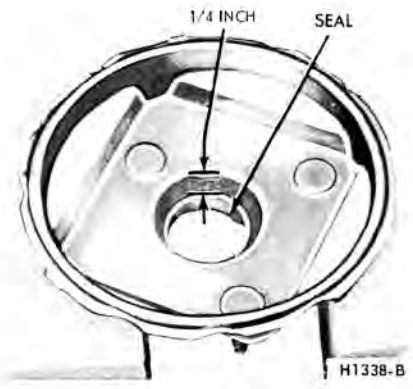


FIG. 42—Installing Rear Shell Seal

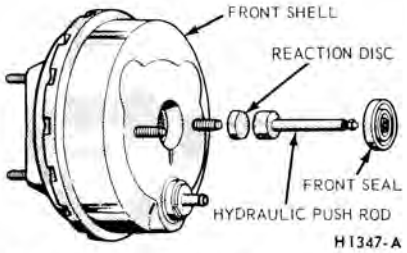


FIG. 43—Installing Reaction Disc, Push Rod and Front Seal



FIG. 44—Bellows to Booster Body Engagement

5. Tuck the filter into place in the plate hub. Press the filter retainer onto the hub being careful not to chip or damage the plastic. (Fig. 39).

6. Install the diaphragm on the diaphragm plate, making sure that the diaphragm lip is tucked in all around the recess between the hub and the plate (Fig. 39).

7. Place the rear shell in a vise. Apply silicone lubricant generously to the top outer flange of the shell. Apply silicone grease to the seal in the rear shell.

8. Carefully guide the valve rod and diaphragm plate hub through the seal in the rear shell.

9. Center the large end of the return spring on the diaphragm plate.

10. Align the index mark on the front shell with the one on the rear shell. Place a flat bar on the front shell and compress the spring until the tangs on the rear shell contact the notched sections of the front shell, and then rotate it clockwise to lock it in place.

11. Apply lubricant sparingly to the stem of the hydraulic push rod keeping it away from the adjusting screw area. Apply silicone grease liberally to the piston area of the push rod and to the reaction disc.

12. Center the reaction disc on the push rod piston. Guide the disc and push rod into the base of the diaphragm plate, and press the rod inward until the disc is bottomed (Fig. 43).

13. Press a new front seal into



H1363-A

FIG. 45—Removing or Installing Rear Seal to End Plate

the front shell until it bottoms in the recess (Fig. 43).

14. Install a new dust seal over the push rod and onto the rear shell.

15. On a Comet, position the mounting plate on the rear shell and secure it in place with speed nuts.

On a Mustang, position the two mounting brackets on the rear shell studs, and install the retaining nuts and lock washers (Fig. 41).

DISASSEMBLY OF BOOSTER—FAIRLANE

REMOVAL OF EXTERNAL PARTS

1. Remove the two attaching nuts and lockwashers, and separate the master cylinder from the booster body.

2. Remove the air filter assembly from the booster body. Separate the cover and retainer, and remove the air filter (Fig. 50).



H1395-A

FIG. 46—Removing or Installing the Bellows Assembly

3. Remove the vacuum manifold and check valve assembly and the rubber grommet from the booster body (Fig. 50).

4. Disconnect the valve operating rod from the lever assembly by removing the retainer clip and connecting pin (Fig. 50).

5. Disconnect the lever assembly from the end plate brackets by removing the retainer clip and pivot pin.

6. Disconnect the push rod link from the lever assembly by removing the retainer and connecting pin.

7. Remove the retaining nuts, and disassemble the brackets from the end plate.

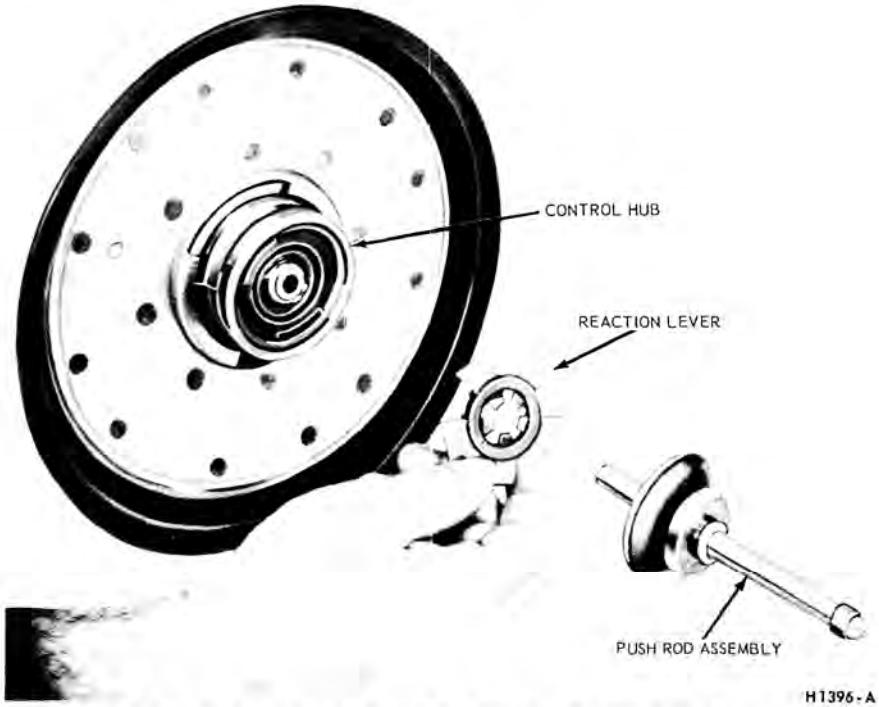
8. Remove the rubber boot from the valve operating rod.

SEPARATION OF MAJOR COMPONENTS

1. Scribe a line across the booster body, clamp band, and end plate.

2. Remove the clamp band screw and nut, and separate the clamp band, booster body, and end plate (Fig. 50).

3. Push the bellows assembly into the vacuum chamber (Fig. 44), and separate the bellows, control valve, diaphragm assembly, and end plate from the booster body.



H1396-A

FIG. 47—Push Rod Assembly, Reaction Lever and Control Hub

4. Push the valve, tail stock, and diaphragm assembly out of the end plate.

5. Remove the rear seal from the end plate (Fig. 45).

DISASSEMBLY OF BELLOWS, PUSH ROD AND VALVE ASSEMBLY FROM DIAPHRAGM

1. Remove the large bellows clamp and separate the bellows, bellows support rings, and bellows protector from the diaphragm and valve assembly (Fig. 46).

2. Remove the two support rings and the protector from the bellows.

3. Remove the push rod assembly and the reaction lever assembly from the control hub (Fig. 47).

4. Remove the two plastic guides from the push rod. Remove the reaction cone retainer and the cone from the push rod (Fig. 47).

5. Remove the valve operating rod from the plunger. To remove, hold the rod firmly and force the plunger off the rod breaking the plastic retainer. If the plunger is to be used again, remove all the broken pieces of the plastic retainer from the groove in the plunger.

6. Turn the control hub and plunger assembly clockwise to separate it from the diaphragm, and then remove the tail stock and O-ring from the diaphragm (Fig. 48).

7. Remove the retainer that holds the plunger to the control hub (Fig. 49). Separate the control hub and plunger assembly. **It may be necessary to file the burr from the protruding end of the plunger before it can be separated from the control hub.**

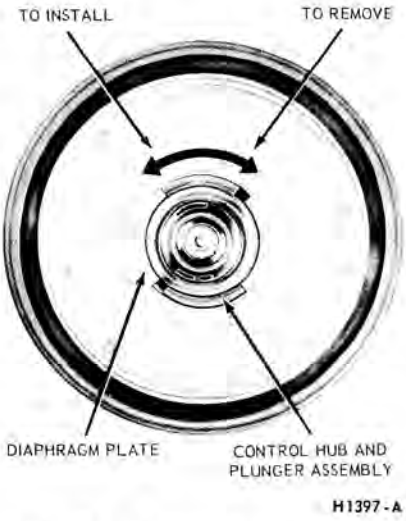


FIG. 48—Removing or Installing Control Hub and Plunger Assembly

DISASSEMBLY OF CONTROL VALVE PLUNGER

1. Compress the spring towards the rubber valve and remove the spring retainer.

2. Remove the spring, valve plate, rubber valve, "O" ring, and fiber washer from the plunger (Fig. 50).

ASSEMBLY OF BOOSTER—FAIRLANE

CONTROL VALVE PLUNGER

1. Assemble the rubber valve, valve plate, spring, "O" ring, and fiber washer on the plunger.

2. Compress the spring towards the rubber valve and assemble the spring retainer on the plunger with the flange towards the spring (Fig. 50).

ASSEMBLY OF VALVE ASSEMBLY, PUSH ROD, AND BELLOWS TO DIAPHRAGM

1. Assemble the control valve plunger assembly into the control hub so that the round holes in the rubber valve index with the raised projections on the hub, and the flat on the valve plate indexes with the flat projection on the hub (Fig. 51). Compress the valve spring, and install the retainer in the plunger groove to secure the control valve plunger to the control hub (Fig. 49).

2. Assemble the tail stock over the plunger with the flat on the tail stock indexing with the flat on the hub.

3. Assemble the "O" ring over the tail stock and into the "V" groove

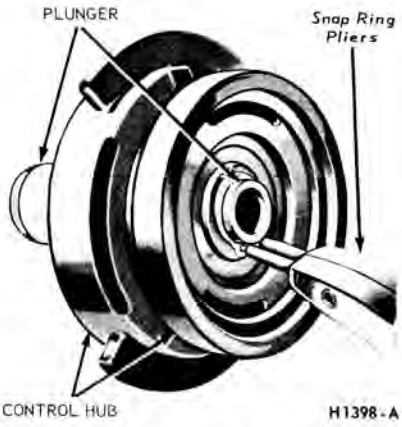


FIG. 49—Removing or Installing Plunger-to-Control Hub Retainer

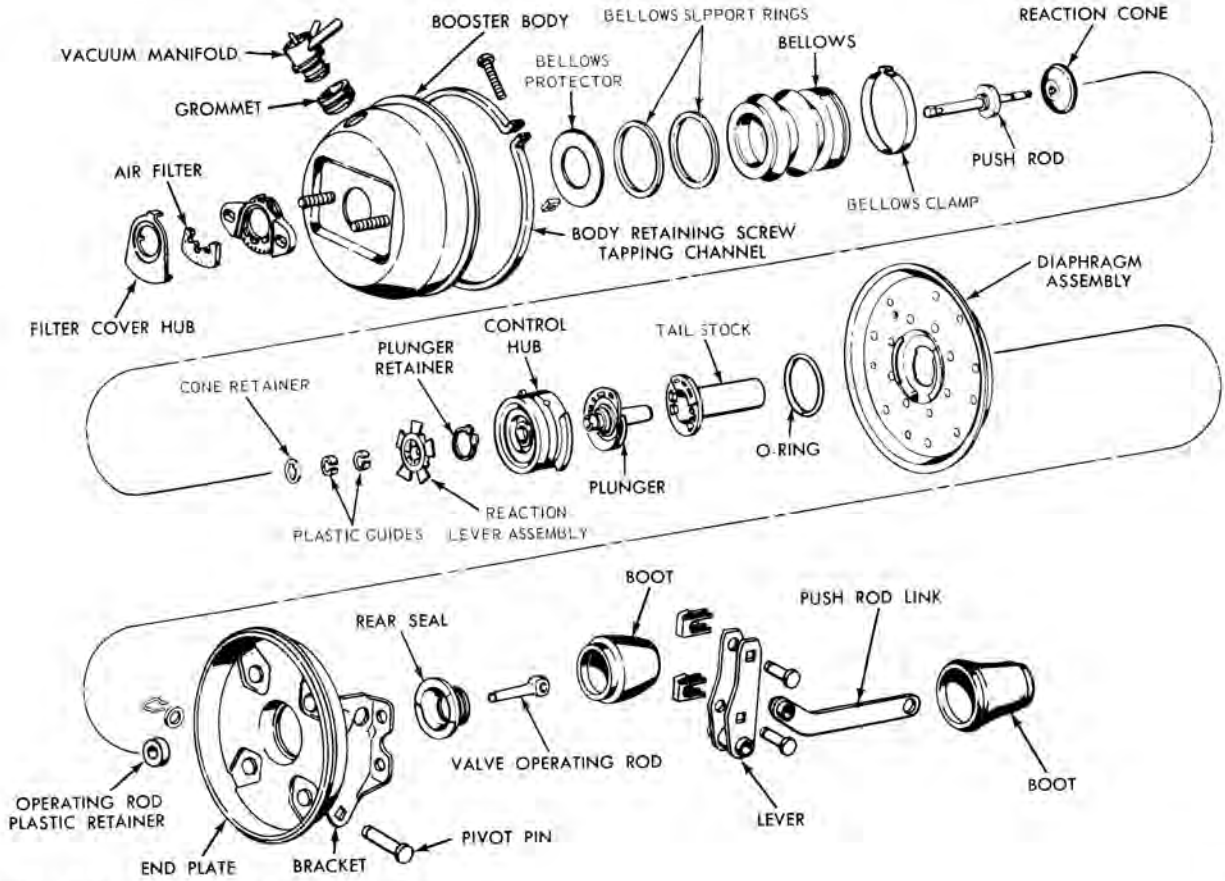


FIG. 50—Booster Unit Disassembled

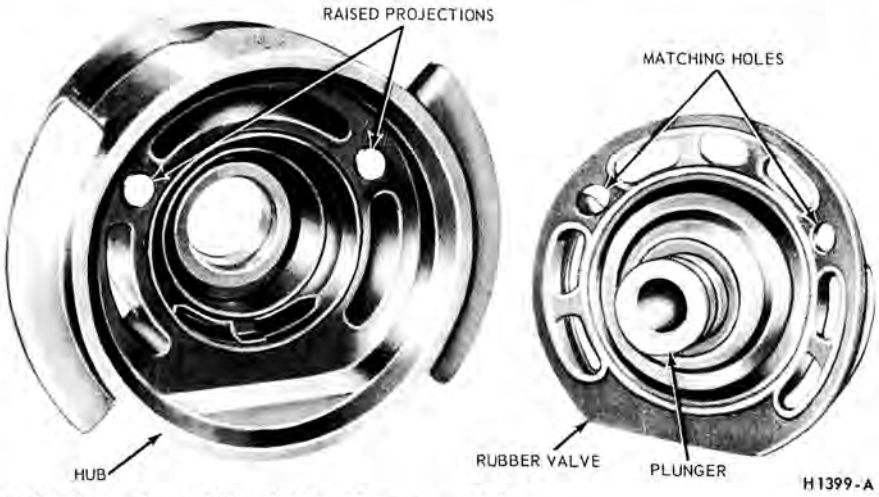


FIG. 51—Assembling Valve Plunger to Hub

formed by the tail stock and hub.

4. Assemble the tail stock and the plunger and control hub assembly to the diaphragm, and turn the hub counterclockwise to secure these parts together (Fig. 48).

5. Install the lever assembly in the control hub with the rubber protusions toward the hub (Fig. 47).

6. Assemble the reaction cone, retainer, and two plastic push rod guides on the push rod. Install the push rod assembly in the valve hub so that the push rod indexes in the valve plunger.

7. Install the two bellows support rings and bellows protector on the bellows. The support rings are positioned in the two larger folds of the bellows and the protector in the smaller fold.

8. Assemble the bellows on the control hub so that the lip of the bellows indexes in the groove on the hub. Secure the bellows to the hub by assembling the large bellows clamp on the diaphragm end of the bellows approximately 1/32" from the end of the bellows (Fig. 46).

ASSEMBLY OF MAJOR COMPONENTS

1. Assemble the rear seal in the end plate (Fig. 45) and position the diaphragm, the control valve components, and the bellows as an assembly into the end plate.

2. Install the rubber grommet in the booster body with the large diameter side to be outside of the booster. Force the vacuum manifold and check valve assembly through the grommet (Fig. 50).

3. Assemble the booster body to the end plate. Make sure that the lip of the diaphragm is evenly positioned on the retaining radius of the end plate and the booster body. Pull the front lip of the bellows through the booster body and position it evenly around the hole in the booster body (Fig. 47).

4. Install the clamp band over the lips of the booster body and end plate. Align the scribe lines, compress the assembly together, and secure with the clamp and band bolt. Tap the clamp band with a fibre hammer around its circumference as the bolt is being tightened. Tighten to 15 inch-pounds of torque.

INSTALLATION OF EXTERNAL PARTS

1. Install the rubber boot to the valve operating rod and assemble the plastic retainer to the end of the rod. Insert the rod into the plunger so that the retainer engages the groove in the plunger. Install the lip of the boot in the groove of the rear seal (Fig. 50).

2. Connect the valve operating rod to the upper end of the lever, and connect the push rod link to the center of the lever with the connecting pins and clips.

3. Position the mounting brackets to the end plate and install the retaining nuts.

4. Connect the lever assembly to the lower end of the mounting brackets with the pivot pin and clip.

5. Position the air filter in the plastic filter cover and then snap the cover and filter on the metal hub with the filter between.

6. Assemble the cover, filter, and hub assembly to the booster body with the metal hub against the booster body.

7. Assemble the master cylinder to the booster body. Torque the master cylinder mounting nuts to specification.

PART 2-3 SPECIFICATIONS

LINING DIMENSIONS—INCHES

FALCON AND COMET

MODELS	POSITION	FRONT	REAR	COLOR CODE
Falcon & Comet Sedan & Hardtop—Six Cylinder	Primary Secondary	2.25 x 7.75 2.25 x 10.0	1.5 x 7.75 1.5 x 10.0	Red-Blue Green
Falcon & Comet Convertibles & Station Wagons—Six Cylinder	Primary Secondary	2.25 x 7.75 2.25 x 10.0	2.25 x 7.75 2.25 x 10.0	Red-Blue Green
Falcon & Comet All-Eight Cylinder	Primary Secondary	2.25 x 8.35 2.25 x 10.75	1.75 x 8.35 1.75 x 10.75	Silver Yellow-White

MUSTANG

MODELS	POSITION	FRONT	REAR	COLOR CODE
All Six Cylinder	Primary Secondary	2.25 x 7.75 2.25 x 10.0	1.5 x 7.75 1.5 x 10.0	Red-Blue Green
All Eight Cylinder	Primary Secondary	2.25 x 8.35 2.25 x 10.75	1.75 x 8.35 1.75 x 10.75	Silver Yellow-White
All Eight Cylinder	Disc	4.82 x 1.84	—	N/A

FAIRLANE

MODELS	POSITION	FRONT	REAR	COLOR CODE
Fairlane Passenger Cars	Primary Secondary	2.25 x 8.35 2.25 x 10.75	1.75 x 8.35 1.75 x 10.75	Silver Yellow-White
Fairlane LPO Police— Maximum Fade Resist.	Primary Secondary	2.50 x 9.51 2.50 x 10.70	2.00 x 9.51 2.00 x 10.70	Yellow-Black Black-Black
Fairlane LPO Taxi— Max. Wear Resist. (Bonded)	Primary Secondary	2.50 x 9.51 2.50 x 10.70	2.00 x 9.51 2.00 x 10.70	Red White
Station Wagons	Primary Secondary	2.50 x 8.35 2.50 x 10.75	2.50 x 8.35 2.50 x 10.75	Silver Yellow-White

CHECKS AND ADJUSTMENTS—INCHES

FALCON AND COMET

Master Cylinder Bore Diameter Standard Power	 1.000 0.875	Lining Maximum Wear Limit (From Top of Rivets)	0.031
Master Cylinder Maximum Allowable Hone	0.003		
Front Wheel Cylinder Bore Diameter 6 Cylinder Engine 8 Cylinder Engine	 1.062 1.125	Lining Maximum Clearance to Shoe (Midway Between Rivets)	0.008
Rear Wheel Cylinder Bore Diameter 6 Cylinder Engine Sedan & Hardtop Convertibles & Station Wagons 8 Cylinder Engine All Except Sta. Wag. Station Wagon	 0.844 0.906 0.906 0.938	Pedal Travel—Standard Pedal Travel—Power Push Rod Adjustment—Power Brakes	6.50 4.75 0.985-0.970
Wheel Cylinder Maximum Allowable Hone*	0.003	Hydraulic Line Diameter	0.188
Drum Diameter 6 Cylinder Engine 8 Cylinder Engine	 9.0 10.0	Parking Brake—Type Hand Operated with Handle Mounted on Lower	
Drum Maximum Allowable Run-Out	0.007	Left Side of the Instrument Panel	
Drum Maximum Boring Diameter 6 Cylinder Engine 8 Cylinder Engine	 9.060 10.060		

*Front Wheel Brake Cylinders on 6 Cylinder Vehicles cannot be Honed.

CHECKS AND ADJUSTMENTS—INCHES (Continued)

MUSTANG

Master Cylinder Bore Diameter Standard Power	 1.000 0.875	Lining Maximum Wear Limit (From Top of Rivets)	0.031
Master Cylinder Maximum Allowable Hone	0.003	Lining Maximum Clearance to Shoe (Midway Between Rivets)	0.008
Front Wheel Cylinder Bore Diameter 6 Cylinder Engine 8 Cylinder Engine	 1.062 1.125	Pedal Travel—Standard	6.50
Rear Wheel Cylinder Bore Diameter 6 Cylinder Engine 8 Cylinder Engine	 0.844 0.906	Pedal Travel—Power Push Rod Adjustment—Power Brakes	3.54 0.985-0.970
Wheel Cylinder Maximum Allowable Hone*	0.003		
Drum Diameter: 6 Cylinder Engine 8 Cylinder Engine	 9.0 10.0	Hydraulic Line Diameter Parking Brake-Type Hand Operated with Handle Mounted on Lower Left Side of the Instrument Panel	0.188
Drum Maximum Allowable Run-Out	0.007		
Drum Maximum Boring Diameter 6 Cylinder Engine 8 Cylinder Engine	 9.060 10.060		
FRONT WHEEL DISC BRAKE (RPO—8 CYLINDER ENGINE)			
Master Cylinder Bore Diameter	0.938	Lining Thickness:	0.400 Nominal
Master Cylinder Maximum Allowable Hone	0.003		
Caliper Cylinder Bore Diameter	1.636	Lining Maximum Wear Limit (From Surface of Shoe)	0.030
Rotor Diameter: Outside Inside	 11.375 7.375	Lining to Rotor Clearance (Brakes Released)	0.002-0.010
Rotor Thickness	0.810	Pedal Travel (Non Power)	6.50
Rotor Maximum Allowable Runout	0.002	Pedal Ratio	5.7:1
Lining Area	34.00 sq. in.		

*Front Wheel Brake Cylinders on 6 Cyl. Vehicles cannot be Honed

FAIRLANE

Master Cylinder Bore Diameter	1.000	Lining Maximum Wear Limit (From Top of Rivets or Shoe Rim)	0.031
Master Cylinder Maximum Allowable Hone	0.003		
Front Wheel Cylinder Bore Diameter Passenger Station Wagon	 1.125 1.125	Lining Maximum Clearance to Shoe (Midway Between Rivets)	0.008
Rear Wheel Cylinder Bore Diameter Passenger Station Wagon	 0.906 0.938	Pedal Travel—Standard Pedal Travel—Power	6.5 4.5
LPO Maximum Fade & Maximum Wear Resistant Wheel Cylinders		Push Rod Adjustment--Power Brakes	1.00-0.005
Front Wheel Cylinder Bore Diameter	1.062		
Rear Wheel Cylinder Bore Diameter	0.844	Hydraulic Line Diameter	0.188
Drum Diameter	10.0		
Drum Maximum Allowable Run-Out	0.007	Parking Brake—Type Hand Operated with Handle Mounted on Lower Left Side of the Instrument Panel	
Drum Maximum Boring Diameter	10.060		
Drum Width—Front Passenger Station Wagon—Maximum Fade and Wear Resistant	 2.25 2.50		
Drum Width—Rear Passenger Station Wagon Maximum Fade & Maximum Wear Resistant	 1.75 2.50 2.00		

TORQUE LIMITS—BRAKES

Description	Falcon and Comet Foot-Pounds	Mustang Foot-Pounds	Fairlane Foot-Pounds
Brake Cylinder to Brake Carrier Plate Bolt	5-7	5-7	10-20
Hand Brake Control Assembly to Instrument Panel Bolt	8-12	8-12	15-20
Master Cylinder to Dash Panel Bolt	20-34	18-25	20-34
Tube Connector to Master Cylinder	6-19	6-12	6-12
Master Cylinder Cover	Finger Tight	Finger Tight	Finger Tight
Hand Brake Control Assembly to Dash Panel Bolt	8-12	8-12	15-20
Brake Hose Bolt	12-18	12-18	10-15
Brake Pedal Support Bracket to Dash Panel Bolt	20-34	18-25	20-34
Brake Pedal Support Bracket to Instrument Panel Nut	9-13	—	—
FRONT DRUM BRAKES ONLY			
Wheel Assembly to Wheel Hub and Drum Assembly Nut	8 Cyl.—75-110 6 Cyl.—55-85	55-85—6 Cyl. 75-110—8 Cyl.	75-110
Wheel, Hub and Drum Assembly to Wheel Spindle Nut*	17-25	17-25	17-25
Carrier Plate to Spindle Nut	25-45	25-45	25-45
REAR BRAKES ONLY			
Axle Housing to Carrier Plate Lock Nut	25-35	25-35	30-40
Drum to Axle Shaft Assembly Speednut	Hand Push Fit	Hand Push Fit	Hand Push Fit
Wheel Assembly to Axle Shaft to Drum Assembly Nut	55-85—6 Cyl. 75-110—8 Cyl.	55-85—6 Cyl. 75-110—8 Cyl.	75-110
Brake Line Connection to Axle Housing Bolt	12-18	12-18	
Bleeder Screw to Wheel Cylinder	50 Inch-Pounds Max.	50 Inch-Pounds Max.	55 Inch-Pounds Max.
POWER BRAKES			
Vacuum Manifold to Booster Body Mounting Bolt	8-10		
Master Cylinder to Booster Body	10-13		
Brake Booster to Dash Panel	12-15		
Push Rod to Brake Pedal Bolt	10-15		

*.0005 to .0065 Bearing end play at assembly.

TORQUE LIMITS—DISC BRAKES
RPO MUSTANG 8 CYL FRONT

Description	Ft-lbs
Caliper Assembly to Mounting Bracket	45-60
Mounting Bracket to Spindle	35-45
Caliper Bleeder Screw	10 (120 in.-lbs. maximum)—Must be leak proof
Caliper Splash Shield	7-9
Caliper Bridge Bolts	65-75
Rotor Splash Shield to Spindle	10-20
Hub and Rotor Assembly to Front Wheel Spindle	17-25—Rotate rotor while torquing.*
Wheel Assembly to Front Wheel Hub and Rotor Assembly	75-110 ft./lbs.
Brake Tube Fitting Nuts to Proportioning Valve	70 in.-lbs.—maximum—Must be leak proof

*.0005" to .0065" maximum bearing end play with torque specification of 17-25 ft./lbs.

SUSPENSION, STEERING, WHEELS AND TIRES — GROUP 3

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PART 3-1 SUSPENSION, STEERING, WHEELS AND TIRES GENERAL SERVICE

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1 DIAGNOSIS AND TESTING

MANUAL STEERING

Table 1 lists various steering gear and linkage trouble symptoms and possible causes. Several of these symptoms are also common to suspension frame, and wheel and tire troubles. For this reason, be sure that the cause of the trouble is in the steering gear or linkage before adjusting, repairing, or replacing any of the steering parts.

POWER STEERING

PRELIMINARY TESTS

The following preliminary checks should always be made before performing any trouble-shooting operations.

Check Pump Belt. If the pump belt is broken, glazed, or worn, replace with a new belt. **Use only the specified type of belt.**

Check the belt tension. If the belt is too loose or too tight, it should be adjusted to the proper tension as outlined in Part 3-4.

A "used belt" is one that has run 15 minutes or longer.

Check Fluid Level. Start the engine, turn the steering wheel all the way to the left and right several times, and shut off the engine.

Check the fluid level in the reservoir. If the level is low, add enough fluid to raise the level to the base of the filler neck. **Do not overfill the reservoir.**

Check For Fluid Leaks.

1. If the power steering fluid does not already include yellowish green dye, pre-mix one teaspoonful of oil-soluble aniline dye with 2 pints of automatic transmission fluid CIAZ-19582-A. Then refill the reservoir with the dye solution.

2. With the engine running at idle speed, turn the steering wheel all the way to the right stop and to the left stop several times to distribute the dye soluion throughout the hydraulic system. Do not hold the wheel against each wheel stop for more than 3 to 5 seconds.

3. Shut off the engine, and check for leaks.

FITTING AND TUBE SEAT LEAK. Since most fluid leaks occur at the fittings and connections in a power steering hydraulic system, these parts should be checked before any other part is replaced.

1. With the engine running at idle speed, raise the car on a hoist.

2. Clean the outside of the control valve and the power cylinder, the bottom surfaces of the pump, and all lines and fittings. Dirt, oil, and grease should be removed from all areas where leaks may exist.

3. Tighten all fittings, using a special 5-flat tube wrench. **Do not tighten the fitting with a standard open end wrench.** If a properly tightened fitting leaks, replace the seat.

PUMP, CONTROL VALVE, AND POWER CYLINDER LEAK. If the fittings and connections do not leak, check the other parts of the system.

Check the hose connection at the pump for leaks, and tighten the hose clamp if necessary.

PUMP LEAKS. If leakage occurs at the pump reservoir seal, pump outlet valve seals, support stud seal or the pump shaft seal, check the torque of the outlet valve nut and the support stud nut. If torque is within specifications, replace the power steering pump if leaks are evident other than the lines.

CONTROL VALVE LEAKS. If the control valve is leaking (somewhere other than the tube seats), replace all the seals, using a control valve seal kit. Use all the parts in the kit, and be sure they are correctly installed. When assembling the new seals in the valve, an application of silicone grease to the internal parts will help to provide a better seal against future leakage. Apply grease to the centering spring area, especially on the cap and spacer mating surfaces. Coat the threads of the cap retaining bolts with grease. The rubber boot seals, the actuator assembly, and the metal cup seals in the control valve should also be coated with silicone grease.

Some oil remaining from the manufacturing processes may be found in the sleeve near the ball stud. Do not confuse this oil with leaking fluid from the hydraulic system.

POWER CYLINDER LEAKS. The power cylinder may leak at the piston rod seals. A power cylinder seal kit should be used to correct leakage. **Do not replace the power cylinder assembly unless the piston rod is scored or has a dull gray finish instead of a high luster chrome finish.**

Check Turning Effort. With the front wheels properly aligned and tire pressures correct, check the effort required to turn the steering wheel.

1. With the car on dry concrete, set the parking brakes.

2. With the engine warmed up and running at idle speed, turn the steering wheel to the left and right several times to warm the fluid.

3. Attach a torque wrench to the steering wheel hub. (Fig. 1). Check the effort required to turn the wheel at least one complete revolution in both directions. See Part 3-6 for the specified torque which should be approximately equal in both directions.



FIG. 1—Checking Turning Effort —Typical

TROUBLE DIAGNOSIS GUIDE

BINDING OR POOR RECOVERY	If the steering wheel binds or sticks when turned, or if poor recovery to the straight-ahead position occurs, check the Pitman arm ball stud in the control valve sleeve. If the ball stud is rubbing against the edge of the sleeve slot, the roll pin may be missing. If either of the idler arm bushings are worn or damaged, replace both bushings. Check the steering gear adjustment (Section 2). Check the operation of the control valve spool in the valve housing. If the spool is binding in the housing,	check the spool adjustment. If the adjustment is correct, overhaul or replace the control valve. Check the control valve travel regulator stop adjustment. If the stop is drawn up too tightly, the ball stud will bind in the seats. Adjust the stop as required. Check the control valve sleeve and the socket tube for damage. Replace parts that show signs of damage, and adjust the travel regulator stop. Check for possible interference between the steering wheel and the steering column.
HARD STEERING	If the effort required to turn the steering wheel is greater than normal for the entire travel of the front wheels, check the tire pressure then, test the fluid pressure. Be sure that there are no leaks, that the reservoir is properly filled, and that the belt is properly adjusted. If the pump output pressure is low, the pump may be defective and should be replaced. If the pressure test shows that the trouble is in the control valve or power cylinder, remove and inspect these units. Repair or replace any damaged parts. If the pressure test indicates that the pressures throughout the system are within specifications, check the following items in the order given: Check the control valve spool centering spring adjustment. Adjust if required (Section 2). Check the control valve spool for movement. If the spool does not move freely, check for, and eliminate, interference between the socket tube and the valve sleeve. If the spool is sticking in the housing, remove the spool and check the spool lands for burrs. Small burrs may be removed with crocus cloth if the edges of the valve lands are not rounded in the process. If the spool cannot be repaired, replace the control valve. Check the control valve ball stud for free movement in the ball stud seats. If the stud is binding in the seats, adjust the travel regulator stop. If the hard steering still persists, check the front end alignment.

CONTINUED ON NEXT PAGE

TROUBLE DIAGNOSIS GUIDE (Continued)

EXCESSIVE FREE PLAY	If excessive free play or lost motion is noticed when steering, check the steering gear preload and mesh adjustment. Check for excessive clearance between the steering arm ball stud and the ball stud seats. If the ball stud is loose in the seats, adjust the control valve travel regulator stop. Check the control valve centering spring adjustment. If the spring adjustment nut is loose, tighten the nut until it is snug, and then back off the nut not more than ¼ turn. **Excessive tightening may damage the stop pin.**
NOISE	Check the pump belt tension. A loose or glazed belt can cause belt squeal. A glazed belt, even when properly adjusted, may slip. Excessive torque at the pressure line joints may distort the tube seats and cause noise.	Noise may result if the specified hose is not used or if it is improperly routed. If noise still exists with the specified hose properly installed and routed, the pump should be replaced.
STEERING CHATTER	A loose pump belt or air in the fluid can cause chatter against the wheel stops during an extremely sharp turn. Check the belt tension, and adjust it to specifications or fill the reservoir if necessary. Check for looseness in the idler arm rod connection. Looseness at this point may be due to worn mounting bushings or improper	mounting nut torque. Replace the bushings if worn. Torque the nut to specification. Check the power cylinder piston rod insulators for looseness. If the insulators are worn, replace them. If the mounting nut is loose, torque it to specification, and torque the locknut to specification.
RATTLES	Check the control valve spool centering spring adjustment. If the adjustment is loose, tighten the nut until snug, and then back off the nut not more than ¼ turn. **Excessive**	**tightening may damage the stop pin.** Check for looseness between the control valve ball stud and the ball stud seats. If the stud is loose in the seats, adjust the travel regulator stop.
LOSS OF POWER ASSIST	Check the entire system for damage, replacing parts as necessary. Tighten a loose pump belt. Test the fluid pressure to determine whether the trouble is in the pump, the control valve, or the power cylinder. If the pressure test indicates that the pump is at fault, replace the pump. If the pressure test indicates that the control valve or power cylinder is at fault, check as follows: Disconnect the power cylinder piston rod from the idler arm bracket. Operate the piston by hand to check	for resistance to movement. If the piston moves easily with little or no resistance, the internal parts of the power cylinder are broken or damaged. Replace the power cylinder if broken or damaged. Maladjustment of the control valve spool centering spring can cause a loss of either right or left power assist. Check the adjustment, and readjust if necessary. Replace all defective parts. Check the operation of the control valve check valve. If the check valve does not operate freely, replace the check valve assembly.

Pump-Fluid Pressure Test.

A fluid pressure test will show whether the pump or some other unit in the power steering system is causing trouble in the system. Steps outlined below should be followed to determine the cause of the trouble.

1. Measure the pump belt tension.

When adjusting the belt tension on the power steering pump, do not pry against the pump to obtain the proper belt load.

A half-inch cast boss has been incorporated on the front face of the pump cover plate onto which a 9/16" open end wrench can be fitted to pry the pump and obtain the proper belt tension.

2. Disconnect the pressure line hose from the pump outlet, and install a 0-2000 psi pressure gauge and shut off valve between the end of the hose and the pump outlet (Fig. 2).

Be sure that the pressure gauge is between the pump and the shut off valve, all connections are tight, and the shut off valve is fully open.

3. Connect a tachometer.

4. Start the engine and operate it at idle speed for at least two minutes to warm up the fluid.

TABLE 1—Trouble Symptoms and Possible Causes

SYMPTOMS	POSSIBLE CAUSES OF TROUBLE														
	Jerky Steering	Loose Steering	Hard Steering and/or Loss of Power Assist	Hard Turning When Stationary	Steering and Suspension Noises	Shimmy or Wheel Tramp	Pull to One Side	Side-to-Side Wander	Body Sway or Roll	Tire Squeal on Turns	Binding or Poor Recovery	Abnormal or Irregular Tire Wear	Sag at One Wheel	Hard or Rough Ride	Rear Suspension Misalignment (Dog-Tracking)
1. Incorrect Tire Pressure			X	X		X	X	X	X	X	X	X	X	X	
2. Tire Sizes Not Uniform			X	X			X	X		X		X	X		
3. Overloaded or Unevenly Loaded Vehicle							X	X				X	X	X	
4. Power Steering Fluid Level Low-Leak	X		X	X	X										
5. Sagging or Broken Spring					X		X	X	X			X	X	X	
6. Glazed, Loose or Broken Power Steering Pump Belt	X		X	X	X										
7. Rear Spring Tie Bolt Off Center							X					X			X
8. Broken Rear Spring Tie Bolts					X	X	X	X	X			X			X
9. Rear Spring Front Hanger Mislocated							X					X			X
10. Bent Spindle Arm							X	X		X		X			
11. Bent Spindle							X	X		X		X			
12. Lack of Lubrication			X	X	X						X			X	
13. Air in Power Steering System	X		X		X	X									
14. Obstruction in Power Steering Lines			X	X	X										
15. Loose or Weak Shock Absorber					X	X		X	X			X		X	
16. Loose or Worn Suspension Arm Bushings					X	X						X		X	
17. Binding Front Suspension Ball Joints or Steering Linkage	X		X	X	X						X			X	
18. Loose, Worn, or Damaged Steering Linkage or Connections	X	X			X	X		X		X		X			
19. Loose Steering Gear Mountings	X	X			X	X		X							
20. Insufficient Steering Pump Pressure			X	X							X				
21. Incorrect Steering Gear Adjustment	X	X	X	X	X	X		X	X		X	X			
22. Incorrect Brake Adjustment	X				X		X					X			
23. Incorrect Front Wheel Bearing Adjustment	X	X			X	X	X	X				X			
24. Wheel Out of Balance	X					X						X		X	
25. Incorrect Front Wheel Alignment			X		X	X	X	X		X	X	X			
26. Out-of-Round Wheel or Brake Drum						X						X		X	
27. Frame or Underbody Out of Alignment							X					X			X
28. Bent Rear Axle Housing					X		X					X			X
29. Excessive Wear of Steering Pump Internal Parts			X		X										
30. Steering Gear Valve Spool Binding or out of Adjustment			X	X			X				X				
31. Obstruction Within Steering Gear	X		X	X							X				

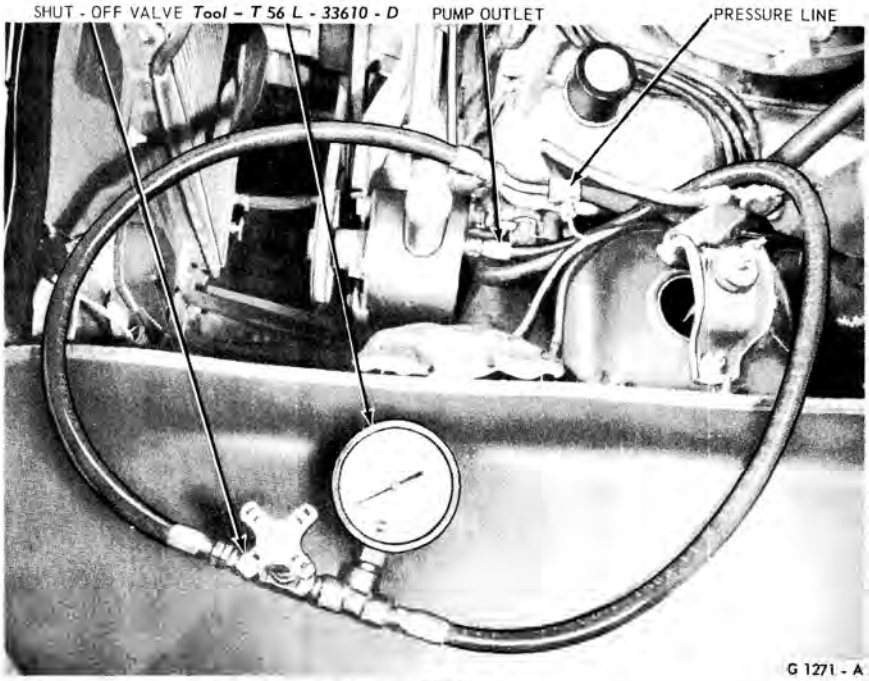


FIG. 2—Pressure Testing Tool Installed

5. Cycle the steering wheel from stop-to-stop several times to expel any air from the system; stop the engine. Remove the reservoir filler cap and check the fluid level in the reservoir. If necessary, add lubricant CIAZ-19582-A to the proper level.

6. With the engine running at **approximately** 500 rpm and no steering effort applied, and the lubricant at normal operating temperature, the pressure gauge should show a pressure of less than **50** psi. If the pressure is higher, inspect the hoses for kinks and obstructions.

7. Increase the engine speed to 1000 rpm; then, slowly close the gauge shut-off valve. With the valve fully closed, the pump pressure should be as follows: Fairlane, Falcon, Comet, Mustang 750 to 900 psi.

Do not close the valve for more than a few seconds, as this would abnormally increase the lubricant temperature and cause undue pump wear.

If pressure is more or less than specification, replace the pump assembly. If pressure is as specified and steering efforts are heavy, the gear and/or control valve could be at fault.

FRONT WHEEL ALIGNMENT CHECKS

Do not attempt to check and adjust front wheel alignment without first making a preliminary inspection of the front-end parts.

Check all the factors of front wheel alignment except the turning angle before making any adjustments. The turning angle should be checked only after caster, camber, and toe-in have been adjusted to specification.

The front wheel alignment specifications, given in Part 3-6 are correct only when the car is at "Curb Height". Before checking or adjusting the alignment factors, the suspension alignment spacers must be installed to obtain the curb height.

EQUIPMENT INSTALLATION

Equipment used for front wheel alignment inspection must be accurate. Alignment height spacers (Figs. 4 and 5) are used to check caster, camber and toe-in. If the car is operated under abnormal load conditions, the spacers should be omitted when checking toe-in.

1. Drive the car in a straight line far enough to establish the straight-ahead position of the front wheels, and then mark the steering wheel hub and the steering column collar (Fig. 3). **Do not adjust the steering wheel spoke position at this time.** If the front wheels are turned at any time during the inspection, align the marks to bring the wheels back to the straight-ahead position.



FIG. 3—Straight Ahead Position Marks—Typical

2. With the car in position for the front end alignment inspection and adjustment, install the alignment spacers as follows to establish the curb height.

Insert the pin in the spacer hole marked for the model being checked (Mustang rear does not use the pin).

Raise the front of the car and position the alignment spacers between the suspension upper arm and the spring tower as shown in Fig. 4. The lower end of the spacer should be placed over the head of the ball joint front outside attaching rivet. Position the alignment spacers for the rear of the car between the rear axle and the side rail as shown in (Fig 5).

3. Install the wheel alignment equipment on the car. Whichever type of equipment is used, follow the installation and inspection instructions provided by the equipment manufacturer.

CASTER

Check the caster angle at each front wheel.

Caster is the forward or rearward tilt of the top of the wheel spindle (Fig. 6). If the spindle tilts to the rear, caster is positive. If the spindle tilts to the front, caster is negative. The correct caster angle, or tilt, is specified in Part 3-6. The maximum difference between both front wheel caster angles should not exceed ½°. However, a difference of not more than ¼° is preferred.

CAMBER

Check the camber angle at each front wheel.

Camber is the amount the front

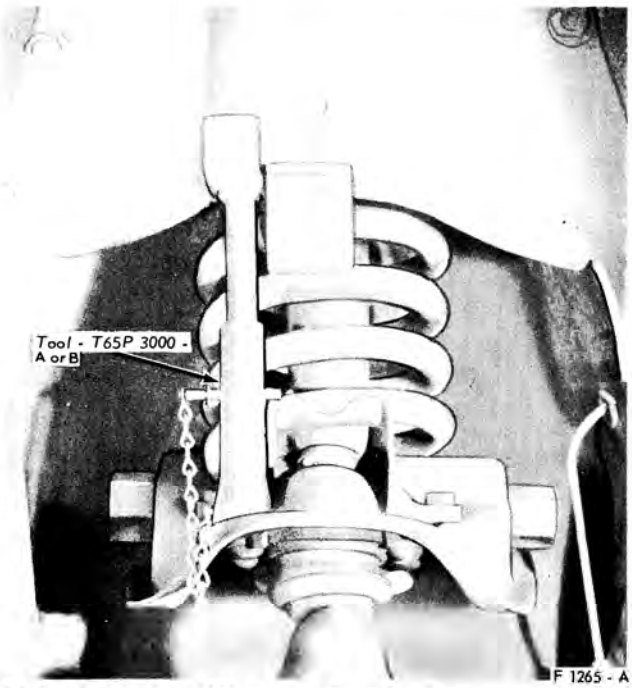


FIG. 4—Typical Alignment Spacer—Front

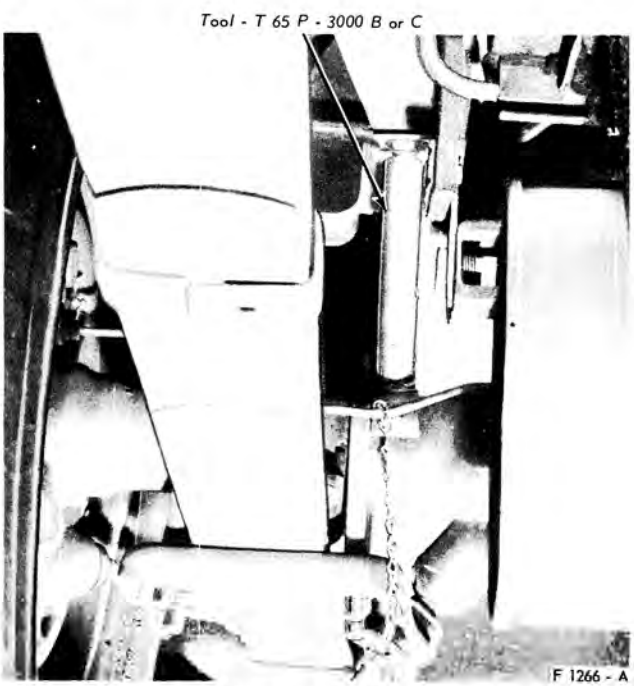


FIG. 5—Typical Alignment Spacer—Rear

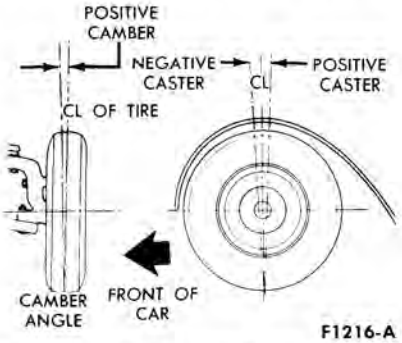


FIG. 6—Caster and Camber Angles

wheels are tilted at the top (Fig. 6). If a wheel tilts outward, camber is positive. If a wheel tilts inward, camber is negative. The correct camber angle, or outward (positive) tilt, is specified in Part 3-6. The maximum difference between both front wheel camber angles should not exceed ½°. However, a difference of not more than ¼° is preferred.

TOE-IN

Alignment height spacers are used on all cars to check and adjust toe-in, except on those operated under abnormal conditions. Toe-in should only be checked and adjusted after the caster and camber has been adjusted to specification.

Check the toe-in with the front wheels in the straight-ahead position. **Run the engine so that the power steering control valve will be in the center (neutral) position (if so equipped).** Measure the distance between the extreme front and also between the extreme rear of both front wheels. The difference between these two distances is the toe-in.

Correct toe-in, or inward pointing of both front wheels at the front, is specified in Part 3-6.

FRONT WHEEL TURNING ANGLE

When the inside wheel is turned 20°, the turning angle of the outside wheel should be as specified in Part 3-6. The turning angle cannot be adjusted directly, because it is a result of the combination of caster, camber, and toe-in adjustments and should, therefore, be measured only after these adjustments have been made. If the turning angle does not measure to specifications, check the spindle or other suspension parts for a bent condition.

2 COMMON ADJUSTMENTS AND REPAIRS

After front wheel alignment factors have been checked, make the necessary adjustments. **Do not attempt to adjust the front wheel alignment by bending the suspension or steering parts.**

CASTER AND CAMBER ADJUSTMENTS—FALCON, COMET AND MUSTANG

Be sure **all** the equipment listed in Equipment Installation is installed before adjusting the caster and camber.

Caster and camber can be adjusted by removing or installing shims between the inner shaft of the front suspension upper arm and the underbody (Fig. 7).

Both caster and camber adjustment can be made at the same time by loosening the nuts on the two bolts that fasten the inner shaft to the underbody. After the required shims have been removed or installed, torque the nuts to specification. Caster and camber adjusting shims are available in $\frac{1}{32}$-inch and ⅛-inch thickness.

The $\frac{1}{32}$ inch shims should be placed against the fender housing sheet metal or between the ⅛ inch shims.

CASTER

To adjust caster, remove or install

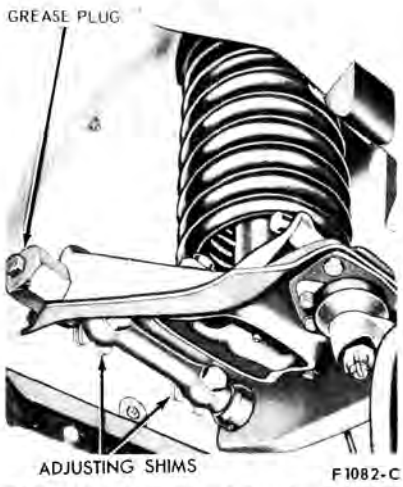


FIG. 7—Caster and Camber Adjustments

shims at either the front bolt or the rear bolt (Fig. 7).

The removal of shims at the front bolt or the installation of shims at the rear bolt will cause the upper ball joint to move forward. The removal of shims at the rear bolt or the installation of shims at the front bolt will cause the ball joint to move rearward. A $\frac{1}{32}$-inch change of shim thickness at either bolt will change the caster angle approximately ½°. The difference between the shim stack thickness at the two bolts should not exceed $\frac{1}{16}$ inch (Fig. 7).

CAMBER

To adjust camber, remove or install equal shim thickness at both bolts (Fig. 7).

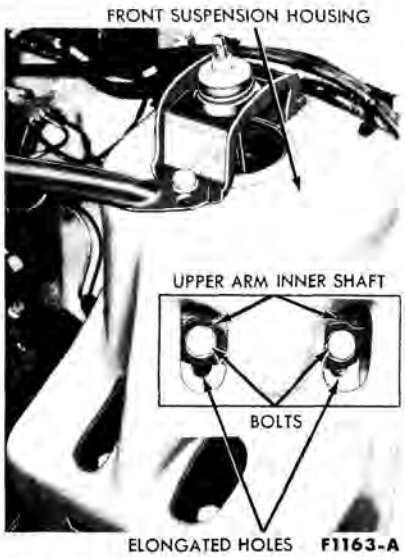


FIG. 8—Upper Arm Inner Shaft Bolts—Fairlane

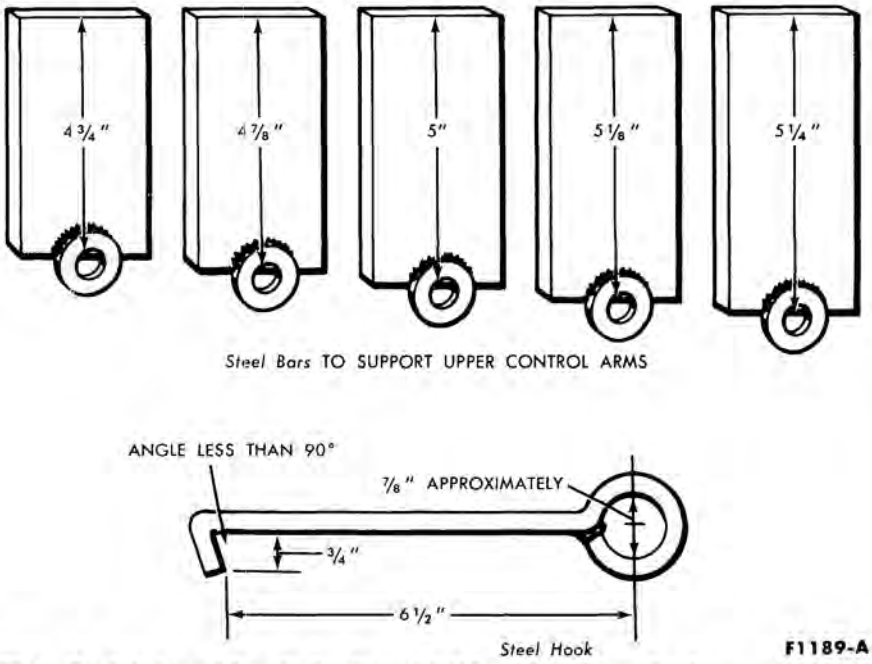


FIG. 9—Fabricated Details for Use with Wheel Alignment Tool

The removal of equal shims at both bolts will move the upper ball joint inward. The installation of equal shims at both bolts will move the ball joint outward. A $\frac{1}{16}$-inch change of shim thickness at both bolts will change the camber angle $\frac{1}{3}$°. The total shim stack thickness at each bolt should not exceed $\frac{9}{16}$-inch (Fig. 7).

CASTER AND CAMBER ADJUSTMENTS—FAIRLANE

The alignment spacers (T65P-3000-B or C) must be removed to adjust the caster and camber on Fairlane models. After the adjustment is made, the fabricated blocks must be removed and the alignment spacers re-installed to check the adjustment.

Caster and camber can be adjusted by loosening the bolts that attach the upper suspension arm inner shaft to the underbody, and moving the arm assembly in or out in the elongated bolt holes (Fig. 8).

In order to adjust front wheel alignment more accurately, fabricate the following additional details for use with tool T62F-3000-A.

1. Cut five bars of steel from ¼ or $\frac{5}{16}$ inch stock, 1¼ or 1½ inches wide, of the following lengths—4¾, 4⅞, 5, 5⅛ and 5¼ inches. To the end of each bar, weld or braze a flat washer (Fig. 9).

2. Fabricate a hook from an eleven inch length of ⅜ inch diameter rod (Fig. 9).

TOOL INSTALLATION

1. With the car in normal resting position measure the distance between the top of the side rail sheet metal and back under the lip of the upper control arm spring pocket (Fig. 10). Select one of the fabricated steel bars which is closest to being ⅛ inch longer than this measured dimension.

2. Position the fabricated hook on the lip of the body side rail, place any standard pry bar through the eye of the hook and under the suspension lower arm, then pull down (Fig. 11). Pulling down on the pry bar will raise both lower and upper

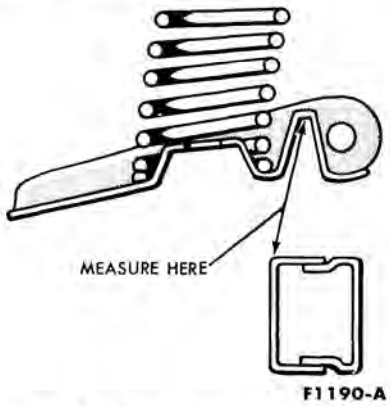


FIG. 10—Measuring Dimensions for Bar Selection

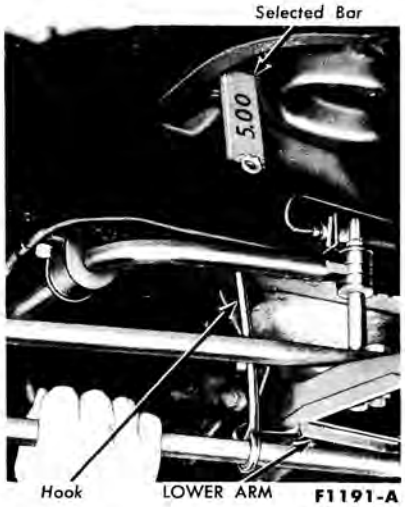


FIG. 11—Installing Bar Between Upper Arm and Side Rail

arms. While thus raising the upper arm far enough for clearance, install the selected bar between the upper arm and side rail.

3. Position the tool arms securely on the suspension upper arm and turn the tool screws until the pivot pad of the tool is snug (finger-tight) against the sheet metal. Tighten each screw one turn with a wrench (Figs 12 and 13).

4. Loosen the upper arm inner shaft retaining bolts several turns until they are 3/16-1/4 inch away from the top face of the shaft boss, then lift up on the front end of the car. A sharp crack will usually be heard when the upper arm inner shaft serrations separate from the sheet metal.

5. Check the cross shaft retaining bolts at this point. The bolts must be loose enough to allow the bolt serrations to separate from the serrations on top of the sheet metal and the caged nut serrations to separate from the serrations on the underside of the sheet metal (Fig. 14). **These serrations must be free in order to effect an adjustment.** If they are not, loosen the bolts more. Strike the bolt heads a sharp blow. Use a long bar to loosen the caged nut serrations.



FIG. 13—Caster-Camber Adjusting Tool—Lower Front View

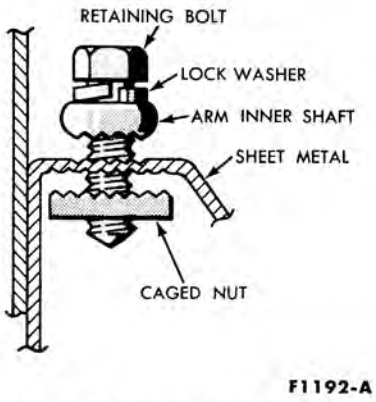


FIG. 14—Separation of Inner Shaft and Caged Nut Serrations

GENERAL PRECAUTIONS

1. Loosen or tighten the tool screws not more than **two** complete turns alternately to avoid collapsing the sheet metal.

2. Adjust caster first. Check caster readings at intervals during the adjustment process to determine the extent of the correction.

3. Approximately 4 complete screw turns will change a reading 1 degree. These turns, however, should be divided equally between both screws alternately for the same resultant 1 degree movement.

Example:

Caster reading indicates +1½ degrees.

Desired reading should be +½ degree (1 degree difference toward negative).

First, **loosen** the tool front screw 2 turns (Fig. 12).

Second, **tighten** the tool rear screw 2 turns.

The caster should now read ½ degree or 1 degree less positive than it did at the beginning.

4. Do not consider camber misalignment during caster adjustment.

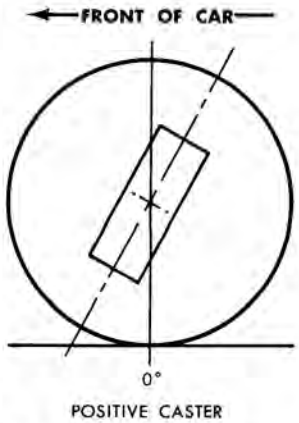
5. Allow approximately +⅛ degree on Caster and Camber readings to compensate for the torque of the cross shaft retaining bolts.

CASTER ADJUSTMENT

Positive Caster Movement. To adjust from negative caster toward positive (or more positive) caster, turn (tighten) the adjusting tool front screw clockwise (into the body) to pull the arm outward and turn



FIG. 12—Caster-Camber Adjusting Tool Installation—Upper Side View



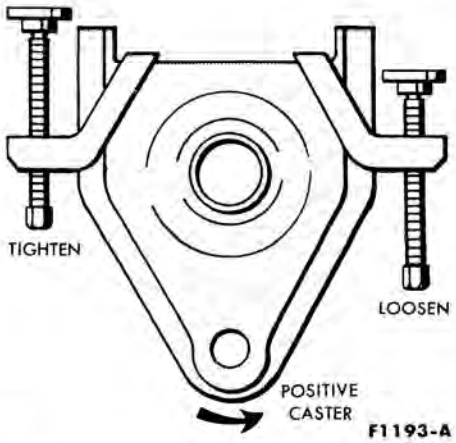


FIG. 15—Positive Caster Adjustment

(loosen) the adjusting tool rear screw counter-clockwise (away from the body) as shown in Fig. 15).

If the rear tool tends to become completely loose, turn the wheels 20 degrees outboard, then back through 0-20 degrees inboard, then return to 0 degrees (straight ahead). The rear screw should now be tight. If it is not, the serrations of either the nuts or the cross shaft are not free. Loosen the cross shaft retaining bolts a little more, raise up the front of the car, then tap the bolt heads to make sure the serrations are loose.

Negative Caster Movement. To adjust from positive caster toward negative (or more negative) caster turn (tighten) the adjusting tool rear screw clockwise (into the body) to pull the arm outward and turn (loosen) the adjusting tool front screw counterclockwise (away from the body) as shown in Fig. 16. If the front tool tends to become completely loose, follow the procedure outlined for this condition under "Positive Caster Movement".

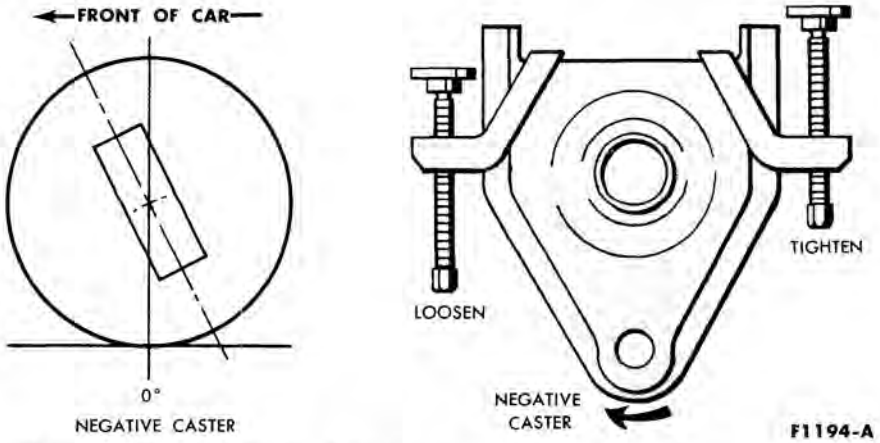


FIG. 16—Negative Caster Adjustment

CAMBER ADJUSTMENT

For proper camber adjustment without effecting the caster adjustment just completed, when tightening or loosening the tool adjusting screws, each screw must be turned in or out an equal number of turns.

Positive Camber Adjustment. To adjust from negative camber to positive (or more positive) camber, the adjusting tool screws must be turned in against the sheet metal an equal number of turns to move the upper control arm outward (Fig. 17).

Negative Camber Adjustment. To adjust from positive camber to negative (or more negative) camber, the adjusting tool screws must be turned outward away from the sheet metal an equal number of turns to move the upper control arm inward (Fig. 18).

After camber has been corrected, recheck the caster. If it is not within specifications, determine the amount of correction required and make the necessary adjustments.

Torque the upper arm inner shaft bolts to specifications and remove the adjusting tool and alignment spacers.

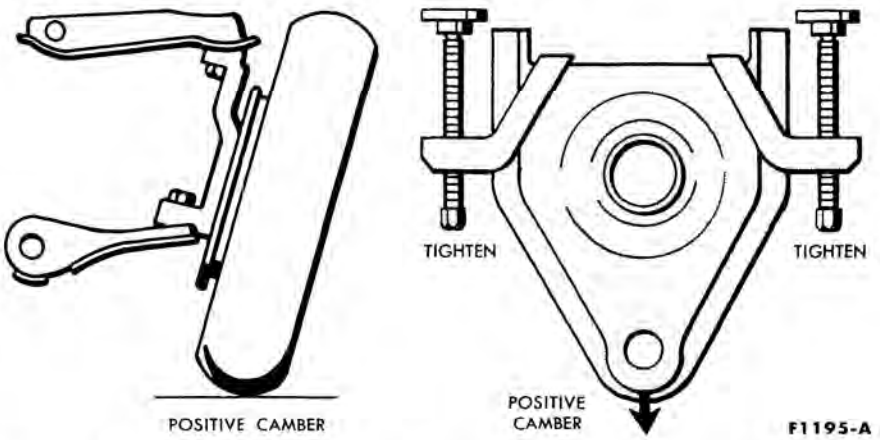


FIG. 17—Positive Camber Adjustment

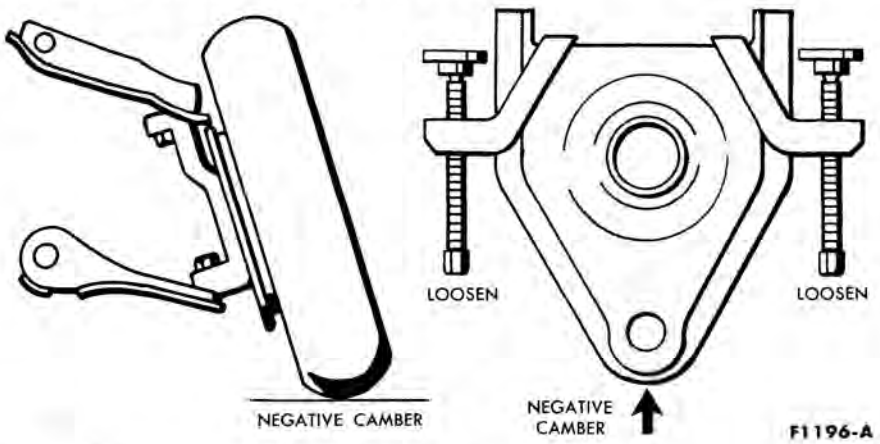


FIG. 18—Negative Camber Adjustment

TOE-IN AND STEERING WHEEL ALIGNMENT ADJUSTMENTS

Check the steering wheel spoke position when the front wheels are in the straight-ahead position. If the spokes are not in their normal position, they can be properly adjusted while toe-in is being adjusted.

1. Loosen the two clamp bolts on each spindle connecting rod sleeve (Fig. 19).

2. Adjust toe-in. If the steering wheel spokes are in their normal position, lengthen or shorten both rods equally to obtain correct toe-in (Fig. 20). If the steering wheel spokes are not in their normal position, make the necessary rod adjustments to obtain correct toe-in and steering wheel spoke alignment (Figs. 21 and 22).

3. Recheck toe-in and steering wheel spoke alignment. If toe-in is correct and the steering wheel spokes



FIG. 19—Spindle Connecting Rod Sleeve—Typical

are still not in their normal position, turn both connecting rod sleeves upward or downward the same number of turns to move the steering wheel spokes (Fig. 21 and 22).

4. When toe-in and steering wheel spoke alignment are both correct torque the clamp bolts on both connecting rod sleeves to specification. **The sleeve position should not be changed when the clamp bolts are tightened.**

LUBRICANT CHECKING PROCEDURE

COMET, FALCON, MUSTANG

1. Center the steering wheel.

2. Remove the steering gear housing filler plug.

3. Remove the **upper** cover-to-housing attaching bolt.

4. With a **clean** punch or like instrument, clean out or push inward the loose lubricant in the filler plug hole and cover to housing attaching bolt hole.

5. Slowly turn the steering wheel to the **right** stop, lubricant should rise within the **upper** cover bolt hole; then slowly turn the steering wheel to the **left** stop, lubricant should rise within the filler plug hole. If lubricant does not rise in both the cover bolt hole and the filler plug hole, add lubricant until it comes out both holes during this check.

6. Install the upper cover-to-housing attaching bolt.

FAIRLANE

1. Center the steering wheel.

2. Remove the steering gear housing filler plug.

3. Remove the lower cover-to-housing attaching bolt.

4. With a **clean** punch or like instrument, clean out or push inward the loose lubricant in the filler plug hole and cover to housing attaching bolt hole.

5. Slowly turn the steering wheel to the **left** stop, lubricant should rise within the lower cover bolt hole; then slowly turn the steering wheel to the **right** stop, lubricant should rise within the filler plug hole. If lubricant does not rise in both the cover bolt hole and the filler plug hole, add lubricant until it comes out both holes during this check.

6. Install the lower cover-to-housing attaching bolt and the filler plug.

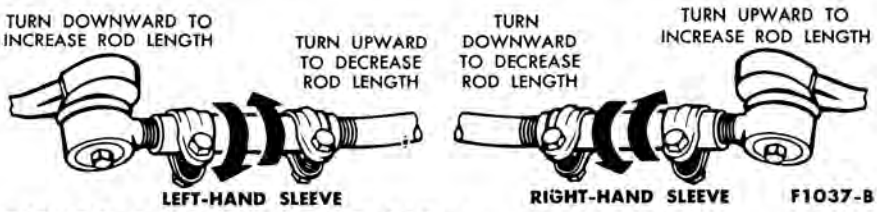


FIG. 20—Spindle Connecting Rod Adjustment

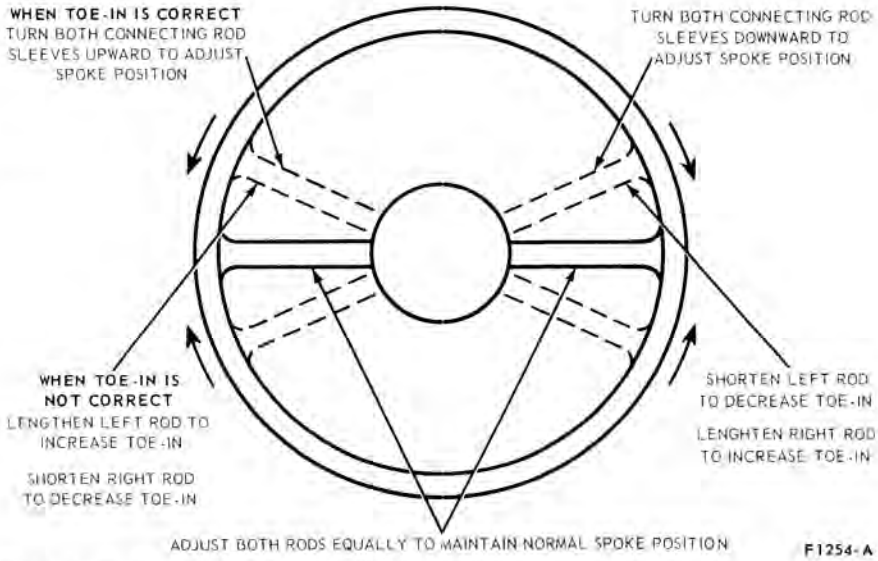


FIG. 21—Toe-In and Steering Wheel Spoke Adjustments—Falcon, Comet, Fairlane

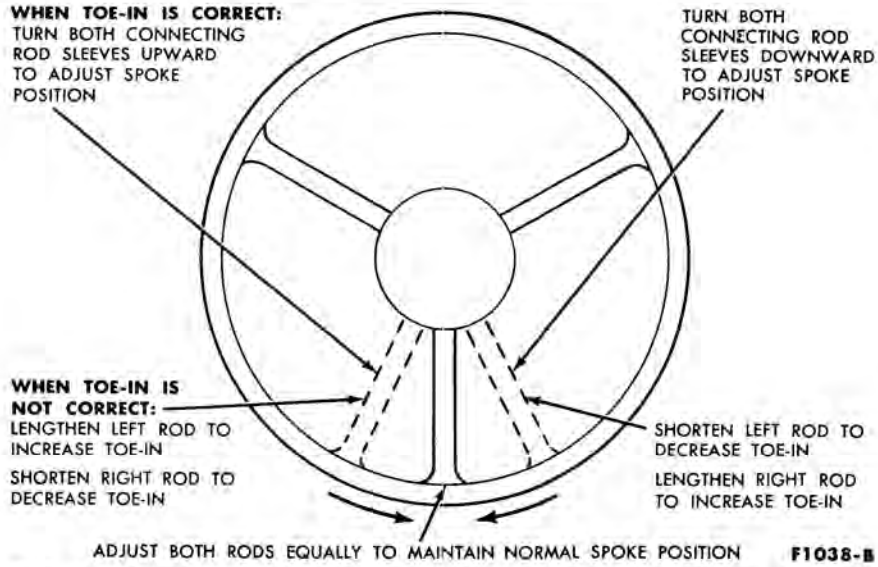


FIG. 22—Toe-In and Steering Wheel Spoke Adjustments—Mustang

3 CLEANING AND INSPECTION

STEERING GEAR CLEANING AND INSPECTION

Wash all parts in a cleaning solvent, and dry with a lint-free cloth. **The bearing should not be spun dry with compressed air.** Inspect the shaft and worm for scoring, cracks or checks, and for straightness of the shaft. Check the splines and the threads on the sector shaft for wear and burrs. Inspect the gear teeth for scoring, pitting and other wear. Inspect the ball bearings for free movement, and the cups for wear or irregular surfaces. Check the housing for cracks and the sector shaft needle bearing for free movement or other wear.

Check the power steering pump pressures. If the pump has a visible leak or if the pressures are not up to specification, replace the pump.

FLUSHING THE POWER STEERING SYSTEM

Should a power steering pump become inoperative, the shaft and pulley should be checked for freedom of rotation. If the pump shaft does not turn freely (binding), it is an indication that there is wear on the pump internal components and the need for flushing the steering system, when installing a **new** pump.

1. Remove the power steering pump and pulley as outlined in Part 3-4.

2. Install a new pump and connect only the pressure hose to the pump (Part 3-4).

3. Place the oil return line in a suitable container and plug the reservoir return pipe.

4. Fill the reservoir with lubricant CIAZ-19582-A.

5. Disconnect the coil wire to prevent the engine from starting and raise the front wheels off the ground.

6. While approximately two quarts of steering gear lubricant are being poured into the reservoir, turn the engine over using the ignition key, at the same time cycle the steering wheel from stop to stop.

7. As soon as all of the lubricant has been poured in, turn off the ignition key, and attach the coil wire.

8. Remove the plug from the reservoir return pipe, and attach the return hose to the reservoir.

9. Check the reservoir fluid level; if low add fluid to the proper level. **Do not overfill.**

10. Lower the car.

11. Start the engine and cycle the steering wheel from stop to stop to expel any trapped air from the system.

FRONT END GENERAL INSPECTION

Do not check and adjust front wheel alignment without first making the following inspection for front-end maladjustment, damage, or wear.

1. Check for specified air pressures in all four tires.

2. Raise the front of the car off the floor. Shake each front wheel grasping the upper and lower surfaces of the tire to check the front suspension ball joints and mountings for looseness, wear, and damage. Check the brake backing plate mountings. Torque all loose nuts and bolts to specifications. Replace all worn parts as outlined in Part 3-2.

3. Check the steering gear mountings and all steering linkage connections for looseness. Torque all mountings to specifications. If any of the linkage is worn or bent, replace the parts as outlined in Part 3-3.

4. Check the front wheel bearings. If any in-and-out free play is noticed, adjust the bearing to specification (Part 3-5). Replace worn or damaged bearings as outlined in Part 3-5.

5. Spin each front wheel with a wheel spinner, and check and balance each wheel as required.

6. Check the action of the shock absorbers. If the shock absorbers are not in good condition, the car may not settle in a normal, level position, and front wheel alignment may be affected.

WHEEL INSPECTION

Wheel hub nuts should be tightened to specification at the predelivery inspection. Loose wheel hub nuts may cause shimmy and vibration. Elongated stud holes in the wheels may also result from loose hub nuts.

Keep the wheels and hubs clean. Stones wedged between the wheel and drum and lumps of mud or grease can unbalance a wheel and tire.

Check for damage that would affect the runout of the wheels. Wobble or shimmy caused by a damaged wheel will cause premature tire wear and eventually damage the wheel bearings. Inspect the wheel rims for dents that could permit air to leak from the tires.

UPPER BALL JOINT INSPECTION

1. Raise the car on a frame contact hoist or by floor jacks placed beneath the underbody until the wheel falls to the full down position as shown in Figs. 23 and 24. This will unload the upper ball joint.

2. Adjust the wheel bearings as described in Part 3-5.

3. Attach a dial indicator to the upper arm. Position the indicator so

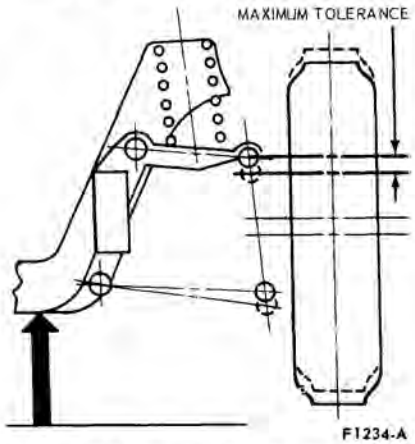


FIG. 23—Measuring Upper Ball Joint Axial Play

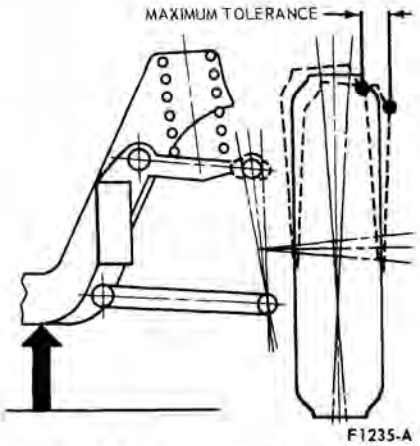


FIG. 24—Measuring Upper Ball Joint Radial Play

that the plunger rests against the underside of the spindle at the upper ball joint stud.

4. Grasp the tire at the front and rear sides and slowly move the tire up and down (Fig. 23). If the dial indicator reading (axial play) exceeds specifications (Part 3-6), replace the upper ball joint.

5. With the dial indicator attached to the upper arm, position the indicator so that the plunger rests against the inner side of the wheel rim adjacent to the upper arm ball joint.

6. Grasp the tire at the top and bottom, and slowly move the tire in and out (Fig. 24). Note the reading (radial play) on the dial indicator. If the reading exceeds specifications (Part 3-6), replace the upper ball joint.

LOWER BALL JOINT INSPECTION

1. Raise the car on a frame contact hoist or by floor jacks placed beneath the underbody until the wheel falls to the full down position.

2. Ask an assistant to grasp the lower edge of the tire and move the wheel in and out.

3. As the wheel is being moved in and out, observe the lower end of the spindle and the lower arm.

4. Any movement between the lower end of the spindle and the lower arm indicates ball joint wear and loss of preload. If any such movement is observed, replace the lower arm.

During the foregoing check, the upper ball joint will be unloaded and may move. Disregard all such movement of the upper ball joint. Also, do not mistake loose wheel bearings for a worn ball joint.

PART 3-2 SUSPENSION

Section		Page
1	Description and Operation	3-13
2	In-Car Adjustments and Repairs	3-14
3	Removal and Installation	3-15

1 DESCRIPTION AND OPERATION

FRONT SUSPENSION

Each front wheel rotates on a spindle. The upper and lower ends of the spindle are attached to upper and lower ball joints which are mounted to an upper and lower arm respectively. The upper arm pivots on a bushing and shaft assembly which is bolted to the underbody. The lower arm pivots on a bolt that is located in an underbody bracket (Figs. 1 and 15).

A coil spring seats between the upper arm and the top of the spring housing. A double acting shock absorber is bolted to the arm and the top of the spring housing.

The swiveling action of the ball joints allow the wheel and spindle assemblies to move up and down with changes in road surface. The swiveling ball joints also permit the spindles and wheels to be turned to the left or right by the steering gear and linkage.

The pivoting action of the suspension arms provides an **up and down** movement for the spindles and wheels as required by bumps or depressions in the road surface. The coil springs, shock absorbers and stabilizer bar control the front suspension up and down movements. The struts, which are connected between the suspension lower arms and the underbody prevent the suspension arms from moving forward and backward.

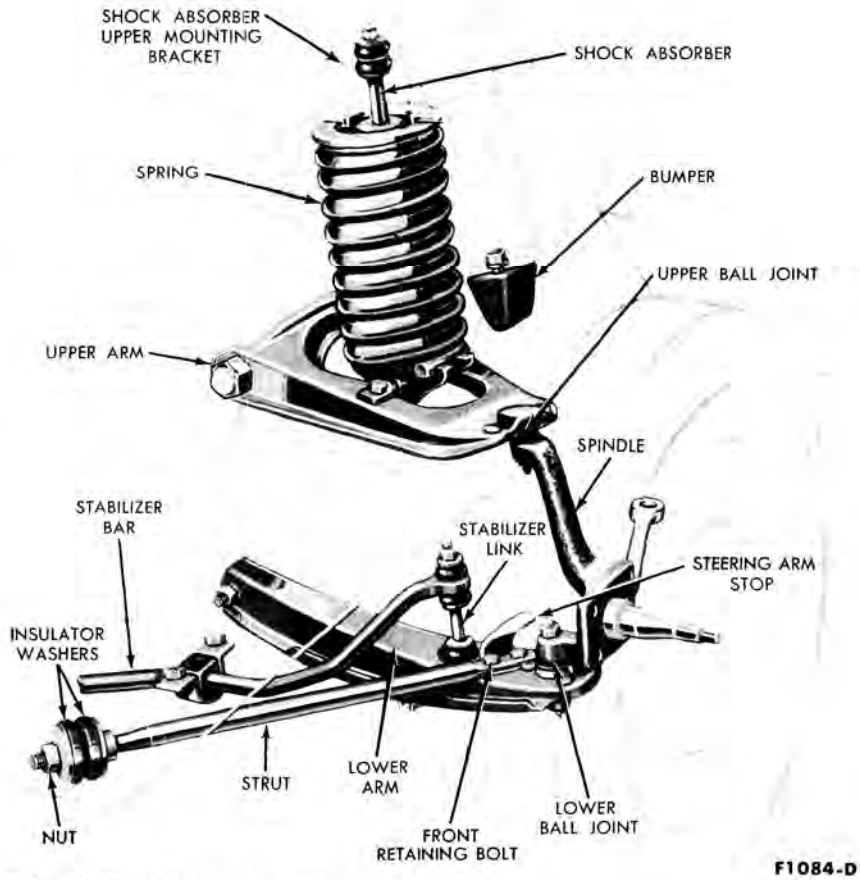


FIG. 1—Front Suspension—Typical

REAR SUSPENSION

Each rear wheel, hub and brake drum assembly is bolted to the rear axle shaft flange. The wheel and axle shaft assembly rotates in the rear axle housing. Two spring pads integral with the axle housing, rest on two leaf type springs. The axle housing is fastened to the springs by spring clips. (U-bolts), spring clip plates and nuts (Figs. 2 and 21). Each spring is suspended from the underbody side rail by a hanger at the front and a shackle at the rear. The upper end of each shock absorb-

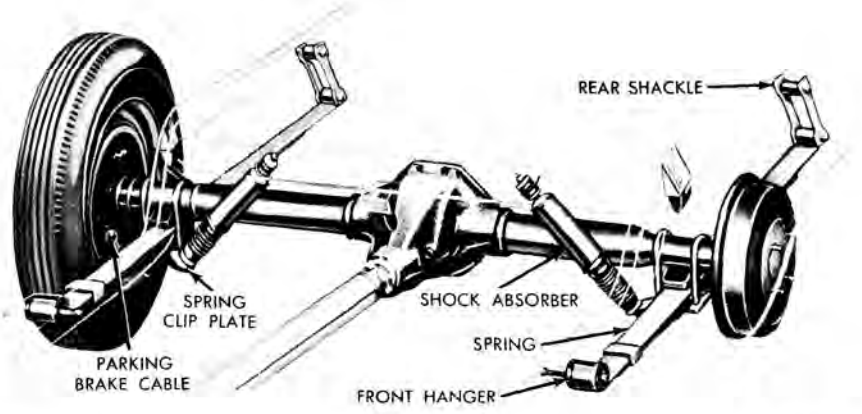


FIG. 2—Rear Suspension

er is mounted to a bracket in the underbody. The lower end is mounted to the spring pad at the axle housing.

The springs and shock absorbers provide for up and down movement of the rear axle and wheels as required by changes in the road surface. They also cushion road shocks.

2 IN-CAR ADJUSTMENTS AND REPAIRS

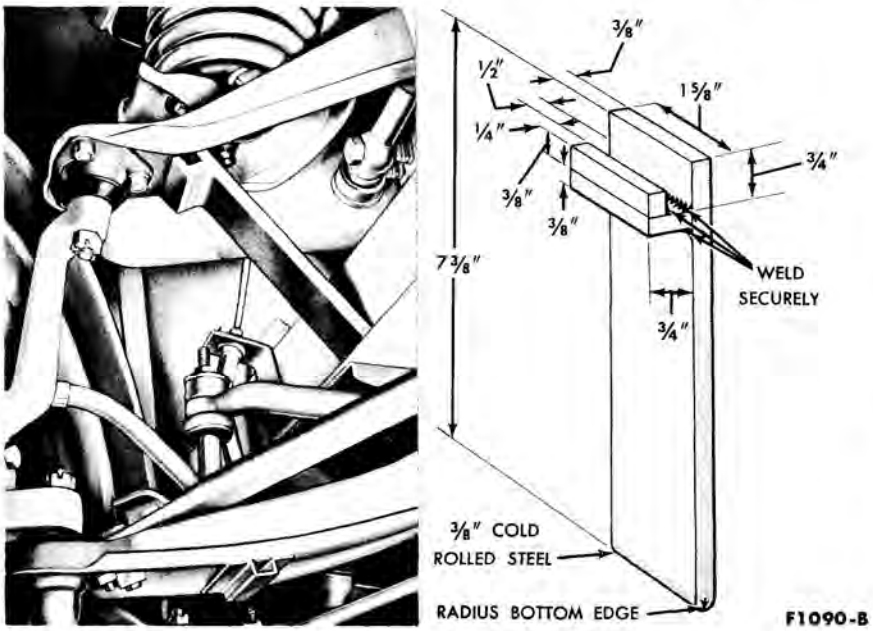


FIG. 3—Upper Arm Support—Falcon, Comet, Mustang

UPPER BALL JOINT REPLACEMENT—ARM IN CAR

1. Position a support between the upper arm and frame side rail as shown in Figs. 3 and 4, then raise the car and position safety stands.

2. Remove the wheel and tire.

3. Using a large chisel, cut off the three upper ball joint retaining rivets.

4. Remove the cotter pin and nut from the upper ball joint stud.

5. Position the ball joint remover tool as shown in Fig. 4. **The tool should seat firmly against the ends of both studs, and not against the lower stud nut.** It may be necessary to remove the lower ball joint cotter pin if it prevents the tool from seating on the lower stud.

6. Turn the tool with a wrench until both studs are under tension, and then, with a hammer, tap the spindle near the upper stud to loosen the stud from the spindle. **Do not loosen the stud with tool pressure alone.** Raise the stud out of the spindle bore, and remove the ball joint.

7. Clean the end of the arm, and remove all burrs from the hole edges. Check for cracks in the metal at the holes, and replace the arm if it is cracked.

8. Attach the new ball joint to the upper arm. **Use only the specified bolts, nuts, and washers. Do not rivet the new ball joint to the arm.** Torque the nuts to specification (Part 3-6).

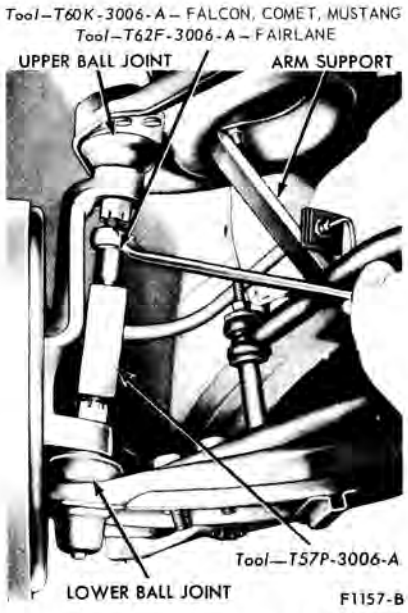


FIG. 4—Loosening Ball Joint Studs in Spindle—Fairlane—Typical of Falcon, Comet, Mustang

9. Position the ball joint stud in the spindle bore, and torque the retaining nut to specification. Install a new cotter pin, tighten the nut if necessary to line up the cotter pin hole.

10. Lubricate the ball joint, and install the wheel and tire.

11. Remove the safety stands, and lower the car.

12. Remove the support from between the upper arm and frame.

13. **Check and, if necessary, adjust caster, camber, and toe-in.**

UPPER ARM SHAFT AND/OR BUSHING REPLACEMENT

1. On a Falcon, Comet, or Mustang proceed as follows:

a. Compress the spring, disconnect the suspension upper arm from the underbody, and swing the arm assembly out for accessibility as outlined in steps 1 through 6 of the applicable front spring "Removal" procedure in Section 3.

b. Rotate the inner shaft so that the retaining studs can be removed. Remove the retaining studs with a soft mallet.

On a Fairlane proceed as follows:

a. Remove the front spring as outlined in the applicable front spring "Removal" procedure in Section 3.

b. Working from the engine compartment remove the upper arm inner shaft retaining bolts and lockwashers (Fig. 8, Part 3-1).

c. Pull the upper arm and shaft assembly away from the underbody and swing the assembly 180° outboard for accessibility. Position a stand under the upper arm for support.

2. Unscrew the bushings from the shaft and suspension arm; then, remove the shaft from the arm.

3. Position the shaft in the arm, apply grease to the new bushings

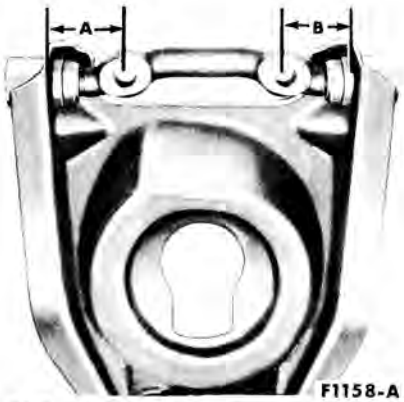


FIG. 5—Shaft Centered in Arm—Typical

(Part 3-6), and install the bushings loose on the shaft and arm. **Turn the bushings so that the shaft is exactly centered in the arm.** The shaft will be properly centered when dimensions A and B in Fig. 5 are equal.

4. Fabricate a spacer from a section of ¾-inch diameter pipe or metal of comparable size and strength. On a Falcon, Comet, or Mustang the spacer should be 7 7/16 inches long. On a Fairlane, the spacer should be 8⅛ inches long.

5. Position the spacer parallel with the inner shaft, and force the spacer between the flanges of the upper arm (Fig. 6).

If the spacer can not be forced between the arm flanges due to excessive distortion, replace the upper arm assembly.

6. With the spacer positioned in the arm, torque the bushings to specification. Move the arm on the shaft to be sure that no binding exists, then remove the spacer.

7. On a Falcon, Comet, or Mustang proceed as follows:

a. Connect the suspension upper arm to the underbody, install the adjusting shims, and release the front spring as outlined in steps 3 through 6 of the applicable front spring "Installation" procedure in Section 3.

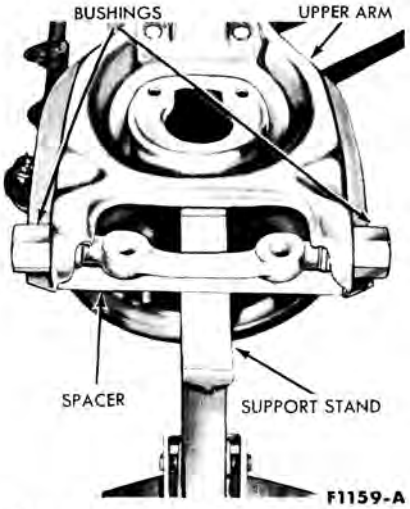


FIG. 6—Torque Upper Arm Inner Shaft Bushings—Typical

b. Remove the spring tool, and install the shock absorber and the wheel and tire assembly as outlined in steps 7 through 11 of the applicable front spring "Installation" procedure in Section 3.

On a Fairlane, proceed as follows:

a. Swing the arm and shaft assembly inboard to the underbody, and install the retaining bolts and lock washers. The arm and shaft assembly should be positioned so that the bolts and caged nuts are centered in the elongated bolt holes (Fig. 8, Part 3-1).

b. With the arm and shaft properly positioned, torque the retaining bolts to specification.

c. Install the coil spring as outlined in the applicable front spring "Installation" procedure in Section 3.

STABILIZER REPLACEMENT

1. Raise the car high enough to provide working space, and place supports under both front wheels.

2. Disconnect the stabilizer from each link. Disconnect both stabilizer retaining brackets, and remove the stabilizer.

3. Coat the necessary parts of the stabilizer with RUGLYDE or a comparable lubricant, and slide new insulators onto the stabilizer.

4. Connect the stabilizer retaining brackets, and connect the stabilizer to both links. Torque the bracket retaining screws and the link bolt nut to specification.

5. Remove the supports and lower the car.

LOWER ARM STRUT AND/OR BUSHING REPLACEMENT

1. Position the block as shown in Figs. 3 and 4 under the upper arm for support.

2. Raise the car, position safety stands, and remove the wheel and tire.

3. Remove the strut-to-bracket forward retaining nut, washer and insulator bushings (Figs. 1 and 15).

4. Remove the 2 strut-to-lower arm retaining nuts and bolts; then, lift the strut with rear insulator bushing and washer from the car.

5. Install the new rear washer and insulator bushing on the forward end of the strut rod.

6. Position the strut into the mounting bracket and to the lower suspension arm. Install the strut-to-arm retaining bolts and nuts, and torque to specification.

7. Install the forward insulator bushing, washer, and nut to the forward end of the strut, and torque the strut rod nut to specification.

8. Install the wheel and tire, remove the safety stands and lower the car. Remove the tool supporting the upper arm.

3 REMOVAL AND INSTALLATION

FRONT SPRING—FALCON, COMET, AND MUSTANG

REMOVAL

1. Raise the front of the car, position safety stands under the frame, and lower the car slightly.

2. Remove the wheel and tire assembly.

3. Remove the shock absorber lower retaining nuts and washers.

4. Remove the shock absorber upper mounting bracket retaining nuts, and remove the shock absorber and bracket as an assembly (Fig. 17).

5. Since the Falcon, Comet and Mustang front suspensions are all of the same design, either of two special tool combinations can be used to compress the front spring on any of these models. The Ford tools are available at Ford dealers (generally used on the Falcon and Mustang). The Manzel tools are available at Lincoln-Mercury dealers (generally used on the Comet).

On all 8-cylinder cars, remove the

air cleaner to obtain access for tool installation.

If the Ford tool combination is used (Falcon and Mustang), compress the spring as follows:

a. Position the upper plate (Tool T64K-5310-A) at the spring upper seat, place the bearing of tool T63P-5310-A on the plate and insert the tool shaft (detail A1) through the bearing and upper plate with the tool nut (detail A2) against the bearing as shown in Fig. 7.

b. Install the tool lower plate (detail A3) under the third coil from the bottom (Fig. 8). Secure the plate to the shaft screw (detail A1) with the retainer (detail A4). The retainer engages the groove in the shaft screw below the plate as shown. The tang of the retainer engages the cut-out in the plate.

c. Insert a ½-inch square drive flexhandle wrench in the drive hole in the lower plate to prevent the tool and spring from turning (Fig. 8). While thus holding the tool, compress the spring by turning the tool shaft nut clockwise (Fig. 7) until the spring clears the suspension upper arm.



FIG. 7–Compressing or Releasing Spring on Falcon and Mustang–Upper View

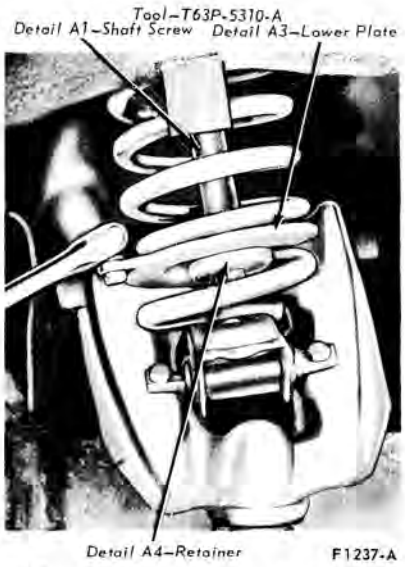


FIG. 8–Compressing or Releasing Spring on Falcon and Mustang–Lower View

If the Lincoln-Mercury tool combination (Comet) is used, compress the spring as follows:

a. Position the upper plate of tool T64K-5310-B and the tool thrust bearing at the spring upper seat and install the shaft screw (tool 5310-C) through the plate and bearing into the tool nut as shown in Fig. 9.

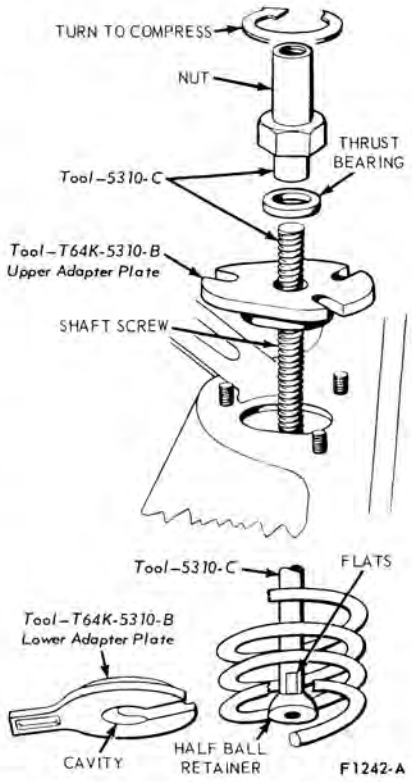


FIG. 9–Comet Spring Tool Installation

b. From underneath the fender slide the lower plate of tool T64K-5310-B through the second or third coil from the bottom of the spring over the flats on the shaft screw (Fig. 9).

Be sure that the cavity on the bottom of the plate fits completely over the half ball retainer at the bottom of the shaft screw.

c. Compress the spring by turning the shaft nut of tool 5310-C clockwise until the spring clears the suspension upper arm.

6. Remove the upper suspension arm inner shaft retaining nuts from the engine compartment, and pull the arm, shaft, and retaining bolts away from the underbody. Measure and note the total shim thickness at each inner shaft retaining bolt. Swing the upper arm and shaft assembly 180° out to provide clearance for spring removal (Fig. 10).

7. Turn the tool shaft nut counterclockwise until the spring is released (Fig. 7). **With the Ford tool (Falcon and Mustang), hold the tool lower plate from turning during spring release. Use the ½-inch square drive flex-handle wrench (Fig. 8).**

8. Remove the components of the spring compressing tool, and then remove the spring as shown in Fig. 10.



FIG. 10–Removing or Installing Spring–Falcon, Comet, and Mustang

INSTALLATION

1. With the upper arm turned out of the way for clearance, install the spring in the housing (Fig. 10).

2. Install the appropriate spring tool combination and compress the spring as described in step 5 of the foregoing "Removal" procedure.

3. Swing the suspension upper arm assembly inboard, and insert the arm inner shaft retaining bolts through the mounting holes in the underbody.

4. From inside the engine compartment, install but do not tighten the nuts and lockwashers on the two inner shaft retaining bolts. **The specified keystone type lock washers must be used.**

5. Install the adjusting shims on both bolts between the inner shaft and the underbody. **Install the same shim thicknesses that were removed from each bolt when the arm was disconnected.** Torque the inner shaft retaining nuts to specification.

6. Turn the tool shaft nut counterclockwise to release the spring (Fig. 7). As the spring is being released, guide the spring into its lower seat.

7. Remove the components of the spring tool.

8. Position the shock absorber in the spring housing so that the holes in the upper mounting bracket engage the upper retaining studs in the housing (Fig. 17). The lower retaining bolts go through the mounting holes in the spring lower seat.

9. Install the bracket retaining nuts, and torque to specifications. Install the shock absorber lower retaining nuts on the bolts at the underside of the lower spring seat and torque to specification.

10. Install the wheel and tire assembly, remove the safety stands and lower the car.

11. Check and, if necessary, adjust caster, camber, and toe-in.

FRONT SPRING—FAIRLANE

REMOVAL

1. Raise the car, and remove the wheel and tire assembly.

2. Remove the retaining bolts and washers, then remove the suspension bumper and bracket assembly.

3. Remove the shock absorber lower retaining nuts from the underside of the suspension upper arm.

4. Remove the shock absorber upper mounting bracket retaining nuts. Move the mounting bracket-to-dash panel brace to one side, then remove the bracket and shock absorber (Fig. 11).

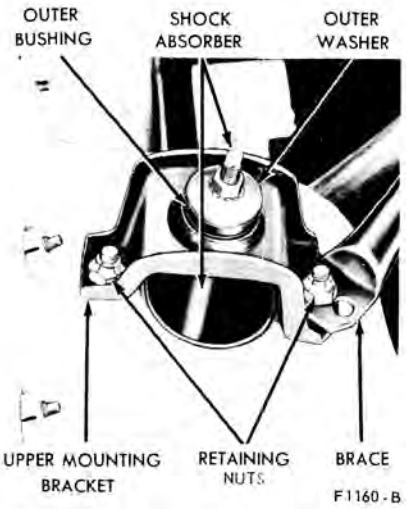


FIG. 11—Front Shock Absorber Upper Mounting

5. Install one mounting bracket bolt and washer to hold the spring upper seat to the spring housing while the spring is being compressed (Fig. 12).

6. Install spring removal tool T63P-5310-A. Slide the tool bearing and pilot over the shaft screw against the shaft nut, and insert the assembly through the top of the coil spring with the pilot and bearing positioned as shown in Fig. 12.

7. From under the car, place the tool lower plate under the third spring coil from the bottom. Secure the plate to the coil by installing the tool retainer to the groove in the shaft screw (Fig. 13).

8. A ½-inch square drive hole has been provided on the lower plate. Insert a ½-inch square drive flex-handle wrench in the drive hole to prevent the tool and spring from turning (Fig. 13). While thus holding the tool, compress the spring by turning the tool shaft nut clockwise (Fig. 12). Remove the bolt and washer that holds the spring upper seat to the housing, then remove the spring and tool assembly from underneath the car (Fig. 13). If a new spring is to be installed, refer to the replacement procedure.

INSTALLATION

1. Install the spring and tool assembly in the spring housing with the end of the bottom coil bearing against the punched end of the recess in the spring lower seat (Fig. 13).

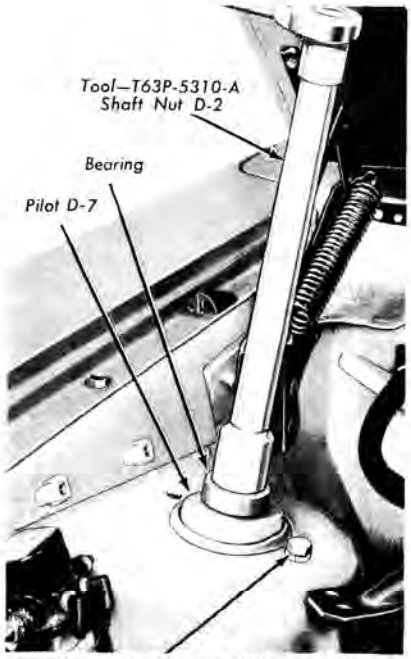


FIG. 12—Compressing or Releasing Spring in Car

2. Secure the spring upper seat to the top of the spring housing with two bolts and washers. This will hold the spring in the correct position while it is being released.



FIG. 13—Removal and Installation of Spring in Car

3. Release the spring tension by turning the tool shaft nut counterclockwise (Fig. 12). **Hold the tool lower plate from turning during spring release. Use the ½-inch square drive flex-handle wrench.** When the spring is fully released and in position, continue turning the tool shaft nut from the shaft screw until the tool lower plate and retainer can be removed from the shaft screw and spring (Fig. 13).

4. Remove the bolts and washers installed in step 2, then remove the remaining tool components from the top of the spring housing.

5. Install the shock absorber and upper mounting bracket assembly to the car (Fig. 11). The shock absorber lower retaining bolts go through the mounting holes in the suspension upper arm.

6. Install the shock absorber lower retaining nuts from the under side of the suspension upper arm.

7. Position the wide leg of the shock absorber upper mounting bracket inboard, and position the bracket-to-dash panel brace to the wide leg (Fig. 11). Install the mounting bracket retaining bolts and washers, and torque to specifications.

8. Install the suspension bumper and bracket assembly, and secure with retaining bolts and washers.

9. Install the wheel and tire assembly, and lower the car.

10. Check and, if necessary, adjust caster, camber and toe-in.

REPLACEMENT

1. Remove the old spring from the car as outlined under "Removal" in the foregoing procedure.

2. Position the spring and tool assembly in a vise. Scribe two marks on the narrow side of the spring upper seat for proper alignment with the replacement spring (Fig. 14). The first mark should be aligned with the center line of the caged nut. The second mark should be ¾-inch from the first and in alignment with the end of the bottom coil.

3. Turn the tool shaft nut counterclockwise until the spring is released, then, remove the tool components and upper seat from the spring (Fig. 14). **Hold the tool lower plate from turning during spring release. Use the ½-inch square drive flex-handle wrench.** Remove the old spring from the vise.

4. Place the new spring in a vise, and position the upper seat and insulator assembly to the spring so that the mark made during removal is aligned with the end of the bottom coil (Fig. 14).

5. If a new seat is being installed, first scribe a mark at the center line of the caged nut on the **narrow side** of the seat. Position the seat to the spring with the caged nut mark aligned with the end of the bottom coil. Scribe a second mark ¾-inch clockwise from the first, then, turn the seat counterclockwise until the second mark is aligned with the bottom coil (Fig. 14).

6. Install the components of tool T63P-5310-A to the spring as shown in Fig. 14 and turn the tool shaft nut clockwise until the spring is compressed. **Hold the tool lower plate from turning during spring compression. Use the ½-inch square drive flex-handle wrench.**

7. Install the new spring and tool assembly in the car as outlined under "Installation" in the foregoing procedure.

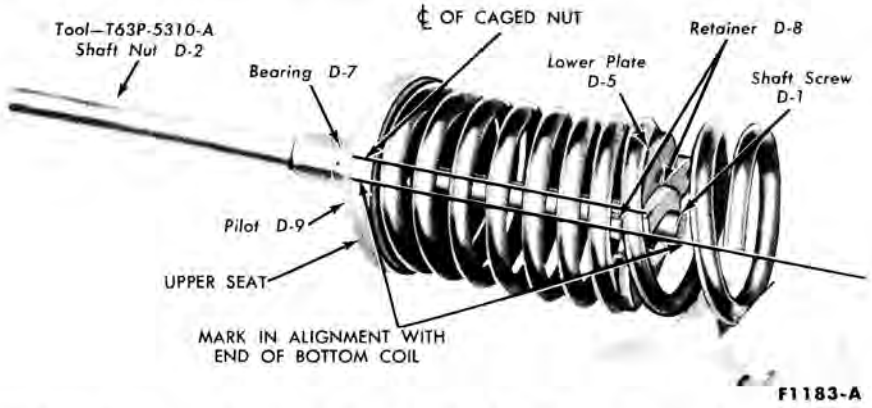


FIG. 14—Removal and Installation of Tool and Upper Seat on Bench

FRONT SUSPENSION UPPER ARM

REMOVAL

1. **On a Falcon, Comet, or Mustang,** install the appropriate spring tool combination and compress the spring as outlined in steps 1 through 5 of the "Removal" procedure under "Front Spring – Falcon, Comet, and Mustang".

On a Fairlane, remove the front spring as outlined in the "Removal" procedure under "Front Spring – Fairlane".

2. Position a safety stand under the lower arm.

3. Remove the cotter pin from the nut on the upper ball joint stud, and loosen the nut one or two turns. **Do not remove the nut from the stud at this time.**

4. Position the ball joint remover tool between the upper and lower ball joint studs as shown in Fig. 4. **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

5. Turn the tool with a wrench until the tool places the studs under tension; then, tap the spindle near the upper stud with a hammer to loosen the stud in the spindle. **Do not loosen the stud in the spindle with tool pressure only.** If both arms are being removed, loosen the lower stud in the same manner as the upper stud.

6. Remove the nut from the upper stud and lift the stud out of the spindle.

7. **On a Falcon, Comet, or Mustang,** remove the upper arm inner shaft retaining nuts from the engine compartment, and remove the upper arm. Measure and note the total shim thickness at each inner shaft bolt.

On a Fairlane, remove the upper arm inner shaft retaining bolts and lock washers (Fig. 8, Part 3-1) and remove the arm.

8. Wipe off all loose dirt from the upper arm parts. **Do not wash the ball joint with a solvent.**

INSTALLATION

1. On a Falcon, Comet, or Mustang, proceed as follows:

a. Position the upper arm on the underbody mounting bracket, and install but do not tighten the nuts and lockwashers on the two inner shaft

retaining bolts. **The specified keystone-type lockwashers must be used.**

b. Install the adjusting shims on both bolts between the inner shaft and the underbody. **Install the same shim thicknesses that were removed from both bolts during disassembly** (Fig. 7, Part 3-1). Torque the nuts to specification.

On a Fairlane, install the suspension arm and shaft assembly to the underbody. Install the retaining bolts and lock washers. The arm and shaft assembly should be positioned so that the bolts and caged nuts are centered in the elongated bolt holes. The bolts should be snug, not torqued at this point (Fig. 8, Part 3-1).

2. Position the upper ball joint stud in the top of the wheel spindle, and install the stud nut. Torque the nut to specification, and continue to tighten it until the cotter pin hole and slots line up. Install a new cotter pin.

3. On a Falcon, Comet, or Mustang, proceed as follows: Release the coil spring, remove the tool, and install the front shock absorber and the wheel and tire assembly as outlined in steps 6 through 11 of the "Installation" procedure under "Front Spring–Falcon, Comet, and Mustang".

On a Fairlane, install the front spring as outlined in the "Installation" procedure under "Front Spring –Fairlane".

FRONT SUSPENSION LOWER ARM

REMOVAL

1. Position a support between the upper arm and side rail as shown in Figs. 3 and 4.

2. Raise the car, position safety stands, and remove the wheel and tire.

3. Remove the stabilizer bar and link retaining nut, disconnect the bar from the link, and remove the link bolt.

4. Remove the strut to lower arm retaining nuts and bolts. On a Falcon, Comet, or Mustang, remove the steering arm stop.

5. Remove the cotter pin from the nut on the lower ball joint stud, and loosen the nut one or two turns. **Do not remove the nut from the stud at this time.**

6. Straighten the cotter pin on the upper ball joint stud nut. Position the ball joint remover tool between the upper and lower ball joint studs in the reverse position from that shown in Fig. 4. **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

7. Turn the tool with a wrench until the tool places the studs under tension, and tap the spindle near the lower stud with a hammer to loosen the stud in the spindle. **Do not loosen the stud in the spindle with tool pressure only.** If both arms are being removed, loosen the upper stud in the same manner as the lower stud.

8. Remove the nut from the lower ball joint stud, and lower the arm.

9. Remove the lower arm to underbody pivot bolt, nut and washer. Remove the lower arm.

INSTALLATION

1. Position the lower arm to the underbody bracket and install the pivot bolt, washer, and nut loose (Fig. 15).

2. Raise the lower arm, guide the lower ball joint stud into the spindle bore, and install the stud retaining nut loose.

3. Install the stabilizer link bolt, washers, bushings and spacer. Connect the stabilizer bar to the link. Install the retaining nut and torque to specifications (Figs. 1 and 16).

4. Position the strut to the lower arm, install the retaining bolts and nuts, and torque to specification (Figs. 1 and 15). On Falcon and Comet, install the steering arm stop between the arm and strut. On a Mustang, install the stop on top of the strut.

5. Torque the lower ball joint stud nut to specification, continue to tighten the nut until the cotter pin hole and slots are aligned, and install a new cotter pin.

6. Torque the lower arm-to-underbody pivot bolt and nut to specification.

7. Remove the safety stands and lower the car.

8. Remove the support from between the upper arm and frame.

9. Check and, if necessary, adjust caster, camber, and toe-in.

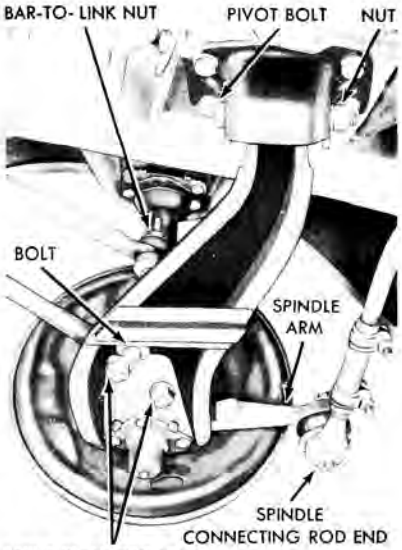


FIG. 15—Lower Suspension Arm Installed

FRONT WHEEL SPINDLE

DRUM BRAKES

Removal

1. Position a support between the upper arm and frame as shown in Figs. 3 and 4; then, raise the car and position safety stands.

2. Remove the hub cap or wheel cover, and back off the brake shoe adjusting screw if necessary.

3. Remove the grease cap from the hub; then, remove the adjusting nut, washer, and outer bearing cone and roller assembly.

4. Pull the wheel, hub, and drum assembly off the wheel spindle.

5. Remove the brake carrier plate from the spindle. Support the plate to prevent damage to the brake hose.

6. Disconnect the spindle connecting rod end from the spindle arm using Tool 3290-C.

7. Remove the cotter pins from both ball joint stud nuts, and loosen the nuts one or two turns. **Do not remove the nuts from the studs at this time.**

8. Position the ball joint remover tool between the upper and lower ball joint studs (Fig. 4). **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

9. Turn the tool with a wrench until the tool places the studs under tension, and, with a hammer, tap the spindle near the studs to loosen them

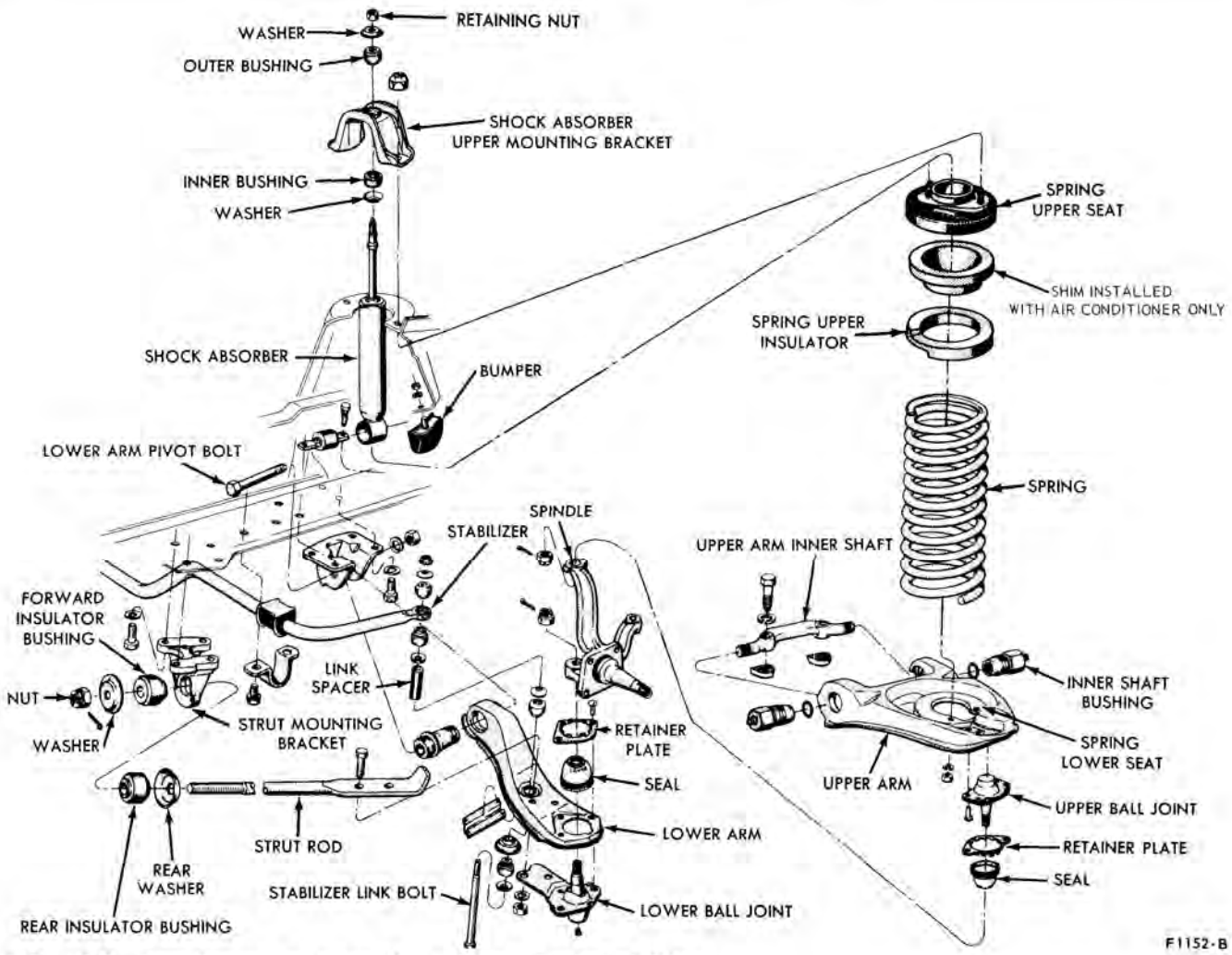


FIG. 16—Front Suspension Assembly—Fairlane—Typical of Others

in the spindle. **Do not loosen the studs in the spindle with tool pressure alone.**

10. Remove the stud nuts and the spindle from both studs, using a floor jack under the lower suspension arm.

Installation

1. Position the spindle on the lower ball joint stud and install the stud nut (Fig. 16).

2. Using a floor jack raise the lower suspension arm, and guide the upper ball joint stud into the spindle. Install the stud nut.

3. Torque the upper stud nut and then the lower stud nut to specification. Continue to tighten both nuts until the cotter pin holes and slots line up. Install new cotter pins.

4. Connect the spindle connecting rod end to the spindle arm.

5. Install the brake carrier plate on the spindle, and torque the bolts to specification.

6. Install the wheel and drum, adjust the wheel bearing (Part 3-5) and adjust the brakes (Group 2).

7. Remove the safety stands, and lower the car.

8. Remove the support from between the upper arm and frame.

9. Check and, if necessary, adjust caster, camber, and toe-in.

DISC BRAKES

Removal

1. Remove the hub cap or wheel cover, and remove the wheel and tire from the hub.

2. Remove two bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.

3. Remove the grease cap from the hub, then, remove the adjusting nut, washer, and outer bearing cone and roller assembly.

4. Pull the hub and rotor assembly off the wheel spindle.

5. Remove four bolts and nuts and remove the splash shield and caliper bracket from the spindle.

6. Disconnect the spindle connecting rod end from the spindle arm using Tool 3290-C.

7. Remove the cotter pins from both ball joint stud nuts, and loosen the nuts one or two turns. **Do not remove the nuts from the studs at this time.**

8. Position the ball joint remover tool between the upper and lower ball joint studs (Fig. 4). **The tool should seat firmly against the ends of both studs and not against the stud nuts.**

9. Turn the tool with a wrench until the tool places the studs under tension, and, with a hammer, tap the spindle near the studs to loosen them in the spindle. **Do not loosen**

the studs in the spindle with tool pressure alone.

10. Position a floor jack under the lower suspension arm.

11. Remove the upper and lower ball joint stud nuts; lower the jack and remove the spindle.

Installation

1. Position the spindle on the lower ball joint stud and install the stud nut (Fig. 16). Torque the nut to specification and install the cotter pin.

2. Using a floor jack raise the lower suspension arm, and guide the upper ball joint stud into the spindle. Install the stud nut.

3. Torque the nut to specifications and install the cotter pin. Then, remove the floor jack.

4. Connect the spindle connecting rod end to the spindle arm and install the retaining nut. Torque the nut to specifications and install the cotter pin.

5. Position the caliper bracket and splash shield to the spindle and install the attaching bolts and nuts. Torque the nuts and bolts to specification.

6. Install the hub and rotor on the spindle.

7. Position the caliper to the rotor and caliper bracket and install the attaching bolts.

8. Install the wheel and tire on the hub and adjust the wheel bearing (Part 3-5).

9. Install the hub cap or wheel cover.

SHOCK ABSORBERS

Passenger cars and station wagons are equipped with hydraulic shock absorbers of the direct-acting type and are nonadjustable and nonrefillable, and cannot be repaired.

Before replacing a shock absorber, check the action of the shock absorbers by grasping the bumper and jouncing the car up and down. If the shock absorbers are in good condition the car will immediately settle to a normal position after the bumper is released.

TESTING

To check a shock absorber removed from a car proceed as follows:

1. Hold the shock absorber in the vertical position with the piston (lower end) up, and pull out the piston rod until the shock is extended to its full length.

2. With the shock absorber held in the same position, push in the piston rod until the shock is compressed to its shortest length.

3. Repeat steps 1 and 2 several times until all the air is expelled.

4. Clamp the lower end (small diameter) in a vise in a vertical position.

5. Extend the shock to its full length and then compress it to its shortest length. There should be a constant drag during the complete cycle. Any sudden loss of drag indicates air in the system, loss of fluid, or faulty internal valve operation. Replace defective shock absorbers.

FRONT SHOCK ABSORBER – FALCON, COMET, AND MUSTANG

Removal

1. Raise the front end of the car and place supports under both suspension lower arms. **Be sure that the lower end of the shock absorber remains accessible for servicing.**

2. Remove the shock absorber lower retaining nuts and bushings at the spring lower seat.

3. Remove the shock absorber upper mounting bracket retaining nuts. Lift the bracket and shock absorber from the car (Fig. 17). Remove the bushings from the lower studs.

4. On a Falcon or Comet, remove move the upper retaining nut washer and bushing, and separate the shock absorber from the bracket. Remove the inner bushing and washer from the shaft.

On a Mustang, remove the two upper mounting bolts, and separate the shock absorber from the bracket (Fig. 17).

Installation

1. On a Falcon or Comet, install the inner bushing to the shock absorber shaft. Install the bracket on the shaft, install the outer bushing, washer, and the retaining nut on the shaft and torque to specifications.

On a Mustang, attach the upper end of the shock absorber to the upper bracket with the two mounting bolts (Fig. 17).

2. Assemble the inner bushings to the shock absorber lower attaching studs, and install the assembly through the spring housing.

3. Extend the shock absorber and insert the lower studs through the holes in the spring lower seat. Install the lower bushings, washers and retaining nuts on the studs. Torque the nuts to specifications.

4. Install the shock absorber mounting bracket-to-body nuts and torque to specifications.



FIG. 17—Front Shock Absorber Removal or Installation—Mustang —Typical of Comet and Falcon

REAR SHOCK ABSORBER – FALCON, COMET, AND MUSTANG

Removal

1. Disconnect the shock absorber from the spring clip plate (Fig. 22).

2. On the passenger car, remove the shock absorber access cover from the luggage compartment (Fig. 18).

On the Ranchero, remove the retaining screws, and lift the forward half of the floor panel from the body; then, remove the access cover



FIG. 18—Rear Shock Absorber Access Cover

from the opening in the floor pan over the shock absorber.

On station wagons, remove the access cover from the opening in the seat riser over the shock absorber.

3. Remove the shock absorber upper retaining nut.

4. Compress the shock absorber and remove it from the car. Remove the bushings and washers from the shock absorber studs.

Installation

1. Place the bushings and washers on the shock absorber studs.

2. Connect the upper stud to the mounting, and install the bushing, washer, and nut on the stud. Torque the nut to specification, and install the cover (on a station wagon or car).

On the Ranchero, after installing the access cover in the floor pan, install the forward half of the floor panel.

3. Connect the lower stud to the spring clip plate, and install the bushing, washer, and nut on the stud. **Be sure the spring clip plate is free of burrs.** Tighten the nut to specification.

FRONT SHOCK ABSORBER – FAIRLANE

Removal

1. Raise the car and install safety stands.

2. Remove the shock absorber lower retaining nuts and washers (Fig. 16).

3. Open the hood, then remove the shock absorber upper mounting bracket retaining nuts. Move the mounting bracket-to-dash panel brace to one side; then, remove the mounting bracket and shock absorber as an assembly (Fig. 11).

4. Remove the shock absorber upper retaining nut, bushing, and washer; then, separate the shock absorber from the upper mounting bracket (Fig. 16). Remove the inner bushing and washer.

Installation

1. Install the inner washer and bushing to the shock absorber shaft, and assemble the upper mounting bracket to the shock absorber shaft (Fig. 16).

2. Install the outer bushing and washer, then the bracket-to-shaft retaining nut.

3. Install the shock absorber and upper mounting bracket assembly (with shims) to the car. The shock lower retaining bolts go through the holes in the spring lower seat (Fig. 16).

4. Install the shock absorber lower retaining nuts and lock washers and torque to specification.

5. Position the wide leg of the shock absorber upper mounting bracket inboard, and position the bracket-to-dash panel brace to the wide leg.

6. Install the mounting bracket retaining bolts and washers, and torque to specification (Fig 11).

REAR SHOCK ABSORBER – FAIRLANE

Removal

1. Open the luggage compartment door, and remove the spare wheel and tire. On a station wagon, remove the floor bed panel (14 screws).

2. Remove the shock absorber access cover from the floor pan and remove the nut outer washer, and rubber bushing that retain the shock absorber to the upper mounting in the floor pan (Fig. 19).

3. Raise the car and remove the retaining nut, outer washer and bushing from the shock absorber at the spring clip plate (Fig. 22). Compress the shock absorber and remove it from the car.

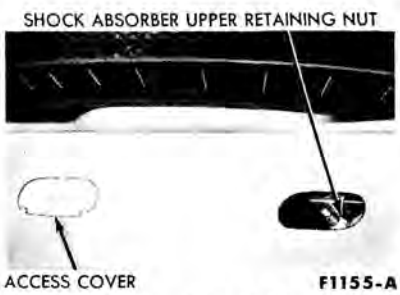


FIG. 19—Rear Shock Absorber Upper Mounting

4. If the shock absorber is serviceable and requires new bushings remove the inner bushings and washers from the shock absorber studs.

Installation

1. Place the inner washer and bushing on each shock absorber stud.

2. Expand the shock absorber and position it to the spring clip plate and to the mounting in the floor pan.

3. Connect the lower stud to the spring clip plate, and install the bushing, washer, and nut on the stud (Fig. 22). **Be sure the spring clip plate is free of burrs.** Tighten the nut to specification.

4. From the luggage compartment, install the bushing washer and retaining nut to the upper mounting stud (Fig. 19). Torque to specification. On a station wagon, replace the floor bed panel (14 screws).

5. Place the spare wheel and tire in the luggage compartment, and secure it in the storage position.

REAR SPRING AND/OR BUSHING—FALCON, COMET, AND MUSTANG

Removal

1. Raise the car on a hoist and place supports beneath the underbody and under the axle.

2. Disconnect the lower end of the shock absorber from the spring clip plate, and push the shock out of the way.

3. Remove the spring clip plate nuts from the U-bolts, then remove the plate (Fig. 22).

4. Remove the two retaining nuts, the rear shackle bar, and the two shackle inner bushings.

5. Remove the rear shackle assembly and the two outer bushings.

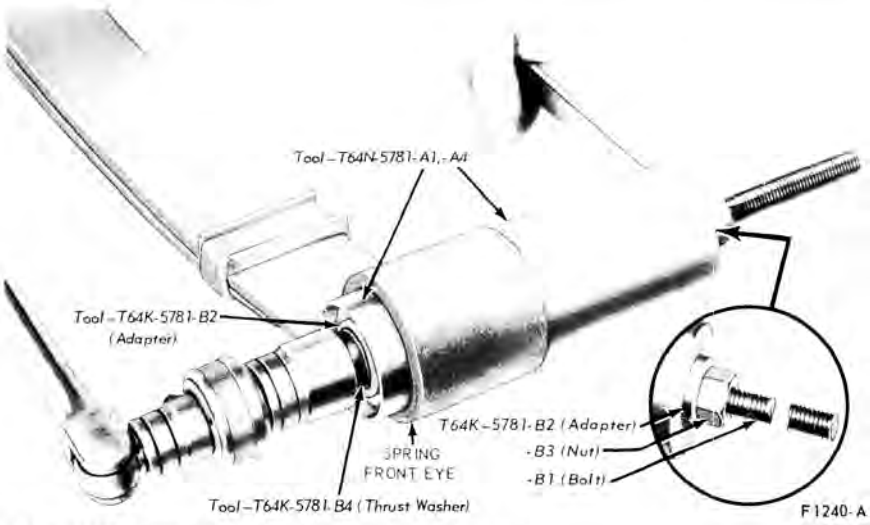


FIG. 20—Rear Spring Front Bushing Removal

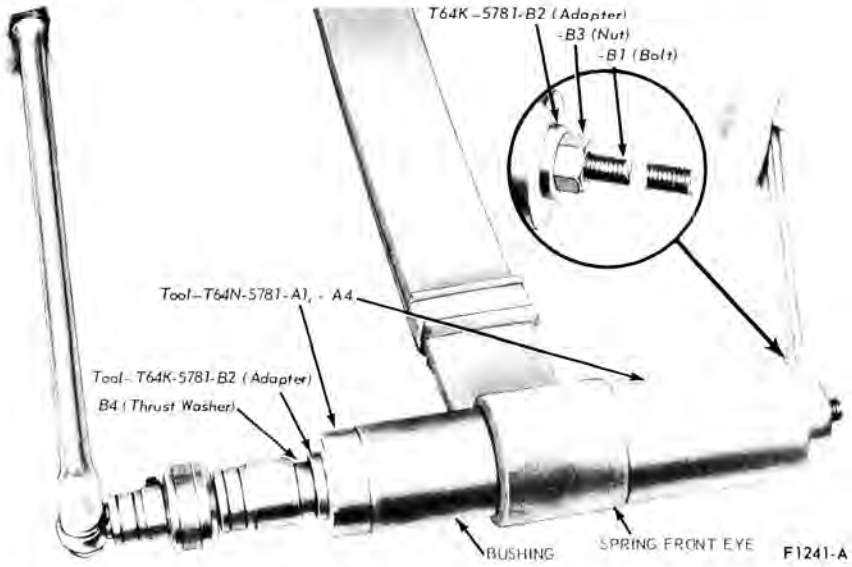


FIG. 21—Rear Spring Front Bushing Installation

6. Remove the front hanger bolt, nut, and washer from the eye at the forward end of the spring. Lift out the spring assembly.

7. If the front bushing is being replaced, assemble the special tool combination to the bushing in the spring front eye as shown in Fig. 20.

8. While holding the tool nut, tighten the tool bolt against the tool thrust washer, the adapter, and detail A1. This operation will force the bushing out of the spring eye into detail A4 of the tool as shown.

Installation

1. Assemble the bushing and the special tool combination to the spring front eye as shown in Fig. 21.

2. While holding the tool nut, tighten the tool bolt against the tool thrust washer, adapter, and detail A4 to force the bushing into the spring eye as shown.

3. Position the spring under the rear axle and insert the shackle assembly into the rear hanger bracket and the rear eye of the spring.

4. Install the shackle inner bushings, the shackle plate, and the locknuts. Tighten the locknuts finger tight.

5. Position the spring front eye in the front hanger, slip the washer on the front hanger bolt, and (from the inboard side) insert the bolt through the hanger and eye. Install the lock nut on the hanger bolt and tighten finger tight.

6. Torque the rear shackle locknuts to specification.

7. Lower the rear axle until it rests on the spring. Position the spring clip plate on the clips (U-bolts). Install the U-bolt nuts and torque to specification.

8. Connect the lower end of the shock absorber to the spring clip plate.

9. Place safety stands under the rear axle, lower the car until the spring is in the approximate curb load position, and then torque the front hanger stud locknut to specification.

10. Remove the safety stands and lower the car.

REAR SPRING—FAIRLANE

REMOVAL

1. Raise the car until the rear wheels clear the floor, and place supports beneath the underbody and beneath the axle.

2. Disconnect the lower end of the shock absorber from the spring clip plate, and position out of the way.

3. Disconnect the brake line connector from the axle housing in order to relieve the strain on the brake hose when the axle is lowered.

4. Lower the rear axle slightly to reduce some of the spring load; then remove the spring clip (U-bolt) nuts, the clips (U-bolts), spring clip plate, and lower insulator.

5. Remove the spring front hanger-to-underbody mounting bolts (Fig. 22).

6. Remove the rear shackle nuts and shackle bar; then, remove the shackle assembly from the underbody side member and spring rear eye.

7. Remove the spring and front hanger as an assembly.

8. Remove the upper insulator and retainer from the spring.

INSPECTION AND REPAIR – SPRING REMOVED

Front Hanger Assembly

If the front hanger or bushing is to be replaced, proceed as follows:

1. Remove the nut from the spring mounting bolt and tap the bolt out of the bushings and front hanger (Fig. 22). Remove the hanger from the spring.

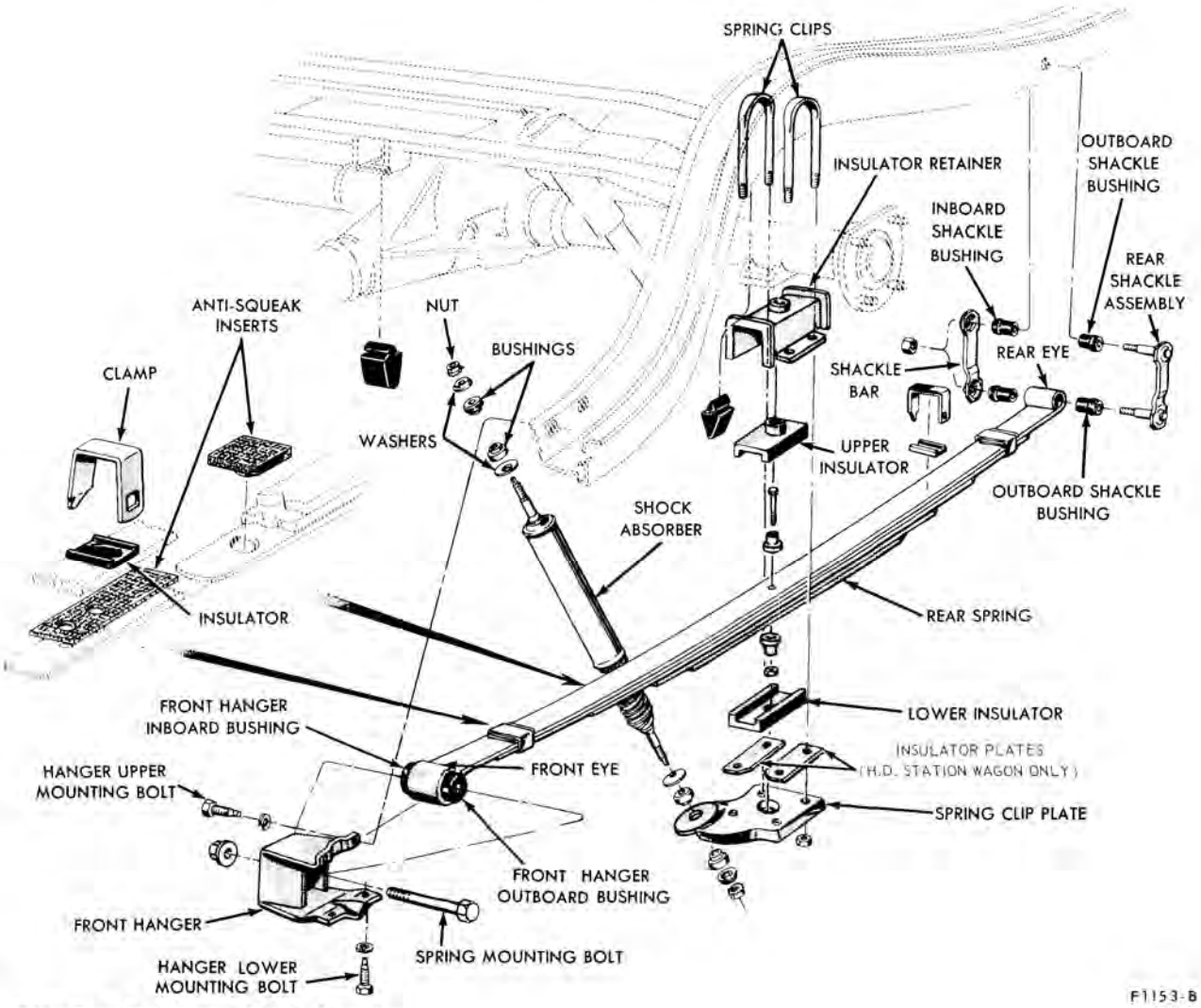


FIG. 22–Rear Spring and Shock Absorber

2. If the front bushing is being replaced, assemble the special tool combination to the bushing in the spring front eye as shown in Fig. 20.

3. While holding the tool nut, tighten the tool bolt against the tool thrust washer, the adapter, and detail A1. This operation will force the bushing out of the spring eye into detail A4 of the tool as shown.

4. Assemble the bushing and the special tool combination to the spring front eye as shown in Fig. 21.

5. While holding the tool nut, tighten the tool bolt against the tool thrust washer, adapter, and detail A4 to force the bushing into the spring eye as shown.

6. Position the spring end in the hanger and install the spring mounting bolt and nut, and torque to specification.

Rear Shackle

1. Inspect the rear shackle, bushings, and studs for wear or damage.

2. Replace parts where necessary.

Spring Leaves and Tie Bolt

1. Check for broken spring leaves. Inspect the anti-squeak inserts between the leaves, and replace them if they are worn. **The spring leaves must be dry and free of oil and dirt before new inserts are installed.**

2. Inspect the spring clips for worn or damaged threads. Check the spring clip plate and insulator retainers for distortion.

3. If the spring center tie bolt requires replacement, clamp the spring in a vise to keep the spring compressed during bolt removal and installation.

INSTALLATION

1. Install the outboard shackle bushings in the underbody sidemember and in the rear eye of the spring (Fig. 22).

2. Insert the lower stud of the rear shackle assembly through the outboard bushing and spring rear eye.

3. Raise the rear end of the spring and the shackle assembly into position, and insert the shackle upper stud through the bushing in the outboard side of the body sidemember.

4. Install the inboard bushings on the shackle studs in the body sidemember and spring rear eye.

5. Install the shackle bar and retaining nuts. **Do not tighten the nuts at this time.**

6. Position the spring and front hanger assembly to the underbody

sidemember, and install the hanger mounting bolts and lock washers.

Start the two upper mounting bolts at the side before starting the two lower mounting bolts from underneath (Fig. 22). Do not tighten the bolts at this time.

7. Install the upper insulator and retainer on the spring as shown in Fig. 22. Lower the axle housing onto the upper insulator and retainer.

8. Install the lower insulator, spring clips (U-bolts), plate, and clip (U-bolt) nuts. **Do not tighten the spring clip nuts at this time.**

9. Torque the rear shackle nuts and the front hanger mounting bolts to specification.

10. Torque the spring clip nuts evenly to specification.

11. Raise the axle housing, and connect the brake line connector to the housing.

12. Connect the lower end of the shock absorber to the spring clip plate.

PART 3-3 MANUAL STEERING

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2	In-Car Adjustments and Repairs	3-26
3	Removal and Installation	3-28
4	Major Repair Operations	3-29
5	Steering Linkage Repair	3-30

1 DESCRIPTION

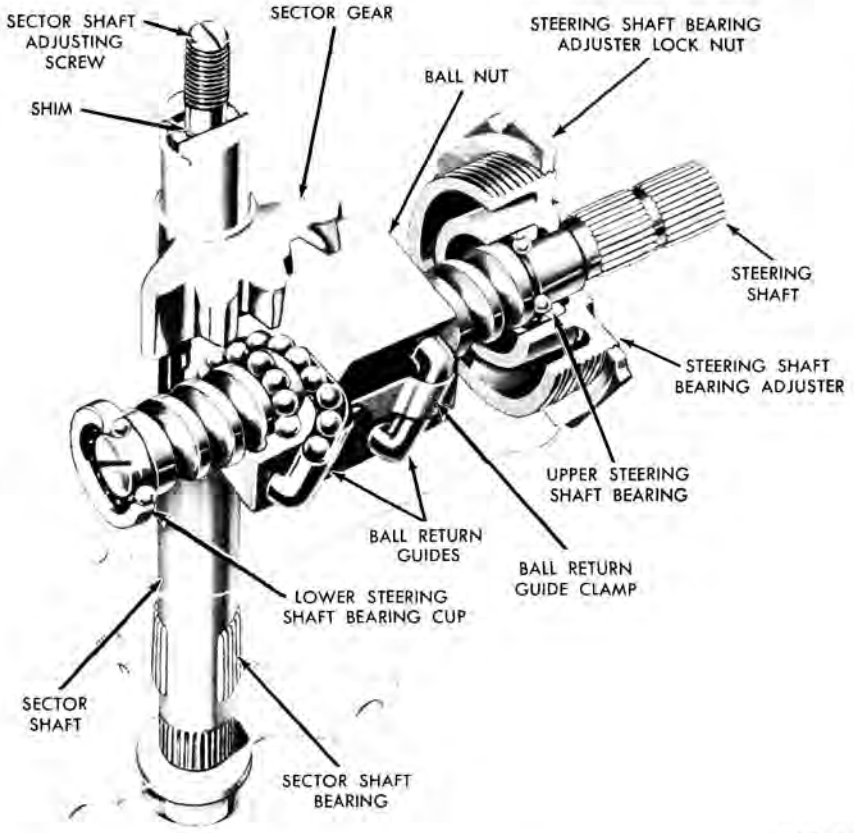


FIG. 1—Recirculating Ball Type Steering Gear

The steering gear (Fig. 1) is of the worm and recirculating ball type. The sector shaft rotates in needle bearings that are pressed into the gear housing.

The worm bearing preload is controlled by the large bearing adjuster which is threaded into the housing. The sector shaft mesh load is controlled by an adjusting screw located in the housing cover.

A steering gear identification tag is provided under one of the cover attaching bolts (Fig. 2).

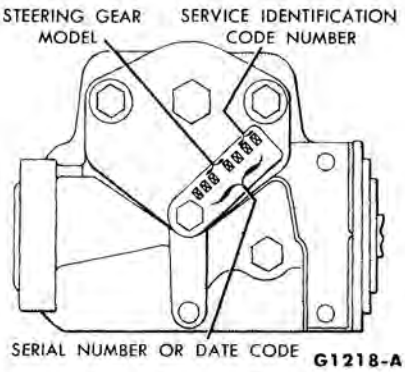


FIG. 2—Steering Gear Identification Tag

2 IN-CAR ADJUSTMENTS AND REPAIRS

STEERING WORM AND SECTOR GEAR ADJUSTMENTS

The ball nut assembly and the sector gear must be adjusted properly to maintain minimum steering shaft end play (a factor of preload adjustment) and minimum backlash between sector gear and ball nut. There are only two possible adjustments within the recirculating ball-type steering gear, and **these should be made in the following order to avoid damage or gear failure.**

1. Disconnect the Pitman arm from the sector shaft.

2. Remove the steering wheel, spring and the centering cone from the shaft and note the relation of the shaft to the bearing.

3. If the shaft is not centered, attach a spring scale to it.

4. Center the shaft by pulling on the scale and note the reading.

5. If more than 20 lbs. pull is required to center the shaft, the steering column should be aligned as detailed in steering gear installation, before adjusting the preload and mesh load.

6. Loosen the nut which locks the sector adjusting screw (Fig. 3), and turn the adjusting screw counterclockwise.

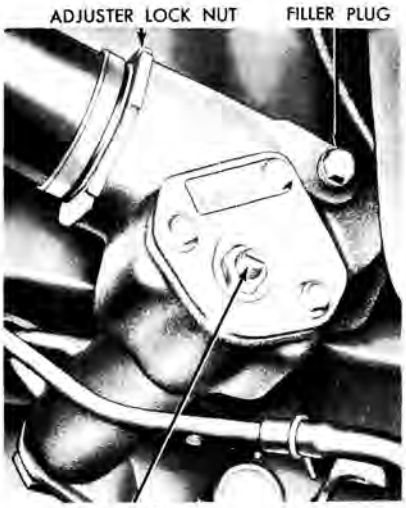


FIG. 3—Steering Gear Adjustments

7. Measure the worm bearing preload by attaching an in.-lb. torque wrench to the steering wheel nut (Fig. 4). With the steering wheel off center, read the pull required to rotate the input shaft approximately 1½ turns either side of center. If the torque or preload is not within specification (Part 3-6), adjust as explained in the next step.

8. Loosen the steering shaft bearing adjuster lock nut, and tighten or back off the bearing adjuster (Fig. 3) to bring the preload within the specified limits.

9. Tighten the steering shaft bearing adjuster lock nut, and recheck the preload.

10. Turn the steering wheel slowly to either stop. **Turn gently against the stop to avoid possible damage to the ball return guides.** Then rotate the wheel 2¼ turns to center the ball nut.



FIG. 4—Checking Pre-Load

11. Turn the sector adjusting screw clockwise until the specified pull (Part 3-6) is necessary to rotate the worm past its center high spot (Fig. 4). **No perceptible backlash is permissable at 30° on either side of center.**

12. While holding the sector adjusting screw, tighten the locknut to specification and recheck the backlash adjustment.

13. Connect the Pitman arm to the sector shaft and torque to specification.

STEERING WHEEL SPOKE POSITION ADJUSTMENT

When the steering gear is on the high point, the front wheels should be in the straight-ahead position and the steering wheel spokes should be in their normal position with the Pitman arm pointing directly forward. If the spokes are not in their normal position, they can be adjusted without disturbing the toe-in adjustment (Part 3-1).

STEERING WHEEL REPLACEMENT

1. Remove the horn ring (or button) assembly and related parts.

2. Remove the steering wheel attaching nut and remove the steering wheel from the shaft, using the tool shown in (Fig. 5).

3. With the front wheels straight forward, position the steering wheel on the steering shaft with the post on the steering wheel hub at the top.

4. Apply Loctite Sealer (C3AZ-19554-A) to the steering shaft threads and install the steering wheel nut on the shaft. Torque the nut to specification.



FIG. 5—Removing Steering Wheel—Typical

5. With the front wheels straight forward (post on steering wheel hub at the top), install the horn ring (or button) assembly and the related parts.

STEERING COLUMN SHIFT TUBE REPLACEMENT

REMOVAL

1. Remove the steering wheel, spring and centering sleeve.

2. Remove the turn indicator lever. Place the gear shift selector lever in the neutral position and remove the lever.

3. Remove the bearing retainer and move the turn signal switch to one side.

4. Loosen the flange retaining nuts until pressure on the nuts (toward the column center) will disengage the bolt heads. Lift the flange from the column and drape the flange and the signal wires over the top of the column.

5. Remove the gear shift lever socket from the steering column tube.

6. Remove the shift tube.

INSTALLATION

1. After applying Lubriplate to the lower area of the shift tube, position the shift tube in the steering column tube. The shift tube is seated when spring pressure can be felt.

2. Install the gear shift lever socket, being careful not to damage the wiring insulation as the socket is positioned.

3. Install the flange and tighten the retaining nuts.

4. Install the turn signal switch and bearing retainer.

5. Install the turn signal lever and the selector lever.

6. Install the centering sleeve, spring and steering wheel.

STEERING COLUMN UPPER BEARING REPLACEMENT

1. Disconnect the horn wire and the turn indicator wires at the connectors. Remove the horn ring (or button) and the spring.

2. Remove the steering wheel attaching nut. Remove the steering wheel (Fig. 5) with a puller. Lift

the spring and the centering sleeve from the shaft.

3. Remove the turn indicator lever. Remove the upper bearing retainer screws and move the turn signal switch to one side.

4. Remove the steering column upper bearing from the flange.

5. After applying Lubriplate, install the new upper bearing.

6. Position the upper bearing retainer and the signal switch and install the three retainer screws.

7. Apply Loctite Sealer (C3AZ-19554-A) to the turn indicator lever and install the turn indicator lever. Position the centering sleeve and the spring. After applying Lubriplate to the horn switch brush plates, apply Loctite Sealer (C3AZ-19554-A) to the steering shaft threads and install the retaining nut.

8. Connect the turn indicator and horn wires and test their operation.

3 REMOVAL AND INSTALLATION

STEERING GEAR REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the horn and turn indicator wires under the instrument panel. Also on a car with an automatic transmission, disconnect the neutral switch wires.

2. Remove the horn ring (or button). Remove the steering wheel retaining nut and the steering wheel (Fig. 5).

3. Remove the upper bearing centering sleeve and spring.

4. Remove the steering column clamp to instrument panel bolts and remove the clamp and the insulator.

5. Pull the rubber seal up on the steering column, fold the floor mat aside, and move the dash panel insulation out of the way.

6. Remove the retaining screws from the steering column weather seal on the dash panel. Remove the steering column cover plates and gasket.

7. Slide the steering column tube assembly from the steering gear shaft, guiding the shift lever (s) up through the opening in the dash panel.



FIG. 6–Removing Pitman Arm –Typical

8. Raise the car and remove the clutch equalizer and bracket assembly from the frame side rail and engine if so equipped to obtain clearance.

9. On power steering equipped vehicles, remove pal nut attaching nut insulator and washer and remove the power steering cylinder rod from the bracket to obtain clearance for removal of Pitman arm.

10. Remove the inlet pipe from the manifold to obtain clearance.

11. Remove nut and washer. Install Tool T64P-3590-F and remove the Pitman arm from the sector shaft (Fig. 6).

12. Remove steering gear retaining bolts.

13. Lower the car and disconnect the wires from the left bank of spark plugs to prevent damaging them.

14. On Comet and Falcon 8-cylinder models, remove the manifold from the engine to obtain clearance.

15. On vehicles equipped with column mounted shift mechanism, disconnect the transmission shift rod(s) at the gear shift lever(s).

16. Remove brake booster if necessary.

17. Remove the support rod from cowl to spring tower (except Comet).

18. Loosen air cleaner to obtain clearance if necessary.

19. Lift the steering gear and shaft assembly from the engine compartment by raising the gear up and forward past the engine and spring tower taking care not to soil or tear the front seat fabric with the end of the steering shaft.

INSTALLATION

1. Install the steering gear from engine side and guide the shaft through the dash panel being careful not to soil or tear the front seat fabric. Install the steering gear attaching bolts but do not tighten.

2. Center the steering shaft for straight ahead drive position.

3. Raise car on hoist and install clutch equalizer assembly to engine and underbody if car is so equipped.

4. Install inlet pipe to manifold.

5. Install Pitman arm to the sector shaft and install the lock washer and the torque nut to specification.

6. If equipped with power steering, install power cylinder rod to bracket and install insulator washer and nut to retain.

7. Partially lower car onto safety stands and install the steering column tube assembly over the steering shaft, guiding the shifting arms through the opening in the dash panel.

8. Position the steering column assembly and retaining clamp and insulator, and loosely install the attaching bolts and nuts.

9. Tighten the steering gear to side rail mounting bolts and column to instrument panel retaining bracket.

Check steering shaft to column upper bearing clearance. If the shaft does not touch the bearing, no further readjustment is required. If the shaft is touching the column upper bearing, it will be necessary to check the pull required to center the shaft in the column, using a fish scale. Where pull exceeds 20 lbs. at either plane to center the shaft in the column, the following correction must be made:

Vertical movement of the steering shaft can be accomplished by loosening the steering gear mounting bolts and pivoting the gear up and down.

Horizontal movement of the steering shaft can be accomplished by loosening the steering column to instrument panel retaining bracket and moving the column to the left or right.

Should additional horizontal move-

ment be required to align the steering shaft, it will be necessary to insert shim(s) of proper thickness between the steering gear assembly and the vehicle side rail. Front end alignment shims can be used for this purpose. After the steering shaft is centered, torque all bolts to specification.

10. Position the upper bearing centering sleeve and spring. After applying Lubriplate to the upper surface of the steering shaft upper bearing and the horn switch brush plate, position the steering wheel on the steering shaft. Apply Loctite sealer (C3AZ-19554-A) to the steering shaft threads and install the retaining nut. Apply Loctite sealer sparingly to the turn indicator lever threads and install the lever.

11. Install the horn ring (or button) and spring, and steering wheel to the center point.

12. Set gap between column tube and steering wheel and tighten column to instrument panel.

13. Lower the car from the safety stands. Connect the horn, turn indicator wires, and (on a car with an automatic transmission) the neutral switch wires.

14. Position the steering column cover plates and gasket on the dash panel and install the retaining screws.

15. Position the dash panel insulation just above the steering column. Position the floor mat and push the rubber seal down to the floor mat.

16. Connect the transmission shift rods and correct adjustment of shift lever(s) and the neutral switch.

17. Install the exhaust manifold on Falcon and Comet 8-cylinder models.

18. Connect ignition wires.

19. Connect cowl to spring tower support rod (except Comet).

20. Tighten the air cleaner.

4 MAJOR REPAIR OPERATIONS

STEERING GEAR

DISASSEMBLY

1. Rotate the steering shaft approximately 2¼ turns from either stop.

2. After removing the sector adjusting screw locknut and the housing cover bolts, remove the sector shaft with the cover. Remove the cover from the shaft by turning the screw clockwise. **Keep the shim with the screw.**

3. Loosen the worm bearing adjuster nut, and remove the adjuster assembly and the steering shaft upper bearing and cup.

4. Carefully pull the steering shaft and ball nut from the housing. **To avoid possible damage to the ball return guides, keep the ball nut from running down to either end of the worm.**

Disassemble the ball nut only if there is indication of binding or tightness.

5. Remove the lower bearing and cup from the housing. It may be necessary to tap the housing on a block of wood (Fig. 7) to loosen it from the housing.

6. Remove the ball return guide clamp and the ball return guides from the ball nut. **Keep the ball nut clampside up until ready to remove the balls.**

7. Turn the ball nut over, and rotate the worm shaft from side to side until all 62 balls have dropped out of the nut into a clean pan. With the balls removed, the ball nut will slide off the worm.

Press both sector shaft bearings out of the housing (Fig. 8). **Remove the seal and the bearings only if there is an indication of wear or damage, or bearing mislocation. Do not install a new bearing in a housing in which the bearing has turned or is found to be mislocated. A new housing must be used.**

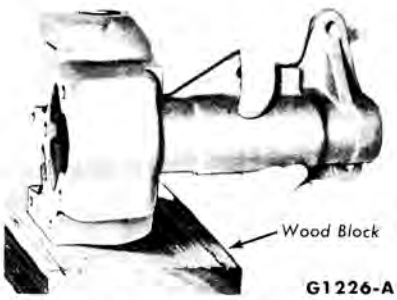


FIG. 7—Removing Lower Bearing Cup from Housing



FIG. 8—Removing Sector Shaft Bearing

STEERING GEAR

ASSEMBLY

1. If the sector shaft bearings have been removed, press new bearings into the housing (Fig. 9).

2. Position a bearing cup in the adjuster.

3. If the sector shaft oil seal has been removed, install a new oil seal.



FIG. 9—Installing Sector Shaft Bearing

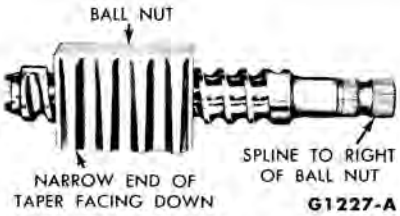


FIG. 10—Positioning Ball Nut—Typical

4. Swab the inside diameter of the ball nut and the outside diameter of the worm with gear lubricant C3AZ-19578-A prior to assembly. Lay the steering shaft on a bench as shown in Fig. 10. After positioning the shaft, turn the ball nut to place the guide holes in the up position. Align the grooves in the worm and in the ball nut by sighting through the ball guide holes.

5. Insert the ball guides into the holes of the ball nut, tapping them lightly with a wood handle of a screw driver if necessary to seat them.

6. Insert 31 balls into the hole in the top of each ball guide. It may be necessary to rotate the shaft slightly one way, then in the opposite direction to distribute the balls in the circuit.

7. After the 62 balls are installed, install the ball guide clamp. Check the ball nut to see that it rotates freely. Torque the screw to specification.

8. Coat the threads of the steering shaft bearing adjuster, the housing cover bolts, and the sector adjusting screw with a suitable oil-resistant sealing compound. **Do not apply sealer to female threads, and especially avoid getting any sealer on the steering shaft bearings.**

9. Coat the worm bearings, sector shaft bearing and gear teeth with gear lubricant C3AZ-19578-A.

10. Clamp the housing in a vise, with the sector shaft axis horizontal, and position the steering shaft lower bearing cup and the bearing in place.

11. Position the steering shaft and ball nut assembly in the housing.

12. Position the steering shaft upper bearing on the top of the worm, and install the steering shaft bearing adjuster and cup. Install the lock nut with the flat side against the bearing adjuster and the letter "S" outward. Leave the nut loose.

13. After installing the steering wheel nut on the steering shaft, adjust the worm bearing preload, using an inch-pound torque wrench to check for specified preload.

14. Position the sector adjusting screw and the adjuster shim, and check the end clearance which should not exceed 0.002 inch between the screw head and the end of the sector shaft. If clearance is greater than 0.002 inch, replace the shim.

15. Thread the sector shaft adjusting screw into the housing cover.

16. Install a new gasket on the housing cover.

17. Rotate the steering shaft until the ball nut teeth are in position to mesh with the sector gear, tilting the housing so that the ball nut will tip toward the housing cover opening.

18. Apply enough gear lubricant C3AZ-19578-A to fill the pocket in the housing between the sector shaft bearings 30% full.

19. Push the housing cover with the sector shaft into place.

20. Turn the cover to one side and fill the housing with ½ lb. of gear lubricant C3AZ-19578-A.

21. **Install but do not tighten the housing cover attaching bolts. Do not tighten the cover bolts until it is certain that there is some lash between the ball nut and the sector gear teeth.**

22. After loosely installing the sector shaft adjusting screw lock nut, adjust the sector shaft mesh to the specified mesh load, then tighten the adjusting screw lock nut. Remove the steering wheel nut.

5 STEERING LINKAGE REPAIR

The manual steering linkage (Fig. 11) consists of the Pitman arm, the steering arm-to-idler arm rod, the steering idler arm, and the spindle connecting rods (tie rods). **Do not attempt to straighten bent linkage; use new parts.**

SPINDLE CONNECTING ROD END REPLACEMENT

The spindle connecting rod ends, which are threaded into the outer ends of the rod sleeves, have non-adjustable, spring-loaded ball studs. A rod end should be replaced when excessive looseness at the ball stud is noticed.

1. Remove the cotter pin and nut from the worn rod end ball stud (Fig. 11).

2. Disconnect the end from the spindle, connecting arm, Pitman arm, or idler arm as shown in Fig 13.

3. Loosen the connecting rod sleeve clamp bolts, and count the number of turns needed to remove the rod end from the sleeve. Discard all rod end parts that were removed from the sleeve. **All new parts should be used when a spindle connecting rod end is replaced.**

4. Thread a new rod end into the sleeve, but do not tighten the sleeve clamp bolts at this time.

5. Install the seal (Fairlane only) on the rod end ball stud, insert the stud in the part from which the old one was removed, and install the stud nut. Torque the nut to specification and install the cotter pin.

6. Check and, if necessary, adjust toe-in (Part 3-1). **After toe-in is checked and adjusted, torque the old sleeve clamp bolts to specification. Add four pounds torque if new bolts are used.** The tie rod sleeve clamps must be installed with the bolt down on Comet, Falcon, and Mustang models to prevent interference with the side rail.

SPINDLE SLEEVE REPLACEMENT

A spindle sleeve should be replaced if it becomes worn or damaged (Fig. 11). **Do not attempt to straighten the sleeve if threaded portion is damaged.**

1. Remove the spindle connecting rod ends as described in the previous sub-section.

2. Screw the spindle rod ends into the new sleeve the same number of turns as the ends that were removed. Do not tighten the clamp bolts at this time.

3. After installing the seal (Fairlane only) on the rod ends, position the sleeve assembly on the Pitman arm (or the idler arm) and the spindle arm. Install the attaching nut, torque it to specification, and install the cotter pin.

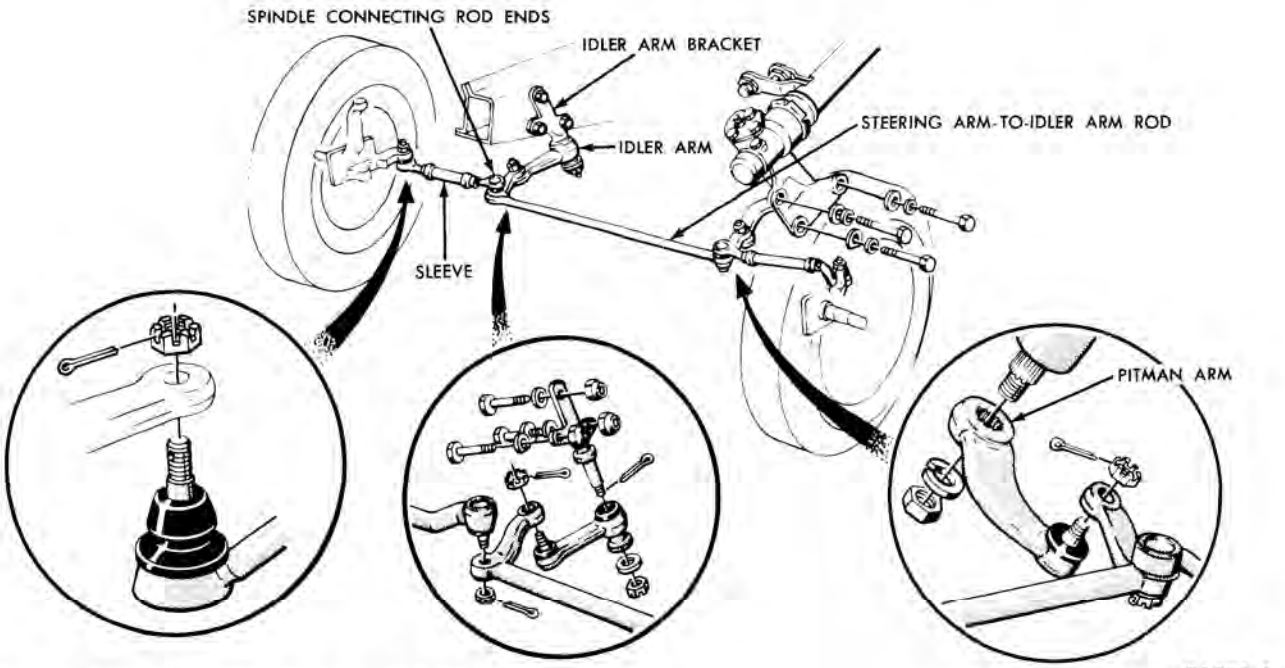


FIG. 11—Typical Steering Linkage—8-Cylinder Shown

4. Check and, if necessary, adjust toe-in (Part 3-1). After toe-in is checked and adjusted, torque the sleeve clamp bolts to specification. The sleeve clamp must be installed with the bolt down on Comet, Falcon, and Mustang models to prevent interference with the side rail.

STEERING ARM-TO-IDLER ARM ROD REPLACEMENT

The rod connecting the Pitman arm and the idler arm is non-adjustable and has non-adjustable ball studs on all 6-cylinder car steering linkage. On the 8-cylinder car linkage, the rod connecting the Pitman arm and the idler arm is provided with tapered holes to accommodate the ball studs (Fig. 11). The rod should be replaced when damaged (all) or when worn at the ball studs (6-cylinder only).

1. Remove the cotter pins and nuts from the ball studs at the sector shaft arm and the idler arm, and remove the steering arm-to-idler arm rod (Fig. 12).

2. After installing new seals (Fairlane only) on the ball studs, position the new steering arm-to-idler arm rod on the idler arm and the steering arm.

3. Install the ball stud retaining nuts and torque to specification.

4. Install cotter pins, lubricate the power steering ball stud socket if necessary.

5. Check and, if necessary, adjust toe-in (Part 3-1).



FIG. 12—Disconnecting Spindle End

STEERING IDLER ARM BUSHING REPLACEMENT

6-CYLINDER CARS

The idler arm used to service the Comet models includes the bushing, therefore it is only necessary to replace the complete arm when worn. Use the following procedure to replace the Falcon idler arm bushing:

To replace the bushing, use the tool shown in Fig. 13. After replac-

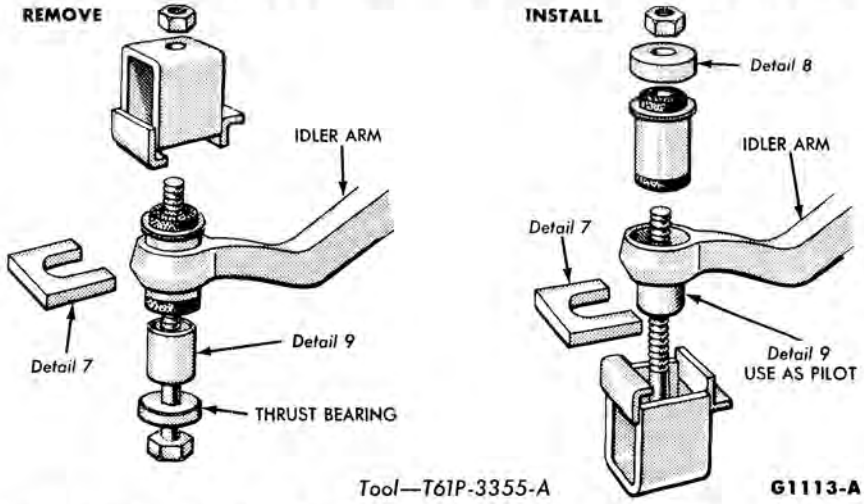


FIG. 13—Replacing Idler Arm Bushing

ing the bushing and connecting the linkage, check and, if necessary, adjust the toe-in.

It will be necessary to replace the idler arm if the bushing or ball joint is worn or damaged.

To replace the idler arm, remove the cotter pin and nut that secures the steering arm-to-idler arm rod. Disconnect the rod from the idler arm as shown in Fig. 12. Remove the cotter pin, nut and the washer that secures the idler arm to the idler arm bracket. Remove the idler arm from the bracket.

Position the new idler arm on the idler arm bracket and secure it with a washer and slotted nut. Secure the rod to the idler arm with a slotted nut. Torque the slotted nuts to specifications and install the cotter pins.

PART 3-4 POWER STEERING

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1	Description	3-33
2	Pump-Fluid Pressure Test	3-33
3	In-Car Adjustments and Repairs	3-35
4	Removal and Installation	3-35
5	Major Repair Operations	3-37

1 DESCRIPTION

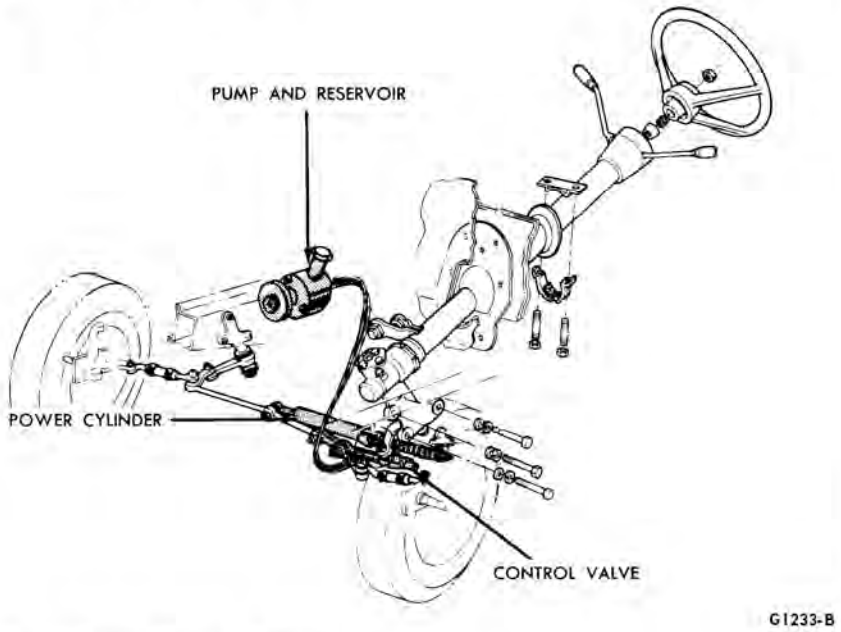


FIG. 1—Power Steering System

The Power Steering (Fig. 1) is a hydraulically controlled linkage-type steering system which includes an integral pump and fluid reservoir, a control valve, a power cylinder, the connecting fluid lines, and the steering linkage. The hydraulic pump, belt-driven from the engine crankshaft, draws fluid from the reservoir and provides fluid pressure for the system. Within the pump itself is a pressure-relief valve which governs the pressures within the steering system according to the varying conditions of operation. After fluid has passed from the pump to the control valve and the power cylinder, it returns to the reservoir.

The control valve, operated by steering wheel movement, directs the pressure developed by the pump. When the front wheels are in the straight-ahead position, the control valve spool is held in the center (neutral) position by its centering spring. Fluid then flows around the valve lands and returns to the reservoir (Fig. 2), Within the control valve body there is a reaction limiting valve which reduces parking effort.

When force of about 4 pounds is exerted for a left turn, the valve spool overcomes the pressure of the centering spring and moves toward the right end of the valve. As a result, pressure is exerted on the right side of the power cylinder piston, and fluid in the left end of the cylinder returns to the reservoir (Fig. 2).

If the direction of the force on the steering wheel is reversed, the front wheels will turn to the straight forward position. Or as force on the steering wheel falls below approximately 4 pounds the valve spool centering spring forces the spool back to the center position and there the pressure on both sides of the power cylinder piston is equal. With normal forward driving movement of the car and in the absence of operative pressure within the power cylinder, the front wheels will seek to return to the straight ahead position. This is a normal effect of the front wheel alignment.

For a right turn, the directional forces explained above are reversed (Fig. 2).

If, for any reason, the pump fails to deliver fluid pressure, the car may be steered without pump pressure.

2 PUMP-FLUID PRESSURE TEST

A fluid pressure test will show whether the pump or some other unit in the power steering system is causing trouble in the system. Steps outlined below should be followed to determine the cause of the trouble.

1. Measure the pump belt tension.

When adjusting the belt tension on the power pump, do not pry against the pump to obtain the proper belt load.

A half inch cast boss has been incorporated on the front face of the pump cover plate onto which a 9/16" open end wrench can be fitted to pry the pump and obtain the proper belt tension.

2. Disconnect the pressure line hose from the pump outlet, and install a 0-2000 psi pressure gauge and

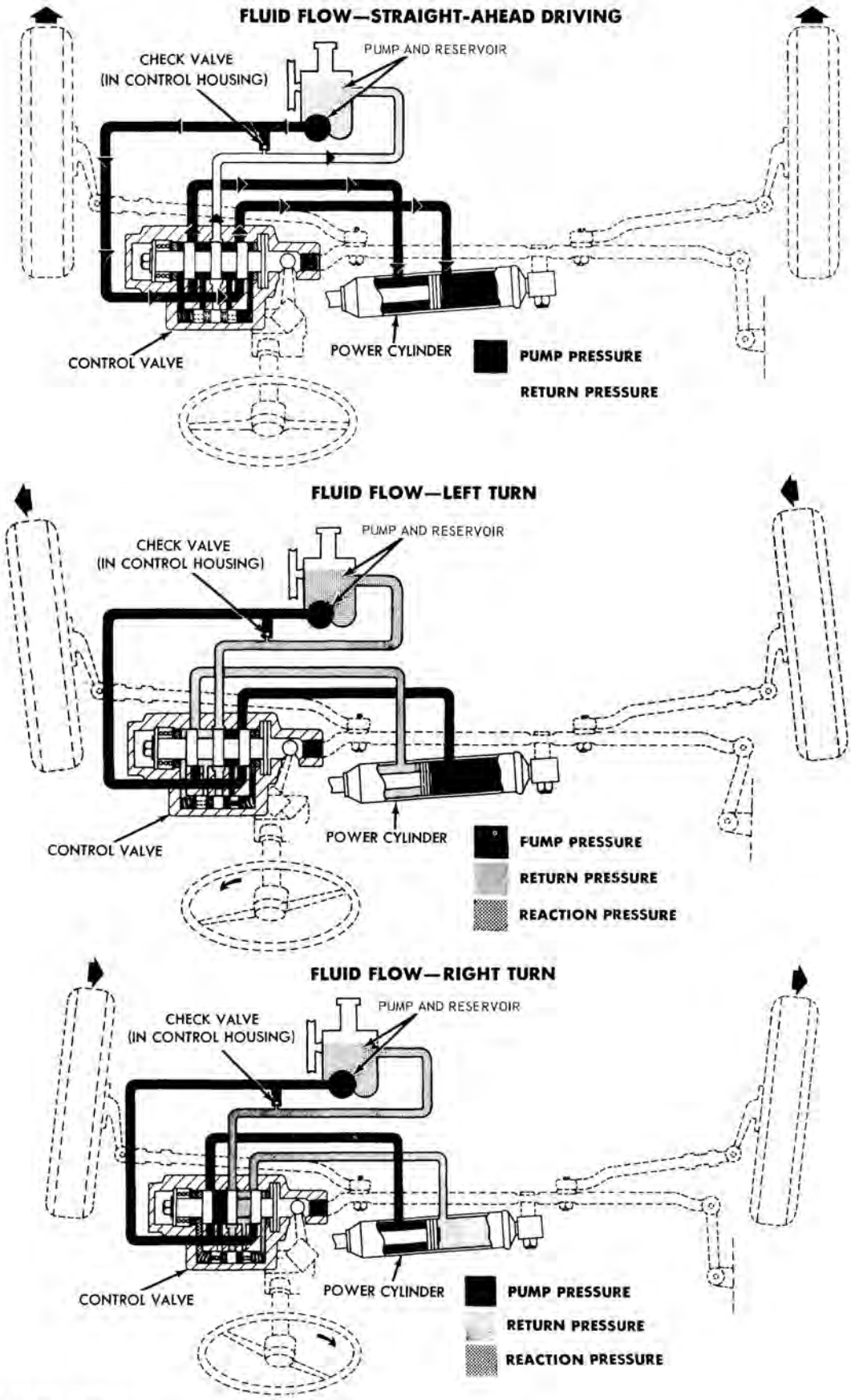


FIG. 2—Fluid Flow Diagram

shut off valve between the end of the hose and the pump outlet.

Be sure that the pressure gauge is between the pump and the shut off valve, all connections are tight, and the shut off valve is fully open.

3. Connect a tachometer.

4. Start the engine and operate it at idle speed for at least two (2) minutes to warm up the fluid.

5. Cycle the steering wheel from stop-to-stop several times to expel any air from the system; stop the engine. Remove the reservoir filler cap and check the fluid level in the reservoir. If necessary, add specified lubricant C1AZ-19582-A to the proper level.

6. With the engine running at **approximately** 500 rpm and no steering effort applied, and the lubricant at normal operating temperature, the pressure gauge should show a pressure of less than **50** psi. If the pressure is higher, inspect the hoses for kinks and obstructions.

7. Increase the engine speed to 1000 rpm, then slowly close the gauge shut-off valve. With the valve fully closed, the pump pressure should be as follows: Fairlane, Falcon, Comet and Mustang 750 to 900 psi.

Do not close the valve for more than a few seconds, as this would abnormally increase the lubricant temperature and cause undue pump wear.

If pressure is more or less than specification, replace the pump assembly. If pressure is as specified and steering efforts are heavy, the gear and/or control valve could be at fault.

3 IN-CAR ADJUSTMENTS AND REPAIRS

PUMP BELT TENSION ADJUSTMENT

Pump drive belt tension cannot be checked accurately using the thumb pressure or belt deflection methods. Correct belt adjustment is assured only with the use of a belt tension gauge.

1. Check the belt tension with a gauge. With a new belt, or one that has been run for less than 15 minutes, the tension should be within 120-150 lbs. With a belt that has been run for more than 15 minutes, the tension should be within 90-120 lbs.

2. To adjust the belt, loosen the mounting bolts incorporated on the front face of the pump cover plate (hub side) and one nut at the rear. Fix a 9/16" open end wrench on the projecting 1/2" boss and pry upward to correct tension.

Do not pry against the reservoir to obtain proper belt load as it can be deformed and cause a leak.

3. Recheck the belt tension. When the tension has been correctly adjusted, tighten the bolts and the nut to 22-28 ft-lbs torque.

4 REMOVAL AND INSTALLATION

STEERING GEAR

Refer to Group 3-3, Section 3 for detailed instructions.

POWER STEERING PUMP

6-CYLINDER

Removal

1. Remove the fill cap from the reservoir and remove the fluid with a suction gun.

2. Disconnect the fluid return hose from the reservoir.

3. Disconnect the oil pressure line from the pump.

4. Loosen the adjusting bolts and remove the drive belt from the pulley.

5. Drain the coolant from the radiator and remove 3 bolts and spacers attaching the pump bracket to the engine. Remove one bolt attaching the support to the lower edge of the bracket and remove the pump and bracket from the car.

6. Place the bracket in a vise and install a 3/8-16x3/4 inch bolt in the end of the pump shaft.

7. Install tool T63L-10300-B on the pulley and remove the pulley from the pump shaft. Refer to Fig. 6 for tool installation.

8. Remove 3 bolts retaining the pump to the bracket and remove the pump from the bracket.

Installation

1. Position the pump to the bracket and install the 3 retaining bolts.

2. Position the pulley to the pump shaft and install tool T65P-3A733A. Press the pulley on the shaft. (Refer to Fig. 7 for tool installation). Then, remove the tool.

3. Position the pump and bracket to the engine and install the attaching bolts and spacers.

4. Install one bolt to attach the brace to the bottom of the bracket. Tighten the bracket attaching bolts.

5. Position the belt on the pulley and adjust the belt tension to specification with Tool T63L-8620-A.

6. Connect the pressure and return lines to the pump and reservoir.

7. Fill the radiator with coolant.

8. Fill the pump reservoir to the correct level. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system and check for leaks. Check the fluid level (Section 1, Part 3-1) and fill as required and install the fill cap.

8-CYLINDER

Removal

1. Remove the fill cap from the reservoir and remove the fluid with a suction gun.

2. Disconnect the fluid return hose from the reservoir.

3. Disconnect the oil pressure line from the pump.

4. Loosen the belt adjusting bolts and nut and remove the drive belt from the pump pulley.

5. Remove 2 pivot bolts and 2 adjusting bolts and remove the pump from the car.

Installation

1. Position the pump to the bracket and loosely install the 2 pivot bolts and 2 adjusting bolts.

2. Position the drive belt on the pulley and adjust the belt tension to specification with tool T63L-8620-A. Tighten the adjusting bolts and pivot bolts.

3. Connect the pressure and return lines to the pump and reservoir.

4. Fill the pump reservoir to the correct level. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system and check for leaks. Check the fluid level, fill as required, and install the fill cap.

POWER STEERING CONTROL VALVE

REMOVAL

1. Disconnect the pressure lines leading from the power cylinder to the control valve, at the valve. Allow the lines to drain into a container.

2. Disconnect the lines leading from the power steering pump to the control valve at the valve. Allow the lines to drain into a container. Remove the clamp that secures the lines to the valve.

3. Remove the two bolts that secure the control valve to the steering arm-to-idler arm rod.

4. Remove the cotter pin and the castellated nut that secures the control valve to the Pitman arm.

5. Disconnect the control valve from the Pitman arm as shown in Fig. 3.

6. Inspect the tube fittings and the seats in the valve for nicks, burrs or damage. Replace the seats in the valve or the tubes as required.

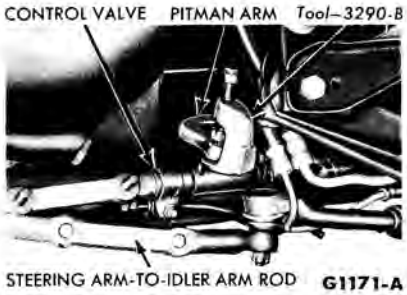


FIG. 3–Disconnecting Control Valve from Pitman Arm

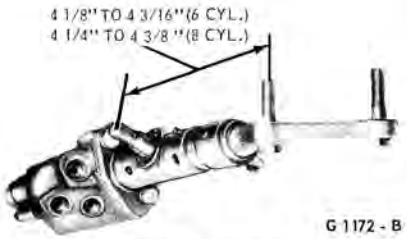


FIG. 4–Control Valve Length Adjustment

INSTALLATION

1. Place the stud in a straight vertical position. Measure from the center of the stud parallel to the bolt mounting surface (Fig. 4) to the center of the first bolt hole. The distance should be from 4¼-4⅜ in. (8 cyl. models) and 4⅛-4$^{3}/_{16}$ in. (6 cyl. models). If not within these limits adjust the length as required.

2. Secure the control valve stud to the Pitman arm with the castellated nut and a cotter pin.

3. Secure the end of the control valve to the steering arm-to-idler arm rod with two bolts, lock washers and nuts.

4. Connect the pressure line and the oil return line to their respective fittings on the valve. Install the line retaining clamp around the valve.

5. Connect the two lines from the power cylinder to their respective fittings on the valve.

6. Fill the reservoir to the correct level.

7. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system. Stop the engine.

8. Check the fluid level and fill as necessary. Install the fill cap.

9. Start the engine and check for leaks.

POWER CYLINDER

REMOVAL

1. Disconnect the two fluid lines from the power cylinder and allow them to drain into a container.

2. Remove the pal nut, attaching nut, washer and the insulator from the end of the power cylinder rod.



FIG. 5–Disconnecting Power Cylinder Stud

3. Remove the cotter pin and castellated nut that secures the power cylinder stud to the steering arm-to-idler arm rod.

4. Disconnect the power cylinder stud from the steering arm-to-idler arm rod as shown in Fig. 5.

5. Remove the insulator sleeve and washer from the end of the power cylinder rod.

6. Inspect the tube fittings and the seats in the power cylinder for nicks, burrs or damage. Replace the seats in the cylinder or the tubes as required.

INSTALLATION

1. Install the washer, sleeve and the insulator on the end of the power cylinder rod.

2. Extend the rod as far as possible. Insert the rod in the bracket on the frame and compress the rod as necessary to insert the stud in the steering arm-to-idler arm rod. Secure the stud with a castellated nut and a cotter pin.

3. Secure the power cylinder rod with an insulator, washer, nut and a pal nut.

4. Connect each of the two fluid lines to their respective part in the cylinder.

5. Fill the reservoir to the correct level.

6. Start the engine and turn the steering wheel to each end of its travel several times to cycle the system. Stop the engine.

7. Check the fluid level and fill as necessary. Install the fill cap.

8. Start the engine and check for leaks.

5 MAJOR REPAIR OPERATIONS



FIG. 6—Removing Pulley from Pump

POWER STEERING PUMP PULLEY REPLACEMENT

REMOVAL

Other than pulley removal, pump should not be disassembled for any repairs but replaced as a unit.

1. Drain as much of the fluid as possible from the pump through filler pipe.

2. Install the pulley remover tool, T63L-10300-B on pulley hub, and place the tool and pump in a vise as shown in Fig. 6.



FIG. 7—Pulley Installation

3. Hold the pump and rotate the tool nut counterclockwise to remove the pulley (Fig. 6).

INSTALLATION

1. Position the pulley to the pump shaft and install Tool T65P-3A733-A as shown in Fig. 7.

2. Hold the pump and rotate the tool nut clockwise to install the pulley on the shaft. The pulley face will be flush with end of pump shaft.

3. Remove the tool.

CONTROL VALVE

DISASSEMBLY

1. Wipe all fluid and loose dirt from the outside of the control valve.

2. Remove the centering spring cap from the valve housing (Fig. 8).

When holding the control valve for disassembly, use a softjawed vise, and clamp the valve only around the sleeve flange to prevent damage to the housing, spool, or sleeve.

3. Remove the nut from the end of the valve spool bolt. Remove the washers, spacer, centering spring, adapter, and bushing from the bolt and the valve housing.

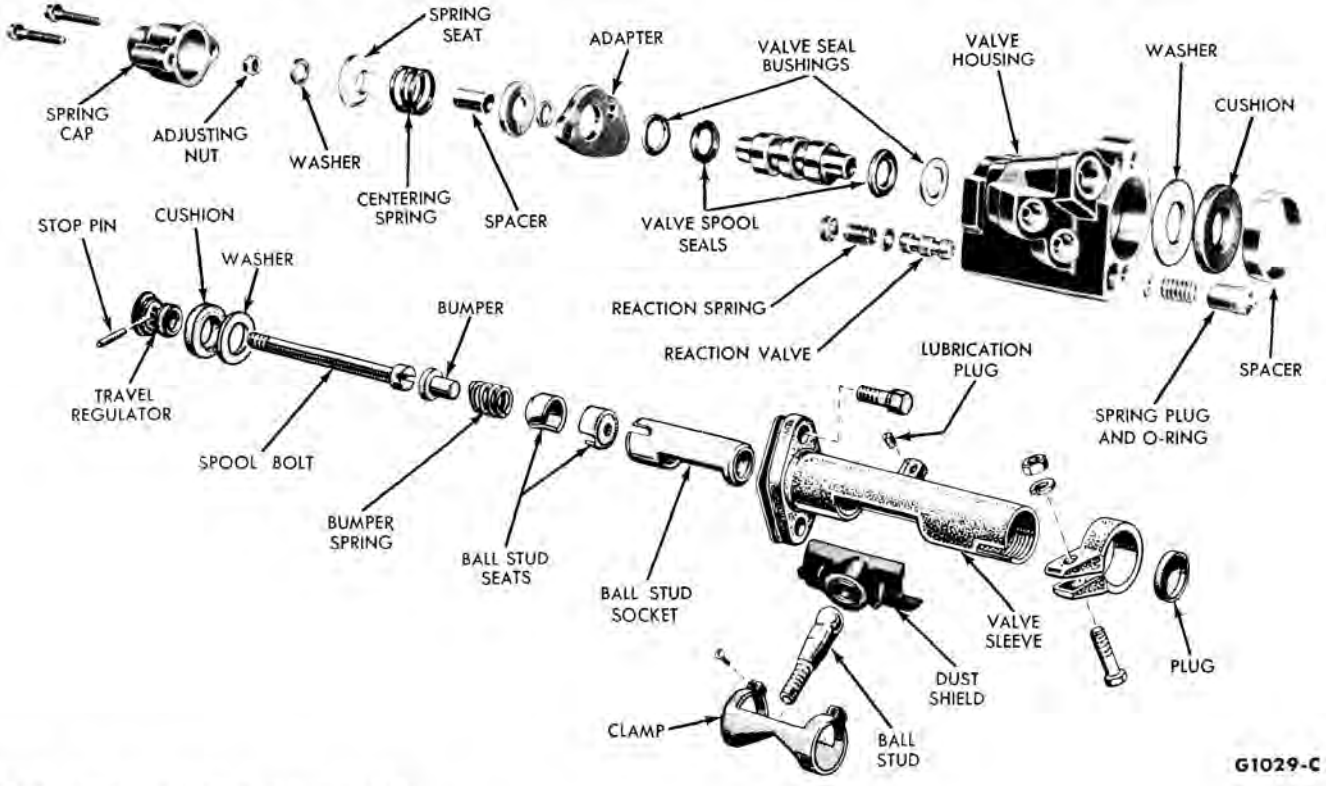


FIG. 8—Control Valve Disassembled

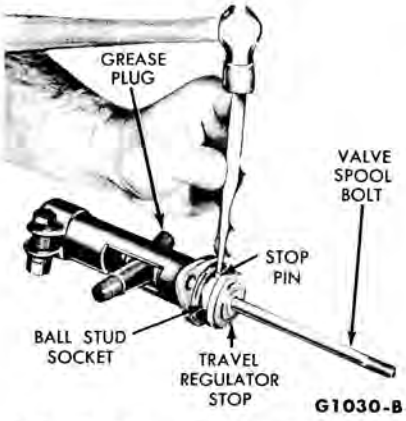


FIG. 9—Removing Stop Pin

4. Remove the two bolts that hold the valve housing and the sleeve together, and separate the housing from the sleeve.

5. Remove the plug from the valve sleeve.

6. Push the valve spool out of the centering spring end of the valve housing, and remove the seal from the spool.

7. Remove the spacer, bushing, and seal from the sleeve end of the valve housing.

8. Drive the stop pin out of the travel regulator stop with a punch and hammer (Fig. 9). **Pull the head of the valve spool bolt tightly against the travel regulator stop before driving the pin out of the stop.**

9. Turn the travel regulator stop counterclockwise in the valve sleeve to remove the stop from the sleeve.

10. Remove the valve spool bolt, spacer, and rubber washer from the travel regulator stop.

11. Remove the rubber boot and clamp from the valve sleeve.

12. Slide the bumper, spring, and ball stud seat out of the valve sleeve, and remove the ball stud socket from the sleeve.

13. After removing the return port hose seat, remove the return port relief valve.

14. After removing the spring plug and O-ring, remove the reaction limiting valve (Fig. 10).

POWER CYLINDER

SEAL REMOVAL

1. Clamp the power cylinder in a vise, and remove the snap ring from the end of the cylinder. **Be careful not to distort or crack the cylinder in the vise.**



FIG. 10—Removing Reaction Valve Plug

2. Pull the piston rod out all the way to remove the scraper, bushing, and seals. If the seals cannot be removed in this manner, remove them from the cylinder with a sharp pick. Take care, when using a pick, not to damage the shaft or seal seat.

CONTROL VALVE

TUBE SEAT REPLACEMENT

If a hose seat is worn or damaged it should be replaced. It can be removed with an Easy-Out tool, or by using a bolt of appropriate size as a puller.

1. Tap the existing hole in the hose seat, using a starting tap of suitable size. **Be sure to remove all metal chips from the hose seat port after tapping.**

2. Place a nut and large flat washer on a bolt of the same size as the tapped hole. The washer must be large enough to cover the hose seat port.

3. Insert the bolt in the tapped hole, and using the nut as a puller, remove the hose seat.

4. Place a new hose seat in the port, and thread a bolt of suitable size into the port. Tighten the bolt enough to bottom the seat in the port.

ASSEMBLY

Before assembling the control valve, coat all parts except the seals with Ford Automatic Transmission Fluid. Coat the seals with lubricant COAZ-19553-A.

1. Install the reaction limiting valve, the spring, and the plug.

2. Install the return port relief valve and the hose seat.

3. Insert one of the ball stud seats (flat end first) into the ball stud socket, and insert the threaded end of the ball stud into the socket.

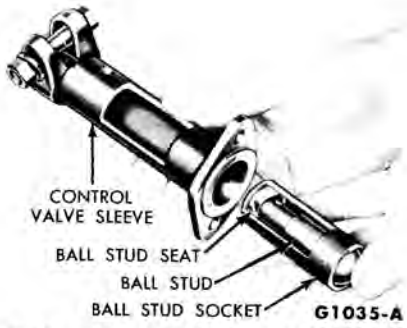


FIG. 11—Installing Ball Stud, Seal and Bracket

4. Place the socket in the control valve sleeve so that the threaded end of the ball stud can be pulled out through the slot in the sleeve (Fig. 11).

5. Place the other ball stud seat, the spring, and the bumper (Fig. 8) in the socket, and install and securely tighten the travel regulator stop.

6. Loosen the stop just enough to align the nearest hole in the stop with slot in the ball stud socket, and install the stop pin in the ball stud socket, travel regulator stop, and valve spool bolt (Fig. 9).

7. Install the rubber boot, clamp, and the plug on the control valve sleeve. **Make sure that the lubrication fitting is turned on tightly and does not bind on the ball stud socket.**

8. Insert the valve spool in the valve housing. **Rotate the spool while inserting it in the housing. (Fig. 12).**

9. Move the spool toward the centering spring end of the housing, and place the small seal bushing, and spacer in the sleeve end of the housing.

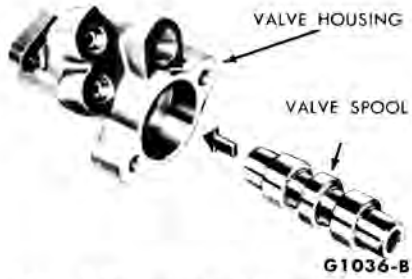


FIG. 12—Inserting Valve Spool

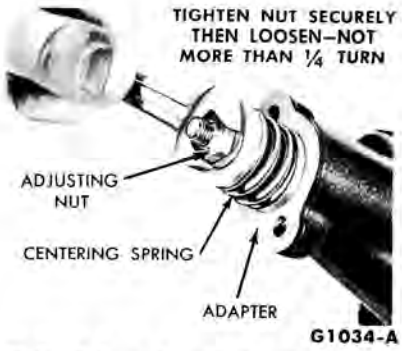


FIG. 13–Adjusting Centering Spring

10. Press the valve spool against the inner lip of the seal and, at the same time, guide the lip of the seal over the spool with a small screwdriver. **Do not nick or scratch the seal or the spool during installation.**

11. Place the sleeve end of the housing on a flat surface so that the seal, bushing, and spacer are at the bottom end and push down the valve spool until it stops.

12. Carefully install the spool seal and bushing in the centering spring end of the housing. Press the seal against the end of the spool, guiding the seal over the spool with a small screwdriver. **Do not nick or scratch the seal or the spool during installation.**

13. Pick up the housing, and slide the spool back and forth in the housing to check for free movement.

14. Place the valve sleeve on the housing so that the ball stud is on the same side of the housing as the ports for the two power cylinder lines. Install the two bolts in the sleeve, and torque them to specifications.

15. Place the adapter on the centering spring end of the housing, and install the bushing, washers, spacers, and centering spring on the valve spool bolt.



FIG. 14–Inspecting Valve Spool Movement

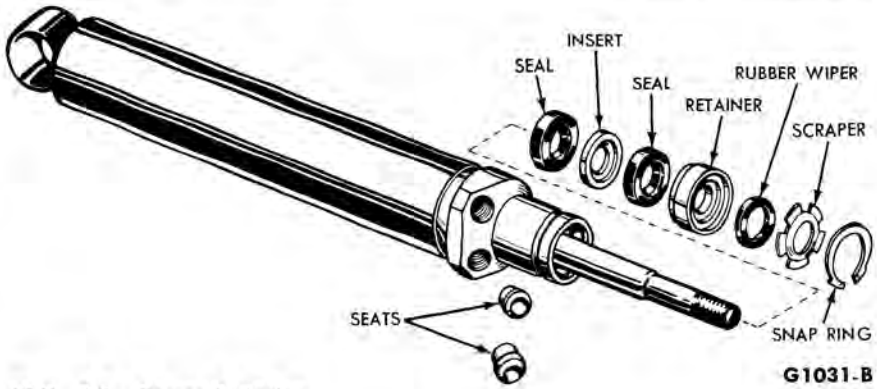


FIG. 15–Power Cylinder

16. Compress the centering spring, and install the nut on the bolt. Tighten the nut snuggly, then loosen it not more than ¼ turn (Fig. 13). **Excessive tightening of the nut may break the stop pin at the travel regulator stop.**

17. Move the ball stud back and forth in the sleeve slot to check the spool for free movement. See Part 3-6 for the specified travel. Apply COAZ-19553-A (silicone) grease at the sealing areas.

18. Install the centering spring cap on the valve housing, and torque the two cap bolts to specification.

19. Install the nut on the ball stud so that the valve can be positioned in a vise as shown in Fig. 14. Then push forward on the cap end of the valve to check the valve spool for free movement.

20. Turn the valve around in the vise, and push forward on the sleeve end to check the spool for free movement.

SEAL INSTALLATION

When replacing the power cylinder seals, install all of the parts supplied in the repair kit for the cylinder being repaired.

1. Coat the new seals with lubricant COAZ-19553-A and place the parts (Fig. 15) on the piston rod which has been coated with the same grease.

2. Push the rod in all the way, and install the parts in the cylinder with a deep socket slightly smaller than the cylinder opening (Fig 16).

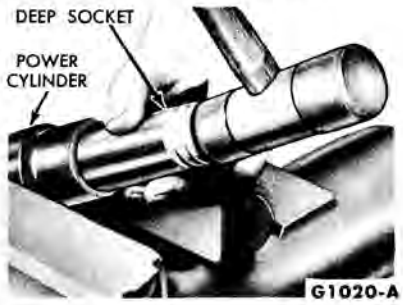


FIG. 16–Installing Power Cylinder Seals

PART 3-5 WHEELS AND TIRES

Section	Page	Section	Page
1 Description and Operation	3-40	3 Removal and Installation	3-41
2 In-Car Adjustments and Repairs	3-40	4 Major Repair Operations	3-42

1 DESCRIPTION AND OPERATION

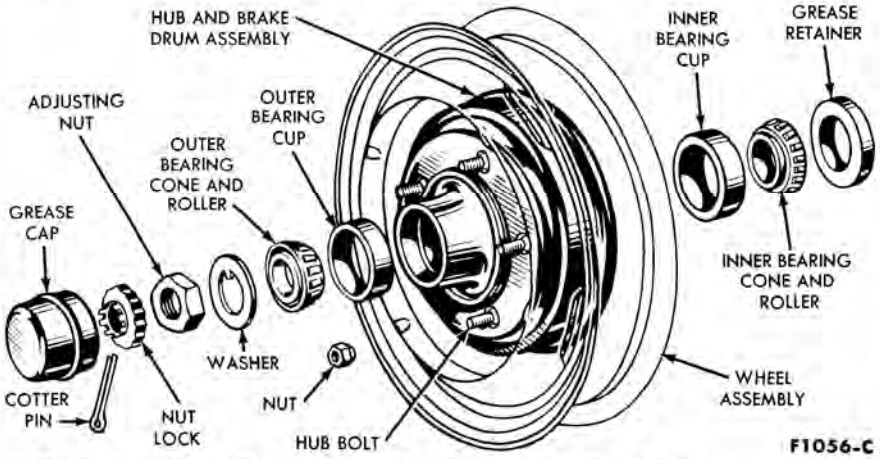


FIG. 1—Front Hub, Bearings and Grease Retainer—Drum Brakes

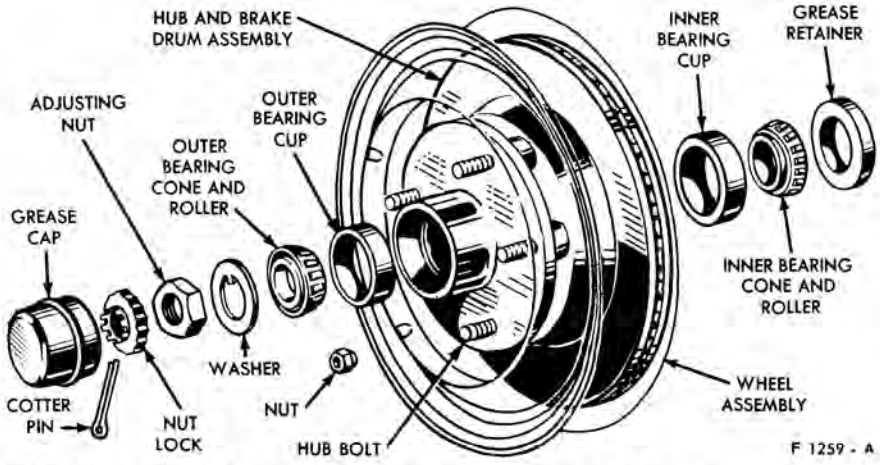


FIG. 2—Front Hub, Bearings and Grease Retainer—Disc Brakes

FRONT WHEEL

Each front wheel and tire assembly is bolted to its respective front hub and brake drum or rotor on Mustang with disc brakes (optional on Mustang models). Two opposed tapered roller bearings are installed in each hub. A grease retainer is installed at the inner end of the hub to prevent lubricant from leaking into the drum or on the rotor. The entire assembly is retained to its spindle by the adjusting nut, nut lock and cotter pin (Figs. 1 and 2).

REAR WHEEL

The rear brake drum assembly is retained to studs on the rear axle shaft flange by three speed nuts. The wheel and tire assembly mounts on the same rear axle shaft flange studs and is held against the hub and drum by the wheel nuts. The rear wheel bearing is pressed onto the axle shaft just inside the shaft flange, and the entire assembly is retained to the rear axle housing by the bearing retainer plate which is bolted to the housing flange.

The inner end of each axle shaft is splined to the differential in the rear axle.

2 IN-CAR ADJUSTMENT AND REPAIRS

FRONT WHEEL BEARING ADJUSTMENT

The front wheel bearings should be adjusted if the wheel is too loose on the spindle or if the wheel does not rotate freely. The following procedure will bring the bearing adjustment to specification.

1. Raise the car until the wheel and tire clear the floor.

2. Pry off the hub cap or wheel cover and remove the grease cap from the hub.

3. Wipe the excess grease from the end of the spindle, and remove the cotter pin and nut lock.

4. While rotating the wheel, hub, and drum or rotor assembly, torque the adjusting nut to 15-20 ft-lbs. to seat the bearings (Fig. 3).

5. Locate the nut lock on the adjusting nut so that the castellations on the lock are aligned with the cotter pin hole in the spindle.

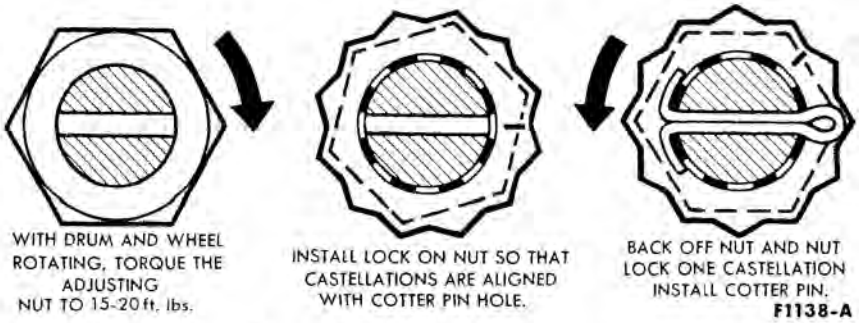


FIG. 3—Front Wheel Bearing Adjustment

6. Back off both the adjusting nut and the nut lock together until the next castellation on the nut lock aligns with the cotter pin hole in the spindle.

7. Install a new cotter pin, and bend the ends of the cotter pin around the castellated flange of the nut lock.

8. Check the front wheel rotation. If the wheel rotates properly, install the grease cap and the hub cap or wheel cover. If the wheel still rotates roughly or noisily, clean or replace the bearings and cups as required.

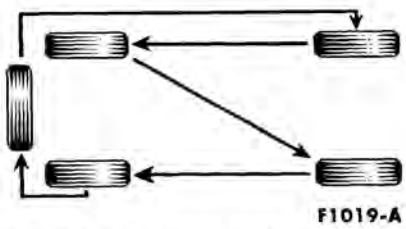


FIG. 4—Tire Cross-Switching Diagram

TIRE ROTATION

Cross-switching tires will equalize tire wear and may improve smoothness of ride, but the improvement may not justify the cost of having it done. If it becomes necessary, the pattern in Fig. 4 is recommended.

3 REMOVAL AND INSTALLATION

WHEEL AND TIRE ASSEMBLY

REMOVAL

1. Pry off the wheel hub cap or cover. Loosen but do not remove the wheel hub nuts.

2. Raise the car until the wheel and tire clear the floor.

3. Remove the wheel hub nuts from the bolts, and pull the wheel and tire assembly from the hub and drum or rotor.

REMOVING TIRE FROM WHEEL

The tire can be demounted on a mounting machine. **Be sure that the outer side of the wheel is positioned downward.** If tire irons are used follow the procedure given here.

1. Remove the valve cap and core, and deflate the tire completely.

2. With a bead loosening tool, break loose the tire side walls from the wheel (Fig. 5).

3. **Position the outer side of the wheel downward,** and insert two tire irons about 8 inches apart between the tire inner bead and the back side of the wheel rim. **Use only tire irons with rounded edges or irons designed for demounting tubeless tires.**

4. Leave one tire iron in position, and pry the rest of the bead over the rim with the other iron. Take small "bites" with the iron around the tire in order to avoid damaging the sealing surface of the tire bead.



FIG. 5—Bead Loosening Tool

5. Stand the wheel and tire upright with the tire outer bead in the drop center well at the bottom of the wheel. Insert the tire iron between the bead and the edge of the wheel rim, and pry the wheel out of the tire.

INSTALLING TIRE ON WHEEL

1. If a used tire is being installed remove all dirt from the tire.

If a tire is being mounted to the original wheel, clean the rim with emery cloth or fine steel wool. Check the rim for dents.

If a new wheel is being installed, coat a new valve with RUGLYDE or similar rubber lubricant and position the valve to the new wheel. Use a rubber hammer or a valve replacing tool to seat the valve firmly against the inside of the rim.

2. Apply RUGLYDE or a similar rubber lubricant to the sealing surface on both tire beads. With the outer side of the wheel down, pry the beads over the wheel rim with two tire irons. **Do not use a hammer or mallet to force the beads over the rim.**

3. Align the balance mark on the tire with the valve on the wheel.

4. Hold the beads against the rim flanges by positioning a tire mounting band over the tire (Fig. 6). If a mounting band is not available, tie a tourniquet of heavy cord around the circumference of the tire. Tighten the cord with a tire iron. Center the tire on the wheel with a rubber mallet.



FIG. 6—Tubeless Tire Mounting Band

5. Give the tire a few quick bursts of air to seat the beads properly, then inflate the tire to 40 pounds pressure. Check to see that the bead positioning rings (outer rings near the side walls) are evenly visible just above the rim flanges all the way

around the tire. If the rings are not even, deflate the tire completely and inflate it again.

6. When the rings are properly positioned, deflate the tire to the recommended pressure.

INSTALLATION

1. Clean all dirt from the hub and drum or rotor.

2. Position the wheel and tire assembly on the hub and drum or rotor. Install the wheel hub nuts and tighten them alternately in order to draw the wheel evenly against the hub and drum or rotor.

3. Lower the car to the floor, and torque the hub nuts to specification.

4 MAJOR REPAIR OPERATIONS

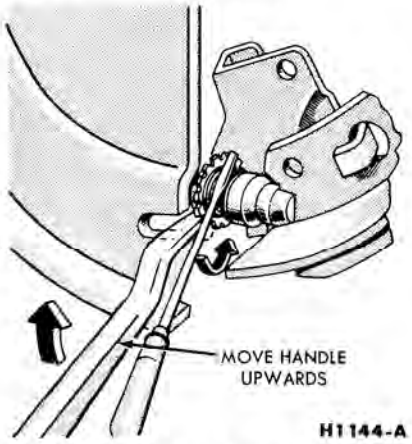
FRONT WHEEL GREASE SEAL AND BEARING REPLACEMENT AND/OR REPACKING

If bearing adjustment will not eliminate looseness or rough and noisy operation, the hub and bearings should be cleaned, inspected, and repacked. If the bearing cups or the cone and roller assemblies are worn or damaged, they should be replaced.

DRUM BRAKES

1. Raise the car until the wheel and tire clear the floor.

2. Insert a narrow screwdriver through the brake adjusting hole at the inner side of the brake backing plate, and disengage the adjusting lever from the adjusting screw. While holding the adjusting lever away from the screw, back off the adjusting screw with the brake adjusting tool (Fig. 7). **Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise the self adjusting mechanism will not function properly.**



H1144-A

FIG. 7—Backing off Brake Adjustment

3. Remove the wheel cover or hub cap. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 1).

4. Pull the wheel, hub, and drum assembly off the wheel spindle.

5. Remove the grease retainer and the inner bearing cone and roller assembly from the hub with a drift.

6. Clean the lubricant off the inner and outer bearing cups with solvent and inspect the cups for scratches, pits, excessive wear, and other damage. If the cups are worn or damaged, remove them with a drift.

7. Soak a new grease retainer in light engine oil at least 30 minutes before installation. Thoroughly clean the inner and outer bearing cones and rollers with solvent, and dry them thoroughly. **Do not spin the bearings with compressed air.**

Inspect the cone and roller assemblies for wear or damage, and replace them if necessary. **The cone and roller assemblies and the bearing cups should be replaced as a unit if damage to either is encountered.**

8. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old lubricant.

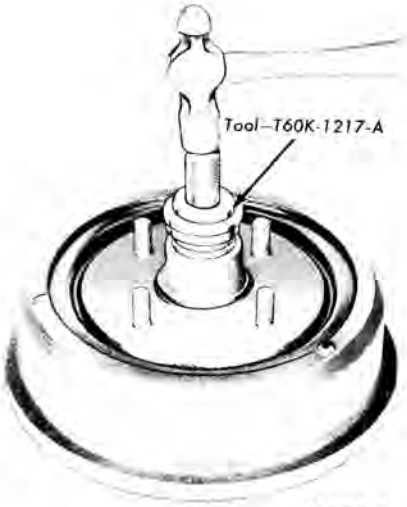
Cover the spindle with a clean cloth, and brush all loose dust and dirt from the brake assembly. **To prevent getting dirt on the spindle, carefully remove the cloth from the spindle.**

9. If the inner and/or outer bearing cup(s) were removed, install the replacement cup(s) in the hub with the tool shown in Figs. 8 or 9). **Be sure to seat the cups properly in the hub.**

10. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups (Fig. 10).

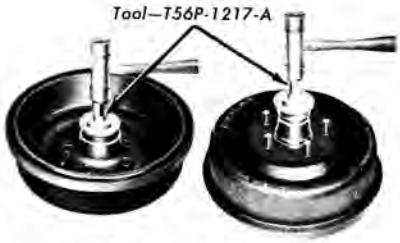
11. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

12. Place the inner bearing cone and roller assembly in the inner



F1093-A

FIG. 8—Front Wheel Bearing Cup Installation—Falcon, Comet, and Mustang—6-Cylinder



F1057-A

FIG. 9—Installing Front Wheel Bearing Cup—All Fairlane, and Falcon, Comet, and Mustang—8-Cylinder

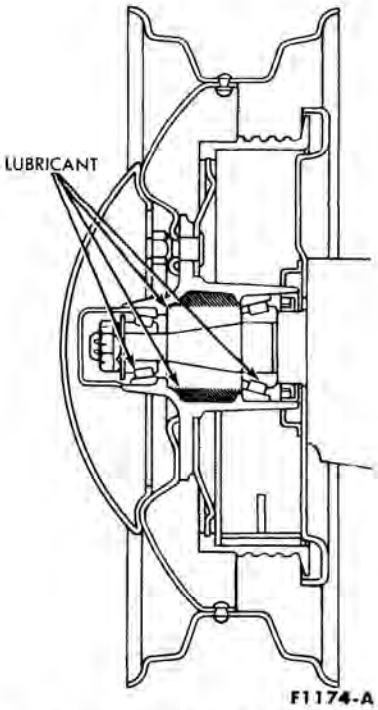


FIG. 10—Front Wheel Hub Lubrication

cup, and install the new grease retainer with the reverse end of the tool shown in Figs. 8 to 9. **Be sure that the retainer is properly seated.**

13. Install the wheel, hub, and drum assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads.**

14. Install the outer bearing cone and roller assembly and the flat washer on the spindle, then install the adjusting nut (Fig. 1).

15. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.

16. If the brake shoes were backed off to remove the drum, adjust them as outlined in Part 2-2, Section 2.

17. Install the hub cap or wheel cover.

DISC BRAKES

1. Raise the car until the wheel and tire clear the floor.

2. Remove the wheel cover or hub cap.

3. Remove the wheel and tire from the hub.

4. Remove 2 bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.

5. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 2).

6. Pull the hub and rotor off the wheel spindle.

7. Remove the grease retainer and the inner bearing cone and roller assembly from the hub with tool 1175AE.

8. Clean the lubricant off the inner and outer bearing cups with solvent and inspect the cups for scratches, pits, excessive wear, and other damage. If the cups are worn or damaged, remove them with a drift.

9. Soak a new grease retainer in light engine oil at least 30 minutes before installation. Thoroughly clean the inner and outer bearing cones and rollers with solvent, and dry them thoroughly. **Do not spin the bearings with compressed air.**

Inspect the cone and roller assemblies for wear or damage, and replace them if necessary. **The cone and roller assemblies and the bearing cups should be replaced as a unit if damage to either is encountered.**

10. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old lubricant.

Cover the spindle with a clean cloth, and brush all loose dust and dirt from the brake assembly. **To prevent getting dirt on the spindle, carefully remove the cloth from the spindle.**

11. If the inner and/or outer bearing cup(s) were removed, install the replacement cup(s) in the hub with the tool shown in Figs. 8 or 9. **Be sure to seat the cups properly in the hub.**

12. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups.

13. All old grease should be completely cleaned from the bearings before packing them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

14. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Figs. 8 or 9. **Be sure that the retainer is properly seated.**

15. Install the hub and rotor on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads.**

16. Install the outer bearing cone and roller assembly and the flat washer on the spindle, then install the adjusting nut.

17. Position the caliper over the rotor and install the 2 attaching bolts.

18. Install the wheel and tire on the hub.

19. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.

20. Install the hub cap or wheel cover and lower the car.

FRONT HUB AND DRUM REPLACEMENT

When the hub and drum assembly is replaced, new bearings, cups, and grease retainer must be installed in the new assembly. The new grease retainer should be soaked in light engine oil at least 30 minutes before installation.

1. Raise the car until the wheel and tire clears the floor. Pry off the hub cap or wheel cover, and remove the wheel and tire assembly from the hub and drum assembly.

2. Back off the brake adjustment, if necessary, as follows:

Insert a narrow screwdriver through the brake adjusting hole at the inner side of the brake backing plate, and disengage the adjusting lever from the adjusting screw. While holding the adjusting lever away from the screw, back off the adjusting screw with the brake adjusting tool (Fig. 7). **Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise the self adjusting mechanism will not function properly.**

3. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 1).

4. Pull the wheel, hub, and drum assembly off the wheel spindle.

5. Remove the protective coating from the new hub and drum with carburetor degreaser. Install new inner and outer bearing cups in the new hub with the tool shown in Figs. 8 or 9. **Be sure to seat the cups properly in the hub.**

6. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups (Fig. 10).

7. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

8. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Fig. 8 or 9. **Be sure that the retainer is properly seated.**

9. Install the new hub and drum assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer.**

10. Install the outer bearing cone and roller assembly and the flat washer on the spindle, then install the adjusting nut (Fig 1).

11. Position the wheel and tire assembly on the new hub and drum assembly. Install the wheel hub nuts and tighten them alternately in order to draw the wheel evenly against the hub and drum.

12. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cup. Install the grease cup.

13. If the brake shoes were backed off to remove the drum, adjust them as outlined in Part 2-2, Section 2.

14. Install the hub cap or wheel cover.

FRONT HUB AND ROTOR REPLACEMENT

When the hub and rotor assembly is replaced, new bearings, cups, and grease retainer must be installed in the new assembly. The new grease retainer should be soaked in light engine oil at least 30 minutes before installation.

1. Raise the car until the wheel and tire clears the floor. Pry off the hub cap or wheel cover, and remove the wheel and tire assembly from the hub and rotor.

2. Remove 2 bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.

3. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 2). Pull the hub and rotor off the wheel spindle.

4. Remove the protective coating from the new hub and rotor with carburetor degreaser. Install new inner and outer bearing cups in the new hub with the tool shown in Figs. 8 or 9. **Be sure to seat the cups properly in the hub.**

5. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups.

6. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

7. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer with the reverse end of the tool shown in Figs. 8 or 9. **Be sure that the retainer is properly seated.**

8. Install the new hub and rotor assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer.**

9. Install the outer bearing cone and roller assembly and the flat washer on the spindle, then, install the adjusting nut (Fig. 2).

10. Position the wheel and tire assembly on the new hub and rotor. Install the wheel hub nuts and tighten them alternately in order to draw the wheel evenly against the hub and rotor.

11. Adjust the wheel bearings as outlined in Section 2, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent ininterference with the radio static collector in the grease cap. Install the grease cap.

12. Install the hub cap or wheel cover.

PART 3-6 SPECIFICATIONS

FRONT WHEEL ALIGNMENT

COMET AND FALCON	Checking Specifications			Optimum Re-setting Specification
	Min.	Max.	Maximum Variation Between Wheels	Desired Alignment
Caster—6 Cyl.	−¼°	+1¾°	½°	+¾°
Caster—8 Cyl.	−1¼°	+¾°	½°	−¼°
Camber—All	−¼°	+1¼°	½°	+½°
Toe-In	5/32 in.	13/32 in.	—	9/32 in.

FAIRLANE	Checking Specifications			Optimum Re-setting Specifications
	Min.	Max.	Maximum Variation Between Wheels	Desired Alignment
Caster	−1°	+1°	½°	0°
Camber	−½°	+1°	½°	+¼°
Toe-In	3/32 in.	11/32 in.	—	7/32 in.

MUSTANG	Checking Specifications			Optimum Re-setting Specifications
	Min.	Max.	Maximum Variation Between Wheels	Desired Alignment
Caster—6 Cyl.	0°	+2°	½°	+1°
Caster—8 Cyl.	−1°	+1°	½°	0°
Camber—All	−¼°	+1¼°	½°	+½°
Toe-In	3/32 in.	11/32 in.	—	7/32 in.

COMET, FALCON AND MUSTANG	Checking Specifications		Optimum Re-Setting Specifications
	Min.	Max.	Desired Alignment
King Pin Angle	—	—	7¼° @ + ½° Camber
Turning Angle of Outside Wheel with Inside Wheel Turned 20°			
6 Cyl. Std. Steering	19°	19¼°	19⅛°
6 cyl. Power Steering	20°	20¼°	20⅛°
8 cyl. Std. Steering	18¾°	19°	18⅞°
8 cyl. Power Steering	18¾°	19°	18⅞°

FAIRLANE	Checking Specifications		Optimum Re-Setting Specifications
	Min.	Max.	Desired Alignment
King Pin Angle	—	—	7¾° @ 0° Camber
Turning Angle of Outside Wheel With Inside Wheel Turned 20°	17⅜°	17⅝°	17½°

BALL JOINTS

	Axial Play (Inches) Max. Allowable	Radial Play (Inches) Max. Allowable
Upper Ball Joint	0.200	0.250
Lower Ball Joint	Replace If Perceptibly Loose	

TORQUE LIMITS—FRONT SUSPENSION

Description	FT. LBS.		
	Falcon Comet	Mustang	Fairlane
Lower Arm Ball Joint Assembly to Spindle Slotted Nut	60-90	60-90	60-80
Upper Arm Ball Joint Assembly to Spindle Slotted Nut	60-90	60-90	60-80
Bumper Assembly—Suspension Compression to Body Bracket Stud Nut	12-17	12-17	10-15
Arm and Inner Shaft Assembly—Upper Suspension to Body Bolt	90-120	55-75	125-166
Lower Arm Assembly to Underbody Lock Nut	35-50	35-50	80-120
Lower Arm Strut to Underbody Lock Nut	40-55	40-55	60-75
Shock Absorber Assembly to Spring Seat	12-17	12-17	30-40
Shock Absorber to Upper Mounting Bracket Stud Nut	20-28	10-15	15-25
Brake Assembly to Front Spindle Lock Nut	25-35	25-35	25-35
Front Stabilizer to Lower Arm Stud Nut	5-10	5-11	5-10
Front Strut to Lower Arm Bolt	55-70	55-70	70-113
Shock Absorber Upper Bracket to Body Nut	8-13	8-16	32-51
Front Stabilizer to Body Lock Nut	11-16	17-25	10-17
Wheel Bearing Adjusting Nut	15-20	15-20	15-20
Shaft—Upper Arm Spring Seat to Upper Arm Lock Nut	17-25	17-25	—
Wheel Nut Torque Limits—6 Cyl.	55-85	55-85	75-110
8 Cyl.	75-110	75-110	75-110
Upper Ball Joint to Suspension Arm	12-15	12-15	12-15

TORQUE LIMITS—REAR SUSPENSION

Description	FT. LBS.		
	Falcon Comet	Mustang	Fairlane
Spring Assembly to Rear Spring Front Hanger	35-50	35-60	55-65
Spring Shackle Bars to Body Lock Nut	15-22	15-22	15-22
Spring Shackle Bar to Rear Spring Assembly Lock Nut	15-22	15-22	15-22
Spring Assembly to Rear Axle "U" Bolt Lock Nut	30-45	30-45	30-45
Universal Joint Flange—Axle End to Bearing Ass'y Nut	7-10	7-10	12-15
Rear Shock Absorber to Upper Mounting Bracket Stud Nut	15-25	15-25	15-25
Rear Shock Absorber to Spring Clip Plate	15-25	15-25	15-25
Rear Shackle Hanger Bracket to Underbody (Station Wagon)	20-27	20-27	55-65
Rear Brake Assy. and Bearing Retainer to Rear Axle Housing	25-35	25-35	30-40

STEERING

VEHICLE	FAIRLANE		MUSTANG			FALCON	FALCON COMET	COMET
Model	HCA-BU	HCA-BV	HCC-AT	HCC-AX	HCC-AW	HCC-AM-1	HCC-AZ	HCC-BB
Gear Type	Manual	Power	Manual	Soecial Manual	Power	Manual	Power	Manual
Gear Ratio	20:1	16:1	19.9:1	16:1	16:1	19.9:1	16:1	16:1
Turns of Steering Wheel (Stop to Stop) #	5	4	4⅝	3¾	3¾	4⅝	3¾	3¾
Worm Bearing Preload @	4-5	3-4	4-5	4-5	3-4	4-5	3-4	4-5
Total Preload (Worm Bearing plus Sector Mesh) §	9-10	*8-9	9-10	9-10	*8-9	9-10	*8-9	9-10
Maximum Pull Required to Turn Wheel at Least One Complete Turn Either Direction (Engine Idling)						Power		
Normal Fluid Pressure Against Either Stop (Engine 1000 rpm)						Power	750-900 psi	
Control Valve Spool Travel (from Center)						Power	0.060 in Approx.	
Power Steering Belt Tension Using tool BT-33-73F						Power	New: 120-150 lbs.	
							Used: 90-120 lbs.	

Adjustments All Models:

Adjusting screw clearance at bottom of sector shaft T-slot—.000"-.002".

Sector Shaft end play—steering linkage disconnected—none.

With gear mounted in vehicle or on a suitable fixture and positioned on center, and the sector shaft retained to prevent rotation, apply a 15 lb. in. torque on the steering gear input shaft in both right and left turn directions. The total angular travel of the input shaft cannot exceed 8½ degrees, with 8 lb. in. net mesh load.

NOTES:

#Gear only—not attached to Pitman arm.

*Total (mesh load plus worm bearing preload) must be a minimum of 2 lb. in. greater than worm bearing preload.

§Required to rotate input shaft and worm assembly past the center high point.

@Torque required to rotate input shaft at approximately 1½ turns either side of center (gear out of vehicle or Pitman arm disconnected)

MANUAL APPLICATION	COMET FALCON		MUSTANG		FAIRLANE
	6 Cyl.	8 Cyl.	6 Cyl.	8 Cyl.	
	TORQUE FT-LB				
Steering Spindle Arm Connecting Rod and End Assembly to Spindle Arm	—		25-35	30-40	35-40
Steering Spindle Arm Connecting Rod & End Assembly to Rod—Strg. Pitman to Idler Arm	—		—	25-30	35-40
Steering Spindle Connecting Rod Clamp to Adj. Sleeve	10-15	19-26	10-15	19-26	10-14
Rod—Strg. Pitman to Idler Arm to Idler Arm Assy.	—	35-47	—	35-47	—
Steering Idler Arm Mounting Bracket to Frame Assembly	28-35		28-35		28-35
Steering Idler Arm Assy. to Idler Arm Mounting Bracket	40-55		40-55		40-55
Rod—Strg. Pitman to Idler Arm to Pitman Arm Assy.	35-47		—	35-47	35-40
Steering Pitman Arm to Sector Shaft	85-110		85-110		150-225
Steering Wheel to Steering Gear Assembly	25-35		25-35		20-30
Steering Gear Housing—Cover to Housing Assembly	15-22	12-20	15-22		17-25
Steering Gear Assembly to Frame Assembly	45-65	45-55	45-55		40-55
Steering Column Bracket to Instrument Panel	9-13		9-13		12-16
Steering Pitman Arm and Idler Arm to Cross-Link	25-35	—	25-35	—	—
Steering Spindle Arm Connecting Rod and End Assembly to Idler Arm and Pitman Arm	25-35	—	25-35	—	—
Steering Spindle Arm Connecting Sleeve & End Assembly to Spindle Arm	—	30-40	—		—
Steering Spindle Arm Connecting Sleeve & End Assembly to Rod—Strg. Pitman to Idler Arm	—	25-30	—		—
Ball Return Guide Clamp Screw	18-42 In. Lb.				42-70 In. Lb.
Mesh Load Adjusting Screw Lock Nut	45-60		45-60		60-80

STEERING (Continued)

POWER APPLICATION	COMET FALCON MUSTANG		FAIRLANE
	6 Cyl.	8 Cyl.	
	TORQUE FT-LB		
Steering Spindle Arm Connecting Sleeve & End Assembly to Rod—Strg. Pitman to Idler Arm	25-35	25-30	–
Steering Spindle Connecting Rod Clamp to Adj. Sleeve	19-26		–
Rod—Strg. Pitman to Idler Arm Assy.	35-47		–
Steering Idler Arm Mounting Bracket to Frame Assembly	28-35		20-25
Steering Idler Arm Assy. to Idler Arm Mounting Bracket	90-110		60-70
Steering Pitman Arm to Sector Shaft Assembly	85-110		150-225
Steering Gear Housing—Cover Assembly to Housing Assembly	12-20		–
Steering Gear Assembly to Frame Assembly	45-65		–
Steering Column Bracket to Instrument Panel	9-13		–
Steering Wheel to Steering Gear Assembly	25-35		–
Power Cylinder to Bracket—Lock Nut	3-5		3-5
Power Cylinder to Pitman to Idler Arm Rod	35-47		–
Steering Spindle Arm Connecting Sleeve and End Assembly to Spindle Arm	25-35	30-40	–
Steering Spindle Arm Connecting Rod & End Assy. to Control Rod Assembly	–		35-40
Steering Spindle Arm Connecting Rod & End Assy. to Spindle Arm	–		35-40
Power Cylinder Assembly to Control Rod Assembly	–		35-52
Valve & Link Assy. to Pitman Arm	35-47		35-47
Valve & Link Assy. to Rod-Strg. Pitman to Idler Arm—Bolt Nut	35-45 35-45		– –
Hydraulic Control Valve Actuator Clamp to Valve Link Assy.	15-20		15-20
Cylinder Mounting Bracket to Rail (Bottom Hole)	35-43		35-43
Cylinder Mounting Bracket to Rail (Side Hole)	35-43		35-43
Power Cylinder to Bracket	18-24		18-24
Pressure Hose Fitting to Pump	45-50		45-50
Pressure Hose Fitting to Control Valve	6-9		6-9
Pump Support Stud Nut	15-22		15-22

STEERING GEAR LUBRICATION

VEHICLE	FAIRLANE		MUSTANG			FALCON	FALCON-COMET	COMET
Model	HCA-BU	HCA-BV	HCC-AT	HCC-AX	HCC-AW	HCC-AM-1	HCC-AZ	HCC-BB
Gear Type	Manual	Power	Manual	Special Manual	Power	Manual	Power	Manual
Lube Type	ESW-M-1C87-A							
Lube Capacity (Lb.)	.7 – .07	.7 – .07	.5 – .05	.5 – .05	.5 – .05	.5 – .05	.5 – .05	.5 – .05

TIRES

MODELS	TIRE SIZE 6 CYLINDER Std.	TIRE SIZE 6 CYLINDER R.P.O.	TIRE SIZE 8 CYLINDER Std.	TIRE SIZE 8 CYLINDER R.P.O.	TIRE PRESSURE FRONT	TIRE PRESSURE REAR
FALCON						
Sedan (Std. Trans.)	6.00 x 13	a6.50 x 13	6.45 x 14	c6.95 x 14	24	24
(Auto. Trans.)	6.45 x 14	—	6.45 x 14	c6.95 x 14	24	24
Convertible (Std. Trans.)	6.50 x 13	6.45 x 14	6.45 x 14	c6.95 x 14	24	24
(Auto. Trans.)	6.45 x 14	—	6.45 x 14	c6.95 x 14	24	24
Hardtop (Std. Trans.)	6.50 x 13	6.45 x 14	6.45 x 14	c6.95 x 14	24	24
(Auto. Trans.)	6.45 x 14	—	6.45 x 14	c6.95 x 14	24	24
Wagon (Std. Trans.)	6.45 x 14	—	6.95 x 14	—	24	28
(Auto. Trans.)	6.45 x 14	—	6.95 x 14	—	24	28
Ranchero	6.45 x 14	6.95 x 14	6.95 x 14	—	24	d
Delivery	6.45 x 14	6.95 x 14	6.95 x 14	—	24	d
COMET						
Sedan	6.95 x 14	—	6.95 x 14	7.35 x 14	24	24
Convertible	6.95 x 14	—	6.95 x 14	e7.35 x 14	24	24
Hardtop	6.95 x 14	—	6.95 x 14	7.35 x 14	24	24
Wagon	6.95 x 14	—	6.95 x 14	7.35 x 14	24	28
FAIRLANE						
Sedan	6.95 x 14	7.35 x 14	f6.95 x 14	7.35 x 14	24	24
Hardtop	6.95 x 14	7.35 x 14	f6.95 x 14	7.35 x 14	24	24
Wagon	7.35 x 14	—	7.35 x 14	—	24	28
MUSTANG						
Convertible	6.50 x 13	6.95 x 14	g6.50 x 13	6.95 x 14	24	24
Hardtop	6.50 x 13	6.95 x 14	g6.50 x 13	6.95 x 14	24	24
Imp. Handling	—	—	5.50/5.90 x 15	—	34	30

a—Mandatory with 13 inch wheels and air conditioning.
b—Optional 6.45 x 14.
c—Mandatory option with air conditioning
d—6 cylinder—30 psi—8 cylinder—28 psi
e—Standard with air conditioning.
f—Use 7.35 x 14 with air conditioning.
g—Use 7.00 x 13 with air conditioning.

WHEELS

Model	Std.	R.P.O.	Mtg. Holes	Wheel Nut Torque
FALCON				
Sedan—6 Cyl. Std. Trans.	13 x 4.0	14 x 4.5	4	55-85
All 6 Cyl. Auto. Trans.	14 x 4.5	—	4	55-85
All 8 Cyl.	14 x 5.0	—	5	75-110
Hardtop & Convertible 6 Cyl. Std. Trans.	13 x 4.5	14 x 4.5	4	55-85
Wagon—6 Cyl.	14 x 4.5	—	4	55-85
COMET				
All 6 Cyl.	14 x 4.5	—	4	75-110
All 8 Cyl.	14 x 5.0	—	5	75-110
FAIRLANE—All	14 x 5.0	—	5	75-110
MUSTANG				
6 Cyl.	13 x 4.5	14 x 4.5	4	55-85
8 Cyl.	13 x 4.5	14 x 5.0	5	75-110
8 Cyl. w/AC	—	14 x 5.0	5	75-110
Imp. Handling	—	15 x 5.5	5	75-100

Ford Tool No.	Former No.	Description
T53L-200-A	—	Handle Adapter
—	OTC-462	Shock Link, Tie Rod Separator
T57P-3006-A	3006-B	Spindle Ball Joint Assembly Remover Press
T60K-3006-A*	3006 C	Spindle Ball Joint Press Adapter Screw
T57P-3006-A†	—	Spindle Ball Joint Press Adapter Screw
TOOL-3290-B	3290 B	Dist. Gear and Tie Rod Ends Remover
TOOL-3290-C	3290 C	Tie Rod Ends and Control Valve Ball Stud Remover
T61P-3355-A	3355 E	Idler Arm Bushing Remover and Replacer
T60K-3576-A	3576 AA	Sector Shaft Bushing Remover and Replacer
T64P-3590-F	TOOL 3590 FCA	Pitman or Steering Arm Remover
TOOL-3660-AA	3600 AA	Bolt-on Type Steering Wheel Remover

*Comet, Falcon, Mustang
†Fairlane

Ford Tool No.	Former No.	Description
T64K-5310-A	—	Front Coil Spring Compressor
T63P-5310-A	—	Front Coil Spring Compressor
T64K-5310-A	—	Front Coil Spring Compressor Adapter
5310-C	—	Front Coil Spring Compressor Adapter
T63L-8620-A	8620	Belt Tension Gauge
T56L-33610-D	3500-D	Power Steering Pump Pressure Gauge
T53P-33623-A	33623	Power Steering Pump Rotor Shaft Oil Seal Replacer Adapter
T63L-10300-B	—	Pulley Remover
T65P-3A733-A	—	Pulley Installer
T65P-3000-B or C	—	Alignment Spacer
T62F-3000-A	—	Upper Arm Caster and Camber Adjuster
T59L-100-B	—	Impact Slide Hammer
T58L-101-A	—	Puller Attachment

REAR AXLE

GROUP 4

PART 4-1 PAGE
GENERAL AXLE SERVICE 4-1
PART 4-2
REAR AXLES 4-10
PART 4-3 PAGE
SPECIFICATIONS 4-29

PART 4-1 GENERAL AXLE SERVICE

Section	Page	Section	Page
1 Diagnosis and Testing	4-1	3 Cleaning annd Inspection	4-8
2 Common Adjustments and Repairs	4-5		

Two types of axles are covered in this group. The **integral carrier** type axle is used in Mustang, Falcon, and Comet 6-cylinder models only. In this type axle, the differential carrier is integral with the axle housing. The **removable carrier** type axle is used in Mustang, Falcon and Comet 8-cylinder models, and in all Fairlane models. In this type axle, the differential carrier is bolted to the axle housing and can be removed from the housing for service. A locking differential is available as optional equipment in either type axle.

1 DIAGNOSIS AND TESTING

DIAGNOSIS GUIDE

Certain rear axle and drive line trouble symptoms are also common to the engine, transmission, tires, and other parts of the car. For this reason, be sure that the cause of the trouble is in the rear axle before adjusting, repairing, or replacing any of the axle parts.

Also, certain trouble symptoms are common to both the conventional and locking differential axles, while still other symptoms are found only in the locking differential.

To determine whether the car is equipped with a conventional or a locking differential, check the car warranty plate and the axle ratio tag. Refer to CAR IDENTIFICATION at the front of this manual.

LOCKING DIFFERENTIAL

The locking differential can be checked for proper operation without removing the carrier from the axle housing.

Jack up one rear wheel and remove the wheel cover. On a car with a removable carrier type axle, install tool T59L-4204-A on the axle shaft flange studs as shown in Fig. 1. On a car with an integral carrier type axle, use tool T65K-4204-A.

Using a torque wrench of at least 200 foot-pounds capacity, rotate the axle shaft. **Be sure that the transmission is in neutral gear, one rear wheel is on the floor, and the other rear wheel is raised off the floor.** The torque required to continuously rotate the shaft should be as specified in Part 4-3. The initial breakaway torque may be higher than the continuous turning torque, but this is normal. The axle shaft should turn with even pressure throughout the check without slipping or binding.

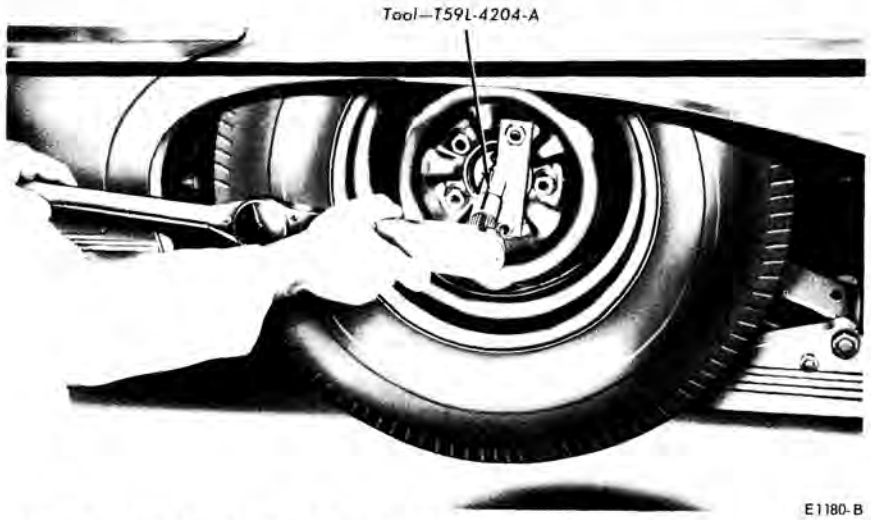


FIG. 1—Typical Locking Differential Check

If the torque reading is less than the specified minimum, check the differential for improper assembly.

A car equipped with a locking differential will always have both wheels driving. If, while the car is being serviced, only one wheel is raised off the floor and the rear axle is driven by the engine, the wheel on the floor will drive the car off the stand or jack.



FIG. 2–Ideal Tooth Pattern–Integral Carrier Type Axle

REAR AXLE TROUBLE SYMPTOMS AND POSSIBLE CAUSES

EXCESSIVE REAR AXLE NOISE (ALL REAR AXLES)	Since gears are in mesh, some rear axle noise is normal. However, excessive noise often indicates the beginning of other troubles in the axle. A road test can help determine whether the noise is being caused by trouble in the rear axle or in other parts of the car. **Before road-testing the car, make sure that the tire pressures and the rear axle lubricant level are normal. Then drive the car far enough to warm the axle lubricant to its normal operating temperature.** With the car stopped and the transmission in neutral, run the engine at various speeds. If the noise still exists during this test, it probably comes from the engine or the exhaust system. To determine if the noise is being caused by the rear axle or the tires, drive the car over several different types of road surfaces. Smooth asphalt or black-top roads minimize tire noises. Tire noises may be eliminated by cross-switching the tires. Snow tires often cause noises not heard with conventional tires.	Noise caused by a worn or damaged wheel bearing is often loudest when the car is coasting at low speeds, and it usually stops when the brakes are gently applied. To find the noisy bearing, jack up each wheel and check each bearing for roughness while the wheel is rotating, provided that the car is equipped with a conventional differential. If all possible external sources of noise have been checked and eliminated, and the noise still exists, road-test the rear axle under all four driving conditions–drive, cruise, float, and coast. Any noise produced by the sidegears and pinions in the differential case will be most pronounced on turns. A continuous whine under a light load between 20 and 35 miles per hour indicates rough or brinnelled pinion bearings. If the tone of drive, coast and float noise differs with speed and if the noise is very rough and irregular; worn, rough or loose differential or pinion shaft bearings are indicated. Remove, disassemble, and inspect the axle.
EXCESSIVE REAR AXLE BACKLASH (ALL REAR AXLES)	Excessive backlash in the axle driving parts may be caused by worn axle shaft splines, loose axle shaft flange nuts, loose U-joint flange mountings, excessive backlash between the drive	pinion and ring gear, excessive backlash in the differential gears, or bearings which are worn or out of adjustment.
ONE WHEEL SPINS EXCESSIVELY (LOCKING DIFFERENTIAL ONLY)	Use the procedure given under "Locking Differential" for checking the locking differential while the unit is in the car. If the torque required to rotate one rear wheel is less than	the specified minimum, the differential is not functioning properly. To repair the unit, remove it from the axle housing.
AXLE HAS A HIGH-PITCHED, CHATTERING NOISE ON TURNS (LOCKING DIFFERENTIAL ONLY)	Drive the car in a fairly tight circle, making five circles clockwise and five counterclockwise. This will permit the lubricant to work in between the clutch plates. If the noise does not disappear during this driving test, it is probable that the axle does not	have the approved Ford lubricant. The lubricant may be checked by draining two tablespoonfuls from the axle and mixing it with an equal amount of white alcohol, such as rubbing alcohol. Mix the lubricant and alcohol thoroughly and let it

CONTINUED ON NEXT PAGE

REAR AXLE TROUBLE SYMPTOMS AND POSSIBLE CAUSES (Continued)

AXLE HAS A HIGH-PITCHED, CHATTERING NOISE ON TURNS (LOCKING DIFFERENTIAL ONLY) (Continued)	stand for at least two minutes. If the sample now has a blue tint, the lubricant is approved Ford lubricant. If it has a yellow tint, it is not the correct lubricant. Drain and refill the axle with the approved lubricant. It is not necessary to flush the axle housing. After refilling the axle drive the car in fairly tight circles clockwise and counterclockwise. The chattering noise should disappear as soon as the new lubricant works in between the clutch plates.	



FIG. 3—Ideal Tooth Pattern—Removable Carrier Type Axle

GEAR TOOTH CONTACT PATTERN CHECK

Paint the gear teeth and roll a pattern as described in Section 3. After diagnosing the tooth pattern as explained here, make the appropriate adjustments as outlined in Section 2.

In making a final gear tooth contact pattern check, it is necessary to recognize the fact that there are three different types of gear set, hunting, non-hunting and partial non-hunting. Each type is determined by the ratio and the number of teeth in the gears. The non-hunting and partial non-hunting types can be identified by the paint "timing" marks on the pinion and ring gear teeth (Part 4-2, Fig. 30). See Part 4-3 for complete identification specifications.

THE IDEAL TOOTH PATTERN

Figs. 2 and 3 show the ideal tooth pattern. **This pattern is not a rigid standard but merely a general norm.**

In general, desirable tooth patterns should have the following characteristics:

(a) The drive pattern should be fairly well centered on the tooth.

(b) The coast pattern should be centered on the tooth but may be slightly toward the toe.

(c) Some clearance between the pattern and the top of the tooth is desirable.

(d) There should be no hard lines where the pressure is high.

The individual gear set need not conform exactly to the "ideal" pattern in order to be acceptable. Characteristic differences between the three types of gear sets as well as differences between individual gear sets of the same type will result in patterns that are acceptable yet different from those shown in Fig. 3.

HUNTING GEAR SET

In a hunting-type gear set, any one pinion gear tooth comes into contact with all drive gear teeth. In this type, several revolutions of the ring gear are required to make all possible gear combinations.

Acceptable Pattern. The drive pattern shown in Fig. 4 was rolled on a hunting-type gear set. Since each pinion tooth came into contact with each ring gear tooth, the pattern is a result of the **combined** tooth contacts. Therefore, the pattern is uniform from tooth to tooth.

Unacceptable Pattern. An erratic tooth pattern on a hunting gear set indicates gear runout and possible need for gear replacement.

A pattern that is uniform, but off center indicates a change in shim or backlash (Figs. 9 or 10).

NON-HUNTING GEAR SET

In a non-hunting type gear set, any one pinion gear tooth comes into contact with only a few ring gear teeth. In this type, only one revolution of the ring gear is required to make all possible tooth contact combinations.

Acceptable Patterns. The drive patterns shown in Figs. 5 and 6 were



FIG. 4—Acceptable Hunting Gear Pattern



E1338-A

FIG. 5—Acceptable Non-Hunting Pattern—Center-Toe-Center

rolled on two different non-hunting type gear sets. The pattern in Fig. 5 runs from the tooth center toward the toe and then back to center. The pattern in Fig. 6 runs from the tooth center toward the heel and then back to center. These patterns are not unusual for non-hunting gear sets and are acceptable. The pattern on any one ring gear tooth was formed by only **one** pinion tooth coming into contact with it. Because of this limited tooth contact, the non-hunting pattern can be more erratic than the hunting pattern and still be acceptable. Likewise, the coast pattern on a non-hunting gear set is usually less uniform tooth to tooth than it would be on a hunting gear set (Fig. 7).

Fig. 8 shows a pattern rolled on another gear set. In this case, the pattern is fairly uniform from tooth to tooth.



E1339-A

FIG. 6—Acceptable Non-Hunting Pattern—Center-Heel-Center



E1340-A

FIG. 7—Acceptable Non-Hunting Gear Set—Coast Pattern

Unacceptable Patterns. A non-hunting gear set should be checked for runout and possible replacement if the pattern runs from the tooth center toward the toe and back to center on some gear teeth (Fig. 5) while on other teeth of the same gear, the pattern runs from the tooth center toward the heel and back to center (Fig. 6).

A non-hunting gear set requires a change in shimming or backlash when its pattern tends to concentrate toward the heel or toe, top or bottom of **most** teeth (Figs. 9 and 10).

PARTIAL NON-HUNTING GEAR SET

In a partial non-hunting type gear set, any one pinion tooth comes into contact with only part of the ring gear teeth, but more than one revolution of the ring gear is required to make all possible gear tooth combinations.

Tooth to tooth pattern uniformity will usually be in between the hunting and the non-hunting patterns. Partial non-hunting gear set patterns will usually be less uniform than hunting gear set patterns, but more uniform than non-hunting gear set patterns.



E1341-A

FIG. 8—Acceptable Non-Hunting Pattern—Uniform

SHIM AND BACKLASH CHANGES

The patterns shown in Figs. 9 and 10 are typical of gear sets that have either an incorrect backlash or an incorrect shim adjustment. Since each gear set rolls a characteristic pattern, the patterns in Figs. 9 and 10 should be considered as typical only and should be used as a guide rather than a rigid standard. The drive pattern is rolled on the convex side of the tooth, and the coast pattern is rolled on the concave side.

The movement of tooth contact patterns with changes in backlash and shimming can be summarized as follows:

Integral Carrier Type Axle. (Fig. 9).

1. Thinner shim with the backlash constant moves the pinion farther from the ring gear.

a. Drive pattern moves toward the top of the tooth (face contact) and toward the heel.

b. Coast pattern moves toward the top of the tooth and slightly toward the toe.

2. Thicker shim with the backlash constant moves the pinion closer to the ring gear.

a. Drive pattern moves deeper on the tooth (flank contact) and slightly toward the toe.

b. Coast pattern moves deeper on the tooth and toward the heel.

3. Decreasing backlash moves the drive gear closer to the pinion:

a. Drive pattern (convex side of gear) moves slightly lower and toward the toe.

b. Coast pattern (concave side of gear) moves lower and toward the toe.

4. Increasing backlash moves the ring gear away from the pinion:

a. Drive pattern moves slightly higher and toward the heel.

b. Coast pattern moves higher and toward the heel.

If the patterns are not correct, make the changes as indicated. The differential case and drive pinion will have to be removed from the carrier casting to change a shim. When re-

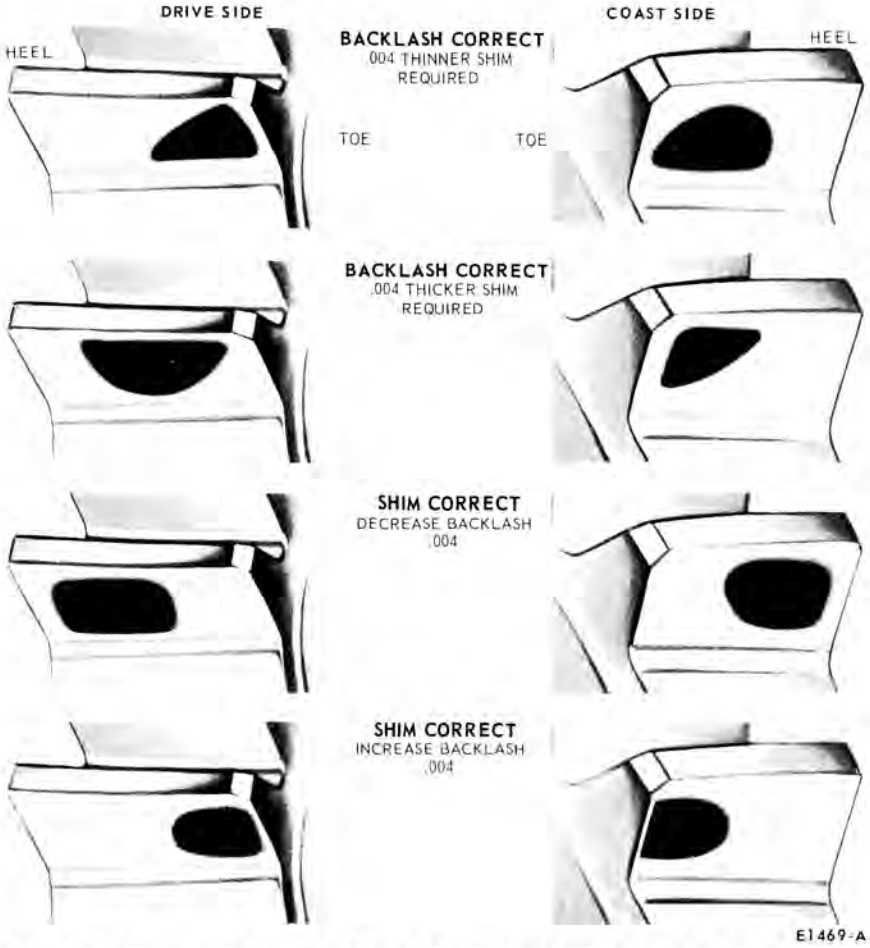


FIG. 9—Typical Gear Tooth Contact Patterns Indicating Shim or Backlash Change—Integral Carrier Type

installing the pinion and ring gear of a non-hunting or partial non-hunting gear set, be sure that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 30, Part 4-2). Refer to "Pinion and Ring Gear Tooth Contact Adjustment," Section 2.

Removable Carrier Type Axle. (Fig. 10).

1. Thicker shim with the backlash constant moves the pinion farther from the ring gear:

a. Drive pattern moves toward the top of the tooth (face contact) and toward the heel.

b. Coast pattern moves toward the top of the tooth and slightly toward the toe.

2. Thinner shim with the backlash constant moves the pinion closer to the ring gear:

a. Drive pattern moves deeper on the tooth (flank contact) and slightly toward the toe.

b. Coast pattern moves deeper on the tooth and toward the heel.

3. Decreasing backlash moves the ring gear closer to the pinion:

a. Drive pattern moves slightly lower and toward the toe.

b. Coast pattern moves lower and toward the toe.

4. Increasing backlash moves the ring gear away from the pinion:

a. Drive pattern moves slightly higher and toward the heel.

b. Coast pattern moves higher and toward the heel.

If the patterns are not correct, make the changes as indicated. The pinion need not be disassembled to change a shim. All that is required is to remove the pinion, bearing, and retainer assembly and install a different shim. When reinstalling the pinion and retainer assembly of a non-hunting or partial non-hunting gear set, be sure that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 30, Part 4-2). Refer to "Pinion and Ring Gear Tooth Contact Adjustment," Section 2.

2 COMMON ADJUSTMENTS AND REPAIRS

PINION AND RING GEAR TOOTH CONTACT ADJUSTMENT

Two separate adjustments affect pinion and ring gear tooth contact. They are pinion location and backlash (Figs. 11 and 12).

Individual differences in matching the differential housing and the gear set require the use of shims to locate the pinion for correct contact with the ring gear. On the integral carrier type axle, the pinion locating shim pack is installed between the pinion rear bearing cone and the pinion gear (Fig. 11); whereas, on the removable carrier type axle, the shims are installed between the pinion retainer and the carrier (Fig. 12). Due to this difference in shim position, it should be noted that adding or removing shims in the integral carrier type (Fig. 11) causes the pinion to move in a direction exactly opposite to the pinion movement caused by adding or removing shims in the removable carrier type (Fig. 12).

When adjusting either type axle, shims should be added to or removed from the original shim pack only as indicated by the tooth pattern check described in the foregoing Section 1. When adjusting the integral carrier type axle, **add shims** to move the pinion **toward** the ring gear; **remove** shims to move the pinion **away** from the ring gear (Fig. 11). When adjusting the removable carrier type axle, **remove** shims to move the pinion **toward** the ring gear; add shims to move the pinion **away** from the ring gear (Fig. 12).

The tooth pattern check also indicates whether the ring gear should be adjusted away from or toward the pinion to increase or decrease backlash between the gears.

If the tooth pattern check indicates a change in backlash only, follow the procedure under "Backlash and Bearing Preload Adjustments." If the tooth pattern indicates a change in shim thickness, follow the procedure under "Pinion Location."

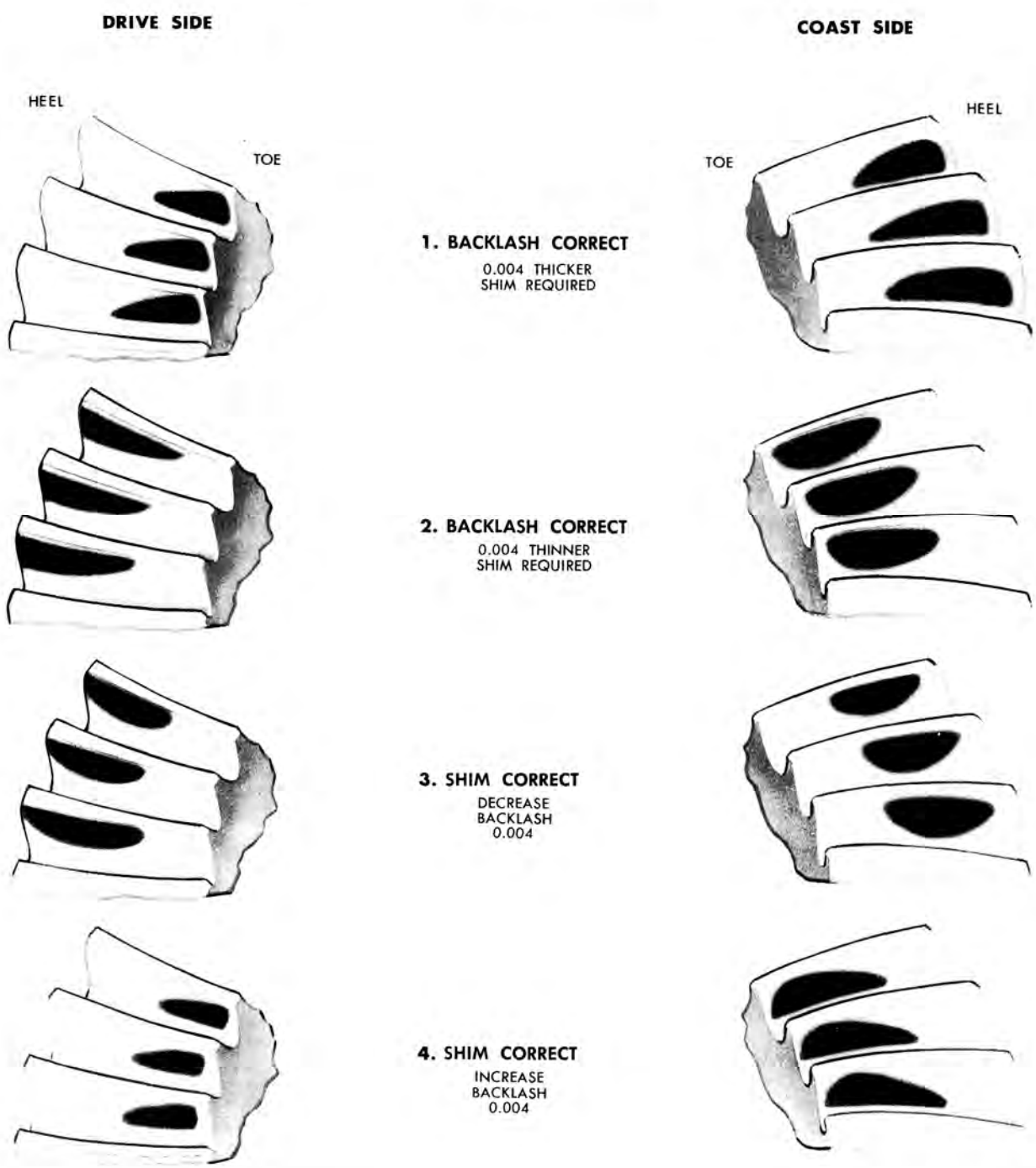


FIG. 10—Typical Gear Tooth Contact Patterns Indicating Shim or Backlash Change—Removable Carrier Type

BACKLASH AND DIFFERENTIAL BEARING PRELOAD ADJUSTMENTS

In both types of axle (Figs. 12 and 13), the ring gear is moved away from or toward the pinion as described in the following procedure.

1. Remove the adjusting nut locks, loosen the differential bearing cap bolts, then torque the bolts to (5 ft-lbs on integral carrier type axles; 25 ft-lbs on removable carrier type axles) before making adjustments.

2. The left adjusting nut is on the ring gear side of the carrier. The right nut is on the pinion side. Loosen the right-hand nut until it is away from the cup. Tighten the left nut until the ring gear is just forced into the pinion with no backlash. (Recheck the right-hand nut at this time to be sure that it is still loose.) **Tightening the left-hand nut moves the ring gear into the pinion to decrease backlash, and tightening the right nut moves the ring gear away.**

3. Loosen the left adjusting nut 1 to 1½ notches. Tighten the right nut two notches beyond the position

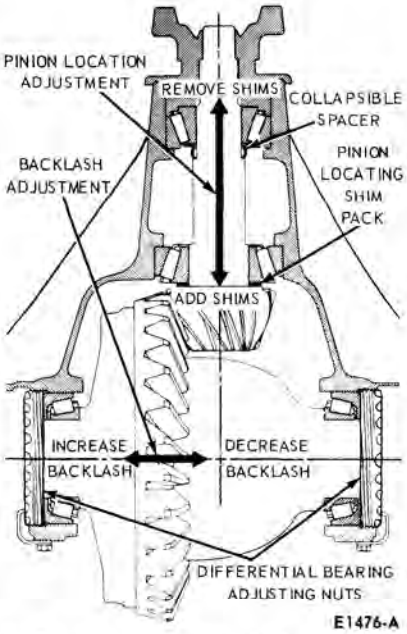


FIG. 11–Pinion and Ring Gear Tooth Contact Adjustment–Integral Carrier Type Axles

where it first contacts the bearing cup. Rotate the drive gear several revolutions in each direction while the bearings are loaded, to seat the bearings in their cups. **This step is important.**

4. Again loosen the right nut to release the pre-load. If there is any backlash between the gears, tighten the left nut just enough to remove this backlash. At this time, make sure that one of the slots in the left-hand nut is so located that the lock can be installed without turning the nut. Carefully tighten the right nut until it just contacts the cup. On integral carrier type axles, set a preload of 2 to 3 notches tight by the right nut. On removable carrier type axles, the preload is 2½ to 3 notches. As preload is applied from the right side, the ring gear is forced away from the pinion and usually results in the correct backlash.

5. Torque the differential cap bolts to specification.

6. Measure the backlash on several teeth around the ring gear. If the measurements vary more than (0.002 inch – integral carrier type; 0.003 inch–removable carrier type) there is excessive runout in the gears or their mountings, which must be corrected to obtain a satisfactory unit. If the backlash is out of specification, loosen one adjusting nut and tighten the opposite nut an equal amount, to move the ring gear away from or toward the pinion. **When moving the adjusting nuts, the final movement should always be made in a tightening direction. For example, if the left nut had to be loosened one notch, loosen the nut two notches, then tighten it one. This insures that the nut is contacting the bearing cup, and that the cup cannot shift after being put in service.**

7. Again check the tooth contact pattern. If the pattern is still incorrect, a change in pinion location (shim thickness) is indicated.

PINION LOCATION

Internal Carrier Type Axle (Fig. 11)

1. Remove the differential case and the drive pinion from the carrier casting, and then remove the pinion bearings as described under "Removal of Differential Case and Drive Pinion" in Section 4.

2. Measure the original shim thickness with a micrometer. Increase or decrease the shim thickness as indicated by the tooth pattern check described in the foregoing Section 1 and shown in Fig. 9.

3. Install the corrected shim pack and the bearings on the pinion, and then install the pinion and the differential case in the carrier casting as outlined under "Installation of Drive Pinion and Differential Case" in Section 4 of Part 4-2.

4. Adjust the backlash between the ring gear and pinion as outlined in the foregoing procedure.

5. Make a tooth pattern check. If the pattern is still unsatisfactory, repeat this procedure changing the shim thickness each time until a satisfactory tooth pattern is obtained.

Removable Carrier Type Axle (Fig. 12)

1. Remove the retaining bolts and the pinion and bearing retainer assembly from the carrier.

2. Measure the original shim thickness with a micrometer. Increase or decrease the shim thickness as indicated by the tooth pattern check described in Section 1.

3. Replace the pinion retainer O-ring (Fig. 47, Part 4-2). Coat the O-ring with axle lubricant before installing. **Do not roll the O-ring into the groove. Snap it into position.**

4. Being careful not to pinch the O-ring, install the pinion and bearing retainer assembly in the carrier with the corrected shim pack.

Before installing the pinion and bearing retainer assembly, determine which type of gear set is being used. The **non-hunting** and **partial non-hunting** types can be identified by the paint "timing" marks on the gear teeth (Fig. 30, Part 4-2). Part 4-3 can also be referred to for identification.

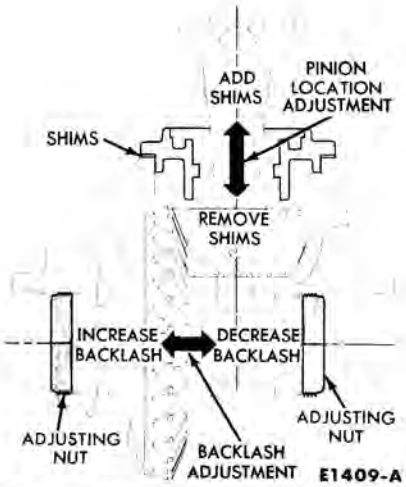


FIG. 12–Pinion and Ring Gear Tooth Contact Adjustment–Removable Carrier Type Axles

If the gear set is of the **non-hunting** or **partial non-hunting** type, clean the teeth on both the pinion and ring gear so that the timing marks are visible. Rotate the differential case and drive gear assembly in the carrier until the marked teeth on the ring gear are opposite the pinion entry hole. Place the pinion retainer assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 30, Part 4-2).

In almost every case of improper assembly (gear assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

When installing the **hunting** type gear set (no "timing marks"), assemble the pinion and retainer assembly into the carrier without regard to the matching of any particular gear teeth.

5. Install the retainer-to-carrier mounting bolts and torque to specifications.

6. Adjust the backlash between the ring gear and pinion as outlined in the foregoing procedure.

7. Make a tooth pattern check. If the pattern is still unsatisfactory, repeat this procedure changing the shim thickness each time until a satisfactory tooth pattern is obtained.

3 CLEANING AND INSPECTION

INSPECTION BEFORE DISASSEMBLY OF CARRIER

The differential case assembly and the drive pinion should be inspected before they are removed from the housing. These inspections can help to find the cause of the trouble and to determine the correction needed.

On removable carrier type axles, mount the carrier in the holding fixture shown in Fig. 13.



E1306-B

FIG. 13—Bench Fixture for Carrier Overhaul—Removal Carrier Type

Wipe the lubricant from the internal working parts, and visually inspect the parts for wear or damage.

Rotate the gears to see if there is any roughness which would indicate defective bearings or chipped gears. Check the gear teeth for scoring or signs of abnormal wear.

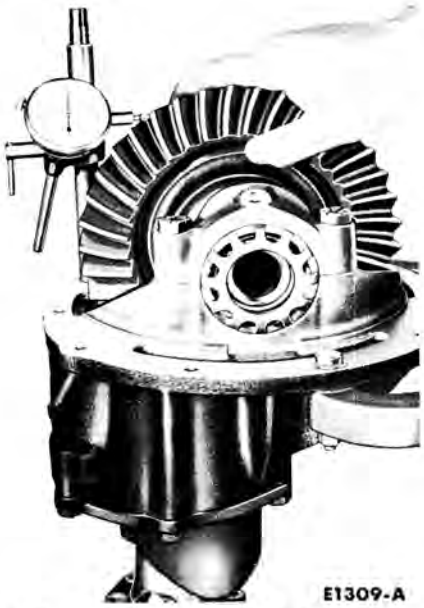
Check the differential case and the drive pinion for end play.

Set up a dial indicator (Fig. 14 or 15) and check the backlash at several points around the ring gear.

Backlash should be within specifications as outlined in the Specifications Section, Part 4-3.

To check the gear tooth contact, paint the gear teeth with suitable gear marking compound, such as a paste made with dry red lead and oil. A mixture that is too wet will run and smear. Too dry a mixture cannot be pressed out from between the teeth. Wrap a cloth around the drive pinion flange to act as a brake. Rotate the ring gear back and forth (use a box wrench on the ring gear attaching bolts for a lever) until a clear tooth contact pattern is obtained.

Certain types of gear tooth contact patterns on the ring gear indicate incorrect adjustment. Noise caused by incorrect adjustment can often be corrected by readjusting the gears. Typical patterns and the necessary corrections are explained under "Gear Tooth Contact Pattern Check" in Section 1.

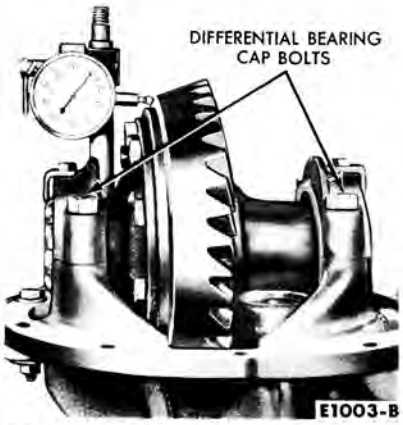


E1309-A

FIG. 14—Backlash Check—Removable Carrier Type

Gear tooth runout can sometimes be detected by an erratic pattern on the teeth. However, a dial indicator should be used to measure the runout of the back face of the ring gear, as shown in Fig. 15 or 16. Refer to Specifications Section for maximum allowable runout.

Loosen the differential bearing cap bolts, and then torque to specification. Remove the adjusting nut locks. Carefully loosen one of the adjusting nuts to determine if any differential bearing preload remains. If at least one notch of preload remains, the differential bearings may be re-used, provided they are not pitted or damaged.



E1003-B

FIG. 16—Drive Gear Runout Check—Removable Carrier Type

INSPECTION AFTER DISASSEMBLY

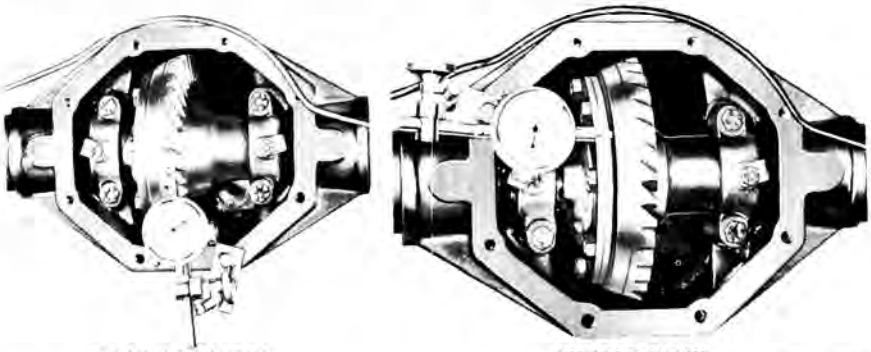
Thoroughly clean all parts. **Always use new solvent when cleaning bearings.** Do not spin bearings with compressed air. Oil the bearings immediately to prevent rusting. Inspect the parts for any major defects. Clean the inside of the housing before rebuilding and installing the parts.

When a scored gear set is replaced, the axle housing should be washed thoroughly and steam cleaned. This can only be done effectively if the axle shafts and shaft seals are removed from the housing. Inspect individual parts as outlined below.

GEARS

Examine the pinion and ring gear teeth for scoring or excessive wear. **Extreme care must be taken not to damage the pilot bearing surface of the pinion.**

The pattern taken during disas-



E1256-A

FIG. 15—Backlash and Runout Check—Integral Carrier Type

sembly should be helpful in judging if gears can be re-used. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring is the result of excessive shock loading or the use of an incorrect lubricant. Scored gears cannot be re-used.

Examine the teeth and thrust surfaces of the differential gears. Wear on the hub of the differential side gear can cause a "chucking" noise known as "chuckle" when the car is driven at low speeds. Wear on splines, thrust surfaces, or thrust washers can contribute to excessive drive line backlash.

BEARING CUPS

Check bearing cups for rings, scores, galling, or erratic wear patterns. Pinion bearing cups must be solidly seated. Check by attempting to insert a 0.0015 inch feeler between these cups and the bottoms of their bores.

CONE AND ROLLER ASSEMBLIES

When operated in the cups, bearing rollers must turn without roughness. Examine the roller ends for wear. Step-wear on the roller ends indicates that the bearings were not preloaded properly or that the rollers were slightly misaligned.

If inspection reveals either a defective cup or a defective cone and roller assembly, **both parts should be replaced to avoid early failure.**

DIFFERENTIAL BEARING ADJUSTING NUTS

Temporarily install the bearing caps and test the fit of the adjusting nuts in their threads.

The nuts should turn easily when the caps are tightened to 5 ft-lbs (integral carrier type) or 25 ft-lbs (removable carrier type). The faces of the nuts that contact the bearing cups must be smooth and square. Polish these with a fine abrasive on a flat surface. Replace the nuts or examine the threads in the carrier, if their fit is not proper. Be sure that the bearing caps and adjusting nuts are on the side which they were machined to fit by observing the punch marks and scribe marks made during disassembly operations.

DRIVE PINION FLANGE

Be sure that the ears of the flange have not been damaged in removing the drive shaft or in removing the flange from the pinion. The end of the flange that contacts the bearing cone (integral carrier type) or the oil slinger (removable carrier type) as well as the flat surface of the pinion nut counterbore must be smooth. Polish these surfaces if necessary. Roughness aggravates backlash noises, and causes wear of the flange with a resultant loss in pinion bearing preload.

PINION RETAINER– REMOVABLE CARRIER TYPE AXLE ONLY

Be sure that the pinion bearing cups are seated. Remove any chips or burrs from the mounting flange. Clean the groove for the O-ring seal and all lubricant passages. If the cups were removed, examine the bores carefully. Any nicks or burrs in these bores must be removed to permit proper seating of the cups.

CARRIER HOUSING

Make sure that the differential bearing bores are smooth and the threads are not damaged.

Remove any nicks or burrs from the mounting surfaces of the carrier housing.

DIFFERENTIAL CASE

Make sure that the hubs where the bearings mount are smooth. Carefully examine the differential case bearing shoulders, which may have been damaged when the bearings were removed. The bearing assemblies will fail if they do not seat firmly against the shoulders. Check the fit (free rotation) of the differential side gears in their counterbores. Be sure that the mating surfaces of the two parts of the case are smooth and free from nicks or burrs.

LOCKING DIFFERENTIAL PARTS

Inspect the clutch plates for uneven or extreme wear. The dog-eared clutch plates must be free from burrs, nicks, or scratches which could cause excessive or erratic wear to the bonding material of the internally splined clutch plates. The internally splined clutch plates should be inspected for condition of the bond, bonding material, and wear. Replace the bonded plates if their thickness is less than 0.085 inch or if the bonded material is scored or badly worn. Inspect the bonded plate internal teeth for wear. Replace them, if excessive wear is evident. Bonded plates should be replaced as a set only.

Examine all thrust surfaces and hubs for wear. Abnormal wear on these surfaces can contribute to a noisy axle.

Inspect the Belleville spring for proper free height of ¼ inch.

PART 4-2 REAR AXLES

Section		Page
1	Description and Operation	4-10
2	In-Car Adjustment and Repair	4-12
3	Removal and Installation	4-15
4	Major Repair Operations—Integral Carrier Type Axle	4-16
5	Major Repair Operations—Removable Carrier Type Axle	4-22

1 DESCRIPTION AND OPERATION

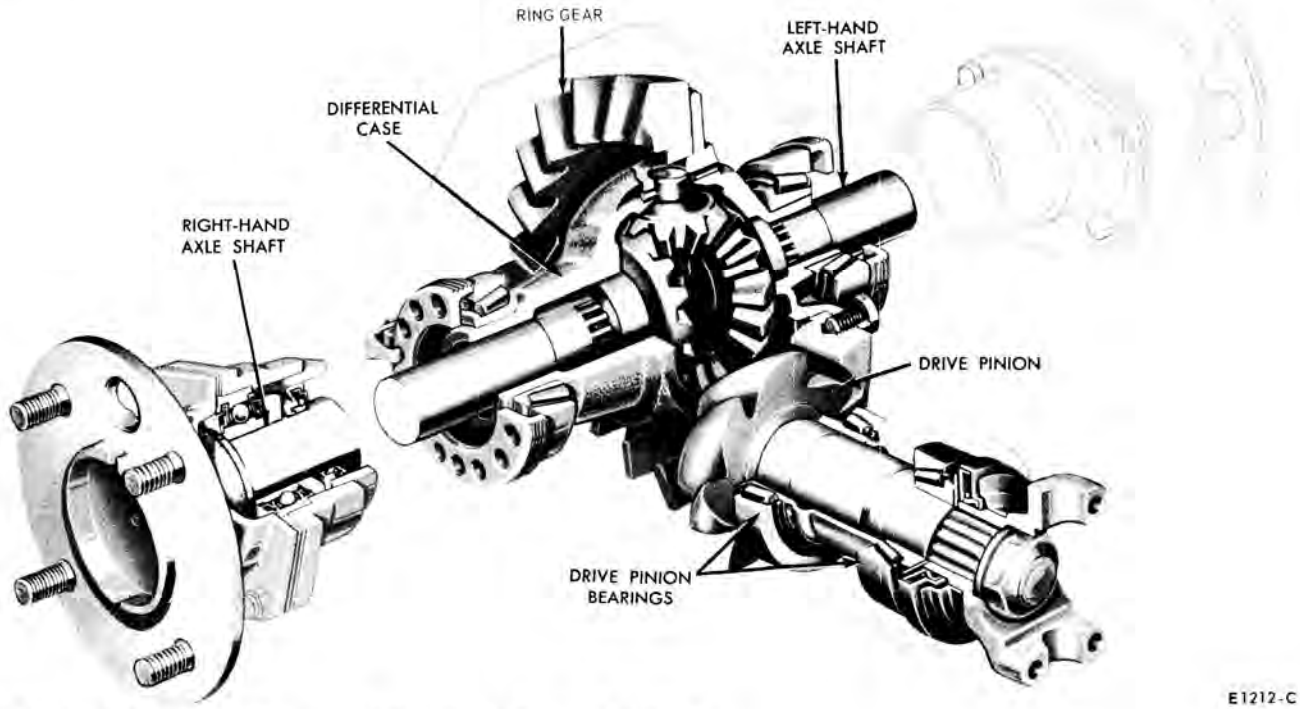


FIG. 1—Typical Rear Axle Assembly—Integral Carrier Type Axle

IDENTIFICATION

A metal tag stamped with the model designation and gear ratio is secured to all Ford-produced axles under one of the rear cover-to-housing bolts (integral carrier type) or the carrier-to-housing bolts (removable carrier type). The first five spaces on the top line are reserved for the model designation letters such as WCY-E, WDJ-A, or WDK-E. These letters indicate a specific combination of the following factors: conventional or locking axle; diameter of ring gear; small or large wheel bearings; and the gear ratio. It is important, therefore, to use the model designation for obtaining the correct replacement parts.

CONVENTIONAL AXLES

DESCRIPTION

Integral Carrier Type Axle. The rear axle assembly is an integral-type housing, hypoid design, with the centerline of the pinion set below the centerline of the ring gear (Fig. 1).

The semi-floating axle shafts are retained in the housing by ball bearings and a bearing retainer at the axle housing outer ends.

The differential assembly is mounted on two opposed tapered roller bearings. The bearings are retained in the housing by removable caps. Differential bearing preload and drive gear backlash is adjusted by nuts located behind each differential bearing cup.

The drive pinion assembly is mounted on two opposed tapered roller bearings. Pinion bearing preload is adjusted by a collapsible spacer on the pinion shaft. Pinion and ring gear tooth contact is adjusted by shims between the rear bearing cone and pinion gear.

A cover on the rear of the differential housing provides access for inspection and the removal and installation of the differential assembly and drive pinion.

Removable Carrier Type Axle. The rear axle is of the banjo-housing, hypoid gear type, in which the centerline of the pinion is mounted below the centerline of the ring gear (Fig. 2).

The integral pinion gear and shaft and the pinion bearings are assembled in a pinion retainer, which is bolted to the carrier. In this axle, the pinion is straddle mounted; that is, the pinion is supported by bearings both in front of and to the rear of the pinion gear. Two opposed tapered roller bearings support the pinion shaft in front of the pinion gear. A straight roller (pilot) bearing supports the pinion shaft at the rear of the pinion gear. Pinion and ring gear tooth contact is adjusted by shims between the pinion retainer and the carrier housing.

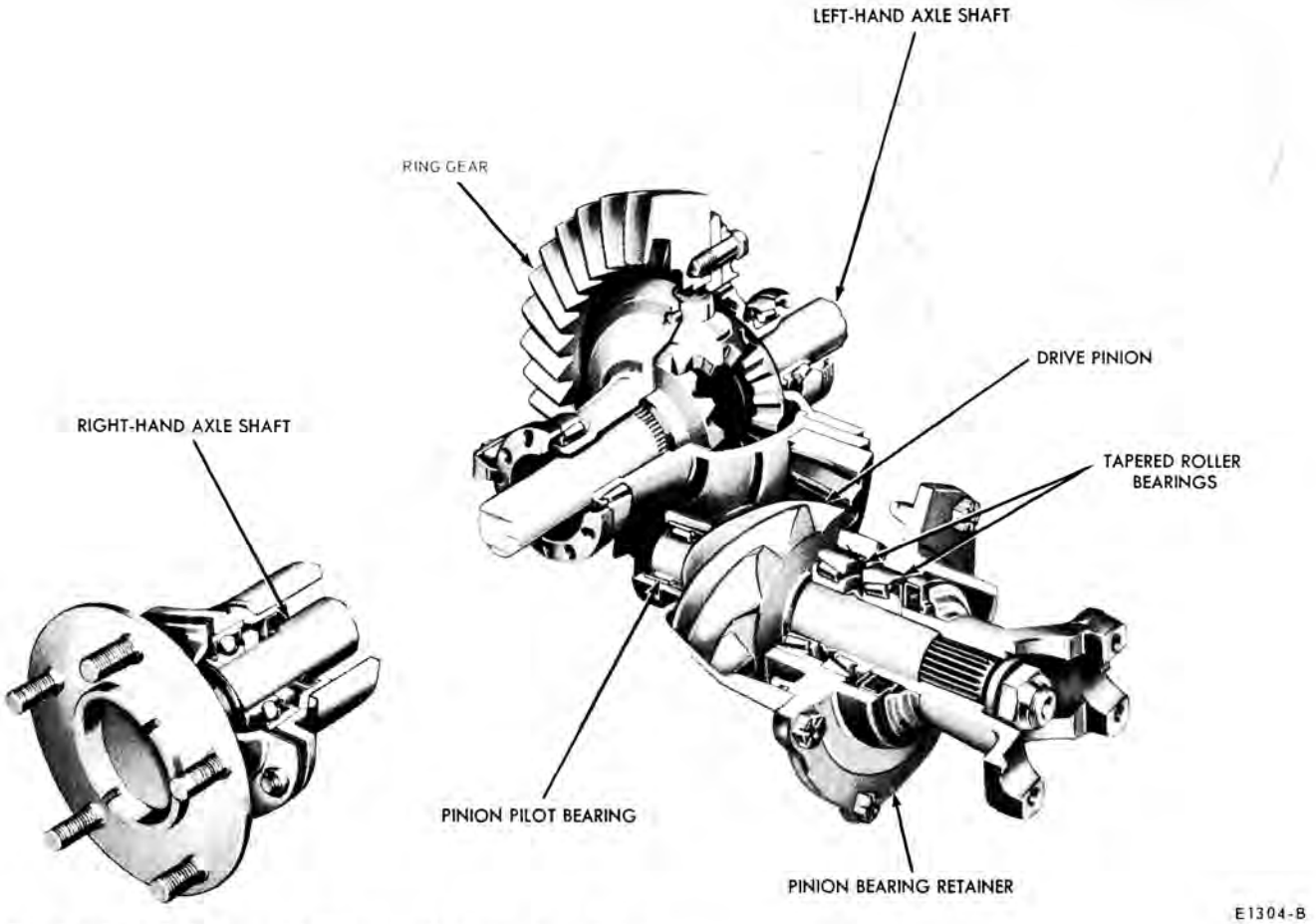


FIG. 2–Rear Axle Assembly–Removal Carrier Type Axle

The differential assembly is mounted on two opposed tapered roller bearings, which are retained in the carrier by removable caps. The entire carrier assembly is bolted to the axle housing.

Ball bearing assemblies (rear wheel bearings) are pressed onto the outer ends of the axle shafts and set in the outer ends of the axle housing. These bearings support the semi-floating axle shafts at the outer ends. The inner ends of the shafts spline to the differential side gears. Bearing retainer plates hold the shafts in the housing. The left and right axle shafts are not interchangeable, because the left axle shaft is shorter than the right.

OPERATION

The rear axle drive pinion receives its power from the engine through the transmission and drive shaft. The pinion gear rotates the differential case through engagement with the ring gear, which is bolted to the case outer flange. Inside the case, there are two differential pinion gears mounted on the differential pinion shaft which is pinned to the case. These pinion gears are engaged with the side gears, to which the axle shafts are splined. Therefore, as the differential case turns, it rotates the axle shafts and rear wheels. When it is necessary for one wheel and axle shaft to rotate faster than the other, the faster turning side gear causes the pinions to roll on the slower turning side gear to allow differential action between the two axle shafts.

LOCKING DIFFERENTIAL AXLE

The locking differential is provided as optional equipment in both the integral and the removable carrier type axle.

DESCRIPTION

The axle assembly, except for the differential case and its internal components, is identical to the conventional axle.

A constant-friction locking differential, which employs automatic transmission-type clutch plates to control differential action, is available as optional equipment (Fig. 3).

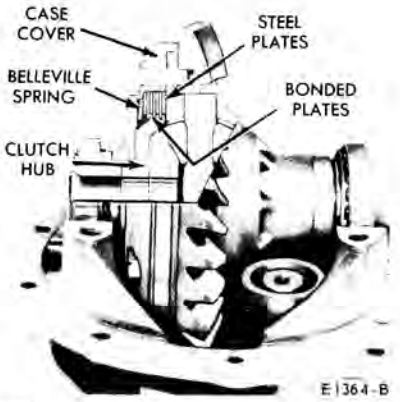


FIG. 3–Typical Locking Differential

Four dog-eared steel clutch plates are locked into the differential cover. Three bronze, bonded clutch plates are splined to the left-hand axle shaft. A Belleville spring washer maintains

a constant pressure between the steel and bonded clutch plates so that the clutch is always engaged.

OPERATION

The pressure between clutch plates opposes differential action at all times. When the car turns a corner the clutch "slips" allowing normal differential action to take place. Under adverse weather conditions, where one or both wheels may be on a low-traction surface such as snow, ice or mud, the friction between the clutch plates will transfer a portion of the usable torque to the wheel with the most traction. Thus, the wheel that is on ice or snow will not spin, but will have a tendency to operate with the opposite wheel in a combined driving effort.

2 IN-CAR ADJUSTMENT AND REPAIR

REAR AXLE SHAFT, WHEEL BEARING AND OIL SEAL REPLACEMENT

The rear axle shafts, wheel bearings, and oil seal can be replaced without removing the differential assembly from the axle housing.

1. Remove the wheel and tire from the brake drum.

2. Remove the Tinnerman nuts that secure the brake drum to the axle housing flange, and then remove the drum from the flange.

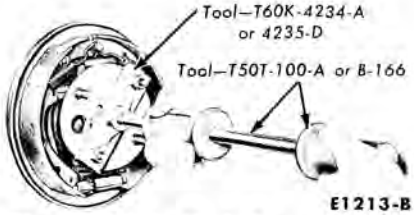


FIG. 4—Axle Shaft Removal—Integral Carrier Type Axle

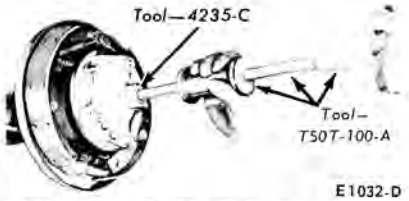


FIG. 5—Axle Shaft Removal—Removable Carrier Type Axle

3. Working through the hole provided in each axle shaft flange, remove the nuts that secure the wheel bearing retainer plate. Then pull the axle shaft assembly out of the axle housing (Fig. 4 or 5). **The brake carrier plate must not be dislodged. Install one nut to hold the plate in place after the axle shaft is removed.**

4. If the rear wheel bearing is to be replaced, loosen the inner retainer nick by nicking it deeply with a cold chisel in several places (Fig. 6). It will then slide off easily.

5. Remove the bearing from the axle shaft with the tool shown in Fig. 7 or 8. If the "push-puller" operation shown in Fig. 8 is used, be sure that the puller arms contact **the flat surface** of the axle shaft flange rather than the bolt heads. Also with this method, be careful not to damage or burr the oil seal journal as the bearing breaks loose.

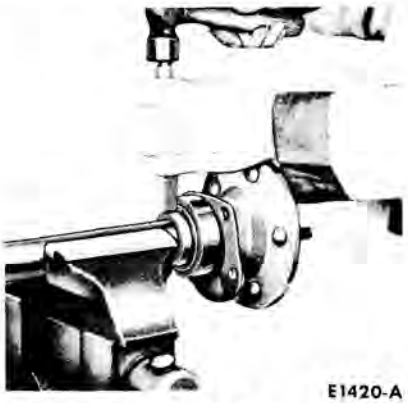


FIG. 6—Rear Wheel Bearing Retainer Ring Removal

6. Whenever a rear axle shaft is removed, the oil seal must be replaced. Remove the seal with the tools shown in Fig. 9. Soak new oil seals in SAE 10 oil for ½ hour before installing.

7. Inspect the machined surface of the axle shaft and the axle housing for rough spots or other irregularities which would affect the sealing action of the oil seal. Check the axle shaft splines for burrs, wear or damage. Carefully remove any burrs or rough spots. Replace worn or damaged parts.

8. Lightly coat wheel bearing bores with ball joint grease (C1AZ-19590-A).

9. Place the retainer plate on the axle shaft, and press the new wheel bearing on the shaft with the tool shown in Fig. 7 or 8. **The bearing should seat firmly against the shaft shoulder. Do not attempt to press on both the bearing and the inner retainer ring at the same time.**

10. Using the bearing installation tool, press the bearing inner retainer ring on the shaft until the retainer seats firmly against the bearing.

11. Wipe all lubricant from the inside of the axle housing in the area of the oil seal before installing the new seal.

12. Wipe a small amount of oil resistant sealer on the outer edge of the seal before it is installed. **Do not put sealer on the sealing lip.**

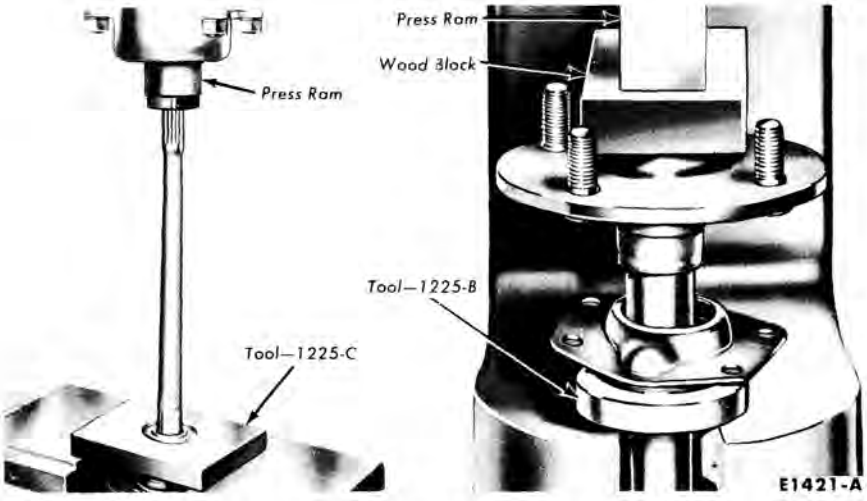
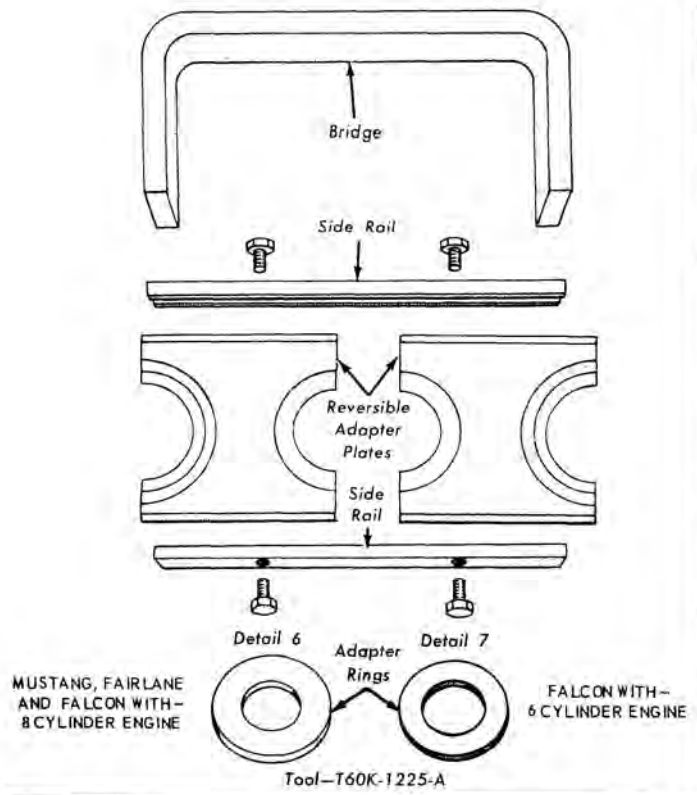
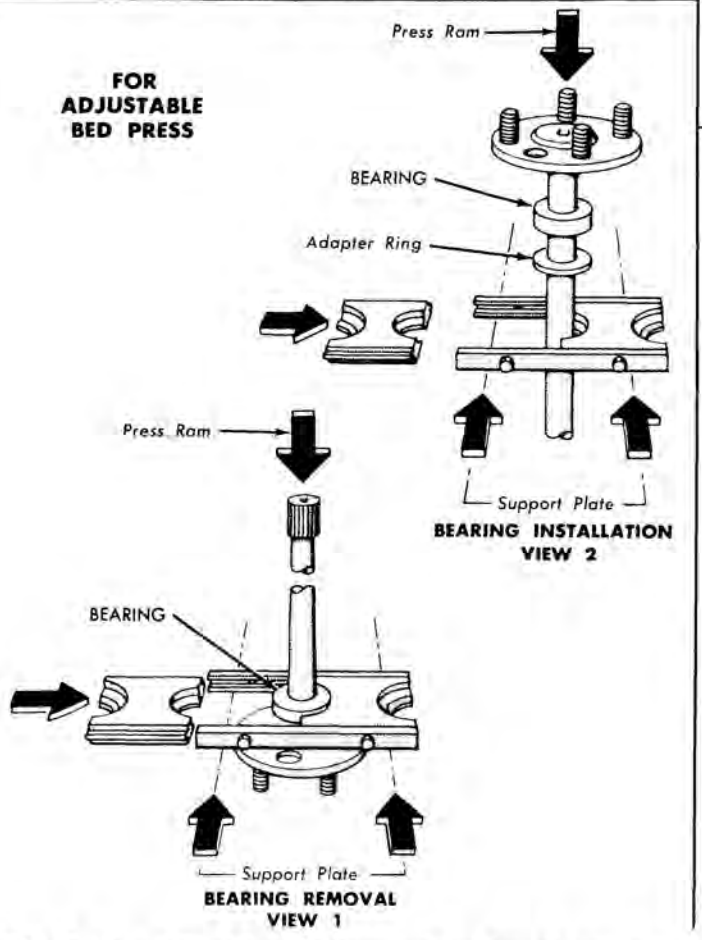
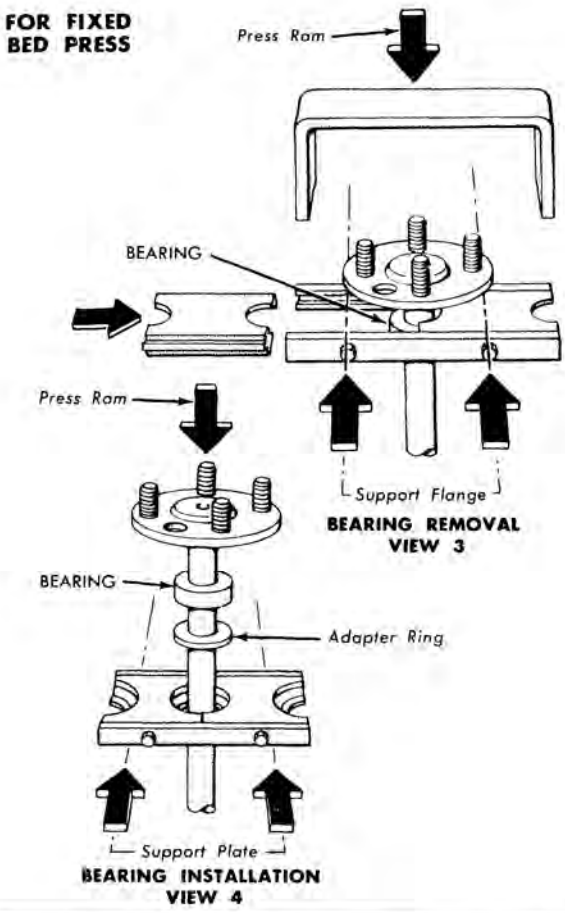
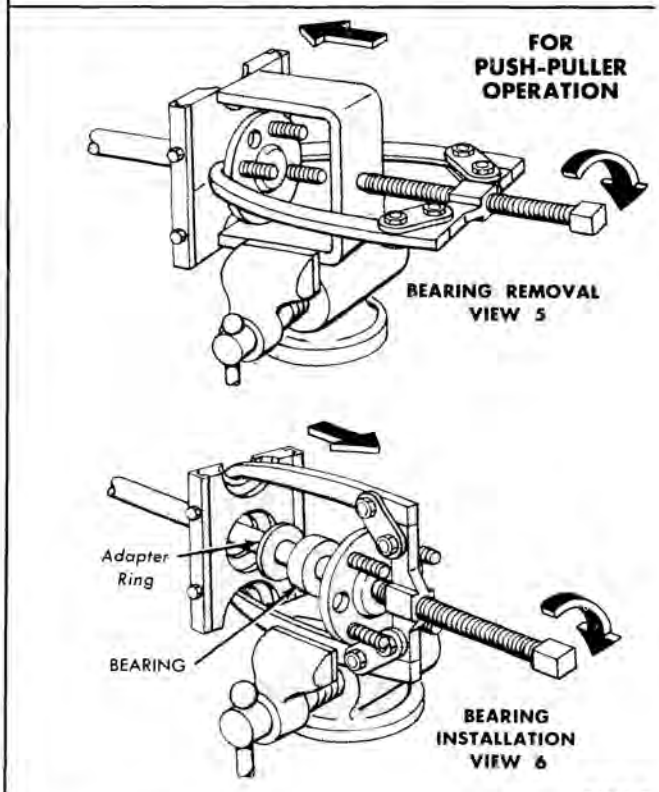


FIG. 7—Rear Wheel Bearing Removal and Installation—Comet









E1211-C

FIG. 8–Rear Wheel Bearing Removal and Installation–Falcon, Mustang and Fairlane



FIG. 9—Axle Shaft Seal Removal and Installation

13. Install the new oil seal with the tools shown in Fig. 9. **Installation without use of the proper tool will distort the seal and cause leakage. Be sure the new seal has been soaked in SAE 10 oil for ½ hour.**

14. Place a new gasket on each side of the brake carrier plate, and then carefully slide the axle shaft into the housing so that the rough forging of the shaft will not damage the oil seal. Start the axle splines into the side gear, and push the shaft in until the bearing bottoms in the housing.

15. Install the bearing retainer plate on the mounting bolts at the axle housing, and install the retaining nuts. Torque the nuts to specifications.

16. Install the brake drum and the drum retaining nuts.

17. Install the wheel and tire on the drum.

DRIVE PINION OIL SEAL REPLACEMENT

The drive pinion oil seal can be replaced without removing the differential carrier assembly from the axle housing. Soak new seals in SAE 10 oil for ½ hour before use.

1. Make scribe marks on the drive shaft end yoke and the axle U-joint flange to insure proper position of the drive shaft at assembly (Fig. 14). Disconnect the drive shaft from the axle U-joint flange. **Be careful to avoid dropping the loose universal joint bearing cups.** Hold the cups on the spider with tape. Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the transmission extension housing to prevent transmission leakage. Refer to the transmission group for the appropriate tool.

2. Make punch marks on the end of the pinion shaft, the pinion shaft nut, and the U-joint flange inner surface for realignment. While holding the flange with the tool shown in Fig. 10, remove the integral pinion nut and washer.

3. Clean the pinion bearing retainer around the oil seal. Place a drain pan under the seal, or raise the front of the car higher than the rear.

4. Using the tool shown in Fig. 11, remove the pinion U-joint flange.

5. Using the tool shown in Fig. 37, remove the drive pinion oil seal.

6. Clean the oil seal seat.

7. Coat the outer edge of the new seal with a small amount of oil resistant sealer. **Do not put any of the sealer on the sealing lip.** Install the seal in the retainer, using the tool shown in Fig. 12 on integral carrier type axles. With removable carrier type axles, use tool T62F-4676-A or 4676-H on all except cars equipped with 289-4V high performance engines. On cars equipped with high performance engines, use tool T58L-4676-A or 4676-F.



FIG. 10—Typical Drive Pinion Shaft Nut Removal



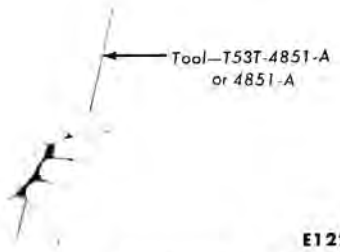


FIG. 11—Typical Drive Pinion Flange Removal

8. Align the punch mark on the U-joint flange with the mark on the end of the pinion shaft, and install the flange. With removable carrier type axles, it will be necessary to use the tool shown in Fig. 49 to install the flange.

9. Install the integral retaining nut and washer on the pinion shaft. Tighten the nut until the punch mark on the nut is aligned with the punch marks on the end of the pinion shaft and on the inner surface of the U-joint flange.

10. Tighten the nut an additional ¼ turn beyond the alignment marks. Hold the flange with the tool shown

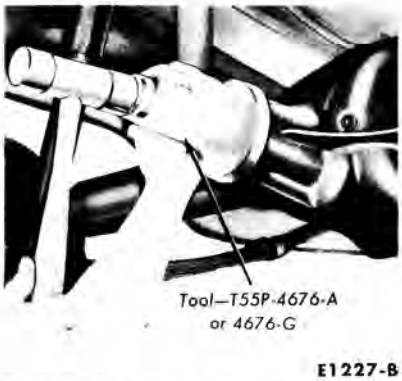


FIG. 12—Typical Drive Pinion Flange Seal Installation

in Fig. 10 while the nut is being tightened.

11. Remove the oil seal replacer tool from the transmission extension housing. Install the front end of the drive shaft on the transmission output shaft.

12. Connect the rear end of the drive shaft to the axle U-joint flange, aligning the scribe marks made on the drive shaft end yoke and the axle U-joint flange (Fig. 14).

13. Check the lubricant level, and add whatever amount of specified lubricant is necessary.

3 REMOVAL AND INSTALLATION

REAR AXLE HOUSING— INTEGRAL CARRIER TYPE AXLE

REMOVAL

1. Raise the car and support it with safety stands under the rear frame member.

2. Drain the lubricant from the axle.

3. Disconnect the drive shaft at the drive pinion flange.

4. Disconnect the lower end of the shock absorbers.

5. Remove the wheels, brake drums and both axle shafts as outlined in the foregoing Section 2.

6. Remove vent hose front vent tube (Corbin clamp) and remove vent tube from brake tube junction and axle housing.

7. Remove the hydraulic brake T-fitting from the axle housing. **Do not open the hydraulic brake system lines.** Remove the hydraulic brake line from its retaining clip on the axle housing.

8. Remove both axle shaft oil seals with the tools shown in Fig. 9.

9. Remove both brake carrier plates from the axle housing and suspend them above the housing with mechanic's wire. The hydraulic brake lines and the parking brake cables are still attached to the brake carrier plates.

10. Support the rear axle housing on a jack, and then remove the spring clip nuts. Remove the spring clip plates (Fig. 13).

11. Lower the axle housing and remove it from under the car.

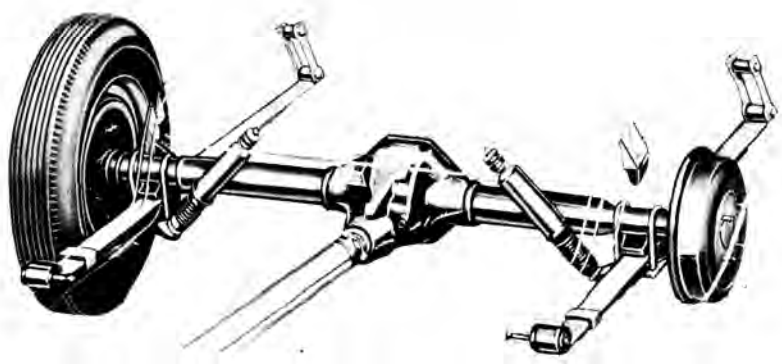
12. If the axle housing is being replaced, transfer all the differential and pinion parts to the new housing. See Section 4, "Major Repair Operations."

INSTALLATION

1. Raise the axle housing into position so that the spring clip plates can be installed. On a Comet, position the spring upper insulators and retainers between the axle housing and springs and install the lower insulators. Torque the spring clip nuts to specification.

2. Place the brake carrier plates in their normal position on the axle housing. Use new gaskets on each side of the brake carrier plates.

3. Install new axle shaft oil seals with the tool shown in Fig. 9. Soak the new seals in light weight engine oil (SAE 10) for ½ hour before installing them. **Installation without use of the proper tool will distort the seal and cause leakage.** Coat the outside edges of the new oil seal with a hardening type of sealer such as Permatex No. 2 or its equivalent.



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FIG. 13—Rear Axle Installation—Integral Carrier Type

4. Install the axle shafts, brake drums and wheels as outlined in the foregoing Section 2.

5. Attach the hydraulic brake line "T" fitting to the axle housing, and secure the hydraulic brake line in its retainer on the axle housing.

6. Install vent tube to brake tube junction and install vent hose to vent tube.

7. Raise the axle housing and connect the shock absorbers.

8. Connect the drive shaft at the drive pinion shaft.

9. Fill the axle with the proper grade and amount of lubricant.

10. Road test the car.

DIFFERENTIAL CARRIER— REMOVABLE CARRIER TYPE AXLE

REMOVAL

1. Raise the car on a hoist and remove the two rear wheel and tire assemblies.

2. Remove the two brake drums (3 Tinnerman nuts at each drum) from the axle shaft flange studs. If difficulty is experienced in removing the drums, back off the brake shoes as explained in Part 2-2.

3. Working through the hole provided in each axle shaft flange, remove the nuts that secure the rear wheel bearing retainer plate. Pull each axle shaft assembly out of the axle housing (Fig. 5). Install a nut on one of the brake carrier plate retaining bolts to hold the plate to the axle housing after the shaft has been removed. **Whenever a rear axle shaft is removed, the wheel bearing oil seal must be replaced.** Remove both seals with the tools shown in Fig. 9.

4. Make scribe marks on the drive shaft end yoke and the axle U-joint flange to insure proper position at assembly. Disconnect the drive shaft at the rear axle U-joint, remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the housing to prevent transmission leakage. Refer to the transmission group for the appropriate tool.

5. Place a drain pan under the carrier and housing, remove the carrier retaining nuts, and drain the axle. Remove the carrier assembly from the axle housing.

INSTALLATION

1. Clean the axle housing and shafts using kerosene and swabs. To avoid contamination of the grease in the sealed ball bearings, do not allow any quantity of solvent directly on the wheel bearings. Clean the mating surfaces of the axle housing and carrier.

2. Position the differential carrier on the studs in the axle housing using a new gasket between carrier and housing. Install the copper washers and the carrier-to-housing retaining nuts, and torque to specifications.

3. Remove the oil seal replacer tool from the transmission extension housing. Position the drive shaft so that the front U-joint slip yoke splines to the transmission output shaft.

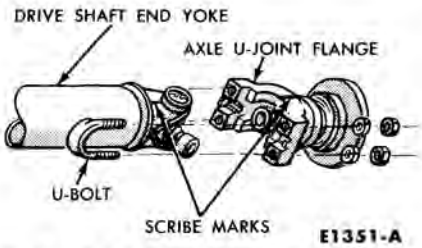


FIG. 14—Drive Shaft-To-Axle U-Joint Connection

4. Connect the drive shaft to the axle U-joint flange, aligning the scribe marks made on the drive shaft end yoke and the axle U-joint flange during the removal procedure (Fig. 14). Install the U-bolts and nuts and torque to specifications.

5. Soak two new rear wheel bearing oil seals in SAE 10 oil for ½ hour before installation. Wipe a small amount of an oil resistant sealer on the outer edge of each seal before it is installed. **Do not put any of the sealer on the sealing lip.** Install the oil seals in the ends of the rear axle housing with the tool shown in Fig. 9.

6. Install the two axle shaft assemblies in the axle housing. The shorter shaft goes into the left side of the housing.

When installing an axle shaft, place a new gasket on each side of the brake carrier plate and carefully slide the axle shaft into the housing so that the rough forging of the shaft will not damage the oil seal. Start the axle splines into the differential side gear, and push the shaft in until the bearing bottoms in the housing.

7. Install the bearing retainers on the attaching bolts on the axle housing flanges. Install the nuts on the bolts and torque to specifications.

8. Install the two rear brake drums and the drum retaining (Tinnerman) nuts.

9. Install the rear wheel and tire assemblies.

10. If the rear brake shoes were backed off, adjust the brakes as outlined in Part 2-1.

11. Fill the rear axle with specified lubricant.

AXLE HOUSING—REMOVABLE CARRIER TYPE AXLE

REMOVAL

1. Remove the carrier assembly from the axle housing as outlined in the foregoing precedure.

2. Position safety stands under the rear frame members.

3. Disengage the brake line from the clips that retain the line to the axle housing.

4. Disconnect the vent tube from the rear axle housing.

5. Remove the brake carrier plate assemblies from the axle housing, and support them with wire. Do not disconnect the brake line.

6. Disconnect each rear shock absorbers from the spring clip plate and position out of the way.

7. Lower the rear axle slightly to reduce some of the spring tension. At each rear spring, remove the spring clip (U-bolt) nuts, spring clips, and spring clip plate. Remove the spring lower insulator and retainer. See Part 3-2.

8. Remove the rear axle housing from under the car.

INSTALLATION

1. Position the rear axle housing on the rear springs. On a Comet or Fairlane, position the spring upper insulators and retainers between the axle housing and springs, and install the lower insulators.

2. Install the spring clips (U-bolts), spring clip plate, and nuts. **Torque the spring clip nuts evenly to specifications.**

3. If a new axle housing is being installed, remove the bolts that retain the carrier plate and bearing retainer from the old housing flanges. Position the bolts in the new housing flanges to hold the brake carrier plates in position. Install the carrier plates with new gaskets to the axle housing flanges.

4. Connect the vent tube to the axle housing.

5. Position the brake line to the axle housing, and secure with the retaining clips.

6. Raise the rear axle housing and springs enough to allow connecting the rear shock absorbers to the spring clip plates. Connect the lower stud of each shock absorber to its spring clip plate, and install the bushing, washer, and nut on the stud. **Be sure the spring clip plate is free of burrs. Tighten the nut to specified torque.**

7. Install the carrier assembly and the two axle shaft assemblies in the axle housing as outlined in the "Installation" procedure under "Differential Carrier – Removable Carrier Type Axle."

4 MAJOR REPAIR OPERATIONS—INTEGRAL CARRIER TYPE AXLES

DISASSEMBLY

All service operations on the differential case assembly and the drive pinion assembly can be performed with the housing in the car.

REMOVAL OF DIFFERENTIAL CASE AND DRIVE PINION

1. Raise the car and support it on the underbody, so that the rear axle drops down as far as the springs and shock absorbers permit.

2. Remove the cover from the carrier casting rear face, and drain the lubricant. On a Mustang, the muffler assembly must be removed to provide clearance for removing the cover.

3. Perform the "Inspection Before

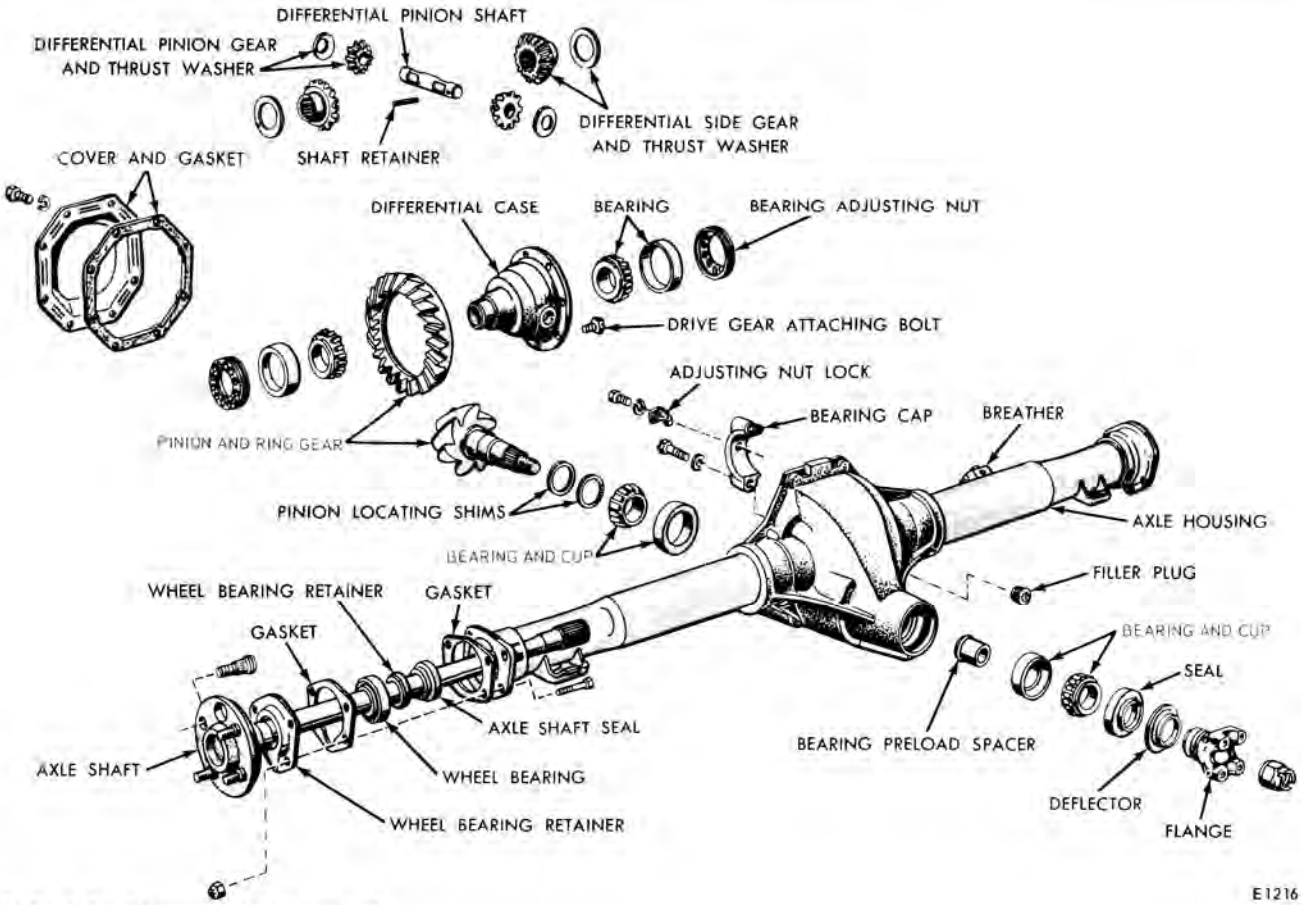


FIG. 15—Disassembled Rear Axle

Disassembly of Carrier" in Part 4-1, Section 3.

4. Remove both rear wheels.

5. Back off the rear brake shoe adjustments, and then remove the brake drums.

6. Working through the hole provided in the axle shaft flange, remove the nuts that attach the wheel bearing retainers to the axle housing.

7. Pull the axle shafts with the tool shown in Fig. 4. Install a nut on one of the brake carrier plate retaining bolts to hold the plate to the axle housing after the shaft has been removed. **Whenever a rear axle shaft is removed the wheel bearing oil seal must be replaced.** Remove both seals with the tool shown in Fig. 9.

8. Make scribe marks on the drive shaft end yoke and the axle U-joint flange to insure proper position of the drive shaft at assembly (Fig. 14). Disconnect the drive shaft from the axle U-joint flange. **Be careful to avoid dropping the loose universal joint bearing cups.** Hold the cups on the spider with tape. Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing. Install an oil seal replacer tool in the transmission extension housing to prevent transmission leakage. Refer to the transmission group for the appropriate tool.

9. Remove the differential bearing adjusting nut locks (Fig. 15).

10. Mark one differential bearing cap and the case (Fig. 16) to help position the parts properly during assembly.

11. Remove the differential bearing cap bolts and bearing caps. **Hold the differential case assembly in the housing after the caps are removed.**

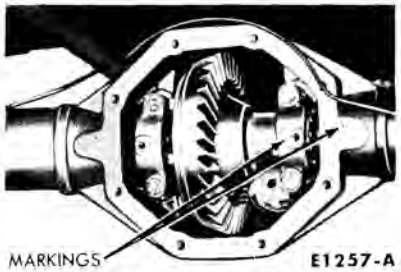


FIG. 16—Typical Differential Bearing Cap Marking



FIG. 17—Differential Case Removal or Installation

12. Remove the differential case and bearing cups (Fig. 17).

13. Hold the drive pinion flange and remove the pinion nut (Fig. 10).

14. Remove the pinion flange (Fig. 11).

15. With a soft-faced hammer, drive the pinion out of the front bearing cone and remove it through the rear of the carrier casting.

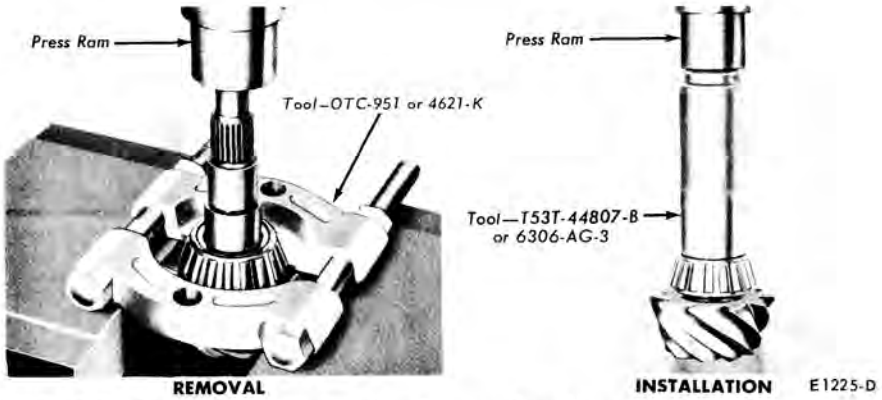


FIG. 18—Pinion Rear Bearing Cone Removal and Installation

16. Drive against the pinion front bearing cone, and drive the pinion flange seal and the bearing cone out of the front of the carrier casting.

17. To remove and install the pinion rear bearing cone use the tools in Fig. 18.

18. Measure the shim which is found under the bearing cone with a micrometer. Record the thickness of the shim.

DISASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. If the differential bearings are to be removed, use the tools shown in Fig. 19.

2. Remove the bolts that attach the ring gear to the differential case. Press the ring gear from the case or tap it off with a soft-faced hammer.

3. With a drift, drive out the differential pinion shaft lock pin (Fig. 20).

4. Drive out the pinion shaft with a brass drift. Remove the gears and thrust washers.

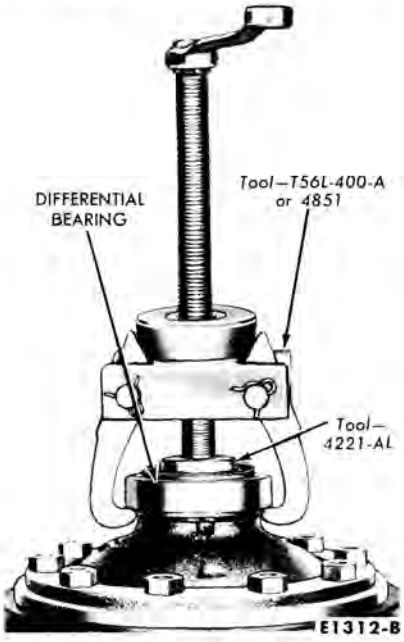


FIG. 19—Differential Bearing Removal

DISASSEMBLY OF LOCKING DIFFERENTIAL CASE

1. Place the differential case in a hydraulic press, and apply about one ton pressure across the case bearing hubs while removing the drive gear attaching bolts. This procedure will contain the spring pressure between the differential case and cover until after the bolts are removed, and thereby prevent stripping of the threads.

2. Release the hydraulic press ram, and remove the differential case cover.

3. Remove the Belleville spring (Fig. 21).

4. Remove the steel and the bonded clutch plates.



FIG. 20—Differential Pinion Shaft Lock Pin Removal

5. Remove the differential clutch hub, outer side gear, and thrust washer.

6. Remove the ring gear from the differential case.

7. Drive out the differential pinion shaft lock pin.

8. With a brass drift, drive out the differential pinion shaft. Then remove the pinion gears, inner side gear and thrust washers.

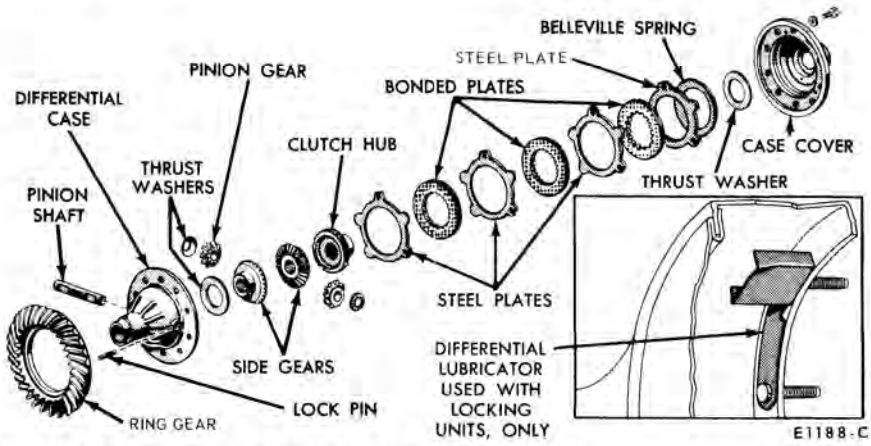


FIG. 21—Locking Differential Assembly

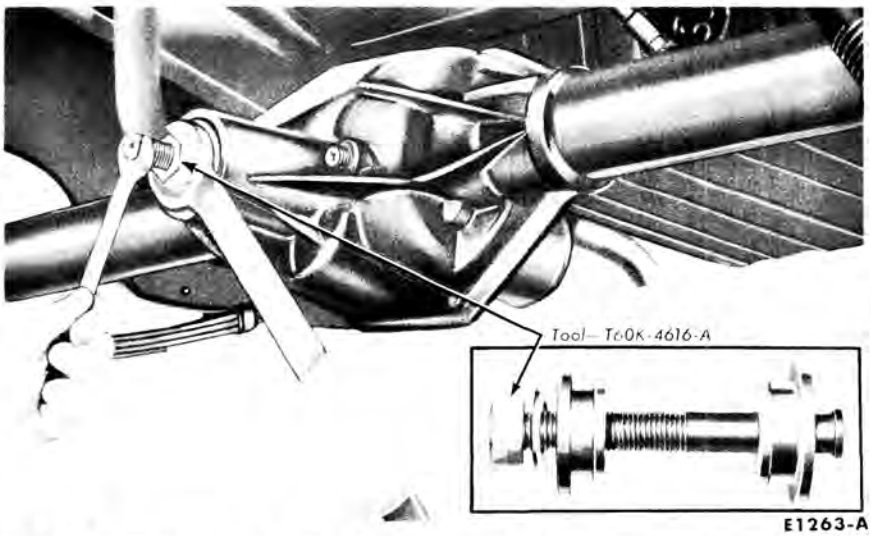


FIG. 22–Pinion Bearing Cup Removal or Installation

PARTS REPAIR OR REPLACEMENT

Clean and inspect all the parts as outlined in Part 4-1, Section 3. Before assembling the carrier, repair or replace all parts as indicated by the inspection.

The principal replacement operations are covered in the following procedures. All other repair or replacement operations are performed during "Cleaning and Inspection" Part 4-1, Section 3, or during the "Assembly" in this section.

PINION BEARING CUPS

Do not remove the pinion bearing cups from the carrier casting unless the cups are worn or damaged.

If the pinion bearing cups are to be replaced, drive them out of the carrier casting with a drift. Install the new cups with the tool shown in Fig. 22. Make sure the cups are properly seated in their bores. If a 0.0015 inch feeler gauge can be inserted between a cup and the bottom of its bore at any point around the cup, the cup is not properly seated.

Whenever the cups are replaced, the cone and roller assemblies should also be replaced.

DRIVE PINION AND GEAR SET

Individual differences in machining the carrier casting and the gear set require a shim between the pinion rear bearing cone and the pinion gear to locate the pinion for correct tooth contact with the ring gear. In order to adjust the shim pack to the correct thickness for a given gear set, each pinion gear is marked with an adjustment number such as the +2 marking in Fig. 23.

When replacing a ring gear and pinion it should be noted that the **original** factory installed shim is of the correct thickness to adjust for individual variations in **both** the carrier casting dimension and in the original gear set dimension; therefore, to select the correct shim thickness for the new gear set to be installed, follow these steps:

1. Measure the thickness of the **original shim** with a micrometer.

2. Note the shim adjustment number on both the old pinion and the new pinion.

3. Refer to Table 1 to determine the correct amount of shim thickness change. The amount shown in Table 1 under the old pinion shim adjustment number and in line with the new pinion number is the amount of **change** that should be made to the **original** shim thickness.

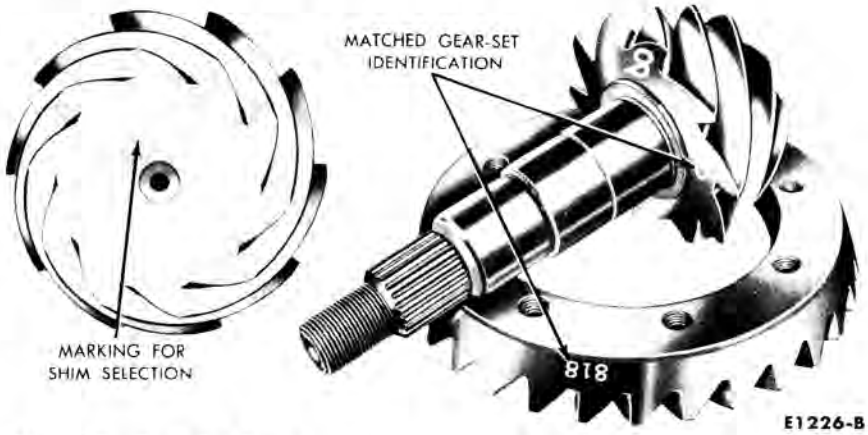


FIG. 23–Gear Set Markings

TABLE 1–Drive Pinion Adjusting Shim Thickness Changes (Inches)

Old Pinion Marking	New Pinion Marking								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

If the old pinion is marked +4, for example, and the pew pinion is marked —2, the table indicates that 0.006 inch of shim stock should be added to the **original** shim pack.

If the **original** shim pack was lost or if a new carrier casting is being installed, substitute a **nominal** 0.018 inch shim for the **original,** and follow the foregoing procedure for a trial build-up. If any further shim change is necessary, it will be indicated in the tooth pattern check.

A new ring gear and pinion should always be installed in an axle as a matched set (never separately). **Be sure that the same matching number appears on both the drive pinion and the ring gear.** Note the number "818" in Fig. 23.

4. After determining the correct shim thickness as explained in the foregoing steps, install the new pinion and ring gear as outlined under "Assembly."

DIFFERENTIAL CASE, BEARINGS, AND DRIVE GEAR

If the ring gear runout check (before disassembly) exceeded specifications, the condition may be caused by a warped gear, a defective case, or excessively worn differential bearings.

To determine the cause of excessive runout proceed as follows:

1. Assemble the two halves of the differential case together **without** the ring gear, and press the two differential side bearings on the case hubs.

2. Place the cups on the bearings and set the differential case in the carrier.

3. Install the bearing caps and adjusting nuts as outlined in steps 11 thru 14 under "Installation of Drive Pinion and Differential Case" in this section.

4. Tighten the right nut two notches beyond the position where it first contacts the bearing cup. Rotate the differential case several revolutions in each direction while the bearings are loaded to seat the bearings in their cups. **This step is important.**

5. Again loosen the right nut to release the preload. Check to see that the left nut contacts the bearing cup. Then set a preload of 2 to 3 notches tight at the right nut.

6. Check the runout of the differential case flange with a dial indicator. If the runout does **not now** exceed specifications, install a new ring gear. If the runout still exceeds specifications, the ring gear is true and the trouble is due to either a defective case or worn bearings.

7. Remove the differential case from the carrier and remove the side bearings from the case.

8. Install **new** bearings on the case hubs, and again install the differential assembly in the carrier **without** the ring gear.

9. Check the case runout again with the new bearings. If the runout is **now** within limits, the old bearings were excessively worn. Use the new bearings for assembly. If the runout is still excessive, the case is defective and should be replaced.

ASSEMBLY

Refer to Part 4-1 for Cleaning and Inspection before starting assembly operations.

ASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. Lubricate all the differential parts with axle lubricant, before they are installed in the case.

2. Place the side gears and thrust washers in the case.

3. Place the two pinion gears and thrust washers exactly opposite each other in the case openings and in mesh with the side gears.

4. Turn the pinions and thrust washers until the holes in the pinion gears align with the pinion shaft holes in the case.

5. Start the pinion shaft into the differential case. Carefully align the shaft lock pin hole with the pin hole in the case. Drive the shaft into place and install the lock pin (Fig. 20).

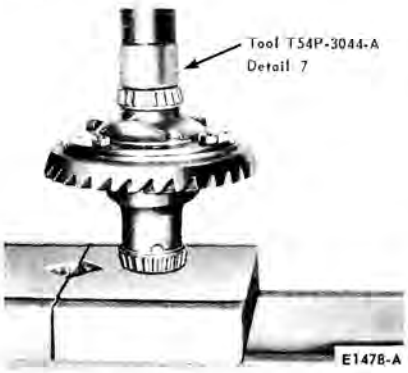


FIG. 24—Differential Bearing Installation

6. Place the ring gear on the differential case and install the bolts. Torque the bolts to specification.

7. If the differential bearings have been removed, press them on as shown in Fig. 24.

ASSEMBLY OF LOCKING DIFFERENTIAL CASE

1. Place the side gear and thrust washer in the differential case (Fig. 21). **Lubricate all parts liberally with axle lubricant during assembly.**

2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.

3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**

4. Install the pinion shaft lock pin. **The lock pin must not extend beyond the surface of the case.**

5. Insert two 2-inch 7/16 (N. F.) bolts through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the drive gear into position.

6. Clamp the differential case in a soft-jawed vise. Install the other differential side gear on the differential pinion gears. Place the clutch hub on the side gear. Place the thrust washer on the hub (Fig. 25).

7. To align the clutch plates during assembly, insert two 3/16 x 2 dowel pins into the differential case. Place a steel plate on the differential case so that the slots in the dog ears straddle the dowel pin (Fig. 25). **Lubricate all the locking differential parts with axle lubricant so that an accurate torque check can be made.**

8. Place a bonded plate on the steel plate. Make sure the bonded plate inner spline teeth properly en-

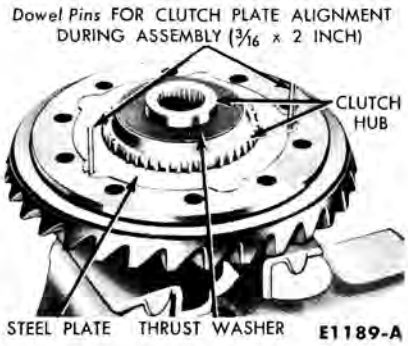


FIG. 25—Clutch Plate Installation



FIG. 26–Belleville Spring Installation

gage the hub spline. Assemble the remaining plates: a steel plate, a bonded plate, a steel plate, a bonded plate, and lastly a steel plate.

9. Place the Belleville spring on the top steel plate. The Belleville spring is assembled with the concave side down (Fig. 26). Carefully center the Belleville spring so that it will fit into the cover.

10. Place the differential case cover on the case (Fig. 27). Start the ring gear bolts.

11. Tighten the bolts evenly and alternately across the diameter of the drive gear. As the bolts are tightened the Belleville spring is compressed and the differential case and cover are pulled together.

12. Remove the dowel pins.

13. Torque the case to ring gear bolts to specifications.

14. Check the torque required to rotate one side gear while the other side gear is held (Fig. 28). Ignore the torque required to start the side gear turning. The torque required to keep it moving steadily should be between 100 and 125 ft-lbs, if new clutch plates were installed. The torque should be at least 50 ft-lbs,

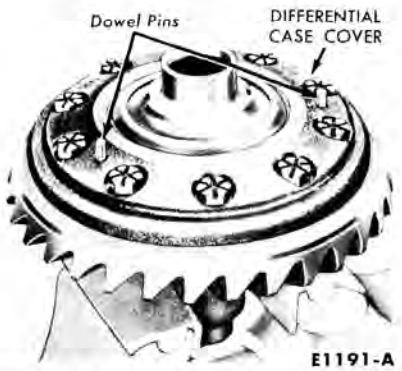


FIG. 27–Differential Cover Installation



FIG. 28–Differential Torque Check

if the original clutch plates were installed. If the required torque is not within these limits, check for improper assembly.

15. If the differential bearings have been removed, press them on as shown in Fig. 24.

INSTALLATION OF DRIVE PINION AND DIFFERENTIAL CASE

1. Place the shim and pinion rear bearing cone on the pinion shaft. Press the bearing and shim firmly against the pinion shaft shoulder (Fig. 18).

2. Place a **new** pinion bearing preload spacer on the pinion shaft.

3. Lubricate the pinion rear bearing with axle lubricant.

4. Lubricate the pinion front bearing cone and place it in the housing.

5. Coat the outside edge of a new oil seal with an oil resistant sealer and install it in the carrier casting (Fig. 12).

6. Insert the drive pinion shaft flange into the seal and hold it firmly against the pinion front bearing cone. From the rear of the carrier casting, insert the pinion shaft into the flange.

7. Place the flat washer on the pinion shaft and start the nut. Use a new nut. Hold the flange with the tool shown in Fig. 10 and tighten the pinion shaft nut. As the pinion shaft nut is tightened, the pinion shaft is pulled into the front bearing cone and into the flange.

As the pinion shaft is pulled into the front bearing cone, pinion shaft end play is reduced. While there is still end play in the pinion shaft, the flange and cone will be felt to bottom. This indicates that the bearing cone and flange have bottomed on the collapsible spacer.

From this point, a much greater torque must be applied to turn the pinion shaft nut, since the spacer must be collapsed. From this point, also, the nut should be tightened very slowly and the pinion shaft end play checked often, so that the pinion bearing preload does not exceed the limits.

If the pinion shaft nut is tightened to the point that pinion bearing preload exceeds the limits, the pinion shaft must be removed and a new collapsible spacer installed. **Do not decrease the preload by loosening the pinion shaft nut.** This will remove the compression between the pinion front and rear bearing cones and the collapsible spacer and may permit the front bearing cone to turn on the pinion shaft.

8. As soon as there is preload on the bearings, **turn the pinion shaft in both directions several times to set the bearing rollers.**

9. Adjust the bearing preload to specification. Measure the preload with the tool shown in Fig. 29.

10. Wipe a thin coating of lubricant on the bearing bores so that the differential bearing cups will move easily.

11. Place the cups on the bearings and set the differential case assembly in the carrier casting (Fig. 17).

If the gear set is of the **non-hunting** or **partial non-hunting** type, assemble the differential case and ring gear assembly in the carrier so that the marked tooth on the pinion

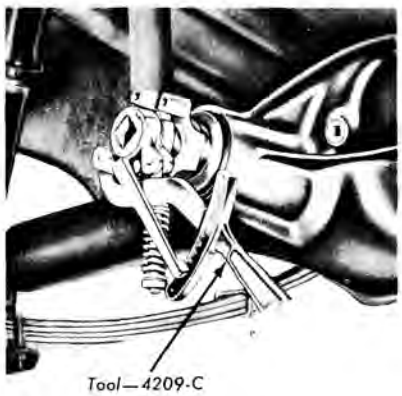


FIG. 29–Pinion Bearing Pre-Load Check

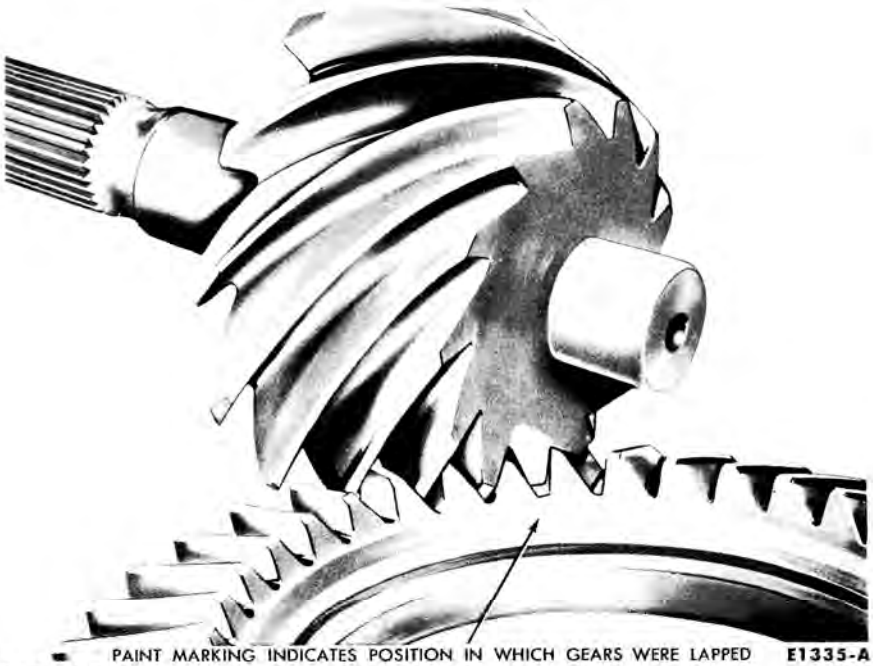


FIG. 30—Typical Gear Set Timing Marks

indexes between the marked teeth on the ring gear as shown in Fig. 30.

In almost every case of improper assembly (gears assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

When installing the **hunting** type gear set (no "timing marks"), assemble the differential case and ring gear assembly in the carrier without regard to the matching of any particular gear teeth.

12. Slide the case assembly along the bores until a slight amount of backlash is felt between the gear teeth. Hold the differential case in place.

13. Set the adjusting nuts in the bores so that they just contact the bearing cups.

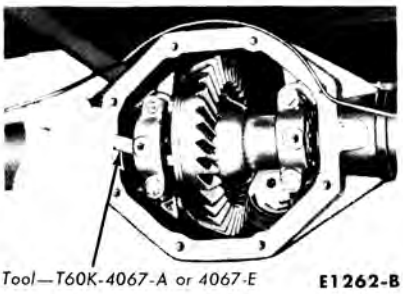


FIG. 31—Backlash and Bearing Pre-Load Adjustment

14. Carefully position the bearing caps on the carrier casting. Match the marks made when the caps were removed.

15. Install the bearing cap bolts and lockwashers. As the bolts are tightened, turn the adjusting nut with the tool shown in Fig. 31.

16. If the adjusting nuts do not turn freely as the cap bolts are tightened, remove the bearing caps and again inspect for damaged threads or incorrectly positioned caps. Tightening the bolts to the specified torque is done to be sure that the cups and adjusting nuts are seated. Loosen the cap bolts, and torque them to only 5 ft-lbs before making adjustments. Refer to part 4-1 for backlash and bearing preload adjustment procedures.

5 MAJOR REPAIR OPERATIONS—REMOVABLE CARRIER TYPE AXLES

DISASSEMBLY

After removing the carrier from the axle housing as described in section 3, mount the carrier in a holding fixture and perform the "Inspection Before Disassembly of Carrier" as explained in Part 4-1, Section 3. Then disassemble the carrier as outlined in the following procedures.

REMOVAL AND DISASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. Mark one differential bearing cap and the mating bearing support with punch marks to help position the parts properly during assembly of the carrier. Also, mark one of the bearing adjusting nuts and the carrier with scribe marks for proper location during assembly (Fig. 45).

2. Remove the adjusting nut locks, bearing caps, and adjusting nuts. Then lift the differential assembly out of the carrier.

3. If the differential bearings are to be removed, use the tool shown in Fig. 19. On cars equipped with 289-4V high performance engines, use tool T57L-4220-A.

4. Mark the differential case, cover, and ring gear for assembly in the original position.

5. Remove the bolts that attach the ring gear to the differential case. Press the gear from the case or tap it off with a soft-faced hammer.

6. With a drift, drive out the differential pinion shaft lock pin (Fig. 32) and separate the 2-piece differential case.



FIG. 32—Differential Pinion Shaft Lock Pin Removal



FIG. 33—Driving Out Differential Pinion Shaft

7. Drive out the pinion shaft with a brass drift (Fig. 33).

8. Remove the gears and thrust washers (Fig. 34).

REMOVAL AND DISASSEMBLY OF LOCKING DIFFERENTIAL CASE

1. Remove the differential case from the carrier and remove the bearings from the differential as outlined in steps 1 through 4 in the foregoing procedure.

2. Place the differential case in a hydraulic press, and apply about one ton pressure across the case bearing hubs while removing the ring gear attaching bolts. This procedure will contain the spring pressure between the differential case and cover until after the bolts are moved, and thereby prevent stripping of the threads. Loosen **alternate** bolts an **equal** amount so that the spring pressure will release evenly.

3. Release the hydraulic press ram, and remove the differential case cover.

4. Remove the Belleville spring (Fig. 21).

5. Remove the steel and the bonded clutch plates.

6. Remove the differential clutch hub, outer side gear, and thrust washer.

7. Remove the ring gear from the differential case.

8. Drive out the differential pinion shaft lock pin.

9. With a brass drift, drive out the differential pinion shaft. Then remove the pinion gears, inner side gear, and thrust washers.

REMOVAL AND DISASSEMBLY OF DRIVE PINION AND BEARING RETAINER

1. Turn the carrier case upright, and remove the pinion shaft nut (Fig. 35). Then remove the U-joint flange (Fig. 36).

2. Remove the seal (Fig. 37) and the slinger.

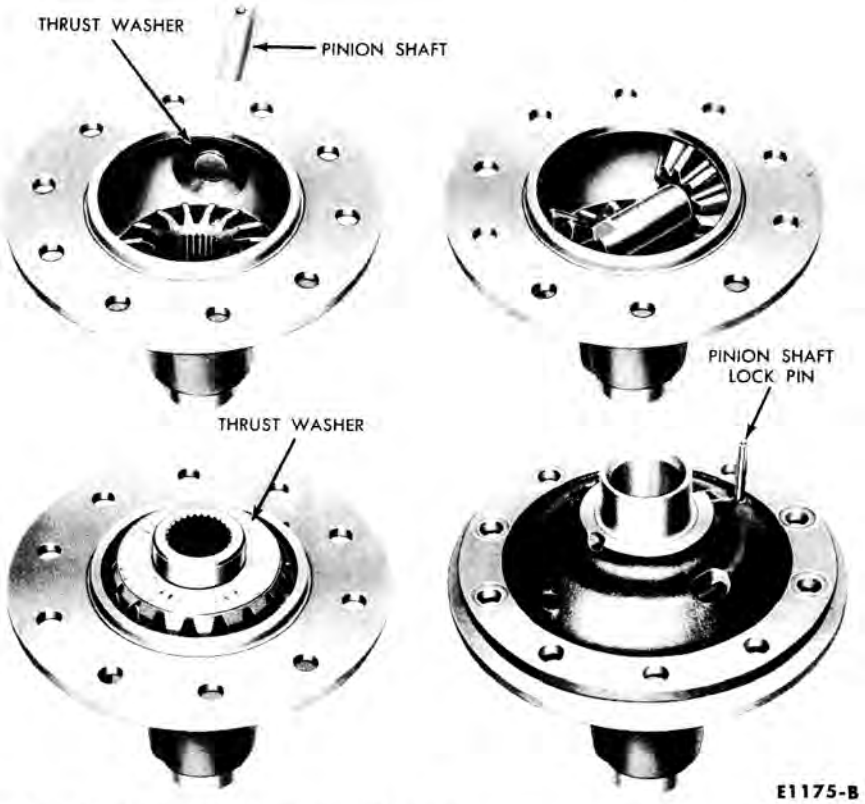


FIG. 34—Assembly of Differential Case

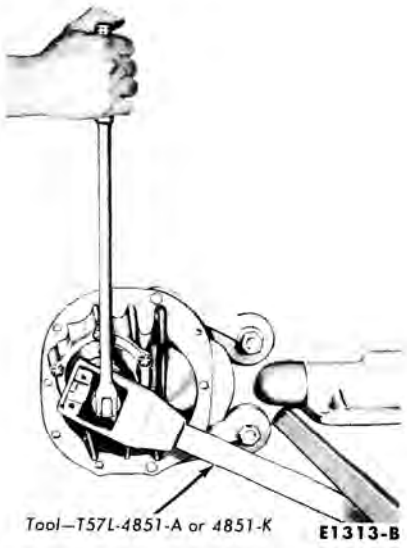


FIG. 35—Pinion Shaft Nut Removal



FIG. 36—U-Joint Flange Removal

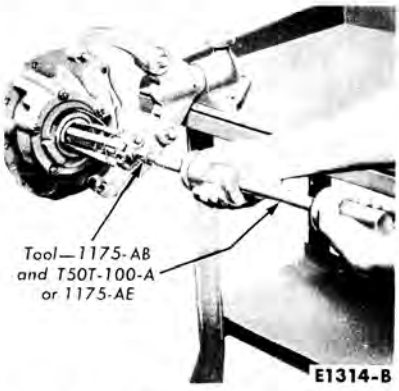


FIG. 37—Pinion Seal Removal

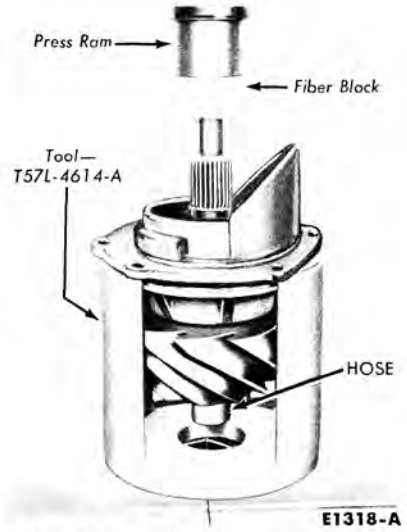


FIG. 38—Pinion Front Bearing Cone Removal

3. Remove the pinion, bearing, and retainer assembly from the carrier housing (Fig. 48). Measure the shim thickness with a micrometer. Record this original shim thickness. If a new gear set is installed during assembly, a new shim will have to be installed. The original shim thickness is one of the factors necessary in calculating the new shim thickness. **Extreme care must be taken not to damage the mounting surfaces of the retainer and carrier.**

4. Place a protective sleeve (hose) on the pinion pilot bearing surface. Press the pinion shaft out of the pinion front bearing cone (Fig. 38).

5. Press the pinion shaft out of the pinion rear bearing cone (Fig. 39).

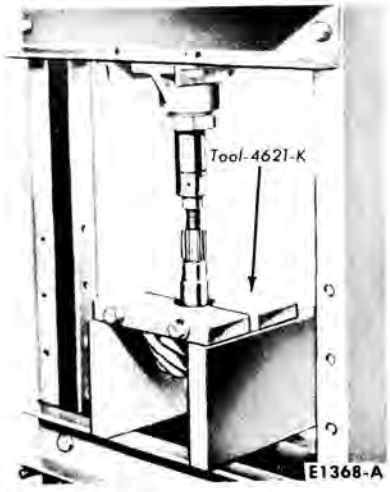


FIG. 39—Pinion Rear Bearing Cone Removal

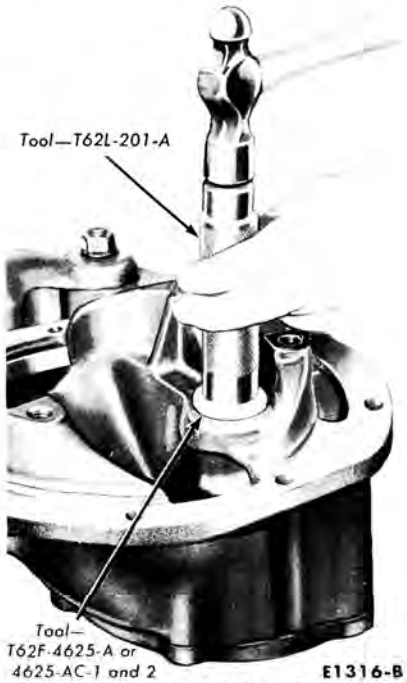


FIG. 40—Pilot Bearing Removal

PARTS REPAIR OR REPLACEMENT

Clean and inspect all the parts as outlined in Part 4-1, Section 3. Before assembling the carrier, repair or replace all parts as indicated by the inspection.

The principal replacement operations are covered in the following procedures. All other repair or replacement operations are performed during "Cleaning and Inspection" Part 4-1, Section 3, or during the "Assembly " in this section.

PILOT BEARING

1. Remove the pilot bearing as shown in Fig. 40. Drive out the pilot bearing and the bearing retainer together. On cars with high performance engines, use handle adapter T53L-200A with tool 757L-4625-A or 4625-K.

2. Drive the new bearing in until it bottoms as shown in Fig. 41. On cars with high performance engines, use handle adapter 753L-200-A with tool 757L-4625-A, or 4625-K, or 4625-KA.

3. Using the same tool, install a **new** pilot bearing retainer with the concave side up.

PINION BEARING CUPS

Do not remove the pinion bearing cups from the retainer unless the cups are worn or damaged. The flange and pilot of the retainer are machined during manufacture by locating on these cups after they are installed in their bores. If the cups are worn or damaged, they should be removed and replaced as shown in Figs. 42 and 43. On cars



FIG. 41—Pilot Bearing Installation

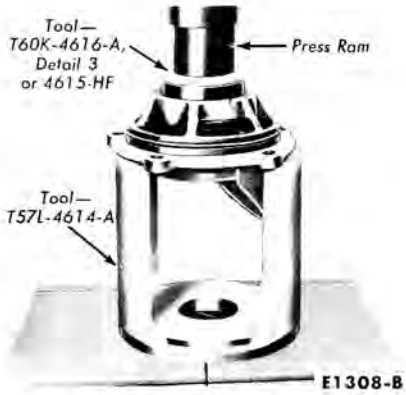


FIG. 42—Pinion Bearing Cup Removal

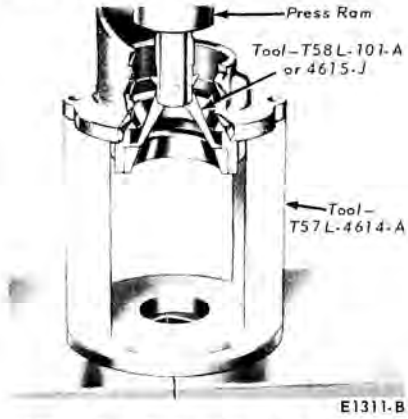


FIG. 43—Pinion Bearing Cup Installation

TABLE 2—DRIVE PINION ADJUSTING SHIM THICKNESS CHANGES (Inches)

New Pinion Marking	Old Pinion Marking								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

equipped with 289-4V, high performance engines, use the following tools: T57L-4614-A with T57L-4616-A for front cup removal except Comet; tool 4615-D for Comet front cup removal; T57L-4614-A with T57L-4616-A2 for front cup installation and T57L-4614-A with T55P-4616-A2 for rear cup installation.

After the new cups are installed, make sure they are seated in the retainer by trying to insert a 0.0015 inch feeler gauge between the cup and the bottom of the bore.

Whenever the cups are replaced, the cone and roller assemblies should also be replaced.

DRIVE PINION AND GEAR SET

When replacing a ring gear and pinion, note that the original factory installed shim is of the correct thickness to adjust for individual variations in both the carrier housing dimension and in the original gear set dimension. Therefore, to select the correct shim thickness for the new gear set to be installed, follow these steps:

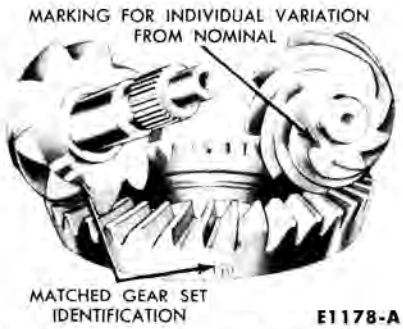


FIG. 44—Pinion and Ring Gear Markings

1. Measure the thickness of the **original shim** with a micrometer.

2. Note the shim adjustment number on both the old pinion and the new pinion. Each pinion gear is marked with an adjustment number such as the +1 marking in Fig. 44.

3. Refer to Table 2 to determine the correct amount of shim thickness change. The amount shown in the table under the old pinion shim adjustment number and in line with the new pinion number is the amount of **change** that should be made to the **original** shim thickness.

If the old pinion is marked +4, for example, and the new pinion is marked −2, the table indicates that 0.006 inch of shim stock should be removed from the **original** shim pack.

If the **original** shim pack was lost or if a new carrier housing is being installed, substitute a **nominal** 0.020 inch shim for the **original,** and follow the foregoing procedure for a trial build-up. If any further shim change is necessary, it will be indicated in the tooth pattern check.

A new ring gear and pinion should always be installed in an axle as a matched set (never separately). **Be sure that the same matching number appears on both the drive pinion and the ring gear.** Note the number "170" in Fig. 44.

4. After determining the correct shim thickness as explained in the foregoing steps, install the new pinion and ring gear as outlined under "Assembly."

DIFFERENTIAL CASE, BEARINGS AND RING GEAR

If the ring gear runout check (before disassembly) exceeded specifications, the condition may be caused by a warped gear, a defective case, or excessively worn differential bearings.

To determine the cause of excessive runout proceed as follows:

1. Assemble the two halves of the differential case together **without** the ring gear, and press the two differential side bearings on the case hubs.

2. Place the cups on the bearings and set the differential case in the carrier.

3. Install the bearing caps and adjusting nuts as outlined in steps 11 thru 14 under "Assembly and Installation of Conventional Differential Case" in this section.

4. Tighten the right nut two notches beyond the position where it first contacts the bearing cup. Rotate the differential case several revolutions in each direction while the bearings are loaded to seat the bearings in their cups. **This step is important.**

5. Again loosen the right nut to release the preload. Check to see that the left nut contacts the bearing cup. Then set a preload of 2½ to 3 notches tight at the right nut.

6. Check the runout of the differential case flange with a dial indicator. If the runout does **not now** exceed specifications, install a new drive gear. If the runout still exceeds specifications, the ring gear is true and the trouble is due to either a defective case or worn bearings.

7. Remove the differential case from the carrier and remove the side bearings from the case.

8. Install **new** bearings on the case hubs, and again install the differential assembly in the carrier **without** the ring gear.

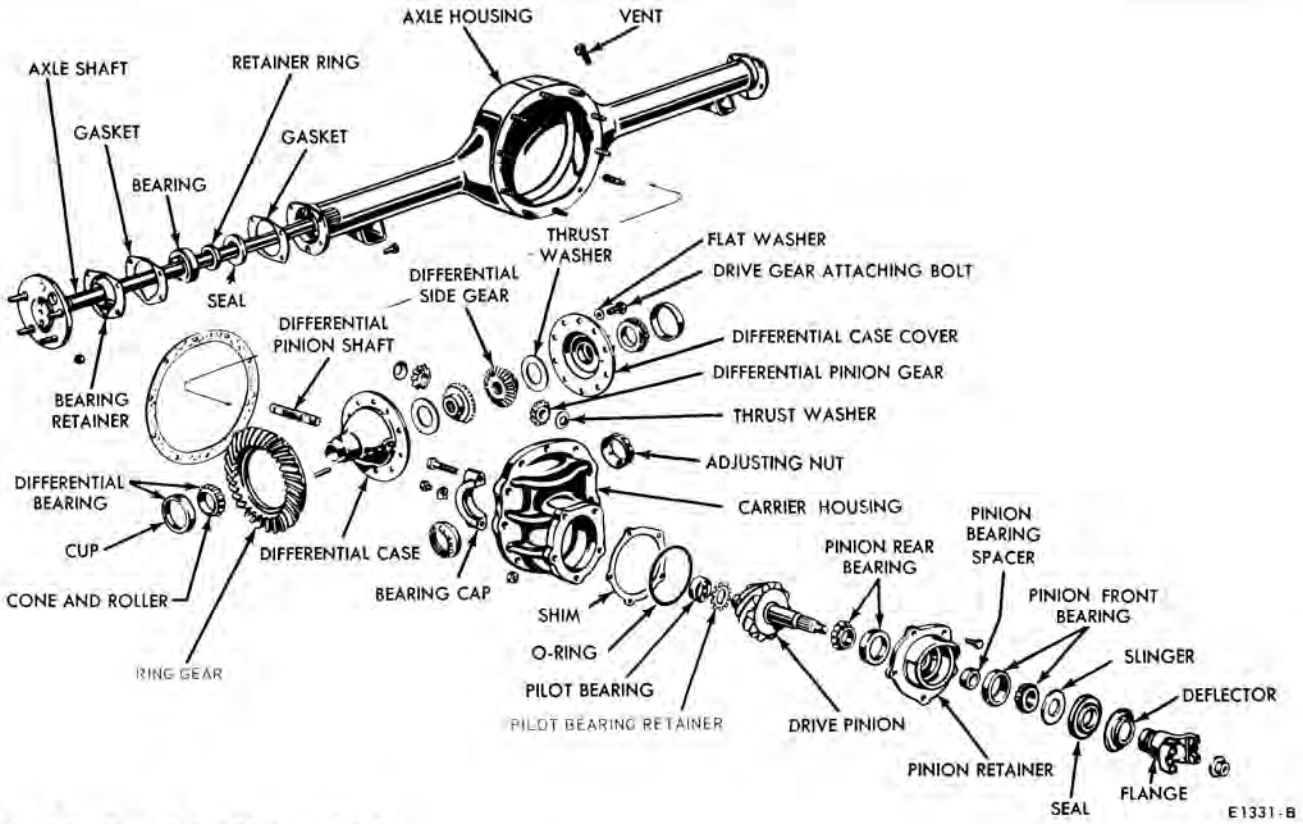


FIG. 45—Rear Axle—Disassembled

9. Check the case runout again with the new bearings. If the runout is **now** within limits, the old bearings were excessively worn. Use the new bearings for assembly. If the runout is still excessive, the case is defective and should be replaced.

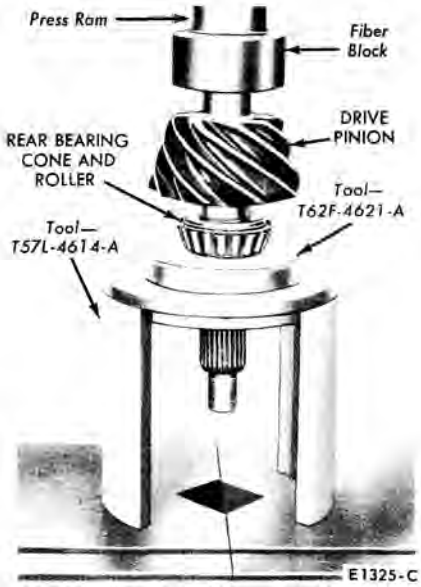


FIG. 46—Pinion Rear Bearing Cone Installation

ASSEMBLY

Refer to Part 4-1 for Cleaning and Inspection before starting assembly operations. Fig. 45 shows the disassembled parts.

ASSEMBLY AND INSTALLATION OF DRIVE PINION AND BEARING RETAINER

1. Install the drive pinion rear bearing cone and roller on the pinion shaft (Fig. 46). On cars equipped with 289-4V high performance engines use tool T57L-4621-B along with tool 757L 4614-A as shown in Fig. 46. Place a new spacer on the pinion shaft (Fig. 47).

2. Place the bearing retainer on the pinion shaft, and install the front bearing cone and roller in the retainer. Press the front bearing cone and roller into position with the same tools as used in Fig. 46 for front bearing installation. On cars with high performance engines, use T57L-4621-B along with tool T57L-4614-A.

3. Lubricate the O-ring with axle lubricant and install it in its groove in the pinion retainer. Be careful not to twist it. Snap the O-ring into position.

4. Place the proper shim on the carrier housing and install the pinion and retainer assembly being careful not to pinch the O-ring (Fig. 48).

5. Install the pinion retainer bolts. Torque bolts to specifications.

6. Place the slinger on the pinion shaft.

7. Coat the outside edge of a new oil seal with a small amount of an oil resistant sealer. **Do not put any of the sealer on the sealing lip.** Install the seal in the bearing retainer (Fig. 49). On cars with high performance engines, use tool T58L-4676-A or tool 4676-F.

New seals should be soaked in SAE 10 oil for ½ hour before use.

8. Install the U-joint flange (Fig. 50).

9. Start a new integral nut and washer on the pinion shaft.

10. Hold the flange (Fig. 35) and tighten the pinion shaft nut to 175 ft-lbs. Do not exceed 175 ft-lbs at this time. As the pinion shaft nut is tightened, rotate the pinion shaft frequently to allow the bearing to seat.

