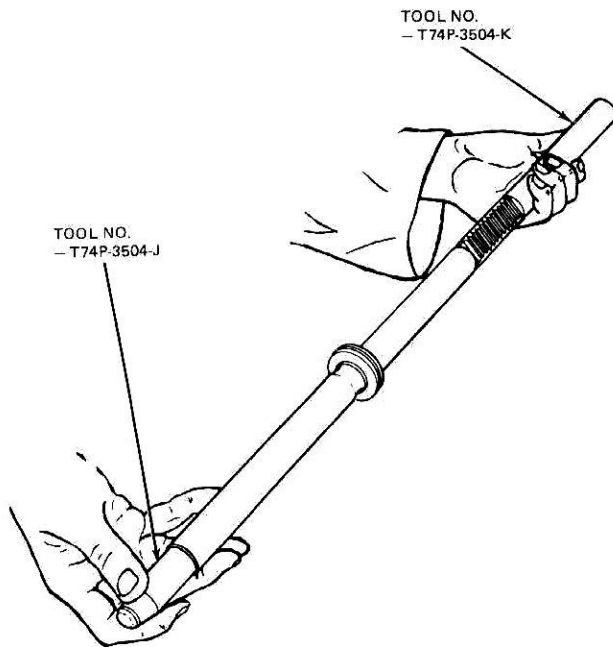
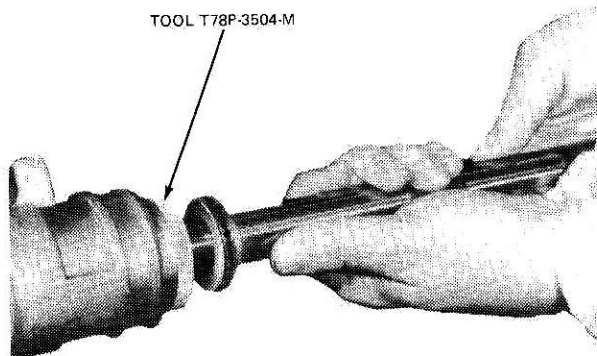




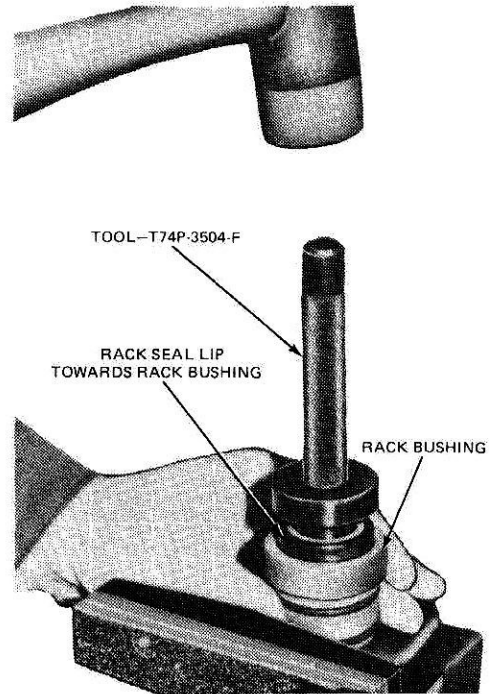
G2703-1A

FIG. 46 Installing Long and Short Protective Sleeve Tool



G2760-1A

FIG. 47 Installing Rack Into Gear Housing



G2761-1A

FIG. 48 Installing Rack Seal In Rack Bushing

14. Install the rod assemblies. Torque both tie rod ball joint nuts simultaneously to specification by holding one and turning the other (Fig. 9) as outlined earlier in the Tie Rod Section.
15. Install roll pins in ball joint nuts by lightly tapping with hammer until seated (Fig. 10).
16. Install the input shaft and valve assembly as outlined earlier in this part.
17. Fill yoke plug hole with 2 oz. specified lube. Insert plastic yoke, spring, plug and locknut. Adjust yoke bearing preload as outlined in the Adjustment portion of this part.
18. Install the external pressure lines, making sure the O-rings are good. Torque to specification.
19. Apply specified lube to under-cut in tie rods where the bellows clamp to the tie rods. This is required to keep the bellows from twisting during toe-in adjustment.
20. Install bellows and pressure equalizer tube. Install new clamps retaining the bellows to the gear housing. Use Tool T63P-9171-A to secure the clamps properly (Fig. 12).
21. Install clamps retaining the bellows to the tie rods.
22. Install jam nuts and tie rod ends on the tie rods.

DETROIT IRON
SPECIFICATIONS
SPECIFICATION CHART – RACK & PINION – FORD

Gear Ratio	20.1 on Center 14.2 at Stops
Number of Turns	3.05
Pinion, Rack Lubricant Capacity	23-27 Grams
Power Steering Fluid Capacity (Including Steering Pump)	2.5 Pints
Pinion, Rack and Pinion Bearing Lubricant	ESB-M1C119-A
Seal Lubricant (Cavity under Dust Seal)	ESA-M1C45-A
Power Steering Fluid (ATF)	C1AZ-19582-A, C, D
Effort Required to Initiate Proper Input Shaft Rotation (Power Cylinder drained and gear removed from Vehicle)	7-18 In-Lb
Tie Rod Articulation Effort (On Pull Scale)	1-6 Lbs.

CG2713-2A

TORQUE CHART – RACK & PINION – FORD

Torque	Ft-Lb	Torque	Ft-Lb
Pressure Line Fitting (Pump-to-Gear 1/2 Hex)	10-15	Yoke Plug Locknut	44-66
Return Line Fitting	10-15	Pressure Line Fittings at Valve	14-20
Gear-to-Crossmember Mounting Bolt Nut	80-100	Pressure Line Fittings at Power Cylinder (Gear Housing)	14-20
Tie Rod End-to-Spindle Arm Nut	35-47 ①	Pinion Bearing Locknut	23-34
Tie Rod End-to-Tie Rod Jam Nut	35-50	Pinion Bearing Plug	40-60
Steering Flex Coupling Bolt	20-30	Tie Rod Ball Socket Assembly to Rack	55-60

① Tighten to nearest cotter pin slot after torquing to specification.

CG2714-2A

Tool No.	Description	Tool No.	Description
T74P-3504-F	Outer Rack Oil Seal Replacer	T78P-3504-B	Valve Body Puller
T74P-3504-G	Plastic Ring Replacer	T78P-3504-K	Inner Rack Oil Seal Replacer
T74P-3504-J	Rack Seal Protecting Sleeve (Short)	T78P-3504-H	Pinion Housing Yoke Nut Wrench
T74P-3504-K	Rack Seal Protecting Sleeve (Long)	T78P-3504-G	Pinion Bearing Replacer
T74P-3504-R	Pinion Shaft Torque Adapter	T78P-3504-J	Rack Oil Seal Remover
T74P-3504-U	Pinion Housing Yoke Plug Nut Wrench	T78P-3504-C	Valve Body Insertion Tool
T74P-3504-Y	Spring Scale (0-10 Lbs.)	T78P-3504-D	Pinion Bearing & Seal Replacer
T50T-100-A	Slide Hammer	T78P-3504-M	Plastic Ring Sizing Tool
T57L-500-B	Bench Mount	T78P-3504-E	Pinion Seal Remover
T58L-101-A	Attachment	T78P-3504-N	Pin Remover
T71P-19703-C	O-Ring Remover	T63P-9171-A	Crimp Tool
T78P-3504-L	Rack Bushing Holding Tool	T75L-3517-A	Rotary Valve Tool Kit
T78P-3504-F	Pinion Seal Replacer		

CG2716-2A

Integral Power Rack and Pinion Steering Gear - TRW

PART
13-47

Applies To Mustang II/Pinto/Bobcat, Fairmont/Zephyr

SUBJECT	PAGE	SUBJECT	PAGE
ADJUSTMENTS	47-10	DISASSEMBLY AND ASSEMBLY (Cont'd.)	
DESCRIPTION	47-1	Valve and Valve Housing	47-14
DIAGNOSIS	47-5	OPERATION	47-5
DISASSEMBLY AND ASSEMBLY		REMOVAL AND INSTALLATION	
Gear Housing, Rack Yoke Bearing,		Steering Gear	47-13
Rack Assembly, Rack Bushing		Tie Rod Articulation Torque Check	47-13
and Oil Seals	47-19	Tie Rod Ends and Bellows	47-13
Tie Rod Ball Sockets	47-13	SPECIFICATIONS AND	
		SPECIAL TOOLS	47-29

CG2667-2A

DESCRIPTION

1978 TRW-built

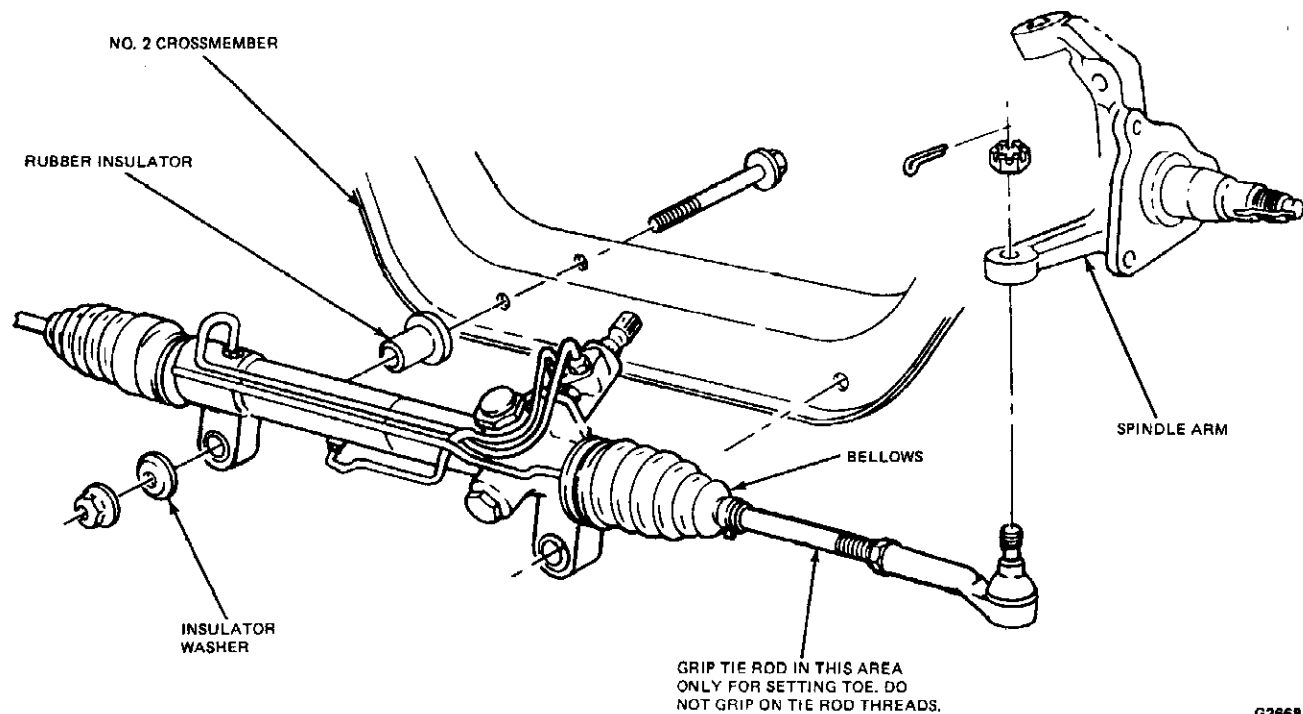
The integral power rack and pinion gear (Fig. 1) features:

- Variable ratio steering
- A new yoke and yoke adjuster plug
- Deletion of the tube bracket previously used.
- *Encapsulated tie rod and ball housing assembly* with spiral locking pin feature to eliminate the drilled pin previously used.
- Use of grease for gear and bearing lubrication in place of previously used oil.

The integral power rack and pinion steering gear is a hydraulic mechanical unit, which uses an integral piston and rack design to provide power assisted vehicle steering control.

Internal valving directs pump flow and controls pressure, as required, to reduce steering effort during operation.

The unit contains a rotary hydraulic fluid control valve integrated to the input shaft and a boost cylinder integrated with the rack (Fig. 2).

**FIG. 1 Power Steering Gear Installation—TRW**

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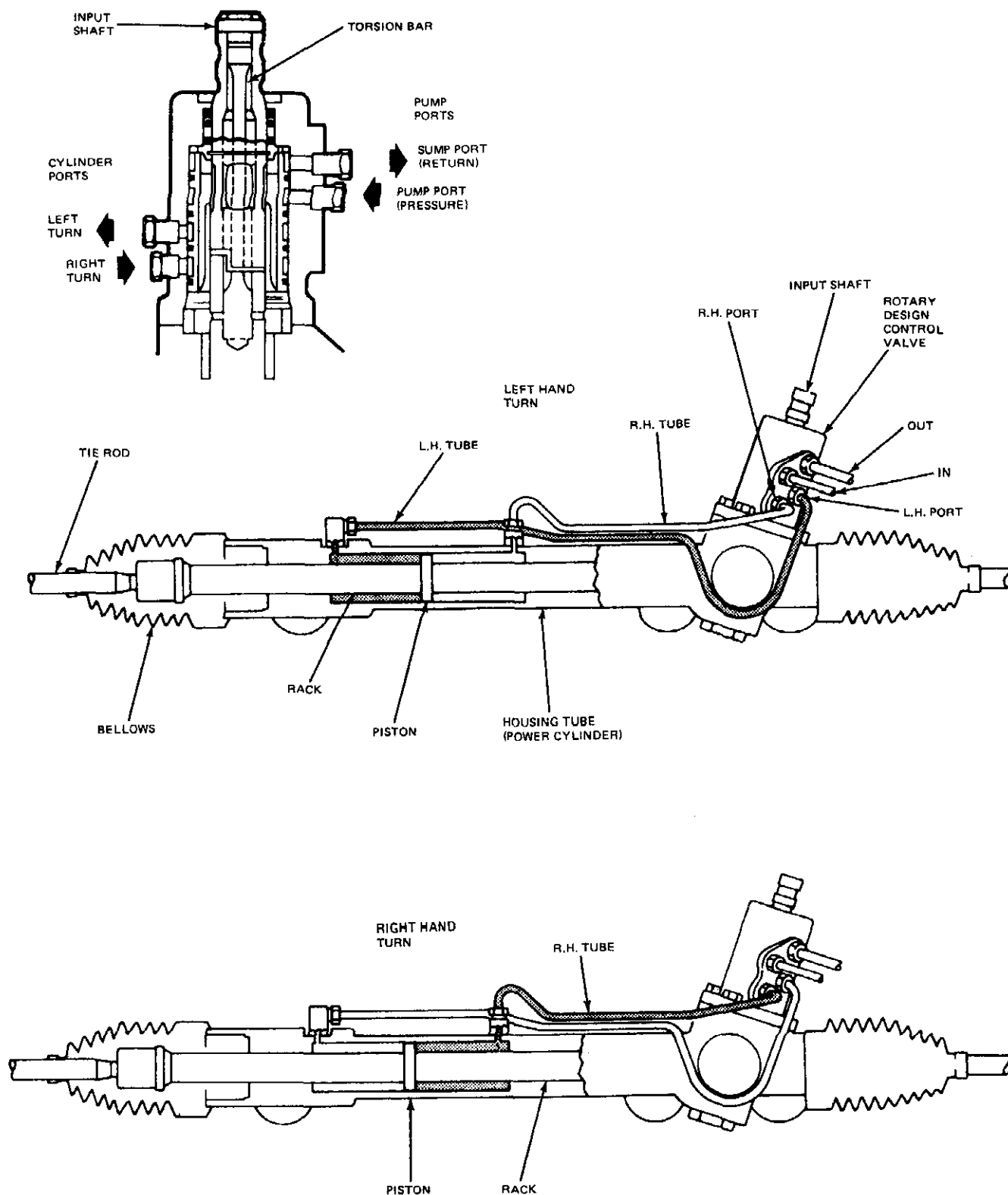


FIG. 2 Rack Movement and Oil Flow—TRW

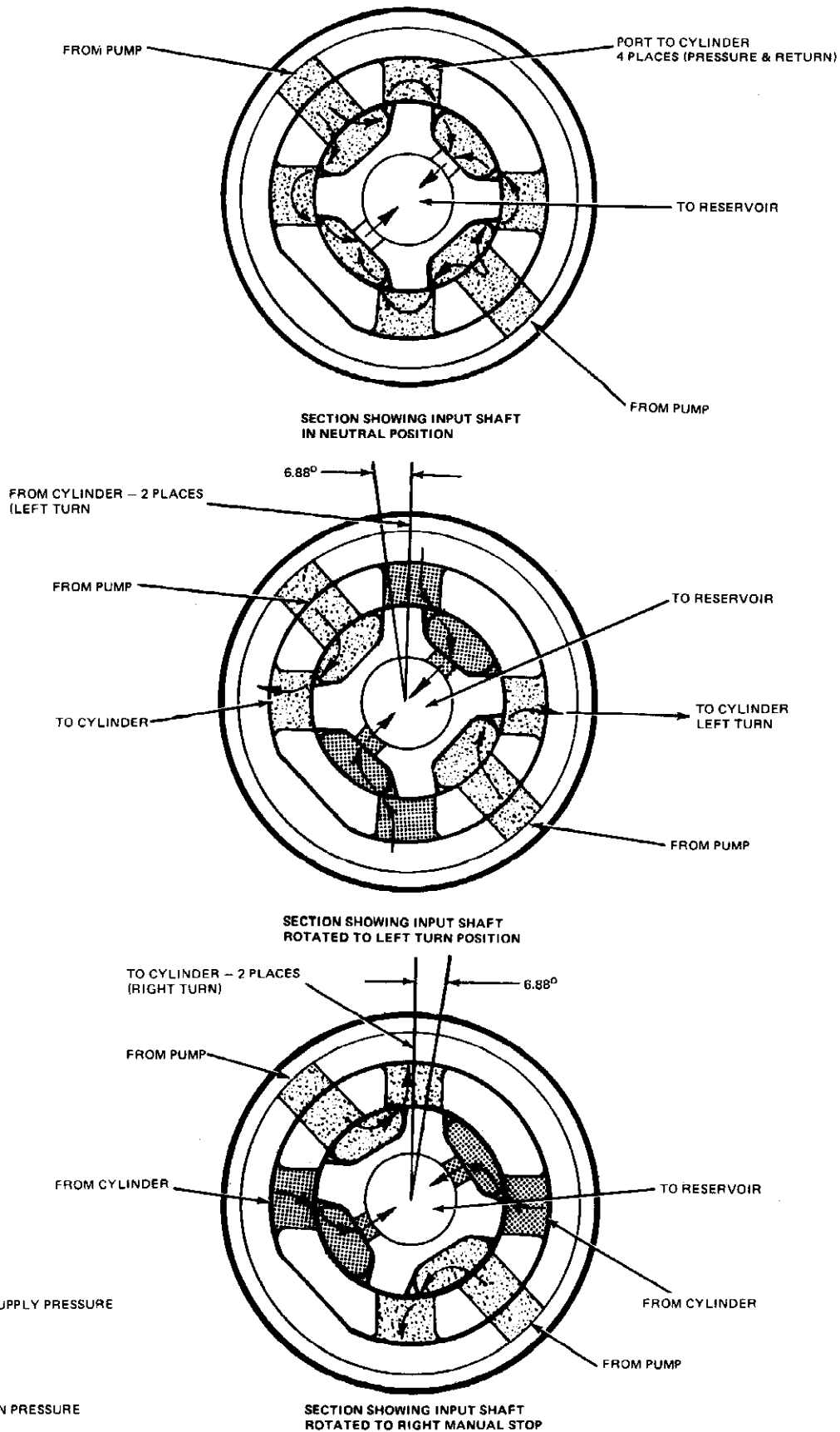


FIG. 3 Power Rack and Pinion Steering Gear Rotary Valve Operation—TRW

G2670-2A

OPERATION

ROTARY VALVE:

The rotary design control valve uses relative rotational motion of the input shaft and valve sleeve to direct fluid flow.

When the steering wheel is turned, resistance of the wheels and the weight of the vehicle cause a torsion bar to deflect. This deflection changes the position of the valve spool and sleeve ports, directing fluid under pressure to the appropriate end of the power cylinder. The difference in pressure forces on the piston helps move the rack to assist turning effort. The piston is attached directly to the rack, and the housing tube functions as the power cylinder. The oil in the opposite end of the power cylinder is forced to the control valve and back to the pump reservoir.

When the driver stops applying steering effort, the valve is forced back to a centered position by the torsion bar. When this occurs, pressure is equalized on both sides of the piston and the front wheels tend to return to a straight ahead position. Refer to illustration (Figs. 2 and 3) showing path of oil flow during turns.

DIAGNOSIS

Before any internal service is performed to the rack and pinion power steering, diagnosis must be performed. Make sure that tire size is correct with matched tires (front and rear) inflated to specifications. The following conditions, possible causes and resolutions will assist in performing proper repairs.

DIAGNOSIS GUIDE — TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● Front End Wander Front end wander is a condition that is noticed when the car is driven in a straight ahead position with the wheel held in a firm position, but the car wanders to either the right or left. Front end alignment should be checked before any gear service is made.	● Tie rod ball socket loose/worn. ● Gear housing loose on No. 2 crossmember. ● Loose Pins in the input shaft and valve assembly. ● Worn pinion bushing in gear housing. ● Loose pinion ball bearing. ● Worn right hand gear housing aluminum housing. ● Loose outer ball joints.	● Replace tie rod/ball socket assembly. ● Tighten mounting bolt nuts (2) to specification. ● Replace the input shaft and valve assembly. ● Replace gear housing. ● Replace pinion ball bearing. ● Replace aluminum bushing. ● Replace outer ball joints.

DIAGNOSIS GUIDE – TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● Feedback (Rattle, Chuckle, Knocking Noises in Steering Gear) Feedback is a condition that is noticed when a car is driven over rough pavement and this roughness is felt in the steering wheel by the driver. In addition, if the gear is not adjusted properly, excessive rattle, knocking and/or chuckle noises can be heard inside the car.	● Loose/worn tie rod ball socket. ● Tie rod thrust bearing broken or worn. ● Oversize pinion shaft bushing in the gear housing. ● Mounting bracket loose on gear housing tube. ● Gear housing loose on No. 2 crossmember. ● Worn rack bushing. ● Loose pinion bearing locknut. ● Loose pinion bearing plug. ● Loose yoke bearing. ● Broken yoke bearing spring. ● Loose yoke bearing plug. ● Deteriorated shock absorbers.	● Replace tie rod/ball socket assembly. ● Replace tie rod/ball socket assembly. ● Replace gear housing. ● Replace gear housing. ● Tighten mounting bolt nuts (2) to specifications. ● Replace rack bushing. ● Tighten pinion bearing locknut to specification. ● Tighten pinion bearing plug to specifications. ● Adjust yoke bearing preload to specifications. ● Replace yoke bearing spring. ● Adjust yoke bearing preload to specification. ● Replace shock absorbers.

DIAGNOSIS GUIDE – TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● Heavy Steering Efforts, Poor Assist A heavy effort and poor assist condition is recognized by the driver while turning corners and especially while parking. A road test can verify the condition.	● Loose valve housing bolts causing leakage. ● Leakage/loss of fluid due to leaking rack, pinion and/or input shaft seals. ● Low steering system fluid level. ● Loose rack piston. ● Bent rack assembly. ● Damaged/worn plastic piston O-ring. ● Loose/missing rubber backup piston O-ring. ● Undersize pinion shaft bushing in the gear housing. ● Rack bushing O-ring and/or rack seal leak. ● Valve assembly internal leakage. ● Valve plastic O-rings cut or twisted. ● Rack bushing locknut broken or backed out.	● Tighten valve housing bolts to specification. ● Replace rack seals, pinion seals, and/or input shaft seals. ● Add steering fluid to proper level. ● Replace rack and piston assembly. ● Replace rack and piston assembly. ● Replace plastic piston O-ring. ● Replace/install rubber backup piston O-ring. ● Replace gear housing. ● Replace O-ring and/or rack seal. ● Replace input shaft and valve assembly. ● Replace plastic O-rings. ● Replace rack bushing locknut or torque to specification.

DIAGNOSIS GUIDE — TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● Poor Returnability—Sticky Feeling Poor returnability is a condition that is noticed when the vehicle is in a turn and returns to center with effort from the driver. In addition, when the driver returns the steering wheel to center, it may have a sticky or catchy feel.	● Yoke bearing plug too loose or too tight. ● Binding in valve assembly. ● Bent gear housing tube. ● Broken gear housing. ● Damaged/failed input shaft support bearing. ● Loose/broken valve housing bolts. ● Damaged/failed pinion bearing. ● Loose pinion bearing locknut. ● Misaligned steering column. ● Excessive lash in tie rod ends. ● Binding or looseness in tie rod ball joints. ● Deformed engine mounts (results in damage to the steering gear). ● Bent or broken No. 2 crossmember.	● Adjust yoke bearing preload to specification. ● Replace input shaft and valve assembly. ● Replace gear housing. ● Replace gear housing. ● Replace input shaft support bearing. ● Torque valve housing bolts to specifications/replace. ● Replace pinion bearing. ● Torque locknut to specifications. ● Align steering column. ● Replace as required. ● Replace as required. ● Inspect and replace as required. ● Inspect and replace as required.

