GROUP

STEERING SYSTEM 11

(3000)

SECTION 11-00 Steering System—Service

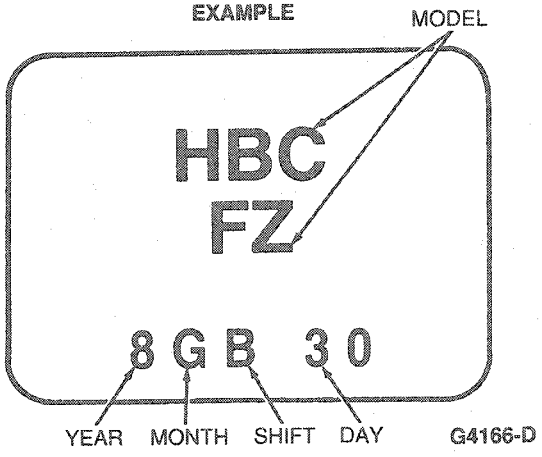
VEHICLE APPLICATION

Taurus / Sable and Taurus SHO.

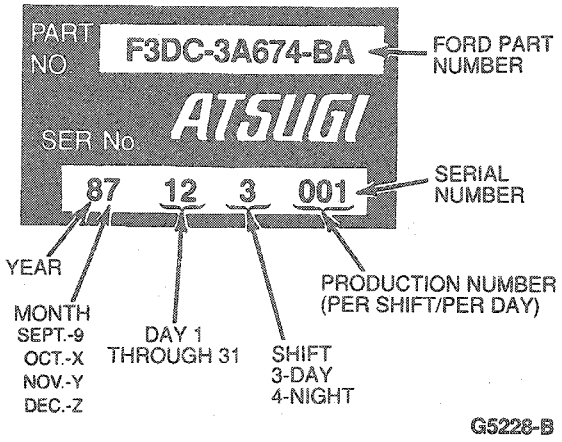
DESCRIPTION

The power steering pump has a service identification tag to identify assemblies for service purposes. The tag is located on reservoir body and contains information as shown below.

Power Steering Pump Model Identification



DESCRIPTION (Continued)



TESTING

Preliminary Tests

Make the following preliminary tests before power steering disassembly.

Air Bleeding

If bubbles are present in the power steering fluid, bleed the system as follows:

1. Fill reservoir.
2. Run engine until fluid reaches normal operating temperature of 74-79°C (165-175°F).

   CAUTION: Do not hold wheel in the far left or right position, or damage to power steering pump may result.
3. Turn steering wheel all the way to the left and right several times.
4. Check fluid level.
5. If air is still trapped in system, refer to Purging Power Steering System of Air.

Fluid Level Check

1. Idle engine for two to three minutes. Turn steering wheel all the way to the left and right several times to warm fluid to 43-49°C (110-120°F).

   CAUTION: Do not overfill reservoir.
2. Check fluid level in the power steering reservoir. Fluid level should be at the COLD FULL mark. If level is low, add Premium Power Steering Fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent.

Pump Belt Check

Replace and adjust broken, glazed or worn pump belts. Refer to Section 03-05 for adjustment procedures.

Fluid Leak Check

1. With engine idling, turn steering wheel left to right several times. Check all possible leakage points.
2. Tighten all loose fittings. Replace damaged lines and seals.
3. Check hoses for cut O-rings.

Turning Effort Check

Ensure front wheels are properly aligned and tire pressure is correct before checking turning effort.

1. Park vehicle on dry concrete and set parking brake.
2. Idle engine for two to three minutes. Turn steering wheel to the left and right several times to warm fluid to 43-49°C (110-120°F).
3. With engine running, attach a pull scale to rim of steering wheel. Measure pull required to turn wheel one complete revolution in each direction. Refer to Specifications at end of this Section for acceptable measurements.

Pump Flow and Pressure Test

Before performing pump flow and pressure test, complete the following checks for conditions which could cause loss of power assist. Take corrective action if necessary.

1. Check pump reservoir for proper fluid level.
2. Check tires for correct air pressure.
3. Check pump belt for proper tension.
4. Check pump for correct model and vehicle application.
5. Check for correct size pulleys on pump and engine.
6. Check entire system for damage. Replace parts, if necessary.

If the above items are correct, or have been corrected, and the loss of assist still exists, test power steering pump flow and pressure to determine whether the trouble is in the pump, power steering gear or hoses.

Test Equipment

1. Engine tachometer.
2. Thermometer: -17.8° to 148.9°C (0° to 300°F).
3. Rotunda Power Steering System Analyzer 014-00207 or equivalent.
4. Set of adapter fittings.

The test procedure used in conjunction with the Rotunda Power Steering System Analyzer or equivalent provides a method for checking the complete power steering system. This analyzer can be used to determine the cause of hard steering and/or lack of assist concerns.

The analyzer provides readouts for the following:

- System Back Pressure
- Pump Flow
- Steering Gear Internal Leakage
- Pump Relief Pressure

TESTING (Continued)

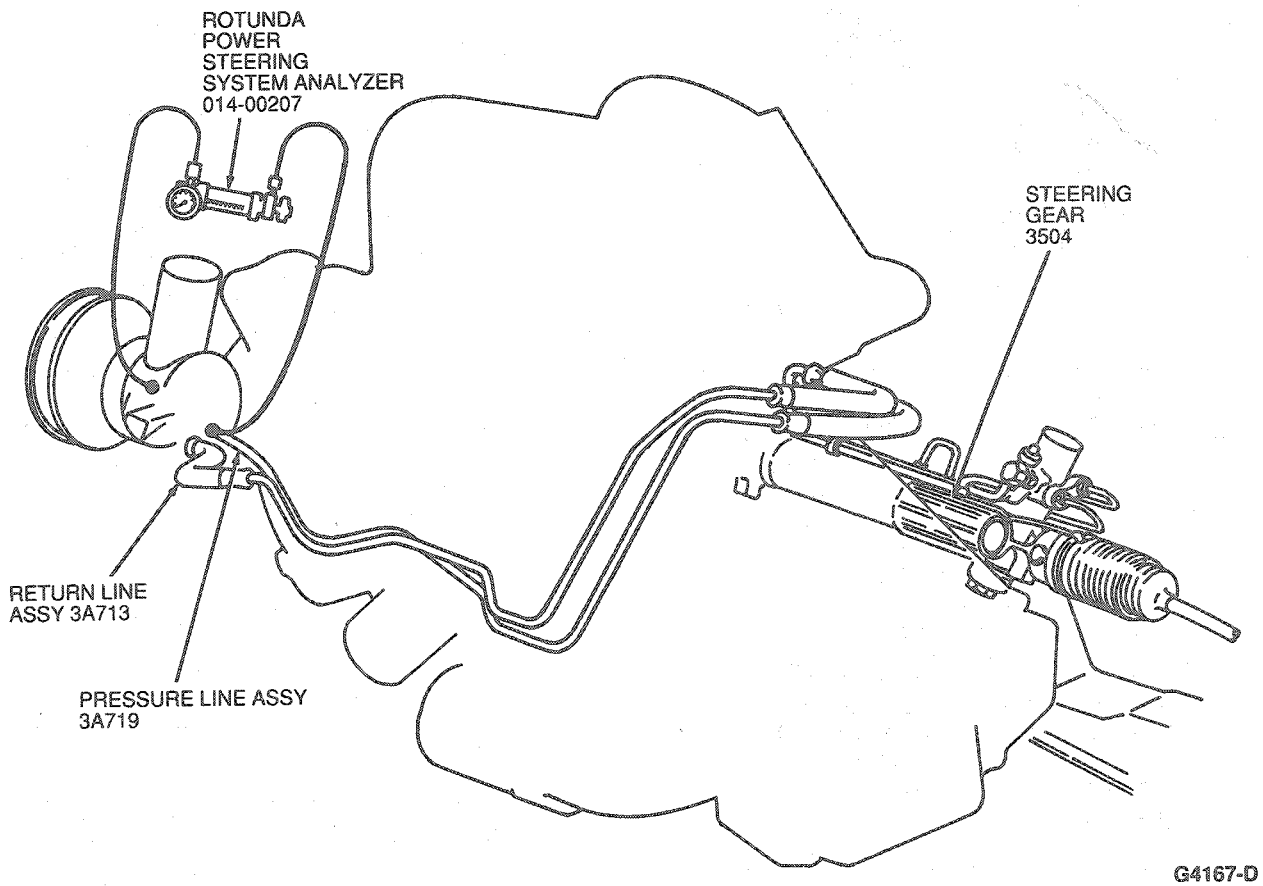
The interpretation of the above readouts will determine which of the following conditions or components are the cause of the concern:

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

Test Procedure

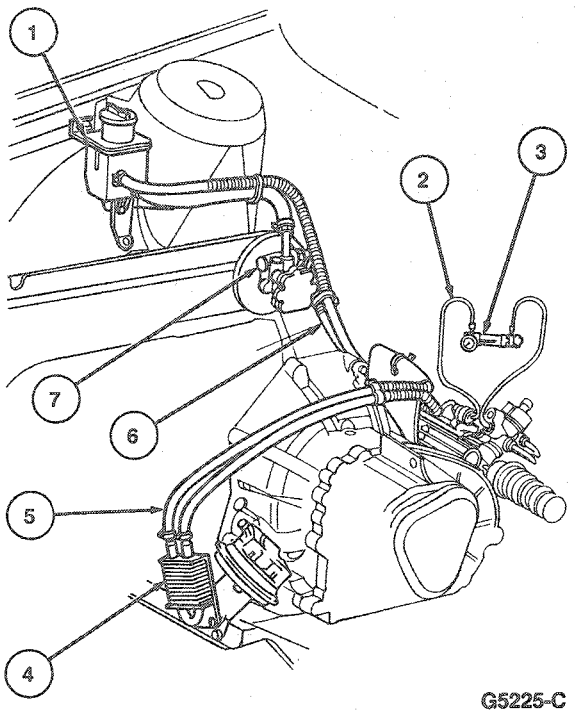
1. Loosen power steering line bracket at rear of engine.
2. Disconnect the high-pressure line from the pump and connect it into the appropriate hose adapter of the analyzer. For Taurus SHO, fitting 014-00208 or equivalent.
3. Thread the other analyzer adapter into pump. On Taurus SHO, thread the adapter into the steering gear.
4. Connect analyzer hoses to adapters. Tighten both connections to 20 N·m (15 lb-ft) maximum.

Taurus/Sable



TESTING (Continued)

Taurus SHO



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Item	Part Number	Description
1	3R700	Power Steering Reservoir
2	—	Pressure Hose From Pump
3	014-00207	Rotunda Power Steering System Analyzer
4	3D746	Cooler Assy
5	3F731	Hose Assy
6	3A719	Hose Assy
7	3A674	Power Steering Pump Assy

5. Add power steering fluid to the pump, on Taurus / Sable or reservoir on Taurus SHO if required. Start the engine and run it for approximately two minutes at idle.
6. Record the following:
   a. Flow: liters / min (gallons / min) at 78° ± 2°C (172° ± 5°F).
   b. Pressure: kPa (psi) at 78° ± 2°C (172° ±5°F) at idle with the gate valve fully open.
      - If flow is below 5.7 liters / min (1.5 gallons / min), Taurus / Sable, or 8.3 liters / min (2.2 gallons / min) Taurus SHO, the pump may require service. However, at this point, continue the diagnosis. Check flow and relief pressure against the model pump being tested.
      - If pressure is above 1034 kPa (150 psi), check hoses for restrictions.
7. Partially close the gate valve to build up 5100 kPa (740 psi). Observe and record flow, liters / min (gallons / min) at 78° ± 2°C (172° ± 5°F).

   If flow drops to a level lower than the value, disassemble the pump and replace the cam pack. If the pressure plates are cracked or worn, replace them. Continue with diagnosis.

   On Taurus SHO, if flow drops to a level lower than 3.4 liters / min (0.9 gallons / min) replace pump.
8. Completely close and partially open gate valve three times. (Do not allow valve to remain closed for more than five seconds.) Observe and record pressure, kPa (psi).

   Refer to the chart for pressure specification for the applicable pump model and vehicle application. If pressure recorded is lower than minimum specification, replace flow control valve in the pump used on Taurus / Sable. On Taurus SHO, replace pump.

   If the pressure recorded is above maximum specification listed, the flow control valve in the pump should be removed and cleaned or replaced on Taurus / Sable. On Taurus SHO, the pump should be removed and cleaned or replaced.
9. Increase engine speed from idle to approximately 1500 rpm. Observe and record flow, liters / min (gallons / min).

   If flow exceeds the maximum free flow specified, the flow control valve in the pump on Taurus / Sable should be removed and cleaned or replaced. On Taurus SHO, the pump should be removed and cleaned or replaced.
10. Check idle speed, and set if necessary. With the engine at idle, turn (or have an assistant turn) steering wheel to the left and right stops. Record pressure and flow at stops.

    Pressure developed at both stops should be nearly the same as maximum pump output pressure.

    At the same time, flow should drop below 1.9 liters / min (0.5 gallon / min). If the pressure does not reach maximum output or the flow does not drop below 1.9 liters / min (0.5 gallon / min), excessive internal leakage is occurring. Remove and disassemble steering gear. Replace damaged or broken . Pay particular attention to rack piston and valve seals for damage.
11. Turn (or have an assistant turn) steering wheel slightly in both directions, and release quickly while watching the pressure gauge. The needle should move from the normal back pressure reading and snap back as the wheel is released. If it comes back slowly or sticks, the rotary valve in steering gear is sticking or the column is binding. Ensure that the column is not binding before replacing the rotary valve.

    NOTE: If concern still exists, check ball joints and linkage. Refer to Diagnosis.

TESTING (Continued)

12. Remove, disassemble and clean the steering gear. Refer to Section 11-02 for disassembly. Also, flush power steering hoses and power steering pump before installing steering gear.
13. Disconnect and remove analyzer and connect lines.
14. Secure pressure line bracket at engine.

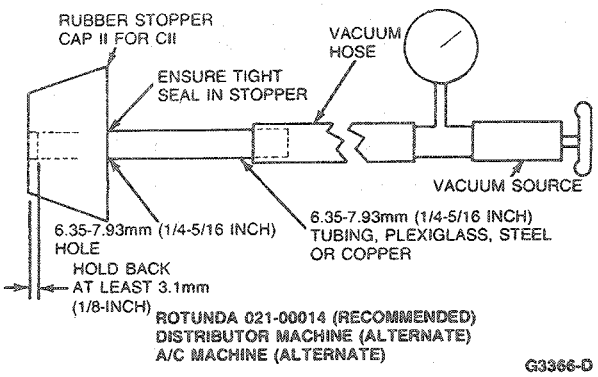
POWER STEERING PUMP SPECIFICATIONS

Engine	Pump Model	Minimum Flow* @ 5100 kPa (740 psi)		Minimum Relief Pressure		Max. Relief Pressure		Maximum Free Flow @ 1500 Rpm	
		Liters/Min. 78°C (172°F)	Gal./Min. 78°C (172°F)	kPa	psi	kPa	psi	Liters/Min.	Gal./Min.
3.0L and 3.8L Police	HBC-KE	3.4	.9	9650	1400	10550	1530	9.8	2.6
3.0L/3.2L SHO	F3DC-3A674 -BA	3.4	.9	9650	1400	10550	1530	9.8	2.6

***IMPORTANT:** Flow depends on pump model, engine rpm and pulley drive ratio. Engine idle rpm must be set to specification when checking pump minimum flow capacity.

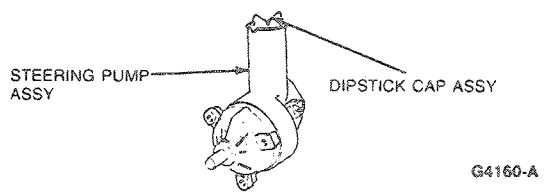
Purging Power Steering System of Air

Air trapped in power steering system, which causes a whine or moan-type noise, can be removed by using a power steering pump air evacuator assembly (devac tool). Fabricate as shown, or use Rotunda Vacuum Tester 021-00014 or equivalent.



CAUTION: Under no circumstances should engine vacuum be utilized.

1. Remove pump dipstick cap assembly.



2. Check and fill pump reservoir with Premium Power Steering Fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent to the COLD FULL mark on pump dipstick.
3. Disconnect ignition coil wire and raise front wheels off floor. Refer to Section 00-02.
4. Crank engine with starter motor and check fluid level. Do not turn steering wheel at this time.
5. Fill pump reservoir to COLD FULL mark on dipstick. Crank engine with starter motor while cycling steering wheel from lock-to-lock. Check fluid level.
6. Tightly insert rubber stopper of the air evacuator assembly into pump reservoir fill neck. Reconnect coil wire.
7. Apply 51 kPa (15 in-Hg) maximum vacuum on pump reservoir for a minimum of three minutes with engine idling. As air purges from system, vacuum will fall off. Maintain adequate vacuum with vacuum source.
8. Release vacuum and remove vacuum source. Refill reservoir to COLD FULL mark.
9. With engine idling, apply 51 kPa (15 in-Hg) vacuum to pump reservoir. Slowly cycle steering wheel from lock-to-lock every 30 seconds for approximately five minutes. Do not hold steering wheel on stops while cycling. Maintain adequate vacuum with vacuum source as air purges.
10. Release vacuum and remove vacuum equipment. Add fluid if necessary. Install dipstick.
11. Start engine and cycle steering wheel slowly. Check for fluid leaks at all connections. In severe cases of aeration, it may be necessary to repeat Steps 5 through 10.
12. Lower front wheels.

TESTING (Continued)

Start-Up Procedure

After Power Steering Pump or Gear Overhaul

After engine start up, follow these steps to eliminate excessive steering system noise due to air trapped in the system during service:

1. Disconnect ignition coil wire.
2. Fill reservoir and raise front wheels off floor.
3. Crank engine with starter and add fluid until level remains constant.

   NOTE: Front wheels must be off the floor during lock-to-lock rotation of steering wheel.
4. While cranking the engine, rotate steering wheel from lock-to-lock.
5. Check fluid level and add fluid if necessary.
6. Connect ignition coil wire and lower front wheels.
7. Start the engine, and allow it to run for several minutes.
8. Rotate steering wheel from lock-to-lock.
9. Turn engine off and check fluid level. Add fluid if necessary.
10. Purge system of air as outlined, if air is still present.

DIAGNOSIS

Drive vehicle to determine exactly what condition exists. Refer to the Steering System Diagnosis charts and service as required.

NOTE: The following diagnosis chart applies to a non-variable assist steering system.

STEERING SYSTEM

CONDITION	POSSIBLE SOURCE	ACTION
● Front End Wander—Condition where the vehicle wanders back and forth on the roadway when it is driven straight ahead while the steering wheel is held in a firm position.	● Check tire size and pressure (front and rear). ● Check if vehicle is unevenly or excessively loaded. ● Loose tie rod ends. ● Gear assembly loose on sub-frame. ● Loose suspension struts or ball joint(s). ● Column intermediate shaft connecting bolts loose. ● Column intermediate shaft universal joints loose / worn. ● Improper toe adjustment. ● Loose tie rod inner ball joints.	● Be sure tire sizes are correct, and adjust tire pressures. ● Adjust load. ● Replace tie rod end assembly. Refer to Section 11-02. ● Tighten mounting bolts. Refer to Section 11-02. ● Tighten strut mounting bolts or replace ball joint(s). Refer to Section 04-01. ● Tighten at gear and column. Refer to Section 11-04. ● Replace intermediate shaft assembly. ● Adjust as required. Refer to Section 04-00. ● Check ball housing torque. Refer to Section 11-02.

DIAGNOSIS (Continued)

STEERING SYSTEM (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Pulls to One Side — Condition where the vehicle tends to pull to one side when driven on a level surface.	• Improper tire pressure. • Improper tire size or different type. • Vehicle is unevenly or excessively loaded. • Improper toe adjustment. • Damaged front suspension components. • Damaged rear suspension components. • Steering gear valve effort out of balance (Power Steering only). • Check front and rear brakes for proper operation. • Check for damaged or sagging springs on front and / or rear suspension. • Check rear suspension for loose / worn shock absorber struts or suspension arm attaching fasteners. • Bonded rubber outer tie rod ends not installed properly.	• Adjust tire pressure. • Replace as required. • Adjust load. • Adjust toe as required. Refer to Section 04-00. • Refer to Section 04-01 for replacement. • Refer to Section 04-00 for replacement. • Place transmission in NEUTRAL while driving and turn engine off (coasting). If vehicle does not pull with the engine off, replace the steering gear valve assembly. Refer to Section 11-02. • If vehicle does drift with engine off: — Cross-switch front tire / wheel assemblies. — If vehicle pulls to opposite side, cross-switch tire / wheel assemblies that were on the rear to same side on the front. — If vehicle pull direction is not changed, check front suspension components and toe adjustment. • Service as necessary. Refer to Section 06-00. • Replace as required. • Replace shocks and / or tighten all attaching fasteners. • Remove outer tie rod ends from front knuckle and install by aiming front wheels straight ahead and connect outer tie rod end to front knuckle.
• Feedback (rattle, chuckle, squeak, knocking noises in steering gear) — Condition where roughness is felt in the steering wheel by the driver when the vehicle is driven over rough pavement.	• Column intermediate shaft universal joints loose / worn. • Loose tie rod end(s) and / or tie rod inner ball joints. Lack of lube in inner ball joint. • Gear assembly loose on sub-frame. • Column intermediate shaft connecting bolts loose. • Loose suspension bushings / fasteners or ball joints. • Check column conditions.	• Replace intermediate shaft assembly. Refer to Section 11-04. • Replace tie rod end(s) and / or tie rod assemblies. Refer to Section 11-02. • Tighten mounting bolts. Refer to Section 11-02. • Tighten bolts at gear and column. Refer to Section 11-04. • Tighten suspension fasteners, replace worn bushings, or replace ball joints. Refer to Section 04-01. • Refer to Section 11-04.

DIAGNOSIS (Continued)

STEERING SYSTEM (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Poor Returnability-Sticky Feel—Condition noticed when the steering fails to return to center following a turn without manual effort from the driver. In addition, when the driver returns the steering wheel to center, it may have a sticky or catchy feel.	• Improper tire pressure. • Improper tire size or incorrect type. • Column flange rubbing steering wheel and / or flange. • Column intermediate shaft universal joints binding. • Check for boot tears and / or evidence of binding or damage to tie rod ends or ball joints. • Improper toe adjustment. • Column bearing binding. • System contaminated.	• Adjust tire pressures. • Replace as required. • Refer to Section 11-04. • Replace intermediate shaft assembly. Refer to Section 11-04. • Replace as necessary. Refer to Section 11-02. • Adjust toe as required. Refer to Section 04-00. • Replace bearing. Refer to Section 11-04. • Flush power steering system. Refer to Flushing procedure Section 11-02.

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NOTE: The following diagnosis chart applies to a variable assist steering system.

STEERING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• High (Excessive) Steering Gear Efforts at All Vehicle Speeds is a Condition Recognized While Turning Corners and During Low Speed Maneuvers and Especially While Parking. The Assist Concerns May Occur in Both Directions or Only in One Direction, They May be Intermittent, or Consistent. NOTE: Discolored steering fluid in a rack-and-pinion steering system should not be misdiagnosed as a functional or noise concern.	• Low pump fluid. • Gear assembly external or internal leak. • Pump external leak. • Pump pressure and flow improper. • VAPS (Variable Assist Power Steering) system malfunction. • Improper drive belt tension. • Hose external leak. • Hose restriction. • Pump pulley loose / warped. • Power steering pump belt loose / glazed / broken or water on belt. • Engine idle too low. • Tires not properly inflated. • Suspension bent or interference. • System contaminated. • Valve screen plugged. • Flex coupling rubbing against housing face. • Column misaligned or binding.	• Fill as required and check for system leaks. • Replace steering gear assembly. Refer to Section 11-02. • Refer to Section 11-02. • Perform pump flow and relief pressure tests. Service as required. • Refer to VAPS system diagnostic procedure in Section 11-02. • Check for proper belt tension. • Service or replace as necessary. • Clean and replace as necessary. • Replace pulley. Refer to Section 11-02. • Inspect, adjust belt tension or replace as required. • Adjust idle. • Inflate. • Inspect service or replace as necessary. Refer to Section 04-00. • Inspect system for foreign object, kinked hose, etc. —flush system —refer to power steering pump, Section 11-02. • Prior to rebuilding a pump, examine the valve screen for contamination, Replace all valves which have plugged or contaminated valve screens. • Reposition flex coupling. • Align column assembly.
• High (Excessive) Efforts at Low Vehicle Speeds	• VAPS (Variable Assist Power Steering) system malfunction.	• Refer to VAPS system diagnostic procedure and service or replace components accordingly. Refer to Section 11-02.

DIAGNOSIS (Continued)

STEERING SYSTEM DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Low Efforts at All Vehicle Speeds	• VAPS system malfunction.	• Refer to VAPS system diagnostic procedure and service or replace components accordingly.
• Low Steering Gear Efforts Above 30 mph	• VAPS system malfunction	• Refer to VAPS system diagnostic procedure and service or replace components accordingly.
• External Leakage NOTE: Clean Off the Steering Gear Before Performing ANY Steering Gear External Leakage Checks.	• Leaks between actuator and gear. • Leaks between actuator and actuator bolts. • Gear fittings loose, cross threaded or stripped. • Leaks from steering gear seals (input shaft, pinion or either rack seals). • Housing cracked or leaking (due to a porous condition).	• Tighten actuator bolts. Refer to Section 11-02. • Tighten actuator bolts. • Replace two upper actuator seals. • Inspect and tighten or replace gear assembly. • Replace gear assembly. • Replace gear assembly. NOTE: The only serviceable components on the VAPS steering gear are the boots, tie rods, actuator, and actuator bolts and seals. All external leaks, which cannot be serviced by tightening tube fittings, are to be serviced by installing a "short rack" assembly (Part No. 3L547).
• Loose On Center NOTE: This Condition Should be Checked on Center Only. The Loose Condition Can be Detected With Greater Reliability With the Engine Off and Steering Wheel Straight Ahead. A Very Light Touch on the Steering Wheel Should be Used in Checking for This Condition.	• Steering gear mounting bolts loose. • Column intermediate shaft connecting bolt loose. • Intermediate shaft spring loaded U-bolt distorted. • Flex coupling clamp bolt loose. • Gear tie rod inner ball socket loose. • Column intermediate shaft joints loose or worn. • Steering column shaft clips missing or broken. • Flex coupling fractured. • Tie rod ends loose or worn. • Wheel loose or worn. • Loose wheel lug nuts.	• Tighten retaining nuts to specification. Refer to Section 11-02. • Tighten. Refer to Section 11-04. • Replace U-bolt. • Tighten. • Replace gear tie rod. • Replace intermediate shaft assembly. Refer to Section 11-04. • Replace as required. • Replace as required. • Tighten or replace as required. • Replace as required. Refer to Section 04-01. • Tighten. Refer to Section 04-04.
• Steering Wheel Not Centered Properly NOTE: Groove on Steel Hub of Steering Wheel Must Be In Line With Mark on Top End of Steering Shaft With Front Wheels in Straight Ahead Position to Line Up Steering Wheel Spokes Properly. Steering Wheel Centerline Should Be Within 10 Degrees of Vertical Plane After Toe-In Is Adjusted.	• Incorrect toe setting. • Flex coupling clamp bolts loose / missing. • Pinion installed in rack off location. • Improperly installed steering wheel. • Steering gear loose on frame. • Column intermediate shaft installed off location in column shaft V-block.	• Set. Refer to Section 04-00. • Replace and tighten. • Replace gear assembly. Refer to Section 11-02. • Reposition steering wheel. • Tighten. Refer to Section 11-02. • Index shaft to correct position.

DIAGNOSIS (Continued)

STEERING SYSTEM DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Smoothness / Sticky Feeling—Condition of Momentary Build Up, Hitch, Lump or Hesitation in Steering Efforts, Usually Occurring Just as the Turn is Begun. It May Occur Right or Left, and in Rare Cases, Occur in Both Directions. It May be Noticed During Parking, Low Speed Turns or at Road Speeds. If This Condition is Detected During Parking Maneuvers, it May Also be Noticed During Higher Speed Driving. NOTE: Discolored Steering Fluid in Rack-and-Pinion Steering System Should Not Be Misdiagnosed as a Functional or Noise Concern.	• Loose or worn pulley belt. • Front lower control arm ball joint worn. • Column trim rubbing steering wheel. • Binding in gear control valve assembly. • Water or oil on pulley belt. • Column misaligned or binding. • Flex coupling distorted or fractured. • Flex housing rubbing against housing face. • Column intermediate shaft joints loose, worn or binding. • Column intermediate shaft connecting bolt loose. • Steering linkage, shock absorbers or struts are loose, worn or binding. • Tight steering column bearings. • Column shaft clips missing or damaged. • Steering gear retaining bolts loose or damaged. • Wheel bearing loose or worn. • Loose wheel lug nuts. • Bent or damaged rack assembly. • Low tire pressure. • Improper front end alignment.	• Tighten or replace. Refer to Section 03-05. • Replace front lower control arm assembly. Refer to Section 04-01. • Reposition trim on column. • Replace gear assembly. Refer to Section 11-02. • Clean or replace. • Align column assembly. Refer to Section 11-04. • Align or replace as required. • Align or reposition flex coupling. • Replace as required. • Tighten. • Lubricate, adjust or replace as necessary. • Lubricate or replace as required. • Service as required. • Tighten. • Replace as required. Refer to Section 04-01. • Tighten. Refer to Section 04-04. • Replace gear assembly. • Inflate. • Align front end. Refer to Section 04-04.

DIAGNOSIS (Continued)

STEERING SYSTEM DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Uneven Drive Efforts, Pulls or Leads to One Side—Condition Recognized by the Driver While Turning the Steering Wheel in a Left or Right Turn. This Condition Will Reveal Lighter Efforts in One Direction, Very Noticeable to the Driver. Vehicle Pulls or Leads to One Side. Keep in Mind Road Conditions and Wind. Pulls or Leads Refers to the Tendency of a Vehicle to Drift Consistently to One Side on a Reasonably Flat Road. It May or May Not be Accompanied by Unequal Effort Requirements at the Steering Wheel. NOTE: Peform the Following Test to Determine if Concern is Related to Steering Gear or Vehicle System. At 15-55 mph on a flat straight surface, set vehicle in a straight line, place shift selector in NEUTRAL position and turn off ignition. If the vehicle continues to pull or drift in the same direction as the original concern, then the steering gear is not the cause. If the vehicle does not pull, but remains on a straight line this indicates a steering gear concern and steering efforts should also be noticeably light in direction of pull. This condition is normally due to an unbalanced steering gear valve assembly.	• Radial tires (misaligned belts). • Front or rear end misaligned. • Steering gear valve efforts unbalanced. (Efforts will be lighter in one direction.) • Front suspension components damaged. • Low tire pressure or incorrect front to rear. • Incorrect tire size or incorrect type. • Check front and rear brakes for proper operation. • Check for bent rear axle housing and for damaged or sagging springs in the front or rear suspension. • Check rear suspension for loose or worn shock absorber struts, suspension arm retaining fasteners. • Vehicle unevenly loaded. • Front or rear wheel bearing loose or worn. • Steering gear retaining bolts loose or damaged. • Column misaligned or binding. • Halfshaft or CV joint bind.	• Replace as necessary. • Align. • Replace gear assembly. Refer to Section 11-02. • Replace as required. Refer to Section 04-04. • Check pressure and inflate / deflate as necessary. • Correct as required. • Adjust if necessary. Refer to Section 06-00. • Replace if necessary. • Tighten all retaining fasteners. Refer to Section 04-02. • Correct as required. • Refer to Sections 04-01 or 04-02. • Tighten. • Align column assembly. • Replace CV joints. Refer to Section 05-04.
• Poor Returnability is a Condition Noticed When the Vehicle Fails to Return to a Nearly Straight Ahead Position After a Corner Maneuver. The Wheel Should Return Within a Reasonable Period of Time Without Undue Help From the Driver. Returnability Concerns May Occur From Both Directions or Only From One Direction. NOTE: This Condition is Accompanied By a Momentary Build Up, Hitch, Lump, or Hesitation, in Steering Efforts Usually Occurring Just Off Center Either in One Direction or Both. Concern Occurs Only During Driving, and Not During Parking Maneuvers.	• Column trim rubbing steering wheel. • Front lower control arms worn. • Brinelled or binding upper strut bearing. • Tight tie rod and / or tie rod end ball joints. • Steering valve assembly off balance. Efforts will be light in one direction and return will be poor in light direction. • Improper front end alignment. • Steering linkage, shock absorbers, struts, loose, worn or binding. • Tilt column bearing sideloaded by spring. • Intermediate column shaft joints binding. • Bent or damaged crossmember. • Column bearing binding. • Column misaligned or binding. • Low tire pressure or incorrect pressure front to rear. • Steering wheel clear vision off location. • Incorrect tire size or incorrect type.	• Reposition trim ring in column assembly slots. • Replace lower control arms. Refer to Section 04-01. • Replace bearing. • Replace tie rod and / or tie rod ends. • Replace gear assembly. Refer to Section 11-02. • Align front end. • Lubricate, adjust or replace as necessary. • Remove spring. If improved, replace tilt yoke, shaft or steering wheel. • Replace intermediate shaft assembly. • Replace as necessary. Refer to Section 01-00. • Replace as necessary. • Align column assembly. • Check pressure and inflate / deflate as necessary. • Adjust as required. • Replace as required.

DIAGNOSIS (Continued)

STEERING SYSTEM DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Noise / Rattle / Chuckle / Clicks / Pops / Squeaks / Creaks / Clunk / Squawk / Hiss There are Many System Noises Which Can be Misdiagnosed as Originating From the Power Steering Gear. Most System Noises are RPM Sensitive. Therefore, Turning the Steering Wheel will Vary the RPM and Consequently the Noise Pitch. Careful Diagnosis is Necessary to Prevent Unnecessary Services. Disconnecting of Belts and Re-evaluation is Essential in Many Cases, as is Partially Cycling the Steering Wheel With the Engine in OFF. NOTE: A Common Noise in the Rack-and-Pinion Steering Gear is a Hissing Sound. The Sound is Most Evident at Static Position or During Parking Maneuvers. There is No Relationship Between this Noise and Performance of the Steering. "Hiss" May Occur at End of Steering Wheel Travel or When Slowly Turning at Stand Still, or at a Particular Position.	• Column intermediate shaft connecting bolt loose. • Column trim rubbing steering wheel. • Loose or worn pump belt. • Front lower control arm worn or binding. • Brinelled or binding upper strut bearing. • Flex coupling distorted. • Flex coupling clamp bolt loose. • Pump bracket loose or misaligned. • Lack of lubricant where horn brush contacts rub steering wheel plate. • Column shaft clips missing. • Column U-joints loose. • Loose tie rod ends or ball joints. • Gear assembly loose on frame. • Loose suspension struts. • Flex coupling fractured. • Loose wheel lug nuts. • Pressure hose grounded against fender or vacuum canister. • Front wheel bearing loose or worn. • Column misaligned or lower bearing out of position. • Steering shaft insulators cracked or dry. • Kinked pressure hoses. • Steering gear or pump external leak. • Pulley loose or warped. • Aerated fluid. • Water in steering fluid.	• Tighten. Refer to Section 11-04. • Reposition trim on column. • Adjust or replace as required. Refer to Section 03-05. • Replace as required. Refer to Section 04-01. • Replace strut bearing. Refer to Section 04-01. • Align flex coupling. • Tighten. Refer to Section 11-04. • Tighten and align. Refer to Section 11-02. • Lubricate or adjust as required. • Replace as required. • Replace if necessary. • Replace tie rod assembly. • Tighten. Refer to Section 11-02. • Adjust or replace as required. • Replace as required. • Tighten. Refer to Section 04-04. • Reposition pressure hoses. • Replace bearing. Refer to Section 04-01. • Correct as necessary. • Replace or lubricate as required. • Reposition pressure hoses. Refer to Section 11-02. • Inspect and replace or service as required. • Replace pulley assembly. • Purge and evacuate system. • Purge and evacuate system.

DIAGNOSIS (Continued)

STEERING SYSTEM DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Wandering / Darting / Pointing — Condition Noticed When the Car is Driven in a Straight Ahead Position With the Wheel Held in a Firm Position, and the Vehicle Wanders to Either Side. Darting Refers to Down the Road Steering Feel, it is Not Smooth and Seems to be Sticky and the Driver Cannot Make Minor Correction With Ease. Pointing Refers to the Inability of the Vehicle to Return to a Straight Ahead Position After a Moderate to Higher Speed Lane Change. NOTE: Pointing Characteristics are Normal with the Rack-and-Pinion Steering System Up to 10 Degrees Off-Center.	• Steering gear retaining bolts loose or damaged. • Improper front or rear end alignment. • Front lower control arm ball joint(s) worn. • Brinelled or binding strut upper bearing. • Steering wheel clear vision off location. • Column trim rubbing steering wheel. • Loose suspension struts or ball joints binding. • Loose tie rod ends. • Column intermediate shaft joint loose or worn. • Column misaligned or binding. • Gear tie rod inner ball joint loose or worn. • Column intermediate shaft connecting bolt loose. • Low tire pressure or incorrect pressure front to rear. • Incorrect tire size or incorrect type. • Radial tires (misaligned belts). • Front and / or rear wheel bearing loose or worn. • Loose or worn rear suspension. • Loose flex coupling bolt. • Improper brake operation or adjustment. • Vehicle unevenly loaded.	• Tighten. Refer to Section 11-02. • Align. • Replace as required. Refer to Section 04-01. • Replace bearing. • Correct as required. • Reposition trim on column assembly. • Adjust or replace as required. • Replace tie rod ends. • Replace intermediate shaft. • Align column assembly. • Replace gear tie rods. • Tighten. Refer to Section 11-04. • Check tire pressure and inflate / deflate as necessary. • Correct as required. • Replace as required. • Refer to Sections 04-01 and / or 04-02. • Tighten or replace as necessary. Refer to Section 04-00. • Tighten. • Inspect and adjust. Correct as required. Refer to Section 06-00. • Correct as required.

TG5402D

SPECIFICATIONS

STATIC STEERING WHEEL TURNING EFFORT

Vehicle	Power
Taurus / Sable, Taurus SHO with VAP	2.27 kg (5.0 Lb)
Taurus / Sable without VAP	3.18 kg (7.0 Lb)

POWER STEERING RELIEF PRESSURE

Vehicle	Min. Relief Pressure	
	kPa	psi
3.0L, 3.8L and Taurus Police 3.8L	9650	1400
3.0L / 3.2L SHO	9650	1400

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
014-00207	Power Steering System Analyzer
021-00014	Vacuum Tester
014-00208	Taurus 3.0L / 3.2L SHO Fitting

SECTION 11-02 Steering System, Power

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION

Steering Gear

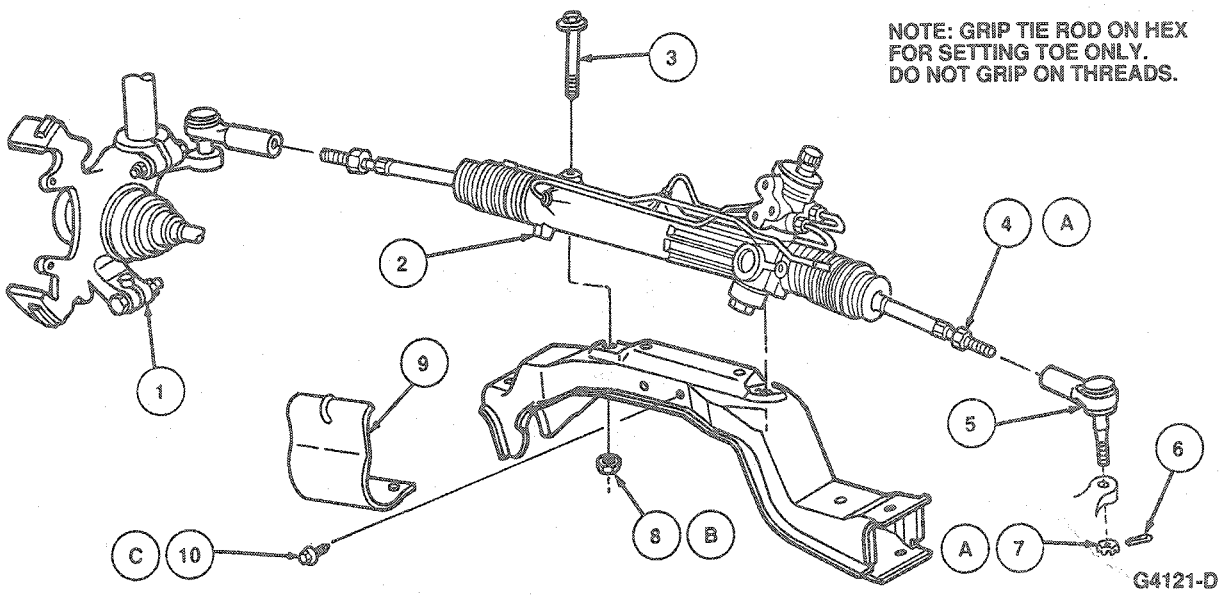
The power steering gear is a 16:1 constant ratio power rack-and-pinion design for all vehicles except Taurus LX and Sable.

The gear housing and valve housing are combined into a one-piece aluminum die casting. The gear design incorporates quick connect fittings for the pressure and return lines that allow the lines to swivel; this is normal and does not indicate loose fittings. If the fittings leak, check to ensure they are tightened to 14-20 N·m (10-15 lb-ft). Do not overtighten. If the leak is not corrected, replace the fitting seals.

The 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.

NOTE: The power steering gear used on the Taurus SHO utilizes travel restrictors mounted inboard of the ball joint housings. The restrictors limit wheel travel to prevent the tires from hitting the wheel housing.

