SHOP TIPS

Autolite Ford

VOL. 8, NO. 3 NOVEMBER, 1969

Technical parts and service information published by the Autolite-Ford Parts Division and distributed by Ford and Lincoln-Mercury dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

DIAGNOSING and TESTING FORD-DESIGN POWER STEERING PUMPS...

PLUS . . . All About Ford's New Column-Mounted Ignition Switch and Electronic Distributor Modulator

SEE CENTER INSERT FOR TIMELY PROMOTIONS!

SERVICE REPLACEMENT SHOCK ABSORBERS FOR BOSS 302 & BOSS 429 MUSTANGS

IN THIS ISSUE

Be sure and file this and future bulletins for ready reference. If you have any suggestions for additional information that you would like to see included in this publication, please write to: Autolite-Ford Parts Division of Ford Motor Company, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

The descriptions and specifications contained in this book were in effect at the time the publication was approved for printing. The Ford Motor Company, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change specifications or design without notice and without incurring obligation.

Autolite Ford

VOL. 70 MSD 14 LITHO IN U.S.A.

The August issue of Shop Tips provided a detailed description of the Boss 302 and Boss 429 Mustangs. In this issue, reference was made that the shock absorbers used on these models were "Gabriel." No mention was made as to service replacement. While Gabriel currently manufactures these shock absorbers, they are produced according to Ford Engineering Specifications. Also, these shock absorbers are available through Autolite-Ford service parts under the following part numbers:

	FRONT	REAR
BOSS 302	C9ZZ-18124-B	C9ZZ-18125-C
BOSS 429	C9ZZ-18124-D	C9ZZ-18125-G

CORRECTIONS TO SEPTEMBER (NEW CAR INTRODUCTION) ISSUE

The following corrections should be made to the specifications published in the September issue:

On Page 4: Camshaft listed under "Valve Train" should be hydraulic instead of solid lifter.

On Pages 13, 23 and 27: Change the spark plug listed under "351 CID V-8 2V" from "AF-42 (14mm)" to "BF-42 (18mm)".

On Pages 13, 25 and 27: Change the compression ratio under "351 CID V-8 4V" from "11.4:1" to "11.0:1."

On Page 16: Change the fuel tank capacities under "With Evaporative Emission System" from "23.0 qts." and "21.1 qts." to "23.0 gal." and "21.1 gal."

DIAGNOSING and TESTING POWER STEERING PUMPS

DESCRIPTION AND OPERATION

Before diagnosing power steering pumps, it's helpful to understand pump operation and important parts. The Ford-design power steering pump is a belt driven, slipper type pump with an integral fluid reservoir. The reservoir attaches to the rear of the pump housing front plate. It has the operating parts of the pump body encased inside.

Eight slippers and springs revolving with a rotor inside a cam insert with two lobes 180 degrees from each other creates pumping action. Each pair of slippers, along with the cam and rotor surfaces and pressure plates, forms a sealed chamber within a crescent-shaped void. As the rotor turns, a combination of centrifugal force, slipper spring force and fluid pressure acting on the underside of the slipper, forces the slipper outward against the cam insert. As a slipper slides outward in its slot, after passing over a cam lobe, the volume of the sealed chamber increases. This creates a vacuum and sets up a suction area. The inlet port is located in this area to fill the chamber with fluid. When the slipper rides over a cam lobe, the volume of the sealed chamber decreases, thus creating a pressure area. The pressure or outlet port to the steering gear is located here. The two cam lobes are located 180 degrees apart to give "balanced" pumping action for smoother operation (figures 1 and 2).

The pump utilizes a flow control valve (figure 1) to meter fluid to the steering gear. It is a variable flow mechanism that regulates the *constant* flow of the pump (whose continuous output varies with pump speed) with respect to the *changing* demands of the steering gear.

The pump also uses a pressure relief valve (figure 1) to limit hydraulic pressure when the steering wheel is turned to full left or right against the stops.

CLEANING AND OVERHAUL PRECAUTIONS

Cleanliness is of utmost importance when working on hydraulic units. If diagnosis indicates the pump must be disassembled, make sure all work is done on a clean bench. Clean the pump exterior with a suitable solvent and drain as much fluid as possible. When removing only the reservoir, plug the inlet and outlet openings with masking tape or plugs. Do not immerse the shaft oil seal in solvent.

If the rotor shaft seal must be replaced use extreme caution to prevent tool marks or scratches from crossing sealing surfaces, or they will provide a "leak path" for the oil. This can be accomplished during disassembly by wrapping 0.005" shim stock (free from burrs) around the rotor shaft and pushing it into the seal I.D. until it is against the bushing. Using a sharp tool such as a sheet metal punch, the old seal can then be pried out by carefully piercing the metal seal body face.

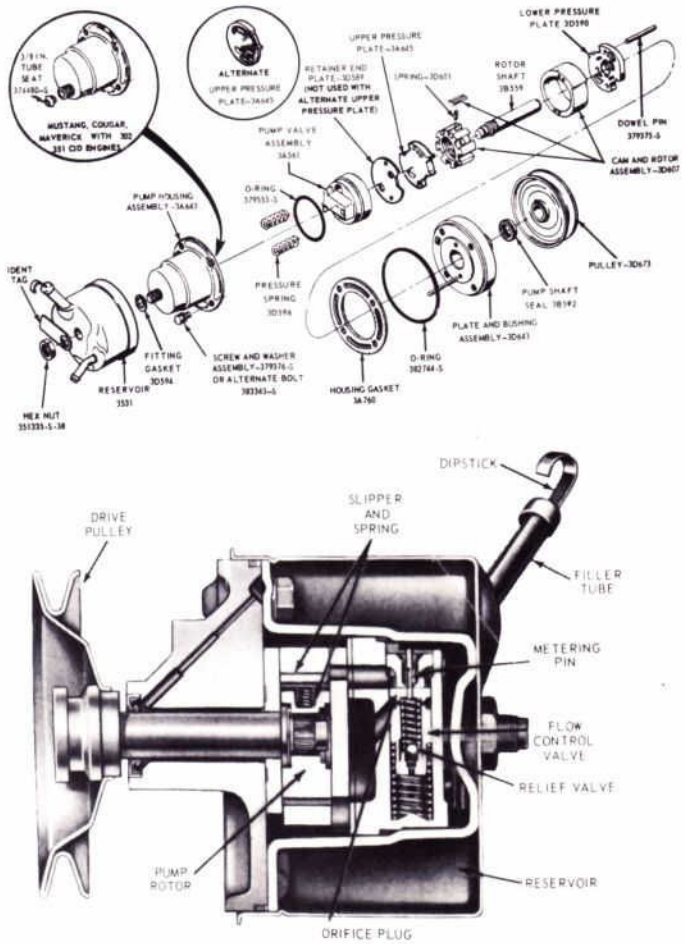


Figure 1—Power Steering Pump Components

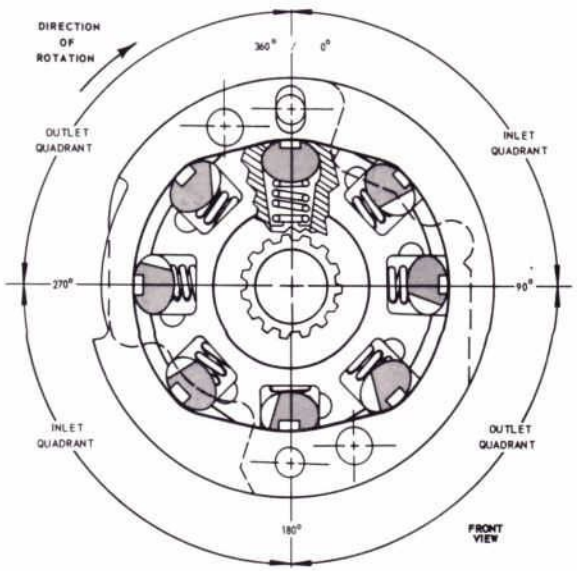
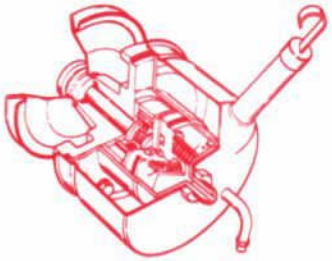


Figure 2—Power Steering Pump Cycle



DIAGNOSING and TESTING

THREE BASIC PROBLEMS

The first step in diagnosing power steering pump problems is to thoroughly quiz the customer to get his description of the condition. Generally, three basic problems will arise that require a partial or complete overhaul of the pump:

- EXTERNAL LEAKAGE
- PUMP NOISE
- INSUFFICIENT PUMP PRESSURE

EXTERNAL LEAKAGE

A variety of conditions may cause external leakage. However, before condemning the pump for leakage, be sure it's truly leaking. In other words, check for "false leakage" first.

False Leakage

Overfilling the reservoir, or turning the steering wheel with the engine off may force fluid out of the filler tube and deposit it on the outside of the pump. This can be corrected by simply wiping the outside of the pump clean.