DIAGNOSIS GUIDE — TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● Loss of Power Assist When loss of power assist occurs, heavy steering effort is required by the driver to steer the car.	● Piston disengaged from rack or improper depth of piston ring groove. ● Gear housing oil seal leak. ● <i>Damaged gear housing tube.</i> ● Valve rings cut, twisted. ● Rack piston ring cut, twisted. ● Input shaft oil seal failure. ● Rack bushing locknut cracked. ● Leakage from pump hose fittings.	● Replace rack assembly. ● Replace gear housing oil seals. ● <i>Replace gear housing.</i> ● Replace valve rings. ● Replace rack piston ring. ● Replace input shaft oil seal. ● Replace rack bushing locknut. ● Tighten hose fittings to specification (10-15 lbs.) and check for crossed/or stripped threads. CAUTION: Do not overtighten hose fitting. It is normal for the hose to be free to swivel in the fitting on 1978 pumps. Excessive torque may result in damage to the tube nut.

DIAGNOSIS GUIDE — TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● External Leakage One of the most common conditions causing repeat service is fluid leaks. Make sure you clean off the steering gear first before any steering gear external leakage checks are performed.	● O-rings, in the following areas, out or missing: Pressure cylinder joint next to rivets. Rack Bushing. ● Oil seals damaged or improperly installed: Valve housing. Rack. Input shaft dust. ● Rack bellows twisted, cut, clamps missing, clamps loose or damaged. ● Pressure line or flare gasket failures only or Pressure fittings not torqued properly, cross threaded or damaged.	● Replace O-rings as necessary. Gear housing must be replaced for L.H. inner O-ring failure (joint next to rivets). ● Replace oil seals as required. ● Repair, replace as required. ● Torque to specifications or replace pressure lines, seats and flare gaskets as required. NOTE: Fairmont/Zephyr use "quick connect" fittings on the gear. Refer to last item under "Loss of Power Assist" Condition listed previously.

CG2671-2A5

DIAGNOSIS GUIDE — TRW INTEGRAL POWER RACK AND PINION STEERING GEAR

COMPLAINT	POSSIBLE CAUSE	RESOLUTION
● Hissing Sound There is some noise in all power steering systems. One of the most common is a hissing sound most evident at standstill parking. There is no relationship between this noise and the performance of the steering gear.	● "Hiss" may be expected when the steering wheel is at the end of travel or when turning it at standstill.	● Hiss is a normal characteristic of rotary valve steering gears and in no way affects steering. Do not replace the input shaft and valve assembly unless the hiss is extremely objectionable. A replacement valve will also exhibit a slight noise and is not always a cure for the condition. Investigate for a grounded column or a loose boot at the dash panel. Any metal to metal contacts will transmit valve hiss into the passenger compartment through the steering column. Verify clearance between flexible coupling components. Be sure steering column shaft and gear are aligned so flexible coupling rotates in a flat plane and is not distorted as shaft rotates.

CG2671-2A6

ADJUSTMENTS

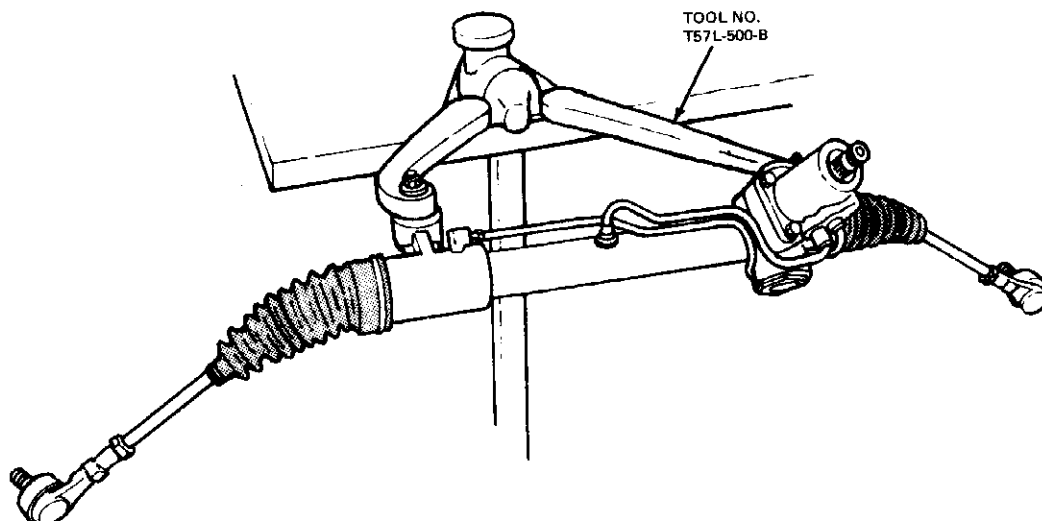
The power rack and pinion steering gear provides for only one service adjustment. The gear must be removed from the vehicle to perform this adjustment.

RACK YOKE BEARING PRELOAD:

1. Clean the exterior of the steering gear thoroughly.

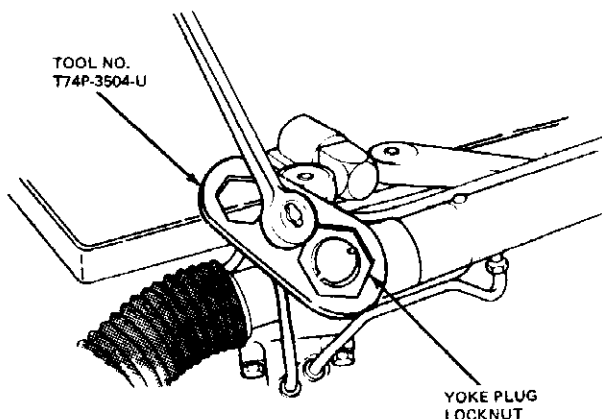
2. Remove the power steering fluid from the power cylinder by removing the external pressure line assemblies from the gear, and draining the fluid out through the openings.
3. Install two long bolts and washers through the bushings, and attach to the bench mounted holding fixture (Tool No. T57L-500-B) (Fig. 4).
4. Insert a in-lb torque wrench (max. capacity 30 to 60 in-lbs) into the input shaft torque adapter, T74P-3504-R. Position the adapter and wrench on the input shaft splines.
5. Loosen the yoke plug locknut with wrench T74P-3504-U (Fig. 5).
6. Insert the Rack Bushing Lockring Tool, T77P-3504-A, with a in-lb torque wrench into the slots in the yoke plug (Fig. 6).
7. With the rack at the center of travel, tighten the yoke plug until a reading of 45-50 in-lbs is observed on the torque wrench. If the threads of the yoke plug are dirty or corroded, clean them prior to torquing to prevent a false reading.
8. Back off the yoke plug (maximum of 45 degrees) until the torque required to initiate and sustain rotation of the input shaft is 7-15 in-lbs. Input torque should be checked with the gear in a horizontal position so that the weight of the rack doesn't affect the torque reading.
9. Place the yoke plug locknut wrench, T74P-3504-U, on the yoke plug locknut. While holding the yoke plug firmly with wrench, torque the locknut to specification. **No** movement of the yoke plug is to be allowed during this torquing operation, or the preload will be affected. Recheck input shaft torque after tightening locknut.
10. Remove all tools from the gear and reinstall the external pressure line assemblies. Torque the fittings to specifications.

NOTE: Make sure the copper flare gaskets are replaced and in place when reinstalling the external pressure lines.



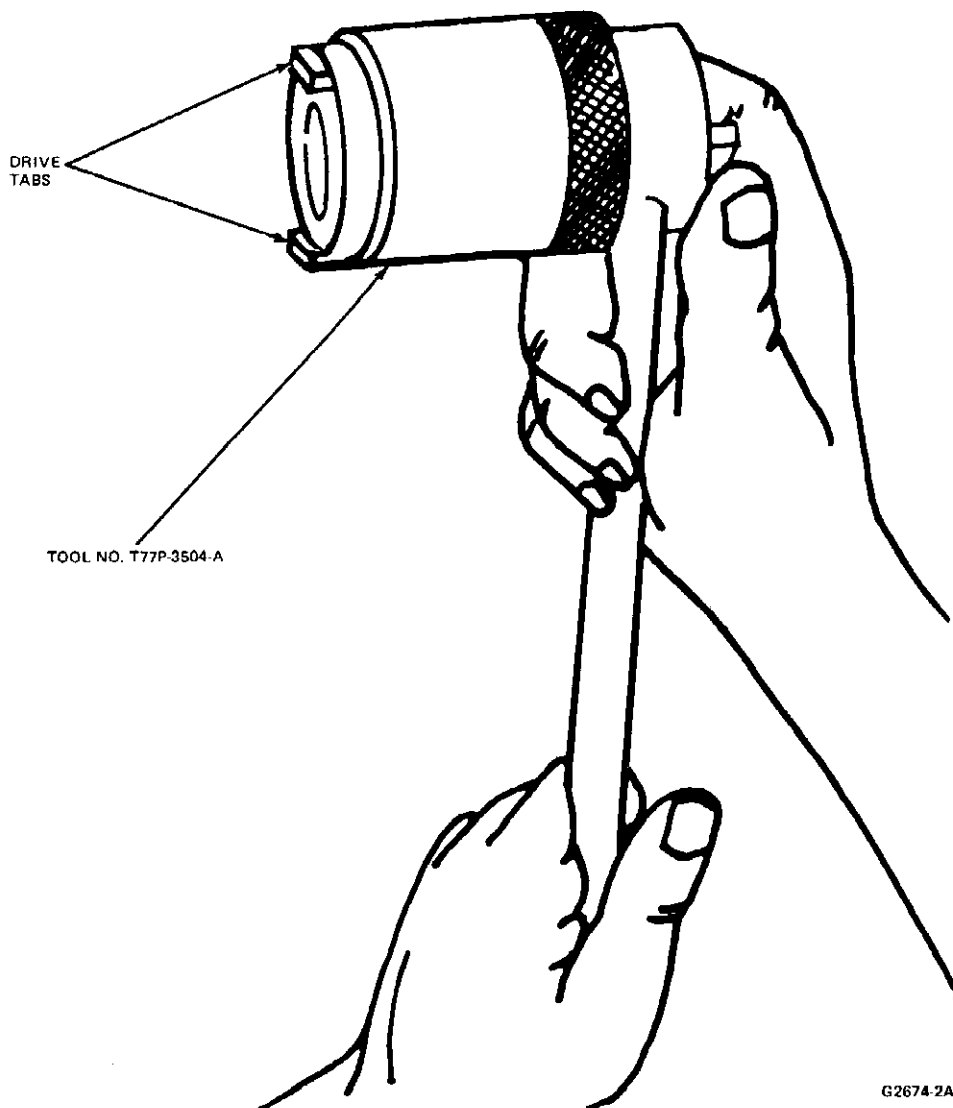
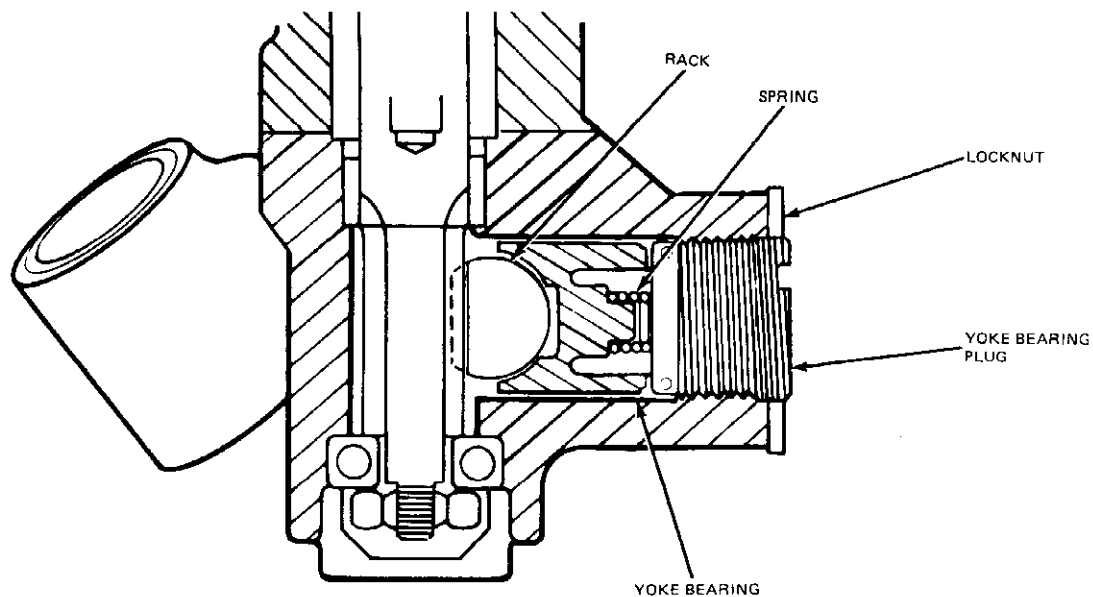
G2672-2A

FIG. 4 Gear Mounted in Bench Holding Fixture



G2673-1A

FIG. 5 Loosening/Tightening Yoke Plug Locknut

**FIG. 6 Loosening or Adjusting Yoke Bearing Plug**

REMOVAL AND INSTALLATION

STEERING GEAR

Removal:

1. Disconnect the negative battery cable from the battery.
2. Remove the one bolt retaining the flexible coupling to the input shaft.
3. Leave the ignition key in the ON position and raise the vehicle on a hoist.
4. Remove the two tie rod end retaining cotter pins and nuts. Separate the studs from the spindle arms, using the ball joint separator tool.
5. On Mustang II only, remove the 2A crossmember behind the No. 2 crossmember to allow removal of steering gear attaching bolts. Support the steering gear and remove the two nuts, insulator washers and bolts retaining the steering gear to the No. 2 crossmember. Lower the gear slightly to permit easier access to the pressure and return line fittings. Refer to Fig. 1 for illustration.
6. Remove the clip attaching the power steering hose to the gear line. Disconnect the pressure and return lines from the steering gear valve housing. Plug the lines and ports in the valve housing to prevent entry of dirt.
7. Remove the steering gear assembly from the vehicle.

Installation:

1. Support the steering gear and position it so the pressure and return line fittings can be connected to the valve housing. Torque the fittings to specification. On Fairmont/Zephyr, hose swivel is normal when torqued to specification. Do not overtighten hoses.
2. Install the clip attaching the power steering hose to the gear line.
3. Insert the input shaft into the flexible coupling and position the steering gear to the No. 2 crossmember. Install the two bolts, insulator washers and nuts and torque the nuts to specification. On Mustang II only, install 2A crossmember.
4. Connect the tie rod ends to the spindle arms and install the two retaining nuts. Torque the nuts to specifications and install the two cotter pins.
5. Lower the vehicle and install the one bolt retaining the flexible coupling to the input shaft. Torque the bolt to specification.
6. Turn the ignition key to the OFF position.
7. Connect the negative battery cable to the battery.
8. Remove the coil wire. Fill the power steering pump reservoir and, while engaging the starter, cycle the steering wheel to distribute the fluid. Check the fluid level and add as required. Install the coil wire, start the engine and cycle the steering wheel. Check for fluid leaks.
9. Check the wheel alignment and reset toe if necessary. Before setting the toe, be sure to remove small bellows clamp to avoid bellows twisting and possible damage. Replace clamp after toe

adjustment has been made. Do not grip tie rod in area of threads. See Fig. 1 for illustration.

10. Inspect gear for twisted bellows and improperly installed clamps. Correct as necessary.

TIE ROD ENDS AND BELLOWES

In-Chassis Bellows Removal:

1. Remove the tie rod outer end retaining cotter pin and nut. Separate the stud from the spindle arm, using the joint separator tool.
2. To avoid resetting the toe, mark the position of the tie rod and locknut with tape or paint as shown in Fig. 7. Remove the tie rod end and locknut and check the tie rod for nicks and burrs. Clean the tie rod of rust and dirt to ensure that no damage will occur to the new bellows.
3. Both clamps of the defective bellows are then removed followed by the removal of the bellows.

Installation:

1. Install the bellows and insert the breather tube. Install new clamps on the bellows and position as shown in Fig. 8. Use Tool No. T63P-9171-A to crimp the large clamp (Fig. 9). Note that no bellow fluid is required for the 1978 gear.
2. Install the tie rod end and locknut, loosely, to the original position on the tie rod. Attach the tie rod end to the spindle and torque the tie rod locknut to specification. If necessary to reset the toe, remove the small clamp to avoid twisting and damaging the bellows. Replace clamp after toe adjustment.

TIE ROD ARTICULATION TORQUE CHECK

The tie rod articulation effort can be measured with the gear on or off the vehicle. Disconnect the tie rod end from the wheel spindle and place the hook of the pull scale (Tool No. T74P-3504-Y) through the hole in the threaded area of the ball joint. The effort to move the tie rod, measured on the scale should be within 1 to 6 lbs. (Refer to Fig. 10). If the effort exceeds specification, then the tie rod/ball socket assembly must be replaced because the torque cannot be adjusted.

Caution: Make sure the new tie rod is the same length as the original tie rod.

DISASSEMBLY AND ASSEMBLY

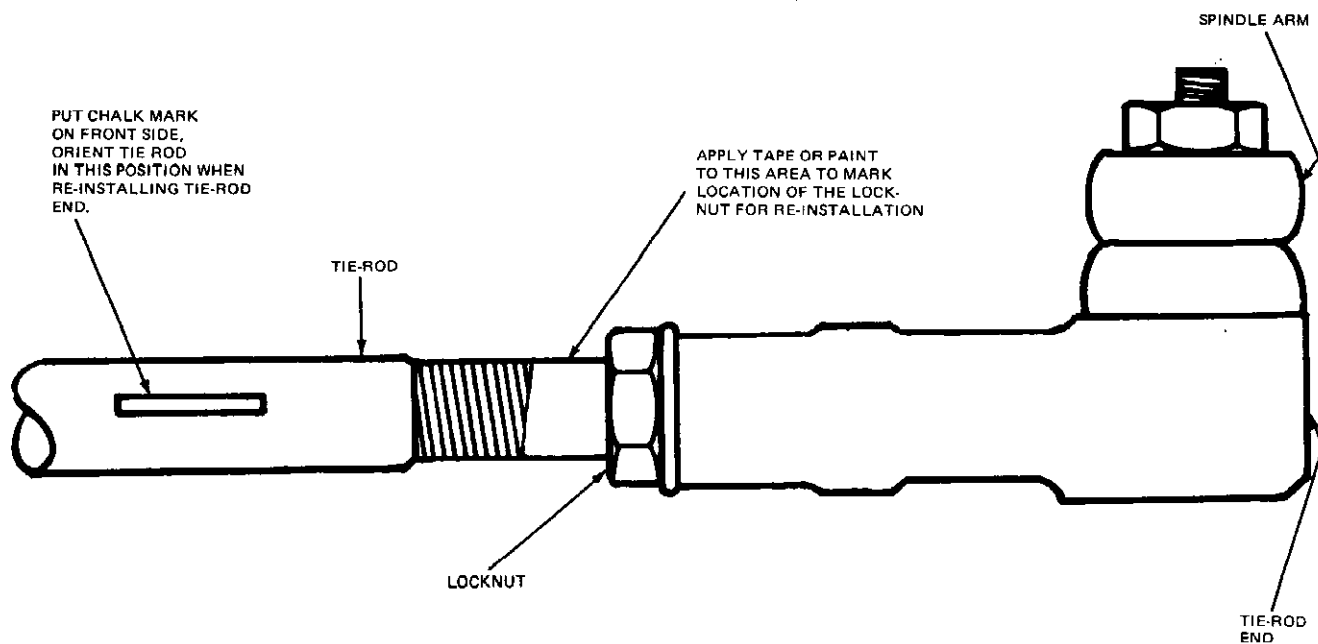
Other than the tie rod ends and bellows, all disassembly must be performed with the gear removed from the vehicle. Fig. 11 shows a breakdown of the 1978 TRW power rack and pinion steering gear.

TIE ROD BALL SOCKETS:

Removal

1. Locate steering gear in bench mounted holding fixture, Tool No. T57L-500-B, shown in Fig. 4.
2. Remove tie rod outer ends and locknuts.
3. Remove bellow clamps, bellows and breather tube. Use care so as to not damage the bellows. Discard the clamps.

BELLOWS REMOVAL — IN CHASSIS



G2762-2A

FIG. 7 Marking Tie Rod to Maintain Toe Adjustment

- Using a left-hand threaded easy-out tool, remove the spiral pin which locks each tie rod socket to the rack. Save the pins for reinstallation. Refer to Fig. 12 for pin and socket removal.
- Socket removal requires the usage of Tool No. T74P-3504-U and a torque wrench for the socket; and a crescent wrench to restrain the rack from rotating (see Fig. 12). If the rack is not held, then the rack teeth and/or pinion teeth can be damaged, resulting in additional repairs. Retain the tie rod assemblies for reinstallation unless the articulation torque was not within specification.

Installation

- Install and tighten tie rod ball sockets on rack until sockets are hand tight. Use a crescent wrench to restrain the rack from rotating, while torquing the left socket to 50-75 ft-lbs, using Tool No. T74P-3504-U and a torque wrench. Note that if the rack is not restrained from rotating, then the rack teeth and/or pinion teeth can be damaged, resulting in additional repairs (see Fig. 12). If new tie rods are used, make certain the length is the same as the original tie rods.
- Install the left spiral pin using pliers and a small hammer. The flared head must be oriented away from the hole to install the pin properly.
- Restrain the left tie rod ball socket while torquing the right socket to specification.
- Install the right pin in the socket.
- NOTE: This new tie rod/ball socket is not to be used for past model service.**
- Install the bellows and the breather tube. Install new clamps (Figs. 8 and 9), retaining the bellows to the gear housing. Use existing Tool, T63P-9171-A, to secure the clamps properly.
- Install the tie rod ends and lock nuts on the outer end of the tie rods.

VALVE AND VALVE HOUSING**Removal and Disassembly:**

- Thoroughly clean the areas of the input shaft, valve housing, yoke locknut and plug, and the pinion bearing plug.
- Mount the gear in the bench mounted holding fixture, Tool No. T57L-500-B, attaching the gear as previously outlined.
- Remove the external pressure lines from the valve and the gear housing. Remove the four small flare gaskets from the ports.
- Loosen the yoke plug locknut and the yoke plug to relieve the preload on the rack. (Illustrated in Figs. 5 and 6.)
- Remove the pinion bearing plug, using a 1 1/8" socket.
- Install the pinion shaft torque Tool, T74P-3504-R, on the input shaft. Hold the input shaft and remove the pinion bearing locknut with a suitable 11/16" socket (Fig. 13). Discard the locknut.
- Remove the three bolts and washers retaining the valve housing to the gear housing.
- Move the rack to the left stop (rack teeth exposed). With a file or chalk, mark the relative position of

the flat (blocked tooth) on the input shaft splines to the valve housing face (Fig. 14). It is important that when subsequent assembly of the input shaft is made, that the flat (blocked tooth) be aligned in the same position.

9. The valve housing cannot be removed as a single component because of the new pinion seal design. To service the valve housing, valve assembly or the pinion seal, the complete valve housing and valve assembly must be removed as a unit. **Note that the pinion bearing locknut must be removed before attempting to remove the valve housing.**
10. Carefully work the valve housing and valve assembly as a unit, out and away from the gear assembly.
11. Hand-hold the removed unit by the valve housing and using a nonmetallic hammer, tap the input shaft to remove assembly. Refer to Fig. 15 for an

illustration of pinion seal and valve assembly removal. Discard the oil pinion seal and any other damaged or worn parts. Fig. 16 shows the disassembled components.

12. Remove the pinion bearing from the gear housing with slide hammer T50T-100-A, and attachment Tool No. T58L-101-A (Fig. 17). Note that the bearing to gear housing O-ring seal has been deleted beginning with the 1978 model gear.
13. The only serviceable components of the input shaft and valve assembly are the four plastic O-rings. Remove the O-rings with O-ring remover, Tool No. T71P-19703-C, taking care not to damage the lands and grooves (Fig. 18).
14. Using the slide hammer, T50T-100-A, and attachment Tool T58L-101-A, remove the input shaft support bearing from its bore in the valve housing (Fig. 19). Remove the input shaft oil seal from the same bore with the fingers.