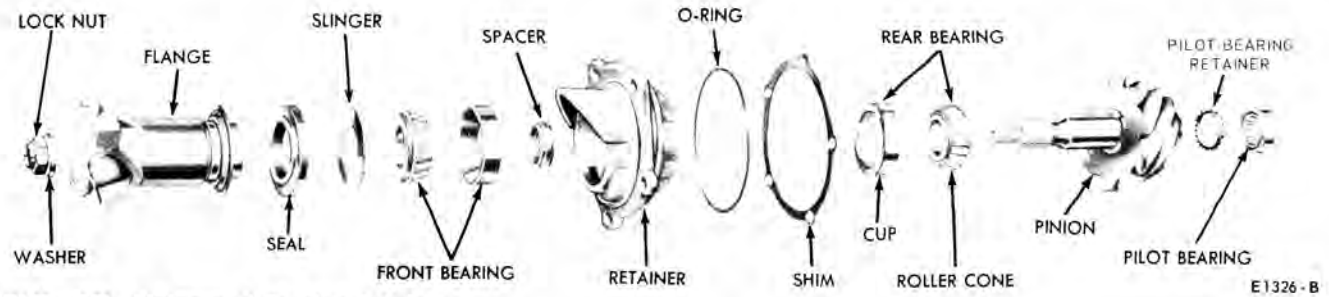


FIG. 47—Pinion and Bearing Retainer



FIG. 48—Pinion and Retainer Installation

11. Check the pinion bearing preload as shown in Fig. 51. If an inch-pound torque wrench is not available tool 4209-C may be used in combination with tool 4209-C12. Correct preload will be obtained when the torque required to rotate the pinion in the retainer is as specified in Part 4-3. If the torque required to rotate the pinion is less than specified, tighten the pinion shaft nut a little at a time until the proper preload is established. **Do not overtighten the nut.** If excessive preload is obtained as a result of overtightening, replace the collapsible bearing spacer.

Do not back off the pinion shaft nut to establish pinion bearing preload. If the torque on the pinion shaft nut is less than 175 ft-lbs. after bearing preload is established, a new collapsible spacer must be used.

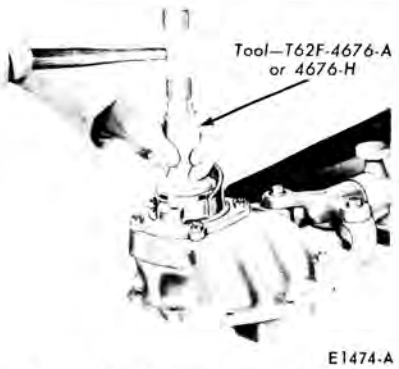


FIG. 49—Oil Seal Installation

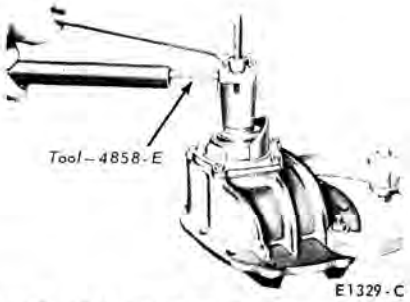


FIG. 50—U-Joint Flange Installation

ASSEMBLY AND INSTALLATION OF CONVENTIONAL DIFFERENTIAL CASE

1. Place a side gear and thrust washer in the differential case bore (Fig. 34). **Lubricate all differential parts liberally with axle lubricant during assembly.**

2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.

3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**

4. Place the second side gear and thrust washer in position (Fig. 34), and install the cover on the differential case. Install the pinion shaft lock pin. A pinion or axle shaft spline can be inserted in the side gear spline to check for free rotation of the differential gears.

5. Insert two 7/16 (N. F.) bolts two inches long through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes Press or tap the ring gear into position.

6. Install and tighten the ring gear bolts and washers evenly, and torque them alternately across the gear to specification.

7. If the differential bearings have been removed, press them on as shown in Fig. 52.

8. Wipe a thin coating of lubricant on the bearing bores so that the

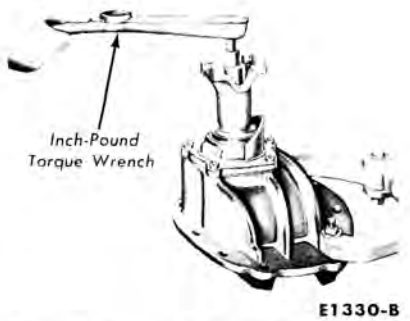


FIG. 51—Pinion Bearing Pre-Load Check

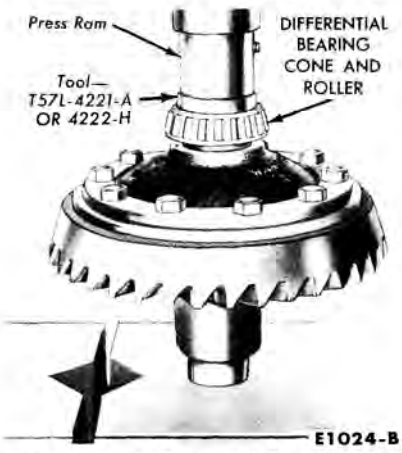


FIG. 52—Differential Bearing Installation

differential bearing cups will move easily.

9. Place the cups on the bearings. If the gear set is of the **non-hunting** or **partial non-hunting** type, assemble the differential case and ring gear assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the ring gear as shown in Fig 30.

In almost every case of improper assembly (gears assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

When installing the **hunting** type gear set (no "timing marks"), assemble the differential case and ring gear assembly in the carrier without regard to the matching of any particular gear teeth.

10. Slide the assembly along the bores until a slight amount of backlash is felt between the gear teeth.

11. Set the adjusting nuts in the bores so that they just contact the bearing cups. The nuts should be engaged about the same number of threads on each side.

12. Carefully position the bearing caps on the carrier. Match the marks made when the caps were removed.

13. Install the bearing cap bolts and alternately torque them to 70-80 ft-lbs.

14. If the adjusting nuts do not turn freely as the cap bolts are tightened, remove the bearing caps and again inspect for damaged threads or incorrectly positioned caps. Tightening the bolts to the specified torque is done to be sure that the cups and adjusting nuts are seated. Loosen the cap bolts, and torque them to only 25 ft-lbs. before making adjustments.

15. Adjust the backlash between the ring gear and pinion as outlined in Part 4-1, Section 2.

16. Be sure to make a final tooth pattern check before installing the carrier assembly in the axle housing.

ASSEMBLY AND INSTALLATION OF LOCKING DIFFERENTIAL CASE

1. Place the side gear and thrust washer in the differential case (Fig. 21). **Lubricate all parts liberally with axle lubricant during assembly.**

2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.

3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**

4. Install the pinion shaft lock pin. **The lock pin must not extend beyond the surface of the case.**

5. Insert two 2-inch 7/16 (N. F.) bolts through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the ring gear into position.

6. Clamp the differential case in a soft-jawed vise. Install the other differential side gear on the differential pinion gears. Place the clutch hub on the side gear. Place the thrust washer on the hub (Fig. 25).

7. To align the clutch plates during assembly, insert two 3/16 x 2 dowel pins into the differential case. Place a steel plate on the differential case so that the slots in the dog ears straddle the dowel pin (Fig. 25). **Lubricate all the locking differential parts with axle lubricant so that an accurate torque check can be made.**

8. Place a bonded plate on the steel plate. Make sure the bonded plate inner spline teeth properly engage the hub spline. Assemble the remaining plates: a steel plate, a bonded plate, a steel plate, a bonded plate, and lastly a steel plate.

9. Place the Belleville spring on the top steel plate. The Belleville spring is assembled with the concave side down (Fig. 26). Carefully center the Belleville spring so that it will fit into the cover.

10. Place the differential case cover on the case (Fig. 27). Start the ring gear bolts.

11. Tighten the bolts evenly and alternately across the diameter of the ring gear. As the bolts are tightened the Belleville spring is compressed and the differential case and cover are pulled together.

12. Remove the dowel pins.

13. Torque the case to ring gear bolts to specifications.

14. Check the torque required to rotate one side gear while the other side gear is held (Fig. 28). Ignore the torque required to start the side gear turning. The torque required to keep it moving steadily should be between 155 and 195 ft-lbs, if new clutch plates were installed. The torque should be at least 75 ft-lbs, if the original clutch plates were installed. If the required torque is not within these limits, check for improper assembly.

15. Install the side bearings on the differential case, and install the case in the carrier as described in steps 7 through 16 under "Assembly and Installation of Conventional Differential Case".

PART 4-3 SPECIFICATIONS

REAR AXLE LUBRICATION

Axle Type	Ford Specification	Ford Part No.	Capacity
Integral Carrier	M2C28-B	C2AZ-19590-A	2½ Pints (Approximate)
Removable Carrier (Except with 289-4V Engine)	M-2C50-B	C1AZ-19580-E or F	4½ Pints (Approximate)
Removable Carrier (With 289-4V Engine)	M2C57-A	C2AZ-19580-D	5 Pints (Approximate)
All Axles Equipped With Locking Differential	Use M-2C50-B, plus (1) ounce of M-2C58-A (C1AA-19B546-A) additive per pint of M-2C50-B (4 oz. for complete refill).		

For temperatures above −25°F use SAE 90 Grade lubricant.
For temperatures below −25°F use SAE 80 Grade lubricant.

REAR AXLE—INTEGRAL CARRIER TYPE

DRIVE PINION ADJUSTING SHIM THICKNESS CHANGES—INCHES

Old Pinion Marking	New Pinion Marking								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

REAR AXLE RATIOS, GEAR AND CODE IDENTIFICATION

Identification Tag	Ring Gear Diameter (Inches)	Type of Differential	Axle Ratio	No. of Teeth		Type of Gear Set
				Ring Gear	Pinion	
WCY-F WCY-AC	7¼	Conventional	3.50:1	35	10	Partial Non-Hunting
WDJ-D WDJ-H	7¼	Locking				
WCY-T	7¼	Conventional	4.00:1	36	9	Non-Hunting
WCY-AB WCY-E	7¼	Conventional	3.20:1	32	10	Partial Non-Hunting
WCY-AD WCY-L	7¼	Locking				
WCY-R WCY-AF WCY-N	7¼	Conventional	2.83:1	34	12	Non-Hunting
WCY-AG WCY-AA	7¼	Locking				

ADJUSTMENTS

	Inch
Backlash Between Ring Gear and Pinion	0.008-0.012
Backlash Variation Between Teeth	Max. 0.002
Runout of Backface of Ring Gear as Assembled	Max. 0.002
Thickness: Differential Side Gear Thrust Washers Differential Pinion Gear Thrust Washers	 0.030-0.032 0.030-0.032
Rear Bearing Cone to Pinion Gear Nominal Shim	 0.017
Shims Available:	0.008-0.024

TORQUE LIMITS

	Ft-lbs
Rear Cover Bolts	10-17
Differential Bearing Cap Screws	40-55
Differential Bearing Adjusting Nut Lock Bolts	12-20
Rear Shock Absorbers to Rear Spring Clip Plate Assembly Nuts	15-25
Universal Joint Flange Axle End to Universal Joint Bearing Assembly Nuts	10-14
Ring Gear Attaching Cap Screws	40-50
Rear Axle Shaft Bearing Retaining Nuts	30-35
Spring Clip Nuts (Rear Springs to Axle Housing)	13-20
Minimum Torque Required to Tighten Pinion Flange Lock Nut to Obtain Correct Pinion Bearing Preload	140
Pinion Bearing Preload New Bearings Used Bearings	 17-27* 6-12*
Differential Bearing Preload	2-3 notches tight

*Inch-pounds

REAR AXLE—REMOVABLE CARRIER TYPE

REAR AXLE RATIOS, GEAR AND CODE IDENTIFICATION

Identification Tag	Ring Gear Diameter (Inches)	Type of Differential	Axle Ratio	No. of Teeth		Type of Gear Set
				Ring Gear	Pinion	
WCZ-M WCZ-F	8	Conventional	3.00:1	39	13	Non-Hunting
WDJ-G WDJ-C	8	Locking				
WCZ-A WCL-K WCZ-K	8	Conventional	3.25:1	39	12	Partial Non-Hunting
WCZ-G WCZ-N WCL-J	8	Conventional	3.50:1	35	10	Partial Non-Hunting
WCU-B*	8¾					
WDJ-D WDJ-H	8	Locking				
WDK-B*	8¾					
WCU-C* WCZ-H*	8¾	Conventional	3.89:1	35	9	Partial Non-Hunting
WCU-D* WCZ-J*	8¾	Conventional	4.11:1	37	9	Hunting
WCZ-L WCL-N	7¾	Conventional	2.80:1	42	15	Hunting

*Used with 289-4V High Performance Engine

ADJUSTMENTS

	Inch
Backlash Between Ring Gear and Pinion	0.008-0.012
Maximum Backlash Variation Between Teeth	0.003
Maximum Runout of Backface of Ring Gear as Assembled	0.003

	Inch
Thickness Differential Side Gear Thrust Washers Differential Pinion Gear Thrust Washers	 0.030-0.032 0.030-0.032
Nominal Pinion Locating Shim	0.020
Available Shims (In steps of 0.001 inch)	0.010-0.029

TORQUE LIMITS

Description			Except with 289-4V H.P. Ft-lbs	With 289-4V High Performance Ft-lbs
Differential Bearing Cap Screws			55-65	70-85
Differential Bearing Adjusting Nut Lock Bolts			12-20	12-25
Carrier to Housing Stud Nuts			30-40	30-40
Pinion Retainer to Carrier Cap Screws			30-40	30-45
Ring Gear Attaching Cap Screws			65-75	65-80
Rear Axle Shaft Bearing Retainer Bolts			30-40	30-40
Rear Shock Absorber to Rear Spring Clip Plate Assembly Nuts			15-22	15-22
Pinion Flange U-Bolt Nuts			12-15	15-20
Spring Clip Nuts (Rear Springs to Axle Housing)			30-45	30-45
Minimum Torque Required to Tighten Pinion Nut to Obtain Correct Pinion Bearing Preload			175*	175*
Pinion Bearing Preload	New Bearings and New Seal	22-32 inch-pounds		22-32 inch-pounds
	Used Bearings and New Seal	10-14 inch-pounds		10-14
Differential Bearing Preload		2½-3 notches tight		2½-3 notches tight

*If this torque can not be obtained with a used spaces, install a new spacer.

REAR AXLES WITH LOCKING DIFFERENTIAL

Torque Check		Integral Carrier Type Axles	Removable Carrier Type Axles
Minimum torque required to turn axle shaft and side gear with one wheel on the ground		50 ft-lbs	75 ft-lbs
Bench Check After Assembly	With New Clutch Plates	100-125 ft-lbs	155-195 ft-lbs
	With Original Clutch Plates	50 ft-lbs Minimum	75 ft-lbs Minimum

SPECIAL TOOLS

Ford Tool No.	Former No.	Description
T50T-100-A	B-166	Impact Hammer
T58L-101-A		Puller Attachment
T62L-201-A	—	Handle Adapter
T56L-400-A	4851-A	Puller
T57L-500-A	—	Bench Mounted Holding Fixture
T00L-1175-AB	1175-AB	Grease Seal Remover (Head Only)
T50T-100-A and T00L-1175-AB	1175-AE	Seal Remover
T60K-1177-B	1177-B	Rear Wheel Bearing Oil Seal
T60K-1225-A or T00L-1225-C		Axle Shaft Bearing Remover and Replacer. Axle Shaft Bearing Remover
T00L-1225-B		Axle Shaft Bearing Replacer
T60K 4067-A	4067-E	Differential Bearing Adjuster Nut Wrench
T00L-4209-C	4209-C	Pinion Tension Scale with T00L-4209-C12 Socket
T00L-4221-AL	4221-AL	Differential Bearing Cone Remover Pilot (Use with T00L-4221-C or T00L-4851-A)
T57L-4221-A	4222-K	Differential Bearing Cone Replacer
T00L-4222-H	4222-H	Differential Bearing Cone Replacer
T60K-4234-A	4235-D	Rear Axle Shaft Assemly Remover Adapter
T57L-4614-A	4614	Drive Pinion and Drive Pinion Retainer Assembly Support
T00L-4615-J	4615-J	Drive Pinion Front Bearing Cup Remover
T60K-4616-A	4615-HF 4625-HR	Pinion Bearing Cup Replacer
T57L-4616-A	4615-D	Pinion Front Bearing Cup Remover
T57L-4616-A2		Pinion Front Bearing Cup Replacer
T55P-4616-A2		Pinion Rear Bearing Cup Replacer
T00L-4621-K	4621-K	Drive Pinion Rear Bearing Cone Remover
T62F-4621-A		Pinion Bearing Cone Replacer
T62F-4625-A	4625-AC-1 & 2	Drive Pinion Pilot Bearing Remover and Replacer
T55P-4676-A	4676-G	Drive Pinion Oil Seal Replacer
T62F-4676-A	4676-H	Drive Pinion Oil Seal Replacer
T53T-4851-A	4851-A 4858-D	Flange (Universal Joint) Axle End Remover
T57L-4851-A	4851-K	Universal Joint Flange Holder
T00L-4858-E	4858-E	Companion Flange and Pinion Bearing Replacer
T59L-4204-A	44211 and 44211-A	Locking Differential Torque Check
T65K-4204-A		Locking Differential Torque Check Adapter

DRIVE PINION ADJUSTING SHIM THICKNESS CHANGES (inch)

New Pinion Marking	New Pinion Marking								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

DRIVE LINE AND CLUTCH

GROUP 5

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PART 5-1 DRIVE LINE

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1 Trouble Diagnosis 5-1
2 Description and Operation 5-1
3 Replacement 5-2

1 TROUBLE DIAGNOSIS

DRIVE SHAFT TROUBLE DIAGNOSIS AND POSSIBLE CAUSES

DRIVE SHAFT VIBRATION	Undercoating or other foreign material on shaft. Universal joint U-bolts loose. Universal joints worn, or lack of lubricant. Drive shaft mis-aligned (drive line angle).	Drive shaft and universal joints 180° out of phase. Broken rear spring center bolt. Broken rear spring. Rear springs not matched (sagged to one side). Drive shaft damaged (bent) or out of balance (missing balance weights).
U-JOINT NOISE	Universal joint U-bolts loose. Lack of lubrication.	Worn U-joints.

2 DESCRIPTION AND OPERATION

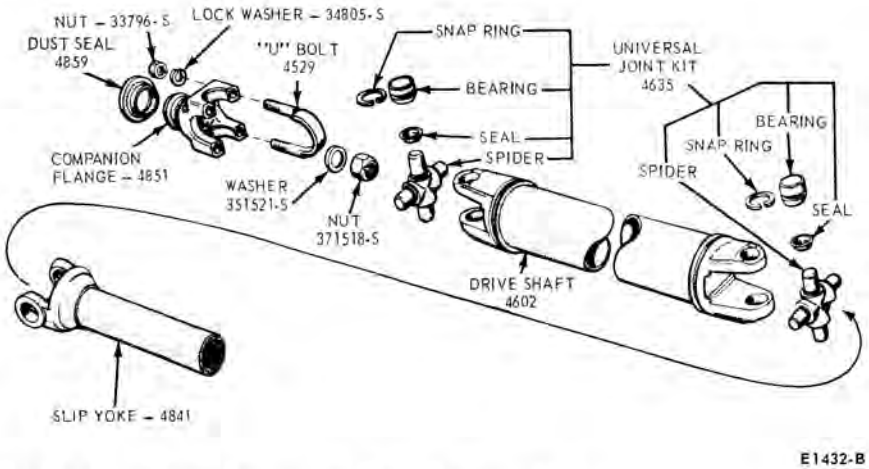


FIG. 1—Drive Line & Universal Joints Disassembled

The drive shaft is the means of transferring power from the engine to the differential in the rear axle and then to the rear wheels. The drive shaft incorporates two universal joints and a slip yoke. The universal joints (Fig. 1) are provided with a threaded plug which can be removed for lubrication when necessary. The splines in the yoke and on the transmission output shaft permit the drive shaft to move forward and rearward as the axle moves up and down.

All drive shafts are balanced. If the car is to be undercoated, cover the drive shaft and universal joints to prevent application of the undercoating material.

3 REPLACEMENT

REMOVAL

1. To maintain drive line balance, mark the relationship of the slip yoke and the drive flange on the axle with the shaft so that they may be installed in their original positions.

2. Disconnect the rear U-joint from the drive pinion flange. Wrap tape around the loose bearing caps to prevent them from falling off the spider. Pull the drive shaft toward the rear of the car until the front U-joint yoke clears the transmission expansion housing and the seal. Install the appropriate Extension Housing Seal Installation tool into the extension housing to prevent lubricant leakage.

3. Place the drive shaft in a vise being careful not to damage it.

4. Remove the snap rings that retain the bearings in the yoke and in the drive shaft.

5. Position the tool shown in Fig. 2 on the shaft and press the bearing out of the yoke. If the bearing cannot be pressed all the way out of the yoke, remove it with vise grip or channel lock pliers.

6. Reposition the tool to press on the spider to remove the bearing from the opposite side of the yoke.

7. Remove the yoke from the spider.

8. Remove the bearings and spider from the drive shaft in the same manner.

9. Clean all foreign matter from the yoke area at each end of the drive shaft.

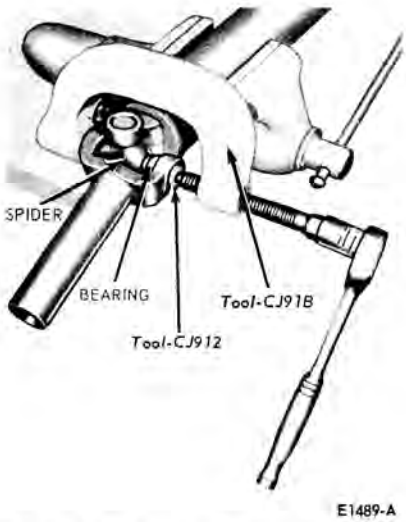


FIG. 2–Removing Universal Joint Bearing

INSTALLATION

1. Start a new bearing into the yoke at the rear of the drive shaft.

2. Position the spider in the rear yoke and press the bearing ¼ inch below the surface (Fig. 3).

3. Remove the tool and install a new snap ring.

4. Start a new bearing into the opposite side of the yoke.

5. Install the tool and press on the bearing until the opposite bearing contacts the snap ring.

6. Remove the tool and install a new snap ring.

7. Reposition the drive shaft and install the new spider and two new bearings in the same manner as the rear yoke.

8. Position the yoke on the spider and install two new bearings and snap rings.

9. Check the joint for freedom of movement. If a bind has resulted from misalignment during the foregoing procedures, tap the ears of the drive shaft sharply to relieve the bind. Do not install the drive shaft unless the universal joints are free of bind.

10. If the rubber seal installed on the end of the transmission extension housing is damaged in any manner, install a new seal.

11. Lubricate the yoke spline with B8A-19589-A lubricant. This spline is sealed so that the transmission fluid does not "wash" away the spline lubricant (Fig. 4). Remove the tool from the extension housing. Install the yoke on the transmission output shaft.

12. Install the U-bolts and nuts that attach the U-joint to the drive pinion flange. Torque the U-bolt nuts to 15-20 ft-lbs.

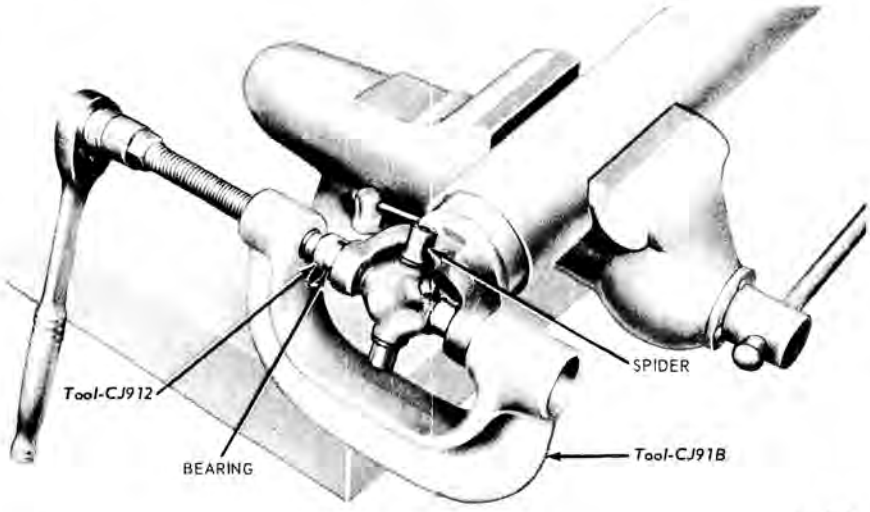


FIG. 3–Installing Universal Joint Bearing

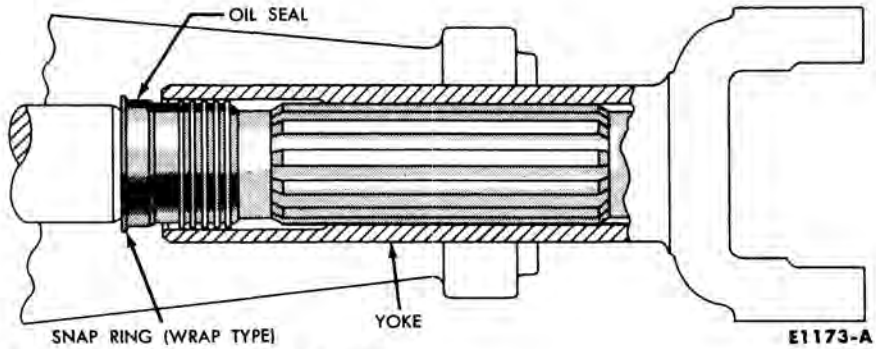


FIG. 4–Output Shaft Spline Seal

PART 5-2 GENERAL CLUTCH SERVICE

Section		Page
1	Diagnosis and Testing	5-3
2	Flywheel Housing Alignment	5-3
3	Cleaning and Inspection	5-6

1 DIAGNOSIS AND TESTING

TROUBLE SYMPTOMS AND POSSIBLE CAUSES

CLUTCH NOISY WITH ENGINE STOPPED	Pressure plate lugs rubbing against cover. Clutch linkage improperly adjusted or inadequately lubricated.	Clutch assist spring clunking. Release bearing hub burred and dragging on transmission bearing retainer.
CLUTCH NOISY WHEN PEDAL FREE TRAVEL IS TAKEN OUT, ENGINE RUNNING	Release bearing failure due to: Improper travel adustment. Bearing cocked on hub.	Release lever out of plane. Flywheel housing misalignment. Excessive crankshaft end play.
CLUTCH NOISY WHEN PEDAL IS THREE-QUARTERS TO FULLY DEPRESSED, ENGINE RUNNING	Pressure plate lugs rubbing against window openings in cover.	Release bearing failure. Loose and worn pilot bearing.
CLUTCH SLIPS OR CHATTERS	Incorrect pedal free travel. Grease or oil on clutch facings from: Release bearing.	Release lever Pilot bearing. Transmission. Pressure plate fingers binding.
CLUTCH VIBRATION	Improper or defective clutch disc. Release bearing out of plane.	Flywheel housing misalignment. Pressure plate fingers binding.
THUD	Excessive engine crankshaft end play.	
GEAR CLASH OR POOR RELEASE	Incorrect pedal free travel. Disc binding on transmission input shaft.	Excessive disc runout. Flywheel housing misalignment. Excessive engine idle speed.
CLUTCH PEDAL SCRUBBING	Release lever cocked. Pedal push rod rubbing on firewall felt and insulator. Release lever pivot knife edge rough. Pedal shaft binding at support bracket.	Pressure plate finger rubbing internally. Burrs on clutch pedal or clutch assist spring retainer. Release bearing hub scrubbing on input shaft bearing retainer.

2 FLYWHEEL HOUSING ALIGNMENT

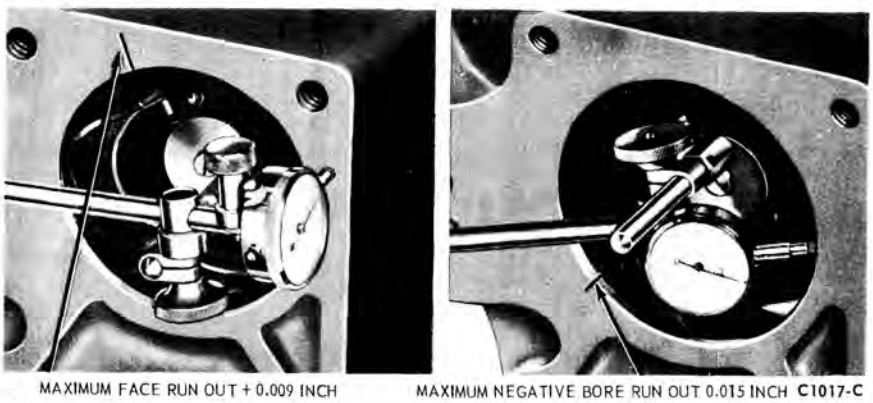


FIG. 1—Flywheel Housing Alignment Check

Alignment of the flywheel housing bore and rear face with the engine should be checked as a possible cause of any of the following troubles: excessive transmission gear wear, transmission jumping out of gear, especially third gear, drive line vibration, excessive pilot bushing wear, noisy release bearing, or excessive clutch spin time.

INSPECTION

1. With the clutch release bearing removed, install the indicator pilot tool shown in Fig. 1.

STEP 1
WITH A DIAL INDICATOR MEASURE THE FACE RUNOUT OF THE HOUSING.

STEP 2
MARK ON THE FACE OF THE HOUSING THE POINT OR THE EXTREMES AND THE MAXIMUM AMOUNT OF THE POSITIVE (+) READING.

STEP 3
MEASURE THE RUNOUT OF THE TRANSMISSION PILOT BORE.

STEP 4
MARK ON THE FACE OF THE HOUSING THE POINT OR EXTREMES AND THE AMOUNT OF THE MAXIMUM NEGATIVE (−) READING.

STEP 5
SELECT THE DIA-L-IGNER PILOT WHICH WILL FIT SNUGLY IN THE BORE OF THE HOUSING. OBSERVE THE NUMBER (1, 2, OR 3) ON THE PILOT.

STEP 6
PRESS THE PILOT FIRMLY OVER THE ROUND LOCATOR ON THE BACK OF THE DIAL.

STEP 7
POSITION THE DIA-L-IGNER ON THE FACE OF THE HOUSING WITH THE PILOT IN THE BORE.

STEP 8
ROTATE THE FACE RUNOUT ARROW UNTIL IT POINTS AT THE MARK INDICATING THE POSITIVE FACE READING MARK. (OR ONE OF THE EXTREMES—SEE NOTE)

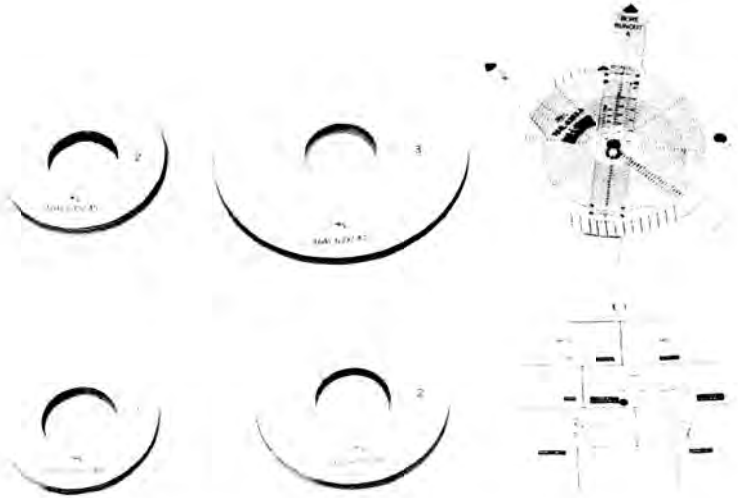
STEP 9
LEAVING THE FACE RUNOUT ARROW IN POSITION, ROTATE ARROW "A" UNTIL IT POINTS AT THE MARK INDICATING THE NEGATIVE (−) BORE READING. (OR ONE OF THE EXTREMES—SEE NOTE)

STEP 10
SET THE AMOUNT OF BORE RUNOUT ON THE BORE RUNOUT SLIDE. (USE SCALE NUMBER INDICATED BY THE PILOT NO. SELECTED)

STEP 11
ROTATE ARROW "B" UNTIL IT POINTS IN THE DIRECTION OF THE FACE RUNOUT ARROW AND ITS ⊥ PARALLEL TO THE FACE R. O. ARROW ↕.

STEP 12
FIND THE AMOUNT OF THE FACE R. O. ON THE "B" ARROW CHART.

STEP 13
THE VALUE OF THE CIRCULAR LINE BENEATH THE AMOUNT OF FACE RUNOUT WILL BE THE DESIRED READING



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FIG. 2—Dia-L-Igner Gauge

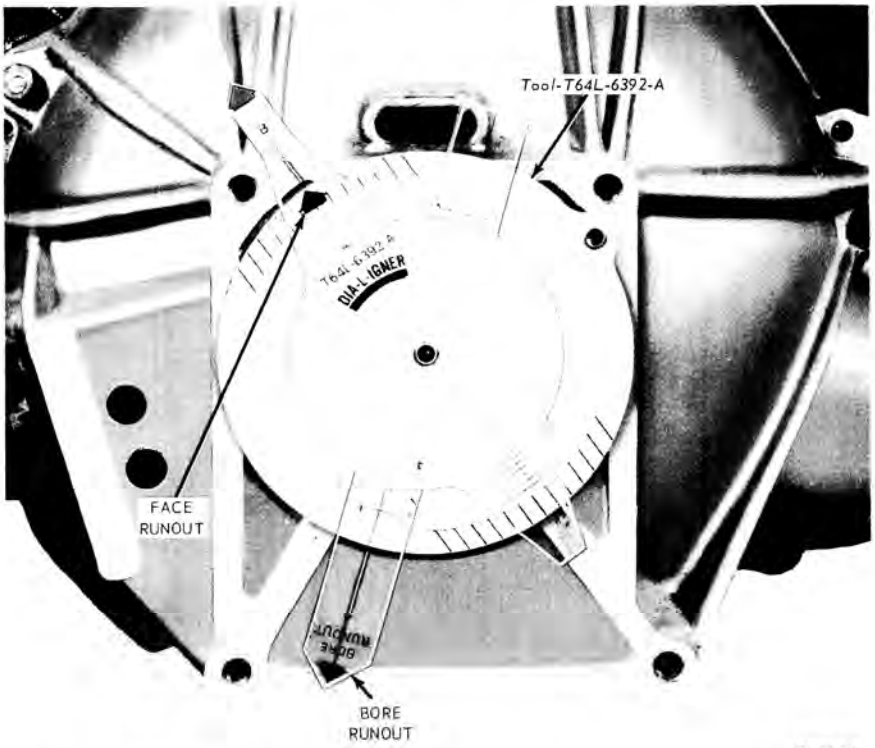


FIG. 3—Dia-L-Igner Gauge Installed

2. Clean the faces of the flywheel housing bolt bosses, and remove all burrs, nicks, and paint from the mounting face of the housing.

3. Install the dial indicator on the pilot and adjust the holder so the button will contact a circumference just inside of the transmission mounting holes (Fig. 1).

4. Push the flywheel forward to remove crankshaft end play. Set the dial indicator face to read zero.

5. Remove the spark plugs to alleviate compression.

6. While forcing the flywheel forward, rotate the crankshaft through one revolution and note the point of maximum runout. Mark runout on the face of housing as detailed in Steps 1 and 2 of the Dia-L-Igner instructions (Fig. 2).

7. Position the dial indicator to check bore alignment (Fig. 1). The bore must be clean and free of burrs, nicks and paint.

8. Pull the crankshaft through one revolution. Note the indicator reading and mark the maximum point of runout on the face of the housing as detailed in Steps 3 and 4 of the Dia-L-Igner instructions (Fig. 2).

9. Remove the dial indicator from the crankshaft and the housing.

10. Select the Dia-L-Igner pilot (Fig. 3) which will fit snugly in the bore of the flywheel housing.

11. Press the pilot into place on the locator on the back of the dial.

12. Position the Dia-L-Igner on the face of the housing (Fig. 4) with the pilot in the bore.

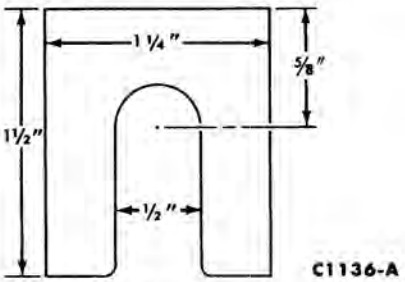


FIG. 4—Fabricated Flywheel Housing Shim

13. Rotate the face runout arrow to the positive face runout mark on the housing.

14. Without moving the face runout arrow, route arrow A until it is at the negative bore reading.

15. Slide arrow A to register the amount of bore runout on the –.010 –line of the white scale. Use the scale No. to coincide with the pilot being used.

16. Rotate arrow B until it points in the direction of the face runout arrow and its centerline is parallel to the centerline of the face runout arrow.

17. Determine the amount of the face runout on the B arrow scale.

18. The value of the circular line beneath the amount of face runout will be the desired reading. If the reading is in excess of 0.014 inch the housing alignment is unacceptable.

19. Remove the Dia-L-Igner gauge from the flywheel housing.

20. Install the spark plugs and connect the wires.

CORRECTION

ENGINE IN CAR

Since any change in face alignment will change bore alignment, it may be possible to correct bore alignment by changing face alignment. Face alignment can be changed by shimming between the flywheel housing and engine. Fig. 4 shows the type of shim which can be fabricated.

Not more than 0.010 inch thickness shims may be used between the flywheel housing and engine. If a 0.010-inch shim will not bring face and bore alignment within limits, replace the flywheel housing.

The shim required is one half the maximum (–) indicator reading, and should be located at the point of maximum minus (–) indicator reading.

If both the bore and face alignment are out of limits, shim between the flywheel housing and engine to bring face alignment within limits. Check the bore alignment.

If the bore alignment is out of limits and the face alignment is within limits, shim the flywheel housing to the limit of face misalignment and check the bore alignment. If it is not within limits, replace the housing.

ENGINE OUT OF CAR

The same procedure to correct alignment may be used with the engine out of the car or in the car, up to the point of replacing the flywheel housing. If the bore alignment cannot be brought within limits by shimming, follow this procedure:

1. Remove the flywheel housing from the engine and remove the

dowel pins. Install the flywheel housing and tighten the attaching bolts.

2. Install the dial indicator (Fig. 1). Check the face alignment, and shim as required to bring face alignment within limits.

3. Position the indicator to check the bore alignment. If the bore alignment is not within limits, reduce the tension on the flywheel housing attaching bolts so that the housing can be moved by striking it with a lead hammer or a block of wood and a steel hammer.

4. The lateral alignment should be brought within limits so that an indicator reading is within limits between the 9 o'clock and 3 o'clock positions on the bore circle. When the lateral alignment is within limits, the housing usually can be moved straight up or down without disturbing the lateral alignment. When alignment is within limits, torque the housing bolts and recheck bore alignment.

5. If the flywheel housing cannot be moved enough to bring the alignment within limits, mark the holes restricting movement, and then remove the housing and drill the marked bolt holes 1/32 inch larger.

6. When the flywheel housing bore alignment is within limits and the attaching bolts are at normal torque, hand ream the dowel pin holes 1/32 inch larger. Use a straight reamer and ream from the flywheel housing side. Oversize dowel pins can be made from drill rod stock.

7. Remove the flywheel housing and then install the oversize dowel pins in the cylinder block. Complete the assembly in the usual way.

8. Recheck the flywheel housing with the Dia-L-Igner gauge to make sure that the housing is within the specified limits.

3 CLEANING AND INSPECTION

RELEASE BEARING

Wipe all oil and dirt off the release bearing. **The bearing is prelubricated and should not be cleaned with solvent.**

Inspect the bearing retainer for loose spring clips and rivets.

Inspect the release bearing assembly for burrs which may cause the assembly to drag on the transmission bearing retainer. Any such burrs should be cleaned up with fine crocus cloth. If burrs are found, inspect the transmission input shaft bearing retainer for evidence of scoring. Any scoring should be polished out with crocus cloth. Coat the bearing retainer with a thin film of lithium-base grease (COAZ-19584-A). Prior to release bearing installation, apply a light film of Lubriplate on both sides of the release lever fork where it contacts the release bearing hub and retaining springs. Apply a light film of Lubriplate to the release bearing surface that contacts the pressure plate fingers. Care must be exercised when applying lubricants to the release bearing, release bearing hub and the release lever fork to avoid excessive grease from contaminating the clutch disc.

Hold the bearing inner race and rotate the outer race while applying pressure to it. If the bearing rotation is rough or noisy, replace the bearing.

Most release bearing failures are caused by improper clutch pedal adjustments. If the clutch linkage does not have enough free travel, the release bearing will constantly touch the release fingers and will spin whenever the engine is running.

When installing a release bearing, use the tool shown in Fig. 5.

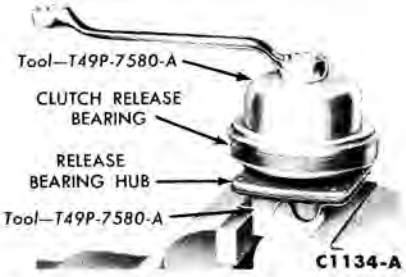


FIG. 5—Installing Clutch Release Bearing on Hub

Release bearing failure can be caused by the release lever contact points being out of plane. Check the wear on the release bearing assembly where the release lever contacts it.

If one side of the assembly shows more wear than the other, the release lever is bent out of plane, or is not centering on the bracket on the flywheel housing.

Misalignment between the engine and transmission can cause release bearing failure. Other symptoms of misalignment are: transmission jumping out of gear, especially third gear, drive line vibration; excessive wear in the pilot bushing, excessive clutch disc spin time resulting in gear clash, and excessive transmission gear wear.

PRESSURE PLATE AND COVER

Inspect the surface of the pressure plate for burn marks, scores, or ridges. Generally, pressure plate resurfacing is not recommended. However, minor burn marks, scores, or ridges may be removed. During the resurfacing process, the flatness of the pressure plate must be maintained. If the pressure plate is badly heat-checked or deeply scored, replace the pressure plate and cover assembly. Clean the pressure plate and flywheel surfaces with a suitable solvent to be sure the surfaces are free from any oil film. **Do not use cleaners with petroleum base, and do not immerse the pressure plate in the solvent.**

Place the plate on the floor, being careful not to score or scratch the surface. Force each individual finger down, then release it quickly. If the finger does not return quickly, a binding condition is indicated, and the pressure plate should be replaced.

The pressure plate should be lubricated with a lithium-base grease between the driving lugs and the edges of the pressure plate. Depress the pressure plate fingers fully, apply the lubricant, and then move the fingers up and down until the lubricant is worked in. **Do not apply excessive lubricant.**

CLUTCH DISC

Inspect the clutch disc facings for oil or grease. **Eliminate the source of any oil or grease before replacing the disc.** An excessive amount of grease in the pilot housing or release bearing hub will find its way to the disc facings. Too much lubricant in the transmission or a plugged transmission vent will force the transmis-

sion lubricant out the input shaft and onto the disc facings.

Inspect the clutch disc for worn or loose facings. Check the disc for distortion and for loose rivets at the hub. Check for broken springs. **Springs loose enough to rattle will not cause noise when the car is operating.** Replace the disc assembly if any of these defects are present. **Be especially careful when installing a new disc to avoid dropping it or contaminating it with oil or grease.**

PILOT BUSHING

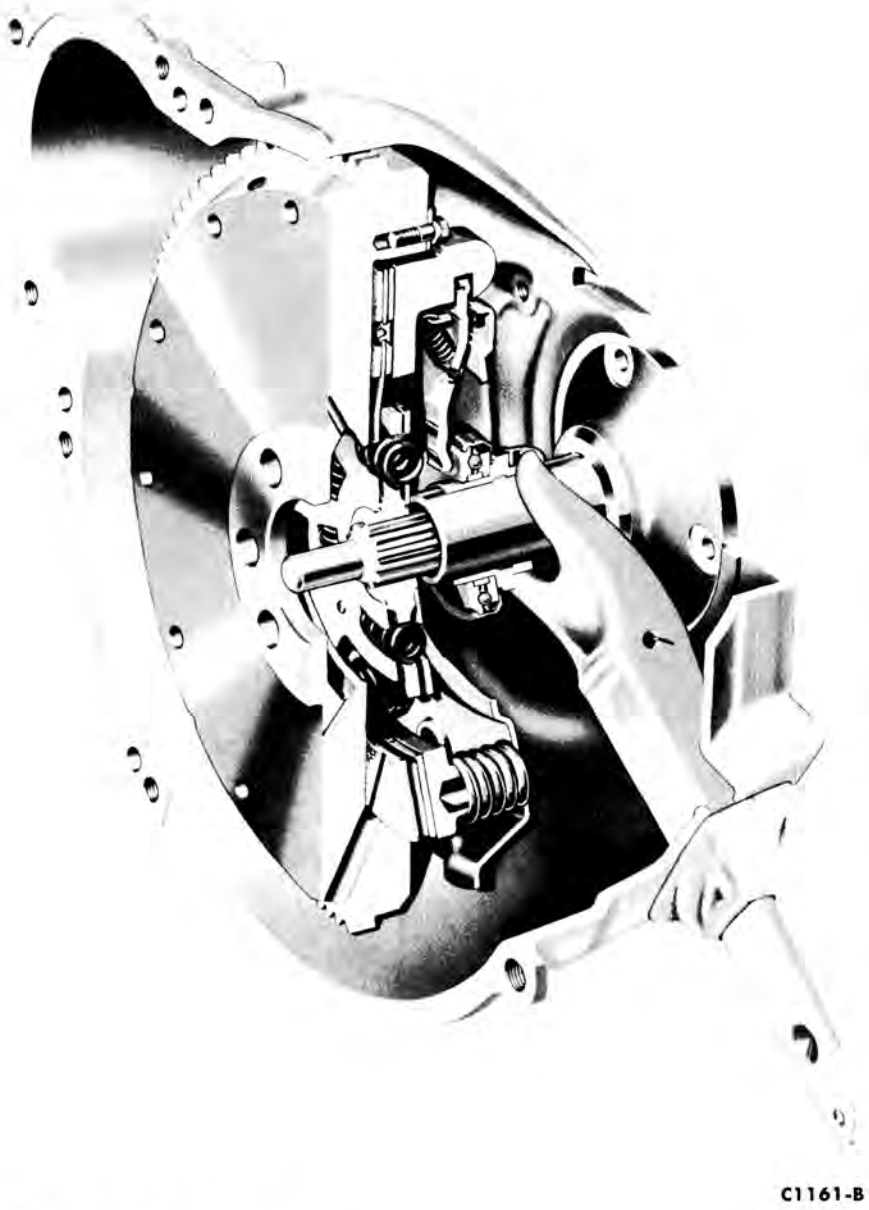
Check the fit of the clutch pilot bushing in the bore of the crankshaft.

The bushing is pressed into the crankshaft and should not be loose. Inspect the inner surface of the bushing for wear or a bell-mouthed condition. If the bushing is worn or damaged, replace the bushing with a new service bearing. Refer to the applicable engine for the replacement procedure.

PART 5-3 CLUTCH

Section		Page
1	Description and Operation	5-8
2	In-Car Adjustment and Repairs	5-9
3	Clutch Removal and Installation	5-12

1 DESCRIPTION AND OPERATION



C1161-B

FIG. 1—Clutch Assembly

The clutch is of the centrifugal single dry disc type and consists of the clutch disc, pressure plate and the clutch release bearing (Fig. 1).

OPERATION

The clutch is actuated by a clutch pedal and a series of mechanical linkage.

When the clutch pedal is in the engaged position, the clutch disc facings are clamped between the friction surface of the engine flywheel and the face of the clutch pressure plate, thereby connecting engine power to the transmission. Depressing the clutch pedal actuates the clutch release shaft fork which moves the clutch release bearing against the clutch fingers. This, in turn, moves the pressure plate away from the clutch disc. Since the disc is splined to the transmission input shaft, the clutch disc and transmission input shaft will stop when the clutch is disengaged, thereby disconnecting engine power from the transmission.

2 IN-CAR ADJUSTMENTS AND REPAIRS

CLUTCH PEDAL ADJUSTMENT

Adjust the clutch pedal whenever the clutch does not disengage or engage properly, or when new clutch parts are installed. Both the total travel and the free travel of the pedal should be adjusted. **Improper adjustment of the clutch pedal is one of the most frequent causes of clutch failure and can be a contributing factor in some transmission failures.**



FIG. 2—Clutch Pedal Travel Measurement

1. Measure the total travel of the pedal (Fig. 2). If the travel is not within specifications, move the clutch pedal bumper and the bracket up or down until the travel is within specified limits. **Always check and adjust total travel before checking free travel.**

2. With the clutch pedal against its bumper (pedal released), measure the overall length of the spring (Fig. 4). The spring length should be 10¼ inches on Falcon and Comet, 10 inches on Fairlane and no adjustment on Mustang.

3. With the engine idling, depress the pedal just enough to take up the free travel and note the reading on the tape (Fig. 2). The difference between this reading and the reading where the pedal is released is the clutch pedal free travel. If the free travel is not within specifications, adjust the clutch pedal to equalizer rod (Fig. 3). To increase the free travel, loosen the rearward adjusting nut and tighten the forward nut. To reduce the free travel, loosen the forward nut and tighten the rearward nut. **Both nuts must be tightened against the trunnion after making the adjustment.**

4. As a final check, measure the pedal free travel with the transmission in neutral and the engine running at about 3000 rpm. If the free travel at this speed is not ½ inch, readjust the clutch pedal to equalizer rod to obtain the specified free travel. Otherwise, the release fingers may contact the release bearing continuously, resulting in premature bearing and clutch failure. **Free travel must be exactly to specification.**

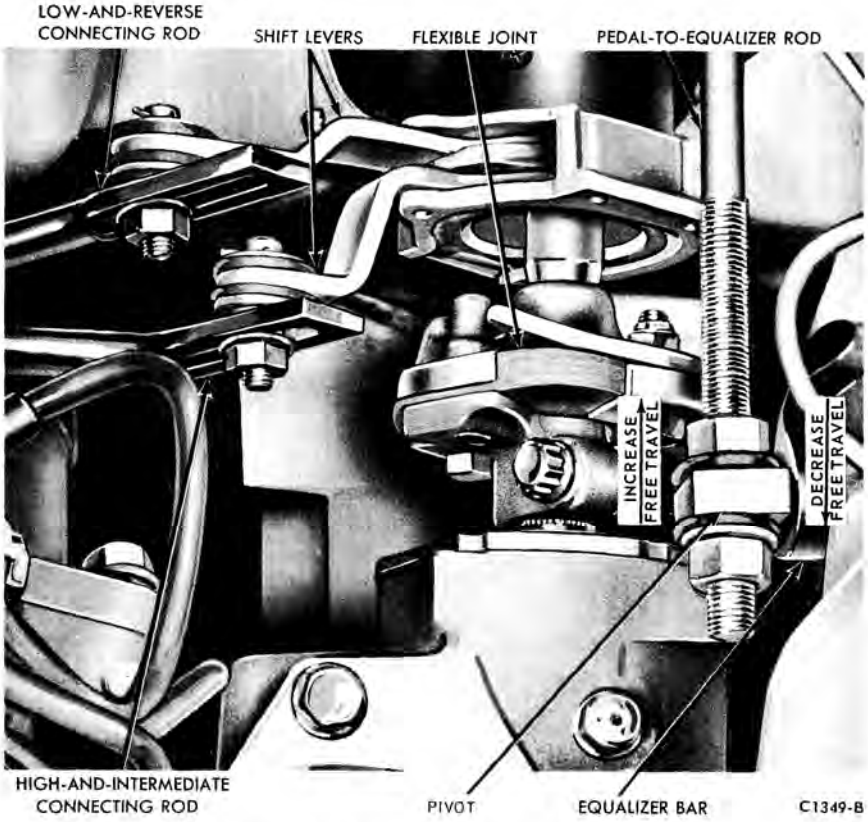


FIG. 3—Clutch Pedal Travel Adjustment—Typical

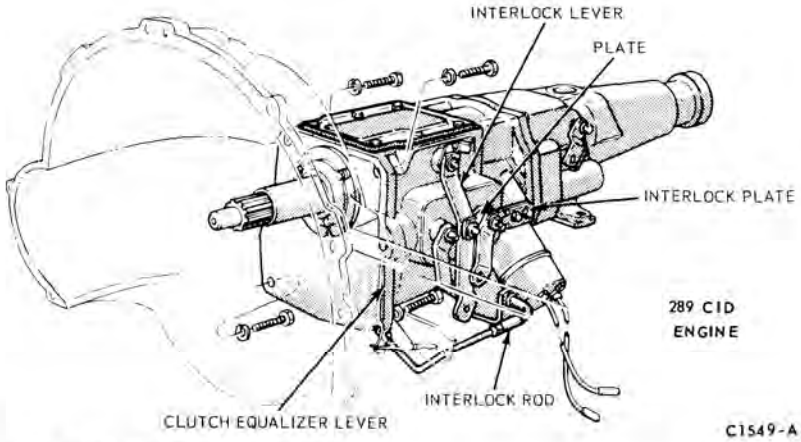


FIG. 4—Clutch Interlock Mechanism

INTERLOCK (OVERDRIVE MODELS ONLY)

Be sure that the clutch linkage is correctly adjusted before adjusting the interlock mechanism (Fig. 4).

1. Place the gearshift lever in neutral position.

2. Loosen the adjustment lock nut on the interlock rod.

3. Disconnect the rod from the interlock lever.

4. Loosen the interlock pawl attaching screws. Move the interlock lever forward as far as possible to seat the interlock pawl in the first and reverse-speed shift lever. Tighten the two pawl attaching screws.

5. Adjust the length of the interlock rod so that it can be connected to the interlock lever while being held in the forward position. Connect the rod to the lever.

6. Shift the transmission into low and into neutral to check operation of the interlock. Readjust the interlock pawl for snug fit if necessary.

7. Use COAZ-19584-A lubricant as required for the interlock linkage.

CLUTCH PEDAL AND/OR BUSHING REPLACEMENT

REMOVAL (COMET, FALCON, FAIRLANE)

1. Remove the nut from the retainer on the upper end of the assist spring. Then remove the spring and retainer from the pedal and pedal support (Fig. 5).

2. Disconnect the clutch pedal to equalizer rod from the pedal.

3. Remove the retaining clip and spring washer from the clutch pedal shaft. Then remove the shaft, bushings, and pedal from the support.

4. Remove ahe bushings from the pedal shaft, and transfer the pedal pad.

INSTALLATION (COMET, FALCON, FAIRLANE)

1. After lubricating the clutch pedal shaft bushings, position them on the shaft. Then position the shaft and pedal in the pedal support.

2. Install the spring washer and retaining clip on the pedal shaft.

3. Connect the clutch pedal to equalizer rod to the pedal.

4. After positioning the assist spring eye insulators, depress the clutch pedal and install the assist spring and retainer.

5. Adjust the clutch pedal travel.

REMOVAL (MUSTANG)

1. Remove the retaining clip (Fig. 6) that secures the equalizer rod to the clutch pedal.

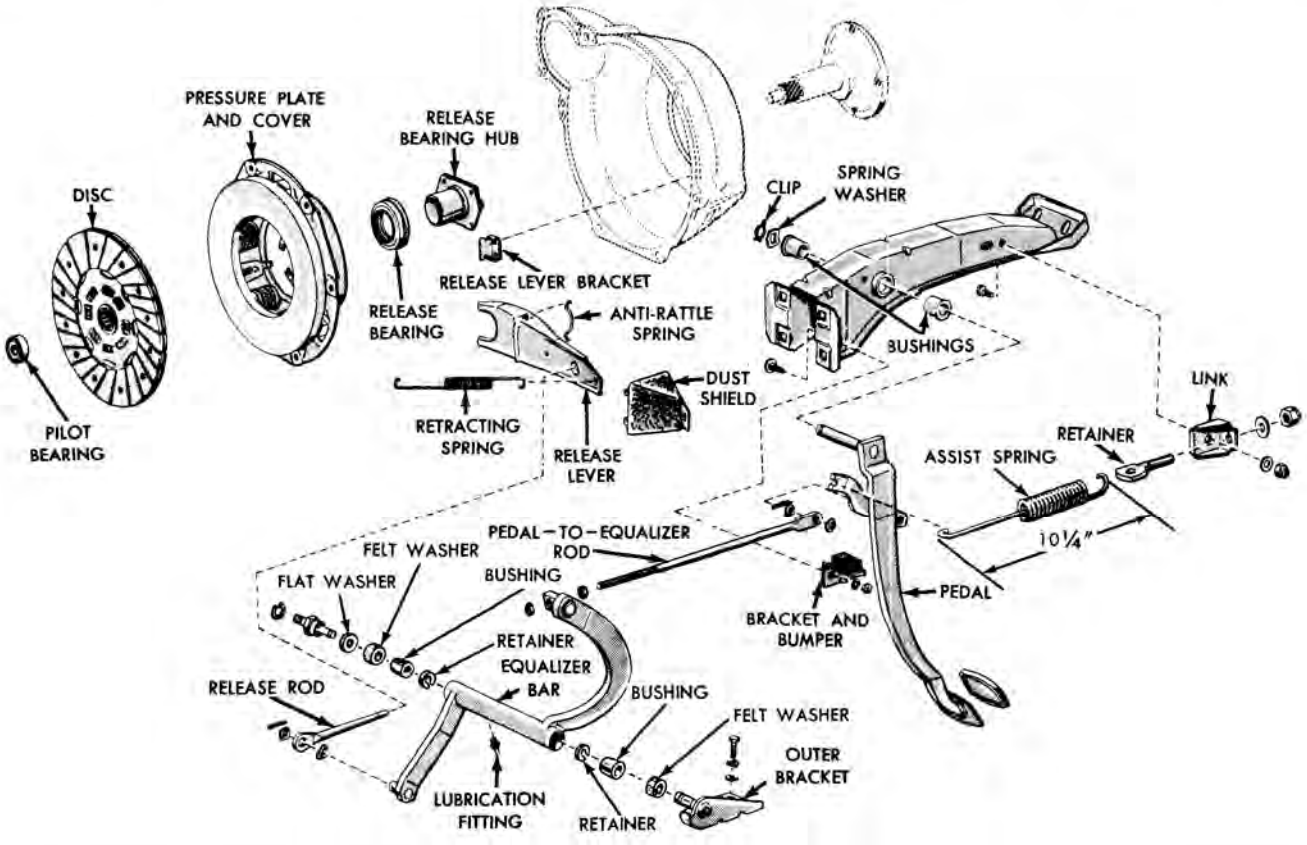
2. Remove the attaching nut from the clutch pedal stop, then remove the stop.

3. Pull the clutch pedal upward as far as possible, then disconnect the spring from the pedal and the bracket. Do not lose the two inserts.

4. Remove C – washer that secures the master cylinder push rod to the brake pedal. Lift the rod and bushings off the brake pedal.

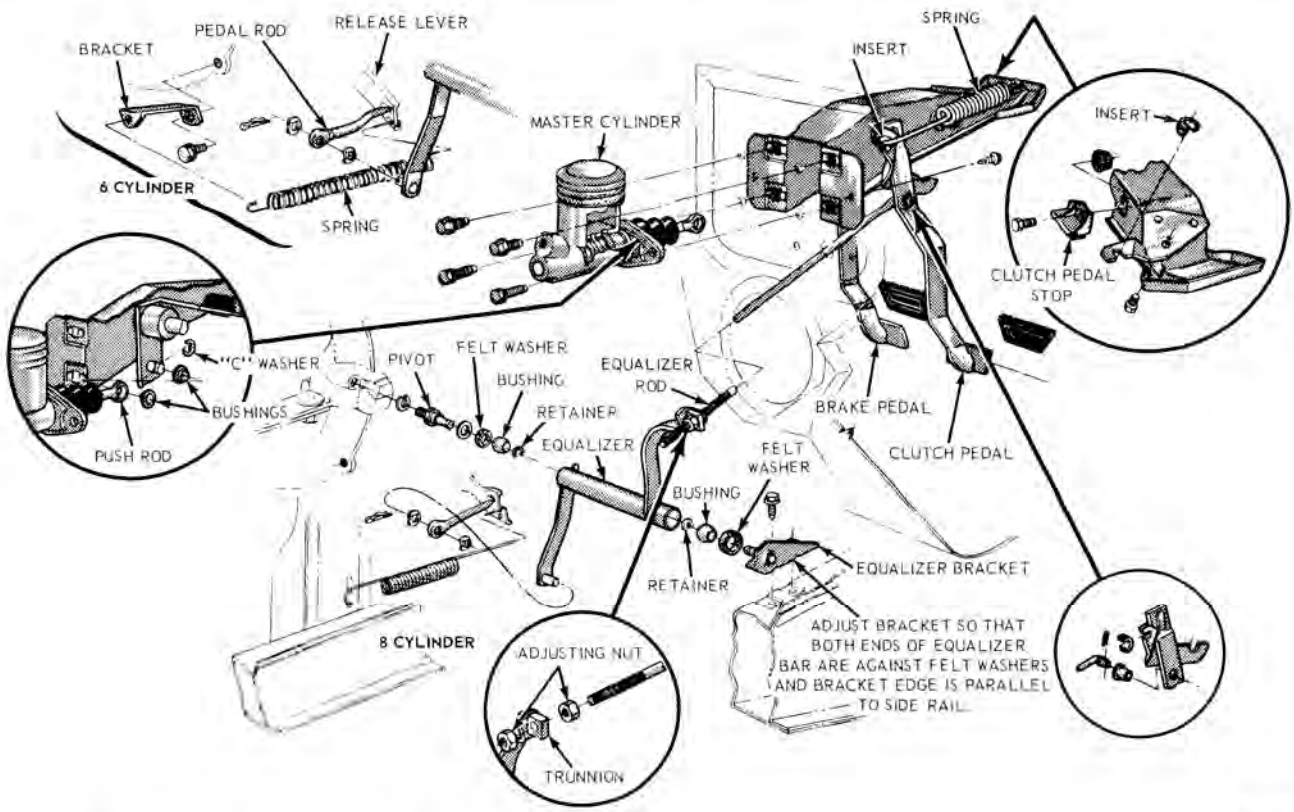
5. Working from the engine compartment, remove the two nuts and flat washers that secure the parking brake mounting bracket to the cowl panel.

6. Remove the two bolts that secure the handbrake and the air vent



C1180-B

FIG. 5—Clutch and Linkage Disassembled



C1538-A

FIG. 6—Mustang Clutch and Linkage Disassembled

control cable bracket to the instrument panel. Position these controls to one side.

7. Remove the three bolts that secure the left air vent to the plenum chamber. Remove the air vent and control cable.

8. Remove the retaining clip and spring washer from the right end of the clutch pedal shaft.

9. While supporting the brake pedal, slide the clutch pedal from the mounting bracket.

10. Remove the delrin bushings from the pedals.

INSTALLATION (MUSTANG)

1. Lubricate the delrin bushings and position them in place.

2. Hold the brake pedal in place, then slide the clutch pedal shaft through the support and the brake pedal. Secure the clutch pedal with a spring washer and the retaining clip.

3. Position the master cylinder push rod and delrin bushings on the brake pedal and secure them with a C-washer.

4. Pull the clutch pedal all the way up, then install the delrin insulators and the spring.

5. Install the clutch pedal stop.

6. Connect the equalizer rod to the clutch pedal and secure it in place with a retaining clip.

7. Hold the air vent duct in place on the plenum chamber and secure it with the three attaching bolts.

8. Hold the hand brake control and the air vent control cable bracket in place on the lower end of the instrument panel and secure them with the two attaching bolts.

9. Working from the engine compartment, secure the parking brake mounting bracket to the cowl panel with two flat washers and nuts.

10. Check and if necessary, position the clutch pedal rod in the clutch release lever.

11. Adjust the clutch pedal total travel and free travel as required.

EQUALIZER BAR AND/OR BUSHING REPLACEMENT

1. Disconnect the pedal to equalizer rod at the pedal, and then disconnect this rod from the equalizer bar (Fig. 5).

2. Raise the car and disconnect the release lever retracting spring at the lever.

3. Remove the equalizer bar outer bracket and the bushing.

4. Remove the release rod from the equalizer bar, and then remove the equalizer bar. Remove the bushings and spacers from the inner mounting stud.

5. Position the equalizer bar, spacers, inner bushing, and retainers on the inner stud.

6. After positioning the outer bushing, install the outer bracket (with the equalizer bar in place).

7. Connect the release rod and the release lever retracting spring.

8. After lowering the car, install the pedal to equalizer rod.

9. Adjust the clutch pedal free travel.

3 CLUTCH REMOVAL AND INSTALLATION

REMOVAL

1. Raise the car on a hoist.

2. Disconnect the drive shaft from the rear U-joint flange. Then slide the drive shaft off the transmission output shaft. Insert appropriate Extension Housing Seal Installation tool over the output shaft and into the extension housing oil seal.

3. Disconnect the speedometer cable from the extension housing.

4. Disconnect the gear shift rods from the transmission levers. If the car is equipped with a 4-speed transmission, remove the bolts that secure the shift control bracket to the extension housing.

5. Disconnect the parking brake cable, and support the rear of the engine with a transmission jack.

6. Remove the bolts that attach the extension housing to the leaf spring. Remove the engine rear support attaching bolts and remove the support and leaf spring as a unit.

7. Remove the bolts that attach the transmission to the flywheel housing.

8. Move the transmission rearward until the input shaft clears the flywheel housing, then remove the transmission.

9. Disconnect the clutch release lever retracting spring from the release lever.

10. Remove the starter cable. Remove the starter motor from the flywheel housing.

11. Remove the bolts that secure the engine rear plate to the front lower part of the flywheel housing.

12. Remove the bolts that attach the flywheel housing to the cylinder block and remove the housing and the release lever as a unit.

13. Loosen the six pressure plate cover attaching bolts evenly to release the spring tension. **If the same pressure plate and cover is to be installed after the clutch is overhauled, mark the cover and flywheel so that the pressure plate can be installed in the same position, to maintain a balanced assembly.**

14. Remove the six attaching bolts while holding the pressure plate cover then, remove the pressure plate and clutch disc.

INSTALLATION

1. Hold the clutch disc, and pressure plate and cover assembly in position on the flywheel. Start the cover attaching bolts to hold the pieces in place but do not tighten them. **Avoid dropping the parts or contaminating them with oil or grease.**

2. Align the clutch disc with a clutch arbor as shown in Fig. 7 and torque the six pressure plate cover attaching bolts evenly to specification. Then remove the tool.

3. Make certain that the release bearing and hub is properly installed on the release lever. Coat the bearing retainer inside diameter with a light film of lithium soap-type grease. **Do not lubricate the bearing hub.**

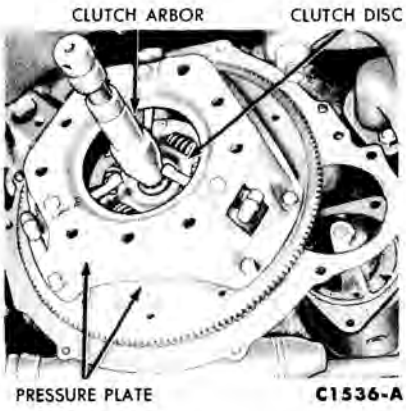


FIG. 7—Installing Clutch Disc

4. Make certain that the flywheel housing and the cylinder block mounting surfaces are clean. Position the flywheel housing on the cylinder block and install the attaching bolts. Torque the bolts to specifications.

5. Seat the clutch release rod in the release lever socket and install the release lever retracting spring.

6. Secure the engine rear plate to the front of the flywheel housing with the attaching bolts.

7. Install the starting motor and connect the cable.

8. The mounting surfaces of the transmission and the flywheel housing must be free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until it is positioned against the flywheel housing.

9. Install the two upper mounting bolts. Then remove the guide pins and install the two lower mounting bolts. Torque all bolts to specifications.

10. Install the engine rear support and the leaf spring. Install the bolts that attach the extension housing to the leaf spring.

11. Remove the transmission jack and connect the parking brake cable.

12. Connect the gear shift rods to the transmission levers. If the car is equipped with a 4-speed transmission, connect the shift control bracket to the extension housing. Adjust the shift linkage.

13. Remove the tool from the transmission output shaft, and install the drive shaft.

14. Adjust the clutch pedal total travel and free play.

PART 5-4 SPECIFICATIONS

CLUTCH SPECIFICATION

CAR LINE	ENGINE	TRANSMISSION	PRESSURE PLATE			DISC		
			DIAMETER (INCHES)	NO. OF SPRINGS	COLOR IDENT. (PAINT DAUB)	DIAMETER (INCHES)	NO. OF SPRINGS	SPRING COLOR
Mustang	200-1V	Standard and 4-Speed	8½	9		8½	6	
Mustang	289-2V, 4V	Standard and 4-Speed	10⅜	9	Pressure Plate—White Cover Plate—Pink Springs—Bronze	10⅜	6 6	Orange—Small Orange—Large
Mustang	289-4V Hi-Performance	4-Speed	10⅜	9	Pressure Plate—Bronze Cover Plate—Bronze Springs—Green	10⅜	8	Gray
Fairlane	200-1V	Standard	8½	9		8½	6	Orange
Fairlane	200-1V	Standard Heavy Duty	9½	6	Pressure Plate—Orange Cover Plate—Green and Orange Springs—N/A	9½	2 2 2	Gray Aluminum Black
Fairlane	289-2V, 4V	Standard and 4-Speed	10⅜	9	Pressure Plate—White Cover Plate—Pink Springs—Bronze	10⅜	6 6	Orange—Small Orange—Large
Fairlane	289-4V Hi-Performance	4-Speed	10⅜	9	Pressure Plate—Bronze Cover Plate—Pink Springs—Green	10⅜	8	Gray
Falcon	170-1V	Standard	8½	6	Pressure Plate—Blue Cover Plate—Blue Springs—N/A	8½	3 3	Green No Color
Falcon and Comet	200-1V	Standard						
Falcon and Comet	289-2V, 4V	Standard and 4-Speed	10⅜	9	Pressure Plate—White Cover Plate—Pink Springs—Bronze	10⅜	6 6	Orange—Small Orange—Large

CLUTCH ADJUSTMENTS

	MUSTANG Inches	FAIRLANE Inches	FALCON—COMET Inches
Clutch Pedal Free Travel	⅞"-1⅛"	15/16"-1 1/16" (Engine Idling 475-500 rpm)	⅞"-1⅛"
Clutch Pedal Total Travel	6½"	6¾"	6½"
Assist Spring Length Installed	10" (End of Spring Hooks) Not Adjustable	10" (End of Spring Hooks)	10¼" (End of Spring Hooks)

TORQUE SPECIFICATIONS

FALCON AND COMET

APPLICATION	BOLT	NUT	DESCRIPTION	FT-LBS
Clutch Return Spring Bracket to Flywheel Housing	5/16-18	Flywheel Housing	Bolt and Lock Washer	10-13
Clutch Release Equalizer Frame Bracket	⅜-16	Cage Nut		15-24
Clutch Pressure Plate	5/16-18	Tapped into Flywheel		23-28

TORQUE SPECIFICATIONS (Cont'd)

FAIRLANE

APPLICATION	BOLT	NUT	DESCRIPTION	FT-LBS
Clutch Release Equalizer Frame Bracket	3/8-16 x 1.00	Riv-Nut	Hexagon Washer Head Locking	25-30
Clutch Pressure Plate	5/16-18	Tapped into Flywheel		23-28

MUSTANG

Clutch Return Spring Bracket to Flywheel Housing	5/16-18	Flywheel Housing	Bolt and Lock Washer	10-13
Clutch Release Equalizer Frame Bracket	3/8-16	Cage Nut		15-24
Attach Clutch Pedal Assist Spring Bracket to Brake Pedal Support Bracket	5/16-24	Tapped in	Bolt and Lock Washer	
Clutch Pressure Plate	5/16-18	Tapped into Flywheel	Bolt and Lock Washer	23-28

LUBRICATION SPECIFICATIONS

FALCON AND COMET

DESCRIPTION	MATERIAL	PART NO.	PLACES
Clutch Equalizer Bar Assy. and Balls	White Grease	C1AZ-19590-B	4
Clutch Idler Lever Trunnion	Engine Oil SAE 10W		1
Clutch Pedal Assist Spring Ends	White Grease	C0AZ-19584-A	2
Clutch Pedal to Idler Lever Rod	White Grease	C1AZ-19590-B	1
Clutch Release Rod	White Grease	C1AZ-19590-B	2

FAIRLANE

DESCRIPTION	MATERIAL	PART NO.	PLACES
Clutch Pedal Assist Spring Ends	White Grease	C1AZ-19590-B	2
Clutch Pedal to Idler Lever Rod (Clutch Pedal End and Dash Seal)	White Grease	C1AZ-19590-B	2
Clutch Release Rod Ends	White Grease	C1AZ-19590-B	2
Swivel Clutch Release Idler Lever	SAE 10W Motor Oil		1

MUSTANG

DESCRIPTION	MATERIAL	PART NO.	PLACES
Clutch Pedal Assist Spring Ends	White Grease	C0AZ-19584-A	2
Clutch Idler Lever Trunnion	Engine Oil SAE 10W		1
Clutch Equalizer Bar and Balls	White Grease	C1AZ-19590-B	4
Clutch Pedal to Idler Lever Rod	White Grease	C1AZ-19590-B	1
Clutch Release Rod	White Grease	C1AZ-19590-B	2

SPECIAL TOOLS

Tool Number	Description
T60K-7657-A or B 7657-C	Transmission Extension Housing Oil Seal Replacer
CJ-91-B	Universal Joint Bearing Replace Tool
T64-L 6392-A	Dia-L-Igner Gauge
T49-P 7580-A	Transmission Clutch Release Bearing Replacer

MANUAL SHIFT TRANSMISSIONS

GROUP 6

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PART 6-1 GENERAL TRANSMISSION SERVICE

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1 Diagnosis and Testing	6-1
2 Common Adjustments and Repairs	6-2
3 Cleaning and Inspection	6-3

1 DIAGNOSIS AND TESTING

The problems related to the transmission usually are: excessive amount of noise; hard shifting efforts; transmission jumps out of gear; gears clash when transmission is shifted from one gear ratio to another; and lubricant leakage.

If the car can be driven, road test it to determine what is causing the problem. Before and during the road test, make sure the clutch is functioning properly. Also, make sure the transmission shift linkage is properly adjusted.

DIAGNOSIS GUIDE

GEAR NOISE

Some gear noise is to be expected in all except fourth gear. Comparison with another car is the only means of determining whether or not gear noise is excessive. Before removing the transmission for correction of gear noise, determine by road test which gears are noisy under load, so that these parts can be thoroughly inspected when removed. Shifting out of reverse very slowly will usually result in some noise just as the gears disengage. This is normal because of the gear pointing necessary for easy engagement. Noise when disengaging reverse indicates that the reverse idler gear is at fault. All tests must be made by disengaging reverse gear while car is still in motion.

NOISY IN FORWARD SPEEDS

Low lubricant level.
Incorrect lubricant.
Transmission misaligned or loose.
Gear relative to pertinent speed involved worn or damaged.
Input shaft bearing worn or damaged.
Output shaft bearing worn or damaged.
Countershaft gear or bearings worn or damaged.
Input shaft gear worn or damaged.
Synchronizers worn or damaged.

NOISY IN REVERSE

Reverse idler or shaft, worn or damaged.
Reverse sliding gear worn or damaged.

HARD SHIFTING

Clutch not releasing fully.
Shift linkage out of adjustment.
Bent, damaged, or loose shift linkage.
Low lubricant level.
Incorrect lubricant.
Shift levers, shafts, or forks worn.
Synchronizers worn or damaged.

JUMPING OUT OF GEAR

Shift linkage out of adjustment, worn or loose.
Not enough over-shift travel (partial engagement of gears).
Transmission misaligned or loose.
Bent or worn shift fork, lever and/or shaft.
Worn input shaft pilot bearing.
End play in input shaft (bearing re-

tainer loose or broken, loose or worn bearings on input and output shafts).

Detent springs weak.

Detent notches worn.

Worn clutch teeth on input shaft and/or worn clutch teeth on synchronizer sleeve.

Worn or broken synchronizer.

Bent output shaft.

STICKING IN GEAR

Clutch not releasing fully.

Low lubricant level.

Incorrect lubrication.

Corroded transmission levers (shaft).

Defective (tight) input shaft pilot bearing.

Stuck detent plug.

Frozen synchronizing blocking ring on input shaft gear cone.

Burred or battered teeth on synchronizer sleeve and/or input shaft.

GEARS SPINNING WHEN SHIFTING INTO GEAR FROM NEUTRAL

Clutch not fully releasing.

Binding input shaft pilot bearing.

Synchronizers not functioning.

FORWARD GEARS CLASH

Clutch not releasing fully.

Weak or broken detent springs in the synchronizer assembly.

Worn blocking rings and/or cone surfaces.

Broken blocking rings.

Excessive rock of synchronizer assembly on output shaft.

Excessive output shaft end play.

REVERSE GEAR CLASH

Allow approximately two – three seconds after the clutch pedal has been depressed before shifting into reverse gear.

If gear clash continues after allowing proper time for the clutch plate to stop, check the clutch adjustments to make sure that they are within specifications.

Make sure that the engine idle speed is set to specifications.

Gear clash can also be caused by the following:

Dragging clutch plate.

Distorted clutch plate.

Tight or frozen input shaft bearing.

SCORED OR BROKEN GEAR TEETH

Insufficient lubricant.

Failure of the car operator to fully engage the gears on every shift before engaging the clutch and applying engine power.

2 COMMON ADJUSTMENTS AND REPAIRS

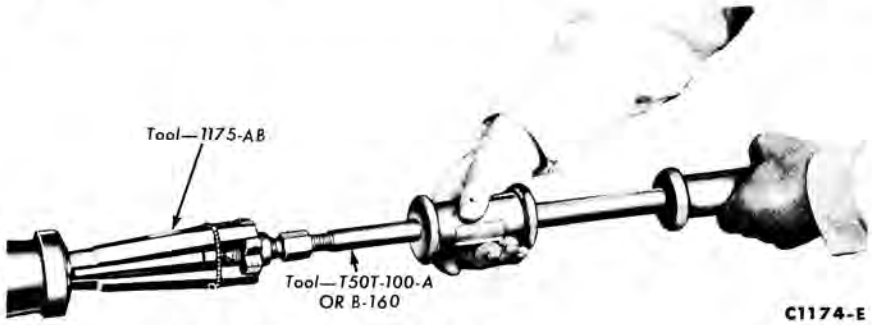


FIG. 1—Removing Extension Housing Seal

REAR SEAL REPLACEMENT

1. Remove the driveshaft.

2. Remove the seal from the extension housing with the tool shown in Fig. 1.

3. Install the new seal in the extension housing with the tool shown in Fig. 2.

4. Install the driveshaft.

REAR BUSHING AND SEAL REPLACEMENT

1. Remove the driveshaft from the car.



FIG. 2—Installing Extension Housing Seal



FIG. 3—Removing Extension Housing Bushing and Seal

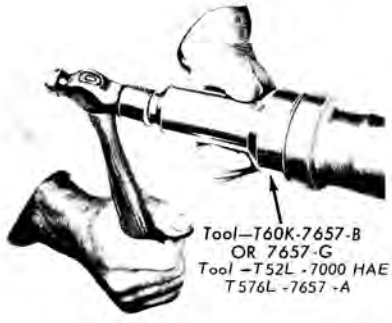


FIG. 4—Installing Extension Housing Bushing

2. Insert the tool shown in Fig. 3 into the extension housing until it grips the front side of the bushing.

3. Turn the screw clockwise until the seal and the bushing are free of the housing.

4. Drive a new bushing into the extension housing with the tool shown in Fig. 4.

5. Install a new seal in the housing as shown in Fig. 2.

6. Install the driveshaft.

LUBRICATION

Lubrication level should be in line with the bottom of filler hole right side of transmission case.

3 CLEANING AND INSPECTION

CLEANING

1. Wash all parts, except the ball bearings, in a suitable cleaning solvent. Brush or scrape all foreign matter from the parts. Be careful not to damage any parts with the scraper. Dry all parts with compressed air.

2. Rotate the ball bearings in a cleaning solvent until all lubricant is removed. Hold the bearing assembly to prevent it from rotating and dry it with compressed air.

3. Lubricate the bearings with approved transmission lubricant and wrap them in a clean, lint-free cloth or paper until ready for use.

INSPECTION

1. Inspect the transmission case for being cracked, worn or damaged bearing bores, damaged threads or any other damage which could affect the operation of the transmission.

2. Inspect the front face of the case for small nicks or burrs that could cause misalignment of the transmission with the flywheel housing. Remove all small nicks or burrs with a fine stone.

3. Replace a cover that is bent or distorted. Make sure that the vent hole in the cover is open.

4. Check the condition of the shift levers, forks, shift rails and the lever and shafts.

5. Examine the ball bearing races for being cracked, worn or rough. Inspect the balls for looseness, wear, end play or other damage. Check the bearings for looseness in the bores. If any of these conditions exist, replace the bearings.

6. Replace roller bearings that are broken, worn or rough.

7. Replace the countershaft (cluster) gear if the teeth are chipped, broken or worn. Replace the countershaft if it is bent, scored or worn.

8. Replace the reverse idler gear or sliding gear if the teeth are chipped, worn or broken. Replace the idler gear shaft if bent, worn or scored.

9. Replace the input shaft and gear if the splines are damaged or if the teeth are chipped, worn or broken. If the roller bearing surface in the bore of the gear is worn or rough, or if the cone surface is damaged, replace the gear and the gear rollers.

10. Replace all other gears that are chipped, broken or worn.

11. Check the synchronizer sleeves for free movement on their hubs. Make sure that the alignment marks (etched marks) are properly indexed.

12. Check the blocking rings for the grooves being worn smooth or for the teeth being damaged.

13. Replace the speedometer drive gear if the teeth are stripped or damaged. Make certain to install the correct size replacement gear.

14. Replace the output shaft if there is any evidence of wear or if any of the splines are damaged.

15. Inspect the bushing and the seal in the extension housing. Replace them if they are worn or damaged. The bushing and/or seal should be replaced after the extension housing has been installed on the transmission.

16. Replace the seal in the input shaft bearing retainer.

17. Replace the seals on the cam and shafts.

PART 6-2 MODEL 2.77 THREE-SPEED TRANSMISSION

Section	Page	Section	Page
1 Description and Operation	6-4	3 Removal and Installation	6-6
2 In-Car Adjustments and Repairs	6-4	4 Major Repair Operations	6-6

1 DESCRIPTION AND OPERATION

DESCRIPTION

The 2.77 C.D. three-speed transmission is used in all models with a 144 or 170 C.I.D. engine. The designation 2.77 C.D. is the actual distance between the centerline of the countershaft and the centerline of the input shaft.

An identification plate (Fig. 1) is attached to the upper right extension housing attaching bolt.

A synchronizer is provided for shifting to second and third speeds. Shifts to first and reverse speeds are accomplished with a sliding gear.

Ball bearings support the input shaft and gear and the center of the output shaft (Fig. 2). Needle bearings in the input shaft bore support the front of the output shaft. The countershaft gear (cluster gear) also runs on 2 rows of needle bearings. A bronze bushing is used in the reverse idler gear.

A bushing located at the rear of the extension housing supports the rear of the output shaft. The synchronizer and the blocking rings are the conventional tapered ring and straight clutch gear type.

OPERATION

When first gear is selected, the shift lever moves the first and reverse sliding gear into mesh with the low gear on the countershaft (cluster) gear. Power flow is now from the input gear, through the countershaft gear to the first and reverse sliding gear and out through the output shaft.

When second gear is selected, the shift lever moves the second and third speed synchronizer sleeve rearward to force the blocking ring conical surface against the matching cone on the constant mesh intermediate gear located on the output shaft. When the vehicle is moving, as when shifting from low to a higher gear ratio, the internal teeth of the synchronizer sleeve and those on the blocking ring will not index until the intermediate gear is brought up or down to the speed of the synchronizer sleeve which is rotating at output shaft speed.

The synchronizer sleeve with further movement will slide over the blocking ring and engage the clutch teeth on the constant mesh intermediate gear. Since the intermediate gear is now locked to the output shaft by means of the synchronizer sleeve, power flow is from the input shaft through the countershaft gear to the constant mesh intermediate gear to the output shaft.

Engagement of third speed is the same as second except for ratio. In third gear, the clutch teeth on the input shaft are locked directly to the output shaft by the second and third speed synchronizer to provide a ratio of 1:1.

Reverse gear is accomplished by moving the first and reverse sliding gear rearward to engage the reverse idler gear. The drive is then from the input gear, through the countershaft gear, to and through the reverse idler gear to the first and reverse sliding gear which is splined to the output shaft. The gears in this position will rotate the output shaft in a reverse direction.

An interlock pin prevents selection of more than one gear at a time. Detent balls are provided to hold the selected gear in the desired position.

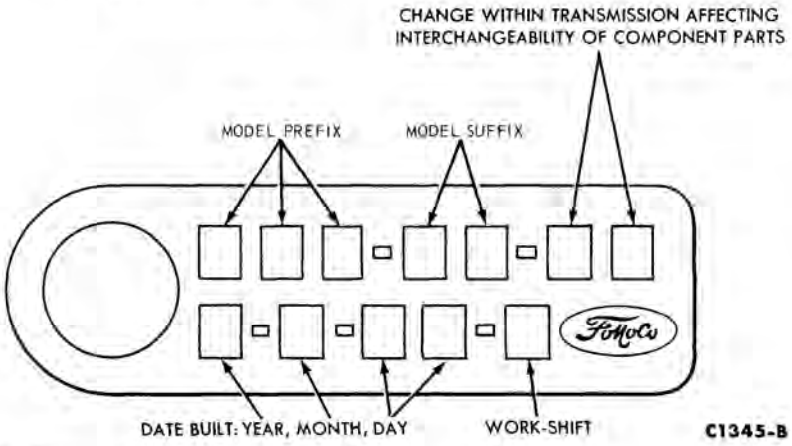


FIG. 1—Transmission Identification Tag

2 IN-CAR ADJUSTMENTS AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT—FAIRLANE

1. Place the gear shift lever in the neutral position.

2. Loosen the two gearshift rod adjustment nuts (Fig. 2).

3. Insert a 3/16-inch diameter alignment pin through the first and reverse gearshift lever and the second and third gearshift lever. It may be necessary to align the levers to insert the pin.

4. Tighten the two gearshift rod adjustment nuts.

5. Remove the alignment pin from the levers.

6. Start the engine and shift the selector lever to each position to make sure it operates freely.

GEAR SHIFT LINKAGE ADJUSTMENT—COMET, FALCON (6 AND 8 CYLINDER)

1. Place the gearshift lever in the neutral position.

2. Loosen the two gearshift rod adjustment nuts.

3. Insert a dealer fabricated special tool in the slot provided in the lower steering column. (See Fig. 3.) It may be necessary to align the levers to insert the tool.

4. Tighten the two gearshift rod adjustment nuts.

5. Remove the tool from the slot in the steering column.

6. Start the engine and shift the selector lever to each position to make sure it operates freely.

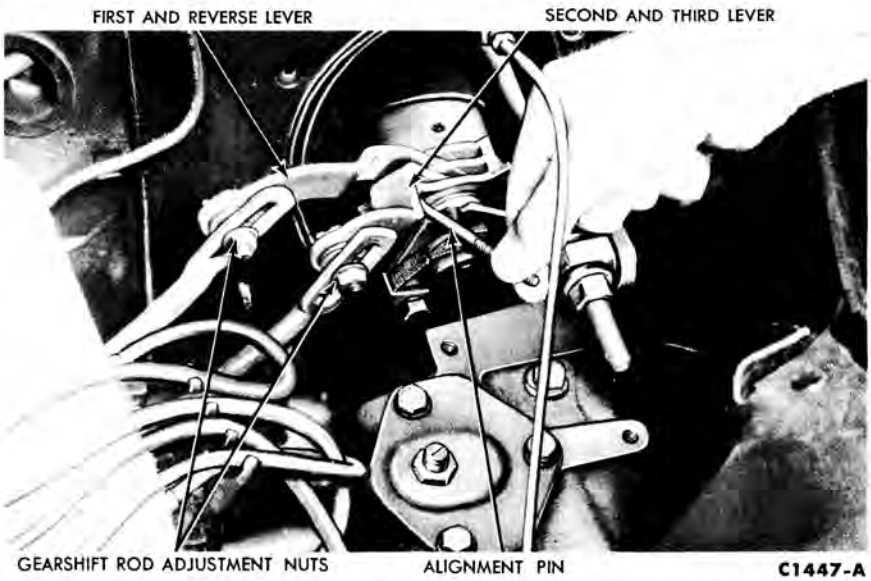


FIG. 2—Gearshift Linkage Adjustment—Fairlane

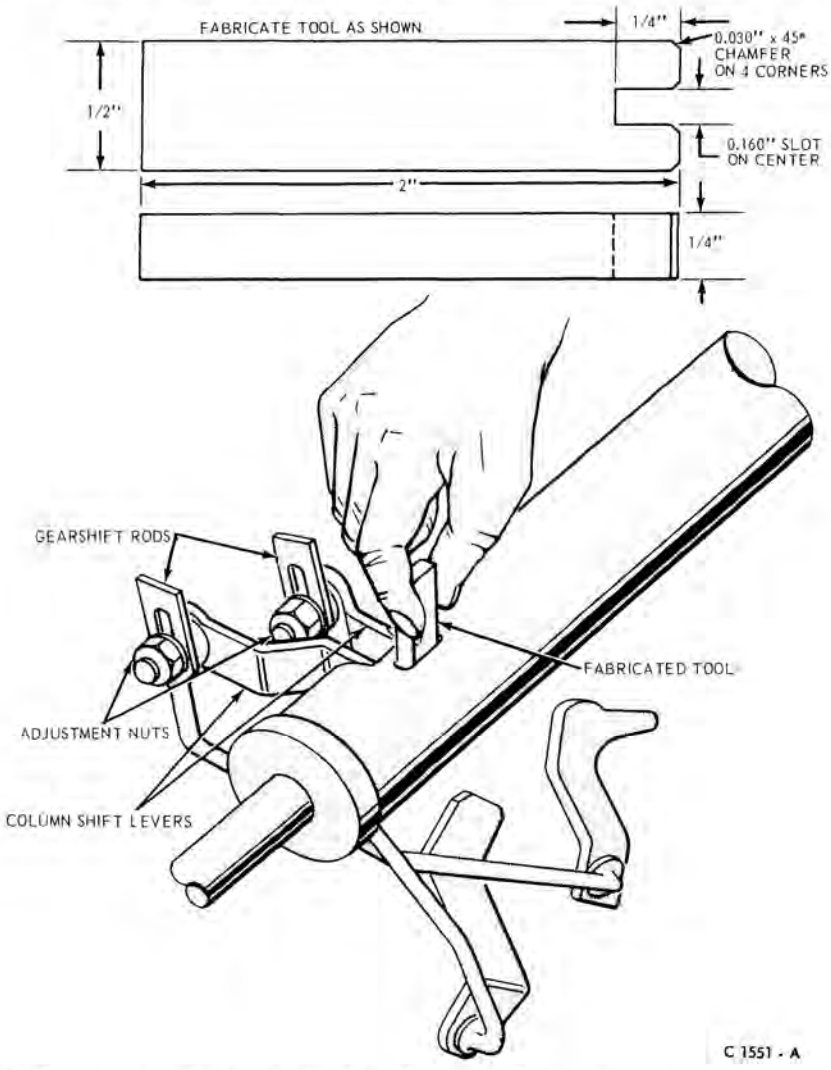


FIG. 3—Comet and Falcon Gearshift Linkage Adjustment

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the car on a hoist.

2. Remove the driveshaft. Insert the extension housing seal installation tool, Fig. 2, Part 6-1, into the opening of the extension housing to prevent the lubricant from leaking out.

3. Disconnect the speedometer cable from the extension housing, and disconnect the gear shift rods from the transmission shift levers.

4. Remove the two cap screws and lock washers that attach the transmission support to the extension housing. Remove from support spring on Falcon or Comet.

5. Place a transmission jack under the flywheel housing and raise the rear of the engine slightly.

6. Remove the two bolts that attach engine rear support to the underbody. Disconnect the brake cable from the engine rear support.

7. Move the jack under the transmission. Remove the four transmission to flywheel housing mounting bolts.

8. Move the transmission back just far enough to clear the input shaft, and remove it from under the car.

INSTALLATION

1. Install two guide pins in the flywheel housing lower mounting holes. Start the input shaft through the release bearing. Align the output shaft splines with splines in the clutch disc. Move the transmission forward on to the guide pins. If the transmission front bearing retainer hangs-up on the release bearing hub, move the clutch release lever to free it.

2. Move the transmission forward until the input shaft is through the clutch hub and enters the pilot bearing.

3. Install the two upper transmission to flywheel housing attaching bolts and lockwashers.

4. Remove the two guide pins and install the two lower attaching bolts. Torque all attaching bolts to specifications. Install the rear support before lowering the engine and removing the transmission jack.

5. Secure the extension housing to the rear support and install the brake cable. Secure to support spring on Falcon or Comet.

6. Connect the gear shift rods and the speedometer cable.

7. Remove the tool (Fig. 2, Part 6-1) from the rear of the extension housing. Install the driveshaft, and torque the rear U-bolt nuts to specification.

8. Fill the transmission with approved lubricant. Check the shifting action of the transmission.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant.

2. Remove the transmission cover and gasket.

3. Remove the extension housing attaching bolts and remove the extension housing and gasket. To prevent the output shaft from following the housing (with the resultant loss of needle bearings), tap the end of the output shaft with a soft-faced hammer while withdrawing the extension housing. See disassembly (Fig. 4.)

4. Remove the speedometer drive gear snap ring, the gear, and drive ball from the output shaft.

5. Remove the retainer for the reverse idler shaft and countershaft (Fig. 4).

6. Hold the countershaft gear with a hook and using the tool shown in Fig. 5, drive the countershaft rearward out of the countershaft gear and the transmission case. Then carefully lower the countershaft gear to the bottom of the case.

7. After removing the input shaft bearing retainer and gasket, remove the input shaft assembly and front synchronizer blocking ring from the transmission case (Fig. 6).

8. Remove the synchronizer retaining snap ring from the output shaft. Then, while holding the synchronizer assembly together, pull the output shaft out of the transmission case. The intermediate gear and the low and reverse gear will slide off the output shaft as it is withdrawn from the case. Lift the synchronizer assembly, intermediate, low and reverse sliding gears out of the case and remove the two shift forks. **For reference in assembly, notice which synchronizer hub end faces forward.**

9. Using a soft drift, drive the reverse idler shaft out of the transmission case. Lift the reverse idler gear and the countershaft gear out of the case.

10. Remove the shift levers.

PARTS REPAIR OR REPLACEMENT

CAM AND SHAFTS AND OIL SEALS

1. From the underside of the case, use a punch to drive out the tapered pins that hold the cam and shaft assemblies in the case (Fig. 7): **Use hard, firm blows.** Using a plastic hammer, drive the intermediate and high cam and shaft toward the inside of the case and separate the detent

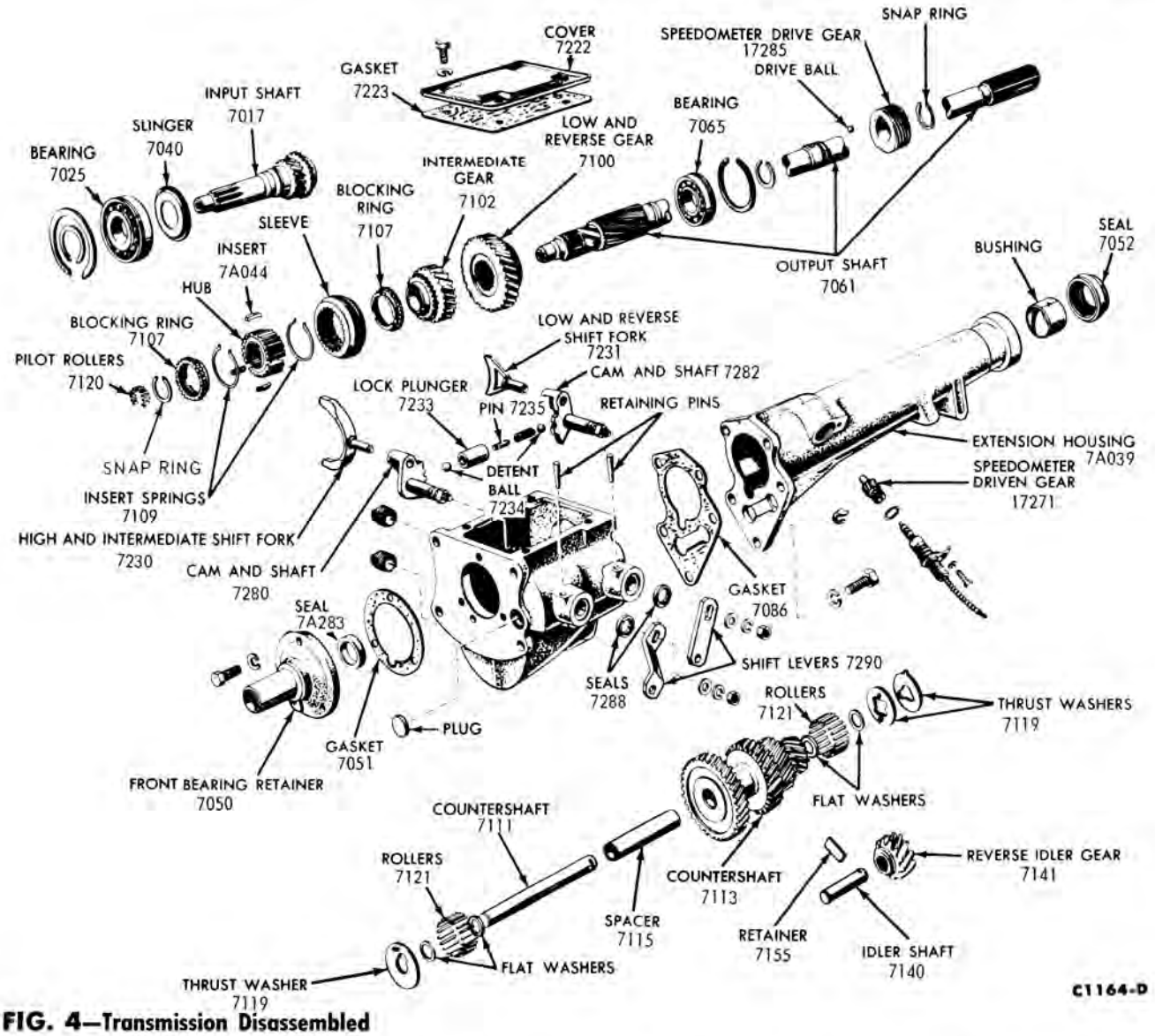


FIG. 4—Transmission Disassembled

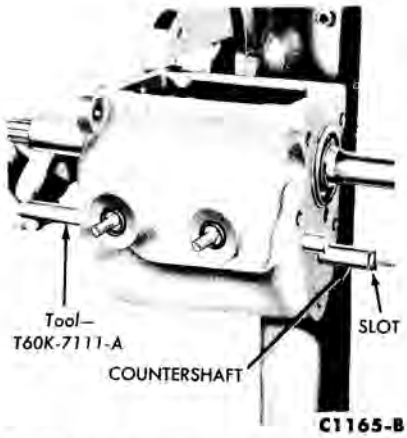


FIG. 5—Removing or Installing Countershaft

balls and spring from the plunger. Push out the cam and shaft assemblies, and remove the plunger.

2. If required, the cam and shaft oil seals in the case may be removed with the tools shown in Fig. 8.

3. Use the tool shown in Fig. 9 to drive in the seals.

4. Install the reverse and low shift cam and shaft through the case opening. Assemble the spacer and spring in the plunger. Apply grease to each ball and position them in each end of the plunger. Hold the plunger assembly in position and install the intermediate and high cam and shaft in the case opening, allowing the balls to register in the cam detents.

5. Align the cam and shaft grooves with the openings in the shaft bosses in the case, and install the retaining pins. Check the cam action. Bent pins may restrict movement.

INPUT SHAFT BEARING

1. Remove the snap ring securing the input shaft bearing, and press the input shaft out of the bearing and oil slinger.

2. Press the input shaft bearing and oil slinger onto the input shaft with the tool shown in Fig. 10, and install the snap ring on the shaft.



FIG. 6–Removing Input Shaft



FIG. 7–Removing Cam and Shaft Retaining Pins

OUTPUT SHAFT BEARING

1. Remove the snap ring securing the output shaft bearing. Remove the bearing as shown in Fig. 11.

2. Press the output shaft bearing onto the shaft as shown in Fig. 11, and install the snap ring on the shaft.

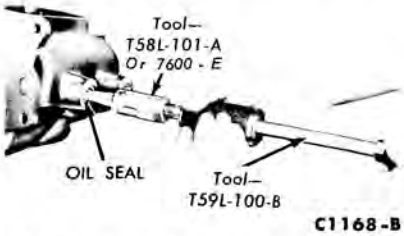


FIG. 8–Removing Cam and Shaft Oil Seals

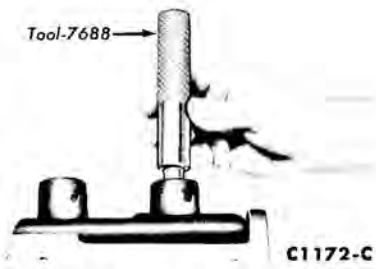


FIG. 9–Installing Cam and Shaft Oil Seals

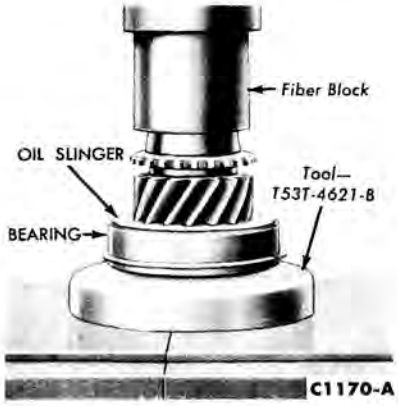


FIG. 10–Installing Input Shaft Bearing

SYNCHRONIZER

1. Remove the synchronizer sleeve, blocking rings, inserts, and retainers from the synchronizer hub.

2. Hold the three inserts in place in the synchronizer hub (Fig. 4).

3. Align the etch mark on the hub with the etch mark on the sleeve. Slip the hub and inserts into the sleeve making sure that the etch marks are aligned.

4. Secure the hub and inserts in the sleeve with the two insert springs.

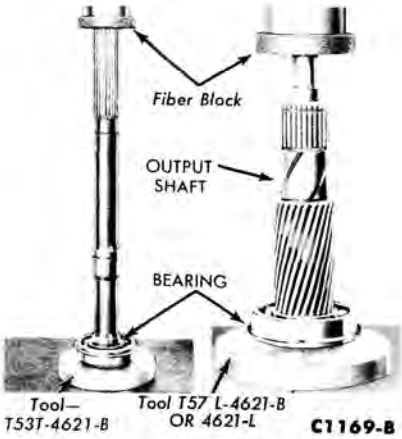


FIG. 11–Replacing Output Shaft Bearing

COUNTERSHAFT GEAR BEARINGS

1. Remove the flat washers, dummy shaft, spacer, and needle bearings from the countershaft gear.

2. Insert the spacer and dummy shaft into the countershaft gear. Position one flat washer at each end of the spacer (Fig. 4). Apply a coating of grease to the other two flat washers and the thrust washers and assemble at each end of the countershaft gear. **Note the position of the tangs on the thrust washers.**

3. Position the gear assembly in the bottom of the transmission case with the larger gear toward the front of the case.

FRONT BEARING RETAINER SEAL

1. Remove the input shaft seal from the front bearing retainer as shown in Fig. 12.

2. Install a new input shaft seal as shown in Fig. 13.

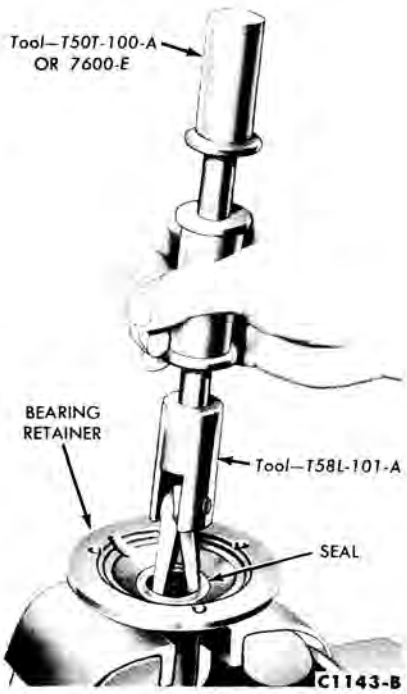


FIG. 12–Removing Input Shaft Seal

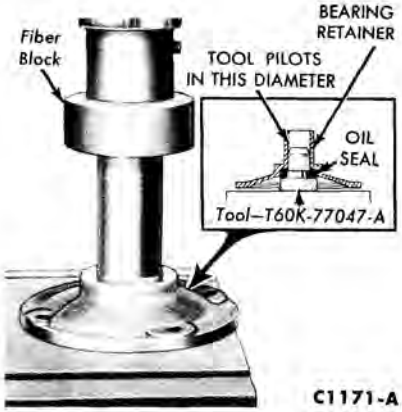


FIG. 13–Installing Input Shaft Seal

ASSEMBLY

1. If the countershaft gear is not already positioned in the bottom of the case, do it at this time.

2. Position the reverse idler gear, and insert the shaft (from the rear) through the case just far enough to hold the gear.

3. Using a light coat of grease, assemble the needle bearings in the input shaft. **A thick film of grease could plug the lubricant holes and prevent lubrication to the bearings.** Install the front synchronizer blocking ring on the input shaft.

4. Install the shift forks on the cam and shaft assemblies, with the large fork on the intermediate and high cam and shaft. The web of the low and reverse fork must be to the rear of the shaft center.

5. Start the output shaft through the rear opening of the transmission case. Place the low and reverse gear on the shaft, followed by the intermediate gear. Tilt the output shaft enough to allow the rear shift fork to engage the sliding gear groove.

6. With the longer hub end forward slide the synchronizer assembly on to the output shaft and engage the synchronizer sleeve in the intermediate and high shift fork.

7. Install the synchronizer hub snap ring.

8. Position the input shaft and synchronizer front blocking ring.

9. Place a new gasket on the input shaft bearing retainer. Install the input shaft bearing retainer, using sealer on the bolts. Line up the drain groove in the retainer with the oil hole in the case.

10. Raise the countershaft gear to align the dummy shaft with the countershaft holes in the case. Start the countershaft into the case from the rear, and carefully drive the shaft into position.

11. Install the idler gear shaft and the retainer.

12. Install the speedometer drive gear and drive ball. Then secure the gear with the snap ring.

13. Install a new gasket, and the extension housing, using sealer on the bolts. Torque the bolts to specification.

14. Install the shift levers.

15. If the extension housing bushing and/or seal is to be replaced, refer to Part 6-1, Section 2, for the detailed instructions.

16. Check transmission operation through all shift positions.

17. Fill the transmission to the proper level and install the transmission case cover and gasket. Use sealer on the bolts. **The gasket vent holes must be toward the rear, and the cover vent hole must be toward the front.**

PART 6-3 MODEL 3.03 THREE-SPEED TRANSMISSION

Section	Page	Section	Page
1 Description and Operation	6-10	3 Removal and Installation	6-13
2 In-Car Adjustment and Repairs	6-11	4 Major Repair Operations	6-13

1 DESCRIPTION AND OPERATION

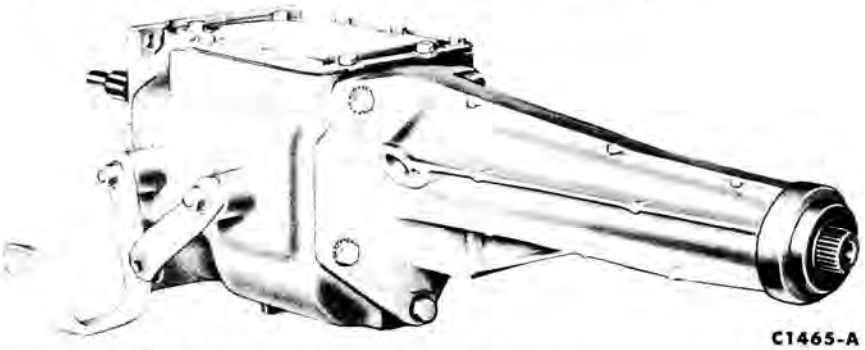


FIG. 1—3-Speed Transmission—Falcon—Comet

DESCRIPTION

The 3.03 HEF Model three-speed transmission (Fig. 1) is used on all models having a 260 or 289 C.I.D. engine. The designation 3.03 is the actual distance between the centerline of the countershaft and the centerline of the input shaft.

This transmission is of the fully synchronized type, with all gears except the reverse gear and sleeve being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves (Fig. 2) instead of sliding gears. The synchronizers enable quicker shifts, greatly reduce gear clash and permit down-shifting, high to intermediate between 40-20 mph and from intermediate to low below 20 mph.

The forward-speed gears are helical-cut an are in constant mesh (Fig. 2). Gears used in the reverse gear train are spur-cut and are not synchronized.

Ball bearings support the input shaft and gear and the center of the output shaft (Figs. 14 and 16). Roller bearings in the input shaft bore support the front of the output shaft. The countershaft gear (cluster gear) runs on two rows of roller bearings. Two bronze bushings are used in the reverse idler gear (Fig. 13). A bushing located at the rear of the extension housing supports the rear of the output shaft.

Synchronizers and blocking rings are the conventional tapered ring and straight clutch gear type (Figs. 18 and 19).

The shift forks, shift rails, detent

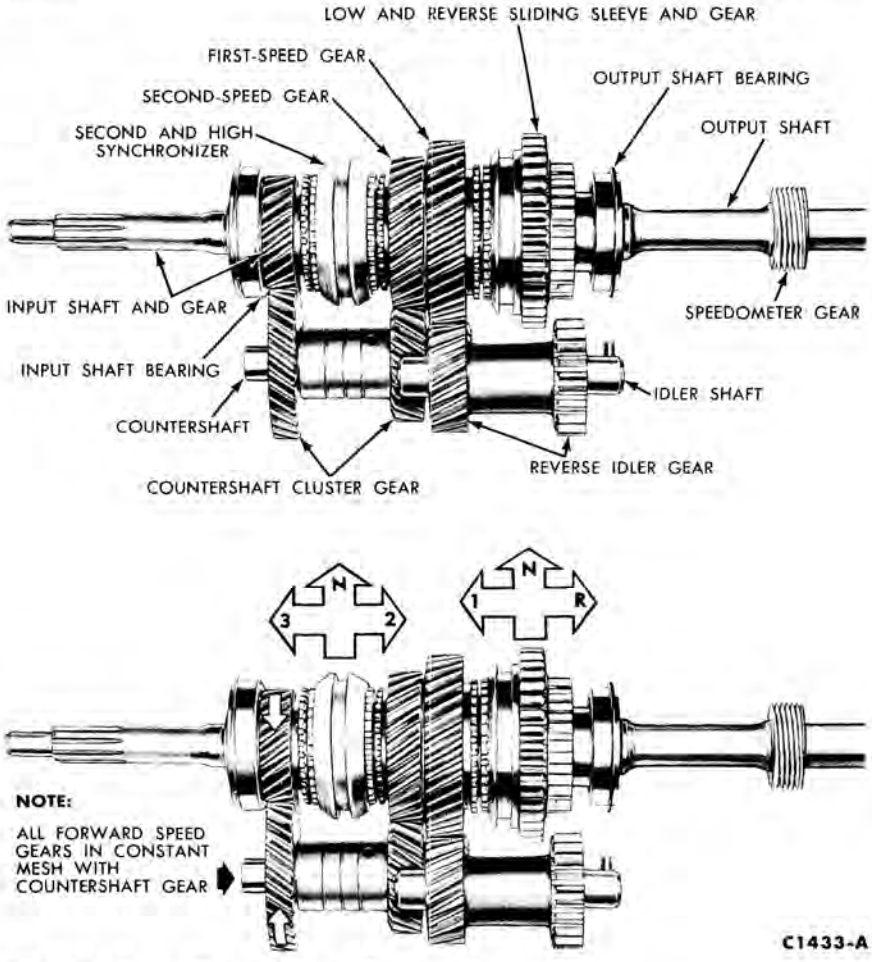


FIG. 2—Power Flow—3-Speed Transmission

mechanism, and related parts are provided in the transmission case (Fig. 10).

OPERATION

When the first-speed gear is selected, the shift lever moves the reverse gear and sleeve forward and forces the synchronizer blocking ring conical surface against the matching cone on the constant mesh first gear located on the output shaft. If the car is moving, the internal teeth of the reverse gear and sleeve and blocking ring will not index until the constant mesh first gear is brought up or down to the speed of the reverse gear and sleeve which is rotating at output shaft speed.

The reverse gear and sleeve has internal splines that, with further movement, will slide over the blocking ring and engage external clutch teeth on the constant mesh first gear. Since first gear is now locked to the output shaft and is always meshed with the countershaft (cluster) gear, the power flow is from the input gear, through the countershaft gear, to the constant mesh first gear, through the reverse gear and sleeve to the output shaft, and out the rear of the transmission.

Engagement of second and third gears is the same as first except for ratio. In third gear, the input gear and shaft is locked directly to the output shaft by the second and third speed synchronizer to provide a ratio of 1:1.

Spur teeth are cut on the outside of the reverse gear and sleeve. The reverse gear and sleeve like the hub are always locked to the output shaft. Reverse gear is engaged by sliding the reverse gear and sleeve into mesh with the spur gear at the rear of the idler gear. The drive is then from the input gear, through the countershaft gear, to and through the reverse idler gear to the output shaft reverse gear and sleeve. The gears in this position will rotate the output shaft in a reverse direction.

A system of interlocks and detents in the transmission case prevents the selection of more than one gear at a time and helps to hold any gear in the selected position.

2 IN-CAR ADJUSTMENTS AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT—FAIRLANE

1. Place the gear shift lever in the neutral position.

2. Loosen the two gearshift rod adjustment nuts (Fig. 3).

3. Insert a 3/16-inch diameter alignment pin through the first and reverse gearshift lever and the second and third gearshift lever. It may be necessary to align the levers to insert the pin.

4. Tighten the two gearshift rod adjustment nuts.

5. Remove the alignment pin from the levers.

6. Start the engine and shift the selector lever to each position to make sure it operates freely.

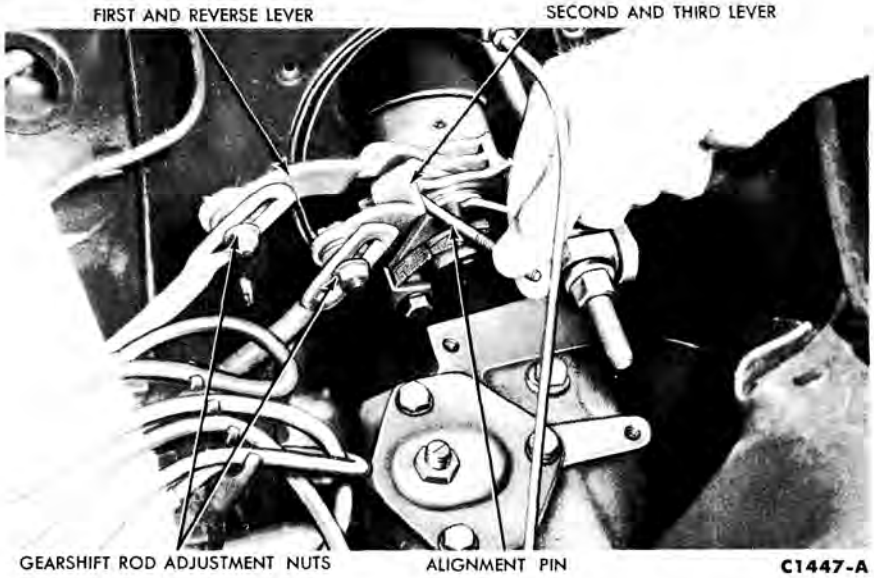


FIG. 3—Gearshift Linkage Adjustment—Fairlane

GEAR SHIFT LINKAGE ADJUSTMENT—COMET, FALCON

1. Place the gear shift lever in the neutral position.

2. Loosen the two gearshift rod adjustment nuts.

3. Insert a dealer fabricated special tool in the slot provided in the lower steering column. (See Fig. 4).

It may be necessary to align the levers to insert the tool.

4. Tighten the two gearshift rod adjustment nuts.

5. Remove the tool from the slot in the steering column.

6. Start the engine and shift the selector lever to each position to make sure it operates freely.

SHIFT LINKAGE ADJUSTMENT—MUSTANG

1. Loosen the three shift linkage adjustment nuts. Install a ¼ inch diameter alignment pin through the control bracket and levers as shown in Fig. 5.

2. Tighten the three linkage adjustment nuts and then remove the alignment pin.

3. Check the gear shift lever for a smooth crossover.

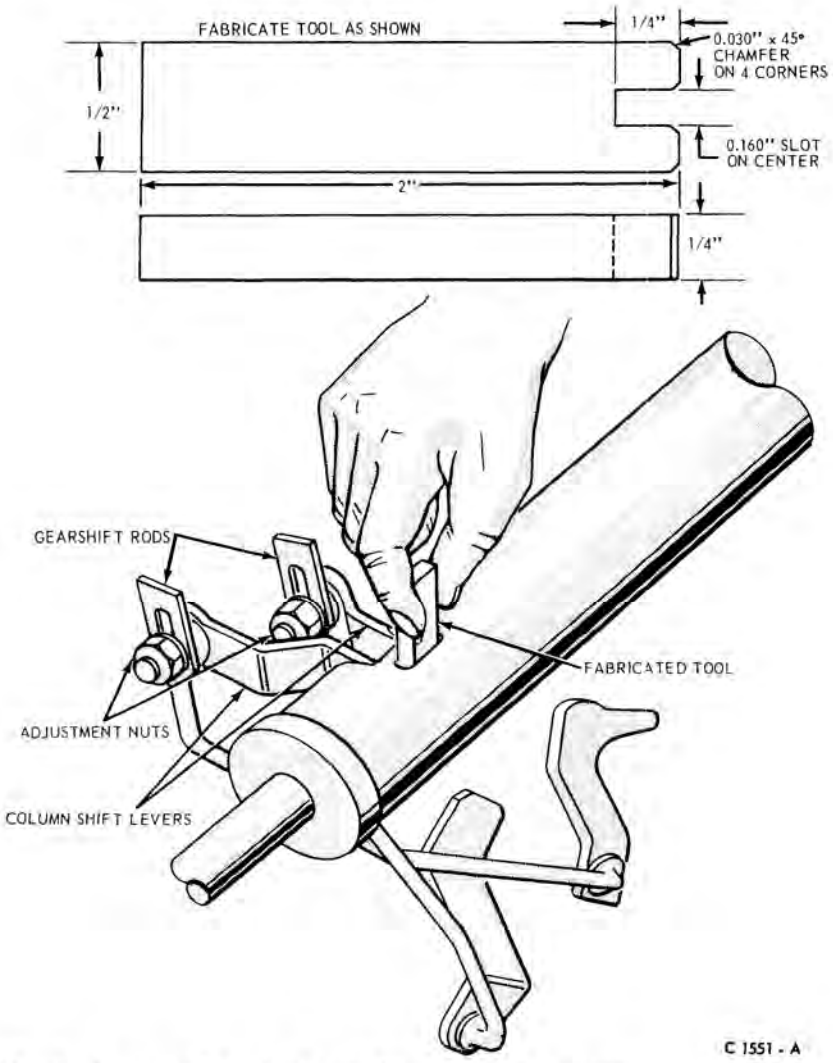


FIG. 4—Comet and Falcon Gearshift Linkage Adjustment

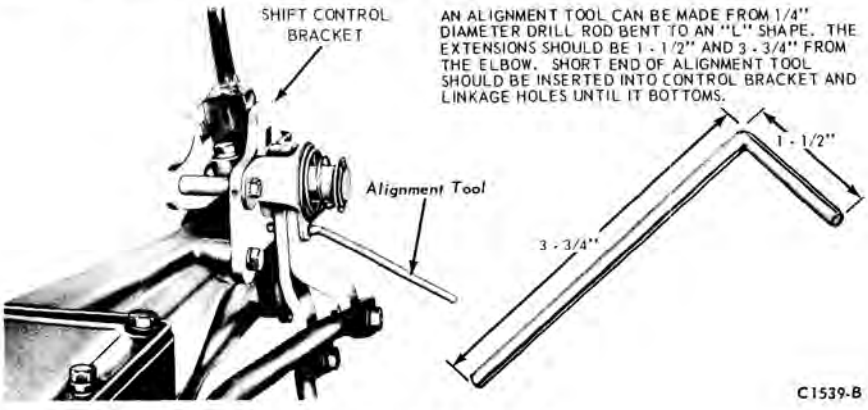


FIG. 5—Three-Speed Shift Linkage Adjustment

3 REMOVAL AND INSTALLATION

REMOVAL

1. Working, from inside of the car, remove the dust boot retaining ring attaching screws. Slide the boot and ring upward on the shift lever.

2. Remove the shoulder bolts and flat washers that secure the shift lever to the shift control mechanism (Fig. 5) and remove the lever. Be careful not to lose the two trunnions and springs.

3. Raise the car on a hoist and drain the lubricant from the transmission.

4. Disconnect the driveshaft from the rear U-joint flange.

5. Disconnect exhaust inlet pipes at manifolds.

6. Slide the front of the driveshaft out of the extension housing and off the output shaft. Insert the tool shown in Fig. 2, Part 6-1, to prevent the lubricant from leaking out.

7. Remove the cap screw and lock washer that secures the speedometer cable retainer to the extension housing. Pull the speedometer cable out of the extension housing.

8. Remove the cotter pin, flat washer, and spring washer that secure the shift rods to the shift levers on the transmission.

9. Disconnect the parking brake cable from the equalizer.

10. Remove the two cap screws and lock washers that secure the extension housing to the support, or support spring on Falcon and Comet.

11. Raise the rear of the engine enough to remove the weight from the frame crossmember. Remove the engine rear support attaching bolts, washers and remove the support and the spring as an assembly.

12. Support the transmission with a transmission jack and remove the four flywheel-housing-to-transmission case attaching bolts and lock washers.

13. Move the transmission and jack rearward until the input shaft is clear of the flywheel housing.

14. Remove the transmission from the jack and mount it in a holding fixture.

INSTALLATION

1. Make certain that the machined surfaces of the transmission case and the flywheel housing are free of dirt, paint and burrs.

2. Install a guide pin in each lower mounting bolt hole.

3. Start the input shaft through the release bearing. Align the splines on the input shaft with the splines in the clutch disc. Move the transmission forward on the guide pins until the input shaft pilot enters the bearing or bushing in the crankshaft. If the transmission front bearing retainer binds up on the clutch release bearing hub, work the release bearing lever until the hub slides onto the retainer. Install the two transmission - to - flywheel housing upper mounting bolts and lock washers. Remove the two guide pins and install the lower mounting bolts and lock washers. Torque the four mounting bolts to specifications.

4. Raise the rear of the engine high enough to provide clearance for installing the engine rear support. Secure the support with the attaching bolts and lock washers.

5. Lower the engine until the extension housing just contacts the support or support spring on Falcon or Comet. Align the bolt holes in the extension housing with those in the spring, then lower the engine and remove the jack. Install the two extension housing - to - support attaching bolts and lock washers.

6. Insert the parking brake front cable in the equalizer and install the equalizer in the bracket on the crossmember. Secure the parking brake rear cable to the equalizer with a cotter pin.

7. Connect each shift rod to its respective lever on the transmission with a spring washer, flat washer and cotter pin.

8. Insert the speedometer cable and driven gear in the extension housing and secure with a cap screw and lock washer.

9. Remove the tool shown in Fig. 2, Part 6-1, from the extension housing. Slide the front universal joint yoke onto the output shaft and into the extension housing. Connect the rear universal joint to the axle pinion flange and torque the nuts to specifications.

10. Connect exhaust inlet pipes at manifolds.

11. Fill the transmission to the proper level with the approved lubricant.

12. Install the shift lever, secure with flat washers and shoulder bolts.

13. Install the dust boot, retaining ring and screws.

14. Adjust the clutch pedal free travel and the shift linkage as required.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture.

2. Remove the nine cap screws that attach the cover to the case. Remove the cover and the gasket (Fig. 6) from the case.

3. Remove the five cap screws and lock washers that attach the extension housing to the case. Remove the extension and gasket from the case.

4. Remove the four cap screws and lock washers that attach the front bearing retainer to the case. Remove the retainer and gasket from the case.

5. Remove the lubricant filler plug from the right side of the case. Working through the plug opening, drive the roll pin out of the case and countershaft with a ¼-inch punch (Fig. 7).

6. Hold the countershaft gear with a hook and with the tool shown in Fig. 8, push the countershaft out the rear of the case.

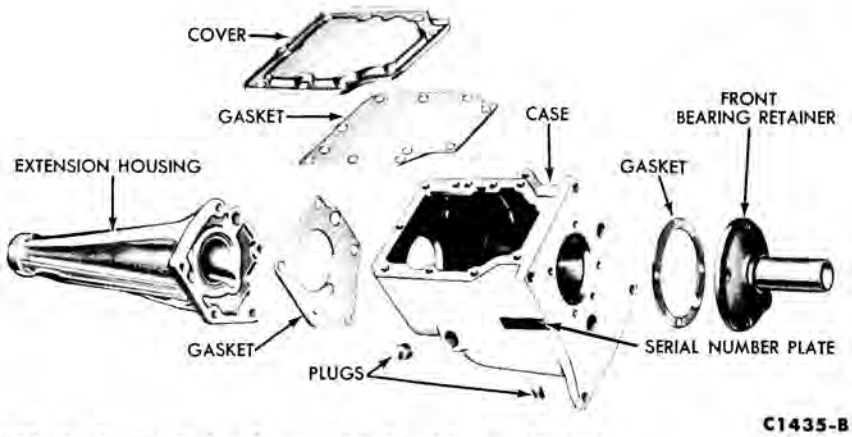


FIG. 6—Transmission Case and Related Parts—Typical

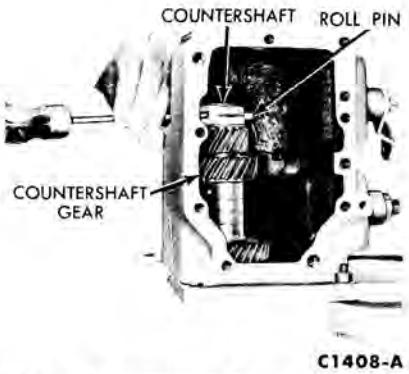


FIG. 7—Removing Countershaft Roll Pin

The countershaft (cluster) gear and thrust washers (Fig. 12) can be lowered to the bottom of the case. Remove the countershaft from the rear of the case.

7. Remove the snap ring that secures the speedometer drive gear on the shaft. Slide the speedometer drive gear off the output shaft. Remove the speedometer drive gear lock ball from the shaft.

8. Remove the snap ring that retains the output shaft bearing on the shaft. Remove the bearing from the case and shaft as shown in Fig. 9.

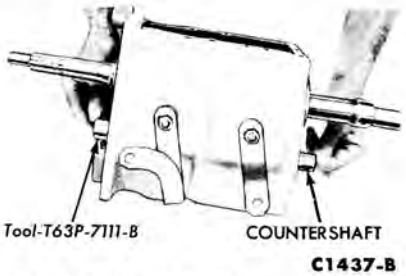


FIG. 8—Removing Countershaft

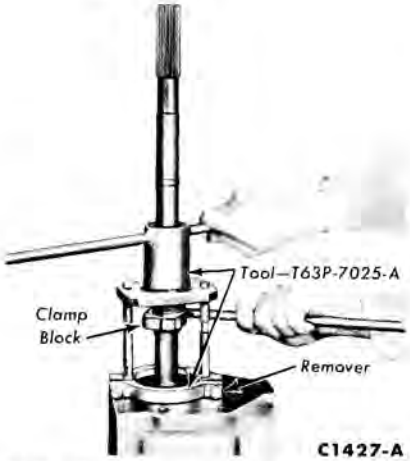


FIG. 9—Removing Output Shaft Bearing

9. Place both shift levers in the neutral (center) position.

10. Remove the set screw (Fig. 10) that retains the detent springs and plugs in the case. Remove the detent spring and plug from the case.

11. Remove the set screw that secures the first and reverse shift fork to the shift rail. Slide the first and reverse shift rail out through the rear of the case.

12. Slide the first and reverse synchronizer forward as far as possible, then rotate the first and reverse shift fork upward, then lift it from the case.

13. Move the second and third-speed shift fork to the second speed position to gain access to the set screw. Remove the set screw from the fork. Rotate the shift rail 90° as shown in Fig. 11.

14. Lift the interlock plug (Fig. 10) from the case with a magnet.

15. Tap on the inner end of the second and third shift rail to remove the expansion plug (Fig. 10) from the front of the case. Remove the shift rail.

16. Remove the second and third detent plug and spring from the detent bore.

17. Pull the input shaft and gear out the front of the case.

18. Rotate the second and third shift fork upward, and lift it from the case.

19. Carefully lift the output shaft assembly out through the top of the case.

20. Driving from the front of the case, remove the reverse idler gear shaft from the case and then lift the

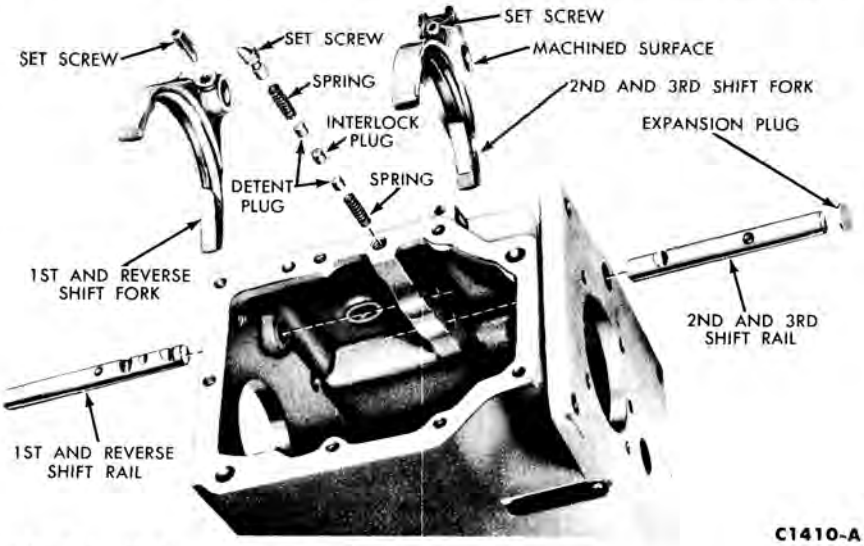


FIG. 10—Shift Rails and Forks—Disassembled

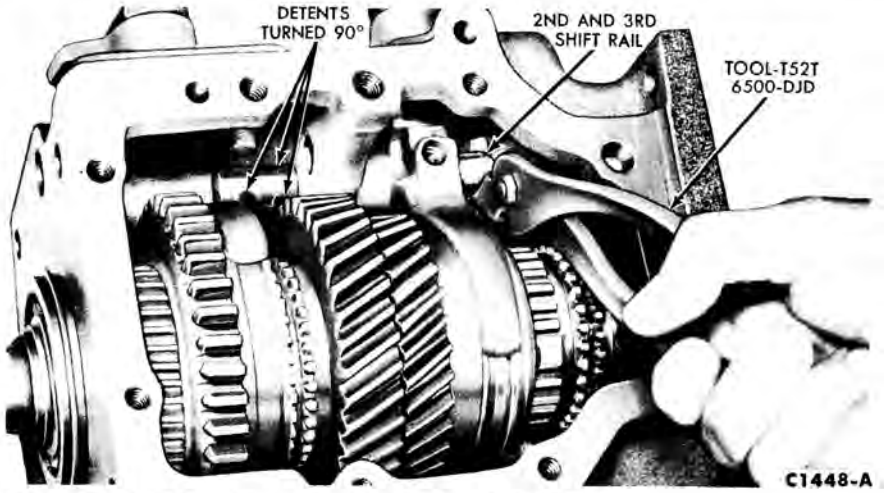


FIG. 11—Rotating Second and Third-Speed Shift Rail

reverse idler gear and two thrust washers (Fig. 12) from the case.

21. Remove the snap ring from the front of the output shaft, then slide the synchronizers and the second speed gear (Fig. 13) off the shaft.

22. Remove the next snap ring and tabbed thrust washer from the output shaft, and then slide the first gear and blocking ring off the shaft.

23. Remove the next snap ring from the output shaft, and slide the reverse gear and sleeve off the shaft.

PARTS REPAIR OR REPLACEMENT

SHIFT LEVERS AND SEALS

1. Remove the nut, lock washer and flat washer that secures each shift lever (Fig. 14) to the lever and shaft in the transmission case. Lift the levers off the shafts. Slide each lever and shaft out of the case. Discard the "O" ring from each shaft.

2. Lubricate the new seals with transmission lubricant and install them on the shafts.

3. Install the lever and shafts in the case.

4. Position a shift lever on each shaft and secure them with a flat washer, lock washer and nut.

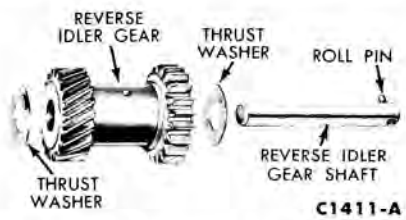


FIG. 12—Reverse Idler Shaft and Gear—Disassembled

INPUT SHAFT BEARING

1. Remove the snap ring securing the input shaft bearing (Fig. 15), and press the input shaft out of the bearing.

2. Press the input shaft bearing onto the input shaft with the tool shown in Fig. 16 and install the snap ring on the shaft.

SYNCHRONIZERS

1. Push the synchronizer hub from each synchronizer sleeve.

2. Separate the inserts and insert springs from the hubs. Do not mix the parts from the second and third speed synchronizer with the first and reverse synchronizer (Figs. 17 and 19).

3. Install the rear insert spring (Fig. 20) in the groove of the first and reverse synchronizer hub. Make sure that the spring covers all insert grooves. Start the hub in the sleeve making sure that the alignment marks are properly indexed. Position the three inserts in the hub making sure that the small end is over the spring and that the shoulder is on the inside of the hub. Slide the sleeve and reverse gear onto the hub until the detent is engaged. Install the front insert spring in the hub to hold the inserts against the hub.

4. Install one insert spring (Fig. 19) into a groove of the second and third speed synchronizer hub, making sure that all three insert slots are fully covered. With the alignment marks on the hub and sleeve aligned, start the hub into the sleeve. Place the three inserts on top of the retaining spring and push the assembly together. Install the remaining insert spring, so that the spring ends cover the same slots as does the other spring. Do not stagger the springs. Place a synchronizer blocking ring on each end of the synchronizer sleeve.

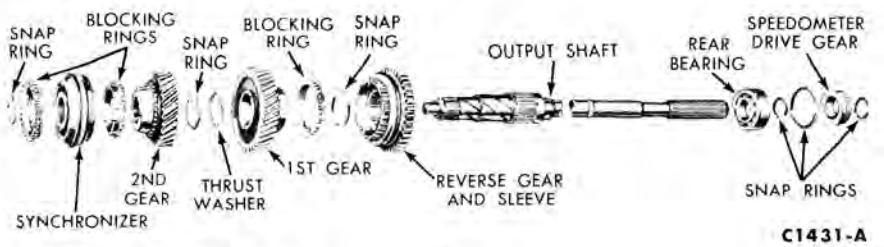


FIG. 13—Output Shaft—Disassembled

COUNTERSHAFT GEAR BEARINGS

1. Remove the dummy shaft, 50 roller bearings, and the two bearing retainer washers from the countershaft gear (Fig. 18).

2. Coat the bore in each end of the countershaft gear with grease.

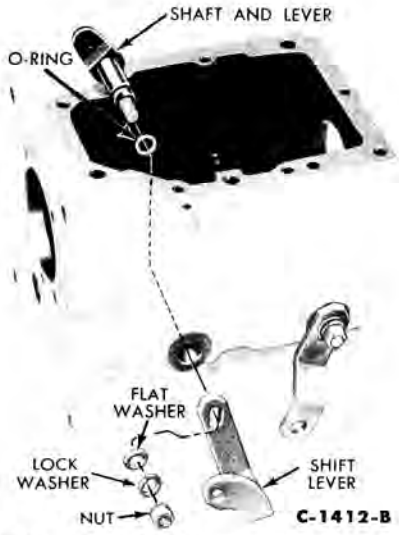


FIG. 14—Shift Lever and Shaft—Disassembled

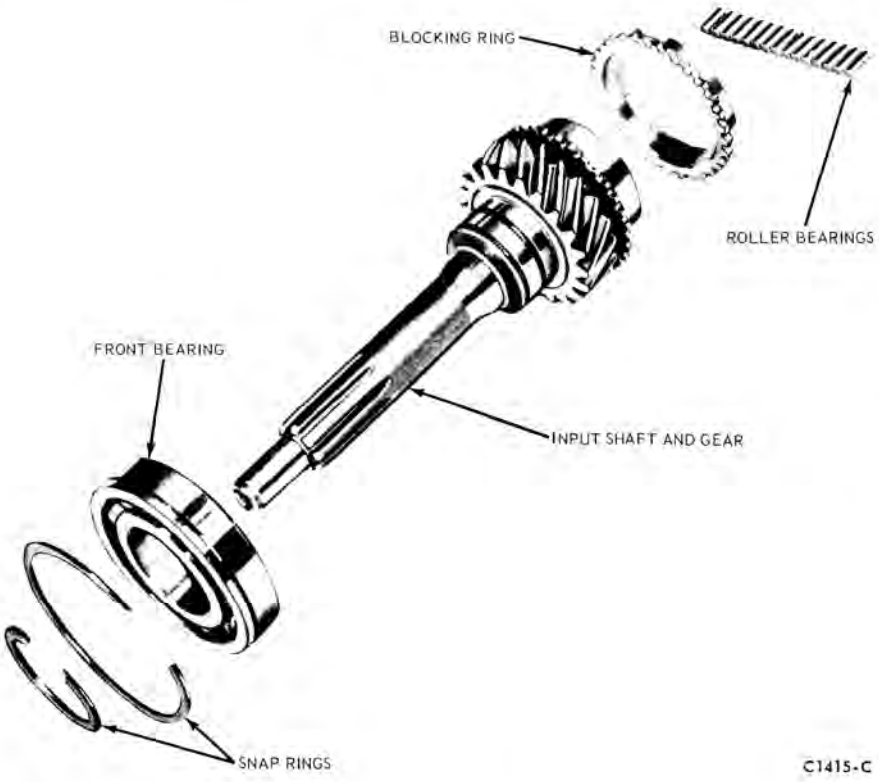


FIG. 15—Input Shaft Gear—Disassembled

3. Hold the dummy shaft in the gear and install the 25 roller bearings and a retainer washer in each end of the gear.

4. Position the countershaft gear, dummy shaft, and roller bearings in the case.

5. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.

6. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be 0.004-0.018 inch. If not within these limits, replace the thrust washers.

7. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.

ASSEMBLY

1. Place countershaft gear in proper position at bottom of case. The countershaft gear will remain in the bottom of the case until the output and the input shafts have been installed.

2. Coat the reverse idler gear thrust surfaces in the case with a thin film of lubricant and position the two thrust washers (Fig. 13) in place.

3. Position the reverse idler gear and dummy shaft in place. Align the gear bore and thrust washers with the case bores and install the reverse idler shaft.

4. Measure the reverse idler gear end play with a feeler gauge. End play should be 0.004-0.018 inch. If the end play is not within limits, replace the thrust washers. If the end play is within limits, leave the reverse idler gear installed.

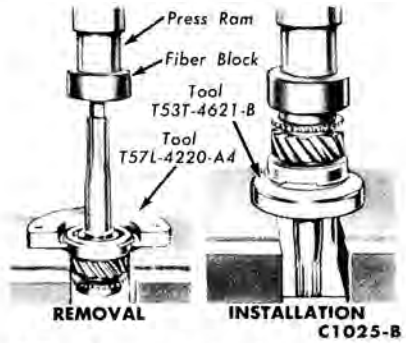


FIG. 16—Replacing Input Shaft Bearing

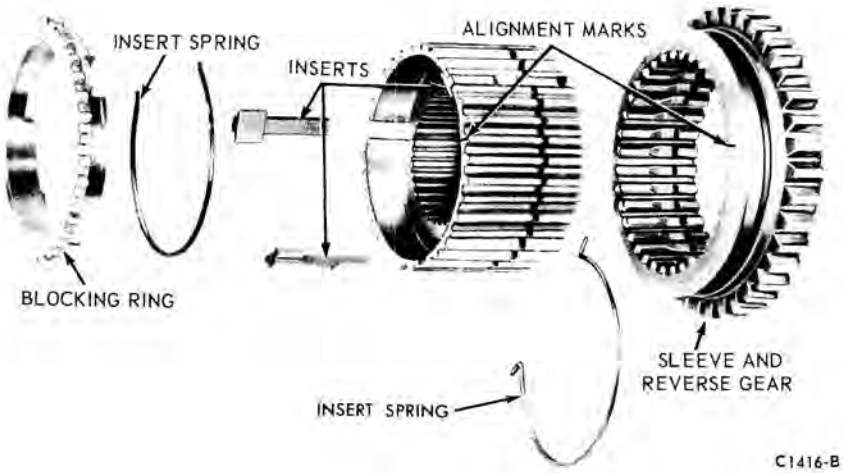


FIG. 17—First and Reverse Synchronizer—Disassembled

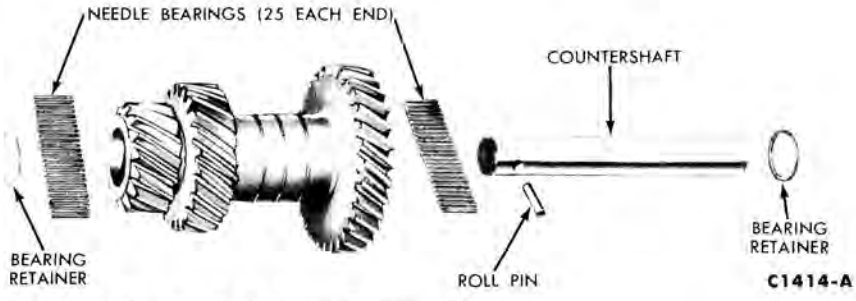


FIG. 18—Countershaft Gear—Disassembled

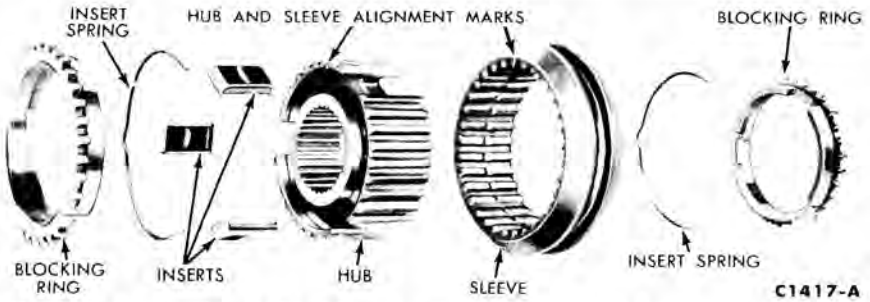


FIG. 19—Second and Third Synchronizer—Disassembled

5. Lubricate the output shaft splines and machined surfaces with transmission lubricant.

6. Slide the first and reverse gear and sleeve (Fig. 14) onto the output shaft with the teeth end of the gear facing toward the rear of the shaft. Secure it in place with the snap ring.

7. Place the blocking ring on the tapered machined surface of the first gear.

8. Rotate the gear as necessary to engage the three notches in the blocking ring with the synchronizer inserts. Secure the first gear with the thrust washer and snap ring.

9. Slide the blocking ring onto the tapered machined surface of the second gear. Slide the second gear with blocking ring and the second and third gear synchronizer onto the mainshaft. The tapered machined surface of the second gear must be toward the front of the shaft. Make sure that the notches in the blocking ring engage the synchronizer inserts. Secure the synchronizer with a snap ring.

10. Coat the bore of the input shaft and gear with a thin film of grease. **A thick film of grease will plug the lubricant holes and prevent lubrication to the bearings.** Install the bearings (Fig. 16) in the bore.

11. Position the output shaft assembly in the case. Position the second and third shift fork on the second and third speed synchronizer.

12. Place a detent plug spring and a plug in the case (Fig. 10). Place the second and third speed synchronizer in the second speed position (toward rear of transmission). Align the fork and install the second and third speed shift rail. It will be necessary to depress the detent plug to enter the rail in the bore. Move the rail inward until the detent plug engages the forward notch (second speed position).

13. Secure the fork to the shaft with the set screw. Move the synchronizer to the neutral position.

14. Install the interlock plug in the case. If the second and third shift rail is in the neutral position, the top of the interlock will be slightly lower than the surface of the first and reverse shift rail bore.

15. Move the first and reverse synchronizer forward to the first speed position. Place the first and reverse shift fork in the groove of the first and reverse synchronizer. Rotate the fork into position and install the first and reverse shift rail. Move the rail inward until the center notch (neutral) is aligned with the detent bore. Secure the fork to the shaft with the set screw.

16. Install a new expansion plug in the case.

17. Hold the input shaft and blocking ring in position, and then move the output shaft forward to seat the pilot in the roller bearings of the input gear.

18. Tap the input gear bearing into place in the case while holding the output shaft to prevent the roller bearings from dropping. Install the front bearing retainer and new gasket, making sure that the oil return slot is at the bottom of the case. Install and torque the four attaching screws to 19-25 ft-lbs.

19. Install the large snap ring on the rear bearing. Place the bearing on the output shaft with the snap ring end toward the rear of the shaft. Press the bearing into place with the tool shown in Fig. 21. Secure the bearing to the shaft with a snap ring.

20. Hold the speedometer drive gear lock ball in the detent and slide the speedometer drive gear into place. Secure the gear with a snap ring.

21. Place the transmission in the vertical position. Working through

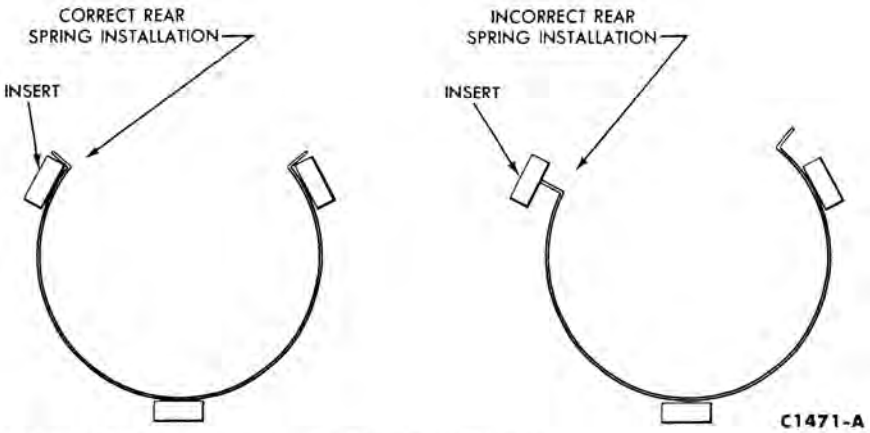


FIG. 20—First and Reverse Speed Synchronizer Insert Spring Installation

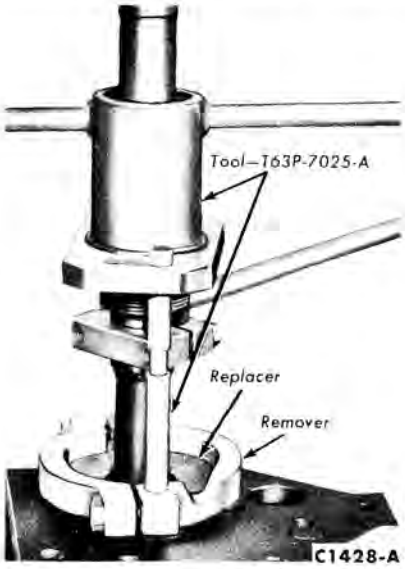


FIG. 21—Installing Output Shaft Rear Bearing

the drain hole in the bottom of the case, align the bore of the countershaft gear and the thrust washers with the bore of the case with a screwdriver.

22. Working from the rear of the case, push the dummy shaft out of the countershaft gear with the countershaft. Before the countershaft is completely inserted in the bore, make sure that the hole that accommodates the roll pin is in alignment with the hole in the case. Push the countershaft into place and install the roll pin.

23. Coat a new extension housing gasket with sealer and position it on the case.

24. Install lock washers on the five attaching screws. Dip the threads of the cap screws in sealer. Secure the housing to the case and torque the cap screws to 42-50 ft-lbs.

25. Install the filler and drain plugs in the case. Make sure that the magnetic plug is installed in the bottom of the case.

26. Place the transmission in gear. Pour lubricant over the entire gear train while rotating the input or output shaft.

27. Place a detent plug, spring and set screw in the case (Fig. 10). Coat a new cover gasket (Fig. 6) with sealer. Secure the cover with nine cap screws. Torque the screws to 14-19 ft-lbs.

28. Check the operation of the transmission in all of the gear positions.

PART 6-4 DAGENHAM FOUR-SPEED TRANSMISSION

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1	Description and Operation	6-19
2	In-Car Adjustment and Repairs	6-20
3	Removal and Installation	6-21
4	Major Repair Operations	6-21

1. DESCRIPTION AND OPERATION

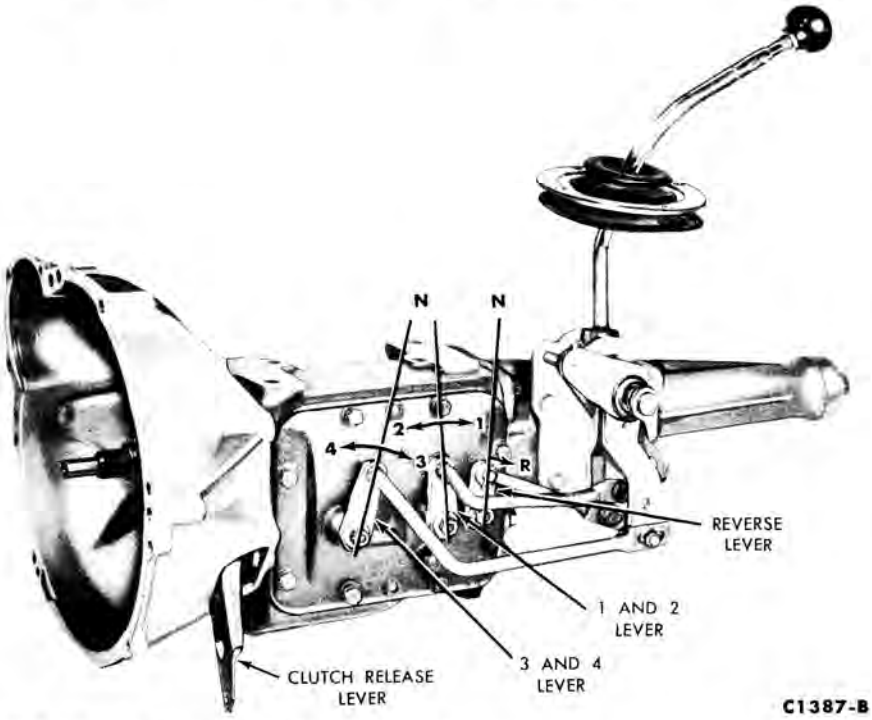


FIG. 1—4-Speed Floor Shift Transmission

DESCRIPTION

1. The Dagenham four-speed transmission (Fig. 1) is of the fully synchronized type, with all gears except the reverse sliding gear being in constant mesh. All forward speed changes are accomplished with synchronizer sleeves (Fig. 2) instead of sliding gears. The synchronizers will enable quicker shifts, greatly reduce gear clash and permit downshifting in all forward speeds.

The shift linkage is mounted directly on the transmission extension housing (Fig. 1) and enters the driver's compartment through an opening in the floor pan. A flexible rubber boot is provided to seal the driver's compartment (Fig. 3) from the exterior.

The shift pattern is shown on the top of the gear shift lever knob. A finger-operated release lever is provided on the shift lever (Fig. 3) to prevent the transmission from being accidentally shifted into reverse gear.

The forward speed gears are helical-cut and are in constant mesh (Fig. 2). Gears used in the reverse gear train are spur-cut and are not synchronized.

Ball bearing assemblies support the input gear and the center of the output shaft (Figs. 9 and 10). Roller bearings in the input gear bore support the front of the output shaft. The countershaft gear (cluster) also runs on two rows of roller bearings. A bronze bushing is used in the reverse idler gear (Fig. 19). The rear of the output shaft is supported by the driveshaft front yoke which in turn runs on a steel-backed bushing that is pressed into the extension housing.

Synchronizers and blocking rings are the conventional tapered ring and straight clutch gear-type (Fig. 17).

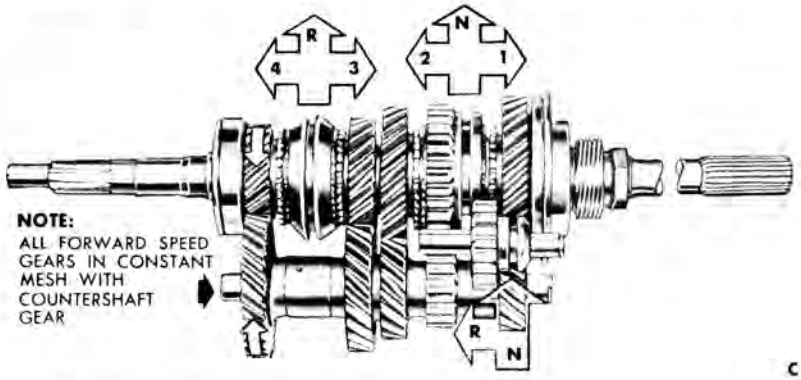


FIG. 2—Power Flow—4-Speed Transmission



FIG. 3—4-Speed Floor Shift Installed

A removable shift cover contains the shift cams, forks, shafts, detents and interlocks (Figs. 14 and 15).

OPERATION

When first gear is selected, the shift lever and linkage move the first and second shift fork and synchronizer sleeve toward the rear and force the synchronizer blocking ring conical surface against the matching cone on the output shaft first gear. If the car is moving, the synchronizer sleeve, blocking ring and first gear clutch teeth will not index until first gear is brought up or down to the speed of the synchronizer and the output shaft. The synchronizer sleeve has internal splines that, with further movement, will slide over the blocking ring and engage external clutch teeth on the first gear. Since first gear is now locked to the output shaft and is always meshed with the countershaft (cluster) gear, the power flow is from the input gear, through the countershaft gear, to the first gear on the output shaft, through the synchronizer sleeve and hub to the output shaft and out the rear of the transmission.

Engagement of second and third gears is the same as first except for ratio.

Fourth gear operation is accomplished in the same manner as first, second, and third, but the input gear is locked directly to the output shaft and the ratio is 1:1.

Spur teeth are cut on the outside of the first and second gear synchronizer sleeve. The sleeve and hub are always locked to the output shaft. Reverse gear is engaged by sliding an idler gear into mesh with the teeth on the first and second synchronizer sleeve and the spur teeth on the countershaft gear. The drive is then from the input gear, through the countershaft gear, through the idler gear, to the output shaft reverse gear (synchronizer sleeve) and the output shaft, which is rotated in a reverse direction.

A system of interlocks and detents in the shift cover prevents the selection of more than one gear speed at a time and helps to hold any gear in the selected position.

2 IN-CAR ADJUSTMENT AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT

To adjust the linkage, place the shift lever in the neutral position and raise the car on a hoist. Insert a ¼-inch fabricated alignment tool into the alignment hole as shown in Fig. 4. If the rod will not enter, check for bellied or bent shift rods. If the shift rods are the correct shape, check for loose lever lock nuts at the rod ends. Reset the linkage by loosening the three rod-retaining lock nuts and moving the levers until the alignment tool will enter the alignment holes. Make sure the transmission shift levers are in neutral and the reverse shift lever is in the neutral detent (Fig. 1). If there is any doubt about location of the neutral position, disconnect the shift rods at the retaining lock nuts and rotate each forward speed shift lever through its three positions until the center (neutral) detent is positively located. Move the reverse shift lever forward until positive engagement of the detent is felt. Install the shift rods and torque

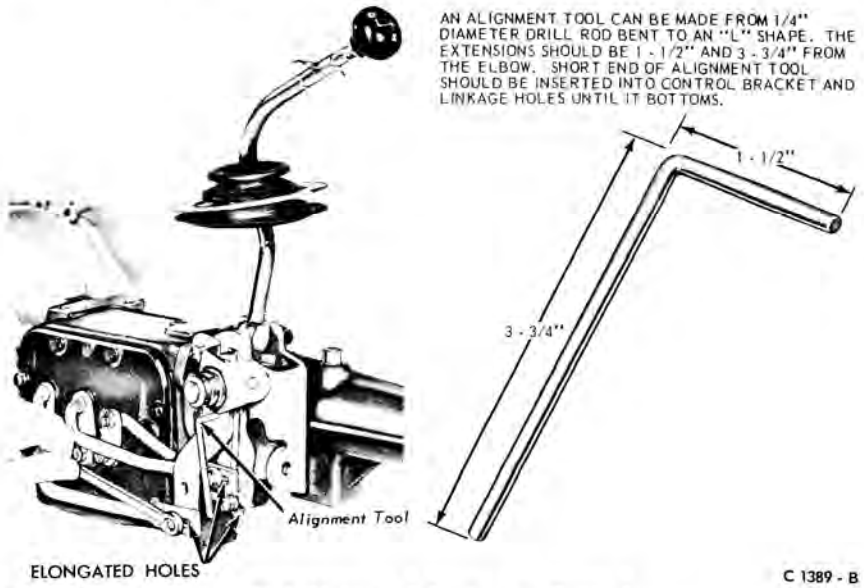


FIG. 4—Gear Floor Shift Linkage Adjustment—Typical

the lock nuts to 15-20 ft-lbs. Remove the alignment tool. Operate the shift levers to make sure that the detents are engaging. Lower the car and check for smooth cross-over operation.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Working from inside the car, remove the four screws that attach the retaining ring and boot to the floor pan (Fig. 3).

2. Raise the boot and ring to gain access to the two cap screws that attach the shift lever to the shift linkage assembly (Fig. 3). Remove the cap screws and shift lever.

3. Raise the car, remove the starter cable from the starter, and remove the starter. Drain the transmission lubricant.

4. Disconnect the driveshaft at the pinion flange and tape the U-joint bearing races in place if the joint does not have a strap spot welded to it. Pull the driveshaft off the transmission and insert the tool shown in Fig. 2, Part 6-1 into the seal and extension housing to prevent lubricant leakage.

5. Remove the back-up lamp switch (if so equipped) from the shift linkage control bracket.

6. Remove the clip from the equalizer bar at the clutch release rod and remove the rod. Remove the linkage return spring from the release lever.

7. Disconnect the parking brake front cable from the equalizer bar. Disconnect the speedometer cable from the extension housing.

8. Support the engine with a jack and remove the two bolts that attach the rear mount spring to the extension housing.

9. Raise the rear of the engine and remove the transmission support cross-member from the underbody.

10. Support the transmission and remove the bolts that attach the flywheel housing to the engine and the cover to the housing. Remove the cover.

11. Move the transmission and clutch housing assembly toward the rear until the transmission input shaft splines are clear of the clutch assembly. Lower the transmission.

INSTALLATION

1. Raise the transmission and align the input shaft splines with those in the clutch hub. Move the transmission forward until the flywheel housing is against the engine.

2. Install the housing to engine bolts and torque them to specifications.

3. Position the engine rear support on the frame and install the attaching bolts.

4. Lower the engine and transmission onto the spring mount and install the spring to extension housing bolts. Torque the bolts to specifications.

5. Connect the parking brake front cable to the equalizer bar and the speedometer cable drive gear adapter to the extension housing.

6. Connect the clutch release rod to the clutch equalizer shaft and to the clutch release lever. Attach the retaining clip and lever return spring.

7. Remove the tool from the extension housing and slide the driveshaft yoke onto the transmission output shaft, being careful not to damage the seal.

8. Be sure the pinion flange locating slots are clean, and then position the U-joint. Install the bolts and torque them to specifications.

9. Install the back-up lamp switch (if the car is so equipped) on the shift linkage bracket.

10. Install the starter and cable.

11. Fill the transmission to the bottom of the fill plug hole with the specified lubricant.

12. Adjust the shift linkage as outlined in Section 2.

13. Lower the car and position the shift lever on the linkage assembly. Install the lever to linkage cap screws and torque them to specifications.

14. Install the boot and the retaining ring. Secure with the four screws (Fig. 3).

15. Drive the car to check for proper operation.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Disconnect the three shift rods from the shift levers (Fig. 1). The reverse shift lever nut must be loosened to free the reverse rod.

2. Remove the three bolts that attach the shift selector assembly to the extension housing.

3. Insert a reworked screwdriver (Fig. 5) through the clutch release lever and unhook the retainer that secures the clutch release lever to the retainer bracket.

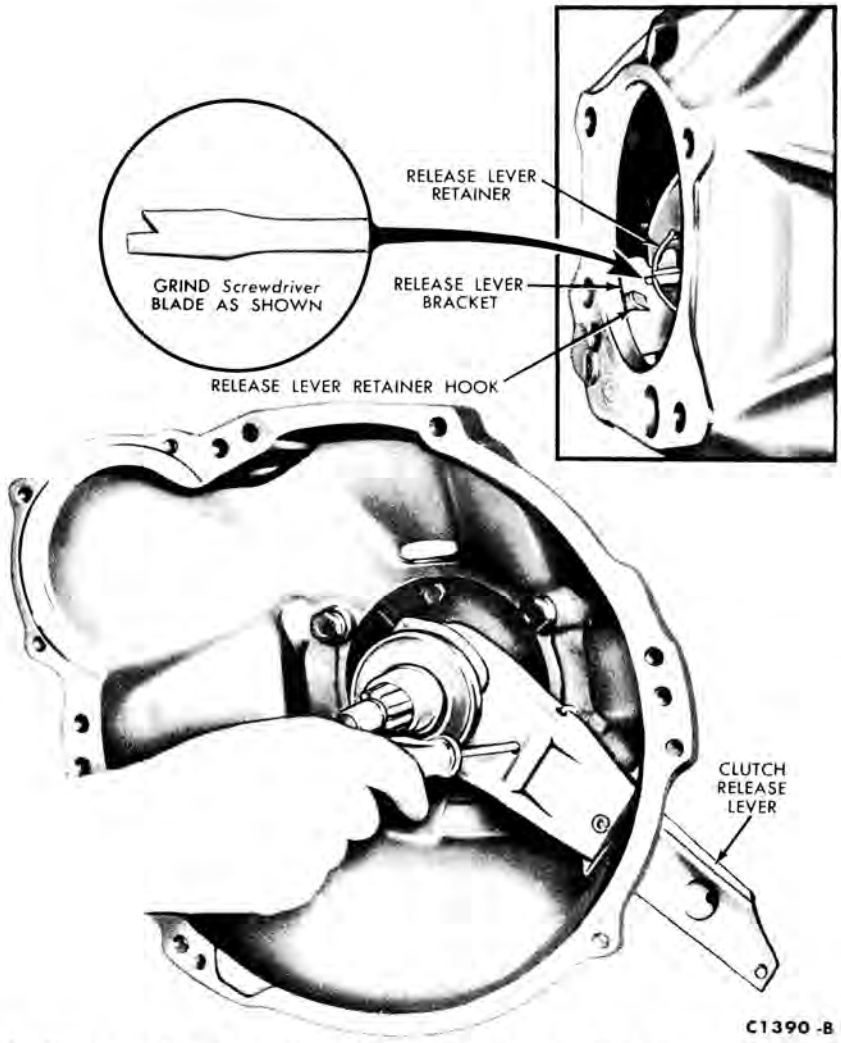


FIG. 5—Removing or Installing Clutch Release Lever Retainer

4. Remove the four bolts that attach the flywheel housing to the transmission.

5. Remove the eight attaching bolts and the shift cover from the transmission.

6. Remove the three bolts and the input gear bearing retainer from the front of the transmission.

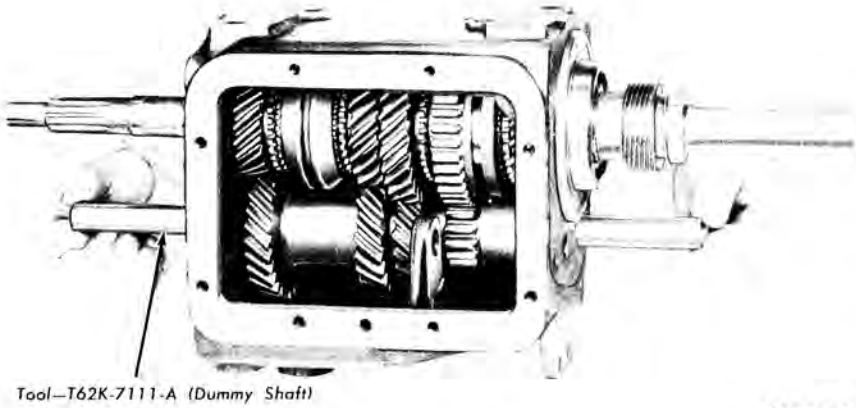


FIG. 6—Removing or Installing Countershaft

7. Remove the four bolts that secure the extension housing and output shaft bearing adapter to the transmission case. In the event that two long and two shorter bolts are used, the two longer bolts must be installed in the upper right and lower left holes (viewed from the rear). Remove the extension housing.

8. Working from the front of the case, drive the countershaft, with a drift, until it is just clear of the front wall of the case. Hold the countershaft gear with a hook and using the tool shown in Fig. 6, push the countershaft out of the countershaft (cluster) gear and transmission case. Carefully lower the countershaft gear to the bottom of the case.

9. Remove the output shaft assembly from the rear of the case (Fig. 7).

10. Remove the input gear and bearing (Fig. 8) from the front of the case.

11. Lift the countershaft gear assembly out through the cover opening of the case. Note the smallest diameter thrust washer is positioned between the rear of the countershaft gear and the case and that the larger diameter steel and bronze washers are at the front (Fig. 18).

12. Thread a 5/16-24 bolt into the rear of the reverse idler gear shaft and pull the shaft using tools T50T-7140-B (adapter) and T59L-1000-A (puller). Remove the idler gear.

13. Remove the speedometer gear and drive ball. Remove the speedometer gear spacer (Fig. 9).

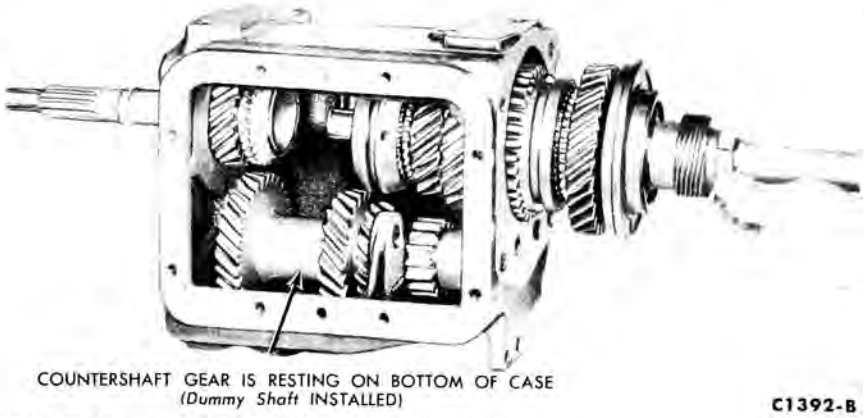


FIG. 7—Removing or Installing Output Shaft

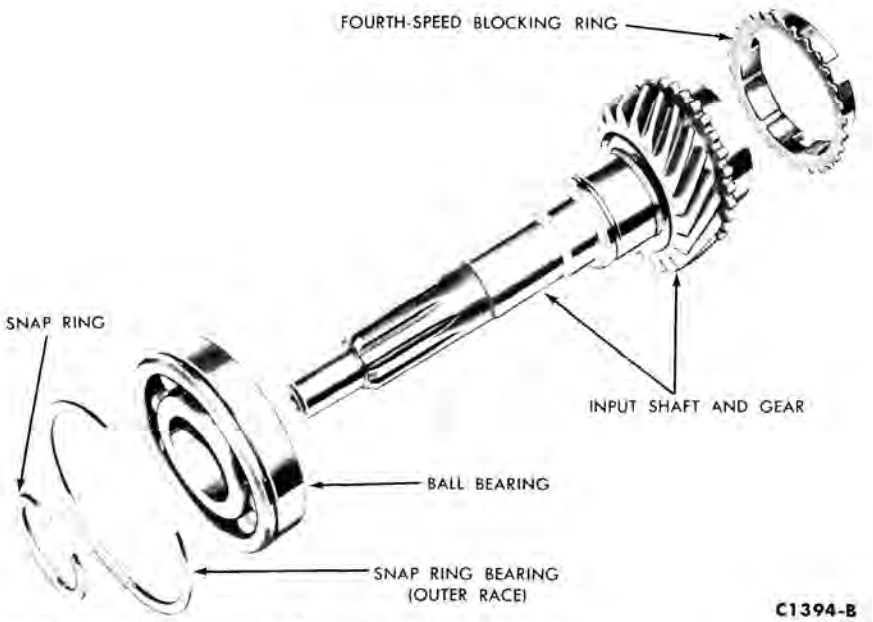


FIG. 8—Input Gear and Bearing—Disassembled

14. Remove the lock washer and nut which retains the speedometer drive gear and spacer from the rear of the output shaft.

15. Place the output shaft assembly in an arbor press as shown in Fig. 10 and press the bearing, adapter, first gear, first and second speed synchronizer assembly, and second gear off the shaft. Do not lose the first speed gear sleeve retainer ball.

16. With snap ring pliers, remove the snap ring from in front of the third and fourth-speed synchronizer on the output shaft. Press the third gear and the synchronizer off the shaft as shown in Fig. 11.

PARTS REPAIR OR REPLACEMENT

GEAR SHIFT LEVER

1. Remove the snap ring from the end of the selector shaft with pointed snap ring pliers (Fig. 12).

2. Remove the flat washer and spring.

3. After removing two bolts, pull the retainer, selector levers, and bracket from the shaft.

4. Drive the short selector lever pin from the shaft with a large pin punch.

5. Drive the long trunnion pin from the shaft and remove the trunnion and shaft.

6. If necessary to remove the studs from the selector levers, remove the cotter pins, flat washers, wave washers and studs.

7. Lubricate all mating friction surfaces with Lubriplate before assembly.

8. Install the shaft in the bracket. Position the trunnion and drive the long straight pin through the trunnion and into the shaft until an equal length of the pin is exposed on both sides of the shaft.

9. Drive the short pin into the shaft until the pin is centered in the shaft.

10. Install the levers and the neutral index bracket on the shaft as shown in Fig. 12.

11. Position the retainer and start the bolts. Before tightening the bolts be sure that the retainer is not interfering with free movement of the shaft. Tighten the bolts.

12. Install the spring, flat washer and snap ring.

13. Install the lever studs if they were removed.

SHIFT COVER

1. Remove the levers from the cam and shafts (Fig. 13).

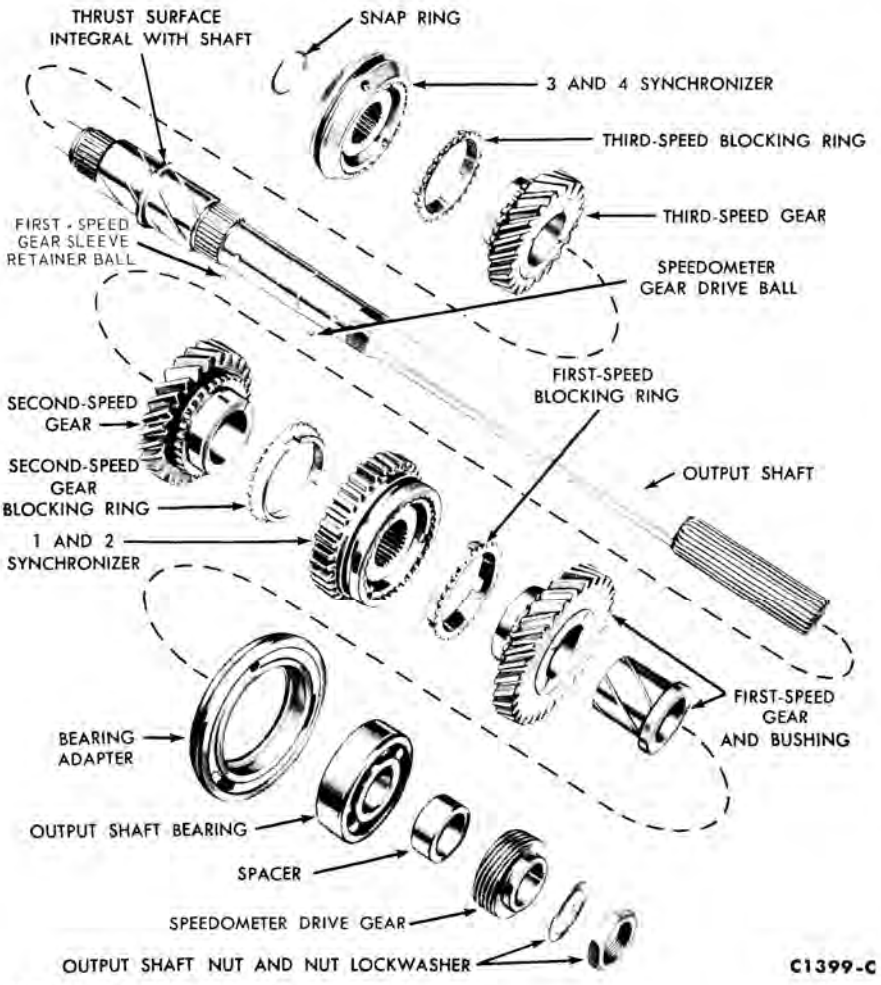


FIG. 9—Output Shaft Disassembled

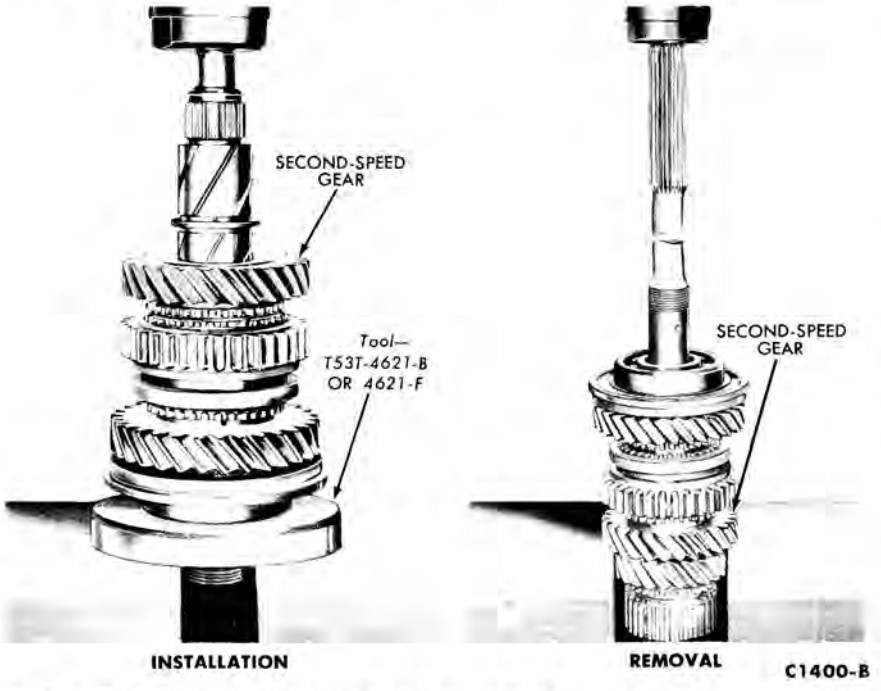


FIG. 10—Removing and Installing Output Shaft Bearing

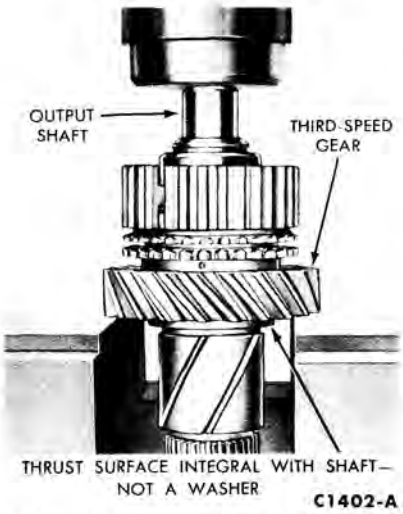


FIG. 11—Removing Third Gear and Third and Fourth Synchronizer Hub

2. Remove the roll pin from the upper fork and shaft and remove the shaft and forks.

3. Remove the reverse cam and shaft.

4. Rotate the reverse fork and shaft to disengage the detent ball and remove the fork and shaft (Fig. 14). Hold a cloth over the shaft cover boss nearest to the fork to catch the detent ball and spring when the shaft clears the boss hole.

5. Remove the 1-2 and 3-4 shift cam assemblies. Hold a cloth over the interlock and cam assemblies to catch the detent balls.

6. Push the interlock sleeve, spring and remaining ball out of the cover.

7. Remove the 1-2 and 3-4-to-reverse interlock pins from the reverse fork and shaft bosses in the cover.

8. If the seals need replacing, remove them with a screwdriver and install them as shown in Fig. 15.

9. Place the 1-2 and 3-4-to-reverse interlock pins in the holes in the reverse fork and shaft bosses (Figs. 13 and 14).

10. Install the 3-4 shift cam in the cover.

11. Install the parts of the 1-2 and 3-4 cam interlock, sleeve, ball, spring

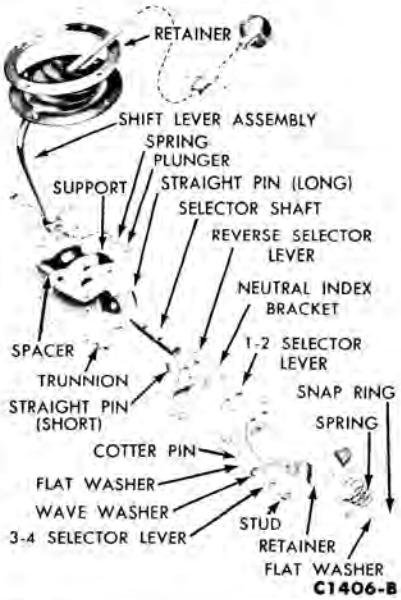


FIG. 12—Gear Shift Lever Disassembled

and another ball, in that order.

12. Hold the 3-4 cam in neutral position and the 1-2 ball depressed while the 1-2 cam is installed in the cover.

13. Install the 1-2 and the 3-4 levers, washers and nuts.

14. Check the clearance between the interlock, detent sleeve and the 1-2 and 3-4 shift cams in, and between, all shift positions. The sleeve to cam clearance must be a minimum of 0.0005 inch and a maximum of 0.010 inch. Service sleeves are available in the following lengths ±0.010 inch: 1.2875, 1.2905, 1.2935, 1.2965, 1.2995, and 1.3025.

15. With the 1-2 and 3-4 shift cams in neutral and the 1-2 and 3-4-to-reverse interlock pin resting on the cams, install the reverse shaft detent spring and ball and the reverse fork and shaft.

16. Install the reverse shift cam through the cover and into the aligned fork and shaft. Install the reverse cam operating lever (washer and nut loose).

17. Position the 1-2 and 3-4 forks onto the shift cams and install the fork shaft. Align the shaft hole with the one in the cover and install the lock pin.

18. Check all shift positions for freedom of movement, detent and interlock action.

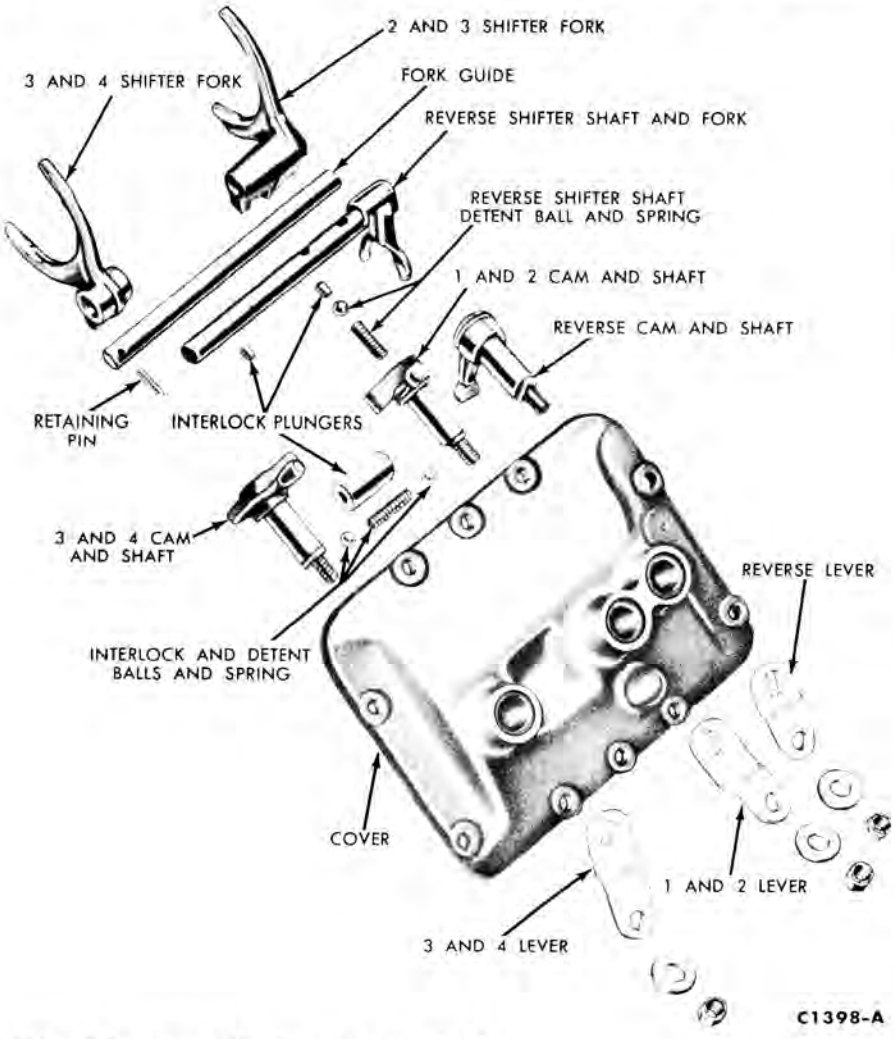


FIG. 13—Gear Shift Cover Disassembled

SYNCHRONIZERS

1. Before disassembling the synchronizers, scribe an alignment mark across the hub and sleeve if they do not have alignment marks. The alignment marks will permit the sleeves and hubs to be assembled in their original positions.

2. Remove the front and rear insert springs from both synchronizer assemblies (Fig. 16).

3. Slide the sleeves off the hubs. Remove the hub inserts (detents).

4. Place the long inserts (detents) into the slots in the 1-2 synchronizer hub and slide the combination sleeve and reverse gear over it making sure that the etch or scribe marks on the hub and sleeve are aligned (Fig. 16). Snap the insert springs into place. The tab on each spring must set into the underside of an insert.

5. Position the short inserts (detents) into the slots in the 3-4 synchronizer hub and slide the clutch sleeve over it making sure that the etch or scribe marks are aligned. Install the insert springs in the same manner as with the 1-2 synchronizer.

INPUT SHAFT BEARING

1. If the input shaft and gear bearing needs replacing, remove it as shown in Fig. 17.

2. Press the bearing onto the input shaft with the outer race snap ring

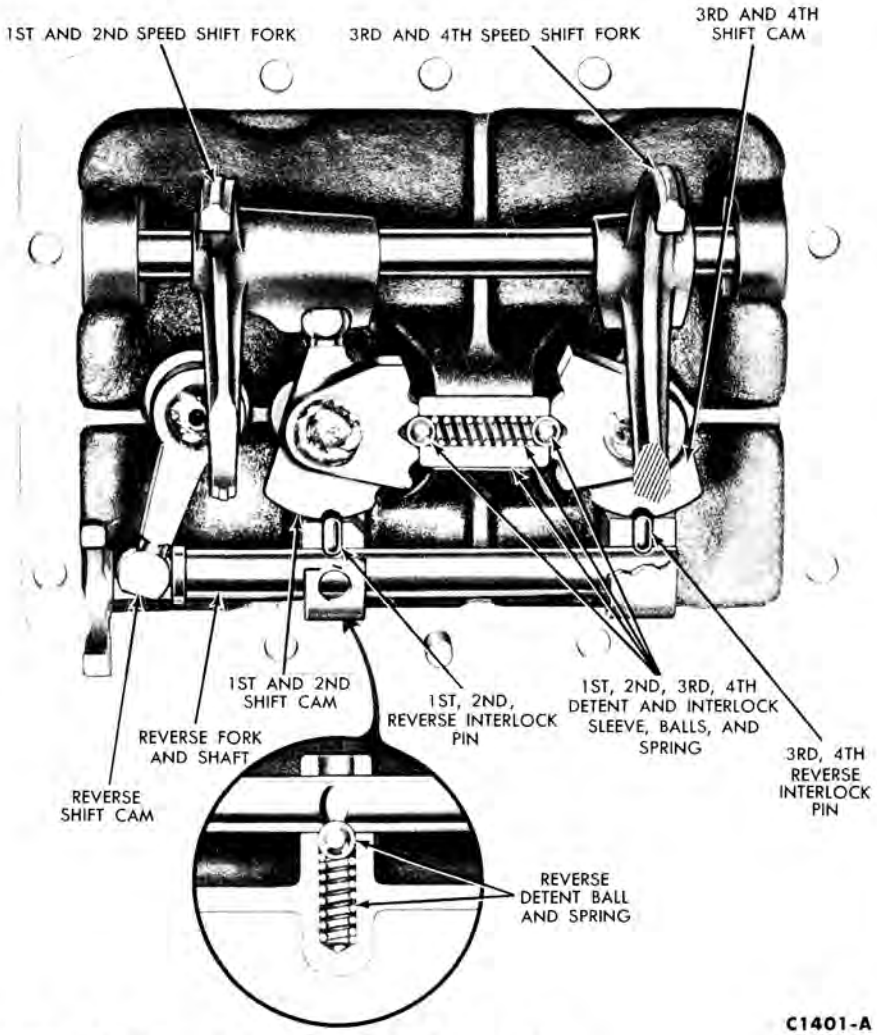


FIG. 14—Transmission Shift Mechanism Details

groove toward the front (Fig. 17).

3. Install the snap rings on the bearing outer race and on the gear shaft with snap ring pliers.

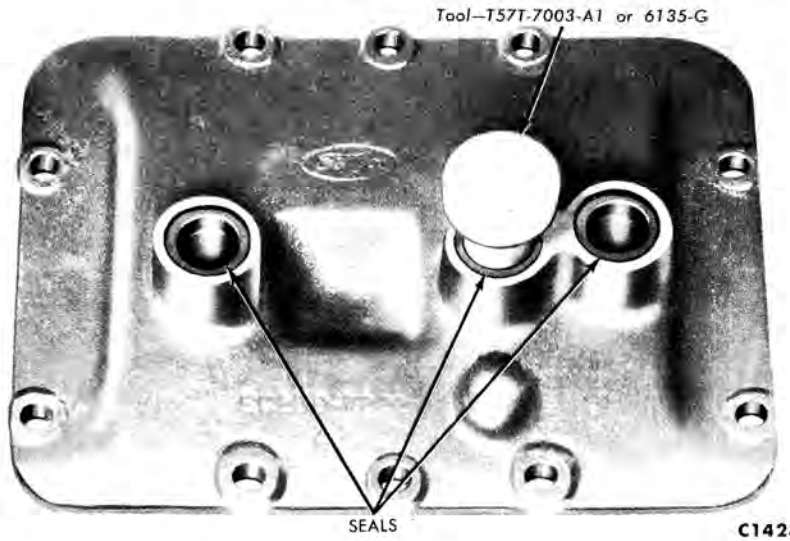


FIG. 15—Installing Cam and Shaft Seals

COUNTERSHAFT GEAR BEARINGS

1. Remove the thrust washers from each end of the countershaft gear (Fig. 18).

2. Remove the dummy shaft from the gear.

3. Remove the two washers and 22 roller bearings from each end of the gear. Coat the bore in each end of the countershaft with grease.

4. Place the tool shown in Fig. 6 in the countershaft (cluster) gear. Starting on either end, drop a steel washer (Fig. 18) over the tool and into the gear. Install 22 roller bearings into the gear. Lay another steel washer on the ends of the bearings and the thrust washers that were previously selected.

5. Repeat the above operation for the other end of the gear. Do not lose the bearings and washers in the initially assembled end when inverting the gear to assemble the opposite end.

ASSEMBLY

1. Place the second gear on the rear of the output shaft with the clutch teeth and tapered synchronizer end toward the rear. Install a blocking ring with the clutch teeth toward the front (Fig. 9).

2. Install the first and second synchronizer and reverse gear assembly on the rear of the output shaft with the shift fork groove toward the rear. Be sure the second-speed blocking ring is not cocked on the gear and that the three index slots align with the synchronizer inserts (detents).

3. Install the first-speed blocking ring with the clutch teeth to the rear and the slots engaging the synchronizer inserts (detents). Pack grease into the ball pocket on output shaft then insert the first-speed gear sleeve retainer ball. See (Fig. 9).

4. With taper and clutch teeth to front, and the sleeve (bushing) shoulder to the rear, slide the first gear and

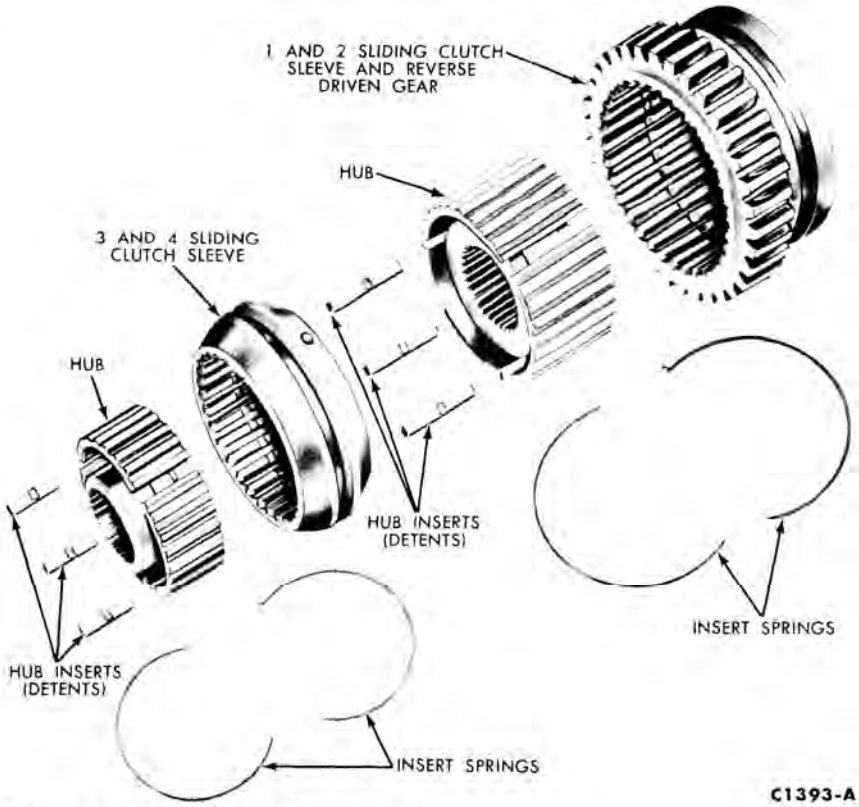


FIG. 16—Synchronizers Disassembled

sleeve onto the output shaft and align the slot on the I.D. of the first-speed gear sleeve over the ball.

5. Assemble the output shaft ball bearing into the recess in the bearing adapter. Position the adapter and bearing on the rear of the output shaft with the adapter forward. Hold the first gear and sleeve (bushing) forward and place the assembly in a press with the tool resting against the rear of the bearing inner race. Press the bearing until it is seated firmly against the first gear sleeve (bushing).

6. Place the spacer, speedometer gear drive ball, speedometer gear (shoulder to rear), lock washer (tab into speedometer gear), and nut on the output shaft (Fig. 9). Torque the nut to **80 ft-lbs to insure axial location of the synchronizer hub, first speed gear sleeve, rear mainshaft bearing, spacer and speedometer drive gear on the output shaft. Loosen the locknut and retorque to 25 ft.-lbs. Bend the washer over a flat on the nut.**

7. Set the third-speed gear on the front of the output shaft with the clutch teeth toward the front. Place the blocking ring on the gear.

8. Install the 3-4 synchronizer with the wide thrust surface of the hub toward the rear. Align the blocking ring slots with the synchronizer inserts (detents). The hub to shaft spline fit may require a slight press to assemble.

9. Using snap ring pliers, install the snap ring in its groove on the front of the output shaft.

10. Position the countershaft gear in the case with the two thrust washers at the front. Allow the gear and tool assembly to lay in the bottom of the case until the input and output shafts are installed.

11. Using a light film of grease, install roller bearings in the bore of the input shaft and gear. **A thick film of grease could plug the lubricant holes and restrict lubrication to the bearings.**

12. Install the input shaft and gear in the case front bore. Place the fourth gear blocking ring on the rear of the input gear with the clutch teeth forward.

13. Enter the output shaft assembly through the rear of the case and guide the output shaft front pilot into the input gear bore and bearings (Fig. 8). Be sure the fourth gear synchronizer blocking ring slots index with the inserts (detents) on the 3-4 synchronizer.

14. Raise the countershaft (cluster) gear and thrust washers until the countershaft can be inserted from the rear of the case into the gear and bearings. The shaft should push through, easily displacing the tool.

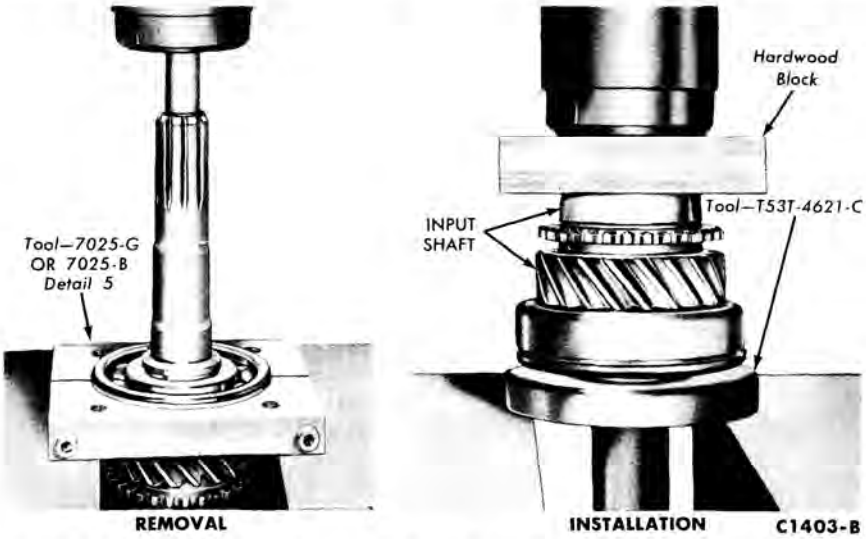


FIG. 17—Removing and Installing Input Gear Bearing

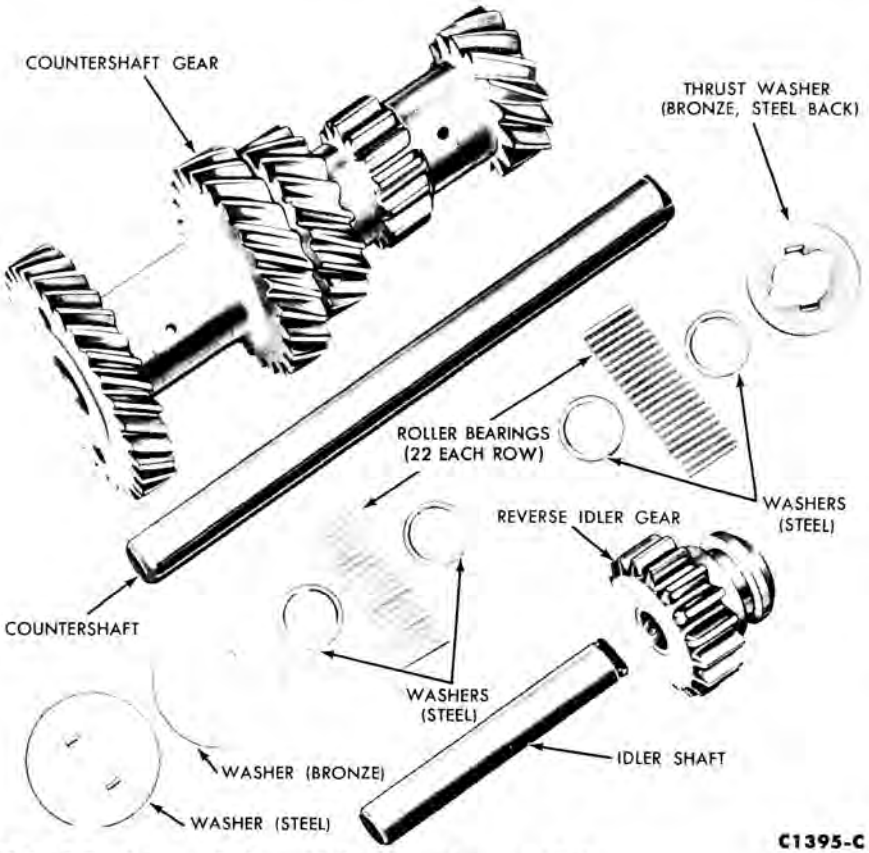


FIG. 18—Countershaft and Idler Gear Disassembled

Push on the shaft until it contacts the front of the case (Fig. 6). Position the flat on the rear of the countershaft in a horizontal plane so it will align with the slot in the extension housing. Tap the shaft into place.

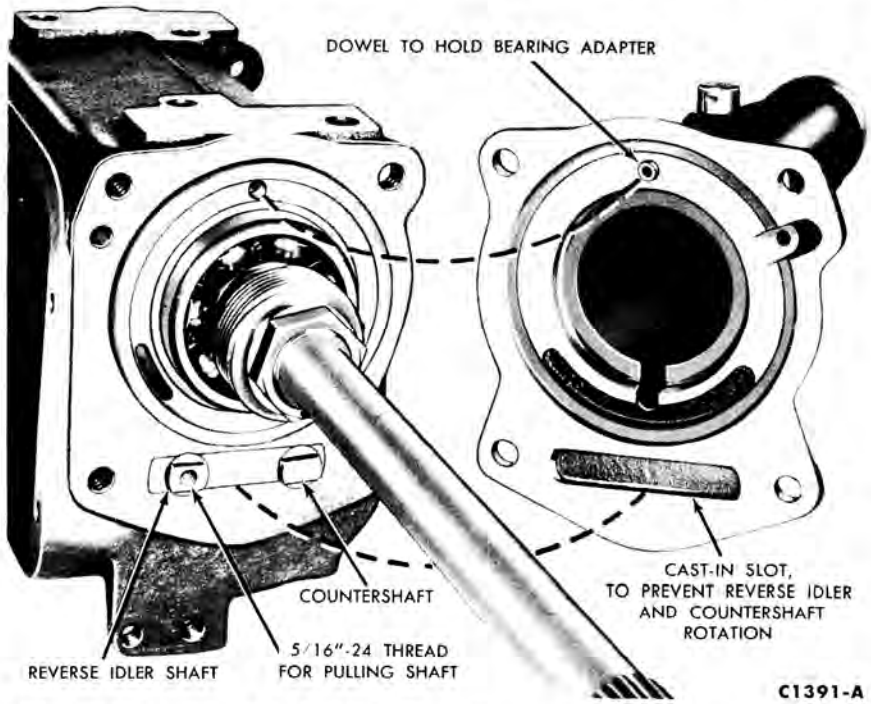


FIG. 19—Extension Housing Installation

15. Install the reverse idler gear with the fork groove toward the rear and the idler shaft flat horizontal and parallel with the countershaft flat.

16. Position a new extension housing gasket on the rear of the case, using a non-drying sealer.

17. Install the extension housing. Align the dowel in the housing with the hole in the rear bearing adapter (Fig. 19). Be sure the housing is seated squarely on the case, bearing and adapter before torquing the bolts. If two long and two short bolts are used, install the two long bolts in the upper right and lower left holes.

18. If the input gear bearing retainer seal needs replacing, refer to Fig. 20. Install the new bearing retainer gasket, using sealer. Install the bearing retainer with the drain slot facing downward. Seal and torque the bolts to specifications.

19. Place the 1-2 and 3-4 synchronizer in neutral and the reverse idler gear in reverse (forward) position. Set the reverse shift lever in the reverse position. Install a new shift cover gasket on the case, using sealer. Install the shift cover. Use sealer on the bolts and torque them to specifications.

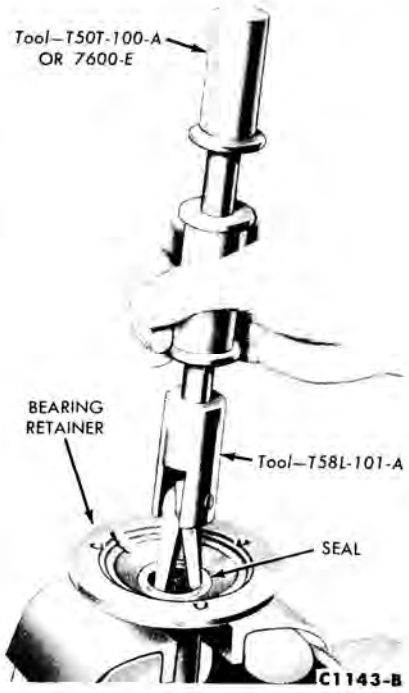


FIG. 20—Removing Input Shaft Bearing Retainer Seal

20. Install the flywheel housing. Use sealer on the retaining bolts and torque them to specifications.

21. Install the clutch release bearing on the clutch release lever. Position the release lever through the housing from inside the housing and clip the lever retainer onto its hook as shown in Fig. 5.

22. Install the shift lever selector assembly on the extension housing (Fig. 1).

23. Insert the shift rods in the cam levers and secure them with the spring washers and cotter pins or clips. Tighten the reverse cam lever nut.

24. Loosely assemble the shift rods to the linkage levers. Insert a ¼-inch diameter alignment tool through the three linkage levers and into the support (Fig. 4). Adjust the linkage as outlined in "Gear Shift Linkage Adjustment." Remove the alignment tool.

25. Assemble the shield over the shift selector.

PART 6-5 FORD DESIGN FOUR-SPEED TRANSMISSION

Section	Page	Section	Page
1 Description and Operation	6-30	3 Removal and Installation	6-32
2 In-Car Adjustment and Repairs	6-32	4 Major Repair Operations	6-33

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Ford designed 4-speed transmission (Fig. 1) is of the fully synchronized type with all gears except the reverse sliding gear being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves instead of sliding gears. The synchronizers will enable quicker shifts, greatly reduce gear clash, and permit down-shifting into any forward-speed gear while the car is moving.

The shift linkage is mounted directly on the transmission extension housing (Fig. 1) and enters the driver's compartment through an opening in the floor pan. A flexible rubber dust boot is provided to seal the driver's compartment from the exterior.

The shift pattern is shown on the top of the gear shift lever knob. A finger-operated release lever is provided on the shift lever to prevent the transmission from being accidentally shifted into reverse gear. All forward-speed gears in the transmission are helical-type, however, the reverse sliding gear and the exterior of the first- and second-speed synchronizer sleeve are spur-type gears. The specifications of this section Part 6-6 lists the transmission model numbers and vehicles in which they are used.

A transmission service identification tag is located on the right side of the case at the front. The first line on the tag will show the transmission model and service identification code when required. The second line will show the transmission serial number.

EXAMPLE:

Trans. Model

HEH-A 1 — Service identifcation code (when required to reflect service parts changes affecting interchangeability)

012345 — Serial Number

The four-speed transmission will be designated by the numeral 5 on the vehicle warranty plate.

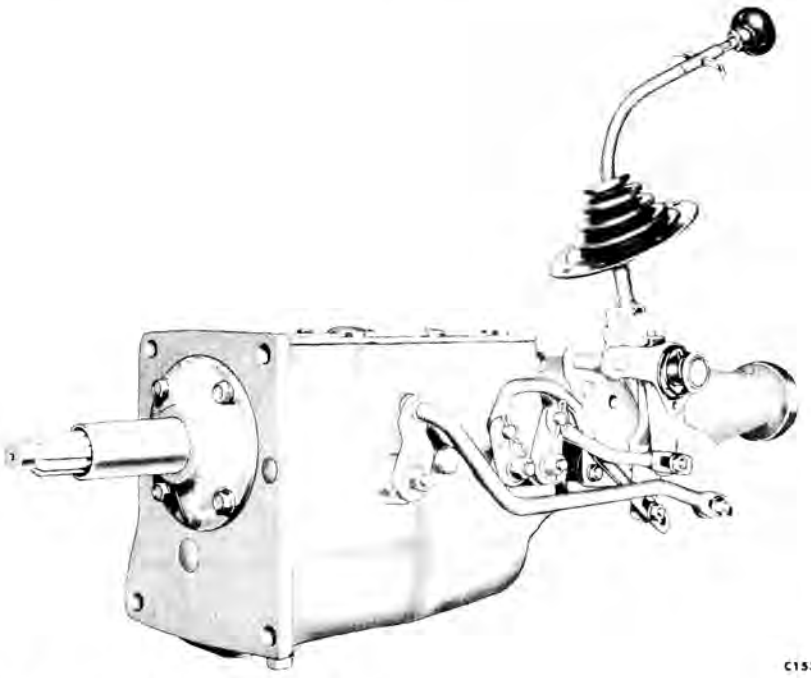


FIG. 1—Four-Speed Transmission

OPERATION

In first-speed (Figure 2), the first- and second-speed synchronizer sleeve is moved rearward by the shift fork.

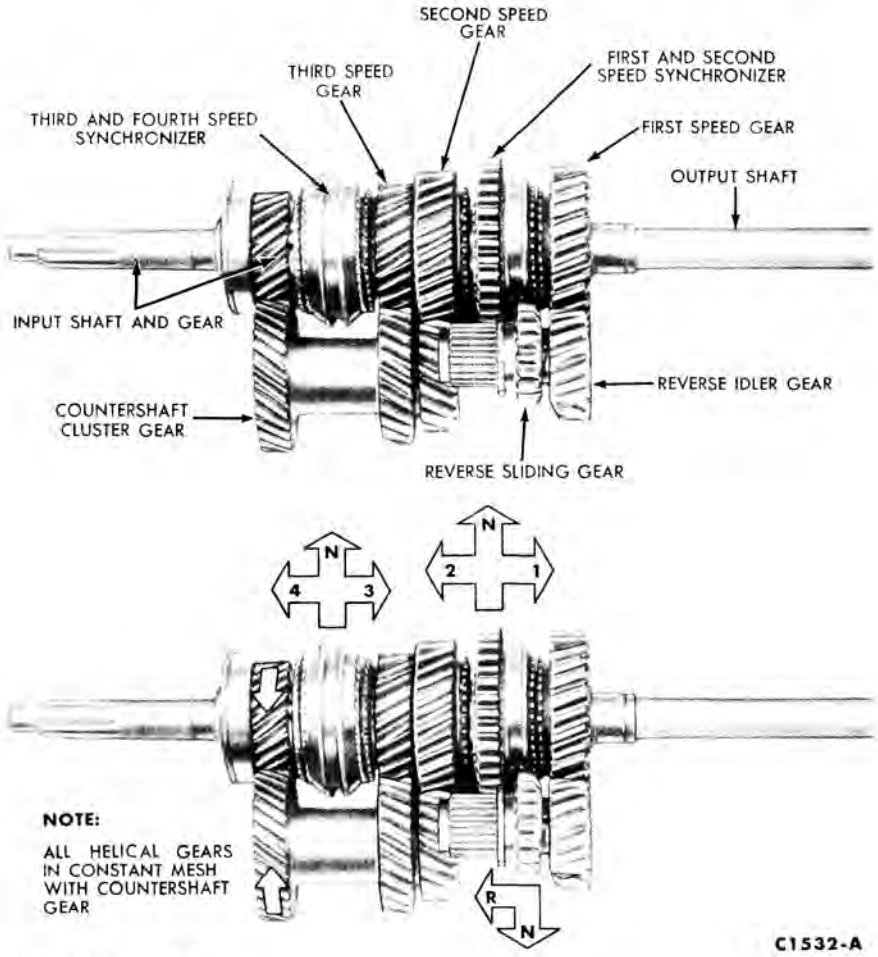


FIG. 2–Power Flow

The sleeve engages the first-speed blocking ring, which acts as a cone clutch applied to the free-wheeling first-speed gear. This action speeds up or slows down the first-speed gear to match the speed of the output shaft. Further movement of the sleeve locks the first-and-second-speed synchronizer hub to the first-speed gear by means of internal splines. On engagement of the clutch, power flows through the input shaft and gear to the meshed countershaft gear and thence to the first-speed gear. This gear transmits the power through the locked synchronizer hub to the transmission output shaft. All the other forward-speed gears are in idler motion, as they are all driven by the countershaft (cluster) gear, but they do not transmit power because they are not locked to the output shaft. All the forward-speed shifts are made in the same manner as the first-speed shift, due to the constant-mesh features.

Reverse gear is engaged by moving the reverse sliding gear forward on the reverse idler gear until it meshes with the external teeth (spur-type) of the first-and second-speed synchronizer sleeve. Movement of the sliding gear is accomplished by the center shaft lever. With all forward-speed synchronizer sleeves in neutral, power flow in reverse is through the input shaft to the constant-mesh countershaft (cluster) gear, thence to the constant mesh reverse idler. Splines then carry the power through the reverse sliding gear to the first-and-second speed synchronizer sleeve which is locked to the output shaft. As the reverse sliding gear is meshed with the synchronizer sleeve, power is transmitted to the output shaft, rotating it in a reverse direction.

2 IN-CAR ADJUSTMENTS AND REPAIRS

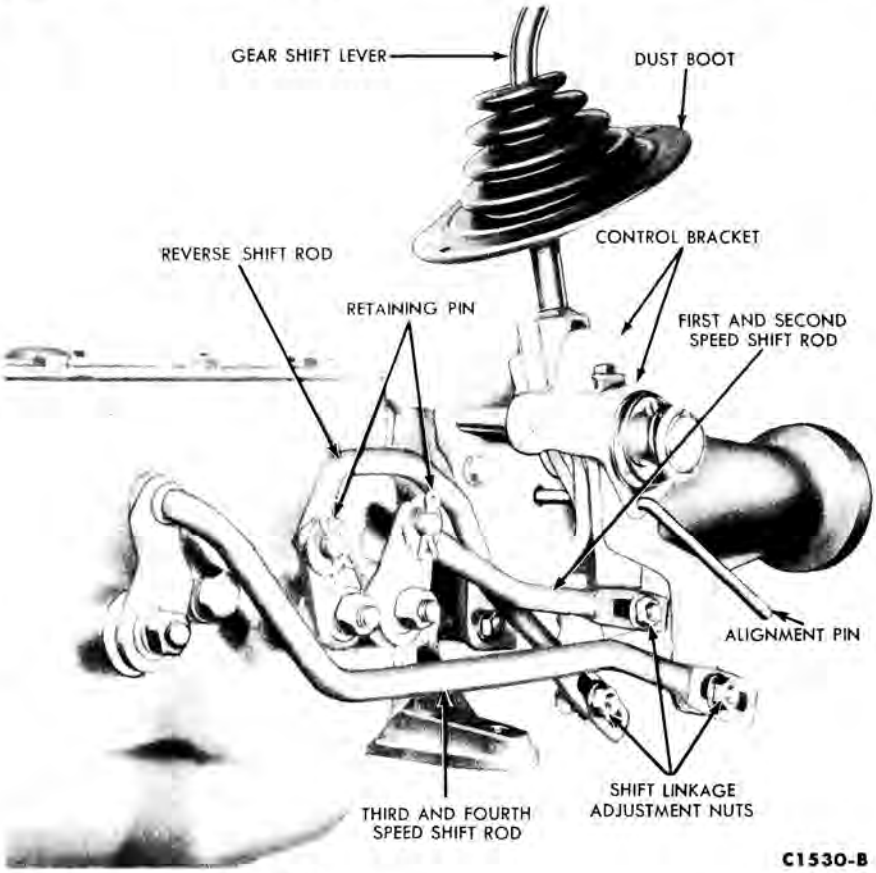


FIG. 3—Adjusting Shift Linkage

SHIFT LINKAGE ADJUSTMENT

1. Loosen the three shift linkage adjustment nuts. Install a ¼ inch diameter alignment tool through the control bracket and levers as shown in Fig. 3.

An alignment tool can be made from ¼" diameter drill rod bent to an "L" shape. The extensions should be 1½" and 3¾" from the elbow. Short end of alignment pin should be inserted into control bracket and linkage holes until it bottoms.

2. Tighten the three linkage adjustment nuts and then remove the alignment pin.

3. Check the gear shift lever for a smooth crossover.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Before raising the car, remove the transmission gear shift selector lever boot retainer and slide the boot upward on the selector lever. Remove the selector lever retaining bolts and remove the selector lever from the control assembly being careful not to lose the two trunnions and springs. The remaining shift linkage may be left on the transmission during removal.

2. Disconnect the drive shaft from the rear U-joint flange. Slide the drive shaft off the transmission output shaft and install the extension housing seal installation tool into extension housing to prevent lubricant leakage.

3. Disconnect the speedometer cable from the extension housing.

4. Disconnect the parking brake at the equalizer bar and support the engine with a transmission jack.

5. Remove the extension housing-to-engine rear support attaching bolts.

6. Raise the rear of the engine with the transmission jack. Disconnect the frame crossmember at the frame and remove the crossmember and engine rear support as a unit.

7. Support the transmission on a jack and remove the bolts that attach the transmission to the flywheel housing.

8. Move the transmission and jack rearward until the transmission input shaft clears the flywheel housing. If necessary, lower the engine enough to obtain clearance for transmission removal.

Do not depress the clutch pedal while the transmission is removed.

INSTALLATION

1. Make sure that the mounting surfaces of the transmission and the flywheel housing are free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until the input shaft splines enter the clutch hub splines and the case is positioned against the flywheel housing.

2. Install the two upper transmission to flywheel housing mounting bolts snug and then remove the two guide pins. Install the two lower mounting bolts. Torque all mounting bolts to specifications.

3. Raise the rear of the engine, and install the crossmember and the engine rear support as a unit. Torque the crossmember attaching bolts to

specifications, then lower the engine.

4. With the transmission extension housing resting on the engine rear support, install the transmission extension housing attaching bolts. Torque the bolts to specifications.

5. Connect the speedometer cable to the extension housing, and connect the parking brake cable to the equalizer.

6. Remove the extension housing installation tool and slide the forward end of the drive shaft over the transmission output shaft. Connect the drive shaft to the rear U-joint flange.

7. Place both forward gear shift levers and the reverse shift lever in the neutral position and insert a ¼ inch diameter alignment tool in the shift linkage alignment hole (Fig. 3.) It may be necessary to loosen the adjustment nuts to install the alignment tool. Adjust the linkage as necessary and tighten the adjustment nuts to specifications. Remove the alignment tool.

8. Fill the transmission to the proper level with the specified lubricant.

9. Lower the car and install the shift selector lever and the dust boot.

10. Check the shift and crossover motion for full shift engagement and smooth crossover operation.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Remove the retaining clip, flat washer and spring washer that secures the shift rods to the shift levers.

2. Remove the shift linkage control bracket attaching screws and remove the shift linkage and the control bracket.

3. Remove the cover attaching screws from the case. Lift the cover and gasket from the case.

4. Remove the extension housing attaching screws and lock washers. Remove the housing and the gasket.

5. Remove the input shaft bearing retainer attaching screws. Slide the retainer off the input shaft.

6. Support the countershaft gear with a wire hook. Working from the front of the case, push the countershaft out the rear of the case as shown in Fig. 4. Lower the countershaft to the bottom of the case with the wire hook. Remove the hook.

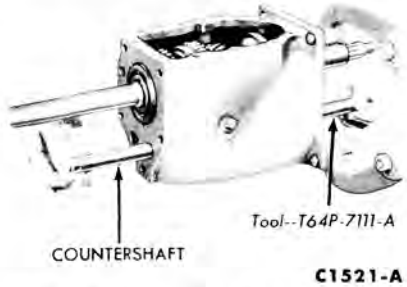


FIG. 4—Removing Countershaft from Case

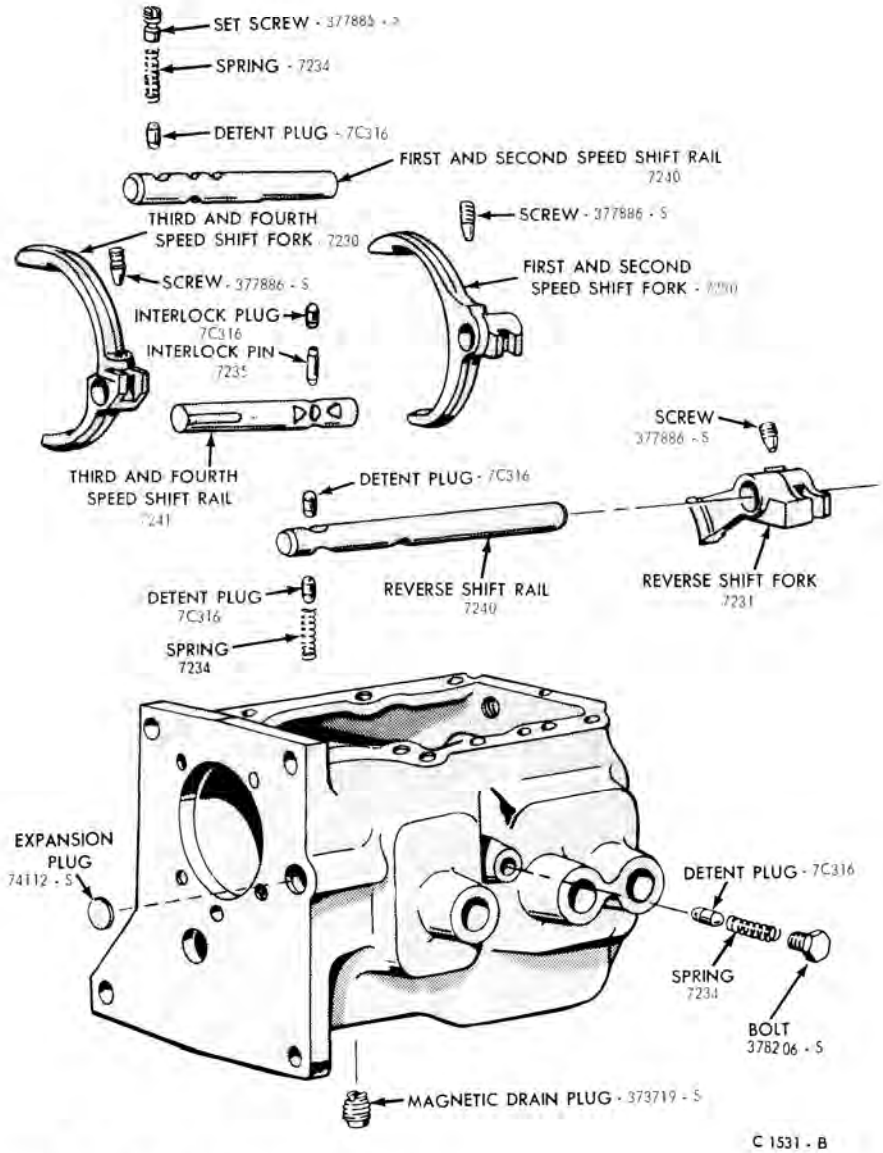


FIG. 5—Shift Rails and Forks Disassembled

7. Place the first-and-second-speed gear shift lever and the reverse shift lever in the neutral position. Place the third- and fourth-speed gear shift lever in the third-speed position.

8. Remove the bolt that retains the third- and fourth-speed shift rail detent spring and the plug in the left side of the case as shown in Fig. 5. Remove the spring and the plug with a magnet.

9. Remove the detent mechanism set screw from the top of the case. Remove the detent spring and plug with a small magnet.

10. Remove the attaching screw from the third- and fourth-speed shift fork. Tap on the inner end of the shift rail to unseal the expansion plug from the front of the case. Then withdraw the third- and fourth-speed shift rail from the front of the case. Do not lose the interlock pin from the shift rail.

11. Remove the set screw from the first- and second-speed shift fork. Slide the first- and second-speed shift rail out the rear of the case.



FIG. 7—Removing Shift Forks from Case



FIG. 8—Removing Output Shaft Assembly

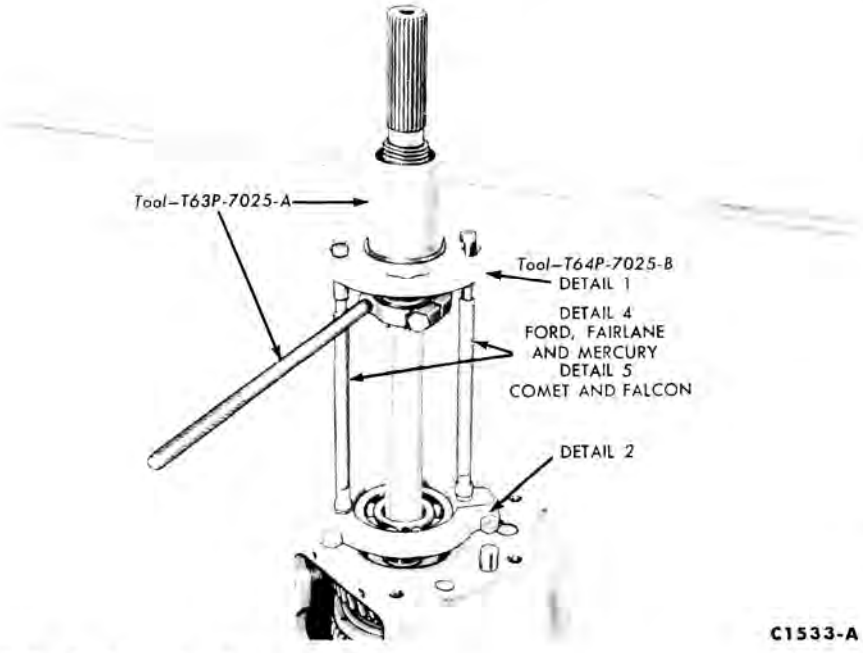


FIG. 6—Removing Output Shaft Bearing

12. Remove the interlock plug and the detent plug from the top of the case (Fig. 5) with a magnet.

13. Remove the snap ring that secures the speedometer drive gear to the output shaft. Slide the gear off the shaft, then remove the speedometer gear drive ball.

14. Remove the snap ring that secures the output shaft bearing to the shaft.

15. Remove the output shaft bearing as shown in Fig. 6.

16. Remove the input shaft and bearing and the blocking ring from the front of the case.

17. Move the output shaft to the right side of the case to provide clearance for the shift forks. Rotate the forks as shown in Fig. 7, then lift them from the case.

18. Support the first-speed gear to prevent it from sliding off the shaft, then lift the output shaft assembly from the case as shown in Fig. 8.

19. Remove the reverse gear shift fork set screw. Rotate the reverse shift rail 90° as shown in Fig. 9. Slide the shift rail out the rear of the case. Lift the reverse shift fork from the case.

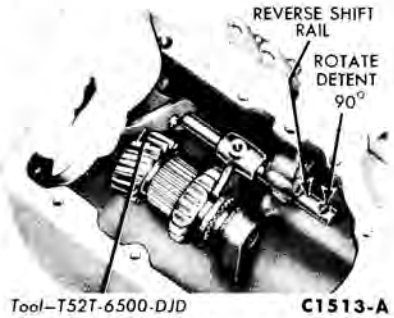


FIG. 9—Rotating Reverse Shift Rail

20. Remove the reverse detent plug and spring from the case with a magnet.



FIG. 10—Removing Reverse Idler Gear Shaft

21. Remove the reverse idler gear shaft from the case as shown in Fig. 10.

22. Lift the reverse idler gear and the thrust washers from the case. Be careful not to drop the bearings and the dummy shaft from the gear.

23. Lift the countershaft gear and the thrust washers from the case. Be careful not to drop the bearings or the dummy shaft from the countershaft gear.

24. Remove the snap ring from the front of the output shaft. Slide the third- and fourth-speed synchronizer (Fig. 11) blocking ring and the third-speed gear off the shaft.

25. Remove the next snap ring and the second-speed gear thrust washer from the shaft. Slide the second-speed gear and the blocking ring off the shaft.

26. Remove the next snap ring, then slide the first- and second-speed synchronizer, blocking ring and the first-speed gear off the shaft.

27. Remove the thrust washer from the rear of the shaft.

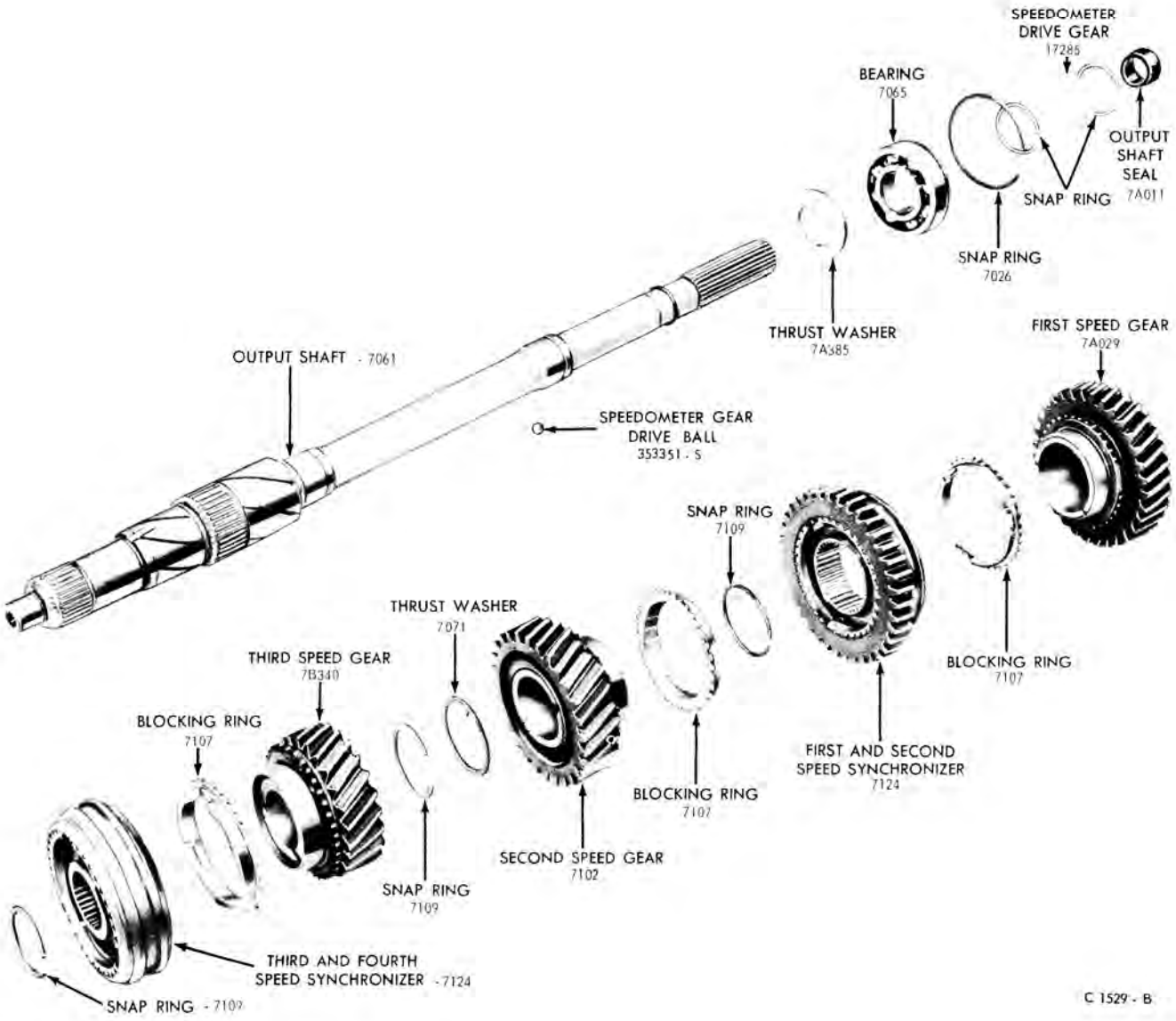


FIG. 11—Output Shaft Disassembled

PARTS REPAIR OR REPLACEMENT

CAM AND SHAFT SEALS

1. Remove the attaching nut, lock washer and the flat washer from each shift lever and remove the three levers.

2. Remove the three cam and shafts from inside the case.

3. Remove the O-ring from each cam and shaft (Fig. 12).

4. Dip the new O-rings in gear lubricant and install them on the cam and shafts.

5. Slide each cam and shaft into its respective bore in the transmission case.

6. Secure each shift lever with a flat washer, lock washer and nut.

INPUT SHAFT BEARING

1. Remove the snap ring that secures the bearing to the shaft (Fig. 13).

2. Press the input shaft gear out of the bearing as shown in Fig. 14.

3. Press a new bearing onto the input shaft with the tool shown in Fig. 14.

4. Secure the bearing with a snap ring.

SYNCHRONIZERS

1. Push the synchronizer hub from each synchronizer sleeve (Fig. 15).

2. Separate the inserts and insert springs from the hubs. Do not mix the parts of the first- and second-speed synchronizer with the third- and fourth-speed synchronizer.

3. Position the hub in the sleeve, making sure that the alignment marks are properly indexed.

4. Place the three inserts into place on the hub. Install the insert

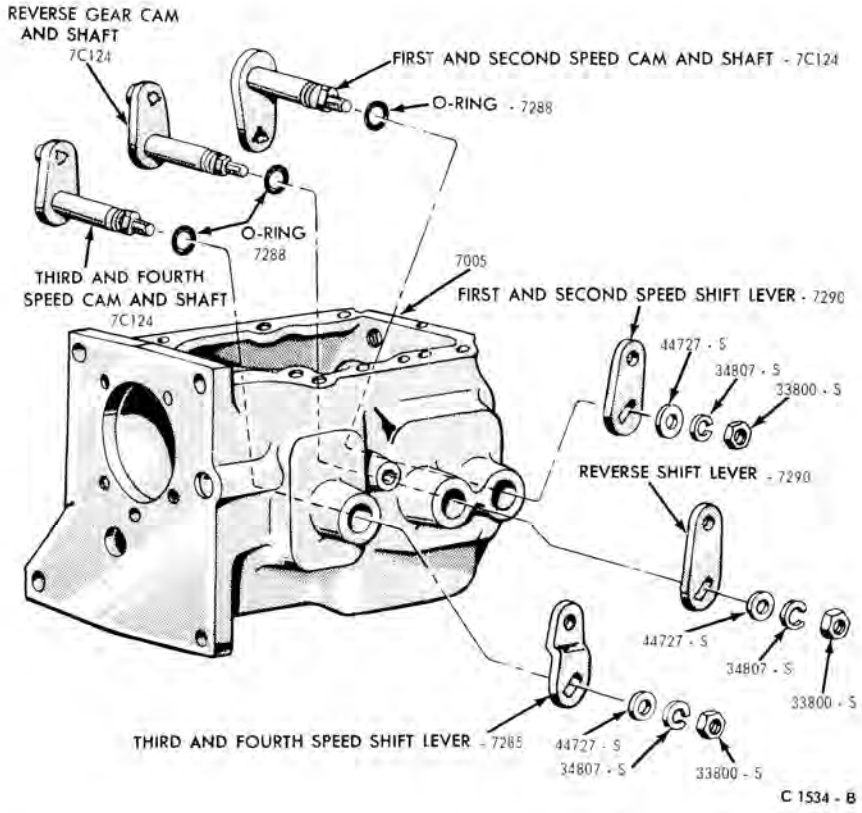


FIG. 12—Cam and Shafts and Shift Levers Disassembled

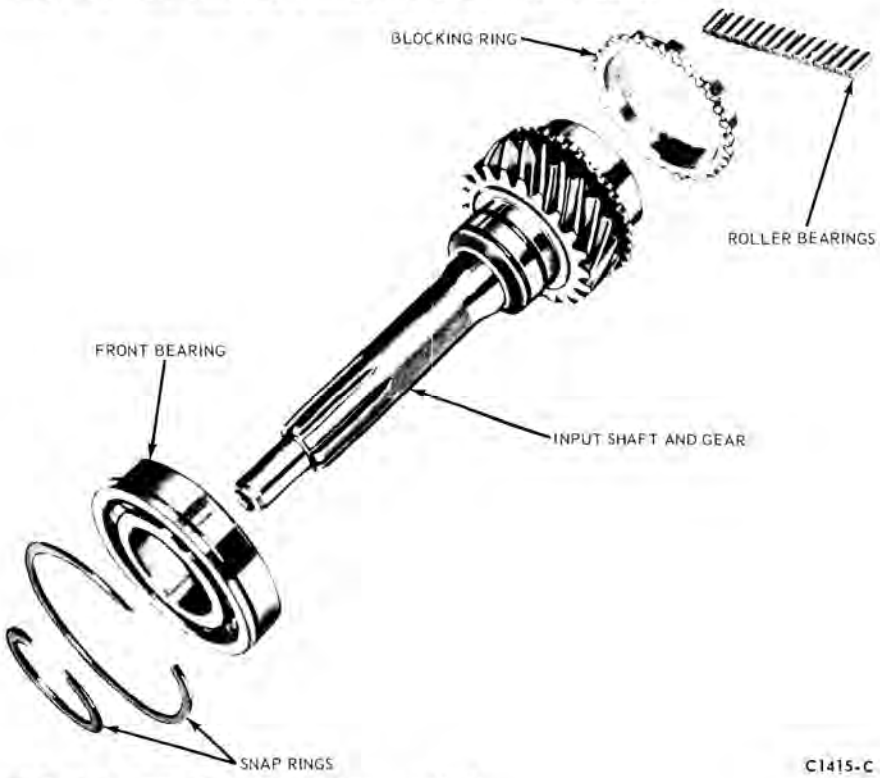


FIG. 13—Input Shaft Gear Disassembled

springs making sure that the irregular surface (hump) is seated in one of the inserts. Do not stagger the springs.

COUNTERSHAFT GEAR BEARINGS

1. Remove the dummy shaft, two bearing retainer washers, and the 21 roller bearings (Fig. 16) from each end of the countershaft gear.

2. Coat the bore in each end of the countershaft gear with grease.

3. Hold the dummy shaft in the gear and install the 21 roller bearings and the retainer washer in each end of the gear.

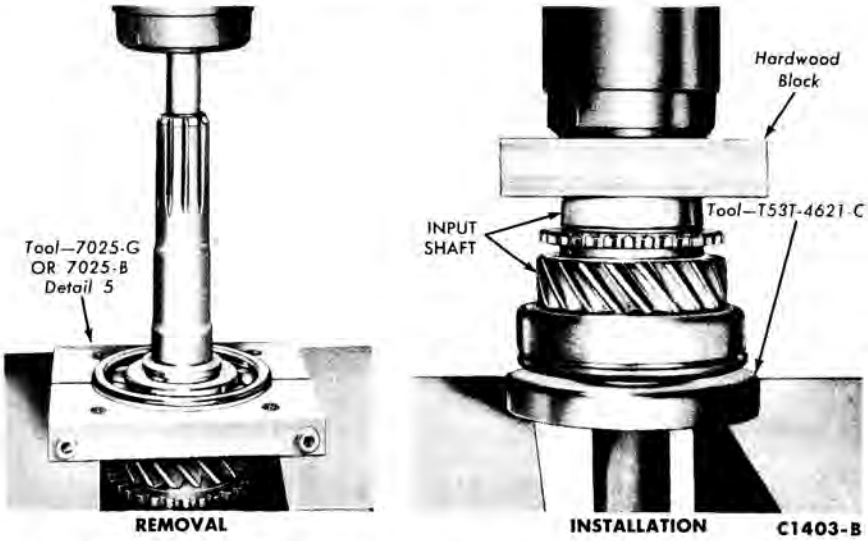
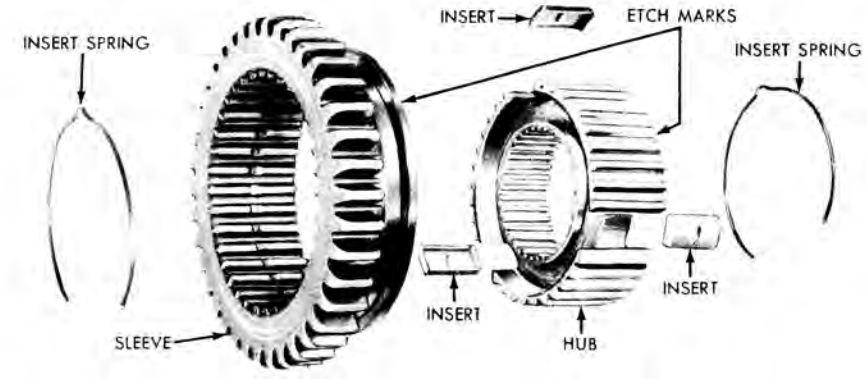


FIG. 14—Replacing Input Shaft Bearing



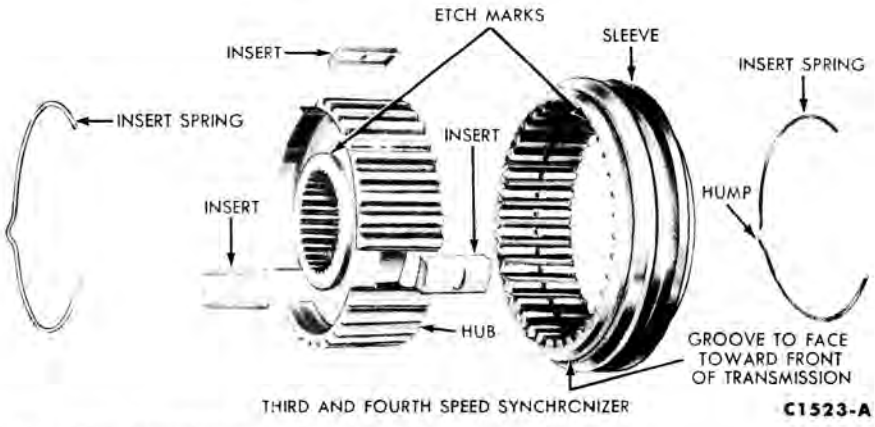


FIG. 15—Synchronizers Disassembled

REVERSE IDLER GEAR BEARINGS

1. Slip the reverse idler sliding gear off of the reverse idler gear (Fig. 17).

2. Remove the dummy shaft, two bearing retainer washers and the 44 roller bearings from the reverse idler gear.

3. Coat the bore in each end of the reverse idler gear with grease.

4. Hold the dummy shaft in the gear and install the 22 roller bearings and the retainer washer in each end of the gear.

5. Install the reverse idler sliding gear on the reverse idler gear making sure that the shift fork groove is toward the front (Fig. 17).

INPUT SHAFT SEAL

1. Remove the seal from the input shaft bearing retainer as shown in Fig. 18.

2. Coat the sealing surface with lubricant.

3. Install the seal as shown in Fig. 19.

ASSEMBLY

1. Coat the countershaft gear thrust surfaces in the case with a thin film of lubricant and position a thrust washer (Fig. 16) at each end of the case.

2. Position the countershaft gear, dummy shaft, and roller bearings in the case

3. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.

4. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be 0.004-0.018 inch. If not within these limits, replace the thrust washers.

5. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.

6. Coat the reverse idler gear thrust surfaces in the case with a thin film of lubricant and position the two thrust washers (Fig. 17) in place.

7. Position the reverse idler gear, sliding gear, dummy shaft and the roller bearings in place making sure that the shift fork groove in the sliding gear is toward the front of the case.

8. Align the gear bore and thrust washers with the case bores and install the reverse idler shaft.

9. Measure the reverse idler gear end play with a feeler gauge. End play should be 0.004-0.018 inch. If the end play is not within limits, replace the thrust washers. If the end play is within limits, leave the reverse idler gear installed.

10. Position the reverse gear shift rail detent spring and detent plug in the case. Hold the reverse shift fork in place on the reverse idler sliding gear and install the shift rail from the rear of the case. Secure the fork to the rail with the Allen head set screw.

11. Install the first-and second speed synchronizer onto the front of the output shaft (Fig. 11) making sure that the shift fork groove is toward the rear of the shaft.

12. Position the blocking ring on the second-speed gear.

13. Slide the second-speed gear onto the front of the shaft, make sure that the inserts in the synchronizer engage the notches in the blocker ring.

14. Install the second-speed gear thrust washer and snap ring.

15. Slide the third-speed gear onto the shaft with the synchronizer coned surface toward the front.

16. Place a blocking ring on the third-speed gear.

17. Slide the third-and fourth-speed gear synchronizer onto the shaft making sure that the inserts in the synchronizer engage the notches in the blocking ring.

18. Install the snap ring on the front of the output shaft.

19. Position the blocking ring on the first-speed gear.

20. Slide the first-speed gear onto the rear of the output shaft making sure that the notches in the blocking ring engage the synchronizer inserts.

21. Install the heavy thrust washer on the rear of the output shaft.

22. Carefully lower the output shaft assembly into the case as shown in Fig. 8.

23. Position the first-and second-speed shift fork and the third-and fourth-speed shift fork in place on their respective gears and rotate them into place.

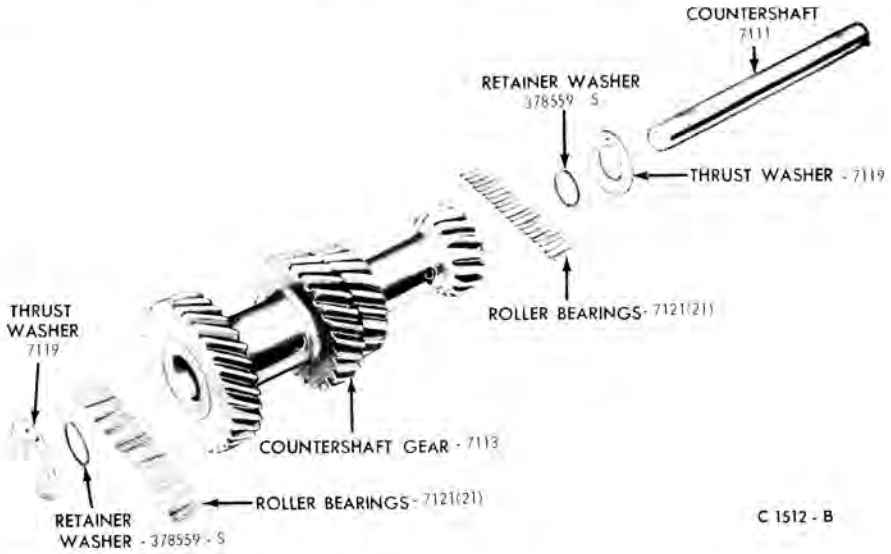


FIG. 16—Countershaft Gear Disassembled

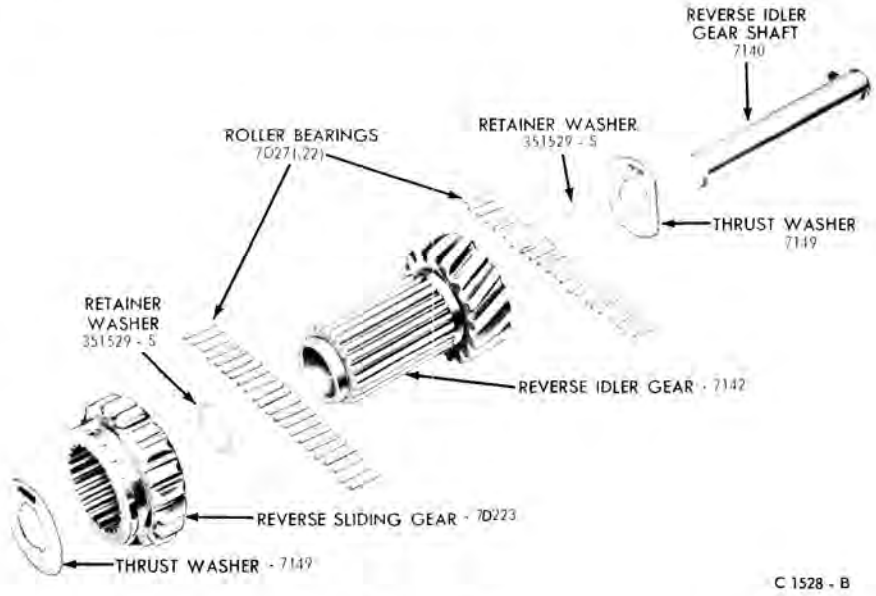


FIG. 17—Reverse Idler Gear Disassembled

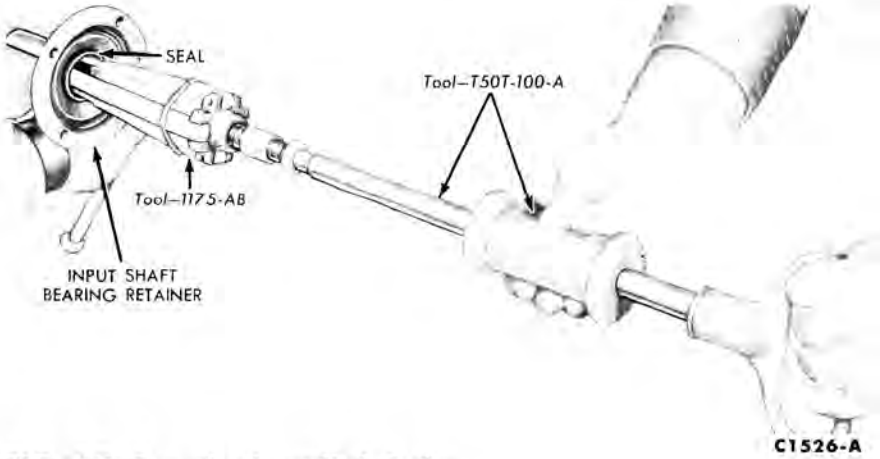


FIG. 18–Removing Input Shaft Seal



FIG. 19–Installing Input Shaft Seal

24. Place a detent plug (Fig. 5) in the detent bore. Place the reverse shift rail into neutral position.

25. Coat the third-and fourth-speed shift rail interlock pin with grease and position it in the shift rail.

26. Align the third-and fourth-speed shift fork with the shift rail bores and slide the shift rail into place making sure that the three detents are facing toward the outside of the case. Place the front synchronizer into third-speed position and install the set-screw in the third-and fourth-speed shift fork. Move the synchronizer to the neutral position. Install the third-and fourth-speed shift rail detent plug, spring and bolt in the left side of the transmission case (Fig. 5). Place the interlock plug (tapered ends) in the detent bore.

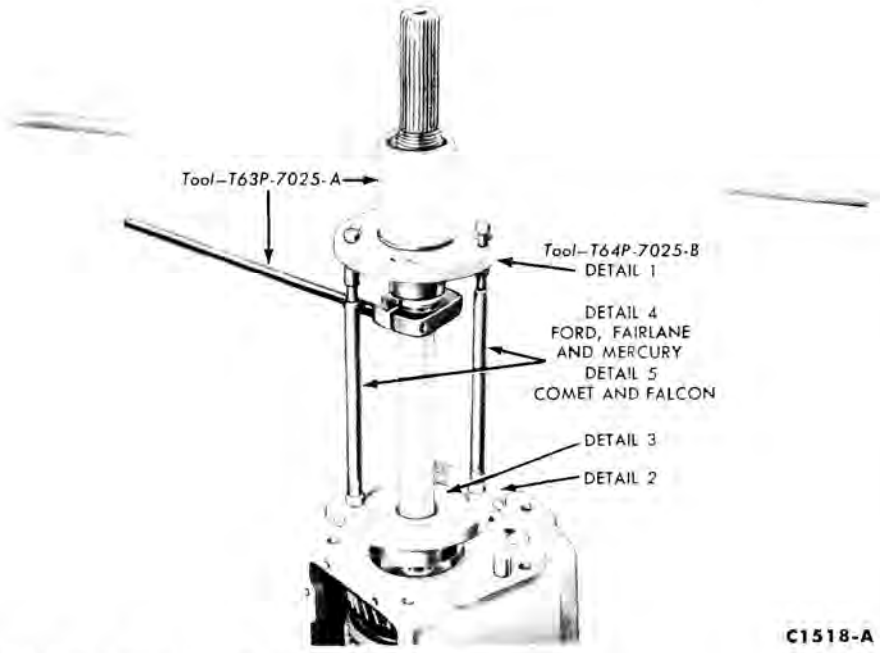


FIG. 20–Installing Output Shaft Bearing

27. Align the first-and second-speed shift fork with the case bores and slide the shift rail into place. Secure the fork with the set screw. Install a detent plug and spring in the detent bore. Thread the set screw into the case until the head is flush with the case.

28. Coat the input gear bore with a thin film of grease, then install the 15 roller bearings in the bore. **A thick film of grease could plug the lubricant holes and restrict lubrication to the bearings.**

29. Position the front blocking ring in the third and fourth-speed synchronizer. Place the input shaft gear in the transmission case making sure that the output shaft pilot enters the roller bearings in the input gear.

30. Place a new gasket on the input shaft bearing retainer. Dip the attaching bolts in sealer and install and tighten them to specifications.

31. Install the output shaft bearing as shown in Fig. 20. Install the snap ring to retain the bearing.

32. Position the speedometer gear drive ball in the output shaft and slide the gear into place. Secure the gear with the snap ring.

33. Place the transmission in a vertical position as shown in Fig. 23. Align the countershaft gear bore and thrust washers with the bore in the case. Install the countershaft.

34. Use a new gasket and secure the extension housing to the case with the attaching screws. Use a sealer on the extension housing attaching screws. Torque the screws to specifications.

35. Install the filler and drain plugs in the case if they were removed. Make sure that the mag-

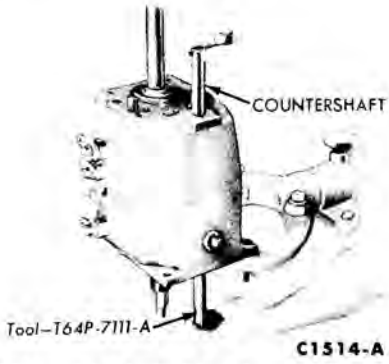


FIG. 21—Installing Countershaft

netic plug is installed in the bottom of the case.

36. Pour the specified lubricant over the entire gear train while rotating the input shaft.

37. Place each shift fork in all positions to make sure that they operate properly.

38. Use a new cover gasket and install the cover. Coat the cover attaching screws with sealer and install and tighten them to specifications.

39. Coat the third-and fourth-speed shift rail plug bore with a sealer and install a new plug.

40. If the extension housing bushing and seal are to be replaced, refer to Section 4.

41. Secure each shift rod to its respective lever with a spring washer, flat washer and a retaining pin.

42. Position the shift linkage control bracket to the extension housing and install and torque the attaching screws to specifications.

43. Adjust the shift linkage as detailed in Section 4.

PART 6-6 WARNER GEAR FOUR-SPEED TRANSMISSION

Section		Page
1	Description and Operation	6-41
2	In-Car Adjustment and Repairs	6-42
3	Removal and Installation	6-43
4	Major Repair Operations	6-44

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Warner 4-speed transmission (Fig. 1) is of the fully synchronized type with all gears except the reverse sliding gear being in constant mesh. All forward-speed changes are accomplished with synchronizer sleeves (Fig. 2) instead of sliding gears. The synchronizers will enable quicker shifts, greatly reduce gear clash, and permit down-shifting into any forward speed gear while the car is moving.

The shift linkage is mounted directly on the transmission extension housing (Fig. 1) and enters the drivers compartment through an opening in the floor pan. A flexible rubber boot is provided to seal the driver's compartment (Fig. 3) from the exterior.

The shift pattern is shown on the top of the gear shift lever knob. A finger-operated release lever is provided on the shift lever to prevent the transmission from being acci-

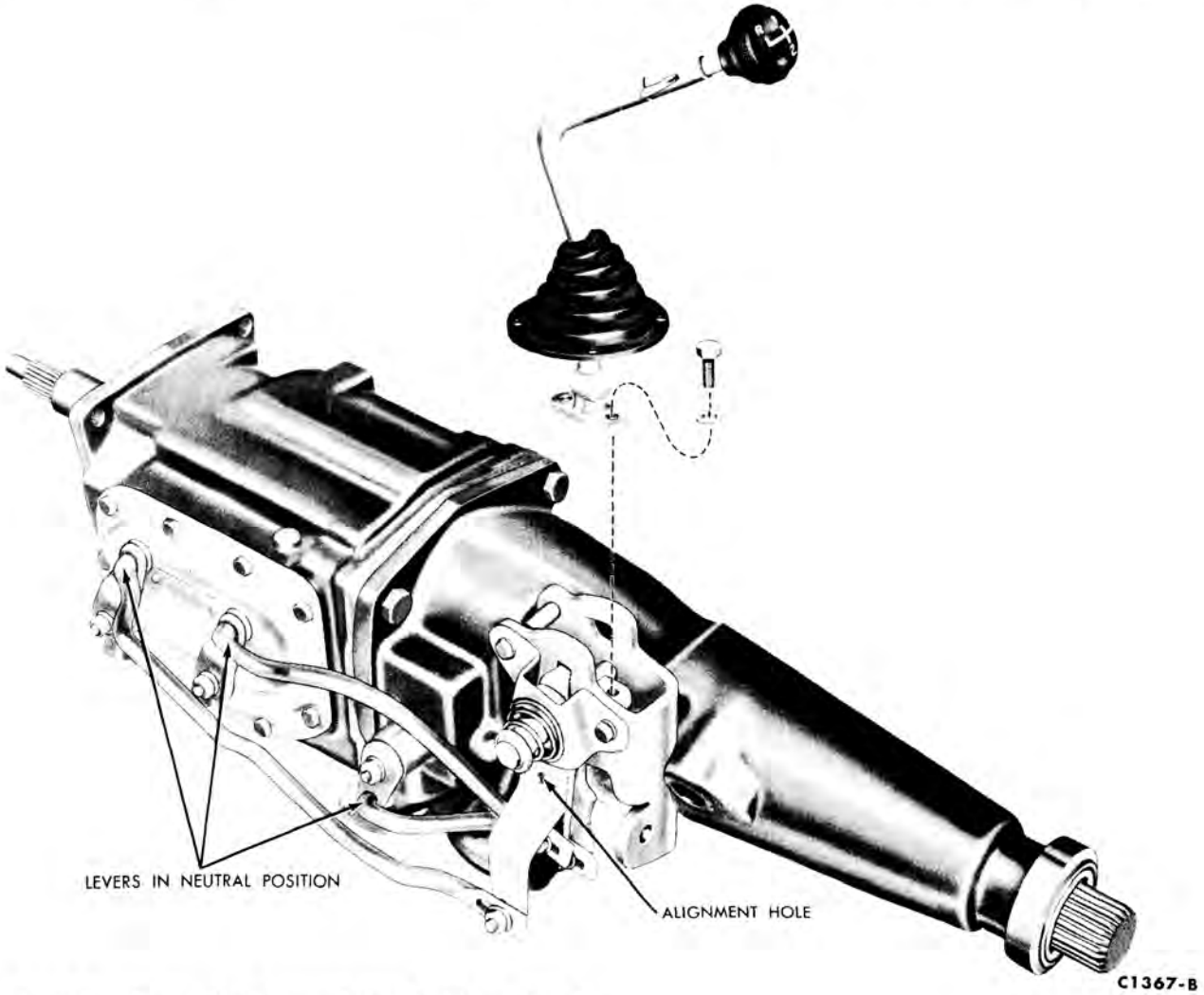


FIG. 1—4-Speed Floor Shift Transmission—Fairlane, Comet

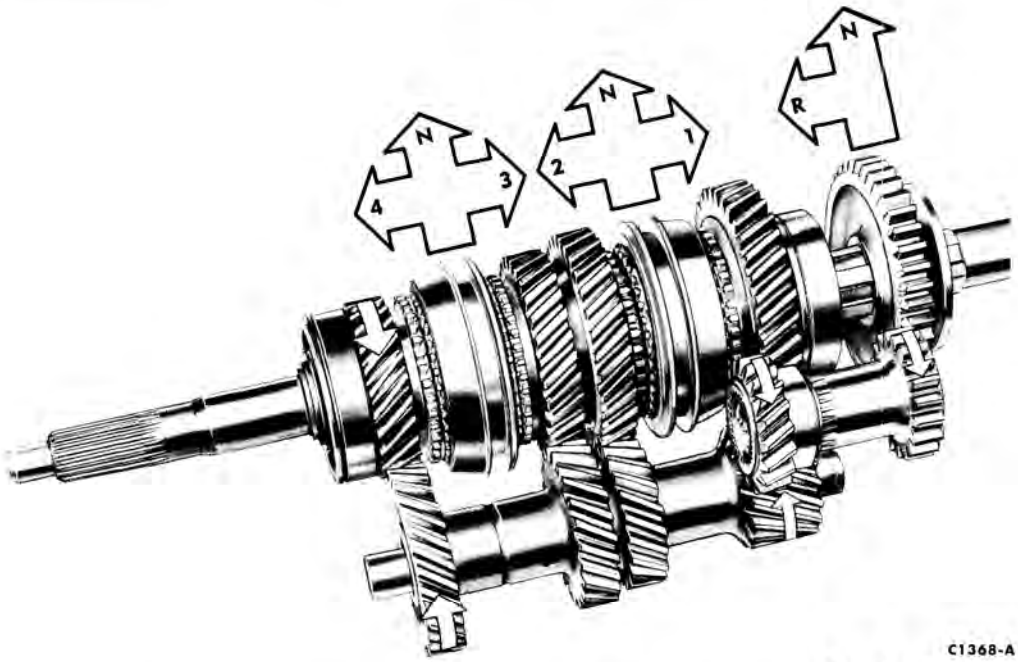


FIG. 2—Power Flow—4-Speed Transmission

dentally shifted into reverse gear. All forward speed gears in the transmission are helical-type, however, the reverse sliding gear and the reverse rear idler gears located in the extension housing are spur-type gears.

OPERATION

In first speed, the first and second speed synchronizer sleeve is moved rearward by the shift fork. The sleeve engages the first speed blocking ring, which acts as a cone clutch applied to the free-wheeling first speed gear. This action speeds up or slows down the first-speed gear to match the speed of the output shaft. Further movement of the sleeve locks the first-and second-speed synchronizer hub to the first-speed gear by means of internal splines. On engagement of the clutch, power flows through the input shaft and gear to the meshed countershaft gear and thence to the first-speed gear. This gear transmits the power through the locked synchronizer hub to the transmission output shaft. All the other forward speed gears are in idler motion, as they are all driven by the countershaft (cluster) gear, but they do not transmit power because they are not locked to the output shaft. All the forward-speed shifts are made in the same manner as the first-speed shift, due to the constant-mesh features.



FIG. 3—Shift Lever Installation

Reverse gear is engaged by moving the reverse sliding gear forward on the output shaft until it meshes with the reverse rear idler gear. Movement of the sliding gear is accomplished by a separate shift fork mounted in the extension housing. With all forward speed synchronizer sleeves in neutral, power flow in reverse is through the input shaft to the constant-mesh countershaft (cluster) gear, thence to the constant-mesh reverse gear front idler. Splines then carry the power through the adapter plate to the reverse gear rear idler in the extension housing. As the sliding reverse gear is meshed with the reverse gear rear idler, power is transmitted to the output shaft, rotating it in a reverse direction.

2 IN-CAR ADJUSTMENT AND REPAIRS

GEAR SHIFT LINKAGE ADJUSTMENT

To adjust the gear shift linkage, place the shift lever in neutral position and raise the car on a hoist. Insert a ¼" diameter tool into the alignment hole as shown in Fig. 4. An alignment tool can be made from ¼" diameter drill rod bent to an "L" shape. The extensions should be 1½" and 3¾" from the elbow. Short end of alignment pin should be

inserted into control bracket and linkage holes until it bottoms.

If the tool will not enter, check for bellied or bent shift rods. If the shift rods are the correct shape, check for loose lever lock nuts at the rod ends. Reset the linkage by loosening the three rod-retaining lock nuts (Fig. 5) and moving the levers until the ¼-inch alignment tool will enter the alignment holes. Make sure the transmission shift levers are in neutral and the reverse shift lever is in the neutral detent. If there is any doubt about location of the neutral position, disconnect the shift rods at the retaining lock nuts and rotate each forward-speed shift lever through its three positions until the center (neutral) detent is positively located. Move the reverse shift lever forward until positive engagement of the detent is felt. Install the shift rods and tighten the lock nuts to specifications. Remove the tool. Operate the shift levers to make sure that the detents are engaging. Lower the car and check for smooth cross-over operation.



FIG. 4—Shift Linkage Adjustment

3 REMOVAL AND INSTALLATION

REMOVAL

1. Before raising the car, remove the transmission gear shift selector lever boot retainer (Fig. 5). Working under the boot, **remove the shift selector lever retaining bolts** and remove the selector lever from the shift assembly. The remaining shift linkage may be left on the transmission during removal.

2. Disconnect the drive shaft from the rear U-joint flange. Slide the drive shaft off the transmission output shaft and install appropriate extension housing seal installation tool to prevent lubricant leakage.

3. Disconnect the speedometer cable from the extension housing.

4. Disconnect the parking brake at the equalizer bar and support the engine with a transmission jack.

5. Remove the extension housing-to-engine rear support spring attaching bolts on Falcon and Comet, or to rear support on Fairlane and Mustang.

6. Raise the rear of the engine with the transmission jack. Disconnect the frame crossmember at the frame and remove the crossmember and engine rear support as a unit.

7. Support the transmission on a jack and remove the bolts that attach the transmission to the flywheel housing.

8. Move the transmission and jack rearward until the transmission input shaft clears the flywheel housing. If necessary, lower the engine enough to obtain clearance for transmission removal.

Do not depress the clutch pedal while the transmission is removed.

INSTALLATION

1. Make sure that the mounting surfaces of the transmission and the flywheel housing are free of dirt, paint, and burrs. Install two guide pins in the flywheel housing lower mounting bolt holes. Move the transmission forward on the guide pins until the input shaft splines enter the clutch hub splines and the case is positioned against the flywheel housing.

2. Install the two upper mounting bolts snug and then remove the two guide pins. Install the two lower mounting bolts. Torque all mounting bolts to specifications.

3. Raise the rear of the engine and install the engine rear support and spring mount as a unit. (No spring on Fairlane or Mustang.) Then lower the engine. Torque the rear support-to-frame attaching bolts to specifications.

4. With the transmission extension housing resting on the spring mount, install the transmission extension housing attaching bolts. Torque to specifications. (No spring on Fairlane or Mustang.)

5. Connect the speedometer cable to the extension housing, and connect the parking brake cable to the equalizer.

6. Remove the extension housing seal installation tool and slide the forward end of the drive shaft assembly over the transmission output shaft. Connect the drive shaft to the rear U-joint flange.

7. Place the shift cover levers and the reverse shift lever in neutral position and insert a ¼-inch diameter alignment tool in the shift linkage alignment hole. See Part 6-5 (Fig. 3). Adjust the linkage as necessary and tighten the linkage lever lock nuts to specifications. Remove the alignment tool.

8. Fill the transmission to the proper level with the specified lubricant.

9. Lower the car and install the shift selector lever and boot.

10. Check the shift and cross-over motion for full shift engagement and smooth cross-over operation.

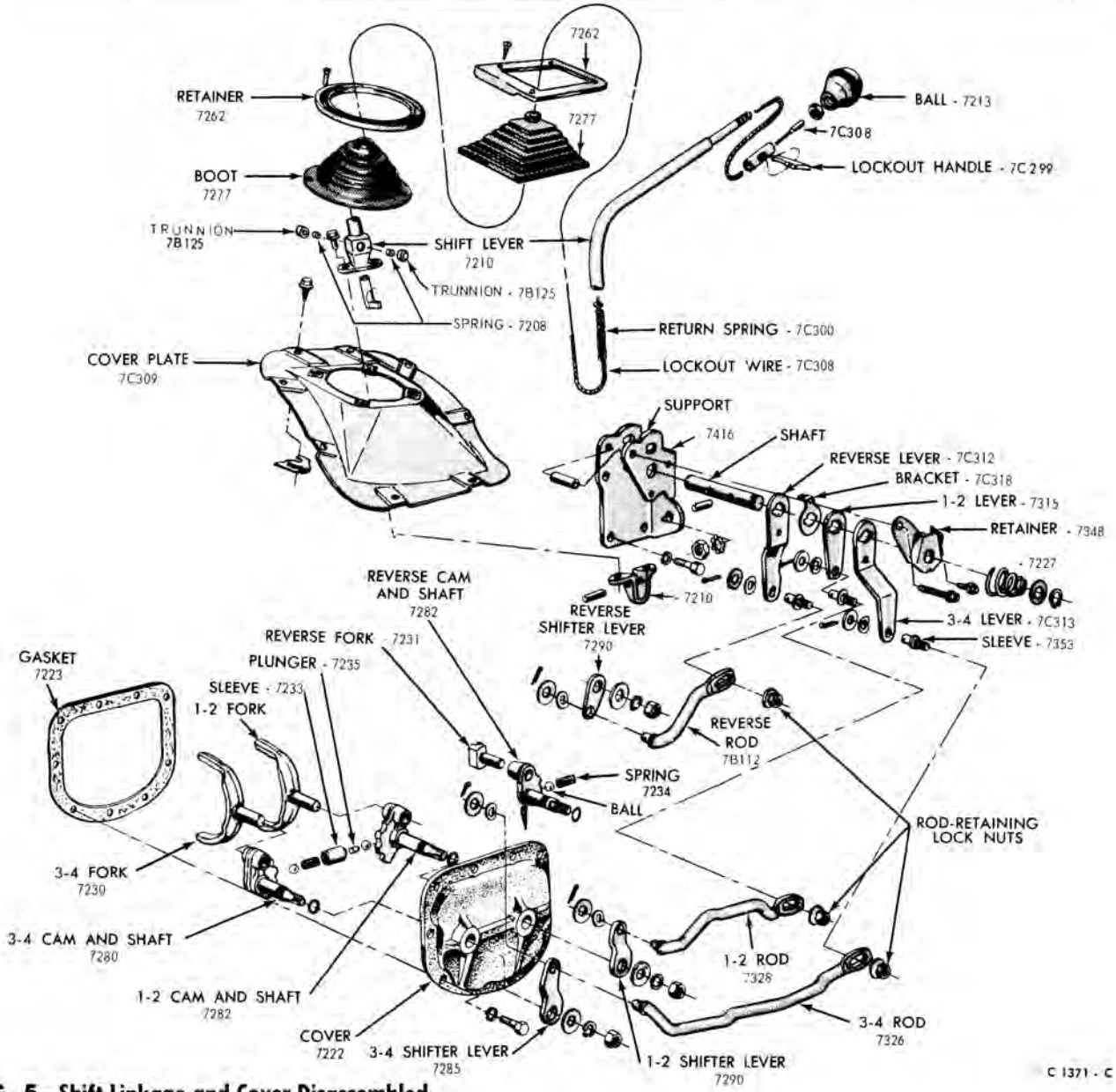


FIG. 5—Shift Linkage and Cover Disassembled

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

1. Mount the transmission in a holding fixture and drain the lubricant.

2. Disconnect the shift linkage rods at the shift levers. Remove the shift linkage from the extension housing as a unit.

3. Remove the transmission shift cover, gasket and shift forks as an assembly.

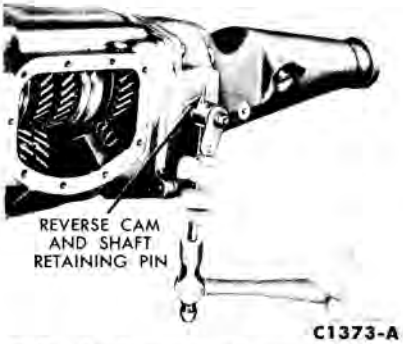
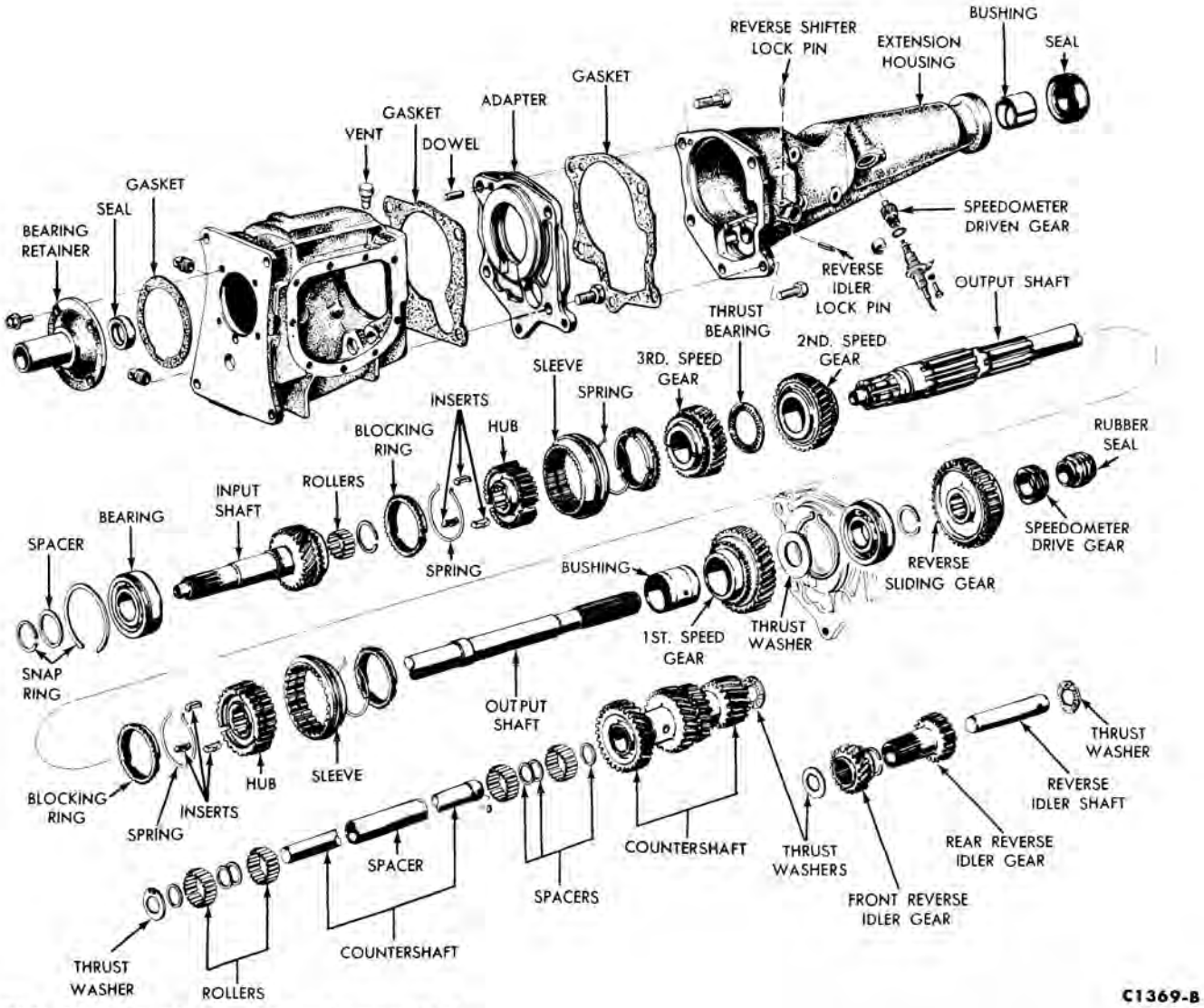


FIG. 6—Removing Reverse Cam and Shaft Retaining Pin

4. Drive the reverse shift shaft pin (Fig. 6) out of the extension housing. Pull the reverse shift shaft out of the extension housing approximately ⅛-inch. This operation frees the reverse shift fork from the reverse sliding gear located in the extension housing.

5. Remove the extension-to-case attaching bolts (Fig. 7). Tap the extension housing with a soft hammer to free it from the case. Slide the



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FIG. 7—4-Speed Transmission Disassembled

extension housing rearward until the reverse idler shaft (Fig. 8) is clear of the reverse rear idler gear. Rotate the extension housing to the left to clear the reverse shift fork and remove the extension housing.

6. Lift the reverse gear rear idler (Fig. 9) from the case.

7. Remove the self-locking bolt that attaches the adapter plate to the transmission case. Remove the transmission output shaft assembly along with the adapter plate (Fig. 10). Catch any of the input shaft pilot rollers that may stick to the output shaft. Remove the remaining rollers from the input shaft bore.

8. Remove the fourth-speed gear synchronizer blocking ring which will be stuck on the input shaft gear or will have fallen into the case.

9. Remove the reverse gear front idler and thrust washer from the case (Fig. 11).

10. Working from the front of the case, use a drift to start the countershaft rearward. Arrange a hook around the countershaft gear, then insert the tool (dummy shaft) shown in Fig. 12 and push out the countershaft, allowing the countershaft (cluster) gear to settle to the bottom of the case. Remove the Woodruff key from the rear of the countershaft.

11. Remove the input shaft bearing retainer and discard the gasket. Remove the input shaft bearing retaining snap ring and push the input shaft and bearing assembly inward and out of the bearing bore. Remove the input shaft assembly from inside the case.

12. Remove the countershaft (cluster) gear from the case (including dummy shaft and thrust washers). Note the arrangement of the spacers.

13. Remove the input shaft bearing retainer oil seal as shown in Fig. 13.

14. Install the input shaft bearing retainer oil seal using the tool shown in Fig. 14.

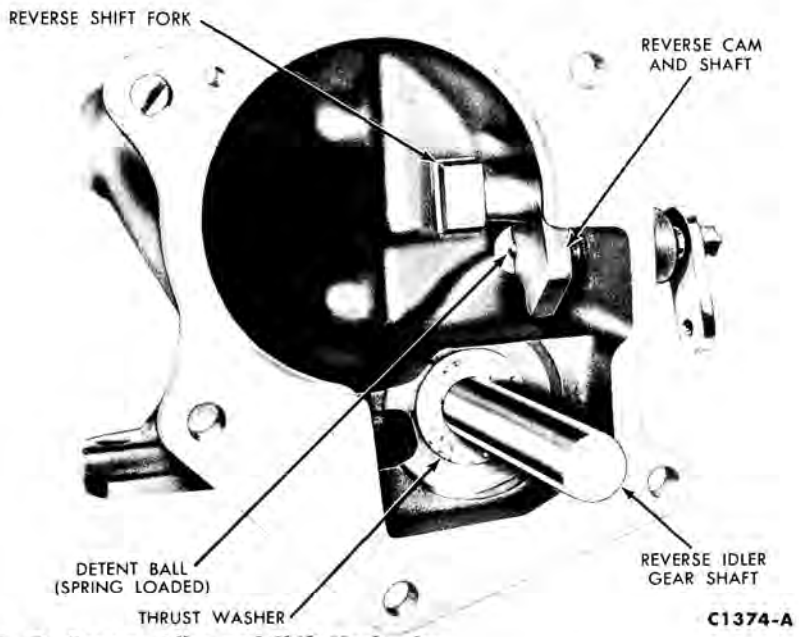


FIG. 8—Reverse Idler and Shift Mechanism

15. To disassemble the output shaft, remove the small snap ring at the front of the shaft and slide the third and fourth-speed gear synchronizer assembly (Fig. 15), third-speed gear synchronizer blocking ring, third-speed gear (Fig. 16), thrust washer, second-speed gear, and second-speed synchronizer blocking ring (Fig. 17) off the shaft.

16. Remove the output shaft rear oil seal from the shaft. Position the output shaft in a press and remove the speedometer drive gear (Fig. 18). Slide the reverse sliding gear off the output shaft.

17. Spread the retaining snap ring (Fig. 19) and press or tap the adapter plate off the output shaft rear bearing. Remove the snap ring retaining the output shaft bearing to the shaft and press the bearing off the shaft. (Fig. 20).

18. Complete the disassembly of the output shaft by sliding off the first-speed gear thrust washer (plain), first-speed gear, first-speed gear bushing, first-speed synchronizer blocking ring and first and second-speed synchronizer assembly (Fig. 20).

19. To disassemble the extension housing, first remove the oil seal as shown in Fig. 1, Part 6-1. If necessary to replace the extension housing bushing, do so after reinstalling the extension housing, so that the tool shown in Fig. 2, Part 6-1, will be supported by the output shaft.

20. Pull the reverse shift fork from the reverse shift shaft and cam. Remove the reverse shift lever and carefully tap the shaft and cam into the housing, allowing the detent ball and spring to drop out of the detent bore. Remove the O-ring seal from the shift shaft.

21. Remove the reverse idler shaft by driving the retaining pin inward until it bottoms. Pull the shaft from the extension housing. Tap the shaft with a soft-faced hammer to loosen it if necessary.

PARTS REPAIR OR REPLACEMENT

SYNCHRONIZERS

1. Scribe an index mark across the sleeve and the hub so that they may be installed in their original position when assembling them.

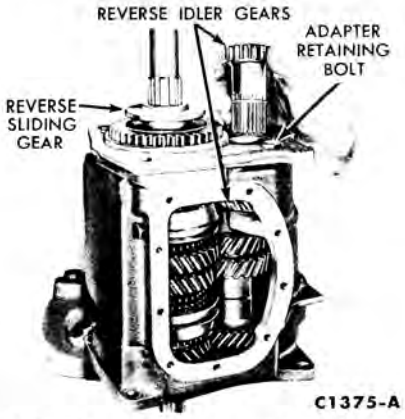


FIG. 9—Reverse Gear Rear Idler Removal

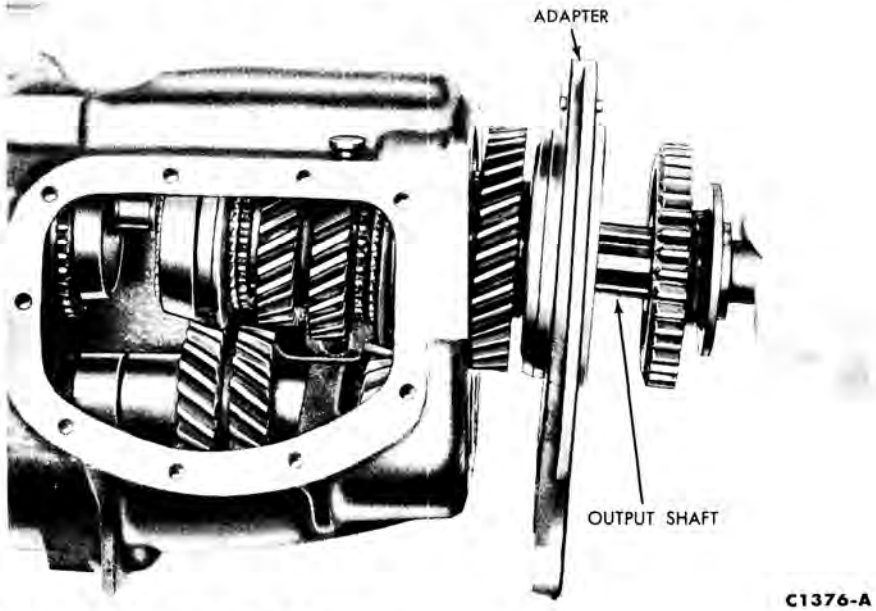


FIG. 10—Output Shaft Removal

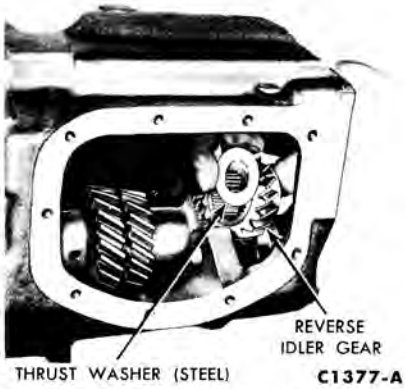


FIG. 11—Reverse Gear Front Idler Removal

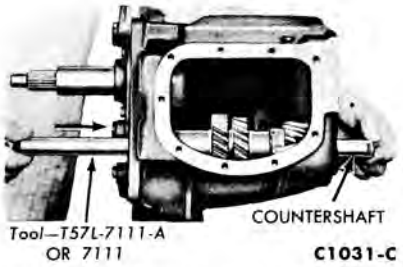


FIG. 12—Countershaft Removal

2. Disassemble the first and second-speed and third and fourth-speed synchronizers (Fig. 7) by sliding the clutch sleeves off the hubs and removing the three inserts and two insert springs from each assembly.

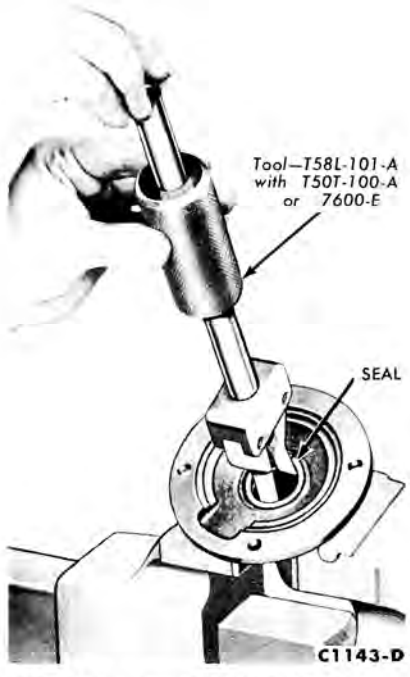


FIG. 13—Input Shaft Oil Seal Removal



FIG. 14—Input Shaft Oil Seal Installation

3. In both units, the synchronizer is assembled by installing two insert springs and three inserts on the synchronizer hub.

4. The springs should be assembled with one tang of each spring in the same insert, but the springs turned in opposite directions so that the openings do not line up.



FIG. 15—Third and Fourth-Speed Synchronizer Removal

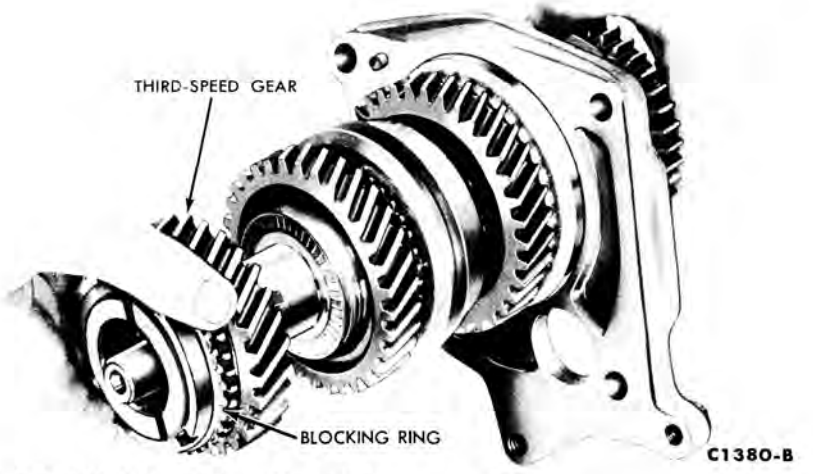


FIG. 16—Third-Speed Gear Removal

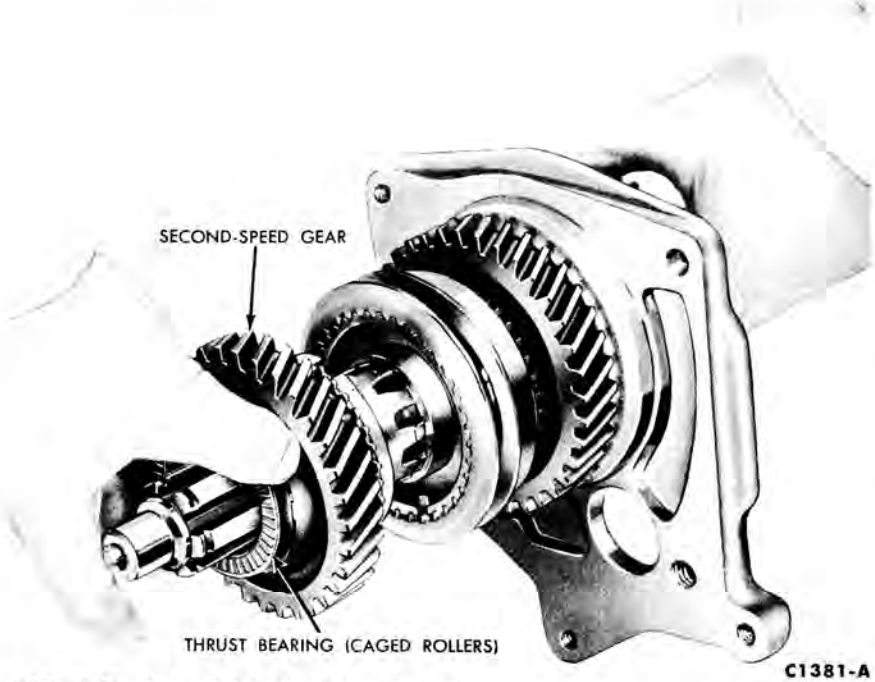


FIG. 17—Second-Speed Gear Removal



FIG. 18—Speedometer Drive Gear Removal

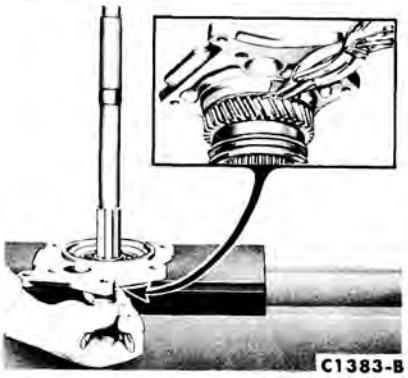


FIG. 19—Adapter Plate Removal

5. Line up the etched marks on the sleeves and hub and slide the sleeve onto the hub.

SHIFT COVER

1. Remove the shift levers (Fig. 5) from the cam and shaft assemblies.

2. Pull the shift forks and shafts out of the gear shift cover. With the shafts removed, the detent balls, retainer, and spring will fall out of the gear shift cover.

3. Pull the shifter forks out of the cams.

4. Remove the seal rings from the cam shafts.

5. Install new seal rings on the shift lever cam shafts. Lubricate the seal rings and shaft bores in the cover.

6. Position one cam and shaft in the cover and place it in the neutral position.

7. Install the interlock spring, sleeve, pin, and one detent ball in the shift cover detent bore (Fig. 5).

8. Position the remaining detent ball and second cam and shaft in the cover. Install the gear shift levers and forks on the shafts. Check operation of the assembly.

COUNTERSHAFT GEAR BEARINGS

1. Disassemble the countershaft gear as shown in Fig. 21. The six steel spacer washers are interchangeable.

2. Coat the bore in each end of the countershaft gear with grease.

3. Position the long countershaft roller spacer on the remover tool (dummy shaft) and install it in the countershaft (cluster) gear.

4. Install 20 roller bearings, two spacer washers, 20 more roller bearings, one spacer, and one thrust washer in each end of the countershaft gear (Fig. 21).

5. Install the thrust washers with the flat bronze sides toward the countershaft gear faces.

INPUT SHAFT BEARING

1. To disassemble the input shaft on a Falcon, Fairlane and Mustang transmission, remove the bearing retainer snap ring, and spacer washer. Reinstall the bearing outer snap ring

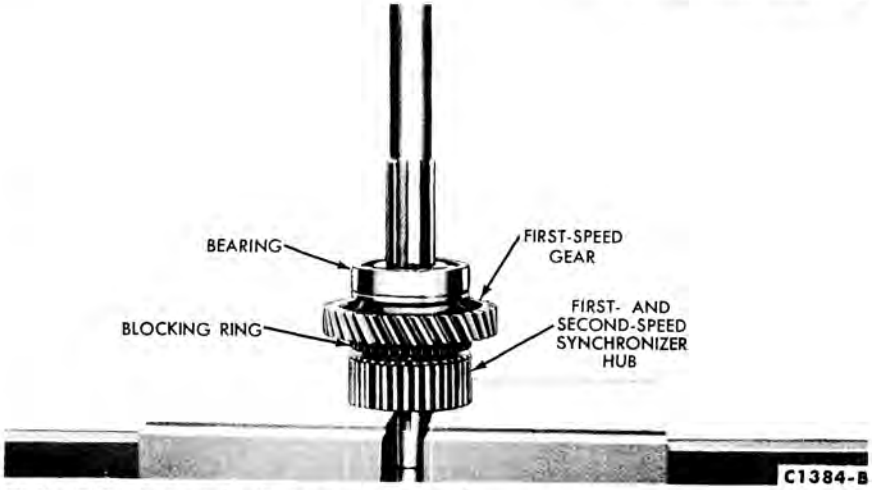


FIG. 20—Output Shaft Bearing Removal

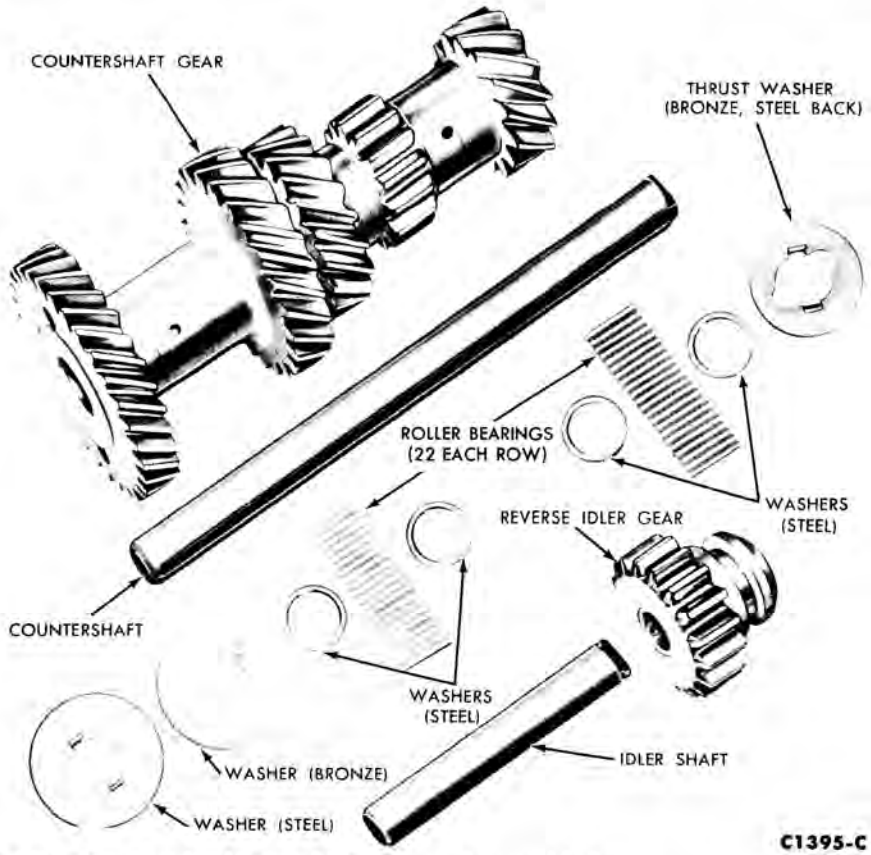


FIG. 21—Countershaft and Idler Gear Disassembled

that was removed previously, then press the bearing off the shaft as shown in Fig. 22, using the tool indicated. To disassemble the input shaft on a Comet transmission, remove the bearing retainer snap ring, and spacer washer. Insert the lip of the tool in the bearing snap ring groove and press the shaft out of the bearing.

2. Assemble the input shaft bearing on the input shaft as shown in Fig. 22. Retain the bearing on the shaft with a spacer and snap ring.

3. Position the input shaft pilot rollers in the input shaft bore using a light film of heavy grease.

A thick film of grease could plug the lubricant holes and restrict lubrication to the bearings.

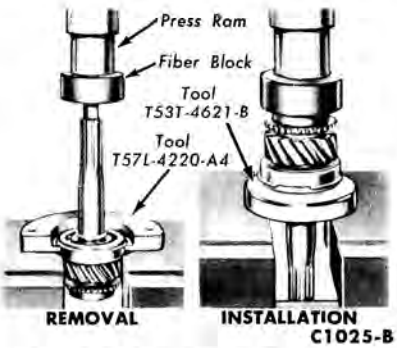


FIG. 22—Input Shaft Bearing Replacement

ASSEMBLY

1. Place the countershaft gear in the case, aligning the thrust washer tangs with the slots in the case. Instal the countershaft and check the countershaft gear end play (Fig. 23). Replace the thrust washers as required so that end play does not exceed 0.025 inch. Insert the remover tool in place of the countershaft and allow the countershaft gear to rest on the bottom of the case.

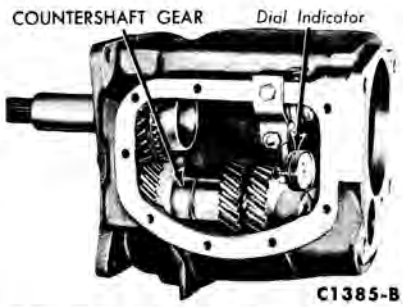


FIG. 23—Checking Countershaft Gear End Play

2. Install the input shaft assembly in the case, working through the shift cover opening. Install the input shaft assembly retaining snap ring in the front bearing groove.

3. Raise the countershaft gear into mesh with the input shaft gear and install the countershaft. Line up the countershaft Woodruff key slot with the counterbore provided in the case and install the Woodruff key. Tap the countershaft into position flush with the rear face of the case.

4. Position the fourth-speed synchronizer blocking ring on the input shaft gear taper.

5. Working from the rear of the output shaft, slide the first and second-speed synchronizer onto the shaft. The sliding clutch sleeve long taper should face the rear (Fig. 19).

6. Slide the first-speed gear bushing onto the output shaft. Position the first-speed gear synchronizer blocking ring on the first and second-speed gear synchronizer, aligning the notches in the blocking ring with the inserts in the synchronizer. Install the first-speed gear on the first-speed gear bushing, tapered hub facing forward. Install the first-speed gear thrust washer, with the grooved side to the gear (Fig. 7).

7. Position the output shaft rear bearing on the output shaft with the snap ring groove in the bearing race facing forward. Press the bearing on the shaft. Seat the bearing firmly against the shaft shoulder and install the retaining snap ring. Use a new and thickest snap ring which will assemble.

8. Install the adapter plate on the output shaft rear bearing by spreading the snap ring in the adapter plate and tapping or pressing the plate over the bearing (Fig. 19). Release the snap ring.

9. Position the reverse sliding gear on the output shaft, with the shift collar toward the rear. Press the speedometer drive gear on the output shaft until the measurement from the rear end of the output shaft to the rear face of the speedometer gear is 8 11/16 inches on Comet, Falcon and Mustang and 9¼" on Fairlane.

10. Working from the front of the output shaft (Fig 17), position the second - speed gear synchronizer blocking ring on the previously in-

stalled first and second-speed synchronizer. Line up the notches in the blocking ring with the inserts in the synchronizer.

11. Slide the second-speed gear onto the output shaft, with the tapered hub facing toward the rear. Position the radial roller thrust bearing against the front hub face of the second-speed gear (Fig. 17).

12. Install the third-speed gear on the output shaft, with the tapered hub facing forward. Position the third-speed gear synchronizer blocking ring on the taper of the third-speed gear, with the notches in the blocking ring facing forward (Fig. 16).

13. Position the third and fourth-speed gear synchronizer assembly on the output shaft, lining up the synchronizer insert with the notches in the third-speed gear blocking ring. Install the output shaft front snap ring (Fig. 15). Select snap ring to give .003–.008 clearance between snap ring and synchronizer hub.

14. Position the output shaft seal on the output shaft.

15. Working through the output shaft opening, install the reverse gear front idler and thrust washer in the case as shown in Fig. 11.

16. Make sure that the fourth-speed synchronizer blocking ring is in place on the input shaft gear and that the input shaft pilot rollers are installed. Apply a gasket to the rear of the case. Position the output shaft in the transmission case and move it forward, lining up the notches in the fourth-speed blocking ring with the inserts in the third and fourth-speed synchronizer. Line up the dowel pin in the adapter with the locating hole in the main case and push or tap the output shaft and adapter into position. Install the self-locking bolt retaining the adapter plate to the transmission case and torque it to specifications.

17. Install the reverse gear rear idler gear (Fig. 9).

18. Line up the retaining pin holes in the idler shaft and housing and tap the reverse idler shaft into the extension housing with a soft hammer. Coat the retaining pin with oil resistant sealer and install the pin flush with the outside of the housing.

19. Position the "O"-ring seal on the reverse shifter shaft. Install the detent ball and spring in the detent bore. Working from inside the extension housing, hold the detent ball down with a suitable tool and insert the shift shaft and cam from the inside. Install the reverse shift lever. Position the reverse shift fork on the reverse shift shaft (Fig. 8).

20. Install the reverse idler gear tanged thrust washer on the idler shaft with the tang gear facing rearward (Fig. 8). Apply heavy grease to retain the washer against the extension housing.

21. Position a new gasket on the adapter, using sealer to hold the gasket in place.

22. Move the reverse shift lever to bring the shift fork to the extreme forward position (Fig. 8). Pull the lever outward so that the reverse fork will clear the reverse gear on assembly. Slide the reverse gear forward on the output shaft until it engages the reverse idler gear.

23. Position the extension housing over the output shaft and carefully push the housing forward. Insert the reverse idler shaft into the reverse idler gears. When the reverse shift fork seats in the reverse gear shift collar groove (Fig. 24), push the reverse shift shaft into position. Move the reverse gear rearward with the shift lever, and seat the extension housing against the adapter plate.

24. Place the 1-2 and the 3-4 synchronizer in neutral and the reverse idler gear in reverse (forward) position. Set the reverse shift lever in the reverse position. Install a new shift cover gasket on the case, using sealer. Install the shift cover. Use sealer on the bolts and torque them to specifications.

25. Check the operation of the reverse shift lever. If satisfactory, install the extension housing to the adapter plate and transmission case. Apply sealer to the lower right bolt to prevent lubricant leaks. Torque the bolts to specifications.

26. Install the reverse shifter cam and shaft locking pin (Fig. 6).

27. Install the extension housing bushing and oil seal as shown in Figs. 4 and 2, Part 6-1.

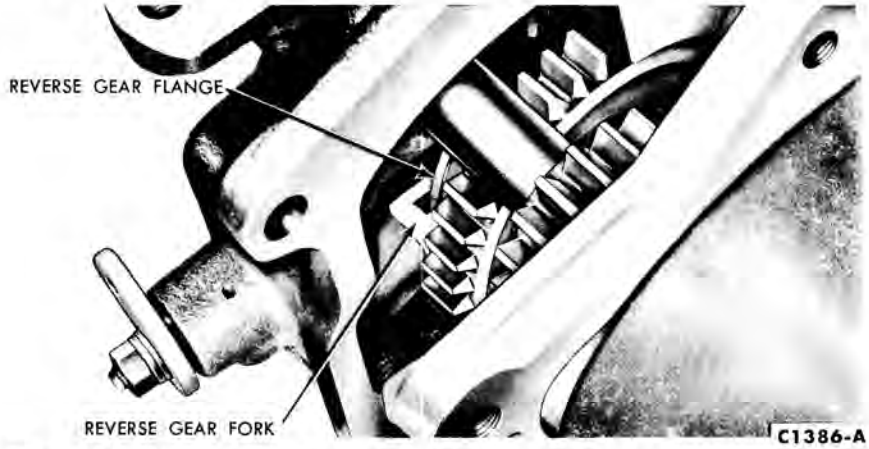


FIG. 24—Extension Housing Installation

PART 6-7 OVERDRIVE TRANSMISSION

Section	Page
1 Diagnosis and Testing	6-51
2 Cleaning and Inspection	6-53
3 Description and Operation	6-53
4 In-Car Adjustments and Repairs	6-55
5 Transmission Removal and Installation	6-55
6 Major Repair Operations	6-56

1 DIAGNOSIS AND TESTING

When trouble occurs in the overdrive unit, check the mechanical operation of the unit before checking the operation of the overdrive electrical control system.

MECHANICAL CHECKS

OVERDRIVE CONTROL HANDLE CLEARANCE CHECK

Check the specified clearance between the overdrive control handle shank and the bezel on the instrument panel.

OVERDRIVE CONTROL LEVER POSITION CHECK

Raise the car and check the position of the overdrive control lever at the overdrive unit housing. The lever should rest firmly against its stop at the rear. If the lever is not all the way back the overdrive shift rail may be locking the pawl and preventing it from engaging the balk ring gear.

With the engine stopped and the clutch engaged, shift the transmission to third or second gear and shift the overdrive control lever to the automatic (rearward) position. The drive shaft should then turn freely in a clockwise direction (when viewed from the front), but should lock up when turned counterclockwise.

With the transmission remaining in third or second gear, shift the overdrive control lever to the locked-out (forward) position. The drive shaft should lock up when turned either clockwise or counterclockwise.

PAWL ENGAGEMENT CHECK

Check the mechanical engagement of the pawl with the balk ring gear, using the following procedure:

1. Turn the ignition switch to the ON position and raise the car.

2. Shift the overdrive control lever to the locked-out (forward) position, and shift the transmission to neutral.

3. Turn the drive shaft clockwise and, at the same time ground the governor white wire with a jumper. The solenoid will click, indicating that it is energized.

4. Keep the solenoid energized, and shift the transmission to third or second gear to lock the transmission output shaft against rotation. Shift the overdrive control lever to the automatic (rearward) position.

5. Turn the drive shaft clockwise. At less than ¼ turn of the driveshaft, the pawl will engage the balk ring gear and lock the drive shaft against rotation in both directions.

If the pawl does not engage the balk ring gear, replace the solenoid and repeat the test. If the pawl still does not engage, remove the overdrive unit from the car for inspection and repair.

ELECTRICAL CHECKS

GOVERNOR CIRCUIT CHECK

1. Turn the ignition switch ON and OFF, and listen for the relay or solenoid to click. If either clicks as soon as the ignition switch is turned ON, the governor circuit (Fig. 1) is grounded or the relay is defective.

2. To determine which condition is present, remove the wire from the TH-SW terminal on the relay and turn the ignition switch ON. If the relay clicks, the relay is defective. If it does not click, the governor circuit is grounded.

3. To check the governor operation when the relay does not click as the ignition switch is turned On, disconnect the wire at the TH-SW terminal.

4. Raise the rear wheels off the floor.

5. Connect a test lamp between the battery and the wire removed from the TH-SW terminal.

6. Start the engine and, with the transmission in third-speed, bring the speedometer reading up through 28 mph. The lamp should light at or about this speed.

7. Throttle the engine down through 22 mph and at or about this speed the lamp should go out. If the lamp lights, and goes out at or about these speeds, the governor and governor circuit are working properly.

8. Turn the ignition switch ON and raise the car. Disconnect the yellow wire from the white wire at the governor connector.

9. Ground the white wire on the transmission case. If the relay and solenoid click, the governor circuit is working properly from the TH-SW terminal to the connector (Fig. 1), and the trouble is in the yellow wire or the governor. If the relay and solenoid do not click when the white wire is grounded, the trouble is between the TH-SW terminal and the connector (Fig. 1).

SOLENOID CIRCUIT CHECK

1. With the engine stopped and the ignition switch ON, ground the

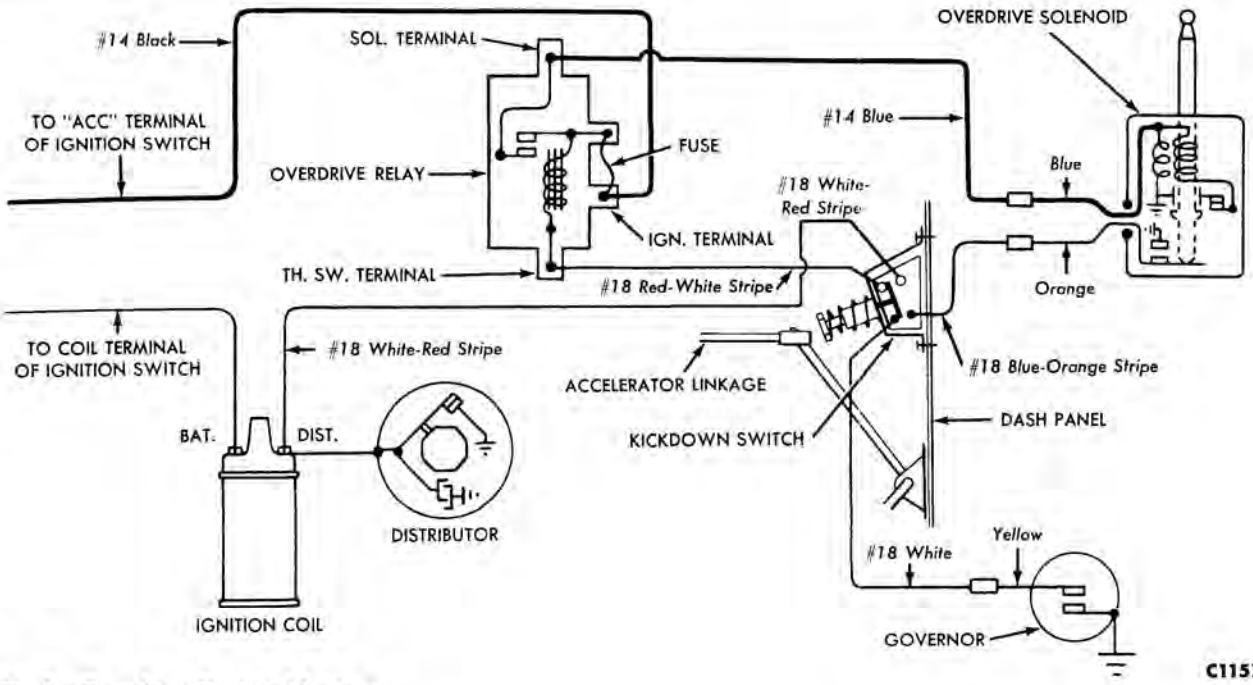


FIG. 1—Overdrive Electrical System

TH-SW terminal on the relay. If the relay and solenoid click as the ground is made and broken, the solenoid circuit is working properly. If the relay does not click as the TH-SW terminal is grounded, check the relay IGN terminal with a test lamp.

2. With the ignition switch ON, the test lamp should light when it is connected between the IGN terminal on the relay and at a ground. If it does not, the trouble is between the ignition switch and the IGN terminal.

3. Connect the test lamp at the other end of the fuse and at a ground. If the lamp lit at the IGN end and not at the other, replace the fuse. **Sometimes the fuse will "open" under the fuse end caps where the "open" cannot be seen.**

4. With current at both ends of the fuse, connect the test lamp between the solenoid terminal and at a ground. Ground the TH-SW terminal. The lamp should light. If it does not, replace the relay.

5. With the relay working properly, the solenoid should click when the TH-SW terminal is grounded. If it does not, connect a jumper from the SOLENOID relay terminal to the short blue wire separated from its connector near the solenoid. If the solenoid does not click when the relay closes with the jumper wire connected, replace the solenoid. If it does click, replace the wire from the SOLENOID relay terminal to the connector.

INTERRUPTER CIRCUIT CHECK

If the interruptor circuit does not ground the engine ignition momentarily when the driver depresses the accelerator pedal to the floor, the overdrive unit cannot shift from overdrive to direct.

1. The first check of the ignition interruptor circuit is at the ignition coil. The black wire which runs from the ignition coil to the kickdown switch must be connected to the DIST terminal on the coil. Sometimes this wire is improperly connected to the BAT terminal during ignition work.

2. Disconnect the blue wire with an orange band (Fig. 1) from its connector near the solenoid, and ground it to the transmission case with a jumper.

3. With the engine running at fast idle, push the kickdown switch stem in until it bottoms (Fig. 2). When the stem bottoms, the engine should stop.

If it does not stop, the circuit is open between the DIST terminal and the connector.

4. To check the ignition grounding contacts inside the solenoid, disconnect the jumper and remove the solenoid from the overdrive unit.

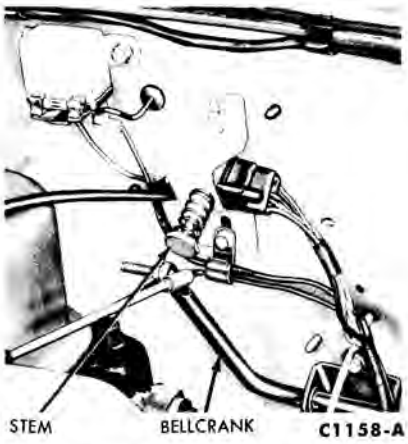


FIG. 2—Kickdown Switch Installation

5. Attach the solenoid to an adapter so that the stem can extend fully when the solenoid is energized. Make sure the solenoid is grounded.

6. Connect both solenoid wires at their connectors.

7. Ground the governor wire with a jumper.

8. With the engine running at fast idle, press in on the kickdown switch stem until it bottoms. The engine should stop. If it does not, replace the solenoid.

2 CLEANING AND INSPECTION

CLEANING

Clean and inspect the transmission unit parts in the same manner as for the conventional transmission. Clean all overdrive parts thoroughly.

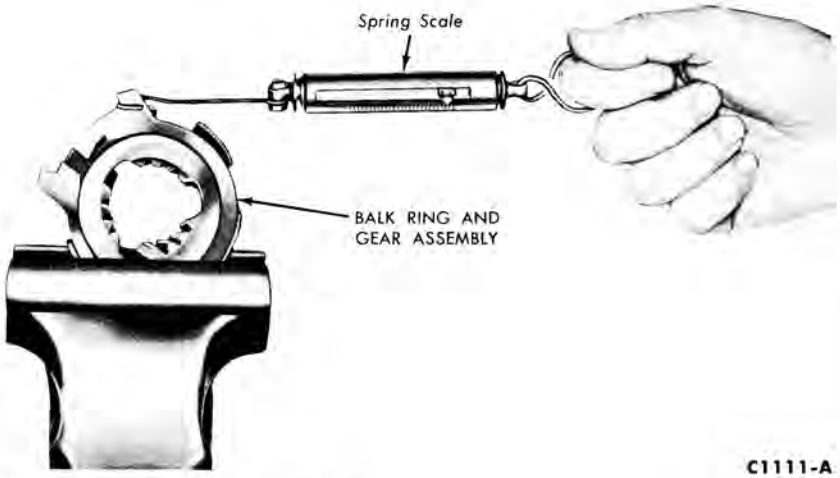


FIG. 3—Checking Balk Ring Tension

INSPECTION

Check the balk ring tension, as shown in Fig. 3 for a pull of 3½-5½ pounds. Read the spring scale while the balk ring is turning, because the initial effort required to start the ring turning may be considerably higher than the specified pull. Replace the assembly if the tension is not within specifications.

Check the inner surface of the free-wheel clutch outer race. If the surface is worn or "chattered," the overdrive output shaft must be replaced.

Check the clutch rollers for cracks and wear. Replace the complete set of 12 rollers if any are cracked or worn.

3 DESCRIPTION AND OPERATION

DESCRIPTION

The overdrive unit is basically an automatic planetary transmission attached to the rear of a conventional three-speed transmission (Fig. 4) to provide four forward speeds instead of three. The overdrive can be mechanically locked out by a control cable located on the instrument panel.

The electrical system which controls the operation of the overdrive when the control cable is pushed in, consists of a relay, a manual kick-

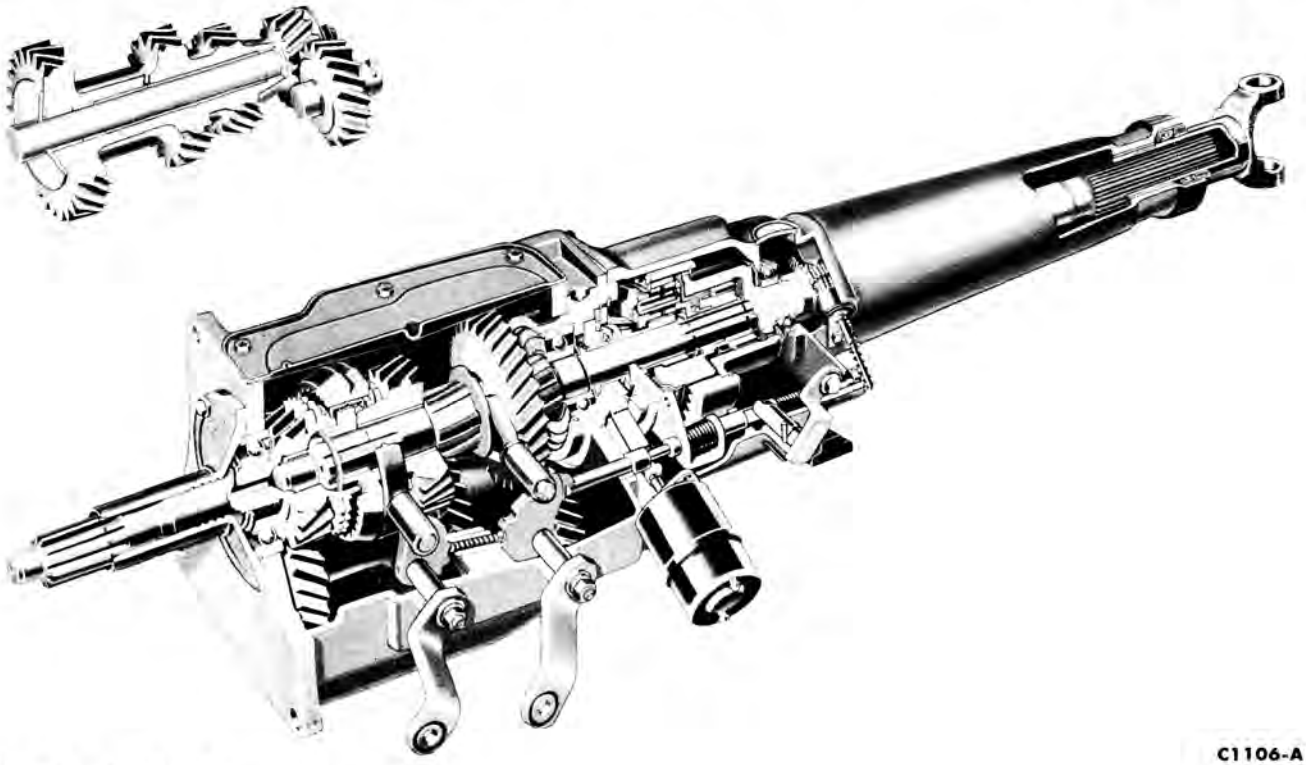


FIG. 4—Overdrive Transmission

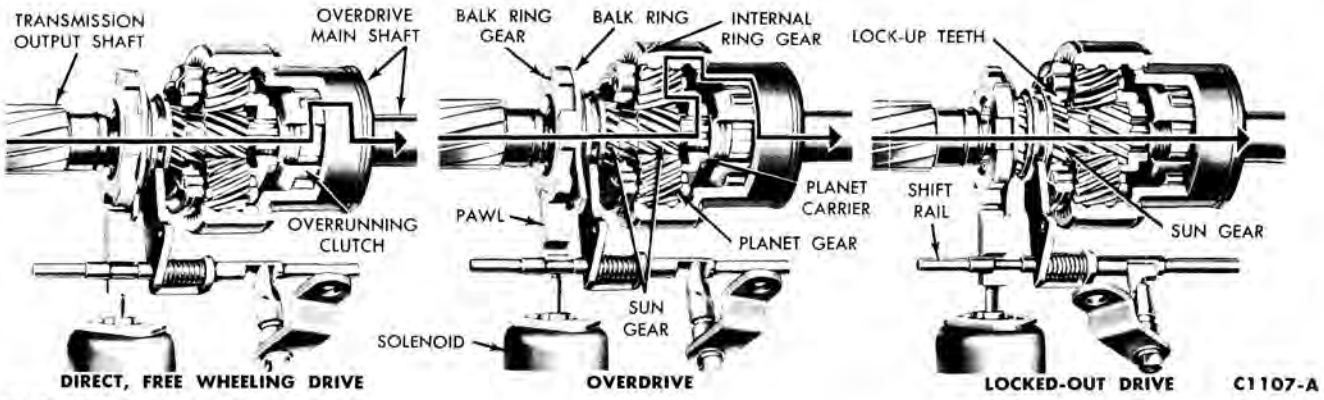


FIG. 5—Overdrive Power Flow

down switch, solenoid, governor, and the circuit wiring.

MECHANICAL OPERATION

Direct, Free-Wheeling Drive. When the control handle is pushed in, the drive through the overdrive unit from start to approximately 28 mph is direct (1.00:1) and free-wheeling.

The power flow is from the transmission output shaft, through the overrunning clutch (free-wheel unit), to the overdrive main shaft (Fig. 5).

This drive is said to be free-wheeling because the overrunning clutch permits the transmission output shaft to drive the overdrive main shaft, but it does not permit the drive to reverse. **In a free-wheeling drive, the engine can drive the rear wheels, but the rear wheels cannot drive the engine.**

In direct, free-wheeling drive, the planetary gearing is in neutral, because the sun gear can run free. It can rotate clockwise (from the front), counterclockwise, or stand still, depending on the relative speeds of the planet carrier (transmission output shaft), and the internal ring gear (overdrive main shaft). At a 0.70:1 ratio, the sun gear will stand still. At a higher ratio, the sun gear will turn clockwise (from the front). At a lower ratio than 0.70:1, it will turn counterclockwise.

Overdrive. To shift the overdrive unit from direct (1.00:1) to overdrive (0.70:1) the sun gear is held against rotation (Fig. 5).

This is accomplished by engaging a pawl in the balk ring gear which is splined to the sun gear.

In overdrive, the power flow is from the transmission output shaft to the planet carrier splined to it, through the planet gears and then to the sun gear. With the sun gear held against rotation, the planet gears are forced to "walk around" the sun gear and drive the internal ring gear. The transmission output shaft will then drive the overdrive main shaft at a ratio of 0.70:1.

In overdrive, the overrunning clutch is uncoupled because the outer race (overdrive main shaft) is turning faster than the clutch cam (transmission output shaft). Overdrive is a two-way drive; the engine can drive the rear wheels and the rear wheels can drive the engine.

To shift from overdrive back to direct, the pawl is disengaged from the balk ring gear, permitting the sun gear to run free. The overdrive gearing is now in neutral. As soon as the speed of the transmission output shaft comes up to the speed of the overdrive main shaft, the overrunning clutch automatically locks up and direct drive is restored.

Locked-Out Drive. When the control handle is pulled out, the overdrive unit cannot function at any car speed. This lockout is accomplished by the shift rail moving the sun gear into engagement with the lock-up teeth on the planet carrier (Fig. 5).

When the sun gear is locked to the planet carrier, the planetary gearing is locked as one mechanical unit and the transmission output shaft is locked to the overdrive main shaft. This lock-up is necessary in reverse, because the transmission output shaft reverses its rotation and therefore cannot drive the overdrive main shaft through the overrunning (one-way) clutch. The lock-up in reverse is accomplished by the low and reverse position. This locked-up drive is also necessary when the car is pushed to start the engine, since the overrunning clutch will not transmit power from the overdrive main shaft to the transmission output shaft.

ELECTRICAL SYSTEM

The overdrive electrical system, which engages and disengages the pawl, consists of a relay, a manual kick-down switch, a solenoid, a centrifugal governor and the circuit wiring.

There are three separate circuits (Section 1, Fig. 1) in the electrical system: a governor circuit which opens and closes the relay, a solenoid circuit which supplies current through the relay to energize the solenoid, and an ignition interrupter circuit, which momentarily grounds the engine ignition for full-throttle downshift (kickdown).

Pawl Engagement. The electrical system does not operate until car speed reaches approximately 28 mph. At this speed, the governor contacts close, permitting current to flow from the battery through the relay to the solenoid.

There are two coils in the solenoid, usually referred to as the "pull-in" and "hold-in" coils. The pull-in coil is energized only while the solenoid plunger is being pulled in. As soon as the plunger is in, a set of points inside the solenoid opens the pull-in circuit.

As the plunger is pulled in, an engaging spring and a return spring are engaged.

Under pressure from the pawl engaging spring, the pawl is pushed in until it strikes the balk ring.

The usual position of the balk ring when the solenoid engaging spring pushes the pawl against it is

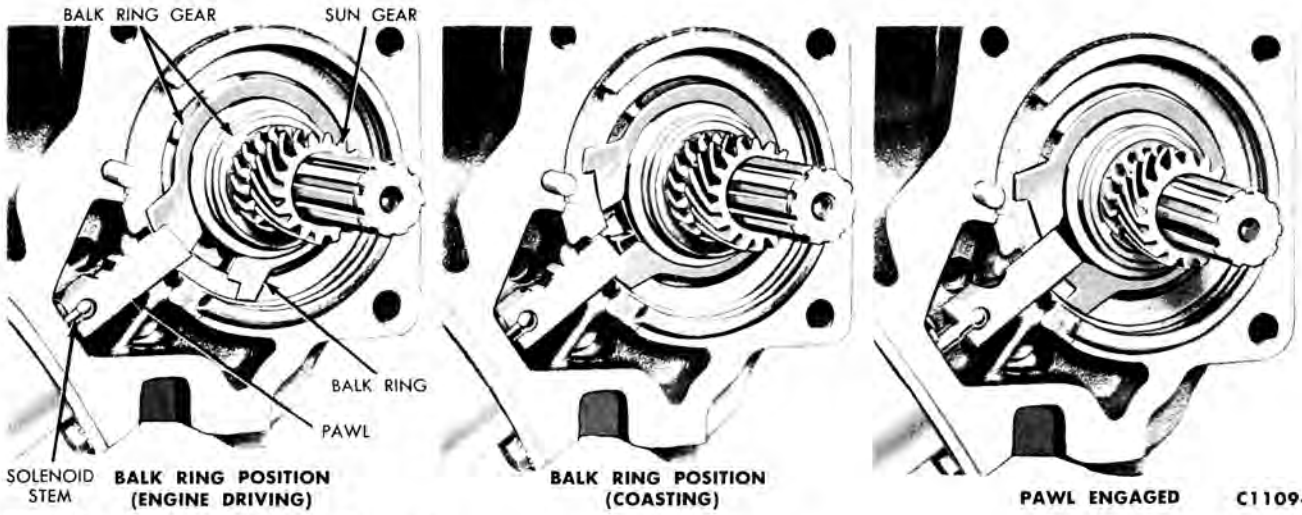


FIG. 6—Pawl and Balk Ring Positions

shown in the left view of Fig. 6. When the transmission output shaft is driving the overdrive main shaft through the overrunning clutch, all elements of the planetary gearing are revolving as a unit, and in a counterclockwise (from the rear) direction. This rotates the balk ring against the pawl.

When the driver releases the throttle, the overdrive main shaft overruns the transmission output shaft. When this overrun exceeds the ratio of 0.70:1, the sun gear and balk ring reverse, releasing the pawl to engage the balk ring gear.

The position of the balk ring, should the solenoid be energized when the car is coasting (engine idling) up through 28 mph, is shown in the right view of Fig. 6. Under this condition the sun gear will be rotating clockwise (from the rear) and the pawl will be blocked.

The pawl engages when the engine speeds up, and brings the transmission output shaft up through the 0.70:1 ratio with the overdrive main shaft. This action will cause the sun gear to reverse its clockwise (from the rear) rotation and release the pawl to engage the bulk ring gear.

Pawl Disengagement. The pawl disengages under two conditions. First, when the car speed drops below approximately 22 mph, the governor opens the circuit through the relay and de-energizes the solenoid, permitting the return spring to pull out the pawl. Second, the driver may shift the overdrive back to direct drive at any road speed, by pressing the accelerator pedal to the floor so that it depresses the kickdown switch stem.

When this happens, the kickdown switch opens the governor circuit through the relay, and de-energizes the solenoid, permitting the return spring to try to pull out the pawl.

Also, it closes the interrupter circuit and grounds the ignition long enough for the return spring to pull out the pawl.

Normal ignition is restored as soon as the pawl comes out, and the solenoid stem opens the ignition grounding contacts. The actual time of ignition interruption is equal to that required for one revolution of the crankshaft.

4 IN-CAR ADJUSTMENTS AND REPAIRS

OVERDRIVE CONTROL CABLE ADJUSTMENT

1. Loosen the overdrive cable lock nut at the overdrive control lever.

2. Position the overdrive cable until there is ¼ inch clearance between the cable control handle and bezel.

3. Move the overdrive control lever to the rear against the stop. When moving the lever, be careful not to move the cable out of position.

4. Tighten the control cable lock nut on the overdrive.

5 TRANSMISSION REMOVAL AND INSTALLATION

REMOVAL

The overdrive unit cannot be removed from the car as a separate assembly. Remove the transmission and overdrive unit together, following the steps detailed below:

1. Disconnect the solenoid and governor wires from the connectors near the solenoid.

2. Remove the overdrive wiring harness from its clip on the transmission.

3. Disconnect the overdrive control cable from the lever on the side of the overdrive unit and from the clamp at the solenoid.

4. Remove the overdrive transmission from the car, following the procedure given in Part 6-2 for removing the 3-speed Conventional Drive transmission.

INSTALLATION

The overdrive unit must be assembled and installed on the transmission before the transmission is installed in the car.

1. Install the ovedrive transmission in the car, following the procedure given in Part 6-2 for installing the 3-speed Conventional Drive transmission.

2. Connect the overdrive control cable to the lever on the side of the overdrive unit. With the cable connected, there must be ¼ inch clearance between the control handle shank and the bezel when the lever at the overdrive housing is against its rear stop.

3. Connect the solenoid and governor to the connectors near the solenoid.

4. Install the overdrive wiring harness in its clip on the transmission.

6 MAJOR REPAIR OPERATIONS

DISASSEMBLY (OVERDRIVE USED WITH 223 and 289 CID ENGINES)

1. Mount the transmission in a holding fixture. Then drain the transmission and the overdrive unit.

2. Remove the solenoid retaining screw, and then rotate the solenoid about ¼ turn to remove it.

3. Remove the governor.

4. Remove the transmission cover and gasket.

5. With a sharp punch, pierce the snap ring hole cover (Fig. 7), and remove the cover.



FIG. 7—Removing Overdrive Housing

6. Remove the four overdrive housing to transmission case bolts, and the overdrive control shaft pin.

7. Pull the overdrive control lever and shaft out as far as possible. Spread the snap ring that retains the overdrive output shaft bearing and then remove the overdrive housing (Fig. 7).

It may be necessary to tap the overdrive output shaft with a soft-faced hammer to free the output shaft bearing from the housing.

8. Remove the overdrive output shaft from the assembly. Catch any of the free-wheel unit rollers that drop out. Remove the rest of the rollers.

9. Remove the speedometer gear retaining snap ring. Remove the gear and drive ball.

10. If the overdrive output shaft bearing is to be replaced use the tools shown in Fig. 8.

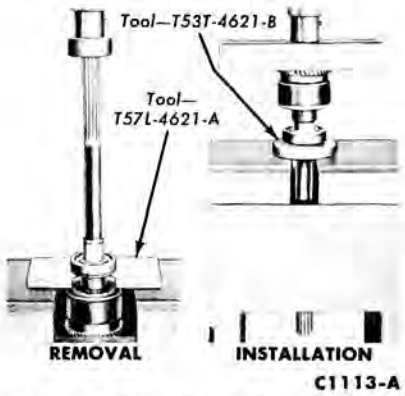


FIG. 8—Replacing Output Shaft Bearing

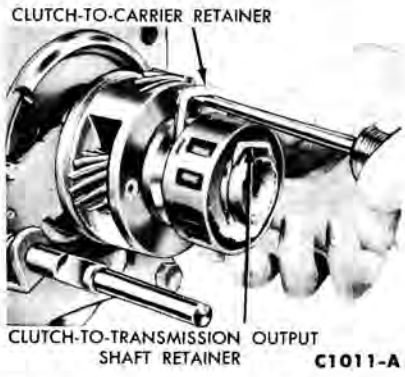


FIG. 9—Removing Free Wheel Unit Retainer

11. Remove the free-wheel unit retainers (Fig. 9). Then remove the clutch, planet carrier, sun gear, and shift rail.

12. Remove the snap ring from the adapter, and then remove the plate and trough, balk ring gear and pawl.

13. Remove the input shaft bearing retainer and gasket (Fig. 10).

If the input shaft seal is to be replaced, use the same tools which are used on the conventional 3-speed transmission.

14. Rotate the overdrive adapter to expose the countershaft lock, and remove the lock.

15. With a drift, drive the countershaft toward the rear until it just clears the hole at the front of the case, support the countershaft gear with a hook then push the countershaft out of the rear with the bearing retainer tool shown in Fig. 11.

16. Lower the countershaft gear to the bottom of the case to provide clearance for removal of the input shaft and bearing. Tap the input shaft and bearing out of the front of the case.

17. Remove the shift lever shaft retaining pins (Fig. 12).

18. Pull the low and reverse shift lever out as far as it will go; then remove the low and reverse fork.

19. Remove the overdrive adapter and transmission output shaft as an assembly (Fig. 13).

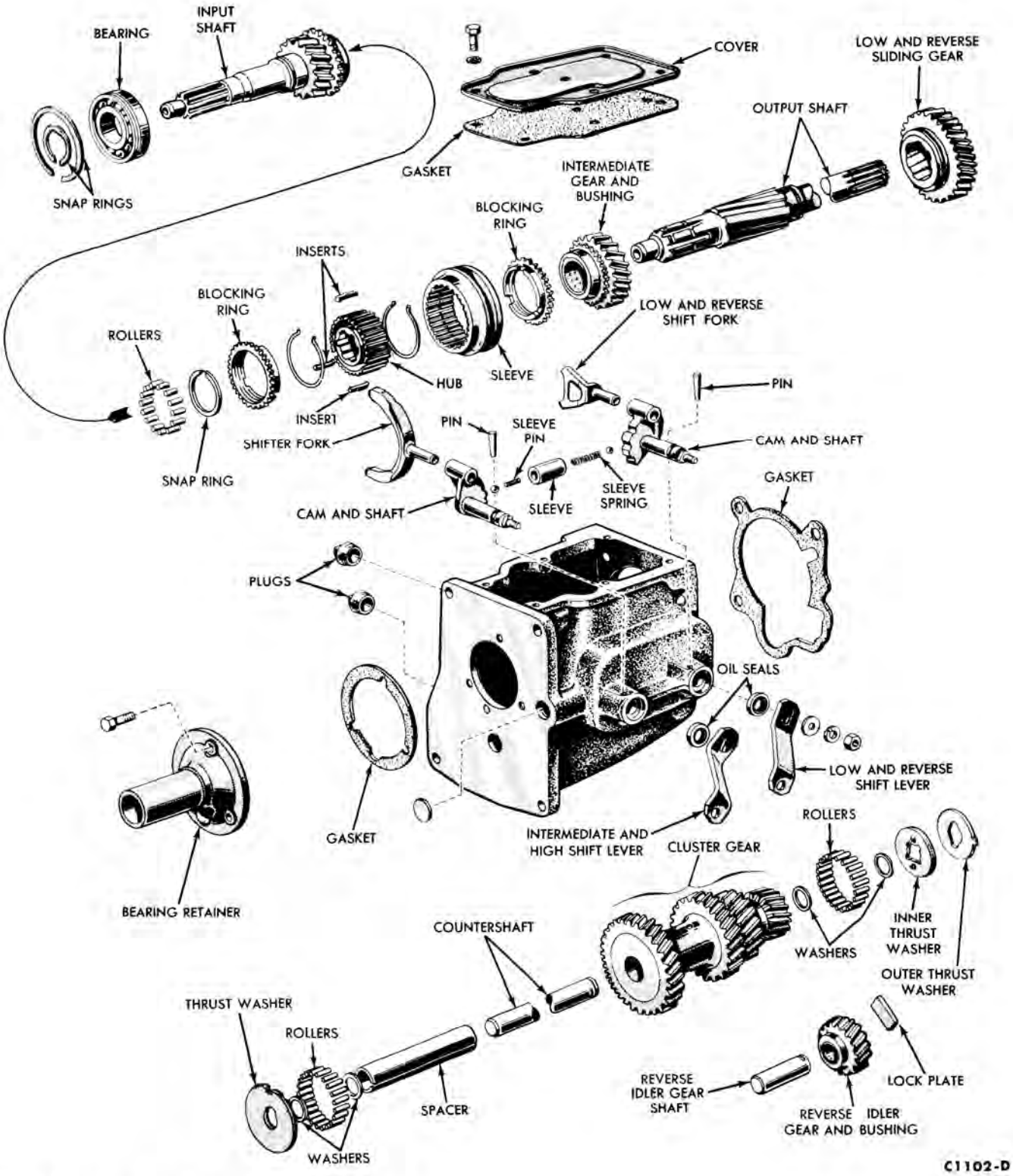


FIG. 10—Overdrive Transmission Disassembled

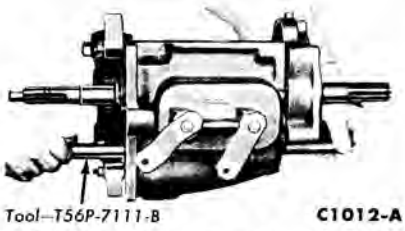


FIG. 11—Removing Countershaft

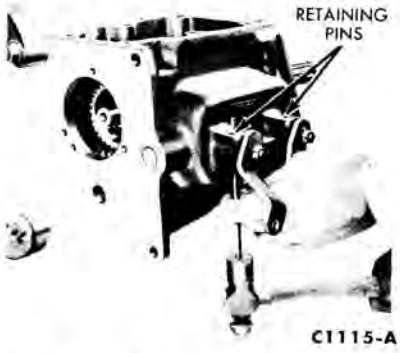


FIG. 12—Removing Shift Lever Shaft Retaining Pin

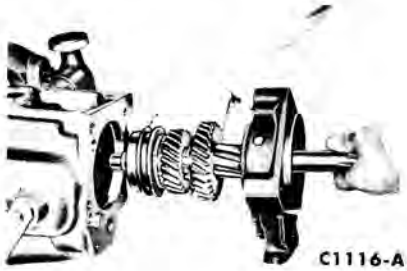


FIG. 13—Removing Output Shaft and Adapter

20. Remove the snap ring at the front of the transmission output shaft, and then slide the synchronizer intermediate gear, and the sliding low and reverse gear off the shaft.

21. While holding the washers and bearing retainer tool at the small end of the countershaft gear to prevent the roller bearings and bearing retainer tool from falling out, lift the gear from the case.

22. Drive the reverse idler gear shaft out of the rear of the case with a brass drift and a hammer, and remove the idler gear from the case.

23. Remove the lock plunger, spring, pin, and detent balls from the case (Fig. 14).

PARTS REPAIR OR REPLACEMENT

INPUT SHAFT

1. If the input shaft bearing is to be replaced, remove the snap ring that retains the bearing, and press the bearing and baffle off the shaft (Fig. 15).

2. Press a new bearing into place on the gear and shaft.

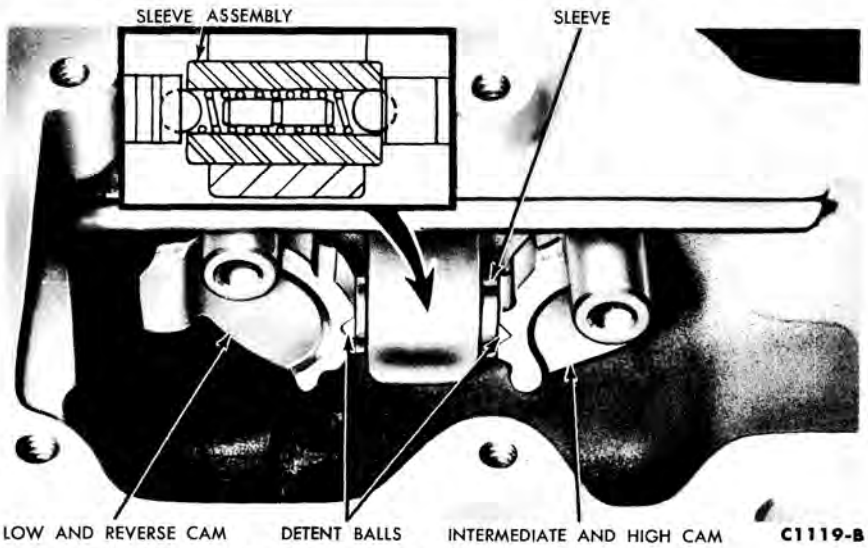


FIG. 14—Cams and Detent Balls Installed

SYNCHRONIZER

1. Disassemble the synchronizer unit (Fig. 10) by sliding the intermediate and high sleeve off the hub. Remove the three inserts and two springs from the hub.

2. Assemble the synchronizer unit by installing the two springs on the hub and placing the three inserts in the hub. Hook one spring end in an insert as shown in Fig. 16.

3. After lining up the etched marks on the sleeve and hub splines, slide the sleeve into place on the hub.

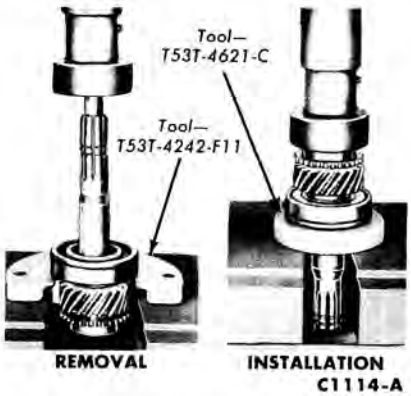


FIG. 15—Replacing Input Shaft Bearing

OUTPUT SHAFT BEARING

1. Remove the snap ring which retains the output shaft in the adapter (Fig 17), and tap the bearing out of the adapter. Remove the baffle from the adapter.

2. Remove the snap ring and press the old bearing off and the new bear-

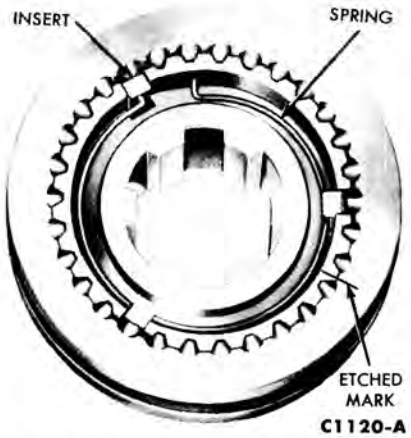


FIG. 16—Synchronizer

ing on with the tools shown in Fig. 18.

Install the snap ring to retain the bearing.

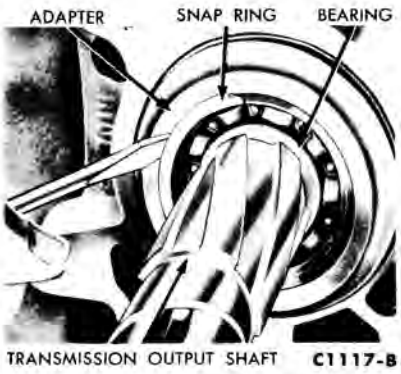


FIG. 17—Removing Output Shaft Bearing Snap Ring

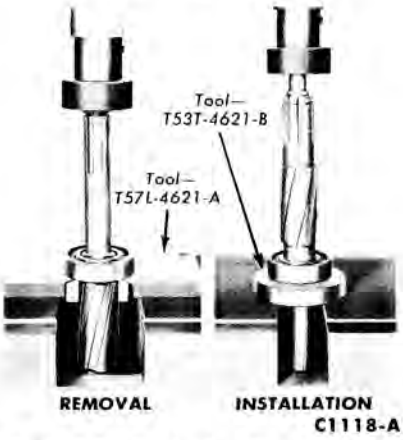


FIG. 18—Replacing Output Shaft Bearing

3. Position the baffle in the adapter (Fig. 17). Tap the bearing and shaft into place in the adapter.

4. Install the snap ring to retain the bearing.

CAM AND SHAFT SEALS

1. Remove the nuts and lock washers that secure the levers on the cam and shaft units, and remove the levers from the shafts and cams.

2. Remove the cams and shafts, detent balls, pin, spring, and sleeve (Fig. 10) from the case.

3. Remove the seals with a suitable puller.

4. Install the new seals with a suitable driver.

5. Install the intermediate and high shift fork and shaft in the case.

6. Insert a detent ball, sleeve, spring and pin in the bore of the case. Move the cam and shaft so that the detent ball seats in the neutral (center) notch.

7. Install the low and reverse cam and shaft assembly, and then install the levers on the shafts with nuts and lock washers.

8. Install a detent ball in the sleeve at the low and reverse end. Then push the low and reverse cam toward the detent ball far enough to hold the ball in place in the neutral notch. The ball must seat in the notch of the cam.

9. Install the shift lever shaft retaining pins (Fig. 12).

10. In order to assure positive shifting, and eliminate the possibility of engaging more than one set of gears at the same time, the clearance between the ramp of one cam and the sleeve must be checked.

COUNTERSHAFT ROLLERS

1. Remove the thrust washers from each end of the countershaft.

2. Remove the dummy shaft, retainer washers, rollers, and spacer from the countershaft gear.

3. Position the spacer and the dummy shaft in the countershaft.

4. Place a retainer washer in each end of the countershaft gear.

5. Apply grease to all of the rollers and place them in each end of the countershaft gear.

6. Apply grease to the two remaining retainer washers and to the contact surface of the thrust washers. Install the retainer washers and the thrust washers on each end of the gear.

ASSEMBLY

Always use new gaskets and gasket sealer during assembly. To provide initial lubrication, apply a thin coating of lubricant on all parts before installation.

1. Position the countershaft gear, dummy shaft, and roller bearings in the case.

2. Place the case in a vertical position. Align the gear bore and the thrust washers with the bores in the case and install the countershaft.

3. Place the case in a horizontal position and check the countershaft gear end play with a feeler gauge. The end play should be 0.004-0.018 inch. If not within these limits, replace the thrust washers.

4. After establishing the correct end play, install the dummy shaft in the countershaft gear and allow the gear to remain at the bottom of the case.

5. Install the reverse idler gear in the case, with the chamfered gear teeth ends toward the front.

6. Drive the reverse idler shaft into the case, with the locking notch aligned with the countershaft hole.

7. Install the low and reverse sliding gear on the output shaft, with the shifter fork groove toward the front.

8. Install the intermediate gear on the output shaft, with the clutch teeth toward the front.

9. Place a blocking ring on the intermediate gear, and install the synchronizer assembly on the transmission output shaft, with the hub thrust surface toward the rear (Fig. 16). Install the snap ring that retains the synchronizer.

10. Install the shift forks in the cams inside the transmission case.

The offset in the low and reverse fork goes toward the front.

11. Install a new solenoid seal in the overdrive adapter.

12. Place a new gasket on the overdrive adapter and hold it in place with gasket sealer.

13. Install the overdrive adapter and transmission output shaft assembly in the transmission.

14. Engage the shift forks with the high and intermediate sleeve, and with the low and reverse sliding gear.

15. Seat the overdrive adapter squarely against the transmission case, and secure with a cap screw.

16. Insert the pilot roller bearings in the input shaft and retain with grease.

17. Place the blocking ring on the input shaft gear.



FIG. 19—Plate and Trough Installed



FIG. 20—Sun Gear and Shift Rail Installation

18. Tap the input shaft and bearing into the case with a soft hammer, and at the same time line up the slots in the blocking ring with the synchronizer inserts.

19. Place a new gasket on the input shaft bearing retainer, and hold it in place with gasket sealer.

20. Install the input shaft bearing retainer on the transmission case.

21. Swing the transmission to an inverted position in the fixture.

22. Remove the cap screw holding the adapter in place. Pull the adapter outward approximately ¼ inch, and rotate it to expose the countershaft hole.

23. Work the countershaft gear into normal position by rotating the input and output shafts.

24. Push the countershaft into the case from the rear.

25. Align the slots in the countershaft with the slot in the reverse idler shaft and install the lock plate.

26. Rotate the adapter to its normal position and set it squarely against the transmission case. Check the blocking rings to make sure the slots are aligned with the synchronizer inserts.

27. Swing the transmission so that the input shaft is pointing down.

28. Place the balk ring gear assembly and pawl in the adapter (Fig. 19).

29. Place the plate and trough assembly in the adapter and install its snap ring.

30. Install the sun gear and shift rail (Fig. 20).

31. Install the planet carrier and the clutch cam. Install the retainers.

32. Install the 12 clutch rollers and hold them in position with a strong rubber band.

33. Rotate the roller cage counterclockwise (from the rear) until the rollers are off the cam surfaces. The rubber band will hold them there.

34. Slide the overdrive output shaft carefully over the clutch rollers. The rubber band will not affect operation of the overdrive.

35. Align the shift rail spring with the holes in the overdrive housing.

36. Place a new gasket on the overdrive adapter, and hold it in place with gasket sealer. (Fig. 21).

37. Install the overdrive housing, over the overdrive output shaft and shift rail. Install the four bolts.

38. If the overdrive output shaft bearing snap ring does not drop into its groove when the housing is seated squarely on the adapter, pry the overdrive output shaft bearing toward the rear, working through the snap ring hole. Install the three bolts and one nut.

39. Engage the overdrive shaft lever by pushing it inward. The lever is correctly engaged when a spring load is apparent as the lever is pushed forward.

40. Install the retaining pin in the overdrive housing to hold the control shaft in place.

41. If the overdrive housing bushing and seal are to be replaced, use the same tools which are used on conventional transmissions.

42. Thread the governor into the overdrive housing.

43. Rotate the solenoid ¼ turn from normal position so that the half ball on the solenoid stem can engage the pawl. Install the two solenoid attaching screws.

If the solenoid stem is properly engaged, the solenoid cannot be removed from the overdrive in its normal position. Any attempt to pull it out will merely compress the engaging spring in the solenoid.

44. Install the drain plugs in the transmission case and in the overdrive housing.

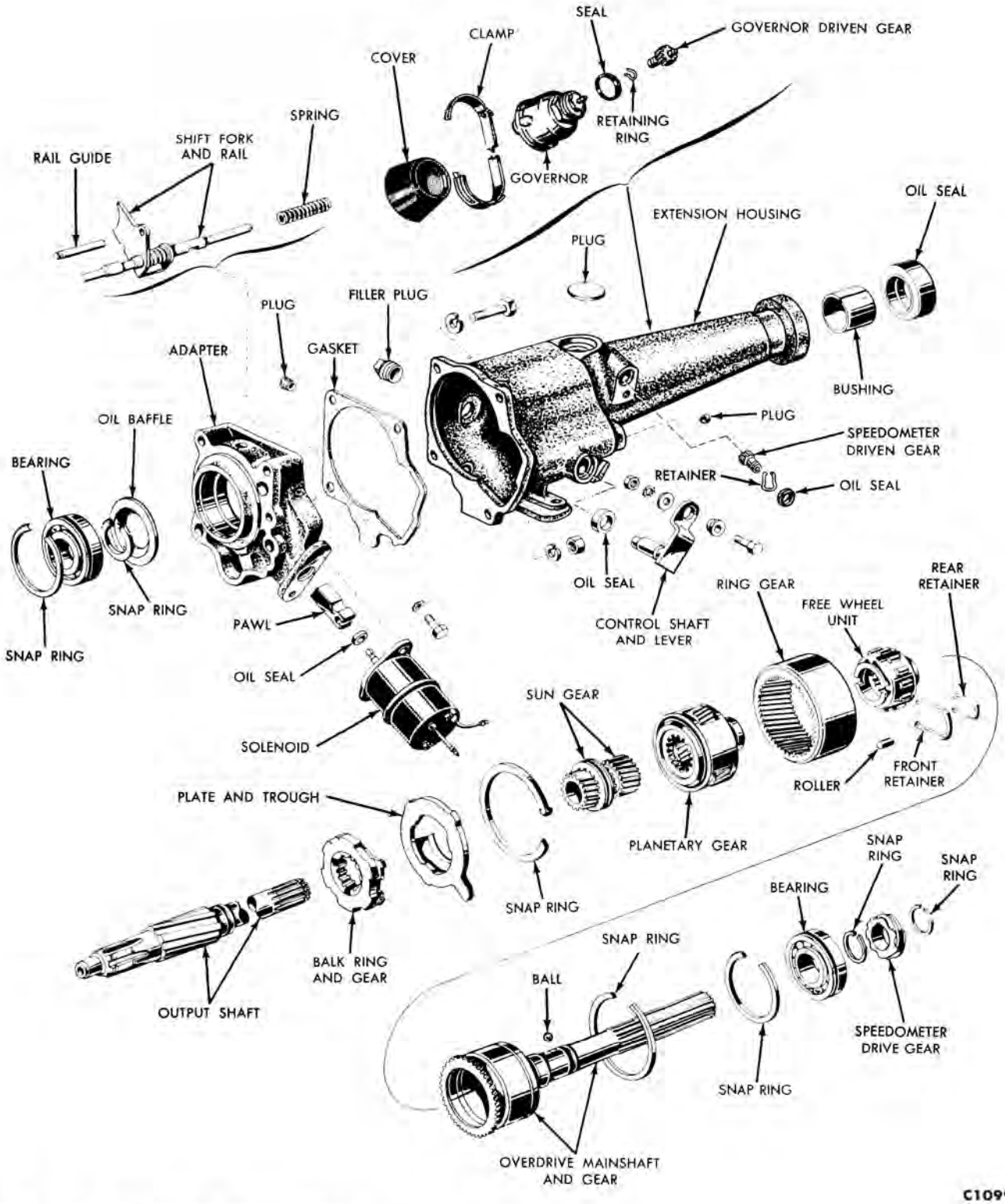


FIG. 21—Overdrive Unit Disassembled

PART 6-8 SPECIFICATIONS

THREE-SPEED TRANSMISSION—2.77

GEAR RATIOS

Engine	Gear			
	First Speed	Second Speed	Third Speed	Reverse
170 C.I.D.	3.29	1.83	1.00:1	4.46

TORQUE LIMITS

Description	Ft-Lbs.
Extension Housing Bolts—7/16-14 —3/8-16	42-50
Input Shaft Bearing Retainer to Transmission Case Bolts	19-25
Transmission to Flywheel Housing Bolts	32-36
Transmission Cover to Transmission Case Bolts	14-19
Engine Rear Support to Extension Housing Bolt	18-24
Engine Rear Support to Extension Housing Bracket Nut	18-24
Gear Shift Levers to Cam and Shaft Assembly Lock Nuts	14-19
Filler Plug to Case	10-15
Drain Plug to Case	20-30

CLEARANCES

	Inches
Cam Ramp to Interlock Shift Sleeve—Clearance	0.001-0.013
(5) Interlock Shift Sleeves Available—Length	1.286-1.288
Countershaft Gear End Play	0.004-0.018

LUBRICANT

Type Lubricant	Mild EP Gear Oil C3RZ19547-B
Capacity	2 pints

THREE-SPEED TRANSMISSION—3.03

GEAR RATIOS

Car Usage	Transmission Model	Engine C.I.D.	Ratio			
			First Speed	Second Speed	Third Speed	Reverse
Falcon-Comet-Fairlane-Mustang	HEF	289-2V-4V	2.79	1.70	1.00:1	2.87

TORQUE LIMITS

Description	Ft-Lbs.
Input Shaft Bearing Retainer to Transmission Case	19-25
Extension Housing to Transmission Case	42-50
Access Cover to Transmission Case	14-19
Gear Shift Control Levers to Cam and Shaft	18-23
Shift Fork to Shift Rail	10-18
Filler Plug to Case	10-15
Drain Plug to Case	20-30
Detent Set Screw (Special)	*

*Flush to 0.020 inches below top of case.

CLEARANCES

Description	Inches
Countershaft Gear End Play	0.004-0.018
Reverse Idler Gear End Play	0.004-0.018

LUBRICANT

Type Lubricant	Mild EP Gear Oil C3RZ19547-B
Capacity	3½ pints

FORD FOUR-SPEED TRANSMISSION

GEAR RATIOS

Trans. Model	Vehicle Usage	Engine Displacement	Ratios 1st	2nd	3rd	4th	Rev.
HEH-M	Falcon Comet	289—2V 289—2V & 4V	2.78	1.93	1.36	Direct	2.78
HEH-L	Fairlane	289—4V	2.78	1.93	1.36	Direct	2.78
HEH-N	Fairlane	289—4V H.P.	2.32	1.69	1.29	Direct	2.32
HEH-P	Mustang	289—4V	2.78	1.93	1.36	Direct	2.78
HEH-T	Mustang	289—4V H.P.	2.32	1.69	1.29	Direct	2.32

CLEARANCES

Description	Inches
Countershaft Gear End Play	0.004-0.018
Reverse Idler Gear End Play	0.004-0.018

LUBRICANTS AND SEALERS

Description	Material	Capacity	Ford Design	Borg Warner Design
Transmission	Mild E. P. Gear Oil C3RZ19547-B	Fairlane, Falcon Comet, Mustang	4.0 pts.	3.5 pts.
Main Shaft Roller Bearing	Lube Grease M-4659			
Countershaft Gear Roller Bearing	Lube Grease M-4659			
Bolts and Gaskets	Sealer M-4G91-B			

TORQUES

Description	Part Name	Ft-Lbs.
Input Shaft Bearing Retainer to Transmission Case	Bolt—5/16-18 x 3/4 Hex Head	19-25
Extension Housing to Transmission Case	Bolt—7/16-14 x 1¼ Hex Head	42-50
Access Cover to Transmission Case	Screw—5/16-18 x 5/8 Hex Head Screw—5/16-18 x 1 Hex Head	14-19
Gear Shift Lever to Cam and Shaft	Nut—3/8-24 Hex	18-23
Shift Fork to Shift Rail	Screw—5/16-24 x .92 Set Locking	10-18
Filler Plug to Case	Plug—½-14	10-20
Drain Plug to Case	Plug—½-14 (Magnetic)	20-30
Detent Set Screw (Special)	Screw—3/8-16 x .88 Set	Flush to 0.020" below surface
Third and Fourth Shift Rail Detent Bolt	Bolt—3/8-16 x .38 Hex Head	10-18

WARNER FOUR-SPEED TRANSMISSION

TORQUE LIMITS

Description	Ft-Lbs.
Adapter Plate to Extension Housing Bolts	20-30
Engine Rear Support to Extension Housing Bolts	35-40
Gear Shift Control Levers to Cam and Shaft Assembly	12-15
Gear Shift Housing to Transmission Case Bolts	15-20
Gear Shift Linkage to Transmission Extension Housing Bolts	12-15
Input Shaft Bearing Retainer Bolt	15-20
Third Crossmember to Support Bracket Bolts	45-50
Transmission to Extension Housing Bolts	35-45

CLEARANCES

Description	Inches
Countershaft Gear End Play	0.025

LUBRICANT

Type Lubricant	Mild EP Gear Oil C3RZ19547-B
Capacity (Dry)	3½ pints

OVERDRIVE

TORQUE SPECIFICATIONS

Description	Ft-Lbs.
Output Shaft Bearing Retainer to Transmission Case Bolt	12-15
Transmission to Flywheel Housing Bolts	37-42
Gearshift Housing to Transmission Case Bolts	12-15
Transmission Extension Housing to Case Bolts or Nuts	37-42
Gearshift Control Levers to Cover and Shaft Assembly Nuts	12-15
Overdrive Assembly to Transmission Case Nuts	37-42
Engine Rear Support to Extension Housing Bolts	35-40

LUBRICANT

Type Lubricant – Mild EP Gear Oil C3RZ19547-B
Capacity (Fairlane) – 3.7 pints

Trans. Model	Trans. Assy. Part Number	Vehicle Usage	Engine Displacement	Ratios				
				1st	2nd	3rd	Rev.	O.D.
HEK-H	C5OR-7003-E	Fairlane	289–2V	2.80	1.69	Direct	3.80	.70

A service identification tag is located under the upper right extension to case attaching bolt as viewed from the rear of the transmission. The tag is shows the transmission model and service identification code.

SERVICE TOOLS

Tool Numbers	Description
T50T-100A	Impact Hammer—Long
T59L-100B	Impact Hammer—Short
T58L-101A	Puller Attachment
1175AB	Grease Seal Remover
T57L-4220-A	Differential Bearing Assembly Remover
T53T-4621-B or (4621-F)	Drive Pinion Bearing Cone Replacer Front & Rear
T53T-4621-C	Drive Pinion Bearing Cone Replacer
T-4621-K	Drive Pinion Bearing Cone Replacer
T53T-4242-F11	Differential Side Bearing Cone Replacer or Input Shaft Bearing Remover
6135-G	Piston Pin Remover & Replacer
T52T-6500 DJD (6500-D)	Solid Tappet Remover or Reverse Shift Rail Pliers
T52L-7000 GAE	Extension Housing Bushing and Seal Remover
T52L-7000HAE	Extension Housing Bushing Installer
T57T-7003-A	Transmatic Drive Bushing Replacer
T63P-7025-A	Output Shaft Bearing Remover & Replacer
T64P-7025-B	Output Shaft Bearing Remover & Replacer

Tool Numbers	Description
T-7025B	Rear Main Shaft Bearing Remover
T-7025G	Main Shaft Bearing Remover & Replacer
T57L-7111-A	Cluster Gear Roller Retainer Shaft
T60K-7111-A	Cluster Gear Roller Retainer Shaft
T62K-7111-A	Cluster Gear Roller Retainer Shaft
T64P-7111-A	Cluster Gear Roller Retainer Shaft
T56P-7111-B	Cluster Gear Roller Retainer Shaft
T63P-7111-B	Cluster Gear Roller Retainer Shaft
T64P-7140-A	Reverse Idler Shaft Remover
T57L-7657-A	Transmission Extension Housing Oil Seal Replacer
T64P-7657-A	Transmission Extension Housing Oil Seal Replacer
760K-7657-B (7657-G)	Transmission Extension Housing Oil Seal Replacer
T7688	Lockout Lever Oil Seal Replacer
T60K-7697-A	Transmission Extension Housing Bushing Remover
T57P-77047-A	Transmission Input Shaft Oil Seal Replacer —Standard Transmission
T60K-77047-A	Transmission Input Shaft Oil Seal Replacer— Standard Transmission

AUTOMATIC TRANSMISSION

GROUP 7

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PART 7-1 GENERAL TRANSMISSION SERVICE

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2 Common Adjustments and Repairs 7-9
3 Cleaning and Inspection 7-9

1 DIAGNOSIS AND TESTING

When diagnosing transmission problems, first refer to the diagnosis guide for detailed information on the items that could be causing the problem. The following preliminary checks should be made in the order given:

1. Check the fluid level. Check the fluid for a burnt clutch plate odor.
2. Check the engine idle speed and dashpot adjustments.
3. Check the manual linkage adjustment.
4. Check the accelerator pedal height and downshift linkage.
5. Check the throttle linkage to assure wide open throttle operation.
6. Check the engine for proper operation.