Cap and Dipstick Leakage

Leakage can occur at the top of the filler tube (figure 3) if the cap and dipstick assembly is improperly installed, damaged or lost. If required, replace the cap and dipstick assembly making sure it's installed *securely*.

Leakage Through Brazing

If there's leakage through the brazing at the filler neck or return tube (figure 3) correct by replacing the reservoir.

Leakage Between Reservoir and Housing Plate

External leakage between the reservoir and housing plate can be caused by:

- Foreign material or damaged O-ring seal
- Damaged reservoir or housing plate
- Out-of-round or oversize reservoir
- Defective outlet fitting
- Damaged housing/reservoir gasket

Foreign Material and Damaged Seals in the O-ring reservoir area are likely causes of external leakage. These may take the form of metal chips, a damaged seal or a seal out of position (figure 4). Correct by cleaning the seal area and replacing the reservoir O-ring seal, making sure it's properly positioned.

Damaged Reservoir or Housing Plate may be another reason for leakage at the reservoir O-ring seal area (figure 4). Usually this means a damaged inside diameter of the reservoir or a damaged outside diameter of the housing plate. If these "mating" surfaces are damaged, the defective part, or parts, must be replaced.

Out-of-Round or Oversized Reservoir is a remote, but nevertheless a possible cause for leakage. To correct this condition, the complete reservoir must be replaced. And as before, remember, every time the reservoir is disassembled from the pump, use a new reservoir O-ring seal during reassembly.

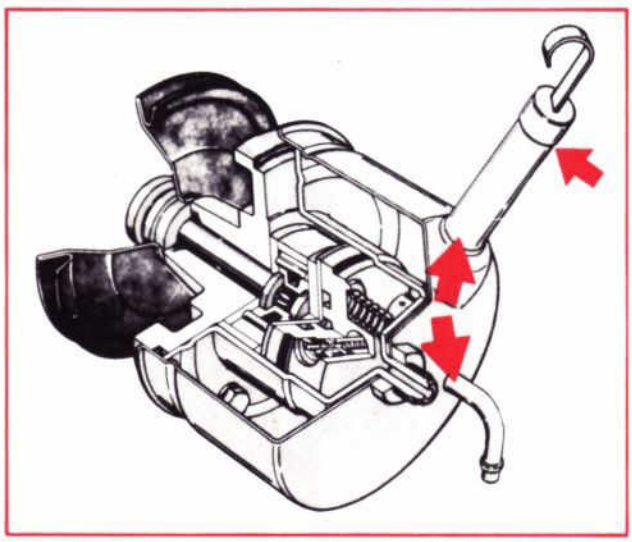


Figure 3—Leakage Through Brazing or at Dipstick

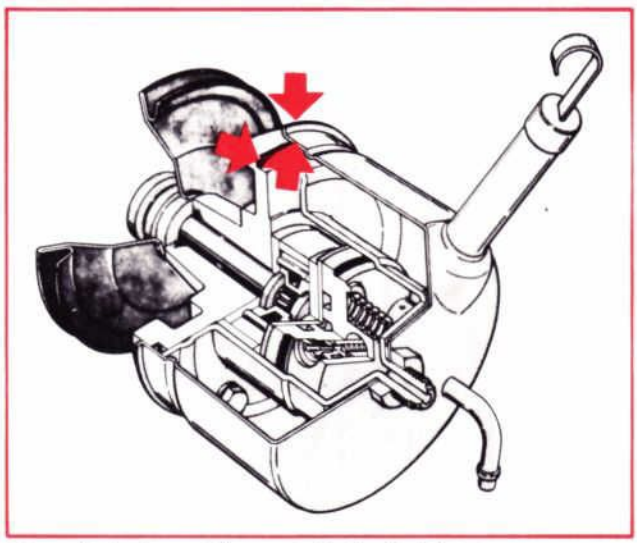
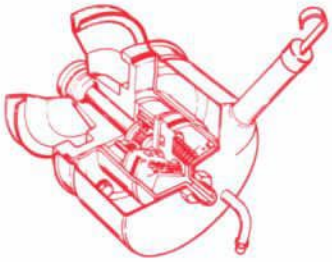


Figure 4—Leakage at Reservoir O-ring Seal Area

POWER STEERING PUMPS

Continued



Leakage at Outlet Fitting area (figure 5) may be caused by one of three things. First, is an improperly assembled fitting. Correct by replacing fitting. Second, is insufficient tightening of the outlet fitting nut. This can be corrected by torquing the nut to 47 foot-pounds. *Do not exceed this torque limit.* Third, is damaged sealing surfaces on the inside of the reservoir and the outside of the pump housing at the outlet fitting gasket. Replace the part(s) with the damaged sealing surface(s).

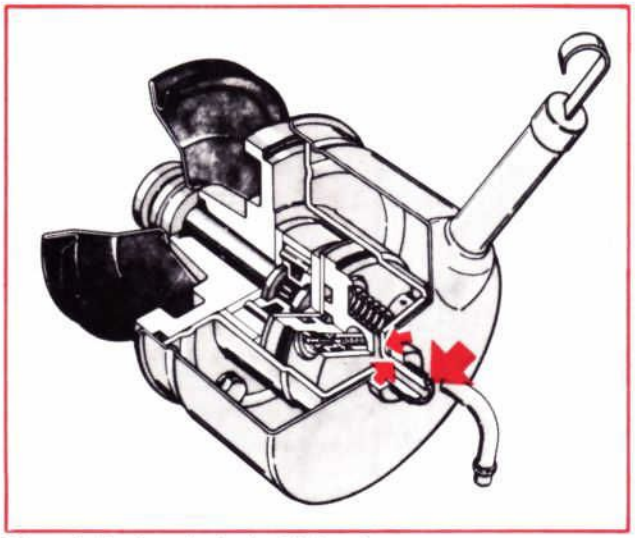


Figure 5—Leakage in Outlet Fitting Area

Leakage at Housing/Reservoir Gasket may occur if gasket (figure 6) was damaged before or during assembly; it can cause a leak. A damaged gasket *must* be replaced. This gasket should also be replaced every time the housing and reservoir are disassembled.

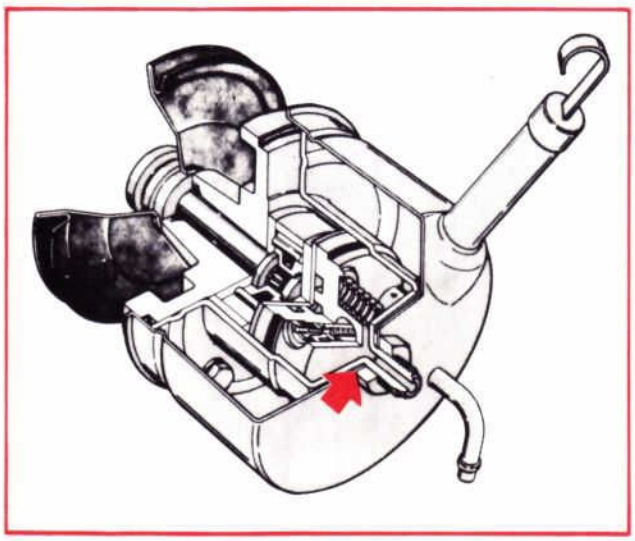


Figure 6—Leakage at Housing/Reservoir Gasket

Leakage at Shaft Seal

Five types of leakage are generally associated with the pump shaft seal area. They occur at:

- The shaft seal
- The rotor shaft
- The counterbore bottom
- The drain-back hole
- The shaft bushing

Seal Leakage will occur if the shaft seal was not pressed flush with the housing plate surface, or if the shaft seal lip was damaged prior to assembly (figure 7).

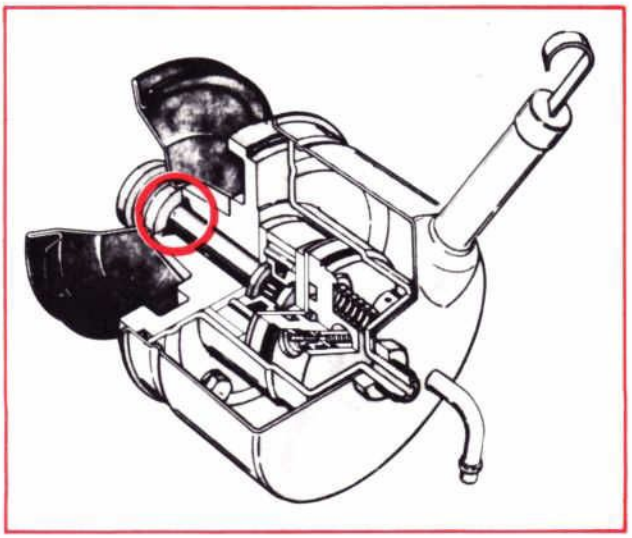


Figure 7—Leakage at Rotor Shaft Seal

Rotor Shaft leakage may occur if the outside diameter is damaged with helical grooving or scratches along axis of shaft (figure 8). Correct by replacing the rotor shaft.