DESCRIPTION (Continued)



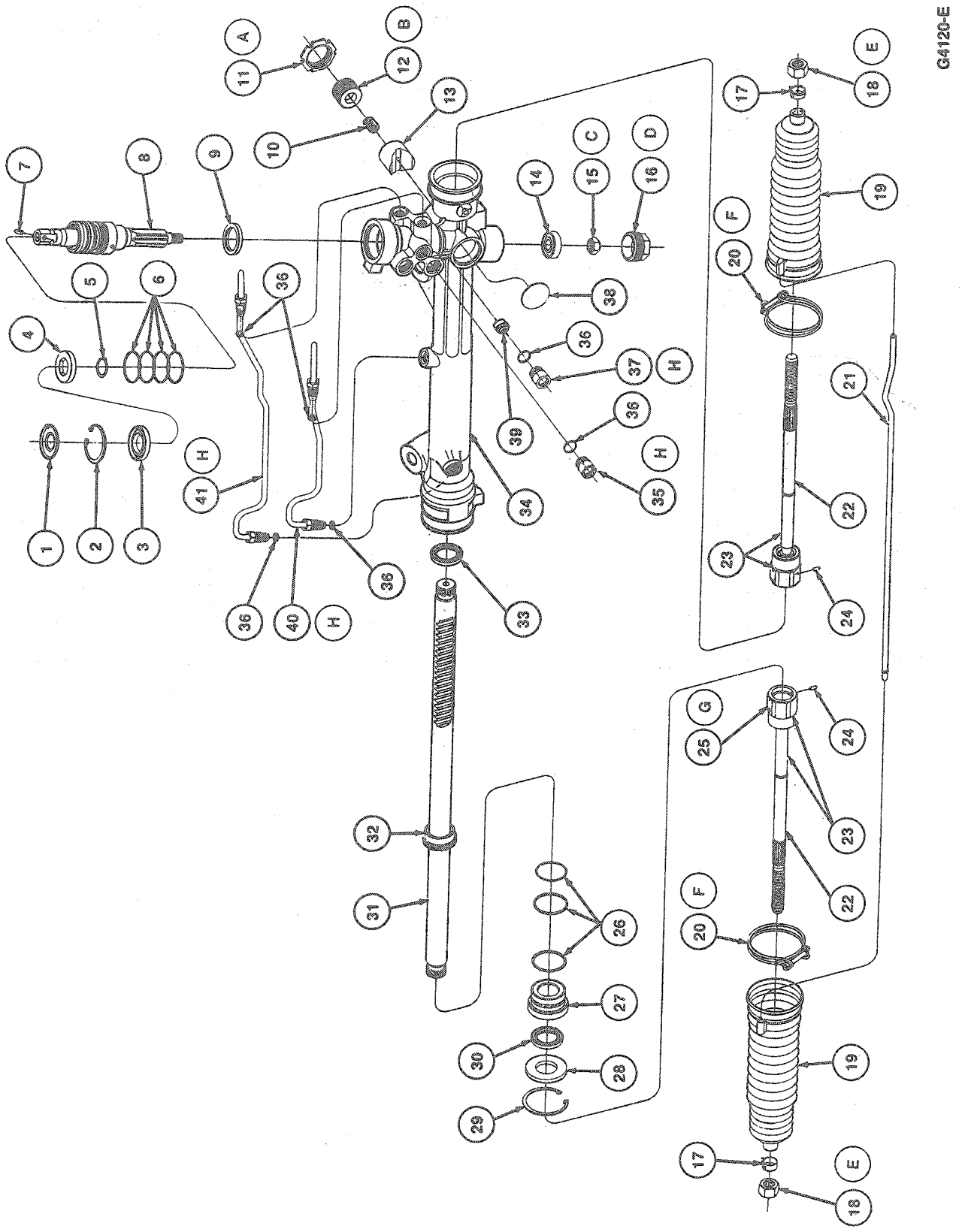
Item	Part Number	Description
1	3K1867	Spindle Assy
2	3504	Gear Assy
3	804246-S150	Bolt (2 Req'd)
4A	N803637-S36	Nut (2 Req'd)
5	3289	Tie Rod End Assy (2 Req'd)
6	—	Cotter Pin (2 Req'd)
7A	N803972-S150	Nut (2 Req'd)

(Continued)

Item	Part Number	Description
8B	N803956-S150	Nut (2 Req'd)
9	3F540	Shield
10C	N610957-S36	Bolt (2 Req'd)
A		Tighten to 47-68 N·m (35-50 Lb-Ft)
B		Tighten to 115-135 N·m (85-100 Lb-Ft)
C		Tighten to 5.5-8.0 N·m (49-71 Lb-In)

DESCRIPTION (Continued)

Taurus / Sable



DESCRIPTION (Continued)

Item	Part Number	Description
1	3D527	Power Steering Gear Input Shaft Dust Seal
2	6140	Snap Ring
3	3D526	Power Steering Gear Input Shaft Seal
4	3D525	Power Steering Gear Input Shaft Bearing
5	386387-S	Snap Ring
6	3D728	Seals
7	390920-S	Roll Pin
8	3D517	Power Steering Gear Input Shaft and Control Assy
9	3591	Seal
10	3F516	Spring
11A	3F606	Yoke Plug Locknut
12B	3580	Yoke Plug
13	3F515	Sector Shaft Support Yoke
14	3552	Steering Gear Worm Bearing
15C	34988-S100	Nut
16D	3568	Steering Gear Housing Cover
17	3C650	Clamp
18E	N803637-S	Nut
19	3332	Boot
20F	N803259-S	Clamp
21	3K762	Breathe Tube
22	—	Spindle Rod (Part of 3280)
23	3280	Tie Rod Assy
24	—	Roll Pin (Part of 3280)
25G	—	Ball Joint Housing (Part of 3280)

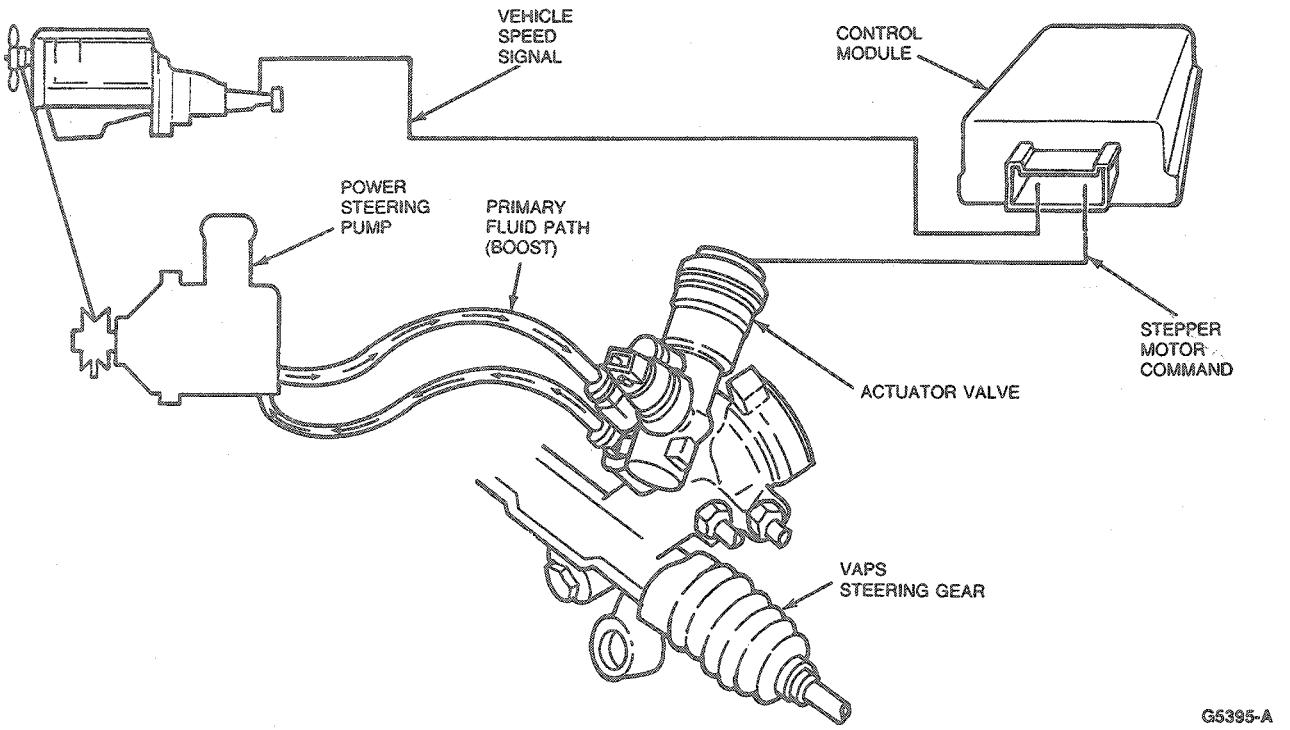
(Continued)

Item	Part Number	Description
26	N803637-S	Seal
27	3576	Bushing
28	3568	Plate
29	97630-S	Snap Ring
30	3F520	Seal
31	3575	Rack Assy
32	—	Piston (Part of 3575)
33	3F520	Rack Seal
34	3548	Steering Gear Housing Assy
35H	3R608	Transfer Tube Connector
36	388898-S	Seal
37H	3C751	Transfer Tube Connector
38	N804432-S	Plug
39	3N603	Check Valve
40H	3A714	Transfer Tube Assy
41H	3A717	Transfer Tube
A		Tighten to 60-89 N·m (44-66 Lb-Ft)
B		Tighten to 5-5.6 N·m (45-50 Lb-In)
C		Tighten to 41-54 N·m (31-39 Lb-Ft)
D		Tighten to 54-68 N·m (40-50 Lb-Ft)
E		Tighten to 47-68 N·m (35-50 Lb-Ft)
F		Tighten to 2.2-3.4 N·m (20-30 Lb-In)
G		Tighten to 75-88 N·m (55-65 Lb-Ft)
H		Tighten to 13-27 N·m (10-20 Lb-Ft)

DESCRIPTION (Continued)

Variable Assist Power Steering (VAPS)

The variable assist power steering (VAPS) system consists of a microprocessor-based module, a power rack-and-pinion steering gear, an actuator valve assembly, hose assemblies, and a high efficiency power steering pump for Taurus LX and Sable 3.0L and 3.8L.



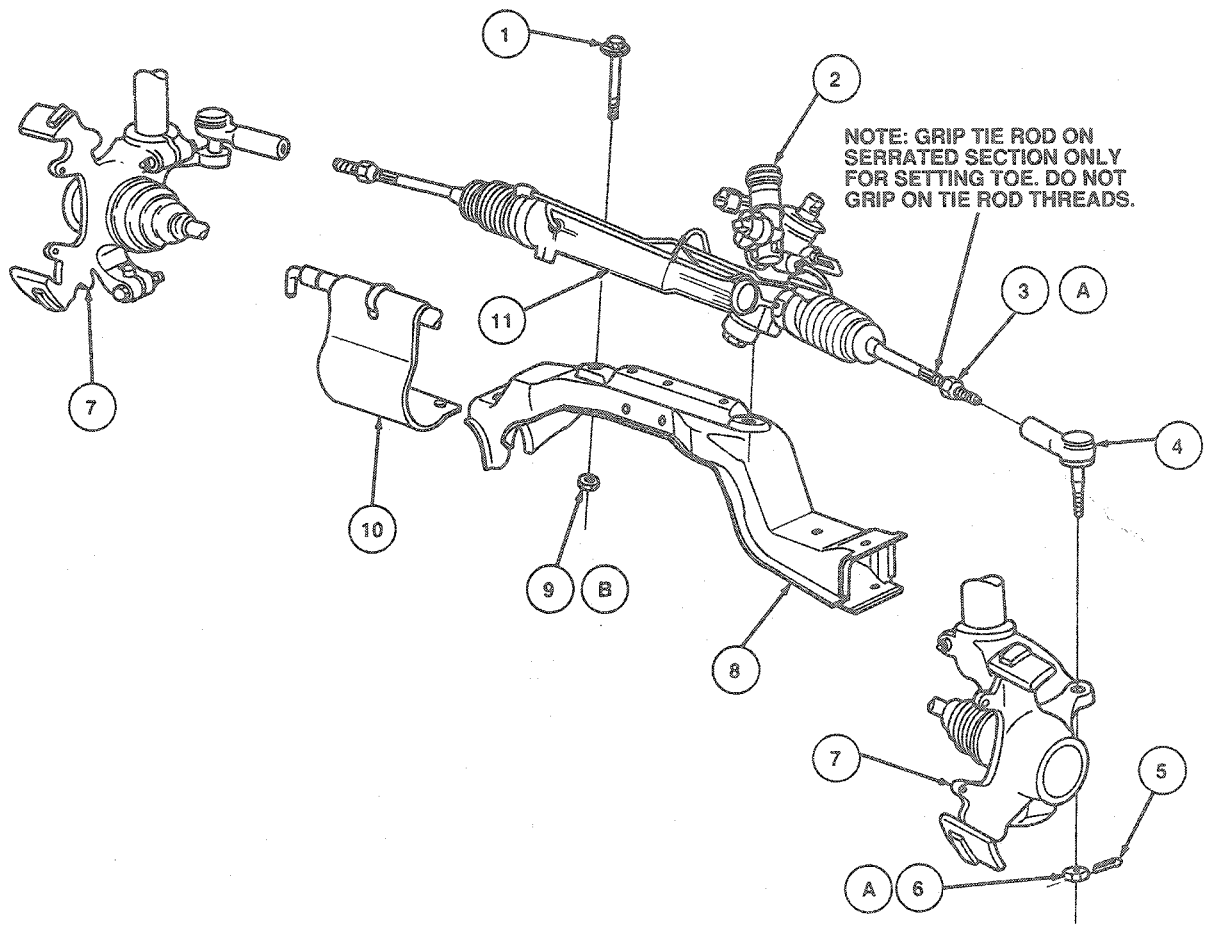
The system uses a modified rotary valve in the gear with two independent hydraulic circuits called the primary and secondary circuits. During parking and low speed operation, the flow from the pump is routed to the primary circuit by an electrically controlled actuator valve assembly. As vehicle speed increases, the actuator valve gradually opens, diverting an increasing amount of fluid to the secondary circuit.

The actuator valve is a pressure-balanced variable orifice valve, controlled by a stepper motor-driven linear spool. The VAPS module receives inputs from a vehicle speed sensor, and signals the stepper motor-driven spool to adjust the opening of the actuator valve.

The VAPS module is programmed to perform a self-diagnostic check every 16 milliseconds. If a concern is detected, the module microprocessor deactivates its outputs.

The VAPS module is programmed to perform a service diagnostic procedure when activated by the service technician.

DESCRIPTION (Continued)



Item	Part Number	Description
1	N804433-S150	Bolt (2 Req'd)
2	3N803	Actuator Assy
3A	N803637-S36	Nut (2 Req'd)
4	3289	Tie Rod End Assy (2 Req'd)
5	72044-S100	Cotter Pin (2 Req'd)
6A	N803972-S150	Nut (2 Req'd)
7	3K185 (LH) 3K186 (RH)	Spindle Assy

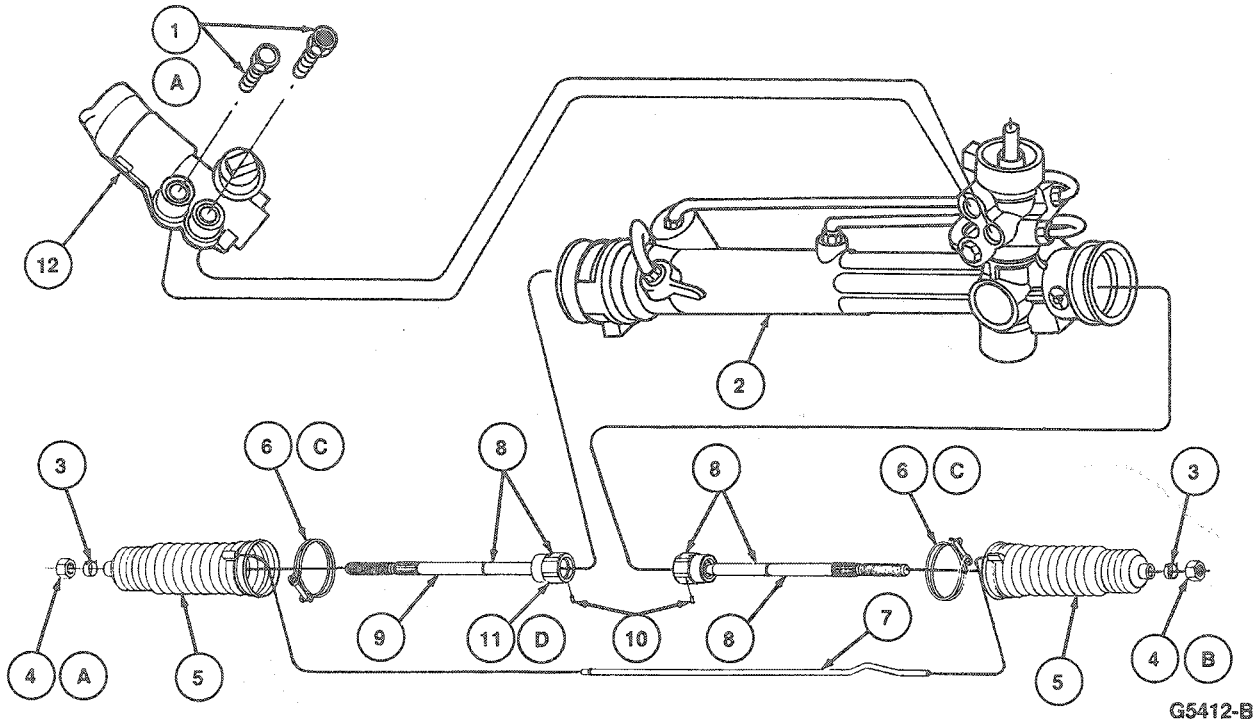
(Continued)

Item	Part Number	Description
8	—	Crossmember
9B	N803956-S150	Nut (2 Req'd)
10	3F570	Shield
11	3504	Gear Assy
A		Tighten to 47-68 N·m (35-50 Lb-Ft)
B		Tighten to 115-135 N·m (85-100 Lb-Ft)

TG4920C

DESCRIPTION (Continued)

VAPS Exploded View



Item	Part Number	Description
1A	3R659	Bolt
2	3548	Steering Gear Housing Assy
3	3C650	Clamp
4B	N803637-S	Nut
5	3332	Boot
6C	N803259-S	Clamp
7	3K762	Breather Tube
8	3280	Tie Rod Assy
9	—	Spindle Rod (Part of 3280)
10	—	Roll Pin (Part of 3280)

(Continued)

Item	Part Number	Description
11D	—	Ball Joint Housing (Part of 3280)
12	3N803	Actuator Assy
A		Tighten to 27-34 N·m (20-25 Lb-Ft)
B		Tighten to 47-68 N·m (35-50 Lb-Ft)
C		Tighten to 2.2-3.4 N·m (20-30 Lb-In)
D		Tighten to 75-88 N·m (55-65 Lb-Ft)

TG5412B

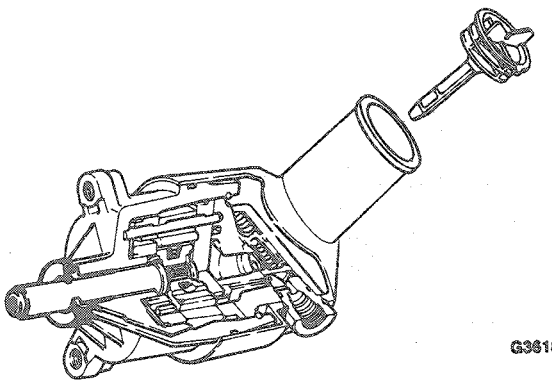
Steering Pump, CII

The Ford Model CII power steering pump is a belt-driven, 10-slipper type pump with a fiberglass-filled nylon reservoir. The reservoir is attached to the rear side of the aluminum pump housing, and the pump body is encased within the housing and reservoir. The pump design incorporates a pump pressure fitting which allows the pump pressure line to swivel. This is normal and does not indicate a loose fitting.

DESCRIPTION (Continued)

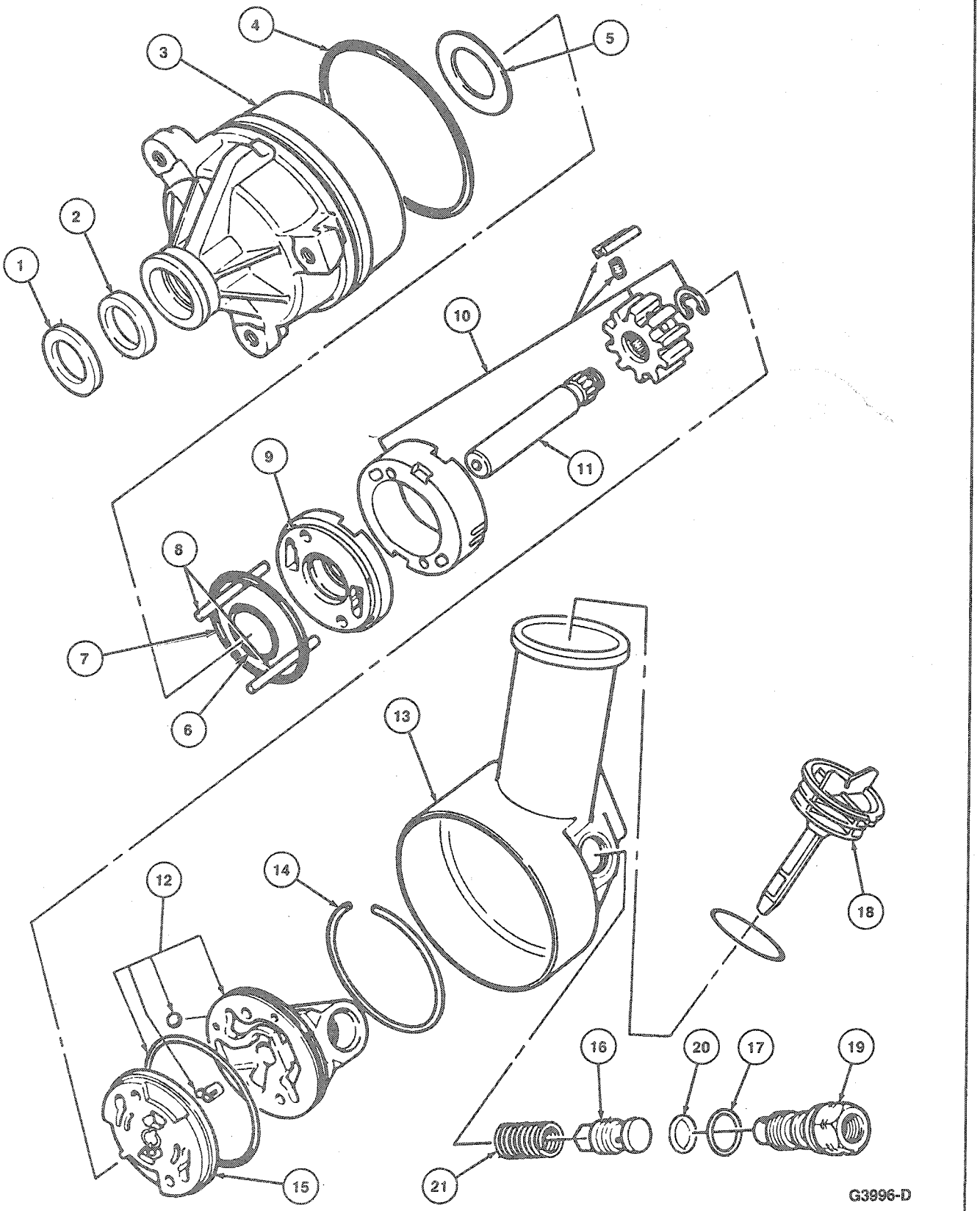
A pressure-sensitive identification tag is attached to the reservoir body. This tag indicates the basic model number and the suffix.

CAUTION: Always use the model codes on the tag when requesting service parts in case of differences in internal components. Refer to Section 11-00 for an example of this tag.



G3618-B

DESCRIPTION (Continued)



DESCRIPTION (Continued)

Item	Part Number	Description
1	3F655	Retainer Assy
2	3B592	Shaft Seal
3	3A643	Pump Housing Plate
4	387572-S100	Seal
5	3D596	Belleville Spring
6	387569-S100	Seal
7	3875700-S100	Seal
8	387579-S	Dowel Pin (2 Req'd)
9	3D590	Lower Plate
10	3D607	Cam and Rotor Assy
11	3B599	Shaft

(Continued)

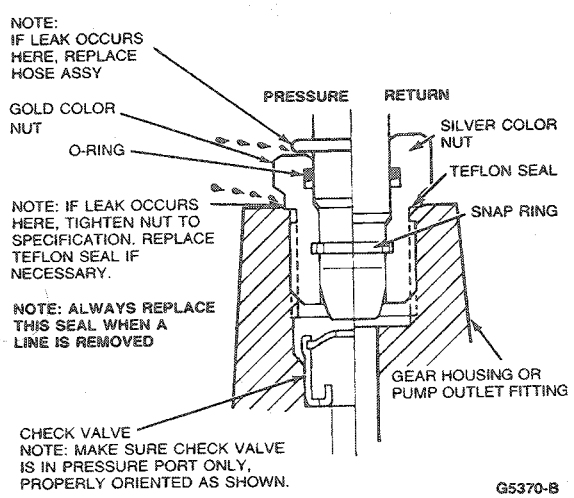
Item	Part Number	Description
12	3C544	Valve Cover Assy
13	3A578	Reservoir
14	387573-S	Retaining Ring
15	3A645	Upper Plate
16	3B604	Valve Body
17	389349-S	Seal
18	3A006	Dipstick
19	3D653	Outlet Fitting
20	384975-S94	Seal
21	3D586	Spring

TG3996D

Power Steering Hoses

The power steering hoses use O-ring seals at the quick connect fittings. Note that there are two possible leak points.

Power Steering Pump and Gear Connection



G5370-B

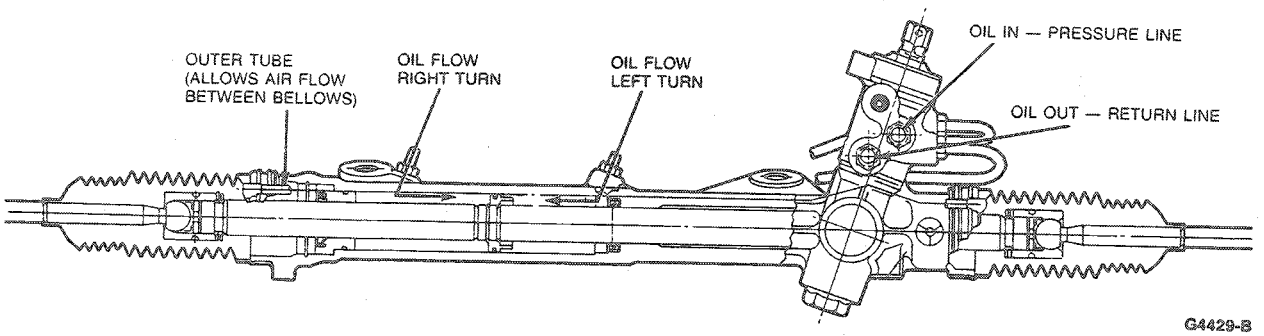
Atsugi Steering Pump

The Atsugi power steering pump is a belt driven, vane-type power steering pump. The pump uses a remote reservoir mounted on the RH fender apron, an oil cooler and a special quick connect fitting at the pump outlet.

OPERATION

Rotary Valve

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

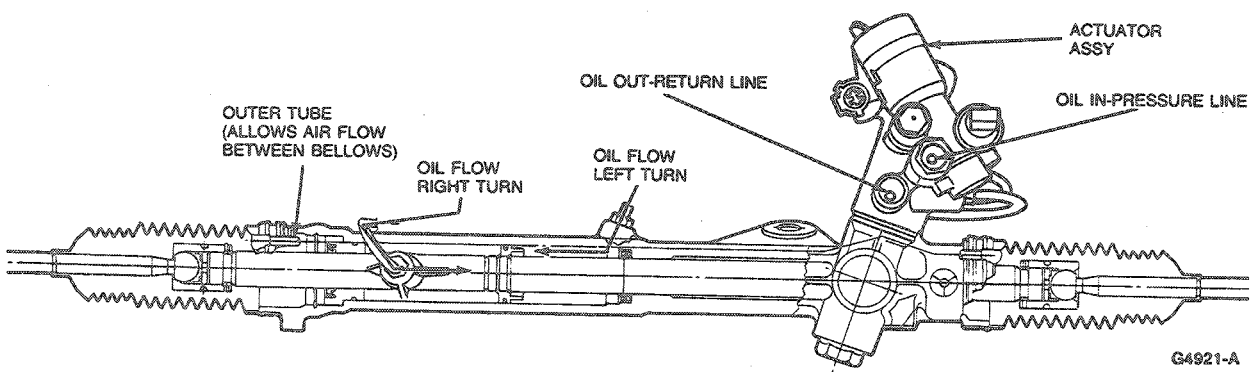


When the steering wheel is turned, resistance of the wheels and the weight of the vehicle cause a torsion bar to deflect. This deflection changes the position of the valve spool and sleeve ports, directing fluid under pressure to the appropriate end of the power cylinder. The difference in pressure forces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

Rotary Valve, VAPS

The rotary design control valve directs fluid flow using relative rotational motion of the input shaft and valve sleeve.



OPERATION (Continued)

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 pressurized fluid 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 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.

DIAGNOSIS AND TESTING

The diagnosis charts provide procedures to resolve typical customer concerns encountered with the power steering system.

Follow the sequence indicated to save time during condition identification and corrective action.

Power Steering Diagnosis

Before any internal service is performed on the rack and pinion power steering, diagnosis of the condition must be performed. Ensure that the tire size is correct, with matched tires (front and rear), all inflated to specifications. The following conditions, possible sources and corrective action will assist in performing the proper service.

POWER STEERING DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Wander: Condition Where Vehicle Wanders Side-To-Side On The Roadway When Being Driven Straight Ahead While The Steering Wheel Is Held In A Firm Position. Evaluation Should Be Conducted On A Level Road (Little Road Crown).	• Loose tie rod ends. • Inner ball housing loose or worn . • Gear assembly mounting loose. • Loose suspension struts or ball joints. • Column intermediate shaft connecting bolts loose. • Column intermediate shaft joints loose or worn. • Improper wheel alignment.	• Replace tie rod end assemblies. • Replace tie rod assemblies. • Tighten mounting bolt to specification. • Adjust or replace as required. • Tighten bolts to specification. • Replace intermediate shaft. • Set alignment to specification.
• Feedback—Rattle, Chuckle, Knocking Noises In the Steering Gear. Condition Where Roughness Is Felt In The Steering Wheel By The Driver When The Vehicle Is Driven Over Rough Pavement.	• Column U-joints loose. • Loose tie rod ends. • Loose / worn tie rod ball. • Gear assembly mounting loose. • Piston disengaged or loose on rack. • Column intermediate shaft connecting bolts loose. • Loose suspension struts or ball joints.	• Replace if damaged or worn. • Replace tie rod end assemblies. • Replace tie rod assemblies. • Tighten mounting bolts to specification. • Replace rack assembly. • Tighten bolts to specification. • Adjust or replace as necessary.

DIAGNOSIS AND TESTING (Continued)

POWER STEERING DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Poor Returnability— Sticky Feel: Condition Where The Steering Fails To Return To Center Following A Turn Without Manual Effort From The Driver. In Addition, When The Driver Returns The Steering To Center, It May Have A Sticky Or Catchy Feel.	• Misaligned steering column or column flange rubbing steering wheel and / or flange. • Check rotational torque of intermediate shaft joints. • Tight inner tie rod ball joints. • Tight inner tie rod end ball studs. • Binding in valve assembly. • Bent or damaged rack. • Bent or damaged subframe. • Column bearing binding. • Tight suspension struts or lower control arm ball joints. • Improper wheel alignment. • Contamination in system. • Improper yoke clearance (tight).	• Align column. • If binding, replace intermediate shaft. • Replace tie rod as required. • Replace tie rod end assemblies. • Replace input shaft valve assembly. • Replace rack assembly. • Replace as necessary. • Replace bearing. • Adjust or replace as required. • Set to specification. • Flush power steering system. • Set to specification.
• Heavy Steering Efforts — Poor or Loss of Assist: Condition Where A Heavy Effort And Poor Assist Condition Is Recognized By The Driver While Turning Corners And Especially While Parking. A Road Test Will Verify This Condition.	• Leakage / loss of fluid. • Low pump fluid. • Valve seal cut or twisted. • Damaged / worn Teflon® piston seal. • Loose / missing rubber backup piston O-ring. • Loose rack piston. • Gear assembly oil passages restricted. • Bent / damaged rack assembly. • Pump external leakage. • Improper drive belt tension. • Hose or cooler external leakage. • Improper engine idle speed. • Pulley loose or warped. • Pump / flow pressure not to specification. • Hose cooler line restrictions.	• Refer to external leakage diagnosis for service. • Fill as necessary. • Replace seal. • Replace seal. • Replace / install O-ring. • Replace rack assembly. • Clear / service as required. • Replace rack assembly. • Service per Pump Diagnosis. • Readjust belt tension. • Replace as necessary. • Readjust idle. • Replace pulley. • Refer to Pump Service Diagnosis. • Clear or replace as required.

TG3117F

FORD INTEGRAL POWER RACK-AND-PINION STEERING GEAR

CONDITION	POSSIBLE SOURCE	ACTION
• Hissing Sound NOTE: 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. **CAUTION: Do not hold steering wheel at full lock more than five seconds, as damage to power steering pump may result.**	• Hiss may be expected when the steering wheel is at the end of travel or when turning at standstill.	• Hiss is a normal characteristic of rotary steering gears and in no way affects steering. Do not replace the rack assembly unless the hiss is extremely objectionable. A replacement rack 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 contact will transmit valve hiss into the passenger compartment through the steering column. Verify clearance between flexible coupling components. Ensure steering column shaft and gear are aligned so flexible coupling rotates in a flat plane and is not distorted as shaft rotates.

TG3022G

DIAGNOSIS AND TESTING (Continued)

External Leakage

When looking for leaks, use this procedure to pinpoint the exact cause and location to avoid mis-diagnosis:

1. Check for overfilled power steering pump reservoir.
2. Wipe suspected area dry.
3. Check for power steering pump overflow and aeration.
4. Check for exact source of oil. Example: Oil may be running down from another area (engine, etc.) and drip may not be leak point.

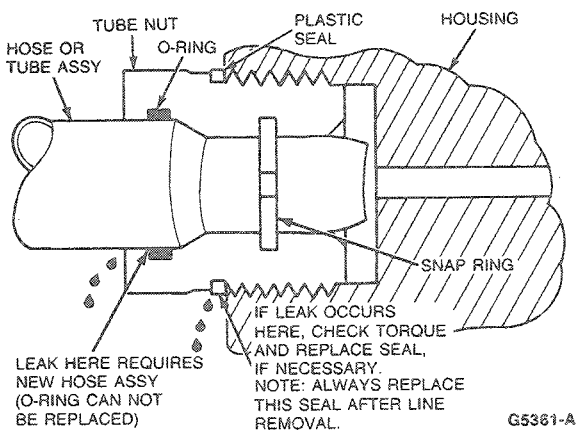
   CAUTION: Do not hold the steering wheel against a stop for more than three to five seconds at a time, as damage to power steering pump may result. Cycle the steering wheel from stop to stop 10 times and check for leaks. The bellows may have to be moved back from the housing to see the leak.
5. Some leaks are high pressure leaks and may require holding steering wheel against stops to seep out.
6. Power steering gear assembly leaks fall into several categories as listed in the Leakage Diagnosis chart. The category determines which seals or parts to replace. Refer to the corresponding illustrations for the leak category.

LEAKAGE DIAGNOSIS

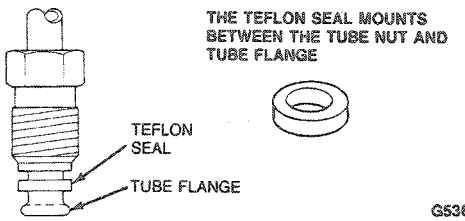
Leak Category	Part Required to Service
1. Hose fittings.	• Loose—Tighten to specification—Do not over-tighten. • Plastic seals at tube nut—Plastic seals should be replaced each time hose is disconnected. • O-ring leaks—Replace hose.
2. Leak at (right or left) transfer line.	• Loose—Tighten to specification—Do not over-tighten. • Replace plastic seals. • Replace line assembly as required.
3. Leak at input shaft seal.	• Replace input shaft seal kit. Rack and tie rod assembly removal is not required.
4. Leak at either or both bellows.	• Replace all gear housing and rack bushing seals. Do not disturb transfer lines.
5. Leak at end of input shaft.	• Replace input shaft valve assembly along with input shaft seal kit. Rack and tie rod assembly removal is not required.
6. Housing—porosity, cracked or stripped threads.	• Replace the housing assembly.

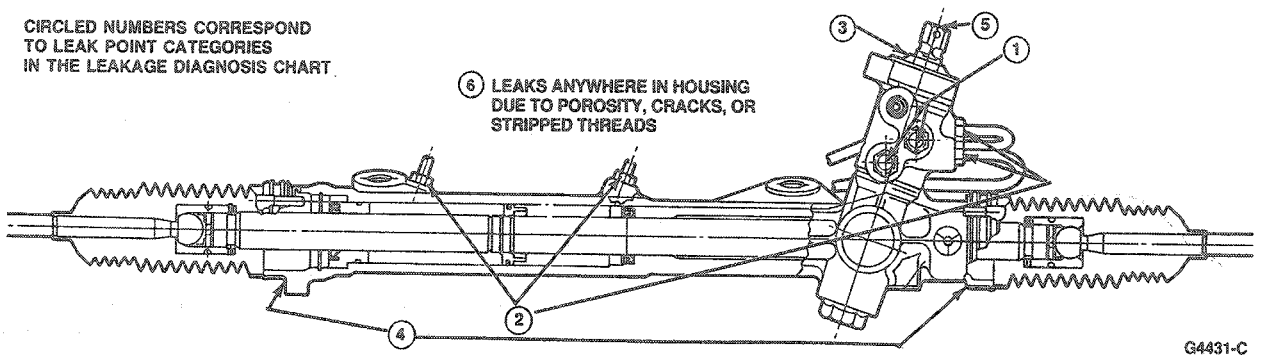
TG3118F

NOTE: Whenever a gear assembly is disassembled for seal replacement, the gear seal contact surfaces should be checked for roughness and cleaned. Replace components such as input shaft / valve assembly or rack assembly only if the sealing surfaces cannot be cleaned satisfactorily with crocus cloth.



DIAGNOSIS AND TESTING (Continued)





Pump Noise, Atsugi

NOTE: The power steering pump is serviced as an assembly. If any service is required, the entire pump assembly must be replaced.

Refer to pump noise diagnosis chart.

Test Procedure

For test procedure refer to Section 11-00.

DIAGNOSIS AND TESTING (Continued)

Pump Noise, CII

Refer to the pump noise diagnosis chart.

PUMP NOISE DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Power Steering	• Check belt for proper tension or glazing.	• Tighten or replace belt as required.
• Pump Noisy	• Low fluid level and possible leakage.	• Refill to specified level. Purge air from system. Check for leaks. Service as required.
• Swish-Type Noise	• Fluid flow into the bypass valve of the pump valve housing with fluid temperature below 54°C (130°F).	• Normal noise.
• Whine-Type Noise	• Aerated fluid, or cam contour damaged.	• Purge system of air. If condition is not resolved, replace rotor assembly.
• Clicking Mechanical-Type Noise	• Pump slippers too long, excessive wear of pumping elements. Excessive slipper to slot clearance, or out of square slipper springs.	• Replace rotor assembly.
• Chatter-Type Noise	• Chipped corners on rotor outside diameter or distorted slipper spring.	• Replace rotor assembly.
• Other Cause of Noise	• Improper assembly of components such as slippers.	• Rebuild pump and replace components as required.
	• Imperfections on rotor outside diameter or rotor end surface.	• Replace rotor assembly.
	• Damaged rotor splines.	• Replace rotor assembly.
	• Hairline crack on cam inner surface.	• Replace rotor assembly.
	• Interference between rotor and cam.	• Replace rotor assembly.
	• Excessively worn or scored pumping elements and pressure plates.	• Replace rotor assembly and pressure plates.

CG4058-C

The diagnosis charts provide procedures to resolve typical concerns encountered with the power steering system.

Follow the sequence indicated to save time during condition identification and corrective action.

Electrical Component Diagnosis

Tools Required:

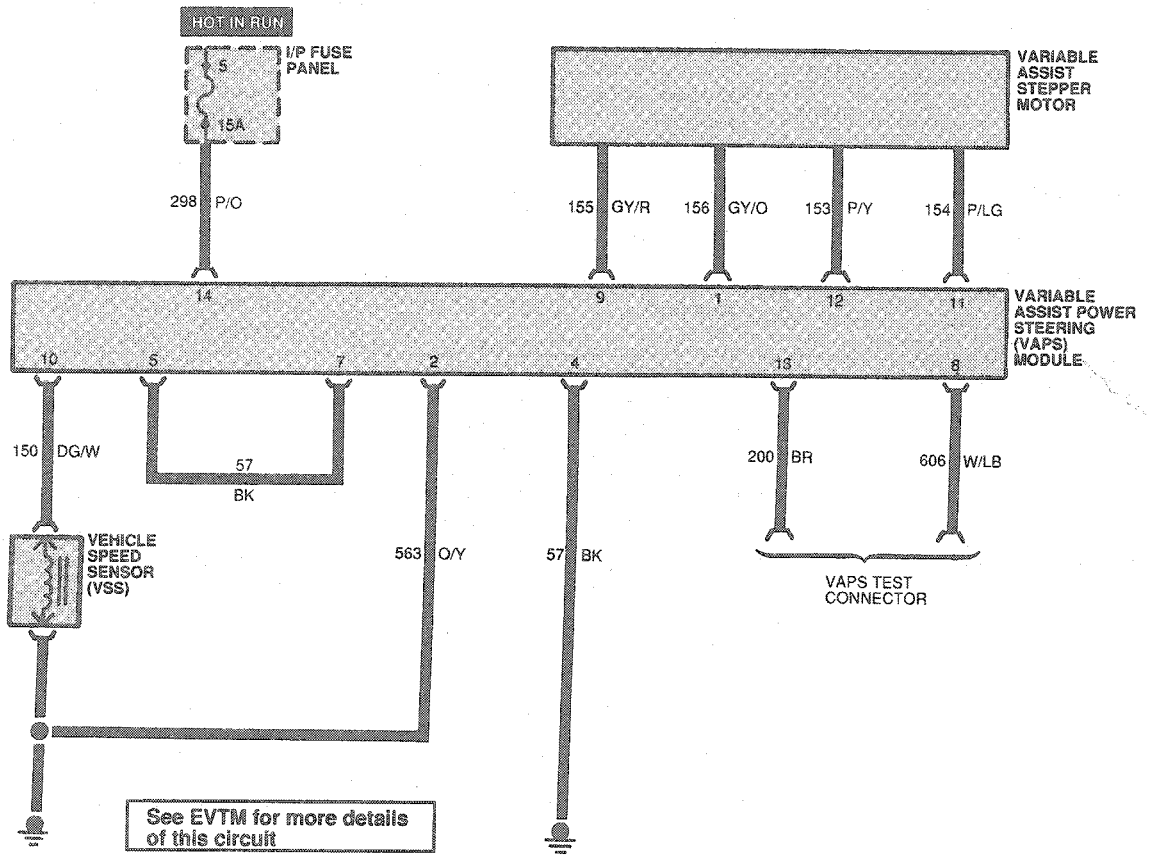
- Rotunda Digital Volt Ohmmeter 007-00001
- Rotunda Inductive Dwell-Tach-Volt-Ohm Tester 059-00010

This portion of the power steering diagnosis refers only to the electrical components of the VAPS system:

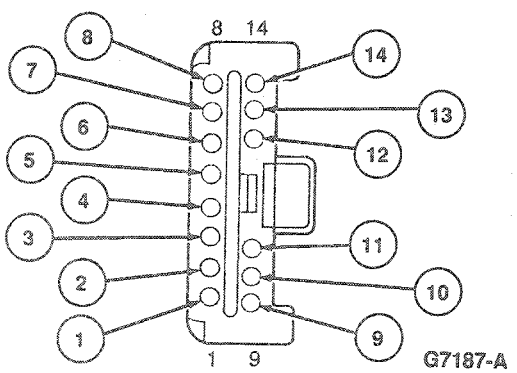
- VAPS Control Module
- Speed Sensor
- Actuator Valve
- Wiring Harness and Connectors

DIAGNOSIS AND TESTING (Continued)

The procedure is a systematic method of determining which of the above components, if any, require servicing. Testing can be done using Rotunda Digital Volt Ohmmeter 007-00001, Rotunda Inductive Dwell-Tach-Volt-Ohm Tester 059-00010 or equivalent.



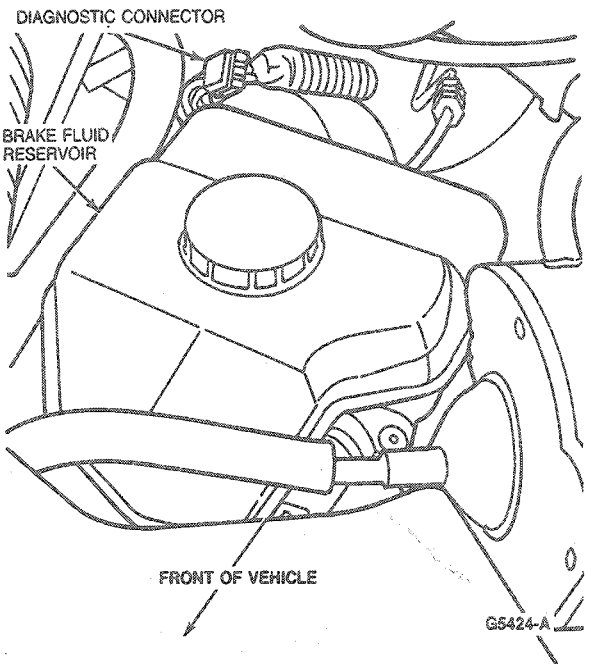
VAPS Connector End View



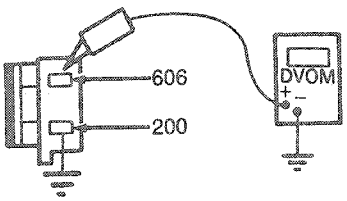
Item	Part Number	Description
1	156 (GY/O)	Stepper Motor
2	563 (O/Y)	Ground
3	—	Not Used
4	57 (BK)	Ground
5	57 (BK)	Ground
6	—	Not Used
7	57 (BK)	Ground
8	606 (W/LB)	VAPS Test Connector
9	155 (GY/R)	Stepper Motor
10	150 (DG/W)	Vehicle Speed Sensor (VSS) 9E731
11	154 (P/LG)	Stepper Motor
12	153 (P/Y)	Stepper Motor
13	200 (BR)	VAPS Test Connector
14	298 (P/O)	Hot in RUN

DIAGNOSIS AND TESTING (Continued)

A diagnostic connector is located in the engine compartment near the brake fluid reservoir and brake booster.

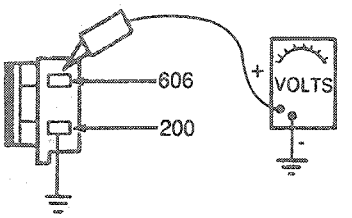


PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS

TEST STEP		RESULT	ACTION TO TAKE
A1	MODULE CHECK		
	• Turn ignition switch to OFF. • Locate test connector 14489 in engine compartment near brake booster. • Connect DVOM positive lead (R) to Circuit 606 and negative lead (BK) to vehicle ground.  G5315-A • Position DVOM where it can be observed. • Start engine. • Observe voltage reading on DVOM.	Voltage reads 11-14 volts Voltage reads zero Voltage reads above 14 volts	GO to A2. GO to A3. CORRECT over-voltage condition then GO to A2.

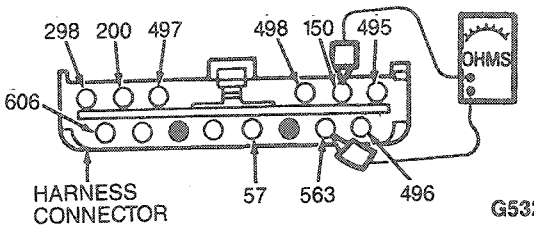
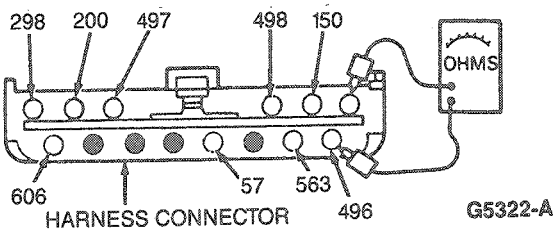
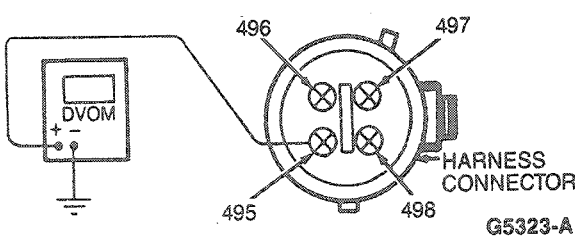
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A2	MODULE CHECK		
	• Turn ignition switch to OFF. • Connect an analog voltmeter as in Step A1. • Use jumper wire and ground Circuit 200.  G5320-A • Start engine. • Rotate steering wheel for approximately 90 seconds noting any changes in steering effort. The effort required to turn the steering wheel should vary between light and heavy in both directions. • After approximately 90 seconds, voltmeter will show a sweep pattern four times between battery voltage and zero if module proveout is OK. Six or zero sweeps if a system component is malfunctioning. After a five second pause, the sweep pattern will be repeated. • Remove Circuit 200 ground before proceeding to next test.	Effort changes with 2 sweeps ▶ No effort change with 2 sweeps ▶ Effort change with 4 sweeps ▶ No effort change with 4 sweeps ▶ Effort change with 6 sweeps ▶ No effort change with 6 sweeps ▶ Effort change with 0 sweeps ▶ No effort change with 0 sweeps ▶	GO to A4. GO to A7. GO to A19. GO to A19. GO to A20. GO to A12. GO to A20. GO to A12.
A3	FUSE CHECK		
	• Inspect fuse located in fuse panel on LH side below instrument panel. • **Is fuse OK?**	Yes ▶ No ▶	GO to A16. REPLACE fuse. GO to A1.
A4	TEST DRIVE VEHICLE		
	• Ensure VAPS system is connected. • Drive vehicle up to 55 mph and set speed control. • **Do steering efforts change and is effort balanced (left vs. right turn direction)?** • While driving vehicle, note operation of speedometer.	Change in steering effort ▶ Assist only at high speed ▶ No change in steering effort ▶ Efforts unbalanced left to right ▶	Diagnostics complete. System is OK. GO to A11. GO to A5. REPLACE steering gear assembly. REPEAT A4.
A5	SPEEDOMETER CHECK		
	• Note operation of speedometer and speed control (from Step A4). • **Are speedometer and speed control operating properly?** • The VAPS system requires a speed signal from the vehicle speed sensor. If the speedometer or speed control does not work, these systems should be serviced using the appropriate diagnostic and service procedures.	Yes ▶ No ▶	GO to A6. SERVICE as required. GO to A4.