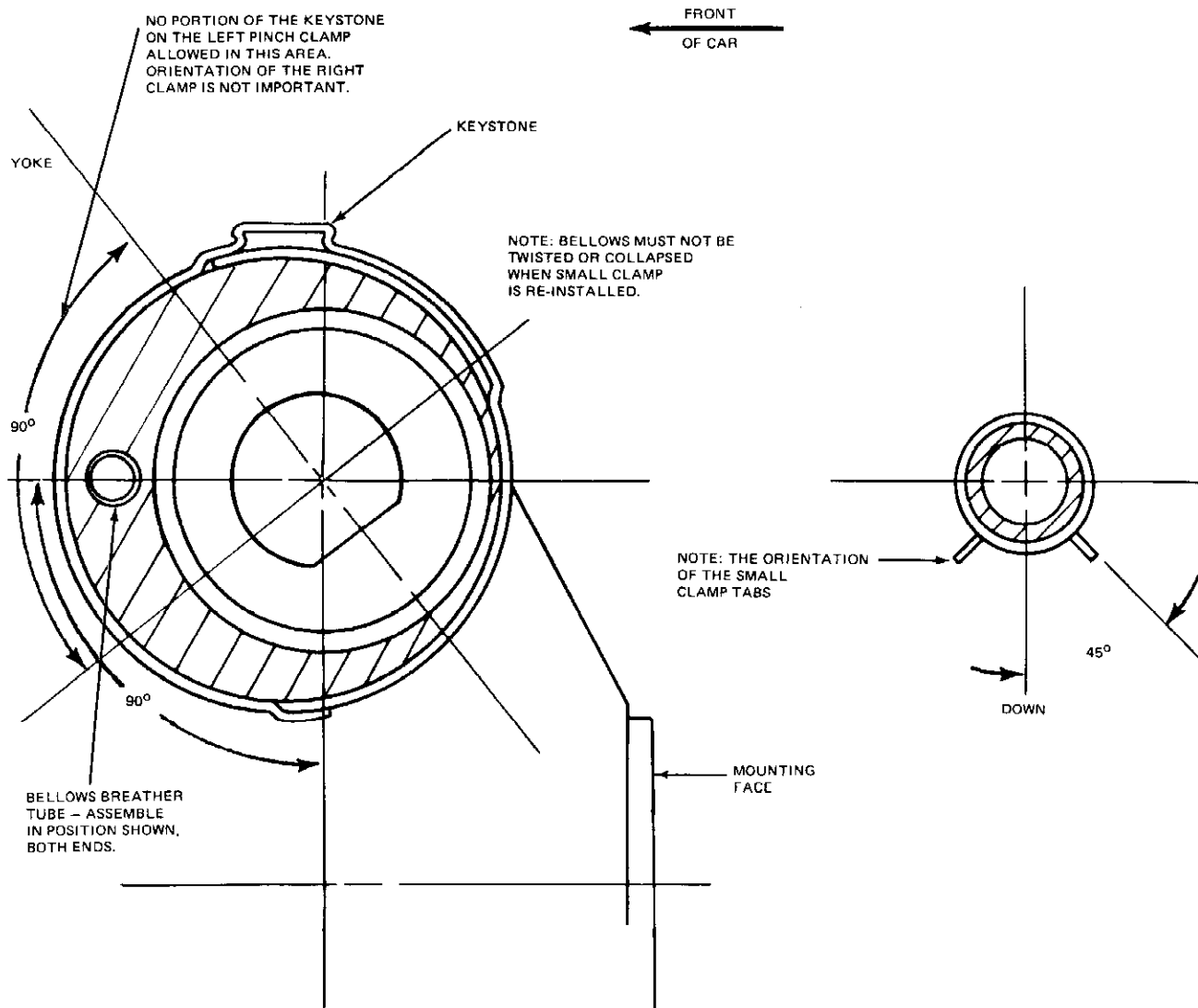
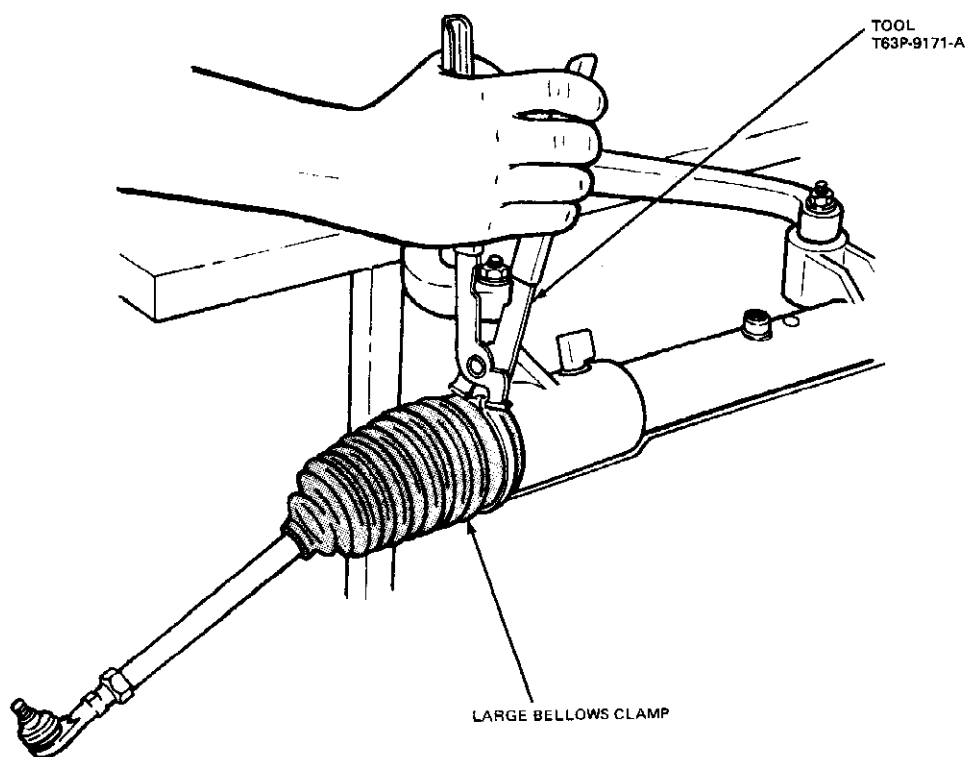
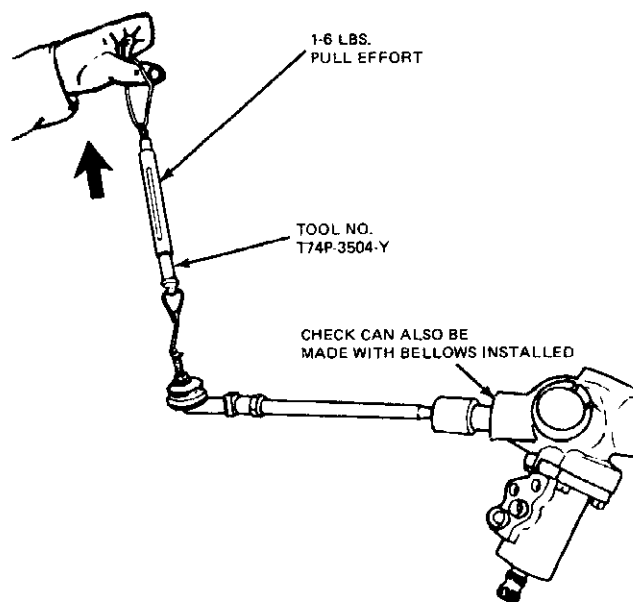


FIG. 8 Bellows and Clamp Orientation



G2676-2A

FIG. 9 Installing Large Bellows Clamps



G2677-1A

FIG. 10 Checking Articulation Effort

15. Pry the input shaft dust seal out of the valve housing with a small sharp chisel. Prevent damage to any of the surfaces on the valve housing.

Assembly and Installation:

1. Install the input shaft oil seal in the valve housing, pressing it in firmly with a finger. The seal must be installed with the lip facing the inside of the housing (refer to Fig. 20 and 21). The seal must bottom in its bore to avoid contact with the input shaft support bearing.
2. Fill the input shaft dust seal bore in the valve housing with ESA-M1C45-A or equivalent lubricant. Install the dust seal with replacer Tool, T74P-3504-N (Fig. 22).
3. Lubricate the input shaft support bearing with power steering fluid and install it in the valve housing with input shaft bearing replacer T74P-3504-P. The tool will control the installation depth of the bearing to avoid contact with the oil seal (Fig. 23).
4. Install the four plastic O-rings in the grooves on the valve assembly. Using plastic ring replacer T74P-3504-G, start the O-rings onto the valve. With O-ring remover T71P-19703-C, carefully work the O-rings into the grooves. The last O-ring will snap into the outboard groove directly off the O-ring installer (Fig. 24).
5. Lubricate the thrust washer with power steering fluid and install over the input shaft. Refer to Fig. 16 for illustration.

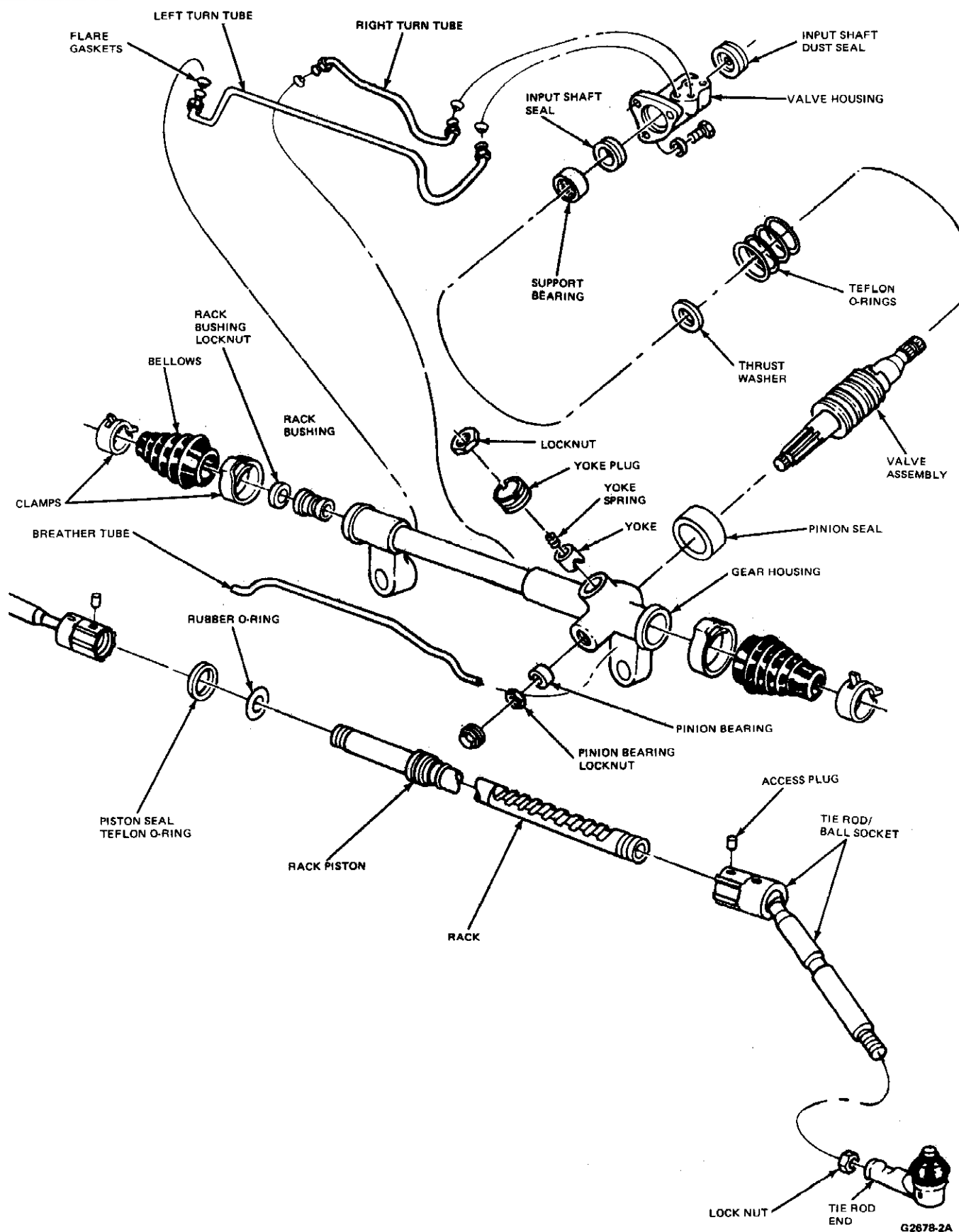
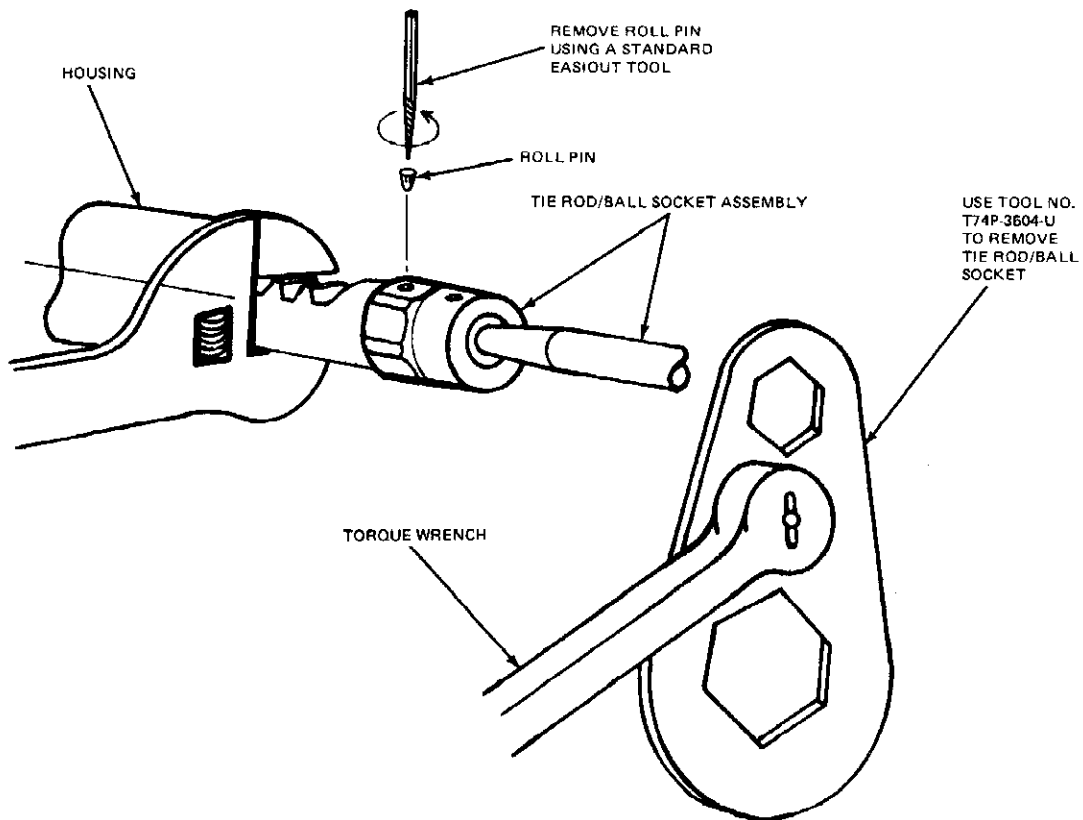


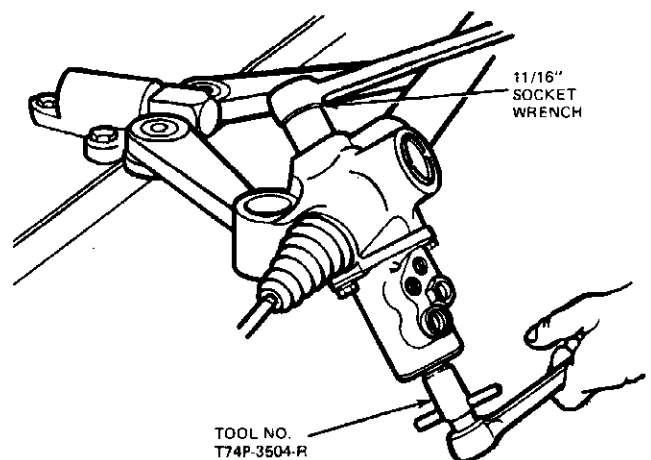
FIG. 11 TRW Power Rack and Pinion Exploded View



G2679-2A

FIG. 12 Removing/Installing Tie Rod Ball Housing

6. Lubricate the O-rings and valve liberally with power steering fluid. Insert the assembly, splined end first, into the larger opening of the plastic ring sizing Tool, T74P-3504-H. Position the unit over the valve bore of the housing (Fig. 25). Push the unit through until it bottoms and the full spline passes through the dust seal. Remove the sizing tool.
7. Carefully place the pinion seal on the pinion shaft and slide the seal on the shaft until it contacts the valve housing as shown in Fig. 26. Note that the cup shape of the pinion seal must face toward the valve housing with the seal lip outermost from the valve housing. Note that the valve housing O-ring has been deleted beginning with the 1978 model gear.
8. Install the pinion bearing in the lower gear housing, through the plug bore with the pinion bearing replacer, Tool No. T78P-3504-G (Fig. 27). Note that the bearing O-ring seal has been deleted beginning with the 1978 model gear.



G2680-1A

FIG. 13 Installing/Removing Pinion Bearing Locknut

9. Prior to installing the valve and valve housing, apply grease lubricant (ESA-M1C45-A or equivalent) to the pinion bushing, pinion bearing, and to the pinion teeth.
10. Move the rack to the left stop (rack teeth exposed). Install the valve and valve housing assembly in the gear housing bore. The flat (blocked tooth) on the input shaft splines must be in the same relative position with the file or chalk mark that was noted before disassembly.
11. Install the three bolts and washers retaining the valve housing to the gear housing and tighten until finger tight. Using a wrench, tighten each bolt one turn at a time in rotation until the pinion seal is fully seated and the valve housing retaining bolts are torqued to specification.
12. Install the pinion shaft torque adapter, T74P-3504-R, on the input shaft splines.
13. Install the pinion bearing locknut on the pinion shaft. While hooding the input shaft, torque the locknut to specifications (Fig. 13). The rack should be away from the stop during this operation.
14. Install the pinion bearing plug using a torque wrench with a 1 1/8" socket. Torque the plug to specification. Note that no plug staking is required beginning with the 1978 model gear.
15. Install new flare gaskets in the line fittings on both gear housing and control valve housing except on the two P.S. pump hose fittings on Fairmont/Zephyr which are quick connect. Install pressure lines and torque to specification.
16. Install the yoke plug locknut. Prior to torquing the locknut, set the rack yoke bearing preload, as

outlined in the Adjustment portion of this procedure.

GEAR HOUSING, RACK YOKE BEARING, RACK ASSEMBLY, RACK BUSHING AND OIL SEALS

Disassembly:

1. Remove the tie rod and socket assemblies from both ends of the rack, and the input shaft and valve assembly as previously outlined in this procedure.
2. Remove the yoke plug locknut with Tool No. T74P-3504-U. Remove the yoke plug with Tool No. T77P-3504-A. Remove the yoke spring and the yoke bearing from the gear housing (Refer to Figs. 28 and 6).
3. Working from the right side of the gear (opposite pinion end), push the rack in until it bottoms.
4. Insert rack bushing locknut Tool No. T74P-3504-B over the exposed end of the rack and into the housing bore. Position the tool so that the two drive tabs engage the slots in the rack bushing locknut and remove the locknut (Fig. 29).
5. Slowly pull the rack out of the right side of the housing until the rack piston contacts the aluminum rack bushing. Apply pulling effort (do not hammer) on the rack until the bushing is withdrawn from the housing. Remove the rack from the housing.
6. To remove the internal high pressure rack oil seal, insert the seal remover, Tool No. T74P-3504-C, into the housing until it bottoms (Fig. 30). Activate the expander with a wrench, as shown in Fig. 31 until the expander fully tightens. Remove the tool and the oil seal from the housing, with slide hammer

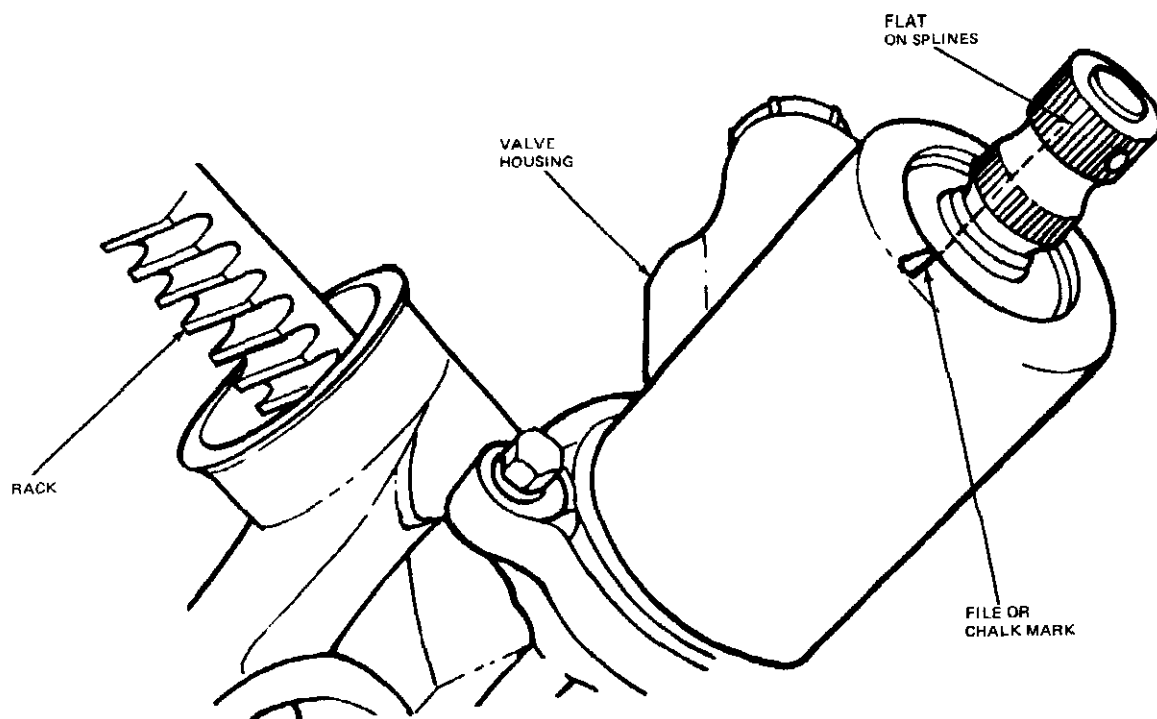
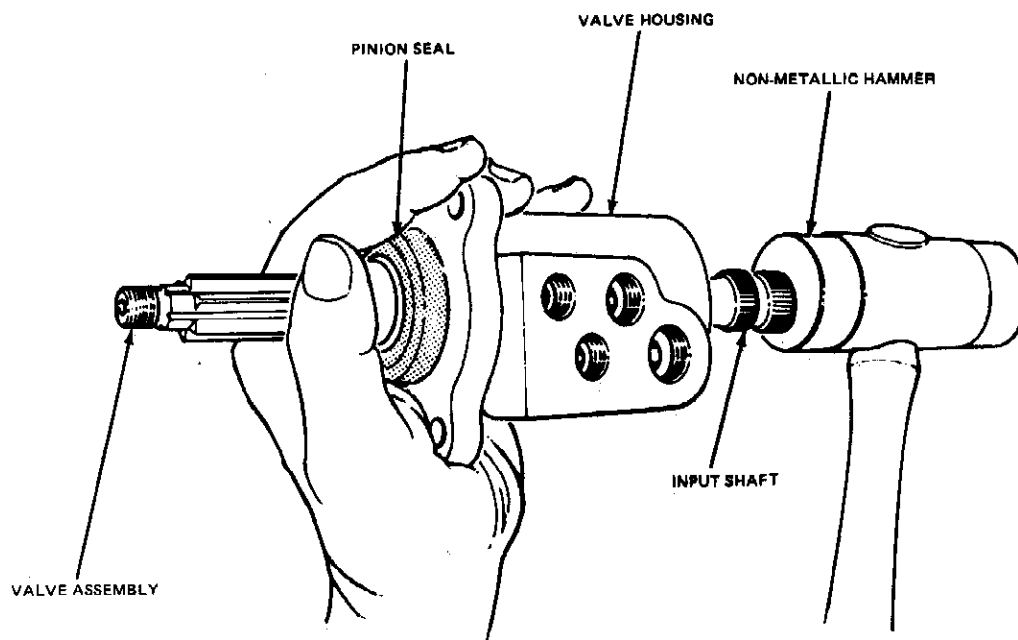
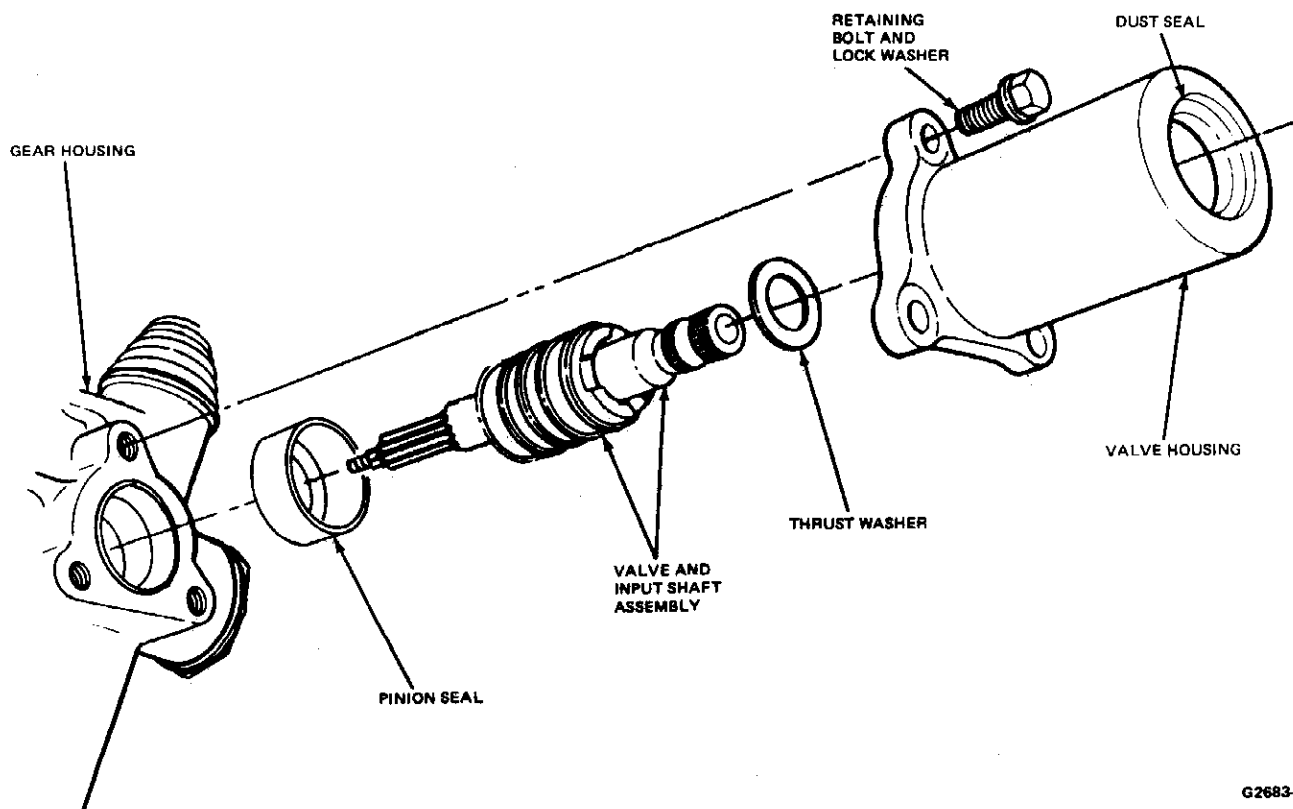