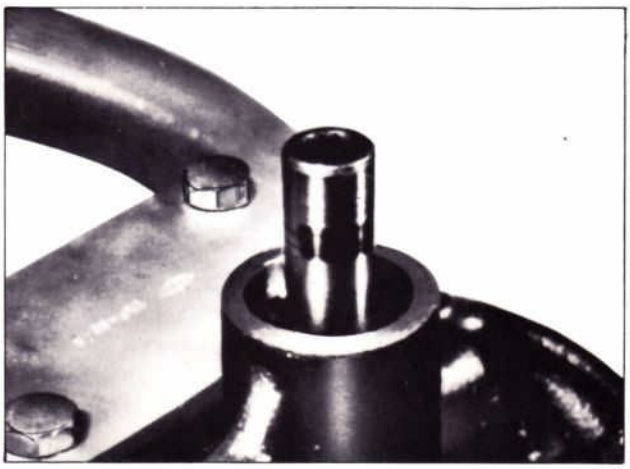
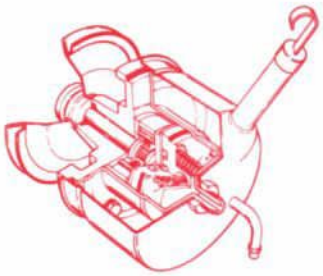


Figure 8—Damaged Rotor Shaft



DIAGNOSING and TESTING

Shaft Seal Counterbore leakage can occur if it is excessively rough or damaged (figure 9). Correct by replacing the housing plate and bushing assembly.

Worn Shaft Bushing can also cause leakage around the shaft seal. Correct by replacing the housing plate and bushing assembly.

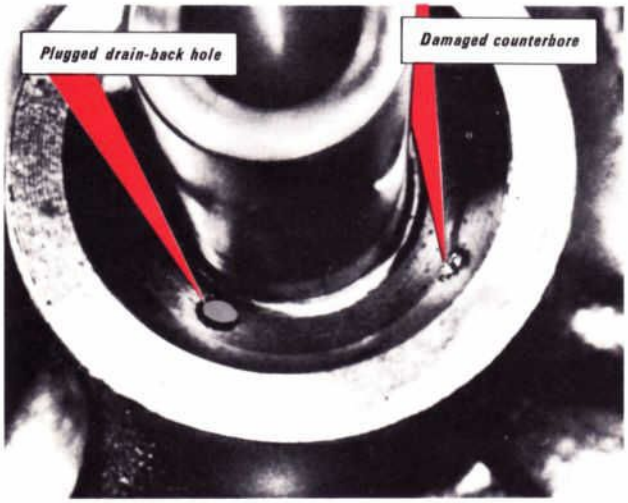


Figure 9—Plugged Drain-Back Hole and Damaged Counterbore

Shaft Seal Drain-Back Hole can cause leakage if plugged (figure 9). It must permit fluid flow back into the reservoir. If the hole is plugged, clean it, after partially disassembling the pump. If the hole is not drilled through, replace the housing plate and bushing assembly.

Also, leakage can occur if the drain-back hole in the housing is not lined up with the hole in the housing plate (figure 10). Make sure the holes are properly aligned during assembly.

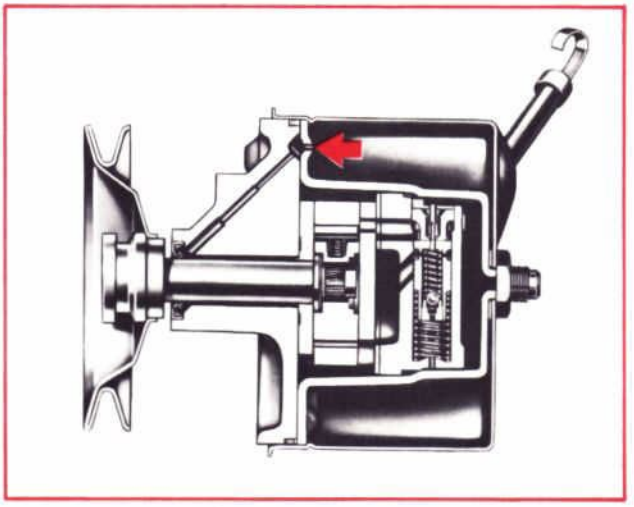


Figure 10—Drain-Back Hole Alignment

PUMP NOISE DIAGNOSIS

Here are some of the more common noises and their causes that may be described by owners or heard during a road test.

Swish

An excessive flow of fluid into the by-pass port of the pump valve housing may cause a "swishing" noise, with the fluid temperature below 130 degrees. The shearing effect of the heavier, cool oil is *not* harmful to pump operation and should diminish at normal operating temperatures.

Whine

Interference between pumping components may cause a "whine." Aerated fluid also creates this noise.

Click

A "clicking" noise may be caused by pump slippers being too long, by broken slipper springs, or by excessive wear of the pumping elements.

On-Center Hiss

Fluid passing through a damaged outlet fitting, or excessive fluid flow produces an "on-center hiss." This term is used because the noise is heard when the flow control valve is in the "on-center" position.

Chatter

"Chatter" is caused by chipped corners at the rotor outside diameter, or a bent or distorted slipper spring (figure 11).

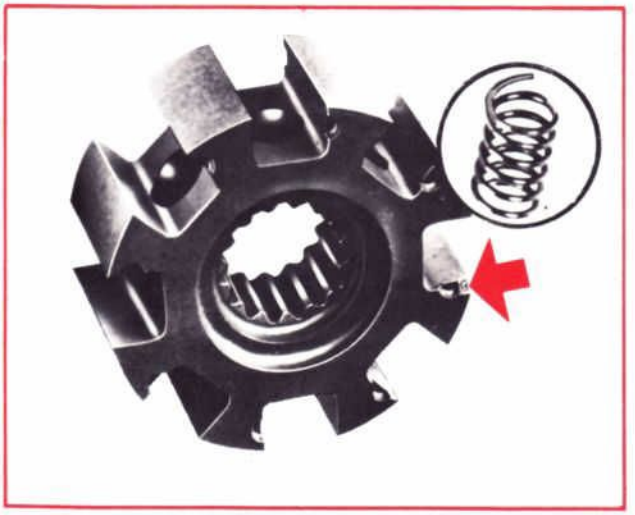
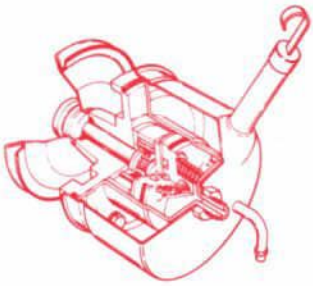


Figure 11—Damaged Rotor and Slipper Spring

POWER STEERING PUMPS

Continued



Noise Due to Aerated Fluid

Aerated fluid causes the greatest amount of excessive pump noise. To correct pump noise caused by aerated fluid, first eliminate the cause of fluid aeration, then purge the hydraulic system of air. Here are some of the most common ways for air to get into the fluid.

Low Fluid Level will produce aerated fluid. This should always be checked during the "Preliminary Diagnostic Procedures" as outlined on page 8.

Broken Reservoir Baffle as shown in figure 12 will also aerate the fluid. Either re-weld the baffle or install a new reservoir.

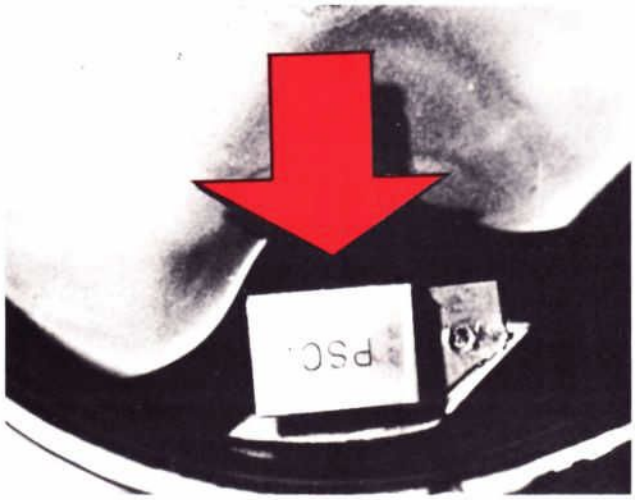


Figure 12–Broken Reservoir Baffle

Loose Housing-to-Plate Screws will cause aeration and pump noise. Correct by tightening screws to 28-32 ft.-lbs. (figure 13).