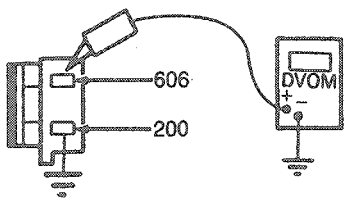
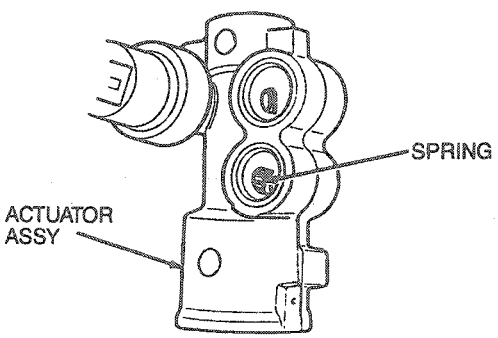
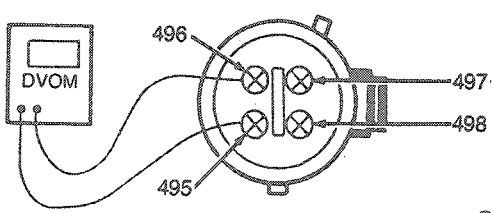
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP	RESULT	ACTION TO TAKE
A6 SPEED SENSOR CIRCUIT CHECK ● Disconnect VAPS connector from module. ● Connect DVOM across Circuits 150 and 563. ● Measure resistance. 	Resistance is between 150-225 ohms Resistance is less than 150 or greater than 225 ohms	REPLACE VAPS module. GO to **A4.** SERVICE harness. GO to **A4.**
A7 ACTUATOR (ELECTRICAL) CHECK ● Turn ignition switch to OFF. ● Disconnect VAPS harness connector from module. ● Connect DVOM to Circuits 495 and 496. ● Measure resistance.  ● Connect DVOM to Circuits 497 and 498. ● Measure resistance.	Resistance between 43 and 70 ohms Resistance less than 43 or greater than 70 ohms	GO to **A8.** GO to **A10.**
A8 HARNESS VOLTAGE AT ACTUATOR CONNECTOR ● Turn ignition switch to OFF. ● Verify that VAPS connector is connected to VAPS module. ● Disconnect actuator connector from VAPS harness connector. ● Turn ignition switch to RUN. ● Wait five seconds. ● Measure DC voltage between Circuit 495 and ground. Then measure voltage between Circuit 496 and ground. ● One of these two circuits should be greater than 10 volts and the other less than 2 volts. ● Repeat the two steps above for Circuit 497 and 498. ● **Do voltage readings check OK?** 	Yes No	GO to **A9.** REPLACE VAPS module. GO to **A2.**

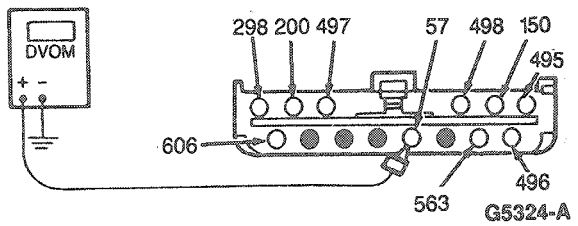
DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP	RESULT	ACTION TO TAKE
A9 ACTUATOR (MECHANICAL) CHECK		
• Turn ignition switch to OFF. • Remove actuator as outlined. • Reconnect actuator connector to VAPS harness connector. • Attach DVOM to diagnostic connector (near brake booster) as shown.  G5315-A • Turn ignition switch to ON. • The module will go through a diagnostic check, consisting initially of the 90 second efforts change sequence. • If the actuator is mechanically operable, the actuator valve will move between its two limits of travel. This movement can be detected by watching the valve spring expand and relax between the travel limits. • **Does spring move?**  G5316-A	Yes ▶ No ▶	REPLACE steering gear assembly. GO to **A2.** REPLACE actuator. GO to **A2.**
A10 ACTUATOR (ELECTRICAL) CHECK		
• Turn ignition switch to OFF. • Disconnect actuator connector from harness connector. • Connect DVOM to Circuits 495 and 496. • Measure resistance.  G5317-A • Connect DVOM to Circuit 497 and 498. • Measure resistance.	Resistance between 43 and 70 ohms ▶ Resistance less than 43 or greater than 70 ohms ▶	GO to **A11.** REPLACE actuator. GO to **A2.**

DIAGNOSIS AND TESTING (Continued)

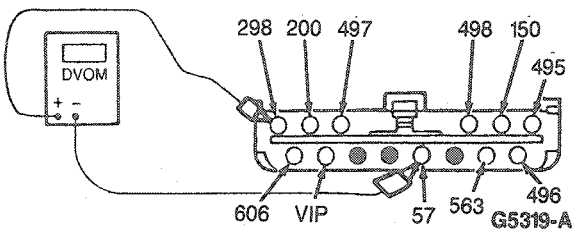
PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A11	CONTINUITY CHECK		
	• Turn ignition switch to OFF. • Disconnect module connector from module. • Disconnect actuator connector from actuator. • Check continuity of Circuit 495 from module connector to actuator connector. • Repeat for Circuits 296, 497 and 498. • **Do all circuits check OK?**	Yes ▶ No ▶	GO to A9. SERVICE harness. GO to A2.
A12	VAPS HARNESS AND CONNECTORS CHECK		
	• Turn ignition switch to OFF. • Disconnect VAPS connector from module. • Connect positive lead of DVOM to Circuit 57 and negative lead to ground. • Measure resistance. • **Is resistance greater than 15 ohms?**  NOTE: All doors and hood must be closed for proper resistance readings.	No ▶ Yes ▶	GO to A13. SERVICE harness. REPEAT A12.

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP		RESULT ▶	ACTION TO TAKE
A13	VAPS HARNESS AND CONNECTORS CHECK		
• Disconnect VAPS connector from module. • Connect DVOM as shown.		Yes ▶ No ▶	GO to A14. SERVICE harness. REPEAT A13.



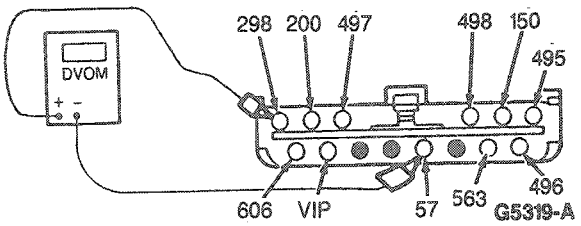
- Turn ignition switch to ON.
- Measure voltage at each circuit (Circuit 57 to ground).
- **Are voltage readings near given values?**

Row	Circuit	Function	Volts (DC)
Top	298	Power	Battery
Top	200	Diagnostic	<.1
Top	497	Actuator	<.1
Top	498	Actuator	<.1
Top	150	Speed Sensor	—
Top	495	Actuator	<.1
Bottom	606	Diagnostic	<.1
Bottom	57	Ground	<.1
Bottom	563	Speed Sensor	—
Bottom	496	Actuator	<.1
Bottom	—	VIP	<.1

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

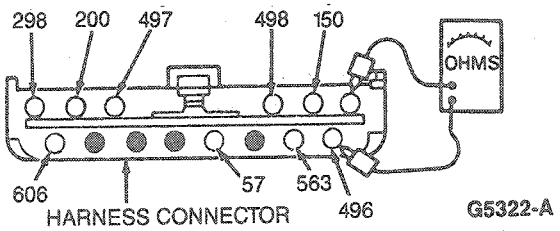
TEST STEP	RESULT	ACTION TO TAKE
A14 VAPS HARNESS AND CONNECTORS CHECK ● Turn ignition switch to OFF. ● Measure resistance between Circuit 57 ground and all other indicated circuits. ● Connect DVOM as shown.		



● Measure resistance of each circuit, by moving positive lead.
● **Is resistance near given values?**

Row	Circuit	Function	Typical Value (ohm)
Top	298	Power	3.6
Top	200	Diagnostic	Open
Top	497	Actuator	Open
Top	498	Actuator	Open
Top	150	Speed Sensor	195
Top	495	Actuator	Open
Bottom	606	Diagnostic	Open
Bottom	563	Speed Sensor	0.6
Bottom	496	Actuator	Open
Bottom	—	VIP	Open

	Yes ▶	GO to A15.
	No ▶	SERVICE harness. GO to A2.
A15 ACTUATOR (ELECTRICAL) CHECK ● Connect VOM to Circuit 495 and 496. ● Measure resistance.		

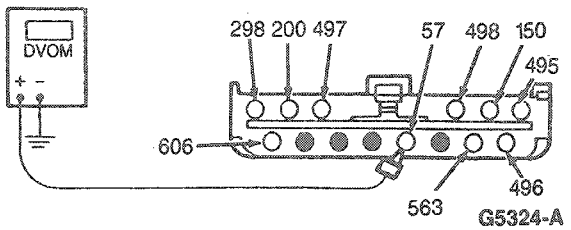
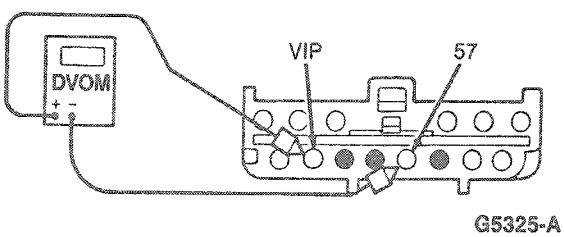


● Connect VOM to Circuit 497 and 498.
● Measure resistance.

	Resistance between 43 and 70 ohms ▶	REPLACE VAPS module. GO to A2.
	Resistance less than 43 or greater than 70 ohms ▶	SERVICE harness or connectors. GO to A2.

DIAGNOSIS AND TESTING (Continued)

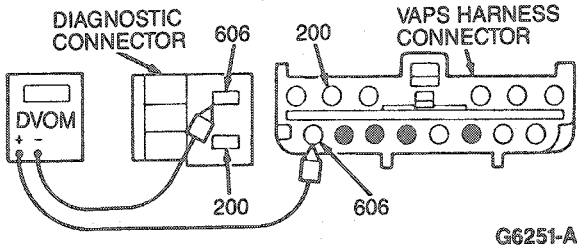
PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP	RESULT	ACTION TO TAKE
A16 VAPS HARNESS AND CONNECTORS CHECK • Turn ignition switch to OFF. • Disconnect VAPS connector from module. • Connect positive lead of DVOM to Circuit 57 and negative lead to ground. • Measure resistance. • **Is resistance greater than 15 ohms?**  NOTE: All doors and hood must be closed for proper resistance readings.	No ▶ Yes ▶	GO to **A17.** SERVICE harness. GO to **A1.**
A17 VAPS HARNESS AND CONNECTORS CHECK • Connect positive lead of DVOM to Circuit 298 and negative lead to Circuit 57. • Turn ignition switch to ON. • Measure voltage. • Turn ignition switch to OFF. • **Does DVOM read 12 volts?**	Yes ▶ No ▶	GO to **A18.** SERVICE harness. GO to **A1.**
A18 CONTINUITY CHECK • Check continuity of Circuit 606 from diagnostic connector to module connector. • **Is Circuit 606 OK?**	Yes ▶ No ▶	REPLACE module. GO to **A1.** SERVICE Circuit 606. GO to **A1.**
A19 VAPS HARNESS AND CONNECTORS CHECK (VIP PIN) • Turn ignition switch to OFF. • Doors and hood must be closed for proper reading. • Connect DVOM as shown. • Measure resistance between Circuit 57 (ground) and VIP Pin 7. Typical resistance is infinite. • Measure voltage between Circuit 57 (ground) and VIP Pin 7. Typical voltage is less than 0.1 volt. • **Is resistance and voltage near given values?**  	Yes ▶ No ▶	GO to **A4.** SERVICE harness. GO to **A2.**

DIAGNOSIS AND TESTING (Continued)

PINPOINT TEST A
VARIABLE ASSIST POWER STEERING ELECTRICAL COMPONENT DIAGNOSIS (Continued)

TEST STEP		RESULT	ACTION TO TAKE
A20	VAPS HARNESS AND CONNECTOR CHECK (DIAGNOSTIC CONNECTOR)		
	• Turn ignition switch to OFF. • Doors and hood must be closed for proper readings. • Disconnect VAPS harness connector from module. • Connect DVOM as shown. • Measure resistance between Circuit 606 of VAPS harness connector and Circuit 606 of diagnostic connector. Typical resistance is 2.0 ohms or less. • Measure voltage between Circuit 606 of VAPS harness connector and Circuit 606 of diagnostic connector. Typical voltage is less than 0.1. • Move leads to Circuit 200. Measure resistance between Circuit 200 of VAPS harness connector and Circuit 200 of diagnostic connectors. Typical resistance is 2.0 ohms or less. • Measure voltage between Circuit 200 of VAPS harness connector and Circuit 200 of diagnostic connector. Typical voltage is less than 0.1 volt. • **Is resistance and voltage near given values?**	Yes No	Go to **A2.** SERVICE harness. GO to **A2.**



TG5305D

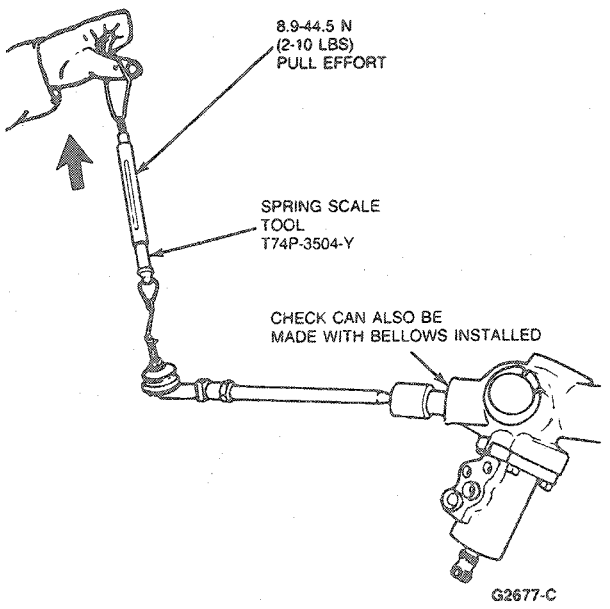
Tie Rod Articulation Torque Check

Tools Required:

- Hook Spring Scale T74P-3504-Y
- Tie Rod End Remover TOOL-3290-D

This check may be done with the gear on or off the vehicle.

1. Disconnect tie rod end from spindle using Tie Rod End Remover TOOL-3290-D or equivalent.
2. Hook Spring Scale T74P-3504-Y over tie rod end and measure force required to move tie rod.
3. If force required to move tie rods is not between 8.9N and 45N (2 lb and 10 lb), replace tie rod.



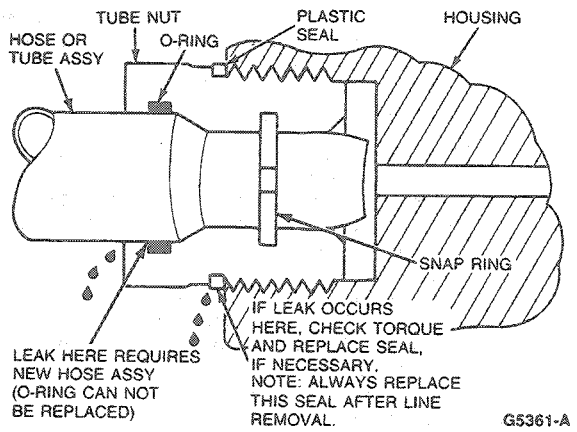
DIAGNOSIS AND TESTING (Continued)

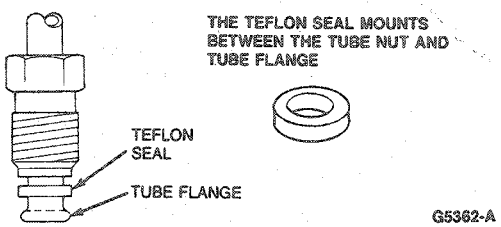
External Leakage

When looking for leaks, use this procedure to pinpoint the exact cause and location to avoid misdiagnosis:

1. Check for overfilled power steering pump reservoir.
2. Wipe suspected area dry.
3. Check for power steering pump overflow and aeration.
4. Check for exact source of oil. Example: Oil may be running down from another area (engine, etc.) and drip may not be leak point.

   CAUTION: Do not hold the steering wheel against a stop for more than three to five seconds at a time, as damage to power steering pump may result. Cycle the steering wheel from stop-to-stop 10 times and check for leaks. The bellows may have to be moved back from the housing to see the leak.
5. Some leaks are high-pressure leaks and may require holding steering wheel against stops to seep out.
6. Power steering gear assembly leaks fall into several categories as listed in the Leakage Diagnosis chart. If the leak cannot be serviced by tightening a fitting to the specified toque, replace the gear.

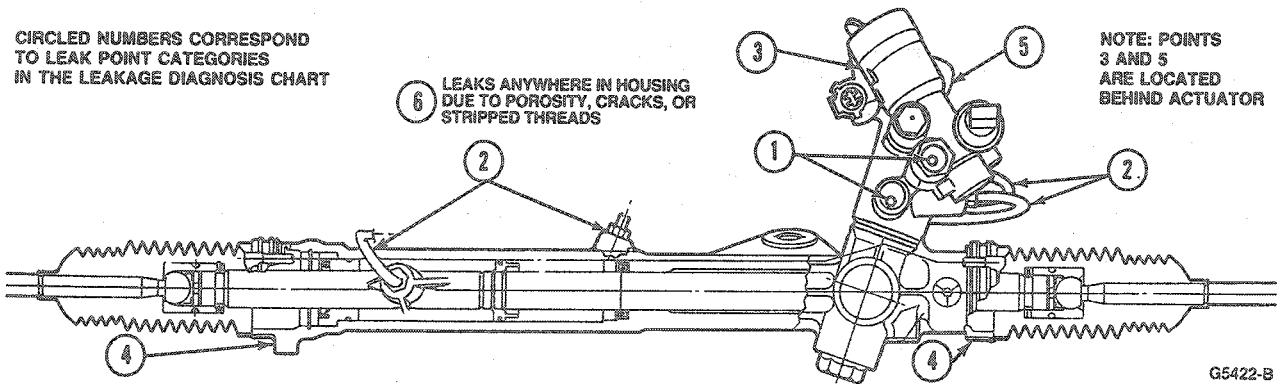




LEAKAGE DIAGNOSIS

Leak Category	Part Required to Service
1. Hose fittings.	a. Loose—Tighten to specification—Do not over-tighten. b. Plastic seals at tube nut—Plastic seals should be replaced each time hose is disconnected.
2. Leak at (right or left) transfer line.	a. Loose—Tighten to specification—Do not over-tighten.
3. Leak at input shaft seal.	a. Replace gear assembly.
4. Leak at either or both bellows. 5. Leak at end of input shaft.	a. Replace gear assembly a. Replace gear assembly.
6. Housing—porosity, cracked or stripped threads.	a. Replace gear assembly.

TG5423A



REMOVAL AND INSTALLATION

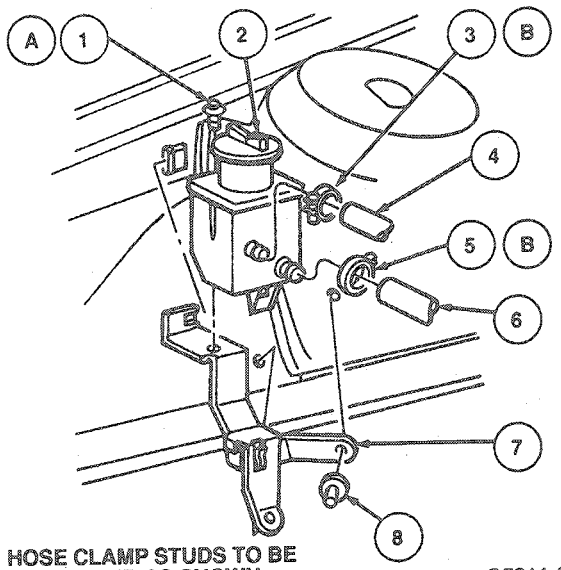
Remote Reservoir

Removal

1. Loosen inlet and outlet hose clamps.
2. Remove hoses and allow fluid to drain into a container.
3. Remove retaining screw and reservoir from attachments.

Installation

1. Position reservoir to attachments. Tighten retaining screw to 6-8 N·m (54-70 lb-in).
2. Install hoses. Tighten clamps to 1.4-2 N·m (13-17 lb-in).
3. Fill reservoir to proper level. Refer to Section 11-00.



HOSE CLAMP STUDS TO BE POSITIONED AS SHOWN G5211-C

Item	Part Number	Description
1A	W611101-S2	Screw
2	3R700	Power Steering Reservoir Assy
3B	390462-S100	Clamp (3 Req'd)
4	3493	Hose
5B	97242-S100	Clamp (2 Req'd)
6	3691	Hose
7	3490	Bracket Assy
8	N803710-S	Rivet (2 Req'd)
A		Tighten to 6-8 N·m (54-70 Lb-In)
B		Tighten to 1.4-2 N·m (13-17 Lb-In)

Power Steering Pump

Removal

1. Disconnect negative battery cable.
2. Remove engine damper strut. Refer to Section 03-01B.
3. Remove power steering belt.
4. Raise vehicle on hoist. Refer to Section 00-02.
5. Remove right front wheel and tire assembly.
6. Position jack under engine. Remove right rear engine mount. Refer to Section 03-01B.
7. Remove power steering pump pulley.
8. Position drain pan. Remove pressure and return lines from pump.
9. Remove four pump retaining bolts (three in front, one in rear) and remove pump.

Installation

1. Position pump and install retaining bolts. Tighten retaining bolts to 20-32.5 N·m (15-24 lb-ft).
2. Install pressure and return lines to pump. Remove drain pan.
3. Install power steering pump pulley.
4. Install right rear engine mount and remove jack. Refer to Section 03-01B.
5. Install right front wheel and tire assembly. Tighten wheel lug nuts to 115-142 N·m (85-105 lb-ft).
6. Lower vehicle.
7. Install belt to pump pulley.
8. Install engine damper strut.
9. Connect negative battery cable.
10. Fill power steering fluid to proper level. Refer to Section 11-00.

Tie Rod End Replacement

Tools Required:

- Tie Rod End Remover TOOL-3290-D

Steering Gear Installed

Removal

1. Remove and discard cotter pin and nut from worn tie rod end ball stud.
2. Disconnect tie rod end from steering spindle, using Tie Rod End Remover TOOL-3290-D or equivalent.
3. Hold tie rod end with a wrench and loosen tie rod jam nut.
4. Note depth to which tie rod was located by using the jam nut as a marker. Grip tie rod with a pair of suitable pliers, and remove rod end assembly from tie rod.

Installation

1. Clean tie rod threads.
2. Thread new tie rod end into tie rod to same depth as removed tie rod end.

REMOVAL AND INSTALLATION (Continued)

3. Place tie rod end stud into steering spindle. Ensure front wheels are pointed straight ahead before connecting stud to spindle.
4. Install a new nut on tie rod end stud. Tighten nut to 48 N·m (35 lb-ft), and continue tightening nut to align next castellation of nut with cotter pin hole in stud. Install a new cotter pin.
5. Set toe to specification. Refer to Section 04-00. Tighten jam nut to 47-68 N·m (35-50 lb-ft).

Steering Gear

Except Taurus LX

Removal

1. From inside vehicle, remove nuts retaining steering shaft weather boot to dash panel.
2. Remove two bolts retaining intermediate shaft to steering column shaft.
3. Set weather boot aside. Remove pinch bolt at steering gear input shaft and remove intermediate shaft.
4. Raise vehicle on a hoist. Refer to Section 00-02.
5. Remove LH front wheel.
6. Remove heat shield.
7. Cut bundling strap retaining hydraulic pressure and return lines to gear.
8. Remove tie rod ends from spindles.

   NOTE: The pressure and return lines are on the front of the valve housing. Do not mix them with the transfer lines on the side of the valve.
9. Place a drain pan under vehicle and remove hydraulic pressure and return lines from steering gear.

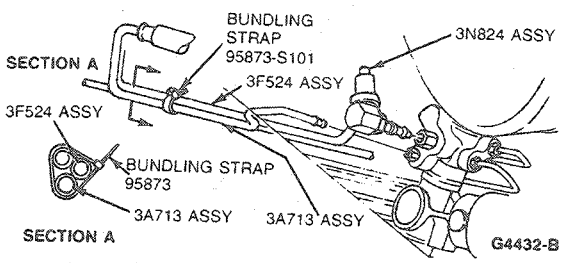
   NOTE: The bolts are pressed into the gear housing and should not be removed during gear removal.
10. Remove gear retaining nuts.
11. Push weather boot end into vehicle and lift gear out of mounting holes. Rotate gear so input shaft will pass between brake booster and floorpan. Carefully start working steering gear out through LH fender apron opening.

    NOTE: If steering gear seems to be stuck, check RH rod to ensure stud is not caught on any obstacle.
12. Rotate input shaft so that it clears LH fender apron opening and complete removal of steering gear.

Installation

1. Install new plastic seals on hydraulic line fittings as outlined.
2. Insert steering gear through LH fender apron. Rotate input shaft forward to completely clear fender apron opening. To allow gear to pass between brake booster and floorpan, rotate input shaft rearward.
3. Align steering gear bolts to bolt holes and install retaining nuts. Tighten to 115-135 N·m (85-100 lb-ft).
4. Lower vehicle.

   NOTE: Swivel movement of lines is normal when fittings are properly tightened.
5. From engine compartment, install hydraulic pressure and return lines. Tighten pressure line to 20-35 N·m (15-25 lb-ft), and return line to 20-35 N·m (15-25 lb-ft).
6. Raise vehicle.
7. Secure pressure and return lines to transfer tube with bundling strap as shown.



8. Install heat shield.
9. Install tie rod ends to spindles. Tighten castellated nuts to minimum of 48 N·m (35 lb-ft). If necessary, tighten slightly more to align slot in nut for the cotter pin.
10. Install a new cotter pin.
11. Install LH front wheel and lower vehicle.
12. From inside vehicle, pull weather boot end out of vehicle and install over valve housing.
13. From inside vehicle, install intermediate shaft to steering gear input shaft.
14. Install inner weather boot to floorpan.
15. Install intermediate shaft to steering column shaft.
16. Fill power steering system with premium power steering fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent.
17. Check system for leaks and proper operation.
18. Adjust toe setting. Refer to Section 04-00.

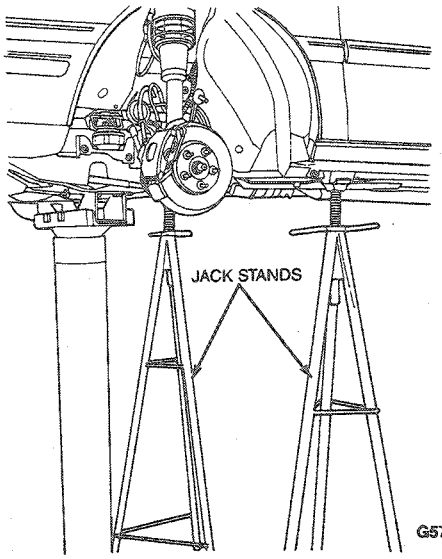
Taurus LX and Sable

Removal

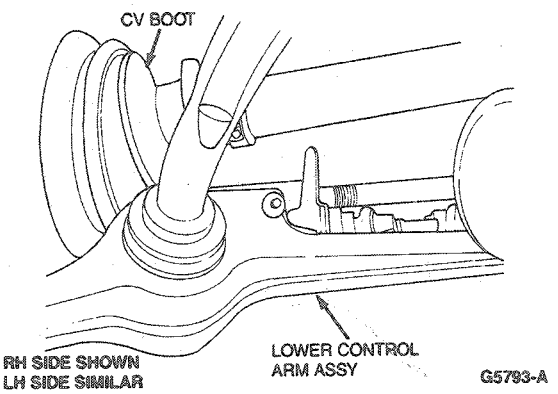
1. From inside vehicle, remove nuts retaining steering shaft weather boot to dash panel.
2. Remove two bolts retaining intermediate shaft to steering column shaft.
3. Set weather boot aside. Remove pinch bolt at steering gear input shaft and remove intermediate shaft.

REMOVAL AND INSTALLATION (Continued)

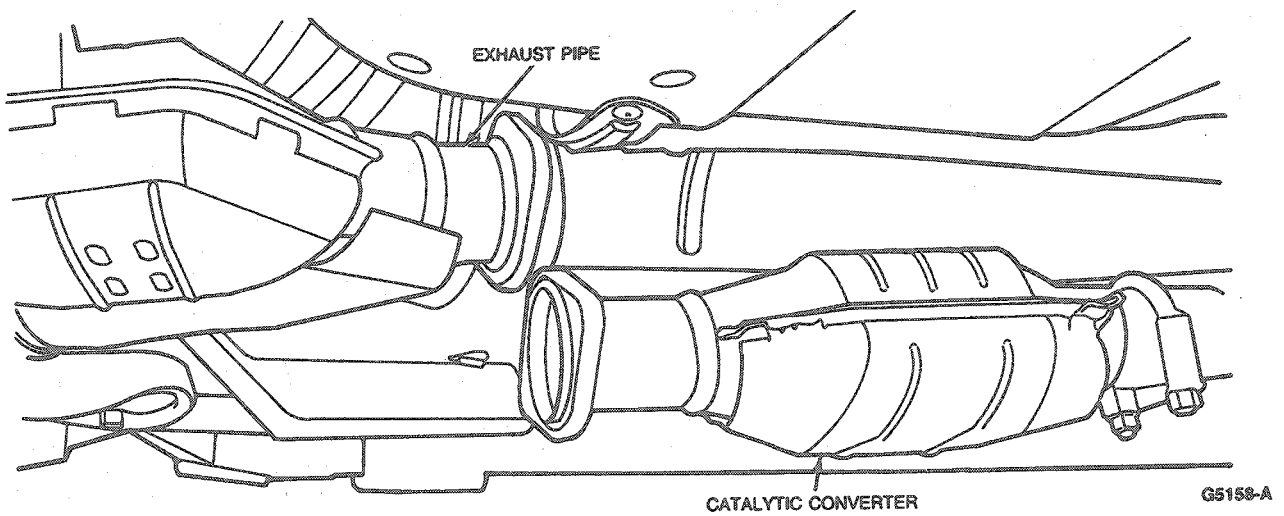
4. Raise vehicle on a twin post hoist and remove front wheel and tire assemblies. Refer to Section 00-02.



5. Support vehicle with jackstands under rear edge of subframe.
6. Remove tie rod cotter pins and nuts, and remove tie rod ends from spindle.
7. Remove tie rod ends from shaft. Mark position of jam nut to maintain alignment.
8. Remove nuts from gear-to-subframe retaining bolts.



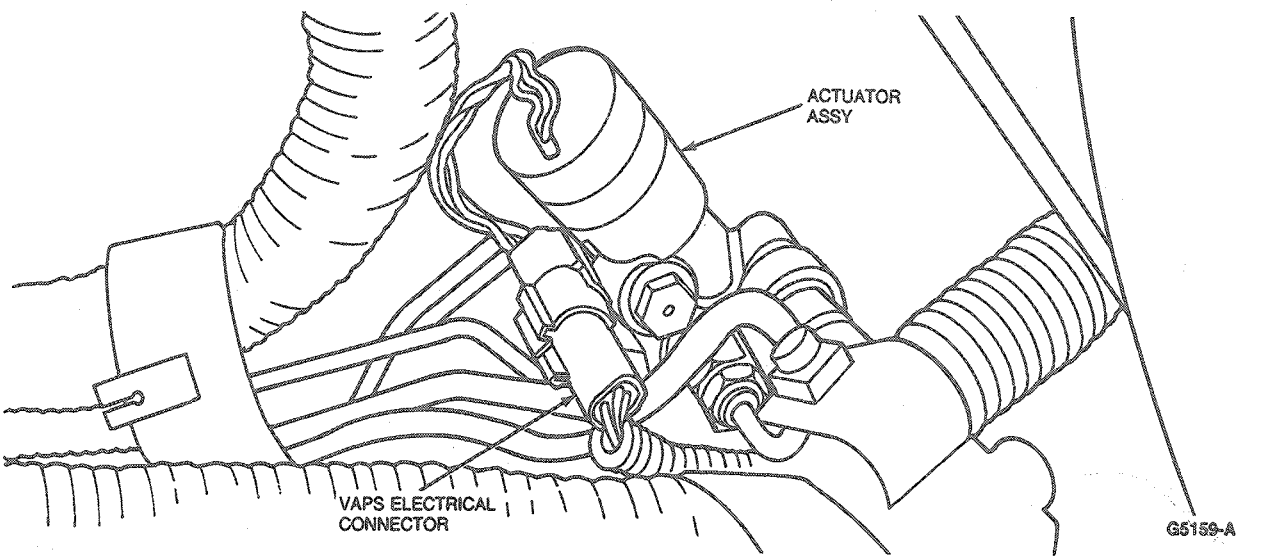
9. Remove rear subframe-to-body retaining bolts.
10. Remove exhaust pipe-to-catalytic converter attachment.



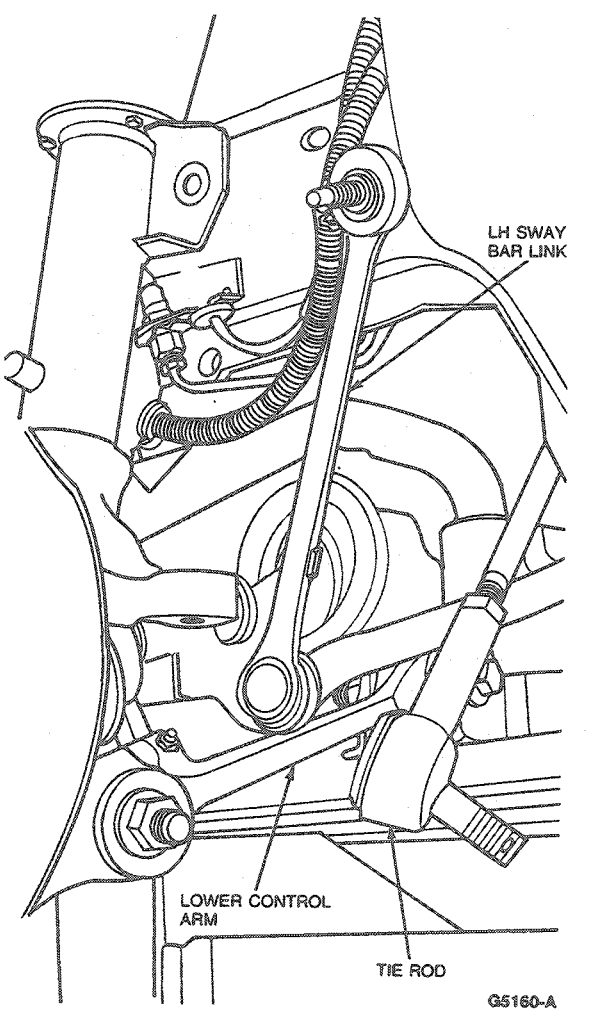
11. Lower twin post hoist carefully until subframe separates from body; approximately four inches.
12. Remove heat shield band and fold shield down.

REMOVAL AND INSTALLATION (Continued)

13. Disconnect VAPS electrical connectors.



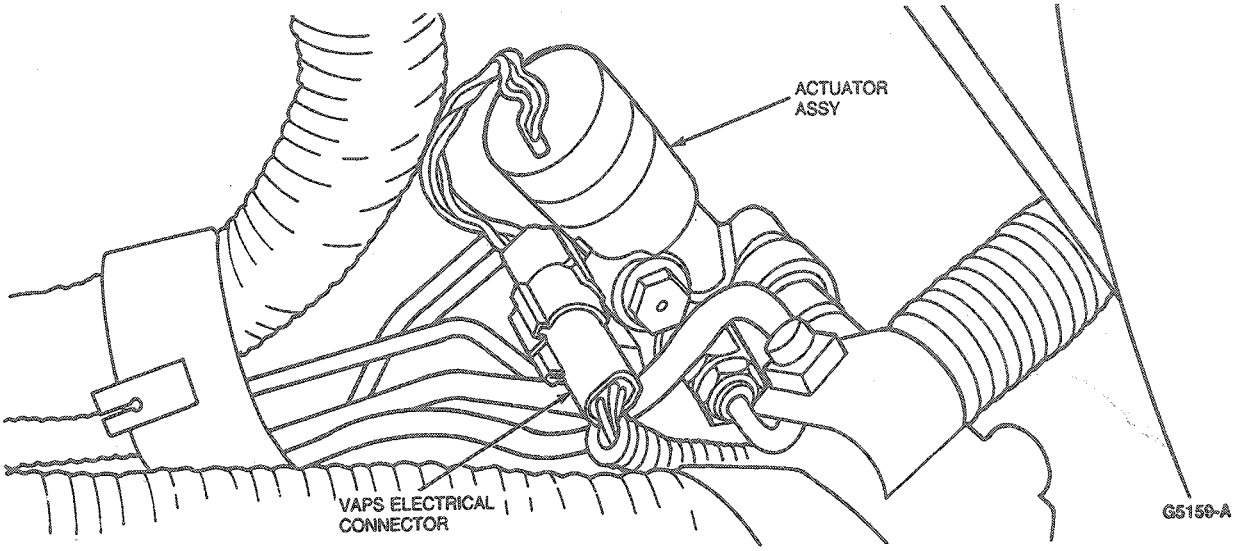
14. Rotate gear to clear bolts from subframe and pull left to facilitate line fitting removal.
15. Place a drain pan under vehicle and remove line fittings.
16. Remove LH sway bar link.
17. Remove gear assembly through LH wheel well.



REMOVAL AND INSTALLATION (Continued)

Installation

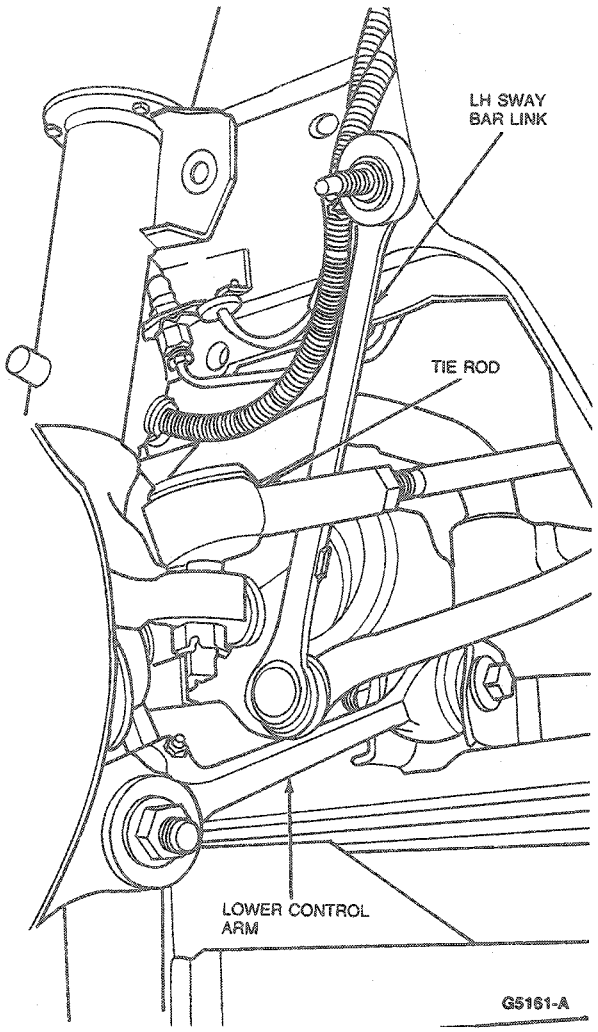
1. Install new TFE O-rings on line fittings as outlined in Pressure and Return Line Seal Replacement.
2. Place gear retaining bolts in gear housing.
3. Install gear through LH wheel well.
4. Install power steering line fittings to gear assembly.
5. Install VAPS electrical connectors.



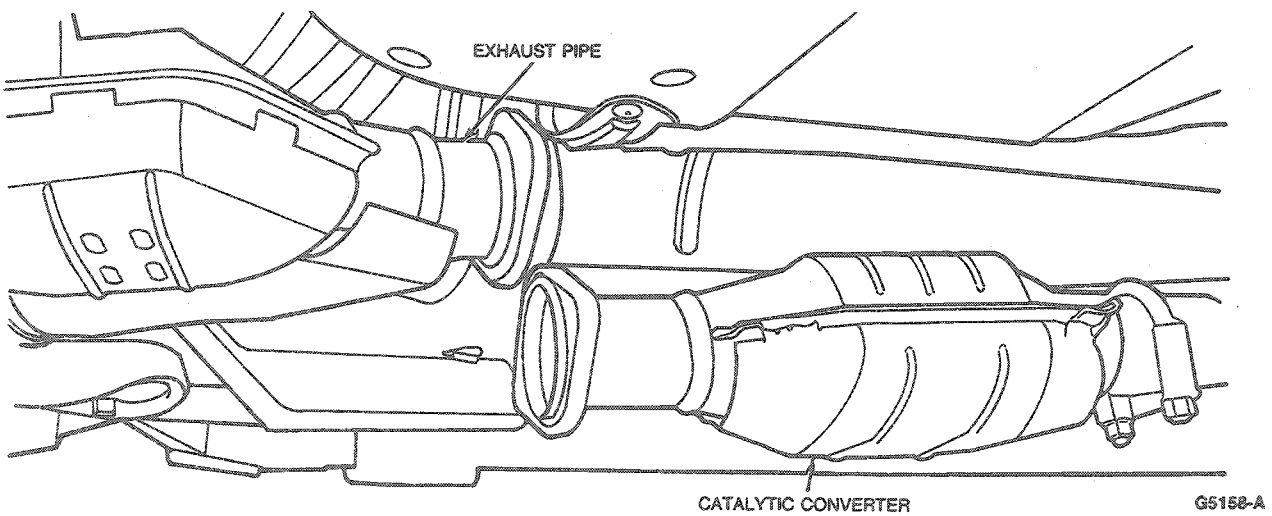
6. Position gear into subframe.
7. Install tie rod ends onto shaft.
8. Install band on heat shield.
9. Attach tie rod ends to spindle. Install nuts and new cotter pins.

REMOVAL AND INSTALLATION (Continued)

10. Attach sway bar links.



11. Raise hoist until subframe contacts body.
12. Install subframe retaining bolts.
13. Install gear-to-subframe nuts and tighten to 115-135 N·m (85-100 lb-ft).
14. Attach exhaust pipe to catalytic converter.



REMOVAL AND INSTALLATION (Continued)

15. Install tire and wheel assemblies. Tighten wheel lug nuts to 115-142 N·m (85-105 lb-ft).
16. Remove jackstands and lower vehicle.
17. From inside vehicle, push weather boot end out of vehicle and install over valve housing.
18. Install intermediate shaft to steering gear input shaft. Tighten bolt to 41-51 N·m (30-38 lb-ft).
19. Install inner weather boot to floorpan.
20. Install intermediate shaft to steering column shaft. Refer to Section 11-04.
21. Fill with premium power steering fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent.
22. Bleed power steering system. Refer to Section 11-00.
23. Check system for leaks and proper operation.
24. Adjust toe setting. Refer to Section 04-00.

Pressure and Return Lines

Taurus/Sable

Removal

1. Disconnect battery ground cable.
2. Remove remote air cleaner.
3. Disconnect electrical connector in back of radiator fan motor.
4. Disconnect electrical connector from purge valve.
5. Remove radiator fan shroud.
6. Disconnect integrated module harness from headlamp harness and place module on top of engine to provide accessibility to power steering lines.
7. Remove wiring harness guide retaining screws and position guide aside.
8. Remove screw at pressure and return line bracket.
9. Remove anti-rattle clip.

   NOTE: Removal of pressure switch may allow for additional tool clearance.

10. Disconnect electrical connector on power steering pressure switch at steering gear.
11. Remove plastic strap attaching tubes to steering gear.
12. Remove pressure line fitting at power steering pump using a 5/8-inch open-end wrench.
13. Loosen clamp and remove return line at pump.
14. Remove return line fitting at steering gear using an 18mm open-end wrench.
15. Remove pressure line fitting at steering gear, using an 11/16-inch open-end wrench.

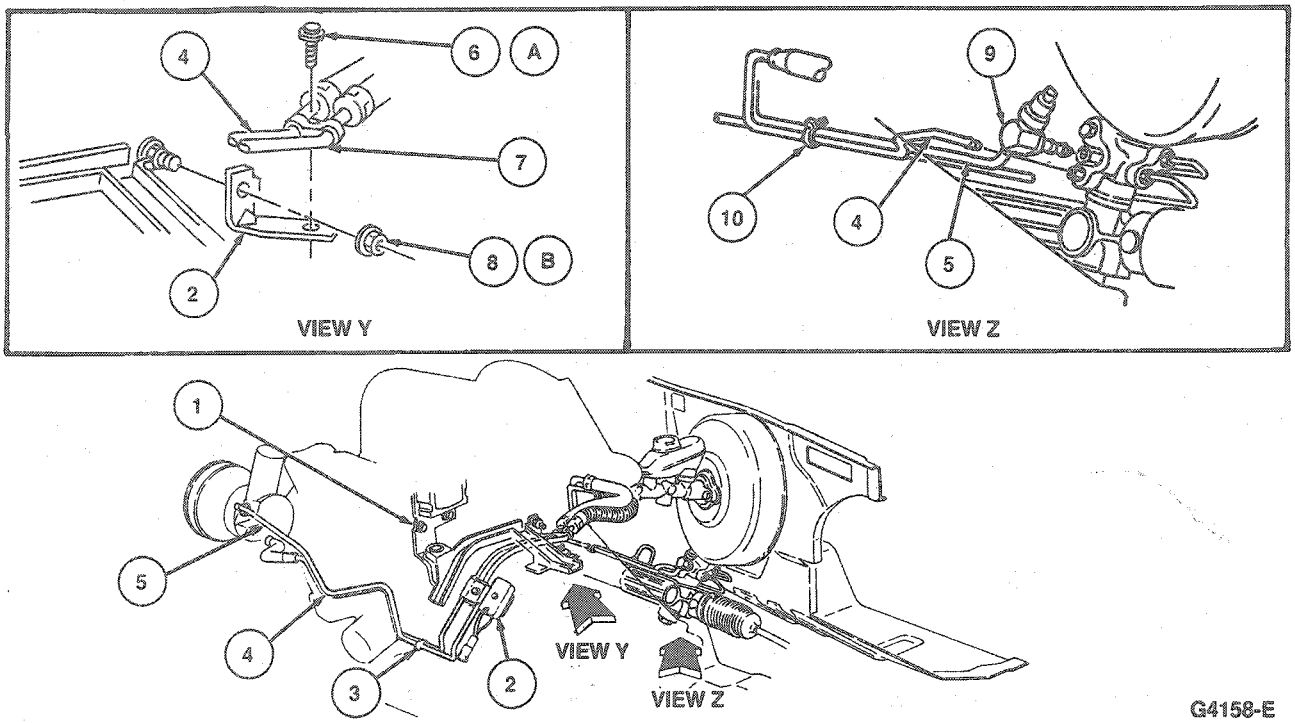
Installation

NOTE: Pressure and return fittings have the same thread size. Ensure the pressure nut (gold color) on line is installed in the pressure port, and that the check valve is properly oriented. The return fitting is silver colored and longer than the pressure line fitting.