TRANSMISSION FLUID LEVEL CHECK

1. Make sure that the vehicle is standing level. Then firmly apply the parking brake.
2. Run the engine at normal idle speed. If the transmission fluid is cold, run the engine at fast idle speed (about 1200 rpm) until the fluid reaches its normal operating temperature. When the fluid is warm, slow the engine down to normal idle speed.
3. Shift the selector level through all positions, and place the lever at P. Do not turn off the engine during the fluid level checks.
4. Clean all dirt from the transmission fluid dipstick cap before removing the dipstick from the filler tube.
5. Pull the dipstick out of the tube, wipe it clean, and push it all the way back into the tube.
6. Pull the dipstick out of the tube again, and check the fluid level. If necessary, add enough fluid to the transmission through the filler tube to raise the fluid level to the F (full) mark on the dipstick. **Do not overfill the transmission.**

FLUID AERATION CHECK

Fluid foaming will cause erratic operation and, in extreme cases, will force the fluid out of the vent. Fluid foaming can be caused by overfilling the transmission, use of improper fluid, or by water from the cooling system getting into the transmission fluid. Fluid foaming can also be caused by the pump aerating the fluid. This happens when the pump sucks air along with the fluid. When the fluid is depressurized, the air expands and bubbles form in the fluid.

TRANSMISSION FLUID LEAKAGE CHECKS

Check the speedometer cable connection at the transmission. Leakage at the oil pan gasket often can be stopped by tightening the attaching bolts to the proper torque. If necessary, replace the gasket. Check the fluid filler tube connection at the transmission. If the filler tube O-ring seal is leaking, replace the seal.

The transmission fluid is water cooled; check the fluid lines and fittings between the transmission and the cooler in the radiator tank for looseness, wear, or damage. If leakage cannot be stopped by tightening a fitting, replace the leaking parts.

Check the engine coolant in the radiator. If transmission fluid is present in the coolant, the cooler in the radiator tank is probably leaking.

The cooler can be further checked for leaks by disconnecting the lines at the cooler fittings and applying 5 psi air pressure to the fittings. If the cooler is leaking and will not hold this pressure, the radiator must be replaced. **The cooler cannot be replaced separately.**

If leakage is found at either the

throttle lever shaft or the manual lever shaft, replace either or both seals.

Inspect the pipe plug in the case. If the plug shows leakage, torque the plug to specification. If tightening does not stop the leaks, replace the plug.

When converter drain plugs leak, remove the two drain plugs with a six-point wrench. Coat the threads with FoMoCo Perfect Sealing Compound or its equivalent, and install the plugs. Torque the drain plugs to specification. **Fluid leakage from the converter housing may be caused by engine oil leaking past the rear main bearing or from oil gallery plugs. Be sure to determine the exact cause of the leak.**

Oil-soluble aniline or fluorescent dyes premixed at the rate of ½ teaspoon of dye powder to ½ pint of transmission fluid have proved helpful in locating the source of the fluid leakage. Such dyes may be used to determine whether an engine oil or transmission fluid leak is present, or if the fluid in the oil cooler leaks into the engine coolant system. A black light, however, must be used with the fluorescent dye solution.

OIL LEAKAGE CONVERTER AREA

In diagnosing and correcting fluid leaks in the front pump and converter area, use the following procedures to facilitate locating the exact cause of the leakage. Leakage at the front of the transmission, as evidenced by oil around the converter housing, may have several sources. By careful observation, it is possible, in many instances, to pinpoint the source of the leak before removing the transmission from the vehicle. The paths which the fluid takes to reach the bottom of the converter housing are shown in Fig. 1.

1. Fluid leaking by the front pump seal lip will tend to move along the drive hub and onto the back of the impeller housing. Except in the case of a total seal failure, fluid leakage by the lip of the seal will be deposited on the inside of the converter housing only, near the outside diameter of the housing.

2. Fluid leakage by the outside diameter of the seal and front pump body will follow the same path as leaks by the front pump seal or may run down the face of the front pump.

3. Fluid that leaks by a front pump and converter housing to case bolts will be deposited on the inside of the converter housing only. Fluid will not be deposited on the back of the converter.

4. Leakage by the front pump to case and O-ring seal may cause fluid to be deposited on the outside lower part of the converter housing as shown in Fig. 1.

5. Fluid leakage from the converter drain plugs will appear at the outside diameter of the converter.

Engine oil leaks are sometimes improperly diagnosed as front pump seal leaks. The following areas of possible leakage should also be checked to determine if engine oil leakage is causing the problem:

(a) Leakage at the rocker arm cover (valley cover) may allow oil to flow over the converter housing or seep down between the converter housing and engine block causing oil to be present in or at the bottom of the converter housing.

(b) Oil gallery plug leaks will allow oil to flow down the rear face of the block to the bottom of the converter housing.

(c) Leakage by the crankshaft seal will work back to the flywheel, and then into the converter housing.

Fluid leakage from other areas, forward of the transmission could cause fluid to be present around the converter housing due to blow-back or road draft.

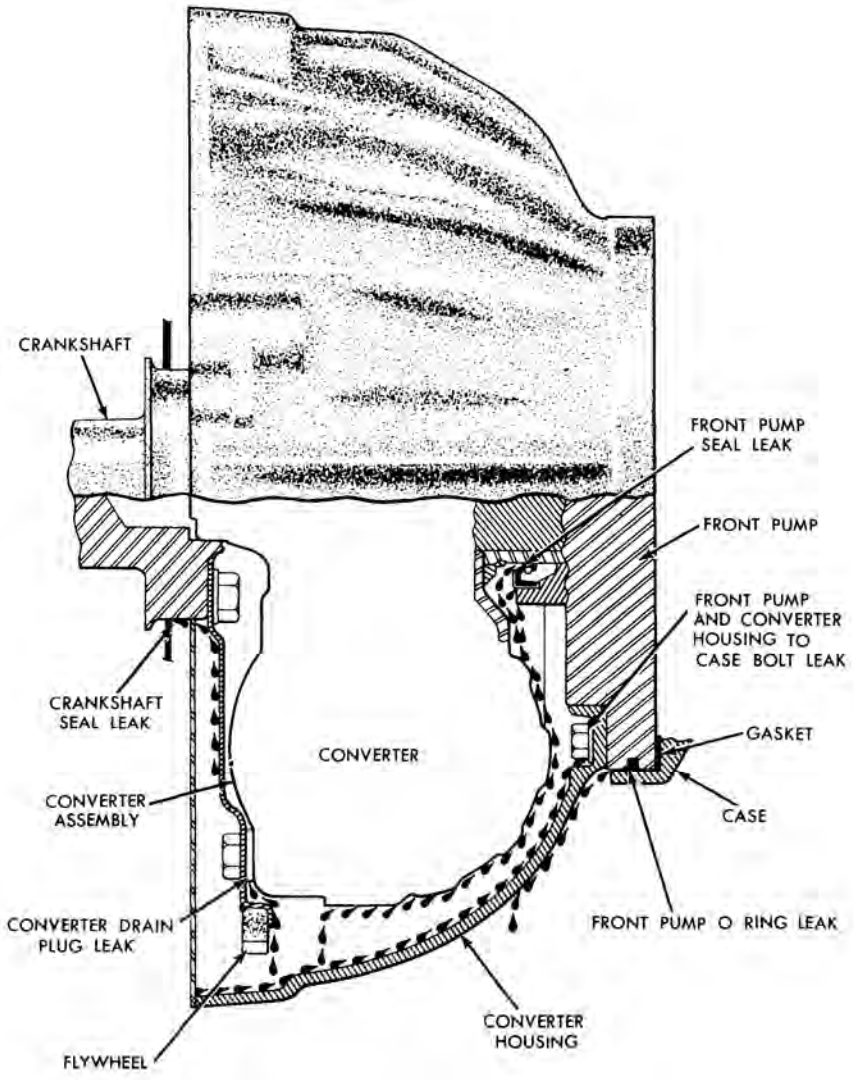


FIG. 1—Typical Converter Area Leakage Checks

The following procedure should be used to determine the cause of leakage before any repairs are made:

(a) Remove the transmission dipstick and note the color of the fluid. Original factory fill fluid is dyed red to aid in determining if leakage is from the engine or transmission. Unless a considerable amount of "make-up" fluid has been added or the fluid has been changed, the red color should assist in pinpointing the leak.

Since road draft may cause leaking valley cover oil fluid to be preesnt on the transmission, this leakage, if present, should be eliminated before performing work on the transmission.

(b) Remove the lower converter housing cover. Clean off any fluid from the top and bottom of the converter housing, front of the transmission case, and rear face of the engine and engine oil pan. Clean the converter area by washing with suitable non-flammable solvent, and blow dry with compressed air.

(c) Wash out the converter housing, the front of the flywheel, and the converter drain plugs. The converter housing may be washed out using cleaning solvent and a squirt-type oil can. Blow all washed areas dry with compressed air.

(d) Start and run the engine until the transmission reaches its normal operating temperature. Observe the back of the block and top of the converter housing for evidence of fluid leakage. Raise the car on a hoist and run the engine at fast idle, then at engine idle, occasionally shifting to the drive and reverse ranges to increase pressures within the transmission. Observe the front of the flywheel, back of the block (in as far as possible), and inside the converter housing (Fig. 1). Run the engine until fluid leakage is evident and the probable source of leakage can be determined.

CONVERTER LEAKAGE CHECK

During the above fluid leakage checks, if there are indications that the welds on the torque converter are leaking, the converter will have to be removed and the following check made before the unit is replaced:

A leak checking tool (Fig. 2), can be made from standard parts.

1. Install the plug in the converter (Fig. 3) and expand it by tightening the wing nut. Attach the safety chains.

2. Install the air valve in one of the drain plug holes.

3. Introduce air pressure into the converter housing. Check the pressure with a tire gauge and adjust it to 20 psi.

4. Place the converter in a tank of water. Observe the weld areas for bubbles. If no bubbles are observed, it may be assumed that the welds are not leaking.

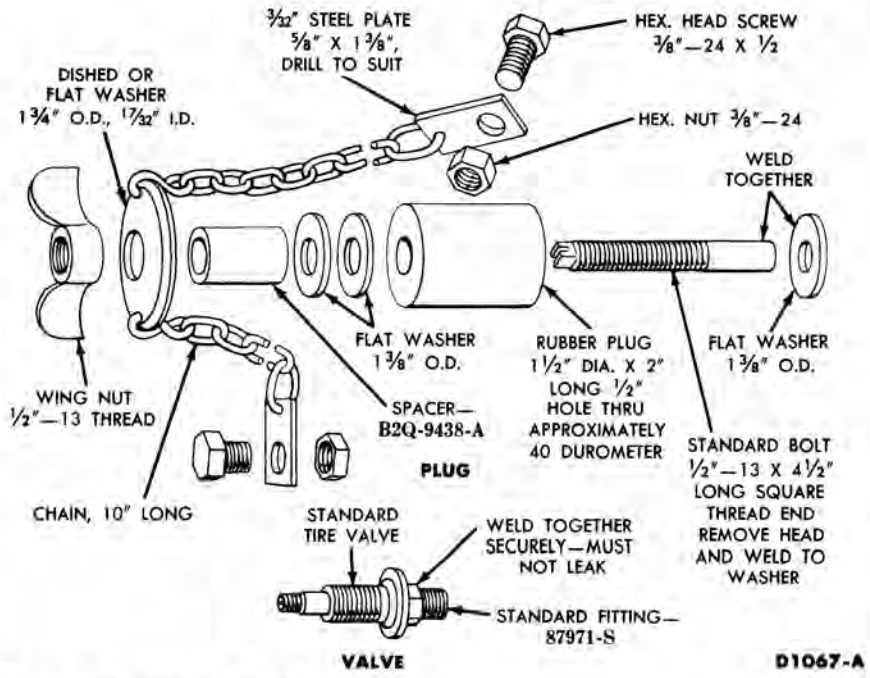


FIG. 2—Converter Leak Checking Tool



FIG. 3—Typical Converter Leak Checking Tool

ENGINE IDLE SPEED CHECK

Check and, if necessary, adjust the engine idle speed, using the procedure given in Group 10.

If the idle speed is too low, the engine will run roughly. An idle speed that is too high will cause the car to creep when the transmission is shifted into gear and will cause rough transmission engagement.

ANTI-STALL DASHPOT CLEARANCE CHECK

After the engine idle speed has been properly adjusted, check the anti-stall dashpot clearance. Follow the procedure given in Group 10 for checking and adjusting this clearance.

MANUAL LINKAGE CHECKS

Correct manual linkage adjustment is necessary to position the manual valve for proper fluid pressure direction to the different transmission components. Improperly adjusted manual linkage may cause cross-leakage and subsequent transmission failure. Refer to "Linkage Adjustments" for detailed manual linkage adjustment procedures.

CONTROL PRESSURE AND VACUUM DIAPHRAGM UNIT CHECK

When the vacuum diaphragm unit (Fig. 4) is operating properly and the downshift linkage is adjusted

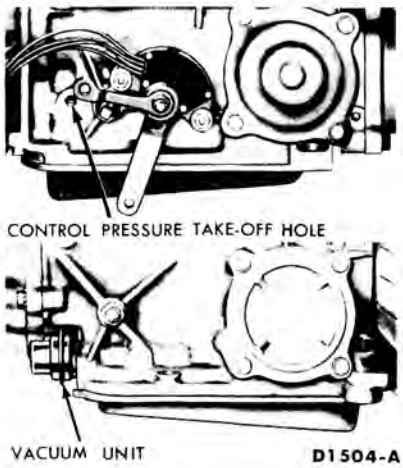


FIG. 4—Typical Vacuum Diaphragm and Control Pressure Connecting Point

properly, all the transmission shifts (automatic and kickdown) should occur within the road speed limits specified in the Specification Section.

If the automatic shifts do not occur within limits or the transmission slips during shift points, the following procedure is suggested to separate engine, transmission, linkage, and diaphragm unit or valve body problems.

1. Attach a tachometer to the engine and a vacuum gauge to the transmission vacuum line at the vacuum unit (Fig. 5).

2. Attach a pressure gauge to the control pressure outlet at the transmission (Fig. 4).

3. Firmly apply the parking brake and start the engine.

4. Adjust the engine idle speed to the specified rpm. If the engine idle speed cannot be brought within limits by adjustment at the carburetor idle adjustment screw, check the throttle and downshift linkage for a binding condition. If the linkage is satisfactory, check for vacuum leaks in the transmission diaphragm unit (Fig. 6), and its connecting tubes and hoses. Check all other vacuum operated units for vacuum leaks.

VACUUM UNIT CHECK

To check the vacuum unit for diaphragm leakage, remove the unit from the transmission. Use a distributor tester equipped with a vacuum pump (Fig. 6). Set the regulator knob so that the vacuum gauge reads 18 inches with the end of the vacuum hose blocked off.

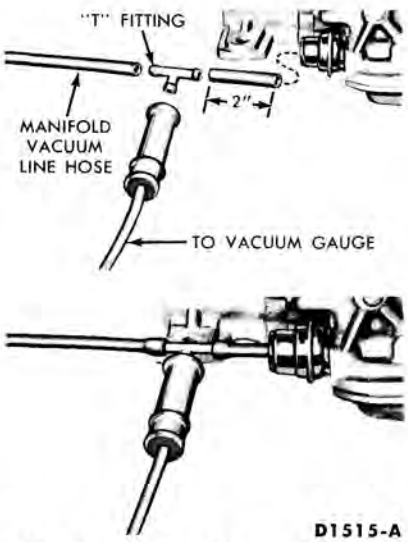


FIG. 5—Typical Vacuum Test Line Conections

Then connect the vacuum hose to the transmission vacuum unit. If the gauge still reads 18 inches, the vacuum unit diaphragm **is not leaking.** As the hose is removed from the transmission vacuum unit, hold a finger over the end of the control rod. When the hose is removed, the internal spring of the vacuum unit should push the control rod outward.

CONTROL PRESSURE TESTS

The test results of the following checks should agree with the specifications given in Table 1.

TEST NUMBER 1–CONTROL PRESSURE CHECK AT ENGINE IDLE

1. With the transmission in neutral, and at the correct engine idle, the vacuum gauge should show a minimum of 18 inches at sea level. If the vacuum reading is lower than 18 inches, an engine problem is indicated or there is leakage in the vacuum line. Make necessary repairs to obtain a minimum vacuum reading of 18 inches.



FIG. 6—Testing Transmission Vacuum Unit for Leakage

At engine idle, check the transmission control pressure gauge at all selector lever positions. Transmission control pressures should agree with the specifications in Table 1.

At altitudes above sea level, it may not be possible to obtain 18 inches vacuum at engine idle. At these altitudes with idle vacuum of less than 18 inches, refer to the following specifications to determine idle speed control pressure in forward driving ranges D1, D2 or L.

Engine Vacuum (At Idle)	Control Pressure (psi)
17 Inches	55-62
16 Inches	55-68
15 Inches	55-74
14 Inches	55-80
13 Inches	55-87
12 Inches	55-93
11 Inches	55-99

TABLE 1–
CONTROL PRESSURE AT ZERO OUTPUT SHAFT SPEED
(All Models Including Fairlane 289—4V High Performance)

Test No.	Engine Speed or Manifold Vacuum	Throttle Position	Shift Selector Lever Position	*Control (Line) Pressure (psi)
1	Idle—Above 18 Inches of Vacuum	Closed	P, N, D1, D2, L	55-62
			R	55-100
2	17.0 Approximate Inches of Vacuum	As Required	D1, D2, L	Line Pressure Increase
3	10 Inches of Vacuum	As Required	D1, D2, L	96-105
4	3 Inches of Vacuum	As Required	D1, D2, L	138-148
			R	215-227

*Transmission oil at normal operating temperature.

2. At engine idle, depress and release the accelerator pedal quickly and observe the vacuum gauge. The amount of vacuum should decrease and increase with the changes in throttle openings. If the vacuum response to changes in throttle opening is too slow the vacuum line to the diaphragm unit could be restricted. **Make the necessary repairs before completing the test.**

TEST NUMBER 2–CONTROL PRESSURE INCREASE CHECK

The control pressure increase should be checked in all ranges except Park and Neutral. Shift the transmission into D1, D2, L, and R, and check control pressure increase in each range. With the correct control pressure at engine idle, advance the throttle until the engine vacuum reading is approximately 17.0 inches. As the vacuum gauge reading decreases into these specifications, **the control pressure should start to increase.**

Control pressure increase may be noted immediately when the throttle is opened due to the increased pump output, resulting from increased engine rpm. When this happens, the pressure increase point can be checked by using a distributor vacuum tester. Install the distributor tester vacuum line on the diaphragm assembly. Adjust the tester to provide over 18 inches of vacuum. Increase the engine to 600-700 rpm. Reduce the tester vacuum reading to approximately 17.0 inches and observe the transmission pressure gauge for the pressure increase.

TEST NUMBER 3–CONTROL PRESSURE CHECK AT 10 INCHES OF VACUUM

A control pressure check should be made at 10 inches of vacuum in D1, D2, and L. Advance the throttle until the engine vacuum reading is 10 inches and check the control pressure regulation. Control pressure should be 96-105 psi, as shown in Table 1.

TEST NUMBER 4–CONTROL PRESSURE CHECK AT THREE INCHES OF VACUUM

Check control pressure at three inches of vacuum in D1, D2, and L. The control pressure should be 138-148 psi. Then move the selector lever to R. With the vacuum at three inches the control pressure should be 215-227 psi, as shown in Table 1.

While making this pressure test, do not hold the throttle open for more than five seconds in each detent position. Between each test move the selector lever to neutral and run the engine at 1000 rpm for fifteen seconds to cool the converter.

If the vacuum and pressure gauge readings are within specifications, the diaphragm unit and transmission control pressure regulating system are operating properly.

If the transmission control pressure is too low, too high, fails to rise with throttle opening, or is extremely erratic, use the procedure given under the following appropriate heading to resolve the problem.

TEST NUMBER 1–CONTROL PRESSURE IS LOW AT ENGINE IDLE

If control pressure at engine idle is low in all selector lever positions, trouble other than the diaphragm unit is indicated.

When control pressure at engine idle is low in all ranges, check for excessive leakage in the front oil pump, case, and control valve body, or a sticking control pressure regulator valve.

TEST NUMBER 1–CONTROL PRESSURE IS HIGH AT ENGINE IDLE

If transmission control pressure at engine idle is too high in all ranges, the trouble may be in the diaphragm unit or its connecting vacuum tubes and hoses, throttle valve, or control rod.

With the engine idling, disconnect the hose from the diaphragm unit and check the engine manifold vacuum. Hold a thumb over the end of the hose and check for vacuum. If the engine speeds up when the hose is disconnected and slows down as the thumb is held against the end of the hose, the vacuum source is satisfactory.

Stop the engine, and remove the diaphragm unit and the diaphragm unit control rod. Inspect the control rod for a bent condition and for corrosion. Check the diaphragm unit for leakage with the distributor tester.

TEST NUMBER 2–CONTROL PRESSURE DOES NOT INCREASE WITH VACUUM AT APPROXIMATELY 17.0 INCHES

When the control pressure is within specifications at engine idle, but does not increase as the vacuum is decreased to the specified limits, first check the control rod between the vacuum unit and throttle valve for proper engagement. If the control rod is not assembled into the end of the throttle valve or vacuum unit, the valve cannot regulate throttle pressure to increase control pressure. Next check for a stuck secondary or primary throttle valve, pressure booster valve, or a stuck control pressure regulator valve.

If control pressure increases before or after vacuum is decreased to approximately 17.0 inches, check for a leaking diaphragm assembly, bent diaphragm can, or worn or bent control rod.

TESTS NUMBER 3 AND 4–CONTROL PRESSURE NOT WITHIN LIMITS AT 10 OR 3 INCHES OF VACUUM

If idle pressure and pressure point increase are within specifications but pressures at 10 or 3 inches of vacuum are not within specification in all ranges, excessive leakage, low pump capacity, or a restricted oil pan screen is indicated.

If pressures are not within specifications for specific selector lever positions only, this indicates excessive leakage in the clutch or servo circuits used in those ranges.

When the control pressure is within specifications at engine idle, **but not within specifications** at the pressure rise point of approximately 17.0 inches of vacuum, at 10 inches of vacuum, or at 3 inches of vacuum, the vacuum diaphragm unit may need adjustment.

The vacuum diaphragm assembly used on the C4 Automatic Dual Range transmission has an adjusting

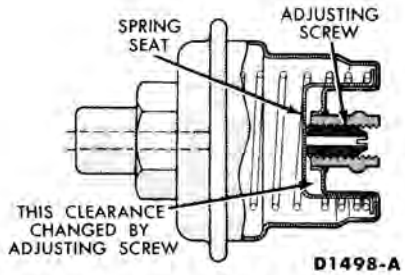


FIG. 7–Vacuum Diaphragm Unit

screw in the vacuum hose connecting tube (Fig. 7). The inner end of the screw bears against a plate which in turn bears against the vacuum diaphragm spring.

All readings slightly high or all readings slightly low may indicate the vacuum unit needs adjustment to correct a particular shift condition.

For example, if the pressure at 10 inches of vacuum was 120 psi and the pressure at 3 inches of vacuum was 170 psi, and upshifts and downshifts were harsh, a diaphragm adjustment to reduce the diaphragm assembly spring force would be required.

If pressure readings are low, and line pressure does not start to build up until vacuum drops to 15 inches, an adjustment to increase diaphragm spring force is required.

To increase control pressure, turn the adjusting screw in clockwise. To reduce control pressure, back the adjusting screw out by turning counterclockwise.

One complete turn of the adjusting screw (360°) will change idle line control pressure approximately 2-3 psi. After adjustment is made, install the vacuum line and recheck the pressures, particularly the pressure at 10 inches of vacuum.

The diaphragm should not be adjusted to provide pressures below the ranges previously specified in order to change shift feel. To do so could result in soft or slipping shifts and damage to the transmission.

STALL TEST

Start the engine to allow it to reach its normal temperature. Apply both the parking and service brakes while making tests.

The stall test is made in D2, D1, L, or R, at full throttle to check engine performance, converter clutch operation or installation, and the holding ability of the forward clutch, reverse-high clutch and low-reverse band and the gear train one-way clutch. **While making this test, do not hold the throttle open for more than five seconds at a time.** Then move the selector lever to Neutral and run engine at 1000 rpm for about 15 seconds to cool the converter before making the next test. If the engine speed recorded by the tachometer exceeds the maximum limits specified in Table 2, release the accelerator immediately because clutch or band slippage is indicated.

STALL SPEED TOO HIGH

If stall speed exceeds specifications, band or clutch slippage is indicated, depending on transmission selector lever position. Excessive engine rpm only in D1, D2 and L indicates forward clutch slippage. Excessive engine rpm only in R indicates either reverse-high clutch or low-reverse band slippage. Excessive engine rpm only in D1 indicates gear train one-way clutch slippage.

STALL SPEED TOO LOW

When the stall test speeds are low and the engine is properly tuned, converter stator clutch problems are indicated. A road test must be performed to determine the exact cause of the trouble.

If the stall test speeds are 300 to 400 rpm below the specifications shown in Table 2, and the car cruises properly but has very poor acceleration, the converter stator clutch is slipping.

If the stall test speeds are 300 to 400 rpm below the specified values, and the car drags at cruising speeds and acceleration is poor, the stator clutch could be installed backwards.

Remove the converter and check the stator clutch as described in "Cleaning and Inspection."

When the stall test shows normal speeds, the acceleration is good, but the car drags at cruising speeds, the difficulty is due to a seized stator assembly. If the stator is defective, replace the converter.

TABLE 2–Stall Speed Limits

Engine Model	Engine Speed (rpm)
170-Six	1400-1600
200-Six	1550-1750
289-V8	1750-1950

INITIAL ENGAGEMENT CHECKS

Initial engagement checks are made to determine if initial band and clutch engagements are smooth.

Run the engine until its normal operating temperature is reached. With the engine at the correct idle speed, shift the selector lever from N to D2, D1, L, and R. Observe the initial band and clutch engagements. Band and clutch engagements should be smooth in all positions. Rough initial engagements in D1, D2, L, or R are caused by high engine idle speed or high control pressures.

SHIFT POINT CHECKS

Check the light throttle upshifts in D1. The transmission should start in first gear, shift to second, and then shift to third within the shift points specified in the specifications section.

While the transmission is in third gear, depress the accelerator pedal through the detent (to the floor). The transmission should shift from third to second or third to first, depending on the car speed.

Check the closed throttle downshift from third to first by coasting down from about 30 mph in third gear. The shift should occur within the limits specified in the specifications section.

When the selector lever is at D2, the transmission can operate only in second and third gears. Shift points for second to third and third to second are the same in both D2 and D1.

With the transmission in third gear and road speed over 30 mph, the transmission should shift to second gear when the selector lever is moved from D2 or D1 to L. When the same manual shift is made below about 20 mph, the transmission will shift from second or third to first. **This check will determine if the governor pressure and shift control valves are functioning properly.**

During the shift check operation, if the transmission does not shift within specifications or certain gear ranges cannot be obtained, refer to the "Diagnosis Guide" to resolve the problem.

AIR PRESSURE CHECKS

A "NO DRIVE" condition can exist, even with correct transmission fluid pressure, because of inoperative clutches or bands. The inoperative units can be located through a series of checks by substituting air pressure for the fluid pressure to determine the location of the malfunction.

When the selector lever is at D2, a "NO DRIVE" condition may be caused by an inoperative forward clutch. A "NO DRIVE" condition at D1 may be caused by an inoperative forward clutch or one-way clutch. When there is no drive in L, the difficulty could be caused by improper functioning of the forward clutch or low-reverse band and the one-way clutch. The low-reverse band cannot be checked in L. If the low-reverse band fails, the one-way clutch will hold the gear train and operation will be normal. Failure to drive in reverse range could be caused by a malfunction of the reverse-high clutch or low-reverse band. Erratic shifts could be caused by a stuck governor valve.

To make the air pressure checks, drain the transmission fluid, and then remove the oil pan and the control valve body assembly. The inoperative units can be located by introducing air pressure into the transmission case passages leading to the clutches, servos, and governor.

FORWARD CLUTCH

Apply air pressure to the transmission case forward clutch passage (Fig. 8). A dull thud can be heard when the clutch piston is applied. If no noise is heard, place the finger tips on the input shell and again apply air pressure to the forward clutch passage. Movement of the piston can be felt as the clutch is applied.

Governor. Apply air pressure to the control pressure to governor passage and listen for a sharp clicking or whistling noise. The noise indicates secondary governor valve movement.

REVERSE-HIGH CLUTCH

Apply air pressure to the reverse-high clutch passage (Fig. 8). A dull thud indicates that the reverse-high clutch piston has moved to the applied position. If no noise is heard, place the finger tips on the clutch drum and again apply air pressure to detect movement of the piston.

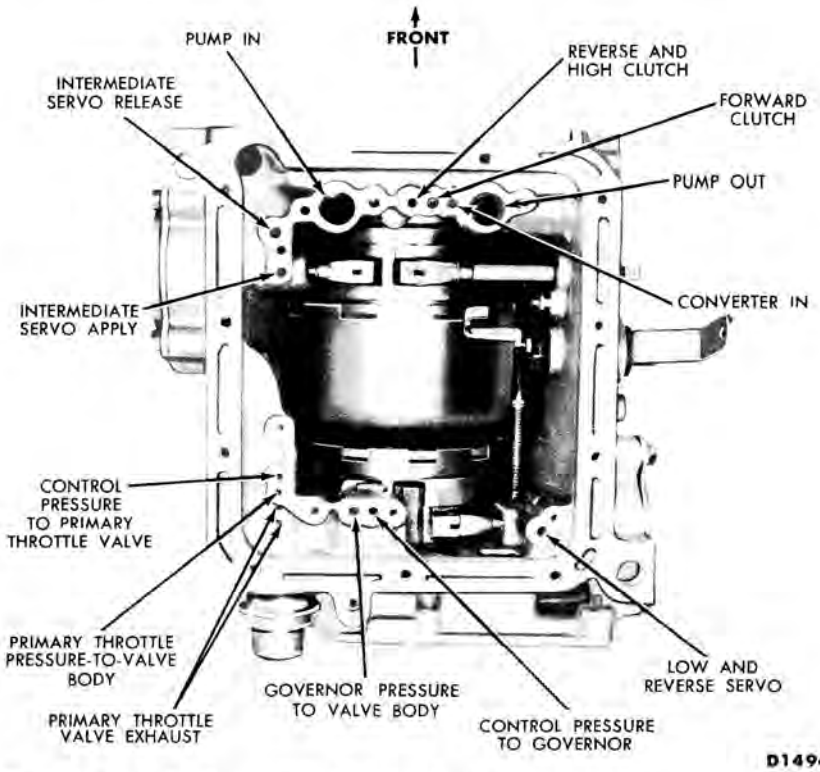


FIG. 8—Case Oil Passage Hole Identification

Intermediate Servo. Hold the air nozzle in the intermediate servo apply passage (Fig. 8). Operation of the servo is indicated by a tightening of the intermediate band around the drum. Continue to apply air pressure into the intermediate servo apply passage, and introduce air pressure into the intermediate servo release passage. The intermediate servo should release the band against the apply pressure.

LOW-REVERSE SERVO

Apply air pressure to the low-reverse apply passage (Fig. 8). The low-reverse band should tighten around the drum if the servo is operating properly.

If the servos do not operate, disassemble, clean and inspect them to locate the source of the trouble.

If air pressure applied to either of the clutch passages fails to operate a clutch or operates both clutches at once, remove and, with air pressure, check the fluid passages in the case and front pump to detect obstructions.

If the passages are clear, remove the clutch assemblies, and clean and inspect the malfunctioning clutch to locate the trouble.

DIAGNOSIS GUIDE

The "Transmission Diagnosis Guide" lists the most common trouble symptoms that may be found in the transmission, and gives the items that should be checked to find the cause of the trouble.

The items to check for each trouble symptom are arranged in a logical sequence which should be followed for quickest results. The letter symbols for each item are explained in the "Key to the Diagnosis Guide."

If items A, B, C, D, E, and the stall test have already been checked during the preliminary checks and adjustments, they need not be repeated when following the "Diagnosis Guide."

C4 AUTOMATIC DUAL RANGE DIAGNOSIS GUIDE

Trouble Symptom	Items to Check	
	Transmission in Vehicle	Transmission Out of Vehicle
Rough Initial Engagement in D1 or D2	K B W F E	
Rough Initial Engagement D2 Only	G J	
1-2 or 2-3 Shift Points Incorrect	A B C D W E L	
Rough 2-3 Shift	B F E	
Engine Overspeeds on 2-3 Shift	B G W E F	r
No Shift Points	B C D E J	
No 2-3 Shift	C R D E	b r
No 3-1 Shift in D1	B E	
No Forced Downshifts	L W E	
Runaway Engine on Forced Downshift	G F E J B	c
Rough 3-2 or 3-1 Shift at Closed Throttle	K B E	
Shifts 1-3 in D1 and D2	G J	
No Engine Braking In First Gear–Manual Low Range	H I	
Creeps Excessively in D1 or D2	K	
Slips or Chatters in First Gear, D1	A B W F E	a c i
Slips or Chatters in Second Gear	A B G W F E J	a c
Slips or Chatters in R	A H W F E I	b c
No Drive in D1 only	C E	i
No Drive in D2 only	C	
No Drive in R only	C H I E R	b c
No Drive in D1, D2, or L	D W R	a
No Drive in Any Selector Lever Position	A C W F E R	c h
Lockup in D2 only	H I	i
Lockup in R only		a g
Parking Lock Binds or Does Not Hold	C	g
Transmission Overheats	A O F	n
Maximum Speed Too Low, Poor Acceleration		n
Transmission Noisy in N	F	d
Transmission Noisy in First, Second, and Reverse Gear	F	h d
Transmission Noisy in P	F	d
Fluid Leak	M N O P Q S U X	j m p

KEY TO DIAGNOSIS GUIDE

TRANSMISSION IN VEHICLE	
A	Fluid Level
B	Vacuum Diaphragm Unit or Tubes
C	Manual Linkage
D	Governor
E	Valve Body
F	Control Pressure Regulator Valve
G	Intermediate Band
H	Low-Reverse Band
I	Low-Reverse Servo
J	Intermediate Servo
K	Engine Idle Speed
L	Downshift Linkage
M	Convertor Drain Plugs
N	Oil Pan Gasket, or Filler Tube
O	Oil Cooler and Connections
P	Manual or Downshift Lever Shaft Seal
Q	⅛-inch Pipe Plug in Side of Case
R	Perform Air-Pressure Check
S	Extension Housing to Case Gaskets and Lockwashers
U	Extension Housing Rear Oil Seal
W	Perform Control Pressure Check
X	Speedometer Driven Gear Adapter Seal

TRANSMISSION OUT OF VEHICLE	
a	Forward Clutch
b	Reverse-High Clutch
c	Leakage in Hydraulic System
d	Front Pump
g	Parking Linkage
h	Planetary Assembly
i	Planetary One-Way Clutch
j	Engine Rear Oil Seal
m	Front Pump Oil Seal
n	Converter One-Way Clutch
p	Front Pump to Case Gasket or Seal
r	Reverse-High Clutch Piston Air Bleed Valve

2 COMMON ADJUSTMENTS AND REPAIRS

TRANSMISSION FLUID DRAIN AND REFILL

Normal maintenance and lubrication requirements do not necessitate periodic automatic transmission fluid changes.

If a major failure, such as a clutch, band, bearing, etc., has occurred within the transmission, it will have to be removed for service. At this time the converter must be thoroughly flushed to remove any dirt.

When filling a dry transmission and converter, install 5 quarts of fluid. Start the engine, shift the selector lever as in Step 5 below, and check and add fluid as necessary.

Following is the procedure for partial drain and refill due to minor repairs.

1. Loosen and remove all but two of the oil pan bolts, and drop one edge of the oil pan to drain the oil. Remove and thoroughly clean the oil pan and screen. Discard the oil pan gasket.
2. Place a new gasket on the oil pan, and install the screen and pan on the transmission.
3. Add three quarts of fluid to the transmission through the filler tube.
4. Run the engine at idle speed for about two minutes. Check the oil level, and add oil if necessary. Run the engine at fast idle speed (about 1200 rpm) until it reaches its normal operating temperature. **Do not race the engine.**
5. Shift the selector lever through all the positions, place it at P, and check the fluid level. If necessary, add enough fluid to the transmission to raise the level to the F (Full) mark on the dipstick. **Do not overfill the transmission.**

OIL COOLER FLUSHING PROCEDURE

When a clutch or band failure or other internal trouble has occurred in a transmission that has the water oil cooling feature, any metal particles or clutch plate or band material that may have been carried into the cooler should be removed from the system by flushing the cooler before the transmission is put back into service.

1. Disconnect the fluid return line from the rear of the transmission.
2. Start the engine and drain about two quarts of fluid from the cooler into a pan. Discard the drained fluid. If there is no fluid flow or the fluid does not flow freely from the return line, shut off the engine and disconnect both lines at the cooler and transmission.
3. Use an air hose (with not more than 100 psi air pressure) to reverse flush the lines and the cooler.
4. Connect both lines at the cooler, and the pressure line at the transmission.
5. Start the engine and check the fluid flow. If the fluid flows freely, connect the return line at the transmission and fill the transmission with new fluid to the specified level. If there is no fluid flow or if the flow is restricted, replace the radiator. **Do not attempt to correct cooler or cooling line leaks by closing off the lines.**

OIL COOLER TUBE REPLACEMENT

When fluid leakage is found at the oil cooler, the entire radiator must be replaced. **The oil cooler cannot be removed from the radiator for replacement.**

When one or more of the oil cooler steel tubes must be replaced, each replacement tube must be fabricated from the same size steel tubing as the original line.

Using the oil tube as a guide, bend the new tube as required. Add the necessary fittings, and install the tube.

After the fittings have been tightened, add fluid as needed, and check for fluid leaks.

3 CLEANING AND INSPECTION

CLEANING AND INSPECTION

Clean all parts with suitable solvent and use moisture-free air to dry off all parts and clean out the various oil passages.

The composition clutch plates and bands should not be cleaned in a vapor degreaser or with any type of detergent solution. To clean these parts, wipe them off with a lint-free cloth. New clutch plates and bands should be soaked in transmission oil for fifteen minutes before they are assembled.

CONVERTER CLEANING

If there is reason to believe that the converter has an excessive amount of foreign material in it, a commercial converter cleaning machine or the following cleaning procedure should be used.

1. With the converter on the bench, remove both drain plugs and tilt the converter in all directions to drain as much fluid as possible.
2. Install the drain plugs and fill the converter through the pump drive hub with a light-body oil such as kerosene, or a cleaning solvent suitable for transmission cleaning.
3. Install the tool shown in Fig. 9 in the converter. Expand the bushing in the turbine spline. Rotate the tool to circulate the fluid in the converter.
4. Remove both drain plugs and thoroughly drain the converter.
5. Repeat the procedure given in steps 2, 3, and 4, as required, to remove all foreign material.
6. Install the drain plugs.

The torque converter is permanently enclosed in a welded steel housing and cannot be disassembled for servicing.

A special tool (Fig. 10) must be used to check the condition of the converter. This special tool is used to check the turbine and stator end play and the operation of the one-way stator clutch.

TURBINE AND STATOR END PLAY CHECK

1. Insert the tool into the converter pump drive hub until it bottoms.
2. Install the guide over the converter pump drive hub.
3. Expand the split fiber bushing in the turbine spline by tightening the adjusting nut. Tighten the adjust-

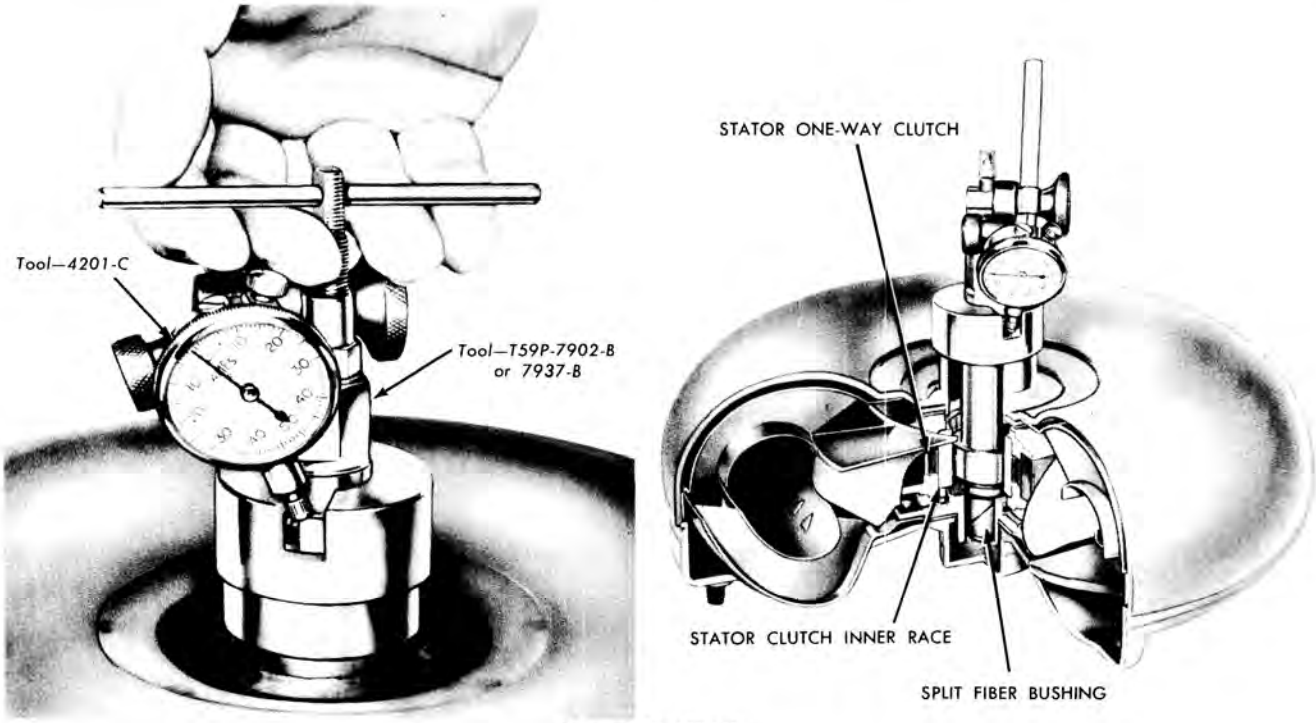


FIG. 10—Typical Converter Checking Tool Installation



FIG. 9—Converter Checking Tool

ing nut until the tool is securely locked to the turbine spline.

4. Attach a dial indicator to the tool (Fig. 10). Position the indicator button on a converter pump drive hub, and set the dial face at 0 (zero).

5. Lift the tool upward as far as it will go and note the indicator reading. The indicator reading is the total end play which the turbine and stator share. If the total end play exceeds specifications, replace the converter.

6. Loosen the adjusting nut to free the split bushing, and then remove the tool from the converter.

STATOR ONE-WAY CLUTCH CHECK

1. Install the stator outer race holding tool in one of the holes provided in the stator.

2. Insert the tool in the converter pump drive hub.

3. As the tool enters the converter, the spline on the tool (Fig. 10) will engage the stator clutch inner race spline.

4. Place a torque wrench on the tool (Fig. 10). The tool (and stator inner race) should turn freely clockwise (from the pump drive hub side of the converter). It should lock up and hold a 10 ft-lb pull when the wrench is turned counterclockwise. Try the clutch for lockup and hold in at least five different locations around the converter. If the clutch



FIG. 11—Typical Stator to Impeller Interference Check

fails to lock up and hold a 10 ft-lb torque, replace the converter unit.

The metal ring, which is a part of this tool, will have to be held by hand, to hold the lock pin during this check.

5. Remove the tools from the converter.

STATOR TO IMPELLER INTERFERENCE CHECK

1. Position a stator support shaft on the bench with the spline end of the stator shaft pointing up (Fig. 11).

2. Place the front pump rotor over the stator shaft with the flat side of the rotor down.

3. Place the converter over the stator support shaft so that the front pump driving lugs are in normal (running) engagement with the pump rotor. The converter pump driving hub will bottom the rotor.

4. While holding the stator shaft stationary, try to rotate the converter counterclockwise. The converter should rotate freely without any signs of interference or scraping within the converter assembly.

5. If there is an indication of scraping, the trailing edges of the stator blades may be interfering with the leading edges of the impeller blades. In such cases, replace the converter.

STATOR TO TURBINE INTERFERENCE CHECK

1. Position the converter, front side down, on the bench.

2. Install the front pump assembly (complete) to engage the mating splines of the stator support and stator, and pump drive gear lugs.

3. Install the input shaft, engaging

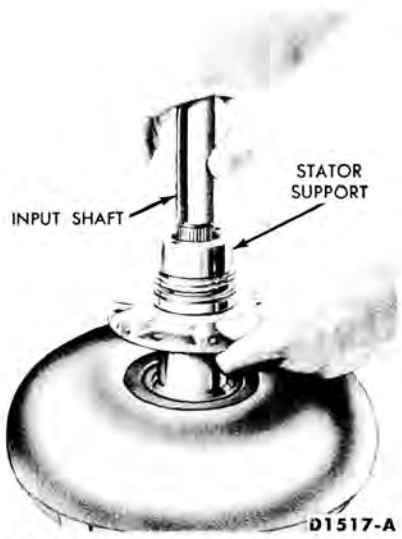


FIG. 12—Typical Stator to Turbine Interference Check

the splines with the turbine hub (Fig. 12).

4. While holding the pump stationary, attempt to rotate the turbine with the input shaft. The turbine should rotate freely in both directions without any signs of interference or scraping noise.

5. If interference exists, the stator front thrust washer may be worn, allowing the stator to hit the turbine. In such cases, the converter must be replaced.

FRONT PUMP AND STATOR SUPPORT

1. Inspect the clutch drum journal for wear and roughness.

2. Check the side clearances between the clutch apply pressure seal rings and their grooves in the stator support. These clearances should be between 0.0035 and 0.0045 inch.

3. Remove the clutch apply rings and install them in their normal running position in the clutch drum. Then check the ring gaps. This ring gap clearance should be between 0.002 and 0.009 inch.

4. Inspect the input shaft bushings in the stator support shaft for wear.

Check the oil ring grooves in the stator support for nicks, burrs or damaged edges. Check the gasket mating surface of the pump body for damaged surface.

5. Inspect the converter pump drive hub bushing in the front pump housing. Inspect the pump seal in the

pump housing for defects that would cause oil leakage.

GOVERNOR

1. Inspect the governor valve(s) and housing for wear. **Crocus cloth may be used to polish the valve if care is taken to avoid rounding the sharp edges of the valve.**

2. Install the governor valves in the governor housing and check the valve for free movement. The valve should fall of its own weight when dry.

CLUTCH ASSEMBLY

1. Inspect the composition clutch plates for damage. These plates should be flat. If the plates are not flat, they must be replaced. If the old plates are to be re-used, they must **not** be cleaned in a vapor degreaser or cleaned with any type of detergent solution. Wipe them clean with lint-free towels.

If new composition plates are to be installed, soak them in automatic transmission fluid for at least 15 minutes before assembling them in the clutch drum. This soaking prevents damage to the plates during the transmission fluid fill period and initial "running-in".

2. Inspect the steel clutch plates. These clutch plates should also be flat. If they are not flat, they should be replaced.

3. Inspect the clutch piston ball check valve for free movement and proper seating. Make sure the orifice in the clutch piston is open.

4. Inspect the clutch drum bushing for wear.

CONTROL VALVE BODY

1. Inspect all valve and plug bores for scores. Check all fluid passages for obstruction. Inspect the check valves for free movement. Inspect all mating surfaces for burrs or distortion. Inspect all plugs and valves for burrs and scores. **Crocus cloth can be used to polish valves and plugs if care is taken to avoid rounding the sharp edges of the valves and plugs.**

2. Inspect all springs for distortion. Check all valves and plugs for free movement in their respective bores. Valves and plugs, when dry, must fall from their own weight in their respective bores.

PINION CARRIERS

The front planet carrier parts are serviceable. Individual parts of the reverse planet carrier are not serviceable.

1. Inspect the front planet thrust bearing and races for excessive wear or damaged needle bearings.

2. Inspect the pinion needle bearing thrust washers for scored condition.

3. Inspect the pinion gears for damaged or excessively worn areas.

4. Inspect the carrier for loose pinion gear shaft pin fit. Inspect the pins for excessive wear.

5. Check for free rotation of the pinion gears in their assembled position.

SERVO-ASSEMBLIES

1. Inspect the servo piston and seals for defects that would cause hydraulic leakage.

2. Inspect the cover seal and gasket cover sealing surface for defects.

CASE

1. Inspect the case for cracks.

2. With an air hose, check all fluid passages for obstruction or cross leakage.

3. Check all case linkage parts for free travel and proper engagement.

4. Check the vent for obstructions with an air hose.

ONE-WAY CLUTCH

1. Inspect the outer and inner races for scores or damaged surface area where the rollers contact the races.

2. Inspect the rollers and springs for excessive wear or damage.

3. Inspect the spring and roller cage for bent or damaged spring retainers.

PART 7-2 C4 AUTOMATIC DUAL RANGE TRANSMISSION

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1	Description and Operation	7-13
2	In-Car Adjustments and Repairs	7-23
3	Removal and Installation	7-30
4	Major Repair Operations	7-31

1 DESCRIPTION AND OPERATION

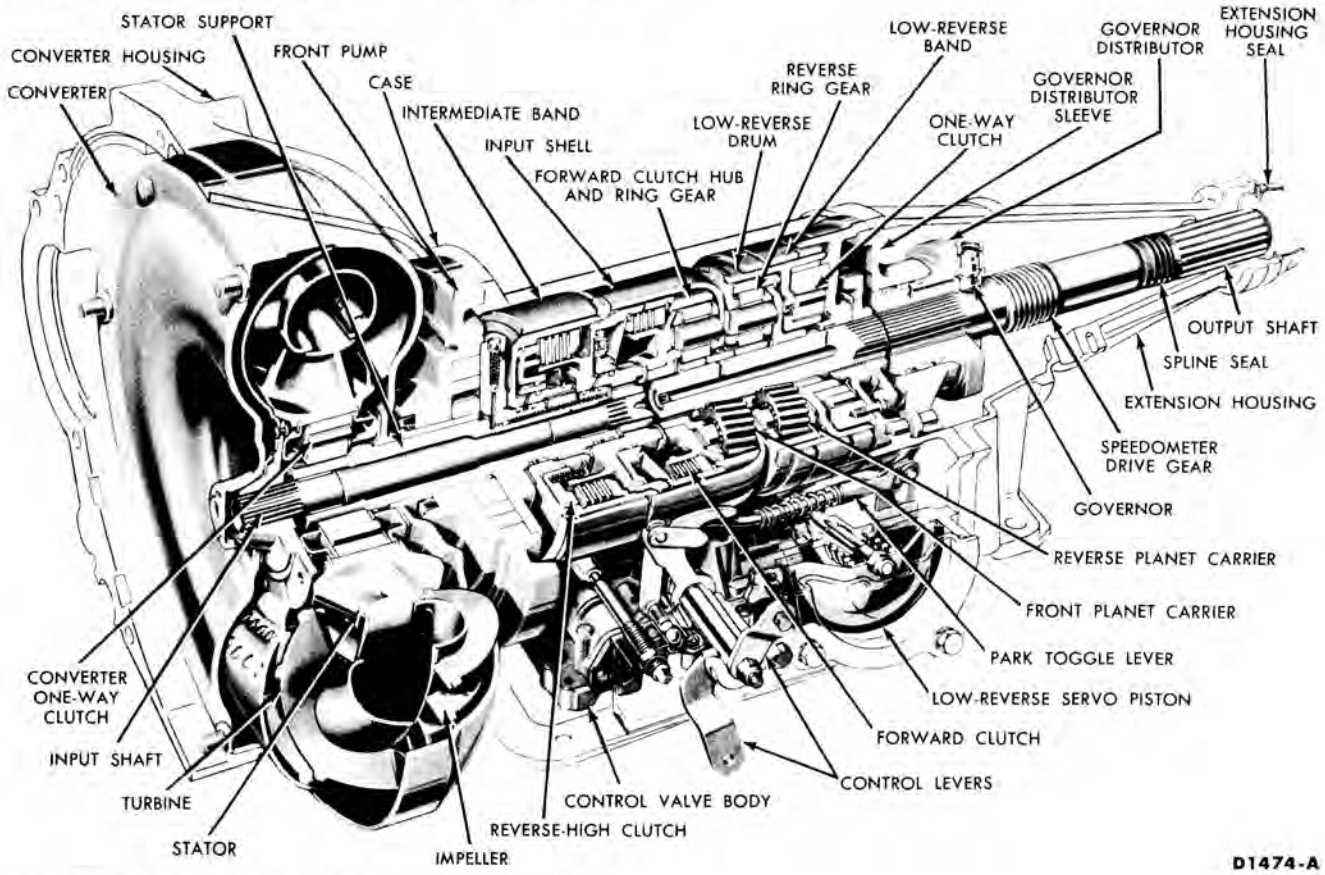


FIG. 1—C4 Automatic Dual Range Transmission

DESCRIPTION

Figure 1 shows the location of the converter, front pump, clutches, gear train and most of the internal parts used in the C4 transmission. The identification tag (Fig. 2) attached by the low-reverse servo cover bolt, includes the model prefix and suffix, as well as a service identification number and date code. The service identification number indicates changes to service details which affect interchangeability **when the transmission model is not changed.** For interpretation of this number, see the Master Parts Catalog.

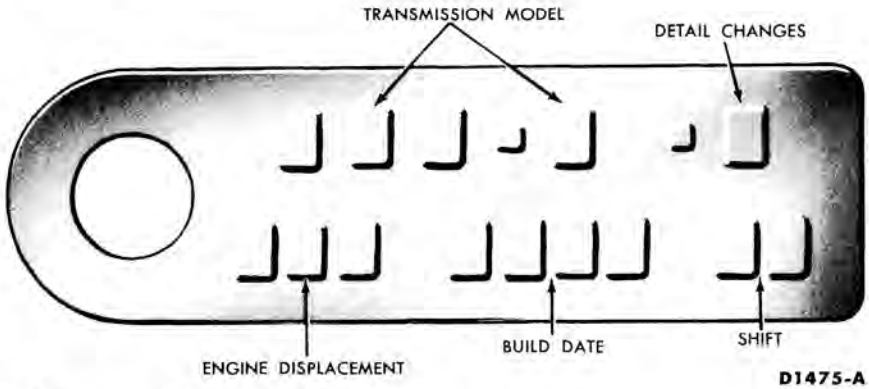


FIG. 2—Identification Tag

TABLE 1—Engine and Transmission Application

CAR MODEL	TRANSMISSION MODEL	ENGINE MODEL
Falcon	PCS-E	170-1V
Mustang	PCS-F	200-1V
Comet-Falcon	PCS-G	200-1V
Fairlane (Column Shift)	PCS-J	200-1V
Fairlane (Floor Shift)	PCS-M	200-1V
Comet-Falcon	PCW-AA	289-2V-4V
Mustang	PCW-J	289-2V-4V
Fairlane (Column Shift)	PCW-M	289-2V-4V
Fairlane (Floor Shift)	PCW-AD	289-2V-4V
Fairlane (Column Shift)	PCW-AC	289-4V-H.P.
Fairlane (Floor Shift)	PCW-AF	289-4V-H.P.

Table 1 shows the engine and transmission model applications.

OPERATION
TORQUE CONVERTER

The hydraulic torque converter (Fig. 3) consists of an impeller (pump), a turbine, and a stator. All these parts are enclosed and operate in a fluid-filled housing.

When the engine is running, the fluid in the torque converter flows from the impeller to the turbine and back to the impeller through the stator. This flow produces a maximum torque increase of about 2 to 1 when the turbine is stalled. When enough torque is developed by the impeller, the turbine begins to rotate, turning the turbine shaft (input shaft).

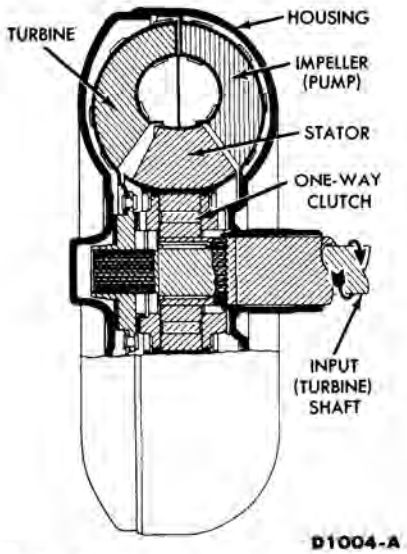


FIG. 3—Sectional View of Torque Converter—Typical

The converter torque multiplication gradually tapers off as turbine speed approaches impeller speed, and it becomes 1 to 1 when the turbine is being driven at $^{9}/_{10}$ impeller speed. This is known as the "coupling point."

When the turbine is rotating at less than $^{9}/_{10}$ impeller speed, the converter is multiplying torque. The fluid leaving the turbine blades strikes the front face of the stator blades. These blades are held stationary by the action of a one-way clutch (Fig. 3) as long as the fluid is directed against the front face of the blades.

When the turbine rotates faster than $^{9}/_{10}$ impeller speed the converter no longer multiplies torque. The fluid is directed against the back face of the stator blades. As the one-way clutch permits the stator to rotate only in the direction of impeller rotation, the stator begins to turn with the impeller and turbine. The converter operates as an efficient fluid coupling as long as the turbine speed remains greater than $^{9}/_{10}$ impeller speed.

A constant flow of fluid into and out of the converter is maintained. The fluid coming out of the converter is forced through a cooler located in the radiator tank.

PLANETARY GEAR TRAIN, CLUTCHES, BANDS, AND SERVOS

Planetary Gear Train. The gear train consists of an input shaft that is splined to the turbine of the converter and the forward clutch cylinder (Fig. 4). The forward clutch cylinder rotates the steel internal clutch plates of the forward clutch and the composition clutch plates of the reverse-high clutch. When the reverse-high clutch is applied, the external area of the clutch hub is splined to and drives the input shell to rotate the sun gear. When the forward clutch is applied, the composition clutch plates drive the forward clutch hub and ring gear. The ring gear rotates the forward planet gears.

When applied, the intermediate band holds the reverse-high clutch drum, input shell and sun gear from rotating.

The sun gear, which is driven by the input shell, is meshed with the forward and reverse planet gears. The reverse planet carrier and low reverse drum are locked together with external splines. The low-reverse drum can be held from rotating by the low-reverse band. In D1 the low-reverse drum is also held from rotating by a roller type one-way clutch.

The forward planet carrier, reverse ring gear hub, park gear and governor distributor are all splined to the output shaft.

Forward Clutch. The input shaft is splined to and drives the forward clutch cylinder (Fig. 4). Rotation of the cylinder drives the steel clutch plates in the forward clutch and the composition clutch plates of the reverse-high clutch.

When the forward clutch piston is applied by hydraulic pressure, the movement of the piston against the disc spring locks the steel and composition clutch plates together to drive the forward clutch hub and ring gear.

When hydraulic pressure is released from the piston, the disc spring moves the piston to the released position. As the disc spring moves, the steel and composition clutch plates are released. This stops the rotation of the forward clutch hub and ring gear (Fig. 4). The forward clutch is applied in all forward drive gear ratios.

Reverse-High Clutch. When hydraulic pressure is directed to the clutch piston, the piston moves against the release springs (Fig. 4). The piston movement locks the steel and rotating composition clutch plates together. The steel clutch plates drive the reverse-high clutch

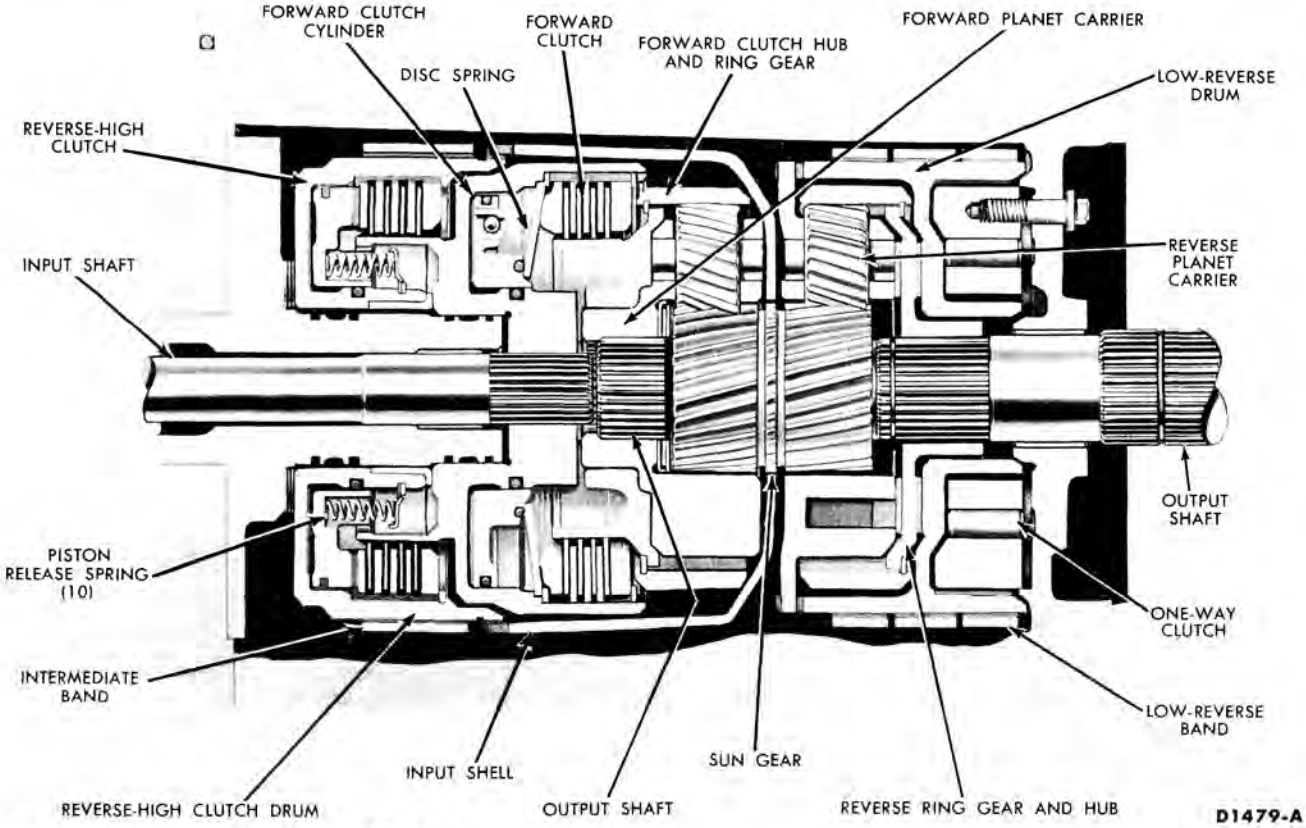


FIG. 4—Gear Train, Clutches and Bands

drum which is splined to the input shell. Rotation of the input shell drives the sun gear which is splined to the input shell.

To release the reverse-high clutch, hydraulic pressure is exhausted from the apply side of the piston. The return springs move the piston to the released position. The steel and composition clutch plates are now released to stop rotation of the reverse-high clutch drum, input shell and sun gear.

Intermediate Servo and Band. The intermediate servo is machined into the transmission case and the band has an **external** adjustment screw (Fig. 5). To apply the servo, hydraulic pressure is directed from the control valve body, through a hole in the case to the hole in the servo piston stem. The pressure passes through the center of the piston stem and then to the apply side of the piston. The piston moves against the return spring to tighten the intermediate band around the reverse-high clutch drum.

To release the servo piston, hydraulic pressure is directed to the release side of the piston. The release pressure is assisted by the compressed return spring to move the servo piston and intermediate band to the OFF position. The intermediate servo and band are applied only during the intermediate gear operation.

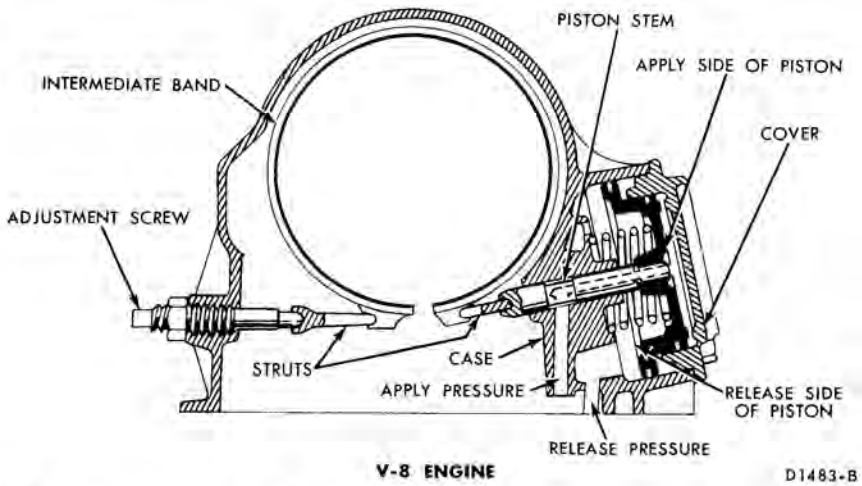


FIG. 5—Intermediate Servo and Band

Low-Reverse Servo and Band. The low-reverse servo is machined into the transmission case and the band has an **external** adjustment screw (Fig. 6). To apply the servo, hydraulic pressure is directed from the control valve body through a hole in the case to a hole in the piston stem. The pressure then passes through the center of the piston stem to the apply area of the servo piston. The apply pressure force moves the piston against the piston return spring to tighten the low-reverse band around the low-reverse drum.

To release the servo piston and

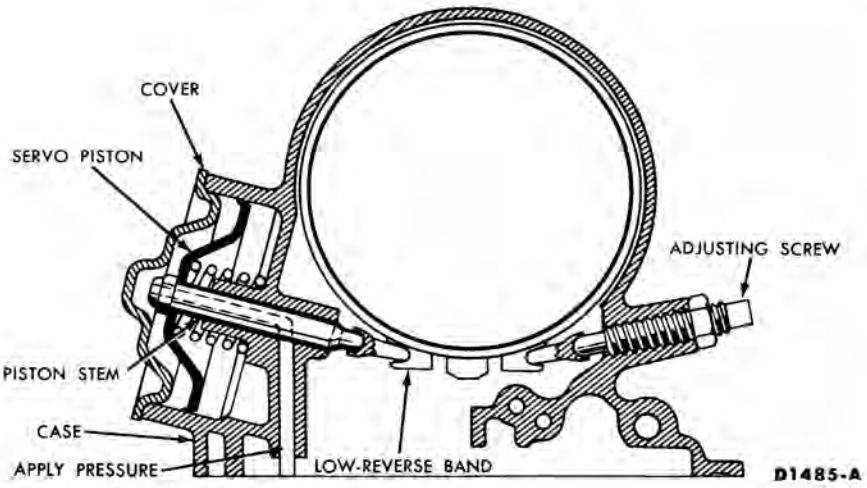


FIG. 6—Low-Reverse Servo and Band

band, the hydraulic pressure is exhausted from the apply side of the piston. The compressed return spring expands to release the piston and the low-reverse band.

POWER FLOW

All Gear Rotations are viewed from the front of transmission. Table 2 shows the gear ratios obtained in the different selector lever positions.

Power Flow Neutral. In neutral (Fig. 7) the clutches or bands are not applied, therefore, no power is transmitted to the output shaft.

Power Flow First Gear. In low gear (Fig. 7), the forward clutch is applied, and the planet one-way clutch or low-reverse band is holding the low-reverse drum and reverse planet carrier from rotating. The power flow is through the input shaft and into the forward clutch. The input shaft is splined to and drives the forward clutch cylinder. Rotation of the forward clutch drives the forward clutch hub and ring gear. The ring gear rotates the forward planet gears clockwise to cause the sun gear to rotate counterclockwise.

Counterclockwise rotation of the sun gear turns the reverse planet gear clockwise. The reverse planet carrier being splined to the low-reverse drum is held from rotating by the one-way clutch or low-reverse band.

With the reverse planet carrier held stationary, the clockwise rotation of the reverse planet gears rotates at the same speed as the output clockwise. The hub of the reverse ring gear is splined to the output shaft and rotates the output shaft clockwise.

The output shaft rotation is at a reduced speed, compared to the input shaft rotation, but at an increased torque.

The output shaft rotation at a reduced speed is caused by the fact that the forward planet carrier rotates at the same speed of the output shaft and in the same direction since the carrier is splined to the output shaft. The forward ring gear and planet assembly are rotating in the same direction, but the planet carrier is rotating at a slower speed than the ring gear. Therefore, the low gear ratio (torque multiplication) is a combination of the ratios provided by the forward and reverse planet assemblies.

Power Flow Intermediate Gear. In intermediate gear (Fig. 7), the forward clutch is applied and the intermediate band is holding the reverse high clutch drum, input shell and sun gear from turning.

The power flow is through the input shaft into the forward clutch and forward front planet assembly ring gear. The sun gear is held from rotating by the intermediate band. This causes the forward planet pinions to rotate (walk) around the sun gear, carrying the forward planet carrier with them. The forward planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduction in speed compared to the speed of the input shaft, and at an increase in torque.

Clockwise rotation of the output shaft causes clockwise rotation of the output shaft ring gear, causing the reverse planet pinions to also rotate (walk) around the sun gear in a clockwise direction. The reverse planet carrier will also rotate clockwise and the one-way clutch inner race, being splined to the reverse planet carrier, will overrun.

Power Flow High Gear. In high gear (Fig. 7), the forward and reverse-high clutches are applied. The power flow is through the input shaft into the forward clutch cylinder. (The forward clutch cylinder rotates the steel clutch plates of the forward clutch and the composition clutch plates of the reverse-high clutch). The forward clutch directs the power flow through the forward

TABLE 2—Gear Ratios

Transmission Selector Position	Gear	Gear Ratios	Forward Clutch	Reverse High Clutch	Intermediate Band	Low Reverse Band	One-Way Clutch
N or P	Neutral	——	Off	Off	Off	Off	Off
L	Low	2.46:1	On	Off	Off	On	Holding
D1	Low	2.46:1	On	Off	Off	Off	Holding
D1 or D2	Intermediate	1.46:1	On	Off	On	Off	Over-Running
D1 or D2	High	1.00:1	On	On	Off	Off	Over-Running
R	Reverse	2.20:1	Off	On	Off	On	Not Affected

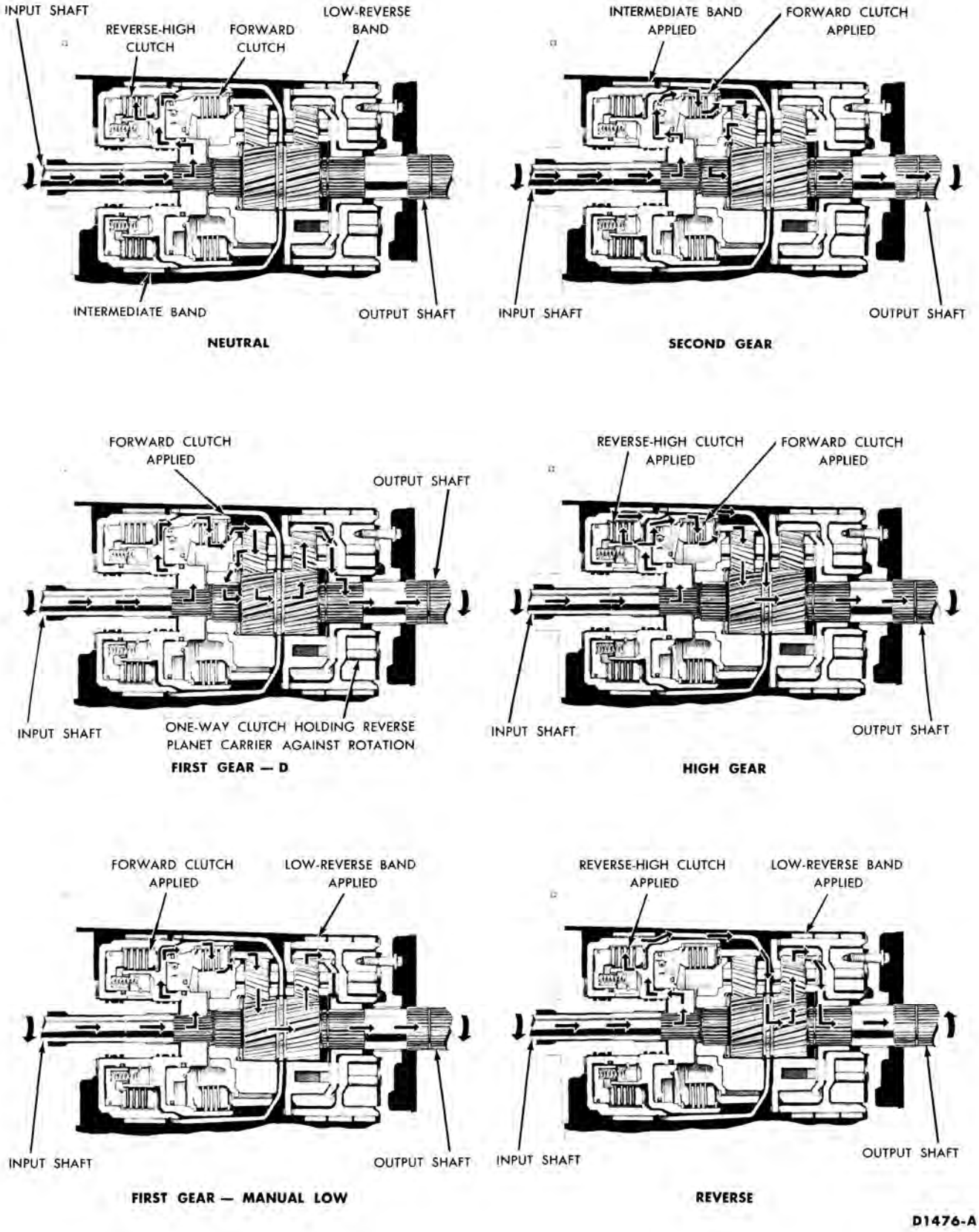


FIG. 7—Power Flow

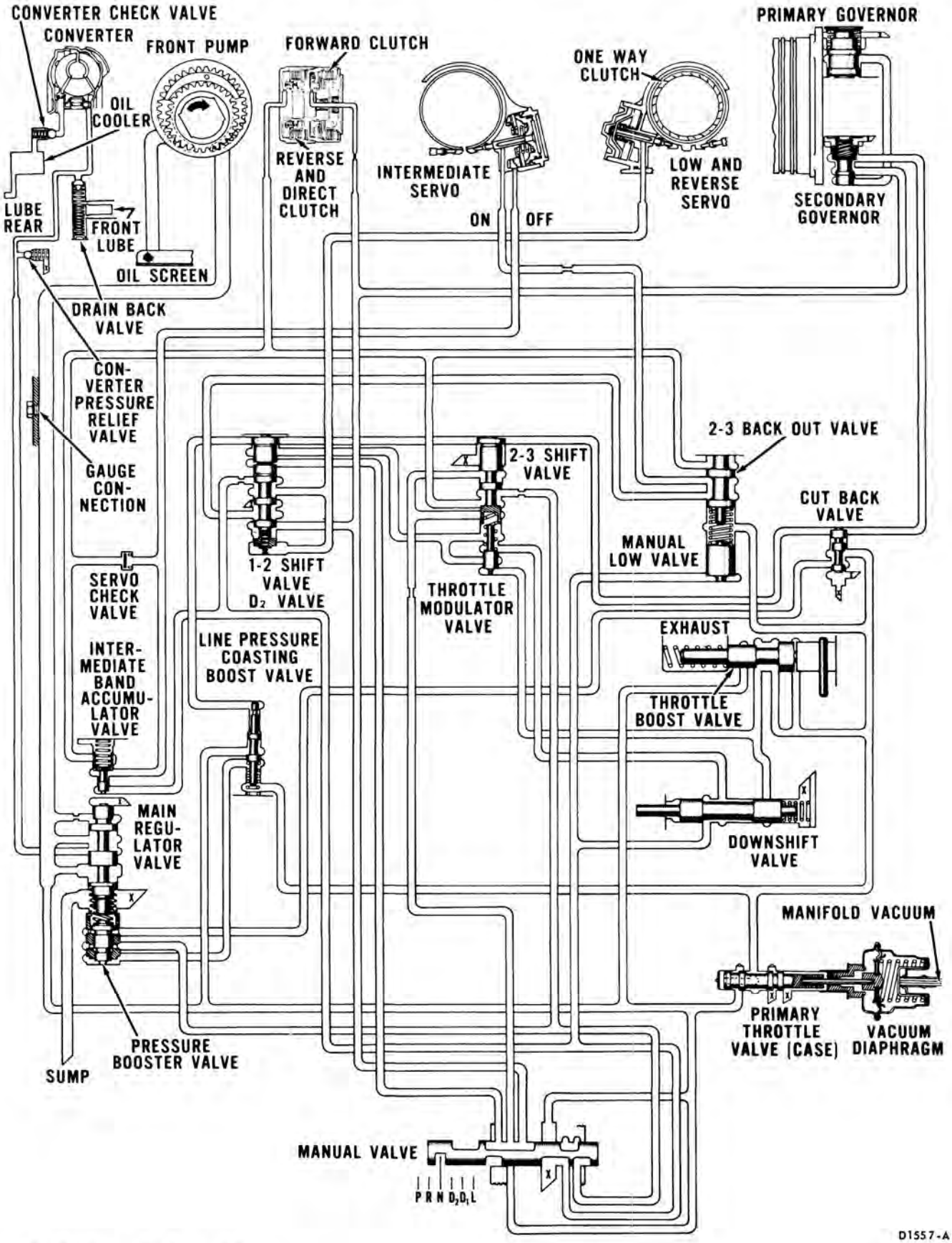


FIG. 8—Hydraulic Control System

clutch hub and ring gear to the forward planet carrier.

The reverse-high clutch directs the power flow through the input shell to the sun gear. With the sun gear and the forward clutch hub ring gear driven at the same speed the forward planet assembly (that is splined to the output shaft) is forced to rotate the output shaft at the same speed and direction to provide high gear.

Power Flow Reverse. In reverse (Fig. 7), the reverse-high clutch and low-reverse band are applied. The power flow is through the input shaft, reverse-high clutch, input shell and to the sun gear. Clockwise rotation of the sun gear causes counterclockwise rotation of the reverse planet gears.

The low-reverse band, holding the low-reverse drum and reverse planet carrier from turning, causes the reverse planet gears to rotate counterclockwise.

This rotates the reverse ring gear and hub counterclockwise. The hub splined to the output shaft rotates the output shaft counterclockwise at a reduction in speed and at an increase in torque for reverse gear.

HYDRAULIC CONTROL SYSTEM

The hydraulic system described below (Fig. 8) includes all models.

Front Pump. Fluid for operation of the hydraulic control system is supplied by one gear type pump mounted on the front of the transmission case. Pump intake is through a screen which is part of the main control assembly, into the case casting and pump. Discharge is through the case into the main control assembly. Fluid from the front pump is directed to the following valves in the main control assembly.

Main Oil Pressure Regulator Valve

Throttle Booster Valve

Manual Valve

In addition, fluid is also directed to the primary throttle valve, which is located in the rear of the case. Fluid delivered to these valves is at a pressure controlled by the main oil pressure regulator valve.

Main Oil Pressure Regulator Valve. The main regulator valve assembly consists of the main oil pressure regulator valve and spring, retainer, main oil pressure booster valve, spring and sleeve, located in one bore in the main control assembly (Fig. 8).

Fluid is delivered to three valleys of the main regulator valve, from the front pump. The difference in diameter between the end land and the second land provides an area differential for regulation. Fluid pressure in this area tends to move the valve against spring force. Spring force is such that at approximately 60 psi front pump pressure, the main valve will move so that the third land uncovers the converter feed port, allowing additional pump volume to be used to charge the converter. If volume supplied by the front pump is greater than that required to maintain 60 psi line pressure, and converter and lube requirements, the valve will move further allowing the fourth land to uncover the port which allows excess pump volume to be discharged into the sump.

Pressures over 60 psi which are required under various operating conditions are obtained by delivering fluid under pressure to the pressure booster valve, where it will cause the pressure booster valve to assist the main regulator valve spring in increasing regulated line pressure.

Source of these pressures which cause variations in control pressure are discussed later.

Manual Valve. Two passages deliver control pressure to the manual valve. The valve is positioned by the manual linkage according to mode of operation desired, to direct fluid out of two or more of the line passages which lead from the manual valve. The five passages leading from the manual valve (from left to right) are:

1. R
2. N
3. D2
4. D1
5. L

The D2 passage is charged in D2 range only.

The D1 passage is charged in D2 and D1 ranges.

The D passage is charged in all forward ranges, (including manual low).

The L-R passage is charged in L and R ranges.

The R passage is charged in reverse range only.

In Park and Neutral the valve blocks the flow of control pressure and exhausts the five passages leading from the manual valve.

The D passage supplies fluid pressure to the governor secondary valve, D2 valve and forward clutch.

The D2 passage supplies fluid to the adjoining ends of the D2 and 1-2 shift valves.

The D1 passage supplies fluid to the 2-3 shift valve.

Manual Valve. The L and R passage supplies fluid to the lower end of the intermediate band accumulator valve, end of the manual low valve, through the downshift valve, to and through the throttle modulator valve bore, under the 2-3 shift valve and to the underside of the first land of the 1-2 shift valve.

In addition, oil is supplied to the D2 valve and through the valve when it is in the closed (up) position, to the Low and Reverse Servo, applying the low and reverse band. The same fluid is also directed to the spring end (opposite governor) of the D2 valve.

The "R" passage supplies fluid to the middle valley of the pressure booster valve, through the 2-3 shift valve to the reverse and direct clutch, applying it, and to the release side of the intermediate servo. Fluid is also supplied to the end of the 2-3 back-out valve, and to the intermediate band accumulator valve.

Primary Throttle Valve. The primary throttle valve is actuated by changes in manifold vacuum. Primary throttle pressure starts at 20" (nominal) of mercury vacuum. Primary throttle pressure is delivered to the:

1. End of the pressure booster valve (through line pressure coasting boost valve).

2. Upper valley of pressure booster valve (through cutback valve).

3. Downshift valve and throttle modulator valve (through throttle booster valve).

4. End of the throttle booster valve.

5. Spring end of the 2-3 back-out valve and manual low valve. Figure 9 shows how primary throttle pressure varies with engine vacuum.

Pressure Booster Valve. T.V. pressure is delivered to the upper valley of the pressure booster valve and to the end of the pressure booster valve. When force created on the

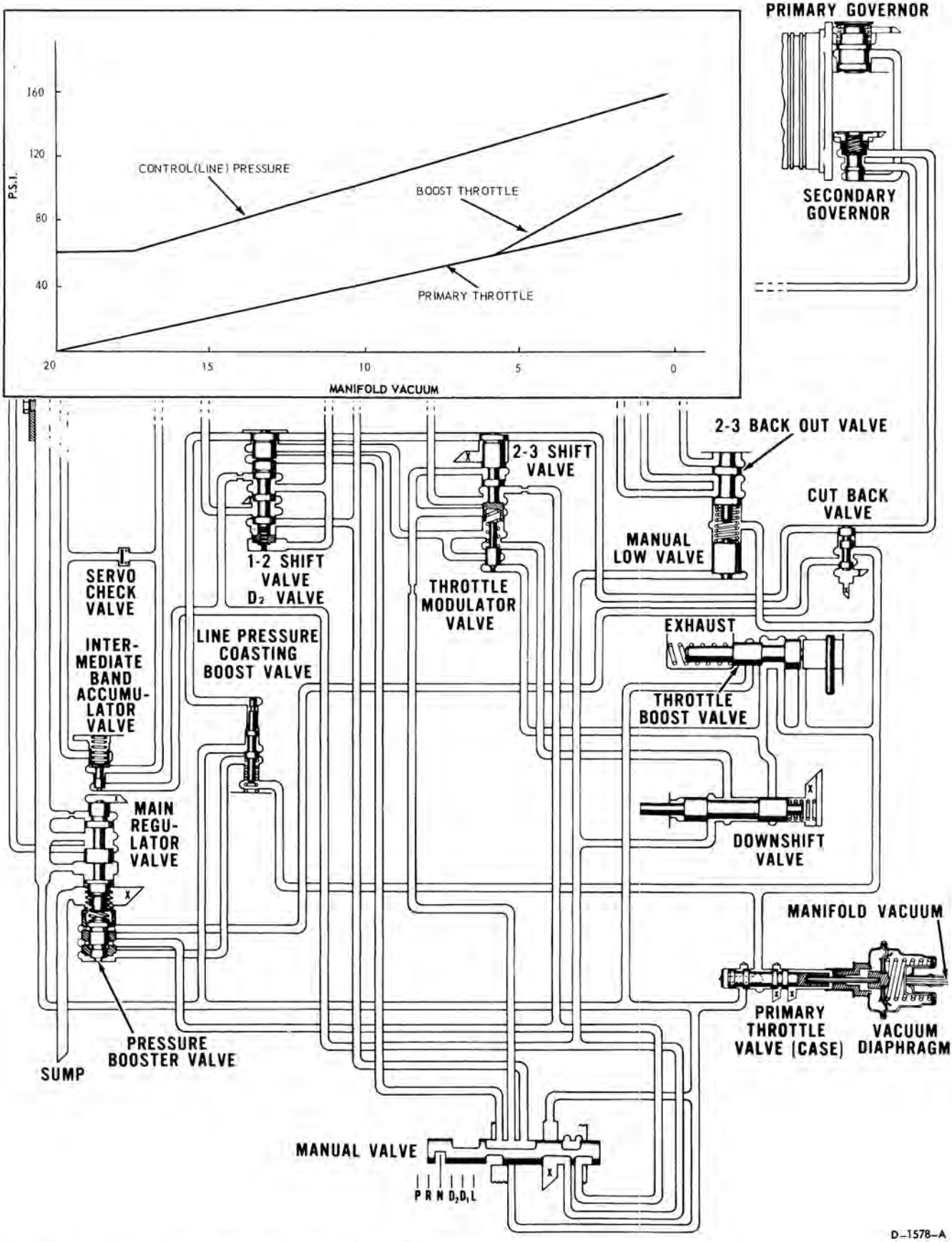


FIG. 9—Throttle Pressure Regulator Chart and Related Valves

booster valve by T.V. pressures in these two areas exceeds pressure booster valve spring force, the force will be added to the main regulator valve spring force transmitted to the main regulator valve. This will provide increased control pressures required to compensate for increased throttle openings and engine torque output. Figure 9 shows how control pressure varies with engine vacuum at "O" output shaft RPM.

GOVERNOR

At Rest (0 mph). Control pressure (line) is fed to the secondary governor valve through the center passage in the valve body. Because of the differential in area of the inner and outer lands of the valve, the valve will be forced inward, shutting off line pressure feed to the governor passage and allowing this passage to be opened to exhaust, at the inner end of the valve. At the same time, line pressure will pass by two flats on the outer end of the valve, pressurizing the "line leakage" passage leading to the primary governor valve. At rest, the spring on the outer end of the primary governor valve holds the primary governor valve inward, blocking further flow of the fluid in the "line leakage" passage. This causes pressure in the "line leakage" passage to build to the same value as line pressure. As a consequence, the secondary governor valve is held "in" and there is no pressure in the governor circuit.

Above 10 mph. When vehicle speed reaches approximately 10 mph, centrifugal force on the primary governor valve overcomes spring force, and the valve moves outward, opening the "line leakage" passage to exhaust. This action reduces the pressure on the end of the secondary governor valve to zero (0), allowing the secondary valve to also move outward, due to spring force and centrifugal force. When the secondary valve moves outward, it closes the governor exhaust passage, and allows line pressure to enter the governor passage. As pressure builds in the governor passage it will create a force on the secondary governor valve due to the differential in areas of the inner and outer lands of the valve. This force tends to move the valve inward. When the force on the valve created by pressure in the governor passage exceeds the centrifugal force plus spring force, the valve will move inward, allowing governor pressure to exhaust, and close the passage between line pressure and governor pressure. When governor pressure is reduced, the secondary valve will again move outward, closing the governor exhaust port and opening the line pressure to governor passage. Above 10 mph, governor pressure is regulated in this manner, and will vary with vehicle speeds.

If vehicle speed drops below 10 mph, the primary valve spring will move the primary governor valve in, closing the "line leakage" exhaust port at the primary valve. Pressure in the "line leakage" passage will become equal to line pressure, forcing the secondary governor valve in. This action shuts off line pressure feed to the governor passage and exhausts the governor circuit.

When the secondary governor valve is regulating, governor pressure will be delivered to the cut-back valve, end of the 2-3 shift valve, 1-2 shift valve and the end of the line pressure coasting boost valve. Figure 10 shows the relationship between governor pressure and output shaft RPM.

Throttle Booster Valve. Throttle plate openings above 50° provide very little change in engine vacuum as compared to throttle plate openings below 50°. The throttle booster valve is provided to boost throttle pressure and provide the necessary shift delay for engine throttle plate openings above 50°.

Below approximately 60 PSI primary T.V. pressure, T.V. pressure flows to and through the throttle boost valve unaffected, working on the end of the boost valve and on the area differential on the spring side of the boost valve. As a consequence, T.V. pressure passes through the throttle boost valve unaffected.

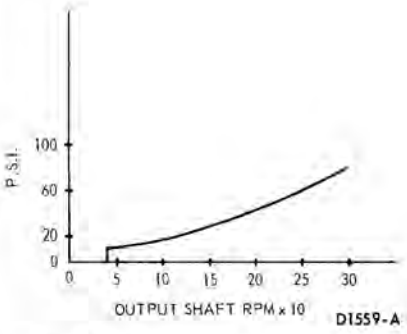


FIG. 10—Governor Pressure Regulator

When T.V. pressure increases above 60 psi, the force created by T.V. pressure acting on the end of the throttle boost valve, minus the force of T.V. pressure acting on the area differential on the spring side, will exceed the force of the spring. This causes the valve to move against the spring, closing off primary T.V. pressure to the area differential on the spring side and permitting this area to be fed from line pressure, causing a boost in the pressure used for shift delay only. Because the area of the end of the throttle boost valve exceeds the area differential on the spring side by 2½ to 1, throttle boost pressure above 60 psi primary T.V. pressure will increase 2.5 psi, per 1 psi primary T.V.

T.V. pressure from the throttle booster valve is delivered to the downshift valve and throttle modulator valve.

Figure 9 shows the relationship between primary T.V. pressure and boosted throttle pressure.

Throttle Modulator Valve. The throttle modulator valve, located in the end of the 2-3 shift valve bore reduces throttle pressure which acts on the ends of the 2-3 shift valve and on the area differential of the 1-2 shift valve. Modulated throttle pressure in these areas provides shift delay in relation to throttle opening.

Cut Back Valve. Increased line pressure is required to prevent clutch and band slippage under stall conditions. Dependent upon vehicle speed, the requirements for increased line pressure are considerably reduced. When governor pressure acting on the end of the cutback valve exceeds the force of T.V. pressure acting on its area opposing governor, the cutback valve will move cutting off primary T.V. pressure being fed to the upper valley of the pressure booster valve. This action reduces the assist that the pressure booster valve provides to the main regulator valve spring. The cutback valve movement will therefore vary with engine throttle opening and vehicle speed.

Line Pressure Coasting Boost Valve. Primary T.V. pressure is delivered to the end of the coasting boost valve and through the valve bore to the lower end of the pressure booster valve, providing increased control pressure required for

"throttle-on" operation. When the throttle is closed at speeds above 50 mph approximately, governor pressure will force the coasting boost valve down, allowing control pressure to be delivered across the coasting boost valve, to the end of the pressure booster valve. This action results in an increased control pressure to insure adequate intermediate band holding pressure on a coasting 3-2 downshift when using manual low for engine breaking, at speeds above 50 mph approximately.

1-2 Shift Valve Train. The 1-2 shift valve train is composed of the 1-2 shift valve, the D2 valve, and the 1-2 shift valve spring.

(D-1 RANGE). In D1 range the 1-2 shift valve is held closed (up) by modulated throttle pressure acting on the differential area between the two lands of the 1-2 shift valve, by "D" oil pressure acting on the differential in area between the two lands at the spring end of the D2 valve, and by the 1-2 shift valve spring. Governor pressure tends to move the 1-2 shift valve train against these forces. When force created by governor pressure exceeds the forces holding the 1-2 shift valve train closed, the 1-2 shift valve and D2 valve will be opened (moved downward), closing the exhaust port and allowing "D" oil to pass through the D2 valve to accomplish the 1-2 shift. When the D2 valve is moved downward "D" oil is exhausted from the differential in areas provided by the lower two lands of the D2 valve. This action eliminates the force created by "D" oil which tends to hold the 1-2 shift valve train closed.

If governor pressure is reduced to the point where spring force and modulated throttle pressure force exceeds governor pressure force, the 1-2 shift valve train will move up (close) cutting off the flow of "D" oil through the valve and opening the exhaust port allowing a downshift to low gear.

If the throttle is open to the point where modulated throttle pressure acting on the 1-2 shift valve plus the 1-2 shift valve spring force creates a force greater than that provided by governor pressure, the 1-2 shift valve train will be closed, providing a torque demand downshift to low.

If the throttle is open through detent, the downshift valve moves to allow boosted throttle pressure to enter the modulated throttle pressure passage at the 1-2 shift valve to provide a forced 2-1 downshift.

(L RANGE). In "L" range "L-R" fluid enters the modulated throttle pressure passage to provide a manual low downshift to first gear. Once the transmission is in low gear "L-R" fluid, which is directed to the D2 valve, passes through the D2 valve and is delivered to the spring end of the D2 valve preventing an upshift. "L-R" fluid which passes through the D2 valve also applies the reverse and low servo.

(D2 RANGE). In D2 range, D2 oil is introduced between the 1-2 shift and D2 valves. This action opens the D2 valve and holds it open, providing a second gear start and preventing a 2-1 downshift.

2-3 Shift Valve. The 2-3 shift valve is held closed by throttle modulator valve spring force, modulated throttle pressure force, and by D1 oil pressure force acting on the differential in area of the lands of the valve to which it is delivered.

Governor pressure tends to open the 2-3 shift valve. When force created by governor pressure exceeds the forces holding the valve closed, the valve will move downward (open) closing the exhaust passage (through the manual valve) and opening the D1 passage to allow "D1" fluid to apply the direct clutch and release the intermediate servo.

With the shift valve open (down) the throttle modulator valve is held down cutting off modulated throttle pressure to the 2-3 shift valve and 1-2 shift valve. In addition, the port which delivered "D1" oil to the differential in area of the shift valve lands, is closed.

The shift valve will be reopened (moved up) causing a downshift under one or more of the following conditions:

GOVERNOR PRESSURE REDUCED. If governor pressure is reduced to the point where it can no longer hold the shift valve down against spring force and T.V. pressure force, the valve will move up causing a downshift. Under closed throttle conditions, the 2-3 shift valve will close at approximately 10 MPH (speed at which governor pressure is cut off). Since governor pressure is cut off at this speed the 1-2 shift valve train also closes at the same time. This will provide a 3-1 downshift when coasting in D1 range.

THROTTLE PRESSURE INCREASED. If throttle pressure is increased sufficiently, it will move the throttle modulator valve and consequently the 2-3 shift valve up, causing a 3-2 "torque demand downshift".

THROTTLE PRESSURE INTRODUCED BELOW 2-3 SHIFT VALVE. If the downshift valve is moved through detent, boosted throttle pressure is directed to the undersize of the 2-3 shift valve, forcing the valve up and causing a forced 3-2 downshift. Maximum 3-2 forced downshift speed is controlled by governor pressure.

EXHAUSTING D1 OIL FEED TO THE 2-3 SHIFT VALVE. If manual valve is moved to "L" range, the D1 passage which feeds oil to the 2-3 shift valve will be opened to exhaust allowing "direct clutch apply-intermediate servo release" oil to exhaust, permitting the intermediate band to apply, causing a 3-2 downshift.

2-3 Back-Out Valve. The purpose of the 2-3 back-out valve is to provide smooth upshifts, when the throttle is suddenly closed while accelerating in second gear. Operation is as follows:

NORMAL THROTTLE-ON 2-3 UPSHIFTS. When the 2-3 shift valve moves to cause a 2-3 upshift, D1 oil passes through the valve to apply the direct clutch and release the intermediate servo. This same fluid is also directed to the end of the 2-3 back-out valve. However, with throttle open, primary throttle pressure on the opposite end of the 2-3 back-out valve, assists spring force in holding the valve up, so that there will be no valve movement until after the 2-3 shift has been completed.

BACK-OUT 2-3 UPSHIFTS. When the throttle is closed during a 2-3 upshift, and before the shift is completed, there may be enough pressure in the direct clutch cylinder to apply the clutch at the reduced engine torque input, but not enough pressure to release the intermediate servo. This condition could cause a harsh 2-3 shift. However, if the throttle is closed during a 2-3 shift, primary throttle pressure will be reduced to zero (0), and reverse and direct clutch apply pressure on the end of the 2-3 back-out valve will

move the valve "down" against spring force. This action immediately connects the clutch apply circuit to the intermediate servo apply circuit, reducing the pressure on apply side of the servo to the same value as in the direct clutch (and also on the release side of the intermediate servo). When this happens, the intermediate band is released, to provide a smooth 2-3 shift.

Manual Low Valve. The manual low valve insures that the 2-3 backout valve will be moved "up" the instant that pressure drops in the direct clutch apply-intermediate servo release circuit, when a shift to manual low range is made or a forced downshift is made, from high gear. This is accomplished by directing control pressure to the end of the manual low valve, when "L" range is selected or, by directing T.V. pressure to the end of the manual low valve, when the downshift valve is moved to the downshift position.

Intermediate Band Accumulator Valve. The intermediate band accumulator valve train is composed of the intermediate band accumulator valve and spring. The intermediate band accumulator valve train in conjunction with the intermediate servo check valve controls intermediate servo apply force on all applications of the intermediate band, under all operating conditions, in D1 and D2 ranges. In low range the intermediate servo accumulator valve provides no control on the application of the intermediate band on 3-2 downshifts.

Operation is as follows:

(D1 AND D2 RANGES) (1-2 UPSHIFTS AND 3-2 DOWNSHIFTS). Fluid pressure from the D2 valve acting on the apply side of the intermediate servo piston tending to apply the servo, causes the fluid which is trapped in the intermediate servo release passage to be pressurized. This pressure acting on the area differential of the intermediate servo accumulator valve will cause the accumulator valve to move against its spring to exhaust, to maintain a certain level of pressure on the release side of the intermediate servo until it has completely stroked, applying the band. Force created by this pressure on the release side of the servo, plus spring force, is subtracted from the force of control pressure acting on the apply side of the servo, thereby controlling the servo apply force during any condition requiring the intermediate band to be on in D1 or D2 ranges.

(LOW RANGE) (3-2 DOWNSHIFT). Low and reverse pressure acting on the end of the intermediate servo accumulator valve will move the valve against the accumulator valve spring to insure that the fluid in the release side of the intermediate servo can exhaust freely.

(D1 AND D2 RANGES) (2-3 UPSHIFTS). During a 2-3 upshift, D1 oil from the 2-3 shift valve will unseat the intermediate servo check valve, bypassing the intermediate servo accumulator valve, allowing the release side of intermediate servo to be pressurized at the same pressure level as the direct clutch.

Main Control Valve – Fairlane High Performance (Models PCW-AC, AF) To provide the required calibration (pressures) the T.V. boost spring and the intermediate servo accumulator spring will be different in PCW-AC and AF models. Otherwise the main control used with these models will be the same as previously discussed.

2 IN-CAR ADJUSTMENTS AND REPAIRS

CONTROL LINKAGE ADJUSTMENTS

The transmission control linkage adjustments should be performed in the order in which they appear in this section of the manual.

THROTTLE AND DOWNSHIFT LINKAGE ADJUSTMENTS— ALL CARS

1. Apply the parking brake, and place the selector lever at N.
2. Run the engine at normal idle speed. If the engine is cold, run the engine at fast idle speed (about 1200 rpm) until it reaches normal operating temperature. When the engine is warm, slow it down to normal idle speed.
3. Connect a tachometer to the engine.
4. Adjust engine idle speed to the specified rpm with the transmission selector lever at D1 or D2, the drive positions.
5. **The carburetor throttle lever must be against the hot idle speed adjusting screw at the specified idle speed in D1 (large dot) or D2 (small dot).** To make sure that the carburetor throttle lever is against the idle adjusting screw, refer to Group 10 for the carburetor adjusting procedures.

COMET, FALCON LINKAGE— V-8 ENGINES

1. With the engine off, check the accelerator pedal for a height of 4¼ inch, measured from the top of the pedal to the floor pan. To obtain the correct pedal height, adjust the accelerator connecting link.
2. With the engine off, at the adjustable upper end of the downshift rod loosen the lock nut (Fig. 11).
3. With the carburetor choke in the OFF position, depress the accelerator pedal to the floor. Block the pedal to hold it in the wide open position.
4. Adjust the downshift rod to position the rod in the kickdown detent position. The rod has to be lengthened to the limit of its travel.
5. Back off the adjustment to allow about 1/16 inch free travel of the bellcrank assembly. Tighten the lock nut and release the accelerator pedal. Road test the car for forced downshift operation.

COMET, FALCON LINKAGE— SIX-CYLINDER ENGINES

1. With the engine stopped, adjust the carburetor throttle rod length to obtain an accelerator pedal height of 4¼ inches, measured from either top front corner of the pedal to the floor mat.
2. **Disconnect the throttle return spring and the downshift linkage return spring.**
3. Loosen the adjustment screw on the downshift control rod (Fig. 12).
4. Pull the downshift control rod and the throttle linkage Z bar up to the limit of their travel.

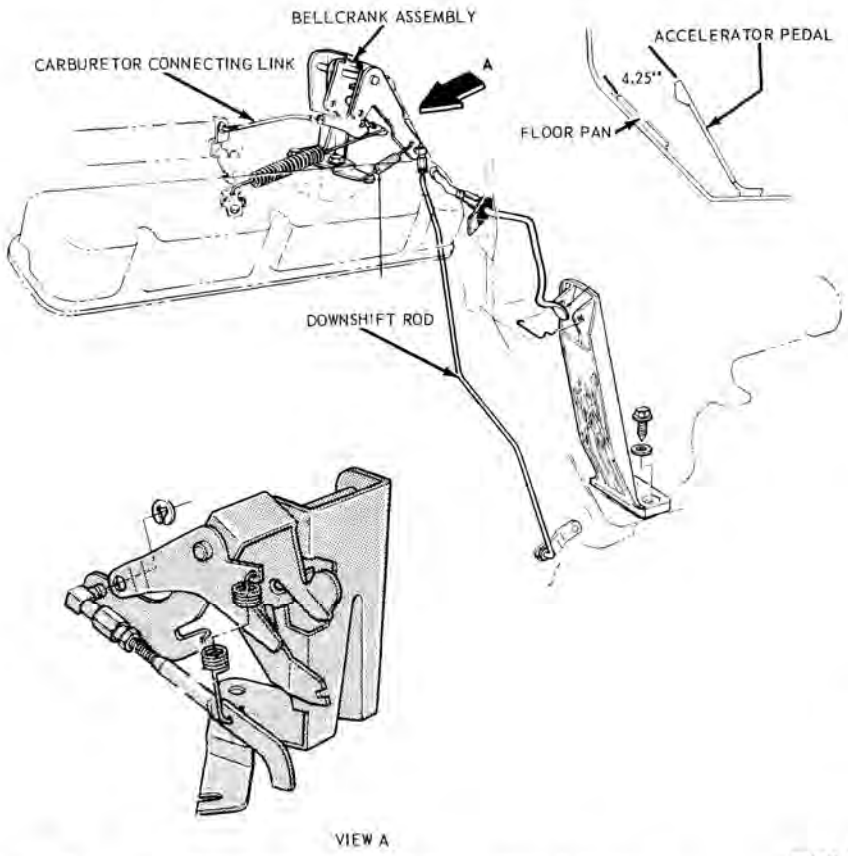


FIG. 11—Throttle Linkage—Comet-Falcon with V-8 Engine

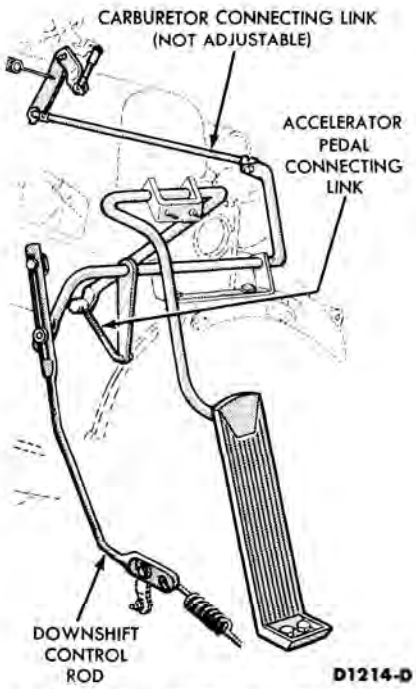


FIG. 12—Throttle Linkage—Comet-Falcon with 6-Cylinder Engine

5. Hold them in this position; then slide the adjustment screw down against the Z bar and tighten the adjustment screw.

6. Install the return springs and check the throttle and downshift linkage for full travel.

FAIRLANE LINKAGE—V-8 ENGINES

1. Adjust the accelerator connecting link to obtain a pedal height of $4\frac{5}{16}$ inches. Measure from a top corner of the pedal to the floor pan (Fig. 13.)

2. Disconnect the carburetor connecting link from the accelerator bellcrank assembly.

3. Insert a gauge pin (¼-inch drill rod) through the gauge pin holes as shown in Fig. 13.

4. Lift the carburetor connecting link to its normal operating position. Maintain forward pressure on it so that the carburetor throttle lever is solidly against the hot idle speed adjusting screw. With forward pressure on the link adjust its length so that the trunnion can be freely fitted into the accelerator assembly lever. From this free-fit position, rotate the trunnion one full turn counterclockwise to lengthen the link. Remove the gauge pin and connect the link to the accelerator assembly lever.

5. Check the alignment of the gauge pin holes. Open the throttle and permit the throttle linkage retracting spring to return the linkage to its hot idle position. Now, the pin must enter freely. If necessary, readjust the carburetor connecting link to obtain a free entry for the gauge pin. The downshift rod is not adjustable.

FAIRLANE LINKAGE—6-CYLINDER ENGINES

1. With the engine stopped, check the accelerator pedal height. When measuring from the top of the pedal to the floor pan, the pedal height should be 4⅜ inches (Fig. 14).

2. The pedal height can be adjusted, by disconnecting the carburetor rod at Point "A". Adjust the position of the trunnion on the rod to reposition the "Z" Bar to obtain the correct pedal height.

3. With the accelerator pedal at the correct engine idle height, measure the distance between the edge of the downshift lever and the bracket on the "Z" Bar. The clearance between the two parts should be $\frac{29}{32}$ of an inch.

To adjust the clearance, disconnect the downshift rod at Point "B", and adjust the trunnion to obtain the correct distance between the downshift lever and bracket.

MUSTANG LINKAGE—ALL ENGINES

1. With the engine stopped and the accelerator pedal in normal idle position, check the pedal for a height of 3⅞ inches (Fig. 15). **Be sure the fast idle cam is not contacting the fast idle adjusting screw of the carburetor.**

2. To check for free pedal travel, depress the accelerator pedal to the full-throttle position (carburetor throttle lever against full-throttle stop). Release the pedal and re-check the pedal height.

3. If necessary, adjust the accelerator pedal height as follows:

On six-cylinder engines, disconnect the carburetor return spring and carburetor rod. Adjust the length of the rod to bring the pedal height within specifications. Connect the carburetor rod and tighten the jam nut. Install the return spring.

On V-8 engines, disconnect the

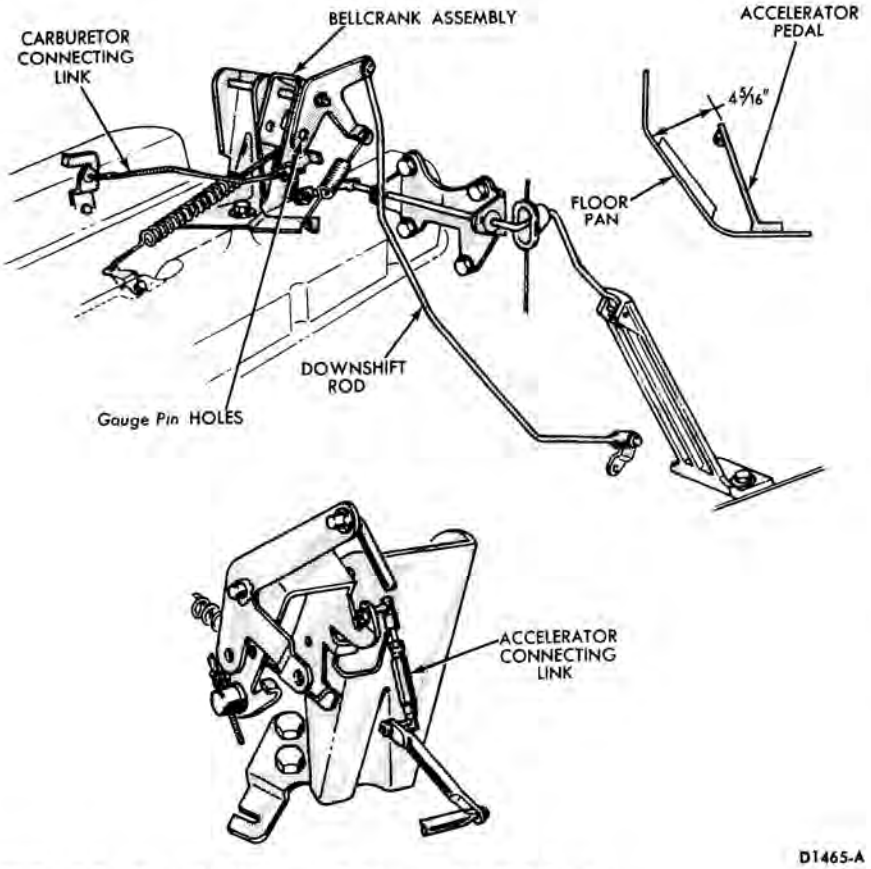


FIG. 13—Throttle Linkage—Fairlane with V-8 Engine

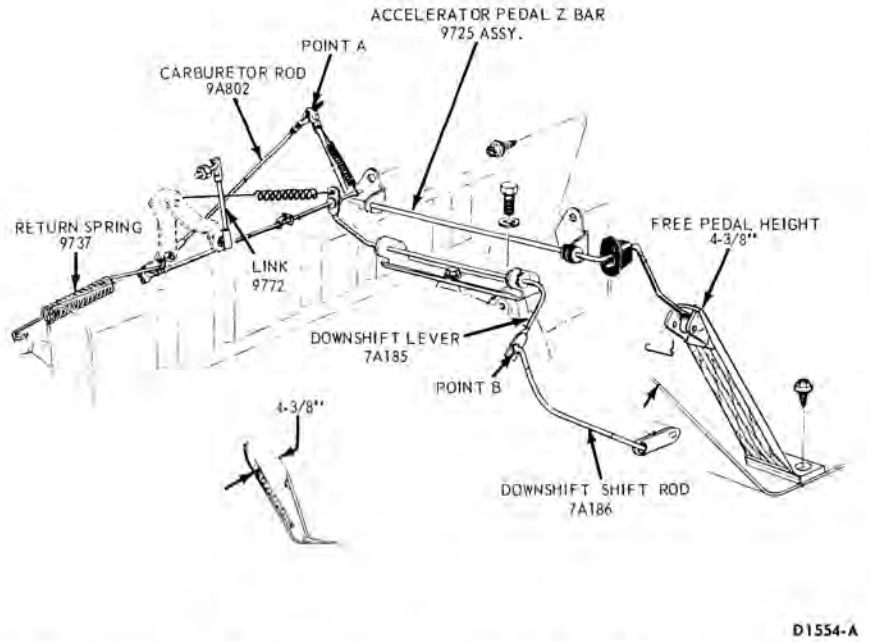


FIG. 14—Throttle Linkage—Fairlane with 6-Cylinder Engine

carburetor return spring and the carburetor rod at point "C" (Fig. 15). Adjust the length of the rod to bring the pedal height within specifications. Connect the carburetor rod and return spring.

4. If necessary, adjust the transmission kickdown linkage as follows:

On six-cylinder engines, disconnect the kickdown cable return spring at the transmission. Disconnect the carburetor return spring at the manifold. Disconnect the kickdown cable at Point "A" (Fig. 15).

Position the kickdown lever in the downshift position (carburetor-wide open position). Hold the kickdown lever on the transmission against the stop, in a counterclockwise direction (kickdown position).

Adjust the trunnion at point "A" on the kickdown cable so it aligns with the hole in the kickdown lever and install the attaching clip. Install the return springs.

On eight-cylinder engines, disconnect the kickdown return spring at the bellcrank. Disconnect the carburetor return spring (Fig. 15).

Disconnect the kickdown lever rod at point "B". Hold the carburetor rod in the wide open throttle position. The step in the rod should place the bellcrank in the downshift position. Hold the kickdown lever rod in the downward position. This positions the transmission lever in the downshift position.

Adjust the kickdown lever trunnion at point "B" so it aligns with the hole in the bellcrank. Install the trunnion and retaining clip. Release the levers and install the carburetor rod and bellcrank return springs.

MANUAL LINKAGE ADJUSTMENT

COMET, FALCON, FAIRLANE

Column Shift Transmission.

1. With the engine stopped, loosen the clamp at the shift lever at point "A" so that the shift rod is free to slide in the clamp (Fig. 16).

2. Position the transmission selector lever into the D1 (large dot) position making sure that the selector lever is against the D, stop on the selector plate.

3. Shift the manual lever at the transmission into the D1 detent position, second from the rear.

4. Tighten the clamp on the shift rod at point "A".

5. Check the pointer alignment and transmission operation for all selector lever detent positions.

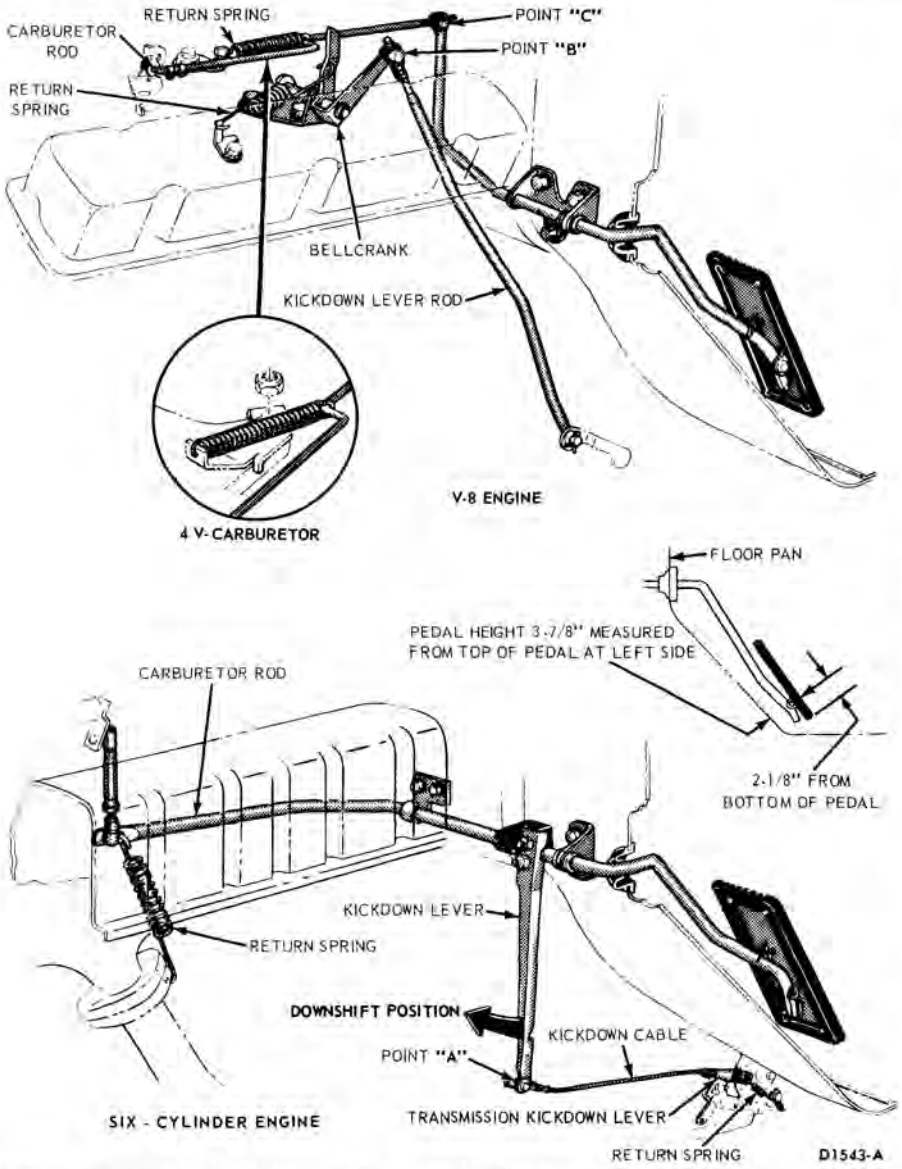


FIG. 15—Throttle Linkage—Mustang All Engines

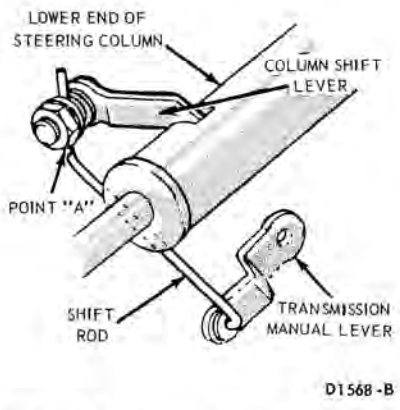


FIG. 16—Manual Linkage—Typical Remote Control

Console Shift Transmission. Before adjusting the manual linkage, check the starter neutral switch operation. If the switch needs adjusting the adjustment can be made at the time the manual linkage is adjusted. The shift ball must be tight on the selector lever.

1. With the engine stopped, check the adjustment of the button assembly on top of the shift knob (Fig. 17). The button should be flush to 0.030 inch above the knob. To adjust the button, loosen the adjustment screw in the center of the knob. Rotate the button to the proper height and tighten the lock screw. This adjustment positions the detent rod to obtain the proper alignment and detent travel of the rod.

2. Move the shift lever to the D1 detent position against the stop.

3. Raise the car and loosen the manual linkage rod retaining nut (Fig. 17). Move the transmission manual lever to the D1 position, second from the rear. The last detent position is low position.

4. With the selector lever and the transmission manual lever in the D1 position, tighten the rod retaining nut to specifications (Fig. 17).

MUSTANG

Linkage Adjustment.

1. Position the transmission selector lever in D1 (large dot) position (Fig. 18).

2. Raise the car and loosen the manual lever control rod retaining nut. Move the transmission manual lever to the D1 position, second detent position from the back of the transmission. The last detent position is manual low.

3. With the transmission selector lever against the stop and manual lever in the D1 positions, torque the retaining nut 20 to 25 ft-lbs.

4. Check the operation of the transmission in each selector lever position.

Selector Lever Removal Adjustment and Installation.

1. Raise the car and remove the manual lever control rod retaining nut (Fig. 18).

2. Lower the car, remove the selector lever handle retaining screw.

3. Remove the dial housing retaining screws and the housing.

4. Remove the selector lever plate retaining screws and the plate.

5. Disconnect the dial indicator light (Fig. 19).

6. Remove the selector housing and lever assembly retaining bolts. Remove the selector lever and housing.

7. Remove the selector lever to housing retaining nut (Fig. 19). Remove the lever from the housing.

8. Install the selector lever in the housing and install the retaining nut. Torque the nut to 20 to 25 ft-lbs.

9. Install the dial indicator light.

10. Install the selector lever handle.

11. Position the selector lever as shown in Figure 19. With a feeler gauge check the clearance between the detent pawl and plate. The clear-

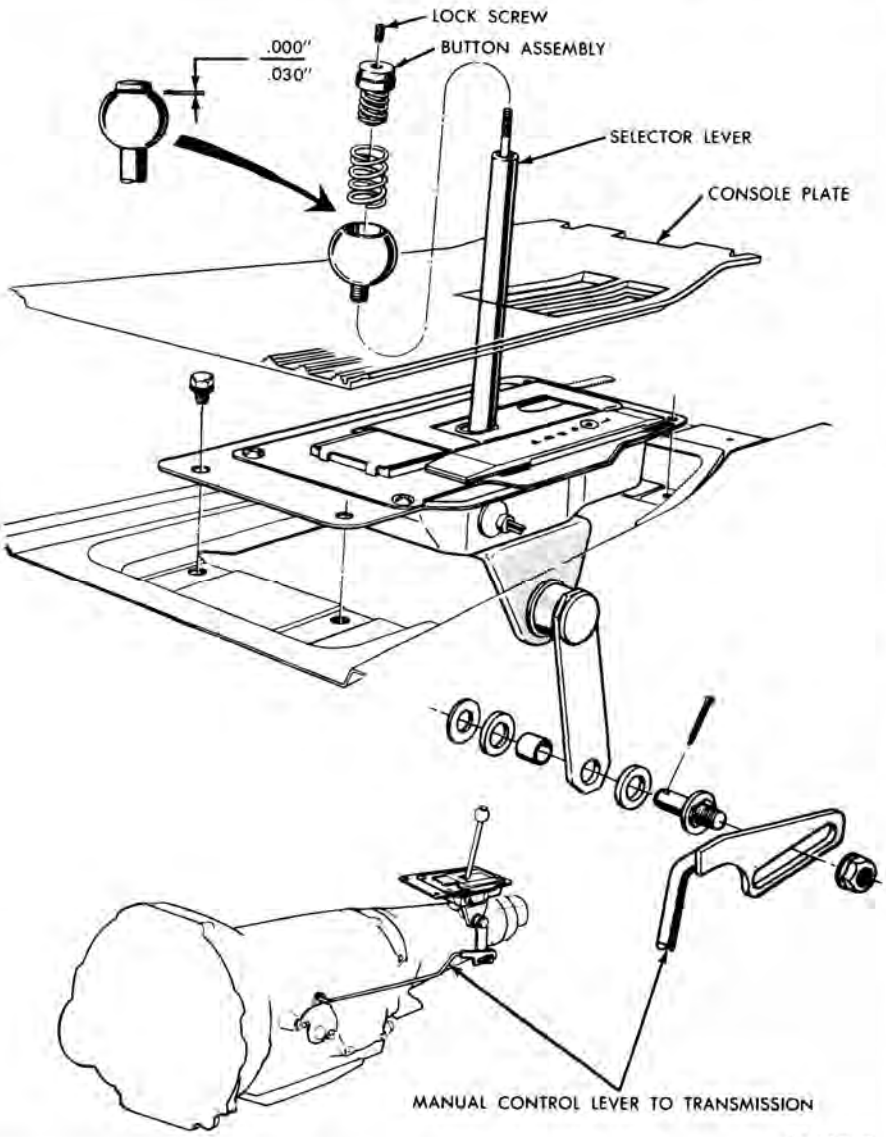


FIG. 17—Manual Linkage Adjustment—Console

ance should be 0.005 to 0.010 inch. If necessary adjust the height of the detent pawl as shown in Figure 19.

12. Remove the handle from the selector lever.

13. Install the selector housing and lever assembly as shown in Figure 18. Torque the retaining bolts 8 to 12 ft. lbs.

14. Connect the dial indicator light wires.

15. Install the selector lever plate and tighten the retaining screws.

16. Install the dial housing and tighten the retaining screws.

17. Install the selector lever handle and tighten the retaining screw.

18. Position the selector lever in the D1 (large dot) position.

19. Raise the car. Install the transmission manual lever rod to the selector lever. Adjust the manual linkage.

20. Lower the car and check the transmission operation in each selector lever detent position.

NEUTRAL START SWITCH ADJUSTMENT

1. With the manual lever properly adjusted, loosen the two switch retaining bolts (Fig. 20).

2. With the transmission manual lever in neutral, rotate the switch and insert the gauge pin (No. 43 drill shank end) into the gauge pin holes of the switch. **The gauge pin has to be inserted to a full $^{31}/_{64}$ inch into the three holes of the switch (Fig. 20).**

3. Torque the two switch retaining bolts to specification. Remove the gauge pin from the switch.

4. Check the operation of the switch. The engine should start only with the transmission selector lever in Neutral and Park.

NEUTRAL START SWITCH REPLACEMENT

1. Remove the downshift linkage rod from the transmission downshift lever.

2. Remove the transmission downshift outer lever retaining nut and lever (Fig. 20).

3. Remove the two neutral start switch retaining bolts.

4. Disconnect the two multiple wire connectors. Remove the neutral switch from the transmission.

5. Install the neutral start switch on the transmission. Install the two retaining bolts.

6. With the transmission manual lever in neutral, rotate the switch and install gauge pin (No. 43 drill) into the gauge pin hole (Fig. 20).

7. Tighten the switch retaining bolts to specification and remove the gauge pin.

8. Install the outer downshift lever and retaining nut, and torque the nut to specification. Install the downshift linkage rod to the downshift lever.

9. Install the switch wires. Connect the wire multiple connectors, red to red and blue to blue. Check the operation of the switch in each detent position. The engine should start only with the transmission selector lever in N (neutral) and P (park).

BAND ADJUSTMENTS

INTERMEDIATE BAND

1. Clean all the dirt from the band adjusting screw area. Loosen the lock nut several turns.

2. With the tool shown in Fig. 21, tighten the adjusting screw until the tool handle clicks. The tool is a preset torque wrench which clicks and overruns when the torque on the adjusting screw reaches 10 ft-lbs.

3. Back off the adjusting screw exactly 1¾ turns.

4. Hold the adjusting screw from turning and torque the locknut to specification.

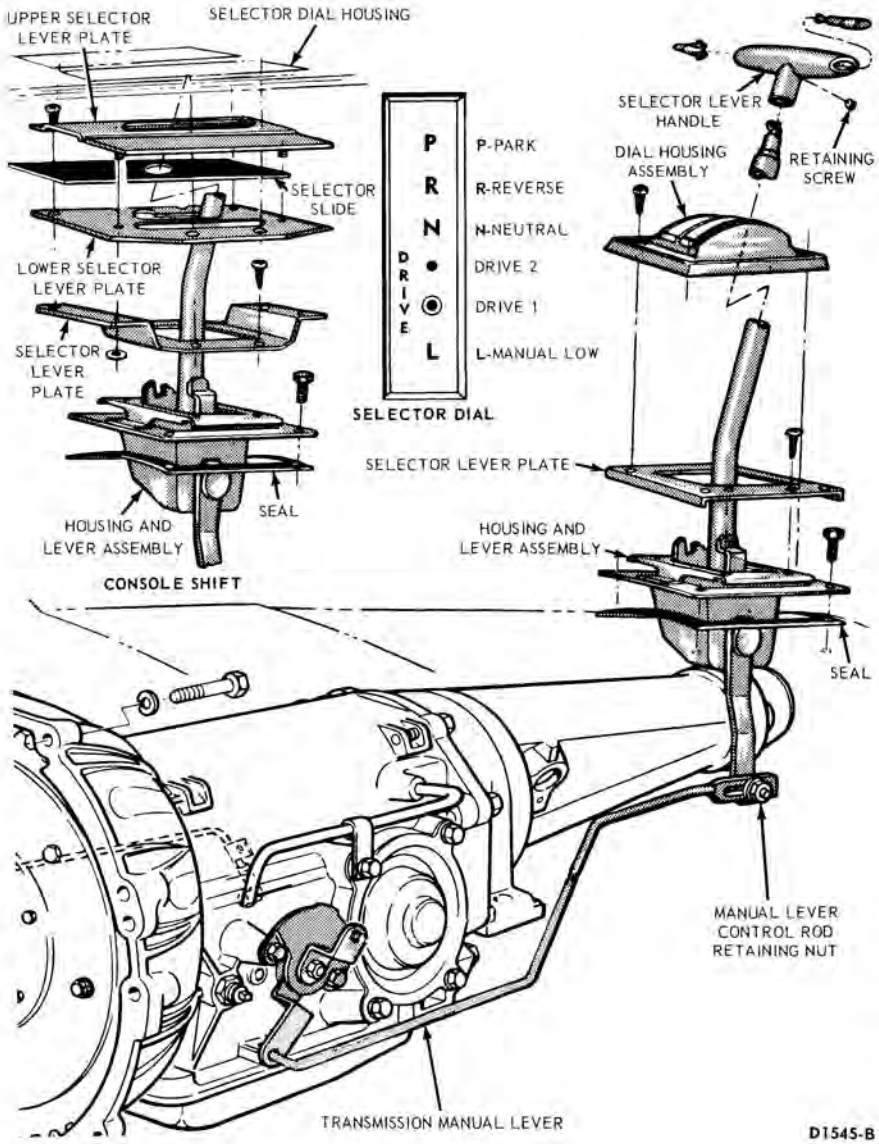


FIG. 18—Manual Linkage—Mustang

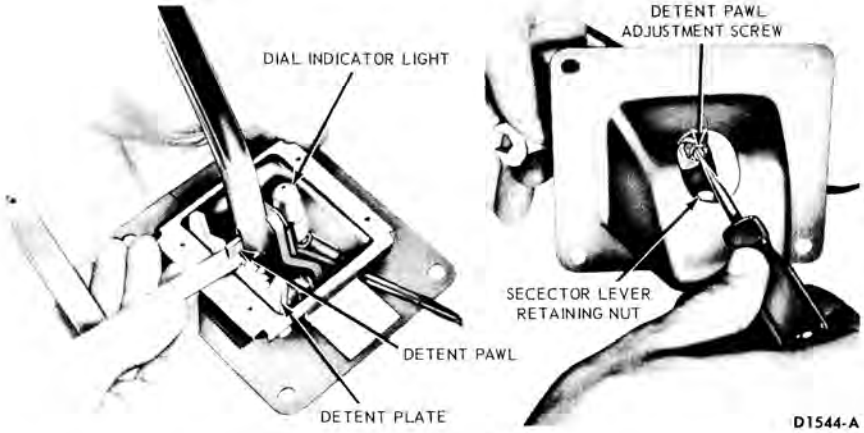


FIG. 19—Selector Lever Detent Pawl Adjustment—Mustang

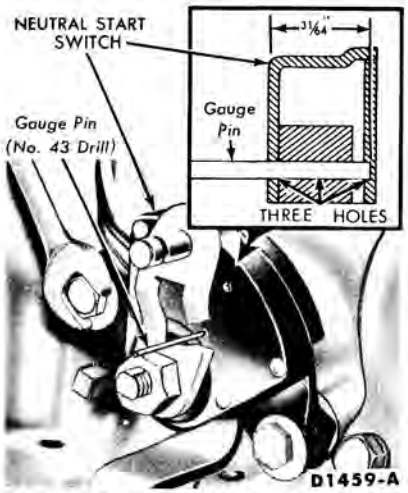


FIG. 20—Neutral Start Switch



FIG. 21—Intermediate Band Adjustment

LOW-REVERSE BAND

1. Clean all the dirt from the band adjusting screw area. Loosen the lock nut several turns.

2. With the tools shown in Fig. 22, tighten the adjusting screw until the



FIG. 22—Low-Reverse Band Adjustment

tool handle clicks. The tool is a preset torque wrench which clicks and overruns when the torque on the adjusting screw reaches 10 ft-lbs.

3. Back off the adjusting screw exactly 3 full turns.

4. Hold the adjusting screw from turning and torque the lock nut to specification.

OIL PAN AND CONTROL VALVE BODY REPLACEMENT

1. Raise the car so the transmission oil pan is accessible.

2. Loosen the oil pan retaining bolts and lower one edge of the oil pan to drain the transmission oil. **If the same fluid is to be used again, filter the fluid through a 100 mesh screen. Re-use the fluid only if it is in good condition.**

3. Remove the transmission oil pan retaining bolts, oil pan and gasket.

4. Remove the valve body to case retaining bolts (Fig. 33). Remove the valve body from the case and the inner transmission control levers.

5. Refer to the "Major Repair Operation" for control valve body repair operation.

6. Thoroughly clean and remove all the gasket material from the oil pan and the oil pan mounting face of the case. Install the valve body to the case, engaging the transmission inner control levers with the valve body manual and downshift valves.

7. Install the valve body to case retaining bolts. Torque the bolts to specification. **Operate the external manual and downshift levers to check for proper travel of the valve body manual and downshift valves.**

8. Place a new gasket on the oil pan. Install the oil pan and retaining bolts. Torque the bolts to specification.

9. Lower the car and fill the transmission with fluid. Check the transmission oil pan area for oil leakage.

INTERMEDIATE SERVO REPAIR

1. Raise the car and remove the four servo cover to case retaining bolts.

2. Remove the servo cover, gasket, piston, and piston return spring. Remove the piston from the cover (Fig. 53).

3. Remove the piston seals and cover gasket.

4. Install new piston seals on the piston. Lubricate the piston seals with clean transmission oil. Install the servo piston in the cover.

5. Install the piston return spring in the case. Place a new gasket on the cover. Install the piston and cover into the transmission case. Use two $\frac{5}{16}$—18x1¼ bolts, 180° apart to position the cover against the case.

6. Install the two servo cover retaining bolts. Remove the two 1¼-inch bolts and install two retaining bolts. Torque the bolts to specification.

7. Adjust the intermediate band. Lower the car and check the transmission fluid level.

8. If the band cannot be adjusted properly, the struts are not in position. Remove the oil pan and valve body. Install the struts, valve body, oil pan, and adjust the band. Refill the transmission with oil.

LOW-REVERSE SERVO PISTON REPLACEMENT

1. Raise the car on a hoist.

2. Loosen the reverse band adjusting screw lock nut. Tighten the reverse band adjusting screw to 10 ft.-lbs torque. (Tightening the screw will insure that the band strut will be held against the case by the band, preventing it from falling down when the reverse servo piston assembly is removed).

3. Remove the four servo cover to case retaining bolts. Remove the identification tag and vent tube retaining clip. Remove the servo cover and seal from the case.

4. Remove the reverse servo piston and stem from the case as an assembly.

5. Insert a small screwdriver in the hole of the piston stem (Fig. 52). Remove the piston attaching nut.

6. Remove the servo piston from the stem. The piston seal cannot be replaced without replacing the piston. The seal is bonded to the piston.

7. Install a new piston on the stem. Install the retaining nut. Torque the nut to specification.

8. Install the reverse servo piston assembly in the case. Make sure that the release spring is in position.

9. Install the reverse servo cover and a new seal, positioning the breather tube clip and service identification tag under the proper cover to case bolts. Torque the bolts to specification.

10. Adjust the reverse band.

11. Lower the car and check the transmission fluid level.

EXTENSION HOUSING BUSHING AND REAR SEAL REPLACEMENT

1. Disconnect the drive shaft from the transmission.

2. When only the rear seal needs replacing, carefully remove it with a tapered chisel or the tools shown in Fig. 23. Remove the bushing as shown in Fig. 24. **Use the bushing remover carefully so that the spline seal is not damaged.**

3. When installing a new bushing use the special tool shown in Fig. 25.

4. Before installing a new seal, inspect the sealing surface of the universal joint yoke for scores. If scores are found, replace the yoke.

5. Inspect the counterbore of the housing for burrs and remove with crocus cloth.

6. Install the seal into the housing with the tool shown in Fig. 26. The seal should be firmly seated in the bore. Coat the inside diameter of the fiber portion of the seal with B8A-19589-A lubricant.

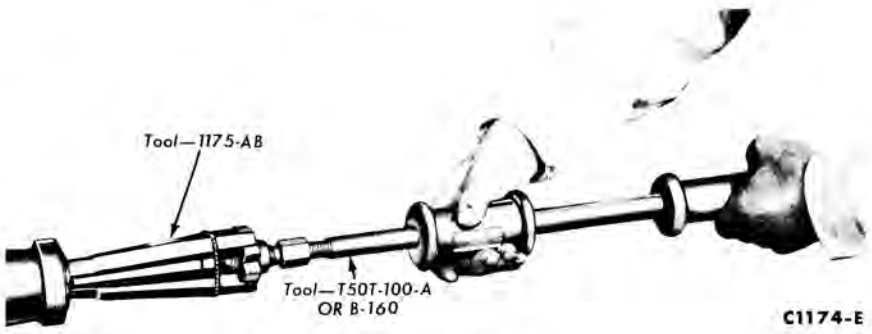


FIG. 23—Removing Extension Housing Seal

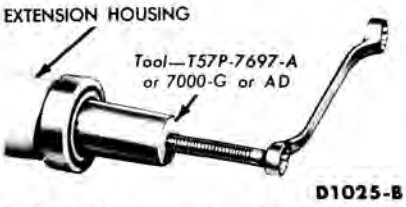


FIG. 24—Removing Extension Housing Bushing

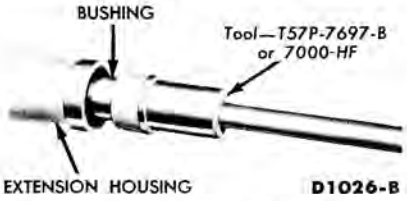


FIG. 25—Installing Extension Housing Bushing

7. Coat the front universal joint spline with B8A-19589-A lubricant and install the drive shaft.

EXTENSION HOUSING AND GOVERNOR REPLACEMENT

1. Raise the car on the hoist.

2. Remove the drive shaft. Position the transmission jack to support the transmission.

3. Remove the speedometer cable from the extension housing.

4. Remove the extension housing to crossmember mount retaining bolts. Raise the transmission and remove the mounting pad between the extension housing and the crossmember.

5. Loosen the extension housing retaining bolts to drain the transmission fluid. Disconnect the exhaust inlet pipes at the manifold and lower the inlet pipes.

6. Remove the six extension housing-to-case retaining bolts and remove the extension housing.

7. Remove the governor housing to governor distributor retaining bolts (Fig. 27). Remove the governor housing from the distributor.

8. Refer to "Major Repair Operations" for governor repair operations.

9. Install the governor housing on the governor distributor (Fig. 27). Install the retaining bolts and torque the bolts to specification.

10. Install a new extension housing gasket on the case. Install the extension housing and six retaining bolts. Torque the bolts to specification.

11. Install the transmission mounting pad to the crossmember. Lower the transmission and install the extension housing to crossmember retaining bolts. Torque the retaining bolts to specification. Remove the transmission jack.

12. Install the speedometer cable in the extension housing. Install the drive shaft.

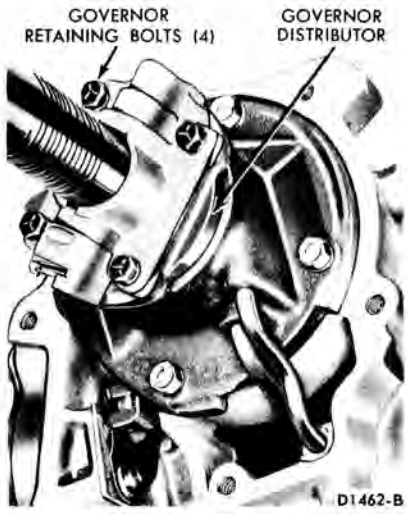


FIG. 27—Governor Installed

13. Install the inlet pipes on the manifold.

14. Lower the car and fill the transmission with fluid.

15. Check the extension housing area for fluid leakage.

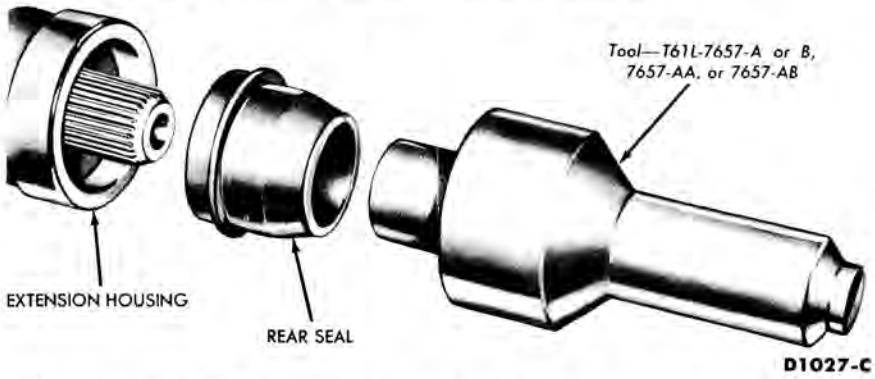


FIG. 26—Installing Extension Housing Seal

3 REMOVAL AND INSTALLATION

REMOVAL

1. Raise the car and remove the three converter cover retaining bolts, at the lower front side of the converter housing. Remove the cover.

2. Remove the two converter drain plugs (Fig. 28). Drain the oil from the converter. Install the two converter drain plugs.

3. Remove the drive shaft and install the extension housing seal replacer tool in the extension housing.

4. Remove the vacuum line hose from the transmission vacuum unit. Disconnect the vacuum line from the retaining clip.

5. Remove the two extension housing to crossmember bolts.

6. Remove the speedometer cable from the extension housing.

7. Disconnect the exhaust pipe flange from the manifolds.

8. Remove the parking brake cable from the equalizer lever.

9. Loosen the 11 transmission oil pan bolts and drain the oil at one corner of the oil pan. Tighten the retaining bolts.

10. Disconnect the oil cooler lines from the transmission case. Remove the oil filler tube from the case.

11. Remove the manual and kickdown linkage rods from the transmission control levers.

12. Disconnect the neutral start switch wires from the retaining clamps and connectors.

13. Remove the starter cable. Remove the starter retaining bolts and



FIG. 28—Converter Drain Plug Location

remove the starter from the converter housing.

14. Remove the four converter to flywheel retaining nuts.

15. Position the transmission jack to support the transmission and secure the transmission to the jack with a safety chain.

16. Remove the four crossmember and mounting pad retaining bolts and lower the crossmember.

17. Remove the five converter housing to engine retaining bolts. Lower the transmission (Fig. 29), and remove it from under the car.

INSTALLATION

1. With the converter properly installed place the transmission on

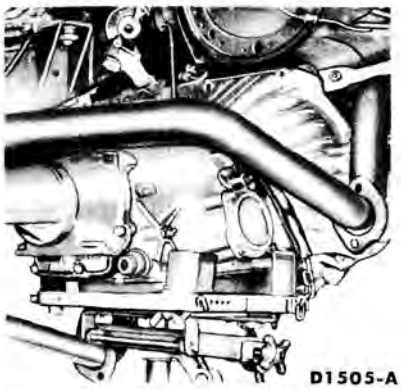


FIG. 29—Transmission Mounted on Jack

the jack (Fig. 29). Secure the transmission to the jack with the safety chain.

2. Raise the transmission into position and install the five converter housing to engine retaining bolts. Torque the bolts to specification. Remove the safety chain from the transmission.

3. Position the crossmember and mounting pad into position and install the four retaining bolts. Torque the bolts to specifications.

4. Lower the transmission and install the extension housing and cross member retaining bolts. Torque the bolts to specification.

5. Install the four flywheel to converter retaining nuts. Torque the nuts to specification.

6. Remove the transmission jack. Install the vacuum hose on the transmission vacuum unit. Install the vacuum line retaining clip.

7. Install the transmission oil filler tube. Connect the oil cooling lines to the transmission case.

8. Connect the neutral start switch wires to their respective connectors and secure the harness in the retaining clamps.

9. Install the linkage rods on the transmission downshift and manual control levers.

10. Install the speedometer cable on the extension housing.

11. Connect the exhaust inlet pipes to the manifolds.

12. Install and adjust the parking brake cable at the equalizer lever.

13. Install the converter housing cover and torque the retaining bolts to specification.

14. Install the starter and torque the retaining bolts to specification. Install the starter cable.

15. Install the drive shaft. Torque the companion flange U-bolts retaining nuts to specification.

16. Lower the car and fill the transmission with fluid. Adjust the manual and kickdown linkage.

4 MAJOR REPAIR OPERATIONS

Before removing any of the subassemblies, thoroughly clean the outside of the transmission to prevent dirt from entering the mechanical parts. During the repair operations, refer to Part 7-1 for common adjustments and repairs or cleaning and inspection procedures.

During the transmission disassembly or assembly operations, ten thrust washers located between the sub-assemblies must be removed and installed. It is important that each thrust washer be in the correct position during the assembly operation.

To properly locate and identify the thrust washers, the various positions of the thrust washers are shown in the illustrations and are numbered 1 through 10. Number 1 is the first thrust washer located at the front pump. The last thrust washer, No. 10, is located at the parking gear.

DISASSEMBLY OF TRANSMISSION

1. Remove the converter from the transmission front pump and converter housing.

2. Remove the transmission vacuum unit with the tool shown in Fig. 30. Remove the vacuum unit gasket and control rod.

3. From the vacuum unit hole in the case, remove the primary throttle valve (Fig. 31).

4. Remove the two extension housing to case retaining bolts and mount the transmission in the holding fixture as shown in Fig. 32.

5. Remove the 11 oil pan retaining bolts, and the oil pan and gasket.

6. Remove the eight control valve body retaining bolts (Fig. 33). Remove the control valve body from the case.

7. Loosen the intermediate band adjusting screw (Fig. 34) and remove the intermediate band struts from the case. Loosen the low-reverse band adjusting screw and remove the low-reverse band struts (Fig. 34).

TRANSMISSION END PLAY CHECK

1. To keep the output shaft in alignment during the end play check, install the extension housing oil seal replacer tool or a front universal

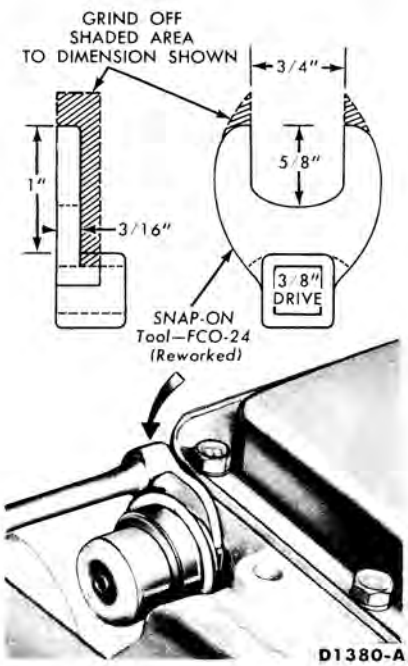


FIG. 30—Removing Vacuum Unit



FIG. 31—Removing or Installing Primary Throttle Valve



FIG. 32—Transmission Mounted in Holding Fixture

joint yoke in the extension housing.

2. Remove one of the converter housing and front pump to case retaining bolts and mount the dial indicator as shown in Fig. 35.

3. The input shaft is a loose part and has to be properly engaged with the spline of the forward clutch hub during the end play checking procedure. Move the input shaft and gear train toward the back of the transmission case.

4. With the dial indicator contacting the end of the input shaft, set the indicator at zero (Fig. 35).

5. Insert a screwdriver behind the input shell (Fig. 35). Move the input shell and the front part of the gear train forward.

6. Record the dial indicator reading. The end play should be 0.008 to 0.042 inch. If the end play is not within specifications, **both selective thrust washers (Fig. 31) must be replaced.**

When it is necessary to change thrust washers, use the selective thickness of thrust washer No. 2 to obtain the proper end play. Fig. 36 gives the selectivity that is available to obtain the correct selective thrust washers.

7. Remove the dial indicator and remove the input shaft from the front pump stator support (Fig. 37).



FIG. 33—Control Valve Attaching Bolts

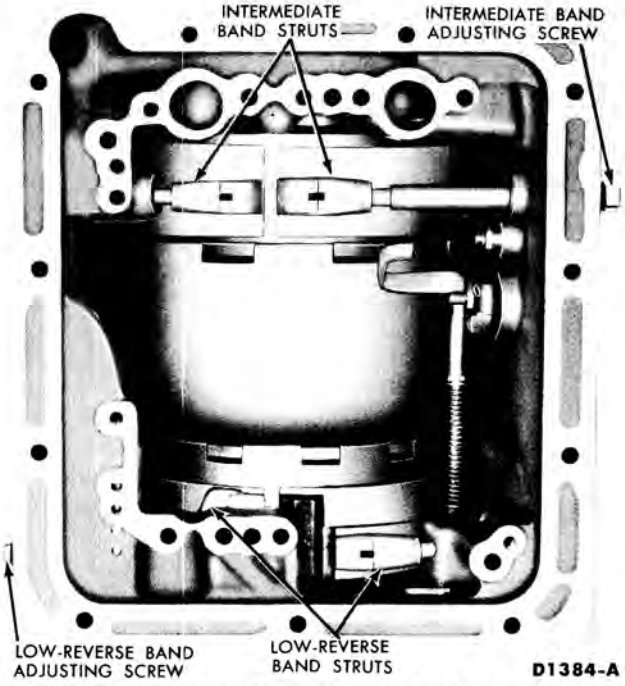


FIG. 34—Band Adjusting Screws and Struts



FIG. 35—Checking End Play

2. Remove the six converter housing and front pump to case retaining bolts. Remove the converter housing from the front pump.

3. Remove the front pump by inserting a screwdriver behind the input shell (Fig. 38). Move the input shell forward until the front pump seal is above the edge of the case. Remove the front pump and gasket from the case. If the selective thrust washer No. 1 did not come out with the front pump, remove it from the top of the reverse-high clutch.

4. Remove the intermediate and low-reverse band adjusting screws from the case. Rotate the intermediate band to align the band with the clearance hole in the case (Fig. 39). Remove the intermediate band from the case. If the intermediate band is to be re-used, do not clean the band in a vapor degreaser, or with a detergent solution. Clean the band with a lint free cloth.



FIG. 39—Removing or Installing Intermediate Band

5. Using a screwdriver between the input shell and rear planet carrier (Fig. 40) lift the input shell upward and remove the forward part of the gear train as an assembly (Fig. 41).

6. Place the forward part of the

SELECTIVE THRUST WASHERS *

WASHER NO. 1 (FIBER)		WASHER NO. 2 (STEEL-BACK BRONZE)	
THICKNESS (INCHES)	IDENTIFICATION (DYE-COLOR)	THICKNESS (INCHES)	IDENTIFICATION (STAMPED NO.)
.038-.042	GREEN	.041-.043	1
.053-.057	TAN	.053-.056	2
.070-.074	BLACK	.073-.075	3
.087-.091	YELLOW	.090-.092	4
.104-.108	BLUE	.107-.109	5
0.121-0.125	RED		
0.138-0.142	PURPLE		

* SELECTION IN PAIRS NOT APPLICABLE

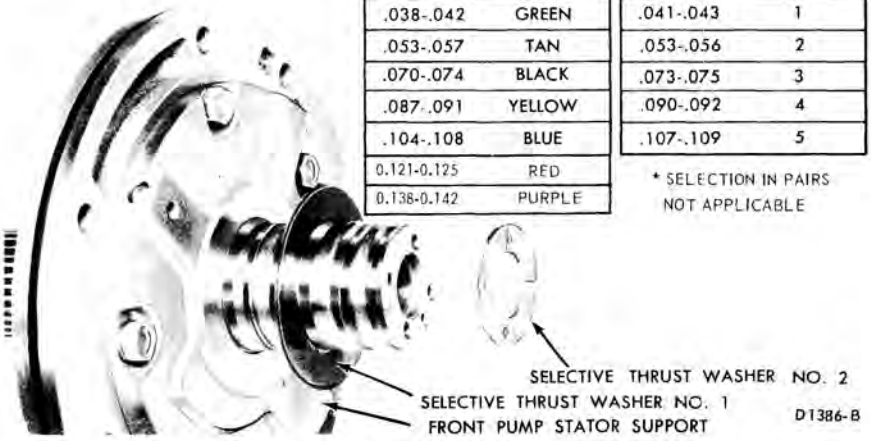


FIG. 36—Selective Thrust Washer Locations

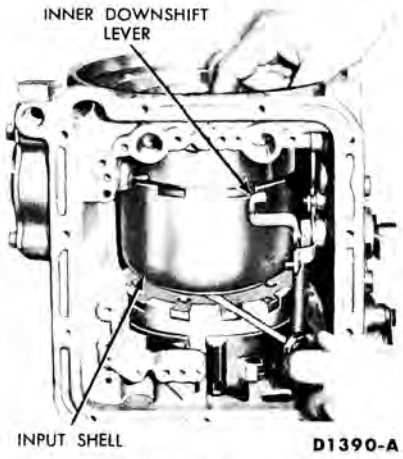


FIG. 40—Lifting Input Shell and Gear Train

REMOVAL OF CASE AND EXTENSION HOUSING PARTS

1. Rotate the holding fixture to put the transmission in a vertical position with the converter housing up.

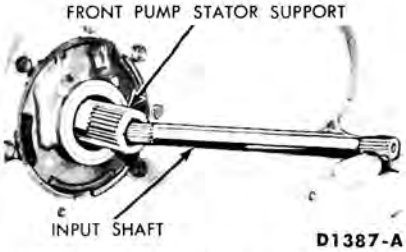


FIG. 37—Removing or Installing Input Shaft



FIG. 38—Removing Front Pump

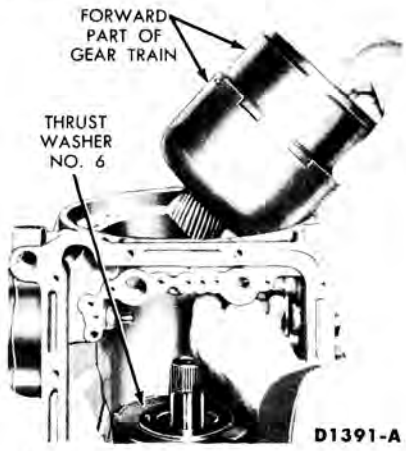


FIG. 41—Removing or Installing Forward Part of Gear Train



FIG. 42–Forward Part of Gear Train Positioned in Holding Fixture

gear train in the holding fixture shown in Fig. 42.

7. From the gear train in the holding fixture, remove the reverse-high clutch and drum from the forward clutch (Fig. 43).

8. If thrust washer No. 2 (Fig. 31) did not come out with the front pump, remove the thrust washer from the forward clutch cylinder. Remove the forward clutch from the forward clutch hub and ring gear (Fig. 43).

9. If thrust washer No. 3 (Fig. 42) did not come out with the forward clutch, remove the thrust washer from the forward clutch hub.

10. Remove the forward clutch hub and ring gear from the front planet carrier (Fig. 43).

11. Remove thrust washer No. 4 and the front planet carrier from the input shell.

12. Remove the input shell, sun gear and thrust washer No. 5 from the holding fixture (Fig. 43).

13. From inside the transmission case, remove thrust washer No. 6 (Fig. 44) from the top of the reverse planet carrier.

14. Remove the reverse planet carrier and thrust washer No. 7 from the reverse ring gear and hub (Fig. 44).

15. Move the output shaft forward and with the tool shown in Fig. 45 remove the reverse ring gear hub to output shaft retaining ring.

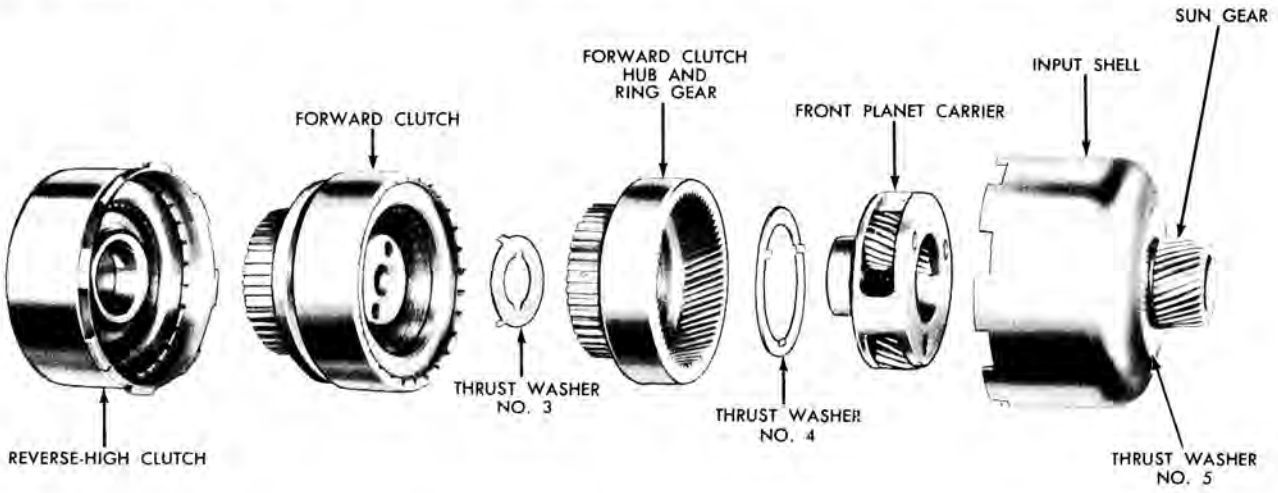


FIG. 43–Forward Part of Gear Train Disassembled

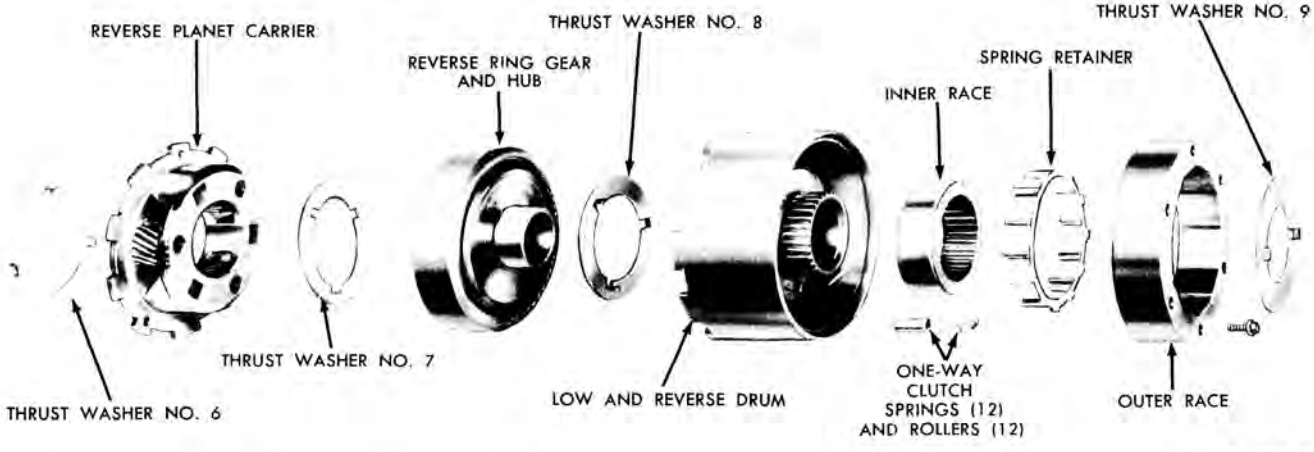


FIG. 44–Lower Part of Gear Train Disassembled



FIG. 45—Removing or Installing Reverse Ring Gear Hub Retaining Ring

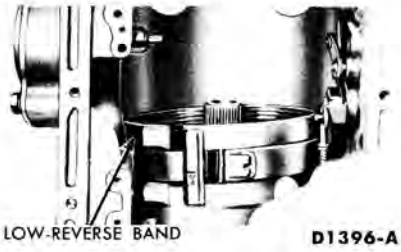


FIG. 46—Removing or Installing Low-Reverse Band



FIG. 47—Removing or Installing Output Shaft and Governor Distributor

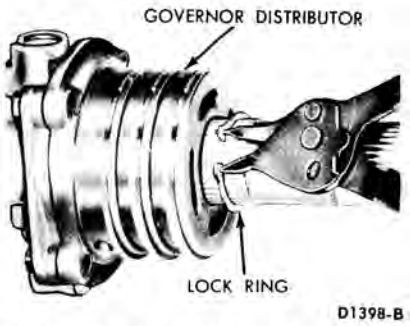


FIG. 48—Removing or Installing Governor Distributor Lock Ring

16. Remove the reverse ring gear and hub from the output shaft. Remove thrust washer No. 8 from the low and reverse drum.

17. Remove the low-reverse band from the case (Fig. 46).

18. Remove the low-reverse drum from the one-way clutch inner race (Fig. 44).

19. Remove the one-way clutch inner race by rotating the race clockwise as it is removed.

20. Remove the 12 one-way clutch rollers, springs and the spring retainer from the outer race (Fig. 44). **Do not lose or damage any of the 12 springs or rollers. The outer race of the one-way clutch cannot be removed from the case until the extension housing, output shaft and governor distributor sleeve are removed.**

21. Remove the transmission from the holding fixture. Position the transmission on the bench in a vertical position with the extension housing up. Remove the four extension housing to case retaining bolts. Remove the extension housing and gasket from the case.

22. Pull outward on the output shaft and remove the output shaft and governor distributor assembly from the governor distributor sleeve (Fig. 47).

23. Remove the governor distributor lock ring from the output shaft (Fig. 48). Remove the governor distributor from the output shaft.

24. Remove the four distributor sleeve to case retaining bolts. Remove the distributor sleeve from the case. **Do not bend or distort the oil tubes as the tubes are removed from the case with the distributor sleeve.**

25. Remove the parking pawl return spring, pawl, and pawl retaining pin from the case (Fig. 49).

26. Remove the parking pawl gear and thrust washer No. 10 from the case.

27. Remove the six one-way clutch outer race to case retaining bolts with the tool shown in Fig. 50. As the retaining bolts are removed, hold the outer race located inside the case in position. Remove the outer

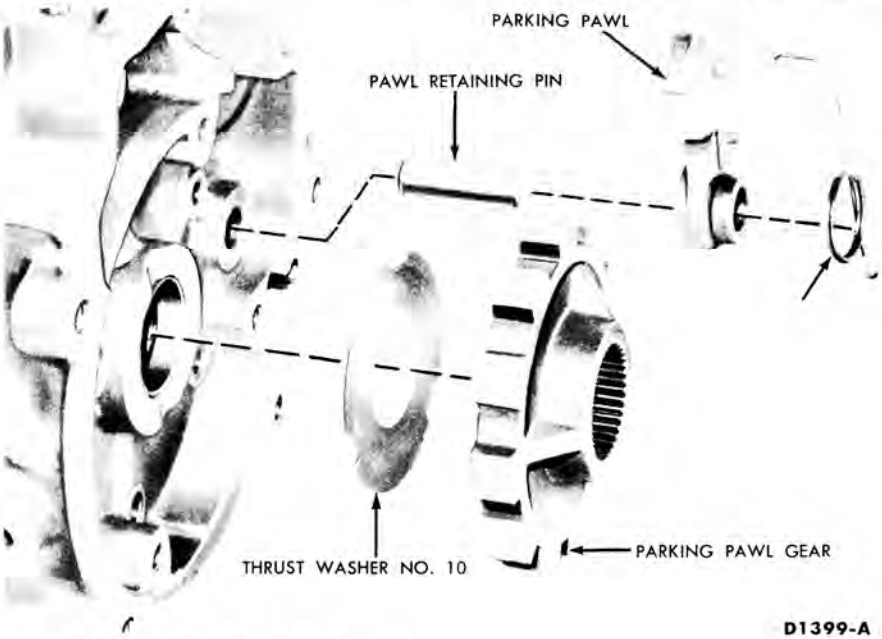


FIG. 49—Parking Pawl Mechanism

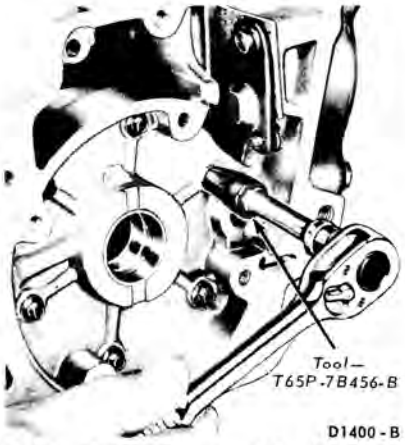


FIG. 50—Removing One-Way Clutch Outer Race Attaching Bolts

race and thrust washer No. 9 from the case (Fig. 44).

PARTS REPAIR OR REPLACEMENT

During the repair of the sub-assemblies, certain general instructions which apply to all units of the transmissions must be followed. These instructions are given here to avoid unnecessary repetition.

Handle all transmission parts carefully to avoid nicking or burring the bearing or mating surfaces.

Lubricate all internal parts of the transmission before assembly with clean automatic transmission fluid. **Do not use any other lubricants except on gaskets and thrust washers which may be coated with vaseline to facilitate assembly.** Always install new gaskets when assembling the transmission.

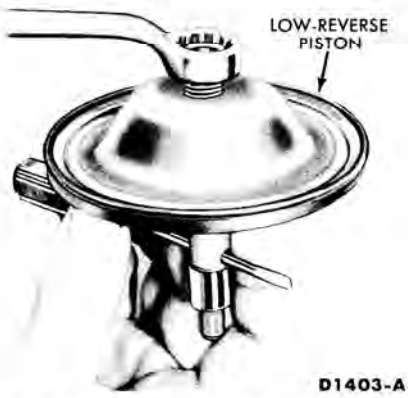


FIG. 52—Removing or Installing Low-Reverse Servo Piston

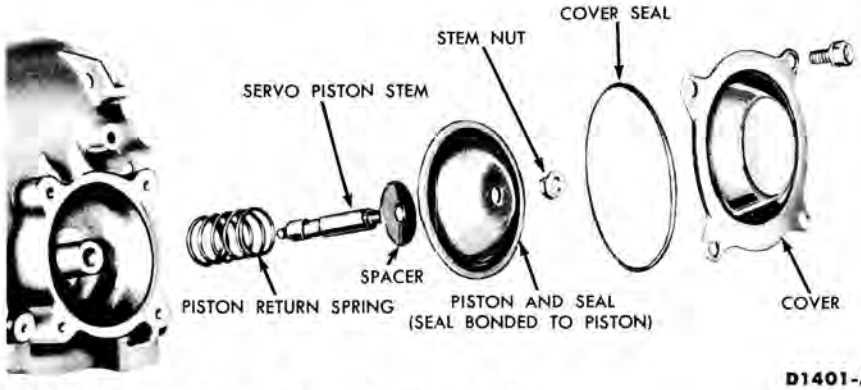


FIG. 51—Low-Reverse Servo Disassembled

Tighten all bolts and screws to the recommended torque outlined in the Specification Section.

TRANSMISSION CASE AND LINKAGE REPAIR

Low-Reverse Servo.

1. Remove the four servo cover to case retaining bolts. Remove the transmission identification tag, vent tube and retaining clip from the case.

2. Remove the servo cover, cover seal, servo piston and piston return spring from the case (Fig. 51).

3. The servo piston seal is bonded to the piston. If the seal has to be replaced, replace the piston assembly which includes the seal. Disassemble the servo piston from the piston rod by inserting a small screwdriver in the hole of the piston rod and removing the piston retaining nut (Fig. 52). Install the new servo piston and torque the piston retaining nut to specification.

4. Place the piston return spring in the servo bore of the case. Lubricate the piston seal with clean transmission oil and install the servo piston (Fig. 51).

5. Place a new cover seal on the cover and install the servo cover. Install the identification tag and the vent tube and retaining clip. Install the four cover retaining bolts. Torque the cover to case retaining bolts to specification.

Intermediate Servo Repair

1. Remove the four servo cover to case retaining bolts.

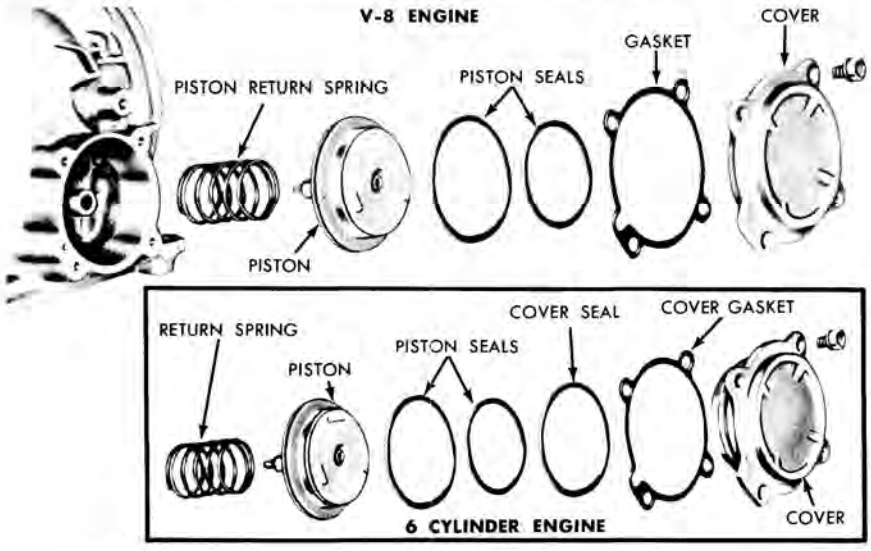


FIG. 53—Intermediate Servo Disassembled



FIG. 54—Removing Intermediate Servo Piston—6-Cylinder Engine

2. Remove the servo cover, gasket, servo piston, and piston return spring from the case (Fig. 53).

3. On a transmission used with six cylinder engines, remove the intermediate servo piston from the cover by inserting air pressure into the pressure hole in the cover (Fig 54).

4. Remove the seal rings from the servo piston and cover.

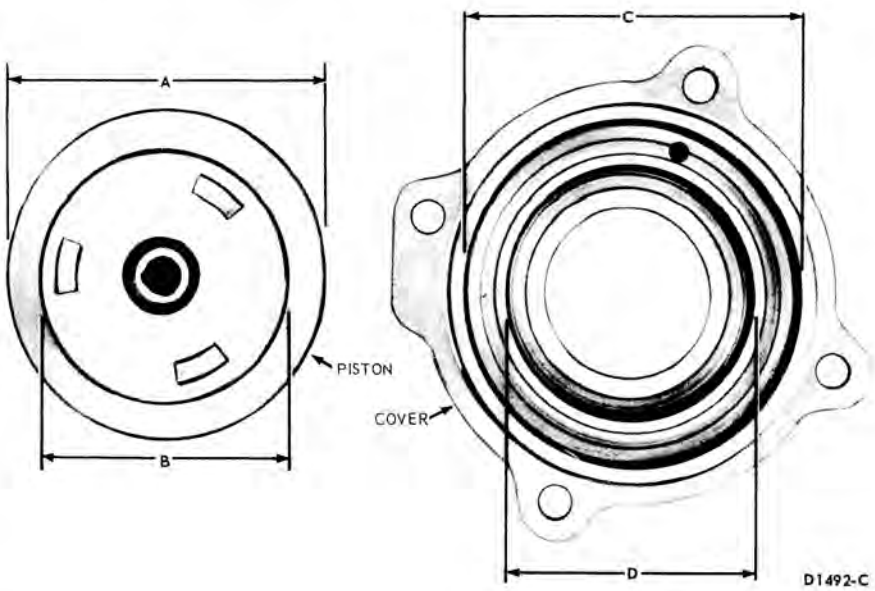
5. Install a new seal on the cover and servo piston. Figure 55 shows the correct servo piston and cover for each transmission model. Lubricate the seals with clean transmission oil. Install the piston into the cover. Be careful not to damage the piston seal.

6. Install the piston return spring in the servo bore of the case.

7. Place a new gasket on the servo cover. Position the servo piston and cover assembly into the case. Use two 5/16-18 bolts, 1¼ inch long, 180° apart, to position the cover against the case. Install two cover retaining bolts. Remove the two 1¼ inch bolts and install the other two cover retaining bolts. Torque the cover retaining bolts to specification.

Downshift and Manual Linkage

1. Remove the downshift outer lever retaining nut. Remove the downshift outer and corner levers. Remove the neutral start switch by placing a screwdriver behind the switch and carefully prying the switch off of the lever. From inside the transmission case, remove the upper retaining ring and flat washer from the manual lever link (Fig. 56). Remove the upper end of the lever link from the case retaining pin.



CAR	ENGINE	TRANS. MODEL	SERVO PISTON		SERVO COVER	
			Dia. "A"	Dia. "B"	Inside Dia. "C"	Inside Dia. "D"
Falcon	170-1V	PCS-E	3.3265	2.3765	3.340	2.390
CFFM	170-1V, 200-1V	PCS-F, G, H, J and M	3.3265	2.4865	3.340	2.500
CFFM	289-2V, 4V	PCW-AA, J, M and AD	3.7875	2.8265	None	2.840
Fairlane	289-4V	PCW, AC, AF	3.0075	None	3.021	None

FIG. 55—Intermediate Servo Piston and Cover Identification

2. From the back of the transmission case, remove the upper retaining ring and flat washer from the parking pawl link (Fig. 57). Remove the pawl link from the case retaining pin.

3. From the back of the transmission case, remove the parking pawl link, toggle rod, and manual lever link as an assembly (Fig. 58).

4. Remove the rear parking pawl link lower retaining ring, flat washer and link from the toggle rod (Fig. 59).

5. Remove the manual lever link lower retaining ring, flat washer and link from the toggle rod.

6. Remove the inner manual lever retaining nut and lever. Remove the outer manual lever from the case.

7. To remove the manual lever seal, use the tools shown in Fig. 59. To install the new seal, use the tool shown in Fig. 60.

8. Install the outer manual lever in the case. Install the inner manual lever and retaining nut (Fig. 56). Torque retaining nut to specification.

9. From the back of the transmission case, install the parking toggle rod and link assembly into the case (Fig. 58).

10. Install the parking pawl link on the case retaining pin. Install the flat washer and link retaining ring (Fig. 57).

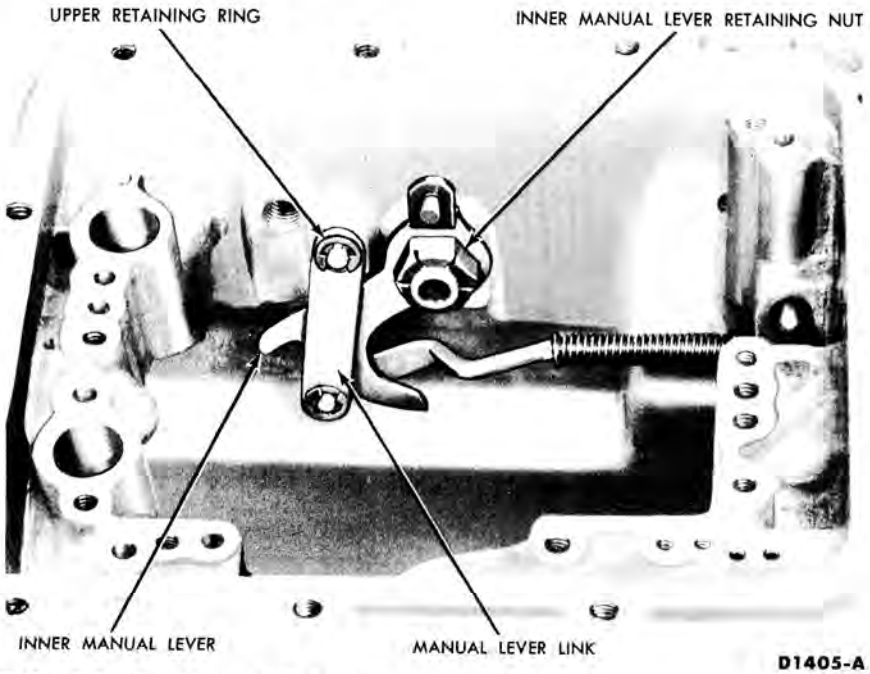


FIG. 56—Case Internal Linkage

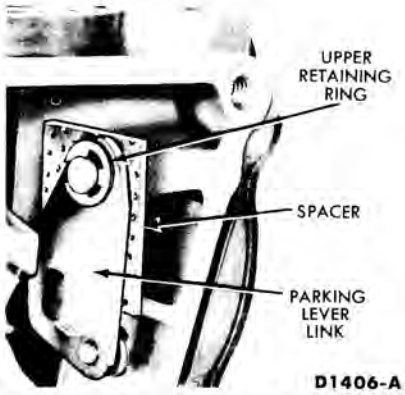


FIG. 57—Parking Pawl Link Installed

11. Position the inner manual lever behind the manual lever link, with the cam of the lever contacting the lower link pin (Fig. 62).

12. Install the upper end of the manual lever link on the case retaining pin. Install the flat washer and retaining ring.

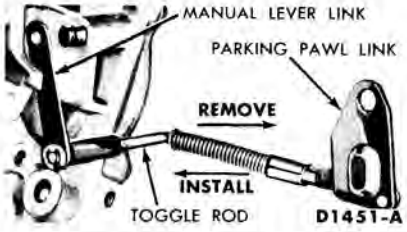


FIG. 58—Removing or Installing Parking Pawl Toggle Rod

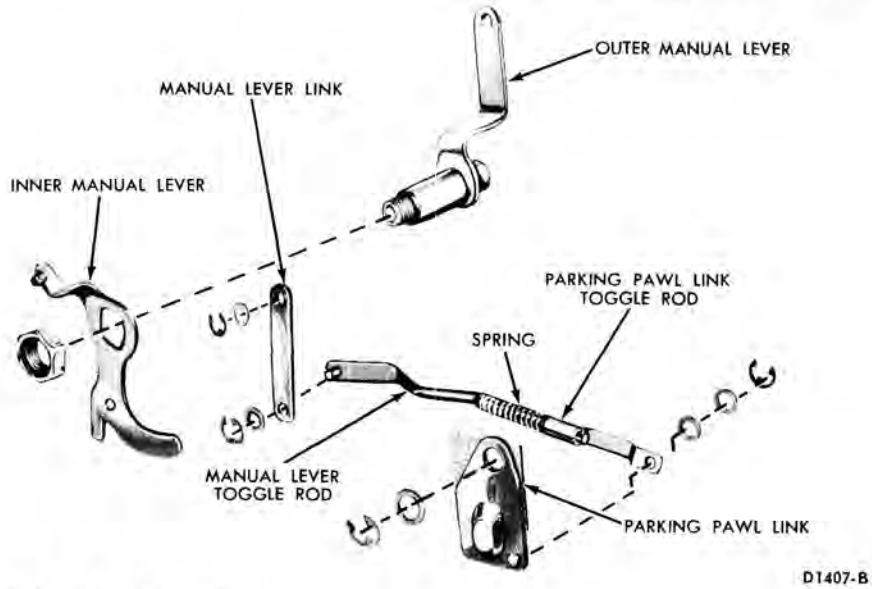


FIG. 59—Case Linkage

13. Operate the manual lever and check for correct linkage operation.

14. Install the neutral start switch.

15. Install the inner and outer downshift levers. Torque the retaining nut to specifications.

Thread Repair—Case. Thread service kits may be purchased from local jobbers or the Heli-Coil Corporation. To repair a damaged thread, the following procedures should be carefully followed.

1. Drill out the damaged threads, **using the same drill size as the thread O.D.** For example, use a $^{5}/_{16}$-inch drill for a $^{5}/_{16}$-18 thread.

2. Select the proper **special** tap and tap the drilled hole. The tap is marked for the size of the thread being repaired. Thus, the special tap marked $^{5}/_{16}$-18 will not cut the same thread as a standard $^{5}/_{16}$-18 tap. It does cut a thread large enough to accommodate the insert, and after the insert is installed the original thread size ($^{5}/_{16}$-18) is restored.

3. Select the proper coil inserting tool. These tools are marked with the thread size being repaired. Place the insert on the tool and adjust the sleeve to the length of the insert being used.

Press the insert against the face of the tapped hole. Turn the tool clockwise and wind the insert into

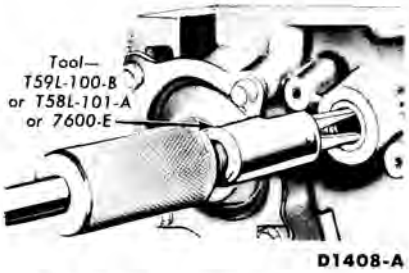


FIG. 60—Removing Manual Lever Seal



FIG. 61—Installing Manual Lever Seal

the hole until the insert is ½ turn below the face.

4. Working through the insert, bend the insert tang straight up and down until it breaks off at the notch.

5. If the inserts are not properly installed, they can be removed with the extractor tool. Place the extractor tool in the insert so that the blade rests against the top coil ¼ to ½ turn away from the end of the coil. Tap the tool sharply with a hammer so that the blade cuts into the insert. Exert downward pressure on the tool and turn it counterclockwise until the insert is removed.

CONTROL VALVE

Disassembly

1. Remove the nine screws that attach the oil screen to the body and remove the screen (Fig. 62).

2. Remove the seven attaching screws from the underside of the lower valve body. Separate the lower valve body, separator plate, gasket and hold-down plates (Fig. 64) from the upper valve body.

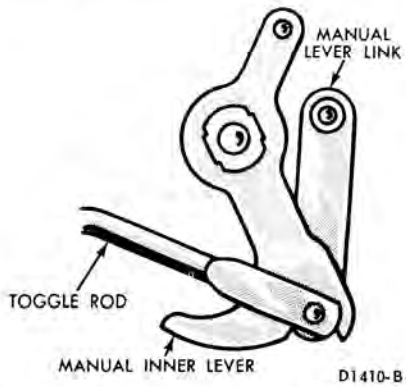


FIG. 62—Inner Manual Lever Location

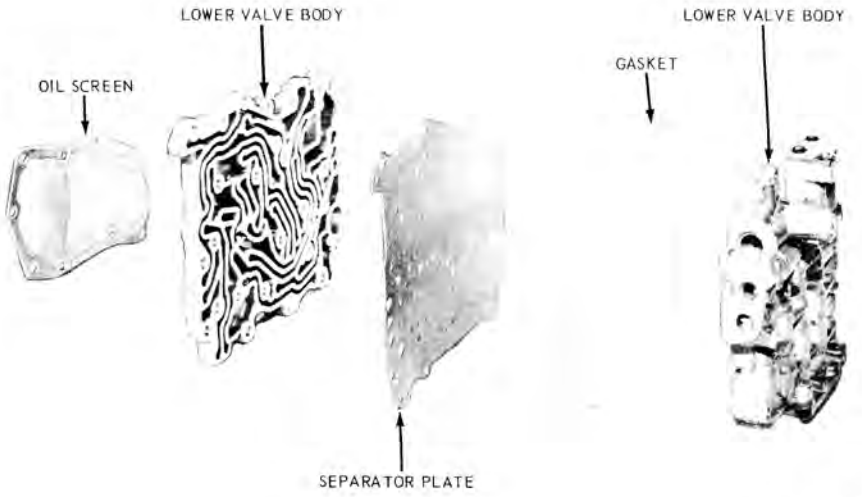


FIG. 63—Upper and Lower Valve Bodies Disassembled

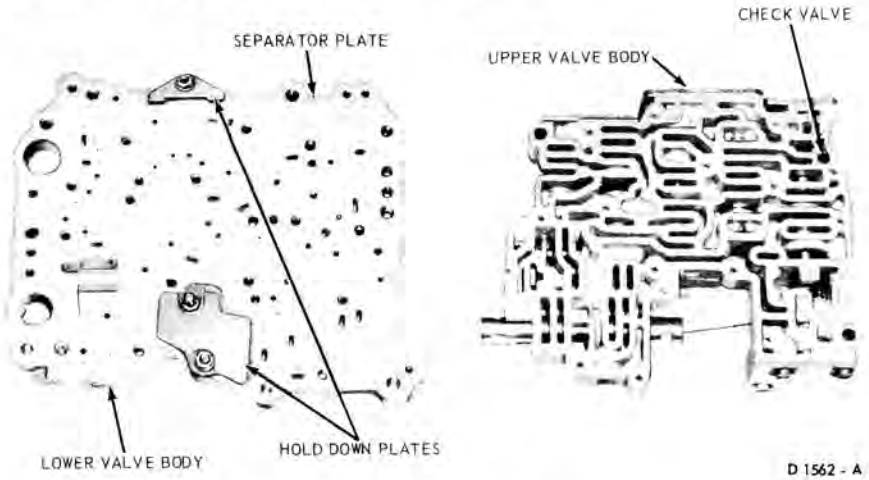


FIG. 64—Separating Upper and Lower Valve Bodies

3. Depress the manual valve detent spring with the tool shown in Fig. 65. Remove the spring retaining pin (roll pin) from the upper valve body. Remove the spring and detent plunger.

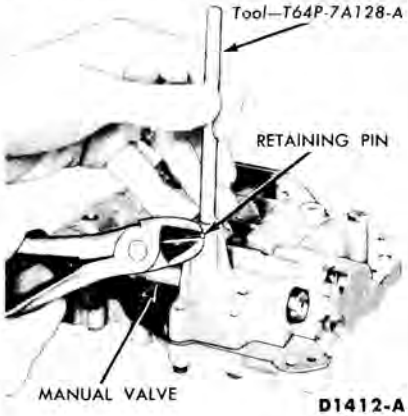


FIG. 65—Removing Manual Valve

4. Slide the manual valve out of the body.

5. Remove the cut-back and the back-out valve cover plate from the valve body (Fig. 66).

6. Remove the cut-back valve from the body.

7. Remove the 2-3 back-out valve, spring and the manual low valve from the body.

8. Remove the 1-2 shift valve and the 2-3 shift valve cover plate from the valve body.

9. Remove the 2-3 shift valve and the throttle modulator valve from the body.

10. Remove the 1-2 shift valve,

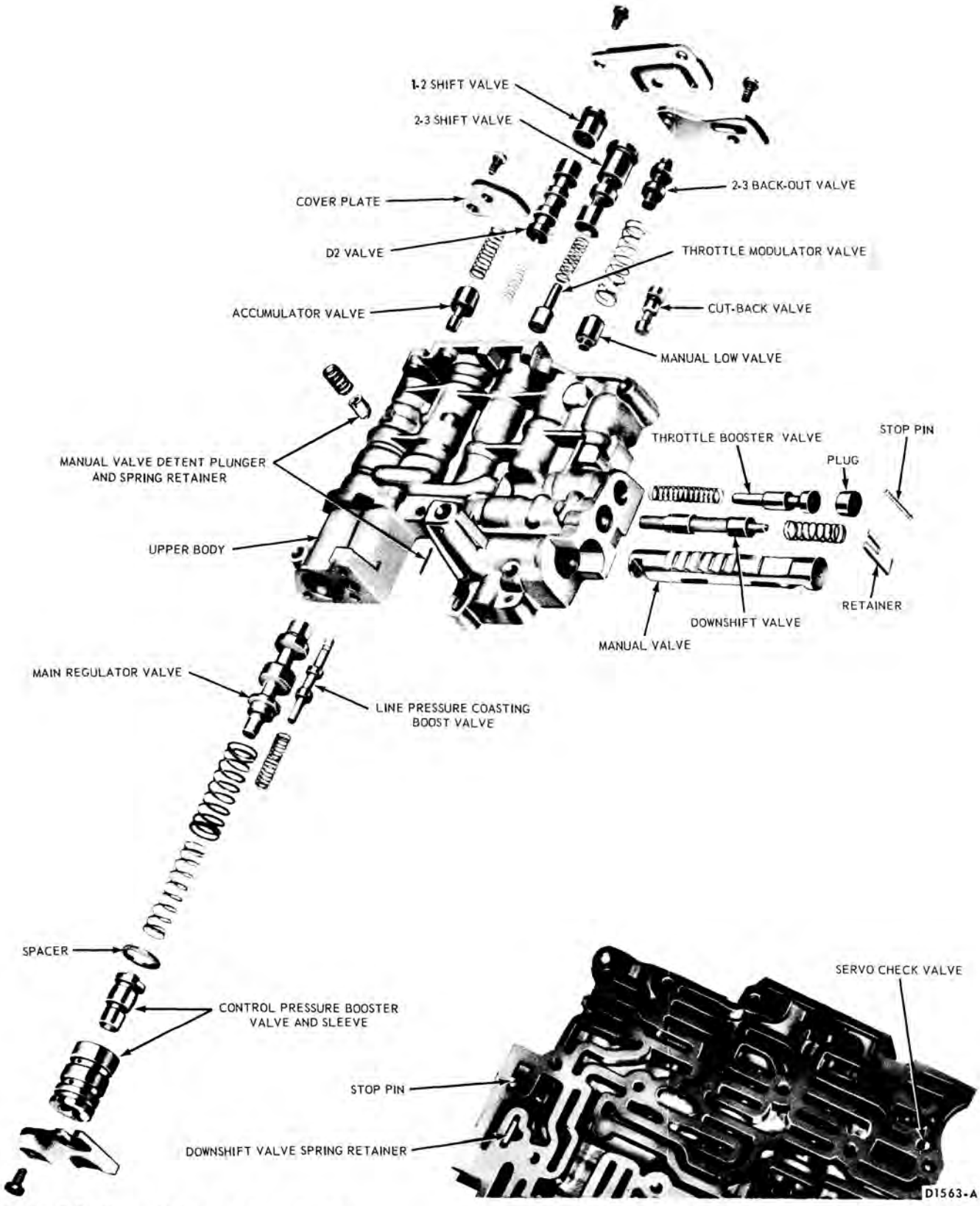


FIG. 66—Upper Valve Body Disassembled

D2 valve and the spring from the body.

11. Remove the intermediate band accumulator valve cover plate from the valve body.

12. Remove the spring and the intermediate band accumulator valve.

13. Remove the pressure booster valve and the line pressure coasting boost valve cover plate (Fig. 66).

14. Remove the pressure booster valve, washer, springs and the main regulator valve.

15. Remove the line pressure coasting boost valve spring and valve from the body.

16. Carefully pry the downshift valve retainer from the body, then remove the spring and valve.

17. Hold the upper valve body as shown in Fig. 67 and depress the throttle booster valve plug to release the retaining pin. Remove the plug, valve and the spring.

18. Remove the two hold-down plates and the separator plate from the lower valve body.

Assembly

1. Position the separator plate and the two hold-down plates on the lower valve body and install the four attaching screws and torque them to specification.

2. Place the throttle booster valve spring, valve (long end into spring) and the plug (Fig. 66). Depress the plug and install the retaining pin.

3. Insert the downshift valve into the body with the large diameter facing inward. Install the downshift valve spring and the retainer (Fig. 66).

4. Place the main regulator valve

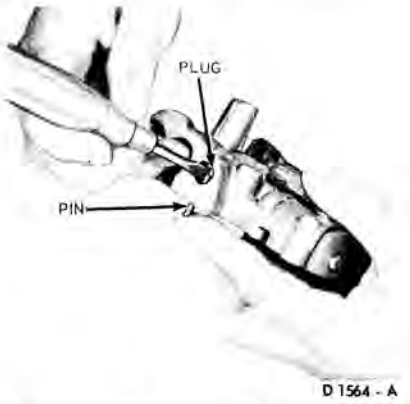


FIG. 67—Removing Throttle Booster Valve

in the body with the large diameter facing inward. Install the two springs and the pressure booster valve.

5. Place the line pressure coasting boost valve in the body with the notched end facing inward. Place the spring in place.

6. Hold the pressure booster valve and the line pressure coasting boost valve cover plate in place and install the three attaching screws and torque them to specification.

7. Position the intermediate band accumulator valve and spring in the body. Secure the cover to the body with the attaching screw. Torque the screw to specifications.

8. Position the spring, D2 valve and the 1-2 shift valve in the body.

9. Place the throttle modulator valve, spring, and 2-3 shift valve in the body.

10. Secure the 1-2 shift valve and the 2-3 valve cover plate to the body and torque the screws to specifications.

11. Place the manual low valve, spring, and the 2-3 back-out valve in the body.

12. Place the cut-back valve in the body.

13. Secure the cut-back and the back-out cover plate to the body with two screws. Torque the screws to specifications.

14. Slide the manual valve into the body making sure that the notch for the manual lever is toward the inside and that the detent notches are facing upward.

15. Place the detent plunger and spring in the body. Depress the spring and install a new roll pin.

16. Position a new rubber check valve in the upper valve body (Fig. 64).

17. Place a new gasket, separator plate and the lower valve body in place on the upper valve body and secure them with the attaching screws. Torque the screws to specifications.

18. Secure the oil screen to the body with the attaching screws. Torque the screws to specifications.

FRONT PUMP

1. Remove the four seal rings from stator support and the O-ring seal from the pump housing.

2. Remove the five bolts that retain the stator support to the front pump housing. Remove the stator support from the pump housing (Fig. 68).

3. Remove the drive and driven gears from the front pump housing.

4. Install the drive and driven gears in the pump housing. Each gear has an identification mark on the side of the gear teeth that are

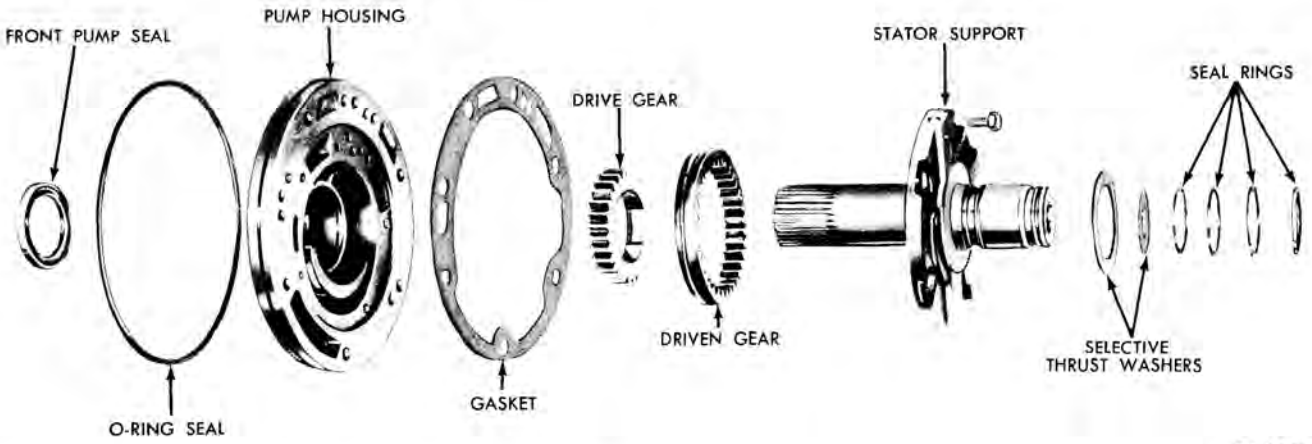


FIG. 68—Front Pump and Stator Support Disassembled

chamfered. **The chamfered side with the identification mark has to be positioned downward against the face of the pump housing.**

5. Place the stator support in the pump housing and install the five retaining bolts. Torque the bolts to specifications.

6. Install the four seal rings on the stator support. The two large oil rings are assembled first in the oil ring grooves toward the front of the stator support. Install the O-ring seal on the pump housing (Fig. 68).

7. Check the pump gears for free rotation by placing the pump on the converter drive hub in its normal running position and turning the pump housing.

8. If the front pump seal must be replaced, mount the pump in the transmission case and remove the seal with the tool shown in Fig. 69. To install the new seal use the tool shown in Fig. 70..

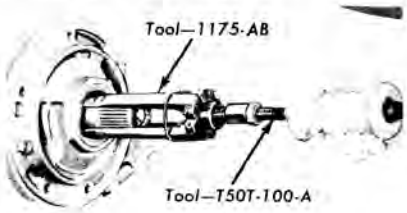


FIG. 69—Removing Front Pump Seal

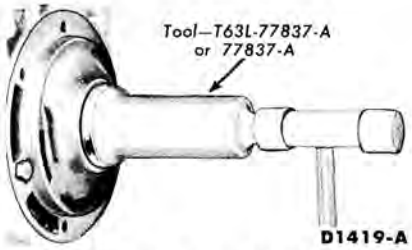


FIG. 70—Installing Front Pump Seal

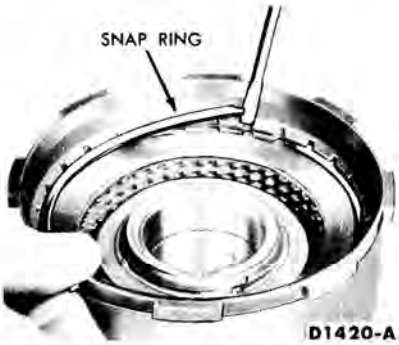


FIG. 71—Removing or Installing Reverse High Clutch Pressure Plate Snap Ring



FIG. 73—Removing or Installing Clutch Piston Spring Retainer Snap Ring



FIG. 74—Removing Reverse High Clutch Piston

REVERSE-HIGH CLUTCH

1. Remove the pressure clutch retaining snap ring (Fig. 71).

2. Remove the pressure plate, and the drive and driven clutch plates. (Fig. 72). If the composition clutch plates are to be reused, do not clean the plates in a vapor degreaser or with a detergent solution. Wipe the plates clean with lint-free cloth.

3. To remove the piston spring retainer snap ring, place the clutch hub in the arbor press. With the tools shown in Fig. 73., compress the piston return springs and remove the snap ring. When the arbor press ram is released, guide the spring retainer to clear the snap ring groove of the drum.

4. Remove the spring retainer and ten piston return springs.

5. Remove the piston by inserting air pressure in the piston apply hole of the clutch hub (Fig. 74).

6. Remove the piston outer seal from the piston and the piston inner seal from the clutch drum (Fig. 71).

7. Install a new inner seal in the clutch drum and a new outer seal on the clutch piston (Fig. 71). Lu-

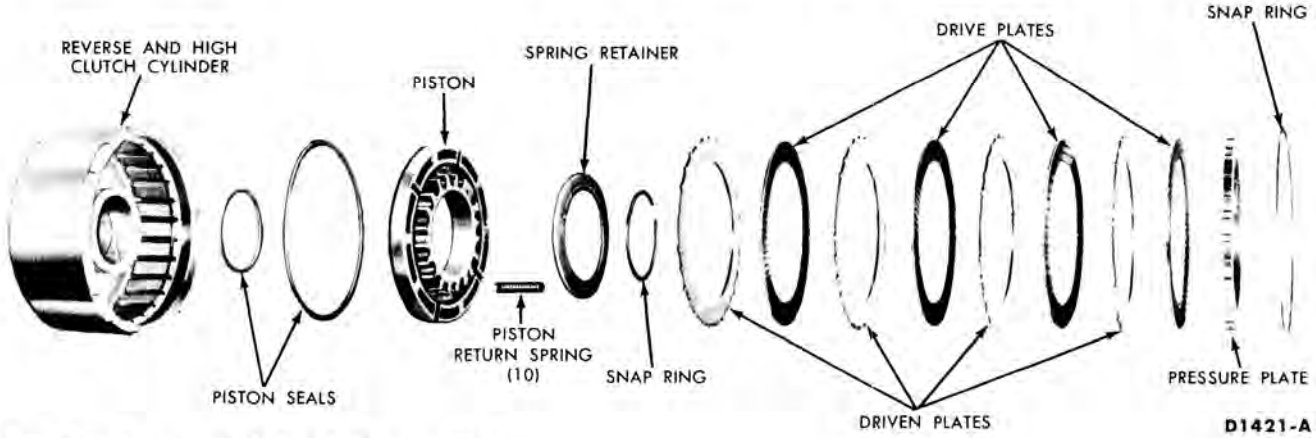


FIG. 72—Reverse High Clutch Disassembled

bricate the seals with clean transmission oil and install the piston into the clutch drum.

8. Place the ten clutch piston springs into position on the clutch piston. Place the spring retainer on top of the springs. To install the snap ring, use the tools shown in Fig. 73. As the press ram is moved downward, make sure the spring retainer is centered to clear the drum. Install the snap ring. **Before the press ram is released make sure the snap ring is positioned inside of the four snap ring guides on the spring retainer.**

9. When new composition clutch plates are used, soak the plates in transmission oil for fifteen minutes before the plates are assembled. Install the clutch plates alternately by starting first with a steel plate then a non-metallic plate (Fig. 72). The last plate installed is the pressure plate with the internal chamfered side up. For the correct number of clutch plates required for each transmission model, refer to Part 7-4.

10. Install the pressure plate retaining snap ring (Fig. 71). Make sure the snap ring is fully seated in the snap ring groove of the clutch hub.

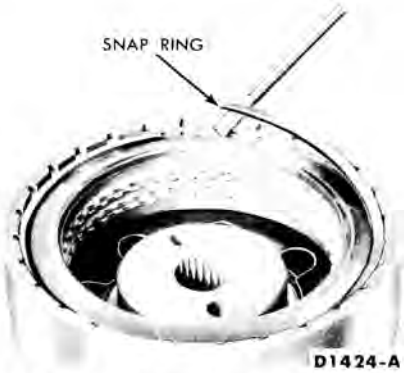
11. With a feeler gauge, check the clearance between the snap ring and the pressure plate (Fig. 75).

12. The pressure plate should be held downward as the clearance is checked. The clearance should be 0.060 to 0.080 inch. If the clearance is not within specifications, selective thickness snap rings are available in these thicknesses, 0.088-0.092, 0.074-0.078, 0.060-0.064 and 0.102-0.106 inch. Install the correct size snap ring and recheck the clearance.



D1550-A

FIG. 75—Checking Reverse-High Clutch Snap Ring Clearance



D1424-A

FIG. 76—Removing or Installing Forward Clutch Pressure Plate Snap Ring

FORWARD CLUTCH

1. Remove the clutch pressure plate retaining snap ring (Fig. 76).

2. Remove the pressure plate, and the drive and driven clutch plates from the clutch hub (Fig. 77).

3. Remove the disc spring retaining snap ring (Fig. 76).

4. Apply air pressure at the clutch piston pressure hole (Fig. 79), to remove the piston from the clutch hub.

5. Remove the clutch piston outer seal and the inner seal from the clutch hub (Fig. 77).

6. Install new clutch piston seals on the clutch piston and drum. Lubricate the seals with clean transmission oil.

7. Install the clutch piston into the clutch hub. Install the disc spring and retaining snap ring (Fig. 78).



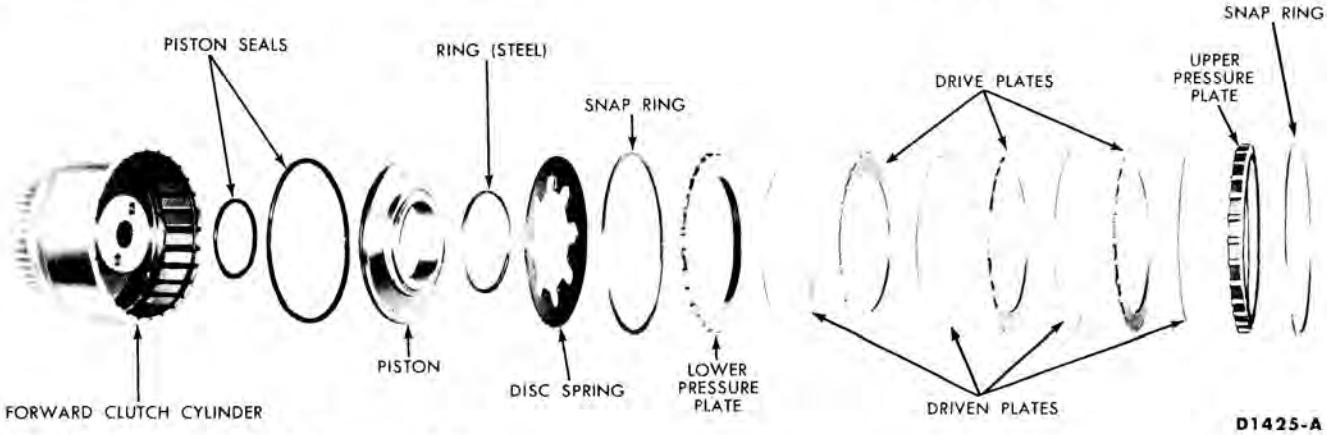
D1426-A

FIG. 78—Removing or Installing Disc Spring Snap Ring



D1427-A

FIG. 79—Removing Forward Clutch Piston



D1425-A

FIG. 77—Forward Clutch Disassembled

8. Install the lower pressure plate with the flat side up and radius side downward.

Install one non-metallic clutch plate and alternately install the drive and driven plates. The last plate installed will be the top pressure plate with the internal chamfered side up. (Fig. 77). Refer to Specification Section for the correct number of clutch plates for the applicable model transmission.

9. Install the pressure plate retaining snap ring (Fig. 76). Make sure the snap ring is fully seated in the ring groove of the clutch hub.

10. With a feeler gauge, check the clearance between the snap ring and the pressure plate (Fig. 80). Downward pressure on the plate should be used when making this check. The clearance should be 0.022 to 0.042 inches.

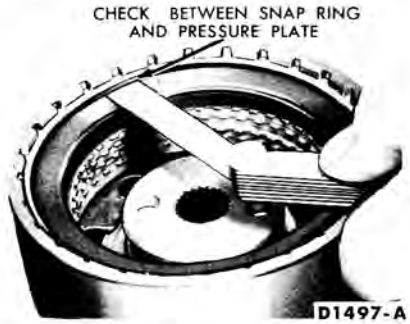


FIG. 80–Checking Forward Clutch Snap Ring Clearance

11. If the clearance is not within specifications, selective snap rings are available in these thicknesses, 0.088-0.092, 0.074-0.078, and 0.060-0.064. Insert the correct size snap ring and recheck the clearance.

FORWARD CLUTCH HUB AND RING GEAR

1. Remove the forward clutch hub retaining snap ring (Fig. 81).

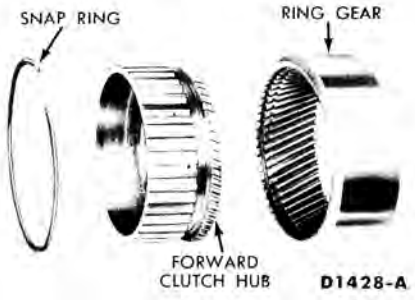


FIG. 81–Forward Clutch Hub and Ring Gear Disassembled

2. Remove the foward clutch hub from the ring gear.

3. Install the forward clutch hub in the ring gear. Make sure the hub is bottomed in the groove of the ring gear.

4. Install the front clutch hub retaining snap ring. Make sure the snap ring is fully seated in the snap ring groove of the ring gear.

FORWARD PLANET CARRIER

1. Using a small punch inserted into the end of the planet gear retaining pin hole (Fig. 82), force the shaft retaining pins outward. With a pair of side cutters remove the retaining pins.

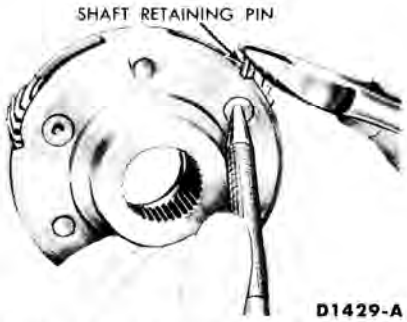


FIG. 82–Removing Pinion Shaft Retaining Pin

2. Remove the three planet gears pins (Fig. 83).

3. Remove the three planet gears and thrust washers.

4. Remove the outer race, thrust bearing, and the inner race.

5. Install the inner race, thrust bearing, and outer race.

6. Install 21 roller bearings in each planet gear. Retain the roller bearings in each gear with Vaseline. Position the planet gears and thrust washers in the carrier.

7. Install the gear pins and line up the retaining pin holes in the pin with the retaining pin holes of the carrier. Install the retaining pins in the carrier and shafts.

8. When only the thrust bearing and races have to be removed, remove only two of the planet gear pins. Move the gears outward far enough to allow removal of the thrust bearing and races. This will keep the planet gear roller bearings in position. Reassemble the thrust bearing and races, two gears, and pins.

INPUT SHELL AND SUN GEAR

1. Remove the external snap ring

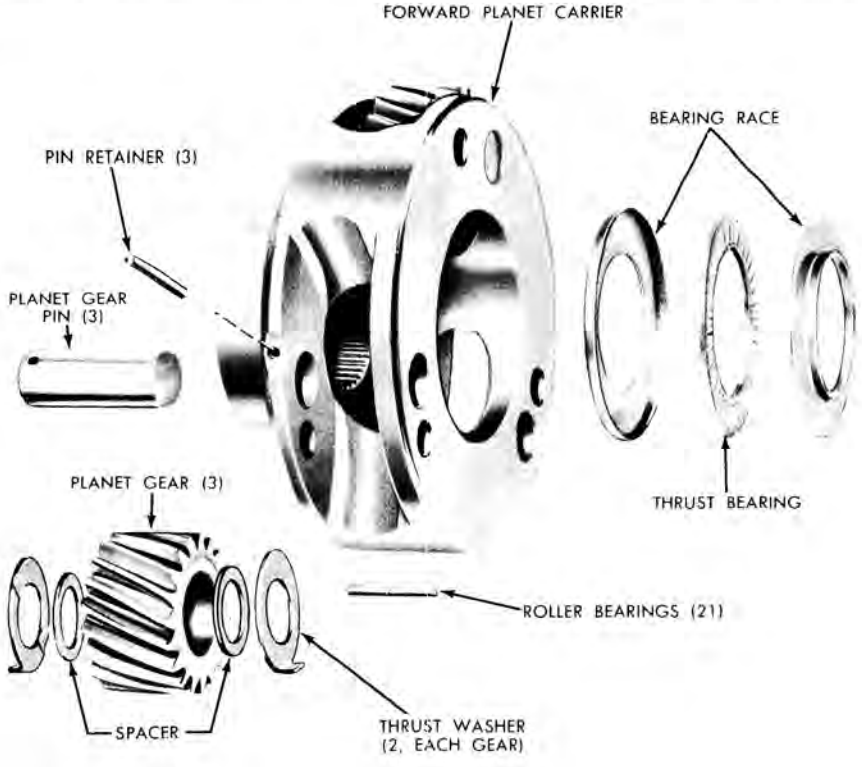


FIG. 83–Forward Planet Carrier

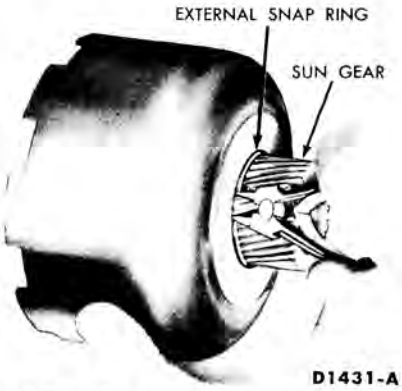


FIG. 84—Removing or Installing Sun Gear External Snap Ring

from the sun gear (Fig. 84).

2. Remove thrust washer No. 5 from the input shell and sun gear (Fig. 85).

3. From inside the input shell, remove the sun gear. Remove the internal snap ring from the sun gear.

4. Install the internal snap ring on the sun gear. Install the sun gear in the input shell.

5. Install thrust washer No. 5 on the sun gear and input shell (Fig. 85).

6. Install the external snap ring on the sun gear (Fig. 84).

REVERSE RING GEAR AND HUB

1. Remove the hub retaining snap ring from the reverse ring gear.

2. Remove the hub from the reverse ring gear (Fig. 86).

3. Install the hub in the reverse ring gear. Make sure the hub is fully seated in the groove of the ring gear.

4. Install the snap ring in the reverse ring gear. Make sure the snap ring is fully seated in the snap ring groove of the ring gear.

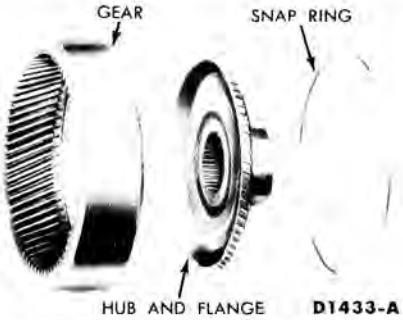


FIG. 86—Reverse Ring Gear and Hub Disassembled

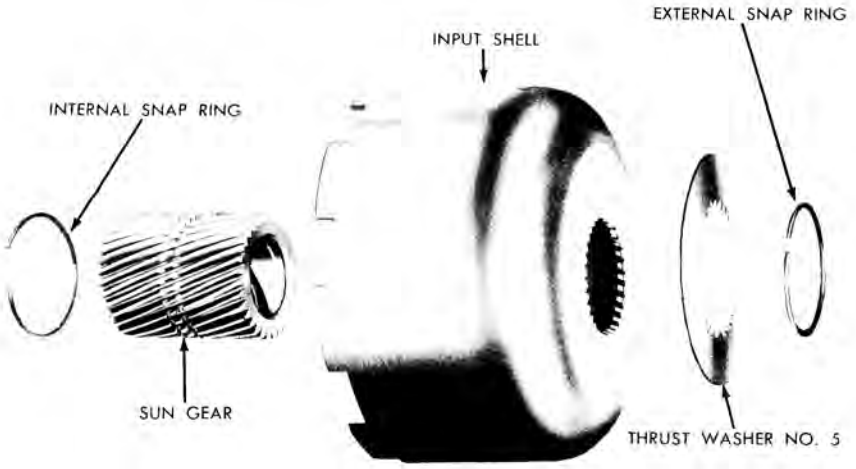


FIG. 85—Input Shell and Sun Gear Disassembled

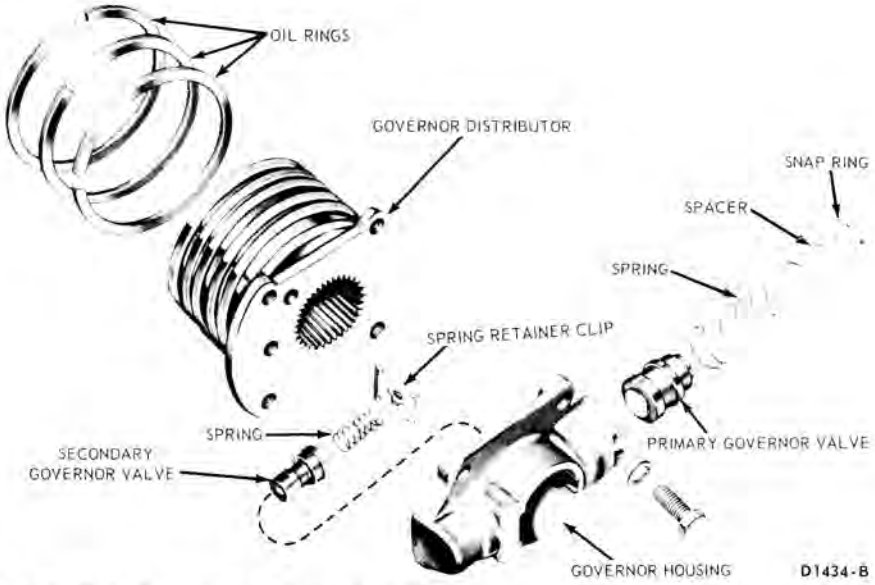


FIG. 87—Governor and Oil Distributor

GOVERNOR AND OIL DISTRIBUTOR

1. Remove the oil rings from the governor oil distributor (Fig. 89).

2. Remove the governor housing to distributor retaining bolts. Remove the governor from the oil distributor.

3. Remove the primary governor valve retaining ring (Fig. 88). Remove the washer, spring, and primary governor valve from the housing.

4. Remove the secondary governor valve spring retaining clip, spring, and governor valve from the housing.

5. Install the secondary governor valve in the housing. Install the

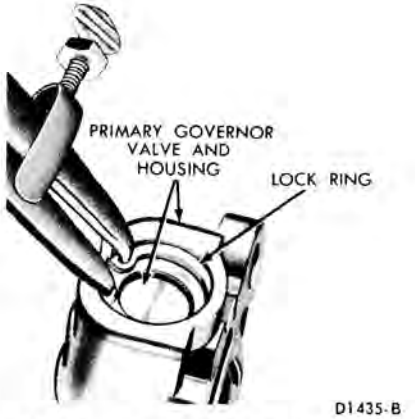
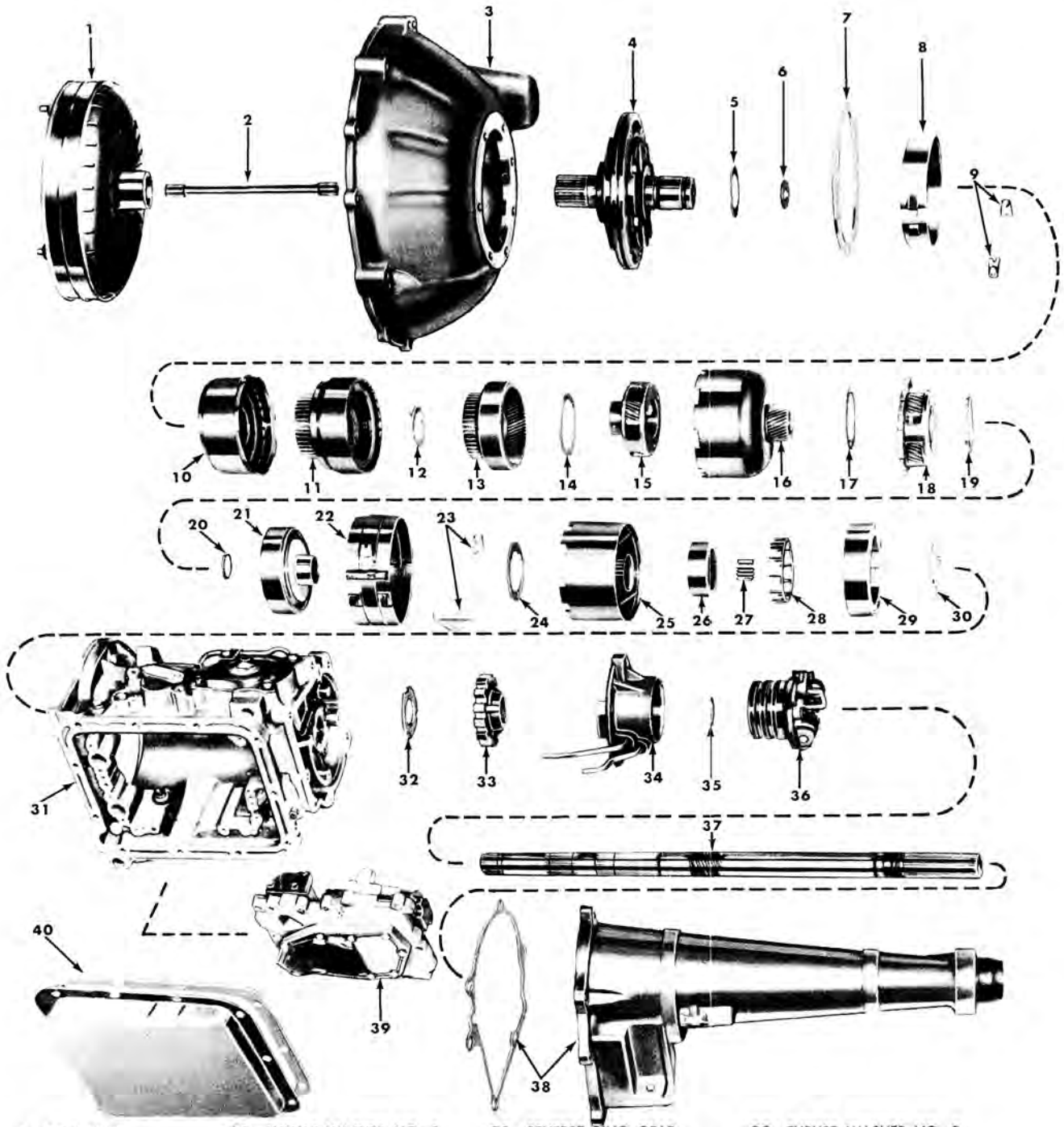


FIG. 88—Removing or Installing Retaining Ring



1. CONVERTER
2. INPUT SHAFT
3. CONVERTER HOUSING
4. FRONT PUMP
5. THRUST WASHER NO. 1
6. THRUST WASHER NO. 2
7. FRONT PUMP GASKET
8. INTERMEDIATE BAND
9. BAND STRUTS
10. REVERSE AND HIGH CLUTCH DRUM
11. FORWARD CLUTCH AND CYLINDER
12. THRUST WASHER NO. 3
13. FORWARD CLUTCH HUB AND RING GEAR
14. THRUST WASHER NO. 4
15. FRONT PLANET CARRIER
16. INPUT SHELL, SUN GEAR AND THRUST WASHER NO. 5
17. THRUST WASHER NO. 6
18. REVERSE PLANET CARRIER
19. THRUST WASHER NO. 7
20. SNAP RING
21. REVERSE RING GEAR AND HUB
22. LOW AND REVERSE BAND
23. BAND STRUTS
24. THRUST WASHER NO. 8
25. LOW AND REVERSE DRUM
26. ONE-WAY CLUTCH INNER RACE
27. ROLLER (12) AND SPRING (12)
28. SPRING AND ROLLER CAGE
29. ONE-WAY CLUTCH OUTER RACE
30. THRUST WASHER NO. 9
31. CASE
32. THRUST WASHER NO. 10
33. PARKING GEAR
34. GOVERNOR DISTRIBUTOR SLEEVE
35. SNAP RING
36. GOVERNOR VALVES & DISTRIBUTOR
37. OUTPUT SHAFT
38. EXTENSION HOUSING AND GASKET
39. CONTROL VALVE BODY
40. OIL PAN AND GASKET

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FIG. 89—Transmission Sub-Assemblies

spring and retaining clip. **Make sure the clip is installed with the small concaved area facing downward, to hold the spring in the correct position.**

6. Install the primary governor valve in the housing. Install the spring, washer and retaining ring. **Make sure the washer is centered in the housing on top of the spring and the retaining ring is fully seated in the ring groove of the housing.**

7. Install the governor assembly on the oil distributor and torque the retaining bolts to specificaion.

8. Install the oil rings on the distributor. Check the oil rings for free rotation in the ring grooves of the oil distributor.

ASSEMBLY OF TRANSMISSION

When assembling the transmission sub-assemblies (Fig. 89), make sure that the correct thrust washer is used beween certain sub-assemblies. Vaseline should be used to hold the thrust washers in their proper location. Lubricate thrust washers, bushings and journal with automatic transmission fluid. If the end play is not within specifications, after the transmission is assembled, either the wrong selective thrust washers were used, or a thrust washer came out of position during the transmission assembly operation.

1. Install thrust washer No. 9 inside the transmission case (Fig. 90).

2. Place the one-way clutch outer

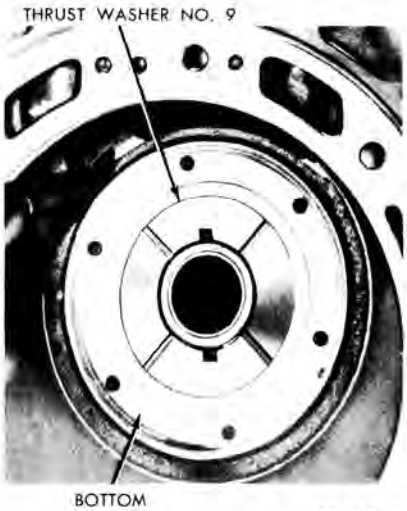


FIG. 90—Number 9 Thrust Washer Location

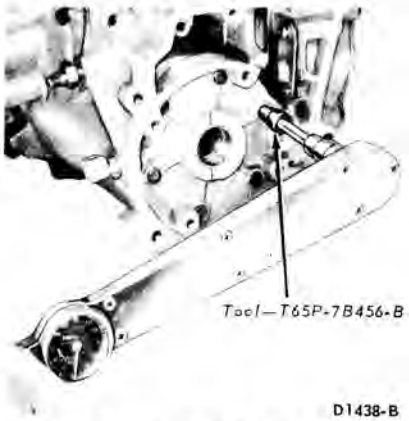


FIG. 91—Installing One-Way Clutch Outer Race Retaining Bolt

race inside the case. From the back of the case install the six outer race to case retaining bolts. **Torque the bolts to specification with the tools shown in Fig. 91.**

3. Place the transmission case in a vertical position with the back face of the case upward. Install the parking pawl retaining pin in the case (Fig. 92).

4. Install the parking pawl on the case retaining pin. Install the parking pawl return spring as shown in Fig. 92.

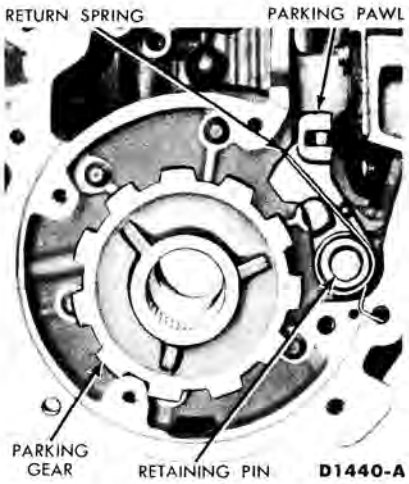


FIG. 92—Parking Pawl and Bolt

5. Install thrust washer No. 10 on the parking pawl gear (Fig. 93). Place the gear and thrust washer on the back face of the case. (Fig. 92).

6. Place the two oil distributor tubes in the governor distributor sleeve. Install the distributor sleeve on the case. As the distributor sleeve is installed, the oil tubes have to be

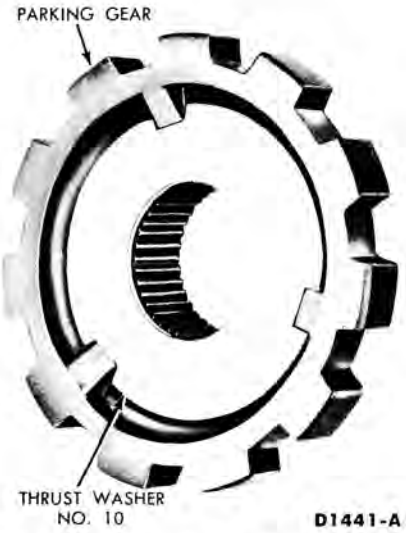


FIG. 93—Number 10 Thrust Washer Location

inserted in the two holes in the case and the parking pawl retaining pin has to be inserted in the alignment hole in the distributor sleeve.

7. Install the four governor distributor sleeve to case retaining bolts and torque the bolts to specification.

8. Install the governor distributor assembly on the output shaft. Install the distributor retaining snap ring. Fig. 94 shows the correct snap ring that is to be used.

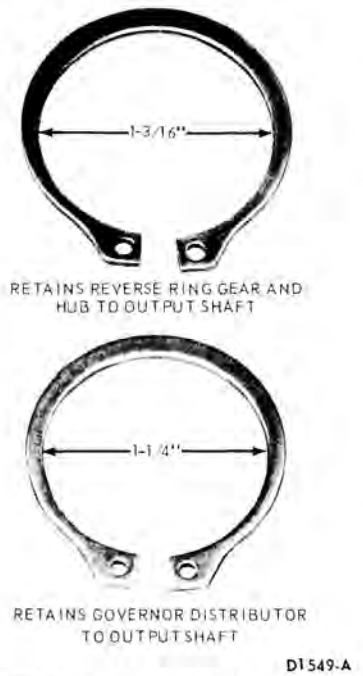


FIG. 94—Governor and Reverse Ring Gear and Hub Identification

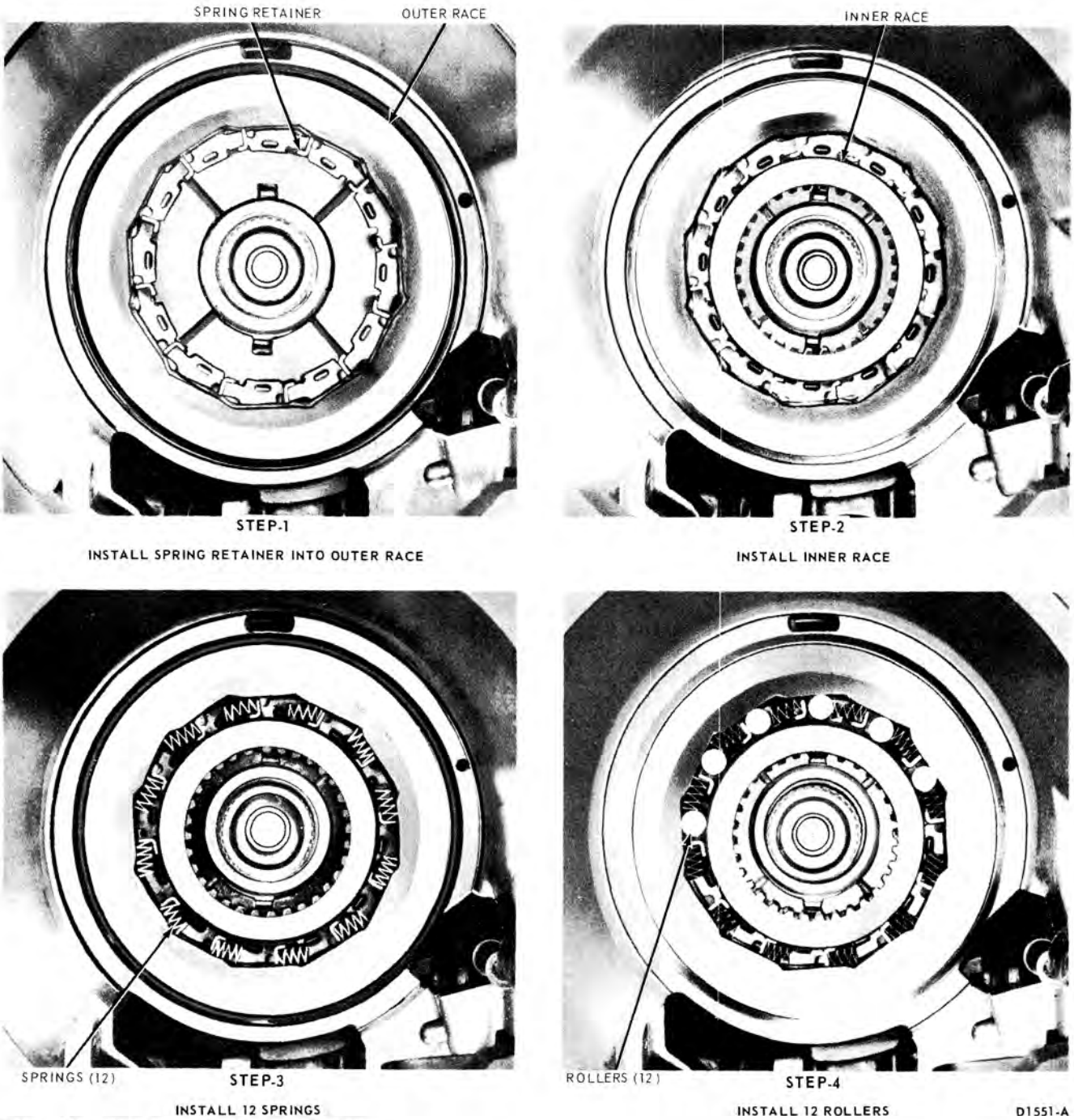


FIG. 95—One-Way Clutch Installation

9. Check the oil rings in the governor distributor, making sure the oil rings are fully inserted in the ring grooves and will rotate freely. Install the output shaft and governor distributor assembly in the distributor sleeve (Fig. 47).

10. Place a new extension housing gasket on the case. Install the extension housing, vacuum tube clip, and the extension housing to case retaining bolts. Torque the bolts to specification.

11. Place the transmission in the holding fixture with the front pump mounting face of the case up. **Make sure thrust washer No. 9 is still located at the bottom of the transmission case. (Fig. 90).**

12. Install the one-way clutch spring retainer into the outer race (Fig. 95).

13. Install the inner race inside of the spring retainer.

14. Install the individual springs between the inner and outer race as shown in Figure 95.

15. Starting at the back of the transmission case, install the one-way clutch rollers by slightly compressing each spring and positioning the roller between the spring and the spring retainer.

16. After the one-way clutch has been assembled rotate the inner race clockwise to center the rollers and

springs. Install the low and reverse drum (Fig. 89). The splines of the drum have to engage with the splines of the one-way clutch inner race, and the bushing in the drum must go on the outer race. Check the one-way clutch operation by rotating the low and reverse drum. The drum should rotate clockwise but should not rotate counterclockwise.

17. Install thrust washer No. 8 on top of the low and reverse drum (Fig. 96). Install the low-reverse band in the case, with the end of the band for the small strut toward the low-reverse servo (Fig. 41).



FIG. 96—Number 8 Thrust Washer Location

18. Install the reverse ring gear and hub on the output shaft (Fig. 89).

19. Move the output shaft forward and install the reverse ring gear hub to output shaft retaining ring (Figs. 45 and 94).

20. Place thrust washer Nos. 6 and 7 on the reverse planet carrier (Fig. 97).

21. Install the planet carrier in the reverse ring gear and engage the tabs of the carrier with the slots in the low-reverse drum.

22. Install the forward clutch in the reverse-high clutch by rotating the units to mesh the reverse-high clutch plates with the splines of the forward clutch (Fig. 98).

23. Install thrust washer No. 3 on the forward clutch (Fig. 99).

24. Install the forward clutch hub and ring gear in the forward clutch by rotating the units to mesh the forward clutch plates with the splines on the forward clutch hub (Fig. 100).

25. Install thrust washer No. 4 on the front planet carrier (Fig. 101). Install the front planet carrier into the forward clutch hub and ring gear (Fig. 102). **Check the forward thrust bearing race inside the planet carrier for proper location against the thrust bearing. Make sure the race is centered for align-**

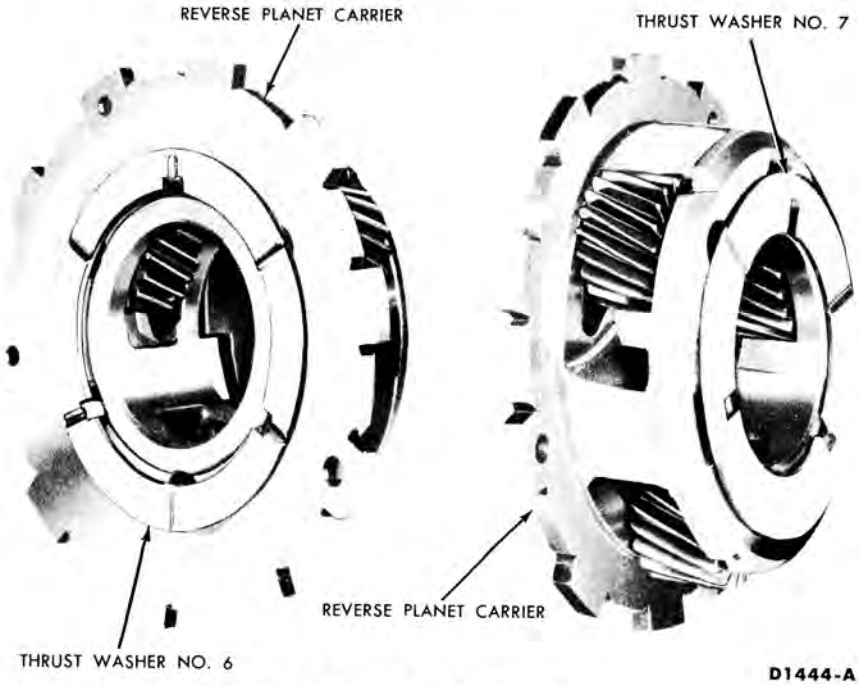


FIG. 97—Numbers 6 and 7 Thrust Washer Location



FIG. 98—Installing Clutch Units

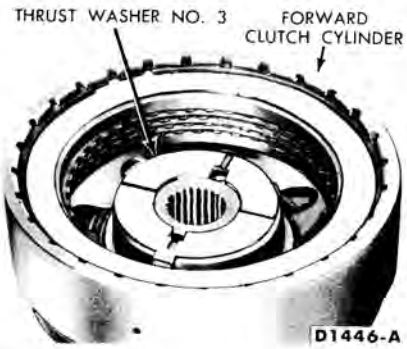


FIG. 99—Number 3 Thrust Washer Location



FIG. 100—Installing Forward Clutch Hub and Ring Gear

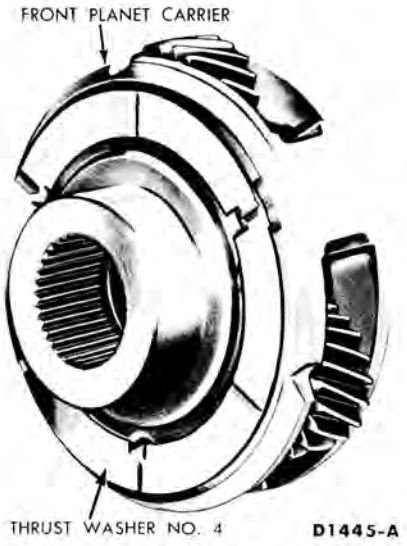


FIG. 101—Number 4 Thrust Washer Location



FIG. 102—Installing Front Planet Carrier

ment with the sun gear on the input shell.

26. Install the input shell and sun gear on the gear train (Fig. 103). Rotate the input shell to engage the drive lugs of the reverse-high clutch. If the drive lugs will not engage, the outer race inside the forward planet carrier is not centered to engage the

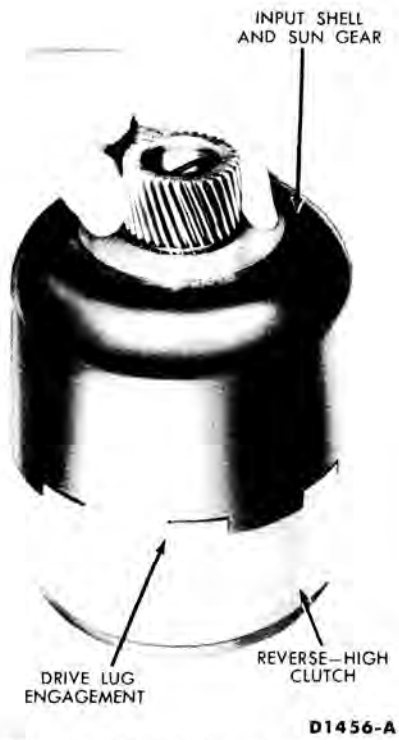


FIG. 103—Installing Input Shell

end of the sun gear inside the input shell. Center the thrust bearing race and install the input shell.

27. Hold the gear train together and install the forward part of the gear train assembly in the case (Fig. 41). The input shell sun gear must mesh with the reverse pinion gears. The front planet carrier internal splines must mesh with the splines on the output shaft.

28. Install the intermediate band through the front of the case (Fig. 39). The side of the band with the anchor points has to be positioned toward the back of the transmission.

29. Install a new front pump gasket on the case. Line up the bolt clearance holes in the gasket with the holes in the case. Using the end play check reading that was obtained during the transmission disassembly to determine which No. 2 steel backed thrust washer is required, proceed as follows:

a. Position the stator support vertically on the work bench and install the correct No. 2 thrustwasher to bring the end play within specifications.

b. Install the reverse-high clutch and the forward clutch on the stator support.

c. Invert the complete unit making sure that the intermediate brake drum bushing is seated on the forward clutch mating surface.

d. Select the thickest fiber washer (No. 1) that can be inserted between the stator support and the intermediate brake drum thrust surfaces and still maintain a slight clearance. Do not select a washer that must be forced between the stator support and intermediate brake drum.

e. Remove the intermediate brake drum and forward clutch unit from the stator support.

f. Install the selected Nos. 1 and 2 thrustwashers on the front pump stator support (Fig. 36) using enough Vaseline to hold the thrust washers in position during the front pump installation.

30. Lubricate the front pump O-ring seal with clean transmission fluid. Install the front pump stator support into the reverse-high clutch. Align the pump to case retaining bolt holes. Install two front pump to case retaining bolts 180° apart. Tighten the bolts until the front pump is properly seated in the case. Remove the two front pump retaining bolts.

31. Install the converter housing on the front pump and case. Install the six converter housing to case retaining bolts. Torque the bolts to specification.

32. Install the input shaft (Fig. 37). Rotate the holding fixture to place the transmission in a horizontal position. Check the transmission end play as shown in Fig. 35. If the end play is not within specification, either the wrong selective thrust washers (Fig. 36) were used or one of the ten thrust washers (Fig. 89) is not properly positioned.

33. Remove the dial indicator used for checking the end play and install the one converter housing to case retaining bolt. Torque the bolt to specification.

34. Install the intermediate and low-reverse band adjusting screws in the case. Install the struts for each band (Fig. 34).

35. Adjust the intermediate and low-reverse band. Refer to In-Car Adjustments and Repair for band adjusting procedures.

36. Install a universal joint yoke on the output shaft. Rotate the input and output shafts in both directions



FIG. 104—Installing Vacuum Unit

to check for free rotation of the gear train.

37. Install the control valve body (Fig. 33). As the valve body is installed engage the manual and downshift valves with the inner control levers. Torque the eight control valve body to case retaining bolts to specification.

38. Place a new oil pan gasket on the case and install the oil pan and 11 oil pan to case retaining bolts. Torque the retaining bolts to specification.

39. Remove the transmission from the holding fixture. Install the two extension housing to case retaining bolts. Torque the bolts to specification.

40. Install the primary throttle valve in the transmission case (Fig. 31).

41. Install the vacuum unit, gasket, and control rod in the case. Using the tools shown in Fig. 104 torque the vacuum unit to 15-23 ft.-lbs.

42. Make sure the input shaft is properly installed in the front pump stator support and gear train. Install the converter in the front pump and the converter housing.

PART 7-3 SPECIFICATIONS

CONTROL PRESSURE AT ZERO OUTPUT SHAFT SPEED

Engine Speed	Throttle	Manifold Vac. Ins. HG.	Selector Lever Position	Control Pressure (PSI)
Idle	Closed	*Above 18	P, N, D1, D2, L	55-62
			R	55-100
As Req'd.	As Req'd.	Approx. 17.0	D1, D2, L	Pressure Starts to Increase
As Req'd.	As Req'd.	10	D1, D2, L	96-105
As Req'd.	As Req'd.	3	D1, D2, L	138-148
			R	215-227

*Vehicles checked at high altitudes

At altitudes above sea level it may not be possible to obtain 18" of engine vacuum at idle. For idle vacuums of less than 18" refer to following table to determine idle speed pressure specification in forward driving ranges (D1, D2 or L).

Engine Vacuum	Control Pressure (PSI)
17	55-62
16	55-68
15	55-74
14	55-80
13	55-87
12	55-93
11	55-99

LUBRICANT REFILL CAPACITY

Models	Capacity
PCS-E, F, G, J and M	7 qts. 25 oz.
PCW-J, M, AA, AD and AF	8 qts. 27 oz.

CHECKS AND ADJUSTMENTS

Operation	Specification
Transmission End Play Check	0.880-0.042 Selective Thrust Washers Available
Turbine and Stator End Play Check	0.060 inch (maximum)
Intermediate Band Adjustment	Adjust screw to 10 foot pounds torque, and back off 1¾ turns
Low-Reverse Band Adjustment	Adjust screw to 10 foot pounds torque, and back off three turns
Forward Clutch Pressure Plate to Snap Ring Clearance	0.022 to 0.041 inch Selective Snap Ring Thicknesses 0.092-0.088 0.078-0.074 0.064-0.060
Reverse-High Clutch Pressure Plate to Snap Ring Clearance	0.060-0.080 inch Selective Snap Ring Thicknesses 0.092-0.088 0.078-0.074 0.064-0.060 0.102-0.106*

*Use with PCU, PCW, PCZ and PDA models.

SELECTIVE THRUST WASHERS— CONTROL TRANSMISSION END PLAY* (No. 1 and 2)

Thrust Washer No. 1		Thrust Washer No. 2	
Composition Thrust Washer	Color of Washer	No. Stamped on Washer	Metal Thrust Washer
0.108-0.104	Blue	5	0.109-0.107
0.091-0.087	Yellow	4	0.092-0.090
0.074-0.070	Black	3	0.075-0.073
0.057-0.053	Tan	2	0.058-0.056
0.042-0.038	Green	1	0.043-0.041
0.121-0.125	Red		
0.138-0.142	Purple		

*Selection in pairs not applicable.

CONTROL VALVE BODY SPRING IDENTIFICATION

Spring	Total Coils	Free Length	O.D.	Wire Diameter	Lbs. Load at Length	
Manual Valve Detent	9	0.74	0.295	0.045	7.5	0.601
Line Pressure Relief	15	1.12	0.287	0.032	3.5	0.62
2-3 Backout Control Valve	11½	1.26	0.450	0.032	1.47	0.580
Main Oil Pressure Regulator Valve	9.75	1.86	0.615	0.047	6.2	0.608
Throttle Pressure Modulator Valve	15	1.513	0.292	0.0286	3.573	0.620
Control 1-2 Shift Valve	13	0.95	0.230	0.019	1.0	0.450
Throttle Downshift Valve	9	1.042	0.360	0.031	3.0	0.476
Throttle Pressure Booster Valve	15	0.458	0.243	0.036	5.25	0.84
Line Pressure Boost Valve (Inner)	12.5	2.055	0.450	0.032	0.298	0.564
Intermediate Band Accumulator Valve	12.5	1.107	0.325	0.025	1.10	0.55

SHIFT SPEEDS (APPROXIMATE)

	Range	Shift	1	2	3	4	5	6	7	8	9
Minimum Throttle	D1	1-2	7-8	7-9	7-9	7-9	8-10	8-10	9-11	9-11	9-11
	D1	2-3	9-17	10-18	10-18	11-19	11-20	12-21	12-22	13-23	13-23
	D2	3-2	9	9	9	9	10	10	11	11	11
	D1	3-1	9	9	9	9	10	10	11	11	11
	L	2-1	17	18	18	19	20	21	22	23	23
Maximum Throttle	D1	1-2	25-33	26-34	27-35	28-36	29-37	30-41	33-42	34-44	35-45
	D1, D2	2-3	46-59	48-61	50-63	52-65	53-67	55-73	60-76	62-78	63-81
	D1, D2	3-2	54	55	58	60	61	67	70	72	74
	D1	2-1 or 3-1	26	27	28	29	30	33	34	35	36

Car	Engine Displacement	Axle Ratio	Tire Size	Use Column No.
Comet and Falcon	170-1V or 200-1V	3.50:1	6.00 x 13	1
			6.50 x 13 or 6.45 x 14	2
			6.95 x 14	3
		3.20:1	6.00 x 13	3
		2.83:1	6.00 x 13	6
			6.50 x 13 or 6.45 x 14	7
			6.95 x 14	8
	289-4V	3.00:1	6.45 x 14 or 6.95 x 14	6
			7.35 x 14	7
		2.80:1	6.45 x 14	7
			6.95 x 14	8
			7.35 x 14	9
Fairlane	200-1V or *289-2V, 4V	3.50:1	6.95 x 14	3
			7.35 x 14	4
		3.25:1	6.95 x 14	5
			7.35 x 14	6
		3.00:1	6.95 x 14	6
			7.35 x 14	7
		2.80:1	6.95 x 14	8
			7.35 x 14	9
Mustang	200-1V	2.83:1	6.50 x 13	7
			6.95 x 14	8
	289-2V-4V	3.00:1	6.50 x 13 or 6.95 x 14	6
			5.50/5.90 x 15	7
		2.80:1	6.50 x 13	7
			6.95 x 14	8
			5.50/5.90 x 15	9

*Except high performance

TORQUE LIMITS

Item	Foot Pounds
Pressure Gauge Tap Plug	9-15
Intermediate Servo Cover to Case Bolts	12-20
Low-Reverse Servo Cover to Case Bolts	12-16
Downshift Lever to Case Nut	12-20
Support Assy. to Front Pump Bolts	12-20
Oil Pan to Case Bolts	12-16
Distributor Sleeve to Case Bolts	12-20
Reverse Servo Piston to Shaft Nut	12-20
Outer Race to Case Bolts	13-20
Diaphragm Assy. to Case	15-23
Converter Drain Plug	20-30
Ext. Hsg. to Case Bolts	28-40
Converter Housing & Pump to Case Bolts	28-40
Intermediate Band Adj. Stop to Case Nut	35-45
Low-Reverse Band Adj. Stop to Case Nut	35-45
Manual Lever to Shaft Nut	35-45

TORQUE LIMITS (Continued)

Item	Inch Pounds
End Plate to Valve Body Screw	20-35
Lower to Upper Valve Body Bolts	40-55
Screen to Valve Body Screws	40-55
Neutral Switch to Case Screws	55-75
Screen to Valve Body Bolt	80-120
Screen and Valve Body to Case Bolts	80-120
Governor Bodies to Distributor Body Bolts	80-120
Cooler Line Fittings	80-120

STALL SPEED LIMITS

Engine Model	Engine Speed (rpm)
170—6-Cyl.	1400-1600
200—6-Cyl.	1550-1750
289—V-8	1750-1950

CLUTCH PLATES

Transmission Model	Reverse-High Clutch		Forward Clutch	
	Steel Plates	Composition Plates	Steel Plates	Composition Plates
PCS (260)	3	3	3	4
PCW (289)	4	4	4	5

SHIFT SPEEDS (APPROXIMATE)

	Range	Shift	1	2	3	4	5	6	7	8	9
Minimum Throttle	D1	1-2	7-8	7-9	7-9	7-9	8-10	8-10	9-11	9-11	9-11
	D1	2-3	9-17	10-18	10-18	11-19	11-20	12-21	12-22	13-23	13-23
	D2	3-2	9	9	9	9	10	10	11	11	11
	D1	3-1	9	9	9	9	10	10	11	11	11
	L	2-1	17	18	18	19	20	21	22	23	23
Maximum Throttle	D1	1-2	25-33	26-34	27-35	28-36	29-37	30-41	33-42	34-44	35-45
	D1, D2	2-3	46-59	48-61	50-63	52-65	53-67	55-73	60-76	62-78	63-81
	D1, D2	3-2	54	55	58	60	61	67	70	72	74
	D1	2-1 or 3-1	26	27	28	29	30	33	34	35	36

SERVICE TOOLS

Ford Tool No.	Former No.	Description
T59L-100-B	—	Impact Slide Hammer
T58L-101-A		Puller Attachment
T53L-200-A	—	Handle Adapter
T57L-500-A	—	Bench Mounted Holding Fixture
TOOL-1175-AB	1175-AB	Grease Seal Remover (Head Only)
T50T-100-A and TOOL-1175-AB	1175-AE	Seal Remover
T53T-1175-E	—	Rear Wheel Grease Retainer Replacer
TOOL-3552-H	3552-H	Special Jaws for 7600-E
TOOL-4201-C	4201-C	Differential Backlash and Runout Gauge, with Universal Bracket, Dial Indicator and Bracket
TOOL-6005-MD	6000-MD 6005-M	KRW Twin Stand Bracket Kit
TOOL-6005-MDM	6005-MDS 6005-MS	Manzel Twin Stand Bracket Kit
TOOL-7000-DD	7000-DD	Air Nozzle Rubber Tip Assembly
T52L-7000-GAE	7000-G	Transmission Extension Housing Rear Bearing Remover
T52L-7000-HAE	7000-HF	Transmission Extension Housing Rear Bearing Remover
T59P-7000-A	7000-DG	Transmission Holding Fixture
T64P-7A128-A	—	Manual Valve Detent Spring
T65P-7B456-B	—	Clutch Race to Case Bolt Socket
T58L-101-A and T59L-100-B	7600-E	Seal Remover (Head and Hammer)
T61L-7657-A	7657-AA	Transmission Extension Housing Oil Seal Replacer
T61L-7657-B	7657-AB	Transmission Extension Housing Oil Seal Replacer
T57P-7697-A	—	Transmission Extension Housing Bushing Remover
T57P-7697-B	—	Transmission Extension Housing Bushing Replacer
T60K-7697-A	7000-AF	Transmission Extension Housing Bushing Remover
T59P-7902-B	7937-B	Welded Converter Sprag Driver and Gauge Post
T63P-7902-A	—	Converter Stator Check Adapter
T64L-7902-A	—	Welded Converter Sprag Driver and Gauge Post Adapter Kit for T59P-7902-B
T59P-77059-A	77184 77185	Pinion Bearing Retainer Pins
T59P-77059-B	77059-B	Output Shaft and Carrier Assembly Holding Bracket
TOOL-77288	77288	Control Shaft Seal Replacer
T59P-77370-B	7345	Front Band Torque Wrench
T59P-77409-A	7355-A	Rear Band Gauge and Holding Tool
T59P-77423-A	7355-B	Rear Band Torque Wrench
T59L-77515-B	77515-A	Rear Clutch Spring Compressor
TOOL-77530-A	77530-A	Clutch Assembly Fixture
TOOL-77717	77717	Output Shaft Assembly Sleeve
T59P-77837-A	—	Front Pump Seal Replacer
T63L-77837-A	77837-A	Front Pump Seal Replacer

ENGINE

GROUP 8

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This part covers engine diagnosis, tests and adjustment and repair procedures. In addition, the cleaning and inspection procedures are covered.

For engine removal, disassembly, assembly, installation and major repair procedures, refer to the pertinent part of this group.

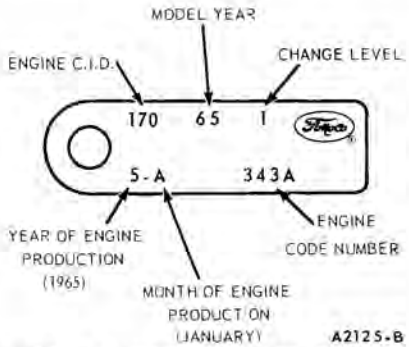


FIG. 1–Engine Identification Tag

An engine identification tag is attached to the engine. The symbol code (Fig. 1) identifies each engine for determining parts usage; i.e., engine cubic inch displacement and model year. The change level and engine code number determine if parts are peculiar to a specific engine.

1 DIAGNOSIS AND TESTING

DIAGNOSIS

Engine performance complaints usually fall under one of the basic headings listed in the "Diagnosis Guide." When a particular trouble can not be traced to a definite cause by a simple check, the possible items that could be at fault are listed in the order of their probable occurrence. Check the items in the order listed. For example, under "Poor Acceleration," the ignition system is listed as a probable cause of the trouble. All the conventional ignition system items that affect acceleration are listed. Check all these items before proceeding to the next probable cause.

DIAGNOSIS GUIDE

ENGINE WILL NOT CRANK	The cause of this trouble is usually in the starting system (Group 14). If the starting system is not at fault, check for a hydrostatic lock or a seized engine as follows: Remove the spark plugs, then attempt to crank the engine with the starter. If the engine cranks, it indicates that water is leaking into the cylinders. Remove the cylinder head(s) and inspect the gasket(s) and/or head(s) for cracks. Examine the cylinder block for cracks.
ENGINE CRANKS NORMALLY, BUT WILL NOT START	Check the fuel supply. If there is sufficient fuel in the tank and the proper starting procedure is used, the cause of the trouble probably lies in either the ignition or the fuel system. To determine which system is at fault, perform the following test: Disconnect a spark plug wire. Check the spark intensity at the end of the wire by installing a terminal adapter in the end of the wire. Then hold the adapter approximately 5/16 inch from the exhaust manifold and crank the engine. **IF THERE IS NO SPARK OR A WEAK SPARK AT THE SPARK PLUGS** The cause of the trouble is in the ignition system. **Disconnect the brown lead ("I" terminal) and the red and blue lead ("s" terminal) at the starter relay.** Install an auxiliary starter switch between the battery and "s" terminals of the starter relay. To determine if the cause of the trouble is in the primary or the secondary circuit, remove the coil high tension lead from the top of the distributor, **and hold it approximately 3/16 inch from the cylinder head.** With the ignition on, crank the engine and check for a spark. If the spark at the coil high tension lead is good, the cause of the trouble is probably in the distributor cap, rotor or spark plug wires. If there is no spark or a weak spark at the coil high tension lead, the cause of the trouble is probably in the primary circuit, coil to distributor high tension lead, or the coil. **IF THERE IS A GOOD SPARK AT THE SPARK PLUGS** Check the spark plugs. If the spark plugs are not at fault, check the following items: **MANUAL CHOKE** Check the choke linkage for binding or damage. Make certain the choke plate closes when the choke knob on the instrument panel is pulled out and that the plate opens when the knob is pushed in. **AUTOMATIC CHOKE** Check the position of the choke plate. If the engine is hot, the plate should be open. If the plate is not open, the engine will load up due to the excessively rich mixture and will not start. If the engine is cold, the plate should be closed. If the plate is not operating properly, check the following items: The choke plate and linkage for binding. The fast idle cam linkage for binding. Thermostatic spring housing adjustment. **FUEL SUPPLY AT THE CARBURETOR** Work the throttle by hand several times. Each time the throttle is actuated, fuel should spurt from the accelerating pump discharge port (6-cylinder) or nozzles (V-8). If fuel is discharged by the accelerating pump, the engine is probably flooded, or there is water in the fuel system, or an engine mechanical item is at fault. If fuel is not discharged by the accelerating pump, disconnect the carburetor fuel inlet line at the carburetor. Use a suitable container to catch the fuel. Crank the engine to see if fuel is reaching the carburetor. If fuel is not reaching the carburetor, check: The fuel filter. The fuel pump. The carburetor fuel inlet line for obstructions. The fuel pump flexible inlet line for a collapsed condition. The fuel tank line for obstructions. For fuel tank vent restriction. If fuel is reaching the carburetor, check: The fuel inlet system including the fuel inlet needle and seat assembly and the float assembly. **ENGINE** Mechanical failure in camshaft drive.

CONTINUED ON NEXT PAGE

DIAGNOSIS GUIDE (Continued)

ENGINE STARTS, BUT FAILS TO KEEP RUNNING	**FUEL SYSTEM** Idle fuel mixture needle(s) not properly adjusted. Engine idle speed set too low. The choke not operating properly. Float setting incorrect. Fuel inlet system not operating properly. Dirt or water in the fuel lines or in the fuel filter. Carburetor icing. Fuel pump defective. Check for dirt in the carburetor not allowing fuel to enter or be discharged from the idle system.	**IGNITION SYSTEM** Defective spark plugs. Leakage in the high tension wiring. Open circuit in primary resistance wire. Breaker points not properly adjusted.
ENGINE RUNS, BUT MISSES	Determine if the miss is steady or erratic and at what speed the miss occurs by operating the engine at various speeds under load. **MISSES STEADILY AT ALL SPEEDS** Isolate the miss by operating the engine with one cylinder not firing. This is done by operating the engine with the ignition wire removed from one spark plug at a time, until all cylinders have been checked. Ground the spark plug wire removed. If the engine speed changes when a particular cylinder is shorted out, that cylinder was delivering power before being shorted out. If no change in the engine operation is evident, the miss was caused by that cylinder not delivering power before being shorted out. In this case, check the: **IGNITION SYSTEM** If the miss is isolated in a particular cylinder, perform a spark test on the ignition lead of that cylinder. If a good spark does not occur, the trouble is in the secondary circuit of the system. Check the spark plug wire and the distributor cap. If a good spark occurs, check the spark plug. If the spark plug is not at fault, a mechanical component of the engine is probably at fault. **ENGINE** Intake manifold gasket leak. Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.	**MISSES ERRATICALLY AT ALL SPEEDS** **EXHAUST SYSTEM** Exhaust system restricted. **IGNITION SYSTEM** Breaker points not properly adjusted. Defective breaker points, condenser, secondary wiring, coil or spark plugs. High tension leakage across the coil, rotor or distributor cap. Defective ignition switch. **FUEL SYSTEM** Float setting incorrect. Fuel inlet system not operating properly. Dirt or water in the fuel lines or carburetor. Restricted fuel filter. Loose booster venturi (V-8). **COOLING SYSTEM** Check the cooling system for internal leakage and/or for a condition that prevents the engine from reaching normal operating temperature. **ENGINE** Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault. **MISSES AT IDLE ONLY** **FUEL SYSTEM** Idle fuel mixture needle(s) not properly adjusted. Restriction in idle fuel system. **IGNITION SYSTEM** Excessive play in the distributor shaft. Worn distributor cam.

CONTINUED ON NEXT PAGE

DIAGNOSIS GUIDE (Continued)

ENGINE RUNS, BUT MISSES (Continued)	Defective coil, rotor, condenser, breaker points, ignition wiring or spark plugs. **ENGINE** Valve lash (engines with mechanical valve lifters) or valve clearance (engines with hydraulic valve lifters) set too tight. Worn camshaft lobe(s). Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault. **MISSES AT HIGH SPEED ONLY** **FUEL SYSTEM** Power valve or passages clogged or damaged.	Low or erratic fuel pump pressure. Fuel inlet system not operating properly. Restricted fuel filter. Restricted main fuel system. Positive crankcase ventilation system restricted or not operating properly. **IGNITION SYSTEM** Defective spark plugs. **COOLING SYSTEM** Engine overheating. **ENGINE** Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.
ROUGH ENGINE IDLE	**FUEL SYSTEM** Engine idle speed set too low. Idle fuel mixture needle(s) not properly adjusted. Float setting incorrect. Air leaks between the carburetor, spacer and the manifold and/or fittings. Intake manifold gasket leak (V-8). Fuel leakage at the carburetor fuel bowl. Power valve leaking fuel (V-8). Idle fuel system air bleeds or fuel passages restricted. Fuel bleeding from the accelerating pump discharge port (6-cylinder) or nozzles (V-8). Secondary throttle plate(s) not closing (4-barrel carburetor). Improper secondary throttle plate stop adjustment (4-barrel carburetor). Leaking fuel pump, lines or fittings.	**IGNITION SYSTEM** Improperly adjusted or defective breaker points. Fouled or improperly adjusted spark plugs. Incorrect ignition timing. Spark plug misfiring. **ENGINE** Loose engine mounting bolts or worn engine support insulator. Cylinder head bolts not properly torqued. Valve clearance set too tight. Crankcase ventilation regulator valve defective or a restricted vent tube. Worn camshaft lobes. Perform a manifold vacuum or compression test to determine which mechanical component is at fault.
POOR ACCELERATION	**IGNITION SYSTEM** Incorrect ignition timing. Fouled or improperly adjusted spark plugs. Improperly adjusted or defective breaker points. Distributor not advancing properly. Loose or defective spark control valve (6-cylinder). **FUEL SYSTEM** Accelerating pump malfunction. Float setting incorrect. Throttle linkage not properly adjusted. Accelerating pump stroke not properly adjusted. Leaky power valve, gaskets or accelerating pump diaphragm. Power valve piston stuck in the up position (6-cylinder). Dirt or corrosion in accelerating	system. Distributor vacuum passages in the carburetor blocked. Restricted fuel filter. Defective fuel pump. **BRAKES** Improper adjustment–too tight. **TRANSMISSION** Clutch slippage (manual-shift transmissions). Improper band adjustment (automatic transmissions). Converter One-Way Clutch (automatic transmissions). **ENGINE** Perform a manifold vacuum or compression test to determine which mechanical component of the engine is at fault.

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DIAGNOSIS GUIDE (Continued)

ENGINE DOES NOT DEVELOP FULL POWER, OR HAS POOR HIGH SPEED PERFORMANCE	**FUEL SYSTEM** Restricted air cleaner. Restricted fuel filter. Clogged or undersize main or secondary jets and/or low float setting. Power valve or passages clogged or damaged. Fuel pump pressure incorrect. Distributor vacuum passage in the carburetor blocked. Power valve piston stuck in the up position (6-cylinder). Secondary throttle plates not opening (V-8). Automatic choke malfunctioning or improperly adjusted. **IGNITION SYSTEM** Ignition timing not properly adjusted. Defective coil, condenser or rotor. Distributor not advancing properly. Excessive play in the distributor shaft. Distributor cam worn. Fouled or improperly adjusted spark plugs, or spark plugs of incorrect heat range. Improperly adjusted or defective breaker points. **EXHAUST SYSTEM** Restriction in system. **COOLING SYSTEM** Thermostat inoperative or of incorrect heat range. Thermostat installed incorrectly. Check the cooling system for internal leakage and/or for a condition that prevents the engine from reaching normal operating temperature. **ENGINE** Perform a manifold vacuum or engine compression test to determine which mechanical component of the engine is at fault. One or more camshaft lobes worn beyond wear limit. Worn valve guides. Positive crankcase ventilation system not operating properly. **TRANSMISSION** Improper band adjustment (automatic transmissions).
EXCESSIVE FUEL CONSUMPTION	Determine the actual fuel consumption with test equipment installed in the car. If the test indicates that the fuel consumption is not excessive, demonstrate to the owner how improper driving habits will affect fuel consumption. If the test indicates that the fuel consumption is excessive, make a preliminary check of the following items before proceeding to the fuel and ignition systems. **PRELIMINARY CHECKS** **CHASSIS ITEMS** Check: Tires for proper pressure. Front wheel alignment. Brake adjustment. **EXHAUST SYSTEM** System restricted. **ODOMETER** Check calibration. **IGNITION SYSTEM** Check: Distributor breaker points. Ignition timing. **ENGINE** Crankcase ventilation regulator valve defective or restricted tubes (Positive Crankcase Ventilation System). **FINAL CHECKS** **FUEL SYSTEM** Check: Fuel pump pressure. Engine idle speed. Idle fuel mixture needle(s) for proper adjustment. Automatic choke for proper operation. Fast idle speed screw for proper adjustment. Accelerating pump stroke adjustment. Anti-stall dashpot for proper adjustment. Air cleaner for restrictions. Float setting or fuel level. Jets for wear and/or damage. Power valve operation. Air bleeds for obstructions. Accelerating pump discharge port (6-cylinder) or nozzles (V-8) for siphoning. Accelerator linkage for binds. Choke adjustment.

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DIAGNOSIS GUIDE (Continued)

EXCESSIVE FUEL CONSUMPTION (Continued)	**IGNITION SYSTEM** Check: Ignition timing. Spark plug condition and adjustment. Distributor spark advance operation. Spark control valve for proper seating (6-cylinder). **ENGINE** Perform a manifold vacuum or engine compression test to determine	which mechanical component of the engine is at fault. Check valve clearance (hydraulic lifters) or valve lash (mechanical tappets). **COOLING SYSTEM** Check thermostat operation and heat range. **TRANSMISSION** Check band adjustment (automatic transmissions).
ENGINE OVERHEATS	**TEMPERATURE SENDING UNIT AND GAUGE** Unit or gauge defective (not indicating correct temperatures) or constant voltage regulator defective. **ENGINE** Cylinder head bolts not properly torqued. Incorrect valve lash (engine with mechanical valve lifters) or valve clearance (engines with hydraulic valve lifters). Low oil level or incorrect viscosity oil used. **COOLING SYSTEM** Insufficient coolant.	Cooling system leaks. Drive belt tension incorrect. Radiator fins obstructed. Thermostat defective. Thermostat improperly installed. Cooling system passages blocked. Water pump inoperative. Faulty fan drive. **IGNITION SYSTEM** Incorrect ignition timing. Incorrect distributor advance. **EXHAUST SYSTEM** Restrictions in system. **BRAKES** Improper adjustment–too tight.
LOSS OF COOLANT	**COOLING SYSTEM** Leaking radiator or water pump. Loose or damaged hose connections. Radiator cap defective. Overheating. **ENGINE** Cylinder head gasket defective.	Intake manifold to cylinder head gasket defective (V-8). Cylinder head or intake manifold bolts (V-8) not properly torqued. Cylinder block core plugs leaking. Temperature sending unit leaking. Cracked cylinder head or block, or warped cylinder head or block gasket surface.
ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE	**TEMPERATURE SENDING UNIT AND GAUGE** Unit or gauge defective (not indicating correct temperature) or constant voltage regulator defective.	**COOLING SYSTEM** Thermostat inoperative or of incorrect heat range.
NOISY HYDRAULIC VALVE LIFTER	A noisy hydraulic valve lifter can be located by operating the engine at idle speed and placing a finger on the face of the valve spring retainer. If the lifter is not functioning properly, a shock will be felt when the valve seats. Another method of identifying a noisy lifter is by the use of a piece of hose. With the engine operating at idle speed, place one end of the	hose near the end of the valve stem and the other end to the ear and listen for a metallic noise. Repeat this procedure on each intake and exhaust valve until the noisy lifter(s) has been located. The most common causes of hydraulic valve lifter troubles are dirt, gum, varnish, carbon deposits and air bubbles. Dirt in the lifter assembly can

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DIAGNOSIS GUIDE (Continued)

NOISY HYDRAULIC VALVE LIFTER (Continued)	prevent the disc valve from seating, or it may become lodged between the plunger and body surfaces. In either case, the lifter becomes inoperative due to failure to "pump-up," or because the internal parts are no longer free to function properly. When dirt is found to be responsible for lifter malfunction, remove the lifter assembly and thoroughly clean it. Recommended engine oil and filter change intervals should be followed to minimize lifter problems caused by dirt (Group 19). Deposits of gum and varnish cause similar conditions to exist which may result in lifter malfunction. If these conditions are found to be present, the lifter should be disassembled and cleaned in solvent to remove all traces of deposits. Air bubbles in the lubricating oil, caused by an excessively high or low oil level, may likewise cause lifter malfunction. A damaged oil pick-up tube may allow air to be drawn into the lubricating system. Check for engine oil aeration as follows: Check the engine oil level to be sure it is within specification and correct as required. **Be sure the correct engine oil dipstick is being used.** Operate the engine at approximately 1200 rpm until normal operating temperature is reached. Stop the engine and remove the oil pressure sending unit. Install a fitting in this opening with a petcock-type valve that will permit attachment of a ¼ to ⅜-inch-diameter hose of sufficient length to direct the oil discharge into the oil filler pipe. Close the valve. Start the engine and operate it at approximately 500 rpm for a minimum of 5 minutes; then, open the valve slightly to permit a steady discharge of oil. Check the oil flow for air bubbles. Increase the engine speed to approximately 1000 rpm and check for air bubbles in the oil. **To facilitate checking for air bubbles, direct the oil flow over white paper or through a piece of transparent tube. The engine should not be operated at excessive speeds or for extended periods with the oil bleed attached.** If oil aeration is evident, remove the oil pan for further test and/or inspection of the oil pump intake system. Perform corrective action as required to remove air from the lubricating oil.

TESTING

CAMSHAFT LOBE LIFT

Check the lift of each lobe in consecutive order and make a note of the readings.

1. Remove the air cleaner and the valve rocker arm cover(s).

2. On a 170 or 200 six, remove the valve rocker arm shaft assembly and install a solid tappet-type push rod in the push rod bore of the camshaft lobe to be checked or use the adapter for ball-end push rods shown in Fig. 2.

On a 260 or 289 V-8, remove the rocker arm stud nut, fulcrum seat and rocker arm.

3. Make sure the push rod is in the valve lifter socket. Install a dial indicator in such a manner as to have the ball socket adapter of the indicator on the end of the push rod and in the same plane as the push rod movement (Fig. 2 or 3).

On a socket-type push rod, position the actuating point of the indicator in the push rod socket and in the same plane as the push rod movement (Fig. 2).

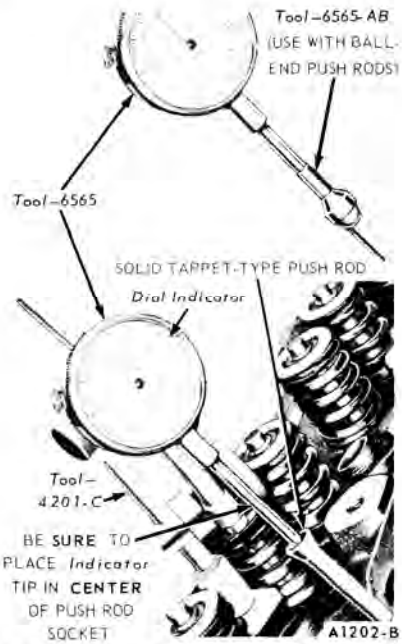


FIG. 2—Camshaft Lobe Lift—170 and 200 Six

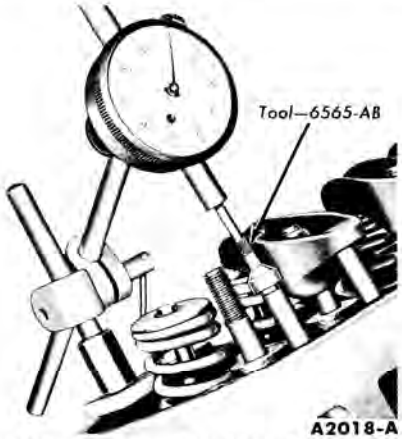


FIG. 3—Camshaft Lobe Lift—260 and 289 V-8

4. Disconnect the brown lead ("I" terminal) and the red and blue lead ("S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay. **Crank the engine with the ignition switch "OFF".**

"Bump" the crankshaft over until the tappet or lifter is on the base

circle of the camshaft lobe. **At this point, the push rod will be in its lowest position.**

5. Zero the dial indicator. Continue to rotate the crankshaft slowly until the push rod is in the fully raised position.

6. Compare the total lift recorded on the indicator with specifications.

7. To check the accuracy of the original indicator reading, continue to rotate the crankshaft until the indicator reads zero. **If the lift on any lobe is below specified wear limits, the camshaft and the valve lifters operating on the worn lobe(s) must be replaced.**

8. On a 170 or 200 six, install the rocker arm shaft assembly.

On a 260 or 289 V-8, install the rocker arm, fulcrum seat and stud nut. Adjust the valve clearance (Section 2).

On a 289 high performance V-8, install the rocker arm, fulcrum seat and stud nut. Perform a preliminary valve lash adjustment. Install the valve rocker arm cover(s) and **partially tighten the retaining bolts.** Operate the engine until normal operating temperature has been reached. Remove the valve rocker arm cover(s). Check and adjust the valve lash (Section 2).

9. Install the vave rocker arm cover(s) and the air cleaner.

COMPRESSION TEST

1. Be sure the crankcase oil is at the proper level. Be sure the battery is fully charged. Operate the engine for a minimum of 30 minutes at 1200 rpm or until the engine is at normal operating temperature. Turn the ignition switch off, then remove all the spark plugs.

2. Set the throttle plates (primary throttle plates only on a 4-barrel carburetor) and choke plate in the wide open position.

3. Install a compression gauge in No. 1 cylinder.

4. Disconnect the brown lead ("I" terminal and the red and blue lead "S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay. **Crank the engine with the ignition switch "OFF".** Using an auxiliary starter switch, crank the engine a minimum of five pumping strokes, and record the highest reading.

Note the number of compression strokes required to obtain the highest reading.

5. Repeat the test on each cylinder, cranking the engine the same number of times for each cylinder as was required to obtain the highest reading on the No. 1 cylinder.

Test Conclusions. A variation of ±20 psi from specified pressure is satisfactory. However, the compression of all cylinders should be uniform within 20 psi.

A reading of more than the allowable tolerance above normal indicates excessive deposits in the cylinder or wrong cylinder head(s) on the engine.

A reading of more than the allowable tolerance below normal indicates leakage at the cylinder head gasket, piston rings or valves or wrong cylinder head(s) on the engine.

A low, even compression in two adjacent cylinders indicates a cylinder head gasket leak. This should be checked before condemning the rings or valves.

To determine whether the rings or the valves are at fault, squirt the equivalent of a tablespoon of heavy oil into the combustion chamber. Crank the engine to distribute the oil and repeat the compression test. The oil will temporarily seal leakage past the rings. If approximately the same reading is obtained, the rings are satisfactory, but the valves are leaking. If the compression has increased substantially over the original reading, there is leakage past the rings.

During a compression test, if the pressure fails to climb steadily and remains the same during the first two successive strokes, but climbs higher on the succeeding strokes, or fails to climb during the entire test, it indicates a sticking valve.

MANIFOLD VACUUM TEST

A manifold vacuum test aids in determining the condition of an engine and also in helping to locate the cause of poor engine performance. To check manifold vacuum:

1. Operate the engine for a minimum of 30 minutes at 1200 rpm or until the engine is at normal operating temperature.

2. On 6-cylinder engines, install an accurate, sensitive vacuum gauge in the intake manifold fitting.

TABLE 1—Manifold Vacuum Gauge Readings

Gauge Reading	Engine Condition
18 inches or over—All engines.	Normal.
Low and steady.	Loss of power in all cylinders possibly caused by late ignition or valve timing, or loss of compression due to leakage around the piston rings.
Very low.	Intake manifold, carburetor, spacer or cylinder head gasket leak.
Needle fluctuates steadily as speed increases.	A partial or complete loss of power in one or more cylinders caused by a leaking valve, cylinder head or intake manifold gasket, a defect in the ignition system, or a weak valve spring.
Gradual drop in reading at engine idle.	Excessive back pressure in the exhaust system.
Intermittent fluctuation.	An occasional loss of power possibly caused by a defect in the ignition system or a sticking valve.
Slow fluctuation or drifting of the needle.	Improper idle mixture adjustment or carburetor, spacer or intake manifold gasket leak or restricted crankcase ventilation system.

On a V-8 engine, remove the plug or power brake line at the rear of the intake manifold and install an accurate, sensitive vacuum gauge.

3. Operate the engine at recommended idle rpm, with the transmission selector lever in neutral.

4. Check the vacuum reading on the gauge.

Test Conclusions. Manifold vacuum is affected by carburetor adjustment, valve timing, ignition timing, the condition of the valves, cylinder compression, the condition of the positive crankcase ventilation system, and leakage of the manifold, carburetor, carburetor spacer or cylinder head gaskets.

Because abnormal gauge readings may indicate that more than one of the above factors are at fault, exercise caution in analyzing an abnormal reading. For example, if the vacuum is low, the correction of one item may increase the vacuum enough so as to indicate that the trouble has been corrected. It is important, therefore, that each cause of an abnormal reading be investigated and further tests conducted, where necessary, in order to arrive at the correct diagnosis of the trouble.

Table 1 lists various types of readings and their possible causes.

Allowance should be made for the effect of altitude on the gauge reading. The engine vacuum will decrease with an increase in altitude.

HYDRAULIC VALVE LIFTER TESTS

Dirt, deposits of gum and varnish and air bubbles in the lubricating oil can cause hydraulic valve lifter failure or malfunction.

Dirt, gum and varnish can keep a check valve from seating and cause a loss of hydraulic pressure. An open valve disc will cause the plunger to force oil back into the valve lifter reservoir during the time the push rod is being lifted to force the valve from its seat.

Air bubbles in the lubricating system can be caused by too much oil in the system or too low an oil level. Air may also be drawn into the lubricating system through an opening in a damaged oil pick-up tube. **Air in the hydraulic system can cause a loss of hydraulic pressure in the valve lifter.**



FIG. 4—Placing Steel Ball in Valve Lifter Plunger

Assembled valve lifters can be tested with tool 6500-E to check the leak down rate. The leak down rate specification (for gauging purposes) is 10-50 seconds at 50 lbs. load. Plunger travel is 0.125 inch. Test the valve lifters as follows:

1. Place the valve lifter in the tester, with the plunger facing upward. Pour hydraulic tester fluid into the cup to a level that will cover the valve lifter assembly. **The fluid can be purchased from the manufacturer of the tester. Do not use kerosene, for it will not provide an accurate test.**

2. Place a 5/16-inch steel ball in the plunger cup (Fig. 4).

3. Adjust the length of the ram so that the pointer is in line with the starting mark when the ram contacts the valve lifter plunger (Fig. 5).



FIG. 5—Adjusting the Ram Length

4. Work the valve lifter plunger up and down until the lifter fills with fluid and all traces of air bubbles has disappeared.

5. Allow the ram and weight to force the valve lifter plunger downward. Measure the exact time it takes for the pointer to travel from the "Start Timing" to the "Stop Timing" marks of the tester.

6. A valve lifter that is satisfactory must take at least 10 seconds, but not more than 50 seconds, to leak down.

7. If the valve lifter is not within specifications, disassemble the lifter and clean and inspect it as outlined in Section 3. Assemble the lifter and test the lifter again. If it does not meet specifications, replace it with a new lifter. **Always test a new lifter before installing it in the engine.**

8. Remove the fluid from the cup and bleed the fluid from the lifter by depressing the plunger up and down. **This step will aid in depressing the lifter plungers when checking the valve clearance.**

POSITIVE CRANKCASE VENTILATION SYSTEM TEST

A malfunctioning positive crankcase ventilation system may be indicated by loping or rough engine idle. Do not attempt to compensate for this poor idle condition by disconnecting the crankcase ventilation system and/or making carburetor adjustments. The removal of the crankcase ventilation system from the engine will adversely affect the fuel economy and engine ventilation with resultant shortening of engine life.

To determine whether the loping or rough idle condition is caused by a malfunctioning crankcase ventilation system, perform either of the following tests.

Regulator Valve Test. Install a known good regulator valve in the crankcase ventilation system.

Start the engine and compare the engine idle condition to the prior idle condition.

If the loping or rough idle condition remains when the good regulator valve is installed, the crankcase ventilation system is not at fault. Further engine component diagnosis will have to be conducted to find the malfunction.

If the idle condition is found to be satisfactory, replace the regulator valve and clean the hoses, fittings, etc.

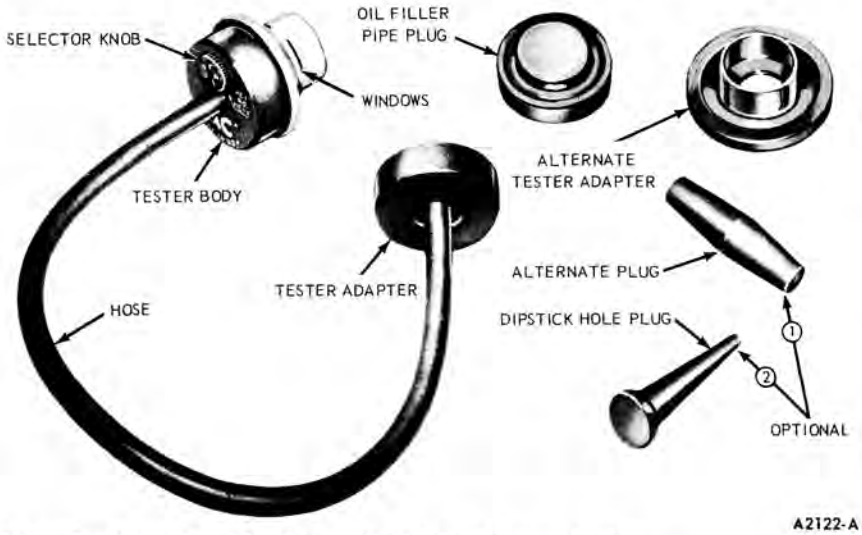


FIG. 6—AC Position Crankcase Ventilation System Tester

Air Intake Test. This test uses the AC positive crankcase ventilation tester (Fig. 6) which is operated by engine vacuum through the oil filler opening. Follow the procedures described below to install the tester and check the crankcase ventilation system for faulty operation.

1. With the engine at normal operating temperature, remove the oil filler cap and the dipstick.

2. Connect one end of the hose to the tester body and connect the other end of the hose to the tester adapter.

3. Use the dipstick hole plug to plug the opening in the dipstick tube.

4. Insert the tester adapter in the filler cap opening and turn the selector knob (Fig. 6) to number 2 for the 260 and 289 V-8 and number 4 for the 170 and 200 six.

CRANKCASE VENTILATION SYSTEM DIAGNOSIS WITH AC TESTER

COLOR	CAUSE
GREEN	SYSTEM OPERATING PROPERLY.
GREEN AND YELLOW	REGULATOR VALVE OR SYSTEM PARTIALLY PLUGGED. SLIGHT KINK IN TESTER HOSE. SLIGHT ENGINE BLOW-BY. PLUGS FROM THE KIT OR THE ENGINE VACUUM LINES ARE NOT PROPERLY SEALED. TESTER KNOB IMPROPERLY SET.
YELLOW	REGULATOR VALVE OR SYSTEM PARTIALLY PLUGGED. TESTER HOSE KINKED OR BLOCKED. BLOW-BY AT MAXIMUM CAPACITY OF REGULATOR VALVE. PLUGS FROM THE KIT OR THE ENGINE VACUUM LINES ARE NOT PROPERLY SEALED. TESTER KNOB IMPROPERLY SET.
YELLOW AND RED	REGULATOR VALVE OR SYSTEM PARTIALLY OR FULLY PLUGGED. MORE ENGINE BLOW-BY THAN REGULATOR VALVE CAN HANDLE. VENT HOSE PLUGGED OR COLLAPSED.
RED	REGULATOR VALVE OR SYSTEM FULLY PLUGGED OR STUCK. VENT HOSE PLUGGED OR COLLAPSED. EXTREME BLOW-BY.

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FIG. 7—Diagnosis of Air Intake Test

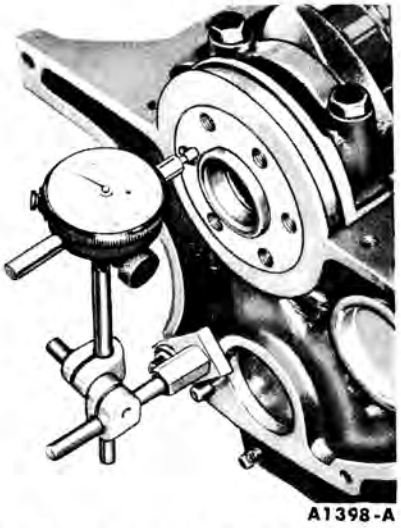


FIG. 8—Typical Crankshaft End Play

5. If the vehicle has a closed crankcase ventilation system with the tube from the air cleaner going into the oil filler cap, disconnect the hose at the oil filler cap and plug the tube connector on the filler cap.

6. Start the engine and let it idle.

7. With the plugs secure, and the tube free of kinks, hold the tester body upright and note the color in the tester windows. Fig. 7 lists the various colors and the probable cause or related condition of the crankcase ventilation system.

8. Clean or replace the malfunctioning or defective components, and repeat the test to ensure that the crankcase ventilation system is operating satisfactorily.

CRANKSHAFT END PLAY

1. Force the crankshaft toward the rear of the engine.

2. Install a dial indicator so that the contact point rests against the crankshaft flange and the indicator axis is parallel to the crankshaft axis (Fig. 8).

3. Zero the dial indicator. Push the crankshaft forward and note the reading on the dial.

4. If the end play exceeds the wear limit, replace the thrust bearing. If the end play is less than the minimum limit, inspect the thrust bearing faces for scratches, burrs, nicks or dirt. If the thrust faces are not defective or dirty, they probably were not aligned properly.


A1408-A

FIG. 9—Typical Flywheel Face Runout

Install the thrust bearing and align the faces following the procedure recommended under "Main Bearing Replacement" in the pertinent engine section. Check the crankshaft end play.

FLYWHEEL FACE RUNOUT—MANUAL-SHIFT TRANSMISSIONS

Install a dial indicator so that the indicator point bears against the flywheel face (Fig. 9). Turn the flywheel making sure that it is full forward or rearward so that crankshaft end play will not be indicated as flywheel runout.

If the clutch face runout exceeds the specifications, remove the flywheel and check for burrs between the flywheel and the face of the crankshaft mounting flange. If no burrs exist, check the runout of the crankshaft mounting flange. Replace the flywheel or machine the crankshaft flywheel mounting face if the mounting flange runout is excessive.

If the ring gear runout exceeds specifications, replace it or reinstall it on the flywheel, following the procedure in Section 2.

FLYWHEEL RUNOUT—AUTOMATIC TRANSMISSION

Remove the spark plugs.

Install a dial indicator so that the indicator point rests on the face of the ring gear.

Push the flywheel and crankshaft forward as far as possible to prevent crankshaft end play from being indicated as flywheel runout.

Set the indicator dial on the "zero" mark. Turn the flywheel one complete revolution while observing the total indicator reading (T.I.R.). If the T.I.R. exceeds specifications, the starter ring gear or flywheel and ring gear assembly must be replaced.

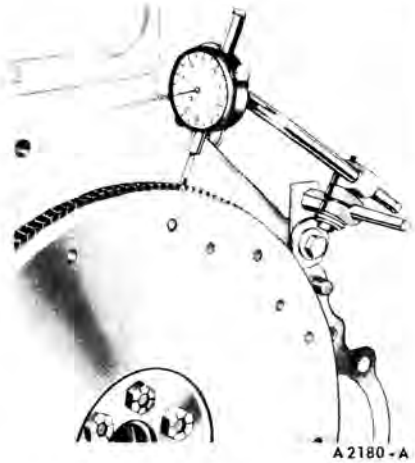

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FIG. 10—Typical Flywheel Ring Gear Runout

FLYWHEEL RING GEAR RUNOUT

Install the dial indicator so that the point rests on a tooth of the ring gear (Fig. 10), and check the outside diameter (O.D.) of the assembled flywheel and ring gear. **For this check, carefully adjust the indicator on the gear tooth so that the indicator point is near the extreme limit of its travel. This will prevent the indicator point from catching between the gear teeth as the flywheel is turned.** Set the indicator dial on the "zero" mark and slowly turn the flywheel through one revolution while observing the total indicator reading. The T.I.R. must be within specifications, or the ring gear must be replaced.

CAMSHAFT END PLAY

Push the camshaft toward the rear of the engine. Install a dial indicator so that the indicator point is on the camshaft sprocket retaining screw (Fig. 11). Zero the dial indicator. Position a large screw driver between the camshaft sprocket and the block. Pull the camshaft forward and release it. Compare the dial indicator reading with specifications. If the end play is excessive, replace the thrust plate. Remove the dial indicator.

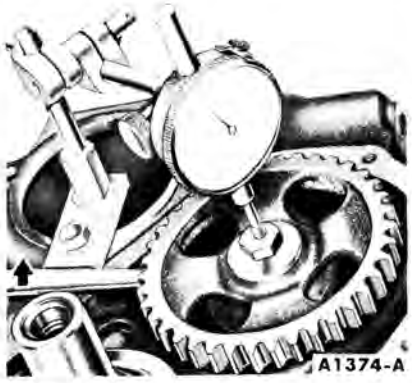
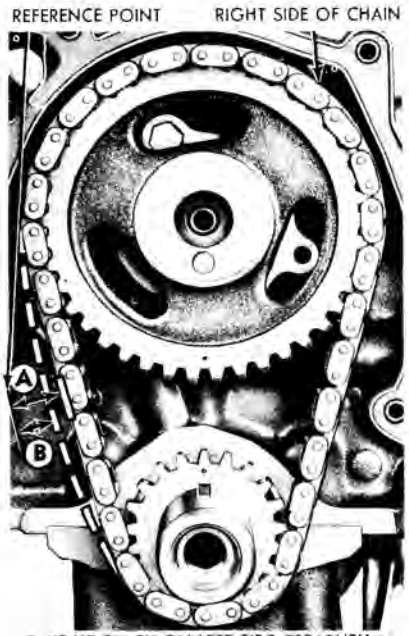

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FIG. 11—Typical Camshaft End Play

TIMING CHAIN DEFLECTION

1. Rotate the crankshaft in a clockwise direction (as viewed from the front) to take up the slack on the left side of the chain.

2. Establish a reference point on the block and measure from this point to the chain (Fig. 12).



TAKE UP SLACK ON LEFT SIDE, ESTABLISH A REFERENCE POINT. MEASURE DISTANCE **A**. TAKE UP SLACK ON RIGHT SIDE. FORCE LEFT SIDE OUT. MEASURE DISTANCE **B**. DEFLECTION IS **A** MINUS **B**.
A1602-B

FIG. 12—Typical Timing Chain Deflection

3. Rotate the crankshaft in the opposite direction to take up the slack on the right side of the chain. Force the left side of the chain out with the fingers and measure the distance between the reference point and the chain. The deflection is the difference between the two measurements.

If the deflection exceeds specifications, replace the timing chain and sprockets.

2 COMMON ADJUSTMENTS AND REPAIRS

ADJUSTMENTS

VALVE CLEARANCE– 170 AND 200 SIX

The valve clearance of an individual cylinder can be checked by placing the piston of the cylinder on TDC after the compression stroke and proceeding with step 3.

1. Using an auxiliary starter switch, rotate the crankshaft until the No. 1 piston is on TDC after the compression stroke. By using the procedure in step 3, check the following valves:

No. 1 Intake	No. 3 Exhaust
No. 1 Exhaust	No. 4 Intake
No. 2 Intake	No. 5 Exhaust

2. Now rotate the crankshaft until the No. 6 piston is on TDC after the compression stroke (1 revolution of the crankshaft). By using the procedure in step 3, check the following valves:

No. 2 Exhaust	No. 5 Intake
No. 3 Intake	No. 6 Intake
No. 4 Exhaust	No. 6 Exhaust

3. Using Tool–6513-K apply pressure to the push rod end of the rocker arm (Fig. 13) to slowly bleed



FIG. 13–Valve Clearance Check –170 and 200 Six

down the valve lifter until the plunger is completely bottomed. Hold the lifter in this position and check the available clearance between the rocker arm and the valve stem tip with a feeler gauge.

If the clearance is less than 0.066 inch, install an undersize push rod. If the clearance is greater than 0.216 inch, install an oversize push rod.

VALVE CLEARANCE– 260 AND 289 REGULAR V-8

The cylinders are numbered from front to rear–right bank, 1-2-3-4; left bank, 5-6-7-8.

The valves on the right bank are arranged from front to rear, I-E-I-E-I-E-I-E.

The valves on the left bank are arranged from front to rear, E-I-E-I-E-I-E-I.

1. Disconnect the brown lead ("I" terminal) and the red and blue lead ("S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay. **Crank the engine with the ignition switch "OFF."**

2. Make three chalk marks on the crankshaft damper (Fig. 14).

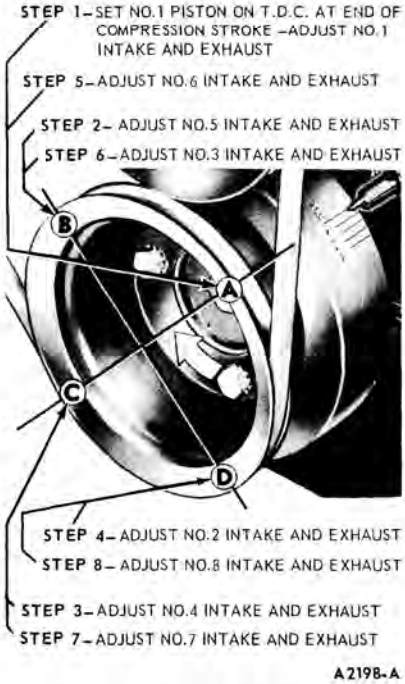


FIG. 14–289 V-8 Valve Clearance

Space the marks approximately 90° apart so that with the timing mark, the damper is divided into four equal parts (90° represents ¼ of the distance around the damper circumference).

3. Rotate the crankshaft until No. 1 piston is on TDC at the end of the compression stroke. **Check the breaking torque (torque required to turn nut in a counterclockwise direction)** of the No. 1 intake and exhaust stud nuts. Replace the stud nut if the breaking torque does not meet specifications. If the breaking torque still is not within specifications, replace the stud.

4. With No. 1 piston on TDC at the end of the compression stroke, adjust the intake and exhaust valve clearance for No. 1 cylinder. Loosen the rocker arm stud nut until there is end clearance in the push rod, then tighten the nut to just remove all the push rod to rocker arm clearance. This may be determined by rotating and/or moving the push rod with the fingers as the stud nut is tightened (Fig 15). When the



FIG. 15–Typical Valve Clearance Adjustment–260 or 289 V-8

push rod end clearance has been eliminated, tighten the stud nut an additional 1½ turns to place the hydraulic lifter plunger in the center of its travel.

5. Repeat this procedure for the remaining set of valves, turning the crankshaft with an auxiliary starter switch, ¼ turn at a time, in the direction of rotation, while adjusting the valves in the firing order sequence. The firing order is 1-5-4-2-6-3-7-8.

An alternate method is to remove the distributor cap and turn the crankshaft with an auxiliary starter switch until the breaker points are on the next peak of the distributor cam lobe. When the breaker points are on the next distributor cam lobe, the valves for the cylinder next in the firing order can be adjusted.

These procedures require two complete turns of the crankshaft.

6. Operate the engine and check for rough engine idle or a noisy lifter(s). Valve clearance set too tight will cause rough engine idle, and valve clearance set too loose

will cause a noisy lifter(s). If it has been determined that these conditions are caused by improper valve clearance, adjust the affected valve(s) using the following procedure:

Position the piston(s) on TDC after the compression stroke (See Step 2 above). Apply pressure to slowly bleed down the valve lifter until the plunger is completely bottomed (Fig. 16). While holding the



FIG. 16—Typical Valve Clearance Check—260 and 289 V-8

valve lifter in the fully collapsed position, check the available clearance between the rocker arm and valve stem tip (Fig. 16). If the clearance is not within specifications, rotate the rocker arm stud nut "clockwise" to decrease the clearance and "counterclockwise" to increase the clearance. **Normally one turn of the rocker arm stud nut will vary the clearance by 0.066 inch.**

VALVE LASH—289 HIGH PERFORMANCE V-8

Preliminary (Cold). If the valve rocker arm(s) has been removed and installed, it will be necessary to make a preliminary (cold) valve lash adjustment before starting the engine. If the adjustment is made for an engine tune-up, follow the final (hot) adjustment procedure.

1. Follow steps 1 thru 3 under "Valve Clearance—260 and 289 Regular V-8".

2. With the No. 1 piston on TDC at the end of the compression stroke, adjust the intake and exhaust valve lash to the specified cold setting.

3. Follow step 5 under "Valve Clearance—260 and 289 Regular V-8."

Final (Hot). It is very important that the valve lash be held to the correct specifications because:

If the lash is set too close, the valve will open too early and close too late, resulting in rough engine idle. Burning and warping of the valves will occur also because the valves cannot make firm contact with the seats long enough to cool properly. If the lash is excessive, it will cause the valve to open too late and close too early causing valve bounce. In addition, damage to the camshaft lobe is likely because the tappet foot will not follow the pattern of the camshaft lobe causing a shock contact between these two parts.

1. Be sure the engine is at normal operating temperature before attempting to set the valve lash.

2. With the engine idling, set the valve lash (Fig. 17) using a step-



FIG. 17—Final Valve Lash Adjustment—289 High Performance V-8

type feeler gauge only ("go" and "no go"). The final (hot) intake and exhaust valve lash settings are listed in the Specification Section.

For example, to obtain the correct setting if the valve lash is 0.019 inch, use a step-type gauge of 0.018 inch ("go") and 0.020 inch ("no go"). The "go" step should enter, and the "no go" step should not enter. The resultant setting will be to the required setting (0.019 inch).

REPAIRS

VALVE ROCKER ARM AND/OR SHAFT ASSEMBLY

Dress up minor surface defects on the rocker arm shaft and in the rocker arm bore with a hone.

If the pad at the valve end of the rocker arm has a grooved radius, replace the rocker arm. **Do not attempt to true this surface by grinding.**

For a 260 or 289 V-8 engine, refer to "Cylinder Head Repair" for the rocker arm stud replacement procedure.

PUSH RODS

Following the procedures in Section 3 under "Push Rod Inspection," check the push rods for straightness.

If the runout exceeds the maximum limit at any point, discard the rod. **Do not attempt to straighten push rods.**

CYLINDER HEADS

Replace the head if it is cracked. **Do not plane or grind more than 0.010 inch from the cylinder head gasket surface.** Remove all burrs or scratches with an oil stone.

Rocker Arm Stud Nut Replacement. If the rocker arm stud nut breaking torque is less than specified, install a new standard stud nut and recheck the breaking torque. Refer to "Valve Clearance Adjustment" for the torque procedure.

Rocker Arm Stud Replacement—260 and 289 Regular V-8. If it is necessay to remove a rocker arm stud, a rocker arm stud kit (tool T62F-6A527-A) is available which contains the following: a stud remover, a 0.006-inch O.S. reamer, a 0.015-inch O.S. reamer and a stud installer.

Rocker arm studs that are broken or have damaged threads may be replaced with standard studs. Loose studs in the head may be replaced with 0.006 or 0.015-inch oversize studs which are available for service. The standard studs have no identification markings, whereas the 0.006-inch oversize stud has two grooves around the pilot end of the stud and the 0.015 inch oversize stud has a step produced by the increased diameter of the stud approximately $1\frac{5}{32}$ inches from the pilot end.

When going from a standard size rocker arm stud to a 0.015-inch oversize stud, always use the 0.006-inch reamer before finish reaming with the 0.015-inch reamer.

1. Position the sleeve of the rocker arm stud remover (tool T62F-6A527-A1) over the stud with the bearing end down. Thread the puller into the sleeve and over the stud

until it is fully bottomed. Hold the sleeve with a wrench; then rotate the puller clockwise to remove the stud (Fig. 18).



FIG. 18—Rocker Arm Stud Removal

If the rocker arm stud was broken off flush with the stud boss, use an easy-out to remove the broken stud following the instructions of the tool manufacturer.

2. If a loose rocker arm stud is being replaced, ream the stud bore using the proper reamer (or reamers in sequence) for the selected oversize stud (Fig. 19). **Make sure the metal particles do not enter the valve area.**

3. Screw the new stud into the sliding driver of the rocker arm stud installer (tool T62F-6A527-A4) and coat the end of the stud with Lubriplate. Align the stud and installer

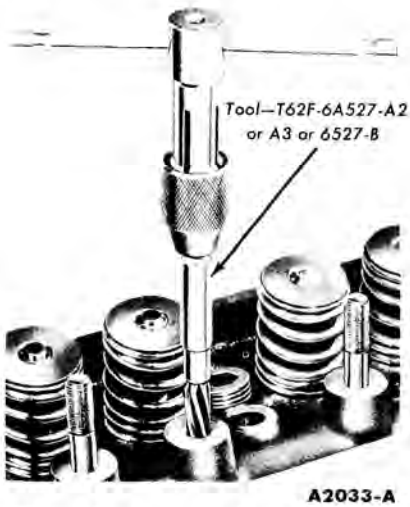


FIG. 19—Reaming Rocker Arm Stud Bore



FIG. 20—Rocker Arm Stud Installation

with the stud bore; then tap the sliding driver until it bottoms (Fig. 20). When the installer contacts the stud boss, the stud is installed to its correct height.

Valve Rocker Arm Stud Replacement—289 High Performance V-8. The valve rocker arm and stud assembly is shown in Fig. 21.

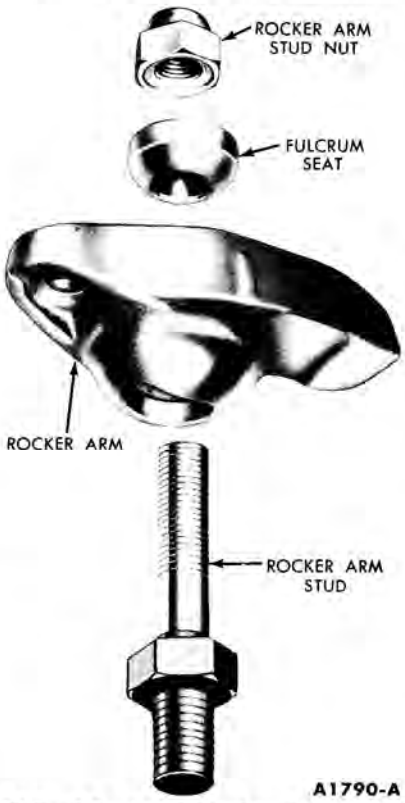


FIG. 21—Valve Rocker Arm and Stud Assembly

REMOVAL.

1. Remove the air cleaner.

2. Disconnect the spark plug wires at the spark plugs. Remove the wires from the bracket(s) on the rocker arm cover(s) and position the wires out of the way.

3. If a rocker arm and stud is being removed from the right cylinder head, pull the regulator valve out of the rubber grommet and position the hose and valve out of the way. Also remove the automatic choke heat tube.

4. Remove the valve rocker arm cover(s).

5. Remove the valve rocker arm stud nut, fulcrum seat, and rocker arm.

6. Remove the rocker arm stud.

INSTALLATION.

1. Apply water-resistant sealer to the rocker arm stud threads (side that screws into the head only). Install the rocker arm stud and torque to 60-70 ft-lbs.

2. Apply Lubriplate to the top of the valve stem and at the push rod guide in the cylinder head.

3. Install the valve rocker arm, fulcrum seat, and stud nut. Perform a preliminary (cold) valve lash adjustment.

4. Temporarily lay the valve rocker arm covers in place and connect the spark plug wire to the spark plugs. Operate the engine at 1200 rpm for 30 minutes to stabilize engine temperatures. Remove the valve rocker arm covers and perform a hot valve lash adjustment with the engine idling.

5. Clean the valve rocker arm cover(s) and the cylinder head gasket surface. Apply oil-resistant sealer to one side of a new cover gasket(s). Lay the cemented side of the gasket(s) in place in the cover(s).

6. Position the cover(s) on the cylinder head(s). Make sure that the gasket seats evenly around the head. Install the valve cover bolts. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

If the right valve rocker arm cover was removed, install the automatic choke heat tube and the crankcase ventilation regulator valve.

Reaming Valve Guides. If it becomes necessary to ream a valve

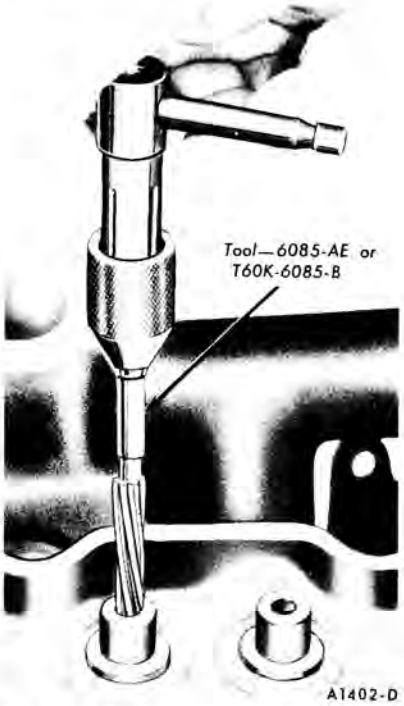


FIG. 22—Reaming Valve Guides

guide (Fig. 22) to install a valve with an oversize stem, a reaming kit is available which contains the following reamer and pilot combinations: a 0.003-inch O.S. reamer with a standard diameter pilot, a 0.015-inch O.S. reamer with a 0.003-inch O.S. pilot, and a 0.030-inch reamer with a 0.015-inch O.S. pilot.

When going from a standard size valve to an oversize valve, always use the reamers in sequence. **Always reface the valve seat after the valve guide has been reamed.**

Refacing Valve Seats. Refacing of the valve seats should be closely coordinated with refacing of the valve face so that the finished seat and valve face will be concentric and the specified interference fit will be maintained. This is important so that

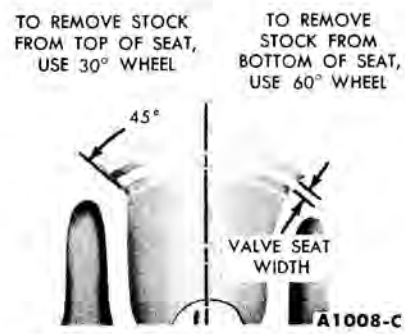


FIG. 23—Valve Seat Refacing

the valve and seat will have a compression tight fit. Be sure that the refacer grinding wheels are properly dressed.

Grind the valve seats to a true 45° angle (Fig. 23). Remove only enough stock to clean up pits, grooves, or to correct the valve seat runout. After the seat has been refaced, use a seat width scale to measure the seat width (Fig. 24). Narrow the seat, if



FIG. 24—Valve Seat Width

necessary to bring it within specifications.

If the valve seat width exceeds the maximum limit, remove enough stock from the top edge and/or bottom edge of the seat to reduce the width to specifications (Fig. 23).

Use a 30° angle grinding wheel to remove stock from the top of the seats (lower the seats) and use a 60° angle wheel to remove stock from the bottom of the seats (raise the seats).

The finished valve seat should contact the approximate center of the valve face. It is good practice to determine where the valve seat contacts the face. To do this, coat the seat with Prussian blue, then set the valve in place. Rotate the valve with light pressure. If the blue is transferred to the center of the valve face, the contact is satisfactory. If the blue is transferred to the top edge of the valve face, lower the valve seat. If the blue is transferred to the bottom edge of the valve face, raise the valve seat.

VALVES

For inspection procedures refer to Section 3.

Valve defects, such as minor pits, grooves, etc., may be removed. Discard valves that are severely damaged, or if the face runout or stem clearance exceed specifications.

Discard any defective part of the valve assembly.

Refacing Valves. The valve refacing operation should be closely coordinated with the valve seat refacing operation so that the finished angles of the valve face and of the valve seat will provide a compression-tight fit. Be sure that the refacer grinding wheels are properly dressed.

If the valve face runout is excessive and/or to remove pits and grooves, reface the valves to a true 44° angle. Remove only enough stock to correct the runout or to clean up the pits and grooves. If the edge of the valve head is less than $\frac{1}{32}$ inch thick after grinding, replace the valve as the valve will run too hot in the engine. **The interference fit of the valve and seat should not be lapped out.**

Remove all grooves or score marks from the end of the valve stem, and chamfer it as necessary. Do not remove more than 0.010 inch from the stem.

If the valve and/or valve seat has been refaced, it will be necessary to check the clearance between the rocker arm pad and the valve stem with the valve train assembly installed in the engine.

Select Fitting Valves. If the valve stem to valve guide clearance exceeds the wear limit, ream the valve guide for the next oversize valve stem. Valves with oversize stem diameters of 0.003, 0.015 and 0.030 inch are available for service. **Always reface the valve seat after the valve guide has been reamed.** Refer to "Reaming Valve Guides."

CAMSHAFT

Remove light scuffs, scores or nicks from the camshaft machined surfaces with a smooth oil stone.

CRANKSHAFT

Dress minor imperfections with an oil stone. If the journals are severely marred or exceed the wear limit, they should be refinished to size for the next undersize bearing.

Refinishing Journals. Refinish the journal to give the proper clearance with the next undersize bearing. If the journal will not "clean up" to give the proper clearance with the maximum undersize bearing available, replace the crankshaft.

Always reproduce the same journal shoulder radius that existed originally. Too small a radius will

TABLE 2—Oversize Service Pistons

ENGINE	PISTON OVERSIZE (inches)
170 Six	0.020, 0.030, 0.040, 0.060
200 Six	0.020, 0.030, 0.040
260 V-8	0.020, 0.030, 0.040, 0.060
289 V-8 (2-V and 4-V)	0.020, 0.030, 0.040
289 High Performance V-8	Standard Only

result in fatigue failure of the crankshaft. Too large a radius will result in bearing failure due to radius ride of the bearing.

After refinishing the journals, chamfer the oil holes, then polish the journal with a No. 320 grit polishing cloth and engine oil. Crocus cloth may be used also as a polishing agent.

PISTONS, PINS AND RINGS

Fitting Pistons. Pistons are available for service in standard sizes and the oversizes shown in Table 2.

The standard-size pistons are color coded "red" or "blue" on the dome. Refer to the specifications for the standard-size piston dimensions. Piston pins are provided with new pistons.

Follow the procedures in Section 3 to measure the piston O.D. and cylinder bore I.D. The dimensions should be within specifications, and the piston to bore clearance (bore I.D. minus piston O.D.) must be within the specified limits. Then, the piston fit in the bore can be checked with a feeler gauge and spring scale following the procedure below:

If the clearance is greater than the maximum limit, recheck calculations to be sure that the proper size piston has been selected, check for a damaged piston; then, try a new piston.

If the clearance is less than the minimum limit, recheck calculations before trying another piston. If none can be fitted, refinish the cylinder for the next size piston.

When a piston has been fitted, mark it for assembly in the cylinder to which it was fitted.

If the taper and out-of-round conditions of the cylinder bore are within limits, new piston rings will give satisfactory service provided the piston clearance in the cylinder bore is within limits. If the new rings are to be installed in a used cylinder that has not been refinished, remove the cylinder wall "glaze". Be sure to clean the cylinder bore thoroughly, following the procedure in Section 3.

TO FIT A PISTON:

1. Calculate the size piston to be used by taking a cylinder bore check. Follow the procedures outlined in Section 3.

2. Select the proper size piston to provide the desired clearance (refer to the specifications).

3. Make sure the piston and cylinder block are at room temperature (70°F). **After any refinishing operation, allow the cylinder bore to cool and make sure the piston and bore are clean and dry before the piston fit is checked.**

To check the measured fit of piston to cylinder bore, use a feeler gauge and tension scale following the procedure in steps 4 - 7 below. **This procedure must not be used to overrule the calculated fit determined from measuring the piston and cylinder bore (Section 3).** If the feeler gauge check does not agree with the calculated fit, repeat both to determine the error, and correct as necessary.

4. Attach a tension scale to the end of a feeler gauge ribbon that is free of dents or burrs. The feeler ribbon should be ½-inch wide and of one of the recommended thicknesses shown in Fig. 25.

5. Position the ribbon in the cylinder bore so that it extends the entire length of the piston at 90° from the piston pin location.

6. Invert the piston and install it in the bore so that the end of the piston is about 1½ inches below the top of the cylinder block and the piston pin is parallel to the crankshaft axis.

When checking the piston to bore clearance, the ribbon and piston fit in the bore must be snug in order to obtain an accurate reading. It is necessary to support the weight of the piston with one hand to prevent twisting the piston in the bore and obtaining an erroneous reading.

PISTON CLEARANCE							
RIBBON 0.0015 THICK & 0.500 WIDE		RIBBON 0.002 THICK & 0.500 WIDE		RIBBON 0.0035 THICK & 0.500 WIDE		RIBBON 0.006 THICK & 0.500 WIDE	
Ribbon Pull Lbs.	Clearance Inches	Ribbon Pull Lbs.	Clearance Inches	Ribbon Pull Lbs.	Clearance Inches	Ribbon Pull Lbs.	Clearance Inches
13	—	13	—	13	0.0012	13	0.0038
12	—	12	—	12	0.0014	12	0.0040
11	—	11	—	11	0.0016	11	0.0041
10	—	10	—	10	0.0018	10	0.0043
9	—	9	0.0002	9	0.0021	9	0.0045
8	—	8	0.0005	8	0.0023	8	0.0047
7	0.0002	7	0.0007	7	0.0025	7	0.0049
6	0.0004	6	0.0010	6	0.0027	6	0.0050
5	0.0007	5	0.0012	5	0.0030	5	0.0057
4	0.0009	4	0.0015	4	0.0032	4	0.0059
3	0.0012	3	0.0017	3	0.0033	3	0.0060
2	0.0015	2	0.0020	2	0.0036	2	0.0062
1	0.0017	1	0.0022	1	0.0038	1	0.0063
0	0.0020	0	0.0025	0	0.0040	0	0.0065

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FIG. 25—Piston Clearance Chart

7. Hold the piston and slowly pull the scale in a straight line with the ribbon, noting the pull required to remove the feeler ribbon (Fig. 26).

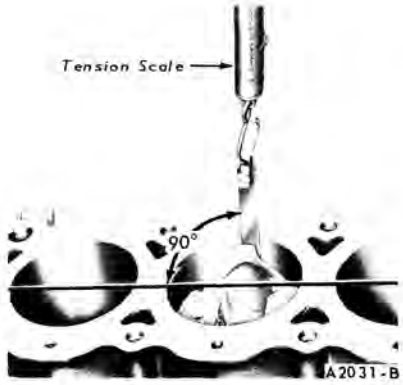


FIG. 26—Checking Piston Clearance—Typical

Compare the required pull with (Fig. 25) to determine the piston clearance.

FITTING PISTON RINGS

1. Select the proper ring set for the size piston to be used.

2. Position the ring in the cylinder bore in which it is going to be used.

3. Push the ring down into the bore area where normal ring wear is not encountered.

4. Use the head of a piston to position the ring in the bore so that the ring is square with the cylinder wall. **Use caution to avoid damage to the ring or cylinder bore.**

5. Measure the gap between the ends of the ring with a feeler gauge (Fig. 27). If the ring gap is less or greater than the specified limits, try another ring set.

6. Check the ring side clearance



FIG. 27—Piston Ring Gap



FIG. 28—Ring Side Clearance

of the compression rings with a feeler gauge inserted between the ring and its lower land (Fig. 28). The gauge should slide freely around the entire ring circumference without binding. Any wear that occurs will form a step at the inner portion of the lower land. **If the lower lands have high steps, the piston should be replaced.**

Fitting Piston Pins. The piston pin to piston should be a light thumb press fit at normal temperature (70°F). Refer to the specifications for the piston pin dimension.

The piston pin is an interference fit in the connecting rod. Oversize piston pins are not recommended. Refer to the specifications for the piston pin and connecting rod pin bore dimensions.

CYLINDER BLOCK

Refinishing Cylinder Walls. Honing is recommended for refinishing cylinder walls only when the walls have minor imperfections, such as light scuffs and scratches or for fitting pistons to the specified clearance. The grade of hone to be used is determined by the amount of metal to be removed. Follow the instructions of the hone manufacturer. If coarse stones are used to start the honing operation, leave enough material so that all hone marks can be removed with the finishing hone which is used to obtain the proper piston clearance.

Cylinder walls that are severely marred and/or worn beyond the specified limits should be refinished. Before any cylinder is refinished, all main bearing caps must be in place and tightened to the proper torque so that the crankshaft bearing bores will not become distorted from the refinishing operation.

Refinish only the cylinder or cylinders that require it. **All pistons are the same weight, both standard and oversize; therefore, various sizes of pistons can be used without upsetting engine balance.**

Refinish the cylinder with the most wear first to determine the maximum oversize. If the cylinder will not clean up when refinished for the maximum oversize piston recommended, replace the cylinder block.

Refinish the cylinder to within approximately 0.0015 inch of the required oversize diameter. This will allow enough stock for the final step of honing so that the correct surface finish and pattern are obtained. Use clean sharp hones of No. 180-220 grit for this operation.

For the proper use of the refinishing equipment, follow the instructions of the manufacturer. Only experienced personnel should be allowed to perform this work.

After the final operation in either of the two refinishing methods described and prior to checking the piston fit, thoroughly clean and oil the cylinder walls, following the procedure in Section 3. Check the piston fit, following the procedure in this section and Section 3. Mark the pistons to correspond to the cylinders in which they are to be installed. When the refinishing of all cylinders that require it has been completed and all pistons are fitted, thoroughly clean the entire block to remove all particles from the bearing bores, oil passages, cylinder head bolt holes, etc. Coat the cylinder walls with oil.

FLYWHEEL RING GEAR—MANUAL-SHIFT TRANSMISSIONS

To replace a defective ring gear, heat the defective ring gear with a blow torch on the engine side of the gear, and knock it off the flywheel. **Do not hit the flywheel when removing the ring gear.**

Heat the new ring gear evenly until the gear expands enough to slip onto the flywheel. Make sure the gear is seated properly against the shoulder. **Do not heat any portion of the gear to a temperature higher than 500°F. If this limit is exceeded, the temper will be removed from the ring gear teeth.**

3 CLEANING AND INSPECTION

The cleaning and inspection procedures in this section are for a complete engine overhaul; therefore, for partial engine overhaul or parts replacement, follow the pertinent cleaning or inspection procedure.

INTAKE MANIFOLD

CLEANING

Remove all gasket material from the machined surfaces of the manifold. Clean the manifold in a suitable solvent and dry it with compressed air.

INSPECTION

Inspect the manifold for cracks, damaged gasket surfaces, or other defects that would make it unfit for further service. Replace all studs that are stripped or otherwise damaged. **Remove all filings and foreign matter that may have entered the manifold as a result of repairs.**

EXHAUST MANIFOLDS

CLEANING

Remove all gasket material from the manifolds. Make sure the automatic choke air inlet and outlet holes (right exhaust manifold on V-8 engines) are completely open and the cover does not leak.

Blow out the automatic choke air heat tube with compressed air.

INSPECTION

Inspect the manifold(s) for cracks, damaged gasket surfaces, or other defects that would make them unfit for further service.

VALVE ROCKER ARM AND/OR SHAFT ASSEMBLY

CLEANING

Clean all the parts thoroughly. Make sure all oil passages are open.

On ball stud rocker arms, make sure the oil passage in the push rod end of the rocker arm is open.

INSPECTION

On rocker arm shaft assemblies, check the clearance between each rocker arm and the shaft by checking the ID of the rocker arm bore and the OD of the shaft. If the clearance between any rocker arm and the shaft exceeds the wear limit, replace the shaft and/or the rocker arm. Inspect the shaft and the rocker arm bore for nicks, scratches, scores, or scuffs.

Inspect the pad at the valve end of the rocker arm for indications of scuffing or abnormal wear. If the pad is grooved, replace the rocker arm. **Do not attempt to true this surface by grinding.**

On ball stud rocker arms, check the rocker arm and fulcrum seat for excessive wear, cracks, nicks or burrs. Check the rocker arm stud and nut for stripped or broken threads.

On a 289 High Performance V-8, check the rocker arm adjusting screws and the push rod end of the rocker arms for stripped or broken threads, and the ball end of the adjusting screw for nicks, scratches, or excessive wear.

PUSH RODS

CLEANING

On a 260 V-8 or 289 V-8, clean the push rods in a suitable solvent. Blow out the oil passage in the push rods with compressed air.

INSPECTION

Check the ends of the push rods for nicks, grooves, roughness or excessive wear.

The push rods can be visually checked for straightness while they are installed in the engine by rotating them with the valve closed. They also can be checked with a dial indicator (Fig. 29).

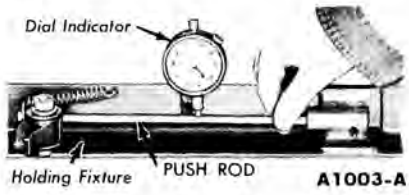


FIG. 29—Push Rod Runout

CYLINDER HEADS

CLEANING

With the valves installed to protect the valve seats, remove deposits from the combustion chambers and valve heads with a scraper and a wire brush. **Be careful not to damage the cylinder head gasket surface.** After the valves are removed, clean the valve guide bores with a valve guide cleaning tool. Use cleaning solvent to remove dirt, grease, and other deposits. Clean all bolt holes; be sure the oil transfer passage is clean.

Remove all deposits from the valves with a fine wire brush or buffing wheel.

INSPECTION

Check the cylinder head for cracks, and inspect the gasket surface for burrs and nicks. Replace the head if it is cracked.

The following inspection procedures are for a cylinder head that is to be completely overhauled. For individual repair operations, use only the pertinent inspection procedure.

Cylinder Head Flatness. When a cylinder head is removed because of gasket leaks, check the flatness of the cylinder head gasket surface



FIG. 30—Typical Cylinder Head Flatness

(Fig. 30) for conformance to specifications.

If necessary to refinish the cylinder head gasket surface, **do not plane or grind off more than 0.010 inch.**

Valve Seat Runout. Check the valve seat runout with an accurate gauge (Fig. 31). Follow the instruc-



FIG. 31—Typical Valve Seat Runout

tions of the gauge manufacturer. If the runout exceeds the wear limit, reface the valve and valve seat.

Valve Seat Width. Measure the valve seat width (Fig. 24). Reface the valve seats if the width is not within specifications.

Valves. The critical inspection points and tolerances of the valves are illustrated in Fig. 32. Refer to

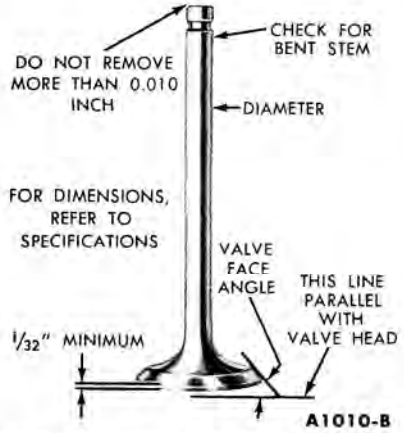


FIG. 32—Critical Valve Tolerances

the specifications for the wear limits. Inspect the valve face and the edge of the valve head for pits, grooves, scores or other defects. Inspect the stem for a bent condition and the end of the stem for grooves or scores. Check the valve head for signs of burning, erosion, warpage and cracking. Defects, such as minor pits, grooves, etc., may be removed. Discard valves that are severely damaged.

Inspect the valve springs, valve spring retainers, locks and sleeves for defects.

Valve Face Runout. Check the valve face runout (Fig. 33). It



FIG. 33—Valve Race Runout

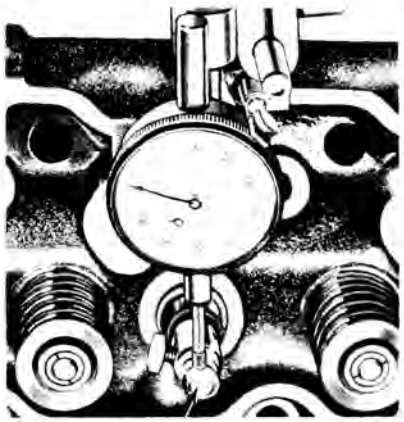


FIG. 34—Typical Valve Stem Clearance

should not exceed the specified wear limit. If the runout exceeds the wear limits, the valve should be refaced or replaced as outlined under "Refacing Valves" in Section 2.

Valve Stem Clearance. Check the valve stem to valve guide clearance of each valve in its respective valve guide with the tool shown in Fig. 34 or its equivalent.

Valve Spring Pressure. Check the spring for proper pressure (Figs. 35 or 36) at the specified spring lengths. Weak valve springs cause poor engine performance; therefore, if the pressure of any spring approaches the wear limit, replace the spring.

Valve Springs. Check each spring for squareness using a steel square and a surface plate (Fig. 37). Stand the spring and square on end on the surface plate. Slide the spring up to the square. Revolve the spring slowly and observe the space between the top coil of the spring and the square. If the spring is out of square more than 1/16 inch, replace it.

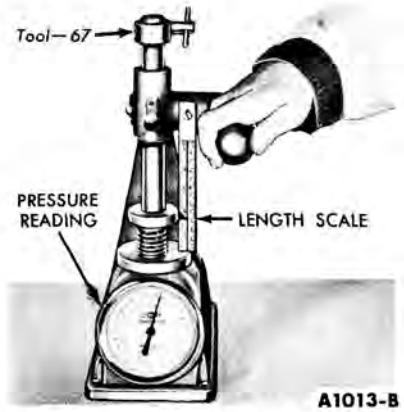


FIG. 35—Valve Spring Pressure —Falcon, Fairlane and Mustang

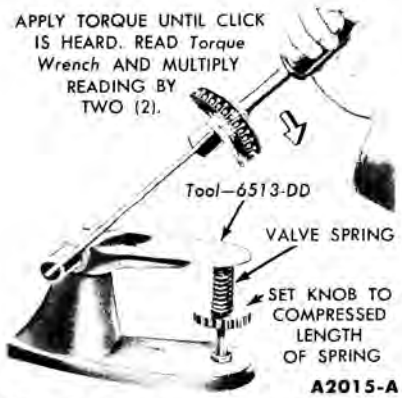


FIG. 36—Valve Spring Pressure —Comet

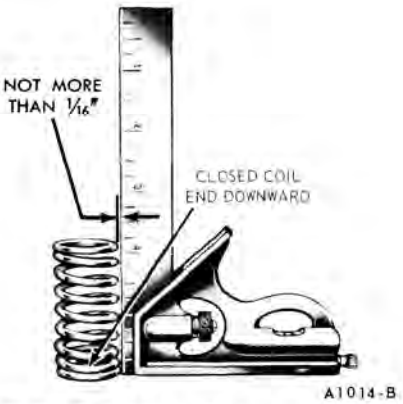


FIG. 37—Valve Spring Squareness

HYDRAULIC VALVE LIFTERS

The valve lifter assemblies should be kept in proper sequence so that they can be installed in their original position. Inspect and test each lifter separately so as not to intermix the internal parts. **If any part of the lifter assembly needs replacing, replace the entire assembly.**

CLEANING

Thoroughly clean all the parts in clean solvent and wipe them with a clean, lint-free cloth.

INSPECTION

Inspect the parts and discard the entire lifter assembly if any part shows pitting, scoring, galling or evidence of non-rotation. Replace the entire assembly if the plunger is not free in the body. The plunger should drop to the bottom of the body by its own weight.

Assemble the lifter assembly and check for freeness of operation by pressing down on the push rod cup. The lifters can also be checked with a hydraulic tester to test the leak

down rate. Follow the instructions of the test unit manufacturer or the procedure in Section 1.

TIMING CHAIN AND SPROCKETS

CLEANING

Clean all parts in solvent and dry them with compressed air.

INSPECTION

Inspect the chain for broken links and the sprockets for cracks, and worn or damaged teeth. Replace all components of the timing chain and sprocket assembly if any one item needs replacement.

On the 260 and 289 V-8, inspect the fuel pump drive eccentric for scores, nicks and excessive wear. If the eccentric is scored, replace it.

CAMSHAFT

CLEANING AND INSPECTION

Clean the camshaft in solvent and wipe dry. Inspect the camshaft lobes for scoring, and signs of abnormal wear. Lobe wear characteristics may result in pitting in the general area of the lobe toe. This pitting is not detrimental to the operation of the camshaft; therefore, the camshaft should not be replaced until the lobe lift loss has exceeded 0.005 inch.

The lift of the camshaft lobes can be checked with the camshaft installed in the engine or on centers. Refer to "Camshaft Lobe Lift."

Check the distributor drive gear for broken or chipped teeth.

CRANKSHAFT

CLEANING

Handle the crankshaft with care to avoid possible fractures or damage to the finished surfaces. Clean the crankshaft with solvent, then blow out all oil passages with compressed air.

INSPECTION

Inspect main and connecting rod journals for cracks, scratches, grooves or scores.

Measure the diameter of each journal in at least four places to determine out-of-round, taper or undersize condition (Fig. 38).

On engines used with a manual shift transmission, check the fit of the clutch pilot bushing in the bore

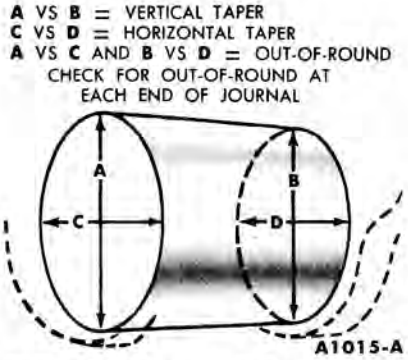


FIG. 38—Crankshaft Journal Measurements

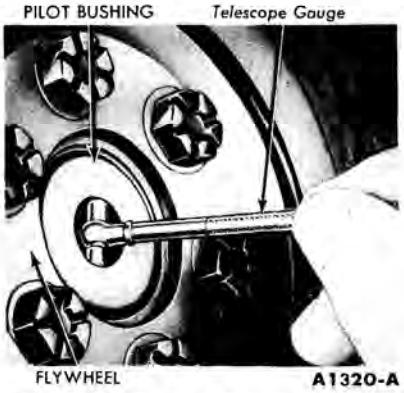


FIG. 39—Typical Clutch Pilot Bushing Wear Check

of the crankshaft. The bushing is pressed into the crankshaft and should not be loose. Inspect the inner surface of the bushing for wear or a bell-mouth condition. Check the ID of the bushing (Fig. 39). Replace the bushing if it is worn or damaged or the ID is not within specifications.

Inspect the pilot bearing, when used, for roughness, evidence of overheating or loss of lubricant. Replace it if any of these conditions are found.

FLYWHEEL—MANUAL-SHIFT TRANSMISSIONS

INSPECTION

Inspect the flywheel for cracks, heat check, or other defects that would make it unfit for further service. Machine the friction surface of the flywheel if it is scored or worn. If it is necessary to remove more than 0.045 inch of stock from the original thickness, replace the flywheel.

Inspect the ring gear for worn, chipped or cracked teeth. If the teeth are damaged, replace the ring gear.

With the flywheel installed on the crankshaft, check the flywheel face runout, following the procedure in Section 1.

FLYWHEEL—AUTOMATIC TRANSMISSION

INSPECTION

Inspect the flywheel for cracks or other defects that would make it unfit for further service. Inspect the starter ring gear for worn, chipped or cracked teeth. If the teeth are damaged, replace the starter ring gear.

With the flywheel installed on the crankshaft, check the gear face runout and outside diameter runout of the flywheel (refer to Section 1 for the proper procedure).

CONNECTING RODS

CLEANING

Remove the bearings from the rod and cap. Identify the bearings if they are to be used again. Clean the connecting rod in solvent, including the rod bore and the back of the inserts. **Do not use a caustic cleaning solution.** Blow out all passages with compressed air.

INSPECTION

The connecting rods and related parts should be carefully inspected and checked for conformance to specifications. Various forms of engine wear caused by these parts can be readily identified.

A shiny surface on the pin boss side of the piston usually indicates that a connecting rod is bent or the piston pin hole is not in proper relation to the piston skirt and ring grooves.

Abnormal connecting rod bearing wear can be caused by either a bent connecting rod, an improperly machined crankpin, or a tapered connecting rod bore.

Twisted connecting rods will not create an easily identifiable wear pattern, but badly twisted rods will disturb the action of the entire piston, rings and connecting rod assembly and may be the cause of excessive oil consumption.

Inspect the connecting rods for signs of fractures and the bearing bores for out-of-round and taper.

If the bore exceeds the recommended limits and/or if the connecting rod is fractured, it should be replaced.

Check the I.D. of the connecting rod piston pin bore. Replace the connecting rod if the pin bore is not within specifications.

Replace defective connecting rod nuts and bolts.

After the connecting rods are assembled to the piston, check the connecting rods for bend or twist on a suitable alignment fixture. Follow the instructions of the fixture manuton, rings and connecting rod asfacturer. If the bend and/or twist exceeds specifications, the connecting rod must be straightened or replaced.

PISTONS, PINS AND RINGS

CLEANING

Remove deposits from the piston surfaces. Clean gum or varnish from the piston skirt, piston pins and rings with solvent. **Do not use a caustic cleaning solution or a wire brush to clean pistons.** Clean the ring grooves with a ring groove cleaner (Fig. 40). Make sure the oil ring slots (or holes) are clean.



FIG. 40—Cleaning Ring Grooves

INSPECTION

Carefully inspect the pistons for fractures at the ring lands, skirts and pin bosses, and for scuffed, rough or scored skirts. If the lower inner portion of the ring grooves has a high step, replace the piston. The step will interfere with ring operation and cause excessive ring side clearance.

Spongy, eroded areas near the edge of the top of the piston are usually caused by detonation or pre-ignition. A shiny surface on the thrust surface of the piston, offset from the centerline between the piston pin holes, can be caused by a bent connecting rod. Replace pistons that show signs of excessive wear, wavy ring lands or fractures or damage from detonation or pre-ignition.

Check the piston to cylinder bore clearance by measuring the piston and bore diameters. Refer to the specifications for the proper clearance. Refer to "Cylinder Block Inspection" for the bore measurement procedure. **Measure the O.D. of the piston with micrometers at the centerline of the piston pin bore and at 90° to the pin bore axis.** Install the piston(s) and recheck the clearance with a tension scale and ribbon, following the procedure under "Fitting Pistons" in Section 2. Check the ring side clearance following the procedure under "Fitting Piston Rings" in Section 2.

Replace piston pins showing signs of fracture, etching or wear. Check the piston pin fit in the piston and rod. Refer to "Pistons and Connecting Rods Assembly" in the pertinent engine section.

Check the O.D. of the piston pin and the I.D. of the pin bore in the piston. Replace any piston pin or piston that is not within specifications.

Replace all rings that are scored, chipped or cracked. Check the end gap and side clearance. It is good practice to always install new rings when overhauling the engine. Rings should not be transferred from one piston to another regardless of mileage.

MAIN AND CONNECTING ROD BEARINGS

CLEANING

Clean the bearing inserts and caps thoroughly in solvent, and dry them with compressed air. **Do not scrape gum or varnish deposits from the bearing shells.**

INSPECTION

Inspect each bearing carefully. Bearings that have a scored, chipped or worn surface should be replaced. Typical examples of bearing failures and their causes are shown in Fig. 41. The copper lead bearing base may be visible through the bearing overlay. This does not mean that the bearing is worn. It is not necessary to replace the bearing if the bearing clearance is within recommended limits. Check the clearance of bearings that appear to be satisfactory with Plastigage. Fit new bearings following the recommended procedure in the pertinent part of Group 8.

CYLINDER BLOCK

CLEANING

After any cylinder bore repair operation, such as honing or deglazing, clean the bore(s) with soap or detergent and water. **Then, thoroughly rinse the bore(s) with clean water to remove the soap or detergent, and wipe the bore(s) dry with a clean, lint-free cloth. Finally, wipe the bore(s) with a clean cloth dipped in engine oil. If these procedures are not followed, rusting of the cylinder bore(s) may occur.**

If the engine is disassembled, thoroughly clean the block in solvent. Remove old gasket material from all machined surfaces. Remove

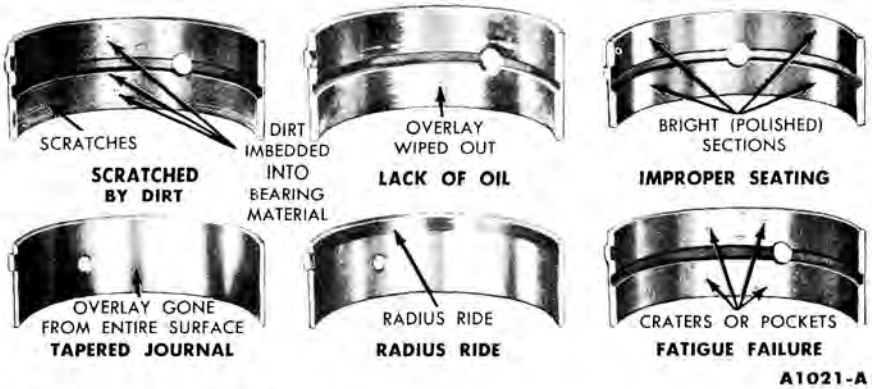


FIG. 41—Typical Bearing Failures

all pipe plugs which seal oil passages; then clean out all the passages. Blow out all passages, bolt holes, etc., with compressed air.

Make sure the threads in the cylinder head bolt holes are clean. Dirt in the threads may cause binding and result in a false torque reading. Use a tap to true-up threads and to remove any deposits.

INSPECTION

After the block has been thoroughly cleaned, make a check for cracks. Minute cracks not visible to the naked eye may be detected by coating the suspected area with a mixture of 25% kerosene and 75% light motor oil. Wipe the part dry and immediately apply a coating of zinc oxide dissolved in wood alcohol. If cracks are present, the coating will become discolored at the defective area. Replace the block if it is cracked.

Check all machined gasket surfaces for burrs, nicks, scratches and scores. Remove minor imperfections with an oil stone. Check the flatness of the cylinder block gasket surface following the procedure and specifications recommended for the cylinder head. The cylinder block can be machined to bring the cylinder head gasket surface within the flatness specifications, **but not to exceed 0.010 inch stock removal.**

Replace all expansion-type plugs that show evidence of leakage.

Inspect the cylinder walls for scoring, roughness or other signs of wear. Check the cylinder bore for out-of-round and taper. Measure the bore with an accurate gauge following the instructions of the manufacturer. Measure the diameter of each cylinder bore at the top, middle and bottom with the gauge placed at right angles and parallel to the centerline of the engine (Fig. 42).

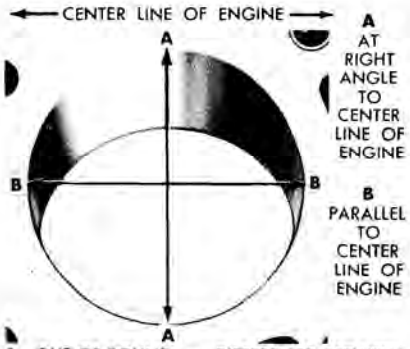


FIG. 42—Cylinder Bore Out-of-Round and Taper

Refinish cylinders that are deeply scored and/or when out-of-round and/or taper exceed the wear limits.

If the cylinder walls have minor surface imperfections, but the out-of-round and taper are within limits, it may be possible to remove the imperfections by honing the cylinder walls and installing new service piston rings providing the piston clearance is within specified limits. Use the finest grade of honing stone for this operation.

OIL PAN

CLEANING

Scrape any dirt or metal particles from the inside of the pan. Scrape all old gasket material from the gasket surface. Wash the pan in a solvent and dry it thoroughly. Be sure all foreign particles are removed from below the baffle plate.

INSPECTION

Check the pan for cracks, holes, damaged drain plug threads, a loose baffle, and a nicked or warped gasket surface.

Repair any damage, or replace the pan if repairs can not be made.

OIL PUMP

CLEANING

Wash all parts in a solvent and dry them thoroughly with compressed air. Use a brush to clean the inside of the pump housing and the pressure relief valve chamber. Be sure all dirt and metal particles are removed.

INSPECTION

Refer to the specifications for clearances and wear limits.

Check the inside of the pump housing and the outer race and rotor for damage or excessive wear.

Check the mating surface of the pump cover for wear. If the cover mating surface is worn, scored or grooved, replace the cover.

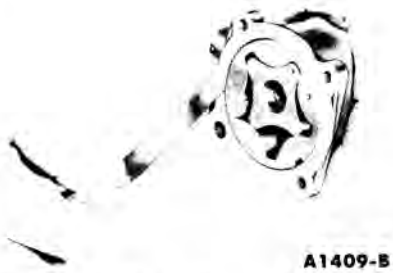


FIG. 43—Outer Race to Housing Clearance

Measure the outer race to housing clearance (Fig. 43) which should be to specifications.

With the rotor assembly installed in the housing so that the identification mark on the outer race is toward the bottom of the pump, place a straight edge over the rotor assembly and the housing. Measure the clearance (rotor end play) between the straight edge and the rotor and outer race (Fig. 44).



FIG. 44—Rotor End Play

The outer race, shaft and rotor are replaceable only as an assembly.

Check the drive shaft to housing bearing clearance by measuring the OD of the shaft and the ID of the housing bearing.

Inspect the relief valve spring for a collapsed or worn condition. Check the relief valve spring tension. If the spring tension is not within specifications and/or the spring is defective, replace the spring.

Check the relief valve piston for scores and free operation in the bore.

CRANKCASE VENTILATION SYSTEM

Refer to Group 19 for the correct mileage interval for maintenance.

CLEANING

Positive Crankcase Ventilation System. Do not attempt to clean the crankcase ventilation regulator valve. It should be replaced at the specified mileage intervals (Group 19).

The oil filler tube breather cap, located on the valve rocker arm cover should be cleaned at the specified mileage intervals. (Group 19).

The oil filler tube breather cap, located on the valve rocker arm cover should be cleaned at the specified interval. On a closed crankcase ventilation system, the oil filler tube cap is not an air filter and does not require cleaning. Remove the cap and wash it in a low-volatility, petroleum-base solvent. Probe the breather hole(s) to assure removal of any accumulated deposits. Shake the cap dry and install it. **Do not dry with compressed air as air pressure may damage the filter element.**

Clean the crankcase ventilation system connection on the carburetor spacer by probing the inlet nipple with a flexible wire or bottle brush.

Clean the rubber hoses with a low-volatility, petroleum-base solvent and dry with compressed air.

Vent Tube-Type Crankcase Ventilation System. On a car with a vent tube-type crankcase ventilation system, the road draft tube seldom requires cleaning except during a high mileage engine overhaul. However, if there is evidence of crankcase pressure, the tube should be checked for excessive sludge and cleaned out if necessary.

PART 8-2 170 AND 200 SIX

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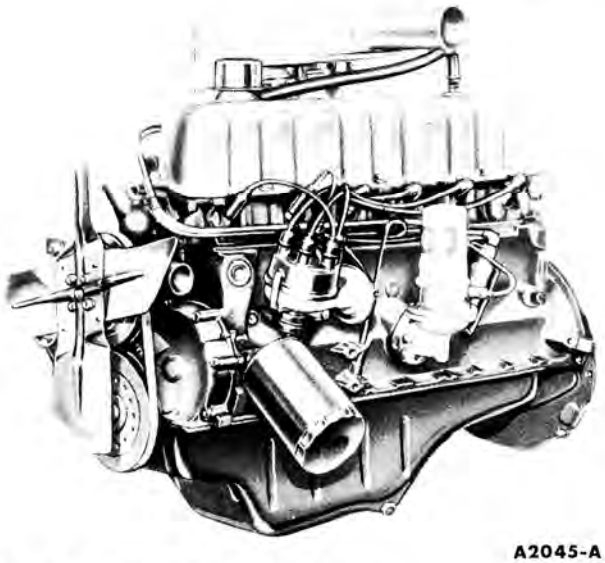
1 DESCRIPTION AND OPERATION

The 170 and 200 Six engines (Figs. 1, 2 and 3) have the same compression ratio of 8.7:1. The 170 Six engine has a piston displacement of 170 cubic inches and the patent plate identification symbol is "U". The 200 Six engine has a piston displacement of 200 cubic inches and the patent plate symbol is "T".

MANIFOLDS

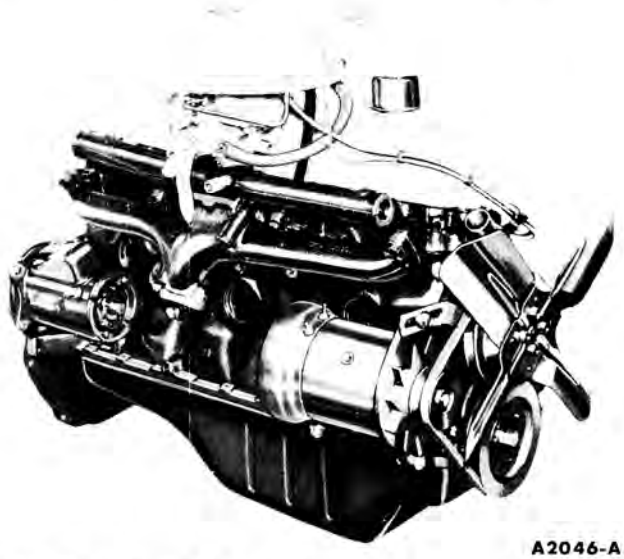
Exhaust gases provide the heat necessary to assist in vaporizing the incoming fuel mixture.

To prevent carburetor icing at the throttle plate, a spacer, heated by engine coolant, is located between the carburetor and the intake manifold (Fig. 4). The coolant flows from the front of the engine through the spacer inlet hose into the carburetor coolant spacer. The coolant circulates through the spacer and flows into the heater inlet hose and into the heater. On cars that do not have a heater the coolant flows through the spacer and flows into the return hose and into the water pump.



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FIG. 1—Typical ¾ Left Front View



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FIG. 2—Typical ¾ Right Front View

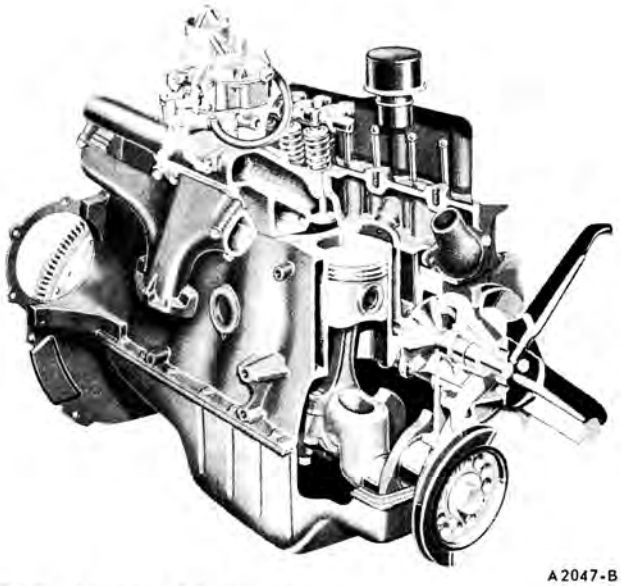


FIG. 3–Typical Sectional View

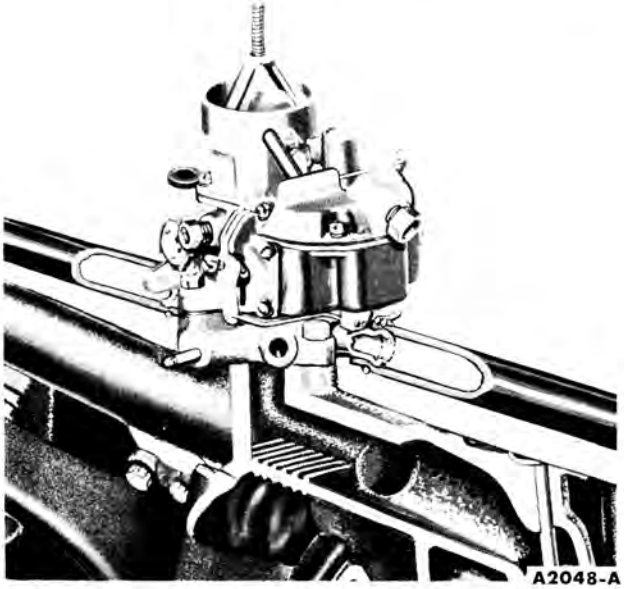


FIG. 4–Typical Coolant-Heated Carburetor Spacer

CYLINDER HEAD

The cylinder head carries the valves, valve rocker arm shaft assembly, integrally cast intake manifold, the coolant outlet and thermostat. Valve guides are integral with the head. The valves are arranged from front to rear E-I-I-E-I-E-E-I-E-I-I-E.

CYLINDER BLOCK

The cylinders are numbered from 1 to 6 starting at the front of the engine. The firing order is 1-5-3-6-2-4.

The distributor, located on the left front of the engine, drives the oil pump through an intermediate drive shaft.

The crankshaft used on the 170 engine is supported by four main bearings. Crankshaft end thrust is controlled by the flanges of the No. 3 main bearing.

The crankshaft used on the 200 engine is supported by seven main bearings. Crankshaft end thrust is controlled by the flanges of the No. 5 main bearing.

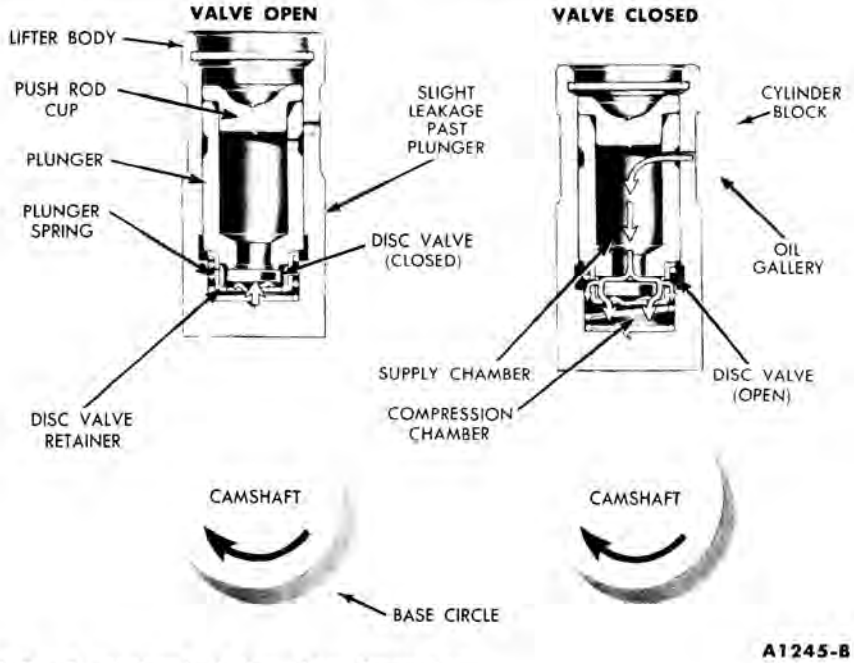


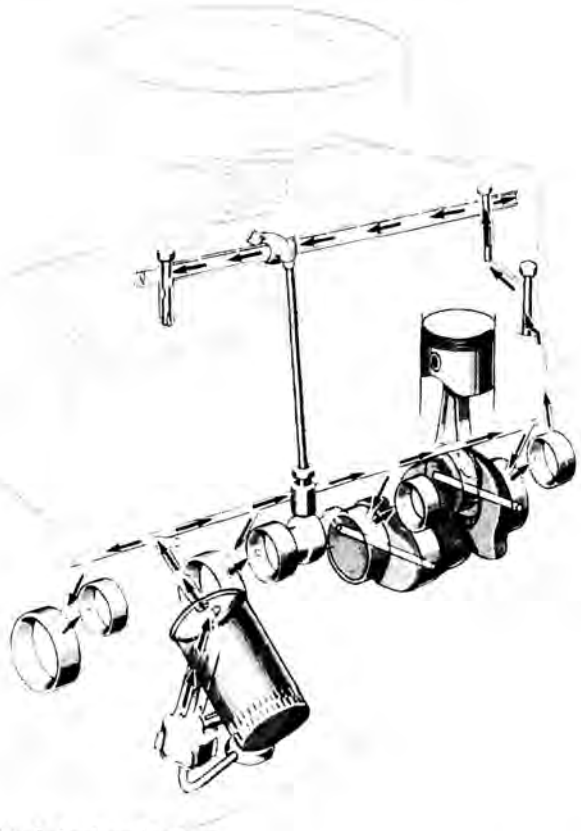
FIG. 5–Hydraulic Valve Lifter Operation

The pistons have two compression rings and one oil control ring. The top compression ring is molybdenum coated and the lower compression ring is phosphate-coated. The oil control ring assembly consists of a serrated spring and two chrome-plated steel rails.

VALVE TRAIN

The 170 and 200 Six engines utilize hydraulic valve lifters to provide zero lash. The operation and parts identification of the hydraulic valve lifters are shown in Fig. 5. When the valve is closed, the lifter assembly is on the base circle of the camshaft lobe and the valve push rod is in its lowest position. With the lifter assembly in this position, the plunger spring expands, forcing the plunger upward. This action is transmitted to the valve rocker arm via the valve push rod until there is solid contact between the valve and the valve end of valve rocker arm (zero valve lash).

As the lifter plunger moves upward, the volume of the compression chamber is increased, resulting in reduced oil pressure in the compression chamber. Therefore, to equalize the resulting pressure differential between the supply chamber and the compression chamber, the disc valve moves off its seat and permits oil to flow from the supply chamber to the compression chamber. When the compression chamber becomes filled



A2049-B

FIG. 6—Typical Lubrication System

with oil, the pressures in the two chambers are equalized. The oil flow ceases and the disc valve spring seats the disc valve and closes the disc valve port.

As the camshaft rotates, the lifter assembly is raised by the camshaft lobe. This increases the push rod force against the lifter plunger and hydraulic pressure immedately builds up in the compression chamber until it acts as a solid member of the valve operating mechanism. The lifter then becomes a hydraulic ram which forces the valve in the cylinder head to open. During this period, a slight leakage of oil past the plunger occurs (calibrated leak down rate).

As the high point of the camshaft lobe rotates and passes by the foot of the valve lifter, the valve in the cylinder head seats and the valve lifter assembly is forced downward. Reduced force on the lifter plunger at this time relieves the pressure on the lifter plunger and it is free to be moved upward by the plunger spring. This action allows oil to flow once again through the indexed oil holes in the lifter body and plunger.

The operating cycle is completed for each revolution of the camshaft. Zero clearance (lash) in the valve train mechanism is maintained at all times by the hydraulic force and expansion of the plunger spring between the lifter body and plunger.

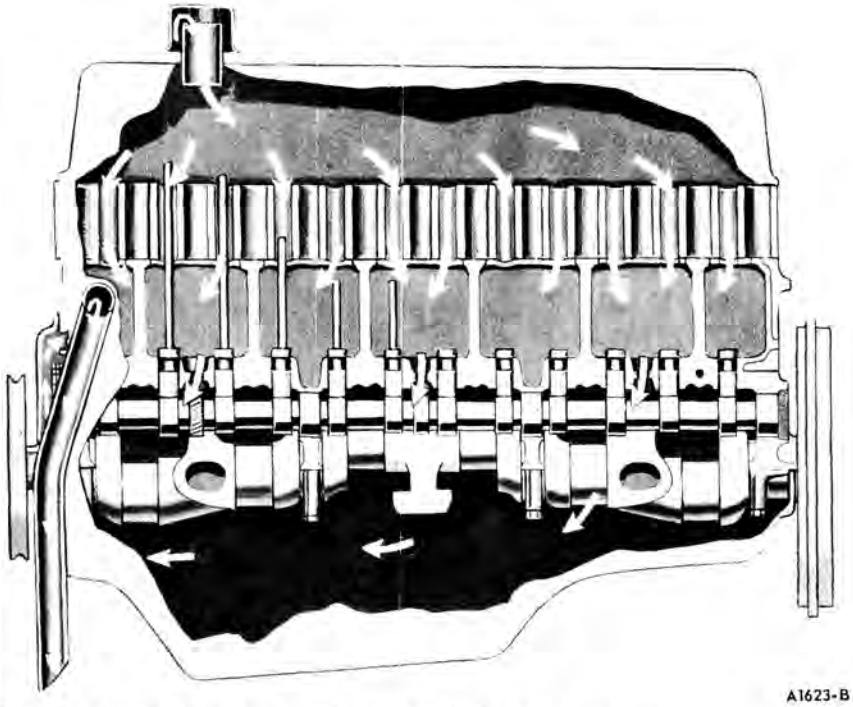
LUBRICATION SYSTEM

Oil from the oil pan sump is forced through the pressure-type lubrication system (Fig. 6) by a rotor pump. A spring-loaded relief valve in the pump limits the maximum pressure of the system. Oil relieved by the valve is directed back to the intake side of the pump.

All the oil discharged by the pump passes through a full flow-type Rotunda filter before it enters the engine. The filter has an integral by-pass valve and mounting gasket. The by-pass valve permits oil to by-pass the filter if it becomes clogged, thereby maintaining an emergency supply of oil to the engine at all times. An anti-drain back diaphragm prevents a reverse flow of oil when the engine is stopped.