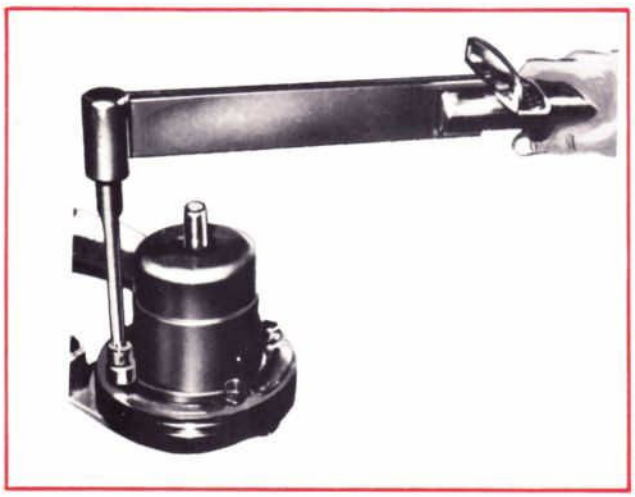
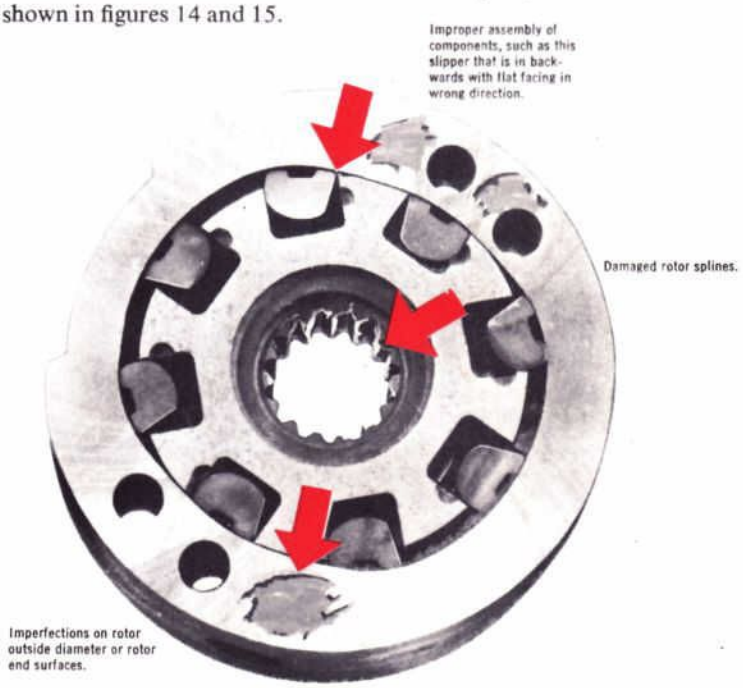


Figure 13–Tightening Housing-to-Plate Screws

Additional Causes of Noise

There are several other causes for excessive pump noise as shown in figures 14 and 15.



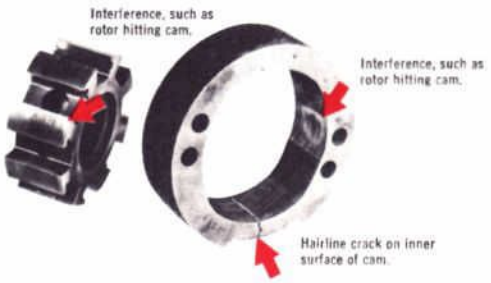


Figure 14–Noise Due to Rotor and Cam Problems

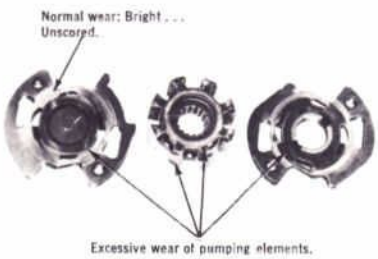
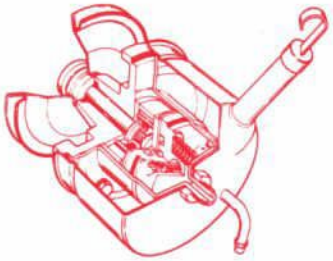


Figure 15–Noise Due to Pumping Element Problems

A "hissing" noise from a pump may be caused by the lack of a chamfer, or an improperly ground chamfer on the outlet fitting orifice. This is caused by fluid flow rather than interference of moving parts.



DIAGNOSING and TESTING

INSUFFICIENT PUMP PRESSURE (TESTING)

Testing is generally required only if the pump puts out insufficient pressure. Before testing pump flow and pressure, perform the following "Preliminary Diagnostic Procedures."

Preliminary Diagnostic Procedures

- Check system for damage or leaks.
- Check pulley sizes on engine and pump. (See specs page 10).
- Check tire pressure.
- Check for correct vehicle application. (See specs page 10).
- Check reservoir fluid level at normal operating temperature, after turning steering wheel to full left and right several times, and shutting engine off. Fluid level should show on cross hatching between bottom of dipstick and full mark. If necessary, add automatic transmission fluid (such as Ford C1AZ-19582-A) to raise fluid level to F mark on dipstick. DO NOT OVERFILL.
- Check drivebelt tension. Do not test by pushing down with thumb for a ¼-inch deflection. Instead use an accurate drivebelt tension gauge. New belts should measure 140 lbs. and used belts (run more than ten minutes) should measure 110 lbs. **CAUTION:** Do not pry against reservoir to obtain proper tension as this may deform reservoir and cause a leak. **NOTE:** On 1970 models with 429 and 460 engines, the power steering pump incorporates a unique adjustable bracket (figure 16).

To remove or replace a power steering pump belt:

1. Loosen the three nuts on the vertical studs in the slotted holes so the adjustable bracket is free to slide inboard on the stationary bracket.
2. Loosen the nut on the horizontal stud sufficiently to move the pump assembly and adjustable bracket inboard. Remove the belt.
3. If installing a new belt, position it on the proper pulleys.
4. Tighten the nut on the horizontal adjustment stud until snug.
5. Install a belt tension gauge on the belt and tighten the horizontal adjustment stud until the proper tension is attained (120-150 lbs. for a new belt, 90-120 for a used belt).
6. Torque the nuts on the vertical studs in the slotted holes to 30-40 ft.-lbs.
7. Remove the tension gauge.

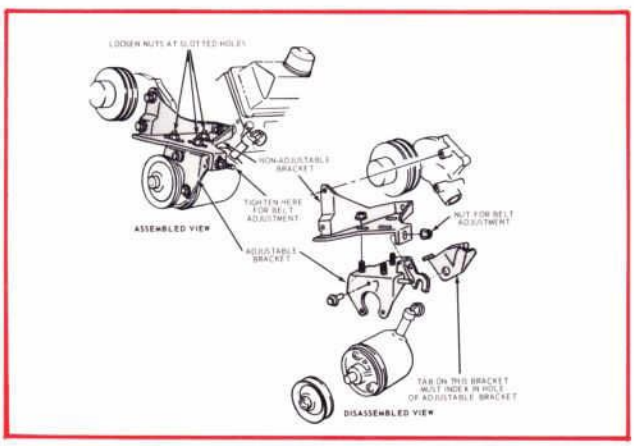


Figure 16—Pump Brackets for 1970 429 and 460 Engines

Test Equipment

Two types of equipment are generally used to check the power steering system. One type tests pressure in the complete pump and gear system. The other tests only pressure flow in the pump (figure 17). Whichever type of equipment is used, be sure and follow the recommended instructions. The *minimum* acceptable pressure is 620 PSI with fluid temperature between 165° F-175° F. If pressure reads below 620 PSI, the pump should be overhauled.

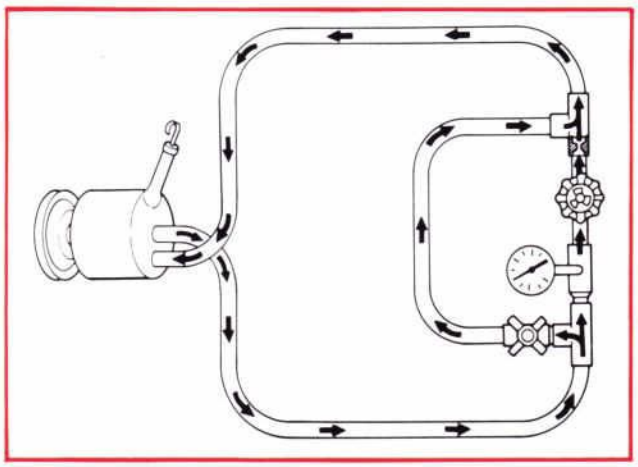


Figure 17—Pump Flow Test Schematic

Causes of Low Outlet Pressure

Low pressure is usually caused by a leak, or obstruction in the hydraulic system. And in some cases it may be something as simple as extremely low fluid level or a loose belt. *External* leaks have already been covered on pages 4 through 6. Here are some of the *internal* problems that can cause low pressure.