1. Position power steering lines in vehicle and connect lines at power steering pump and steering gear. Tighten fitting(s) to 34-46 N·m (26-33 lb-ft). Tighten hose clamps to 1.4-2 N·m (13-17 lb-in).
2. Install screw at pressure and return line bracket.
3. Install anti-rattle clip.
4. Install plastic strap attaching lines to transfer tube on steering gear.
5. Connect power steering pressure electrical connector to switch.
6. Install wiring harness guide.
7. Position integrated module to top of fan shroud and connect module harness to headlamp harness.
8. Install fan shroud.
9. Connect electrical connector to purge valve.
10. Connect electrical connector to radiator fan motor.
11. Install remote air cleaner.
12. Connect battery ground cable.
13. Fill system. Refer to Section 11-00.

REMOVAL AND INSTALLATION (Continued)

3.0L Engine



Item	Part Number	Description
1	12257	Engine Coil Bracket
2	3C510	Bracket Assy
3	38511-S2	Clip
4	3A713	Power Steering Line Assy
5	3F524	Power Steering Line Assy
6A	N610959-S2	Bolt

(Continued)

Item	Part Number	Description
7	3A719	Pressure Hose Assy
8B	N621939-S2	Nut
9	3N824	T-Fitting Assy
10	95873-S101	Retainer
A		Tighten to 4.5-5.7 N·m (40-50 Lb-In)
B		Tighten to 8.1-13 N·m (6-9 Lb-Ft)

Supply Line—Reservoir to Pump

Taurus SHO

Removal

1. Disconnect battery ground cable.
2. Remove engine damper shock. Refer to Section 03-01B.
3. Remove power steering belt.
4. Loosen supply line hose clamp at reservoir and remove hose.
5. Drain fluid into a suitable container.
6. Remove strap retaining supply line to return line.
7. Raise vehicle on hoist. Refer to Section 00-02.
8. Remove RH front wheel and tire.
9. Position adjustable jack under engine.
10. Remove RH rear engine mount. Refer to Section 03-01C.
11. Remove power steering pump pulley.
12. Position drain pan under pump.
13. Disconnect supply line at pump.
14. Remove supply line from vehicle.

Installation

1. Position supply line in vehicle.
2. Connect supply line hose to pump. Tighten hose clamp to 1.4-2 N·m (13-17 lb-in).
3. Install power steering pump pulley.
4. Install RH rear engine mount.
5. Remove jack.
6. Install wheel and tire. Tighten wheel lug nuts to 115-142 N·m (85-105 lb-ft).
7. Remove drain pan.
8. Lower vehicle.
9. Install engine damper shock.

REMOVAL AND INSTALLATION (Continued)

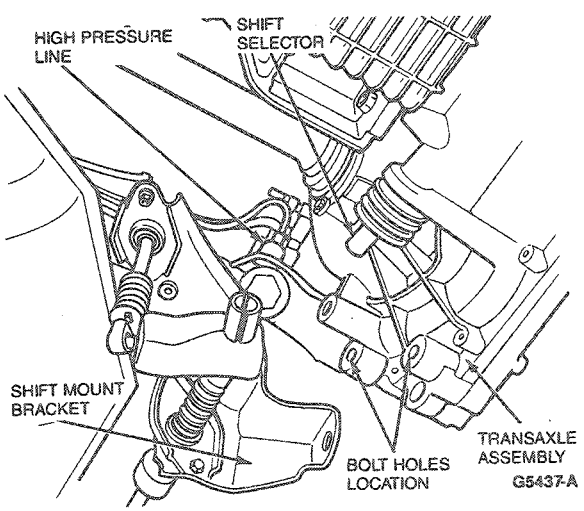
10. Install strap to secure supply line to return line.
11. Connect battery ground cable.
12. Fill system. Refer to Section 11-00.

Pressure Line

Taurus SHO

Removal

1. Disconnect battery ground cable.
2. Remove engine damper shock. Refer to Section 03-01B.
3. Remove power steering belt.
4. Raise vehicle. Refer to Section 00-02.
5. Remove RH front wheel and tire.
6. Position jack under engine.
7. Remove RH rear engine mount. Refer to Section 03-01B.
8. Remove power steering pump pulley.
9. Position drain pan under pump.
10. Remove pressure line fitting at power steering pump.
11. Cut tie straps and remove heat shield around steering gear assembly.
12. Remove shift linkage mount bracket from transaxle to gain access to high pressure line at gear housing.



13. Disconnect electrical connector on power steering pressure switch at steering gear.
14. Remove pressure line fitting at steering gear.
15. Remove high pressure line from vehicle.

Installation

1. Position high pressure line in vehicle and connect line at power steering pump and steering gear.
2. Connect electrical harness to power steering pressure switch.
3. Install shift linkage mount bracket to transaxle.
4. Position heat shield around steering gear assembly and install tie straps.
5. Remove drain pan.
6. Install power steering pump pulley.
7. Install RH rear engine mount.
8. Remove jack.
9. Install wheel and tire. Tighten wheel lug nuts to 115-142 N·m (85-105 lb-ft).
10. Lower vehicle.
11. Install power steering belt.
12. Install engine damper shock.
13. Connect battery ground cable.
14. Fill system. Refer to Section 11-00.

Cooler Lines

Steering Gear to Cooler

Taurus SHO

Removal

1. Disconnect battery ground cable.
2. Raise vehicle. Refer to Section 00-02.
3. Loosen hose clamp at cooler. Disconnect line and drain fluid into a suitable container.
4. Remove shift mount bracket.
5. Cut tie straps and remove heat shield from steering gear.
6. Disconnect hose at steering gear.
7. Lower vehicle.
8. Remove hose from vehicle.

Installation

1. Position hose in vehicle.
2. Raise vehicle.
3. Connect hose at steering gear.
4. Position heat shield and install tie straps.
5. Install shift mount bracket.
6. Connect line to cooler and tighten clamp to 1.4-2 N·m (13-17 lb-in).
7. Lower vehicle.
8. Connect battery ground cable.
9. Fill system. Refer to Section 11-00.

Cooler to Reservoir

Taurus SHO

Removal

1. Disconnect battery ground cable.
2. Raise vehicle. Refer to Section 00-02.

REMOVAL AND INSTALLATION (Continued)

3. Loosen hose clamp at cooler. Disconnect hose and drain fluid into a suitable container.
4. Remove shift mount bracket.
5. Cut tie straps and remove heat shield from steering gear.
6. Lower vehicle.
7. Loosen hose clamp at reservoir and disconnect return line.
8. Remove hose from vehicle.

Installation

1. Position reservoir-to-cooler hose in vehicle.
2. Connect hose to reservoir and tighten clamp to 1.4-2 N·m (13-17 lb-in).
3. Raise vehicle.
4. Position heat shield at steering gear and install tie straps.
5. Install shift mount bracket.
6. Connect hose to cooler and tighten clamp to 1.4-2 N·m (13-17 lb-in).
7. Lower vehicle.
8. Connect battery ground cable.
9. Fill system. Refer to Section 11-00.

Cooler

Taurus SHO

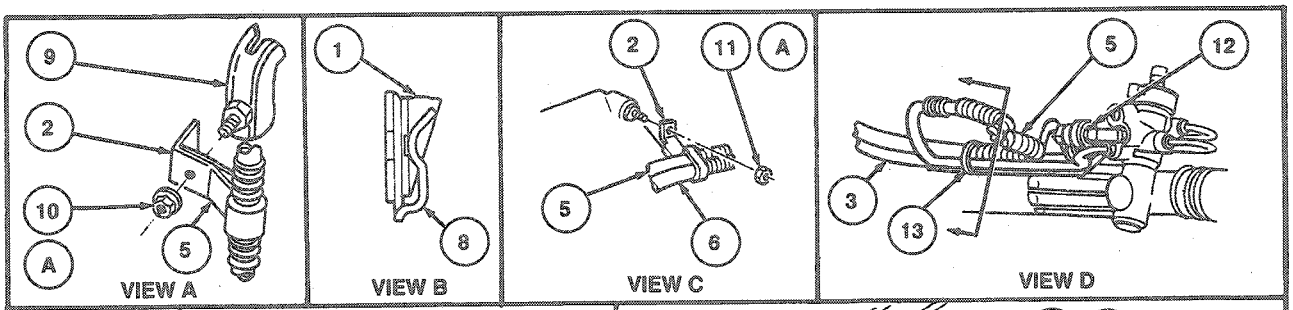
Removal

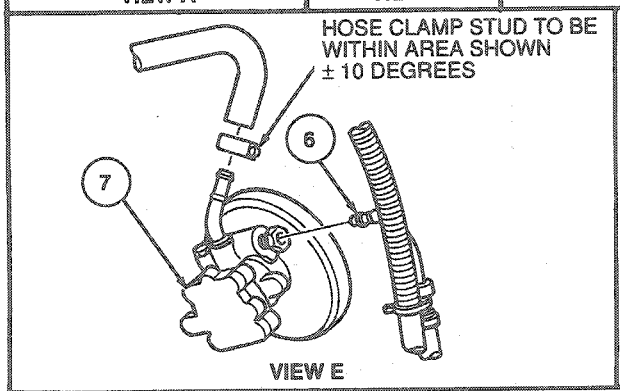
1. Disconnect battery cable.
2. Loosen hose clamps at cooler and remove return lines from cooler.
3. Remove two screws retaining cooler assembly to vehicle. Remove cooler.

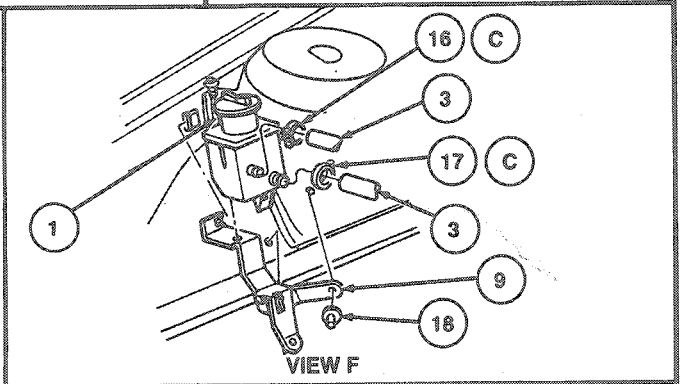
Installation

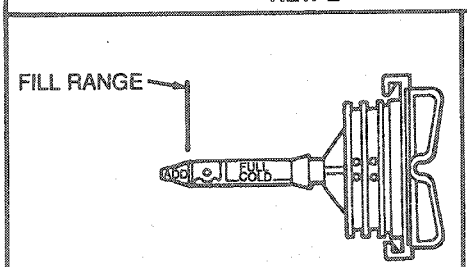
1. Position cooler and install two screws. Tighten to 18-28 N·m (14-20 lb-ft).
2. Connect return line hoses to cooler. Position hose clamps and tighten to 1.4-2 N·m (13-17 lb-in).
3. Connect battery ground cable.
4. Fill system. Refer to Section 11-00.

REMOVAL AND INSTALLATION (Continued)

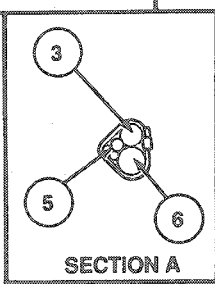


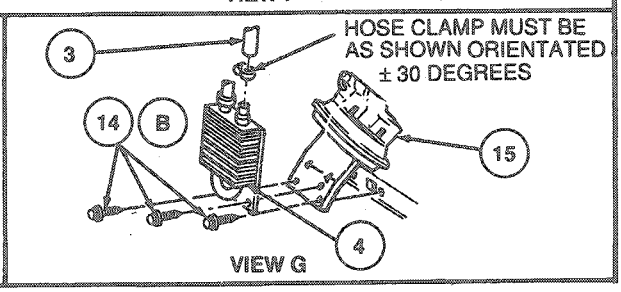




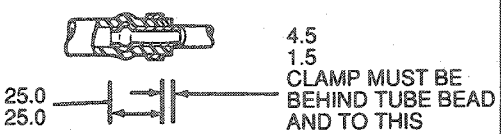


FLUID MUST SHOW ON DIPSTICK
AS SHOWN
VIEW OF POWER STEERING PUMP
DIPSTICK SHOWING FILL INSTRUCTIONS

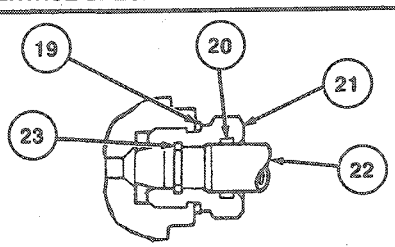




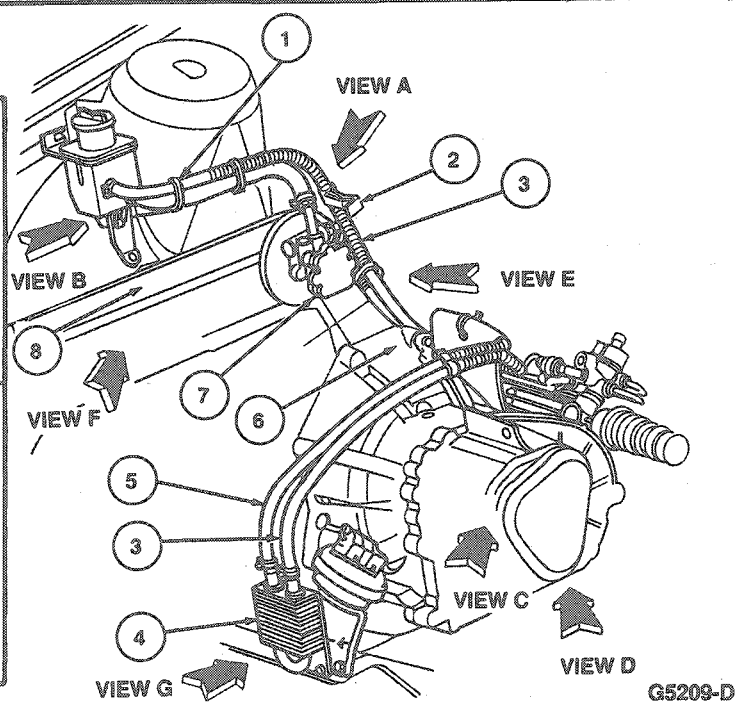
HOSE CLAMP



TYPICAL HOSE CLAMP CONNECTION.
ROTATIONAL POSITION OF CLAMP UNLESS OTHERWISE SPECIFIED.



QUICK CONNECT INSTALLATION AT PUMP



REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1	3R700	Power Steering Reservoir Assy
2	3C510	Clamp
3	3F751	Hose Assy
4	3D746	Cooler Assy
5	3F731	Hose Assy
6	3A719	Hose Assy
7	3A674	Power Steering Pump
8	3490	Bracket
9	—	Engine Mounted Stud
10A	N621939-S2	Nut
11A	N801310-S	Nut
12	3N803	Actuator Assy
13	95873	Strap

(Continued)

Item	Part Number	Description
14B	N610959-S2	Screw (3 Req'd)
15	—	Speed Control Servo
16C	390462-S100	Clamp (3 Req'd)
17C	383522-S	Clamp (2 Req'd)
18	N803710-S	Rivet (2 Req'd)
19	388898-S	Seal
20	N804753-S	Seal
21	3F656	Housing
22	—	Hose or Tube Assy
23	N804753-S	Snap Ring
A		Tighten to 23.3-31.7 N·m (17-23 Lb-Ft)
B		Tighten to 4.0-5.6 N·m (35-50 Lb-in)
C		Tighten to 1.6-2.2 N·m (14-20 Lb-in)

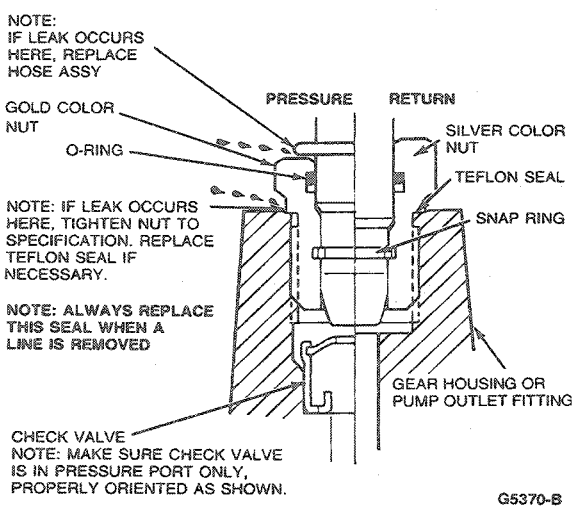
Pressure and Return Line Fitting at Steering Gear and Power Steering Pump

Tools Required:

- Teflon Seal Installer D90P-3517-A3

Seal Replacement

If a leak occurs between the tubing and tube nut, replace the hose assembly. If a leak occurs between the tube nut and the aluminum gear housing or pump outlet fitting, replace the plastic washer.



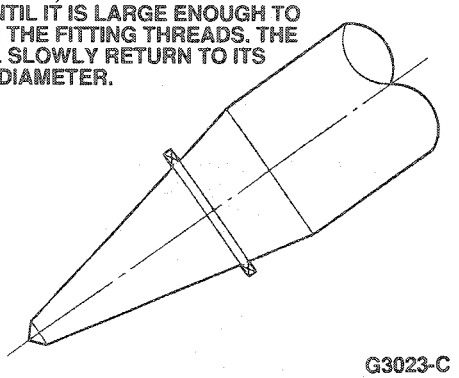
The following procedure should be used:

1. Check fittings to determine which fitting is leaking and whether leak is between tube and tube nut or between tube nut and gear housing or pump outlet fitting.

   CAUTION: DO NOT over-tighten. If tube nuts are overtorqued stripping of housing threads may occur and bores may concave.

2. If leak is between tube nut and gear housing or pump outlet fitting, check to ensure nut is tightened to 27-34 N·m (20-25 lb-ft).
3. If leak continues or if leak is between tube and tube nut, remove line.
4. Unscrew tube nut, and inspect plastic seal washer. Always replace plastic seal washer (pressure line plastic washer at gear, 388897-S, and return line plastic washer at gear or pump outlet, 388898-S) when line is removed. To facilitate assembly of new plastic seal washer, a tapered shaft may be required to stretch washer, so it may be slipped over tube nut threads.

STRETCH PLASTIC SEAL OVER A TEFLON SEAL INSTALLER (D90P-3517-A3) OR A TAPERED TOOL, SUCH AS A CENTER PUNCH, UNTIL IT IS LARGE ENOUGH TO SLIP OVER THE FITTING THREADS. THE SEAL WILL SLOWLY RETURN TO ITS ORIGINAL DIAMETER.



5. The rubber O-ring cannot be serviced with this design. If leak is due to the O-ring, replace the hose assembly.

REMOVAL AND INSTALLATION (Continued)

6. Connect tube nuts and tighten to 27-34 N·m (20-25 lb-ft). Install plastic strap to attach pressure and return lines to LH turn transfer line.

The quick connect fittings may disengage if not fully assembled, if the snap ring is missing, or if the tube nut, or the hose end is not machined properly.

If the fitting disengages, replace the hose assembly. The fitting is fully engaged only when the hose will not pull out. To test for positive engagement, the system should be properly filled, the engine started, and the steering wheel cycled from lock-to-lock. Service hose assemblies have tube nuts, snap rings and O-rings already attached.

Pressure Switch

Tools Required:

- Rotunda Digital Volt Ohmmeter 007-00001

The pressure switch uses an O-ring seal. If a leak occurs, check that the switch is properly tightened to 7-14 N·m (5-10 lb-ft). If the leak continues, replace the O-rings, then the pressure tube, and finally the pressure switch.

Pressure Switch Functional Check

Check operation of the switch if either or both of the following concerns are noted:

- Engine stalls during parking maneuvers.
- Engine idles at high speed.

The following test is based on the fact that the switch is normally closed. As power steering load increases, the switch opens and increases the idle speed.

1. Disconnect the electrical connector at the pressure switch.
2. Connect a continuity tester, Rotunda Digital Volt Ohmmeter 007-00001 or equivalent, across the pressure switch terminals.
3. Start engine and let idle.
4. Switch should be normally closed (zero ohms) with steering wheel straight ahead.
5. Turn steering toward either stop while watching continuity tester. Switch should open near the stops (no continuity or infinite reading on ohmmeter).
6. If switch fails either test, replace the switch. If switch is OK, check the engine idle speed control system.

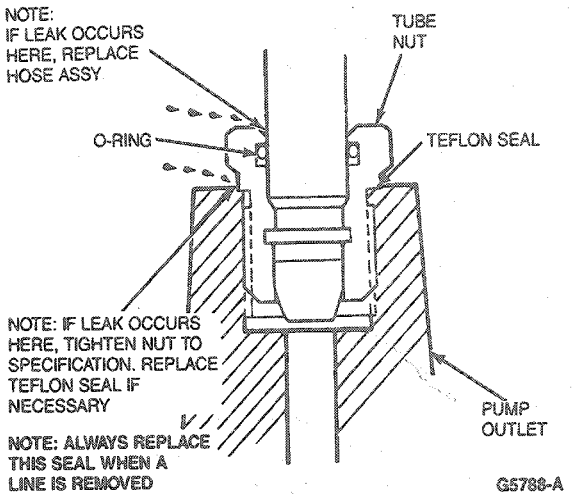
Quick Connect Power Steering Fitting, CII

Tools Required:

- Teflon Seal Installer D90P-3517-A3

Seal Replacement

If a leak occurs between the tubing and tube nut, replace the hose assembly. If a leak occurs between the tube nut and the pump outlet, replace the plastic washer.

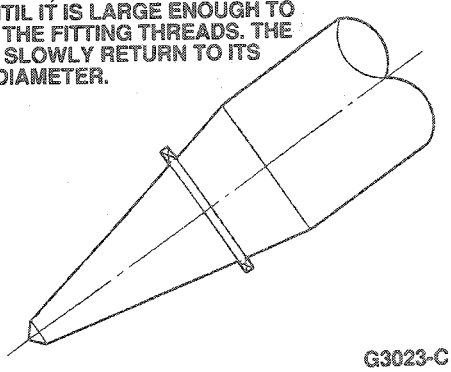


The following procedure should be used:

1. Check fitting to determine whether leak is between tube and tube nut or between tube nut and pump outlet

   CAUTION: DO NOT over-tighten. If tube nuts are overtorqued, stripping of housing threads may occur and bores may concave.
2. If leak is between tube nut and pump outlet, check to ensure nut is tightened to 27-34 N·m (20-25 lb-ft).
3. If leak continues or if leak is between tube and tube nut, remove line.
4. Unscrew tube nut, and inspect plastic seal washer. Always replace plastic seal washer (388898-S) when line is removed. To facilitate assembly of new plastic seal washer, a tapered shaft may be required to stretch washer, so it may be slipped over tube nut threads.

STRETCH PLASTIC SEAL OVER A TEFLON SEAL INSTALLER (D90P-3517-A3) OR A TAPERED TOOL, SUCH AS A CENTER PUNCH, UNTIL IT IS LARGE ENOUGH TO SLIP OVER THE FITTING THREADS. THE SEAL WILL SLOWLY RETURN TO ITS ORIGINAL DIAMETER.



REMOVAL AND INSTALLATION (Continued)

5. The rubber O-ring cannot be serviced with this design. If leak is due to the O-ring, replace the hose assembly.
6. Connect tube nut and tighten to 27-34 N·m (20-25 lb-ft).

The quick connect fitting may disengage if not fully assembled, if the snap ring is missing, or if the tube nut or the hose end is not machined properly.

If the fitting disengages, replace the hose assembly. The fitting is fully engaged only when the hose will not pull out. To test for positive engagement, the system should be properly filled, the engine started, and the steering wheel cycled from lock-to-lock. Service hose assemblies have tube nuts, snap rings and O-rings already attached.

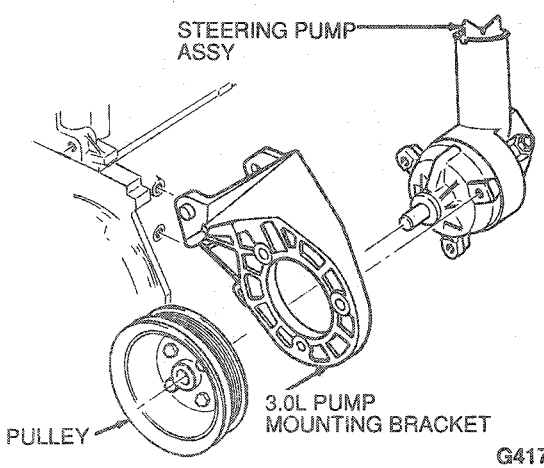
Steering Pump

Removal

1. Remove radiator overflow bottle to gain access to three bolts retaining pulleys to pulley hub.
2. Mark both pulley-to-hub positions with grease pencil or paint daub for reassembly to maintain balance.
3. Remove the three bolts and two pulleys from pulley hub.

Installation

1. Install two pulleys on hub, aligning marks put on hub and pulleys during removal.
2. Install the three bolts and tighten to 21-32 N·m (15-23 lb-ft).
3. Install radiator overflow bottle.



Steering Pump and Pulley Hub

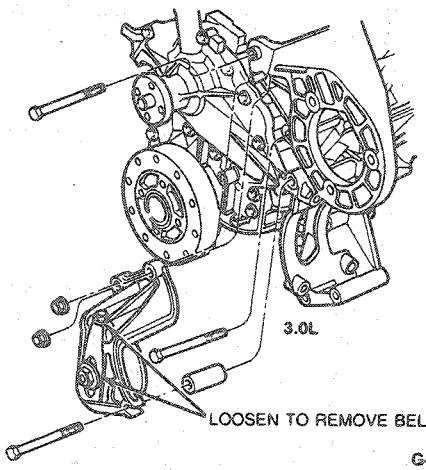
3.0L Engine

Removal

1. Disconnect battery ground cable.
2. Loosen idler pulley and remove power steering belt.
3. Remove pulley from hub.
4. Remove return line from pump.
5. Completely back off pressure line nut. Line will separate when pump is removed from bracket.
6. Remove three pump retaining bolts and remove pump.

Installation

1. Install pump on mounting bracket. Guide pressure line into pump outlet fitting while installing pump.
2. Install pressure and return lines.
3. Install pulley on hub.
4. Install steering pump drive belt and adjust tension. Refer to Section 03-05.
5. Connect battery ground cable.
6. Fill pump with fluid and check operation. Refer to Section 11-00.



Pump Reservoir

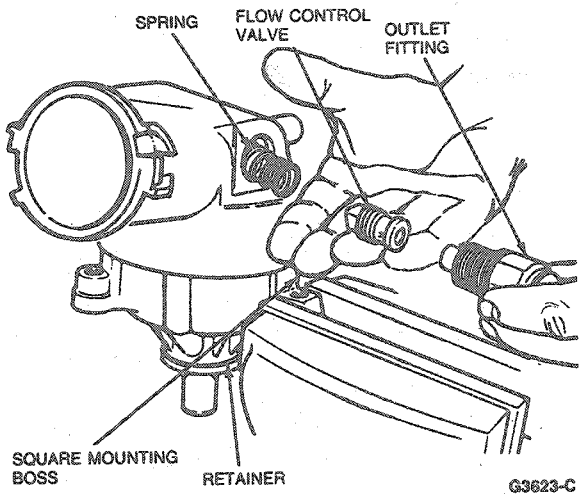
Take the following precautions when servicing the power steering pump reservoir:

- Use clean work bench and tools.
- Plug inlet and outlet openings of pump with plugs or masking tape.
- Thoroughly clean exterior of pump with solvent.

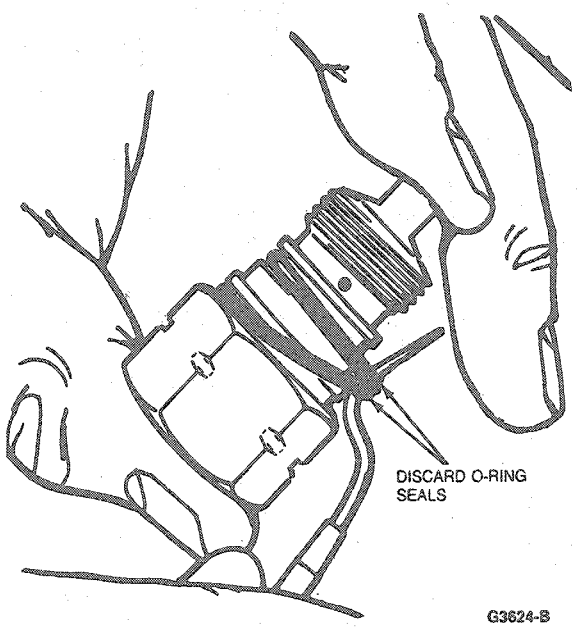
REMOVAL AND INSTALLATION (Continued)

Removal

1. Place pump assembly in a bench vise with soft jaws and remove outlet fitting, flow control valve, and spring. Discard all seals.

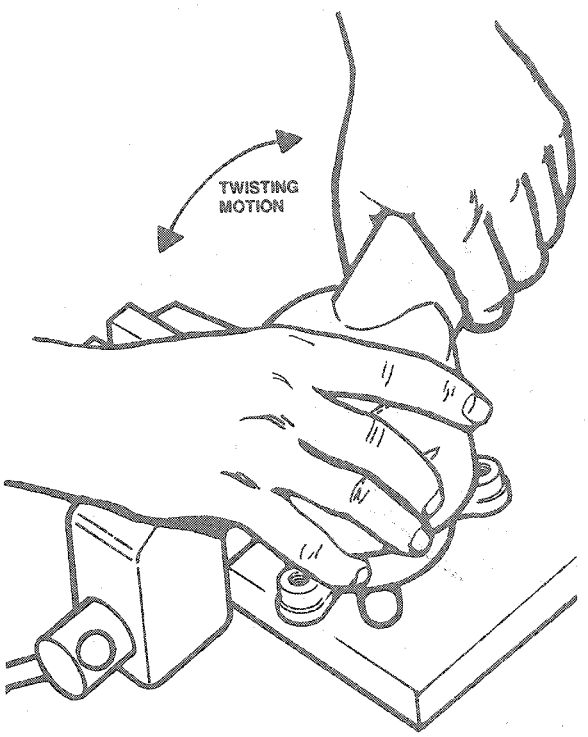


G3623-C



G3624-B

2. Remove fiberglass reservoir by twisting side-to-side and lifting.



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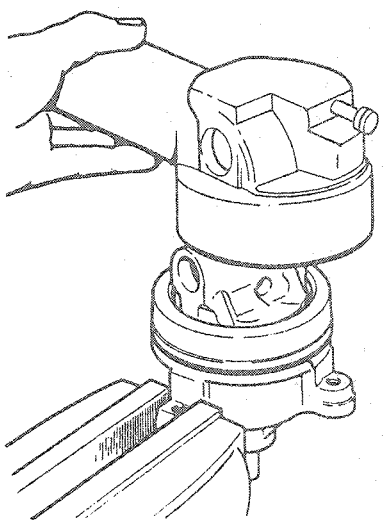
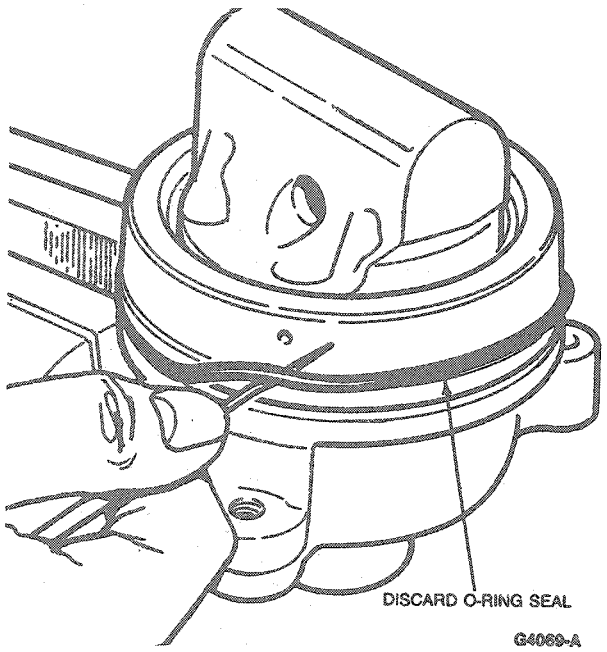


G5891-A

CAUTION: Do not hammer on the reservoir.

REMOVAL AND INSTALLATION (Continued)

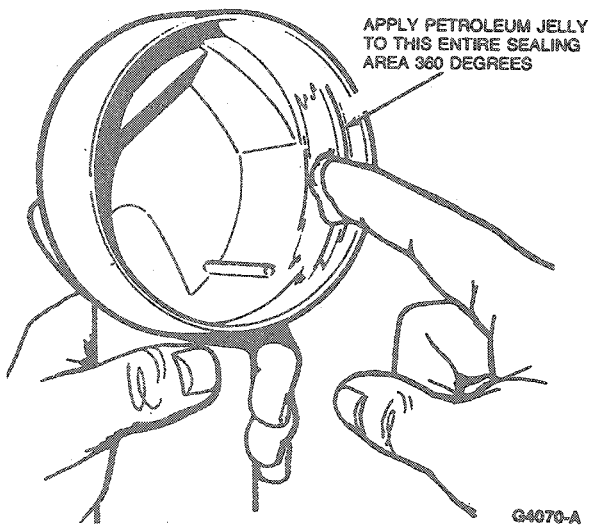
3. Discard O-ring seal on pump housing.



Installation

1. Install a new O-ring seal on pump housing.
2. Apply petroleum jelly to reservoir O-ring seal and inside edge of reservoir. Do not twist O-ring seal.
3. Install reservoir over pump and align outlet fitting hole in reservoir with hole in valve cover.

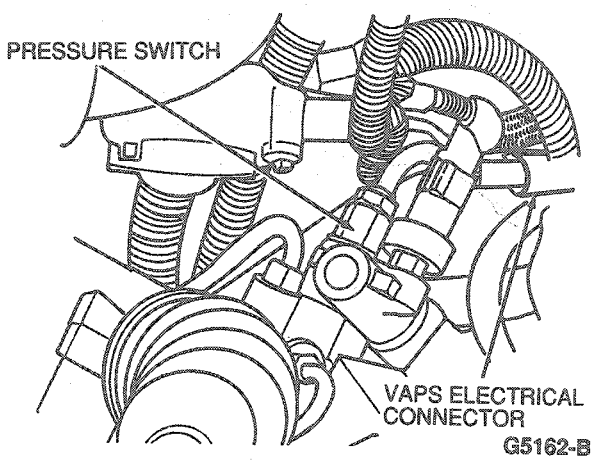
   CAUTION: If valve is cocked, it may become stuck in the valve cover. Do not force valve forward. Forcing the valve may shear off metal and carry the metal chips into the valve bore.
4. Place new O-ring seals on outlet fitting. Install flow control spring, flow control valve and outlet fitting into reservoir and valve cover. Tighten fitting to 33-47 N·m (25-34 lb-ft).



Steering Gear Actuator

Removal

1. Remove air inlet duct for access to actuator.
2. Disconnect VAPS electrical connector from actuator.
3. Disconnect pressure switch.
4. Remove two actuator-to-steering gear retaining bolts.
5. Lift actuator from gear assembly.



Installation

NOTE: Ensure that the two seals (between the actuator and gear assembly) are in place when setting the actuator on the gear assembly.

1. Align actuator on steering gear.
2. Install two actuator-to-steering gear retaining bolts. Tighten to 27-34 N·m (20-25 lb-ft).
3. Reconnect pressure switch and VAPS electrical connector.
4. Install the air inlet duct.

VAPS Module

The VAPS module is located below the instrument panel on the RH side of the steering column.

Removal

1. Disconnect wiring harness connector from VAPS module.
2. Remove three module fixture retaining screws from column mounting fixture and remove module.

Installation

1. Align mounting holes of new module to mounting holes on column mounting fixture.
2. Install three module fixture retaining screws and tighten to 4-5 N·m (35-45 lb-in).
3. Reconnect wiring harness connector to VAPS module.

DISASSEMBLY AND ASSEMBLY

Tie Rods, Bellows

Tools Required:

- Bench Mounted Holding Fixture T57L-500-B
- Nut Wrench T74P-3504-U
- Locknut Pin Remover D81P-3504-N

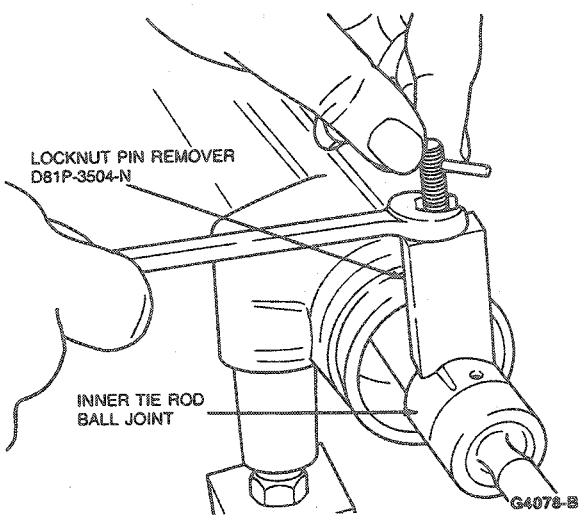
Disassembly

1. Mount gear assembly in Bench Mounted Holding Fixture T57L-500-B.

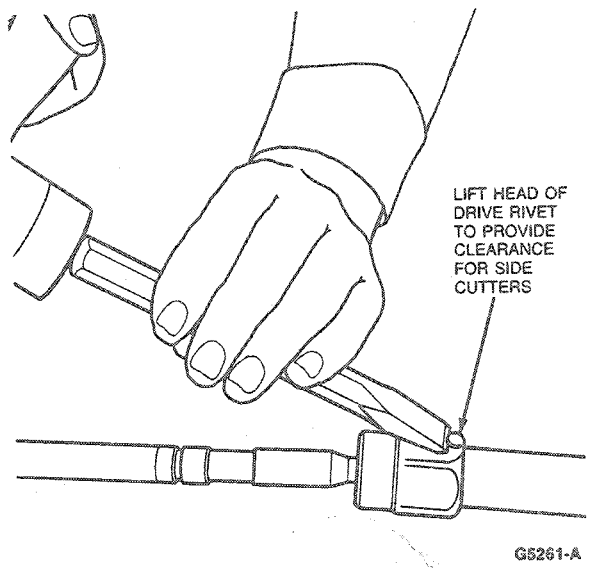
   NOTE: Drill out mounting holes in holding fixture with a 9/16-inch drill to allow the gear assembly mounting bolts to fit.
2. Remove tie rod ends.
3. Remove four clamps retaining bellows to gear housing and tie rods. Discard clamps if damaged or excessively corroded.

   CAUTION: Use care not to damage bellows.
4. Remove bellows along with breather tube.

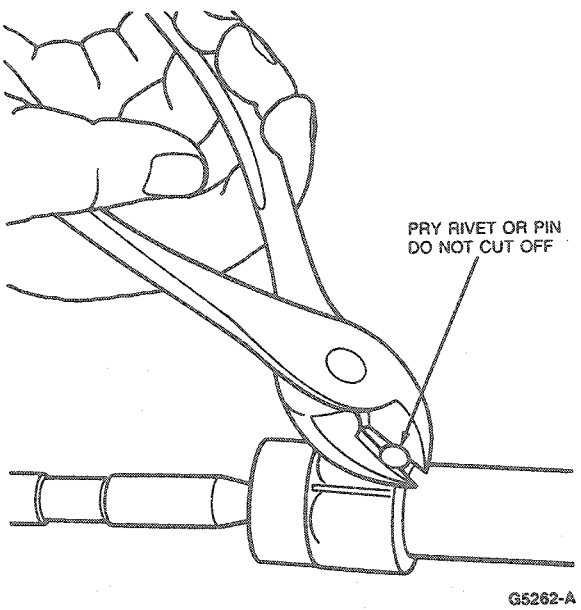
   NOTE: For units equipped with rivets in place of the coiled pins, perform Steps 6 and 7.
5. Using Locknut Pin Remover D81P-3504-N or equivalent, remove coiled lock pins from inner tie rod ball joints.



6. With a sharp chisel, gently tap around rivet head so it lifts away from ball joint. Use caution so the center pin is not sheared off.



7. Use side cutters to pry out drive pin.
8. Position rack so that several rack teeth are exposed. Hold rack with an adjustable wrench on end teeth only, while loosening ball joint nuts with Nut Wrench T74P-3504-U.

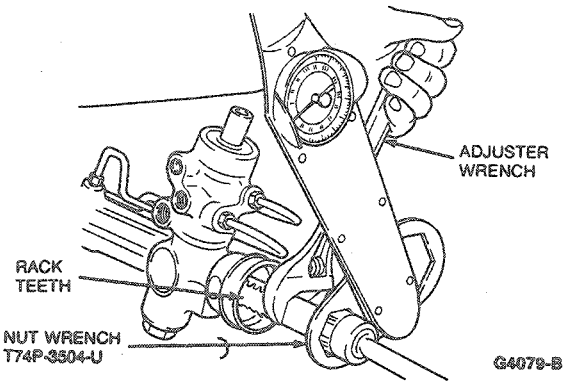


Assembly

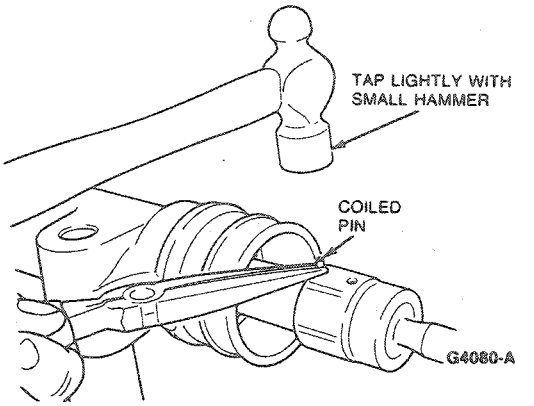
1. Expose several rack teeth and hold rack with adjustable wrench.

DISASSEMBLY AND ASSEMBLY (Continued)

2. Tighten each ball joint assembly separately to 75-88 N·m (55-65 lb-ft) using Nut Wrench T74P-3504-U.

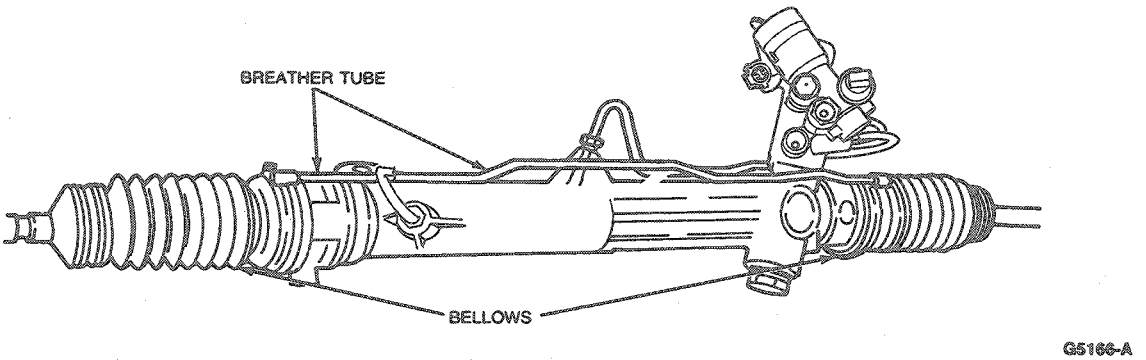


3. Install new coiled pins in tie rod ball housing by tapping lightly with a small hammer.



NOTE: Replenish any grease that may have been removed from rack teeth with Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent.

4. Thoroughly clean rack and housing bore of any foreign material. Any abrasive material is extremely harmful to high-pressure oil seals.
5. Apply Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent to groove in rods where bellows clamp to tie rod. This allows for toe-in adjustment without twisting bellows.
6. Install bellows and breather tube. Ensure breather tube is positioned as shown.

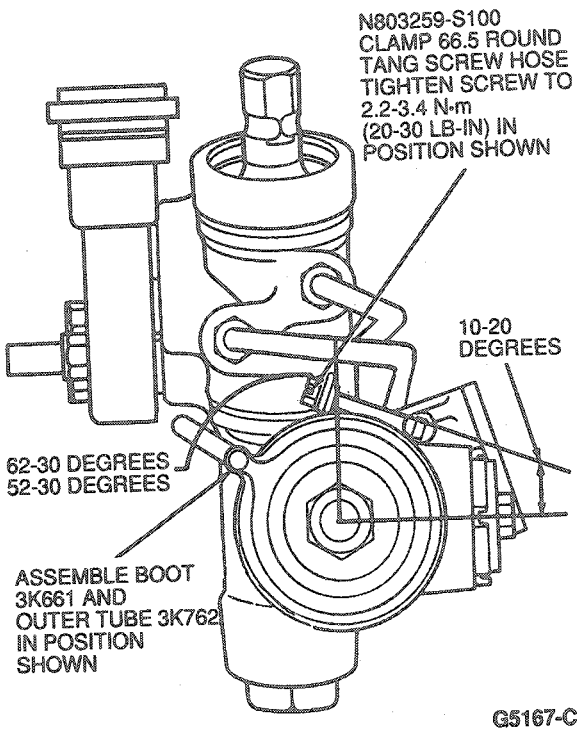


7. Install clamps and position screw axis as shown. Tighten to 2.2-3.4 N·m (20-30 lb-in).
8. Install new clamps retaining bellows to tie rods.