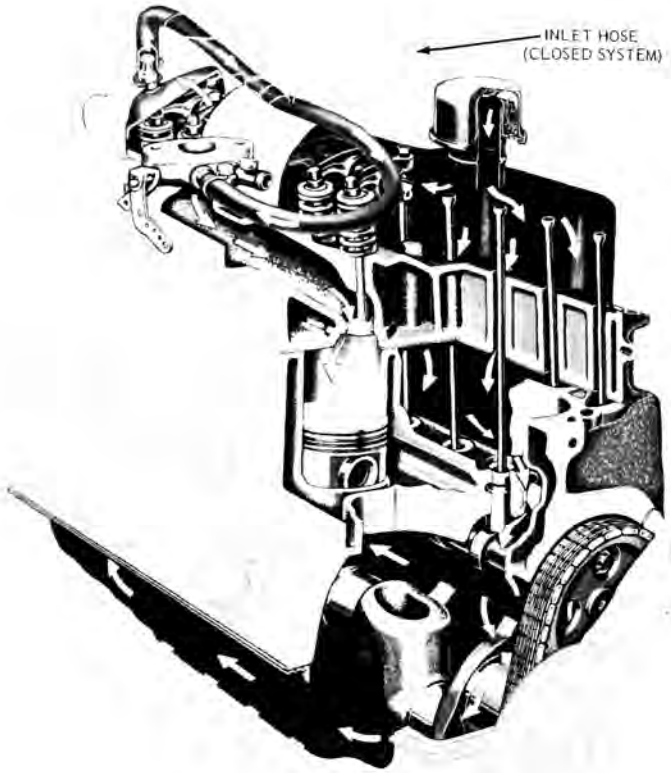
From the filter, the oil flows into the main oil gallery. The oil gallery supplies oil to all the camshaft and main bearings through a drilled passage in each main bearing web.

Oil from the main oil gallery feeds the valve lifter assemblies. A reservoir at each valve lifter bore boss traps oil so that oil is available for valve lifter lubrication as soon as the engine starts.



A1623-B

FIG. 7—Vent Tube-Type Crankcase Ventilation System



A2050-B

FIG. 8–Typical Positive Crankcase Ventilation System

CRANKCASE VENTILATION

The engines are equipped with either a vent tube-type crankcase ventilation system, an open positive crankcase ventilation system or a closed positive crankcase ventilation system. In the vent tube-type system, the crankcase vapors are discharged to the atmosphere. In the positive systems, the crankcase vapors are directed to the intake manifold.

VENT TUBE-TYPE CRANKCASE VENTILATION SYSTEM

A crankcase ventilation tube is located at the left front of the engine. The forward motion of the car causes a partial vacuum to be formed at the tube outlet. This vacuum action causes air to be drawn through the engine from the combination oil filler and breather cap located in the front of the valve push rod chamber cover (Fig. 7). The filler cap contains a maze filtering element.

Filtered air from the breather cap flows into the front section of the valve rocker arm shaft chamber. Here, the air normalizes its temperature before contacting contaminating vapors originating in the crankcase. Warm ventilating air minimizes the formation of crankcase sludge.

The ventilating air moves down past the push rods and into the crankcase. Air is diverted from the front section of the crankcase through holes in the front of the cylinder block wall to ventilate the timing chain chamber. The air from the crankcase is then directed into the crankcase ventilation tube by the rotating action of the crankshaft.

The timing chain and sprockets are splash-lubricated from the oil pan.

Oil slingers prevent leakage by directing oil away from the crankshaft front and rear oil seals.

Cylinder walls, pistons and piston pins are lubricated through a drilled hole in each connecting rod which indexes with a drilled hole in the connecting rod journal of the crankshaft.

Oil under reduced pressure is fed to the valve rocker arm shaft assembly through a drilled passage in the cylinder block at the No. 4 camshaft bearing. The oil is metered by a groove in the camshaft journal. The passage in the block indexes with a hole in the cylinder head. The oil passage in the cylinder head is drilled from the cylinder head bolt bore to the No. 6 valve rocker arm shaft support. The rocker arm shaft supports have a square cored mounting bolt hole for more positive lubrication of the rocker arms, shafts and valves. The oil flows through the valve rocker arm shaft through drilled holes in each rocker arm to lubricate the valve and the ball end of the rocker arm. The excess oil spirals down the rotating push rod and assists in lubricating the valve lifter and push rod seat. An oil outlet in the No. 1 rocker arm shaft support, exhausts excess oil from the valve rocker arm shaft. The oil from each rocker arm drains into the push rod chamber through the push rod bore holes in the cylinder head.

The oil in the push rod chamber drains back into the oil pan through cored openings in the block.

POSITIVE CRANKCASE VENTILATION SYSTEMS

Open Ventilation System. The air flow in the positive crankcase ventilation system is shown in Fig. 8.

Ventilating air enters the engine through the oil filler cap located on the front of the valve rocker arm cover. The filler cap contains a filtering element which filters the incoming air.

From the oil filler cap, the air flows into the front section of the valve rocker arm shaft chamber. The ventilating air moves down past the push rods and into the crankcase. Air is diverted from the front section of the crankcase through holes in the front of the cylinder block wall to ventilate the timing chain chamber.

The rotating action of the crankshaft causes the air to flow towards

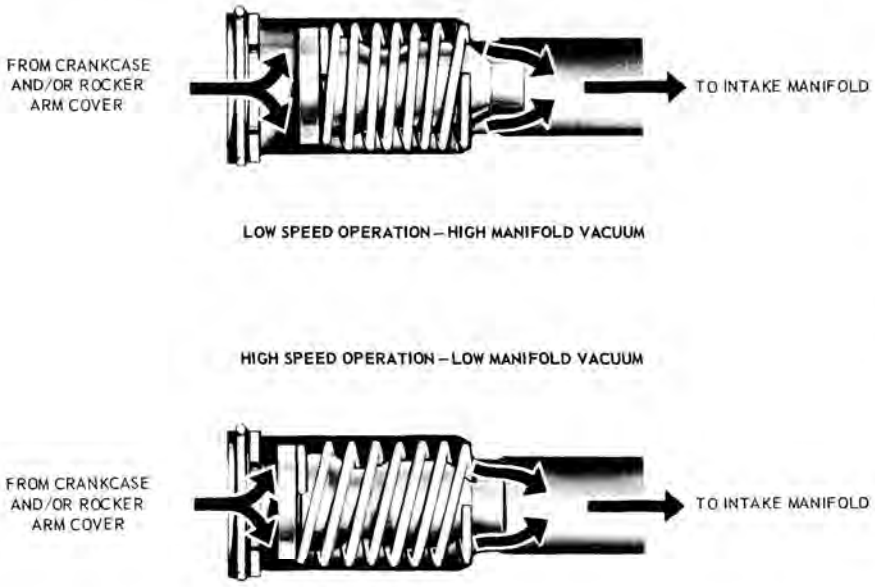


FIG. 9—Positive Crankcase Ventilation Regulator Valve Operation

the rear of the crankcase and up into the rear section of the valve rocker arm cover. The air then enters a spring-loaded regulator valve that regulates the amount of air flow to meet changing operating conditions. The air is then directed to the intake manifold through the crankcase vent hose.

During idle, intake manifold vacuum is high. The high vacuum overcomes the tension of the spring pressure and moves the valve to a low flow position (Fig. 9). With the valve in this position, all the ventilating air passes through the restricted passage in the valve. With the valve in this position, there is minimum ventilation. As engine speed increases and manifold vacuum decreases, the spring forces the valve out of the passage and to the full open position (Fig. 9). This increases the flow of ventilating air.

Closed Ventilation System. The closed ventilation system is the same as the open ventilation system except for the following:

The ventilating air is picked up at the air cleaner and transferred through a tube to the oil filler cap.

The oil filler cap is otherwise closed to the atmosphere.

COOLING SYSTEM

The coolant is drawn from the bottom of the radiator by the water pump which delivers the coolant to the cylinder block (Fig. 10).

As the coolant enters the block, it travels through cored passages to cool the entire length of each cylinder wall. Upon reaching the rear of the cylinder block, the coolant is directed upward into the cylinder head where it cools the combustion chambers, valves, and valve seats on its return to the front of the engine.

At this point, the coolant flows into the coolant outlet connection, past the thermostat if it is open, and into the top of the radiator. If the thermostat is closed, a small portion of the coolant is returned to the water pump for recirculation. The entire system is pressurized to 13-15 psi.

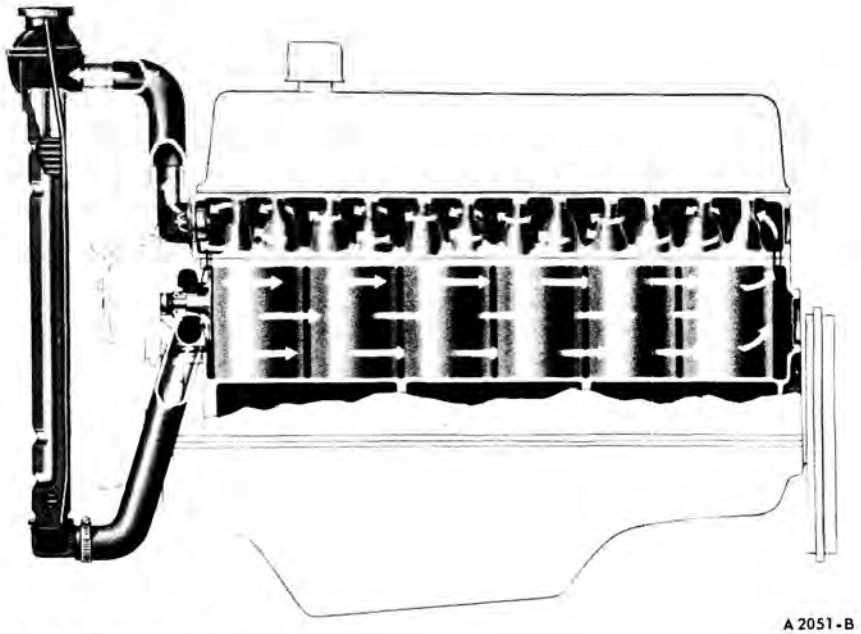


FIG. 10—Cooling System

2 IN-CAR ADJUSTMENTS AND REPAIRS

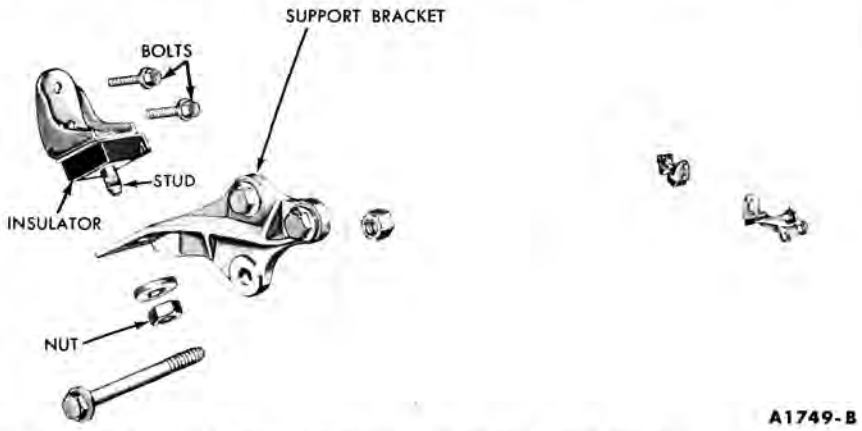


FIG. 11—Comet, Falcon, and Mustang Engine Front Supports

ENGINE SUPPORTS

The engine front supports are located on each side of the crankcase (Figs. 11 and 12), and the rear support is located at the transmission extension housing (Figs. 11 and 12).

ENGINE FRONT SUPPORTS

The procedures given apply to either a right or left installation.

Comet, Falcon and Mustang

REMOVAL

1. Remove the insulator to support bracket nuts and washers from both insulators (Fig. 11).
2. Raise the engine with a jack and wood block placed under the oil pan.
3. Remove the insulator to engine bolts and washers and remove the insulator.

INSTALLATION

1. Position the insulator assembly (Fig. 11) on the engine and install the insulator to engine bolts and washers finger-tight.
2. Lower the engine carefully to make sure the insulator stud engages the hole in the support bracket.
3. Install the insulator to support bracket washer and nut on both engines front mounts. Tighten the insulator bolts and nuts to specifications.

Fairlane

REMOVAL

1. Remove the rebound insulator retaining nut, lock washer, rebound insulator, and insulator plate from both supports (Fig. 12) so that the engine can be raised.

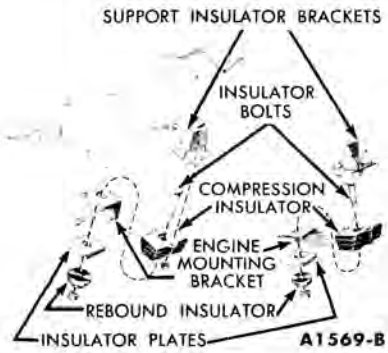


FIG. 12—Fairlane Engine Front Supports

2. Raise the engine slightly with a jack and a wood block placed under the oil pan.
3. Remove the support insulator bracket to engine block retaining bolts and lock washers. Remove the bracket and compression insulator assembly.
4. Remove the engine mounting bracket to front suspension lower arm mounting bracket retaining bolts. Remove the mounting bracket to underbody retaining bolt and remove the mounting bracket.
5. Remove the support insulator bracket to compression insulator assembly retaining nuts, then remove the compression insulator and bolt.

INSTALLATION

1. Position the compression insulator and bolt to the support insulator bracket. Install the support insulator bracket to compression insulator assembly retaining nuts.
2. Position the engine mounting bracket to the front suspension lower arm mounting bracket and install the retaining nuts. Install the support bracket to underbody retaining bolt and lock washer. Torque the bolts and nuts to specifications.
3. Position the support insulator bracket and compression insulator assembly to the engine block. Install the support insulator bracket retaining bolts and lock washers. Torque the bolts to specifications.

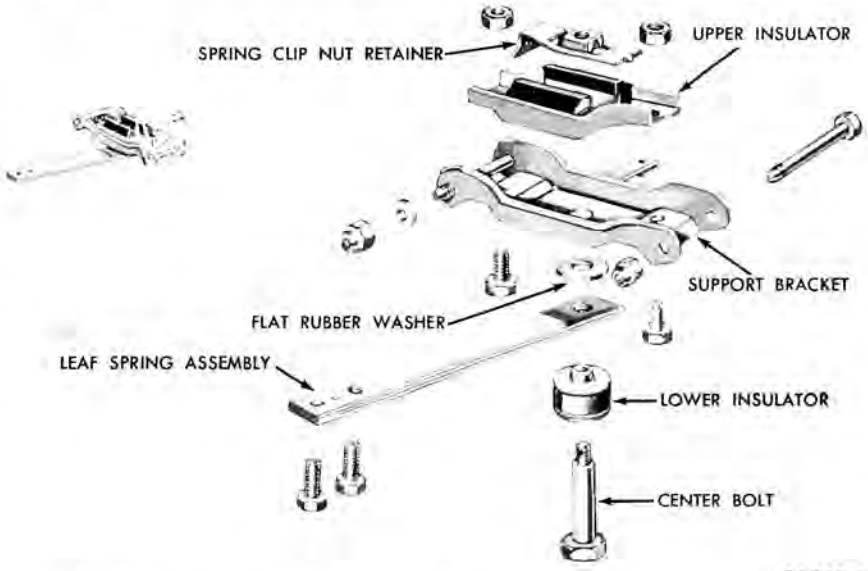


FIG. 13—Comet and Falcon Engine Rear Support

4. Lower the jack and guide the insulator bolt through the holes in the engine mounting bracket. Remove the jack and wood block.

5. Install the insulator plate, rebound insulator, lock washer, and nut. Torque the nut to specifications.

ENGINE REAR SUPPORT

Comet and Falcon

REMOVAL

1. Disconnect the parking brake equalizer lever from the support bracket.

2. Support the transmission with a floor jack. Remove the leaf-spring center bolt and lower insulator (Fig. 13). Remove the leaf-spring to transmission extension housing attaching bolts. Remove the leaf-spring and flat rubber washer.

3. Remove the support bracket to body cross member bolts, and remove the support bracket and upper insulator assembly and spring clip nut retainer.

4. Remove two bolts to disassemble the support bracket and upper insulator.

INSTALLATION

1. Assemble the support bracket and upper insulator (Fig. 13) and tighten the bolts and nuts to specifications.

2. Position the spring clip nut retainer on the upper insulator and support bracket assembly, and install the support bracket assembly on the body cross member. **Make sure there is a minimum clearance of 0.20 inch between the transmission extension housing and the upper insulator.** Tighten the support bracket to body cross member bolts to specifications.

3. Position the flat rubber washer on top of the leaf-spring and install the leaf-spring on the transmission extension housing. Torque the bolts to specifications.

4. Install the lower insulator and center bolt, and tighten the center bolt to specifications. Remove the transmission jack.

5. Connect the parking brake equalizer lever to the support bracket.

Fairlane

REMOVAL

1. Remove the parking brake cable from the clip on the left support bracket.

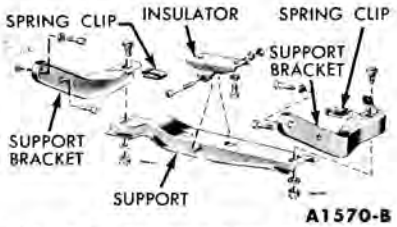


FIG. 14—Fairlane Engine Rear Support

2. Remove the insulator assembly to extension housing bolts and lock washers (Fig. 14). Remove the insulator assembly to support retaining bolt and lock washer.

3. Raise the transmission with a floor jack, then remove the insulator assembly. Remove the support to bracket retaining bolts and spring clips, then remove the support.

4. Remove the support bracket to underbody bolts and remove the bracket.

INSTALLATION

1. Position the support bracket to the underbody (Fig. 14). Install and torque the bolts to specifications.

2. Position the support to the brackets and install the bolts and spring clips. Torque the bolts to specifications.

3. Position the insulator assembly to the support and install the bolt and lock washer. Torque the bolt to specifications.

4. Lower the transmission and remove the jack. Install the insulator to extension housing retaining bolts and lock washers. Torque the bolts to specifications.

5. Install the parking brake cable in the clip on the left support bracket.

Mustang

REMOVAL

1. Remove the insulator to rear support nuts and washers (Fig. 15).

2. Raise and support the transmission with a transmission jack.

3. Loosen one of the rear support to crossmember bolts.

4. Remove the other rear support to crossmember bolt, washer (right side only) and nut, and swing the rear support down and out of the way.

5. On a 3-speed, manual-shift transmission, remove the support extension to transmission bolts and lockwashers, and remove the insulator and the support extension.

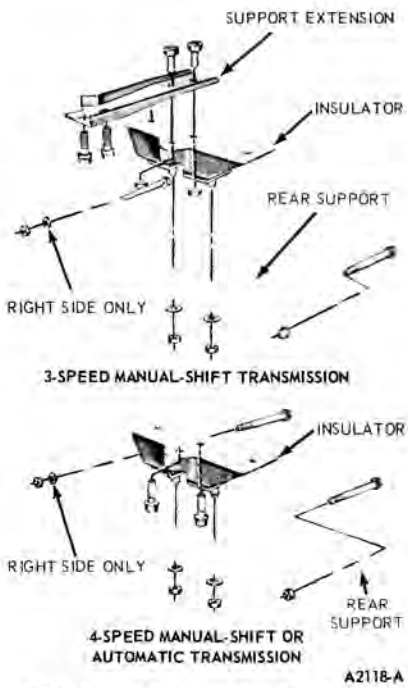


FIG. 15—Mustang Engine Rear Support

Separate the support extension to insulator nuts and bolts.

On a 4-speed, manual-shift or an automatic transmission, remove the insulator to transmission bolts and washers and remove the insulator.

INSTALLATION

1. On a 4-speed, manual-shift or an automatic transmission, position the insulator against the transmission and install the insulator to transmission bolts and washers (Fig. 15). Torque the bolts to specifications.

On a 3-speed, manual-shift transmission, attach the support extension to the insulator with the support extension to insulator nuts and bolts. Torque the nuts to specifications. Position the support extension and insulator assembly against the transmission and install the support extension to transmission bolts and lockwashers. Torque the bolts to specifications.

2. Swing the rear support up into position and install the rear support to crossmember bolt, washer (right side only) and nut. Torque both rear support to crossmember nuts to specifications.

3. Lower the transmission and install the insulator to rear support nuts and washers. Torque the nuts to specifications.

EXHAUST MANIFOLD

REMOVAL

1. Remove the air cleaner. Disconnect the muffler inlet pipe from the exhaust manifold.

2. Bend the exhaust manifold retaining bolt lock tabs back and remove the retaining bolts. Remove the exhaust manifold.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the mating surfaces of the exhaust manifold and cylinder head. Scrape the gasket material from the mounting flange of the exhaust manifold and muffler inlet pipe.

2. Apply graphite grease to the mating surface of the exhaust manifold.

3. Position the exhaust manifold on the cylinder head and install the retaining bolts and tab washers. Working from the center to the ends, torque the bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

4. Place a new gasket on the muffler inlet pipe. Position the muffler inlet pipe to the manifold. Install and torque the retaining nuts to specifications.

5. Install the air cleaner. Start the engine and check for exhaust leaks.

POSITIVE CRANKCASE VENTILATION SYSTEM

The positive crankcase ventilation system components are shown in Fig. 16.

REMOVAL

1. On a closed ventilation system, remove the inlet hose from the air cleaner and the oil filler cap.

2. Remove the air cleaner.

3. Grasp the crankcase vent hose near the rocker arm cover grommet and pull to remove the regulator valve from the rocker arm cover.

4. Using hose clamp pliers, slide both hose clamps towards the center of the vent hose. Remove the regulator valve from the vent hose and remove the vent hose from the hose fitting in the intake manifold.

5. Remove the vent hose fitting from the intake manifold.

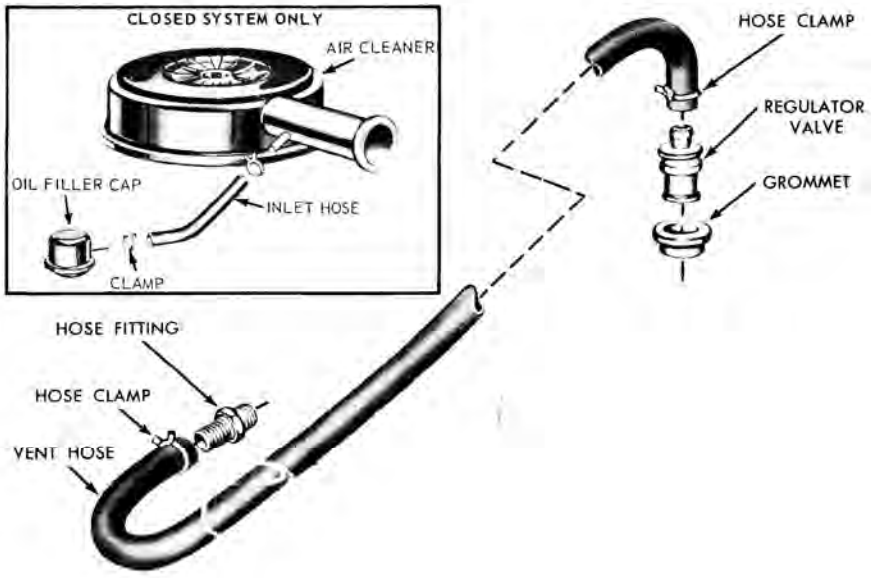


FIG. 16—Positive Crankcase Ventilation System Components

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Install the vent hose fitting in the intake manifold.

2. Position the hose clamps on the vent hose. Install the hose on the fitting in the intake manifold and the regulator valve in the hose. Using hose clamp pliers, slide the clamps into position.

3. Insert the regulator valve into the rocker arm cover mounting grommet.

4. Install the air cleaner.

5. On a closed ventilation system, connect the inlet hose to the air cleaner and the oil filler cap.

6. Operate the engine and check for leaks.

VALVE ROCKER ARM SHAFT ASSEMBLY

REMOVAL

1. Remove the air cleaner and the crankcase ventilation system.

2. Remove the valve rocker arm cover and discard the gasket.

3. Remove the rocker arm shaft support bolts by loosening the bolts two turns at a time in sequence. Remove the rocker arm shaft assembly (Fig. 17). Remove the valve push rods.



FIG. 17—Valve Rocker Arm Shaft Removal

INSTALLATION

1. Apply Lubriplate to both ends of the push rods and to the valve stem tip.

2. Install the valve push rods. Position the valve rocker arm shaft assembly on the cylinder head.

3. Install and tighten all valve rocker arm support bolts, two turns at a time in sequence, until the supports fully contact the cyinder head. Torque the bolts to specifications.

4. Check the valve clearance, following the procedure outlined under "Valve Clearance—170 and 200 Six" (Part 8-1, Section 2).

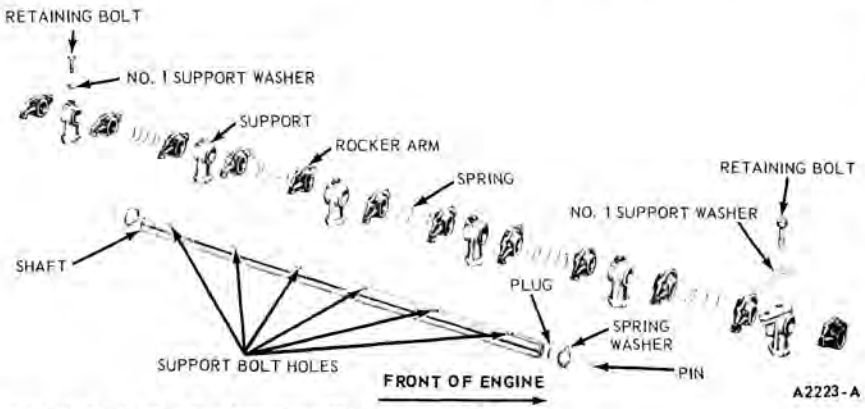


FIG. 18–Valve Rocker Arm Shaft Assembly

5. Clean the valve rocker arm cover and cylinder head gasket surfaces. Coat one side of a new gasket with an oil resistant sealer and lay the cemented side of the gasket in place on the cover. Install the cover, making sure the gasket seats evenly around the head. Tighten the cover retaining bolts in two steps. First, torque the bolts to specifications; then, retorque to the same specifications two minutes after initial tightening.

6. Install the crankcase ventilation system and the air cleaner.

DISASSEMBLY

1. Remove the pin and spring washer from each end of the valve rocker arm shaft.

2. Slide the valve rocker arms, springs, and supports off the shaft. Be sure to identify the parts.

3. If it is necessary to remove the plugs from each end of the shaft, drill or pierce the plug on one end. Use a steel rod to knock out the plug on the opposite end. Working from the open end, knock out the remaining plug.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

ASSEMBLY

1. Lubricate all parts with engine oil. Apply Lubriplate to the valve and push rod ends of the rocker arm.

2. If the plugs were removed from the ends of the shaft, use a blunt tool or large diameter pin punch and install a plug, cup side out, in each end of the shaft.

3. Install the spring washer and pin on one end of the shaft.

4. Install the valve rocker arms, supports, and springs in the order shown in Fig. 18. **Be sure the oil holes in the shaft are facing downward. Complete the assembly by installing the remaining spring washer and pin.**

CYLINDER HEAD

REMOVAL

1. Drain the cooling system. Remove the air cleaner.

2. Disconnect the muffler inlet pipe at the exhaust manifold. Pull the muffler inlet pipe down. Remove the gasket.

3. Disconnect the accelerator rod retracting spring. Disconnect the accelerator rod at the carburetor.

4. Disconnect the fuel inlet line and the distributor vacuum line at the carburetor.

5. Disconnect the coolant lines at the carburetor spacer.

6. Disconnect the distributor vacuum line at the distributor. Disconnect the carburetor fuel inlet line at the fuel pump. Remove the lines as an assembly.

7. Disconnect the spark plug wires at the spark plugs and the temperature sending unit wire at the sending unit.

8. Remove the crankcase ventilation system.

9. Remove the valve rocker arm cover.

10. Remove the valve rocker arm shaft assembly. Remove the valve push rods in sequence (Fig. 19).

11. Remove the remaining cylinder head bolts and remove the

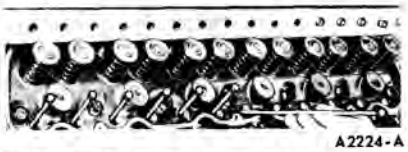


FIG. 19–Valve Push Rod Removal

cylinder head. **Do not pry between the cylinder head and block as the gasket surfaces may become damaged.**

INSTALLATION

1. Clean the head and block gasket surfaces. If the cylinder head was removed for a gasket change, check the flatness of the cylinder head and block. Install guide studs at each end of the cylinder block (Fig. 20).

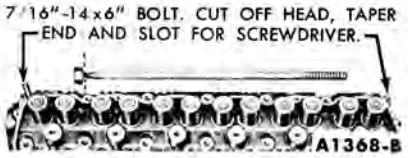


FIG. 20–Cylinder Head Guide Studs

2. On the 170 Six engine, apply cylinder head gasket sealer to both sides of a new gasket. Use the brush furnished to spread the sealer evenly over the entire gasket surface. **Do not apply sealer to a 200 Six engine head gasket.** Position the gasket over the guide studs on the cylinder block.

3. Install a new gasket on the flange of the muffler inlet pipe.

4. Lift the cylinder head over the guides and slide it down carefully, guiding the exhaust manifold studs into the muffler inlet pipe.

5. Coat the threads of the Nos. 1 and 6 bolts for the right side of the cylinder head with a small amount of water resistant sealer. Install, but do not tighten two bolts at opposite ends of the head to hold the head and gasket in position. Remove the



FIG. 21–Cylinder Head Bolt Torque Sequence

guides and install the remaining bolts.

6. The cylinder head bolts are tightened in three progressive steps. Torque all the bolts in sequence (Fig. 21) to 55 ft-lbs, then to 65 ft-lbs, and finally to specifications. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.**

7. Apply Lubriplate to both ends of the push rods. Install the push rods in their original bores, positioning the lower end of the rods into the tappet sockets. Apply Lubriplate to the valve stem tips and to the rocker arm pads.

8. Install the valve rocker arm shaft assembly following steps 1 thru 7 under "Valve Rocker Arm Shaft Installation."

Check the valve clearance, following the procedure outlined under "Valve Clearance" (Part 8-1, Section 2).

9. Install a new gasket on the muffler inlet pipe. Install the muffler inlet pipe lock washers and retaining nuts. Torque the nuts to specifications.

10. Connect the radiator upper hose at the coolant outlet housing. Connect the coolant hoses at the carburetor spacer.

11. Position the distributor vacuum line and the carburetor fuel inlet line on the engine. Connect the fuel line and the distributor vacuum line at the carburetor.

12. Connect the accelerator rod retracting spring. Connect the accelerator rod at the carburetor.

13. Connect the distributor vacuum line at the distributor. Connect the carburetor fuel inlet line at the fuel pump.

14. Connect the temperature sending unit wire at the sending unit. Connect the spark plug wires. **Be sure the wires are forced all the way down into their sockets.**

15. Fill and bleed the cooling system.

16. Install the crankcase ventilation system.

17. Start the engine and check for coolant and oil leaks.

DISASSEMBLY

1. Install the cylinder head holding fixtures (Fig. 22). Remove deposits from the combustion chambers and valve heads with a scraper and a wire brush before removing the



FIG. 22—Cylinder Head Holding Fixtures



FIG. 23—Compressing Valve Spring—On Bench

valves. **Be careful not to scratch the cylinder head gasket surfaces.**

2. Compress the valve springs (Fig. 23). Remove the valve retainer locks and release the spring. If the valve locks are stuck, place a piece of steel tubing (¾-inch OD, ½-inch ID and 3-inches long) over the end of the valve stem squarely against the sleeve surface. Tap the tube with a steel hammer to dislodge the locks.

3. Remove the sleeve, spring retainer, stem seal, and valve. Discard the valve stem seals. Identify all valve parts.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for repair procedures.

ASSEMBLY

1. Lubricate the valve guides and valve stems with engine oil. Apply Lubriplate to the tip of the valve stems.

2. Install each valve (Fig. 24) in the valve guide from which it was

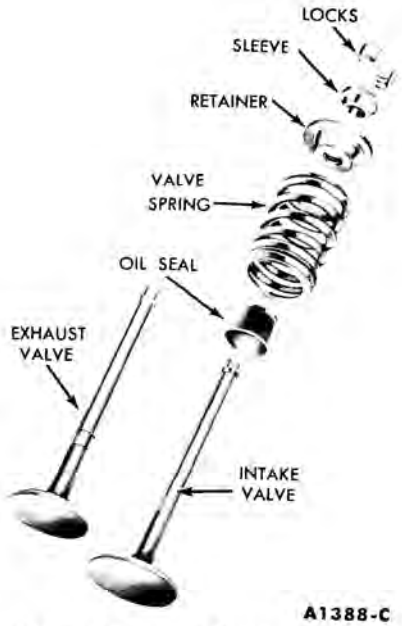


FIG. 24—Typical Valve Assembly

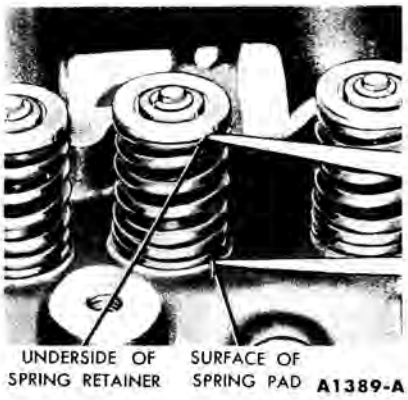


FIG. 25—Valve Spring Assembled Height

removed or to which it was fitted. Install a new stem seal on the valve.

3. Install the valve spring assembly over the valve. Install the spring retainer and sleeve.

4. Compress the spring and install the retainer locks (Fig. 23).

5. Measure the assembled height of the valve spring from the surface of the cylinder head spring pad to the underside of the spring retainer with dividers (Fig. 25).

6. Check the dividers against a scale. If the assembled height is greater than specifications, install the necessary 0.030-inch thick spacer(s) between the cylinder head spring pad and the valve spring to bring the assembled height to the recommended dimension. **Do not install spacers un-**

less necessary. Use of spacers in excess of recommendations will result in overstressing the valve springs and overloading the camshaft lobes which would lead to spring breakage and worn camshaft lobes.

VALVE SPRING, RETAINER AND STEM SEAL REPLACEMENT

Broken valve springs or defective valve stem seals and retainer may be replaced without removing the cylinder head, provided damage to the valve or valve seat has not occurred.

1. Remove the air cleaner. Remove the crankcase ventilation system from the valve rocker arm cover and remove the valve rocker arm cover. Remove the applicable spark plug.

2. Crank the engine until the applicable cylinder is on TDC after the compression stroke. Be sure that both valves are closed. **Make sure that the piston is on TDC to prevent the crankshaft from turning when the air is supplied.**

3. Remove the valve rocker arm shaft and the valve push rod(s).

4. Install an air line with an adapter in the spark plug hole.

5. Install the valve rocker arm shaft and tighten the retaining bolt just enough to seat the shaft supports on the cylinder head. Push the rocker arm to one side and secure it in this position (Fig. 26). To move the rocker arm on either end of the shaft, it will be necessary to remove the retaining pin and spring washer and slide the rocker arm off the shaft.

6. Turn on the air supply. Using the valve spring compression tool shown in Fig. 26, compress the valve

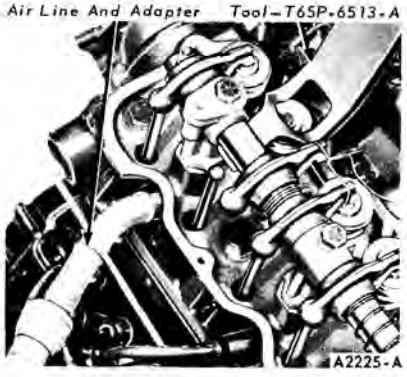


FIG. 26–Compressing Valve Spring–In Chassis



FIG. 27–Valve Stem Seal Removal

and remove the valve spring retainer locks, the sleeve, spring retainer and the valve spring.

7. Remove the valve stem seal (Fig. 27).

8. Install a new valve stem seal. Position the spring over the valve. Install the spring retainer and sleeve. Compress the valve spring and install the valve spring retainer locks.

9. Apply Lubriplate to both ends of the push rod, the valve and push rod ends of the rocker arm, and the valve stem tip. Remove the rocker arm shaft and install the push rod(s), making sure the lower end of the rod is positioned in the valve lifter push rod cup.

10. Remove the wire securing the valve rocker arm and slide the rocker arm into position. If an end valve rocker arm was removed, slide it into position on the shaft and install the spring washer and retaining pin. Turn off the air and remove the air line and adapter. Install the spark plug and spark plug wire.

11. Install the rocker arm shaft by following the instructions under "Rocker Arm Shaft Assembly Installation".

12. Install the valve rocker arm cover.

13. Insert the crankcase ventilation regulator valve into the valve rocker arm cover mounting grommet. Install the air cleaner.

CYLINDER FRONT COVER AND TIMING CHAIN

REMOVAL

1. Drain the cooling system and the crankcase. Disconnect the radiator upper hose at the coolant outlet housing and the radiator lower hose at the water pump.

2. Remove the radiator. Remove the drive belt, fan and pulley. Using tool T58P-6316-A, remove the crankshaft damper.

3. Remove the cylinder front cover and gasket. Remove the crankshaft front oil slinger.

4. Rotate the crankshaft in a clockwise direction (as viewed from the front) to take up the slack on the left side of the chain.

5. Establish a reference point on the block and measure from this point to the chain. Rotate the crankshaft in the opposite direction to take up the slack on the right side of the chain. Force the left side of the chain out with the fingers and measure the distance between the reference point and the chain. The deflection is the difference between the two measurements. If the deflection extends ½ inch, replace the timing chain and sprockets.

6. Crank the engine until the timing marks are aligned as shown in Fig. 28. Remove the camshaft sprocket retaining bolt and washer. Slide both sprockets and timing chain forward and remove them as as assembly (Fig. 29).

7. Remove the oil pan and related parts.

FRONT OIL SEAL REPLACEMENT

It is good practice to replace the oil seal each time the cylinder front cover is removed.

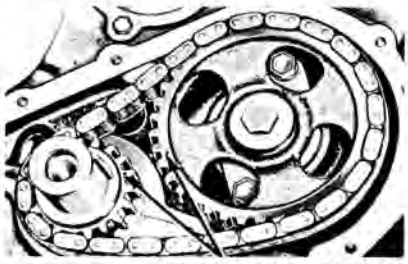


FIG. 28–Aligning Timing Marks

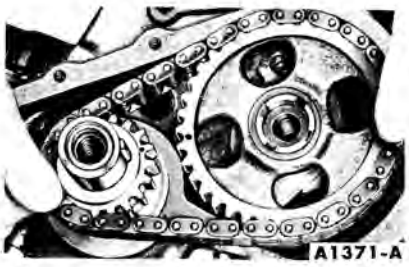


FIG. 29–Timing Chain and Sprockets Removal

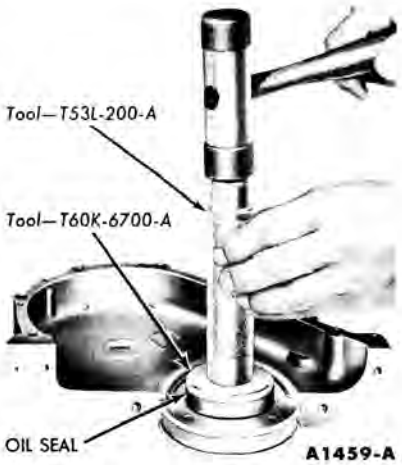


FIG. 30—Crankshaft Front Oil Seal Replacement

1. Drive out the oil seal with a pin punch. Clean the recess in the cover.

2. Coat a new seal with grease and install the seal. Drive the seal in until it is fully seated in the recess. (Fig. 30). Check the seal after installation to be sure the spring is properly positioned in the seal.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Position the sprockets and timing chain on the camshaft and crankshaft. Be sure the timing marks on the sprockets and chain are positioned as shown in Fig. 28. Install the camshaft sprocket retaining bolt and washer. Torque the bolt to specifications. Install the oil slinger so that the raised side of the embossed pointer is facing outward.

2. Clean the cylinder front and the gasket surface of the cylinder block. Apply sealer to a new cylinder front cover gasket and position the gasket on the cylinder front cover. Install the cylinder front cover using the tool shown in Fig. 31. Torque the retaining bolts to specifications.



FIG. 31—Cylinder Front Cover Alignment

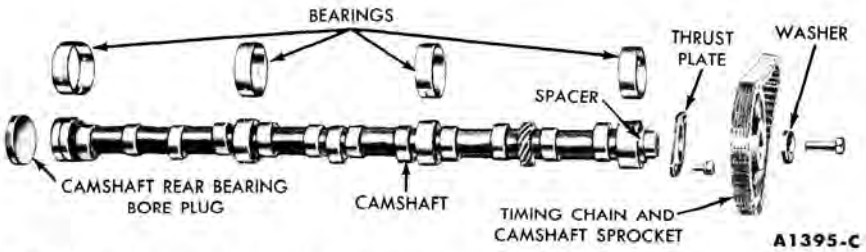


FIG. 32—Camshaft and Related Parts

3. Using tool T52L-6306-AEE, install the crankshaft damper. Torque the retaining bolt to specifications.

4. Install the oil pan and related parts.

5. Install the fan, pulley and drive belt. Adjust the drive belt.

6. Install the radiator. Connect the radiator upper and lower hoses.

7. Fill and bleed the cooling system. Fill the crankcase with the proper quantity and grade of engine oil.

8. Start the engine and check the ignition timing. Operate the engine at fast idle and check all hose connections and gaskets for leaks.

CAMSHAFT

The camshaft and related parts are shown in Fig. 32.

REMOVAL

1. Drain the cooling system and the crankcase. Remove the air cleaner.

2. Disconect the radiator hoses from the coolant outlet housing and the water pump. Remove the radiator. Remove the grille.

3. On a Mustang, remove the grille center support bracket. Remove the bolts from the left side of the upper and lower stone shields. If necessary, loosen the bolts on the right side of the stone shields and raise the stone shields out of the way to remove the camshaft.

4. Disconnect the accelerator rod retracting spring. Disconnect the accelerator rod from the carburetor.

5. Disconnect the fuel inlet line and the distributor vacuum line from the carburetor.

6. Disconnect the coolant hoses from the carburetor spacer.

7. Disconnect the muffler inlet pipe from the exhaust manifold. Pull the muffler inlet pipe down. Remove the gasket.

8. Disconnect the distributor vacuum line from the distributor. Disconnect the carburetor fuel inlet line from the fuel pump. Remove the lines as an assembly.

9. Disconnect the spark plug wires from the spark plugs and the coil high tension lead at the coil. Remove the distributor cap and spark plug wires as an assembly. Disconnect the primary wire from the coil and remove it from the retaining clip on the cylinder head.

10. Disconnect the engine temperature sending unit wire from the sending unit. Disconnect the flexible fuel line from the fuel tank line and plug the line. Remove the distributor, the fuel pump, and the oil filter.

11. Remove the crankcase vent hose, regulator valve, valve rocker arm cover and cylinder head by following steps 8 thru 11 under "Cylinder Head Removal."

12. Using a magnet, remove the valve lifters and keep them in order so that they can be installed in their original location (Fig. 33).

13. Remove the drive belt, fan and pulley. Remove the crankshaft damper using tool T58P-6316-A.

14. Remove the oil level dipstick. Remove the oil pan. Remove the oil pump and inlet tube assembly.

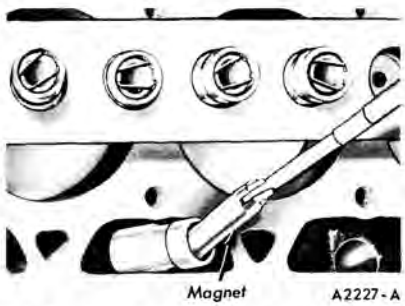


FIG. 33—Valve Lifter Removal

15. Remove the cylinder front cover and gasket. Remove the crankshaft front oil slinger.

16. Push the camshaft toward the rear of the engine. Install a dial indicator so that the indicator point is on the camshaft sprocket cap screw (Fig. 34). Zero the dial indicator.



FIG. 34—Camshaft End Play

Position a large screw driver between the camshaft sprocket and the block. Pull the camshaft forward and release it. Compare the dial indicator reading with specifications. If the end play is excessive, replace the thrust plate.

17. Remove the dial indicator. Remove the timing chain and sprockets following steps 4 and 5 under "Cylinder Front Cover and Timing Chain Removal."

18. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the journals and lobes.**

INSTALLATION

1. Clean the oil passage that feeds the rocker arm shaft by blowing compressed air into the opening in the block. Oil the camshaft and apply Lubriplate to all the camshaft lobes. Carefully slide the camshaft through the bearings.

2. Install the thrust plate and torque the retaining bolts to specifications. Replace the crankshaft front oil seal.

3. Follow steps 1, 2 and 3 under "Cylinder Front Cover and Timing Chain Installation" and install the sprockets and timing chain, oil slinger, cylinder front cover and crankshaft damper.

4. Clean the oil pump inlet tube screen, and oil the pan and block gasket surfaces. Install the oil pump inlet tube and oil pump and the oil pan and related parts. Install the oil level dipstick.

5. Install the fan and fan pulley and drive belt. Adjust the belt tension. Install the radiator and the grille.

On a Mustang, install the bolts in the upper and lower stone shields, and install the grille, grille center support bracket and bumper.

6. Dip the valve lifter foot in Lubriplate. Coat the remainder of each valve lifter with engine oil. Install the valve lifters in their original bores.

7. Install the cylinder head, push rods and the valve rocker arm shaft assembly by following steps 1 thru 9 under "Cylinder Head Installation."

8. Using a new gasket, install the fuel pump and connect the flexible fuel line. Install the oil filter.

9. Position the No. 1 piston at TDC after the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position and the breaker points open. Install the distributor hold down clamp.

10. Connect the engine temperature sending unit wire. Connect the coil primary wire. Install the distributor cap. Connect the spark plug wires and the coil high tension lead.

11. Install the carburetor fuel inlet line. Connect the distributor vacuum line to the carburetor.

12. Connect the radiator upper and lower hoses. Connect the coolant hoses to the carburetor spacer.

13. Connect the accelerator rod retracting spring. Connect the accelerator rod at the carburetor.

14. Fill and bleed the cooling system. Fill the crankcase.

15. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line to the distributor. Check for coolant and oil leaks. Adjust the engine idle speed and the idle fuel mixture.

CAMSHAFT REAR BEARING BORE PLUG REPLACEMENT

1. On a car with a manual-shift transmission, slide the transmission to the rear and remove the clutch pressure plate and disc following the procedure in Group 5.

On a car with automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel and engine rear cover plate.

3. Drill a ½-inch hole in the camshaft rear bearing bore plug and use tool T58L-101-A to remove the plug (Fig. 35).



FIG. 35—Camshaft Rear Bearing Bore Plug Removal

4. Clean out the plug bore recess thoroughly.

5. Coat the flange of a new plug with oil-resistant sealer and install it with the flange facing out and slightly below the chamfer in the bore (Fig. 36).



FIG. 36—Camshaft Rear Bearing Bore Plug Installation

6. Install the engine rear cover plate, apply oil-resistant sealer to the flywheel bolts and install the flywheel.

On a car with a manual-shift transmission, install the clutch pressure plate, disc, and transmission following the procedure in Group 5.

On a car with automatic transmission install the transmission and con-

verter housing following the procedure in Group 7.

HYDRAULIC VALVE LIFTER

REPLACEMENT

1. Remove the cylinder head and related parts following the procedure under "Cylinder Head Removal."

2. Using a magnet, remove the valve lifters (Fig. 33). Place the lifters in a rack so they can be installed in their original positions.

If the lifters are stuck in their bores by excessive varnish or gum, it may be necessary to use a plier-type tool to remove the lifters. Rotate the lifter back and forth to loosen the gum and varnish which may have formed on the lifter.

The internal parts of each hydraulic valve lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

3. Install new (or cleaned) hydraulic valve lifters through the push rod openings with a magnet (Fig. 33).

4. Install the cylinder head and related parts.

DISASSEMBLY

Each valve lifter is a matched assembly; therefore, the parts are not interchangeable. Disassemble and assemble each lifter carefully, keeping the assemblies in proper sequence so they will be installed in their original bores.

1. Grasp the lock ring with needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release the lock ring.

2. Remove the push rod cup, plunger and spring.

3. Invert the plunger assembly and remove the check valve retainer by carefully prying up on it with a screwdriver. Remove the check valve and spring.

CLEANING AND INSPECTION

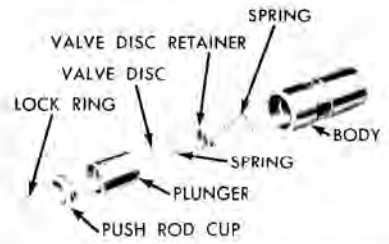
Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

A typical hydraulic valve lifter assembly is shown in Fig. 37.

1. Place the plunger upside down on a clean work bench.

2. Place the check valve in position over the oil hole on the bottom



NOTE: PLUNGER AND BODY ARE MATCHED SELECTIVE FIT SETS. DO NOT MISMATE PAIRS.

A1835-A

FIG. 37—Typical Valve Lifter Assembly

of the plunger. Set the check valve spring on top of the check valve.

3. Position the check valve retainer over the check valve and spring and push the retainer down into place on the plunger.

4. Place the plunger spring and then the plunger (open end up) into the tappet body.

5. Place the push rod seat in the plunger.

6. Depress the plunger and position the closed end of the lock ring in the lifter body groove. Release the plunger; then depress it again to fully seat the lock ring.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

MAIN AND CONNECTING ROD BEARING REPLACEMENT

The main bearing inserts are selective fit. **Do not file or lap bearing caps or use bearing shims to obtain the proper bearing clearance.**

Selective fit main bearings are available for service in standard sizes only. Standard bearings are divided into two sizes and are identified by a daub of red or blue paint. Refer to the Parts Catalog for the available sizes. **Red marked bearings increase the clearance; blue marked bearings decrease the clearance.** Undersize bearings, which are not selective fit, are available for use on journals that have been refinished.

MAIN BEARING

1. Drain the crankcase. Remove the oil level dipstick. Remove the oil pan and related parts.

2. Remove the oil pump inlet tube assembly and the oil pump.

3. Replace one bearing at a time, leaving the other bearings securely fastened. Remove the main bearing cap to which new bearings are to be installed.

4. Insert the upper bearing removal tool (tool 6331) in the oil hole in the crankshaft.

5. Rotate the crankshaft in the direction of engine rotation to force the bearing out of the block.

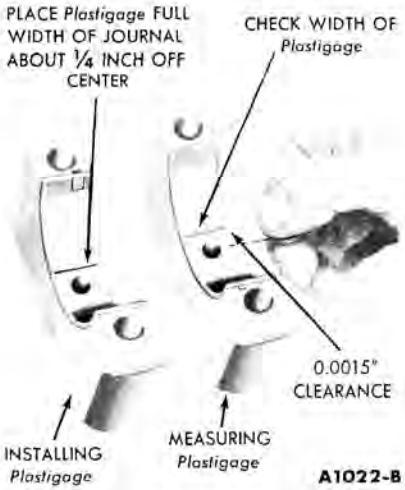
6. Clean the crankshaft journal. **When replacing standard bearings with new bearings, it is good practice to first try to obtain the proper clearance with two blue bearing halves.**

7. To install the upper main bearing, place the plain end of the bearing over the shaft on the locking tang side of the block and partially install the bearing so that tool 6331 can be inserted in the oil hole in the crankshaft. With tool 6331 positioned in the oil hole in the crankshaft, rotate the crankshaft in the opposite direction of engine rotation until the bearing seats itself. Remove the tool.

8. Replace the cap bearing.

9. Support the crankshaft so that its weight will not compress the Plastigage used in Step 10 and provide an erroneous reading. Position a jack so that it will bear against the couterweight adjoining the bearing which is being checked.

10. Place a piece of Plastigage on the bearing surface the full width of the bearing cap and about ¼-inch off center (Fig. 38).



A1022-B

FIG. 38—Installing and Measuring Plastigage—Engine Installed

11. Install the cap and torque the bolts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**

12. Remove the cap. Using the Plastigage scale, check the width of the Plastigage. **When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance. Check at the narrowest point in order to get the maximum clearance. The difference between the two readings is the taper.**

13. If the clearance is less than the specified limits, try two red bearing halves or a combination of red and blue, depending upon the condition. If the standard bearings do not bring the clearance within the desired limits, refinish the crankshaft journal, then install undersize bearings.

14. If the rear main bearing is replaced, replace the lower oil seal in the rear main bearing cap as follows:

Remove and discard the rear seal. If there is evidence of oil seal leakage, the upper half of the oil seal must also be replaced to assure satisfactory sealing.

Clean the mating surfaces of the block and rear main bearing cap, and the rear journal oil seal groove. Preform the new seal by hand to the approximate radius of the cap.

Insert the seal in the oil seal groove, seating the center of the seal first with the seal extending equally on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both ends of the seal into the groove working from the ends to the center.

Position the seal forming tool as shown in Fig. 39 and complete the seal installation. After installation, cut the ends of the seal flush.

Apply a thin coating of oil resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 39). **Do not apply sealer to the area forward of the oil slinger groove.**

The upper oil seal in the block cannot be replaced with the crankshaft installed.

15. After the bearing has been fitted, apply a light coat of engine oil to the journal and bearings, then install the bearing cap. Torque the cap bolts to specifications.

16. Repeat the procedure for the remaining bearings that require replacement.

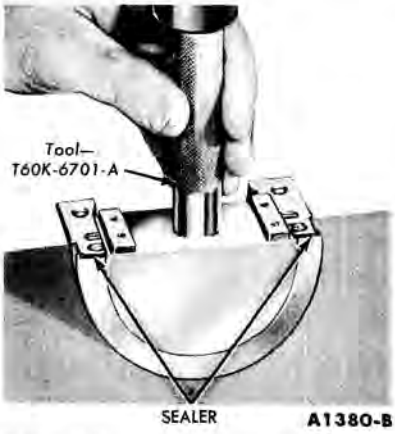


FIG. 39–Seal to Rear Bearing Cap Installation

17. If the thrust bearing cap (No. 3 main bearing) has been removed, install it as follows:

Install the thrust bearing cap with the bolts finger-tight. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 59). Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 59). This will align the thrust surfaces of both halves of the bearing. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications (Fig. 59).

18. Clean the oil pump inlet tube screen. Install the oil pump and the inlet tube assembly.

19. Position the oil pan gaskets on the oil pan. Position the oil pan front seal on the cylinder front cover. Position the oil pan rear seal on the rear main bearing cap. Install the oil pan and related parts. Install the oil level dipstick.

20. Fill the crankcase. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil leaks.

21. Check and adjust the ignition timing.

CONNECTING ROD BEARING

1. Follow steps 1 and 2 under "Main Bearing Replacement."

2. Turn the crankshaft until the connecting rod to which new bearings are to be fitted is down. Remove the connecting rod cap. Remove the bearing inserts from the rod and cap.

3. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts may distort the bearing and cause a failure.

4. Clean the crankshaft journal.

5. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slot provided.

6. Pull the connecting rod assembly down firmly on the crankshaft journal.

7. Place a piece of Plastigage on the lower bearing surface, the full width of the cap and about ¼ inch off center.

8. Install the cap and torque the connecting rod nuts to specification. **Do not turn the crankshaft while the Plastigage is in place.**

9. Refer to step 12 under "Main Bearing Replacement."

If proper clearance cannot be achieved with standard or 0.002 U.S. bearings, the crankshaft will have to be ground undersize and fitted with undersize bearings.

10. After the bearing has been fitted, clean and apply a light coat of engine oil to the journal and bearings. Install the connecting rod cap. Torque the nuts to specifications.

11. Repeat the procedure for the remaining connecting rods that require new bearings.

12. Follow steps 18 thru 21 under "Main Bearing Replacement."

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

PISTONS AND CONNECTING RODS

REMOVAL

1. Drain the cooling system and the crankcase.

2. Refer to "Cylinder Head Removal" and remove the cylinder head and related parts.

3. Remove the oil pan and related parts. Remove the oil pump inlet tube and the oil pump.

4. Turn the crankshaft until the piston to be removed is at the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove any ridge and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

5. Make sure all the connecting rod caps are marked so that they

can be installed in their original positions. Remove the connecting rod cap.

6. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. Avoid damage to the crankpin or the cylinder wall when removing the piston and rod.

INSTALLATION

1. Clean the oil pump inlet tube screen, and the oil pan and block gasket surfaces.

2. Oil the piston rings, pistons and cylinder walls with light engine oil.

3. Be sure to install the pistons in the same cylinders from which they were removed, or to which they were fitted. The connecting rod and bearing caps are numbered from 1 to 6 beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder.

4. Make sure the ring gaps are properly spaced around the circumference of the piston. Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 40). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the notch in the piston head toward the front of the engine.**

5. Check the clearance of each bearing following the procedure under "Connecting Rod Bearing Replacement."

6. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

7. Turn the crankshaft throw to the bottom of its stroke, then push

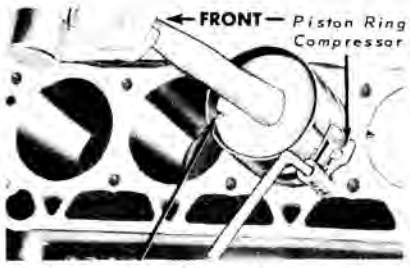


FIG. 40—Piston Installation



FIG. 41—Typical Connecting Rod Side Clearance

the piston all the way down until the connecting rod bearing seats on the crankshaft journal. Install the connecting rod cap. Torque the nuts to specifications.

8. After the piston and connecting rod assemblies have been installed, check the connecting rod side clearance on each crankshaft journal (Fig. 41).

9. Install the oil pump and the oil pump inlet tube. Install the oil pan and related parts.

10. Install the cylinder head by following steps 1 through 17 under "Cylinder Head Installation."

11. Fill the crankcase.

12. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil and coolant leaks.

13. Check and adjust the ignition timing, engine idle speed and the fuel mixture.

14. Install the air cleaner.

DISASSEMBLY

1. Remove the bearing inserts from the connecting rod and cap.

2. Mark the pistons and pins to assure assembly with the same rod and installation in the same cylinders from which they were removed.

3. Remove the piston pin from the piston and connecting rod (Fig. 42). Remove the piston rings.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

To fit new pistons, pins or rings, refer to Part 8-1, Section 2.

ASSEMBLY

The piston, connecting rod and related parts are shown in Fig. 43. **Check the fit of a new piston in the cylinder bore before assembling the piston and piston pin to the connecting rod.**

The piston pin bore of a connecting rod and the diameter of the piston pin must be within specifications. Refer to Part 8-4.

1. Apply a light coat of engine oil to all parts. **Assemble the piston to the connecting rod with the oil squirt hole in the connecting rod and the indentation in the piston positioned as shown in Fig. 44.**

2. Start the piston pin in the piston and connecting rod. Draw the piston pin through the piston and connecting rod until the end of the pin seats in Detail 2 (Fig. 45).

3. Follow the instructions contained on the piston ring package and install the piston rings.

4. Check the ring side clearance of the compression rings with a feeler gauge. Refer to "Fitting Piston Rings" in Part 8-1, Section 2.

5. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts may distort the bearing and cause a failure. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

FLYWHEEL

REMOVAL

1. On a manual-shift transmission, remove the transmission, clutch pressure plate and disc, following the procedures in Group 5.

On a car with automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

To check flywheel face runout, refer to Part 8-1, Section 1.

INSTALLATION

1. Position the flywheel on the crankshaft flange. Apply oil-resistant sealer to the retaining bolts. Install and torque the bolts in sequence across from each other to specifications.

2. On a manual-shift transmission, install the clutch pressure plate, disc, and the transmission following the procedures in Group 5.

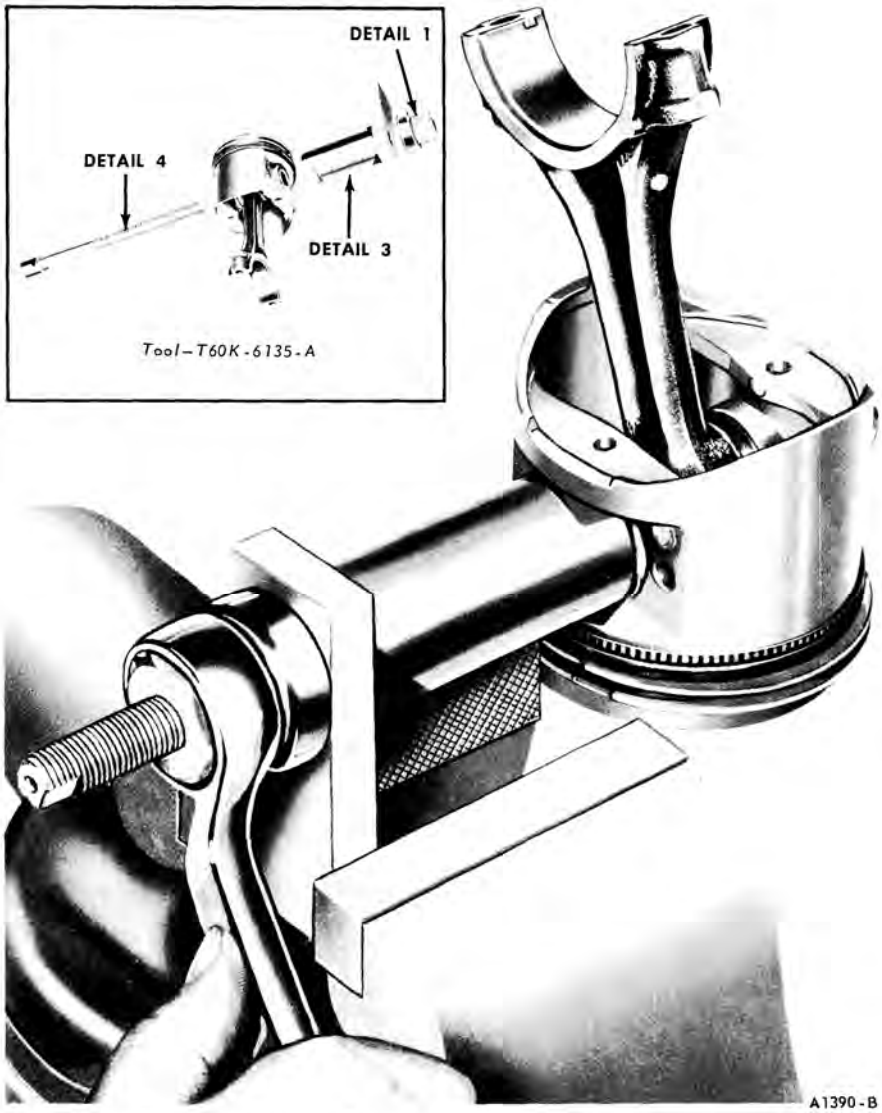


FIG. 42—Piston Pin Removal

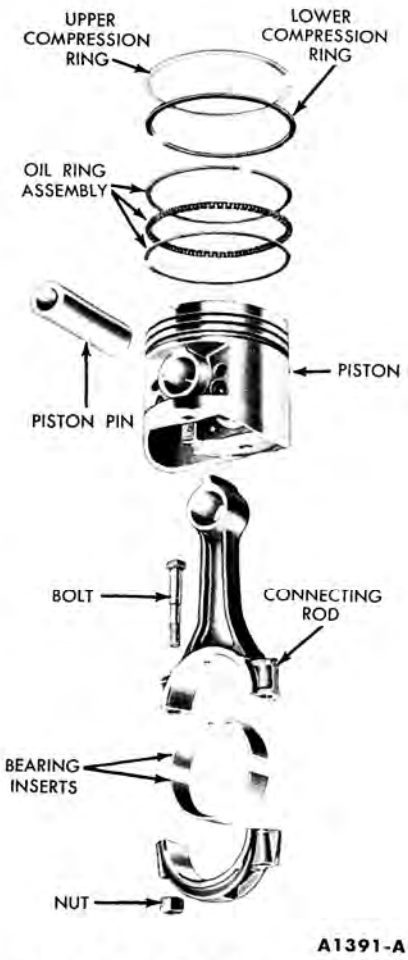


FIG. 43—Typical Piston, Connecting Rod and Related Parts

On a car with automatic transmission, install the converter housing and transmission following the procedure in Group 7.

CLUTCH PILOT BUSHING REPLACEMENT

Inspection procedures are outlined under "Flywheel Cleaning and Inspection" in Part 8-1, Section 3.

1. Remove the transmission, clutch pressure plate, and disc following the procedures in Group 5.

2. Using tools T59L-100-B and T58L-101-A, remove the pilot bushing (Fig. 46).

3. Coat the pilot bushing bore in the crankshaft with a small quantity of wheel bearing lubricant. **Avoid using too much lubricant as it may be thrown onto the clutch disc when the clutch revolves.**

4. Using tool T52T-12175-AJD, install the pilot service bearing (Fig. 47).

5. Install the clutch pressure plate, disc, and the transmission following the procedures in Group 5.

OIL FILTER REPLACEMENT

1. Place a drip pan under the filter. Unscrew the filter from the adapter fitting. Clean the adapter filter recess.

2. Coat the gasket on the replacement filter with oil. Position the filter on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face, then advance it ½ turn.

3. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

OIL PAN

REMOVAL

1. Drain the crankcase.

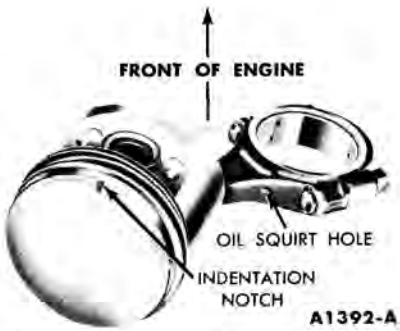


FIG. 44—Typical Piston and Connecting Rod Assembly

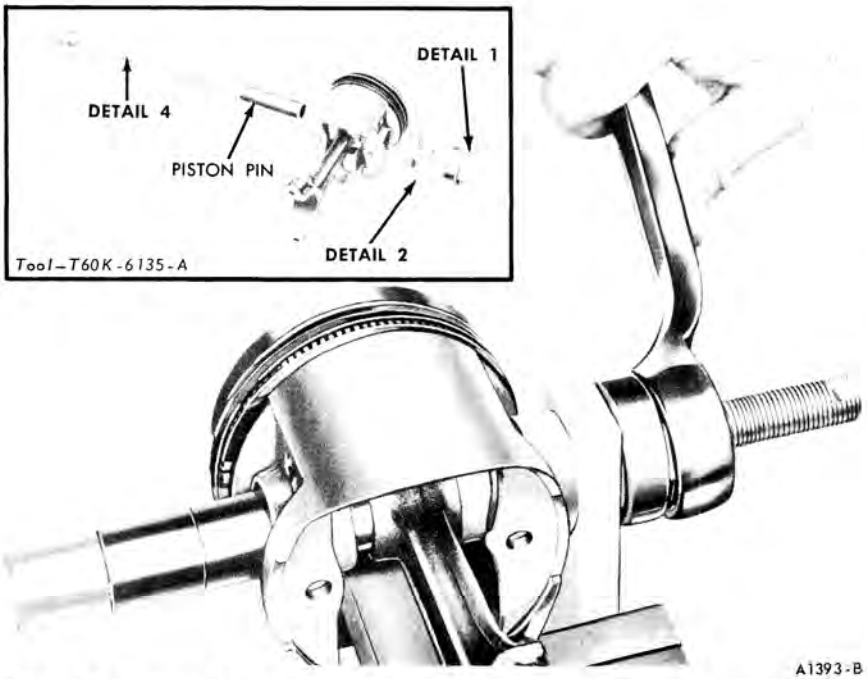


FIG. 45–Piston Pin Installation

2. Remove the oil level dipstick and the flywheel housing inspection cover.

3. On a Mustang, remove the stabilizer bar.

4. Remove the oil pan and gasket.

5. Remove the oil pump inlet tube and screen assembly.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean and install the oil pump inlet tube and screen assembly (Fig. 48 or 49).

2. Clean the gasket surfaces of the block and oil pan. The oil pan has a two-piece gasket. Coat the block surface and the oil pan gasket surface with oil-resistant sealer. Position the oil pan gaskets on the cylinder block (Fig. 50 or 51).

3. Position the oil pan front seal on the cylinder front cover (Fig. 50 or 51). **Be sure the tabs on the seal are over the oil pan gasket.**

4. Position the oil pan rear seal on the rear main bearing cap (Fig. 50 or 51). **Be sure the tabs on the seal are over the oil pan gasket.**

5. Hold the oil pan in place against the block and install a bolt, finger-tight, on each side of the oil pan. Install the remaining bolts. Torque the bolts from the center outward in each direction to specifications.

6. On a Mustang, install the stabilizer bar.

7. Install the oil level dipstick. Fill the crankcase with the proper



FIG. 48–170 Six Oil Pump Inlet Tube Installed

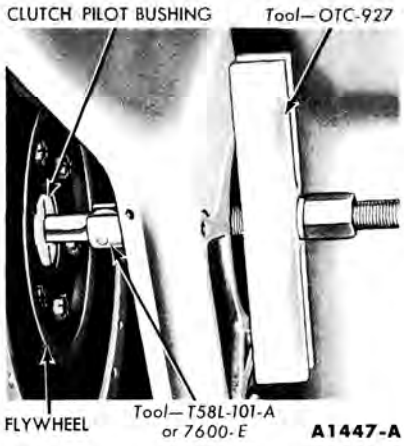


FIG. 46–Typical Clutch Pilot Bushing Removal

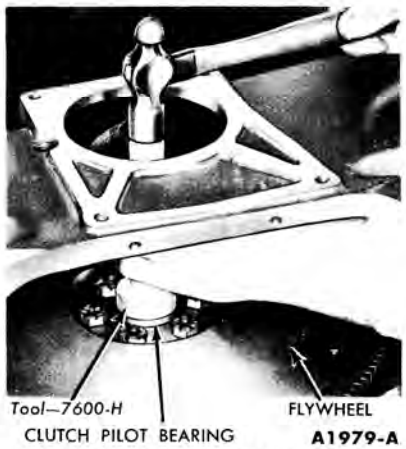


FIG. 47–Typical Clutch Pilot Service Bearing Installation



FIG. 49–200 Six Oil Pump Inlet Tube Installed

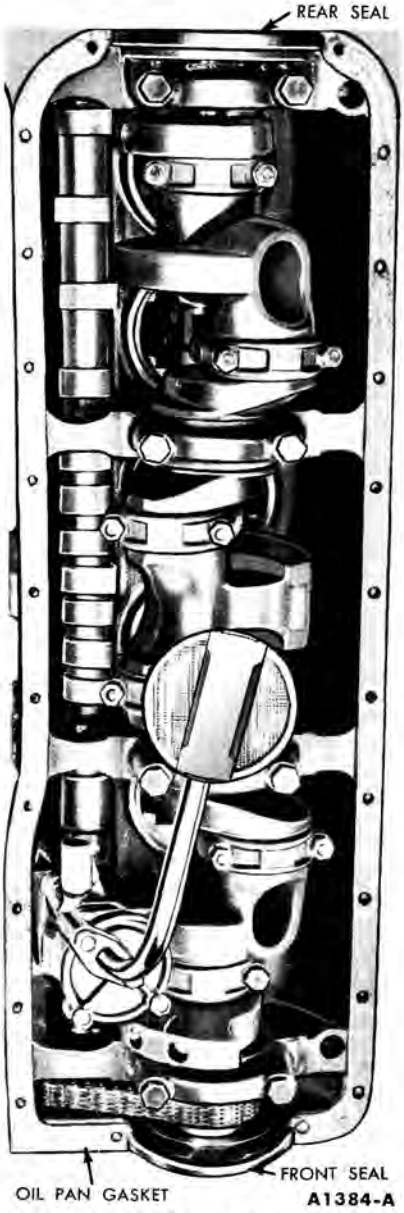


FIG. 50—170 Six Oil Pan Gaskets and Seals Installed

grade and quantity of engine oil. Operate the engine and check for oil leaks.

OIL PUMP

REMOVAL

1. Remove the oil pan and related parts as outlined under "Oil Pan Removal."

2. Remove the oil pump retaining bolts and remove the oil pump, gasket, and intermediate drive shaft.

INSTALLATION

1. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

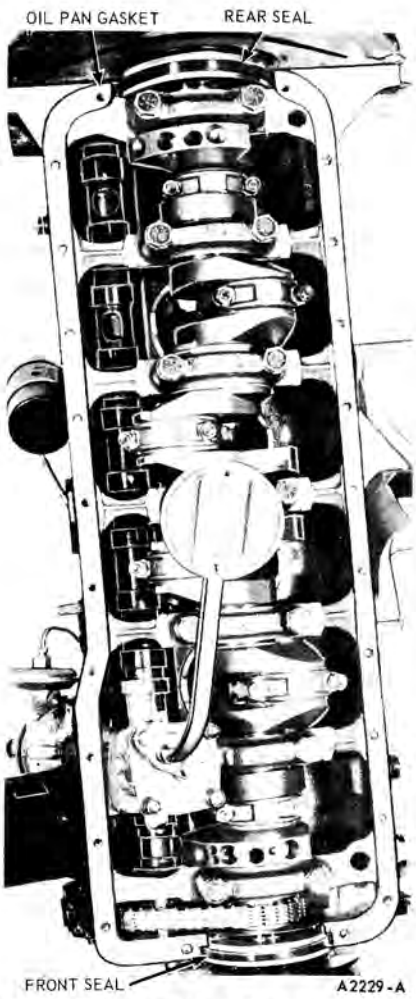


FIG. 51—200 Six Oil Pan Gaskets and Seals Installed

2. Position the intermediate drive shaft into the distributor socket. With the shaft firmly seated in the distributor socket, the stop on the shaft should touch the roof of the crankcase. Remove the shaft and position the stop as necessary.

3. Position a new gasket on the pump housing. With the stop properly positioned, insert the intermediate drive shaft into the oil pump. Install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate drive shaft into a new position.** Torque the oil pump retaining screws to specifications.

4. Install the oil pan and related parts as outlined under "Oil Pan Installation."

DISASSEMBLY

1. Remove the oil inlet tube from the oil pump and remove the gasket.

2. Remove the cover retaining screws, and remove the cover. Remove the inner rotor and shaft assembly, and remove the outer race.

3. Insert a self-threading sheet metal screw of the proper diameter into the oil pressure relief valve chamber cap and pull the cap out of the chamber. Remove the spring and plunger.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

The oil pump assembly is shown in Fig. 52.

1. Oil all parts thoroughly.

2. Install the oil pressure relief valve plunger, spring, and a new cap.

3. Install the outer race, and the inner rotor and shaft assembly. **Be sure the identification mark on the rotor and on the outer race both face to the bottom of the pump. The inner rotor and shaft, and the outer race are serviced as an assembly. One part should not be replaced without replacing the other.** Install the cover and torque the cover retaining screws to specifications.

4. Position a new gasket and the oil inlet tube on the oil pump and install the retaining bolts.

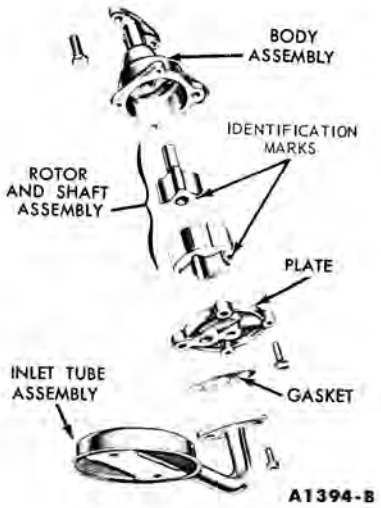


FIG. 52—Typical Oil Pump Assembly

3 ENGINE REMOVAL AND INSTALLATION

REMOVAL

1. Remove the hood.

2. Drain the cooling system and the crankcase.

3. Remove the air cleaner. Disconnect the battery ground cable at the cylinder head. Disconnect the radiator upper hose at the water outlet housing and the radiator lower hose at the water pump.

4. Remove the radiator. Remove the drive belt, fan, and pulley.

5. Disconnect the heater hoses from the water pump and the carburetor spacer. Disconnect the alternator wires from the alternator, the starter cable from the starter, the accelerator rod and the choke control cable from the carburetor.

6. Disconnect the flexible fuel line at the fuel tank line and plug the fuel tank line.

7. Disconnect the coil primary wire at the coil. Disconnect the oil pressure and the water temperature sending unit wires at the sending units.

8. Remove the starter and dust seal.

On a car with a manual-shift transmission, disconnect the clutch retracting spring. Disconnect the clutch equalizer shaft and arm bracket at the underbody rail and remove the arm bracket and equalizer shaft.

9. Raise the car. Remove the flywheel or converter housing upper retaining bolts through the access holes in the underbody.

10. Disconnect the muffler inlet pipe at the exhaust manifold. Loosen the inlet pipe clamp and slide it off the support bracket on the engine. Disconnect the engine right and left mount at the underbody bracket. Remove the flywheel or converter housing cover.

On a car with a manual-shift transmission, remove the flywheel housing lower retaining bolts.

On a car with automatic transmission, disconnect the converter from the flywheel. Remove the converter housing lower retaining bolts.

11. Lower the car. Support the transmission and flywheel or converter housing with a jack.

12. Attach the engine lifting hook (Fig. 53). Carefully lift the engine out of the engine compartment. Install the engine on a work stand (Fig. 54).

INSTALLATION

1. Install guide pins in the flywheel or converter housing bolt holes in the rear of the engine. Place a new gasket over the studs of the exhaust manifold.

2. Carefully lower the engine into the engine compartment.

3. Make sure the studs on the exhaust manifold are aligned with the holes in the muffler inlet pipe and the guide pins in the block engage the holes in the flywheel housing.

On a car with automatic transmission, start the converter pilot into the crankshaft.

On a car with a manual-shift transmission, start the transmission main drive gear into the clutch disc. It may be necessary to adjust the position of the transmission in relation to the engine if the input shaft will not enter the clutch disc. **If the engine "hangs up" after the shaft enters, turn the crankshaft slowly (transmission in gear) until the shaft splines mesh with the clutch disc splines.**



FIG. 53—Engine Lifting Hook

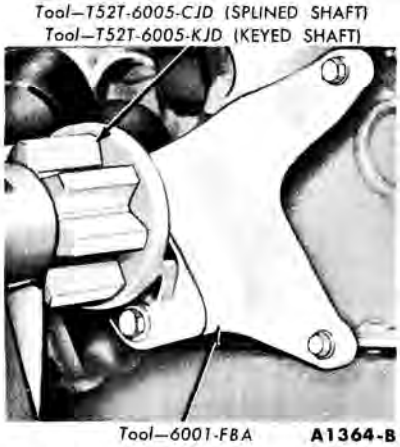


FIG. 54—Engine Work Stand

4. Remove the engine lifting hooks. Install the flywheel or converter housing upper retaining bolts.

5. Remove the jack from the transmission. Raise the car.

6. Remove the guide pin and install the flywheel or converter housing lower retaining bolts.

On a car with automatic transmission, attach the converter to the flywheel and torque the retaining nuts to specifications.

7. Install the flywheel or converter housing dust cover.

On a car with a manual-shift transmission, install the clutch equalizer shaft and arm bracket. Connect the clutch retracting spring.

8. Install the engine left and right mount to the underbody bracket. Install the sediment bowl on the fuel pump.

9. Remove the plug from the fuel tank line and connect the flexible fuel line to the fuel tank line. Install the exhaust manifold to muffler inlet pipe retaining lock washers and nuts. Torque the nuts to specifications. Position the inlet pipe clamp on the support bracket on the engine and tighten the clamp.

10. Lower the car. Connect the oil pressure and the engine temperature sending unit wires. Connect the coil primary wire. Connect the windshield wiper vacuum hose to the vacuum pump. Connect the accelerator rod. Connect and adjust the choke control cable.

11. Install the starter motor and dust seal. Connect the starter cable. Connect the alternator wires. Connect the heater hose at the water pump and carburetor spacer. Connect the battery ground cable.

12. Install the pulley, fan, and drive belt. Adjust the drive belt tension. Install the radiator. Connect the radiator upper and lower hoses. Fill and bleed the cooling system. Fill the crankcase with the proper

grade and quantity of engine oil.

13. Install and adjust the hood.

14. Operate the engine at fast idle and check all gaskets and hose connections for leaks.

On a car with automatic transmission, adjust the transmission control linkage (Group 7).

15. Install the air cleaner.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the engine from the car and install it on a work stand.

CRANKSHAFT

REMOVAL

The crankshaft and related parts are shown in Fig. 55 or 56.

1. Loosen the alternator adjusting bolts and remove the fan belt. Remove the oil level dipstick.

2. Remove the crankshaft damper retaining bolt and washer. Remove the crankshaft vibration damper, remove the damper using tool T58P-6316-A.

3. Remove the cylinder front cover and gasket.

4. Remove the oil slinger. Check the timing chain deflection, then remove the timing chain and sprockets

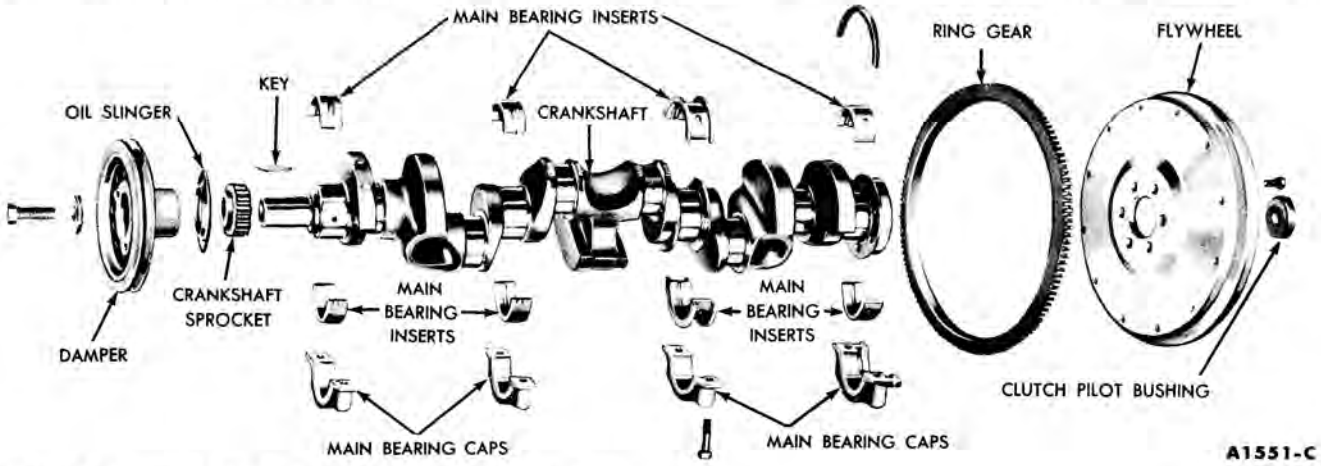


FIG. 55—Typical 170 Six Crankshaft and Related Parts

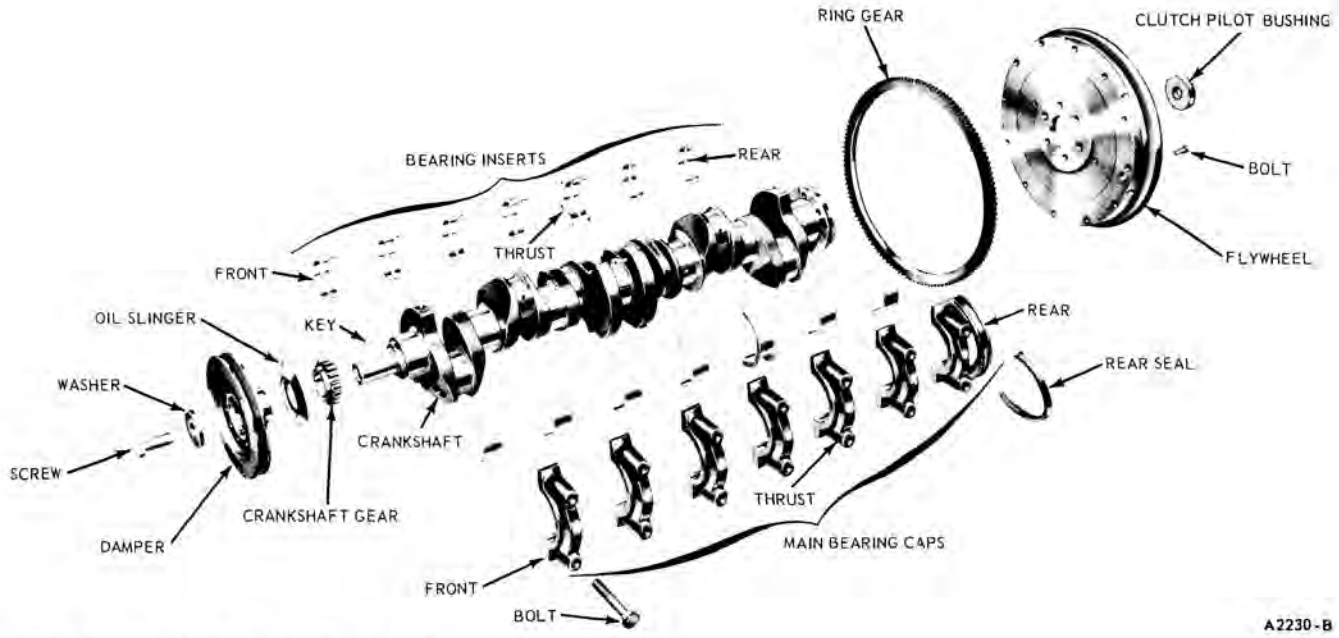


FIG. 56—Typical 200 Six Crankshaft and Related Parts

by following steps 4 and 5 under "Cylinder Front Cover and Timing Chain Removal."

5. Invert the engine on the work stand. Remove the flywheel. Remove the oil pan and gasket. Remove the oil pump.

6. Make sure all bearing caps (main and connecting rod) are marked so that they can be installed in their original locations. Turn the crankshaft until the connecting rod from which the cap is being removed is down. Remove the connecting rod cap. Push the connecting rod and piston assembly up in the cylinder.

7. Remove the main bearing caps.

8. Carefully lift the crankshaft out of the block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

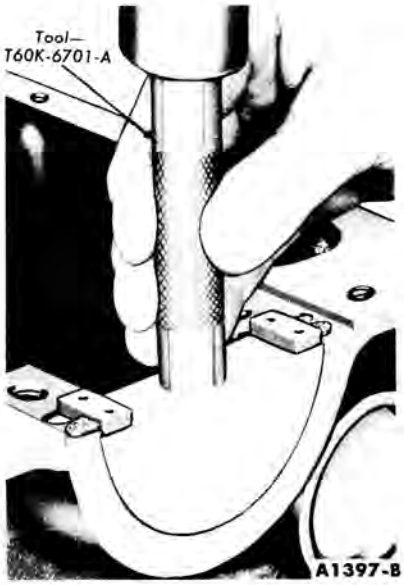


FIG. 57—Rear Oil Seal to Block Installation

INSTALLATION

1. Remove the rear journal oil seal from the block and rear main bearing cap.

2. Remove the main bearing inserts from the block and bearing caps.

3. Remove the connecting rod bearing inserts from the connecting rods and caps.

4. Clean the rear journal oil seal grooves. Install a new rear journal oil seal in the block (Fig. 57) and rear main bearing cap (Fig. 39). After installation, cut the ends of the seals flush.

5. Apply a thin coating of oil resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 39) **Do not apply sealer to the area forward of the oil slinger groove.**

6. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts will distort the bearing and cause a failure.

7. Place the upper main bearing inserts in position in the bores with the tang fitting in the slot provided.

8. Install the lower main bearing inserts in the bearing caps.

9. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

10. Check the clearance of each main bearing. Place a piece of Plastigage on the crankshaft journal the full width of the journal and about ¼ inch off center (Fig. 58). Follow steps 11 thru 13 under "Main Bearing Replacement."

11. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings. Install all the bearing caps, except the thrust bearing cap (No. 3 bearing on a 170 Six engine or No. 5 bearing on a 200 Six engine). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

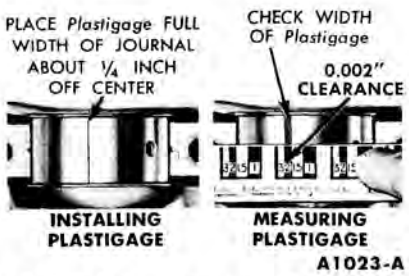


FIG. 58—Installing and Measuring Plastigage—Engine on Work Stand

12. Install the thrust bearing cap with the bolts finger-tight.

13. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 59).

14. Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 59). This will align the thrust surfaces of both halves of the bearing.

15. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications (Fig. 59).

16. Force the crankshaft toward the rear of the engine.

17. Install a dial indicator so that the contact point rests against the crankshaft flange and the indicator axis is parallel to the crankshaft axis (Fig. 60).

18. Zero the dial indicator. Push the crankshaft forward and note the reading on the dial.

19. If the end play exceeds the wear limit (0.012 inch), replace the thrust bearing. If the end play is less than the minimum limit, inspect the thrust bearing faces for scratches, burrs, nicks, or dirt. If the thrust faces are not defective or dirty, they probably were not aligned properly. Install the thrust bearing and align the faces following the recommended procedure (steps 12, 13, 14, and 15). Check the end play which should be within specifications.

20. Install new bearing inserts in

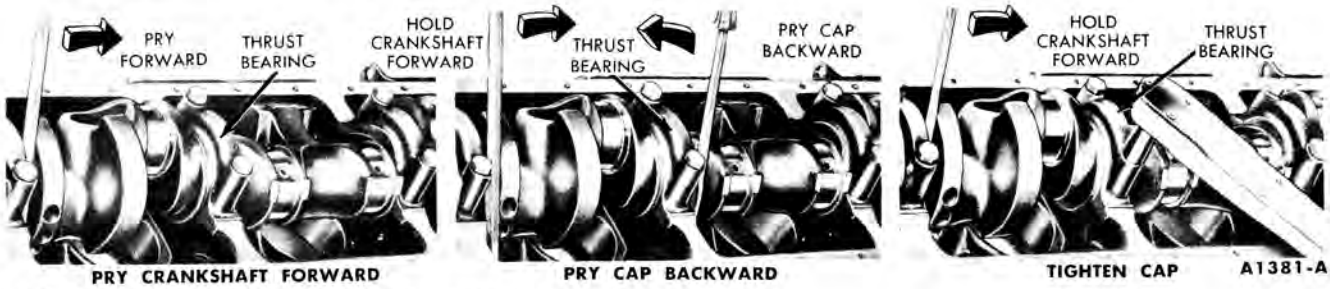


FIG. 59—Typical Thrust Bearing Alignment

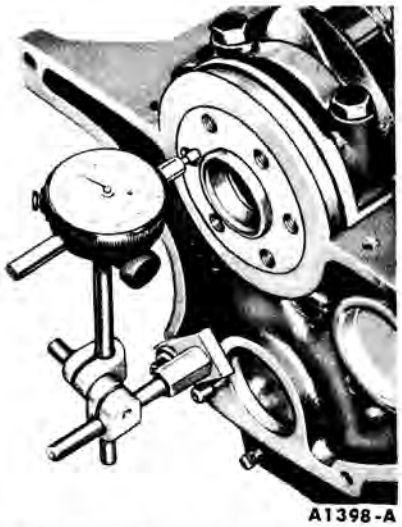


FIG. 60—Crankshaft End Play

the connecting rods and caps. Check the clearance of each bearing following the procedure under "Connecting Rod Bearing Replacement."

21. If the bearing clearances are to specifications, apply a light coat of engine oil to the journals and bearings.

22. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the rod bearing seats on the crankshaft journal.

23. Install the connecting rod cap. Torque the nuts to specifications.

24. After the piston and connecting rod assemblies have been installed, check the connecting rod side clearance on each connecting rod crankshaft journal (Fig. 41).

25. Clean the oil pan, oil pump, and oil pump screen.

26. Prime and install the oil pump following steps 1, 2, and 3 under "Oil Pump Installation." Install the oil pan following steps 2 thru 5 under "Oil Pan Installation."

27. Position the flywheel on the crankshaft. Apply oil-resistant sealer to the flywheel retaining bolts. Install and torque the retaining bolts to specifications.

On a flywheel for a manual-shift transmission, use tool 7563 to locate the clutch disc. Install the pressure plate.

28. Turn the engine on the work stand so that the front end is up.

29. Install the timing chain and sprockets, cylinder front cover and crankshaft pulley or damper, following steps 1 thru 3 under "Cylinder Front Cover and Timing Chain Installation."

30. Turn the engine on the work stand so that the engine is in the normal position. Install the oil level dipstick. Install and adjust the drive belt.

31. Remove the engine from the work stand and install it in the car.

CAMSHAFT BEARING REPLACEMENT

The camshaft bearings are available pre-finished to size and require no reaming for standard and 0.015-inch undersize journal diameters.

1. Remove the flywheel and the camshaft. Remove the rear bearing bore plug (Fig. 35).

2. Remove the camshaft bearings (Fig. 61).

3. Position the bearings in the bearing bore and press them into place (Fig. 61). **No. 1 camshaft bearing must be pressed in 0.115 to 0.125 inch below the front face of the bearing bore. Press the remaining bearings in sufficiently to align the oil supply holes. The No. 4 bearing has two oil holes and must be installed 24¾ inches from the face of the camshaft thrust plate surface.** Check the oil passage that feeds the rocker arm shaft for obstructions by squirting oil into the opening in the cylinder block and observing the flow through the oil hole at No. 4 camshaft bearing.

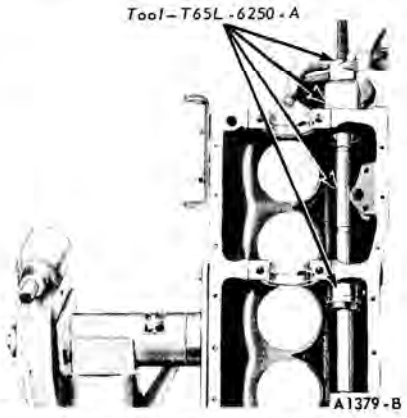


FIG. 61—Camshaft Bearing Removal or Installation

4. Clean the camshaft rear bearing bore plug recess thoroughly. Apply oil-resistant sealer and install a new plug (Fig. 36).

5. Install the camshaft and related parts.

6. Install the engine in the car.

CYLINDER ASSEMBLY REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 3, 5 thru 13, and 24 under "Engine Disassembly." Remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Check all assembly clearances and transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 28 thru 44, 47 thru 50, 53 and 56 thru 58 under "Engine Assembly."

CYLINDER BLOCK REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 3, 5 thru 19, 21 and 24 under "Engine Disassembly." Remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Check all assembly clearances and transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 1 thru 4, 6 thru 9, 11 thru 21, 28 thru 50, 53 and 56 thru 58 under "Engine Assembly."

ENGINE DISASSEMBLY

1. Disconnect the distributor vacuum line and the fuel inlet line at the carburetor.

2. Disconnect the carburetor fuel inlet line at the fuel filter. Disconnect the distributor vacuum line at the distributor. Remove the fuel inlet line and distributor vacuum line as an assembly.

3. Remove the crankcase ventilation system by following the procedures under "Crankcase Ventilation System Removal" in Section 2 of this part of the manual.

4. Remove the carburetor and gasket. Remove the exhaust manifold.

5. Remove the coil. Remove the distributor cap and spark plug wires as an assembly. Remove the distributor, fuel pump, oil pressure sending unit, oil filter and oil filter mounting insert. Remove the spark plugs.

6. Remove the valve rocker arm cover. Remove the valve rocker arm shaft assembly (Fig. 18) by removing the support bolts evenly and equally 2 turns at a time.

7. Remove the valve push rods in sequence and identify them so that they can be installed in their original positions (Fig. 19).

8. Remove all cylinder head bolts. Lift the cylinder head assembly off the engine. **Do not pry between the head and block as the gasket surfaces may become damaged.** Remove the valve lifters in sequence.

On a flywheel for a manual-shift transmission, mark the pressure plate cover so that it can be replaced in the same position. Remove the clutch pressure plate and cover assembly.

Remove the flywheel. Remove the clutch pilot bushing and engine rear cover plate (Fig. 46).

9. Remove the dipstick and the oil pan. Discard the gasket and seals.

10. Remove the oil pump and inlet tube assembly. Discard the oil pump gasket.

11. Loosen the alternator mounting bolts and disconnect the alternator adjusting arm at the water pump. Remove the drive belt.

12. Remove the alternator, the water pump and the crankshaft damper. Remove the damper by using tool T58P-6316-A.

13. Remove the cylinder front cover. Discard the gasket. Remove the crankshaft front oil slinger. Check the camshaft end play by following step 15 under "Camshaft Removal." Check timing chain deflection by following step 4 under "Cylinder Front Cover Removal."

14. Remove the camshaft sprocket retaining bolt and washer. Slide both sprockets and the timing chain forward and remove them as an assembly (Fig. 29).

15. Remove any ridges and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridges with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

16. Make sure all bearing caps (main and connecting rod) are marked so they can be installed in their original locations. Turn the crankshaft until the connecting rod being removed is down. Remove the connecting rod cap.

17. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the crankpin or the cylinder wall when removing the piston and rod.**

18. Remove the bearing inserts from the connecting rods and caps. Remove the main bearing caps.

19. Carefully lift the crankshaft out of the cylinder block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

20. Remove the rear journal oil seal from the block and rear main bearing cap. Remove the main bearing inserts from the block and bearing caps.

21. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the journals and lobes.**

22. Remove the camshaft rear bearing bore plug (Fig. 35).

23. Remove the camshaft bearings (Fig. 61).

24. Remove the dipstick tube and the plug or drain.

ENGINE ASSEMBLY

1. Install the camshaft bearings and rear bore plug by following steps 3 and 4 under "Camshaft Bearing Replacement."

2. The camshaft and related parts are shown in Fig. 32. Oil the camshaft and apply Lubriplate to all camshaft lobes. Carefully slide the camshaft through the bearings.

3. Install the thrust plate. Torque the retaining screws to specifications.

4. The crankshaft and related parts are shown in Fig. 55 or 56. Be sure that the rear journal oil seal grooves are clean. Install a new rear journal oil seal in the block (Fig. 57) and rear main bearing cap (Fig. 39). After installation, cut the ends of the seals flush.

5. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing bores are clean. Place the upper main bearing inserts in position in the bore with the tang fitting in the slot provided.

6. Install the lower main bearing inserts in the bearing caps.

7. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

8. Check the clearance of each main bearing following steps 10 thru 13 under "Main Bearing Replacement." In step 10, place the Plastigage on the crankshaft journal instead of in the bearing cap (Fig. 58).

9. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings. Install all the bearing caps, except the thrust bearing cap (No. 3 bearing on 170 six engine or No. 5 bearing on 200 six engine). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

10. Install the thrust bearing cap by following steps 12 thru 15 under "Crankshaft Installation."

11. Check the crankshaft end play by following steps 17 thru 19 under "Crankshaft Installation."

12. Turn the engine on the work stand so that the front end is up.

13. Oil the piston rings, pistons, and cylinder walls with light engine oil.

14. Be sure to install the pistons in the same cylinders from which they were removed, or to which they were fitted. The connecting rod and bearing cap are numbered from 1 to 6 beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number.

15. Make sure the ring gaps are properly spaced around the circumference of the piston.

16. Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 40). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the notch in the piston head toward the front of the engine.**

17. Check the clearance of each bearing following the procedure under "Connecting Rod Bearing Replacement."

18. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

19. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the connecting rod bearing seats on the crankshaft journal.

20. Install the connecting rod cap. Torque the nuts to specifications.

21. After the piston and connecting rod assemblies have been installed, check the connecting rod side clearance on each crankshaft journal (Fig. 41).

22. Lubricate the timing chain and sprockets with engine oil. Place the keys in position in the slots on the crankshaft and camshaft.

23. Position the sprockets and timing chain on the camshaft and crankshaft. Be sure the timing marks on the sprockets and chain are positioned as shown in Fig. 28.

24. Install the camshaft sprocket retaining bolt and washer. Torque the bolt to specifications. Install the oil slinger.

25. Clean the cylinder front cover and the gasket surface of the cylinder block.

26. Install a new crankshaft front oil seal.

27. Coat the gasket surface of the block and the cover with oil-resistant sealer. Position a new gasket on the block.

28. Using tool T61K-6019-A, install the cylinder front cover on the block. Torque the screws to specifications.

29. Line up the crankshaft damper keyway with the key on the crankshaft.

30. Install the crankshaft damper using tool T52L-6306-AEE. Torque the retaining bolt to specifications.

31. Install the water pump, alternator, fan pulley, and fan. Install and adjust the drive belt.

32. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

33. Using a new gasket, install the oil pump. Clean and install the oil inlet tube assembly.

34. Make sure the gasket surfaces of the block and oil pan are clean.

35. Coat the block surface and oil pan gasket surface with oil-resistant sealer and position the gasket on the block (Fig. 50 or 51).

36. Install the oil pan front seal on the cylinder front cover and the oil pan rear seal on the rear main bearing cap (Fig. 50 or 51). **Be sure the tabs on the seals are over the oil pan gasket.**

37. Position the oil pan on the block. Install the retaining screws. Torque the screws from the center outward in each direction to specifications.

38. Install the clutch pilot bushing (Fig. 47). Install the engine rear cover plate, position the flywheel on the crankshaft and install the retaining bolts. Torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use tool 7563 to locate the clutch disc. Install the pressure plate. Torque the retaining bolts to specifications.

39. Using a new gasket, install the fuel pump.

40. Turn the crankshaft until No. 1 cylinder is at TDC after the compression stroke. Position the distributor and intermediate drive shaft into the block with the rotor at the No. 1 firing position and the breaker points open. Install the hold down clamp. **Make sure the oil pump intermediate drive shaft is properly seated in the oil pump. It may be necessary to reposition the intermediate shaft in order to engage it in the oil pump.**

41. Install the oil filter insert and oil filter assembly.

42. Dip the valve lifter foot in Lubriplate. Coat the remainder of each valve lifter with engine oil. Install the lifters in their original bores.

43. Clean the head and block gasket surfaces.

44. Inspect the head for any damage and repair as necessary.

45. On a 170 six engine, apply cylinder head gasket sealer to both sides of a new gasket. **Do not apply sealer to the gasket on a 200 six engine.** Install the cylinder head guide studs (Fig. 20). Position the gasket over the guide studs on the cylinder block.

46. Lift the cylinder head over the guides and slide it down carefully. Before installing the cylinder head bolts, coat the threads of the end bolts for the right side of the cylinder head with a small amount of water resistant sealer. Install, but do not tighten, two bolts at opposite ends of the head to hold the head and gasket in position. Remove the guides, then install the remaining bolts.

47. The cylinder head bolts are torqued in three progressive steps. Follow the sequence shown in Fig. 21. Torque the bolts to 55 ft-lbs, then torque them to 65 ft-lbs. Finally, torque the bolts to specifications. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.**

48. Apply Lubriplate to both ends of the push rods. Install the push rods in their proper sequence, positioning the lower end of the rods in the lifter sockets.

49. Apply Lubriplate to the valve tips and the rocker arm pads. Position the valve rocker arm shaft assembly on the head. **Be sure the oil holes in the shaft are facing downward.**

50. Install the valve rocker arm shaft bolts evenly and equally 2 turns at a time until the specified torque is obtained.

51. Refer to Part 8-1, Section 2 and check the valve clearance.

52. Clean the gasket surfaces on the valve rocker arm cover and cylinder head. Coat one side of a new gasket with an oil-resistant sealer and lay the cemented side of the gasket on the cover. Install the cover making sure the gasket seats evenly around the head. Torque the cover bolts to specifications. Torque the cover bolts to specifications again two minutes later.

53. Install the spark plugs. Install the distributor cap and spark plug wire assembly. Connect the spark plug wires. Install the coil on the block and connect the coil high tension lead.

54. Position the exhaust manifold on the cylinder head. Install the tab washers and bolts. Torque the bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

55. Position the carburetor gasket on the spacer. Install the carburetor.

56. Install the carburetor fuel inlet line, the manifold vacuum line and the distributor vacuum line.

57. Install the crankcase ventilation system by following the procedure under "Crankcase Ventilation System Installation" in Section 2 of this part of the manual.

58. Install the oil pressure sending unit, dipstick tube and dipstick.

59. Install the engine in the car.

60. Check the ignition timing and adjust if necessary. Adjust the engine idle fuel mixture and idle speed.

PART 8-3 260 AND 289 V-8

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1 DESCRIPTION AND OPERATION

The 260 V-8 and the 289 V-8 engines (Figs. 1 and 3) have the same basic design. Typical engine sections are shown in Figs. 2 and 4. Differences in the engines are called out when they exist. Refer to Table 1 for the engine identification and application.

An engine identification tag is attached to the ignition coil bracket; refer to Part 8-1, Section 1.

MANIFOLDS

Coolant flows from the front of the engine through the intake manifold into the heater inlet hose and circulates through the heater. On cars that do not have a heater, the coolant is returned to the water pump through a by-pass hose.

Exhaust gases flowing through the crossover passage (Fig. 5) provide the initial heat necessary to assist in vaporizing the incoming fuel mixture.

The intake manifold has two sets of fuel passages, each with its own separate inlet connection to the carburetor (Fig. 6). The right barrel(s) of the carburetor feeds Nos. 1, 4, 6 and 7 cylinders and the left barrel(s) feeds Nos. 2, 3, 5 and 8 cylinders.

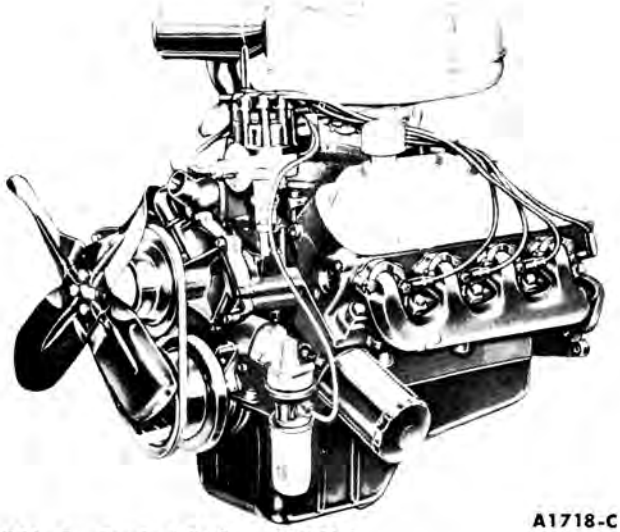
Filtered air is drawn from the air cleaner, through an air inlet tube, into the heat chamber in the right exhaust manifold. Here the air is heated and then directed to the automatic choke through the air outlet choke tube (Fig. 7).

CYLINDER HEADS

The cylinder head assemblies contain the valves and the valve rocker

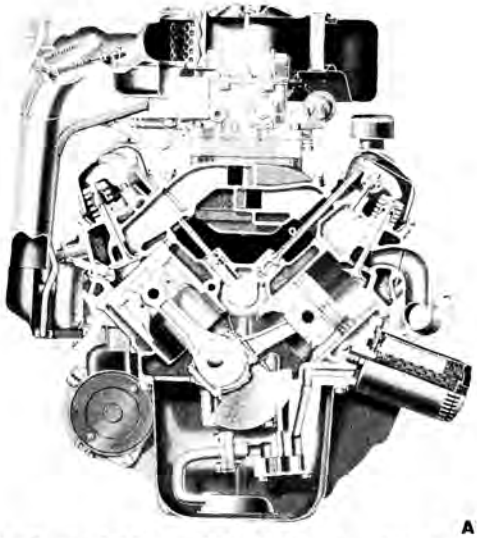
TABLE 1—Engine Identification and Application

Engine	Patent Plate Code	Engine Prefix	Piston Displacement	Bore and Stroke	Compression Ratio	Valve Lifters	Carburetor	Distributor	Fuel Required	Model Application
260	F	EEY	260	3.80 x 2.87	8.8:1	Hydraulic	2-V Ford	Dual Advance	Regular	Early Mustangs
289	C	EGA	289	4.00 x 2.87	9.0:1	Hydraulic	2-V Ford	Dual Advance	Regular	All
289	D	EGA	289	4.00 x 2.87	9.0:1	Hydraulic	4-V Ford	Dual Advance	Regular	Early Mustangs
289	A	EGA	289	4.00 x 2.87	9.0:1	Hydraulic	4-V Ford	Dual Advance	Premium	All
289 High Performance	K	EGA	289	4.00 x 2.87	10.5:1	Mechanical	4-V Ford	Centrifugal Advance	Premium	Fairlane and Mustang



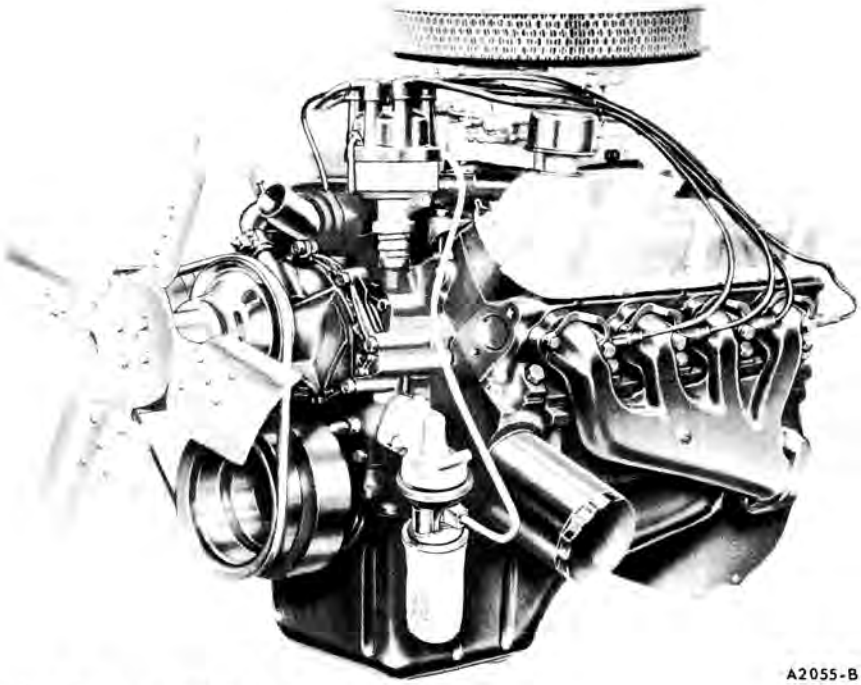
A1718-C

FIG. 1—Typical 260 or 289 V-8



A1717-C

FIG. 2—Typical 260 or 289 V-8 Engine Sectional



A2055-B

FIG. 3—Typical 289 High Performance V-8

arm assemblies. The valve guides and push rod guides are machined in the head with a cast combustion chamber. The valve arrangement from front to rear on the left bank is E-I-E-I-E-I-E-I and on the right bank I-E-I-E-I-E-I-E (Fig. 8).

CYLINDER BLOCK

The cylinders are numbered from front to rear, on the right bank 1, 2, 3 and 4 and on the left bank 5, 6, 7 and 8. The firing order is 1-5-4-2-6-3-7-8.

The oil pump, mounted inside the oil pan at the left front, is driven by the distributor through an intermediate drive shaft.

The oil filter is mounted on the left lower front of the block.

The crankshaft is supported by five main bearings. Crankshaft end thrust is controlled by the flanges of the No. 3 main bearing.

The pistons have two compression rings and one oil control ring. The top compression ring is chrome-plated and the lower compression ring is phosphate-coated. The oil control ring assembly consists of a serrated spring and two chrome-plated steel rails.

VALVE TRAIN

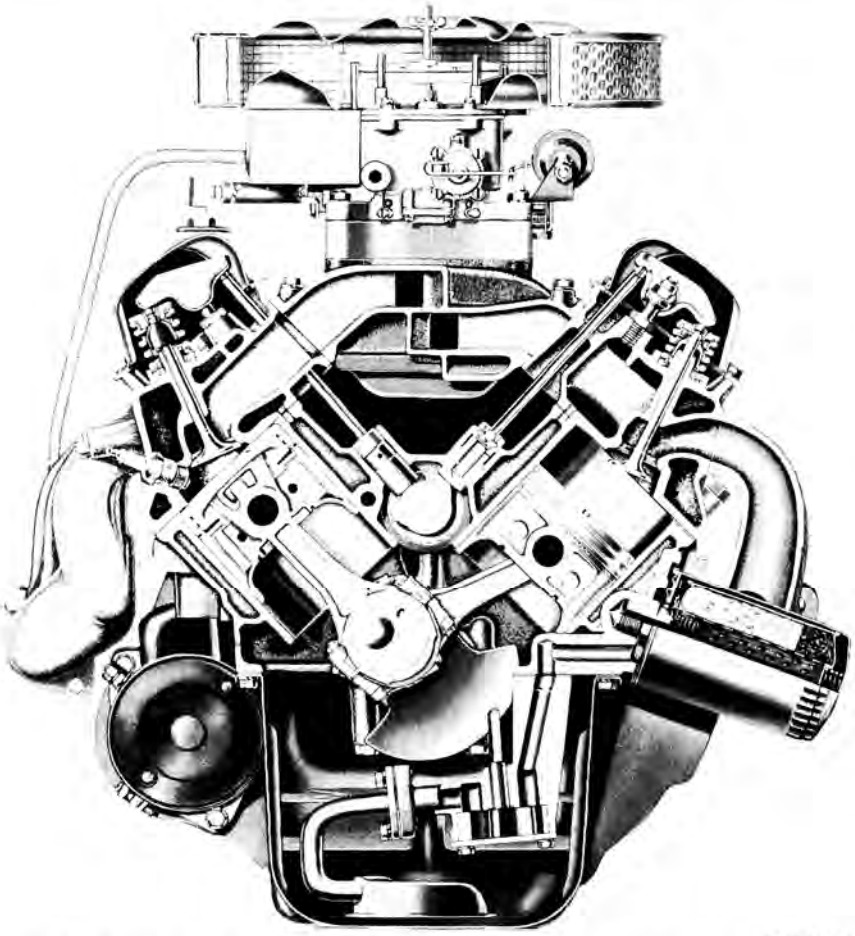
The push rods are tubular steel with ball ends. The push rods supply oil from a metering valve (disc) in the valve lifters through drilled holes in the ball ends for independent lubrication of each rocker arm.

The rocker arms have a drilled hole in the push rod end for lubrication. They are individually mounted on a stud that is either pressed into the cylinder head on regular performance engines or threaded into the cylinder head on high performance engines. A fulcrum seat controls the rocker motion and a nut secures the rocker arm on the stud.

The camshaft is supported by five stepped diameter bearings pressed into the block with a dowel for positioning the camshaft sprocket. It is driven by a sprocket and timing chain in mesh with a sprocket on the crankshaft. Camshaft end play is controlled by a thrust plate attached to the cylinder block. An eccentric, bolted to the front end of the camshaft, operates the fuel pump.

On the 289 high performance V-8 engine, mechanical valve lifters are used. Valve lash is maintained by self-locking adjusting screws.

On all other engines, hydraulic valve lifters are used. These lifters provide zero valve lash. The operation and parts identification of the hydraulic valve lifters are shown in Fig. 9.



A2056-B

FIG. 4—Typical 289 High Performance V-8 Engine Sectional

When the valve is closed, the lifter assembly is on the base circle of the camshaft lobe and the valve push rod is in its lowest position. With the lifter assembly in this position, the plunger spring expands, forcing the plunger upward. This action is transmitted to the valve rocker arm via the valve push rod until there is solid contact between the valve and the valve end of the valve rocker arm (zero valve lash). In this position, the oil hole in the lifter and plunger is indexed with the lifter oil gallery in the cylinder block.

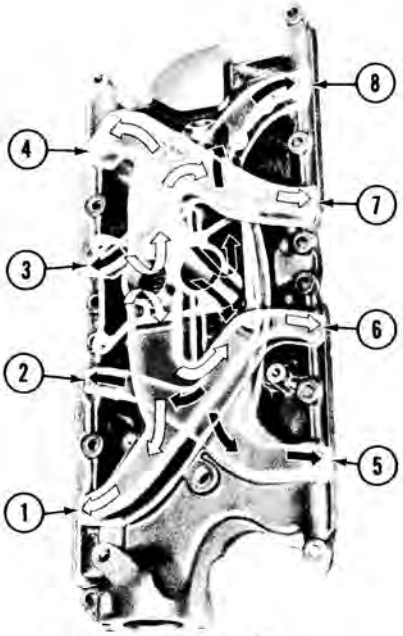
As the lifter plunger moves upward, the volume of the compression chamber is increased, resulting in reduced oil pressure in the compression chamber. Therefore, to equalize the resulting pressure differential between the supply chamber and the compression chamber, the disc valve moves off its seat and permits oil to flow from the supply chamber to the compression chamber. When the compression chamber becomes filled with oil, the pressures in the two chambers are equalized. The oil flow ceases and the disc valve spring seats the disc valve and closes the disc valve port.

As the camshaft rotates, the lifter assembly is raised by the camshaft lobe. This increases the push rod force against the lifter plunger and hydraulic pressure immediately builds up in the compression chamber until it acts as a solid member of the valve operating mechanism. The lifter then becomes a hydraulic ram which forces the valve in the cylinder head to open. During this period, a slight leakage of oil past



A1578-B

FIG. 5—Intake Manifold Exhaust Gas Crossover Passage



A1579-C

FIG. 6—Typical Intake Manifold Fuel Passages



A2014-A

FIG. 7—Automatic Choke Heat Chamber

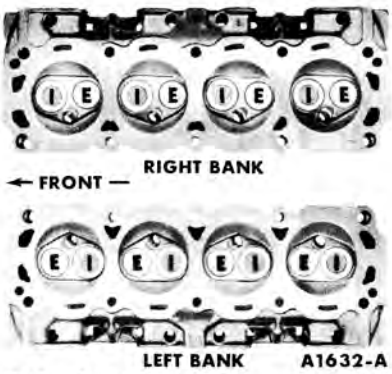


FIG. 8—Valve Port Arrangement

the plunger occurs (calibrated leak down rate).

As the high point of the camshaft lobe rotates and passes by the foot of the valve lifter, the valve in the cylinder head seats and the valve lifter assembly is forced downward. Reduced force on the lifter plunger at this time relieves the pressure on the lifter plunger and it is free to be moved upward by the plunger spring. This action allows oil to flow once again through the indexed oil holes in the lifter body and plunger.

The operating cycle is completed for each revolution of the camshaft. Zero clearance (lash) in the valve train mechanism is maintained at all times by the hydraulic force and expansion of the plunger spring between the lifter body and plunger.

LUBRICATION SYSTEM

Oil from the oil pan sump, located in the front of the oil pan, is forced through the pressure-type lubrication system (Fig. 10) by a rotor oil pump. A spring-loaded relief valve in the pump limits the maximum pressure of the system. Oil relieved by the valve is directed back to the intake side of the pump.

All the oil discharged by the pump passes through an exclusive design full flow-type Rotunda filter before it enters the engine. The filter is mounted at the lower left front of the engine.

On a cartridge-type oil filter, a relief valve in the filter permits oil to bypass the filter if the element becomes clogged.

On an element-type oil filter, a bypass in the center bolt provides oil to the engine in case the filter element becomes clogged. The bypass is located in the hollow center bolt of the filter and consists of a spring-loaded valve. When the element is clean and oil will flow through it, the pressure difference between the inner and outer faces of the valve is not great enough to overcome the spring pressure behind the valve. Therefore, no oil flows through the bypass. When the element is dirty and will not permit a sufficient flow of oil, the pressure acting on the inner face of the valve drops. If the pressure difference between the valve faces is great enough to overcome spring pressure, the valve will open. Oil then bypasses the element, maintaining an emergency supply of oil to the engine.

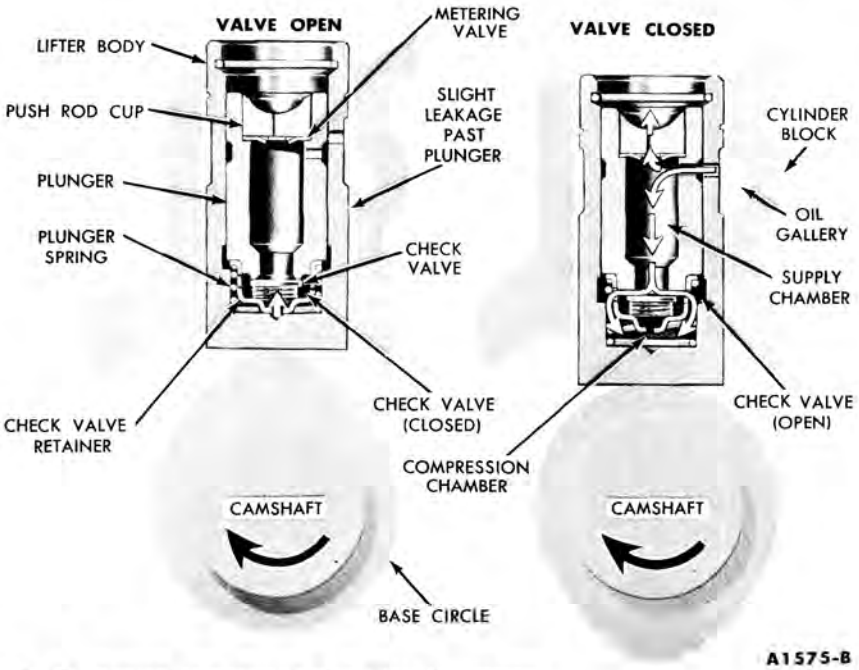


FIG. 9—Typical Hydraulic Valve Lifter Operation

From the filter, the oil flows into the main oil gallery which is located to the right side of the camshaft. The oil gallery supplies oil to each individual main bearing, through drilled passages in the block. Passages are drilled from each main bearing to each camshaft bearing. Number 1 main bearing feeds No. 1 camshaft bearing, and No. 2 main bearing feeds No. 2 camshaft bearing, etc. The oil then flows through notches or grooves in the main bearings to lubricate the crankshaft journals. The timing chain and sprockets are lubricated by oil deflected from the front camshaft bearing by an oil drip trough on the cylinder front cover.

The crankshaft is drilled from the main bearings to the connecting rod bearings.

A small groove is located in the connecting rod at the mating face where the cap contacts the connecting rod. This groove is used as an oil squirt hole for cylinder wall lubrication. Oil from the connecting rod squirt hole lubricates the opposite cylinder wall. For example, the No. 1 connecting rod oils No. 5 cylinder, etc. As the crankshaft turns, the hole in the connecting rod bearing aligns with the hole in the journal causing a direct squirt of oil onto the cylinder wall (Fig. 10).

Oil passages are drilled from the main oil gallery to each valve lifter oil gallery. Oil from here feeds the valve lifter assemblies. A reservoir at each valve lifter bore boss traps oil so that oil is available for valve lifter lubrication as soon as the engine starts.

When the hydraulic lifter is on the base circle of the camshaft lobe (valve closed), the oil hole in the hydraulic lifter and plunger is indexed with the lifter oil gallery and oil flows into the plunger. Oil is also metered through the metering valve (disc) through the oil passages in the push rod cup and then flows up the hollow push rod. In this position, the drilled hole in the ball end of the push rod is indexed with a drilled hole in the rocker arm and the oil

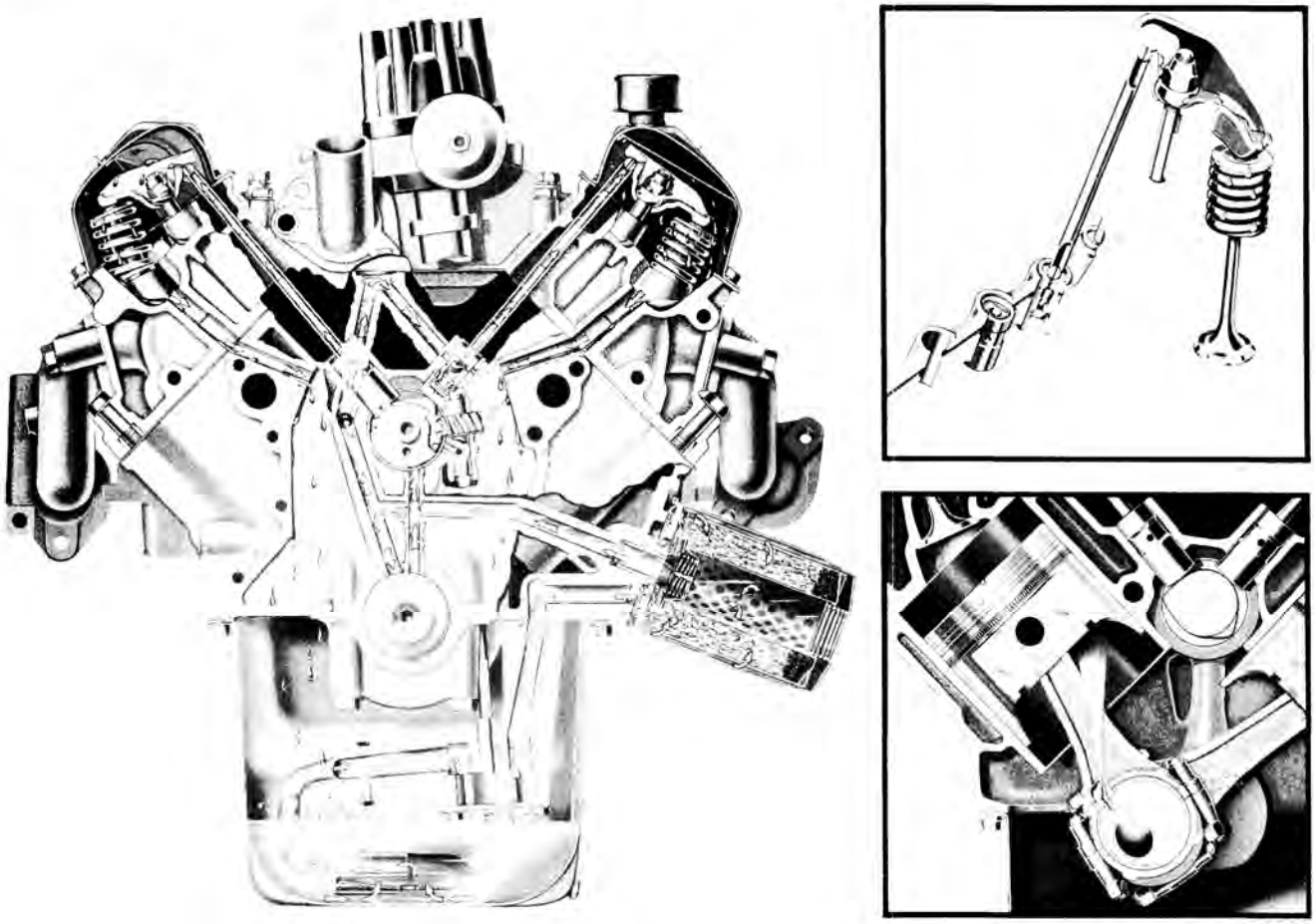


FIG. 10—Lubrication System

lubricates the upper valve train bearing areas (Fig. 10). Excess oil is returned to the oil pan through drain back holes located at each end of the cylinder heads and block (Fig. 10).

AIR INTAKE SYSTEM

The temperature of the air entering the air cleaner is thermostatically controlled by an air intake duct and thermostat assembly (Fig. 2). This system supplies warm air to the engine during the warm-up period, resulting in better fuel vaporization and reducing the possibility of carburetor icing. The air duct shroud and tube assembly together with the air duct and thermostat assembly direct warm air into the air cleaner and carburetor.

If the temperature of the air passing over the thermostat is less than 75°F., the valve plate in the air duct is held in an up or "heat on" position by a valve plate tension spring. When the valve plate is in the "heat on" position, the air entering the air cleaner is drawn through the shroud and tube assembly. The air passing through the shroud and tube is first directed over the exhaust manifold and heated.

A wax-filled thermostat is connected to the valve plate by a thermostat rod. The incoming air passes over the thermostat before entering the air cleaner. As the temperature of the air passing over the thermostat approaches 85°F., the wax begins to expand and pushes the thermostat rod against the valve plate. The tension of the valve plate spring is overcome and the valve plate is moved downward to partially close off the warm air duct to allow the cooler air from the engine compartment to mix with the warm air directed from the exhaust manifold.

If the temperature of the incoming air is approximately 105°F., the valve plate moves downward to a "heat off" position to close off the warm air duct. Cooler air from the engine compartment is then directed to the air cleaner without passing over the exhaust manifold.

CRANKCASE VENTILATION

The engine is equipped with either a vent tube-type crankcase ventilation system or a positive crankcase ventilation system. In the vent tube-type system, the crankcase vapors are discharged to the atmosphere. In the positive system, the crankcase vapors are directed to the intake manifold.

VENT TUBE-TYPE CRANKCASE VENTILATION SYSTEM

A crankcase ventilation tube is located at the rear of the right valve rocker arm cover. The forward motion of the car causes a partial vacuum to be formed at the tube outlet. This vacuum action causes air to be drawn through the engine from the



FIG. 11—Positive Crankcase Ventilation System

combination oil filler and breather cap located on the front left valve rocker arm cover. The filler cap contains a maze filtering element.

From the oil filler cap, the air flows into the front section of the left valve rocker arm chamber. The ventilating air moves down past the push rods into the front of the lower crankcase and into the timing chain chamber.

The rotating action of the crankshaft causes the air to flow towards the rear of the crankcase and up into the rear section of the right valve rocker arm cover. The air is then directed out the vent tube.

POSITIVE CRANKCASE VENTILATION SYSTEMS

Open Ventilation System. The air flow in the positive crankcase ventilation system is shown in Fig. 11.

Ventilating air enters the engine through the oil filler cap located on the front of the left valve rocker arm cover. The filler cap contains a filtering element which filters the incoming air.

From the oil filler cap, the air flows into the front section of the valve rocker arm chamber. The ventilating air moves down past the push rods into the front of the lower crankcase and into the timing chain chamber.

The rotating action of the crankshaft causes the air to flow towards the rear of the crankcase and up into the rear section of the right valve rocker arm cover. The air then enters a spring-loaded regulator valve that regulates the amount of air to meet changing operating conditions. The air is then directed to the intake manifold through the crankcase vent hose.

During idle, intake manifold vacuum is high. The high vacuum overcomes the tension of the spring pressure and moves the valve to the "Low Speed Operation" position (Fig. 12). With the valve in this position, the ventilating air passes between the valve (jiggle pin) and the outlet port. With the valve in this position, there is minimum ventilation.

As engine speed increases and manifold vacuum decreases, the spring forces the valve to the full open position (Fig. 12). This increases the flow of ventilating air.

Closed Ventilation System. The closed ventilation system is the same as the open ventilation system except for the following:

The crankcase ventilating air source is the carburetor air cleaner. The air passes through a hose connecting the air cleaner to the oil filler cap. The oil filler cap is sealed at the filler opening to prevent the entrance of atmospheric air. A restriction in the air cleaner at the hose connec-

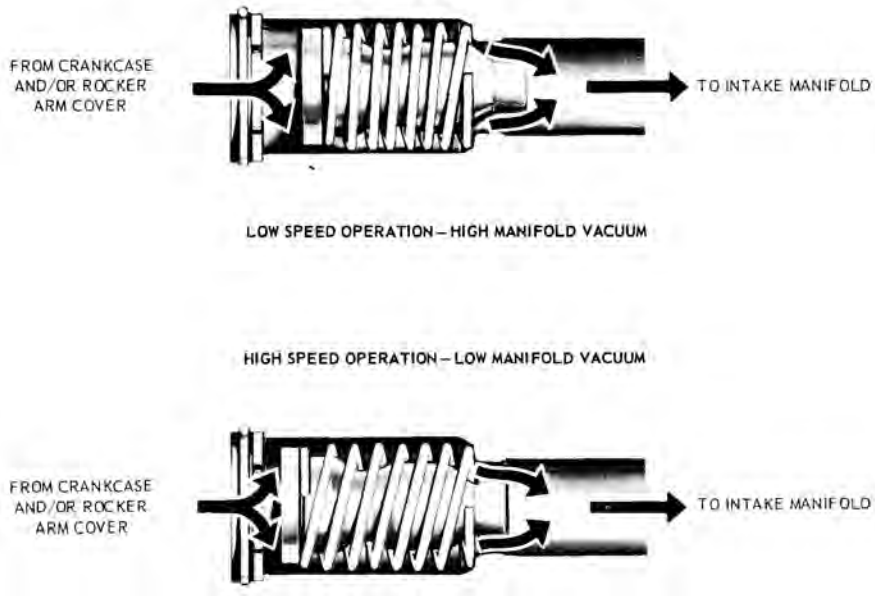


FIG. 12—Positive Crankcase Ventilation Regulator Valve Operation

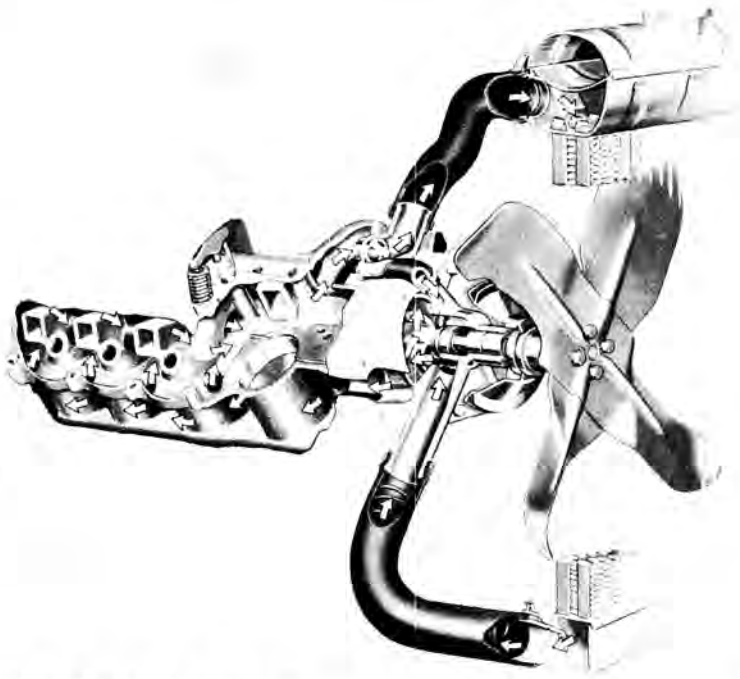
tion, assists the crankcase ventilation regulator valve in maintaining a slight vacuum in the crankcase.

COOLING SYSTEM

The coolant is drawn from the bottom of the radiator by the water pump which delivers the coolant to the cylinder block (Fig. 13).

The coolant travels through cored passages to cool the entire length of each cylinder wall. Upon reaching the rear of the cylinder block, the coolant is directed upward into the cylinder heads, where it cools the combustion chambers, valves and valve seats on its return to the front of the engine.

The coolant from each cylinder head flows through the water passages in the intake manifold past the water thermostat, if it is open, into the top of the radiator. If the thermostat is closed, a small portion of the coolant is returned to the water pump for recirculation. The entire system is pressurized to 12-15 psi.



A1584-D

FIG. 13—Cooling System

2 IN-CAR ADJUSTMENTS AND REPAIRS

ENGINE FRONT SUPPORT INSULATORS

The front supports are located on each side of the cylinder block (Figs. 14, 15 and 16). The procedures given apply to either a right or left installation.

FALCON, COMET AND MUSTANG (EXCEPT HIGH PERFORMANCE)

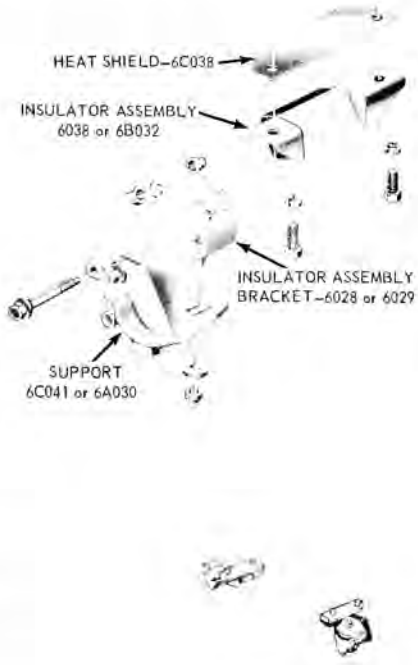
To ensure installing the right and left insulator brackets in their proper locations, the right insulator bracket is identified by a yellow stripe painted on the bracket.

Removal.

1. Remove the insulator assembly bracket to support lock nuts and washers from both insulator assembly brackets.

2. Raise the engine with a jack and wood block placed under the oil pan.

3. Remove the insulator assembly to engine bolts and lock washers. Remove the insulator assembly, insulator assembly bracket and heat shield as an assembly. Remove the insulator assembly to insulator assembly bracket nuts and washers to separate the insulator assembly from the insulator bracket.



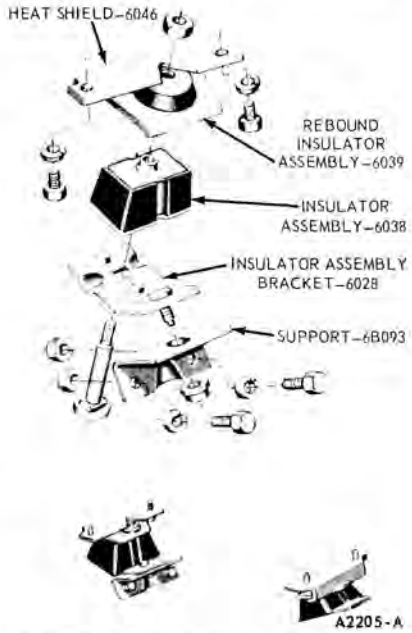
A1779-C

FIG. 14—Falcon, Comet and Mustang (Except High Performance) Engine Front Supports

Installation.

1. Position the insulator assembly bracket to the insulator assembly and install the nut and washer. Torque the nut to specifications.

2. Position the insulator assembly,



A2205-A

FIG. 15—Fairlane Engine Front Supports

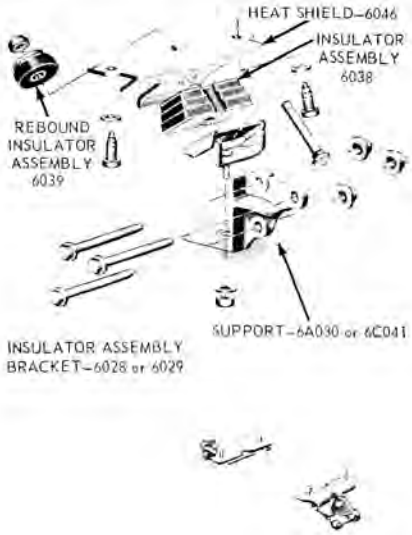


FIG. 16–Mustang High Performance Engine Front Supports

insulator assembly bracket and heat shield on the engine and install the bolts and lock washers. Torque the bolts to specifications.

3. Lower the engine carefully to make sure the insulator assembly bracket studs engage the holes in each support.

4. Install the insulator assembly bracket to support lock nuts and washers on both engine front mounts. Torque the nuts to specifications.

FAIRLANE AND HIGH PERFORMANCE MUSTANG

Removal.

1. Remove the heat shield to engine bolts and lock washers from both heat shields.

2. Raise the engine with a jack and wood block placed under the oil pan.

3. Remove the nut and washer from the insulator assembly to support bolt and remove the rebound insulator, heat shield, insulator assembly and insulator assembly bracket as as assembly.

4. Remove the insulator assembly bracket to rebound insulator assembly bolt and nut and separate the insulators from the heat shield and the insulator assembly bracket.

Installation

1. Position the insulators on the heat shield and the insulator assembly bracket. Install the insulator assembly bracket to rebound insulator assembly bolt and nut. Torque the nut to specifications.

2. Position the heat shield, rebound insulator assembly, insulator assembly and insulator assembly bracket on the engine and install the bolts and lock washers. Torque the bolts to specifications.

3. Lower the engine carefully to make sure the insulator assembly bracket bolts engage the holes in each support.

4. Install the insulator assembly bracket to support nut on both mounts. Torque the nuts to specifications.

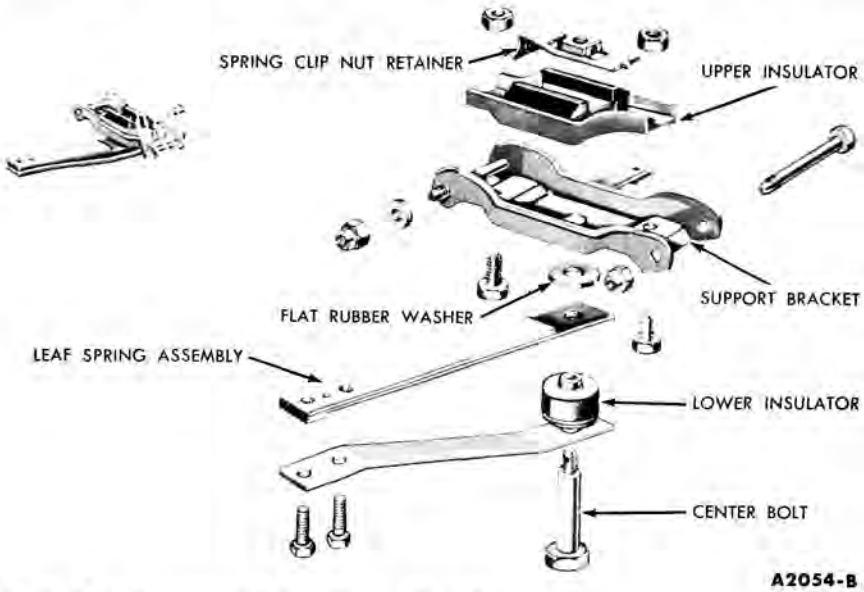


FIG. 17–Comet and Falcon Engine Rear Support

ENGINE REAR SUPPORT INSULATOR

COMET AND FALCON

Removal

1. Disconnect the parking brake equalizer lever from the support bracket.

2. Support the transmission with a floor jack. Remove the leaf-spring center bolt and lower insulator (Fig. 17). Remove the leaf-spring to transmission extension housing attaching bolts. Remove the leaf-spring and flat rubber washer.

3. Remove the support bracket to body cross member bolts, and remove the support bracket and upper insulator assembly and spring clip nut retainer.

4. Remove two bolts to disassemble the support bracket and upper insulator.

Installation

1. Assemble the support bracket and upper insulator (Fig. 17) and tighten the bolts and nuts to specifications.

2. Position the spring clip nut retainer on the upper insulator and support bracket assembly and install the support bracket assembly on the body cross member. **Make sure there is a minimum clearance of 0.20 inch between the transmission extension housing and the upper insulator.** Tighten the support bracket to body cross member bolts to specifications.

3. Position the flat rubber washer on top of the leaf-spring and install the leaf-spring on the transmission extension housing. Torque the bolts to specifications.

4. Install the lower insulator and center bolt, and tighten the center bolt to specifications. Remove the transmission jack.

5. Connect the parking brake equalizer lever to the support bracket.

FAIRLANE

Removal

1. Remove the insulator assembly to cross member retaining bolt and lock washer (Fig. 18).

2. Remove the insulator assembly to transmission extension housing bolts and lock washers.

3. Raise the transmission with a

floor jack. Remove the insulator assembly and insulator retainer.

Installation

1. Position the insulator assembly and insulator retainer on the transmission extension housing.

2. Install the insulator assembly to transmission extension housing bolts and lock washers. Torque the bolts to specifications. Lower the transmission.

3. Install the insulator assembly to cross member retaining bolt and lock washer. Torque the bolt to specifications.

MUSTANG

Removal

1. Remove the insulator assembly to crossmember retaining nuts and washers (Fig. 19).

2. Raise the transmission with a floor jack.

3. Remove the insulator assembly to transmission extension housing bolts and washers (automatic transmission only).

4. Remove the insulator assembly.

Installation

1. Position the insulator assembly on the transmission extension housing and install the insulator assembly to transmission extension housing bolts and washers (automatic transmission only). Torque the bolts to specifications.

2. Lower the transmission carefully to make sure the insulator assembly studs engage the holes in the crossmember.

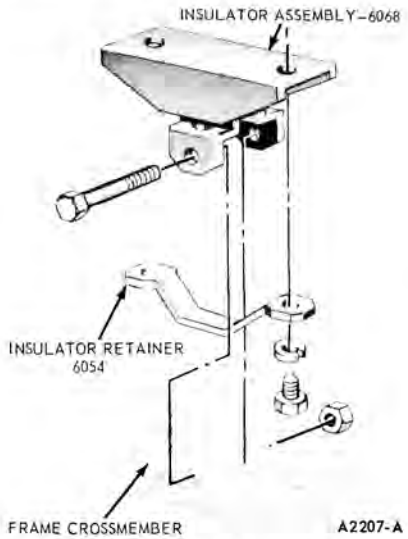


FIG. 18–Fairlane Engine Rear Support

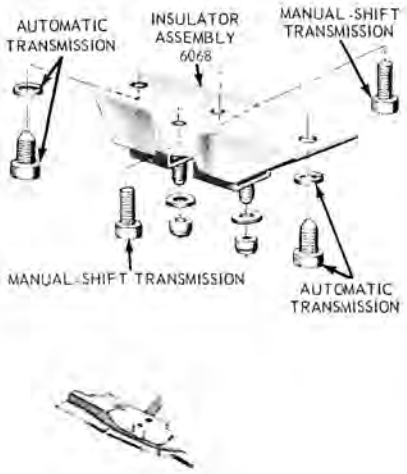


FIG. 19–Mustang Engine Rear Support

3. Install the insulator assembly to crossmember nuts and washers. Torque the nuts to specfications.

VALVE ROCKER ARM ASSEMBLY

The valve rocker arm assembly is shown in Fig. 20.

REMOVAL

1. To remove a valve rocker arm assembly from the right cylinder head, disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. **Do not remove the air inlet hose at the air cleaner.**

Remove the air cleaner and intake duct assembly.

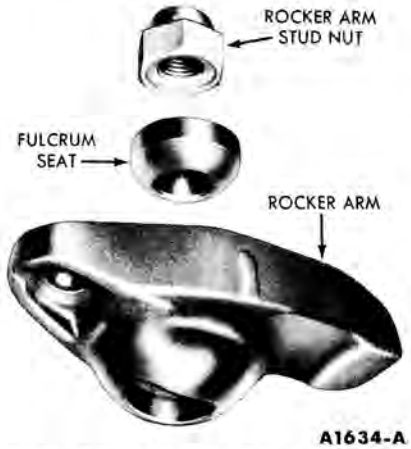


FIG. 20–Valve Rocker Arm Assembly

Remove the automatic choke heat tube. Remove the crankcase ventilation regulator valve or the vent tube from the valve rocker arm cover.

2. Disconnect the spark plug wires at the spark plugs by grasping the moulded cap only. Remove the wires from the bracket on the valve rocker arm cover(s) and position the wires out of the way.

3. Remove the valve rocker arm cover(s).

4. Remove the valve rocker arm stud nut, fulcrum seat and rocker arm.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

If removal of the rocker arm stud is necessary, refer to the procedure under "Cylinder Head Repairs" in Part 8-1, Section 2.

INSTALLATION

1. Apply Lubriplate to the top of the valve stem and at the push rod guide in the cylinder head.

2. Install the valve rocker arm, fulcrum seat and stud nut. Adjust the valve clearance following the procedure in Part 8-1, Section 2.

3. Clean the valve rocker arm cover(s) and the cylinder head gasket surface. Apply oil-resistant sealer to one side of new cover gasket(s). Lay the cemented side of the gasket(s) in place in the cover(s).

4. Position the cover(s) on the cylinder head(s). Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

If the right cover was removed, install the automatic choke heat tube and the crankcase ventilation regulator valve or the vent tube.

Install the air cleaner and intake duct assembly.

Connect the automatic choke heat chamber air inlet hose.

5. Install the spark plug wires in the bracket on the valve rocker arm cover(s). Connect the spark plug wires.

INTAKE MANIFOLD

The intake manifold assembly is shown in Fig. 21.

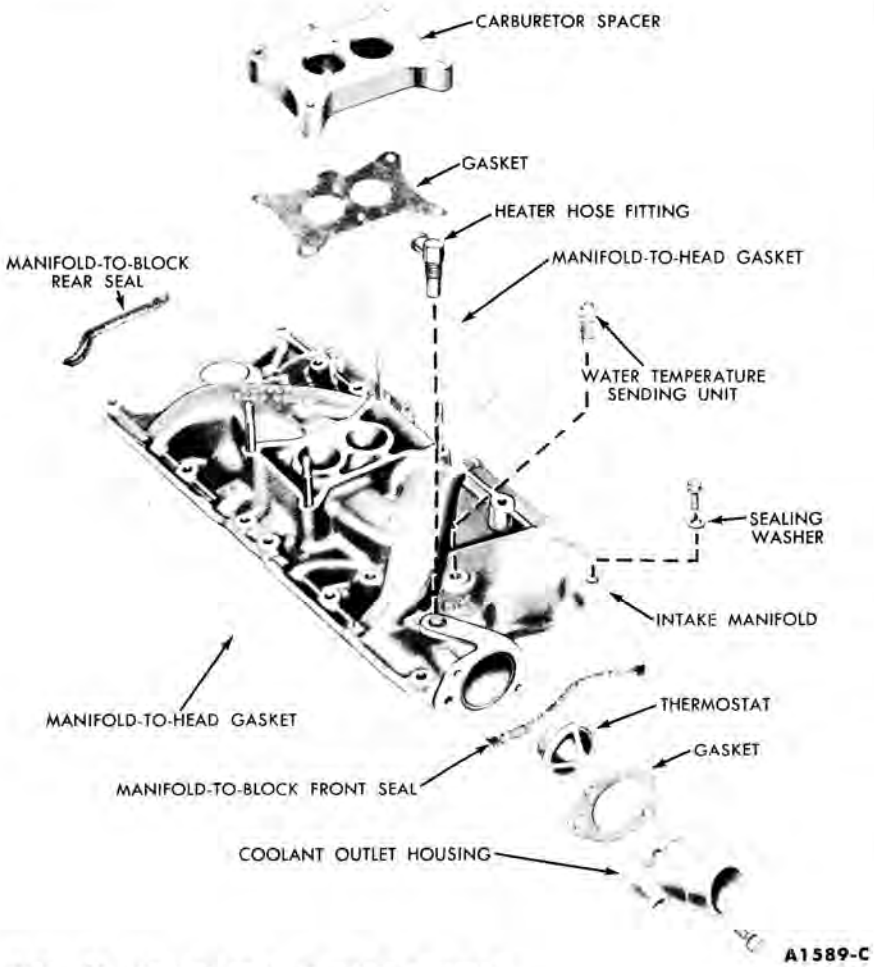


FIG. 21—Typical Intake Manifold Assembly

REMOVAL

1. Drain the cooling system. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. **Do not remove the air inlet hose at the air cleaner.** Remove the air cleaner and intake duct assembly.

2. Disconnect the accelerator rod at the carburetor. Remove the accelerator retracting spring. Remove the bellcrank assembly from the intake manifold and position it out of the way. (On a car with power steering and air conditioning, remove the speed-up control assembly from the bellcrank before removing the bellcrank from the intake manifold).

On a car with an automatic transmission, disconnect the throttle valve vacuum line at the intake manifold.

3. Disconnect the high tension lead and wires at the coil.

4. Disconnect the spark plug wires at the spark plugs by grasping the moulded cap only. Remove the wires from the harness brackets on the valve rocker arm covers. Remove the distributor cap and spark plug wire assembly.

5. Remove the carburetor fuel inlet line and the automatic choke heat tube.

6. Disconnect the distributor vacuum line at the carburetor. Remove the distributor hold down bolt and remove the distributor and vacuum line.

7. Disconnect the radiator upper hose at the coolant outlet housing, and the water temperature sending unit wire at the sending unit. Remove the heater hose from the automatic choke housing and disconnect the hose at the intake manifold.

8. Loosen the clamp on the water pump bypass hose at the coolant outlet housing and slide the hose off the outlet housing.

9. Disconnect the crankcase vent hose (if so equipped) at the valve rocker arm cover.

10. If the car is equipped with air conditioning, remove the compressor to intake manifold brackets.

11. Remove the intake manifold and carburetor as an assembly. It may be necessary to pry the intake manifold away from the cylinder heads. Remove the intake manifold gaskets and seals. Discard the intake manifold retaining bolt sealing washers.

12. If the manifold is to be disassembled, remove the coolant outlet housing, gasket and thermostat. Remove the temperature sending unit, carburetor, spacer and gaskets.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

Intake manifold alignment tools are required when installing the intake manifold on the cylinder block and cylinder heads. Fabricate two alignment tools according to the specifications shown in Fig. 22.

1. If the intake manifold was disassembled, install the temperature sending unit (threads coated with electrical conductive sealer), carburetor, spacer and gaskets. Position the thermostat in the intake manifold. Coat the thermostat gasket with water-resistant sealer and position it on the intake manifold. Install the coolant outlet housing.

2. Clean the mating surfaces of the intake manifold, cylinder heads and cylinder block. Use a suitable solvent to remove all traces of oil. Coat the cylinder block seal surfaces with quick-drying sealer.

3. Position new seals on the cylder block and new gaskets on the cylinder heads with the gaskets interlocked with the seal tabs. Be sure the



FIG. 22—Intake Manifold Alignment

holes in the gaskets are aligned with the holes in the cylinder heads.

Apply non-hardening sealer at the four junction points of the gaskets and seals.

4. Carefully lower the intake manifold into position on the cylinder block and cylinder heads. **After the intake manifold is in place, run a finger around the seal area to make sure the seals are in place. If the seals are not in place, remove the intake manifold and position the seals.**

5. Be sure the holes in the manifold gaskets and manifold are in alignment. Position the intake manifold alignment tools (Fig. 22) in the front and rear bolt holes (Nos. 10 and 12) on the left bank of the manifold.

6. Using new sealing washers, install the intake manifold retaining bolts. Working from the center to the ends, torque the bolts in sequence (Fig. 23) to 3-5 ft-lbs.

7. Remove the manifold alignment tools from the front and rear bolt holes (Nos. 10 and 12). Using new sealing washers, install the two remaining bolts and torque to 3-5 ft-lbs.

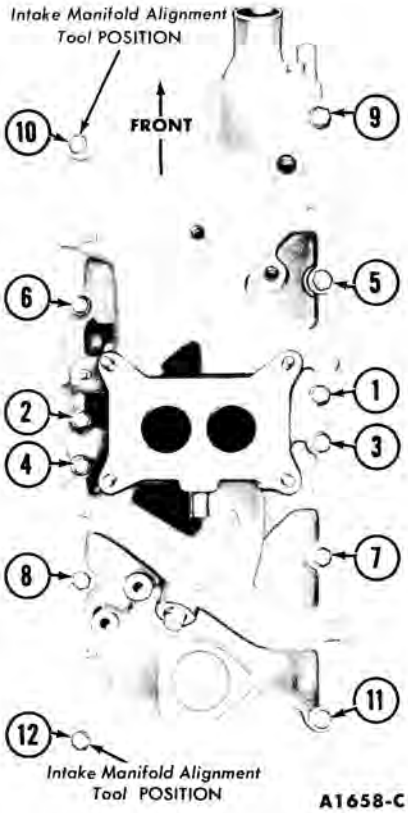


FIG. 23—Intake Manifold Torque Sequence

8. Torque all the manifold retaining bolts in sequence to 11-14 ft-lbs. Finally, torque all the retaining bolts in sequence to 14-16 ft-lbs.

9. Install the water pump bypass hose on the coolant outlet housing. Slide the clamp into position and tighten the clamp.

10. Connect the radiator upper hose. Install the heater hose against the automatic choke housing and connect the hose at the intake manifold.

11. Install the carburetor fuel inlet line and the automatic choke heat tube.

12. Rotate the crankshaft damper until the No. 1 piston is on TDC at the end of the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

13. Install the distributor cap. Position the spark plug wires in the harness brackets on the valve rocker arm covers, and connect the spark plug wires.

14. Connect the crankcase vent hose (if so equipped). Connect the stall the ignition coil. Connect the high tension lead and coil wires.

15. Install the bellcrank assembly and accelerator retracting spring. Connect the accelerator rod.

On a car with power steering and air conditioning, install the speed-up control assembly on the bellcrank assembly.

On a car with an automatic transmission, connect the throttle valve vacuum line.

On a car with air conditioning, install the compressor to intake manifold brackets.

16. Fill and bleed the cooling system.

17. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line at the carburetor.

18. Operate the engine at fast idle and check all hose connections and gaskets for leaks. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

On a car with power steering and air conditioning, adjust the speed-up control assembly as outlined in Group 3.

19. Adjust the transmission throttle linkage. Install the air cleaner and intake duct assembly.

20. Connect the automatic choke heat chamber air inlet hose.

EXHAUST MANIFOLDS

REMOVAL

1. On a right exhaust manifold, disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. **Do not remove the air inlet hose at the air cleaner.**

Remove the automatic choke heat tube from the right exhaust manifold.

2. Remove the air cleaner and intake duct assembly.

3. Disconnect the exhaust manifold at the muffler inlet pipe.

4. Remove the retaining bolts and tab washers and remove the exhaust manifold.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the mating surfaces of the exhaust manifold and cylinder head. Clean the mounting flange of the exhaust manifold and muffler inlet pipe.

2. Apply graphite grease to the mating surface of the exhaust manifold.

3. Position the exhaust manifold on the cylinder head and install the retaining bolts and tab washers. Working from the center to the ends, torque the bolts to specifications. Lock the bolts by bending one tab of the washer over a flat on the bolt.

4. Place new gaskets on the muffler inlet pipe. Position the muffler inlet pipe to the manifold. Install and torque the retaining nuts to specifications.

5. Install the automatic choke heat tube on the right exhaust manifold. Install the air cleaner and intake duct assembly.

6. Connect the automatic choke heat chamber air inlet hose.

7. Start the engine and check for exhaust leaks.

POSITIVE CRANKCASE VENTILATION SYSTEM

The positive crankcase ventilation system components are shown in Fig. 24.

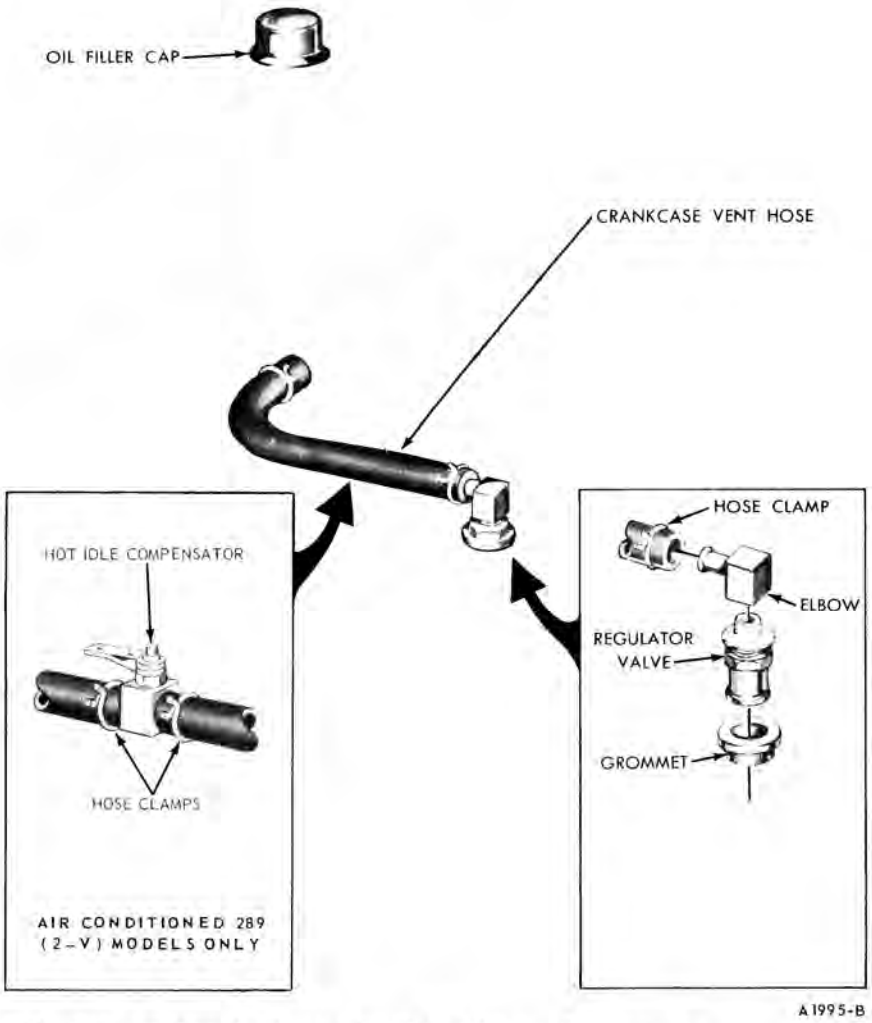


FIG. 24—Positive Crankcase Ventilation System Components

REMOVAL

1. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. **Do not remove the choke heat chamber air inlet hose at the air cleaner.** On a closed ventilation system, remove the ventilation system air intake hose from the air cleaner and the oil filler cap.

2. Remove the air cleaner and intake duct assembly.

3. Using hose clamp pliers, slide both crankcase vent hose clamps towards the center of the vent hose.

Slide the vent hose clamps away from the hot idle compensator (if so equipped).

Disconnect the crankcase vent hose at the carburetor spacer, regulator valve and hot idle compensator (if so equipped).

4. Pull the regulator valve and fitting (elbow) out of the valve rocker arm cover mounting grommet.

INSTALLATION

1. Insert the regulator valve and fitting (elbow) into the valve rocker arm cover mounting grommet.

2. Position the hose clamps on the vent hose. Connect the vent hose to the carburetor spacer regulator valve and hot idle compensator (if so equipped). Using hose clamp pliers, slide the clamps into position.

3. Install the air cleaner and intake duct assembly.

4. Connect the automatic choke heat chamber air inlet hose. On a closed ventilation system, install the ventilation system air intake hose to the air cleaner and the oil filler cap.

5. Operate the engine and check for leaks.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

TESTING

Refer to Part 8-1, Section 1 for the test procedures.

CYLINDER HEADS

If a cylinder head is to be replaced, follow the procedures under "Cylinder Head Disassembly and Assembly", and transfer all valves, springs, spark plugs, etc., to the new cylinder head. Clean and inspect all parts, reface the valves (refer to Part 8-1) and check all assembly clearances before assembling the used parts to the new cylinder head.

REMOVAL

1. Remove the intake manifold and carburetor as an assembly following the procedure under "Intake Manifold Removal."

2. Disconnect the battery ground cable at the cylinder head. Remove the rocker arm cover(s).

If the left cylinder head is to be removed, on a car with an air conditioner, isolate and remove the compressor as outlined in Group 15.

If the left cylinder head is to be removed, on a car with power steering, disconnect the power steering pump bracket from the left cylinder head and remove the drive belt from the pump pulley. Wire the power steering pump out of the way and in a position that will prevent the oil from draining out.

3. If the right cylinder head is to be removed, remove the alternator mounting bracket bolt and spacer, vent tube (if so equipped), ignition coil and air cleaner inlet duct from the right cylinder head assembly.

4. Disconnect the exhaust manifold(s) at the muffler inlet pipe(s).

5. Loosen the rocker arm stud nuts so that the rocker arms can be rotated to the side. Remove the push rods in sequence (Fig. 25).

6. Install the cylinder head holding fixtures (Fig. 26). Remove the cylinder head retaining bolts and lift the cylinder head off the block. Remove and discard the cylinder head gasket.



FIG. 25—Valve Push Rod Removal

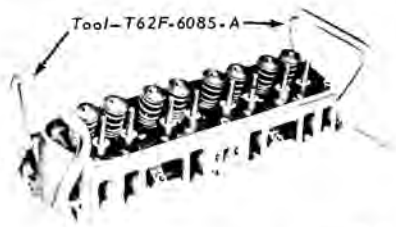


FIG. 26–Cylinder Head Holding Fixtures

INSTALLATION

1. Clean the cylinder head intake manifold, valve rocker arm cover and cylinder block gasket surfaces. If the cylinder head was removed for a cylinder head gasket replacement, check the flatness of the cylinder head and block gasket surfaces.

2. Position the new cylinder head gasket over the cylinder dowels on the block. Coat the head bolts with water-resistant sealer. Position the cylinder head to the block and install the retaining bolts. Remove the holding fixtures.

3. The cylinder head bolts are tightened in three progressive steps. Torque all the bolts in sequence (Fig. 27) to 50 ft-lbs. then to 60 ft-lbs., and finally to specifications. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.**

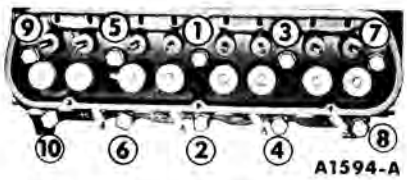


FIG. 27–Cylinder Head Bolt Torque Sequence

4. Clean the push rods in a suitable solvent. Blow out the oil passage in the push rod with compressed air. Check the ends of the push rods for nicks, grooves, roughness or excessive wear. Visually check the push rods for straightness or check push rod runout with a dial indicator. If runout exceeds the maximum limit at any point, discard the rod. **Do not attempt to straighten push rods.**

5. Install the push rods in their original positions. Apply Lubriplate to the valve stem tips and the push rod guides in the cylinder head.

6. Install the rocker arms. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

7. Position a new gasket(s) on the muffler inlet pipe(s). Connect the exhaust manifold(s) at the muffler inlet pipe(s). Torque the nuts to specifications.

8. If the right cylinder head was removed, install the alternator retaining bolt and spacer, vent tube (if so equipped), ignition coil and air cleaner inlet duct on the right cylinder head assembly. Adjust the drive belt tension to specifications.

9. Apply oil-resistant sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the cover(s). Install the valve rocker arm cover(s).

If the left cylinder head was removed, on a car with an air conditioner, install the compressor as outlined in Group 15.

If the left cylinder head was removed, on a car with power steering, install the drive belt and power steering pump bracket. Install the bracket retaining bolts. Adjust the drive belt to specifications.

10. Install the intake manifold and related parts following the procedure under "Intake Manifold Installation."

DISASSEMBLY

1. Remove the exhaust manifolds and the spark plugs.

2. Clean the carbon out of the cylinder head combustion chambers before removing the valves.

3. Compress the valve springs (Fig. 28). Remove the spring retainer locks and release the spring.

4. Remove the spring retainer, spring, stem seal and valve. Discard valve stem seals. Identify all valve parts.

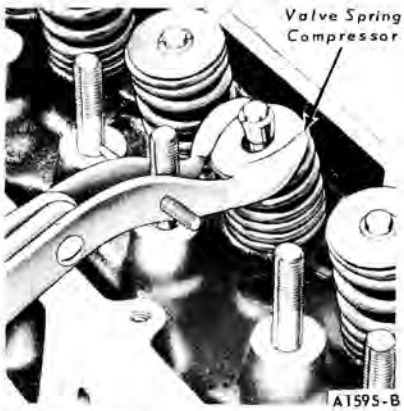


FIG. 28–Compressing Valve Spring- On Bench

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Cylinder head repair and rocker arm stud replacement procedures, and checks such as valve and valve seat refacing, cylinder head flatness checks, etc., are covered in Part 8-1, Section 2.

ASSEMBLY

1. Install each valve (Fig. 29) in the port from which it was removed or to which it was fitted. Install a new stem seal on the valve.

2. Install the valve spring over the valve, and then install the spring retainer. Compress the spring and install the retainer locks (Fig. 28).

3. Measure the assembled height of the valve spring from the surface of the cylinder head spring pad to the underside of the spring retainer with dividers (Fig. 30). Check the dividers against a scale. If the assembled height is greater than specifications, install the necessary 0.030-inch thick spacer(s) between the cylinder head spring pad and the valve spring to bring the assembled height to the recommended height.

Do not install the spacers unless necessary. Use of spacers in excess of recommendations will result in overstressing the valve springs and overloading the camshaft lobes which could lead to spring breakage and worn camshaft lobes.

4. Install the exhaust manifolds and the spark plugs.

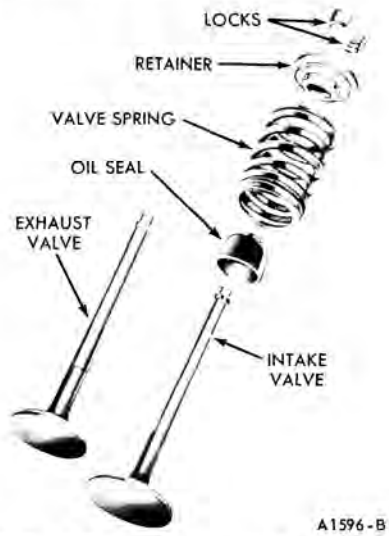


FIG. 29–Valve Assembly

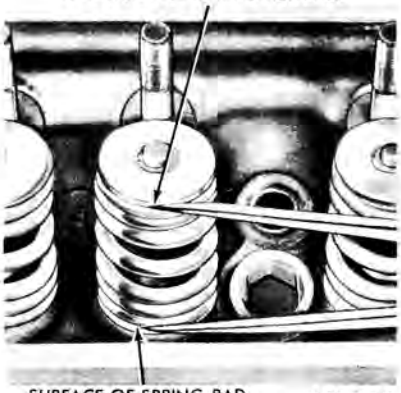


FIG. 30—Valve Spring Assembled Height

VALVE SPRING, RETAINER AND STEM SEAL REPLACEMENT

Broken valve springs, or defective valve stem seals and retainers may be replaced without removing the cylinder head, providing damage to the valve or valve seat has not occurred.

1. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. **Do not remove the air inlet hose at the air cleaner.**

2. Remove the air cleaner and intake duct assembly.

To remove the right valve rocker arm cover, remove the automatic choke heat tube. Remove the crankcase ventilation regulator valve or the vent tube from the valve rocker arm cover.

3. Remove the valve rocker arm cover and the applicable spark plug.

4. Crank the engine until the applicable piston is on TDC after the compression stroke. Be sure that both valves are closed. **Be sure that the piston is on TDC to prevent the crankshaft from turning when the air is applied.**

5. Install an air line with an adapter in the spark plug hole and turn on the air supply.

6. Remove the applicable valve rocker arm stud nut, fulcrum seat, valve rocker arm and push rod. Install the stud nut and position the compressor tool as shown in Fig. 31. Compress the valve spring and remove the retainer locks, spring retainer and valve spring.

7. Remove and discard the valve stem seal (Fig. 32).

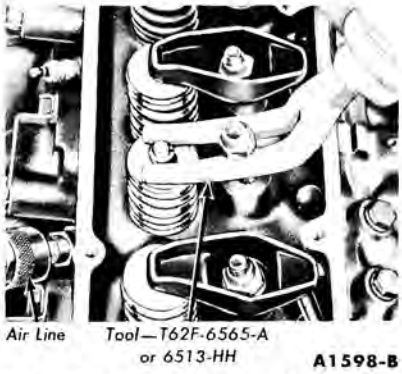


FIG. 31—Compressing Valve Spring—In Chassis

8. Install a new valve stem seal (Fig. 32). Place the spring in position over the valve and install the valve spring retainer. Compress the valve spring and install the valve spring retainer locks. Remove the compressor tool and stud nut.

9. Install the push rod. Apply Lubriplate to the tip of the valve stem and at the push rod guide in the cylinder head.

10. Install the valve rocker arm, fulcrum seat and stud nut. Adjust the valve clearance following the procedure in Part 8-1, Section 2.

11. Turn off the air and remove the air line and adapter. Install the spark plug and connect the spark plug wire.

12. Clean and install the rocker arm cover.

If the right cover was removed install the automatic choke heat tube and the crankcase ventilation regulator valve.

13. Install the air cleaner and intake duct assembly.

14. Connect the automatic choke heat chamber air inlet hose.



FIG. 32—Valve Stem Seal Removal or Installation

CYLINDER FRONT COVER AND TIMING CHAIN

REMOVAL

1. Drain the cooling system and the crankcase.

2. Disconnect the radiator lower hose at the water pump.

3. Disconnect the heater hose at the water pump. Slide the water pump bypass hose clamp toward the water pump.

4. Loosen the alternator to cylinder head mounting bolt. Remove the alternator bracket bolts at the water pump and position the alternator and brackets out of the way.

5. On a car with power steering and/or air conditioning, loosen the drive belt tension and remove the belt(s).

6. Remove the fan, spacer, pulley and drive belt.

7. Remove the crankshaft pulley from the crankshaft vibration damper. Remove the damper retaining screw and washer. Install the puller on the crankshaft vibration damper (Fig. 33) and remove the vibration damper.

8. Disconnect the fuel pump outlet line at the fuel pump. Remove the fuel pump retaining bolts and lay the pump to one side with the flexible fuel line still attached.

9. Remove the oil level dipstick.

10. Remove the oil pan to cylinder front cover retaining bolts. Remove the cylinder front cover and water pump as an assembly.

If a new cylinder front cover is to be installed, remove the water pump and dipstick tube from the old cylinder front cover and install them on the new cover.

11. Discard the cylinder front cover gasket. Remove the crankshaft front oil slinger.

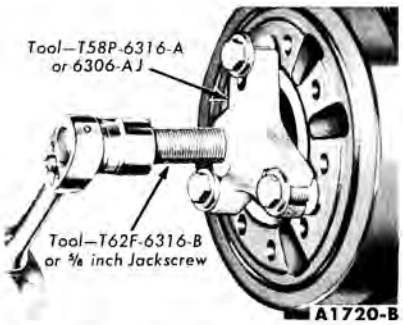


FIG. 33—Crankshaft Vibration Damper Removal

12. Rotate the crankshaft in a clockwise direction (as viewed from the front) to take up the slack on the left side of the chain.

13. Establish a reference point on the block and measure from this point to the chain (Fig. 34).

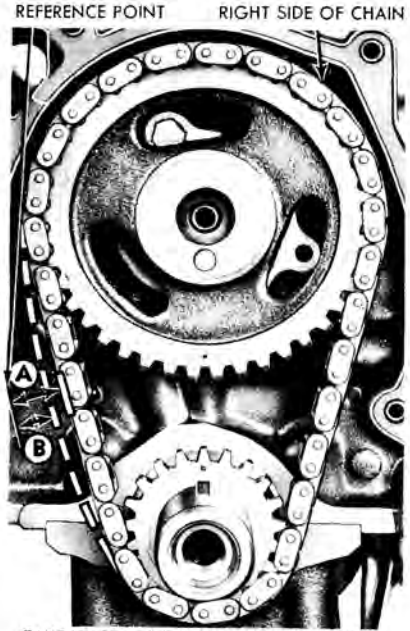
14. Rotate the crankshaft in the opposite direction to take up the slack on the right side of the chain. Force the left side of the chain out with the fingers and measure the distance between the reference point and the chain. The deflection is the difference between the two measurements.

If the deflection exceeds ½ inch, replace the timing chain and/or sprockets.

15. Crank the engine until the timing marks on the sprockets are positioned as shown in Fig. 35.

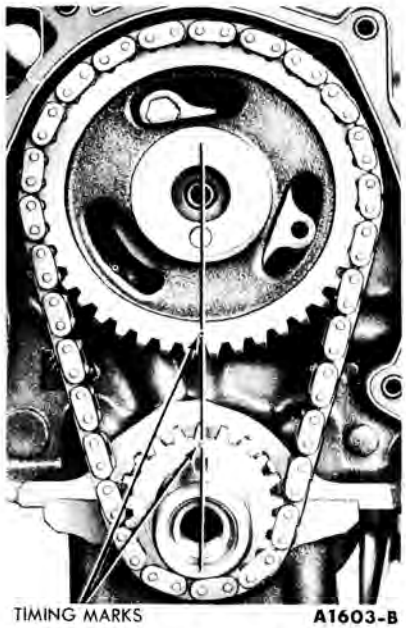
16. Remove the camshaft sprocket cap screw, washers and fuel pump eccentric. Slide both sprockets and the timing chain forward, and remove them as an assembly (Fig. 36).

17. Remove the oil pan and oil pump pickup tube by following the procedure under "Oil Pan Removal".



TAKE UP SLACK ON LEFT SIDE, ESTABLISH A REFERENCE POINT. MEASURE DISTANCE **A**. TAKE UP SLACK ON RIGHT SIDE. FORCE LEFT SIDE OUT. MEASURE DISTANCE **B**. DEFLECTION IS **A** MINUS **B**. A1602-B

FIG. 34—Timing Chain Deflection



A1603-B

FIG. 35—Aligning Timing Marks

CLEANING AND INSPECTION

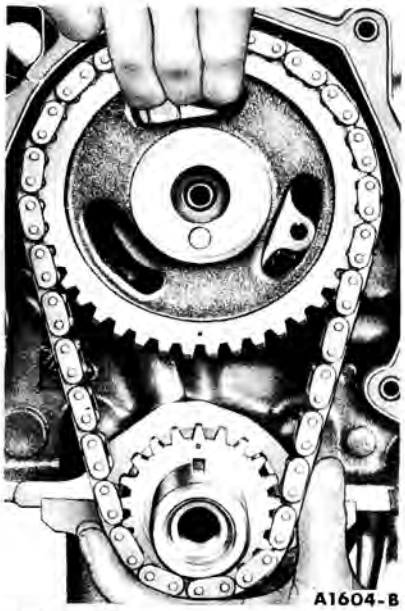
Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

FRONT OIL SEAL REPLACEMENT

It is good practice to replace the oil seal each time the cylinder front cover is removed.

1. Drive out the old seal with a pin punch. Clean out the recess in the cover.

2. Coat a new seal with grease,



A1604-B

FIG. 36—Timing Chain Removal or Installation



A1637-B

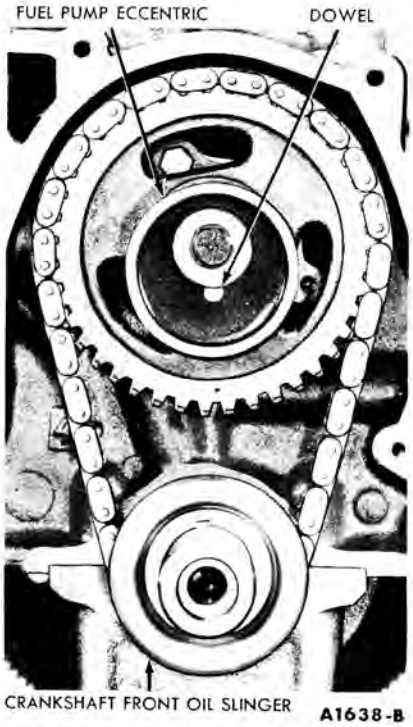
FIG. 37—Crankshaft Front Oil Seal Replacement

then install the seal (Fig. 37). Drive the seal in until it is fully seated in the recess. Check the seal after installation to be sure the spring is properly positioned in the seal.

INSTALLATION

1. Position the sprockets and timing chain on the camshaft (Fig. 36). Be sure the timing marks on the sprockets are positioned as shown in Fig. 35.

2. Install the fuel pump eccentric, washers and camshaft sprocket cap screw. Torque the sprocket cap screw to specifications. Install the crankshaft front oil slinger (Fig. 38).



A1638-B

FIG. 38—Fuel Pump Eccentric and Front Oil Slinger Installed



FIG. 39–Cylinder Front Cover Alignment

3. Clean the cylinder front cover, oil pan and the block gasket surfaces.

4. Coat the gasket surfaces of the block and cover with sealer. Position a new gasket on the block.

5. Install the alignment pilot tool on the cylinder front cover so that the keyway in the pilot aligns with the key in the crankshaft. Position the cover and pilot over the end of the crankshaft and against the block (Fig. 39). Coat the threads of the retaining screws with oil-resistant sealer and install the screws. While pushing in on the pilot, torque the screws to specifications. Remove the pilot.

6. Line up the crankshaft vibration damper keyway with the key on the crankshaft. Install the vibration damper on the crankshaft (Fig. 40). Install the cap screw and washer. Torque the screw to specifications. Install the crankshaft pulley.

7. Install the oil pump pickup tube and oil pan following the procedure under "Oil Pan Installation."

8. Install the fuel pump using a new gasket. Connect the fuel pump outlet pipe.

9. Install the water pump pulley, drive belt, spacer and fan.

10. Install the alternator bracket. Adjust the drive belt tension to specifications and tighten the alternator mounting bolts.

11. Connect the heater hose and the water pump bypass hose. Slide the bypass hose clamp into position.

12. Connect the radiator.

13. On a car with power steering and/or air conditioning, install and adjust the drive belts.

14. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

15. Operate the engine at fast idle and check for coolant and oil leaks. Check and adjust the ignition timing.

CAMSHAFT

The camshaft and related parts are shown in Fig. 41.

REMOVAL

1. Remove the cylinder front cover and the timing chain following the procedure under "Cylinder Front Cover and Timing Chain Removal."

2. Disconnect the spark plug wires at the spark plugs and remove the wires from the ignition harness brackets on the valve rocker arm covers. Disconnect the coil high tension lead at the coil. Remove the distributor cap and spark plug wire assembly.

3. Disconnect the ignition coil wires at the coil and remove the coil from the intake manifold.

4. Disconnect the distributor vacuum line at the carburetor. Remove the distributor hold down bolt and clamp and remove the distributor.

5. Disconnect the automatic choke heat tube at the carburetor. Remove the heater hose from the automatic choke and disconnect the hose at the intake manifold.

On a car with an automatic transmission, disconnect the throttle valve vacuum line at the intake manifold. Disconnect the transmission oil cooler lines at the radiator.

6. Disconnect the radiator upper hose and remove the radiator.

7. Disconnect the accelerator rod at the carburetor. Remove the accelerator retracting spring. Remove the bellcrank assembly from the intake manifold and position it out of the way. (On a car with power steering and air conditioning, remove the speed-up control assembly from the bellcrank before removing the bellcrank from the intake manifold).

8. Disconnect the water temperature sending unit wire at the sending unit and the engine ground strap at the engine.

9. Remove the intake manifold and carburetor as an assembly. Remove the intake manifold gaskets and seals.

10. Remove the crankcase ventilation regulator valve or the vent tube from the valve rocker arm cover. Remove the valve rocker arm covers. Loosen the valve rocker arm stud nuts and rotate the rocker arms to the side.

11. Remove the valve push rods in sequence so that they can be installed in their original positions.

12. Using a magnet, remove the valve lifters and place them in a



FIG. 40–Crankshaft Vibration Damper Installation

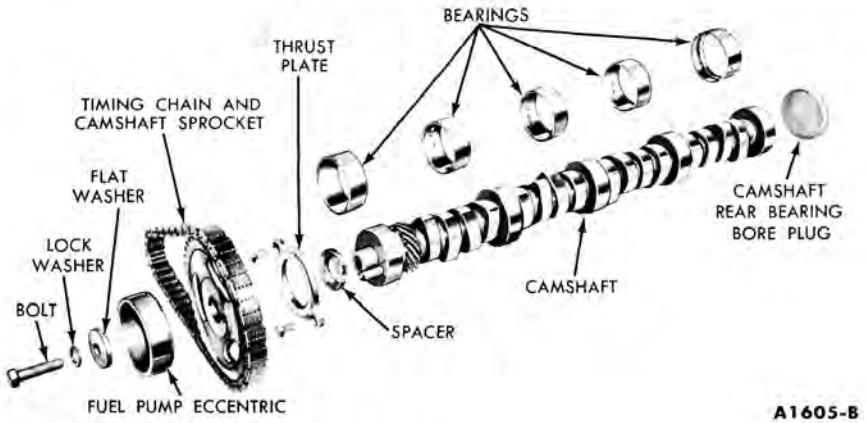


FIG. 41–Camshaft and Related Parts



FIG. 42–Valve Lifter Removal

rack so that they can be installed in their original bores (Fig. 42).

If the valve lifters are stuck in their bores by excessive varnish, etc. it may be necessary to use a plier-type tool (T52T-6500-DJD or 6500-D) to remove the lifters. Rotate the lifter back and forth to loosen it from the gum or varnish that may have formed at the lifter.

13. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. **Use caution to avoid damaging the camshaft bearings.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

INSTALLATION

1. Oil the camshaft and apply Lubriplate to the lobes. Carefully slide the camshaft through the bearings. Install the camshaft thrust plate.

2. Install the valve lifters in the bores from which they were removed.

3. Install the push rods in their original position. Apply Lubriplate to the valve stem tips and the push rod guides in the cylinder head. Position the rocker arms over the push rods.

4. Install the intake manifold and related parts by following steps 1 thru 6 under "Intake Manifold Installation."

5. Connect the water temperature sending unit and the engine ground strap.

6. Install the bellcrank assembly and accelerator retracting spring. Connect the accelerator rod.

On a car with power steering install the speed-up control assembly on the bellcrank assembly.

7. Install the radiator.

On a car with an automatic transmission, connect the transmission oil cooler lines and throttle valve vacuum line.

8. Install the heater hose against the automatic choke housing and connect the heater hose at the intake manifold. Position and connect the fuel line.

9. Replace the crankshaft front oil seal. Install the timing chain, cylinder front cover and related parts following steps 1 thru 13 under "Cylinder Front Cover and Timing Chain Installation."

10. With No. 1 piston on TDC at the end of the compression stroke, position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

11. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

12. Clean the valve rocker arm covers and the cylinder head gasket surface. Apply oil-resistance sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the covers.

13. Position the covers on the cylinder heads. Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

14. Clean and install the crankcase ventilation system.

15. Install the automatic choke heat tube. Install the ignition coil and connect the wires.

16. Install the distributor cap. Position the spark plug wires in the harness brackets on the valve rocker arm covers and connect the spark plug wires. Connect the high tension lead at the coil.

17. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

18. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line at the carburetor.

19. Operate the engine at fast idle and check all hose connections and gaskets for leaks. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

On a car with power steering, adjust the speed-up control assembly as outlined in Group 3.

20. Adjust the transmission throttle linkage. Install the air cleaner and intake duct assembly.

21. Connect the automatic choke heat chamber air inlet hose.

CAMSHAFT REAR BEARING BORE PLUG REPLACEMENT

1. On a car with a manual-shift transmission, remove the transmission, clutch pressure plate and disc following the procedures in Group 5.

On a car with an automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel. Remove the engine rear cover plate.

3. Drill a ½-inch hole in the camshaft rear bearing bore plug and remove the plug using the tools shown in Fig. 65.

4. Clean out the plug bore recess thoroughly and coat the flange of a new plug with oil-resistant sealer. Install the new plug with the flange facing in. Drive the plug in until it is slightly below the chamfer in the bore (Fig. 69).

5. Coat the flywheel retaining bolts with oil-resistant sealer. Position the engine rear cover plate on the cylinder block dowels. Position the flywheel on the crankshaft flange. Install and torque the retaining bolts in sequence across from each other to specifications.

On a car with a manual-shift transmission, install the clutch pressure plate, disc and the transmission following the procedures in Group 5.

On a car with an automatic transmission, install the transmission and converter housing following the procedure in Group 7.

VALVE LIFTER REPLACEMENT

1. Remove the intake manifold and related parts by following steps

1 thru 10 under "Intake Manifold Removal."

2. Remove the crankcase ventilation regulator valve or vent tube from the valve rocker arm cover. Remove the valve rocker arm covers. Loosen the valve rocker arm stud nuts and rotate the rocker arms to the side.

3. Remove the valve push rods in sequence so that they can be installed in their original positions.

4. Using a magnet, remove the valve lifters and place them in a rack so that they can be installed in their original bores (Fig. 42).

If the valve lifters cannot be removed from their bores because of excessive varnish, etc., it may be necessary to use a plier-type tool (T52T-6500-DJD or 6500-D) to remove the lifters. Rotate the lifter back and forth to loosen it from the gum or varnish that may have formed at the lifter.

On hydraulic valve lifters, the internal parts of each lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

5. Clean and install the valve lifters in the bores from which they were removed. If a new lifter(s) is being installed, test the new lifter(s) for a free fit in the bore in which it is to be installed.

6. Install the push rods in their original position. Apply Lubriplate to the valve stem tips and the push rod guides in the cylinder head.

7. Position the rocker arms over the push rods. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

8. Install the valve rocker arm covers. Install the crank case ventilation regulator valve or vent tube in the valve rocker arm cover.

9. Install the intake manifold and related parts by following steps 2 thru 20 under "Intake Manifold Installation."

HYDRAULIC VALVE LIFTER DISASSEMBLY

Each valve lifter is a matched assembly. If the parts of one lifter are intermixed with those of another, improper valve operation may result. Disassemble and assemble each lifter separately. Keep the lifter assemblies in proper sequence so that they can be installed in their original bores.

1. Grasp the lock ring with needle nose pliers to release it from the groove. It may be necessary to depress the plunger to fully release the lock ring.

2. Remove the push rod cup, metering valve (disc), plunger and spring.

3. Invert the plunger assembly and remove the check valve retainer by carefully prying up on it with a screw driver. Remove the check valve (disc or ball check) and spring.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

HYDRAULIC VALVE LIFTER ASSEMBLY

A typical hydraulic valve lifter assembly is shown in Fig. 43.

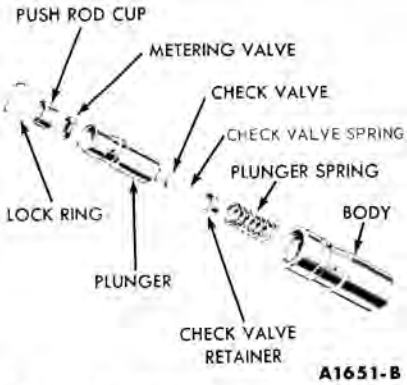


FIG. 43—Typical Hydraulic Valve Lifter Assembly

1. Place the plunger upside down on a clean work bench.

2. Place the check valve (disc or ball check) in position over the oil hole on the bottom of the plunger. Set the check valve spring on top of the check valve (disc or ball check).

3. Position the check valve retainer over the check valve and spring and push the retainer down into place on the plunger.

4. Place the plunger spring, and then the plunger (open end up) into the lifter body.

5. Position the metering valve (disc) in the plunger, then place the push rod seat in the plunger.

6. Depress the plunger, and position the closed end of the lock ring in the groove of the lifter body. With the plunger still depressed, position the open ends of the lock ring in the groove. Release the plunger, then depress it again to fully seat the lock ring.

TESTING

Refer to Part 8-1, Section 1 for the testing procedures.

CRANKSHAFT REAR OIL SEAL REPLACEMENT

Replacement of a crankshaft rear oil seal because of oil leakage requires replacement of both the upper and lower seals. Remove the engine; then remove the crankshaft and replace the seals by following the procedure under "Crankshaft Removal and Installation" (Section 4).

MAIN AND CONNECTING ROD BEARING REPLACEMENT

The main and connecting rod bearing inserts are selective fit. **Do not file or lap bearing caps or use bearing shims to obtain the proper bearing clearance.**

Selective fit bearings are available for service in standard sizes only. Standard bearings are divided into two sizes and are identified by a daub of red or blue paint. Refer to the Parts Catalog for the available sizes. **Red marked bearings increase the clearance; blue marked bearings decrease the clearance.** Undersize bearings, which are not selective fit, are available for use on journals that have been refinished.

MAIN BEARING

1. Drain the crankcase. Remove the oil level dipstick. Remove the oil pan and related parts.

2. Remove the oil pump inlet tube assembly and the oil pump.

3. Replace one bearing at a time, leaving the other bearings securely fastened. Remove the main bearing cap to which new bearings are to be installed.

4. Insert the upper bearing removal tool (tool 6331) in the oil hole in the crankshaft.

5. Rotate the crankshaft in the direction of the engine rotation to force the bearing out of the block.

6. Clean the crankshaft journal. **When replacing standard bearings with new bearings, it is good practice to first try to obtain the proper clearance with two blue bearing halves.**

7. To install the upper main bearing, place the plain end of the bearing over the shaft on the locking tang side of the block and partially install the bearing so that tool 6331

can be inserted in the oil hole in the crankshaft. With tool 6331 positioned in the oil hole in the crankshaft, rotate the crankshaft in the opposite direction of engine rotation until the bearing seats itself. Remove the tool.

8. Replace the cap bearing.

9. Support the crankshaft so that its weight will not compress the Plastigage and provide an erroneous reading. Position a jack so that it will bear against the counterweight adjoining the bearing which is being checked.

10. Place a piece of Plastigage on the bearing surface the full width of the bearing cap and about ¼ inch off center (Fig. 44).

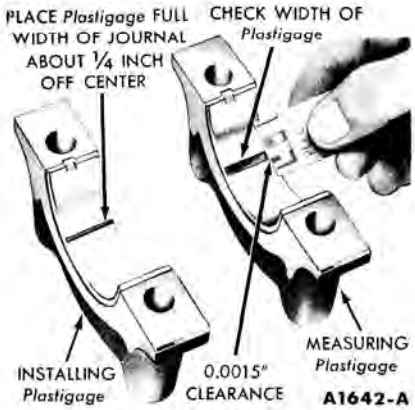


FIG. 44—Installing and Measuring Plastigage—Engine Installed

11. Install the cap and torque the bolts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**

12. Remove the cap. Using the Plastigage scale, check the width of the Plastigage. When checking the width of the Plastigage, check at the widest point in order to get the minimum clearance Check at the narrowest point in order to get the maximum clearance.The difference between the two readings is the taper.

13. If the clearance is less than the specified limits, try two red bearing halves or a combination of red and blue depending upon the condition. If the standard bearings do not bring the clearance within the desired limits, refinish the crankshaft journal, then install undersize bearings.

14. After the bearing has been fitted, apply a light coat of engine oil to the journal and bearings, then install the bearing cap. Torque the cap bolts to specifications.

15. Repeat the procedure for the remaining bearings that require replacement.

16. If the rear main bearing is to be replaced, remove the rear main bearing cap. Remove and discard the rear oil seal.

17. Clean the rear journal oil seal groove and the mating surfaces of the block and rear main bearing cap. Preform the new seal by hand to the approximate radius of the cap.

18. Insert the seal in the oil seal groove, seating the center of the seal first and allowing the seal to extend equally on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both ends of the seal into the groove, working from the ends to the center.

19. Position the seal forming tool as shown in Fig. 45 and complete the seal installation. After installation, cut the ends of the seal flush.

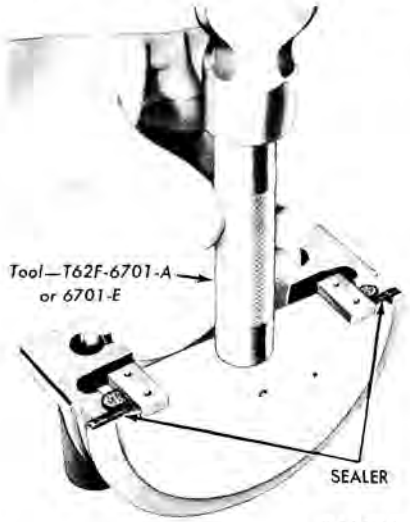


FIG. 45—Seal to Rear Bearing Cap Installation

20. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 45). **Do not apply sealer to the area forward of the oil slinger groove.** Install the rear main bearing cap and torque the cap bolts to specifications.

21. If the thrust bearing cap (No. 3 main bearing) has been removed, install it as follows:

Install the thrust bearing cap with the bolts finger-tight. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 63). Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 63). This will align the thrust surfaces of both halves of the bearing. Retain the forward pressure on the crankshaft. Torque the cap bolts to specifications (Fig. 63).

22. Clean the oil pump inlet tube screen. Prime and install the oil pump and the inlet tube assembly.

23. Position the oil pan gaskets on the oil pan. Position the oil pan front seal on the cylinder front cover. Position the oil pan rear seal on the rear main bearing cap. Install the oil pan and related parts. Install the oil level dipstick.

24. Fill the crankcase. Start the engine and check for oil pressure. Operate the engine at fast idle and check for oil leaks.

CONNECTING ROD BEARING

1. Follow steps 1 and 2 under "Main Bearing Replacement."

2. Turn the crankshaft until the connecting rod to which new bearings are to be fitted is down. Remove the connecting rod cap. Remove the bearing inserts from the rod and cap.

3. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts may distort the bearing and cause a failure.

4. Clean the crankshaft journal. **When replacing standard bearings with new bearings, it is good practice to first try to obtain the proper clearance with two blue bearing halves.**

5. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

6. Pull the connecting rod assembly down firmly on the crankshaft journal.

7. Place a piece of Plastigage on the lower bearing surface, the full width of the cap and about ¼ inch off-center.

8. Install the cap and torque the connecting rod nuts to specifications. **Do not turn the crankshaft while the Plastigage is in place.**

9. Refer to steps 12 and 13 under "Main Bearing Replacement."

10. After the bearing has been fitted, clean and apply a light coat of engine oil to the journal and bear-

ings. Install the connecting rod cap. Torque the nuts to specifications.

11. Repeat the procedure for the remaining connecting rods that require new bearings.

12. Follow steps 22 thru 24 under "Main Bearing Replacement."

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspecting procedures.

PISTONS AND CONNECTING RODS

REMOVAL

1. Drain the cooling system and the crankcase. Remove the intake manifold, cylinder heads, oil pan and oil pump following the procedures in this section.

2. Remove any ridge and/or deposits from the upper end of the cylinder bores as follows:

Turn the crankshaft until the piston to be removed is at the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove any ridge and/or deposits from the upper end of the cylinder bores. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.**

3. Make sure all connecting rod caps are marked so that they can be installed in their original positions.

4. Turn the crankshaft until the connecting rod being removed is down.

5. Remove the connecting rod cap.

6. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the crankshaft journal or the cylinder wall when removing the piston and rod.**

7. Remove the bearing inserts from the connecting rod and cap.

8. Install the cap on the connecting rod from which it was removed.

INSTALLATION

1. If new piston rings are to be installed, remove the cylinder wall glaze. Follow the instructions of the tool manufacturer.

2. Oil the piston rings, pistons and cylinder walls with light engine oil. **Be sure to install the pistons in the same cylinders from which they were removed or to which they were fitted. The connecting rod and bearing caps are numbered from 1 to 4 in the right bank and from 5 to 8 in the left bank, beginning at the front of the engine. The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number.**

3. Make sure the ring gaps are properly spaced around the circumference of the piston. (Fig. 46).

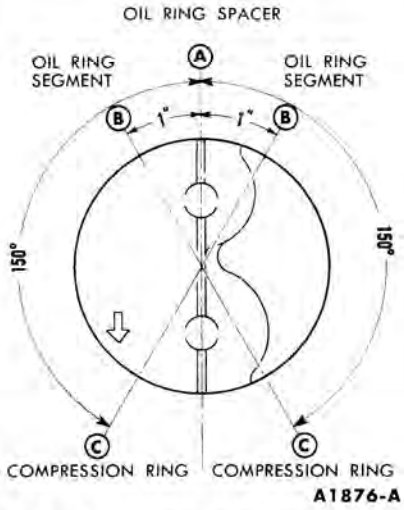


FIG. 46—Piston Ring Spacing

4. Install a piston ring compressor on the piston and push the piston in with a hammer handle until it is slightly below the top of the cylinder (Fig. 47). Be sure to guide the connecting rods to avoid damaging the crankshaft journals. **Install the piston with the indentation notch in the piston head toward the front of the engine.**

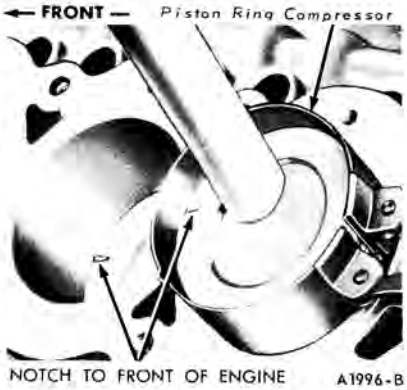


FIG. 47—Piston Installation

5. Check the clearance of each bearing following the procedure under "Connecting Rod Bearing Replacement."

6. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

7. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the connecting rod bearing seats on the crankshaft journal.

8. Install the connecting rod cap. The high performance engine uses 3/8-inch-diameter connecting rod bolts. **The bolts must be installed with the flat on the outside of the connecting rod. If improperly installed, the bolt will loosen and eventually fail.** Torque the nuts to specifications.

9. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each crankshaft journal (Fig. 48).



FIG. 48—Connecting Rod Side Clearance

10. Disassemble, clean and assemble the oil pump. Clean the oil pump inlet tube screen, and the oil pan and block gasket surfaces.

11. Prime the oil pump by filling either the inlet port or outlet port with engine oil and rotating the pump shaft to distribute the oil within the housing. Install the oil pump and the oil pan.

12. Install the cylinder heads following steps 1 thru 9 under "Cylinder Head Installation."

13. Install the intake manifold following steps 2 thru 15 under "Intake Manifold Installation."

14. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

15. Start the engine and check and adjust the ignition timing. Connect the distributor vacuum line at the carburetor.

16. Operate the engine at fast idle and check for oil and coolant leaks. Operate the engine until engine temperatures have stabilized and adjust the engine idle speed and idle fuel mixture.

On a car with power steering and air conditioning, adjust the speed-up control assembly as outlined in Group 3.

17. Adjust the transmission throttle linkage. Install the air cleaner and intake duct assembly.

18. Connect the automatic choke heat chamber air inlet hose.

DISASSEMBLY

1. Remove the bearing inserts from the connecting rod and cap.

2. Mark the pistons and pins to assure assembly with the same rod and installation in the same cylinders from which they were removed.

3. Remove the piston pin from the piston and connecting rod (Fig. 49). Remove the piston rings.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

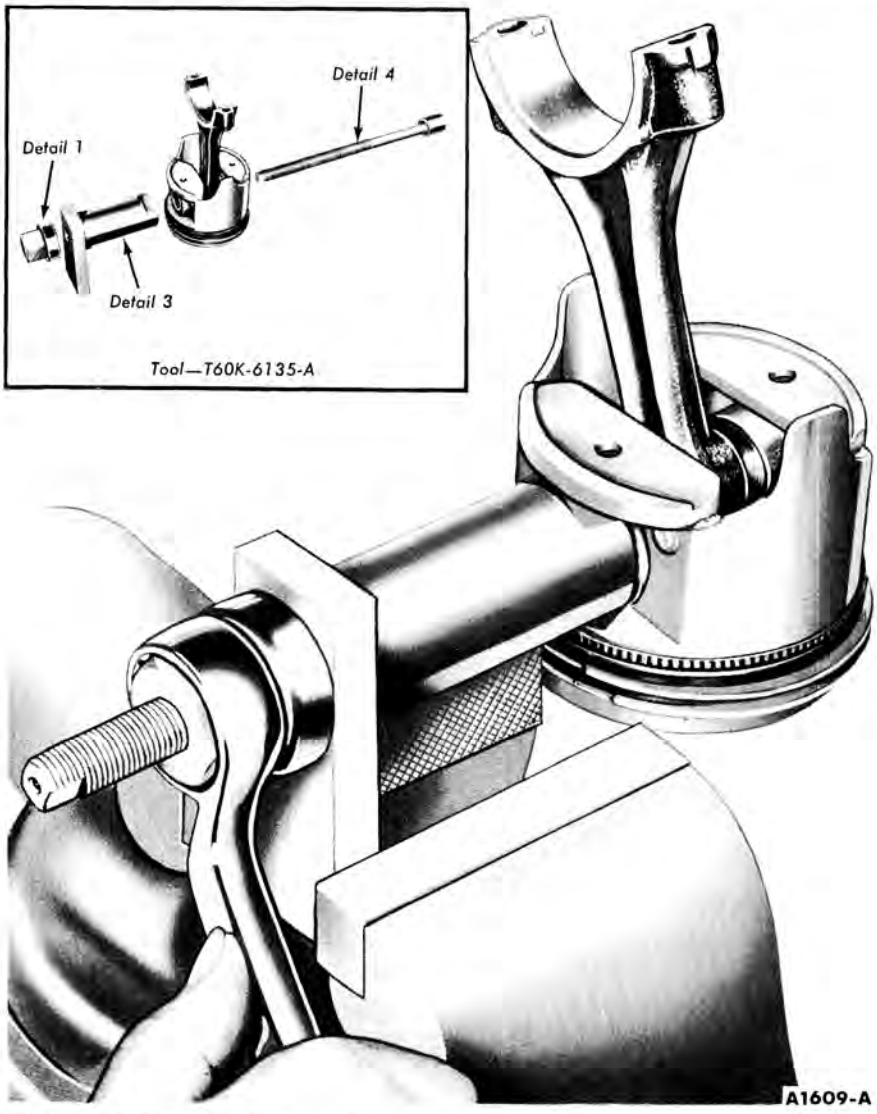


FIG. 49—Piston Pin Removal

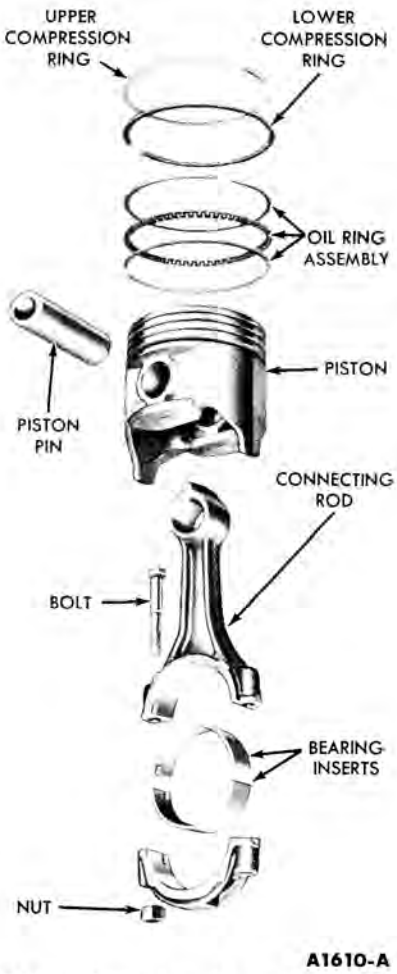


FIG. 50—Piston, Connecting Rod and Related Parts

REPAIRS

Refer to Part 8-1, Section 2 for the repair procedures.

ASSEMBLY

The piston, connecting rod and related parts are shown in Fig. 50. **Check the fit of a new piston in the cylinder bore before assembling the piston and piston pin to the connecting rod.**

The piston pin bore of a connecting rod and the diameter of the piston pin must be within specifications. Refer to Part 8-4.

1. Apply a light coat of engine oil to all parts. **Assemble the piston to the connecting rod with the oil squirt hole in the connecting rod and the indentation notch in the piston positioned as shown in Fig. 51.**

2. Start the piston pin in the piston and connecting rod. Draw the piston pin through the piston and connecting rod until the end of the pin seats in Detail 2 (Fig. 52).

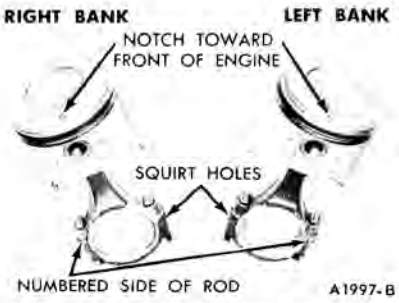


FIG. 51—Correct Piston and Rod Positions

3. Follow the instructions contained on the piston ring package and install the piston rings.

4. Check the ring side clearance of the compression rings with a feeler gauge inserted between the ring and its lower land. (Part 8-1, Section 2). The gauge should slide freely around the entire ring circumference without binding. Any wear that occurs will form a step at the inner portion of the lower land. **If the lower lands have high steps, the piston should be replaced.**

5. Be sure the bearing inserts and the bearing bore in the connecting rod and cap are clean. Foreign material under the inserts may distort the bearing and cause a failure. Install the bearing inserts in the connecting rod and cap with the tangs fitting in the slots provided.

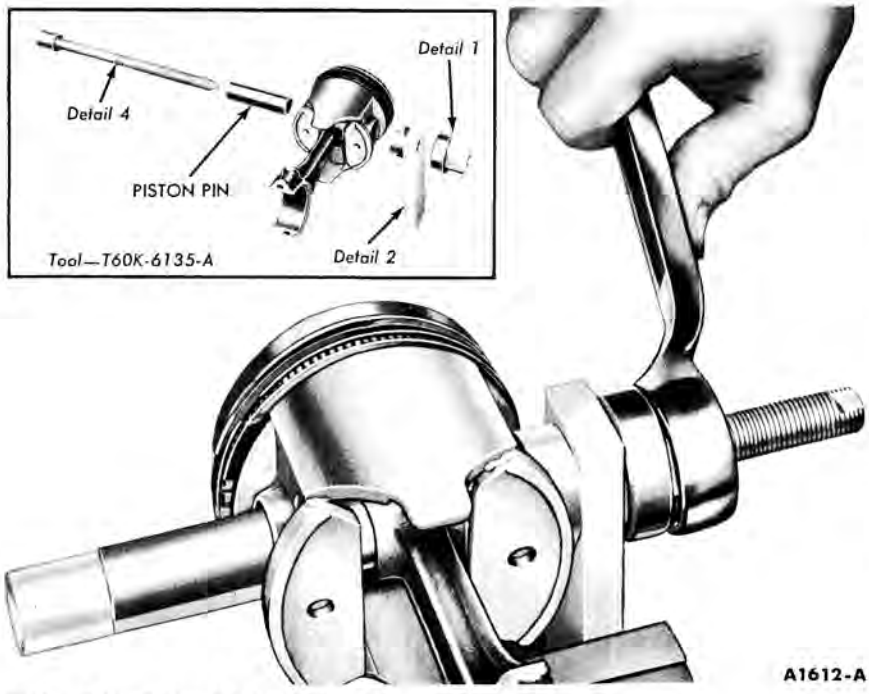


FIG. 52—Piston Pin Installation

FLYWHEEL

REMOVAL

1. On a car with a manual-shift transmission, remove the transmission, clutch pressure plate and disc following the procedures in Group 5.

On a car with an automatic transmission, remove the transmission and converter housing following the procedure in Group 7.

2. Remove the flywheel retaining bolts and remove the flywheel.

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures for manual-shift transmissions.

REPAIRS

To check flywheel face runout refer to Part 8-1, Section 1.

INSTALLATION

1. Coat the threads of the flywheel retaining bolts with oil-resistant sealer. Position the flywheel on the crankshaft flange. Install and torque the bolts in sequence across from each other to specifications.

2. On a car with a manual-shift transmission check the flywheel runout, following the procedure in Part 8-1, Section 1 and install the clutch pressure plate, disc and the transmission following the procedures in Group 5.

On a car with an automatic transmission check the flywheel runout, following the procedure in Part 8-1, Section 1 and install the transmission and converter housing following the procedure in Group 7.

CLUTCH PILOT BUSHING REPLACEMENT

1. Remove the transmission, clutch pressure plate and disc following the procedures in Group 5.

2. Remove the pilot bushing as shown in Fig. 69.

3. Coat the pilot bushing bore in the crankshaft with a small quantity of wheel bearing lubricant. **Avoid using too much lubricant as it may be thrown onto the clutch disc when the clutch revolves.**

4. Install the clutch pressure plate, disc and the transmission following the procedures in Group 5.

OIL FILTER REPLACEMENT

CARTRIDGE-TYPE OIL FILTER

The Rotunda oil filter assembly is shown in Fig. 53.

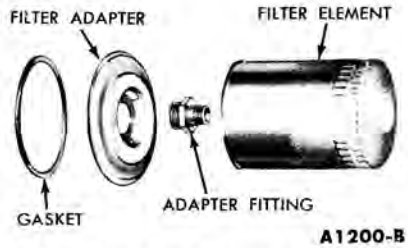


FIG. 53—Cartridge-Type Oil Filter

1. Place a drip pan under the filter. Unscrew the filter from the adapter fitting and clean the adapter recess.

2. Coat the gasket on a new Rotunda filter with oil. Place the new Rotunda filter in position on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face, and then advance it ½ turn.

3. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

ELEMENT-TYPE OIL FILTER

The oil filter assembly is shown in Fig. 54.

1. Place a drip pan under the filter. Loosen the filter center bolt,

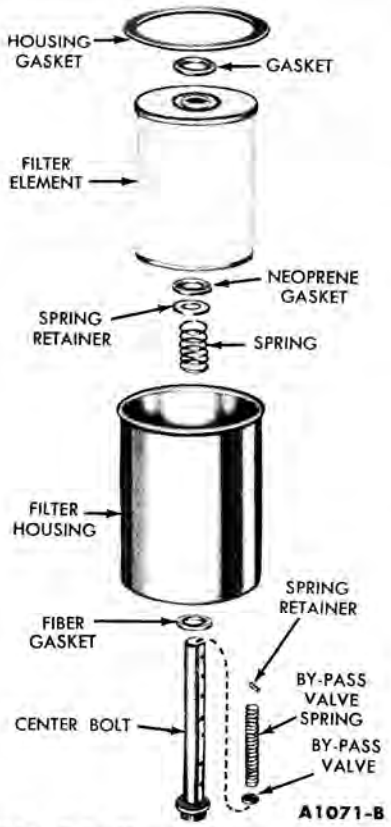


FIG. 54—Element-Type Oil Filter

and then remove the filter assembly and gasket.

2. Remove the filter element, neoprene gasket, spring and seat. Remove the center bolt from the filter cover and the fiber gasket from the bolt. Discard the filter element and all gaskets.

3. Wash all parts in solvent. Make sure all the openings in the center bolt are clean.

4. Install a new Rotunda filter element in the filter cover following the instructions furnished with the new element.

5. Clean the oil filter cover mounting surface on the adapter. Position a new gasket in the adapter recess.

6. Place the filter assembly in position, and thread the center bolt into the adapter finger-tight. Rotate the filter slightly, in each direction, to make sure the gasket is seated evenly.

7. Torque the center bolts to 20-25 ft-lbs. **Do not overtighten the center bolt.**

8. Add oil to the crankcase if necessary. Operate the engine at fast idle, and check for leaks.

9. If oil leaks are evident, perform the necessary repair to correct the leakage.

OIL PAN

REMOVAL

1. Drain the crankcase. Remove the oil level dipstick.

2. On a Comet or a Falcon, disconnect the inlet pipes at the exhaust manifolds and lower the inlet pipes.

3. On a Fairlane or a Mustang, lower the stabilizer bar, disconnect one end of the crossmember, loosen the other end of the crossmember and lower the crossmember.

On a Mustang, the idler arm will also have to be lowered.

4. Remove the oil pan retaining bolts and crank the engine as required to obtain clearance and remove the oil pan.

5. Remove the oil pump inlet tube and screen assembly.

6. Remove and discard the inlet tube to pump gasket.

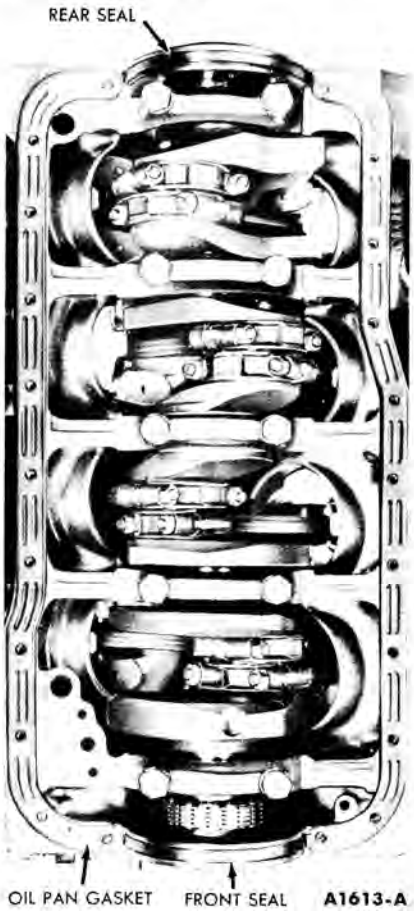


FIG. 55—Oil Pan Gaskets and Seals Installed

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

INSTALLATION

1. Clean the oil pump inlet tube and screen assembly.

2. Using a new inlet tube to pump gasket, install the inlet tube and screen assembly.

3. Clean the gasket surfaces of the block and oil pan. The oil pan has a two-piece gasket. Coat the block surface and the oil pan gasket surface with sealer. Position the oil pan gaskets on the cylinder block (Fig. 55).

4. Position the oil pan front seal on the cylinder front cover (Fig. 55). **Be sure the tabs on the seal are over the oil pan gasket.**

5. Position the oil pan rear seal on the rear main bearing cap (Fig. 55). **Be sure the tabs on the seal are over the oil pan gasket.**

6. Hold the oil pan in place against the block and install a bolt, finger-tight, on each side of the oil pan. Install the remaining bolts. Torque the bolts from the center outward in each direction to specifications.

7. On a Comet or a Falcon, place new gaskets on the inlet pipes and connect the inlet pipes to the exhaust manifolds.

8. On a Fairlane or a Mustang, connect the stabilizer bar and the crossmember.

On a Mustang, the idler arm must be installed.

9. Install the oil level dipstick. Fill the crankcase with the proper grade and quantity of engine oil. Operate the engine and check for oil leaks.

OIL PUMP

REMOVAL

1. Remove the oil pan and related parts as outlined under "Oil Pan Removal."

2. Remove the oil pump inlet tube and screen assembly. Discard the gasket.

3. Remove the oil pump retaining bolts and remove the oil pump, gasket and intermediate drive shaft.

INSTALLATION

1. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

2. Position the intermediate drive shaft into the distributor socket. With the shaft firmly seated in the distributor socket, the stop on the shaft should touch the roof of the crankcase. Remove the shaft and position the stop as necessary.

3. Position a new gasket on the pump housing. With the stop properly positioned, insert the intermediate drive shaft into the oil pump. Install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate drive shaft into a new position.** Torque the oil pump retaining screws to specifications.

4. Clean the oil pump inlet tube and screen assembly (Fig. 56).

5. Using a new gasket, install the oil pump inlet tube and screen assembly.

6. Install the oil pan and related parts as outlined under "Oil Pan Installation."

DISASSEMBLY

1. Remove the oil inlet tube from the oil pump and remove the gasket.

2. Remove the cover retaining screws, then remove the cover. Remove the inner rotor and shaft assembly, then remove the outer race.

3. Insert a self-threading sheet metal screw of the proper diameter into the oil pressure relief valve chamber cap and pull the cap out of the chamber. Remove the spring and plunger.

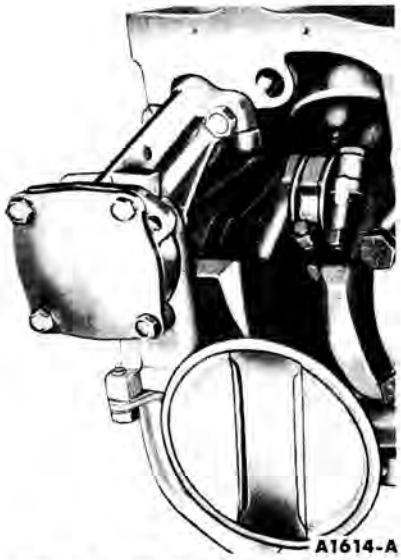


FIG. 56—Oil Pump and Inlet Tube Installed

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

The oil pump assembly is shown in Fig. 57.

1. Oil all parts thoroughly.

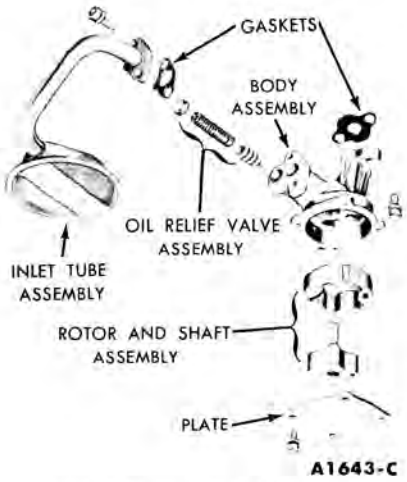


FIG. 57—Oil Pump Assembly

2. Install the oil pressure relief valve plunger, spring and a new cap.

3. Install the outer race, and the inner rotor and shaft assembly. **The inner rotor and shaft, and the outer race are serviced as an assembly. One part should not be replaced without replacing the other. Be certain that the dimple (identification mark) on the outer race is facing outward on the same side as the identification mark on the rotor.** Install the cover and torque the cover retaining screws to specifications.

4. Position a new gasket and the oil inlet tube on the oil pump and install the retaining bolts.

3 ENGINE REMOVAL AND INSTALLATION

The engine removal and installation procedures are for the engine only without the transmission attached.

REMOVAL

1. Drain the cooling system and the crankcase. Remove the oil filter.

2. Remove the hood. Disconnect the battery ground cable at the cylinder block.

3. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover. **Do not remove the air inlet hose at the air cleaner.** Remove the air cleaner and intake duct assembly.

4. Disconnect the radiator upper hose at the coolant outlet housing and the radiator lower hose at the water pump.

On a car with an automatic transmission, disconnect the transmission oil cooler lines at the radiator.

5. Remove the radiator. Remove the fan, spacer, belt and pulley.

6. Disconnect the wires at the alternator. Loosen the alternator adjusting bolts to allow the alternator to swing down and out of the way.

7. Disconnect the oil pressure sending unit wire at the sending unit, and the flexible fuel line at the fuel tank line. Plug the fuel tank line.

8. Disconnect the accelerator rod at the bellcrank.

On a car with an automatic transmission, disconnect the throttle valve vacuum line at the intake manifold. Disconnect the manual shift rod at the bellcrank and remove the retracting spring. Disconnect the transmission filler tube bracket at the cylinder block.

On a car with an air conditioner, isolate and remove the compressor as outlined in Group 16.

On a car with power steering and air conditioning, remove the speed-up control assembly from the bellcrank assembly.

On a car with power steering, disconnect the power steering pump bracket from the cylinder head. Remove the drive belt. Wire the power steering pump out of the way and in a position that will prevent the oil from draining out. Disconnect the brake vacuum line at the intake manifold.

9. Remove the heater hose from the automatic choke housing. Disconnect the heater hoses at the water pump and intake manifold.

Disconnect the water temperature sending unit wire at the sending unit.

10. Remove the flywheel or converter housing to engine upper bolts.

11. Disconnect the primary wire at the ignition coil and position the wire out of the way.

12. Raise the front of the car. Disconnect the starter cable at the starter. Remove the starter and dust seal.

13. Disconnect the muffler inlet pipes from the exhaust manifolds. Disconnect the engine support insulators at the brackets on the frame underbody.

On a car with a manual-shift transmission, remove the remaining flywheel housing to engine bolts.

On a car with an automatic transmission, remove the converter housing inspection cover. Disconnect the flywheel from the converter. Secure the converter assembly in the housing. Remove the remaining converter housing to engine bolts.

14. Lower the car, then support the transmission. Install the engine left lifting bracket at the front of the left cylinder head, and install the engine right lifting bracket at the rear of the right cylinder head, then attach the engine lifting sling (Fig. 58).

15. Remove the air cleaner duct stud from the exhaust manifold. Remove the battery.

16. Raise the engine slightly and carefully pull it from the transmission. Carefully lift the engine out of the engine compartment so that the rear cover plate is not bent or other components damaged. Install the engine on a work stand.

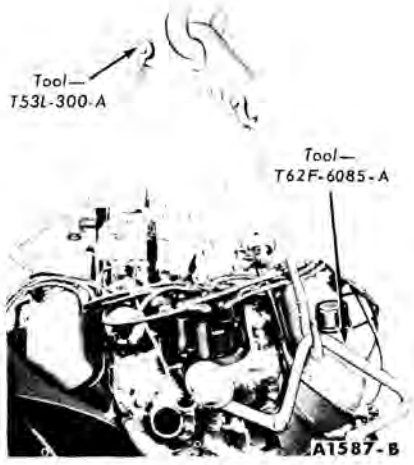


FIG. 58—Engine Lifting Brackets and Sling—Typical

INSTALLATION

1. Position new gaskets on the muffler inlet pipes.

2. Attach the engine lifting brackets and sling (Fig. 58). Remove the engine from the work stand.

3. Lower the engine carefully into the engine compartment. Make sure the exhaust manifolds are properly aligned with the muffler inlet pipes and the dowels in the block are through the rear cover plate and engage the holes in the flywheel housing.

On a car with an automatic transmission, start the converter pilot into the crankshaft.

On a car with a manual-shift transmission, start the transmission main drive gear into the clutch disc. It may be necessary to adjust the position of the transmission in relation to the engine if the input shaft will not enter the clutch disc. **If the engine "hangs up" after the shaft enters, turn the crankshaft slowly (transmission in gear) until the shaft splines mesh with the clutch disc splines.**

4. Install the flywheel or converter housing upper bolts.

5. Install the engine support insulator to bracket retaining nuts. Disconnect the engine lifting sling and remove the lifting brackets.

6. Raise the front of the car. Connect both exhaust manifolds to the muffler inlet pipes. Torque the nuts to specifications.

7. Position the dust seal and install the starter.

On a car with a manual-shift transmission, install the remaining flywheel housing to engine bolts.

On a car with an automatic transmission, remove the retainer securing the converter in the housing. Attach the converter to the flywheel. Install the converter housing inspection cover. Install the remaining converter housing retaining bolts.

8. Remove the support from the transmission and lower the car.

9. Connect the engine ground strap and coil primary wire.

10. Connect the water temperature sending unit wire. Install the heater hose on the automatic choke housing and connect the hose at the intake manifold.

11. Connect the accelerator rod at the bellcrank.

On a car with an automatic transmission, connect the transmission filler tube bracket. Connect the manual shift rod and install the retracting spring. Connect the throttle valve vacuum line.

On a car with an air conditioner, install the compressor as outlined in Group 16.

On a car with power steering and air conditioning, install the speed-up control assembly on the bellcrank assembly.

On a car with power steering, install the drive belt and power steering pump bracket. Install the bracket retaining bolts. Adjust the drive belt tension to specifications. Connect the brake vacuum line.

12. Remove the plug from the fuel tank line. Connect the flexible fuel line and the oil pressure sending unit wire.

13. Install the pulley, belt, spacer and fan. Adjust the belt tension to specifications.

14. Install the battery. Install the air cleaner duct stud on the exhaust manifold.

15. Tighten the alternator adjusting bolts. Connect the alternator wires and the battery ground cable.

16. Install the radiator. Connect the radiator upper and lower hoses.

On a car with an automatic transmission, connect the transmission oil cooler lines.

17. Install the oil filter. Fill and bleed the cooling system. Connect the heater hose at the water pump. Fill the crankcase with the proper grade and quantity of oil.

18. Adjust the transmission throttle linkage.

On a car with power steering and air conditioning, adjust the speed-up control assembly as outlined in Group 3.

19. Operate the engine at fast idle and check all gaskets and hose connections for leaks.

20. Install the air cleaner and intake duct assembly. Connect the automatic choke heat chamber air inlet hose.

21. Install and adjust the hood.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the engine from the car and install it on a work stand.

CRANKSHAFT

The crankshaft and related parts are shown in Fig. 59.

REMOVAL

1. Disconnect the spark plug wires at the spark plugs and remove the wires from the ignition harness brackets on the valve rocker arm covers. Remove the distributor cap and spark plug wire assembly. Remove the spark plugs to allow easy rotation of the crankshaft.

2. Remove the fuel pump and oil filter. Slide the water pump bypass hose clamp toward the water pump. Remove the alternator and mounting brackets.

3. Remove the crankshaft pulley from the crankshaft vibration damper. Remove the cap screw and washer from the end of the crankshaft. Install the puller on the crankshaft vibration damper (Fig. 40) and remove the damper.

4. Remove the cylinder front cover and water pump as an assembly.

5. Remove the crankshaft front oil slinger. Check the timing chain deflection, then remove the timing chain and sprockets by following steps 12 thru 16 under "Cylinder Front Cover and Timing Chain Removal."

6. Invert the engine on the work stand. Remove the clutch pressure plate and disc (manual-shift transmission). Remove the flywheel. Remove the oil pan and gasket. Remove the oil pump.

7. **Make sure all bearing caps (main and connecting rod) are marked so that they can be installed in their original locations.** Turn the crankshaft until the connecting rod from which the cap is being removed is down and remove the bearing cap. Push the connecting rod and piston assembly up into the cylinder. Repeat this procedure until all the connecting rod bearing caps are removed.

8. Remove the main bearing caps.

9. Carefully lift the crankshaft out of the block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

CLEANING AND INSPECTION

Refer to Part 8-1, Section 3 for the cleaning and inspection procedures.

REPAIRS

To refinish journals, dress minor imperfections, etc., refer to Part 8-1, Section 2.

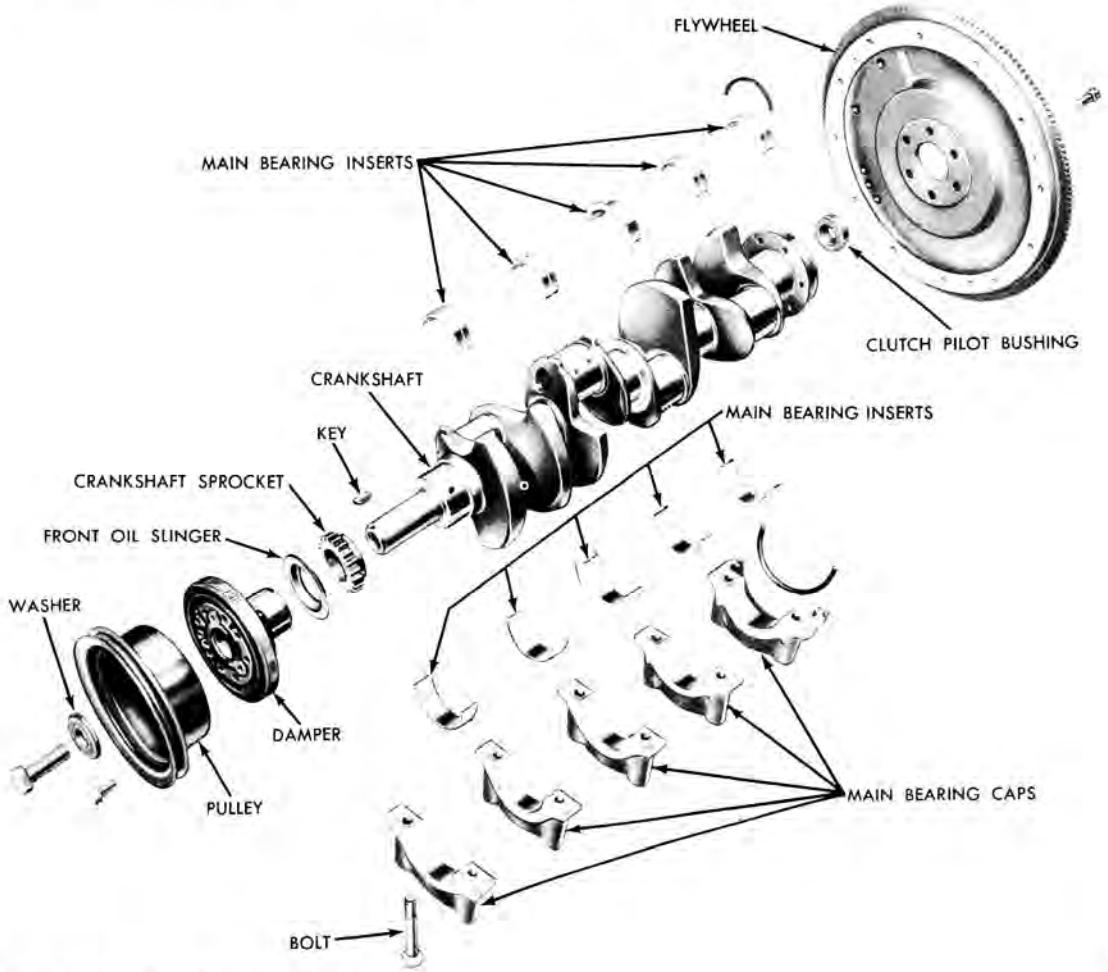


FIG. 59—Crankshaft and Related Parts

INSTALLATION

1. Remove the rear journal oil seal from the block and rear main bearing cap.

2. Remove the main bearing inserts from the block and bearing caps.

3. Remove the connecting rod bearing inserts from the connecting rods and caps.

4. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts may distort the bearing and cause a failure.

5. Place the upper main bearing inserts in position in the bores with the tang fitting in the slot provided.

6. Install the lower main bearing inserts in the bearing caps.

7. Clean the rear journal oil seal groove and the mating surfaces of the block and rear main bearing cap. Preform the new seal by hand to the approximate radius of the cap.

8. Insert the seal in the oil seal groove, seating the center of the seal first and allowing the seal to extend equally on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both ends of the seal into the groove, working from the ends to the center.

9. Position the seal forming tool as shown in Fig. 60 and complete the seal installation. After installation, cut the ends of the seal flush.

10. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**



FIG. 60—Rear Oil Seal to Block Installation

11. Check the clearance of each main bearing as follows:

Place a piece of Plastigage on the crankshaft journal the full width of the journal and about ¼ inch off-center (Fig. 61). Follow steps 11 thru 15 under "Main Bearing Replacement."

12. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings. Install a new seal in the rear main bearing cap and install the rear main bearing cap by following steps 17 thru 20 under "Main Bearing Replacement." Install all the bearing caps, except the thrust bearing cap (No. 3 bearing). **Be sure that the main bearing caps are installed in their original locations.** Torque the bearing cap bolts to specifications.

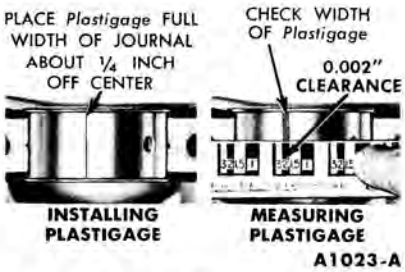


FIG. 61—Installing and Measuring Plastigage—Engine on Work Stand

13. Install the thrust bearing cap with the bolts finger-tight.

14. Pry the crankshaft forward against the thrust surface of the upper half of the bearing (Fig. 62).

15. Hold the crankshaft forward and pry the thrust bearing cap to the rear (Fig. 62). This will align the thrust surfaces of both halves of the bearing.

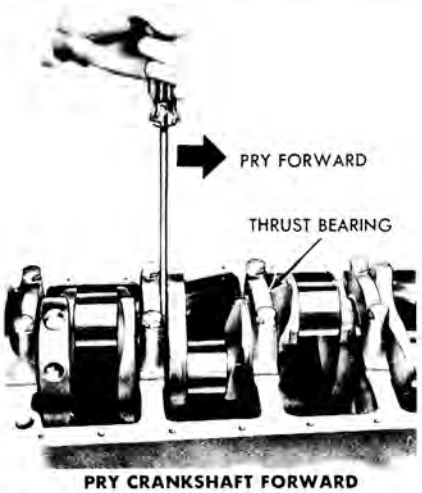
16. Retain the forward pressure on the crankshaft. Tighten the cap bolts to specifications (Fig. 62).

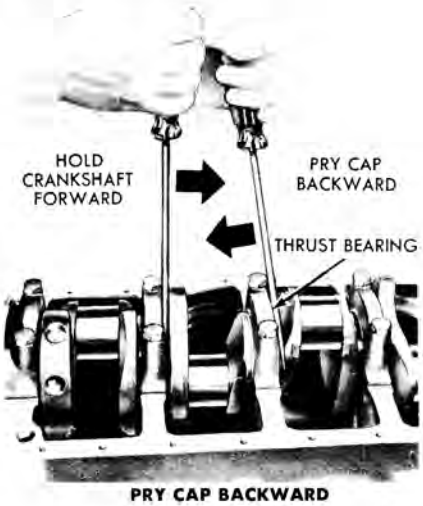
17. Force the crankshaft toward the rear of the engine.

18. Install a dial indicator so that the contact point rests against the crankshaft flange and the indicator axis is parallel to the crankshaft axis (Fig. 63).

19. Zero the dial indicator. Push the crankshaft forward and note the reading on the dial.

20. If the end play exceeds the wear limit, replace the thrust bearing. If the end play is less than the





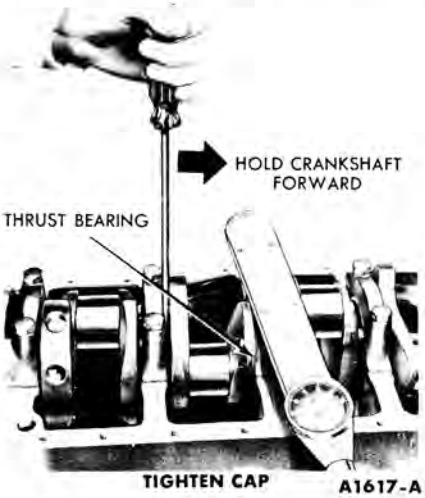


FIG. 62—Thrust Bearing Alignment

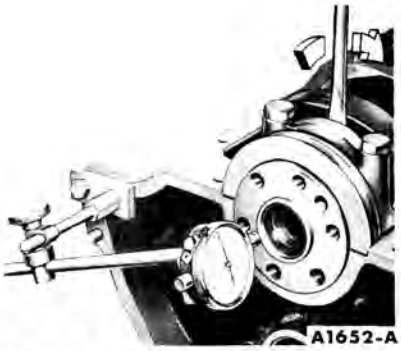


FIG. 63—Crankshaft End Play

minimum limit, inspect the thrust bearing faces for scratches, burrs, nicks or dirt. If the thrust faces are not defective or dirty, they probably were not aligned properly. Install the thrust bearing and align the faces following the recommended procedure (steps 13, 14, 15 and 16), then check the end play.

21. Install new bearing inserts in the connecting rods and caps. Check the clearance of each bearing following the recommended procedure.

22. After the connecting rod bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

23. Turn the crankshaft throw to the bottom of its stroke. Push the piston all the way down until the rod bearing seats on the crankshaft journal.

24. Install the connecting rod cap. Torque the nuts to specifications.

25. After the piston and connecting rod assemblies have been installed, check the side clearance between the connecting rods on each connecting rod crankshaft journal (Fig. 48).

26. Clean the oil pan, oil pump and oil pump screen. Prime the oil pump by filling either the inlet or outlet port with engine oil and rotating the pump shaft to distribute oil within the housing. Install the oil pump and oil pan by following the procedures under "Oil Pan and Oil Pump Installation."

27. Coat the threads of the flywheel retaining bolts with oil-resistant sealer. Position the flywheel on the crankshaft flange. Install and torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use tool 6392-N to locate the clutch disc. Install the pressure plate. Tighten the retaining bolts.

28. Install the timing chain and sprockets, cylinder front cover and crankshaft pulley and adapter, following steps 1 thru 6 under "Cylinder Front Cover and Timing Chain Installation."

29. Install the Rotunda oil filter, fuel pump and connect the fuel lines. Install the generator or alternator, shield and mounting bracket.

30. Install the spark plugs, distributor cap and spark plug wires. Connect the spark plug wires and high tension lead.

31. Install the engine in the car.

CAMSHAFT BEARING REPLACEMENT

Camshaft bearings are available pre-finished to size for standard and 0.015-inch undersize journal diameters. The bearings are not interchangeable from one bore to another.

1. Remove the camshaft, flywheel and crankshaft, following the appropriate procedures in Section 2 or Section 4. Push the pistons to the top of the cylinders.

2. Remove the camshaft rear bearing bore plug (Fig. 64). Remove the camshaft bearings (Figs. 65 or 66).

If the camshaft bearings are being removed with the tool shown in Fig. 66, the following procedure will apply: Select the proper size expanding collet and back-up nut and assemble on the expanding mandrel. With the expanding collet collapsed, install the collet assembly in the camshaft bearing, and tighten the back-up nut on the expanding mandrel until the collet fits the camshaft bearing. Assemble the puller screw and extension



FIG. 64—Camshaft Rear Bearing Bore Plug Removal

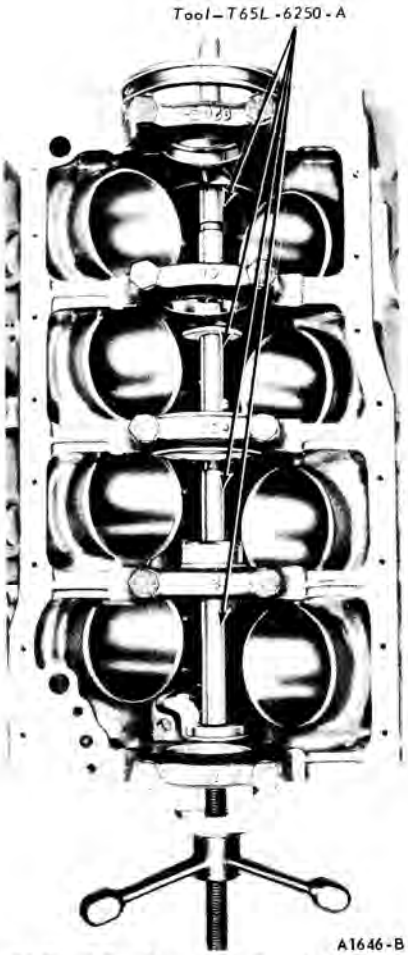


FIG. 65—Camshaft Bearing Replacement

(if necessary) as shown and install on the expanding mandrel. Tighten the pulling nut against the thrust bearing and pulling plate to remove the camshaft bearing. To remove the front bearing, install the puller screw from the rear of the cylinder block.

3. Position the new bearings at the bearing bores, and press them in place with the tool shown in Fig. 65 or Fig. 66. Align the oil holes in the bearings with the oil holes in the cylinder block when the bearings are installed. **Be sure the front bearing is installed 0.005-0.020 inch below the front face of the cylinder block (Fig. 67).**

4. Clean out the camshaft rear bearing bore plug recess thoroughly. Coat the flange of a new plug with oil-resistant sealer and install the plug (Fig. 68) with the flange edge of the plug facing outward.

5. Install the camshaft, crankshaft, flywheel and related parts, following

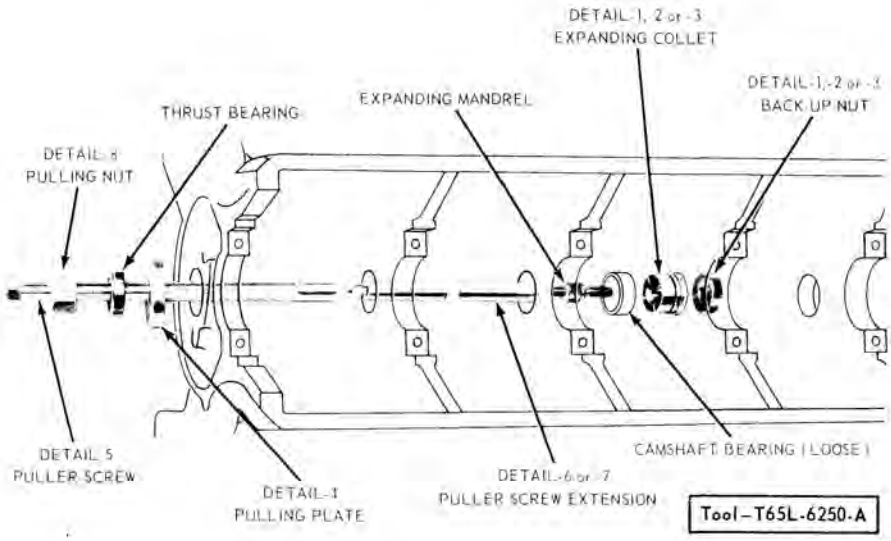


FIG. 66–Typical Camshaft Bearing Replacement

the appropriate procedures in Section 2 or Section 4, except do not check connecting rod and main bearing clearances as a part of "Camshaft Bearing Replacement." Install the engine in the car.

CYLINDER ASSEMBLY REPLACEMENT

DISASSEMBLY

Follow steps 1 thru 9, 11 thru 13, and 16 thru 18 under "Engine Disassembly." Remove 4 cylinder head dowels from the cylinder block. Remove the cylinder block drain plugs, and remove the cylinder assembly from the work stand.

CLEANING

Clean the gasket and seal surfaces of all parts and assemblies (refer to Part 8-1, Section 3).



FIG. 67–Camshaft Front Bearing Measurement

ASSEMBLY

Install the replacement cylinder block assembly on a work stand. Install the cylinder block drain plugs and cylinder head dowels. Transfer all parts removed from the old cylinder assembly to the new cylinder assembly, following the procedures in steps 21 thru 31 and 35 thru 59 under "Engine Assembly."

ENGINE DISASSEMBLY

1. Install the engine on the workstand.

2. Remove the distributor cap and spark plug wire assembly.

3. Disconnect the distributor vacuum line at the distributor. Remove the carburetor fuel inlet line and fuel pump outlet line. Remove the fuel pump and discard the gasket. Remove the oil filter.



FIG. 68–Camshaft Rear Bearing Bore Plug Installation

4. Slide the clamp on the water pump bypass hose toward the water pump. Remove the automatic choke-heat tube.

5. Remove the valve rocker arm covers and the crankcase ventilation system.

6. Remove the alternator and mounting brackets. Remove the ignition coil. Remove the distributor hold down bolt and remove the distributor.

7. Remove the intake manifold retaining bolts. Raise the manifold and carefully remove it from the engine. Discard the intake manifold gaskets, seals and sealing washers.

8. Loosen the valve rocker arm stud nuts so that the valve rocker arms can be rotated to the side. Remove the valve push rods in sequence and put them in a rack or holder so that they can be installed in their original position.

9. Using a magnet, remove the valve lifters and place them in a rack so that they can be installed in their original bores (Fig. 42).

If the valve lifters are stuck in their bores by excessive varnish, etc., it may be necessary to use a plier-type tool (T52T-6500-DJD or 6500-D) to remove the lifters. Rotate the lifter back and forth to loosen it from the gum or varnish that may have formed at the lifter.

The internal parts of each hydraulic valve lifter assembly are matched sets. Do not intermix the parts. Keep the assemblies intact until they are to be cleaned.

10. Remove the exhaust manifolds and the spark plugs.

11. Install the cylinder head holding fixtures (Fig. 26). Remove the cylinder head bolts and lift the cylinder heads off the block. Discard the cylinder head gaskets.

12. Remove the crankshaft pulley from the crankshaft vibration damper. Remove the cap screw and washer from the end of the crankshaft. Install the puller on the crankshaft vibration damper (Fig. 33) and remove the vibration damper.

13. Remove the oil pan to cylinder front cover retaining bolts. Remove the cylinder front cover retaining screws. Remove the cylinder front cover and water pump as an assembly. Discard the gasket and remove the crankshaft front oil slinger.

14. Check the timing chain deflection and remove the timing chain

and sprockets by following steps 12 thru 16 under "Cylinder Front Cover and Timing Chain Removal." Remove the crankshaft sprocket key.

15. Remove any ridge and/or carbon deposits from the upper end of the cylinder bores. Move the piston to the bottom of its travel and place a cloth on the piston head to collect the cuttings. Remove the cylinder ridge with a ridge cutter. Follow the instructions furnished by the tool manufacturer. **Never cut into the ring travel area in excess of 1/32 inch when removing ridges.** After the ridge has been removed, remove the cutter from the cylinder bore.

16. On a flywheel for manual-shift transmission, remove the clutch pressure plate and disc.

17. Remove the flywheel and rear cover plate. Remove the clutch pilot bushing (Fig. 69).

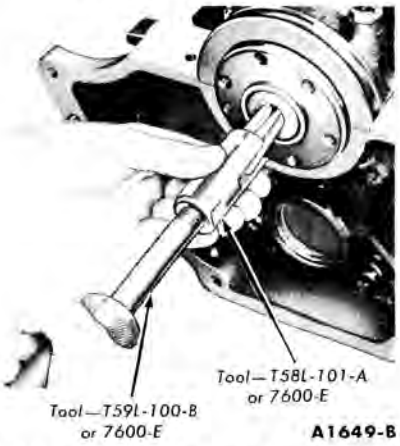


FIG. 69—Clutch Pilot Bushing Removal

18. Invert the engine. Remove the oil pan and discard the gaskets and seals.

19. Remove the oil pump and inlet tube as an assembly. Remove the intermediate drive shaft. Discard the oil pump gasket.

20. Make sure all connecting rods and caps are marked so that they can be installed in their original locations. Turn the crankshaft until the connecting rod being removed is down. Remove the rod cap.

21. Push the connecting rod and piston assembly out the top of the cylinder with the handle end of a hammer. **Avoid damage to the connecting rod journal or the cylinder wall when removing the piston and rod.**

22. Remove the bearing inserts from the connecting rods and caps. Install the rod caps on the connecting rods from which they were removed.

23. Remove the main bearing caps.

24. Carefully lift the crankshaft out of the cylinder block so that the thrust bearing surfaces are not damaged. **Handle the crankshaft with care to avoid possible fracture or damage to the finished surfaces.**

25. Remove the rear journal oil seal from the block and rear bearing cap.

26. Remove the main bearing inserts from the block and bearing caps. Install the main bearing caps in their original positions.

27. Remove the camshaft thrust plate. Carefully remove the camshaft by pulling it toward the front of the engine. Use caution to avoid damaging the journals and lobes.

28. Remove the camshaft rear bearing bore plug (Fig. 64). Remove the camshaft bearings (Fig. 65).

ENGINE ASSEMBLY

If the cylinder block is to be replaced, transfer the cylinder head dowels and cylinder block drain plugs to the new cylinder block and start the assembly procedures with step 5.

1. Remove the glaze from the cylinder bores by following the instructions of the tool manufacturer.

2. Invert the engine on the work stand.

3. Position the new camshaft bearings at the bearing bores, and press them in place with the tool shown in Fig. 65. Align the oil holes in the cylinder block when the bearings are installed. **Be sure the camshaft front bearing is installed 0.005-0.020 inch below the front face of the cylinder block (Fig. 67).**

4. Clean out the camshaft rear bearing bore plug recess thoroughly. Coat the flange of a new plug with oil-resistant sealer and install it with the cup side facing out (Fig. 68). Drive the plug in until it is slightly below the chamfer in the bore.

5. Oil the camshaft journals and apply Lubriplate to all lobes, then carefully slide it through the bearings.

6. Clean the rear journal oil seal groove and the mating surfaces of the block and rear main bearing cap. Preform the new seal by hand to the approximate radius of the cap.

7. Insert the seal in the oil seal groove, seating the center of the seal first and allowing the seal to extend equally on both ends. Press the seal down firmly with the thumb at the center of the seal, then press both ends of the seal into the groove, working from the ends to the center.

8. Position the seal forming tool as shown in Fig. 60 and complete the seal installation. After installation, cut the ends of the seal flush.

9. If the crankshaft main bearing journals have been refinished to a definite undersize, install the correct undersize bearings. Be sure the bearing inserts and bearing bores are clean. Foreign material under the inserts may distort the bearing and cause a failure.

Place the upper main bearing inserts in position in the bore with the tang fitting in the slot provided.

10. Install the lower main bearing inserts in the bearing caps.

11. Carefully lower the crankshaft into place. **Be careful not to damage the bearing surfaces.**

12. Check the clearance of each main bearing following the procedure under "Main Bearing Replacement."

13. After the bearings have been fitted, apply a light coat of engine oil to the journals and bearings.

14. Install a new journal oil seal in the cap (Fig. 45) by following steps 6, 7 and 8. Apply a thin coating of oil-resistant sealer to the rear main bearing cap at the rear of the top mating surface (Fig. 45). **Do not apply sealer to the area forward of the oil slinger groove.** Install the rear main bearing cap and the remainder of the caps, except the thrust bearing cap (No. 3 bearing). **Be sure that the main bearing caps are installed in their original positions.** Torque the bearing cap bolts to specifications.

15. Install the thrust bearing cap and check crankshaft end play by following steps 13 thru 20 under "Crankshaft Installation."

16. Turn the engine on the work stand so that the front end is up.

17. Install the pistons and connecting rods by following steps 1 thru 9 under "Piston and Connecting Rod Installation."

18. Position the sprockets and timing chain on the camshaft and crankshaft (Fig. 36). Be sure the timing marks on the sprockets are positioned as shown in Fig. 35.

19. Lubricate the timing chain and sprockets with engine oil.

20. Install the fuel pump eccentric, washer and camshaft sprocket cap screw. Torque the sprocket cap screw to specifications. Install the crankshaft front oil slinger (Fig. 38).

21. Clean the cylinder front cover and the cylinder block gasket surfaces. Install a new crankshaft front oil seal (Fig. 37).

22. Coat the gasket surface of the block and cover and the cover bolt threads with oil-resistant sealer. Position a new gasket on the block.

23. Install the alignment pilot tool on the cylinder front cover so that the keyway in the pilot aligns with the key in the crankshaft. Position the cover (and water pump) and pilot over the end of the crankshaft and against the block (Fig. 39).

24. Install the cylinder front cover screws finger tight. While pushing in on the pilot, torque the cover bolts to specifications. Remove the pilot.

25. Lubricate the crankshaft with a white lead and oil mixture and lubricate the oil seal rubbing surface with grease.

26. Line up the crankshaft vibration damper keyway with the key on the crankshaft, then install the vibration damper on the crankshaft (Fig. 40). Install the damper cap screw and washer, and torque the screw to specifications. Install the crankshaft pulley.

27. Using a new gasket, install the fuel pump.

28. Turn the engine on the work stand so that the top of the engine is up.

29. Clean the cylinder head and block gasket surfaces. Install the head gasket over the cylinder head dowels.

30. Place the cylinder head on the engine, then remove the holding fixtures. Coat the head bolt threads with water-resistant sealer, and then install the bolts.

31. The cylinder head bolt tightening procedure is performed in three progressive steps. Torque the bolts in sequence (Fig. 27) to 50 ft-lbs, then to 60 ft-lbs and finally to specifications. **After the cylinder head bolts have been torqued to specifications, the bolts should not be disturbed.**

32. Coat the mating surfaces of the exhaust manifold with a light film of graphite grease. Position new gaskets on the muffler inlet pipe.

33. Position the exhaust manifolds on the cylinder heads and install the retaining bolts and tab washers. Torque the retaining bolts to specifications, working from the center to the ends. Lock the bolts by bending one tab of the washer over a flat on the bolt.

34. Install the spark plugs.

35. Coat the outside of each valve lifter with engine oil to provide initial lubrication. **Do not fill the lifters with oil. The lifters will fill much faster after the engine is started, if they are free of any oil film which may cause an oil seal between the plunger and the lifter body.** Place each lifter in the bore from which it was removed.

36. Install the push rods in their original positions. Apply Lubriplate over the valve stem tips and the push rod guides in the cylinder head. Install the rocker arms over the push rods. Perform a valve clearance adjustment as outlined in Part 8-1, Section 2.

37. Clean the mating surfaces of the intake manifold, cylinder heads and cylinder block.

38. Coat the intake manifold and cylinder block seal surfaces with quick-setting adhesive.

39. Position new seals on the cylinder block and new gaskets on the cylinder heads with the gaskets interlocked with the seal tabs. Apply non-hardening sealer at the four junction points of the seals and gaskets. Be sure the holes in the gaskets are aligned with the holes in the cylinder heads.

40. Carefully lower the intake manifold on the cylinder block and cylinder heads. **After the intake manifold is in place, run a finger around the seal area to make sure the seals are in place. If the seals are not in place, remove the intake manifold and position the seals.**

41. Be sure the holes in the manifold gaskets and manifold are in alignment. Position the intake manifold alignment tools (Fig. 22) in the front and rear (Nos. 10 and 12) bolt holes on the left bank of the manifold.

42. Using new sealing washers, install the intake manifold retaining bolts. Working from the center to the ends, torque the bolts in sequence (Fig. 23) to 3-5 ft-lbs.

43. Remove the manifold alignment tools from the front and rear bolt holes (Nos. 10 and 12). Using new sealing washers, install the two remaining bolts and torque to 3-5 ft-lbs.

44. Torque all the manifold retaining bolts in sequence to 11-14 ft-lbs. Finally, torque all the retaining bolts in sequence to 12-15 ft-lbs.

45. Install the water pump bypass hose on the coolant outlet housing. Slide the clamp into position and tighten the clamp.

46. Rotate the crankshaft until the No. 1 piston is on TDC after the compression stroke, then position the distributor in the block with the rotor at the No. 1 firing position and the points open. Install the hold down clamp.

47. Install the ignition coil. Position and install the generator or alternator, shield and mounting bracket.

48. Clean the valve rocker arm covers and the cylinder head gasket surface. Apply oil-resistant sealer to one side of new cover gaskets. Lay the cemented side of the gaskets in place in the covers.

49. Position the covers on the cylinder heads. Make sure the gasket seats evenly all around the head. Install the bolts. The cover is tightened in two steps. Torque the bolts to specifications. Two minutes later, torque the bolts to the same specifications.

50. Install the crankcase ventilation system.

51. Install the automatic choke heat tube. Install the distributor cap. Position the spark plug wires in the brackets on the valve rocker arm covers. Connect the spark plug wires.

52. Connect the carburetor fuel inlet line and pump inlet line.

53. Prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.

54. Invert the engine on the work stand. Position the intermediate drive shaft into the distributor socket. With the shaft firmly seated in the distributor socket, the stop on the shaft should touch the roof of the

crankcase. Remove the shaft and position the stop as necessary.

55. With the stop properly positioned, insert the intermediate drive shaft into the oil pump.

56. Position a new gasket on the pump housing and install the pump and shaft as an assembly. **Do not attempt to force the pump into position if it will not seat readily. The drive shaft hex may be misaligned with the distributor shaft. To align, rotate the intermediate shaft into a new position.** Torque the oil pump retaining screws to specifications.

57. Clean the gasket surfaces of the block and oil pan. Coat the block surface and the oil pan gasket surface with sealer. Position new gaskets on the block and position a new seal on the cylinder front cover and rear main bearing cap. Make sure the tabs on the seal are over the oil pan gasket. Install the retaining screws and torque them from the center outward to specifications (one screw retains the fuel line bracket).

58. Clean the oil filter adapter gasket surface. Coat the gasket on the filter with oil. Place the Rotunda filter in position on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face, then advance it ½ turn.



FIG. 70—Clutch Pilot Bearing Installation

59. Install the clutch pilot service bearing (Fig. 70). Coat the threads of the flywheel retaining bolts with oil-resistant sealer. Position the rear cover plate on the block and the flywheel on the crankshaft flange. Install and torque the bolts to specifications.

On a flywheel for a manual-shift transmission, use tool T58P-7563-A to locate the clutch disc. Install the pressure plate.

60. Install the engine in the car. Fill and bleed the cooling system. Fill the crankcase with the proper grade and quantity of engine oil.

61. Operate the engine and check for oil and coolant leaks. Check and adjust the ignition timing. Connect the distributor vacuum line at the distributor.

62. Adjust the engine idle speed, fuel mixture and anti-stall dashpot (if applicable). Adjust the transmission throttle linkage (Group 7).

On a car with power steering and air conditioning, adjust the speed-up control assembly as outlined in Group 3.

PART 8-4 SPECIFICATIONS

NOTE: All specifications are given in inches unless otherwise noted.

GENERAL ENGINE

MODEL PREFIX	
170	EET
200	EFZ
260	EEY
289	EGA
ENGINE MODELS AND PISTON DISPLACEMENT—Cubic Inches	
170 Six	170
200 Six	200
260 V-8	260
289 V-8	289
COMPRESSION RATIO	
170	9.1:1
200 Six	9.2:1
260 V-8	8.8:1
289 V-8 (2-V)	9.3:1
289 V-8 (4-V)	10.0:1
289 V-8 High Performance	10.0:1
BRAKE HORSEPOWER @ Specified rpm	
170 Six	105 @ 4400
200 Six	120 @ 4400
260 V-8	164 @ 4400
289 V-8 (2-V)	200 @ 4400
289 V-8 (4-V)	225 @ 4800
289 V-8 High Performance	271 @ 6000
TORQUE—Ft-lbs @ Specified rpm	
170 Six	158 @ 2400
200 Six	190 @ 2400
260 V-8	258 @ 2200
289 V-8 (2-V)	282 @ 2400
289 V-8 (4-V)	305 @ 3200
289 V-8 High Performance	312 @ 3400
BORE AND STROKE	
170 Six	3.50 x 2.940
200 Six	3.68 x 3.126
260 V-8	3.80 x 2.870
289 V-8	4.00 x 2.870
COMPRESSION PRESSURE—psi (Sea Level @ Cranking Speed)	
170 and 200 Six	155-195
260 and 289 V-8	130-170
Allowable tolerance between cylinders	± 20 psi
TAXABLE HORSEPOWER	
170 Six	29.40
200 Six	32.50
260 V-8	46.20
289 V-8	51.20
FIRING ORDER	
170 and 200 Six	1-5-3-6-2-4
260 and 289 V-8	1-5-4-2-6-3-7-8
VALVE ARRANGEMENT—Front to Rear	
All Six's	E-I-I-E-I-E-E-I-E-I-I-E
All V-8	Right I-E-I-E-I-E-I-E
	Left E-I-E-I-E-I-E-I
ENGINE IDLE RPM*	
Manual-Shift Transmissions	
All Except 289 V-8 High Performance	575-600
289 V-8 High Performance	750-775
Automatic Transmissions—Drive Range	
All Six's	500-525
All V-8 (Except High Performance)	475-500
289 V-8 High Performance	650-675

*If unit is equipped with air conditioner, it should be operated at least 20 minutes before setting engine idle speed. Refer to Group 10, Part 10-1, Section 2, for proper procedures in setting idle speed.

GENERAL ENGINE (Continued)

ENGINE IDLE MANIFOLD VACUUM—Minimum Inches of Mercury @ Specified Engine Neutral Idle rpm (Sea Level)	
260 V-8	16
170 and 200 Six	17
289 V-8 (Except High Performance)	18
289 V-8 High Performance	15
INITIAL IGNITION TIMING—BTDC**	
Manual-Shift Transmission	
170 and 200 Six	6°*
260 and 289 V-8	6°
Automatic Transmission	
170 Six	12°*
200 Six	10°*
260	10°
289	8°

*For altitude operation, and/or to obtain optimum engine performance and fuel economy, the initial ignition timing may be advanced 5° over the "normal" setting. No further improvement in engine performance or fuel economy will be achieved by advancing beyond this point. Advance the timing progressively until engine detonation (spark knock) is evident under actual road test acceleration. Retard the timing until the detonation (spark knock) is eliminated.

**If the individual requirements of the car and/or the use of sub-standard fuels dictate, the initial timing may have to be retarded from the recommended setting to eliminate detonation (spark knock). If retarding is necessary, it should be done progressively and not to exceed 2° BTDC.

OIL CAPACITY*	U.S. MEASURE	IMPERIAL MEASURE
170 and 200 Six	4.50 quarts	3.75 quarts
260 and 289 V-8	5.00 quarts	4.25 quarts

*Includes one U.S. quart required with oil filter replacement.

OIL PRESSURE—Hot @ 2000 rpm	
All Engines	35-55 psi

CYLINDER HEAD

GASKET SURFACE FLATNESS	
170 and 200	0.003 inch in any 6 inches or 0.007 inch overall
260 and 289	0.003 inch in any 6 inches or 0.006 inch overall
VALVE GUIDE BORE DIAMETER—Standard	
Intake and Exhaust	
170 and 200	0.3115-0.3125
260 and 289	0.3433-0.3443
VALVE SEAT WIDTH	
Intake and Exhaust	
170 and 200	0.070-0.080
260 and 289	0.060-0.080
VALVE SEAT ANGLE	
Intake and Exhaust	
All Engines	45°
VALVE SEAT RUNOUT	
Maximum 260 and 289	0.0015
Maximum Other Engines	0.002
ROCKER ARM STUD BORE DIAMETER	
260 and 289	0.3685-0.3695
COMBUSTION CHAMBER VOLUME—CC	
170 and 200	48.3-50.3
260	53.0-56.0
289	52.0-55.0

VALVE MECHANISM

VALVE CLEARANCE*
170 and 200 ..... 0.066-0.216
260 and 289 ..... 0.082-0.152
*Clearance specified is obtained at the valve stem tip with the hydraulic valve lifter collapsed.

VALVE LASH
Cold
Intake and Exhaust
289 High Performance 0.022
Hot
Intake and Exhaust
289 High Performance 0.018

VALVE STEM DIAMETER
Standard
INTAKE
All Except 289 ..... 0.3100-0.3107
289 ..... 0.3416-0.3423
EXHAUST
All Except 289 ..... 0.3090-0.3097
289 ..... 0.3406-0.3413
0.003 Oversize
INTAKE
All Except 289 ..... 0.3130-0.3137
289 ..... 0.3446-0.3453
EXHAUST
All Except 289 ..... 0.3120-0.3127
289 ..... 0.3436-0.3443
0.015 Oversize
INTAKE
All Except 289 ..... 0.3250-0.3257
289 ..... 0.3566-0.3573
EXHAUST
All Except 289 ..... 0.3240-0.3247
289 ..... 0.3556-0.3563
0.030 Oversize
INTAKE
All Except 289 ..... 0.3400-0.3407
289 ..... 0.3716-0.3723
EXHAUST
All Except 289 ..... 0.3390-0.3397
289 ..... 0.3706-0.3713

VALVE FACE ANGLE
All Engines ..... 44°

VALVE STEM TO VALVE GUIDE CLEARANCE
Intake
All Except 289 ..... 0.0008-0.0025—Wear Limit 0.0045
289 ..... 0.0010-0.0027—Wear Limit 0.0045
Exhaust
All Except 289 ..... 0.0018-0.0035—Wear Limit 0.0055
289 ..... 0.0020-0.0037—Wear Limit 0.0055

VALVE HEAD DIAMETER
Intake
170 and 200 ..... 1.642-1.657
260 ..... 1.582-1.597
289 ..... 1.662-1.677
Exhaust
170, 200 and 260 ..... 1.381-1.396
289 ..... 1.442-1.457

VALVE FACE RUNOUT
Intake and Exhaust
170 and 200 ..... 0.0015
260 and 289 ..... 0.0020

VALVE SPRING FREE LENGTH—Approximate
170 and 200 ..... 1.79
260 ..... 2.15
289 (Except High Performance) 2.09
289 High Performance 2.04

VALVE SPRING OUT OF SQUARE—Maximum
All Engines 0.072

VALVE MECHANISM (Continued)

VALVE SPRING PRESSURE—Lbs. @ Specified Length
170 and 200 ..... 51-57 @ 1.590
Wear Limit 46 @ 1.590
142-158 @ 1.222
Wear Limit 128 @ 1.222
260 ..... 57-63 @ 1.770
Wear Limit 52 @ 1.770
161-178 @ 1.380
Wear Limit 145 @ 1.380
289 (Except High Performance) ..... 71-79 @ 1.780
Wear Limit 64 @ 1.780
161-177 @ 1.390
Wear Limit 145 @ 1.390
289 High Performance ..... 83.5-92.5 @ 1.770
Wear Limit 75 @ 1.770
234.5-259.5 @ 1.320
Wear Limit 211 @ 1.320

VALVE SPRING ASSEMBLED HEIGHT
170 and 200 ..... 1 1/16-1 39/64
260 and 289 ..... 1 3/4-1 25/32

VALVE PUSH ROD MAXIMUM RUNOUT
260 and 289 ..... 0.015
Other Engines 0.025

VALVE TAPPET DIAMETER—Standard
All Engines 0.8740-0.8745

VALVE TAPPET TO TAPPET BORE CLEARANCE
All Engines ..... 0.0005-0.0020—Wear Limit 0.005

HYDRAULIC VALVE LIFTER LEAK DOWN RATE—Wear Limit
All Engines ..... 10-100 Seconds

ROCKER ARM TO ROCKER ARM SHAFT CLEARANCE
170 and 200 ..... 0.002-0.0045—Wear Limit 0.006

ROCKER ARM SHAFT O.D.
170 and 200 ..... 0.780-0.781

ROCKER ARM BORE DIAMETER
170 and 200 ..... 0.783-0.784

CAMSHAFT AND TIMING CHAIN

CAMSHAFT JOURNAL DIAMETER—Standard
170 and 200 ..... 1.8095-1.8105
260 and 289 #1 ..... 2.0805-2.0815
260 and 289 #2 ..... 2.0655-2.0665
260 and 289 #3 ..... 2.0505-2.0515
260 and 289 #4 ..... 2.0355-2.0365
260 and 289 #5 ..... 2.0205-2.0215

CAMSHAFT JOURNAL TO BEARING CLEARANCE
All Engines ..... 0.001-0.003—Wear Limit 0.006

CAMSHAFT JOURNAL MAXIMUM OUT-OF-ROUND
All Engines 0.0005

TIMING CHAIN MAXIMUM DEFLECTION
All Engines 0.5

CAMSHAFT LOBE LIFT
Intake and Exhaust
170 ..... 0.232—Wear Limit 0.227
200 ..... 0.245—Wear Limit 0.240
260 ..... 0.2375—Wear Limit 0.2325
289 (Except High Performance) ..... 0.2303—Wear Limit 0.2253
289 High Performance ..... 0.2983—Wear Limit 0.2933

CAMSHAFT END PLAY
All Engines ..... 0.001-0.007—Wear Limit 0.012

CAMSHAFT BEARINGS

INSIDE DIAMETER	
170 and 200	1.8115-1.8125
No. 1 bearing is installed with the front edge 0.115 to 0.125 inch toward the rear from the front face of the cylinder block.	
260 and 289 #1	2.0825-2.0835
260 and 289 #2	2.0675-2.0685
260 and 289 #3	2.0525-2.0535
260 and 289 #4	2.0375-2.0385
260 and 289 #5	2.0225-2.0235
No. 1 bearing is installed with the front edge 0.005 to 0.020 inch toward the rear from the front face of the cylinder block.	

CRANKSHAFT

MAIN BEARING JOURNAL DIAMETER	
Standard	
All Six	2.2482-2.2490
All V-8 Coded Red	2.2486-2.2490
Coded Blue	2.2482-2.2486
MAIN BEARING JOURNAL RUNOUT—Maximum	
170 and 200	0.0025—Wear Limit 0.0035
260 and 289	0.002—Wear Limit 0.003
CONNECTING ROD AND MAIN BEARING JOURNALS MAXIMUM OUT-OF-ROUND	
All Engines	0.0004
CONNECTING ROD AND MAIN BEARING JOURNALS MAXIMUM TAPER	
All Engines	0.0003 per inch
THRUST BEARING JOURNAL LENGTH	
170 and 200	1.275-1.277
260 and 289	1.137-1.139
MAIN BEARING JOURNAL THRUST FACE RUNOUT	
All Engines	0.001
CONNECTING ROD JOURNAL DIAMETER	
Standard	
170 and 200	2.1232-2.1240
260 Coded Red	2.1236-2.1240
Coded Blue	2.1232-2.1236
289 Coded Red	2.1232-2.1236
Coded Blue	2.1228-2.1232
CRANKSHAFT FREE END PLAY	
All Engines	0.004-0.008—Wear Limit 0.012
ASSEMBLED FLYWHEEL CLUTCH FACE MAXIMUM RUNOUT	
All Six	0.007
All V-8	0.010
ASSEMBLED FLYWHEEL O.D. MAXIMUM RUNOUT	
Standard Transmission	
All Six	0.018
All V-8	0.007
Automatic Transmission	
All Engines	0.020

MAIN BEARINGS

JOURNAL CLEARANCE	
170 and 200	0.0007-0.0026
260	0.0007-0.0030
289	0.0005-0.0028
BEARING WALL THICKNESS FOR STANDARD AND UNDERSIZE JOURNAL	
170 and 200 Coded Red	0.0754-0.0759
Coded Blue	0.0758-0.0763
0.002 U.S.	0.0768-0.0773
260 Coded Red	0.0955-0.0958
Coded Blue	0.0959-0.0962
0.002 U.S.	0.0969-0.0972
289 Coded Red	0.0954-0.0959
Coded Blue	0.0958-0.0963
0.002 U.S.	0.0968-0.0973

CONNECTING ROD

PIN BORE STANDARD DIAMETER	
Standard	
All Engines Except 289	0.9107-0.9112
289	0.9104-0.9112
BEARING BORE DIAMETER—Standard	
170 and 200	2.2390-2.2398
260 and 289 Coded Red	2.2390-2.2394
Coded Blue	2.2394-2.2398
BEARING BORE MAXIMUM OUT-OF-ROUND	
170 and 200	0.0003-0.0004
260 and 289	0.0004
BEARING BORE MAXIMUM TAPER	
All Engines	0.0004
CONNECTING ROD LENGTH—Center to Center	
170 and 200	4.714-4.716
260 and 289	5.154-5.157
CONNECTING ROD*	
Twist Maximum Total Difference	
All Six	0.008
All V-8	0.012
Bend Maximum Total Difference	
All Engines	0.004
*Piston pin bore and crankshaft bearing bore must be parallel and in the same vertical plane within the specified total difference at ends of 8-inch long bar measured 4-inches on each side of rod.	
CONNECTING ROD ASSEMBLY—Assembled to Crankshaft	
Side Clearance	
170 and 200	0.0035-0.0105—Wear Limit 0.014
260	0.006-0.016—Wear Limit 0.019
289	0.010-0.020—Wear Limit 0.023

CONNECTING ROD BEARINGS

BEARING TO CRANKSHAFT CLEARANCE	
170	0.0006-0.0022
200	0.0006-0.0026
260 and 289	0.0009-0.0029
BEARING WALL THICKNESS FOR STANDARD AND UNDERSIZE JOURNAL	
All Six Coded Red	0.0571-0.0574
0.002 U.S.	0.0583-0.0588
All V-8 Coded Red	0.0569-0.0574
Coded Blue	0.0573-0.0578
0.002 U.S.	0.0583-0.0588

PISTON

PISTON DIAMETER—At Right Angle to Pin Centerline	
Color Coded Red	
170	3.4987-3.4982
200	3.6784-3.6778
260	3.7976-3.7982
289 (Except High Performance)	3.9984-3.9990
289 High Performance	3.9978-3.9984
Color Coded Blue	
170	3.4988-3.4994
200	3.6790-3.6796
260	3.7988-3.7994
289 (Except High Performance)	3.9996-4.0002
289 High Performance	3.9990-3.9996
PISTON TO BORE CLEARANCE	
170	0.0021-0.0027
200	0.0020-0.0026
260	0.0021-0.0039
289 (Except High Performance)	0.0014-0.0022
289 High Performance	0.0030-0.0038
PISTON PIN BORE DIAMETER	
All Six	0.9122-0.9125
All V-8	0.9124-0.9127

PISTON (Continued)

RING GROOVE WIDTH	
Upper Compression Ring	
170	0.0790-0.0800
200	0.0805-0.0815
260 and 289	0.0800-0.0810
Lower Compression Ring	
170	0.0790-0.0800
200	0.0805-0.0815
260	0.0950-0.0960
289	0.0800-0.0810
Oil Ring	
All Engines	0.1880-0.1890

PISTON PIN

PISTON PIN DIAMETER	
Standard	
All Engines	0.9119-0.9124
PISTON PIN LENGTH	
All Engines	3.010-3.040
PISTON PIN TO PISTON CLEARANCE—Loose	
All Engines	0.0003-0.0005—Wear Limit 0.0008

PISTON RINGS

RING WIDTH	
Compression Ring	
UPPER	
All Engines	0.0774-0.0781
LOWER	
170, 200 and 289	0.0770-0.0780
260	0.0930-0.0940
SIDE CLEARANCE	
Compression Ring	
UPPER	
170	0.0009-0.0026
Other Engines	0.0019-0.0036—Wear Limit 0.006
LOWER	
170, 200 and 289	0.0020-0.0040—Wear Limit 0.006
260	0.0010-0.0040—Wear Limit 0.006
Oil Ring	
All Engines	Snug
RING GAP WIDTH	
Compression Ring—Standard Bore—Upper and Lower	
170, 200 and 289	0.010-0.020
260	0.010-0.032
Oil Ring*—Standard Bore	
170 and 200	0.015-0.055
260	0.015-0.067
289	0.015-0.069
*Steel Rail	

CYLINDER BLOCK

CYLINDER BORE DIAMETER—Standard Spreads for 8 Grades	
170	3.5000-3.5024
200	3.6800-3.6824
260	3.8003-3.8027
289	4.0000-4.0024
CYLINDER BORE MAXIMUM OUT-OF-ROUND	
All Engines	0.001—Wear Limit 0.005
CYLINDER BORE TAPER	
All Engines	0.001—Wear Limit 0.010
HEAD GASKET SURFACE FLATNESS	
170 and 200	0.003 inch in any 6 inches or 0.007 inch overall
260 and 289	0.003 inch in any 6 inches or 0.006 inch overall
MAIN BEARING BORE DIAMETER	
170 and 200 Coded Red	2.4012-2.4016
Coded Blue	2.4016-2.4020
260 and 289 Coded Red	2.4412-2.4416
Coded Blue	2.4416-2.4420

OIL PUMP—Rotor Type

RELIEF VALVE SPRING TENSION—Lbs. @ Specified Length	
170 and 200	8.6-9.5 @ 1.078
260 and 289	11.15-11.75 @ 1.704
RELIEF VALVE CLEARANCE	
All Engines	0.0015-0.0029
DRIVE SHAFT TO HOUSING BEARING CLEARANCE	
All Engines	0.0015-0.0029
ROTOR ASSEMBLY END CLEARANCE—Pump Assembled	
All Engines	0.0011-0.0041
OUTER RACE TO HOUSING—Radial Clearance	
All Engines	0.006-0.012

TORQUE LIMITS—Ft-Lbs

MAIN BEARING CAP BOLTS—Oiled Threads	
All Engines	60-70
CYLINDER HEAD BOLTS—Oiled Threads	
170 and 200	70-75
260 and 289	65-70
OIL PAN TO CYLINDER BLOCK	
170 and 200	7-9
260 and 289 ¼-20 Bolt	7-9
5/16-18 Bolt	9-11
MANIFOLDS TO CYLINDER HEAD	
Intake	
260 and 289	14-16
Exhaust	
All Engines	13-18
FLYWHEEL TO CRANKSHAFT	
All Engines	75-85
OIL PUMP TO CYLINDER BLOCK	
170 and 200	12-15
260 and 289	23-28
OIL PUMP COVER PLATE	
All Engines	6-9
OIL FILTER ADAPTER TO CYLINDER BLOCK	
170 and 200	10-15
260 and 289	60-100
OIL FILTER TO ADAPTER OR CYLINDER BLOCK	
All Engines	With grease on the gasket surface, hand tighten until gasket contacts adapter face. Then tighten ½ turn more.
CYLINDER FRONT COVER	
170 and 200	7-9
260 and 289	12-15
WATER OUTLET HOUSING	
All Engines	12-15
OIL PAN DRAIN PLUG	
All Engines	15-20
CAMSHAFT THRUST PLATE TO CYLINDER BLOCK	
170 and 200	12-15
260 and 289	6-9
WATER PUMP TO CYLINDER BLOCK OR FRONT COVER	
All Engines	12-15
CAMSHAFT SPROCKET TO CAMSHAFT	
170 and 200	35-45
260 and 289	30-35
DAMPER OR PULLEY TO CRANKSHAFT	
170 and 200	85-100
260 and 289	70-90
CONNECTING ROD NUTS	
All Except 289 High Performance	19-24
289 High Performance	40-45
VALVE ROCKER ARM COVER	
All Engines	3-5

TORQUE LIMITS—Ft-Lbs (Continued)

VALVE ROCKER SHAFT SUPPORT TO CYLINDER HEAD	
170 and 200	30-35
VALVE ROCKER ARM ADJUSTING NUT	
260 and 289	4.5-15

TORQUE LIMITS—Ft-Lbs (Continued)

OIL INLET TUBE TO OIL PUMP	
All Engines	12-15
FUEL PUMP TO CYLINDER BLOCK OR CYLINDER FRONT COVER	
All Engines	12-15

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

CAUTION: If any of the torque limits listed in this table disagree with any of those listed in the preceding table, the limits listed in the preceding tables prevail.

Size (Inches)	1/4-20	1/4-28	5/16-18	5/16-24	3/8-16	3/8-24
Torque (Ft-lbs)	6-9	6-9	12-15	15-18	23-28	30-35
Size (Inches)	7/16-14	7/16-20	1/2-13	1/2-20	9/16-18	5/8-18
Torque (Ft-lbs)	45-50	50-60	60-70	70-80	85-95	130-145

SPECIAL TOOLS

Description	Ford Tool No.	Former No.	Application in engine size			
			170	200	260	289
Impact Slide Hammer (Replaces OTC-927)	T59L-100-B	—	X	X	X	X
Puller Attachment—Use with T50T-100-A or T59L-100-B	T58L-101-A	OTC-927	X	X	X	X
Handle Adapter	T53L-200-A	—	X	X	X	X
Engine Lifting Sling	T53L-300-A	6000-BA			X	X
Engine and Transmission Assembly Lifting Hook	T60K-6000-A	6000-AE	X	X		
Adapter Mount To fit K R. Wilson 1009 or Manzel 6001-TES	T64L-6001-B or T64L-6001-C	T52T-6005-CJD T52T-6005-KJD TOOL-6001-FBA	X	X	X	X
Cylinder Front Cover Pilot	T61K-6019-A	4222-M 6059-D 6059-E	X	X		
Cylinder Front Cover Pilot	T61P-6019-B	6059-F			X	X
Engine Lifting and Head Holding Brackets	T62F-6085-A	6005-BDA			X	X
Valve Guide Reamer Kit	T60K-6085-B	6085-AE	X	X	X	X
Piston Pin Remover and Replacer Press	T60K-6135-A	6135-J	X	X	X	X
Camshaft Bearing Remover and Replacer Adapters	T65L-6250-A	T52L-6261-CEE	X	X	X	X
Cylinder Head Core Plug, Cylinder Block Core Plug and Camshaft Bearing Bore Plug Replacer	T52L-6266-BGD	6266-B	X	X		
Camshaft Rear Bearing Bore Plug Replacer—Adapter—Use with T53L-200-A	T62F-6266-A	—			X	X
Crankshaft Sprocket and Crankshaft Damper Replacer	T52L-6306-AEE	3355-D 6306-AC	X	X	X	X
Crankshaft Damper Remover	T58P-6316-B	—	X	X	X	X
Crankshaft Damper Remover Adapter Screw—Use with T58P-6316-B	T62F-6316-B	—			X	X
Upper Main Bearing Insert Remover and Replacer	TOOL-6331	6331	X	X	X	X
Solid Tappet Remover	T52T-6500-DJD	6500-D			X	X
Hydraulic Tappet Leakdown Tester	TOOL-6500-E	6500-E	X	X	X	X

SPECIAL TOOLS (Continued)

Description	Ford Tool No.	Former No.	Application in engine size			
			170	200	260	289
Valve Stem Clearance Checking Tool	TOOL-6505-G	6505-G	X	X	X	X
Tru-Valve Gauge	T64L-6507-A	—	X	X	X	X
Valve Spring Compressor	T65P-6513-A	—	X	X		
Compressor—Tappet Bleed-Down	TOOL-6513-AC	6513-AC			X	X
Valve and Clutch Spring Tester	TOOL-6513-DD	6513-DD	X	X	X	X
Push Rod Check Compressor	TOOL-6513-K	6513-K	X	X		
Rocker Arm Stud Kit	T62F-6A527-A	6527-A, B			X	X
Cup Shaped Adapter to Tool-6565	TOOL-6565-AB	6565-AB	X	X	X	X
Valve Spring Compressor	T62F-6565-A	6513-HH			X	X
Cylinder Block Front Cover Oil Seal Replacer Adapter	T58P-6700-B	6700-B			X	X
Cylinder Block Front Cover Oil Seal Replacer Adapter	T60K-6700-A	6700-C	X	X		
Crankshaft Rear Oil Seal Forming Tool	T60K-6701-A	6701-E	X	X		
Crankshaft Rear Seal Replacer	T62F-6701-A	6701-E			X	X
Clutch Disc Alignment Pilot	TOOL-7563-E	7563-E	X	X		
Clutch Pilot Bearing Replacer	TOOL-7600-H	7600-H	X	X	X	X

IGNITION SYSTEM

GROUP 9

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PART 9-1 GENERAL IGNITION SERVICE

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1 DIAGNOSIS AND TESTING

GENERAL INFORMATION

The ignition system consists of a primary (low voltage) and a secondary (high voltage) circuit (Fig. 1).

The primary circuit consists of the:

1. Battery.
2. Ignition switch.
3. Primary circuit resistance wire.
4. Primary windings of the ignition coil.
5. Breaker points.
6. Condenser.

The secondary circuit consists of the:

1. Secondary windings of the ignition coil.
2. Distributor rotor.
3. Distributor cap.
4. High tension wires.
5. Spark plugs.

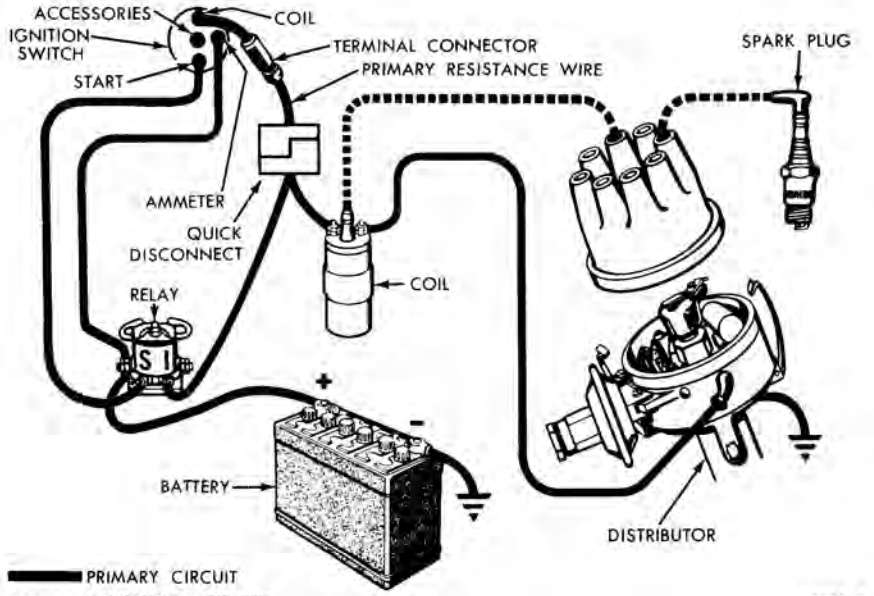


FIG. 1—Typical Ignition System Circuit

When the breaker points are closed, the primary or low voltage current flows from the battery through the ignition switch to the primary windings in the coil, then to ground through the closed breaker points. When the breaker points open, the magnetic field built up in the primary windings of the coil moves through the secondary windings of the coil producing high voltage current. **High voltage current is produced each time the breaker points open.** The high voltage flows through the coil high tension lead to the distributor cap where the rotor distributes it to one of the spark plug terminals in the distributor cap. This process is repeated for every power stroke of the engine.

IGNITION SYSTEM DIAGNOSIS

TROUBLE ISOLATION

Ignition system troubles are caused by a failure in the primary and/or the secondary circuit or incorrect ignition timing. If an engine trouble has been traced to the ignition system from the "Engine Trouble Diagnosis Guide," the trouble can be found by

performing an ignition system test on a scope or by further isolating the trouble to the primary or secondary circuit as follows:

1. Disconnect the brown wire from the starter relay "I" terminal and the red and blue wire from the starter relay "S" terminal.

2. Remove the coil high tension lead from the distributor cap.

3. Turn on the ignition switch.

4. While holding the high tension lead approximately 3/16 inch from the cylinder head or any other good ground, crank the engine by using an auxiliary starter switch between the starter relay battery and "S" terminals.

If the spark is good, the trouble lies in the secondary circuit.

If there is no spark or a weak spark, the trouble is in the primary circuit, coil to distributor high tension lead, or the coil.

Primary Circuit. A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring, or loose or corroded terminals.

2. Burned, shorted, sticking or improperly adjusted breaker points.

3. A defective coil.

4. A defective condenser.

To isolate a trouble in the primary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch from the starter relay.

Install the coil high tension lead in the distributor cap, the red and blue wire on the starter relay "S" terminal and the brown wire on the starter relay "I" terminal.

Now perform a primary circuit test.

Secondary Circuit. A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.

2. Defective high tension wiring.

3. High tension leakage across the coil, distributor cap or rotor.

To isolate a trouble in the secondary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch from the starter relay.

Install the coil high tension lead in the distributor cap, the red and blue wire on the starter relay "S" terminal and the brown wire on the starter relay "I" terminal.

Now perform a secondary circuit test.

PRIMARY CIRCUIT TESTS

A complete test of the primary circuit consists of checking the circuit from the battery to the coil, the circuit from the coil to ground, and the starting ignition circuit.

Excessive voltage drop in the primary circuit will reduce the secondary output of the ignition coil, resulting in hard starting and poor performance.

Battery to Coil Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 2.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn the lights and accessories off.

4. Turn the ignition switch on.

RESULTS. If the voltmeter reading is 6.9 volts or less, the primary circuit from the battery to the coil is satisfactory.

If the voltmeter reading is greater than 6.9 volts, check the following:

1. The battery and cables for loose connections or corrosion.

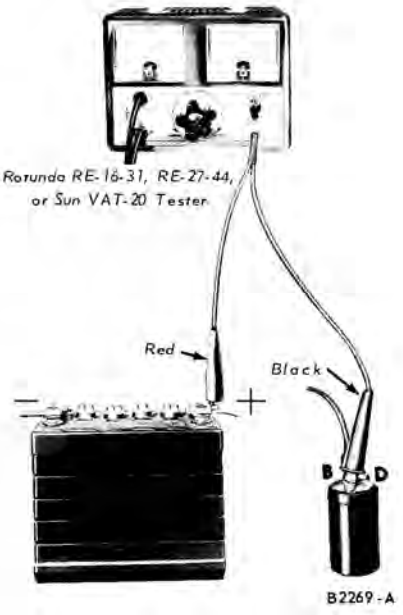


FIG. 2—Battery to Coil and Starting Ignition Circuit Test

2. The primary wiring for worn insulation, broken strands, and loose or corroded terminals.

3. The resistance wire for defects.

4. The relay to ignition switch for defects.

Starting Ignition Circuit Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 2.

2. Disconnect and ground the coil to distributor high tension lead at the distributor.

3. With the ignition switch off, crank the engine by installing a jumper wire between the battery and the "S" terminal of the starter relay while observing the voltage drop.

RESULTS. If the voltage drop is 0.1 volt or less, the starting ignition circuit is satisfactory.

If the voltage drop is greater than 0.1 volt, clean and tighten the terminals in the circuit or replace the wiring as necessary.

Ignition Switch Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 3.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor body.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

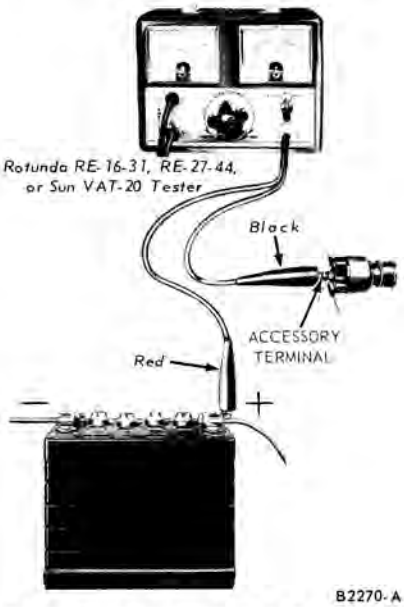


FIG. 3—Ignition Switch Test

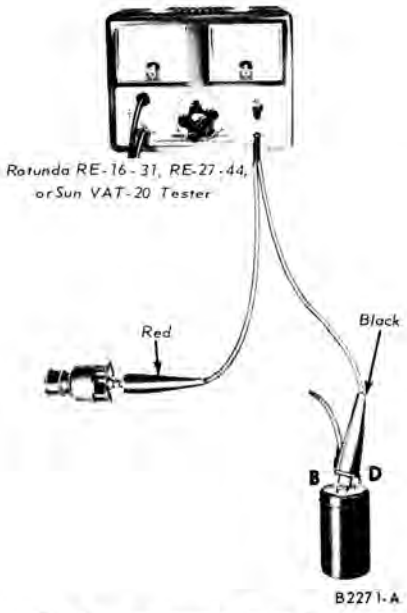


FIG. 4—Resistance Wire Test

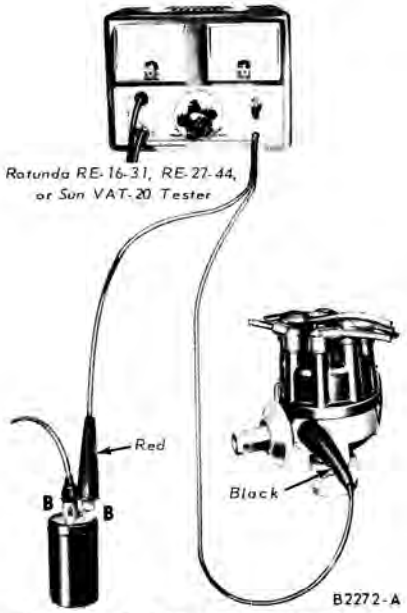


FIG. 5—Coil to Ground Test

RESULTS. If the voltmeter reading is 0.3 volt or less, the ignition switch and the relay to switch wire are satisfactory.

If the voltmeter reading is greater than 0.3 volt, either the ignition switch and/or the wire are defective.

Resistance Wire Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 4.

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

RESULTS. If the voltmeter reading is 6.6 volts or less, the resistance wire is satisfactory.

If the voltmeter reading is greater than 6.6 volts, replace the resistance wire.

Coil to Ground Test

PROCEDURE

1. Connect the voltmeter leads as shown in Fig. 5.

2. Close the breaker points.

3. Turn all lights and accessories off.

4. Turn the ignition switch on.

RESULTS. If the voltmeter reading is 0.1 volt or less, the primary circuit from coil to ground is satisfactory.

If the voltmeter reading is greater than 0.1 volt, test the voltage drop of each of the following:

1. Coil to distributor primary wire.

2. The movable breaker point and the breaker plate.

3. The breaker plate and the distributor housing.

4. The distributor housing and engine ground.

Breaker Points. The breaker points are tested by following the procedure under "Ignition System Tests."

Coil. The coil is tested by following the instructions under "Ignition System Tests" in this section of the manual.

Condenser. The condenser is tested by following the instructions under "Ignition System Tests" in this section of the manual.

SECONDARY CIRCUIT TESTS

The following procedure is used on both ignition systems.

Preliminary Checks

1. Remove the coil to distributor high tension lead and the spark plug wires from the distributor cap and from the spark plugs. Inspect the terminals for looseness and corrosion. Inspect the wires for breaks and cracked insulation. Replace all defective wiring.

2. Clean the inside of the distributor cap, and inspect it for cracks, burned contacts or permanent carbon tracks. Remove dirt or corrosion from the sockets. Replace the cap if it is defective.

3. Inspect the rotor for cracks or defects. Replace the rotor if it is defective.

Secondary (High Tension) Wires. The secondary wires include the wires connecting the distributor cap to the spark plugs and the wire connecting the center terminal of the distributor cap to the center terminal of the ignition coil.

With the exception of the optional wires on high performance engines, these wires are the radio resistance-type which filter out the high frequency electrical impulses that are the source of ignition noise interference. The resistance of each wire should not exceed 24,500 ohms.

The optional wires used on high performance engines are solid core wires. There should be little or no resistance in these wires.

When checking the resistance of the wires or setting ignition timing, do not puncture the wires with a probe. The probe may cause a separation in the conductor.

At regular intervals, clean and inspect the wires for cracked insulation and loose terminals. Repair or replace the wires as required. A spark plug wire set is available for service.

When removing the wires from the spark plugs, grasp and twist the moulded cap, then pull the cap off the spark plug. Do not pull on the wire because the wire connection inside the cap may become separated or the insulator seal may be damaged.

SPARK INTENSITY

1. Disconnect a spark plug wire. **Check the spark intensity of one wire at a time.**

2. Install a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16-inch from the exhaust manifold and crank the engine, using a remote starter switch. The spark should jump the gap regularly.

3. If the spark intensity of all the wires is satisfactory, the coil, condenser, rotor, distributor cap and the secondary wires are probably satisfactory.

If the spark is good at only some wires, perform a high resistance test of the faulty leads.

If the spark is equal at all wires, but weak or intermittent, make a high resistance check of the coil, distributor cap and the coil to distributor high tension wire.

Spark Plugs. Clean, inspect and gap the plugs following the instructions in Sections 2 and 3. After the proper gap is obtained, check the plugs on a testing machine. Compare the sparking efficiency of the cleaned and gapped plug with a new plug. Replace the plug if it fails to meet 70% of the new plug performance.

Test the plugs for compression leakage at the insulator seal. Apply a coating of oil to the shoulder of the plug where the insulator projects through the shell, and to the top of the plug, where the center electrode and terminal project from the insulator. Place the spark plug under pressure with the tester's high tension wire removed from the spark plug. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the plug. If the plug is satisfactory, wipe it clean.

Ignition Timing. Incorrect ignition timing can be caused by:

1. Timing incorrectly adjusted.

2. Distributor bushing and/or shaft worn, or a bent distributor shaft.

3. Defective vacuum advance system.

4. Defective centrifugal advance system.

IGNITION SYSTEM TESTS—ROTUNDA TESTERS

TEST CONNECTIONS—RE 27-55, RE-651 AND RE-881

The test connections for the RE-27-55 tester are shown in Fig. 6, the test connections for the RE-651 tester are shown in Fig. 7, and the test connections for the RE-881 tester are shown in Fig. 8.

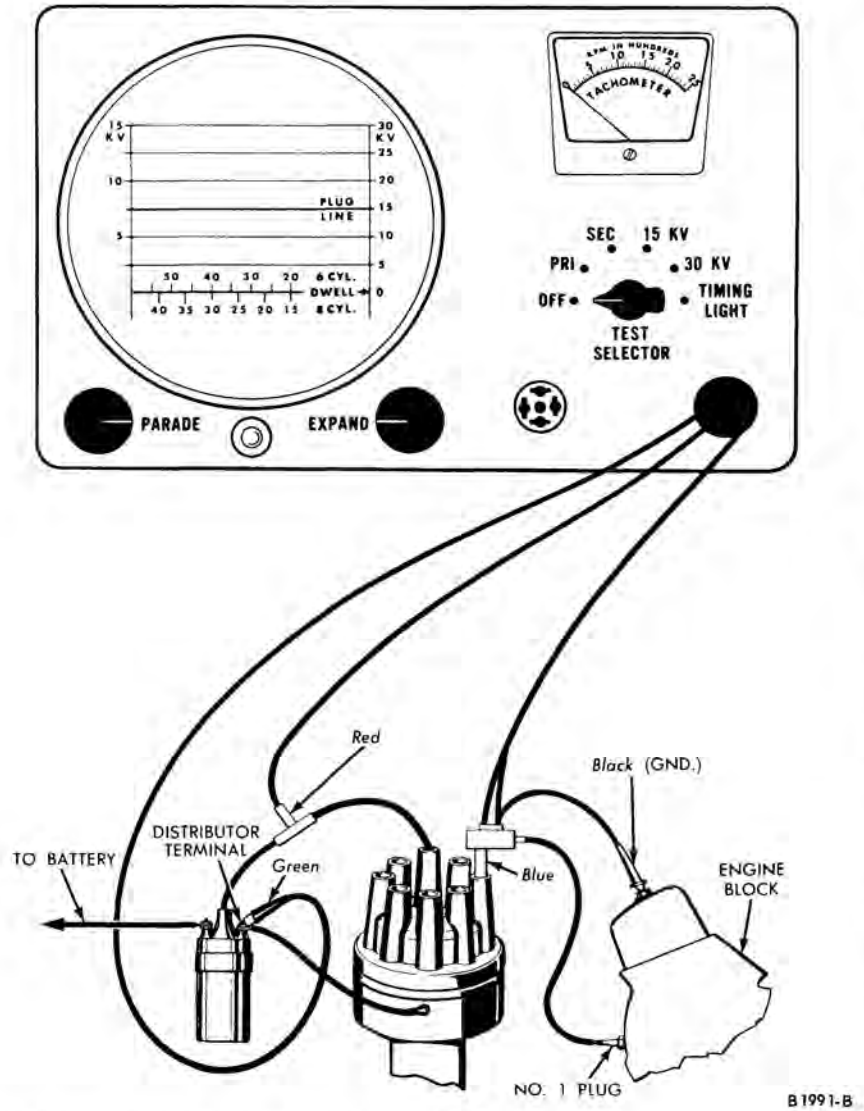


FIG. 6—Rotunda RE-27-55 Test Connections

1. With the tester turned off, plug the power plug into a proper AC outlet.

2. Connect the green lead to the distributor terminal of the coil.

3. Remove the No. 1 plug wire from the distributor cap, place the blue pickup in the cap and place the plug wire in the pickup.

4. On the RE-27-55 tester, connect the black lead to a good ground.

5. Clip the red pickup over the coil-to-distributor high tension wire.

6. If the engine timing is to be checked, plug the timing light into its socket.

The following steps pertain to the RE-651 and RE-881 testers only.

7. Disconnect the battery positive cable at the battery.

8. Install the battery adapter to the battery post.

9. Connect the battery positive cable to the battery adapter.

10. Connect the shunt to the adapter.

11. Connect the shunt spade terminal and the yellow lead to the battery cable post on the battery adapter.

12. Turn the ground polarity switch to the minus position. On the RE-881 tester, turn the volts switch to the 20-volt position.

POINT RESISTANCE TEST

RE-651 Tester

1. Remove and ground the high tension wire from the center of the distributor.

2. Turn the volts switch to the point resistance (PT. RES.) position. The points should be closed for this test. If the breaker points are open, the meter will read the battery voltage (0 to 40 scale).

3. Disconnect the brown wire ("I" terminal) and the red and blue wire ("S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay. With the ignition switch "ON", tap the auxiliary starter switch until the lowest voltmeter reading is obtained.

4. Depress the PT. RES. pushbutton.

5. The voltmeter pointer should read within the 12V area as shown in black on the meter dial. If not,

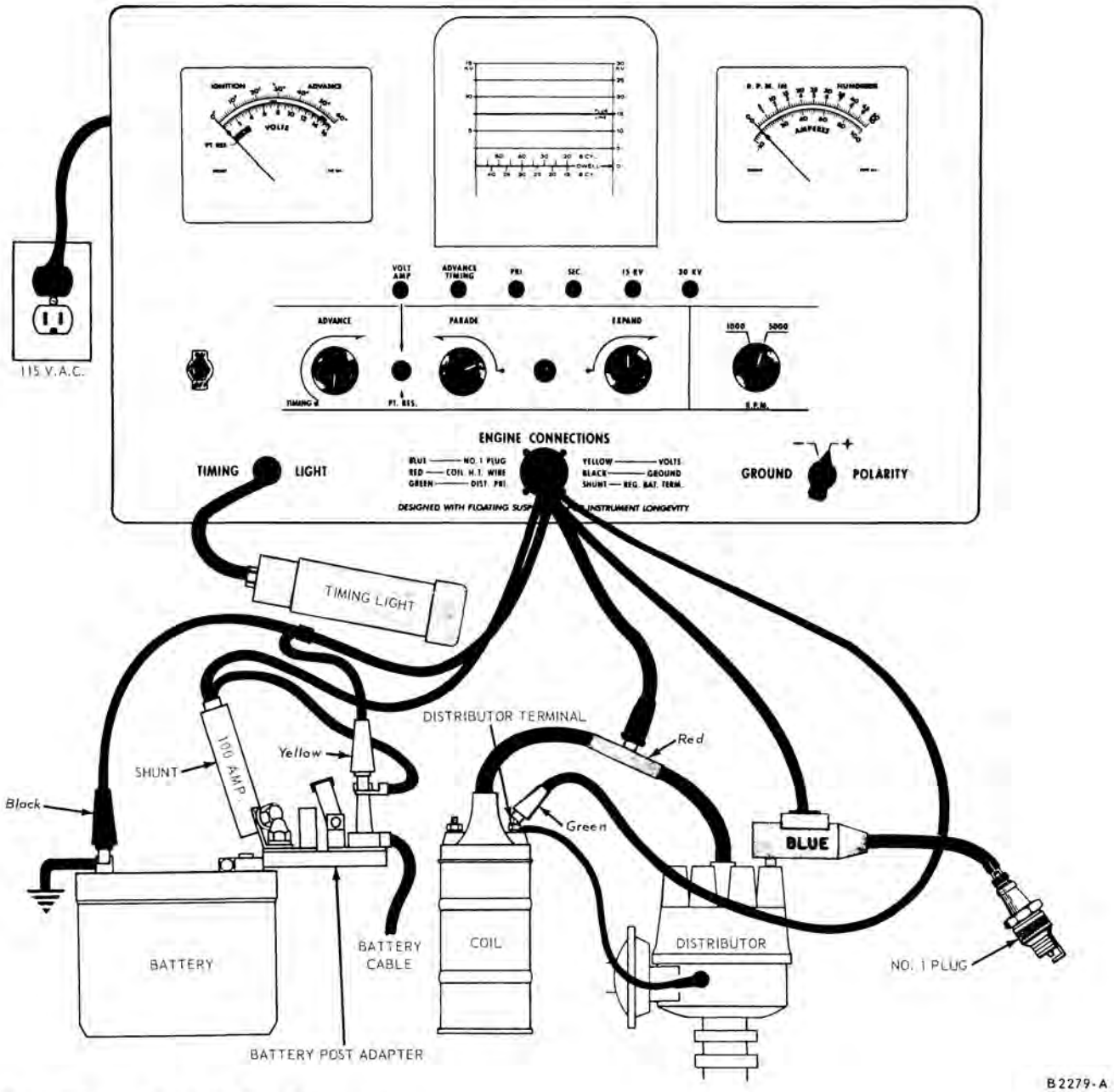


FIG. 7—Rotunda RE-651 Test Connections

check for incorrect breaker point spring tension or for burned or pitted points.

6. Connect the high tension wire to the distributor.

7. Remove the auxiliary starter switch from starter relay and connect the brown wire and the red and blue wire to the starter relay.

RE-881 Tester

1. Remove and ground the high tension wire from the center of the distributor.

2. Disconnect the brown wire ("I" terminal) and the red and blue wire ("S" terminal) at the starter relay. Install an auxiliary starter switch between the battery and "S" terminals of the starter relay. With the ignition switch "ON", tap the auxiliary starter switch until the lowest voltmeter reading is obtained.

3. The voltmeter pointer should read in the black, OK PT. RES. area. If it doesn't, check for improper breaker point spring tension, a loose or defective primary or ground wire or for burned or pitted points.

4. Connect the high tension wire to the distributor.

5. Remove the auxiliary starter switch from starter relay and connect the brown wire and the red and blue wire to the starter relay.

IGNITION TIMING

Refer to Section 2 of this part for the timing mark locations.

Disconnect the vacuum line. If necessary, clean and mark the desired timing mark.

RE-27-55 Tester

1. Start the engine and allow it to warm up.

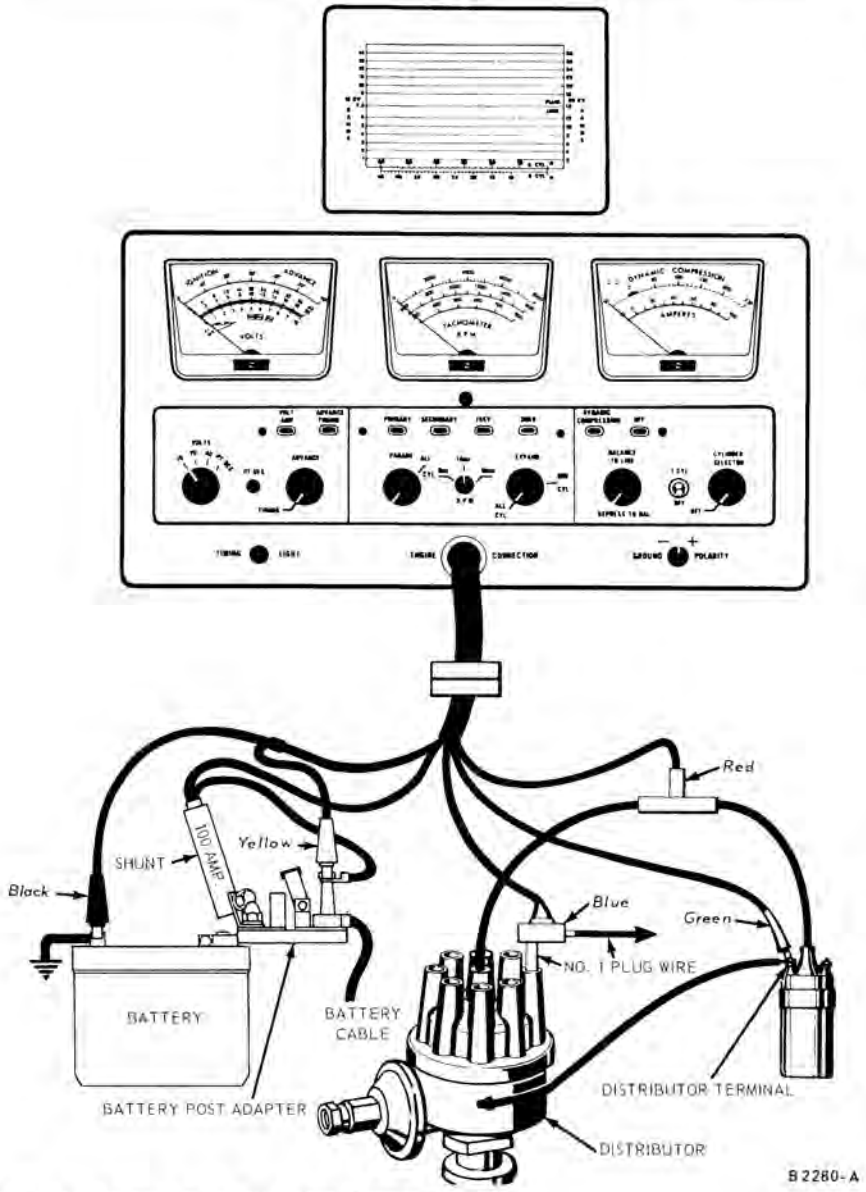


FIG. 8—Rotunda RE-881 Test Connections

2. Operate the engine below 550 rpm and point the timing light towards the pointer. The desired timing mark should line up with the pointer. If it doesn't, loosen the distributor hold down bolt(s) and rotate the distributor until the mark lines up with the pointer. Now tighten the hold down bolt(s) and check the timing.

RE-651 Tester

1. Turn the rpm selector to the 1000 position.

2. Depress the advance timing pushbutton.

3. Start the engine and allow it to warm up.

4. Operate the engine below 550 rpm.

5. Turn the advance knob until the ignition advance meter reads 0°.

6. Point the timing light towards the timing pointer. The desired timing mark should line up with the pointer. If it doesn't, loosen the distributor hold down bolt(s) and rotate the distributor until the desired timing mark and pointer line up. Tighten the distributor hold down bolt(s) and check the timing.

RE-881 Tester. The method of testing is the same as the RE-651 tester with the exception of Step 1 which should (for the RE-881) read "turn the rpm selector to the 800 position."

SUPERIMPOSED PRIMARY PATTERN

Procedure

RE-27-55 TESTER

1. With the engine running at 1000 rpm, turn the test selector switch to the primary (PRI) position.

2. Adjust the parade control to position the left end of the pattern at the left vertical line on the screen.

3. Adjust the expand control so that the right end of the pattern is at the right vertical line on the screen.

RE-651 TESTER

1. Turn the rpm selector to the 5000 position. Start the engine and adjust it to 1000 rpm.

2. Depress the PRI. pushbutton on the console panel.

3. Adjust the parade and expand controls to position the left end of the pattern at the left vertical line on the screen and the right end of the pattern at the right vertical line on the screen.

RE-881 TESTER. The test procedure for the RE-881 is the same as the test procedure for the RE-651 except for the setting of the rpm selector. For the RE-881 tester, the rpm selector is turned to the 1600 position.

Results. A normal test pattern for an eight cylinder engine is shown in Fig. 9. The six cylinder test pattern would be very similar, the only difference would be the dwell value.

Point A indicates the spark plug line which is the time when the points open. At B, the coil energy is used up sufficiently so that the plug no longer fires and only the energy stored in the breaker point con-

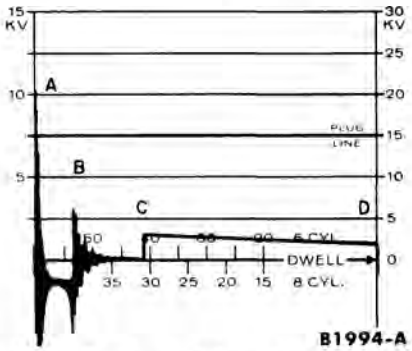


FIG. 9—Normal Superimposed Primary Pattern

denser remains. This coil/condenser oscillation which is indicated in the pattern between B and C is completely used up at C which is the points close mark. The portion of the pattern between C and D is the points close time, which is cam angle or dwell time. At D, the points again open and the firing cycle repeats.

If points A and C are below the 0 line, the battery polarity is incorrect. This could be caused by a battery that is either installed incorrectly or improperly charged, causing a polarity reversal.

If the firing line is not below the 0 horizontal line and there are no oscillations at point C, there is an open circuit at the coil high tension tower. This could be caused by a broken wire inside the coil tower, or a broken center contact on the distributor rotor.

If the dwell time is too short, the breaker points are incorrectly set (the larger the gap, the smaller the dwell).

If point A is at a reduced height, and the distance to B is short or nonexistent, and the oscillations at point C are reduced in height, there is a high resistance in the coil primary circuit. This could be caused by a fouled plug, defective ignition switch, or a bad wire or connection. If the scope pattern is still the same after the above ignition parts have been checked and proven satisfactory, run the 15 KV test to check for a gasket leak or a lean fuel mixture.

If point A is at a greatly reduced height and there are no oscillations at point B, the coil has a defective primary winding or the condenser has an excessive series resistance.

If there is a variation of more than 3° at point C, the cam lobes are uneven, the distributor shaft is bent, or the distributor bushings are worn.

SUPERIMPOSED SECONDARY PATTERN

Procedure

RE-27-55 TESTER

1. With the engine running at 1000 rpm, turn the test selector switch to the secondary (SEC.) position.

2. Adjust the parade and expand controls so that the left end of the pattern is at the left vertical line on the screen and the right end of the pattern is at the right vertical line on the screen.

RE-651 AND RE-881 TESTERS. The procedure is the same as the procedure for the primary (superimposed) except, the SEC. pushbutton is depressed instead of the PRI. pushbutton.

Results. A normal test pattern for an eight cylinder engine is shown in Fig. 10. The six cylinder test pattern would be very similar, the only difference would be the dwell value.

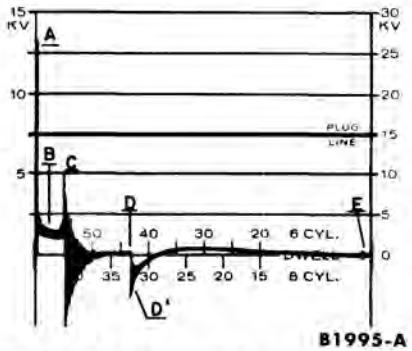


FIG. 10—Normal Superimposed Secondary Pattern

Point A is the points open time. The height of the pattern at point A indicates the high tension voltage required to overcome the spark plug gap resistance.

Point B is the plug firing line. Notice that this portion of the pattern is quite thick. Remember that this pattern is actually 6 or 8 firing patterns superimposed one on top of the other. This increase in thickness of the pattern at B is caused by slight variations in the plug gap, distributor rotor gap and slight differences in the resistance of the individual spark plug circuits.

The pattern area between points C and D shows the coil/condenser oscillations to be correct. No point bounce at D indicates correct breaker point spring tension.

The few so called damped oscillations appearing at D are normal and are caused by the surge of current through the coil primary winding when the breaker points first close.

This current levels off and decreases slightly toward the points open position at E as indicated by the slight downward slope of the curve at about the 15° mark on the cam angle scale.

To observe the coil/condenser oscillations and the damped oscillations at D' in greater detail, adjust the expand control so that the pattern area between points C and D nearly fills the screen.

If there is erratic action at points C and D, and there is a blotch above point E, the breaker points are burned or badly pitted.

If the length of B is reduced and the pattern between C and D is not superimposed, there is a series gap in the coil high tension tower or wire.

If the line at B is sloping downward greatly (resistor plugs will cause a slight slope), there is a high resistance in the spark plug wires, distributor cap or rotor.

If point D is varying erratically, the distributor is badly worn. If this variation is definite instead of erratic, the advance mechanism in the distributor is defective.

If the dwell line between points D' and E is not the smooth line shown, there is a loose connection in the primary circuit. Check the primary circuit for loose connections, damaged wires or a defective starter switch.

15 KV PATTERN

Procedure

RE-27-55 TESTER. With the engine operating at 1000 rpm, turn the test selector switch to the 15 KV position. Adjust the expand and parade controls to produce the pattern shown in Fig. 11.

RE-651 TESTER. With the rpm selector at the 5000 position and the engine operating at 1000 rpm, depress the 15 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 11.

RE-881 TESTER. With the rpm selector at the 1600 position and the engine operating at 1000 rpm, depress the 15 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 11.

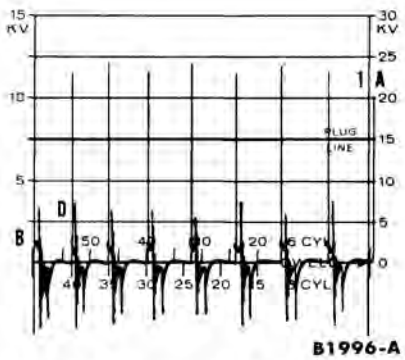


FIG. 11—Normal 15 KV Pattern

Results. A normal eight cylinder engine 15 KV pattern is shown in Fig. 11. The six cylinder pattern would have six similar images. The spark plug line (A) for the No. 1 spark plug is on the extreme right hand side of the screen. The remainder of the No. 1 firing pattern is on the left side of the screen. The remainder of the patterns are shown from left to right in their firing order.

With the exception of the No. 1 spark plug line (which should be shorter than the others), the patterns should be similar. If one of the patterns differs from the others, adjust the expand and parade controls until that pattern fills the screen in the same manner as in the secondary test (Fig. 10).

The following list of symptoms will refer to Fig. 10.

If the points open line (A) is higher than the rest and the plug firing line (B) is sloped downward at an unusually large slope, there is excessive resistance in the high tension wire to that cylinder or in the distributor cap.

If the points open line (A) is low and the firing line (B) is long and nearly straight, the spark plug is shorted out.

If the points open line (A) is low and the firing line (B) is long and wide, the spark plug gap is out of adjustment.

If there are no oscillations at points C or D, the coil primary windings are partially shorted.

If the points open line (A) and the oscillations at point D are both displaced to the right on all cylinders, check the breaker points.

If all of the points open lines (A) are at varied heights, check the idle adjustment of the carburetor (always adjust the idle mixture on the rich side).

30 KV PATTERN

Procedure

RE-27-55 TESTER. With the engine running at 600 rpm, turn the test selector switch to the 30 KV position. Adjust the expand and parade controls to produce the pattern shown in Fig. 12.

RE-651 TESTER. With the rpm selector at the 5000 position and the engine operating at 600 rpm, depress the 30 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 12.

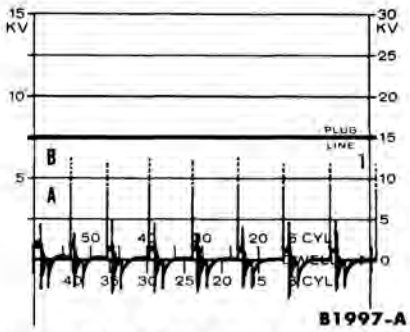


FIG. 12–Normal 30 KV Pattern

RE-881 TESTER. With the rpm selector at the 1600 position and the engine operating at 600 rpm, depress the 30 KV pushbutton. Adjust the expand and parade controls to produce the pattern shown in Fig. 12.

Results. A normal eight cylinder engine 30 KV pattern is shown in Fig. 12. The six cylinder pattern would have six similar images. The spark plug line (A) for the No. 1 spark plug is on the extreme right hand side of the screen. The remainder of the No. 1 firing pattern is on the left side of the screen. The remainder of the patterns are shown from left to right in their firing order.

Notice the average height of the solid part of the points open line. Increase the speed of the engine and notice the height of the dotted lines. The difference is the required ignition output under load. The maximum output should be between 13.5 and 15 KV.

If the maximum for one or more of the plugs is above 15 KV, check the complete circuit(s) of the plug(s) for any trouble that would cause this resistance. If the maximum does not increase during the increase in engine speed, check for a fouled or improperly gapped spark plug or for very low compression.

Remove the high tension wire **at the distributor cap** for any plug except No. 1. Notice the change between the average points open line and the points open line of the

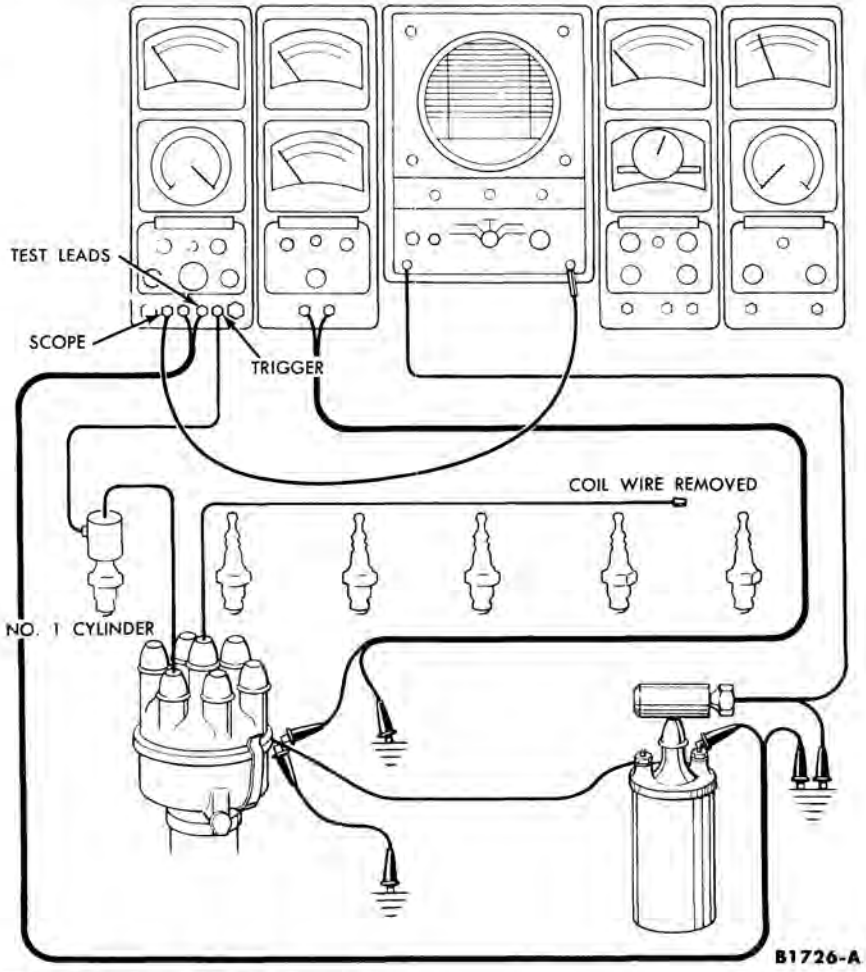


FIG. 13–Sun 900 Test Connections

cylinder with the high tension wire removed. This height difference is the coil reserve. The coil reserve should be at least 30% of the maximum output. If it is less than 30%, replace the coil.

Remove and do not ground one spark plug wire at the spark plug. If a plug firing line shows up on the scope for that cylinder, check the plug wire and distributor cap for bad insulation.

IGNITION SYSTEM TESTS—SUN 900 TESTER

TEST CONNECTIONS

Most of the ignition system can be tested by using the Sun 900 Scope Motor Tester. Make the connections as follows (Fig. 13).

1. Plug the power cord into a proper outlet.

2. Turn the AC master switch to the ON position.

3. Turn the Tach-Dwell selector switch to the calibration (CAL.) position and adjust the dwell calibrator until the meter pointer reads on the SET LINE.

4. Turn the Tach-Dwell rpm switch to the 5000 position.

5. Connect the Tach-Dwell leads; connect the RED insulator lead to the primary distributor lead at the coil. Connect the BLACK insulator lead to a good ground.

6. Connect the trigger pickup into the circuit of the first spark plug in the firing order.

7. Turn the Voltage Leakage unit control counterclockwise to the TIMING position.

8. Connect a jumper lead from the distributor primary to a good ground.

9. Set the Voltage Leakage switch to the 20 V position.

10. Connect the Voltage Leakage test leads; the RED lead is connected to the battery side of the coil and the BLACK lead is connected to a good ground.

11. Remove the high tension wire from the coil and leave the wire disconnected.

12. Insert the scope pattern pickup into the coil tower and attach the ground clip to a good ground.

13. Set the scope ground polarity switch to the POSITIVE (+) position.

14. Turn the scope display selector to the SCOPE CHECK position and adjust the horizontal and vertical knobs until the trace appears on the ZERO (0) line (allow about 30 seconds for warm-up before adjustment).

CRANKING VOLTAGE

1. With the tester connected, turn the ignition switch ON. Make sure that the transmission is in neutral and that the parking brake is set.

2. Crank the engine, observe the speed, and note the reading on the voltmeter.

If the meter reads less than 9 volts, check for the following: weak battery, defective cables, connections, switch, starter, by-pass circuit, or ignition circuit to coil.

If the speed is uneven or slow, the engine or starting circuit is defective.

BREAKER POINTS

1. With the motor tester connected, turn the scope display selector to the INDIVIDUAL CYLINDER position.

2. Remove the jumper lead from the distributor to ground.

3. Insert the coil high tension wire into the scope pattern pickup.

4. Operate the engine at 1200 rpm.

5. Observe the point open and point close signals (Fig. 14). If an unusual point close signal is obtained (an unusual point close signal is one that does not have a short straight downward line followed by a series of closely grouped rapidly diminishing oscillations), check for poor point contact, misaligned points, or weak point spring tension.

If an unusual point open signal is obtained (an unusual point open signal is one that does not form a firing line that is straight up and down), check for dirty or burned points, or high series resistance.

COIL

Polarity

1. Remove the jumper lead from the distributor to ground, if it is still connected.

2. Insert the coil high tension lead into the scope pattern pickup.

3. Adjust the engine speed to 1200 rpm.

4. Turn the scope display selector to the ALL CYLINDERS position, and adjust the pattern length control until all cylinders appear between the vertical lines on both sides of the screen.

5. Rotate the pattern shift control counterclockwise until the last pattern on the screen appears complete.

6. Observe the patterns, noting if they are upright or inverted (Fig. 14).

If they are inverted, check for the scope ground polarity switch in the MINUS (−) position, battery polarity reversed, coil improperly connected, or incorrect coil.

Primary and Secondary Tests. To check the coil for shorted or open windings and for primary or secondary resistance, calibrate the Condenser-Coil Unit as follows:

1. Turn the AC switch to ON.

2. Set the Condenser-Coil Unit selector switch at the OHMS position.

3. Set the Condenser-Coil ohms switch to the desired range.

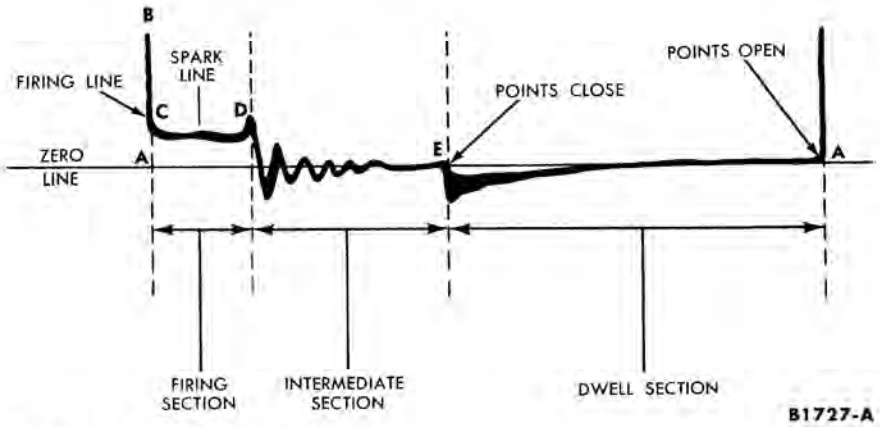


FIG. 14—Typical Scope Pattern

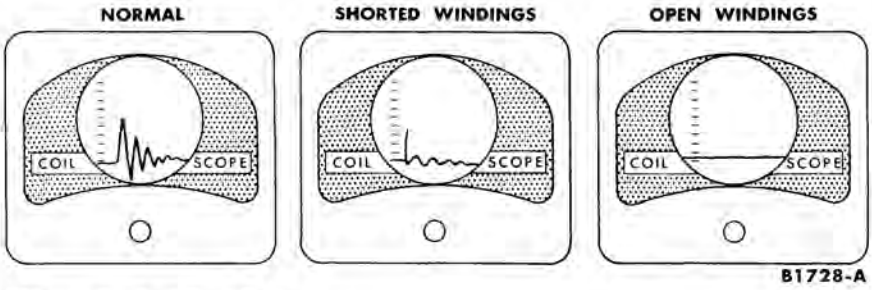


FIG. 15—Coil Test Patterns

4. Connect the test leads together.

5. Adjust the Condenser-Coil calibrator until the meter pointer reads ZERO on the ohms scale.

6. Disconnect the test leads.

7. Disconnect all leads from the coil.

SHORTED OR OPEN WINDINGS

1. Calibrate the Condenser-Coil Unit (the ohm switch should be in the OHMS position).

2. Connect the test leads, one to each coil primary terminal. Observe the polarity.

3. Insert the coil pickup into the secondary tower of the coil and connect the ground lead of the pickup to a good ground.

4. Turn the Condenser-Coil Unit selector switch to the COIL TEST position and observe the wave pattern visible on the coil test scope. Refer to Fig. 15 for checking the data obtained.

PRIMARY RESISTANCE

1. Calibrate the Condenser-Coil Unit (set the ohm switch to the OHMS position).

2. Connect the test leads, one to each primary terminal of the coil.

3. Observe the meter reading and compare it with specifications.

SECONDARY RESISTANCE

1. With the ohm switch set at the OHMS x 1000 position, calibrate the Condenser-Coil Unit.

2. Install the coil pickup test lead in the tower of the coil.

3. Connect the ohmmeter test leads, one to either primary terminal and the other to the open (pigtail) end of the coil pickup test lead.

4. Observe the meter reading and compare it with specifications.

If the meter reading exceeds 20,000 ohms, the secondary winding is open.

CONDENSER

For the condenser tests, calibrate the Condenser-Coil Unit as follows:

1. Set the selector switch to the CONDENSER position.

2. Connect the test leads together.

3. After allowing approximately one minute for the tester to warm up, adjust the calibrator until the meter pointer reads on the set line at the right end of the meter scale. **Do not change this setting during the tests.**

Resistance

1. Connect the test leads, one to the primary terminal of the distributor and the others to a ground on the distributor body.

2. With the condenser test switch in the SERIES RESISTANCE position, the meter should read in the black bar at the right end of the scale.

3. Move the condenser pigtail. If a deflection of the meter is noted, the pigtail is making poor contact and the condenser should be replaced.

If the reading is outside the black bar, move the grounded lead to the body of the condenser. If the reading improves, the condenser is not properly grounded to the distributor housing.

Capacity

1. Turn the condenser test switch to the CAPACITY position.

2. Read the red scale of the meter (0.5) for the microfarad capacity of the condenser being tested.

3. Refer to the specifications for the recommended condenser capacity.

If the readings are not within specifications, replace the condenser.

Leakage

1. Turn the condenser test switch to the LEAKAGE position.

2. The meter should now read in the black bar at the left end of the scale if the condenser leakage is satisfactory.

If the meter pointer reads outside the black bar, the condenser insulation is leaking and the condenser should be replaced.

If the condenser does not meet specifications while mounted in the distributor, remove the condenser and retest it. The same procedure is followed as above. If the condenser tests bad in the distributor, but tests good when removed, there is a short or ground in the distributor primary circuit. Inspect the insulation of the distributor primary terminal and the internal circuit of the distributor.

FIRING VOLTAGE

1. Remove the jumper from the distributor to ground.

2. Insert the coil high tension lead into the scope pickup.

3. Adjust the engine speed to 1200 rpm.

4. Turn the scope display selector to the ALL CYLINDERS position, and adjust the pattern length control until all of the cylinders appear between the vertical lines on the screen.

5. Rotate the pattern shift control counterclockwise until the last pattern on the screen appears complete.

6. Observe the height of each firing line, on the scope, and compare for uniformity and height (Fig. 14).

If the firing voltages are uniform, but high, check for worn spark plugs, late ignition timing, lean fuel mixture, too large a rotor gap, or a break in the coil wire.

If the firing voltages are uneven, check for worn spark plugs, uneven compression, breaks in spark plug wires, or a cocked or worn distributor cap.

AVAILABLE VOLTAGE

1. Make the same connections and adjustments as for the firing voltage test above.

2. Disconnect a spark plug wire with a pair of insulated pliers.

3. Hold the wire away from a ground and notice the upward extent of the pattern on the scope.

If the available voltage is less than 20 KV, check for excessive resistance in the primary circuit, low primary input voltage, defective coil, wrong coil, reversed coil polarity, dwell less than specified, or defective secondary insulation.

SECONDARY INSULATION

1. Continue with the same connections and adjustments as in the last two tests.

2. Observe the downward extent of the pattern of the spark plug with the wire removed.

3. Connect the spark plug wire.

4. Perform this test on all of the cylinders (trigger cylinder may be tested in the SCOPE CHECK position).

If the lower extent is not at least half the size of the upper extent, check for insulation leakage in the coil, coil tower, rotor, coil wire, distributor cap, or spark plug wire.

SECONDARY RESISTANCE

1. The connections and adjustments for this test are the same as for the last three tests, except for the scope display Selector switch which is now placed in the ALL CYLINDERS position.

2. Observe and compare the spark line (Fig. 14) of the patterns for length, height, angle and oscillations.

If all cylinders are affected, check for high resistance in the coil tower, coil wire, rotor, or distributor cap tower; also check for an accumulation of deposits on the spark plugs, or poor contact between the rotor and distributor cap.

If one or more cylinders are affected, check for high resistance in the distributor cap tower, spark plug wires, or spark plugs.

SPARK PLUGS

To test the spark plugs on the car, connect the motor tester in the same manner as for the firing voltage test.

1. Turn the display selector switch to the ALL CYLINDERS position; rotate the pattern shift control in the FULL CLOCKWISE position.

2. Momentarily accelerate the engine to about 2000 rpm and return to 1200 rpm.

3. Observe the rise of the firing lines during the momentary engine acceleration.

If one or more of the firing lines is higher than the others, check for wide plug gap, open spark plug resistor wire, or badly deteriorated electrodes.

If one or more of the firing lines is lower than the others, check for spark plug fouling, flashover, or cracked insulators.

DISTRIBUTOR CHECKS

DISTRIBUTOR DIAPHRAGM LEAKAGE AND FREENESS OF OPERATION—LOADOMATIC AND DUAL ADVANCE DISTRIBUTORS

These tests can be made with the distributor installed on the engine. The tests are sufficient for an engine tune-up. However, if there are indications that the spark advance is not functioning properly, remove the distributor from the engine and check the distributor spark advance on a distributor test set.

Check the vacuum advance mechanism for freeness of operation by manually rotating the breaker plate in the direction of rotation. **Do not rotate the plate by pushing on the condenser or the breaker points. Use a hook or other suitable instrument to rotate the plate.** The breaker plate should turn without binding and return to its original position when released. If the breaker plate binds, remove the plate. Clean, inspect and lubricate it as described for the particular distributor.

To check the diaphragm for leakage:

1. Remove the vacuum line from the distributor. Adjust the vacuum pressure of a distributor tester to its maximum position. Hold your hand over the end of the tester's vacuum hose and note the maximum reading obtained. **Do not exceed 25 inches Hg.**

2. If the maximum reading is 25 inches Hg or less, connect the tester's vacuum line to the vacuum fitting on the diaphragm **without changing any of the adjustments.** The maximum gauge reading should not be less than it was in step 1. If it is less, the diaphragm is leaking and should be replaced.

DISTRIBUTOR GEAR BACKLASH—LOADOMATIC DISTRIBUTOR

The distributor gear backlash can not be accurately checked on the dual advance or centrifugal advance distributor.

1. Mount a dial indicator on the distributor so that the indicator point rests on the rotor, 5/8-inch from the center.

2. Turn the rotor as far as it will go and set the indicator on zero.

3. Turn the rotor in the opposite direction and note the reading on the dial indicator. This is the backlash.

4. The backlash should be 0.003 to 0.005 inch. If the backlash is not to specifications, it indicates an incorrect number of teeth on the distributor or camshaft gear, or excessively worn gears.

DISTRIBUTOR SHAFT END PLAY

If the shaft end play is not to specifications, check the location of the gear on the shaft (loadomatic distributor), or the distributor shaft collar (dual advance or centrifugal advance distributor).

Loadomatic Distributor. The shaft end play can be checked with the distributor installed on the engine.

1. Mount a dial indicator on the distributor so that the indicator tip rests on the top of the distributor shaft.

2. Push the shaft down as far as it will go and set the dial indicator on zero.

3. Pull the distributor shaft upward as far as it will go and read the end play. The end play should be within specifications with the distributor removed or installed.

Dual Advance and Centrifugal Advance Distributor

1. Remove the distributor from the engine.

2. Place the distributor in the holding tool and clamp it in a vise.

3. Push the distributor shaft upward as far as it will go, and check the end play with a feeler gauge placed between the collar and the distributor base. The end play should be within the specified limits.

DISTRIBUTOR TESTS—ROTUNDA RE-27-44 TESTER

TEST CONNECTIONS

1. Connect the red lead to the distributor terminal of the coil.

2. Connect the black lead to a good ground on the engine.

DWELL ANGLE CHECK

1. Connect the tester.

2. Turn the test control knob to the set position.

3. Adjust the set control knob until the needle on the dwell meter lines up with the set line.

4. Start the engine and let it idle.

5. Turn the test control knob to the 8 CYL position for eight cylinder engines or to the 6 CYL position for 6 cylinder engines.

6. Read the dwell angle on the dwell meter and compare the reading to specifications.

7. Turn off the engine.

8. If the dwell angle was below the specified amount, the breaker point gap is too large. If the dwell angle was above the specified amount, the breaker point gap is too small.

On dual point distributors, the gaps of both breaker point assemblies should be the same.

If the dwell is to specifications, turn the test selector knob to the OFF position and disconnect the tester leads.

DWELL ANGLE ADJUSTMENT

If the dwell angle is not within specifications, proceed as follows:

1. Remove the coil high tension lead from the distributor and ground it.

2. Remove the distributor cap and place it out of the way.

3. Disconnect the brown wire ("I" terminal) and the red and blue wire ("S" terminal) from the starter relay.

4. Loosen the breaker point assembly retaining screw near the breaker point contacts.

5. With the ignition on, crank the engine with an auxiliary starter switch connected between the battery and "S" terminals of the starter relay and adjust the gap to specifications.

6. Release the auxiliary starter switch and tighten the breaker point assembly retaining screw.

7. Since the adjustment may have changed when the retaining screw was tightened, crank the engine again with the auxiliary starter switch and check the dwell.

On dual-point distributors, when the combined dwell has been set to specifications, the individual dwells should be checked. To check the individual dwells, block one set of points open with a piece of insulating material and check the dwell of the other set. The individual dwells should be the same.

DISTRIBUTOR TESTS— ROTUNDA RE-236 TESTER

MOUNTING DISTRIBUTOR

1. Adjust the distributor support arm in relation to the distributor shaft length.

2. Set the distributor in the support arm and enter the lower end of the distributor shaft in the Synchrograph chuck.

3. Tighten the chuck on the distributor shaft, using the wrench located near the support arm column.

4. Align the distributor shaft by shifting the support arm and distributor, and tighten the clamp screw.

5. Clamp the distributor securely in the distributor support arm clamp so that it will not turn in its mounting.

6. Connect the synchrograph test lead to the primary wire of the distributor.

MECHANICAL OPERATIONS

1. Turn the OFF, SET, CAM, SYNC. switch to SET.

2. Adjust the SET TACH control so the tachometer pointer is on the SET line.

3. Turn the OFF, SET, CAM, SYNC. switch to SYNC. position.

4. Turn the MOTOR switch to the LEFT for 8 cylinder cars or to the RIGHT for 6 cylinder cars.

5. Adjust the speed control to vary the distributor speed between 400 and 4000 engine rpm, or at the maximum speed of the engine on which the distributor is used. Erratic or thin faint flashes of light preceding the regular flashes as the speed of rotation is increased can be due to weak breaker arm spring tension or binding of the breaker arm on the pivot pin.

6. Operate the distributor at approximately 2500 engine rpm and move the protractor scale so that the zero degree mark on the scale is opposite one of the neon flashes. The balance of all the flashs should come within 1°, plus or minus, evenly around the protractor scale. A variation larger than 1° or erratic or wandering flashes may be caused by a worn cam or distributor shaft or a bent distributor shaft.

DWELL ANGLE

Single Point Distributors

1. Turn the OFF, SET, CAM, SYNC. switch to the CAM position. Operate the distributor at about 1000 rpm.

2. Adjust the breaker point gap until the cam angle is to specifications.

Dual Point Distributors

1. Turn the OFF, SET, CAM, SYNC. switch to the CAM position. Operate the distributor at about 1000 rpm.

2. Adjust the breaker points until the combined dwell is to specifications and the individual dwells are the same.

The individual dwells are checked by isolating one set of points from the circuit. This is done by placing a piece of insulating material between the contacts.

BREAKER PLATE WEAR

A worn breaker plate on the loadomatic or dual advance distributors will cause the breaker point gap and contact dwell to change as engine speed and load conditions are varied.

On the loadomatic distributor, there should not be over a 3° variation in dwell between engine idle speed and 2500 rpm. If the contact dwell changes more than 3°, the plate bushing should be replaced.

On the dual advance distributor, adjust the test set to 0° advance, 0 inches vacuum, and 1000 rpm. Adjust the dwell angle to 26°. Apply vacuum to the distributor diaphragm and increase it very slowly while observing the indicated dwell angle. The maximum dwell angle variation should not exceed 6° when going from zero to maximum vacuum at constant rpm. If the dwell angle variation exceeds this limit, there is excessive wear at the stationary subplate pin or the diaphragm rod is bent or distorted.

DISTRIBUTOR SPARK ADVANCE

The spark advance is checked to determine if the ignition timing advances in proper relation to engine speed and load.

Loadomatic Distributor

1. Check the breaker point contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension. Adjust if necessary.

3. Adjust the test set to 0° advance, 0 inch vacuum and the initial

rpm setting listed in the specifications.

4. Check the operation of the vacuum advance at the lowest and highest vacuum and rpm settings given in the specifications.

If the spark advance is not within the limits under low vacuum, the primary spring adjustment is at fault. If the spark advance is not within the limits under high vacuum, the secondary spring adjustment is at fault.

To adjust the spark advance, release the tension on the retard springs by turning the adjusting posts as required (Fig. 16). Adjust



FIG. 16—Spark Advance Adjustment

the primary spring (spring farthest from the vacuum chamber) first, for the low vacuum settings. Adjust the secondary spring last, for the high vacuum settings. As a final check, check the advance throughout the entire range.

If it is impossible to adjust both springs to give the correct spark advance throughout the range, one or both springs should be replaced and the spark advance readjusted. If the advance characteristics still cannot be brought within specifications, replace the diaphragm assembly.

Dual Advance Distributor

1. Check the contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension and adjust it, if necessary.

The dual advance distributor has two independently operated spark advance systems. Each system is adjusted separately. **Adjust the centrifugal advance before adjusting the vacuum advance.**

CENTRIFUGAL ADVANCE

1. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.

2. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Fig. 17). Bend the adjustment bracket



FIG. 17—Centrifugal Advance Adjustment

away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension). After the adjustment is made, identify the bracket.

3. After an adjustment has been made to one spring, check the minimum advance point again.

4. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

5. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

VACUUM ADVANCE

1. Connect the test set vacuum line to the fitting on the diaphragm.



FIG. 18—Vacuum Advance Adjustment

2. Set the test set to 0° advance, 0 vacuum, and at 1000 rpm.

3. Check the advance at the first vacuum setting given in the specifications.

4. If the advance is incorrect, change the calibration washers between the vacuum chamber spring and nut (Fig. 18). After installing or removing the washers, position the gasket in place and tighten the nut. **The addition of a washer will decrease advance and the removal of a washer will increase advance.**

5. After one vacuum setting has been adjusted, the others should be checked. **Do not change the original rpm setting when going to a different vacuum setting.** If the other settings are not within limits, there is incorrect spring tension, leakage in the vacuum chamber and/or line, or the wrong fibre stop has been installed in the vacuum chamber of the diaphragm housing.

Centrifugal Advance Distributor

1. On a high performance centrifugal advance distributor, check the gap of the breaker point assemblies or the combined dwell.

2. Check the breaker arm spring tension and adjust it if necessary.

3. Turn the OFF, SET, CAM, SYNC. switch to SYNC. position.

4. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.

5. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment



FIG. 19—Dual Point Distributor Centrifugal Advance Adjustment

bracket to change its tension (Fig. 19). **Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension).** After the adjustment is made, identify the bracket.

6. After an adjustment has been made to one spring, check the minimum advance point again.

7. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

8. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

Lack of synchronization, excessive cam wear, worn bearings, or weak breaker arm spring tension causing contact point chatter are all disclosed by uneven or intermittent flashes around the protractor scale.

DISTRIBUTOR TESTS— ROTUNDA RE-1416 TESTER

MOUNTING DISTRIBUTOR

1. Clamp the distributor securely in the distributor support arm clamp so that it will not turn in its mounting.

2. Loosen the hand-operated locking screw on the side of the distributor support arm and adjust the support arm column up or down by turning the crank on the knob at the top of the column until the distributor shaft or adapter shaft can be securely fastened in the driving chuck. Use adapter shafts provided when driving distributors having short shafts.

3. Securely tighten the drive chuck to the distributor drive shaft by means of the chuck key, attached by a chain to the Syncrograph.

4. Rotate the drive chuck by hand to make sure the distributor shaft turns freely and then tighten the locking screw on the distributor support arm.

5. Connect the Syncrograph test lead to the primary lead wire of the distributor.

BREAKER POINT RESISTANCE

1. Turn the test selector to POINT RES. position.

2. Revolve the chuck by hand until the distributor breaker points are closed.

3. The meter pointer on the cam angle meter should read in the OK zone at the left side of the meter scale. If the meter pointer does not fall in the OK zone, there is excessive resistance caused by a faulty contact across the distributor points, a faulty primary lead, or a poorly grounded base plate. A faulty contact across the distributor points indicates improper spring tension or burned or pitted points.

INSULATION AND LEAKAGE

1. Turn the test selector to the cam angle position and revolve the chuck by hand until the distributor breaker contacts are open.

2. The cam angle meter should show a zero reading. If a zero reading is not obtained, a short circuit to ground exists.

A short could be caused by poor primary lead wire insulation, a shorted condenser, or a short between the breaker arm and breaker plate.

MECHANICAL OPERATION

1. Turn the test selector to the SYNCHRO. position and check to make sure the drive chuck is securely tightened on the distributor shaft.

2. Turn the motor control switch to the left for an eight cylinder car or to the right for a six cylinder car.

If it is necessary to reverse the rotation of the drive motor, turn the motor control switch to the OFF position and allow the chuck to come to a complete stop before reversing the switch.

3. Adjust the rpm control to vary the distributor speed between 400 and 4000 engine rpm or at the maximum speed of the engine on which the distributor is used. Erratic or thin faint flashes of light preceding the regular flashes as the speed of rotation is increased can be due to weak breaker arm spring tension or binding of the breaker arm on the pivot pin.

4. Operate the distributor at approximately 2500 engine rpm.

5. Move the protractor scale with the adjustment control so that the zero degree mark on the scale is opposite one of the neon flashes. The balance of all the flashes should come within 1°, plus or minus, evenly around the protractor scale. A larger variation than 1° or erratic or wandering flashes may be caused by a worn cam or distributor shaft or a bent distributor shaft.

DWELL ANGLE

Single Point Distributor

1. Turn the cylinder selector to the figure corresponding to the number of lobes on the cam of the distributor being tested.

2. Turn the test selector switch to the cam angle position and operate the distributor at approximately 1000 engine rpm.

3. Adjust the distributor breaker point gap to the dwell angle shown in the specifications.

Dual Point Distributor

1. Follow steps 1 and 2 under "Single Point Distributor."

2. Adjust the breaker points until the combined dwell is to specifications and the individual dwells are the same.

The individual dwells are checked by isolating one set of points from the circuit. This is done by placing a piece of insulating material between the contacts.

BREAKER PLATE WEAR

A worn breaker plate on the loadomatic or dual advance distributors will cause the breaker point gap and contact dwell to change as engine speed and load conditions are varied.

On the loadomatic distributor there should not be over a 3° variation in dwell between engine idle speed and 2500 rpm. If the contact dwell changes more than 3°, the plate bushing should be replaced.

On the dual advance distributor adjust the test set to 0° advance, 0 inches vacuum, and 1000 rpm. Adjust the dwell angle to 26°. Apply vacuum to the distributor diaphragm and increase it very slowly while observing the indicated dwell angle. The maximum dwell angle variation should not exceed 6° when going from zero to maximum vacuum at constant rpm. If the dwell angle variation exceeds this limit, there is excessive wear at the stationary sub-plate pin or the diaphragm.

DISTRIBUTOR SPARK ADVANCE

The spark advance is checked to determine if the ignition timing advances in proper relation to engine speed and load.

Loadomatic Distributor

1. Check the breaker point contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension. Adjust if necessary.

Attach the vacuum adapter fitting to the vacuum unit and attach the vacuum hose between the distributor vacuum control and the vacuum outlet located at the upper right of the front panel. Check the zero setting of the vacuum gauge and, if necessary, adjust the small knob at the lower edge of the dial rim so that the vacuum gauge hand rests on zero.

Turn the vacuum supply switch to the ON position.

3. Adjust the test set to 0° advance, 0 inch vacuum and the initial rpm setting listed in the specifications.

4. Check the operation of the vacuum advance at the lowest and highest vacuum and rpm settings given in the specifications.

If the spark advance is not within the limits under low vacuum, the primary spring adjustment is at fault. If the spark advance is not within the limits under high vacuum, the secondary spring adjustment is at fault.

To adjust the spark advance, release the tension on the retard springs by turning the adjusting posts as required (Fig. 16). Adjust the primary spring (spring farthest from the vacuum chamber) first, for the low vacuum settings. Adjust the secondary spring last, for the high vacuum settings. As a final check, check the advance throughout the entire range.

If it is impossible to adjust both springs to give the correct spark advance throughout the range, one or both springs should be replaced and the spark advance readjusted. If the advance characteristics still cannot be brought within specifications, replace the diaphragm assembly.

Dual Advance Distributor

1. Check the contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension and adjust it if necessary.

The dual advance distributor has two independently operated spark advance systems. Each system is adjusted separately. **Adjust the centrifugal advance before adjusting the vacuum advance.**

CENTRIFUGAL ADVANCE

1. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.

2. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Fig. 17). **Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension).** After the adjustment is made, identify the bracket.

3. After an adjustment has been made to one spring, check the minimum advance point again.

4. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

5. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

VACUUM ADVANCE

1. Connect the test set vacuum line to the fitting on the diaphragm and turn the vacuum supply switch on.

2. Set the test set to 0° advance, 0 vacuum, and at 1000 rpm.

3. Check the advance at the first vacuum setting given in the specifications.

4. If the advance is incorrect, change the calibration washers between the vacuum chamber spring and nut (Fig. 18). After installing or removing the washers, position the gasket in place and tighten the nut. **The addition of a washer will decrease advance and the removal of a washer will increase advance.**

5. After one vacuum setting has been adjusted, the others should be checked. **Do not change the original rpm setting when going to a different vacuum setting.** If the other settings are not within limits, it indicates incorrect spring tension, leakage in the vacuum chamber and/or line, or the wrong fiber stop has been installed in the vacuum chamber of the diaphragm housing.

Centrifugal Advance Distributor

1. On a high performance centrifugal advance distributor, check the gap of the breaker point assembly (ies), or the dwell (combined dwell on dual points). If they are not within specifications, adjust the gap.

2. Check the breaker arm spring tension and adjust it if necessary.

3. Turn the test selector to the SYNCRO. position.

4. Operate the distributor in the direction of rotation (counterclockwise) and adjust the speed to the initial rpm setting listed in the specifications. Move the protractor scale so that one of the flashes lines up with the zero degree mark.

5. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Fig. 19). **Bend the adjustment bracket away from the distributor shaft to decrease advances (increase spring tension) and toward the shaft to increase advance (decrease spring tension).** After the adjustment is made, identify the bracket.

6. After an adjustment has been made to one spring, check the minimum advance point again.

7. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

8. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

Lack of synchronization, excessive cam wear, worn bearings, or weak breaker arm spring tension causing contact point chatter are all disclosed by uneven or intermittent flashes around the protractor scale.

DISTRIBUTOR TESTS— SUN DT-600 TESTER

MOUNTING

1. Using the elevation crank, raise the clamp arms high enough to permit the shaft of the distributor to clear the drive chuck.

2. Position the distributor in the clamp with the vacuum diaphragm (if so equipped) pointing towards the right. Tighten the clamp arms securely around the distributor body. Install the proper adapter to the vacuum diaphragm on dual advance and loadomatic distributors.

3. Lower the distributor with the elevation crank until the gear or ¾ inch of the tip of the distributor shaft enters the drive chuck, or until the shaft engages the adapter if an adapter is being used. **Do not bottom the distributor shaft in the chuck.**

4. Tighten the chuck. **Do not try to raise or lower the distributor after the chuck has been tightened.**

CONDENSER TESTING

Condensers should be tested for series resistance, capacity, and leakage. The preparation procedure is as follows:

1. Trip the motor switch to the proper position for the rotation of the distributor being tested.

2. Turn the condenser test selector switch to the SERIES RESISTANCE position and connect the condenser test leads together.

3. Turn the condenser calibrate control clockwise from the OFF position.

4. Allow the tester to warm up for approximately 30 seconds and then adjust the calibrate control until the condenser meter reads on the SET LINE.

5. Rotate the distributor shaft until the cam holds the breaker points open.

6. Separate the test leads and connect one to the distributor primary lead and the other to the distributor body.

Series Resistance. Turn the condenser test selector switch to the SERIES RESISTANCE position. The condenser meter should read in the black bar on the right end of the scale.

Capacity. Turn the condenser test selector switch to the CAPACITY position. The condenser meter will now read the capacity in microfarads. Compare this reading with specifications.

Leakage. Turn the condenser test selector switch to the LEAKAGE position. The condenser meter should read in the black bar at the left of the scale.

Turn the test selector switch to the SERIES RESISTANCE position and turn OFF the condenser calibrator before disconnecting the test leads.

DISTRIBUTOR RESISTANCE

1. With the motor switch in the proper position for the rotation of the distributor being tested and the speed set at ZERO rpm, clip the tester's distributor and ground lead together.

2. Set the tachometer dwell selector switch to the CALIBRATE position and adjust the dwell regulator until the dwell meter reads on the SET LINE.

3. Separate the leads and connect the tester's distributor lead to the distributor primary or distributor-transistor lead.

4. Rotate the chuck by hand until the points are closed. The dwell meter should read in the black bar at the right end of the scale.

If it does not read in the black bar, move the tester's distributor wire step by step through the circuit toward the ground. When there is a measurable difference between 2 points, check that area for the cause of the resistance.

CAM LOBE ACCURACY

1. Connect the test leads following the directions in the distributor resistance test.

2. Turn the tachometer dwell switch to the position corresponding to the number of cylinders on the car from which the distributor was removed.

3. Adjust the distributor speed to 1000 rpm.

4. Rotate the degree ring of the tester until the ZERO on the ring lines up with one of the flashes.

5. Observe the positions of the remaining flashes. If the flashes are not evenly spaced (within $\pm 1°$), check for a worn cam, worn distributor shaft or a bent distributor shaft.

DWELL ANGLE

This test has the same connections as the preceding test, therefore they can be done at the same time.

Adjust the speed to 200 rpm and notice the dwell reading. If it is not within specifications, adjust the points until the proper dwell is obtained. Now increase the speed and check the dwell reading. If the reading changes more than 2 degrees, check for a worn distributor shaft or worn bushings.

DISTRIBUTOR SPARK ADVANCE

The spark advance is checked to determine if the ignition timing advances in proper relation to engine speed and load.

Loadomatic Distributor

1. Check the breaker point contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension and adjust it if necessary.

3. Adjust the test set to 0° advance, 0 inch vacuum, and the intial rpm setting listed in the specifications.

4. Check the operation of the vacuum advance at the lowest and highest vacuum and rpm settings given in the specifications.

If the spark advance is not within the limits under low vacuum, the primary spring adjustment is at fault. If the spark advance is not within the limits under high vacuum, the secondary spring adjustment is at fault.

To adjust the spark advance, release the tension on the retard springs by turning the adjusting posts as required (Fig. 16). Adjust the primary spring (spring farthest from the vacuum chamber) first, for the low vacuum settings. Adjust the secondary spring last, for the high vacuum settings. As a final check, check the advance throughout the entire range.

If it is impossible to adjust both springs to give the correct spark advance throughout the range, one or both springs should be replaced and the spark advance readjusted. If the advance characteristics still can not be brought within specifications, replace the diaphragm assembly.

Dual Advance Distributor

1. Check the contact dwell. If the contact dwell or the breaker point gap is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension and adjust it if necessary.

The dual advance distributor has two independently operated spark advance systems. Each system is adjusted separately. **Adjust the centrifugal advance before adjusting the vacuum advance.**

CENTRIFUGAL ADVANCE

1. Do not connect the test set vacuum line to the diaphragm. Operate the distributor in the direction of rotation counterclockwise) and set the test set to 0° advance and the initial rpm setting listed in the specifications.

2. Slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Fig. 17). **Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension).** After the adjustment is made, identify the bracket.

3. After an adjustment has been made to one spring, check the minimum advance point again.

4. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

5. Check the advance at all rpm settings listed in the specifications. Operate the distributor both up and down the rpm range.

VACUUM ADVANCE

1. Connect the test set vacuum line to the fitting on the diaphragm.

2. Set the test set to 0° advance, 0 vacuum, and at 1000 rpm.

3. Check the advance at the first vacuum setting given in the specifications.

4. If the advance is incorrect, change the calibration washers between the vacuum chamber spring and nut (Fig. 18). After installing or removing the washers, position the gasket in place and tighten the nut. **The addition of a washer will decrease the advance and the removal of a washer will increase the advance.**

5. After one vacuum setting has been adjusted, the others should be checked. **Do not change the original rpm setting when going to a different vacuum setting.** If the other settings are not within limits, it indicates incorrect spring tension, leakage in the vacuum chamber and/or line, or the wrong fiber stop has been installed in the vacuum chamber of the diaphragm housing.

Centrifugal Advance Distributor

1. On a high-performance centrifugal advance distributor, check the gap of the breaker point assembly(ies) or the dwell (combined dwell on dual points). If they are not within specifications, adjust the gap.

2. Check the breaker arm spring tension and adjust it if necessary.

3. The equipment should be set the same way that it was for the Cam Lobe Accuracy test.

4. Operate the distributor at 250 rpm, and move the protractor scale so one flash lines up with the 0° mark.

5. Increase distributor speed to correspond with the lowest speed shown in the specifications. Note the number of degrees the neon flash has moved from the zero degrees and compare with specifications. Check advance degrees at all the speeds shown in the specifications. If the centrifugal advance does not conform to the specifications to within plus or minus 1°, the trouble may be due to improper breaker arm spring tension, faulty or dirty centrifugal advance mechanism or excessive distributor shaft end play.

Lack of synchronization, excessive cam wear, worn bearings or weak breaker arm spring tension causing contact point chatter are all disclosed by uneven or intermittent flashes around the protractor scale.

2 COMMON ADJUSTMENTS AND REPAIRS

BREAKER POINTS AND CONDENSER

REPLACEMENT

Loadomatic Distributors

REMOVAL

1. Remove the distributor cap and rotor.

2. Disconnect the condenser and primary lead wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws and lift the breaker point assembly and condenser out of the distributor.

INSTALLATION

1. Place the breaker point assembly and condenser in position on the breaker plate and install the screws. Be sure that the ground wire is under the breaker point assembly screw. Align and adjust the breaker points.

2. Connect the primary and condenser wires to the breaker point assembly.

3. Install the rotor and distributor cap.

Dual Advance Distributors

REMOVAL

1. Remove the distributor cap and the rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

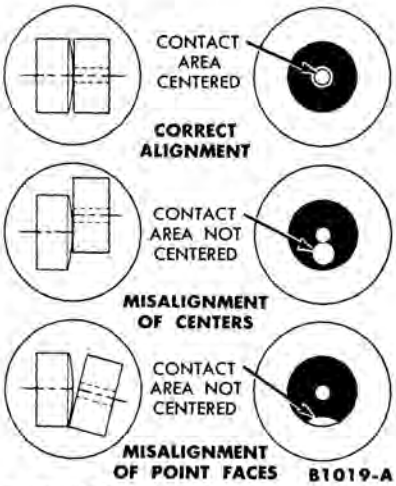


FIG. 20—Breaker Point Alignment

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

INSTALLATION

1. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts.

2. Align and adjust the breaker point assembly.

3. Connect the primary and condenser wires to the breaker point assembly.

4. Install the rotor and the distributor cap.



FIG. 21—Aligning Breaker Points

Centrifugal Advance Distributor

REMOVAL

1. Remove the distributor cap and the rotor.

2. Disconnect the primary lead, the jumper strap, and the condenser lead from the breaker point assemblies.

3. Remove the retaining screws from the breaker point assemblies and the condenser. Lift the breaker point assemblies and the condenser out of the distributor.

INSTALLATION

1. Place the breaker point assemblies and the condenser in position and install the retaining screws.

2. Align and adjust the breaker point assemblies.

3. Connect the primary lead, the jumper strap, and the condenser lead to the breaker point assemblies.

4. Install the rotor and the distributor cap.

BREAKER POINT ALIGNMENT

The vented-type breaker points must be accurately aligned and strike squarely in order to realize the full advantages provided by this design and assure normal breaker point life. Any misalignment of the breaker point surfaces will cause premature wear, overheating and pitting.

1. Turn the cam so that the breaker points are closed and check the alignment of the points (Fig. 20).

If the distributor is in the engine, close the points by proceeding as follows:

Disconnect the brown wire and the red and blue wire from the starter relay and, with the ignition switch off, crank the engine by using an auxiliary starter switch between the "S" and the battery terminals of the starter relay.

2. Align the breaker points to make full face contact by bending the stationary breaker point bracket (Fig. 21). **Do not bend the breaker arm.**

3. After the breaker points have been properly aligned, adjust the breaker point gap or dwell.

BREAKER POINT GAP ADJUSTMENT

A scope, a dwell meter, or a feeler gauge can be used to check the gap of new breaker points.

A scope or a dwell meter can be used to check the gap of used breaker points. Due to the roughness of used points, it is not advisable to use a feeler gauge to check the gap.

To check and adjust the breaker points with a feeler gauge:

1. Check and adjust the breaker point alignment.

2. Rotate the distributor until the rubbing block rests on the peak of a cam lobe.

If the distributor is in the engine place the rubbing block on the peak of the cam by proceeding as follows:

Disconnect the brown wire and the red and blue wire from the starter relay and, with the ignition switch off, crank the engine by using an auxiliary starter switch between the "S" and battery terminals of the starter relay.

Insert the correct blade of a clean feeler gauge between the breaker points (Fig. 22). The gap should be

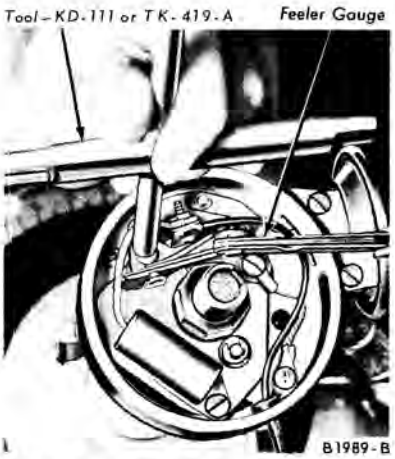


FIG. 22—Adjusting New Breaker Point Gap

set to the larger opening because the rubbing block will wear down sightly while seating to the cam.

Apply a light film of distributor cam lubricant to the cam when new points are installed. **Do not use engine oil to lubricate the distributor cam.**

Set the ignition timing.

If a scope or a dwell meter is used to adjust new points, be sure the points are in proper alignment. Also, set the contact dwell to the low setting. New points must be set to the low dwell as the rubbing block will wear down slightly while seating to the cam.

To check and adjust the breaker points with a scope, refer to "Ignition System Tests."

To check and adjust the breaker points with a dwell meter, refer to "Distributor Tests."

BREAKER POINT SPRING TENSION ADJUSTMENT

Correct breaker point spring tension is essential to proper engine operation and normal breaker point life. If the spring tension is too great, rapid wear of the breaker arm rubbing block will result, causing the breaker point gap to close up and retard the spark timing. If the spring tension is too weak, the breaker arm will flutter at high engine rpm resulting in an engine miss.

To check the spring tension on either the pivot-type or the pivotless breaker points, place the hooked end of the spring tension gauge over the movable breaker point. Pull the gauge at a right angle (90°) to the movable arm until the breaker points just start to open (Fig. 23). If the

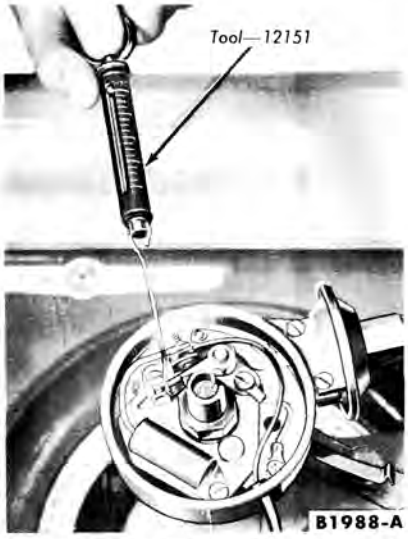


FIG. 23—Checking Breaker Point Spring Tension

tension is not within specifications, adjust the spring tension on the pivot-type points or replace the breaker point assembly on the pivotless points.

To adjust the spring tension (Fig. 24):

1. Disconnect the primary or distributor-transistor lead wire and the condenser lead if so equipped, and the jumper strap on the centrifugal advance distributor at the breaker point assembly primary terminal.

2. Loosen the nut holding the



FIG. 24—Adjusting Breaker Point Spring Tension

spring in position. **Move the spring toward the breaker arm pivot to decrease tension and in the opposite direction to increase tension.**

3. Tighten the lock nut, and then check spring tension. Repeat the adjustment until the specified spring tension is obtained.

4. Install the primary or distributor-transistor lead wire, the condenser lead (if so equipped) and the jumper strap on the centrifugal advance distributor with the lockwasher and tighten the nut securely.

On the centrifugal advance distributor with dual breaker points, loosen the lock nut holding the jumper strap to the other breaker point assembly and follow steps 2 and 3. After the adjustment has been completed, connect the jumper strap.

IGNITION TIMING

TIMING MARK LOCATIONS

There are two methods of showing the timing position. Both methods use the crankshaft damper and a timing pointer.

One method uses degree marks on the crankshaft pulley (Fig. 25). These degree marks range from 0° or top dead center (TDC) to some value before top dead center (BTDC). When checking the timing, the correct degree mark should be in line with the timing pointer when the timing light flashes.

The other method uses degree marks on the timing pointer (Fig. 26). These also range from 0° or top dead center (TDC) to some value before top dead center (BTDC). When checking the timing, the correct degree mark should be in line with the timing mark on the



FIG. 25—Typical V-8 Engine Timing Marks

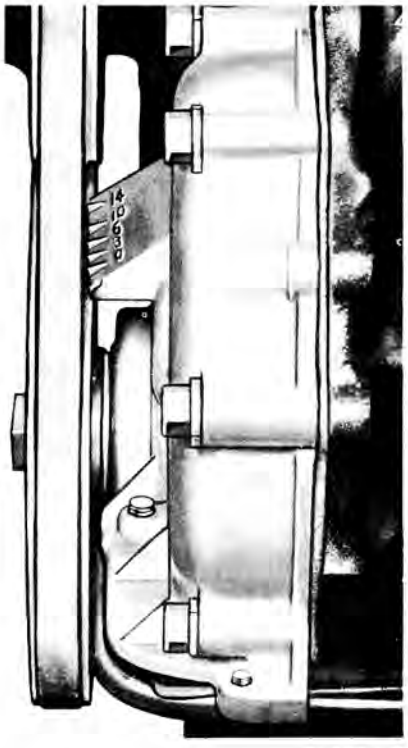


FIG. 26—Typical Six Cylinder Engine Timing Marks

crankshaft pulley when the timing light flashes.

ADJUSTMENT

The procedure for checking and adjusting the ignition timing with a scope is given in Section 1 of this part.

To check and adjust the timing

with a Rotunda 13-07 power timing light, proceed as follows:

1. Remove the plug wire from the number 1 spark plug.

2. Install the spark plug adaptor on the spark plug.

3. Connect the plug wire to the spark plug adaptor.

4. Clamp the timing light spark plug lead to the spark plug adaptor.

5. Connect the timing light battery leads to the battery terminals.

6. Disconnect the distributor vacuum line (if so equipped).

7. If necessary, clean and mark the timing marks.

8. Operate the engine below 550 rpm and point the timing light at the timing pointer.

9. If the timing is incorrect, loosen the distributor hold down bolt and rotate the distributor until the desired initial advance is obtained.

10. Tighten the distributor hold down bolt and check the timing again.

11. Turn off the engine.

12. Remove the timing light and connect the vacuum line.

SPARK PLUG WIRE REPLACEMENT

When removing the wires from the spark plugs, grasp and twist the moulded cap only. Do not pull on the wire because the wire connection inside the cap may become separated or the weather seal may be damaged.

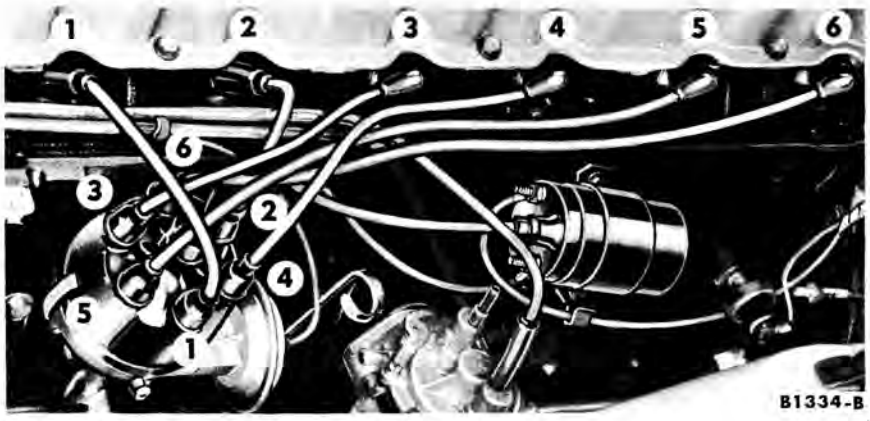


FIG. 27—6-Cylinder Engine Ignition Wiring

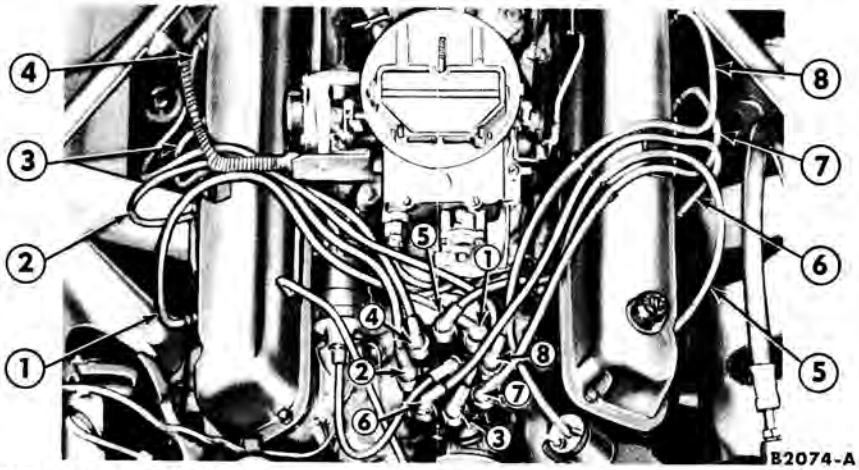


FIG. 28—8-Cylinder Engine Ignition Wiring

170 AND 200 C.I.D. SIX CYLINDER ENGINES

The ignition wire installation is shown in Fig. 27.

Removal

1. Disconnect the wires at the spark plugs and at the distributor cap.

2. Remove the coil high tension lead.

Cleaning and Inspection. Refer to section 3 of this part for the cleaning and inspection procedures.

Installation

1. Connect the wires to the proper spark plugs.

2. Insert the ends of the wires in the correct sockets in the distributor cap. Be sure the wires are forced all the way down into their sockets and that they are held firmly in position. The No. 1 socket is identified on the cap. Install the wires in a clockwise direction in the firing order (1-5-3-6-2-4) starting at the No. 1 socket.

3. Install the coil high tension lead. Push all weatherseals into position.

ALL V-8 ENGINES

A typical ignition wiring installation is shown in Fig. 28.

Removal

1. Disconnect the wires from the spark plugs and distributor cap.

2. Pull the wires from the brackets on the valve rocker arm covers and remove the wires.

3. Remove the coil high tension lead.

Cleaning and Inspection. Refer to section 3 of this part for the cleaning and inspection procedures.

Installation

1. Insert each wire in the proper socket of the distributor cap. Be sure the wires are forced all the way down into their sockets. The No. 1 socket is identified on the cap. Install the wires in a counterclockwise direction in the firing order (1-5-4-2-6-3-7-8) starting at the No. 1 socket. Cylinders are numbered from front to rear; right bank 1-2-3-4, left bank 5-6-7-8.

2. Remove the brackets from the old spark plug wire set and install them on the new set in the same relative position. Install the wires in the brackets on the valve rocker arm covers. (Fig. 28). Connect the wires to the proper spark plugs. Install the coil high tension lead. **Be**

sure the No. 7 spark plug wire is positioned in the bracket as shown in Fig. 28.

SPARK PLUG REPLACEMENT

REMOVAL

1. Remove the wire from each spark plug by grasping and twisting the moulded cap of the wire only. **Do not pull on the wire because the wire connection inside the cap may become separated or the weather seal may be damaged.**



FIG. 29—Checking Spark Plug Gap

2. Clean the area around each spark plug port with compressed air, and then remove the spark plugs.

CLEANING AND INSPECTION

Refer to section 3 of this part for the cleaning and inspection procedures.

ADJUSTMENT

Set the spark plug gap to specifications by bending the ground electrode (Fig. 29).

INSTALLATION

1. Install the spark plugs and torque each plug to 15-20 ft-lbs.

When a new spark plug is installed in a new replacement cylinder head, torque the plug to 20-30 ft-lbs.

2. Connect the spark plug wires Push all weatherseals into position.

RESISTANCE WIRE REPLACEMENT

1. Cut the brown wire and the red wire (with a green band) from the upper quick disconnect at the dash panel. Cut the wires as close to the quick disconnect as possible.

2. Solder a male bullet-type terminal to the brown wire and to the red wire (with a green band). Make a single terminal of the two wires. Using a female bullet terminal connector, connect the wires to one end of the service replacement resistance wire. **Do not splice the resistance wire.**

3. Drill a ¾-inch hole through one of the accessory dimples in the dash panel.

4. Install a grommet into the hole drilled in the dash panel.

5. Thread one end of the service replacement resistance wire through the grommet in the dash panel and connect it to the jumper wire at the ignition switch. Make sure the wire is routed through the retaining clips.

6. Cut off and discard (at the point where it enters the taped area) the length of defective resistance wire which is not enclosed in the taped portion of the wiring assembly.

3 CLEANING AND INSPECTION

SPARK PLUGS

Clean the plugs on a sand blast cleaner, following the manufacturer's instructions. **Do not prolong the use of the abrasive blast as it will erode the insulator.** Remove carbon and other deposits from the threads with a stiff wire brush. Any deposits will retard the heat flow from the plug to the cylinder head causing spark plug overheating and pre-ignition.

Clean the electrode surfaces with a a small file (Fig. 30). Dress the electrodes to secure flat parallel surfaces on both the center and side electrode.

After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrodes, and other signs of failure. Replace as required.



FIG. 30—Cleaning Spark Plug Electrode

Examine the firing ends of the spark plugs, noting the type of deposits and the degree of electrode erosion. Refer to Fig. 31 for the various types of spark plug fouling and their causes.

DISTRIBUTORS

Soak all parts of the distributor assembly (except the condenser, breaker point assembly, lubricating wick, vacuum diaphragm, distributor base oil seal, and electrical wiring) in a mild cleaning solvent or mineral spirits. Do not use a harsh cleaning solution. Wipe all parts that can not be immersed in a solvent with a clean dry cloth.

After foreign deposits have been loosened by soaking, scrub the parts

with a soft bristle brush. **Do not use a wire brush, file, or other abrasive object.** Dry the parts with compressed air.

Examine the bushing surface(s) of the distributor shaft and the bushing(s) for wear. On all distributors, the minimum allowable shaft diameter at the bushing(s) and the maximum allowable inside diameter of the bushing(s) should not exceed specifications. Replace worn parts.

Inspect the distributor cam lobes for scoring and signs of wear. If any lobe is scored or worn, replace the cam assembly (dual advance distributor) or the shaft (loadomatic distributor).

Inspect the breaker plate assembly for signs of distortion. In addition, on the dual advance distributor, inspect the stationary sub-plate for worn nylon contact buttons. Replace the breaker plate assembly if it is defective.

The breaker point assembly and condenser should be replaced whenever the distributor is overhauled.

Inspect all electrical wiring for fraying, breaks, etc., and replace any that are not in good condition.

Check the distributor base for cracks or other damage.

Check the diaphragm housing, bracket, and rod for damage. Check the vacuum line fitting for stripped threads or other damage. Test the vacuum fittings, case, and diaphragm for leakage as explained under "Distributor Tests." Replace all defective parts.

The breaker point assembly consists of the stationary point bracket assembly, breaker arm and the primary wire terminal.

Breaker points should be inspected, cleaned and adjusted as necessary. Breaker points can be cleaned with chloroform and a stiff bristle brush.

CONDITION	IDENTIFICATION	CAUSED BY
 OIL FOULING	Wet, sludgy deposits.	Excessive oil entering combustion chamber through worn rings and pistons, excessive clearance between valve guides and stems, or worn or loose bearings.
 GAS FOULING	Dry, black, fluffy deposits.	Incomplete combustion caused by too rich a fuel-air mixture or by a defective coil, breaker points or ignition cable.
 BURNED OR OVERHEATING	White, burned, or blistered insulator nose and eroded electrodes.	Inefficient engine cooling, or engine overheating caused by improper ignition timing, wrong type of fuel, loose spark plugs, or too hot a plug, low fuel pump pressure.
 NORMAL CONDITIONS	Rusty brown to grayish-tan powder deposit and minor electrode erosion.	Regular or unleaded gasoline.
 NORMAL CONDITIONS	White, powdery deposits.	Highly leaded gasolines.
 CARBON FOULING	Hard, baked on black carbon.	Too cold a plug. Weak ignition, defective fuel pump, dirty air cleaner, too rich a fuel mixture.
 SILICONE DEPOSIT	Hard and scratchy	Formed when fine sand particles combine with anti-knock compounds in the fuel. Most common industry areas. The plugs cannot be cleaned.
 SPLASHED FOULING		Deposits, accumulated after a long period of misfiring, suddenly loosened when normal combustion chamber deposits are restored after new plugs are installed. During a high speed run these deposits are thrown into the plug. B1005-E

FIG. 31—Spark Plug Inspection

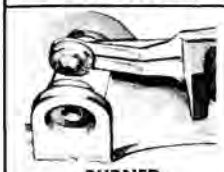
Replace the breaker point assembly if the contacts are badly burned or excessive metal transfer between the points is evident (Fig. 32). Metal transfer is considered excessive when it equals or exceeds the gap setting.

SECONDARY WIRING

Wipe the wires with a damp cloth and check for fraying, breaks, etc. Replace any wires that are not in good condition.

COIL

Wipe the coil with a damp cloth and check for any cracks or other defects.

CONDITION	CAUSED BY
 BURNED	Any discoloration other than a frosted slate grey shall be considered as burned points.
 EXCESSIVE METAL TRANSFER OR PITTING	Incorrect alignment. Incorrect voltage regulator setting. Radio condenser installed to the distributor side of the coil. Ignition condenser of improper capacity. Extended operation of the engine at speeds other than normal.

B1443-B

FIG. 32—Breaker Point Inspection

PART 9-2 LOADOMATIC DISTRIBUTORS

Section		Page	Section		Page
1	Description and Operation	9-24	3	Removal and Installation	9-25
2	In-Car Adjustments and Repairs	9-24	4	Major Repair Operations	9-25

1 DESCRIPTION AND OPERATION

The direction of distributor rotation is clockwise as viewed from the top of the distributor.

Engine speed and load requirements are satisfied by the action of the breaker plate which is controlled by a vacuum-actuated diaphragm working against the tension of two calibrated breaker plate springs (Fig. 1). The breaker plate is free to rotate on the shaft bushing. The diaphragm moves the breaker plate in a counterclockwise direction to advance the spark, and the springs move the plate in a clockwise direction to retard the spark. The degree of spark advance is determined by the strength of the vacuum acting on the diaphragm.

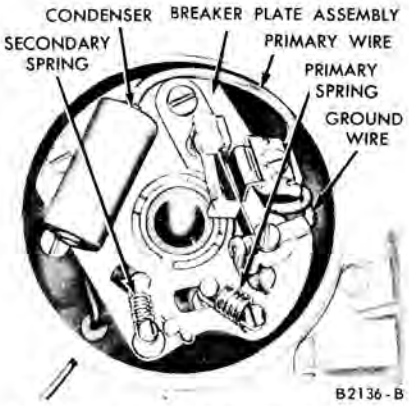


FIG. 1—Breaker Plate Installed

Vacuum is transmitted to the distributor diaphragm from two interconnected passages in the carburetor (Fig. 2). The opening of one passage is in the throat of the venturi and the opening(s) of the other passage is in the throttle bore just above the closed throttle plate.

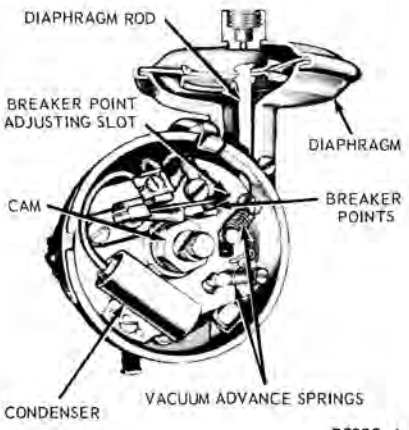


FIG. 2—Spark Advance Mechanism

All manifold vacuum to the distributor passes through a spark control valve located in the carburetor throttle body or main body. Under steady part throttle operation, the spark valve is held open against the pressure of a calibrated spring. A combination of atmospheric pressure outside the spark valve diaphragm and manifold vacuum from within holds the spark valve open. When accelerating, manifold vacuum momentarily drops below a predetermined point and the calibrated spring closes the spark valve shutting off the manifold vacuum port. Vacuum from the venturi prevents full spark retard.

As engine speed approaches the throttle setting, manifold vacuum increases sufficiently to open the spark valve and allow a higher vacuum to operate the distributor.

At high engine speed, manifold vacuum falls and the valve closes. This prevents loss of venturi vacuum due to bleed back caused by the lower manifold vacuum. This assures full spark advance at high engine speed.

The spark valve functions in a similar manner to provide an intermediate spark retard whenever the load on the engine is increased to a degree where normal road load spark advance would be too great and the wide-open throttle spark retard would reduce the efficiency of the engine.

2 IN-CAR ADJUSTMENTS AND REPAIRS

BREAKER POINT AND CONDENSER REPLACEMENT

The replacement procedures are covered in Part 9-1, Section 2.

VACUUM DIAPHRAGM REPLACEMENT

REMOVAL

1. Remove the distributor cap and rotor.
2. Remove the vacuum line from the diaphragm.
3. Remove the spring clip that secures the diaphragm link to the breaker plate.
4. Remove the diaphragm retaining screws and remove the diaphragm.

INSTALLATION

1. Install the vacuum unit on the distributor body. Insert the tip of the vacuum rod through the breaker plate and attach the rod with the spring clip.
2. Install the vacuum line in the diaphragm assembly and tighten the fitting.
3. Install the rotor and distributor cap.

ADJUSTMENTS

Refer to Part 9-1 for the proper procedures for adjusting the breaker points and spark advance.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the primary wire at the coil and remove the distributor cap.

2. Disconnect the vacuum line at the distributor.

3. Scribe a mark on the distributor body, indicating the position of the rotor, and scribe another mark on the body and engine block, indicating the position of the body in the block. These lines will be used as guides when installing the distributor in the correctly timed engine.

4. Remove the retaining screw and lock washer and lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft has not been rotated while the distributor was removed, position the distributor in the block with the rotor aligned with the mark previously scribed on the distributor body.

2. Install the distributor retaining screw(s).

3. Connect the distributor primary wire and install the distributor cap.

4. Start the engine and check the ignition timing with a timing light. Connect the distributor vacuum line, and check the advance with the timing light when the engine is accelerated.

If ignition timing is required, rotate the crankshaft until the No. 1 piston is on TDC after the compression stroke. Position the distributor in the block with the rotor at the No. 1 firing position. **Make sure the oil pump intermediate drive shaft is properly seated in the oil pump.** Install, but do not tighten, the distributor retaining screws. Rotate the distributor body clockwise until the breaker points are just starting to open. Tighten the retaining screws and follow steps 3 and 4 above.

4 MAJOR REPAIR OPERATIONS

To perform the operations in this section, it will be necessary to remove the distributor from the car.

BENCH DISASSEMBLY

The distributor assembly is shown in Fig. 3.

1. Remove the pin that retains the oil pump drive shaft in the distributor shaft, then remove the oil pump drive shaft.

2. Install the distributor in a vise.

3. Remove the rotor and retainer.

4. Remove the vacuum diaphragm rod and spring clip. Push the diaphragm rod out of the plate. Remove the vacuum diaphragm unit from the distributor.

5. Disconnect the primary and condenser wires from the breaker point terminal. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

6. Remove the condenser.

7. Remove the breaker point assembly.

8. Release the tension on the return springs and disconnect the springs. **Do not stretch the springs as distortion may result, making it impossible to obtain an adjustment. If the springs are distorted, discard them.**

9. Remove the distributor from the vise. Remove the distributor cap

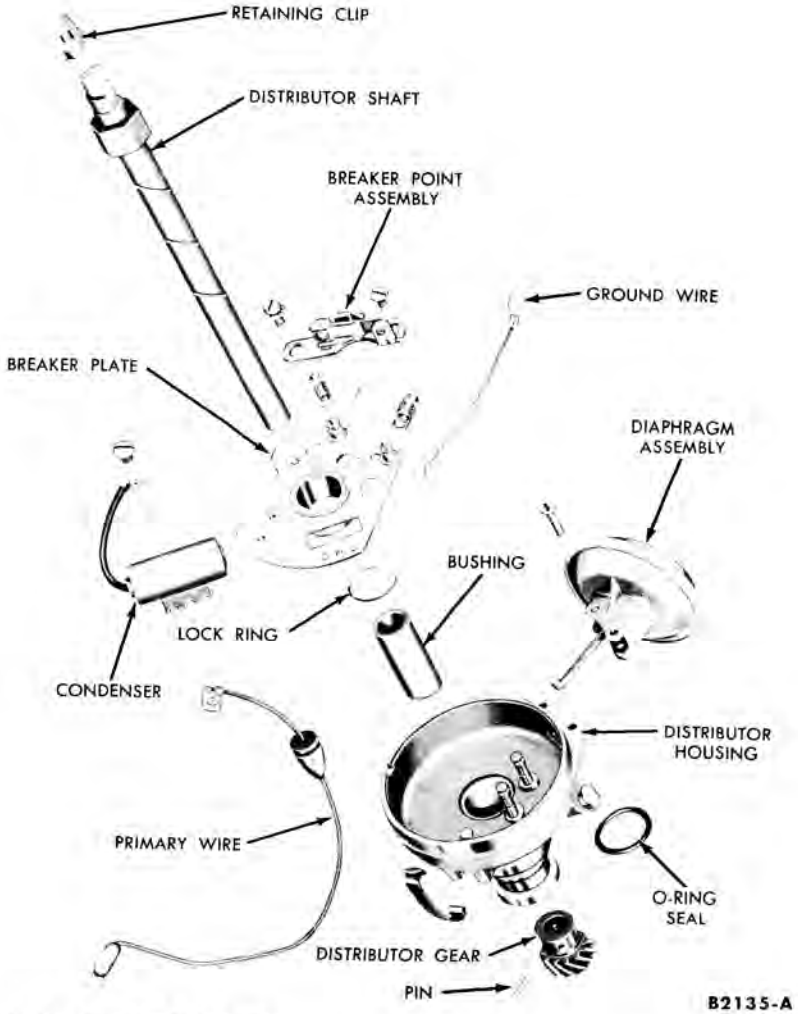


FIG. 3—Distributor Assembly

clamps. Drive out the drive gear pin with a punch (Fig. 4).

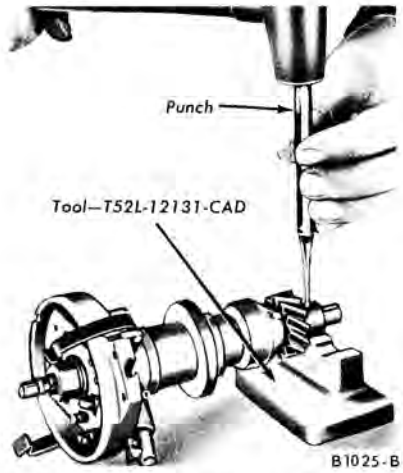


FIG. 4—Gear Pin Removal or Installation

10. If the gear and shaft are to be used again, mark the gear and shaft so that the pin holes can be easily aligned for assembly.

11. Press the gear off the shaft (Fig. 5). Slide the distributor shaft out of the body.

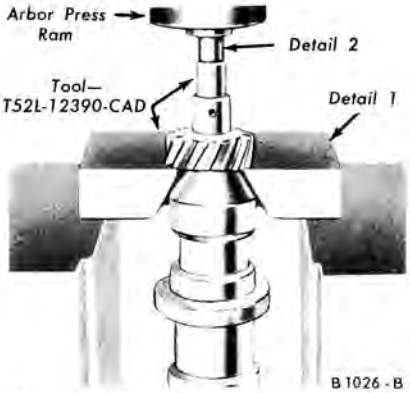


FIG. 5—Gear Removal

12. Position the distributor in a vise.

13. Remove the lock ring attaching the breaker plate to the upper bushing. Lift the breaker plate from the body.

14. Remove the ground wire.

15. Compress and insert the slotted end of the bushing removal tool in the distributor body. Allow it to expand and butt against the bushing. Drive out the bushing (Fig. 6).

BENCH ASSEMBLY

1. Oil the bushing and position it in the body with the lock ring end up. Install the bushing (Fig. 9). Turn

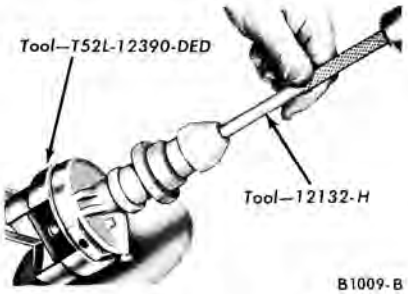


FIG. 6—Bushing Removal

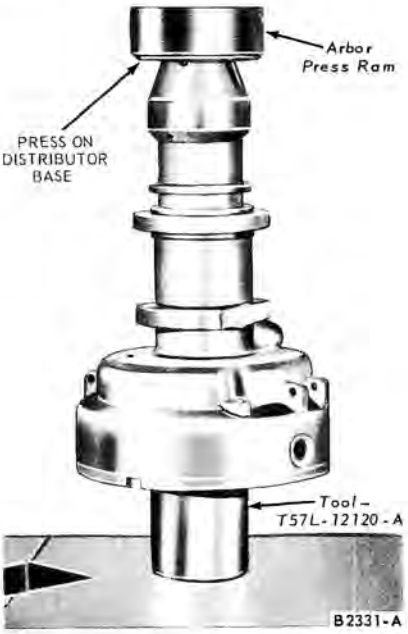


FIG. 7—Bushing Installation

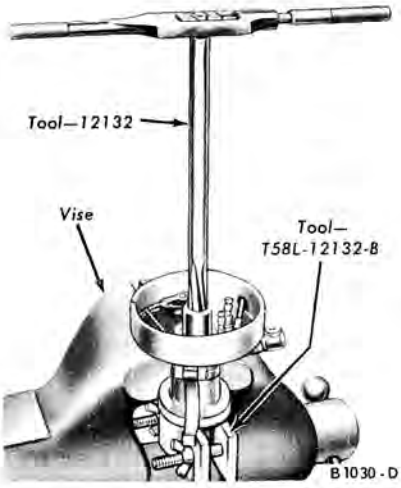


FIG. 8—Burnishing Bushing

the tool until the adapter bottoms firmly against the distributor body.

2. Burnish the bushing to the proper size (Fig. 8).

3. Install the ground wire. Position the breaker plate in the body. Install the lock ring to secure the plate.

4. Position a new breaker point assembly on the breaker plate. Be sure the pivot pin enters the hole in the breaker plate.

5. Connect the ground wire to the breaker plate at the end further from the adjustment slot. Install the other screw and lock washer at the opposite end of the assembly.

6. Install a new condenser. Pass the primary wire assembly through the opening in the distributor, working from the inside to the outside of the distributor housing. Pull the wire through the opening until the locating stop is flush with the inside of the distributor. Place the condenser lead, primary lead, lock washer, and nut on the primary terminal.

7. Install the return springs on the adjustment and breaker plate posts. **Make certain that the secondary spring is installed adjacent to the vacuum chamber.**

8. Install the vacuum diaphragm on the distributor body.

9. Insert the tip of the vacuum diaphragm rod through the breaker plate. Attach the rod with the spring clip.

10. Slide the shaft into the body using care not to damage the rubbing block on the breaker points. **The shaft and gear are replaced as an assembly. One part should not be replaced without replacing the other.**

11. Place the spacer on the gear end of the shaft. Press the gear on the shaft (Fig. 9) until the specified

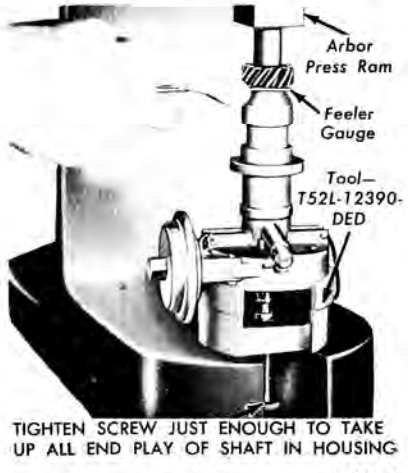


FIG. 9—Gear Installation

end clearance is obtained. If a new shaft is being installed, drill the shaft with a ⅛-inch drill using the pin hole in the gear shoulder as a guide.

12. Install the pin through the gear and shaft. Install the distributor cap clamps. Lubricate the cam with distributor cam lubricant.

13. Refer to Part 9-1 and adjust the breaker point spring tension, align the beaker points, and adjust the gap. Check the vacuum advance, and the breaker point dwell and resistance.

14. Insert the oil pump drive shaft into the end of the distributor shaft.

PART 9-3 DUAL ADVANCE DISTRIBUTORS

Section		Page
1	Description and Operation	9-28
2	In-Car Adjustments and Repairs	9-28
3	Removal and Installation	9-30
4	Major Repair Operations	9-30

1 DESCRIPTION AND OPERATION

The dual advance distributor has two independently operated spark advance systems. A centrifugal advance mechanism (Fig. 1) is located below the stationary sub-plate assembly, and a vacuum operated spark control diaphragm is located on the side of the distributor base (Fig. 2). As speed increases, the centrifugal weights cause the cam to advance or move ahead with respect to the distributor drive shaft. The rate of advance is controlled by calibrated springs.

The vacuum advance mechanism has a spring-loaded diaphragm which is connected to the breaker plate. The spring-loaded side of the diaphragm is airtight and is connected through a vacuum line to the carburetor throttle bore. When the throttle plates open, the distributor vacuum passage is exposed to manifold vacuum, which causes the diaphragm to move against the tension of the spring. This action causes the movable breaker plate to pivot on the stationary sub-plate. The breaker point rubbing block, which is positioned on the opposite side of the cam from the pivot pin, then moves against distributor rotation and advances the spark timing. As the movable breaker plate is rotated from retard position to full advance position, the dwell decreases slightly. This is because the breaker point rubbing block and the cam rotate on different axes.

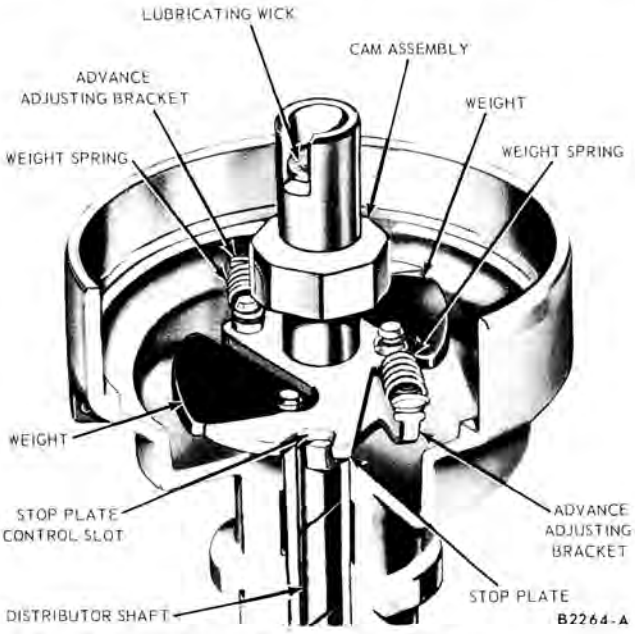


FIG. 1—Centrifugal Advance Mechanism

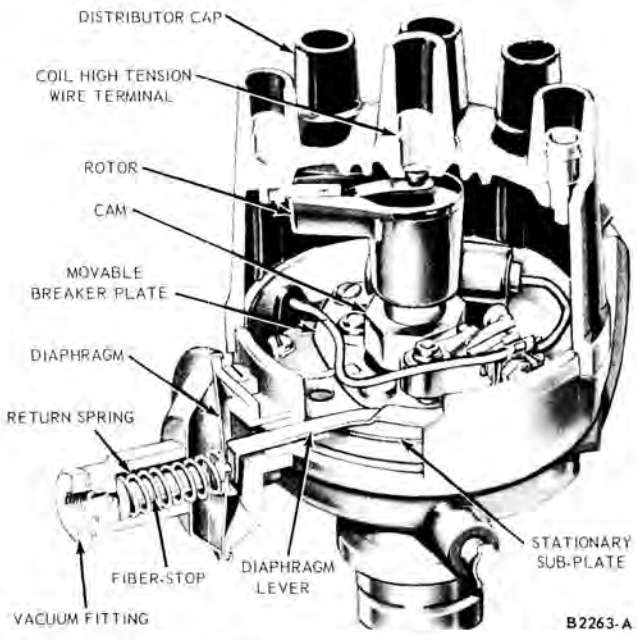


FIG. 2—Vacuum Advance Mechanism

2 IN-CAR ADJUSTMENTS AND REPAIRS

BREAKER POINT AND CONDENSER REPLACEMENT

The replacement procedures are covered in Part 9-1, Section 2.

REMOVAL

1. Remove the distributor cap and the rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

INSTALLATION

1. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts.

2. Align and adjust the breaker

point assembly by following the procedure in Part 9-1.

3. Connect the primary and condenser wires to the breaker point assembly.

4. Install the rotor and the distributor cap.

VACUUM DIAPHRAGM REPLACEMENT

REMOVAL

1. Remove the distributor cap and the rotor.

2. Remove the vacuum line from the diaphragm fitting.

3. Remove the spring clip that secures the diaphragm link to the movable breaker plate.

4. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.

INSTALLATION

1. Slide the diaphragm into the opening in the distributor and place the link in its position.

2. Install the spring clip that secures the diaphragm link to the movable breaker plate and the diaphragm retaining screws.

3. Install the vacuum line on the diaphragm fitting.

4. Install the rotor and the distributor cap.

BREAKER PLATE AND SUB-PLATE REPLACEMENT

Refer to Figs 3 and 4 for the proper location of parts.

REMOVAL

1. Remove the distributor cap and the rotor.

2. Remove the breaker point assembly, the condenser, and the vacuum diaphragm.

3. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

4. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the sub-plate.

5. Remove the sub-plate retaining screws and lift both plates out of the distributor.

INSTALLATION

1. Place the breaker plate in position on the sub-plate.

2. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.

3. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the primary wire opening in the distributor.

4. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

5. Install the breaker point assembly, the condenser, and the vacuum diaphragm.

6. Install the rotor and the distributor cap.

CAM AND CENTRIFUGAL ADVANCE MECHANISM REPLACEMENT

REMOVAL

1. Remove the distributor cap and the rotor.

2. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

3. Remove the sub-plate retaining screws and lift the plate assembly out of the distributor.

4. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.

5. Carefully unhook and remove the weight springs.

6. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

7. Remove the weight retainers and lift the weights out of the distributor.

INSTALLATION

1. Fill the grooves in the weight pivot pins with distributor cam lubricant.

2. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.

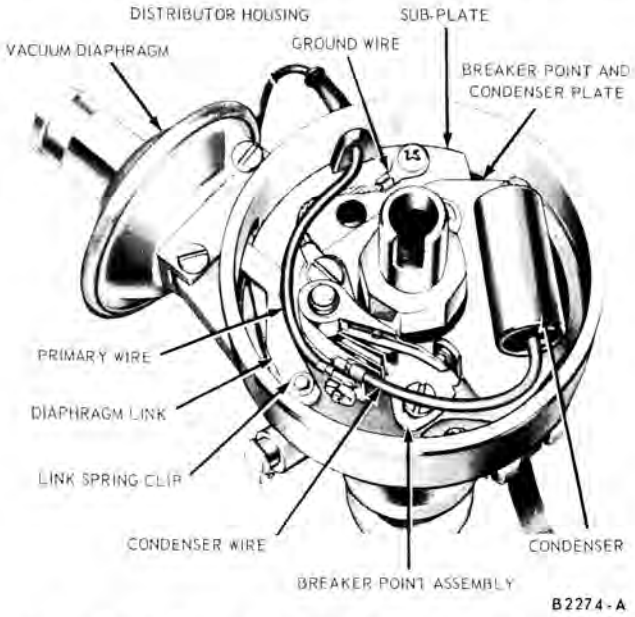


FIG. 3—Breaker Plate Installed—Pivot-Type Points

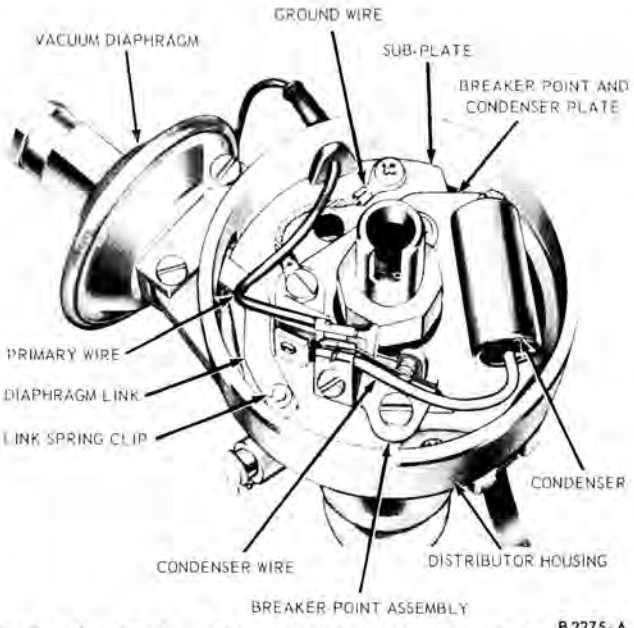


FIG. 4—Breaker Plate Installed—Pivotless Points

3. Place the thrust washer on the shaft.

4. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant.

5. Install the cam assembly. Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate. Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

6. Install the weight springs. Be sure that the marked spring is attached to the marked spring brackets.

7. Install the sub-plate assembly.

8. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

9. Install the rotor and the distributor cap.

ADJUSTMENTS

Refer to Part 9-1, Section 3 for the adjustment procedures.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the primary wire at the coil. Disconnect the vacuum advance line at the distributor. Remove the distributor cap.

2. Scribe a mark on the distributor body and engine block indicating the position of the body in the block, and scribe another mark on the distributor body indicating the position of the rotor. These marks can be used as guides when installing the distributor in a correctly timed engine.

3. Remove the distributor hold down cap screw and clamp. Lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft was rotated while the distributor was removed from the engine, it will be necessary to time the engine. Rotate the crankshaft until No. 1 piston is on TDC after the compression stroke. Align the TDC mark on the timing pointer with the timing pin on the crankshaft damper. Position the distributor in the block with the rotor at the No. 1 firing position.

Make sure the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft.

Install, but do not tighten, the retaining clamp and screw. Rotate the distributor body counterclockwise until the breaker points are just starting to open. Tighten the clamp.

2. If the crankshaft has not been rotated, position the distributor in the block with the rotor aligned with the mark previously scribed on the distributor body, and the marks on the distributor body and engine block in alignment. Install the retaining clamp.

3. Install the distributor cap.

4. Connect the primary wire to the coil.

5. Check the ignition timing with a timing light and adjust if necessary. Connect the vacuum line, and check the advance with the timing light when the engine is accelerated.

4 MAJOR REPAIR OPERATIONS

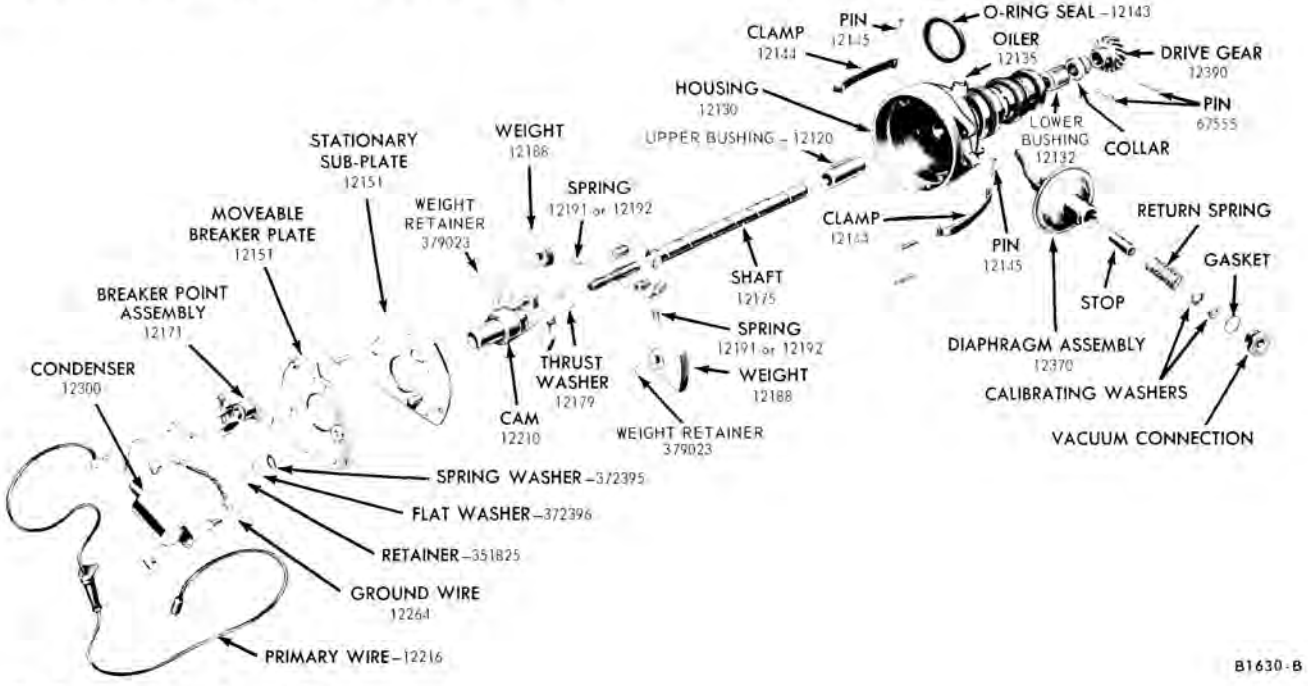


FIG. 5—Distributor Assembly

To perform the operations in this section, it will be necessary to remove the distributor from the car and place it in a vise.

BENCH DISASSEMBLY

The distributor assembly is shown in Fig. 5.

1. Remove the rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

4. Remove the spring clip that secures the diaphragm link to the moveable breaker plate.

5. Remove the diaphragm retaining screws and slide the diaphragm out of the distributor.

6. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

7. Remove the spring clip, the flat washer, and the spring washer securing the breaker plate to the sub-plate.

8. Remove the sub-plate retaining screws and lift both plates out of the distributor.

9. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.

10. Carefully unhook and remove the weight springs.

11. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

12. Remove the weight retainers and lift the weights out of the distributor.

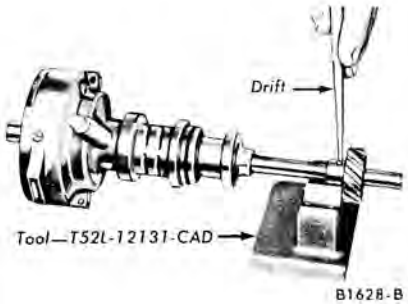


FIG. 6—Gear Pin Removal or Installation

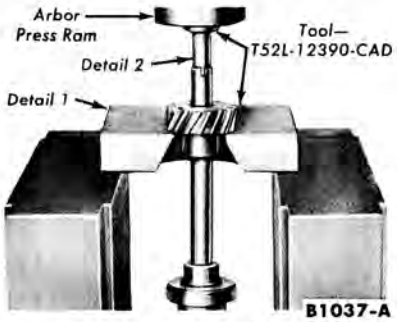


FIG. 7—Gear Removal

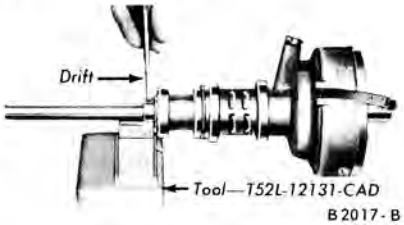


FIG. 8—Collar Retaining Pin Removal or Installation

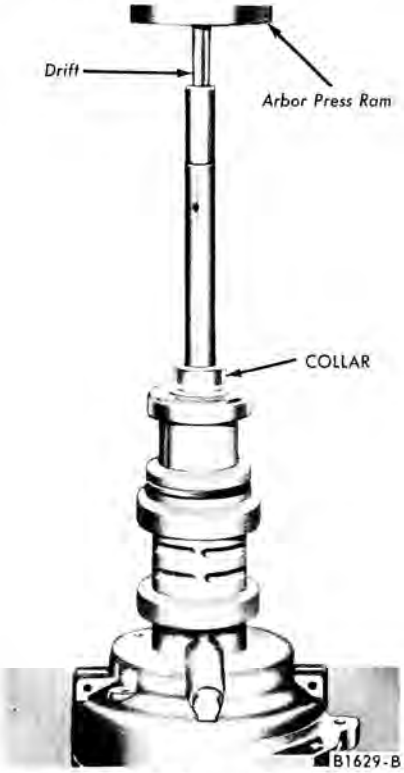


FIG. 9—Shaft Removal

13. Remove the distributor cap clamps.

14. If the gear and shaft are to be used again, mark the gear and the shaft so that the pin holes can be easily aligned for assembly. Remove the gear roll pin (Fig. 6), and then remove the gear (Fig. 7).

15. Remove the shaft collar roll pin (Fig. 8).

16. Invert the distributor and place it on a support plate in a position that will allow the distributor shaft to clear the support plate and press the shaft out of the collar and the distributor housing (Fig. 9).

17. Refer to Figs. 10 and 11 and remove the distributor shaft upper and lower bushings.

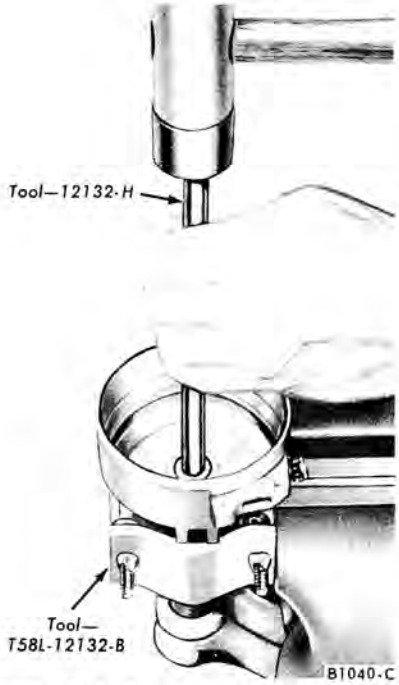


FIG. 10—Lower Bushing Removal

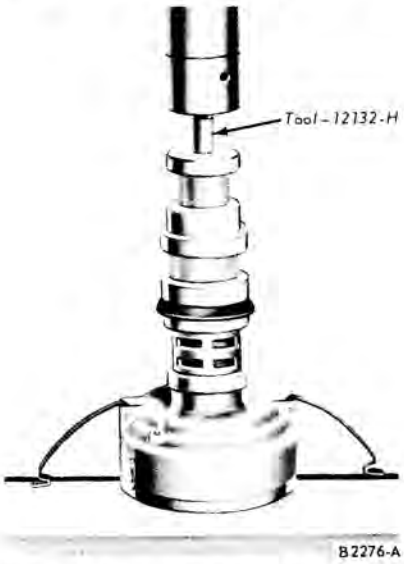


FIG. 11—Upper Bushing Removal



FIG. 12—Upper Bushing Installation

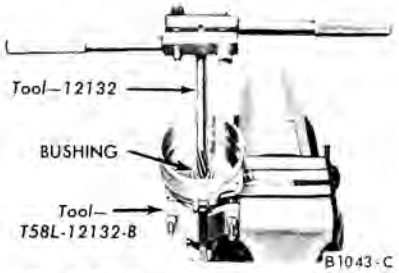


FIG. 13—Burnishing Bushing

BENCH ASSEMBLY

ORIGINAL SHAFT AND GEAR

1. Oil the new upper bushing, and position it on the bushing replacer tool. Install the bushing (Fig. 12). When the tool bottoms against the distributor base, the bushing will be installed to the correct depth.

2. Burnish the bushing to the proper size (Fig. 13).

3. Invert the distributor and install the lower bushing in a similar manner.

4. Oil the shaft and slide it into the distributor body.

5. Place the collar in position on the shaft and align the holes in the collar and the shaft, then install a new pin. Install the distributor cap clamps.

6. Check the shaft end play with a feeler gauge placed between the collar and the base of the distributor. If the end play is not within specifications, replace the shaft and gear.

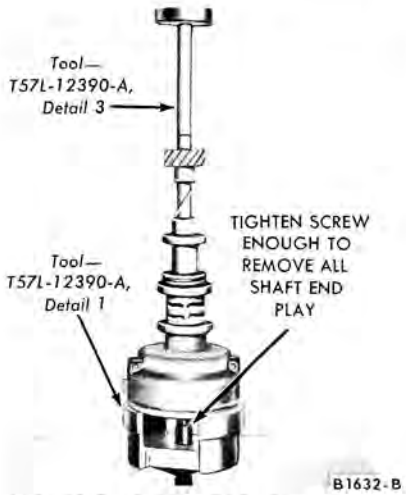


FIG. 14—Original Shaft and Gear Installation

7. Attach the distributor shaft supporting tool to the distributor. Tighten the backing screw in the tool enough to remove all shaft end play.

8. Install the assembly in a press. Press the gear on the shaft (Fig. 14), using the marks made on the gear and shaft as guides to align the pin holes.

9. Remove the distributor from the press. Install the gear retaining pin (Fig. 6).

10. Position the distributor in a vise. Fill the grooves in the weight pivot pins with a distributor cam lubricant.

11. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.

12. Place the thrust washer on the shaft.

13. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant.

14. Install the cam assembly. Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate. Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

15. Install the weight springs. Be sure that the marked spring is attached to the marked spring brackets.

16. Place the breaker plate in position on the sub-plate.

17. Install the spring washer, the flat washer, and the spring clip that secures the breaker plate to the sub-plate.

18. Install the sub-plate hold down screws (the ground wire should be under the sub-plate hold down screw near the primary wire opening in the distributor).

19. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

20. Slide the diaphragm into the opening in the distributor and place the link in its position.

21. Install the spring clip that secures the diaphragm link to the moveable breaker plate.

22. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts. Align and adjust the breaker point assembly by following the procedure in Part 9-1.

23. Connect the primary and condenser leads to the breaker point assembly.

24. Install the rotor and the distributor cap.

25. Check and adjust (if necessary) the centrifugal and vacuum advance (Refer to Part 9-1).

NEW SHAFT AND GEAR

The shaft and gear are placed as an assembly. One part should not be replaced without replacing the other. Refer to Fig. 5 for the correct location of the parts.

1. Follow steps 1, 2, 3, and 4 under "Installing Original Shaft and Gear – Conventional Ignition System Distributor."

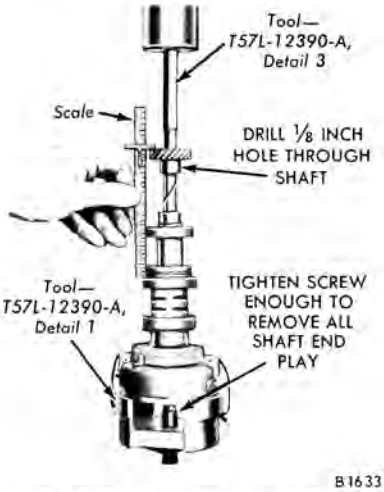


FIG. 15—New Shaft and Gear Installation

2. Attach the distributor shaft supporting tool to the distributor and install the assembly in a vise, Insert a 0.002-inch feeler gauge between the backing screw and the shaft. Tighten the backing screw on the tool enough to remove all shaft end play. Remove the feeler gauge and allow the shaft to rest on the backing screw. Slide the collar on the shaft. While holding the collar in place against the distributor base (Fig. 15), drill a ⅛-inch hole through the shaft using the access opening in the collar as a pilot.

3. Position the gear on the end of the shaft. Install the assembly in a press.

4. With the backing screw on the support tool tightened enough to remove all end play, press the gear on the shaft to the specified distance from the bottom face of the gear to the bottom face of the distributor mounting flange (Fig. 15). Drill a ⅛-inch hole through the shaft using the hole in the gear as a pilot.

5. Remove the distributor from the press and remove the support tool. Install the collar retaining pin (Fig. 8) and the gear retaining pin (Fig. 6).

6. Complete the assembly by following steps 9 thru 25 under "Installing Original Shaft and Gear".

PART 9-4 CENTRIFUGAL ADVANCE DISTRIBUTORS

Section	Page	Section	Page
1 Description and Operation	9-34	3 Removal and Installation	9-35
2 In-Car Adjustments and Repairs	9-34	4 Major Repair Operations	9-36

1 DESCRIPTION AND OPERATION

The centrifugal advance distributor is a straight mechanical-type unit. A governor-type centrifugal advance is located below the stationary breaker plate (Fig. 1). Two centrifugal weights cause the cam to advance or move ahead with respect to the distributor drive shaft. The rate of advance is controlled by two calibrated springs.

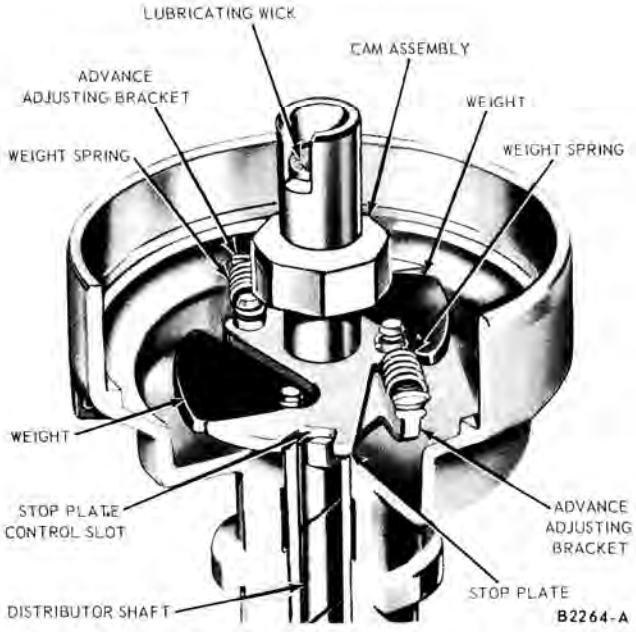


FIG. 1—Centrifugal Advance Mechanism

The breaker points are located on the stationary breaker plate and are connected in parallel with an insulated jumper strap. One breaker point assembly closes the primary circuit and the other opens the primary circuit. This type of construction results in a greater amount of dwell with approximately the same amount of gap spacing as the single breaker point distributor. The breaker arm spring tension is greater than on the loadomatic or dual advance distributors. This increased dwell and breaker arm spring tension assures reserve spark plug voltage for high speed performance.

2 IN-CAR ADJUSTMENTS AND REPAIRS

The replacement procedures are in Part 9-1, Section 2.

BREAKER POINT AND CONDENSER PLATE REPLACEMENT

REMOVAL

1. Remove the distributor cap and the rotor.
2. Remove the breaker point assemblies and the condenser.
3. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.
4. Remove the breaker point and condenser plate retaining screws and lift the plate out of the distributor.

INSTALLATION

The breaker point and condenser plate assembly installation is shown in Fig. 2.

1. Place the breaker point and condenser plate in position and install the retaining screws.
2. Working from the inside of the distributor, push the primary wire through the opening in the distributor housing.
3. Install the breaker point assemblies and the condenser.
4. Install the rotor and the distributor cap.

CAM AND CENTRIFUGAL ADVANCE MECHANISM REPLACEMENT

REMOVAL

1. Remove the distributor cap and the rotor.
2. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

3. Remove the breaker point and condenser plate retaining screws and lift the plate assembly out of the distributor.

4. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.

5. Carefully unhook and remove the weight springs.

6. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

7. Remove the weight retainers and lift the weights out of the distributor.

INSTALLATION

1. Fill the grooves in the weight pivot pins with distributor cam lubricant.

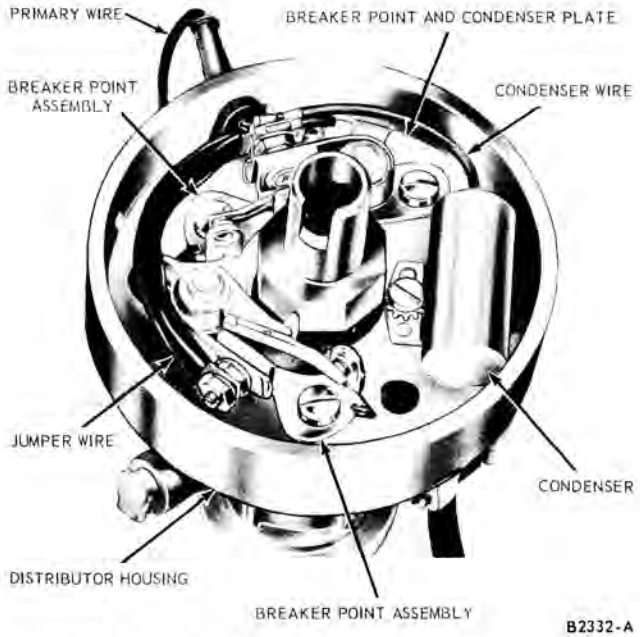


FIG. 2–Breaker Plate Installed

2. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.

3. Place the thrust washer on the shaft.

4. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant.

5. Install the cam assembly. Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate. Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

6. Install the weight springs. Be sure that the marked spring is attached to the marked spring brackets.

7. Install the breaker point and condenser plate assembly.

8. Working from the inside of the distributor, push the primary wire through the opening in the distributor.

9. Install the rotor and the distributor cap.

ADJUSTMENTS

Refer to Part 9-1, Section 3 for the adjustment procedures.

3 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the primary wire at the coil. Remove the distributor cap.

2. Scribe a mark on the distributor body and engine block indicating the position of the body in the block, and scribe another mark on the distributor body indicating the position of the rotor. These marks can be used as guides when installing the distributor in a correctly timed engine.

3. Remove the distributor hold down cap screw and clamp, and then lift the distributor out of the block.

Do not rotate the crankshaft while the distributor is removed, or it will be necessary to time the engine.

INSTALLATION

1. If the crankshaft was rotated while the distributor was removed from the engine, it will be necessary to time the engine. Rotate the crankshaft until No. 1 piston is on TDC (after the compression stroke). Align the TDC mark on the timing pointer with the timing pin on the crankshaft damper. Position the distributor in the block with the rotor at the No. 1 firing position.

If the crankshaft has not been rotated, position the distributor in the block with rotor aligned with the mark previously scribed on the distributor body, and the marks on the distributor body and engine block in alignment. Install the retaining clamp.

Make sure the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft.

2. Install, but do not tighten, the retaining clamp and screw. Rotate the distributor body counterclockwise until one set of breaker points are just starting to open. Tighten the clamp.

3. Install the distributor cap.

4. Connect the primary wire to the coil.

5. Check the ignition timing with a timing light and adjust it if necessary.

4 MAJOR REPAIR OPERATIONS

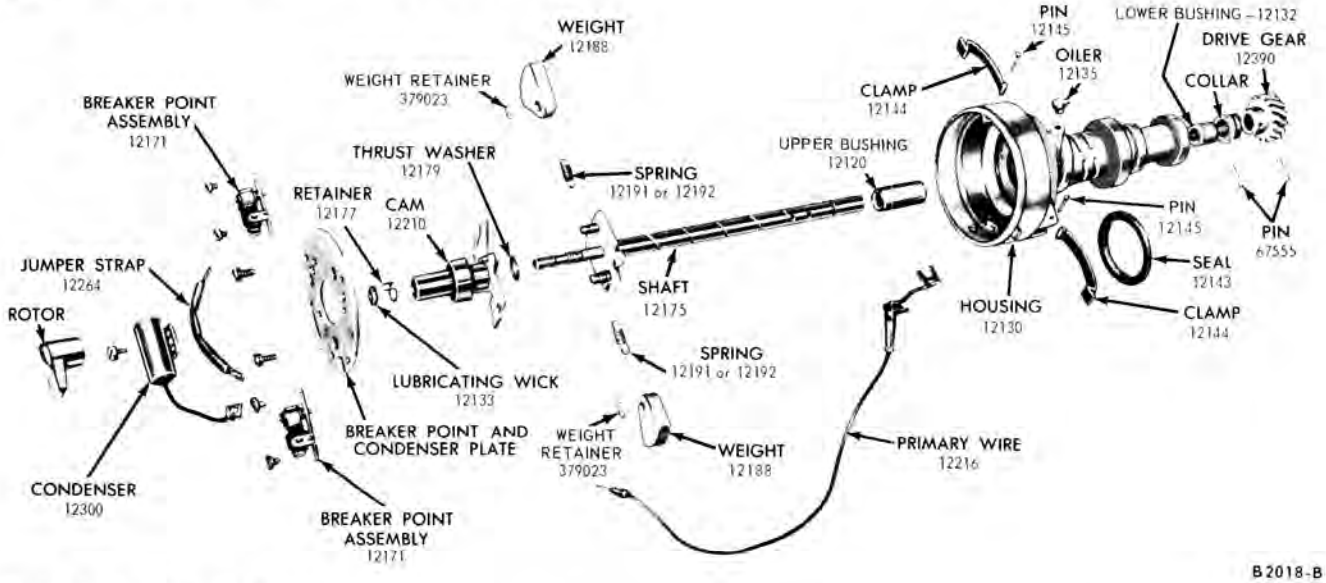


FIG. 3—Distributor Assembly

To perform the operations in this section, it will be necessary to remove the distributor from the car and place it in a vise.

BENCH DISASSEMBLY

Refer to Fig. 3 for the location of parts.

1. Remove the rotor.

2. Disconnect the primary wire, the jumper strap, and the condenser wire from the breaker point assemblies.

3. Remove the retaining screws from the breaker point assemblies and condenser. Lift the breaker point assemblies and the condenser out of the distributor.

4. Working from the inside of the distributor, pull the primary wire through the opening in the distributor.

5. Remove the breaker point and condenser plate retaining screws and lift the plate out of the distributor.

6. Mark one of the distributor weight springs and its brackets. Also mark one of the weights and its pivot pin.

7. Carefully unhook and remove the weight springs.

8. Lift the lubricating wick from the cam assembly. Remove the cam assembly retainer and lift the cam assembly off the distributor shaft. Remove the thrust washer.

9. Remove the weight retainers and lift the weights out of the distributor.

10. Remove the distributor cap clamps.

11. **If the gear and shaft are to be used again, mark the gear and the shaft so that the pin holes can be easily aligned for assembly.** Remove the gear roll pin (Fig. 4), and then remove the gear (Fig. 5).

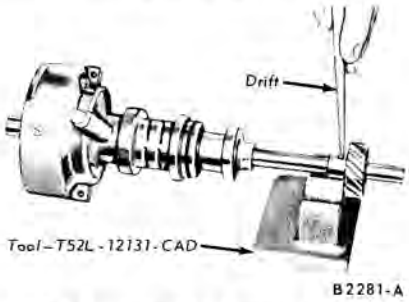


FIG. 4—Gear Pin Removal or Installation



FIG. 5—Gear Removal

12. Remove the shaft collar roll pin (Fig. 6).

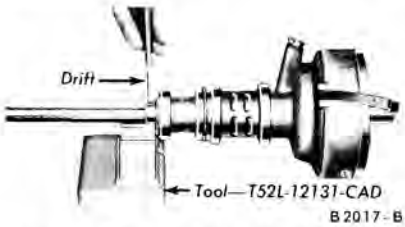


FIG. 6—Collar Retaining Pin Removal or Installation

13. Invert the distributor and place it on a support in a position that will allow the distributor shaft to clear the support plate and press the shaft out of the collar and the distributor housing (Fig. 7).

14. Remove the distributor shaft upper bushing (Fig. 8).

15. Remove the distributor shaft lower bushing (Fig. 9).

BENCH ASSEMBLY

ORIGINAL SHAFT AND GEAR

1. Oil the new upper bushing, and install it on the bushing replacer tool. Then install the upper bushing (Fig. 10). When the tool bottoms against the distributor base, the bushing will be installed to the correct depth.

2. Burnish the bushing to the proper size (Fig. 11).

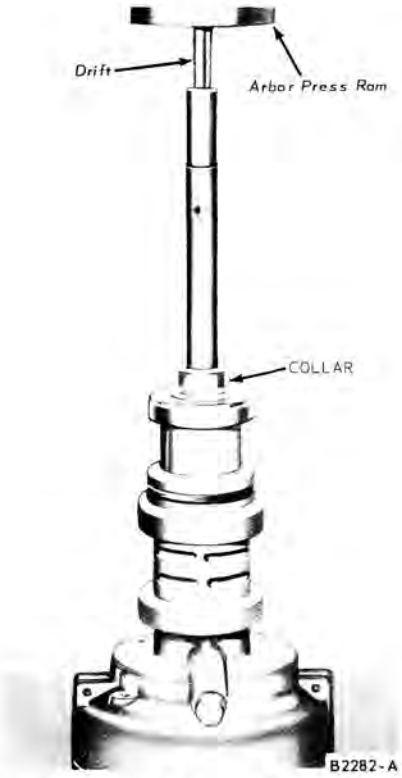


FIG. 7—Shaft Removal

3. Invert the distributor and install the lower bushing in a similar manner.

4. Oil the shaft and slide it into the distributor body.

5. Place the collar in position on the shaft and align the holes in the collar and shaft, then install a new pin (Fig. 6). Install the distributor cap clamps.

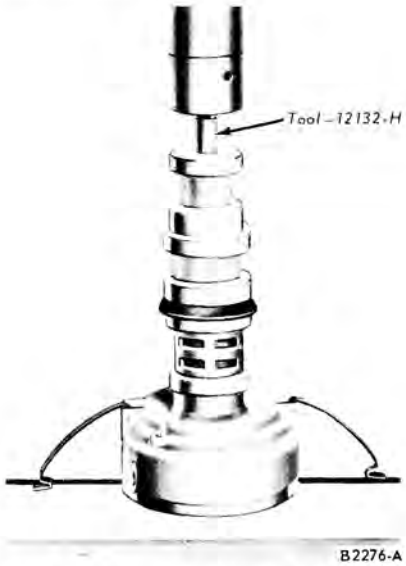


FIG. 8—Upper Bushing Removal

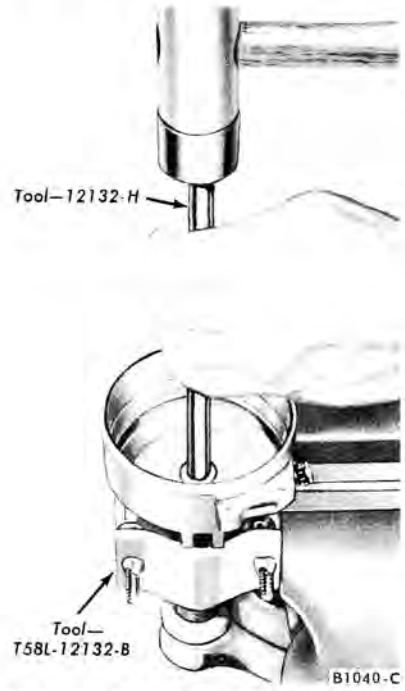


FIG. 9—Lower Bushing Removal

6. Check the shaft end play with a feeler gauge placed between the collar and the base of the distributor. If the end play is not within limits, replace the shaft and gear.

7. Attach the distributor shaft supporting tool to the distributor. Tighten the backing screw in the tool enough to remove all shaft end play.

8. Install the assembly in a press. Press the gear on the shaft (Fig. 12), using the marks made on the gear and shaft as guides to align the pin holes.

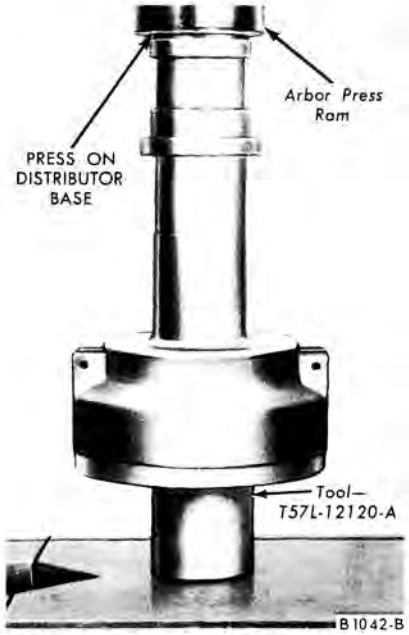


FIG. 10—Upper Bushing Installation

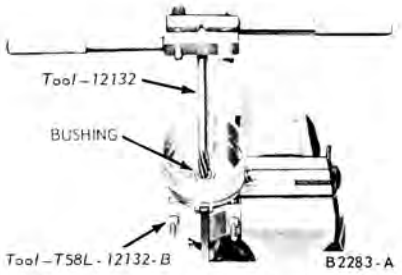


FIG. 11—Burnishing Bushing

9. Remove the distributor from the press. Install the gear retaining pin (Fig. 4).

10. Position the distributor in a vise. Fill the grooves in the weight pivot pins with distributor cam lubricant.

11. Position the weights in the distributor (the marked weight is placed on the marked pivot pin) and install the weight retainers.

12. Place the thrust washer on the shaft.

13. Fill the grooves in the upper portion of the distributor shaft with distributor cam lubricant.

14. Install the cam assembly. Be sure that the marked spring bracket on the cam assembly is near the marked spring bracket on the stop plate. Place a light film of distributor cam lubricant on the distributor cam lobes. Install the retainer and the wick. Saturate the wick with SAE 10W engine oil.

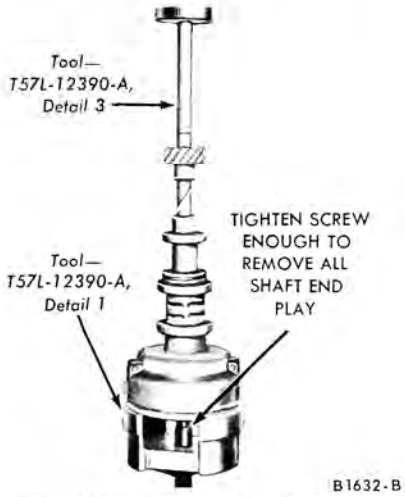


FIG. 12—Original Shaft and Gear Installation

15. Install the weight springs. Be sure that the marked spring is attached to the marked spring brackets.

16. Place the breaker point and condenser plate in position and install the retaining screws.

17. Working from the inside of the distributor, push the primary wire through the opening in the distributor housing.

18. Place the breaker point assemblies and the condenser in position and install the retaining screws.

19. Align and adjust the breaker point assemblies by following the procedure in Part 9-1.

20. Connect the primary wire, the jumper strap, and the condenser wire to the breaker point assemblies.

21. Install the rotor and the distributor cap.

22. Check and adjust (if necessary) the centrifugal advance mechanism (Refer to Part 9-1).

NEW SHAFT AND GEAR

The shaft and gear are replaced as an assembly. One part should not be replaced without replacing the other.

1. Follow steps 1, 2, 3, and 4 under "Installing Original Shaft and Gear."

2. Attach the distributor shaft supporting tool to the distributor and install the assembly in a vise. Insert a 0.002-inch feeler gauge between the backing screw and the shaft. Tighten the backing screw on the tool enough to remove all shaft end play, then remove the feeler gauge and allow the shaft to rest on the backing screw. Slide the collar on the shaft. While holding the collar in place against the distributor base, drill a ⅛-inch hole through the shaft using the access opening in the collar as a pilot.

3. Position the gear on the end of the shaft. Install the assembly in a press.

4. With the backing screw on the support tool tightened enough to remove all end play, press the gear on the shaft to the specified distance from the bottom face of the gear to the bottom face of the distributor mounting flange (Fig. 13). Drill a ⅛-inch hole through the shaft using the hole in the gear as a pilot.

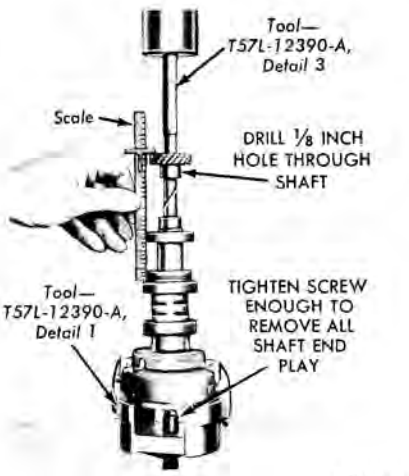


FIG. 13—New Shaft and Gear Installation

5. Remove the distributor from the press and remove the support tool. Install the collar retaining pin (Fig. 6) and the gear retaining pin (Fig. 4).

6. Complete the assembly by following steps 10 thru 22 under "Installing Original Shaft and Gear."

PART 9-5 SPECIFICATIONS

DISTRIBUTOR

GENERAL

170 and 200 Six	
Breaker Arm Spring Tension (Ounces)	17-21
Contact Spacing (Inches)	0.024-0.026
Dwell Angle at Idle Speed	35°-38°
260 and 289 Regular V-8	
Breaker Arm Spring Tension (Ounces)	17-21
Contact Spacing (Inches)	0.014-0.016
Dwell Angle at Idle Speed	26°-28½°
289 High Performance V-8	
Breaker Arm Spring Tension (Ounces)	27-30
Contact Spacing (Inches)	0.019-0.021
Combined Dwell Angle at Idle Speed	30°-33°

DIMENSIONS

Shaft End Play—Distributor Removed (Inches)	
170 and 200 Six	0.022-0.033
260 and 289 V-8	0.024-0.035
Distance From Bottom of Mounting Flange to Bottom of Gear (Inches)	
170 and 200 Six	2.510-2.515
260 and 289 V-8	4.031-4.038

CONDENSER

Capacity (Microfarads)	0.21-0.25
Minimum Leakage (Megohms)	5
Maximum Series Resistance (Ohms)	1

IGNITION TIMING

ENGINES	Recommended Setting (BTDC)**	
	Manual-Shift Transmission	Automatic Transmission
170 Six	*6°	*12°
200 Six	*6°	*12°
260 (2-V) V-8	6°	10°
289 (2-V) V-8	6°	6°
289 (Regular 4-V) V-8	6°	6°
289 (High Performance) V-8	12°	12°

*For altitude operation, and/or to obtain optimum engine performance and fuel economy, the initial ignition timing may be advanced 5° over the "normal" setting. No further improvement in engine performance or fuel economy will be achieved by advancing beyond this point. Advance the timing progressively until engine detonation (spark knock) is evident under actual road test acceleration. Retard the timing until the detonation (spark knock) is eliminated.

**If the individual requirements of the car and/or the use of substandard fuels dictate, the initial timing may have to be retarded from the recommended setting to eliminate detonation (spark knock). If retiming is necessary, it should be done progressively and not to exceed 2° BTDC.

ADVANCE CHARACTERISTICS

Note: The advance characteristics given apply to the distributor with the indicated number only. The distributor number is stamped on the distributor housing or on a plate attached to the distributor housing.

170 Six (Distributor No. C42F-12127-A used with Manual-Shift Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
800	1¾-2¾	0.80
1200	6-7	1.80
1600	8½-9¾	3.00
2000	10-11¼	3.90
Maximum Advance Limit		15°

170 Six (Distributor No. C4DF-12127-B used with Automatic Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
500	1-2	0.30
800	5½-6¾	0.80
1200	9¾-11	1.80
1600	11½-13	3.00
2000	12¼-13¾	3.90
Maximum Advance Limit		15¾°

170 Six (Distributor No. C5DF-12127-C used with Manual-Shift Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
800	2½-3½	0.80
1200	6½-7½	1.80
1800	8¾-10	3.00
2000	10¼-11½	3.90
Maximum Advance Limit		14½°

170 Six (Distributor No. C5DF-12127-D used with Automatic Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
800	1¼-2¼	0.80
1200	3¾-4¾	1.80
1600	5½-6¾	3.00
2000	6¾-8	3.90
Maximum Advance Limit		11°

DISTRIBUTOR (Continued)

ADVANCE CHARACTERISTICS (Continued)

170 Six (Distributor No. C4ZF-12127-A used with Manual-Shift Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
800	1¾-2¾	0.80
1200	6-7	1.80
1600	8½-9¾	3.00
2000	10-11¼	3.90
Maximum Advance Limit		15°

170 Six (Distributor No. C4DF-12127-D used with Automatic Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
500	1½-2½	0.35
800	3¾-4¾	0.80
1200	6-7	1.80
1600	7½-8½	3.11
2000	8½-9¾	4.10
Maximum Advance Limit		12¼°

200 Six (Distributor No. C5DF-12127-E used with Manual-Shift Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
600	1-2	0.44
800	5-6	0.80
1200	8¼-9¼	1.90
2000	10¼-11½	3.80
Maximum Advance Limit		15½°

200 Six (Distributor No. C5DF-12127-F used with Automatic Transmission)

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
600	0-1	0.44
800	1¾-2¾	0.80
1200	5-6	1.90
2000	8¼-9½	3.80
Maximum Advance Limit		13½°

260 V-8 (Distributor No. C4ZF-12127-B used with Manual-Shift Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
700	1¼-2¼	0
800	3-4	0
1200	6-7¼	0
1600	8¼-9½	0
2000	8¾-10¾	0
Maximum Advance Limit		10¾°

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1-4	7
1000	4-7	9
1000	7-10	12
1000	9½-12½	20
Maximum Advance Limit		12½°

260 V-8 (Distributor No. C4ZF-12127-E used with Automatic Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1-2	0
1500	5-6	0
2000	9-10	0
Maximum Advance Limit		

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1-4	7
1000	5½-8½	12
1000	7½-10½	16
1000	8-11	20
Maximum Advance Limit		11°

260 V-8 (Distributor No. C4OF-12127-B used with Automatic Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
600	½-1½	0
800	2½-3½	0
1200	4¾-6	0
1600	7¼-8½	0
2000	9½-11	0
Maximum Advance Limit		

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1-4	8
1000	5½-8½	12
1000	7½-10½	16
1000	8-11	20
Maximum Advance Limit		11°

289 2-V V-8 (Distributor No. C5AF-12127-M used with Manual-Shift Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
650	1½-2½	0
800	4¾-5¾	0
1200	8½-9½	0
1600	10¼-11¾	0
2000	12-13¾	0
Maximum Advance Limit		14°

VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.

Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1½-4½	8
1000	3½-6½	10
1000	6¾-9¾	14
Maximum Advance Limit		11°

DISTRIBUTOR (Continued)

ADVANCE CHARACTERISTICS (Continued)

289 2-V V-8 (Distributor No. C5AF-12127-N used with Automatic Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
450	1½-2½	0
600	5¼-6¼	0
800	7¼-8¼	0
1400	8¾-10	0
2000	10½-12	0
Maximum Advance Limit		14°
VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1½-4¾	8
1000	5-8	10
1000	8¼-11	14
Maximum Advance Limit		12½°

289 2-V V-8 (Distributor No. C4ZF-12127-C used with Manual-Shift Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
500	¾-1¾	0
800	5-6	0
1200	7-8¼	0
1600	7¾-9	0
2000	8½-10	0
Maximum Advance Limit		
VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	2-5	8
1000	7-10	12
1000	9-12	16
1000	9½-12½	20
Maximum Advance Limit		12½°

289 2-V V-8 (Distributor No. C4GF-12127-B used with Automatic Transmission)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
600	1-2	0
700	3-4¼	0
900	6-6¾	0
1500	8-9¼	0
2000	9¼-11	0
Maximum Advance Limit		11°
VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	2-5	8
1000	7-10	12
1000	9-12	16
1000	9½-12½	20
Maximum Advance Limit		12½°

289 4-V V-8 (Distributor No. C5GF-12127-A)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
550	1½-2¼	0
700	5-6	0
1000	6¾-7¾	0
1400	7½-8¼	0
2000	8½-10	0
Maximum Advance Limit		14°
VACUUM ADVANCE. Set the test stand to 0° at 1000 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
1000	1½-4½	8
1000	3½-6¾	10
1000	6¾-9¾	14
1000	8-11	20
Maximum Advance Limit		11°

289 High Performance V-8 (Distributor No. C5DF-12127-E)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
650	2¼-3¾	0
750	4-5½	0
1000	6½-7½	0
1600	7½-8¾	0
2000	8¼-9¾	0
Maximum Advance Limit		14°

289 High Performance V-8 (Distributor No. C3OF-12127-D)

CENTRIFUGAL ADVANCE. Set the test stand to 0° at 250 rpm and 0 inches of vacuum.		
Distributor (rpm)	Advance (Degrees)	Vacuum (Inches of Mercury)
450	0-1	0
600	1½-3	0
800	5-6½	0
1200	7¼-8¼	0
2000	8¼-9¾	0
2500	9-10¾	0
Maximum Advance Limit		

SPARK PLUGS

Engines	Type	Size	Gap (Inches)	Torque (Ft-lbs)*
170-200	BF-82	18MM	0.032-0.036	15-20
260-289	BF-42	18MM	0.032-0.036	15-20
289 H.P.	BF-32	18MM	0.028-0.032	15-20

*When a new spark plug is installed in a new replacement cylinder head, torque the spark plug to 20-30 ft-lbs.

COIL

Primary Resistance (Ohms)*	1.40-1.54 (75°F.)
Secondary Resistance (Ohms)	8000-8800 (75°F.)
Amperage Draw—Engine Stopped	4.5
—Engine Idling	2.5
*Primary Circuit Resistor	1.30-1.40 (75°F.)

SPECIAL TOOLS

DESCRIPTION	TOOL NO.
Breaker point aligning tool	KD-111 or TK-419-A
Breaker point spring tension scale	12151
Bushing burnisher	12132
Bushing installer	T57L-12120-A or 12132-A
Bushing remover	12132-H
Distributor holding clamp	T58L-12132-B
Distributor testers	RE-236 RE-1416 DT-600
Drive gear installing fixture	T57L-12390-A
Drive gear remover kit	T52L-12390-CAD
Ignition scopes	RE-27-55 RE-651 RE-881 Sun 900
Pin removing fixture	T60K-12131-A
Tach-dwell tester	RE-27-44
Timing light	13-07

FUEL SYSTEM

GROUP 10

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PART 10-1 GENERAL FUEL SYSTEM SERVICE

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This part covers general fuel system diagnosis, tests, adjustment and repair procedures. In addition, the cleaning and inspection procedures are covered.

For fuel system component removal, disassembly, assembly, installation, major repair procedures and specifications, refer to the pertinent part of this group.

The carburetor identification tag is attached to the carburetor. The basic part number for all carburetors is 9510. To procure replacement parts, it is necessary to know the part number prefix and suffix and, in some instances, the design change code (Fig. 1).

Always refer to the Master Parts Catalog for parts usage and interchangeability before replacing a carburetor or a component part for a carburetor.

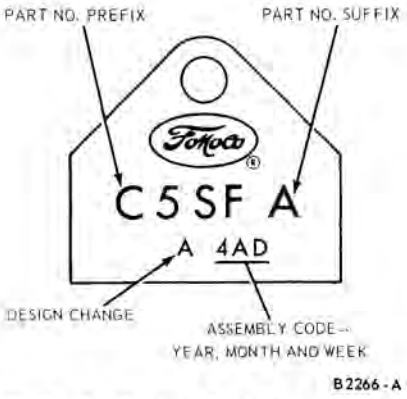


FIG. 1—Typical Carburetor Identification Tag

1 DIAGNOSIS AND TESTING

FUEL TANK, LINES AND FILTER

Water and dirt that accumulate in the fuel tank can cause a restricted fuel line or filter and malfunction of fuel pump, or carburetor. Condensation, which is the greatest source of water entering the fuel tank, is formed by moisture in the air when it strikes the cold interior walls of the fuel tank.

If the accumulation of sediment in the filter is excessive, the fuel tank should be removed and flushed,

and the line from the fuel pump to the tank should be blown out.

Leakage in the fuel inlet line can cause low vacuum, pressure and volume conditions, and loss of fuel.

A restricted fuel tank vent can cause low fuel pump pressure and volume and may, in some instances, result in collapsed inlet hoses or a collapsed fuel tank.

FUEL PUMP

Incorrect fuel pump pressure and low volume (flow rate) are the two most likely fuel pump troubles that will affect engine performance. Low pressure will cause a lean mixture and fuel starvation at high speeds and excessive pressure will cause high fuel consumption and carburetor flooding. Low volume will cause fuel starvation at high speeds.

Two tests: fuel pump static pressure and fuel volume are necessary to determine that the fuel pump is in satisfactory condition.

If both the fuel pump volume and pressure are within specifications (Part 10-8) and the pump and lines are in satisfactory condition, a vacuum test is not required.

If the pump volume is low, but the pressure is within specifications, a fuel pump capacity test must be made with the filter removed. If the pump volume meets specifications with the filter removed, replace the filter. If the pump volume is still below specifications, repeat the capacity test, using an auxiliary fuel supply. If the pump volume still does not meet specifications, replace the pump. If the pump does meet specifications, there is a restriction in the fuel supply from the tank or the tank is not venting properly.

The tests are performed with the fuel pump installed on the engine and the engine temperature stabilized at the normal operating temperature. **Make certain the replaceable fuel filter element has been changed within the recommended maintenance mileage interval.** When in doubt, install a new filter prior to performing the tests. A clogged or restricted filter is often the cause of fuel system malfunction.

PRESSURE TEST

1. Remove the carburetor air cleaner assembly (Part 10-5). Disconnect the fuel inlet line at the carburetor. **Use care to prevent combustion due to fuel spillage.**

2. Connect a pressure gauge, petcock and flexible hose (Fig. 2) between the carburetor inlet connector and the fuel inlet line connector.

3. Position the flexible hose restrictor so that the fuel can be expelled into a suitable container (Fig. 2) for the capacity (volume) test.

4. Operate the engine at 500 rpm. Vent the system into the container by opening the hose restrictor momentarily before taking a pressure reading.

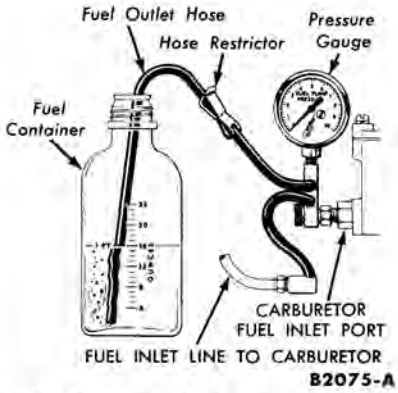


FIG. 2–Typical Fuel Pump Pressure and Capacity Tests

5. Operate the engine at 500 rpm. After the fuel pump pressure has stabilized, it should be to specification (Part 10-8).

CAPACITY (VOLUME) TEST

Perform this test only when the fuel pump pressure is within specifications (Part 10-8).

1. Operate the engine at 500 rpm.

2. Open the hose restrictor and expel the fuel into the container (Fig. 2), while observing the time required to expel one pint; then close the restrictor. One pint of fuel should be expelled within the specified time limit (Part 10-8).

3. Remove the test equipment, and connect the fuel inlet line to the carburetor.

FUEL PUMP, TANK AND LINES DIAGNOSIS GUIDE

LOW FUEL PUMP PRESSURE OR VOLUME	Diaphragm stretched or leaking. Fuel pump diaphragm spring is weak. Rocker arm or eccentric worn or undersize. Excessive clearance between rocker arm and fuel pump link. Fittings loose or cracked.	Fuel filter clogged (low volume). Fuel line cracked or broken. Fuel pump valves improperly seating. Dirt in fuel tank and/or lines. Fuel tank vent restricted. Diaphragm ruptured. Main body retaining screws loose.
HIGH FUEL PUMP PRESSURE OR VOLUME	Diaphragm spring too strong or improper spring. Diaphragm surface too tight (overtensioned).	Pump link has no free play (frozen). Diaphragm vent opening plugged or omitted.
LOW FUEL PUMP VACUUM	Diaphragm stretched or leaking. Fuel pump springs weak. Fuel pump valves improperly seating. Diaphragm ruptured.	Rocker arm or eccentric worn. Excessive clearance between rocker arm and fuel pump link. Main body retaining screws loose.
LOW FUEL PUMP VOLUME WITH NORMAL PRESSURE	Fuel filter clogged. Fuel pump to carburetor inlet line obstructed, crimped or leaks.	Restriction in fuel supply line to fuel pump.

CONTINUED ON NEXT PAGE

FUEL PUMP, TANK AND LINES DIAGNOSIS GUIDE—Continued

FUEL PUMP LEAKS FUEL	Diaphragm defective. Fittings loose.	Threads on fittings stripped. Body cracked.
FUEL PUMP LEAKS OIL	Fuel pump retaining bolts loose. Mounting gasket defective.	Diaphragm pull rod oil seal ruptured or improperly installed.
FUEL PUMP NOISE	Rocker arm or eccentric worn. Mounting bolts loose. Rocker arm springs weak or broken.	Rocker arm bumper pad defective.
FUEL TANK AND/OR INLET LINE HOSES COLLAPSED	Fuel tank vent restricted.	

AIR INTAKE DUCT TEST—289 V-8

Proper operation of the air intake duct thermostatic valve can be determined by the following test:

1. Remove the air duct (Part 10-5). Place the air duct assembly in a container of cool water (below 75°F). Be sure that the thermostat is covered by the water.

2. Place the thermometer in the water and observe the temperature.

3. With water temperature at 75°F or below, the valve should be in the heat-on position.

4. Using a hot plate or other suitable device, heat the water slowly.

5. When the water temperature reaches 85°F the valve should start to open. **If the valve does not start to open at this time, stabilize the water temperature at 85°F for eight minutes before condemning the unit.**

6. When the water temperature reaches 100°F or higher, the valve should be in the full heat-off position.

7. If the operation of the valve is unsatisfactory, remove the thermostat and spring assembly and check the valve plate shaft for binding.

8. If the valve plate moves freely, replace the thermostat and spring assembly. Retest the heat-on and the heat-off temperatures.

9. If the valve does not operate correctly, adjust the thermostat rod. By increasing the rod length, the valve plate will be moved toward the heat-off position. By decreasing the rod length the valve plate will be moved toward the heat-on position.

CARBURETOR

Dirt accumulation in the fuel and air passages, improper idle adjustments, and improper fuel level are the major sources of carburetor troubles.

TESTS

Accelerating Pump Discharge

1. Remove the air cleaner (Part 10-5).

2. Open the primary throttle plates and observe the fuel flow from the accelerating pump discharge nozzles. If the system is operating correctly, a quick steady stream of fuel will flow from the discharge nozzles.

Secondary Vacuum System—Ford 4-V Carburetor. Opening of the secondary throttle plates is controlled by vacuum from the left primary booster venturi. The vacuum is transmitted from the secondary throttle control vacuum tube through passages in the air horn, air horn mounting gasket, and main body area behind the secondary operating diaphragm. The diaphragm spring, ball check and a vacuum bleed in the ball check seat (located in the vacuum passage in the diaphragm housing) controls the rate at which the secondary throttle plates are allowed to open (high vacuum) or close (low vacuum).

With the engine temperature stabilized at the normal operating temperature and the air cleaner removed (Part 10-5), check the operation and seals of the secondary vacuum system as follows:

1. Position the transmission selector lever in neutral position and start the engine. Open the throttle gradually through its range of travel from the fully closed to the fully open position, hold the throttle fully open for approximately 5 seconds before allowing the throttle to close and observe the operation of the secondary throttle lever. **To prevent injury due to possible combustion back-flash thru the carburetor air horn, do not position any part of the body (head, hands, etc.) near the top of the carburetor air horn when checking the secondary vacuum system.**

2. If the secondary throttle lever doesn't open fully as the throttle reaches the maximum open position for a period of 5 seconds, air leakage at the diaphragm or the air horn mounting gasket may be causing the malfunction. Tighten the air horn and secondary diaphragm retaining screws. Check the secondary throttle plate operating rod for binds. Check the secondary vacuum tube to make certain it is properly positioned.

3. Gradually open and close the throttle once again (as indicated in Step 1) while observing the action of the secondary throttle lever. If the secondary throttle lever does not fully open and close, the malfunction may be caused by an air leak where the secondary vacuum tube fits into the air horn, air leakage between the secondary diaphragm housing cover and the housing, air leakage between the air horn and main body, the secondary diaphragm return spring is too stiff, a restricted vacuum pick-up tube, secondary throttle plates

wedged in the barrels or a bent secondary throttle shaft.

Power Valve—Ford 2-V and 4-V Carburetors. A power valve must not be replaced unless it is leaking sufficiently to cause an unadjustable rough engine idle condition. Fuel accumulation in the power valve cover does not necessarily indicate a defective power valve. Fuel vapors will be drawn into the vacuum side of the power valve and condense during periods of deceleration. Leakage in the power valve area can be caused by an improperly tightened cover or defective gaskets. Any defect in the gasket sealing qualities must be corrected before the power valve is replaced.

Power valve leakage that causes an unadjustable rough engine idle condition can be diagnosed, in most instances, by the fact that the idle mixture needle(s) must be nearly, or completely seated in order to obtain a relatively smooth engine idle condition. If power valve leakage is suspected, the following test procedure must be performed.

1. Remove the carburetor from the intake manifold. Invert the carburetor.

2. Remove the glass bowl from the fixture (Fig. 3). Fill the bowl half-full of water. Install the bowl on the fixture.

3. Connect a line from the vacuum pump to the fitting on top of the fixture. Insert the large OD end of the wand into the tube and attach the other end of the tube to the fitting on the side of the fixture. Slip the rubber gasket (furnished with the tool) over the small OD end of the wand. Hold this end against the power valve vacuum pick-up port (Fig. 3).

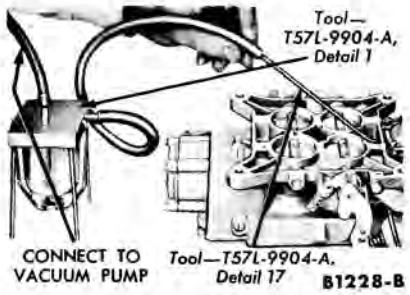


FIG. 3—Typical 4-V Carburetor Power Valve Test

4. Look for bubble formations in the water in the bowl. A continuous stream of bubbles indicates leakage through the power valve diaphragm or gasket, or the cover or gasket.

If leakage is encountered, the power valve, power valve gasket, cover, and cover gasket should be replaced one at a time with a new part and the test repeated until the source of leakage has been found. If the source of leakage can not be found, the gasket seats are damaged and the defective parts should be replaced.

A few bubbles may be noticed immediately upon attaching the vacuum line. The bubbling should stop within approximately 15 seconds or after the air has been removed from the system. If no bubbles are seen, the power valve, gaskets and cover are sealing properly.

CARBURETOR DIAGNOSIS GUIDE

FLOODING OR LEAKING CARBURETOR	Cracked carburetor body. Defective main body and/or fuel bowl gasket. High fuel level or float setting. Fuel inlet needle not seating properly or worn needle and/or seat.	Ruptured accelerating pump diaphragm. Excessive fuel pump pressure. Defective power valve gasket. Ruptured power valve diaphragm.
HARD STARTING	Improper starting procedure causing a flooded engine. Improper carburetor fuel level. Improper idle adjustments. Sticking or incorrectly seating fuel inlet needle. Incorrect fuel pump pressure. Improper carburetor gasket and/or spacer combination.	Incorrect setting of choke thermostatic spring housing. Choke linkage or plate binding. Binding or broken manual choke linkage. Restrictions or air leaks in the choke vacuum or hot air passages. Dirty air cleaner element.
STALLING	**ENGINE HOT OR COLD:** Incorrect idle fuel mixture. Engine idle speed too slow (fast or cold idle adjustments). Dirt, water or ice in fuel filter. Positive crankcase ventilation system malfunctioning. Fuel lines restricted or leaking air. Fuel tank vent restricted. Leakage intake manifold or carburetor gaskets. Carburetor icing (cold, wet or humid weather). Incorrect throttle linkage adjustment to carburetor. Clogged air bleeds or idle passages. Defective fuel pump. **ENGINE HOT ONLY:** Improperly adjusted or defective carburetor dashpot (if so equipped). Idle compensator malfunctioning (if so equipped). Coolant control thermostat defective. Excessive looseness of throttle shaft in bore(s) of throttle body.	

CONTINUED ON NEXT PAGE

CARBURETOR DIAGNOSIS GUIDE—Continued

ROUGH IDLE	Positive crankcase ventilation system malfunctioning or restricted. Incorrect idle mixture adjustment. Idle compensator malfunction (if so equipped). Idle adjusting needle(s) grooved, worn, or otherwise damaged. Idle air bleeds restricted. Idle air or fuel passages restricted. Idle discharge holes restricted. Idle discharge holes not in proper relation to throttle plate(s). Excessive dirt in air cleaner. High or low fuel level or float setting. Fuel inlet needle not seating properly, or worn needle or seat. Power valve leaking. Restricted air bleeds. Plugged idle fuel channel restrictor. Worn or damaged main metering jet. Accelerating pump discharge ball check and/or weight not seating properly. Fuel pump pressure too low, or excessive. Fuel siphoning from secondary main fuel system (Ford 4-V carburetor). Restriction in main fuel passage.
POOR ACCELERATION	Poor acceleration complaints fall under one of three headings: the engine is sluggish on acceleration, the engine stalls when accelerated, or the engine hesitates or develops a flat spot when accelerated. Poor acceleration is caused by either an excessively lean or rich mixture on acceleration and/or defects or improper adjustments in the ignition system.
	A LEAN MIXTURE ON ACCELERATION CAN BE CAUSED BY: Low fuel pump pressure. Sticking fuel inlet needle. Low fuel level or float setting. Restriction in main fuel passage. Air leak between the carburetor and the manifold caused by loose mounting bolts or defective gasket. Air leak at the throttle shaft caused by a worn throttle shaft. Accelerating pump diaphragm defective. Incorrect accelerating pump stroke adjustment. Accelerating pump fuel inlet valve (Elastomer valve or ball check—Ford 2-V or 4-V carburetor) not seating on acceleration. Restriction in the accelerating pump discharge passage. Accelerating pump discharge Elastomer valve (Ford 2-V or 4-V carburetor), ball check or weight not coming fully off its seat, or failing to seat properly on the reverse stroke of the pump diaphragm. Air leak at the accelerating pump cover caused by a defective gasket or warped pump cover. **4-V CARBURETORS:** Defective secondary diaphragm. Air leak where secondary vacuum pick-up tube fits into air horn, between air horn and main body, or between the secondary diaphragm housing cover and housing. Secondary throttle plates wedged in barrels. Bent secondary throttle shaft. Secondary throttle plates operating rod binding, or disconnected from secondary diaphragm or secondary throttle lever. Secondary vacuum passage ball check stuck on its seat. Secondary vacuum probe restricted or not properly positioned. Defective power valve spring.
	A RICH MIXTURE ON ACCELERATION CAN BE CAUSED BY: Excessive fuel pump pressure. High fuel level or float setting. Fuel inlet needle not seating properly or worn needle and/or seat. Malfunctioning automatic choke. Excessive dirty air cleaner. Incorrect accelerating pump stroke adjustment. Power valve leakage. Restricted air bleeds. Worn or damaged main metering jet. Accelerating pump Elastomer valve (Ford 2-V or 4-V carburetor) ball check and/or weight not seating properly.
INCONSISTENT ENGINE IDLE SPEED	Fast idle screw contacting low step of cam at curb idle. Incorrect throttle linkage adjustment to carburetor. Binding or sticking throttle linkage or accelerator pedal. Sticking carburetor throttle shaft. Excessive looseness of throttle

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CARBURETOR DIAGNOSIS GUIDE—Continued

INCONSISTENT ENGINE IDLE SPEED (Continued)	shaft in bores of throttle body. Improperly adjusted or defective carburetor dashpot (if so equipped). Incorrectly installed throttle plates. Idle compensator malfunctioning (if so equipped).	Positive crankcase ventilation system restricted. Sticking fuel inlet needle. Defective spark valve or gasket (170 and 200 Six only). Defective power valve or gasket.
AUTOMATIC CHOKE SLOW WARM-UP, ON TOO OFTEN	Thermostatic choke setting too rich. Choke linkage sticking or binding. Incorrect choke linkage adjustment. Choke plate misaligned or binding in air horn.	Defective coolant thermostat. Restricted coolant line at carburetor. Restriction or air leak in the choke vacuum or hot air passage. Choke heat inlet tube restricted. Choke clean air tube restricted.
SEVERE TRANSMISSION ENGAGEMENT AFTER COLD ENGINE START	Carburetor fast idle speed setting too high. Throttle operating on starting step	(highest step) of the fast idle cam. Binding or sticking throttle linkage.
SURGING (CRUISING SPEEDS TO TOP SPEEDS)	Clogged main jets. Improper size main jets. Low fuel level or float setting. Low fuel pump pressure or volume.	Clogged filter or filter screen. Distributor vacuum passage clogged. Defective spark valve or gasket (170 and 200 Six only).
REDUCED TOP SPEED	Float setting too high or too low. Fuel pump pressure or volume too high or too low. Improper size or obstructed main jets. Power valve spring weak, or power valve restricted. Restricted air bleeds. Restriction in main fuel passages. Excessive dirt in air cleaner. Throttle plate(s) not fully open. Faulty choke operation. Improper throttle linkage adjustment. **4-V CARBURETORS:** Air leak where secondary vacuum	pick-up tube fits into air horn and main body, or air leakage between the secondary diaphragm housing cover and housing or the air horn mounting gasket. Secondary diaphragm return spring too stiff. Secondary throttle plates wedged in barrels. Bent secondary throttle shaft. Secondary throttle plate operating rod binding. Secondary vacuum passage ball check sticking on its seat.

2 COMMON ADJUSTMENTS AND REPAIRS

FORD 1-V CARBURETOR

The automatic choke fast idle cam linkage and automatic choke plate clearance (pull-down) adjustments are performed only as bench adjustments.

The carburetor float adjustment, preliminary idle fuel mixture and curb idle settings, choke thermostatic spring housing and the accelerating pump adjustments can be performed with the carburetor on the bench or in the car.

The final idle (hot engine) speed and mixture, fast (cold engine) idle speed, vent valve, anti-stall dashpot (automatic transmission equipped cars) and the throttle linkage adjustments are performed only with the carburetor installed on the car.

FLOAT ADJUSTMENT

1. With the carburetor upper-body and mounting gasket removed from the carburetor assembly (Part 10-2), turn the upper-body upside down.

2. Measure the distance from the gasket surface of the upper body to the top of the float (Fig. 4). If the float adjustment is not within the specified dimension, bend the float arm tab, as necessary, to obtain the specified dimension. **Do not apply pressure on the fuel inlet needle. The viton tip of the fuel inlet needle may be damaged through undue pressure exerted on it and thus cause an improper fuel level within the bowl.**

AUTOMATIC CHOKE FAST IDLE CAM LINKAGE AND CHOKE PLATE CLEARANCE (PULL-DOWN) ADJUSTMENTS

The automatic choke fast idle cam linkage must be properly adjusted before performing the choke plate

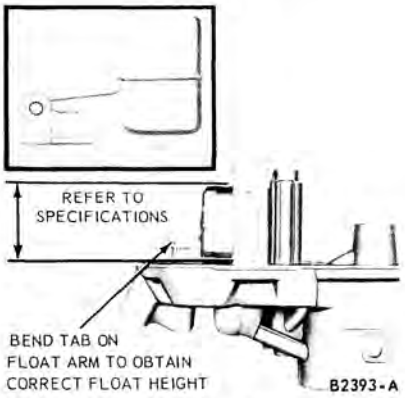


FIG. 4—Carburetor Float Adjustment

clearance (pull-down) adjustment, because the position of the pull-down rod is one of the determining factors affecting the throttle to choke opening relationship.

1. Insert a gauge pin or drill of the specified clearance (Part 10-8) thickness between the throttle plate and the side of the throttle bore. Hold the throttle plate against the gauge pin or drill (Fig. 5). Close the choke plate and turn the fast idle screw inward until it just contacts the fast idle cam.

2. Place a drill or gauge of the same thickness as the specified clearance (Part 10-8) between the choke plate and the upper body wall (Fig. 6). Close the choke plate on the drill or gauge and hold it securely.

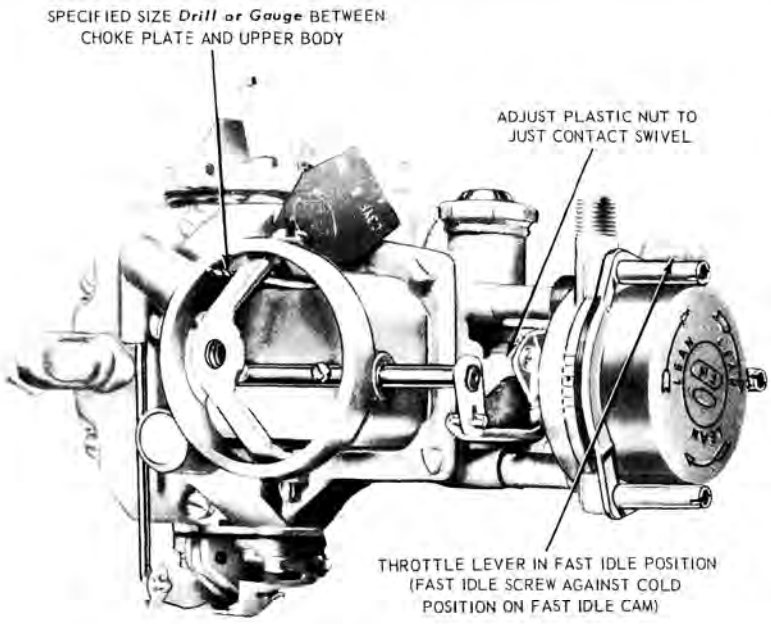


FIG. 6—Automatic Choke Linkage Adjustment

3. Close the throttle until the fast idle screw touches the fast idle cam. Adjust the plastic nut to just contact the swivel on the choke lever assembly.

AUTOMATIC CHOKE THERMOSTATIC SPRING HOUSING ADJUSTMENT

1. Remove the carburetor air cleaner assembly (Part 10-5), coolant hose and mounting bracket from the carburetor, if they have not been previously removed.

2. Loosen the thermostatic spring housing clamp retaining screws. Set the spring housing to the specified (Part 10-8) index mark (Fig. 7) and tighten the clamp retaining screws.

3. Install the coolant hose and mounting bracket on the carburetor and tighten the retaining screws. If other carburetor adjustments are not required, install the carburetor air cleaner assembly (Part 10-5).

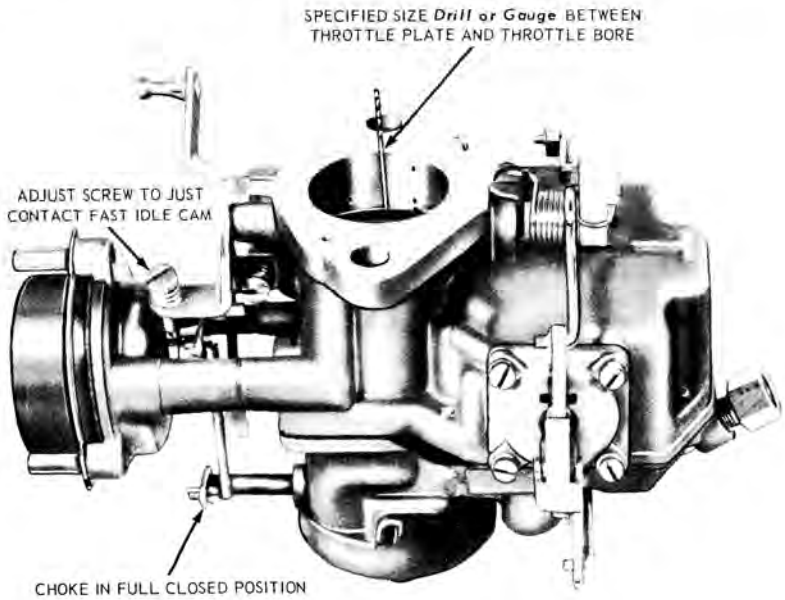


FIG. 5—Automatic Choke Fast Idle Cam Linkage Adjustment

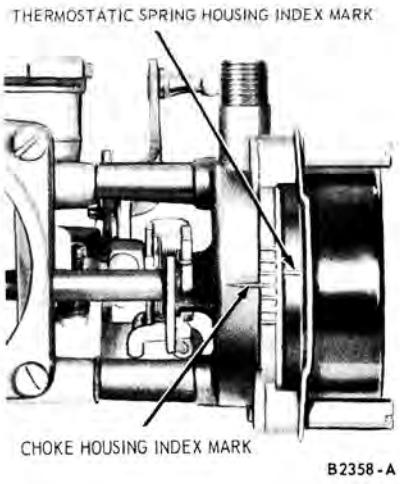


FIG. 7—Automatic Choke Thermostatic Spring Housing Adjustment



FIG. 8—Idle Fuel Mixture Adjustment



FIG. 9—Idle Speed Adjustments

IDLE FUEL MIXTURE AND IDLE SPEED ADJUSTMENTS

The engine idle speed is adjusted to settings for a hot engine and a cold engine (fast idle speed). Make the idle and fuel mixture adjustments in the sequence listed.

Preliminary Idle Mixture Setting. Set the preliminary idle mixture by turning the idle mixture screw inward (clockwise) until it is lightly seated (Fig. 8); then turn the screw outward (counterclockwise) the specified number of turns (Part 10-8). **Do not turn the screw needle tightly against its seat as this may groove the end. If the needle is damaged, it must be replaced before a satisfactory fuel mixture can be obtained.**

PRELIMINARY CURB IDLE ADJUSTMENT—AUTOMATIC CHOKE

A stop screw on the throttle lever inner flange contacts the carburetor lower body and controls the engine idle speed. Turn the screw inward (clockwise) to increase engine idle speed and outward (counterclockwise) to decrease the engine idle speed (Fig. 9).

Position the choke mechanism so that the choke plate is fully open. Seat the throttle plate in the throttle bore. **It may be necessary to back off on the dashpot (if so equipped) adjustment screw to seat the throttle plate in the throttle bore.** Set the idle adjusting screw (Fig. 9) to just make contact with the stop on the lower body; then turn the screw inward (clockwise) an additional turn.

The "Final Idle (Hot Engine) and Fuel Mixture Adjustments" provide the specified rpm required.

FINAL IDLE (HOT ENGINE) SPEED AND MIXTURE ADJUSTMENT

1. Place the transmission selector lever in neutral position and set the parking brake.

2. Operate the engine for 30 minutes at approximately 1200 rpm to stabilize engine temperatures. **On a car with an air conditioner, the engine idle speed is adjusted with the air conditioner operating.**

3. Turn on the headlamps. **It is necessary to place the alternator under a load condition in this manner in order to obtain the specified idle speed during the adjustment procedure.**

4. On a car with a manual-shift transmission, the engine idle speed and mixture is adjusted with the gear shift lever in neutral position.

On a car with an automatic transmission, the engine idle speed and mixture is checked and adjusted with the automatic transmission selector lever in drive range position. **Be sure the parking brake is on.**

5. Attach a tachometer to the engine.

6. Turn the idle (hot engine) speed adjustment screw (Fig. 9) in a direction to obtain the specified engine rpm. Position the transmission selector lever in neutral (automatic transmission), and open the throttle by hand and allow it to close normally.

7. On a car with an automatic transmission, position the transmission selector lever in drive range.

8. Turn the idle fuel mixture adjustment screw inward until the engine rpm begins to drop from the lean mixture. Turn the needle outward until the engine rpm increases and just begins to drop again due to the rich mixture; then, turn the screw inward for maximum engine rpm and smoothness. **Always favor a rich mixture rather than a lean mixture.**

9. Check the engine idle (hot engine) speed and adjust it to specifications (Part 10-8), if necessary. **Final engine idle speed may be varied to suit the conditions under which the car is to be operated.**

10. Adjust the fast (cold engine) idle speed to specification (Part 10-8).

FAST (COLD ENGINE) IDLE SPEED

Always make certain the idle (hot engine) speed is adjusted to specification before attempting to set the fast idle speed.

The fast (cold engine) adjustment screw (Fig. 9) contacts one edge of the fast idle cam. The cam permits a faster engine idle speed for smoother running when the engine is cold during choke operation. As the choke plate is moved through its range of travel from the closed to the open position, the fast idle cam pick-up lever rotates the fast idle cam. Each position on the fast idle cam permits a slower idle rpm as the engine temperature rises and choking is reduced.

1. Start the engine and manually rotate the choke plate to the pull-down clearance position then release the choke plate. This will position the fast idle screw on the fast idle cam. (Fig. 9).

2. Check the fast idle rpm. Turn the fast idle adjusting screw inward or outward as required to obtain the specified fast idle rpm (Part 10-8). Repeat step one after each adjustment of the fast idle screw.

3. Place the transmission selector lever in neutral (automatic transmission) and turn off the engine. Switch off the headlamps and the air conditioner (if so equipped).

4. If the car is equipped with an automatic transmission, check the anti-stall dashpot for proper adjustment.

ANTI-STALL DASHPOT ADJUSTMENT—AUTOMATIC TRANSMISSION

1. Adjust the throttle position to the hot idle setting. Turn the dashpot adjusting screw (Fig. 10) outward until it is clear of the dashpot plunger assembly.

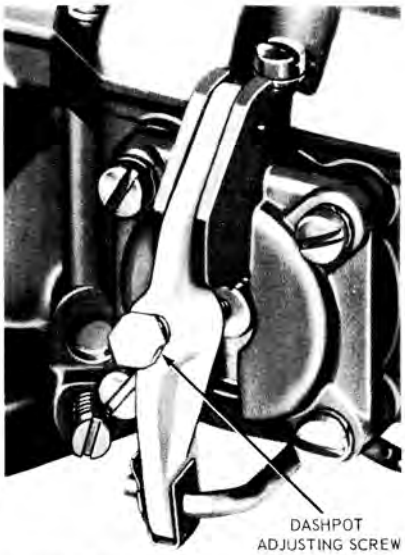


FIG. 10—Anti-Stall Dashpot Adjustment

2. Turn the dashpot adjusting screw inward until it initially contacts the dashpot plunger assembly; then, turn the adjusting screw inward (clockwise) the specified number of turns against the dashpot diaphragm plunger assembly.

3. Check the accelerating pump lever for proper adjustment.

ACCELERATING PUMP ADJUSTMENTS

Accelerating Pump Clearance Adjustment. The accelerating pump clearance is usually performed as a bench adjustment; however, if the need arises, the clearance adjustment can be performed with the carburetor installed on the car.

1. Insert the roll pin in the lower hole ("HI") position in the lever stop hole (Fig. 11).

2. Position the throttle and choke linkage so that the throttle plate will seat in the throttle bore. Hold the throttle plates in the closed position. Position a gauge or drill of the specified thickness (Part 10-8) between the roll pin and the cover surface. Bend the accelerating pump actuating rod to obtain the specified gauge or drill clearance between the pump cover and the roll pin in the pump lever (Fig. 11).

Accelerating Pump Lever Adjustments. Acceleration requirements in various climates are satisfied by controlling the amount of fuel discharged by the accelerating pump. The pump stroke is controlled by changing the location of the roll pin in the lever stop hole (Fig. 12).

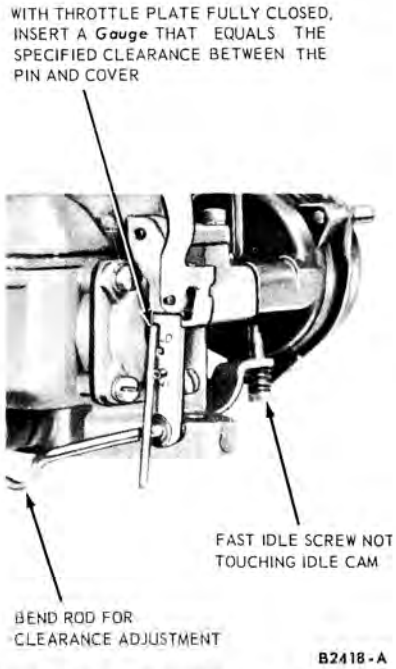


FIG. 11—Accelerating Pump Clearance Adjustment

For operation in ambient temperatures 50°F. and below, place the roll pin in the hole of the pump operating lever marked "HI" (lower hole). For best performance and economy at normal ambient temperatures and high altitude (above 50°F. and/or above 5,000 feet altitude), place the roll pin in the "LO" (upper hole) of the lever.

Check the vent valve for proper adjustment.

VENT VALVE ADJUSTMENT

The vent valve adjustment is always performed after the accelerating pump adjustment has been completed.

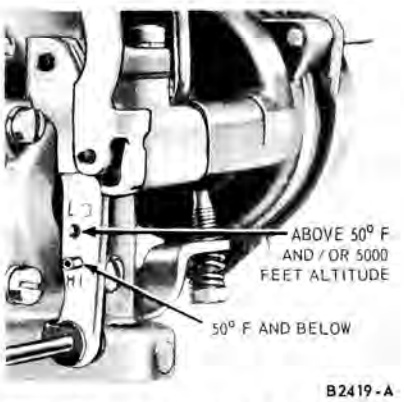


FIG. 12—Accelerating Pump Lever Adjustments

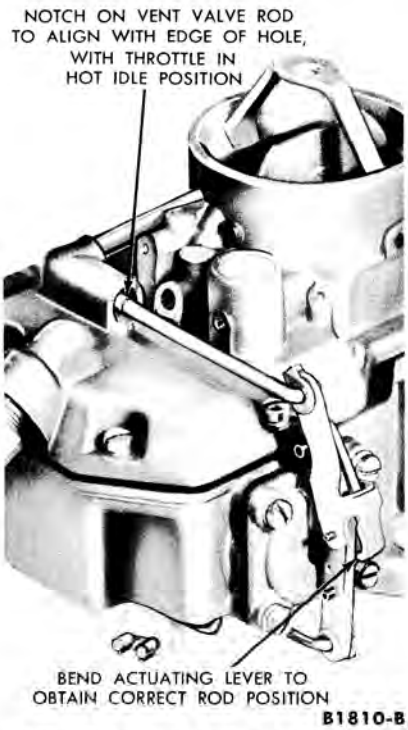


FIG. 13—Vent Valve Adjustment

Set the throttle linkage to the hot idle position. The groove in the vent valve rod should now be even with the open end of the vent (Fig. 13). Bend the arm on the vent valve rod actuating lever (where it contacts the accelerating pump lever) to align the groove with the edge of the bore.

FORD 2-V AND 4-V CARBURETORS

The manual choke plate clearance (pull-down) adjustment (4-V carburetor), fuel level float adjustment (dry) and the secondary throttle plate adjustments (4-V carburetors) are performed only as bench adjustments.

The automatic choke fast idle cam linkage and choke plate clearance (pull-down) adjustments, automatic choke thermostatic spring housing adjustment and the accelerating pump stroke adjustment can be performed with the carburetor on the bench or in the car.

The fuel level float adjustment (wet), idle fuel mixture and idle speed adjustments, and the anti-stall dashpot adjustment are performed only with the carburetor installed in the car.

FLOAT ADJUSTMENT (DRY)

The dry float fuel level adjustment is a preliminary adjustment only. The final float adjustment must be made after the carburetor is mounted on the engine.

1. Remove the air horn.

2. With the float raised and the fuel inlet needle seated, check the distance between the top surface of the main body and the top surface of the float for conformance to specifications (Part 10-8). Take the measurement at a point ⅛ inch from the free end of the float and 5/16 inch in from the side of the float adjacent to the inside wall of the fuel bowl. **If the cardboard gauge is used, place the float gauge in the corner of the enlarged end section of the fuel bowl (Fig. 14). The gauge should touch the float near the end, but not on the end radius.** Depress the float tab to seat the fuel inlet needle. The float height is measured from the gasket surface of the main body with the gasket removed. If necessary, bend the tab on the float to bring the setting within the specified limits. This should provide the proper fuel level.

SECONDARY THROTTLE PLATE ADJUSTMENT (4-V CARBURETOR)

1. Hold the secondary throttle plates closed.

2. Turn the secondary throttle shaft lever adjusting screw out (counterclockwise) (Fig. 15) until the secondary throttle plates stick in the throttle bores.

3. Turn the screw in (clockwise) until the screw just contacts the secondary lever.

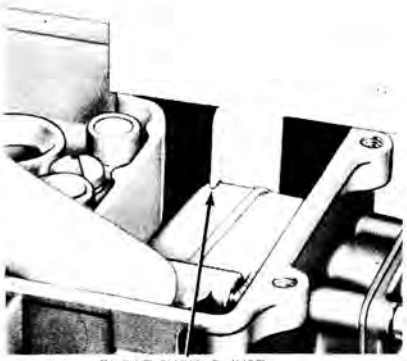


FIG. 14—Fuel Level Float Adjustment (Dry)—Typical for 2-V and 4-V Carburetors



FIG. 15—Secondary Throttle Plate Adjustment—4-V Carburetor

4. Turn the screw in (clockwise) the specified distance (Part 10-8).

MANUAL CHOKE PLATE CLEARANCE (PULL-DOWN) ADJUSTMENT

1. Pull the choke cam and lever to the full choke position. Insert the specified size gauge or drill (Part 10-8) between the downward side of the choke plate and the air horn wall. The gauge or drill will open the choke plate against the pull-down spring tension. Adjust the choke operating (pull-down) rod adjusting nut to just contact the plastic swivel (Fig. 16).

FAST IDLE CAM LINKAGE AND AUTOMATIC CHOKE PLATE CLEARANCE ADJUSTMENTS

The automatic choke fast idle cam linkage must be properly adjusted before performing the choke plate clearance (pull-down) adjustment, because the position of the pull-down rod is one of the determining factors affecting the throttle to choke relationship.

1. If the air cleaner, heater hose and mounting bracket have not been removed previously, remove them from the carburetor.

2. Position the fast idle (rpm) adjustment screw on the index mark of the fast idle cam (Fig. 17).

3. Turn the choke thermostatic cover 90° rich (counterclockwise) and check the clearance between the front of the choke plate and the air horn (Fig. 17). Adjust the clearance to specification (Part 10-8), if required. **Turn the fast idle cam lever adjusting screw clockwise (inward) to increase the clearance and counterclockwise (outward) to decrease the clearance. Make certain the fast idle screw remains on the index mark (kickdown step) of the fast idle cam during the adjustment procedure.**

4. Bend a specified size (Part 10-8) wire gauge (tool) at a 90°

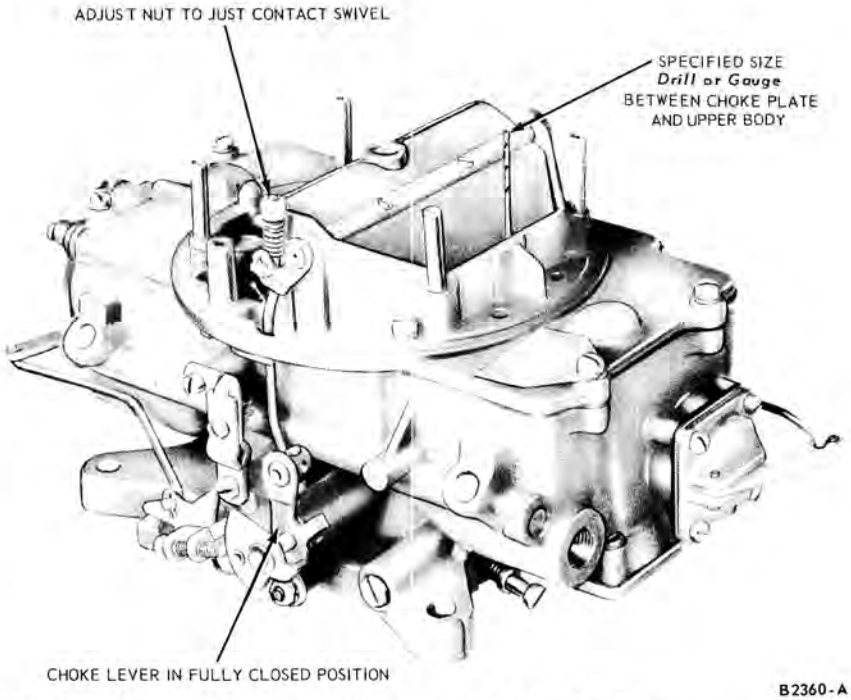


FIG. 16—Manual Choke Plate Clearance (Pull-Down) Adjustment

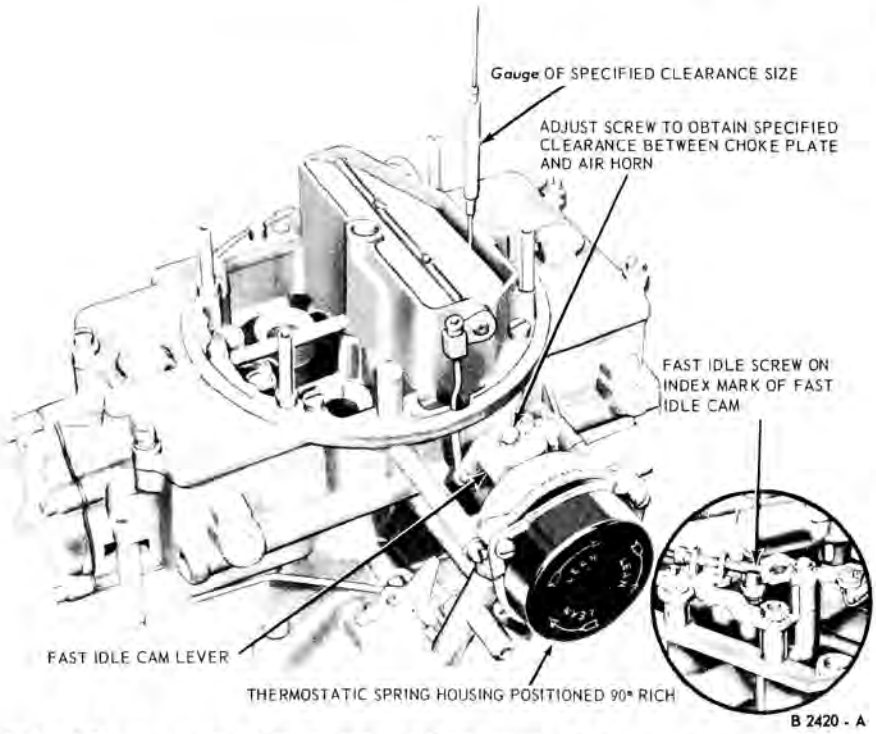


FIG. 17—Automatic Choke Fast Idle Cam Linkage Adjustment—Typical for 2-V and 4-V Carburetors

angle, approximately ⅛ inch from its end (Fig. 18).

5. Remove the choke thermostatic spring housing. Block the throttle about half-open so that the fast idle cam does not contact the fast idle adjustment screw.

6. Insert the bent end of the gauge between the lower edge of the piston slot and the upper edge of the right hand slot in the choke housing (Fig. 18), and pull the choke countershaft lever counterclockwise until the gauge is snug in the piston slot. Hold the wire gauge in place by exerting light pressure on the countershaft lever, and adjust the choke plate clevis (pull-down) adjusting nut to obtain the specified clearance (Part 10-8) between the front of the choke plate and the air horn (Fig. 18).

7. Install the choke thermostatic spring housing and gasket. Install the housing retainer and the retaining screws.

8. Set the choke thermostatic housing to the specified index mark. Refer to "Automatic Choke Thermostatic Spring Housing Adjustment" in this section. If no other carburetor adjustments are required, adjust the engine idle speed and idle fuel mixture, and the dashpot (if so equipped).

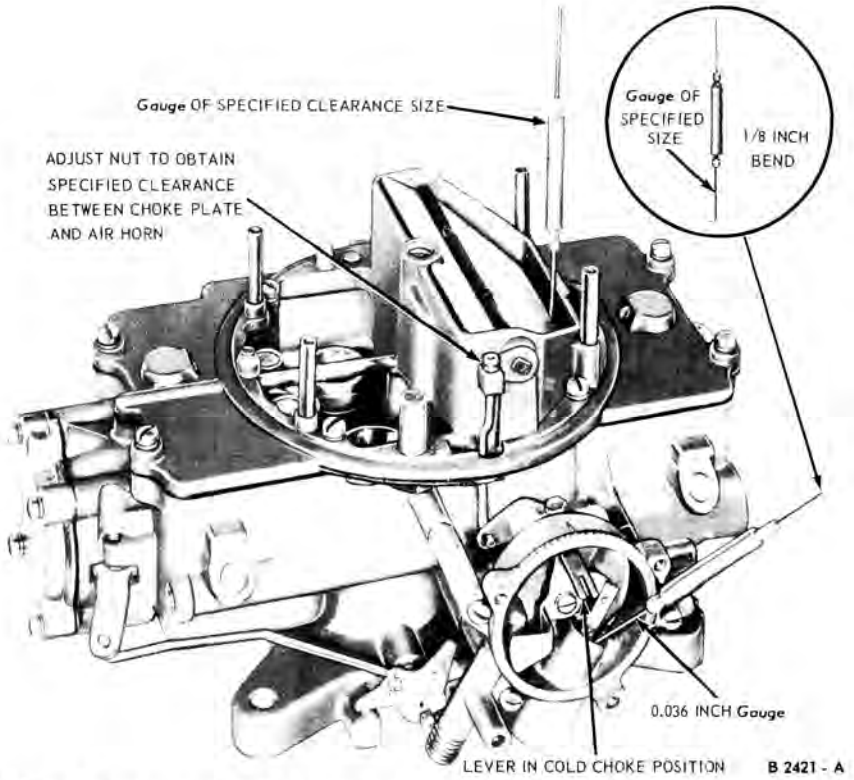


FIG. 18—Automatic Choke Plate Clearance (Pull-Down) Adjustment—Typical for 2-V and 4-V Carburetors

AUTOMATIC CHOKE THERMOSTATIC SPRING HOUSING ADJUSTMENT

1. If the heater hose and mounting bracket, and the carburetor air cleaner assembly have not been previously removed, remove them from the carburetor.

2. Loosen the thermostatic spring housing clamp retaining screws. Set the spring housing to the specified (Part 10-8) index mark (Fig. 19) and tighten the clamp retaining screws.

3. Install the heater hose and bracket on the carburetor and tighten the bracket retaining screws. If other carburetor adjustments are not required, install the carburetor air cleaner assembly.

FUEL LEVEL FLOAT ADJUSTMENT (WET)

The dry (bench) float fuel level settings are preliminary adjustments performed during carburetor overhaul procedures on the bench. These settings are used as a guide only; therefore, a final check and adjustment of the wet fuel level should be made as follows:

1. Operate the engine for 30 minutes at 1200 rpm to normalize engine temperatures, and place the car on a flat surface as near level as possible. Stop the engine.

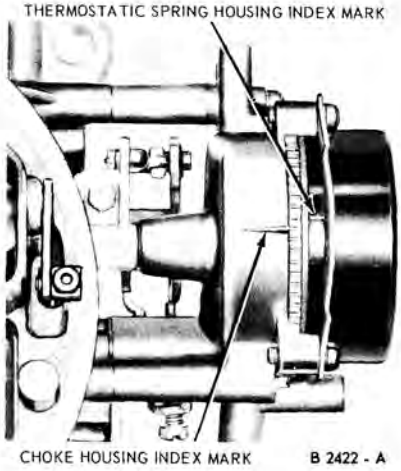


FIG. 19—Automatic Choke Thermostatic Spring Housing Adjustment—Typical for 2-V and 4-V Carburetors

2. Remove the carburetor air cleaner assembly and anchor screw (if they have not been previously removed), the carburetor air horn assembly and gasket.

3. Temporarily place the air horn gasket in position on the carburetor main body and start the engine. Let the engine idle for several minutes, then remove the air horn gasket.

4. While the engine is idling, use a standard depth scale to measure the vertical distance from the top machined surface of the carburetor main body to the level of the fuel in the fuel bowl (Fig. 20). The measurement must be made at least ¼ inch away from any vertical surface to assure an accurate reading, because the surface of the fuel is concave (higher at the edges than in the center). Care must be exercised to measure the fuel level at the point of contact with the fuel. Refer to the specifications (Part 10-8), for the correct fuel level (wet) setting.

5. If any adjustment is required, stop the engine to minimize the hazard of fire due to fuel spray when the float setting is disturbed. To adjust the fuel level, bend the float tab (contacting the fuel inlet valve) upward in relation to the original position to raise the fuel level, and downward to lower it. Each time an adjustment is made to the float tab to alter the fuel level, the engine must be started and permitted to idle for at least three minutes to stabilize the fuel level. Check the fuel level after each adjustment until the specified level is achieved.

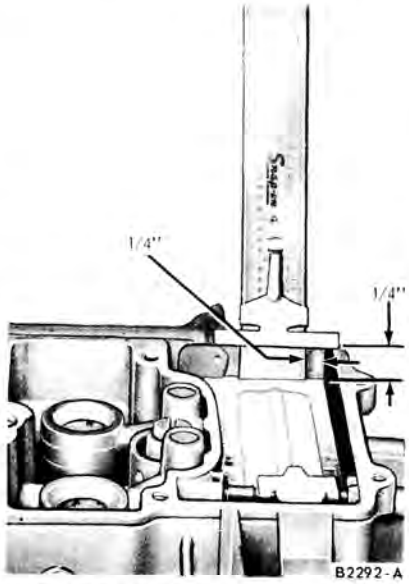


FIG. 20—Fuel Level Float Adjustment (Wet)—Typical for 2-V and 4-V Carburetors

6. Install the new air horn gasket and the carburetor air horn assembly.

7. Check the idle fuel mixture and the idle speed adjustment, and the carburetor dashpot (if so equipped). Adjust the carburetor as required.

8. Install the anchor screw and the air cleaner assembly.

IDLE FUEL MIXTURE AND IDLE SPEED ADJUSTMENTS

The engine idle speed is adjusted to settings for a hot engine, and a cold engine (fast idle speed) during choke operation. With the air cleaner removed make the idle adjustments in the following sequence:

Preliminary Idle Mixture Setting. Set the preliminary idle mixture by turning the idle mixture screws (needles) inward (clockwise) until lightly seated; then, turn the screws outward (counterclockwise) the specified (Part 10-8) turns (Fig. 21). **Do not turn the needles tightly against their seats as this may groove the ends. If the needle is damaged, it must be replaced before a satisfactory fuel mixture can be obtained.**

Idle (Hot Engine) Speed and Mixture.

1. Operate the engine for 30 minutes at approximately 1200 rpm to stabilize engine temperatures.

On a car with an air conditioner, the engine idle speed is adjusted with the air conditioner operating.

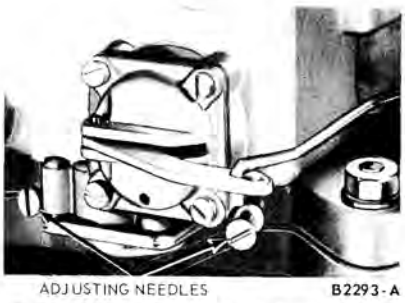


FIG. 21—Idle Fuel Mixture Adjustment—Typical for 2-V and 4-V Carburetors

2. Allow the throttle to drop back to the normal idle speed position. Attach a tachometer to the engine. Set the parking brake.

3. Turn on the headlamps. **It is necessary to place the alternator under a load condition in this manner in order to obtain the specified engine idle speed during the adjustment procedure.**

4. On a car with a manual shift transmission, the engine idle speed is checked and adjusted with the gear shift lever in neutral position. On a car with an automatic transmission, the engine idle speed is checked and adjusted with the automatic transmission selector lever in the drive range position.

5. Check the engine idle speed. **Be sure the dashpot (if so equipped) is not interfering with the throttle lever. On an automatic choke equipped carburetor, make sure the fast idle screw is not contacting the fast idle cam. On a manual choke equipped carburetor, make sure the choke cam and lever is in the slow position, with the fast idle screw not contacting the cam.**

6. Adjust the engine idle speed to specifications (Part 10-8) by turning the engine idle speed screw inward to increase the speed or outward to decrease the speed (Fig. 22).

7. Turn each idle mixture needle inward until the engine rpm begins to drop, due to the lean mixture (Fig. 22); then, turn each needle outward until the rpm increases and then begins to drop, due to the rich mixture, then turn the needle inward for maximum engine rpm and smoothness. **The needles should be turned approximately the same amount. The final setting may vary about ½ turn difference between needles.**

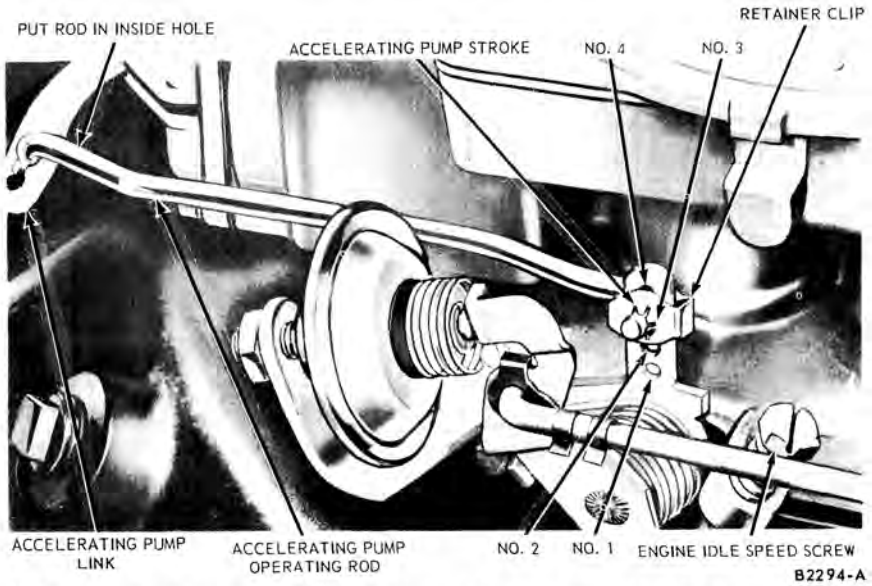


FIG. 22—Accelerating Pump Stroke and Engine Idle Speed Adjustment Points—Typical for 2-V and 4-V Carburetors

8. After the correct engine idle mixture has been obtained, check the idle speed with **the transmission selector lever in neutral and manually opening and closing the throttle.** If the car is equipped with an automatic transmission, position the selector lever in drive range. Check and adjust the idle speed to specification (Part 10-8), if necessary. Shut off the engine.

The final engine idle speed may be varied to suit the conditions under which the car is to be operated.

9. Check the engine fast (cold) idle speed.

FAST (COLD ENGINE) IDLE SPEED—AUTOMATIC CHOKE

The adjusting screw on the right side of the carburetor (Fig. 23) contacts one edge of the fast idle cam. The cam permits a faster engine idle speed for smoother running when the engine is cold during choke operation. As the choke plate is moved through its range of travel from the closed to the open position, the fast idle cam pick-up lever rotates the fast idle cam. Each position on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

1. Manually rotate the fast idle cam (Fig. 23) until the fast idle adjusting screw rests adjacent to the shoulder of the highest step (screw aligned with arrow mark) on the cam.

2. Position the transmission selector lever in neutral. Start the engine, and turn the fast idle adjusting screw inward or outward as required to obtain the specified fast idle rpm (Part 10-8).

3. Remove the tachometer if the idle speed and fuel mixture does not require adjustment. If the idle speed and fuel mixture requires adjustment, leave the tachometer installed.

4. Shut off the engine, turn off the headlamps and the air conditioner (if so equipped).

5. If the car is equipped with an automatic transmission, check the anti-stall dashpot for proper adjustment. Check the accelerating pump stroke and adjust it, if required.



FIG. 23—Automatic Choke Fast (Cold Engine) Idle Speed Adjustment—Typical for 2-V and 4-V Carburetors

FAST (COLD ENGINE) IDLE SPEED—MANUAL CHOKE

The adjusting screw on the right side of the carburetor contacts one edge of the choke cam and lever (Fig. 24). The cam permits a faster engine idle speed for smoother running when the engine is cold during choke operation. As the choke cam and lever is moved through its range of travel from the open to the closed position, the fast idle pick-up lever rotates the throttle shaft. **The idle (hot engine) speed must be adjusted to specification, before the fast (cold engine) idle speed can be adjusted.**

1. Manually rotate the choke cam and lever until the fast idle adjusting screw rests on the index mark (arrow) on the cam (Fig. 24).

2. Turn the fast idle adjusting screw inward or outward (as required) so that the fast idle adjusting screw just contacts the fast idle cam at the index mark to obtain the specified fast idle rpm (Part 10-8).

3. If the car is equipped with an automatic transmission, check the dashpot for proper adjustment. Check the accelerating pump stroke and adjust it, if required.

ANTI-STALL DASHPOT ADJUSTMENT—AUTOMATIC TRANSMISSIONS

The anti-stall dashpot adjustment is made with the carburetor air cleaner assembly removed from the carburetor.

1. With the engine idle speed and mixture properly adjusted, and the engine at normal operating temperature, loosen the anti-stall dashpot lock nut (Fig. 25).

2. Hold the throttle in the closed position and depress the plunger



FIG. 24—Manual Choke Fast (Cold Engine) Idle Speed Adjustment

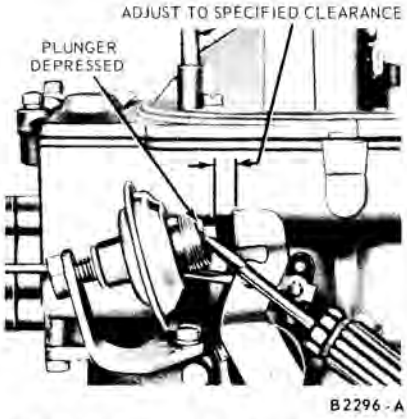


FIG. 25—Anti-Stall Dashpot Adjustment—Typical for 2-V and 4-V Carburetors

with a screwdriver blade. Check the clearance between the throttle lever and the plunger tip with a feeler gauge of the specified clearance dimension. Turn the anti-stall dashpot in its bracket in a direction to provide the specified clearance (Part 10-8) between the tip of the plunger and the throttle lever. Tighten the locknut to secure the adjustment.

3. Install the air cleaner assembly.

ACCELERATING PUMP STROKE

The primary throttle shaft lever (overtravel lever) has 4 holes and the accelerating pump link has 2 holes (Fig. 22) to control the accelerating pump stroke for various ambient temperatures and operating conditions of the engine.

The accelerating pump stroke adjustment is made with the carburetor air cleaner assembly removed from the carburetor.

The accelerating pump operating rod should be in the specified hole in the overtravel lever (Part 10-8) and the inboard hole (hole closest to the pump plunger) in the accelerating pump link (Fig. 22). To release the rod from the retainer clip, press the tab end of the clip toward the rod; then, at the same time, press the rod away from the clip until it is disengaged.

THROTTLE LINKAGE ADJUSTMENT

MANUAL SHIFT TRANSMISSION

The engine idle speed and fuel mixture (Part 10-1, Section 2) must be adjusted to specification prior to performing throttle linkage adjustments.

Views of the throttle (accelerator) linkage for the various car and engine models are shown in Figs. 26, 27 and 28.

Mustang—Six

1. Adjust the engine idle speed (Part 10-1, Section 2) to specification (Part 10-8), if required.

2. With the engine stopped, check the accelerator pedal for the specified idle height (Fig. 28, View "B"). The measurement is made at a right angle to the lower dashpanel, to a point on the top of the accelerator pedal 2⅜ inches up from the end of the pedal on the left side. **Be sure the fast idle cam is not contacting the fast idle screw.**

3. If the pedal height requires adjustment, disconnect the carburetor throttle return spring and the accelerator control shaft rod at the accelerator shaft. Adjust the accelerator control shaft rod length to bring the accelerator pedal within specification (Fig. 28, View "A"). Connect the accelerator control shaft rod so that it centers over the retaining ball stud on the accelerator shaft. Tighten the jam nut on the accelerator control shaft rod. Install the throttle return spring.

Mustang—V-8

1. Adjust the engine idle speed (Part 10-1, Section 2) to specification (Part 10-8) if required.

2. With the engine stopped, check the accelerator pedal for the specified idle height (Fig. 28, View "A"). The measurement is made at a right angle to the lower dashpanel, to a point on the top of the accelerator pedal 2⅜ inches up from the end of the pedal, on the left side. **Be sure the fast idle cam is not contacting the fast idle screw.**

3. If the pedal height requires adjustment, disconnect the carburetor throttle return spring and the accelerator control shaft rod at the accelerator shaft. Adjust the accelerator control shaft rod length to bring the accelerator pedal within specification (Fig. 28, View "A"). Connect the accelerator control shaft rod to the accelerator shaft, and install the attaching clip. Install the throttle return spring.

Falcon, Comet and Fairlane—All Engines

1. Adjust the engine idle speed (Part 10-1, Section 2) to specification, if required.

2. With the engine stopped, check the accelerator pedal for the specified idle height (Figs. 26 or 27, View "A" or "B"). **Be sure the fast idle cam is not contacting the fast idle screw.**

3. To adjust the accelerator pedal height on a car with a V-8 engine, disconnect the accelerator control shaft rod from the bellcrank assembly. With the carburetor throttle lever against the idle adjusting screw stop, lengthen or shorten the accelerator control shaft rod assembled length to obtain the accelerator pedal specified idle height (Figs. 26 or 27, View "A"). Tighten the jamb nut on the accelerator control shaft rod, if it is so equipped.

To adjust the accelerator pedal height on a car with a 170 or 200 Six engine, disconnect the accelerator shaft to bellcrank rod from the accelerator shaft assembly. With the carburetor throttle lever against the idle adjusting screw stop, lengthen or shorten the accelerator shaft to bellcrank rod assembled length to obtain the accelerator pedal specified idle height (Figs. 26 or 27, Views "B").

AUTOMATIC TRANSMISSION

The throttle linkage adjustments for the automatic transmissions are covered in Group 7.

THROTTLE LINKAGE REPAIR — MANUAL SHIFT TRANSMISSIONS

ACCELERATOR PEDAL PAD REPLACEMENT

Mustang

1. Pry the edges of the accelerator pedal pad from the accelerator pedal with the fingers and remove the pad from the pedal (Fig. 28).

2. Position the new accelerator pad on the accelerator pedal. Fold the pedal pad edges over the pedal with the fingers. **Make sure the pedal pad is properly seated on the pedal and that the pedal spring has not been dislodged.**

ACCELERATOR PEDAL REPLACEMENT

Falcon, Comet, Fairlane

1. Remove the screws and washers retaining the accelerator pedal to the dash panel (Figs. 26 and 27). Remove the retainer securing the ac-

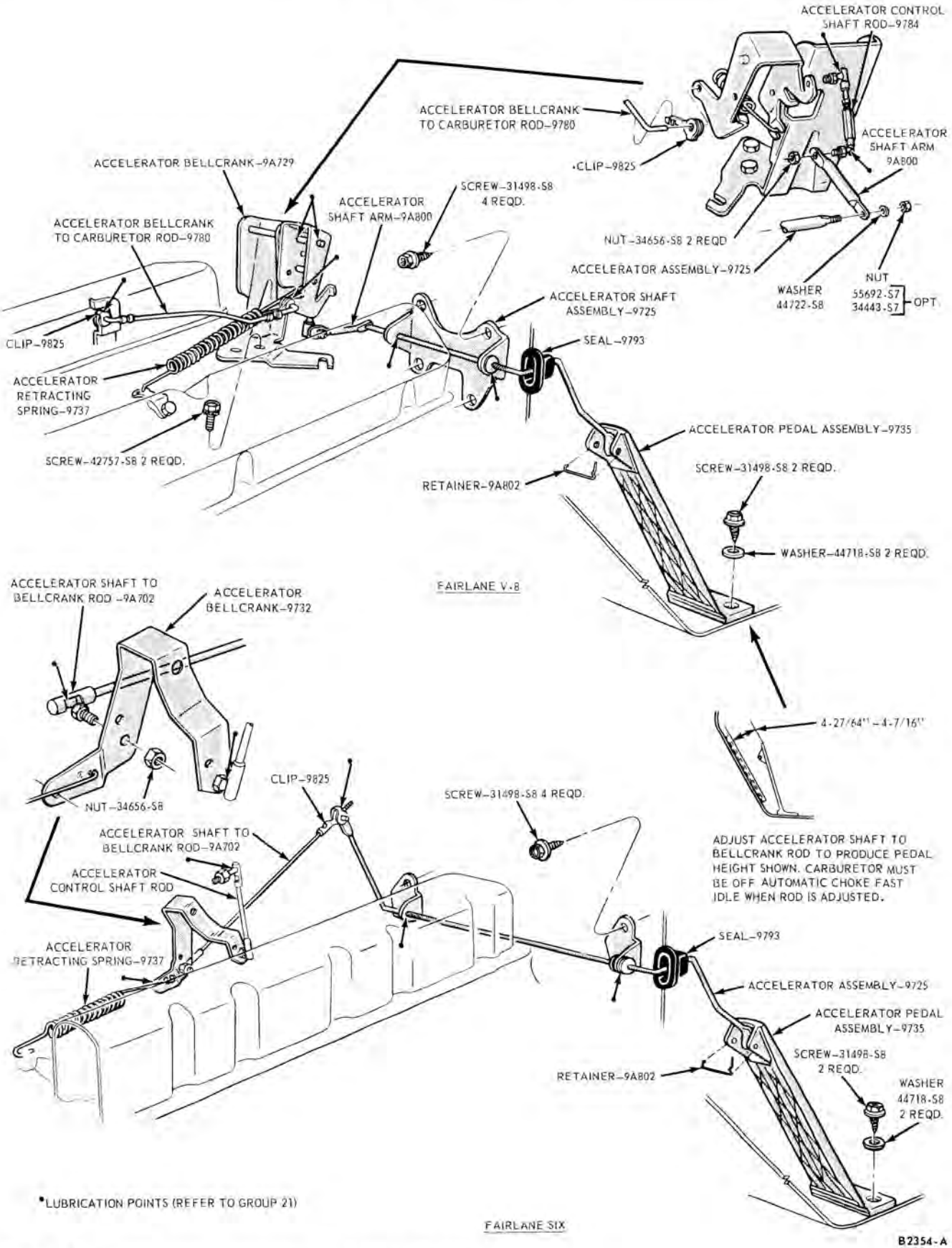


FIG. 26—Throttle Linkage Adjustment—Fairlane Models

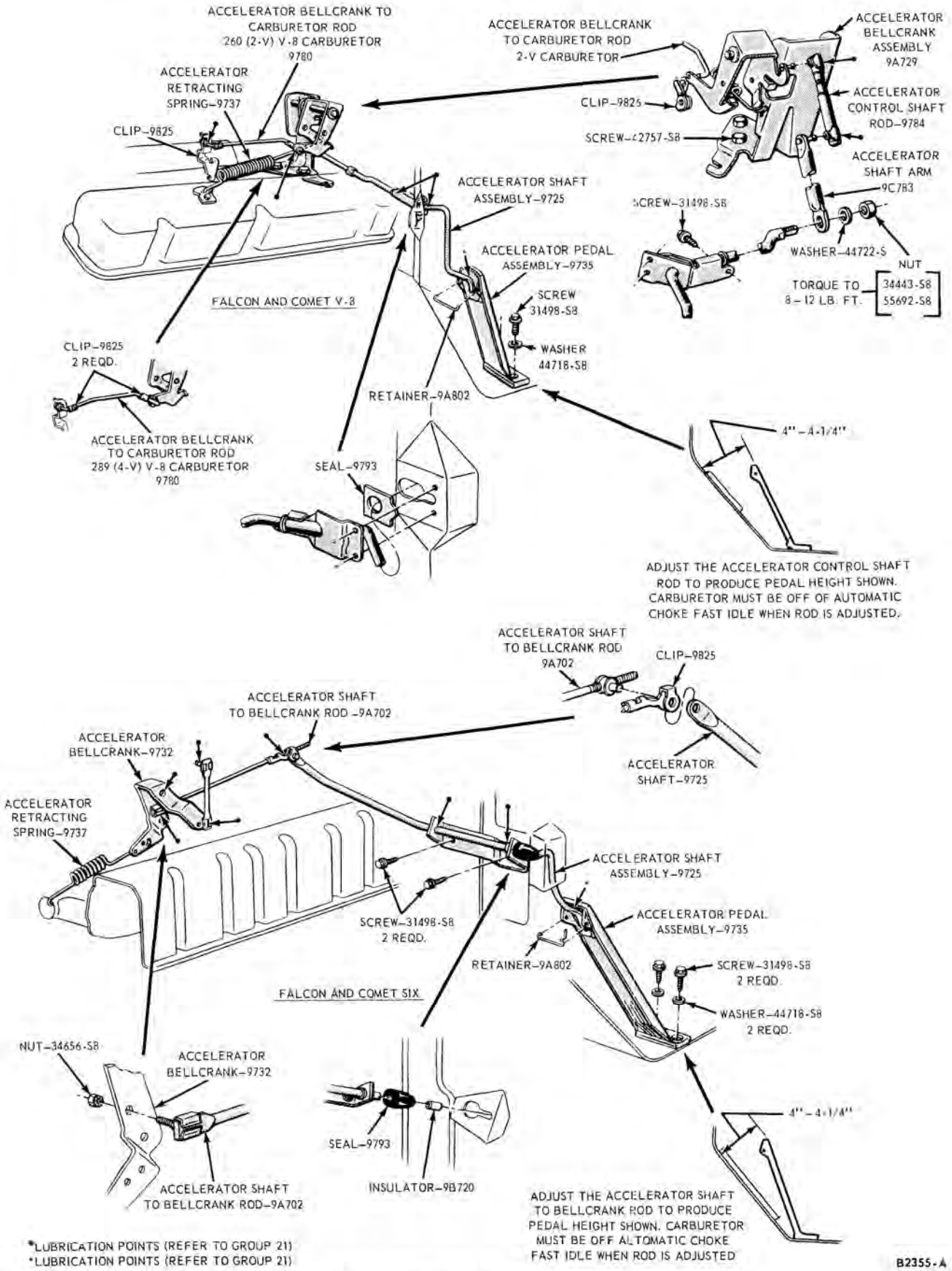
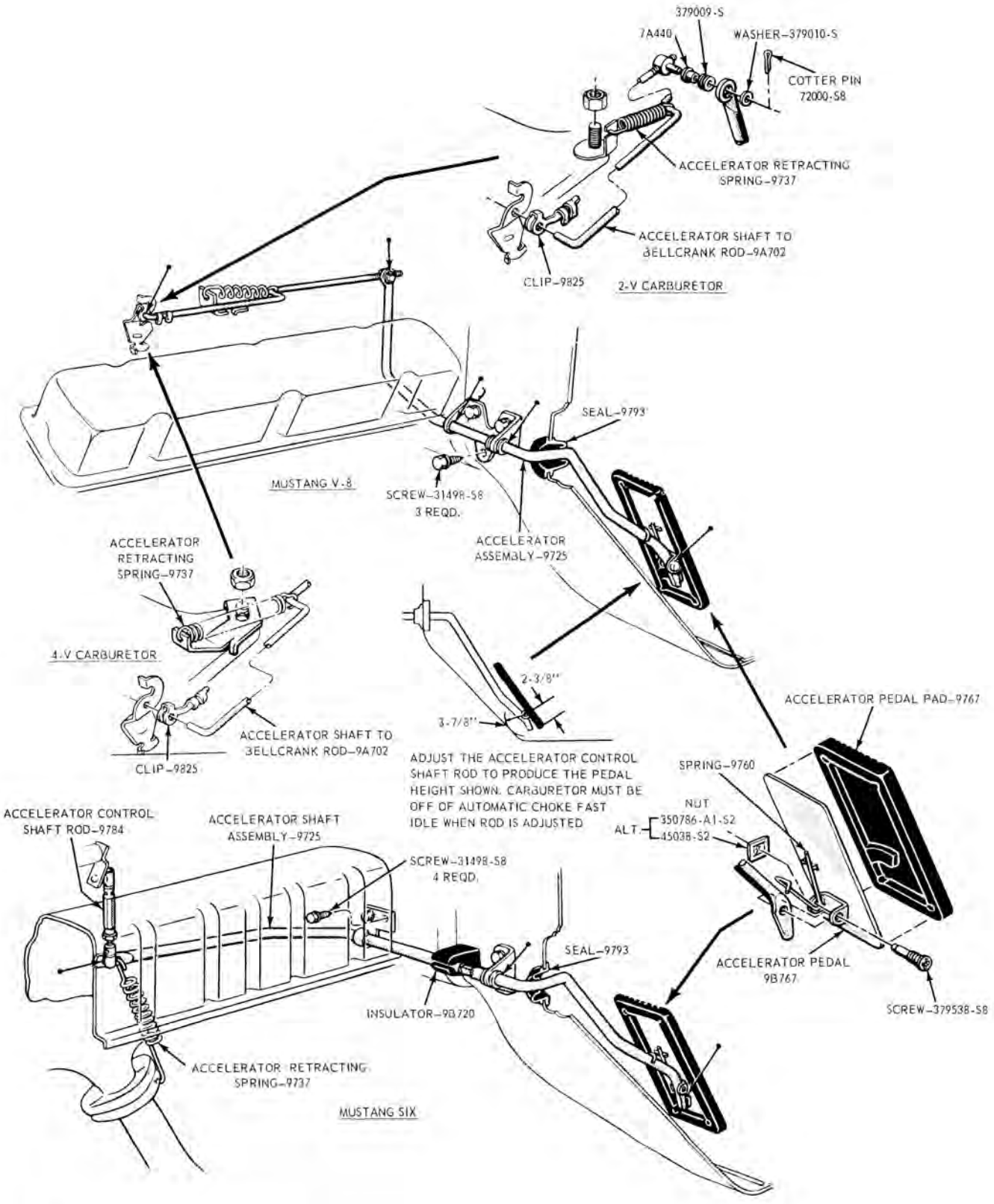


FIG. 27—Throttle Linkage Adjustment—Falcon and Comet Models



*LUBRICATION POINTS (REFER TO GROUP 21)

B2356-A

FIG. 28—Throttle Linkage Adjustment—Mustang Models

celerator pedal to the accelerator shaft.

2. Position the new accelerator pedal on the accelerator shaft, and install the pedal to shaft retainer. Position the accelerator pedal on the dash panel and install the washers and retaining screws.

Mustang

1. Remove the retaining screw and nut securing the accelerator pedal assembly to the accelerator shaft (Fig. 28). Remove the accelerator pedal and spring. Remove the accelerator pad and discard it if it needs to be replaced.

2. Install the accelerator pedal pad on the accelerator pedal. Insert the pedal spring into position in the slot on the lower surface of the pedal.

3. Lubricate the accelerator pedal hinge points with the specified lubricant (Group 21) and position the accelerator pedal and spring assembly on the accelerator shaft and install the retaining screw. **Make sure the spring is properly seated on the pedal and the accelerator shaft. Install the retaining nut.**

ACCELERATOR SHAFT REPLACEMENT–ALL MODELS

1. Remove the accelerator pedal assembly. Refer to "Accelerator Pedal Replacement" in this section for the proper procedures.

2. Disconnect the accelerator retracting spring (Figs. 26, 27 and 28).

3. On Falcon, Comet and Fairlane Six engines and the Mustang V-8 engines, disconnect the accelerator shaft assembly from the accelerator shaft to bellcrank rod (Figs. 26, 27 and 28).

On the Falcon and Comet V-8 engines and the Mustang Six engine, disconnect the accelerator shaft assembly from the accelerator control shaft rod (Figs. 27 and 28).

On the Fairlane V-8 engines, disconnect the accelerator shaft assembly from the accelerator shaft arm (Fig. 26).

4. Remove the retaining screws securing the accelerator shaft assembly bracket(s) to the dashpanel within the engine compartment (Figs. 26, 27 and 28). Remove the accelerator shaft assembly, seal and insulator as a unit. Discard the seal and the insulator if they are worn or damaged.

5. Lubricate the accelerator shaft hinge points with the specified lubricant (Group 21). Install the seal and insulator on the accelerator shaft assembly. Position the accelerator shaft bracket(s) seal and insulator on the dashpanel. **Make sure the seal is properly installed to the entrance of air, dirt and foreign material.** Secure the accelerator shaft assembly bracket(s) to the dashpanel with the retaining screws.

6. On Falcon, Comet and Fairlane Six engines and the Mustang V-8 engines, connect the accelerator shaft assembly to the accelerator shaft to bellcrank rod (Figs. 26, 27 and 28).

On the Falcon and Comet V-8 engines and the Mustang Six engine, connect the accelerator shaft assembly to the accelerator control shaft rod (Figs. 27 and 28).

On the Fairlane V-8 engines, connect the accelerator shaft assembly to the accelerator shaft arm (Fig. 26).

7. Install the accelerator shaft retracting spring.

8. Install the accelerator pedal assembly. Refer to "Accelerator Pedal Replacement" in this section for the proper procedure.

9. Check the accelerator pedal for the specified idle height from the dash panel. Refer to "Throttle Linkage Adjustment" in this section for the proper procedure. Adjust the throttle linkage, if required.

ACCELERATOR CONTROL SHAFT ROD REPLACEMENT

1. Remove the accelerator retracting spring.

2. Disconnect the accelerator control shaft rod (Figs. 26, 27 and 28) and remove it from the car.

3. Lubricate the accelerator control shaft rod hinge points with the specified lubricant (Group 21).

4. Install the accelerator control shaft rod. Tighten the rod retaining nuts, if so equipped. If the accelerator control shaft rod is equipped with ball retaining clips, make sure the clips are properly seated over the ball.

5. Install the accelerator retracting spring.

6. Check the accelerator pedal for the specified idle height from the dash panel. Refer to "Throttle Linkage Adjustment" in this section for the proper procedure. Adjust the throttle linkage, if required.

ACCELERATOR SHAFT TO BELLCRANK OR ACCELERATOR BELLCRANK TO CARBURETOR ROD REPLACEMENT

1. Disconnect the accelerator retracting spring.

2. Disconnect the accelerator shaft to bellcrank rod or the accelerator bellcrank to carburetor rod (Figs. 26, 27 and 28) and remove it from the car.

3. Lubricate the replacement rod hinge points with the specified lubricant (Group 21).

4. Install the replacement rod, retaining clip(s) and/or retaining nut. Tighten the retaining nut, if so equipped, and make sure the retaining clip(s) is properly seated.

5. Install the accelerator retracting spring.

6. Check the accelerator pedal for the specified idle height from the dash panel. Refer to "Throttle Linkage Adjustment" in this section for the proper procedure. Adjust the throttle linkage, if required.

ACCELERATOR SHAFT ARM REPLACEMENT

1. Disconnect the accelerator shaft retracting spring.

2. Disconnect the accelerator shaft arm from the accelerator shaft and the accelerator control shaft rod (Figs. 26 and 27) and remove it from the car.

3. Lubricate the accelerator shaft arm hinge points with the specified lubricant (Group 21).

4. Install the accelerator shaft arm and tighten the retaining nut(s). **Make sure the accelerator control shaft rod ball retaining clip is properly seated.**

5. Install the accelerator shaft retracting spring.

6. Check the accelerator pedal for the specified idle height from the dash panel. Refer to "Throttle Linkage Adjustment" in this section for the proper procedure. Adjust the throttle linkage, if required.

ACCELERATOR SHAFT BELLCRANK REPLACEMENT

1. Disconnect the accelerator shaft retracting spring.

2. On a Falcon, Comet and Fairlane V-8 engine, disconnect the accelerator bellcrank to carburetor rod at the bellcrank (Figs. 26 and 27). Disconnect the accelerator control shaft rod at the bellcrank. Remove

the bellcrank retaining screws and remove the bellcrank.

On a Falcon, Comet and Fairlane Six engine, disconnect the accelerator shaft to bellcrank rod at the bellcrank (Figs. 26 and 27). Disconnect the accelerator control shaft rod from the carburetor. Remove the retainer securing the bellcrank to the carburetor spacer and remove the bellcrank assembly. Remove the accelerator control shaft rod from the bellcrank.

3. Lubricate the hinge points of the accelerator linkage with the specified lubricant (Group 21).

4. On a Falcon, Comet and Fairlane V-8 engine, install the bellcrank assembly and tighten the retaining screws. Connect the accelerator control shaft rod to the bellcrank. Connect the accelerator bellcrank to carburetor rod at the bellcrank. **Make sure the accelerator linkage retaining nuts are properly tightened and the retaining clips are securely installed.**

On a Falcon, Comet and Fairlane Six engine, install the accelerator control shaft rod on the bellcrank. Install the bellcrank assembly on the carburetor spacer and install the bellcrank retainer. Connect the accelerator control shaft rod to the carburetor. Connect the accelerator shaft to bellcrank rod to the bellcrank. **Make sure the accelerator linkage retaining nuts are properly tightened and the retaining clips are securely installed.**

5. Connect the accelerator shaft retaining spring.

6. Check the accelerator pedal for the specified idle height from the dashpanel. Refer to "Throttle Linkage Adjustment" in this section for the proper procedure. Adjust the throttle linkage, if required.

THROTTLE LINKAGE REPAIR — AUTOMATIC TRANSMISSION

The throttle linkage repair procedures for automatic transmissions are covered in Group 7.

3 CLEANING AND INSPECTION

CARBURETOR

Dirt, gum, water or carbon contamination in the carburetor or the exterior moving parts of the carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection.

The cleaning and inspection of only those parts not included in the carburetor overhaul repair kit are covered here. All gaskets and parts included in the repair kit should be installed when the carburetor is assembled and the old gaskets and parts should be discarded.

Wash all the carburetor parts except the accelerating pump diaphragm, spark control valve (2-V carburetors), the power valve (2-V or 4-V carburetors), the secondary operating diaphragm (4-V carburetors), and the anti-stall dashpot assembly (automatic transmission) in clean commercial carburetor cleaning solvent. If a commercial solvent is not available, lacquer thinner or denatured alcohol may be used.

Rinse the parts in kerosene to remove all traces of the cleaning solvent, then dry them with compressed air. Wipe all parts that can not be immersed in solvent with a clean, soft, dry cloth. Be sure all dirt, gum, carbon, and other foreign matter are removed from all parts.

Force compressed air through all passages of the carburetor. **Do not use a wire brush to clean any parts or a drill or wire to clean out any openings or passages in the carburetor.** A drill or wire may enlarge the hole or passage, changing the calibration of the carburetor.

Check the choke shaft for grooves, wear and excessive looseness or binding. Inspect the choke plate for nicked edges and for ease of operation and free it if necessary. Make sure all carbon and foreign material has been removed from the automatic choke housing and the piston. Check the operation of the automatic choke piston in the choke housing to make certain it has free movement.

Check the throttle shafts in their bores for excessive looseness or binding and check the throttle plates for burrs which prevent proper closure.

Inspect the main body, air horn, nozzle bars and booster venturi assemblies (2-V and 4-V carburetors), automatic choke housing and thermostatic spring housing, power valve cover, (2-V and 4-V carburetors), accelerating pump cover, secondary operating diaphragm cover (4-V carburetors) for cracks.

Check the floats for leaks by holding them under water that has been heated to just below the boiling point. Bubbles will appear if there is a leak. If a float leaks, replace it. Replace the float if the arm needle contact surface is grooved. If the floats are serviceable, polish the needle contact surface of the arm with crocus cloth or steel wool. Replace the float shafts if they are worn.

Replace all screws and nuts that have stripped threads. Replace all distorted or broken springs.

Inspect all gasket mating surfaces for nicks and burrs. Repair or replace any parts that have a damaged gasket surface.

On 2-V and 4-V carburetors, inspect the idle tubes in each nozzle bar assembly. If they are plugged, bent or broken, replace the booster venturi and nozzle bar assembly.

Inspect the rubber boot of the anti-stall dashpot (2-V and 4-V carburetors), if so equipped, for proper installation in the groove of the stem bushing. Check the stem movement for smooth operation. Do not lubricate the stem. Replace the assembly if it is defective.

FUEL PUMP

On all fuel pumps, except the Carter permanently sealed type, clean the fuel pump body, valve housing and cover. If the fuel pump is equipped with an integral fuel filter, clean the filter housing in solvent. Blow out all body, housing and cover passages. Inspect the pump body, valve housing, cover, rocker arm, spring and pin for cracks or damage and replace them if necessary. If the fuel valves are not serviceable and replacement is necessary, replace the valve housing and valves as an assembly. Inspect the mounting flange for distortion. Remove the pump body or lap the distorted flange if necessary.

On all Carter permanently sealed fuel pumps, clean the fuel pump

with a cloth. Clean the integral filter housing (if so equipped) in solvent. Inspect the fuel pumps for cracks or damage. Inspect the mounting flange for distortion. Lap the distorted flange, if necessary. Inspect the rocker arm spring, pin and the rocker arm for wear, cracks or damage. **The rocker arm spring, pin and the rocker arm are the only components on the permanently sealed fuel pumps that are replaceable.** If any other fuel pump components are damaged beyond repair, replace the fuel pump.

AIR CLEANER

MAINTENANCE

Refer to Group 19 for the recommended air cleaner assembly maintenance mileage interval.

REMOVAL AND INSTALLATION

Refer to Part 10-5, Section 2 for the air cleaner assembly removal and installation procedures.

FILTER ELEMENT

The polyeurethene filter element on a "closed" crankcase ventilation system equipped car cannot be cleaned; it must be replaced.

The cellulose fiber filter element used on an "open" crankcase ventilation system equipped car must never be cleaned with a solvent or cleaning solution. Also, oil must not be added to the surfaces of the filter element or air cleaner body.

There are two alternate procedures that can be used to clean the air filter element. One method is performed with the use of compressed air. The other is performed by tapping the element on a smooth horizontal surface.

Compressed Air Method. Direct a stream of compressed air through the element in the direction opposite that of the intake air flow, that is from the inside outward. **Extreme care must be exercised to prevent rupture of the element material.**

Tapping Method. Hold the element in the vertical position and tap it lightly against a smooth, horizontal surface to shake the dust and dirt out. **Do not deform the element or damage the gasket surfaces by tapping too hard.** Rotate the filter after each tap until the entire outer surface has been cleaned.

Inspection. Hold the filter in front of a back-up light and carefully inspect it for any splits or cracks. If the filter is split or cracked, replace it.

BODY AND COVER

Clean the air cleaner body and the cover with a solvent or compressed air. If the air cleaner contains an opening for the crankcase ventilation system air flow, probe the opening to assure removal of deposits. Wipe the air cleaner dry if a solvent is used. Inspect the air cleaner body and cover for distortion or damage at the gasket mating surfaces. Replace the cover or body if they are damaged beyond repair.

PART 10-2 FORD 1-V CARBURETOR

Section	Page	Section	Page
1 Description and Operation	10-21	3 Removal and Installation	10-29
2 In-Car Adjustments and Repairs	10-27	4 Major Repair Operations	10-29

1 DESCRIPTION AND OPERATION

DESCRIPTION

The carburetor (Figs. 1 and 2) consists of two main assemblies, the main (upper) body and the throttle (lower) body.

The upper body assembly contains the major metering components of the carburetor: the main and idle fuel system, the power valve, float chamber vent, and the fuel inlet system.

The lower body assembly contains: the fuel bowl, the accelerating pump assembly, the idle mixture adjusting screw, and the spark valve. A hydraulic dashpot is also included in the lower body for use on car models that are equipped with an automatic transmission.

This section applies to all carburetors. Differences in carburetor operation are given when they exist.

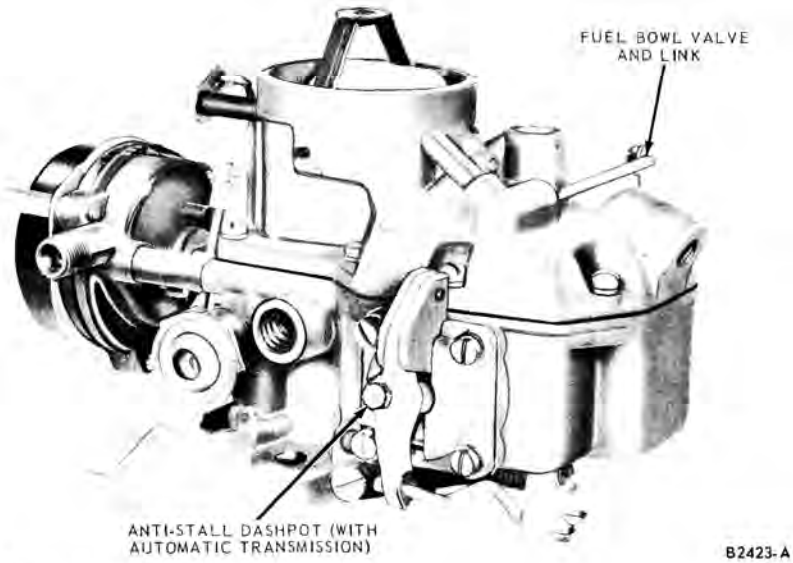


FIG. 1—Carburetor—Right Front ¾ View

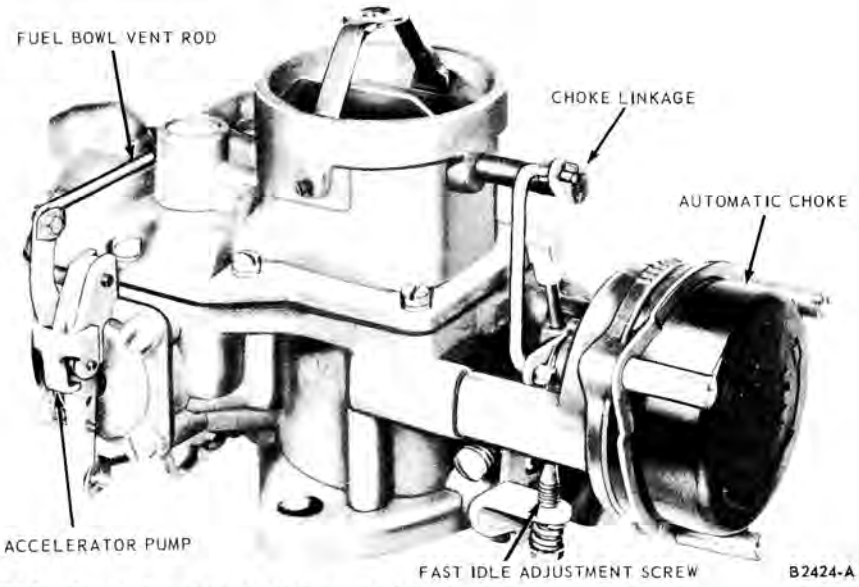


FIG. 2—Carburetor—Left Rear ¾ View

OPERATION

The engine speed is regulated and controlled by the proportion of fuel and air delivered to the cylinders for all engine operating conditions. Operation is based on the principle of pressure differences or "vacuum."

Air is drawn into the carburetor air horn by manifold vacuum. As the air passes through the carburetor on its way to enter the cylinders, lower pressure is created at the fuel discharge outlets of the carburetor. The fuel bowl is vented to atmospheric and to carburetor air inlet pressure through a vent hole in the upper body assembly. The higher air pressure exerted on the fuel in the bowl forces the fuel to travel up through the fuel discharge channels and out into the air stream passing through the carburetor. The fuel and air is mixed at this point and distributed into the engine cylinders for burning.

FUEL INLET SYSTEM

The fuel inlet system (Fig. 3) of the carburetor maintains a predetermined fuel level in the fuel bowl. **The fuel level in the bowl is extremely important to carburetor calibration.** If the level of the fuel in the bowl is below the specified setting, a lean fuel-air mixture will re-

sult. A rich fuel-air mixture will occur from a higher than specified fuel level. The entire calibration of the carburetor is disturbed if the fuel level is not set as specified.

Fuel enters the fuel bowl through the fuel needle valve and seat assembly. The amount of fuel entering is regulated by the distance the needle valve is moved off the seat and by fuel pump pressure. **Correct fuel pump pressure is important if the carburetor fuel level is to be maintained within the specified limits.**

The fuel level is maintained at a predetermined level by the float and lever assembly which controls the movement of the needle valve. The needle valve, riding on the tab of the float and lever assembly, reacts to any change in height of the float and the fuel level.

IDLE FUEL MIXTURE

The idle system (Fig. 4) functions when the engine is operating at low rpm. It supplies the fuel-air mixture when the air flow past the carburetor venturi is insufficient to operate the main metering system.

The range of the idle system will extend into the operation of the main metering system. Fuel will flow from the main well up the idle well and through the calibrated idle jet. Filtered air from the carburetor air horn enters the idle air bleed restriction and mixes with the fuel. The air bleed restriction also serves as a vent to prevent syphoning of fuel at high speeds or when the engine is shut off. The fuel-air mixture then passes down through an idle channel restriction and is transferred to the idle channel in the lower body assembly.

The fuel air mixture passes down the idle channel, past two idle transfer holes, to the idle mixture adjusting screw. The idle transfer holes act as additional air bleeds at normal idle. The fuel air mixture flows past the idle adjusting screw needle and seat and is discharged below the throttle plate. The amount of mixture to be discharged is determined by the position of the idle screw needle in relation to the seat in the lower body passage.

During off-idle operation, when the throttle plate is moved past the idle transfer holes, each hole begins discharging fuel as it is exposed to the lower air pressure (manifold vacuum). Continued opening of the throttle plate increases engine rpm and air flow through the carburetor.

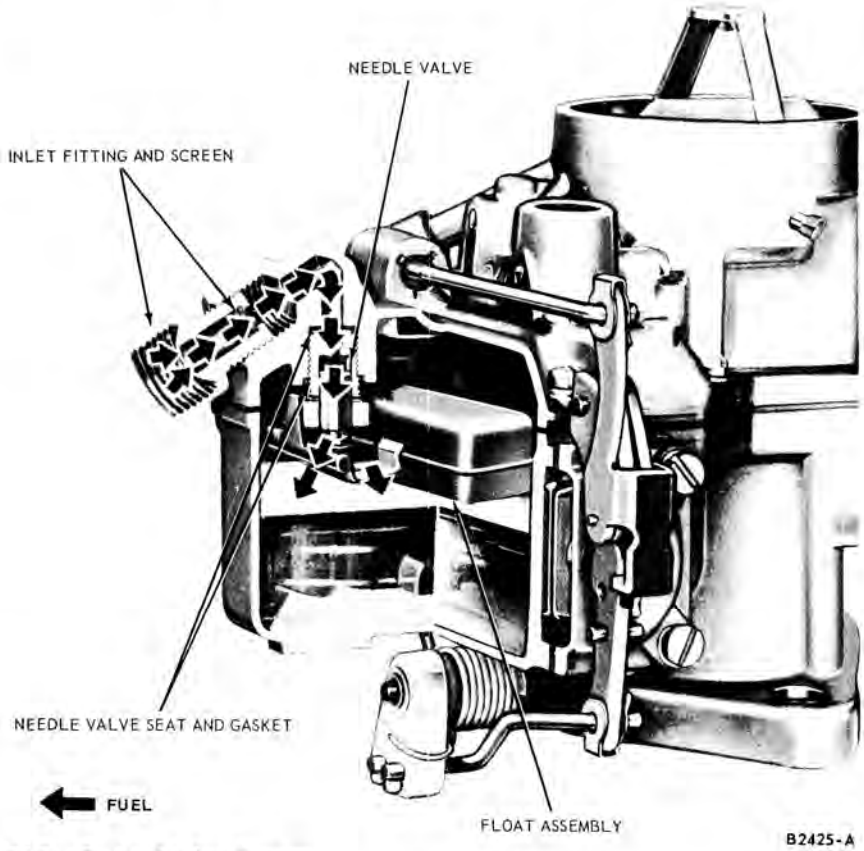


FIG. 3—Fuel Inlet System

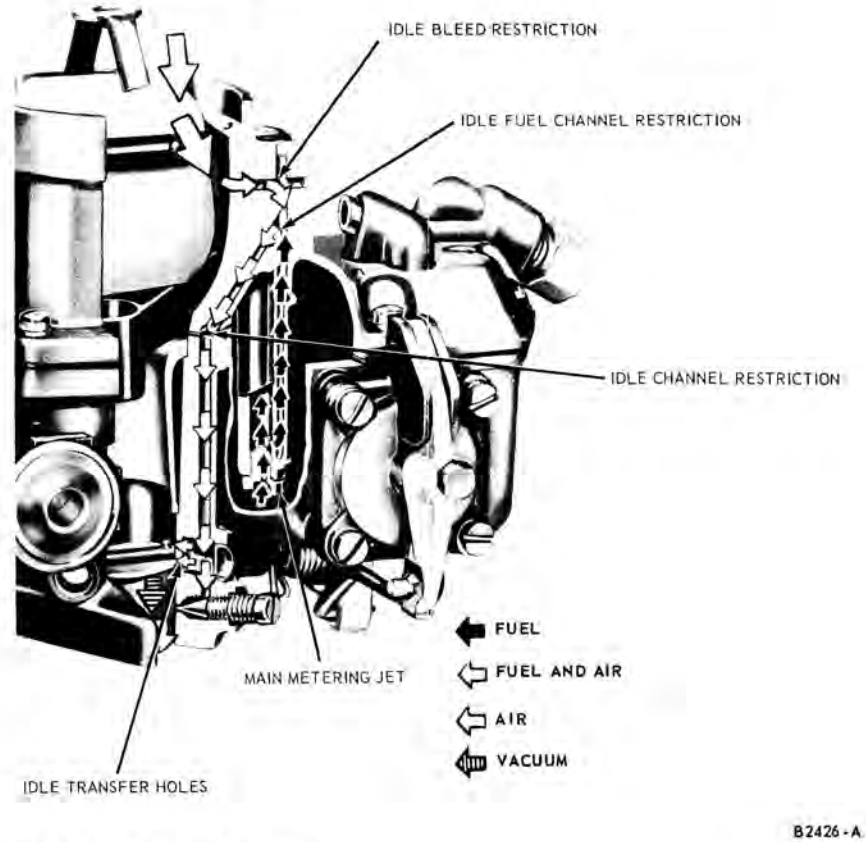


FIG. 4—Idle Fuel System

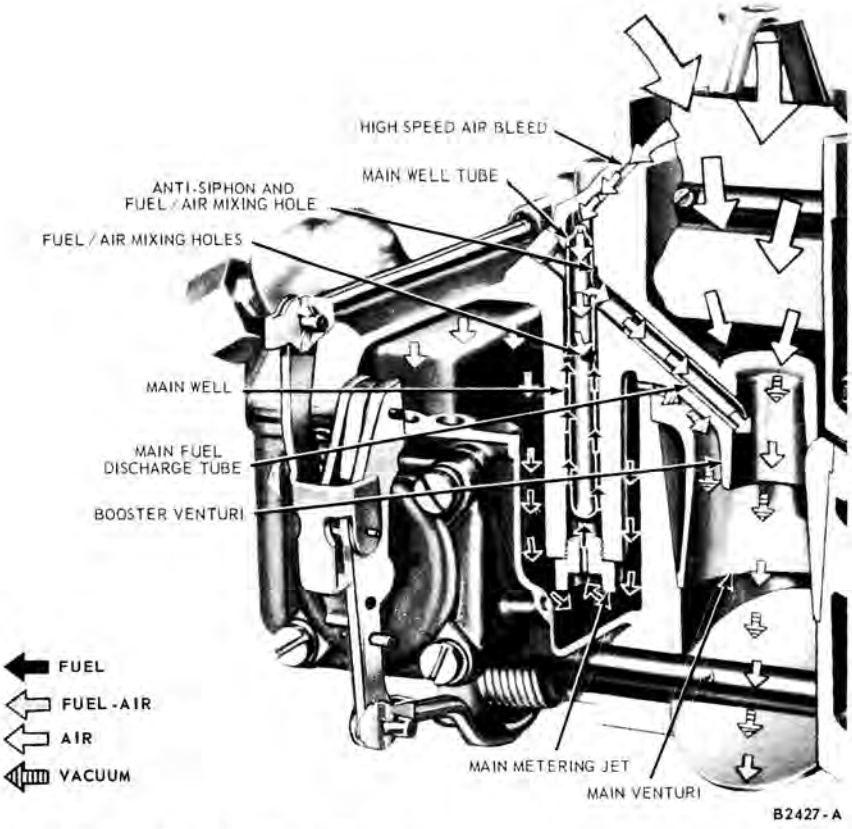


FIG. 5—Main Metering System

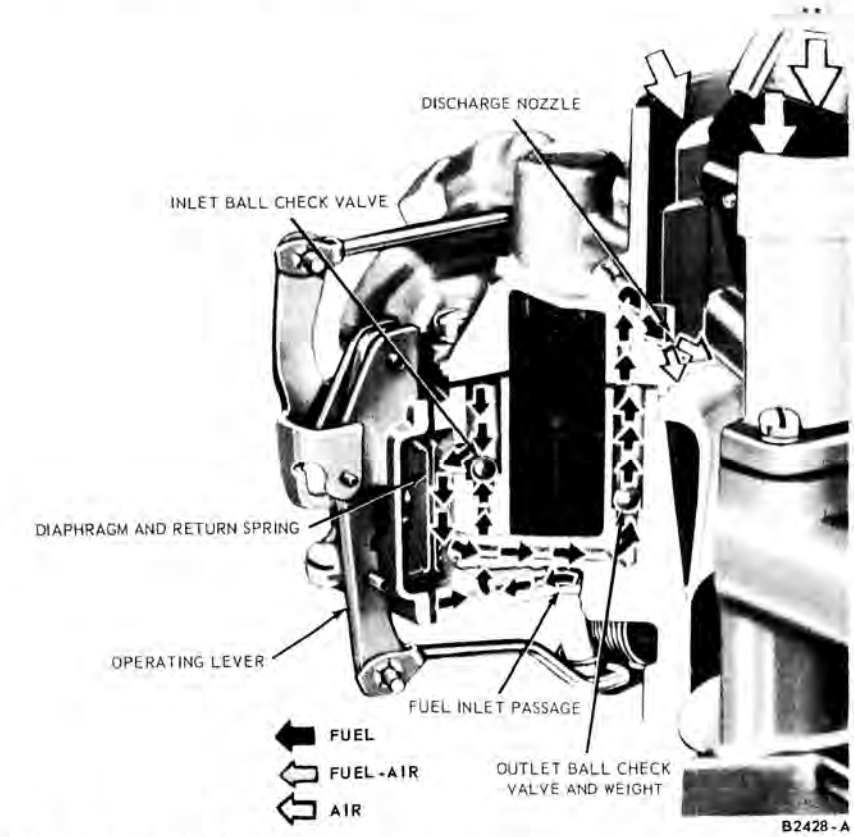


FIG. 6—Accelerating Pump System

The greater air flow past the booster venturi causes a pressure drop in the venturi great enough to bring the main fuel metering system into operation as the idle fuel metering system tapers off.

MAIN FUEL METERING SYSTEM

The main fuel metering system (Fig. 5) supplies the fuel required for engine operation during the cruise or part-throttle range. The system begins the function when the air flow through the carburetor venturi creates a sufficient vacuum to start fuel flowing in the main system. The vacuum at the discharge nozzle will increase as the air flow increases. The faster the engine operates, the more fuel will flow through the main fuel system.

Fuel entering the main jet, located at the bottom of the main well, flows up toward the main nozzle. A main well tube is inserted within the main well. Air from the high speed bleed channel enters the main well tube through a calibrated restriction at the top of the tube. The air passes through holes spaced along the tube, mixing with the fuel flowing up the main well. The fuel and air mixture being lighter than solid fuel, responds faster to changes in venturi pressures. The mixture continues flowing up the main well to the anti-syphon bleed. More air is introduced at the anti-syphon bleed to the fuel and air mixture which is then discharged from the main nozzle. The fuel is mixed with the filtered air moving past and through the booster venturi.

The anti-syphon bleed also acts as a vent to prevent syphoning of fuel at low engine speeds.

ACCELERATING PUMP SYSTEM

Smooth acceleration requires a momentary increase in the supply of fuel. The air flow through the carburetor responds almost immediately to any increase in carburetor throttle valve opening. The fuel within the metering passages will lag momentarily in its response to the pressure difference created by this increased air flow. This lag in fuel response will cause a temporary leanness in the fuel-air mixture that results in a hesitation in engine acceleration. A mechanically operated accelerating pump system (Fig. 6) supplies added fuel to provide a richer fuel-air mixture for this brief period of time.

The accelerating pump, located on the side of the lower body assembly, is actuated by linkage connected to the throttle shaft. When the throttle is opened on acceleration, the diaphragm forces fuel from the accelerating pump chamber into the discharge channel. The inlet ball check closes to prevent a reverse flow of fuel. Fuel under pressure forces the discharge ball check and the weight off its seat, allowing fuel to pass up to the discharge nozzle. The fuel is sprayed from the nozzle into the air stream above the main venturi.

When the throttle plate is closed on deceleration, a return spring forces the diaphragm back, drawing fuel through the inlet channel. The inlet ball check opens, allowing fuel to pass into the chamber while the discharge ball check closes preventing entry of air. A bleed hole is located in the body casting to allow vapor and excess pressure to escape from the diaphragm chamber.

POWER FUEL SYSTEM

When the engine is required to deliver more power to meet an increased road load demand or wide-open throttle operation, the carburetor must deliver a richer fuel-air mixture than supplied during the operation of the main fuel system at cruise or part throttle operation. When the engine is running under a high power demand, intake manifold vacuum is low. The vacuum below the carburetor throttle plate approximates intake manifold vacuum. The carburetor power valve (Fig. 7) will open when the manifold vacuum drops below a predetermined value. The fuel-air mixture is thus automatically enriched to meet the increased engine power demands.

Manifold vacuum is transmitted from an opening below the throttle plate through a channel to the upper body assembly and to the top of the power valve piston. At idle and normal engine speeds, the manifold vacuum is great enough to hold the power valve piston up.

The power valve rod is connected to the piston. The foot of the rod controls the spring-loaded power valve ball check. With the piston held up by manifold vacuum, the ball check closes the power jet inlet channel.

A power valve spring is located on the rod. The spring is shim calibrated to overcome the vacuum above the piston when manifold vacuum

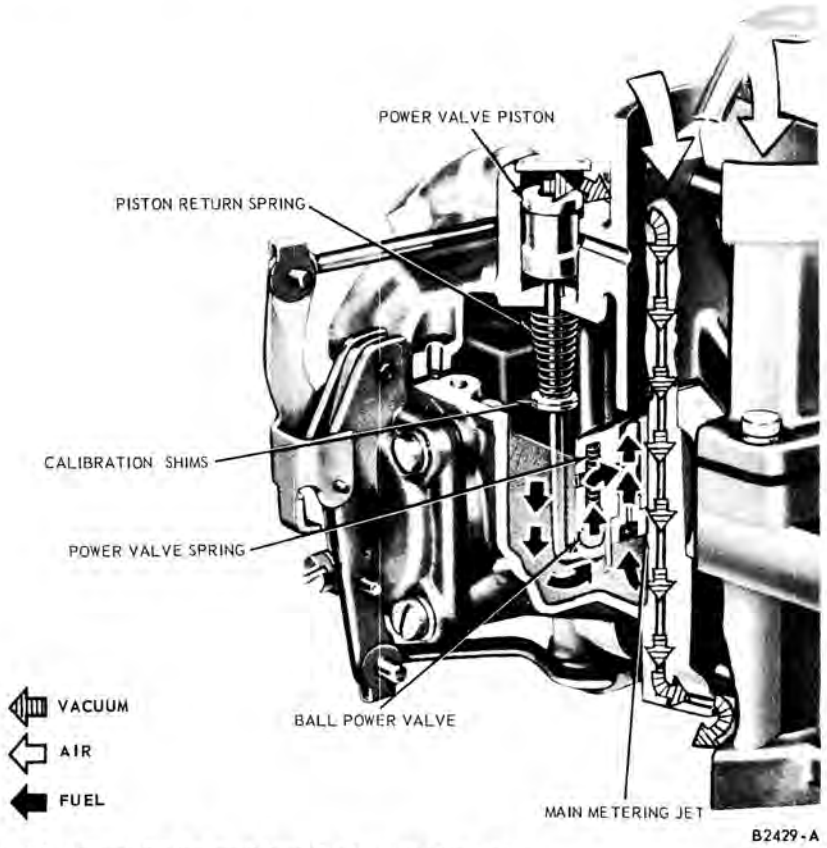


FIG. 7—Power Valve and Fuel Enrichment System

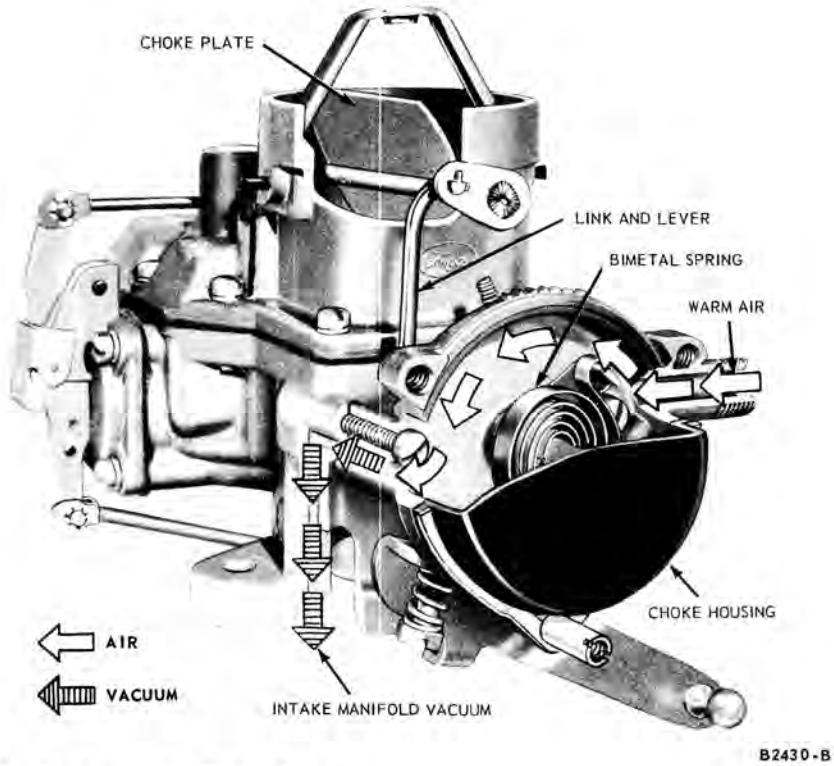


FIG. 8—Automatic Choke System

drops below a predetermined level. Upon demand for more power, the manifold vacuum drops below this level. The spring tension moves the rod down and allows the power valve ball check to open. Air pressure above the fuel bowl forces fuel to flow through the power jet, adding to fuel in the main fuel system, enriching the fuel-air mixture.

As the demand for power decreases and manifold vacuum increases, the vacuum above the piston overcomes the spring tension. The piston and rod move up and the ball check closes the power jet channel.

AUTOMATIC CHOKE SYSTEM

The automatic choke system (Fig. 8) provides all the proper choking action required to enrich the fuel-air mixture during the engine warm up period. This is accomplished primarily through the use of a bimetal thermostatic coil spring. The automatic choke control assembly is mounted on the lower body assembly and linked to the choke shaft lever.

The bimetal thermostatic spring winds up when cold and unwinds when warm. When the engine is cold, the thermostatic spring, through attaching linkage, holds the choke plate in a closed position. A cold engine is started by opening the throttle fully to permit the pressure exerted by the bi-metal spring to close the choke plate when the engine is cold. A fast idle cam is also rotated into position by the automatic choke lever and through a torsion spring to contact the fast idle adjusting screw.

The throttle is returned to a partially opened position and the engine is cranked. When the engine starts running, the spring action of the bi-metal spring will permit partial opening of the choke plate. As the throttle is returned to the idle position, the pulldown rod opens the choke plate mechanically to a calibrated setting. The fast idle screw, attached to the throttle lever, increases the engine idle speed for smoother running when the engine is cold.

During driveaway, increased air flow will result in increased pressure on the choke plate, causing the choke plate to partially open against the force of the bi-metal spring, thereby controlling fuel-air mixture in response to engine demand.

As the engine continues to run, manifold vacuum, channeled through a passage on the bottom of the lower body to the choke housing, draws heated air from the exhaust manifold heat chamber. The amount of air entering the choke housing is controlled by restriction of air channels in the carburetor.

The warmed air from the heat chamber enters the choke housing and heats the thermostatic spring, causing it to warm up. Then tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air in the choke housing is exhausted into the intake manifold. When the engine reaches its normal operating temperature, the spring exerts tension on the choke plate, forcing it to the full open position.

When the choke plate is partially or fully closed, a fast idle cam is rotated into position to contact the fast idle adjustment screw. The screw, attached to the throttle lever, permits a faster engine idle speed for smoother running when the engine is cold. The thermostatic choke lever and torsion spring rotate the fast idle cam to lower the engine idle speed when the engine temperature rises and choking is reduced.

The throttle lever and pulldown rod partially opens the choke plate when the accelerator pedal is fully depressed. This permits unloading a flooded engine.

FUEL BOWL VENT SYSTEM

The fuel bowl requires venting (Fig. 9) to provide proper operation for the various systems. Fuel vapors may form in the fuel bowl when a hot engine is stopped, idling, or operating at very low speeds. By venting the fuel bowl to the atmosphere by means of a vent control valve, engine performance is improved. At higher engine speeds, venting to the carburetor air horn prevents calibration changes due to normal air cleaner contamination.

The restriction of air due to air cleaner contamination causes a pressure drop in the carburetor air horn, and a richer air-fuel mixture. The pressure drop will increase as the demand for air (engine speed) is increased.

On all carburetors a valve connected through linkage to the throttle shaft and located in a bore over

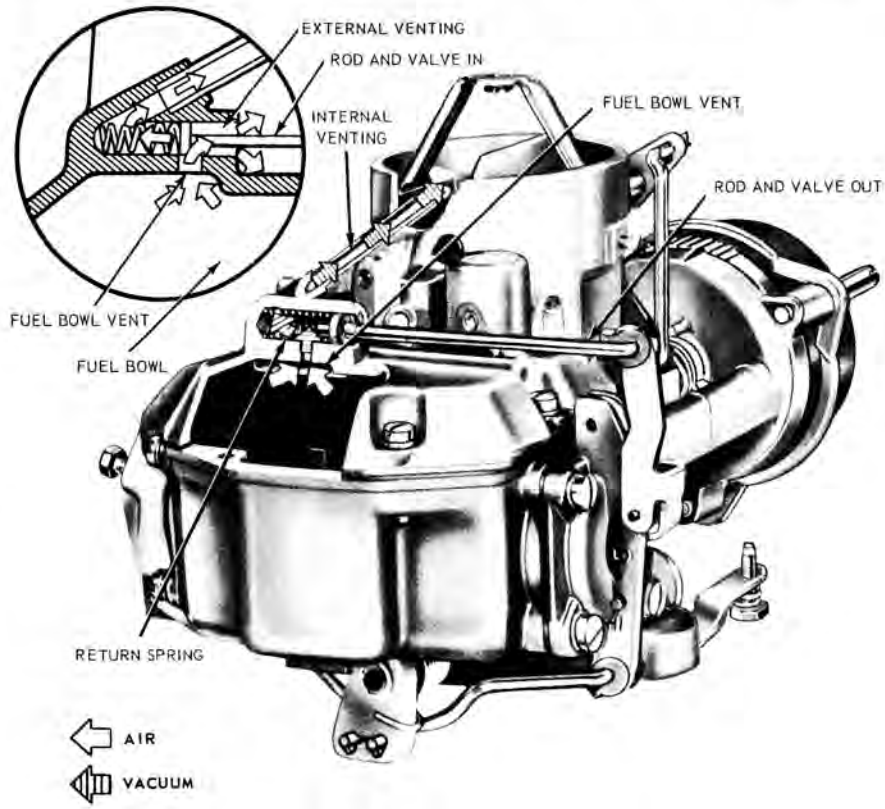


FIG. 9—Fuel Bowl Venting System

the fuel bowl, is at the inward position during closed or part throttle operation. In this position, the valve allows venting only to the atmosphere. At normal or wide-open throttle operation, the valve moves outward sealing the external vent and opening the vent to the carburetor throat.

SPARK (DISTRIBUTOR VACUUM) CONTROL SYSTEM

The degree of spark advance in the distributor is determined by the strength of the vacuum acting on the distributor diaphragm. A high vacuum will increase spark advance. The carburetor is calibrated to provide the required vacuum to the distributor through an interaction of venturi vacuum and manifold vacuum. Venturi vacuum is obtained through the pickup tube in the main venturi and is supplied to the distributor only when it exceeds manifold vacuum (Fig. 10).

Manifold vacuum supplied to the distributor, is obtained from a pick-up hole at the throttle plate edge (when the throttle is closed) and metered to the distributor. An additional passage is always open to manifold vacuum. The purpose of the additional passage is to provide a higher spark advance at closed throttle during deceleration to promote complete burning of the fuel and greater efficiency.

Metering of the manifold vacuum to the distributor is accomplished through the use of the spark valve and restrictors in the vacuum channels. The spark valve is held open through the combination of vacuum and atmospheric pressure acting on the spark valve diaphragm to overcome the tension of a calibrated spring in the spark valve.

Calibrated restrictors in the manifold vacuum channels limit the flow of manifold vacuum to the distributor. Also, during low manifold vacuum periods, the bypass restrictor controls the reduction of venturi vacuum caused by bleed back.

At off-idle engine speeds, vacuum at the throttle edge is high due to a venturi effect created by the position of the throttle plate in the throttle bore. The high vacuum in this area is supplied to the distributor through the manifold vacuum channels for the required increase in distributor spark advance.

Upon acceleration and under wide-open throttle operation, manifold vacuum drops. When the manifold

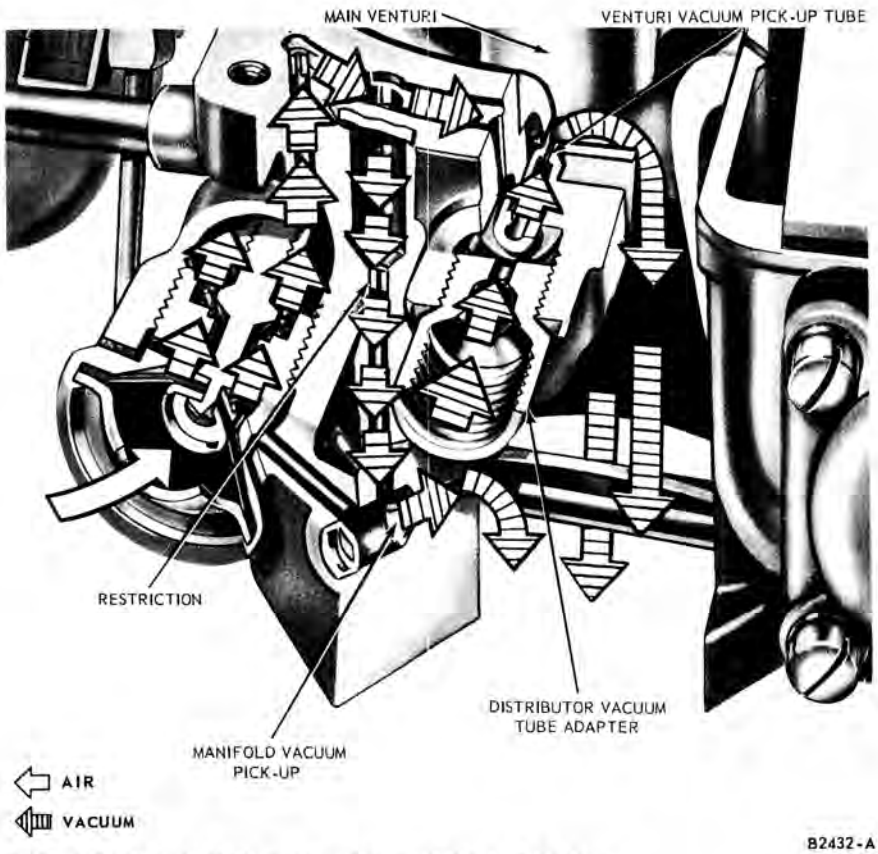


FIG. 10—Spark (Distributor Vacuum) Control System

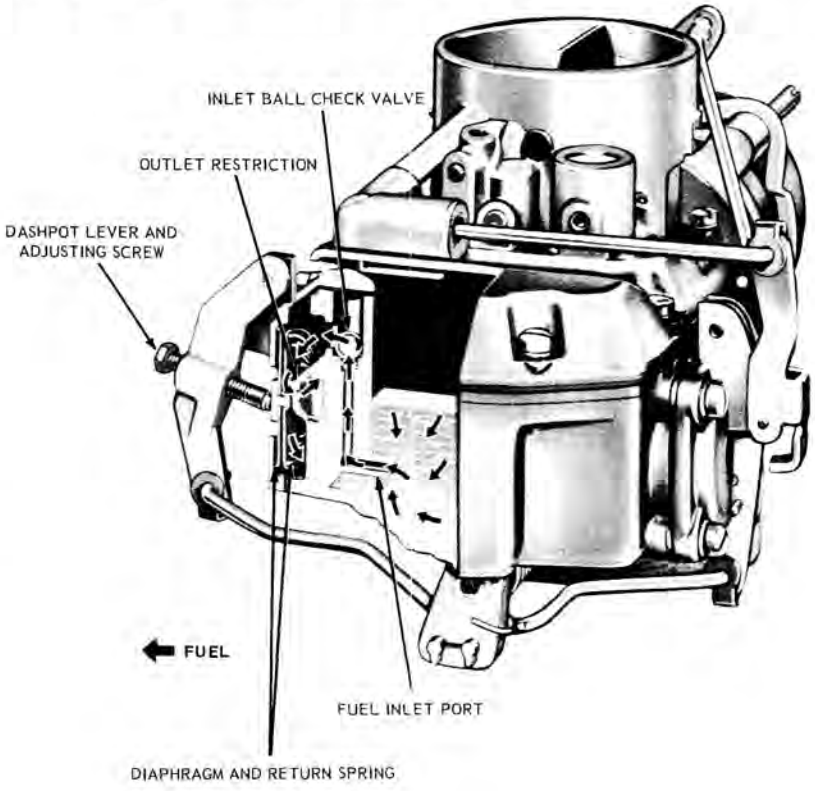


FIG. 11—Anti-Stall Dashpot

vacuum falls below a predetermined point, the spark valve closes, shutting off the manifold vacuum to the distributor. The drop in distributor vacuum retards the spark advance. Venturi vacuum, now greater than manifold vacuum, supplies vacuum to the distributor, thus preventing a full spark retard.

As the engine load demands decrease, the increase in manifold vacuum will become greater than venturi vacuum. The increased manifold vacuum opens the spark valve and the higher vacuum now supplied to the distributor increases the spark advance for more efficient engine operation.

DASHPOT SYSTEM

The low idle rpm setting on automatic transmission equipped units requires a means of control to prevent engine stall upon sudden closing of the throttle plate. This is accomplished by hydraulic dampening of the throttle closing rate.

The dashpot, located on the side of the fuel bowl, is actuated by linkage connected to the throttle shaft (Fig. 11). When the throttle is opened a return spring forces the diaphragm back, drawing fuel through the inlet channel. The inlet ball check opens, allowing fuel to flow into the dashpot chamber.

When the throttle plate is closed, the dashpot actuating lever and adjusting screw moves the diaphragm inward. The diaphragm moving inward seats the inlet ball check, closes the inlet channel and forces fuel through a restriction into the fuel outlet channel into the bowl. The discharge restriction limits the flow of fuel and slows the closing of the throttle plate.

2 IN-CAR ADJUSTMENTS AND REPAIRS

CARBURETOR ADJUSTMENTS

The carburetor adjustments are covered under "Common Adjustments and Repairs" (Part 10-1, Section 2).

The automatic choke plate clearance and fast idle cam linkage adjustments are performed only with the carburetor removed from the car and placed on the bench.

The carburetor float, preliminary idle fuel mixture and idle settings, choke thermostatic spring housing and the accelerating pump adjustments can be performed with the carburetor on the car or on the bench.

The final idle (hot engine) speed and mixture, fast (cold engine) idle speed, vent valve, anti-stall dashpot (automatic transmission equipped cars) and the throttle linkage adjustments are performed only with the carburetor installed on the car.

THROTTLE LINKAGE ADJUSTMENTS

MANUAL-SHIFT TRANSMISSION

The throttle linkage adjustments for the manual-shift transmission equipped cars are covered under "Common Adjustments and Repairs" (Part 10-1, Section 2).

AUTOMATIC TRANSMISSION

The throttle linkage adjustments for automatic transmission equipped cars are covered in Group 7.

REPAIRS

CARBURETOR UPPER BODY TO MAIN BODY GASKET REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2).

2. Remove the fuel inlet line from the carburetor.

3. Depress the tab on the retaining clip that secures the fuel bowl vent rod to the actuating lever and remove the rod and the retainer from the lever.

4. Remove the upper body to lower body retaining screws and the carburetor identification tag.

5. Tilt the fuel bowl vent side of the upper body to allow clearance between the float assembly and the lower body, using a twisting motion to disconnect the choke plate lever from the actuating rod. Remove and discard the gasket.

6. Install a new gasket on the carburetor lower body. **Make sure all holes in the new gasket have been punched and that no foreign material has adhered to the gasket. Make certain the word "Top" (inscribed on the gasket) is facing upward.**

7. Insert the choke plate lever actuating rod thru the choke plate lever. Use a twisting motion to position the carburetor upper body on the mounting gasket. **During the installation, observe the float shaft to make certain it does not dislodge.** Install the upper to lower body retaining screws and the carburetor identification tag. Tighten the screws.

8. Position the fuel bowl vent rod retaining clip on the vent rod actuating lever. Depress the tab on the retaining clip and install the vent rod in the clip and the lever. Release the tab.

9. Connect the fuel inlet line to the carburetor.

10. Adjust the idle fuel mixture and engine idle speed. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) for the proper procedures.

CARBURETOR FLOAT OR NEEDLE VALVE AND SEAT REPLACEMENT

1. Remove the carburetor upper body and gasket by following steps 1 thru 5 under "Carburetor Upper Body to Main Body Gasket Replacement" in this section.

2. Remove the carburetor float shaft and float assembly.

3. If necessary, remove the fuel inlet needle valve, seat and gasket. Discard the gasket.

4. If the needle valve and seat were removed, install the new gasket and the needle valve seat. Tighten the seat with a wrench. Insert the needle valve into the bore, with the viton tip toward the seat.

5. Position the float assembly in the upper body, with the tab on the arm located over the needle valve and the hinge of the arm lined up between the hinge bracket holes in the casting. Insert the float shaft thru the holes in the upper body and float assembly.

6. Check the float setting. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) for the proper procedure.

7. Install the carburetor upper body and gasket by following steps 6 thru 10 under "Carburetor Upper Body to Main Body Gasket Replacement" in this section.

MAIN JET REPLACEMENT

1. Remove the carburetor upper body and gasket by following steps 1 through 5 under "Carburetor Upper Body to Main Body Gasket Replacement" in this section.

2. Remove and replace the carburetor main jets with a jet wrench or wide bladed screwdriver.

3. Install the carburetor upper body and gasket by following steps 6 through 10 under "Carburetor Upper Body to Main Body Gasket Replacement" in this section.

ACCELERATOR PUMP DIAPHRAGM REPLACEMENT

1. Remove the air cleaner assembly (Part 10-6, Section 2).

2. Depress the tab on the accelerating pump lever to control rod retaining clip with pliers, and slide the rod out of the lever. Remove the clip from the lever.

3. Remove the accelerator pump cover retaining screws. Lift the cover upward and remove the diaphragm and return spring.

4. Position the new diaphragm on the diaphragm cover, with the diaphragm plunger facing the lever, and line up the holes. While holding the diaphragm in place, position the small diameter of the diaphragm return spring on the boss in the accelerator pump chamber; then, position the cover and the diaphragm over the return spring and onto the lower body. Install the cover retaining screws finger-tight.

5. Push the diaphragm inward with the lever and tighten the cover screws.

6. Position the accelerating pump actuating rod retaining clip over the hole in the accelerating pump lever, with the tab side of the clip toward the carburetor barrel. Depress the tab and insert the end of the rod through the lever and clip. Release the tab when the rod is inserted. Perform the "Accelerating Pump Adjustment" (Part 10-1, Section 2).

7. Install the air cleaner assembly (Part 10-5, Section 2).

SPARK CONTROL VALVE OR GASKET REPLACEMENT

1. Remove the spark control valve with a wrench. Remove and discard the gasket.

2. Install a new gasket on the spark control valve. Install the spark control valve and tighten it securely with a wrench.

DASHPOT DIAPHRAGM REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2).

2. Depress the tab on the dashpot lever to control rod retaining clip with pliers and slide the rod out of the lever. Remove the clip from the lever.

3. Remove the dashpot cover retaining screws. Remove the cover, diaphragm and return spring.

4. Position the new diaphragm on the dashpot cover, with the diaphragm plunger facing the lever, and line up the holes. Position the small diameter of the spring on the boss in the dashpot chamber; then, position the cover and diaphragm over the return spring and onto the lower body. Install the cover retaining screws finger-tight.

5. Push the diaphragm inward with the lever and tighten the cover screws.

6. Position the dashpot actuating rod retaining clip over the hole in the accelerating pump lever, with the tab side of the clip toward the carburetor barrel. Depress the tab and insert the end of the rod through the lever and clip. Release the tab when the rod is inserted. Perform the dashpot adjustment (Part 10-1, Section 2).

7. Install the air cleaner assembly (Part 10-5, Section 2).

CHOKE THERMOSTATIC SPRING HOUSING OR GASKET REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2).

2. Remove the retaining screws securing the heater hose and bracket to the carburetor.

3. Remove the choke thermostatic spring housing clamp retaining screws. Remove the clamp, housing and gasket. Discard the gasket.

4. If the bimetal thermostatic spring is defective, discard the housing assembly.

5. Install a new thermostatic spring housing gasket on the choke housing. Position the thermostatic spring housing on the choke housing, making sure the loop at the end of the thermostatic spring is on the choke lever. **The spring must wind clockwise when viewed from the choke housing side of the carburetor (Fig. 14).**

6. Loosely install the thermostatic spring housing clamp and the retaining screws. Rotate the spring housing in a counterclockwise (rich) direction and align the index mark on the spring housing with the specified index mark (Part 10-8) on the choke housing. Tighten the clamp retaining screws.

7. Install the heater hose and bracket on the carburetor.

8. Install the air cleaner assembly (Part 10-5, Section 2).

CARBURETOR THERMOSTATIC CHOKE ASSEMBLY– CLEAN AND OVERHAUL

1. Remove the carburetor assembly from the car. Refer to "Removal and Installation" (Part 10-2, Section 3) for the procedures.

2. Remove and disassemble the automatic choke assembly by following steps 1 through 6 under "Automatic Choke Disassembly" (Part 10-2, Section 4).

3. Clean and inspect the automatic choke. Refer to "Cleaning and Inspection" (Part 10-1, Section 2) for the procedures.

4. Assemble and install the automatic choke assembly by following steps 1 through 11 under "Automatic Choke Assembly" (Part 10-2, Section 4).

5. Install the carburetor assembly on the car. Refer to "Removal and Installation" (Part 2, Section 3) for the procedures.

VENT VALVE REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2).

2. Depress the tab on the retaining clip that secures the fuel bowl vent rod to the actuating lever and remove the rod and retainer from the lever.

3. Remove the stake marks from the vent valve opening with a scraper or a small file.

4. Remove the vent rod and valve assembly by pulling it outward. Remove the return spring.

5. Insert the fuel vent valve return spring in the vent passage. Insert the piston end of the fuel vent rod in the passage.

6. Punch 3 indentations in the vent valve passage opening with a center punch and a hammer. The indentations must distort the inside edge of the opening sufficiently to act as a stop for the piston end of the vent rod.

7. Position the fuel bowl vent rod

retaining clip on the vent rod actuating lever. Depress the tab on the retaining clip with pliers and install the vent rod in the clip and the lever. Release the tab.

8. Perform a "Vent Valve Adjustment" (Part 10-1, Section 2).

9. Install the air cleaner assembly (Part 10-5, Section 2).

SPACER AND GASKETS REPLACEMENTS

Perform the carburetor "Removal and Installation" procedure steps (Part 10-2, Section 3) to replace the carburetor spacer and/or gaskets.

THROTTLE LINKAGE REPAIR

The throttle linkage repair procedures are covered under "Common Adjustments and Repairs" (Part 10-1, Section 2).

3 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumble on acceleration, and other performance complaints are, in many instances, caused by the presence of dirt, water, or other foreign matter in the carburetor. To aid in diagnosing the complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowl. The contents of the bowl may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner from the air horn of the carburetor (Part 10-5, Section 2).

2. Disconnect the clean air tube, accelerator return spring, accelerator linkage, automatic choke heat tube, fuel inlet line and the distributor vacuum line.

3. Remove the carburetor to intake manifold retaining nuts. Remove the carburetor, spacer and the upper and lower spacer gaskets. Discard the gaskets.

INSTALLATION

1. Clean the gasket surfaces of the carburetor, intake manifold and spacer. Position the spacer between 2 new gaskets and position them on the intake manifold.

2. Install the carburetor and tighten the retaining nuts, evenly and alternately, to specification.

3. Connect the distributor vacuum line, fuel inlet line, automatic choke heat tube, clean air tube, accelerator linkage and the accelerator return spring.

4. Adjust the idle fuel mixture and engine idle speed, and the anti-stall dashpot (automatic transmission), if so equipped. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) for the proper procedures.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

Use a separate container for the component parts of the various assemblies, to facilitate cleaning, inspection and assembly.

The following is a step by step sequence of operations for completely overhauling the carburetor; however, certain components of the carburetor may be serviced without a complete disassembly of the entire unit.

A disassembled view of the carburetor is shown in Fig. 12.

AUTOMATIC CHOKE

1. Remove the choke pulldown rod to throttle lever retainer (Fig. 12). Remove the rod from the lever.

2. Remove the choke thermostatic spring housing to choke housing retaining screws. Remove the thermostat spring housing clamp, housing and the gasket.

3. Remove the choke housing to lower body retaining screws. Rotate the choke housing to disconnect the choke control rod and remove the choke housing and the gasket.

4. Remove the choke control lever to thermostatic choke shaft screw. Remove the choke control lever assembly and the spring. Slide the choke shaft out of the choke housing.

5. Remove the choke control rod from the lever.

6. Remove the choke pulldown rod adjusting nut from the rod. Slide the rod out of the swivel.

UPPER AND LOWER BODY

1. Depress the tang on the fuel bowl vent rod to accelerating pump actuating lever retainer (Fig. 12), and disconnect the vent rod from the lever. Remove the fuel bowl vent rod to accelerating pump actuating lever retainer (Fig. 12).

2. Remove the upper to lower body retaining screws and the carburetor identification tag. Separate the upper body assembly, gasket and lower body assembly (Fig. 12). Discard the gasket.

3. Invert the lower body assembly and allow the accelerating pump discharge weight and ball check, the accelerating pump inlet ball check, and the dashpot ball check, if so equipped, to fall into the hand.

UPPER BODY

1. Remove the float retaining pin and the float assembly (Fig. 12).

2. Remove the fuel inlet needle valve. Remove the needle valve seat and gasket. Discard the gasket.

3. Remove the main jet.

4. Remove the fuel inlet fitting and the screen assembly.

5. Remove the air cleaner bracket retaining roll pins with pliers. Turn them in a direction that will coil the pins to a smaller diameter. If they offer resistance to turning, turn them in the opposite direction. Pull the bracket out of the retaining channels.

6. If it is necessary to remove the choke plate and shaft, lightly scribe the choke along the choke shaft so that the choke plate can be installed in the same position during installation.

Remove the choke plate screws. The retaining screws are staked in the choke shaft. If the tips of the screws are flared excessively, file off the flared portion to avoid damage to the threads in the choke shaft. Be careful not to damage the choke shaft or venturi while filing the

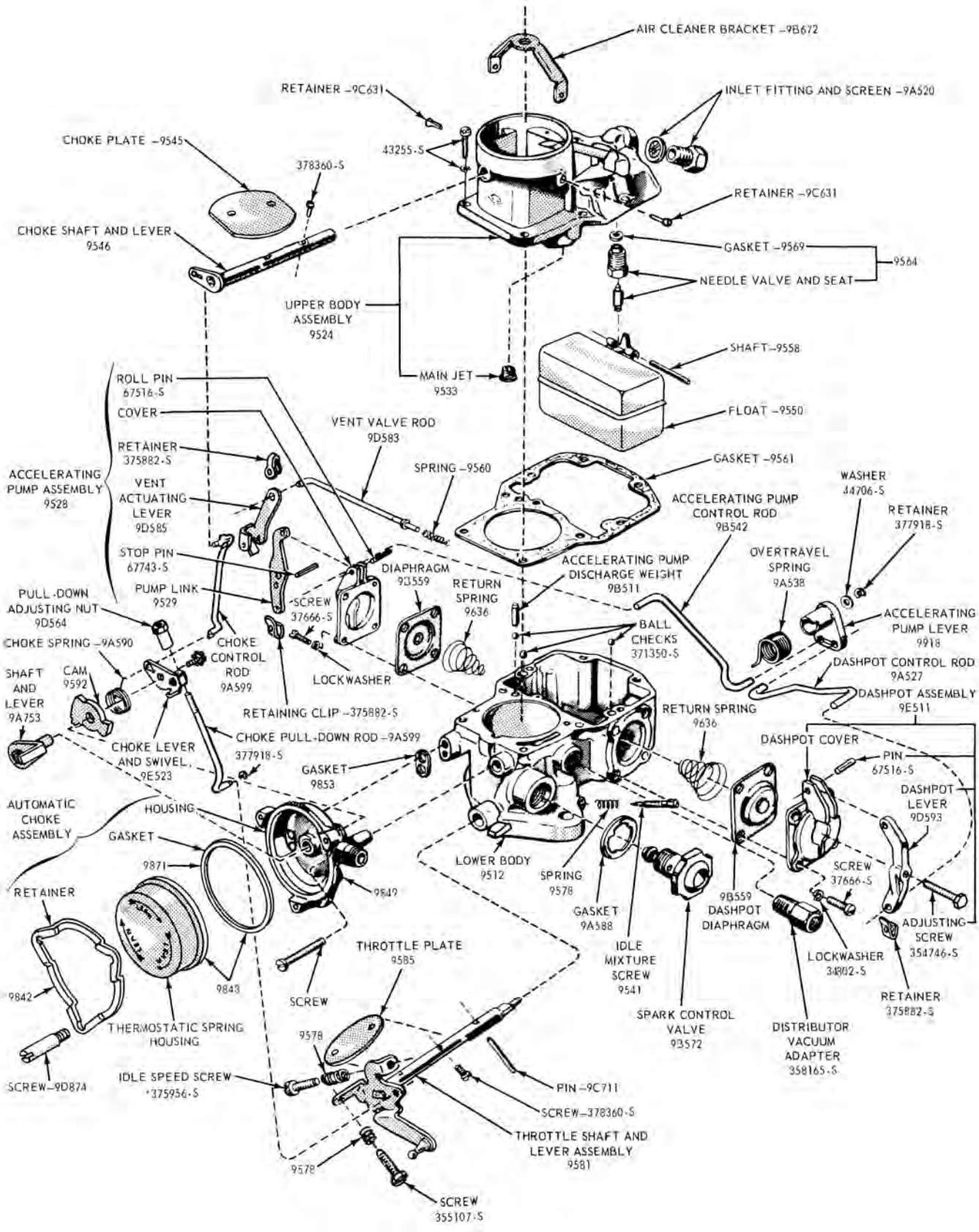


FIG. 12–Single-Barrel Carburetor–Disassembled

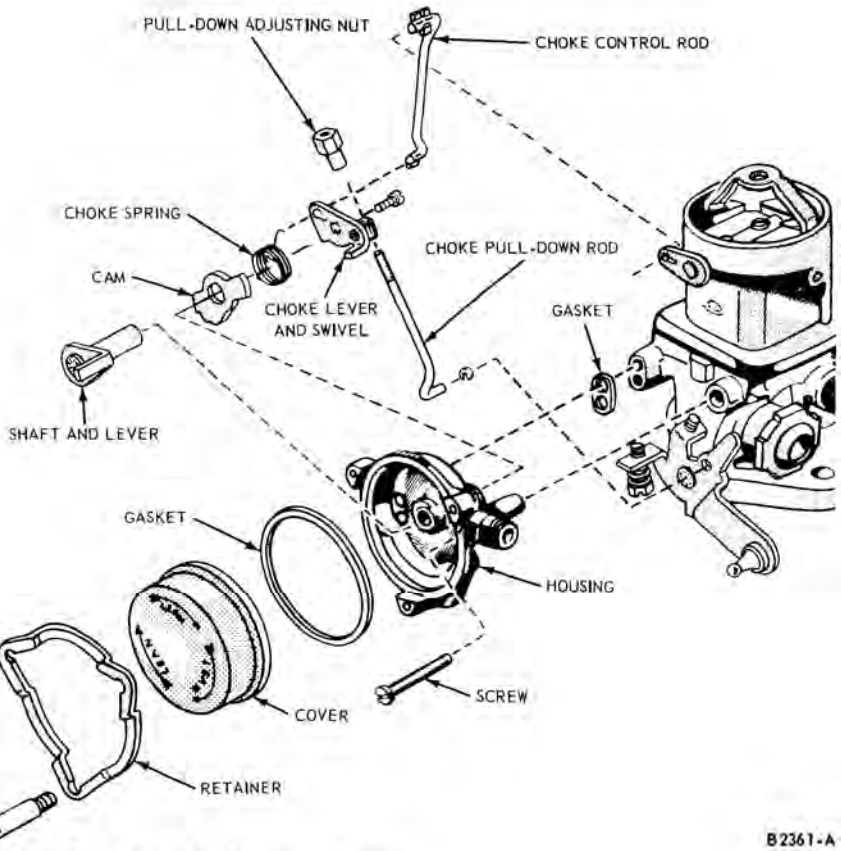


FIG. 13–Automatic Choke Linkage

screws. Remove the choke plate from the top of the air horn by sliding the plate out of the shaft. Slide the shaft out of the body.

FUEL VENT VALVE ROD

1. Remove the stake marks at the vent rod opening with a scraper or file.

2. Remove the vent rod assembly and spring by pulling the vent rod outward.

LOWER BODY

1. Depress the tab on the accelerating pump lever to control rod retaining clip and slide the rod out of the lever (Fig. 12). Remove the clip from the lever.

2. Remove the accelerating pump cover retaining screws. Remove the cover assembly from the lower body. Separate the pump diaphragm and spring from the cover or lower body. If necessary, remove the fuel vent rod actuating lever to cover retaining pin and the accelerating pump lever to cover retaining pin with pliers. Turn them in a direction that will coil the pins to a smaller diameter. If the pins offer resistance to turning, turn them in the opposite direction. Remove the levers from the cover.

3. If the carburetor is equipped with a dashpot, depress the tab on the dashpot lever and control rod retaining clip, and slide the rod out of the dashpot lever. Remove the dashpot cover retaining screws and remove the cover assembly. Separate the diaphragm and spring from the cover or body. If necessary, remove the lever to cover retaining pin with pliers. Turn the pin in a direction that will coil the pin to a smaller diameter. If the pin offers resistance to turning, turn it in the opposite direction and remove the lever from the cover.

4. Remove the throttle shaft lever and retaining ring and washer. Remove the lever and overtravel spring from the throttle shaft. Remove the accelerator pump and dashpot control rods from the lever.

5. Remove the distributor vacuum outlet adapter.

6. Remove the spark valve and the gasket.

7. Remove the idle mixture adjusting screw and spring.

8. If it is necessary to remove the throttle plate and shaft, lightly scribe the throttle plate along the throttle shaft so that the throttle plates can be installed in the same position during installation.

Remove the throttle plate retaining screws and slide the plate out of the shaft. For assembly purposes, note that the dimple in the throttle plate is located below the throttle shaft. **The retaining screws are staked in the throttle shaft.** If the tips of the screws are flared excessively, file off the flared portion to avoid damage to the threads in the throttle shaft. **Be careful not to damage the throttle shaft or venturi while filing the screws.**

9. Remove the overtravel spring tension pin from the throttle shaft and slide the shaft out of the body.

CLEANING AND INSPECTION

Clean and inspect the carburetor component parts. Refer to Part 10-1, Section 3, for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets.

During assembly of the carburetor, certain adjustments are required. The details of these adjustments are covered in Part 10-1, Section 2, under "Common Adjustments and Repairs."

A disassembled view of the carburetor is shown in Fig. 12.

FUEL VENT VALVE ROD

1. Insert the fuel vent valve return spring in the fuel vent passage in the upper body (Fig. 12). Insert the piston end of the fuel vent rod in the passage.

2. Punch three indentations in the vent valve passage opening with a center punch and a hammer. The indentations must distort the inside edge of the opening sufficiently to act as a stop for the piston end of the vent rod. Perform a "Vent Valve Adjustment" after the carburetor is assembled and installed on the car (Part 10-2, Section 2).

UPPER BODY

1. If the choke plate and the shaft were removed, insert the choke shaft assembly into the air horn

with the lever pointing toward the accelerating pump side of the carburetor (Fig. 12).

Refer to the line previously scribed on the choke plate and insert the choke plate into its original position with the plate indentation facing upward and toward the accelerating pump side of the carburetor. Install the choke plate retaining screws snug, but not tight.

Check for proper plate fit, binding in the air horn and free rotation of the shaft by moving the plate from the closed position to the open position. If it moves freely, tighten the choke plate retaining screws while holding the plate in the fully-closed position. Stake the screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

2. Install the fuel inlet adapter in the fuel inlet of the body.

3. Install the main jet in the main fuel well.

4. Install the needle valve seat gasket and the seat within the tapped seat hole. Tighten the needle valve seat firmly. Insert the needle valve into the needle valve seat, with the viton tip toward the seat.

5. Position the float assembly in the body, with the tab on the arm located over the needle valve and the hinge of the arm lined up between the hinge bracket holes in the upper body casting. Insert the float hinge pin through the holes in the upper body and float assembly.

6. Check the float setting. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) for the proper procedure.

7. Insert the air cleaner bracket in the channels of the air horn and install the bracket retaining pins.

LOWER BODY

1. If the throttle plate and shaft were removed, slide the throttle shaft into the lower body, with the lever on the throttle shaft located opposite the fuel bowl and the fast idle adjusting screw facing upward (Fig. 12).

Refer to the line previously scribed on the throttle plate and insert the plate through the slot in the throttle shaft. The plate indentation must face the bottom of the body and point toward the accelerator pump side of the lower body. Install the throttle plate screws snug, but not tight.

Rotate the throttle shaft while lightly tapping the throttle plate within the throttle bore. Check for free rotation of the throttle shaft. Hold the lower body up to the light. **Little or no light should show between the throttle plate and throttle bore.** When the plate is properly located, hold the throttle plate closed; then, tighten and stake the retaining screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

2. Install the distributor vacuum outlet fitting.

3. If the lever was removed from the accelerating pump cover, position the top hole of the lever between the top bracket holes in the cover; then, install the retaining roll pin.

Position the vent rod lever over the accelerating pump cover bracket. Line up the hole in the lever with the holes in the bracket and install the retaining roll pin.

Install the roll pin in the "HI" (lower) stop hole in the lever.

Position the small diameter end of the diaphragm return spring in the boss in the accelerating pump chamber. Position the diaphragm assembly in the accelerating pump cover, with the diaphragm plunger facing the lever, and line up the holes. Position the cover and diaphragm over the return spring and onto the body. Install the cover retaining screws finger-tight. Push the diaphragm assembly inward with the lever and tighten the cover screws.

4. If the carburetor is equipped with a dashpot (Fig. 12), proceed with the following steps:

If the lever was removed from the dashpot cover, position the hole in the lever between the holes in the bracket on the cover. Install the lever retaining roll pin. Install the adjusting screw in the lever, if necessary.

Position the small diameter of the diaphragm return spring on the boss in the dashpot chamber. Position the diaphragm in the dashpot cover with the diaphragm plunger facing the lever, and line up the holes. Position the cover and the diaphragm over the return spring and onto the body. Install the cover retaining screws finger tight. Push the diaphragm assembly inward with the lever and tighten the cover screws.

5. Position the overtravel spring (Fig. 12) on the accelerating pump lever and hook the tang of the spring on the lever. Position the accelerating pump lever and spring on the throttle shaft and insert the accelerating pump actuating rod and dashpot actuating rod, if so equipped, into the two holes in the lever.

6. Install the overtravel tension spring retaining pin in the throttle shaft. Pull the arm of the spring over the retaining pin to apply spring tension to the overtravel lever. Install the washer and retaining clip on the throttle shaft. Insert the "keyed" end of the accelerating pump actuating and the dashpot actuating rod (if so equipped) into the inboard side of the slotted holes in the accelerating pump lever.

7. Position the accelerating pump actuating rod retaining clip over the hole in the accelerating lever, with the tab side of the clip toward the carburetor barrel (Fig. 12). Depress the tab and insert the shorter end of the rod through the lever and clip. Release the tab when the rod is inserted. Perform the "Accelerating Pump Adjustments" (Part 10-1, Section 2) after the carburetor is assembled.

8. If the carburetor is equipped with a dashpot, position the dashpot actuating rod retaining clip over the hole in the dashpot lever, with the tab side of the clip facing toward the carburetor barrel (Fig. 12). Depress the tab and insert the shorter end of the rod through the lever and clip, then release the tab when the rod is inserted. Perform an "Anti-Stall Dashpot Adjustment" (Part 10-1, Section 2) after the carburetor is assembled.

9. Position the spark valve gasket over the spark valve and screw the valve into the lower body (Fig. 12). Tighten the valve securely. **A loose valve will cause poor engine operation.**

10. Install the idle mixture adjusting screw and spring in the lower body (Fig. 12). Perform the "Preliminary Idle Mixture Setting" (Part 10-1, Section 2) after the carburetor is assembled.

UPPER TO LOWER BODY ASSEMBLY

1. Place the ball check and the accelerating pump weight into the lower body accelerating pump outlet passage (Fig. 12). Insert a ball check in the accelerating pump inlet passage.

2. If the carburetor is equipped with a dashpot, insert a ball check in the dashpot inlet passage (Fig. 12).

3. Install the upper to lower body gasket onto the lower body. **Make certain the word "TOP"** (inscribed on the gasket) is facing upward. Position the upper body on the lower body and gasket. **During the installation, observe the float shaft to make certain it does not dislodge.** Install the upper to lower body retaining screws and the carburetor identification tag. Tighten the screws.

4. Position the fuel vent valve rod retaining clip over the hole in the actuating lever, with the tab side of the clip toward the carburetor air horn. Depress the tab on the clip and connect the rod to the actuating lever. Release the tab.

AUTOMATIC CHOKE

1. When facing the cam side of the choke housing (Figs. 12 and 13), position the choke shaft spring over the bushing hub with the hook of the spring on the cam finger (spring windup will rotate the cam counterclockwise).

2. Hold the cam finger clockwise and against the stop of the housing, then rotate the spring counterclockwise until the spring straight end passes the cam finger. Position the choke control lever over the fast idle cam, with the pulldown swivel away from the housing and the short tang between the cam finger and the spring straight end.

3. Insert the thermostatic choke shaft assembly into the choke housing from the bimetal spring side of the housing and into the choke control lever (the pull down swivel and the thermostatic spring arm should be aligned and not opposite), and install the retaining screw.

4. Insert the threaded end of the choke pulldown rod through the swivel (from the bottom) and install the adjusting nut.

5. Position the short end of the choke control rod into the keyhole in the choke housing choke lever.

6. Insert the choke assembly retaining screws into the choke housing. Position the choke control gasket and the choke housing onto the lower body, connecting the rod to the choke plate shaft. Start the retaining screws into the body.

7. Insert the end of the choke pull down rod into the throttle shaft lever hole and install the retainer.

8. Check the position of the choke control gasket and tighten the retaining screws.

9. Position the thermostatic spring, housing gasket and cover to the choke housing, making sure the loop at the end of the thermostatic spring is on the choke lever (Fig. 14). The spring must wind clockwise toward the center when viewed from the choke housing side of the carburetor. Loosely install the spring clamp and the retaining screws. Rotate the spring housing in a counterclockwise (rich) direction and align the index mark on the spring housing with the specified index mark (Part 10-1, Section 2) on the choke housing.



FIG. 14—Correct Position of Automatic Choke Torsion Spring

BENCH ADJUSTMENTS

All carburetor adjustments with the exception of the "Final (Hot) Engine Idle and Fuel Mixture, Dashpot, Fuel Vent Rod and Throttle Linkage" can be performed prior to installing the carburetor in the car. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) for all carburetor adjustment procedures.

PART 10-3 FORD 2-V CARBURETORS

Section	Page	Section	Page
1 Description and Operation	10-34	3 Removal and Installation	10-40
2 In-Car Adjustments and Repairs	10-38	4 Major Repair Operations	10-40

1 DESCRIPTION AND OPERATION

DESCRIPTION

The carburetors (Figs. 1 and 2) have two main assemblies, the air horn and the main body.

The air horn assembly, which serves as the main body cover, contains the choke plate and the vents for the fuel bowl.

The throttle plate, the accelerating pump assembly, the power valve assembly, and the fuel bowl are in the main body. The automatic choke housing is attached to the main body.

The two barrels each contain a main and booster venturi, main fuel discharge, accelerating pump discharge, idle fuel discharge and a throttle plate.

OPERATION

FUEL INLET SYSTEM

The amount of fuel entering the fuel bowl (Fig. 3) is regulated by the distance the fuel inlet needle is raised off its seat and by fuel pump pressure. Movement of the fuel inlet needle in relation to the seat is controlled by the float and lever assembly which rises and falls with the fuel level. When the fuel in the fuel bowl reaches a pre-set level, the float lowers the fuel inlet needle to a position where it restricts the flow of fuel, admitting only enough fuel to replace that being used.

An integral retaining clip is attached to the fuel inlet needle assembly. The clip hooks over the tab of the float assembly. This clip assures reaction of the fuel inlet needle to any downward movement of the float.

A wire-type retainer prevents movement of the float shaft within the guides on each side of the fuel bowl. The retainer fits into a groove on the outside of the fuel inlet needle seat. The ends of the retainer are hooked over grooves on opposite ends of the float shaft.

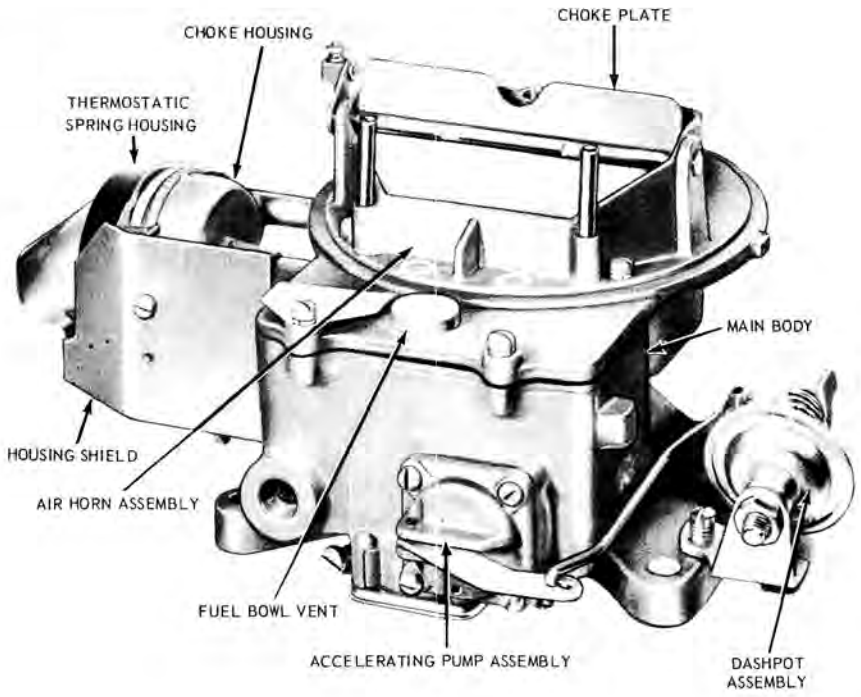


FIG. 1—¾ Left Front View

A torsion (fuel pulsation damper) spring is located on the float shaft, between the inboard end of the float retainer, and the float shaft guide in the fuel bowl. The short end of the spring rests under the float lever, and the long end of the spring rests against the inner face of the fuel bowl.

The torsion spring tension resists and absorbs fuel pump pressure pulsations, and movement of fuel in the bowl due to driving conditions. This assures proper regulation of the fuel inlet needle which rises and falls with the fuel level.

The fuel bowl is internally vented into the air cleaner. It is also externally vented to the atmosphere.

AUTOMATIC CHOKE SYSTEM

The choke plate, located in the air horn above the barrels, when closed, provides a high vacuum above as well as below the throttle plates. With a vacuum above the throttle plates, fuel will flow from the main fuel system as well as from the idle fuel system. This provides the extremely rich fuel mixture necessary for cold engine operation.

The carburetor choke shaft is linked to a thermostatic choke control mechanism mounted on the main body (Fig. 4).

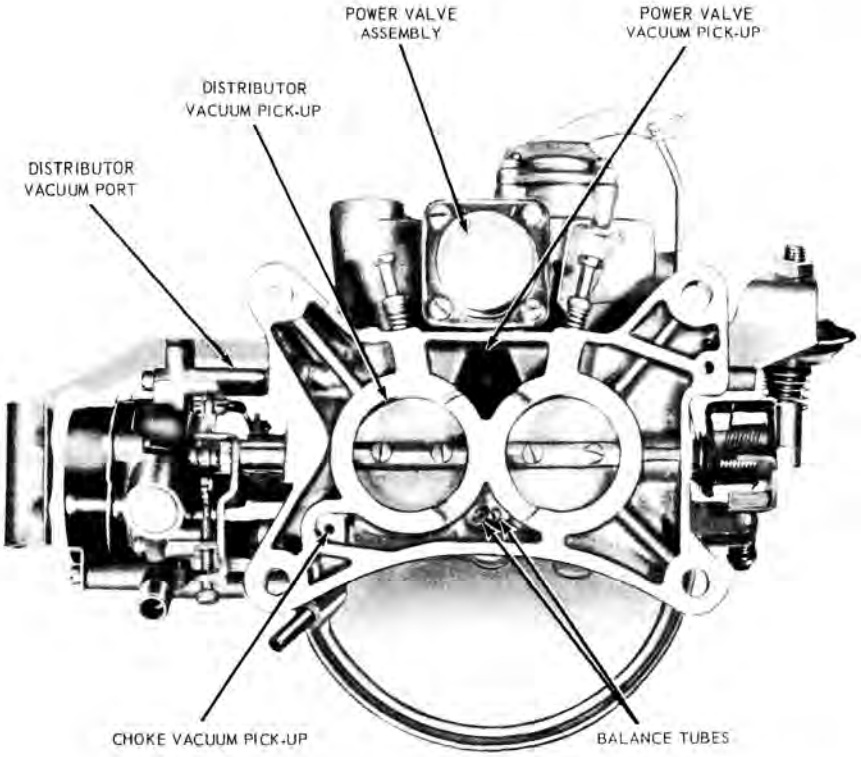


FIG. 2–Bottom View

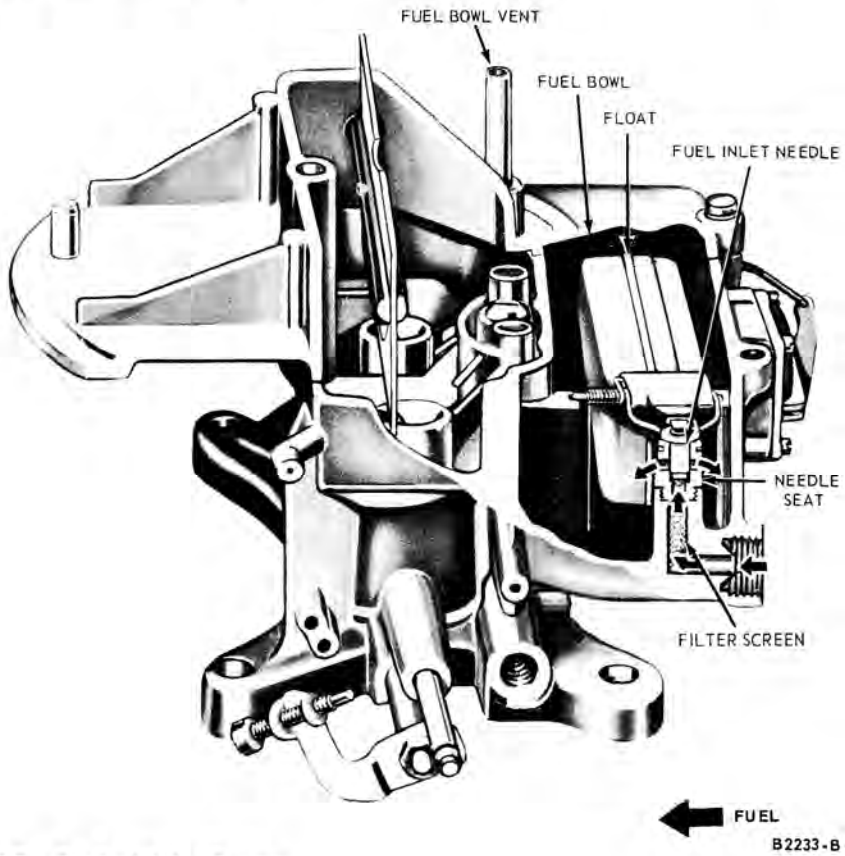


FIG. 3–Fuel Inlet System

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator is fully depressed. This permits unloading of a flooded engine.

The automatic choke is equipped with a bi-metal thermostatic spring and a vacuum piston (Fig. 4). The bi-metal thermostatic spring mechanism winds up when cold and unwinds when warm. When the engine is cold, the thermostatic spring, through attaching linkage, holds the choke piston upward and the choke plate in a closed position prior to engine start. Manifold vacuum channeled through a passage in the choke control housing, draws the choke vacuum piston downward, exerting an opening force on the choke plate.

When the engine is started, manifold vacuum, acting directly on the piston located in the choke housing, immediately moves the plate against the tension of the thermostatic spring to a partially open position to prevent stalling.

As the engine continues to operate, manifold vacuum draws heated air from the exhaust manifold heat chamber. The amount of air entering the choke housing is controlled by restrictions in the air passages in the carburetor.

The warmed air enters the choke housing and heats the thermostatic spring causing it to unwind. The tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air is exhausted into the intake manifold.

When the engine reaches its normal operating temperature, the thermostatic spring exerts tension on the choke plate forcing it to the full open position. In this position, the choke piston is at its lowest point in the cylinder. Slots in the piston chamber wall allow sufficient air to bleed past the piston and into the intake manifold, causing a continual flow of warm air to pass through the thermostatic spring housing. The spring thus remains heated and the choke plate remains fully open until the engine is stopped and allowed to cool.

The choke rod actuates the fast idle cam during choking. Steps on the edge of the fast idle cam contact the fast idle adjusting screw which permits a faster engine idle speed for smoother running when the engine is

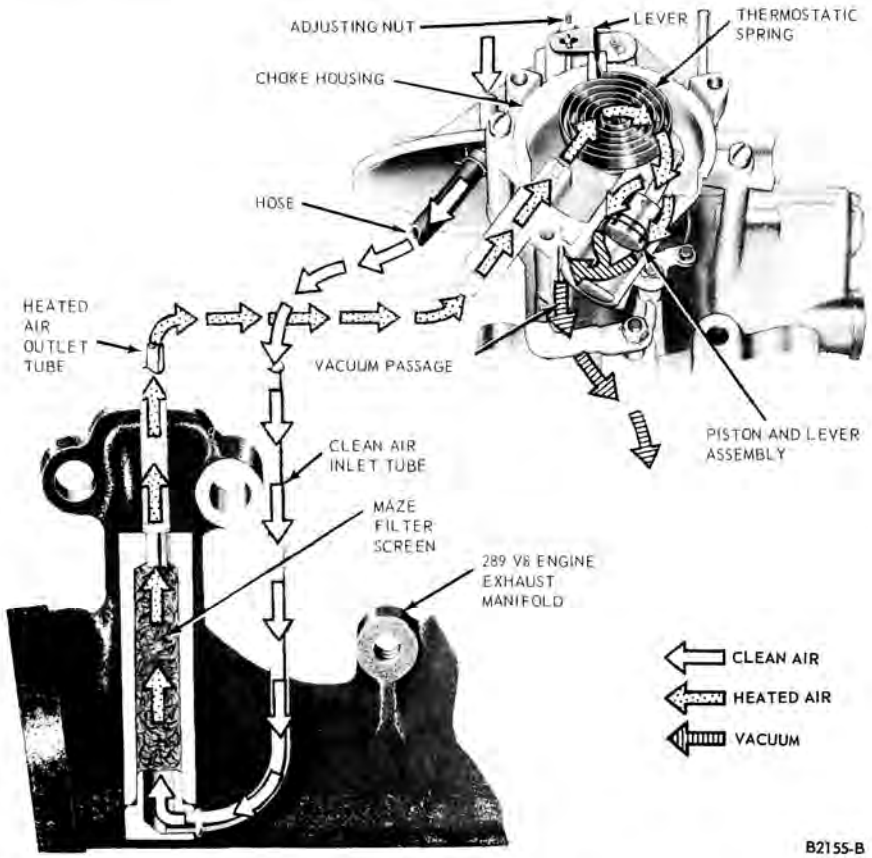


FIG. 4—Automatic Choke System

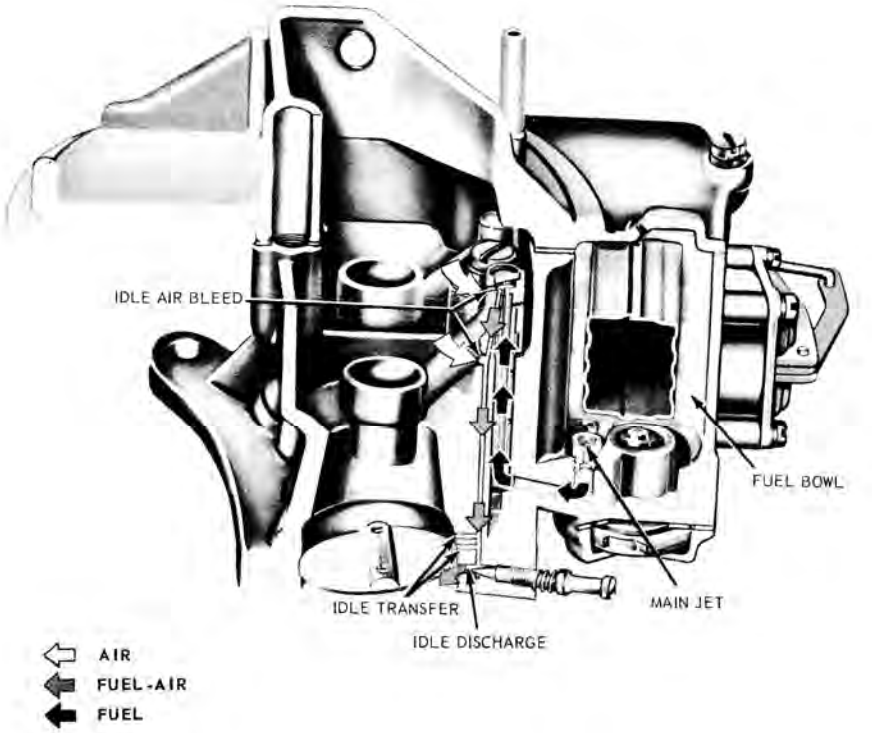


FIG. 5—Idle Fuel System

cold. As the choke plate is moved through its range of travel from the closed to the open position, the choke rod rotates the fast idle cam. Each step on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

During the warm-up period, if the engine should reach the stall point due to a lean mixture, manifold vacuum will drop considerably. The tension of the thermostatic spring then overcomes the lowered vacuum acting on the choke piston, and the choke plate will be moved toward the closed position, providing a richer mixture to help prevent stalling.

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator pedal is fully depressed. This permits unloading of a flooded engine.

IDLE FUEL SYSTEM

The difference in pressure between the fuel bowl and the idle discharge port forces fuel through the idle fuel system. Fuel flows from the fuel bowl through the main jet and into the bottom of the main well (Fig. 5).

From the main well, the fuel flows up through the idle tube and through a short diagonal passage in the booster venturi assembly into the idle passage in the main body. A calibrated restriction, at the upper tip of the idle tube, meters the flow of fuel.

Air enters the idle system from the air bleed which is located directly above the idle tube. The air bleed also acts as a vent to prevent siphoning at off idle or high speeds and when the engine is stopped. Additional air is bled into the system through an air bleed located at the bottom of the diagonal passage in the booster venturi where the fuel enters the idle passage in the main body.

Fuel flows down the idle passage in the main body past three idle transfer holes. The idle transfer holes act as additional air bleeds at curb idle. The fuel then flows past the pointed tip of the adjusting needle which controls the idle fuel discharge. From the adjusting needle chamber, the fuel flows through a short horizontal passage and is discharged below the throttle plates.

During off idle when the throttle plate is moved slightly past the idle transfer holes, each hole begins discharging fuel as it is exposed to

manifold vacuum. As the throttle plate is opened still wider and engine speed increases, the air flow through the carburetor is also increased. This creates a vacuum in the booster venturi strong enough to bring the main fuel system into operation. Fuel flow from the idle fuel system begins tapering off as the main fuel system begins discharging fuel.

ACCELERATING SYSTEM

Upon accelerating, the air flow through the carburetor responds almost immediately to the increased throttle opening. There is, however, a brief interval before the fuel, which is heavier than air, can gain speed and maintain the desired balance of fuel and air. During this interval, the accelerating system (Fig. 6) supplies fuel until the other systems can once again provide the proper mixture.

When the throttle is closed, the diaphragm return spring forces the diaphragm toward the cover, drawing fuel into the chamber through the inlet. The inlet has an Elastomer valve which uncovers the inlet hole to admit fuel from the fuel bowl and covers the inlet hole when the accelerating pump is operated to prevent the fuel from returning to the bowl. A discharge weight and ball check prevents air from entering the discharge nozzle when fuel is drawn into the diaphragm chamber.

When the throttle is opened, the diaphragm rod is forced inward, forcing fuel from the chamber into the discharge passage. Fuel under pressure forces the pump discharge weight and ball off their seat and fuel passes through the accelerating pump discharge screw and is sprayed into each main venturi through discharge ports.

An air bleed in the wall of the accelerating pump fuel chamber prevents vapor entrapment and pressure build-up in the diaphragm chamber.

MAIN FUEL SYSTEM

As engine speed increases, the air passing through the booster venturi creates a vacuum. The amount of vacuum is determined by the air flow through the venturi, which in turn is regulated by the speed of the engine. The difference in pressure between the main discharge port and the fuel bowl causes fuel to flow through the main fuel system (Fig. 7).

At a predetermined venturi vacuum, fuel flows from the fuel bowl,

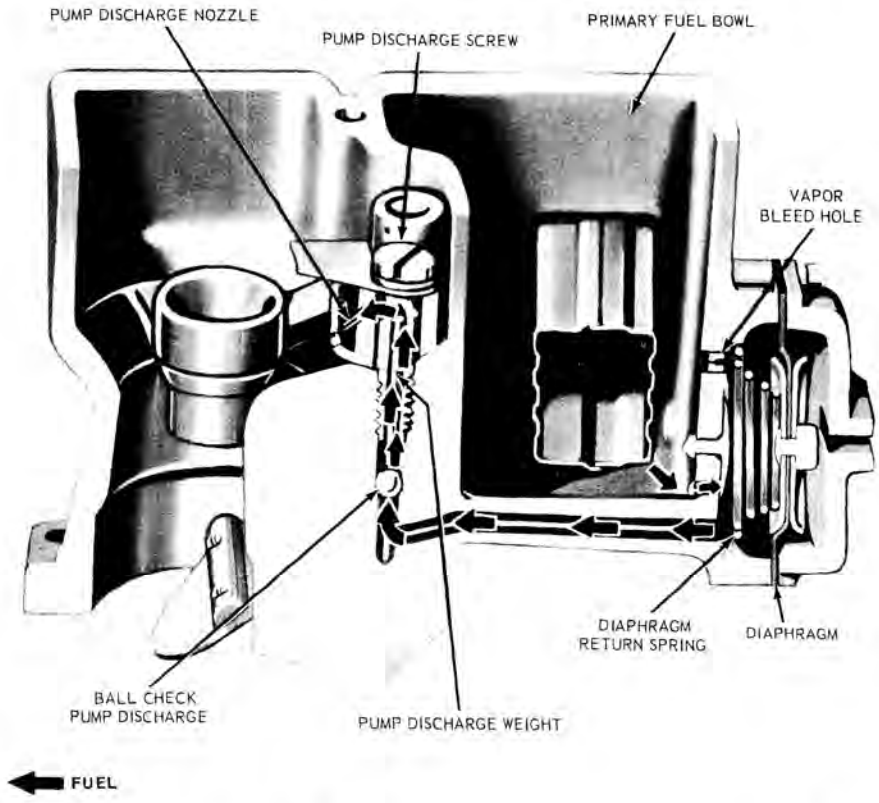


FIG. 6—Accelerating Pump System

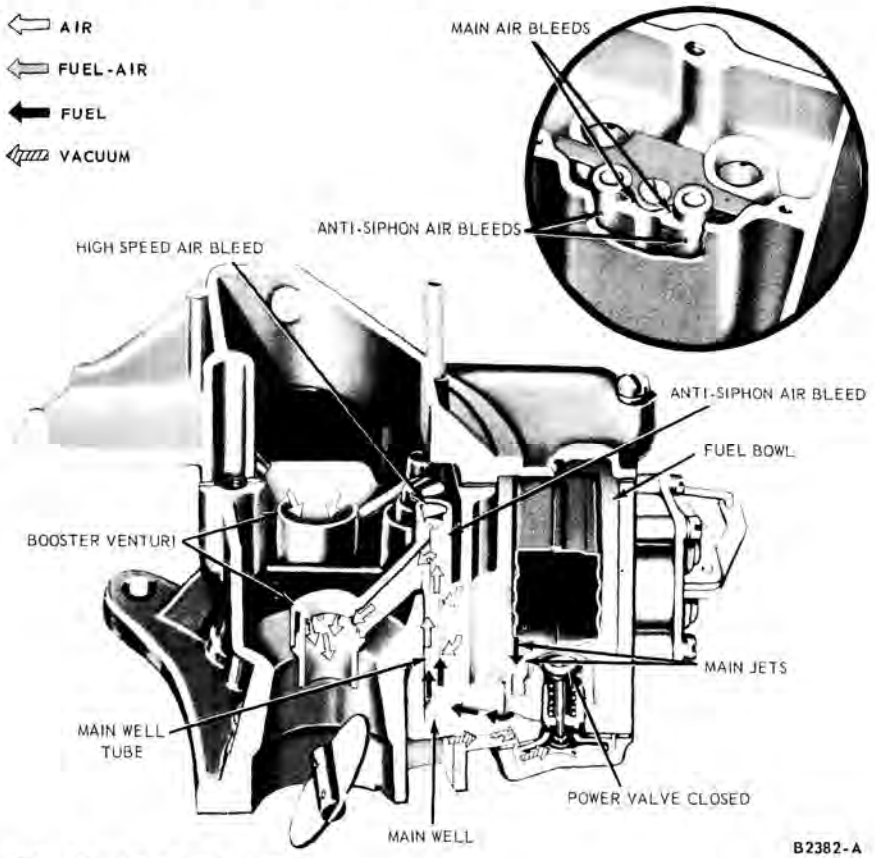


FIG. 7—Main Fuel System

through the main jets, and into the bottom of the main well. The fuel moves up the main well tube past air bleed holes. Filtered air from the high speed air bleed enters the fuel flow in the main well tube through holes in the side of the tube. The high speed air bleed meters an increasing amount of air to the fuel as venturi vacuum increases, maintaining the required fuel-air ratio. The mixture of fuel and air is lighter than raw fuel and responds faster to changes in venturi vacuum. It also vaporizes more readily than raw fuel. The fuel and air continue up the main well tube past another air bleed which also acts as a vent to prevent siphoning when the engine is shut down. The fuel is discharged into the booster venturi where it is vaporized and mixed with the air flowing through the carburetor.

The throttle plate controls the amount of the fuel-air mixture admitted to the intake manifold, regulating the speed and power output of the engine.

A balance tube is located in each barrel directly below the booster venturi. When decelerating, the balance tube siphons off any excess fuel droplets remaining around the edge of the booster venturi and discharges the droplets into the equalizing slots in the base of the carburetor where they are mixed with the idle fuel. The balance tube also acts as an additional air bleed during the idle fuel system operation.

POWER FUEL SYSTEM

During periods of increased road loads or high speed operation, the fuel-air ratio must be increased for added power. The added fuel required during this period is supplied by the power fuel system (Fig. 8).

The power fuel system is controlled by the manifold vacuum.

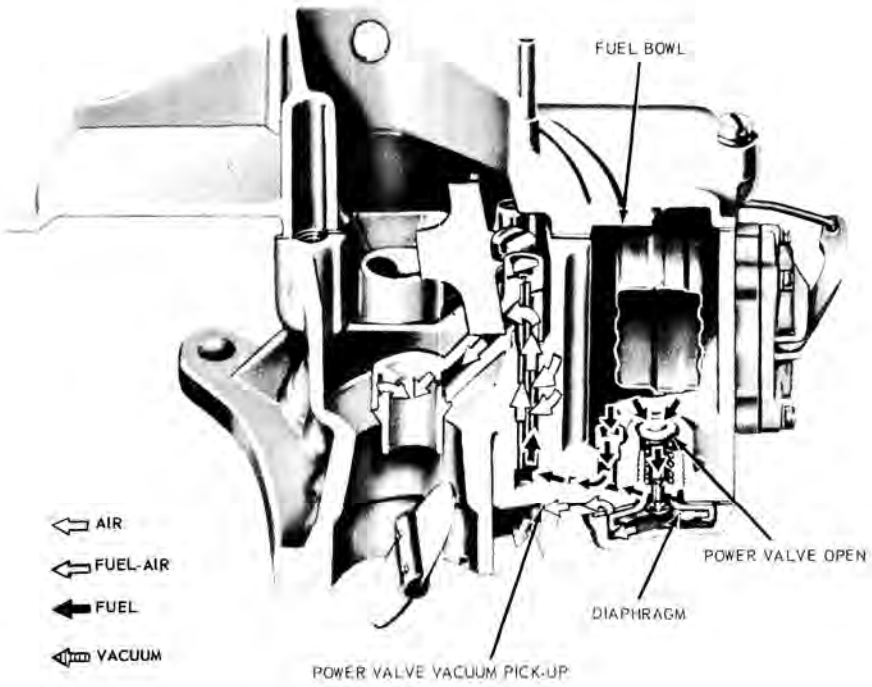


FIG. 8—Power Fuel System

Manifold vacuum is transmitted from an opening in the base of the main body, through a passage in the main body and power valve chamber to the power valve diaphragm. The manifold vacuum, acting on the power valve at idle speed or normal road load conditions, is great enough to hold the power valve diaphragm down, overcoming the tension of the spring on the valve stem and holding the valve closed. When high power operation places a greater load on the engine and manifold vacuum drops below a predetermined value, the spring opens the power valve. Fuel from the fuel bowl flows through the power valve and into passages leading to the main fuel well. Here the fuel is added to the fuel from the main fuel system, enriching the mixture.

As engine power demands are reduced, manifold vacuum increases. The increased vacuum overcomes the tension of the valve stem spring and closes the power valve.

2 IN-CAR ADJUSTMENTS AND REPAIRS

CARBURETOR ADJUSTMENTS

All carburetor adjustments are covered in Part 10-1, Section 2, "Common Adjustments and Repairs."

The fuel level float adjustment (dry) is performed only as a bench adjustment.

The choke plate clearance (pull-down) and fast idle cam linkage adjustment, the automatic choke thermostatic spring housing adjustment, the accelerating pump stroke adjustment, and the initial idle mixture setting can be performed with the carburetor on the bench or installed in the car.

The fuel level float adjustment (wet), the idle fuel mixture and idle speed adjustments, and the anti-stall dashpot adjustment are performed only with the carburetor installed in the car.

THROTTLE LINKAGE ADJUSTMENTS

MANUAL SHIFT TRANSMISSION

The throttle linkage adjustments for manual transmission equipped cars are covered in Part 10-1, Section 2, "Common Adjustments and Repairs."

AUTOMATIC TRANSMISSION

The throttle linkage adjustments

for automatic transmission equipped cars are covered in Group 7.

REPAIRS

AIR HORN TO MAIN BODY GASKET REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2). Remove the air cleaner anchor screw.

2. Disconnect the automatic choke clean air tube at the carburetor.

3. Remove the automatic choke plate operating rod to choke lever retainer.

4. Remove the air horn retaining screws and lockwashers, and the carburetor identification tag. Remove the air horn and the air horn to main body gasket. Discard the gasket.

5. Install a new air horn to main body gasket. **Make sure all holes in the new gasket have been properly punched and that no foreign material has adhered to the gasket.**

6. Position the air horn on the main body and gasket so that the choke plate operating rod fits into the opening in the choke housing lever. Install the choke plate rod retainer.

7. Install the air horn retaining screws and lockwashers and the carburetor identification tag. Install the air cleaner anchor screw.

8. Connect the automatic choke clean air tube to the carburetor.

9. Adjust the idle fuel mixture and idle speed and the dashpot (Part 10-1, Section 2).

10. Install the carburetor air cleaner assembly (Part 10-5, Section 2).

FLOAT, NEEDLE VALVE AND SEAT, OR INLET SCREEN REMOVAL OR REPLACEMENT

1. Remove the carburetor air horn to main body gasket by following steps 1 through 4 under "Air Horn to Main Body Gasket Replacement" in this section.

2. Remove the carburetor float and the fuel inlet needle assembly by following steps 1 under "Main Body Disassembly" (Part 10-3, Section 4).

3. If required, remove the fuel inlet needle seat, gasket and filter screen by following step 2 under "Main Body Disassembly" (Part 10-3, Section 4).

4. If required, install the fuel inlet filter screen, needle valve seat and gasket by following step 12 under "Main Body Assembly" (Part 10-3, Section 4).

5. Install the carburetor float and fuel inlet needle by following steps 13 through 16 under "Main Body Assembly" (Part 10-3, Section 4).

6. Install the carburetor air horn and gasket by following steps 5 through 8 under "Air Horn to Main Body Gasket Replacement" in this section.

7. Perform a "Fuel Level Float Adjustment (Wet)." Refer to Part 10-1, Section 2 for the proper procedure.

MAIN JET REPLACEMENT

1. Remove the carburetor float and needle valve by following steps 1 and 2 under "Float, Needle Valve and Seat, or Inlet Screen Removal or Replacement" in this section.

2. Remove the carburetor main jet(s) with a jet wrench.

3. Install the carburetor main jet(s) with a jet wrench.

4. Install the carburetor needle valve and float by following steps 5 through 7 under "Float, Needle Valve and Seat, or Inlet Screen Removal or Replacement" in this section.

ACCELERATOR PUMP DIAPHRAGM AND ELASTOMER VALVE REPLACEMENT

1. Remove the carburetor air horn to main body gasket by following steps 1 thru 4 under "Air Horn to Main Body Gasket Replacement" in this section.

2. Remove the accelerating pump diaphragm and the elastomer valve by following steps 5 and 6 under "Main Body Disassembly" (Part 10-3, Section 4).

3. Intall the elastomer valve and the diaphragm by following steps 7 and 8 under "Main Body Assembly (Part 10-3, Section 4).

4. Install the carburetor air horn and gasket by following steps 5 thru 10 under "Air Horn to Main Body Gasket Replacement" in this section.

POWER VALVE OR GASKET REPLACEMENT

1. Remove the carburetor from the engine. Refer to steps 1 thru 4 under "Removal" (Part 10-3, Section 3).

2. Test the power valve; refer to steps 1 thru 4 under "Power Valve" (Part 10-1, Section 1).

3. Remove the power valve and/or gaskets by following steps 7 under "Main Body Disassembly" (Part 10-3, Section 4).

4. Replace the power valve and/or gaskets by following step 10 under "Main Body Assembly" (Part 10-3, Section 4).

5. Intall the carburetor assembly. Refer to steps 1 thru 4 under "Installation" (Part 10-3, Section 3).

ANTI-STALL DASHPOT REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2).

2. Remove the retaining nut and the dashpot from the mounting bracket.

3. Install the dashpot and retaining nut on the mounting bracket.

4. Adjust the anti-shall dashpot; refer to "Anti-Stall Dashpot" (Part 10-1, Section 2).

5. Install the air cleaner (Part 10-5, Section 2).

THERMOSTATIC CHOKE SPRING HOUSING AND GASKET REPLACEMENT

1. Remove the carburetor air cleaner assembly (Part 10-5, Section 2).

2. Remove the heater hose and mounting bracket from the carburetor.

3. Remove the thermostatic spring housing clamp retaining screws and remove the spring housing and gasket. Discard the gasket.

4. Replace the spring housing, if required.

5. Position the thermostatic choke spring housing gasket on the choke housing, with the slot in the arm of the thermostatic spring lever inserted into the loop of the thermostatic spring. Position the retainer over the thermostatic spring housing and loosely install the retaining screws.

6. Set the thermostatic spring housing to the specified index mark (Part 10-8) and tighten the retaining screws.

7. Install the heater hose mounting bracket, heater hose and the air cleaner assembly (Part 10-5, Section 2) on the carburetor.

THERMOSTATIC CHOKE REMOVAL AND INSTALLATION –CLEAN OR OVERHAUL

1. Remove the carburetor air cleaner assembly (Part 10-5, Section 2).

2. Remove the heater hose and mounting bracket from the carburetor. Disconnect the choke heat tube from the carburetor.

3. Remove and disassemble the thermostatic choke assembly by following steps 1 thru 4 under "Vacuum Piston Choke Disassembly" (Part 10-3, Section 4).

4. Assemble and install the thermostatic choke assembly by following steps 1 thru 4 under "Vacuum Piston Choke Assembly" (Part 10-3, Section 4). Connect the choke heat tube to the choke housing.

5. Perform the "Fast Idle Cam Linkage" and "Automatic Choke Plate Clearance (Pull-Down) Adjustment" (Part 10-1, Section 2).

6. Install the carburetor air cleaner assembly (Part 10-5, Section 2).

SPACER AND GASKETS REPLACEMENT

Perform the "Carburetor Removal and Installation" procedure steps (Part 10-3, Section 3) to replace the carburetor spacer and/or gaskets.

THROTTLE LINKAGE REPAIR

The "Throttle Linkage Repair" procedures are covered in Part 10-1, Section 2.

3 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumbie on acceleration and other performance complaints are, in many instances, caused by the presence of dirt, water or other foreign matter in the carburetor. To aid in diagnosing the cause of complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowls. The contents of the bowls may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner (Part 10-5, Section 2). Remove the choke shield retaining screws and remove the hose and shield from the carburetor assembly.

2. Remove the accelerator linkage from the carburetor throttle lever. Disconnect the distributor vacuum line, the fuel inlet line and the choke heat tube at the carburetor.

3. Disconnect the choke clean air tube from the air horn.

4. Remove the carburetor retaining nuts and lockwashers; then remove the carburetor. Remove the spacer and gaskets from the manifold. Discard the gaskets.

INSTALLATION

1. Clean the gasket surface of the intake manifold, spacer and carburetor. Place the spacer between two new gaskets and position them on the manifold. Position the carburetor on the spacer.

2. Connect the accelerator linkage, choke heat tube, distributor vacuum line and fuel inlet line. Install the carburetor retaining nuts. Tighten the carburetor retaining nuts. Position the hose on the choke shield and install the shield and retaining screws.

3. Connect the choke clean air tube to the air horn.

4. Refer to Part 10-1, Section 2, "Common Adjustments and Repairs" and adjust the engine idle speed, the idle fuel mixture, anti-stall dashpot (if so equipped) and the accelerating pump stroke (if required). Install the air cleaner (Part 10-5, Section 2).

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

To facilitate working on the carburetor, and to prevent damage to the throttle plates, install carburetor legs on the base. If legs are unavailable, install four bolts about 2¼ inches long of the correct diameter and nuts on the carburetor base.

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor. However, certain components of the carburetor may be serviced without a complete disassembly of the entire unit. For a complete carburetor overhaul, follow all of the steps. To partially overhaul the carburetor or to install a new gasket kit, follow only the applicable steps.

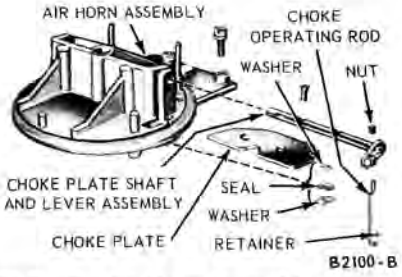


FIG. 9—Air Horn Assembly—Typical

Refer to Fig. 21 for parts identification.

AIR HORN

1. Remove the air cleaner anchor screw.

2. Remove the automatic choke control rod retainer.

3. Remove the air horn retaining screws, lock washers and the carburetor identification tag. Remove the air horn and air horn gasket (Fig. 9).

4. Remove the choke control rod by loosening and turning the choke shaft lever clevis nut counterclockwise. Remove the rod from the air horn. Slide the felt seal and two washers out of the air horn.

If it is necessary to remove the choke plate, remove the staking marks on the choke plate retaining screws and remove the screws. Remove the choke plate by sliding it out of the shaft from the top of the air horn. Slide the choke shaft out of the air horn.

If the tips of the screws are

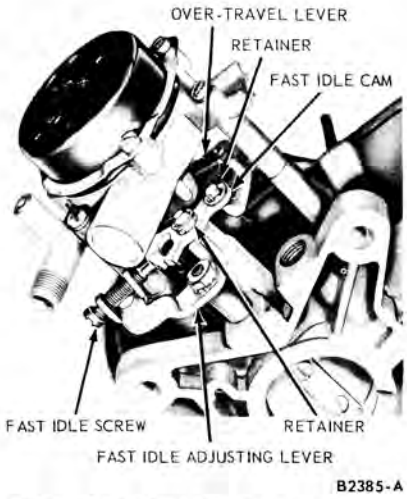


FIG. 10—Fast Idle Cam and Fast Idle Lever

flared excessively, file off the flared portion to prevent damage to the threads in the shaft.

VACUUM PISTON CHOKE

1. Remove the fast idle cam retainer (Fig. 10).

2. Remove the thermostatic choke spring housing retaining screws and remove the clamp, housing and gasket.

3. Remove the choke housing assembly retaining screws. If the air horn was not previously removed, remove the choke control rod retainer. Remove the choke housing assembly, gasket and the fast idle cam. Remove the fast idle cam and rod from the choke over-travel lever.

4. Remove the automatic choke shaft retaining screw and washer (Fig. 11). Remove the choke thermostat lever from the housing. If necessary, remove the pin securing the choke piston to the choke thermostat lever link. Remove the choke



FIG. 11—Choke Shaft and Lever

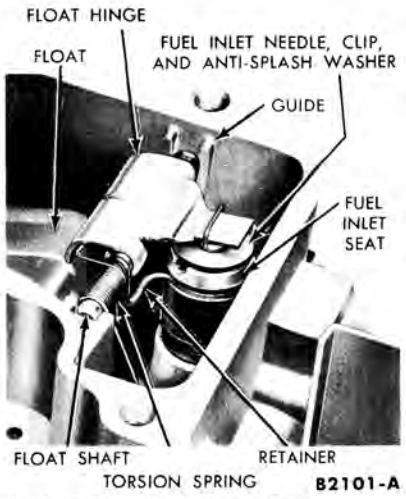


FIG. 12—Float Assembly

shaft and lever assembly, and the over-travel lever from the choke housing.

MAIN BODY

1. Use a hook to disconnect the float shaft retainer from the float shaft. (Figs. 12 and 13). Remove the float, torsion (damper) spring and shaft and the fuel inlet needle and clip assembly from the needle seat.

2. Remove the fuel inlet needle. seat, filter screen, and the main jets with a jet wrench (Figs. 14 and 15).

3. Remove the accelerator pump discharge screw, air distribution plate (if so equipped), booster venturi and gasket (Fig. 16). Invert the main body and let the accelerating pump discharge weight and ball fall into the hand. Remove the fuel inlet fitting.

4. Remove the accelerator pump operating rod from the over-travel lever and the retainer. **To release the operating rod from the over-travel lever retainer, press the ends of the retainer together; then, at the same time, press the rod away from the retainer until it is disengaged.** Remove the rod and retainer.



FIG. 13—Float Shaft Retainer Removal or Installation

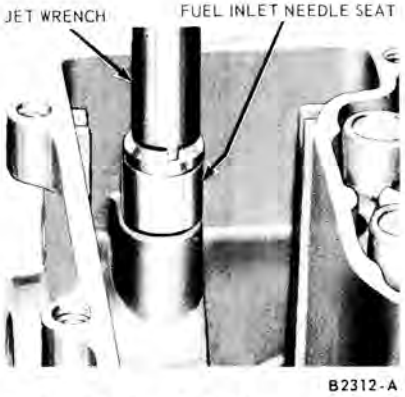


FIG. 14—Fuel Iniet Needle Seat Removal or Installation

5. Remove the accelerating pump cover retaining screws. Remove the accelerating pump cover, diaphragm assembly and spring (Fig. 17).

6. If it is necessary to remove the Elastomer valve, grasp it firmly and pull it out. If the Elastomer valve tip broke off during removal, be sure to remove the tip from the fuel bowl. **An Elastomer valve must be replaced whenever it has been removed from the carburetor.**

7. Invert the main body and remove the power valve cover and the gasket. Remove the power valve with a box wrench or socket wrench (Fig. 18). Remove the power valve gasket. Discard the gasket.

8. Remove the idle fuel mixture adjusting screws (needles) and the springs.

9. If necessary remove the nut and washer securing the fast idle adjusting lever assembly to the throttle shaft, and remove the lever assembly (Fig. 10). If necessary, remove the idle screw and the retainer from the fast idle adjusting lever.

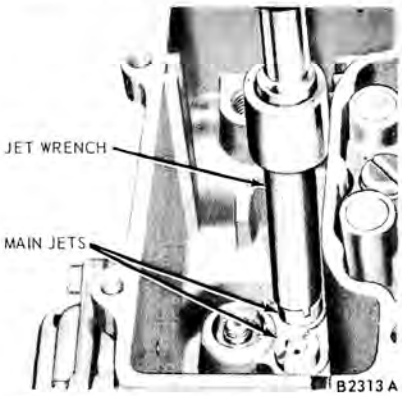


FIG. 15—Main Jet Removal or Installation

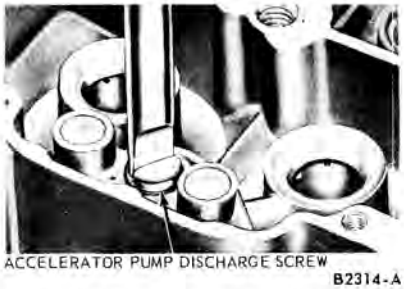


FIG. 16—Booster Venturi Removal or Installation

10. Remove the anti-stall dashpot, if so equipped.

11. If it is necessary to remove the throttle plates, lightly scribe the throttle plates along the throttle shaft, and mark each plate and its corresponding bore with a number or letter for proper installation (Fig. 19).

12. Slide the throttle shaft out of the main body. Remove the accelerating pump over-travel lever retainer. Slide the anti-friction bearing (bushing), spring and the lever off the throttle shaft (Fig. 20).

PARTS REPAIR REPLACEMENT

Clean and inspect the carburetor component parts. Refer to Part 10-1, Section 3 for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Make sure the accelerating pump diaphragm is not torn or cut.

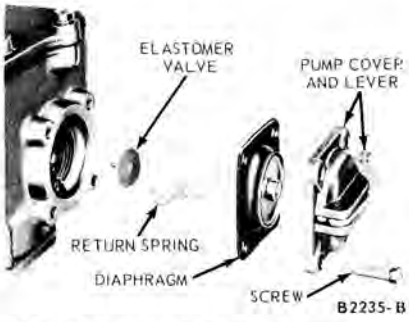


FIG. 17—Accelerating Pump Assembly

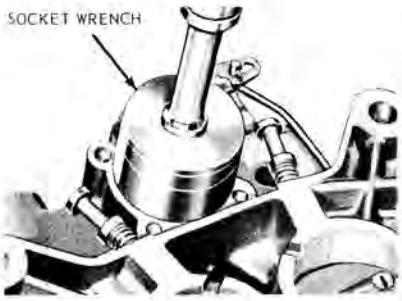


FIG. 18—Power Valve Removal or Installation

The carburetor assembly is shown in Fig. 21).

MAIN BODY

1. If the throttle plates were removed, install the over-travel anti-friction bushing over the boss on the over-travel lever. Place the over-travel spring, with the shortest tang end first, over the bushing and boss on the over-travel lever. Place the short tang of the spring under the lug on the accelerator over-travel lever.

2. Slide the over-travel lever and spring assembly on the throttle shaft and bushing. Hook the longest tang of the spring under the closed throttle lug of the throttle lever (Fig. 22). Install the over-travel lever retainer. Slide the throttle shaft assembly into the main body.

3. Referring to the lines scribed on the throttle plates, install the throttle plates in their proper location with the screws snug, but not tight. Close the throttle plates. Invert the main body, and hold it up to the light. Little or no light should show between the throttle plates and the throttle bores. Tap the plates lightly with a screwdriver handle to seat them. Hold the throttle plates closed and tighten and stake the retaining screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**



FIG. 19—Throttle Plate Removal

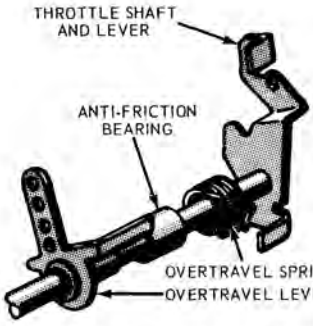


FIG. 20—Throttle Shaft Assembly

4. If necessary, install the engine idle screw retainer and the screw on the fast idle adjusting lever.

5. Install the anti-stall dashpot, if so equipped.

6. If the fast idle lever was removed place the fast idle lever assembly on the throttle shaft and install the retaining washer and nut (Fig. 10).

7. If the Elastomer valve was removed, lubricate the tip of a new Elastomer valve and insert the tip into the accelerator pump cavity center hole. Using a pair of needle nosed pliers, reach into the fuel bowl and grasp the valve tip. Pull the valve in until it seats in the pump cavity wall and cut off the tip at the retaining shoulder.

8. Install the accelerating pump diaphragm return spring on the boss on the chamber (Fig. 17). Insert the diaphragm assembly in the cover and place the cover and diaphragm assembly in position on the main body. Install the cover screws.

9. Insert the accelerating pump operating rod into the inboard hole of the accelerating pump actuating lever. Position the accelerating pump operating rod retainer over the specified hole (Refer to "Specifications," Part 10-8) in the over-travel lever to suit the operating and the climatic conditions under which the car is to be operated. Press the ends of the retainer together; then, at the same time, insert the operating rod through the retainer and the hole in the over-travel lever. Release the ends of the retainer to secure the rod.

10. Invert the main body. Install the power valve (economizer valve) and new gasket with a wrench (Fig. 18). **Tighten the valve securely.** In-

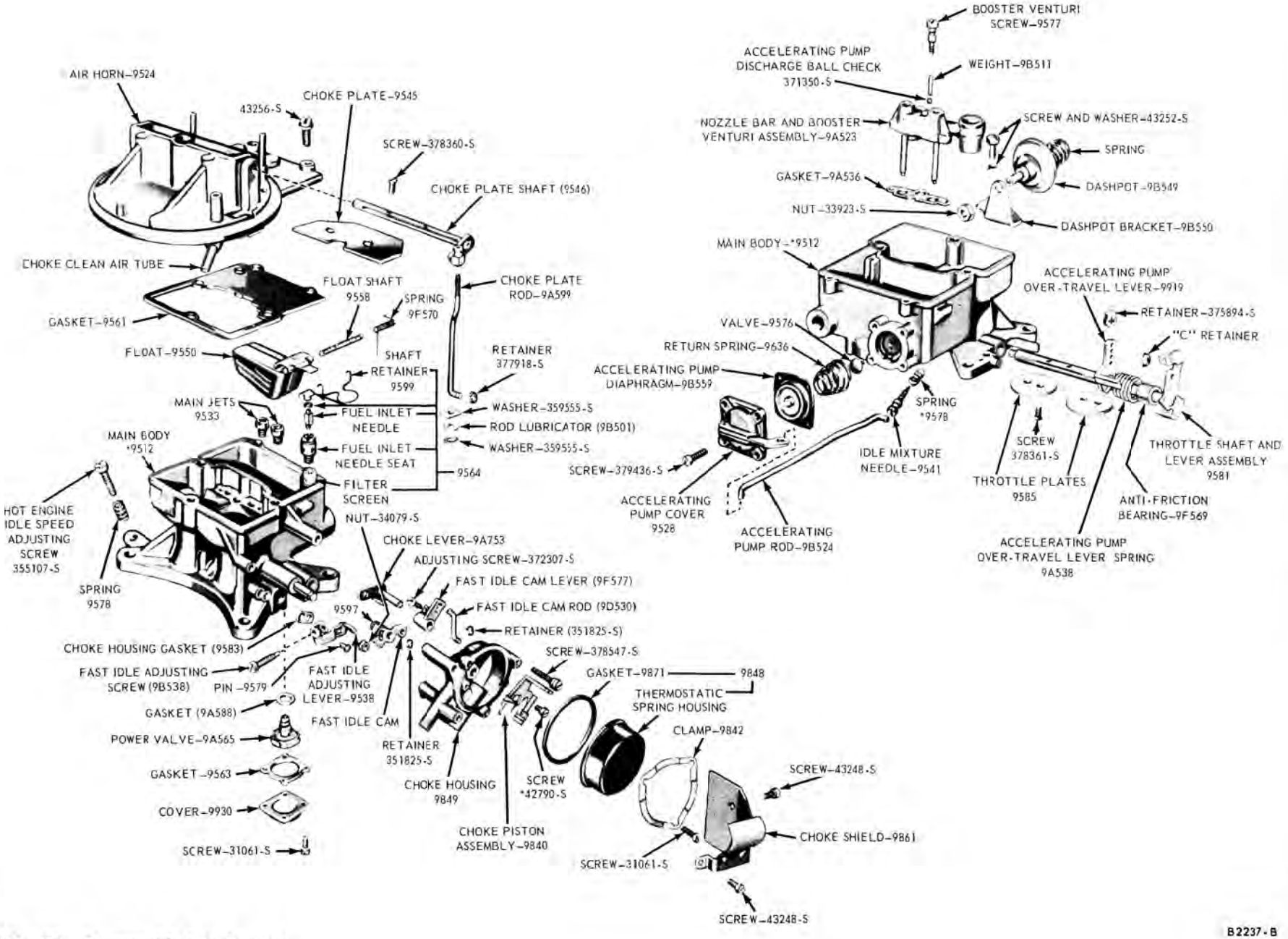


FIG. 21—Disassembled Carburetor

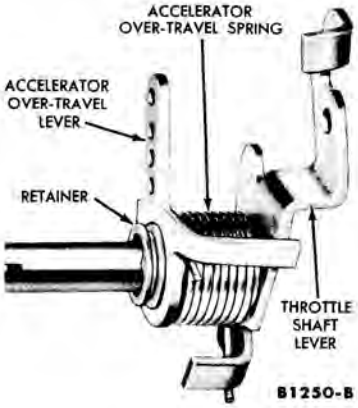


FIG. 22—Accelerator Over-Travel Spring and Lever Installation

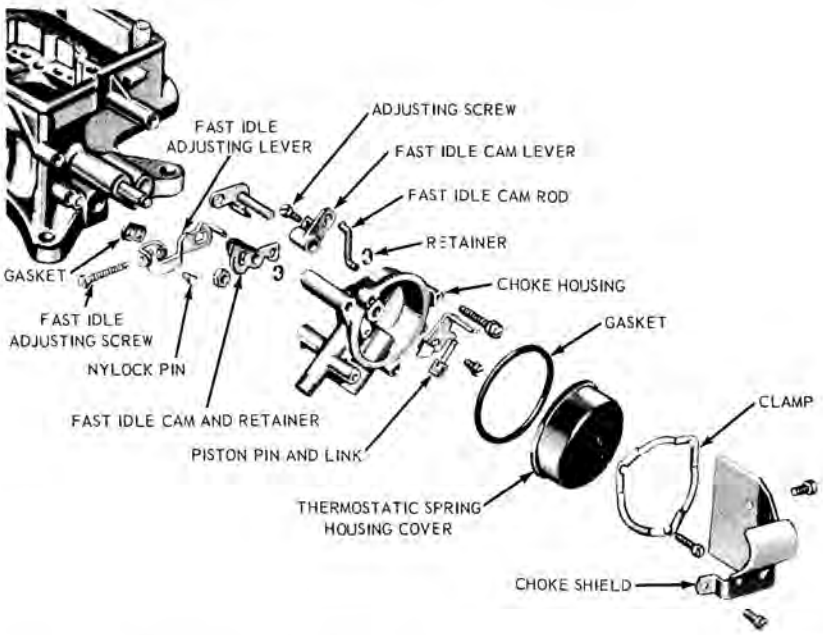


FIG. 23—Choke Housing Assembly

stall the power valve cover and gasket.

11. Install the idle mixture adjusting screws (needles) and springs (Fig. 21). Turn the needles in gently with the fingers until they just touch the seat, then back them off 1-1½ turns for a preliminary idle fuel mixture adjustment.

12. Install the main jets and the fuel inlet seat, filter screen, and new gasket, using a jet wrench (Figs. 14 and 15). **Be sure the correct jets are installed.**

13. Position the float shaft retainer in the groove on the fuel inlet needle seat. Install the fuel inlet needle assembly in the fuel inlet seat. The fuel inlet needle and seat are matched assemblies. **Be sure the correct needle and seat are assembled together.**

14. Slide the float shaft into the float lever (Fig. 12). Install the torsion (damper) spring on the float shaft and insert the short end of the spring under the flange of the float lever.

15. Insert the float assembly into the fuel bowl and hook the float tab under the fuel inlet needle assembly. Insert the float shaft into its guides at the sides of the fuel bowl. Allow the long end of the damper spring to rest against the wall of the fuel bowl.

16. Use a hook to position the shaft retainer in the grooves on the shaft (Fig. 13). Refer to Part 10-1, and check the float setting.

17. Drop the accelerating pump discharge ball into its passage in the main body. Seat the ball with a brass drift and a light hammer. **Make sure the ball is free in the bore.** Drop the accelerating pump discharge weight on top of the ball. Position the new booster venturi gasket and the booster venturi in the main body. Position the air distribution plate, if so equipped, and install the accelerator pump discharge screw (Fig. 16).

VACUUM PISTON CHOKE

1. If the choke piston and link was disassembled install the choke piston on the choke thermostatic spring lever link and install the retaining pin (Fig. 23).

2. Position the fast idle cam lever on the thermostatic choke shaft and lever assembly (Fig. 23). **The bottom of the over-travel lever adjusting screw must rest against the tang on the choke shaft lever.** Insert the choke shaft assembly into the rear of the choke housing. Position the choke shaft lever so that the hole in the lever is to the left side of the choke housing.

3. Insert the choke piston into the choke housing, and install the choke thermostatic spring lever on the flange of the choke shaft. Install the choke thermostatic spring lever to shaft retaining screw and washer (Fig. 11).

4. Install the fast idle cam rod on the fast idle cam lever. Place the fast idle cam on the fast idle cam rod and install the retainer. Place the choke housing vacuum pick-up port to main body gasket on the choke housing flange. Position the choke housing on the main body and at the same time, install the fast idle cam on the hub on the main body. Position the gasket, and install the choke housing retaining screws. Install the fast idle cam retainer. **The thermostatic spring housing is installed after the choke plate has been adjusted to specification.**

AIR HORN

Refer to Fig. 9 for the correct location of the parts.

1. If the choke plate shaft was removed, position the choke plate shaft in the air horn. Place the two brass washers and slide them into position on the choke control rod seal retainer.

Insert the choke control rod through the control rod seal and the air horn. Insert the choke control rod into the choke shaft lever clevis nut, and turn the nut clockwise to thread the rod onto the nut.

2. If the choke plate was removed, insert the choke plate into the choke plate shaft. Install the choke plate screws snug, but not tight. Check for proper plate fit, binding in the air horn and free rotation of the shaft by moving the plate from the closed position to the open position. If necessary, re-

move the choke plate and grind or file the plate edge where it is binding or scraping on the air horn wall. If the choke plate and shaft moves freely, tighten the choke plate screws while holding the choke in the fully-closed position. Stake the screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

3. Position the air horn gasket on the main body, with the fuel bowl vent hole in the gasket located opposite the fuel inlet valve.

4. Position the air horn over the main body and insert the end of the choke lever rod into the automatic choke shaft lever. Install the air horn retaining screws and the carburetor identification tag. Tighten the retaining screws. Install the choke lever rod retainer. Install the air cleaner anchor screw.

5. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) and perform the automatic choke plate clearance (pull-down) and fast idle cam linkage adjustment. **Perform a fuel level float adjustment (wet) after the carburetor has been installed on the car.**

PART 10-4 FORD 4-V CARBURETORS

Section		Page	Section		Page
1	Description and Operation	10-46	3	Removal and Installation	10-54
2	In-Car Adjustments and Repairs	10-52	4	Major Repair Operations	10-54

1 DESCRIPTION AND OPERATION

DESCRIPTION

The Ford 4-V (Venturi) carburetors (Figs. 1, 2, 3, 4, 5) have two main assemblies; the air horn, and the main body.

The air horn assembly, which serves as the main body cover, contains the choke plate, vents for the fuel bowls, secondary throttle control vacuum tube, and the automatic choke (if so equipped) clean air pick-up tube. A rubber hose and steel tube connects the clean air pick-up tube to the automatic choke heat chamber in the right exhaust manifold.

The primary and secondary throttle plates, the accelerating pump assembly, the power valve assembly, the secondary operating diaphragm assembly, and the fuel bowls are in the main body. On an automatic choke equipped carburetor, the choke housing is attached to the main body. On a manual choke equipped carburetor, the choke cable bracket and the choke cam and lever are attached to the main body.

The two primary (front) barrels each contain a main and booster venturi, main fuel discharge, accelerating pump discharge, idle fuel discharge, and a primary throttle plate.

The two secondary (rear) barrels each have a main fuel discharge, and a vacuum operated throttle plate.

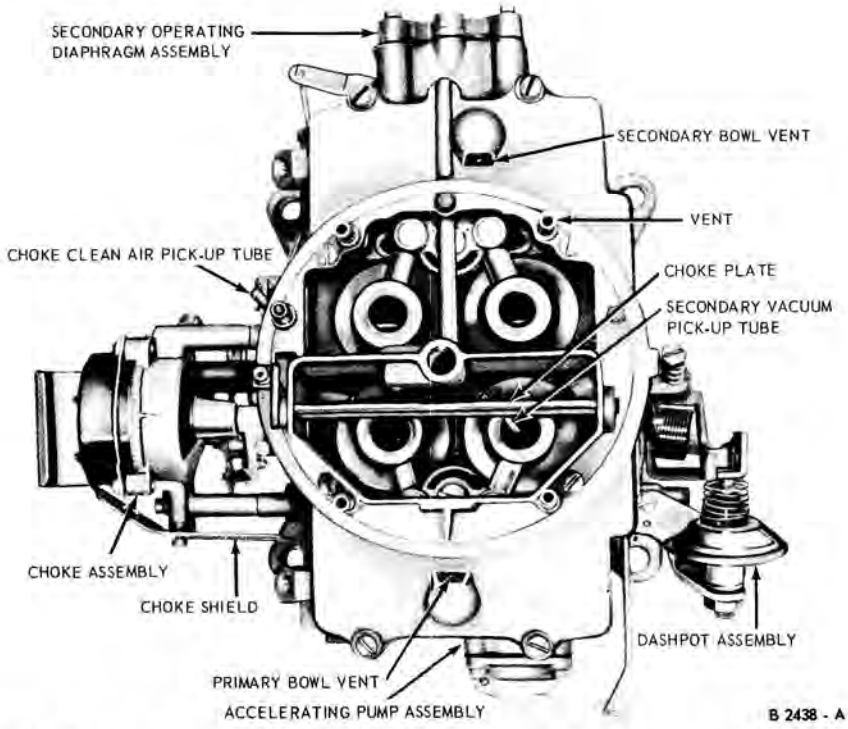


FIG. 1—Top View—Air Horn Installed (Automatic Choke)

OPERATION

FUEL INLET SYSTEM

A separate fuel bowl is provided for the primary and secondary stages (Fig. 6). The fuel first enters the primary fuel bowl through the fuel inlet. A drilled passage through the right side of the main body connects the fuel bowls. The pressure in the two fuel bowls is balanced by means of a pressure equalizing chamber built into the left side of the main body. Two baffles in the internal fuel equalizer passages between the primary and secondary fuel bowls permit proper control and balance of the metering forces within each fuel bowl.

The amount of fuel entering a fuel bowl is regulated by the distance the fuel inlet needle is raised off its seat and by fuel pump pressure. Movement of the fuel inlet needle in relation to the seat is controlled by the float and lever assembly which rises and falls with the fuel level. When the fuel in the fuel bowl reaches a pre-set level, the float lowers the fuel inlet needle to a position where it restricts the flow of fuel, admitting only enough fuel thru the filter screen to replace that being used.

A retracting clip is attached to the fuel inlet needle and hooks over the tab of the float assembly. This clip assures reaction of the fuel inlet needle to any movement of the float.

A wire-type retainer prevents movement of the float shaft within the guides on each side of the fuel bowl. The retainer fits into a groove on the inlet needle seat. The ends of the retainer are hooked over grooves on opposite end of the float shaft.

A torsion (damper) spring is located on the float shaft, between the inboard end of the float retainer and the float shaft guide in the fuel bowl. The short end of the spring rests

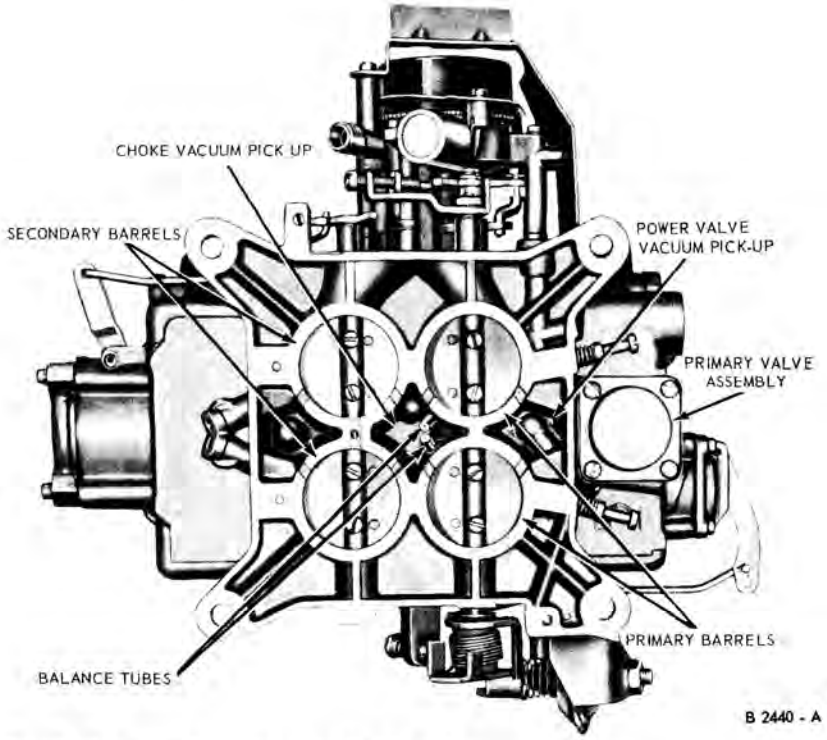


FIG. 2–Bottom View (Automatic Choke)

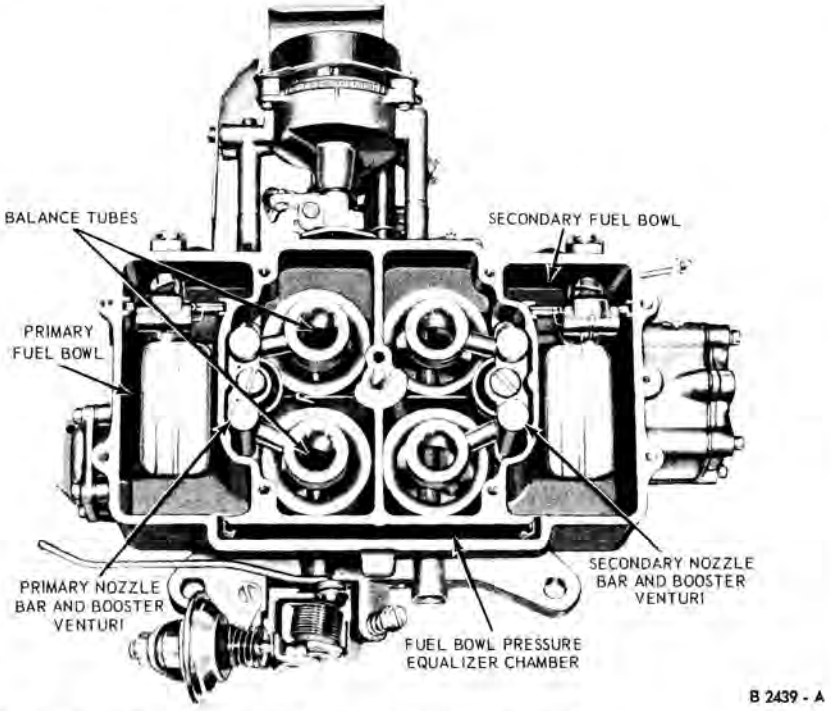


FIG. 3–Top View–Air Horn Removal (Automatic Choke)

under the float lever, and the long end of the spring rests against the inner face of the fuel bowl.

The torsion spring tension resists and absorbs fuel pump pressure pulsations and movement of the fuel in the bowl due to driving conditions. This assures proper regulation of the fuel inlet needle which rises and falls with the fuel level in the bowl.

The fuel filter screen, located below the inlet needle seat, prevents the entrance of foreign matter.

The primary and secondary fuel bowls are vented externally at all times. In addition, both the primary and secondary fuel bowls are internally vented into the air cleaner. The standpipe pitot tubes in the primary and secondary internal vent tube openings raise the level of the internal vent openings above the external vent openings. This provides the necessary pressure differential for proper evacuation of the gaseous vapors through the external vent during a hot soak period.

An integral anti-splash washer is located on top of each fuel inlet needle.

AUTOMATIC CHOKE SYSTEM

The choke plate, located in the air horn above the primary barrels, when closed, provides a high vacuum above as well as below the throttle plates. With a vacuum above the throttle plates, fuel will flow from the main fuel system as well as from the idle fuel system. This provides the extremely rich fuel mixture necessary for cold engine operation.

The carburetor choke shaft is linked to a thermostatic choke control mechanism mounted on the main body (Fig. 7).

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator is fully depressed. This permits unloading of a flooded engine.

The automatic choke is equipped with a bi-metal thermostatic spring and a vacuum piston (Fig. 7). The bi-metal thermostatic spring mechanism winds up when cold and unwinds when warm. When the engine is cold, the thermostatic spring, through attaching linkage, holds the choke piston upward and the choke plate in a closed position prior to engine start. Manifold vacuum channeled through a passage in the choke control housing, draws the choke vacuum piston downward, exerting an opening force on the choke plate.

When the engine is started, manifold vacuum, acting directly on the piston located in the choke housing, immediately moves the plate against the tension of the thermostatic spring to a partially open position to prevent stalling.

As the engine continues to operate, manifold vacuum draws heated

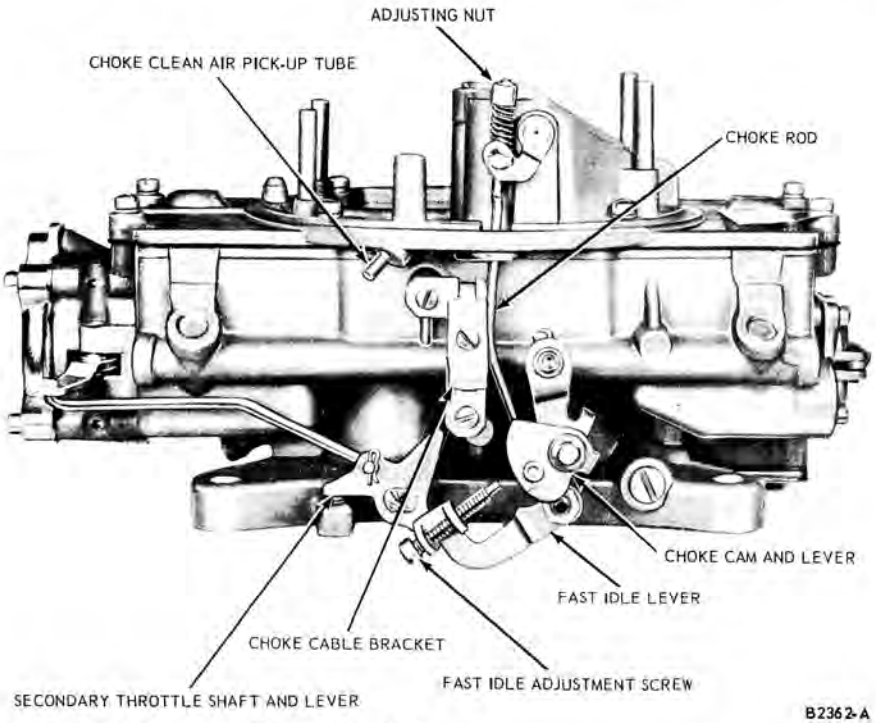


FIG. 4—Side View (Manual Choke)

air from the exhaust manifold heat chamber. The amount of air entering the choke housing is controlled by restrictions in the air passages in the carburetor.

The warmed air enters the choke housing and heats the thermostatic spring, causing it to unwind. The tension of the thermostatic spring gradually decreases as the temperature of the air from the heat chamber rises, allowing the choke plate to open. The air is exhausted into the intake manifold.

When the engine reaches its normal operating temperature, the thermostatic spring exerts tension on the choke plate forcing it to the full open position. In this position, the choke piston is at its lowest point in the cylinder. Slots in the piston chamber wall allow sufficient air to bleed past the piston and into the intake manifold, causing a continual flow of warm air to pass through the thermostatic spring housing. The spring thus remains heated and the choke plate remains fully open until the engine is stopped and allowed to cool.

The choke rod actuates the fast idle cam during choking. Steps on the edge of the fast idle cam contact the fast idle adjusting screw which permits a faster engine idle speed for smoother running when the engine is cold. As the choke plate is moved through its range of travel from the closed to the open position, the choke rod rotates the fast idle cam. Each step on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

During the warm-up period, if the engine should reach the stall point due to a lean mixture, manifold vacuum will drop considerably. The tension of the thermostatic spring then overcomes the lowered vacuum acting on the choke piston, and the choke plate will be moved toward the closed position, providing a richer mixture to help prevent stalling.

The linkage between the choke lever and the throttle shaft is designed so that the choke plate will partially open when the accelerator pedal is fully depressed. This permits unloading of a flooded engine.

MANUAL CHOKE SYSTEM

The choke plate, located in the air horn above the primary barrels, when closed, provides a high vacuum above as well as below the throttle plates. With a vacuum above the throttle plates, fuel will flow from the main fuel system as well as from the idle fuel system. This provides the extremely rich fuel mixture necessary for cold engine operation.

A rod connects the choke cam and lever to the choke shaft through a swivel, spring and spring tension adjusting nut (Fig. 4).

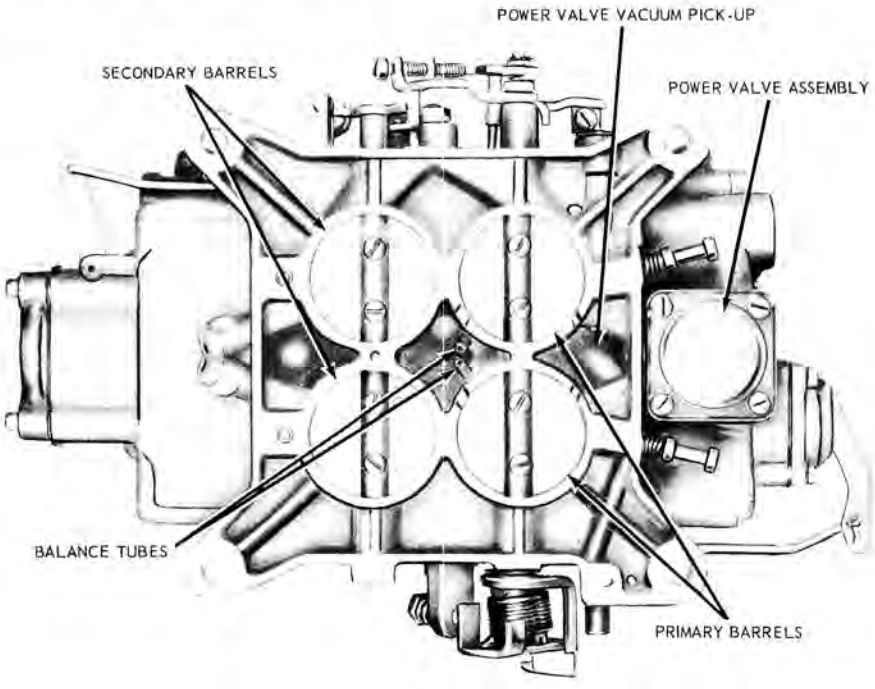


FIG. 5—Bottom View (Manual Choke)

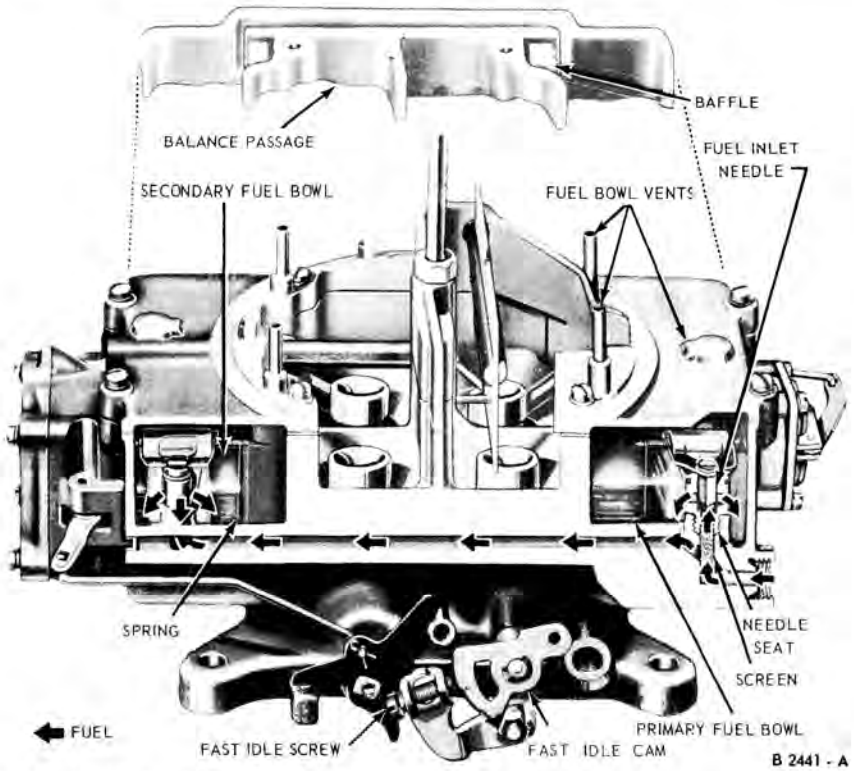


FIG. 6–Fuel Inlet System

When the choke cam and lever is pulled to a full choke position by the choke cable, the pull-down rod actuates the choke shaft and plate through the spring and adjusting nut and rotates the choke shaft and plate to the closed position.

As soon as the engine starts, engine vacuum will open the choke plate, against pull-down spring tension, to the pre-determined setting (pull-down clearance) that was present with a gauge during the initial adjustment. This prevents engine stalls and flooding.

The fast idle speed adjusting screw bears against the bottom of the choke cam during idle or closed throttle conditions. The fast idle speed screw is adjusted to a predetermined setting (fast idle rpm) which opens the throttle slightly for smoother engine running when the engine is cold as the manual choke position is selected.

IDLE FUEL SYSTEM

The difference in pressure between the fuel bowls and the idle discharge ports forces fuel through the primary and secondary stage idle fuel systems.

Primary Stage. Fuel flows from the primary stage fuel bowl through the main jet and into the bottom of the main well (Fig. 8).

From the main well, the fuel flows up through the idle tube and through a short diagonal passage in the booster venturi assembly into the idle passage in the main body. A calibrated restriction, at the upper tip of the idle tube, meters the flow of fuel.

Air enters the idle system from the air bleed which is located directly above the idle tube. The air bleed also acts as a vent to prevent siphoning at off-idle or high speeds and when the engine is stopped. The fuel and air pass down a diagonal passage in the booster venturi and through a calibrated restrictor. Additional air is bled into the system through an air bleed located at the bottom of the diagonal passage where the fuel enters the idle passage in the main body.

Fuel flows down the idle passage in the main body past two idle transfer holes. The idle transfer holes act as additional air bleeds at curb idle. The fuel then flows past the pointed tip of the adjusting needle which controls the idle fuel discharge in the primary stage. From the adjusting needle chamber, the fuel flows through a short horizontal passage and is discharged below the primary throttle plates.

During off-idle when the primary throttle plate is moved slightly past the idle transfer holes, each hole begins discharging fuel as it is exposed to manifold vacuum. As the primary throttle plate is opened still wider and engine speed increases, the air flow through the carburetor is also increased. This creates a vacuum in the booster venturi strong enough to bring the primary stage main fuel system into operation. Fuel flow from the primary idle fuel system begins tapering off as the main fuel system begins discharging fuel.

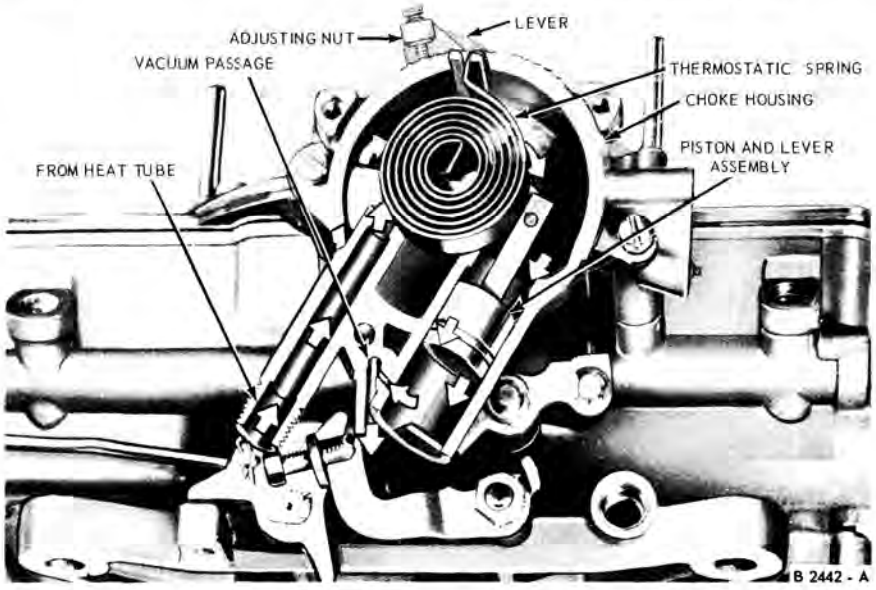


FIG. 7–Automatic Choke System

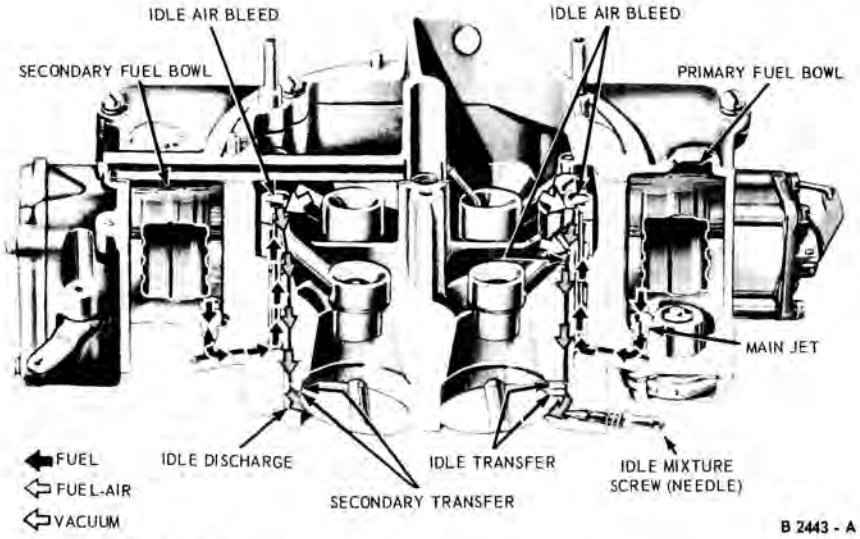


FIG. 8–Idle Fuel System

Secondary Stage. Fuel flows from the secondary stage fuel bowl through the main jet and into the bottom of the main well (Fig. 8).

From the main well, the fuel flows up through the idle tube and through a short diagonal passage in the booster venturi assembly and then into the idle passage in the main body. A calibrated restriction, at the upper tip of the tube, meters the flow of fuel.

Fuel flows down the idle passage in the main body, past two transfer holes above the closed throttle plate, and flows through a metered restriction into a short horizontal passage where it is discharged into the secondary barrel below the closed throttle plate. The transfer holes act as air bleeds at idle. The secondary idle fuel system continues discharging fuel until the secondary main fuel system comes into operation.

Air is introduced into the secondary stage idle fuel system from the idle air bleed, located directly above the idle tube. The air bleed also acts as a vent to prevent siphoning in the idle fuel system at high speeds and when the engine is stopped.

ACCELERATING SYSTEM

Upon accelerating, the air flow through the carburetor responds almost immediately to the increased throttle opening. There is, however, a brief interval before the fuel, which is heavier than air, can gain speed and maintain the desired balance of fuel and air. During this interval, the accelerating system (Fig. 9) supplies fuel until the other systems can once again provide the proper mixture.

When the throttle is closed, the diaphragm return spring forces the diaphragm toward the cover, drawing fuel into the chamber through the inlet. The inlet has an Elastomer valve which uncovers the inlet hole to admit fuel from the fuel bowl and covers the inlet hole when the accelerating pump is operated to prevent the fuel from returning to the bowl. A discharge weight and ball check prevents air from entering from the discharge nozzle when fuel is drawn into the diaphragm chamber.

When the throttle is opened, the diaphragm rod is forced inward, forcing fuel from the chamber into the discharge passage. Fuel under pressure forces the pump discharge weight and ball off their seat and fuel passes through the accelerating pump discharge screw and is sprayed into each main venturi through discharge ports.

An air bleed in the wall of the accelerating pump fuel chamber prevents vapor entrapment and pressure build-up in the diaphragm chamber.

PRIMARY STAGE MAIN FUEL SYSTEM

As engine speed increases, the air passing through the booster venturi creates a vacuum. The amount of vacuum is determined by the air flow through the venturi, which in turn is regulated by the speed of the engine. The difference in pressure between the main discharge port and the fuel bowl causes fuel to flow through the main fuel system (Fig. 10).

At a predetermined venturi vacuum, fuel flows from the primary fuel bowl, through the main jets, and into the bottom of the main well. The fuel moves up the main well tube past air bleed holes. Filtered air from the high speed air bleed enters the fuel flow in the main well tube through holes in the side of the tube. The high speed air bleed meters an increasing amount of air to the fuel as venturi vacuum increases, maintaining the required fuel-air ratio. The mixture of fuel and air is lighter than raw fuel and responds faster to changes in venturi vacuum. It also atomizes more readily than raw fuel. The fuel and air continue up the main well tube past another air bleed which also acts as a vent to prevent siphoning when the engine is shut down. The fuel is discharged into the booster venturi where it is atomized and mixed with the air flowing through the carburetor.

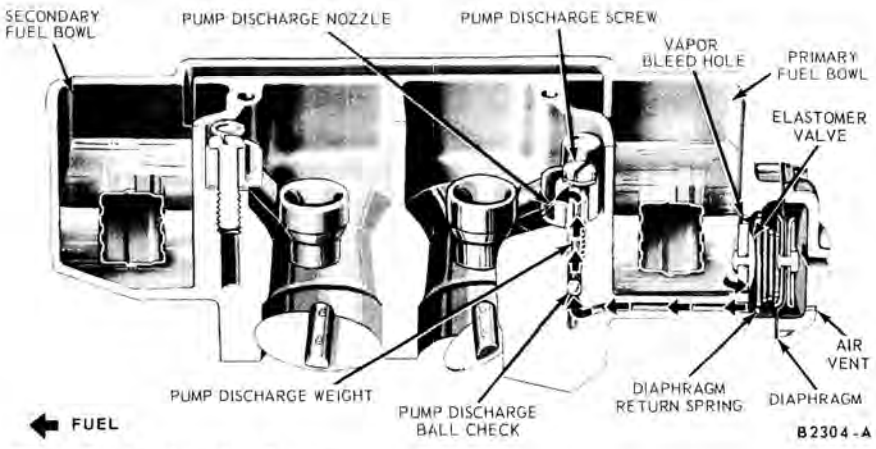


FIG. 9–Accelerating System

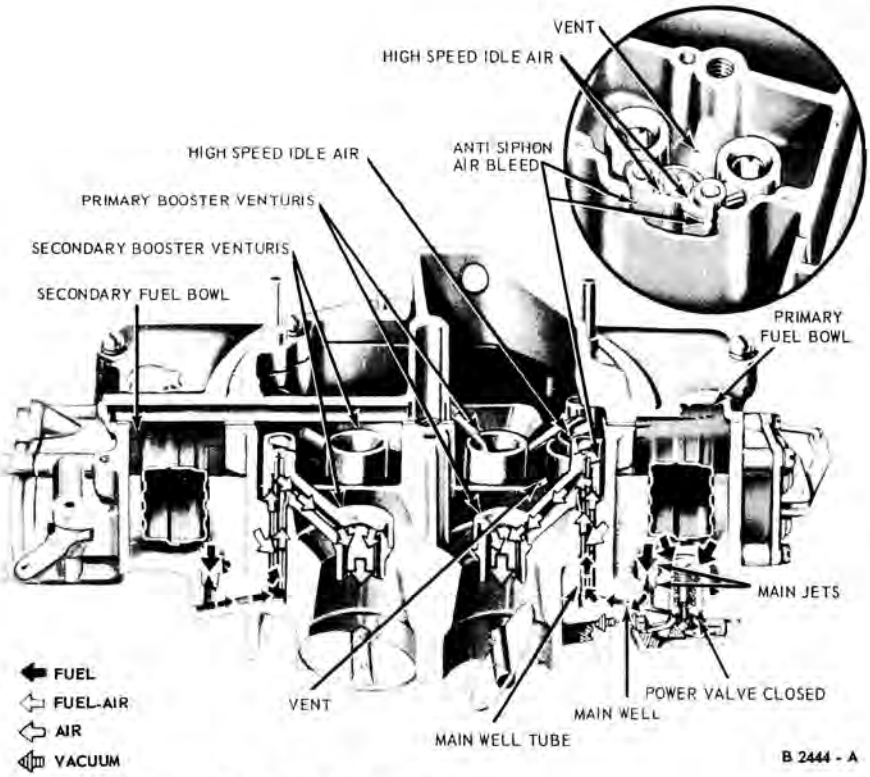


FIG. 10—Primary Stage Main Fuel System

The throttle plate controls the amount of the fuel-air mixture admitted to the intake manifold, regulating the speed and power output of the engine.

A balance tube is located in each primary barrel directly below the booster venturi. When decelerating, the balance tube siphons off any excess fuel droplets remaining around the edge of the booster venturi and discharges the droplets into the equalizing slots in the base of the carburetor where they are mixed with the idle fuel. The balance tube also acts as an additional air bleed during the idle fuel system operation.

POWER FUEL SYSTEM

During periods of increased road loads or high speed operation, the fuel-air ratio must be increased for added power. The added fuel required during this period is supplied by the power fuel system (Fig. 11).

The power fuel system is controlled by manifold vacuum.

Manifold vacuum is transmitted from an opening in the base of the main body, through a passage in the main body and power valve chamber to the power valve diaphragm. The manifold vacuum, acting on the power valve at idle speed or normal road load conditions, is great enough to hold the power valve diaphragm down, overcoming the tension of the spring on the valve stem and holding the valve closed. When high power operation places a greater load on the engine and manifold vacuum drops below a predetermined value, the spring opens the power valve. Fuel from the primary fuel bowl flows through the power valve and into passages leading to both primary stage main fuel wells. Here the fuel is added to the fuel from the primary stage main fuel system, enriching the mixture.

As engine power demands are reduced, manifold vacuum increases. The increased vacuum overcomes the tension of the valve stem spring and closes the power valve.

SECONDARY THROTTLE OPERATION AND MAIN FUEL SYSTEM

To provide sufficient fuel-air mixture to operate the engine at maximum power, the mixture supplied by the primary stage is supplemented by an additional quantity of fuel-air mixture from the secondary stage (Fig. 12).

This additional supply of fuel-air mixture is delivered through the two secondary (rear) barrels of the carburetor. The secondary stage throttle plates are operated by a spring-loaded vacuum diaphragm assembly attached to the main body and linked to the secondary throttle shaft.

Opening of the secondary throttle plates is controlled by vacuum from the left primary booster venturi. The vacuum is transmitted from the secondary throttle control vacuum tube through passages in the air horn, main body, and behind the secondary operating diaphragm.

As the primary throttle plates are opened, primary venturi vacuum increases. When the vacuum reaches a predetermined amount, it starts to act on the secondary stage operating diaphragm, which in turn starts to open the secondary throttle plates.

A ball check, located in the vacuum passage in the diaphragm housing, controls the rate at which the

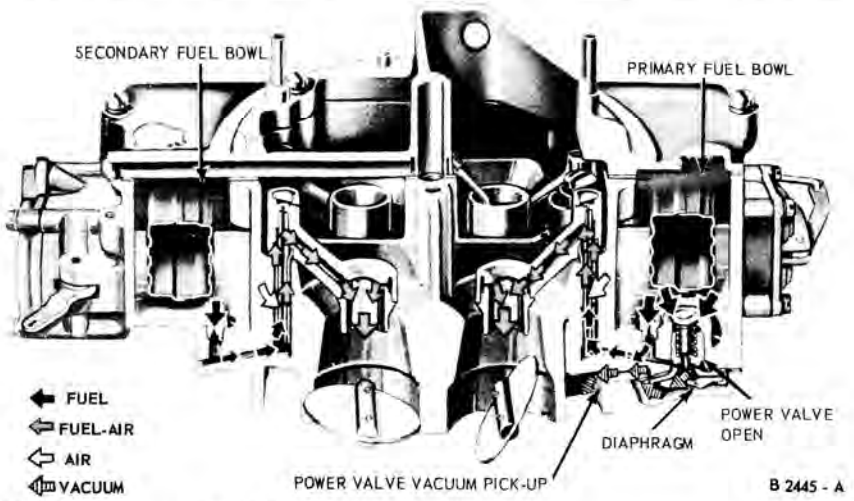


FIG. 11—Power Fuel System

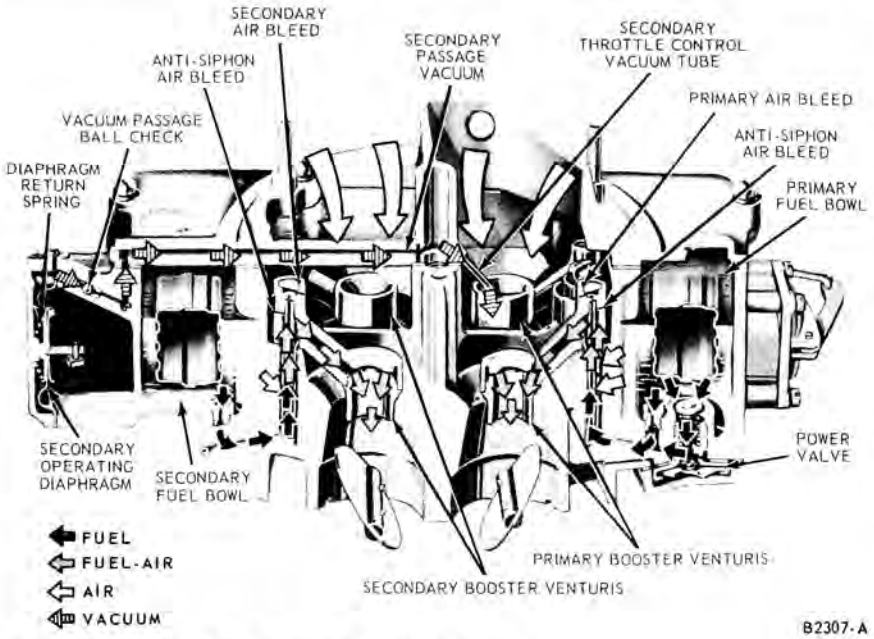


FIG. 12–Secondary Stage Main Fuel System

secondary throttle plates are allowed to open. Any rapid increase in vacuum which would tend to open the secondary throttle plates too suddenly holds the ball check against its seat. The opening of the secondary throttle plates is slowed to a rate governed by the amount of vacuum passing through a bleed in the ball seat.

As the secondary throttle plates begin to open, fuel flows from the secondary fuel bowl through the secondary main jets into the bottom of the main well and up the main well tube past air bleed holes. Air is introduced through an air bleed at the top of the tube. When the secondary throttle plates are moved slightly past the secondary transfer holes, each hole begins discharging fuel as it is exposed to manifold vacuum. As secondary venturi vacuum is increased, the fuel is discharged into the secondary booster venturi. Fuel from the transfer holes tapers off and the holes act as additional air bleeds.

When decelerating, vacuum in the primary venturi decreases, and the secondary throttle plates begin to close. The ball check in the diaphragm housing passage will unseat when the throttle is closed quickly, allowing the low pressure on the vacuum side of the diaphragm to rapidly return to atmospheric pressure. As the vacuum acting on the diaphragm is lessened, the load on the diaphragm spring will start closing the secondary plates.

2 IN-CAR ADJUSTMENTS AND REPAIRS

CARBURETOR ADJUSTMENTS

All carburetor adjustments are covered in Part 10-1, Section 2, "Common Adjustments and Repairs."

The fuel level float adjustment (dry) and the secondary throttle plate adjustment are performed only as bench adjustments.

The fast idle cam linkage and choke plate clearance (pull-down) adjustment, automatic choke thermostatic spring housing adjustment, accelerating pump stroke adjustment and the preliminary idle mixture setting can be performed with the carburetor on the bench or installed in the car.

The fuel level float adjustment (wet), the idle fuel mixture and idle speed adjustments, and the anti-stall dashpot adjustment are performed only with the carburetor installed in the car.

THROTTLE LINKAGE ADJUSTMENTS

MANUAL-SHIFT TRANSMISSION

The throttle linkage adjustments for the manual-shift transmission equipped cars are covered under "Common Adjustments and Repairs" (Part 10-1, Section 2).

AUTOMATIC TRANSMISSION

The throttle linkage adjustments for automatic transmission equipped cars are covered in Group 7.

REPAIRS

AIR HORN TO MAIN BODY GASKET REPLACEMENT

1. Remove the air cleaner assembly (Part 10-5, Section 2). Remove the air cleaner anchor screw.

2. On an automatic choke equipped carburetor, disconnect the automatic choke clean air tube at the carburetor. Remove the automatic choke plate operating rod to choke lever retainer.

On a manual choke equipped carburetor, disconnect the choke cable from the choke lever. Remove the choke lever retainer and washer and remove the choke lever.

3. Remove the air horn retaining screws and lockwashers and the carburetor identification tag. Remove the air horn and air horn gasket.

4. Install a new air horn to main body gasket. **Make sure all holes in the new gasket have been properly punched and that no foreign material has adhered to the gasket.**

5. On an automatic choke equipped carburetor, position the air horn on the main body and gasket so that the choke plate operating rod fits into the opening in the choke housing lever. Install the choke plate rod retainer.

On a manual choke equipped carburetor, position the air horn on the main body and gasket.

Use care to prevent damage to the secondary throttle control vacuum tube during the air horn installation.

6. Install the air horn retaining screws and lockwashers and the carburetor identification tag. Install the air cleaner anchor screw.

7. On an automatic choke equipped carburetor, connect the automatic choke clean air tube to the carburetor.

On a manual choke equipped carburetor, install the choke lever on the choke operating rod and the choke lever shaft on the carburetor. Install the flat washer and the choke lever retainer. Connect the choke cable to the choke lever. With the choke fully-closed, adjust the choke cable to remove all slack.

8. Adjust the idle fuel mixture and idle speed and the dashpot, if so equipped (Part 10-1, Section 2). Install the carburetor air cleaner assembly (Part 10-5, Section 2).

FLOAT, NEEDLE VALVE AND SEAT, OR INLET SCREEN REMOVAL OR REPLACEMENT

1. Remove the carburetor air horn to main body gasket by following steps 1 thru 3 under "Air Horn to Main Body Gasket Replacement" in this section.

2. Remove the carburetor float(s) and the fuel inlet needle assembly(ies) by following step 1 under "Main Body Disassembly" (Part 10-4, Section 4).

3. If required, remove the fuel inlet needle seat(s), gasket(s) and filter screen(s) by following step 2 under "Main Body Disassembly" (Part 10-4, Section 4).

4. Install the fuel inlet filter(s), needle valve seat(s) and gasket(s) by following step 13 under "Main Body Assembly" (Part 10-4, Section 4).

5. Install the carburetor float(s) and fuel inlet needle(s) by following steps 14 thru 16 under "Main Body Assembly" (Part 10-4, Section 4).

6. Install the carburetor air horn and gasket by following steps 4 thru 7 under "Air Horn to Main Body Gasket Replacement" in this section.

7. Perform a fuel level float adjustment (wet) by following steps 1 thru 8 under "Fuel Level Float Adjustment–Wet" (Part 10-1, Section 2).

MAIN JET REPLACEMENT

1. Remove the carburetor float(s), needle valve(s), seat(s) and inlet screen(s) by following steps 1 thru 3 of "Float, Needle Valve and Seat, or Inlet Screen Removal or Replacement" in this section.

2. Remove the carburetor main jet(s) with a jet wrench.

3. Install the carburetor main jet(s) with a jet wrench.

4. Install the carburetor inlet screen(s), needle valve(s), and seat(s), and the carburetor floats by following steps 4 thru 7 under "Float, Needle Valve and Seat, or Inlet Screen Removal or Replacement" in this section.

ACCELERATOR PUMP DIAPHRAGM AND ELASTOMER VALVE REPLACEMENT

1. Remove the carburetor air horn to main body gasket by following steps 1 thru 3 under "Air Horn to Main Body Gasket Replacement" in this section.

2. Remove the accelerating pump diaphragm and the Elastomer valve by following step 6 under "Main Body Disassambly" (Part 10-4, Section 4).

3. Install the Elastomer valve and the diaphragm by following steps 5 thru 7 under "Main Body Assembly" (Part 10-4, Section 4).

4. Install the carburetor air horn and gasket by following steps 4 thru 7 under "Air Horn to Main Body Gasket Replacement" in this section.

SECONDARY DIAPHRAGM REPLACEMENT

1. Remove the carburetor air horn to main body gasket by following steps 1 thru 3 under "Air Horn to Main Body Gasket Replacement" in this section.

2. Remove the secondary diaphragm assembly, except the ball check, by following step 7 under "Main Body Disassembly" (Part 10-4, Section 4).

3. Install the secondary diaphragm assembly by following step 11 under "Main Body Assembly" (Part 10-4, Section 4).

4. Install the carburetor air horn and gasket by following steps 4 thru 7 under "Air Horn to Main Body Gasket Replacement" in this section.

POWER VALVE OR GASKETS REPLACEMENT

1. Remove the carburetor from the engine. Refer to steps 1 thru 5 under "Removal" (Part 10-4, Section 3).

2. Test the power valve; refer to steps 1 thru 4 under "Power Valve" (Part 10-1, Section 1).

3. Remove the power valve and/or gaskets by following step 8 under "Main Body Disassembly" (Part 10-4, Section 4).

4. Replace the power valve and/or gaskets by following steps 6 and 7 under "Main Body Assembly" (Part 10-4, Section 4).

5. Install the carburetor assembly. Refer to steps 1 thru 4 under "Installation" (Part 10-4, Section 3).

ANTI-STALL DASHPOT REPLACEMENT

1. Remove the air cleaner (Part 10-5, Section 2).

2. Remove the retaining nut and the dashpot from the mounting bracket.

3. Install the dashpot and retaining nut on the mounting bracket.

4. Adjust the anti-stall dashpot; refer to "Anti-Stall Dashpot" Part 10-1, Section 2).

5. Install the air cleaner (Part 10-5, Section 2).

CARBURETOR THERMOSTATIC CHOKE SPRING HOUSING, AND GASKET REPLACEMENT

1. Remove the carburetor air cleaner assembly (Part 10-5, Section 2).

2. Remove the heater hose and mounting bracket from the carburetor.

3. Remove the thermostatic spring housing clamp retaining screws and remove the spring housing and gasket.

4. Replace the gasket and/or spring housing. Position the thermostatic choke spring housing gasket on the choke housing.

5. Install the spring housing on the choke housing, with the slot in the arm of the thermostatic spring lever inserted into the loop of the thermostatic spring. Position the retainer over the thermostatic spring housing and loosely install the retaining screws.

6. Set the thermostatic spring housing to the specified index mark (Part 10-8) and tighten the retaining screws.

7. Install the heater hose mounting bracket, heater hose, and the air cleaner accembly (Part 10-5, Section 2) on the carburetor.

THERMOSTATIC CHOKE REMOVAL AND INSTALLATION –CLEAN OR OVERHAUL

1. Remove the carburetor air cleaner assembly (Part 10-5, Section 2).

2. Remove the heater hose and mounting bracket from the carburetor. Disconnect the choke heat tube from the choke housing.

3. Remove and disassemble the

thermostatic choke assembly by folfowing steps 1 thru 4 under "Vacuum Piston Choke Disassembly" (Part 10-4, Section 4).

4. Assemble and install the thermostatic choke assembly by following steps 1 thru 4 under "Vacuum Piston Choke Assembly" (Part 10-4, Section 4). Connect the choke heat tube to the choke housing.

5. Perform a "Fast Idle Cam Linkage and Automatic Choke Plate Clearance (Pull-Down) Adjustment" (Part 10-1, Sction 2).

SPACER AND GASKETS REPLACEMENT

Perform the carburetor "Removal and Installation" procedure steps (Part 10-4, Section 3) to replace the carburetor spacer and/or gaskets.

3 REMOVAL AND INSTALLATION

REMOVAL

Flooding, stumble on acceleration, and other performance complaints are, in many instances, caused by the presence of dirt, water, or other foreign matter in the carburetor. To aid in diagnosing the cause of a complaint, the carburetor should be carefully removed from the engine without removing the fuel from the bowls. The contents of the bowls may then be examined for contamination as the carburetor is disassembled.

1. Remove the air cleaner assembly (Part 10-5, Section 2).

2. Disconnect the throttle rod, fuel inlet line and the distributor vacuum line (if so equipped) from the carburetor.

3. On an automatic choke equipped carburetor, disconnect the choke clean air tube and the choke heat tube from the carburetor. Remove the bracket that secures the heater hose to the automatic choke.

On a manual choke equipped carburetor, loosen the retaining clip securing the choke cable housing to the carburetor. Loosen the retaining screw securing the choke cable to the clevis on the fast idle cam lever. Remove the choke cable assembly from the carburetor.

4. Remove the carburetor retaining nuts and lock washers; then remove the carburetor. Remove the spacer gasket from the spacer and discard the gasket. **Whenever the carburetor is removed from the engine, care must be exercised to prevent damage to the throttle plates. The lower edges of the throttle plates project below the carburetor body whenever they are open.**

5. Disconnect the coolant inlet and outlet hoses, and the crankcase ventilation system hose from the carburetor spacer. Remove the spacer and gaskets. Discard the gaskets.

INSTALLATION

1. Clean the gasket surface of the intake manifold, spacer and carburetor. Place a new gasket above and below the spacer and install the spacer. Connect the crankcase ventilation system hose to the spacer. Position the carburetor on the spacer.

2. Connect the throttle rod, fuel inlet line and the distributor vacuum line (if so equipped) to the carburetor. To prevent leakage, distortion or damage to the carburetor body flange, snug the nuts; then, alternately tighten each nut in a criss-cross pattern to the specified torque. Connect the throttle control rod.

3. On an automatic choke equipped carburetor, connect the choke clean air tube and the choke heat tube to the carburetor.

On a manual choke equipped carburetor, install the manual choke cable assembly on the retaining clip on the carburetor. Connect the choke cable to the clevis on the choke lever clevis. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) and adjust the choke cable linkage.

4. Start the engine and check for leaks. Refer to "Common Adjustments and Repairs" (Part 10-1, Section 2) and adjust the accelerating pump stroke (if necessary), the idle fuel mixture and idle speed, and the anti-stall dashpot (if equipped). Install the air cleaner (Part 10-5, Section 2).

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY

To facilitate working on the carburetor and to prevent damage to the throttle plates, install carburetor legs on the base. If legs are unavailable, install 4 bolts (about 2¼ inches long of the correct diameter) and 8 nuts on the carburetor base.

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection nad assembly.

For a complete carburetor overhaul, follow all the steps. To partially overhaul the carburetor or to install a new gasket kit, follow only the applicable steps.

Refer to Fig. 26 for parts identification.

AIR HORN

1. Remove the air cleaner anchor screw.

2. On an automatic choke equipped carburetor, remove the automatic choke plate operating rod to choke lever retainer (Fig. 13).

On a manual choke equipped carburetor, remove the retainer securing the choke cam and lever to the choke lever shaft on the main body. Remove the flat washer and the choke cam and lever from the carburetor.

3. Remove the air horn retaining screws and lock washers and the identification tag. Remove the air horn and air horn gasket.

4. If necessary, remove the choke plate actuating rod, seal and washers as follows:

On an automatic choke equipped carburetor, remove the choke plate rod by loosening and turning the choke shaft lever clevis nut counterclockwise. Remove the choke rod. Remove the upper and lower seal washers and the seal from the choke rod seal retainer in the air horn.

On a manual choke equipped carburetor, unscrew the plastic nut from

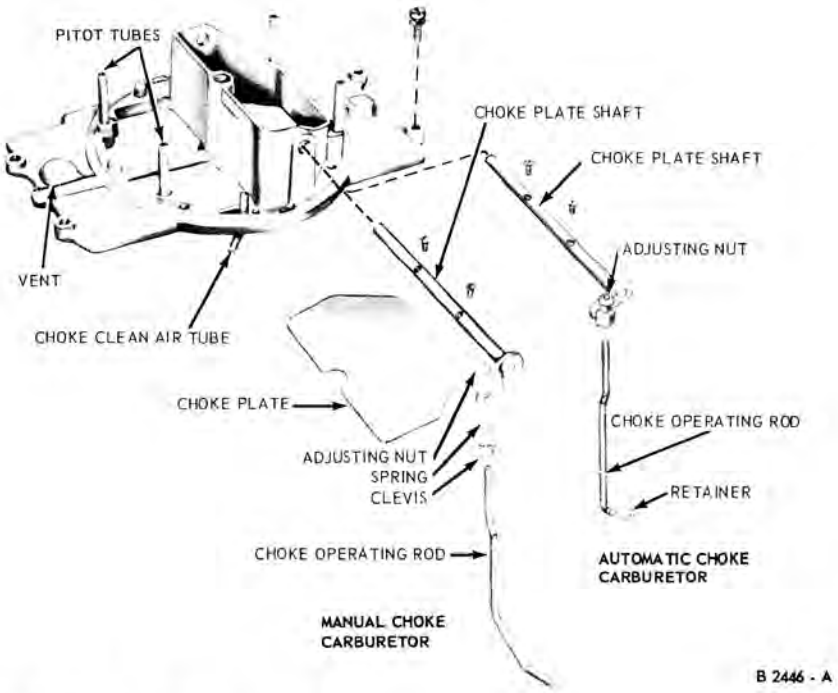


FIG. 13–Air Horn Assembly

the choke rod and remove the choke rod spring (Fig. 13). Remove the swivel from the choke lever. Remove the choke rod. Remove the upper and lower seal washers and the seal from the choke rod seal retainer in the air horn.

5. If it is necessary to remove the choke plate or choke shaft, remove the staking marks on the choke plate retaining screws and remove the screws. **If the tips of the screws are flared excessively, file off the flared portion to prevent damage to the threads of the shaft.** Remove the choke plate by sliding it out of the shaft, from the top of the air horn. Slide the choke shaft out of the air horn.

6. If it is necessary to remove the secondary throttle control vacuum tube, pry it out with needle nose pliers. Discard the tube after removal.



FIG. 14–Fast Idle Cam and Fast Idle Lever

VACUUM PISTON CHOKE

1. Remove the fast idle cam retainer (Fig. 14).

2. Remove the thermostatic choke spring housing retaining screws, and remove the clamp, housing and gasket (Fig. 14).

3. Remove the choke housing assembly retaining screws. If the air horn was not previously removed, remove the choke control rod retainer. Remove the choke housing assembly, gasket and the fast idle cam. Remove the fast idle cam and rod from the fast idle cam lever.

4. Remove the automatic choke shaft retaining screw and washer (Fig. 15). Remove the choke thermostat lever, link and piston from the housing. If necessary, remove the pin securing the choke piston to the choke thermostat lever link. Remove the choke shaft and lever assembly and the fast idle cam lever from the choke housing.

MAIN BODY

1. Using a hook, disconnect the

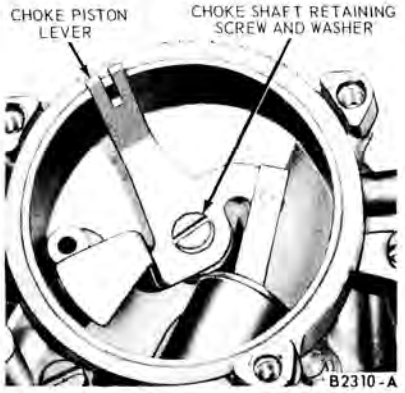


FIG. 15–Choke Shaft and Piston Lever

float shaft retainer from each float (Figs. 16 and 17). Remove the float and shaft and the fuel inlet needle assembly from each fuel bowl. Remove the torsion (damper) spring from the shafts.

2. Using a jet wrench, remove the fuel inlet needle seat, gasket and filter screen from each fuel bowl (Fig. 18).

3. Remove the primary stage and secondary stage main jets (Fig. 19).

4. Remove the air distribution

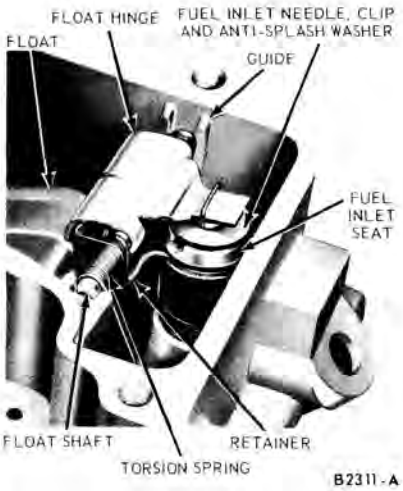


FIG. 16–Float Assembly



FIG. 17–Float Shaft Retainer Removal or Installation

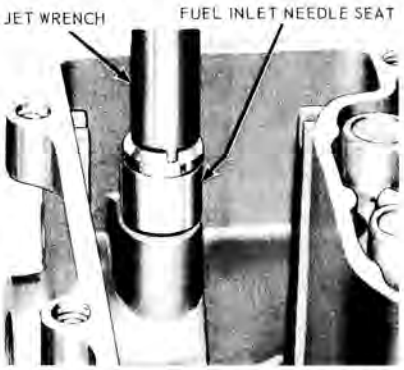


FIG. 18—Fuel Inlet Needle Seat Removal or Installation

plate (if so equipped) primary stage booster venturi assembly and gasket (Fig. 20). Invert the main body and let the accelerating pump discharge weight and ball fall into the hand.

5. Remove the secondary stage booster venturi assembly and gasket.

6. Remove the accelerating pump operating rod retainer. To release the rod from the retainer clip, press the tab ends of the clip together; then, at the same time, press the rod away from the clip until it is disengaged. Remove the rod. Remove the accelerating pump cover, diaphragm assembly and spring (Fig. 21).