- If the housing-to-valve and cover assembly seal (figure 18) is improperly assembled, damaged or omitted, oil will leak from the high pressure chamber into the inlet

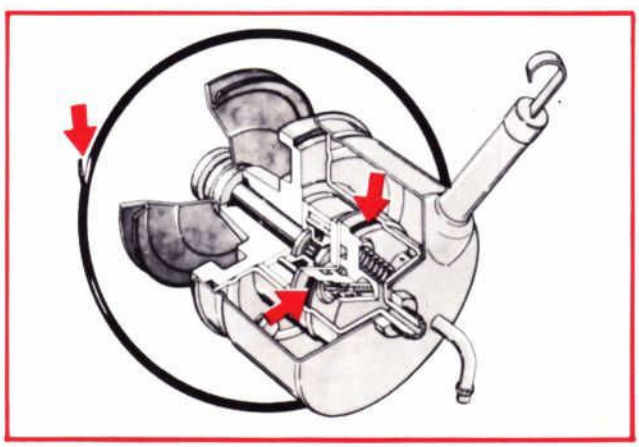


Figure 18—Low Pressure Leak at Housing-to-Valve and Cover Assembly

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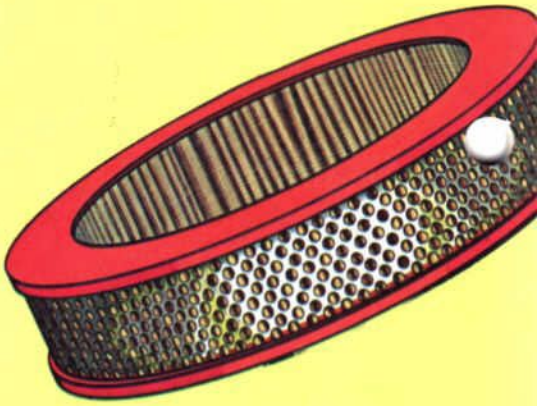

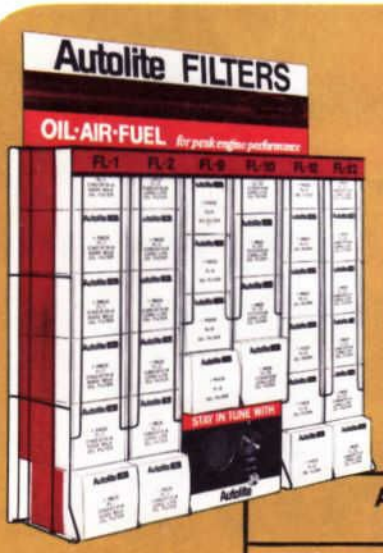

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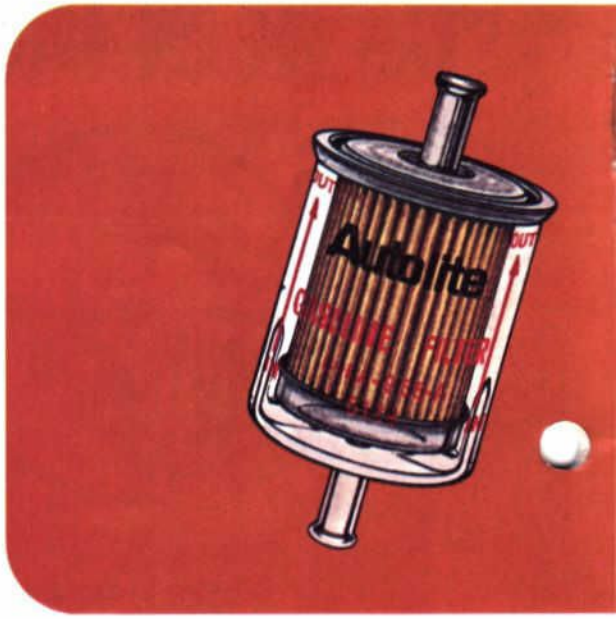

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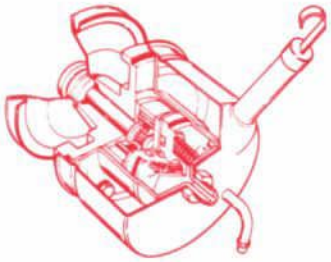
POWER STEERING PUMPS *Continued*



Causes of Low Output Pressure (continued)

chamber and cause low pressure. The same leakage condition, with resulting pressure drop, will exist if valve cover or housing sealing surfaces are damaged.

- Internal leakage and low pressure will result if component parts such as the housing plate, pressure plates, cam insert, retainer end plate, pump valve assembly, or valve and cover assembly are not flat against mating surface or mating surfaces are damaged (figure 19).

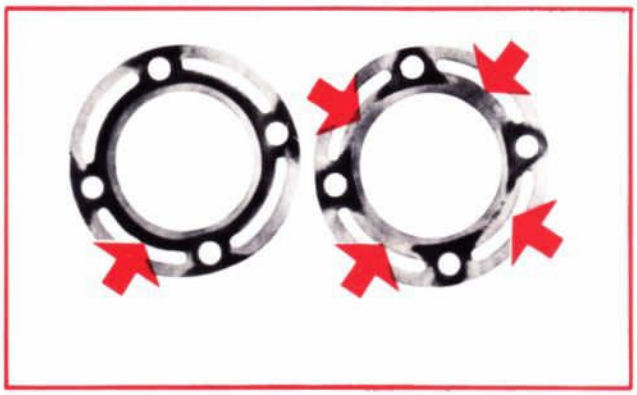


Figure 19—Improper Seal Area on Gasket Surface of Flange

- Improper assembly of internal parts, or missing parts such as pressure plate springs, will cause low pressure output.
- A damaged ball or seat in the relief valve may cause low output pressure. A relief valve ball sticking open or not seated within the valve cover will also cause low pressure (figure 20).
- A plugged sensing orifice in the valve housing can cause a considerable pressure drop, as can a plugged outlet orifice (figure 20).

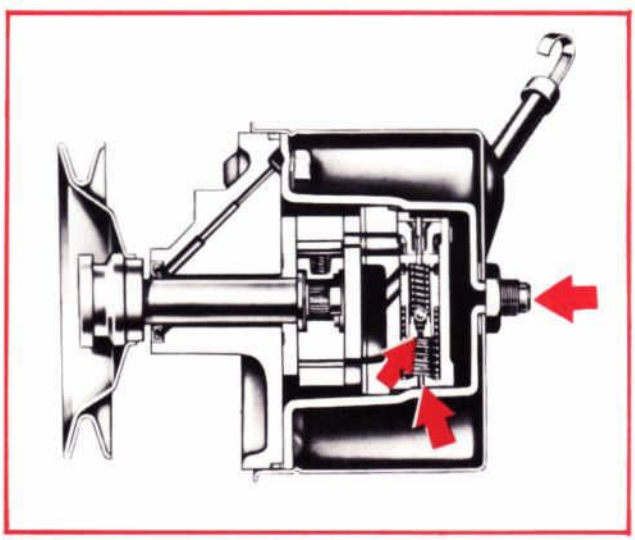


Figure 20—Orifice and Relief Valve Problems Causing Low Pressure

- Scored components, such as pressure plates (figure 15), rotor or cam, can cause flow and pressure below specifications.
- A chipped or damaged upper or lower pressure plate at the pressure port areas (figure 21) will cause low flow and high steering effort due to insufficient pressure.

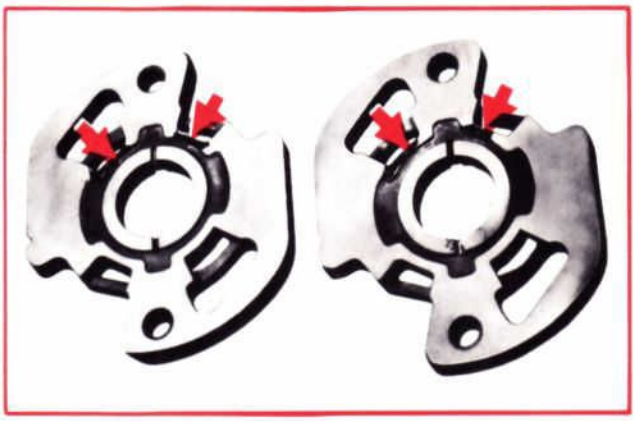


Figure 21—Damaged Upper and Lower Pressure Plates

- Interference between the outside diameter of the rotor and the cam surface will cause a clicking noise, improper assist and low pressure (figure 14).
- An out-of-flat upper or lower pressure plate will also cause a leak path (figure 22). This can result in low flow and high steering effort due to pressure below specifications.

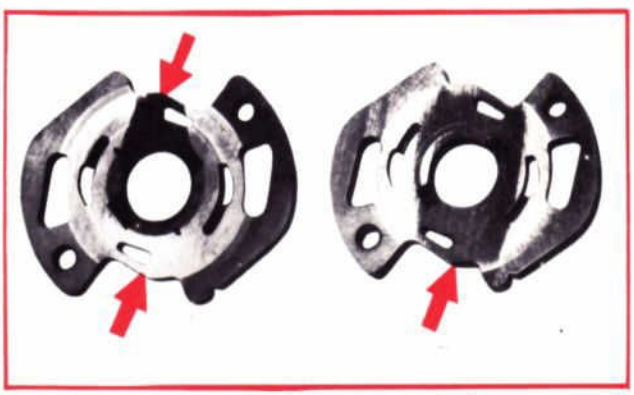
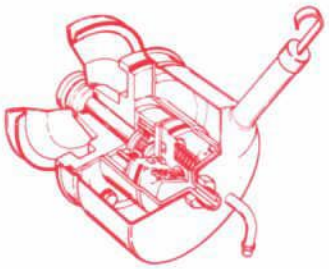


Figure 22—Out-of-Flat Condition of Upper and Lower Plate

Whenever a power steering pump is repaired due to wear, broken parts or dirt, always flush the steering system. Upon completion of overhaul and flushing, make sure the pump reservoir is filled with fluid before operating the engine.