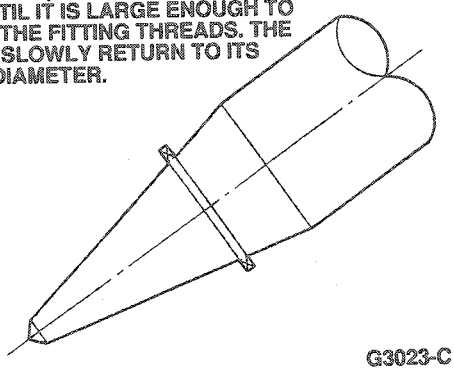
9. Apply Disc Brake Caliper Slide Grease D7AZ-19590-A (ESA-M1C172-A) or equivalent to tie rod threads.

DISASSEMBLY AND ASSEMBLY (Continued)

10. Install tie rod outer ends.



STRETCH PLASTIC SEAL OVER A TEFLON SEAL INSTALLER (D90P-3517-A3) OR A TAPERED TOOL, SUCH AS A CENTER PUNCH, UNTIL IT IS LARGE ENOUGH TO SLIP OVER THE FITTING THREADS. THE SEAL WILL SLOWLY RETURN TO ITS ORIGINAL DIAMETER.



Steering Gear

Take the following precautions when servicing the steering gear:

1. Use a clean work bench and tools.
2. Thoroughly clean the exterior of the unit with solvent. Drain off excess hydraulic fluid.
3. Handle all parts carefully to avoid nicks, burrs, scratches and dirt.
4. Do not use solvent on seals.
5. Impact tools must not be used during any of the operations.

Pressure and Return Line Fitting

Tools Required:

- Teflon Seal Installer D90P-3517-A3

Seal Replacement

If a leak occurs between the tubing and the tube nut, replace the hose assembly. If a leak occurs at the tube nut threads, replace the plastic washer. The following procedure should be used:

1. Check to ensure that nuts are tightened to specification. Do not over-tighten.
2. Unscrew tube nut, and replace plastic seal washer. To facilitate assembly of new TFE seal, a tapered shaft may be required to stretch the washer, so it may be slipped over tube nut threads.

Tie Rod Ends, Bellows and Ball Joint Sockets

Tools Required:

- Bench Mounted Holding Fixture T57L-500-B
- Nut Wrench T74P-3504-U

Disassembly

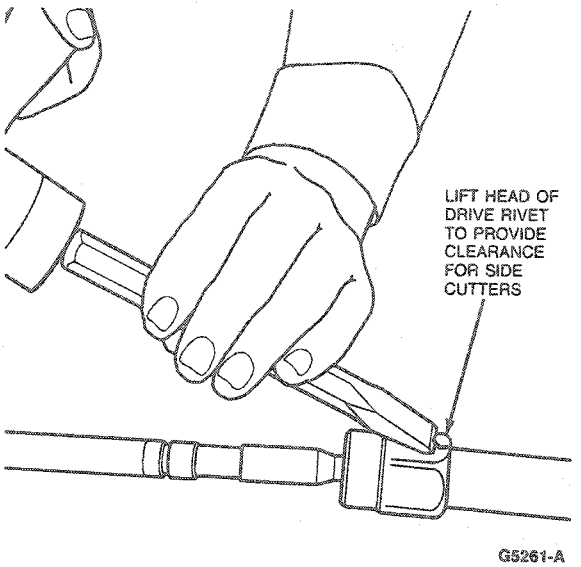
NOTE: Drill out mounting holes in holding fixture with a 9/16-inch drill to allow the gear assembly mounting bolts to fit.

1. Mount gear assembly in Bench Mounted Holding Fixture T57L-500-B.
2. Remove tie rod ends.
3. Remove four clamps retaining bellows to gear housing and tie rods. Discard clamps if damaged or excessively corroded.

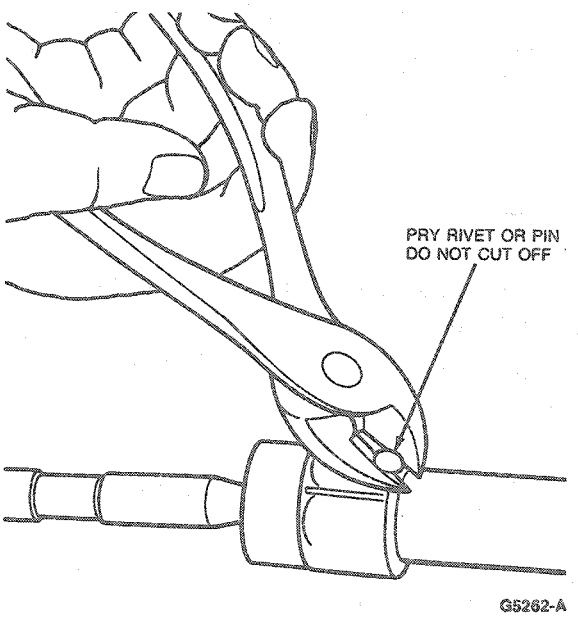
   CAUTION: Use care not to damage bellows.
4. Remove bellows along with breather tube.
5. If pinion requires removal, remove pinion before proceeding. Refer to Input Shaft and Valve Disassembly.

DISASSEMBLY AND ASSEMBLY (Continued)

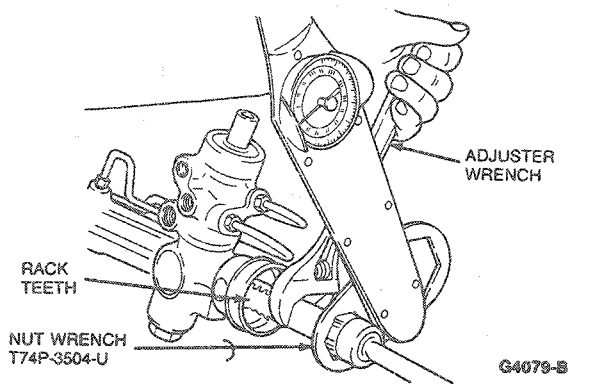
6. With a sharp chisel, gently tap around rivet head so it lifts away from ball joint. Use caution so the center pin is not sheared off.



7. Use side cutters to pry out drive pin.



8. Position rack so that several rack teeth are exposed. Hold rack with an adjustable wrench on end teeth only, while loosening ball joint nuts with Nut Wrench T74P-3504-U.

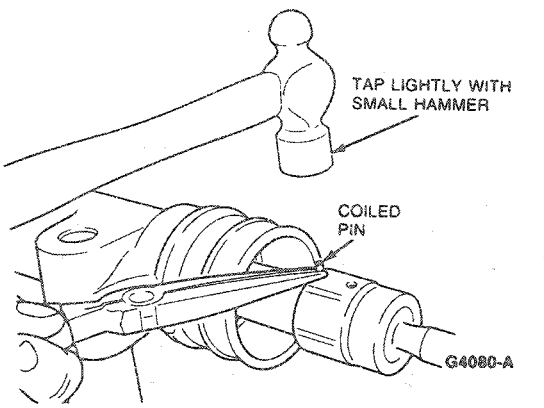


Assembly

1. If pinion was not removed, expose several rack teeth and hold rack with adjustable wrench.

   Tighten each ball joint assembly separately to 75-88 N·m (55-65 lb-ft) using Nut Wrench T74P-3504-U.

2. If valve assembly was removed, hold one ball joint nut with a 1-5/16 inch open-end or box wrench while tightening other nut to 75-88 N·m (55-65 lb-ft) with Nut Wrench T74P-3504-U. Both ends are tightened simultaneously by this method.
3. Install new coiled pins in tie rod ball housing by tapping lightly with small hammer.



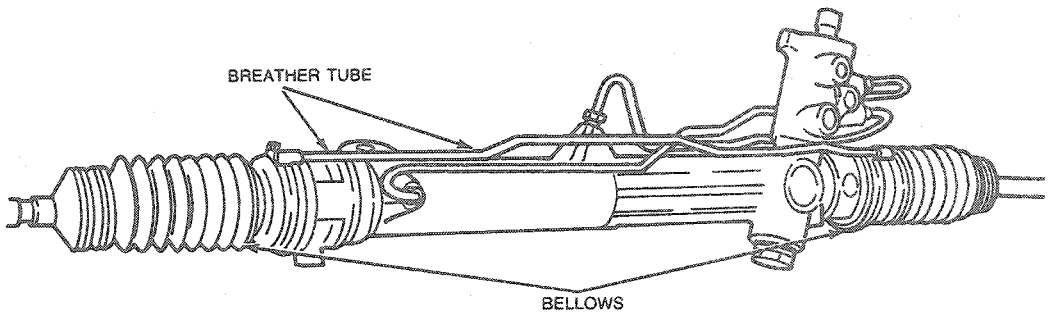
4. If valve assembly was removed, install valve assembly as outlined in Input Shaft and Valve Assembly.

   NOTE: Replenish any grease that may have been removed from rack teeth with Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent.

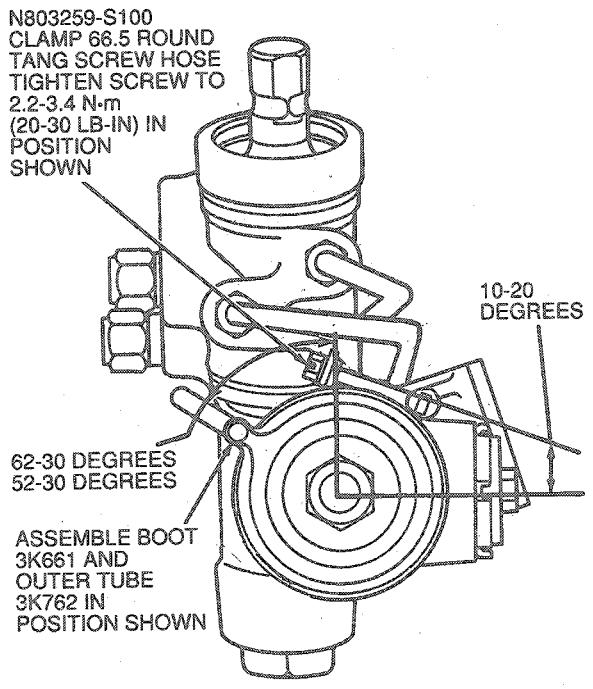
5. Thoroughly clean rack and housing bore of any foreign material. Any abrasive material is extremely harmful to high pressure oil seals.
6. Apply Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent to groove in rods where bellows clamp to tie rod. This allows for toe-in adjustment without twisting bellows.

DISASSEMBLY AND ASSEMBLY (Continued)

7. Install bellows and breather tube. Ensure breather tube is positioned as shown.



8. Install screw-type clamps and position screw axis as shown. Tighten to 2.2-3.4 N·m (20-30 lb-in).



9. Install new clamps retaining bellows to tie rods.
10. Apply Disc Brake Caliper Slide Grease D7AZ-19590-A (ESA-M1C172-A) or equivalent to tie rod threads.
11. Install tie rod outer ends.

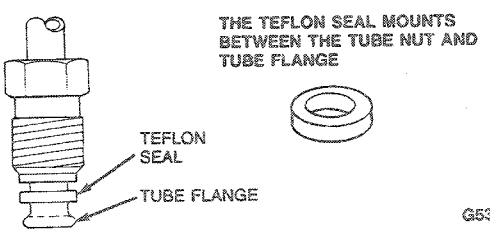
Input Shaft and Valve Assembly

Tools Required:

- Impact Slide Hammer T50T-100-A
- Bench Mounted Holding Fixture T57L-500-B
- Puller Attachment T58L-101-B
- Pinion Shaft Torque Adapter T74P-3504-R
- Seal Installation Kit T75L-3517-A1, A2, A3 and A4
- Valve Body (Screw) T78P-3504-B
- Valve Body Insert Tool T78P-3504-C
- Lower Pinion Bearing Replacer T78P-3504-G
- Upper Pinion Bearing Seal Replacer T78P-3504-D
- Retaining Ring Pliers D79L-7000-A
- Valve Body Puller (Bridge) T86P-3504-D
- Lower Pinion Seal Remover T86P-3504-F
- Lower Pinion Seal Replacer T86P-3504-G
- Lower Pinion Seal Remover Guide T86P-3504-J

Disassembly

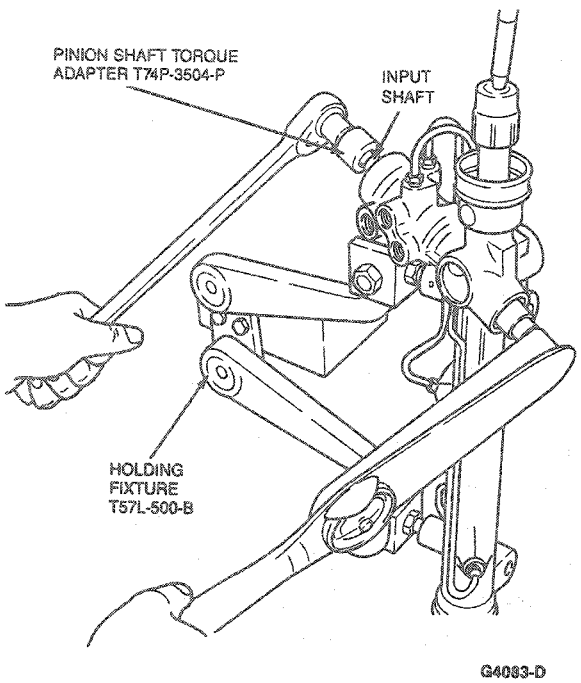
1. Thoroughly clean areas of input shaft valve housing, yoke locknut and plug, and pinion bearing plug.
2. Mount gear in the Bench Mounted Holding Fixture T57L-500-B. Drill out mounting holes in holding fixture with a 9/16-inch drill to allow gear assembly retaining bolts to fit.
3. Do not remove transfer tubes (RH and LH turn lines), unless they are leaking or damaged. If these lines are removed, new Teflon® seals must be installed.



DISASSEMBLY AND ASSEMBLY (Continued)

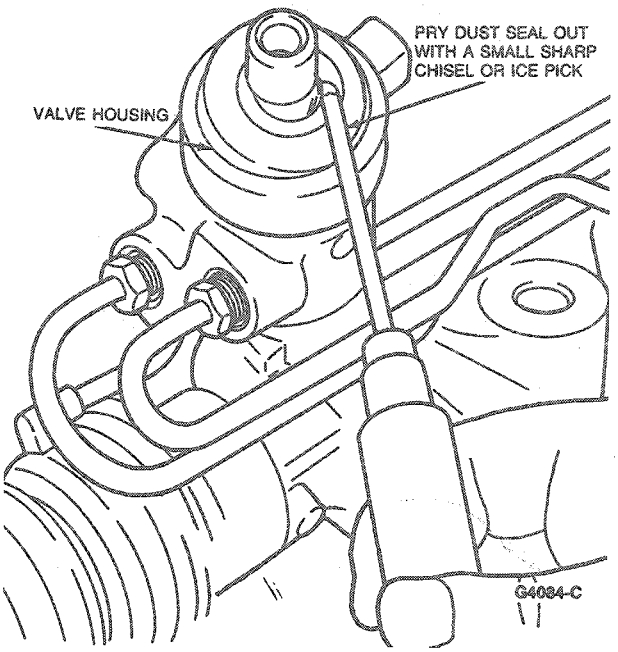
4. Loosen yoke plug locknut and yoke plug to relieve preload on rack.
5. Remove pinion bearing cap.

   CAUTION: Do not allow rack to reach full travel when loosening or tightening the locknut, as damage to rack teeth may occur.
6. Install Pinion Shaft Torque Adapter T74P-3504-R on input shaft. Hold input shaft, and remove pinion bearing locknut with an 11/16-inch socket. Discard locknut.

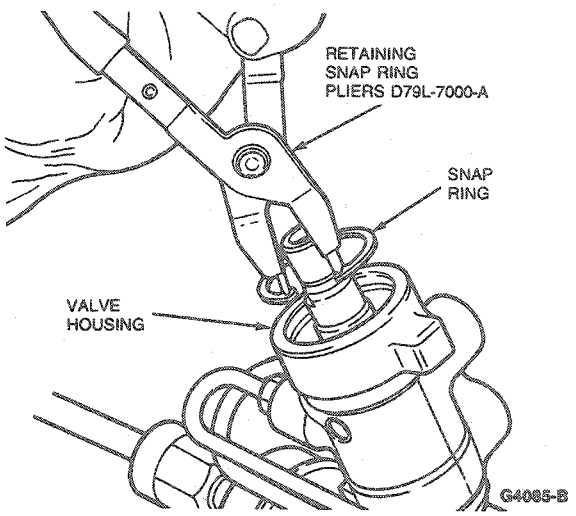


CAUTION: Use care not to damage any valve housing surfaces.

7. Pry input shaft dust seal out of valve housing with a small, sharp chisel or ice pick.

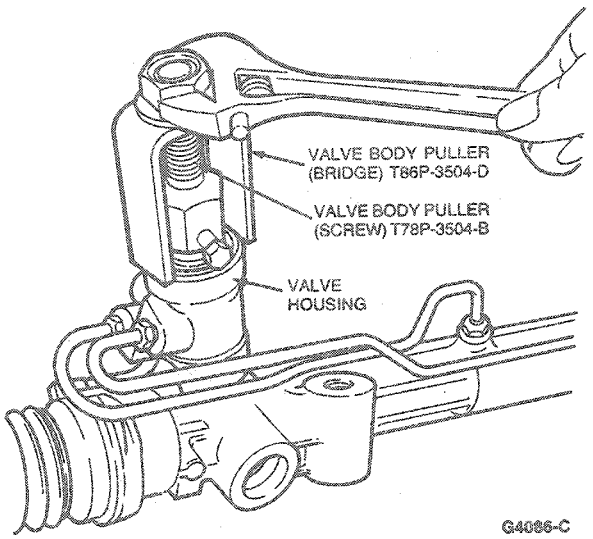


8. Using Retaining Ring Pliers D79L-7000-A or equivalent, remove retaining snap ring, located under dust seal from valve housing.

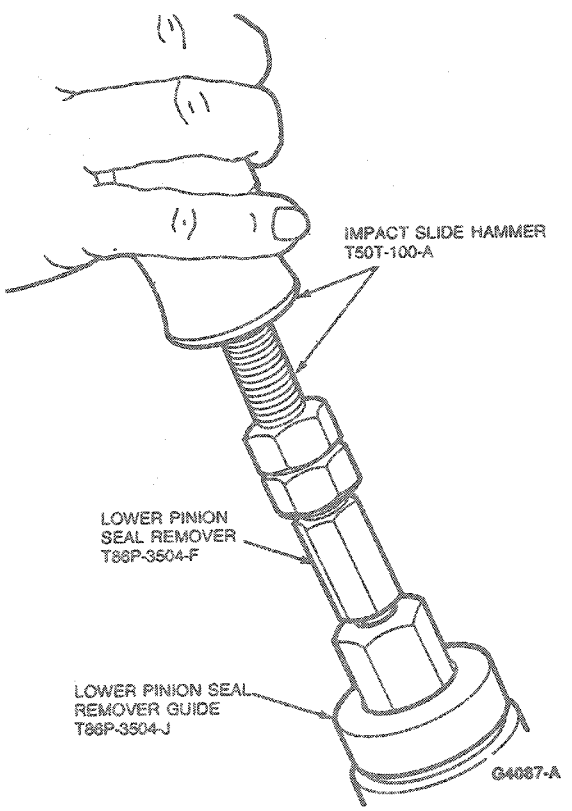


DISASSEMBLY AND ASSEMBLY (Continued)

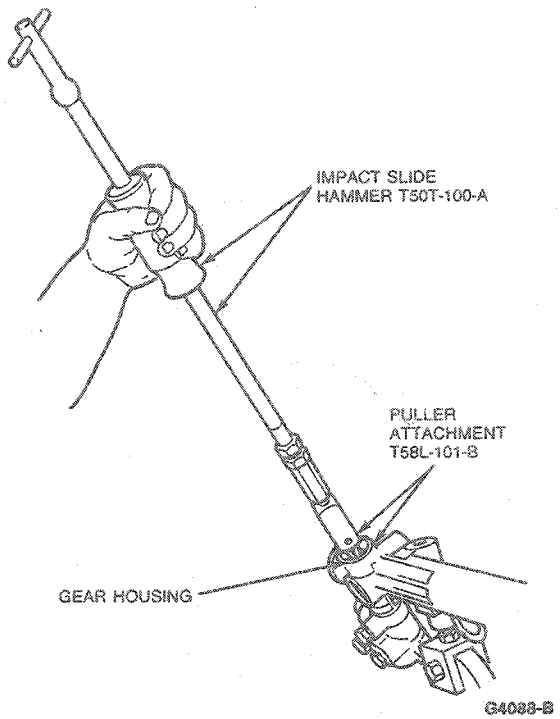
9. Attach Valve Body Puller (Bridge) T86P-3504-D and Valve Body Puller (Screw) T78P-3504-B, to input shaft. Turn nut to remove valve. Input shaft seal and bearing will come out with valve body.



10. To remove lower pinion shaft seal, insert Lower Pinion Seal Remover T86P-3504-F until it bottoms along with Lower Pinion Seal Remover Guide T86P-3504-J. Activate expander with a pair of wrenches by holding large nut and turning small nut until expander fully tightens. Pull tool and seal with Impact Slide Hammer T50T-100-A.

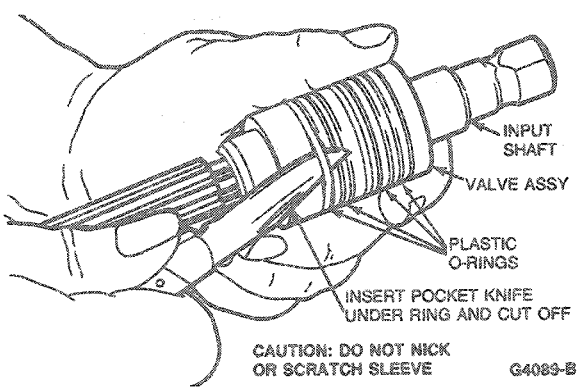


11. Remove pinion bearing from gear housing with Impact Slide Hammer T50T-100-A and Puller Attachment T58L-101-B.



CAUTION: Use care not to scratch valve sleeve. Internal leaking could occur causing power steering fluid to leak under the seals.

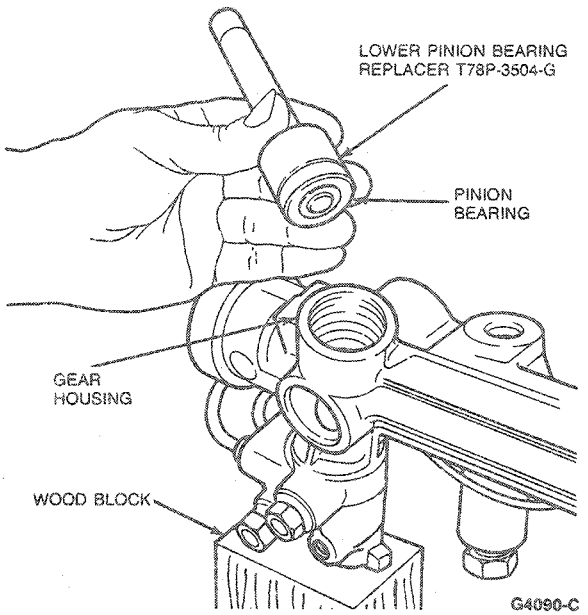
12. The only serviceable components of the input shaft and valve assembly are four plastic O-rings. Remove O-rings by pushing rings to one side, inserting a small pointed pocket knife under each ring, and cutting it off.



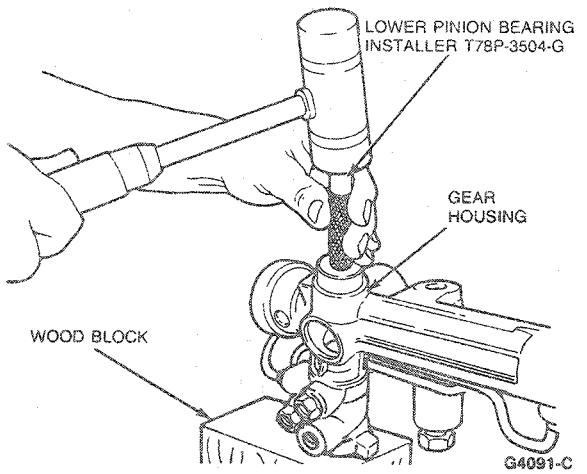
DISASSEMBLY AND ASSEMBLY (Continued)

Assembly

1. Install steering gear pinion bearing in gear housing using Lower Pinion Bearing Replacer T78P-3504-G.

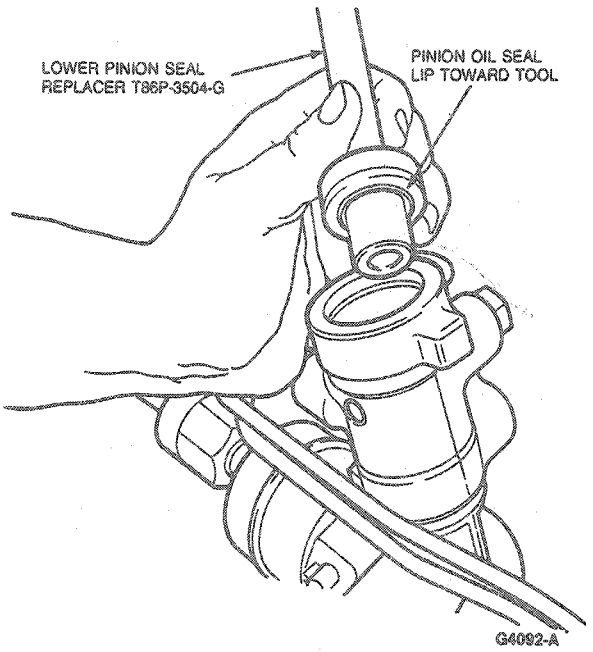


Seat bearing against shoulder in bore. Support valve housing with a wood block when seating pinion bearing.



2. Apply Steering Gear Grease C3AZ-19578-A (ESA-M1C172-A) or equivalent to pinion oil seal, and place it on Lower Pinion Seal Replacer T86P-3504-G or equivalent with seal lip toward tool. Support pinion housing on a flat clean surface.

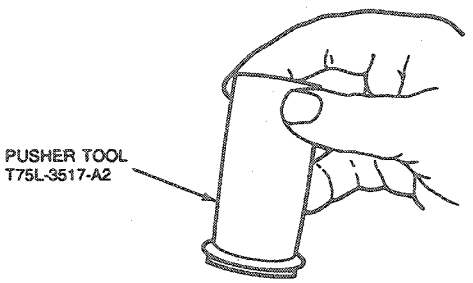
   Install seal in valve bore, seating it against shoulder.

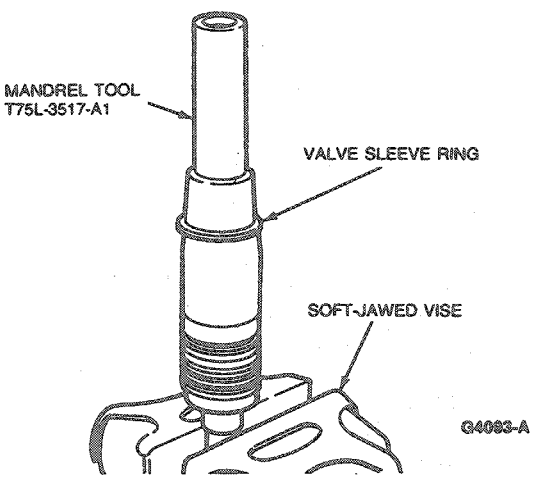


3. Mount input shaft end of valve assembly in a soft-jawed vise. Clamp shaft outside bearing and seal surface.
4. Lubricate Mandrel T75L-3517-A1 with power steering fluid and install over valve assembly. Slide one valve sleeve ring over tool.

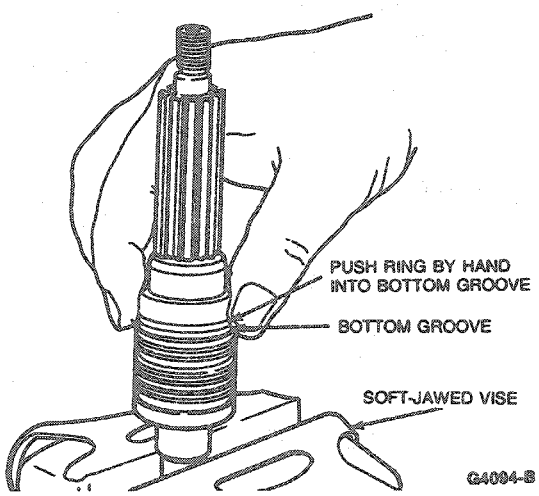
DISASSEMBLY AND ASSEMBLY (Continued)

5. Slide Pusher T75L-3517-A2 over mandrel. Rapidly push down on pusher tool, forcing ring down ramp onto valve sleeve.

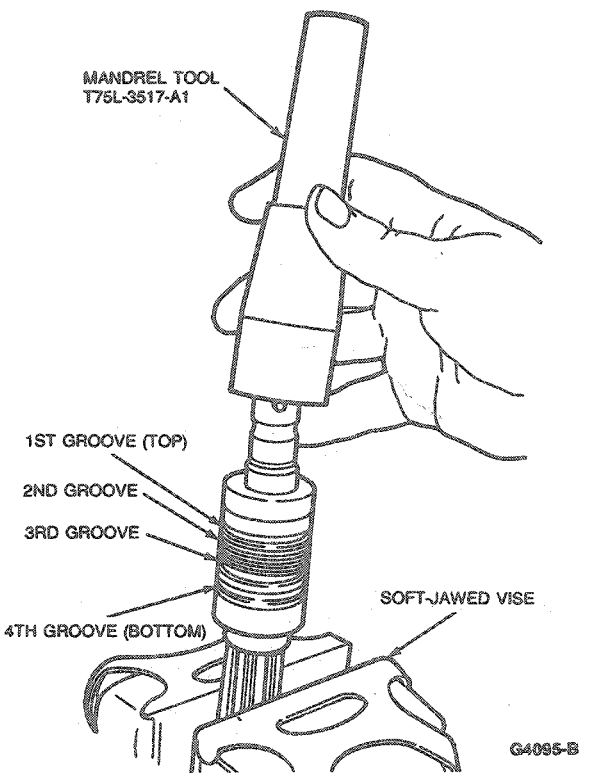




Complete installation by pushing ring into bottom groove.



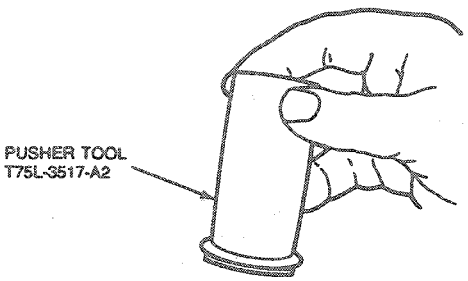
6. Remove valve assembly from vise and regrip it with pinion gear teeth.
7. Install Mandrel T75L-3517-A1 over input shaft. Mandrel will align with the third (next to bottom) groove.

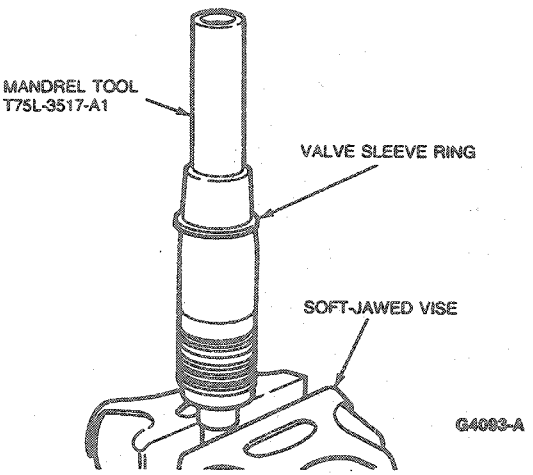


NOTE: Seal grooves do not have port holes. Ensure seals are installed in proper grooves.

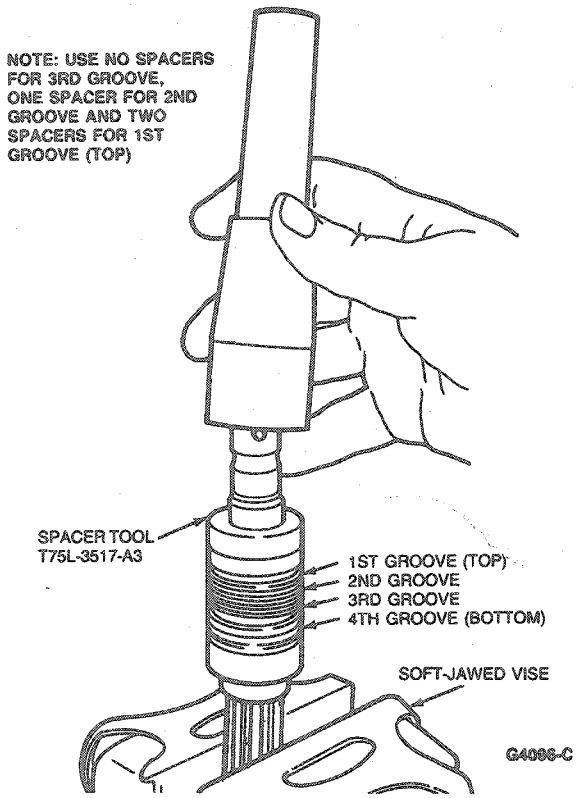
DISASSEMBLY AND ASSEMBLY (Continued)

Install third valve sleeve ring by pushing on it rapidly with Pusher T75L-3517-A2. The ring will snap into proper groove.

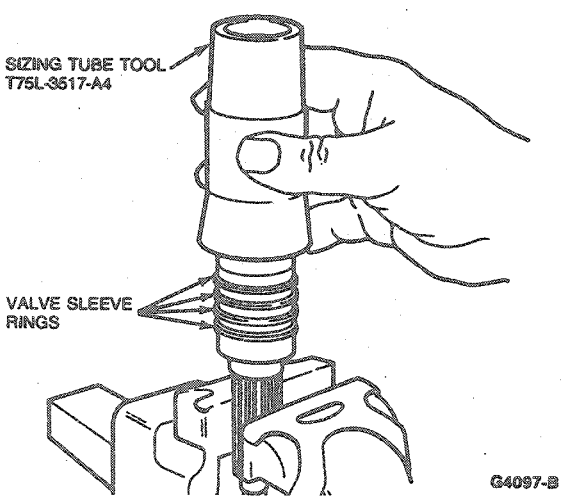




8. Repeat Step 7 using one spacer for second valve sleeve ring (Spacer T75L-3517-A3).



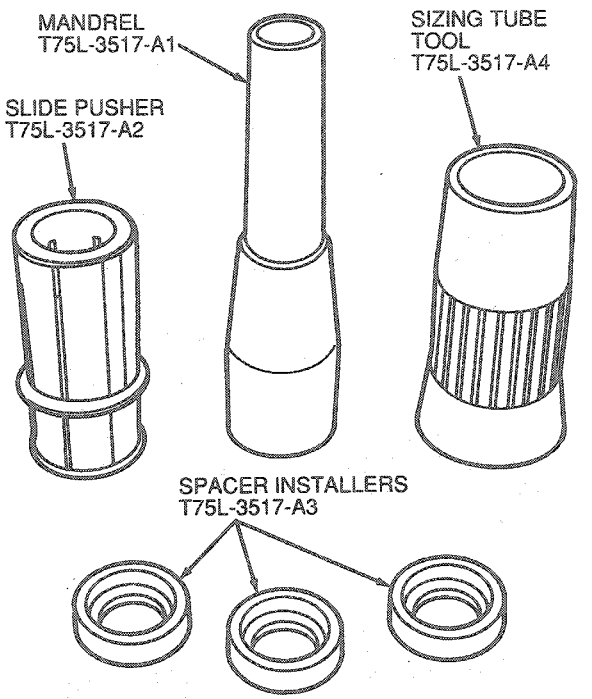
9. Repeat Step 7 using two spacers for the first (top) valve sleeve ring (Spacer T75L-3517-A3).
10. After installing four valve sleeve rings, apply a light coat of Steering Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent to sleeve and rings.
11. Slowly install Sizing Tube T75L-3517-A4 over sleeve valve end of input shaft onto valve sleeve rings. Ensure that rings are not being bent over as tube is slid over them.



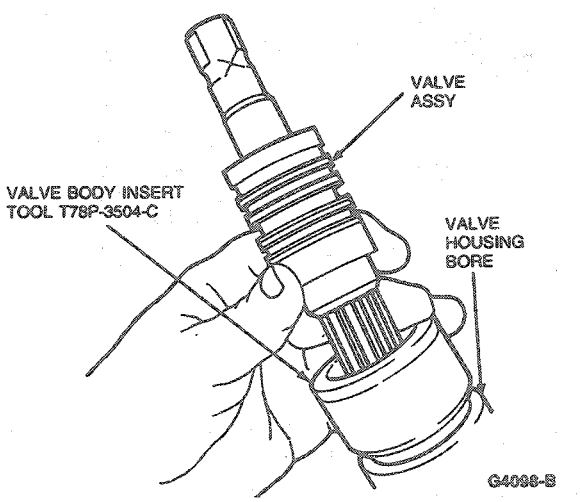
Remove sizing tube, and check condition of rings. Ensure that rings turn freely in grooves.

DISASSEMBLY AND ASSEMBLY (Continued)

The complete set of tools needed to perform the above operations is shown in the illustration. The Tool Kit is T75L-3517-A.

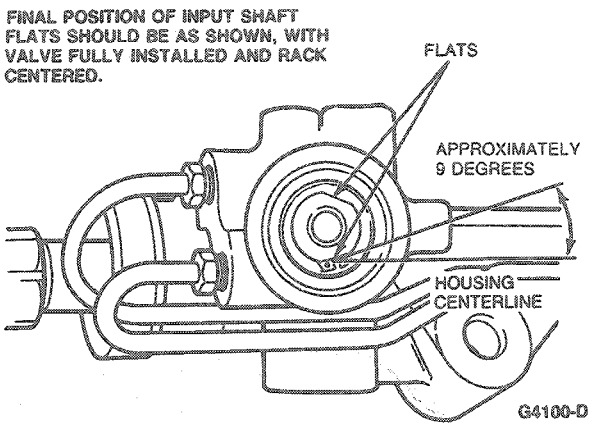


12. Center rack in housing so that equal amounts of rack shaft stick out of each end of housing. Position rack teeth so they will mesh with pinion.
13. Position Valve Body Insert Tool T78P-3504-C in valve housing bore.

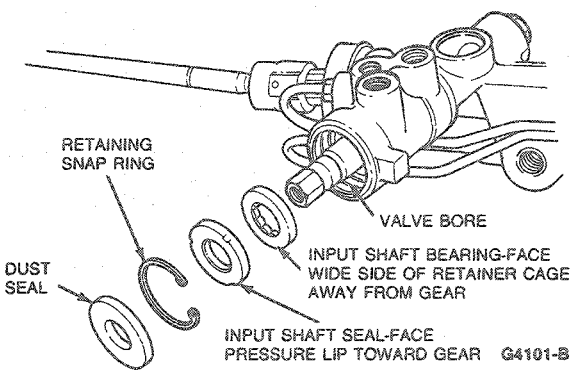


NOTE: If pinion is off one tooth, it will be obvious, since one tooth equals 45 degrees.

14. Insert valve assembly with flats on input shaft in position shown.

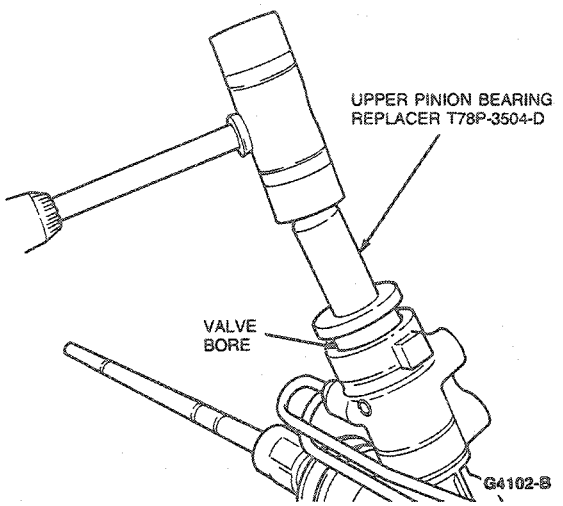


15. Using Pinion Shaft Torque Adapter T74P-3504-R count total turns, stop-to-stop (2.5 turns). From one stop, back off half the total (1-1/4 turns). The position should be as shown in illustration under Step 14. If it is approximately 45 degrees (one tooth) away from position, pull valve assembly out far enough to disengage pinion teeth and install to obtain proper position.
16. Install bearing assembly in valve bore and seat with Upper Pinion Bearing Seal Replacer T78P-3504-D.
17. Apply a film of Steering Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent to input shaft seal, and install with lip toward valve.

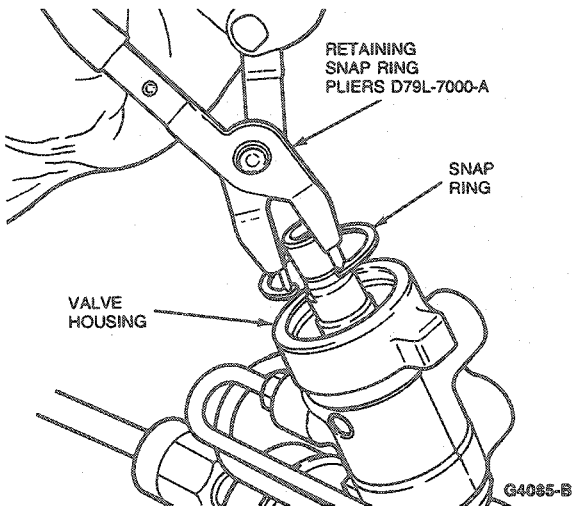


DISASSEMBLY AND ASSEMBLY (Continued)

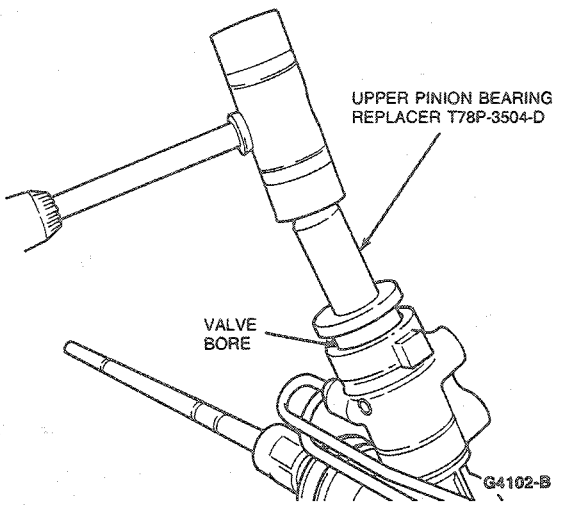
18. Seat seal with Upper Pinion Bearing Seal Replacer T78P-3504-D.



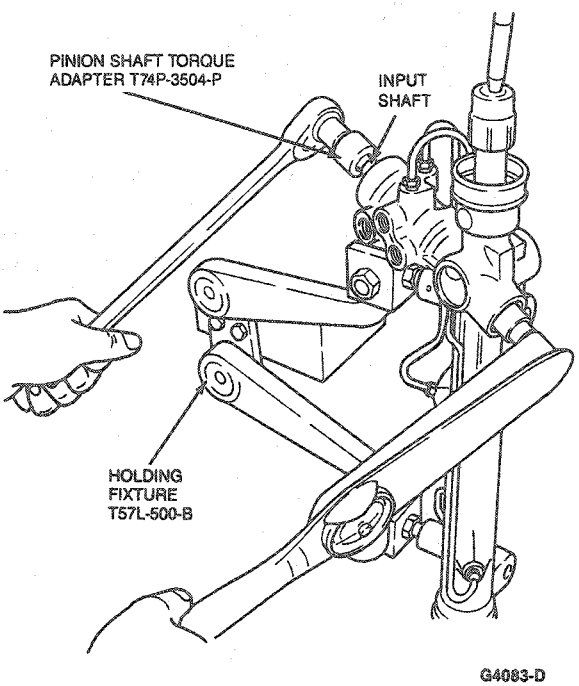
19. Install retaining snap ring in valve bore using Retaining Ring Pliers D79L-7000-A or equivalent.



20. Coat ID and OD of dust seal and input shaft with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A and ESB-M1C93-A) or equivalent.
21. Install dust seal with Upper Pinion Bearing Seal Replacer T78P-3504-D.



22. Install nut on pinion end of valve assembly. Holding input shaft with Pinion Shaft Torque Adapter T74P-3504-R, tighten nut to 41-54 N·m (31-39 lb-ft). Rack must be away from stops during this operation.



23. Install steering gear pinion bearing cap. Tighten to 54-68 N·m (40-50 lb-ft).
24. Set rack yoke preload as outlined.

Gear Housing, Rack Yoke Plug, Rack Assembly, Rack Bushing and Oil Seals

Tools Required:

- Impact Slide Hammer T50T-100-A

DISASSEMBLY AND ASSEMBLY (Continued)

- O-Ring Tool T71P-19703-C
- Outer Rack Seal Replacer T74P-3504-F
- Teflon Ring Replacer T74P-3504-G
- Rack Seal Protector Sleeve T74P-3504-J
- Rack Oil Seal Remover T78P-3504-J
- Rack Bushing Holding Tool T78P-3504-L
- Teflon Ring Sizing Tool T78P-3504-M
- Rack Seal Protector T85L-3504-B
- Pinion Housing Yoke Locknut Wrench T86P-3504-E
- Yoke Plug Torque Gauge T88P-3504-A

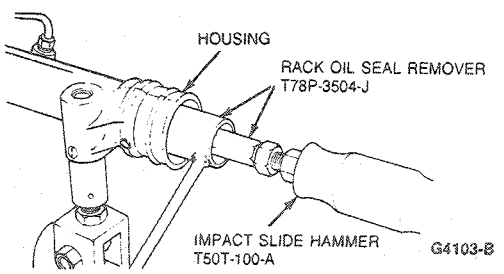
Disassembly

1. Remove tie rod and socket assemblies from both ends of the rack. Loosen yoke plug lock nut and yoke plug to relieve preload on rack. Remove valve assembly from gear housing as outlined. Refer to Input Shaft and Valve Assembly, Disassembly.