FIG. 14 Marking Input Shaft Position



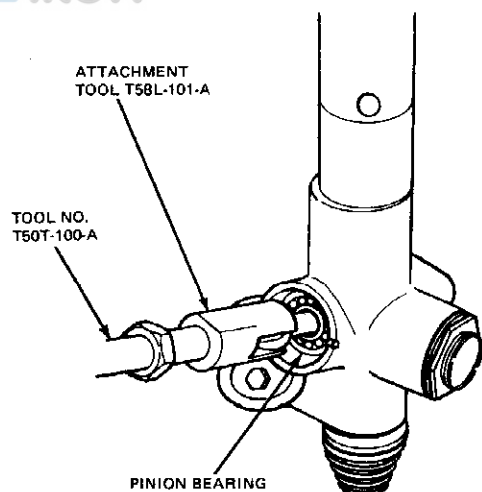
G2682-2A

FIG. 15 Removing Valve Assembly From Valve Housing



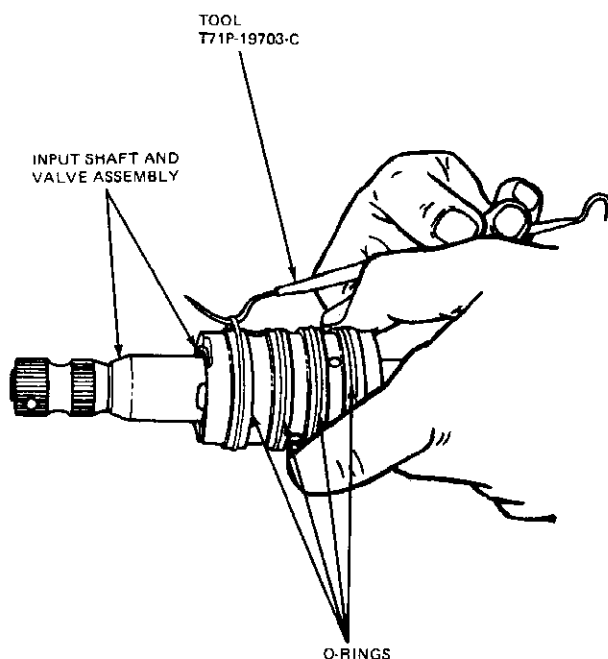
G2683-2A

FIG. 16 Valve Housing Disassembled



G2684-1A

FIG. 17 Removing Pinion Bearing

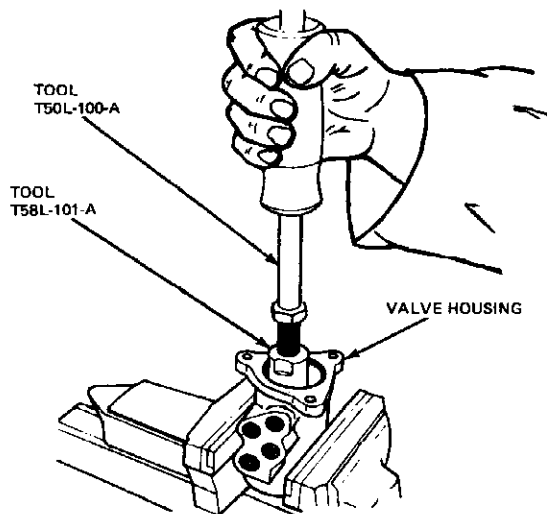


G2685-1A

FIG. 18 Removing Plastic O-Rings

T50T-100-A threaded into the expander end (Fig. 32). Discard the seal.

7. Remove the plastic O-ring and the rubber O-ring from the rack piston.
8. Remove the rack bushing oil seal by placing the bushing in holding Tool T74P-3504-E, and in a vise. Remove the oil seal with rack oil seal remover T74P-3504-C, and slide hammer T50T-100-A (Fig. 33). Remove the rubber O-ring from the bushing.



G2686-1A

FIG. 19 Removing Input Shaft Support Bearing

Assembly

1. Place a high pressure oil seal on the inner rack oil seal replacer, T74P-3504-D, with the lip spring facing the tool (Fig. 34). With the gear housing in a vertical position, insert the replacer into the right side bore of housing (Fig. 34). Tap on the handle of the tool until the seal bottoms. Do not cock the handle during this operation.

NOTE: If the replacer Tool, T74P-3504-D, binds in the area of the left turn pressure port, align the flat on the tool with the pressure port. (A scribe mark on the tool handle aids in aligning the flat with the pressure port). A slight undersize condition at the pressure port may cause the binding condition.

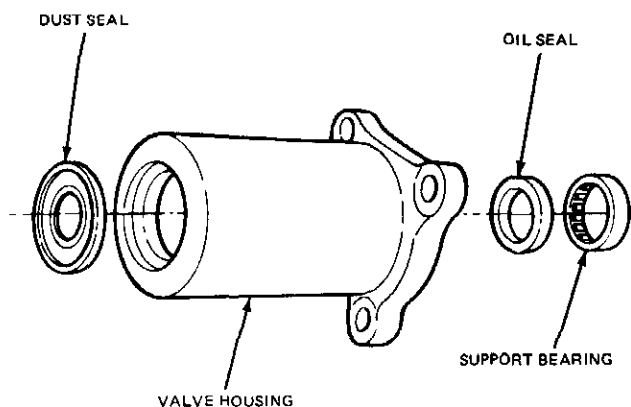
2. Install the rubber O-ring in the groove of the rack piston.
3. Place a plastic O-ring on replacer Tool No. T74P-3504-G. Slide the tool and O-ring on the rack until it is adjacent to the piston. Slide the plastic O-ring off the tool into the piston groove over the rubber O-ring (Fig. 35).
4. Apply grease lubricant (ESA-M1C45-A or equivalent) to rack teeth and to the rack surface that contacts the long protective sleeve.
5. Place the long protecting sleeve, Tool No. T74P-3504-K, over the rack gear teeth (Fig. 36). This is required to protect the internal oil seal from the rack teeth.
6. Thread the short protecting sleeve, Tool No. T74P-3504-J, over the threads on the right side of the rack (Fig. 35).
7. Lubricate the plastic O-ring and the protective sleeve with power steering fluid.
8. Install the larger end of sizing Tool No. T74P-3504-H onto the rack tooth end of the rack. Carefully position the sizing tool so that it compresses the plastic O-ring properly (see Fig. 37).
9. Place the rack, gear tooth end first, into the housing and carefully push the rack into the housing until

the leading end engages the internal oil seal properly. Position the sizing tool against the housing so that the plastic O-ring is accurately aligned with the housing bore (Fig. 37). Push the rack in until the long protective sleeve protrudes from the left side of the gear. Remove the sizing tool and the long protective sleeve from the end of the rack. Place a ball housing socket on the left end of the rack to prevent the rack from damaging the internal oil seal (Fig. 38).

10. Install the rubber O-ring on the aluminum rack bushing.
11. With outer rack oil seal replacer, T74P-3504-F, install the high pressure oil seal in the rack bushing. The lip spring must face the inside of the bushing (Fig. 39).
12. Lubricate the short protective sleeve on the rack end, and the rubber O-ring on the rack bushing with power steering fluid.
13. Start the bushing, seal facing out, on the rack. Pass the bushing and seal over the protective sleeve and into the housing bore until the locknut threads in the housing bore are visible (Fig. 40). Remove the protective sleeve.

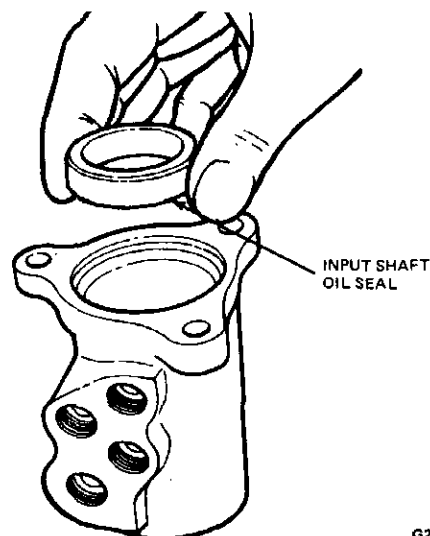
14. Place the rack bushing locknut over the rack and start it into the threads in the housing bore.
15. Insert rack bushing locknut wrench Tool T74P-3504-B, over the exposed end of the rack and into the housing bore (Fig. 30). Engage the tool drive tabs in the slots on the locknut and torque to specification.
16. Install the tie rod ball socket assemblies as outlined earlier in this procedure.
17. Install the input shaft and valve assembly as outlined earlier in this procedure. Install the pinion bearing plug.
18. Install the yoke bearing, spring, plug, and locknut. Prior to torquing the locknut, set the rack yoke bearing preload as outlined in the Adjustment portion of this procedure.
19. Install the bellows as outlined earlier in this procedure.
20. Install tie rod ends as outlined earlier in this procedure.

NOTE: Impact tools must not be used during any of the preceding operations.



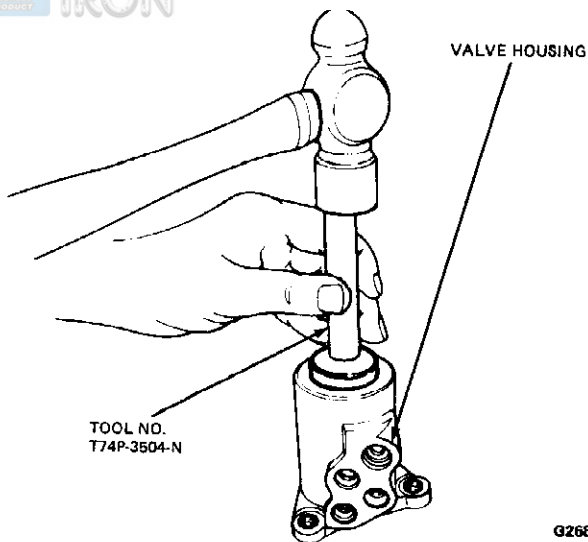
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FIG. 20 Seals and Bearing Removed



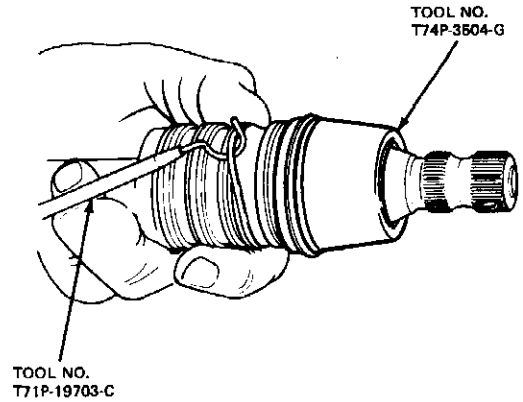
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FIG. 21 Installing Input Shaft Oil Seal



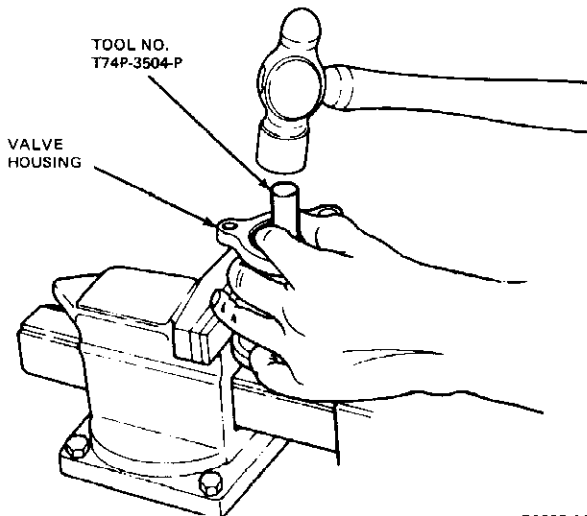
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FIG. 22 Installing Input Shaft Dust Seal



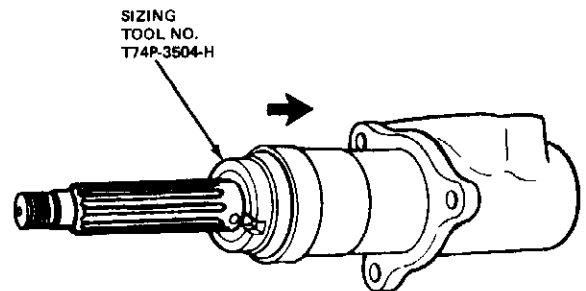
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FIG. 24 Installing Plastic O-Rings



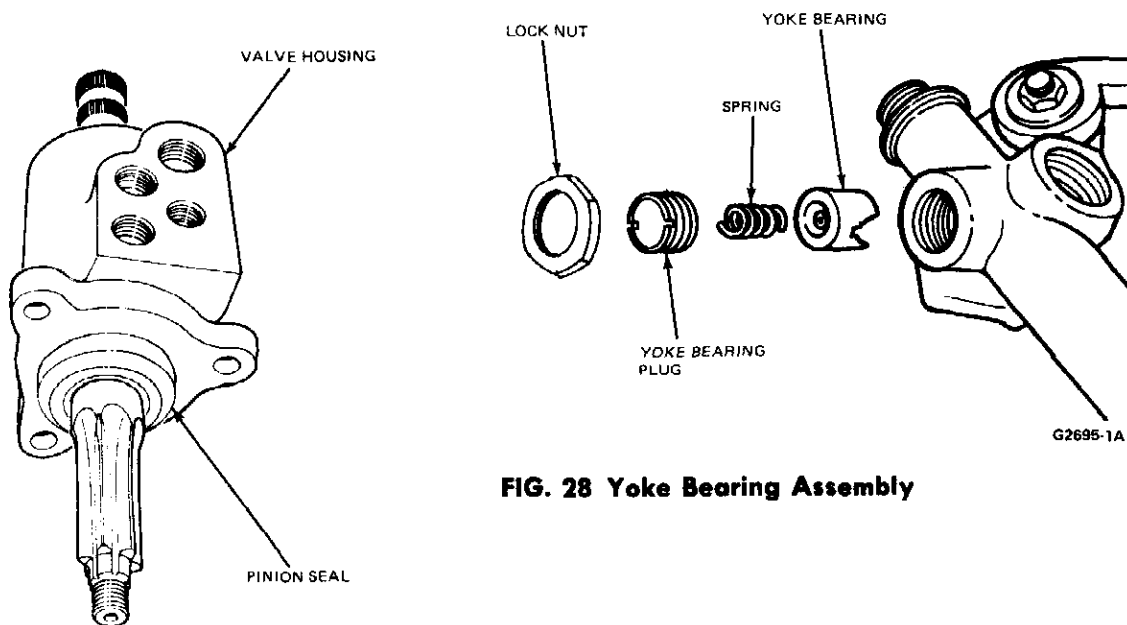
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FIG. 23 Installing Input Shaft Support Bearing

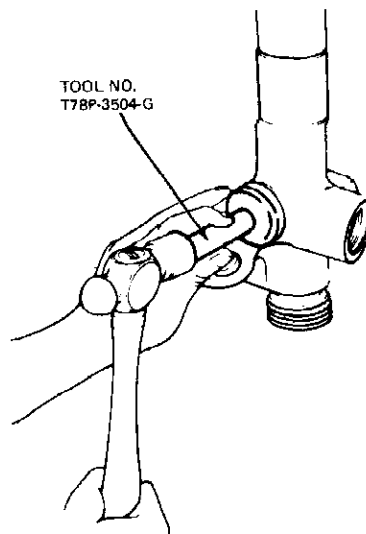


G2692-1A

FIG. 25 Installing Valve Assembly into Valve Housing

**FIG. 28 Yoke Bearing Assembly**

G2693-1A

FIG. 26 Installation of Pinion Seal

G2694-1A

FIG. 27 Installing Lower Pinion Bearing

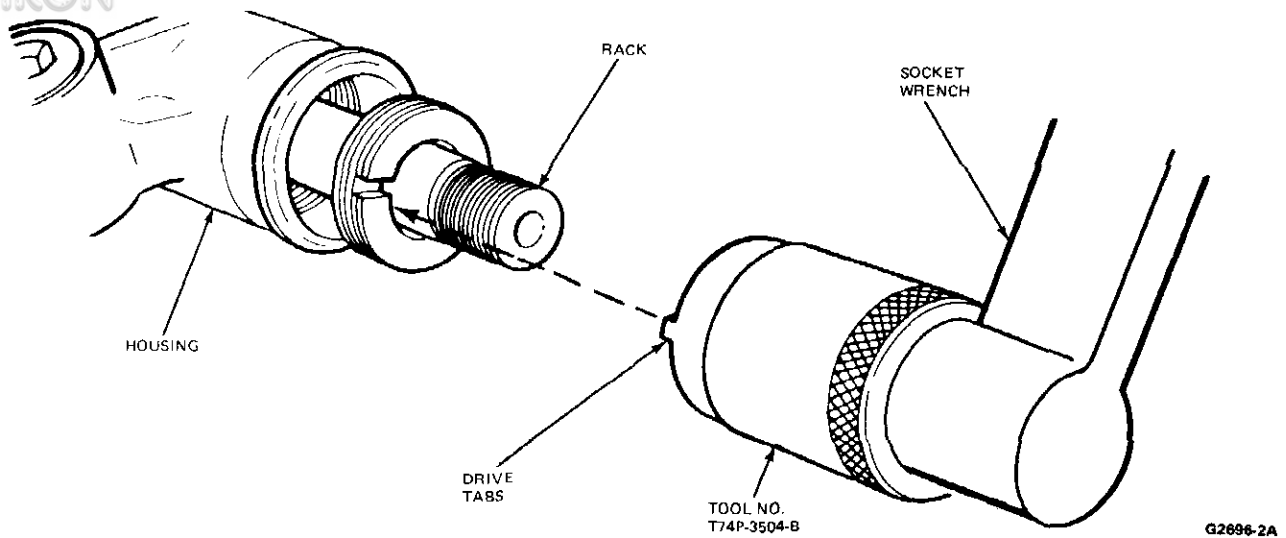


FIG. 29 Removing Rack Bushing Lockring

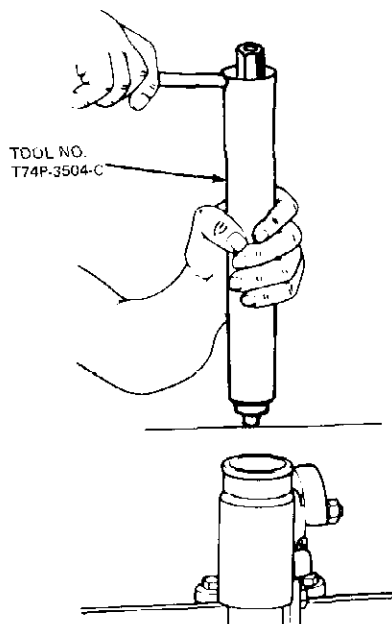


FIG. 30 Inserting Inner Rack Oil Seal Remover

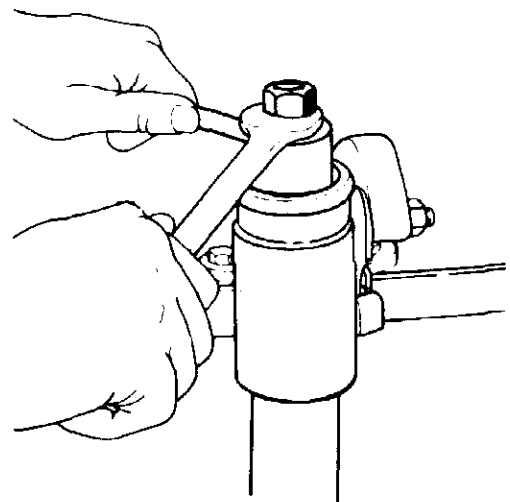


FIG. 31 Activating Expander of Inner Rack Oil Seal Remover

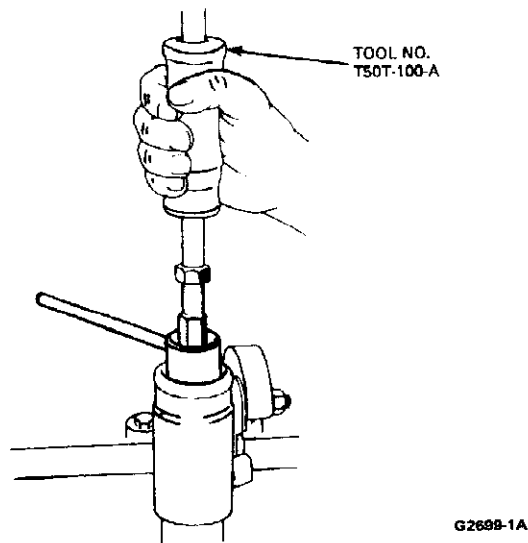


FIG. 32 Removing Inner Rack Oil Seal

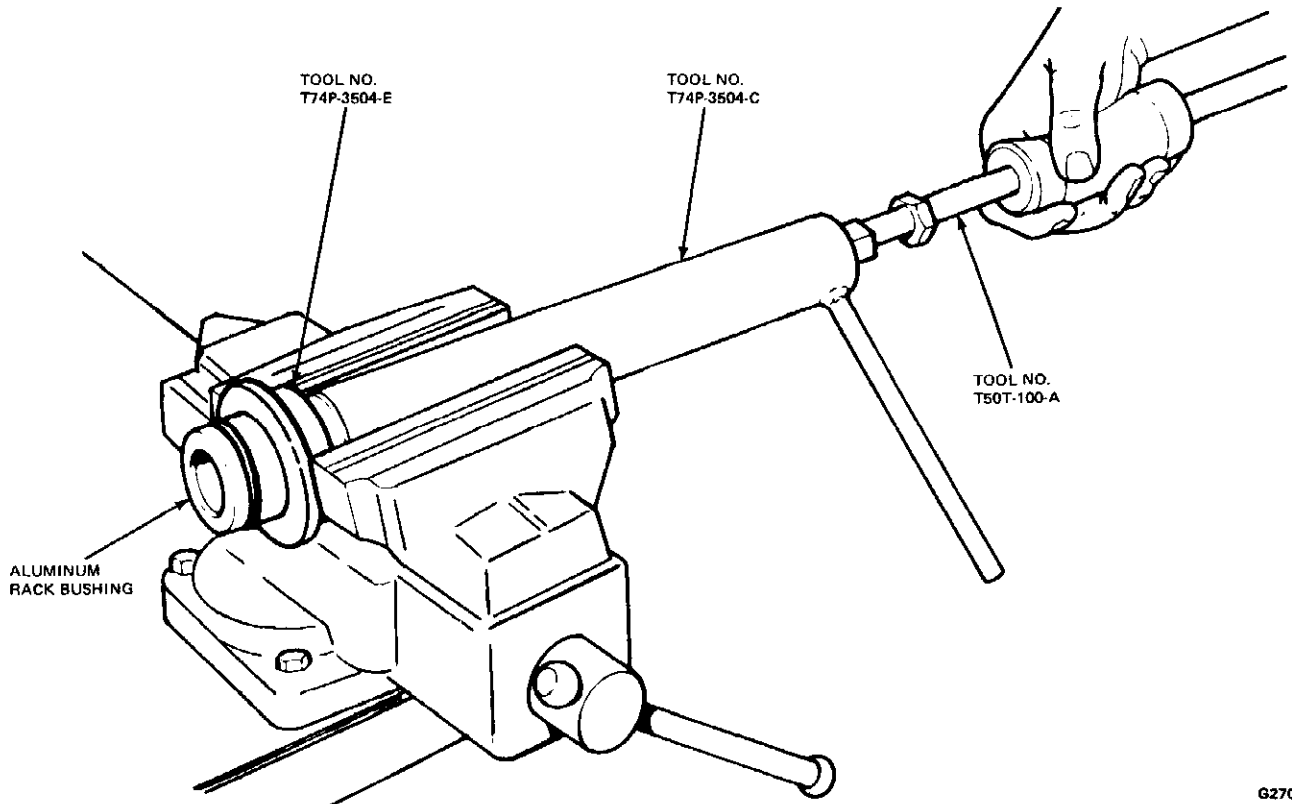
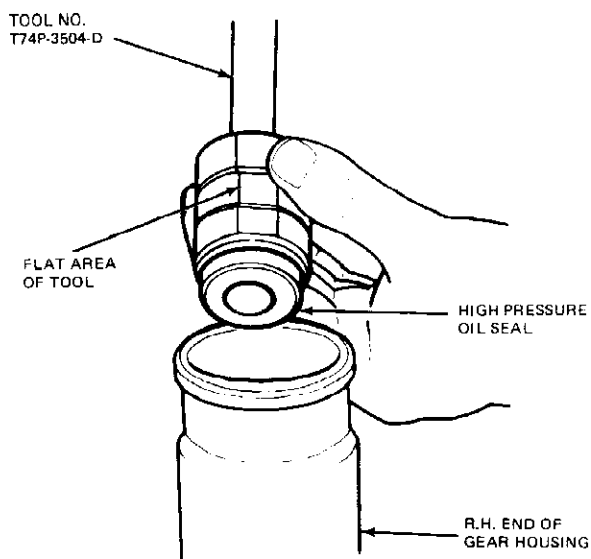
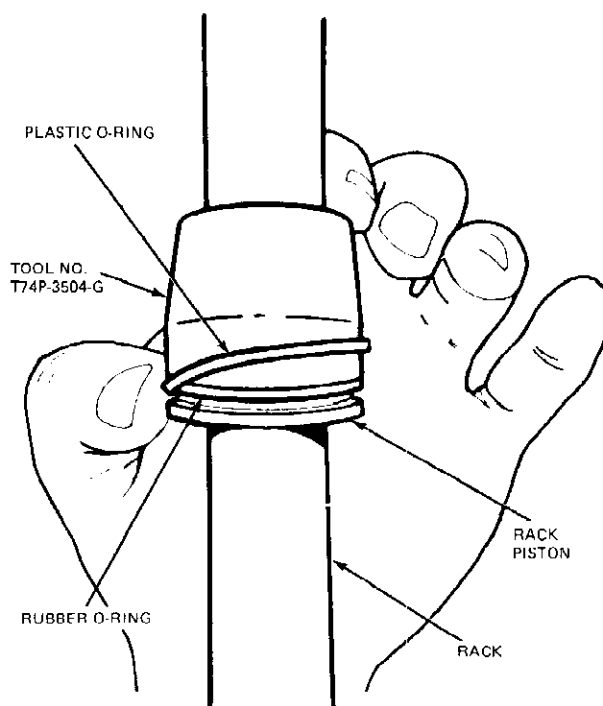