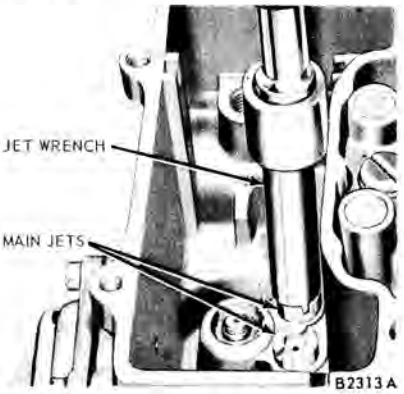


FIG. 19—Main Jet Removal or Installation

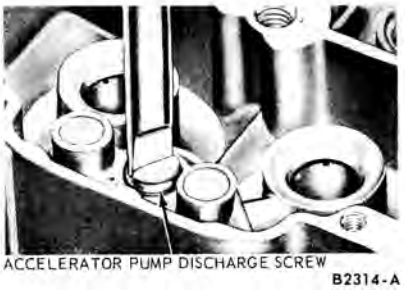


FIG. 20—Booster Venturi Removal or Installation

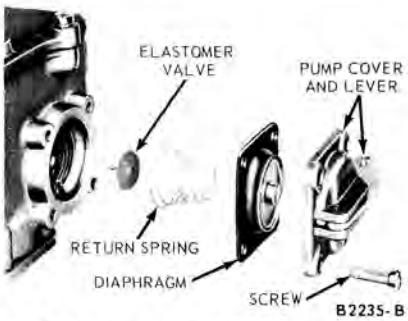


FIG. 21—Accelerating Pump Assembly

If it is necessary to remove the Elastomer valve, grasp it firmly and pull it out. If the Elastomer valve tip broke off during removal, be sure to remove the tip from the fuel bowl. **An Elastomer valve must be replaced whenever it is removed from the main body.**

7. Remove the secondary diaphragm operating rod retainer and remove the rod. Remove the diaphragm cover, return spring, and diaphragm (Fig. 22). Invert the main body and let the secondary ball check fall into the hand.

8. Invert the main body and remove the power valve cover and gasket. Using a box wrench, remove the power valve and gasket (Fig. 23.)

9. Remove the idle fuel mixture adjusting screws (needles) and springs.

10. Remove the anti-stall dashpot, if so equipped.

11. If necessary, remove the idle (hot engine) adjusting screw and spring, and the nut and washer securing the fast idle cam adjusting lever assembly to the primary throttle shaft (Fig. 14). Remove the lever assembly.

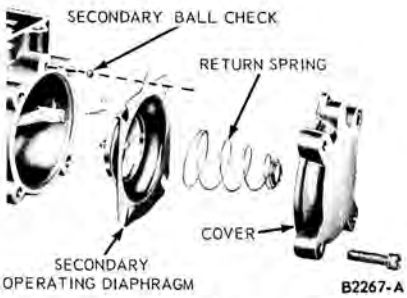


FIG. 22—Secondary Diaphragm Assembly

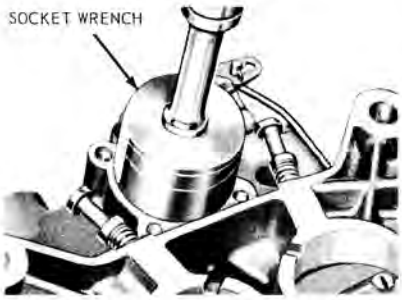


FIG. 23—Power Valve Removal or Installation

12. If it is necessary to remove the throttle plates, lightly scribe the primary and secondary throttle plates along the throttle shafts, and mark each plate and its corresponding bore with a number or letter for proper installation (Fig. 24).

Remove the staking marks on the throttle plate retaining screws and remove the screws. **If the tips of the screws are flared excessively, file off the flared portion to prevent damage to the threads of the shaft(s). Do not scratch the edge of the plates or walls of the barrels.** Remove the screws and the throttle plates.

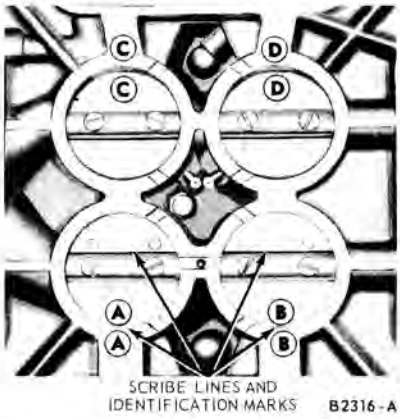


FIG. 24—Throttle Plate Removal

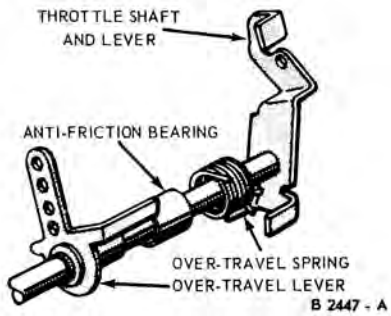


FIG. 25—Throttle Shaft Assembly

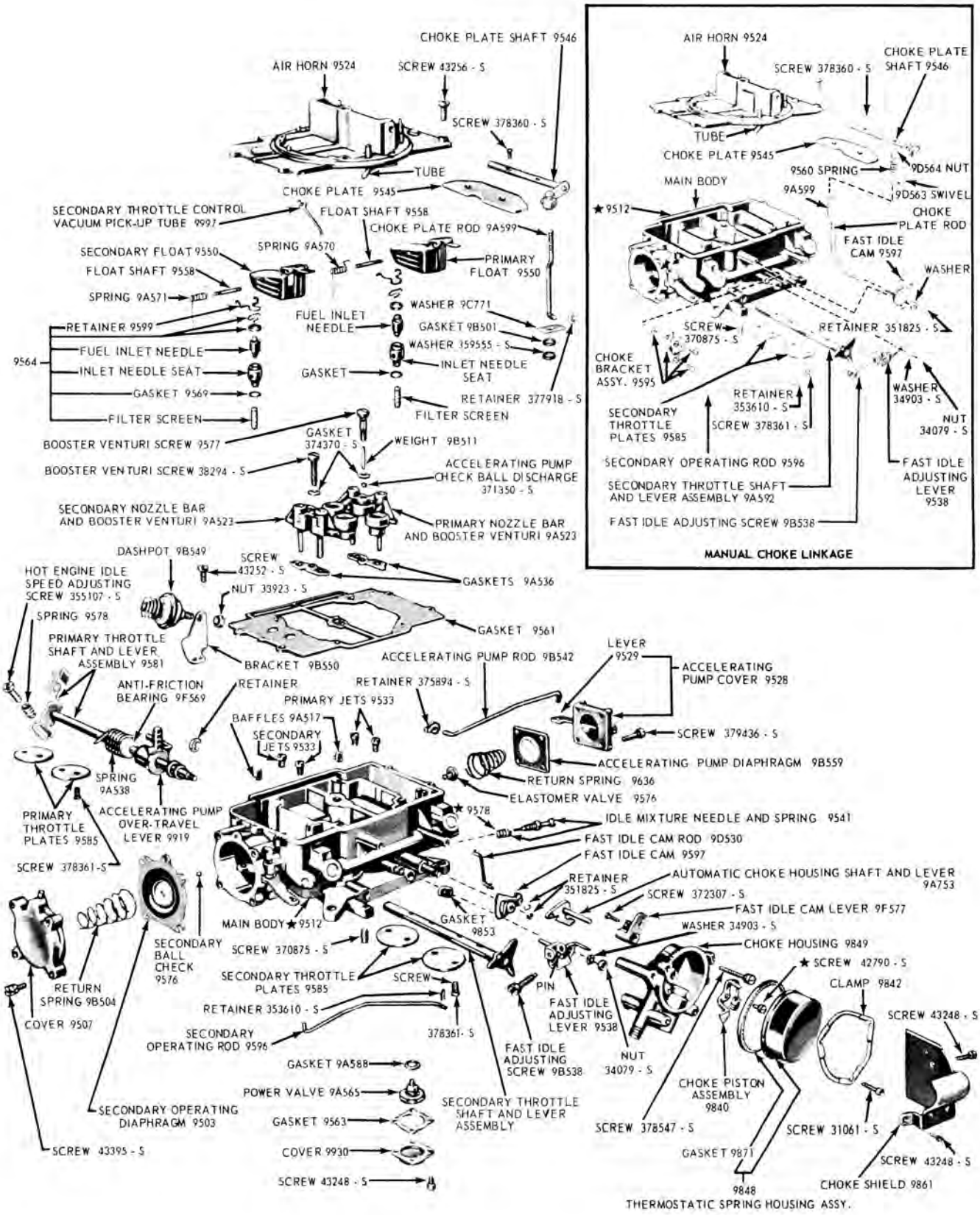


FIG. 26—Carburetor Assemblies

Slide the primary and secondary throttle shafts out of the main body.

Remove the accelerating pump over-travel lever retainer (Fig. 25) and slide the anti-friction bearing, spring and level off the primary throttle shaft.

PARTS REPAIR OR REPLACEMENT

Clean and inspect the carburetor component parts. Refer to "Cleaning and Inspection" Part 10-1) for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

Make sure all holes in the new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Make sure the accelerating pump diaphragm and secondary operating diaphragm are not torn or cut. The carburetor assembly is shown in Fig. 26.

MAIN BODY

1. If the throttle plates were removed, install the accelerator over-travel spring anti-friction bearing on the accelerator over-travel lever boss. Place the accelerator over-travel spring, with the shortest tang end first, over the bearing on the over-travel lever (Figs. 25 and 27). Place the short tang of the spring under the lug on the over-travel lever. Slide the over-travel lever spring and bearing assembly on the primary throttle shaft. Hook the longest tang of the spring under the closed throttle lug of the throttle lever. Install the over-travel lever retainer. Slide the primary throttle shaft assembly into the main body.

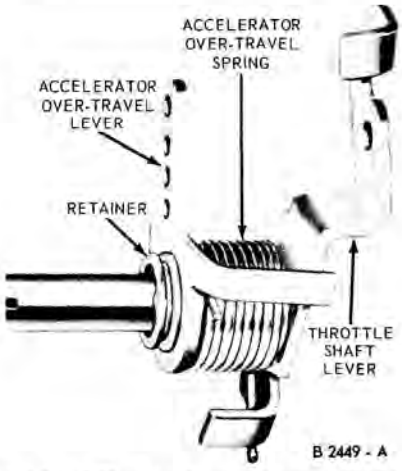


FIG. 27—Accelerator Over-Travel Spring and Lever Installation

Refer to the lines and identification marks scribed on the throttle plates (Fig. 24), and install the primary throttle plates in their proper location with the screws snug, but not tight. Invert the main body and hold it up to the light. Little or no light should show between the throttle plates and the throttle bores. Tap the plates lightly with a screwdriver handle to seat them. Tighten and stake the screws.

Slide the secondary throttle shaft into the main body. Refer to the lines scribed on the secondary throttle plates and install the throttle plates in their proper location. To install the plates, follow the procedure given for the primary throttle plates.

Adjust the secondary throttle plates. Refer to Part 10-1, Section 2 for the proper procedure.

2. Install the idle (hot engine) adjusting screw and spring.

3. If the fast idle lever was removed, place the fast idle lever assembly on the primary throttle shaft, and install the retaining washer and nut (Fig. 14). On an automatic choke equipped carburetor, do not install the fast idle cam or retainer at this time.

4. Install the anti-stall dashpot.

5. If the Elastomer valve was removed, lubricate the tip of a new Elastomer valve and insert the tip into the the accelerator pump cavity center hole (Fig. 21). Using a pair of needle nosed pliers, reach into the fuel bowl and grasp the valve tip. Pull the valve in until it seats and cut off the tip at the retaining shoulder. Position the diaphragm return spring on the boss in the chamber.

6. Position the accelerator pump diaphragm assembly to the cover and place the cover and diaphragm assembly in position on the return spring and main body. Install the cover screws finger tight. Push the accelerating pump plunger the full distance of its travel and tighten the cover screws.

7. Install the accelerating pump operating rod. Refer to Part 10-1, Section 2 and adjust the accelerating pump stroke.

8. Invert the main body. Using a socket wrench or box wrench, install the power valve and gasket (Fig. 23). **Tighten the power valve securely.** Install the cover and gasket.

9. Install the idle adjusting needles and springs. Turn the needles in gently with the fingers until they just touch the seat; then back them off the specified number of turns (Part 10-8) for a preliminary idle adjustment.

10. Drop the secondary discharge ball check into the passage in the main body (Fig. 22).

11. Install the secondary operating diaphragm on the secondary operating lever. Install the diaphragm return spring on the cover. Install the cover with the screws finger tight. With the diaphragm in the extended position, tighten the cover screws. Install the secondary operating rod in the operating lever, and secure the rod to the secondary throttle shaft with the retaining clip.

Check the operation and seal of the secondary vacuum system by opening the primary and secondary throttle plates. Hold the secondary throttle plates open. Place a finger over the secondary vacuum inlet hole in the main body and release the secondary throttle plates. This is a check for vacuum leakage at the diaphragm. The throttle plates should not close fully. They will move slightly when released, but they must stop and should not move toward the closed position after the initial movement. Replace the diaphragm or tighten the cover screws as necessary to correct the vacuum leakage.

12. Using a jet wrench, install the primary and secondary main jets (Fig. 19). **Be sure the correct jets are installed for the primary and secondary systems (Part 10-8).**

13. Install the primary and secondary fuel inlet filters, below the fuel inlet valve seats. Install the valve seats and gaskets (Fig. 18).

14. Position the primary float shaft retainer in the groove on the fuel inlet needle seat (Figs. 16 and 17). Install the fuel needle assembly in the fuel inlet seat. Slide the float shaft into the float lever hinge. Install the damper spring on the float shaft and insert the short end of the spring under the flange of the float lever.

Insert the float assembly into the fuel bowl and hook the float tab under the clip on the fuel inlet needle assembly. Insert the float shaft into its guides at the sides of the fuel bowl. Allow the long end of the damper spring to rest against the wall of the fuel bowl. Using a hook (Fig. 17) position the shaft retainer in the grooves on the shaft.

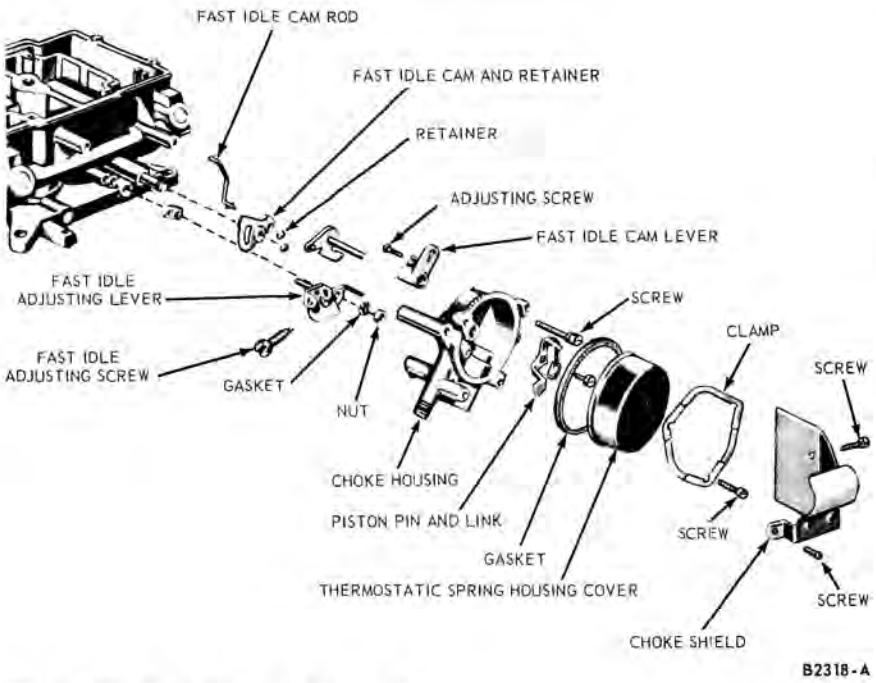


FIG. 28—Choke Housing Assembly

15. Repeat step 14 on the secondary stage fuel bowl.

16. Refer to Part 10-1, Section 2, "Float Adjustment (Dry)" and perform a dry float fuel level adjustment on the primary and secondary floats.

17. Drop the accelerating pump discharge ball into its passage in the primary side of the main body. Seat the ball with a brass drift and a light hammer. **Make sure the ball is free.** Drop the accelerating pump discharge weight on top of the ball. Position the primary booster venturi assembly and gasket in the main body. Install the air distribution plate (if so equipped) and retaining screw. Tighten the retaining screw securely (Fig. 20). **The primary booster screw is hollow.**

18. Position the secondary booster venturi assembly and gasket in the main body, and install the gasket and retaining screw.

VACUUM PISTON CHOKE

1. If the choke piston and link was disassembled, install the choke piston on the choke thermostatic spring lever link and install the retaining pin (Fig. 28).

2. Position the fast idle cam lever on the thermostatic choke shaft and lever assembly (Figs. 28 and 29). **The bottom of the fast idle lever adjusting screw must rest against the tang on the choke shaft lever.** Insert the choke shaft assembly into the rear of the choke housing. Position the choke shaft lever so that the hole in the lever is to the left side of the choke housing (Fig. 29).

3. Insert the choke piston into the choke housing. Position the choke thermostatic spring lever on the flange of the choke shaft, and install the retaining screw and washer (Fig. 15).

4. Install the fast idle cam rod on the fast idle cam lever (Fig. 29). Place the fast idle cam on the fast idle cam rod and install the retainer. Place the choke housing vacuum pick-up port to main body gasket on the choke housing flange. Position the choke housing on the main body, and at the same time, install the fast idle cam on the hub of the main body. Position the gasket and install the choke housing retaining screws. Install the fast idle cam retainer. **The thermostatic spring housing is installed after the choke plate clearance (pull-down) has been adjusted to specification.**

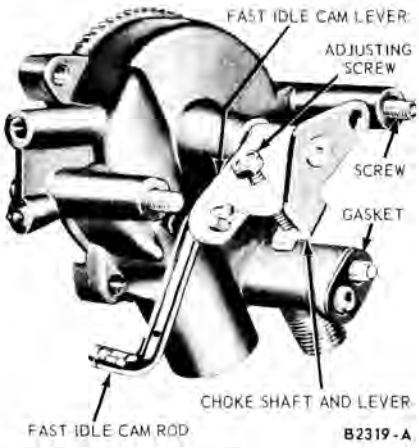


FIG. 29—Choke Linkage Installation

AIR HORN

Refer to Fig. 13 for the correct location of the parts.

1. If the choke plate and shaft was removed, position the choke plate shaft in the air horn.

On an automatic choke equipped carburetor, insert the plastic choke pulldown adjusting nut and swivel into the keyed hole in the choke shaft lever. Position the felt washer between the two brass washers and slide them into place on the choke control rod seal retainer on the bottom of the air horn. Insert the choke control rod through the control rod seal and the air horn. Insert the choke control rod into the choke shaft lever clevis nut, and turn the nut clockwise to thread the rod onto the nut.

On a manual choke equipped carburetor, insert the plastic swivel into the keyed hole in the choke shaft lever (Fig. 13). Position the felt washer between the two brass washers and slide them into place on the choke control rod seal retainer on the bottom of the air horn. Insert the choke control rod thru the control rod seal, air horn and the swivel. Install the control rod spring, and screw the control rod adjusting nut clockwise to thread the nut onto the control rod.

2. If the choke plate and shaft was removed, insert the choke plate into the choke plate shaft. Install the choke plate screws snug, but not tight. Check for proper plate fit, binding in the air horn, and free rotation of the shaft by moving the plate from the closed position to the open position. If necessary, remove the choke plate and grind or file the plate edge where it is binding or scraping on the air horn wall. If the choke plate and shaft moves freely, tighten the choke plate screws while holding the choke in the fully-closed position. Stake the screws. **When staking the screws, support the shaft and plate on a block of wood or a metal bar to prevent bending of the shaft.**

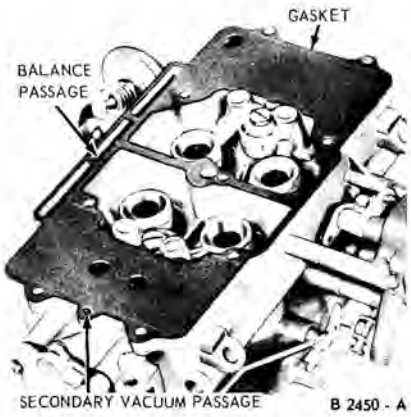


FIG. 30–Main Body Gasket Installation

3. If necessary, start a new secondary throttle control vacuum tube into the air horn. **Make certain the tube is installed in a manner that will insure that the pick-up end will face downward toward the primary booster venturi when the air horn is installed.** Drive the tube into the air horn by grasping it lightly below the shoulder with pliers and striking the pliers with a hammer. Drive the tube in until its stops against its shoulder. **Do not crush or bend the tube. The tube should not touch the booster venturi wall when the air horn is installed on the main body. The correct tube position is 0.020-0.060 inch from the wall.**

4. Position the main body gasket on the main body (Fig. 30).

On an automatic choke equipped carburetor, position the air horn on the main body and gasket so that the choke plate rod fits into the opening in the choke housing lever. Install the choke plate rod retainer.

On a manual choke equipped carburetor, position the air horn on the main body and gasket. Position the choke cam and lever on the choke control rod and the shaft on the main body. Install the flat washer and the choke cam and lever retainer on the shaft.

Use care to prevent damage to the secondary throttle control vacuum tube during the air horn installation.

5. Install the air horn retaining screws, lock washers and the carburetor identification tag.

6. Refer to Part 10-1, Section 2, "Common Adjustments and Repairs" and perform the fast idle cam linkage and automatic choke plate clearance (pull-down) adjustment.

7. On an automatic choke equipped carburetor, position the thermostatic choke spring housing gasket on the choke housing. Install the spring housing on the choke housing and gasket, with the slot in the arm of the thermostatic spring lever inserted into the loop of the thermostatic spring. Position the spring housing retainer (clamp) over the spring housing and loosely install the retaining screws.

8. Refer to Part 10-1, Section 2, "Common Adjustments and Repairs" and perform the automatic choke spring housing adjustment.

BENCH ADJUSTMENTS

The manual choke fast ile cam linkage and choke plate clearance (pull-down) adjustment, fuel level float adjustment (dry) and the secondary throttle plate adjustment are performed only as bench adjustments. Refer to Part 10-1, Section 2 for the procedures.

The automatic choke plate clearance (pull-down) and fast idle cam linkage adjustment, automatic choke spring housing adjustment, and the accelerating pump stroke adjustment can be performed with the carburetor on the bench or in the car. Refer to Part 10-1, Section 2, for the procedures.

PART 10-5 AIR CLEANER

Section	Page	Section	Page
1 Description and Operation	10-61	2 Removal and Installation	10-62

1 DESCRIPTION AND OPERATION

DESCRIPTION

CONVENTIONAL AIR CLEANER

All engines except the 260 V-8 and standard 289 V-8 engines are equipped with a conventional dry-type air cleaner that has a replaceable filtering element. The air cleaner body is mounted on a sealing gasket, located on the carburetor air horn. The air cleaner assembly is retained on the engine by a stud on the carburetor body and a wing nut above the filter cover. The filter element has integral plastic gaskets, located on the top and bottom of the element. The gaskets prevent entry of dirt and unfiltered air into the engine.

HOT AND COLD AIR INTAKE AIR CLEANER

The 260 V-8 and standard 289 V-8 engines are equipped with a thermostatically controlled carburetor air inlet duct assembly.

The air cleaner body is mounted on a sealing gasket, located on the carburetor air horn. The air cleaner assembly is retained on the engine by a stud in the carburetor body and a wing nut above the filter cover. The replaceable filter element assembly has integral plastic gaskets located on the top and bottom of the element. The gaskets prevent entry of dirt and unfiltered air into the engine.

The thermostatically controlled air inlet duct and shroud assembly is attached to the air cleaner body with two wing screws. The shroud is positioned on the left exhaust manifold. The air inlet duct control mechanism, consists of a valve plate, thermostat, adjustable thermostat rod, two springs and a retaining clip.

OPERATION

CONVENTIONAL AIR CLEANER

The air from the engine compartment enters the air cleaner assembly through the opening (horn) on the side of the body, into a silencing chamber and passes through the filter element. Dust particles are trapped in the filter element as the air passes through it. After leaving the filter element, the air is deflected down into the carburetor.

HOT AND COLD AIR INTAKE AIR CLEANER

The air received from the air duct passes through a silencing chamber in the air cleaner body and then through the filter element. After leaving the filter element, the air is deflected down into the carburetor. Dust particles and other foreign materials are trapped in the filter element as the air rushes through it.

The temperature of the air entering the air cleaner is thermostatically controlled by the carburetor air duct assembly (Fig. 1). Air from the engine compartment, or heated air from a shroud around the exhaust manifold, is available to the engine.

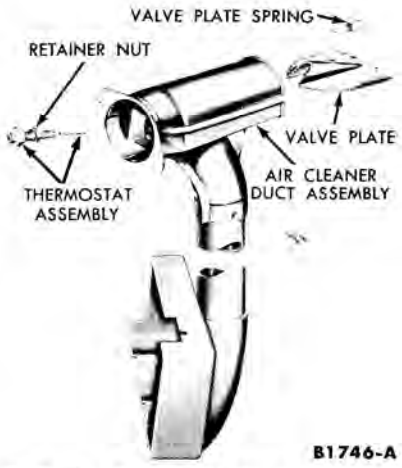


FIG. 1—Typical Air Inlet Duct—Disassembled

A thermostatic bulb in the air duct is exposed to the incoming air. A spring-loaded valve plate is connected to the thermostatic bulb through linkage. The valve plate spring holds the valve in the closed position (heat on) until the thermostatic bulb overcomes the valve tension.

During the engine warm-up period when the air temperature entering the air duct is less than 75°F, the thermostat is in the retracted position and the valve plate is held in the up position (heat on) by the valve plate spring, thus shutting off the air from the engine compartment (Fig. 1). All air is then drawn from the shroud around the exhaust manifold.

As the temperature of the air passing the thermostatic bulb approaches 85°F, the thermostat starts to expand, and pulls the valve plate down. This allows cooler air from the engine compartment to enter the air cleaner. When the temperature of the air reaches approximately 105°F, the valve plate will be in the down position (heat off) so that only engine compartment air is allowed to enter the air cleaner.

CLOSED CRANKCASE VENTILATION SYSTEM

AIR CLEANERS

On the closed crankcase ventilation system engine models, air is drawn into the crankcase ventilation system at the integral air inlet tube, located on the air cleaner body, and passes through the connecting rubber hose into the crankcase ventilation system.

2 REMOVAL AND INSTALLATION

AIR CLEANER MAINTENANCE

Refer to Group 19 for the air cleaner assembly recommended maintenance mileage interval.

CONVENTIONAL AIR CLEANER

REMOVAL

1. Disconnect the crankcase ventilation system hose, if so equipped, from the air cleaner body.
2. Remove the wing nut retaining the air cleaner assembly to the carburetor. Remove the air cleaner assembly, then remove the cover and lift the filter element out of the air cleaner body.

CLEANING AND INSPECTION

Refer to Part 10-1, Section 3 for the recommended cleaning and inspection procedures.

INSTALLATION

1. If required, install a new air cleaner mounting gasket on the carburetor. Position the air cleaner body on the carburetor, and make certain the body is properly seated on the carburetor gasket.
2. Position the filter element in the body and install the cover.
3. Tighten the carburetor air cleaner assembly retaining wing nut. Connect the crankcase ventilation system hose, if so equipped, to the air cleaner body.

HOT AND COLD AIR INTAKE AIR CLEANER

REMOVAL

1. Disconnect the crankcase ventilation system hose, if so equipped, from the air cleaner body. Remove the two wing-type screws that secure the air duct and thermostat assembly to the air cleaner. Remove the wing nut that secures the air cleaner to the carburetor. Remove the air cleaner assembly.
2. Remove the cover and lift the filter element out of the air cleaner body.

CLEANING AND INSPECTION

Refer to Part 10-1, Section 3 for the recommended cleaning and inspection procedures.

INSTALLATION

1. Position the air cleaner body on the carburetor. Connect the air duct to the air cleaner with two wing-type screws. Tighten the screws.
2. Place the element in the body. Install the cover and retaining wing nut. Tighten the nut.
3. Connect the crankcase ventilation system hose, if so equipped, to the air cleaner body.

HOT AND COLD AIR INTAKE DUCT

REMOVAL

1. Remove the air duct and shroud retaining nut and washer from the exhaust manifold.
2. Remove the two wing-type screws that secure the air duct and thermostat assembly to the air cleaner. Carefully lift the air duct, shroud and tube as an assembly from the engine.

AIR INTAKE DUCT ADJUSTMENT

The air intake duct thermostatic valve can be adjusted to change the air temperature at which the valve opens. Increasing the thermostatic rod length will move the valve toward the heat-off position. Decreasing the rod length will move the valve toward the heat-on position. Adjustments must be verified by testing the opening temperature as detailed in Part 10-1, Section 1.

DIAGNOSIS AND TESTING

Refer to Part 10-1, Section 1 for the air duct testing procedures.

INSTALLATION

1. Install the thermostat and air duct assembly, and the shroud and tube assembly on the exhaust manifold as a unit.
2. Secure the thermostat and air duct assembly to the air cleaner with the two wing-type screws. Install the air duct to exhaust manifold retaining nut and washer.

DISASSEMBLY

1. Loosen the retaining screw and separate the shroud and tube assembly from the air cleaner duct and valve assembly. (Fig. 1).
2. Check the operation of the thermostat and air duct assembly. Refer to "Diagnosis and Testing" (Part 10-1, Section 1) for the proper procedure. If inspection reveals that the valve plate is binding, or the thermostat is malfunctioning, remove the thermostat and valve plate as follows:

Detach the valve plate tension spring from the valve plate with the use of long-nose pliers. Loosen the thermostat lock nut and unscrew the thermostat from the mounting bracket. Remove the lock nut. Grasp the valve plate and withdraw it from the duct.

CLEANING

Refer to Part 10-1 for the recommended cleaning and inspection procedure.

ASSEMBLY

1. If it was necessary to disassemble the thermostat and air duct assembly, assemble the unit as follows:

Install the valve plate. Install the lock nut on the thermostat and screw the thermostat into the mounting bracket. Install the valve plate tension spring on the valve plate and the duct.

2. Check the operation of the thermostat and air duct assembly, then adjust the thermostat as required. Refer to "Air Intake Duct Adjustment" in this section for the proper procedure.
3. Install the air cleaner duct and valve assembly on the shroud and tube assembly. Tighten the retaining screw.

PART 10-6 FUEL PUMP

Section		Page
1	Description and Operation	10-63
2	In-Car Adjustments and Repairs	10-64
3	Removal and Installation	10-64
4	Major Repair Operations	10-65

1 DESCRIPTION AND OPERATION

DESCRIPTION

Single action fuel pumps are standard equipment for all car models.

The fuel pumps on the 6-cylinder engines are mounted on the lower, left-center of the engine cylinder block.

On all V-8 engines, the fuel pumps are mounted on the left-side of the cylinder front cover.

An AC design fuel pump (Fig. 1) with a long-life, disposable type fuel filter integrally mounted on the top side of the fuel pump body is used on the 170 and 200 Six engines.

A Carter design fuel pump (Fig. 2) with a long-life, disposable type integrally mounted fuel filter on the pump body is used on the 260 V-8 engines.

Carter permanently sealed fuel pumps with integral fuel filters are used on the 289 V-8 engines (Fig. 3).

OPERATION

The fuel pumps are mechanically actuated by means of the fuel pump rocker arm and an eccentric on the camshaft.

A flexible fuel pump diaphragm is operated by a combination of rocker arm action and calibrated spring tension.

On the fuel intake stroke, the camshaft eccentric causes the rocker arm to lift the fuel pump diaphragm against the diaphgram spring pressure. This action draws fuel through the intake valve into the pump inlet chamber and closes the outlet valve. At the same time, fuel is drawn from the fuel tank through the fuel intake line to replace the fuel drawn into the chamber.

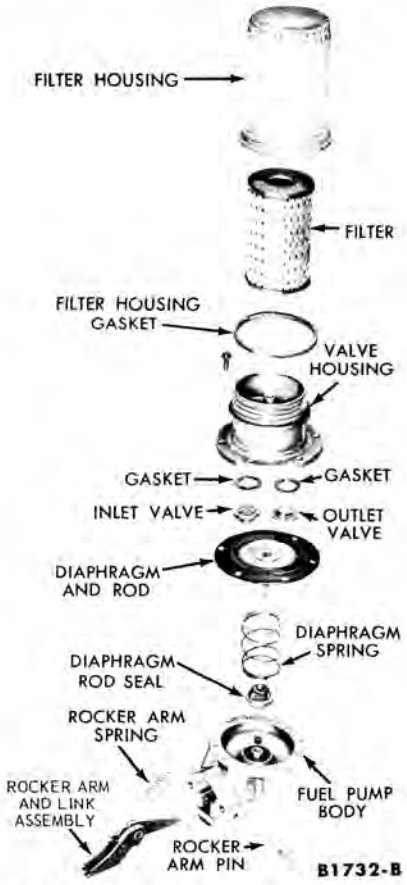


FIG. 1—AC Fuel Pump Assembly —Six-Cylinder Engine

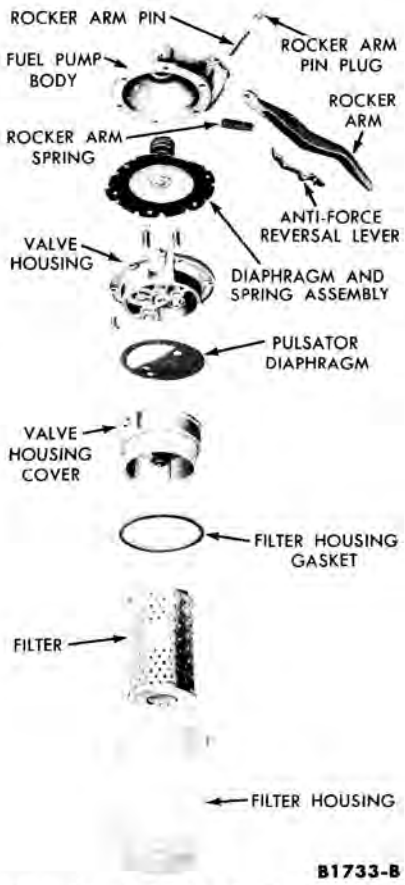


FIG. 2—Typical Carter Fuel Pump Assembly—V-8 Engine



FIG. 3—Typical Carter Sealed Design Fuel Pump

As the camshaft eccentric continues to rotate, the rocker arm relieves the pressure on the diaphragm spring and allows the spring to move the diaphragm toward the inlet and outlet valves, exerting pressure on the fuel inlet chamber. This pressure causes the pump inlet valve to close and the ensuing pressure build-up opens the outlet valve. The fuel is then forced through the pump outlet to the fuel filter where it is cleansed before entering the carburetor. **Fuel is delivered to the carburetor only when the fuel inlet valve in the carburetor is open. The carburetor inlet valve is closed by fuel pressure on the float when the specified fuel level in the carburetor float chamber is reached.**

When there is no demand for fuel from the carburetor, the diaphragm spring tension is not strong enough to force the diaphragm against the fuel pressure built up in the inlet chamber of the pump. Thus, the up and down rocker arm action continues, but the diaphragm remains stationary until pressure against the carburetor float is relieved by a demand for fuel at the carburetor.

The pulsator diaphragm in the 260 V-8 Carter fuel pump dampens the effect of fuel pump pressure pulsations on the carburetor fuel inlet needle valve.

Pressure leak down bleed holes are incorporated in the AC and the 260 V-8 Carter fuel pumps. The Carter permanently sealed pumps for the 289 V-8 engines contain pressure relief orifices in the inlet and outlet valve cages to prevent pressure build-up in the line to the carburetor during hot soak periods.

An air vent is located in the fuel pump bodies to relieve air pressure build up on the spring side of the diaphragm.

The fuel pumps contain a diaphragm rod seal to prevent the entrance of engine oil into the fuel pump.

2 IN-CAR ADJUSTMENTS AND REPAIRS

FUEL FILTER DESCRIPTION

The fuel filters are integrally mounted on the fuel pump.

Replace the filter element (Fig. 4) if it becomes clogged, and also at the recommended maintenance mileage interval.

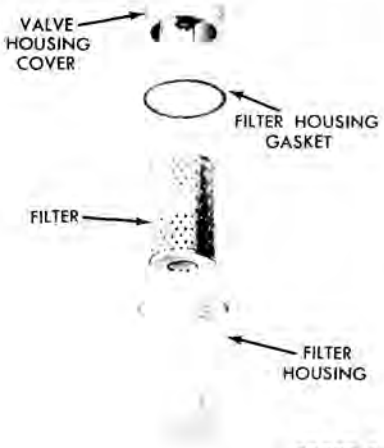


FIG. 4—Typical Integral Fuel Filter Assembly

The fuel filter element for an upright installation (Figs. 1 and 2) is not interchangeable with the filter element on a hang-down installation (Fig. 4). On a hang-down installation filter element, the printed instructions on the bottom of the element, "This End Must Be Installed Down," must be adhered to when the filter is installed on the valve housing cover (Fig. 5).



FIG. 5—Fuel Filter Element Installation Instructions

MAINTENANCE

Refer to Group 19 for the recommended maintenance mileage interval.

FUEL FILTER REPLACEMENT

1. Unscrew the filter housing from the fuel pump. Remove and discard the filter element and gasket. Clean the filter housing in cleaning solvent.

2. Place a new filter element over the spout in the fuel pump valve housing cover (Fig. 4). **Be sure the proper filter element is used for the type of fuel filter installation (upright or hang-down). On a hang-down filter element installation, install the filter element according to the printed insructions on the bottom of the element (Fig. 5).** Coat a new gasket with light engine oil and position the gasket on the filter housing. Screw the filter housing on the fuel pump. Hand-tighten the filter housing until the gasket contacts the pump, then advance it ⅛ turn.

3. Start the engine and check for leaks.

3 REMOVAL AND INSTALLATION

DIAGNOSIS AND TESTING

Fuel pump diagnosis and test procedures are covered in Part 10-1, Section 1.

REMOVAL

1. Disconnect the inlet and outlet lines at the fuel pump.

2. Remove the pump retaining screws, then remove the pump and the gasket. Discard the gasket.

CLEANING AND INSPECTION

Clean and inspect the fuel pump. Refer to "Cleaning and Inspection" in Part 10-1 for the proper procedure.

INSTALLATION

1. Remove all the gasket material from the mounting pad and pump flange. Apply oil-resistant sealer to both sides of a new gasket.

2. Position the new gasket on the pump flange, and hold the pump in position against the mounting pad. Make sure the rocker arm is riding on the camshaft eccentric.

3. Press the pump tight against the pad, install the retaining screws, and alternately torque them to specifications.

4. Connect the fuel inlet and outlet lines.

5. Operate the engine and check for leaks.

4 MAJOR REPAIR OPERATIONS

AC FUEL PUMP— 6-CYLINDER ENGINES

DISASSEMBLY

1. Remove the filter housing, gasket and filter element. Discard the filter element.

2. Scribe a line on the flanges of the pump body and valve housing to identify their original position.

3. Remove the valve housing from the fuel pump body.

4. Remove the staking marks from around the valves, remove both valves and their gaskets from the valve housing. **Carefully note the position of the valves in the valve housing cover so that new valves can be correctly installed.**

5. Using a blunt punch or tool T56L-9350-A, Detail 3, drive the rocker arm pin out of the pump body (Fig. 6).

6. Press the pump diaphragm into the fuel pump body and pull the rocker arm outward to unhook the diaphragm actuating rod from the rocker arm and link assembly (Fig. 7).

7. Remove the diaphragm and diaphragm return spring, rocker arm and link assembly, and the rocker arm return spring from the pump body.



FIG. 6—Rocker Arm Pin Removal or Installation



FIG. 7—Fuel Pump Diaphragm Removal

8. Remove the diaphragm actuating rod oil seal retainer and the oil seal from the pump body (Fig. 1).

CLEANING AND INSPECTION

Refer to Part 10-1, Section 3 for the cleaning and inspection procedures.

ASSEMBLY

1. Immerse the new oil seal in clean engine oil for 2 minutes prior to installation. Install the diaphragm actuating rod oil seal and retainer so that the seal protrudes towards the diaphragm mounting flange (Fig. 1).

2. Seat the oil seal, using tool 9350-C or T56L-9350-A, Detail 1 (Fig. 8). Stake the oil seal retainer in at least 3 places to secure the installation.



FIG. 8—Seating the Oil Seal

3. Install the valves, and their gaskets, in the valve body so that the valve positions are as shown in Fig. 1.

4. Seat the valves firmly in the valve body, using tool 9350-D or T56L-9350-A, Detail 2. Stake the valves in place.

5. Lubricate the diaphragm actuating rod.

6. Position the fuel pump diaphragm and spring assembly into the pump body as shown in Fig. 9.

7. Hold the diaphragm assembly in the pump body; position the pump body so that the mounting flange faces up. Apply slightly more pressure to the lower edge of the diaphragm, and insert the rocker arm link assembly with the cam shoe facing away from the diaphragm. Hook the rocker arm link to the diaphragm actuating rod.

8. Lift one edge of the diaphragm and observe the positioning of the oil seal. **Make sure the oil seal is fully extended as shown in Fig. 10.** If the oil seal is not properly positioned, push the diaphragm into the pump body as far as possible with a slight twisting motion to the diaphragm. This will assist the oil seal to position itself properly on the diaphragm rod. **Do not twist the diaphragm too severely or the rod may be unhooked from the link.**

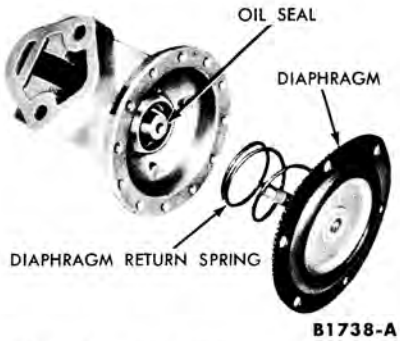


FIG. 9—Diaphragm Installation

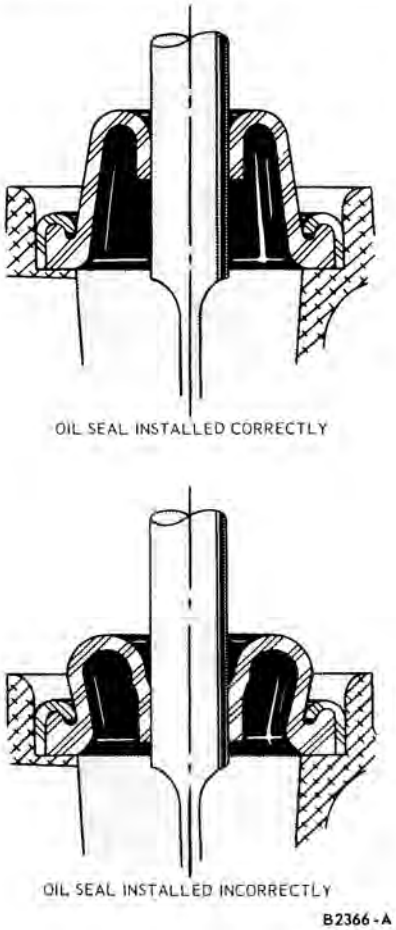


FIG. 10—Fuel Pump Oil Seal Installation

9. Install the rocker arm return spring and hold it in place by cocking the rocker arm slightly.

10. Install the rocker arm pin in the pump body.

11. Position the valve body and pump body so that the previously scribed marks are aligned.

12. Install all the screws and the lockwashers until the screws just engage the fuel pump body. **Make sure that all of the screws pass through the holes in the diaphragm without tearing the fabric.**

13. Alternately and evenly tighten all of the screws.

14. Cover all but one vent hole in the pump lower body, using masking tape or a similar material.

15. Using a suitable vacuum source, apply 15 inches of vacuum (Hg) to the underside of the pump diaphragm at the open vent hole. **Use a suitable rubber tipped probe or hose to assure proper sealing at the sealing at the vent hole.** Apply vacuum to the diaphragm 2 times for a minimum of one minute each time. This will position the oil seal properly on the diaphragm rod. Remove the sealing tape from the vents.

16. Install the fuel filter assembly. Refer to "Fuel Filter Replacement" (Part 10-6, Section 2) for the proper procedure.

CARTER FUEL PUMP V-8 ENGINES

DISASSEMBLY

1. Remove the filter housing, gasket, and filter element. Discard the filter element.

2. Scribe marks on the fuel pump body, valve housing, and valve housing cover so that these parts can be assembled in their original position.

3. Remove the valve housing assembly. Separate the valve housing from the cover and note the position of the pulsator diaphragm so that it can be assembled in its proper position. **Do not remove the fuel valves from the valve housing. The valve housing is replaced as an assembly.**

4. Remove the rocker arm return spring and the anti-force reversal lever.

5. Scrape away the staking mark and remove the rocker arm pin seal plug as shown in Fig. 11.

6. Press the fuel pump diaphragm into the fuel pump body to release the tension on the rocker arm and allow the rocker arm pin to fall out. If the pin does not come out freely, use needle nose pliers (Fig. 12).

7. Press the diaphragm into the fuel pump body and pull the rocker arm out to unhook the rod from the rocker arm link (Fig. 13).

8. Remove the fuel pump diaphragm assembly. Do not disassemble as the diaphragm and spring are serviced as an assembly only.

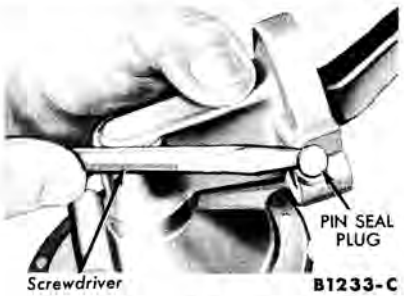


FIG. 11—Rocker Arm Seal Plug Removal

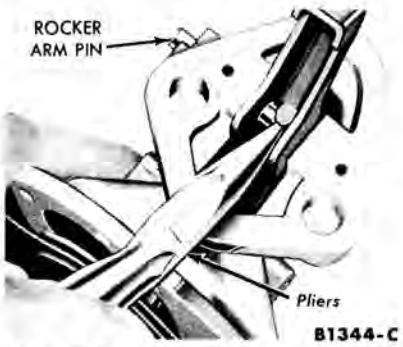


FIG. 12—Rocker Arm Pin Removal or Installation

CLEANING AND INSPECTION

Refer to Part 10-1, Section 3, for the cleaning and inspection procedures.

ASSEMBLY

1. Position the fuel pump diaphragm assembly into the pump body, then apply pressure on the diaphragm spring so that the rocker arm can be hooked on the rod as shown in Fig. 13.

2. Align the rocker arm pin holes by applying slight pressure on the diaphragm spring, then install the rocker arm pin (Fig. 12).

3. Install a new rocker arm pin seal plug. Stake the plug in position. Install the anti-force reversal lever.

4. Position the rocker arm return spring on the boss in the pump body. Compress the spring and slip it over the tang in the anti-force reversal lever.

5. Place a new pulsator diaphargm on the valve housing in the position previously noted on disassembly (opening in the diaphragm over the fuel inlet chamber as shown in Fig. 14). Position the cover on the valve housing, aligning the scribed lines on the cover with the line on the valve housing. Be sure the pulsator dia-



FIG. 13—Fuel Pump Diaphragm Removal or Installation

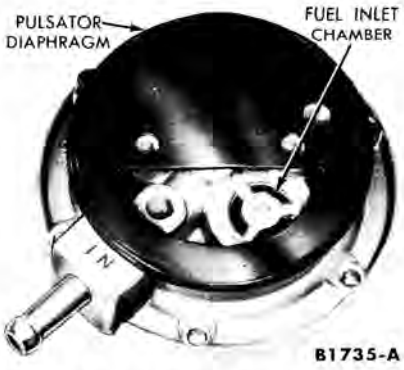


FIG. 14—Pulsator Diaphragm Installation

phragm extends evenly around the edge of the cover. Install and tighten the two retaining screws and lock washers inside the valve housing.

6. Align the scribe line on the valve housing and the line on the fuel pump body. Hold the valve housing assembly tight against the fuel pump body and install the six screws and lockwashers. Be sure the fuel pump diaphragm extends evenly around the edge of the valve housing before tightening the retaining screws.

7. Install the fuel filter assembly. Refer to "Fuel Filter Replacement" (Part 10-6, Section 2) for the proper procedure.

CARTER PERMANENTLY SEALED FUEL PUMPS— 289 V-8 ENGINES

DISASSEMBLY

The fuel pump assembly is shown in Fig. 3.

1. Remove the filter housing, gasket and filter element. Discard the gasket and the filter element (if required).

2. Scrape away the staking mark and remove the rocker arm pin seal plug as shown in Fig. 15.

3. Release the tension on the rocker arm spring pressure and allow the rocker arm pin to fall out. If the pin does not come out freely, tap the fuel pump assembly lightly on the bench until the pin sticks out

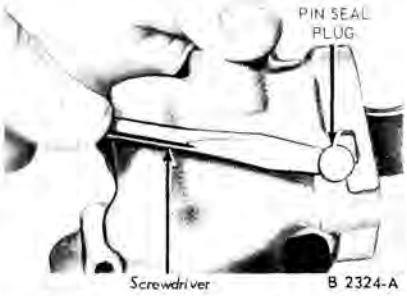


FIG. 15—Rocker Arm Pin Seal Plug Removal

of the bore; then, remove the pin with pliers. Remove the rocker arm and spring(s).

CLEANING AND INSPECTION

Clean and inspect the fuel pump component parts. Refer to "Cleaning and Inspection" (Part 10-1, Section 3) for the proper procedure. Replace all worn or damaged parts.

ASSEMBLY

The fuel pump assembly is shown in Fig. 3.

1. Insert the rocker arm spring into the spring guide bore in the dome of the fuel pump rocker arm cavity.

2. Insert the rocker arm into the cavity and hook it onto the diaphragm rod, directly below the rod flange. Position the rocker arm spring(s) over the spring locater(s) on the rocker arm. Align the rocker arm pin holes and install the rocker arm pin. **Make certain the rocker arm spring(s) is properly positioned on the spring locater on the rocker arm.**

3. Install a new rocker arm pin plug. Stake the plug into position.

4. Install the fuel filter assembly. Refer to "Fuel Filter Replacement" (Part 10-6, Section 2) for the proper procedure.

PART 10-7 FUEL TANK AND LINES

Section	Page	Section	Page
1 Description and Operation	10-68	2 Removal and Installation	10-68

1 DESCRIPTION AND OPERATION

The Falcons (except station wagon, sedan delivery and ranchero models), the Mustangs and the Fairlanes have a 16 gallon fuel tank. The Falcons (station wagon, sedan delivery and ranchero models) and the Comets have a 20 gallon fuel tank.

The tank of the Falcon (except station wagon, sedan delivery and ranchero models), Comet (except station wagon models) and Mustang is in the center of the luggage compartment floor and is retained to the floor by screws. The tank of the Falcon (station wagon, sedan delivery and ranchero models), Comet (station wagon models) and Fairlane is basically the same but is inverted. It is held by two steel support straps. Insulating pad strips are used between the support straps on the wagons and at contact points between the tank and floor pan on all vehicles.

The fuel gauge sender unit is located on the front side of the tank and is accessible from underneath the car.

The fuel outlet line is fastened to a connecting hose that is attached to a line which enters the fuel tank through the sender unit assembly. A filter is located in the tank on the fuel line pick-up tube. **This filter does not require servicing.**

On all except station wagon, sedan delivery and ranchero models, the fuel tank filler pipe opening is located in the center of the lower back panel.

On station wagon, sedan delivery and ranchero models, the fuel tank filler pipe opening is located in the left, rear quarter panel, above and rearward of the wheel well opening.

The tank is vented through the fuel filler cap on the Comet, Falcon (station wagon, sedan delivery and ranchero models), Fairlane and Mustang cars. The tank is vented by a vent tube on the Falcon sedans, hardtops and convertibles.

The filler pipe is attached to the tank with a hose and hose clamps. The fuel line is routed from the fuel tank, passing beneath the left side of the underbody; then, under the left fender and through the forward part of the fender apron. The complete fuel line is replaceable as a unit. However, only the damaged segments are usually replaced.

The fuel systems are shown in Figs. 1 thru 5.

2 REMOVAL AND INSTALLATION

FILLER PIPE

The fuel filler pipe is removeable on all vehicles.

REMOVAL

1. Drain the fuel tank with a siphon to a level below the filler pipe connection in the tank.

2. Remove the retaining screws securing the filler pipe to the body panel. Loosen the hose clamp and loosen the hose from the filler pipe. Rotate the filler pipe and pull it outward to remove it from the fuel tank.

INSTALLATION

1. If necessary, install new hose clamps on the filler pipe hose.

2. Position the filler pipe in the body panel and slide the hose onto the filler pipe. Install and tighten the filler pipe retaining screws.

3. Tighten the hose clamps.

FUEL TANK

The fuel tank installations are shown in Figs. 1 thru 5.

ALL EXCEPT STATION WAGON, RANCHERO, FAIRLANE AND SEDAN DELIVERY MODELS

Removal

1. Raise the rear of the car and position safety stands.

2. Remove the fuel tank drain plug and drain the fuel with a suitable container.

3. Disconnect the fuel gauge sending unit wire at the sending unit.

4. Loosen the hose clamp, slide the clamp forward and disconnect the fuel line at the fuel gauge sending unit.

5. Disconnect the fuel tank vent hose at the tank, if so equipped.

If the fuel gauge sending unit is to be removed, turn the unit retaining ring counterclockwise and remove the sending unit retaining ring and gasket.

6. Remove the spare tire from the luggage compartment. Pull the compartment floor mat out of the way for access to the fuel tank.

7. Remove the fuel tank filler neck retaining screws.

8. Loosen the filler neck to tank hose clamps. Remove the filler neck, mounting gasket, and filler neck to tank hose.

9. Remove the fuel tank to luggage compartment floor pan retaining screws and remove the fuel tank.

Installation

1. Make sure all the old sealer has been removed from the fuel tank mounting flange and mounting sur-

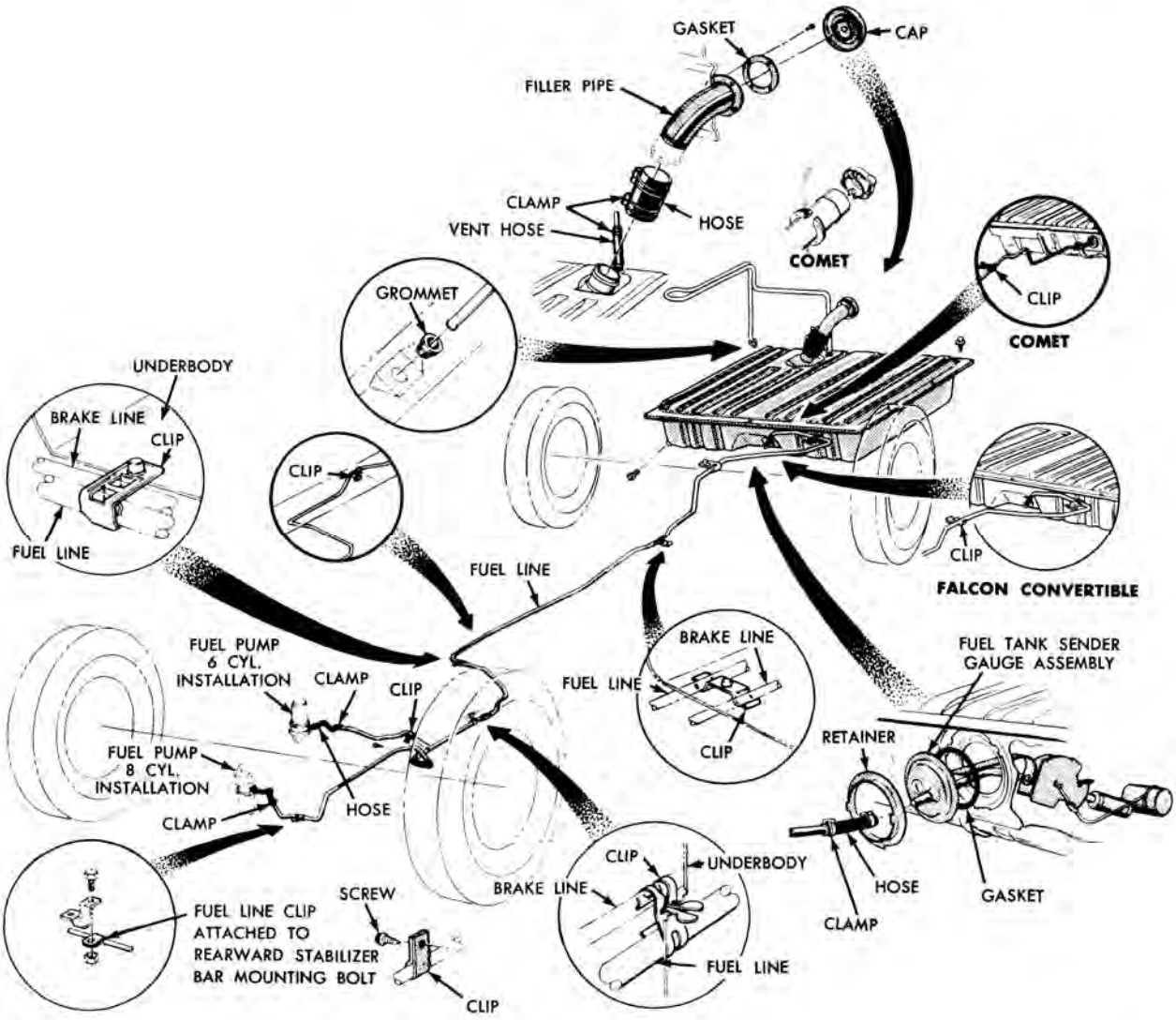


FIG. 1—Fuel System—Comet and Falcon (Except Station Wagon, Sedan Delivery and Ranchero Models)

face at the luggage compartment floor pan. Apply caulking cord to the fuel tank mounting surface at the luggage compartment floor pan.

2. Position the fuel tank to the luggage compartment floor pan and install the retaining screws.

3. Position the hose and filler neck assembly and gasket to the body back panel. Position the hose to the fuel tank neck.

4. Install the filler neck to body back panel retaining screws and tighten the hose clamps.

5. If the fuel gauge sending unit was removed, make sure all the old gasket material has been removed from the unit mounting surface on the fuel tank. Using a new gasket, position the fuel gauge to the fuel tank and secure with the retaining ring.

6. Position the luggage compartment floor mat and install the spare tire.

7. Connect the fuel gauge sending unit wire to the sending unit.

8. Connect the fuel line at the fuel gauge sending unit and tighten the hose clamps securely. Install the drain plug.

9. Connect the fuel tank vent hose, if so equipped.

10. Remove the safety stands and lower the car.

11. Fill the tank and check all connections for leaks.

STATION WAGON, RANCHERO, FAIRLANE AND SEDAN DELIVERY MODELS

Removal

1. Siphon the fuel from the fuel tank into a suitable container.

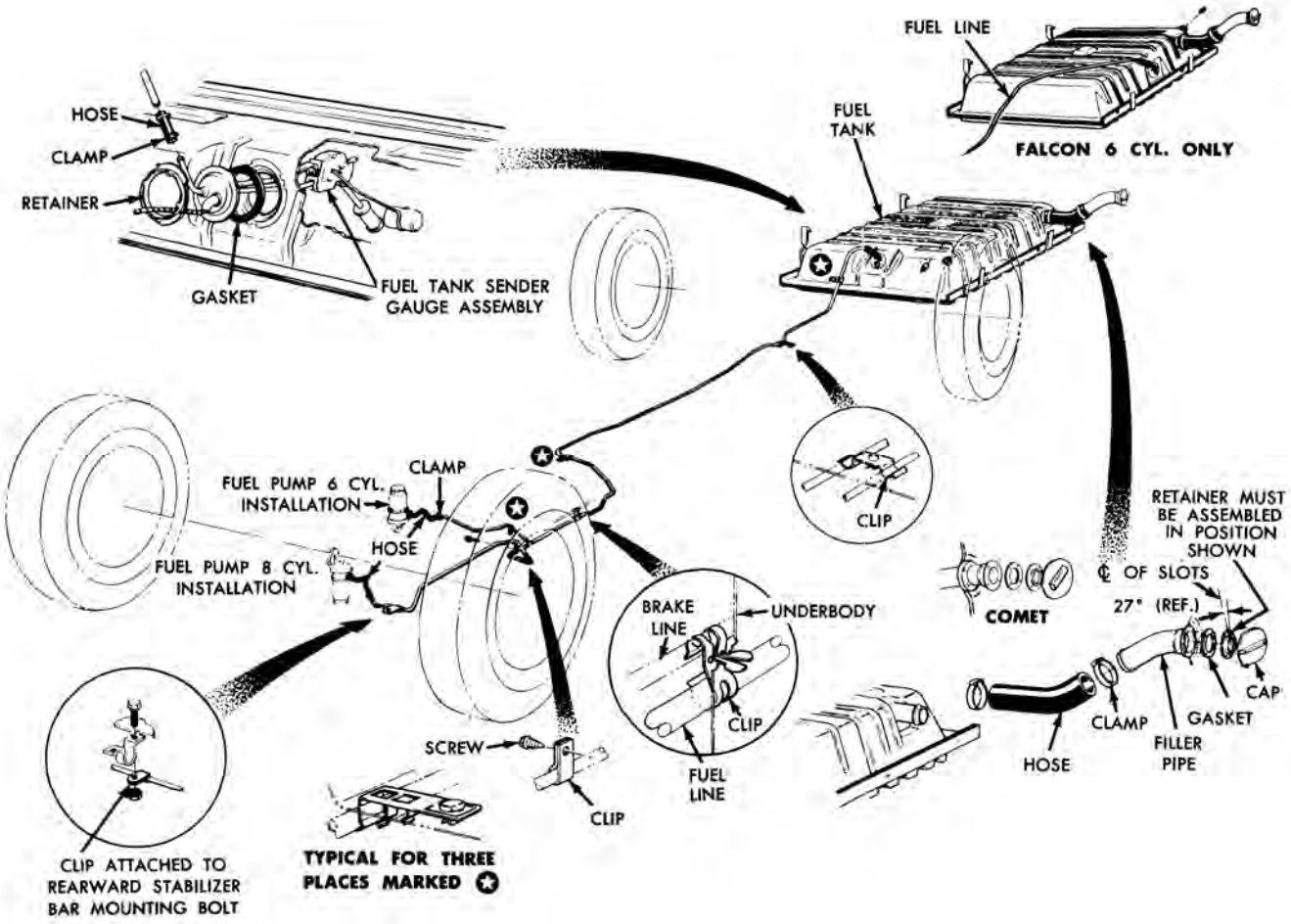
2. Loosen the filler hose clamp at the tank and disconnect the hose.

3. Disconnect the fuel gauge sending unit wire at the sending unit.

4. Loosen the clamps and disconnect the flexible fuel line at the sending unit.

5. Remove the two nuts retaining the fuel tank support straps to the underbody. Remove the straps and lower the tank.

6. Remove the fuel gauge sending unit.



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FIG. 2—Fuel System—Comet and Falcon Station Wagons, Sedan Delivery and Ranchero Models

Installation

1. Using a new gasket, install the fuel gauge sending unit.

2. Hold the tank in position against the underbody. Hook the support straps to the retainers in the underbody. Position the straps over the studs, then install the nuts retaining the straps to the underbody.

3. Connect the fuel line and filler hose.

4. Connect the fuel gauge sending unit wire.

5. Fill the tank and check all connections for leaks.

FUEL LINES

The various fuel lines (Figs. 1 thru 5) are not serviced as assemblies. They must be cut, squared and formed out of rolls of fuel system service tubing and hose material available at dealerships.

A damaged section of **tubing** longer than 12 inches can be cut out of the existing line and replaced by a comparable service **tubing section,** spliced into the line by means of connecting hoses and retaining clamps.

A damaged section of tubing shorter than 12 inches can be cut out of the line and replaced by a length of service hose and two retaining clamps. **All replacement hoses must be cut to a length that will insure proper clamp retention beyond the flared ends of the connecting tubing.**

REMOVAL

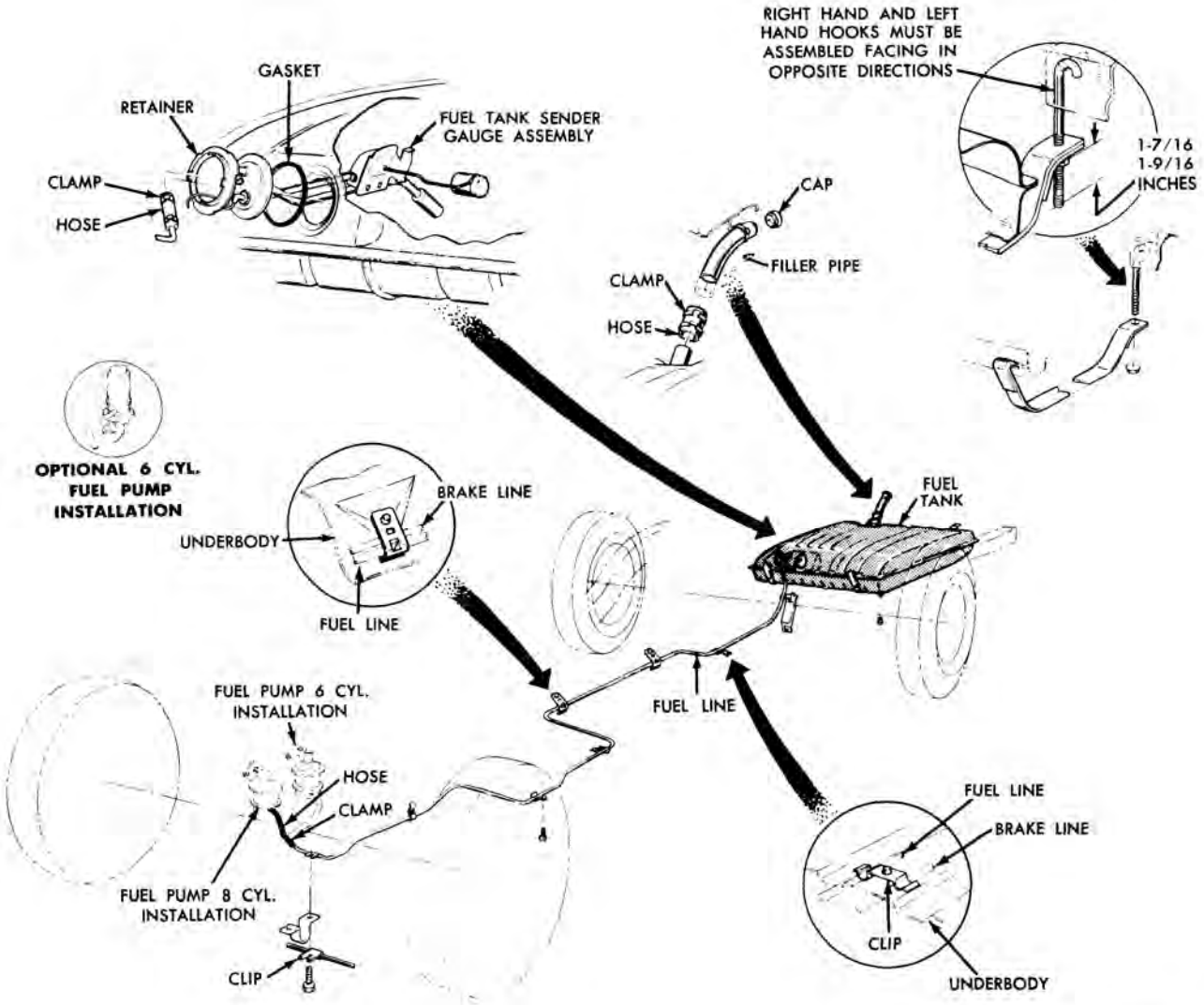
1. Drain the fuel from the tank.

2. Disconnect the line at the fuel gauge sender unit and the fuel pump. Remove the lines from the holding clips along the underbody. Remove all damaged hose sections and tube sections.

INSTALLATION

1. Cut a new section of tubing to approximately the same length as the section to be replaced. **Allow extra length for flaring the ends of the tubing.** Square the ends of the cut tubing with a file.

2. Ream the inside edges of the cut tubing with the reamer blade on the tube cutter. **Be sure metal chips are removed from inside the tube(s).**



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FIG. 3—Fuel System—Fairlane (Except Station Wagon Models)

Flare the ends of the cut tubing, as required, with a standard tube flaring kit and tool (Fig. 6).

3. Bend the tube section to conform to the contour of the original tube. Cut an ample length of hose to form a coupling between the flared ends of the fuel lines. Connect the hose couplings to the tubing and install the retaining clamps.

4. Position the lines in the underbody clips and tighten the clips. Connect the line to the fuel gauge sender unit and the fuel pump. Fill the tank and check for leaks.

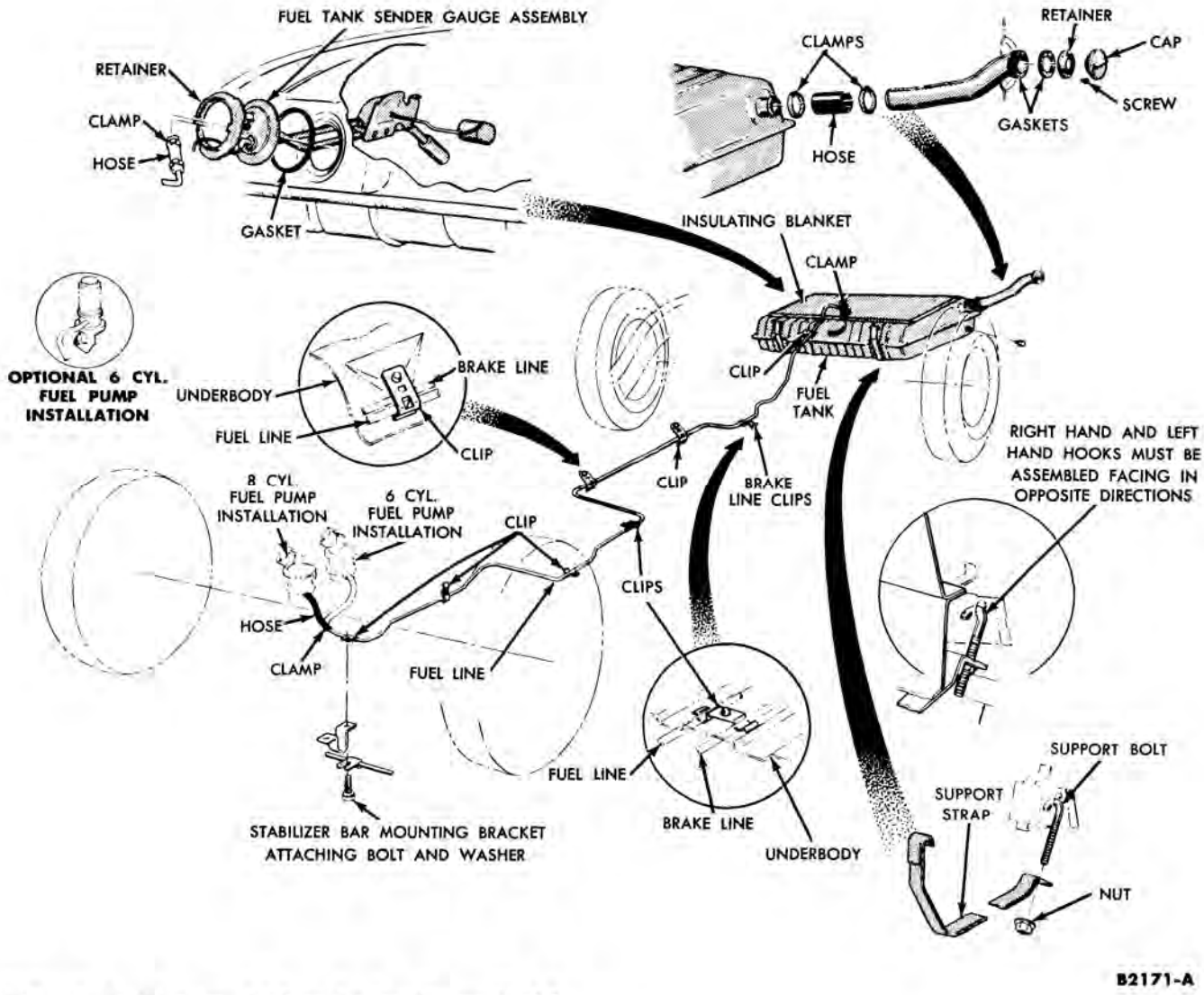


FIG. 4—Fuel System—Fairlane Station Wagon Models

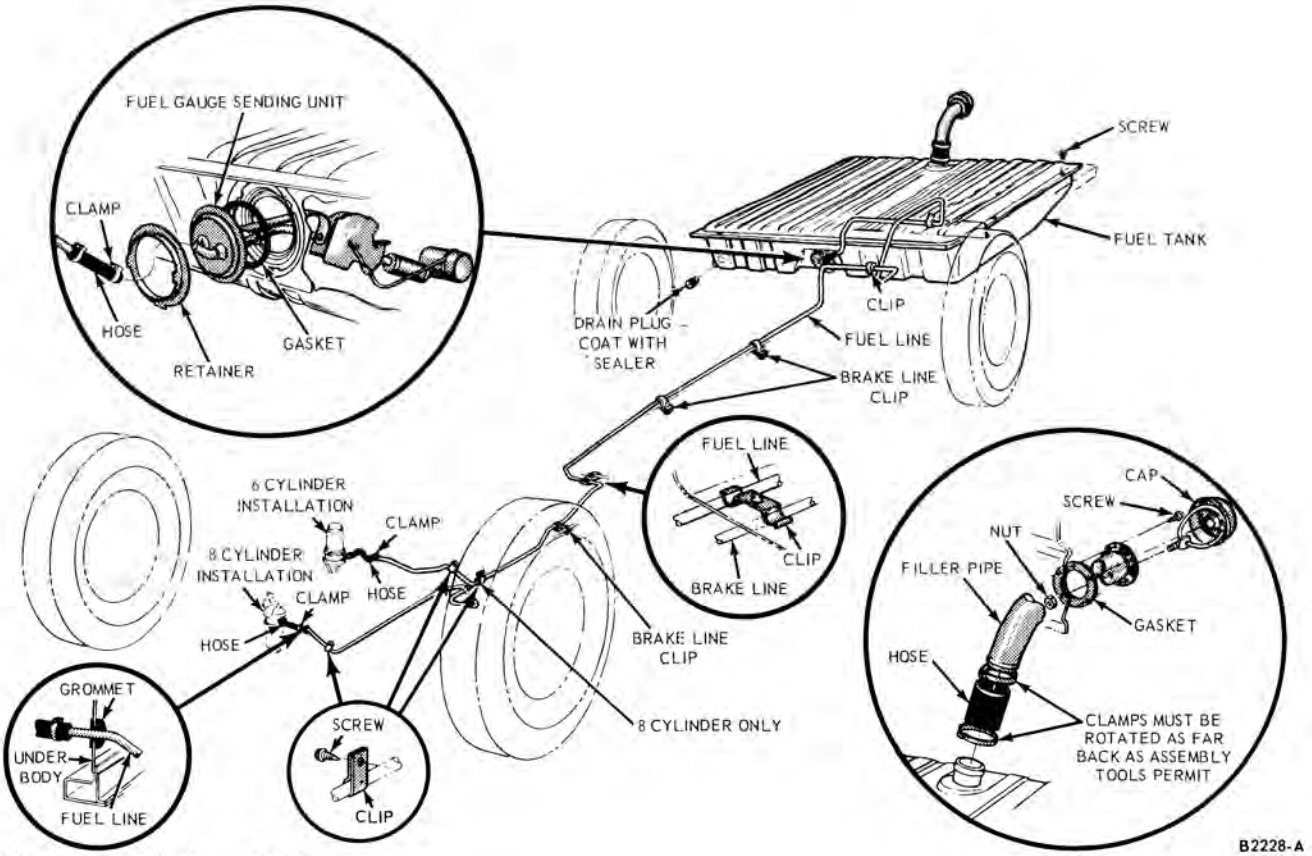


FIG. 5—Fuel System—Mustang

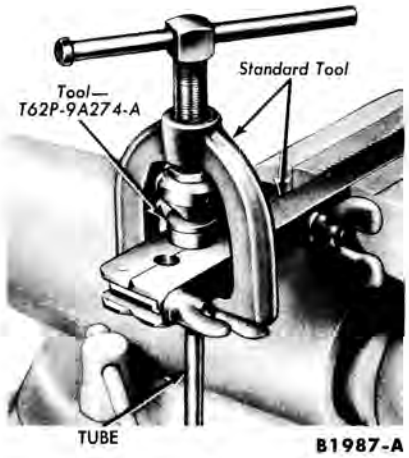


FIG. 6—Fuel Line Tube Die

PART 10-8 SPECIFICATIONS

MECHANICAL FUEL PUMPS

FUEL PUMP STATIC PRESSURE—Psi @ 500 Engine rpm	
All 6-Cyl.	4.0—6.0
All 8-Cyl.	6.0
MINIMUM FUEL PUMP VOLUME—Flow @ 500 Engine rpm	
All 6-Cyl.	1 pint in 30 seconds
All 8-Cyl.	1 pint in 20 seconds
ECCENTRIC TOTAL LIFT	
All 6-Cyl.	0.290—0.310
All 8-Cyl.	0.690—0.710

CARBURETOR APPLICATION

The basic part number of all the carburetors is 9510. The part number prefix and suffix appears on the identification tag mounted on the air horn. Always refer to the Master Parts Catalog for parts interchangeability before replacing a carburetor, or a component part for a carburetor.

Engine	Crankcase Vent System	Trans.	Carburetor Number	Carburetor Type
170	Positive	Manual	C4ZF-9510-A	Ford 1-V
170	Positive	Auto.	C4ZF-9510-B	Ford 1-V
170	Positive	Manual	C4ZF-9510-J	Ford 1-V
170	Positive	Auto.	C4ZF-9510-K	Ford 1-V
170	Positive	Manual	C5DF-9510-E	Ford 1-V
170	Positive	Auto.	C5DF-9510-F	Ford 1-V
170	Vent Tube	Manual	C5DF-9510-G	Ford 1-V
170	Vent Tube	Auto.	C5DF-9510-H	Ford 1-V
200	Positive	Manual	C5OF-9510-E	Ford 1-V
200	Positive	Auto.	C5OF-9510-F	Ford 1-V
200 (Taxi)	Positive	Manual	C5OF-9510-H	Ford 1-V
200	Vent Tube	Manual	C5OF-9510-N	Ford 1-V
200	Vent Tube	Auto.	C5OF-9510-R	Ford 1-V
200 (Taxi)	Vent Tube	—	C5OF-9510-S	Ford 1-V
260	Positive	Manual	C4ZF-9510-F	Ford 2-V
260	Positive	Auto.	C4ZF-9510-E	Ford 2-V
289	Positive	Manual	C4GF-9510-AE	Ford 4-V
289	Positive	Auto.	C4GF-9510-AF	Ford 4-V
289 (HP)	Vent Tube	Manual	C4OF-9510-AL	Ford 4-V (Manual Choke)
289 (HP)	Positive	Auto.	C4OF-9510-AT	Ford 4-V (Manual Choke)
289 (HP)	Positive	Manual	C5OF-9510-J	Ford 4-V
289 (HP)	Positive	Auto.	C5OF-9510-K	Ford 4-V
289 (HP)	Vent Tube	Manual	C5OF-9510-L	Ford 4-V (Manual Choke)
289 (HP)	Vent Tube	Auto.	C5OF-9510-M	Ford 4-V (Manual Choke)
289	Positive	Manual	C5ZF-9510-A	Ford 2-V
289	Positive	Auto.	C5ZF-9510-B	Ford 2-V
289	Positive	Manual	C5ZF-9510-C	Ford 4-V
289	Positive	Auto.	C5ZF-9510-D	Ford 4-V
289	Positive	Manual	C5ZF-9510-E	Ford 4-V
289	Positive	Auto.	C5ZF-9510-F	Ford 4-V
289	Vent Tube	Manual	C5ZF-9510-G	Ford 2-V
289	Vent Tube	Auto.	C5ZF-9510-H	Ford 2-V
289	Vent Tube	Manual	C5ZF-9510-J	Ford 4-V
289	Vent Tube	Auto.	C5ZF-9510-K	Ford 4-V

FORD 1-V CARBURETORS

THROTTLE BORE DIAMETER—Inches	
All Carburetors	1 1/16
VENTURI DIAMETER—Inches	
C4ZF-A, B, J and K	1.100
C5DF-E, F, G and H	1.100
C5OF-E, F, N, R and S	1.200
C5OF-H	1.100
MAIN METERING JET IDENTIFICATION NUMBER	
0-5000 Feet	
C4ZF-J and A	60F
C4ZF-K and B	59F
C5DF-E	64F
C5DF-F	62F
C5DF-G	63F
C5DF-H	61F
C5OF-E	69F
C5OF-F and R	67F
C5OF-H and S	62F
C5OF-N	68F
5,000-10,000 Feet	
C4ZF-9510-A	58F
C4ZF-9510-B	57F
C4ZF-9510-J	60F
C4ZF-9510-K	59F
C5DF-E	62F
C5DF-F	60F
C5DF-G	61F
C5DF-H	59F
C5OF-E	67F
C5OF-F and R	65F
C5OF-H and S	60F
C5OF-N	66F
SPARK CONTROL VALVE IDENTIFICATION—Color.....Plain	
***FAST IDLE CAM LINKAGE SETTING (CLEARANCE)—Inches**	
All Carburetors	0.020 #76 Drill

*Gauge thickness between throttle plate and side of throttle bore with throttle plate and choke plate closed. Turn fast idle adjustment screw inward until it just contacts the fast idle cam.

CHOKE PLATE PULLDOWN CLEARANCE—Inches	
C4ZF-A, B, J and K	0.140
C5DF-E and G	0.100-0.120
C5DF-F and H	0.140-0.160
C5OF-E, H and N	0.130-0.150
C5OF-F	0.140-0.150
C5OF-R	0.140-0.160
C5OF-S	0.160-0.300

ACCELERATOR PUMP

Accelerator Pump Clearance Adjustment

3/16 inch from pump cover surface to pin in "HI" position (throttle plate seated in throttle bore).

Accelerator Pump Lever Adjustment—Temperature and Altitude

Pin in "HI" Position	50°F and below
Pin in "LO" Position	50°F and above, and above 5,000 feet altitude

***FLOAT SETTING DRY—Inches**	
All Carburetors	
Rubber Float	1 ± 1/32
Metal Float	1 3/32 ± 1/32

*Distance from gasket surface of upper body to the top of float (body inverted).

***ANTI-STALL DASHPOT**	
All Carburetors	3¼-3¾

*Turns in after the initial contact of the adjusting screw with the diaphragm

FORD CARBURETORS—Continued

CHOKE THERMOSTATIC SPRING HOUSING
Spring Identification

C4ZF-A, B, J and K	TM
C5DF-E and F	TM
C5DF-G	TS
C5DF-H	TP
C5OF-E, F and R	TP
C5OF-H and N	TS

Housing Initial Setting—Set At:

C4ZF-A, B, J and K	Index
C5OF-E and G	Two digits lean
C5DF-F and H	Index
C5OF-E and H	One digit lean
C5OF-F	Index

DECHOKE CLEARANCE—Inches
Mininum between choke plate and air horn with throttle plate in wide open position ..... ¼

FAST (COLD ENGINE) IDLE ADJUSTMENT—Engine rpm

C4ZF-A and J	1300
C4ZF-B and K	1500
C5DF-E and G	1300
C5DF-F and H	1500
C5OF-E, H, N and S	1300
C5OF-F and R	1500

***PRELIMINARY IDLE FUEL MIXTURE ADJUSTMENT**
All Carburetors ..... 1½ turns open
*Turns back from bottomed needle.

***PRELIMINARY IDLE ADJUSTMENT—All Carburetors**
Set the idle adjusting screw to just make contact with the stop on lower body, then turn the screw inward (clockwise) an additional turn.
*Throttle Plate seated in throttle bore.

IDLE (HOT ENGINE) SPEED ADJUSTMENT
Refer to "Engine Specifications" (Group 8, Part 4).

VENT VALVE ADJUSTMENT
Refer to "Vent Valve Adjustment" (Group 10, Part 10-1, Section 2) for the proper procedure.

FORD 2-V CARBURETORS

THROTTLE BORE DIAMETER—Inches
All Carburetors 1 7/16

VENTURI DIAMETER—Inches

C4ZF-E and F	1.010
C4ZF-A, B, G and H	1.145

BOOSTER VENTURI CODE LETTER

C4ZF-E	CA
C4ZF-F	CD
C5ZF-A and G	CG
C5ZF-B and H	CE

MAIN METERING JET IDENTIFICATION NO.
0-5000 Feet

C4ZF-E	42F
C4ZF-F	43F
C5ZF-A, G and H	51F
C5ZF-B	50F

5,000-10,000 Feet

C4ZF-E	40F
C4ZF-F	41F
C5ZF-A, G and H	49F
C5ZF-B	48F

POWER VALVE IDENTIFICATION NUMBER OR COLOR
0-5,000 Feet

C4ZF-E and F	Green
C5ZF-A	Red
C5ZF-B, G and H	Green

5,000-10,000 Feet

C4ZF-E and F	Yellow
C5ZF-A	Plain
C5AF-B, G, and H	Yellow

CHOKE PLATE PULLDOWN CLEARANCE—Inches

C4AF-E	0.078
C4ZF-F	0.125
C5ZF-A	0.130-0.150
C5ZF-B	0.120-0.140
C5ZF-G	0.130-0.150
C5ZF-H	0.120-0.140

***Gauge Thickness**
All automatic choke equipped carburetors 0.036
*Between lower edge of the automatic choke piston slot and the slot in the choke housing.

***ACCELERATOR PUMP SETTING**

C4ZF-E	No. 3
C4ZF-F	No. 4
C5ZF-A	No. 4
C5ZF-B, G and H	No. 3

*With link in the inboard hole of the pump lever.

***FLOAT SETTING—Dry Inches**

C4ZF-E and F	19/64
C5ZF-A, B, G and H	15/32 ± 1/64

*Measured from the top machined surface of main body to top surface of float at a point ⅛ inch from the free end of float and 5/16 inch in from the side of the float adjacent to the inside wall of the fuel bowl.

***PRELIMINARY IDLE MIXTURE SETTING** ..... 1½ turns open
*Turns back from bottomed needle.

***ANTI-STALL DASHPOT CLEARANCE—Inches**
(Throttle Plate Closed) 5/64
*With engine idle speed and mixture properly adjusted and the engine at normal operating temperature.

***FUEL LEVEL SETTING—WET—Inches**

C4ZF-E and F	¾
C5ZF-A, B, G and H	⅞

*Below the top machined surface of the main body, ¼ inch away from any vertical surface.

CHOKE THERMOSTATIC SPRING HOUSING
Spring Identification

C4ZF-E	TO
C4ZF-F	TK
C5ZF-A and G	TN
C5ZF-B and H	TO

Spring Housing Initial Setting

C4ZF-E	Two digits rich
C4ZF-F	Two digits lean
C5ZF-A and G	At index
C5ZF-B and H	Two digits rich

DECHOKE CLEARANCE—Inches
Minimum between choke plate and air horn with throttle plates in wide open position 1/16

***FAST IDLE CAM LINKAGE SETTING (CLEARANCE)—Inches**

C4ZF-E	0.062
C4ZF-F	0.093
C5ZF-A and G	0.120-0.140
C5ZF-B and H	0.110-0.130

*Clearance between choke plate and air horn with the fast idle screw on the index mark of the fast idle cam and the choke thermostatic spring housing turned 90° rich.

***FAST (COLD ENGINE) IDLE ADJUSTMENT**

C4ZF-E	1600 rpm
C4ZF-F	1400 rpm
C5ZF-A and G	1400 rpm
C5ZF-B and H	1600 rpm

*With fast idle screw adjacent to the shoulder of the highest step (screw aligned with arrow mark) on the cam. The idle speed must be adjusted to specification prior to performing a fast idle adjustment.

IDLE (HOT ENGINE) SPEED ADJUSTMENT
Refer to "Engine Specifications" (Group 8, Part 4).

FORD 4-V CARBURETORS

THROTTLE BORE DIAMETER—Inches

	Primary	Secondary
C4GF-AE and AF	1 1/16	1 1/16
C40F-AL and AT	1 9/16	1 9/16
C50F-J, K, L and M	1 1/16	1 1/16
C5ZF-C, D, E, F, J and K	1 1/16	1 1/16

VENTURI DIAMETER—Inches

	Primary	Secondary
C4GF-AE and AF	1.080	1.189
C40F-AL and AT	1.125	1.189
C50F-J, K, L and M	1.125	1.189
C5ZF-C, D, E, F, J and K	1.080	1.189

BOOSTER VENTURI CODE LETTER

	Primary	Secondary
C4GF-AE	KE	AA
C4GF-AF	KA	BA
C40F-AL	M	BA
C40F-AT	MA	BA
C50F-J and L	M	BA
C50F-K and M	MA	BA
C5ZF-C and E	CF	A
C5ZF-D and F	CH	A
C5ZF-J	M	BA
C5ZF-K	MA	BA

MAIN METERING JET IDENTIFICATION NUMBER

0-5,000 Feet	Primary	Secondary
C4GF-AE	48F	56F
C4GF-AF	45F	56F
C40F-AL	51F	70F
C40F-AT	49F	69F
C50F-J and L	52F	68F
C50F-K and M	50F	69F
C5ZF-C and E	49F	58F
C5ZF-D and F	48F	58F
C5ZF-J	52F	68F
C5ZF-K	50F	69F
5,000-10,000 Feet	**Primary**	**Secondary**
C4GF-AE	46F	54F
C4GF-AF	43F	54F
C40F-AL	49F	68F
C40F-AT	47F	67F
C50F-J and L	50F	66F
C50F-K and M	48F	67F
C5ZF-C and E	47E	56F
C5ZF-D and F	46F	56F
C5ZF-J	50F	66F
C5ZF-K	48F	67F

POWER VALVE IDENTIFICATION NUMBER OR COLOR

0-5,000 Feet	Plain
5,000-10,000 Feet	Green

CHOKE PLATE PULLDOWN CLEARANCE—Inches

C4GF-AE	0.140
C4GF-AF	0.125
C40F-AL and AT	0.218
C50F-J, K, L and M	0.210-0.250
C5ZF-C, D, E, F, J and K	0.110-0.130
*Gauge Thickness	
All automatic choke equipped carburetors	0.036

*Between the lower edge of automatic choke piston slot and the slot in the choke housing.

ACCELERATOR PUMP SETTING

C4GF-AE and AF	3*
C40F-AL	3**
C40F-AT	2*
C50F-J, K, L and M	3*
C5ZF-C, D, E, F, J and K	3*

*With link in the inboard hole of the pump lever.

**With link in the outboard hole of the pump lever.

***FLOAT SETTING—DRY—Inches**

	Primary	Secondary
C4GF-AE and AF	29/64	29/64
C40F-AL and AT	15/32	29/64
C50F-J, K and M	29/64	29/64
C50F-L	15/32	29/64
C52F-C, D, E, F, J and K	29/64	29/64

*Measured from the top machined surface of main body to top surface of float at a point 1/8 inch from free end of float and 5/16 inch in from the side of the float adjacent to the inside wall of the fuel bowl.

***PRELIMINARY IDLE MIXTURE SETTING** 1-1½ turns open

*Turns back from bottomed needle.

***ANTI-STALL DASHPOT CLEARANCE—Inches**

(Throttle Plates Closed) 5/64

*With engine idle speed and mixture properly adjusted and the engine at normal operating temperature.

***FUEL LEVEL SETTING—WET—Inches**

	Primary	Secondary
C4GF-AE and AF	29/32	29/32
C40F-AL and AT	1/8	29/32
C50F-J, K, L and M	1/8	29/32
C5ZF-C, D, E, F, J and K	29/32	29/32

*Below top machined surface of the main body, ¼ inch away from any vertical surface.

CHOKE THERMOSTATIC SPRING HOUSING

Spring Identification	
C4GF-AE and AF	TO
C5ZF-C, E and J	TN
C5ZF-D, F and K	TO
Spring Housing Initial Setting	
C4GF-AE	At index
C4GF-AF	Two digits rich
C5ZF-C, D, E, F, J and K	Two digits rich

DECHOKE CLEARANCE—Inches

Minimum between choke plate and air horn with throttle plates in wide open position 1/16

***FAST IDLE CAM LINKAGE SETTING (CLEARANCE)—Inches**

C4GF-AE	0.125
C4GF-AF	0.109
C5ZF-C, E and J	0.110-0.130
C5ZF-D, F and K	0.090-0.110

*Clearance between choke plate and air horn with the fast idle screw on the index mark on the fast idle cam and the thermostatic spring housing turned 90° rich.

***FAST (COLD ENGINE) IDLE ADJUSTMENT**

C4GF-AE	1400 rpm
C4GF-AF	1600 rpm
C4GF-AL and AT	1800 rpm
C50F-J and K	1800 rpm
C50F-L	1400 rpm
C50F-M	1600 rpm
C5ZF-C, E and J	1400 rpm
C5ZF-D, F and K	1600 rpm

*With fast idle screw adjacent to the shoulder of the highest step (screw aligned with arrow mark) on the cam. The idle speed must be adjusted to specification prior to performing a fast idle adjustment.

SECONDARY THROTTLE PLATE SETTING

Turns after screw contacts lever ¾

IDLE (HOT ENGINE) SPEED ADJUSTMENT

Refer to "Engine Specifications" (Group 8, Part 4).

CARBURETOR AIR CLEANERS

ALL ENGINES	Paper or Plastic

FUEL TANK CAPACITIES

FALCON (Except Ranchero, Sedan Delivery and Station Wagon)	
U.S. Measure	16 gallons
Imperial Measure (Approximate)	13¼ gallons
FALCON RANCHERO, SEDAN DELIVERY AND STATION WAGON	
U.S. Measure	20 gallons
Imperial Measure (Approximate)	16½ gallons
COMET	
U.S. Measure	20 gallons
Imperial Measure (Approximate)	16½ gallons
MUSTANG	
U.S. Measure	16 gallons
Imperial Measure (Approximate)	13¼ gallons
FAIRLANE	
U.S. Measure	16 gallons
Imperial Measure (Approximate)	13¼ gallons

SPECIAL TOOLS

TOOL	NUMBER
Choke Plate Staking Pliers	9586
Wire Gauges or Drills (to meet carburetor adjustment specifications)	As required
Carburetor Power Valve and Gasket Test Fixture	T57L-9904-A and T57L-9904-A17
Vent Arm Adjusting Tool	99701
Throttle Connecting Link Bending Tool	99798
Retaining Ring Remover	9550-AAA
Fuel Pump Pressure and Capacity Tester	
Fuel Pump Overhaul Tool Kit	T56L-9350-A
Fuel Line Tube Die	T62P-9A274-A

COOLING SYSTEM

GROUP 11

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PART 11-1 GENERAL COOLING SYSTEM SERVICE

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2 Maintenance	11-2	4 Cleaning and Inspection	11-4

1 DIAGNOSIS AND TESTING

DIAGNOSIS

Engine overheating and slow engine warm-up are the two engine troubles most commonly attributed to the cooling system.

Loss of coolant, thermostat stuck in the closed position, restricted air flow through the radiator, or accumulation of rust and scale in the system are the main causes of overheating. Coolant loss may be due to external leakage at the radiator, radiator pressure cap, water pump, hose connections, heater, or core plugs. Coolant loss may also be caused by internal leakage due to a defective cylinder head gasket, improper tightening of the cylinder head bolts, or warped cylinder head or block gasket surfaces.

Internal leakage can be detected by operating the engine at fast idle and looking for the formation of bubbles in the radiator. Oil in the radiator may indicate leakage in the engine block or a leak in the automatic transmission oil cooler. Water formation on the oil level dipstick could also be an indication of internal leakage.

Rust and scale that form in the engine water passages are carried into the radiator passages by the circulation of the coolant. This clogs the radiator passages and causes overheating. Rust can be detected by the appearance of the coolant. If the coolant has a rusty or muddy appearance, rust is present.

A defective thermostat that remains open will cause slow engine warm-up.

DIAGNOSIS GUIDE

ENGINE OVERHEATS	Insufficient coolant. Belt tension incorrect. Radiator fins obstructed. Thermostat stuck closed. Cooling system passages blocked by rust, scale or other foreign matter. Water pump inoperative. Faulty fan drive clutch.
ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE	Thermostat stuck open or of incorrect heat range. Temperature sending unit defective (causing gauge to indicate low engine temperature). Temperature gauge defective (not indicating true engine temperature).
LOSS OF COOLANT	Leaking radiator, radiator supply tank, or transmission oil cooler. Loose or damaged hose connections. Water pump leaking. Cylinder head gasket defective. Improper tightening of cylinder head bolts. Cylinder block core plugs leaking. Cracked cylinder head or block, or warped cylinder head or block gasket surface. Radiator pressure cap defective or wrong type.

TESTING

COOLING SYSTEM PRESSURE TEST

It is recommended that a cooling system pressure test gauge be used to properly test the system for:

1. Blown or leaking cooling system sealing gaskets.
2. Internal or external coolant leakage.
3. Pressure cap malfunction.

Many types of pressure gauges are available for use. Therefore, it is recommended that the gauge manufacturer's instructions be followed when performing the test. **Never exceed the rated pressure indicated on the pressure cap when performing the pressure test.**

THERMOSTAT TEST

Remove the thermostat and immerse it in boiling water. Replace the thermostat if it does not open more than ¼ inch.

If the problem being investigated is insufficient heat, the thermostat should be checked for leakage. This may be done by holding the thermostat up to a lighted background. Light leakage around the thermostat valve (thermostat at room temperature) is unacceptable and the thermostat should be replaced. It is possible, on some thermostats, that a slight leakage of light at one or two locations on the perimeter of the valve may be detected. This should be considered normal.

FAN DRIVE CLUTCH TEST

1. Run the engine at approximately 1000 rpm until normal operating temperature is reached. This process can be speeded up by blocking off the front of the radiator with cardboard.
2. Stop the engine and, using a cloth to protect the hand, immediately check the effort required to turn the fan. If considerable effort is required, it can be assumed that the coupling is operating satisfactorily. If very little effort is required to turn the fan, it is an indication that the coupling is not operating properly, and it should be replaced.

2 MAINTENANCE

COOLANT

Correct coolant level is essential for maximum circulation and adequate cooling. In addition, for the cooling system to perform its function, it must receive proper care. This includes keeping the radiator fins clean and a periodic inspection of the cooling system for leakage.

Use care when removing the radiator cap to avoid injury from escaping steam or hot water.

In production, the cooling system is filled with a long-life coolant mixture which prevents corrosion, keeps the cooling system clean, provides anti-freeze protection to –35°F in winter and provides for summer operation at system temperatures up to 250°F without boiling.

For the most effective cooling system operation, this mixture strength should be maintained all year round and in all climates.

All coolant added should be a 50-50 mixture of Rotunda permanent anti-freeze and water.

To avoid possible overheating in very hot weather, do not use mixtures with more than 50% anti-freeze except in areas where anti-freeze protection below –35° is required. In this case, refer to the coolant mixture chart on the Rotunda permanent anti-freeze container.

Whenever the system is completely refilled, add a can of Rotunda Radiator Rust Inhibitor.

A standard ethylene glycol hydrometer can be used to check the protection level of the long-life coolant.

Refer to Group 19 for the recommended cooling system drain interval.

DRAINING AND FILLING THE COOLING SYSTEM

To prevent loss of anti-freeze when draining the radiator, attach a hose on the radiator drain cock and drain the anti-freeze from the radiator into a clean container.

To drain the radiator, open the drain cock located at the bottom of the radiator. The 6-cylinder engine block has one drain plug located at the right rear of the cylinder block, ahead of the starter (Fig. 1). The V-8 engines have a drain plug on each side of the cylinder block.

To fill the cooling system, close the drain cock. Install the block drain plug(s). Disconnect the heater outlet hose at the water pump to bleed or release trapped air in the system. When the coolant begins to escape, connect the heater outlet hose.

Operate the engine until normal operating temperature is reached, and add more coolant, if necessary, to fill the radiator to the proper level, one inch below bottom of filler neck.

After the initial fill the coolant level may drop approximately one quart after the engine has been operated about 20 minutes at 2000 rpm. This is due to the displacement of entrapped air.



FIG. 1—Typical Cylinder Block Drain Plug

FAN DRIVE BELTS

If the fan drive belt(s) are noisy, check the tension of the belts to make certain they are within specifications. Also, check for misaligned pulleys. If the drive belts are worn or frayed, replace them following the procedures in Part 11-1, Section 3.

3 COMMON ADJUSTMENTS AND REPAIRS

ADJUSTMENTS

DRIVE BELTS

The fan drive belt(s) should be properly adjusted at all times. A loose drive belt(s) causes improper alternator, fan and water pump operation. A belt(s) that is too tight places a severe strain on the water pump and the alternator bearings.

Properly tensioned drive belts minimize noise and also prolong service life of the belt. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt, and when adjusted, it must be adjusted to the reset tension shown in the specifications.**

Belt Tension

1. Install the belt tension tool on the drive belt (Fig. 2) and check the tension following the instructions of the tool manufacturer.

Due to the inaccessibility of the generator belt on Comet cars equipped with air conditioning and power steering, a belt tension gage cannot be used. Therefore, it must be tensioned by the deflection method. Deflection should not exceed ¼" when thumb pressure is applied.

2. If adjustment is necessary, loosen the alternator mounting and adjusting arm bolts. Move the alternator toward or away from the engine until the correct tension is obtained. Tighten the alternator adjusting arm and the mounting bolts. Check the belt tension.



FIG. 2—Checking Drive Belt Tension

REPAIRS

FAN REPLACEMENT

6-Cylinder Engines

1. Remove the capscrews and lock washers retaining the fan to the water pump hub. Remove the fan.

2. Position the fan on the water pump hub. Install the lock washers and capscrews and torque the capscrews to specifications.

V-8 Engines. On a car with an air conditioner or extra-cooling radiator, a fan drive clutch may be used (see specifications). Cars without air conditioning utilize a pulley-to-fan spacer.

1. Remove the radiator upper support and fan guard. Remove the capscrews and lock washers retaining the fan and spacer (or fan drive clutch) to the water pump hub. Remove the fan and spacer (or fan drive clutch).

2. If equipped with a fan drive clutch, remove the retaining capscrews and lock washers and separate the fan from the drive coupling. Position the replacement fan on the drive clutch and install the lock washers and capscrews.

3. Position the fan and spacer (or drive clutch) on the water pump hub and install the lock washers and capscrews. Torque the capscrews evenly and alternately to specifications. Install the radiator upper support and fan guard.

FAN BELT REPLACEMENT

1. On a car with power steering, loosen the power steering pump bracket at the water pump and remove the drive belt.

On a car with an air conditioner, remove the compressor drive belt.

2. Loosen the alternator mounting and adjusting arm bolts. Move the alternator toward the engine. Remove the belt(s) from the alternator and crankcase pulleys, and lift them over the fan.

3. Place the belt(s) over the fan. Insert the belt(s) in the water pump pulley, crankshaft pulley and alternator pulley grooves. Adjust the belt tension to specifications.

4. On a car with an air conditioner, install and adjust the compressor drive belt to specifications.

5. On a car with power steering, install the power steering pump drive belt and tighten the pump bracket to the water pump. Adjust the drive belt tension to specifications.

RADIATOR HOSE REPLACEMENT

Radiator hoses should be replaced whenever they become cracked, rotted or have a tendency to collapse.

1. Drain the radiator; then loosen the clamps at each end of the hose to be removed. Slide the hose off the radiator connection and the radiator supply tank connection (upper hose) or the water pump connection (lower hose).

2. Position the clamps at least ⅛" from each end of the hose. Slide the hose on the connections. **Make sure the clamps are beyond the bead and placed in the center of the clamping surface of the connections.** Tighten the clamps. Fill the radiator with coolant. Operate the engine for several minutes; then check the hoses and connections for leaks. Check for proper coolant level after the engine has reached normal operating temperature.

THERMOSTAT REPLACEMENT

A poppet-type thermostat is mounted in a recess in the coolant outlet passage at the front of the intake manifold on the V-8 engines. On 6-cylinder engines, the thermostat is located in the coolant outlet passage at the front of the cylinder head. When the thermostat is closed, coolant flows to the water pump through a bypass passage at the front of the engine. When the thermostat is open, coolant flows through the coolant outlet elbow (thermostat housing) to the radiator.

The thermostat used in production is for use with water or permanent-type anti-freeze. A thermostat is also available for use with non-permanent-type anti-freeze or water. For operating temperatures, refer to specifications.

Check the thermostat before installing it, following the procedure under "Thermostat Test", Part 11-1.

Do not attempt to repair the thermostat. It should be replaced if it is not operating properly.

Removal

1. Drain the cooling system below the level of the coolant outlet housing.

2. Remove the coolant outlet

housing retaining bolts and slide the housing (with the hose attached) to one side.

3. Remove the thermostat and gasket.

Installation

1. Clean the coolant outlet housing and cylinder head surface. Coat a new coolant outlet housing gasket with sealer. Position the gasket on the cylinder head or intake manifold (289 V-8). **The gasket must be positioned on the cylinder head or intake manifold before the thermostat is installed.**

2. Coat the edge of the thermostat with grease for thermostat adhesion. Position the thermostat in the recess of the coolant outlet housing so that the copper pellet or heat element will be in the cylinder head or intake manifold (289 V-8). Install the thermostat with the word "TOP" toward the top of the engine and the valve end of the thermostat facing outward. **If the thermostat is improperly positioned, it will cause the engine to overheat.**

3. Position the coolant outlet housing and install the retaining screws. Torque the screws to specifications.

4. Fill the radiator. Operate the engine and check for coolant leaks and proper coolant level after the engine reaches normal operating temperature.

4 CLEANING AND INSPECTION

CLEANING COOLING SYSTEM

To remove rust, sludge and other foreign material from the cooling system, use either FoMoCo Regular Cooling System Cleanser or in severe cases use Heavy Duty Cleanser. Removal of such material restores cooling efficiency and avoids overheating.

In severe cases where cleaning solvents will not properly clean the cooling system for efficient operation, it will be necessary to use the pressure flushing method.

Various types of flushing equipment are available. If pressure flushing is used, make sure the cylinder head bolts are properly tightened to prevent possible water leakage into the cylinders.

Always remove the thermostat prior to pressure flushing.

A pulsating or reversed direction of flushing water flow will loosen sediment more quickly than a steady flow in the normal direction of coolant flow.

WATER PUMP

1. Clean the gasket mounting surfaces of the water pump and cylinder block.

2. Clean and inspect the seal seating surface of the water pump.

3. Clean the pump housing and inspect it for cracks, sand holes, improper machining, and damaged surfaces. If the water pump housing is damaged beyond repair, replace the complete water pump.

FAN DRIVE CLUTCH

Check the control piston (Fig. 3) for free movement in the coupling. If the control piston sticks, remove the piston and clean it with emery cloth.

For fan drive clutch test procedures, refer to Part 11-1, Section 1.

Check the bi-metallic strip, and if it is damaged, replace the complete fan drive clutch assembly. Bi-metallic strips are not interchangeable. **Be sure to install the bi-metallic strip with the identification stamp "B-1" facing the fan drive clutch.**

After the fan drive clutch is assembled, clean the drive with a clean cloth and solvent. **The fan drive clutch should not be dipped in any liquid.**

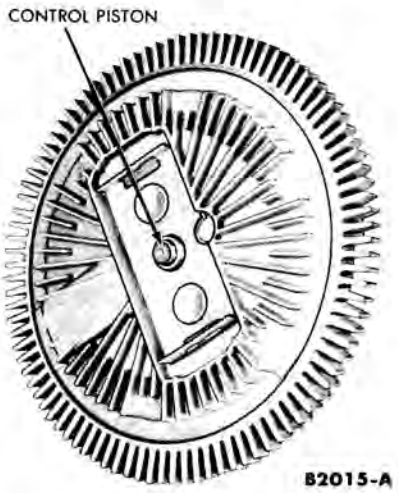


FIG. 3—Control Piston Installed

PART 11-2 WATER PUMP

Section	Page	Section	Page
1 Description and Operation	11-5	2 Removal and Installation	11-5

1 DESCRIPTION AND OPERATION

On 6-cylinder engines, a centrifugal-type water pump is mounted on the front of the cylinder block. On the 289 V-8, the centrifugal-type water pump is mounted on the cylinder front cover. The water pump inlet port is connected to the radiator bottom tank to draw coolant from the radiator when the thermostat is open. On the V-8 engines, a bypass port on the water pump is connected to the coolant outlet housing to permit coolant circulation within the engine when the thermostat is closed, bypassing the radiator. On the 6-cylinder engines, the water pump bypass passage is aligned with a bypass passage in the cylinder block for coolant circulation in the engine when the thermostat is closed.

A vane-type, plastic impeller supplies coolant through centrifugal action to the water pump outlet port on 6-cylinder engines. On the V-8 engines, the water pump has two outlet ports, one for each cylinder bank, to provide uniform coolant circulation in both banks of the engine.

The water pumps have a sealed bearing integral with the water pump shaft. The bearing requires no lubrication. A bleed hole in the water pump housing allows water that may leak past the seal to be thrown out by the slinger. **This is not a lubrication hole.**

The cooling fan hub is pressed a specified distance onto the water pump shaft.

2 REMOVAL AND INSTALLATION

170 SIX AND 200 SIX

REMOVAL

1. Drain the cooling system.

On a car with power steering, remove the power steering drive belt.

On a car with air conditioning, remove the compressor drive belt.

2. Disconnect the radiator lower hose at the water pump. Remove the drive belt, fan, or fan and drive clutch, and water pump pulley.

3. Disconnect the heater hose at the water pump.

4. Remove the water pump.

INSTALLATION

Before a water pump is re-installed, check it for damage. If it is damaged and requires repair, replace it with a new pump or install a rebuilt pump obtained from a Ford-Authorized Reconditioner.

1. If a new water pump is to be installed, remove the heater hose fitting from the old pump and install it on the new pump. Clean the gasket surfaces on the water pump and cylinder block.

2. Coat a new gasket on both sides with water-resistant sealer and position it on the cylinder block.

3. Position the water pump in place and install the lock washers and retaining bolts (the alternator adjusting arm is retained by one water pump bolt). Torque the bolts to specifications.

4. Connect the radiator lower hose and the heater hose to the water pump.

5. Install the water pump pulley and fan or fan and drive clutch. Torque the bolts evenly and alternately to specifications.

6. Install the drive belt and adjust the tension to specifications.

On a car with power steering, install the drive belt and adjust the tension to specifications.

On a car with air conditioner, install the compressor drive belt and adjust the tension to specifications.

7. Fill and bleed the cooling system. Operate the engine until normal operating temperature is reached. Check for leaks and check the coolant level.

289 V-8

REMOVAL

1. Drain the cooling system.

On a car with power steering, remove the power steering drive belt.

On a car with an air conditioner, remove the compressor drive belt.

2. Disconnect the radiator lower hose and heater hose at the water pump. Remove the drive belt, fan, fan spacer or fan drive clutch and pulley.

3. Remove the bolts retaining the pump to the cylinder front cover. Remove the pump and gasket. Discard the gasket.

INSTALLATION

Before a water pump is re-installed, check it for damage. If it is damaged and requires repair, replace it with a new pump or install a rebuilt pump obtained from a Ford-Authorized Reconditioner.

1. Remove all gasket material from the mounting surfaces of the cylinder front cover and water pump.

2. Position a new gasket, coated on both sides with water-resistant sealer, on the cylinder front cover; then install the pump.

3. Install the retaining bolts and torque them to specifications.

On a car with power steering, install the power steering drive belt and adjust the tension to specifications.

On a car with an air conditioner, install the compressor drive belt and adjust the tension to specifications.

4. Install the pulley, spacer or fan drive clutch and fan. Install and adjust the drive belt to the specified belt tension. Connect the radiator hose and heater hose.

5. Fill and bleed the cooling system. Operate the engine until normal operating temperatures have been reached and check for leaks.

PART 11-3 RADIATOR

Section	Page	Section	Page
1 Description and Operation	11-7	2 Removal and Installation	11-7

1 DESCRIPTION AND OPERATION

The radiators are of the tube and corrugated-fin-core type with the tubes arranged for vertical flow of the coolant. Two header tanks, one on the top and one on the bottom of the radiator provide uniform distribution of the coolant to the tubes. The radiator outlet port (lower header tank) is connected to the water pump inlet port. The radiator inlet port (upper header tank) is connected to the coolant outlet housing of the engine, thereby permitting coolant circulation through the radiator when the thermostat is open.

2 REMOVAL AND INSTALLATION

REMOVAL

1. Drain the cooling system. Disconnect the radiator upper and lower hoses at the radiator.
2. On a car with automatic transmission, disconnect the oil cooler lines at the radiator.
3. Remove the radiator support bolts and remove the radiator.

INSTALLATION

1. If a new radiator is to be installed, remove the drain cock from the old radiator and install it in the new radiator. On a car with automatic transmission, remove the oil cooler line fittings from the old radiator, and install them in the new radiator, using sealer M-46-11.
2. Position the radiator assembly and install the support bolts.
3. Connect the radiator upper and lower hoses.

On a car with automatic transmission, connect the oil cooler lines.

4. Close the drain cock. Fill and bleed the cooling system.
5. Operate the engine and check for leaks at the hose connections and the automatic transmission oil cooler lines. Check the automatic transmission fluid level.

PART 11-4 FAN DRIVE CLUTCH

Section		Page
1	Description and Operation	11-8
2	Removal and Installation	11-8
3	Major Repair Operations	11-8

1 DESCRIPTION AND OPERATION

The fan drive clutch (Fig. 4) is a fluid coupling containing silicone oil. Fan speed is regulated by the torque-carrying capacity of the silicone oil. The more silicone oil in the coupling the greater the fan speed, and the less silicone oil the slower the fan speed.

A bi-metallic strip and control piston on the front of the fluid coupling regulates the amount of silicone oil entering the coupling. The bi-metallic strip bows outward with a decrease in surrounding temperature and allows a piston to move outward. The piston opens a valve regulating the flow of silicone oil into the coupling from a reserve chamber. The silicone oil is returned to the reserve chamber through a bleed hole when the valve is closed. Therefore, when air passing through the radiator becomes hotter, the fan speed increases, and as the temperature decreases, the fan slows down.

The input side of the coupling is attached to the water pump hub and the fan is attached to the output side. Fins are cast integrally on the exterior of the fluid coupling to dissipate heat generated by the shearing action of the silicone oil.

2 REMOVAL AND INSTALLATION

REMOVAL

1. Remove the capscrews retaining the fan drive clutch to water pump hub (Fig. 4). Remove the fan drive clutch and fan as an assembly.

2. Remove the retaining capscrews and separate the fan from the drive clutch.

INSTALLATION

1. Position the fan on the drive clutch and install and tighten the retaining capscrews evenly and alternately to specifications.

2. Position the fan drive clutch and fan assembly to the water pump hub (Fig. 4). Install and tighten the retaining capscrews evenly and alternately to specifications.

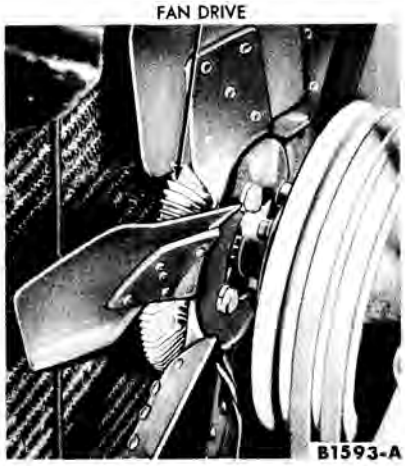


FIG. 4—Typical Fan Drive Clutch Installation

3 MAJOR REPAIR OPERATION

DISASSEMBLY

1. Remove the bi-metallic strip (Fig. 5) by pushing one end of the strip toward the fan clutch body so that it clears the retaining bracket. Then, push the strip to the side so that the opposite end of the strip will spring out of the bracket.

2. Remove the control piston.

CLEANING AND INSPECTION

For cleaning and inspection procedures, refer to Part 11-1.

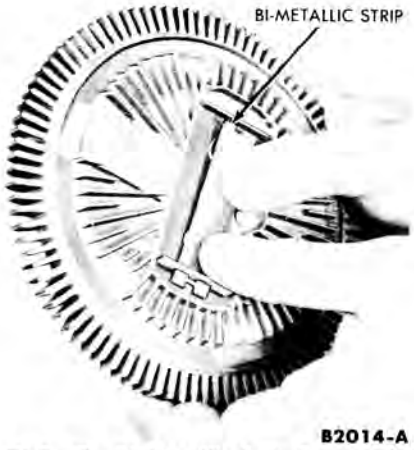


FIG. 5—Bi-Metallic Strip Removal and Installation

ASSEMBLY

The fan drive clutch is shown in Fig. 6.

1. Install the control piston (Fig. 3) so that the projection on the end of the piston will contact the bi-metallic strip.

2. Install the bi-metallic strip with the identification stamp "B-1" facing the fan drive clutch.

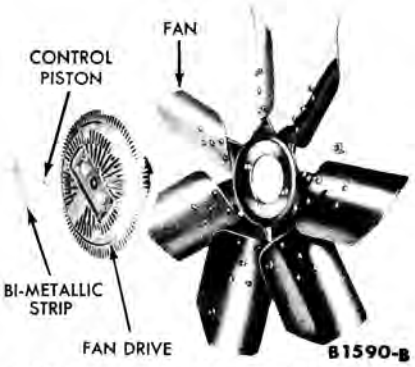


FIG. 6—Typical Fan and Drive Clutch

PART 11-5 SPECIFICATIONS

COOLING FAN

	OUTSIDE DIAMETER	NO. OF BLADES
Standard		
170 (Falcon)	15.50	4
200 (Falcon-Comet)	15.50	4
200 (Fairlane)	17.00	5
200 (Mustang)	15.00	4
289 (All Models)	17.00	4
Extra Cooling		
170 (Falcon)	15.50	4
200 (Falcon-Comet)	15.50	4
200 (Fairlane)	17.00	5
200 (Mustang)	15.00	4
289 (Falcon)	17.00	5
289 (Mustang)	17.00	4
Air Conditioning—Economy		
200 (Comet)	15.50	4
200 and 289 (Fairlane)	17.00	5
Air Conditioning		
170 (Falcon)	15.00	6
200 (Fairlane)	17.25	5
200 (Mustang)	15.00	4
Air Conditioning with Drive Clutch		
289 (Falcon)	17.00	6
289 (Comet)	17.00	5
289 (Fairlane)	17.50	5
289 (Mustang)	17.25	5

WATER PUMP

WATER PUMP DRIVE ARRANGEMENT	
Water pump, fan and alternator drive belt from crankshaft damper.	
WATER PUMP PULLEY TO ENGINE RATIO	
Standard Cooling and Air Conditioner—Equipped	
170	1.04:1
200	1.18:1
289	1.04:1
WATER PUMP ASSEMBLY DIMENSIONS	
Front Face of Pulley Hub to Pump Housing Face	
170 and 200	3.94
289	5.150
Impeller to Housing Cover Mounting Surface Clearance	
170 and 200	0.011-0.045
289	0.030-0.050

DRIVE BELT TENSION

BETWEEN ALTERNATOR AND WATER PUMP PULLEY (SINGLE BELTS)	NEW	USED
All Engines	120-140	90-110
Minimum Operating Tension	70	

BETWEEN ALTERNATOR AND WATER PUMP PULLEY (DUAL BELTS)†		
FRONT	**NEW**	***USED**
All Engines	120-140	90-110
REAR	**NEW**	***USED**
All Engines	120-140	90-110
Minimum Operating Tension	70	

*Belt operated for a minimum of 10 minutes is considered a used belt.
†Dual belts used when equipped with air conditioner.

COOLING SYSTEM CAPACITY

	Approximate Capacity* (Quarts)	
	U.S. Measure	Imperial Measure
STANDARD COOLING SYSTEM		
170 and 200	8½	7
289	14	11½

*Add 1 quart extra for heater.

THERMOSTATS

LOW TEMPERATURE	
OPENS °F	
170 and 200	157°-164°
289	155°-162°
FULLY OPEN	
170 and 200	184°-186°
289	182°
HIGH TEMPERATURE	
OPENS °F	
170 and 200	185°-192°
289	192°-199°
FULLY OPEN	
170 and 200	211°-214°
289	219°-221°

TORQUE VALUES

NOTE: All specifications are given in Ft-Lbs. unless otherwise noted.

Water Pump to Cylinder Block (or Cylinder Front Cover)	
All Engines	12-15
Water Outlet Housing	
All Engines	12-15
Fan and Spacer to Pulley Hub	
All Engines	10-15
Fan to Fan Clutch (with a/c)	
All Engines	10-15
Radiator to Front End Sheet Metal	
All Engines	8-13
Radiator to Engine Hose Clamps	
All Engines	1.0-2.5
Transmission Oil Cooler Tube Hose to Radiator	
Fairlane	8-12
Transmission Oil Cooler Tube Nut to Bottom of Radiator	
All Except Fairlane	10-15
Radiator Inlet and Outlet Hose Clamps	
All Engines	1.0-2.5

SPECIAL SERVICE TOOLS

FORD TOOL NO.	FORMER TOOL NO.	DESCRIPTION
T63-8620-A	8620-A	Belt Tension Gauge

EXHAUST SYSTEMS

GROUP 12

PART 12-1	PAGE	PART 12-2	PAGE
EXHAUST SYSTEMS	12-1	SPECIFICATIONS	12-11

PART 12-1 EXHAUST SYSTEMS

Section	Page	Section	Page
1 Description	12-1	3 Removal and Installation	12-6
2 In-Car Adjustments and Repairs	12-1		

1 DESCRIPTION

The exhaust systems for the various car models are shown in Figs. 1 thru 9.

The single exhaust system on cars with a six cylinder engine consists of a muffler inlet pipe, (muffler inlet pipe extension on Fairlane cars) muffler and outlet pipe or muffler and outlet pipe assembly.

The single exhaust system on cars with a V-8 engine consists of a "Y"-type muffler inlet pipe, muffler inlet pipe extension, muffler and outlet pipe or muffler and outlet pipe assembly.

The dual exhaust system for the Fairlane 289 4V engine (Fig. 7) consists of an "H"-type muffler inlet pipe, inlet pipe extension with integral muffler for each side and a resonator with integral outlet pipe for each side.

The dual exhaust system for the Fairlane 289 4-V high performance engine (Fig. 8) consists of an "H"-type muffler inlet pipe and an integral muffler and outlet pipe for each side.

The dual exhaust system for the Mustang 289 4-V high performance engine (Fig. 9) consists of a "H"-type muffler inlet pipe, resonator and inlet pipe assemblies, transverse muffler and outlet pipe.

The location and type of exhaust system gaskets, retaining clamps and loop-type hanger brackets are shown in the respective exhaust system illustrations. The loop-type hanger brackets eliminate tension on the hangers due to thermal expansion of the system.

2 IN-CAR ADJUSTMENTS AND REPAIRS

The exhaust system must be free of leaks, binds, grounding and excessive vibration.

Exhaust system vibration, grounding or binding is usually caused by loose, broken or improperly aligned clamps or brackets or improperly connected pipes. Any of the aforementioned conditions may cause changes to clearances of the exhaust system components. If any of these conditions exist, the exhaust system components must be checked and adjusted to make certain the specified clearances (Figs. 1 thru 9) are maintained.

EXHAUST SYSTEM ALIGNMENT

Refer to Figs. 1 thru 9 and perform the following procedure to adjust the exhaust system components:

1. Loosen the pipe connection clamps and the support bracket clamp(s).

2. Torque the exhaust manifold to inlet pipe retaining nuts evenly and alternately, to specifications. This is done to obtain an equal distance from the bottom of the inlet pipe flange(s) to the tips of the exhaust manifold(s).

3. Work from the front of the car toward the rear, and progressively adjust the exhaust system components and clamps at the various pipe connections to relieve binds, correct improper pipe connections or clearance conditions and torque the clamps to specifications.

4. Check the exhaust system for leaks.

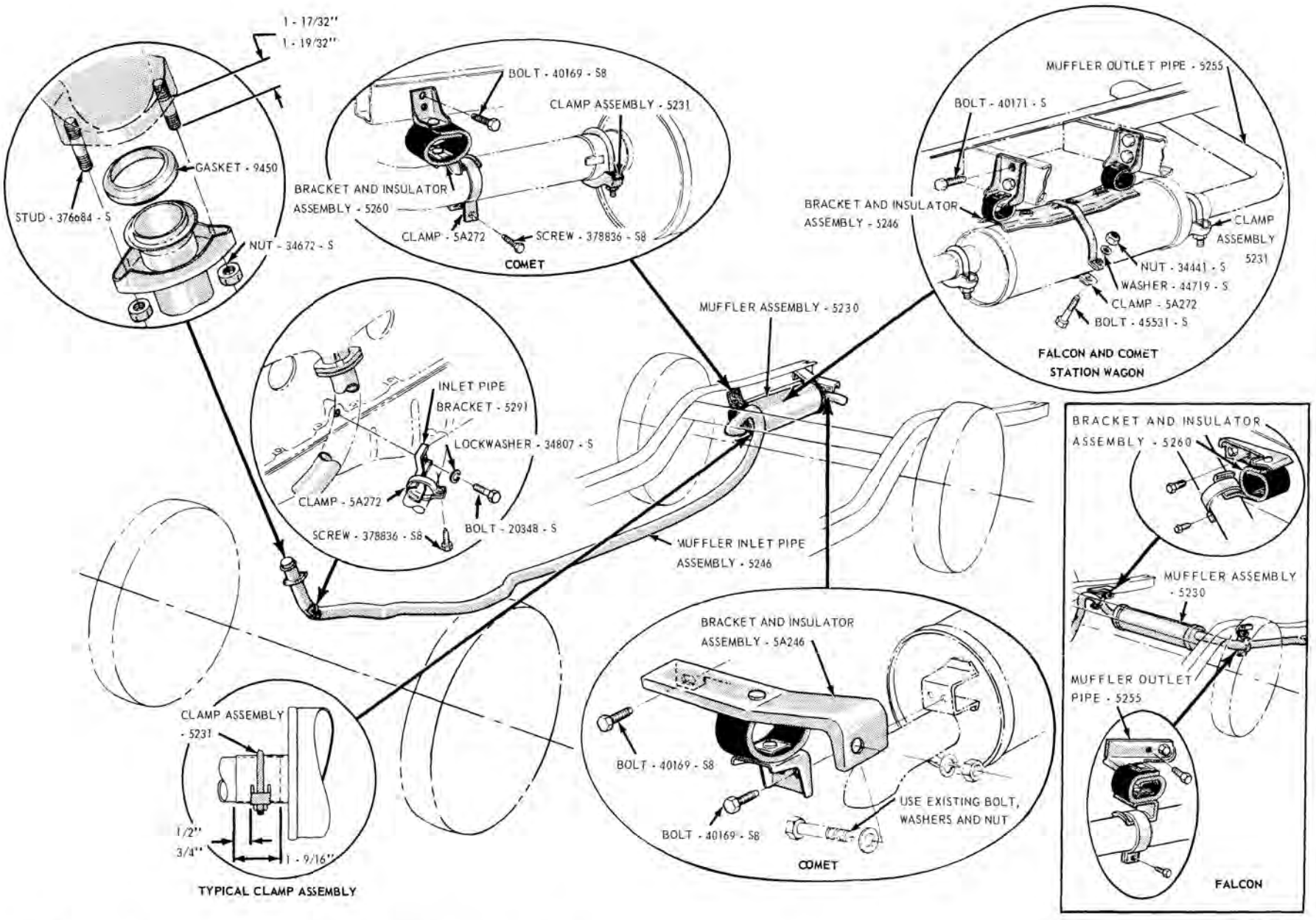


FIG. 1—Falcon and Comet 6-Cylinder Engine Single Exhaust System

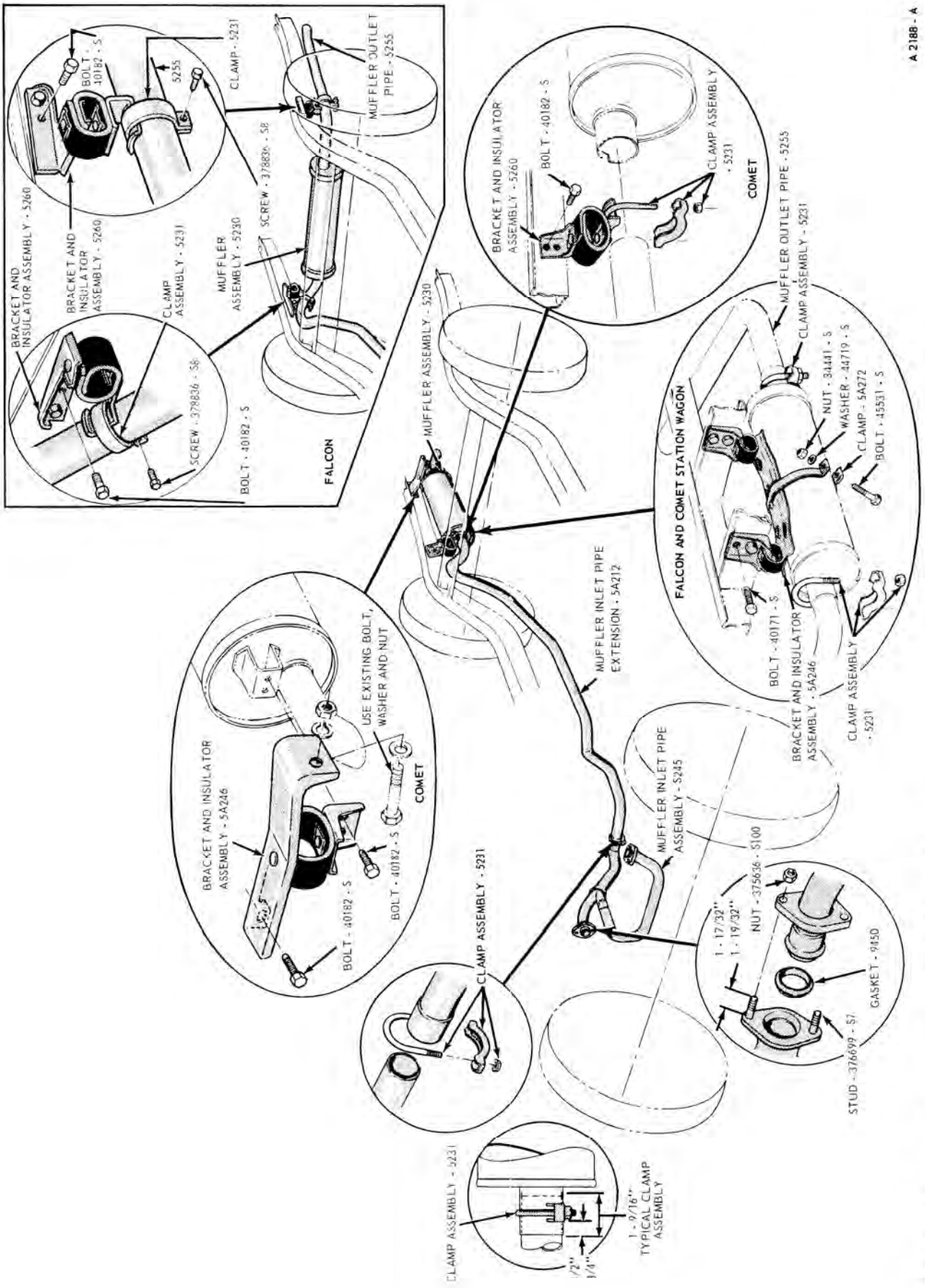


FIG. 2—Falcon and Comet V-8 Engine Single Exhaust System

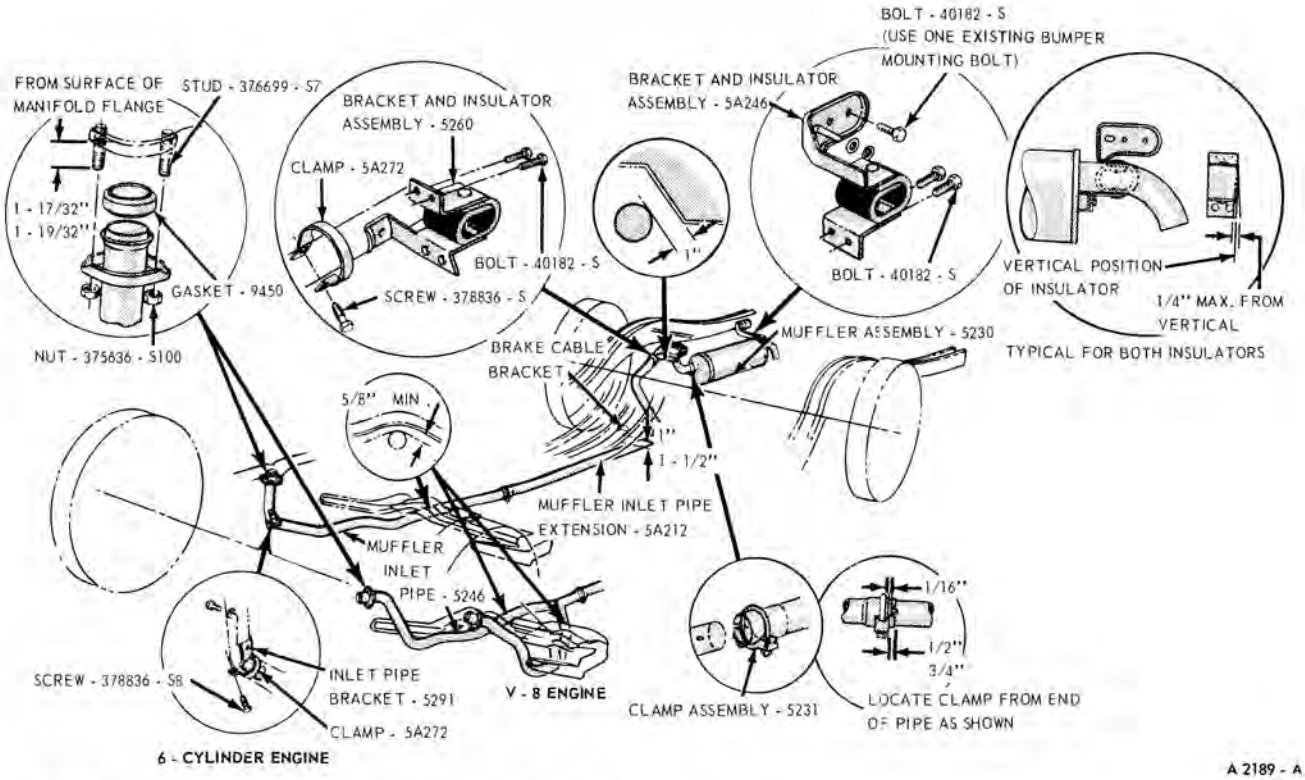


FIG. 3—Fairlane Single Exhaust System—All Except Station Wagon

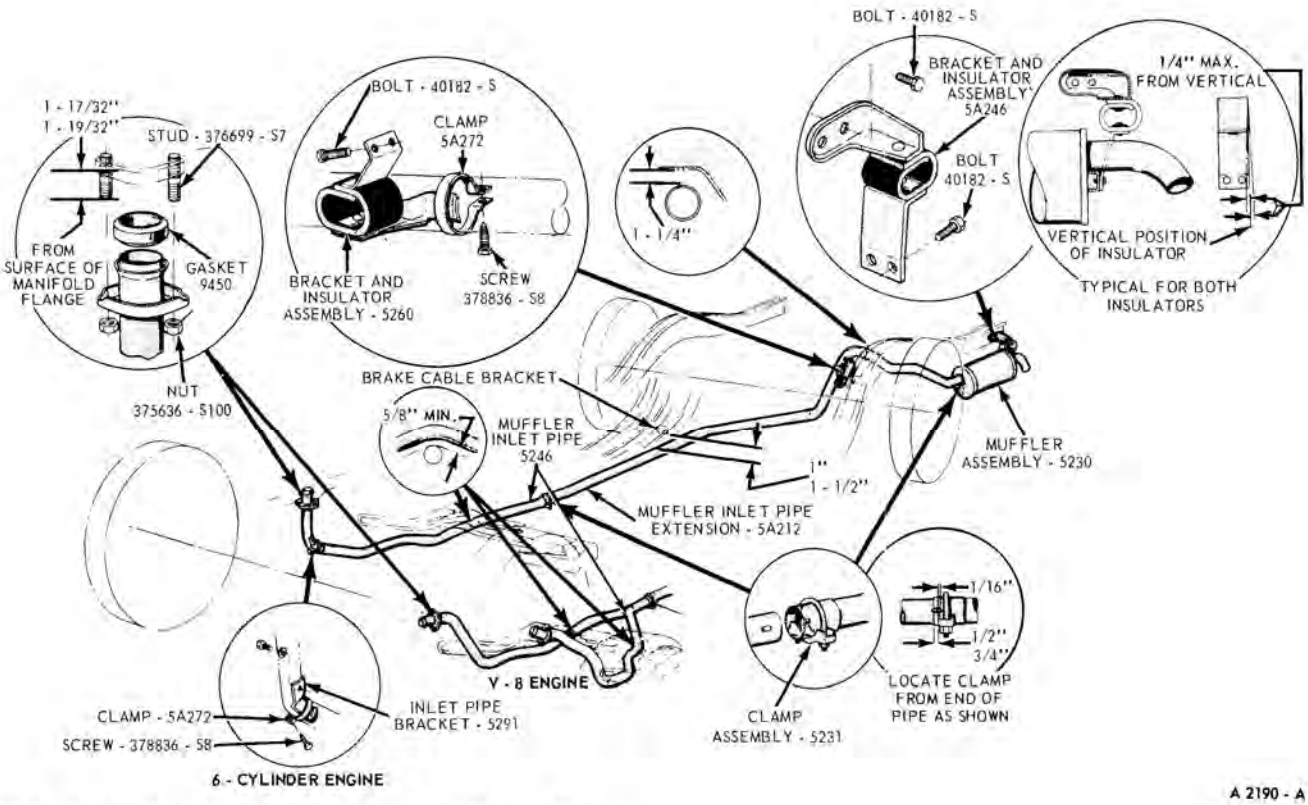


FIG. 4—Fairlane Single Exhaust System—Station Wagon

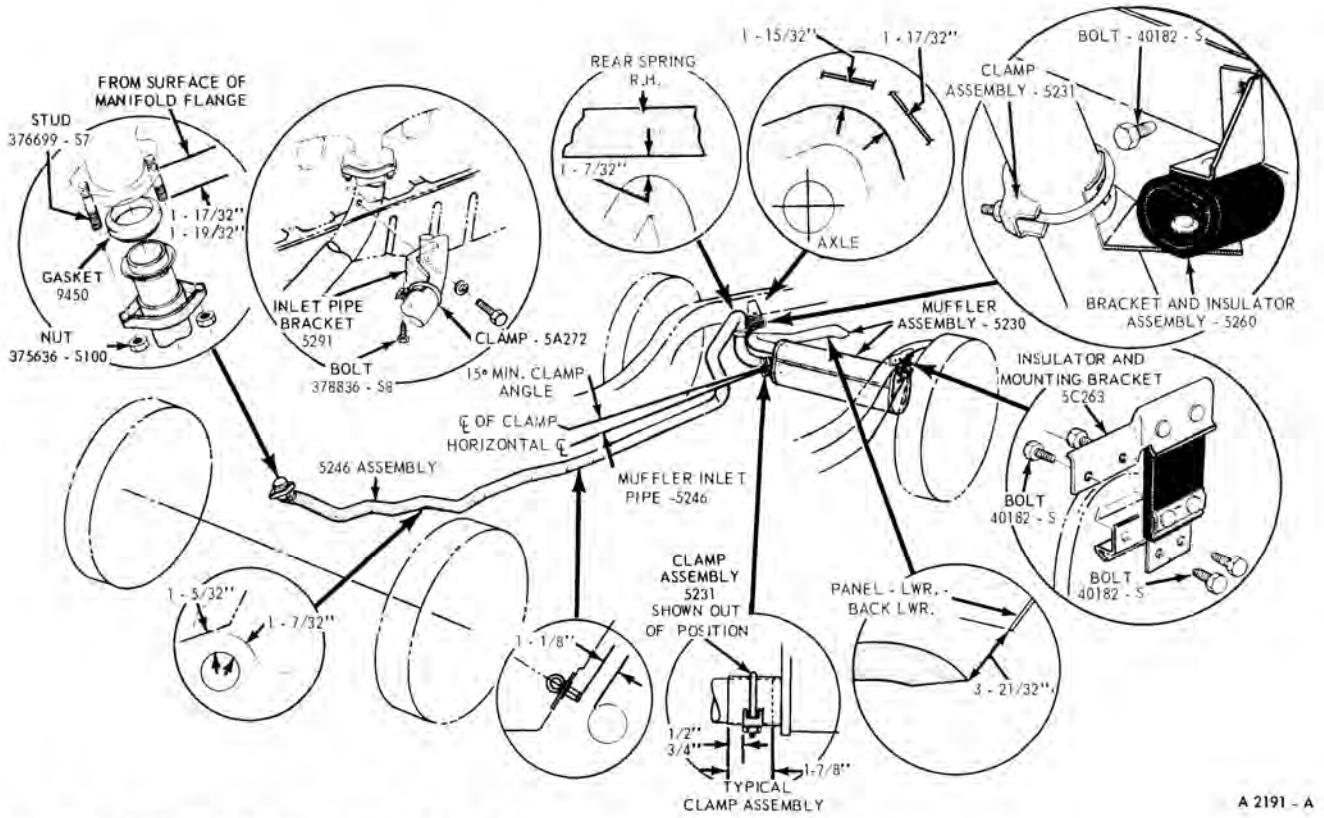


FIG. 5—Mustang 6-Cylinder Engine Exhaust System

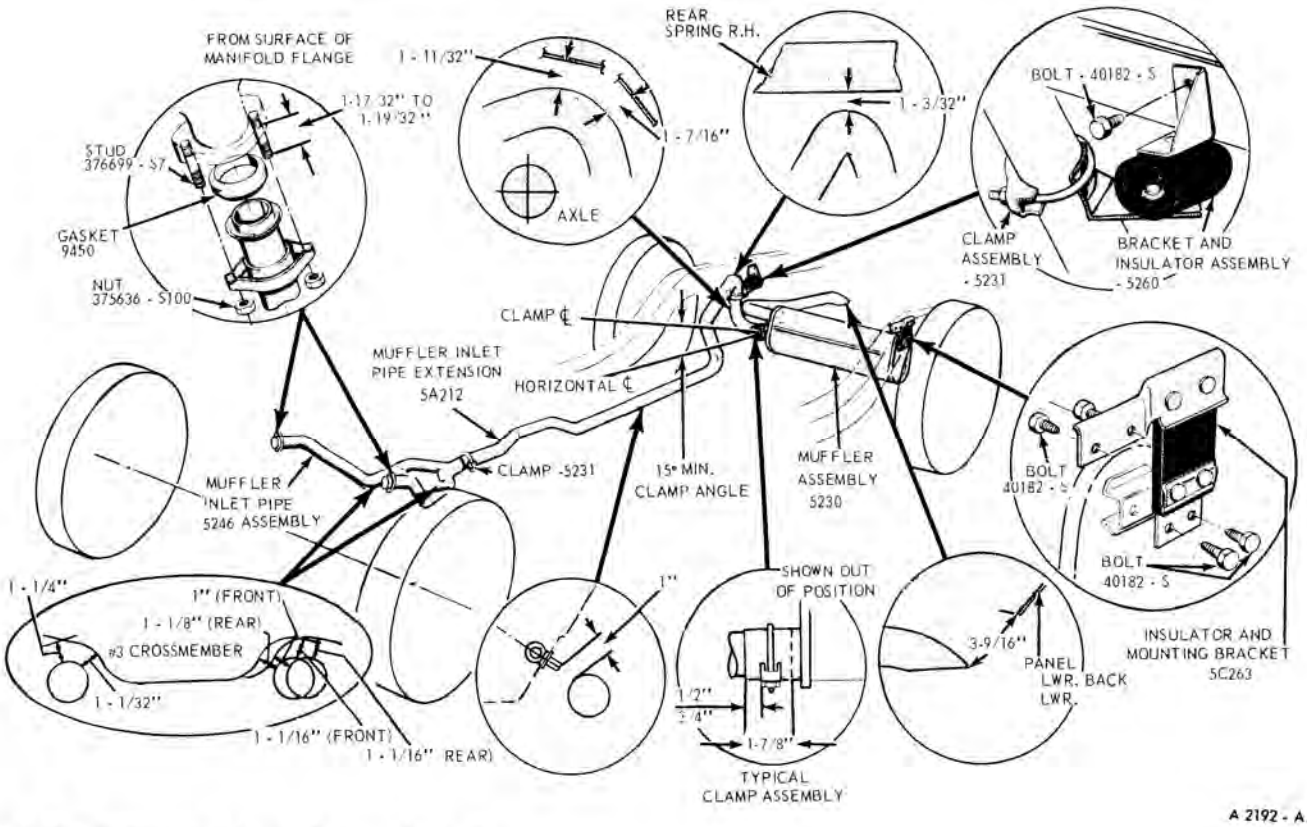


FIG. 6—Mustang V-8 Engine Exhaust System

3 REMOVAL AND INSTALLATION

SINGLE EXHAUST SYSTEMS

MUFFLER AND OUTLET PIPE ASSEMBLY

The single exhaust systems for the various car models are shown in Figs. 1 thru 6.

Removal

1. Loosen the inlet pipe or inlet pipe extension clamp at the muffler and slide the clamp forward.
2. Remove the clamp attaching the outlet pipe to the rear hanger bracket. Remove the bolts that retain the muffler assembly to the rear support bracket (if so equipped).
3. Separate the muffler from the inlet pipe or inlet pipe extension and remove the muffler and outlet pipe assembly.
4. Replace any damaged parts.

Installation

1. Slide the muffler and outlet pipe assembly onto the inlet pipe or inlet pipe extension and position the inlet pipe to muffler clamp.
2. Install the bolts or clamp that retain the muffler assembly to the rear support bracket and/or rear hanger bracket snug, but not tight.
3. Adjust the exhaust system and torque the retaining bolts and clamps to specifications.
4. Start the engine and check the exhaust system for leaks.

OUTLET PIPE

Removal

1. Remove the outlet pipe to muffler clamp.
2. Remove the clamp retaining the outlet pipe to rear hanger bracket, if so equipped.
3. Separate the outlet pipe from the muffler and remove the outlet pipe. Replace any damaged parts.

Installation

1. Position the outlet pipe to the muffler and rear hanger bracket, if so equipped.
2. Install the clamp(s) retaining the outlet pipe to the muffler and/or rear hanger bracket and torque to specifications.

MUFFLER

Removal

1. Loosen the inlet pipe or inlet pipe extension to muffler clamp and slide it forward.
2. Remove the clamp attaching the outlet pipe to rear hanger bracket.

On Falcon and Comet station wagons, remove the retaining strap from around the muffler.

3. Separate the muffler from the inlet pipe or inlet pipe extension and remove the muffler and outlet pipe as an assembly.
4. Remove the outlet pipe to muffler clamp and separate the outlet pipe from the muffler.
5. Replace any damaged parts.

Installation

1. Position the outlet pipe to the muffler and install the retaining clamp finger tight.
2. Slide the muffler and outlet pipe assembly on the inlet pipe or inlet pipe extension. Position the inlet pipe or inlet pipe extension to muffler retaining clamp.
3. Position the outlet pipe to the rear support bracket. Install the outlet pipe to rear support bracket retaining clamp and torque to specifications. Tighten the outlet pipe to muffler retaining clamp to specifications.

On Falcon and Comet station wagons, position the muffler to the muffler support bracket and install the retaining strap. Tighten the bolt to specifications.

4. Position the muffler to inlet pipe or inlet pipe extension retaining clamp the specified distance from the end of the pipe connection and torque the clamp to specification. Start the engine and check the exhaust system for leaks.

INLET PIPE EXTENSION

Removal

1. Loosen the bolts or clamp(s) securing the muffler and outlet pipe.
2. Remove the inlet pipe extension clamp from the intermediate hanger bracket (if so equipped). Loosen the inlet pipe extension to muffler clamp.
3. Loosen the clamp at the inlet pipe to inlet pipe extension and slide it forward. On convertibles only, remove the front floor lower crossmember plate.
4. Remove the inlet pipe extension. Replace any damaged parts.

Installation

1. Slide the inlet pipe extension onto the inlet pipe.
2. Position the inlet pipe to inlet pipe extension clamp. Tighten the clamp snug, but not tight.
3. Connect the inlet pipe extension to the muffler and position the inlet pipe extension to muffler retaining clamp. Position the inlet pipe extension to the intermediate hanger bracket (if so equipped) and loosely install the retaining clamp.
4. Adjust the exhaust system components to conform to the clearance specifications. Working from the front of the car toward the rear, progressively torque the retaining bolts and clamps to specifications. On Convertibles, install the front floor lower crossmember plate.
5. Start the engine and check the exhaust system for leaks.

INLET PIPE– 6-CYLINDER ENGINES

Removal

1. Loosen the inlet pipe to muffler clamp. Remove the clamp attaching the inlet pipe to intermediate hanger bracket (if so equipped). Remove the clamp securing the inlet pipe to engine bracket.
2. Remove the clamp at the inlet pipe to inlet pipe extension (if so equipped). If the car is equipped with an inlet pipe extension, temporarily support it with soft-wire. On convertibles only, remove the front floor lower crossmember plate.
3. Remove the nuts that secure the inlet pipe to the exhaust manifold. Remove the inlet pipe.
4. Clean the gasket surface of the exhaust manifold.
5. Discard the gasket and replace any damaged parts.

Installation

1. Install a new gasket on the inlet pipe flange.
2. Install the inlet pipe to the muffler and exhaust manifold and loosely install the retaining nuts on the studs of the manifold. Position the inlet pipe to muffler retaining clamp.
3. Position the inlet pipe to engine bracket retaining clamp. Connect the inlet pipe to the inlet pipe extension (if so equipped) and position the inlet pipe to inlet pipe extension clamp. Position the inlet pipe to the intermediate hanger bracket (if so equipped) and loosely install the retaining clamp.

4. Adjust the exhaust system components to conform to the clearance specifications. Working from the front of the car toward the rear, progressively torque the retaining nuts and clamps to specifications. On convertibles, install the front floor lower crossover plate. Remove the soft-wire used to temporarily support the inlet pipe extension.

5. Start the engine and check the exhaust system for leaks.

INLET PIPE–V-8 ENGINES

Removal

1. Loosen the clamp at the inlet pipe to inlet pipe extension and slide it rearward.

2. If applicable, loosen the clamp on the inlet pipe extension and slide it off the intermediate hanger bracket.

3. Loosen the inlet pipe extension to muffler clamp and separate the inlet pipe extension from the muffler. Temporarily support the inlet pipe extension in position with soft-wire.

4. Remove the retaining nuts securing the inlet pipe to exhaust manifolds. Slide the inlet pipe out of the inlet pipe extension and remove the inlet pipe from the exhaust manifolds.

5. Clean the gasket surfaces of the exhaust manifolds. Discard the gaskets and replace any damaged parts.

Installation

1. Install new gaskets on the inlet pipe flanges.

2. Install the inlet pipe on the exhaust manifolds and loosely install the retaining nuts on the manifold studs.

3. Connect the inlet pipe to the inlet pipe extension and position the clamp. Place the inlet pipe extension and clamp on the muffler. If applicable, position the inlet pipe extension to the intermediate hanger bracket and install the clamp. Tighten all clamps snug, but not tight. Remove the soft-wire used to temporarily support the inlet pipe extension.

4. Adjust the exhaust system components to conform to the clearance specifications. Working from the front of the car toward the rear, progressively torque the nuts and retaining clamps to specifications.

5. Start the engine and check the exhaust system for leaks.

DUAL EXHAUST SYSTEMS

FAIRLANE–289 4-V

Resonator and Outlet Pipe Assembly

REMOVAL

1. Loosen the inlet pipe extension clamp at the resonator and slide the clamp forward.

2. Loosen the clamp on the inlet pipe extension and slide the clamp off the intermediate hanger bracket. Loosen the "H" pipe (muffler inlet pipe) to exhaust manifold retaining nuts.

3. Remove the bolts attaching the muffler to the rear hanger bracket assembly.

4. Separate the resonator from the inlet pipe extension and remove the resonator and outlet pipe assembly from the car.

5. Replace any damaged parts.

INSTALLATION

1. Slide the resonator and outlet pipe assembly onto the inlet pipe extension (Fig. 7).

2. Position the muffler to the rear hanger bracket assembly and install

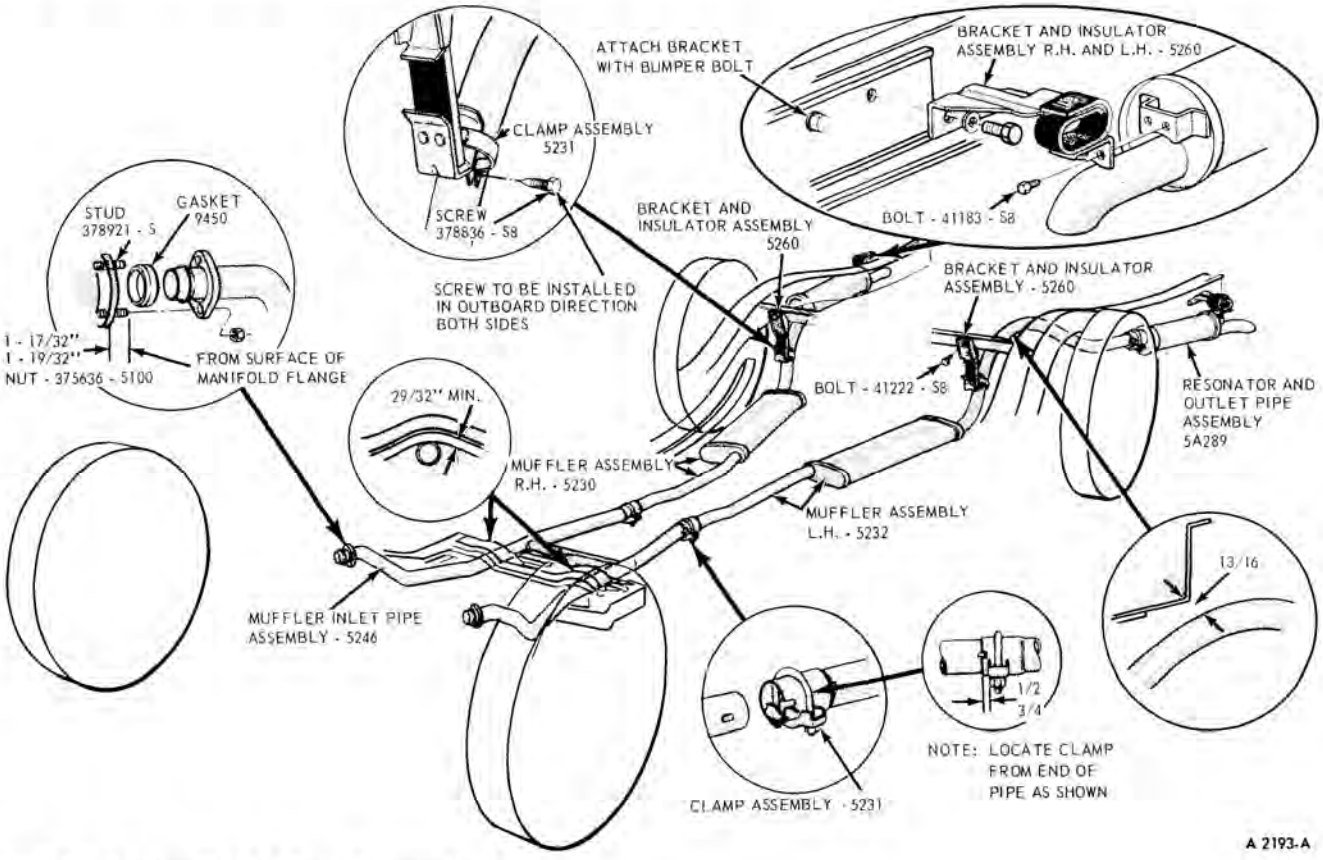


FIG. 7–Fairlane 289 4-V Dual Exhaust System

the bolts. Tighten the bolts snug, but not tight.

3. Position the inlet pipe extension to the intermediate hanger bracket assembly and install the clamp. Tighten the clamp snug, but not tight.

4. Install the clamp on the connection between the resonator and inlet pipe extension so it is not contacting the locating tab or an exhaust leak will result. Tighten the clamp snug, but not tight.

5. Adjust the exhaust system. Starting from the front of the car, progressively torque the clamps and retaining nuts to specification. Start the engine and check the exhaust system for leaks.

Muffler and Inlet Pipe Extension Assembly

REMOVAL

1. Remove the resonator and outlet pipe assembly by following steps 1 thru 4 under "Resonator and Outlet Pipe Assembly Removal."

2. Loosen the clamp at the "H" pipe (muffler inlet pipe) to muffler and inlet pipe extension assembly and slide the clamp forward.

3. Remove the muffler and inlet pipe extension assembly from the vehicle.

4. Replace any damaged parts.

INSTALLATION

1. Slide the muffler and inlet pipe extension assembly onto the "H" pipe (Fig. 7).

2. Position the clamp on the connection between the "H" pipe and the muffler and inlet pipe extension assembly so it is not contacting the locating tab or an exhaust leak will result. Tighten the clamp snug, but not tight.

3. Install the resonator and outlet pipe assembly by following steps 1 thru 4 under "Resonator and Outlet Pipe Assembly Installation."

4. Adjust the exhaust system. Starting from the front of the car, progressively torque the retaining nuts and clamps to specifications.

5. Start the engine and check the exhaust system for leaks.

"H" Pipe (Muffler Inlet Pipe)

REMOVAL

1. Loosen the clamps attaching the muffler and inlet pipe extension assemblies to the "H" pipe (muffler inlet pipe) and slide them rearward.

2. Loosen the clamps attaching the intermediate hanger brackets to the inlet pipe extensions and slide them off the brackets.

3. Remove the bolts attaching the mufflers to the rear hanger brackets. Temporarily support the outlet pipe with soft-wire.

4. Slide the muffler and inlet pipe extension assemblies from the "H" pipe. Temporarily support the muffler and inlet pipe extension assemblies with soft-wire.

5. Remove the retaining nuts securing the "H" pipe to the exhaust manifolds and remove the "H" pipe from the vehicle.

6. Clean the gasket surfaces of the exhaust manifolds and "H" pipe.

7. Discard the gaskets and replace any worn or damaged parts.

INSTALLATION

1. Install new gaskets on the "H" pipe flanges and install the "H" pipe into the vehicle. With the "H" pipe held in the proper location tighten the retaining nuts snug, but not tight.

2. Slide the muffler and inlet pipe extension assemblies onto the "H" pipe and position the clamps on the connections so they do not contact the locating tab or an exhaust leak will result. Tighten the clamps snug, but not tight.

3. Position the mufflers to the rear hanger brackets and install the bolts. Tighten the clamps snug, but not tight.

4. Position the muffler and inlet pipe extension assemblies to the intermediate hanger brackets and install the clamps. Tighten the clamps snug, but not tight.

5. Adjust the exhaust system components to conform to the clearance specifications shown in Fig. 7. Working from the front of the car toward the rear, progressively torque the clamps and retaining nuts to specifications. Remove the soft-wire used to temporarily support the exhaust system.

6. Start the engine and check the exhaust system for leaks.

FAIRLANE–289 4-V HIGH PERFORMANCE ENGINE

Outlet Pipe(s)

REMOVAL

1. Remove the clamp(s) securing the outlet pipe(s) to the muffler inlet pipe ("H" pipe).

2. Remove the outlet pipe(s) clamps at the intermediate hanger and rear hanger brackets.

3. Move the outlet pipe(s) rearward to disengage the pipe(s) from the muffler inlet pipe. Remove the pipe(s).

4. Replace all damaged parts.

INSTALLATION

1. Position the outlet pipe(s) onto the muffler inlet pipe (Fig. 8).

2. Properly position the outlet pipe(s) retaining clamps and secure finger tight.

3. Adjust the exhaust system. Torque the retaining clamps to specification.

4. Start the engine and check the exhaust system for leaks.

Muffler Inlet Pipe ("H" Pipe)

If the muffler inlet pipe is being replaced in conjunction with replacement of the outlet pipes, perform steps 3-5 under Removal and step 1 under Installation.

REMOVAL

1. Remove the clamps securing the outlet pipes to the muffler inlet pipe ("H" pipe).

2. Loosen the outlet pipe clamps at the intermediate hanger and rear hanger brackets. Move the outlet pipes away from the muffler inlet pipe.

3. Remove the retaining nuts securing the muffler inlet pipe to the exhaust manifolds and remove the pipe.

4. Clean the gasket surfaces of the exhaust manifold and muffler inlet pipe.

5. Discard the gaskets and replace all damaged parts.

INSTALLATION

1. Place new gaskets on the muffler inlet pipe flanges and install the pipe on the exhaust manifold (Fig. 8). Install the retaining nuts on the studs of both manifolds and secure finger tight.

2. Position the outlet pipes onto the muffler inlet pipe. Properly position the outlet pipe retaining clamps and secure finger tight.

3. Adjust the exhaust system (Fig. 8). Torque the retaining clamps and inlet pipe to exhaust manifold nuts to specification.

4. Start the engine and check the exhaust system for leaks.

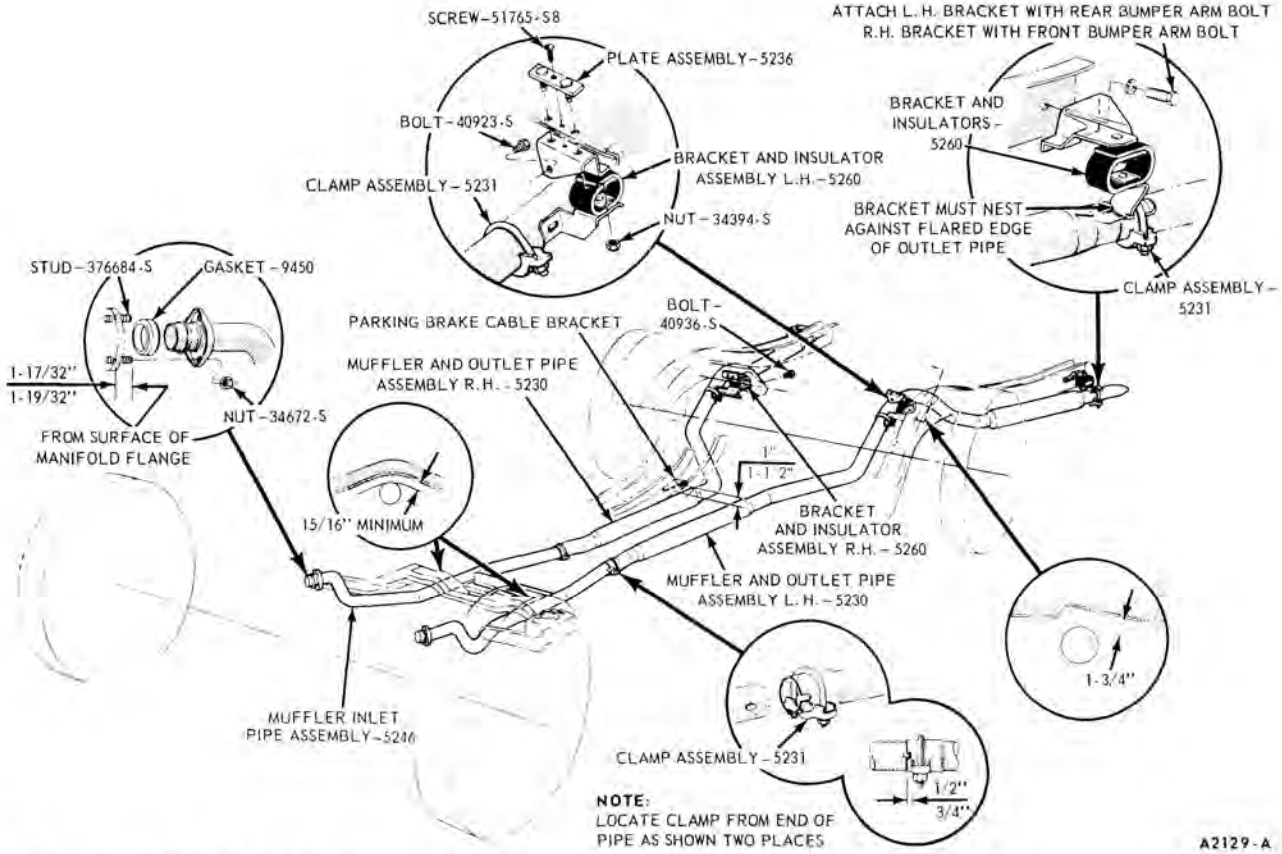


FIG. 8–Fairlane 289 4-V High Performance Dual Exhaust System

MUSTANG–289 4-V HIGH PERFORMANCE ENGINE

Left Outlet Pipe

REMOVAL

1. Remove the clamp attaching the left outlet pipe to the muffler (Fig. 9).

2. Remove the clamp attaching the left outlet pipe to the rear hanger bracket.

3. Remove the left outlet pipe from the muffler.

4. Replace any damaged parts.

INSTALLATION

1. Install the left outlet pipe onto the muffler.

2. Install the clamp on the connection between the left outlet pipe and the muffler so it is not contacting the locating tab or an exhaust leak will result. Tighten the clamp snug, but not tight.

3. Position the left outlet pipe to the rear hanger bracket and install the clamp. Tighten the clamp snug, but not tight.

4. Adjust the exhaust system and torque the clamps to specification. Start the engine and check the exhaust system for leaks.

Muffler and Outlet Pipe Assembly

REMOVAL

1. Remove the left outlet pipe following steps 1 thru 3 under "Left Outlet Pipe Removal."

2. Remove the clamp attaching the right outlet pipe to the rear hanger bracket.

3. Remove the bolts from the flange connections located ahead of the muffler and remove the muffler and outlet pipe assembly from the car.

4. Clean the gasket surfaces of the muffler inlet pipe flanges and the resonator outlet pipe flanges.

5. Discard the gaskets and replace any damaged parts.

INSTALLATION

1. Install new gaskets on the muffler inlet pipe flanges (Fig. 9).

2. Install the muffler and outlet pipe assembly into the car and install the bolts and nuts into the flanges. Tighten the bolts snug, but not tight.

3. Position the right outlet pipe to the rear hanger bracket and install the clamp. Tighten the clamp snug, but not tight.

4. Install the left outlet pipe by following steps 1 thru 3 under "Left Outlet Pipe Installation."

5. Adjust the exhaust system and torque the clamps and bolts to specifications.

6. Start the engine and check the exhaust system for leaks.

Resonator and Inlet Pipe Extension Assembly

REMOVAL

1. Remove the bolts from the flange connection(s) located ahead of the muffler. Temporarily support the muffler with soft-wire.

2. Loosen the clamp(s) attaching the resonator and inlet pipe extension assembly(ies) to the "H" pipe (muffler inlet pipe) and move the clamp(s) forward. On convertibles only, remove the front floor lower crossmember plate.

3. Remove the bolts attaching the intermediate hanger bracket(s) to the resonator(s).

4. Slide the resonator and inlet

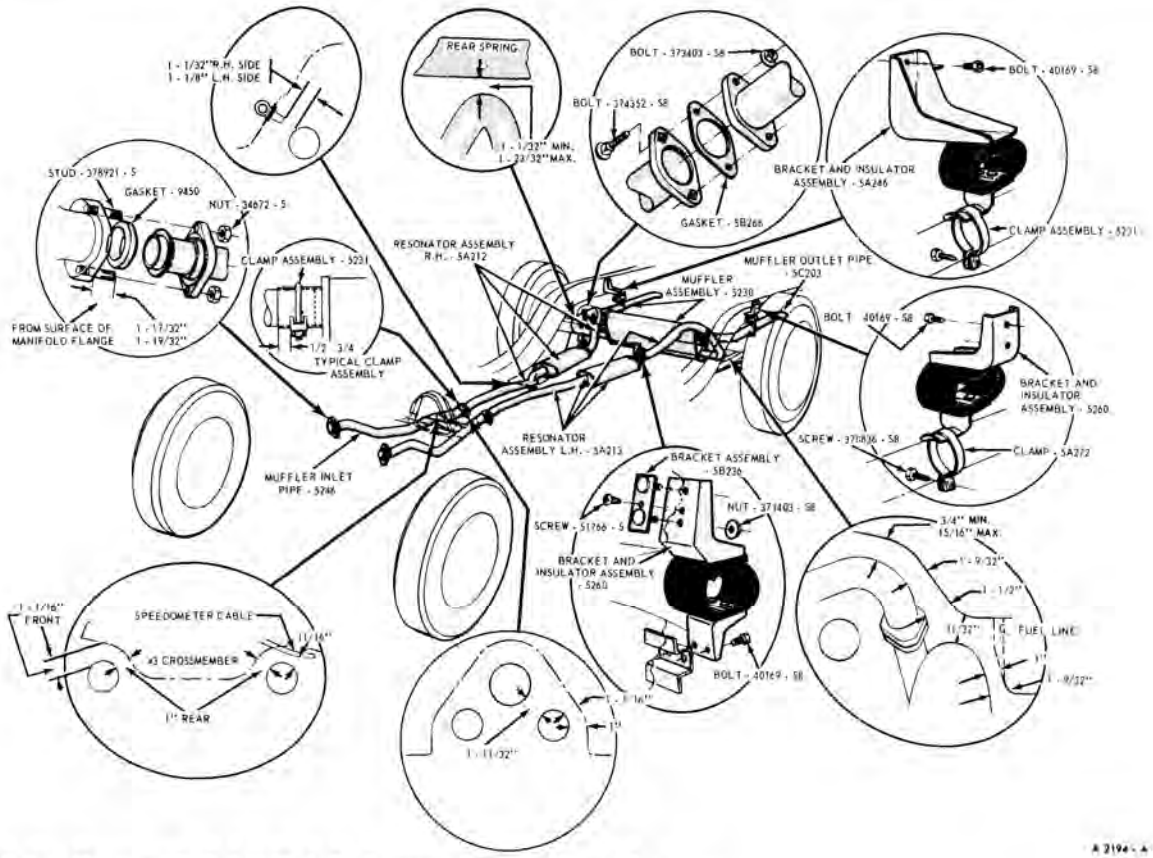


FIG. 9—Mustang 289 4-V High Performance Dual Exhaust System

pipe extension assembly(ies) from the "H" pipe (muffler inlet pipe) and remove from the car.

5. Clean the gasket surfaces of the muffler inlet pipe flange(s) and the resonator outlet pipe flange(s).

6. Discard the gasket(s) and replace any damaged parts.

INSTALLATION

1. Install new gasket(s) on the muffler inlet pipe flange(s).

2. Slide the resonator and inlet pipe extension assembly(ies) onto the "H" pipe.

3. Install the nuts and bolts into the flanged connection(s). Tighten the bolts snug, but not tight.

4. Position the clamp(s) on the resonator and inlet pipe extension assembly(ies) to "H" pipe connection(s). Tighten the clamp(s) snug, but not tight.

5. Install the bolts attaching the intermediate hanger bracket(s) to the resonator(s). Tighten the bolts snug, but not tight.

6. Adjust the exhaust system and torque the clamp(s) and bolts to specifications. Remove the soft-wire used to temporarily support the muffler. Install the front floor lower crossmember plate and torque the bolts to specification.

7. Start the engine and check the exhaust system for leaks.

"H" Pipe (Muffler Inlet Pipe)

REMOVAL

1. Loosen the clamps attaching the resonator and inlet pipe extension assemblies to "H" pipe (muffler inlet pipe) and slide the clamp rearward.

2. Loosen the clamps attaching the outlet pipes to the rear hanger brackets.

3. Remove the bolts attaching the intermediate hanger brackets to the resonators.

4. Remove the retaining nuts securing the "H" pipe to the exhaust manifolds.

5. Slide the "H" pipe from the resonator and inlet pipe extension assemblies and remove the "H" pipe from the car. Temporarily support the inlet pipe extensions with soft-wire.

6. Clean the gasket surfaces of the "H" pipe and exhaust manifolds.

7. Discard the gaskets and replace any worn or damaged parts.

INSTALLATION

1. Install new gaskets on the "H" pipe flanges and install the "H" pipe into the car. With the "H" pipe held in position tighten the retaining nuts snug, but not tight.

2. Slide the resonator and inlet pipe extension assemblies onto the "H" pipe.

3. Position the clamps on the resonator and inlet pipe extension assemblies to "H" pipe connections. Tighten the clamps snug, but not tight.

4. Position the resonators to the intermediate hanger brackets and install the attaching bolts. Tighten the bolts snug, but not tight.

5. Adjust the exhaust system components to conform to the clearance specifications shown in Fig. 9. Working from the front of the car toward the rear, progressively torque the clamps, bolts and retaining nuts to specifications. Remove the soft-wire used to temporarily support the inlet pipe extension.

6. Start the engine and check the exhaust system for leaks.

PART 12-2 SPECIFICATIONS

TORQUE LIMITS—FT-LBS

Inlet Pipe to Exhaust Manifold(s)	25-35
Inlet Pipe to Inlet Pipe Extension Clamp	13-20
Inlet Pipe or Inlet Pipe Extension to Muffler Clamp	13-20
Muffler Support Bracket to Muffler Retaining Bolts	13-20
Muffler Support Bracket(s) to Muffler Clamp(s)	13-20
Inlet Pipe Extension Intermediate Hanger Bracket Clamp	13-20
Inlet Pipe Bracket to Engine Bolt	13-20
Inlet Pipe Bracket Clamp	13-20
Outlet Pipe to Muffler Clamp	13-20

CHARGING SYSTEM

GROUP 13

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PART 13-1 GENERAL CHARGING SYSTEM SERVICE

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1 DIAGNOSIS AND TESTING

ALTERNATOR SYSTEM TROUBLE DIAGNOSIS GUIDE

BATTERY LOW IN CHARGE

Indications of a battery low in charge are slow cranking, hard starting, and headlights dim at engine idle speed. Causes are:

1. The alternator belt worn, or loose and slipping over the pulley.

2. The battery in such poor condition that it will not hold or take a charge.

3. The alternator not producing its rated output.

4. Regulator units out of adjustment, and excessive resistance in the alternator-to-battery circuit or in the battery-to-ground circuit.

First check the belt adjustment and condition.

RECHARGE OR REPLACE BATTERY

Perform a battery Capacity Test (in this part). Replace the battery if the test indicates it is worn out or under capacity. If the battery capacity is normal, proceed as follows:

TEST ALTERNATOR OUTPUT

Test the alternator output (in this part) to determine if the alternator is at fault. If the output is normal or greater than the rating of the unit, check the external circuit to determine the circuit resistance (in this part). If the output is low proceed as follows:

ALTERNATOR OUTPUT LOW

Connect a heavy jumper wire from the battery ground post to the alternator ground terminal. Repeat the output test. If the output now reaches or exceeds rated output, either the alternator or the battery is not properly grounded to the engine frame. Replace the battery-to-ground cable if it is corroded or partially broken. Clean the cable connections at the battery and engine, and tighten the connections. Tighten the alternator mounting bracket bolts.

If the alternator output is still less than normal, the output could be low due to an open or short circuit in the field, stator, brushes, or brush holder, or the generator brushes can be worn too short or may be sticking in the brush holder and not making good contact on the slip rings. Remove the unit for repair.

CONTINUED ON NEXT PAGE

ALTERNATOR SYSTEM TROUBLE DIAGNOSIS GUIDE (Continued)

BATTERY LOW IN CHARGE (Continued)	**TEST REGULATOR** If the alternator output is normal, test the regulator to determine if it is properly adjusted. After checking all regulator units, adjust or replace the regulator as necessary. If the regulator is not at fault, test the circuit resistance. **TEST CIRCUIT RESISTANCE** Check the alternator external circuit to determine the circuit resistance (in this part). **RESISTANCE EXCESSIVE** If the alternator resistance (voltage drop) is greater than that specified for the vehicle, locate the trouble by performing a complete external circuit resistance test (in this part). Repair or replace the defective part. **RESISTANCE NORMAL** If the resistance (voltage drop) is equal to or less than that specified for the car, the low charge is due to operational factors such as: **1.** Excessive use of accessories. **2.** Short trips. **3.** Accidental discharge of battery. **4.** Incorrect engine lubricant for ambient temperature encountered. **5.** Regulator calibration set too close to low limit for vehicle operating conditions.
HIGH CHARGING RATE	Indications of a high charging rate are: **1.** Lights and fuses burn out repeatedly. **2.** Battery requires too frequent refilling. **3.** The ignition contacts have a short life. To determine the possible cause of the high charging rate, check the following items:	**1.** Make certain that all connections, including the regulator ground, are tight. **2.** Check the voltage limiter. If the voltage limit is high, check the contacts and replace the regulator if the contacts are burned. **3.** If the contacts are in good condition, adjust the regulator to the specified limits (Part 13-3).

ALTERNATOR TEST

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses. **Use care when connecting any test equipment to the alternator system, as the alternator output terminal is connected to the battery at all times.**

ALTERNATOR OUTPUT TEST

When an alternator output test is conducted off the car, a test bench must be used. Follow the procedure given by the test bench equipment manufacturer. **When the alternator is removed from the car for this purpose, always disconnect a battery cable, as the alternator battery terminal is connected to the battery at all times.**

To test the output of the alternator on the car, proceed as follows:

1. Place the transmission in neutral or park and apply the parking brake. Make the connections as shown in Fig. 1 or 2. Be sure that the field resistance control is at the OFF position at the start of this test.

2. Close the battery adapter switch. Start the engine, then open the battery adapter switch.

3. Increase the engine speed to approximately 2500 rpm.

4. Adjust the field resistance control until the voltmeter reads exactly 15 volts. Observe the ammeter reading. Add 2 amperes to this reading to obtain total alternator output.

If the battery was fully charged, it might not be possible to obtain maximum current output. If specified current is not obtained, make the following test before condemning the alternator:

5. Turn the field resistance control knob to the maximum counterclockwise position. Rotate the center control knob to the LOAD or CURRENT REG. position. Maintain the engine speed at approximately 2500 rpm.

6. Turn the field resistance control and the center control clockwise, maintaining a voltmeter reading of 15 volts maximum, until the field resistance control is at its maximum clockwise position.

7. Readjust the center control until the voltmeter reads exactly 15 volts. Observe the ammeter reading.

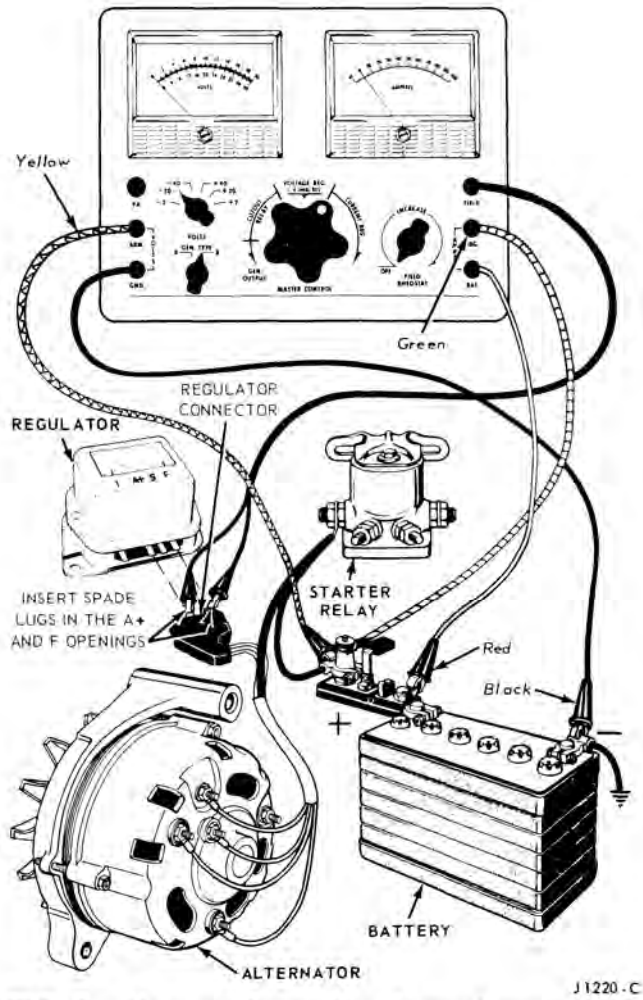


FIG. 1—Alternator Output Test—Except Comet

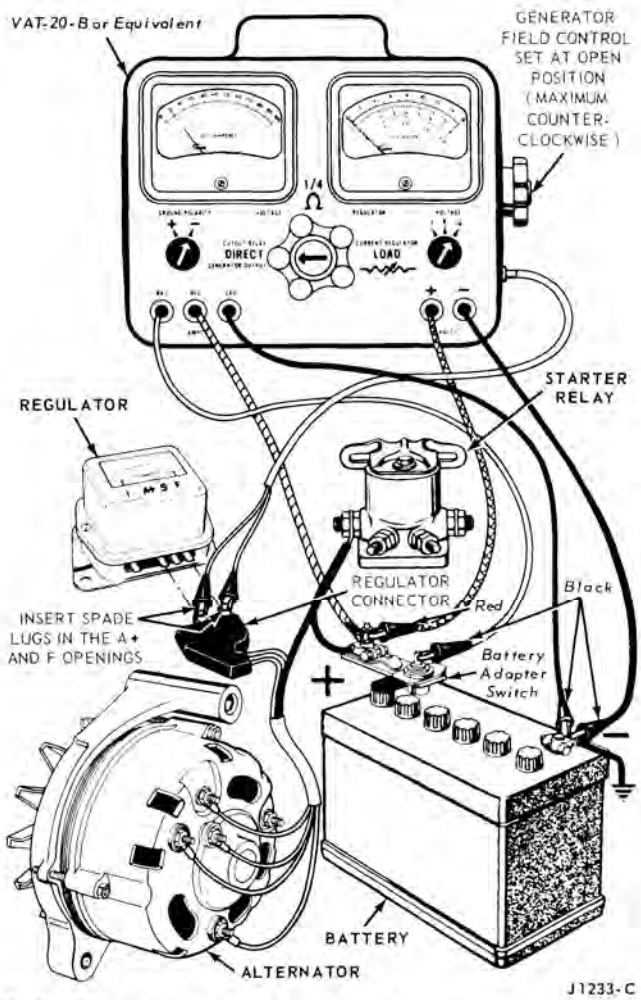


FIG. 2—Alternator Output Test—Comet

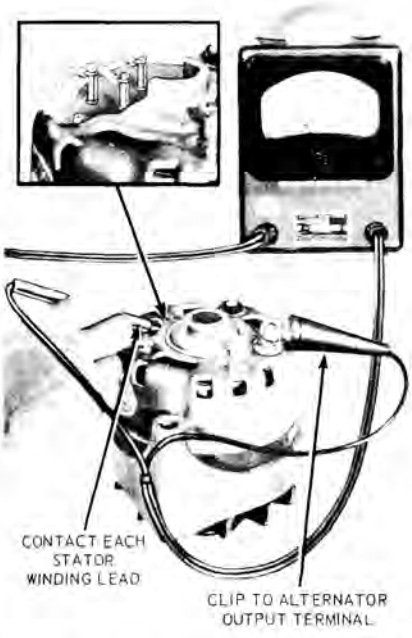


FIG. 3—Positive Diode Test

Add 2 amperes to this reading to obtain total alternator output.

8. Stop the engine, return the field resistance control to the maximum counterclockwise position and disconnect the test equipment.

An output of 2 to 5 amperes below specifications usually indicates an open diode rectifier. An output of approximately 10 amperes below specifications usually indicates a shorted diode rectifier. An alternator with a shorted diode will usually whine, which will be most noticeable at idle speed.

DIODE TEST

To test the positive diodes, make the connections shown in Fig. 3.

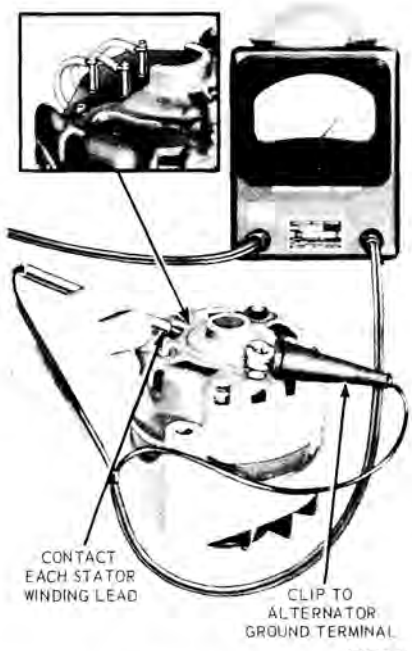


FIG. 4—Negative Diode Test

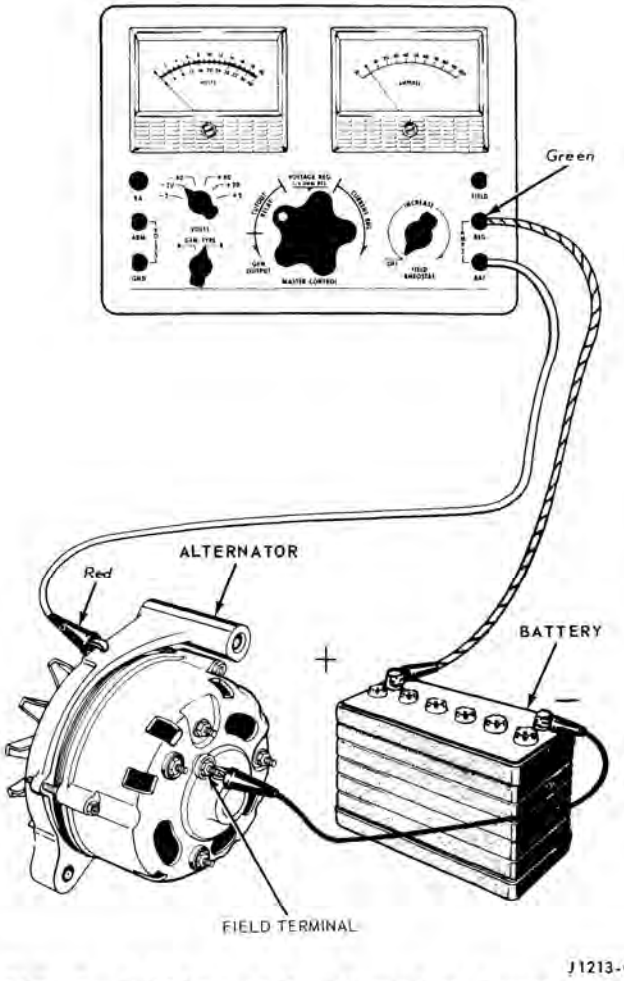


FIG. 5—Field Open or Short Circuit Test—Except Comet

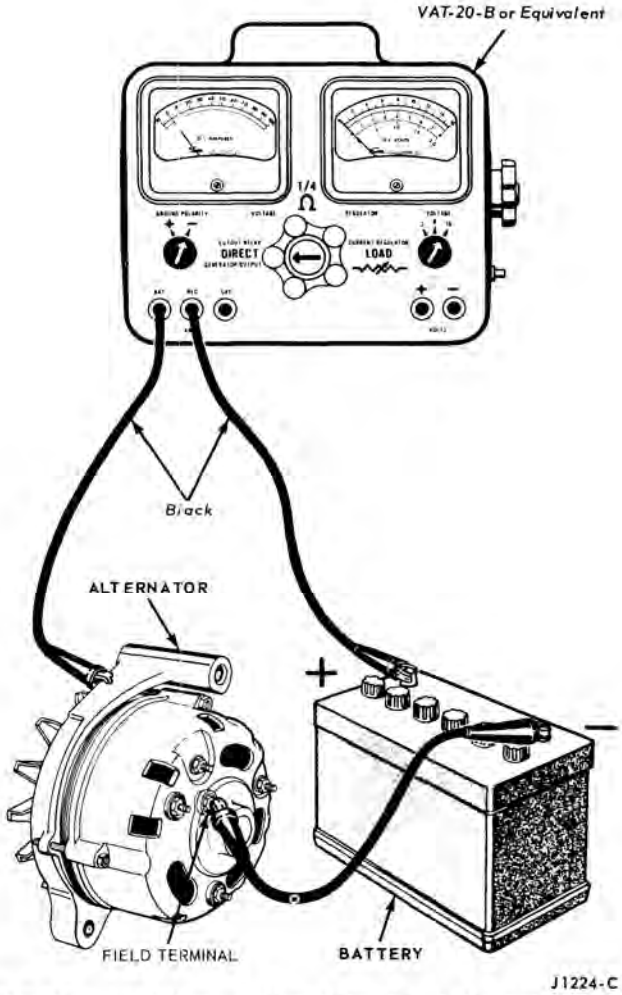


FIG. 6—Field Open or Short Circuit Test—Comet

Contact the probe to each stator lead terminal. Make sure that the tip of the probe is sharp and that it penetrates the varnish at the stator terminals.

To test the negative diodes, make the connections shown in Fig. 4. Follow the same procedure as for the positive diodes.

Good diodes will be indicated as on the meter in Figs. 3 and 4 (2 amps or more and readings alike within 2 scale divisions).

FIELD OPEN OR SHORT CIRCUIT TEST

Make the connection as shown in Fig. 5 or 6. The current draw, as indicated by the ammeter, should be to specifications. If there is little or no current flow, the field or brushes have a high resistance or are open. A current flow considerably higher than that specified above, indicates shorted or grounded turns or brush leads touching. If the test shows that the field is shorted or open and the field brush assembly or slip rings are not at fault, the entire rotor must be replaced.

ALTERNATOR REGULATOR AND CIRCUIT TESTS

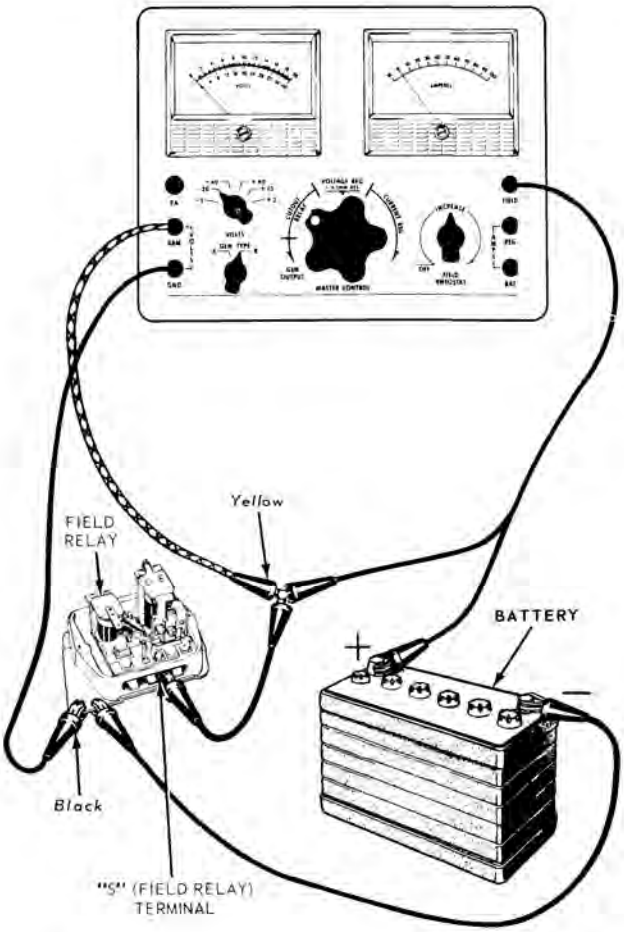
The tests presented are outlined for on-the-car operation. Be sure that the regulator is at normal operating temperature (equivalent to the temperature after 20 minutes of operation of the car with the hood down).

FIELD RELAY TEST

Disconnect the regulator connector plug, and remove the regulator cover. Make the connections as shown in Fig. 7 or 8. Slowly rotate the field resistance control clockwise from the maximum counterclockwise position until the field relay contacts close. Observe the voltmeter reading at the moment that the relay closes. This is the relay closing voltage. If the relay closes immediately, even with the field resistance close to the maximum counterclockwise position, use a 6-volt battery for this test. If the closing voltage is not to specification, adjust the relay (Part 13-3).

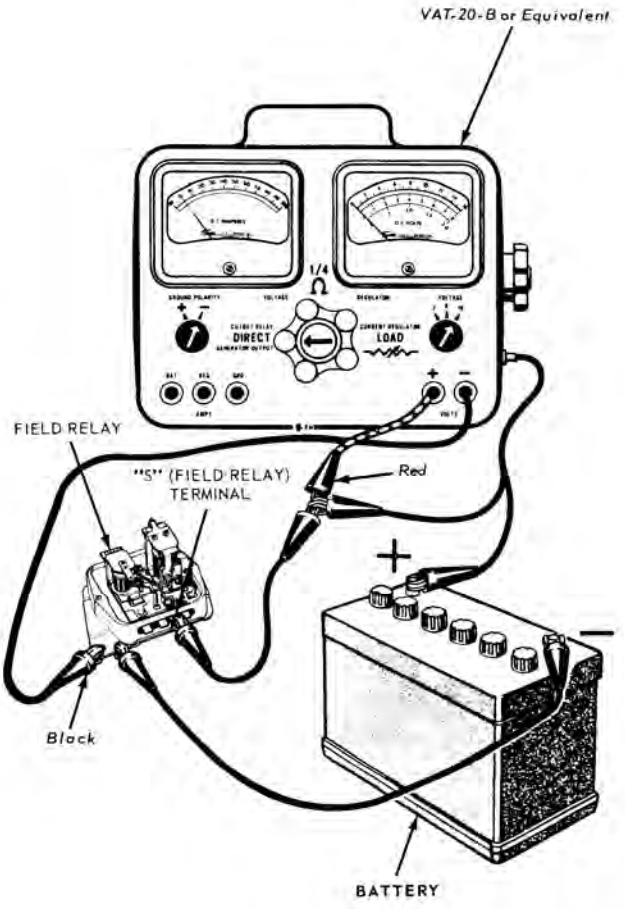
VOLTAGE LIMITER TEST

For test purposes, the lower stage (armature vibrating on the lower contact) regulation is used. Voltage limiter calibration tests must be made



J1215-C

FIG. 7—Field Relay Test—Except Comet



J1229-C

FIG. 8—Field Relay Test—Comet

with the regulator cover in place and the regulator at normal operating temperature (equivalent to the temperature after 20 minutes of operation on the car with the hood down).

Make the test connections as shown in Fig. 9 or 10. Turn all accessories off, including door operated dome lights. Close the battery adapter switch, start the engine, then open the adapter switch. Attach the voltage regulator thermometer (T56L-10505-A or M-183-RT6-5), to the regulator cover. Operate the engine at approximately 1800 rpm for 5 minutes. Turn the center control to the cutout relay position. If the ammeter indicates more than 10 amperes, stop the engine, remove the battery cables and charge the battery.

When the battery is charged, and the voltage regulator has been temperature stabilized, rotate the center control to the ¼ Ohm position. The ammeter should indicate approximately 2 amperes.

Cycle the regulator as follows: stop the engine, close the adapter switch, start the engine, and open the adapter switch. Allow the battery to normalize for a few seconds, then read the voltmeter. Read the thermometer, and compare the voltmeter reading with the voltage given in Table 1 for the ambient temperature indicated on the thermometer. If the regulated voltage is not within specifications, make a voltage limiter adjustment. After each adjustment, be sure to cycle the regulator before each reading. **The readings must be made with the cover in place.**

TABLE 1—Voltage Regulator Setting Versus Ambient Air Temperature

Ambient Air Temperature °F.	Lower Stage Voltage Regulation Setting (Volts)
50	14.3-15.1
75	14.1-14.9
100	13.9-14.7
125	13.8-14.6
150	13.6-14.4
175	13.5-14.3

CIRCUIT RESISTANCE TESTS

For the purpose of this test, the resistance values of the circuits have

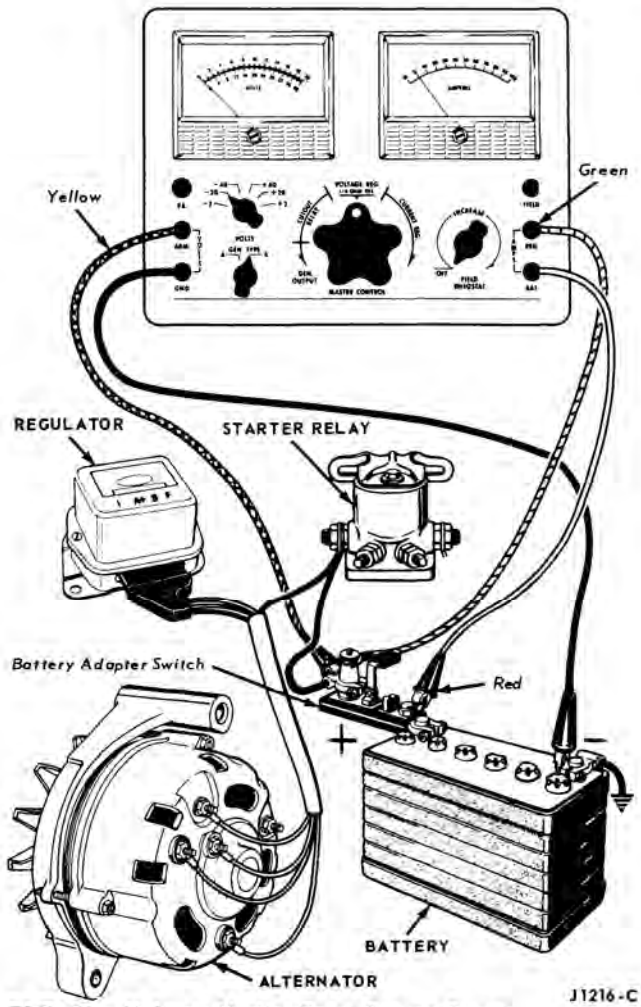


FIG. 9—Voltage Limiter Test—Except Comet

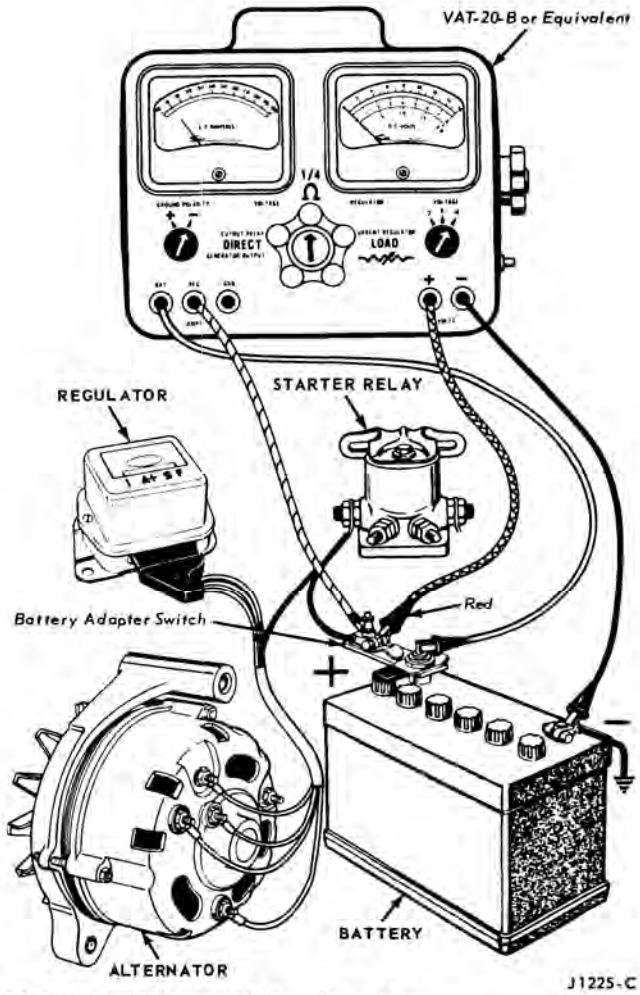


FIG. 10—Voltage Limiter Test—Comet

been converted to voltage drop readings for a current flow of 20 amperes.

Alternator to Battery Positive Terminal. To check the alternator to battery positive terminal voltage drop, make the connections as shown in Fig. 11 or 12. Turn off all electrical accessories and lights. Close the battery adapter switch, start the engine, then open the battery adapter switch. Slowly increase the engine speed until the ammeter reads 20 amperes. Note the voltmeter reading at this point. The voltage reading should be no greater than 0.3 volt.

These voltage drops have been computed for a standard car. The current used by any auxiliary, continuously operating, heavy-duty equipment will not show on the ammeter and will have to be taken into account when making this test.

If the battery is fully charged it may not be possible to read the 20 amperes required for the test. Connect a battery discharge tester to the battery terminals and adjust the load on the battery until the required 20 amperes is indicated.

Alternator to Battery Ground Terminal. To check the alternator to battery ground terminal voltage drop, make the connections as shown in Fig. 13 or 14. Close the battery adapter switch, start the engine and open the adapter switch. Slowly increase the engine speed until the ammeter reads 20 amperes. The voltage indicated on the voltmeter should be less than 0.1 volt. If necessary, use a battery discharge tester, as in the preceding test to obtain the required 20-ampere reading.

BATTERY TESTS AND CONCLUSIONS

Tests are made on a battery to determine the state of charge and also the condition. The ultimate result of these tests is to show that the battery is good, needs recharging, or must be replaced.

If a battery has failed, is low in charge, or requires water frequently, good service demands that the reason for this condition be found. It may be necessary to follow trouble shooting procedures to locate the cause of the trouble (Section 1 in this part).

Hydrogen and oxygen gases are produced during normal battery operation. This gas mixture can explode if flames or sparks are brought near the vent openings of the bat-

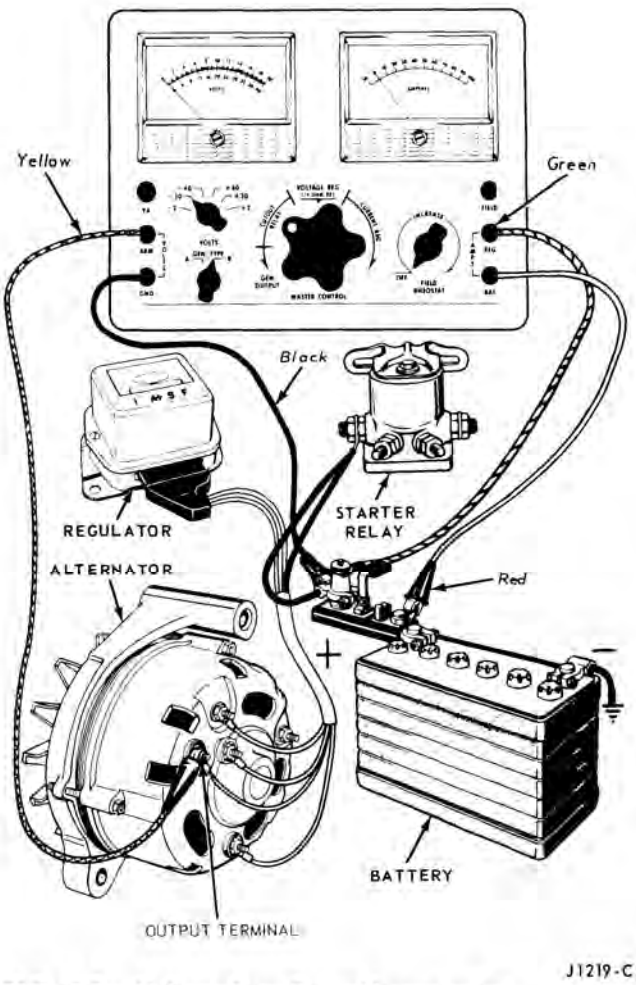


FIG. 11—Voltage Drop Test—Alternator to Battery Positive Terminal—Except Comet

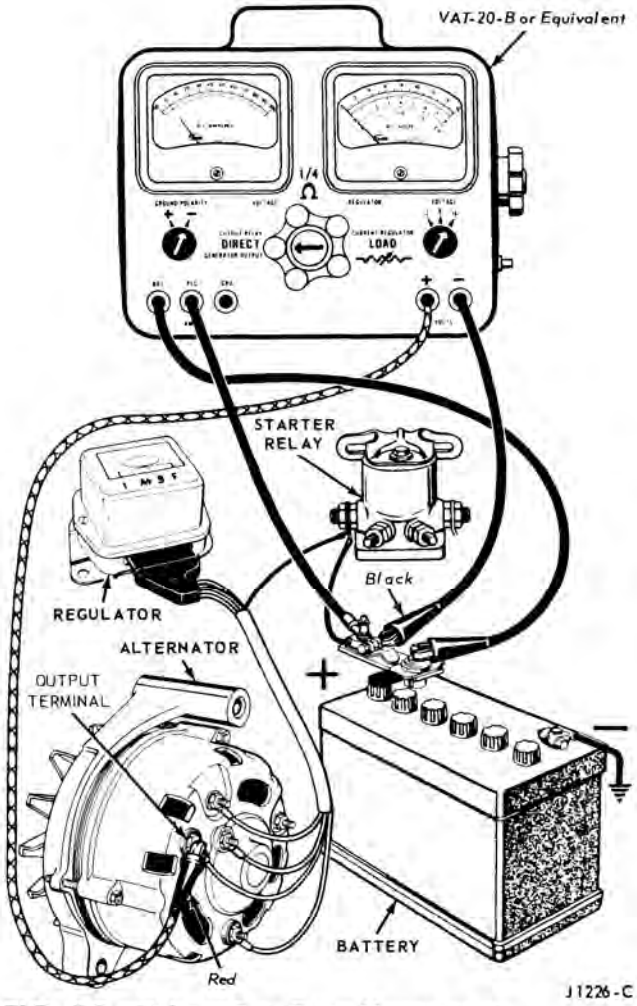


FIG. 12—Voltage Drop Test—Alternator to Battery Positive Terminal—Comet

tery. The sulphuric acid in the battery electrolyte can cause a serious burn if spilled on the skin or spattered in the eyes. It should be flushed away with large quantities of clear water.

Before attempting to test a battery, it is important that it be given a thorough visual examination to determine if it has been damaged. The presence of moisture on the outside of the case and/or low electrolyte level in one or more of the cells are indications of possible battery damage.

The Ford and Mercury batteries incorporate a single one-piece cover which completely seals the top of the battery and the individual cell connectors. This cover must not be pierced with test probes to perform individual cell tests.

A battery can be tested by determining its ability to deliver current. This may be determined by conducting a Battery Capacity Test. Fig. 15 shows the battery capacity test in outline form.

BATTERY CAPACITY TEST

A high rate discharge tester (Battery-Starter Tester) in conjunction with a voltmeter is used for this test.

1. Turn the control knob on the Battery-Starter Tester to the OFF position.

2. Turn the voltmeter selector switch to the 16 or 20-volt position.

3. Connect both positive test leads to the positive battery post and both negative test leads to the negative battery post. **The voltmeter clips must contact the battery posts and not the high rate discharge tester clips. Unless this is done the actual battery terminal voltage will not be indicated.**

4. Turn the load control knob in a clockwise direction until the ammeter reads three times the ampere hour rating of the battery (a 45 ampere-hour battery should be tested at 135 amperes load).

5. With the ammeter reading the required load for 15 seconds, note the voltmeter reading. **Avoid leaving the high discharge load on the battery for periods longer than 15 seconds.**

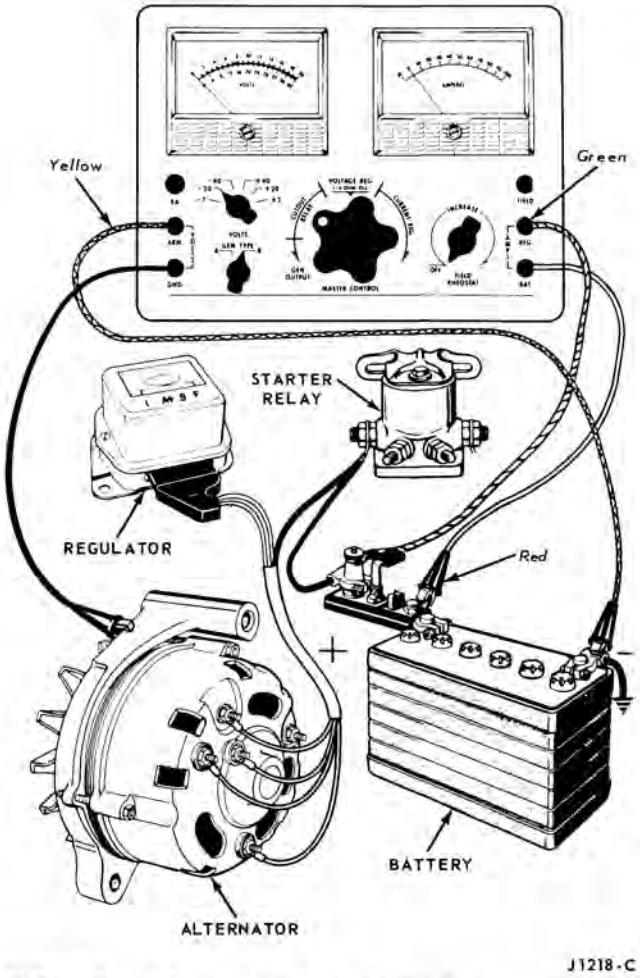


FIG. 13—Voltage Drop Test—Alternator to Battery Ground Terminal—Except Comet

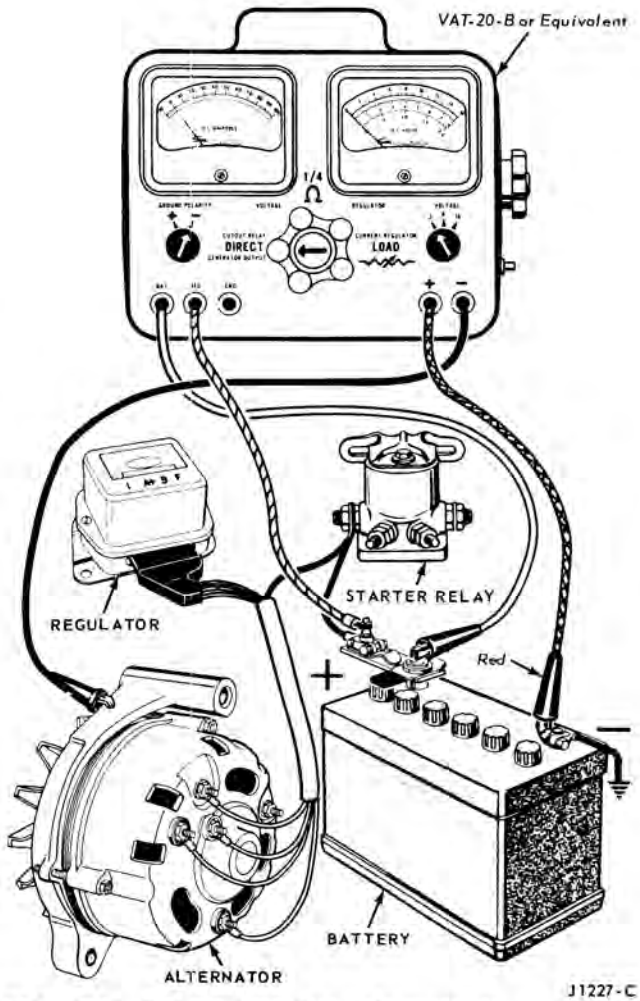


FIG. 14—Voltage Drop Test—Alternator to Battery Ground Terminal—Comet

6. If the voltmeter reading is 9.6 volts or more, the battery has good output capacity and will readily accept a charge, if required. Check the specific gravity. If the specific gravity reading is 1.240 or below, charge the battery until it is fully charged.

The battery is fully charged when the cells are all gassing freely and the specific gravity ceases to rise for three successive readings taken at hourly intervals. Additional battery testing will not be necessary after the battery has been properly charged.

7. If the voltage reading obtained during the capacity test is below 9.6 volts, check the specific gravity of each cell.

8. If the difference between any two cells is more than 50 points (0.050), the battery is not satisfactory for service and should be replaced.

9. If the difference between cells is less than 50 points (0.050), the battery should be charged according to the following charging schedule. In some cases the electrolyte level will be too low to obtain a specific gravity reading. In such cases water should be added until the electrolyte level just covers the ring in the filler well, then charge the battery at 35 amperes for 15 minutes. Check the specific gravity of each cell and if the difference between cells is less than 50

TABLE 2—Allowable Battery High Rate Charge Time Schedule

Specific Gravity Reading	Charge Rate Amperes	BATTERY CAPACITY—AMPERE HOURS			
		45	55	70	80
1.125—1.150*	35	65 min.	80 min.	100 min.	115 min.
1.150—1.175	35	50 min.	65 min.	80 min.	95 min.
1.175—1.200	35	40 min.	50 min.	60 min.	70 min.
1.200—1.225	35	30 min.	35 min.	45 min.	50 min.
Above 1.225	5	**	**	**	**

*If the specific gravity is below 1.125, use the indicated high rate of charge for the 1.125 specific gravity, then charge at 5 amperes until the specific gravity reaches 1.250 at 80° F.

**Charge at 5 ampere rate only until the specific gravity reaches 1.250 at 80°F.

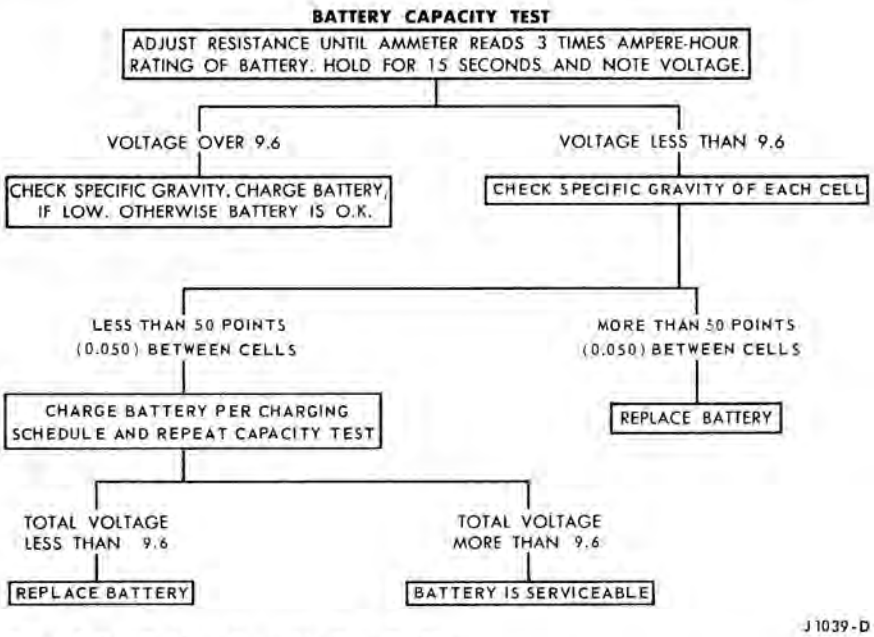


FIG. 15—Battery Capacity Test Outline

points (0.050), charge the battery according to the schedule.

10. After the battery has been charged, repeat the capacity test. If the capacity test battery voltage is still less than 9.6 volts, replace the battery. If the voltage is 9.6 volts or more, the battery is satisfactory for service.

11. If the battery is found to be discharged only, check for a loose fan belt, loose electrical connections, charging system performance, and make a battery drain test (in this section).

BATTERY DRAIN TEST

This test will determine if there is any external load that would cause unwanted battery discharge.

Disconnect the battery ground cable and connect the positive lead of a voltmeter to the cable. Connect the negative lead of the voltmeter to the battery negative post.

With all circuits off, the meter should read zero. Any battery external load will cause the voltmeter to read full battery voltage.

If the car is equipped with an electric clock, momentarily connect the battery ground cable to the battery negative post to make certain that the clock is wound. When the clock runs down at the end of approximately 2 minutes the voltmeter will show full battery voltage.

2 COMMON ADJUSTMENTS AND REPAIRS

BELT ADJUSTMENT

1. Loosen the alternator mounting bolt and the adjusting arm bolts.

2. Apply pressure on the alternator front housing only and tighten the adjusting arm to alternator bolt.

3. Check the belt tension using tool T63L-8620-A. Adjust the belt for specified tension.

4. Tighten all mounting bolts.

3 CLEANING AND INSPECTION

1. The rotor, stator, and bearings must not be cleaned with solvent. Wipe these parts off with a clean cloth.

2. Rotate the front bearing on the drive end of the rotor shaft. Check for any scraping noise, looseness or roughness that will indicate that the bearing is excessively worn. Look for excessive lubricant leakage. If any of these conditions exist, replace the bearing.

3. Inspect the rotor shaft at the rear bearing surface for roughness or severe chatter marks. Replace the rotor assembly if the shaft is not smooth.

4. Place the rear end bearing on the slip-ring end of the shaft and rotate the bearing on the shaft. Make the same check for noise, looseness or roughness as was made for the front bearing. Inspect the rollers and cage for damage. Replace the bearing if these conditions exist, or if the lubricant is lost or contaminated.

5. Check the pulley and fan for excessive looseness on the rotor shaft. Replace any pulley or fan that is loose or bent out of shape. Check the rotor shaft for stripped or damaged threads. Inspect the hex hole in the end of the shaft for damage.

6. Check both the front and rear housings for cracks. Check the front housing for stripped threads in the mounting ear. Replace defective housings.

7. Check all wire leads on both the stator and rotor assemblies for loose soldered connections, and for burned insulation. Resolder poor connections. Replace parts that show burned insulation.

8. Check the slip rings for nicks and surface roughness. Nicks and scratches may be removed by turning down the slip rings. Do not go beyond the minimum diameter limit of 1.22 inches. If the slip rings are badly damaged, the entire rotor will have to be replaced, as it is serviced as a complete assembly.

9. Replace any parts that are burned or cracked. Replace brushes and brush springs that are not to specification.

PART 13-2 ALTERNATOR

Section		Page	Section		Page
1	Description and Operation	13-10	3	Major Repair Operations	13-10
2	Removal and Installation	13-10			

1 DESCRIPTION AND OPERATION

The alternator charging system is a negative (–) ground system, and consists of an alternator, a regulator, a charge indicator, a storage battery and associated wiring. Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

ALTERNATOR

An alternator is belt driven from the engine.

The mechanical construction of the alternator differs from a generator in that the field rotates, and the generating windings are stationary. Energy is supplied from the system to the rotating field through two brushes to two slip rings. The slip rings are mounted on the rotor shaft (Fig. 1).

The alternator produces power in the form of alternating current. The alternating current is rectified to direct current by six diodes (Fig. 1) for use in charging the battery and supplying power to the electrical system.

2 REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the battery ground cable.

2. Loosen the alternator mounting bolts and remove the adjustment arm to alternator bolt.

3. Disengage the alternator belt. Remove the alternator mounting bolt, disconnect the alternator wiring harness, and remove the alternator.

INSTALLATION

1. Attach the alternator wiring harness (Fig. 1). Position the alternator to the engine, and install the alternator mounting bolt finger tight.

2. Install the adjustment arm to alternator bolt.

3. Adjust the belt tension to specification using tool T63L-8620-A. **Apply pressure on the alternator front housing only, when tightening the belt.**

Tighten the adjusting arm bolts and the mounting bolt.

4. Connect the battery ground cable.

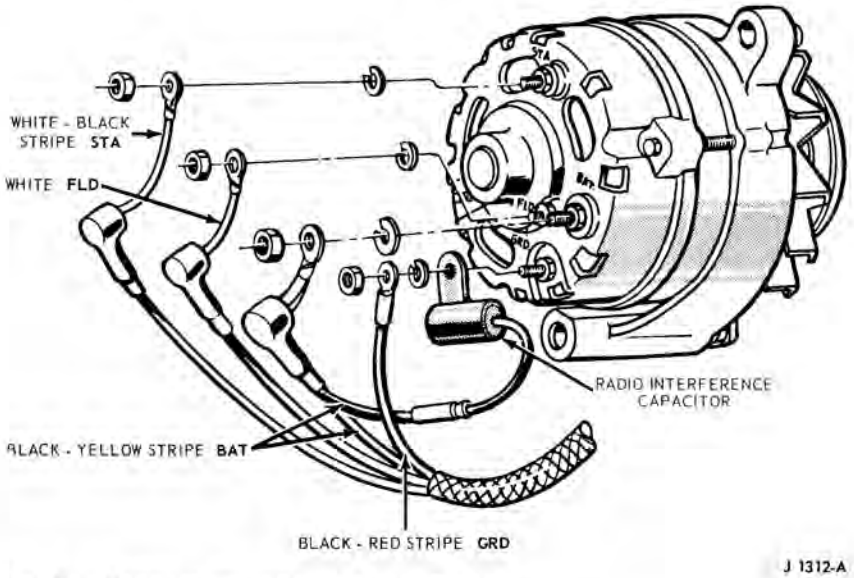


FIG. 1—Wiring Harness Connections—Typical

3 MAJOR REPAIR OPERATIONS

DISASSEMBLY

Fig. 2 shows a disassembled view of the Ford alternator.

1. Mark both end housings and the stator with a scribe mark for assembly.

2. Remove the three housing through bolts.

3. Separate the front end housing

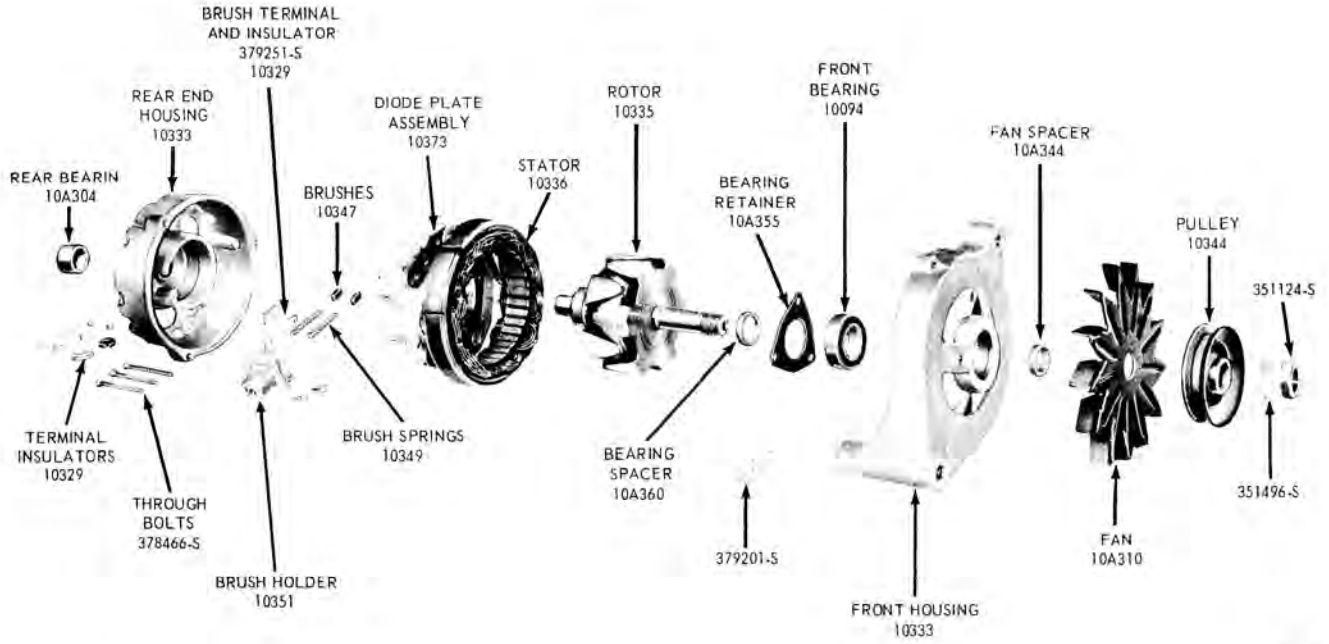


FIG. 2—Disassembled Alternator

and rotor from the stator and rear end housing.

4. Remove all the nuts and washers from the rear end housing and remove the rear end housing from the stator and diode plate assembly.

5. Remove the brush holder mounting screws and remove the holder, brushes, brush springs, insulator and terminal.

6. If replacement is necessary, press the bearing from the rear end housing, supporting the housing on the inner boss.

7. If either diode plate assembly is being replaced, carefully unsolder the stator leads from the printed-circuit board terminals, slip the stator neutral lead split terminal lug out from under the head of the terminal screw, and separate the stator from the diode plate assembly. Use only a 100-watt soldering iron. Leave the soldering iron in contact with the terminals only long enough to remove the wires. Excess heat can damage the printed circuit board.

8. Hold the diode plate that is to be replaced, in a vise. Use a thin hacksaw blade and cut the three diode leads as close to the diodes as possible. Be careful not to break the printed-circuit board.

9. Press the insulated terminal bolt out of the insulators, and remove the insulators.

10. Separate the diode plate from the printed-circuit board. Discard the roll pins.

11. Carefully unsolder and remove tht cut diode leads from the printed-circuit board, using a 100-watt soldering iron. Remove any remaining solder and washers from the diode lead holes.

12. If the printed-circuit board is being replaced, cut the printed-circuit board into six separate pieces and unsolder each piece from the diode it is attached to. Remove and discard the roll pins from the diode plates.

13. Remove the drive pulley nut, pulley, fan, fan spacer, rotor and bearing spacer (Fig. 3).

14. Remove the three screws that hold the front end bearing retainer, and remove the retainer. Support the housing close to the bearing boss, and press out the old bearing from the housing, only if the bearing is loose or has lost its lubricant.

15. Perform a diode test and a field open or short circuit test (Part 13-1).

PARTS REPAIR OR REPLACEMENT

Nicks and scratches may be removed from the rotor slip rings by turning down the slip rings. Do not go beyond the minimum diameter limit of 1.22 inches. If the slip rings

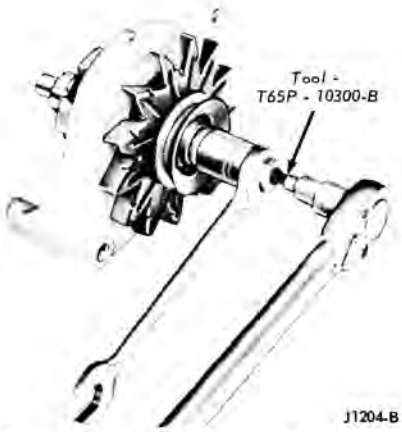


FIG. 3—Pulley Removal

are badly damaged, the entire rotor must be replaced as it is serviced as an assembly. All other assemblies are to be replaced rather than repaired.

ASSEMBLY

1. Press the front end bearing in the bearing boss and install the bearing retainer.

2. If the stop-ring on the rotor drive shaft was damaged, install a new stop-ring. Push the new ring on the shaft and into the groove. **Do not open the ring with snap ring pliers as permanent damage will result.**

3. Position the front end bearing

spacer on the drive shaft with the recessed side against the stop-ring.

4. Position the drive end housing, fan spacer, fan, pulley and lock washer on the drive shaft and install the retaining nut (Fig. 3), to specified torque.

5. If the rear end housing bearing was removed, support the housing on the inner boss and press in a new bearing flush with the outer end surface.

6. Place the brush springs, brushes, brush terminal and terminal insulator in the brush holder and hold the brushes in position by inserting a piece of stiff wire in the brush holder as shown in Fig. 4.

7. Position the brush holder assembly in the rear end housing and install the mounting screws. Position the brush leads in the brush holder as shown in Fig. 5.

8. If a new diode plate or printed-circuit board is being installed, position the diode plate so that the diode leads go through the three holes in the printed-circuit board. Install the terminal bolt and insulator. Maintain

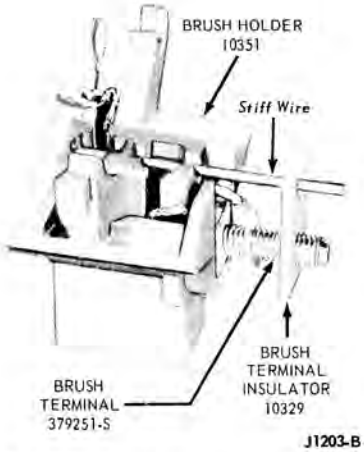


FIG. 4—Brush Holder Assembly

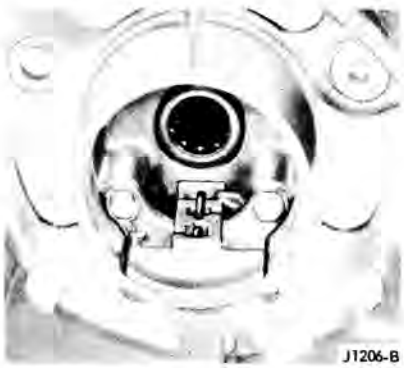


FIG. 5—Brush Lead Positions

the ½-inch insulator spacing between the printed-circuit board and the diode plate. Install a small tinned washer and a solder ring on each

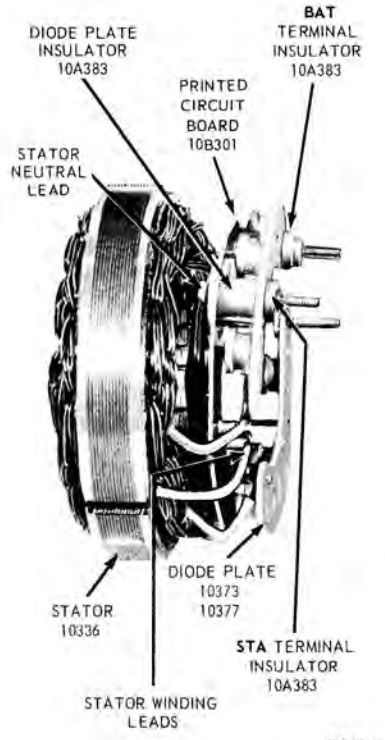


FIG. 6—Stator Lead Connections

diode lead and solder the diode leads to the printed-circuit board. Use a 100-watt iron. Avoid excess heat on the printed-circuit board so as not to loosen the printed-circuit wiring from the board.

9. Wrap the three stator winding leads around the printed-circuit board terminals and solder them. Use a 100-watt soldering iron and rosin-core solder. Slip the stator neutral lead split-terminal lug under the head of the stator terminal screw (Fig. 6).

10. Install the STA and BAT terminal insulators (Fig. 6). Position the stator and diode plate assembly in the rear end housing. Position the STA (black), BAT (red), and FLD (white) insulators, on the terminal bolts, and install five retaining nuts (Fig. 7).

11. Wipe the rear end bearing surface of the rotor shaft with a clean lint-free rag.

12. Position the rear end housing and stator assembly over the rotor and align the scribe marks made during disassembly. Seat the machined portion of the stator core into the step in both end housings. Install the housing through bolts. Remove the brush retracting rod, and put a daub of waterproof cement over the hole to seal it.



FIG. 7—Alternator Terminal Locations

PART 13-3 ALTERNATOR REGULATOR

Section		Page
1	Description and Operation	13-13
2	In-Car Adjustment and Repair	13-13
3	Removal and Installation	13-14

1 DESCRIPTION AND OPERATION

The alternator regulator is composed of two control units, a field relay and a voltage limiter, mounted as an assembly (Fig. 1). Because the reverse current through the rectifier is small, a reverse current cutout relay is not needed. The alternator is self current limiting, thus a current limiter is not needed. Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

FIELD RELAY

The field relay serves to connect the battery and alternator output to the field circuit when the engine is running.

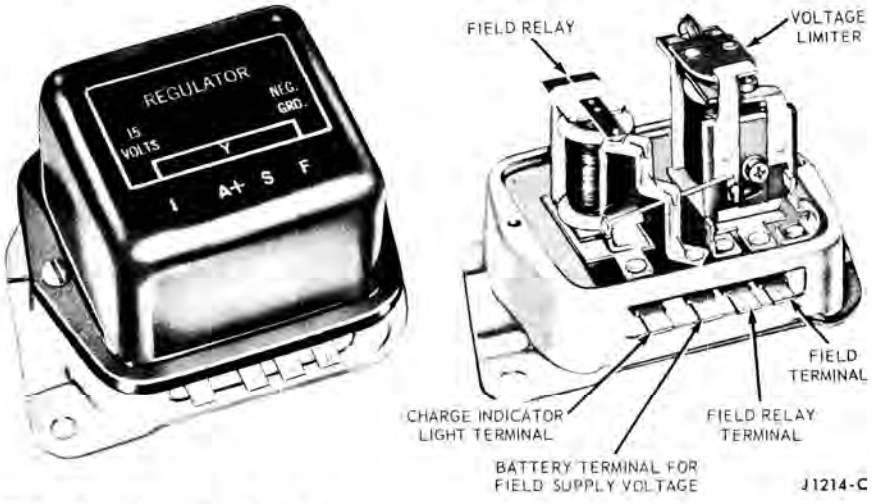


FIG. 1—Alternator Regulator

CHARGE INDICATOR CIRCUIT—LIGHT

When the ignition switch is closed, battery current flows through the charge indicator light and 15-ohm parallel resistor, and through the regulator voltage limiter contacts to the field. This small current is enough to allow the alternator to start generating, and is necessary, as residual magnetism in the alternator is usually too small to start voltage build-up. The charge indicator light is shunted with a 15-ohm resistor to supply adequate starting field current.

When the alternator builds up enough voltage to close the field relay contacts, full voltage is applied to the field, and the charge indicator light goes out.

CHARGE INDICATOR CIRCUIT—AMMETER

When the ignition switch is closed, the field relay is energized. Closing of the relay contacts connects the battery and alternator output to the field through the voltage limiter contacts.

VOLTAGE LIMITER

The temperature compensated voltage limiter is a double contact unit. Limiting is accomplished by controlling the amount of current supplied to the rotating field.

When the upper contacts are closed, full system voltage is applied to the field and maximum field current will flow. When the limiter armature floats between the contacts, field current is reduced by flowing through the field resistor. When the limiter lower contacts are closed, zero current flows to the field. At low engine speed and with a load applied, the armature vibrates on the upper contact. At high engine speed and light or no load, the armature vibrates on the lower contact.

A 50-ohm resistor is connected from the field terminal to ground to absorb electrical surges in the alternator circuits as the voltage limiter armature vibrates on the contacts.

2 IN-CAR ADJUSTMENTS AND REPAIRS

REGULATOR ADJUSTMENTS

Erratic operation of the regulator, indicated by erratic movement of the voltmeter pointer during a voltage limiter test, may be caused by dirty or pitted regulator contacts. Use a very fine abrasive paper such as silicon carbide, 400 grade, to clean the field relay and the voltage limiter contacts. Wear off the sharp edges of the abrasive by rubbing it against another piece of abrasive paper. Fold

the abrasive paper over and pull the paper through the contacts to clean them. Keep all oil or grease from contacting the points. Do not use compressed air to clean the regulator. When adjusting the gap spacing use only hospital clean feeler gauges.

REGULATOR GAP ADJUSTMENTS

Voltage Limiter. The difference between the upper stage and lower stage regulation (0.3 volt), is determined by the voltage limiter point and core gaps. Make the gap adjustments with the regulator removed from the car.

Adjust the point gap first. Loosen the left side lock screw ¼ turn (Fig. 2). Use a screw driver blade in the adjustment slot above the lock screw. Adjust the upper contact until there is 0.017 to 0.022-inch gap between the lower contacts. Tighten the lock screw and recheck the contact gap.

Adjust the core gap with the upper contacts closed. Loosen the center lock screw ¼ turn. Use a screwdriver blade in the adjustment slot under the lock screw. Adjust the core gap for 0.049 to 0.056-inch clearance between the armature and the core at the edge of the core closest to the contact points. Tighten the lock screw and recheck the core gap.

Field Relay. Place a 0.012 to 0.022-inch feeler gauge on top of the coil core closest to the contact points. Hold the armature down on the gauge. Do not push down on the contact spring arm. Bend the contact post arm (Fig. 2) until the bottom contact just touches the upper contact.

REGULATOR VOLTAGE ADJUSTMENTS

Final adjustment of the regulator must be made with the regulator at normal operating temperature.

The field relay closing voltage is adjusted by bending the armature frame (Fig. 2). To increase the closing voltage, bend the frame down. To decrease the closing voltage, bend the frame up.

The voltage limiter is adjusted by bending the voltage limiter spring arm (Fig. 2). To increase the voltage setting, bend the adjusting arm downward. To decrease the voltage setting, bend the adjusting arm upward.

Before setting the voltage and before making a final voltage test, the alternator speed must be reduced to zero and the ignition switch opened momentarily, to cycle the regulator.

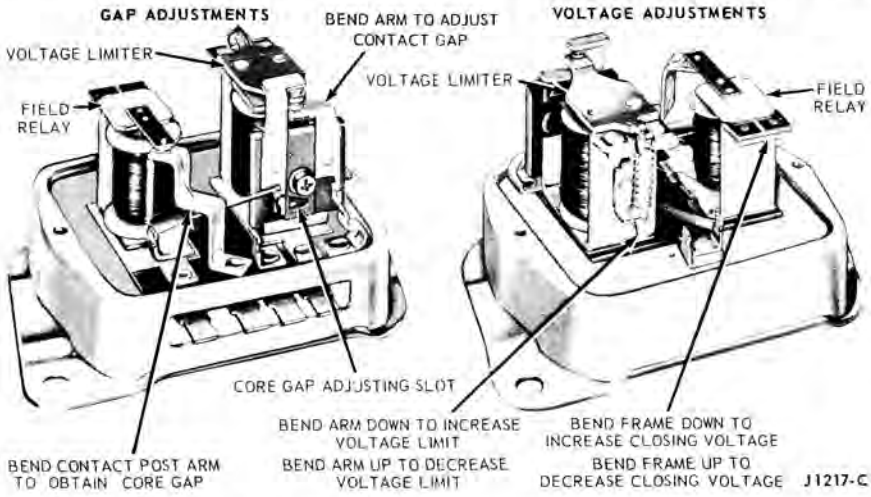


FIG. 2—Regulator Adjustments

3 REMOVAL AND INSTALLATION

1. Remove the battery ground cable.

2. Remove the regulator mounting screws.

3. Remove the cable disconnect from the regulator.

4. Attach the cable disconnect to the new regulator.

5. Mount the regulator to the radiator left air deflector. The radio suppression condenser mounts under the lower mounting screw (Fig. 3).

6. Connect the battery ground cable, and test the system for proper voltage regulation.

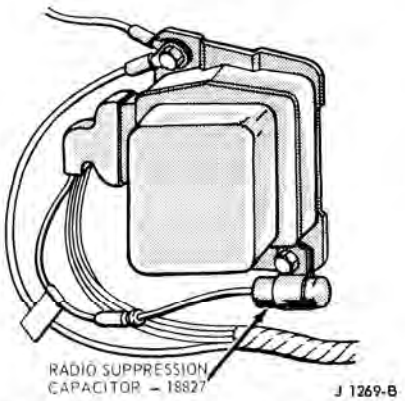


FIG. 3—Regulator Mounting

PART 13-4 SPECIFICATIONS

ALTERNATOR

Supplier	Amperes (@ 15V.)	Watts (@ 15V.)	Field Current (Amps. @ 12V. 75°F.)	Cut-In Speed (Engine R.P.M.)	Rated Output Speed (Engine R.P.M.)	Minimum Slip Ring Turn Down Dia.	Maximum Slip Ring Run Out	BRUSHES		Pulley Nut Torque (Foot Pounds)	BELT TENSION (POUNDS)†	
								Original Length (Inches)	Wear Length (Inches)		6-Cyl.	8-Cyl.
FORD	38	570	2.8—3.3	325	1500 Cold 2500 Hot	1.220	0.0005	½	5/16	60-80	90-120 New 60-90 Used	110-140 New 80-110 Used
FORD	42	630	2.8—3.3	325	1625 Cold 2500 Hot	1.220	0.0005	½	5/16	60-80	90-120 New 60-90 Used	110-140 New 80-110 Used

†Used belt is one that has been in operation for more than 10 minutes.

ALTERNATOR PULLEY NUT TORQUE 60-80 foot pounds.

REGULATOR

Supplier	Current Rating	Voltage Setting (Lower Contacts) (@ + 75°F.)	VOLTAGE LIMITER		FIELD RELAY	
			Contact Gap (Inches)	Armature Air Gap (Inches)	Armature Air Gap (Inches)	Closing Volts @ + 75°F.
FORD	38	14.1 to 14.7	0.017 to 0.022	0.049 to 0.056	0.012 to 0.022	2.5
FORD	42	14.1 to 14.7	0.017 to 0.022	0.049 to 0.056	0.012 to 0.022	2.5

VOLTAGE REGULATION SETTING

Ambient Temperature °F	Standard Alternator Regulator
25	14.4—15.0
50	14.3—14.9
75	14.1—14.7
100	13.9—14.5
125	13.8—14.4
150	13.6—14.2
175	13.5—14.1

ALLOWABLE BATTERY HIGH RATE CHARGE TIME SCHEDULE

Specific Gravity Reading	Charge Rate Amperes	BATTERY CAPACITY—AMPERE HOURS			
		45	55	70	80
1.125—1.150*	35	65 min.	80 min.	100 min.	115 min.
1.150—1.175	35	50 min.	65 min.	80 min.	95 min.
1.175—1.200	35	40 min.	50 min.	60 min.	70 min.
1.200—1.225	35	30 min.	35 min.	45 min.	50 min.
Above 1.225	5	**	**	**	**

*If the specific gravity is below 1.125, use the indicated high rate of charge for the 1.125 specific gravity, then charge at 5 amperes until the specific gravity reaches 1.250 at 80°F.

Charge at 5 ampere rate **only until the specific gravity reaches 1.250 at 80°F

BATTERY

Filler Cap Color	Number of Plates	Amp. Hours
Yellow	54	45
Red	66	55
Gray	66	70
Black	78	80

BATTERY FREEZING TEMPERATURES

Specific Gravity	Freezing Temp.
1.280	—90°F.
1.250	—62°F.
1.200	—16°F.
1.150	+ 5°F.
1.100	+19°F.

TOOLS

Ford Tool No.	Former No.	Description
T56L-10505-A	M-183-RT6-5	Voltage Regulator Thermometer
T63L-8620-A	8620 BT-33-73-F	Belt Tension Gauge

STARTING SYSTEM — GROUP 14

PART 14-1 PAGE
GENERAL STARTING SYSTEM SERVICE. 14-1

PART 14-2
STARTER 14-7

PART 14-3 PAGE
SPECIFICATIONS 14-9

PART 14-1 GENERAL STARTING SYSTEM SERVICE

Section	Page
1 Diagnosis and Testing	14-1
2 Common Adjustments and Repairs	14-5
3 Cleaning and Inspection	14-6

1 DIAGNOSIS AND TESTING

If the engine cranks but will not start, the trouble is in the engine (fuel, or ignition system) and not in the starting system. If the engine will not crank even with a booster battery connected, engine parts may be seized or the starter may be faulty.

On a car with a manual shift transmission, attempt to start the car by pushing it. If it still will not start, tow the car to the shop for a complete diagnosis.

Do not attempt to start a car equipped with an automatic transmission by pushing or towing it.

Do not tow a car at more than 30 mph or for more than 15 miles without raising the rear wheels off the ground, or disconnecting the driveshaft. Be sure that the transmission is in neutral.

STARTER TROUBLE DIAGNOSIS GUIDE

ENGINE WILL NOT CRANK AND STARTER RELAY DOES NOT CLICK

1. The battery may be discharged.
2. The ignition switch, starter, neutral switch or starter relay may be inoperative.
3. The relay control circuit may be open or contain high resistance.

CHECK BATTERY

Perform a Battery Capacity Test (Group 13). If the battery does not test as having good capacity, make a Battery Test Charge (Group 13). Replace the battery if the test indicates that it is worn out or under capacity.

CHECK STARTER RELAY

1. Disconnect and ground the high tension lead from the spark coil so that the engine cannot start. On cars with a transistor ignition, also disconnect the brown wire from the starter relay I terminal. Place the transmission lever in the N or P position.
2. With a fully charged battery, operate the ignition switch to crank the engine. If the engine will not crank and the relay does not click, connect a jumper lead from the battery terminal of the relay to the starter switch terminal of the relay (Fig. 1, connection ①). If the engine

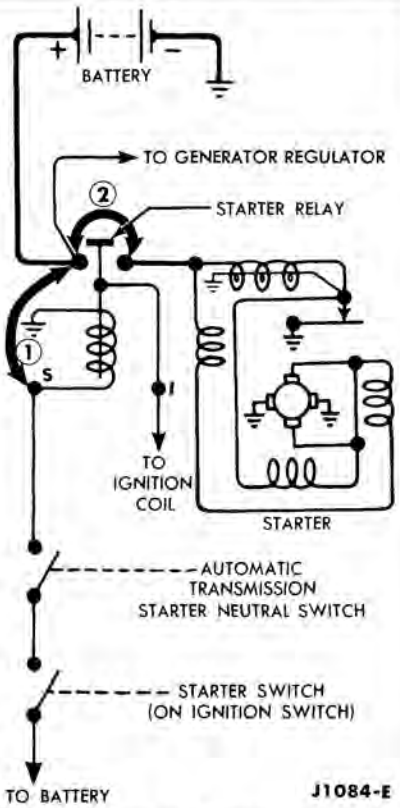


FIG. 1—Starting Control Circuit Test

CONTINUED ON NEXT PAGE

STARTER TROUBLE DIAGNOSIS GUIDE (Continued)

ENGINE WILL NOT CRANK AND STARTER RELAY DOES NOT CLICK (Continued)	does not crank, and the relay does not click, the starter relay is probably defective. **3.** If the engine cranks in Step 2, remove the quick disconnect from the starter neutral switch, which is located on the steering column under the instrument panel. Connect a jumper wire between the quick disconnect terminals that are connected to the two red-blue stripe wires. Operate the ignition switch to crank the engine. **4.** If the engine cranks in Step 3,	the starter neutral switch is defective or out of adjustment. **5.** If the engine does not crank in Step 3, there are three possible defects: The hot wire from the battery terminal of the starter relay to the battery terminal of the ignition switch is loose or broken. The ignition switch is defective. The wire from the ignition switch to the automatic transmission neutral switch or from the neutral switch to the S terminal of the starter relay is loose or broken.
ENGINE WILL NOT CRANK BUT STARTER RELAY CLICKS	If the relay clicks when the ignition switch is operated, and the engine does not crank, connect a heavy jumper from the relay battery terminal to the relay starter terminal (Fig. 1, connection ②). If the engine cranks, replace the relay. If the engine does not crank, observe the spark when connecting and disconnecting the jumper. If there is a heavy spark, see Check Engine and Starter Drive below. If the spark is weak or there is no spark at all, proceed as follows: **CHECK CABLES AND CONNECTIONS** If the spark at the relay is weak when the jumper is connected, inspect the battery starter cables for corrosion and broken conductors. Check the ground cable to see if it is broken, badly corroded, or loose at the connecting points. Inspect all cable connections. Clean and tighten them if necessary. Replace any broken or frayed cables. If the engine still will not crank, the trouble is in the starter, and it must be repaired or replaced. **CHECK ENGINE AND STARTER DRIVE** If a heavy spark is obtained when the jumper wire is connected, loosen the starter mounting bolts to free the starter pinion. If the starter drive is locked, remove the starter from the engine and examine the starter drive pinion for	burred or worn teeth. Examine the teeth on the flywheel ring gear for burrs and wear. Replace the pinion or the flywheel ring gear if they are badly worn or damaged. If the starter drive is not locked, remove the starter from the engine and perform the no-load current test. The starter should run freely. If the current reading at no-load speed is below specifications (70 amperes), the starter has high resistance and should be repaired. If the current reading is above normal, and the starter is running slower than it should at no-load, it is probably due to tight or defective bearings, a bent shaft, or the armature rubbing the field poles. A shorted coil in the starter also causes the current reading to be high. Disassemble the starter and determine the cause. Repair it if possible, or replace the starter. If the no-load current reading of the starter is normal, install the starter, remove all the spark plugs, and attempt to crank the engine with the starter. If the engine cranks with the spark plugs removed, water has probably leaked into the cylinders causing a hydrostatic lock. The cylinder head must be removed, and the cause of internal coolant leakage eliminated. If the engine will still not crank, the engine is seized and cannot be turned by the starter. Disassemble the engine and repair or replace the defective parts.
STARTER SPINS BUT DOES NOT CRANK THE ENGINE	If the starter spins but will not crank the engine, the starter drive is worn out, broken, seized to the	shaft or has a broken armature bypass switch or actuating lever. Repair or replace parts as necessary.

CONTINUED ON NEXT PAGE

STARTER TROUBLE DIAGNOSIS GUIDE (Continued)

ENGINE CRANKS SLOWLY	Several causes may result in this symptom: **1.** The battery may be low in charge. **2.** There may be excessive resistance in the starter circuit. **3.** The starter may be faulty. **4.** The engine may have excessive friction. **CHECK BATTERY** Test the state of charge of the battery. If the battery is discharged, recharge the battery, and check the starter relay for possible internal shorts to ground that may have caused the battery to discharge. Perform a Battery Capacity Test (Group 13). If the battery does not test as having good capacity, make a Battery Test Charge (Group 13). Replace the battery if the test indicates it to be worn out or under capacity. **CHECK EXTERNAL CIRCUIT VOLTAGE DROP** If the battery was fully charged in the previous test, test the starter cranking circuit voltage drop. The voltage drop will be either excessive or normal. **VOLTAGE DROP (RESISTANCE) EXCESSIVE** Locate the exact part of the circuit with the excessive resistance. To correct excessive resistance in the battery to starter relay cable, starter relay to starter cable or battery to ground cable, clean and tighten the cable connections. Recheck the voltage drop. If it is still excessive, replace the cables. To correct excessive resistance of the starter relay contacts, replace the starter relay. **VOLTAGE DROP (RESISTANCE) NORMAL** If the voltage drop (resistance) is normal, make a starter load test. If the starter load current is not to specifications, proceed as follows: **Cranking Current Low.** Remove the starter from the engine, and repair or replace it. **Cranking Current Normal or High.** Remove the starter from the engine, and test the starter current draw at no-load. If the no-load current draw is above or below specifications, repair or replace the starter. If the current draw at no-load is normal, the starter is not at fault. The engine has excessive friction, and the cause must be determined. Repair or replace faulty parts.

STARTER LOAD TEST

Connect the test equipment as shown in Figs. 2 or 3. Be sure that no current is flowing through the ammeter and heavy-duty carbon pile rheostat portion of the circuit (rheostat at maximum resistance).

Crank the engine with the ignition OFF, and determine the exact reading on the voltmeter. This test is accomplished by disconnecting and grounding the high tension lead from the spark coil, and by connecting a jumper from the battery ter-

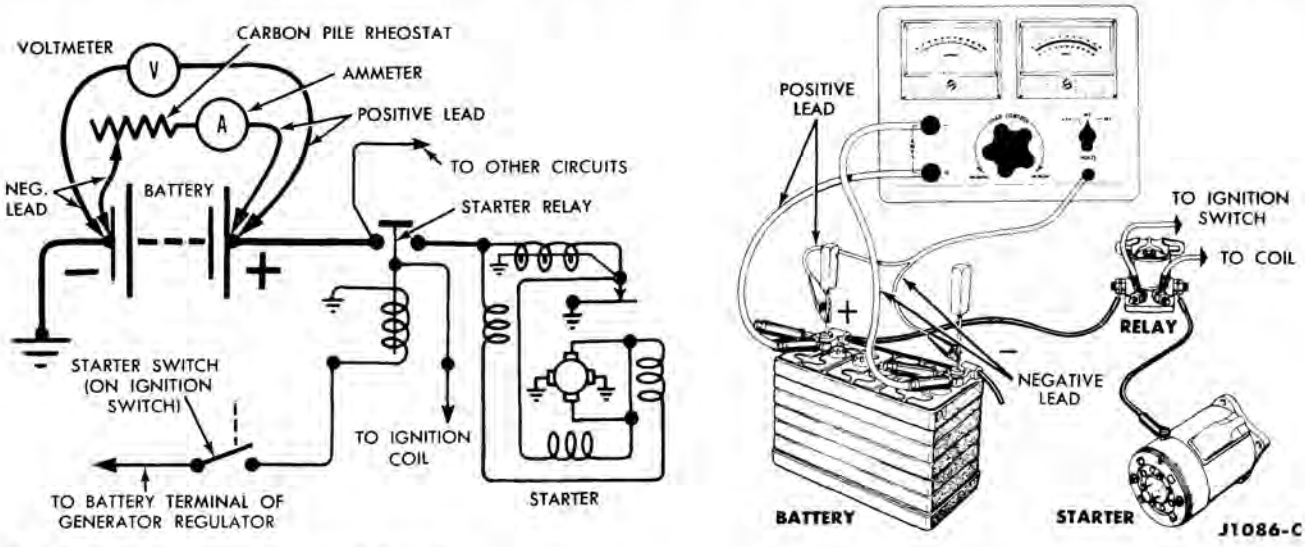


FIG. 2—Starter Load Test—Except Comet

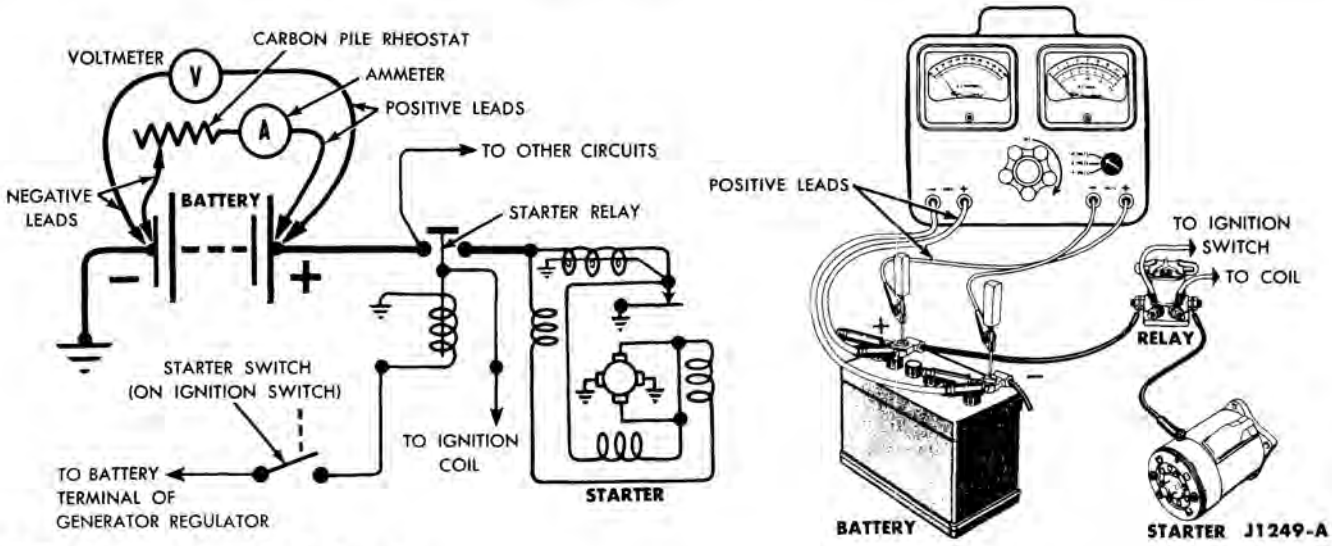


FIG. 3—Starter Load Test—Comet

minal of the starter relay to the ignition switch terminal of the relay.

Stop cranking the engine, and reduce the resistance of the carbon pile until the voltmeter indicates the same reading as that obtained while the starter cranked the engine. The ammeter will indicate the starter current draw under load.

STARTER NO-LOAD TEST

The starter no-load test will uncover such faults as open or shorted windings, rubbing armature, and bent armature shaft. The starter can be tested, at no-load, on the test bench only.

Make the test connections as shown in Fig. 4 or 5. The starter will run at no-load. Be sure that no current is flowing through the ammeter (rheostat at maximum counterclockwise position). Determine the exact reading on the voltmeter.

Disconnect the starter from the battery, and reduce the resistance of the rheostat until the voltmeter indicates the same reading as that obtained while the starter was running. The ammeter will indicate the starter no-load current draw.

ARMATURE OPEN CIRCUIT TEST—ON TEST BENCH

An open circuit armature may sometimes be detected by examining the commutator for evidence of burning. The spot burned on the commutator is caused by an arc formed every time the commutator segment, connected to the open circuit winding, passes under a brush.

ARMATURE AND FIELD GROUNDED CIRCUIT TEST—ON TEST BENCH

This test will determine if the winding insulation has failed, per-

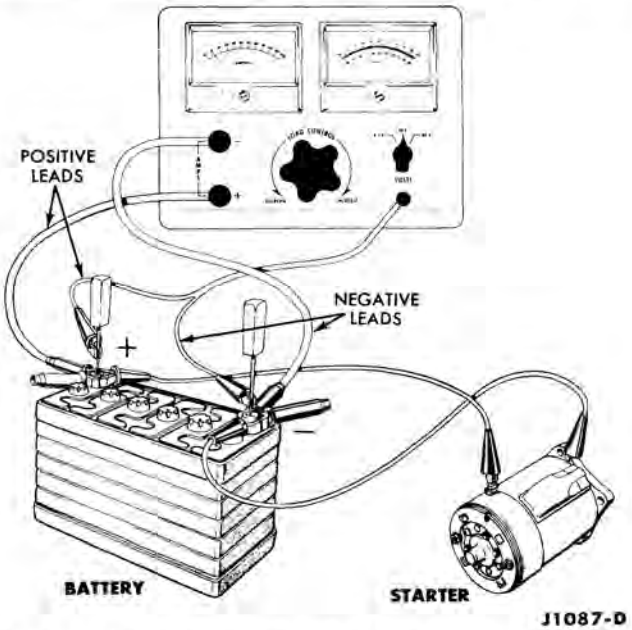


FIG. 4—Starter No-Load Test on Test Bench—Except Comet

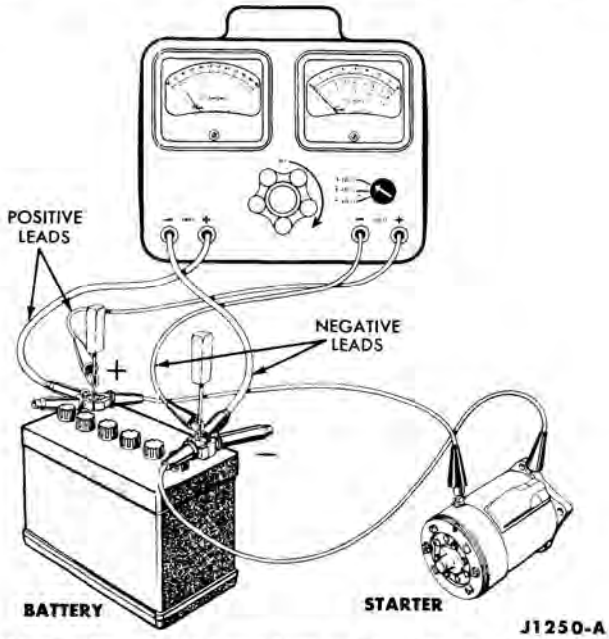


FIG. 5—Starter No-Load Test on Test Bench—Comet

mitting a conductor to touch the frame or armature core.

To determine if the armature windings are grounded, make the connections as shown in Fig. 6. If the voltmeter indicates any voltage, the windings are grounded.

Grounded field windings can be detected by making the connections as shown in Fig. 7. If the voltmeter indicates any voltage, the field windings are grounded.

STARTER CRANKING CIRCUIT TEST

Excessive resistance in the starter circuit can be determined from the results of this test. Make the test connections as shown in Fig. 8. Crank the engine with the ignition OFF. This is accomplished by disconnecting and grounding the high tension lead from the spark coil and by connecting a jumper from the battery terminal of the starter relay to the ignition switch terminal (S), of the relay.

The voltage drop in the circuit will be indicated by the voltmeter (0 to 1 volt range). Maximum allowable voltage drop should be:

1. With the voltmeter negative lead connected to the starter terminal and the positive lead connected to the battery positive terminal (Fig. 8, connection ①) . . 0.5 volt.

2. With the voltmeter negative lead connected to the battery terminal of the starter relay and the positive lead connected to the positive terminal of the battery (Fig. 8, connection ②) . . . . . 0.1 volt.

3. With the voltmeter negative lead connected to the starter terminal of the starter relay and the positive lead connected to the positive terminal of the battery (Fig. 8, connection ③) . . . . . 0.3 volt.

4. With the voltmeter negative lead connected to the negative terminal of the battery and the positive lead connected to the engine ground (Fig. 8, connection ④) . . . 0.1 volt.

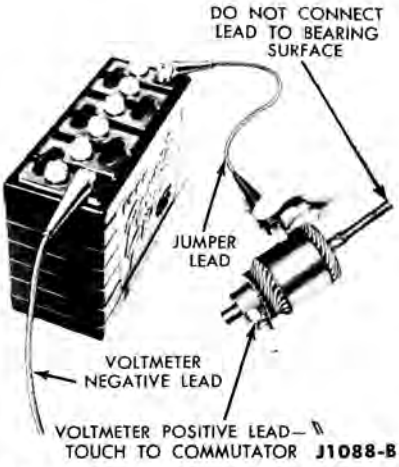


FIG. 6—Armature Grounded Circuit Test

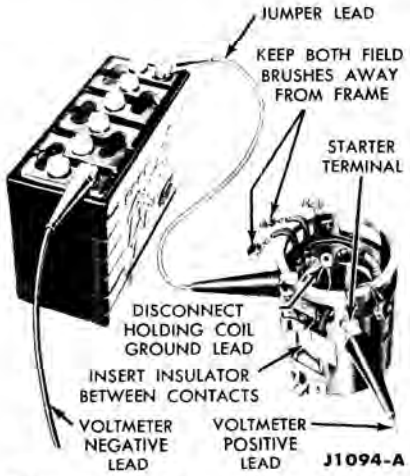


FIG. 7—Field Grounded Circuit Test

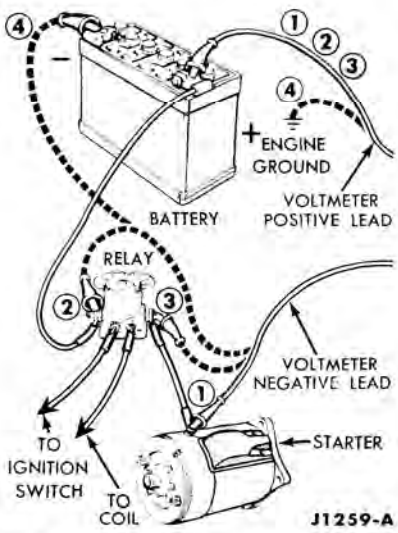


FIG. 8—Starter Cranking Circuit Test

2 COMMON ADJUSTMENTS AND REPAIRS

STARTER DRIVE REPLACEMENT

1. Loosen and remove the brush cover band and the starter drive actuating lever cover.

2. Loosen the through bolts enough to allow removal of the drive gear housing and the starter drive actuating lever return spring.

3. Remove the pivot pin retaining the starter drive actuating lever and remove the lever.

4. Remove the drive gear stop ring retainer and stop ring from the end of the armature shaft and remove the drive gear assembly.

5. Apply a thin coating of Lubriplate 777 on the armature shaft splines. Install the drive gear assembly on the armature shaft and install a new stop ring.

6. Position the starter gear actuating lever on the starter frame and install the pivot pin. **Be sure that the actuating lever properly engages the starter drive assembly.**

7. Install a new stop-ring retainer. Position the starter drive actuating lever return spring and drive gear housing to the starter frame, and then tighten the through bolts to specification (55-75 inch pounds).

8. Position the starter drive actuating lever cover and the brush cover band, with its gasket, on the starter. Tighten the brush cover band retaining screw.

BRUSH REPLACEMENT

Replace the starter brushes when they are worn to ¼ inch. Always install a complete set of new brushes.

1. Loosen and remove the brush cover band and starter drive actuating lever cover. Remove the brushes from their holders.

2. Remove the two through bolts from the starter frame.

3. Remove the drive gear housing, and the actuating lever return spring.

4. Remove the starter drive actuating lever pivot pin and lever, and remove the armature.

5. Remove the brush end plate.

6. Remove the ground brush retaining screws from the frame and remove the brushes (cut the ground brush nearest the starter terminal from the brush terminal block, as

close to the brush lead terminal as possible).

7. Cut (or unsolder) the insulated brush leads from the field coils, as close to the field connection point as possible.

8. Clean and inspect the starter motor.

9. Replace the brush end plate if the insulator between the field brush holder and the end plate is cracked or broken.

10. Position the new insulated field brushes lead on the field coil terminal. Install the clip provided with the brushes to hold the brush lead to the terminal. Solder the lead, clip, and terminal together, using rosin core solder (Fig. 4, Part 14-2). Use a 300-watt iron.

11. Install the ground brush leads to the frame with the retaining screws.

12. Clean the commutator with #00 or #000 sandpaper.

13. Position the brush end plate to the starter frame, with the end plate boss in the frame slot.

14. Position the fiber washer on the commutator end of the armature shaft and install the armature in the starter frame.

15. Install the starter drive gear actuating lever to the frame and starter drive assembly, and install the pivot pin.

16. Position the return spring on the actuating lever, and the drive gear housing to the starter frame. Install the through bolts and tighten to specified torque (55-75 inch pounds). Be sure that the stop ring retainer is seated properly in the drive gear housing.

17. Install the commutator brushes in the brush holders. Center the brush springs on the brushes.

18. Position the actuating lever cover and the brush cover band, with its gasket, on the starter. Tighten the band retaining screw.

19. Connect the starter to a battery to check its operation.

ARMATURE REPLACEMENT

1. Loosen the brush cover band retaining screw and remove the brush cover band and the starter drive actuating lever cover. Remove the brushes from their holders.

2. Remove the through bolts, the drive gear housing, and the drive actuating lever return spring.

3. Remove the pivot pin retaining the starter gear actuating lever, and remove the lever.

4. Remove the armature. If the starter drive gear assembly is being reused, remove the stop ring retainer and the stop ring from the end of the armature shaft, and remove the assembly.

5. Place the drive gear assembly on the new armature with a new stop ring.

6. Install the fiber thrust washer on the commutator end of the armature shaft and install the armature.

7. Position the drive gear actuating lever to the frame and drive gear assembly and install the pivot pin.

8. Position the drive actuating lever return spring, the drive gear housing, and the brush plate to the starter frame, and then install and tighten the through bolts to specification. Be sure that the stop ring retainer is seated properly in the drive gear housing.

9. Place the brushes in their holders, and center the brush springs on the brushes.

10. Position the actuating lever cover and the brush cover band, with its gasket, and then tighten the retaining screw.

11. Connect the starter to a battery to check its operation.

3 CLEANING AND INSPECTION

1. Use a brush or air to clean the field coils, armature, commutator, and armature shaft. Wash all other parts in solvent and dry the parts.

2. Inspect the armature windings for broken or burned insulation and unsoldered connections.

3. Check the armature for open circuits and grounds.

4. Check the commutator for runout (Fig. 9). Inspect the armature shaft and the two bearings for scoring and excessive wear. If the commutator is rough, or more than 0.005 inch out-of-round, turn it down.

5. Check the brush holders for broken springs and the insulated brush holders for shorts to ground. Tighten any rivets that may be loose. Replace the brushes if worn to ¼ inch in length.

6. Check the brush spring tension. Replace the springs if the tension is not within specified limits (40 ounces minimum).

7. Inspect the field coils for burned or broken insulation and continuity. Check the field brush connections and lead insulation.

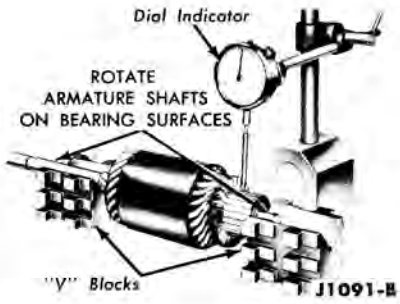


FIG. 9—Commutator Runout Check

PART 14-2 STARTER

Section	Page	Section	Page
1 Description and Operation	14-7	3 Major Repair Operations	14-7
2 Removal and Installation	14-7		

1 DESCRIPTION AND OPERATION

The function of the starting system is to crank the engine at high enough speed to permit it to start. The system includes the starter motor and drive, the battery, a remote control starter switch (part of the ignition switch), the starter neutral switch, the starter switch, and heavy circuit wiring.

The starter mounting is shown in Fig. 1.

Turning of the ignition key to the START position actuates the starter relay, through the starter control circuit. The starter relay then connects the battery to the starter.

Cars equipped with an automatic transmission have a starter neutral switch, in the starter control circuit, which prevents operation of the starter if the selector lever is not in the N (neutral) or P (park) position.

The starter utilizes an integral positive-engagement drive (Fig. 2).

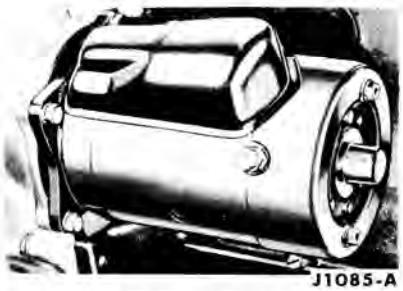


FIG. 1—Starter Mounting

When the starter is not in use, one of the field coils is connected directly to ground through a set of contacts. When the starter is first connected to the battery a large current flows through the grounded field coil, actuating a movable pole shoe. The pole shoe is attached to the starter drive actuating lever and thus the drive is forced into engagement with the flywheel.

When the movable pole shoe is fully seated, it opens the field coil grounding contacts and the starter is then in normal operation. A holding coil is used to maintain the movable pole shoe in the fully seated position, during the time that the starter is turning the engine.

2 REMOVAL AND INSTALLATION

1. Disconnect the starter cable at the starter terminal.

2. Remove the starter mounting bolts. Remove the starter assembly.

3. Position the starter assembly to the flywheel housing, and start the mounting bolts.

4. Snug all bolts, then torque them to specification.

5. Connect the starter cable.

3 MAJOR REPAIR OPERATIONS

Use the following procedure when it becomes necessary to completely overhaul the starter. Figure 2 illustrates a partially disassembled starter.

DISASSEMBLY

1. Loosen the brush cover band retaining screw and remove the brush cover band and the starter drive actuating lever cover. Observe the lead positions for assembly and then remove the commutator brushes from the brush holders.

2. Remove the through bolts, starter drive gear housing, and the starter drive actuating lever return spring.

3. Remove the pivot pin retaining the starter gear actuating lever and remove the lever and the armature.

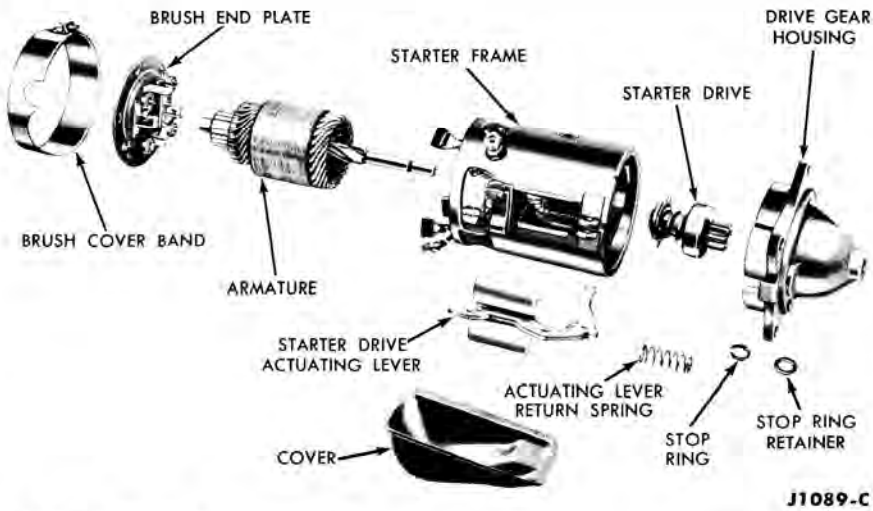


FIG. 2—Starter Disassembled

4. Remove the stop ring retainer. Remove and discard the stop ring retaining the starter drive gear to the end of the armature shaft, and remove the starter drive gear assembly.

5. Remove the brush end plate.

6. Remove the two screws retaining the ground brushes to the frame.

7. On the field coil that operates the starter drive gear actuating lever, bend the tab up on the field retainer and remove the retainer.

8. Remove the three coil retaining screws, using tool 10044-A and an arbor press (Fig. 3). The arbor press prevents the wrench from slipping out of the screw. Unsolder the field coil leads from the terminal screw, and remove the pole shoes and coils from the frame (use a 300-watt iron).

9. Cut (or unsolder) the insulated brush leads from the field coils, as close to the field connection point as possible.

10. Remove the starter terminal nut, washer, insulator and terminal from the starter frame. Remove any excess solder from the terminal slot.

PARTS REPAIR OR REPLACEMENT

Nicks and scratches may be removed from the commutator by turning it down. All other assemblies are to be replaced rather than repaired.

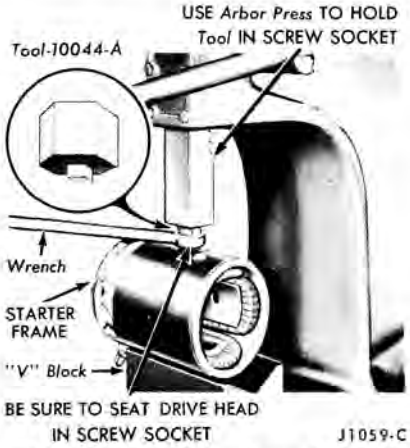


FIG. 3—Pole Shoe Screw Removal

ASSEMBLY

1. Install the starter terminal, insulator, washers, and retaining nut in the frame (Fig. 4). Be sure to position the slot in the screw perpendicular to the frame end surface.

2. Position the coils and pole pieces, with the coil leads in the terminal screw slot, and then install the retaining screws (Fig. 3). As the pole shoe screws are tightened, strike the frame several sharp blows with a soft-faced hammer to seat and align the pole shoes, then stake the screws.

3. Install the solenoid coil and retainer and bend the tabs to retain the coils to the frame.

4. Solder the field coils and solenoid wire to the starter terminal using rosin core solder. Use a 300-watt iron.

5. Check for continuity and grounds in the assembled coils.

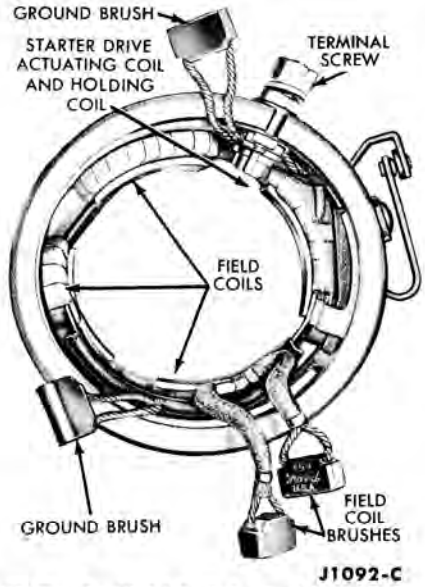


FIG. 4—Field Coil Assembly

6. Position the new insulated field brushes lead on the field coil terminal. Install the clip provided with the brushes to hold the brush lead to the terminal. Solder the lead, clip, and terminal together, using rosin core solder (Fig. 4). Use a 300-watt iron.

7. Position the solenoid coil ground terminal over the nearest ground screw hole.

8. Position the ground brushes to the starter frame and install the retaining screws (Fig. 4).

9. Position the starter brush end plate to the frame, with the end plate boss in the frame slot.

10. Apply a thin coating of Lubriplate 777 on the armature shaft splines. Install the starter motor drive gear assembly to the armature shaft and install a new retaining stop ring. Install the stop ring retainer.

11. Position the fiber thrust washer on the commutator end of the armature shaft and position the armature in the starter frame.

12. Position the starter drive gear actuating lever to the frame and starter drive assembly, and install the pivot pin.

13. Position the starter drive actuating lever return spring and the drive gear housing to the frame and install and tighten the through bolts to specifications (55-75 inch pounds). **Do not pinch the brush leads between the brush plate and the frame.** Be sure that the stop ring retainer is seated properly in the drive housing.

14. Install the brushes in the brush holders. **Be sure to center the brush springs on the brushes.**

15. Position the drive gear actuating lever cover on the starter and install the brush cover band with a gasket. Tighten the band retaining screw.

16. Check the starter no-load amperage draw.

PART 14-3 SPECIFICATIONS

Vendor	Current Draw Under Normal Load (Amperes)	Normal Engine Cranking Speed (rpm)	Minimum Stall Torque @ 5 Volts (Foot Pounds)	Maximum Load (Amperes)	No-Load (Amperes)	Mfg. Length (Inches)	Brushes Wear Limit (Inches)	Brush Spring Tension (Ounces)
Ford Positive Engagement 4½-Inch Diameter	250	250-290	15.5	670	70	0.5	0.25	40
Ford Positive Engagement—4-Inch Diameter	100-150	250-290	9	460	70	0.5	0.25	40

Maximum commutator runout in inches is 0.005.
Maximum starting circuit voltage drop (battery + terminal to starter terminal @ normal engine temperature) 0.5 volt.
Starter through-bolt torque 55-75 inch pounds.
Starter mounting-bolt torque ⅜ inch bolt two-hole mounting 15-20 foot pounds, 5/16 inch bolt three-hole mounting 12-15 foot pounds.

SPECIAL TOOLS

Tool Number	Description
Tool 10044-A	Generator Pole Screw Wrench

LIGHTING SYSTEM, HORNS AND INSTRUMENTS

GROUP 15

PART 15-1 PAGE
GENERAL LIGHTING SYSTEM, HORNS AND INSTRUMENTS SERVICE 15-1
PART 15-2
LIGHTING SYSTEM AND HORNS 15-5
PART 15-3 PAGE
SWITCHES, CIRCUIT BREAKERS AND FUSES 15-8
PART 15-4
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SPECIFICATIONS 15-19

PART 15-1 GENERAL LIGHTING SYSTEM, HORNS AND INSTRUMENTS SERVICE

Section	Page	Section	Page
1 Diagnosis and Testing	15-1	3 Cleaning and Inspection	15-4
2 Common Adjustments and Repairs	15-4		

1 DIAGNOSIS AND TESTING

LIGHT TROUBLE DIAGNOSIS GUIDE

ALL HEADLIGHTS DO NOT LIGHT	**1.** Loose battery cable. **2.** Loose quick disconnect or broken wire from the battery to the headlight switch. **3.** Defective headlight switch. **4.** Disconnected or broken wire from the headlight switch to the beam selector switch.	**5.** Loose or broken wire to the bulbs. **6.** Defective beam selector switch. **7.** All headlight bulbs burned out. This may be caused by a defective or improperly adjusted alternator voltage regulator (Group 13).
INDIVIDUAL LIGHTS DO NOT LIGHT	**1.** Burned out bulb. **2.** Loose or broken wires to the bulb.	**3.** Poor ground.
LIGHTS BURN OUT REPEATEDLY	**1.** Loose or corroded electrical connections. **2.** Excessive vibration.	**3.** Improperly adjusted or defective alternator voltage regulator (Group 13).

INSTRUMENT TROUBLE DIAGNOSIS GUIDE

OIL PRESSURE INDICATOR LIGHT INOPERATIVE	**1.** Indicator bulb burned out. **2.** Loose or broken wire from the light to the indicator switch.	**3.** Defective oil pressure sender unit (in this part).

CONTINUED ON NEXT PAGE

INSTRUMENT TROUBLE DIAGNOSIS GUIDE (Continued)

CHARGE INDICATOR LIGHT INOPERATIVE	**1.** Burned out bulb.	**2.** Loose or broken wires.
OIL PRESSURE INDICATOR GAUGE INOPERATIVE—COMET	**1.** Loose or broken wire from the constant voltage regulator to the oil pressure gauge. **2.** Grounded or broken wire from	the engine oil pressure sending unit. **3.** Defective gauge. **4.** Defective oil pressure sending unit.
AMMETER GAUGE INOPERATIVE–COMET	**1.** Defective gauge (in this part). **2.** Loose or broken wires.	**3.** Generating system malfunction.
FUEL GAUGE ERRATIC OR INOPERATIVE	**1.** Loose or broken wire from the constant voltage regulator to the fuel gauge. **2.** Defective fuel gauge. **3.** Loose, broken, or shorted wire from fuel gauge to the fuel tank sending unit.	**4.** Defective constant voltage regulator. **5.** Defective fuel tank sending unit. **6.** Poor ground between fuel tank and body.
TEMPERATURE GAUGE ERRATIC OR INOPERATIVE	**1.** Loose or broken wire from constant voltage regulator to the temperature gauge. **2.** Defective temperature gauge. **3.** Loose or broken wire from the temperature sending unit to the	temperature gauge. **4.** Defective temperature sending unit. **5.** Defective constant voltage regulator.
FUEL, TEMPERATURE, AND OIL PRESSURE GAUGES ERRATIC	**1.** Loose or corroded constant voltage regulator ground. **2.** Defective constant voltage regulator.	**3.** Broken or loose wire from or to the constant voltage regulator. **4.** Defective ignition switch.

HORN TROUBLE DIAGNOSIS GUIDE

HORNS DO NOT SOUND	**1.** Loose connections at horn button contact. **2.** Open wire (yellow-green stripe) from horn to horn button. **3.** Open wire (yellow) from bat-	tery to horn button. **4.** Horns defective or out of adjustment. **5.** Defective circuit breaker in headlight switch.
ONE HORN FAILS TO OPERATE	**1.** Broken or loose wire to the horn (black).	**2.** Horn defective or out of adjustment.
HORNS OPERATE CONTINUOUSLY	**1.** Horn button defective.	

TURN INDICATOR TROUBLE DIAGNOSIS GUIDE

TURN INDICATOR LIGHTS INOPERATIVE	**1.** Burned out bulbs, or loose sockets. **2.** Loose or broken wire from ignition switch to flasher. **3.** Defective flasher.	**4.** Loose or broken wire from flasher to turn indicator switch. **5.** Defective turn indicator switch. **6.** Broken, shorted, or loose wires from switch to lights.
TURN INDICATOR LIGHTS OPERATE INCORRECTLY	**1.** Burned out bulb. **2.** Loose, broken, or shorted wires from switch to light.	**3.** Defective indicator switch. **4.** Defective flasher.

CONTINUED ON NEXT PAGE

TURN INDICATOR TROUBLE DIAGNOSIS GUIDE (Continued)

TURN INDICATOR CANCELS IMPROPERLY	**1.** Cam improperly positioned on steering wheel hub.	**2.** Coil spring on switch plate assembly loose or weak.

WINDSHIELD WIPER TROUBLE DIAGNOSIS GUIDE

INOPERATIVE OR SLOW WIPER	**1.** Binding linkage. **2.** Defective switch. **3.** Defective wiper motor(s).	**4.** Defective wiring or circuit breaker.

TESTING

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

HORN TEST

The only test necessary on the horn is for current draw.

Current Draw Test. Connect a voltmeter and ammeter to the horn and to a voltage supply as shown in Fig. 2. The normal current draw for the horns at 12 volts is 4.0-5.0 amperes.

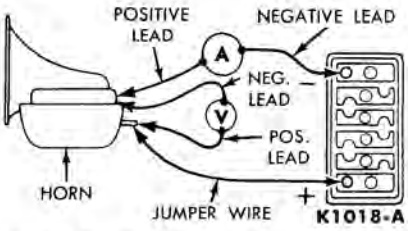


FIG. 1—Horn Current Draw Test

HEADLIGHT SWITCH AND BEAM SELECTOR SWITCH TESTS

The following tests may be made to determine whether a headlight switch or a beam selector switch is defective:

Turn on the headlights, and operate the beam selector switch. If none of the headlights turn on when the beam selector switch is operated, yet the instrument panel lights operate, the headlight switch or the red-yellow stripe wire from the headlight switch to the beam control switch is probably defective. Substitute a known good switch for the suspected switch to determine whether the switch or the wiring is at fault.

If the headlights operate only with the beam selector switch in one position, the selector switch or the wiring from the switch to the headlight is defective. Substitute a known good selector switch for the suspected switch to determine whether the switch or the wiring is at fault.

CONSTANT VOLTAGE REGULATOR TEST

Turn the ignition switch on, check for voltage at the gauge feed wire (black with green stripe) at one of the gauges. The voltage should oscillate between zero and about 10 volts. If it does not, the constant voltage regulator is defective, or there is a short to ground between the voltage regulator and the gauges.

If a gauge unit is inaccurate or does not indicate, replace it with a new unit. If the gauge unit still is erratic in its operation, the sending unit or wiring to the sending unit is faulty.

If both the fuel gauge and the temperature gauge indicate improperly and in the same direction, the constant voltage regulator could be defective, as it supplies both gauges.

FUEL GAUGE AND FUEL LEVEL SENDING UNIT TEST

Disconnect the wire from the fuel level sending unit and connect it to a known good sending unit. Connect a jumper wire from the sending unit mounting plate to the car frame. Raise the float arm to the upper stop, the instrument panel gauge should read full. Lower the float arm to the bottom stop, the gauge should read empty.

If the gauge reads properly, the sending unit in the gas tank is defective.

If the gauge unit still indicates improperly or is erratic in its operation, the gauge unit or the wiring to the gauge unit is faulty. Repair the wire or replace the gauge unit.

TEMPERATURE GAUGE TEST

Start the engine and allow it to run until it has reached normal operating temperature. Place a thermometer in the coolant at the radiator filler cap. The temperature should read close to the temperature range of the coolant thermostat that is being used. The gauge in the instrument panel should indicate within the normal band.

If the gauge does not indicate, momentarily short the temperature sender unit terminal wire to ground (ignition switch on). If the gauge now indicates, the sender unit is defective or it was not properly sealed to the engine. **Be sure to use an electrically conductive sealer C3AZ-19554-B.** If the gauge does not indicate, the gauge, the wires leading to the gauge or the constant voltage regulator are at fault. **Do not leave the sender wire grounded longer than necessary to make the test, as the gauge may be damaged.**

OIL PRESSURE INDICATOR LIGHT TEST

To test the indicator light, turn on the ignition switch. Do not start the engine. The light should come on. Start the engine.The light should go out, indicating that the oil pressure has built up a safe value.

To test the oil pressure switch on the engine, turn the ignition switch on, engine not running, the indicator light should come on. If the indicator light does not come on, short the terminal of the oil pressure switch unit to ground. If the light now comes on, the oil pressure switch is defective or not properly sealed to the engine. **Be sure to use electrically conductive sealer C3AZ-19554-B.** If the light still does not come on, the bulb is burned out or the wires from the bulb to the ignition switch and oil pressure switch are defective.

OIL PRESSURE INDICATOR GAUGE TEST—COMET

Remove the oil pressure sender unit and temporarily attach an oil pressure gauge in its place. Operate the engine to determine the oil pres-

sure. If the oil pressure is normal, the gauge should indicate within the normal band.

If the gauge did not indicate, momentarily short the oil pressure sender wire to ground. If the gauge now indicates the sender unit is defective or it was not properly sealed to the engine. **Be sure to use electrically conductive sealer C3AZ-19554-B.** If the gauge does not indicate, the gauge, the wires leading to the gauge or the constant voltage regulator are at fault. **Do not leave the sender wire grounded longer than necessary to make the test, as the gauge may be damaged.**

CHARGE INDICATOR LIGHT TEST

To test the charge indicator light, turn the ignition switch on with the engine stopped. The light should come on. If it does not, the bulb is burned out, or the wiring to the light is defective.

AMMETER TEST–COMET

To test the ammeter, turn the headlights on with the engine stopped. The meter pointer should move toward the D or discharge scale. If no movement of the needle is observed, check the loop on the rear of the meter housing to see if the battery to circuit breaker wire passes inside the loop. If the wire is in the loop, and the meter does not indicate a discharge, the meter is inoperative. **If the meter pointer moves toward the C or charge scale when the headlights are turned on, the battery is reversed, or the wire passes through the loop in the wrong direction. Feed the wire through in the opposite direction to correct this condition, after checking first to make sure that the battery is not re-reversed.**

SINGLE SPEED ELECTRIC WIPER MOTOR TESTS

When checking an inoperative or sluggish windshield wiper, first examine the linkage under the instrument panel for obstructions. Disconnect the linkage at the motor and check for ease of operation, with the arms and blades removed.

Disconnect the wiring harness connector plug from the motor, turn the wiper switch and ignition switch to the ON position and check for voltage at the center opening of the plug (Fig. 2). No voltage indicates a defective circuit breaker, switch or wiring.

With the switch at the OFF position, check for voltage between the two outside openings of the plug.

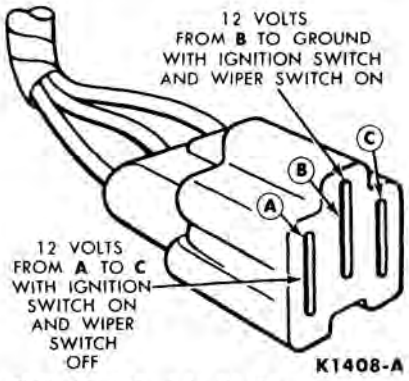


FIG. 2—Windshield Wiper Connector Plug Test Points

If there is no voltage, replace the defective parts.

SPEEDOMETER TESTS

To test the odometer accuracy, drive the car over a measured mile. Speedometer accuracy can be checked by comparing the speedometer in question against one known to be accurate, while two cars are moving at the same speed, or by timing the car on a measured mile. The Ford Car Master Parts Catalog or the Lincoln-Mercury Parts and Accessories Catalog show the proper combination of gears to use for various rear axle and tire size combinations.

2 COMMON ADJUSTMENTS AND REPAIRS

HORN ADJUSTMENT

Current can be adjusted by changing the contact tension. Connect the horn as shown in Fig. 2. Turn the self-locking adjusting nut until the current is within the limits for the horn being adjusted.

3 CLEANING AND INSPECTION

SINGLE-SPEED WIPER MOTOR

1. Clean the gear housing of all old grease. **Do not allow any cleaning fluid to contact the armature shaft and output shaft bearings.**
2. Wipe all other parts with a clean cloth.
3. Cover the motor housing bearing, and blow out any dust from the housing with compressed air.
4. Inspect the armature for burned commutator bars and loose connections. Check all shafts, bushings, and gears for scored surfaces. Check the thrust ball for pitting or discoloration due to heat. Make sure that the output gear is not loose on the output shaft, and that the cam surface is not worn. Replace any defective parts.
5. Check the armature for grounds with a test light. Replace the armature if it is grounded.
6. Inspect the brush plate assembly for cracks or distortion. The brush holders should be securely fastened to the brush plate. Inspect the contact points for burned or pitted surfaces. Replace defective parts.
7. Inspect the motor housing and magnet assembly. Replace the assembly if it has a cracked magnet, or if the thrust button is hollowed out to a diameter greater than $\frac{1}{32}$ inch.
8. Replace the brushes if they are worn to $\frac{5}{16}$ inch. Replace distorted or burned brush springs.
9. Add new grease to the housing and gears.

TWO-SPEED WIPER MOTOR

1. Clean the gear housing of all old grease. **Do not allow any cleaning fluid to contact the armature shaft and output shaft bearings.**
2. Wipe all other parts with a clean cloth.
3. Inspect the gear housing for cracks or distortion. Replace a cracked or distorted housing.
4. Check all shafts, bushings, and gears for scored surfaces. Replace defective parts and add new grease to the housing and gears.

PART 15-2 LIGHTING SYSTEM AND HORNS

Section		Page
1	Description and Operation	15-5
2	In-Car Adjustments and Repairs	15-5
3	Removal and Installation	15-7

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

HEADLIGHTS

The Falcon and Mustang use two No. 2 type sealed-beam headlights. Each light has low-beam and high-beam filaments.

The Comet and Fairlane use four sealed-beam headlights. On the Fairlane, the two outboard lights each have low-beam and high beam filaments and are marked by a numeral 2 molded in the glass lens. Locating tabs molded in the glass allow the mounting of the No. 2 lights in the outboard headlight support frames only. The low beams are used for No. 2 headlight alignment.

The inboard headlights, with a numeral 1 molded in the glass lens, have only one filament and are used with the high beams of the No. 2 headlights. Locating tabs molded in the glass allow the mounting of the No. 1 lights in the inboard headlight support frames only.

On the Comet, the sealed-beam headlights are mounted with the No. 1 lights in the lower position and the No. 2 lights in the upper position.

A conventional beam selector switch is located on the floorboard at the left of the driver.

Quick disconnect terminals are also provided at the left and right of the radiator support assembly. The terminals are color coded. Like colored terminals are connected together.

HORNS

A pair of tuned horns are used. The horn button closes the circuit to the horns. One of the horns has a high-pitched tone; the other has a low-pitched tone.

2 IN-CAR ADJUSTMENTS AND REPAIRS

HEADLIGHT ALIGNMENT

All headlight adjustments should be made with a half-full fuel tank plus or minus one gallon, with a person seated in the driver's seat and a person in the passenger seat, the car unloaded and the trunk empty except for the spare tire and jacking equipment, and recommended pressure in all tires. Before each adjustment, bounce the car by pushing on the center of both the front and rear bumpers, to level the car.

To align the No. 1 headlights by means of a wall screen, select a level portion of the shop floor. Lay out the floor and wall as shown in Fig. 1.

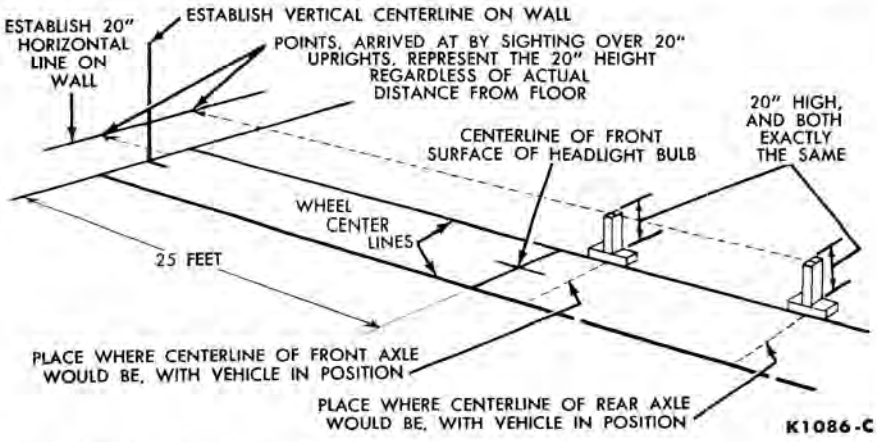


FIG. 1—Floor and Wall Layout

Establish the headlight horizontal centerline by subtracting 20 inches from the actual measured height of the headlight lens center from the floor and adding this dimension (dimension B, upper diagram Fig. 2) to the 20-inch reference line obtained by sighting over the uprights. Draw a horizontal line 2 inches below, and parallel to the headlight horizontal centerline. Then draw the headlight vertical centerlines on the screen as measured on the car (dimension A, upper diagram Fig. 2).

NO. 1 HEADLIGHT ADJUSTMENT (INNER LIGHTS —FAIRLANE ONLY), (LOWER LIGHTS—COMET ONLY)

Adjust each No. 1 headlight beam as shown in Fig. 2.

Cover the No. 2 lights when making this adjustment.

Some states may not approve of the 2-inch dimension for the No. 1 headlights. Check the applicable state law, as a 3-inch dimension may be required.

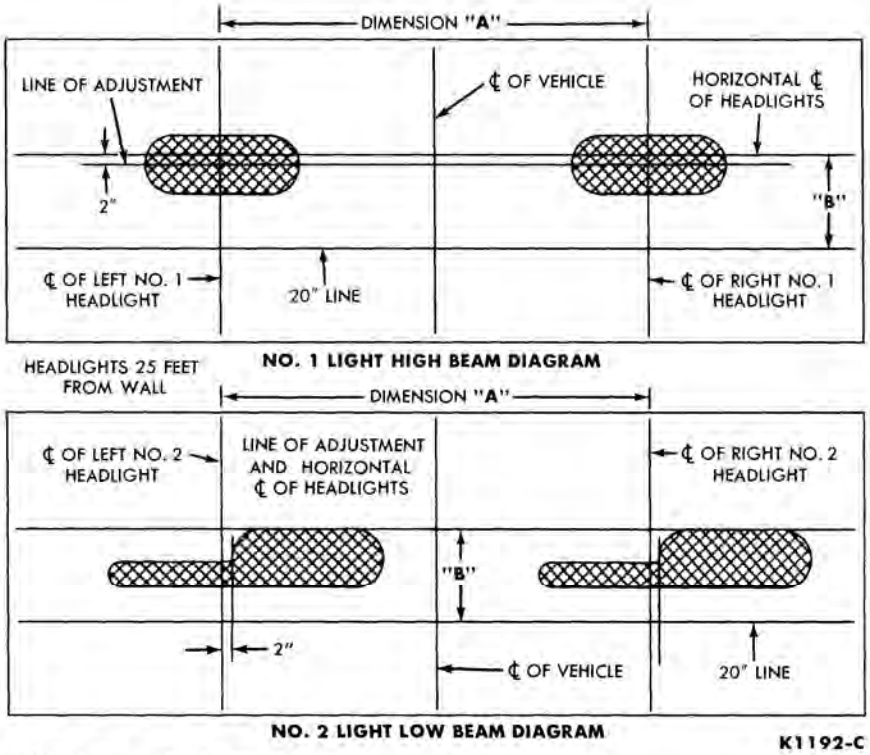


FIG. 2–Headlight Wall Screens

NO. 2 HEADLIGHT ADJUSTMENT–EXCEPT COMET

To align the No. 2 headlights (outer lights on Fairlane), a different wall chart (lower diagram Fig. 2) is used. Dimension B for the No. 2 lights is the same as B for the No. 1 lights. Dimension A is as measured on the car. **Note that the line of adjustment of the No. 2 lights is the horizontal centerline of the No. 2 lights.** Turn the headlights to low beam and adjust each No. 2 light as shown in Fig. 2.

Each headlight can be adjusted by means of two screws located under the headlight trim ring as shown in Fig. 3. Always bring each beam into final position by turning the adjusting screws clockwise so that the headlights will be held against the tension springs when the operation is completed.

NO. 2 HEADLIGHT ADJUSTMENT (UPPER LIGHTS —COMET ONLY)

To align the Comet No. 2 headlights (upper lights), a different wall chart (similar to lower diagram Fig. 2) is used. Dimension B for the No. 2 lights will be different than B for the No. 1 lights, but dimension A which is measured on the car will be the same as for the No. 1 lights. **Note that the line of adjustment of the No. 2 lights is the horizontal centerline of the No. 2 lights.** Turn the headlights to low beam and adjust each No. 2 light as shown in Fig. 2.

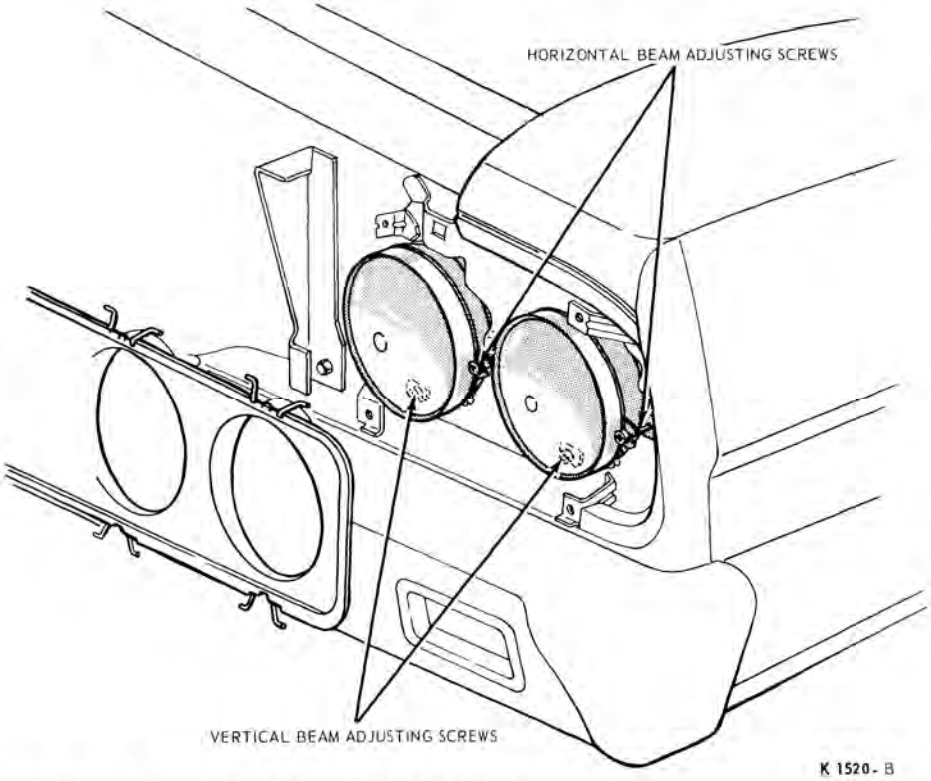


FIG. 3–Headlight Adjustment–Fairlane

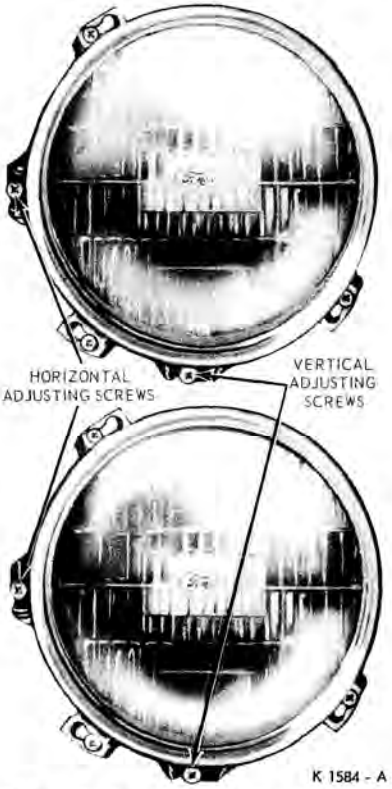


FIG. 4–Headlight Adjustment–Comet

Each headlight can be adjusted by means of two screws located under the headlight trim ring. Always bring each beam into final position by turning the adjusting screws clockwise so that the headlights will be held against the tension springs when the operation is completed (Fig. 4).

3 REMOVAL AND INSTALLATION

HEADLIGHTS

1. Remove the retaining screws and the headlight trim ring.

2. Loosen the bulb retaining ring screws, rotate the retaining ring counterclockwise and remove it.

3. The headlight bulb may now be pulled forward far enough to disconnect the wiring assembly plug.

4. Plug in the new bulb and place it in position, make sure that the locating tabs are placed in the positioning slots.

5. Install the headlight bulb retaining ring, rotate it clockwise under the screws and tighten the screws.

6. Position the headlight trim ring and install the retaining screws.

PARKING LIGHT

The parking light is shown in Fig.



FIG. 5—Parking Light—Typical

5. To replace the bulb, remove the lens retaining screws and the lens.

TAIL, STOP, AND BACK-UP LIGHT BULBS

To replace the tail, stop, and/or the back-up lights, remove the retaining screws and remove the lens, then remove the bulb.

TACHOMETER LIGHT BULBS

To replace the light bulb in either the Sun, or the Sprint tachometer, it is necessary to remove the tachometer from its mounting. In the case of the Sprint tachometer it is also necessary to remove the tachometer from its outside housing. The snap-in bulb socket is then pulled out for replacement of the bulb.

On the Rotunda tachometer the bulb is not serviceable.

LICENSE PLATE LIGHT

To replace the bulb, remove the bezel retaining screw, bezel, and lens.

DOME LIGHT

Remove the two screws retaining the dome light lens. Remove the lens and then replace the bulb.

INSTRUMENT LIGHTS

The instrument panel light bulbs can be replaced by pulling out the individual light sockets from the rear of the instrument panel.

HORNS

Disconnect the horn wire from the terminal. Remove the horn mounting bracket to horn retaining screws and remove the horn.

To install, mount the horn in position, then connect the horn wire to the horn terminal.

HORN BUTTON

1. Disconnect the horn wire connector, that has a yellow and a yellow-green wire in it, under the instrument panel, to the left of the steering column.

2. Press down evenly on the horn button and turn counter-clockwise until it lifts out from the steering wheel.

3. Remove the horn button and spring.

4. The horn button contacts are integral with the turn signal switch and are removed with the switch.

5. Install the horn button spring and button.

6. Connect the horn wire connector under the instrument panel.

PART 15-3 SWITCHES, CIRCUIT BREAKERS, AND FUSES

Section	Page	Section	Page
1 Description and Operation	15-8	2 Removal and Installation	15-8

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

HEADLIGHT SWITCH

A combination headlight switch and two circuit breakers is used (Fig. 1). The headlight circuit is protected by an 18 ampere circuit breaker for the Comet and Fairlane, a 12 ampere circuit breaker for the Falcon and the Mustang. The tail, parking, license plate light and horn circuits are protected by a 15 ampere circuit breaker.

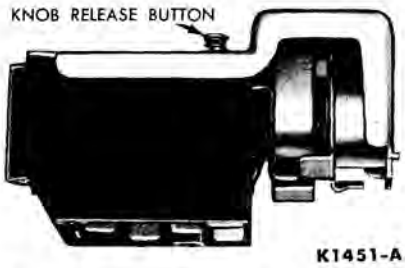


FIG. 1—Headlight Switch

FUSE PANEL

The fuse panel is mounted on the left side cowl panel except that on Fairlane cars it is mounted on the brake pedal support. Fig. 2 shows the fuses, their values and locations.

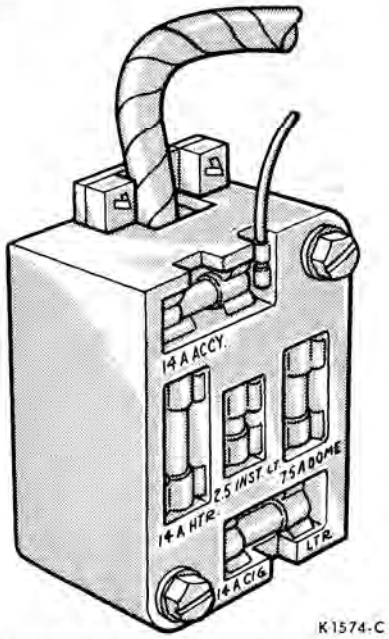


FIG. 2—Fuse Values and Locations—Typical

MECHANCIAL STOP LIGHT SWITCH

The mechanical stoplight switch differs from the hydraulic switch formerly used. The switch assembly is installed on the pin of the brake pedal arm so that it straddles the master cylinder push rod. The switch assembly is a slip fit on the pedal arm pin and thus the switch assembly moves with the pedal arm whenever the brake pedal is depressed.

The brake pedal arm pin has a designed-in clearance with the eye of the master cylinder push rod (Fig. 3). Because of this clearance, whenever the brake pedal is pushed forward, the stop light switch contacts, moving with the pedal arm, are actually pushed against the end of the master cylinder push rod, through the switch actuating pin. It is this movement of the switch with respect to the actuating pin and master cylinder push rod that closes the switch contacts completing the circuit to the stoplights.

When the brake pedal is released, the spring in the stop light switch returns the actuating pin to its normal position and the circuit to the stop lights opens.

2 REMOVAL AND INSTALLATION

HEADLIGHT SWITCH

1. Disconnect the battery ground cable.

2. Remove the control knob and shaft by pressing the knob release button on the switch housing (Fig. 1), with the knob in the full ON position. Pull the knob out of the switch.

3. Unscrew the mounting nut, remove the switch, then remove the junction block from the switch.

4. To install the switch, connect the junction block to the headlight switch, position the switch in the instrument panel, and install the mounting nut.

5. Install the knob and shaft assembly by inserting it all the way into the switch until a distinct click is heard. In some instances it may be necessary to rotate the shaft slightly until it engages the switch-contact carrier.

6. Connect the battery ground cable.

HEADLIGHT BEAM SELECTOR SWITCH

Lay the floor mat back from the area of the switch, and remove the

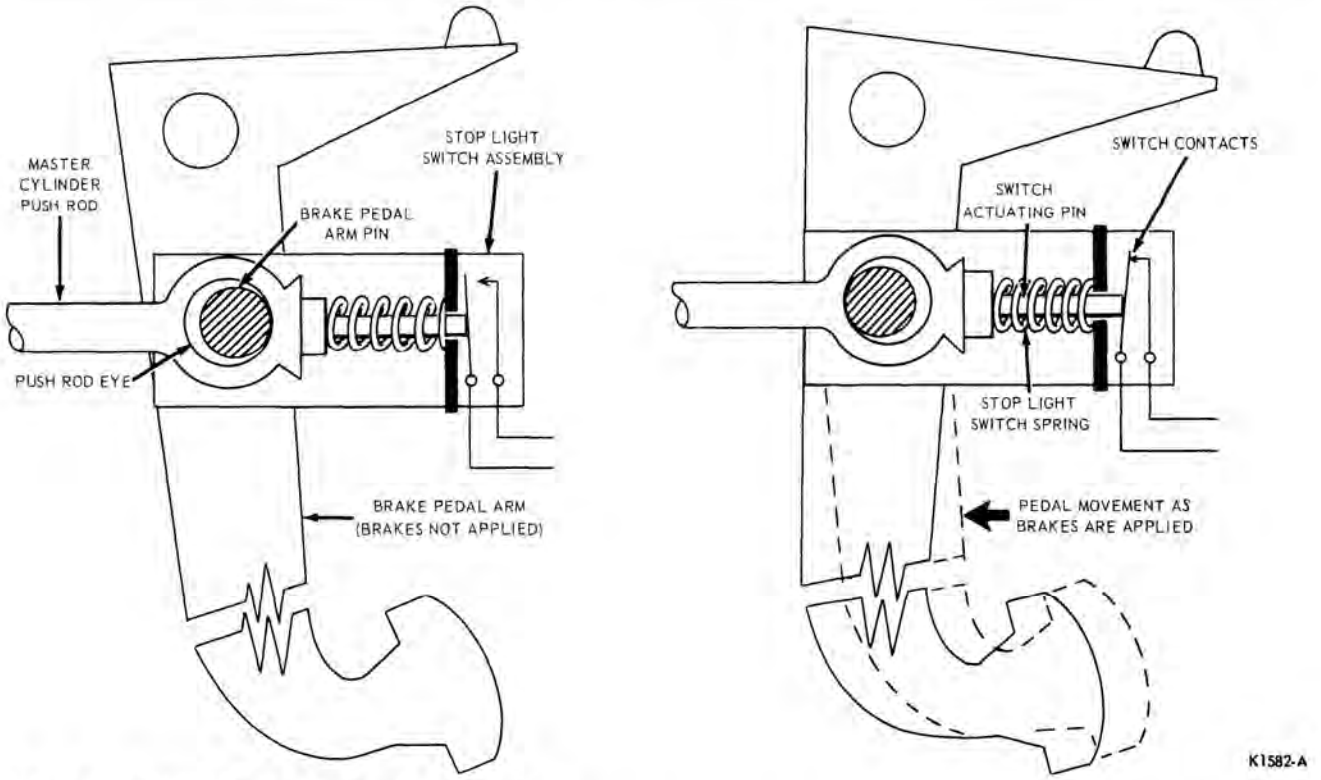


FIG. 3—Mechanical Stop Light Switch Operation

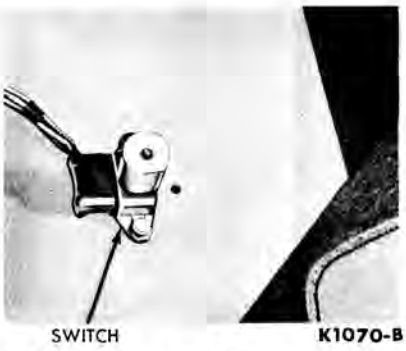


FIG. 4—Headlight Beam Selector Switch

mounting screws (Fig. 4). Disconnect the wire terminal block from the switch.

To install the switch, connect the terminal block to the switch and install the switch to the floor. Replace the floor mat.

STOP LIGHT SWITCH

1. Disconnect the wires at the connector.

2. Remove the hairpin retainer, slide the stop light switch, the push rod and the nylon washers and bushing away from the pedal, and remove the switch (Fig. 5).

3. Position the switch, push rod, and bushing and washers on the brake pedal pin, in the order shown in Fig. 5, and install the hairpin retainer.

4. Connect the wires at the connector, and install the wires in the retaining clip (Fig. 5).

DOME LIGHT SWITCH

The dome light switch is part of the headilght switch. It is actuated by rotating the switch control knob to the maximum counterclockwise position. The dome light and headlight switch is replaced as a unit (Fig. 1).

IGNITION SWITCH AND LOCK CYLINDER

1. Disconnect the negative cable from the battery.

2. Turn the ignition key to the accessory position. Slightly depress the pin shown in Fig. 6, turn the key counterclockwise, and pull the key and lock cylinder out of the switch assembly. If only the lock cylinder is to be replaced, proceed to Step 9.

3. Press in on the rear of the switch and rotate the switch ⅛ turn counterclockwise (as viewed from the terminal end). Remove the bezel, switch, and spacer.

4. Remove the nut from the back of the ignition switch. Remove the accessory and gauge feed wires from the accessory terminal of the switch. Pull the insulated plug from the rear of the switch.

5. If a new ignition switch is to be installed, insert a screwdriver into the lock opening of the ignition switch and turn the slot in the switch to a full counterclockwise position.

6. Connect the insulated plug with wires to the back of the ignition switch. Position the accessory and gauge wires on the ignition switch stud and install the retaining nut.

7. Position the spacer on the switch with the open face away from the switch.

8. Place the bezel, switch, and spacer in the switch opening, press the switch toward the instrument panel and rotate it ⅛ turn to lock it in position.

9. If a new lock cylinder is to be installed, insert the key in the cylinder and turn the key to the accessory position. Place the lock and key in the ignition switch, de-

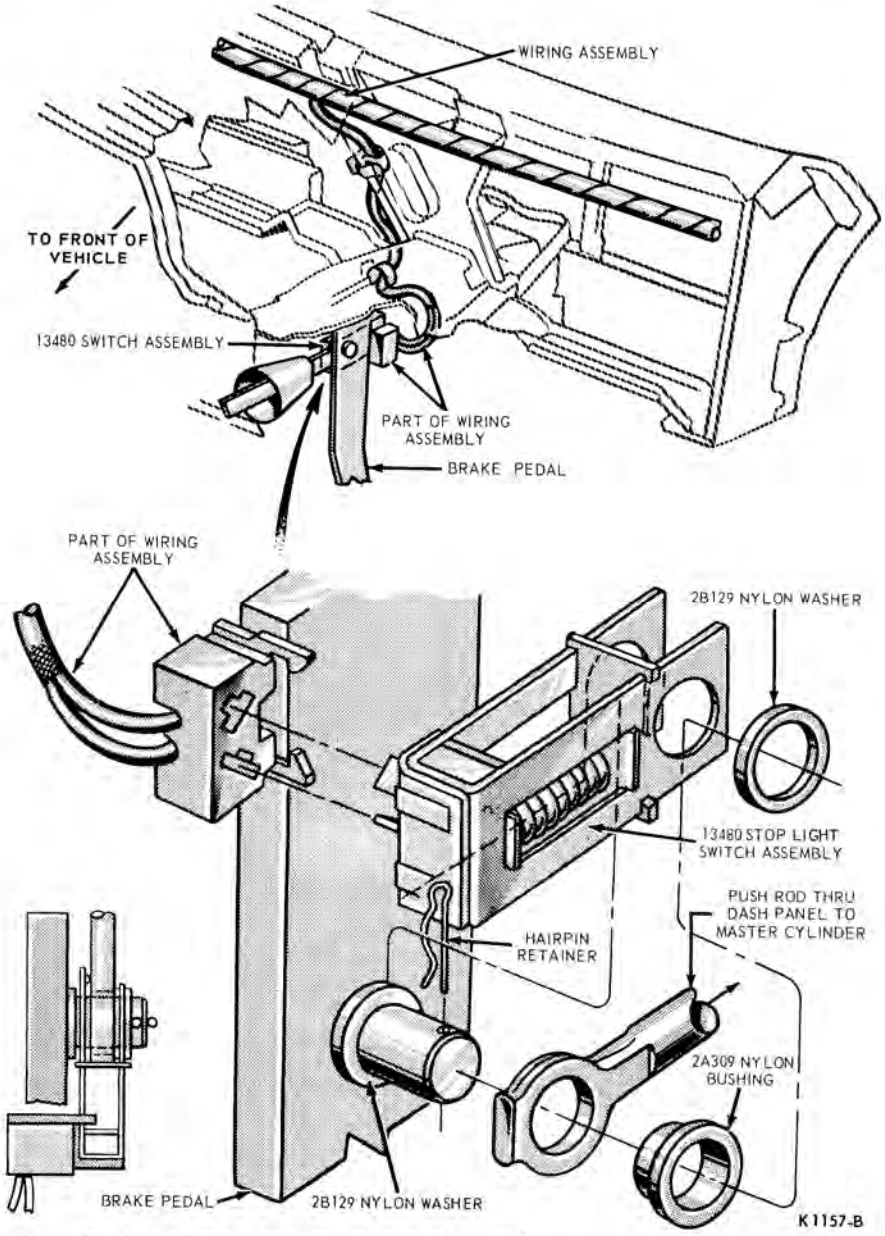


FIG. 5—Mechanical Stoplight Switch Assembly



FIG. 6—Typical Ignition Switch Removal

press the pin slightly (Fig. 6) and turn the key counterclockwise. Push the lock cylinder into the switch. Turn the key to check the lock cylinder operation.

10. Connect the battery cable and check the ignition switch.

WINDSHIELD WIPER SWITCH

1. Disconnect the battery cable.

2. Remove the wiper switch knob, bezel nut, and bezel.

3. Pull out the switch from under the instrument panel. Disconnect the plug connector from the switch and remove the switch.

4. Position the switch and connect the plug connector.

5. Position the switch in the instrument panel and install the bezel, bezel nut, and knob.

6. Connect the battery cable and check the operation of the switch.

PART 15-4 INSTRUMENTS

Section	Page	Section	Page
1 Description and Operation	15-11	3 Removal and Installation	15-12
2 In-Car Adjustments and Repairs	15-12	4 Major Repair Operations	15-16

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

All of the instruments are electrically operated except the speedometer. Brightness of the instrument panel lights is controlled by a rheostat on the lighting switch.

GAUGES

The instrument cluster for the Falcon, Fairlane and Mustang includes a fuel gauge, temperature gauge, charge indicator light, oil pressure indicator light, speedometer, high-beam indicator light, and a left and right-hand turn signal indicator light.

The instrument cluster for the Comet includes the same components except that an oil pressure indicator gauge and a charge indicator gauge are used instead of indicator lights. There are also separate left-and-right-hand turn signal indicator lights in the instrument panel.

CONSTANT VOLTAGE REGULATOR

The constant voltage regulator (Fig. 1) used with the fuel, temperature, and oil gauges maintains an average value of 5.0 volts at the gauge terminals.

The regulator operates by means of a bimetallic arm and a heating coil. When the ignition switch is turned on, the heating coil (Fig. 1) heats the bimetallic arm causing it to bend and break the contacts, disconnecting the voltage supply from the heating coil. The bimetallic arm then cools and brings the contacts together again. The making and breaking of the contacts, causes a pulsating voltage, with an effective average value of 5.0 volts to be supplied to the gauges. Although these pulsations are quite rapid, there is in each gauge a bimetallic

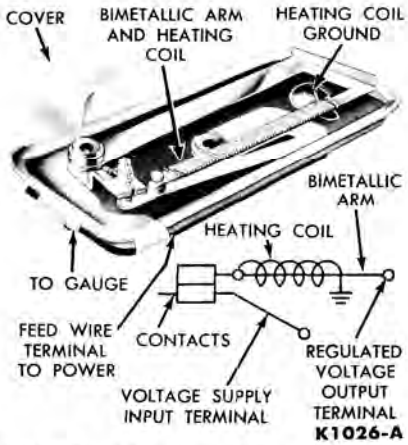


FIG. 1—Constant Voltage Regulator

arm which changes temperature quite slowly, and this assures steady average readings.

As the pulsating voltage would normally cause radio interference, a radio interference suppression choke is connected in series with the constant voltage regulator supply wire.

FUEL GAUGE

The fuel gauge consists of a sending unit, located on the gas tank, and a remote register unit (fuel gauge) mounted in the instrument cluster. The remote register unit pointer is controlled by a bimetallic arm and heating coil. The sending unit is a rheostat that varies its resistance depending on the amount of fuel in the tank. The rheostat is operated by a float control. As the fuel level rises or falls the float control arm moved by the float, varies the resistance.

TEMPERATURE GAUGE

The temperature gauge consists of a sending unit mounted in the cylinder head at the top front on the V-8 (Fig. 2 or 3), left rear on the



FIG. 2—Temperature Sender and Oil Pressure Switch—Falcon V-8

six, and a remote register unit, (temperature gauge) mounted in the instrument cluster.

Changes of engine temperature vary the resistance of the sending unit which in turn operates the temperature gauge.

CHARGE INDICATOR LIGHT—EXCEPT COMET

A red alternator charge indicator light is used. This light flashes on if the battery is discharging and the alternator is not supplying current.

When the ignition switch is closed, battery current flows through the charge indicator light and 15-ohm parallel resistor, and through the regulator voltage limiter contacts to the field.



FIG. 3—Temperature and Oil Pressure Sender—Comet V-8

When the alternator builds up enough voltage to close the field relay contacts, full voltage is applied to the field, and the charge indicator light goes out.

CHARGE INDICATOR GAUGE—COMET

The charge indicator gauge is an ammeter, which indicates whether the battery is being charged or discharged. The ammeter is non-adjustable and should be replaced if proved to be defective.

OIL PRESSURE INDICATOR LIGHT—EXCEPT COMET

A red indicator light flashes on when the oil pressure is below a safe value. The light should come on when the ignition switch is first turned on, and it should go out when the engine comes up to speed. The light is connected between the oil pressure switch unit mounted on the engine at the left rear on the six, above the oil filter on the V-8 (Fig. 2), and the coil terminal of the ignition switch.

OIL PRESSURE INDICATOR GAUGE—COMET

The meter-type oil pressure gauge consists of a sending unit on the engine above the oil filter on the V-8 (Fig. 3), at the left rear on the six, and a remote register unit in the instrument cluster.

The sending unit operates by varying resistance according to actual oil pressure against it, which in turn operates the oil pressure gauge.

TURN INDICATOR

The turn indicator uses the dual filament parking lights as indicator lights.

The turn indicator flasher is located in the back of the instrument panel, on the steering column brace.

On the Mustang the flasher is mounted on the front side of the air duct.

EMERGENCY WARNING FLASHER

The emergency flasher warning system is controlled by a combination switch and flasher assembly. All turn signal lights can be made to flash at the same time by closing the switch of the switch-flasher assembly.

SPEEDOMETER

The speedometer is connected to the output shaft of the transmission by means of a flexible shaft, and a drive gear located inside the transmission. The flexible shaft drives the speedometer which registers speed in miles per hour and also drives an odometer which records distance traveled in miles and tenths of a mile.

WINDSHIELD WIPER

A single-speed and a two-speed electric wiper motor are available. In addition an intermittent wiper is available on the Comet car. This wiper provides high speed (65 to 75 cycles per minute) constant wiping action, and also intermittent low speed (5-30 cycles per minute), intermittent wiping action. This low speed operation is based not on a low speed wiping stroke but on an adjustable dwell period in the park position.

The intermittent wiper is operated through the use of a dual knob. The outer or large knob, when in the center position, turns the system off. When turned fully clockwise, the wiper is in the constant high speed setting. When turned fully counterclockwise, the wiper goes on the intermittent lower speed range. The exact speed is then controlled by the inner, or small knob. Control of the speed is made possible through a vacuum operated governor.

2 IN-CAR ADJUSTMENTS AND REPAIRS

WINDSHIELD WIPER BLADE ADJUSTMENT

Turn the ignition switch to the accessory position momentarily, with the wiper switch off. After bringing the pivot shafts to their park positions, install the wiper blades so that they lie flat against the lower edge of the windshield.

3 REMOVAL AND INSTALLATION

INSTRUMENT CLUSTER—EXCEPT FAIRLANE

1. Disconnect the battery cable.
2. Disconnect the speedometer cable from the speedometer head.
3. Remove the six screws retaining the instrument cluster assembly to the instrument panel and tilt the cluster forward.
4. Disconnect the wiring and the bulb sockets and remove the cluster assembly.
5. Position the cluster and connect the wiring and the bulb sockets.

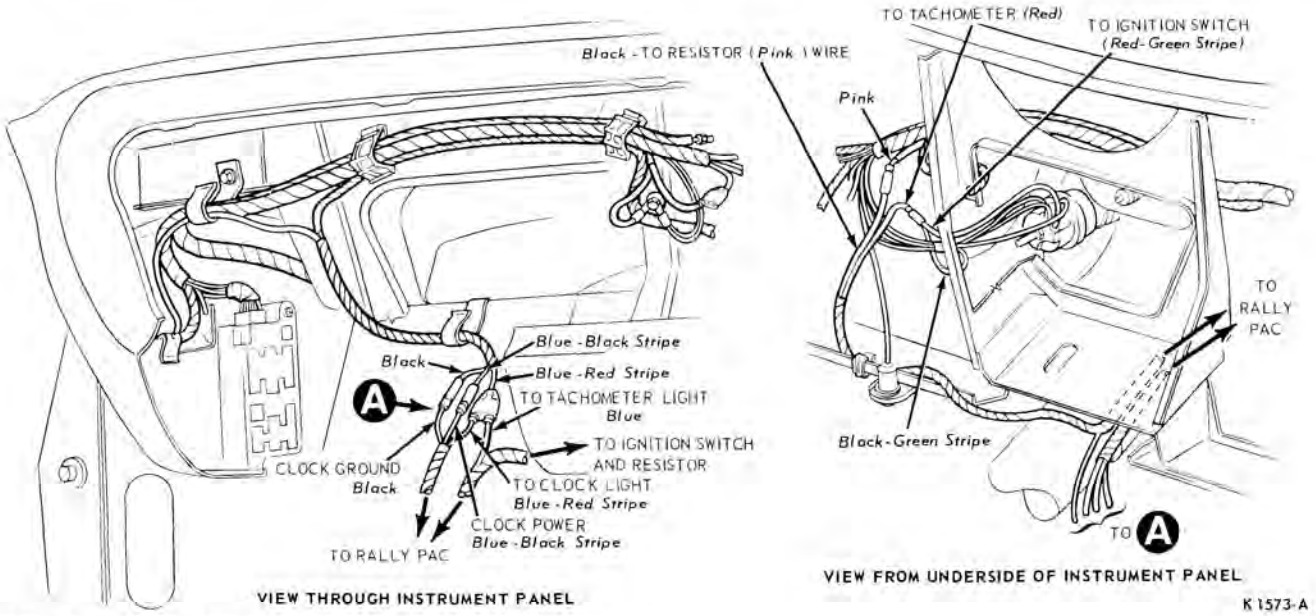


FIG. 4—Rally Pac Wiring Connections

6. Install the instrument cluster assembly to the instrument panel with the six retaining screws.

7. Connect the speedometer cable and the battery cable.

8. Check the operation of all gauges, lights, and signals.

To replace the fuel gauge, temperature gauge, oil pressure gauge, charge indicator gauge, and speedometer, it is necessary to remove the instrument cluster assembly.

INSTRUMENT CLUSTER—FAIRLANE

REMOVAL

1. Disconnect the battery cable.

2. Disconnect the speedometer cable at the speedometer head.

3. Remove the instrument cluster wiring harness from the two retaining clips at the rear of the cluster.

4. Place a shop cloth on the steering column.

5. Remove the instrument cluster assembly retaining screws from the instrument panel. Pull out the cluster and place it on the steering column.

6. Disconnect the wires to the fuel and temperature gauges, and constant voltage regulator.

7. Remove the lights from the instrument cluster.

8. Remove the cluster assembly.

9. Remove the screws that attach the instrument cluster to the bezel and remove the bezel. The instruments may then be removed.

INSTALLATION

1. Assemble the bezel to the instrument cluster. Position the instrument cluster on the steering column and connect the fuel and temperature gauge leads, and the constant voltage regulator leads. Install the instrument panel lights.

2. Install the instrument cluster assembly to the instrument panel.

3. Install the instrument cluster wiring harness in the retaining clips.

4. Connect the speedometer cable and the battery cable.

5. Check the operation of all gauges, lights, and signals.

AUXILIARY INSTRUMENT CLUSTER (RALLY PAC)—MUSTANG

REMOVAL

1. Disconnect the battery ground cable.

2. Diconnect the wiring. Note the color code relationships (for correct assembly later).

3. Remove the mounting clamp assembly screws below the steering column and remove the clamp.

4. Remove the RALLY PAC cluster assembly from the steering column.

INSTALLATION

1. Position the RALLY PAC cluster assembly to the steering column.

2. Position the mounting clamp and install the retaining screws.

3. Connect the wiring (Fig. 4).

4. Connect the battery ground cable.

CONSTANT VOLTAGE REGULATOR

1. Remove the instrument cluster assembly from the instrument panel and tilt the cluster forward.

2. Disconnect the wires from the constant voltage regulator.

3. Remove the regulator retaining screw and remove the regulator.

4. Install the constant voltage regulator in place with the retaining screw.

5. Connect the wires to the regulator.

6. Install the instrument cluster assembly to the instrument panel and check the operation of the gauges.

FUEL GAUGE

1. Remove the instrument cluster assembly.

2. Remove the six screws retaining the instrument cluster back plate assembly, and remove the back plate assembly.

3. Remove the two screws retaining the fuel gauge to the back plate and remove the gauge.

4. Position the fuel gauge and install the two retaining screws.

5. Position the back plate assembly and install the six retaining screws.

6. Install the instrument cluster assembly in the instrument panel.

FUEL SENDING UNIT

1. Remove the fuel from the fuel tank.

2. Disconnect the fuel gauge sending unit wire from the sending unit.

3. Loosen the hose clamp and disconnect the tank line at the sending unit.

4. Remove any dirt that has accumulated around the sending unit so that it will not enter the tank.

5. Turn the sending unit retaining ring counterclockwise and remove the unit, retaining ring, and mounting gasket.

6. Clean the fuel gauge sending unit mounting surface at the fuel tank.

7. Position the sending unit and mounting gasket on the fuel tank and secure with the retaining ring.

8. Connect the sending unit wire and the fuel tank line.

9. Fill the tank with the fuel removed.

10. Check the fuel gauge operation and check for leaks.

TEMPERATURE GAUGE

1. Remove the instrument cluster assembly.

2. Remove the six screws retaining the instrument cluster back plate assembly and remove the back plate assembly.

3. Remove the two screws retaining the temperature gauge to the back plate and remove the gauge.

4. Position the temperature gauge and install the two retaining screws.

5. Position the back plate assembly and install the six retaining screws.

6. Install the instrument cluster assembly in the instrument panel.

TEMPERATURE SENDING UNIT

1. Disconnect the temperature sending unit wire from the sending unit.

2. Prepare the new temperature sending unit for installation by applying a small amount of conductive water resistant sealer C3AZ-19554-B, to the threads.

3. Remove the temperature sending unit from the cylinder head and immediately install the new temperature sending unit.

4. Connect the wire to the temperature sending unit.

5. Start the engine and check the sending unit operation.

OIL PRESSURE INDICATOR GAUGE—COMET

1. Remove the instrument cluster assembly.

2. Remove the six screws retaining the instrument cluster back plate assembly and remove the back plate assembly.

3. Remove the two screws retaining the Speedometer, the two screws retaining the Speedometer dial to the back plate, and remove the speedometer assembly.

4. Remove the two nuts retaining the oil pressure gauge and remove the gauge.

5. Position the oil pressure gauge and install the two retaining nuts.

6. Position the speedometer assembly and install the two speedometer dial retaining screws and the two speedometer retaining screws.

7. Position the back plate assembly and install the six retaining screws.

8. Install the instrument cluster assembly to the instrument panel.

OIL PRESSURE SENDING UNIT OR OIL PRESSURE SWITCH

To replace the unit, disconnect the wire from the terminal. Remove the unit from the engine. Apply conductive sealer C3AZ-19554-B to the threads of the new unit and install the unit. Connect the wire to the terminal and check the operation of the unit.

CHARGE INDICATOR GAUGE—COMET

1. Remove the instrument cluster assembly.

2. Remove the six screws retaining the instrument cluster back plate assembly and remove the back plate assembly.

3. Remove the two screws retaining the speedometer, the two screws retaining the speedometer dial to the back plate and remove the speedometer assembly.

4. Remove the two nuts retaining the charge indicator gauge and remove the gauge.

5. Position the charge indicator gauge and install the two retaining nuts.

6. Position the speedometer assembly and install the two speedometer dial retaining screws and the two speedometer retaining screws.

7. Position the back plate assembly and install the six retaining screws.

8. Install the instrument cluster assembly to the instrument panel.

TURN INDICATOR SWITCH

1. Disconnect the negative (ground) cable from the battery.

2. Remove the steering wheel hub and steering wheel retaining nut.

3. Remove the steering wheel from the shaft.

4. Disconnect the two wire-connector blocks at the dash panel above the steering column.

5. Remove the wires and terminals from the connector blocks. This can be done by depressing the tab on the wire terminal with an awl; then, pull the wire and terminal from the connector block. **Record the color code and location of each wire before removing it from the connector block.** Tape the wires together and attach a piece of heavy cord to the wires to help pull the wires through the steering column during installation.

6. Remove the turn indicator handle from the side of the steering column.

7. Remove 3 bearing retainer attaching screws and remove the bearing retainer and turn indicator switch and wires from the steering column. Disconnect the heavy cord from the switch wires.

8. Tape the ends of the switch wires together and attach the cord to the wires.

9. Pull the wires down through the steering column with the cord, and position the switch to the steering column hub.

10. Install the bearing retainer and attaching screws.

11. Install the turn indicator switch lever.

12. Press the switch wires into the connector blocks in their correct location recorded during removal. Plug the connector blocks together with the mating connector blocks at the dash panel.

13. Install the steering wheel on the shaft.

14. Install the steering wheel retaining nut and hub.

15. Connect the battery ground cable and check the operation of the turn signal switch and horns.

TURN INDICATOR FLASHER

Disconnect the wires from the flasher unit terminals and pull the flasher from its retaining clip. Observe the color code and number on the cover of the flasher. **Be certain to replace it with a new flasher with the same color code and number on the cover.**

EMERGENCY WARNING FLASHER

Pull the flasher from the retaining clip, and disconnect the wires (Fig. 5).

SPEEDOMETER

1. Disconnect the battery ground cable.

2. Disconnect the speedometer cable.

3. Remove the instrument cluster assembly.

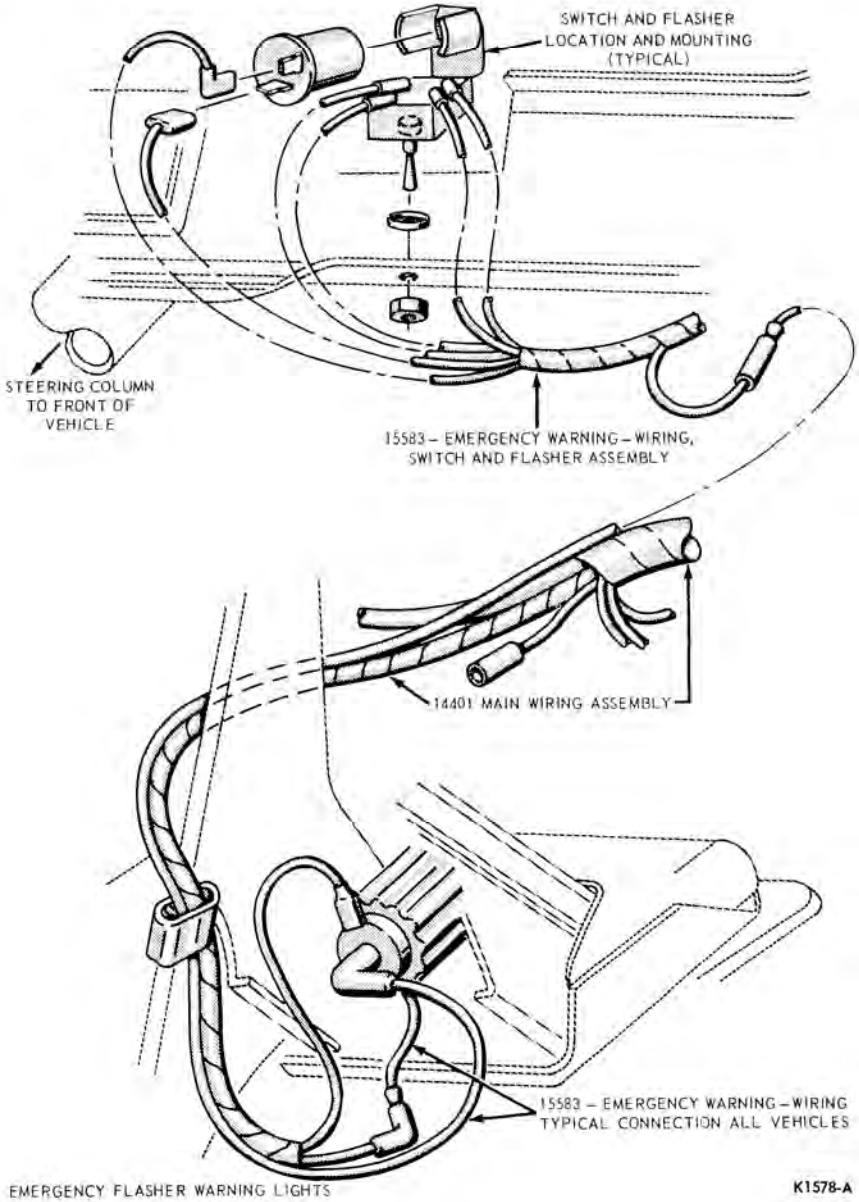


FIG. 5—Emergency Warning Flasher

4. Remove the six screws retaining the instrument cluster back plate assembly and remove the back plate assembly.

5. Remove the two screws retaining the speedometer, the two screws retaining the speedometer dial to the back plate, and remove the speedometer assembly.

6. Position the speedometer and install the two speedometer dial retaining screws and the two speedometer retaining screws.

7. Position the back plate assembly and install the six retaining screws.

8. Install the instrument cluster assembly to the instrument panel.

9. Connect the speedometer cable, avoiding sharp bends.

10. Connect the battery ground cable.

SPEEDOMETER CABLE

To replace the speedometer drive cable, disconnect the cable housing from the speedometer, and pull the cable out of the housing. Wipe off all of the old lubricant. Lubricate the new cable with cable lubricant B5A-19581-A (do not over lubricate), insert it all the way into the housing, and twist it slightly to make sure that the squared drive is engaged in the speedometer driven gear. **If a speedometer cable is broken, it will be necessary to disconnect both ends of the cable housing in order to remove the broken sections. Tighten the mounting bolt to 20-25 foot-pounds torque (Fig. 6).**

The speedometer driven gear is held on to the speedometer cable housing by a retainer clip. When replacing the driven gear, make certain that the gear is secure by placing the gear in position before inserting

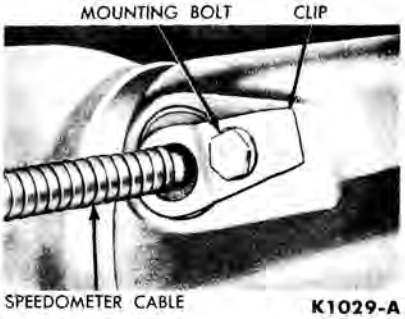


FIG. 6—Speedometer Cable Mounting

the retainer clip through the gear slots.

WINDSHIELD WIPER MOTOR—EXCEPT FAIRLANE

1. Disconnect the harness connector from the wiper motor.
2. Remove the three bolts retaining the wiper motor and mounting bracket assembly to the dash panel. Lower the assembly and disconnect the wiper links at the motor. Remove the motor and bracket assembly.
3. Transfer the mounting bracket with grommets to the new motor.
4. Position the motor and bracket assembly and connect the wiper links to the motor.
5. Position the motor and bracket assembly to the dash panel and install the three retaining bolts.
6. Connect the harness connector to the wiper motor.
7. Connect the battery and check the operation of the wiper motor and the park position of the wiper blades.

WINDSHIELD WIPER MOTOR—FAIRLANE

1. Disconnect the wiper links drive arm from the wiper motor drive shaft (under the instrument panel).
2. Disconnect the wiring leads from the motor.
3. Remove the wiper motor mounting bolts and remove the motor.
4. Apply sealer around the edge of the new motor mounting bracket and around each bracket bolt hole. Position the motor to the dash and install the mounting bolts.
5. Attach the wiring leads to the motor.
6. Position the wiper links drive arm on the motor driveshaft and install the mounting nut.
7. Check the operation of the wiper and adjust the park position if necessary.

WIPER PIVOT SHAFT AND LINK

1. Remove the windshield wiper blade and arm assembly.
2. Remove the pivot shaft retaining nut, bezel and gasket.
3. Disconnect the wiper link from the motor and remove the link and pivot shaft assembly.
4. Position the link and pivot shaft assembly on the cowl and wiper motor. Connect the link to the motor.
5. Install the pivot shaft to the cowl and install the gasket, bezel, and retaining nut.
6. Install the wiper blade and arm assembly.
7. Check the pivot shaft and link operation.

4 MAJOR REPAIR OPERATIONS

DISASSEMBLY—SINGLE-SPEED ELECTRIC WIPER MOTOR

A disassembled view of the single-speed wiper motor is shown in Fig. 7.

1. Remove the gear cover retaining screws, ground terminal and cover.
2. Remove the idler gear and pinion thrust washer and gear.
3. Remove the motor through bolts, motor housing, switch terminal insulator sleeve, and armature. **Do not pound the motor housing magnet assembly as the ceramic magnets may be damaged.**

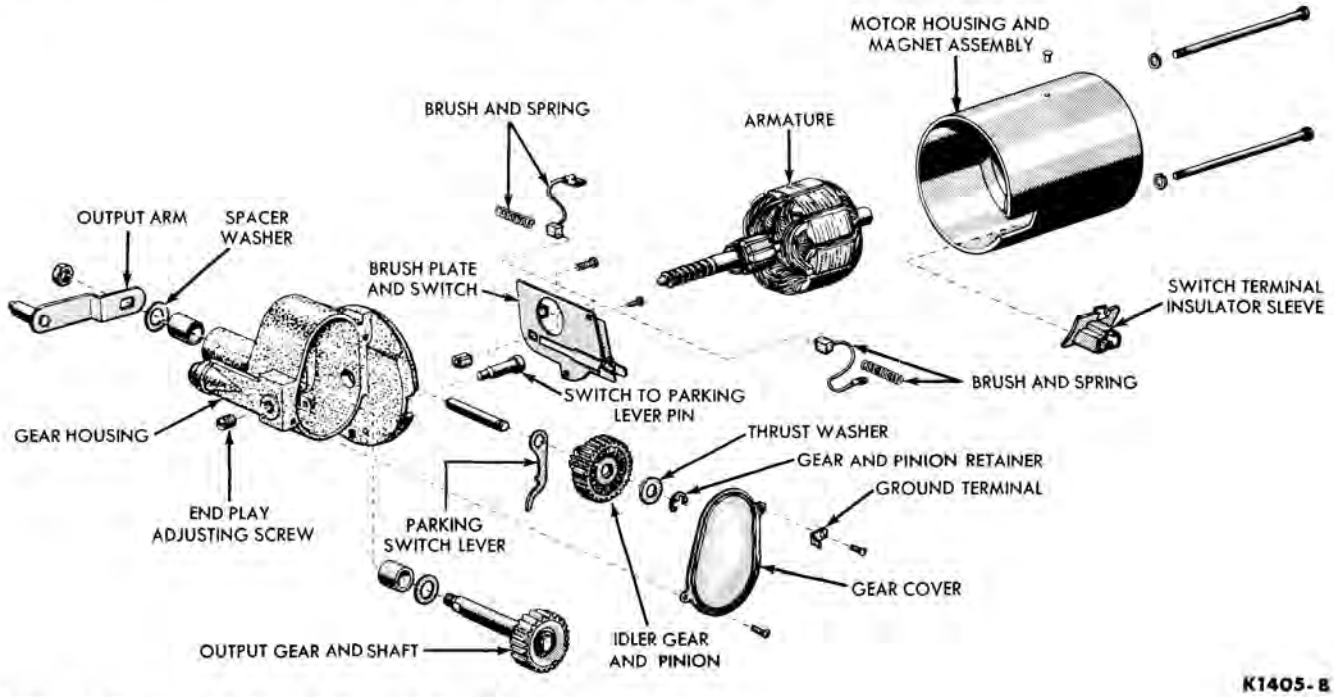


FIG. 7—Disassembled Single-Speed Wiper Motor

4. Remove the armature end play adjusting set screw.

5. Mark the position of the output arm with respect to the output shaft, for assembly. Remove the output arm retaining nut, output arm flat washer, output gear and shaft assembly, thrust washer, and parking switch lever.

6. Remove the brushes and brush springs.

7. Remove the brush plate and switch assembly, and remove the switch contact to parking lever pin from the gear housing.

PARTS REPAIR OR REPLACEMENT

All parts on both the single-speed and two-speed wiper are replaced and not repaired.

ASSEMBLY—SINGLE SPEED ELECTRIC WIPER MOTOR

1. Install the parking switch lever on the gear and pinion shaft with the cam rider pointing toward the gear housing output shaft hole. Make certain that the lever bottoms against the casting.

2. Apply a film of Sun Prestige grease to the output gear teeth and shaft bearing surface. Place the thrust washer on the shaft and insert the shaft in the bearing. Make certain that the parking switch lever is clear of the cam and gear assembly.

3. Place the spacer washer on the shaft, position the output arm on the shaft in the marked position from which it was removed, and install the mounting nut.

4. Position the brush springs and brushes in the holders and wrap wire around them to hold them in the fully retracted position. Push the insulated brush connector onto the switch terminal.

5. Place the switch-contact to parking-lever pin in the gear housing. Position the brush plate assembly to the housing and install the mounting screws. Adjust the switch contact points by turning the adjusting screws clockwise until the inner contact points just open. Then back off the adjusting screw (counterclockwise) one and one half turns. Make this adjustment with the parking lever riding on the lower part of the output gear cam. Then insert a 0.030-inch feeler gauge between the center and outer contact points. Bend the outer arm to attain the 0.030-inch gap.

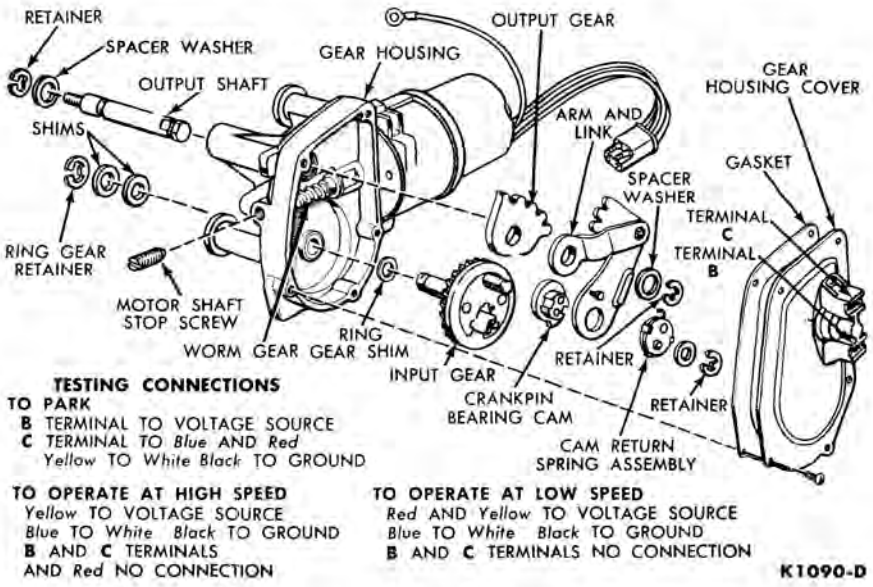


FIG. 8—Two-Speed Wiper Motor

6. Apply Sun Prestige grease to the ball bearing in the end of the armature shaft. Position the armature shaft in the gear housing and remove the brush retracting wires.

7. Holding the armature in position, install the terminal insulating sleeve, motor housing and magnet assembly, and through bolts. Seal the area where the terminal insulator sleeve seats against the motor and gear housings.

8. Apply Sun Prestige grease to the worm gear and idler gear, and install the idler gear, thrust washer and retainer.

9. Install the armature shaft end play adjusting screw and adjust the end play to 0.003-inch.

10. Apply a generous amount of Sun Prestige grease to the area around the end of the armature shaft. Install the gear housing cover and ground terminal.

DISASSEMBLY—TWO-SPEED ELECTRIC WIPER MOTOR

The two-speed electric motor may be disassembled for service of the drive mechanism parts.

1. Remove the gear housing cover plate and gasket (Fig. 8).

2. Remove the output shaft retainer and spacer washer.

3. Remove the crankpin bearing retainer and remove the spacer washer and cam return spring assembly.

4. Remove the arm and link assembly.

5. Remove the crankpin bearing cam.

6. Remove the input gear retainer and outer spacer shim, and remove the input gear and inner spacer shim.

7. Remove the wiper arm lever nut and lock washer.

8. Remove the wiper arm lever and spacer, and remove the output shaft and gear assembly from the housing.

9. The output gear may be removed from its shaft by tapping with a fiber hammer. Be careful not to damage the end of the shaft.

The worm drive gear and armature assembly is not serviced.

PARTS REPAIR OR REPLACEMENT

All parts on both the single-speed and the two-speed electric wipers are replaced and not repaired.

ASSEMBLY—TWO-SPEED ELECTRIC WIPER MOTOR

1. Tighten the motor cover. Adjust the motor shaft end play to 0.000-0.005 inch by turning the shaft stop screw. Measure with a feeler gauge between the stop screw and the motor shaft.

2. Install the input gear shim on the input gear shaft and install the

gear in the housing. Adjust the end play to 0.005 to 0.010 inch by adding or removing shims under the input gear retainer. Install the retainer.

3. Install the output gear on the output shaft. Make sure that the gear is bottomed on the shaft.

4. Install the output shaft and gear assembly into the housing with the gear teeth facing the motor. Install one spacer washer to the outside end of the output shaft and assemble the wiper arm lever to the output shaft, with the linkage studs facing away from and above the shaft. Secure the lever with a lock washer and nut.

5. Place the bearing cam on the crankpin with the small diameter portion of the cam facing outward.

6. Install the arm and link assembly to the bearing cam. As the arm is placed on the shaft, the gears must be meshed and the link which is riveted to the arm must be installed to the output shaft at the same time. Proper gear indexing is obtained when the bottom tooth of the arm and gear segment will be in mesh with the bottom valley of the output shaft gear.

7. Install the output shaft spacer washer and retainer. Check the end play of the output shaft (0.005-0.010 inch). Remove or install spacer washers under the shaft retainer to adjust the end play.

8. Install the cam return spring assembly.

9. Install the bearing spacer and retainer. If the retainer cannot be installed, one or more coils of the spring clutch are probably out of place. If the bearing has excessive end play on the crankpin, the projection of the bearing may ride out of the semi-circular slot in the end plate. Add spacer washers under the retainer if necessary.

10. Apply generous amounts of Sun Prestige grease to all moving parts. Install the gear housing cover plate.

When operating the unit on the bench, do not place hands or fingers between the wiper lever and the case, or inside the gear housing, as considerable power is developed by the gear reduction.

PART 15-5 SPECIFICATIONS

BULB CHART

Unit	Candela* or Wattage	Trade Number
Headlight No. 1 (Inner or Lower)	37,5 W.	4001
Headlight No. 2 (Outer or Upper)	37.5/50 W.	4002
Headlight (Falcon-Mustang)	40/50 W.	6012
Front Turn Signal/Parking	4/32 C.	1157
Rear Turn Signal and Stop/Tail	4/32 C.	1157
License Plate	4 C.	1155
Back-up Lights	21 C.	1141
Spot Light	30 W.	4405
Luggage Compartment	6 C.	631
Dome Light	15 C.	1003
Instrument Panel Indicators:		
Hi Beam	2 C.	1895
Oil Pressure	2 C.	1895

*Candela is the new international term for candlepower

BULB CHART (Continued)

Unit	Candela* or Wattage	Trade Number
Alternator	2 C.	1895
Turn Signal	2 C.	1895
Parking Brake Warning	2 C.	1895
Illumination		
Speedometer	2 C.	1895
Cluster	2 C.	1895
Heater Control	2 C.	1895
Clock	2 C.	1895
Radio Dial	2 C.	1891
Courtesy (Door Mounted)	15 C.	1003
Automatic Transmission Control	2 C.	1895
Map	6 C.	631

CIRCUIT PROTECTION

FUNCTION	LOCATION	Falcon Comet RATING TYPE	Fairlane RATING TYPE	Mustang RATING TYPE
Dome-Courtesy-Map-Cargo	Fuse Panel	7½ SFE	7½ SFE	7½ SFE
Tail-Park-License	Light Switch	15 C.B.	15 C.B.	15 C.B.
Stop Light	Light Switch	15 C.B.	15 C.B.	15 C.B.
Clock	Fuse Panel	14 SFE	15 C.B.	7½ SFE
Backup	Fuse Panel	14 SFE	14 SFE	14 SFE
Turn Signals*				
Radio	Fuse Panel	14 SFE	14 SFE	14 SFE
Heater	Fuse Panel	14 SFE	14 SFE	14 SFE
Instrument Panel Light	Fuse Panel	2½ AGW	2½ AGA	2½ AGA
Cigar Lighter	Fuse Panel	14 SFE	14 SFE	14 SFE
Windshield Washer				
Windshield Wiper	Wiper Switch	5 S. Sp. 12 2 Sp. C.B. 7 Intermittent	5 S. Sp. 12 2 Sp. C.B.	5 S. Sp. 12 2 Sp. C.B.
Luggage Compartment Light	Fuse Panel	7½ SFE	7½ SFE	
Door Open Warning Light	Fuse Panel		7½ SFE	
Glove Box Light	Fuse Panel	7½ SFE	7½ SFE	7½ SFE
Transmission Indicator Light	Fuse Panel	2½ AGW	2½ AGA	2½ AGA
Emergency Warning Flasher	Fuse Panel	14 SFE	14 SFE	14 SFE
Ash Receptacle Light	Fuse Panel	7½ SFE	7½ SFE	
Headlights	Light Switch	12 Falcon C.B. 18 Comet C.B.	18 C.B.	12 C.B.
Horns	Light Switch	15 C.B.	15 C.B.	15 C.B.
Air Conditioner	In Line	15 AGC	15 AGC	15 AGC
Top Control Motor Feed	At Starter Relay	20 C.B.		20 C.B.
Back Light Control	At Starter Relay	20 C.B.	20 C.B.	
Economy Air Conditioner	In Line	15 AGC	15 AGC	15 AGC

*Turn signal flasher unit acts as a circuit breaker.

SPEEDOMETER CABLE

Mounting Clip Bolt Torque	20-25 ft. lbs.

VENTILATING, HEATING, AND ACCESSORIES

GROUP 16

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VENTILATING SYSTEM AND HEATER 16- 1

PART 16-2 **PAGE**
AIR CONDITIONING 16- 8

PART 16-3 **PAGE**
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PART 16-1 VENTILATING SYSTEM AND HEATER

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2	Description and Operation–Heating System	16- 1
3	Diagnosis and Testing	16- 4
4	Common Adjustments and Repairs–Ventilating System	16- 5
5	Common Adjustments and Repairs–Heating System	16- 5
6	Removal and Installation	16- 6

1 DESCRIPTION AND OPERATION — VENTILATING SYSTEM

COMET, FALCON AND MUSTANG

Two manually operated doors located under each end of the instrument panel allow fresh air to enter the passenger compartment. The right door is open to the cowl inlet only when the HEAT lever is in the up position. The position of the fresh air doors deflects the air as desired.

FAIRLANE

Two fresh air inlets are located under each end of the instrument panel. They are opened by pulling out on the two fresh air knobs located on each side of the steering column.

2 DESCRIPTION AND OPERATION — HEATING SYSTEM

COMET, FALCON AND MUSTANG

The fresh air heater is designed to function in conjunction with the right duct of the fresh air ventilating system (Fig. 1). The heater assembly couples to an outlet provided in the right cowl assembly. A door in the duct and two doors in the heater housing are operated by controls located on the instrument panel, allowing the selection of outside air for ventilation or heating (Fig. 2).

The defroster control lever operates a valve in the heater plenum chamber. Push the lever downward for proportionately more air to the defroster registers.

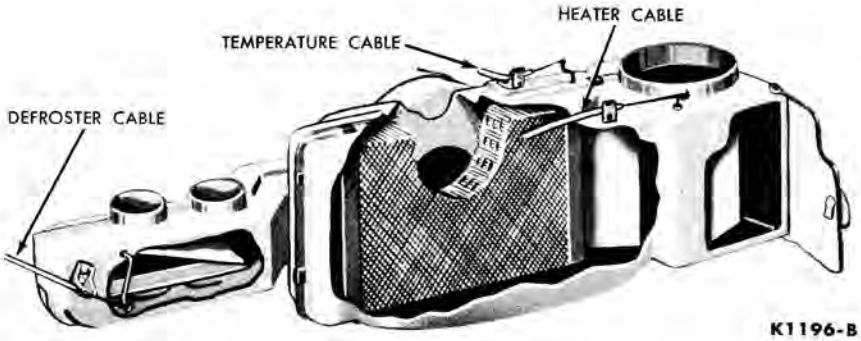
The PUSH FOR TEMP lever operates the blend-air valve in the heater blower housing. The blend-air door controls the amount of air flow through the heater core. Any intermediate position of the blend-air door allows both cool and heated air to be mixed in the plenum chamber for lower than maximum temperatures.