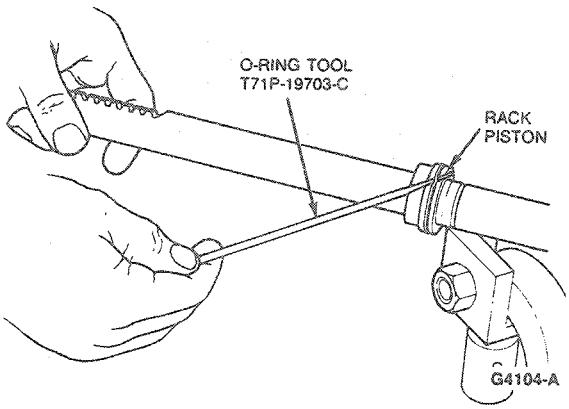
   NOTE: Yoke cannot be removed at this time.
2. Remove yoke plug and spring.
3. Working from RH side of gear (opposite pinion end), push rack in just far enough to facilitate removal of snap ring.
4. Remove snap ring from right end of housing.

   CAUTION: Do not hammer on the rack, aluminum rack bushing or housing. Damage may occur.
5. Slowly pull rack out of RH side of housing until rack piston contacts aluminum rack bushing. Apply pulling effort on rack until bushing is withdrawn from housing. Remove rack from the housing.

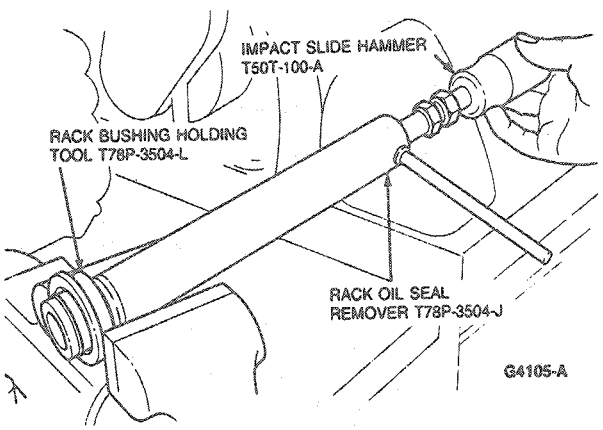
   NOTE: On the first attempt, the nylon ring may pull out of the seal, leaving the seal in the gear. Repeat the procedure, and the seal will come out.
6. To remove internal high-pressure rack oil seal, insert Rack Oil Seal Remover T78P-3504-J into housing until it bottoms. Activate expander with a wrench until expander fully tightens. Remove tool with oil seal from housing using Impact Slide Hammer T50T-100-A threaded into expander end. Discard seal.



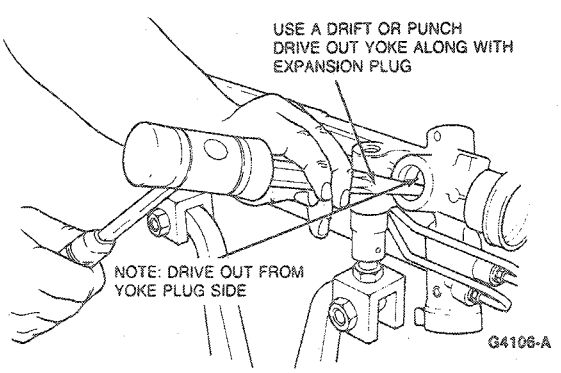
7. Remove plastic O-ring and rubber O-ring from rack piston with O-Ring Tool T71P-19703-C.



8. Insert rack bushing into Rack Bushing Holding Tool T78P-3504-L, seal end first. Place tool and bushing in vise. With Rack Oil Seal Remover T78P-3504-J and Impact Slide Hammer T50T-100-A, remove seal.



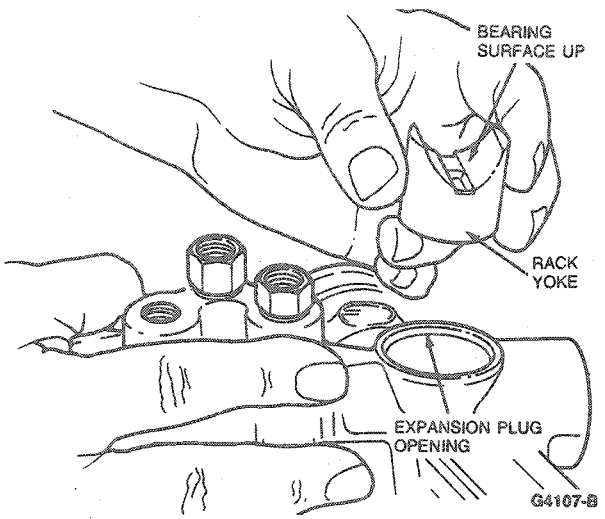
9. Remove rubber O-rings from rack bushing.
10. Inspect rack yoke while still in gear housing. If it is in good condition, do not remove it.
11. If yoke needs replacing, use a drift or punch to knock it out, along with expansion plug.



DISASSEMBLY AND ASSEMBLY (Continued)

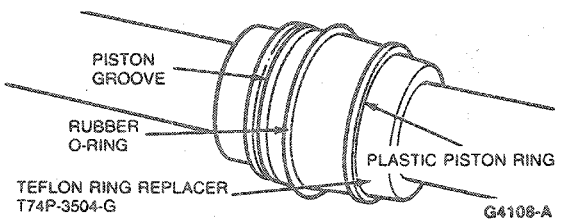
Assembly

1. If yoke was removed during disassembly, a new yoke is required. Coat new yoke with Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent and install through expansion plug opening, rack bearing surface up.



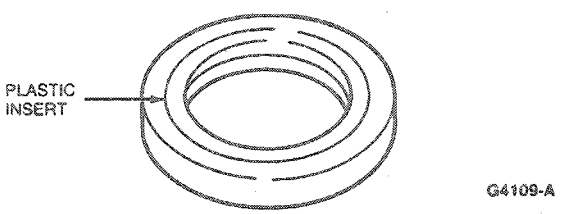
2. Slide Teflon Ring Replacer T74P-3504-G over plain end (without teeth) of rack up to piston.

   Roll rubber O-ring into piston groove, then slide plastic piston ring into piston groove over O-ring.

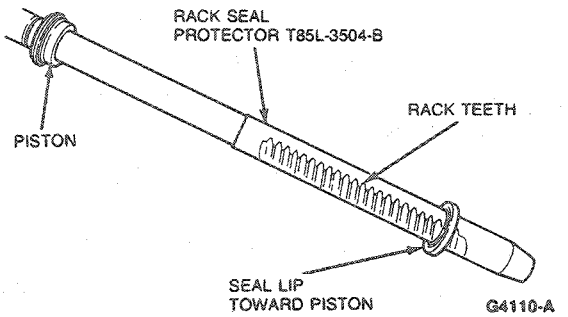


   NOTE: Insert is integral part of seal. It is removed only to avoid damage during installation.

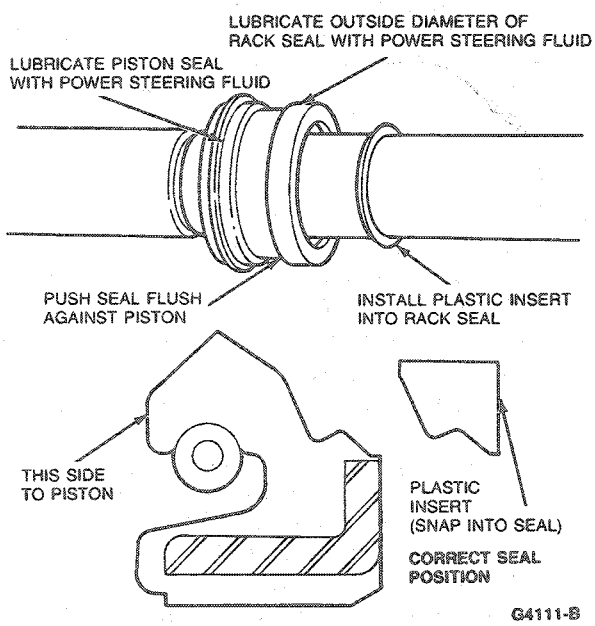
3. Remove plastic insert from rack seal. Save insert for installation.



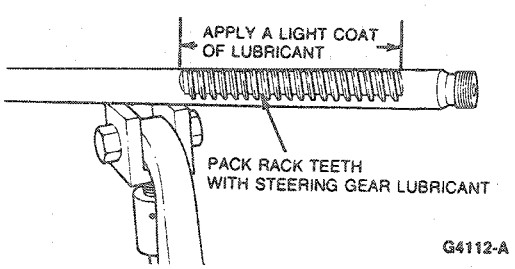
4. Install Rack Seal Protector T85L-3504-B over rack teeth.
5. Lubricate rack seal protector and rack with power steering fluid.
6. Install seal with lip toward piston. Push seal all the way against piston. Remove rack seal protector.



7. Install plastic insert in rack seal.



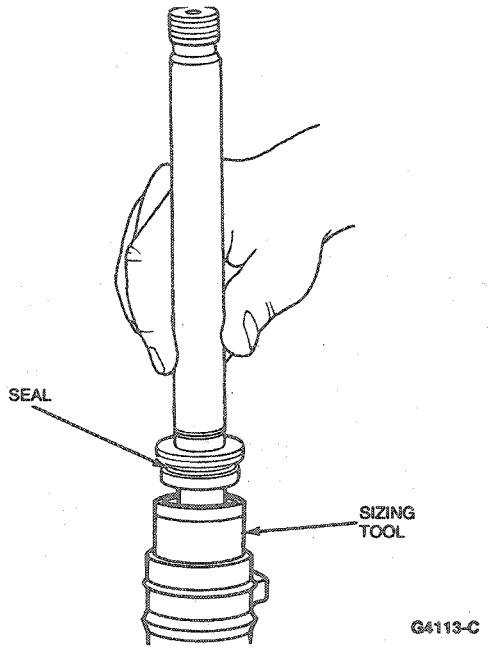
8. Pack rack teeth with Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent. Apply a light coat of steering gear lubricant to yoke contact area on back of rack teeth.



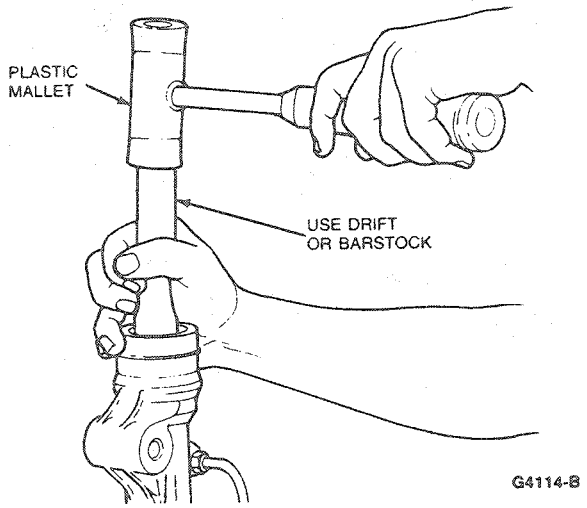
9. Lubricate piston seal and rack seal outside diameter with power steering fluid. Refer to the illustration under Step 7.
10. Install Teflon Ring Sizing Tool T78P-3504-M into end of gear housing.
11. Ensure yoke is all the way in when installing rack.

DISASSEMBLY AND ASSEMBLY (Continued)

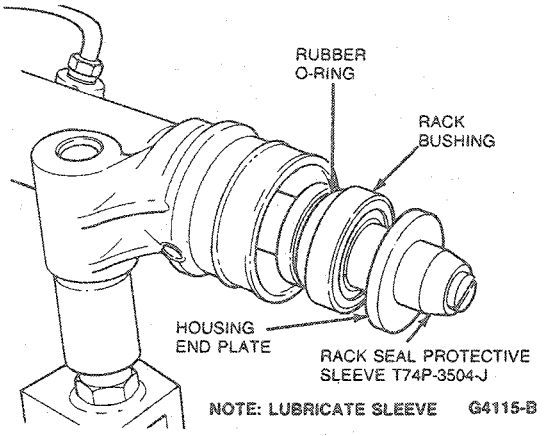
12. Install rack, taking care NOT to scratch housing piston bore.
13. Carefully push piston through sizing tool. Continue pushing on rack until it bottoms. Remove sizing tool.



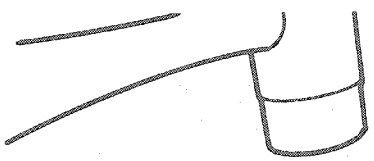
14. Seat rack seal with rack by driving end of rack with a drift or brass bar stock and plastic mallet. Several hits may be required to ensure proper seating. **DO NOT remove rack.**

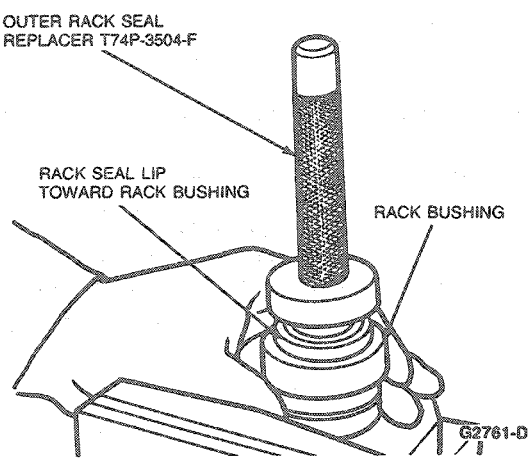


15. Move rack so it is centered in housing.
16. Thread Rack Seal Protector Sleeve T74P-3504-J over threads on RH side of rack. Apply power steering fluid to protective sleeve.



17. Install rubber O-ring on aluminum rack bushing.
18. Apply Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent to the outer rack oil seal. With Outer Rack Seal Replacer T74P-3504-F, install high-pressure oil seal in rack bushing. Lip spring must face the inside of the bushing.

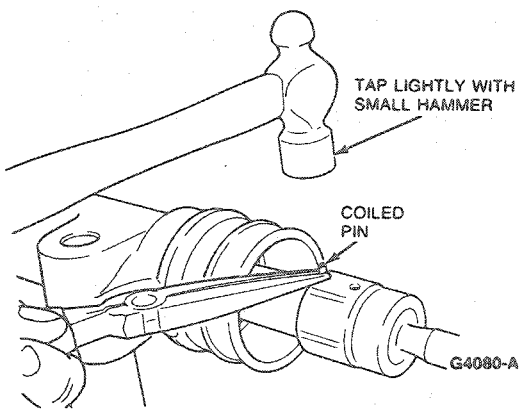




19. Lubricate short Rack Seal Protective Sleeve T74P-3504-J on rack end and rubber O-rings on rack bushing with Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent. Refer to illustration under Step 16.

DISASSEMBLY AND ASSEMBLY (Continued)

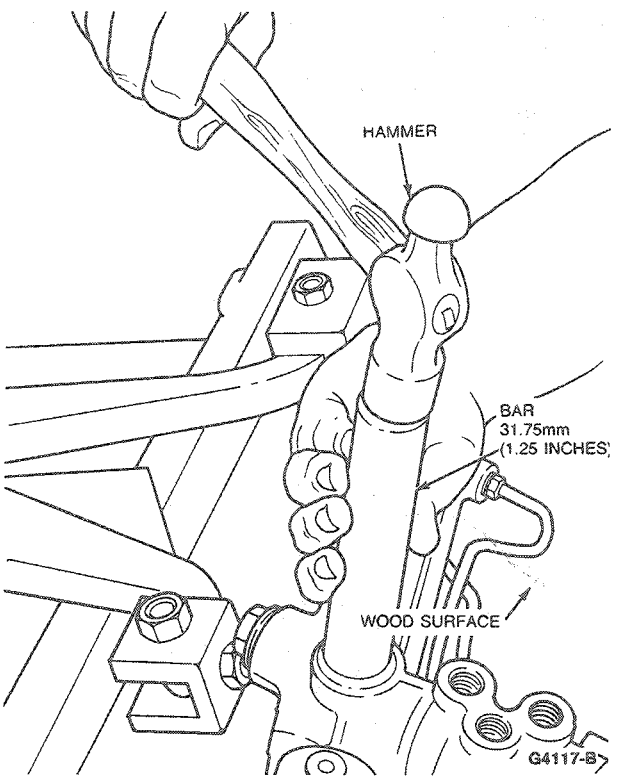
20. Start bushing, seal facing out, on rack. Pass bushing and seal over protecting sleeve and into housing bore. Place end plate against rack bushing. With Teflon Ring Sizing Tool T78P-3504-M apply hand pressure to end plate and rack bushing until bushing seats in gear housing. If rack bushing will not seat with hand pressure, a 1 1/8-inch deep socket (or larger) and a plastic mallet may be used to tap bushing in place. Install retaining ring (snap ring). Remove protective sleeve.
21. Install rod assemblies. Tighten both tie rod ball joint nuts simultaneously to 75-88 N·m (55-65 lb-ft) by holding one and turning the other.
22. Install coiled pins in ball joint nuts by lightly tapping with hammer until seated.



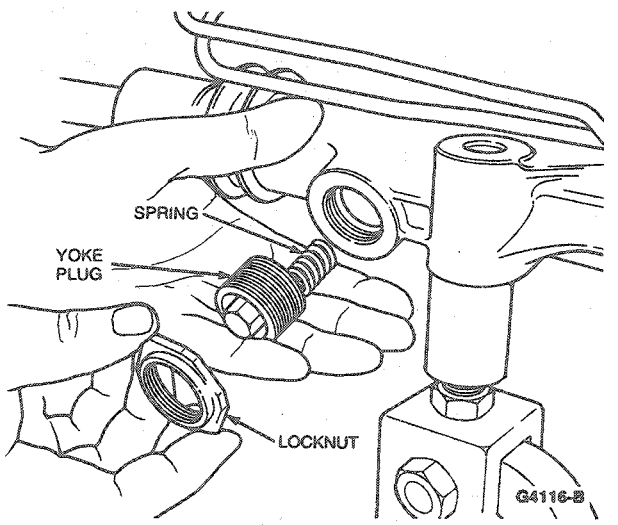
23. Install valve assembly.

    NOTE: Do not perform Step 24 if yoke was not removed.
24. Support gear on wood surface at yoke plug opening. Using a 31.75mm (1.25-inch) bar with a flat end and a hammer, flatten expansion plug until flat portion is approximately one-half to three-quarters of the total plug diameter.

    NOTE: Do not flatten plug completely or it will fall out.

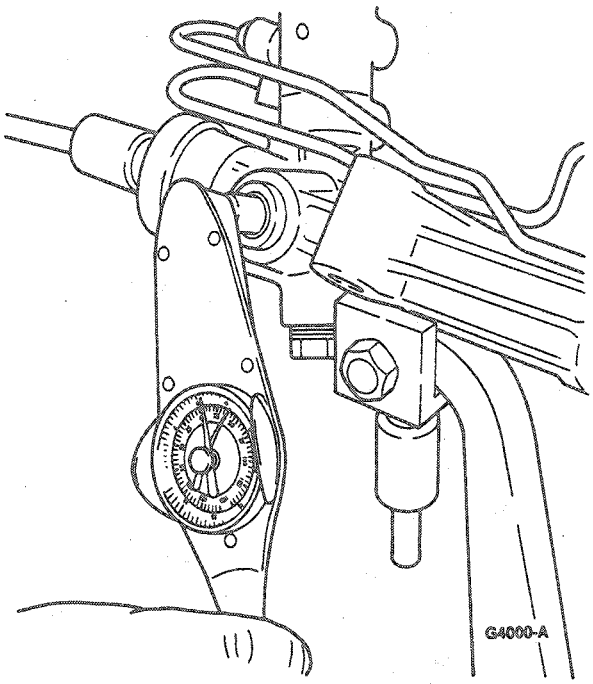


25. Install spring, plug, and locknut.

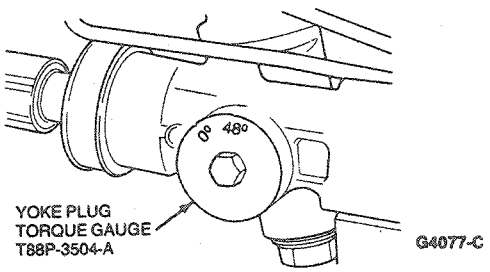


DISASSEMBLY AND ASSEMBLY (Continued)

26. With rack at center of travel, tighten yoke plug to 5-5.6 N·m (45-50 lb-in). Clean threads of yoke plug prior to tightening to prevent a false reading.



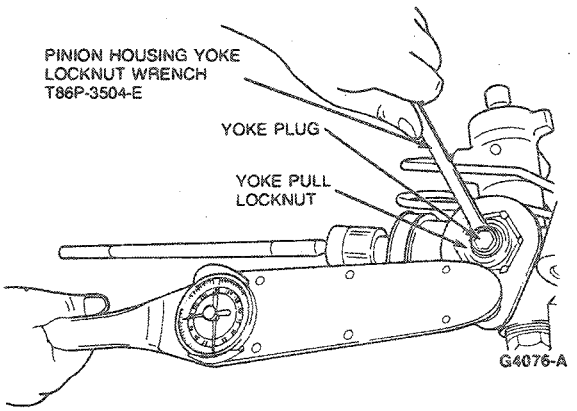
27. Install Yoke Plug Torque Gauge T88P-3504-A. Mark location of zero degree mark on housing. Back off adjuster so 48 degree mark lines up with zero degree mark.



CAUTION: Do not allow yoke plug to move while tightening or preload will be affected.

28. Place Pinion Housing Yoke Locknut Wrench T86P-3504-E on yoke plug locknut. While holding yoke plug, tighten locknut to 54-68 N·m (40-50 lb-ft). Refer to illustration following Step 5.

    Check input shaft torque after tightening locknut.



29. If external transfer tubes were removed, they must be replaced with new service lines. Clean out Teflon® seal shreds from housing ports prior to installation of new lines.
30. Fully extend LH end of rack, so rack teeth are exposed. Using 57 grams (2 oz) of Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent, pack rack teeth and pack any remaining grease into left end of gear housing. Return rack to center position.
31. Apply Steering Gear Grease C3AZ-19578-A (ESW-M1C87-A) or equivalent to groove in tie rods where bellows clamp to tie rods. This is required to keep bellows from twisting during toe-in adjustment.
32. Install bellows and pressure equalizer tube. Install clamps retaining bellows to gear housing.
33. Install clamps retaining bellows to tie rods.
34. Install jam nuts and tie rod ends on tie rods.

Pressure and Return Line Fitting

Tools Required:

- Teflon Seal Installer D90P-3517-A3

Seal Replacement

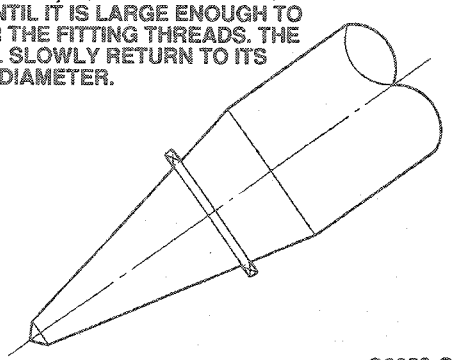
If a leak occurs between the tubing and the tube nut, the entire hose assembly, with a new fitting must be replaced. If a leak occurs between the tube nut and the aluminum gear housing, replace the plastic washer. The following procedure should be used:

1. Check fittings to determine which fitting is leaking and whether leak is between tube and tube nut or between tube nut and gear housing.
2. Check to ensure that nuts are tightened to specification. Do not over-tighten.

DISASSEMBLY AND ASSEMBLY (Continued)

3. Unscrew tube nut, and replace plastic seal washer. To facilitate assembly of new TFE seal, a tapered shaft may be required to stretch the washer, so it may be slipped over tube nut threads.

STRETCH PLASTIC SEAL OVER A TEFLON SEAL INSTALLER (D90P-3517-A3) OR A TAPERED TOOL, SUCH AS A CENTER PUNCH, UNTIL IT IS LARGE ENOUGH TO SLIP OVER THE FITTING THREADS. THE SEAL WILL SLOWLY RETURN TO ITS ORIGINAL DIAMETER.



G3023-C

Steering Pump

Tools Required:

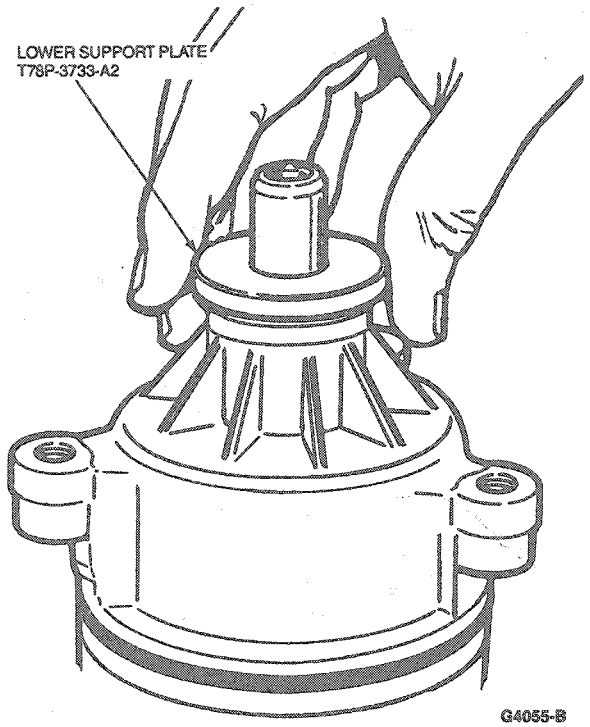
- C-Frame and Clamp Assy T74P-3044-A1
- Upper Support Plate T78P-3733-A1
- Lower Support Plate T78P-3733-A2
- Seal Driver T78P-3733-A3

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

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

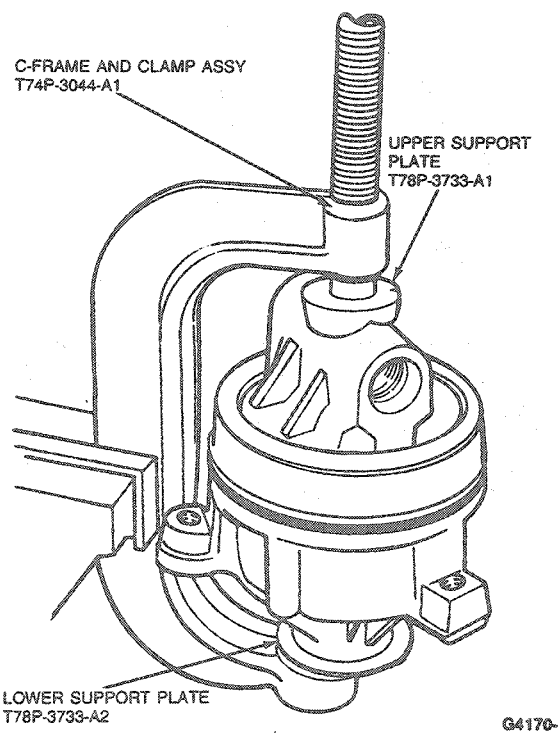
Disassembly

1. Remove pump pulley as outlined.
2. Remove outlet fitting, flow control valve, and flow control spring from pump. Remove pump reservoir as outlined.
3. Place C-Frame and Clamp Assembly T74P-3044-A1 in a bench vise.
4. Place Lower Support Plate T78P-3733-A2 over pump rotor shaft.



G4055-B

5. Install Upper Support Plate T78P-3733-A1 into upper portion of C-clamp.
6. Holding upper support plate, place pump assembly into C-clamp with rotor shaft facing down.

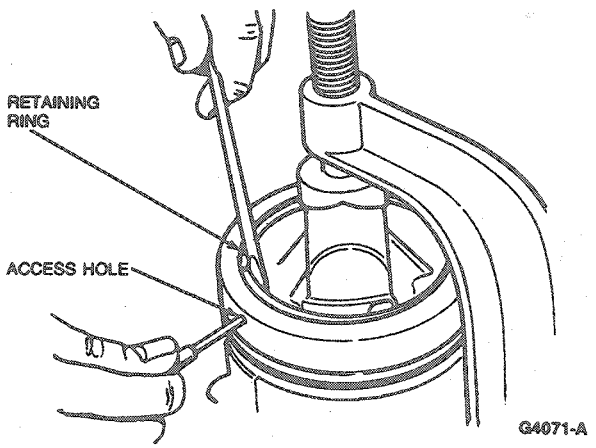


G4170-B

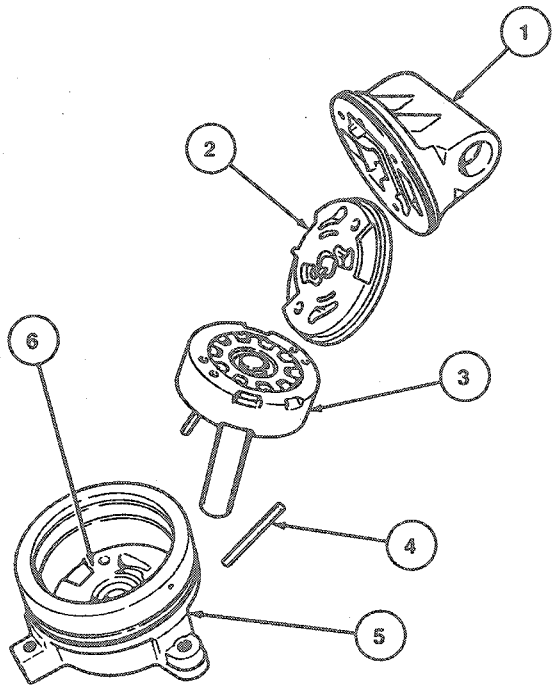
7. Tighten C-clamp until slight bottoming of valve cover is felt.

DISASSEMBLY AND ASSEMBLY (Continued)

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 valve cover retaining ring. While applying inward pressure on retaining ring, place screwdriver under edge of retaining ring. Remove the ring.



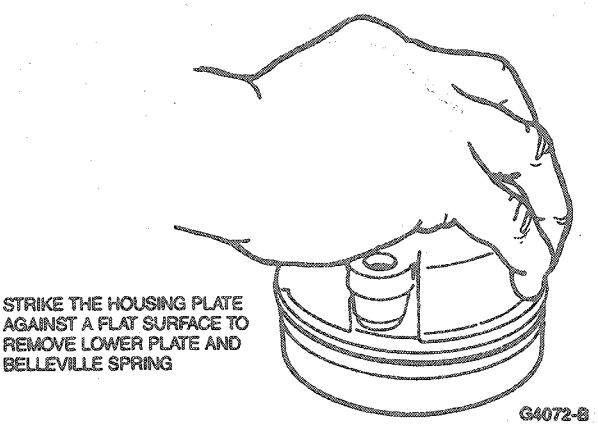
9. Loosen C-clamp, upper compressor plate and pump assembly.
10. Remove pump valve cover. Discard O-ring seal.
11. Push on rotor shaft to remove shaft, upper plate, rotating group assembly and two dowel pins.



Item	Part Number	Description
1	3C544	Valve Cover Assy
2	3D590	Lower Plate
3	3D607	Cam and Rotor Assy
4	387579-S	Dowl Pin (2 Req'd)
5	3D643	Pump Housing Plate
6	3A645	Upper Plate

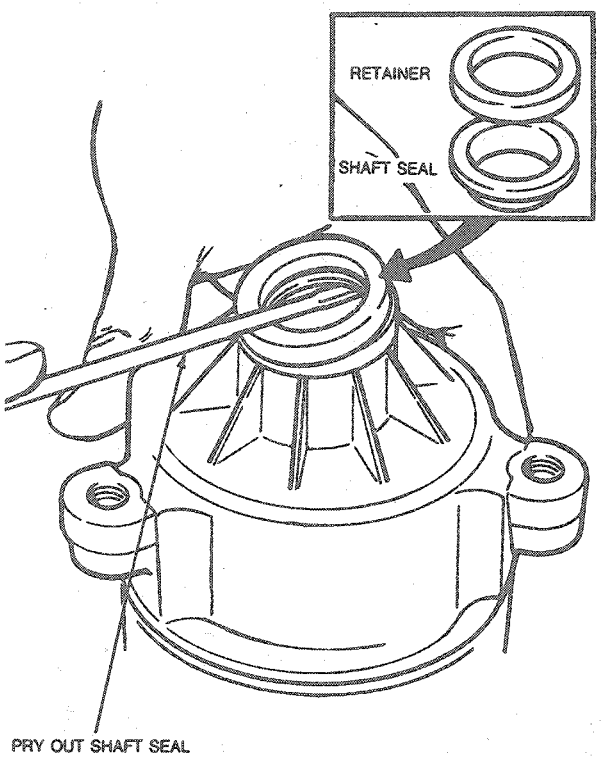
TG4173B

12. The lower plate and Belleville spring will remain in pump housing. To remove, place pump housing on a flat surface. Raise slightly and strike housing against flat surface until lower plate and Belleville spring fall out. Discard O-ring seals.



DISASSEMBLY AND ASSEMBLY (Continued)

13. Remove rotor shaft seal and seal retainer simultaneously by prying out with a screwdriver.

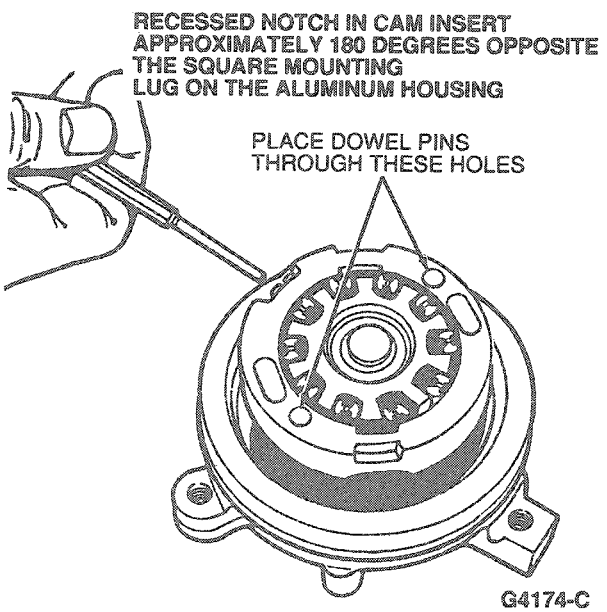


Assembly

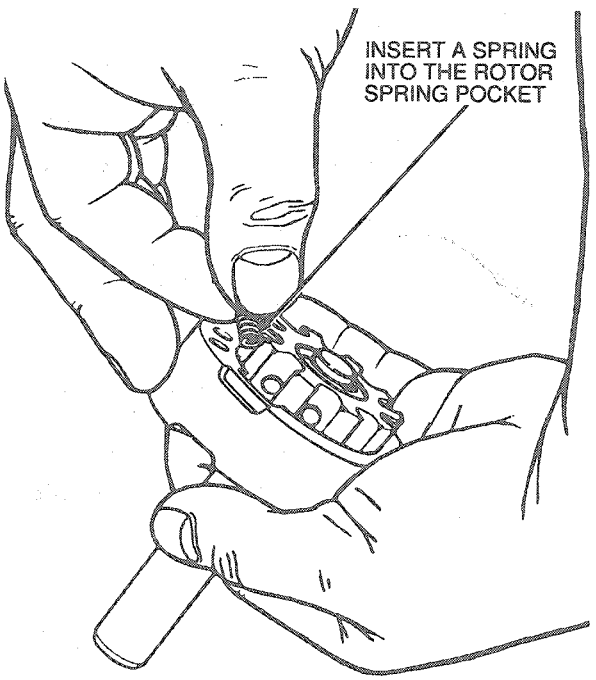
If the rotating group was disassembled for cleaning and inspection, assemble as follows:

NOTE: Rotor is symmetrical, so it can be installed either way.

1. Place rotor on rotor shaft splines.

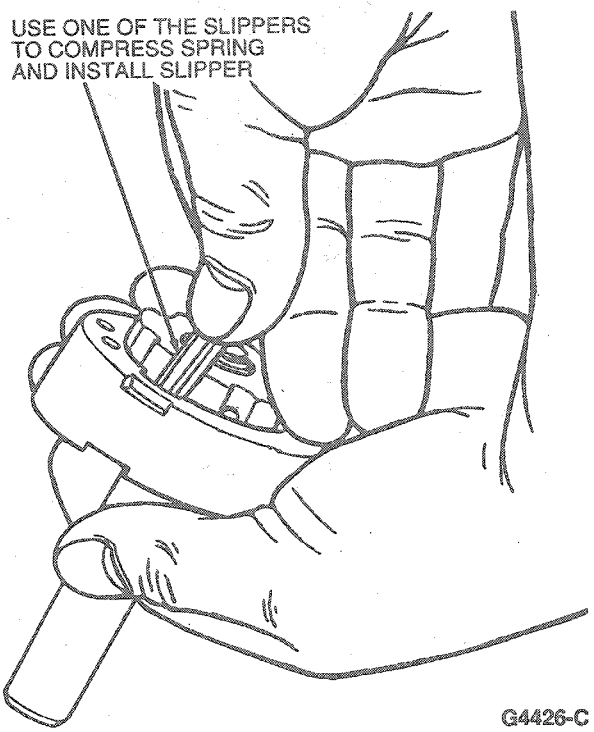


2. Install retaining ring in groove at end of rotor shaft.
3. Place insert cam over rotor. Ensure recessed notch on insert cam faces up.
4. With rotor extended upward approximately half way out of the cam, insert a spring into a rotor spring pocket. Work in rotor cavity directly beneath recessed flats on cam.



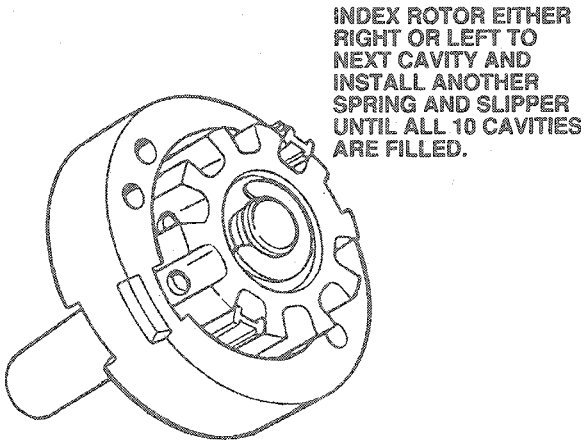
DISASSEMBLY AND ASSEMBLY (Continued)

5. Use one of the slippers to compress spring, and install slipper with groove facing cam profile. Repeat Steps 4 and 5 on slipper cavity beneath opposite inlet recess.



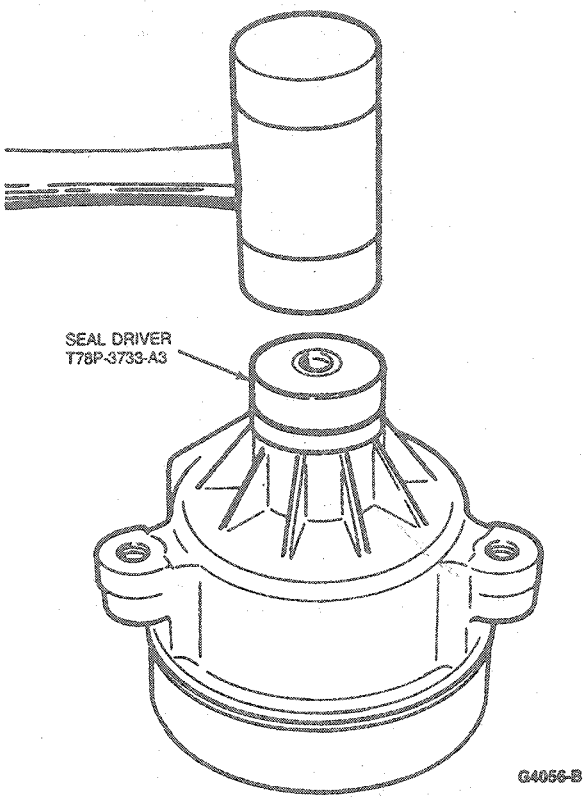
G4426-C

6. Holding cam stationary, index rotor either right or left one space and install another spring and slipper until all 10 rotor cavities have been filled. Turn rotor carefully so that springs and slippers already installed do not fall out.



G4427-D

7. Install a rotor shaft seal using Seal Driver T78P-3733-A3. Using a plastic mallet, drive seal into bore until it bottoms. Install seal retainer in same manner.

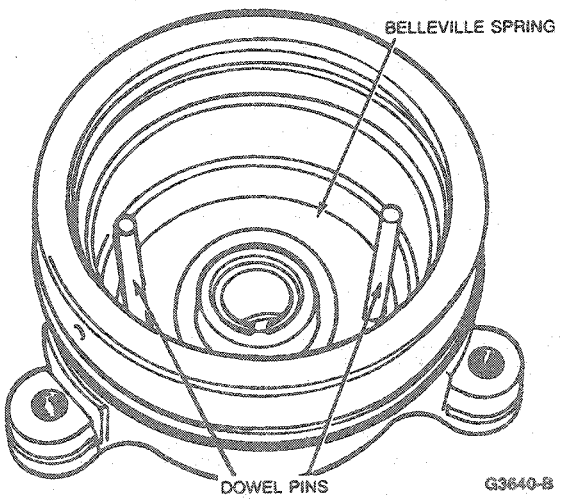


G4056-B

8. Place pump housing plate on flat surface with pulley side facing down.

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

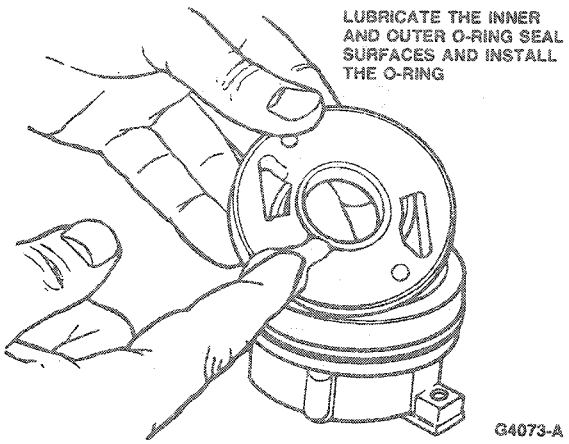
9. Insert two dowel pins and Belleville spring into housing.



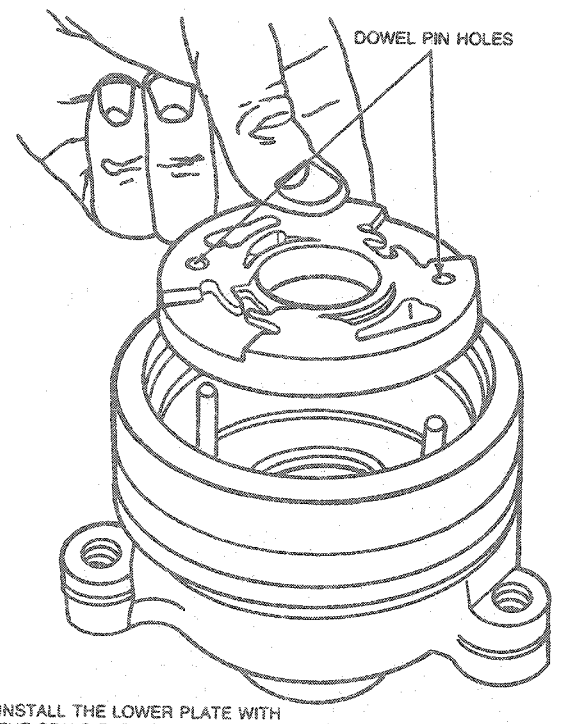
G3640-B

DISASSEMBLY AND ASSEMBLY (Continued)

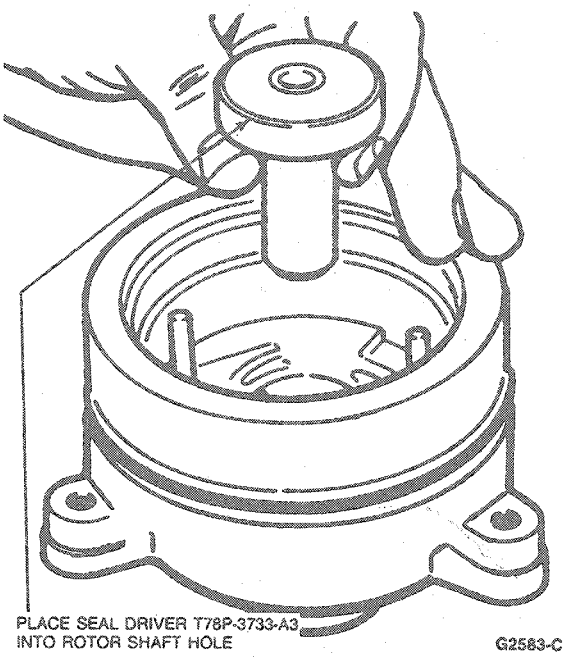
10. Lubricate inner and outer O-ring seals with specified power steering fluid, and install these seals on lower pressure plate.

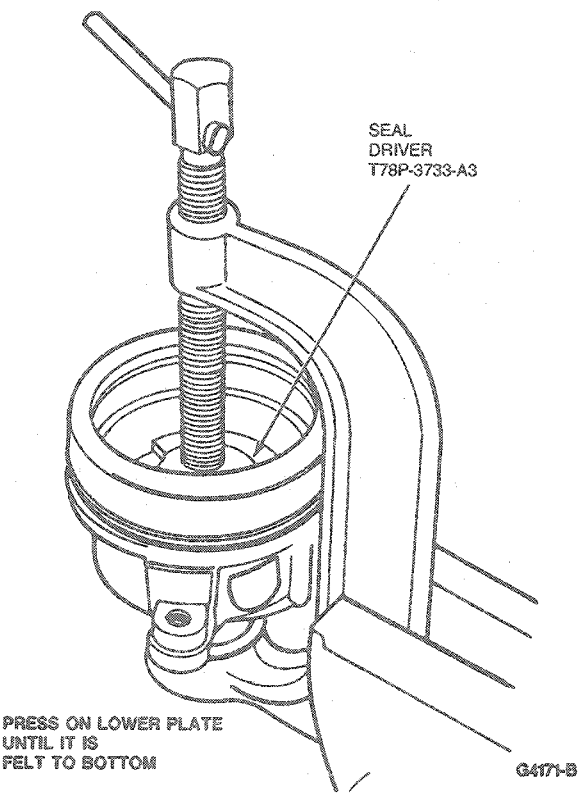


11. Insert lower pressure plate with O-ring seals toward front of pump into housing and over dowel pins.



12. Place entire assembly on C-Frame and Clamp Assembly T74P-30441-A1. Place Seal Driver T78P-3733-A3 into rotor shaft hole. Press on lower plate lightly until it is felt to bottom into pump housing. This operation will seat outer O-ring seal.