Specifications for Ford-design power steering pumps are shown on page 10.



DIAGNOSING and TESTING POWER STEERING PUMPS *Continued*

SPECIFICATIONS

Before performing any service operations, always check the identification tag (figure 23). It has the date code, service model identification and manufacturing plant shift code inscribed.

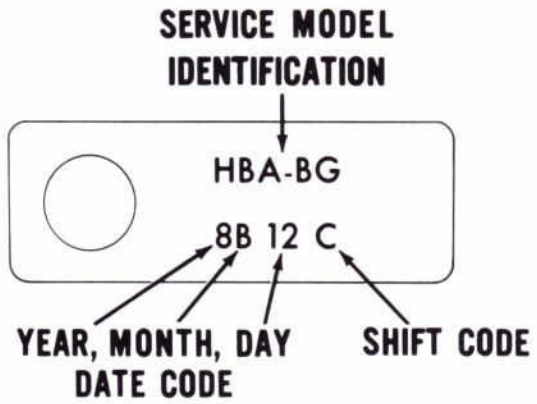


Figure 23—Identification Tag

SERVICE SPECIFICATIONS

DESCRIPTION	FORD
Pump Rotor Shaft End Play	.017 in. Max. .003 in. Min.
Max. Torque Allowed to Rotate Rotor Shaft	15 in.-lbs.
Stamped Housing to Plate Assy. Screw and Washer Assy.	28-32 ft.-lbs.
Reservoir to Stamped Housing Nut	43-47 ft.-lbs.
Minimum Pressure @ 165°-175° F.	620 PSI

FORD POWER STEERING PUMP IDENTIFICATION AND APPLICATION CHART

Model Number	Falcon, Montego, Fairlane, Mustang, Cougar (Except 302, 351 Engines)	Ford, Mercury, Meteor, Thunderbird with XR-50 Steering Gear	Ford with Saginaw Steering Gear and Truck F-100, F-250 (4 x 2)	Falcon, Montego, Fairlane, Mustang, Cougar with 302, 351 Engines
HBA-BF	X			
HBA-BG		X		
HBA-BH			X	
HBA-BK				X

SERVICE IDENTIFICATION MODEL CHART—POWER STEERING PUMP PULLEYS

VEHICLE	ENGINE SIZE	AIR CONDITIONING			DUAL BELT ALTERNATOR			IDENTIFICATION
		With	Without	With or Without	With	Without	With or Without	
Ford, Mercury	428	X				X		7AA
Ford, Mercury, Meteor	390	X				X		7AA
Ford, Mercury, Meteor, Thunderbird	429			X			X	8SA
Ford, Meteor	240		X		X			AD
Ford, Meteor	302		X		X			6AA
Ford, Meteor	390		X			X		6AA
Mercury	390, 428		X			X		6AA
Thunderbird	390	X				X		AF
Ford	428		X			X		6AA
Ford, Meteor	302	X				X		7AD
Fairlane, Montego, Mustang, Cougar	390, 427, 428		X			X		80B
Ford, Meteor	302		X			X		7AE
Fairlane, Falcon, Montego, Mustang, Cougar	302, 351		X		X			80B
Falcon	170, 200			X			X	80A
Mustang	200			X			X	80A
Fairlane, Montego, Mustang	250			X			X	90A
Fairlane, Montego, Mustang, Cougar	390, 428	X				X		AF
Fairlane, Montego, Mustang, Cougar	302, 351	X				X		7AD
Fairlane, Montego, Mustang, Cougar	302, 351		X			X		7AE
Truck F-100, F-250, F-350 (4 x 2)	240, 300			X	X			AD
Truck F-100, F-250, F-350 (4 x 2)	240, 300			X		X		AH
Truck F-100, F-250, F-350 (4 x 2)	360, 390	X				X		7AA
Truck F-100, F-250, F-350 (4 x 2)	360, 390		X			X		6AA

FORD POWER STEERING PUMP TORQUE LIMITS (FT-LBS)

Description		Ford, Mercury, Meteor, Thunderbird	Cougar, Falcon, Fairlane, Montego, Mustang
Pump Rotor Mounting Nut		14-18	20-30
Pressure Hose Nut		20-30	20-30
Pump Attaching Nuts		25-35	30-40
Bracket to Engine Attaching Nuts	6-Cyl.	12-16	7-10
	302-351 CID	18-25	18-25
	390, 428, 429 CID	30-40	30-40
Bracket to Cylinder Head		25-35	25-35
Belt Adjustment Bolt		—	25-35
Rear Support Bracket Attaching Nuts	240 CID	45-60	—
Bracket to Engine Adapter	170-200 CID	—	25-35
Engine Adapter to Engine	170-200 CID	—	17-25
	250 CID	—	30-40
Engine Adapter to Pump	250 CID	—	25-35

THESE CHARTS DO NOT APPLY TO LINCOLN-CONTINENTAL AND MARK III MODELS. THEY USE EATON-DESIGN P/S PUMPS.

SERVICING FORD'S NEW COLUMN-MOUNTED IGNITION SWITCH

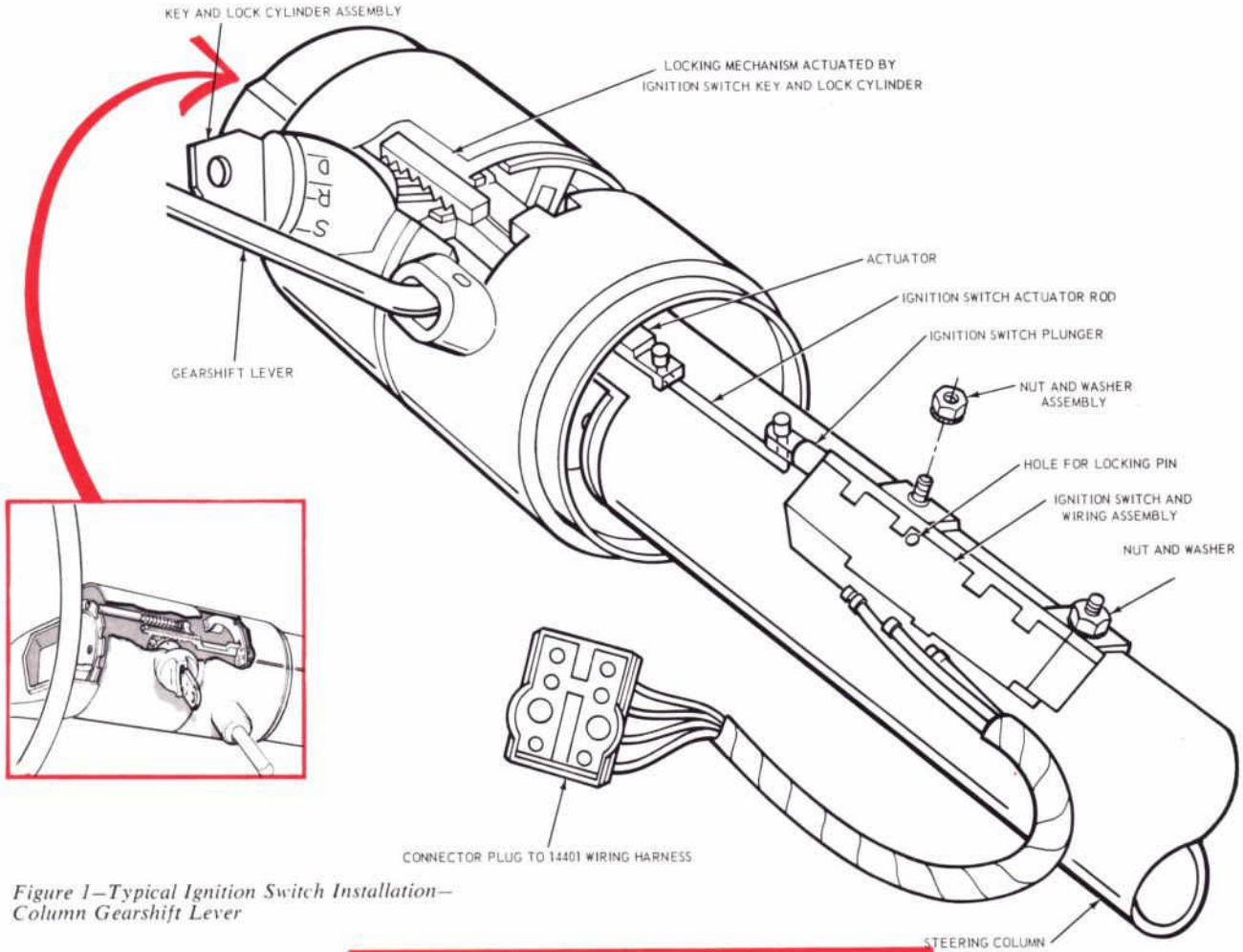


Figure 1—Typical Ignition Switch Installation—Column Gearshift Lever

DESCRIPTION AND OPERATION

All 1970 Ford Motor Company cars (excluding Falcon and Mavericks built before November 3, 1969) use a three-way locking steering column. It deters thefts by locking the ignition switch, steering wheel and transmission together. The locking mechanism at the top of the steering column (Figure 1) is activated by an ignition switch and lock cylinder assembly on the side of the column.