The PUSH FOR HTR lever operates a door in the right incoming air duct. When the lever is in the up position air from the cowl grille enters the passenger compartment through an opening under the right side of the instrument panel. A manually operated door closes the opening, or



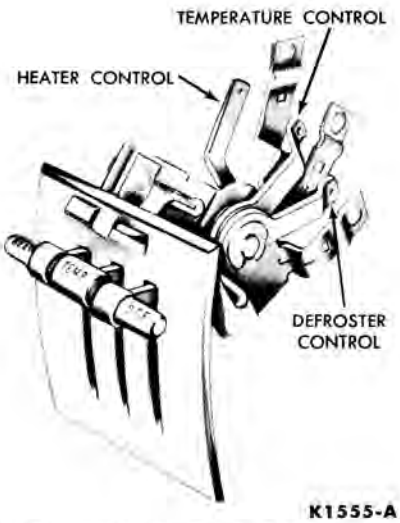
K1195-B

FIG. 1—Heater System—Except Fairlane



K1196-B

FIG. 2—Heater Control Cables—Except Fairlane



K1555-A

FIG. 3—Heater Controls—Except Fairlane

deflects air as desired. Pushing the lever downward allows air to enter the heater blower inlet duct.

To operate the blower motor, move the top lever from the center OFF position. Moving the lever to the left will give high speed operation, and moving it to the right will give low speed operation (Fig. 3).

FAIRLANE

The fresh air heater is designed to function in conjunction with the fresh air ventilating system (Fig. 4). Incoming fresh air enters the car through a grille running the full width of the cowl. The grille is open at all times. A trough directly under the grille collects any water that may enter and directs it to drain tubes on either side of the car.

The heater blower couples to an opening in the right fresh air duct. An air valve in the heater plenum chamber is operated by the air control lever (bottom lever) in the heater control panel. These controls allow the selection of outside air for ventilation, heating, or defrosting.

The air temperature is controlled by the temperature control lever (top lever), in the heater control panel. The lever actuates the heat control valve in the heater blower housing (Fig. 5). The heat control valve controls the amount of air flow through the heater core. Any intermediate position of the heat control valve allows both cool and heated air to be mixed in the plenum chamber for lower than maximum temperatures.

The defroster control (bottom lever), operates a valve in the plenum chamber (Fig. 5). When the defroster is fully on, the valve closes the plenum chamber outlet, causing a maximum flow of air to the defroster. The distribution of air between the defroster and the plenum chamber is regulated by the position of the control lever between HEAT and DEFROST. The OFF position closes the plenum outlet when air flow is not desired.

Three speed ranges are provided for the blower fan by means of a four position switch and resistors. The plenum chamber contains several outlets that serve as nozzles to direct the air downward to the floor. The air then flows under the front seat and circulates through the entire passenger compartment. A door in the front of the plenum chamber allows incoming air to be directed in various directions.

When the right vent air control knob is pushed in, the fresh air is directed through the heater.

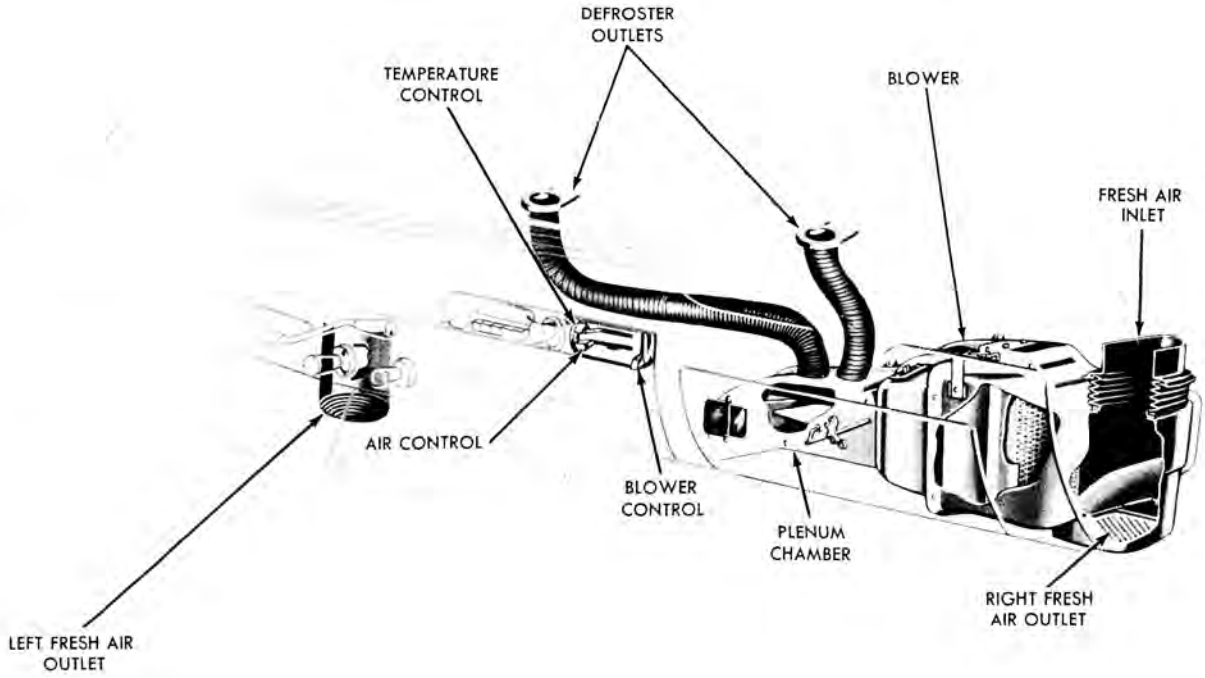


FIG. 4—Fairlane Heater Installation

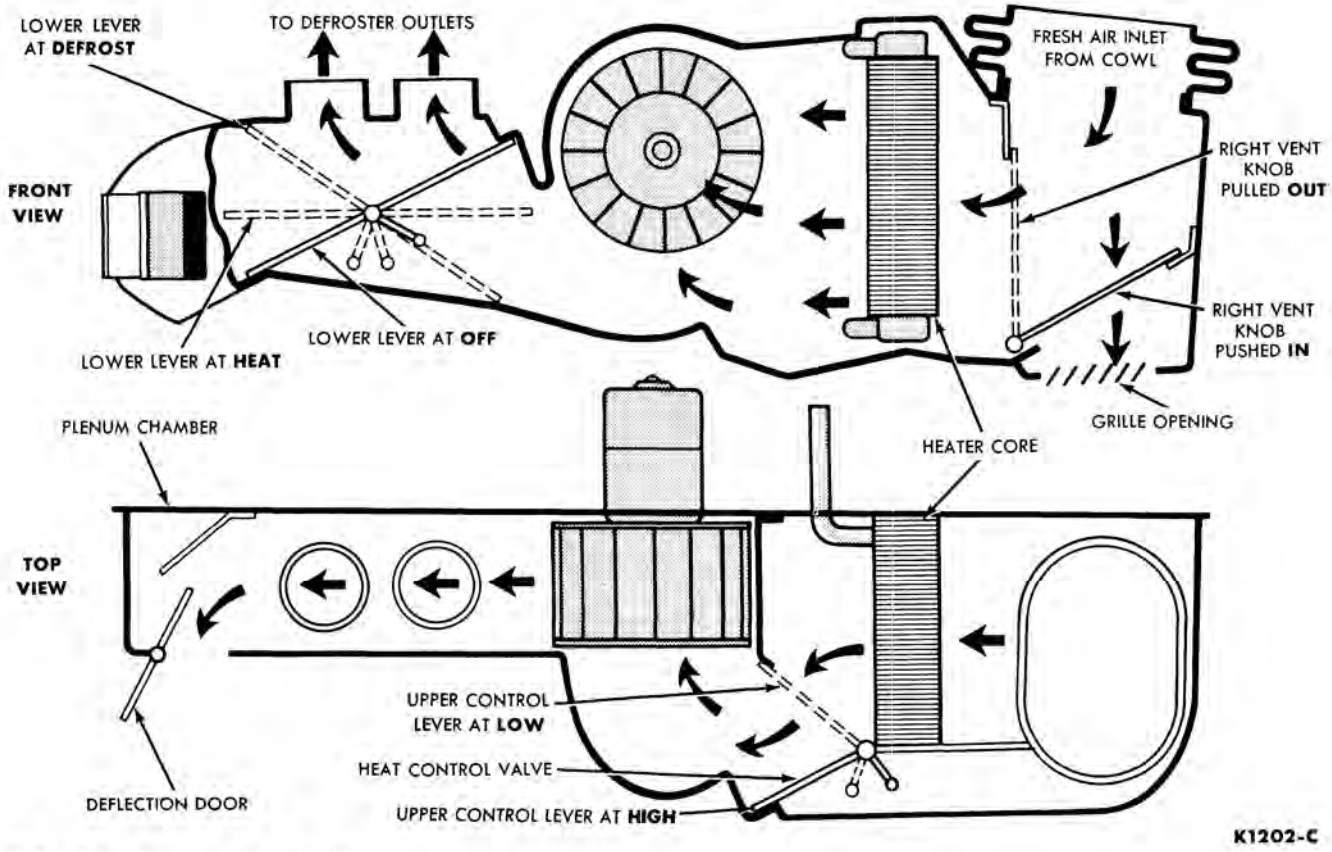


FIG. 5—Fairlane Heater Air Flow

3 DIAGNOSIS AND TESTING

VENTILATING AND HEATING TROUBLE DIAGNOSIS GUIDE

INSUFFICIENT OR NO HEAT	**1.** Burned out fuse or loose wires to the heater blower. **2.** Defective motor ground, or defective blower motor. **3.** Fan loose on motor shaft, or motor stalled. **4.** Defective heater blower switch. **5.** A kinked, clogged, or collapsed water hose.	**6.** Improperly connected heater hoses. **7.** Plugged heater core, or air outlet. **8.** Improperly installed or defective engine thermostat. **9.** Incorrectly installed and adjusted control cables. **10.** Air leaks in the body.
INSUFFICIENT OR NO DEFROSTING	**1.** Improperly adjusted defroster control cable, or disconnected defroster hose. **2.** Binding defroster valve. **3.** Plugged or loose defroster	nozzle, or obstructed defroster openings at windshield. **4.** Defroster hoses not properly attached at plenum.
TOO MUCH HEAT	**1.** Incorrectly adjusted blend-air valve.	

TESTING

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

The following tests may be made on the heater: Burned out fuses, loose wire connections, defective wires, collapsed hoses, loose defroster hoses and air leaks in the body may be determined by visual inspection of the parts.

HEATER CURRENT DRAW TEST

This test will determine if the blower motor is defective. Connect a 0-50 ammeter as shown in Fig. 6. The blower motor will operate independently of the control switch, and the current drawn by the motor will be indicated on the ammeter. Current draw should be to specification.

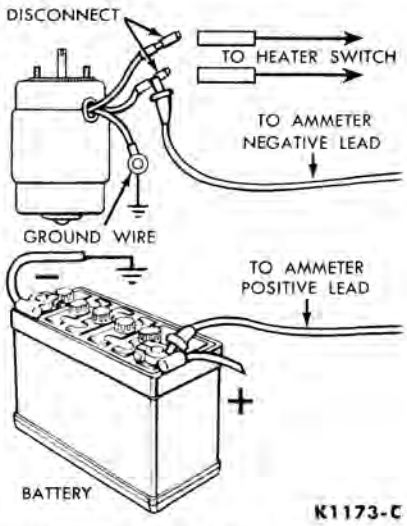


FIG. 6—Heater Motor Current Draw Test

LOOSE MOTOR FAN

Turn on the heater switch, and listen for the sound of the motor. If only a hum is heard, the fan is loose on the motor shaft.

BLOWER SWITCH

Substitute a known good blower switch for the suspected switch.

PLUGGED HEATER CORE

Start the engine and temporarily remove the outlet hose from the heater core (the hose that leads to the water pump). Very little or no flow of water from the core outlet indicates that the core is plugged. Make certain that water is being supplied to the core inlet.

4 COMMON ADJUSTMENTS AND REPAIRS — VENTILATING SYSTEM

Bowden cable operated vents and air inlets are adjusted so that the vents are tightly closed when the control knobs are all the way in. Loosen the Bowden cable retaining screw at the vent control arm, move the cable housing back and forth until the vent is closed when the knob is 1/16–1/8 inch from the in position, then tighten the retaining screw.

5 COMMON ADJUSTMENTS AND REPAIRS — HEATING SYSTEM

CONTROL ADJUSTMENTS— EXCEPT FAIRLANE

To assure maximum temperature the following temperature control adjustments should be used.

1. Insert a 1/8-inch spacer between temperature control lever (center lever) and bottom of the slot. Move the lever down until it is seated against the spacer.

2. Loosen the control cable retaining clip (at either end of the cable).

3. With the temperature control damper crank (heater assembly) held tightly in the full heat position, tighten the control cable retaining clip screw.

4. Remove the spacer from the control head and check the lever travel. All overtravel (springback) should appear at the bottom of the lever travel.

CONTROL ADJUSTMENTS— FAIRLANE

The upper lever of the control assembly is connected to the heat control valve. The control cable must be so adjusted that when the upper control lever is 1/16 inch from the left of the control head slot, the valve closes the outlet from the heater core (valve crank maximum clockwise Fig. 7). Make this adjustment at the control head (Fig. 8).

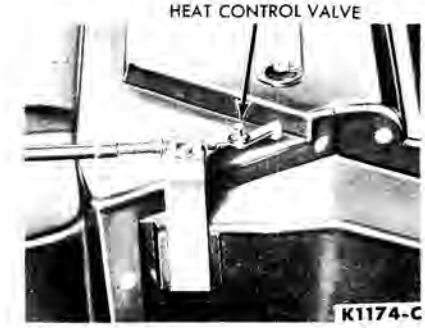


FIG. 7—Heat Control Valve

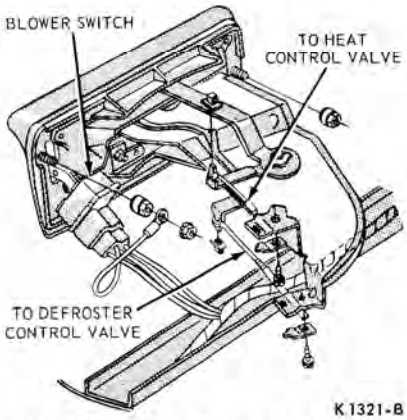


FIG. 8—Control Head Cable Adjustment

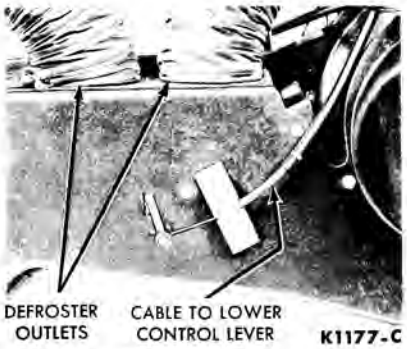


FIG. 9—Defroster Valve Adjustment

With the lower lever at the left, adjust the defroster valve so that the valve crank is in the maximum counterclockwise position (Fig. 9).

BLEEDING AIR FROM HEATER CORE

Remove the hose at the outlet connection of the heater core (hose that leads to the water pump). Allow any trapped air to flow out. When a continuous flow of coolant is obtained, connect the hose to the core.

HEATER HOSE REPLACEMENT

To replace a heater hose, drain the coolant, remove the hose, cut a new hose to the same length as the old hose, install the hose, and replace the coolant. **Make certain that the water hose connection to the block (or manifold) goes to the water valve and not the heater core. Also that the heater hoses can not come in contact with any part of the exhaust system.**

After the coolant has been replaced, bleed the air from the heater core.

6 REMOVAL AND INSTALLATION

COMET, FALCON AND MUSTANG

HEATER

Most of the heater repairs can be performed with the heater assembly lying on the car floor. Therefore, the following procedure will not remove the heater assembly from the car. The heater core or plenum replacement procedures contain the additional required steps to remove the heater assembly from the car.

Removal

1. Drain the cooling system.
2. Remove the glove box.
3. Disconnect the three control cables.
4. Disconnect the defroster hoses at the heater plenum.
5. Disconnect the heater hoses at the water pump and the carburetor heater. Remove the heater hoses from the retaining clips. On 8-cylinder models remove the hose from the choke clip (Fig. 10).
6. Disconnect the wires at the heater motor and remove the ground-wire-to-dash panel retaining screw.
7. Remove the heater and motor assembly retaining nuts from the dash panel.
8. Disconnect the fresh air inlet rubber boot, pull the heater assembly from the dash panel and lay the heater assembly on the floor.

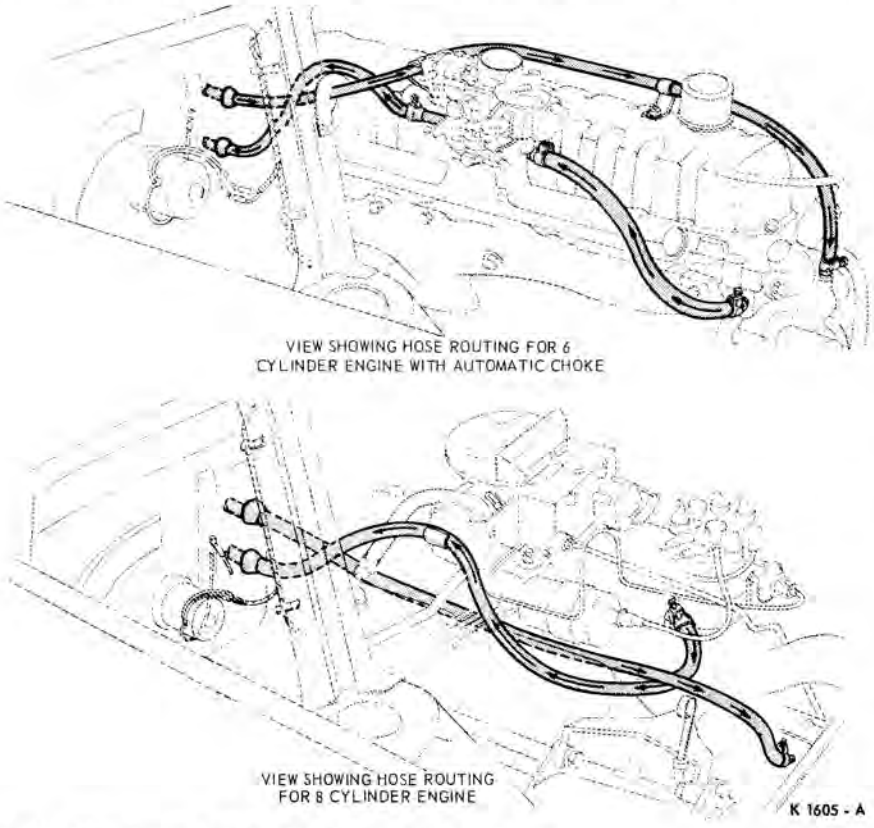


FIG. 10—6 and 8 Cylinder Heater Hose Routings

Installation

1. Position the heater assembly to the dash panel and install the retaining nuts.
2. Connect the heater motor wires to the wiring harness, and connect the heater motor ground wire to the dash panel with the retaining screw.
3. Connect the heater hoses and install the hose retaining clips.
4. Connect the fresh air inlet boot.
5. Connect the defroster hoses to the heater plenum.
6. Connect and adjust the three cables to the heater, and install the glove box.
7. Fill the cooling system, and check the system for leaks.
8. Bleed the system.

HEATER CORE

1. Remove the heater assembly and lay the assembly on the car floor.
2. Remove the clips retaining the heater housing halves together and separate the halves.
3. Lift the heater core from the heater housing chamber. On console

equipped cars it may be necessary to remove the heater from the car.

4. Position the heater core in the forward half of the heater housing, assemble the housing, and install the retaining clips. If a 2-inch core is used, transfer the adapter from the old core to the new core.

5. Position the assembly on the car floor.

6. Install the heater assembly.

7. Refill and bleed the cooling system and check for leaks.

HEATER BLOWER

1. Remove the heater assembly and lay the assembly on the car floor.

2. Remove the blower motor and bracket to the blower housing retaining screws and remove the blower assembly.

3. Loosen the blower cage set screw and remove the blower cage from the motor.

4. Remove the blower motor mounting plate from the motor.

5. Install the blower motor mounting plate to the new motor.

6. Install the blower cage and tighten the set screw.

7. Install the heater motor and bracket to the blower housing.

8. Install the heater assembly.

DEFROSTER NOZZLES

1. Remove the defroster outlet register retaining screws and remove the register.

2. Disconnect the defroster hose at the plenum.

3. Remove the defroster nozzle retaining clips and remove the nozzle assembly.

4. Transfer the retaining clips to the new defroster nozzle assembly.

5. Install the defroster nozzle to the instrument panel.

6. Install the defroster outlet register.

7. Connect the hoses to the plenum.

BLOWER SWITCH

1. Loosen the screw in the knob.

2. Disconnect the wiring.

3. Remove one screw holding the blower switch to the control head assembly, and remove the switch.

HEATER CONTROL ASSEMBLY

Remove two screws from under the instrument panel to remove the control head assembly. Disconnect the three cables. Disconnect the blower switch wiring. Remove the control assembly.

FAIRLANE HEATER CONTROL

The heater control is mounted in the instrument panel to the right of the radio opening. To remove the control assembly, remove the knobs, disconnect the cables, the switch wires, and the pilot light wire from its connector. Remove the two nuts retaining the assembly to the instrument panel. Re-use the bezel nut and anti-rattle pads, and position the ground wire under one of the assembly nuts when installing the new heater control.

HEATER

Removal

1. Partially drain the cooling system.

2. Disconnect the fresh air inlet control cable at the instrument panel. Disconnect the right air inlet boot at the blower housing.

3. Disconnect the defroster valve control cable at the plenum chamber. Disconnect the defroster hoses at the outlets. Disconnect the heater wires from the resistor, and disconnect the motor wire.

4. Disconnect the heater hoses at the firewall (Fig. 10).

5. Remove the plenum chamber retaining nuts at the firewall and lay the assembly on the floor.

6. Disconnect the heat control valve cable at the valve. Remove the assembly from the car.

Installation

1. Position the assembly on the floor of the car.

2. Connect and adjust the heat control valve cable.

3. Position the heater assembly to the firewall and install the retaining nuts.

4. Connect the blower motor and resistor wires.

5. Connect the air inlet boot at the blower housing. Connect the defroster hoses.

6. Connect and adjust the defroster control cable. Attach the right fresh air inlet valve control cable to the instrument panel.

7. Connect the heater hose from the manifold outlet to the heater core lower tube. Fill the cooling system and install the remaining heater hose.

8. Check the heater operation and inspect for leaks.

HEATER CORE

1. Remove the heater assembly.

2. Remove the core cover retaining screws and remove the cover.

3. Remove the heater core from the plenum.

4. Position the heater core in the plenum, so that it will be held by the retaining clips.

5. Install the heater core cover.

6. Position the heater assembly on the car floor and install the heater.

HEATER BLOWER MOTOR

1. Remove the heater assembly. Disconnect the heater wires.

2. Remove the heater blower motor retaining plate screws and remove the motor and fan assembly.

3. Loosen the fan set screw and remove the fan from the blower motor. Remove the retaining plate and gasket from the motor.

4. Install the heater motor retaining plate and gasket to the new motor. Install the fan on the motor and tighten the set screw. Install the blower assembly to the heater. Connect the motor wires.

5. Install the heater assembly. Check the blower motor operation.

PART 16-2 AIR CONDITIONING

Section		Page
1	Description and Operation	16- 8
2	Diagnosis and Testing	16-10
3	Common Adjustments and Repairs	16-13
4	Removal and Installation	16-15
5	Cleaning and Inspection	16-17

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

The Ford air conditioner is used on the Falcon and Fairlane (Fig. 1). The Mercury air conditioner is used on the Comet. The Selectaire (Fig. 2) is available on the Fairlane. All units use a receiver, an expansion valve, an evaporator, a compressor, and a condenser. These parts are the standard units which are used in any air cooling system. Besides these major cooling components there is a liquid sight glass, an oil separator (integral with the compressor), a cooling unit thermostatic switch, and a blower assembly.

Fig. 3 shows an air conditioning system in schematic form. Arrows indicate the direction of refrigerant flow.

RECEIVER UNIT

The air cooling system stores the liquid Refrigerant-12 under pressure in a combination receiver and dehydrator (Fig. 3). The pressure in the receiver normally varies from about 80 to 300 psi, depending on the surrounding air temperature and compressor speed.

The dehydrator serves the purpose of removing any traces of moisture that may have accumulated in the system. Even small amounts of moisture will cause an air cooling unit to malfunction. A fusible plug is screwed into the receiver. This will release the refrigerant before the refrigerant temperature exceeds 212°F.

EVAPORATOR UNIT

When the cooling system is in operation, the liquid Refrigerant-12 flows from the combination receiver and dehydrator unit through a flexible hose to the evaporator (Fig. 3) where it is allowed to evaporate at a reduced pressure.

EXPANSION VALVE

The rate of refrigerant evaporation is controlled by an expansion valve (Fig. 3) which allows only enough refrigerant to flow into the evaporator to keep the evaporator operating efficiently, depending on its heat load.

The expansion valve consists of the valve and a temperature sensing capillary tube and bulb. The bulb is clamped to the outlet pipe of the evaporator. Thus the valve is controlled by evaporator outlet temperature.

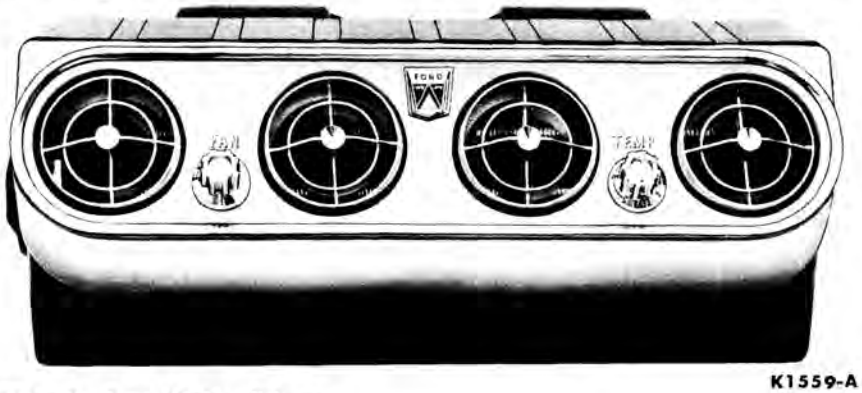
The restricting effect of the expansion valve at the evaporator causes a low pressure on the low pressure side of the system of 12-50 psi, depending on the surrounding air temperature and compressor speed.

COMPRESSOR UNIT

The evaporated refrigerant leaving the evaporator (now in the form of a gas) at a pressure of 12-50 psi is pumped by the compressor, located on the engine (Fig. 4), into the top of the condenser, located in front of the radiator.

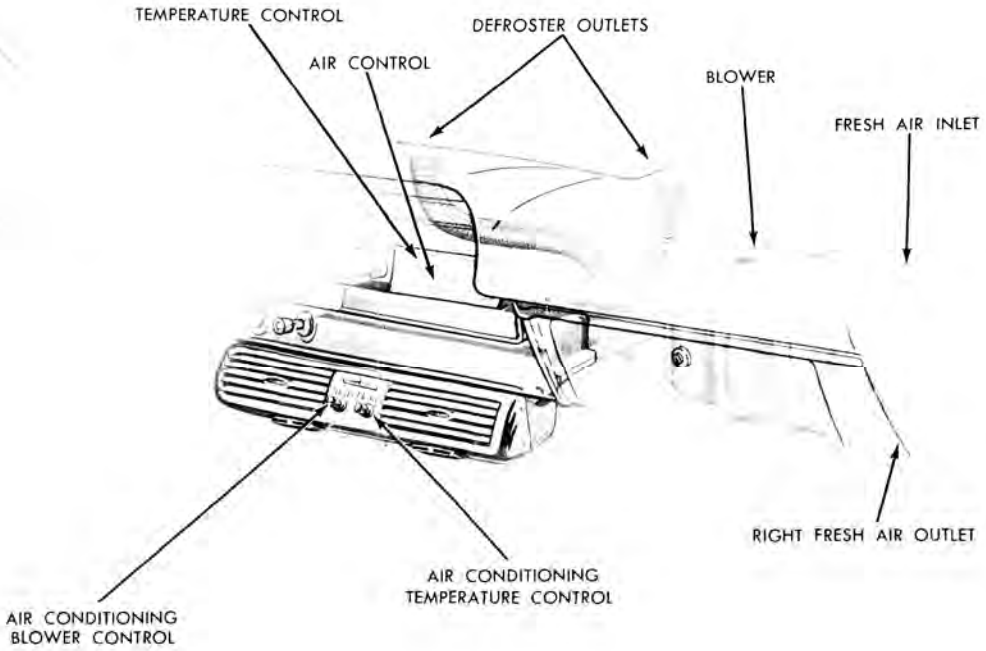
The compressor maintains a pressure on its high pressure side of from 80-300 psi, depending on the surrounding air temperature and compressor speed.

As the now heated and compressed refrigerant gas flows down through the condenser, it is cooled by air passing between the sections of the condenser. The cooled, compressed refrigerant gas condenses to liquid refrigerant which then flows into the receiver.



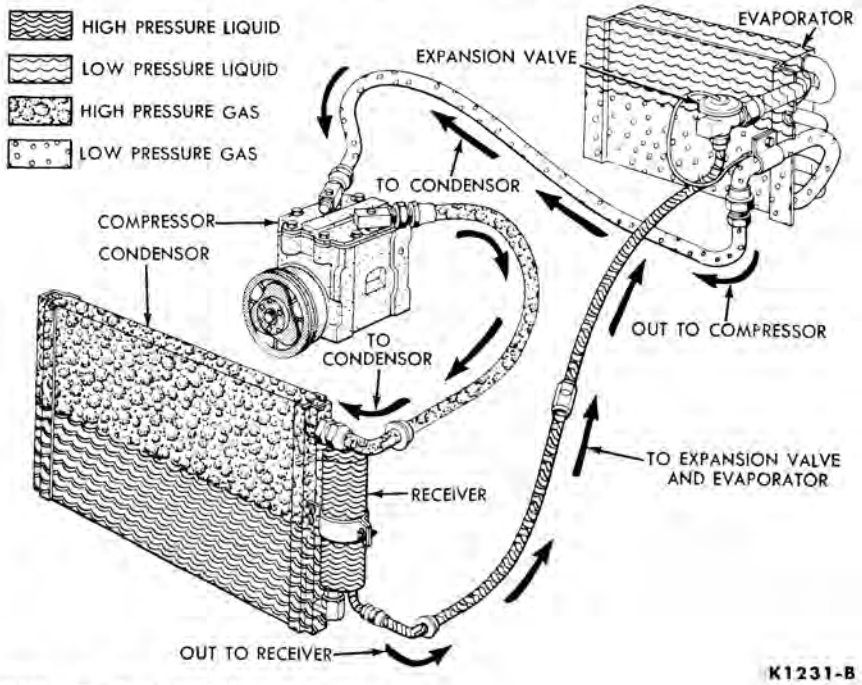
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FIG. 1—Ford Air Conditioner



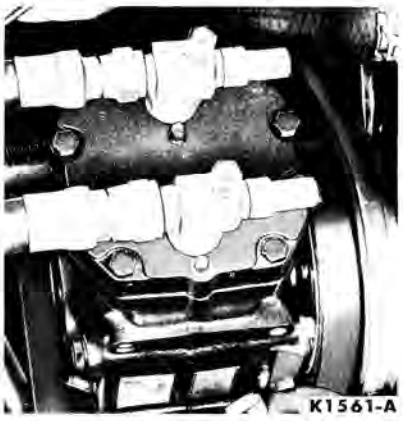
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FIG. 2—Fairlane Heating and Air Conditioning System



K1231-B

FIG. 3—Air Conditioning System



K1561-A

FIG. 4—Compressor Installed

LIQUID SIGHT GLASS

A liquid sight glass is mounted in the high pressure refrigerant line between the receiver and the expansion valve (Fig. 3). The sight glass is used to check whether there is enough liquid refrigerant in the system.

MAGNETIC CLUTCH

It is necessary to control the amount of cooling that the system produces. To accomplish this, the compressor is electrically cut in and out of operation by the use of a magnetic clutch pulley mounted on the compressor crankshaft (Fig. 3). The magnetic clutch is controlled by a thermostatic switch which has its temperature sensing tube inserted in the fins of the evaporator core.

THERMOSTATIC SWITCH

The thermostatic switch controls the operation of the compressor by controlling the compressor magnetic clutch. The temperature sensing tube of the switch is placed in contact with the evaporator fins. When the temperature of the evaporator becomes too cold, the thermostatic switch opens the magnetic clutch electrical circuit, disconnecting the compressor from the engine. When the temperature of the evaporator rises to the upper limit at which the thermostatic switch is set, the thermostatic switch closes and energizes the magnetic clutch. This connects the compressor to the engine, and cooling action begins again.

When the ignition switch is off or the cooling control thermostatic switch is in the off position, the magnetic clutch is not energized, and the compressor can not operate.

When the ignition switch is on (engine running), and the cooling control is in the cooling range, the magnetic clutch is energized, the compressor is connected to the engine and the cooling system is in operation.

The thermostatic switch may be adjusted to maintain an average evaporator temperature of from 30°-60°F. The thermostatic switch operating differential temperature at any one setting is 6°F.

SERVICE VALVES

The service valves on the compressor are used to test and service the cooling system (Figs. 5 and 6).

The high pressure service valve, mounted at the outlet to the compressor, allows access to the high pressure side of the system for attaching a pressure gauge, or a servicing hose.

The low pressure valve, mounted at the inlet to the compressor, allows access to the low pressure side of the system for attaching a pressure gauge or a servicing hose.

Both service valves may be used to shut off the rest of the system from the compressor during compressor service.

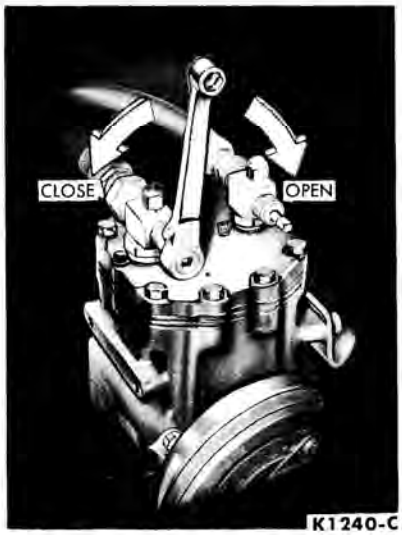


FIG. 5—Low Pressure Service Valve Gauge Port

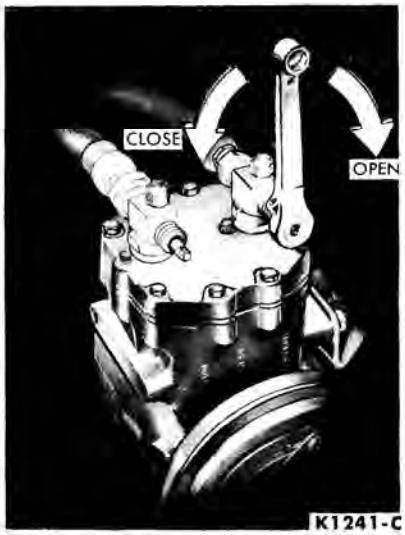


FIG. 6—High Pressure Service Valve Gauge Port

2 DIAGNOSIS AND TESTING

AIR CONDITIONING—DIAGNOSIS GUIDE

INSUFFICIENT OR NO COOLING	**1.** Inoperative magnetic clutch. **2.** Inoperative blower, motor, or switch. **3.** Obstructed air passages. **4.** Complete loss of charge (No foam in sight glass at system start-up). **5.** Partial loss of charge (Continuous foam in sight glass after start-up). **6.** Service valves improperly set (should be maximum counterclockwise). **7.** Compressor defective, or loose or broken compressor belt. **8.** A/C thermostat defective. **9.** Clutch lead disconnected or broken. **10.** Expansion valve inoperative –stays open or closed. **11.** Plugs left in compressor under service valve (both gauges indicate the same pressure). **12.** Moisture in system.
NOISY COMPRESSOR	**1.** Loose, torn or misaligned belt. **2.** Loose or slipping clutch. **3.** Foreign material or damaged parts in compressor. **4.** Compressor loose on bracket.
COMPRESSOR VIBRATION	**1.** Broken or loose mounting bracket. **2.** Loose clutch. **3.** Loose belt.

TESTING

Obstructed air passages, broken belts, disconnected or broken wires, loose clutch, loose or broken mounting brackets may be determined by visual inspection of the parts.

CHECKING FOR LEAKS

Attach the manifold gauge set (Fig. 7). Leave both manifold gauge

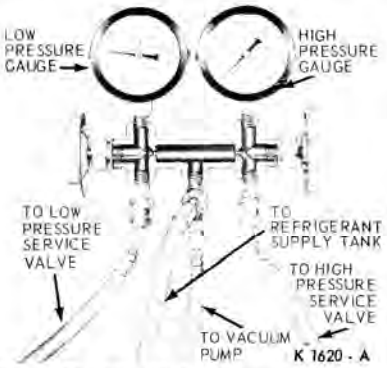


FIG. 7—Manifold Gauge Set

valves at the maximum clockwise position. Set both service valves at the center position. Both gauges should now show approximately 60 to 80 pounds pressure at 75°F. If very little or no pressure is indicated, leave the vacuum pump valve closed, open the Refrigerant-12 tank valve, and set the low pressure manifold gauge valve to the counterclockwise position. This opens the system to tank pressure. Check all connections, and the compressor shaft seal for leaks, using a flame type leak detector (Fig. 8). Follow the directions with the leak detector. The smaller the flame the more sensitive it is to leaks. Therefore, to insure accurate leak indication keep the flame as small as possible. The copper element must be red hot. If it is burned away, replace the element. Hold the open end of the hose at each suspected leak point for two or three seconds (Fig. 9). The flame will normally be almost colorless. The slightest leak will be indicated by a bright color to the flame. Be sure to check the manifold gauge set and hoses for leaks as well as the rest of the system.

If the surrounding air is contaminated with refrigerant gas the leak detector will indicate this gas all the time. Good ventilation is necessary to prevent this situation. A fan, even in a well ventilated area, is very helpful in removing small traces of refrigerant vapor.

USE OF SIGHT GLASS

When observing the sight glass for foam, run the engine at 1500 rpm with the thermostatic switch control lever set for maximum cooling, and the blower on high. Foam in the sight glass indicates an undercharge of refrigerant. Check the system for leaks, repair if necessary and charge the system with the proper amount of Refrigerant-12.

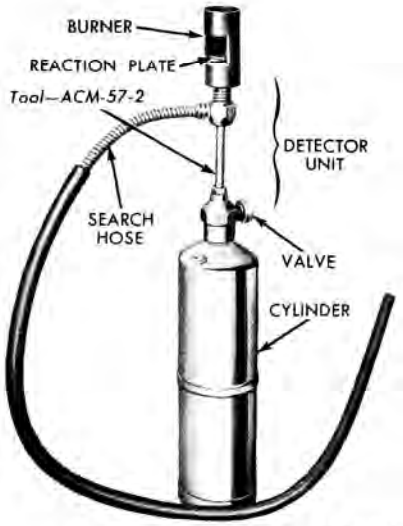


FIG. 8—Flame Type Leak Detector



FIG. 9—Checking for Leaks

No foam in the sight glass will indicate either a full charge or a complete loss of refrigerant. Clean the sight glass. If the system is fully charged, the sight glass will be perfectly clear. If the system is completely empty of refrigerant, the sight glass will look oily and will not be as clear as when refrigerant is flowing through it.

When the compressor is not operating and when the system is completely charged, an occasional large bubble of Refrigerant-12 vapor will normally be seen in the sight glass.

Under conditions of extremely high temperatures occasional foam or bubbles may appear.

CHECKING SYSTEM PRESSURES

The pressures developed on the high pressure and low pressure side of the compressor indicate whether the system is operating properly.

Attach the manifold gauge set (Fig. 7). It will not be necessary to attach the Refrigerant-12 tank unless refrigerant is to be added to the system. Set both manifold gauge valves at the maximum clockwise or closed position. Set both service valves at the center position.

Check the system pressures with the engine running at 1500 rpm, all controls set for maximum cooling, and the front of the car at least five feet from any wall.

The actual pressures indicated on the gauge will depend on the temperature of the surrounding air and the humidity. High air temperatures along with low humidity, will give higher system pressures. The lowest figures given are for an ambient (surrounding air) temperature of 75°F., 50% relative humidity.

The low pressure gauge should indicate a pressure of from 12-50 pounds. The high pressure gauge should indicate a pressure of six or seven times the low pressure or 80-300 pounds.

At idle speed and a surrounding air temperature of 100°-110°F., the high pressure may go as high as 300 pounds or more. If it becomes necessary to operate the air conditioner under these conditions, keep the high pressure down with a fan directed at the condenser and radiator.

INTERPRETING ABNORMAL SYSTEM PRESSURES

Low Pressure Below Normal, High Pressure Normal. These pressures indicate a restriction between the receiver and the expansion valve or between the expansion valve and the low pressure service valve. If the low pressure is actually a vacuum, the expansion valve is probably closed tightly. Shut the system down and allow it to warm to room temperature. Start the engine and if the evaporator will now become cool, the expansion valve was frozen because of moisture in the system. Release the refrigerant, replace the dryer-receiver assembly, check for leaks, then evacuate and charge the system.

Whenever the system has been opened three times the receiver dryer should be replaced as a precaution against internal icing of the expansion valve.

Check the system between the receiver outlet and the low pressure service valve for restrictions, by feeling all of the connections and components. Any portion that is cold to the touch or that frosts up, with the pressures as indicated here, is restricting the refrigerant flow.

Low Pressure Above Normal, High Pressure Normal. Observe both pressure gauges. If the low pressure is above normal (12-50 pounds) and the high pressure is at or near normal (80-300 pounds), the expansion valve is not operating properly. This condition may cause the compressor to receive slugs of liquid and thus to be very noisy. Also, the suction side of the compressor and the crankcase and head will be colder than normal and will frost up.

The expansion valve will allow too much liquid refrigerant to flow to the compressor if it is defective or, if the temperature sensing element is not making close contact with the evaporator outlet pipe. Make sure that the element is securely clamped to the outlet pipe, and properly covered.

High Pressure Below Normal, Low Pressure Above Normal. If the two pressures are equal or within 30 pounds of each other, the compressor may be defective. Perform a compressor volumetric efficiency test. Repair or replace the compressor as needed.

High Pressure Above Normal. High compressor head pressures are caused by an overcharge of refrigerant, condenser air passages clogged, a restriction between the condenser inlet and the receiver, or high surrounding air temperatures. High head pressures are generally evidenced by a noisy compressor.

Discharge excess refrigerant until foam is seen in the sight glass (system operating at 1500 engine rpm), then add ½ pound of refrigerant.

THERMOSTATIC SWITCH TEST

The switch must be removed for this test. Move the switch arm to the coldest temperature setting by holding the arm against the stop nearest to the vacuum actuator. At room temperature the switch should be closed. Use a self powered test light or an ohmmeter connected to the switch leads to check whether or not the switch is closed. Release the switch arm. The switch should be open.

MAGNETIC CLUTCH

Disconnect the magnetic clutch wire at the bullet connector, and connect it to the negative lead of an ammeter. Connect the positive lead of the ammeter to the battery positive terminal. The magnetic clutch should pull in with a distinct click and the current reading on the ammeter should be to specification.

BLOWER MOTOR

Disconnect the blower motor wire at the bullet connector, and connect it to the negative lead of an ammeter. Connect the positive lead of the ammeter to the battery positive terminal. The motor should operate and the reading on the ammeter should be to specification.

EXPANSION VALVE

Remove the expansion valve from the evaporator. Connect the Refrigerant-12 supply hose to the expansion valve inlet with a suitable adapter. Open the refrigerant supply valve slightly. Refrigerant gas should come out of the expansion valve outlet. If no gas comes out of the outlet, the temperature sensing element has lost its charge and the expansion valve must be replaced.

COMPRESSOR VOLUMETRIC EFFICIENCY TEST

Malfunction of the compressor can be isolated by checking the compressor volumetric efficiency with a special tool. Make the test with the car in a clean dry atmosphere.

Run the engine at 1500 rpm with all controls at maximum cooling for at least 10 minutes. Adjust the engine idle with a tachometer to exactly 515 rpm with the compressor clutch engaged. Turn the engine off and set the cooling control to the OFF position. Isolate the compressor, then remove both high and low pressure service valve gauge port caps, allowing the gas in the compressor to escape.

Attach the special tool (calibrated orifice with gauge attached) to the high pressure service valve gauge port (Fig. 10). Start the engine. Engage the magnetic clutch for 15 second intervals, by moving the cooling control from the OFF position to the maximum cooling position, and observe the maximum gauge pressure at the end of each 15 second interval. **Be sure to allow the gauge pressure to drop to zero between the 15 second intervals.** Stop the engine.

A good compressor will bring the pressure to 200 psi in 15 seconds. If the pressure does not come up to 200 psi, in 15 seconds, clean the compressor intake screen. If the intake screen is clean, remove and inspect the valve plate. Most of the

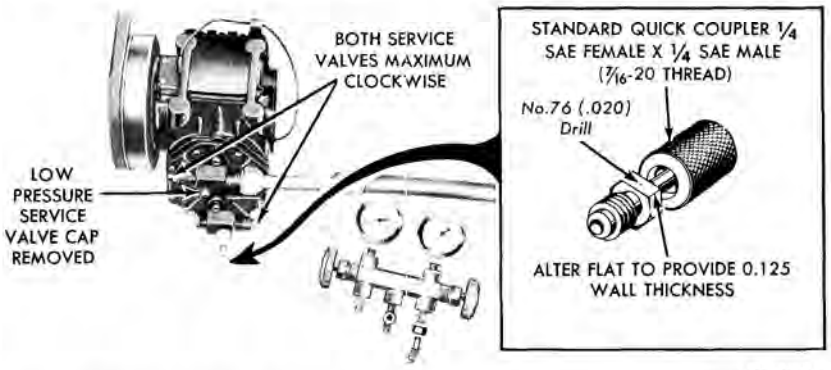


FIG. 10—Voltmetric Efficiency Test

failures to come up to the 200 psi specification will be caused by small foreign particles under the valve plate leaves or a defective valve plate. Clean the valve plate and assemble it to the compressor using new gaskets. If this does not effect a cure, replace the valve plate or the compressor as required.

If no further work is to be done on the system after making the volumetric efficiency test, disconnect the orifice tool and gauge, evacuate the compressor and connect it back into the system.

3 COMMON ADJUSTMENTS AND REPAIRS

SAFETY PRECAUTIONS

The refrigerant used in the air conditioner system is Refrigerant-12. Refrigerant-12 is nonexplosive, noninflammable, noncorrosive, has practically no odor, and is heavier than air. Although it is classified as a safe refrigerant, certain precautions must be observed to protect the parts involved and the person who is working on the unit. **Use only Refrigerant-12.**

Liquid Refrigerant-12, at normal atmospheric pressure and temperatures, evaporates so quickly that it tends to freeze anything that it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from coming in contact with the skin and especially the eyes.

Refrigerant-12 is readily absorbed by most types of oil. It is therefore recommended that a bottle of sterile mineral oil and a quantity of weak boric acid solution be kept nearby when servicing the air conditioning system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out, then wash the eyes clean with the weak boric acid solution. Seek a doctor's aid immediately even though irritation may have ceased.

Always wear safety goggles when servicing any part of the refrigerating system.

The Refrigerant-12 in the system is always under pressure. Because the system is tightly sealed, heat applied to any part would cause this pressure to build up excessively.

To avoid a dangerous explosion, never weld, use a blow torch, solder, steam clean, bake body finishes, or use any excessive amount of heat on, or in the immediate area of, any part of the air cooling system or refrigerant supply tank, while they are closed to the atmosphere whether filled with refrigerant or not.

The liquid refrigerant evaporates so rapidly that the resulting refrigerant gas will displace the air surrounding the area where the refrigerant is released. To prevent possible suffocation in enclosed areas, always discharge the refrigerant from an air cooling system into the garage exhaust collector. Always maintain good ventilation surrounding the work area. **If the car is to be undercoated, make certain that the undercoating does not plug the evaporator drain tubes.**

Although Refrigerant-12 gas, under normal conditions, is non-poisonous, the discharge of refrigerant gas near an open flame can produce a very poisonous gas. This gas will also attack all bright metal surfaces. This poisonous gas is generated in small quantities when the flame-type leak detector is used. Avoid inhaling the fumes from the leak detector. **Make certain that Refrigerant-12 is both stored and installed in accordance with all state and local ordinances.**

When admitting Refrigerant-12 gas into the cooling unit, always keep the tank in an upright position. If the tank is on its side or upside down, liquid Refrigerant-12 will enter the system and damage the compressor. **In surrounding air temperatures above 90°F., prolonged engine idle will result in excessively high compressor pressures.**

DISCHARGING THE SYSTEM

Discharge the refrigerant from the system before replacing any part of the system, except the compressor.

To discharge the system, connect the manifold gauge set to the system (Fig. 11). Do not connect the manifold center connection hoses to the Refrigerant-12 tank, or vacuum pump. Place the open end of these hoses in a garage exhaust outlet. Set the high pressure manifold gauge valve at the maximum counterclockwise or open position. Open the high pressure service valve a slight amount (Fig. 6), and allow the re-

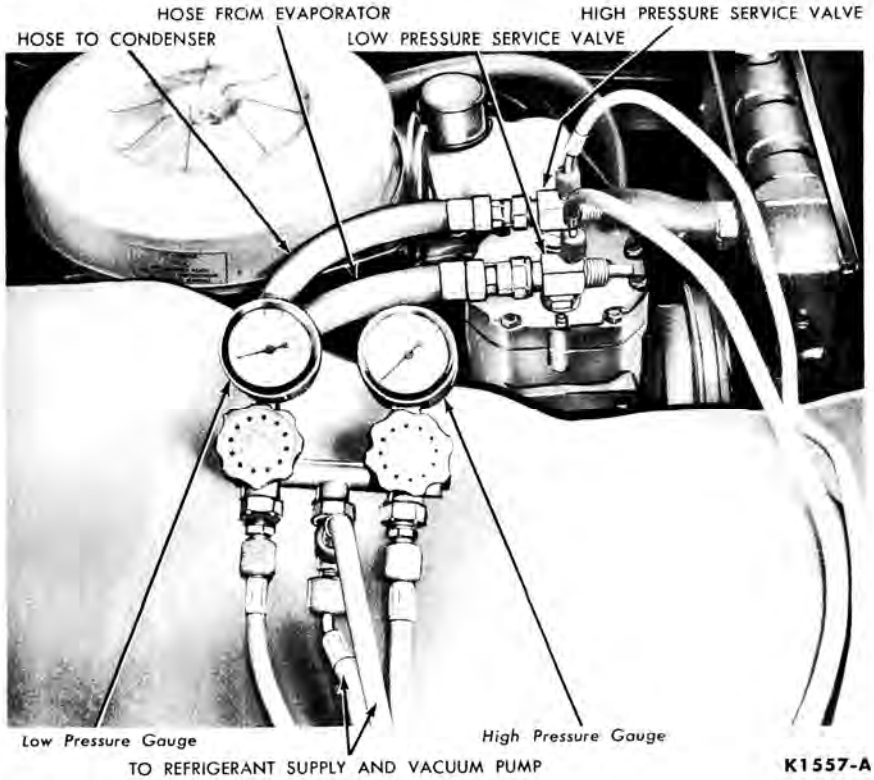


FIG. 11—Charging the Air Conditioning System

frigerant to discharge slowly from the system.

Do not allow the refrigerant to rush out, as the oil in the compressor will be forced out along with it.

EVACUATING THE SYSTEM

Attach the manifold gauge set, a tank of Refrigerant-12 and a vacuum pump to the system (Fig. 11). Make certain that the Refrigerant-12 tank valve is tightly closed. Set both service valves to the mid-position. Open both manifold valves. Release any pressure in the system. Open the vacuum pump valve and run the pump until the low pressure gauge reads at least 25 inches, and as close to 30 inches of vacuum as possible. Continue vacuum pump operation for 20 to 30 minutes to boil any moisture out of the system. Close the pump valve. Turn off the pump.

MAKING A PARTIAL CHARGE

Attach the manifold gauge set (Fig. 11). Open both manifold valves. Close the vacuum pump valve. Open the Refrigerant-12 tank valve. Purge the air from the high pressure hose by loosening the high pressure hose at the service valve, for a few seconds. Tighten the connection and set the high pressure manifold gauge valve at the maximum clockwise position. Loosen the low pressure gauge hose slightly at the low pressure service valve, for a few seconds, to purge the air from the hose. Tighten the connection. Set both service valves at the center position (Fig. 11).

Run the engine at 1500 rpm with all controls at the maximum cold position. Charge the system until all foam disappears from the sight glass, and then add ¼ pound of Refrigerant-12. Shut the Refrigerant-12 tank valve.

It may be necessary to place the Refrigerant-12 tank in a container of hot water at about 150°F. to force the gas from the tank during charging.

Never heat the Refrigerant-12 tank with a torch. A dangerous explosion may result.

Set both service valves at the maximum counterclockwise position. Remove the gauge set, and cap the service valve gauge ports and valve stems.

MAKING A COMPLETE CHARGE

Check for leaks first, release the pressure, then evacuate the system. Leave both service valves at the mid-position and the vacuum pump valve closed. Leave the low pressure manifold gauge valve at the maximum counterclockwise or open position. Set the high pressure manifold gauge valve at the maximum clockwise or closed position. Set all controls to the maximum cold position.

Open the Refrigerant-12 tank valve. Run the engine at 1500 rpm. Charge the system until the sight glass is clear of foam, then add an additional ¼ pound of refrigerant.

During the charging, the high pressure may build up to an excessive value. This can be caused by an overcharge of refrigerant, or an overheated engine, in combination with high surrounding temperatures. Never allow the high pressure to exceed 240 pounds while charging. Stop the engine, determine the cause, and correct it.

After the proper charge has been made, close the Refrigerant-12 tank valve, and check the system pressures for proper operation. Set both service valves at the maximum counterclockwise position. Remove the gauge set, and cap the service valve gauge ports and valve stems.

CHARGING FROM SMALL CONTAINERS

Refrigerant-12 is available in one-pound cans. A scale is not necessary if these small containers are used instead of a tank.

Attach the hose, that would normally attach to the large tank (Fig. 11), to the special valve that is provided for the small cans. Close the valve (maximum clockwise position) and follow the procedure for leak testing, evacuating and charging the system as previously given.

For charging, attach a one-pound can of Refrigerant-12 to the special valve, and open the valve. Keep the can in an upright position. When the can is empty (no frost showing), close the valve, remove the empty can, attach a new one, and open the valve again.

Charge the system until the sight glass clears of foam then add an additional ¼ pound of refrigerant. Estimate the ¼ pound weight by observing the frost line on the one-pound can.

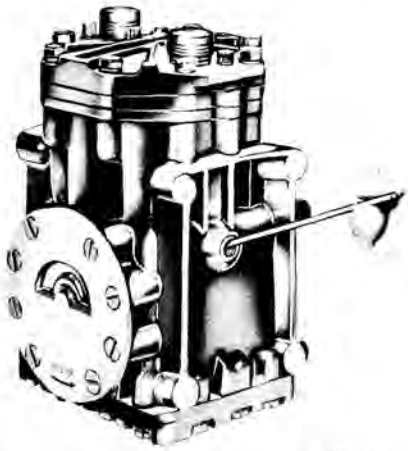
Check the system pressures, set both service valves at the maximum counterclockwise position. **Remove the gauge set, and cap the service valve gauge ports and valve stems.**

COMPRESSOR OIL LEVEL CHECK

Under normal conditions when the air cooling system is operating satisfactorily the compressor oil level need not be checked. There is no place for the oil to go except inside the sealed system. When the car is first started some of the oil will be pumped into the rest of the system. After 15 minutes of operation, most of the oil is returned to the compressor crankcase.

Check the compressor oil level only if a portion of the refrigerant system is being replaced or if there was a leak in the system and the refrigerant is being replaced.

Check the oil after the system has been charged and has been operating at an engine speed of 1500 rpm for 15 minutes in 60°F. surrounding air temperature or above. Turn off the engine, and isolate the compressor. Remove the oil filler plug from the compressor, insert a flattened ⅛-inch diameter rod (Fig. 12), in the oil



K1544-A

FIG. 12—Oil Level Check

filler hole until it bottoms. The rod should show ⅞ inch of oil on Tecumseh compressors and ¾ inch of oil on York compressors. This is equivalent to 11 ounces on Tecumseh and 10 ounces on York. It may be necessary to rotate the compressor crankshaft slightly (by hand) so that the dip rod will clear the crankshaft. If additional oil is needed in the compressor, add Suniso 5 or Capella E refrigerator compressor oil, or equivalent.

If more than ⅞ inch of oil is indicated, as might happen if a new compressor is installed and oil already in the system is pumped back

to the compressor, draw out the excess oil until the proper quantity is indicated.

Replace the oil filler plug, then evacuate and connect the compressor back into the system. Be sure to check the compressor filler opening for leaks.

ISOLATING THE COMPRESSOR

This procedure is used when checking the compressor oil level and when it is desired to replace the compressor without losing the refrigerant charge.

To isolate the compressor from the system, turn both the high and the low pressure service valves to the extreme clockwise position. Loosen the cap on the high pressure service valve gauge port, and allow the gas to escape until the compressor is relieved of refrigerant pressure.

Loosen the cap a small amount only, and do not remove it until the pressure is completely relieved.

To connect the compressor back into the system, evacuate the compressor at the high pressure service valve gauge port, close the vacuum pump valve, turn both service valves to the maximum counterclockwise position, and cap the high pressure service valve gauge port and service valve stems.

4 REMOVAL AND INSTALLATION

EVAPORATOR

REMOVAL

1. Discharge the refrigerant from the system.

2. Disconnect the two wires from the unit, demount the evaporator assembly, and set the unit on the car floor.

3. Disconnect the refrigerant hoses. On some models it may be necessary to remove the assembly from the car before going further.

4. Remove the front panel, covers and the expansion valve from the unit. (See Expansion Valve Removal and Installation.)

5. Remove the thermostatic switch temperature sensing tube from between the evaporator fins, remove the evaporator-to-base mounting screws and remove the evaporator from the base.

INSTALLATION

1. Attach the old expansion valve to the new evaporator and leak test the connection by capping the outlet of the evaporator and using a suitable reducing connector from the valve inlet to a rank of Refrigerant-12.

2. Position the evaporator on the base and install the two evaporator-to-base mounting screws.

3. Push the thermostatic switch sensing tube into the same relative position at about the center of the evaporator, but if the same core is being used position the sensing tube between the next two fins for good temperature conduction. Install the covers and front panel.

4. Attach the refrigerant lines and leak test the connections.

5. Mount the assembly, connect the two wires, leak test, evacuate and charge the system.

CONDENSER

1. Discharge the refrigerant from the system.

2. Remove the front grille to radiator support bracket, and the hood latch.

3. Disconnect the refrigerant lines from the condenser and receiver. Remove the condenser mounting screws and remove the condenser receiver assembly. On the Mustang a special arrangement is used where the radiator retaining studs are part of the condenser.

4. Position and mount the new condenser, remove the protective plugs, attach the refrigerant lines and install the grille to radiator support bracket and hood latch.

5. Check for leaks, evacuate and charge the system.

COMPRESSOR

REMOVAL

1. Isolate the compressor (see Common Adjustments and Repairs in this part). Disconnect the two service valves and hoses from the compressor (Fig. 13). Energize the clutch and loosen and remove the clutch mounting bolt.

2. Install a 5/8-11 bolt in the clutch drive shaft hole. With the clutch still energized, tighten the bolt to loosen the clutch from the shaft. Disconnect the clutch wire at the bullet connector.

3. Loosen the belt, remove the belt and the clutch, and then remove the mounting bolts and the compressor.

4. With the compressor on the work bench, remove the key from the shaft.

INSTALLATION

Before installing the compressor, see Cleaning and Inspection in this part.

1. Mount the clutch on the shaft and install the mounting screw and washer finger-tight. Place the compressor on the mounting bracket and install the four mounting bolts.

2. Connect the clutch wire, energize the clutch and torque the clutch mounting bolt to specification. **If the new compressor was shipped with a bolt and washer in the end of the crankshaft, remove and discard the bolt and use a bolt with a nylon insert in it.** Install and adjust the drive belt.

3. Making sure that the protective rubber plugs have been removed install the service valves on the compressor using new gaskets. Tighten the service valve flared nuts to specification. **Do not over-tighten the flared nuts.** The ROTO-LOK service valves can be rotated slightly on their seat without breaking the high pressure seal. This is not an indication of a loose valve. Leak test the compressor, then evacuate it and connect it back into the system.

4. Check the oil level in the compressor and add or remove oil if necessary.

COMPRESSOR COMPONENTS

All compressor removal and installation operations, except belt replace-

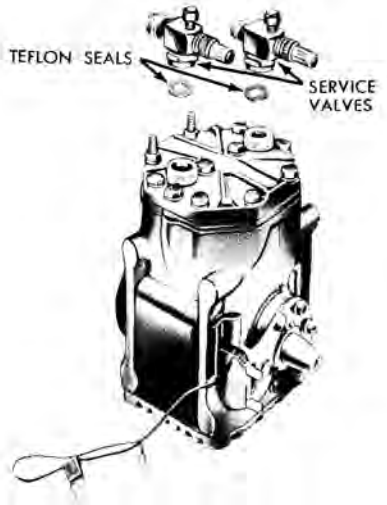


FIG. 13—Compressor—Service Valves Removed

ment, can be performed only after the unit has been isolated from the rest of the system. (See Common Adjustments and Repairs in this part.)

VALVE PLATE

Removal

1. Isolate the compressor and disconnect the service valves. Remove the 12 head bolts.
2. Remove the cylinder head and valve plate from the top of the compressor body (Fig. 14). Do not tap or hit the head with any hard tool, as damage could result (York compressors are made of aluminum.)
3. Remove and discard all gaskets, and be sure to clean gasket shreds from all gasket surfaces. Examine the cylinders and top of the pistons, particularly in case of valve breakage. If there are score marks, replace the compressor assembly.
4. If the cylinders and pistons are in good condition, check the valve plate and valve reeds for damage. If the valve assembly is in good condition, it can be used again. If the valve plate is damaged, install the entire replacement kit which includes the valve plate, valve reeds, and the two gaskets (Fig. 14).
5. When the valve plate assembly is re-used, wash it in clean solvent and dry in dry air. Check the oil for dirt. If the system is not clean, replace the oil.

Installation

1. Starting with the valve plate gasket, assemble the parts in the order shown in Fig. 14. Insert the cylinder head bolts carefully to avoid damaging the gaskets. Before assembly apply a film of new refrigeration oil to both sides of both gaskets.
2. Tighten all bolts finger-tight, then torque the bolts ¼ turn at a time to specification. Then tighten the remaining bolts in a sequence so those diagonally opposite are evenly drawn to the required torque.
3. Connect the compressor into the system. Check the oil level in the compressor, and add or remove oil if necessary. (See Cleaning and Inspection.)

CRANKSHAFT SEAL

REMOVAL

1. Isolate the compressor, loosen and remove the belt.
2. Remove the clutch and remove the Woodruff key (on some six cylinder engine installations it will be necessary to loosen the compressor mounting bolts and slide the compressor back slightly).
3. Carefully remove all accumulated dirt and foreign material from the seal plate and surrounding area of the compressor, and position a small drain pan beneath the seal plate.
4. Remove the seal plate bolts, and remove the plate and gasket. Do not mar the sealing surfaces, or the polished shaft surface.
5. Remove the carbon seal ring and seal housing assembly from the crankshaft. A disassembled view of the crankshaft seal assembly is included in Fig. 14.
6. Clean all old gasket material from the seal plate and the compressor. Make certain that the shaft, the seal plate and the compressor gasket surfaces are completely clean before installing the new seal.

INSTALLATION

1. Lubricate the new shaft seal parts in clean compressor oil, and position the seal assembly on the crankshaft, with the carbon ring toward the seal plate.
2. Position the new gasket on the compressor, center the crankshaft in the seal plate and install the seal plate.
3. Torque the bolts to specification.
4. Make certain that there are no burrs or dirt on the compressor shaft. Then install the key, and the clutch.
5. If the compressor was moved, reposition it and tighten the mounting bolts, then install the belt and adjust the tension.
6. Check the oil level (see Common Adjustments and Repairs).

EXPANSION VALVE

REMOVAL

1. Discharge the refrigerant from the system. Disconnect the two wires from the unit, demount the evaporator assembly, and set the unit on the car floor. Disconnect the refrigerant hoses. On some models, it may be necessary to remove the assembly from the car before going further.
2. Remove the expansion valve protection shield.
3. Carefully slit the insulation cov-

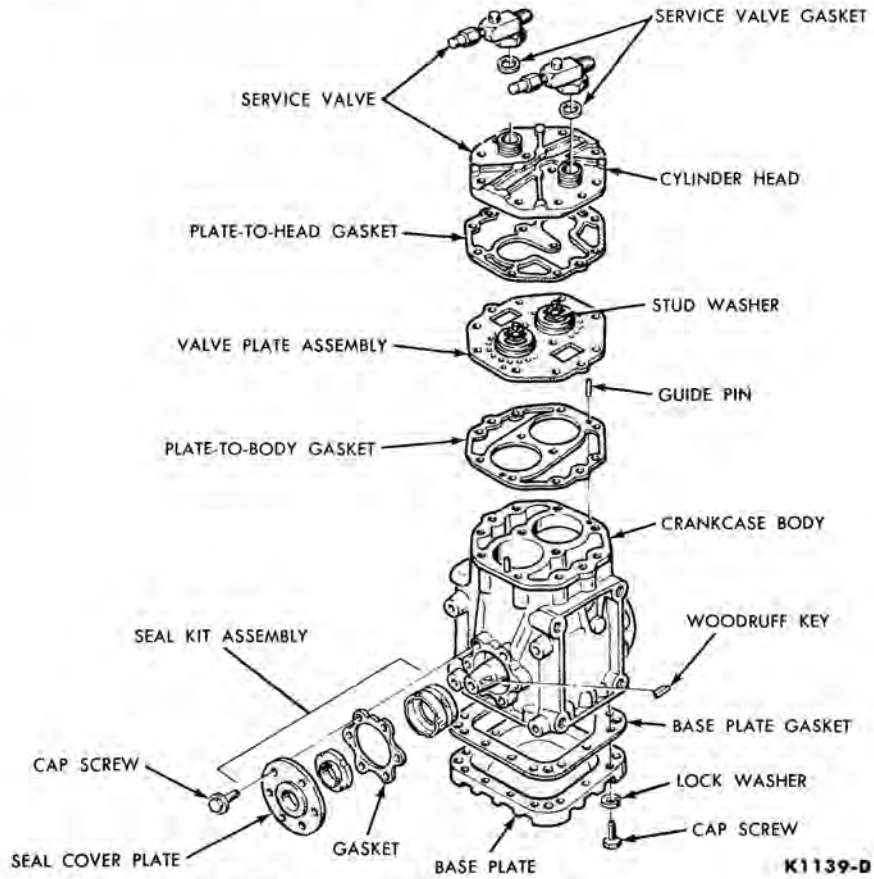


FIG. 14—York Cylinder Head and Valve Assembly

ering the temperature bulb and remove the temperature bulb clamp. Then disconnect the valve from the inlet pipe and remove the valve.

INSTALLATION

1. Connect the new valve to the inlet pipe, and leak test the connection by capping the outlet end of the evaporator and using a suitable reducing connector from the valve inlet to a tank of Refrigerant-12. Position the temperature bulb to the outlet pipe, and install the bulb clamp. Be sure that the bulb, pipe, and clamp are clean and that the clamp is tight. Go over these parts with fine sandpaper to assure this.
2. Wrap the insulating material around the temperature bulb, pipe, and valve, and position the rubber seal over the pipe connections.
3. Install the expansion valve protection shield.
4. Connect the refrigerant hoses and leak test the connections.
5. Mount the assembly, connect the wires, leak test, evacuate and charge the system.

THERMOSTATIC SWITCH

The thermostatic switch is mounted to the air conditioner front register. Remove the three register to evaporator case screws. Pull the register from the case and pull the sensing tube from the evaporator fins. Remove the wires and the knob from the switch and remove the switch.

AIR CONDITIONER BLOWER MOTOR

REMOVAL

1. Disconnect the battery ground cable.
2. Remove one screw and the shield from the right hand lower side of the evaporator case.
3. Remove the cover plate mounting screw and the cover plate at the left hand side of the evaporator case.
4. Remove the mounting screws from the register panel, and remove the panel from the evaporator case. **Care should be taken not to damage the temperature sensing tube when drawing it from between the fins of the evaporator.**
5. Remove the bolts which retain the evaporator case to the lower instrument panel, and lower the evaporator to the floor.
6. Remove the mounting bracket from each side of the evaporator, and remove the ground wire from the left hand side.
7. Remove the clips which connect the upper and lower halves of the evaporator case, and lift off the upper half of the case.
8. Disconnect the blower wire at the connector.
9. Remove the blower retaining screws and remove the blower motor assembly from the evaporator case. (It will be necessary to lift the evaporator core slightly to allow removal of the blower motor wire.)
10. Remove the blower cages, mounting bracket, and the insulator pad.

INSTALLATION

1. Install the blower cages, mounting bracket and insulator pad.
2. Lift the evaporator core slightly to allow positioning of the blower motor wire, and position the blower in the evaporator case.
3. Connect the blower wire at the connector.
4. Position the two halves of the evaporator case, and install the connecting clips.
5. Install the mounting bracket to each side of the evaporator, and install the ground wire on the left hand side.
6. Position the evaporator to the lower instrument panel and install the mounting bolts.
7. Position the register panel near the evaporator and insert the sensing tube between the fins of the evaporator. **For best results the sensing tube should be inserted in between the next two fins from where it was originally withdrawn. This assures a more positive contact and more exact transfer of temperature changes.** Install the mounting screws.
8. Position the cover plate to the left hand side of the evaporator case and install the mounting screw.
9. Position the shield to the lower right hand side of the evaporator case and install the retaining screw.
10. Connect the battery ground cable.

It may be necessary in the case of console equipped cars to remove the evaporator assembly from the car in order to remove the blower motor.

BELT

8-CYLINDER

1. Loosen the idler pulley, then remove the belt.
2. Place the new belt in position, and slide the compressor toward the outside of the car and carefully align the belt. Then tighten the four mounting bolts.
3. Adjust the belt tension to specification, using the idler pulley.

6-CYLINDER

1. Loosen the alternator mounting and adjusting screws, and swing the alternator toward the center of the car until the old belt can be removed.
2. Install the new belt and adjust to specification.
3. Tighten the alternator mounting and adjusting screws. Some engines have a means of adjusting the belt with a vertical lock screw.

CLUTCH

1. Loosen the belt.
2. Energize the clutch and loosen and remove the clutch mounting bolt.
3. Install a 5/8-11 bolt in the clutch drive shaft hole. With the clutch still energized, tighten the bolt to loosen the clutch from the shaft, then remove the magnetic clutch. On some installations for clearance it is necessary to loosen the compressor mounting bolts and slide the compressor back slightly.
4. Install the clutch, the clutch mounting bolt, and the washer.
5. Energize the clutch, and torque the bolt to specification.

5 CLEANING AND INSPECTION

COMPRESSOR

On compressor clutch installations, carefully remove any burrs or dirt that may be on the compressor shaft. The shaft must be dry and brightly polished. Then install the key in the shaft.

When the compressor is disassembled, completely clean all surfaces of gasket shreds and foreign objects.

If the compressor shaft seal is being replaced, inspect the compressor internally and clean out dirt or chips as required.

When installing a new control assembly or parts, inspect for dirt and foreign objects.

PART 16-3 RADIO

Section	Page	Section	Page
1 Description and Operation	16-18	3 Common Adjustments and Repairs	16-19
2 Diagnosis and Testing	16-18	4 Removal and Installation	16-20

1 DESCRIPTION AND OPERATION

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

The radios, and the cars for which they are available are as follows:

Car	Manufacturer and Type	Model No.
Comet	Philco AM Bendix AM-FM	5TPE F5TBE
Falcon	Philco AM	5TPD
Fairlane	Bendix AM	5TBO
Mustang	Philco AM Motorola AM	5TPZ 5TMZ

The antenna is mounted on the right fender. A rear seat speaker is available. The radios have push button tuning as well as manual tuning. On all cars except the Comet the push buttons on the AM-FM radio may be divided between AM and FM stations.

On the Comet, a band selector switch is provided for selection of either the AM or the FM broadcast band. The five push buttons can be preset to select five AM stations or five FM stations or any combination thereof, however, the push buttons cannot be used to change from one broadcast band to the other. The band selector switch must first be positioned to the desired band before selecting stations with the push buttons. When selecting stations with the manual tuning control, the band (AM or FM) in use is controlled by the band selector switch. if the band selector switch is set to AM, the manual tuning control (right hand knob) will select AM stations.

2 DIAGNOSIS AND TESTING

RADIO DIAGNOSIS GUIDE

NO RECEPTION	**1.** Burned out fuse. **2.** Defective antenna. **3.** Shorted speaker lead or defective speaker. **4.** Reversed battery polarity. Make certain that voltage is available at the A lead (12 volts), then substitute a known good antenna and speaker. **Be sure to turn off the radio receiver before removing or installing the speaker.** If the radio still will not play, remove the receiver for a major repair.

CONTINUED ON NEXT PAGE

RADIO DIAGNOSIS GUIDE (Continued)

NOISY OR ERRATIC RECEPTION	**NOISY RECEPTION–ENGINE NOT RUNNING** **1.** Loose connections. **NOISY RECEPTION–ENGINE RUNNING** **1.** Defective suppression equipment. **2.** Suppression condensers not properly grounded.	**3.** Receiver not properly grounded to the instrument panel. **NOISY RECEPTION–CAR IN MOTION** **1.** Loose or broken lead-in cable. **2.** Loose or defective radio antenna. **3.** Defective wheel static collector.
DISTORTED OR GARBLED SOUND	**1.** Voice coil rubbing on center pole piece of speaker magnet. **2.** Torn speaker cone. **3.** Foreign material on cone.	**4.** Bent or twisted speaker mounting. **Be sure to turn off the radio receiver before removing or installing the speaker.**
WEAK RECEPTION	**1.** Poor adjustment of the antenna trimmer (AM only). **2.** Beyond normal reception distance from station (FM only).	**3.** Defective antenna. If FM reception is poor, be sure that the antenna is at 30-32 inch height before trying a new antenna.
NO SOUND FROM ONE SPEAKER	**1.** One speaker defective. **2.** Wiring to dead speaker defective.	Operate the fader to determine the speaker at fault.

TESTING

Tests for any of the components in the radio system may be made by substituting known good parts. In the case of an antenna or speaker, it will not be necessary to remove the suspected antenna or speaker. Disconnect the antenna or speaker at the radio and plug in the known good unit. Check the antenna with the car outside of the garage. Plug the antenna lead into the antenna socket in the radio, and extend the antenna wand through the open window of the car.

3 COMMON ADJUSTMENTS AND REPAIRS

PUSH BUTTON ADJUSTMENT

Turn the radio on, and allow it to warm up for 15 minutes. Extend the antenna to a height of approximately 33 inches.

FALCON, FAIRLANE AND MUSTANG

AM Push Buttons. Press in firmly any one of the push buttons which has been pre-set to the AM position. Pull out the push button to be set to unlock the push button mechanism. If the red bar on the push button face is down, pull out the push button approximately $^1/_{10}$ inch further until the button is free to rotate and rotate the button 180° to the bar up position. Carefully tune in the desired AM station with the manual tuning knob. After the station is clearly tuned in push the button straight in until it stops and then release it. Repeat this procedure for the remaining buttons.

FM Push Buttons. Press in firmly any one of the push buttons which has been pre-set to the FM position. Pull out the push button to be set to unlock the push button mechanism. If the red bar on the push button face is up, pull out the push button approximately $^1/_{10}$ inch further until the button is free to rotate and rotate the button 180° to the bar down position. Carefully tune in the desired FM station with the manual tuning knob. After the station is clearly tuned in, push the button straight in until it stops and then release it. Repeat this procedure for the remaining buttons.

COMET

AM Push Buttons. Place the band selector switch to the AM position. Pull out the push button to be set to unlock the push button mechanism. The letters AM must appear at the top of the push button face. If the letters FM appear, pull the push button out approximately $^1/_{10}$ inch further until the push button is free to rotate and rotate the push button 180° to the AM position. Carefully tune in the desired AM station with the manual tuning knob. After the station is clearly tuned in, push the button straight in until it stops and then release it. Repeat this procedure for the remaining buttons.

FM Push Buttons. Place the band selector switch to the FM position. Pull out the push button to be set to unlock the push button mechanism. The letters FM must appear at the top of the push button face. If the letters AM appear, pull the push button out approximately $^1/_{10}$ inch further until the push button is free to rotate and rotate the push button 180° to the FM position). Carefully tune in the desired FM station with the manual tuning knob. After the station is clearly tuned in, push the button straight in until it stops and then release it. Repeat this procedure for the remaining buttons.

4 REMOVAL AND INSTALLATION

RADIO RECEIVER

REMOVAL

To remove the radio receiver, proceed as follows:

1. Pull the radio control knobs off and remove the nuts and washers retaining the radio to the instrument panel.
2. Disconnect the antenna lead at the right side of the radio (at the back of the AM-FM radio).
3. Disconnect the speaker lead.
4. Disconnect the radio lead wire and the pilot light wire from the quick disconnects.
5. Remove the radio support bracket to radio retaining nut.
6. Remove the radio assembly from the instrument panel.

INSTALLATION

1. Position the radio to the instrument panel, and then install the washers and retaining nuts at the knob shafts. Be sure that the radio mounting stud enters the support bracket.
2. Install the radio support bracket retaining nut. Torque all mounting nuts to specification.
3. Connect the antenna lead to the radio.
4. Connect the radio speaker lead.
5. Connect the radio power lead and the pilot light lead.
6. Install the radio control knobs.
7. Check the radio operation.

ANTENNA

1. Disconnect the antenna lead from the side of the radio receiver (at the back of the AM-FM radio). Tie a string to the end of the antenna lead.
2. Remove the antenna mounting nut, remove the spacer from the antenna, and remove the antenna assembly.
3. Tie the string to the new antenna lead.
4. Position the antenna assembly in the opening, put the spacer in position on the antenna and install the antenna retaining nut. Torque to specifications.
5. Pull the antenna lead through the opening and route the lead over the glove box and connect the lead to the radio.

FRONT SPEAKER

1. Disconnect the speaker wires from the radio receiver.
2. Remove the defroster and radio speaker outlet grille from the top of the instrument panel.
3. Remove the speaker retaining screws and lift the speaker from the instrument panel (Fig. 1).
4. Install the speaker to the instrument panel with the retaining screws.
5. Install the radio speaker outlet grille.
6. Connect the speaker wires to the radio, and check the radio operation.

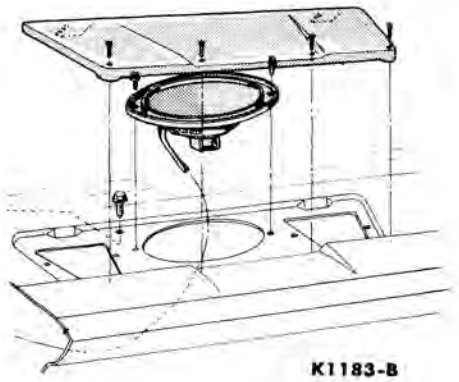


FIG. 1—Radio Speaker Mounting

REAR SPEAKER

The rear seat speaker is accessible for replacement from the luggage compartment. On the station wagon the speaker is mounted on the left rear trim panel. Remove the trim panel to replace the speaker.

INTERFERENCE SUPPRESSION

Interference suppression items are shown in Fig. 2. An alternator condenser, a regulator condenser, and wheel static collectors are used. A constant voltage regulator choke and a hood bonding clip are used on the Comet only. Interference suppression items used on the Fairlane are shown in Fig. 3.

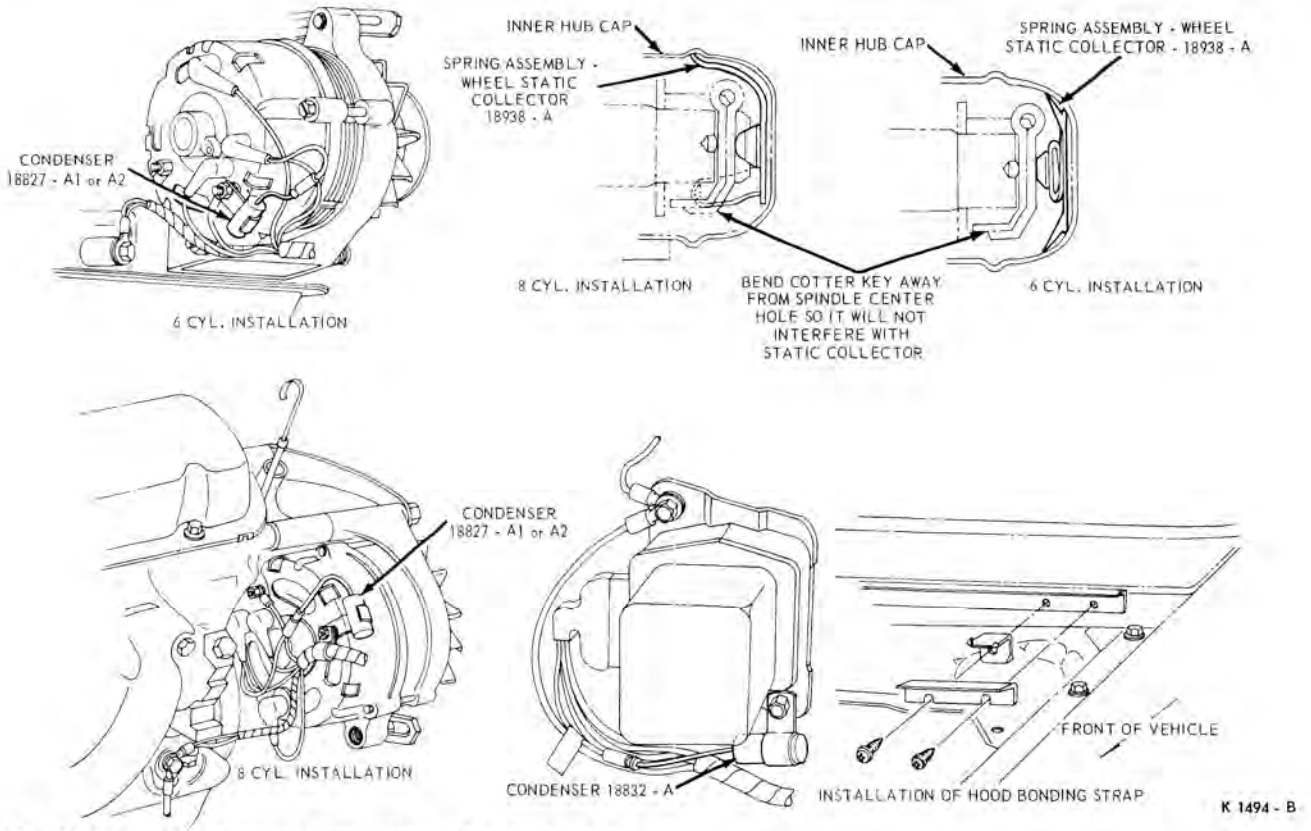


FIG. 2—Radio Interference Suppression—Except Fairlane

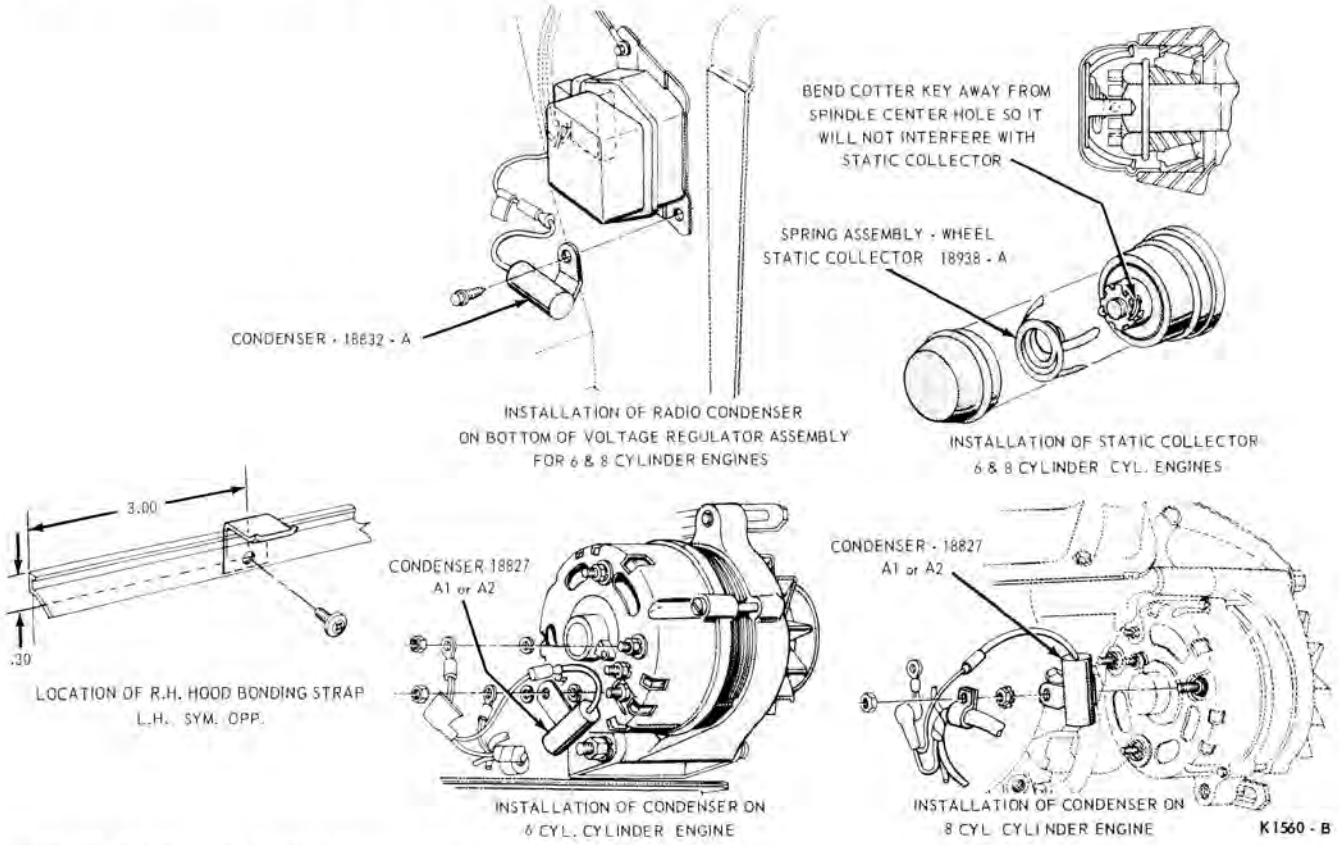


FIG. 3—Fairlane Radio Interference Suppression

PART 16-4 SPECIFICATIONS

Blower Motor Current Draw at 12 Volts	Heater	Air Conditioner
High Speed	6-8 Amps	6.5-7.5 Amps
Medium Speed	4-6 Amps	4.5-5.5 Amps
Low Speed	2-4 Amps	3.0-4.0 Amps
CIRCUIT PROTECTION	SFE 14 Fuse	3AG 15 Fuse
Location	Fuse Panel	In Line

RADIO CURRENT DRAW

1 Amp Max. at 12 Volts

MOUNTING TORQUE TORQUE (IN-LBS)

Radio to Instrument Panel	30
Support Bracket Screw and Nut	30
Antenna Mounting Nut	15

AIR CONDITIONER COMPRESSOR

Location	Torque (ft-lbs.) York
Cylinder Head	14-18
Front Seal Plate	13-17
Service Valves (Rotolock)	35-Max.
Mounting Bolts	14-17
Oil Filler Plug	18-22
Clutch Mounting Bolt	15-22
Base Plate	7-11
Back Plate	7-10
Oil Capacity – ¾ inch (10 ounces) Use Suniso #5, or Capella E	

DRIVEN BELT TENSION

Between Fan Pulley and Air Conditioner Compressor All Engines .....New 120-150 Used* 90-120
*Belt operated for a minimum of 10 minutes is considered a used belt.

BODY, DOORS AND WINDOWS

GROUP 17

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PART 17-1 GENERAL BODY SERVICE

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1 DIAGNOSIS AND TESTING

DUST AND WATER LEAKS

Sealer locations should be considered when checking for dust or water leaks. The forward motion of the car creates a slight vacuum within the body, particularly if a window or ventilator is partially open. Any unsealed small opening in the lower section of the body will permit air to be drawn into the body. If dust is present in the air, it will follow any path taken by the air from the point of entry into the passenger and luggage compartments. Opening the ventilator air ducts will equalize these pressures. Dust accumulates in the rocker panel, and may eventually work its way to the kick-up or the rear body pillar, and follow the contour of the wheelhouse into the luggage compartment.

To eliminate dust leakage, determine the exact point at which the dust enters. The point of entry is often deceptive in that the dust may enter at one point, then follow the passages formed by interior trim to another point.

Under certain conditions, water can enter the body at any point where dust can enter. Any consideration of water leakage must take into account all points covered under dust leaks.

To determine the exact location of a dust leak, remove the following trim from the car:

1. Cowl trim panel.
2. Quarter trim panel.
3. Rear seat back and seat cushion.
4. Luggage compartment floor mats, spare wheel, and side trim panel.
5. Center pillar trim on 4-door models.
6. Scuff plates.

After removing the trim, the location of most leaks will be readily evident. The entrance of dust is usually indicated by a pointed shaft of dust or silt. Seal these leaks, and road test the car on a dusty road to make sure that all leaks are sealed.

After the road tests, check for indications of a dust pattern around the door openings, cowl panel, lower part of the quarter panel, and in the luggage compartment.

Sometimes leaks can be located by putting bright lights under the car, with the above components removed, and checking the interior of the body joints and weld lines. The light will show through where leaks exist.

2 COMMON ADJUSTMENTS AND REPAIRS

TYPES OF SEALER AND APPLICATION

The all-purpose sealers described below have been selected for service use. The method and points of application are given under each sealer type. For illustrations refer to Figs. 1 and 2.

CAULKING CORD AB19560-A

This sealer has a plastic base with an asbestos filler, is heavy bodied, and is commonly known as permagum. It is used on spotweld holes, around moulding clips, or between two surfaces not properly sealed by a gasket. Apply the sealer with a putty knife.

TRIM CEMENT C2AZ-19C525-A

This cement is recommended for instrument panel safety cover and body panel plastic water shield installation. It is also useful for repair or replacement of other vinyl and rubber trim.

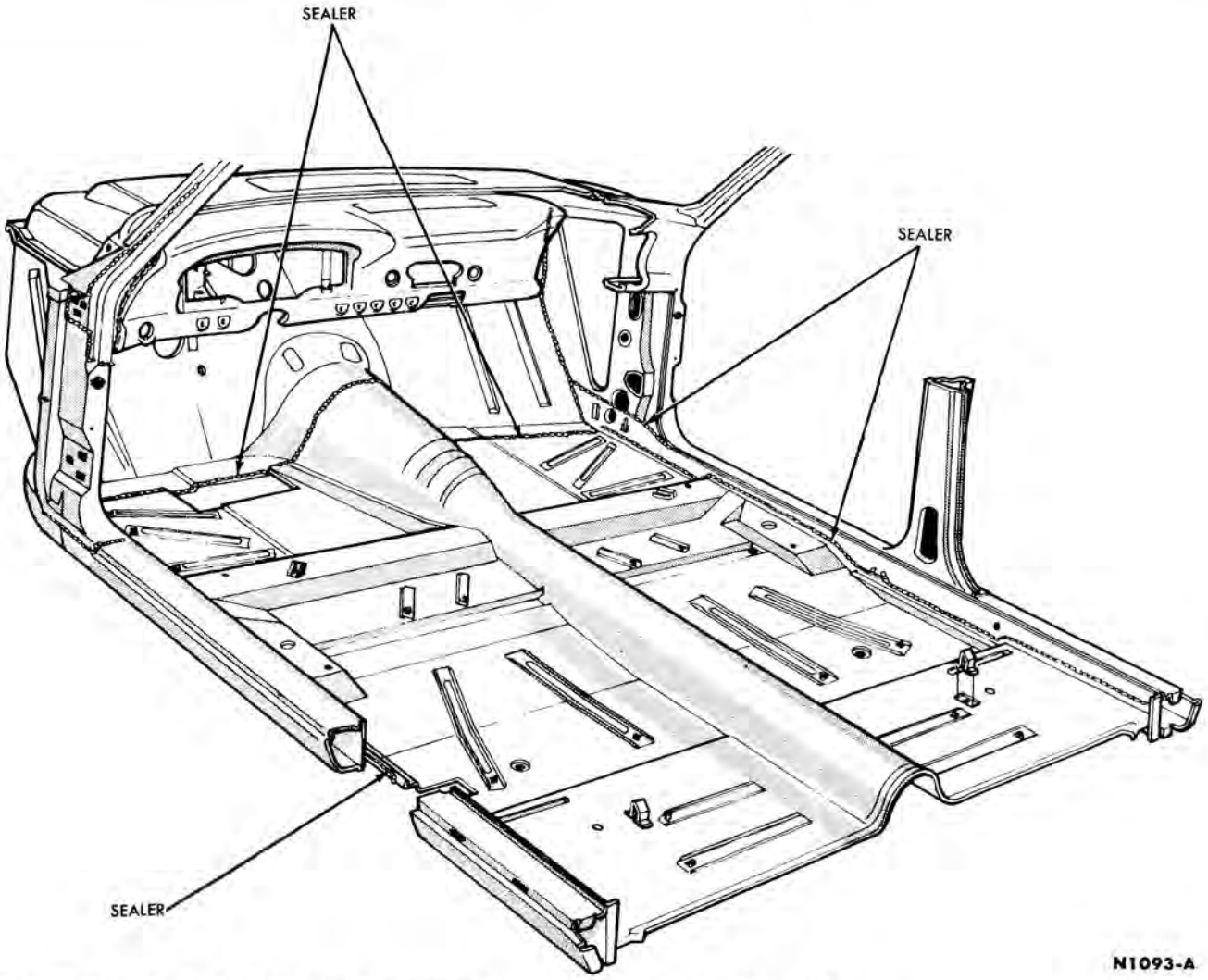


FIG. 1—Front Floor, Cowl, Side and Instrument Panel Sealer Application—Typical

RUBBER CEMENT 8A-19552-B

This quick-drying, strong adhesive material is designed to hold weatherstripping on doors, bodies, deck lids, cowl ventilators, and the surrounding metal. Windows and windshields which are set in rubber can be effectively sealed against leakage by flowing cement into the affected areas.

Clean all grease, dirt, and old sealer from the surfaces to be cemented. For best results, apply a medium coat of cement to both surfaces, allow it to dry until tacky, and press both surfaces firmly together.

SILICON LUBRICANT COAZ-19553-A (JELLY) AND COAZ-19553-C (SPRAY)

This lubricant is to be used on the door window weatherstrips. It is recommended that silicone lubricant be applied to the upper weatherstrips at every regular lubrication period. Its use makes the doors easier to close, avoids weatherstrip squeaks, retards excess weatherstrip wear from chafing between the door glass upper frame and the weatherstrip, and helps to retain door window alignment by reducing friction between the glass frame and rubber weatherstrip.

BODY ALIGNMENT

Servicing the unitized body should present no unusual difficulties or necessitate additional equipment other than that required for the conventional frame and body repair. The application of heat and the use of heavy-duty jacks must be carefully controlled because of the difference in the gauge of the metal in the sub-frame of a unitized body and the stress points developed in a single welded unit construction. It is possible to pull damaged areas back into alignment with the use of light-weight jacks and hydraulic equipment without heating the metal.

Rough out badly damaged areas before taking measurements for squaring up a body. If necessary, remove the glass from the damaged area to prevent damage. In severe cases reinforcement brackets and other inner construction may have to be removed or cut to permit restoration of the outer shell and pillars without excessive strain on the parts. Straighten, install, and secure all such parts in place before attempting to align the body.

In cases of severe or sharp bends, it may be necessary to use heat. Any attempt to cold-straighten a severely bent bracket may cause ruptures of the welds and may also

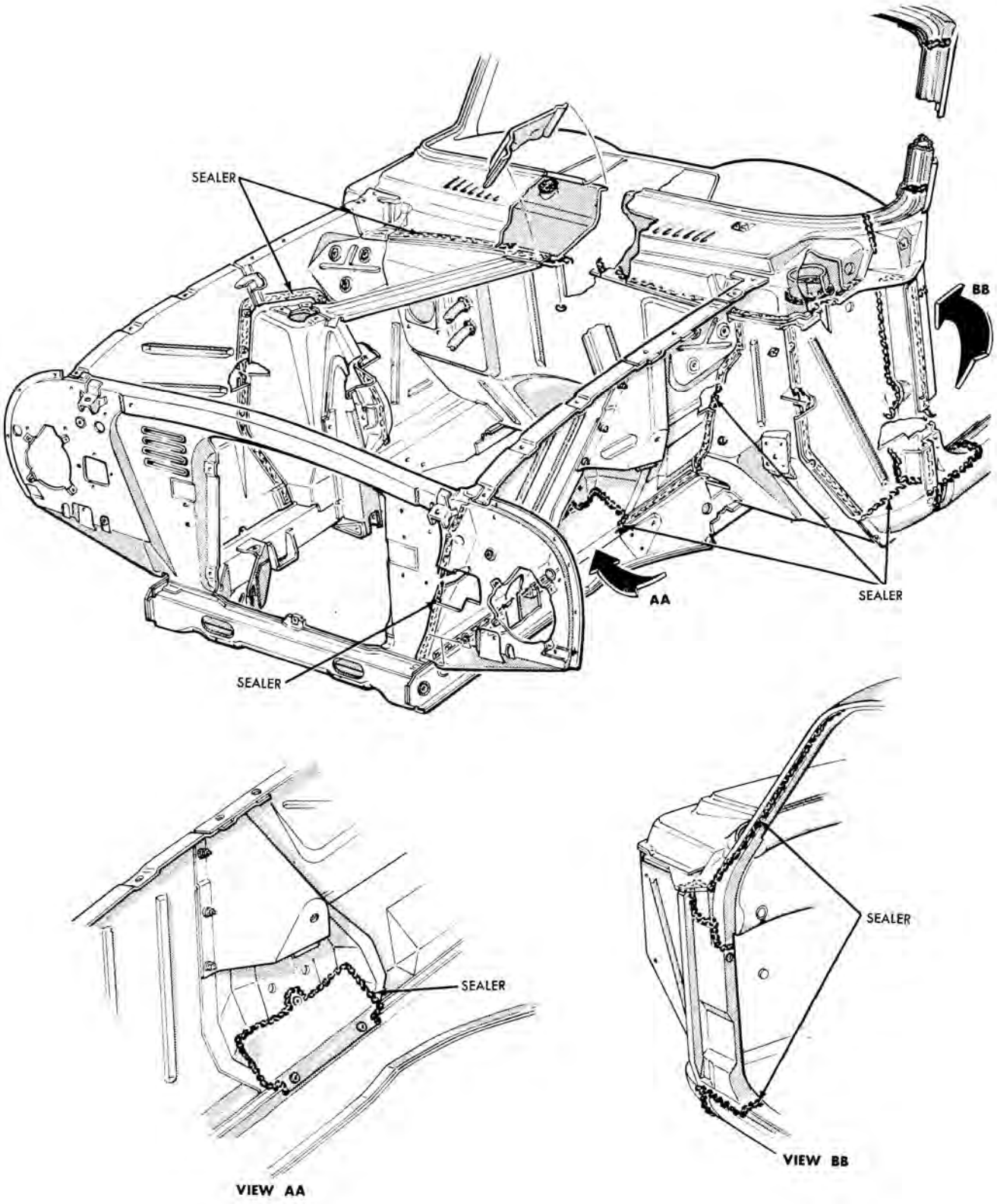


FIG. 2—Radiator, Cowl and Fender Sealer Application—Typical

cause cracks in the bent part. Never heat the area more than a dull red.

CHECKING BODY FOR MISALIGNMENT

To align or square up a body, take two opposite diagonal measurements between pillars. Use a measuring tram for these measurements. Take the measurements between reference points such as crease lines or weld joints which are diagonally opposite each other on the two pillars being measured. Since all measurements should be made from the bare metal, remove all interior trim from the checking points.

In some cases, it is difficult to obtain proper body alignment when repairing a body that is damaged on both sides. In these cases, horizontal and vertical measurements can be taken from a body of the same body style. Once these basic dimensions are taken and established on the damaged body, alignment can be made by diagonal measurements taken from points on the two pillars.

Do not attempt to correct any serious misalignment with one jacking operation. This is particularly true if other sections of the body also require aligning. Align each section proportionately until the proper dimensions are obtained.

Door openings are checked in the same manner as the body. Horizontal, vertical, and diagonal checking points are established on all four sides of the door opening that is being measured.

CHECKING UNDERBODY FOR MISALIGNMENT

The dimensions of the underbody must be restored in the repair of major body damage, to provide correct front and rear wheel geometry (Figs. 3, 4 and 5). All the dimensions are detailed to the center line of existing holes in the underbody assembly. Once the frame and suspension members are aligned, the balance of the repair can be performed.

PAINT REFINISHING

PAINT DAMAGES AND PROCEDURES FOR REPAIR

Paint Repairs on Galvanized Metals. If for any reason it becomes necessary to perform paint repairs on galvanized rocker panels or any other galvanized steel surfaces, care must be exercised in preparing the bare galvanized surface to properly accept paint, and the best possible paint products must be employed to insure satisfactory adhesion to the metal and to give a good color match with acceptable durability. Most of the approved paint suppliers for refinishing materials agree on the procedure for metal preparation but use different primer recommendations. The methods involving the use of DuPont Preparakote and Ditzler Zinc Dust Primer are indicated here and it is important that either one be employed exactly as directed. No short cuts nor any inter-mixing should be attempted.

METAL PREPARATION FOR GALVANIZED STEEL

1. Strip, sand-off or otherwise remove all paint from the affected galvanized steel panel.

2. Wire-brush or steel-wool the entire metal surface and remove all grease or oil by wiping with a clean solvent.

3. Wipe the panel using a clean cloth or sponge with Lithoform No. 2 (Distributed by the Neilson Chemical Division of Amchem Products, Inc.) or Bonderite No. 34 (Distributed by Parker Rustproof). The work should be kept completely wet for at least three minutes and the metal should be thoroughly etched. If any bright metal remains the treatment should be repeated.

4. Rinse the area with clean water and blow off with compressed air.

5. The dried surface must be primed immediately. Then succeeding coats and color as required must be applied according to vendor's directions. Examples such as the DuPont and Ditzler systems are given as follows:

SYSTEM FOR USING DuPONT PREPARAKOTE

1. Spray Preparakote over properly prepared metal. Force-dry with radiant heat or air-dry overnight. This primer must be dried hard enough to sand wet or dry.

2. Sand the Preparakote very carefully, preferably with No. 400 paper so as to avoid cutting through to bare metal. Blow off and tack clean.

3. Spray two coats of No. 22 clear sealer and allow to air-dry for thirty minutes.

4. Spray on matching Acrylic Lacquer as directed. Then air-dry or force-dry until the lacquer is hard enough to be polished.

5. Polish lacquer as recommended by supplier.

SYSTEM FOR USING DITZLER ZINC DUST PRIMER

1. Prime the galvanized area with DPE659 Zinc Dust Primer. This is a two-component product and the zinc must be carefully mixed with the vehicle as directed. A recommended film thickness of one mil may be recoated with a lacquer base primer surfacer such as DZL3200 in about twenty minutes. Do not sand DPE659.

2. Spray primer surfacer DZL3200 reduced as directed to a film thickness of about two mils.

3. After drying the primer surfacer about thirty minutes, carefully sand with No. 360 or No. 400 silicon carbide paper, wet or dry, so as not to cut through the zinc dust primer coat. Blow off and tack clean.

4. Spray matching Duracryl lacquers as directed and after drying rub and polish as required.

All material coatings may be force-dried. Careful manipulation is recommended.

PAINT REFINISHING–ALKYD ENAMELS

The recommended repair procedures for alkyd enamels are as follows:

1. Remove all name scripts, wipers, etc., which are more difficult to mask than to remove. Mouldings, etc., which are not removed should be covered with masking tape and paper.

2. Before sanding the surface to be painted, remove all traces of wax, polish and grease with a good wax and grease remover (M-3721).

3. Scuff sand the area to be painted with No. 320 paper (wet).

4. Feather edge the damaged areas to assure proper blending of paint between panels (where no body seams allow for a clean break point).

5. Wash off the area to be painted with silicone remover (DL60-3721-A) or good enamel thinner. Before the solution has a chance to dry,

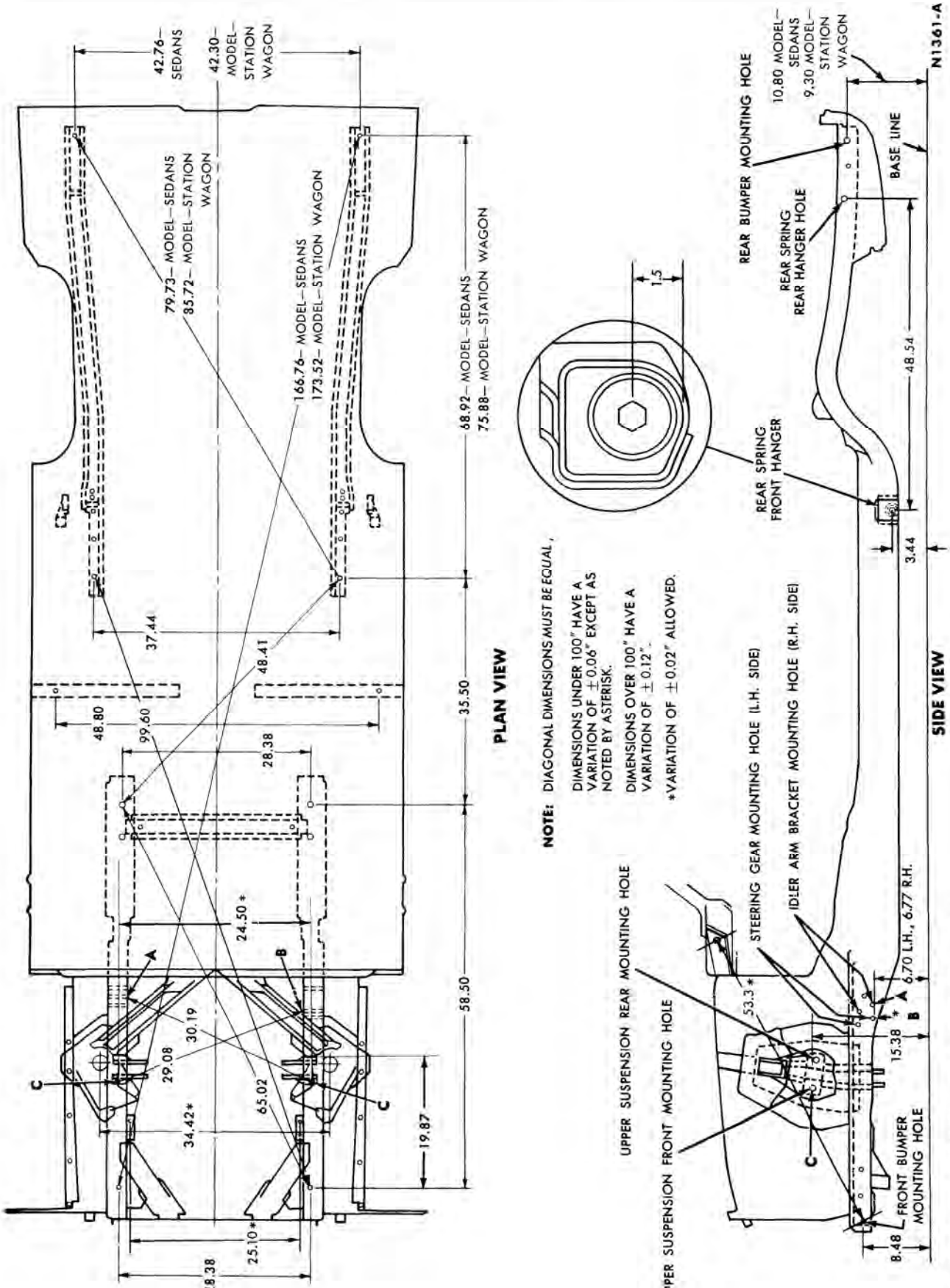


FIG. 3—Comet and Falcon Underbody Dimensions

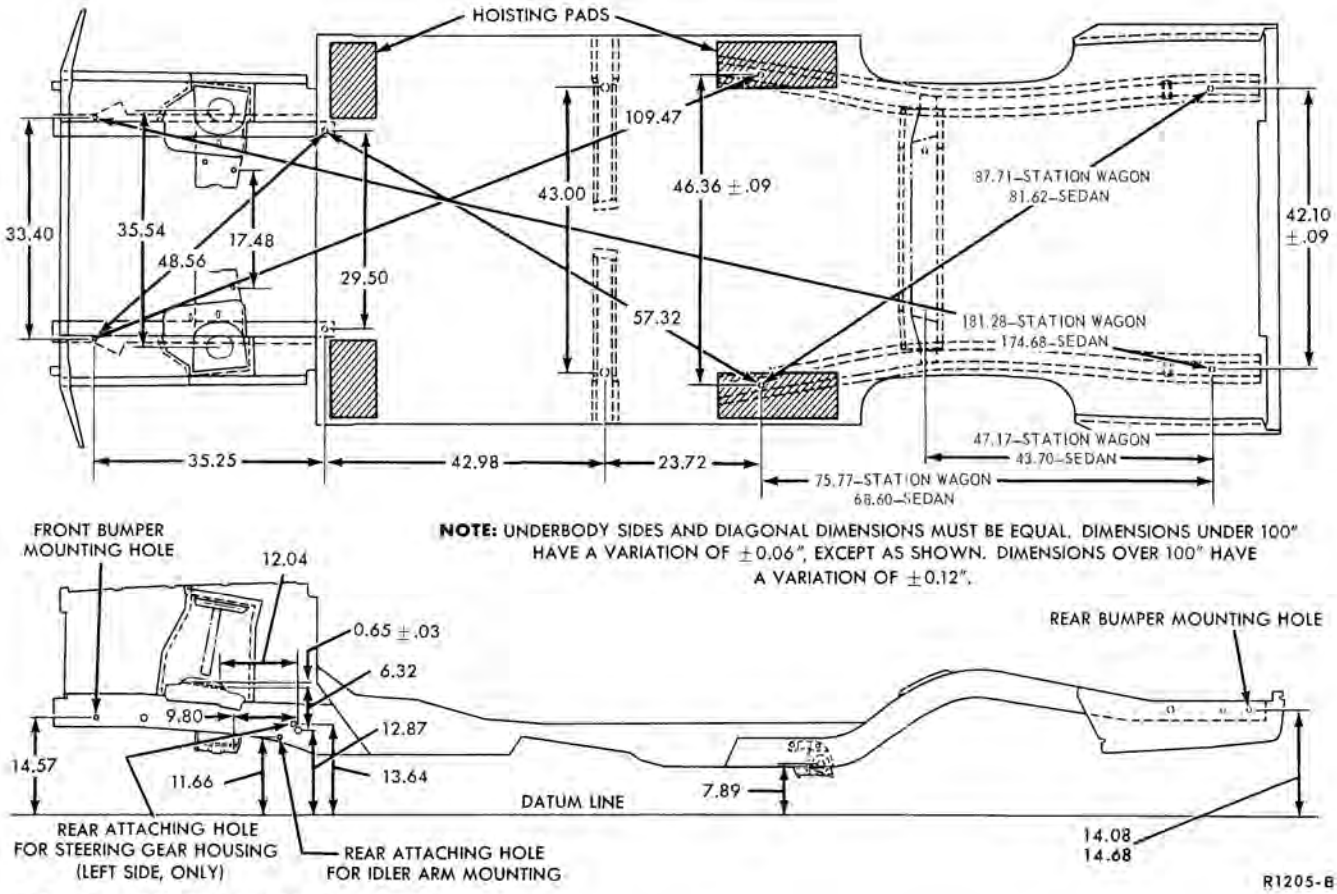


FIG. 4—Fairlane Underbody Dimensions

wipe off with clean dry rags. Change rags frequently.

6. Blow off the panel with compressed air to remove all traces of dust, sanding residue or moisture.

7. Move the car into the spray booth. All of the car except the immediate area to be refinished should be covered to protect from overspray.

8. Wipe the area to be painted with a tack rag to pick up final traces of dust or lint.

9. Spray two full finishing coats of paint. Follow the supplier's instructions on drying time between coats.

If both the color coat and prime coat are damaged, the following additional steps should be applied:

1. Remove the paint in the damaged area to bare metal if necessary for the proper feather edge.

2. Apply two coats of primer surfacer and proceed with the procedures beginning with step 3.

PAINT DEFECTS AND REPAIR PROCEDURES

Listed here are some of the abnormal paint conditions that may be encountered. It is very important to identify the paint condition correctly so that the proper repair procedure may be followed. For each of the following paint conditions described, the recommended repair procedure will be indicated.

Blistering. Blistering is the formation of bubbles or pin points on the surface of the finished work (Figs. 6 and 7). Unless inspected by a magnifying glass, this condition is very hard to identify. In some instances, this complaint may be confused with dirt in the paint. To verify blistering, prick the suspected areas and note whether a hole exists under the bubble. This condition is caused by rust, moisture, or oil between the coats, metal not properly cleaned, or uneven temperatures between the metal and the paint being sprayed.

ALKYD ENAMEL – Repair by repainting. (Color coat.) Priming procedure must be followed if defect is due to poor metal preparation.

Checking. Line checking has the appearance of thin, straight lines criss-crossing each other (Fig. 8). These lines may be from ½-4 inches or longer, increasing in length as the finish ages.

ALKYD ENAMEL – Refinish panels (Color coat–primer if damaged).

Chipping and Stone Bruises. Chipping occurs when the surface of the finish coat of paint has been broken by a sharp blow, and small particles of paint have been flaked off (Fig. 9). Frequently, stone bruises result in chipping (Fig. 10).

ALKYD ENAMEL – Refinish panels. (Prime it to bare metal.)

Cracking. Cracking is evidenced by the paint curling. Frequently, cracking starts at the edge of the panel (Fig. 11). This is caused by poor mixing of paint, or by temperature changes during the various painting stages.

ALKYD ENAMEL – Refinish panel (Prime if both color and primer cracking).

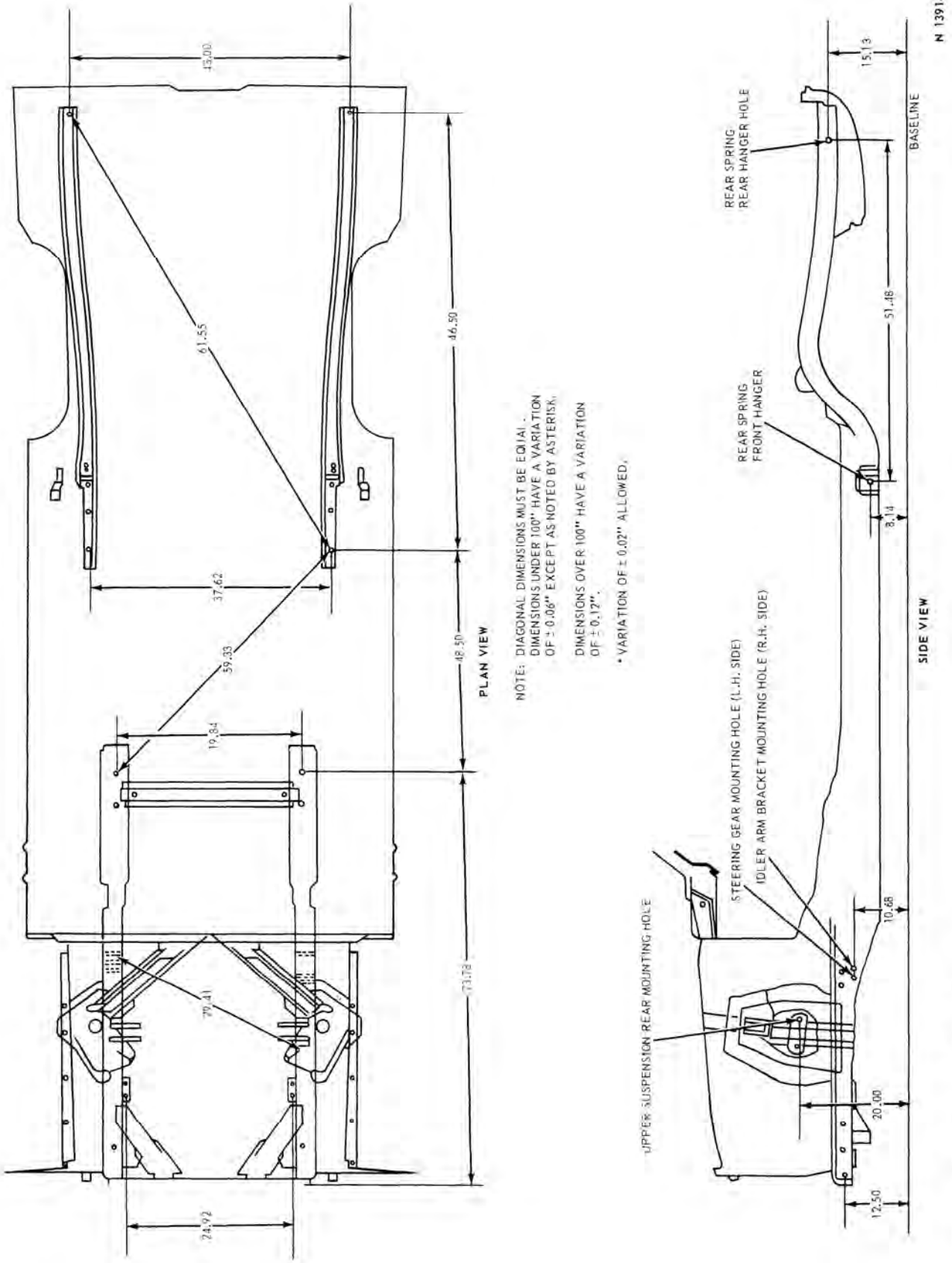


FIG. 5—Mustang Underbody Dimensions


M1004-A

FIG. 6—Random Blisters


M1005-A

FIG. 7—Pattern Blisters


M1008-A

FIG. 8—Line Checking


M1009-A

FIG. 9—Chipping


M1010-A

FIG. 10—Bruises


M1011-A

FIG. 11—Cracking

Crow Footing. Crow footing may be described as small lines branching off from a point in all directions and giving the appearance of a crow's foot (Fig. 12). Crow footing is


M1012-A

FIG. 12—Crowfooting


M1013-A

FIG. 13—Dirt in Paint


M1014-A

FIG. 14—Mildew


M1015-A

FIG. 15—Off Color

usually caused by spraying a second coat before the first coat is dry, by spraying an excessively thick coat, or by thinners which evaporate too fast.

ALKYD ENAMEL – Repaint panel (Color coat).

Dirt in Paint. Patches where dirt appears (Fig. 13) are sometimes confused with blistering. To verify the condition, prick the suspected areas, and note whether there is foreign material under the surfaces.

ALKYD ENAMEL–Sand smooth and refinish (Color coat).

Mildew. Mildew growth is most commonly found in a very dark gray or black color, and occurs along radial lines (Fig. 14).

ALKYD ENAMEL–Repair by polishing.

Off-Color. The term off-color is applied to adjacent areas on which the colors do not match (Fig. 15). It may also appear when making spot repairs.

ALKYD ENAMEL – Refinish panel (Color coat).

ALKYD ENAMEL – Repair by polishing.


M1016-A

FIG. 16—Orange Peel

Orange Peel. Orange peel is a term used to describe an uneven, mottled appearance on the paint surface (Fig. 16). This is usually caused by improper thinning of the paint.

ALKYD ENAMEL – Repair by polishing.

Overspray. Overspray is evidenced by a rough, dull finish in the area surrounding the paint repair (Fig. 17).

ALKYD ENAMEL–Lightly sand out the overspray and apply a properly thinned finish coat if repairs cannot be made by polishing.

Peeling. Peeling occurs when large areas of the finish or primer coat separate from the metal or prime coat (Fig. 18). This is usually caused by wax, grease, rust, or oil under the paint. Do not confuse with orange peel.

ALKYD ENAMEL – Refinish panel (Prime as necessary).


M1017-A

FIG. 17—Overspray


M1018-A

FIG. 18—Peeling



FIG. 19—Pits and Pop-Ups



FIG. 20—Craters



FIG. 21—Thin Paint



FIG. 22—Runs and Sags

Pits and Pop-ups. Pits and pop-ups may be identified by the appearance of small round depressions in the paint (Figs. 19 and 20). These may be caused by not allowing the first coat to dry sufficiently before applying the second coat or from failure to remove silicone polishes before repainting.

ALKYD ENAMEL – Refinish panels (Color coat).

Thin Paint. The primer will show through the finish coat as a result of an excessively thin color coat, or application of the color coat before the surface is dry (Fig. 21).

ALKYD ENAMEL – Refinish panel (Color coat).

Runs, Sags and Wrinkles. The uneven collections of paint on the finished surface are referred to as runs or sags (Fig. 22). The collections may appear in the form of tear drops or sagging lines. Usually these lines are quite soft and sometimes they may be wrinkled (Fig. 23). This is usually caused by over-application of paint or hesitation in the stroke of the gun.

ALKYD ENAMEL – Refinish panels.

Scratches. Scratches are thin marks or tears that may partially or completely penetrate the surface of the finish coat of paint (Fig. 24).

ALKYD ENAMEL – Refinish panels if unable to polish out.

Spot Discoloration. This is evidenced by brown spots or stains on the surfaces. Stains or spots can be caused by road tar, acid or alkali-bearing water from the streets.

ALKYD ENAMEL – Use polish repair procedure. Refinish panel if not effective (Color coat).

Water Spotting. Water spotting is evidenced by a milky pattern where water drops have fallen (Fig. 25).

ALKYD ENAMEL – Use polish repair procedure. Refinish panel if not effective (Color coat).

Industrial Fall-Out. Industrial fall-out is the result of particles being



FIG. 23—Wrinkles



FIG. 24—Scratches



FIG. 25—Water Spotting



FIG. 26—Industrial Fall-Out

exhausted into the air by the various processes of heavy industry, or in areas where there is a concentration of industry.

Industrial fall-out particles appear as tiny rust-colored dots on the paint film, and the surface will feel rough to the touch (Fig. 26). Some of the particles have excellent adhesion and are difficult to remove. However, the following procedure has proven effective in the removal of this fall-out:

1. First wash the car with car wash compound (COAA-19B521-A) to remove loose soil. Rinse well and examine the painted surfaces for iron base fall-out particles. If there is a significant quantity of fall-out not removed by ordinary washing, the oxalic treatment should then be used. All cracks, ledges, grooves, etc., where fall-out has accumulated should be cleaned by wiping or by air blow-off.

2. Dissolve six to eight ounces of oxalic acid (dry) in one gallon of warm water and add one or two tablespoonfuls of a non-alkaline detergent such as car wash compound (COAA-19B521-A).

Neutral detergents are permissible, but all alkaline compounds should be avoided. This acid detergent solution must be prepared and kept in a clean **NON-METALLIC** container.

Apply this solution liberally to all affected surfaces of the car with a large sponge. Use a broad wiping stroke and keep the work completely wet for about 15 minutes, or until the operator can no longer feel any surface roughness or isolated gritty particles with bare or gloved finger tip. If this is not done thoroughly, rust staining may soon redevelop. Again, it is most important that the work be kept wet, since a dry acid residue is not active in loosening fallout. Be sure that the entire acid cleaning procedure is performed in a sheltered area so that the work

will be kept as cool as possible, to prevent rapid evaporation of water and consequent surface drying. **DO NOT WORK IN THE SUN.** Even a strong breeze makes it difficult to keep the job wet over a large area.

3. Rinse the job with clear water. This must be done very thoroughly to prevent possible corrosion.

No traces of acid should be left on any surface. Bright trim parts, particularly anodized aluminum and stainless steel, may be stained by prolonged contact with the cleaning solution. Even painted areas can be spotted by prolonged exposure. It is also important to keep the oxalic acid cleaner solution from leaking inside the car because some fabrics might be bleached or discolored by the solution.

If the fallout is not completely removed or is deeply imbedded in the paint film, cleaning with the acid detergent mixture must be repeated. It is helpful sometimes to briskly rub the work with a mixture of equal parts of the oxalic acid cleaner and FoMoCo cleaner wax polish (8A-19519-A) using a piece of heavy toweling. Again thorough water rinsing is extremely important.

Sometimes small black spots remain after the oxalic cleaning has removed all iron based fall-out. Such deposits might be asphaltic or they might be over-spray. These can usually be removed by rubbing vigorously with a cloth saturated with a mixture of kerosene and Actusol (about 5 parts of kerosene to 1 part of Actusol). Any residue of this solvent mixture may be readily flushed off with water.

Organic Fall-Out. Organic fall-out may result from parking cars under trees or from the air under certain atmospheric conditions (Fig. 27).

ALKYD ENAMEL – Refinish damaged panels (Color coat and primer).

INTERIOR PAINT REPAIRS

The proper matching of colors can be obtained if the following procedures are carefully adhered to:



FIG. 27–Organic Fall-out

1. Clean the surface to be painted with wax and silicone remover.

2. Feather-edge the damaged area with No. 400 grit wet or dry sandpaper. (Prime all areas of bare metal with M-6J-12S Primer).

3. Mix the paint following the instructions on the can and spray several light coats.

Allow the paint to become tacky between the coats.

4. Spray the entire area sparingly with B7A-645-S Lacquer Leveler which will blend the repaired area with the existing painted surfaces.

3 CLEANING AND INSPECTION

FLOOR PAN PLUGS AND GROMMETS

The floor-pan plugs seal the various body bolt access holes. If any plugs are missing or improperly installed, a dust or water leak may result. This also applies to the grommets used on the dash panel. When dust or water leaks are evident, these plugs and grommets should be checked for proper installation.

DRAIN HOLES

Drain holes (Fig. 28), located on the underside of each rocker panel, quarter panel, and door, should be cleared periodically.

BODY MAINTENANCE

Regular body maintenance preserves the car's appearance and reduces the cost of maintenance during the life of the car. The following steps are suggested as a guide for regular body maintenance:

1. Vacuum the interior thoroughly and wash the car.

2. Check all openings for water leaks, and seal where necessary.

3. Cement all loose weatherstrips which are still usable.

4. Replace all door and deck lid weatherstrips which are unfit for service.

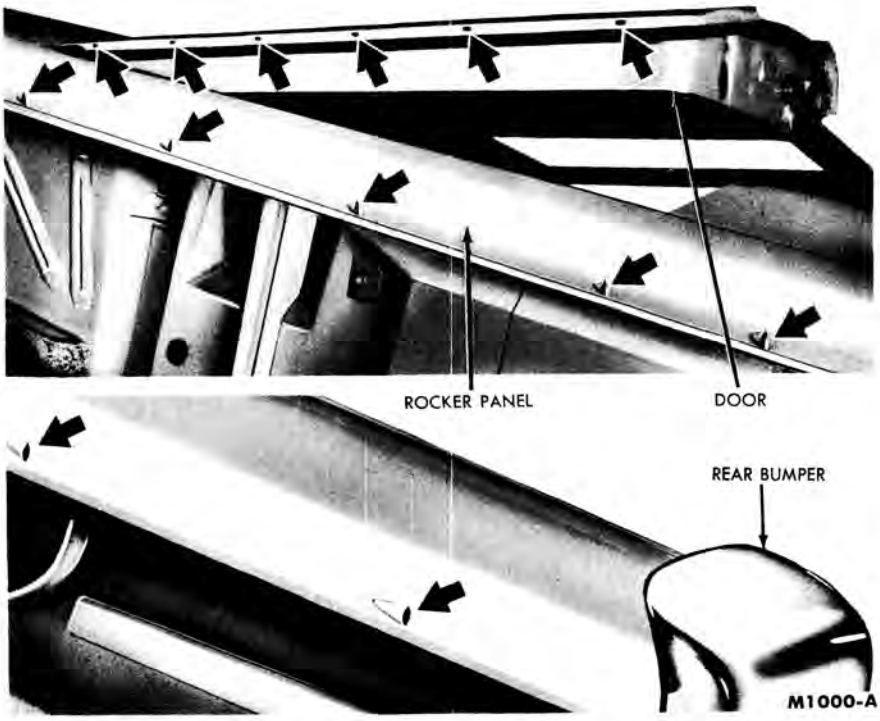


FIG. 28–Drain Holes–Typical

5. Apply silicone lubricant to the weatherstripping.

6. Replace all cracked, fogged, or chipped glass.

7. Align the hood, doors, and deck lid if necessary.

8. Inspect the windshield wiper blades and replace them if necessary.

9. Tighten the sill plate and garnish moulding screws.

10. Clean the seats, door trim panels, and headlining.

11. Touch up or paint chipped or scratched areas.

12. Drain holes located on the underside of each rocker panel, quarter panel, and door, should be cleared periodically.

RATTLE ELIMINATION

Most rattles are caused by a loose bolt or screw. Foreign objects such as nuts, bolts, or small pieces of body deadener in the door wells, pillars and quarter panels are often the source of rattles. Door wells can be checked by carefully striking the underside of the door with a rubber mallet. The impact made by the mallet will indicate if loose objects are in the door well.

In the event that tightening the bolts and screws, located on such assemblies as the doors, hood, and deck lid does not eliminate the rattles, the trouble is probably caused by misalignment. If this is the case, follow the adjustment and alignment procedures for these assemblies.

Rattles and squeaks are sometimes caused by weatherstripping and antisqueak material that has slipped out of position. Apply additional cement or other adhesive, and install the material in the proper location to eliminate this difficulty.

EXTERIOR CLEANING

The outside finish should be frequently washed. Never wipe the painted surface with a dry cloth. Dusting the finish when it is dry tends to rub the dust and dirt into the baked enamel, and leaves a sandpaper effect on the surface. To keep the finish bright and attractive and eliminate the necessity of using polish, wash the car whenever it has accumulated a moderate amount of dirt and road salt.

The bright metal parts of the car require no special care. Periodic cleaning will preserve the beauty and life of these finishes. Wash with clear water or if the parts are very dirty use FoMoCo COAA-19B521-A compound. Using a clean soft cloth or a sponge and water, rinse and wipe the parts dry. FoMoCo Chrome Cleaner may be used sparingly to remove rust or salt corrosion from chrome plated parts. Do not scour aluminum or chrome finished parts with steel wool or polish them with products containing abrasives. A FoMoCo Polish will provide excellent protection for all bright metal parts.

INTERIOR CLEANING

Use a vacuum cleaner to remove dust and dirt from the upholstery or floor covering. Vinyl and woven plastic trim that is dusty can usually be cleaned with a damp cloth. **Do not use cleaning materials containing kerosene, naptha, toluol, xylol 10°, lacquer thinners, cellulose acetate, butyl cellosolve, carbon tetrachloride, body polish, battery acid, antifreeze, gasoline, motor oils or other type lubricants.**

Approved cleaners B8A-19523 -A, or -B, B5A-19525-A, COAZ-19526-A or -B (soft trim cleaners), BAF-19521-A (leather and vinyl upholstery cleaner), and CIAZ-19C507 -A (convertible back window cleaner) are available for service. Instructions for the use of these cleaners are indicated with their containers.

CARE OF WOOD GRAIN PANELING

WASHING

Never wipe the panels or trim rails with a dry cloth. This method of cleaning tends to rub dust particles into the finished surface and leave fine scratches. Flush off all loose dirt and other elements, and wipe the body panels and rails with a sponge and plenty of cold water. If desired, a mild soap may be used. Rinse thoroughly with clear water and wipe dry.

GLASS FIBER TRIM RAIL REMOVAL AND INSTALLATION

The glass fiber trim rails are serviced with the wood-grain already applied. To remove the body side trim rails, remove the cap over each trim rail screw to gain access to the screws. Remove the screws and the trim rail assembly.

When installing the body side trim rail, apply sealer (AB-19560-A) around each mounting hole. Install the cap retainer, screw and cap.

APPLICATION OF WOOD-GRAIN TRANSFERS

Wood grain transfers are available for application to the panels. The materials necessary to apply the transfers are a bonding coat (M-4584), 20% transfer solution of M-5412-A, and clear spar varnish.

If the surface on which the transfer is to be applied is damaged, repair and metal finish first.

1. Mask off the area where the transfer is to be applied.

2. Prime-coat all bare metal areas, and wet-sand.

3. Spray the surface with transfer bonding coat (M-4584). This coat is the binder for the transfer adhesive.

4. Allow the binding coat to air-dry for one hour, or heat-dry (160°F) for 20 minutes.

5. Lightly wet-sand the binding coat, and wipe it dry.

6. Make a paper template of the damaged area, and cut the new transfer to size, using the template as a guide. Leave about ½ inch of extra material around the edge of the transfer to allow for matching and trimming.

7. Mix a solution of 20% transfer solution M-5412-A and 80% water. This solution permits shifting of the transfer after it has been applied, so that the graining can be matched. **Try a sample of the transfer and solution on an old piece of metal or fender. If the transfer cannot be pulled off after two minutes, the solution is too strong and must be diluted with more water.**

8. Soak the transfer in lukewarm water for one minute to loosen the paper backing. **Do not remove the backing until the transfer is applied.**

9. Using a cheese cloth pad, apply a 20% M-5412-A transfer solution to the panel. **Any excess solution that runs down on adjacent panels must be wiped off immediately.**

10. Place the wet transfer on the panel, paper side out. Adjust the transfer to match the graining on adjoining panels, and carefully remove the paper backing.

11. Sponge the transfer with clean

water to remove all traces of the paper backing adhesive.

12. Remove all air bubbles and wrinkles with a squeegee.

13. Wash the transfer with clear water and dry with a chamois.

14. Pierce any blisters or small air bubbles as they appear, and press down the area with a finger to remove the air and excess solution.

15. Allow the panel to air-dry for one hour, or heat dry (160°F.) for 20 minutes.

16. When the panel is dry, spray two coats of clear spar varnish over the transfer. **Do not use clear lacquer or shellac.**

4 HOISTING VEHICLE

The unitized body-frame construction requires special precautions and procedures when the car is jacked up or hoisted. In some cases, special hoist adapters must be used as recommended by specific hoist manufacturers.

Refer to the Owner's Manuals when using the jack supplied with the car.

DRIVE-ON TYPE HOIST

To prevent possible damages to the underbody, do not drive the car onto the drive-on type hoist without first checking for possible interference between the upright flanges of the hoist rails and the underbody. Should there be interference, the hoist flanges should be modified as necessary and/or the approach ramps built up to provide the needed clearance.

RAIL TYPE—FREE WHEELING HOIST

FRONT

The front adapters or hoist plates must be carefully positioned in contact with the lower suspension arms to assure safe, accurate lifting.

REAR

The hoist adapters must be positioned carefully under the rear axle to prevent damage to the shock absorbers when the car is raised. The hoist rails should be raised slowly and the position of the adapters checked.

FORK LIFT—TWIN POST HOIST

FRONT

To assure safe hoisting, the front post adapters must be positioned carefully to contact the center of the lower suspension arms (Figs. 29 and 30).

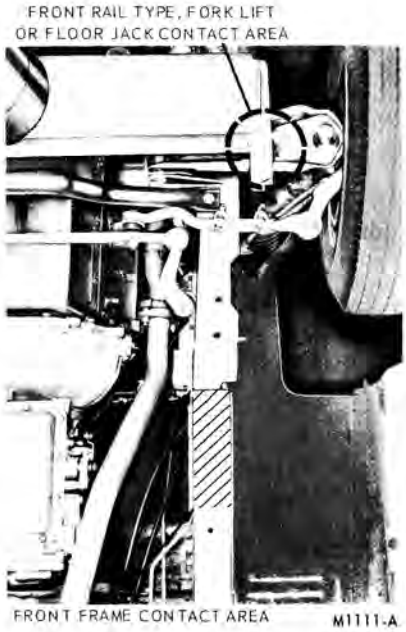


FIG. 29—Front Hoist Contact Areas

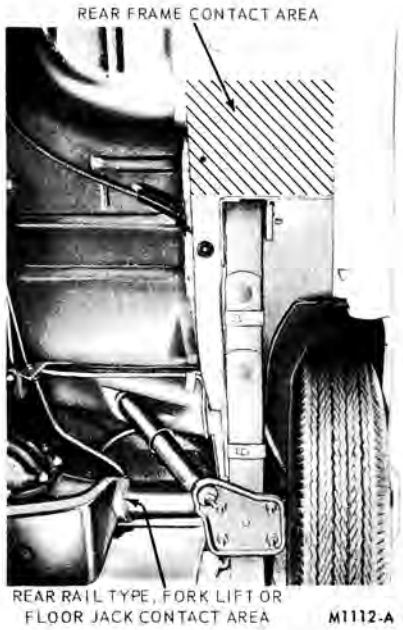


FIG. 30—Rear Hoist Contact Areas

REAR

To prevent damage to the shock absorbers, the rear forks must contact the axle at points not farther out board than one inch from the circumference welds near the differential housing. Carefully raise the rear post and check the position of the fork (Figs. 29 and 30).

FRAME CONTACT HOIST

Frame contact hoist adapters are necessary to lift the car. The hoist adapter pads should each cover at least 12 square inches of underbody area. Figs. 29 and 30 show recommended contact points for the hoist pads.

FLOOR JACK

When a stationary floor jack or a roll jack is to be used, there are several specific recommended points of contact. Either side of the car may be raised at the front by jack contact at the lower arm strut connection. Either side of the front end of the car may also be raised by jack pressure on the front crossmember, or on the crossmember to which the stabilizer is connected. **Do not attempt to use jack pressure on either front or rear Mustang bumpers.**

PART 17-2 FRONT SHEET METAL, BUMPERS, EXTERIOR MOULDINGS

Section	Page	Section	Page
1 In-Car Adjustments and Repairs	17-13	2 Removal and Installation	17-13

1 IN-CAR ADJUSTMENTS AND REPAIRS



FIG. 1—Hood Hinge Installation—Typical

HOOD ADJUSTMENTS

The hood is provided with fore and aft, vertical, and side-to-side adjustments (Fig. 1). These directions refer to the position of the hood when it is fully lowered. The elongated bolt slots in the hinge at the hood provide the side-to-side adjustment. The enlarged holes in the hinge at the fender apron provide both vertical and fore and aft adjustments.

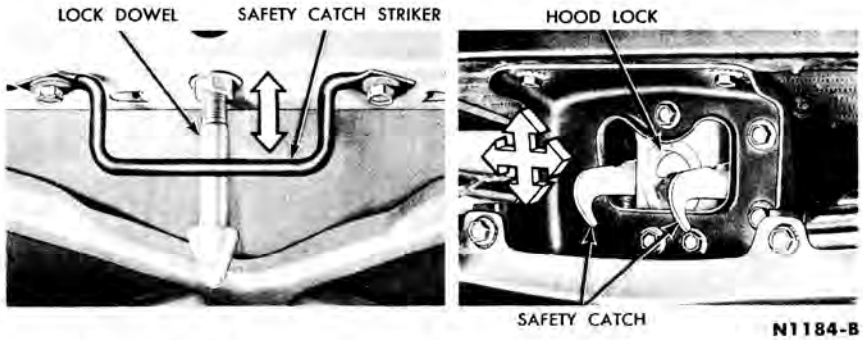


FIG. 2—Hood Lock Mechanism—Typical

HOOD LOCK ADJUSTMENTS

Before adjusting the hood lock mechanism, make certain that the hood is properly aligned. The hood lock (Fig. 2) can be moved fore or aft and side to side to align it with the lock dowel. The safety catch can be adjusted to engage the hood lock catch.

1. Loosen the hood lock attaching bolts. Move the lock assembly as required to align it with the lock dowel on the hood.
2. Tighten the attaching bolts.
3. Loosen the lock nut on the hood lock dowel and turn the dowel inward to adjust the hood tighter, or outward to loosen the adjustment.
4. The lock dowel is adjusted correctly when the top of the hood is flush with the fenders, when locked.
5. Tighten the dowel lock nut after adjusting the lock dowel.
6. To adjust the safety catch striker, loosen the two attaching screws and position the catch correctly. Tighten the screws and lower the hood to make certain the safety catch striker engages the hood lock safety catch.

2 REMOVAL AND INSTALLATION

HOOD HINGE

1. Prop the front of the hood in the open position and cover the fender and cowl panel.
2. Remove the hinge-to-hood retaining bolts, the retaining bolts at the fender apron and cowl (Fig. 1), and remove the hinge.
3. Position the hood hinge on the body and install the hinge retaining bolts.
4. Adjust the hood for proper fit.

GRILLE—COMET

1. Remove the grille retaining bolts and remove the grille assembly (Fig. 3).
2. Place the grille assembly on a bench and remove the grille ornament retaining nuts and remove the ornament.
3. Transfer the grille ornament to the new grille and install the ornament retaining nuts.
4. Position the grille assembly in the grille opening and install the grille retaining bolts.

GRILLE—FALCON

REMOVAL

1. Remove the headlight door retaining screws and remove the headlight doors.
2. Remove one retaining screw from each side of the grille at the headlight housing (Fig. 4).
3. Remove the lower grille to center retaining screw (Fig. 4).
4. Remove the upper grille to support bracket retaining bolts (Fig. 4) and remove the grille assembly.

INSTALLATION

1. Position the grille assembly in the grille opening and loosely install the upper retaining bolts.

2. Loosely install the lower grille-to-center support bracket retaining screw.

3. Install the end grille retaining screw at each headlight housing and tighten all bolts and screws.

4. Install the headlight doors.

GRILLE—FAIRLANE

REMOVAL

1. Remove the upper grille-to-center support bracket and grille-to-outer support bracket retaining screws (Fig. 5).

2. Remove the lower grille-to-center support bracket and grille-to-outer support bracket retaining screws (Fig. 5).

3. Remove either the left or the right headlight door.

4. Remove the grille assembly.

INSTALLATION

1. Position the grille in the grille opening.

2. Install the lower grille-to-center support and the lower grille-to-outer support bracket retaining screws.

3. Install the upper grille-to-center support and the upper grille-to-outer support bracket retaining screws.

4. Install the headlight door.

GRILLE—MUSTANG

REMOVAL

1. Open the hood.

2. Remove the four grille retaining screws from the lower inner flange of the grille.

3. Remove the four grille retaining screws from the upper flange of the grille upper center support bracket to the hood lock hook support.

4. Remove the grille assembly.

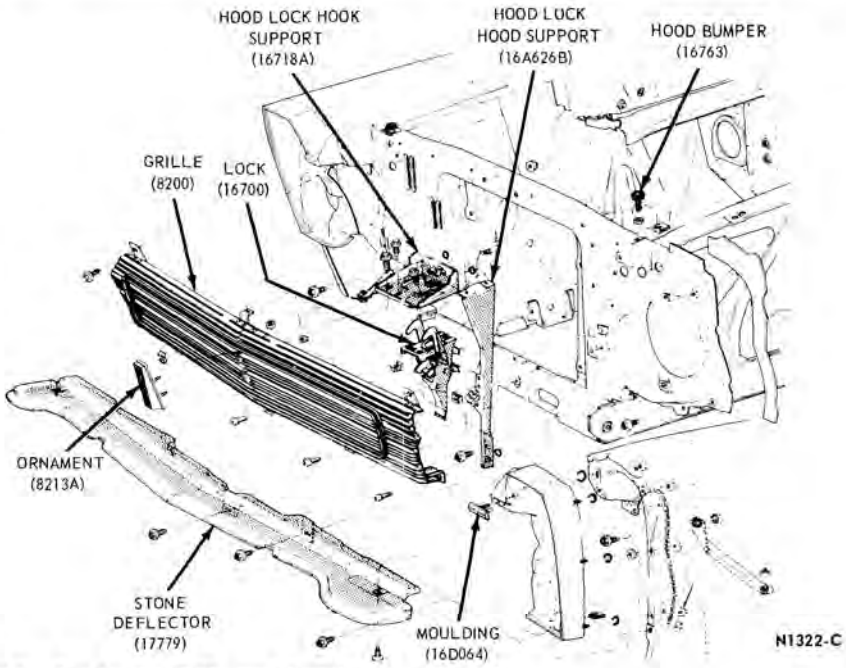


FIG. 3—Comet Grille and Hood Lock Assembly

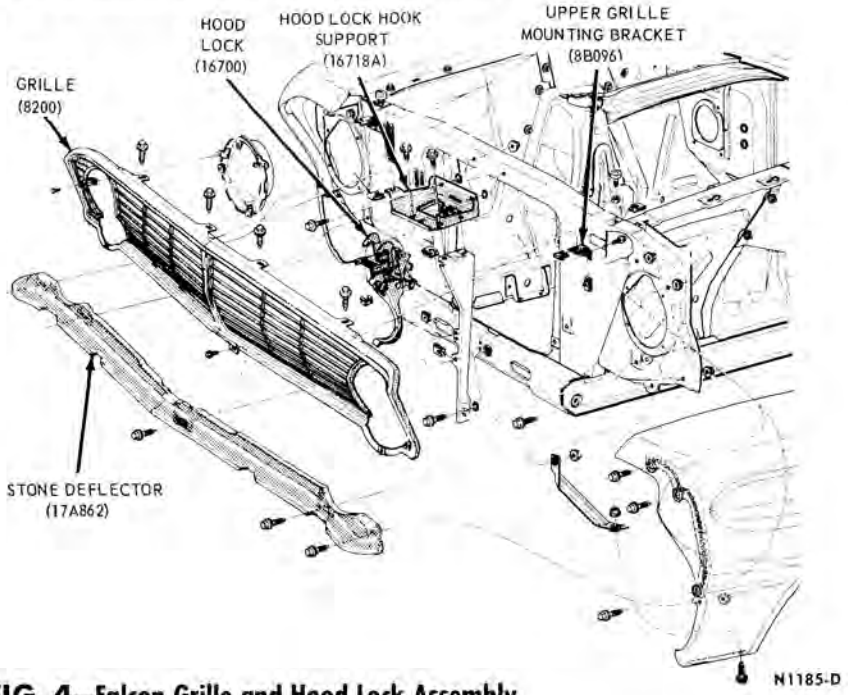


FIG. 4—Falcon Grille and Hood Lock Assembly

INSTALLATION

1. Transfer the upper center support bracket, the grille bars and ornament, and the spring nuts to the new grille assembly.

2. Position the grille assembly on the car and install the grille retaining screws.

3. Close the hood.

FENDER

REMOVAL

1. Open the hood and remove the headlight door.

2. Disconnect the radio antenna lead wire at the radio, if so equipped.

3. Remove the kick pad from the cowl on the inside of the car.

4. Remove the nut that secures

the fender to the cowl.

5. Remove the bolt that secures the fender to the rocker panel.

6. Remove the remaining front fender retaining bolts and carefully lift the fender off the apron and the cowl (Figs. 6, 7, 8, and 9).

INSTALLATION

1. Apply a bead of sealer on the upper edge of the fender apron and to all the attaching bolt holes.

2. Carefully position the front fender to the fender apron and cowl.

3. Install the fender retaining bolts and nut loosely. Adjust the fender for the best possible alignment and fit, using shims where necessary, and tighten all retaining bolts and nuts.

4. Connect the radio antenna lead wire at the radio.

5. Install the cowl side kick pad.

6. Position the headlight door and install the retaining screws.

7. Close the hood.

FRONT BUMPER—COMET, FALCON, FAIRLANE

REMOVAL

1. Disconnect the parking light wiring connectors and push the wires through their routing holes in the fender aprons.

2. Remove the left and right bumper-to-fender end mounting bracket retaining bolts (Fig. 10) (Comet only).

3. Remove the bumper left and right inner and outer arm-to-frame side rail retaining bolts and remove the bumper assembly. (Figs. 10, 11, and 12).

4. Remove the bumper-to-fender end mounting bracket from the bumper (Fig. 10, Comet only).

5. Remove the bumper inner and outer arms from the bumper.

6. Remove the license plate.

7. Remove the parking light assembly retaining nuts and remove the parking light assemblies.

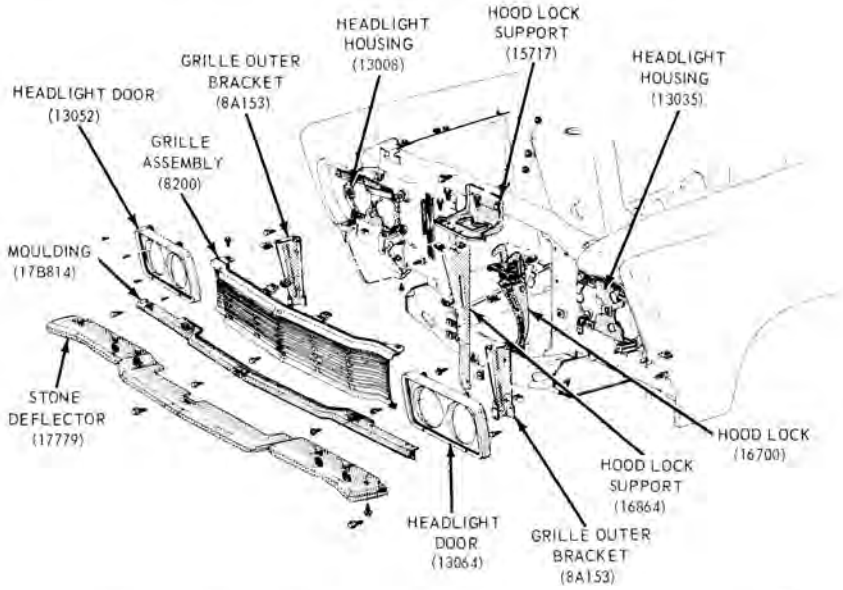


FIG. 5—Fairlane Grille and Lock Assembly

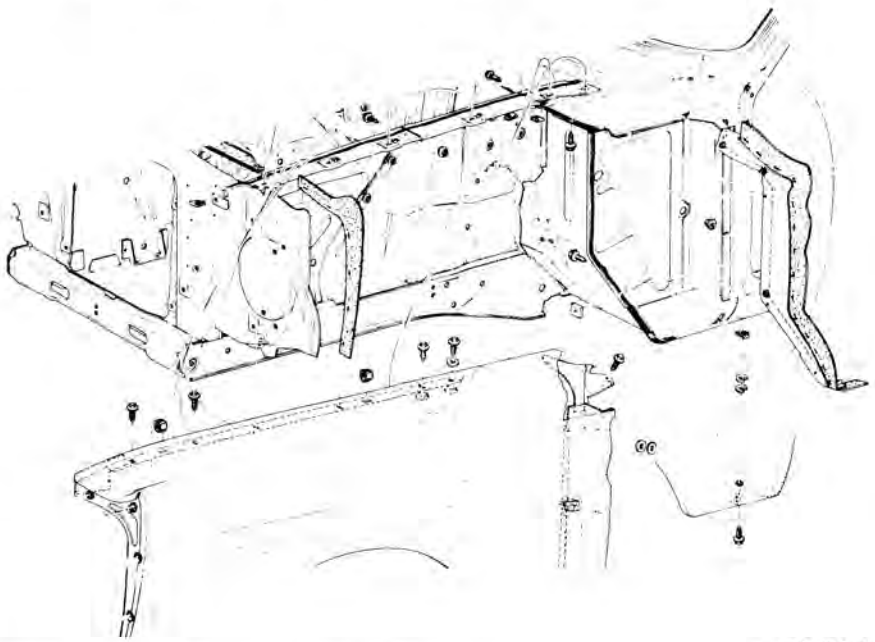


FIG. 6—Comet Front Fender Installation

INSTALLATION

1. Install the license plate on the new bumper.

2. Install the parking light assemblies in the new bumper.

3. Install the bumper inner and outer arms on the new bumper using spacers and washers as shown in Figs. 10 and 11. Torque the nuts to 17-23 ft-lbs.

4. Install the bumper end brackets on the new bumper.

5. Position the bumper assembly to the car and loosely install the bumper arm-to-frame side rail retaining bolts.

6. Align the bumper assembly and tighten the bumper arm-to-frame side rail retaining bolts.

7. Route the parking light wiring through the fender aprons and connect the wiring connectors.

FRONT BUMPER—MUSTANG

REMOVAL

1. Raise the car to provide working access.

2. Tape the stone deflector to prevent scratching the paint finish.

3. Remove the left and right bumper-to-fender bracket bolts from the fenders.

4. Remove the bumper bar-to-inner arm and the bumper bar-to-outer arm retaining bolts from each side of the bumper (Fig. 13). Remove the bumper and bumper-to-fender bracket as an assembly.

INSTALLATION

1. Transfer the bumper-to-fender bracket to the new bumper.

2. Position the bumper on the car. Install the bumper bar-to-inner arm and the bumper bar-to-outer arm retaining bolts.

3. Install the bumper-to-fender bracket retaining bolts.

4. Remove the protective tape from the stone deflector and lower the car.

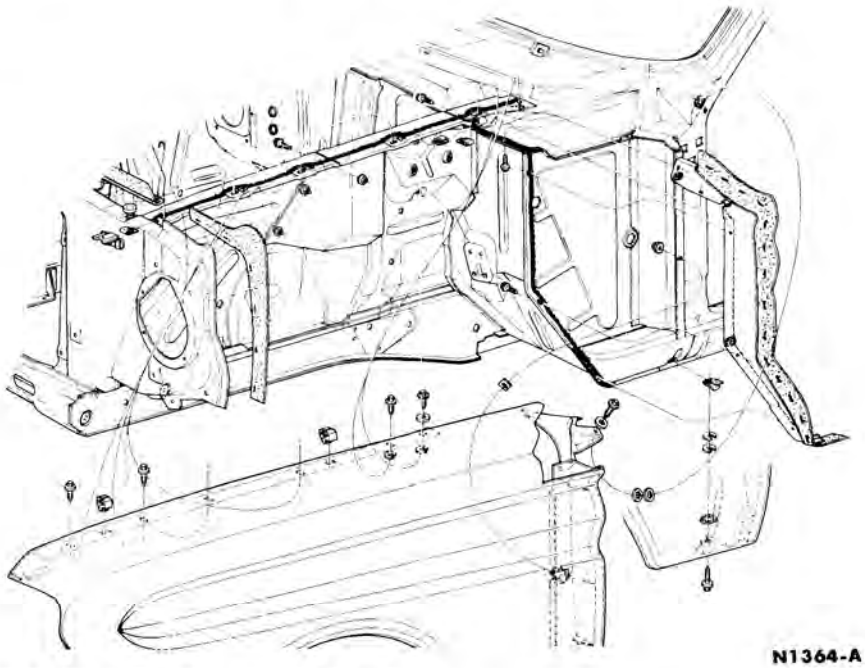
FRONT BUMPER GUARD—MUSTANG

1. Remove the screw and washer retaining the bumper guard to the lower frame side rail (Fig. 13).

2. Remove the screw and washer retaining the bumper-guard-to-guard upper bracket and remove the guard assembly.

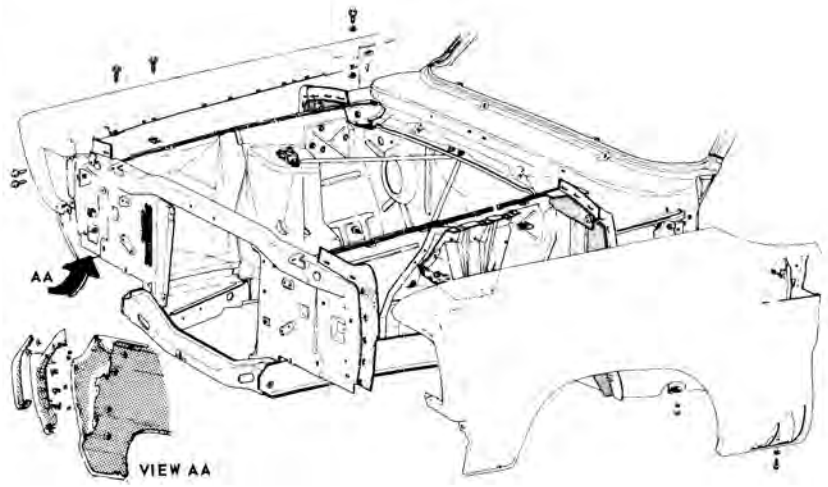
3. Transfer the nut and retainer assembly and the rubber spacer to the new bumper guard (Fig. 13, View "BB").

4. Position the bumper guard assembly on the car.



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FIG. 7—Falcon Front Fender Installation



R-1160-B

FIG. 8—Fairlane Front Fender Installation

5. Install the two retaining screws and washers.

REAR BUMPER—FALCON, COMET, FAIRLANE

REMOVAL

1. Remove the screws retaining the license plate lamp assembly to the rear bumper.

2. Remove the rear license plate.

3. Remove the four bumper arm-to-frame retaining bolts (Figs. 14 and 15), and remove the bumper assembly.

INSTALLATION

1. Transfer the rear bumper arms and rubber bumper to the new

bumper.

2. Position the bumper assembly on the car and install the bumper arm-to-frame retaining bolts.

3. Position the license plate lamp assembly to the bumper and install the retaining bolts.

4. Install the license plate.

REAR BUMPER—MUSTANG

REMOVAL

1. Open the luggage compartment. Remove the spare wheel and disconnect the license light wiring connector.

2. Remove the four bumper mounting bracket-to-body retaining bolts and remove the bumper assembly (Fig. 16).

3. Remove the four bumper-to-mounting bracket retaining bolts and remove the brackets (Fig. 16).

4. Remove the two license plate light and bracket retaining screws and remove the light and bracket.

INSTALLATION

1. Position the license plate light and bracket on the bumper and install the two retaining screws.

2. Position the bumper mounting brackets on the bumper and install the bumper-to-mounting bracket retaining bolts.

3. Connect the license light wiring and install the spare wheel.

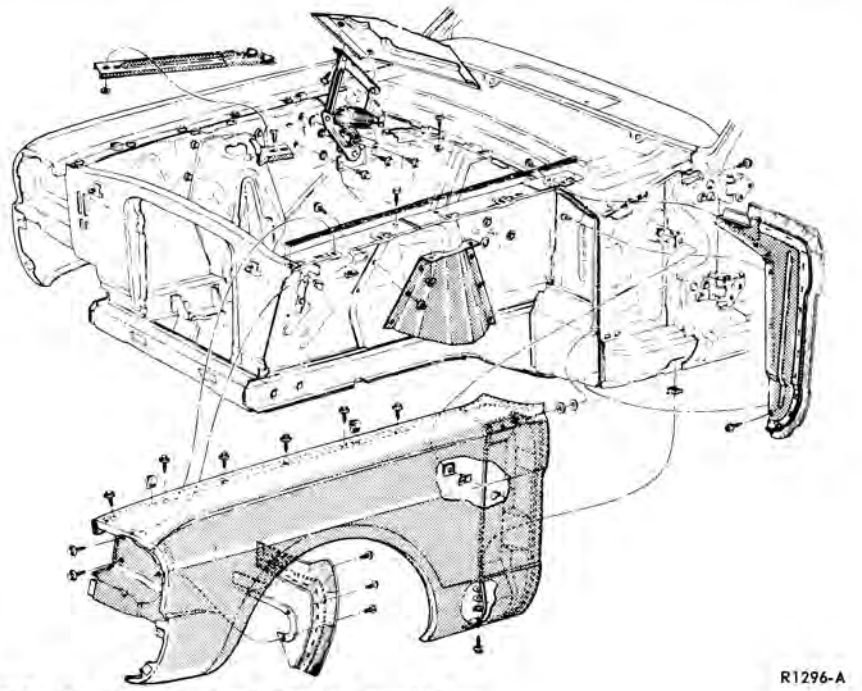
REAR BUMPER GUARD—MUSTANG

REMOVAL

1. Open the luggage compartment door and remove the spare tire assembly to provide access to the upper guard retaining screw and washer.

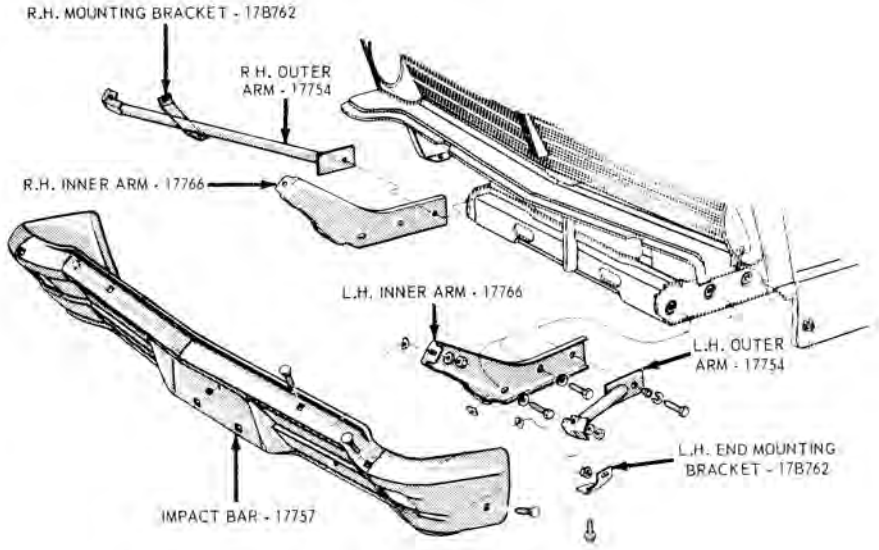
2. From inside the luggage compartment, remove the upper guard retaining screw and washer (Fig. 16).

3. From beneath the car, remove the lower guard retaining screw and washer (Fig. 16). Remove the bumper guard.



R1296-A

FIG. 9—Mustang Front Fender Installation



N 1365 - B

FIG. 10—Comet Front Bumper Installation

INSTALLATION

1. Transfer the two nuts and retainers to the new bumper guard. Transfer the rubber spacers to the new bumper guard.

2. Position the bumper guard on the car and install the two retaining screws and washers.

3. Install the spare tire assembly.

EXTERIOR MOULDINGS

Before removing the exterior mouldings, it should be determined by the type of retainer used whether a respective door, quarter or luggage compartment trim panel must first be removed to provide access (Figs. 17 through 31).

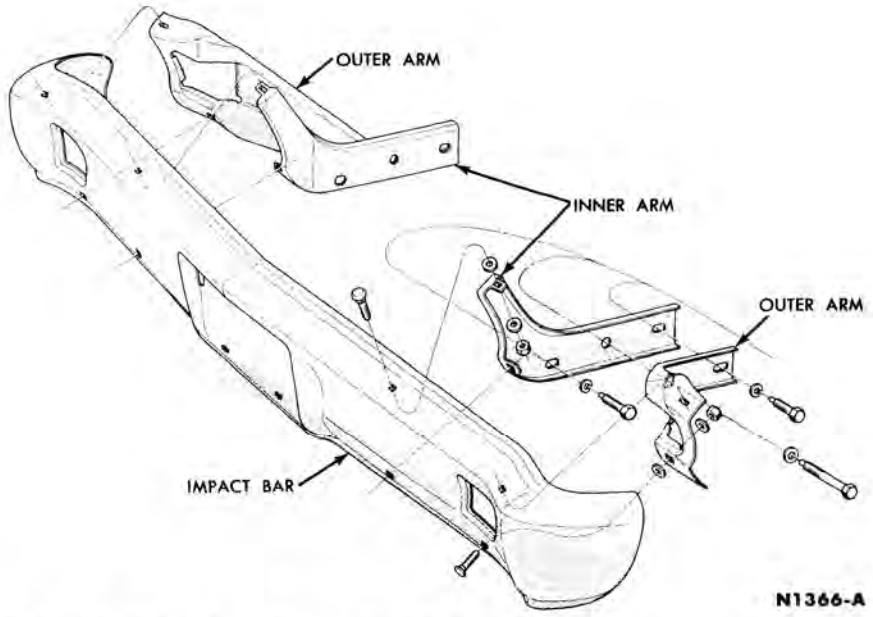


FIG. 11—Falcon Front Bumper Installation

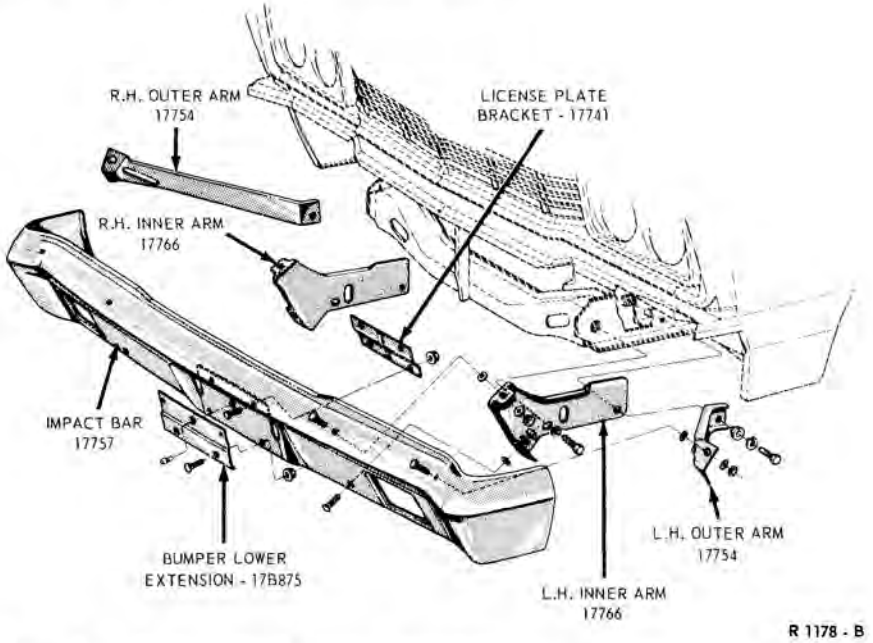


FIG. 12—Fairlane Front Bumper Installation

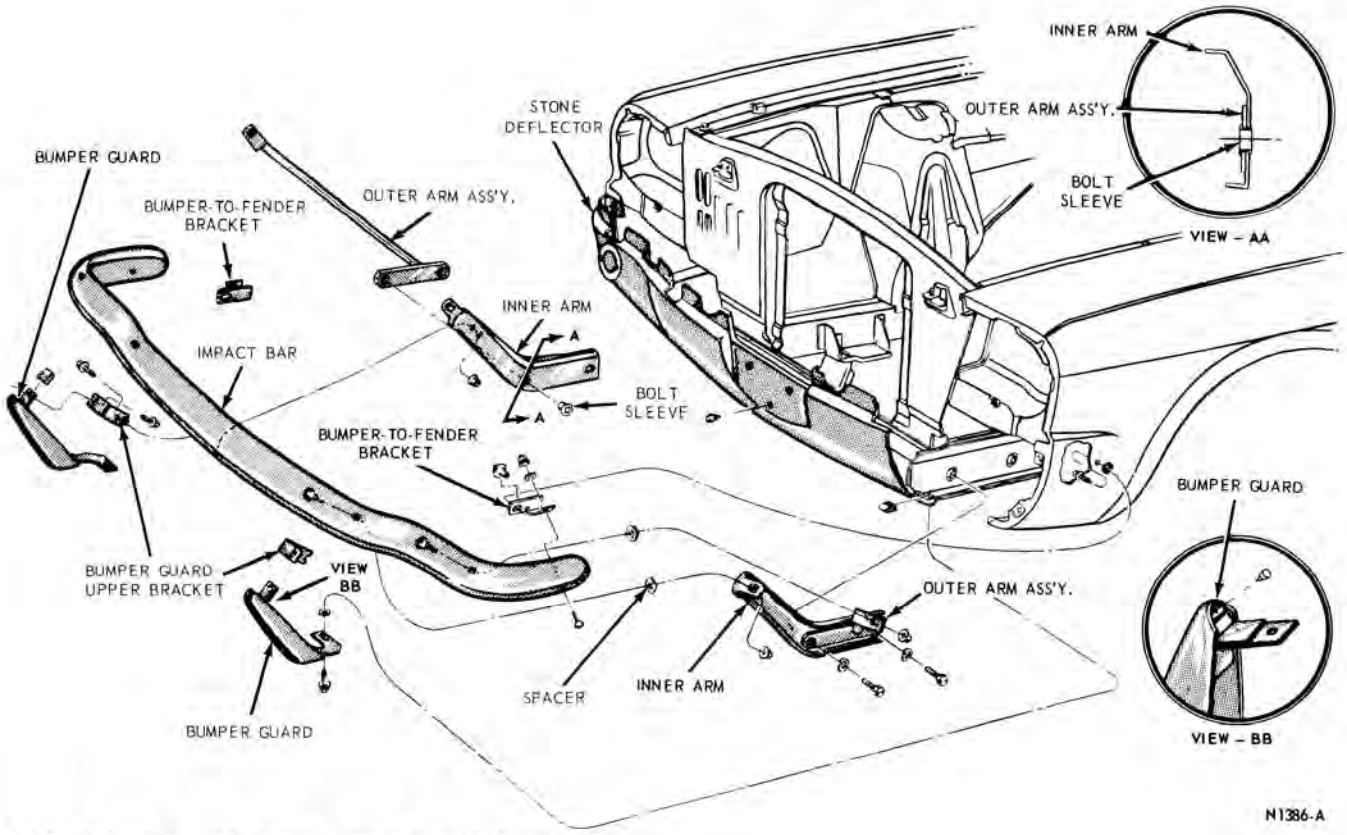


FIG. 13–Mustang Front Bumper Installation

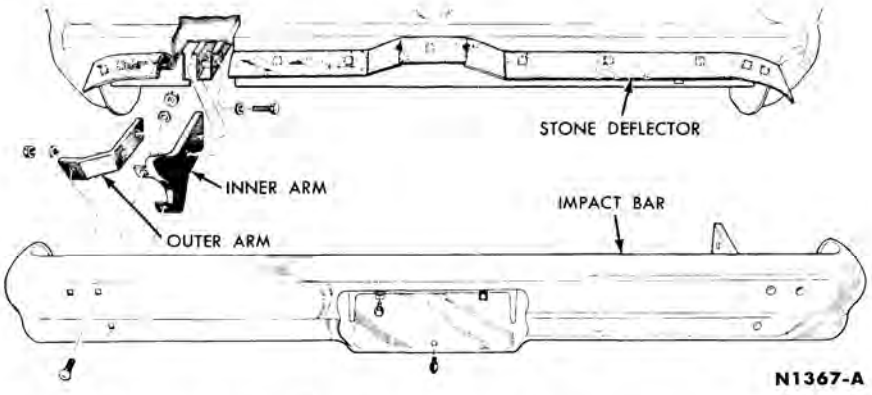
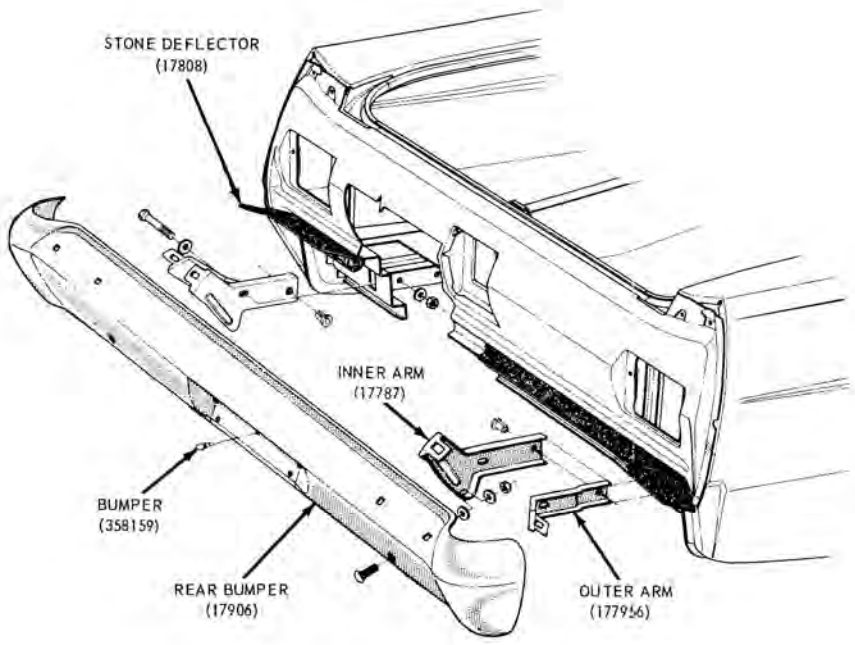
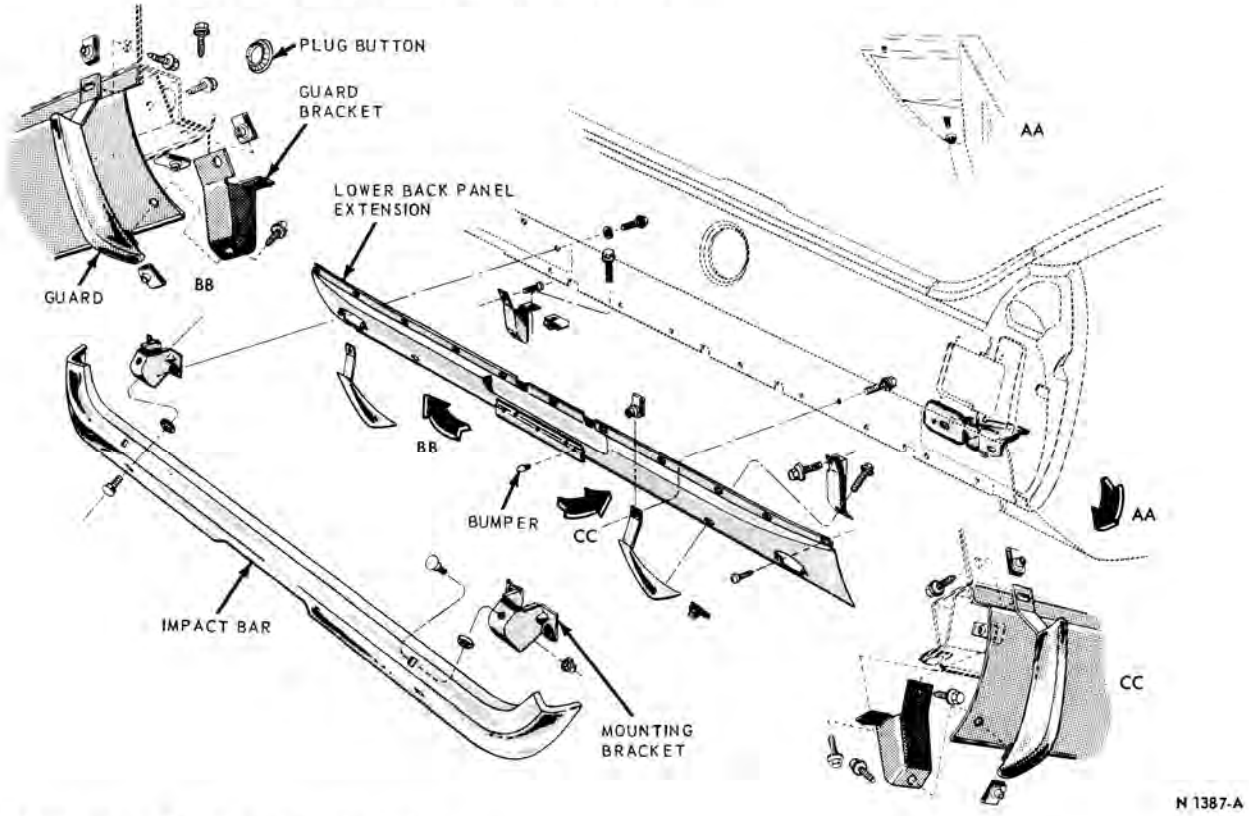


FIG. 14–Comet, Falcon Rear Bumper Installation



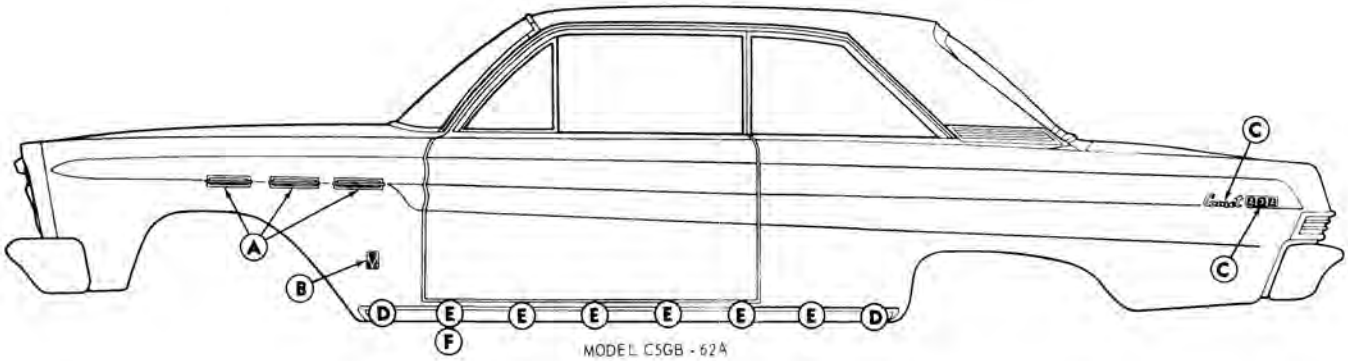
N1417-A

FIG. 15—Fairlane Rear Bumper Installation

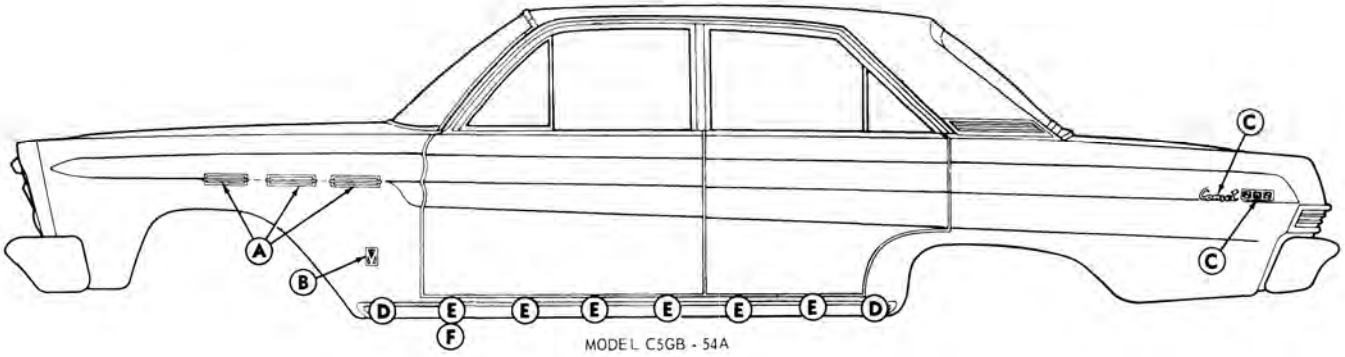


N 1387-A

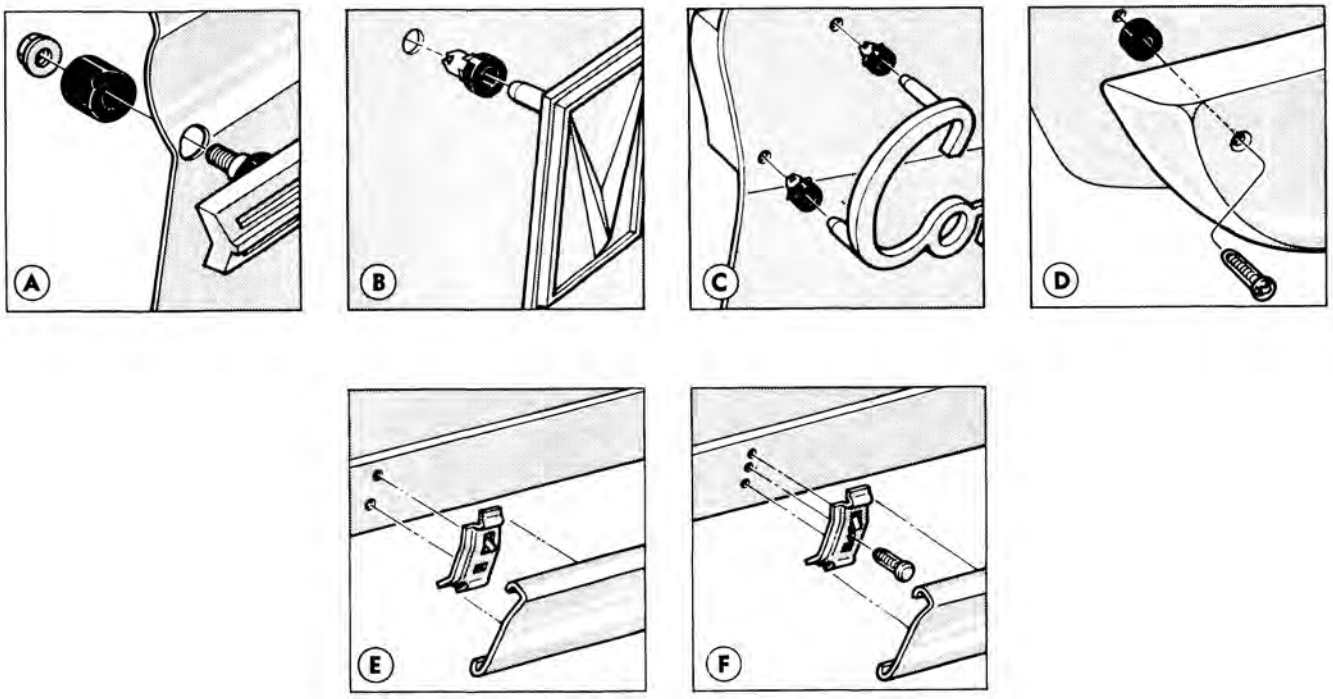
FIG. 16—Mustang Rear Bumper Installation



MODEL C5GB - 62A

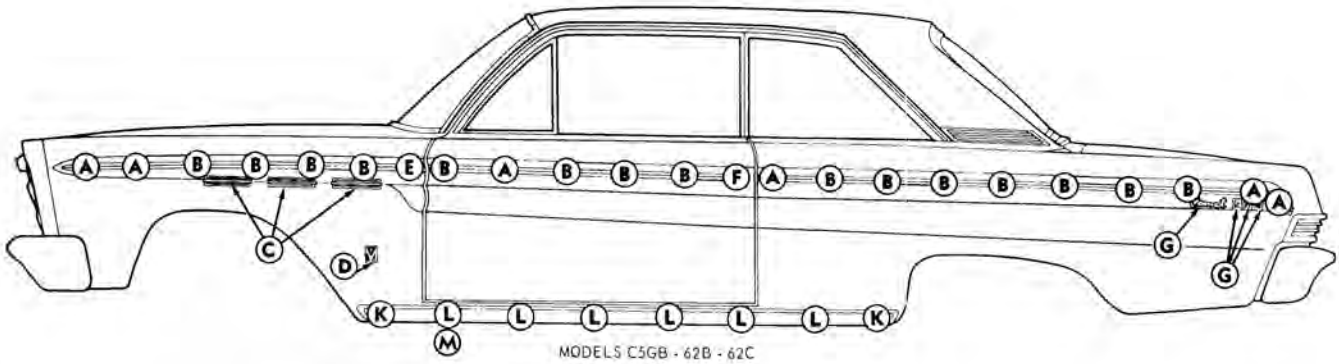


MODEL C5GB - 54A

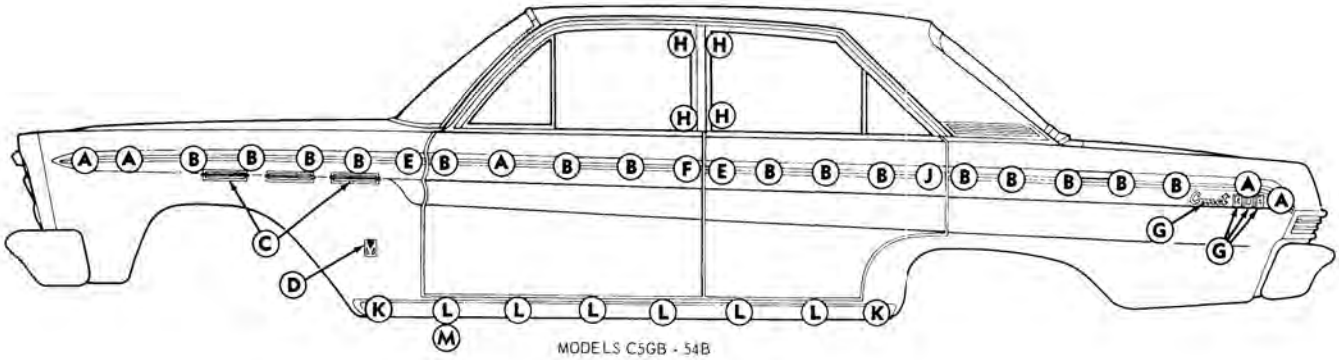


N 1373 - B

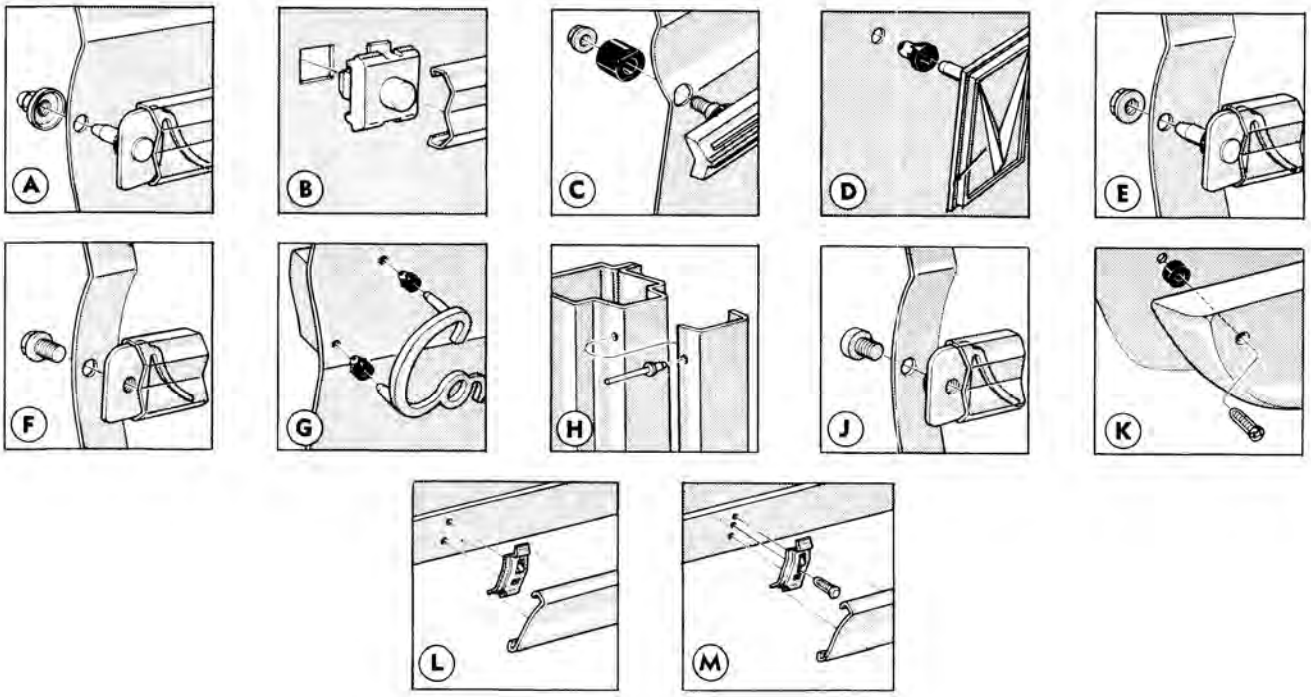
FIG. 17—Exterior Mouldings—Comet Models 54A, 62A



MODELS C5GB - 62B - 62C

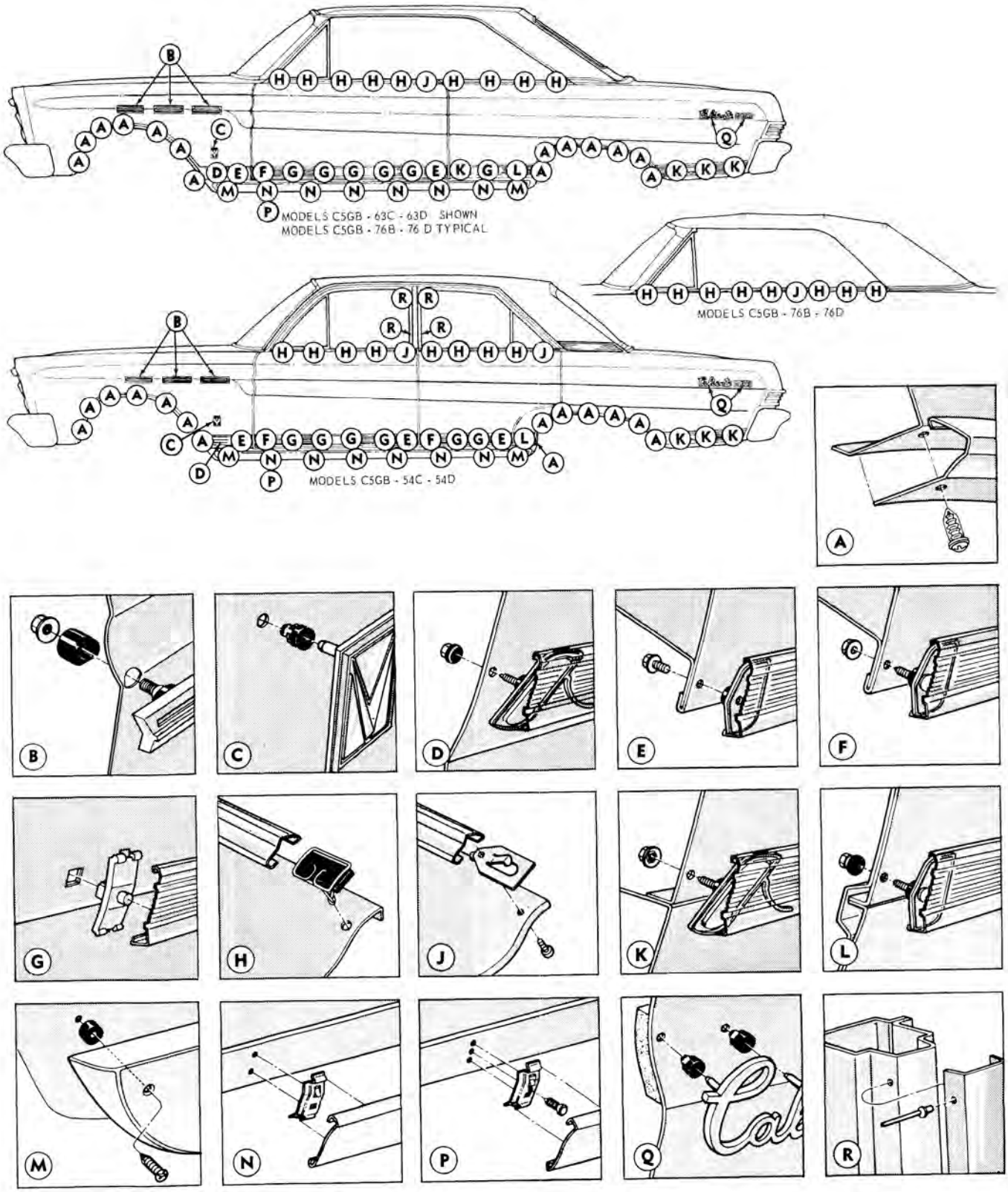


MODELS C5GB - 54B



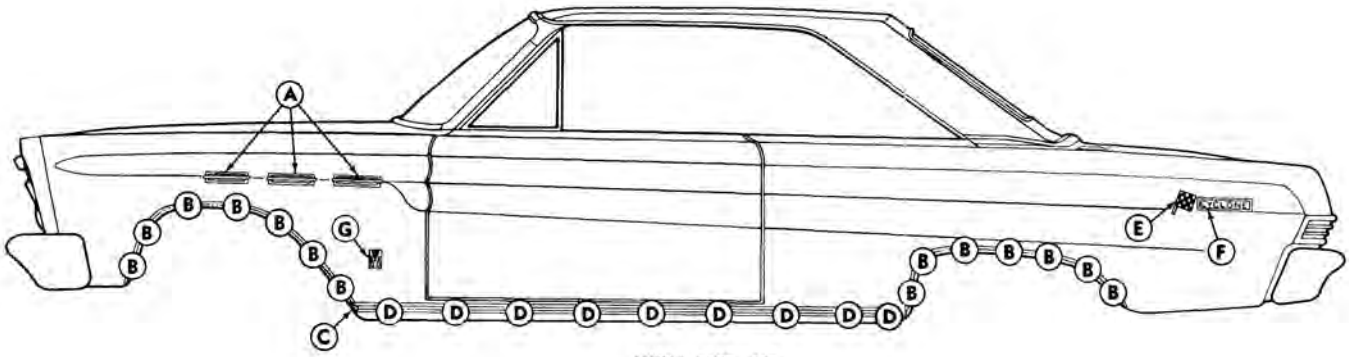
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FIG. 18–Exterior Mouldings–Comet Models 54B, 62B, 62C

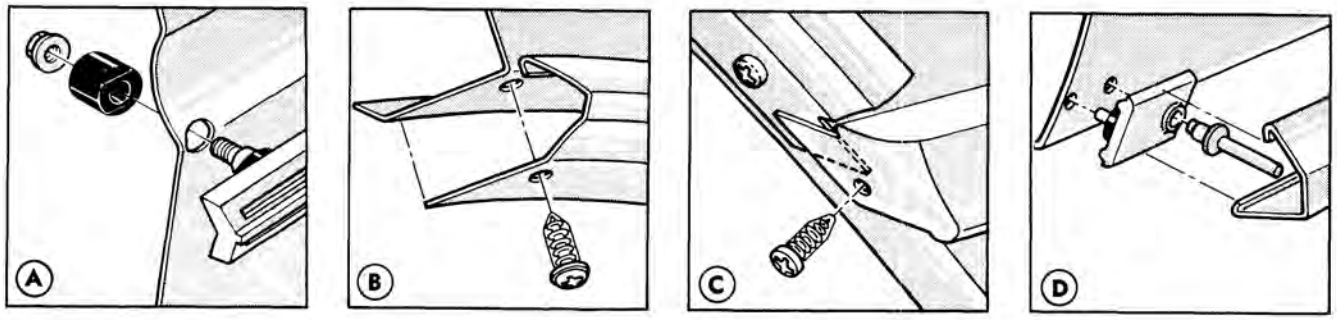


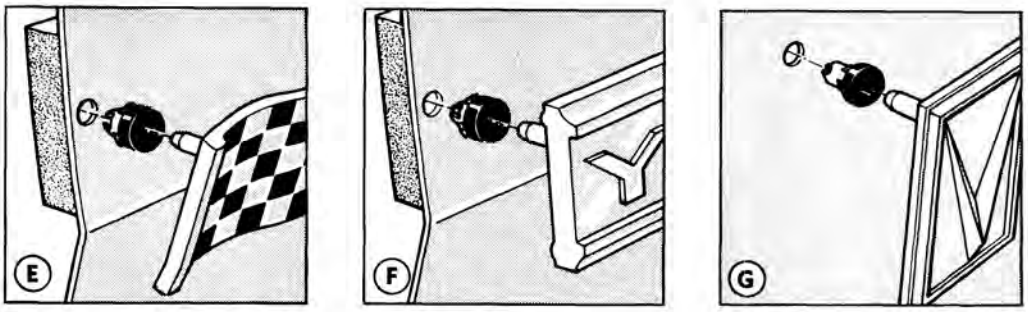
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FIG. 19—Exterior Mouldings—Comet Models 54C, 54D, 63C, 63D, 76B, 76D



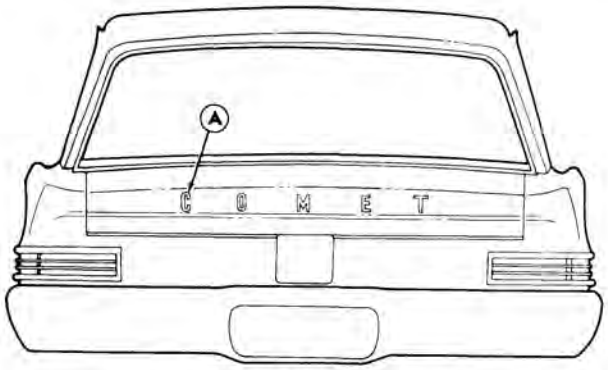
MODEL C5GB - 63E



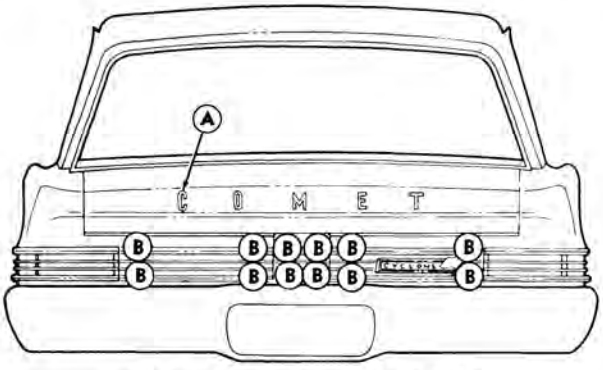


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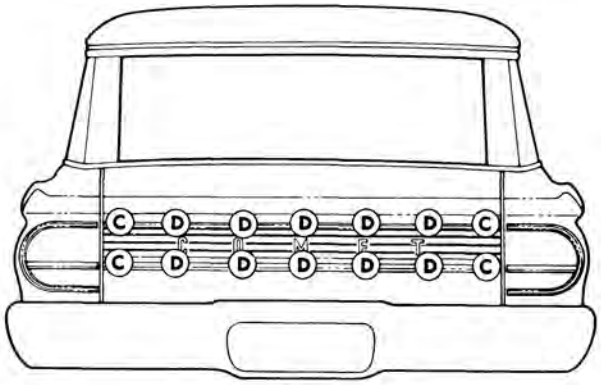
FIG. 20—Exterior Mouldings—Comet Model 71



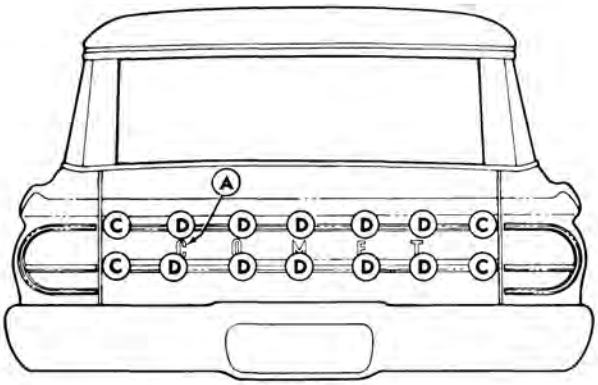
MODELS - 62A - 62B - 54A - 54B



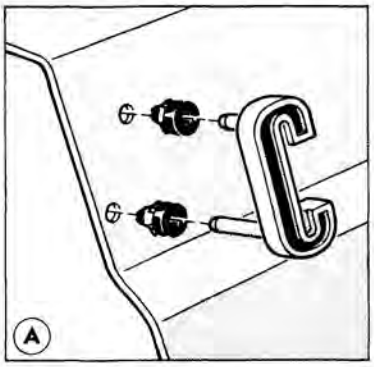
MODELS - 54C - 54D - 63C - 63D - 63E - 76B - 76D

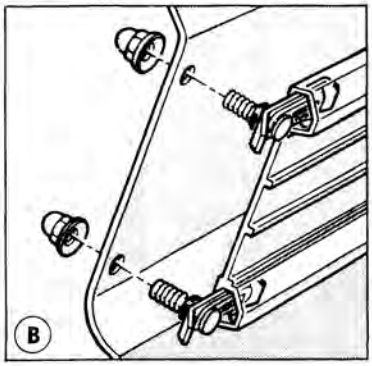


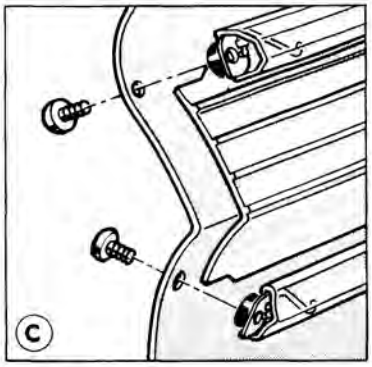
MODEL - 71B

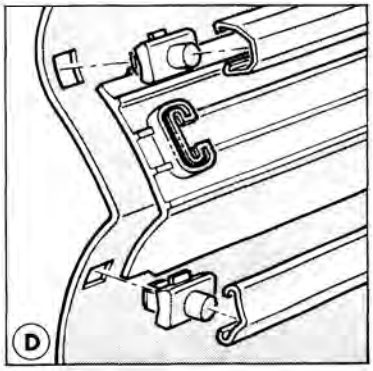


MODELS 71A - 71C



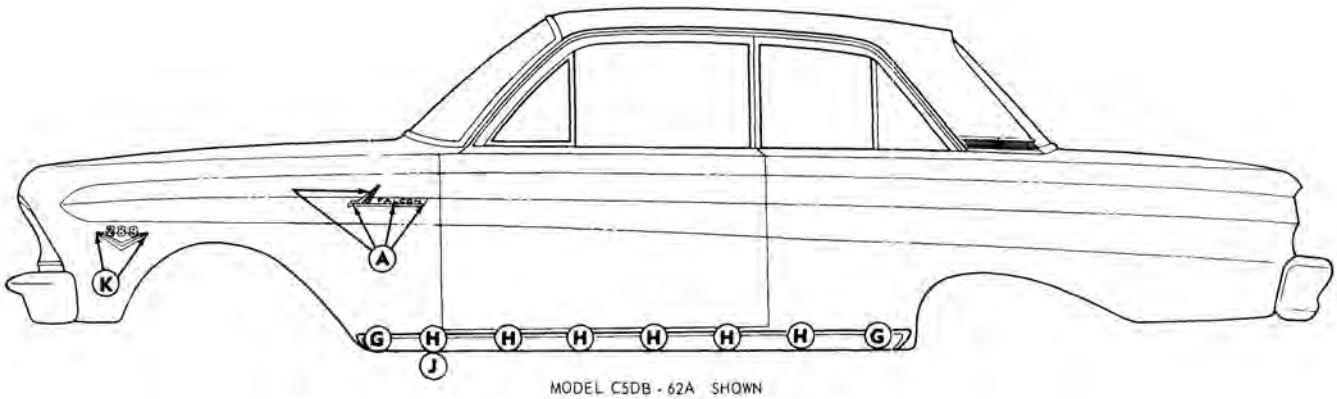




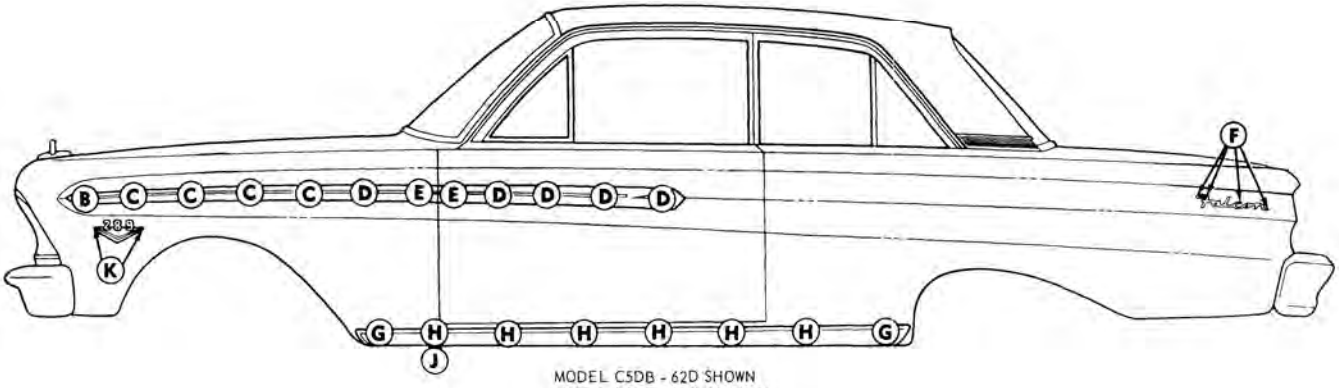


N 1377 - B

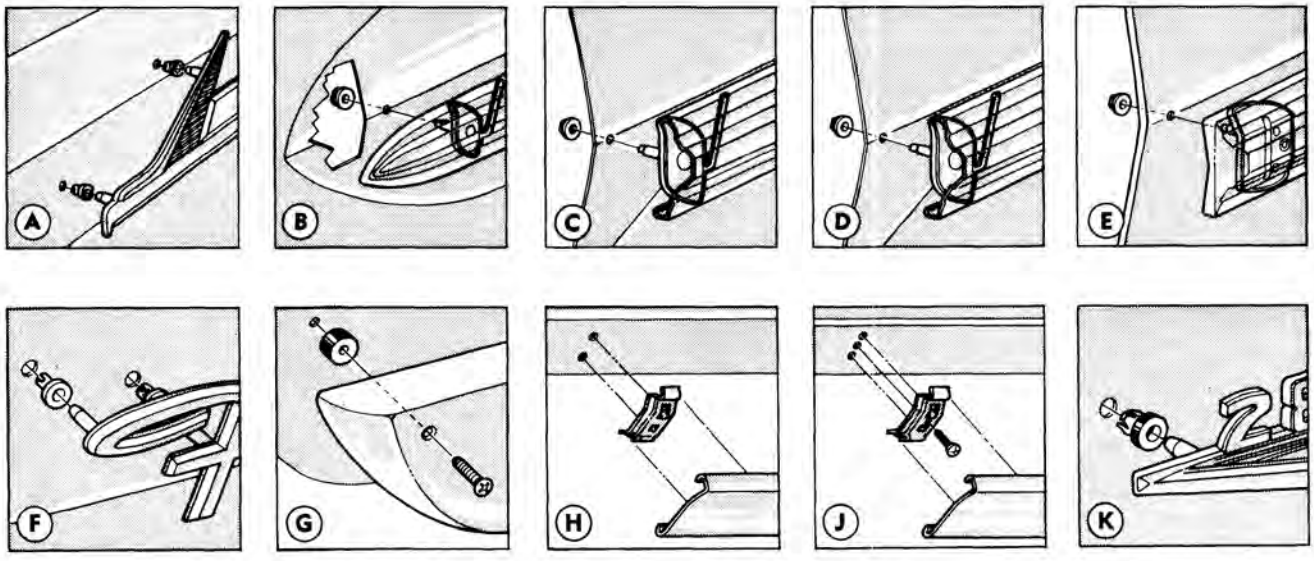
FIG. 21—Exterior Rear Mouldings—Comet Models (All)



MODEL C5DB - 62A SHOWN
MODEL C5DB - 54A TYPICAL

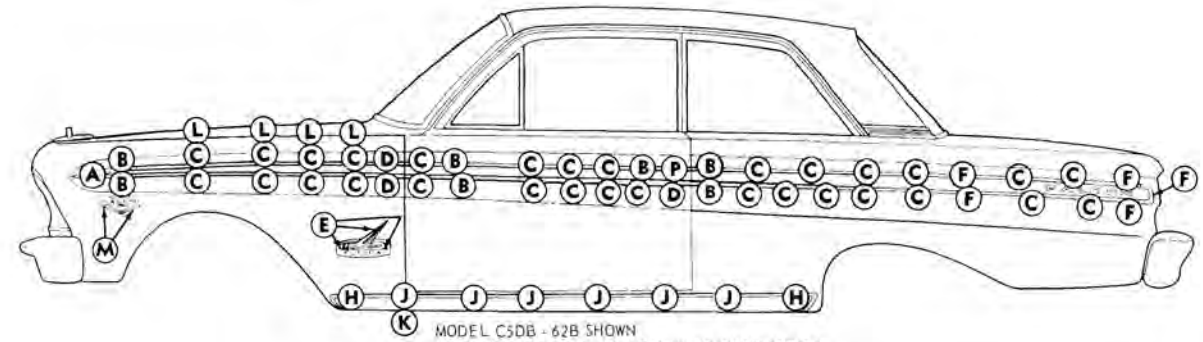


MODEL C5DB - 62D SHOWN
MODEL C5DB - 54D TYPICAL

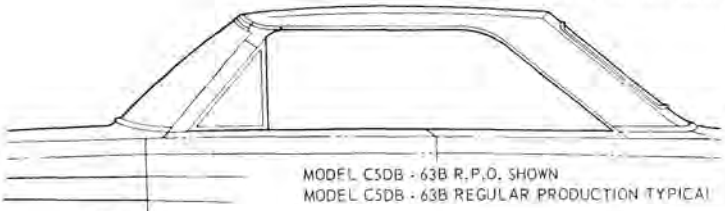


N 1368 - B

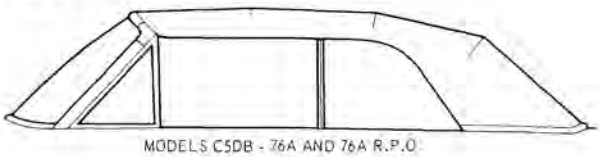
FIG. 22—Exterior Mouldings—Falcon Models 54A, 54D, 62A, 62D



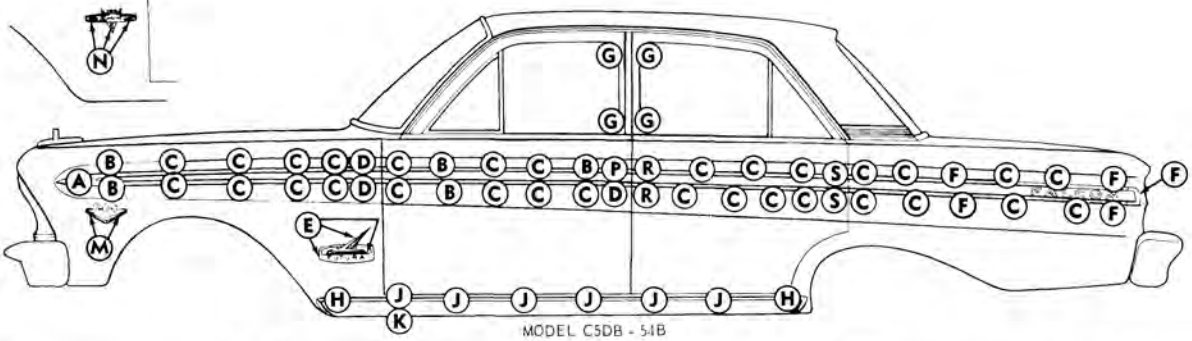
MODEL C5DB - 62B SHOWN
MODELS C5DB - 63B - 76A REGULAR PRODUCTION
AND MODELS C5DB - 63B - 76A R.P.O. TYPICAL



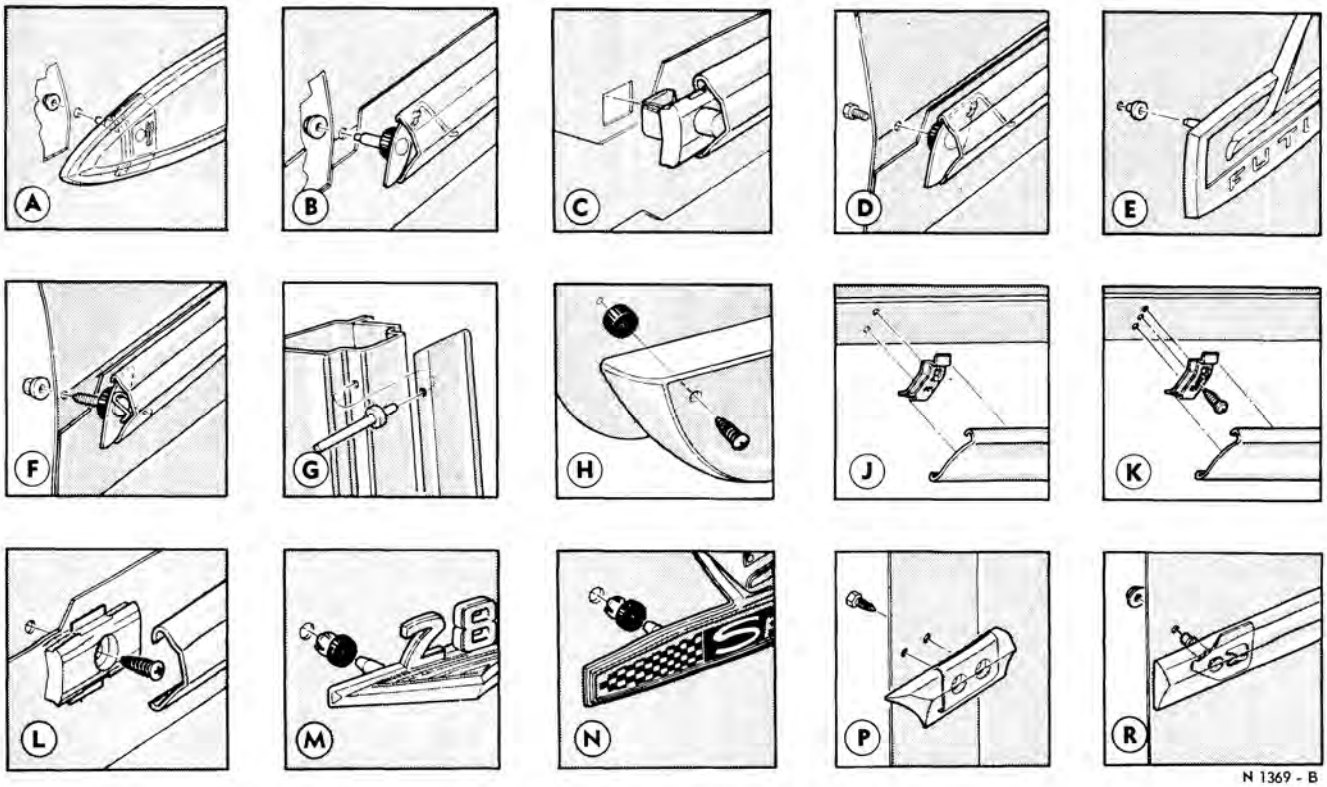
MODEL C5DB - 63B R.P.O. SHOWN
MODEL C5DB - 63B REGULAR PRODUCTION TYPICAL



MODELS C5DB - 76A AND 76A R.P.O.

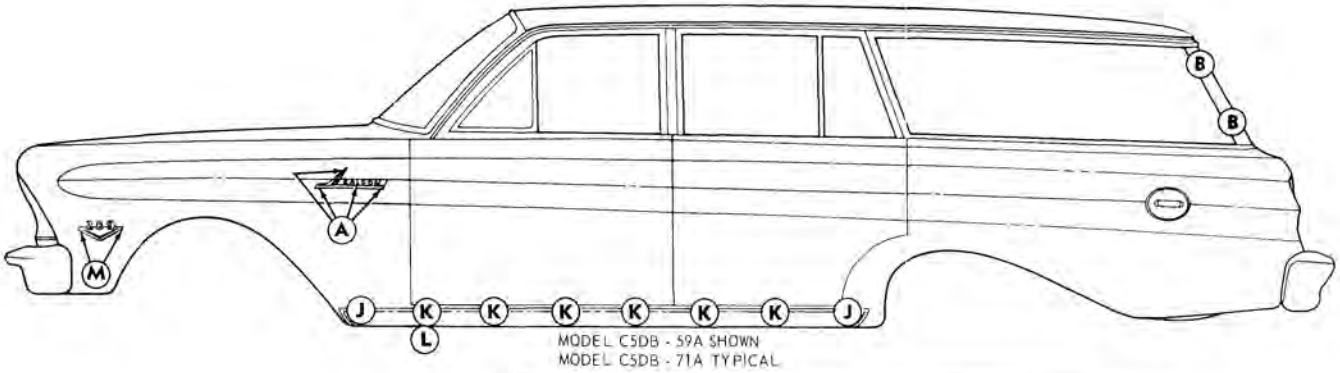


MODEL C5DB - 54B

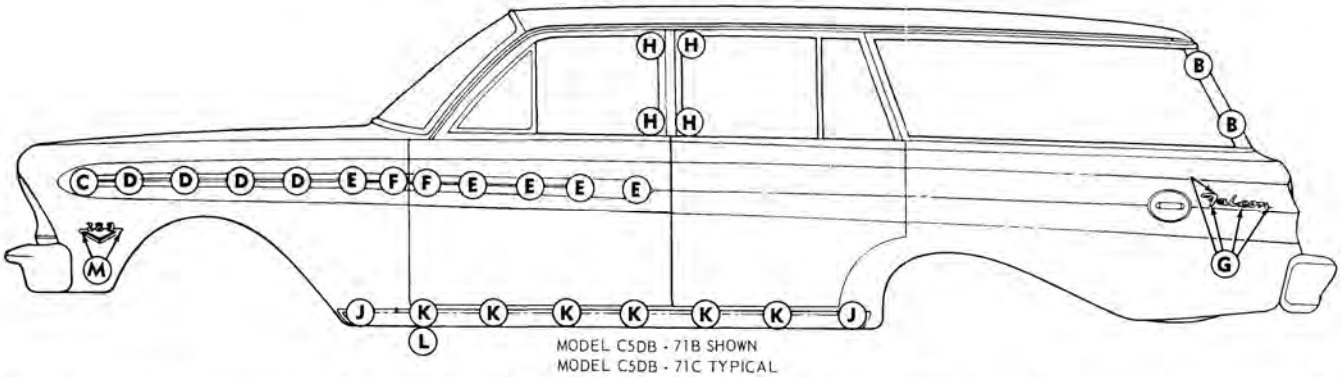


N 1369 - B

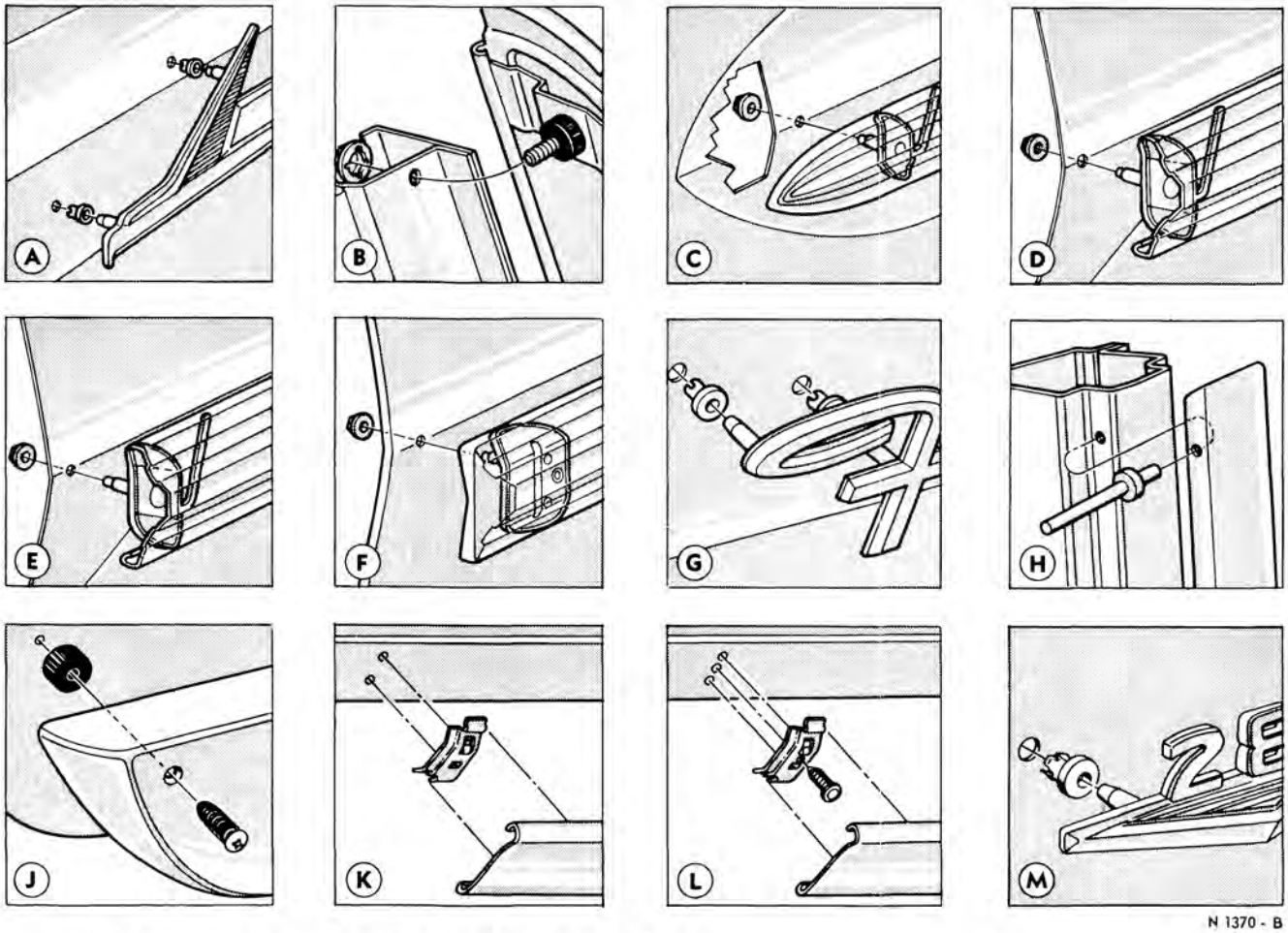
FIG. 23—Exterior Mouldings—Falcon Models 54B, 62B, 63C, 76A, 76B



MODEL C5DB - 59A SHOWN
MODEL C5DB - 71A TYPICAL



MODEL C5DB - 71B SHOWN
MODEL C5DB - 71C TYPICAL



N 1370 - B

FIG. 24—Exterior Mouldings—Falcon Models 59A, 71A, 71B, 71C

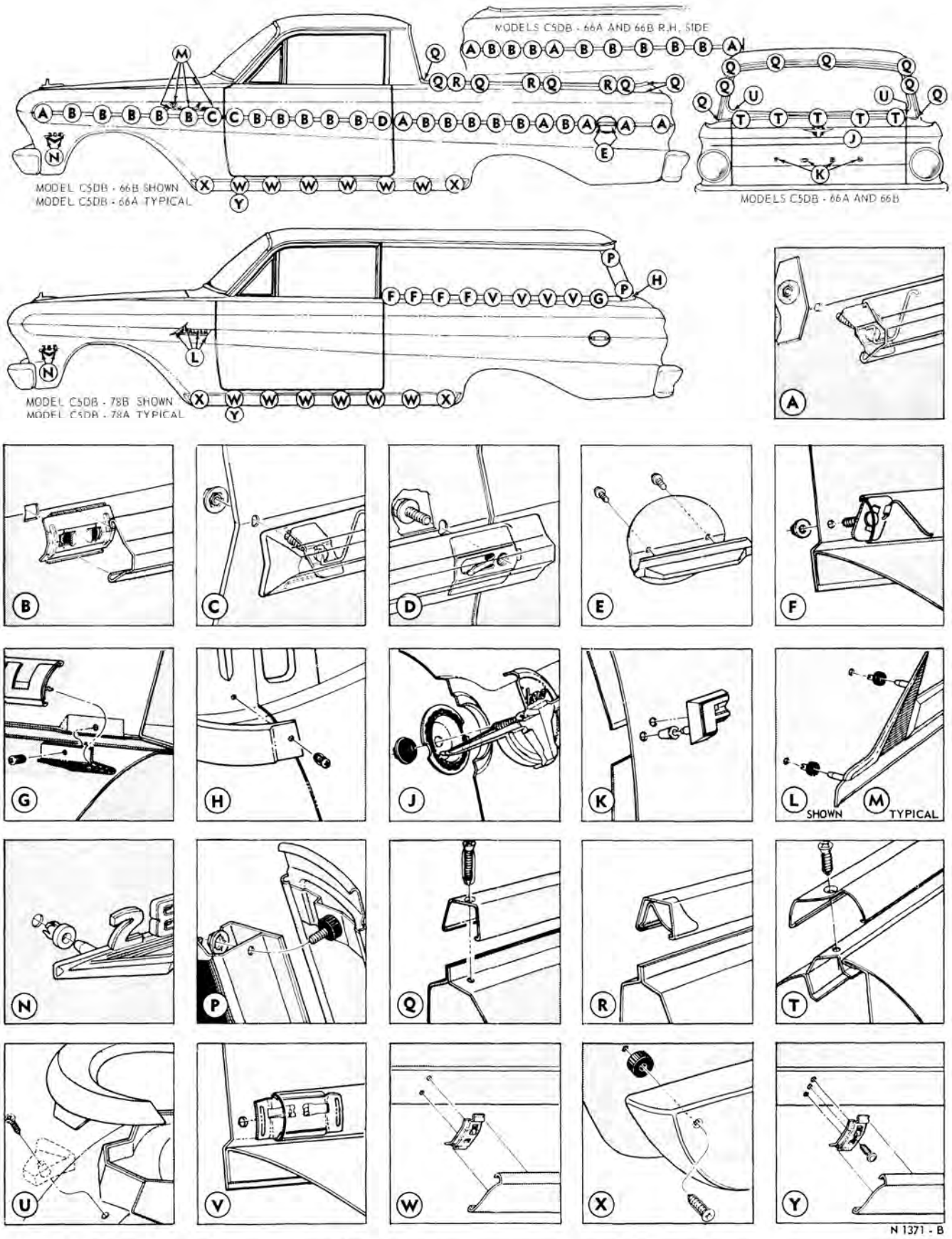
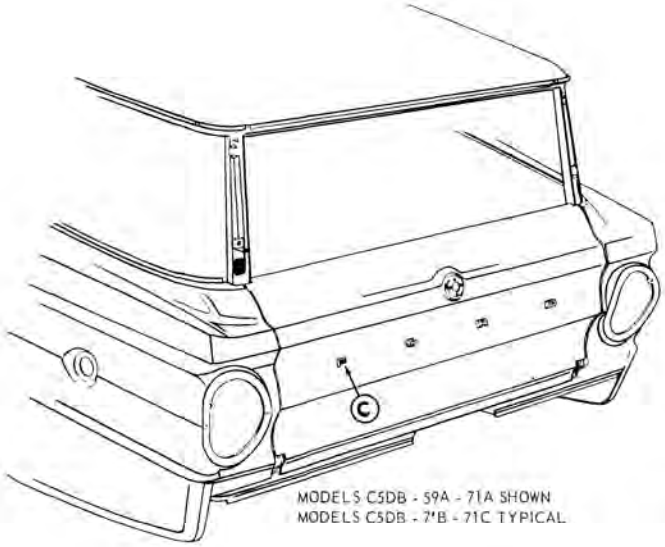
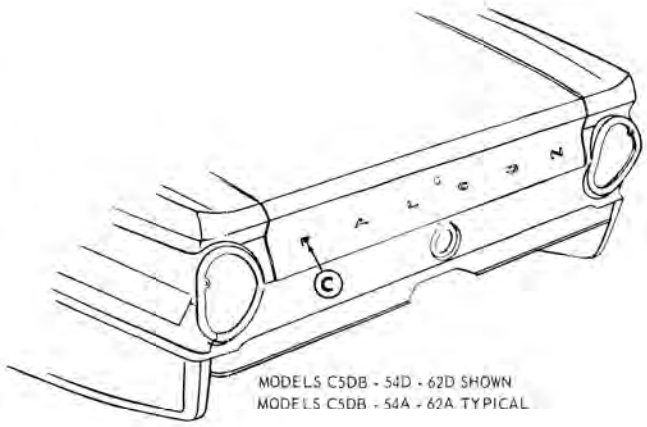
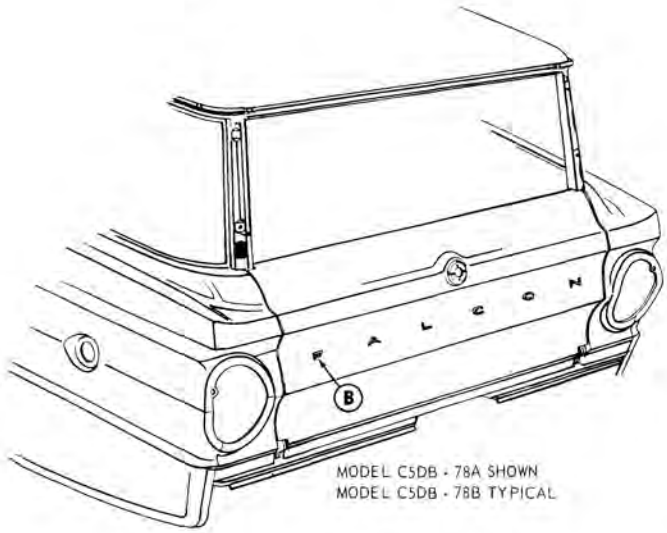
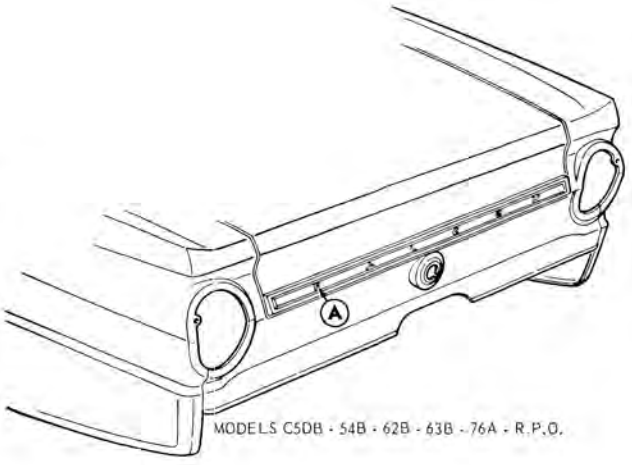


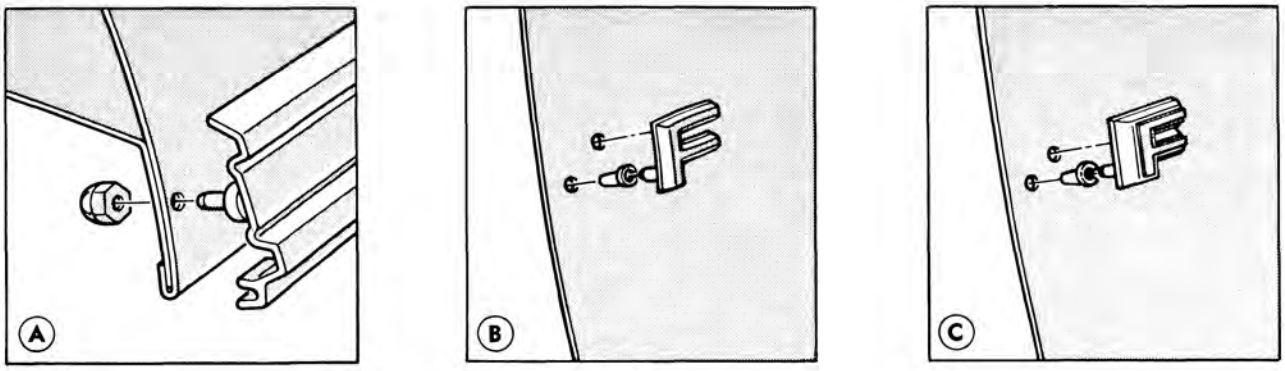
FIG. 25—Exterior Mouldings—Falcon Models 66, 78





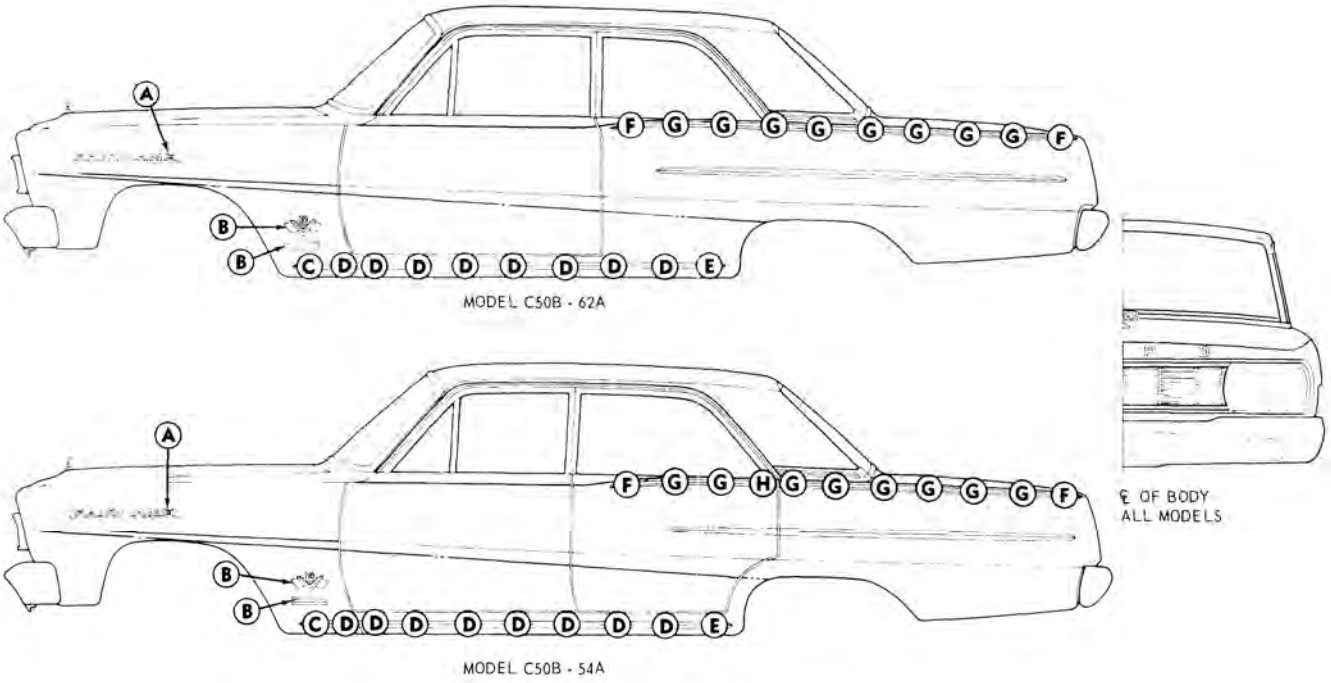


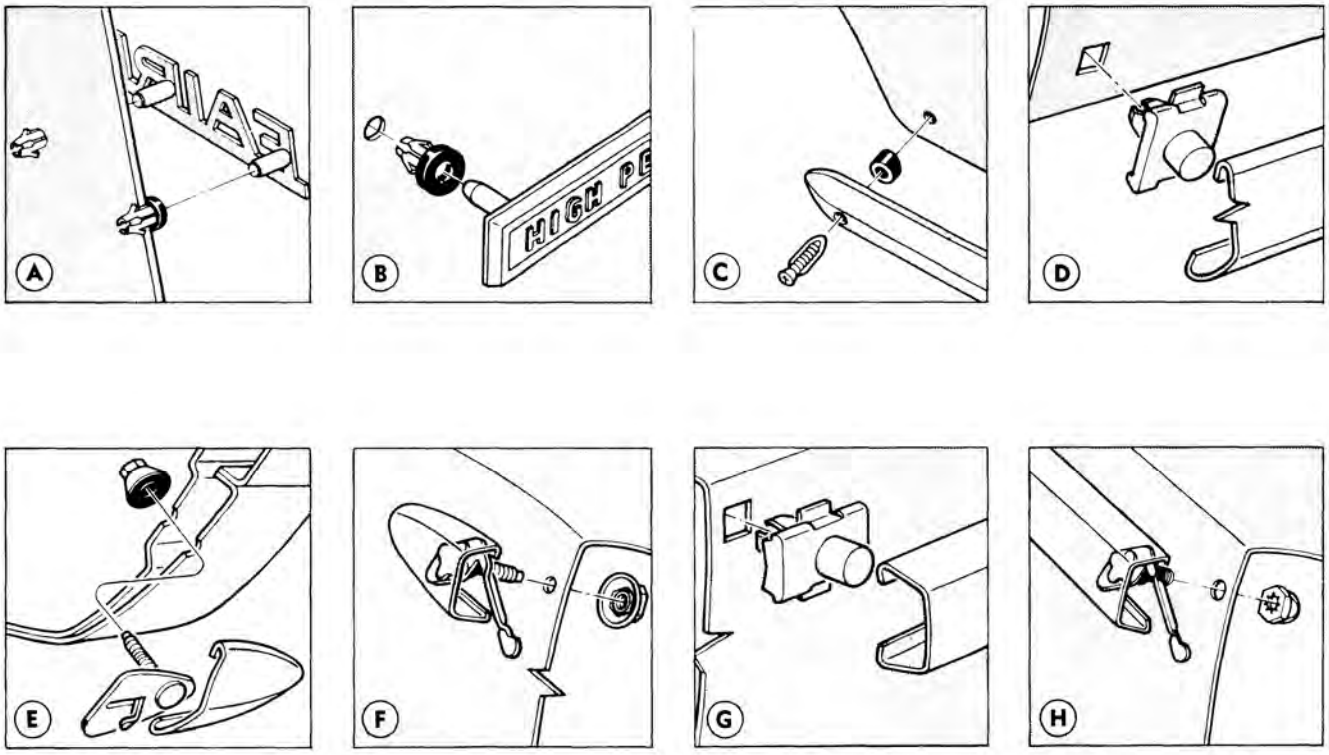




N 1372 - B

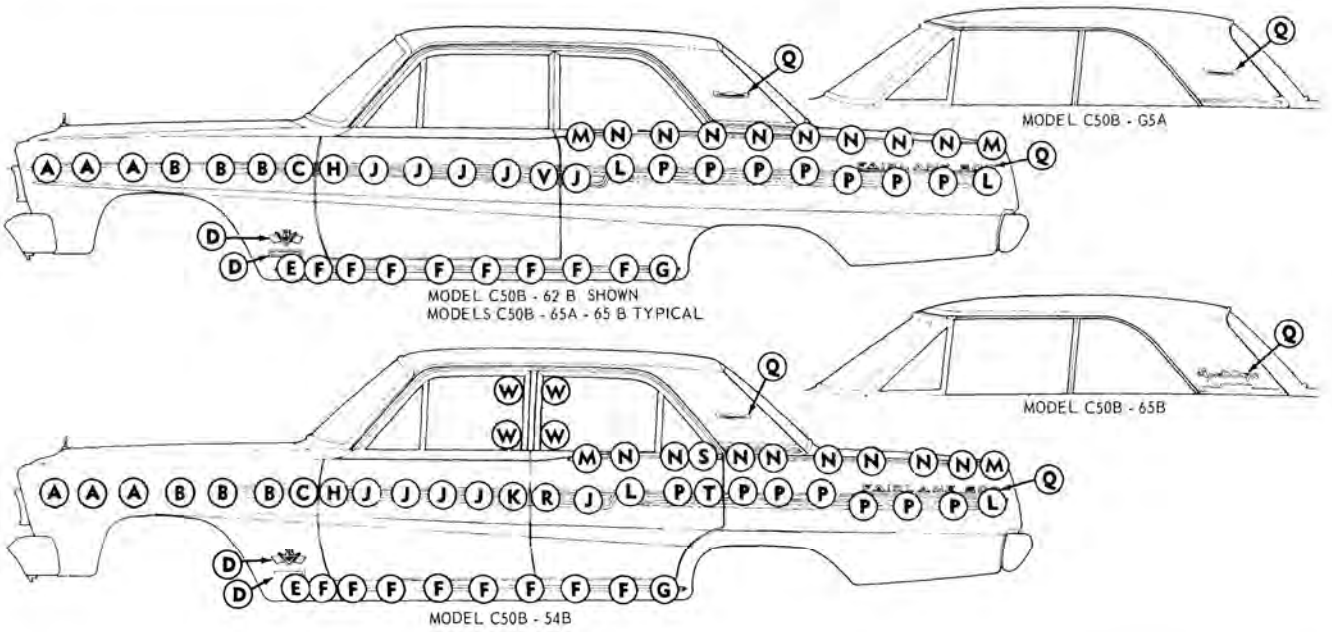
FIG. 26–Exterior Rear Mouldings–Falcon Models (All)





N 1381 - B

FIG. 27—Exterior Mouldings—Fairlane Models 54A, 62A



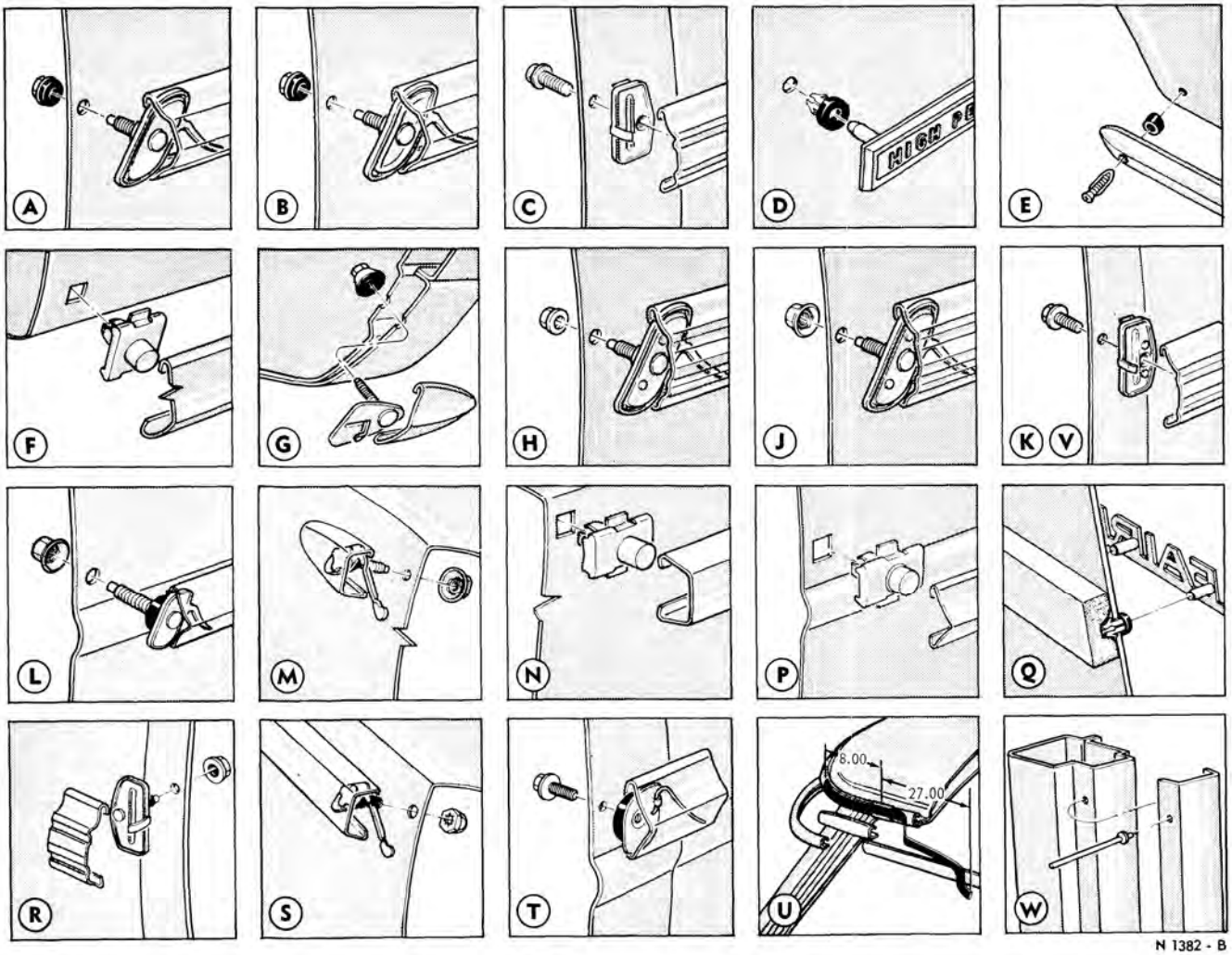
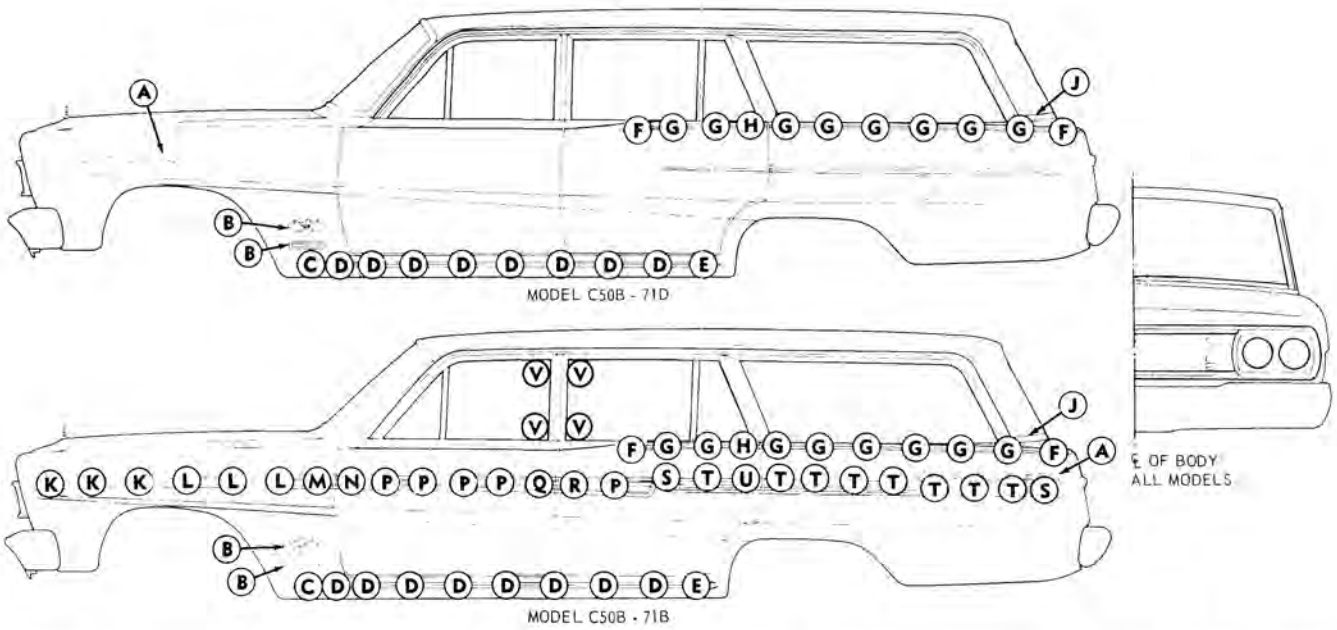


FIG. 28—Exterior Mouldings—Fairlane Models 54B, 62B, 65A, 65B



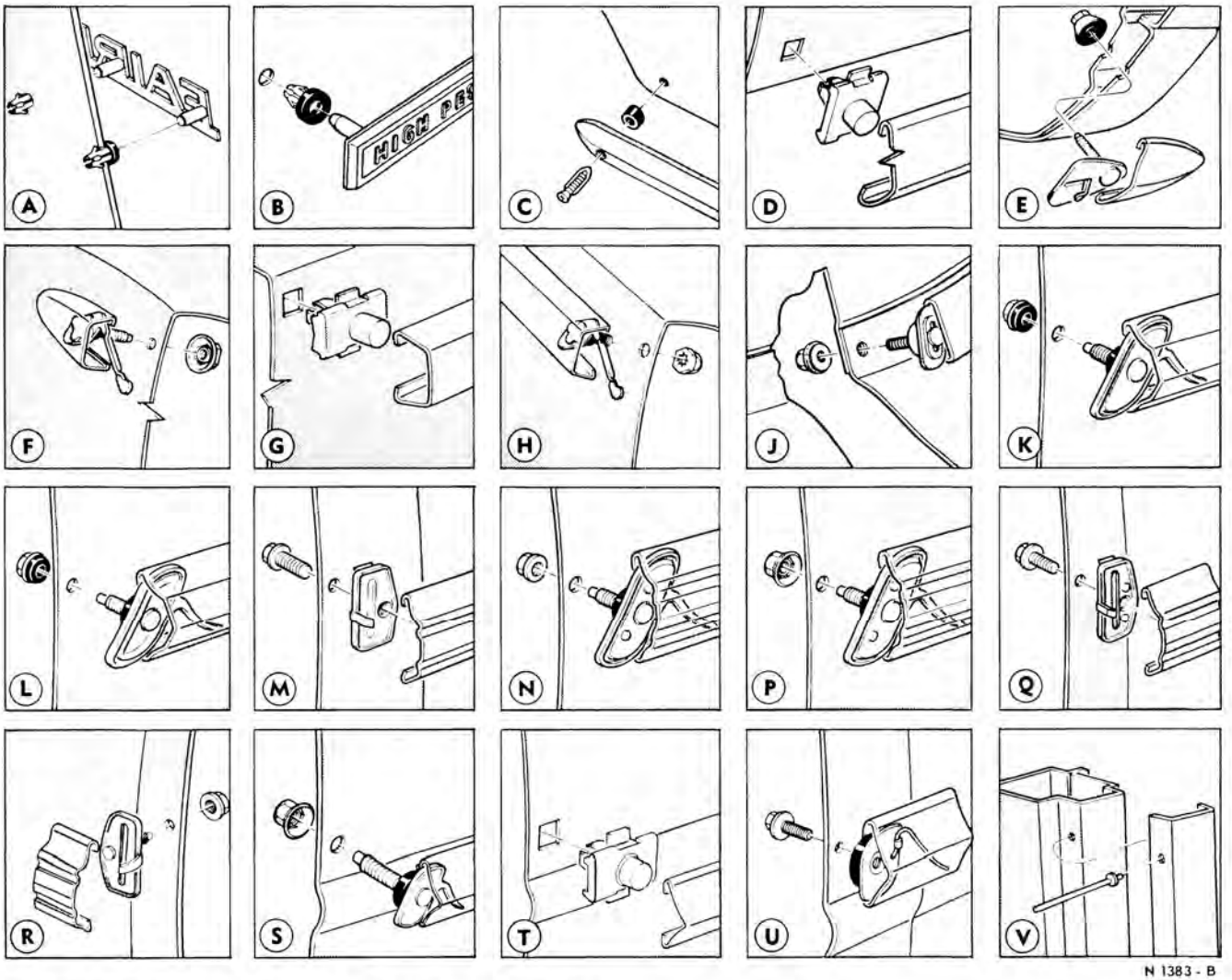
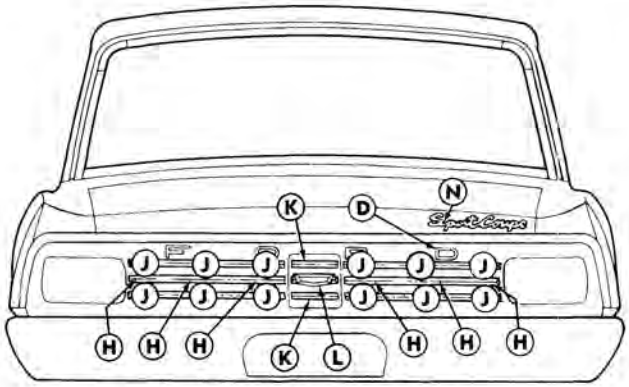
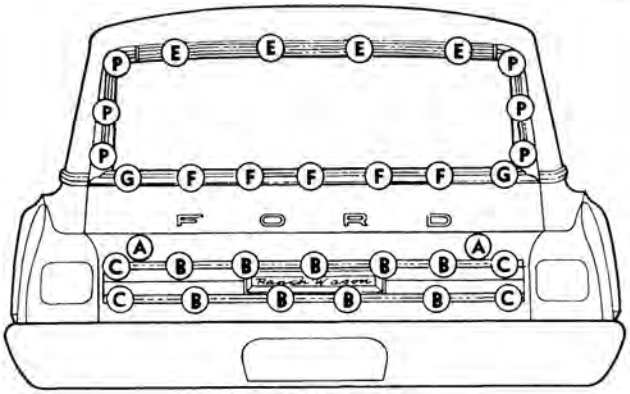


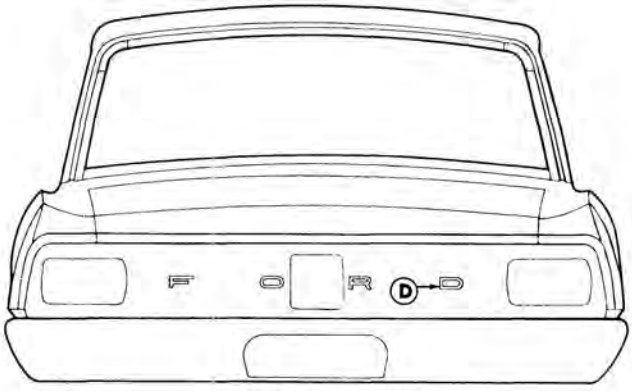
FIG. 29—Exterior Mouldings—Fairlane Models 71B, 71D



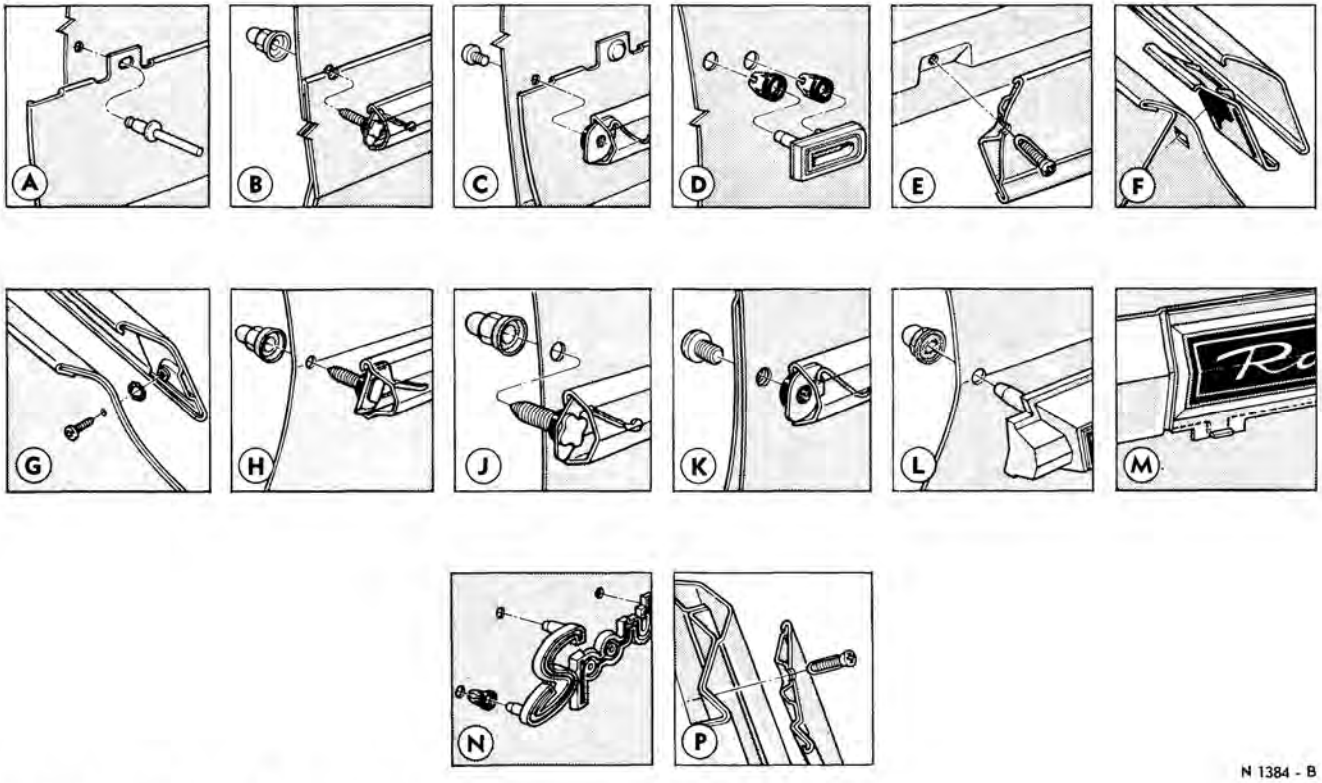
MODELS C50B - 54B - 62B - 65A - 65B



MODELS C50B - 71B - 71D

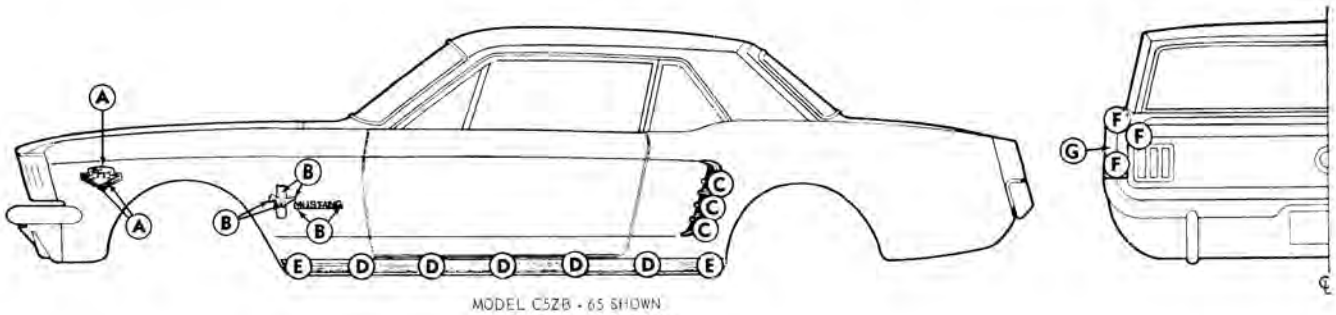


MODELS C50B - 54A - 62A

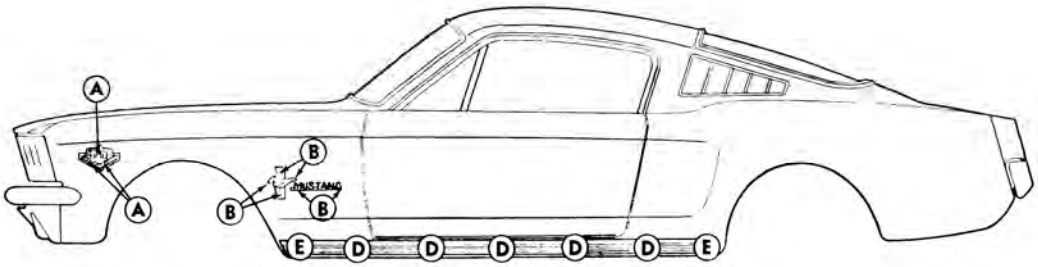


N 1384 - B

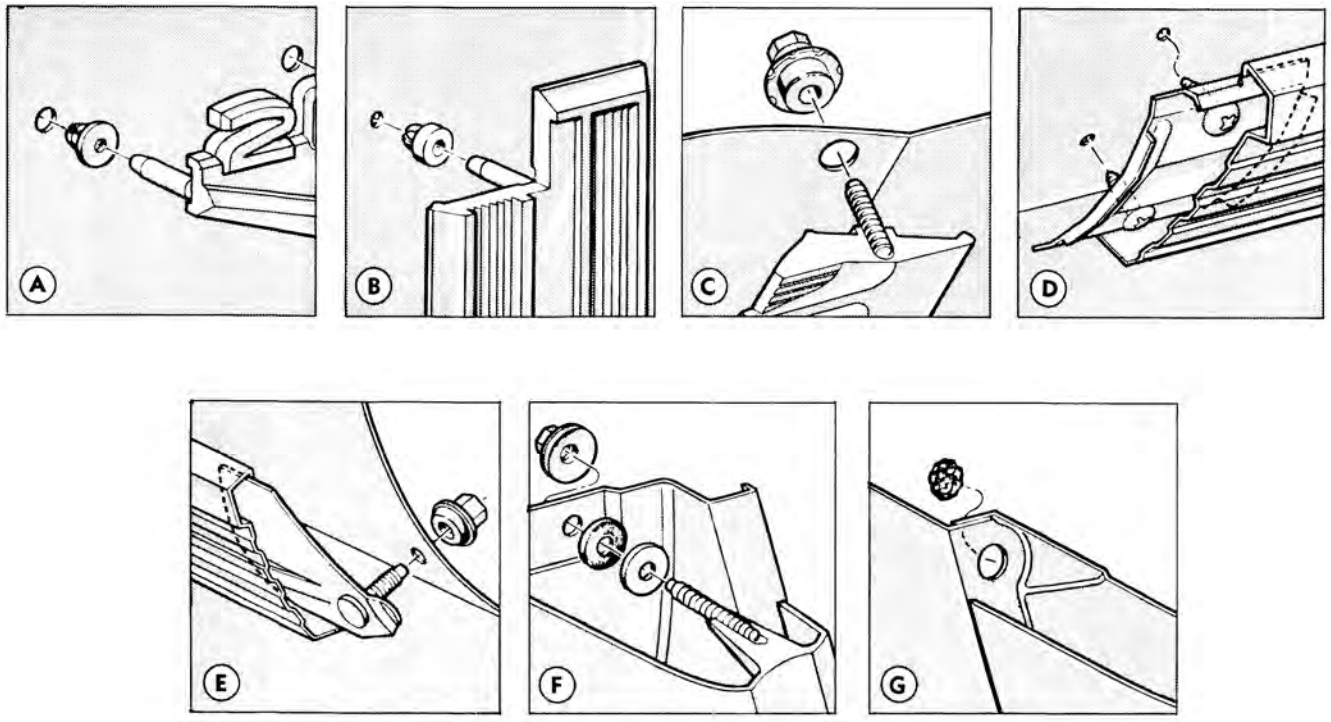
FIG. 30–Exterior Rear Moulding–Fairlane Models (All)



MODEL C5ZB - 65 SHOWN
MODEL C5ZB - 76 TYPICAL



MODEL C5ZB - 63



N 1416 - A

FIG. 31—Exterior Mouldings—Mustang Models (All)

PART 17-3 DOORS, WINDOWS, TAILGATE AND DECK LID

Section	Page	Section	Page
1 In-Car Adjustments and Repairs	17-36	2 Removal and Installation	17-44

1 IN-CAR ADJUSTMENTS AND REPAIRS

DOOR ALIGNMENT

The door hinges provide sufficient adjustment to correct most misalignment conditions. Loosen the door hinge attaching bolts and adjust the door so that it is centered in the door opening when closed. Then, tighten the hinge attaching bolts.

After adjustment at the hinge attaching points, check the alignment between the door lock and striker plate for proper door closing. **Do not cover up poor door adjustment with striker plate adjustment.**

LOCK STRIKER ADJUSTMENT

The striker pin can be adjusted laterally and vertically as well as fore and aft. **The lock striker should not be adjusted to correct door sag.** The lock striker should be shimmed to get the clearance shown in Fig. 1 between the lock striker and the lock. To check this clearance, clean the lock jaws and the striker area, and then apply a thin layer of dark grease to the lock striker. As the door is closed and opened, a measurable pattern will result. Move the striker assembly laterally to provide a flush fit at the door and the pillar or quarter panel.

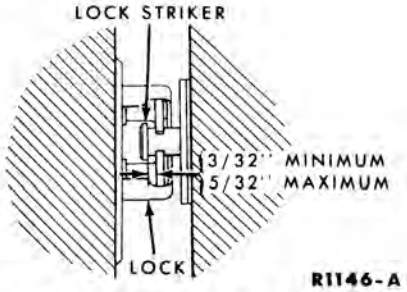


FIG. 1—Door Lock Striker Adjustment

VENT WINDOW ADJUSTMENTS—COMET, FALCON EXCEPT MODELS 63, 76

The vent glass and/or the vent window frame may be adjusted in various ways. With the vent glass installed, the lower pivot spring tension may be adjusted with a socket, extension, and ratchet used through the access hole in the door inner panel. Adjust so that the glass will stay open at highway speeds. The door frame mounting holes are elongated to provide a tight fit for the vent window frame in the door frame. The upper pivot mounting holes are slotted to help provide a weather-proof fit of the glass frame within the vent window frame.

VENT WINDOW ADJUSTMENTS—COMET, FALCON MODELS 63, 76

VERTICAL AND/OR FORE AND AFT

For proper clearance at the body front pillar and at the roof rail weatherstrip, loosen the vent window screw and washer assembly (near the division bar), the front bracket mounting bolt, the lateral adjustment lock nut, and the vent window mounting bolt. Move the vent window as required, and tighten the mountings (Fig. 2).

LATERAL

To align the vent window with the front pillar and/or the door glass,

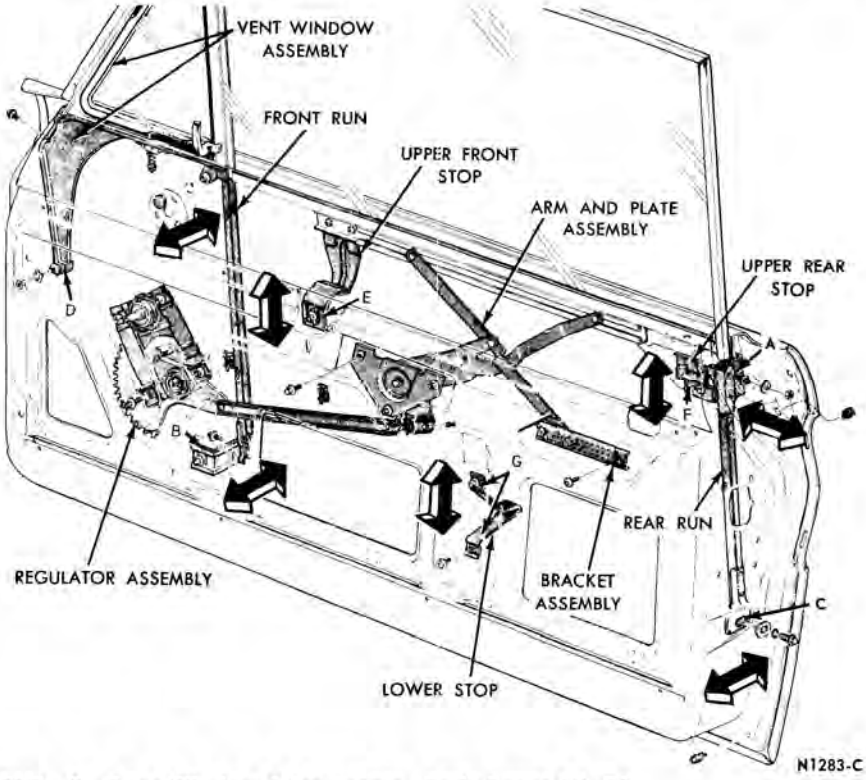


FIG. 2—Door Window Adjustments—Body Types 63, 76

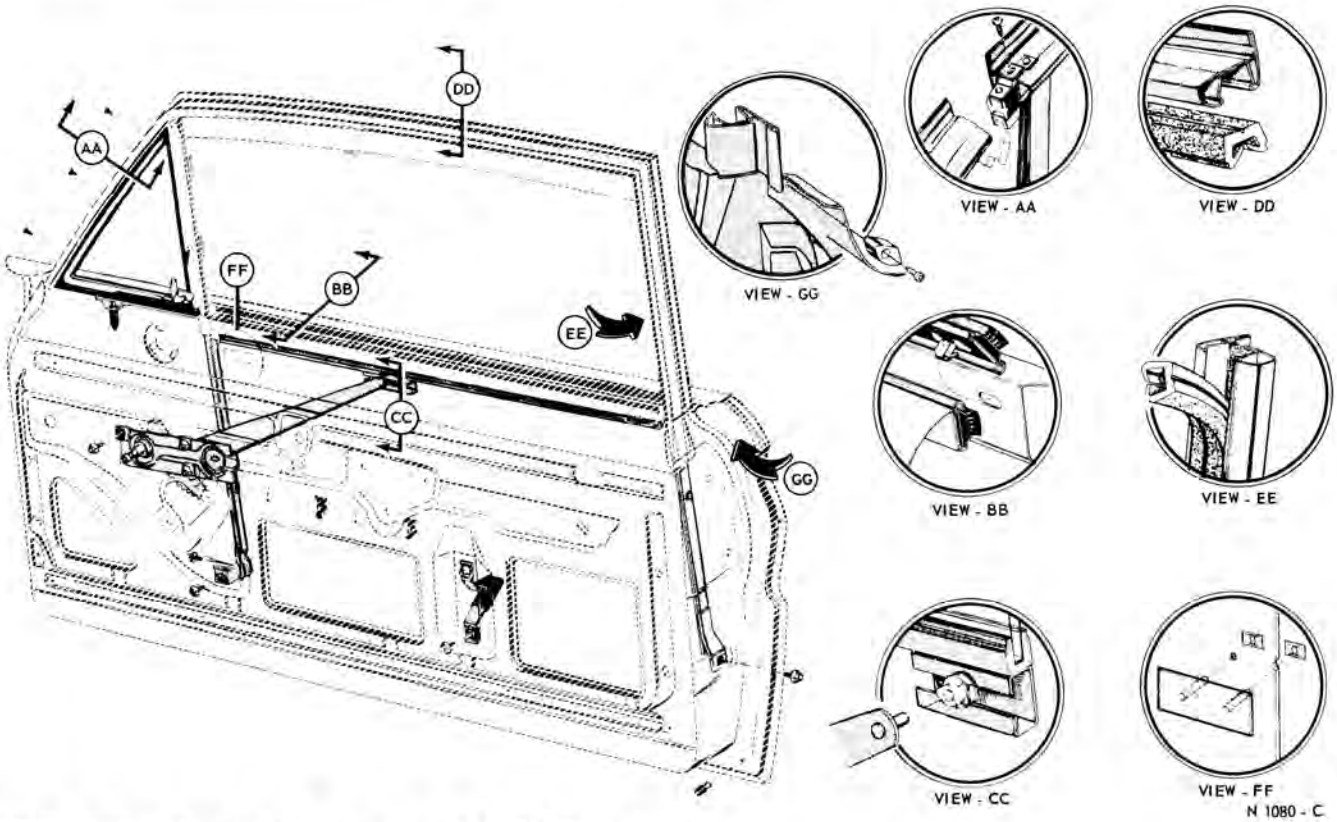


FIG. 3—Front Door—Body Types Except 63, 76—Typical

loosen the lateral adjustment lock nut (Fig. 2), the vent window mounting bolt, the front bracket mounting bolt, and the vent window screw and washer assembly (near the division bar). Adjust the lateral position of the vent window by turning the adjustment allen screw, and then tighten the mountings.

VENT WINDOW TENSION

With the vent glass installed, the lower pivot spring tension may be adjusted with a socket, extension, and ratchet used through the access hole in the door inner panel. Adjust so that the glass will stay open at highway speeds.

FRONT DOOR GLASS ADJUSTMENT—COMET, FALCON MODELS 63, 76

The door must be properly adjusted to the body opening before any glass adjustments are made. The door trim panel must be removed to make any of the following adjustments.

Fore-and-aft adjustment for snug glass fit within the runs is made by means of the rear run upper adjusting screw at A (Fig. 2).

Lateral adjustment for smooth movement of the glass within the runs can be made by moving the lower ends of both the front and rear runs at B and C. The vent window assembly and upper portion of the front run can be moved laterally by means of an adjusting screw which is accessible through an opening in the door inner panel at D (Fig. 2).

Two adjustable stops (at E and F) limit the upward travel of the window, and one adjustable stop (at G) limits its downward travel (Fig. 2).

FRONT DOOR GLASS ADJUSTMENTS—COMET, FALCON EXCEPT MODELS 63, 76

The door trim panel must be removed to make any of the following adjustments.

Fore-and-aft adjustment for snug glass fit within the runs may be made by using suitable shim stock between the front run and the vent window division bar. The front and/or the rear run may also be shimmed at the lower attaching point(s).

Vertical adjustment is possible by means of the single stop (Fig. 3). When the glass is fully lowered, the upper edge should be even with the belt line.

Lateral adjustment for smooth movement of the glass within the runs can be made by moving the lower attaching points of the run (Fig. 3).

DOOR WINDOW ADJUSTMENT—MUSTANG

1. Remove the door trim panel and watershield.

2. With the glass and channel assembly in the up position, the vent window assembly is adjusted forward or backward and up or down at points A to obtain a parallel clearance between the windshield side moulding and the forward edge of the front door vent window frame, typical of Fig. 4. Adjustment fore and aft is to be made so that the glass and channel assembly will operate freely with no binding in the door glass lockside run and retainer assembly, but still have adequate engagement of sliding glass with the vent window division bar run and bracket assembly. Tighten the screw and washer assemblies at point 'A' sufficiently to hold the vent window in position.

3. To obtain proper alignment with the windshield outside side moulding and to obtain the proper interference between the roof rail weatherstrip and the top edge of the vent window frame, the vent window assembly may be tilted toward the inside or outside of the body by rotating the adjusting screw at point B clockwise or counterclockwise. Tighten the jam nut at point B. Then, adjust the set screw at point C until the shoulder of the screw is against the door vent window division bar lower support. Do not create any bind or distort the glass run. After adjustment, tighten the jam nut at point C. Tighten the screw and washer assemblies at point A.

4. To obtain the proper interference of the glass assembly against the outside belt rail weatherstrip and the roof rail weatherstrip, the glass assembly may be adjusted to tilt toward the inside or outside of the body at points D and E. After adjustment, tighten the screw and washer assemblies at points D and E.

5. To obtain a flush condition between the top edge of the glass and channel assembly and the top edge of the vent window frame, the front stop assembly is adjusted up or down at point F; after adjustment, tighten the screw and washer assembly at point F securely. (See View AA, Fig. 4).

6. To make the top edge of the glass assembly parallel to the roof rail weatherstrip, the equalizer arm bracket and the rear stop assembly may be adjusted up or down as required at points G and H. After adjustment, tighten the nuts at points G and the screw and washer assembly, point H securely.

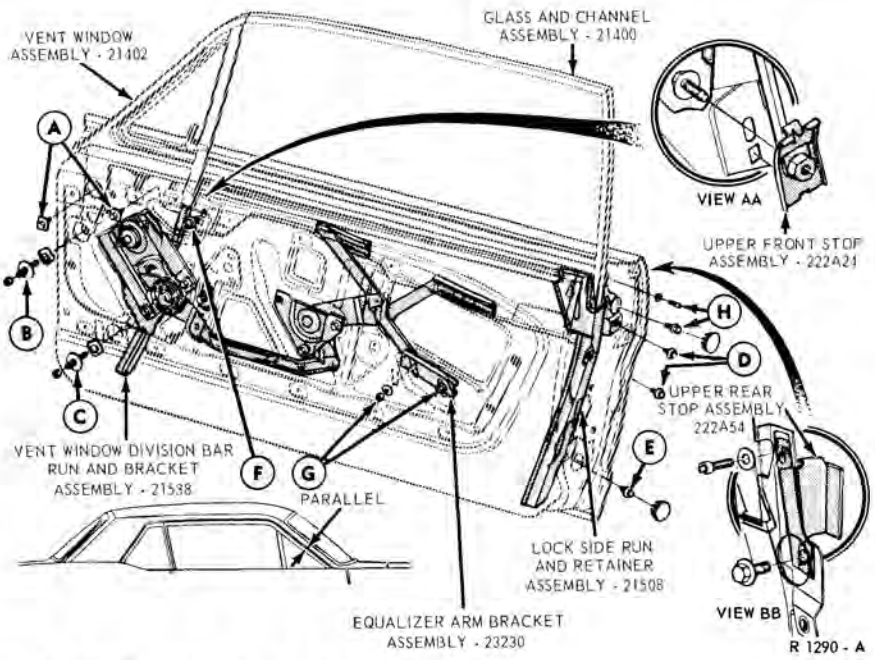


FIG. 4—Door Window Adjustment—Mustang

REAR DOOR GLASS ADJUSTMENT—COMET, FALCON

The trim panel must be removed to make any of the following adjustments.

Fore-and-aft adjustment for snug glass fit within the runs may be made by using suitable shim stock between the front run and the door frame.

Vertical adjustment is possible by means of the single stop (Fig. 5). When the glass is fully lowered, the upper edge should be even with the belt line.

Lateral adjustment for smooth movement of the glass within the runs can be made by moving the

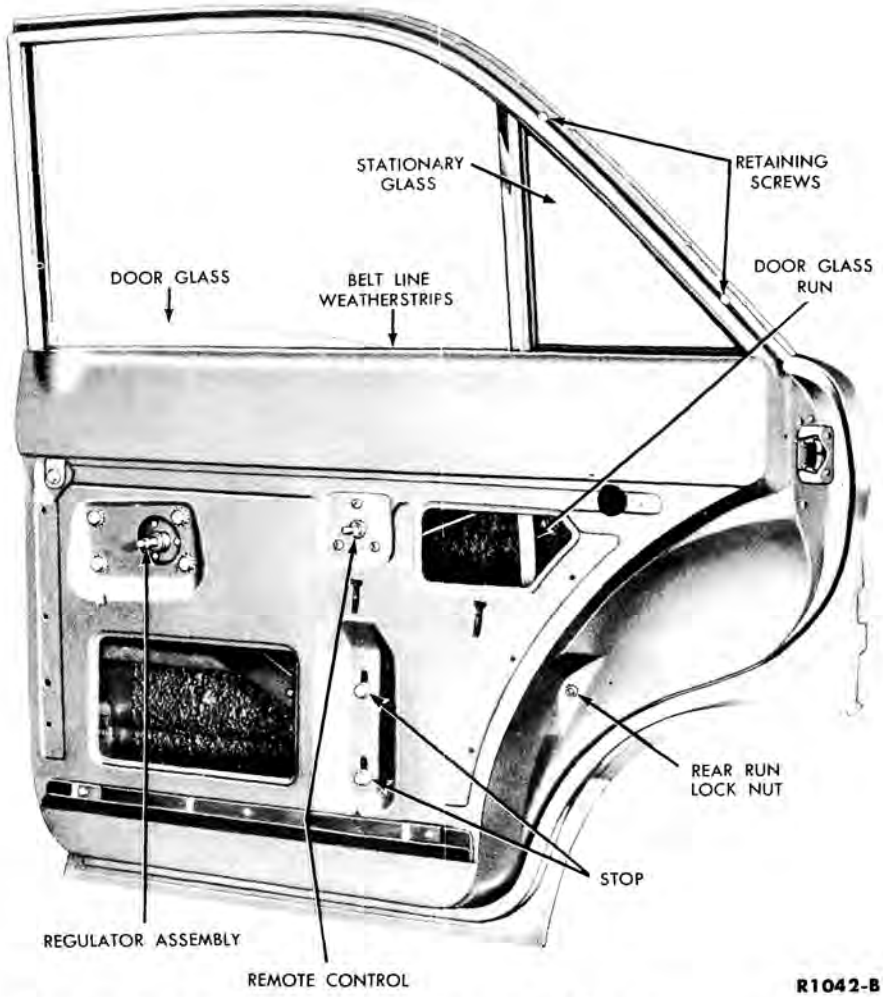


FIG. 5—Rear Door Window Adjustment—Comet, Falcon

lower attaching points of the runs (Fig. 5).

DOOR WINDOW ADJUSTMENTS—FAIRLANE MODEL 65

Fore-and-aft adjustment for snug window fit within the runs is made by means of the rear run upper adjusting screw at point A (Fig. 6).

Lateral adjustment for smooth movement of the glass within the runs can be made by moving the lower ends of both the front and rear runs at points B and C.

Two adjustable stops at points D and E limit the upward travel of the window. The window lower stop (at point F) is not adjustable.

QUARTER WINDOW ADJUSTMENTS—COMET, FALCON MODELS 59, 62

Fore and aft adjustments are made at the rear run (Figs. 7 and 8). Make this adjustment for a snug fit of the glass within the runs.

QUARTER WINDOW ADJUSTMENTS—COMET, FALCON MODEL 63

FORE AND AFT

With the window in its full up position, loosen the lock nuts at points H and L (Fig. 9). Loosen the front guide lower bracket retaining screws at point E and position the window assembly to obtain the 5/16 inch parallel dimension shown in view AA (Fig. 9). Tighten the lock nuts at points H and L and the front guide lower bracket retaining screws at point E.

UP OR DOWN

With the window in its full up position, loosen the upper front stop retaining screws and the upper rear stop retaining nuts R (Fig. 9). Adjust the upper stops as required to obtain the 1/8 inch parallel dimension shown in view B (Fig. 9). Tighten the upper front stop retaining screw and the upper rear stop retaining nuts. Loosen the lower stop retaining bolt C (Fig. 9), and loosen the rear guide retaining screw at point M and the lock nut at point L (Fig. 9). Operate the window to its down position and adjust the lower stop so that the top of the window frame is level with the window opening. Tighten the lower stop retaining bolt.

Tighten the rear guide retaining screw at point M and the lock nut at point L.

LATERAL (IN OR OUT)

With the window in its full up position, loosen the lock nuts H and L (Fig. 9). Rotate the studs at points H and L in or out to obtain the 3/16 inch parallel dimension shown in view BB (Fig. 9). After adjustment, tighten the lock nuts. To obtain the proper alignment of the quarter window assembly with the door window glass and the proper interference fit with the roof rail weatherstrip, loosen the front guide to lower bracket retaining screws at point E (Fig. 9). Tilt the front guide assembly in or out as required. Tighten the retaining screws.

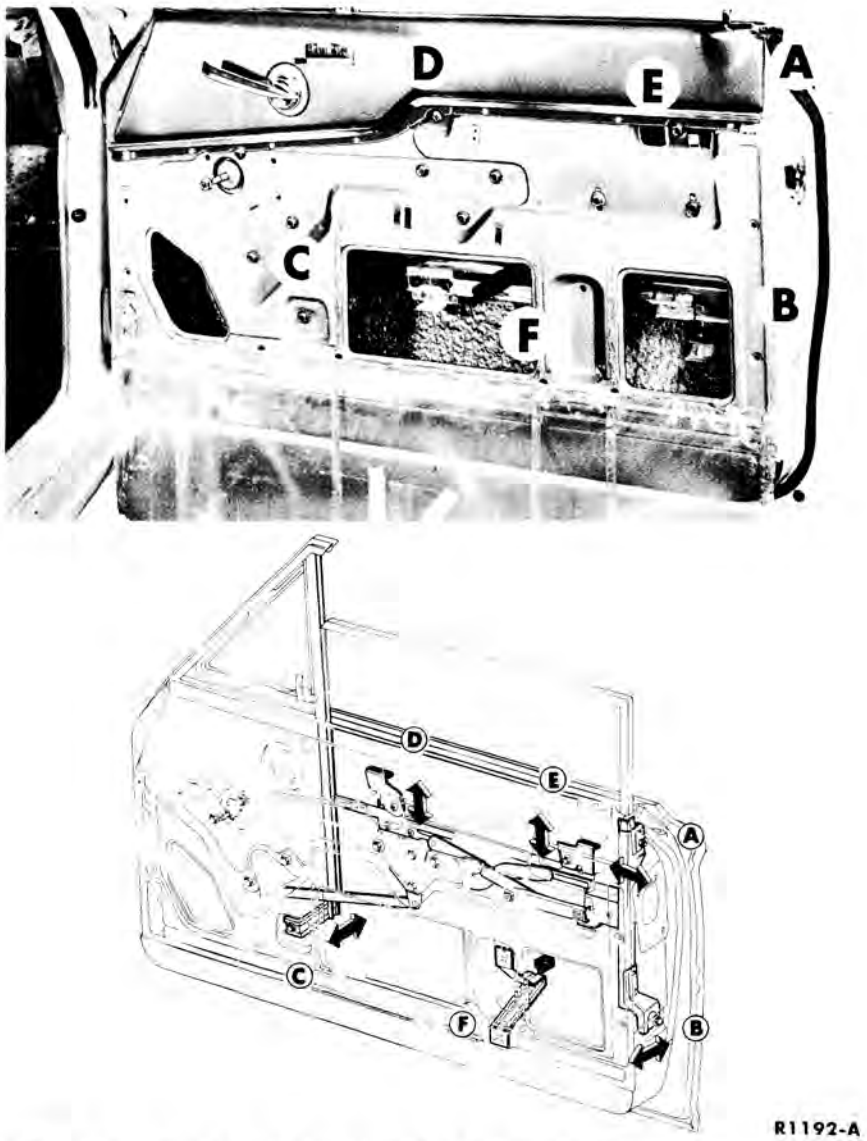


FIG. 6—Door Window Adjustment—Fairlane Model 65

QUARTER WINDOW ADJUSTMENTS—COMET, FALCON MODEL 76

POINT A

The quarter window front guide can be adjusted fore-and-aft and also tilted laterally.

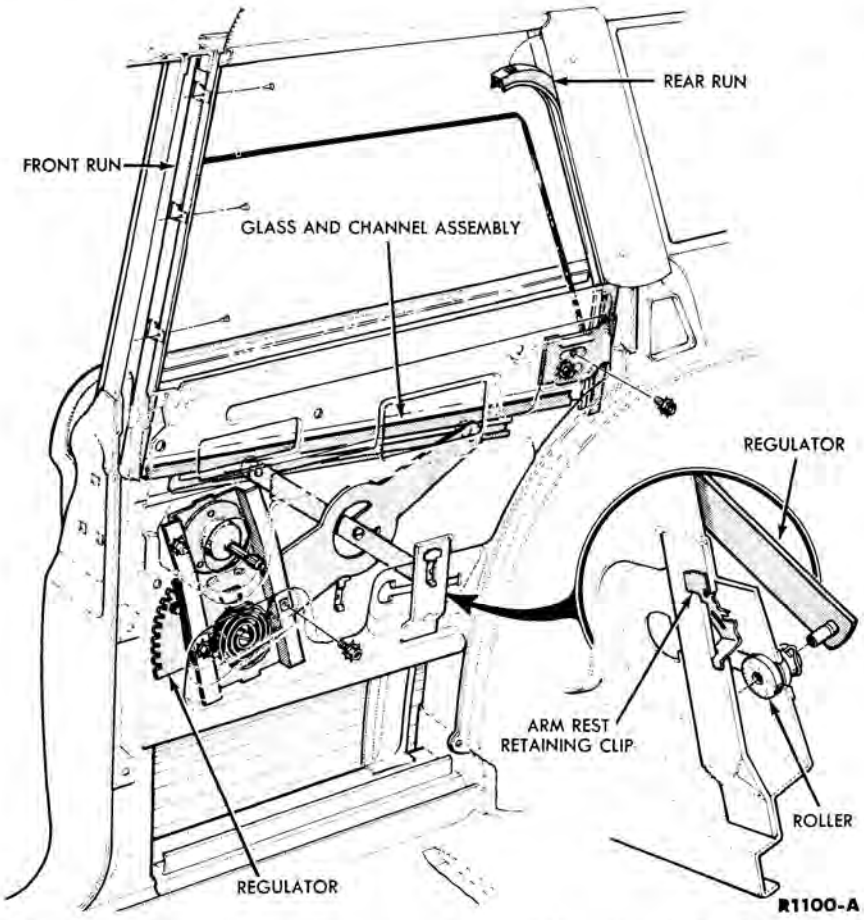


FIG. 8—Quarter Window Mechanism—Comet, Falcon Models 59, 62



FIG. 7—Quarter Window Adjustment—Comet, Falcon Model 62

The fore-and-aft adjustment is used to obtain the proper clearance ($\frac{9}{32}$-inch) between the rear edge of the door window frame and the front edge of the quarter window frame (Fig. 10).

Turning the adjusting screws tilts the guide and window assembly laterally.

POINT B

The front end of the equalizer arm guide can be adjusted vertically to obtain proper alignment and fit of the front upper edge of the window frame at the top side rail weatherstrip (Fig. 10).

POINT C

The quarter window rear guide can be tilted by moving the lower end of the guide laterally to properly align and fit the rear upper edges of the window frame at the top side rail weatherstrip (Fig. 10).

POINT D

The upper end of the window rear guide can be adjusted laterally to properly align the upper sides of the window frame at the glass outer weatherstrip (Fig. 10).

POINT E

The front guide lower bracket can be moved laterally to obtain the proper clearance ($\frac{3}{16}$-inch) between the quarter window and the outer quarter panel at the belt line.

POINTS F AND G

The window upper stops are adjusted up or down to obtain the $\frac{1}{8}$-inch parallel dimension between the window lower frame and the quarter panel at the belt line (Fig. 10).

POINT H

The quarter window lower stop is adjusted up or down to obtain the proper level of the top edge of the window frame in the quarter panel (Fig. 10).

QUARTER WINDOW ADJUSTMENT—FAIRLANE MODEL 65

1. Obtain the 0.24-inch parallel dimension, (sectional View BB, Fig. 11) with the quarter window in the up position. Loosen the lock nuts at points C, L, E and J. Adjust the quarter window toward the inside or outside of the body, by rotating the adjusting screws at points C, L, E and J, clockwise or counterclockwise.

2. Obtain the 0.28-0.25 inch clearance dimension (sectional view AA, and the 0.18-inch parallel dimension, sectional view BB, Fig. 11) with the quarter window in the up position. Loosen the screws at points D and locknut J and adjust the quarter window backward or forward and up or down as required. Tighten the locknuts securely at points C and J. Adjust the quarter window stop upper bumper and tighten the screws at points D securely.

3. To align the front edge of the quarter window with the rear edge of the door glass frame, the quarter window may be adjusted to tilt toward the inside or outside of the body by rotating the adjusting screw at point L clockwise and counterclockwise as required. Tighten the

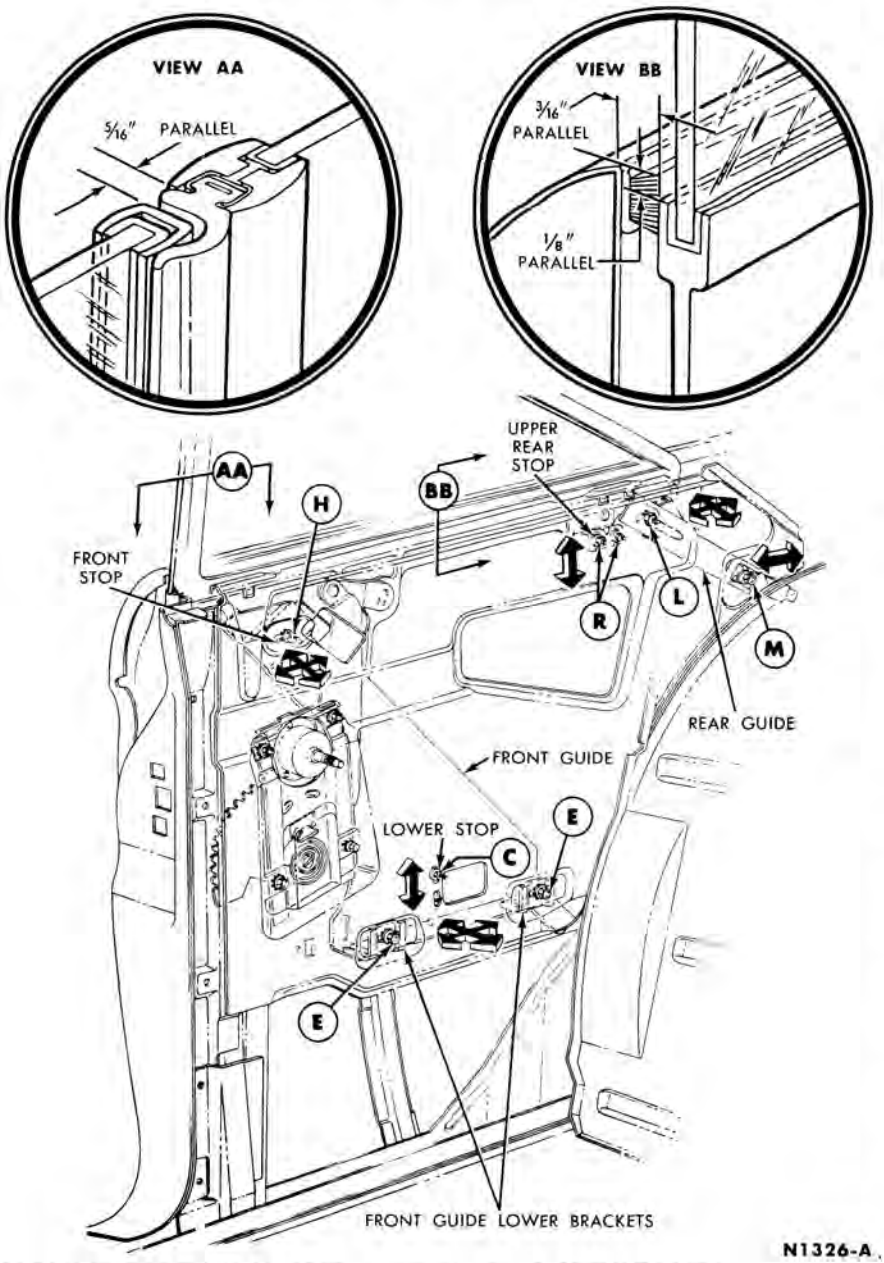


FIG. 9—Quarter Window Adjustment—Comet, Falcon Model 63

locknut at point L securely (Fig. 11).

4. To obtain alignment of the guide assembly for proper operation of the quarter window, loosen the screw at point F and adjust the guide forward or backward as required. Tighten the locknuts securely at points E and J and the screw at point F (Fig. 11).

5. To obtain a flush condition between the front edge of the quarter window and the top edge of the quarter panel at the belt line when the window is in the down position, the quarter window must be cycled to the desired flush down position. Rotate the quarter window bumper G to contact the body and retain the desired position. Tighten the locknut securely (Fig. 11).

6. Position the plate assembly (sectional view CC, Fig. 11) to properly stabilize the quarter window during operation and prevent rattles. Loosen the screws at points H and adjust the plate to the window (in up position). Tighten the screws at points H securely.

QUARTER WINDOW ADJUSTMENT—MUSTANG

1. Remove the rear seat cushion and seat back.

2. Remove the quarter trim panel and watershield.

3. To obtain the 0.28-inch parallel dimension between the front edge of the quarter window frame and the rear edge of the door window frame as shown in sectional view AA (Fig. 12) and to maintain a parallel alignment and interference between the top edge of the quarter window assembly and the roof rail weatherstrip, the quarter window guide assembly is adjusted forward or backward and up or down at the screw and washer assembly items A. See sectional views BB and CC (Fig. 12). Tighten the screw and washer assembly at items A, finger tight.

4. To obtain the proper alignment and interference between the top edges of the quarter window assembly and the roof rail weatherstrip, the guide assembly may be tilted toward the inside or outside of body at the screw and washer assembly at items A and B. After adjustment, tighten the screw and washer assemblies, items A and B securely.

5. To obtain the proper level between the quarter panel at the belt line and top edge of the glass and channel assembly, the quarter window stop may be adjusted up or down as required at the screw and washer assembly, item C. This adjustment is made with the window in the down position. After adjustment, tighten the screw and washer assembly, item C securely.

STATION WAGON TAILGATE ADJUSTMENTS—COMET, FALCON

The tailgate window lower stops can be adjusted up or down to align

the glass edge in the lowered position with the tailgate.

The tailgate regulator has enlarged mounting holes so that the regulator arms can be aligned to the glass channel.

To adjust the tailgate glass runs, remove the tailgate cover panel and then hold the tailgate in the closed position. Roll up the window and observe the runs for alignment. Lower the window, open the tailgate, and adjust the window runs as required (Fig. 13).

TAILGATE HINGE ADJUSTMENT —COMET, FALCON

The tailgate can be adjusted fore or aft and up or down at the hinge to body mounting bolts.

To adjust the tailgate from side to side in the tailgate opening, remove the trim panel, loosen the hinge to tailgate bolts and shift the tailgate as required.

DECK LOCK ADJUSTMENT

The striker plate can be adjusted laterally and vertically and the lock can be adjusted laterally. Before adjusting the deck lid lock, make sure that the deck lid is properly aligned. To adjust the lock, loosen the two attaching screws, move the lock as required to make good contact and tighten the attaching screws. Move the striker plate up or down as necessary to increase or decrease the clearance between the deck lid and the lower back panel (Figs. 14 and 15).

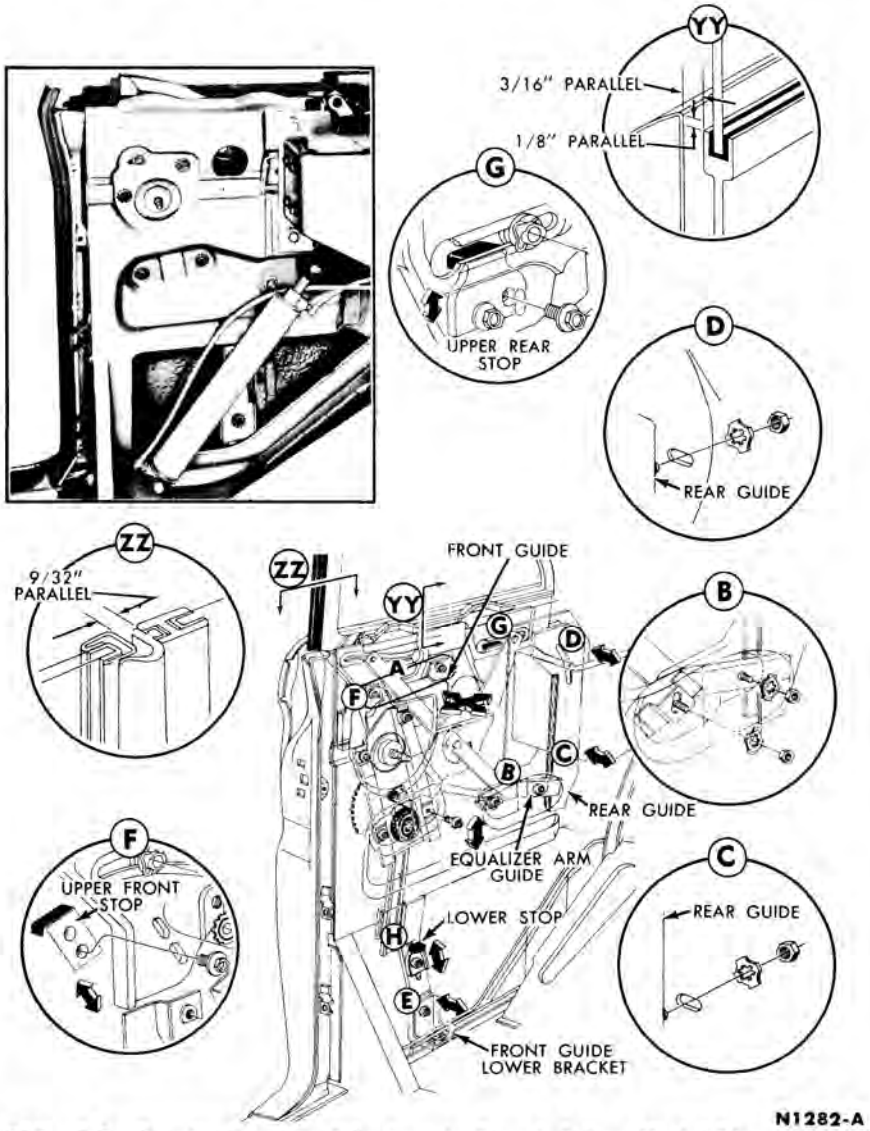


FIG. 10—Quarter Window Adjustment—Comet, Falcon Model 76

DECK LID ALIGNMENT

The deck lid can be shifted fore and aft, up and down, and from side to side. Slotted holes in the lid provide fore and aft movement. Slotted hinge bolt holes in the mounting bracket provide up and down movement. Enlarged hinge mounting bolt holes in the lid inner panel provide limited lateral movement (Fig. 16).

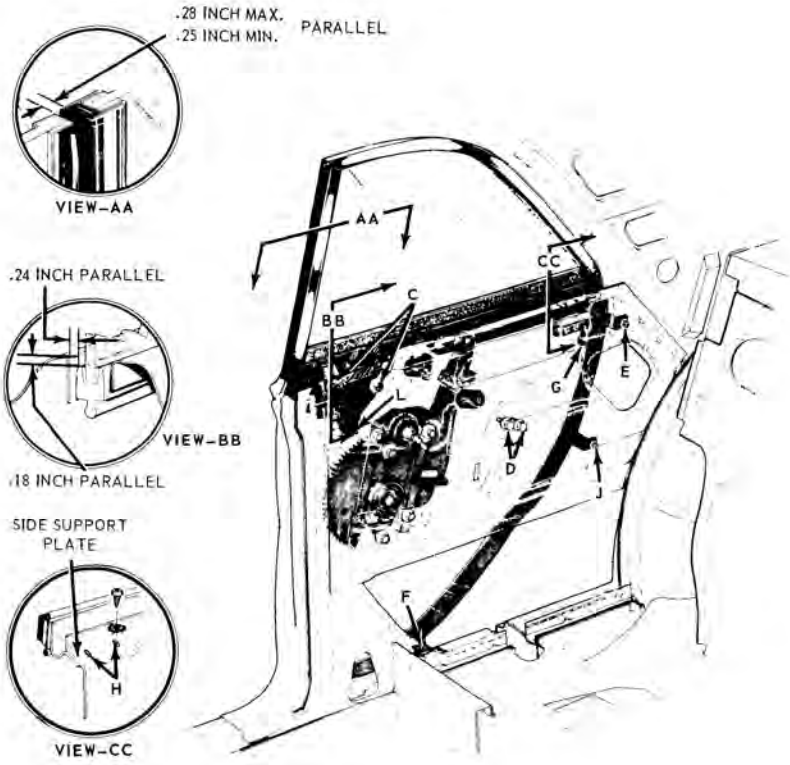


FIG. 11—Quarter Window Adjustment—Fairlane Model 65

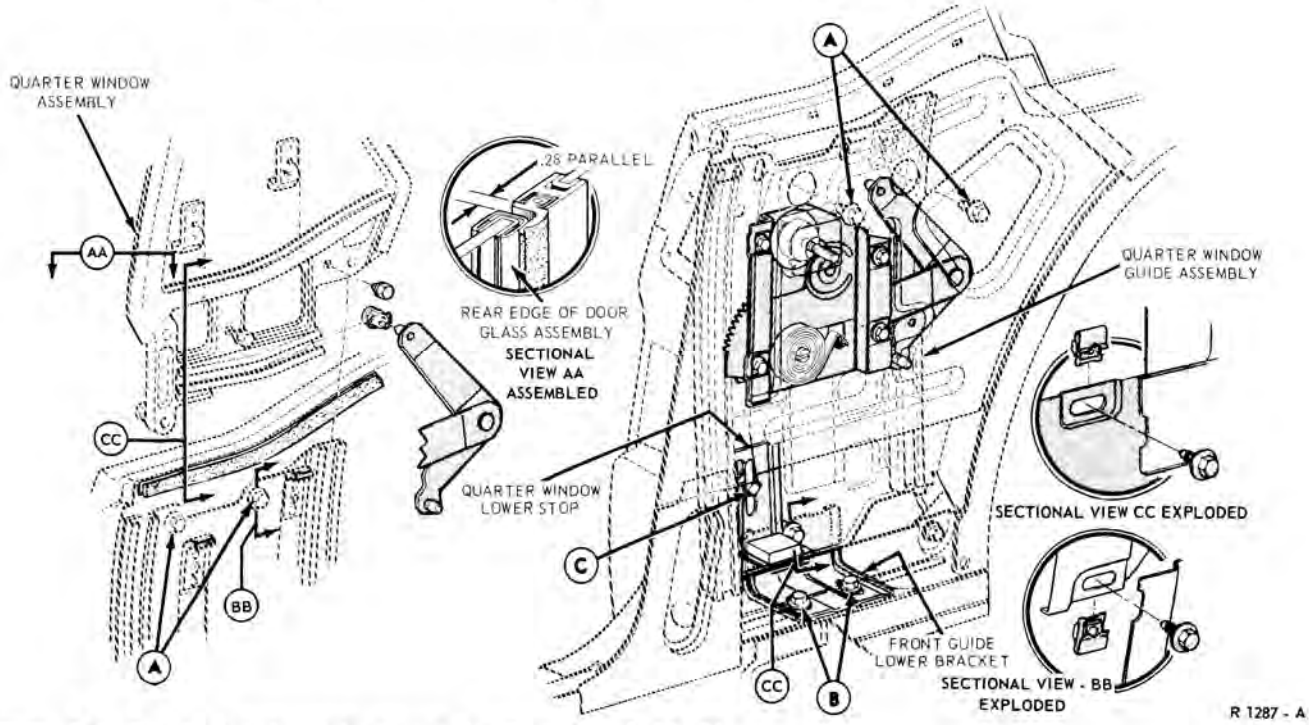


FIG. 12—Quarter Window Adjustment—Mustang Models 65, 76

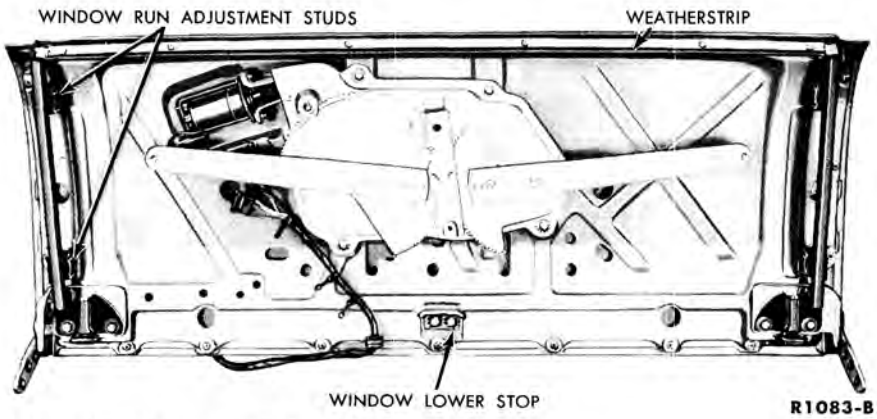


FIG. 13—Tailgate Window Adjustments



FIG. 14—Deck Lid Lock Adjustment

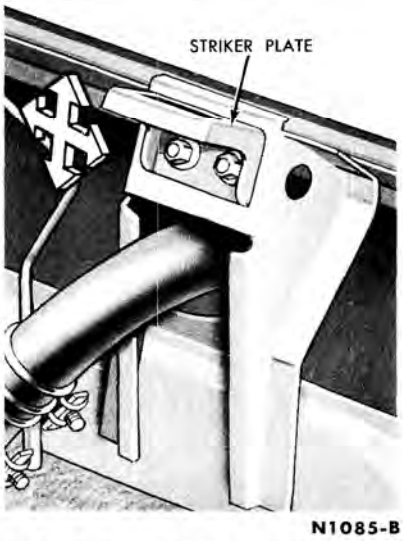


FIG. 15—Deck Lid Striker Plate Adjustment

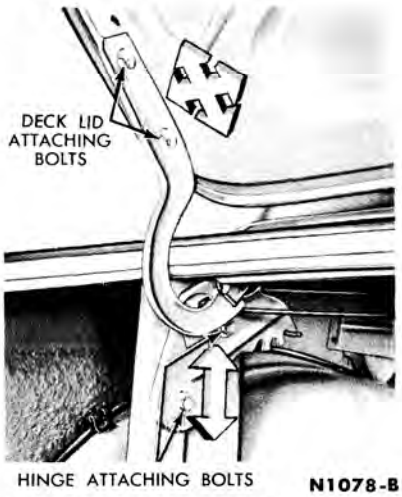


FIG. 16—Deck Lid Adjustments

2 REMOVAL AND INSTALLATION

DOORS

REMOVAL

1. Remove the door hinge-to-door attaching bolts, and remove the door.

2. If a hinge is damaged, remove the pillar attaching bolts and remove the hinge.

3. If the door is damaged, a replacement door is furnished as a sheet metal shell in prime paint. It has no hinges, trim, glass, runs, or hardware. When a door is replaced, make any needed minor repairs to the new shell, drill holes necessary for mouldings, paint the door, and transfer all usable parts. Cement the weatherstrip properly.

If only a door outer panel is seriously damaged, the whole door need not be replaced. A replacement outer panel is available.

INSTALLATION

1. If the hinge was removed, install it to the pillar.

2. Position the door to the hinges. Partially tighten the bolts, align the door, and tighten the bolts securely.

3. Align the door glass, glass runs, stops, regulator, and remote control.

4. Install the door water shield and the door trim.

FRONT DOOR LOCK—MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Remove both window upper stop brackets from the glass lower channel, and remove the rollers from the regulator arms (Fig. 17). Remove the glass assembly.

3. Disconnect the door lock remote control link, the lock actuating rod, and the lock control to cylinder rod at the lock (Fig. 18). Remove the knob from the push button rod.

4. Remove the glass rear run lower retaining bolt. Remove the run upper adjusting screw lock nut. **Do not disturb the position of the adjusting screw.** Remove the run from the door.

5. Remove the lock assembly from the door. Remove the push button rod from the lock.

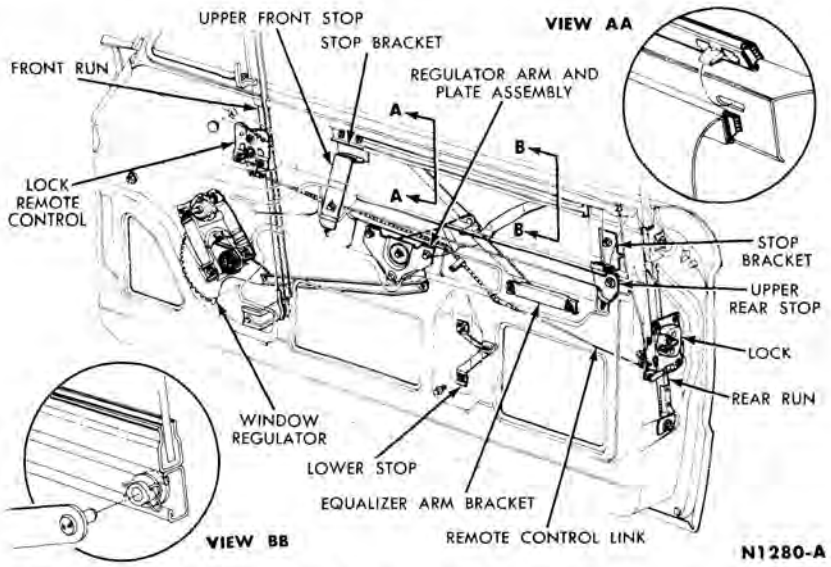


FIG. 17—Door Window Mechanism—Models 63, 76

INSTALLATION

1. Connect the push button rod to the lock.
2. Position the lock in the door, and install the retaining screws. Connect the lock control to cylinder rod, the lock actuating rod, and the remote control link at the lock. Install the push button.
3. Position the glass rear run in the door. Install, and snugly tighten, the lower retaining bolt and the upper adjusting screw lock nut.
4. Position the glass assembly in the door. Install the rollers in the glass lower channel, and connect both regulator arms. Install the window upper stop brackets.
5. Check the window operation and, if necessary, adjust the rear run. Tighten the lower retaining bolt and the upper adjusting screw lock nut.
6. Check the operation of the lock. If necessary, adjust the lock striker.
7. Carefully position the water shield to the inner panel, and install the trim panel.

FRONT DOOR LOCK— EXCEPT MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the door lock remote control link, the lock actuating rod and the lock control to cylinder at the lock (Fig. 18). Remove the knob from the push button rod.
3. Remove the glass rear run lower retaining bolt and position the run away from the door lock.
4. Remove the lock assembly from the door. Remove the push button rod from the lock.

INSTALLATION

1. Connect the push button rod to the lock.
2. Position the lock in the door, and install the retaining screws. Connect the lock control to cylinder rod, the lock actuating rod, and the remote control link at the lock. Install the push button.
3. Position the glass rear run in the door. Install the retaining bolt, adjust the rear run, and tighten the retaining bolt.
4. Check the operation of the lock. If necessary, adjust the lock striker.
5. Carefully position the water shield to the inner panel; and install the trim panel.

REAR DOOR LOCK

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the door lock remote control rod and door lock control rod at the door lock assembly.
3. Remove the lock assembly from the door (Fig. 18).

INSTALLATION

1. Position the lock assembly in the door, and install the retaining screws.
2. Connect the door lock remote control rod and the door lock control rod at the door lock assembly.
3. Check the operation of the lock. If necessary, adjust the lock striker.
4. Carefully position the water shield to the inner panel, and install the trim panel.

DOOR LOCK CYLINDER

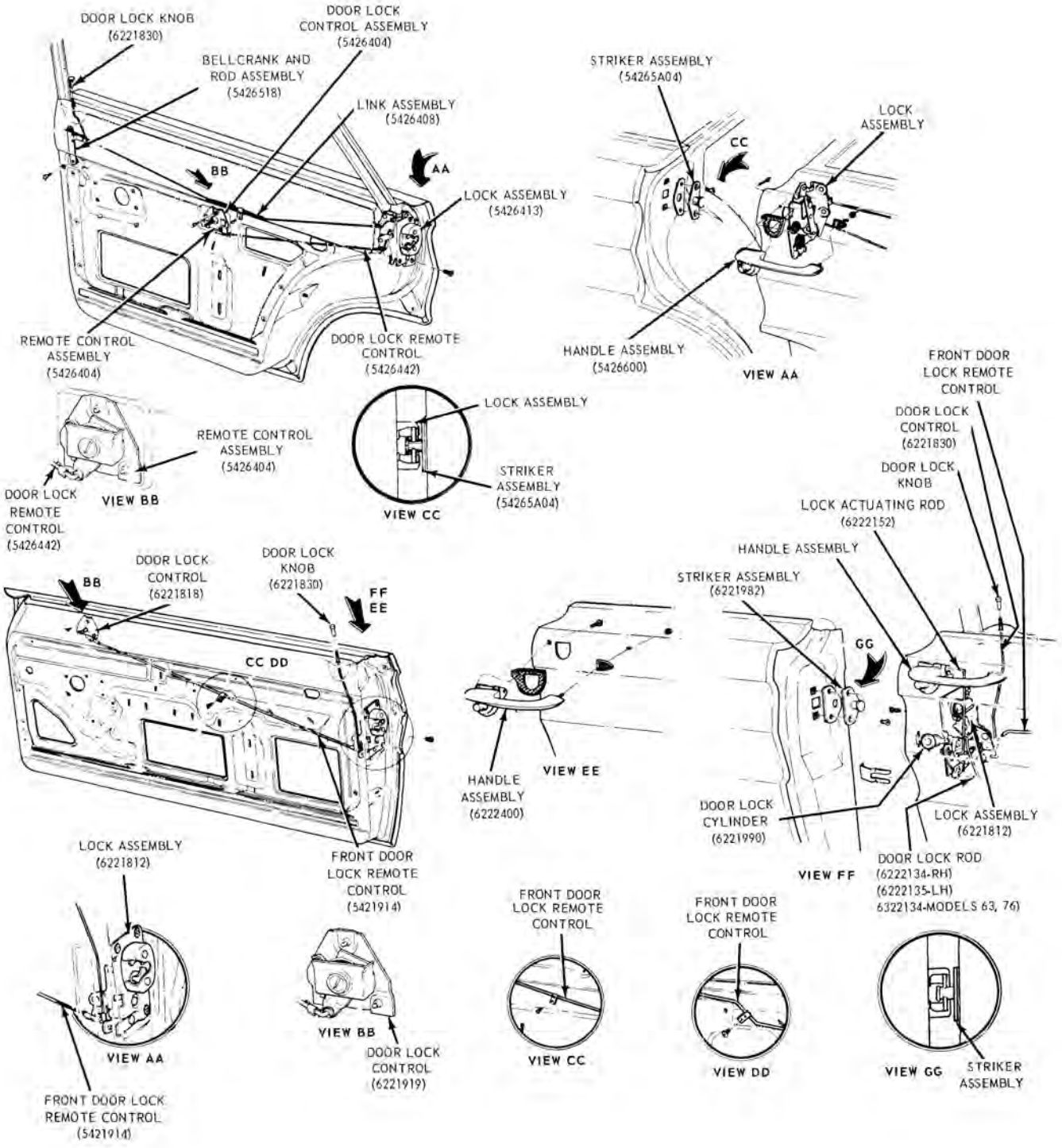
The key code is stamped on the lock cylinder to assist in replacing lost keys.

When a lock cylinder is replaced, both door lock cylinders and the ignition lock cylinder should be replaced in a set. This will avoid carrying an extra key which will fit only one lock.

1. Remove the trim panel and position the water shield away from the access holes.
2. Disconnect the lock control to door lock cylinder rod at the lock cylinder.
3. Pull the door lock cylinder retainer rearward to release the cylinder, and remove the lock cylinder from the door.
4. Transfer the lock cylinder arm to the new lock cylinder.
5. Position the lock cylinder in the door, and install the lock cylinder retainer (Fig. 18).
6. Connect the lock control to door lock cylinder rod at the lock cylinder.
7. **Carefully position the water shield to the inner panel and install the trim panel.**

DOOR HANDLE AND/OR PUSH BUTTON

1. Remove the door trim panel, and position the water shield away from the access holes.
2. Remove the handle retaining screw and nut, and remove the handle (Fig. 18). To remove the front door handle, it will be necessary to disconnect the lock actuating link.
3. To replace the push button remove the retaining plate screw, retaining plate, spring, push button, and rubber seal from the handle.
4. Install the push button assembly if it was removed, and install the handle assembly. Connect the lock actuating link to the door handle.
5. Carefully position the water shield to the inner panel, and install the trim panel.



N1281-C

FIG. 18—Door Handle and Lock Installation



FIG. 19—Glass Channel Replacement

VENT WINDOW OR WEATHERSTRIP—EXCEPT MODELS 63, 76

REMOVAL

The vent window glass may be removed and/or installed by using the tool shown in Fig. 19. When installing new glass, use new glass tape, and apply sealer to the frame horizontal channel and to the other channel in the area of the upper pivot.

1. Remove the door trim panel and position the water shield away from the access holes.
2. Remove the glass stop (Fig. 3) and the front run bracket retaining bolt. Loosen the front run retaining bracket at the inner panel (Fig. 20). Lower the window completely.
3. Pry the door glass front run out of the vent window division bar and remove the run.
4. Remove the vent window frame mounting screw from the belt line of the door (Fig. 21).
5. After carefully pulling away the door weatherstrip from the upper forward area of the door frame, remove the remaining frame mounting screws and the vent window and frame.

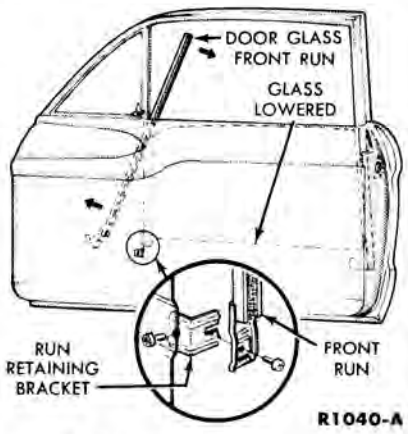


FIG. 20—Door Glass Run Removal—Body Types Except 63, 76



FIG. 21—Vent Window Installed —Body Types Except 63, 76

6. Remove the upper pivot from the frame, and remove the lower pivot spring assembly. **Note the position of the stop washer and the flat washers.**
7. Remove the weatherstrip.

INSTALLATION

1. Install the weatherstrip.
2. Install the pivot and the pivot spring assembly. Adjust the spring tension so that the vent glass will stay open when the car is driven at highway speeds.
3. Install the vent window and frame in the door frame.
4. Install the front run and its bracket, adjusting the bracket position to get correct door glass lateral position and snug fore-and-aft door glass fit.
5. Install the stop, adjusting it for proper door glass height at the belt line with the glass lowered.
6. Carefully position the water shield to the inner panel and install the trim panel.

VENT WINDOW OR WEATHERSTRIP—MODELS 63, 76

REMOVAL

The vent window glass may be removed and/or installed by using the tool shown in Fig. 19. When installing new glass, use new glass tape, and apply sealer to the frame horizontal channel and to the other channel in the area of the upper pivot.

1. Remove the door trim panel and position the water shield away from the access holes.
2. Remove the front run bracket retaining bolt, and position the run out of the vent window division bar (Fig. 2).
3. Remove the door vent window assembly retaining bolts and retaining nut, and remove the vent window assembly.
4. Remove the upper pivot from the frame and remove the lower pivot spring assembly, then remove the vent window and frame.
5. Remove the weatherstrip.

INSTALLATION

1. Install the weatherstrip.
2. Position the vent window and frame into the vent assembly.
3. Install the pivot and the pivot spring assembly. Adjust the spring tension so that the vent glass will stay open when the car is driven at highway speeds.
4. Position the vent window assembly in the door and install the retaining bolts and retaining nut snugly.
5. Position the front run in the vent window division bar and install the retaining bolt snugly.
6. Align the vent window and front run and tighten the retaining bolts and retaining nut.
7. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR GLASS—EXCEPT MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.
2. After removing the stop (Fig. 19), lower the glass until the regulator arm roller is out of the glass channel.
3. Unsnap and remove the belt weatherstrips, loosen the front run



FIG. 22—Door Glass Removal—Except Body Types 63, 76

attaching bolt at the mounting bracket, and remove the bracket attaching bolt from the inner panel.

4. Remove the front run from the division bar by pulling rearward on the edges of the run.

5. Remove the glass (Fig. 22).

INSTALLATION

1. Using the tool shown in Fig. 19, remove the channel from the glass.

2. Install the channel, using new glass tape.

3. Simultaneously, position the glass and run in the door, and install the belt weatherstrips.

4. Position the regulator arm roller in the channel, and finally position the run in the division bar.

5. Connect the run and bracket, making necessary lateral adjustment.

6. Install the stop, making necessary adjustment.

7. Carefully position the water shield, the inner panel, and install the trim panel.

FRONT DOOR GLASS—MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Remove both window upper stop brackets from the glass lower channel. Disconnect both window regulator arms from the lower channel, and remove the rollers. Remove the glass assembly (Fig. 17).

INSTALLATION

1. Remove the glass upper frame to lower channel retaining screws, and remove the frame. Remove the lower channel from the glass (Fig. 19).

2. Install a new glass tape and the lower channel on the glass. Install the glass upper frame.

3. Position the glass assembly in the door. Install the rollers in the glass lower channel, and connect both regulator arms. Attach the window upper stop brackets to the lower channel.

4. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR WINDOW REGULATOR—MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Remove the remaining bolts from the door window regulator arm and plate.

3. Disconnect the front arm and plate arm from the glass channel roller and position the arm and plate down.

4. Remove the retaining pin from the arm and plate and remove the regulator arm.

5. Remove the regulator retaining bolts and remove the regulator through the door access hole (Fig. 17).

INSTALLATION

1. Position the regulator inside the door and install the retaining bolts snugly.

2. Connect the regulator arm to the arm and plate and install the retaining pin.

3. Connect the front arm and plate arm to the lower glass channel.

4. Correctly position the arm and plate in the door and install the retaining bolts snugly.

5. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR WINDOW REGULATOR—EXCEPT MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Disconnect the regulator from the glass channel roller.

3. Raise the glass by hand and secure it in the raised position.

4. Remove the regulator retaining bolts and remove the regulator through the door access hole (Fig 3).

INSTALLATION

1. Position the regulator inside the door and install the retaining bolts snugly.

2. Lower the glass and connect the regulator.

3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.

4. Carefully position the water shield to the inner panel and install the trim panel.

FRONT DOOR REAR GLASS RUN—MODELS 63, 76

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Remove both window upper stop brackets from the glass lower channel.

3. Disconnect both regulator arms from the glass lower channel, and remove the rollers. Remove the glass assembly.

4. Remove the glass rear run lower retaining bolt. Remove the run upper adjusting screw lock nut. **Do not disturb the position of the adjusting screw.** Remove the run from the door.

INSTALLATION

1. Position the rear run in the door and install the lower retaining bolt and upper adjusting screw lock nut snugly.

2. Position the glass assembly in the door. Install the rollers in the glass lower channel, and connect both regulator arms.

3. Attach the window upper stop brackets to the lower channel.

4. Adjust the rear run and tighten the retaining bolt and nut.

5. Carefully position the water shield to the inner panel and install the trim panel.

REAR DOOR GLASS

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Remove the window regulator

and the stop, and lower the window to the bottom of the door.

3. Remove the belt weatherstrips, and remove the rear run adjusting nut (Fig. 5). Disconnect the remote control anti-rattle clip (Fig. 18).

4. Pull down the rear run enough to clear the door frame, and then remove it by pulling it forward and out of the division bar.

5. Tilt the rear edge of the glass to the bottom of the door and then remove the glass.

INSTALLATION

1. Transfer the channel or the glass, using the tool shown in Fig. 19.

2. Simultaneously position the glass and the run in the door, and install the belt weatherstrips.

3. Finally, position the run, press it into the division bar, and install the run adjustment nut finger-tight.

4. Install the regulator and the stop, adjusting the stop as required.

5. Connect the anti-rattle clip, and make any necessary lateral adjustment in the runs. Tighten the adjustment nuts.

6. Carefully position the water shield to the inner panel, and install the trim panel.

REAR DOOR WINDOW REGULATOR

REMOVAL

1. Remove the trim panel and position the water shield away from the access holes.

2. Disconnect the regulator from the glass channel roller.

3. Raise the glass by hand and secure it in the raised position.

4. Remove the regulator retaining bolts and remove the regulator through the door access hole (Fig. 5).

INSTALLATION

1. Position the regulator inside the door and install the retaining bolts snugly.

2. Lower the glass and connect the regulator.

3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.

4. Carefully position the water shield to the inner panel and install the trim panel.

QUARTER GLASS—MODEL 59

REMOVAL

1. Remove the quarter window handle.

2. Remove the ash tray and arm rest assembly.

3. Remove the screw retaining the rear edge of the trim panel, and then remove the trim panel lower retainer.

4. Unsnap the trim panel retaining clips and remove the trim panel.

5. Remove the front and lower garnish mouldings.

6. Position the water shield away from the access hole.

7. Remove the screws retaining the front run to the door pillar (Fig. 8).

8. Disconnect the regulator arms from the rollers in the glass lower channel, and remove the glass with the front run.

INSTALLATION

1. Transfer the glass channel using the tool shown in Fig. 19.

2. Position the rollers and clips in the glass channel.

3. Place the glass assembly and front run in the window opening, and connect the regulator arms to the rollers in the glass channel.

4. Install the front run retainers.

5. Install the front and lower garnish mouldings.

6. Position the water shield and install the trim panel, lower retainer, arm rest, trim panel retaining screw, and the window regulator handle.

QUARTER WINDOW REGULATOR—MODEL 59

REMOVAL

1. Remove the quarter window handle.

2. Remove the ash tray and arm rest assembly.

3. Remove the screw retaining the rear edge of the trim panel, and then remove the trim panel lower retainer.

4. Unsnap the trim panel retaining clips and remove the trim panel.

5. Disconnect the regulator from the glass channel roller.

6. Raise the glass by hand and secure it in the raised position.

7. Remove the regulator retaining bolts, slide the regulator arm out of the equalizer and remove the regulator (Fig. 8).

INSTALLATION

1. Position the regulator inside the quarter panel, engage the arm in the equalizer, and install the regulator retaining bolts snugly.

2. Position the rollers in the glass channel, lower the glass and connect the regulator.

3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.

4. Position the water shield, and install the trim panel, lower retainer, arm rest, trim panel retaining screw, and the window regulator handle.

QUARTER GLASS—MODEL 62

REMOVAL

1. Remove the rear seat cushion and back.

2. Remove the trim panel and position the water shield away from the access hole.

3. Remove the lower and front garnish moldings.

4. Remove the rear run.

5. Lower the window until the regulator rollers are accessible, and disconnect the front roller from the channel.

6. Lower and tilt the glass as shown in Fig. 23, and remove it.

INSTALLATION

1. Transfer the channel, using the tool shown in Fig. 19.

2. Position the glass in the quarter panel, and connect the front rollers.

3. Install the rear run, adjusting it as necessary.

4. Install the garnish mouldings, position the water shield, and install the trim panel.

5. Install the seat cushion and back.



R1045-A

FIG. 23—Quarter Glass Removal —Body Type 62—Typical

QUARTER WINDOW REGULATOR—MODEL 62

REMOVAL

1. Remove the rear seat cushion and back.
2. Remove the trim panel and position the water shield away from the access hole.
3. Disconnect the regulator from the glass channel roller.
4. Raise the glass by hand and secure it in the raised position.
5. Remove the regulator retaining bolts, slide the regulator arm out of the equalizer and remove the regulator (Fig. 7).

INSTALLATION

1. Position the regulator inside the quarter panel, engage the arm in the equalizer, and install the regulator retaining bolts snugly.
2. Position the rollers in the glass channel, lower the glass and connect the regulator.
3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.
4. Position the water shield, and install the trim panel.
5. Install the seat cushion and back.

QUARTER GLASS—MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter window handle, arm rest, the quarter trim panel and position the water shield away from the access hole.
3. Disconnect the regulator arm from the glass channel.
4. Remove the upper rear stop retaining bolts and remove the upper rear stop.
5. Remove the lower stop retaining bolt and remove the lower stop.
6. Remove the retaining nut and two bolts from the front guide assembly.
7. Position the guide assembly in the bottom of the quarter panel and remove the glass and frame assembly (Fig. 9).

INSTALLATION

1. Remove the quarter window front weatherstrip retaining screw and remove the weatherstrip.
2. Remove the two retaining screws from the top front of the glass frame.
3. Remove the two retaining rivets from the rear of the glass frame.
4. Remove the glass lower channel and upper frame from the glass. Clean the channel and frame.
5. Install new glass tape and assemble the lower channel and upper frame to the glass.
6. Position the glass and frame assembly in the quarter panel by starting the assembly in the rear guide first, and then positioning the front guide assembly on the glass roller.
7. Position the front guide assembly and loosely install the retaining bolts and nut. **The window should be in the full down position.**
8. Connect the regulator arm to the glass lower channel and install the retaining clip.
9. Install the front weatherstrip and retaining screw.
10. Install the upper rear stop, the lower stop, and adjust the window assembly.
11. Position the water shield and install the garnish moulding, trim panel, regulator handle and arm rest.
12. Install the rear seat back and seat cushions.

QUARTER WINDOW REGULATOR—MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter window handle, arm rest, quarter trim panel, and position the water shield away from the access hole.
3. Disconnect the regulator arm from the lower glass channel.
4. Raise the glass by hand and secure it in the raised position.
5. Remove the two bottom quarter window front guide retaining bolts.
6. Remove the regulator retaining bolts and remove the regulator out the access hole (Fig. 9).

INSTALLATION

1. Position the regulator in the quarter and install the retaining bolts snugly.
2. Install the two bottom quarter window front guide retaining bolts.
3. Lower the glass and connect the regulator arm to the glass channel.
4. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts.
5. Position the water shield and install the quarter trim panel, regulator handle and arm rest.
6. Install the rear seat back and seat cushion.

QUARTER WINDOW FRONT GUIDE—MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter window handle, arm rest, the quarter trim panel, trim panel retainer, garnish moulding, and position the water shield away from the access hole.
3. Remove the quarter window front guide lower retaining bolts and the adjuster screw lock nut.
4. Turn the adjuster screw to its full in position.
5. With the quarter glass in the lowered position remove the quarter window front guide from the glass channel rollers.
6. Remove the quarter window front guide through the access hole with the window glass in the up position (Fig. 9).

INSTALLATION

1. With the quarter glass in the up position, install the quarter window front guide into the glass channel rollers.
2. Install the quarter window front guide retaining bolts and adjuster screw lock nut snugly.
3. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolts and adjuster screw lock nut.
4. Position the water shield and install the garnish moulding, trim panel retainer, quarter trim panel, regulator handle, and arm rest.
5. Install the rear seat back and seat cushion.

QUARTER WINDOW REAR GUIDE—MODEL 63

REMOVAL

1. Remove the rear seat cushion and seat back.
2. Remove the quarter window handle, arm rest, quarter trim panel, trim panel retainer and garnish moulding, and position the water shield away from the access hole.

3. Position the rear seat back panel cardboard away from the seat back panel.

4. Remove the quarter window rear guide retaining bolt and adjuster screw lock nut, and remove the rear guide (Fig. 9).

INSTALLATION

1. Position the rear guide in the quarter and install the retaining bolt and adjuster screw lock nut snugly.

2. Check the operation of the glass, adjust it if necessary, and tighten the retaining bolt and adjuster screw lock nut.

3. Install the rear seat back panel card board.

4. Position the water shield, and install the garnish moulding, trim panel retainer, trim panel, regulator handle, and arm rest.

5. Install the rear seat back and seat cushion.

QUARTER GLASS—MODEL 76

REMOVAL

1. Remove the rear seat cushion and seat back.

2. Remove the quarter trim and position the water shield away from the access hole.

3. Remove the quarter window upper front and rear stops.

4. Disconnect the regulator arms from the lower glass channel and remove the quarter glass (Fig. 9).

INSTALLATION

1. Remove the glass upper frame and lower channel from the glass.

2. Install glass tape on the new glass, and install the upper frame and lower channel on the glass.

3. Position the quarter glass in the quarter and connect the regulator arms.

4. Install the quarter window upper front and rear stops and adjust the stops.

5. Position the water shield and install the quarter trim.

6. Install the rear seat back and seat cushion.

QUARTER WINDOW REGULATOR—MODEL 76

REMOVAL

1. Remove the rear seat cushion and seat back.

2. Remove the quarter trim and position the water shield away from the access hole.

3. Remove the quarter window upper front and rear stops.

4. Disconnect the regulator arms from the lower glass channel and remove the quarter glass.

5. Remove the regulator retaining bolts and remove the regulator (Fig. 9).

INSTALLATION

1. Position the regulator in the quarter and install the retaining bolts snugly.

2. Position the quarter glass in the quarter and connect the regulator arms.

3. Install the quarter window upper front and rear stops, adjust the stops and the window regulator, and tighten the retaining bolts.

4. Position the water shield and install the quarter trim.

5. Install the rear seat back and seat cushion.

QUARTER WINDOW FRONT GUIDE—COMET, FALCON MODEL 76

REMOVAL

1. Remove the rear seat cushion and seat back.

2. Remove the quarter trim and position the water shield away from the access hole.

3. Remove the quarter window upper front and rear stops.

4. Disconnect the regulator arms from the lower glass channel and remove the quarter glass.

5. Remove the quarter window front guide lower retaining bolt, the rear upper retaining nut, and the front adjuster screw lock nut.

6. Remove the quarter window front guide adjuster screw and position the window regulator arms to the top of their travel.

7. Remove the quarter window front guide from the quarter (Fig. 9).

INSTALLATION

1. Position the quarter window front guide in the quarter and install the adjuster screw.

2. Install the quarter window front guide lower retaining bolt, upper retaining nut and adjuster screw lock nut snugly.

3. Lower the regulator arms, position the quarter glass in the quarter and connect the regulator arms.

4. Install the quarter window upper front and rear stops, adjust the front guide, and tighten the guide retaining bolt and nuts.

5. Position the water shield and install the quarter trim.

6. Install the rear seat back and seat cushion.

QUARTER WINDOW REAR GUIDE—MODEL 76

REMOVAL

1. Unlatch the convertible top from the header and lower the top.

2. Remove the quarter window rear guide upper retaining nut.

3. Raise the convertible top and remove the guide lower retaining nut. Access for the lower retaining nut is gained through the top well boot.

4. Remove the quarter window rear guide (Fig. 9).

INSTALLATION

1. Position the rear guide in the quarter and install the lower retaining nut snugly.

2. Lower the convertible top and install the rear guide upper retaining nut snugly.

3. Check the operation of the quarter glass, adjust if necessary, and tighten the rear guide retaining nuts.

4. Position the convertible top to the header and latch.

REAR QUARTER WINDOW AND/OR WEATHERSTRIP—COMET, FALCON MODELS 59, 71

REMOVAL

1. From inside the car, remove the quarter window front garnish moulding. Remove the window upper corner garnish moulding and the plug button from the rear pillar.

2. Remove the retaining nuts from the rear pillar outside moulding (Fig. 24) and remove the moulding. Remove the outside upper moulding retaining screw at the rear pillar.

3. Remove the window front pillar outside moulding retaining screws (Fig. 24).

4. Working from inside the car, loosen the weatherstrip from the opening flange, and push the window, weatherstrip, and mouldings out of the opening.

INSTALLATION

1. Remove the mouldings and weatherstrip from the glass.

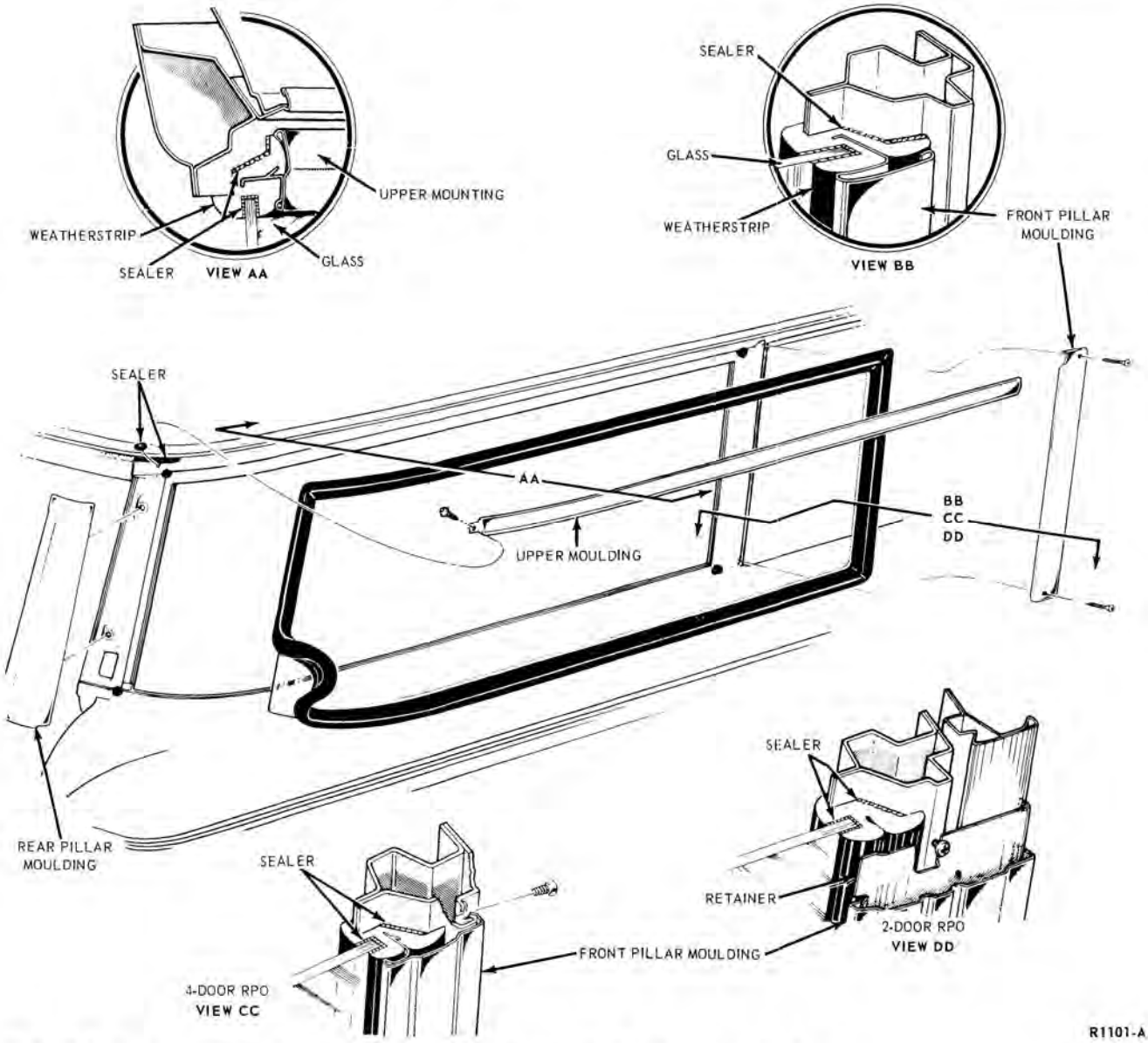


FIG. 24—Stationary Rear Quarter Window—Body Types 59, 71—Comet, and Falcon

2. Using solvent, clean the opening flange and the weatherstrip or glass. Apply a bead of caulking cord to the window opening.

3. Apply sealer in the weatherstrip groove for the glass and position the weatherstrip on the glass. Install the outside mouldings in the weatherstrip.

4. Position a draw cord in the weatherstrip and apply Ru-Glyde to the weatherstrip surfaces that will contact the window opening flange.

5. Position the window in the opening, and with a helper applying pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the opening flange.

6. Install the outside upper moulding retaining screw, rear pillar moulding, plug button, and upper corner garnish moulding.

7. Install the quarter window front garnish moulding.

8. Install the window outside front pillar moulding.

REAR QUARTER WINDOW AND/OR WEATHERSTRIP—FAIRLANE MODEL 71

REMOVAL

1. Remove the spare tire cover and spare tire.

2. Remove the inside lower garnish moulding from the wheel well area.

3. Remove the quarter window inside front garnish moulding.

4. Remove the quarter window outside front moulding (Fig. 25).

5. Working from inside the car, loosen the weatherstrip from the window opening flange, and push the window, weatherstrip and moulding assembly out of the opening.

6. Remove the mouldings and weatherstrip from the glass.

7. Using solvent, remove all old sealer from the window opening flange, the window and the weatherstrip.

INSTALLATION

1. Apply a bead of sealer around the window opening flange.

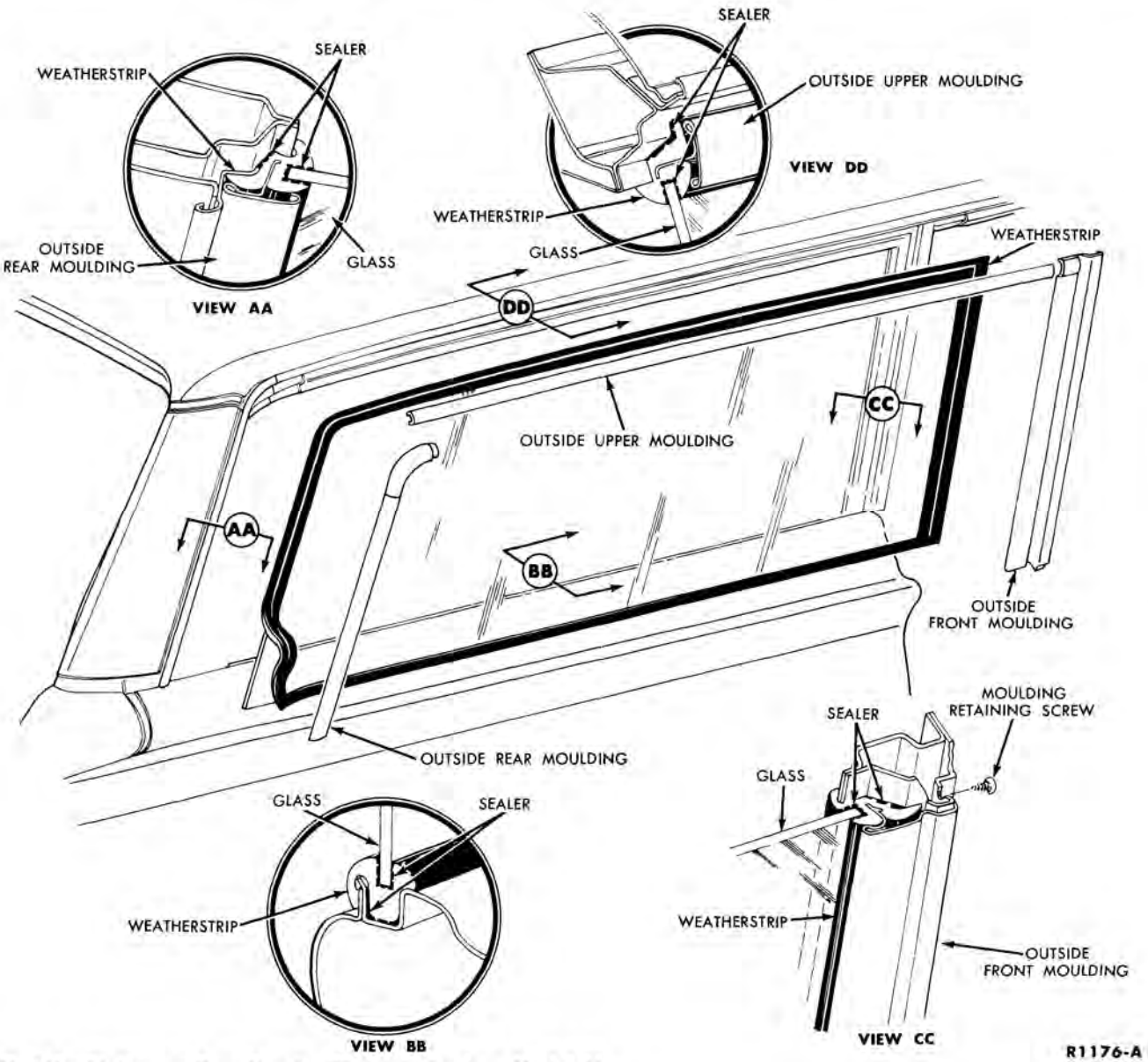


FIG. 25—Stationary Rear Quarter Window—Fairlane Model 71

2. Position the weatherstrip on the glass and install the outer mouldings in the weatherstrip.

3. Install a draw cord in the weatherstrip, and apply Ru-Glyde to the weatherstrip surfaces that will contact the window opening flange.

4. Position the window assembly to the window opening and use the draw cord to pull the weatherstrip over the window opening flange.

5. Using a caulking gun, apply sealer between the outside of the glass and the weatherstrip.

6. Install the outside front moulding retaining screws (Fig. 25).

7. Install the inside quarter window front garnish mouldings.

8. Install the inside lower garnish moulding.

9. Check for water leaks, then clean the glass and mouldings.

10. Install the spare tire and cover.

WINDSHIELD AND/OR WEATHERSTRIP—COMET, FALCON, FAIRLANE

REMOVAL

1. Remove the windshield wiper arms and blades.

2. Tape the roof panel at the upper corners to prevent scratching, and remove the moulding joint covers (Fig. 26) for all models except 63 and 76. The covers are retained by a snap fit.



FIG. 26—Moulding Joint Cover Removal—Body Types Except 63, 65, 76

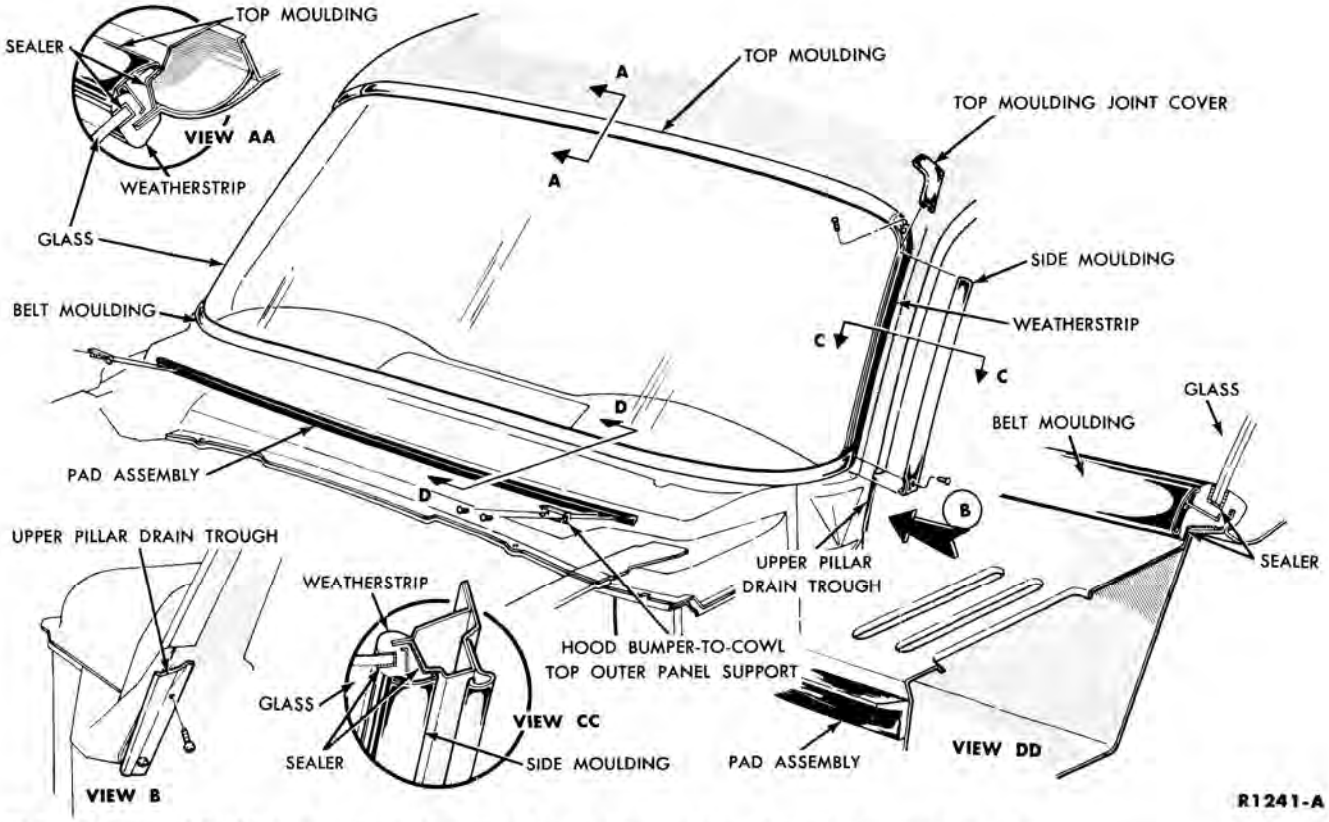


FIG. 27—Windshield Installation—Comet, Falcon, Fairlane—Except Body Types 63, 65, 76

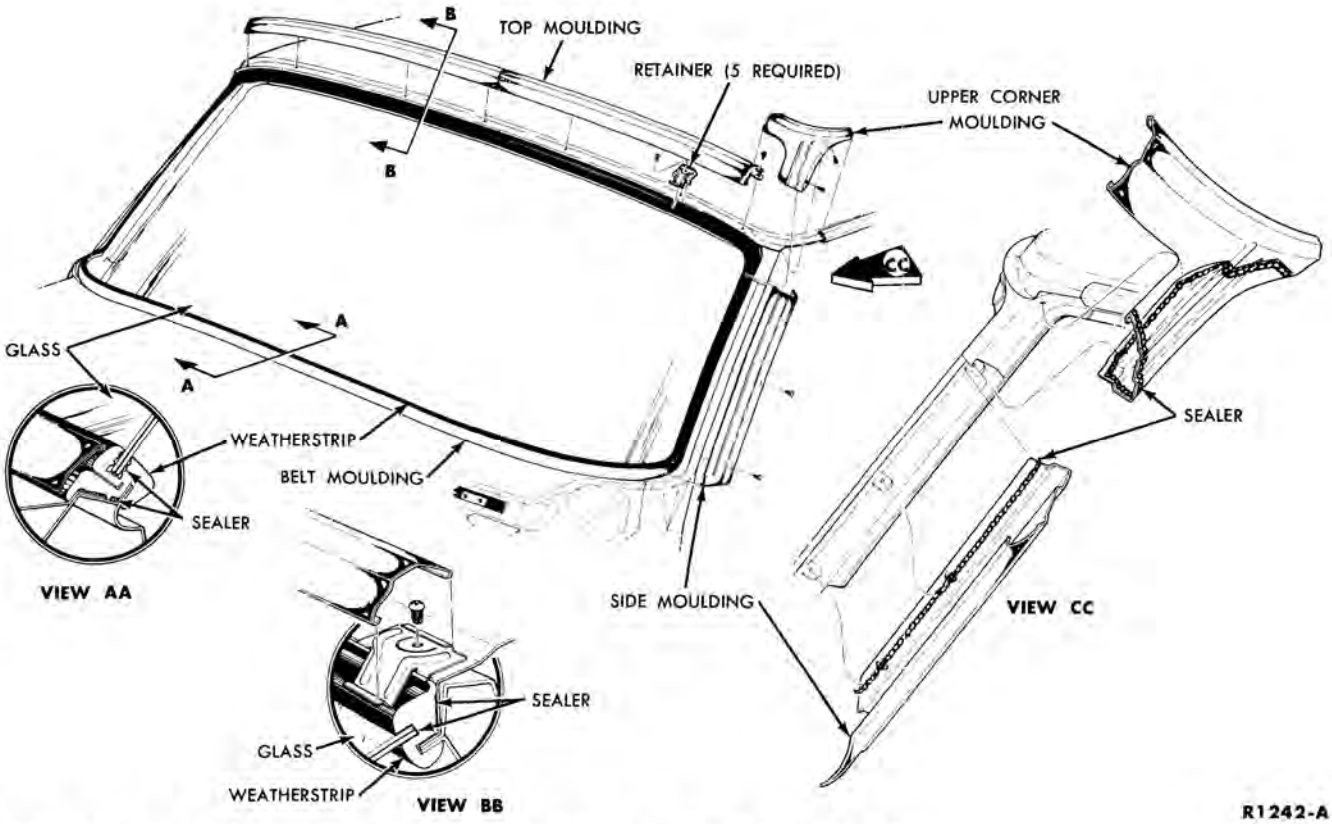


FIG. 28—Windshield Installation—Comet, Falcon, Fairlane—Body Types 63, 65

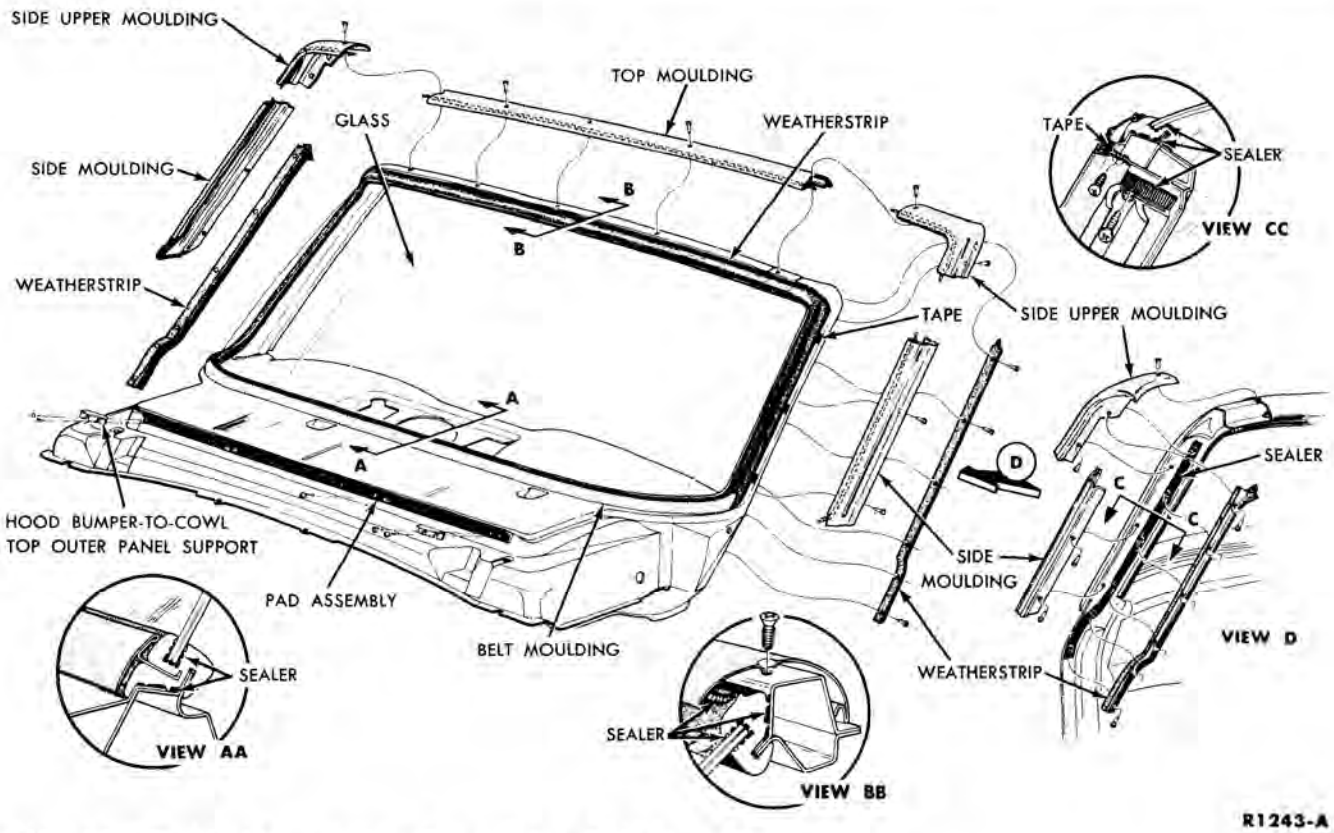


FIG. 29—Windshield Installation—Comet, Falcon Body Types 76

3. On a convertible, lower the top.

4. Remove the top moulding corner retaining screws for models 63, 65 and 76.

5. Remove the windshield outside mouldings.

6. Remove the windshield outside top moulding retaining clips for model 63.

7. Remove the sun visors and the windshield inside garnish mouldings.

8. Remove the inside rear view mirror.

9. Push outward along the edges of the windshield and remove the windshield with the weatherstrip and the outside lower moulding and/or upper moulding (Figs. 27, 28 and 29).