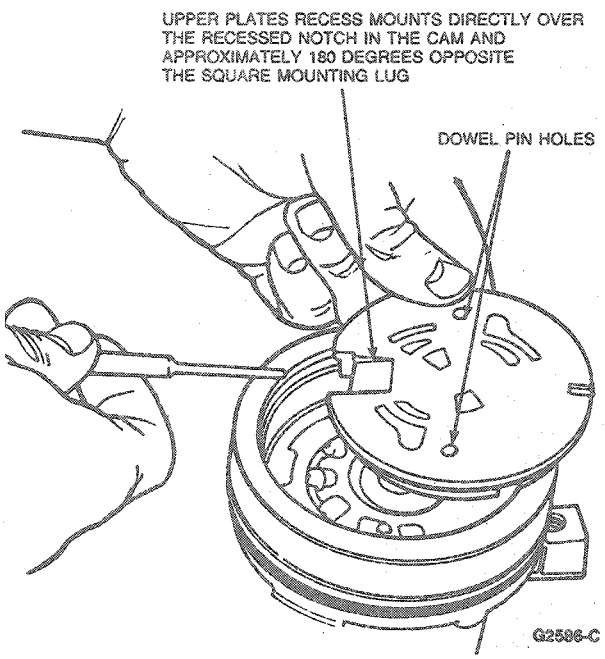




NOTE: When installing this assembly into pump housing, stepped holes must be used for dowel pins, and the recessed notch in cam insert must face toward reservoir and approximately 180 degrees opposite the square mounting lug on aluminum housing. Refer to the illustration under Assembly, Step 1.

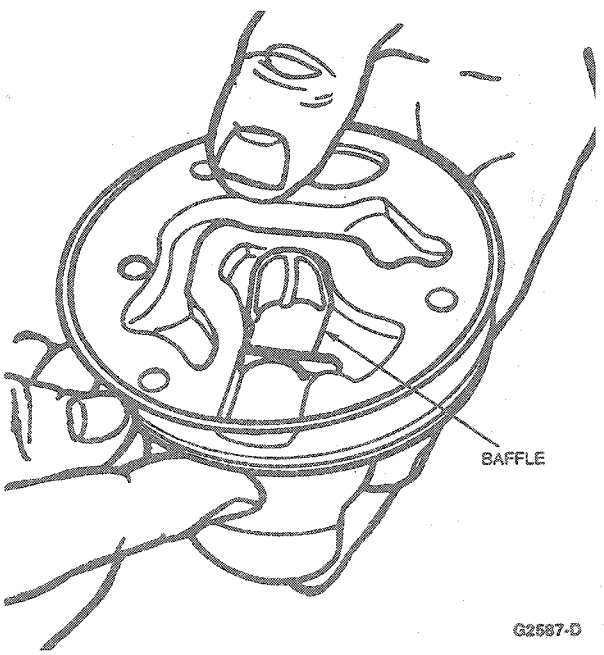
DISASSEMBLY AND ASSEMBLY (Continued)

13. Install cam, rotor and slippers, and rotor shaft assembly into pump housing over dowel pins.
14. Place upper pressure plate over dowel pins with recess directly over recessed notch on cam insert and approximately 180 degrees opposite square mounting lug.

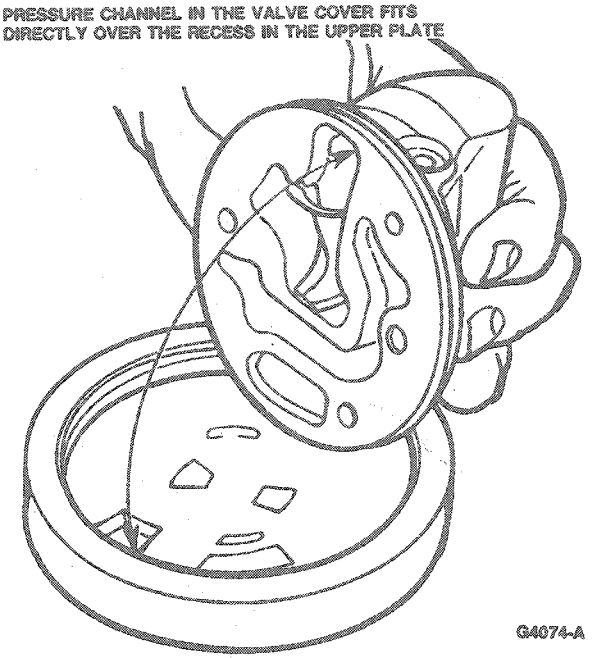


15. Place a new O-ring seal on valve cover. Lubricate this seal with specified power steering fluid.

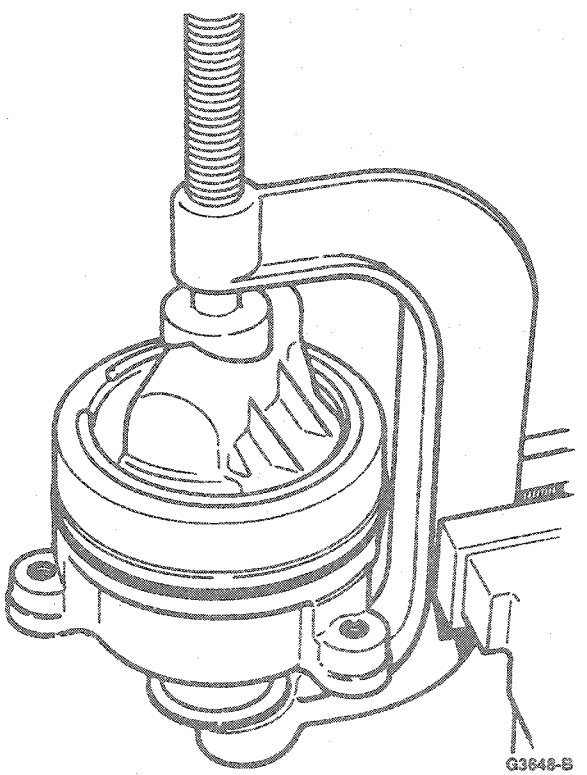
    NOTE: Ensure the plastic baffle is securely in place in valve cover. If baffle is loose, apply a coating of petroleum jelly on the baffle, and install it into location on the valve cover.



16. Insert valve cover over dowel pins. Ensure fitting hole in valve cover is directly in line with square mounting lug of aluminum housing.



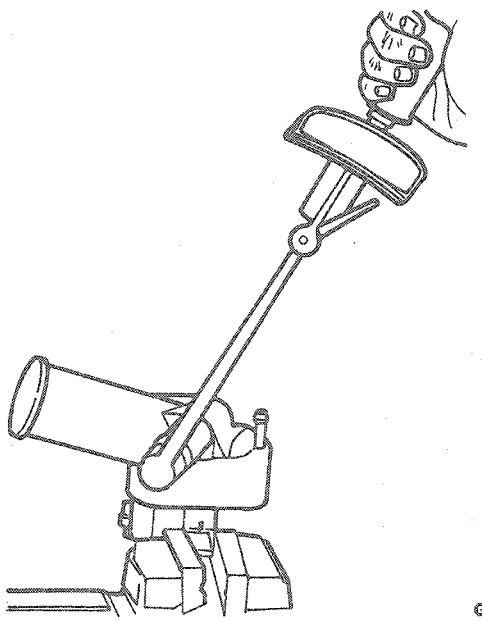
17. Place entire assembly in C-clamp tool and compress valve cover into pump housing, until retaining ring groove is exposed in pump housing.
18. Install valve cover retaining ring with ends near access hole in pump housing.



DISASSEMBLY AND ASSEMBLY (Continued)

19. Remove pump assembly from C-clamp tool.
20. Place a new O-ring seal on pump housing. Lubricate this O-ring seal with specified power steering fluid.
21. Install power steering reservoir.
22. Install flow control spring and flow control valve into valve cover.
23. Place new O-ring seals on outlet fitting. Lubricate these seals with specified power steering fluid.

    CAUTION: 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.
24. Install outlet fitting into valve cover. Tighten to 33-47 N·m (25-34 lb-ft).
25. Install pulley as outlined.



G3649-B

CLEANING AND INSPECTION

Steering Gear, Power

Cleaning

1. Use a clean work bench and tools.
2. Clean the exterior of the gear with solvent. If necessary, drain off excess hydraulic fluid.
3. Handle parts carefully to avoid nicks, burrs, scratches and dirt. Do not use solvent on seals.

Inspection

1. Inspect input shaft bearing. Check fit of bearing on input shaft. Replace bearing if necessary.
2. Inspect valve housing for wear, scoring or burrs.
3. Check fluid passages for obstruction or leakage.
4. Inspect gear housing for cracks and stripped threads and mating surfaces for burrs. Inspect piston bore for scoring or wear. If necessary, replace housing.
5. Ensure input shaft bearing rotates freely.
6. Inspect piston rack-and-pinion shaft teeth for nicks and burrs.

Steering Gear, Power—Flushing

Always flush power steering gear when replacing pump due to fluid contamination.

1. Disconnect fluid return hose at pump and place end in a container. Plug return hose nipple on reservoir.
2. Fill reservoir with Premium Power Steering Fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent.
3. Disconnect ignition coil wire and raise front wheels off floor. Refer to Section 00-02.
4. While adding approximately 1.9 liters (0.5 gallon) of fluid, turn ignition to START position (using the ignition key) and crank engine with starter while turning steering wheel from lock-to-lock.
5. When all fluid has been added, turn ignition to OFF position and connect ignition coil wire.
6. Remove plug from the reservoir return hose nipple. Attach return hose to nipple.
7. Check fluid level. Add fluid if necessary.

   CAUTION: Do not overfill reservoir.
8. Lower vehicle.
9. Start engine and turn steering wheel slowly from lock-to-lock several times. Check fluid level and adjust as required.

Steering Pump, Power—Flushing

If dirt is found in power steering gear, flush pump as follows:

1. Making sure all other hoses are connected, disconnect pressure hose at gear.
2. Place end of hose in a container.
3. Fill reservoir with Premium Power Steering Fluid E6AZ-19582-AA (ESW-M2C33-F) or equivalent.
4. Disconnect ignition coil wire.
5. While adding approximately 1.9 liters (0.5 gallon) of fluid, turn ignition to START position and crank engine with starter. As soon as all fluid has been added, turn ignition to OFF position.
6. Attach pressure hose at gear.
7. Check fluid level.
8. Connect ignition coil wire.
9. Start engine and turn steering wheel slowly from lock-to-lock to expel any air trapped in the system. Check and adjust fluid level.

CLEANING AND INSPECTION (Continued)

Steering Pump, Power

Cleaning

Wash all parts except seals in a chlorinated solvent and dry with compressed air.

Inspection

To determine when to replace power steering pump components, follow these guidelines.

NOTE: Some components must be replaced regardless of condition.

1. Reuse outlet fitting if corners are not rounded and threads are intact.
2. Replace all seals except the rotor shaft seal. Do not remove rotor shaft seal if it does not leak.
3. Reuse reservoir assembly if O-ring surfaces are not damaged.
4. Reuse housing or housing assembly if O-ring and snap ring surfaces are not damaged.
5. Reuse upper and lower pressure plates if there is no scoring on wear surface. Polish phosphate coating, if necessary, but do not remove it.
6. Reuse rotor and cam assembly if wear is limited to removal of phosphate coating on cam contour. Do not disassemble unit. Push rotor part-way through cam insert, being careful not to dislodge slippers and springs. Check cam ID for scoring or burring. Check rotor faces and OD for scoring and chipping.

   Do not service or refinish the upper and lower pressure plates, cam or rotor assembly. If wear or burring is evident, replace them with new components.
7. Install a new rotor and cam assembly if slippers are worn. Replace springs if they are bent or broken.
8. Reuse rotor shaft if thrust faces, bushing diameter and shaft seal diameter are not excessively worn or scored.
9. Reuse housing and bushing assembly if all threaded holes are not damaged beyond service, and bushing diameter is not scored or worn 0.01mm (0.0005-inch) over 18mm (0.6897-inch) maximum. Service threaded holes by drilling out the damaged threads and installing helicoil inserts. If bushing is scored or excessively worn, install a new housing and bushing assembly.
10. Reuse valve body if valve bore is free of nicks and scoring. Valve must fall freely in valve bore. Replace valve housing and / or valve if valve sticks in bore.

ADJUSTMENTS

Rack Yoke Plug Clearance

Tools Required:

- Bench Mounted Holding Fixture T57L-500-B
- Pinion Shaft Torque Adapter T74P-3504-R
- Pinion Housing Yoke Locknut Wrench T78P-3504-H
- Seal Installer D90P-3517-A3

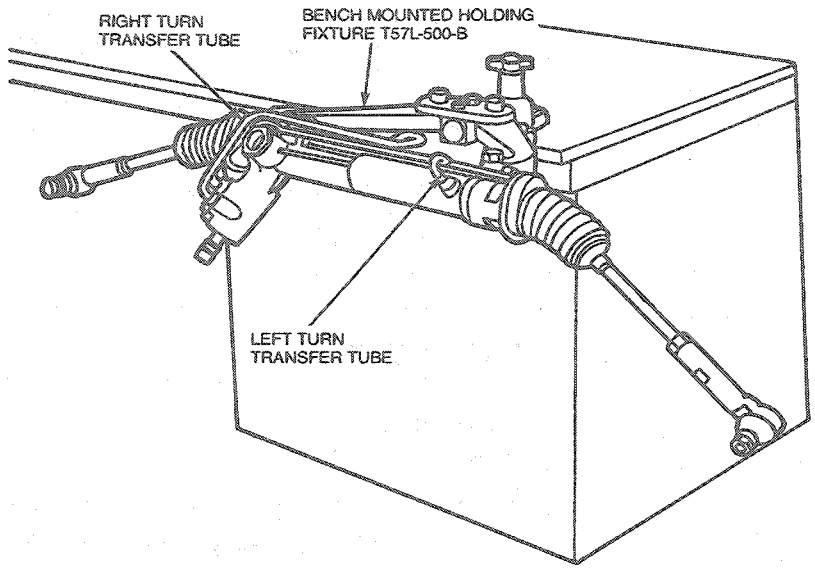
Steering Gear Removed

NOTE: The rack yoke clearance adjustment is not a normal service adjustment. It is only required when the input shaft and valve assembly is removed.

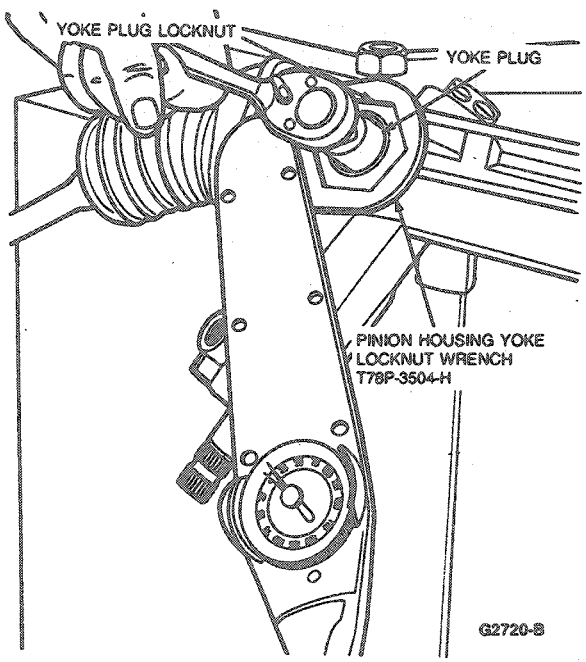
1. Clean exterior of the steering gear thoroughly.

ADJUSTMENTS (Continued)

2. Install two long bolts and washers through the bushings, and attach to the Bench Mounted Holding Fixture T57L-500-B.



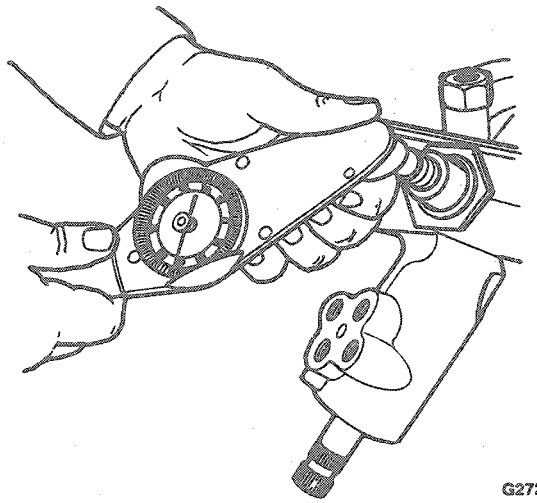
3. Do not remove the external transfer tubes unless they are leaking or damaged. If these lines are removed, they must be replaced with new lines.
4. Drain the power steering fluid by rotating the input shaft lock-to-lock twice using Pinion Shaft Torque Adapter T74P-3504-R. Cover ports on valve housing with shop cloth while draining gear to avoid possible oil spray.
5. Insert a lb-in torque wrench with maximum capacity of 3.39-6.77 N·m (30-60 lb-in) into the Pinion Shaft Torque Adapter T74P-3504-R. Position the adapter and wrench on the input shaft splines.
6. Loosen the yoke plug locknut with Pinion Housing Yoke Locknut Wrench T78P-3504-H.



7. Loosen yoke plug with a 3/4-inch socket wrench.

ADJUSTMENTS (Continued)

8. With the rack at the center of travel, tighten the yoke plug to 5-5.6 N·m (45-50 lb-in). Clean the threads of the yoke plug prior to tightening to prevent a false reading.



G2721-C

9. Back-off the yoke plug approximately one-eighth turn (44 degrees minimum to 54 degrees maximum) until the torque required to initiate and sustain rotation of the input shaft is to 0.78-2.03 N·m (7-18 lb-in).

   CAUTION: Do not allow the yoke plug to move while tightening or the preload will be affected.

10. Place Pinion Housing Yoke Locknut Wrench T78P-3504-H on the yoke plug locknut. While holding the yoke plug, tighten the locknut to 60-89 N·m (44-66 lb-ft).

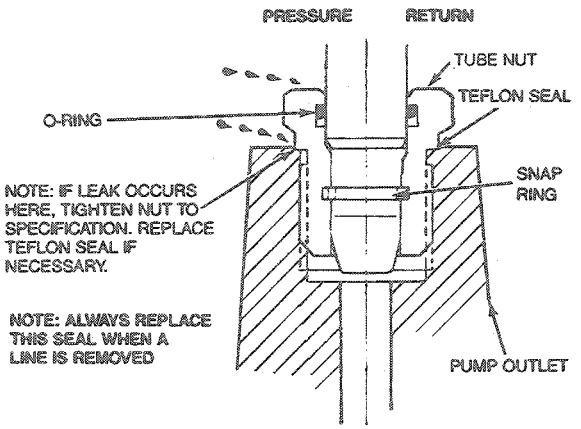
    Check input shaft torque (Step 9) after tightening locknut.

11. If the external transfer tubes were removed, they must be replaced with new service line. Remove the plastic seals from the housing ports prior to installation of new lines.

Quick Connect Power Steering Fitting, Atsugi

Seal Replacement

If a leak occurs between the tubing and tube nut, replace the hose assembly. If a leak occurs between the tube nut and the pump outlet, replace the plastic washer.



G5248-B

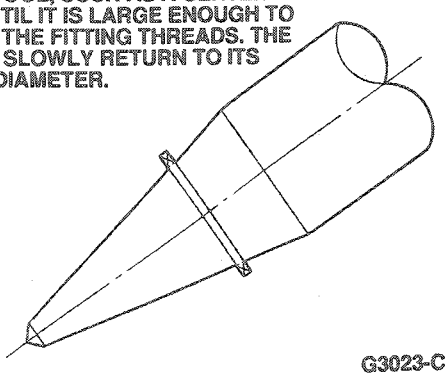
The following procedure should be used:

1. Check fitting to determine whether leak is between tube and tube nut or between tube nut and pump outlet fitting.

   CAUTION: DO NOT over-tighten. If tube nuts are overtorqued, stripping of housing threads may occur and bores may concave.

2. If leak is between tube nut, check to ensure nut is tightened to 20-35 N·m (15-25 lb-ft).
3. If leak continues or if leak is between tube and tube nut, remove line.
4. Unscrew tube nut, and inspect plastic seal washer. Always replace plastic seal washer (Part No. 388898-S) when line is removed. To facilitate assembly of new plastic seal washer, a tapered shaft may be required to stretch washer, so it may be slipped over tube nut threads.

STRETCH PLASTIC SEAL OVER A TEFLON SEAL INSTALLER (D90P-3517-A3) OR A TAPERED TOOL, SUCH AS A CENTER PUNCH, UNTIL IT IS LARGE ENOUGH TO SLIP OVER THE FITTING THREADS. THE SEAL WILL SLOWLY RETURN TO ITS ORIGINAL DIAMETER.



G3023-C

5. The rubber O-ring cannot be serviced with this design. If leak is due to the O-ring, replace the hose assembly.

ADJUSTMENTS (Continued)

6. Connect tube nut and tighten to 20-35 N·m (15-25 lb-ft).

The quick connect fitting may disengage if not fully assembled, if the snap ring is missing, or the tube nut, or the hose end is not machined properly.

If the fitting disengages, replace the hose assembly. The fitting is fully engaged only when the hose will not pull out. To test for positive engagement, the system should be properly filled, the engine started, and the steering wheel cycled from lock-to-lock. Service hose assemblies have tube nuts, snap rings and O-rings already attached.

SPECIFICATIONS

Description	Specifications
Gear Ratio	15:1
Number of Turns	2.5
Pinion, Rack Lubricant Capacity	23-27 Grams
Power Steering Fluid Capacity (Including Steering Pump)	2.5 Pints
Pinion, Rack and Pinion Bearing Lubricant	C3AZ-19578-A (ESW-M1C87-A)
Seal Lubricant (Cavity under Dust Seal)	D0AZ-19584-A (ESB-M1C93-A)
Premium Power Steering Fluid	E6AZ-19582-AA ESW-M2C33-F
Effort Required to Initiate Proper Input Shaft Rotation (Power Cylinder drained and gear removed from Vehicle)	0.78-2.03 N·m (7-18 lb-in)
Tie Rod Articulation Effort (On Pull Scale)	2-10 lbs.
Tie Rod Outer End Lubricant	None (Bonded Rubber Design)

TORQUE SPECIFICATIONS

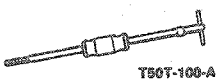
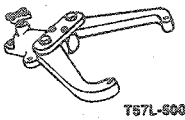
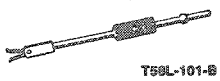
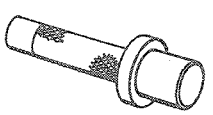
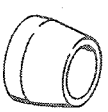
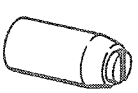
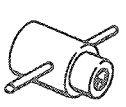
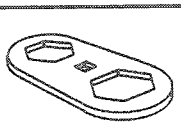
Description	N·m	Lb-Ft
Pressure Line Fitting (at Pump)	14-20	10-15
Gear-to-Crossmember Mounting Bolt Nut	115-135	85-100
Tie Rod End-to-Spindle Arm Nut	48-63	35-47
Intermediate Shaft-to-Steering Gear Bolt	41-51	30-38
Intermediate Shaft-to-Steering Column (2 Nuts)	21-33	15-25
Weather Boot-to-Dash Panel	5.5-6.7	4-5
Bellows Clamp Screw	2.2-3.4	20-30 (Lb-In)
Yoke Plug	5-5.6	45-50 (Lb-In)
Yoke Plug Locknut	60-89	44-66
Pressure Line Fitting at Gear	20-35	15-25
Return Line Fitting at Gear	20-35	15-25
Transfer Tube Fittings at Power Cylinder (Right and Left Turn Lines)	13-27	10-20
Pinion Bearing Locknut	41-54	31-39
Pinion Bearing Cap	54-68	40-50
Tie Rod Ball Socket Assembly to Rack	75-88	55-65
Rack and Pinion Shield Screws	5.5-8	49-71 (Lb-In)

(Continued)

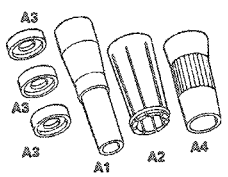
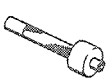
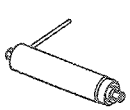
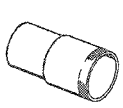
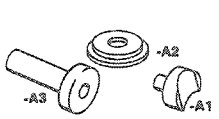
TORQUE SPECIFICATIONS (Cont'd)

Description	N·m	Lb-Ft
Reservoir Screws	6-8	54-70 (Lb-In)
Hose Clamps	1.4-2	13-17 (Lb-In)
Pump Retaining Bolts	20-32.5	15-24
Wheel Lug Nuts	115-142	85-105
Power Steering Line and Bracket	4.5-5.7	40-50 (Lb-In)
Bracket Assembly Bolt	21-32	15-23
Pump Cooler Screws	18-28	14-20
Tube Nut and Gear Housing Fitting	27-34	20-25
Pressure Switch	7-14	5-10
Outlet Fitting to Reservoir and Valve Cover	33-47	25-34
Jam Nut	47-68	35-50
Module Fixture Screws	4-5	35-45 (Lb-In)
Power Steering Line Fittings	34-46	26-33
Clamp Nut	21-32	15-23
Actuator-to-Steering Gear Retaining Bolts	27-34	20-25

SPECIAL SERVICE TOOLS

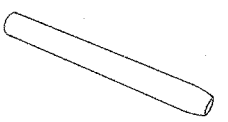
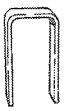
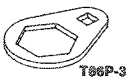
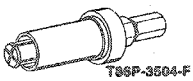
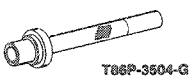
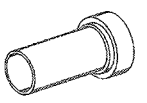
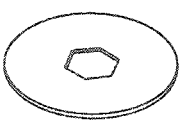
Tool Number / Description	Illustration
T50T-100-A Impact Slide Hammer	 T50T-100-A
T57L-500-B Bench Mounted Holding Fixture	 T57L-500-B
T58L-101-B Puller Attachment	 T58L-101-B
T71P-19703-C O-Ring Tool	 T71P-19703-C
T74P-3044-A1 C-Frame and Clamp Assembly	 T74P-3044-A1
T74P-3504-F Outer Rack Seal Replacer	 T74P-3504-F
T74P-3504-G Teflon® Ring Replacer	 T74P-3504-G
T74P-3504-J Rack Seal Protector Sleeve	 T74P-3504-J
T74P-3504-R Pinion Shaft Torque Adapter	 T74P-3504-R
T74P-3504-U Nut Wrench	 T74P-3504-U
T74P-3504-Y Hook Spring Scale	 T74P-3504-Y

(Continued)

Tool Number / Description	Illustration
T75L-3517-A Seal Installation Set Consists of: T75L-3517-A1 Mandrel T75L-3517-A2 Slide Pusher T75L-3517-A3 Spacer T75L-3517-A4 Sizing Tube	 T75L-3517-A
T78P-3504-C Valve Body Insert Tool	 T78P-3504-C
T78P-3504-D Upper Pinion Bearing Seal Replacer	 T78P-3504-D
T78P-3504-G Lower Pinion Bearing Replacer	 T78P-3504-G
T78P-3504-H Pinion Housing Yoke Locknut Wrench	 T78P-3504-H
T78P-3504-J Rack Oil Seal Remover	 T78P-3504-J
T78P-3504-L Rack Bushing Holding Tool	 T78P-3504-L
T78P-3504-M Teflon® Ring Sizing Tool	 T78P-3504-M
T78P-3733-A1 Upper Support Plate T78P-3733-A2 Lower Support Plate T78P-3733-A3 Seal Driver	 T78P-3733-A

(Continued)

SPECIAL SERVICE TOOLS (Continued)

Tool Number/ Description	Illustration
T85L-3504-B Rack Oil Seal Protector	 T85L-3504-B
T86P-3504-D Valve Body Puller (Bridge)	 T86P-3504-D
T86P-3504-E Pinion Housing Yoke Locknut Wrench	 T86P-3504-E
T86P-3504-F Lower Pinion Seal Remover (Small OD)	 T86P-3504-F
T86P-3504-G Lower Pinion Seal Replacer	 T86P-3504-G
T86P-3504-J Part of Lower Pinion Seal Remover (Large OD)	 T86P-3504-J
T88P-3504-A Yoke Plug Torque Gauge	 T88P-3504-A

Tool Number	Description
D79L-7000-A	Retaining Ring Pliers
D81P-3504-N	Locknut Pin Remover
D90P-3517-A3	Seal Installer
TOOL-3290-D	Tie Rod End Remover

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt Ohmmeter
059-00010	Inductive Dwell-Tach-Volt-Ohm Tester

SECTION 11-04 Steering Column

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION

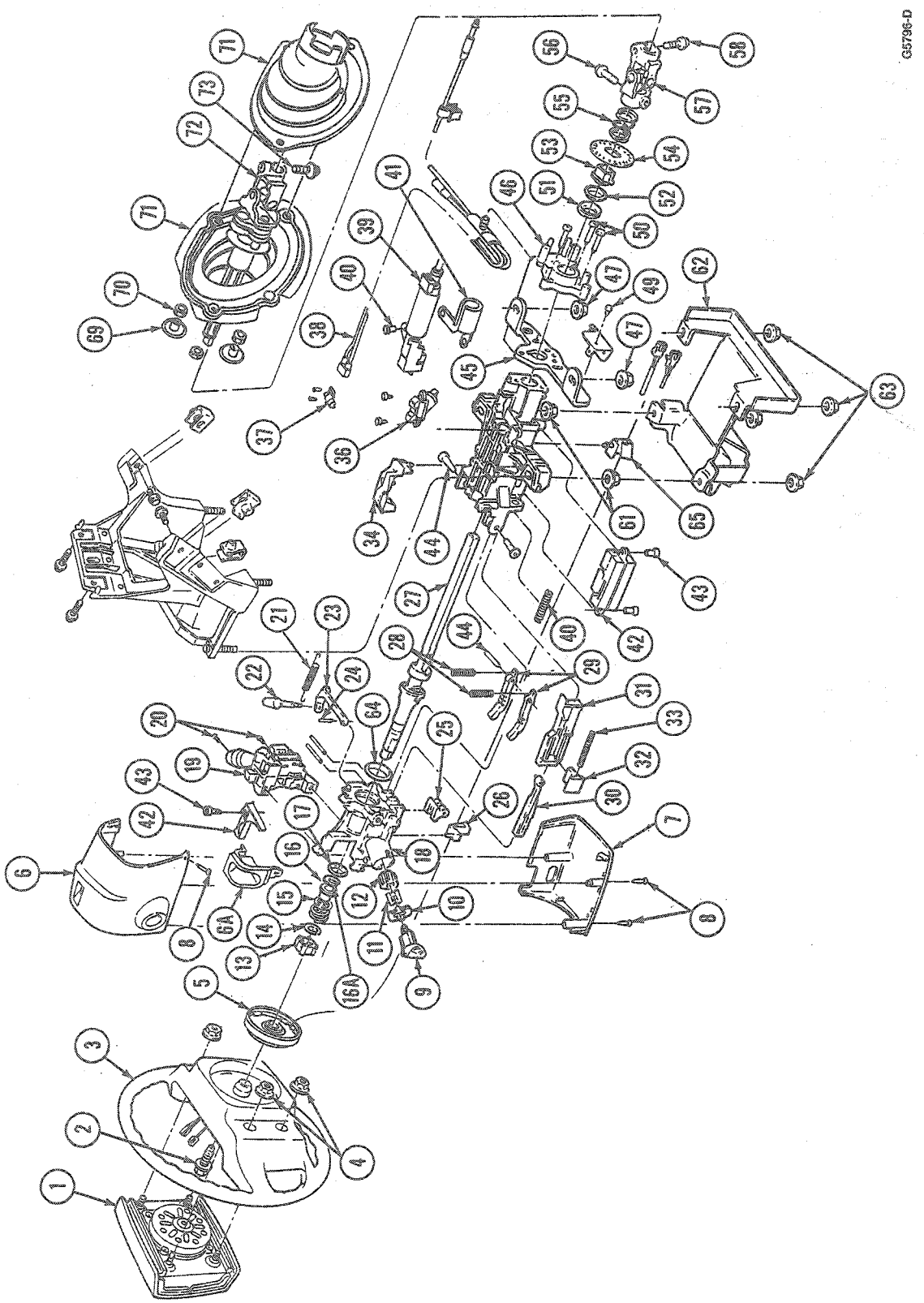
NOTE: All fasteners are important in that they could affect the performance of vital parts and systems, and / or could result in major service expenses. They must be replaced with fasteners of the same part number if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during assembly to ensure proper functioning of these parts.

The steering column has been redesigned for more efficient use of package space and improved strength. The structural part of the column is made of magnesium die castings. The column is attached to a support that is an integral part of the instrument panel. The column lower attachments are through a bracket that bends during column collapse. The upper attachments are through plastic shear modules that separate from the main casting during column collapse. A clip and washer are attached to the shear modules to reduce column shake and to assist in column installation to the beam.

A unique shifter mechanism has been installed on the column (column shift only). It has the insert plate located away from the shift lever and interacts with the shift lever through a linkage system. This system provides a positive interlock with no adjustments required.

DESCRIPTION (Continued)

Steering Column, Console Shift—Exploded View



DESCRIPTION (Continued)

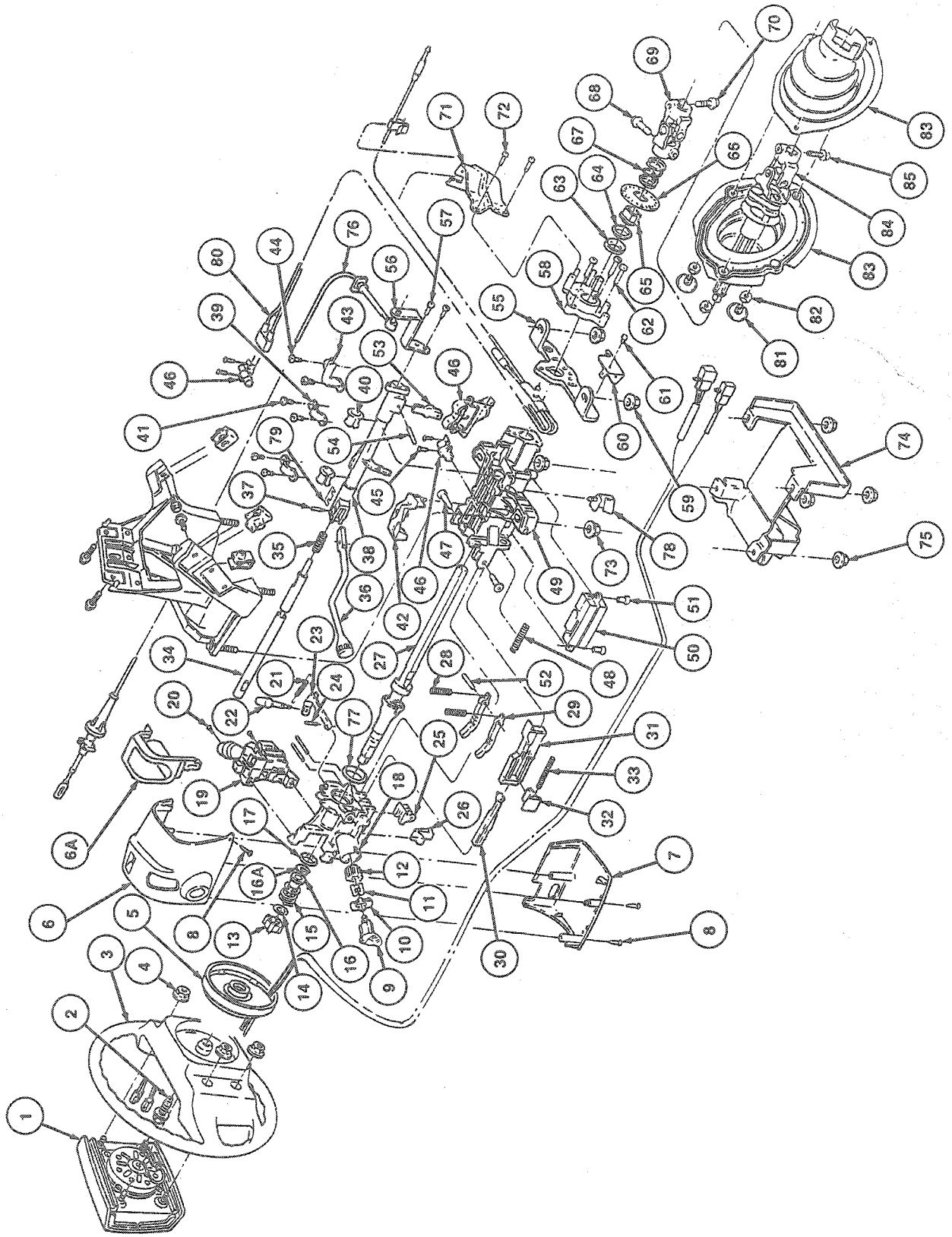
Item	Part Number	Description
1	—	Air Bag Module
2	N804385-S100	Steering Wheel Bolt
3	—	Steering Wheel
4	—	Air Bag Module Retaining Nuts
5	14A664	Air Bag Clockspring Contact Assy
6	3530	Upper Column Shroud
6A	3D677	Seal Assy
7	3533	Lower Column Shroud
8	55929	Shroud Retaining Screws
9	11572	Ignition Lock Cylinder Assy
10	3F579	Retainer
11	3E700	Bearing
12	3E717	Gear — Steering Lock
13	13318	Turn Signal Cancelling Cam
14	3C610	Snap Ring
15	3520	Spring — Upper Bearing
16	3518	Sleeve
16A	3L539	Ring
17	3517	Bearing — Upper (Small)
18	3F642	Lock Cylinder Housing
19	13K359	Multi-Function Switch
20	390345-S36	Screws
21	—	Spring
22	3F527	Tilt Release Lever
23	3D544	Tilt Actuator Lever
24	3F530	Tilt Actuator Lever Pin
25	3E695	Cam Steering Column Lock
26	14A163	Clip Wiring — Upper
27	3D657	Steering Shaft Assy
28	3C732	Spring Lock Lever
29	3B662 (RH) 3D653 (LH)	Lever Steering Column Lock
30	3E723	Lock Actuator Assy — Upper
31	3E715	Lock Actuator Assy — Lower
32	3E691	Pawl — Steering Column Lock (Shaft)
33	3E696	Spring — Steering Column Lock (Shaft)
34	14A099	Shield

(Continued)

Item	Part Number	Description
36	—	Solenoid and Bracket
37	2B623	Release Switch
38	2B654	Hose
39	3F719	Shift Interlock Cable
40	N806038	Screw
41	7H178	Bracket
42	3F527	Lever Assy
43	3F530	Pin
44	N805865	Tilt Pivot Screws
45	3D655	Spring — Steering Column Position Lock
46	3F723	Actuator Housing
47	—	Ignition Switch
48	N805858	Screws
49	3F530	Pin — Pivot Lever
50	3B632	Lower Column Bracket
51	3E738	Lower Bearing Housing Retainer
52	N801555	Lower Column Mounting Nuts
53	14A206	Bracket
54	N804409	Screw
55	805859	Lower Bearing Housing Retaining Screws
56	3A649	Lower Column Bearing Sleeve
57	3517	Lower Column Bearing
58	36539	Tolerance Ring — Lower
59	3C131	Sensor Ring
60	3C674	Spring
61	N803942	Bolt — Flange Yoke
62	3N725	Steering Shaft U — Joint Assy
63	N803942	Bolt
64	N801555	Upper Column Mounting Nuts
65	3E645	Absorber — Steering Column Impact
66	N801555	Nuts
67	3517	Bearing — Upper (Large)
68	14A163	Clip Wiring — Lower
69	N804326	Nut (2 Req'd)
70	N620012	Nut (3 Req'd)
71	3E735	Boot Assy
72	3C662	Intermediate Shaft Assy
73	N806393-S100	Bolt

DESCRIPTION (Continued)

Steering Column, Column Shift—Exploded View



DESCRIPTION (Continued)

Item	Part Number	Description
1	—	Air Bag Module
2	N804385-S100	Steering Wheel Bolt
3	—	Steering Wheel
4	—	Air Bag Module Retaining Nuts
5	14A664	Air Bag Clockspring Contact Assy
6	3530	Upper Column Shroud
6A	3D677	Seal Assy
7	3533	Lower Column Shroud
8	55929	Shroud Retaining Screws
9	11572	Ignition Lock Cylinder Assy
10	3F579	Retainer
11	3E700	Bearing
12	3E717	Gear — Steering Lock
13	13318	Turn Signal Cancelling Cam
14	3C610	Snap Ring
15	3520	Spring — Upper Bearing
16	3518	Sleeve
16A	3L539	Ring
17	3517	Bearing — Upper (Small)
18	3F642	Lock Cylinder Housing
19	13K359	Multi — Function Switch
20	390345-S36	Screws
21	—	Spring
22	3F527	Tilt Release Lever
23	3D544	Tilt Actuator Lever
24	3F530	Tilt Actuator Lever Pin
25	3E695	Cam Steering Column Lock
26	14A163	Clip Wiring — Upper
27	3D657	Steering Shaft Assy
28	3C732	Spring Lock Lever
29	3B662 (RH) 3D653 (LH)	Lever Steering Column Lock
30	3E723	Lock Actuator Assy — Upper
31	3E715	Lock Actuator Assy — Lower
32	3E691	Pawl — Steering Column Lock (Shaft)
33	3E696	Spring — Steering Column Lock (Shaft)
34	7361	Plunger Trans Control Select
35	7B071	Spring — Trans Control Selector Return
36	7302	Shift Lever
37	7W441	Shift Lever Pin
38	7215	Trans Selector Control Tube
39	7E400	Trans Gear Shift Tube Clamps
40	7335	Bushings
41	N805858	Screws
42	14A099	Shield
43	7A216	Trans Control Selector Position Insert
44	N805858	Screws
45	390345-S36	Screws
46	2B623	Parking Brake Vacuum Release Switch
47	N805865	Tilt Pivot Screws
48	3D655	Spring — Steering Column Position Lock
49	3F723	Actuator Housing
50	—	Ignition Switch
51	N805858	Screws
52	3F530	Pin — Pivot Lever
53	3E691	Pawl Steering Column Lock Shifter
54	3B663	Pin — Steering Column Lock Shifter
55	3B632	Lower Column Bracket
56	7D282	Trans Control Selector Lower Lever
57	805858	Screws
58	3E738	Lower Bearing Housing Retainer
59	N801555	Lower Column Mounting Nuts
60	14A206	Bracket
61	N804409	Screw
62	805859	Lower Bearing Housing Retaining Screws
63	3A649	Lower Column Bearing Sleeve
64	3517	Lower Column Bearing
65	3L539	Tolerance Ring — Lower
66	3C131	Sensor Ring
67	3C674	Spring
68	N803942	Bolt — Flange Yoke
69	3N725	Steering Shaft U — Joint Assy
70	N803942	Bolt
71	7E364	Shift Cable Bracket
72	805858	Shift Cable Bracket Mounting Screws
73	N806423-S56	Upper Column Mounting Nuts
74	3E645	Absorber — Steering Column Impact
75	N801555	Nuts
76	7E395	Shift Cable Assy
77	3517	Bearing — Upper (Large)
78	14A163	Clip Wiring — Lower
79	7C464	Clip
80	2B654	Hose
81	N804326	Nut (2 Req'd)
82	N620012	Nut (3 Req'd)
83	3E735	Boot Assy
84	3C562	Intermediate Shaft
85	N806393-S100	Bolt

(Continued)

TG5794D

DIAGNOSIS AND TESTING

Ignition Switch Electrical Diagnosis

Refer to Section 11-05 for Blade Terminal-Type Connector Switch—Mechanical Test.

Refer to the following chart for ignition switch diagnosis.

IGNITION SWITCH MECHANICAL DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• High Key Efforts	• Damaged lock cylinder.	• Lubricate cylinder and check for burrs on key and/or correct key cut. If effort is still excessive, replace lock cylinder.
	• Shrouds mis-aligned.	• Align shroud to fit properly.
	• Casting/actuator binds, sticks, grabs, with key rotation.	• If improper fit between casting and actuator exists, replace parts.
		• If burrs are found on actuator surfaces which contact the casting during key travel, gently file these surfaces until smooth. At no time attempt to file teeth of actuator.
		• If serious burrs are found on casting surface which contact actuator during key travel, replace the casting.
		• If actuator teeth show excessive wear or are burred, replace actuator.
		• Assemble lock housing assembly taking care to thoroughly lube all internal components with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A, ESB-M1C93-A) or equivalent and check key efforts. If still high, replace lock housing assembly.
	• Damaged ignition switch.	• Replace the ignition switch.

TG5186C

Steering Column

Refer to the following charts for steering column diagnosis procedures.

STEERING COLUMN DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Squeak, Moan When Steering Wheel Turned	• Gear rolled up or down allowing input shaft or pinch bolt to contact boot.	• Reposition rack and pinion to proper position and/or reposition boot.
• Engine Compartment Noise, Fumes, Heat, Vapors and/or Water and Liquids Enter Passenger Compartment	• Seal distorted leaving gap to lower shaft.	• Replace boots with visual gaps. Realign gear and/or boot to specifications. If condition isn't resolved, replace boot.
	• Seal missing.	• Replace boot.
	• Boot retaining nuts missing.	• Install nuts.
	• Boot mispositioned.	• Reposition boot.
	• Dash absorber under boot sealing surface.	• Reposition absorber under gap-hinder lip.
	• Dash panel surface deformed.	• Replace rope caulk on sealing surface of boot.
	• Boot missing.	• Install new boot.
	• Boot cut or torn.	• Install new boot.
	• Improper assembly of power steering isolator plastic sleeve.	• Replace boot.

DIAGNOSIS AND TESTING (Continued)

STEERING COLUMN DIAGNOSIS (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
• Rubbing Noise	• **Intermediate Shaft Area** • Boot mispositioned on intermediate shaft. • U-joint bearings damaged or contaminated. • **Lower Column Area** • Damaged, fractured bearing or retainer. • **Upper Column Area** • Wheel rubbing on shroud. • Damaged upper bearing sleeve, lock housing or retainer. • Damaged bearing.	• Install properly. • Replace intermediate shaft. • Replace bearing and retainer. • Install shroud to proper location. • Remove shroud and check for proper installation of lock housing, upper bearing and upper bearing snap ring. Install as required. • Replace bearing. • Replace shaft, lock housing or outer tube.
• Clunk During Acceleration or Deceleration	• Loose intermediate shaft to gear.	• Tighten retaining bolts.
• Rattles, Loose Steering	• **Intermediate Shaft Area** • Intermediate shaft to gear attachment not tight. • Improper boot assembly. • Interference fit between plastic collar and intermediate shaft. • Excessive universal joint lash. • Power steering isolator rubber bond separation. • **Lower Column Area** • Loose intermediate shaft to column or column to support attachment. • **Upper Column Area** • Improper shroud assembly. • Column to support bracket loose. • Loose shaft to upper bearing. • Lock housing assembly.	• Tighten attachments. • Install and tighten screws. • Install to proper location. Replace if necessary. • Replace intermediate shaft. • Replace intermediate shaft. • Tighten attachments. • Install and tighten shroud. • Tighten attachment. • Check that snap ring is engaged to shaft properly. Replace bearing or shaft. • Replace parts as required.
• Binding / HeavyEffort / No Returnability / Column Grounded / Sticks / Binds / Grabs	• Improper installation of dash boot. • Improperly assembled universal joint. • Upper column. • Restrictor assembly on sensor ring not removed (during assembly).	• Reposition boot. • Replace intermediate shaft. • Remove column and check column for binding while disconnected from intermediate shaft. If it binds: A. Remove column shaft and check it for straightness — replace shaft. B. Check upper and lower bearing for ease of rotation—replace. C. Check for contact of shaft to other components—replace parts required. • Replace sensor ring and bearing wedge. **DO NOT** install restrictor.