FIG. 33 Removing Oil Seal From Rack Bushing

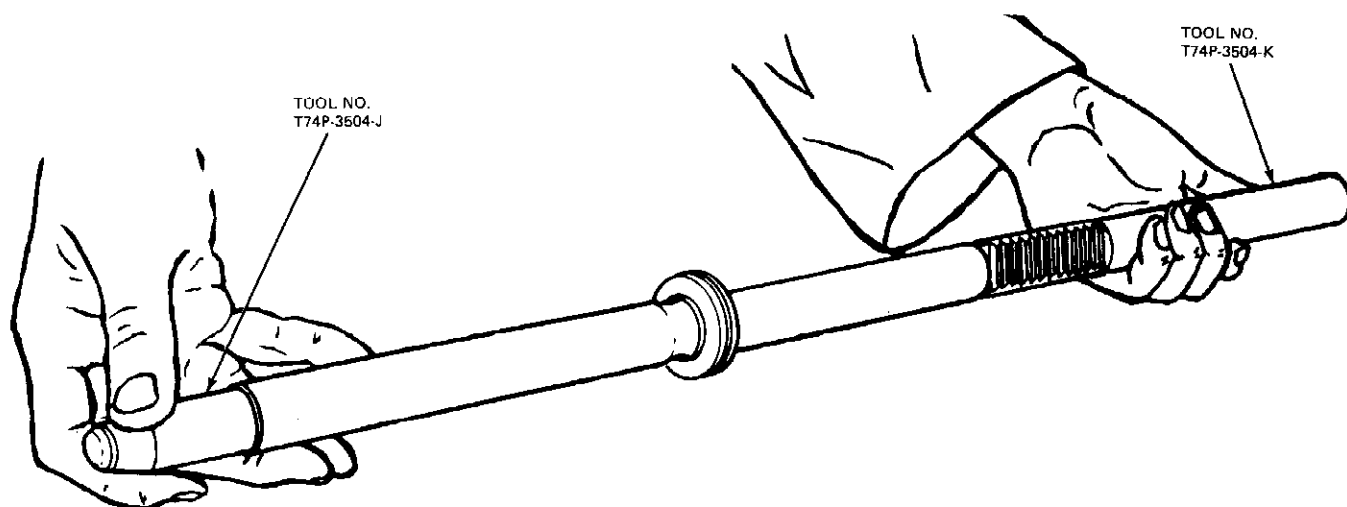


G2701-1A

FIG. 34 Installing Inner Rack Oil Seal

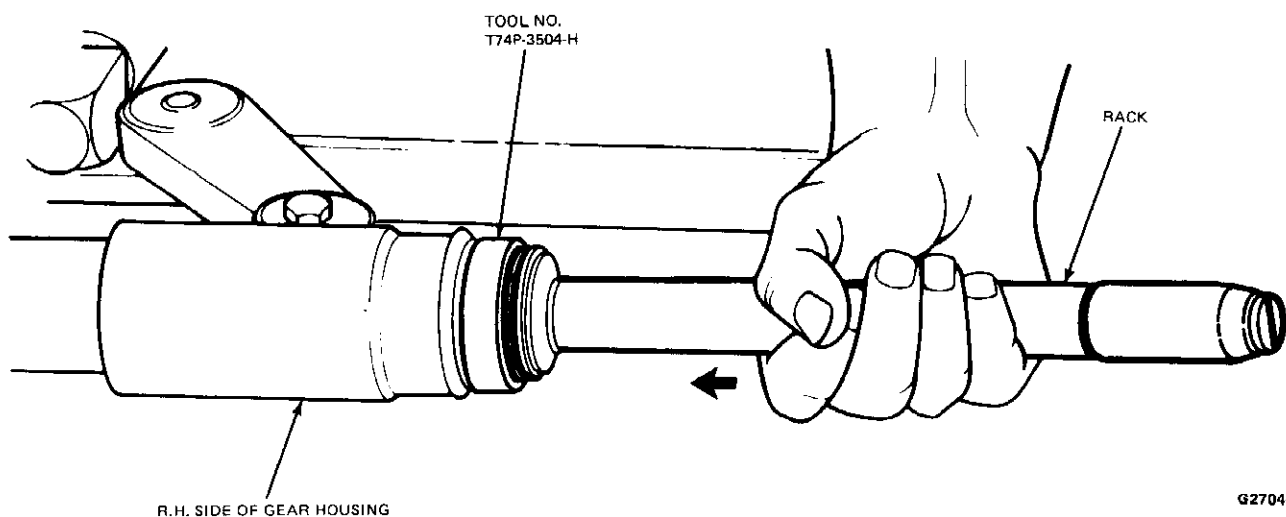
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FIG. 35 Installing Rack Piston Seal



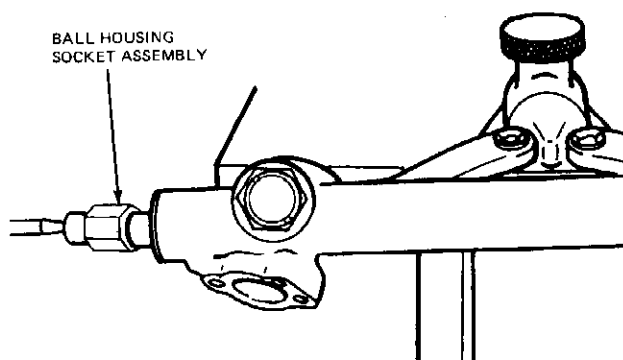
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FIG. 36 Installing Protective Sleeves on Rack



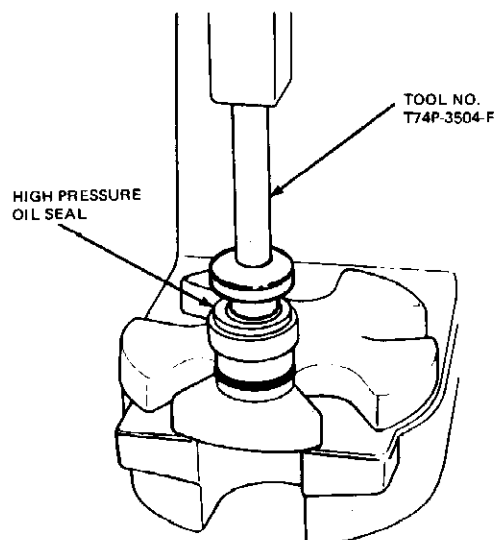
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FIG. 37 Installing Rack in Gear Housing



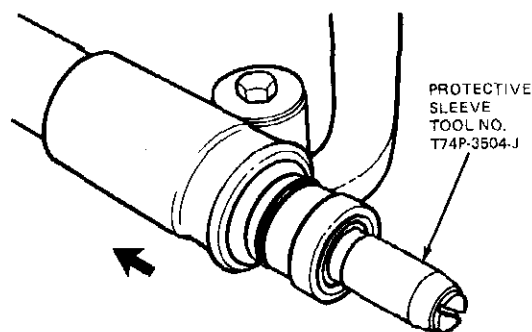
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FIG. 38 Installing Ball Housing to Prevent Rack From Damaging Oil Seal



G2706-1A

FIG. 39 Installing Oil Seal in Rack Bushing



G2707-1A

FIG. 40 Installing Rack Bushing

SPECIFICATIONS

POWER RACK AND PINION STEERING GEAR – TRW

Gear Ratio	18.2 on Center 14.3 at Stops
Number of Turns	3
Pinion & Rack Lubricant Capacity	23-27 Grams
Power Steering Fluid Capacity (Including Steering Pump)	2.44 Pints
Pinion, Rack Tie Rod Inner Ball Socket Lubricant	TMS-L-10053
Seal Lubricant (Cavity under Dust Seal)	ESA-M1C45-A
Power Steering Fluid (ATF)	C1AZ-19582-A, C, D
Effort Required to Initiate Proper Input Shaft Rotation (Power Cylinder Drained and Gear Removed from Vehicle)	7-15 In-Lb
Tie Rod Articulation Effort (On Pull Scale)	1-6 Lbs.

CG2708-2A

TORQUE CHART – POWER RACK AND PINION STEERING GEAR – TRW

Torque	Ft-Lb	Torque	Ft-Lb
Pressure Line Fitting	10-15	Valve Housing to Gear Housing Bolts	10-15
Return Line Fitting	10-15	Pinion Bearing Locknut	20-35
Gear-to-Crossmember Mounting Bolt Nut	80-100	Pinion Bearing Plug	35-55
Tie Rod End-to-Spindle Arm Nut	35-47 ①	Rack Bushing Locknut	80-120
Steering Flex Coupling Bolt	20-30	Tie Rod Ball Socket Locknut	25-35
Yoke Plug Locknut	44-66	Tie Rod End-to-Tie Rod Jam Nut	35-50
Pressure Line Fittings at Valve	10-15	Tie Rod Ball Sockets-to-Rack	55-65
Pressure Line Fittings at Power Cylinder (Gear Housing)	10-15		

① Tighten to nearest cotter pin slot after torquing to specification.

CG2709-2A

Tool No.	Description	Tool No.	Description
T74P-3504-C	Rack Oil Seal Remover	T74P-3504-R	Pinion Shaft Torque Adapter
T74P-3504-D	Inner Rack Oil Seal Replacer	T74P-3504-U	Pinion Housing Yoke Plug Nut Wrench
T74P-3504-E	Rack Bushing Holding Tool	T74P-3504-Y	Spring Scale (0-10 Lbs.)
T74P-3504-F	Outer Rack Oil Seal Replacer	T50T-100-A	Slide Hammer
T74P-3504-G	Plastic Ring Replacer	T57L-500-B	Bench Mount
T74P-3504-H	Plastic Ring Sizing Tool	T58L-101-A	Attachment
T74P-3504-J	Rack Seal Protecting Sleeve (Short)	T71P-19703-C	O-Ring Remover
T74P-3504-K	Rack Seal Protecting Sleeve (Long)	T63P-9171-A	Clamp Crimp Tool
T77P-3504-A	Rack Bushing Lockring Tool	T78P-3504-G	Pinion Bearing Replacer
T74P-3504-N	Input Shaft Dust Seal Replacer	T74P-3504-B	Rack Bushing Locknut Wrench
T74P-3504-P	Input Shaft Needle Bearing Replacer		

Power Steering Pump— Ford Model CII

**PART
13-51**

Applies To All Cars, Except Lincoln Continental and Mark V

SUBJECT	PAGE	SUBJECT	PAGE
ADJUSTMENT	51-5	REMOVAL AND INSTALLATION (Cont.'d)	
DESCRIPTION	51-1	Power Steering Pump Reservoir	51-6
DISASSEMBLY AND ASSEMBLY	51-13	Rotor Shaft Seal	51-6
REMOVAL AND INSTALLATION		SPECIFICATIONS AND	
Power Steering Pump	51-5	SPECIAL SERVICE TOOLS	51-22
		TEST PROCEDURE	51-3

CG2665-2A

DESCRIPTION

POWER STEERING PUMP

The Ford Model C II power steering pump is a belt driven ten-slipper type pump which is integral with a fiberglass nylon reservoir (Fig. 1). The reservoir is attached to the rear side of the aluminum pump housing and the pump body is encased within the housing and reservoir (Fig. 2). The new pump design incorporates a pump pressure fitting which allows the pump pressure

line to swivel; this is normal and does not indicate an undertorqued fitting.

A pressure sensitive identification tag is attached to the reservoir body. This tag indicates the basic model number (HBC) and the suffix. Always use these model codes on the tag when requesting service parts in case of any differences in internal components. A facsimile of this tag is shown in Part 13-01.

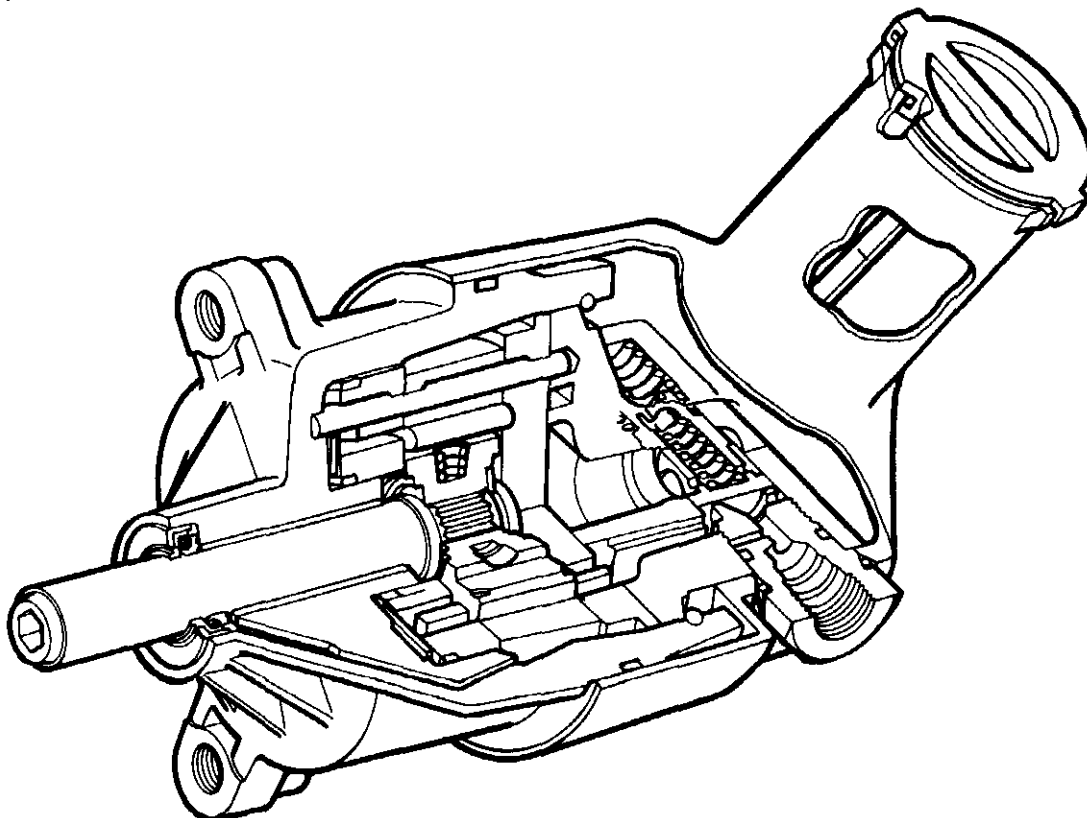
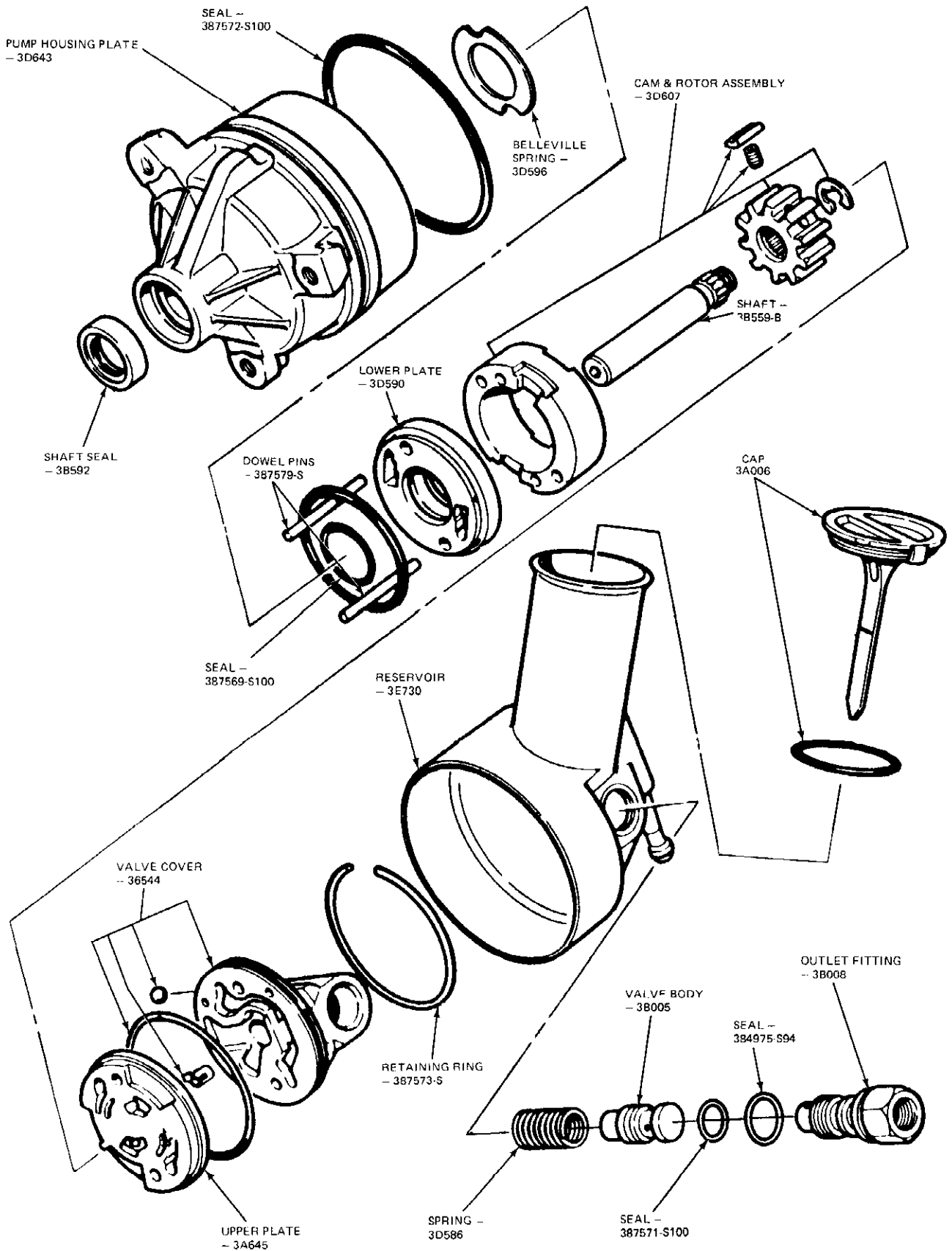


FIG. 1 Ford Model C II Power Steering Pump—Sectional View

G2658-2A



G2580-2A

FIG. 2 Ford Model C II Power Steering Pump—Exploded View

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TEST PROCEDURE: ROTUNDA FLOW/PRESSURE POWER STEERING PUMP ANALYZER OR EQUIVALENT

The test procedure using the Rotunda Flow/Pressure Power Steering Analyzer (Special Tool No. 970-001 or equivalent) provides a method for checking the complete power steering system. The Rotunda Flow/Pressure Power Steering Analyzer or equivalent can be used on integral or non-integral power steering systems to determine the cause of hard steering and/or lack of assist problems.

The analyzer provides readouts for the following:

- System Backpressure
- Pump Flow

The interpretation of the above readouts will determine which of the following conditions or components are the cause of the problem:

- Restriction in Hoses or Fittings
- Inefficient Pump Cam Pack
- Sticking Relief Valve
- Binding in Suspension

The following procedure should be followed when using the Rotunda Flow/Pressure Analyzer or equivalent:

1. To connect the analyzer into the steering system, remove the pressure line from the pump and thread it into the appropriate adapter of the analyzer.
2. Thread the other adapter of the analyzer into the pump.
3. Connect the analyzer to the adapters and tighten all connections to a maximum of 15 ft-lbs.

NOTE: The adapter on the analyzer may be switched so that the connection is made at alternate locations between the pump and gear (See Fig. 3).

4. Add power steering fluid to the pump if required. Start the engine and run it for approximately two minutes with the idle set at manufacturer's specifications.
5. Record the following at idle with the gate valve fully open:

A. Flow (_____ gallons/min. at $170 \pm 5^\circ\text{F}$)

B. Pressure (_____ psi at $170 \pm 5^\circ\text{F}$)

- (a) If flow (A) is below two gallons/min., the pump may require repair; however, at this point

continue the diagnosis. Check chart for flow and relief pressure against the model pump being tested.

- (b) If pressure (B) is above 150 psi, check hoses for restrictions.

NOTE: On non-integral power steering, jiggle the steering wheel to insure that the spool valve is centered prior to test.

6. Partially close the gate valve to build up 750 psi. Observe and record flow.

C. (_____ gallons/min. at $170 \pm 5^\circ\text{F}$)

- (a) If flow (C) drops to a level lower than the value on Chart I disassemble the pump and replace the cam pack. If the pressure plates are cracked or worn replace them. Continue with the diagnosis.

7. Completely close and partially open the gate valve three times. (Do not allow the valve to remain closed for more than five seconds.) Observe and record pressure (D), (_____ psi).

- (a) Check the attached chart for the pressure specification listed for the applicable pump model. If the pressure recorded (D) is 100 psi **lower** than the specification listed, replace the flow control valve in the pump.

- (b) If the pressure recorded (D) is **above** the specification listed by more than 50 psi, the flow control valve in the pump should be removed and either cleaned or replaced with a new valve.

8. Increase the engine speed from idle to approximately 1500 rpm. Observe and record flow (E) (_____ gallons/min.).

- (a) If flow (E) varies more than one gallon/min. from flow (A) the flow control valve in the pump should be removed and either cleaned or replaced.

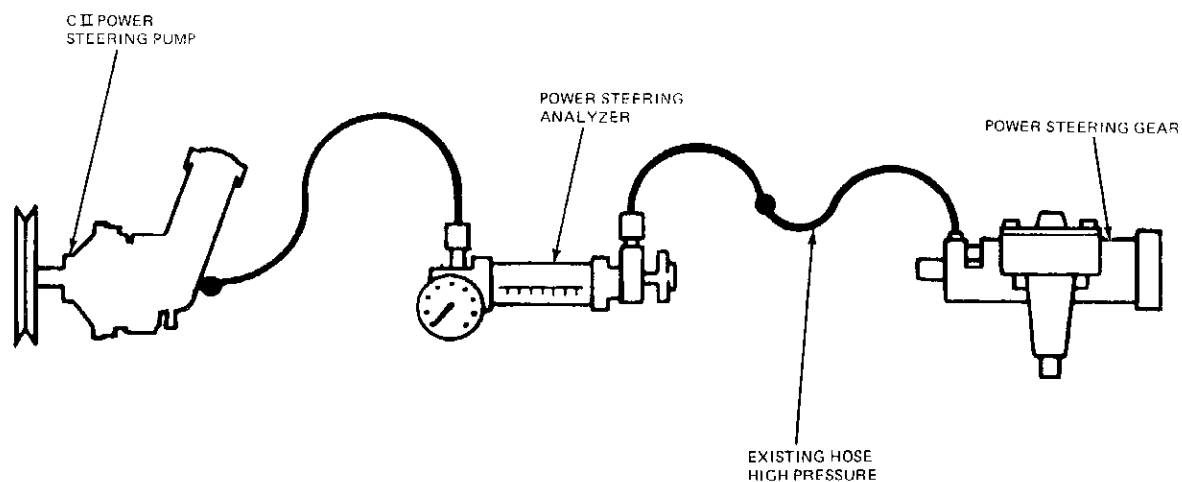
If the system is severely contaminated, both hoses and pumps must be completely disassembled and cleaned before reassembly; and the steering gear should be flushed after reassembly.

NOTE: If problem still exists, check steering gear, ball joints, linkage (See Steering Diagnosis).