INSTALLATION

1. Remove the outside moulding or mouldings and the weatherstrip from the glass.

2. Clean the glass or the weatherstrip and the body opening flange.

3. Using a sealer gun, apply sealer in the weatherstrip glass opening.

4. Position the weatherstrip on the glass, and then install the moulding or mouldings in the weatherstrip.

5. Insert the draw cord in the weatherstrip (Fig. 30), and apply Ru-Glyde to the weatherstrip surfaces that will contact the windshield opening flange.

6. Using a sealer gun, apply a bead of sealer completely around the windshield opening.

7. Position the window assembly in the body opening. With a helper applying hand pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the window opening lower flange, each side flange, and then over the upper flange.

8. Install the windshield outside top moulding retaining clips for model 63.

9. Install the retaining screws in the windshield outside top moulding corners for all models except 63, 76.

10. Install the windshield outside mouldings (Figs. 27, 28 and 29).

11. Install the windshield wiper arms and blades.

12. Install the sun visors and windshield inside garnish mouldings.

13. Install the inside rear view mirror.

14. Check the windshield for leaks, and clean the windshield and mouldings.

15. On a convertible, raise the top.

WINDSHIELD—MUSTANG MODEL 63, 65

REMOVAL

1. Using Tool T64P42430 R or L, remove the top left and right outside windshield mouldings (Fig. 31).

2. Using Tool T64P42430 R or L, remove the left and right windshield outside side mouldings.

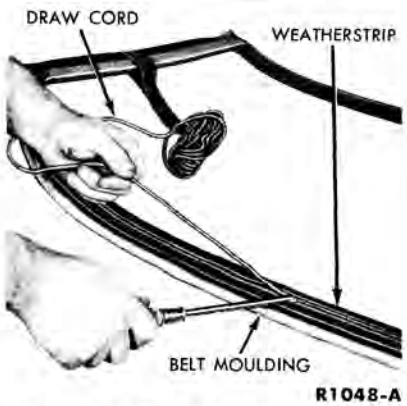


FIG. 30—Draw Cord Installation

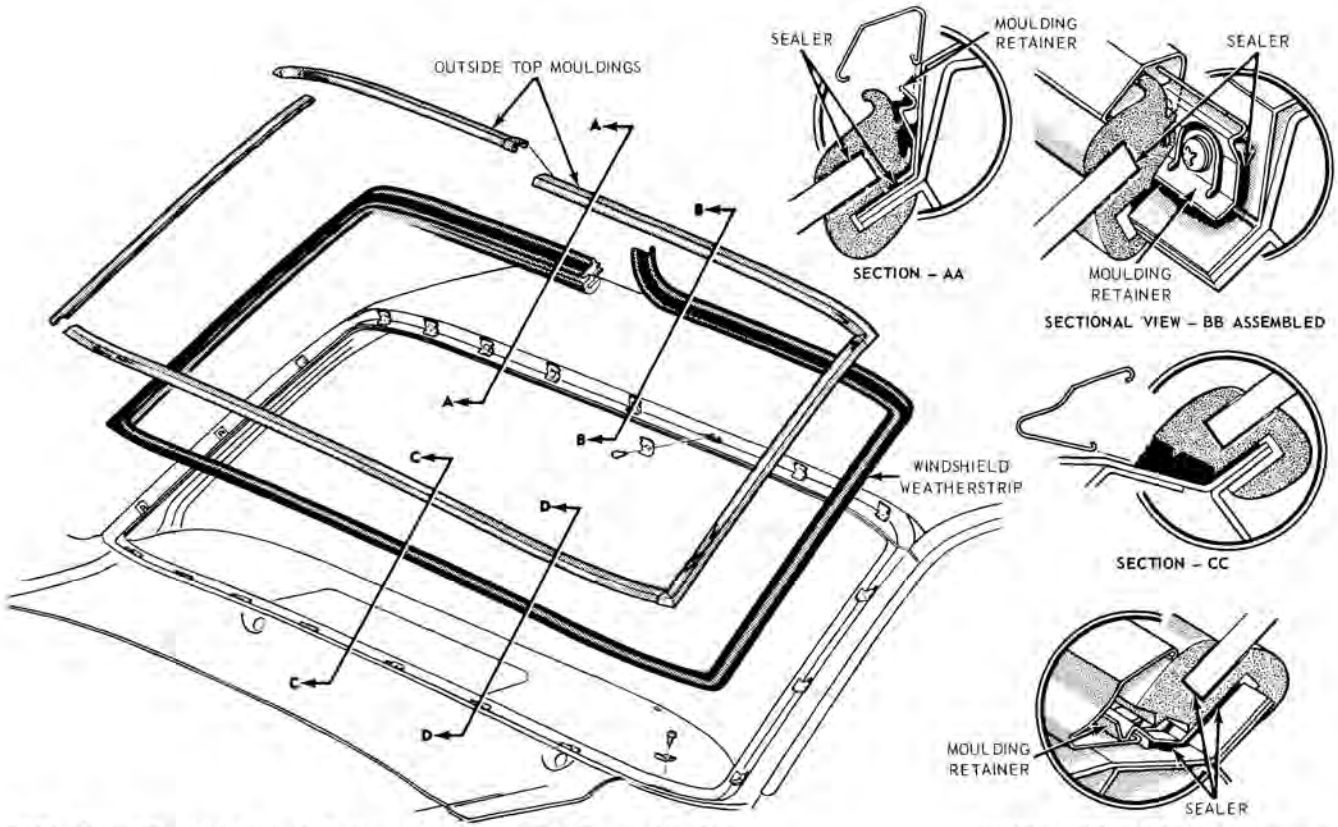


FIG. 31—Windshield Installation—Mustang Body Types 63, 65

3. Remove the windshield wiper arm and blade assemblies.

4. Using Tool T64P42430 R or L, remove the windshield outside belt mouldings (Fig. 31).

5. Remove the windshield and weatherstrip assembly by pushing outward along the inner edges of the windshield.

INSTALLATION

1. Remove the weatherstrip from the glass.

2. Clean all old sealer from the weatherstrip and the body opening flange.

3. Using a caulking gun, apply sealer in the weatherstrip glass opening.

4. Position the weatherstrip on the glass and install a draw cord in the body opening groove of the weatherstrip.

5. Using a caulking gun, apply a bead of sealer all the way around the body opening outer flange.

6. Apply rubber lubricant to the weatherstrip surface that contacts the body opening flange.

7. Position the windshield and weatherstrip assembly in the windshield opening and, with a helper applying pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the window opening lower flange, each side flange and then over the upper flange.

8. Install the outside belt moulding (Fig. 31) by positioning it and snapping it over its clip retainers.

9. Install the outside side mouldings by snapping them over their clip retainers.

10. Install the top right and left outside side mouldings by snapping them over their clip retainers.

11. Clean the windshield and mouldings.

12. Install the windshield wiper arm and blade assemblies.

WINDSHIELD—MUSTANG MODEL 76

REMOVAL

1. Lower the convertible top.

2. Remove the rear view mirror.

3. Remove the four upper garnish moulding retaining screws and remove the upper garnish moulding.

4. Remove the sun visor bracket and pivot retaining screws and remove the sun visor assemblies.

5. Remove the front upper body pillar weatherstrips (Fig. 32). Note that these weatherstrips are pressed into their retainers.

6. Remove the front upper body pillar weatherstrip retainer retaining screws (four) and remove the retainers.

7. Remove the retaining screw and two retaining nuts from each left and right windshield outside top moulding and remove the mouldings (Fig. 32, View AA).

8. Remove the two retaining screws from each windshield outside side moulding and, using Tool T64P42430 R or L, remove the outside side mouldings.

9. Remove the windshield wiper arm and blade assemblies.

10. Using Tool T64P42430 R or L, remove the windshield outside belt moulding.

11. Remove the windshield and weatherstrip assembly by pushing outward along the inner edges of the windshield.

INSTALLATION

1. Remove the weatherstrip from the glass.

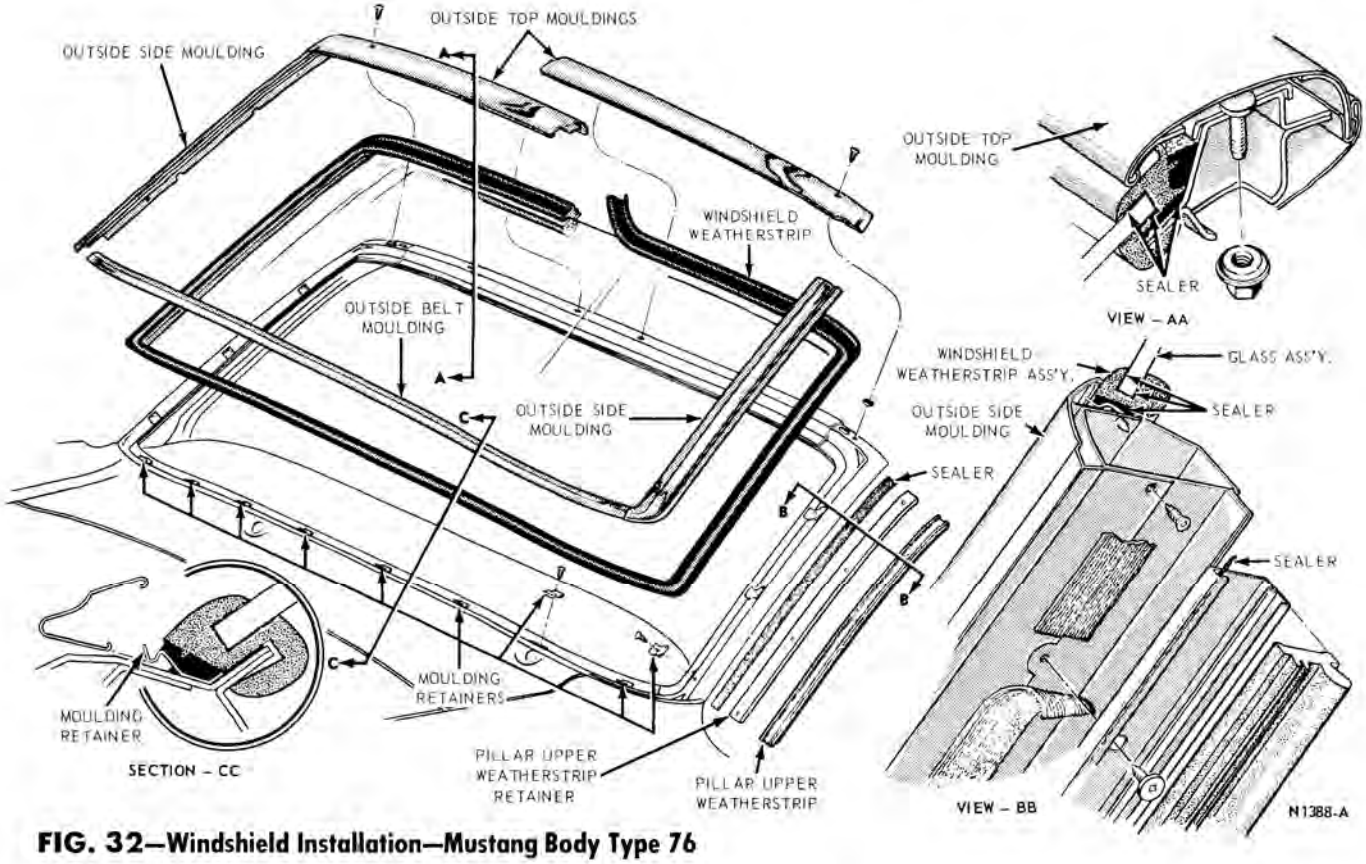


FIG. 32—Windshield Installation—Mustang Body Type 76

2. Clean all old sealer from the weatherstrip and the body opening flange.

3. Using a caulking gun, apply sealer in the weatherstrip glass opening.

4. Position the weatherstrip on the glass and install a draw cord in the body opening groove of the weatherstrip.

5. Using a caulking gun, apply a bead of sealer all the way around the body opening outer flange.

6. Apply rubber lubricant to the weatherstrip surfaces that contact the body opening flange.

7. Position the windshield and weatherstrip assembly in the windshield opening. With a helper applying pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the window opening lower flange, each side flange and then over the upper flange.

8. Install the outside belt moulding (Fig. 32) by snapping the moulding over the retaining clips.

9. Install the outside side mouldings by snapping them over their retaining clips and install the retaining screws.

10. Position the left and right outside top mouldings and install the retaining screws and nuts.

11. Position the left and right front upper body pillar weatherstrip retainers (Fig. 32) and install the retaining screws.

12. Install the front upper body pillar weatherstrips by pressing them securely into their retainers.

13. Install the sun visor bracket and pivot assemblies.

14. Position the upper garnish moulding and install the garnish moulding retaining screws.

15. Install the rear view mirror.

16. Clean the windshield and mouldings.

17. Install the wiper arm and blade assemblies.

BACK WINDOW AND/OR WEATHERSTRIP—MODEL 63

REMOVAL

1. From inside the car, loosen the weatherstrip edges, and then push out the back window, weatherstrip and exterior mouldings as an assembly (Fig. 33).

INSTALLATION

1. Remove the mouldings from the weatherstrip (Fig. 33).

2. Remove the weatherstrip from the glass.

3. Clean the glass or weatherstrip and the body opening flange.

4. Using a sealer gun, apply sealer in the weatherstrip glass opening.

5. Position the weatherstrip on the glass, and then install the mouldings in the weatherstrip.

6. Insert the draw cord in the weatherstrip, and apply rubber lubricant to the weatherstrip surfaces that will contact the back window opening flange (Fig. 30).

7. Using a sealer gun, apply a bead of sealer completely around the back window opening.

8. Position the window assembly in the body opening. With a helper applying hand pressure from the outside, use the draw cord to pull the lips of the weatherstrip over the window opening flanges.

9. Check the back window for leaks and clean the back window and mouldings.

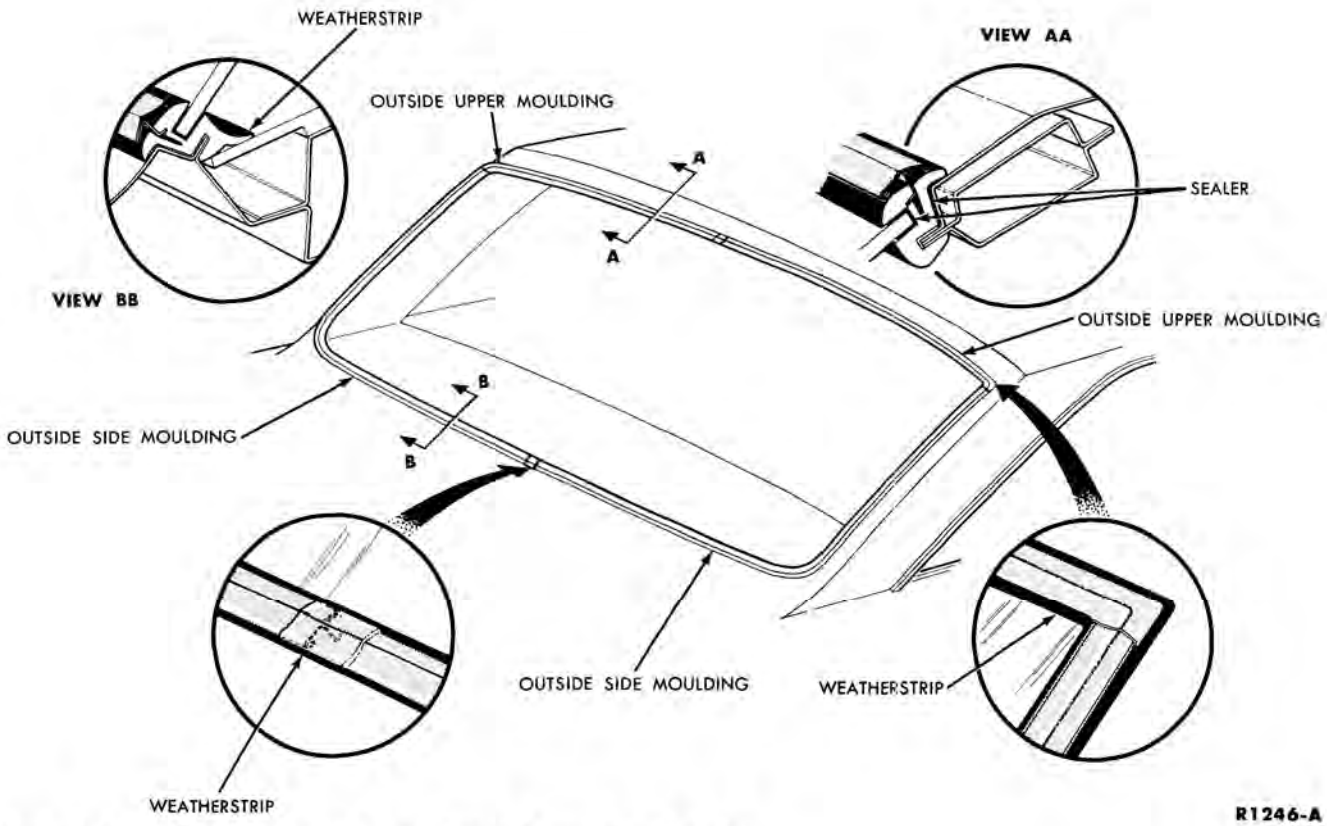


FIG. 33—Back Window Installation—Comet, Falcon Body Type 63

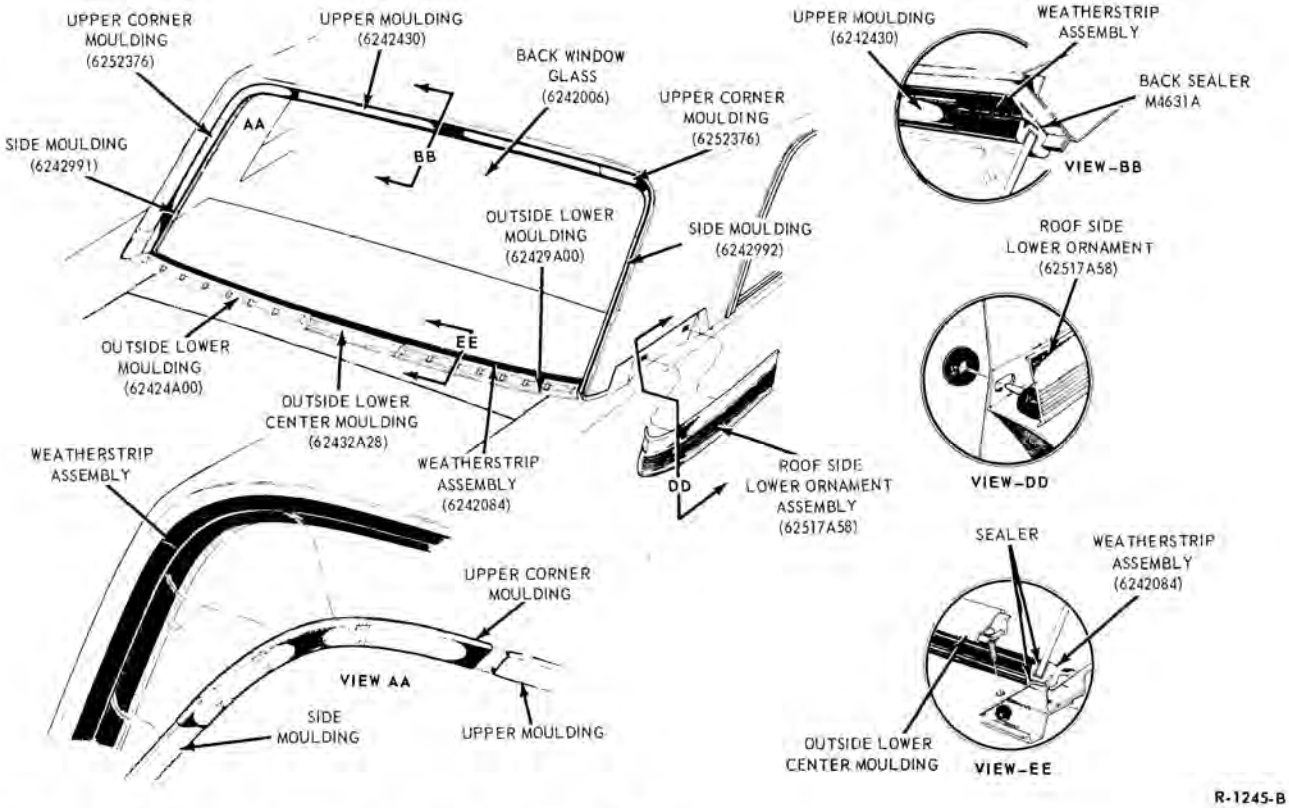


FIG. 34—Back Window Installation—Comet, Falcon—Body Types 54, 62

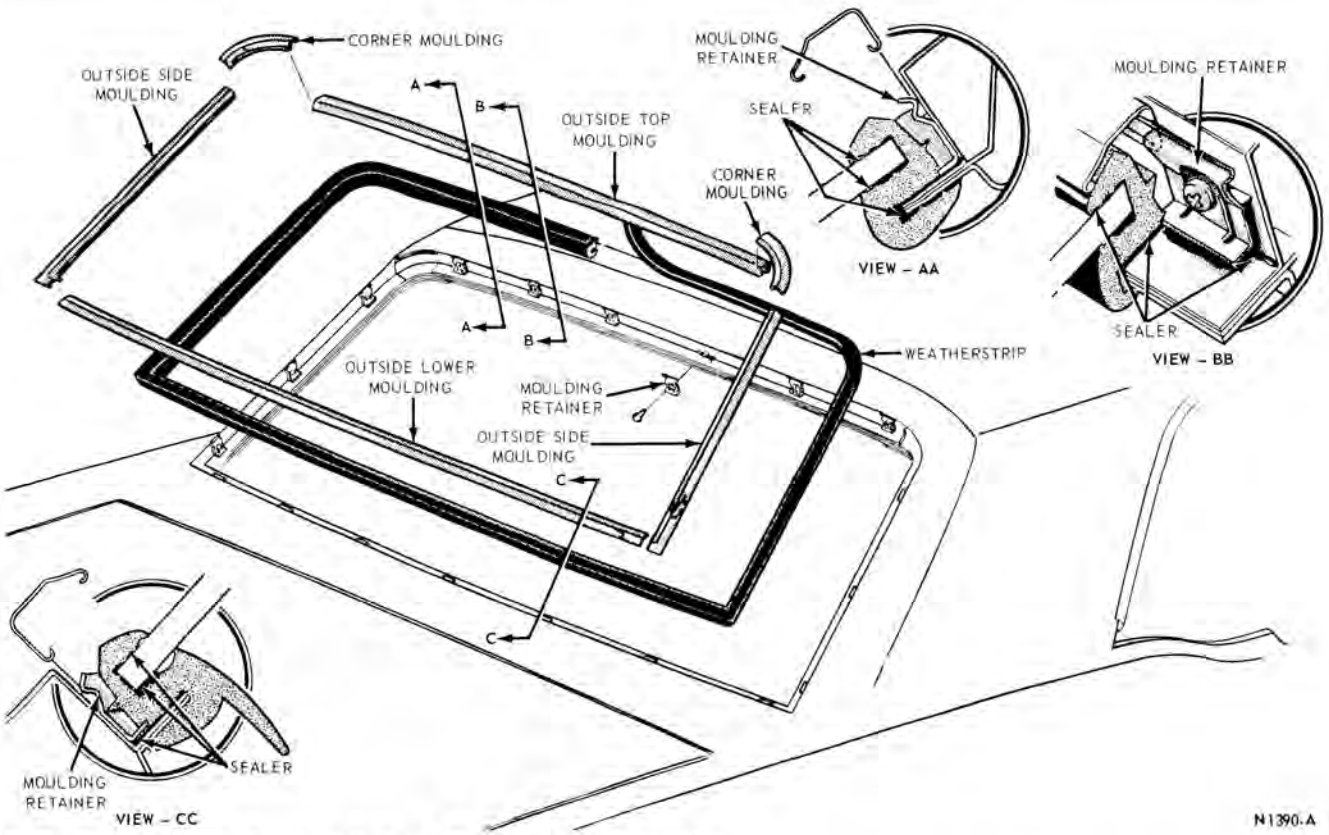


FIG. 35–Back Window Installation–Mustang Body Type 65

BACK WINDOW AND/OR WEATHERSTRIP–FALCON BODY TYPES 54 AND 62

REMOVAL

1. Open the rear deck lid.
2. Remove the left and right outside lower moulding retaining nuts and washers (Fig. 34), and remove the left and right outside lower mouldings.
3. Remove the outside lower center moulding retaining nut and washer and remove the outside lower center moulding.
4. From inside the car, loosen the weatherstrip edges and then push out the back window, weatherstrip, upper moulding and upper corner mouldings as an assembly.
5. Place the window assembly on a bench and remove the mouldings from the weatherstrip. Remove the weatherstrip from the glass.

INSTALLATION

1. Clean the glass, weatherstrip and the body opening flange.
2. Using a sealer gun, apply sealer in the weatherstrip glass opening.
3. Position the weatherstrip on the glass, and then install the mouldings in the weatherstrip.
4. Insert the draw cord in the weatherstrip, and apply rubber lubricant to the weatherstrip surfaces that will contact the back window opening flange.
5. Using a sealer gun, apply a bead of sealer completely around the back window opening.
6. Position the window assembly in the body opening. With a helper applying hand pressure from the outside, use the draw cord to pull the lips of the weatherstrip over the window opening flanges.
7. Install the outside lower left and right mouldings. Install the outside lower center moulding.
8. Clean the window and mouldings.

BACK WINDOW–MUSTANG MODEL 65

REMOVAL

1. Using Tool T64P42430 R or L, remove the outside side mouldings and the outside upper corner mouldings.
2. Using Tool T64P42430 R or L, remove the outside upper moulding and the outside lower moulding.
3. Remove the back window and weatherstrip assembly by pushing outward along the inner edges of the glass.
4. Remove the weatherstrip from the glass.

INSTALLATION

1. Clean all old sealer from the weatherstrip and the body opening flange.
2. Using a caulking gun, apply sealer in the weatherstrip glass opening groove.
3. Position the weatherstrip on the glass and install a draw cord in the weatherstrip body opening groove.
4. Using a caulking gun, apply a bead of sealer all the way around the body opening flange.
5. Apply rubber lubricant to the weatherstrip surface that contacts the body opening flange.
6. Position the window and weatherstrip assembly in the body opening and, with a helper applying pressure from the outside, use the draw cord to pull the lip of the weatherstrip over the body opening flange.
7. Snap the outside lower moulding into position over its retaining clips (Fig. 35).

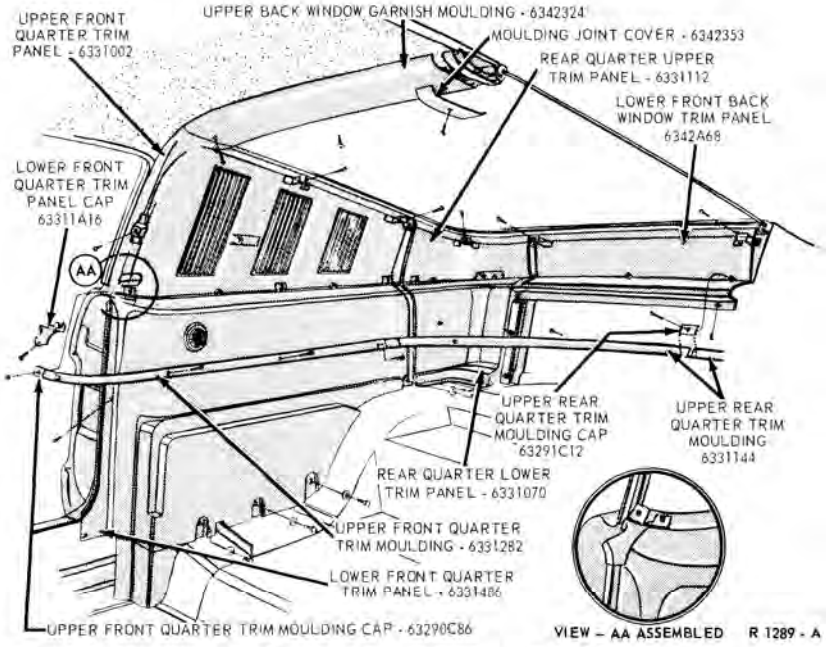


FIG. 36—Interior Moulding and Quarter Trim Panel Installation—Mustang Body Type 63

8. Snap the outside upper moulding into position over its retaining clips (Fig. 35).

9. Snap the outside side mouldings into position over the retaining clips (Fig. 35).

10. Install the outside upper corner mouldings.

11. Clean the glass and mouldings.

BACK WINDOW—MUSTANG MODEL 63

REMOVAL

1. Remove the quarter trim upper front moulding retaining screws and remove the quarter trim upper front mouldings.

2. Remove the quarter trim upper rear moulding cap retaining screw and remove the cap. Remove the quarter trim upper left and right rear moulding retaining screws and remove the mouldings. (Fig. 36).

3. Remove the back window garnish moulding upper joint cover. Remove the back window upper left and right garnish moulding retaining screws and remove the mouldings (Fig. 36).

4. Remove the left and right vent air extractor grille assembly (quarter trim upper front panels) retaining screws and remove the panels (Fig. 36).

5. Remove the back window lower front left and right trim panel retaining bolts and screws and remove the panels (Fig. 36).

6. Remove the quarter trim upper rear left and right panel retaining screws and remove the panels.

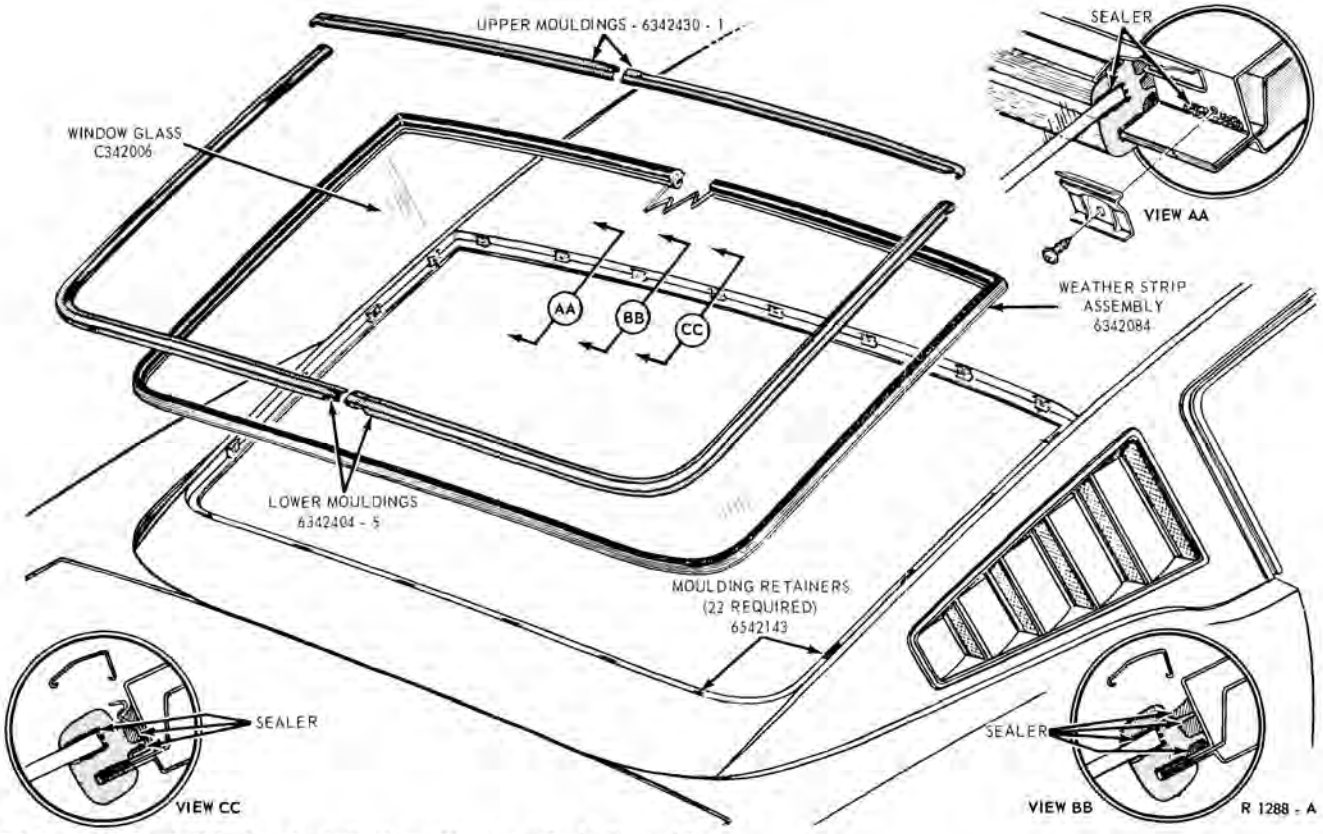
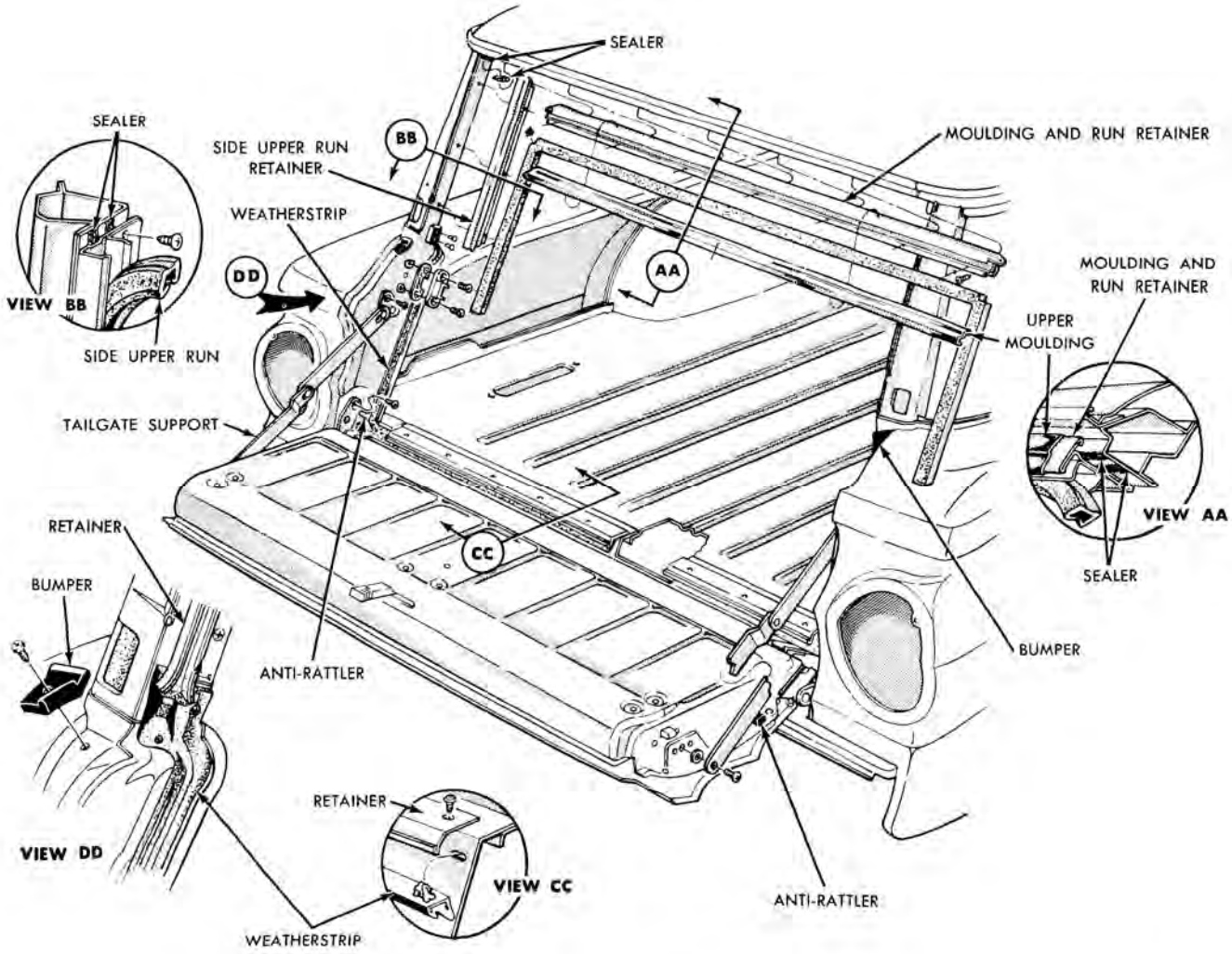


FIG. 37—Back Window Installation—Mustang Body Type 63



R1132-B

FIG. 38—Tailgate and Weatherstrip Installation—Comet, Falcon—Typical

7. Using moulding removal Tool T64P-42006-A or B, remove the back window exterior mouldings in the following order: right upper moulding, right lower moulding, left upper moulding and left lower moulding (Fig. 37).

8. With an assistant applying pressure from the inside, remove the back window and weatherstrip assembly.

9. Remove the weatherstrip from the glass.

INSTALLATION

1. Clean excess old sealer from the body window opening.

2. Clean old sealer from the weatherstrip if the weatherstrip is to be re-used.

3. Position the weatherstrip on the glass and install a pull cord (⅛ inch sash cord) around the weatherstrip body opening groove.

4. With the aid of an assistant, position the glass and weatherstrip assembly in the body window opening. Use the pull cord to pull the lip of the weatherstrip over the pinch-weld while applying pressure to the glass from the outside.

5. Apply sealer between the weatherstrip and the outside pinch weld flange.

6. Apply sealer between the outer glass surface and the weatherstrip.

7. Snap the window exterior mouldings into place in the following order; left lower moulding, left upper moulding, right lower moulding and right upper moulding.

8. Install the upper rear left and right quarter trim panels.

9. Install the upper front left and right quarter trim panels.

10. Install the back window lower front trim panel.

11. Install the upper rear left and right quarter trim mouldings and moulding cap.

12. Install the upper front left and right quarter trim mouldings.

13. Install the back window upper left and right garnish mouldings and garnish moulding joint cover.

14. Clean the back window and mouldings.

TAILGATE GLASS—COMET, FALCON

REMOVAL

1. Open and temporarily support the tailgate.
2. Disconnect the tailgate hinge supports at the tailgate.
3. Remove the tailgate cover panel retaining screws and remove the panel.
4. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.
5. Remove the window from the tailgate.

INSTALLATION

1. With a glass remover tool, remove the glass lower retainer and channel, and weatherstrip.
2. Remove the weatherstrip from the glass lower retainer and channel assembly, and then clean the glass groove.
3. Position the weatherstrip into the glass lower channel. Install the weatherstrip and channel to the glass.
4. Slide the window assembly into the glass runs and connect the regulator arms and rollers to the glass lower channel.
5. Apply Lubriplate to the glass rollers.
6. Clean the old sealer from the tailgate cover panel and apply new sealer.
7. Install the tailgate cover panel to the tailgate.
8. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE WINDOW REGULATOR—COMET, FALCON

REMOVAL

If the tailgate window regulator mechanism should fail with the window in a partially closed or closed position, the tailgate can be opened by removing the window side and upper runs (Fig. 38).

1. Open and temporarily support the tailgate.
2. Disconnect the tailgate hinge supports at the tail gate.
3. Remove the tailgate cover panel retaining screws and remove the panel.
4. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.
5. Remove the tailgate window from the tailgate and scribe the regulator mounting location.
6. Remove the regulator retaining bolts and remove the regulator.

INSTALLATION

1. Place the regulator manual drive spline into the handle, align the regulator, and install the regulator retaining bolts.

   Install the window assembly in the tailgate.
2. Clean the old sealer from the tailgate cover panel and apply new sealer.
3. Install the tailgate cover panel to the tailgate.
4. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE WINDOW REGULATOR—POWER

REMOVAL

If the tailgate window regulator mechanism should fail with the window in a partially closed or closed position, the tailgate can be opened by removing the window side and upper runs (Fig. 38).

1. Open and temporarily support the tailgate.
2. Disconnect the tailgate hinge supports at the tailgate.
3. Remove the tailgate cover panel retaining screws and remove the panel.
4. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.
5. Remove the window from the tailgate.
6. Disconnect the motor leads from the wiring harness in the tailgate.
7. Scribe the regulator mounting location, remove the regulator retaining bolts, and remove the regulator with the motor attached.

INSTALLATION

1. **Do not remove the electric regulator drive assembly for transfer to the new regulator until the regulator counterbalance spring is unloaded.** To unload the regulator counterbalance spring, place the spring in a vise so that the spring can not unwind, disconnect the spring from the outer retaining tab, and then slowly loosen the vise jaws.
2. Remove the screws retaining the regulator drive assembly and the motor to the regulator and remove the drive assembly and motor.
3. Position the drive assembly and motor to the new regulator and install the retaining screws.
4. Drill out the rivets retaining the manual clutch gear and housing assembly to the regulator. Remove and discard the manual drive assembly. **The manual clutch and gear assembly should not be removed until the electric drive assembly is installed.**
5. Install the regulator assembly on the tailgate and align the regulator as required.
6. Connect the wiring harness to the motor and secure the harness in place with the retainer.
7. Install the window assembly into the tailgate.
8. Apply Lubriplate to the glass rollers.
9. Clean the old sealer from the tailgate cover panel and apply new sealer.
10. Install the tailgate cover panel to the tailgate.
11. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE SWITCH AND LOCK CYLINDER—POWER

REMOVAL

1. Open and temporarily support the tailgate.
2. Disconnect the tailgate hinge supports at the tailgate.
3. Remove the tailgate cover panel retaining screws and remove the panel.
4. Remove the window regulator arm roller retaining pins, disconnect the arms from the rollers, and remove the rollers from the glass channel.
5. Remove the window from the tailgate.
6. Remove the regulator.
7. Remove the nuts retaining the lock and switch, and then remove

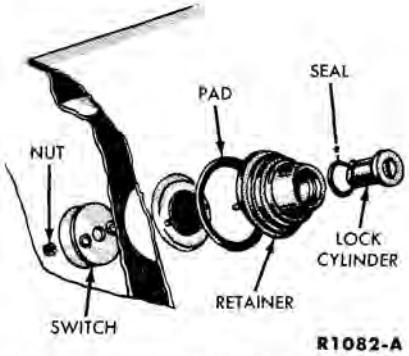


FIG. 39—Tailgate Switch and Lock Installation—Comet, Falcon —Typical

the lock and lock cylinder from the tailgate (Fig. 39).

8. If the switch requires replacement, disconnect the switch wires from the tailgate wiring harness and remove the switch and wires.

9. To remove the lock cylinder, depress the lock cylinder retaining pin, insert the key and rotate the cylinder until the retaining pin drops, and then remove the lock cylinder.

INSTALLATION

1. To install the lock cylinder, insert the key in the lock cylinder and slide the cylinder into the retainer.

2. To install the switch assembly, route the wiring harness through the tailgate to the tailgate harness switch connector.

3. Place the lock assembly and gasket to the tailgate and position the switch to the lock assembly. It may be necessary to rotate the lock cylinder to align the switch and the lock. Install the retaining nuts.

4. Install the window regulator.

5. Install the tailgate window assembly into the tailgate.

6. Apply Lubriplate to the glass rollers.

7. Clean the old sealer from the tailgate cover panel and apply new sealer.

8. Install the tailgate cover panel to the tailgate.

9. Connect the tailgate hinge supports and remove the temporary support.

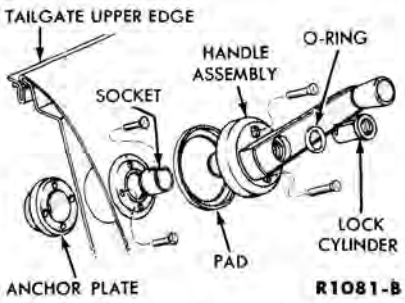


FIG. 40—Tailgate Window Regulator Handle Installation—Comet, Falcon—Typical

TAILGATE WINDOW HANDLE AND LOCK CYLINDER—MANUAL

REMOVAL

1. With the tailgate window in the closed position, unlock the tailgate handle, and rotate the handle assembly to reveal the mounting screws (Fig. 40).

2. Remove the handle mounting screws, and then remove the handle assembly and pad.

3. To remove the lock cylinder turn the key in the cylinder to align the cylinder locking pin with the access hole in the handle assembly. Depress the locking pin and remove the lock cylinder.

INSTALLATION

1. To replace the lock cylinder, transfer the O-rings, and then with the key in the cylinder, install the lock cylinder in the handle assembly.

2. If the window regulator has been replaced, it may be necessary to reposition the handle assembly so that it hangs in a vertical position, with the tailgate window in a closed position. To adjust the handle position, remove the snap ring and socket from the window regulator stem, and then install the socket with the notch at the top.

3. Install the pad and handle assembly.

LATCH RELEASE LEVER AND LINK

REMOVAL

1. Support the tailgate, and remove the bolt and washer retaining the hinge support to the tailgate.

2. Remove the tailgate cover panel retaining screws and remove the panel.

3. Remove the retaining screws from the right or left latch assembly, rotate the latch 90 degrees, and remove the latch (Fig. 41).

4. Pull the knob from the tailgate latch release lever.

5. Remove the latch release lever retaining screws and remove the lever and link.

INSTALLATION

1. Connect the link to the latch on the tailgate, position the release lever on the tailgate, and install the retaining screws.

2. Install the knob on the latch actuating lever.

3. Install the latch.

4. Remove the old sealer from

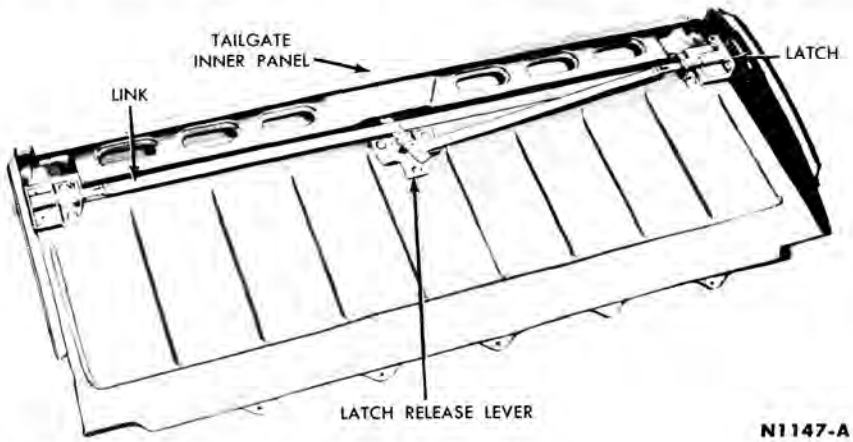


FIG. 41—Latch Release Lever Assembly

the cover panel and apply new sealer.

5. Install the cover panel to the tailgate.

6. Connect the tailgate hinge supports and remove the temporary support.

TAILGATE HINGE—COMET, FALCON

REMOVAL

1. Support the tailgate in the open position.

2. Disconnect both hinge supports at the tailgate.

3. Remove the screws retaining the tailgate cover panel assembly to the tailgate and remove the cover panel.

4. Crank the window regulator enough to gain access to the hinge area. Remove the hinge to cover seal.

5. Insert a screwdriver into the tailgate counterbalance spring strap to prevent the strap hook from entering the spring compartment when the hinge is removed.

6. Loosen the lock nut on the tailgate glass run lower adjusting screw to provide clearance for the removal of the hinge upper retaining bolt.

7. Partially close the tailgate and remove the hinge to tailgate retaining bolts, strap hook, and hook retainer plate.

8. Pull off the tailgate support anti-rattle pad.

9. Scribe the hinge location to the body and remove the screws retaining the hinge. Pull the tailgate slightly away from the body and remove the hinge.

INSTALLATION

1. Position the hinge on the tailgate and snugly install the hinge retaining screws to the body.

2. With the tailgate partially closed, install the tailgate counterbalance spring strap hook and hook retainer plate to the hinge.

3. Remove the screwdriver from the spring strap.

4. Tighten the tailgate glass run lower adjusting screw.

5. Lower the glass and check and adjust the tailgate alignment. Tighten the hinge retaining screws and bolts (Fig. 42).

6. Install the tailgate support anti-rattle pad and the hinge to cover seal.

7. Clean off the old sealer from the cover panel and apply new sealer.

8. Install the inner panel to the tailgate.

9. Install the tailgate hinge supports and remove the temporary support.

TAILGATE COUNTERBALANCE SPRING—COMET, FALCON

REMOVAL

1. Remove the spring access cover (Fig. 43).

2. From inside the vehicle and with the tailgate in the closed position, insert a 12-inch screwdriver



FIG. 42—Tailgate Hinge Adjustments—Comet, Falcon

through the hooked end of the spring and into the hole provided in the member, and unhook the spring from the retaining pin (Fig. 43).

3. Unhook the spring from the tailgate strap and remove the spring.

4. Remove the strap from the counterbalance spring strap hook.

INSTALLATION

1. Position the strap on the hook.

2. Position the spring in the

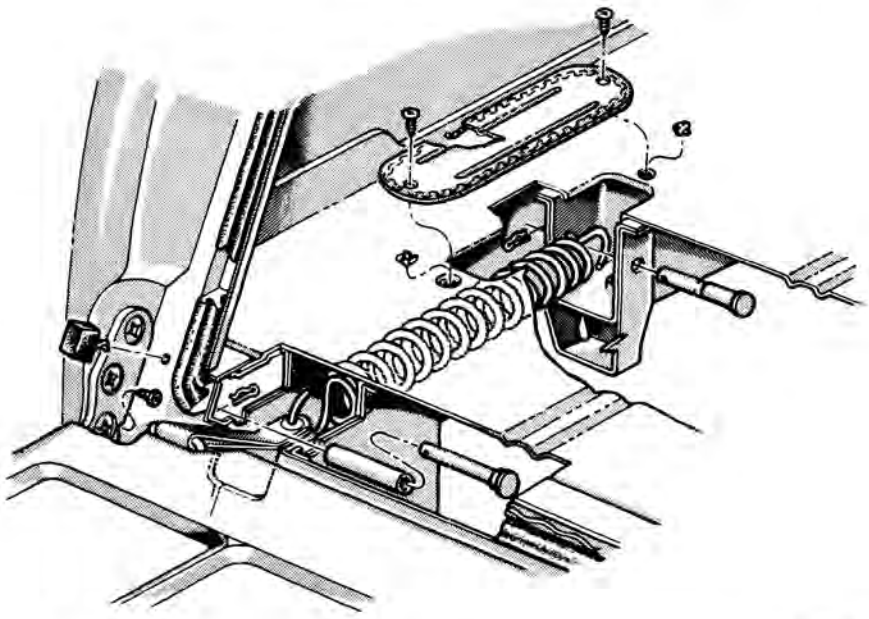


FIG. 43—Tailgate Counterbalance Spring—Comet, Falcon

spring compartment and connect it to the strap.

3. With a long screwdriver and the tailgate in the closed position, hook the spring to the retaining pin.

4. Clean the old sealer from the access cover and floor pan.

5. After applying new sealer, install the access cover.

STATION WAGON TAILGATE AND WINDOW—FAIRLANE

EMERGENCY RAISING AND LOWERING OF WINDOW

If necessary to gain access to the window regulator mechanism to raise or lower the window when normal window operation has failed, the following procedures apply:

WINDOW PARTIALLY OR FULLY RAISED

1. From inside the vehicle, remove the tailgate access cover retaining screws.

2. Remove the plastic water shield.

3. Remove the lock access cover.

4. Remove the regulator arm roller retaining clips, disengage the regulator arm studs from the rollers and lower the window assembly.

5. The tailgate can now be opened and serviced.

WINDOW LOWERED

1. Lower the tailgate and remove the tailgate access cover retaining screws.

2. Remove the plastic water shield.

3. Remove the lock access cover.

4. Remove both inner-panel bottom drain hole seals. Fabricate and insert a hooked tool through the drain holes and remove the regulator arm roller retaining clips. In the same manner, disengage the regulator arm studs from the rollers.

5. The window can now be raised for access to the regulator mechanism.

Window Adjustments. Both the upper and the lower ends of the window lower side runs, in the tailgate, can be adjusted fore-and-aft at point A (Fig. 44) to properly align the window with the upper runs on the body pillars.

The window stop lower bumper can be adjusted up or down at point B (Fig. 44) so that the top edge of the window is flush with the top of the tailgate when the window is in the down position.

WINDOW ELECTRICAL SYSTEM

The tailgate window electrical system (Fig. 45) includes the following:

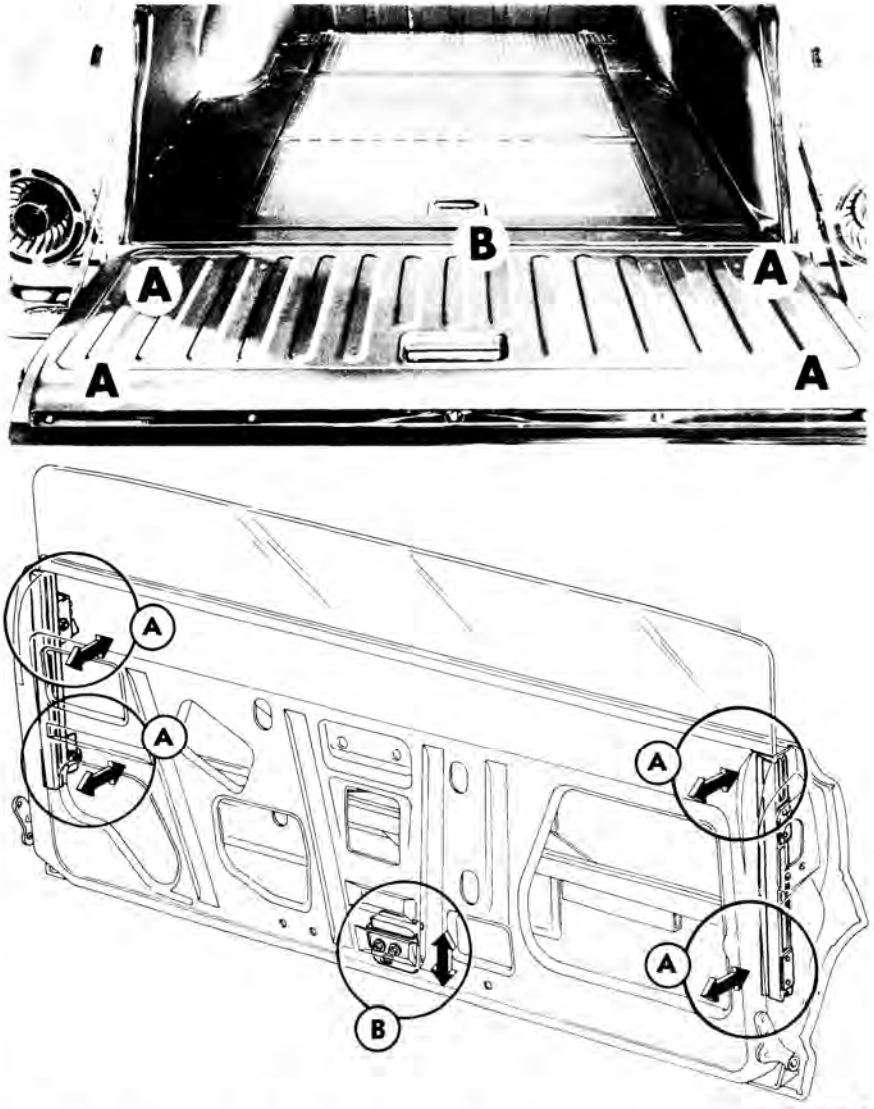
A reversible, 12-volt motor to operate the window regulator mechanism.

A toggle-type control switch mounted in the instrument panel.

A key-operated control switch mounted in the tailgate.

A limit switch mounted in the body rear pillar which prevents raising the window when the tailgate is lowered.

A 30-ampere circuit breaker, attached to the starting motor relay, to protect the electrical circuit.



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FIG. 44—Tailgate Window Adjustments—Fairlane

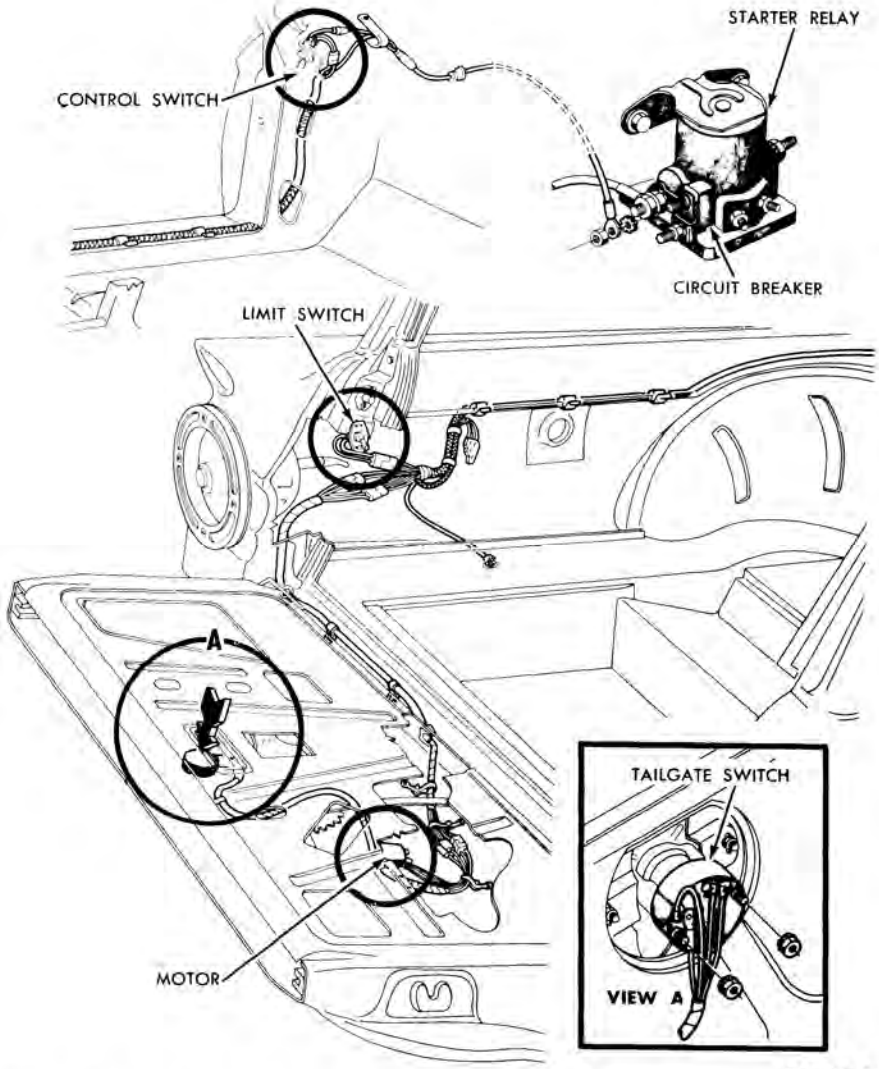


FIG. 45—Tailgate Electrical System—Fairlane

WINDOW ELECTRICAL CHECKS

Window Will Not Operate.

1. Check for battery voltage on both sides of the circuit breaker on the starter relay (Fig. 46). Replace the circuit breaker if it is defective.

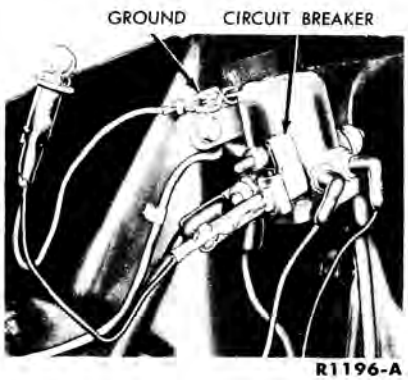


FIG. 46—Circuit Breaker Test

2. Separate the red-orange stripe wire connector under the instrument panel and, using a test lamp, check for battery voltage. Repair or replace the wire to the circuit breaker if required.

3. Separate the control switch two-wire connector behind the instrument panel. Connect one lead of a test lamp to ground. Connect the other lead to the red wire and then to the yellow wire leading to the switch and operate the switch each time (Fig. 47). If the test lamp does not light in either case, the switch and wiring assembly is defective and must be replaced.

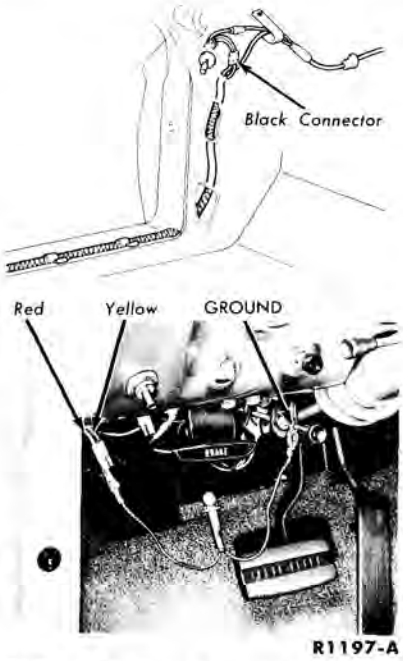


FIG. 47—Circuit Breaker to Control Switch Wiring Test

4. In the left taillight area, disconnect the limit switch wires at the black connector. Connect a self-powered test light to the limit switch wires, and operate the switch (Fig. 48). (The limit switch contacts are open when the tailgate is open.) Replace the switch and wiring assembly if required.

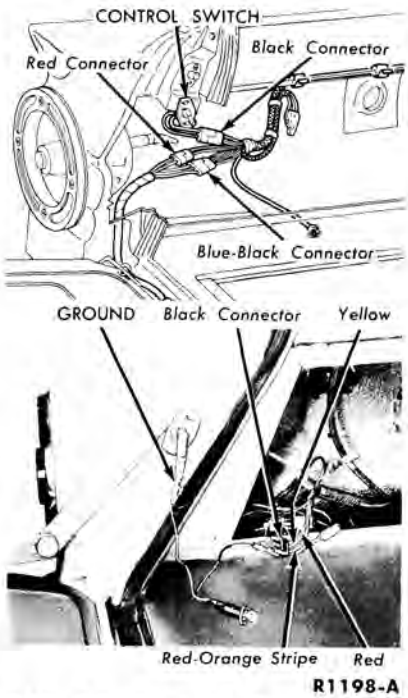


FIG. 48—Control Switch to Limit Switch Wiring Test

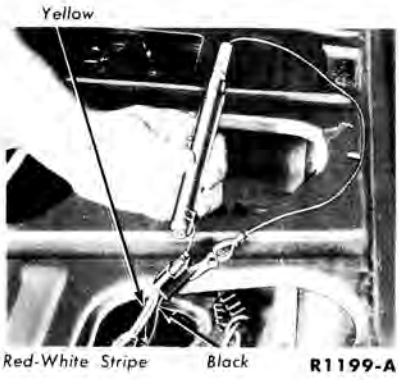


FIG. 49—Testing Motor Wiring

5. In the left taillight area, separate the blue-black connector and check for battery voltage at the red-orange stripe (feed) wire (Fig. 48). Repair or replace the wire if necessary.

6. In the tailgate, separate the tailgate motor connector (black) and connect one lead of a self-powered test light to the motor black ground wire. With the other lead, test the motor red-white stripe (motor up) and the yellow (motor down) wires (Fig. 49). Repair or replace the defective components.

One Switch Will Not Operate.

1. The control switch in the instrument panel can be checked as outlined in steps 1 through 3 under Window Will Not Operate.

2. To check the tailgate switch, separate the red connector. Test for battery voltage at the red-orange stripe (feed) wire (Fig. 50). Repair or replace the wire if required.

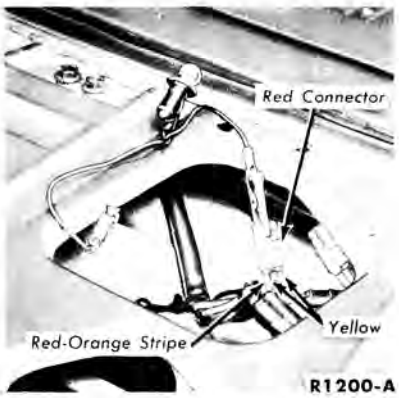


FIG. 50—Testing Tailgate Switch Feed Wire

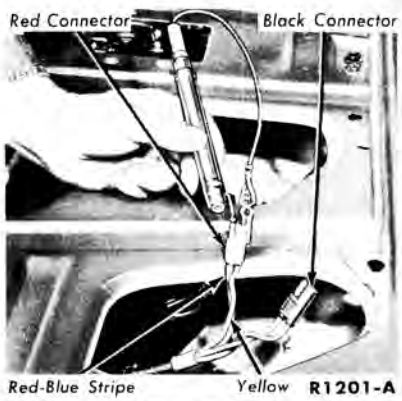


FIG. 51—Testing Tailgate Switch and Wiring

3. The switch and wiring assembly can be checked with a self-powered test light. At the red connector, connect one lead of the test light to the yellow wire and the other lead to red-blue stripe wire and operate the switch (Fig. 51). Repeat the operation at the black connector (Fig. 51). Repair the wiring or replace the switch assembly as necessary.

Window Will Not Go Down.

1. In the left taillight area, separate the blue-black connector and check for battery voltage at the red-orange stripe (feed) wire in the black connector. If voltage is not available, check out the red-orange stripe wire to the circuit breaker on the starter relay. Repair or replace as necessary.

2. At the blue connector, connect one lead of a self-powered test light to the red-orange stripe (feed) wire and connect the other lead to the yellow wire. A completed circuit will indicate that the wires through the motor are good. If the test light indicates an open circuit, repair or replace the wires or motor as required.

Window Will Not Go Up.

1. In the left taillight area, separate the blue-black connector and check for battery voltage at the red-orange stripe (feed) wire in the black connector. If voltage is not available, to the red-orange stripe (feed) wire of the circuit breaker on the starter relay, repair or replace as necessary.

2. Disconnect the limit switch wires at the black connector. Connect a self-powered test light to the limit switch wires, and operate the switch. (The switch contacts are open when the tailgate is open.) Replace the switch and wiring assembly if required.

3. At the blue connector, connect one lead of a self-powered test light to the red-orange stripe (feed) wire and connect the other lead to the red wire. A completed circuit will indicate that the wires through the motor and switch are good. If the test light indicates an open circuit, repair or replace the wires or motor as required.

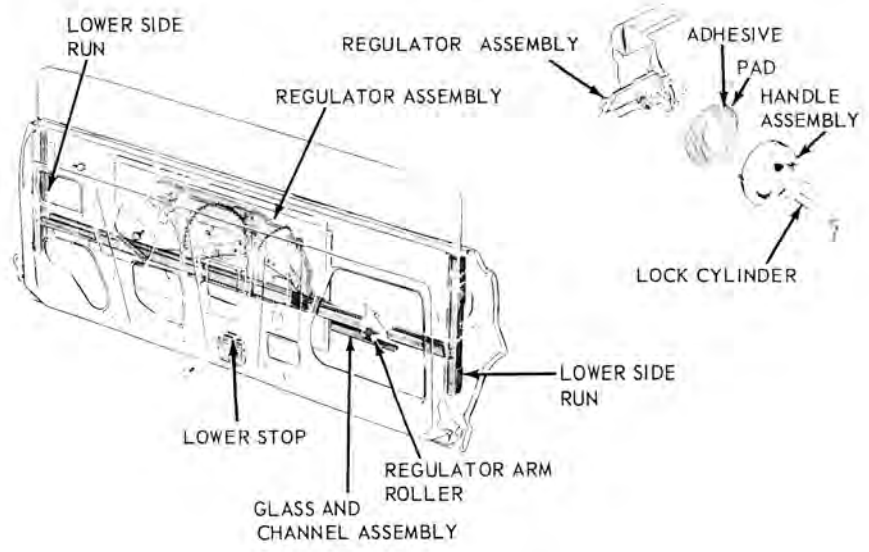


FIG. 52—Tailgate Window Mechanism—Fairlane

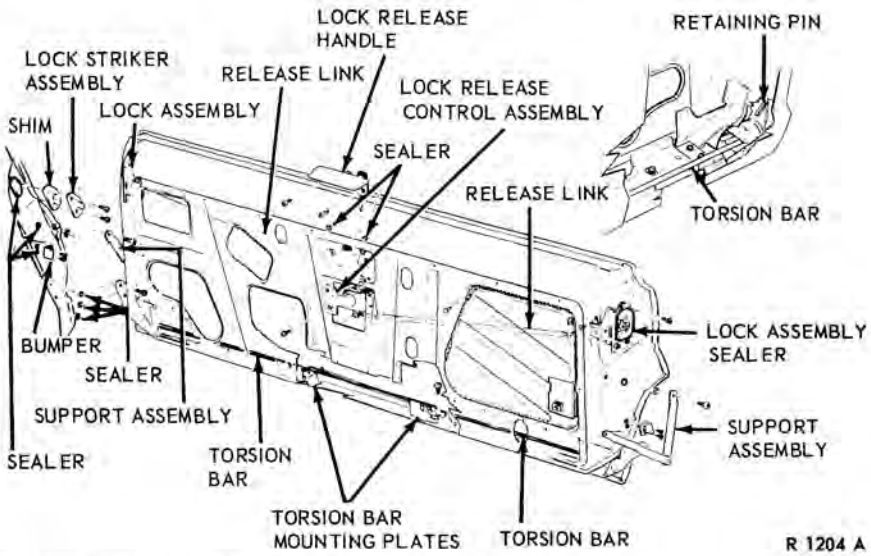


FIG. 53—Tailgate Lock and Hinge Assembly—Fairlane

TAILGATE LOCK CYLINDER AND/OR HANDLE ASSEMBLY —FAIRLANE

REMOVAL

1. Lower the window and open the tailgate.
2. Remove the tailgate trim panel, water shield and access cover.
3. Roll the window partially up to provide access and disconnect the regulator arms from the glass assembly (Fig. 52).
4. Remove the glass assembly.
5. Disconnect the left hand lock release link at the lock release control (Fig. 53).
6. POWER WINDOW ONLY: Disconnect the regulator and window switch wiring harnesses.
7. POWER WINDOW ONLY: Remove the regulator and window switch wiring from the plastic retaining strap on the tailgate.
8. Remove the four regulator retaining bolts and remove the regulator assembly.
9. Remove the three lock and handle assembly retaining nuts (Fig. 52) and remove the lock and handle assembly and gasket.
10. POWER WINDOW ONLY: Remove the switch and wire assembly from the handle assembly.
11. Remove the lock cylinder assembly from the handle assembly.

INSTALLATION

1. Install the lock cylinder assembly into the handle.
2. POWER WINDOW ONLY: Position the switch and wire assembly on the handle assembly.
3. Position the lock, switch (power window) and handle assembly in the tailgate and install the three retaining nuts.
4. Position the window regulator assembly in the tailgate and install the four retaining bolts.
5. POWER WINDOW ONLY: Connect the motor and switch wiring connectors.
6. POWER WINDOW ONLY: Position the wiring harnesses to the plastic strap retainers and snap the retainers in place.
7. Position the tailgate glass in the tailgate.
8. Place the roller retaining clips on the rollers; place the rollers in the lower glass channels and engage the regulator arms in the rollers.
9. Connect the left hand lock release control link to the lock release control.
10. Install the access panel and the water shield.
11. Install the tailgate inner trim panel.

TAILGATE LOCK—FAIRLANE

1. With the tailgate open, remove the inner trim panel, water shield and access cover.
2. Disconnect the window regulator arms and remove the glass assembly.
3. Remove the glass lower side run assembly.
4. Disconnect the lock release control link from the lock.
5. Remove the three lock assembly retaining screws and remove the lock assembly.
6. Position the lock assembly in the tailgate and install the three retaining screws.
7. Connect the lock release control link.
8. Install the window lower side run assembly.
9. Position the glass assembly in the tailgate and connect the regulator arms.
10. Install the access cover, water shield, and inner trim panel.

DECK LID

REMOVAL

New deck lids are furnished in prime paint without hardware. All usable hardware parts should be removed from the old deck lid so that they can be installed in the new one.

Before the old deck lid is removed and disassembled, time will be saved if the new one is prepared for installation. Inspect the new lid for dings and other minor damage, repair as necessary, and sand and paint it. While it is drying, remove and disassemble the old lid. When the new lid is dry, install the hardware.

1. Remove all serviceable hardware.
2. Remove the hinge attaching bolts from the deck lid, and lift it off the hinges.

INSTALLATION

1. Position the lid and install the attaching bolts loosely.
2. Close the lid gently to check the fit.
3. Adjust the deck lid and hinges for proper fit.
4. Adjust the striker plate.

DECK LID HINGE OR TORSION BAR

REMOVAL

1. Prop the deck lid open.
2. Mark the hinge position on the lid and on the mounting bracket for

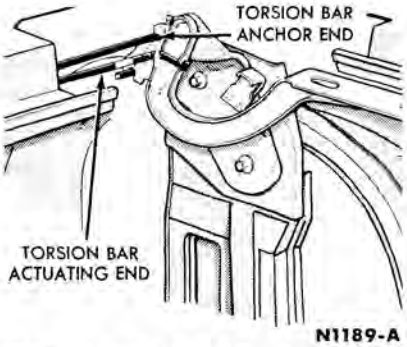


FIG. 54—Deck Lid Torsion Bar —Typical

reference when a new hinge is installed.

3. Using a tool T64K-44890-B pry the anchor end of the torsion bar out of its adjustment notch (Fig. 54). Lower the deck lid and from inside the luggage compartment remove the bar. Prop the deck lid open.

4. Position a cover under the hinge edge of the deck lid to prevent paint damage. Remove the hinge attaching bolt from the deck lid and from the mounting bracket, and remove the hinge.

INSTALLATION

1. Position the hinge, and partially tighten the mounting bolts.

2. Remove the protective cover and install the torsion bar, reversing the procedure in step 3 above. The farther rearward the anchor end is twisted, the greater the tension.

3. Remove the prop and check the lid position. After any necessary adjustment, tighten the hinge attaching bolts.

DECK LID LOCK

1. Unlock and open the deck lid.

2. Remove the bolts retaining the lock assembly and remove the lock.

3. Position the lock assembly to the deck lid and loosely install the retaining bolts.

4. Adjust the lock assembly and tighten the bolts.

DECK LID LOCK CYLINDER

REMOVAL

1. Open the deck lid and remove the lock assembly and the door lock extension.

2. Remove the sleeve assembly retaining nut, lock washer, spacer, and sleeve and cylinder (Fig. 55).

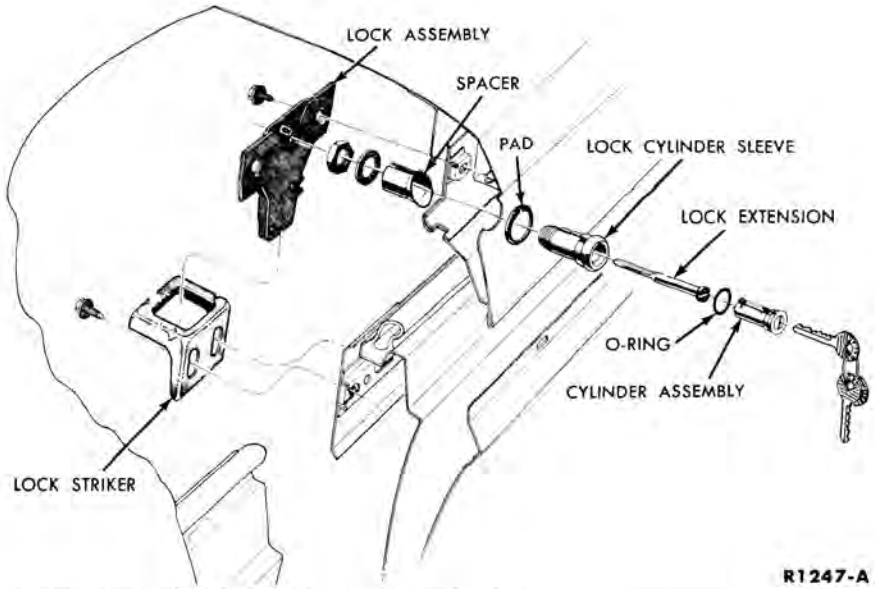


FIG. 55—Deck Lid Lock Installation—Typical

3. To remove the lock cylinder from the sleeve assembly, turn the key in the cylinder ⅛ turn clockwise from the locked position, depress the cylinder retaining pin, and remove the key and cylinder.

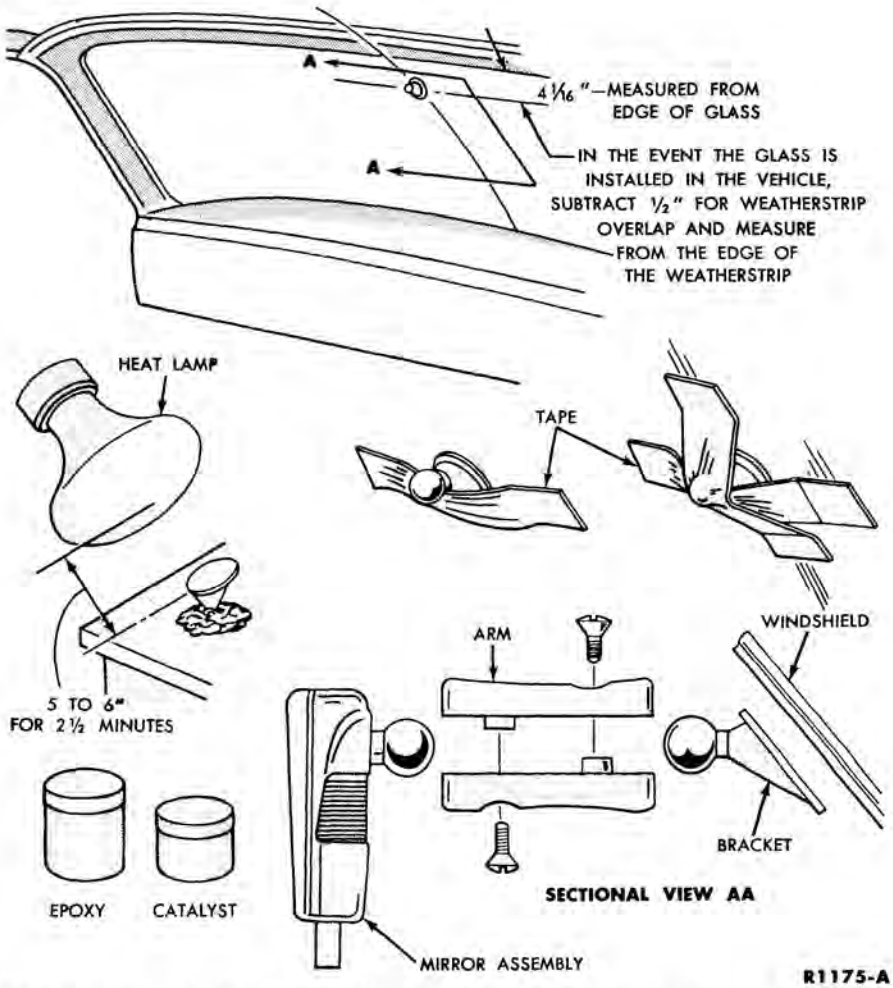


FIG. 56—Bonded Rear View Mirror Installation—Comet, Falcon

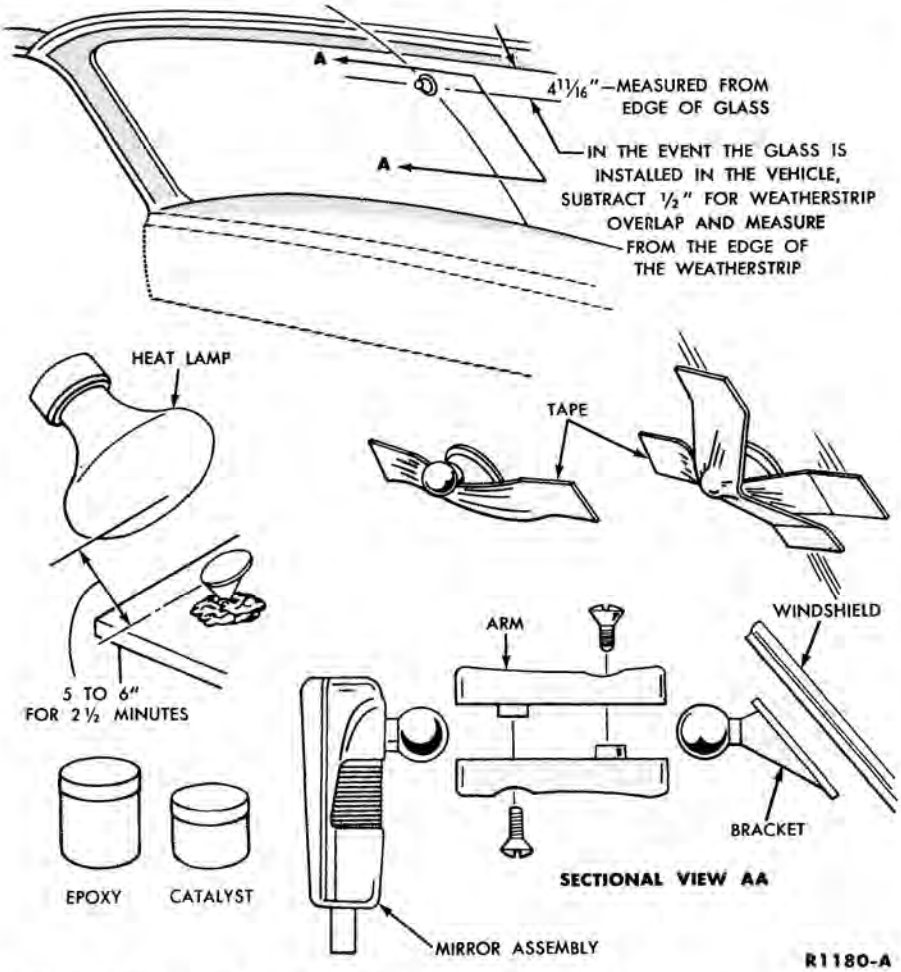


FIG. 57—Bonded Rear View Mirror Installation—Fairlane

INSTALLATION

1. To install the lock cylinder turn the key in the cylinder 1/8 turn clockwise from the locked position and insert the cylinder into the sleeve assembly.

2. Position the sleeve assembly spacer, and washer to the deck lid door and install the retaining nut.

3. Position the door lock extension, install the lock assembly and adjust it.

INSIDE REAR VIEW MIRROR (BONDED TO WINDSHIELD)

REMOVAL

1. Clean both the inside and outside surfaces of the windshield in the area of the mirror mounting bracket. Inspect the windshield for stone chips and scratches.

2. Using welding putty or wet rags, insulate all chips or scratches within 12 inches of the mirror mounting bracket.

3. Apply heat to the bracket mounting area from outside the windshield with a standard 250 watt infrared bulb (heat lamp). Hold the lamp approximately 4 inches from the windshield, and rotate it in a small circle.

4. The mirror mounting bracket can be pulled off the windshield glass in approximately 8-10 minutes using the mirror as a handle.

5. Slowly remove the heat lamp. **Do not remove the insulating materials until the windshield has cooled to room temperature.**

6. Remove the mirror and arm from the bracket.

INSTALLATION

1. Locate and mark with a wax pencil the bracket location on the outside surface of the windshield (Figs. 56 and 57).

2. Use a good grade of Ethyl Alcohol to thoroughly clean the inside glass surface bracket mounting area and mounting bracket face. It is important that the mounting surfaces are properly cleaned before the resin is applied.

3. To mix the resin pour the entire contents of the small catalyst bottle into the large epoxy bottle (Figs. 56 and 57).

4. Stir the contents for 3 to 5 minutes.

To guarantee the correct mixing ratio and resulting bond strength it is mandatory that the entire contents of both bottles are used and properly mixed. Under no circumstances should only portions of the epoxy or catalyst be used.

5. Apply the mixed resin to the bracket mounting surface. Level off the resin film as smoothly as possible.

6. Place the mounting bracket surface upward in a vise or in a small mound of permagum or any suitable holding material that will support the mounting bracket (Figs. 56 and 57). Hold a standard 250 watt infrared lamp about 5 to 6 inches from the mounting surface of the bracket for 2½ minutes.

7. Allow the bracket to cool for one minute. With light hand pressure apply the mounting surface of the bracket to the desired inside area of the windshield.

8. Secure the bracket to the windshield using a piece of tape about 5 inches long located just under the knob of the bracket. Apply another piece of tape in the vertical direction to firmly hold the mounting bracket in place on the windshield.

9. When the temperatures are above 67°F., the mirror and arm should not be mounted to the bracket for 8 hours, to allow the resin to properly adhere the bracket to the glass. However, the car may be used with the bracket taped in place one hour after installation.

When the temperatures are below 67°F., the mirror and arm should not be mounted to the bracket for 16 hours. However, the car can be used 2 hours after the bracket has been taped in place.

10. After the bracket has had time to adhere to the glass, remove the tape and install the mirror and arm to the bracket.

TRIM, SEATS, AND CONVERTIBLE TOP

GROUP 18

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PART 18-1 INTERIOR TRIM AND LANDAU TOP COVER

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1 DOOR AND QUARTER TRIM PANELS

REMOVAL AND INSTALLATION

Basically, all door and quarter trim panels are retained in the same manner. In view of this, one removal and installation procedure will cover all models.

1. Remove the window regulator handle with Tool 21812-B. **Insert the tool between the control handle and the friction plate.** Press the tool against the spring clip until the handle can be released from the shaft.

2. Remove any screws retaining the trim panel to the inner panel, such as the arm rest retaining screws (Fig. 1). To reveal the quarter panel arm rest forward retaining screw, slide the ash tray assembly forward.

3. With a putty knife, pry the trim panel retaining clips out of the inner panel at each side.

4. Bow the trim panel out of the

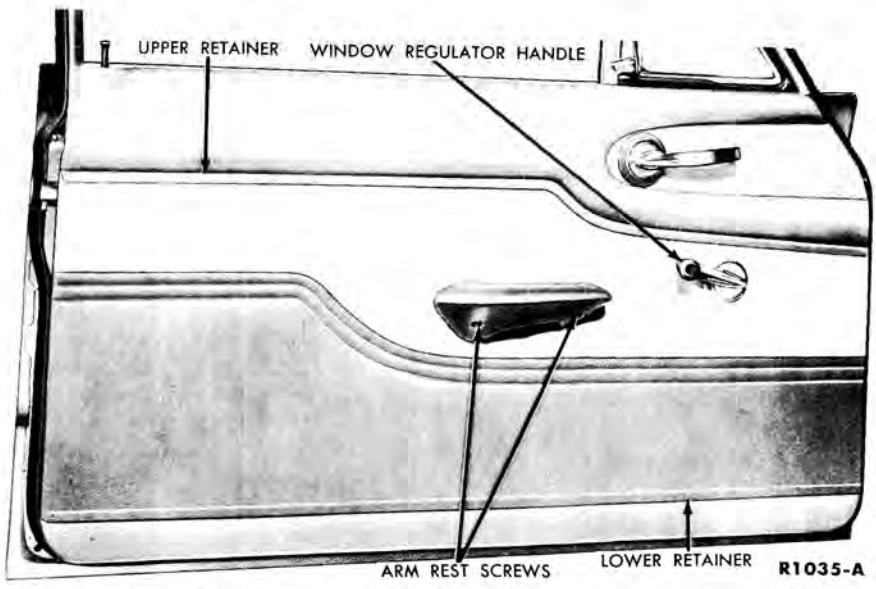


FIG. 1—Typical Door Trim

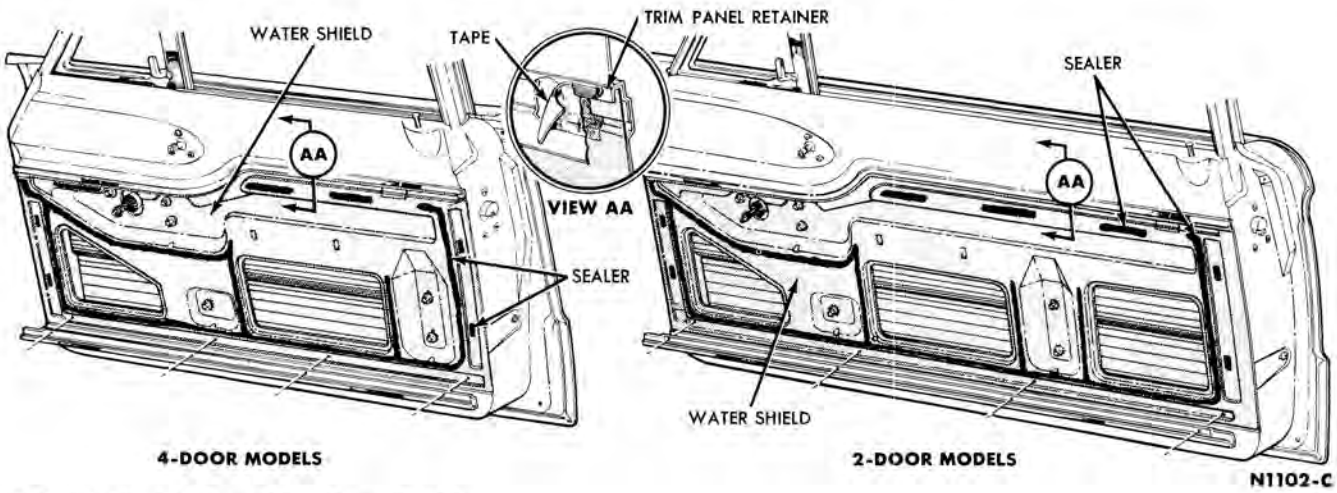


FIG. 2—Typical Door Trim Water Shields

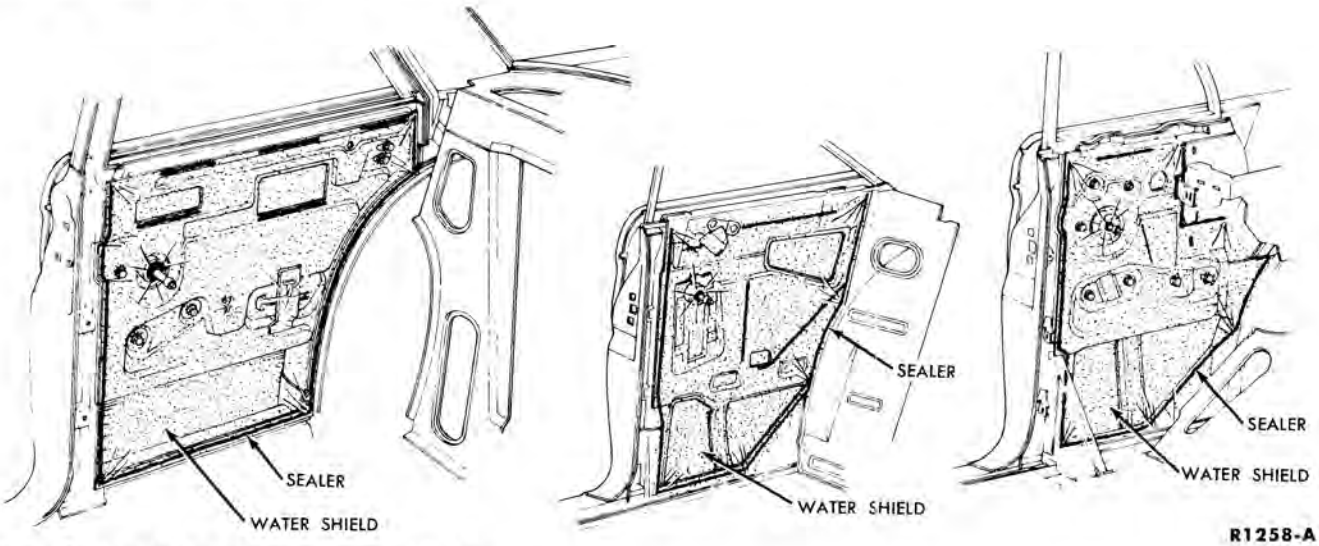


FIG. 3—Typical Quarter Trim Water Shields

retainers, and carefully loosen the water shield, if necessary.

5. Place a daub of sealer over each trim retaining clip hole to seal the retaining clips when they are pushed into the door. Also, apply this sealer around the window regulator shaft and other existing holes.

6. Fasten the water shield to the inner panel (Figs. 2 and 3).

7. Make sure that all the retaining clips are installed in the trim panel. Position the spring on the regulator handle shaft. Place the upper edge of the trim panel in the retainer, bow the trim panel, and then insert the lower edge into the retainer. Push the retaining clips into the holes in the door inner panel.

8. Install the arm rest retaining screws.

9. Insert the spring clip in the handle, place the friction plate against the trim panel and push the handle onto the shaft until the spring clip snaps into the groove.

2 HEADLINING

REMOVAL AND INSTALLATION

COMET, FALCON, FAIRLANE

The following headlining replacement procedure applies to all models in general. If some of the steps in these procedures do not apply to the particular model being serviced, proceed to the next step (Figs. 4 and 5).

1. Remove the windshield garnish mouldings, sun visor assemblies, dome lamp lens, and rear view mirror.

2. Remove the rear seat cushion and seat back to provide working space. Slide the package tray out from the back window weatherstrip and remove it from the shelf. Remove the coat hooks, center pillar garnish mouldings, and quarter window garnish mouldings.

On the station wagon, remove the plug button and the corner garnish moulding from the rear pillar. Remove the nuts which retain the pillar outside moulding studs to the pillar and remove the pillar outside mould-

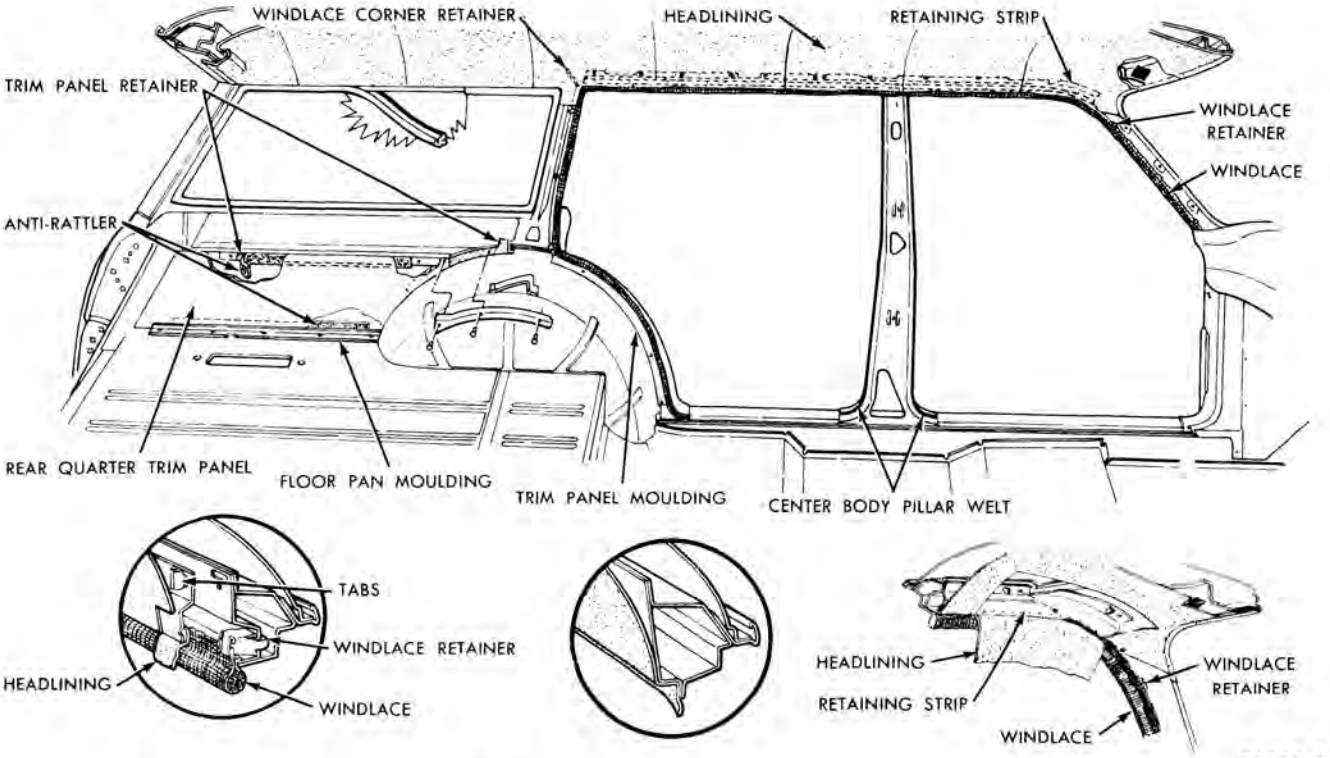


FIG. 4—Typical Station Wagon Roof Trim Panel Installation

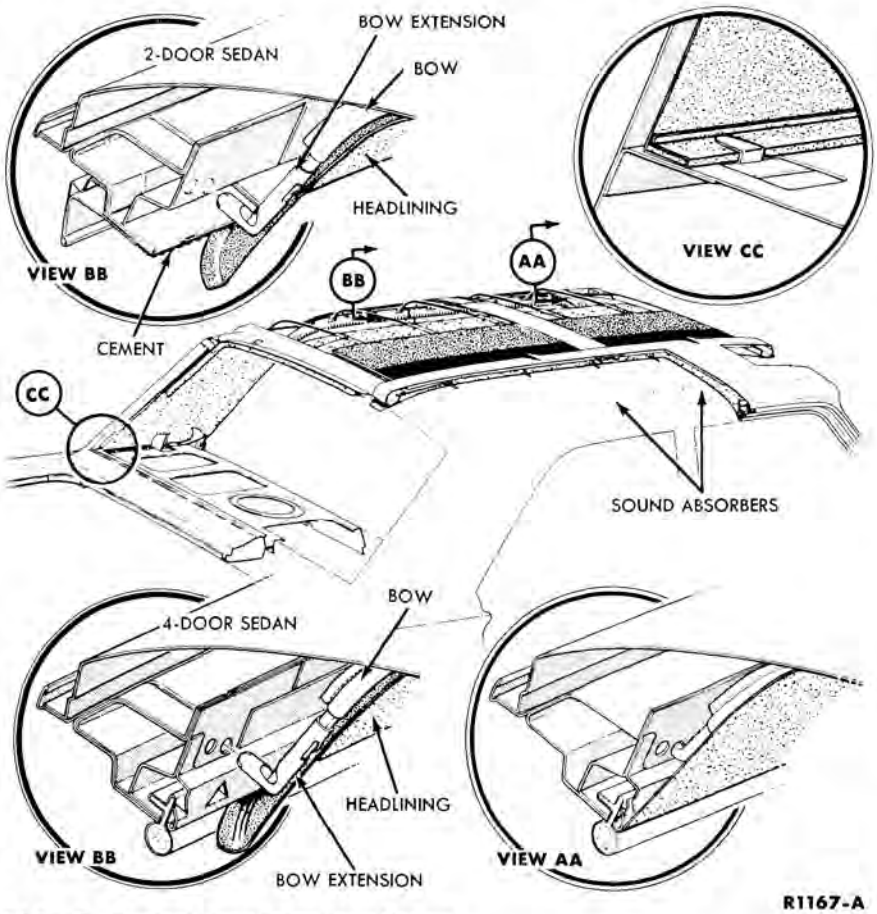


FIG. 5—Typical Headlining Installation

ings. From inside the car, remove the side and upper runs from the pillar and the roof rails.

On the hardtop, remove the door opening windlace assemblies from the roof rail side.

3. Cut the headlining along the edge of the windshield, back window, and stationary window weatherstrips. Disconnect the headlining along the side rails, and then starting at the front of the car, push the ends of the roof bows out of the roof side rails. At the rear bow, release the two rear bow retainers from the roof rear rail, and then remove the headlining.

4. Check the tabs on the headlining side retaining strips. If any tabs are bent or flattened, repair them and tighten the retaining strips.

5. Transfer the headlining bows in sequence to the new headlining.

Roof bows are color coded at each end. When ordering new roof bows, be sure to note the color at each end of the bow.

6. Install the rear bow in the side

rails, and connect the rear bow retainers to the roof rear rail. Install the other headlining bows, working from the rear toward the front of the car. The headlining should be centered and the seams straight.

7. Apply trim cement to the windshield header along the edge of the windshield weatherstrip. Cement the headlining to the windshield header, starting from the center. Trim the headlining approximately ½ inch below the windshield weatherstrip edge and then install the headlining under the windshield weatherstrip.

On the hardtop, staple the headlining to the header corners and position it over the retainer tabs.

8. Apply trim cement to the back window upper frame along the edge of the window weatherstrip.

On a station wagon, apply trim cement to the tailgate window upper run mounting area.

Cement the headlining in place, starting from the center.

9. Trim the headlining around the back window. On the sedan and Ranchero models, trim the headlining approximately ½ inch below the back window weatherstrip edge. Place the headlining under the back window weatherstrip.

10. Pull the headlining down at the sides to remove the wrinkles. Cut the headlining bow retainers to eliminate gathering of the material. Trim the headlining at the door openings to approximately 1½ inches below the windlace. Starting at the front on each side of the car, use a putty knife (with rounded corners) to work the headlining up under the retaining strip. Be sure the headlining catches on the tabs. On the hardtop, apply trim cement to the entire roof side rails and cement the headlining in place.

11. Apply trim cement to the roof side rail at the quarter window opening. Pull the headlining to remove the wrinkles, and cement it in place.

12. On station wagons, apply trim cement to the roof side rail at the edge of the stationary quarter window weatherstrip and cement the headlining in place. Trim the headlining approximately ½ inch below the weatherstrip edge and install the headlining under the weatherstrip.

13. Install the window garnish mouldings, tailgate window runs, coat hooks, seat back and seat cushion, sun visor assemblies, and rear view mirror.

14. Cut a hole in the headlining for the dome light. **Be sure that the dome light lens will cover the hole.** Install the dome light lens.

Use warm water on a sponge to dampen a cloth headlining that sags or is slightly wrinkled, or spray it with live steam. On vinyl headlinings, live steam must be applied to the back side of the headlining through the dome light opening. As it dries, the headlining will shrink slightly, removing most wrinkles and sags.

MUSTANG (MODEL 63)

1. Remove the sun visors and the inside rear view mirror.

2. Remove the roof headlining side front retainer from each A pillar (Fig. 6–View BB).

3. Remove 5 screws and remove the back window upper garnish moulding.

4. Remove 4 screws and remove the quarter trim upper front mouldings and caps (Fig. 7).

5. Remove 5 screws and remove the quarter trim upper front panel.

6. Remove the windlace from the door openings (Fig. 6).

7. Cut the headlining at the windshield weatherstrip and loosen the headlining.

8. Cut the headlining at the back window weatherstrip and loosen the headlining.

9. Pull the headlining from the door opening pinch weld, disconnect the bows, and remove the headlining.

10. Place the old and new headlinings on a clean surface and transfer the bows to the new headlining. The bows are color coded on one end for identification (Fig. 6).

11. Position the headlining in the car and install the roof bows in the side rails.

12. Apply trim cement (C2AZ-19C525-A) to the back side of the headlining at the back window opening.

13. Tuck the headlining under the back window weatherstrip. Smooth out any wrinkles or gathering and trim off any excess material.

14. Apply trim cement (C2AZ-19C525-A) to the back side of the headlining at the windshield opening.

15. Tuck the headlining under the windshield weatherstrip. Smooth out any wrinkles or gathering and trim off any excess material.

16. Apply trim cement (C2AZ-19C525-A) to the roof side rails at the door openings. Position the headlining to the side rails and trim off any excess material (Fig. 6).

17. Install the windlace in the door openings.

18. Install the roof headlining side front retainer at each A pillar.

19. Install the inside rear view mirror and sun visors.

20. Install the right and left quarter trim upper front panels (Fig. 7).

21. Install the quarter trim upper front mouldings and front caps.

22. Install the back window upper garnish moulding.

23. Clean all mouldings and remove any headlining scraps from the car.

MUSTANG (MODEL 65)

1. Remove the rear seat cushion and seat back and remove the quarter trim panels.

2. Remove 2 clips and retainers and remove the package tray.

3. Bend back the headlining lower rear side retaining strip tabs (Fig. 8).

4. Remove the coat hanger hooks.

5. Remove the sun visors.

6. Remove the headlining retainer from each A pillar (Fig. 8).

7. Remove 3 screws and remove the rear view mirror.

8. Remove the door opening windlace from each side of the body.

9. Cut the headlining along the edge of the windshield and back window weatherstrips.

10. Remove the headlining from the right and left sides in the package tray area. Then, remove the head-

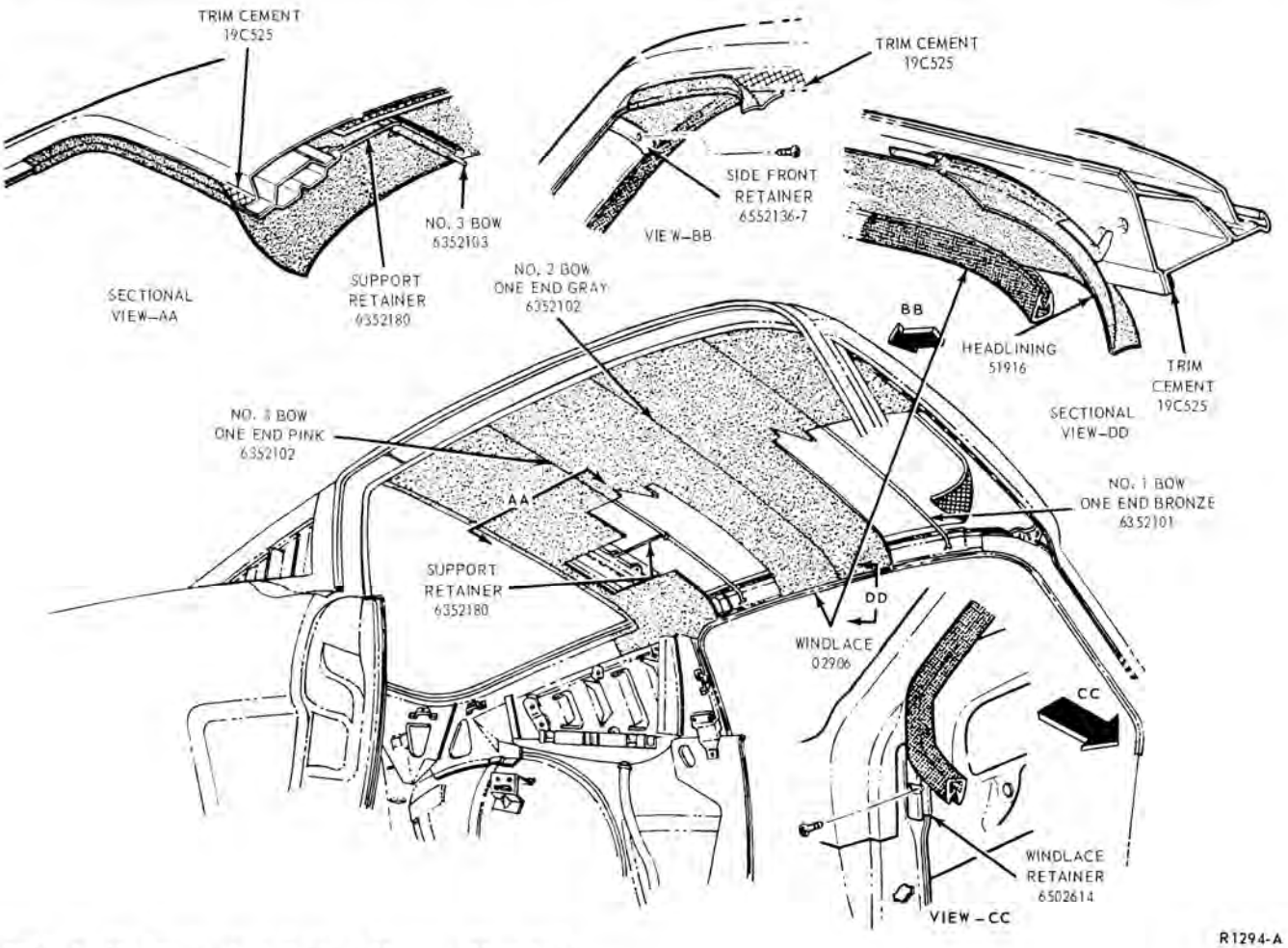


FIG. 6—Headlining Installation—Mustang Model 63

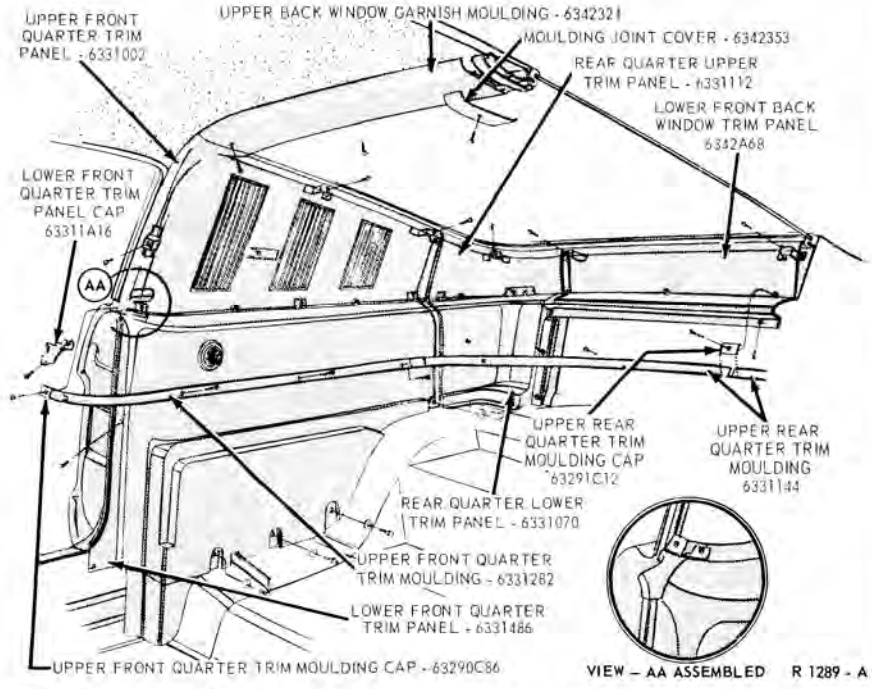


FIG. 7—Interior Mouldings and Quarter Trim Panel Installation

lining from the roof side rails and remove it from the car.

11. Place the new and old headlining on a clean surface and transfer the headlining support wires in sequence to the new headlining. **The roof bows are color coded on one end. When ordering new roof bows, be sure to note the color code.**

12. Position the headlining in the car and install the rear support wire and 2 rear support retainers. Then, install the remaining support wires, working towards the front of the car.

13. Trim the headlining at the windshield header, leaving approximately ½ inch of material for tucking under the windshield header weatherstrip.

14. Apply trim cement to the windshield header and, starting from the center, cement the headlining to

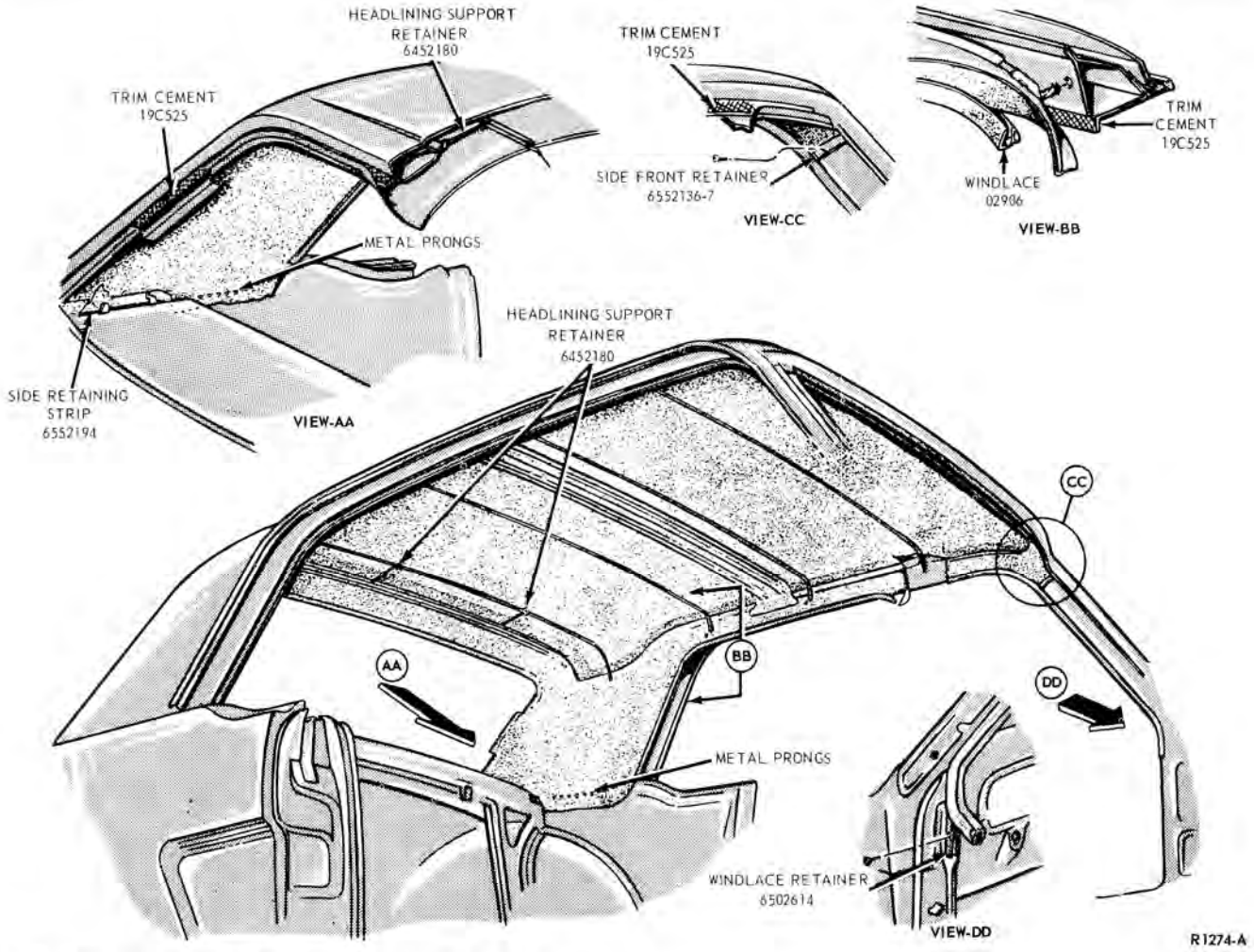


FIG. 8—Headlining Installation—Mustang Model 65

the header. Insert the remaining headlining material under the windshield header weatherstrip.

15. Trim the headlining at the rear window, leaving approximately ½ inch of material for tucking under the weatherstrip. Apply trim cement to the rear window upper rail and, starting from the center, cement the headlining to the upper rail. Insert the remaining material under the rear window weatherstrip.

16. Pull the headlining down at the sides to remove wrinkles. Cut the listings at each end to eliminate gathering of the material.

17. Apply trim cement to the left roof side rail over the door and quarter window. Pull the headlining down to remove wrinkles and cement it in place. Then, trim the headlining as necessary. Cement and trim the right side the same way.

18. Straighten the metal prongs (View AA—Fig. 8) at the package tray area; attach the headlining to the prongs and bend the prongs down as shown.

19. Roll the lower rear side retaining strips into the headlining and retain them by bending the tabs (View AA).

20. Install the right and left roof side windlace at the door and window openings.

21. Install the headlining retainer at the A pillar (View DD).

22. Install the rear view mirror, sun visors, and coat hooks.

23. Slide the package tray into position and install the retainers and clips. Then, install the quarter trim panels and rear seat back and cushion.

3 INSTRUMENT PANEL SAFETY COVER

REMOVAL AND INSTALLATION

COMET, FALCON

1. Remove the windshield interior garnish mouldings and sun visor assemblies.

2. Remove the lower instrument panel pad finish mouldings.

3. Remove the instrument panel pad.

4. Using solvent, clean the old

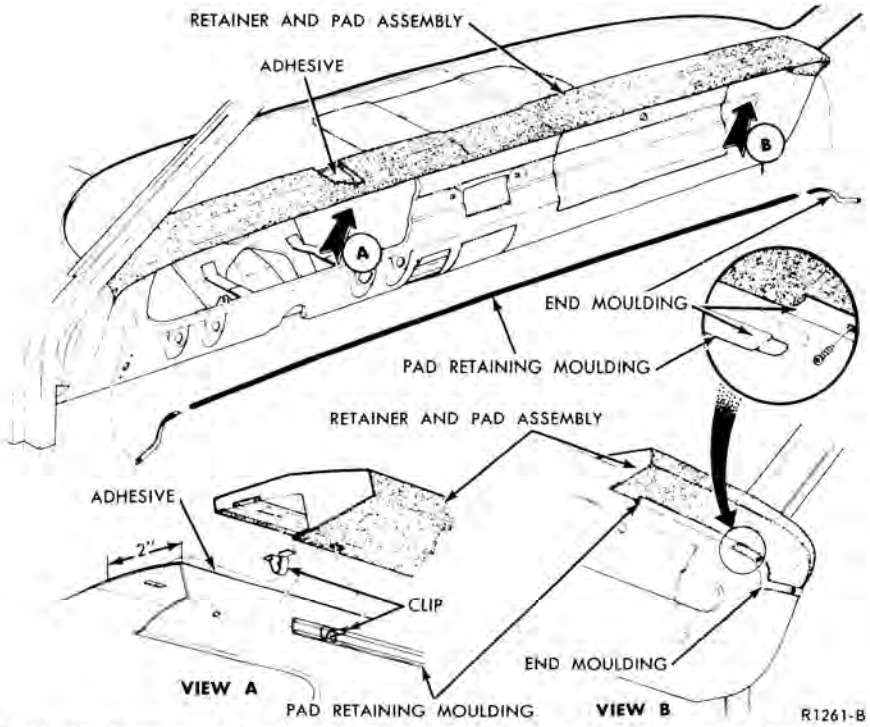


FIG. 9—Instrument Panel Safety Cover Installation—Typical Comet, Falcon

cement from the instrument panel mounting surfaces.

5. Apply a two-inch band of adhesive (C2AZ-19C525-A) to the upper rear surface of the instrument panel as indicated by item B in Fig. 9 and View AA. No adhesive is required on the pad assembly. The adhesive will reach a tacky consistency after approximately three minutes (Fig. 9).

6. Transfer the retaining clips from the old to the new cover. Position the cover assembly on the instrument panel and press it firmly into position.

7. The cover assembly must be free of wrinkles and bulges. The edges of the pad assembly must be trimmed flush with the finish mouldings, after the finish mouldings have been installed.

8. Install the lower instrument panel pad finish mouldings.

9. Install the windshield interior garnish mouldings and sun visor assemblies.

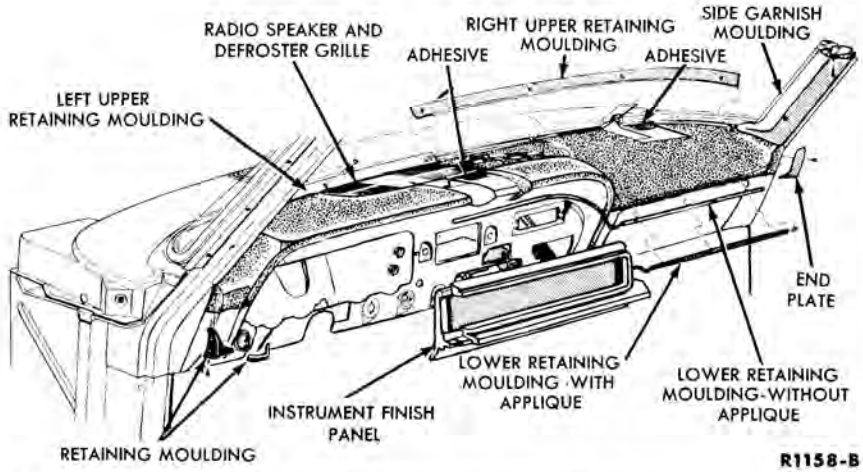


FIG. 10—Instrument Panel Safety Cover Installation—Fairlane

FAIRLANE

1. Unsnap the chrome trim mouldings retaining the instrument panel safety cover lower edge (Fig. 10).

2. Remove the safety cover end plate at each door pillar.

3. Remove the cover upper retaining moulding and the windshield side garnish mouldings and note the screw sizes.

4. Remove the radio speaker and defroster grille assembly.

5. Remove the 5 instrument cluster retaining screws.

6. Loosen the heater control, remove the radio bezel, and then remove the 5 instrument finish panel retaining screws.

7. Pull the safety cover from the instrument panel. Using solvent, clean the old cement from the instrument panel mounting surfaces.

8. Position the cover temporarily, and then mark the cover and the instrument panel at several locations.

9. Using a wide brush, quickly apply C2AZ-19C525-A cement to both the instrument panel and to the safety cover around the outside and the inside edges only.

10. Press the safety cover into position.

11. Install the radio speaker and defroster grille assembly, instrument cluster, instrument finish panel, heater control, and radio bezel.

12. Install the garnish mouldings, safety cover end plates, and the cover retaining mouldings.

MUSTANG

1. Remove the right and left side lower mouldings (Fig. 11) and the upper retaining mouldings.

2. Remove the radio speaker grille.

3. Remove 2 nuts retaining the cover above the radio (View DD),

and pull the cover from the instrument panel.

4. Using solvent, clean the old cement from the instrument panel mounting surfaces.

5. Apply cement to the instrument panel mounting surface and cover. Position the cover on the instrument panel and install the 2 retaining nuts in the area over the radio.

6. Install the radio speaker grille, upper retaining mouldings, and lower mouldings.

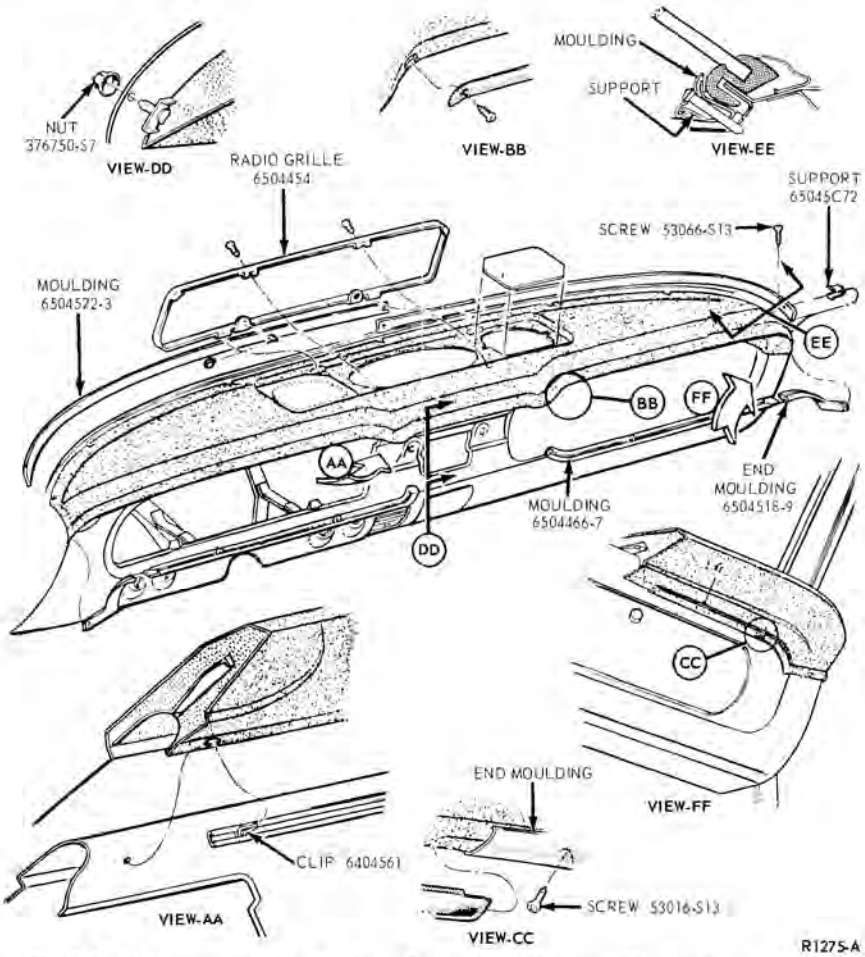


FIG. 11—Instrument Panel Safety Cover Installation—Mustang

4 CONSOLE

REMOVAL AND INSTALLATION

COMET, FALCON

The console assembly is shown in Fig. 12. The glove compartment liner must be removed for access to the hinge and lock. The console assembly body is replaceable and requires the glove compartment liner to be removed for access to the retaining screws.

FAIRLANE

1. Open the console glove box lid and remove 9 screws retaining the liner and remove the liner.

2. Remove the lid, hinge, and door catch from the console panel.

3. Remove 4 screws and remove the center finish panel from the console (Fig. 13).

4. Remove 4 screws and remove the front finish panel from the console.

5. Remove the mouldings from the sides of the console (Fig. 13).

6. Remove 8 screws retaining the console panel to the support assembly and remove the console panel from the car.

7. Position the console panel to the support assembly and install the retaining screws.

8. Install the top front and center finish panels.

9. Position the glove box catch to the console and install the 2 retaining screws.

10. Install the lid and hinge to the console panel and align the lid. Then, tighten the attaching screws.

11. Adjust the lid catch and tighten the retaining screws.

12. Adjust the dowel depth and tighten the lock nut.

13. Apply caulking cord to the hinge reinforcement plate and position the plate to the underside of the console.

14. Install the glove box liner.

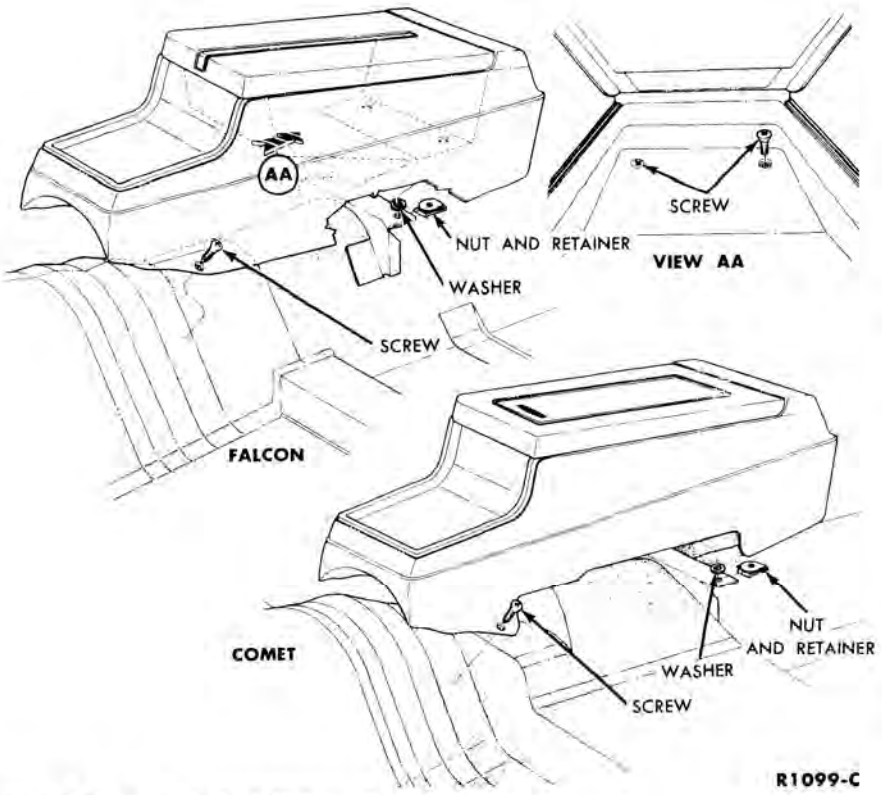


FIG. 12—Console Installation—Comet, Falcon

MUSTANG

The Mustang has 2 optional consoles; one is used when air conditioning is installed and one is used without air conditioning. Models that are not equipped with air conditioning have a glove box at the front end of the console. Models equipped with air conditioning do not have the glove box.

1. Remove the knob or handle from the gear shift selector lever.

2. Remove 3 screws from each side of the console in the seat area.

3. Remove 2 screws from inside the glove box (if equipped).

4. Lift the console rear end up and remove the console from the car.

5. Position the console to the floor pan and install the attaching screws.

6. Install the gear shift lever knob or handle.

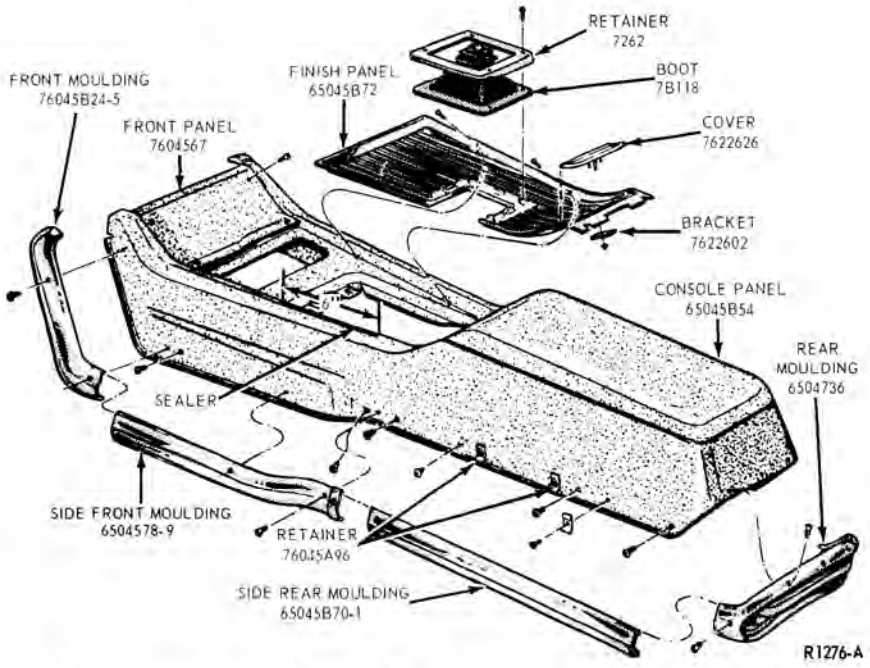


FIG. 13—Console Installation—Fairlane

5 ROOF OUTSIDE COVER

COMET, FALCON

REMOVAL

1. Remove the windshield interior garnish mouldings and sun visor assemblies.

2. Remove the windshield exterior mouldings, retainers, and windshild wipers.

3. Remove the windshield and weatherstrip.

4. Remove the rear seat cushion seat back, and package tray panel.

5. Loosen the headlining sufficiently to permit access to the roof side lower ornaments.

6. Remove the roof side lower ornaments and the back belt moulding (Fig. 14).

7. Remove the drip rail mouldings.

8. Remove the sealer from the drip rails.

9. Using a 0.128-0.132 inch diameter drill, remove the rivets from the drip rail retainers and discard the retainers.

10. Remove and discard all roof cover assembly retaining staples and screws.

11. Remove and discard the cover assembly.

12. Remove all old sealer and/or cement from the roof panel and drip rail areas with cleaning solvent. **It is extremely important that the entire roof and drip rails are thoroughly cleaned.**

INSTALLATION

It is recommended that the ⅛ inch oval head blind rivet (Part No. 378527-S) (Pop rivet) be substituted for the screw and the staples (Fig. 14).

Wherever possible, use the existing drive nail or screw holes. Therefore, each location should be identified on the pinch weld flange with a wax crayon.

Seal all unused holes with either C1AZ-19627-A Pressure Sensitized Tape or AB-19560-A caulking cord.

1. Carefully position the outside cover on the roof panel. (Fore and Aft center punch marks have been provided in the cover for centering purposes.)

2. With the cover properly positioned and temporarily secured, apply an even coating of C2AZ-19C-525-A adhesive to the roof panel and a like amount to the corresponding area of the roof outside cover assembly. For best results, secure limited sections at a time. **Make certain that the adhesive is not lumpy as it will be objectionable from an appearance standpoint.**

3. Using a 0.128-0.132 inch diameter drill, pierce the vinyl material at the existing staple or screw hole locations. Install Pop rivets in each of the holes.

4. Position both drip rail retainers and, using the same drill referred to above, pierce the vinyl at each of the holes. Install the Pop rivets from the underside of the drip rail except at the extreme rear hole in which case the rivet should be inserted from the retainer side.

5. Trim the excess cover material from around the entire perimeter.

6. Apply sealer C3AZ-19562-A (for white tops) or sealer C3AZ-19562-B (for black tops) over the entire surface of the drip rail retainers. With the drip rail properly sealed, a minimum depth of ⅛ inch should be retained for adequate water drainage. **Place masking tape on the cover assembly for the entire length of the drip rail before applying sealer. After sealer has been applied, remove the tape.**

7. Install the drip rail mouldings.

8. Install the back belt moulding and the roof side lower ornaments.

9. Reposition and secure the headlining.

10. Install the back window.

11. Install the package tray panel, rear seat back and seat cushion.

12. Install the windshield.

13. Install the windshield interior garnish mouldings and sun visor assemblies.

14. Install the windshield exterior mouldings, retainers, and windshield wiper blade assemblies.

FAIRLANE

REMOVAL

1. Remove the rear seat cushion seat back, and package tray panel.

2. Remove the right and left side quarter trim panels.

3. Remove the right and left side quarter window garnish mouldings and trim panel retainers.

4. Loosen the headlining sufficiently to permit access to the roof side lower ornaments.

5. Remove the right and left roof side quarter insulation.

6. Remove the right and left roof side outside quarter ornaments and the roof outside belt moulding retaining nuts.

7. Remove the back window outside mouldings.

8. Remove the roof right and left outside belt moulding retaining screws and remove the mouldings.

9. Remove the right, left, and front drip rail snap off mouldings.

10. Remove all sealer from the drip rails.

11. Using a 0.128-0.132 inch diameter drill, remove the rivets from the drip rail retainers and discard the retainers.

12. Remove and discard all roof cover assembly retaining staples.

13. Remove and discard the cover assembly.

14. Remove all old sealer and/or cement from the roof panel and drip rail areas with cleaning solvent. **It is extremely important that the entire roof and drip rails are thoroughly cleaned.**

INSTALLATION

It is recommended that the ⅛ inch oval head blind rivet (Part No. 378527-S) (Pop rivet) be substituted for the staples (Fig. 15).

Wherever possible, use the existing staple holes. Mark the hole locations with a wax crayon on the rear windows and roof side areas.

Seal all unused holes with either C1AZ-19627-A Pressure Sensitized Tape or AB-19560-A Caulking Cord.

1. Locate the center of the front drip rail and the rear window opening.

2. Carefully position the outside cover on the roof panel. (Fore and Aft center punch marks have been provided in the cover for centering purposes.)

3. With the cover properly positioned and temporarily secured, apply an even coating of C2AZ-19C-525-A adhesive to the center portion of the roof front drip rail area and a like amount to the corresponding area of the roof outside cover assembly. **Make certain that the adhesive**

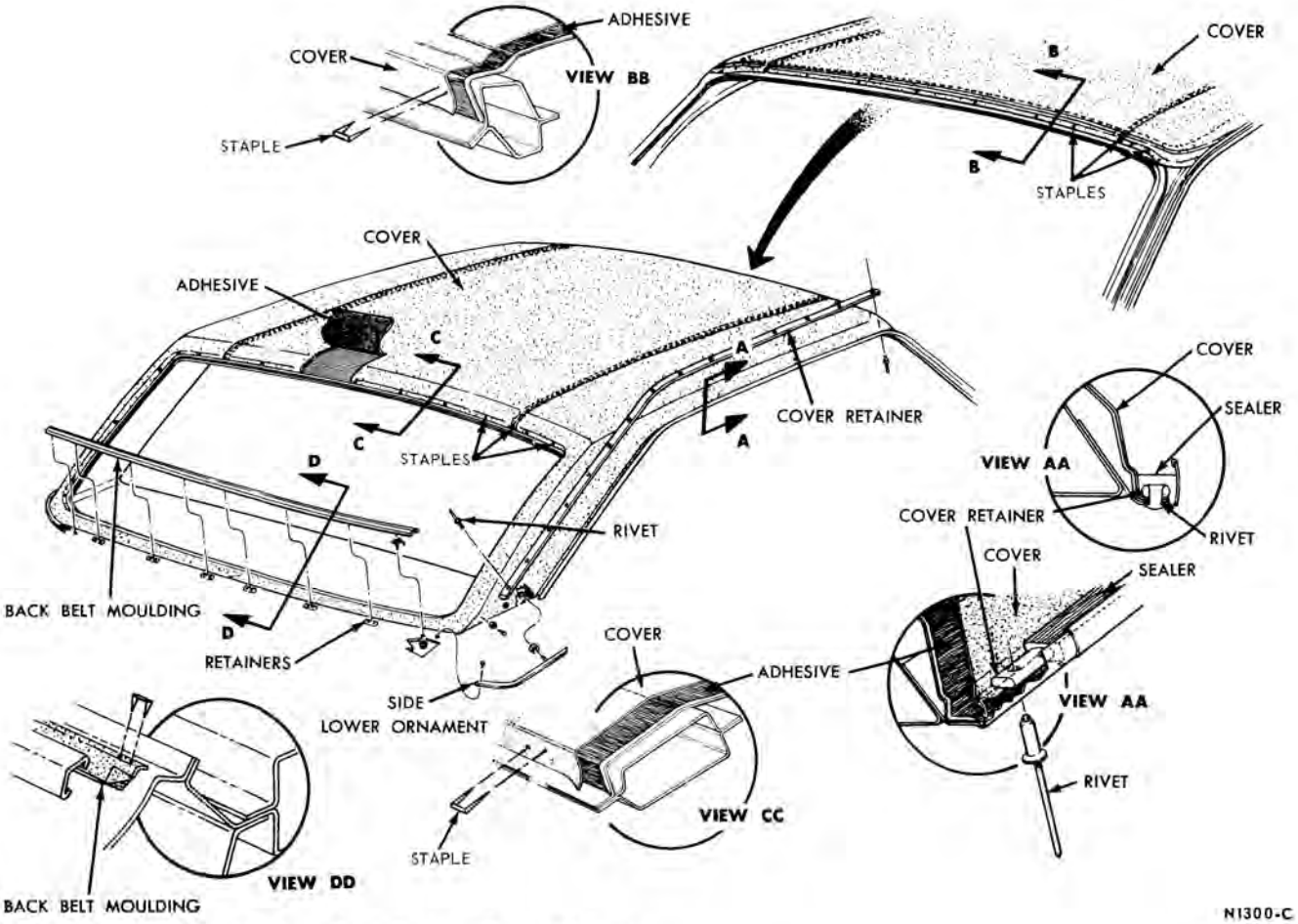


FIG. 14—Roof Outside Cover Installation—Comet, Falcon

is not lumpy as it will be objectionable from an appearance standpoint.

4. Position the front drip rail retainer (Fig. 15) and clamp it into place. Use protective tape to prevent damage to the windshield moulding. Then, install the pop rivets to secure the retainer in place.

5. Apply adhesive to the rear center portion of the roof panel and cover material and cement it into position. Retain the cover at the rear window opening with pop rivets.

6. Apply adhesive to the right and left side drip rail areas and to the underside of the top material and clamp the drip rail retainers in position. Secure the retainers in position with pop rivets (Fig. 15).

7. Clamp the right and left drip rail front corners in position and secure with pop rivets.

8. Apply adhesive to the right and left roof side quarter areas and cover, and retain the cover in place with pop rivets (Fig. 15).

9. Trim excess cover material from the perimeter of the top and the rear window opening and insert the ends of the top material under the rear window weatherstrip.

10. Apply sealer C3AZ-19562-A (for white tops) or sealer C3AZ-19562-B (for black tops) over the entire surface of the drip rail retainers. With the drip rail properly sealed, a minimum depth of ⅛ inch should be retained for adequate water drainage. **Place masking tape on the cover assembly for the entire length of the drip rail before applying sealer. After sealer has been applied, remove the tape.**

11. Install the drip rail mouldings.

12. Install the right and left roof side ornaments and belt mouldings.

13. Apply sealer to all rivet heads around the rear window and install the rear window mouldings.

14. Install the right and left quarter area insulation and headlining and install the package tray.

15. Install the right and left quarter window garnish mouldings and trim retainers.

16. Install the quarter trim panels, rear seat back, and seat cushion.

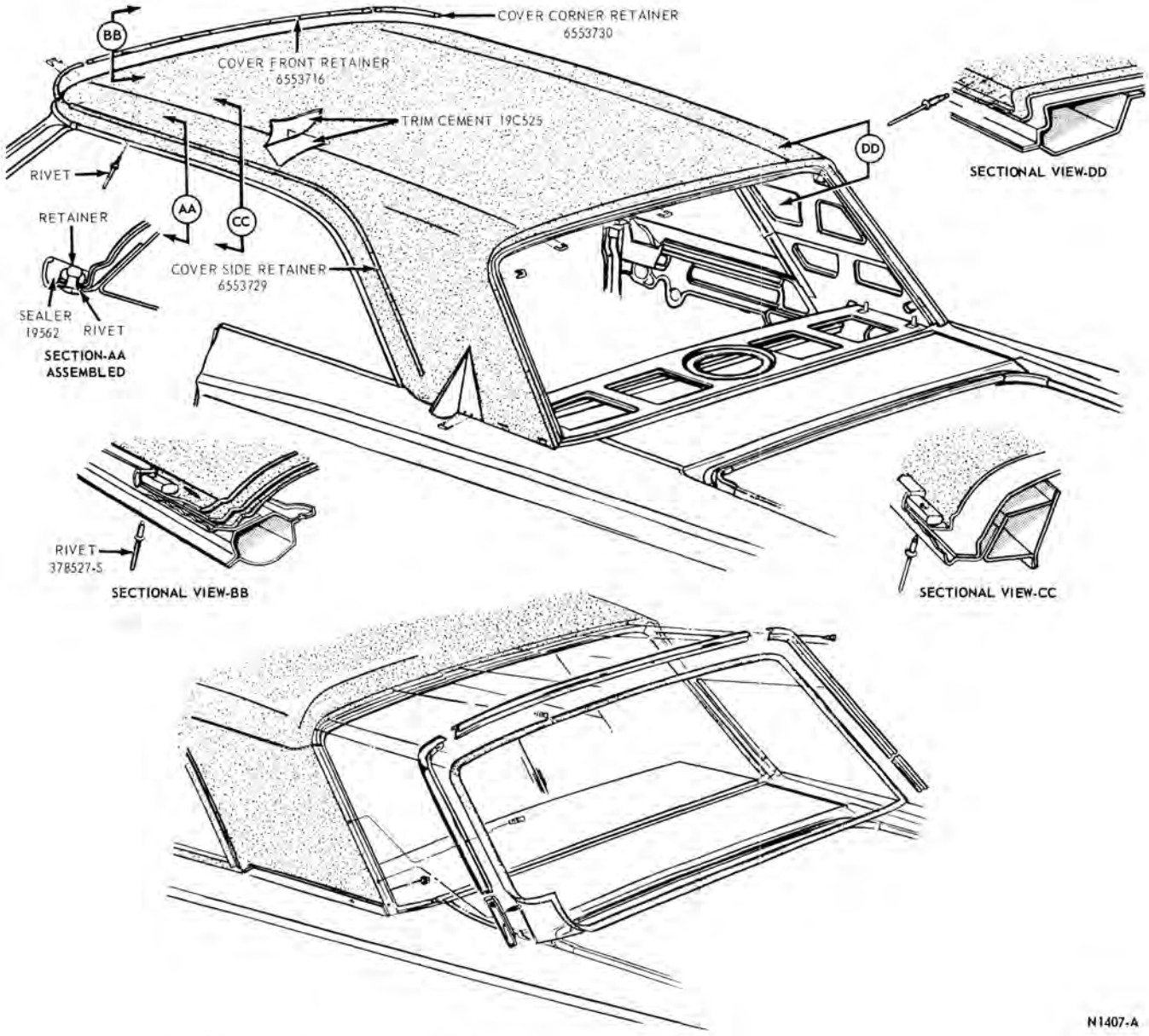


FIG. 15–Roof Outside Cover Installation–Fairlane

PART 18-2 SEATS

Section	Page	Section	Page
1 Standard Seats	18-13	2 Bucket Seats	18-17

1 STANDARD SEATS

REMOVAL AND INSTALLATION

SEAT AND SEAT TRACK

Work, other than that of minor nature, is more easily performed when the front seat assembly is removed from the car.

1. Disconnect and remove the front seat retracting springs from the seat track (Fig. 1).

2. Remove the nuts retaining the seat tracks to the floor pan and lift the seat assembly from the car.

3. Disconnect and remove the tie rod from the eye bolt on the frame. Remove the seat tracks from the frame.

4. Transfer the seat adjusting lever knob to the new left hand track assembly.

5. Position the new seat tracks on the frame and install the retaining bolts and tie rod.

6. Position the seat assembly in the car and install the retaining bolts and nuts. Install the retracting springs.

Tie Rod Adjustment. Tie rod maladjustment will affect only the right side of the seat. In case the latch retaining the track fails to release, turn the tie rod turnbuckle or eye bolt enough turns to shorten the tie rod travel sufficiently to release the track latch. If the latch fails to secure the seat travel, turn the tie rod turnbuckle or eye bolt to lengthen the tie rod enough to allow the latch to snap in the locking position.

FRONT SEAT CUSHION AND/OR BACK

1. Remove the front seat and seat track from the car if the cushion is to be replaced.

2. To replace the seat cushion, remove the seat assembly from the seat track.

3. On cars with a solid seat back, remove the bolts and washers attaching the seat back. Remove the hairpin clips from the pivot pins.

4. On cars with a split front seat back, remove the hairpin clip from the center seat back studs.

5. Remove the seat back.

6. Position the seat back assembly on the seat. On cars with the split back seat, install the hairpin clip at the seat center bracket.

7. Install hairpin clips on the seat back pivot pin. On a car with a solid seat back, install the bolts and washers attaching the seat back to the seat.

8. Position the seat cushion on the seat track and install the retaining bolts or nuts, if removed.

9. Install the front seat and seat track in the car.

REAR SEAT CUSHION AND/OR BACK

1. Lift the rear seat cushion and pull it forward to remove it from the car.

2. Remove one rear seat arm rest.

3. Remove 2 rear seat back attaching screws located at the bottom of the seat back.

4. Lift up on the seat back to disengage the seat from the upper hooks and remove the seat back from the car.

5. Position the seat back in the car and engage the seat with the upper hooks.

6. Install the seat back lower retaining screws and the removed arm rest. Then install the rear seat cushion.

FRONT SEAT CUSHION COVER

Fig. 2 shows a front seat cushion buildup. Seat cushions for all models are built up in basically the same manner. Therefore, when installing new seat cushion covers or pads, refer to Fig. 2 for the location of listing wires, hog rings, anti-squeak pads, and seat pad stack-up.

1. Remove the seat and seat track assembly.

2. On models with a solid seat back, remove the bolts and washers attaching the seat back to the seat cushion frame.

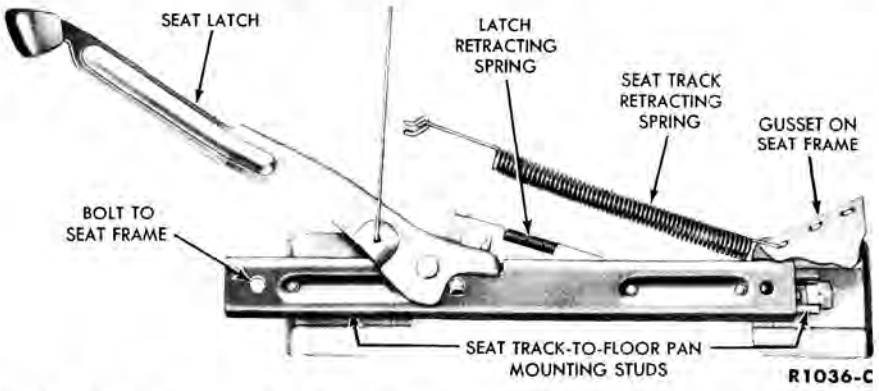


FIG. 1—Typical Front Seat Track

3. Remove the seat back outer support arm covers and remove the hairpin clips from the pivot pins.

4. On models with a split seat back, remove the retaining screw from the seat back center support trim cover and disconnect the arms from the seat cushion frame.

5. Remove the seat back assembly.

6. Remove the seat back scuff plates from the seat cushion.

7. Remove the hog rings retaining the seat cushion cover and remove the cover (Fig. 2). Inspect the pad and replace it if necessary.

8. Transfer the listing wires to the new cover.

9. With the seat cushion assembly right side up, make sure that the pads are stacked properly and centered; then place the cover over the pads to hold them in position.

10. Carefully turn the seat assembly over so that the pads do not shift out of position.

11. After centering the cover and straightening the seams along the front edge of the cushion, fasten the cover to the front of the seat frame with hog rings. Make sure that the hog rings encircle the listing wire. Install 1 hog ring in each hole provided in the seat cushion frame.

12. At the rear of the seat assembly, pull the cover taut over the pads, and install 2 hog rings at the center elements of the spring assembly and 1 hog ring at every other element out to the edge.

13. Fasten the side of the cover to the seat frame side with hog rings through the holes provided (Fig. 2).

14. Install the seat back scuff plates and the seat back.

15. Install the seat tracks to the cushion and the seat assembly in the car.

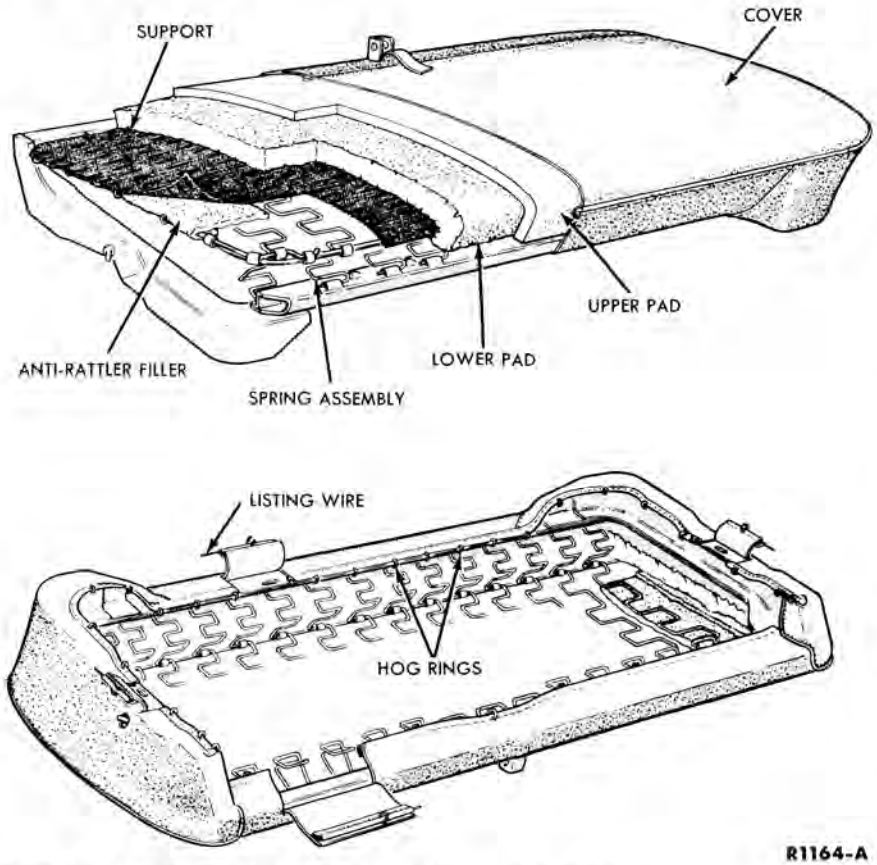


FIG. 2—Typical Front Seat Cushion Cover Installation

REAR SEAT CUSHION COVER

1. Remove the rear seat cushion from the car by lifting on the front of the seat and pulling it forward.

2. Remove the cushion cover hog rings and remove the cushion cover from the seat frame.

3. Inspect the pad and replace it if necessary.

4. Transfer the listing wire to the new cushion cover.

5. Position the new cushion cover on the seat frame and springs and attach it in place with hog rings (Fig. 3).

6. Install the seat cushion in the car.

FRONT SEAT BACK COVER

Repairs to seat backs are performed out of the car and are usually limited to replacement of torn or burned seat covers. In a few instances, the pads may be damaged and require replacement.

Figs. 4 and 5 show a front seat back build-up. Seat backs for all other models are built up in basically the same manner. Therefore, when installing new seat back covers or pads, refer to Figs. 4 and 5 for the location of listing wires, hog rings, anti-squeak pads, and seat pad stack-up.

1. Remove the seat back.

2. Remove the ash receptacle and ash receptacle retainer, if equipped.

3. Remove the hog rings retaining the seat back cover to the frame and remove the cover (Figs. 4 and 5).

4. Transfer the listing wire to the new seat back cover.

5. Inspect the seat pad and spring assemblies, and repair or replace as necessary.

6. Carefuly place the cover over the seat frame and pad assembly. Pull the cover taut over the pads, and install the hog rings and retaining tabs (Figs. 4 and 5).

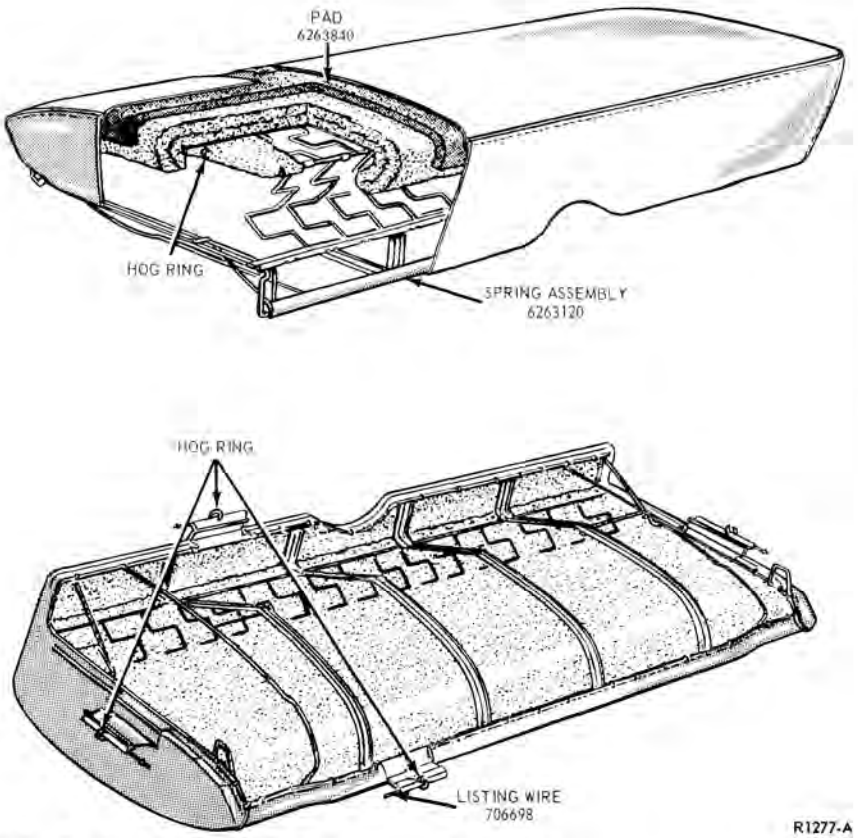


FIG. 3—Typical Rear Seat Cushion Cover Installation

7. Cut a hole in the cover for the ash receptacle retainer, if equipped, and install the receptacle assembly.

8. Install the seat back to the seat cushion.

REAR SEAT BACK COVER

1. Remove the rear seat back from the car.

2. Remove the rear seat back cover.

3. Transfer listing wires to the new cover.

4. Position the new cover on the pad and seat frame and secure it in place with hog rings (Fig. 6).

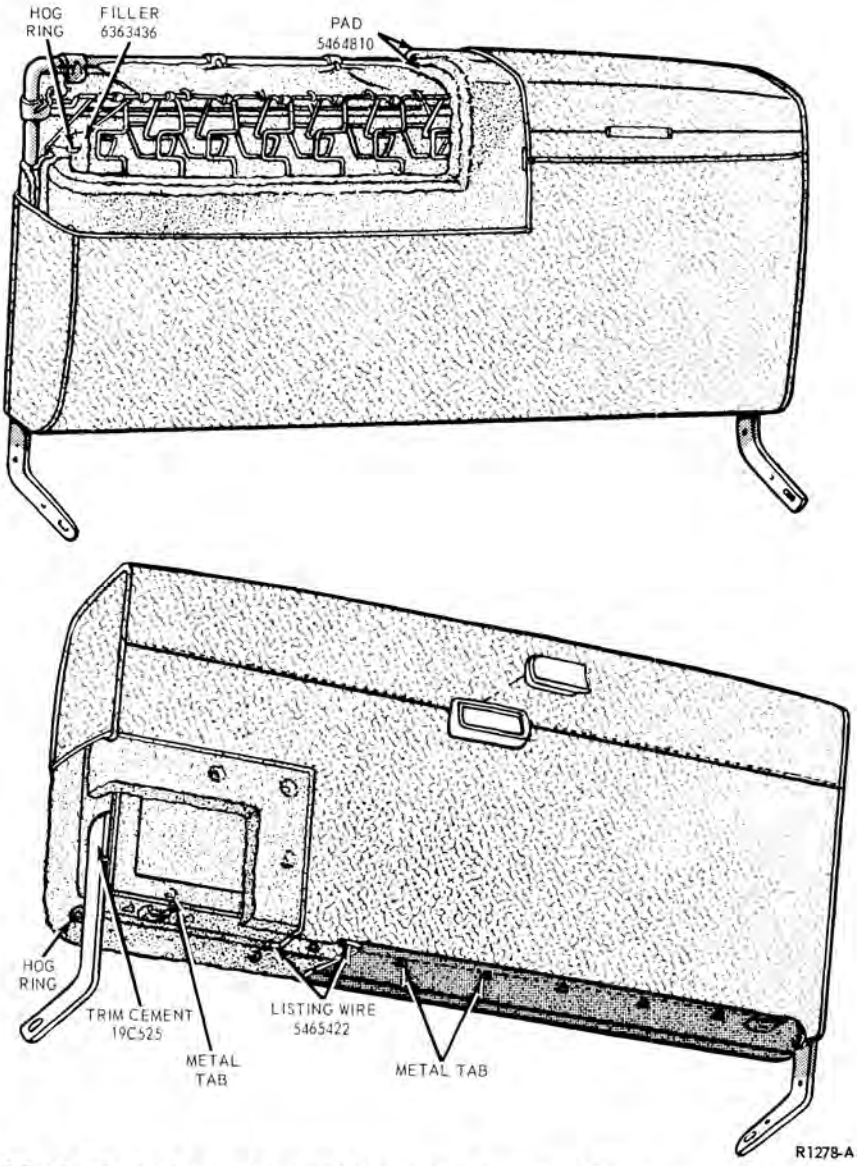


FIG. 4—Typical Front Seat Back Cover Installation—4-Door

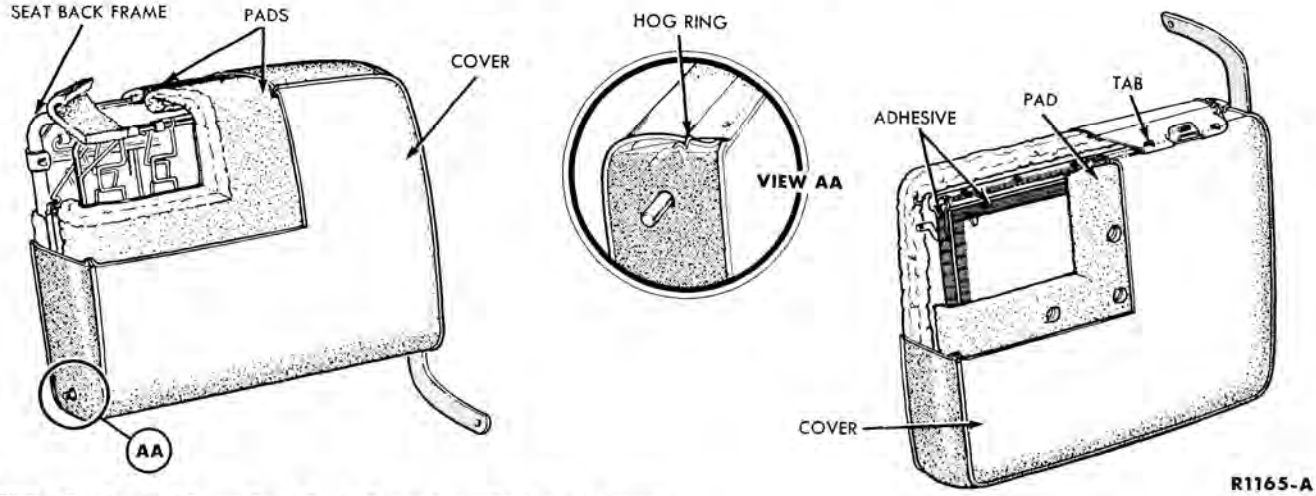


FIG. 5—Typical Front Seat Back Cover Installation—2-Door

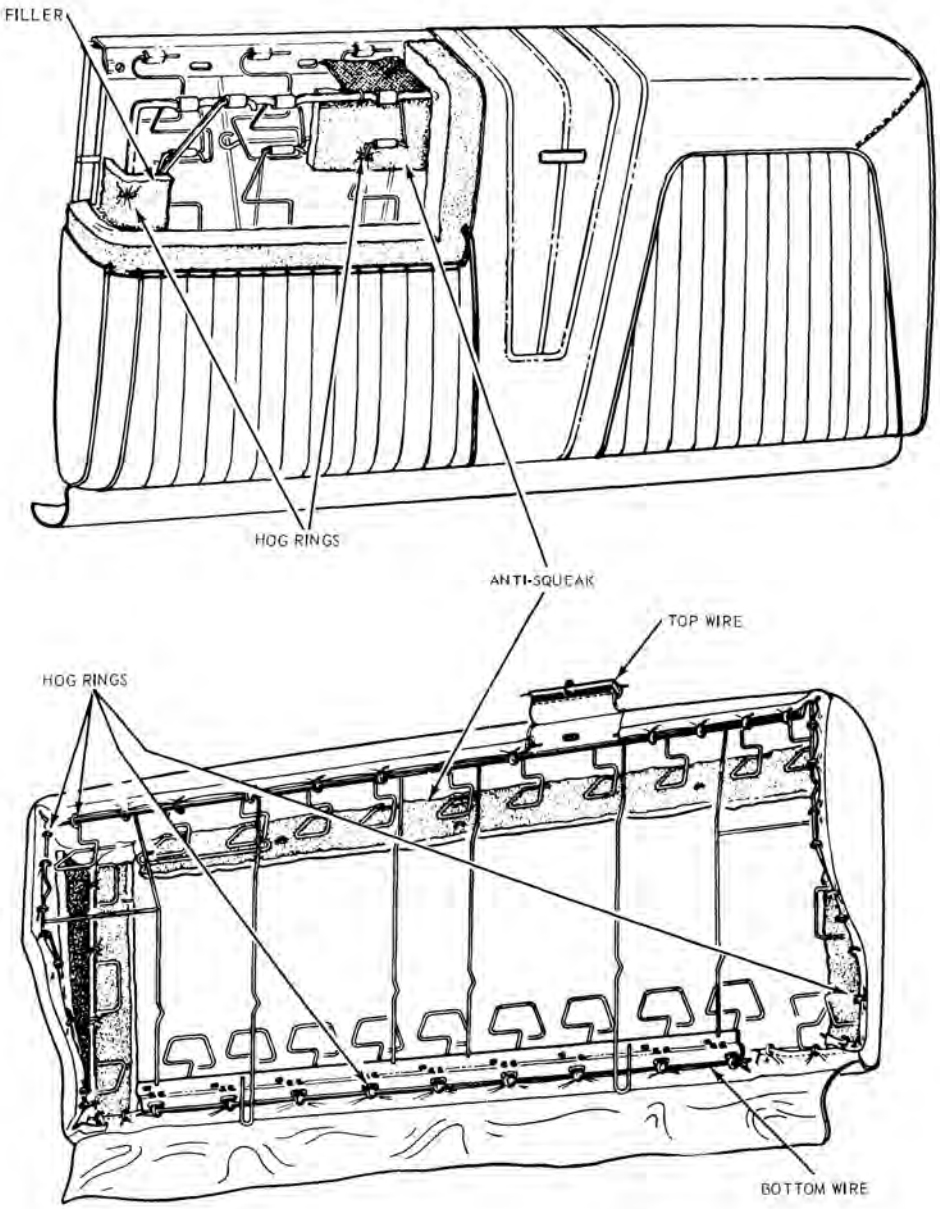


FIG. 6—Typical Rear Seat Back Cover Installation

2 BUCKET SEATS

The seat is mounted in the conventional manner on two seat tracks. The seat release is located at the lower front center of the seat, and is operated by pulling the lever up to release the seat tracks.

REMOVAL AND INSTALLATION

SEAT AND SEAT TRACK

The seat track assembly is easily replaced if the seat assembly is removed from the car.

1. Remove 4 floor pan plug buttons to gain access to the seat track retaining nuts (Mustang only).

2. From under the car, remove the seat track retaining stud nuts and washers. Remove the seat assembly from the car and place it on a clean work area.

3. Remove the screws which retain the seat track assembly to the seat cushion and remove the seat track assembly.

4. Disconnect the seat track brace and latch release rod from the track being replaced, and connect these parts to the new seat track.

5. Loosely install the track-to-floor retaining studs in the seat track.

6. Place the seat track assembly on the seat cushion, and install the retaining screws.

7. Place the seat assembly in the car and install the washers and nuts on the retaining studs.

8. Install the floor pan plug buttons (Mustang only).

FRONT SEAT CUSHION COVER

Comet, Falcon (Model 76 only)

Repairs to seat cushions or seat backs are performed out of the car and are usually limited to replacement of torn or burned seat covers. In a few instances, the pads may be damaged and require replacement.

When installing a new seat cover or pad, refer to Fig. 7 for the location of listing wires, hog rings, anti-squeak pads, and seat pad stack-up.

1. Remove the seat and seat track assembly from the car and place it on a clean work area.

2. Remove the seat cushion from the seat track. From each side of the seat, remove the seat back retaining pin and retainer, and remove the seat back. Then, remove the cushion side shields.

3. Remove the seat back scuff plates and remove the hog rings retaining the seat cushion cover to the spring assembly (Fig. 7). Separate the bottom facing from the cushion cover top rear panel, and allow the facing to remain cemented to the foam rubber pad. Remove the cushion cover.

4. Inspect the pad and spring assemblies, and repair or replace as necessary.

5. Transfer the listing wires to the new cover.

6. Place the new cover assembly over the pad and seat spring assembly and secure it to the front bolster wire with hog rings. Apply trim cement (C2AZ-19C525-A) to the bottom of the cushion cover top rear panel and to the old facing which was left cemented to the foam rubber pad.

7. Secure each side bolster wire to the seat spring assembly with hog rings.

8. The front and side edges of the cover assembly can now be secured to the bottom of the spring assembly with hog rings as shown in Fig. 7.

9. Secure the rear edge of the cover assembly to the bottom of the spring assembly with hog rings.

10. Install the two scuff plates on the cushion.

11. Install the cushion side shields, seat back, and seat tracks. Install the seat assembly.

FRONT SEAT CUSHION COVER AND/OR PAD

Comet, Falcon, Fairlane (All Models Except 76)

1. Remove 4 nuts retaining the seat track to the floor pan and remove the seat and seat tracks from the car.

2. Remove the right and left side seat back pivot covers and remove the seat back retaining bolts, nuts, and cotter pins and remove the seat back from the cushion.

3. Remove the seat back scuff plates from the seat cushion.

4. Remove the hog rings attaching the trim cover to the bottom of the seat frame. Then peel the cover from the sides of the seat cushion to gain access to the hog rings in the center of the seat cushion.

5. Remove the hog rings and remove the trim cover.

6. Remove the pad-attaching hog rings and remove the pad from the frame.

7. Position a new pad upside down on a bench and place the seat cushion frame on top of the pad.

8. Apply trim cement to the seat frame and press the pad listing to the cemented area of the frame.

9. Install hog rings to retain the center part of the pad to the seat frame (Fig. 7).

10. Apply trim cement to the pad (Fig. 7) and position the cushion cover on the pad. Then, position the center area listing wires to the frame and install the hog rings.

11. Position the cover over the side padding and attach the cover to the bottom edge of the seat frame with hog rings (Fig. 7).

12. Install the seat back scuff plates on the seat cushion.

13. Position the seat back on the seat cushion and install the retaining bolts, nuts, and cotter pins. Then, install the right and left side seat back pivot covers.

14. Position the seat and seat track in the car and install the seat track retaining nuts.

Mustang

1. Remove the front seat and track from the car and remove the seat tracks from the seat.

2. Remove the front seat back shield and the seat back pivot side cover.

3. Remove the seat back pivot pin and remove the seat back from the seat cushion.

4. Remove the seat cushion scuff plate.

5. Remove the seat cushion cover and pad.

6. Position the seat cushion pad on the frame and install the hog rings (Fig. 7).

7. Position the cushion cover on the pad. Cement with trim cement (C2AZ-19C525-A) and retain with hog rings (Fig. 7).

8. Install the seat cushion scuff plate.

9. Position the seat back on the pivot and install the pivot pin.

10. Install the front seat back shield and the seat back pivot side cover.

11. Install the seat on the seat tracks and install the seat and seat track in the car.

FRONT SEAT BACK COVER

Comet, Falcon, Fairlane (All Except Model 76)

1. Remove the seat and seat tracks from the car.

2. Remove the right and left side seat back pivot covers and remove the seat back retaining bolts, nuts, and cotter pins and remove the seat back from the cushion.

3. Unsnap and remove the seat back rear cover (Fig. 7).

4. Remove the seat back stop adjusting bolts and remove the hog rings retaining the cover to the frame.

5. Bend up the side retaining tabs (Fig. 7) and lift the cover off the tabs.

6. Remove any additional hog rings retaining the cover to the seat frame.

7. Position the trim cover off the side padding to gain access to the hog rings in the center of the seat back and remove the hog rings.

8. Position the new cover over the front center of the seat back and attach it with hog rings. Position the cover around the sides and top of the sponge padding, pulling the material tight. Then, turn the seat back face down.

9. Pull the trim cover tight and install hog rings at the top. Pull the

cover tight and install hog rings at the bottom.

10. Pull the trim cover tight at the sides and position it over the side retaining tabs (Fig. 7). Bend the tabs down.

11. Position the rear cover on the seat back and snap it into place. Install the seat back stop adjusting bolts and nuts.

12. Install the seat back on the cushion and install the seat back pivot covers.

13. Install the seat and seat track in the car.

Comet, Falcon (Model 76 only)

1. From each side of the seat, remove the seat back pivot arm retaining pin and retainer, and then remove the seat back. Remove the two seat back stops and seat back pivot arm covers, and unsnap the panel cover from the seat back (Fig. 7). Remove the hog rings from the seat back assembly, bend the tabs up on the seat back, and remove the seat back cover. Inspect the pad and spring assemblies, and repair or replace as necessary.

2. Transfer the listing wires to the new cover.

3. Place the new cover over the pad and spring assembly, and with 17 equally spaced hog rings, secure the cover to the bolster wire (Fig. 7).

4. Pierce the cover over the side and bottom retaining tabs, and bend the side retaining tabs toward the center of the seat.

5. Pull the lower rear edge of the cover over the bottom of the spring assembly, and secure each side with three hog rings (Fig. 7).

6. Pull the lower front edge of the cover over the bottom of the spring assembly, and secure it to the lower rear edge of the cover with one hog

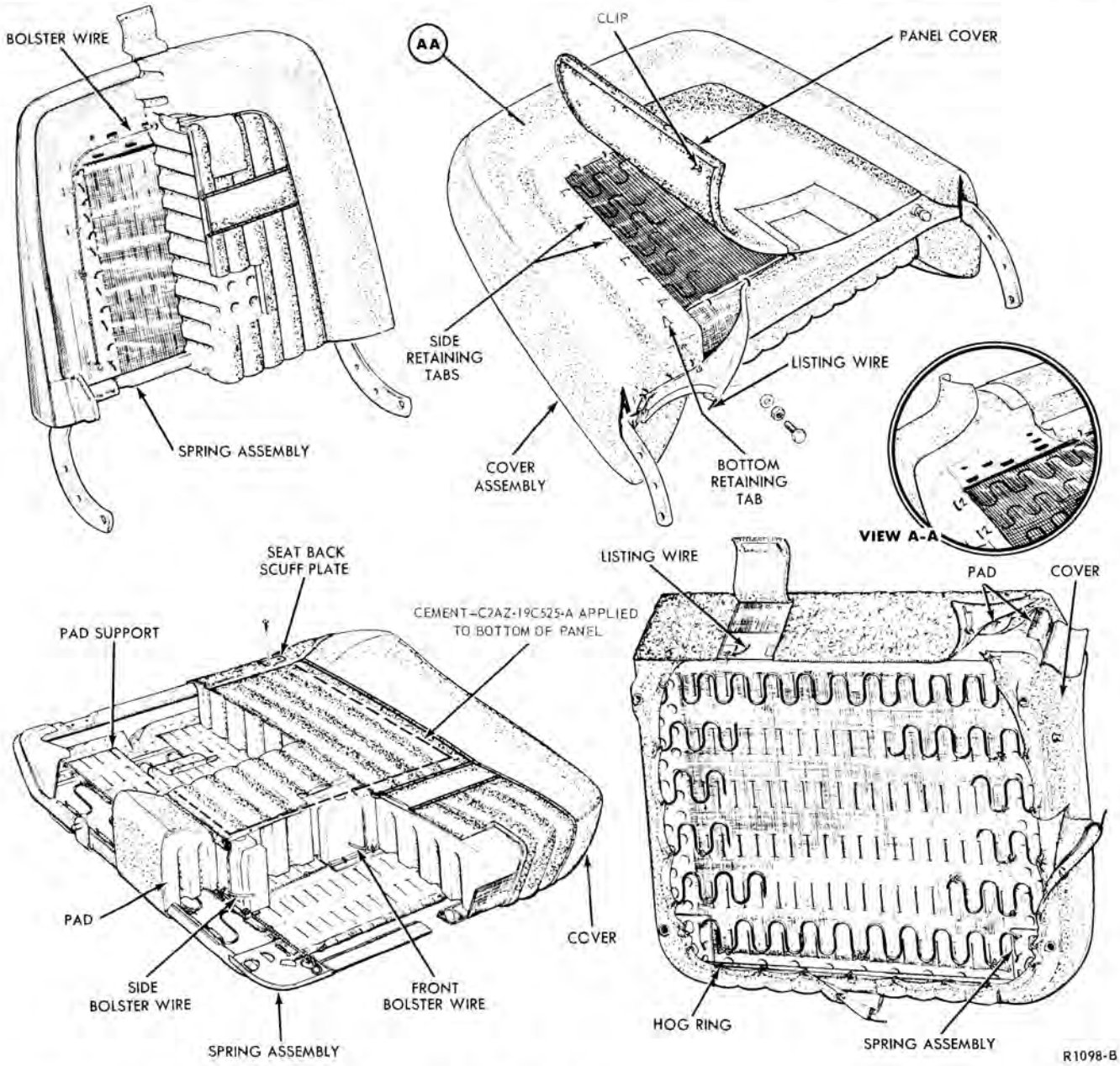


FIG. 7—Typical Bucket Seat Back and Cushion Cover Installation

ring on each side (Fig. 7). Secure the lower listing of the cover assembly to the spring assembly with five hog rings, pierce the cover over the bottom retaining tab, and bend each tab toward the top of the seat.

7. Secure the top rear edge of the cover assembly to the spring assembly with five hog rings.

8. Install the seat back panel with the retaining clips, the seat back pivot arm covers, and the two seat stops to the seat back assembly.

9. Connect the seat back to the seat cushion and install the pivot arm retainers and retaining pins.

Mustang

1. Remove the front seat back shield and the seat back pivot side cover.

2. Remove the seat back pivot retaining pin and remove the seat back from the car.

3. Unsnap and remove the seat back rear panel cover (Fig. 7).

4. Remove the seat back stop adjusting bolt.

5. Remove the hog rings and remove the cover from the seat back frame.

6. Position the seat back cover in place on the pad and connect it to the bolster wire with hog rings. Then, pull the cover tight and secure it to the rear side with hog rings.

7. Install the seat back rear trim panel and adjusting bolt.

8. Position the seat back on the seat cushion and install the pivot retaining pin.

9. Install the seat back shield and pivot side cover.

PART 18-3 CONVERTIBLE TOP

Section	Page	Section	Page
1 Care of Top Fabric	18-21	3 Adjustments and Light Repairs	18-23
2 Diagnosis and Testing—Power Top	18-21	4 Removal and Installation	18-27

The convertible top mechanism used on the Comet and Falcon models is raised and lowered by hydraulic power. However, two types of convertible tops are used on the Mustang. One top is hydraulic powered and the other is a manual top (raised and lowered by hand).

In most cases, the removal and installation procedures (Section 4) for the Comet and Falcon convertible tops are different from the Mustang convertible top. Any procedures that pertain to a specific top (power or manual) or to a specific model (Comet, Falcon or Mustang) are identified. If no reference to model or type of top is given, the procedure is common to all types covered in this manual.

The convertible top adjustments are outlined in Section 3. The Comet and Falcon adjustments are listed together and the Mustang adjustments are listed separately. The adjustments for the Mustang power and manual top are the same except for the Hold Down Side Clamp adjustment. This adjustment is for the manual convertible top only.

1 CARE OF TOP FABRIC

Proper care of the top material will reduce the possibility of water stains, mildew, or shrinkage. Do not stack the top if it is damp. Always use the convertible top vinyl boot to keep the top material clean, dry, and positioned when the top is stacked.

The rear window slide fastener should be lubricated at least once a year with stainless stick lubricant.

Use the top compartment behind the rear seat back only for storage of the top. The storage of other items not only interferes with the proper operation of the top, but may also damage or stain the top material.

The vinyl top may be washed each time the car is washed. Clean the material with FoMoCo Interior Trim Cleaner and a scrub brush. Be sure to rinse the top thoroughly with clean water during and after washing.

Do not use a cleaning material that is not recommended for vinyl material because damage to the top may result.

The vinyl coating becomes tacky at approximately 180°F. Therefore, when making paint repairs, be sure to protect the top material from heat.

2 DIAGNOSIS AND TESTING—POWER TOP

Refer to Wiring Diagram Manual Form 7795P-65 for schematics and locations of wiring harnesses.

If the top cannot be lowered or raised satisfactorily, or if it fails to operate at all, and the trouble is not readily apparent, make the following mechanical, electrical, and hydraulic tests to find the cause of the trouble. **Always check the battery before making any of the following checks.**

Table 1 shows symptoms and possible causes of trouble.

MECHANICAL CHECKS

1. If the action of the top is slow, raise and lower it and look for bent or misaligned linkage.

2. If binding is noted when clamping the top at the header, check the alignment of the door and the quarter windows with the side rail weatherstrips. Also check the top sag adjustment and toggle clamp adjustment.

ELECTRICAL TESTS

BATTERY CHARGE

The battery charge should be determined before making any electrical checks because a partially discharged battery will cause slow motor and pump operation.

CURRENT DRAW

To check the current draw in the top operating circuit, disconnect the black wire at the circuit breaker (located on the starter relay), and connect an ammeter in series in the circuit (Fig. 1). Operate the top control switch and note the ammeter



FIG. 1—Testing Motor Current Draw

TABLE 1—Trouble Symptoms and Possible Causes

Possible Causes of Trouble Symptoms	Trouble Symptoms							
	Top Does Not Retract	Top Action Sluggish	Top Sides Operate Unevenly	Top Does Not Stack	Side Rail(s) Do Not Fit	Top Does Not Rise From Stack	Top Does Not Latch	Top Leaks
Top Control Switch	X					X		
Inadequate Battery Charge	X	X				X		
Motor and Pump	X	X				X		
Circuit Breaker	X					X		
Faulty Wiring	X	X				X		
Hydraulic Cylinder(s)	X	X	X			X		
Air in Hydraulic System	X	X				X		
Insufficient Hydraulic Fluid	X	X				X		
Top Lowered when Wet Causing Fabric to Shrink							X	
Toggle Clamp Adjustment*							X	X
Door Window Adjustment*					X			X
Quarter Window Adjustment*					X			X
Weatherstripping								X
Balance Link Bracket Adjustment				X	X			
Center Side Rail Adjustment (Mustang only)					X			

*The top should not be raised with the windows up.

readings. The current draw should be 35 amperes maximum operating, and 40-50 amperes stalled, with a voltage reading of 9-10. Current in excess of 75 amperes indicates a frozen pump or cylinder or a mechanical obstruction. Low amperage with the motor running and no top movement indicates a defective pump or low fluid level in the reservoir.

TOP CONTROL SWITCH

1. Disconnect the wiring harness at the switch multiple connector located behind the instrument panel.

2. Connect one terminal of a test lamp to the black (feed) wire of the top control switch, and ground the other lead (Fig. 2). If the test lamp does not light, there is an open or short circuit between the battery and the switch or a bad circuit breaker.

3. If there is voltage to the switch, connect a jumper wire between the black (feed) wire and the red wire, and then between the black wire and the yellow wire (Fig. 2). If the top motor operates, the switch is faulty and must be replaced.

CIRCUIT BREAKER

If there is no voltage at the top control switch, connect a jumper wire across the terminals of the circuit breaker (located on the starter relay) and operate the switch (Fig. 3). If the top motor operates, the circuit breaker is faulty and must be replaced. If there is no voltage at the circuit breaker, check the black wire from the circuit breaker to the starter relay.

SWITCH-TO-MOTOR WIRES

Disconnect the yellow and the red switch-to-motor leads at the junction block near the motor. Connect a 12-



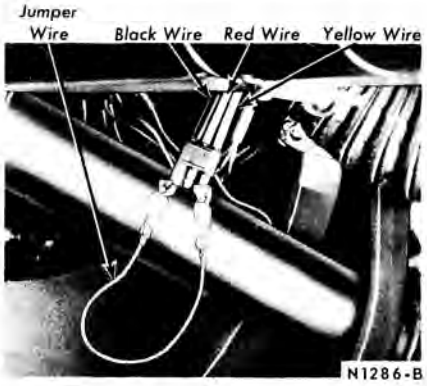


FIG. 2—Testing Switch Wiring

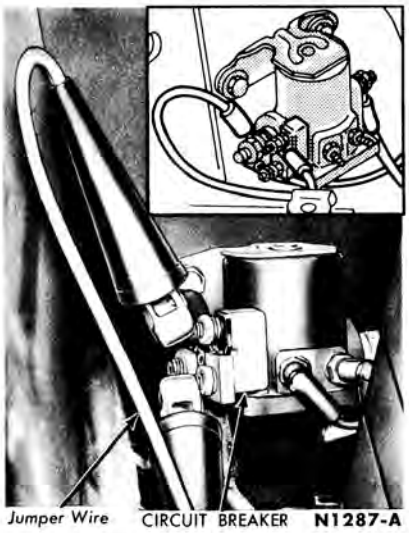


FIG. 3—Testing Circuit Breaker

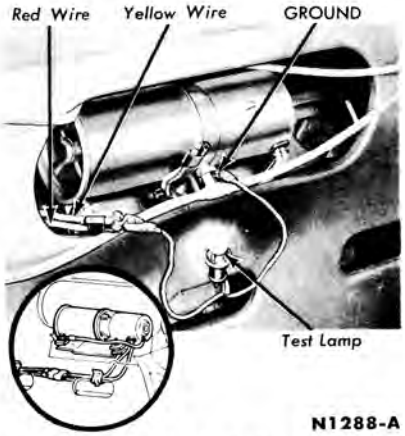


FIG. 4—Testing Switch to Motor Wiring—Typical



FIG. 5—Testing Motor—Typical

volt test lamp between the yellow wire and a ground (Fig. 4) and check by operating the top control switch to raise the top. Connect the test lamp between the red wire and a ground, and check by operating the switch to lower the top. If the test lamp does not light in either case, the wire from the junction block to the switch is open or shorted.

MOTOR

Check the operation of the motor by connecting first one motor lead, and then the other, directly to the battery positive terminal (Fig. 5). If the motor operates in either case, but will not operate when hooked into the wiring harness, check the wiring harness again for short or open circuits. If the motor will not work when hooked directly to the battery, check the black (ground) wire from the motor. If the motor still does not work, it must be replaced.

HYDRAULIC TESTS

Faulty hydraulic system operation can be caused by lack of fluid, leaks, air in the system, obstructions or kinks in the hoses, or faulty operation of the cylinder or the pump.

FLUID LEVEL

1. Remove the rear seat and raise the top.

2. Place absorbent cloths below the filler plug.

3. Remove the filler plug, and check the fluid level. It should be level with the bottom edge of the hole.

4. If the level is low, check the system for leaks, adding automatic transmission fluid Type A, Suffix A as necessary.

LIFT CYLINDER

Remove the rear seat and the quarter trim panels, operate the top control switch, and check the operation of the lift cylinders for the following:

If the movement of the piston rods are sluggish or uneven, check the hoses from the pump to the cylinders for kinks.

If one piston rod moves slower than the other, the cylinder with the slower rod is defective and should be replaced.

If both rods move slowly, or do not move at all, disassemble and repair the pump.

3 ADJUSTMENTS AND LIGHT REPAIRS

Before aligning the top, visually determine if the trouble results from top misalignment and/or window misalignment. It may be necessary to align both the top and the windows because of the relationship between the two. Adjustments of the door and quarter windows must be checked and any necessary changes made before making top adjustments. These windows must be fully closed to insure proper top adjustment. Door window and quarter window adjustments are outlined in Part 17-3.

COMET-FALCON

SIDE RAIL WEATHERSTRIPS ADJUSTMENT

The side rail weatherstrips can be adjusted laterally and also fore and aft. Adjust the weatherstrips laterally so that the sealing lips make full contact with the door and quarter window frames. Adjust the weatherstrips fore or aft to butt the ends of the weatherstrips together for a watertight seal (Fig. 6).

STRIKER PLATE ADJUSTMENT

The striker plates must be aligned with the dowel pins prior to making other top adjustments. The dowel pins are not adjustable. A slight lateral adjustment of the striker plate is provided by loosening the striker plate retaining screws (Fig. 7).

TOGGLE CLAMP ADJUSTMENT

The toggle clamps that hold the No. 1 bow against the header can be adjusted to provide a good seal.

1. To determine which side is not sealing, check the weatherstrip between the No. 1 bow and the header with a 3 x 5-inch card. A reasonable pull must be felt as the card is pulled out. Both toggle clamps need not be adjusted unless necessary.

2. Release the toggle clamps, and

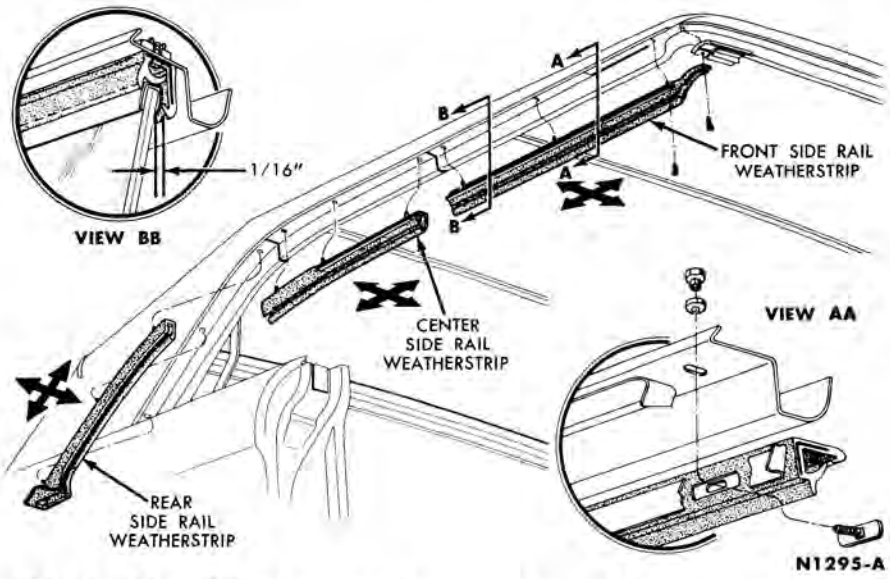


FIG. 6—Side Rail Weatherstrip Adjustment—Comet, Falcon

thread the toggle hook in or out until adequate sealing pressure is applied at the header weatherstrip. Excessive tightening of the toggle hooks will distort the No. 1 bow and cause poor weatherstrip sealing.

BALANCE LINK ADJUSTMENT

The balance link adjusting bracket is mounted on the main pivot bracket support (Fig. 8). Two adjustments are provided at the bracket. Sliding the bracket in the elongated mounting holes permits proper stacking of the top in the well. Turning the Allen head adjusting screw adjusts the side rail to glass clearance. The rear seats and quarter trim panels must be removed to adjust the balance link.

SIDE RAIL SAG

If the side rail sags above the door glass, adjust as follows:

1. Use the top of the door glass and quarter glass as reference points to determine the proper level of the side rail. The design dimension between the bottom edge of the side rail and the top edge of the side windows is 0.45 inch.

2. Have the top locked in the fully raised position.

3. Loosen the adjusting bracket retaining screws. With an Allen wrench, turn the adjusting screw in the balance link adjusting bracket down, to raise the side rail. If the side rail is too high, or crowned, above the windows, turn the adjusting screw up, to lower the side rail. Then, tighten the adjusting bracket retaining screws.

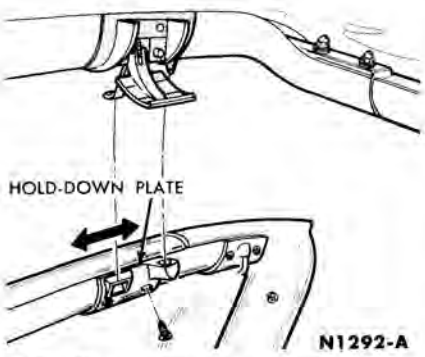


FIG. 7—Striker Plate Adjustment

TOP STACK

When the top is stacked, it may be too high in the well. If the top stacks too high, it will be difficult to fasten down the boot. To obtain proper stacking, proceed as follows:

If the top stacks too high in the well, loosen the main pivot bracket mounting screws, and let the bracket seek its own position; then, tighten the main pivot bracket retaining screw. If it is necessary to make this adjustment, recheck the door glass to side rail clearance.

MAIN PIVOT BRACKET ADJUSTMENTS

The main pivot bracket is mounted on the main pivot bracket support. The support is mounted to the inner quarter panel and the wheelhouse extension. The main pivot bracket mounting support provides for shifting of the entire top assembly, fore and aft, vertically and laterally.

Fore and Aft Adjustment. This adjustment moves the top assembly straight forward or rearward to obtain a good fit between the rear side rail weatherstrip and the rear edge of the quarter glass. The top assembly can also be moved across the windshield header by this adjustment.

1. Loosen the balance link retaining screws and disconnect the top assembly lift cylinders.

2. Loosen the screws which retain the main pivot bracket support to the inner quarter panel and to the wheelhouse extension (Fig. 9).

3. Shift the entire pivot bracket support fore or aft as required to bring the rear side rail in proper relationship to the quarter glass, and tighten the main pivot bracket retaining bolts.

4. Tighten the balance link retaining screws and connect the top assembly lift cylinder.

Vertical Adjustment. This adjustment moves the top assembly up or down to obtain a good fit between the windshield header and the top assembly and the top assembly and the window glass line, the rear and center side rail weatherstrip and the top of the quarter and door glass.

1. Loosen the screws which retain the main pivot bracket to its support (Fig. 9).

2. Shift the main pivot bracket up or down as necessary to obtain the proper clearance along the side rails and the quarter and door glass.

Lateral Adjustment. This adjustment shifts the top assembly sideways to obtain a good seal between the side of the rear side rail and the quarter outside rear side belt moulding.

1. Loosen the screws which retain the main pivot bracket to its support.

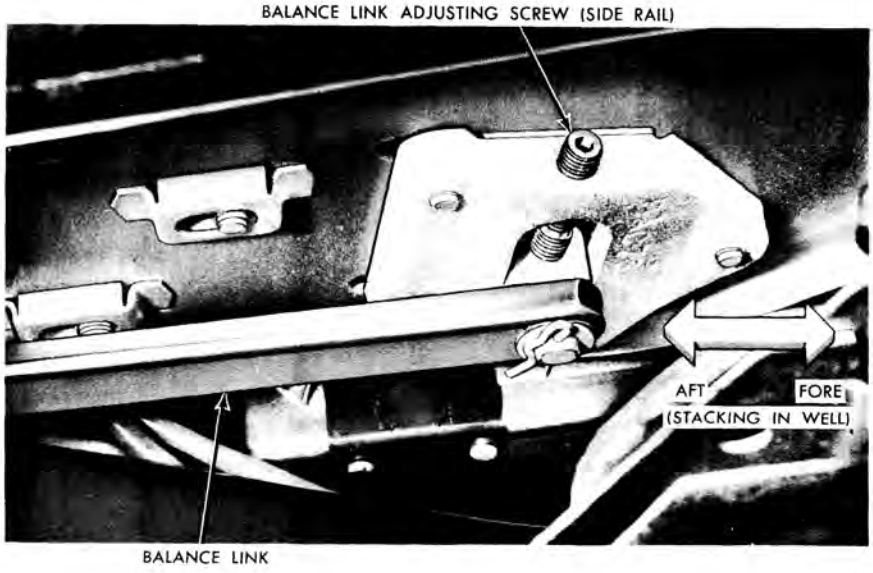
2. Shift the main pivot bracket toward either side as necessary to obtain the proper clearance (⅜ inch) between the rear side rail and the quarter outside rear side belt mouldings, and tighten the retaining screws.

3. Adjust the side rail weatherstrips as necessary to obtain a satisfactory seal along the glass line.

MUSTANG

SIDE RAIL WEATHERSTRIPS ADJUSTMENT

The rear and center side rail



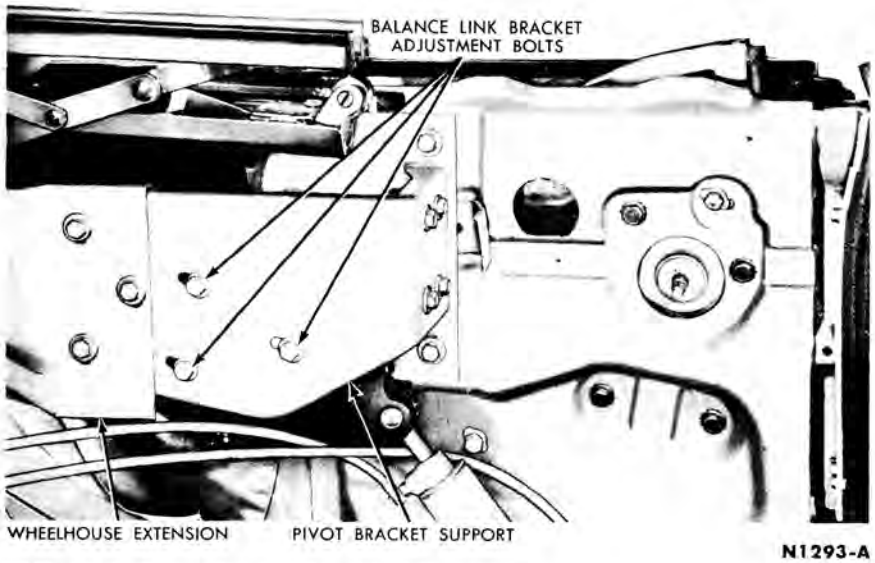


FIG. 8—Balance Link and Bracket Adjustment

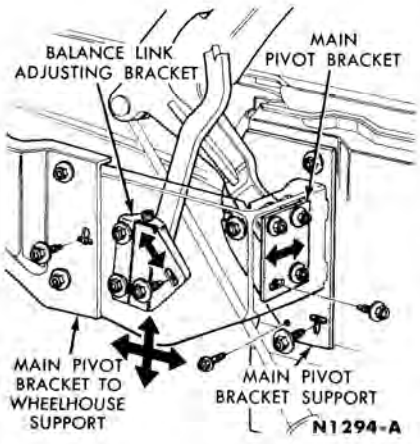


FIG. 9—Main Pivot Bracket Adjustments

weatherstrips are adjustable fore and aft to provide a good seal at the break joints. The front weatherstrip is not adjustable.

1. Lock the top assembly to the windshield header.

2. Trim the rear edge of the front top side rail weatherstrip flush with the rear end of the front side rail to obtain a water tight seal at point X (Fig. 10).

3. Adjust the rear side rail weatherstrip to provide a water tight seal at the joint (Fig. 10), and tighten the weatherstrip retaining nuts.

LATERAL ADJUSTMENT

This adjustment shifts the top assembly sidewise to obtain a good fit between the rear side rail and the quarter outside rear side belt moulding.

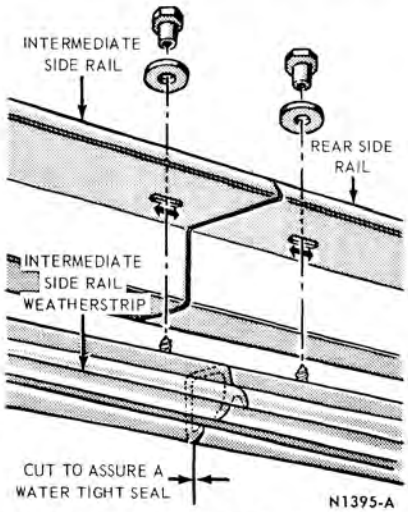


FIG. 10—Side Rail Weatherstrip Adjustment—Mustang

1. Loosen the screws which retain the main pivot bracket to its suport (Fig. 11).

2. Shift the main pivot bracket toward either side as necessary to obtain the proper clearance (9/32 inch) between the rear side rail and the quarter outside rear side belt mouldings and tighten the retaining screws.

INTERMEDIATE SIDE RAIL ADJUSTMENT

This adjustment moves the top assembly to obtain a good fit between the top assembly and the side window glass line.

1. With the door glass properly adjusted, loosen the eccentric nut (View B, Fig. 12), and rotate the eccentric pin to obtain a 3/8-inch parallel dimension between the front door glass and the front and center side rails.

2. Hold the eccentric pin to prevent it from turning, and tighten the eccentric nut. **The main balance link marking and washer pointer is an average dimension of adjustment. Rotation of the eccentric will raise or lower the side rails to obtain the correct design-height dimension between the side rails and the glass.**

BALANCE LINK

The balance link is retained to the intermediate side rail assembly with

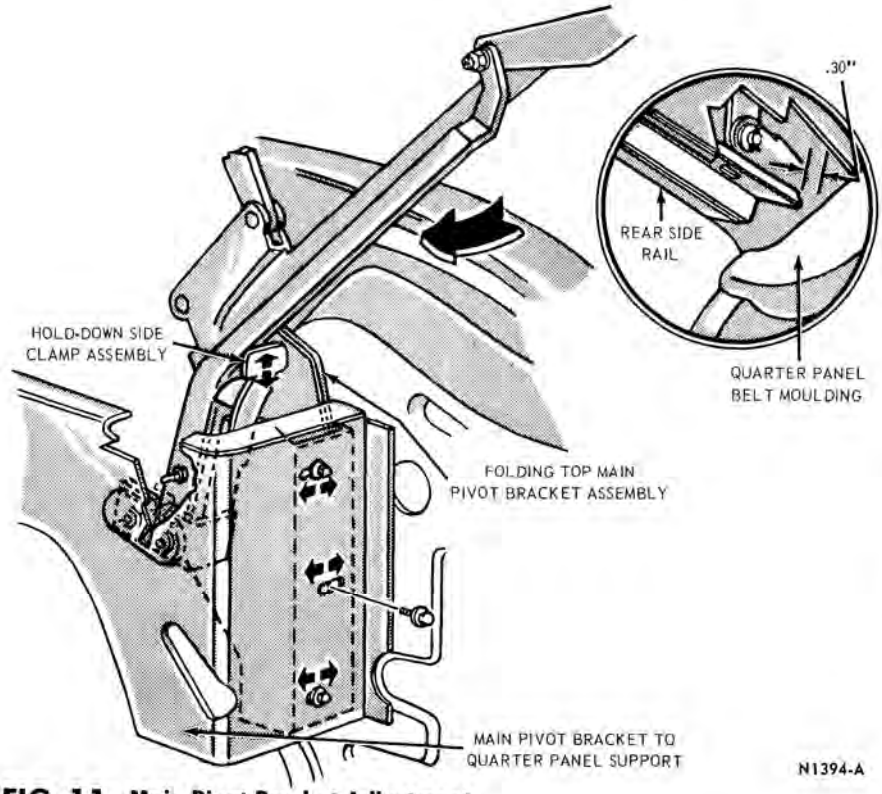


FIG. 11—Main Pivot Bracket Adjustment

an eccentric pin (Fig. 12, View B). Rotation of the eccentric pin raises or lowers the side rail over the door glass area. Clearance between the glass frame and side rail is ⅜ inch constant.

DOWEL PIN ADJUSTMENT

To obtain proper alignment of the dowel pins with the dowel pin holes in the windshield header, loosen the dowel pin retaining nut (Fig. 13) and move the dowel pins inboard or outboard. Then, tighten the dowel retaining nut.

TOGGLE CLAMP ADJUSTMENT

The toggle clamps that hold the No. 1 bow against the header can be adjusted to provide a good seal.

1. To determine which side is not sealing, check the weatherstrip between the No. 1 bow and the header with a 3 x 5-inch card. A reasonable pull must be felt as the card is pulled out. Both toggle clamps need not be adjusted unless necessary.

2. Release the toggle clamps (Fig. 13), loosen the Allen screw, and

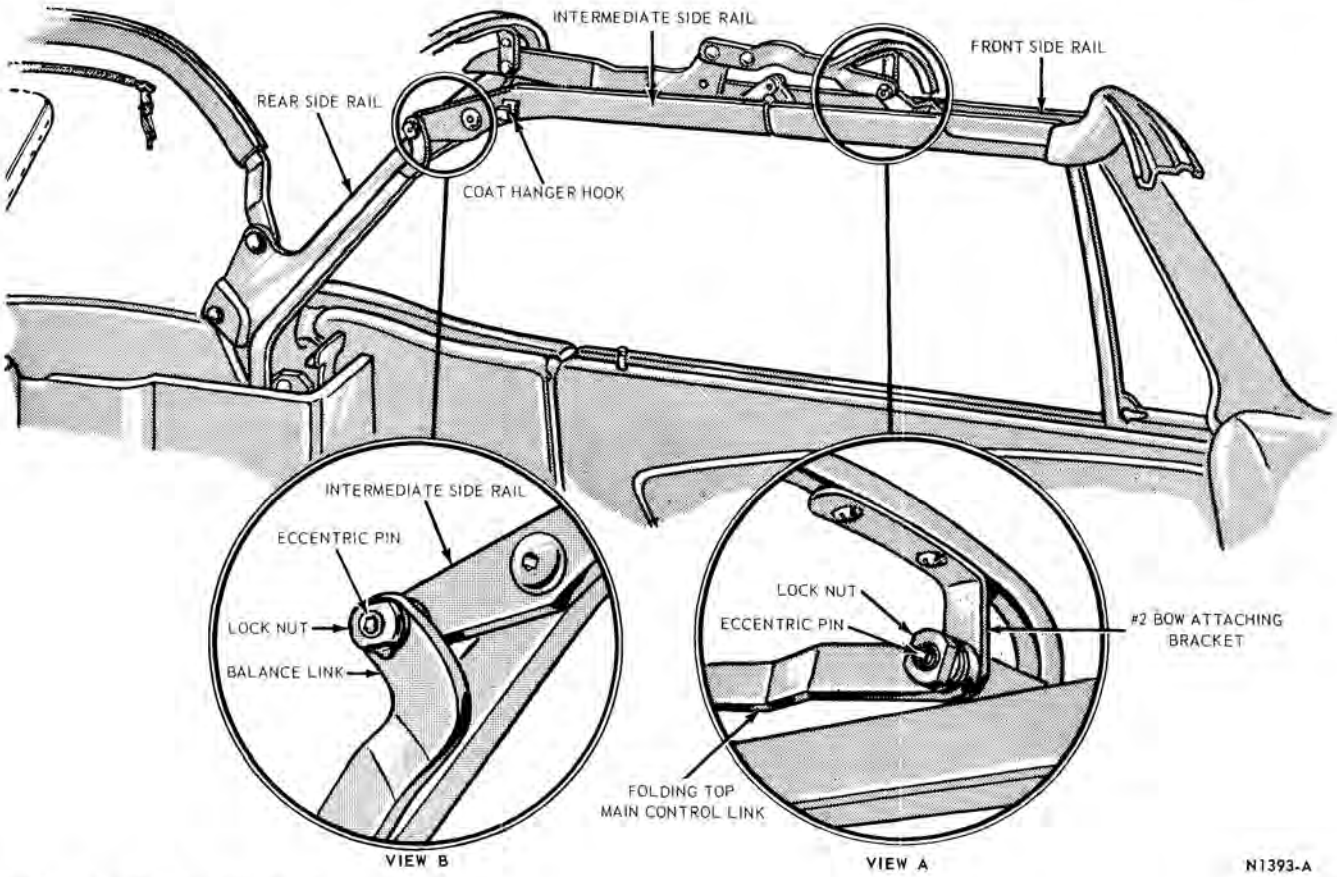


FIG. 12—Top Side Rail Adjustments

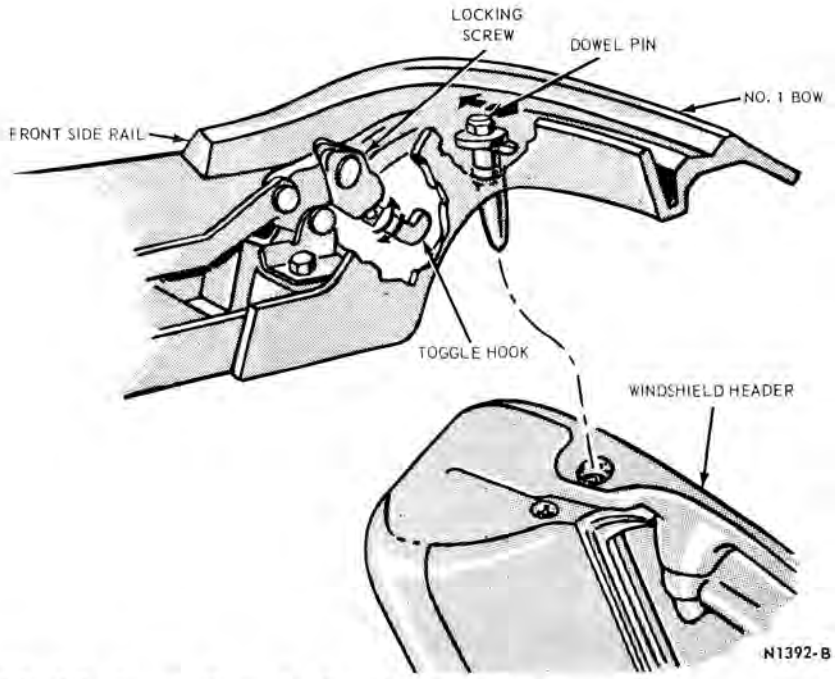


FIG. 13—Toggle Clamp Hook and Dowel Adjustment

thread the toggle hook in or out until adequate sealing pressure is applied at the header weatherstrip. **Excessive tightening of the toggle hooks will distort the No. 1 bow and cause poor weatherstrip sealing.** Tighten the Allen screw after adjusting the clamp.

NO. 2 BOW ADJUSTMENT

Raise the top and lock it to the windshield header. Loosen the lock nut (View A—Fig. 12), and rotate the eccentric pin to raise or lower the top material along the door glass line. The specified clearance for the top material to door glass frame is ⅛ inch. Hold the eccentric and tighten the lock nut.

HOLD DOWN SIDE CLAMPS—MANUAL TOP

The hold down side clamp assemblies located on each quarter panel support mounting (Fig. 11), are adjustable up and down to retain the top assembly when in its fully stacked position.

4 REMOVAL AND INSTALLATION

MOTOR AND PUMP—POWER TOP

A pump repair kit and a reservoir repair kit are available for service.

REMOVAL

1. Operate the top to the fully raised position.

2. Remove the rear seat cushion and seat back.

3. Disconnect the motor leads and the ground wire.

4. Remove the attaching screws, and remove the motor and pump assembly from the floor pan. Do not lose the rubber grommets.

5. Vent the reservoir by removing the filler plug, and then install the filler plug. **The reservoir must be vented in order to equalize the pressure. This lessens the possibility of fluid spraying on the trim and paint when the hoses are disconnected.**

6. Place absorbent cloths beneath the hose connections, disconnect the hoses, and then plug the open fittings and lines.

DISASSEMBLY

1. Remove the filler plug, and drain the fluid from the reservoir into a clean container.

2. Scribe lines on the reservoir and pump body so that these parts can be positioned properly upon assembly.

3. Remove the center bolt from the reservoir (Fig. 14).

4. Remove the reservoir and the seal at the end of the reservoir.

5. Remove the mounting bolts that hold the valve body on the pump body.

6. Place a cloth under the assembly, and carefully remove the valve body so that the check balls are not lost.

7. Remove the inner and outer rotors.

ASSEMBLY

Use all the parts contained in the pump repair kit when assembling the pump or reservoir.

1. Install the inner rotor on the armature shaft.

2. Install the outer rotor over the inner rotor.

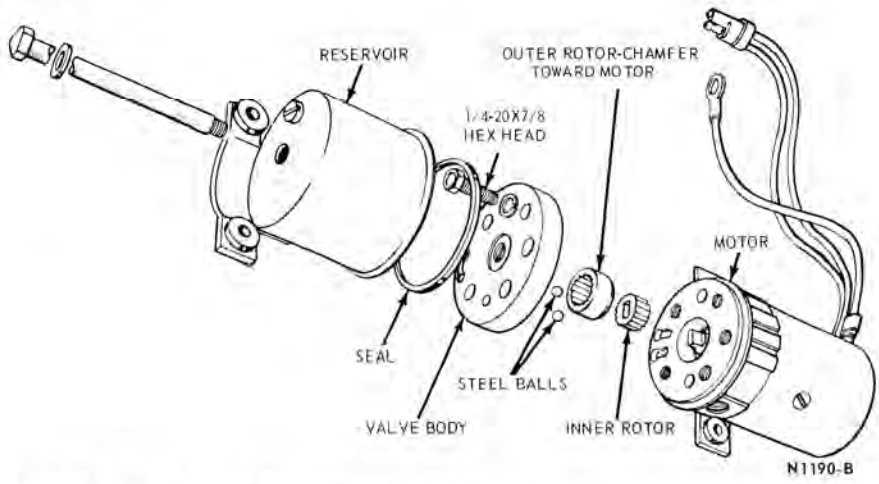


FIG. 14—Motor and Pump Disassembled

3. Place the check balls in the motor body channels.

4. Install the valve body on the motor body.

5. Install the valve body mounting bolts.

6. Install the seal on the valve body.

7. Install a new seal on the center bolt, and install the reservoir on the valve body, using the line previously scribed as a guide.

8. Place the assembly in a horizontal position, fill the reservoir with automatic transmission fluid Type A, Suffix A to the level of the bottom of the filler plug hole. Install the filler plug and a new seal.

INSTALLATION

1. Remove the plugs from the lines and fittings, and connect the lines to the pump. Use cloths to absorb any fluid that leaks out of the lines or the pump.

2. Install the assembly on the floor pan, making sure that the rubber grommets are in proper position under the mounting brackets.

3. Connect the motor lead wires at the connector, and connect the ground wire.

4. Operate the top assembly two or three times to bleed any air from the system, and check the fluid level in the reservoir. The fluid level should not be less than ¼ inch below the filler plug opening. **The top must be up when the fluid level is checked.**

5. Install the rear seat back and seat cushion.

LIFT CYLINDER—POWER TOP

1. Remove the rear seats and quarter trim panel.

2. Remove the hairpin clip, washer, and clevis pin from the upper end of the cylinder.

3. Remove the mounting bolts, bracket, and bushings from the cylinder.

4. Pull the cylinder down; place absorbent cloths below the hose connections; disconnect the hydraulic lines, and remove the cylinder.

5. Install the hydraulic lines on the new cylinder and install the cylinder bushings, mounting bracket, and bolts.

6. Install the clevis pin, washer, and hairpin at the upper end of the cylinder.

7. Operate the top assembly two or three times to bleed any air from the system, and check the fluid level in the reservoir. The fluid level should not be less than ¼ inch below the filler plug opening. **The top must be up when the fluid level is checked.**

8. Install the quarter trim panel and rear seats.

COUNTERBALANCE CYLINDER—MUSTANG MANUAL TOP

REMOVAL

1. Raise the top. **Do not attempt to remove the counterbalance cylinder with the top in the lowered (stacked) position.**

2. Remove the rear seat cushion and seat back.

3. Remove the quarter trim panels.

4. Remove the self locking pin F, Flat washer E, wave washer, and clevis pin G (Fig. 15). Disengage the counterbalance rod B from the rear side rail H (Fig. 15).

5. Remove the two bolts L and the main pivot extension plate K from the main pivot bracket J (Fig. 15), and remove the counterbalance spring assembly. Keep the upper and lower nylon bushings A and C for reuse if serviceable.

INSTALLATION

1. Position the counterbalance spring in place and install the main pivot bracket.

2. Install the counterbalance rod retaining pin and washers.

3. Install the quarter trim panel.

4. Install the rear seat back and seat cushion.

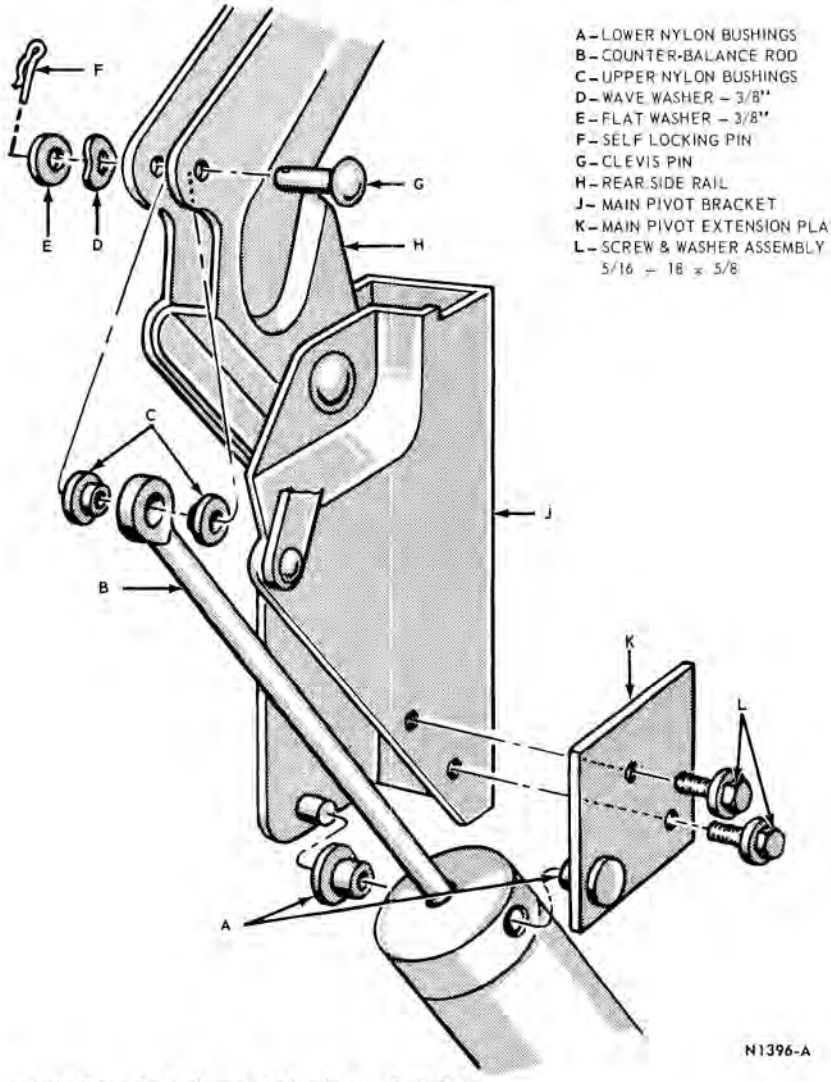


FIG. 15—Counterbalance Cylinder Installation

TOP REAR SIDE RAIL

COMET, FALCON

1. Unfasten the clamps that hold the top to the windshield header.
2. Remove the rear seat cushion, seat back, and quarter trim panel.
3. Remove the bolts and nuts retaining the rear side rail weatherstrip (Fig. 6) and remove the weatherstrip.
4. Pull the top fabric from the rear side rail.
5. Lift the top and temporarily support it in a vertical position. Remove the cotter pin and washers retaining the pivot pin at the control link, rear side rail, and No. 3 bow bracket. Lift the top to the closed position, but do not fasten the windshield header clamps.
6. With a block of wood, support the center side rail.
7. Remove the roll pin and pivot pin retaining the center side rail to the rear side rail.
8. Remove the cotter pin, washers, and pivot pin retaining the rear bow and rear side rail.
9. Remove the pivot pin retaining the top control link, rear side rail and No. 3 bow.
10. Remove the roll pin and pivot pin retaining the power link to the rear side rail.
11. Pry the rear side rail from the center side rail.
12. Remove the cotter pin, washer, and pivot pin retaining the rear side rail to the main pivot bracket support.
13. Remove the rear side rail.
14. Transfer the rear side rail bushings and deflector to the new rear side rail.
15. Connect the rear side rail to the main pivot bracket with the pivot pin, washer and cotter pin.
16. Connect the power link to the rear side rail with the pivot pin and roll pin.
17. Connect the center side rail to the rear side rail with the pivot pin and roll pin.
18. Connect the rear bow to the rear side rail with the pivot pin, washer, and cotter pin.
19. Lift the top, temporarily support it in a vertical position, and remove the center side rail temporary support. Connect the top control link and the No. 3 bow to the rear side rail with the pivot pin, washer, and cotter pin.
20. Close the top and fasten the windshield header clamps.
21. Cement the top fabric to the rear side rail and install the weatherstrip.
22. Install the quarter trim panel, rear seat back and seat cushion.

BACK CURTAIN

COMET, FALCON

1. Unfasten the clamps that hold the top to the windshield header.
2. Unsnap the well cover from the back curtain window rear and side belt tacking strips.
3. Remove the bolts and lock washers that retain the curtain tacking strip to the body panel.
4. Open the back curtain window slide fastener and remove the curtain assembly.
5. Pull the tacking strips from the curtain and remove the staples from the tacking strip (Fig. 16).
6. Remove the tacking strip lock screws from the tacking strips.
7. Properly position the curtain and staple it securely to the tacking strip.
8. Staple the side tacking strips to the curtain.
9. Position the curtain assembly to the body panel, and loosely install the belt tacking strip retaining bolts and lock washers.
10. Close the curtain window slide fastener.
11. To adjust the curtain window tension and remove wrinkles, tighten or loosen the tacking strip retaining bolts as required. After adjusting the curtain, install and tighten the tacking strip lock screws until they bottom against the body panel.
12. Snap the top well cover retainers into the tacking strip.

MUSTANG

1. Unhook the top from the windshield header and prop the top up to relieve tension.
2. Unzip the back curtain.
3. Remove 3 screws retaining each side of the top compartment trim at the quarter panel.
4. Remove 5 screws attaching the top compartment trim to the rear seat and remove the compartment trim tension springs (Fig. 17).
5. To assure the proper location of the back curtain assembly during installation, the following location marks should be made with tailor's crayon or equivalent:

Locate the center punch mark on the belt center tacking strip retainer (Fig. 21, View A-A). Transpose this center mark to the adjacent rear curtain and compartment trim materials.

Mark the rear curtain along the lower edge of the belt center tacking strip (Fig. 21, View BB and CC).

Mark the belt center tacking strip to indicate the rear window opening at both sides (Fig. 21, View BB).

6. Pull the top compartment trim back and remove 8 bolts retaining the back curtain and the center tacking strip.
7. Remove the staples from the webbing and the top quarter from the tacking strip. Remove the back window, top compartment trim, and

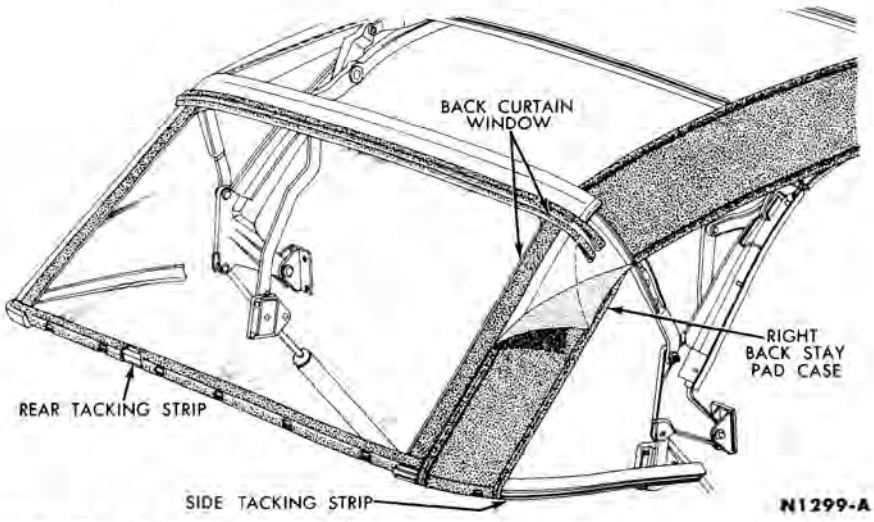


FIG. 16—Back Curtain—Comet, Falcon

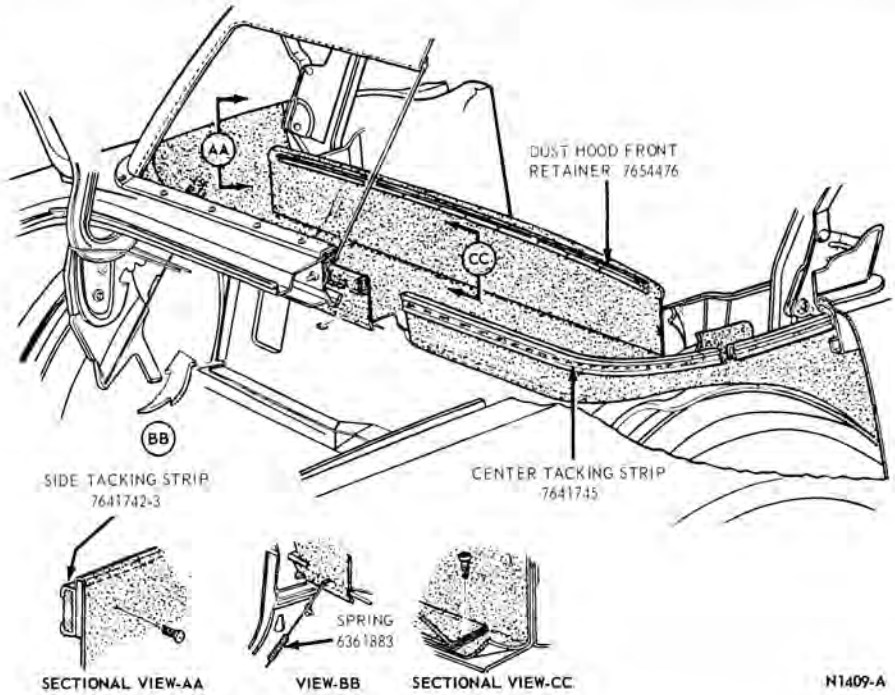


FIG. 17—Back Curtain Installation—Mustang

the tacking strip, as an assembly, from the car.

8. Remove the back curtain from the tacking strip and position the new back curtain to the tacking strip. Cut out the bolt hole locations on the back curtain.

9. Position the back curtain assembly into the car and tack the webbing and quarter assembly to the tacking strip. Then, zip the back curtain shut.

10. Remove the prop from the top and secure the top to the windshield header.

11. Install and tighten the tacking strip attaching bolts.

12. Install the top compartment trim quarter and seat back retaining screws. Clean the top in the rear roof bow area with a suitable cleaner.

BACK CURTAIN ZIPPER

COMET, FALCON

1. Unhook the top from the windshield header and prop the top up to relieve tension.

2. Unzip the back curtain.

3. Remove the rear bow binding end cap; slide out the binding insert, and remove the staples and retainer (Fig. 16).

4. Remove the staples retaining the top deck and quarter assembly to the rear bow.

5. Remove the staples retaining the top right and left back stay pad case assemblies to the rear roof bow (Fig. 16).

6. Remove the staples retaining the zipper to the rear bow tacking strip and remove the zipper.

7. Unsnap the convertible top well cover from the curtain rear and side belt tacking strips.

8. Remove the bolts and flat washers that retain the curtain tacking strip to the body panel, and remove the back curtain.

9. Mark the zipper location on the back curtain, then, remove the zipper from the back curtain and sew on a new zipper.

10. Position the upper half of the back curtain zipper to the center of the rear roof bow tacking strip. Staple or tack it securely to the tacking strip.

11. Staple the top left and right back stay pad case assemblies to the rear bow tacking strip. Seal the unused holes in the top material.

12. Staple the top deck and quarter assembly to the rear bow tacking strip.

13. Staple the binding in position, and install the binding end caps.

14. Position the back curtain in the car and install the retaining bolts.

15. Zip the curtain shut and remove the prop from the top. Then, lock the top to the windshield header.

16. Tighten or loosen the tacking strip retaining bolts as required to adjust the curtain tension and remove wrinkles.

17. Snap the top well cover retainers into the tacking strip.

MUSTANG

1. Unhook the top from the windshield header and prop the top up to relieve tension.

2. Unzip the back curtain.

3. Remove the rear roof bow retainer tips and pull the outside moulding from the rear bow.

4. Remove the staples retaining the top deck and quarter assembly to the rear roof bow tacking strip and remove the retainer.

5. Mark the location of the right and left case assembly, at the roof bow, then, remove the staples retaining the right and left case assembly to the rear roof bow.

6. Mark the location of the zipper center at the rear roof bow with tailor's crayon. Then, pull the upper half of the back curtain zipper from the rear roof bow tacking strip.

7. Remove 3 screws retaining the top compartment trim to the belt front side tacking strip on each side. Remove 5 screws retaining the compartment trim to the seat back (Fig. 17). Remove the top compartment trim tension springs.

8. Pull the top compartment trim back and remove 8 bolts retaining the center tacking strip. Mark the zipper end locations on the top material with tailor's crayon.

9. Remove the staples from the webbing and the top quarter from the tacking strip. Remove the back curtain, well liner, and tacking strip as an assembly from the car.

10. Mark the location of the zipper on the back curtain, then, remove the zipper from the back curtain and sew on a new zipper.

11. Locate the center and position the upper half of the back curtain zipper to the center of the rear roof bow tacking strip and staple or tack it securely to the tacking strip.

12. Position the right and left case assemblies to the rear roof bow tacking strip and staple or tack them securely to the tacking strip.

13. Position the top deck and quarter assembly to the rear roof bow tacking strip and staple or tack it securely to the tacking strip, working from the center outward.

14. Staple or tack the rear roof bow retainer securely to the rear roof bow, then, insert the moulding in the retainer.

15. Install the right and left rear roof bow retainer tips (Fig. 21).

16. Position the back curtain in the car and tack the webbing and quarter assembly to the tacking strip.

17. Zip the curtain shut and remove the prop from the top, then, lock the top to the windshield header.

18. Install the center tacking strip bolts and tighten them until all wrinkles are removed from the back curtain and quarters. Then, install the top compartment trim retaining screws.

CONVERTIBLE TOP FABRIC

The convertible top consists of the deck and two side quarters, bonded into one piece of material. The bonded seams eliminate the possibility of leaks and also separation, due to thread deterioration. In most cases it will be advantageous to replace the back curtain when replacing the top fabric.

COMET, FALCON

Removal

1. Place a protective cover across the deck, cowl and hood to prevent scratching the finish when replacing the top.

2. Remove the rear seat cushion and seat back.

3. Raise the top to gain access to the underside of the front bow.

4. Remove the front weatherstrip retainer (Fig. 18) and the weatherstrip. Remove the windshield header seal.

5. Remove both front side rail weatherstrips.

6. Remove the two center side rail and the two rear side rail weatherstrips.

7. Remove the metal screw and washer that secures each end of the folding top compartment well to the pivot bracket supports (Fig. 18).

8. Disengage the well trim retainer from the tacking strips.

9. Remove the tip (Fig. 18) from each end of the moulding on the rear bow. Carefully pull the moulding out of the retainer. Pry the moulding retainer off the bow.

10. To assure the proper location of the tacking strips in the new top assembly, back curtain assembly and/or compartment trim assembly, mark the following locations with tailor's crayon:

Locate and mark the center of the belt center tacking strip retainer. Transpose this center mark to the adjacent rear curtain and compartment trim materials.

Mark the rear curtain along the lower edge of the belt center tacking strip.

Mark the belt center tacking strip to indicate the rear window opening at both sides.

Mark the top deck quarters along the lower edge and at the ends of each belt side front tacking strip.

11. Remove the bolts that attach the top and back curtain tacking strips to the body.

12. Remove the staples that secure the top material to the rear bow.

13. Carefully pull the top material free from the underside of each side rail.

14. Remove the staples that secure the top material to the underside of the front bow.

15. Remove the retainer screws and carefully separate the top from the listings on the No. 2 and 3 bows. Remove the staples that secure the top back stay-pads.

16. Remove the staples that secure the upper end of the back curtain to the rear bow. Remove the curtain.

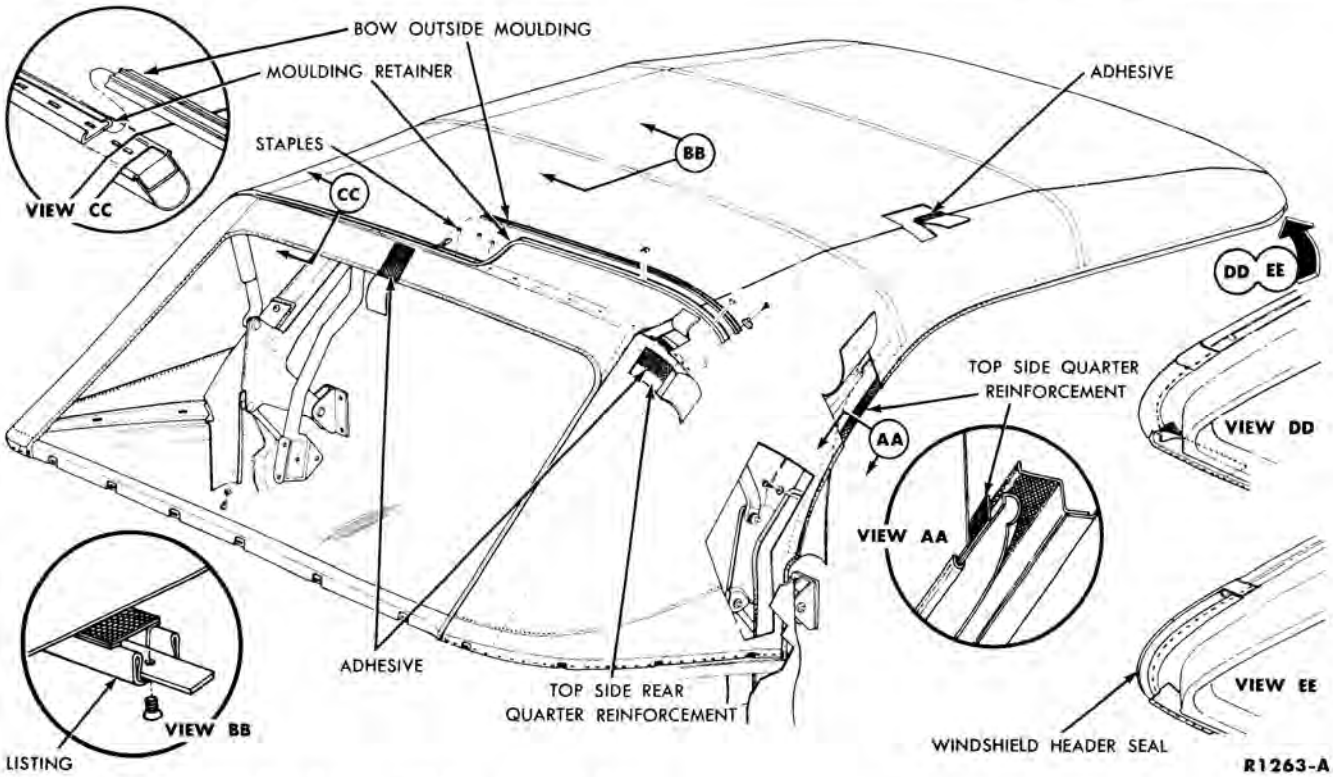


FIG. 18—Convertible Top Trim Installation—Comet, Falcon

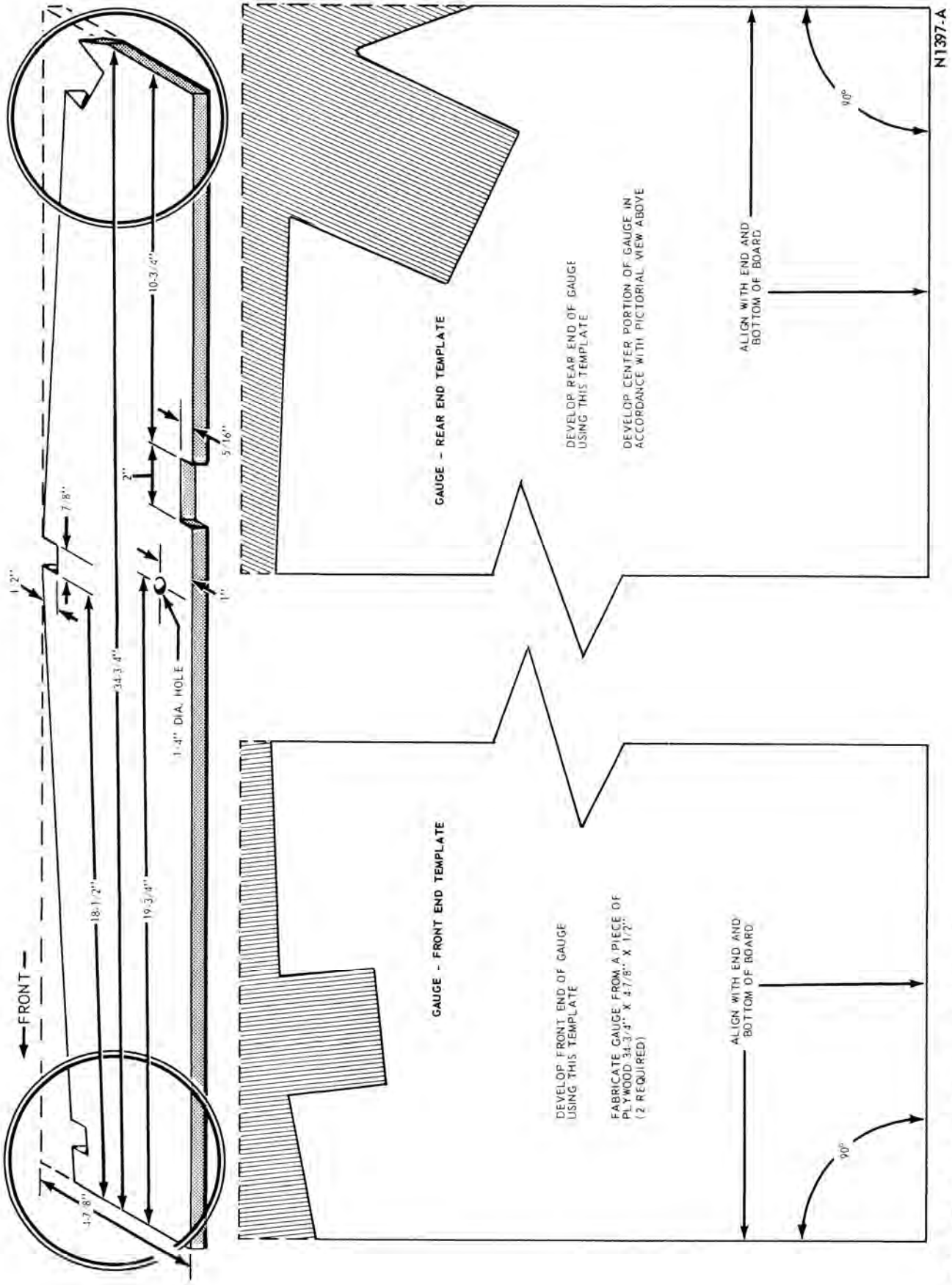


FIG. 19–Bow Locating Gauge Fabrication

Installation

1. Remove the tacking strips from the old top and back curtain.

2. Staple them to the new top and back curtain in the same location as they were on the old top.

3. Center the dot on the back curtain with the V mark (center) on the rear bow and staple the upper half of the zipper to the bow. Separate the curtain from the upper half of the zipper.

4. Retack the top back stay pads. Fit the new top on the roof bows.

5. Working from the center outward, staple the top deck to the rear bow. Make sure that the rear section of the slits is stapled to the bow before drawing and stapling the front portion of the slits (Fig. 18).

6. Secure, and tighten the quarter deck tacking strips to the body.

7. Center the top material and pull it forward over the front bow to remove the wrinkles from the top deck and quarters and to align the listings with the No. 2 and 3 bows. While the material is pulled over the front bow, make a reference mark on the material at the leading edge of the bow with a piece of chalk. The mark should extend the entire length of the bow.

8. Raise the top high enough to gain access to the underside of the front bow.

9. Align the reference mark to the leading edge of the bow and staple the material in place. Install the windshield header seal.

10. Install the weatherstrip and the retainers on the No. 1 bow.

11. Secure the flaps to the underside of the side rail with trim cement. Trim the excess material from the flaps.

12. Install the rear, center and the front weatherstrips on the side rails so that the end of the weatherstrips are in alignment with the side rail joints.

13. Install a piece of tape across the rear bow to cover the staples.

14. Install the moulding retainer, moulding and the two tips on the rear bow.

15. Secure the back curtain to the upper part of the zipper.

16. Secure the back curtain tacking strip in place with the attaching bolts. Tighten the bolts as required working from the center outward to remove all wrinkles.

17. Starting at one end of the folding top compartment, install the trim retainer onto the tacking strip flange.

18. Secure each end of the trim to the pivot bracket supports with a metal screw and washer.

19. Install the rear seat back and cushion.

20. Install listing retainers in the No. 2 and 3 bow listings and install the screws.

21. Remove the protective covers from the deck and the hood.

22. Clean all chalk and reference marks from the top material.

MUSTANG

Removal

1. Protect the painted surfaces of the upper back panel, luggage compartment door and both quarter panels with suitable covers.

2. Fabricate two bow locating gauges to the dimensions shown in Fig. 19.

3. Remove the rear seat cushion and seat back.

4. Remove the top compartment trim side and front attaching screws (Fig. 20).

5. Disengage the 2 retaining springs from the rear compartment trim support wire (Fig. 20).

6. Lower the top and remove the weatherstrip retainer from the No. 1 bow.

7. Remove the front side weatherstrip attaching nuts from both front side rails and remove the weatherstrip assembly (Fig. 21).

8. Remove the windshield header seal assembly and the top material from the No. 1 bow (Fig. 21).

9. Remove the center and rear side rail weatherstrips (Fig. 10). Loosen the top quarter material flaps which are cemented to the front and rear side rails (each side).

10. Disengage the top material hold-down cables from the rear side rail attachment and pull the cables forward until each is removed from the retaining sleeve (Fig. 22).

11. Remove each side rail coat hook.

12. Raise the top and clamp the No. 1 bow to the header.

13. Install the two fabricated bow locating gauges as shown in Fig. 23.

14. Remove the No. 2 and No. 3 bow listing retainer screws and remove both retainers from the listings (Fig. 21).

15. Raise the compartment trim up sufficiently to remove all of the tacking strip attaching screws (Fig. 21).

16. Remove the No. 4 bow outside moulding end tips, moulding and moulding retainer (Fig. 21).

17. Detach the top material from the No. 4 bow. Peel the top material back to expose the No. 4 bow and mark the existing top back stay webbing location at the No. 4 bow and the tacking strip (Fig. 22).

18. Detach the upper end of the webbing from the No. 4 bow. Unzip the rear curtain window and remove the soft trim with tacking strips attached. Place the assembly on a bench.

19. Mark the No. 4 bow at both

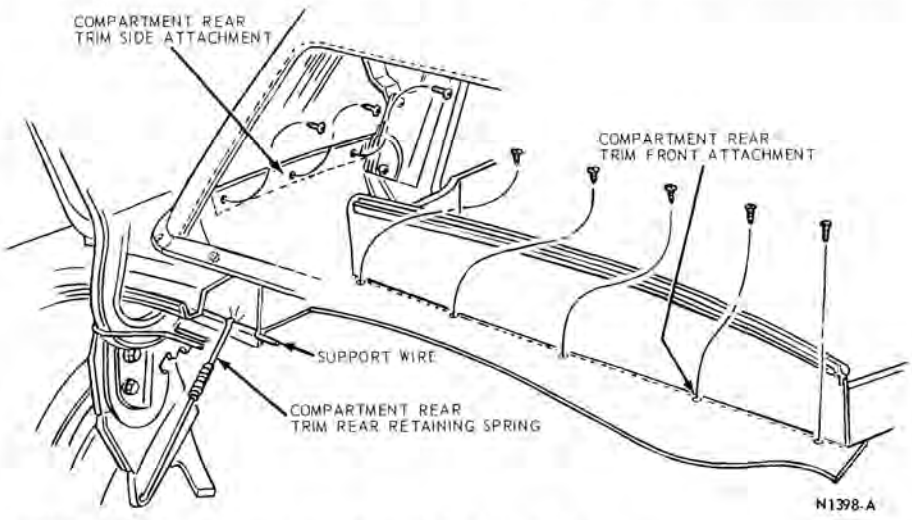


FIG. 20—Top Compartment Rear Trim Installation

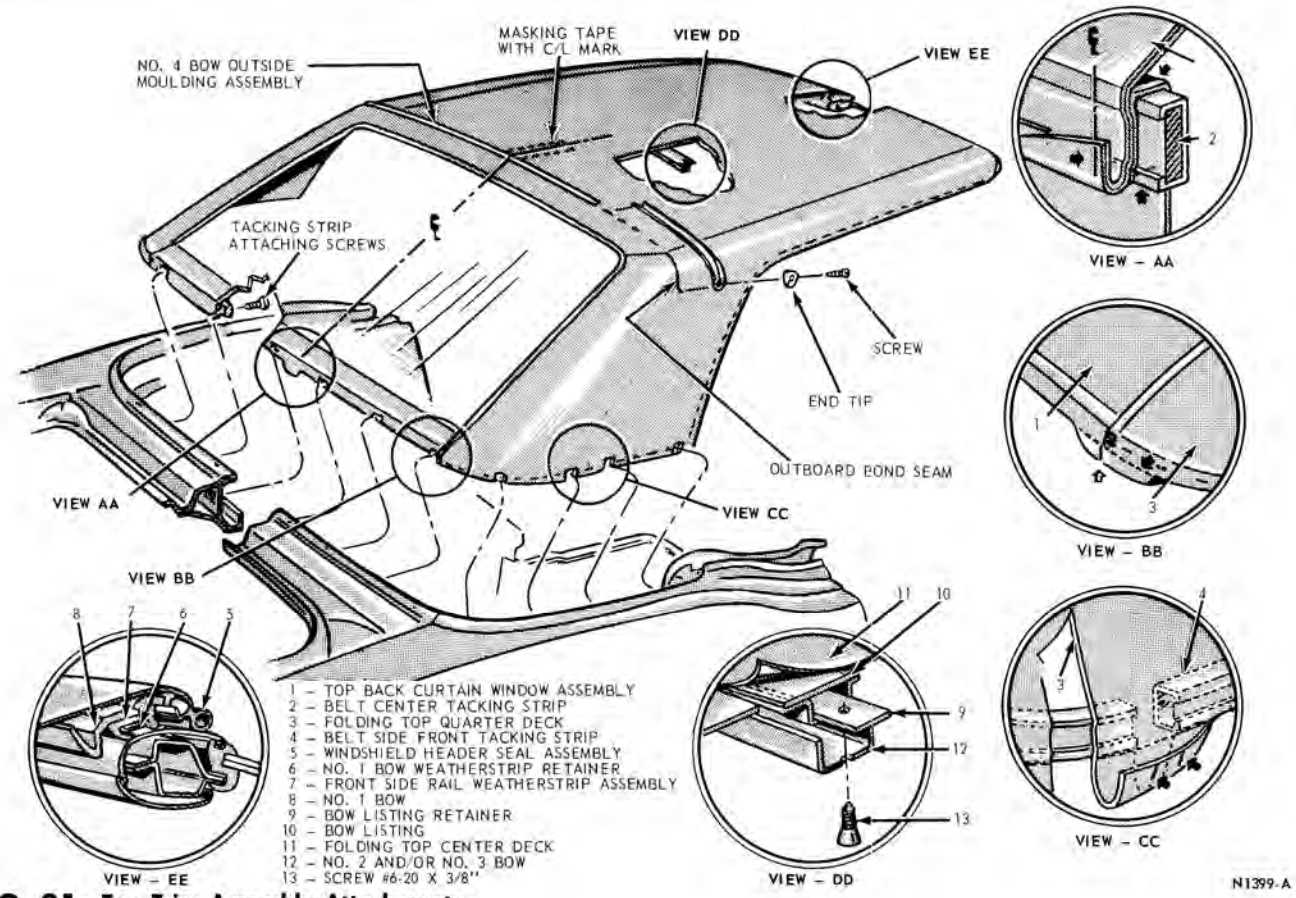


FIG. 21—Top Trim Assembly Attachments

ends of the zipper elastic material and detach the upper half of the zipper assembly from the No. 4 bow.

20. To assure the proper location of the tacking strips in the new top assembly, back curtain window assembly and/or compartment trim assembly, proceed as follows:

a. Locate the center punch mark on the belt center tacking strip retainer (Fig. 21, View A-A). Transpose this center mark to the adjacent

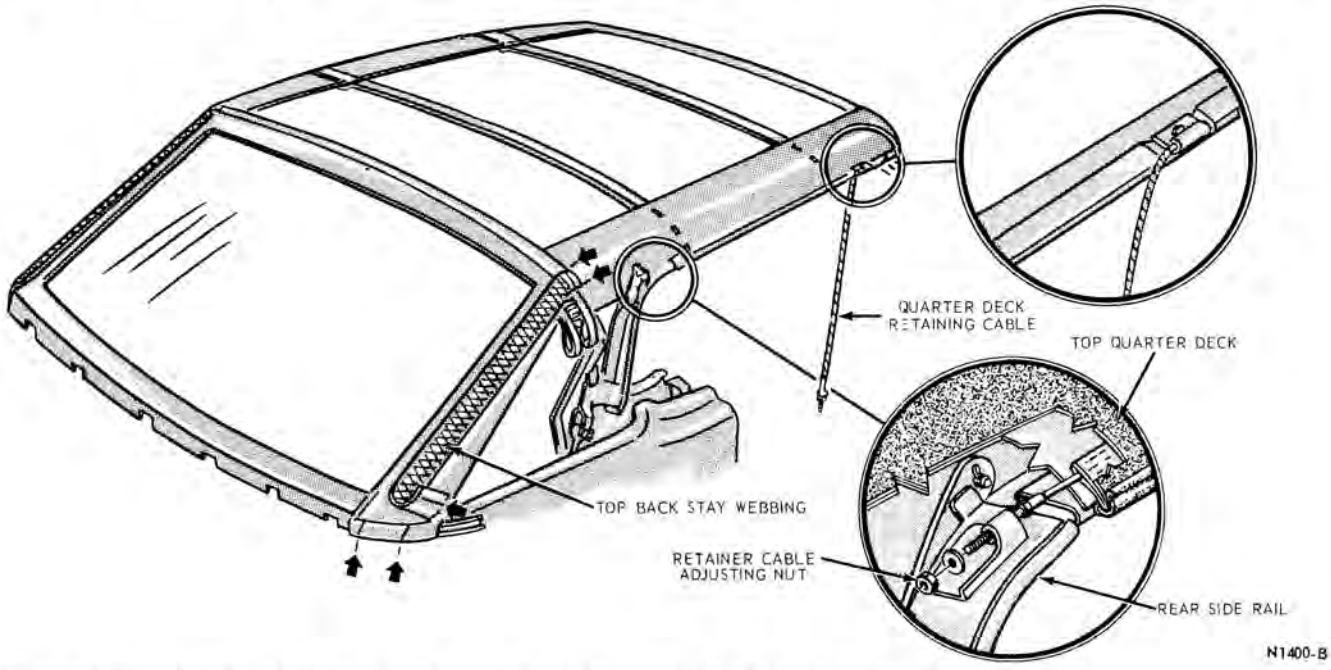


FIG. 22—Top Stay Pad Webbing and Quarter Deck Retainer Cable Attachments

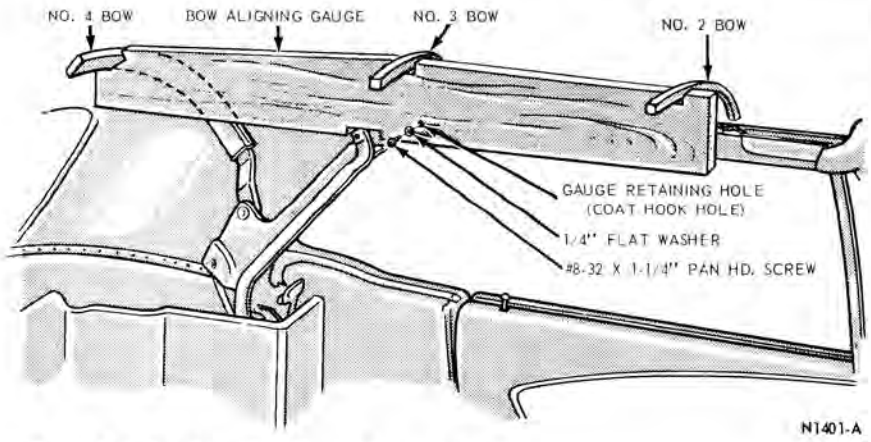


FIG. 23—Bow Locating Gauge Installation

rear curtain and compartment trim materials.

b. Mark the rear curtain along the lower edge of the belt center tacking strip (Fig. 21, View BB and CC).

c. Mark the belt center tacking strip to indicate the rear window opening at both sides (Fig. 21, View BB).

d. Mark the top deck quarters along the lower edge and at the ends of each belt side front tacking strip (Fig. 21, View CC).

21. Carefully and without tearing the material, detach the trim material being replaced from the tacking strips.

22. Trim off the selvage edge of the **old top** deck quarter and/or back curtain material that extends below the tacking strips. **The selvage edge must only be cut from the old parts which are being replaced.**

Installation

1. Lay the new rear curtain window assembly on a clean bench with the interior surface up. Measure the width and mark the center of the back window at the top, above the zipper, and at the bottom, at the tacking strip area (Fig. 21).

2. Using the old rear curtain window assembly as a template, mark the new curtain to indicate the lower edge of the tacking strip. Also mark the tacking strip attaching hole locations. Carefully remove the old rear curtain window assembly and cut out the tacking strip attaching holes in the new curtain, only.

3. Using the old top assembly as a template, mark the new top quarter deck to indicate the lower edge of the tacking strip. Also mark the tacking strip attaching hole locations. Discard the old top. Cut out the tacking strip holes in each quarter of the new top, only. **Do not trim off the selvage edge.**

4. Using the old compartment trim as a template, transpose the markings to the new compartment.

5. Align the belt center tacking strip with the compartment trim alignment marks and retain with staples. The edge of the material should be flush with the bottom of the tacking strip.

6. Align the belt center tacking strip with the rear curtain window aligning marks and retain it with staples.

7. Align the belt side front tacking strip with the aligning marks on the top deck quarter (both sides) and retain it with staples.

8. Position each top back stay webbing on the belt center tacking strip and retain it with staples (Fig. 22).

9. Align the top deck quarter to the belt center tacking strip, maintain proper rear curtain opening and retain it with staples (Fig. 21, View BB).

10. Carefully position the upper half of the zipper assembly on the No. 4 bow aligning the bow and material center marks. The edge of the material should be flush with the front edge of the No. 4 bow tacking strip. Working from the center outboard, secure the assembly with staples. Both ends of the elastic strip should correspond with the marks on the No. 4 bow. Refer to Step 19 under removal.

11. Position the rear curtain and top assembly on the stack and engage the zipper.

12. Position the top back stay webbing on the No. 4 bow aligning marks and secure it with staples (Fig. 22).

13. Install a piece of masking tape on the underside of the No. 4 bow at the centerline punch mark located in the bow. Mark the tape indicating the centerline.

14. Measure and mark the center between the bond seams of the top center deck at the No. 4 bow on the underside of the material. Install a 6-inch piece of masking tape on the top material inner surface at the centerline of the No. 4 bow. Mark the centerline along the entire length of tape. (Refer to Fig. 21.)

15. With the bow locating gauge in place (refer to Step 13 under Removal and Fig. 23), install the belt center tacking strip attaching screws to approximately ¼ to ½-inch from the bottoming out position. Install the belt side front tacking strip attaching screws and tighten to within ¼ to ½-inch of bottoming.

16. Center the top material on the No. 4 bow and pull it forward sufficiently to center the outboard bond seam on the No. 4 bow (Fig. 21). Secure the top material to the No. 4 bow with staples.

17. Install the two retainers in the No. 2 and No. 3 bow listings (Fig. 21).

18. Route the quarter deck retaining cables through the hold down sleeves in the top material and retain each cable at the rear (loosely) with the attaching nut and washer (Fig. 22).

19. Pull the top trim material forward over the No. 1 bow until the No. 2 and No. 3 bow listings (Fig. 21) are centered over their respective bows. While maintaining tension on the top trim, place a pencil mark on the outer surface of the trim material along the forward edge of the No. 1 bow.

20. Remove the two bow aligning gauges and reinstall the coat hooks (Fig. 12).

21. Fold the front edge of the top material back from the No. 1 bow. Disengage the No. 1 bow from the windshield header and prop it up about one foot above the header.

22. Apply an ample amount of trim cement C2AZ-19C525-A across the lower front surface of the No. 1 bow including the tacking strip and to the adjacent inner surface of the top material.

23. Lower the No. 1 bow onto the header but do not clamp it. With the top material properly centered on the No. 1 bow, start at the outer front corners and alternately pull the material forward to the pencil aligning mark. Make certain that all wrinkles are removed, and then fold and cement the material to the underside of the bow.

24. Position the windshield header seal assembly (Fig. 21) and secure the seal and top material with staples. Trim off excess top material.

25. Cement the front and rear flaps to each side rail. Pierce holes in the flaps for the weatherstrip attachments.

26. Install the front side rail weatherstrip and the No. 1 bow retainer.

27. Tighten the retainer cable adjustment nut at each rear side rail sufficiently to hold the top material tightly against the rail.

28. Install the intermediate and rear side rail weatherstrips. Adjust as required (Fig. 10).

29. With the No. 1 bow clamped to the header, tighten all belt tacking strip attaching screws securely.

30. Engage the compartment trim support wire to the luggage compartment door hinge bracket springs (Fig. 20).

31. Install the compartment trim to the belt side front tacking strip with the attaching screws (Fig. 20).

32. Install the compartment trim with the seat back support lower ledge attaching screws (Fig. 20).

33. Install the rear seat back and cushion.

34. Remove the interior centerline tape strips.

35. Install the No. 4 bow outside moulding retainer, insert the moulding and install the two end tips (Fig. 21).

ROOF FRONT HEADER WEATHERSTRIP

COMET, FALCON

1. Release the toggle clamps and lower the top.

2. Remove 12 screws attaching the weatherstrip retainers to the No. 1 bow and remove the retainers and weatherstrip.

3. Position the weatherstrip and retainers to the No. 1 bow and install the retaining screws.

4. Raise the top and lock it to the windshield header.

MUSTANG

1. Release the toggle clamps and partially lower the top.

2. Remove 12 screws attaching the weatherstrip retainer to the header and remove the retainer.

3. Remove 2 screws attaching the weatherstrip to the header at each corner (Fig. 24).

4. Remove 6 nuts and washers (3 each side) retaining the weatherstrip to the roof side rails and remove the weatherstrip.

5. Apply sealer to the header and roof side rails and place the new weatherstrip in position.

6. Install the weatherstrip retainer with 12 screws and the 2 weatherstrip attaching screws at each corner.

7. Install 3 nuts and washers attaching the weatherstrip to each side rail. Trim the weatherstrip for a watertight fit (Fig. 24).

8. Raise the top and lock it to the windshield header.

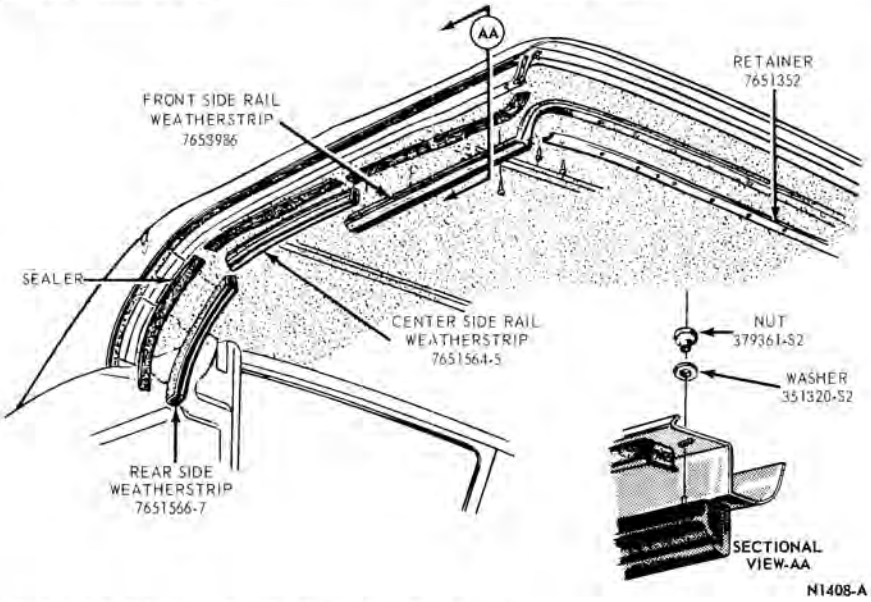


FIG. 24—Side Rail Weatherstrip—Mustang

MAINTENANCE SCHEDULE

GROUP 19

THOUSANDS OF MILES OR NUMBER OF MONTHS, WHICHEVER OCCURS FIRST (Except Where Noted)			As Required	6	12	18	24	30	36
ENGINE									
Change engine oil and filter†				X	X	X	X	X	X
Check engine oil level			At Fuel Stops						
Adjust carburetor—idle speed, idle mixture and fast (cold) idle speed (automatic choke only)			X						
Adjust power steering idle speed compensator—All 6-cylinder and Fairlane 8-cylinder			X						
Clean carburetor air cleaner and filter† (paper type only)				X	X	X	X	X	
Replace carburetor air cleaner filter		Paper†							X
		Plastic†			X		X		X
Clean crankcase oil filler tube breather cap†				X	X	X	X	X	X
Valve tappet adjustment (Conventional) 289—4-V High Performance Engine (Except Falcon)					X		X		X
Check engine accessory drive belts			X						
Replace positive crankcase ventilation system valve and clean passages (if so equipped)†					X		X		X
Check ignition timing					X		X		X
Check distributor points			X						
Check spark plugs			X						
Replace fuel filter									X
Adjust accelerator pump lever			Seasonal						
Replace engine coolant									X*
Check engine coolant level			X						
TRANSMISSION									
Adjust C-4 automatic transmission bands	All Except 289-4V Hi. Perf.	Low-Reverse	X						
		Intermediate							X
	289-4V Hi. Perf. only	Low-Reverse			X		X		X
		Intermediate		X	X	X	X	X	X
Check transmission oil level				X	X	X	X	X	X
CHASSIS									
Lubricate automatic transmission kickdown linkage			X						
Check clutch linkage adjustment			X						
Inspect and cross-switch wheels and tires			X						
Check power steering reservoir fluid level				X	X	X	X	X	X
Check master cylinder fluid level				X	X	X	X	X	X
Check axle fluid level				X	X	X	X	X	X
Lubricate front suspension ball joints									X
Check steering gear pre-load (except Fairlane is, as required)				X	As Required After 6000 Miles				
Lubricate universal joints									X
Check brake lines and lining and repack wheel bearings if required								X	
Check air conditioning system			Annually at Beginning of A/C Season						
Check front wheel alignment and linkage and adjust			X						
Lubricate power steering actuator valve and ball stud (Fairlane—also lubricate steering linkage)									X
Check tire pressure			X						
Check battery fluid level			X						
BODY									
Lubricate hood latch			X						
Lubricate hood auxiliary catch			X						
Lubricate door lock cylinders			X						
Lubricate luggage compartment lock cylinder			X						
Lubricate tailgate lock cylinders (Except Mustang)			X						
Lubricate tailgate support and hinges (Except Mustang)			X						
Lubricate fuel filler door hinges (Except Mustang)			X						
Check convertible top operation (Except Fairlane)			X						
Clean body drain holes			X						
Check convertible top fluid level (Except Fairlane)			X						
Replace windshield wiper blades			X						
Lubricate door hinge and hinge check			X						
Lubricate hood hinge pivots			X						
Lubricate luggage compartment hinge pivots			X						

†On engine items, more frequent intervals will be required if the vehicle is operated in extremely dusty areas for extended periods of idling or short runs which prevent the engine from reaching normal operating temperatures.

*Or every two years

MAINTENANCE OPERATIONS

GROUP 20

PART 20-1 MAINTENANCE OPERATIONS

Section	Page	Section	Page
1 Engine	20-1	3 Chassis	20-9
2 Transmission	20-8	4 Body	20-18

1 ENGINE

CHANGE ENGINE OIL AND FILTER

1. Raise the car.

2. Remove the oil pan drain plug and allow the engine oil to drain into a container.

3. Place a drip pan under the filter. Unscrew the filter from the adapter fitting.

4. Coat the gasket on the filter with oil. Place the filter in position on the adapter fitting. Hand tighten the filter until the gasket contacts the adapter face, then advance it ½ turn.

5. Replace the oil pan drain plug and tighten it securely.

6. Refill the crankcase with the proper amount and grade of oil.

7. Lower the car.

8. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage.

ADJUST CARBURETOR—IDLE SPEED, IDLE MIXTURE AND FAST (COLD) IDLE SPEED (AUTOMATIC CHOKE ONLY)

SIX CYLINDER (1-V) CARBURETOR

The automatic choke fast idle speed and automatic choke linkage (pull-down) adjustments must be performed only as bench adjustments.

The carburetor float level, accelerating pump, anti-stall dashpot, vent valve, automatic choke thermostatic cover, initial idle mixture and initial curb idle speed adjustments can be performed with the carburetor on the bench or in the car.

Automatic Choke Fast Idle Cam Linkage Adjustments. Insert a gauge pin or drill the same thickness as the specified clearance (Part 10-8) between the throttle plate and the side of the throttle bore. Hold the throttle plate against the gauge pin or drill (Fig. 1). Close the choke plate and turn the fast idle screw inward until it just contacts the fast idle cam.

Automatic Choke Linkage (Pulldown) Adjustment. The "Automatic Choke Fast Idle Cam Linkage Adjustment" must be set before performing the choke pulldown adjustment, because the position of the pulldown rod is one of the determining factors affecting the throttle to choke opening relationship.

1. Place a drill or gauge of the same thickness as the specified clearance (Part 10-8) between the choke plate and the upper body bore wall. Close the choke plate on the drill or gauge and hold it securely (Fig. 2).

2. Close the throttle until the fast idle screw touches the fast idle cam. Adjust the plastic nut to just contact the swivel on the choke lever assembly.

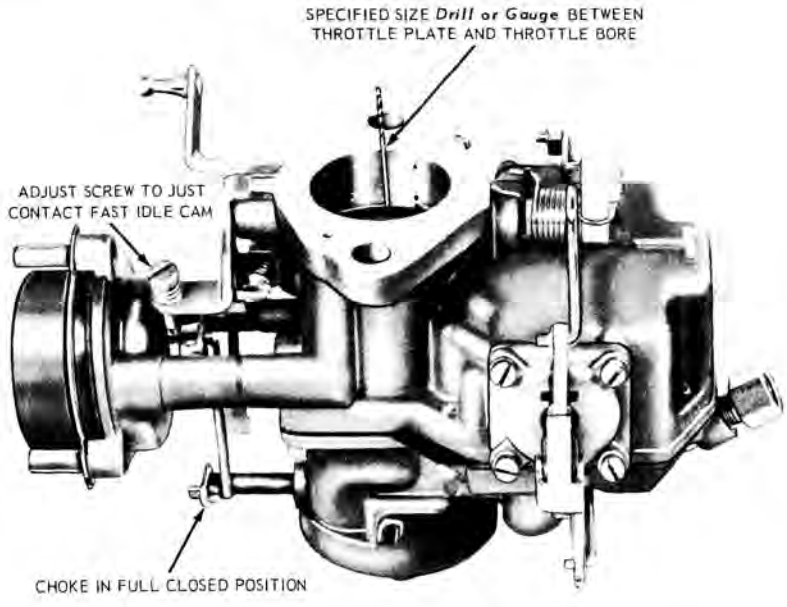


FIG. 1—Automatic Choke Fast Idle Cam Linkage Adjustment

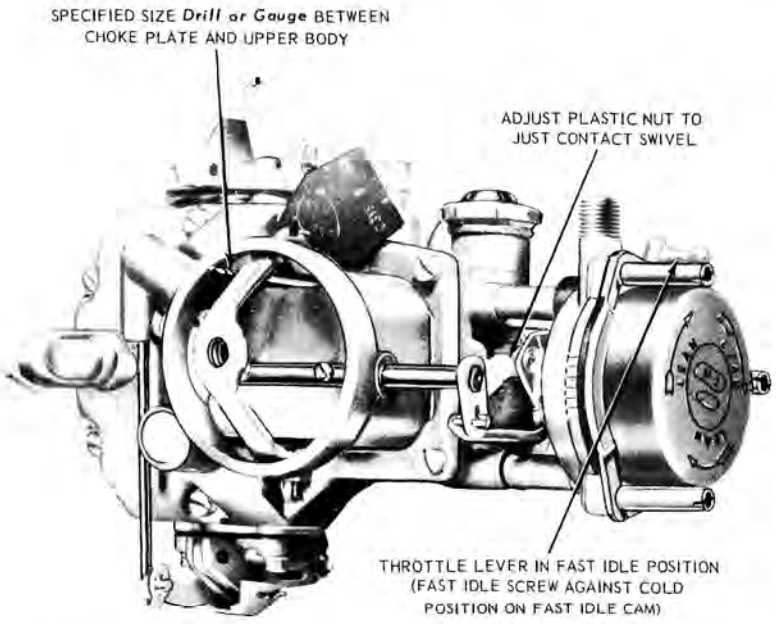


FIG. 2—Automatic Choke Linkage Adjustment

Final (Hot) Engine Idle and Fuel Mixture Adjustments. The "Final (Hot) Engine Idle and Fuel Mixture" adjustments provide the specified rpm required for the car model.

1. Place the transmission selector lever in neutral position and set the parking brake.

2. Operate the engine at fast idle until the temperature has stabilized (approximately 1200 rpm for 30 minutes).

On a car with air conditioning, operate the air conditioner for 20 minutes before setting the engine idle speed. The engine idle speed must be adjusted with the air conditioner operating.

3. Turn on the headlights. **It is necessary to place the alternator under a load condition in this manner in order to obtain the specified idle speed during the adjustment procedure.**

4. Attach a tachometer to the engine.

On a car with a manual-shift transmission, turn the idle speed "stop" screw in a direction to obtain the specified rpm. Open the throttle by hand and allow it to close normally. Recheck the engine idle speed.

On a car with an automatic transmission, **be sure the parking brake is on.** Place the transmission selector lever in neutral position. Check the engine idle speed and adjust it to the specified rpm in drive range.

Final engine idle speed may be varied to suit the conditions under which the car is to be operated.

5. Remove the tachometer if the idle fuel mixture is not going to be adjusted. If the idle fuel mixture is to be adjusted, leave the tachometer installed so that the idle speed can be checked after the mixture has been adjusted.



FIG. 3—Idle Fuel Mixture Adjustment

Idle Mixture. The idle fuel mixture is controlled by the idle mixture adjusting needle. (Fig. 3). Turn the needle inward to lean the mixture, and outward to enrich the mixture.

1. Adjust the engine idle speed.

2. Make the initial mixture adjustment by turning the screw inward until it lightly touches its shoulder; then, back it off the specified number of turns.

3. Be sure the engine is at normal operating temperature.

4. Turn the idle mixture screw (needle) inward until the engine rpm begins to drop, due to the lean mixture. Turn the needle screw outward until the engine rpm increases and begins to drop again, due to the rich mixture; then, turn the screw inward for maximum engine rpm and smoothness. **Always favor a rich mixture rather than a lean mixture.**

5. Check the engine idle speed and adjust it, if necessary.

8-CYLINDER DUAL (2-V) CARBURETOR

The engine idle speed is adjusted to settings for a hot engine, and a cold (fast idle speed) during choke operation. With the air cleaner removed, make the idle adjustments in the following sequence:

Initial Idle Mixture Setting. If necessary, initially set the idle mixture by turning the idle mixture screws (needles) inward (clockwise) until lightly seated; then, turn the screws outward (counterclockwise) 1-1½ turns (Fig. 14). **Do not turn the needles tightly against their seats as this may groove the ends.** If the needle(s) is damaged it must be replaced before a satisfactory fuel mixmixture can be obtained.

Engine Idle Speed and Mixture

1. Operate the engine for 30 minutes at 1200 rpm to stabilize engine temperatures.

On a car with an air conditioner, operate the air conditioner for 20 minutes before setting the engine idle speed.

2. Set the parking brake. Attach a tachometer to the engine.

3. On a car with a manual shift transmission, the engine idle speed is checked and adjusted with the gear shift lever in the neutral position. On a car with an automatic transmission, the engine idle speed is checked and adjusted with the transmission selector lever in the drive range position.

Place the transmission selector lever in neutral position on a car with a manual-shift transmission, or in drive range on a car with an automatic transmission. Check the engine idle speed. Adjust the engine idle speed to specification by turn-



FIG. 4—Typical Idle Adjustments—2-V and 4-V Carburetors

ing the engine idle speed adjustment screw (Fig. 4) inward (clockwise) to increase the speed or outward (counterclockwise) to decrease the speed. **When performing this adjustment, be sure the dashpot is not interfering with the throttle lever or the fast idle adjusting screw is not contacting the fast idle cam.**

4. Turn each idle mixture screw (needle) inward (Fig. 4) until the engine rpm begins to drop from the lean mixture and turn each needle outward until engine rpm increases and begins to drop from the rich mixture. Turn the needles inward for maximum engine rpm and smoothness. The needles should be turned approximately the same amount. The final setting may vary approximately ½ turn difference between needles.

5. After the correct engine idle fuel mixture has been obtained, it is necessary to check the idle speed. **If the car is equipped with an automatic transmission, place the transmission selector lever in neutral position.** Manually open and close the throttle. **If the car is equipped with an automatic transmission, place the transmission selector lever in drive range.** Check the engine idle speed and adjust, if necessary.

Final engine idle speed may be varied to suit the conditions under which the carburetor is to be operated.



FIG. 5—Engine Fast (Cold Engine) Idle

Engine Fast (Cold) Idle Speed. The adjusting screw on the right side of the carburetor (Fig. 5) contacts one edge of the fast idle cam. The cam permits a faster engine idle speed for smoother running when the engine is cold during choke operation. As the choke plate is moved through its range of travel from the closed to the open position, the fast idle cam pick-up lever rotates the fast idle cam. Each position on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

1. Manually rotate the fast idle cam until the fast idle adjusting screw rests adjacent to the shoulder of the highest step align screw with the arrow mark on the cam (Fig. 5).

2. Start the engine, and turn the fast idle adjusting screw inward or outward as required to obtain the specified fast idle rpm.

3. Remove the tachometer if the idle fuel mixture does not require adjustment. If the idle fuel mixture requires adjustment, leave the tachometer installed so that the idle speed can be checked after the idle fuel mixture has been adjusted.

8-CYLINDER 4-BARREL (4-V) CARBURETOR

The engine idle speed is adjusted to settings for a hot engine, and a cold engine (fast idle speed) during choke operation. With the air cleaner removed make the idle adjustments in the following sequence:

Initial Idle Mixture Setting. Initially set the idle mixture by turning the idle mixture screws (needles) inward (clockwise) until lightly seated; then, turn the screws outward (counterclockwise) 1-1½ turns (Fig. 4). **Do not turn the needles tightly against their seats as this may groove the ends. If the needle is damaged, it must be replaced before a satisfactory fuel mixture can be obtained.**

Engine Idle Speed and Mixture (Hot)

1. Operate the engine for three minutes at approximately 1200 rpm to stabilize engine temperatures. **On a car with an air conditioner, operate the air conditioner for 20 minutes before setting the engine idle speed. The engine idle speed is adjusted with the air conditioner operating.**

2. Allow the throttle to drop back to the normal idle speed position. Attach a tachometer to the engine. **Set the parking brake.**

3. Place the transmission selector lever in drive range. Check the engine idle speed. **Be sure the dashpot is not interfering with the throttle lever or the fast idle screw is not contacting the fast idle cam.**

4. Adjust the engine idle speed to drive range specifications by turning the engine idle speed screw inward to increase the speed or outward to decrease the speed (Fig. 4).

5. Turn each idle mixture needle inward until engine rpm begins to drop, due to the lean mixture (Fig. 4); then turn each needle outward until the rpm increases and then begins to drop, due to the rich mixture, then turn the needles inward for maximum engine rpm and smoothness. **The needles should be turned approximately the same amount. The final setting may vary about ½ turn difference between needles.**

6. After the correct engine idle mixture has been obtained, check the idle speed by placing **the transmission selector lever in neutral and manually opening and closing the throttle.** Position the selector lever in drive range, then check and adjust the idle speed, if necessary. Shut off the engine.

The final engine idle speed may be varied to suit the conditions under which the car is to be operated.

Engine Fast (Cold) Idle Speed. The adjusting screw on the right side of the carburetor (Fig. 5) contacts one edge of the fast idle cam. The cam permits a faster engine idle speed for smoother running when the engine is cold during choke operation. As the choke plate is moved through its range of travel from the closed to the open position, the fast idle cam pick-up lever rotates the fast idle cam. Each position on the fast idle cam permits a slower idle rpm as engine temperature rises and choking is reduced.

1. Manually rotate the fast idle cam until the fast idle adjusting screw rests (Fig. 5), adjacent to the shoulder of the highest step (align screw with arrow mark on the cam).

2. Start the engine, and turn the fast idle adjusting screw inward or outward as required to obtain the specified fast idle rpm.

3. Remove the tachometer if the idle fuel mixture does not require adjustment. If the idle fuel mixture requires adjustment, leave the tachometer installed so that the idle speed can be checked after the idle fuel mixture has been adjusted.

ADJUST POWER STEERING IDLE SPEED COMPENSATOR (FALCON AND MUSTANG)

1. Set the carburetor throttle lever against the idle speed stop with the choke open and the engine off.

2. Prior to tightening the clip against the cable assembly, adjust the lever on the bellcrank assembly so that it just contacts the carburetor throttle lever. This adjustment is accomplished by repositioning the cable assembly. The fast idle ballcrank lever adjustment must not prevent the carburetor throttle lever from returning to the idle stop.

3. The wire and cable assembly should be routed underneath the hoses along the left side of the rocker arm cover, and should be routed on the outboard side of the power steering return hose maintaining a minimum clearance of ¾ inch with the return hose.

CLEAN CARBURETOR AIR CLEANER AND FILTER (EXCEPT CALIFORNIA-BUILT CARS)

REMOVAL

1. Remove the wing nut(s) retaining the air cleaner assembly to the carburetor and the air duct (if equipped with air duct).

2. Remove the air cleaner assembly from the carburetor. **To prevent dirt from entering the carburetor, the filter element must never be removed when the air cleaner body is mounted on the carburetor.**

3. Remove the cover and filter element. Discard the air cleaner mounting gasket on the carburetor if it is excessively worn or damaged.

FILTER ELEMENT

The filter element must never be cleaned with a solvent or cleaning solution. Also, oil must not be added to the surfaces of the filter element or air cleaner body.

There are two alternate procedures that can be used to clean the air filter element. One method is performed with the use of compressed air. The other is performed by tapping the element on a smooth horizontal surface.

Compressed Air Method. Direct a stream of compressed air through the element in the direction opposite that of the intake air flow, that is from the inside outward. **Extreme care must be exercised to prevent rupture of the element material.**

Tapping Method. Hold the element in a vertical position and tap it lightly against a smooth, horizontal surface to shake the dust and dirt out. **Do not deform the element or damage the gasket surfaces by tapping too hard.** Rotate the filter after each tap until the entire outer surface has been cleaned.

Inspection. Hold the filter in front of a back-up light and carefully inspect it for any splits or cracks. If the filter is split or cracked, replace it.

BODY AND COVER

Clean the air cleaner body and cover with a solvent or compressed air. Wipe the air cleaner dry if a solvent is used. Inspect the air cleaner body and cover for distortion or damage at the gasket mating surfaces. Replace the cover or body if they are damaged beyond repair.

INSTALLATION

1. Install a new air cleaner mounting gasket on the carburetor, if necessary. Install the air cleaner body on the carburetor so that the word "FRONT" faces the front of the car.

2. Place the element in the air cleaner body. **Make sure the element gasket is properly seated.** Install the cover and connect the air duct to the air cleaner (if equipped with air duct). Tighten the retaining wing nut(s).

REPLACE CARBURETOR AIR CLEANER FILTER

REMOVAL

1. Remove the wing nuts retaining the air cleaner assembly to the carburetor and the air duct (if equipped with air duct).

2. Remove the air cleaner assembly from the carburetor. **To prevent dirt from entering the carburetor, the filter element must never be removed when the air cleaner body is mounted on the carburetor.**

3. Remove the cover and filter element. Discard the filter element. Discard the air cleaner mounting gasket on the carburetor if it is excessively worn or damaged.

INSTALLATION

1. Install a new air cleaner mounting gasket on the carburetor, if necessary. Install the air cleaner body on the carburetor so that the word "FRONT" faces the front of the car.

2. Place the new element in the air cleaner body. **Make sure the element gasket is properly seated.** Install the cover and connect the air duct to the air cleaner (if equipped with air duct). Tighten the retaining wing nuts.

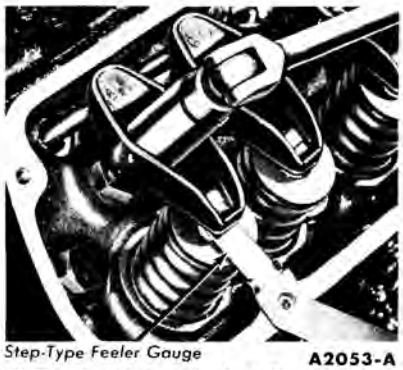


FIG. 6—Valve Lash Adjustment

CLEAN CRANKCASE OIL FILLER BREATHER CAP (EXCEPT CALIFORNIA-BUILT CARS)

Wash the crankcase filler cap in solvent. **Do not oil the filter mesh.**

VALVE TAPPET ADJUSTMENT (CONVENTIONAL) HIGH PERFORMANCE ENGINE ONLY

1. Be sure the engine is at normal operating temperature before attempting to set the valve lash.

2. Remove the air cleaner.

3. Remove the valve rocker arm covers and gaskets.

4. With the engine idling, set the valve lash (Fig. 6) using a step-type feeler gauge only ("go" and "no go"). The final (hot) intake and exhaust valve lash settings are listed in the Specifications Section.

For example, to obtain the correct setting if the valve lash is 0.019 inch, use a step-type feeler gauge of 0.018 inch ("go") and 0.020 inch ("no go"). The "go" step should enter, and the "no go" step should not enter. The resultant setting will be to the required setting (0.019 inch).

5. Install the valve rocker arm cover gaskets and covers.

6. Install the air cleaner.

CHECK ENGINE ACCESSORY DRIVE BELTS

BELT TENSION

Properly tensioned drive belts minimize noise and also prolong service life of the belt. Therefore, it is recommended that a belt tension gauge be used to check and adjust the belt tension. **Any belt that has operated for a minimum of 10 minutes is considered a used belt, and when adjusted, it must be adjusted to the reset tension shown in the specifications.**



FIG. 7—Checking Drive Belt Tension

1. Install the belt tension tool on the drive belt (Fig. 7) and check the tension following the instructions of the tool manufacturer.

Due to the inaccessibility of the generator belt on a Comet equipped with air conditioning and power steering, a belt tension gauge cannot be used. Therefore, it must be tensioned by the deflection method. Deflection should not exceed ¼ inch when thumb pressure is applied.

2. If adjustment is necessary, loosen the alternator mounting and adjusting arm bolts. Move the alternator toward or away from the engine until the correct tension is obtained. Tighten the alternator adjusting arm and the mounting bolts. Check the belt tension.

DRIVE BELT REPLACEMENT

1. On a car with power steering, loosen the power steering pump bracket at the water pump and remove the drive belt.

On a car with an air conditioner, remove the compressor drive belt.

2. Loosen the alternator mounting and adjusting arm bolt. Move the alternator toward the engine. Remove the belt(s) from the alternator and crankshaft pulleys, and lift them over the fan.

3. Place the belt(s) over the fan. Insert the belt(s) in the water pump pulley, crankshaft pulley and alternator or generator pulley grooves. Adjust the belt tension to specifications.

4. On a car with an air conditioner, install and adjust the compressor drive belt to specifications.

5. On a car with power steering, install the power steering pump drive

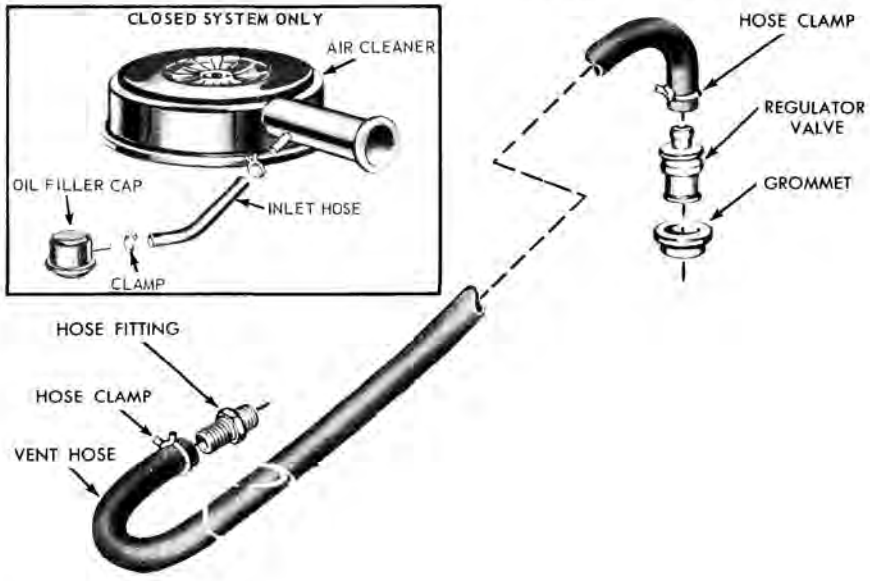


FIG. 8—Crankcase Vent System (Six)

belt and tighten the pump bracket to the water pump. Adjust the drive belt tension to specifications.

CLEAN POSITIVE CRANKCASE VENTILATION SYSTEM (EXCEPT CALIFORNIA-BUILT CARS)

REMOVAL

170 and 200 Six

1. On a closed ventilation system, remove the inlet hose from the air cleaner and filler cap.

2. Remove the air cleaner.

3. Grasp the crankcase vent hose near the rocker arm cover grommet (Fig. 8) and pull to remove the regulator valve from the rocker arm cover.

4. Using hose clamp pliers, slide both hose clamps toward the center of the vent hose. Remove the regulator valve from the vent hose and remove the vent hose from the hose fitting in the intake manifold.

5. Remove the vent hose fitting from the intake manifold.

260 and 289 V-8

1. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve rocker arm cover (Fig. 9). **Do not remove the choke heat chamber air inlet hose at the air cleaner.** On a closed ventilation system, remove the ventilation system air intake hose from the air cleaner and the oil filler cap.

2. Remove the air cleaner and intake duct assembly.

3. Using hose clamp pliers, slide both crankcase vent hose clamps toward the center of the vent hose. Slide the vent hose clamps away from the hot idle compensator (if so equipped).

4. Pull the regulator valve and fitting (elbow) out of the valve rocker arm cover mounting grommet.

CLEANING

Do not attempt to clean the crankcase ventilation regulator valve. It should be replaced at the specified mileage intervals.

The oil filler tube breather cap, located on the valve rocker arm cover, should be cleaned at the specified mileage interval. On a closed crankcase ventilation system, the oil filler tube cap is not an an air filter and does not require cleaning. Remove the cap and wash it in a low-volatility, petroleum-base solvent. Probe the breather hole(s) to assure removal of any accumulated deposits. Shake the cap dry and install it. **Do not dry with compressed air as air pressure may damage the filter element.**

Clean the crankcase ventilation system connection on the carburetor spacer by probing the inlet nipple with a flexible wire or bottle brush.

Clean the rubber hoses with low-volatility, petroleum-base solvent and dry with compressed air.

On a car with a vent tube-type crankcase ventilation system, the road draft tube seldom requires cleaning except during a high-mileage engine overhaul. However, if there is evidence of crankcase pressure, the tube should be checked for excessive sludge and cleaned out if necessary.

INSTALLATION

170 and 200 Six

1. Install the vent hose fitting in the intake manifold.

2. Position the hose clamps on the vent hose. Install the hose on the fitting in the intake manifold and the regulator valve in the hose. Using hose clamp pliers, slide the clamps into position.

3. Insert the regulator valve into the rocker arm cover mounting grommet.

4. Install the air cleaner.

5. On a closed ventilation system, connect the inlet hose to the air cleaner and the filler cap.

6. Operate the engine and check for leaks.

260 and 289 V-8

1. Insert the regulator valve and fitting (elbow) into the valve rocker arm cover mounting grommet.

2. Position the hose clamps on the vent hose. Connect the vent hose to the carburetor spacer regulator valve and hot idle compensator (if so equipped). Using hose clamp pliers, slide the clamps into position.

3. Install the air cleaner and intake duct assembly.

4. Connect the automatic choke heat chamber air inlet hose. On a closed venilation system, install the ventilation system intake hose to the air cleaner and the oil filler cap.

5. Operate the engine and check for leaks.

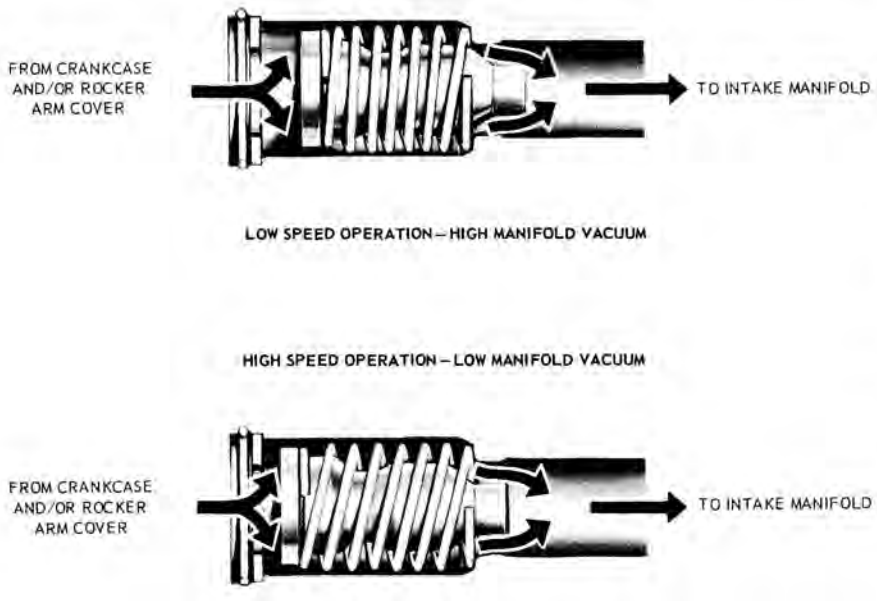


FIG. 9—Crankcase Vent System (V-8)

CHECK IGNITION TIMING

1. Disconnect the vacuum line. If necessary, clean and mark the desired timing mark.

2. Attach a timing light to the number one spark plug.

3. Connect a tachometer to the engine.

When connecting a tachometer to a car equipped with a transistorized ignition, connect the leads to the tachometer block (positive lead to

red terminal, negative to black).

4. Start the engine and adjust the speed to the specified RPM for initial timing adjustment. Allow the engine to warm up.

5. Observe the timing with the light.

6. If the timing is not correct, loosen the hold down bolt and rotate the distributor clockwise to advance the timing or counterclockwise to retard it.

7. Tighten the hold down bolt and check the timing.

CHECK DISTRIBUTOR POINTS

Unsnap the distributor cap retaining clips, lift the distributor cap off the distributor housing, and position the cap out of the way (if necessary, remove the air cleaner and/or the high tension wire to gain access to the distributor).

Lift the rotor off the cam. Remove the dust cover (transistorized ignition).

INSPECTION

Replace the distributor point assembly if the contacts are badly burned or excessive metal transfer between the points is evident. Metal transfer is considered excessive when it equals or exceeds the gap setting.

REMOVAL

1. Remove the primary distributor-transistor lead and condenser wire (if equipped) from the breaker plate.

2. Remove the screw attaching the ground wire to the distributor point assembly.

3. Remove the screw nearest the distributor points, then remove the distributor point asembly.

INSTALLATION

1. When installing new distributor points, reverse the procedure for removal and make sure that the ground wire is attached to the distributor point assembly attaching screw which is furthest from the distributor points.

2. If the used points are serviceable, set the gap using a dwell meter as follows:

Connect the dwell meter following the manufacturer's instructions. **In a car equipped with transistor ignition, make sure that the dwell meter is connected to the tachometer block rather than the coil.**

Operate the engine at idle speed and note the reading on the dwell meter.



FIG. 10—Cleaning Plug Electrode

Stop the engine and adjust the gap (decreasing the gap increases the dwell). Now check the dwell again.

Repeat this procedure until specified dwell is obtained.

If new points are installed, set the gap to specifications using a feeler gauge.

3. Install the dust cover (transistorized ignition).

4. Install the rotor. Install the distributor cap on the distributor housing and snap the retaining clips in place.

5. Install the air cleaner and/or the high tension lead if either was removed.

CHECK SPARK PLUGS

REMOVAL

1. Remove the wire from each spark plug by grasping the moulded cap of the wire only. **Do not pull on the wire because the wire connection inside the cap may become separated or the weather seal may be damaged.**

2. Clean the area around each spark plug port with compressed air, then remove the spark plugs.

3. Clean the plugs on a sand blast cleaner, following the manufacturer's instructions. **Do not prolong the use of the abrasive blast as it will erode the insulator.** Remove carbon and other deposits from the threads with a stiff wire brush. Any deposits will retard the heat flow from the plug to the cylinder head causing spark plug overheating and pre-ignition.

4. Clean the electrode surfaces with with a small file (Fig. 10). Dress the electrodes to secure flat parallel surfaces on both the center and side electrode.

5. After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrodes, and other signs of failure. Replace as required.

ADJUSTMENT

Set the spark plug gap to specifications by bending the ground electrode (Fig. 11).



FIG. 11—Gapping Spark Plug

INSTALLATION

1. Install the spark plugs and torque each plug to specifications.

When a new spark plug is installed in a new replacement cylinder head, torque the plug to 20-30 ft-lbs.

2. Connect the spark plug wires. Push all weather seals into position.

REPLACE FUEL FILTER

1. Raise the car.

2. Remove the filter housing gasket and filter element. Discard the filter element.

3. Place a new filter element in the filter recess. Lightly lubricate and position the gasket, then screw the filter housing on. Hand tighten the filter housing until the gasket contacts the filter recess body, then advance it ⅛ turn.

4. Lower the car.

5. Start the engine and check for leaks.

ADJUST ACCELERATING PUMP LEVER

SIX-CYLINDER ENGINES

The pump stroke is controlled by changing the location of the roll pin

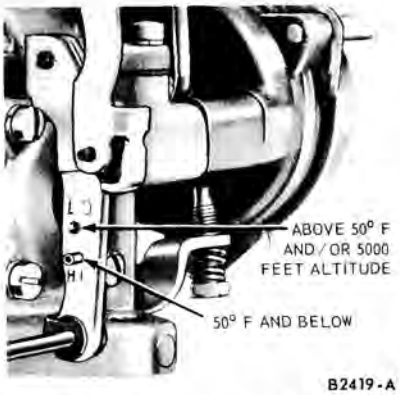


FIG. 12—Accelerating Pump Lever Adjustments

in the lever stop hole (Fig. 12).

For operation in ambient temperature 50°F. and below, place the roll pin in the hole of the pump operating lever marked "H" (lower-hole). For best performance and economy at normal ambient temperatures and high altitude (above 50°F. and/or above 5,000 feet altitude), place the roll pin in the "LO" (upper hole) of the lever.

V-8 ENGINES

Insert the link in the inboard hole of the pump lever for all settings. Insert the link into the overtravel lever to suit climatic conditions.

#4 hole for 40°F and below.

#3 hole for 40°F to 80°F.

#2 hole for 80°F and above.

REPLACE ENGINE COOLANT

Refer to Group 21 for locations of Coolant drain plugs.

To drain the radiator, open the drain cock located at the bottom of the radiator. The cylinder block of a V-8 engine has a drain plug located on both sides of the block (Fig. 13). The six cylinder engines have one drain plug located at the left rear of the cylinder block.

To fill the cooling system, close the drain cocks or install the plugs in the block and close the radiator drain cock. Fill the system to just below the filler neck of the radiator supply tank. Disconnect the heater outlet hose at the water pump to bleed or release trapped air in the system. When the coolant begins to escape, connect the heater outlet hose. Operate the engine until normal operating temperature has been reached. **After the initial fill, the coolant level will drop approximately one quart after the engine has been operated about 20 minutes at 2000 rpm. This is due to the displacement of entrapped air.** Add more coolant to fill the radiator supply tank.

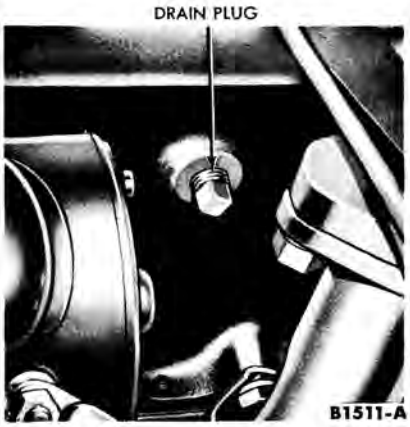


FIG. 13—Typical Cylinder Block Drain Plug

CHECK ENGINE COOLANT LEVEL

The coolant level should be kept below the filler neck.

2 TRANSMISSION

ADJUST CRUISE-O-MATIC DUAL RANGE TRANSMISSION BANDS

INTERMEDIATE BAND

1. Clean all the dirt from the band adjusting screw area. Loosen the lock nut several turns.

2. With the tool shown in Fig. 14 tighten the adjusting screw until the tool handle clicks. The tool is a preset torque wrench which clicks and overruns when the torque on the adjusting screw reaches 10 ft. lbs.

3. Back off the adjusting screw exactly 1½ turns.

4. Hold the adjusting screw from turning and torque the locknut to specification.



FIG. 14—Intermediate Band Adjustment

LOW-REVERSE BAND

1. Clean all the dirt from the adjusting screw area. Loosen the lock nut several turns.

2. With the tools shown in Fig. 15, tighten the adjusting screw until the tool handle clicks. The tool is a present torque wrench which clicks and overruns when the torque on the adjusting screw reaches 10 ft-lbs.

3. Back off the adjusting screw exactly 3 full turns.

4. Hold the adjusting screw from turning and torque the lock nut to specification.

CHECK AUTOMATIC TRANSMISSION FLUID LEVEL

1. Make sure that the car is standing level. Then firmly apply the parking brake.

2. Run the engine at normal idle speed. If the transmission fluid is cold, run the engine at fast idle speed (about 1200 rpm) until the fluid reaches its normal operating temperature. When the fluid is warm, slow the engine down to normal idle speed.



FIG. 15—Low-Reverse Band Adjustment

3. Shift the selector lever through all positions, and place the lever at P. Do not turn off the engine during the fluid level checks.

4. Clean all dirt from the transmission fluid dipstick cap before removing the dipstick from the filler tube.

5. Pull the dipstick out of the tube, wipe it clean, and push it all the way back into the tube. Be sure it is properly seated.

6. Pull the dipstick out of the tube again, and check the fluid level. If necessary, add enough fluid to the transmission through the filler tube to raise the fluid level to the F (full) mark on the dipstick. **Do not overfill the transmission.**

CHECK TRANSMISSION OIL LEVEL

1. Remove the filler plug from the side of the case.

2. If lubricant does not flow from the filler hole, fill the case with the specified lubricant until it is level with the lower edge of the filler hole.

3. Install the filler plug.

3 CHASSIS

LUBRICATE AUTOMATIC TRANSMISSION KICKDOWN LINKAGE

Lubricate all pivot points in the kickdown linkage with the specified engine oil.

CHECK CLUTCH LINKAGE ADJUSTMENT

1. Measure the total travel of the pedal (Fig. 16). If the travel is not within specification, move the clutch pedal bumper and the bracket up or down until the travel is within specified limits. **Always check and adjust total travel before checking free travel.**

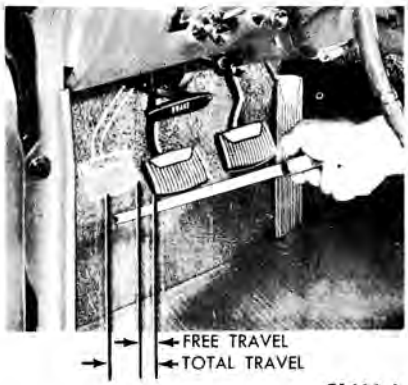


FIG. 16—Typical Clutch Pedal Free-Travel

2. With the clutch pedal against its bumper (pedal release), measure the overall length of the spring. The overall length should be as specified in Part 5-4.

3. With the engine idling, depress the pedal just enough to take up the free travel and note the reading on the tape (Fig. 16). The difference between this reading and the reading where the pedal is released is the clutch pedal free travel. If the free travel is not within specification, adjust the clutch pedal to equalizer rod (Fig. 17). To increase the free travel loosen the rearward adjusting nut and tighten the forward nut. To reduce the free travel, loosen the forward nut and tighten the rearward nut. **Both nuts must be tightened against the trunnion after making the adjustment.**

4. As a final check, measure the pedal free travel with the transmission in neutral and the engine running at about 3000 rpm. If the free travel at this speed is not ½ inch, readjust the clutch pedal to equalizer rod to obtain the specified free travel. Otherwise, the release fingers may contact the release bearing continuously, resulting in premature bearing and clutch failure. Free travel must be exactly to specification.

INTERLOCK (OVERDRIVE MODELS ONLY)

Be sure that the clutch linkage is correctly adjusted before adjusting the interlock mechanism (Fig. 18).

1. Place the gearshift lever in neutral position.

2. Loosen the adjustment lock nut on the interlock rod.

3. Disconnect the rod from the interlock lever.

4. Loosen the interlock pawl attaching screws. Move the interlock lever forward as far as possible to seat the interlock pawl on the first

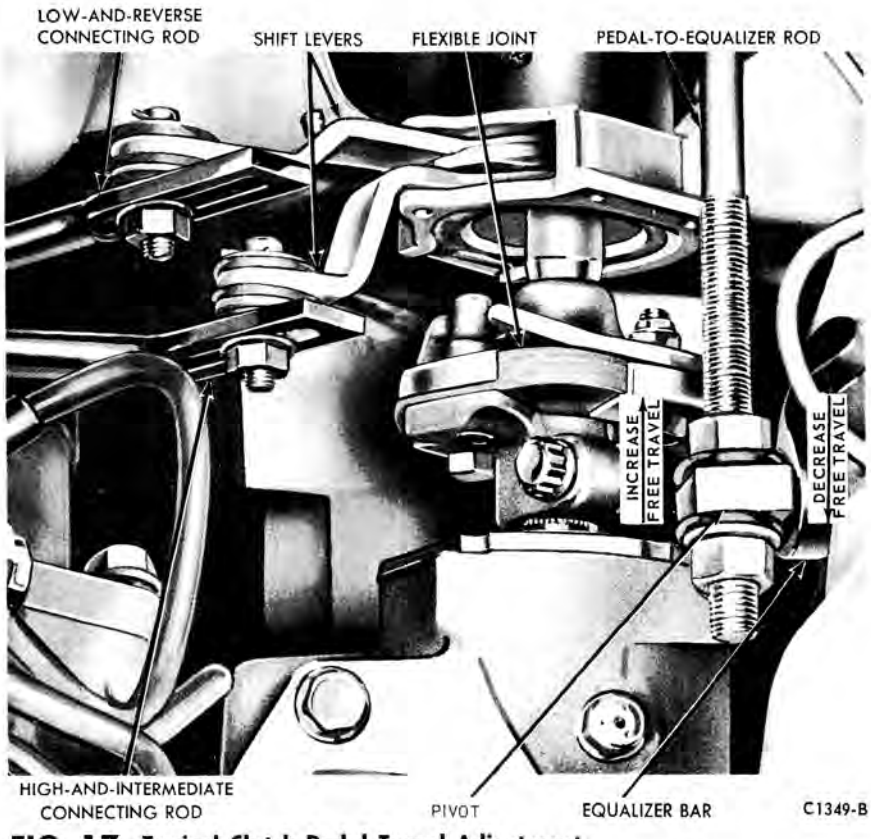


FIG. 17—Typical Clutch Pedal Travel Adjustment

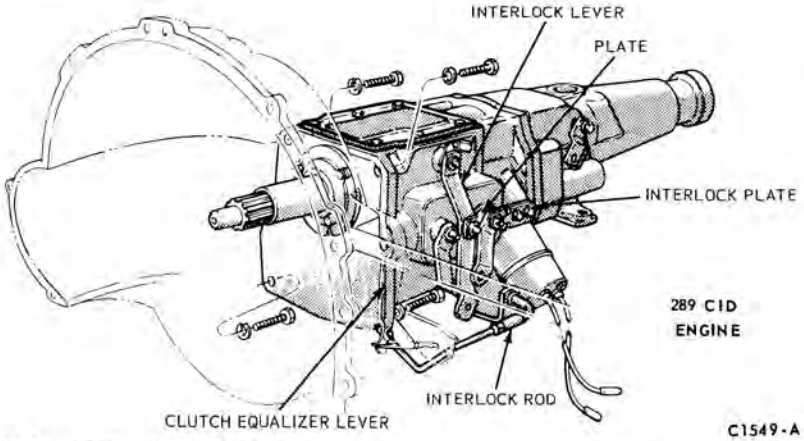


FIG. 18—Interlock Mechanism

and reverse-speed shift lever. Tighten the two-pawl attaching screws.

5. Adjust the length of the interlock rod so that it can be connected to the interlock lever while being held in the forward position. Connect the rod to the lever.

6. Shift the transmission into low and into neutral to check operation of the interlock. Readjust the interlock pawl for snug fit if necessary.

7. Use COAZ-19584-A lubricant as required for the interlock linkage.

INSPECT AND CROSS-SWITCH WHEELS AND TIRES

Switch the tires according to Fig. 19.

Tighten the wheel nuts to specified torque.

CHECK POWER STEERING RESERVOIR FLUID LEVEL

Start the engine, turn the steering wheel all the way to the left and right several times, and shut off the engine.

Check the fluid level in the reservoir. If the level is low, add enough fluid to raise the level to the bottom of the filler neck. **Do not overfill the reservoir.**

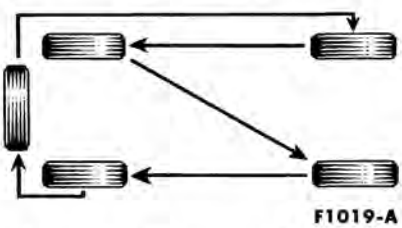


FIG. 19—Tire Cross-Switching Diagram

CHECK BRAKE MASTER CYLINDER FLUID LEVEL

1. Remove the filler cap from the master cylinder. The diaphragm which seals the master cylinder should come off with the cap.

2. Fill the reservoir to ⅜-inch from the top.

3. Install the filler cap, making sure that the diaphragm is properly seated in the cap.

CHECK REAR AXLE FLUID LEVEL

The lubricant level should be maintained at the bottom of the filler plug hole with the specified lubricant.

LUBRICATE FRONT SUSPENSION BALL JOINTS

Wipe any accumulated dirt from around the lubrication plugs.

Remove the plugs and install lubrication fittings. Lubricate the ball joints and remove the lubrication fittings. Install the plugs.

LUBRICATE STEERING LINKAGE (FAIRLANE ONLY)

Wipe any accumulated dirt from around the lubrication plugs.

Remove plugs and install fittings.

Apply the recommended lubricant to each steering linkage fitting with a pressure gun. Remove the fittings and replace the plugs.

CHECK STEERING GEAR PRELOAD

1. Disconnect the Pitman arm from the steering arm-to-idler arm rod. On a car with power steering, disconnect the arm from the control valve ball stud.

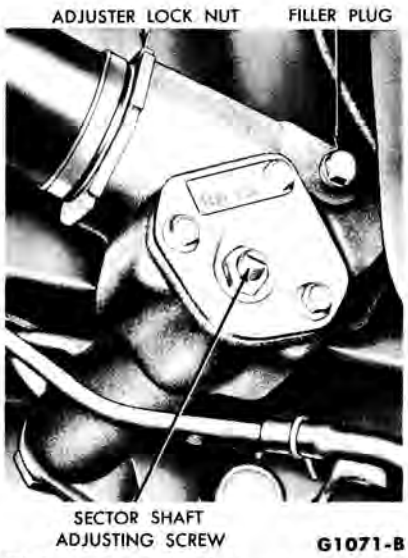


FIG. 20—Typical Steering Gear Adjustments

2. Loosen the nut which locks the sector adjusting screw (Fig. 20), and turn the adjusting screw counterclockwise.

3. Measure the worm bearing preload by attaching an inch-pound torque wrench to the steering wheel nut (Fig. 21). With the steering wheel off center, read the pull required to rotate the input shaft approximately 1½ turns either side of center. If the torque or preload is not within specification, adjust as explained in the next step.

4. Loosen the steering shaft bearing adjuster lock nut, and tighten or back off the bearing adjuster (Fig. 20) to bring the preload within the specified limits.

5. Tighten the steering shaft bearing adjuster lock nut, and recheck the preload.

6. Turn the steering wheel slowly



FIG. 21—Checking Pre-Load

to either stop. **Turn gently against the stop to avoid possible damage to the ball return guides.** Then rotate the wheel 2¾ turns to center the ball nut.

7. Turn the sector adjusting screw clockwise until the specified pull is necessary to rotate the worm past its center (high spot). **No perceptible backlash is permissible at 30° on either side of center.**

8. While holding the sector adjusting screw, tighten the locknut to specifications and recheck the backlash adjustment.

9. Connect the Pitman arm to the steering arm-to-idler arm rod. On a car with power steering, connect the arm to the control valve ball stud.

CLEAN AND PACK FRONT WHEEL BEARINGS

DRUM BRAKES

1. Raise the car until the wheel and tire clear the floor.

2. Insert a narrow screwdriver through the brake adjusting hole at the inner side of the brake carrier plate, and disengage the adjusting lever from the adjusting screw. While holding the adjusting lever away from the screw, back off the adjusting screw with the brake adjusting tool. **Be very careful not to burr, chip, or damage the notches in the adjusting screw; otherwise the self adjusting mechanism will not function properly.**

3. Remove the wheel cover or hub cap. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly.

4. Pull the wheel, hub, and drum assembly off the wheel spindle.

5. Remove the grease retainer and the inner bearing cone and roller assembly from the hub.

6. Clean the lubricant off the inner and outer bearing cups with solvent.

7. Soak a new grease retainer in light engine oil at least 30 minutes before installation. Thoroughly clean the inner and outer bearing cones and rollers with solvent, and dry them thoroughly. Do not spin the bearings dry with compressed air.

Inspect the bearing cups, cones and rollers for wear or damage, and replace them if necessary. The cone and roller assemblies and the bearing cups should be replaced as a unit if damage to either is encountered.

8. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old lubricant.

Cover the spindle with a clean cloth, and brush all loose dust and dirt from the brake assembly. **To prevent getting dirt on the spindle, carefully remove the cloth from the spindle.**

9. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups.

10. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

11. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer. **Be sure that the retainer is properly seated.**

12. Install the wheel, hub, and drum assembly on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads.**

13. Install the outer bearing cone and roller assembly and the flat washer on the spindle, then install the adjusting nut.

14. While rotating the wheel, hub, and drum assembly, torque the adjusting nut to 15-20 ft-lbs to seat the bearings (Fig. 22).

15. Locate the nut lock on the adjusting nut so that the castellations on the lock are aligned with the cotter pin hole in the spindle.

16. Back off both the adjusting nut and the nut lock together until the next castellation on the nut lock aligns with the cotter pin hole in the spindle.

17. Install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.

18. Adjust the brake shoes. Install the wheel cover.

DISC BRAKES

1. Raise the car until the wheel and tire clear the floor.

2. Remove the wheel cover or hub cap.

3. Remove the wheel and tire from the hub.

4. Remove 2 bolts attaching the caliper to the caliper bracket. Remove the caliper from the rotor and wire it to the underbody to prevent damage to the brake hose.

5. Remove the grease cap from the hub. Remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly (Fig. 23).

6. Pull the hub and rotor off the wheel spindle.

7. Remove the grease retainer and the inner bearing cone and roller assembly from the hub with tool 1175-AE.

8. Clean the lubricant off the inner and outer bearing cups with solvent and inspect the cups for scratches, pits, excessive wear, and other damage. If the cups are worn or damaged, remove them with a drift.

9. Soak a new grease retainer in light engine oil at least 30 minutes before installation. Thoroughly clean the inner and outer bearing cones and rollers with solvent, and dry them thoroughly. **Do not spin the bearings with compressed air.**

Inspect the cone and roller assemblies for wear or damage, and

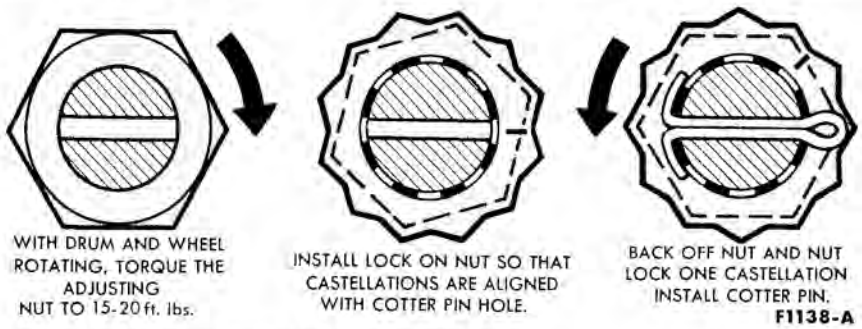


FIG. 22—Front Wheel Bearing Adjustment

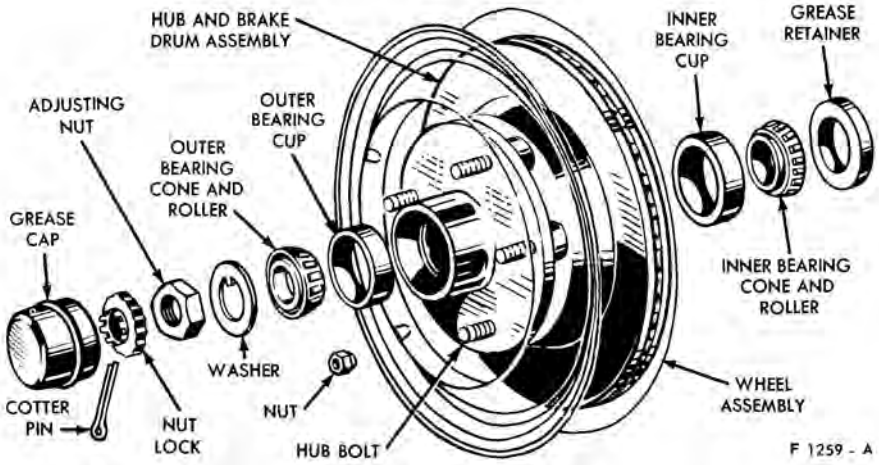


FIG. 23—Hub and Bearing—Disc Brakes

replace them if necessary. **The cone and roller assemblies and the bearing cups should be replaced as a unit if damage to either is encountered.**

10. Thoroughly clean the spindle and the inside of the hub with solvent to remove all old lubricant.

Cover the spindle with a clean cloth, and brush all loose dust and dirt from the brake assembly. **To prevent getting dirt on the spindle, carefully remove the cloth from the spindle.**

11. If the inner and/or outer bearing cup(s) were removed, install the replacement cup(s). **Be sure to seat the cups properly in the hub.**

12. Pack the inside of the hub with specified wheel bearing grease. Add lubricant to the hub only until the grease is flush with the inside diameter of both bearing cups.

13. All old grease should be completely cleaned from the bearings before repacking them with new grease. Pack the bearing cone and roller assemblies with wheel bearing grease. A bearing packer is desirable for this operation. If a packer is not available, work as much lubricant as possible between the rollers and cages. Lubricate the cone surfaces with grease.

14. Place the inner bearing cone and roller assembly in the inner cup, and install the new grease retainer. **Be sure that the retainer is properly seated.**

15. Install the hub and rotor on the wheel spindle. **Keep the hub centered on the spindle to prevent damage to the grease retainer or the spindle threads.**

16. Install the outer bearing cone and roller assembly and the flat washer on the spindle, then install the adjusting nut.

17. Position the caliper over the rotor and install the 2 attaching bolts.

18. Install the wheel and tire on the hub.

19. Adjust the wheel bearings, and install a new cotter pin. Bend the ends of the cotter pin around the castellations of the nut lock to prevent interference with the radio static collector in the grease cap. Install the grease cap.

20. Install the hub cap or wheel cover and lower the car.

LUBRICATE UNIVERSAL JOINTS

Wipe any accumulated dirt from around the lubrication plugs.

Remove the plugs and install lubrication fittings.

Apply the specified lubricant. Remove the fittings and install the plugs.

CHECK BRAKE LINES AND LINING

DRUM BRAKES

Raise all four wheels. Remove one of the front brake drums, and inspect the drum and the linings (the wheel bearings should be inspected at this time and repacked if necessary). **Do not let oil or grease touch the drum or the linings.** If the linings are worn to within 1/32 inch of the rivet heads, replace or reline both sets (primary and secondary) on the front or rear wheels. **Under no circumstances replace one lining only, or one wheel set. Both front wheel sets or both rear wheel sets should be replaced whenever a respective lining or shoe is worn or damaged.** If the drum braking surface is excessively scored, refinish it. The condition of the remaining front linings is usually about the same as that of the one inspected. The rear brake linings may also need replacing at the same time.

FRONT WHEEL DISC BRAKES

Raise all four wheels. Remove one of the front wheel and tire assemblies, and inspect the rotor, caliper, and linings (the wheel bearings should be inspected at this time and repacked if necessary). **Do not let oil or grease touch the drum or the linings.** If the linings are worn to within 0.030 inch of the surface of the shoe, replace both sets of shoe and lining assemblies (inboard and outboard) on the front wheels. **Under no circumstances replace one shoe and lining assembly only, or one wheel set. Both front wheel sets should be replaced whenever a respective shoe and lining is worn or damaged.**

If the rotor braking surface is excessively scored, distorted, warped, worn, or shows runout over 0.0013 inch, it should be replaced. If the caliper is cracked or otherwise damaged, it must be replaced as a unit.

With the parking brakes in the fully released position, check the brake cables. The cable adjustment should be just tight enough to remove the slack. **Excessive tightening may pull the brake shoes off their anchors.**

Check all brake lines for leakage or physical damage and replace or repair as required.

CHECK AIR CONDITIONING SYSTEM

A quick test of the refrigerant supply can be made by observing the flow of refrigerant through the sight glass (Fig. 24).

To check the refrigerant supply, place a large fan in front of the radiator to aid in cooling the engine. Set the servo control for maximum cooling and the blower on high. Operate the engine at 1300 rpm. and observe the sight glass while the compressor is operating. There should be no bubbles in the sight glass after the start of the compressor. Bubbles will appear when the compressor starts but should clear after a few moments.

CHECK FRONT WHEEL ALIGNMENT AND LINKAGE

If abnormal tire wear or ride and handling characteristics such as

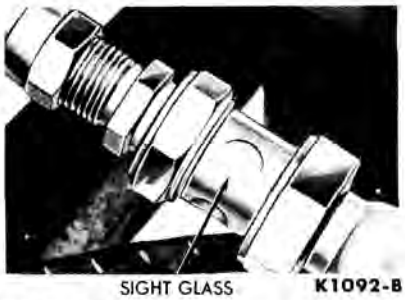

SIGHT GLASS K1092-B

FIG. 24—Sight Glass

vehicle lead or wander are experienced with properly inflated tires, the front end alignment should be checked.

FRONT WHEEL ALIGNMENT CHECKS

Do not check and adjust front wheel alignment without first making the following inspection for front end maladjustment, damage, or wear.

1. Check for specified air pressures in all four tires.

2. Raise the front of the car off the floor. Shake each front wheel grasping the upper and lower surfaces of the tire. Check the front suspension ball joints and mountings for looseness, wear, and damage. Check the brake backing plate mountings. Torque all loose nuts and bolts to specifications.

3. Check the steering gear mountings and all steering linkage connections for looseness. Torque all mountings to specifications. If any of the linkage is worn or bent, replace the parts.

4. Check the front wheel bearings. If any in-and-out free play is noticed, adjust the bearings to specification. Replace worn or damaged bearings.

5. Spin each front wheel with a wheel spinner, and check and balance each wheel as required.

6. Check the action of the shock absorbers. If the shock absorbers are not in good condition, the car may not settle in a normal, level position, and front wheel alignment may be affected.

Wheel Inspection. Wheel hub nuts should be inspected and tightened to specification at pre-delivery. Loose wheel hub nuts may cause shimmy and vibration. Elongated stud holes in the wheels may also result from loose hub nuts.

Keep the wheels and hubs clean. Stones wedged between the wheel and drum and lumps of mud or grease can unbalance a wheel and tire.

Check for damage that would affect the runout of the wheels. Wobble or shimmy caused by a damaged wheel will eventually damage the wheel bearings. Inspect the wheel rims for dents that could permit air to leak from the tires.

Check all the factors of front wheel alignment except the turning angle before making any adjustments. The turning angle should be checked only after caster, camber, and toe-in have been adjusted to specifications.

Equipment Installation. Equipment used for front wheel alignment inspection must be accurate. If portable equipment is being used, perform all inspection operations on a level floor.

Alignment height spacers (Figs. 26 and 27) are used to check caster, camber and toe-in. If the car is operated under abnormal load conditions, the spacers should be omitted when checking toe-in.

1. Drive the car in a straight line far enough to establish the straight-ahead position of the front wheels, and then mark the steering wheel hub and the steering column collar (Fig. 25). **Do not adjust the steering wheel spoke position at this time.** If the front wheels are turned at any time during the inspection, align the marks to bring the wheels back to the straight-ahead position.

2. With the car in position for the front end alignment inspection and adjustment, install the alignment spacers as follows to establish the curb height.

Insert the pin in the spacer hole marked for the model being checked (Mustang rear does not use the pin).

Raise the front of the car and position the alignment spacers between the suspension upper arm and the spring tower as shown in Fig. 26. The lower end of the spacer should be placed over the head of the ball joint front outside attaching rivet. Position the alignment spacers for the rear of the car between the rear axle and the side rail as shown in Fig. 27.


ALIGNMENT MARKS F 1267 - A

FIG. 25—Typical Straight Ahead Position Marks

3. Install the wheel alignment equipment on the car. Whichever type of equipment is used, follow the installation and inspection instructions provided by the equipment manufacturer.

Caster. Check the caster angle at each front wheel.

The caster is the forward or rearward tilt of the top of the wheel spindle. If the spindle tilts to the rear, caster is positive. The spindle tilts to the front, caster is negative. See Part 3-6 for the correct caster specifications. The maximum difference between both front wheel caster angles should not exceed ½°.

Camber. Check the camber angle at each front wheel.

Camber is the amount the front wheels are tilted at the top. If a wheel tilts outward, camber is positive. If a wheel tilts inward, camber is negative. Correct camber specifications are given in Part 3-6. The maximum difference between both front wheel camber angles should not exceed ½°. However, a difference of not more than ¼° is preferred.

Toe-In. Before attemping to check toe-in, remove all the alignment spacers. Toe-in should only be checked and adjusted after the caster and camber has been adjusted to specifications. Check the toe-in with the front wheels in th straight-ahead position. **Run the engine so that the power steering control valve will be in the center (neutral) position.** Measure the distance between the extreme front and also between the extreme rear of both front wheels. The differencs between these two distances is the toe-in.

Front Wheel Turning Angle. When the inside wheel is turned 20°, the turning angle of the outside wheel should be as specified in Part 3-6. The turning angle cannot be adjusted directly because it is a result of the combination of caster, camber, and toe-in adjustments and should therefore, be measured only after these adjustments have been made. If the turning angle does not measure to specifications, check the spindle or other suspension parts for a bent condition.

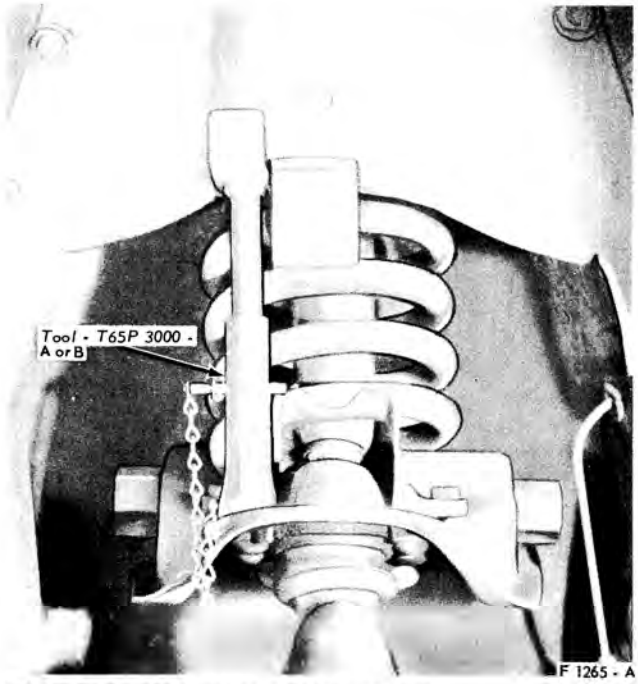


FIG. 26—Alignment Spacers—Front

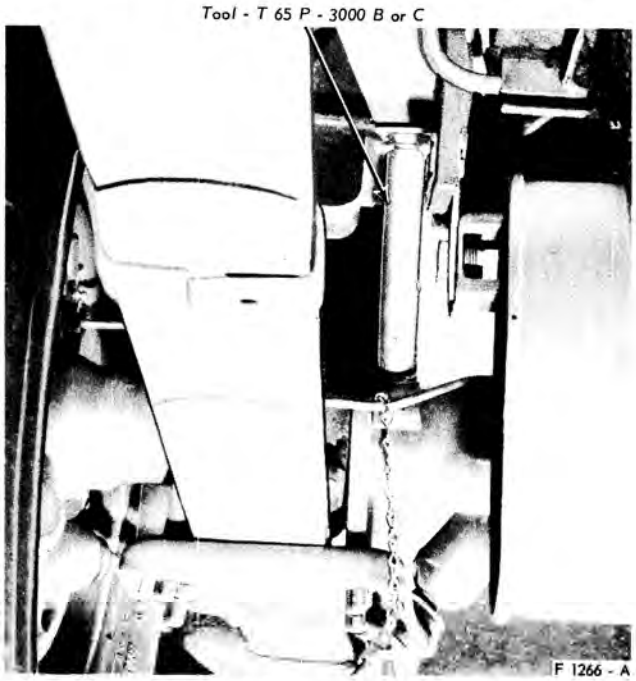


FIG. 27—Alignment Spacers—Rear

After front wheel alignment factors have been checked, make the necessary adjustments. **Do not attempt to adjust front wheel alignment by bending the suspension or steering parts.**

CASTER AND CAMBER ADJUSTMENTS (Mustang, Comet and Falcon)

Be sure all required equipment is installed before adjusting caster and camber.

Caster and camber can be adjusted by removing or installing shims between the inner shaft of the front suspension upper arm and the underbody (Fig. 28).

Both caster and camber adjustments can be made at the same time by loosening the nuts on the two bolts that fasten the inner shaft to the underbody. After the required shims have been removed or installed, torque the nuts to specification. Caster and camber adjusting shims are available in 1/32-inch and ⅛-inch thicknesses.

The 1/32-inch shims should be placed against the fender housing sheet metal or between the ⅛-inch shims.

CASTER

To adjust caster, remove or install shims at either the front bolt or the rear bolt (Fig. 28).

The removal of shims at the front bolt or the installation of shims at the rear bolt will cause the upper ball joint to move forward. The removal of shims at the rear bolt or the installation of shims at the front bolt will cause the ball joint to move rearward. A 1/32-inch change of shim thickness at either bolt will change the caster angle approximately ½°. The difference between the shim stack thickness at the two bolts should not exceed 1/16-inch (Fig. 28).

CAMBER

To adjust camber, remove or install equal shim thicknesses at both bolts.

The removal of equal shims at both bolts will move the upper ball joint inward. The installation of equal shims at both bolts will move the ball joint outward. A 1/16-inch change of shim thickness at both bolts will change the camber angle 1/3°. The total shim stack thickness at each bolt should not exceed 9/16-inch.



FIG. 28—Typical Upper Arm Assembly—Mustang and Falcon

CASTER AND CAMBER ADJUSTMENTS (FAIRLANE ONLY)

The alignment spacers must be re-

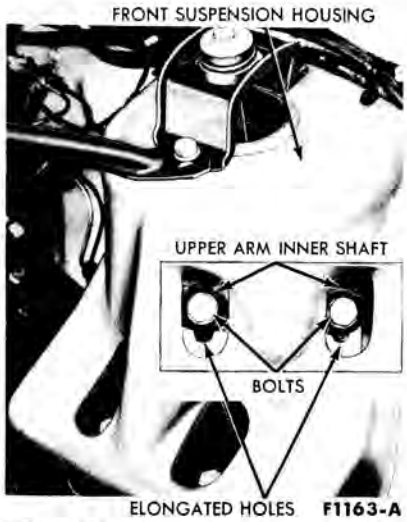


FIG. 29—Upper Arm Inner Shaft Bolts—Fairlane

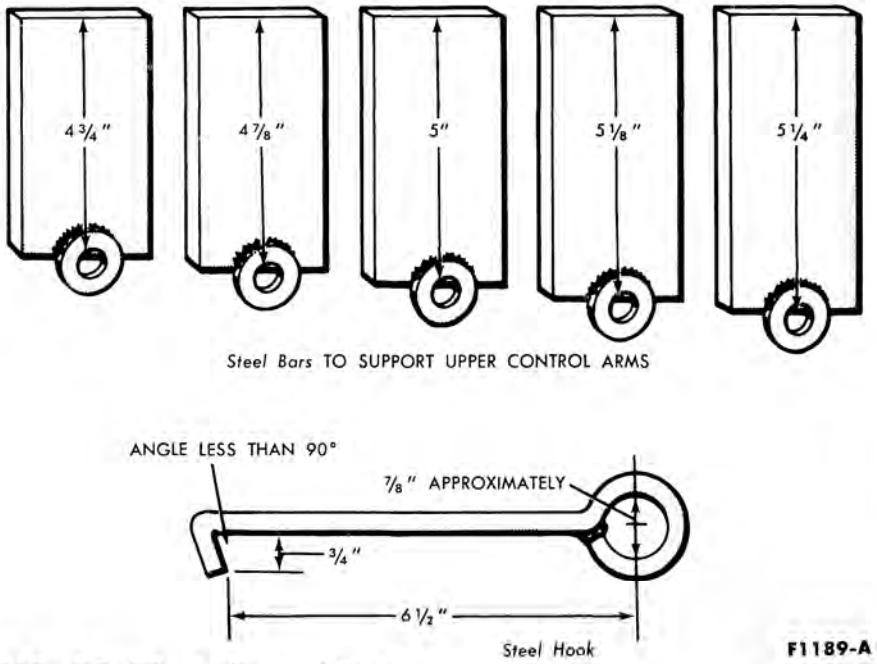


FIG. 30—Wheel Alignment Tools

moved to adjust the caster and camber. After the adjustment is made, the fabricated blocks must be removed and the alignment spacers reinstalled to check the adjustment.

Caster and camber can be adjusted by loosening the bolts that attach the upper suspension arm inner shaft to the underbody, and moving the arm assembly in or out in the elongated bolt holes (Fig. 29).

In order to adjust front wheel alignment more accurately, fabricate the following additional details for use with tool 62F-3000-A.

1. Cut five bars of steel from ¼ or 5/16-in stock, 1¼ or 1½ inches wide, of the following lengths—4¾, 4⅞, 5, 5⅛ and 5¼ inches. To the end of each bar, weld or braze a flat washer (Fig. 30).

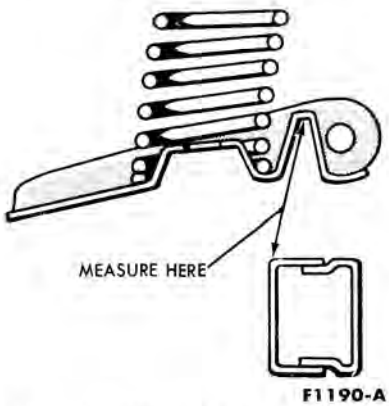


FIG. 31—Measure Dimensions for Bar Selection

2. Fabricate a hook from an eleven inch length of ⅜-inch diameter rod (Fig. 30).

Tool Installation.

1. With the car in a normal resting position, measure the distance between the top of the side rail sheet metal and back under the lip of the upper control arm spring pocket (Fig. 31). Select one of the fabricated steel bars, which is closest to being ⅛-inch longer than this measured dimension.

2. Position the fabricated hook on the lip of the body side rail, place any standard pry bar through the eye of the hook and under the suspension lower arm, then pull down (Fig. 32). Pulling down on the pry bar will raise **both** lower and upper arms. While thus raising the upper arm far enough for clearance, install the selected bar between the upper arm and side rail.

3. Position the tool arms securely on the suspension upper arm and turn the tool screws until the pivot pad of the tool is snug (finger-tight) against the sheet metal. Tighten each screw one turn with a wrench (Figs. 33 and 34).

4. Loosen the upper arm inner shaft retaining bolts several turns until they are 3/16-¼-inch away from the top face of the shaft boss, then lift up on the front end of the car. A sharp crack will usually be heard when the upper arm inner

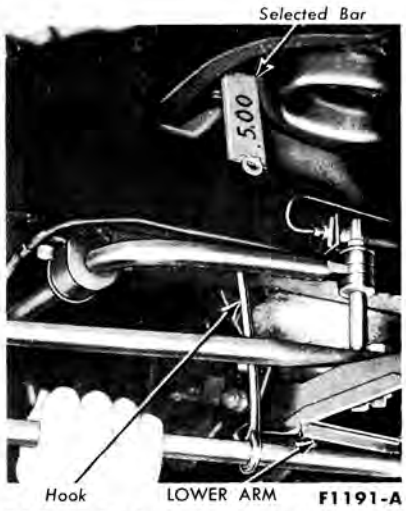


FIG. 32—Installing Bar Between Upper Arm and Side Bar

shaft serrations separate from the sheet metal.

5. Check the cross shaft retaining bolts at this point. The bolts must be loose enough to allow the bolt serrations to separate from the serrations on top of the sheet metal and the caged nut serrations to separate from the serrations on the underside of the sheet metal (Fig. 35). **These serrations must be free in order to effect an adjustment.** If they are not, loosen the bolts more. Strike the bolt heads a sharp blow. Use a long bar to loosen the caged nut serrations.

General Precautions.

1. Loosen or tighten the tool screws not more than **two** complete turns alternately to avoid collapsing the sheet metal.

2. Adjust caster first. Check caster readings at intervals during the ad-



FIG. 33—Caster-Camber Adjusting Tool Installation—Upper Side View



FIG. 34—Caster-Camber Adjusting Tool—Lower Front View

justment process to determine the extent of the correction.

3. Approximately 4 complete screw turns will change a reading 1 degree. These turns, however, should be divided equally between both screws alternately for the same resultant 1 degree movement.

Example:

Caster reading indicates +1½ degrees.

Desired reading should be +½ degree (1 degree difference toward negative).

First, **loosen** the tool front screw 2 turns (Fig. 33).

Second, **tighten** the tool rear screw 2 turns.

The caster should now read ½ degree or 1 degree less positive than it did at the beginning.

4. Do not consider camber misalignment during caster adjustment.

5. Allow approximately +⅛ degree on Caster and Camber readings to compensate for the torque of the cross shaft retaining bolts.

CASTER ADJUSTMENT

Positive Caster Movement. To adjust from negative caster toward positive (or more positive) caster, turn (tighten) the adjusting tool front screw clockwise (into the body) to pull the arm outward and turn (loosen the adjusting tool rear screw counter clockwise (away from the body) as shown in Fig. 36.

If the rear tool tends to become completely loose, turn the wheels 20 degrees outboard, then back through 0-20 degrees inboard, then return to 0 degrees (straight ahead). The rear screw should now be tight. If it is not, the serrations of either the nuts

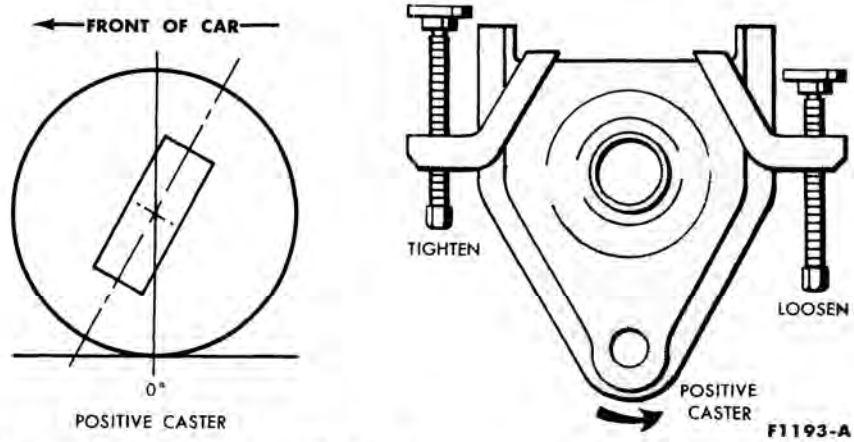


FIG. 36—Positive Caster Adjustment

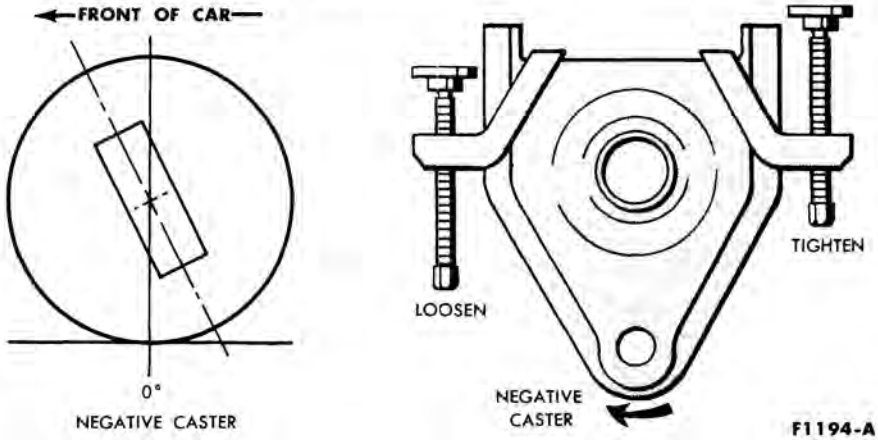


FIG. 37—Negative Caster Adjustment

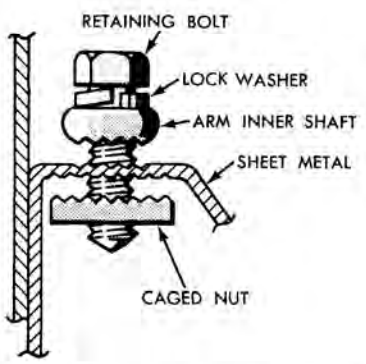


FIG. 35—Separation of Inner Shaft and Caged Nut Serrations

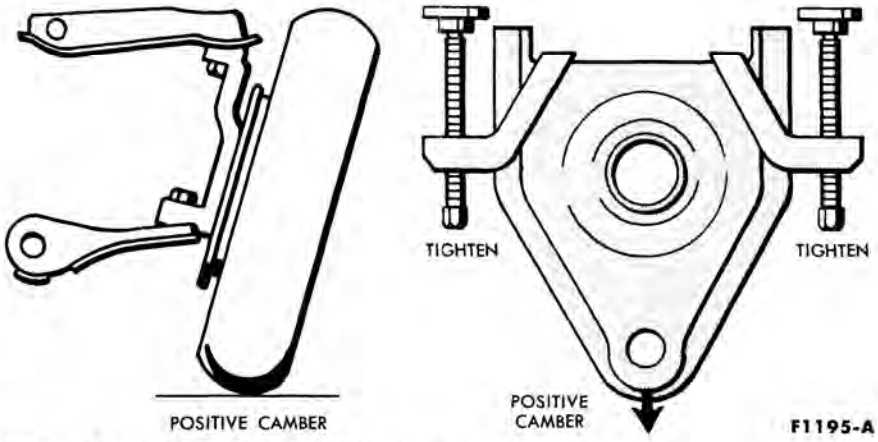


FIG. 38—Positive Camber Adjustment

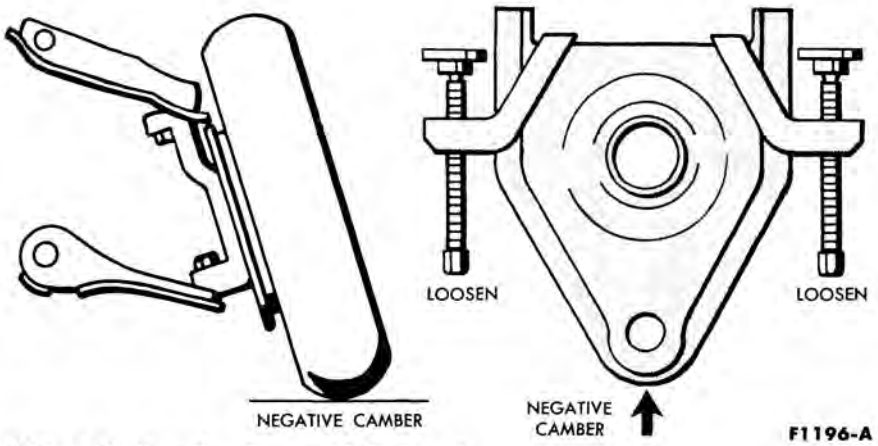


FIG. 39—Negative Camber Adjustment



FIG. 40—Spindle Connecting Rod Sleeve

or the cross shaft are not free. Loosen the cross shaft retaining bolts a little more, raise up the front of the car, then tap the bolt heads to make sure the serrations are loose.

Negative Caster Movement. To adjust from positive caster toward negative (or more negative) caster, turn (tighten) the adjusting tool rear screw clockwise (into the body) to pull the arm outward and turn (loosen) the adjusting tool front screw counterclockwise (away from the body) as shown in Fig. 37. If the front tool tends to become completely loose, follow the procedure outlined for this condition under "Positive Caster Movement."

CAMBER ADJUSTMENT

For proper camber adjustment without effecting the caster adjustment just completed, when tightening or loosening the tool adjusting screws, each screw must be turned in or out an equal number of turns.

Positive Camber Adjustment. To adjust from negative camber to positive (or more positive) camber, the adjusting tool screws must be turned in against the sheet metal an equal number of turns to move the upper control arm outward (Fig. 38).

Negative Camber Adjustment. To adjust from positive camber to negative (or more negative) camber, the adjusting tool screws must be turned outward away from the sheet metal an equal number of turns to move the upper control arm inward (Fig. 39).

After camber has been corrected, recheck the caster. If it is not within specifications, determine the amount of correction required and make the necessary adjustments.

Torque the upper arm inner shaft bolts to specifications and remove the adjusting tools.

TOE-IN AND STEERING WHEEL SPOKE POSITION ADJUSTMENTS

Check the steering wheel spoke position when the front wheels are in the straight-ahead position. If the spokes are not in their normal position, they can be properly adjusted while toe-in is being adjusted. Alignment height spacers are used on all cars to check and adjust toe-in, except those operated under abnormal conditions.

1. Loosen the two clamp bolts on each spindle connecting rod sleeve (Fig. 40).

2. Adjust toe-in. If the steering wheel spokes are in their normal position, lengthen or shorten both rods equally to obtain correct toe-in (Fig. 41). If the steering wheel spokes are not in their normal position, make the necessary rod adjustments to obtain correct toe-in and steering wheel spoke alignment.

3. Recheck toe-in and the steering wheel spoke position. If toe-in is correct and the steering wheel spokes are still not in their normal position, turn both connecting rod sleeves upward or downward the same number of turns to move the steering wheel spokes (Fig. 41).

4. When toe-in and the steering wheel spoke position are both correct, torque the clamp bolts on both connecting rod sleeves to 11-14 ft-lbs. If the car is equipped with power steering, both bolts on the left sleeve should be in a vertical position on the forward side of the sleeve to prevent interference with the control valve. **The sleeve position should not be changed when the clamp bolts are tightened.**

LUBRICATE POWER STEERING ACTUATOR VALVE BALL STUD

Wipe the lubrication fitting clean and apply the specified lubricant.

CAUTION: Care should be exercised to stop the addition of lubricant when the boot seal begins to inflate or bulge.

CHECK TIRE PRESSURES

Check all tires for specified pressures (cold).

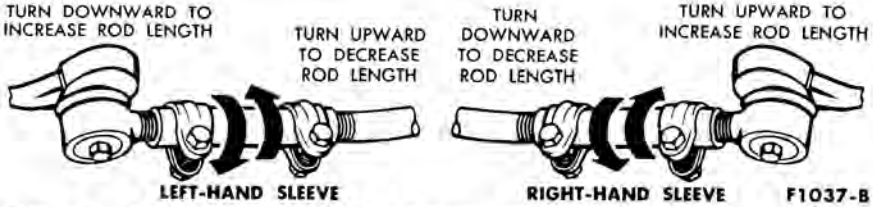


FIG. 41—Spindle Connecting Rod Adjustment

CHECK BATTERY FLUID LEVEL

The battery is mounted under the hood at the right front side of the engine compartment.

Keep the fluid in each battery cell up to the level of the ring in the bottom of the filler well. Generally, tap water may be added unless it has a high mineral content or has been stored in a metal container.

4 BODY

LUBRICATE HOOD LATCH

Apply Rotunda Silicone Lubricant to all pivot points and to the striker plate as required to eliminate any binding condition. Operate the latch mechanism several times to be sure that the lubricant has effectively worked in.

LUBRICATE HOOD AUXILIARY CATCH

Apply Rotunda Silicone Lubricant to all pivot points as required to eliminate any binding conditions. Operate the catch several times to be sure that the lubricant has effectively worked in.

LUBRICATE DOOR LOCK CYLINDERS

Apply Rotunda Lock Lubricant sparingly through the key slot. Insert the key and operate the lock several times to be sure that the lubricant has effectively worked in.

LUBRICATE LUGGAGE COMPARTMENT LOCK CYLINDER

Apply Rotunda Lock Lubricant sparingly through the key slot. Insert the key and operate the lock several times to be sure that the lubricant has effectively worked in.

LUBRICATE TAILGATE LOCK CYLINDER

Apply Rotunda Lock Lubricant sparingly through the key slot. Insert the key and operate the lock several times to be sure that the lubricant has effectively worked in.

LUBRICATE TAILGATE SUPPORT AND HINGES

Apply Rotunda Silicone Lubricant to all pivot and friction points to eliminate any binding conditions. Operate the tailgate several times to be sure that the lubricant has effectively worked in.

LUBRICATE FUEL FILLER DOOR HINGES

Apply Rotunda Silicone Lubricant to the hinge pivot points as required to eliminate any binding condition. Open and close the door several times to be sure that the lubricant has effectively worked in.

CLEAN BODY DRAIN HOLES

Body drain holes located in the bottom of the door panels and lower body side panels (rocker panels) not protected by rubber valves should be checked occasionally. Use a small screwdriver or awl to clean these holes of obstructions.

CHECK CONVERTIBLE TOP OPERATION

If convertible top operation becomes sluggish or slow, check the hydraulic reservoir fluid level. Fluid level should be approximately ¼-inch from the filler opening. The proper fluid for all cars is specified in Group 21.

CHECK CONVERTIBLE TOP FLUID LEVEL

1. Remove the rear seat and raise the top.
2. Place absorbent cloths below the filler plug.
3. Remove the filler plug, and check the fluid level. It should be level with the bottom edge of the hole.
4. If the level is low, check the system for leaks, adding the specified hydraulic fluid as necessary.

REPLACE WINDSHIELD WIPER BLADES

Wiper blade replacement intervals will vary with the amount of use, type of weather, chemical reaction from road tars or salts and the age of the blades. Be sure that the windshield glass surface is not contaminated with oil, tree sap or other foreign substance which cannot be easily rubbed off.

Generally, if the wiper pattern across the glass is still uneven and streaked after these tests, replace the blades.

LUBRICATE DOOR HINGE AND HINGE CHECK

Apply Rotunda Silicone Lubricant to the hinge pivot points as required to eliminate any binding condition. Open and close the door several times to be sure that the lubricant has effectively worked in.

LUBRICATE HOOD HINGE PIVOTS

Apply Rotunda Silicone Lubricant to the hinge pivot points as required. Open and close the hood several times to be sure that the hinge pivots do not bind.

LUBRICATE LUGGAGE COMPARTMENT HINGE PIVOTS

Apply Rotunda Silicone Lubricant to the hinge pivot points as required. Open and close the luggage compartment several times to be sure that the hinge pivots do not bind.

LUBRICATION CHARTS AND SPECIFICATIONS

GROUP 21

LUBRICATION CHARTS AND SPECIFICATIONS

ITEM	FORD PART NO.	PART NAME
Body Hinges	C4AZ-19584-A R-138-B	Lifetime Body Grease
Brake Master Cylinder	B7AZ-19542-A R-103-A	Rotunda Heavy Duty Brake Fluid
Front Suspension Ball Joints and Steering Linkage	C1AZ-19590-B	FoMoCo Ball Joint Grease
Front Wheel Bearings	C2AZ-19585-A	FoMoCo Wheel Bearing Grease
Hood Latch & Safety Catch	C4AZ-19584-A R-138-B	Lifetime Body Grease
Lock Cylinders	B4A-19587-A	Rotunda Lock Lubricant
Rear Axle	C1AZ-19580-E or F	FoMoCo Hypoid Gear Lube
Hi Performance Engines	C2AZ-19580-D	FoMoCo Hypoid Gear Lube
Equa-Lock Axles (use 1 oz. per pint of C1AZ-19580-E or F)	C1AA-19B546-A	Equa-Lock Additive

ITEM	FORD PART NO.	PART NAME
Steering Gear Housing (Manual or Power)	C3AZ-19578-A	Lifetime Steering Gear Grease
Steering—Power (Pump Reservoir)	C1AZ-19582-A R-106-A	Rotunda Automatic Transmission Fluid
Convertible Top Reservoir	C1AZ-19582-A R-106-A	Rotunda Automatic Transmission Fluid
Transmission (Automatic)	C1AZ-19582-A R-106-A	Rotunda Automatic Transmission Fluid
Transmission (Manual Shift)	C3RZ-19C547-B	Rotunda Manual Transmission Lube
Universal Joints	C1AZ-19586-B	FoMoCo Universal Lube
Engine Crankcase Oil		MS Sequence tested SAE 10W-30 above −10°F. SAE 5W-20 for sustained temperatures below −10°F.
Engine Oil Filter	C1AZ-6731-A R1-A	Rotunda Oil Filter—6,000 mile type

ENGINE CRANKCASE OILS

Use of SAE 10W-30 oil will provide the proper viscosity for all normal ranges of outside temperatures. For operation at sustained outside temperatures below −10° F. a 5W-20 oil should be used.

Oil Quality

Use only oils which have been tested and certified by the maker as satisfying automobile manufacturers specifications for Engine Operating Sequence Tests for Service M.S. The Ford Motor Company specification covering these tests is M2C27. These tests are defined by ASTM committee D2 for Section G-IV of technical committee B and are published in the SAE Handbook.

These tests cover oil characteristics as follows:

Sequence I—Low Temperature Wear Prevention—(Cold Starts)

Sequence II—High-Speed—High Temperature Wear Prevention.

Sequence III—High Temperature Deposit Formation—(Varnish)

Sequence IV—Corrosion and Rust Prevention

Sequence V—Sludge Formation

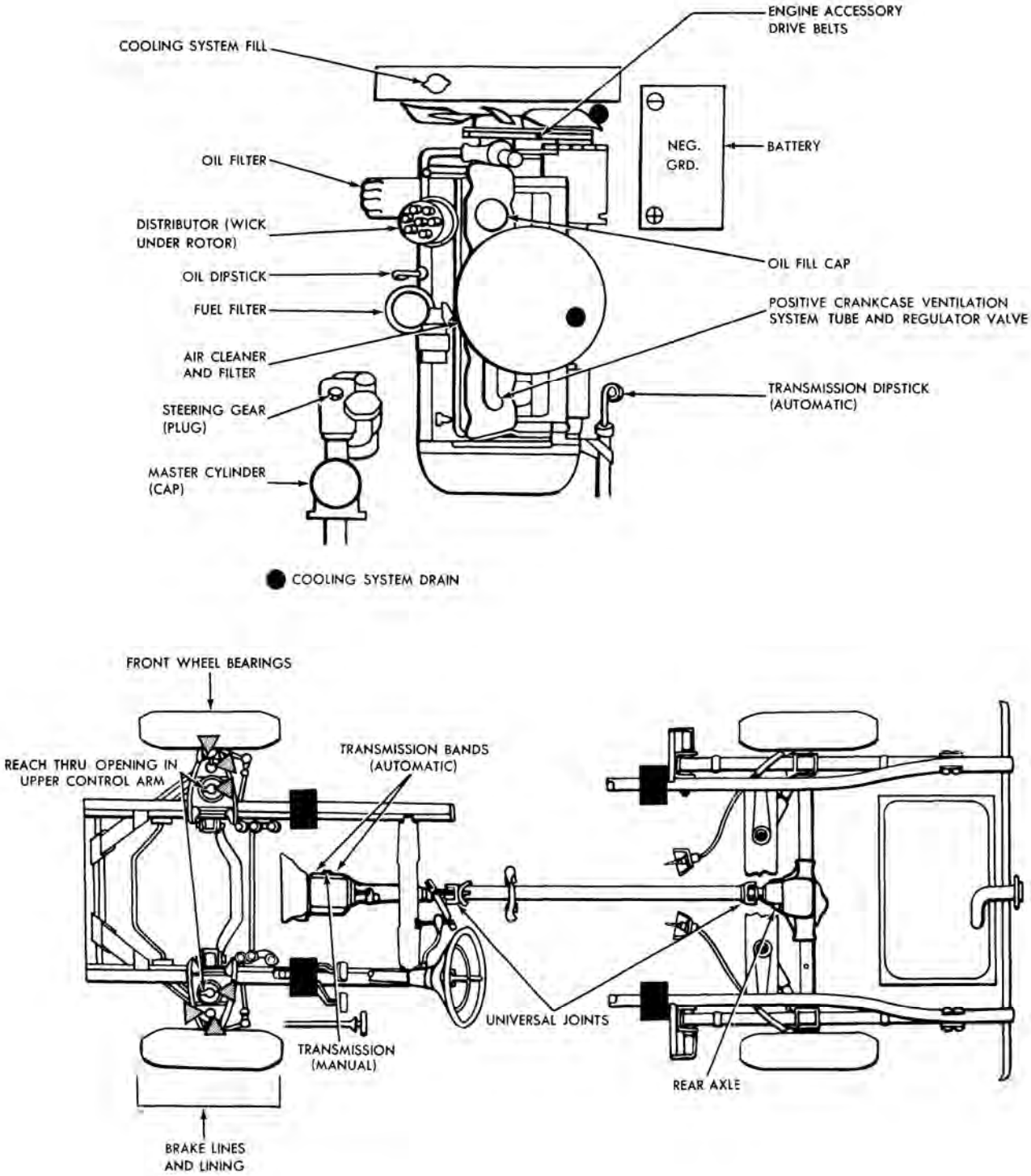
If engine oils are used which do not meet these requirements, it will be necessary to change oil more frequently than every 6,000 miles.

If it is necessary to use an "MS" oil which is not certified by the marketer as having passed the Engine Operating Sequence Tests, the addition of Rotunda Oil Conditioner to the oil will satisfy the requirements.

Oil Filter

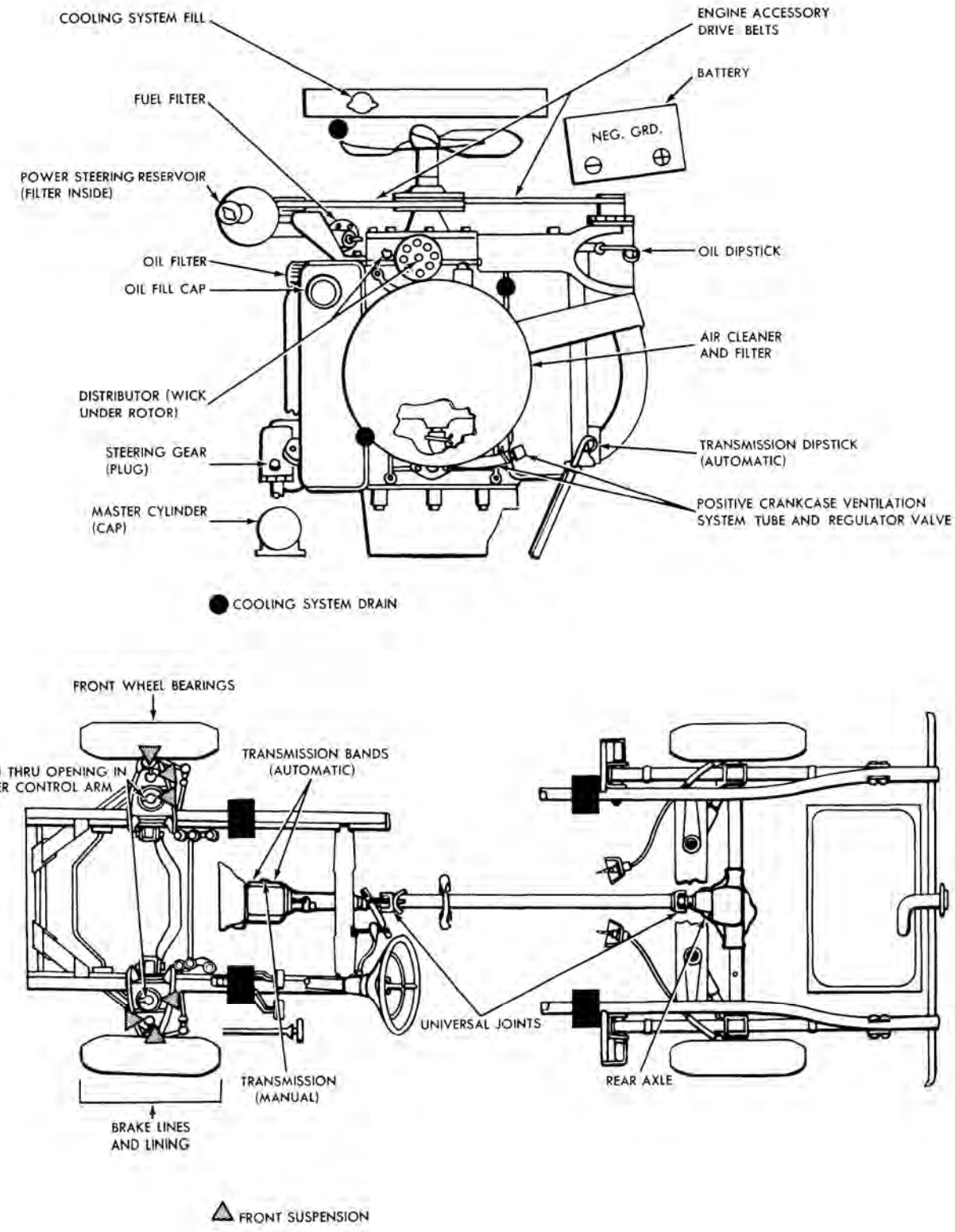
Use of the right oil filter is also essential to good engine life and operation. For 6,000-mile filter change intervals, filters must meet Ford Specification ES-COAE-6714-A.

The Genuine Rotunda Oil Filter meets this requirement.



Y1005-B

FIG. 1—Typical Lubrication Chart—6-Cylinder Engine



Y1004-B

FIG. 2—Typical Lubrication Chart—V-8 Engine

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