The steering wheel is locked when a gear on the end of the lock cylinder actuates a rack drive that engages a spring loaded pin in one hole of a 12-hole locking plate (View A. (Figure 1).

The transmission lever on column-mounted cars is locked by a rack passing into slots in the shift casting. On cars with floor or console shift lever, a rod connected between the transmission shifter and steering column locks the transmission lever.

The ignition switch and lock cylinder assembly has five positions: Accessory . . . Lock . . . Off . . . On and Start in that sequence. When the engine is running, the key will be in the "On" position. To stop the engine, the switch is turned to the "Off" position. This allows the engine to be shut off without locking the steering transmission linkage system together. This permits service repairs or steering in emergencies when the engine is not running. The key cannot be removed, however, unless the switch is turned to the "Lock" position and the selector lever in the correct position. On automatic transmission cars the lever must be in the "Park" position and on manual transmission cars in "Reverse." The accessories operate with the key turned to the "Acc" position, but the transmission and steering remain unlocked.

An ignition switch and wiring assembly also mounts on the steering column. It is connected to the ignition switch and lock cylinder assembly by an actuator rod on cars with a steering column shift lever. On vehicles with a floor or console shift lever, the switch mounts higher up on the column and connects directly to the actuator by a pin.

SERVICE PROCEDURES

Continuity Test

Disconnect the switch wire multiple plug connector. Test for continuity through the switch by connecting a self-powered test light or ohmmeter between the plug terminals indicated for each switch position in Figure 2.

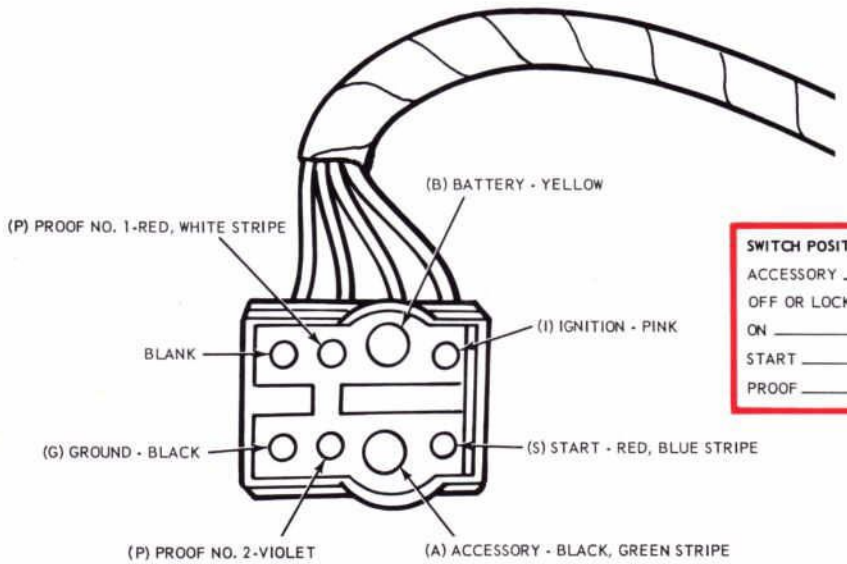
Switch Removal and Installation

1. To gain access to the switch, remove the shrouding from the steering column, and detach and lower the steering column from the brake support bracket.
2. Disconnect the battery cable.
3. Disconnect the switch wiring at the multiple plug.
4. Remove the two nuts that retain the switch to the steering column.
5. On vehicles with a steering column-mounted gearshift lever, detach the switch plunger from the switch actuator rod and remove the switch (Fig. 1).

   On vehicles with a floor- or console-mounted shift lever, remove the pin that connects the switch plunger directly to the actuator and remove the switch.
6. When installing the ignition switch, both the locking mechanism at the top of the column and the switch itself must be in LOCK position for correct adjustment. To hold the mechanical parts of the column in LOCK position, move the shift lever into PARK (with automatic transmissions) or REVERSE (with manual transmissions), turn the key to LOCK position, and remove the key.

   New replacement switches, when received, are already pinned in LOCK position by a plastic shipping pin inserted in a locking hole on top of the switch.

   For an existing switch, pull the switch plunger out as far as it will go and then move it in one detent to LOCK position. Insert a 3/32-inch diameter wire or drill shank in the locking hole on top of the switch (Fig. 1). The switch is now pinned in LOCK position.



SWITCH POSITION:	CONTINUITY SHOULD EXIST ONLY BETWEEN:
ACCESSORY	A & B
OFF OR LOCK	NO CONTINUITY BETWEEN ANY TWO TERMINALS
ON	B AND I, B AND A, I AND A
START	B AND S, B AND I, I AND S, P AND G, P AND P
PROOF	P AND G, B AND I, P AND P

Figure 2—Ignition Switch Continuity Test

COLUMN-MOUNTED IGNITION SWITCH *Continued*

7. On a vehicle with a steering column-mounted gearshift lever, connect the switch plunger to the switch actuator rod (Fig. 1).

   On a vehicle with a floor- or console-mounted shift lever, position the hole in the end of the switch plunger to the hole in the actuator and install the connecting pin.

8. Position the switch on the column and install the retaining nuts, but do not tighten them.
9. Move the switch up and down along the column to locate the mid-position of rod lash, and then tighten the retaining nuts.
10. Remove the (plastic or substitute) locking pin, connect the battery cable, and check for proper start in PARK or NEUTRAL.
11. Attach the steering column to the brake support bracket and install the shrouding.

Switch Adjustment—Existing

This procedure applies only to an existing switch in the car, since a new switch comes pinned and pre-adjusted.

1. Perform steps 1, 2 and 3 of the foregoing procedure.
2. Move the shift lever into PARK (with automatic transmissions) or REVERSE (with manual transmissions), turn the key to LOCK position, and remove the key. This procedure holds the mechanical parts of the column in LOCK position.
3. Loosen the ignition switch retaining nuts.
4. Pull the switch plunger out as far as it will go, and then move it in one detent to LOCK position. Insert a 3/32-inch diameter wire or drill shank in the locking hole on top of the switch (Fig. 1). The switch is now pinned in LOCK position.
5. Perform steps 9, 10 and 11 of the foregoing procedure.

Lock Cylinder Removal and Installation

1. Disconnect the battery ground cable.
2. Fixed Steering Column Units—Remove the steering wheel trim pad and the steering wheel. Insert a wire pin in the hole located inside the column halfway down the lock cylinder housing (Fig. 3).

   Tilt Steering Column Units—Insert a wire pin in the hole located on the outside of the flange casting next to the emergency flasher button (Fig. 3).

3. Place the gear shift lever in PARK (with automatic transmissions) or REVERSE (with manual transmissions) position, and turn the lock cylinder with the ignition key to ON position.
4. Depress the wire pin while pulling up on the lock cylinder to remove. Remove the wire pin.
5. Insert the lock cylinder into its housing in the flange casting, and turn the key to OFF position. This action will extend the cylinder retaining pin into the cylinder housing.
6. Turn the key to check for correct operation in all positions.
7. On fixed column units, install the steering wheel and trim pad.
8. Connect the battery cable.

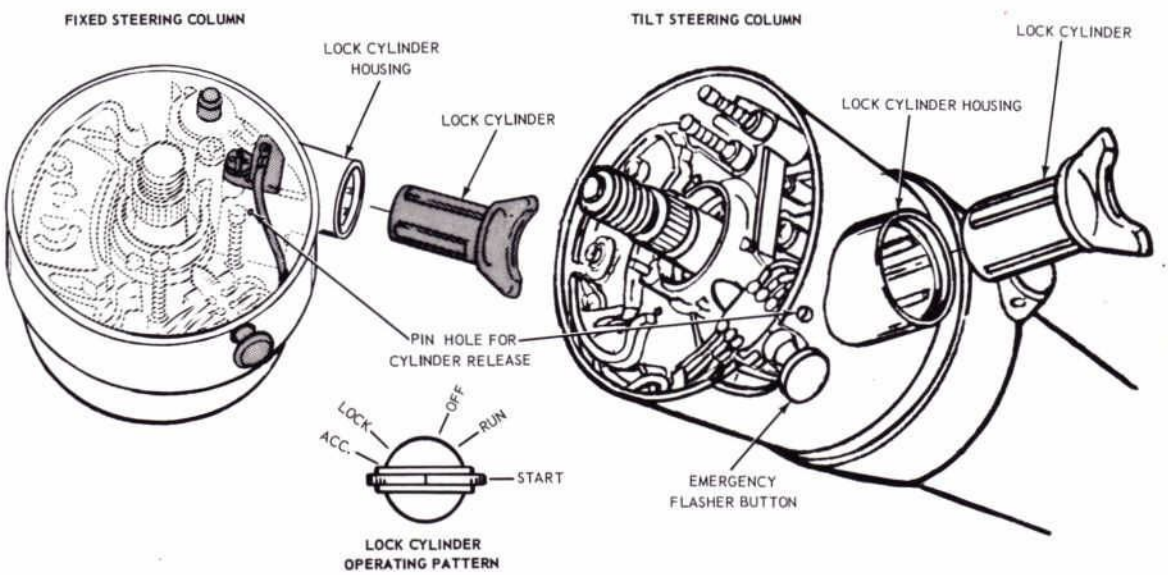
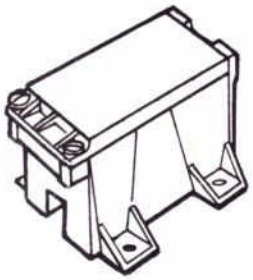