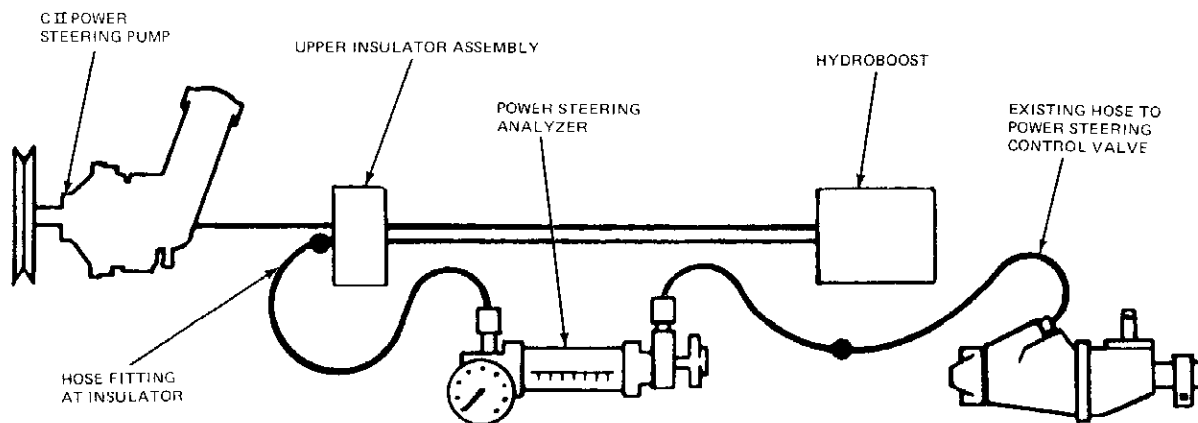
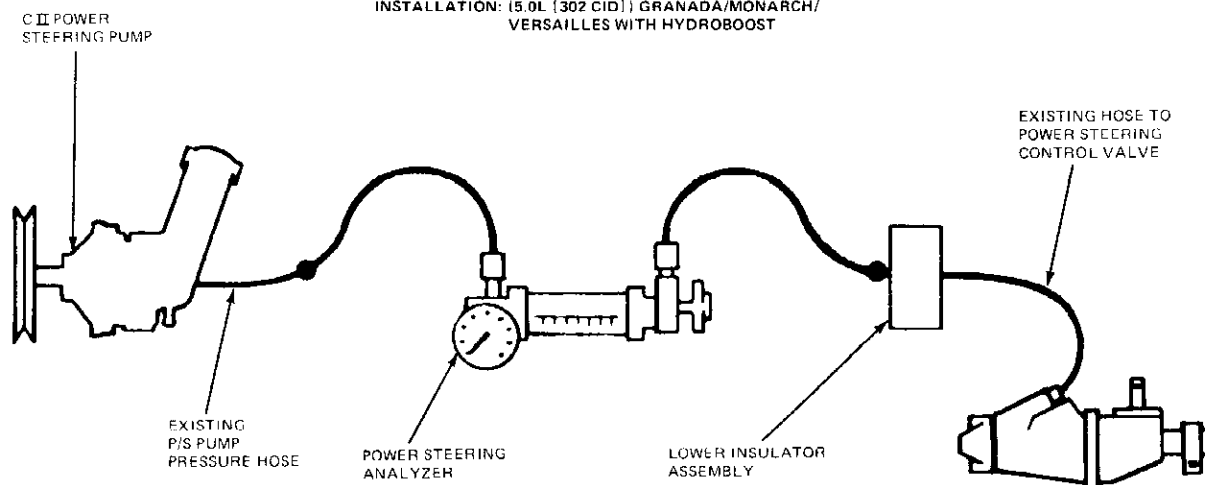
CHART I — FLOW AND PRESSURE

Pump Model	Min. Flow GPM @ $170 \pm 5^\circ\text{F}$.	Min. Relief Pressure	Max. Relief Pressure
HBC-W	1.9	1050 PSI	1200 PSI
HBC-V	1.9	1050 PSI	1200 PSI
HBC-U	1.9	1200 PSI	1350 PSI
HBC-T	1.9	1300 PSI	1450 PSI

CG2666-1A



TYPICAL INSTALLATION

INSTALLATION: (5.0L [302 CID]) GRANADA/MONARCH/
VERSAILLES WITH HYDROBOOSTINSTALLATION: (5.0L [302 CID]) GRANADA/MONARCH/
WITHOUT HYDROBOOST**FIG. 3 Connection Points—Power Steering Analyzer**

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ADJUSTMENTS

PUMP BELT TENSION

Pump drive belt tension cannot be checked accurately using the thumb pressure or belt deflection methods. The adjustment must be made with a belt tension gauge.

1. Check the belt tension with a belt tension gauge Tool T63L-8620-A. For a new belt, or a belt that has been run for less than 15 minutes, tension should be 120 to 150 lbs for a belt that has been run for longer than 15 minutes, tension should be 90 to 120 lbs.
2. Pivot System Adjustment: Loosen the pivot bolts and insert a tool into the square hole in the pivot bracket. Lift the pivot bracket up to obtain the proper belt tension and tighten the pivot bolts. Torque all bolts to the specifications listed in Attachment I.
3. Slider System Adjustment: The proper belt tension may be obtained by tightening or loosening the slider bracket adjusting nut.

NOTE: Do not pry against the reservoir to obtain proper belt tension. Pressure on the fiberglass reservoir may crack the reservoir.

Removal:

1. Drain as much fluid as possible from the pump through the reservoir neck.
2. Install a 3/8-16 inch cap screw in the end of the pump shaft to prevent damage to the shaft end by the tool screw.
3. Install pulley remover Tool T69L-10300-A, on the pulley hub, and place the tool and pump in a vise.
4. Hold the pump and rotate the tool nut counterclockwise to remove the pulley. Do not apply in an out pressure on the pump shaft. Pressure will damage the internal thrust areas.

Installation:

1. Place the pulley on the pump shaft and install Tool T65P-3A733-C.
2. Hold the pump and rotate the tool nut clockwise to install the pulley on the shaft. The pulley face must be flush within 0.010 inch of the end of the

pump shaft. Do not apply in and out pressure on the shaft. Pressure will damage the internal thrust areas.

3. Remove the tool.

QUICK CONNECT POWER STEERING FITTING -SERVICE

The quick connect power steering fitting, under certain conditions may leak and/or result in improper engagement. The leak can be caused by a cut O-ring, imperfections in the outlet fitting ID, or improperly machined O-ring groove. Improper engagement can be caused by an improperly machined tube end, tube nut, snap ring, outlet fitting or gear port.

If a leak occurs, the O-ring should be replaced with quick connect O-rings (3/8 tube end: 87006-S100; 5/16 tube end: 87004-S100). The O-rings that are used on the tube-O power steering fitting should not be used on the quick connect fitting because of dimensional and material changes. If O-ring replacement does not solve the leak problem, outlet fitting replacement and, lastly, hose replacement should be made.

If improper engagement occurs, the entire hose assembly (snap ring, O-ring, hose, and tube nut) should be replaced. The system should then be properly filled, the engine started, and the steering wheel cycled from lock-to-lock to test for positive engagement.

When the quick connect tube nut is tightened or loosened, a tube nut wrench, not an open end wrench, is recommended. An open end wrench may result in tube nut deformation under excessive torque conditions. Care must be taken not to overtorque the tube nut (the spec. is 10-15 ft-lb). Swivel and/or end play of the quick connect fittings is normal and does not indicate an undertorqued fitting.

Quick connect hose assemblies for service will have tube nuts, snap rings, and O-rings already attached. The snap rings and tube nuts will not be a service item.

REMOVAL AND INSTALLATION

POWER STEERING PUMP

Removal:

1. Refer to the appropriate illustration (Figs. 4 through 9). To remove the power steering fluid from the pump reservoir, disconnect the fluid return hose at the reservoir and drain the fluid into a container.
2. Remove the pressure hose from the pump fitting.

NOTE: Do not remove the fitting from the pump.

3. Remove the mounting bracket. Disconnect the belt from the pulley and remove the pump.

Installation:

NOTE: Prior to pump installation, remove the shipping tube nut from the pressure fitting.

1. Place the pump on the mounting bracket and install the bolts at the front of the pump. Torque to specifications.
2. Place the belt on the pulley and adjust belt tension as described in this part.
3. Install the pressure hose to the pump fitting. Tighten the tube nut with a tube nut wrench rather than with an open end wrench. Do not overtorque this fitting (spec. is 10-15 ft-lbs). Swivel and/or end play of the fitting is normal and does not indicate an undertorqued fitting.

NOTE: Overtorquing the tube nut can collapse the tube nut wall, resulting in a leak and requiring replacement of the entire

pressure hose assembly. Use of an open end wrench to tighten the nut can deform the tube nut hex which may result in improper torque and may make further servicing of the system difficult.

4. Connect the return hose to the pump and tighten the clamp. Raise vehicle on hoist and connect lower return line (hydroboost only).

5. Fill the reservoir with specified power steering fluid.

NOTE: Use start-up procedure after power steering pump or gear overhaul as outlined in General Steering Service, Part 13-01.

6. Check for leaks and recheck the fluid level. Add fluid if necessary.

ROTOR SHAFT SEAL

Removal:

1. Remove the pump pulley from the rotor shaft as described in this part.
2. Place the pump assembly in a holding fixture, Tool No. T57L-500-B, or on the assembled adapter plate, Tool No. T69P-3A674-A, with the pulley end of the shaft up.
3. Clean any rust or dirt from the pulley end of the rotor shaft.
4. To prevent scoring of the rotor shaft, wrap .005 shim stock (free of burrs) around the shaft and push this shim stock into the ID of the seal until it contacts the bushing.
5. Using a sheet metal punch, or a similar tool, carefully pierce the metal portion of the seal body face, and pry the old seal out.

NOTE: Do not damage the bushing, housing, or the rotor shaft.

Installation:

1. Remove the shim stock from the rotor shaft.
2. Apply Motorcraft adhesive No. D5AZ-19554-A (Loctite No. 242 or 271) or equivalent, to the outside diameter of the new seal and apply Motorcraft D0AZ-19554-B primer (Locquic NF or T) or equivalent, to the housing seal bore. Place the new rotor shaft seal on the seal protector Tool T68P-3B592-B.
3. Place the seal protector tool and the rotor shaft seal on the rotor shaft.
4. Using seal installation Tool T68P-3B592-A and a plastic or rubber mallet, tap on the end of the tool until the seal is flush with the end of the seal bore.
5. Remove the tools.
6. Install the pulley on the rotor shaft as described in this part.

POWER STEERING PUMP RESERVOIR

Take the following precautions when servicing the power steering pump reservoir:

1. Use a clean work bench and tools.
2. Plug the inlet and outlet openings of the pump with plugs or masking tape.
3. Thoroughly clean the exterior of the pump with solvent.

Removal:

1. Place the pump assembly in a bench vise with soft jaws (Fig. 10) and remove the outlet fitting, flow

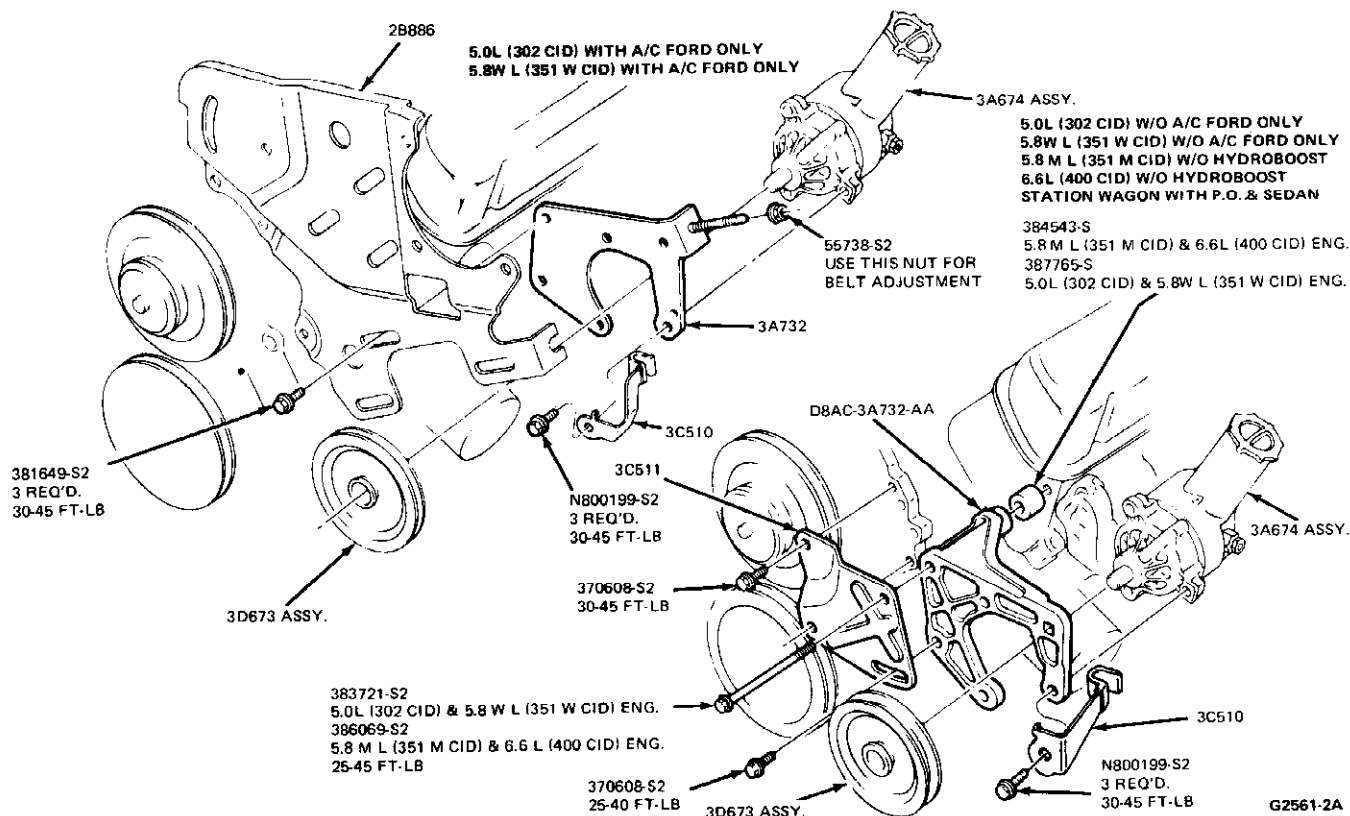


FIG. 4 Model C II Power Steering Pump Installation—Ford and Mercury

- control valve and spring. Discard all seals (Fig. 11).
2. Remove the fiberglass reservoir (Figs. 12-13).
3. Discard O-ring seal on pump housing (Fig. 14).

NOTE: Do not hammer on the reservoir.

Installation:

1. Install a new O-ring seal on the pump housing.
2. Apply petroleum jelly to the reservoir O-ring seal and the inside edge of the reservoir. Do not twist the O-ring seal (Fig. 15).
3. Place the reservoir over the pump and align the outlet fitting hole in the reservoir with the hole in the valve cover.
4. Place new O-ring seals on the outlet fitting. Install the flow control spring, flow control valve and outlet fitting into the reservoir and valve cover. Torque the fitting to proper torque specifications.

NOTE: If the valve is cocked, it may become stuck in the valve cover. Do not force the valve forward; forcing the valve may shear off metal and carry the metal chips into the valve bore.

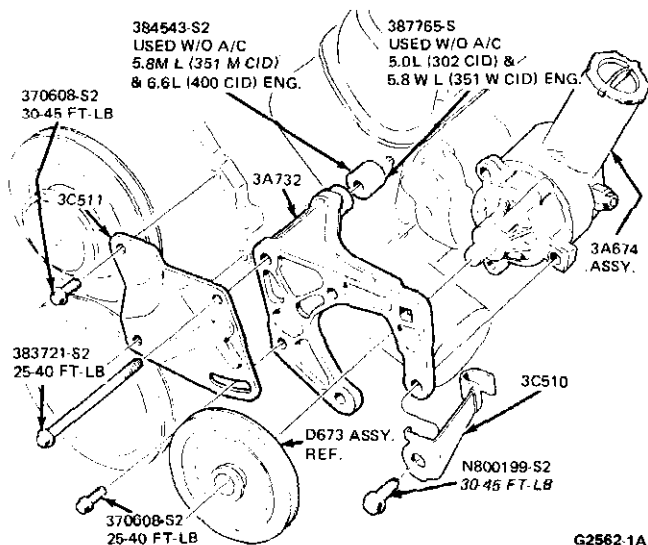


FIG. 5 Model C II Power Steering Pump Installation—LTD II, Cougar, Thunderbird and Cougar XR-7

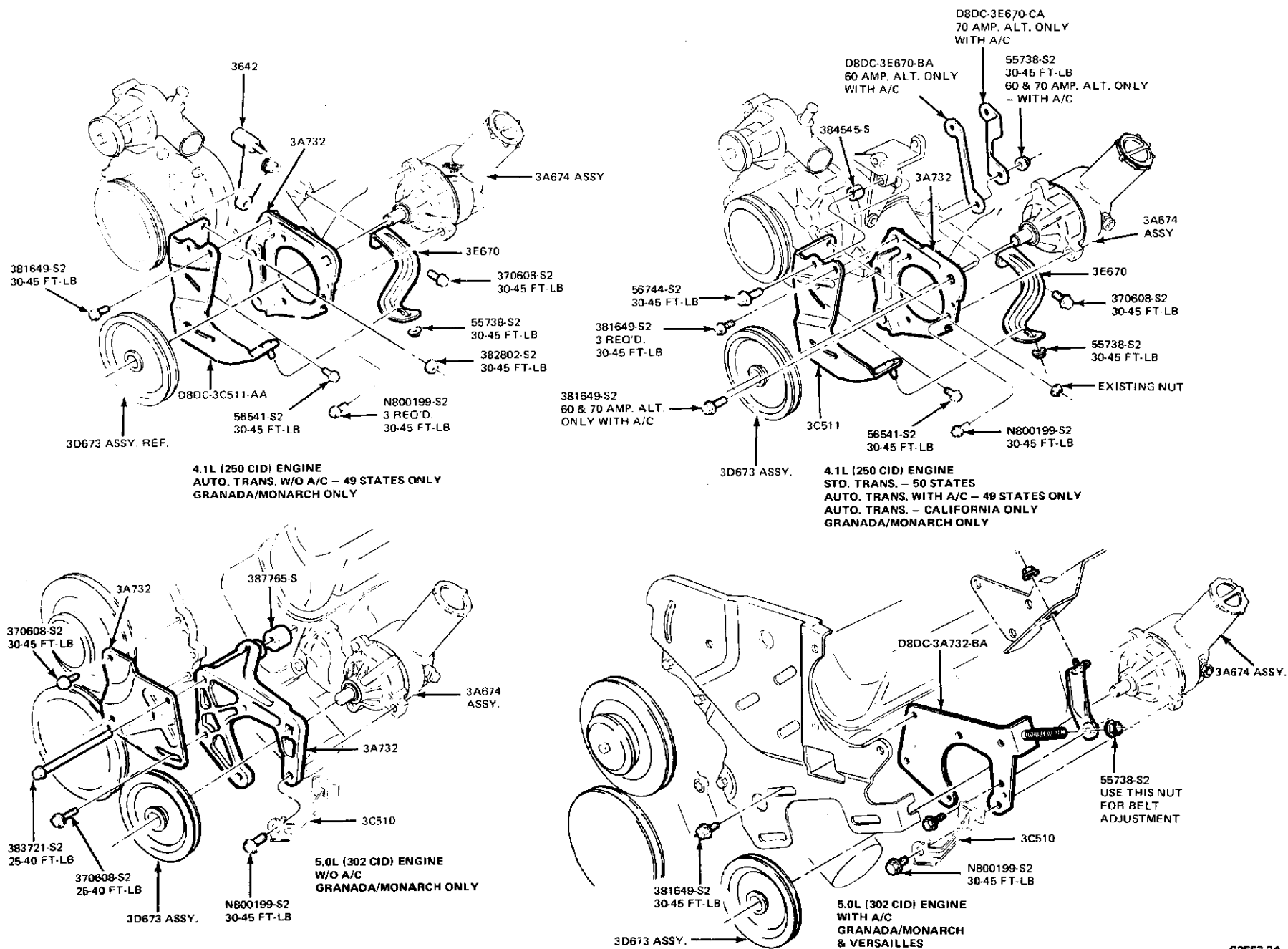


FIG. 6 Model C II Power Steering Pump Installation—Granada, Monarch and Versailles

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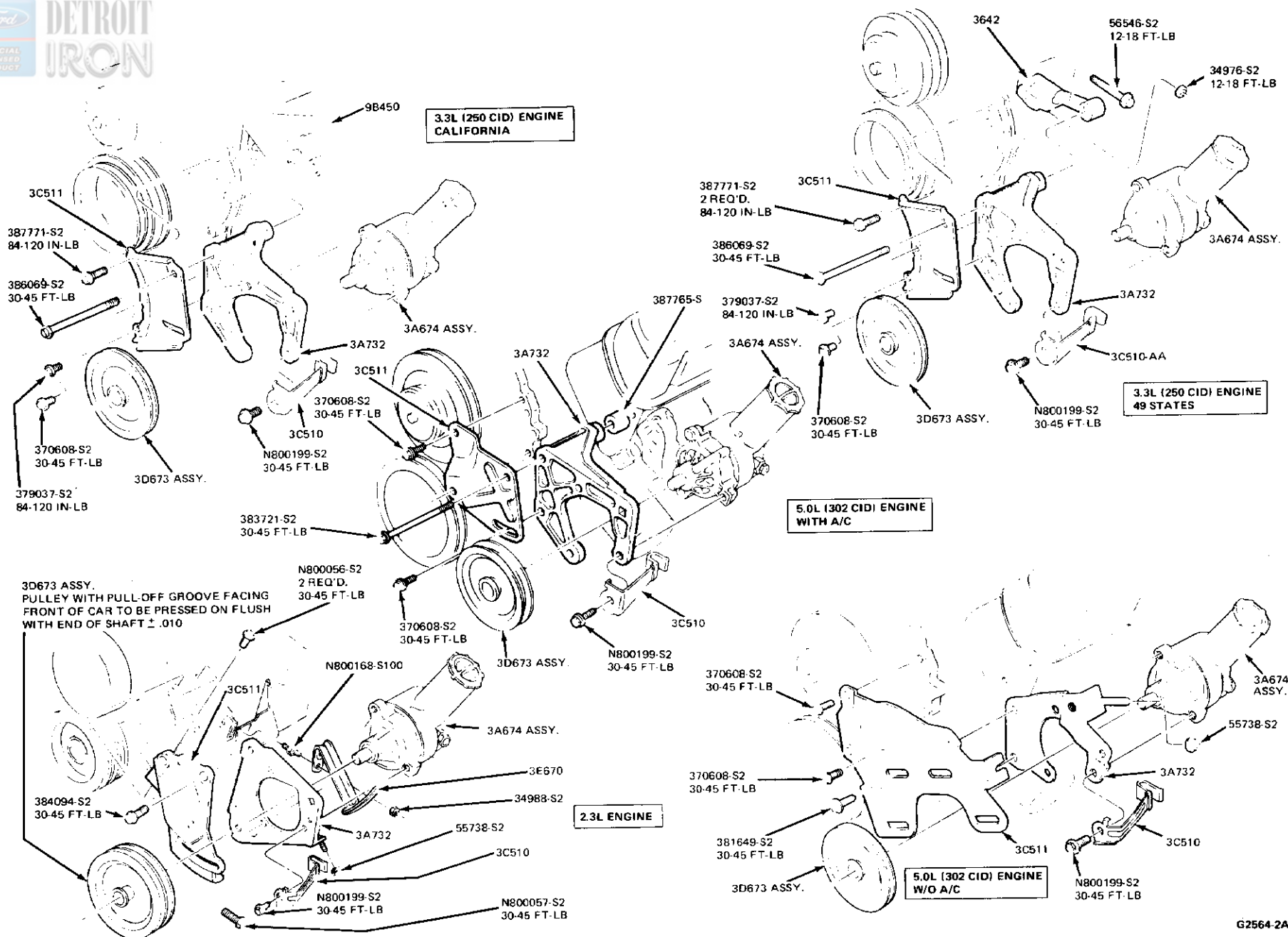


FIG. 7 Model CII Power Steering Pump Installation—Fairmont and Zephyr

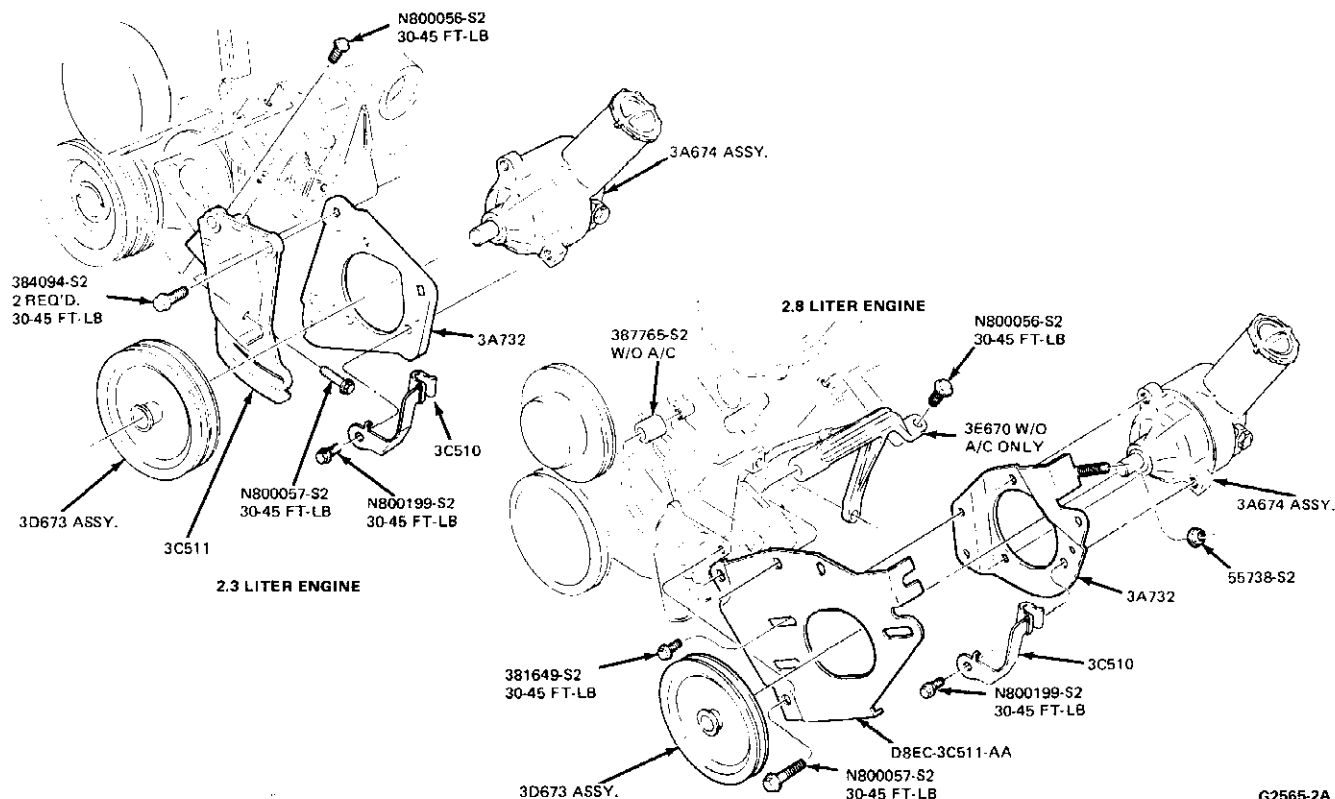
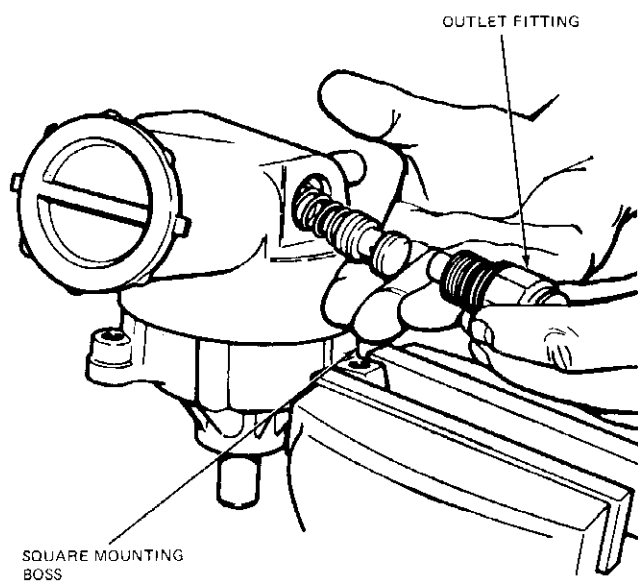
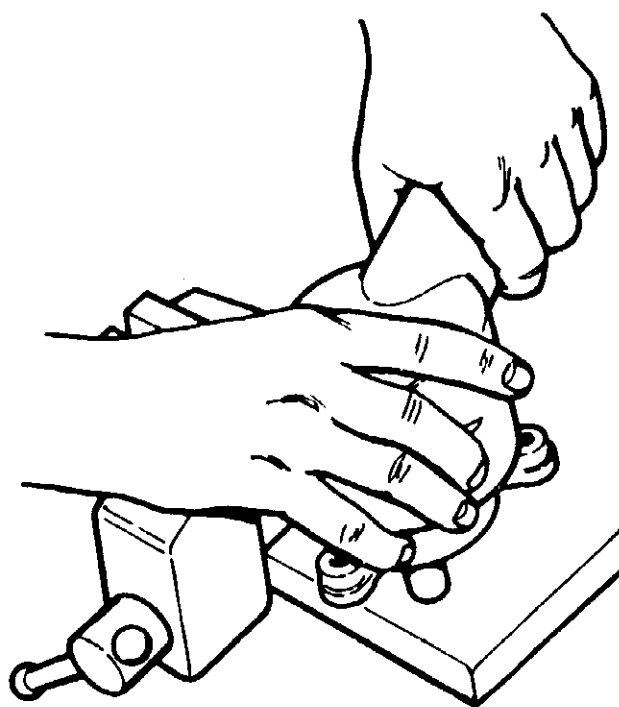


FIG. 8 Model C II Power Steering Pump Installation—Pinto and Bobcat



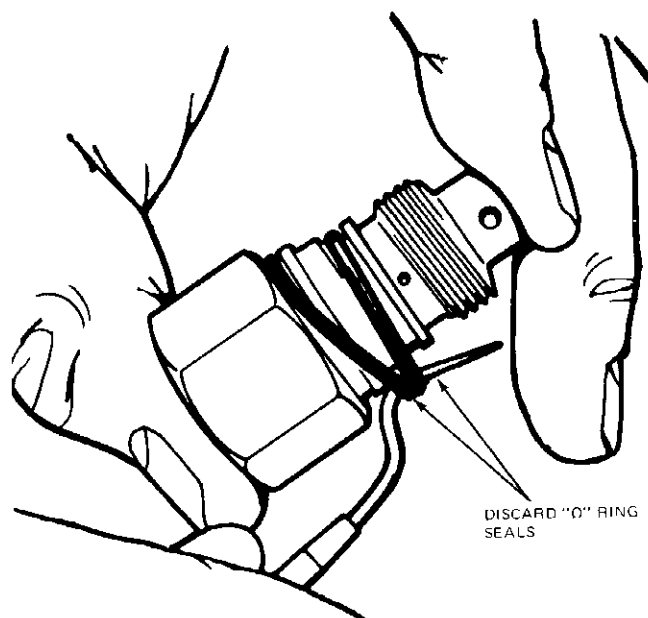
G2567-1A

FIG. 10 Removing Outlet Fitting, Flow Control Valve and Spring



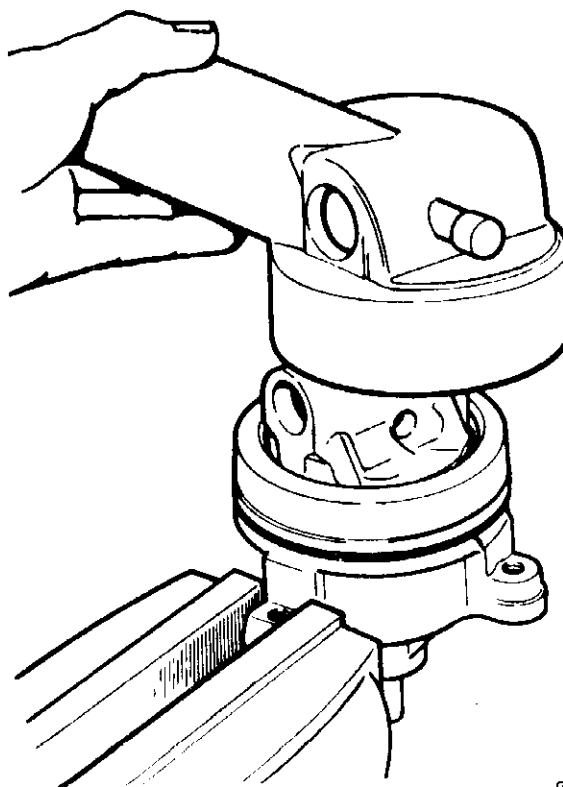
G2569-1A

FIG. 12 Loosening Reservoir



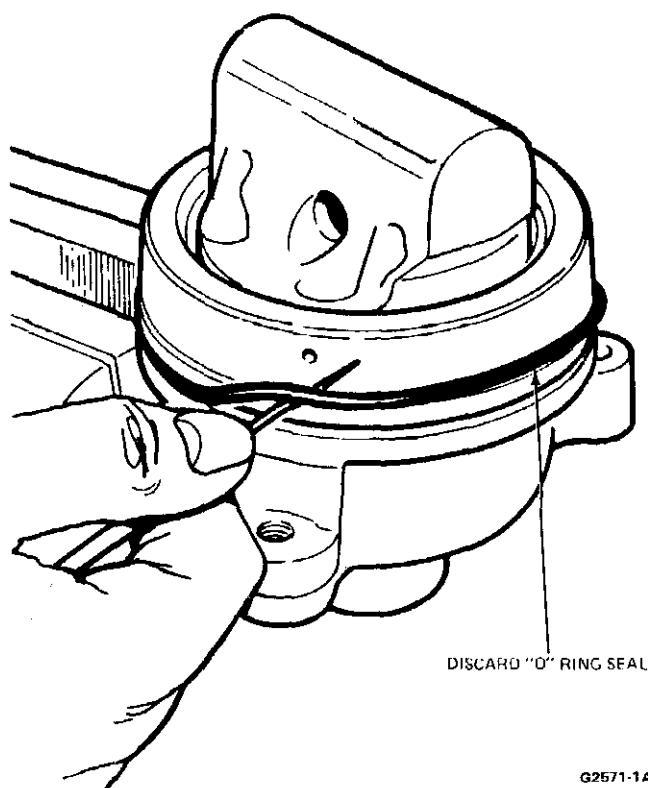
G2568-1A

FIG. 11 Removing Seals



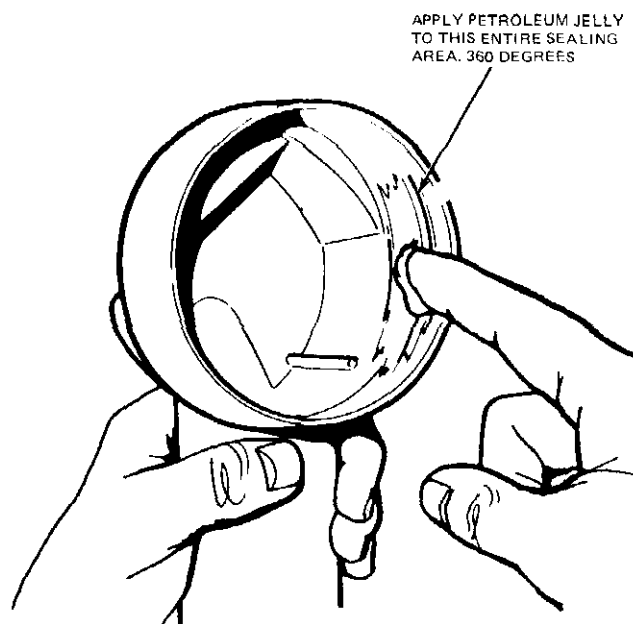
G2570-1A

FIG. 13 Removing Reservoir



G2571-1A

FIG. 14 Removing O-Ring



G2572-1A

FIG. 15 Applying Petroleum Jelly

DISASSEMBLY AND ASSEMBLY: POWER STEERING PUMP

The following precautions must be observed when servicing the power steering pump:

1. Use a clean work bench and tools.
2. Thoroughly clean the exterior of the unit with solvent. Drain as much fluid from the pump as possible.
3. If only the reservoir is to be removed, clean as detailed under Reservoir Removal.
4. If only the rotor shaft seal is to be removed, clean as detailed under Reservoir Removal.
5. Do not use cleaning solvents on the seal.

Disassembly:

1. Remove the pump pulley as outlined under Pump Pulley Removal in this Part.
2. Remove the outlet fitting, flow control valve, and flow control spring from the pump and remove the pump reservoir.
3. Place C clamp (Tool No. T74P-3044-A1) in a bench vise.
4. Place the lower support plate (Tool No. T78P-3733-A2) over the pump rotor shaft (Fig. 16).
5. Install the upper compressor plate (Tool No. T78P-3733-A1) into the upper portion of the C clamp.
6. Holding the upper compressor tool, place the pump assembly into the C clamp with the rotor shaft facing down (Fig. 17).
7. Tighten the C-clamp until a slight bottoming of the valve cover is felt.

8. In the side of the pump housing is a small hole. Through this hole insert a small drift or suitable tool and push inward on the valve cover retaining ring. While applying inward pressure on the retaining ring, place screwdriver under the edge of the retaining ring and remove the ring (Fig. 18).
9. Loosen the C-clamp; remove the upper compressor plate; and remove the pump assembly.
10. Remove the pump valve cover. Discard the O-ring seal.
11. Push on the rotor shaft to remove the rotor shaft, upper plate, rotating group assembly and two dowel pins (Fig. 19).
12. The lower plate and the Belleville spring will remain in the pump housing. To remove, place the pump housing on a flat surface. Raise slightly and slam the housing down flat until the lower plate and the Belleville spring fall out. Discard the O-ring seals (Fig. 20).
13. Remove the rotor shaft seal by prying out with a screwdriver (Fig. 21).

NOTE: This method is used only when the pump is disassembled.

Assembly:

If the rotating group was disassembled for cleaning and/or inspection, reassemble as follows:

1. Place the rotor on the rotor shaft splines with the triangle detent in the rotor counterbore facing upwards.

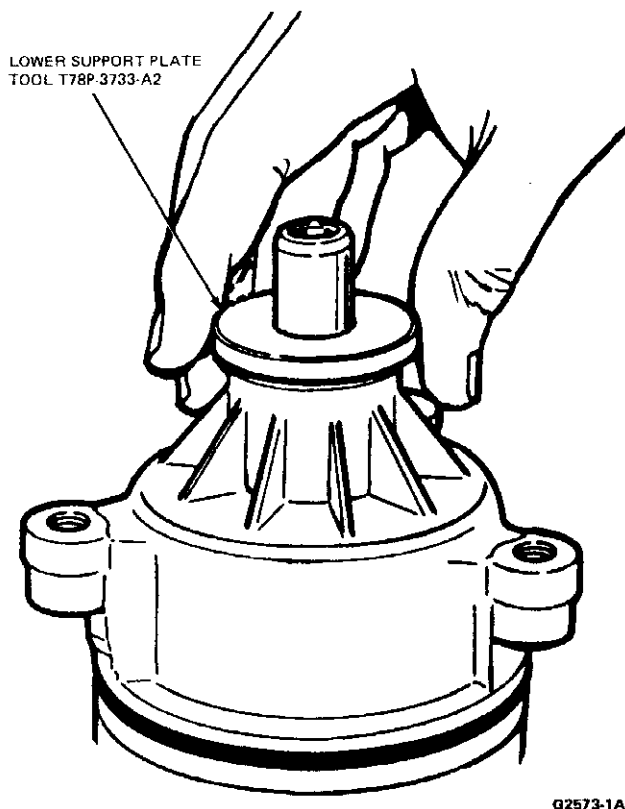


FIG. 16 Installing Lower Support Plate

2. Install the retaining ring in the groove at the end of the rotor shaft.
3. Place the insert cam over the rotor. Be sure that the recessed notch on the insert cam faces up.
4. With the rotor extended upward approximately half way out of the cam, insert a spring into a rotor spring pocket. Work in the rotor cavity directly beneath the recessed flats on the cam (Fig. 22).
5. Use one of the slippers to compress the spring and install the slipper with the groove facing the cam profile. Repeat Steps 4 and 5 on the slipper cavity beneath the opposite inlet recess (Fig. 23).
6. Holding the cam stationary, index the rotor either right or left one space and install another spring and slipper until all ten rotor cavities have been filled. Turn the rotor carefully so that the springs and slippers already installed do not fall out (Fig. 24).
7. Apply Motorcraft adhesive No. D5AZ-19554-A (Loctite No. 242 or 271) or equivalent to the outside diameter of the new seal and apply Motorcraft DOAZ-19554-B primer (Locquic NF or T) or equivalent to the housing seal bore. Install the new rotor shaft seal using seal driver Tool No. T78P-3733-A3. Using a plastic mallet, drive the seal into the bore until a bottoming is felt (Fig. 25).
8. Place the pump housing plate on a flat surface with the pulley side facing down.
9. Insert the two dowel pins and the Belleville spring into the housing (Fig. 26).

NOTE: The Belleville spring must be inserted with the dish surface upward.

10. Lubricate the inner and outer O-ring seals with the specified power steering fluid and install these seals on the lower pressure plate (Fig. 27).
11. Insert the lower pressure plate with the O-ring seals toward the front of the pump into the pump housing (Fig. 28) and over the dowel pins. Place the entire assembly on the C-clamp. Place driver Tool No. T78P-3733-A3 into the rotor shaft hole (Fig. 29) and press on the lower plate lightly until it is felt to bottom into the pump housing. This operation will seat the outer O-ring seal (Fig. 30).
12. Install the cam, rotor and slippers, and rotor shaft assembly into the pump housing over the dowel pins (Fig. 31).

NOTE: When installing this assembly into the pump housing, the stepped holes must be used for the dowel pins, and the recessed notch in the cam insert must face toward the reservoir and approximately 180 degrees opposite the square mounting lug on the aluminum housing.

13. Place the upper pressure plate over the dowel pins (Fig. 32) with the recess directly over the recessed notch on the cam insert and approximately 180 degrees opposite the square mounting lug.
14. Place a new O-ring seal on the valve cover. Lubricate this seal with the specified power steering fluid (Fig. 33).

NOTE: Be sure that the plastic baffle is securely in place in the valve cover. If the baffle is loose, apply a coating of petroleum jelly on the baffle and install it into location on the valve cover.

15. Insert this valve cover over the dowel pins. Be sure the outlet fitting hole in the valve cover is directly in line with the square mounting lug of the aluminum housing (Fig. 34).
16. Place the entire assembly in the C-clamp tool and compress the valve cover into the pump housing, until the retaining ring groove is exposed in the pump housing.
17. Install the valve cover retaining ring with the ends near the access hole in the pump housing (Fig. 35).
18. Remove the pump assembly from the C-clamp tool.
19. Place a new O-ring seal on the pump housing. Lubricate this O-ring seal with the specified power steering fluid.
20. Install the power steering reservoir.
21. Install the flow control spring and the flow control valve into the valve cover.
22. Place new O-ring seals on the outlet fitting, lubricate these seals with the specified power steering fluid.
23. Install the outlet fitting into the valve cover and torque to 25-34 ft-lbs (Fig. 36).

NOTE: If the flow control valve is cocked, it may become stuck in the valve cover. Do not force the valve forward; forcing the valve may shear off metal and carry the metal chips into the valve bore.

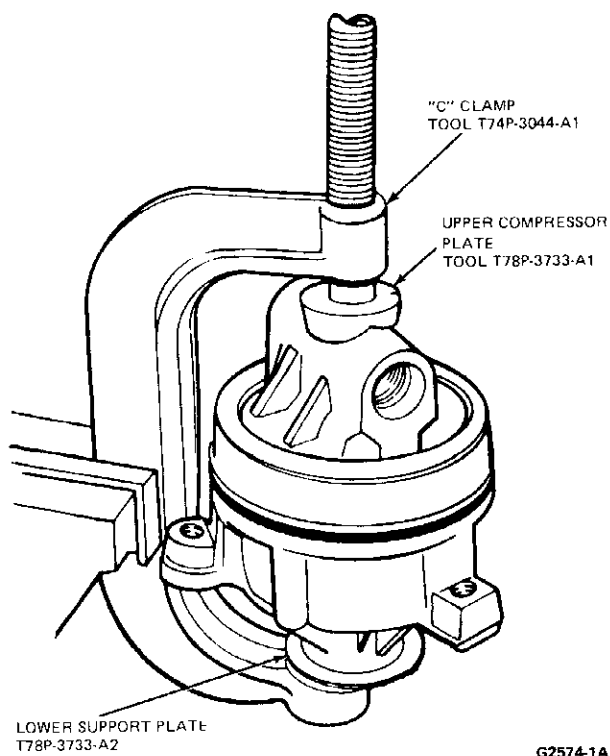


FIG. 17 Positioning Pump in C-Clamp

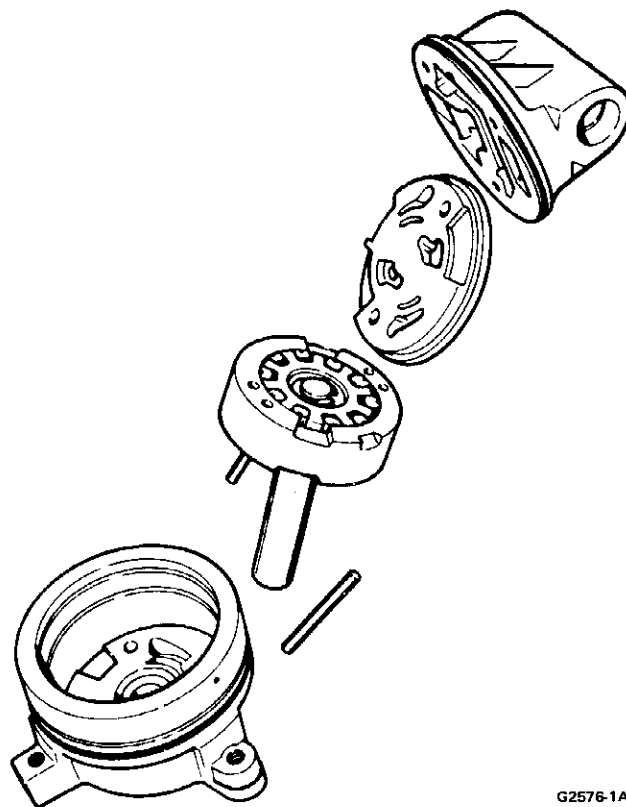


FIG. 19 Disassembling Pump

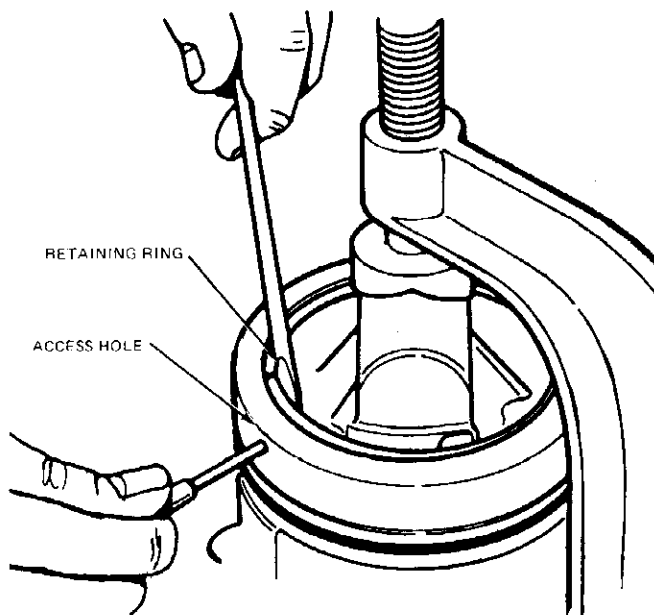


FIG. 18 Removing Valve Cover Retaining Ring

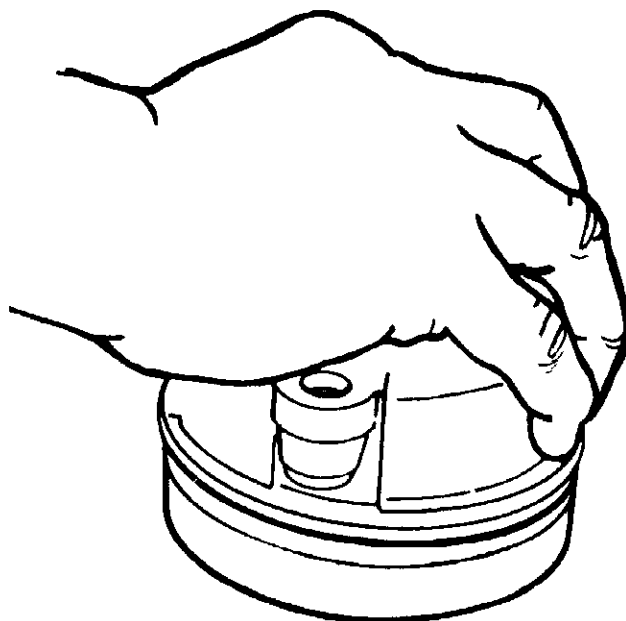
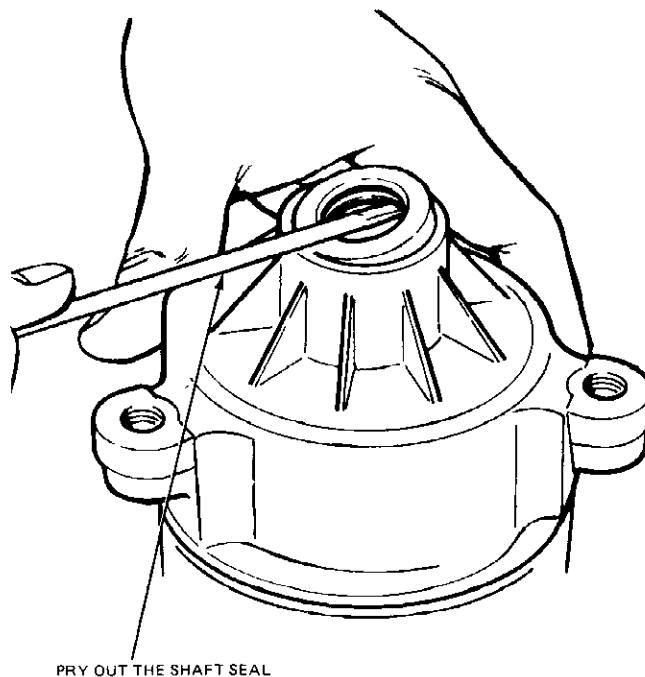
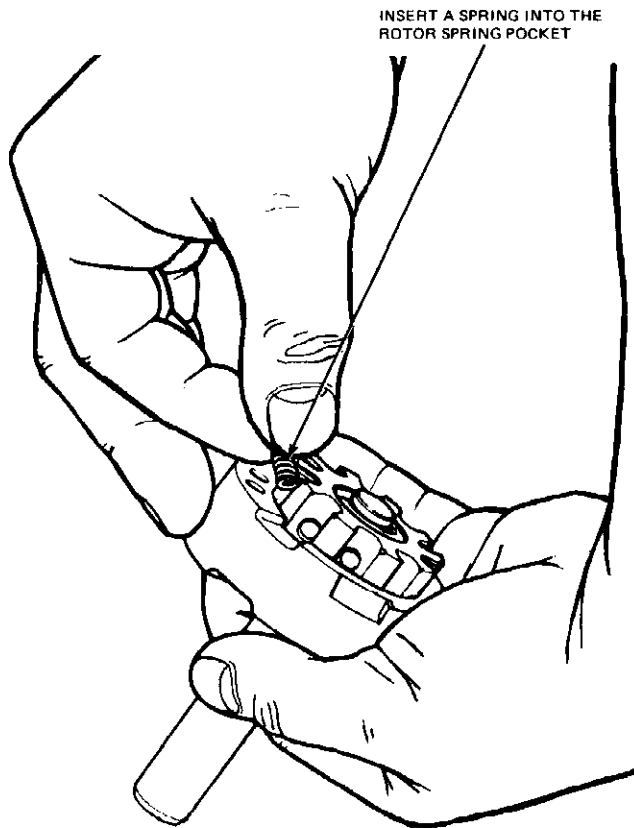