Figure 3—Lock Cylinder Removal and Installation



TESTING FORD'S NEW

APPLICATION CHART

	Automatic Transmission	Manual Transmission
Electronic Distributor Modulator	240, 302, 351 & 390 CID	351-CID 4V

DESCRIPTION AND OPERATION

1970 Ford Motor Company vehicles with the engine/transmission combinations shown in the above chart use a distributor modulator to help control engine hydrocarbon emissions. It does this by maintaining close control of distributor spark advance for more complete combustion.

The modulator electronically prevents spark advance below 23 (±2.3) mph on acceleration and below approximately 18 mph on deceleration. A temperature sensitive thermal switch cancels out control by the modulator when outside air temperature drops below 58°F. The distributor then operates through the standard vacuum control system.

The distributor modulator system consists of four components: a speed sensor; a thermal switch; an electronic control amplifier and a three-way solenoid valve (see Fig. 1). The control amplifier and solenoid assembly mounts inside the passenger compartment on the dash panel. The speed sensor connects to the speedometer cable. The thermal switch is mounted near the front door hinge pillar on the outside of the cowl, on either the right or left side.

SERVICE PROCEDURES

Adjustment

No adjustment to this system is possible.

Removal and Installation

Components can be removed or installed by referring to the disconnect points in Figure 2 for a typical V-8 engine. Six-cylinder engines are similar.

Assembly and Disassembly

If testing reveals a malfunctioning component, do not attempt to overhaul it. Replace damaged components as required for the system to operate properly.

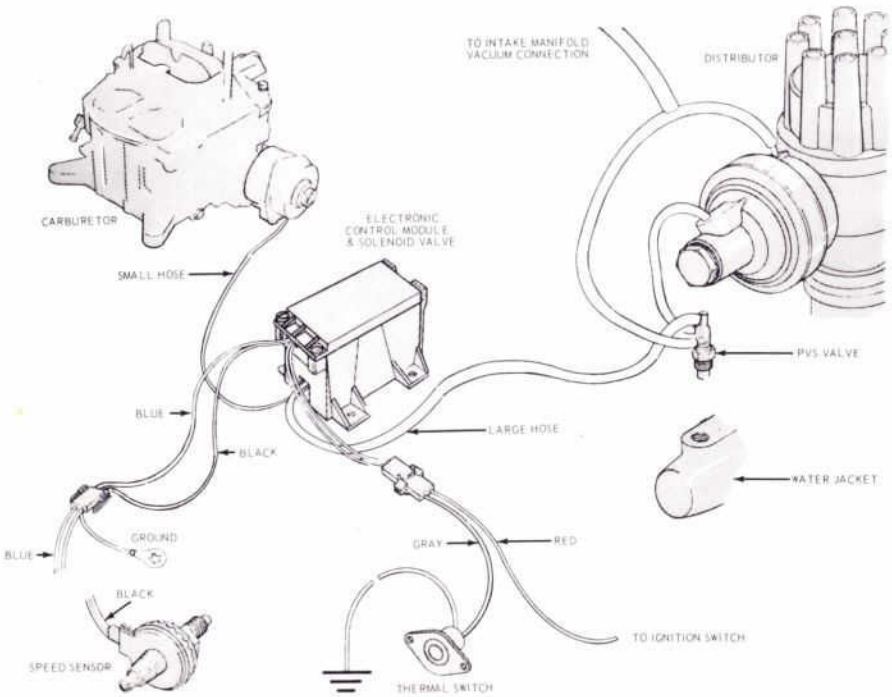


Figure 1—Distributor Modulator System—Schematic

ELECTRONIC DISTRIBUTOR MODULATOR

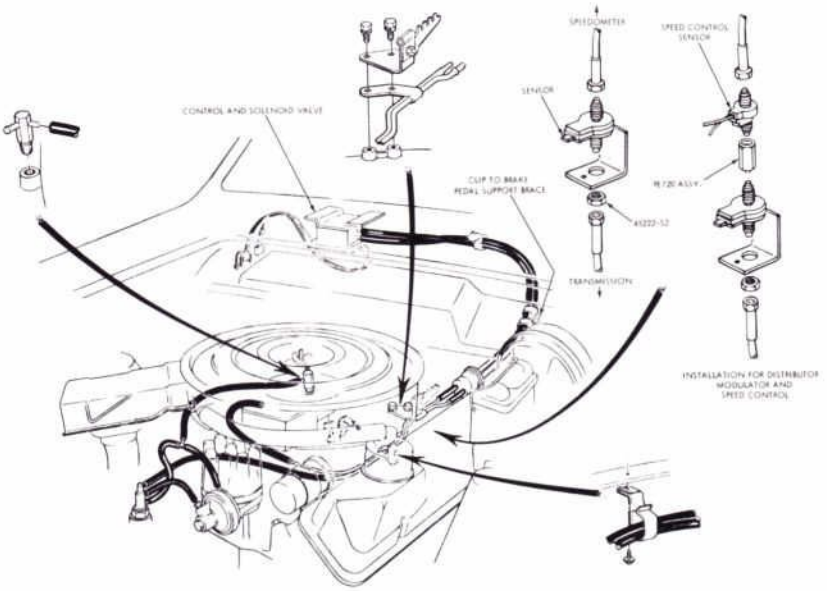


Figure 2–Distributor Modulator Disconnect Points

Testing

Excessive fuel consumption, loss of engine performance and a general road test symptom of retarded ignition may indicate a malfunctioning distributor modulator system. Check as follows:

1. Connect a vacuum gauge to the large hose connection of the electronic module.
2. Elevate the rear wheels of the vehicle.
3. Start the engine. With the transmission in neutral, the vacuum gauge should read zero.
4. With the transmission in gear, slowly accelerate to 30 mph.
5. Vacuum should cut in between 21 to 25 mph. Vacuum reading should be at least 6 inch Hg. at 25 mph.
6. Allow the vehicle to coast down from 25 to 15 mph. At some speed in this range the vacuum should drop to zero and remain there.
7. With the transmission in neutral and engine running, chill the thermal switch by evaporation, using an aerosol oil spray or similar device. Place the engine on fast idle –1500 rpm (approx.). There should be a vacuum reading.
   If unit checks out, no further checking is required. If not, proceed as follows:
8. Check supply voltage at the red wire of the quick disconnect (female end) with ignition switch in the ON position. Meter should read the battery voltage.
9. If meter reads zero, check the fuse and wiring from the ignition switch.
10. Check the thermal switch by disconnecting the yellow quick disconnect and inserting an ohmmeter from the gray wire of the quick disconnect (female end) to ground.
11. Place one hand on the thermal switch. Allow the thermal switch to warm up. The switch should now be open.
12. Chill the thermal switch. The switch should now be closed.
13. Replace the switch with a known good one if the switch is damaged.
14. Leave the plug disconnected and insert a jumper between the male and female plugs, connecting the two red wires together.
15. Connect a jumper from the gray wire of the male plug. Do not connect the other end of this wire to anything at this time.
16. Run the engine at fast idle–1500 rpm (approx.).
17. Connect a vacuum gauge at the carburetor spark port vacuum connection–record gauge reading.
18. Reconnect vacuum line to carburetor.
19. Connect a vacuum gauge at PVS connection (large hose connection) of solenoid valve.
20. Vacuum gauge should read 0 inch Hg.
21. Ground gray wire at thermal switch quick disconnect (switch is unhooked from circuit).
22. Gauge reading should be the same as in step 17.
23. Replace module if reading is incorrect in either step 20 or 22.
24. Remove jumper wire from thermal switch. Leave switch disconnected.
25. Put the vehicle on a hoist.
26. Run the vehicle (in gear) to 30 mph. Vacuum gauge should show a vacuum.
27. Check the speed sensor for continuity. Resistance of the speed sensor is 40-60 ohms (at room temperature). Also check the resistance of the speed sensor to ground. The resistance should be an open circuit.
28. Replace the speed sensor if meter reading is incorrect in step 27 and repeat step 26.
    If vacuum gauge still reads zero, replace the electronic module package. Tighten the nut on the speed sensor to 19-25 in.-lbs. to eliminate noise in the speedometer cable system.

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