FIG. 20 Removing Lower Plate

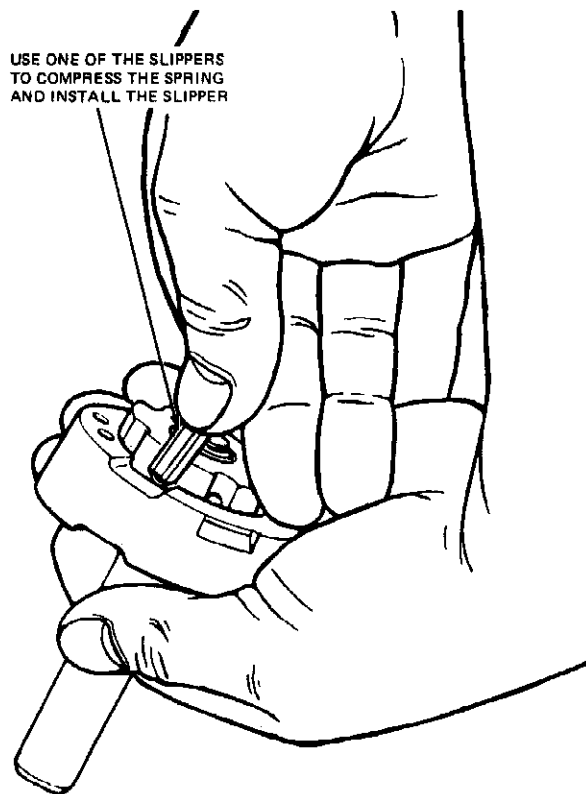


G2578-1A

FIG. 21 Removing Shaft Seal

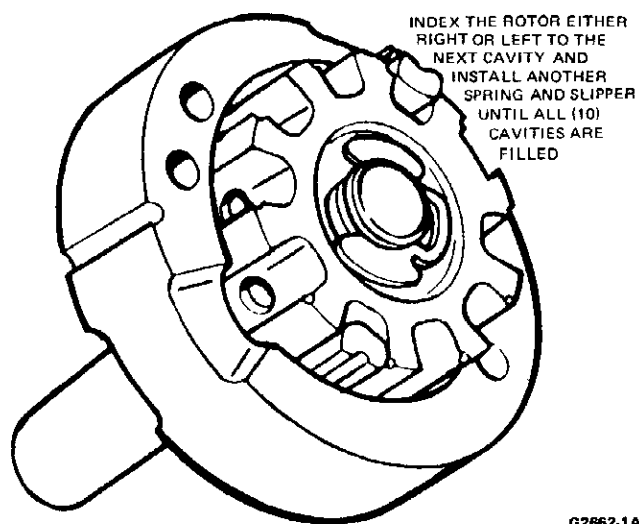


G2660-1A

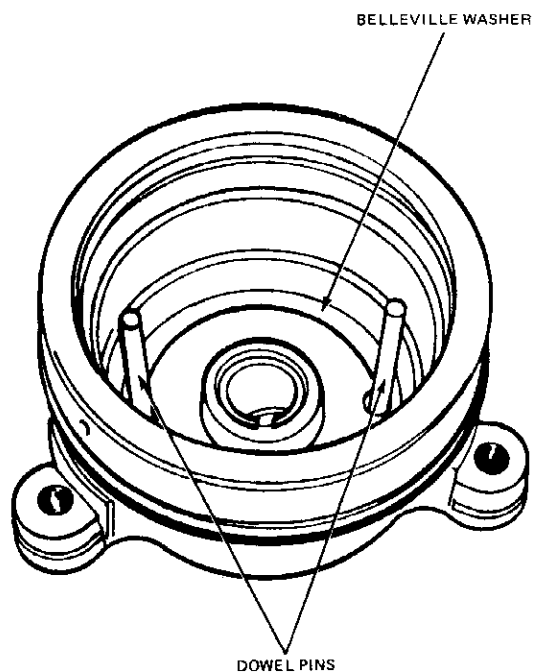
FIG. 22 Inserting Spring

G2661-1A

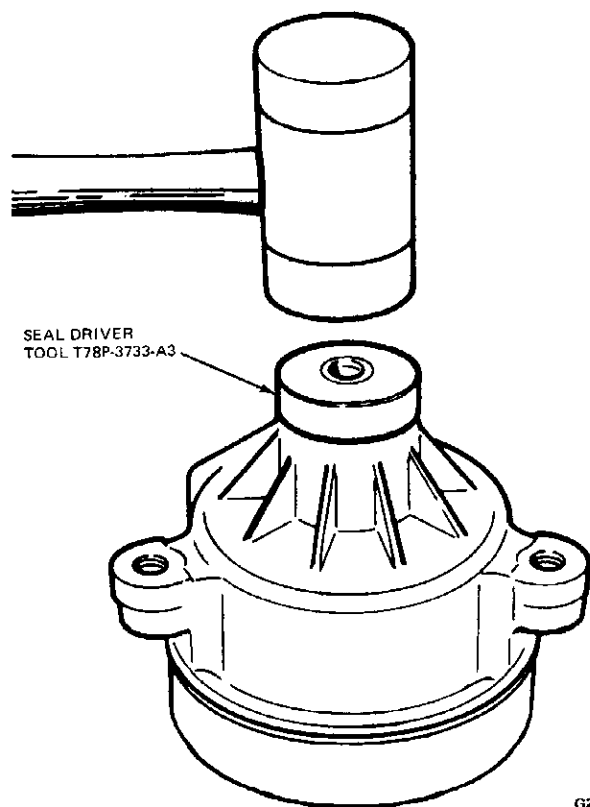
FIG. 23 Installing Slipper



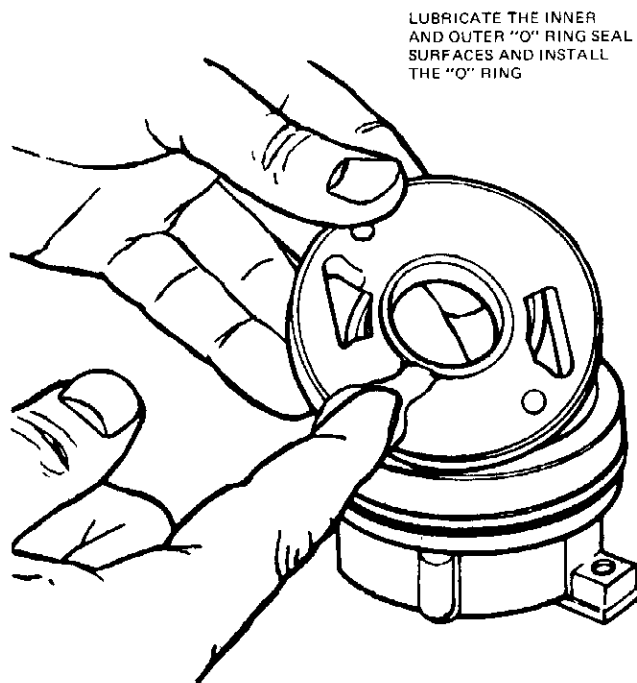
G2862-1A

FIG. 24 Assembling Slippers and Springs

G2580-1A

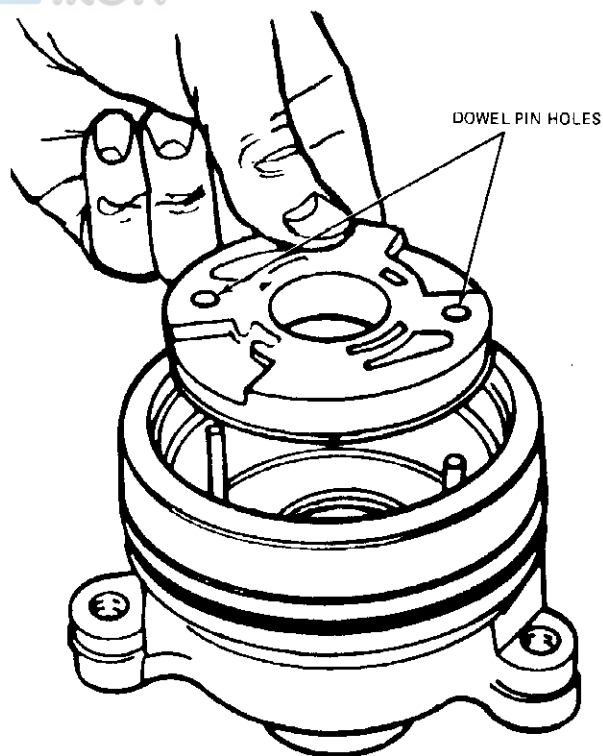
FIG. 26 Installing Spring and Dowel Pins

G2579-1A

FIG. 25 Installing Rotor Shaft Seal

G2581-1A

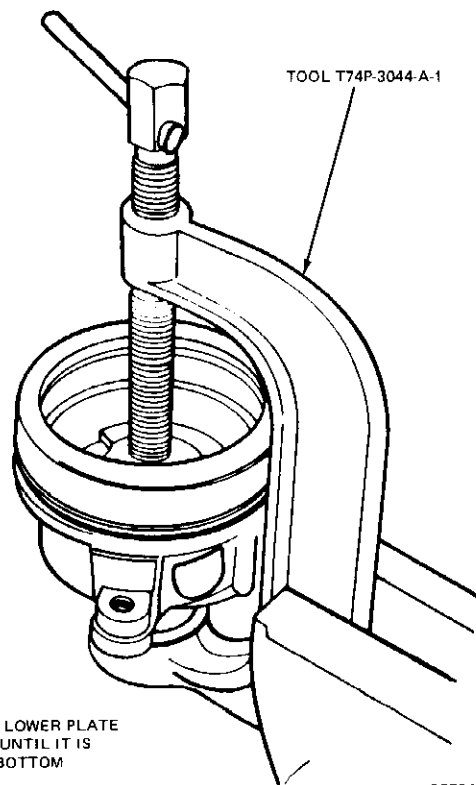
FIG. 27 Installing O-Rings



INSTALL THE LOWER PLATE WITH THE SEALS FACING TOWARD THE PUMP HOUSING

G2582-1A

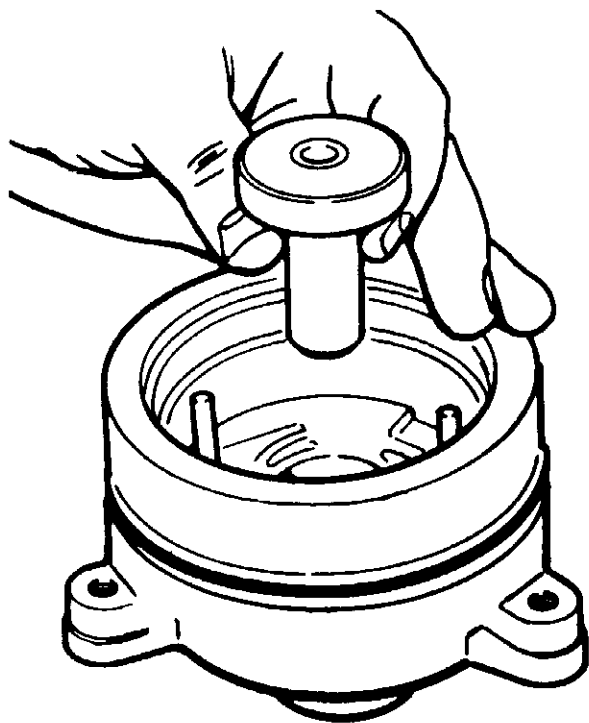
FIG. 28 Installing Lower Pressure Plate



PRESS ON LOWER PLATE LIGHTLY UNTIL IT IS FELT TO BOTTOM

G2584-1A

FIG. 30 Pressing Lower Plate Into Position

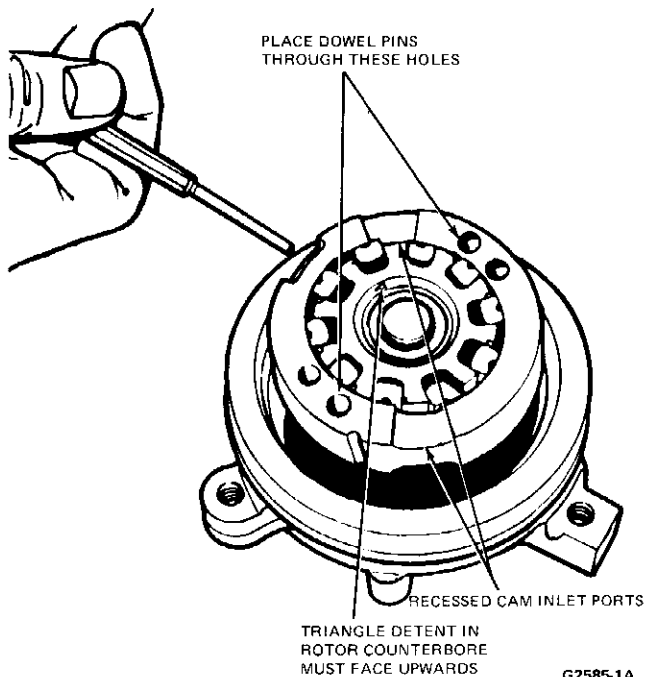


PLACE DRIVER TOOL T78P-3733-A3 INTO ROTOR SHAFT HOLE

G2583-1A

FIG. 29 Positioning Driver Tool

RECESSED NOTCH IN CAM INSERT APPROXIMATELY 180 DEGREES OPPOSITE THE SQUARE MOUNTING LUG ON THE ALUMINUM HOUSING

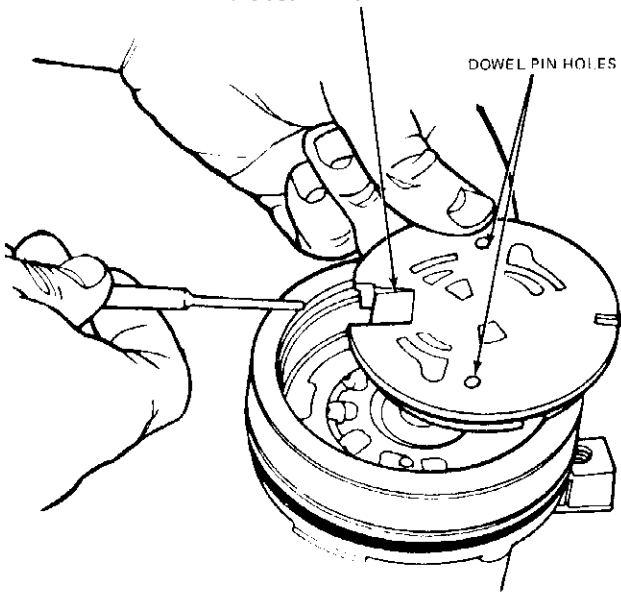


G2585-1A

FIG. 31 Assembling Cam, Rotor and Slippers

UPPER PLATES RECESS MOUNTS DIRECTLY OVER THE RECESSED NOTCH IN THE CAM AND APPROXIMATELY 180 DEGREES OPPOSITE THE SQUARE MOUNTING LUG

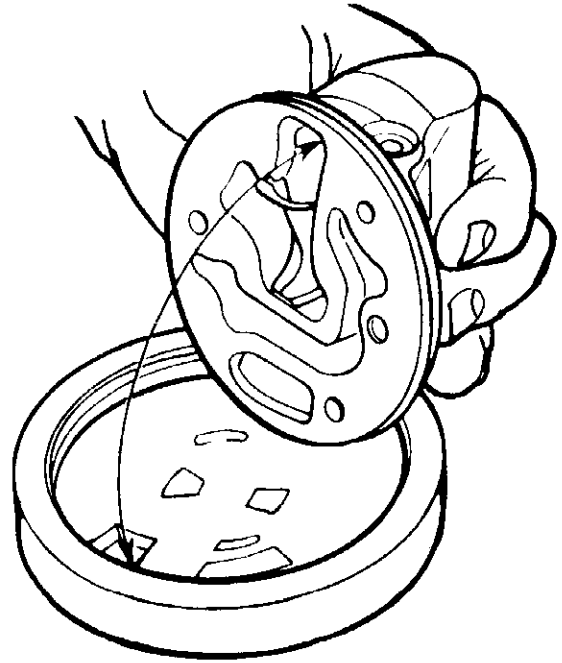
DOWEL PIN HOLES



G2586-1A

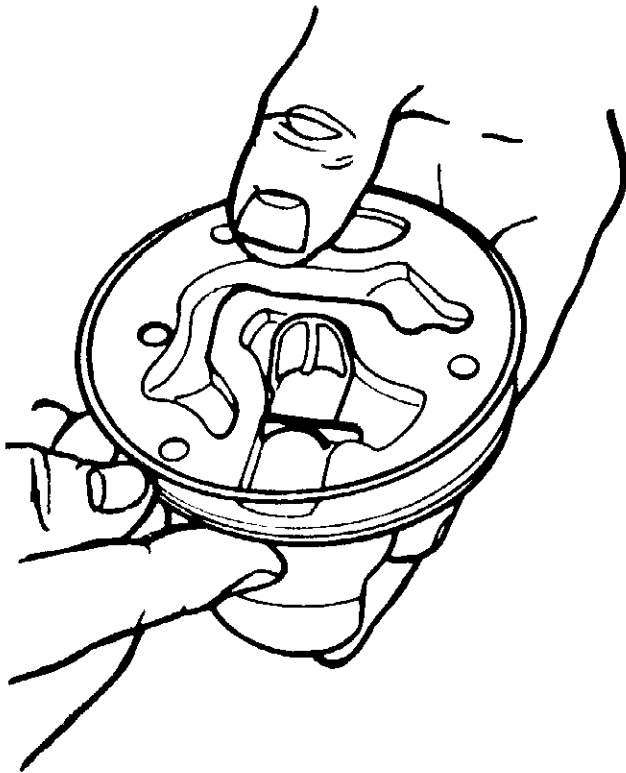
FIG. 32 Installing Upper Pressure Plate

PRESSURE CHANNEL IN THE VALVE COVER FITS DIRECTLY OVER THE RECESS IN THE UPPER PLATE



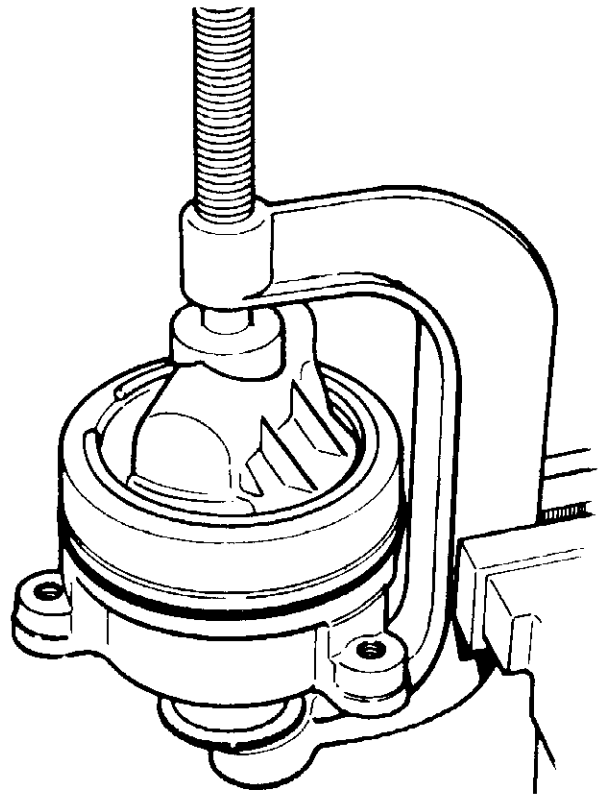
G2588-1A

FIG. 34 Installing Valve Cover



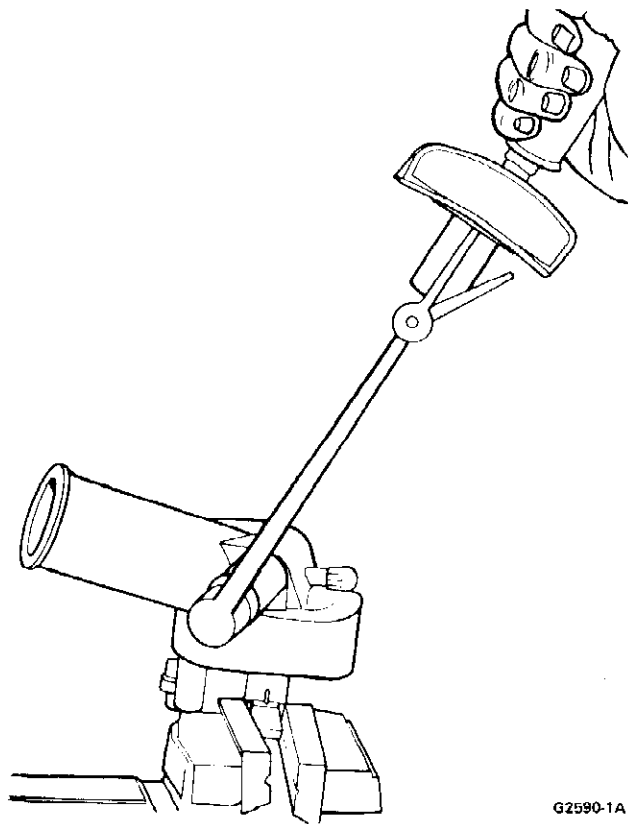
G2587-1A

FIG. 33 Installing O-Ring



G2589-1A

FIG. 35 Installing Valve Cover Retaining Ring



G2590-1A

FIG. 36 Installing Outlet Fitting

SPECIFICATIONS

MODEL C-II PUMP TORQUE SPECIFICATIONS

Engine Application	2.3L	2.8L	3.3L (200 CID)	4.1L (250 CID)	5.0L (302 CID)	5.7LW (351W CID)	5.7LM (351M CID)	6.6L (400 CID)
Pivot Bolt (Ft-Lb)	30-45	—	30-45	30-45	30-45	30-45	30-45	30-45
Front Bolts to Support Bracket (Ft-Lb)	30-45	30-45	30-45	30-45	30-45	30-45	30-45	30-45
Support Bracket to Engine (Ft-Lb)	30-45	30-45	30-45	30-45	30-45	30-45	30-45	30-45
Support Bracket to Water Pump Housing (Ft-Lb)	—	30-45	84-120 In-Lb	—	30-45	30-45	30-45	30-45
Pump to Bracket (Ft-Lb)	30-45	30-45	30-45	30-45	30-45	30-45	30-45	30-45
Belt Adjusting Nut (Slider)			Adjust to proper belt tension.					
Pressure Hose Tube Nut to Pump Pressure Fitting (Ft-Lb)	12-15	12-15	12-15	12-15	12-15	12-15	12-15	12-15
Return Hose to Pump (Hose Clamp) (In-Lb)	12-24	12-24	12-24	12-24	12-24	12-24	12-24	12-24

CG2663-2A

SPECIAL SERVICE TOOLS

SPECIAL SERVICE TOOLS—MODEL C II PUMP

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Tool No.	Description
T74P-3044-A1	C-Frame and Clamp Assembly
T78P-3733-A1	Upper Support Plate
T78P-3733-A2	Lower Support Plate
T78P-3733-A3	Seal Driver
970-001	Rotunda Power Steering Analyzer

CG2664-1A