TG4444E

REMOVAL AND INSTALLATION

CAUTION: Do not remove the steering column, steering wheel and air bag module as an assembly from the vehicle unless the column is locked to prevent rotation, or lower end of steering shaft should be wired in such a way to prevent the steering wheel from being rotated.

Steering Wheel

Tools Required:

- Steering Wheel Puller T67L-3600-A

Removal

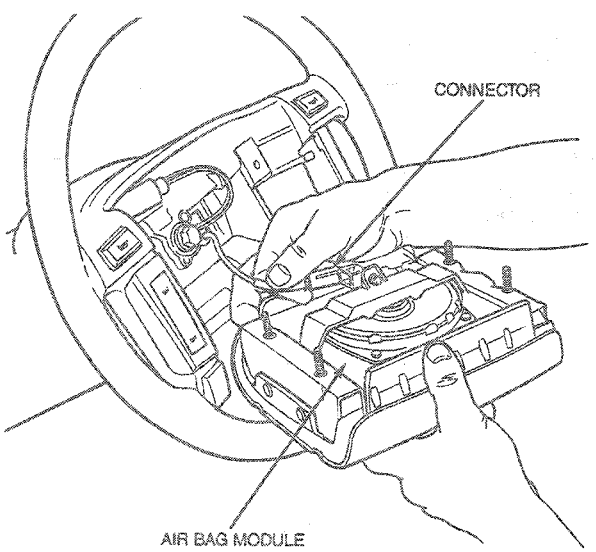
1. Center front wheels to the straight-ahead position.

   WARNING: THE BACKUP POWER SUPPLY MUST BE DISCONNECTED BEFORE ANY AIR BAG COMPONENT IS SERVICED.

2. Disconnect battery ground cable and air bag backup power supply. Refer to Section 01-20B.

   NOTE: Taurus SHO only, remove two steering wheel back cover plugs. Remove two air bag module retaining bolts and lift module off steering wheel.

3. Remove four air bag module retaining nuts and lift module off steering wheel.
4. Disconnect air bag wire harness from air bag module and remove module from wheel.

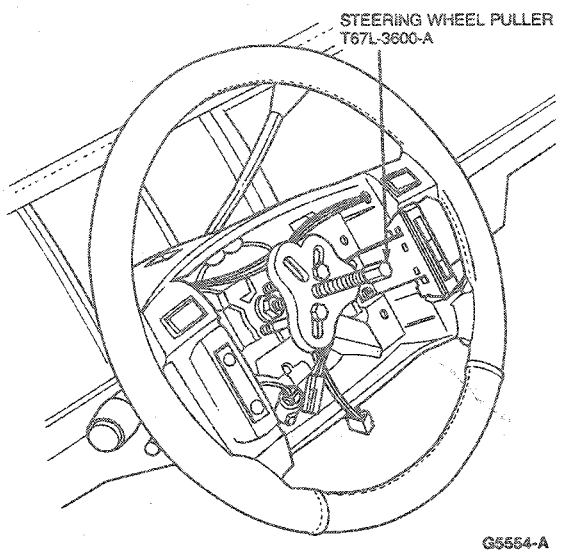


G5703-A

5. Disconnect speed control wire harness from steering wheel.

   CAUTION: Be sure contact assembly wire harness does not get caught on wheel assembly when lifting off shaft.

6. Remove and discard steering wheel retaining bolt.
7. Install Steering Wheel Puller T67L-3600-A or equivalent and remove steering wheel. Route contact assembly wire harness through steering wheel as wheel is lifted off shaft.



G5554-A

Installation

1. Ensure that vehicle's front wheels are in the straight-ahead position.
2. Route contact assembly wire harness through steering wheel opening at the three o'clock position and position steering wheel on steering shaft. The steering wheel and shaft alignment marks should be aligned. Be sure air bag contact wire is not pinched.
3. Install new steering wheel retaining bolt and tighten to 31-45 N·m (23-33 lb-ft).

   CAUTION: Be sure wiring does not get trapped between steering wheel and contact assembly.

4. Connect speed control wire harness to wheel and snap connector assembly into steering wheel clip.
5. Connect air bag wire harness to air bag module and install module to steering wheel. Tighten module retaining nuts to 4-5.4 N·m (36-47 lb-in). (Taurus SHO: Tighten retaining screws to 10.2-13.8 N·m (7.5-10 lb-ft.) Install back cover plugs.)
6. Connect air bag backup power supply and battery ground cable. Verify air bag warning indicator.

Tilt Lock Lever

Removal and Installation

1. To remove tilt lock lever, rotate lever counterclockwise.

REMOVAL AND INSTALLATION (Continued)

2. To install, position lever and rotate clockwise until tight.

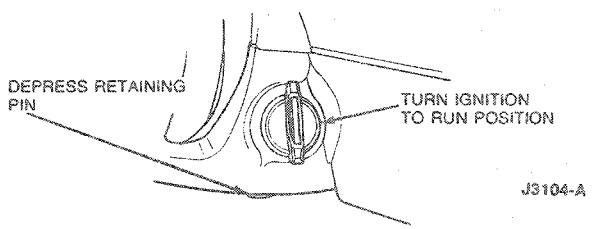
Ignition Lock Cylinder Assembly

Functional Lock

Removal

The following procedure applies to vehicles that have functional lock cylinders. Lock cylinder keys are available for these vehicles, or the lock cylinder key numbers are known and the proper key can be made.

1. Disconnect battery ground cable.
2. Turn lock cylinder key to RUN position.
3. Place a 3.17mm (1/8 inch) diameter wire pin or small drift punch in hole in trim shroud under lock cylinder. Depress retaining pin while pulling out on lock cylinder to remove it from column housing.



Installation

1. Install lock cylinder by turning it to RUN position and depressing retaining pin. Insert lock cylinder into lock cylinder housing. Ensure cylinder is fully seated and aligned in interlocking washer before turning key to OFF position. This will permit cylinder retaining pin to extend into cylinder housing hole.
2. Rotate lock cylinder, using lock cylinder key, to ensure correct mechanical operation in all positions.
3. Connect battery ground cable.

Non-Functional

Removal

The following procedure applies to vehicles in which the ignition lock is inoperative and the lock cylinder cannot be rotated due to a lost or broken lock cylinder key, unknown key number, or a lock cylinder cap that has been damaged and/or broken to the extent that the lock cylinder cannot be rotated.

1. Disconnect battery ground cable.
2. Remove steering wheel as outlined.
3. Using channel-lock pliers or vise-grip-type pliers, twist lock cylinder cap until it separates from lock cylinder.
4. Using a 3/8-inch diameter drill, drill down middle of ignition lock key slot approximately 44mm (1-3/4 inch) until lock cylinder breaks loose from breakaway base of lock cylinder. Remove lock cylinder and drill shavings from lock cylinder housing.
5. Remove retainer, washer, ignition switch and actuator. Thoroughly clean all drill shavings and other foreign materials from casting.
6. Carefully inspect lock cylinder housing for damage from the above operation. If damage is apparent, housing must be replaced.

Installation

1. Replace lock cylinder housing, if damaged.
2. Install actuator and ignition switch as outlined.
3. Install trim and electrical parts.
4. Install new ignition lock cylinder as outlined.
5. Install steering wheel as outlined.
6. Check lock cylinder operation.

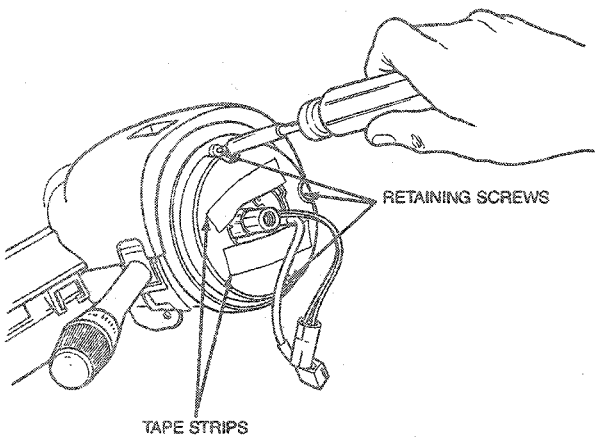
Contact Assembly

Removal

1. Ensure that vehicle's front wheels are in the straight-ahead position and steering column shaft alignment mark is at the 12 o'clock position.
2. Disconnect battery ground cable and air bag backup power supply.
3. Remove steering wheel as outlined.
4. Remove lower RH and LH mouldings from instrument panel by pulling up and snapping out of retainer.
5. Remove instrument panel lower trim panel and lower steering column shroud.
6. Disconnect contact assembly wire harness.
7. Apply two strips of tape across contact assembly stator and rotor to prevent accidental rotation.
8. Remove lock cylinder and remove key warning buzzer wire.
9. Detach harness 14401 mating connectors down column side.

REMOVAL AND INSTALLATION (Continued)

10. Remove three contact assembly retaining screws and pull contact assembly off steering column shaft.



Installation

1. Ensure that vehicle's front wheels are in the straight-ahead position and steering column shaft alignment mark is at the 12 o'clock position.
2. Align contact assembly to column shaft and mounting bosses and slide contact assembly on to the shaft.
3. Install three retaining screws. Tighten screws to 2-3 N·m (18-26 lb-in). Remove tape strips.

   NOTE: If a new contact assembly is being installed, remove the plastic lock mechanism after contact assembly is secured to column.
4. Route contact assembly down column assembly and connect to wire harness.
5. Install key warning buzzer into lock cylinder housing and secure lock cylinder.
6. Connect harness 14401 connectors down column side.
7. Install lower shroud and instrument panel cover.
8. Install steering wheel as outlined.
9. Connect air bag backup power supply and battery ground cable.
10. Verify air bag warning indicator.

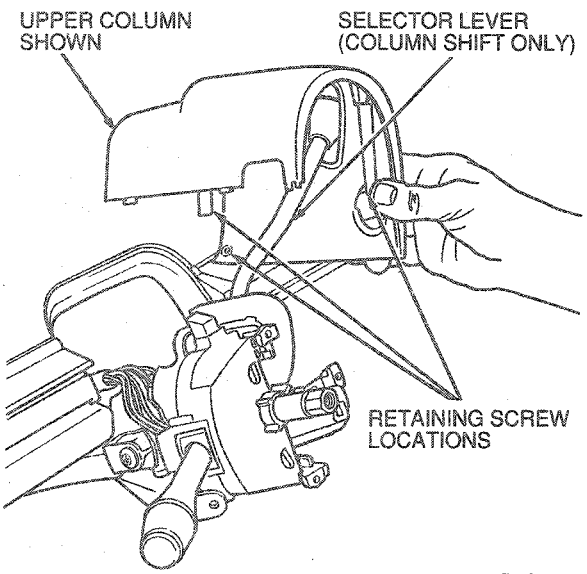
Steering Column

Ensure that vehicle front wheels are in the straight-ahead position.

Removal

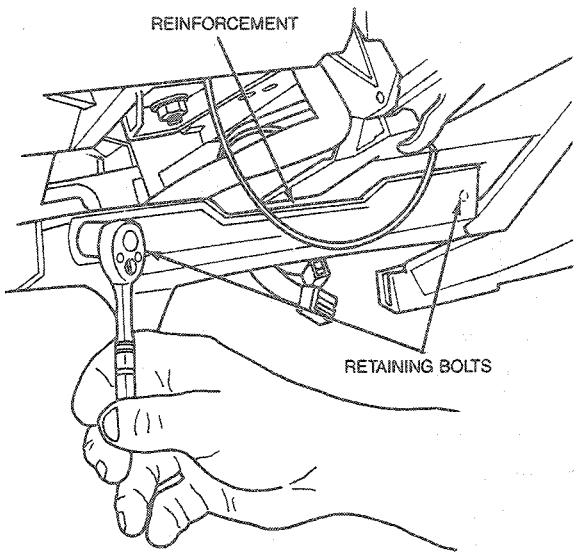
NOTE: All steering column components are assembled with fasteners. They are designed with a thread locking system to prevent loosening due to vibrations associated with normal vehicle operation.

1. Disconnect battery ground cable and air bag backup power supply.
2. Remove steering wheel as outlined.
3. Remove instrument panel lower trim cover.
4. Remove air bag clockspring contact assembly as outlined.
5. Remove tilt lever by unscrewing it from column and remove four screws.
6. Rotate ignition lock cylinder to RUN position. Using a 1/8-inch drift, depress lock cylinder retaining pin through access hole and remove lock cylinder.
7. Remove four retaining screws from lower shroud and remove column shrouds.



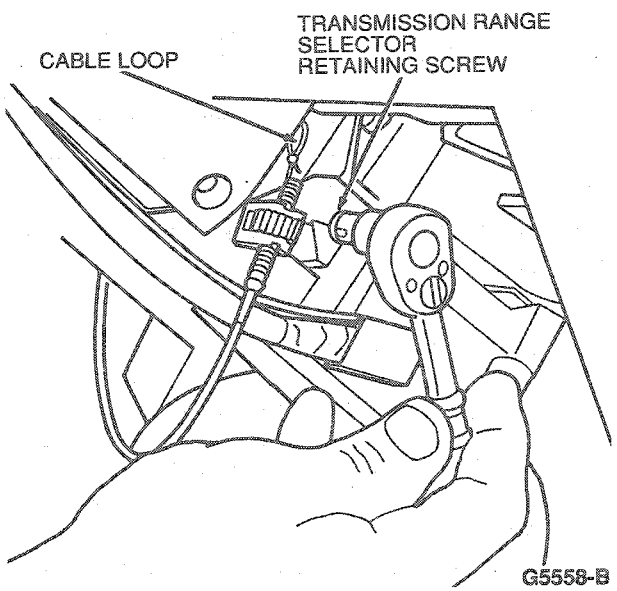
REMOVAL AND INSTALLATION (Continued)

8. Remove two instrument panel reinforcement brace retaining bolts. Remove reinforcement.



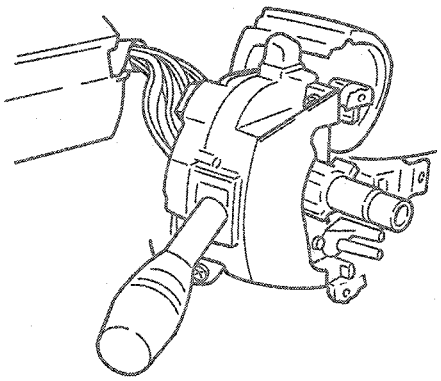
G5557-A

9. Disconnect transmission range selector cable from actuator housing by removing one screw (column shift).



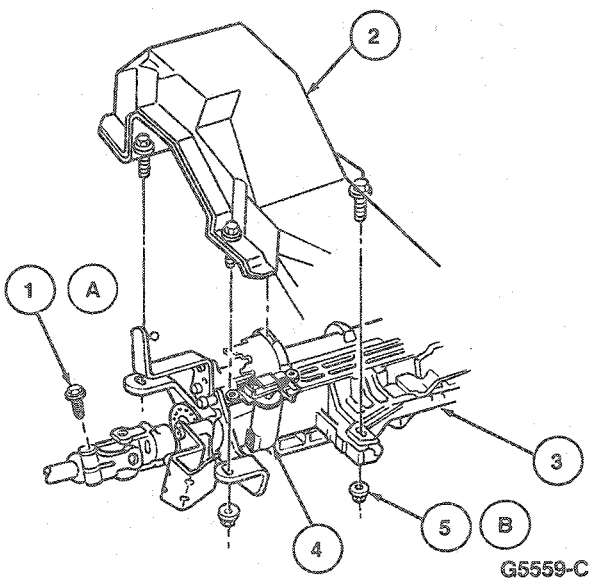
G5558-B

10. Disconnect transmission range selector cable loop from shift tube hook (column shift).
11. Remove two multi-function switch retaining screws and set multi-function switch aside. Remove wiring connector from ignition switch.



G5809-B

12. Remove column skid plate.
13. Remove pinch bolt from steering shaft flex coupling.
14. While supporting column assembly, remove four column assembly retaining nuts. Lower column and disconnect vacuum hoses at parking brake release switch or remove vacuum release assembly.
15. Disconnect shift cable from selector lever pivot.
16. Remove shift cable and bracket from lower column mounting.
17. Remove four brake shift interlock cable retaining screws and remove cable (console shift).
18. Remove column from vehicle.



G5559-C

REMOVAL AND INSTALLATION (Continued)

Item	Part Number	Description
1A	N803942-S100	Screw
2	—	Body
3	3C529	Steering Column Assy
4	3Z719	Brake Shift Interlock Solenoid
5B	N806423-S56	Nut (4 Req'd)
A		Tighten to 41-56 N·m (31-41 Lb-Ft)
B		Tighten to 13-19 N·m (9-14 Lb-Ft)

Installation

1. Align the column lower universal joint to lower shaft. Install one bolt and tighten to 41-56 N·m (31-41 lb-ft).
2. Connect parking brake release vacuum hoses.
3. Position Brake Solenoid Interlock cable and install four retaining screws (automatic console shift).
4. Support the column assembly to column support bracket. Install four retaining nuts and tighten to 13-19 N·m (9-14 lb-ft).
5. Position shift cable bracket (with shift cable attached) to lower two screws of column. Tighten to 7-11 N·m (5-8 lb-ft).
6. Snap shift cable onto shift selector pivot ball.
7. Position multi-function switch and install two retaining screws. Tighten to 2-3 N·m (18-26 lb-in).
8. Connect all electrical connectors.
9. Attach transmission range selector cable loop on shift selector hook, and install transmission range selector cable bracket to actuator housing. Install retaining screw.
10. Install steering column to parking brake control shake brace.
11. Install instrument panel reinforcement brace and secure with two retaining bolts.
12. Install lower instrument panel cover.
13. Install upper and lower column shrouds.
14. Install lock cylinder assembly.
15. Install tilt lever onto column.
16. Install air bag contact assembly screw. Tighten to 2-3 N·m (18-26 lb-in).
17. Install steering wheel onto column shaft. Install a new bolt and tighten to 31-48 N·m (22-33 lb-ft).
18. Position air bag module to wheel. Install four retaining nuts. Tighten to 4-5.4 N·m (36-47 lb-in).
19. Connect battery ground cable and air bag backup power supply.
20. Verify air bag warning indicator.

Steering Shaft, Intermediate

Removal

1. Remove bolt from upper U-joint-to-shaft connection. Collapse intermediate shaft.
2. Remove three nuts retaining primary boot-to-dash panel and remove boot.

   CAUTION: Be sure the steering column is in the locked position. The lower end of the steering column may be wired in such a way to prevent the steering wheel from being turned as air bag clockspring assembly will be damaged.
3. Remove bolt retaining intermediate shaft assembly to steering gear input shaft.
4. From inside of vehicle, remove intermediate shaft.
5. Remove secondary boot.

Installation

1. Turn secondary boot inside out and position over three mounting studs then mount to gear.
2. Install intermediate shaft through boot and to steering gear input shaft. Install new bolt and tighten to 41-56 N·m (31-41 lb-ft).
3. Install primary boot over intermediate shaft and down onto three studs in dash panel.
4. Install three boot retaining nuts. Tighten to 5-7 N·m (44-61 lb-in).
5. Extend shaft and insert into U-joint at end of steering column. Tighten bolt to 41-56 N·m (31-41 lb-ft).
6. Check steering column for proper operation.

Gear Shift Lever, Cover and/or Shift Lever Clip

Column Shift

Removal

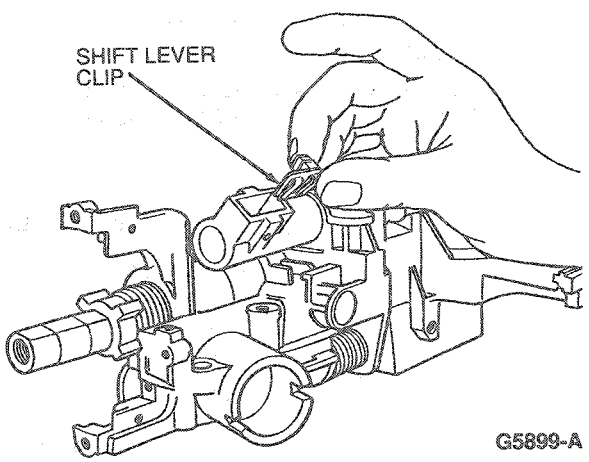
1. Remove tilt lever by unscrewing it from the column.
2. Turn ignition switch to RUN position. Using a 1/8-inch drift, depress lock cylinder retaining pin through access hole and remove lock cylinder.
3. Remove lower instrument panel cover retaining screws and remove cover.
4. Remove four retaining screws from lower shroud. Remove upper and lower shroud assemblies.
5. Remove shift lever cover, pin assembly and shift lever.
6. If necessary, remove shift lever clip.

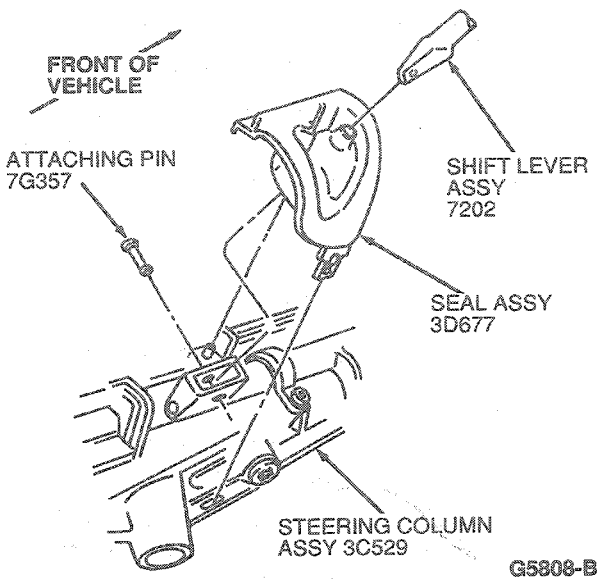
Installation

1. If removed, install shift lever clip into opening in shifter housing assembly as shown.
2. Insert shift lever through hole in PVC cover. Position cover on shift lever.

REMOVAL AND INSTALLATION (Continued)

3. Insert shift lever into opening in shifter housing assembly.
4. Install a new pin assembly into position and tap in place until the head seats against shifter housing assembly and the Tinnerman nut is visible on bottom of shifter housing.
5. Position shift lever cover on the lock cylinder housing. Insert lower attachment into the slot on side of housing.
6. Position upper attachment on mounting pin and press into place. Install a Tinnerman nut to secure cover to pedestal on lock cylinder housing.
7. Install upper and lower shrouds with four screws.
8. Install lower instrument panel cover and retaining screws.
9. Install lock cylinder into lock cylinder housing.
10. Install tilt lever onto column.
11. Check for proper start in PARK and NEUTRAL. Ensure start circuit cannot be actuated in DRIVE or REVERSE positions and the column is locked in the LOCK position.





Ignition Lock Cylinder

Removal

1. Rotate ignition lock cylinder to RUN position. Using a 1/8-inch drift, depress lock cylinder retaining pin through access hole and remove lock cylinder.

   CAUTION: Carefully note the position of the bearing retainer prior to removal.
2. Remove blue plastic bearing retainer by inserting a screwdriver or similar tool, with a 90 degree bend on the tip, between bearing retainer and bearing and by prying upward.
3. Insert tip of a screwdriver into Double-D slot of bearing, then rotate 90 degrees. Remove bearing.
4. Remove lock drive gear. Carefully note relationship of lock drive gear to position of rack teeth.

Installation

1. Position lock drive gear in base of lock cylinder housing in the same position as that noted during removal procedure. The position of lock drive gear is correct if last tooth on drive gear is meshed with last tooth on rack.
2. Position bearing retainer in lock cylinder housing. Insert tip of a screwdriver into Double-D slot of bearing, then rotate 90 degrees.
3. Press blue plastic bearing retainer into lock cylinder housing. Ensure retainer is in its original position.
4. Line up flats of drive gear with flats of washer by pulling down on the column lock actuator.
5. Install lock cylinder assembly.

REMOVAL AND INSTALLATION (Continued)

6. Check for proper start in PARK and NEUTRAL. Also, check to ensure start circuit cannot be actuated in DRIVE or REVERSE positions and the column is locked in LOCK position.

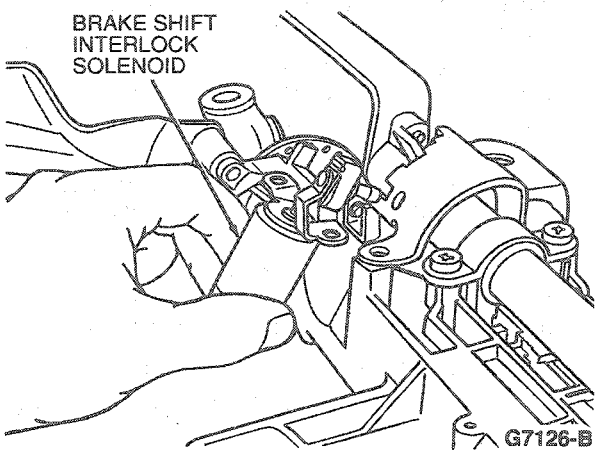
Brake Shift Interlock Solenoid

Removal

1. Disconnect battery ground cable and air bag backup power supply.
2. Remove lower RH and LH mouldings from instrument panel by pulling up and snapping out of retainer.
3. Remove five retaining screws from instrument panel lower cover and remove cover.
4. Remove instrument panel reinforcement.
5. Disconnect transmission range selector cable from actuator housing by removing one screw.
6. Remove four column attaching nuts and lower column assembly.
7. Remove electrical harness from brake shift interlock (BSI) solenoid assembly.
8. Remove three screws attaching BSI solenoid and insert plate to column assembly and remove solenoid and insert plate. Separate solenoid from insert plate by removing tinnerman clip.

Installation

1. Position brake shift interlock solenoid and insert plate in place and attach to column assembly with three screws as shown.
2. Connect electrical harness to BSI solenoid.
3. Attach column assembly to half car beam with four nuts.
4. Connect transmission range selector cable to column assembly with one screw.
5. Attach instrument panel reinforcement brace with three bolts.
6. Attach instrument panel lower trim cover with five bolts.
7. Install RH and LH mouldings on instrument panel.
8. Connect air bag backup power supply and battery ground cable.

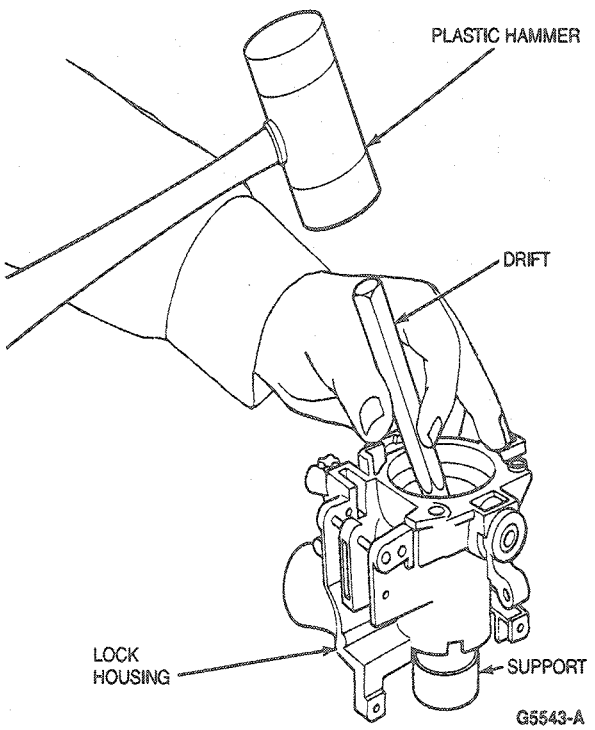


Shaft Bearing, Upper

Column Removed

Removal

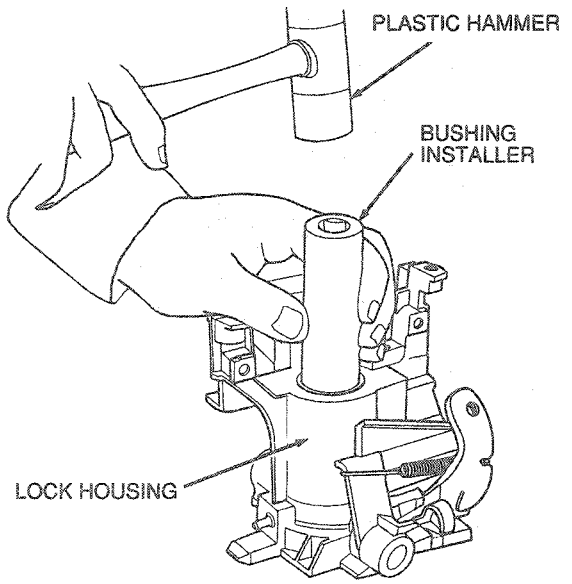
1. Remove lock housing from steering column assembly as outlined.
2. Suitably support housing and tap out small bearing with an appropriate drift and a plastic hammer.



REMOVAL AND INSTALLATION (Continued)

Installation

1. Suitably support housing. Position small bearing so that the opening between races is "up." Tap into place with a plastic hammer and a bushing driver installer or socket the same size as outer race of bearing.
2. Install housing on steering column as outlined.



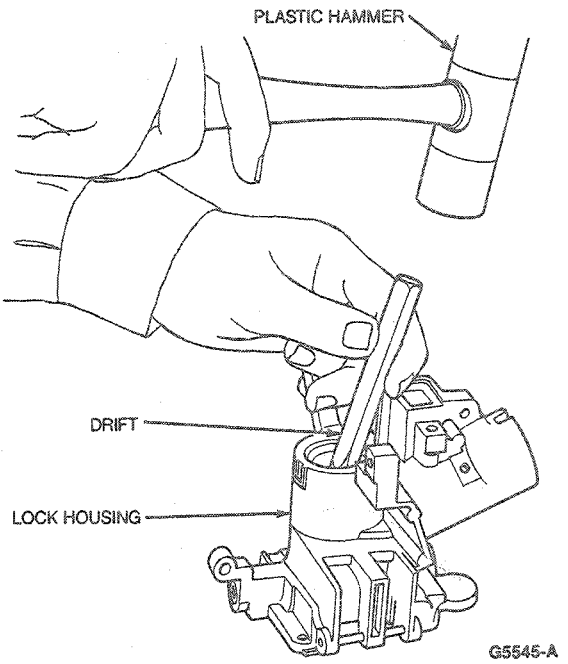
G5544-B

Shaft Bearing, Intermediate

Column Removed

Removal

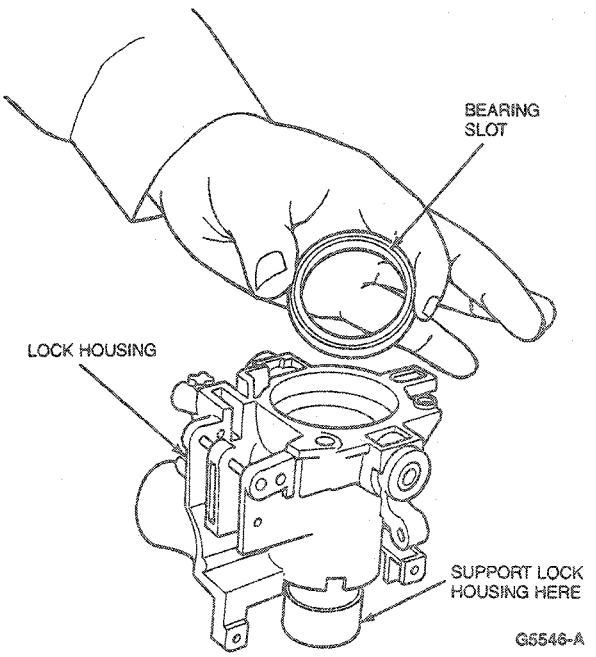
1. Remove lock housing as outlined.
2. Set housing flat on workbench and tap large bearing loose with suitable drift and a plastic hammer.



G5545-A

Installation

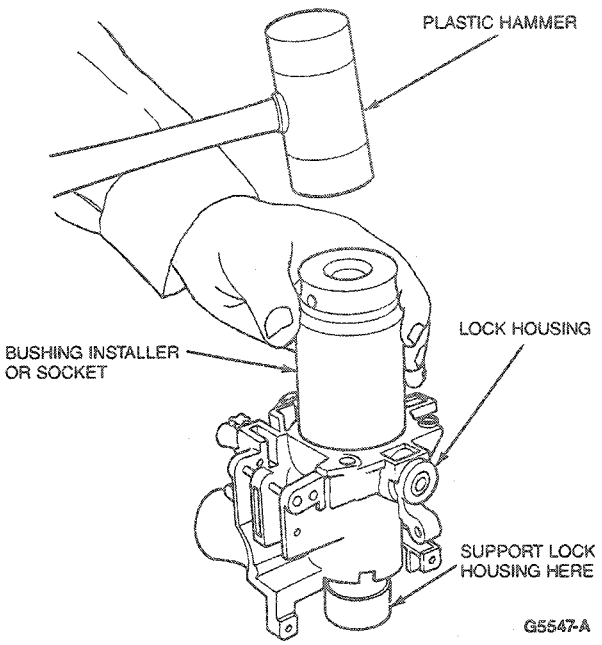
1. Support lock housing on workbench.
2. Position bearing so that the opening between races will face up, or out from housing, when installed.



G5546-A

REMOVAL AND INSTALLATION (Continued)

3. Using a socket or bushing driver the same size as outer race of bearing, tap bearing into housing with a plastic hammer until fully seated.

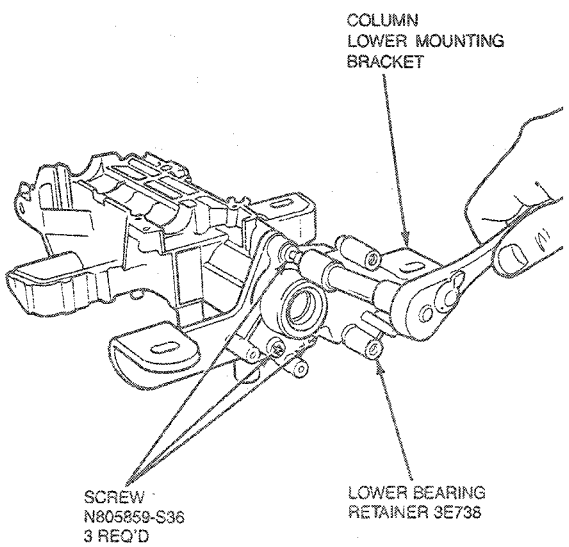


Shaft Bearing, Lower

Column Removed

Removal

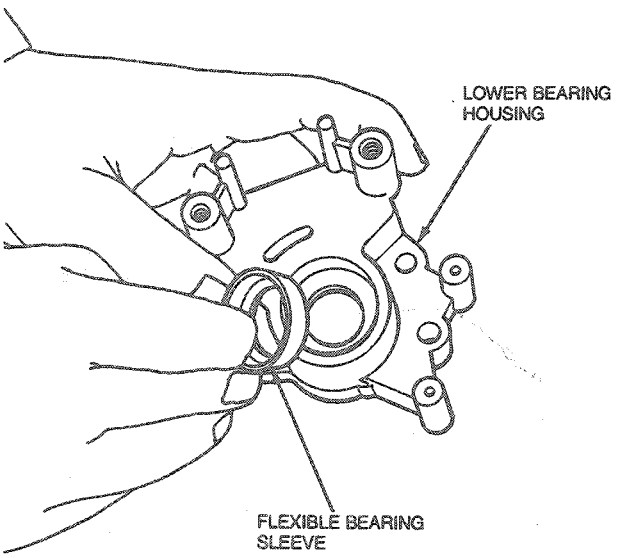
1. Remove lower steering shaft bearing and housing assembly as outlined.



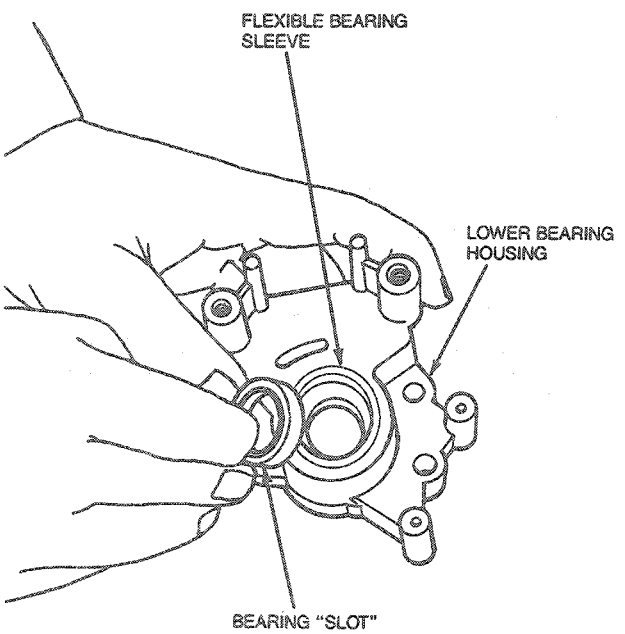
2. Suitably support housing and tap out bearing with a hammer and a drift.

Installation

1. Inspect flexible bearing sleeve. Replace if damaged.



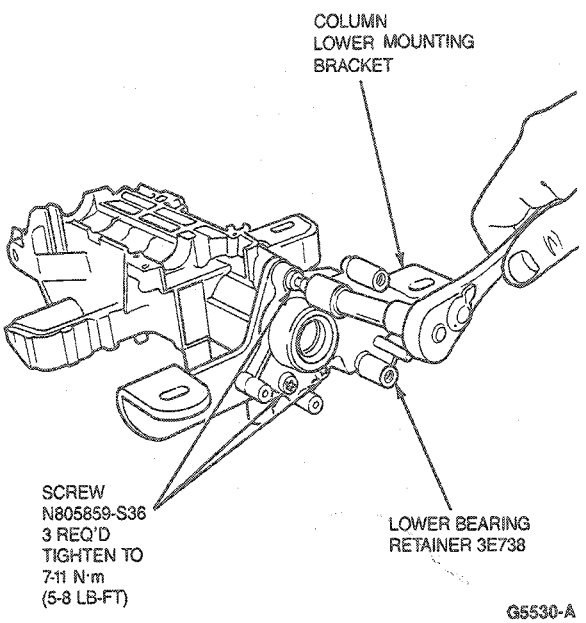
2. Position bearing sleeve in housing.



3. Press in the new bearing with thumb pressure until seated. Slot between inner and outer races should face down when installed in the vehicle.

REMOVAL AND INSTALLATION (Continued)

4. Install bearing housing on steering column as outlined.



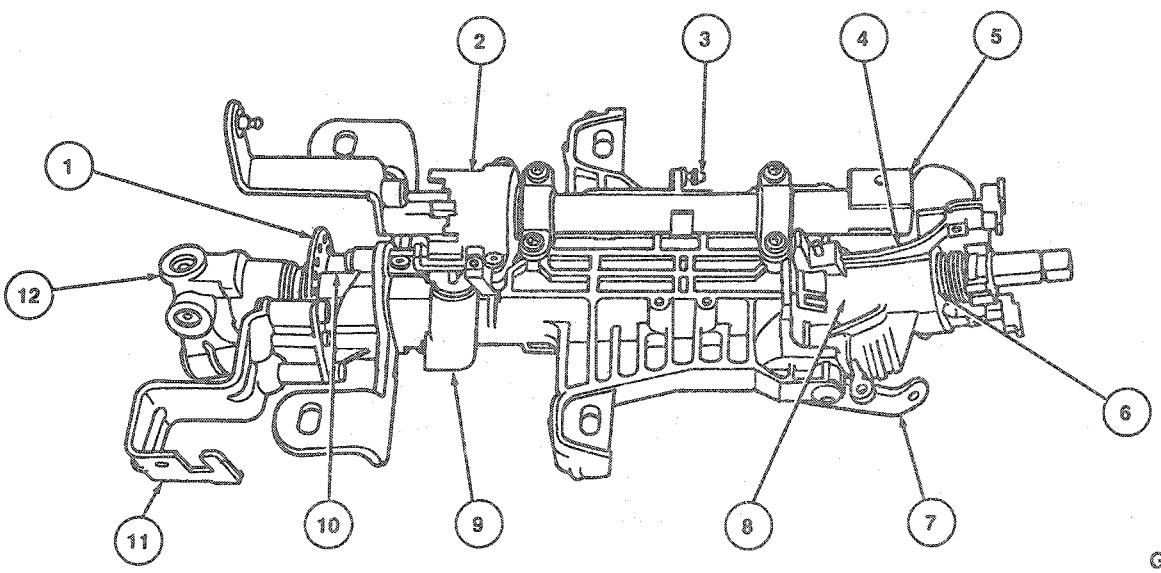
DISASSEMBLY AND ASSEMBLY

Steering Column

Disassembly

1. Disconnect battery ground cable and air bag backup power supply.
2. Remove steering wheel assembly as outlined.
3. Remove steering column from vehicle as outlined.
4. Remove lower U-joint, spring, sensor ring and bushing.

Column Shift Only



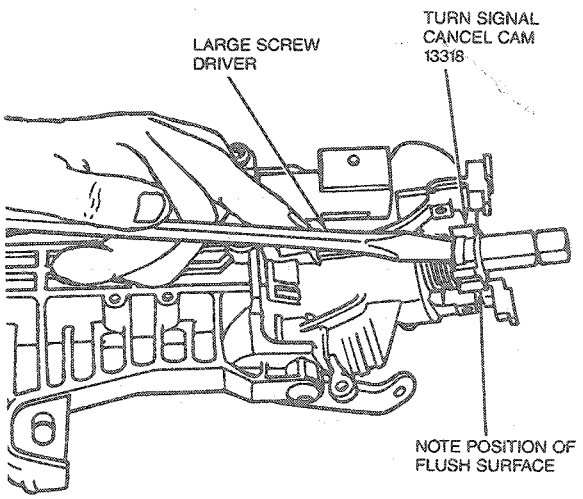
DISASSEMBLY AND ASSEMBLY (Continued)

Item	Part Number	Description
1	3C131	Sensor Ring
2	7A216	Shift Control Selector Bracket
3	7212	Shift Position Indicator Attaching Point
4	3511	Tilt Lock Housing
5	7212	Shift Selector Assy

(Continued)

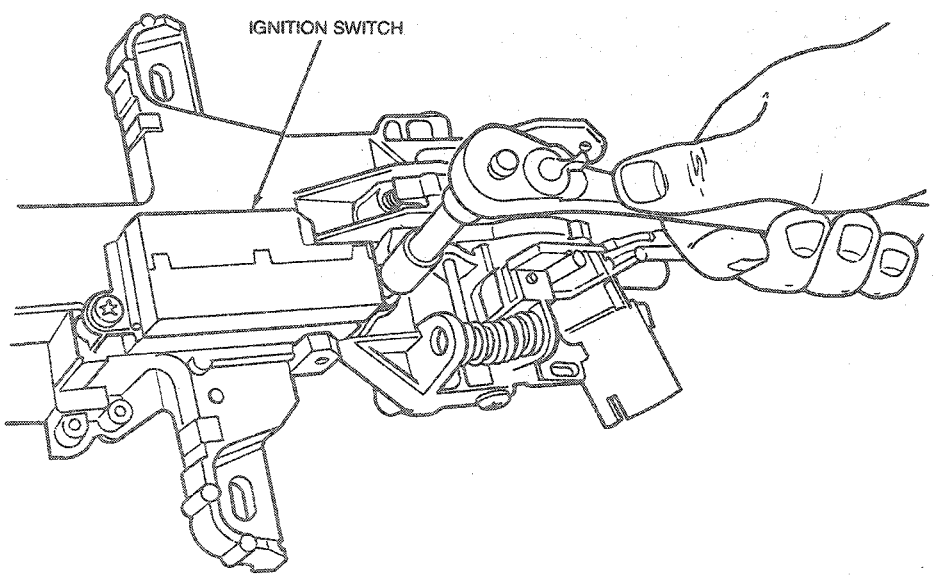
Item	Part Number	Description
6	3517	Upper Bearing (In Lock Housing)
7	3D544	Tilt Release
8	3517	Intermediate Bearing (In Lock Housing)
9	3Z719	Brake Shift Interlock Solenoid
10	3517	Lower Bearing Assy
11	7E364	Shift Cable Bracket
12	3N725	Flex Coupling

5. Remove turn signal cancelling cam by pushing up with flat-bladed screwdriver. Note direction of flush surface.



G5450-A

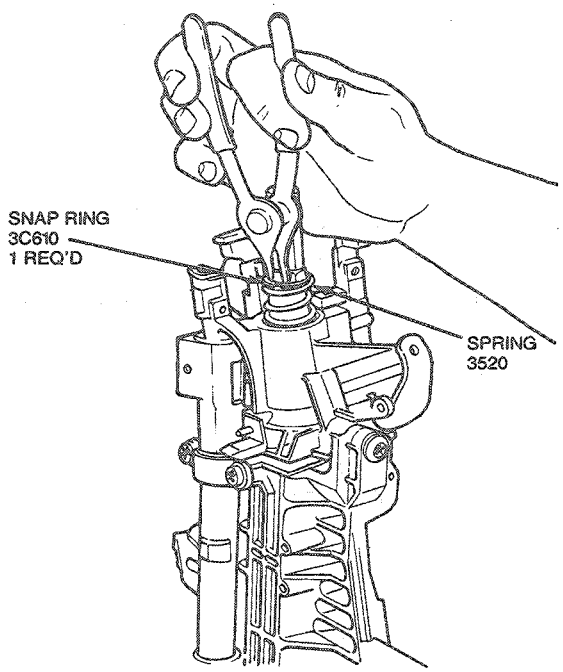
6. Remove ignition switch assembly.



G5538-A

DISASSEMBLY AND ASSEMBLY (Continued)

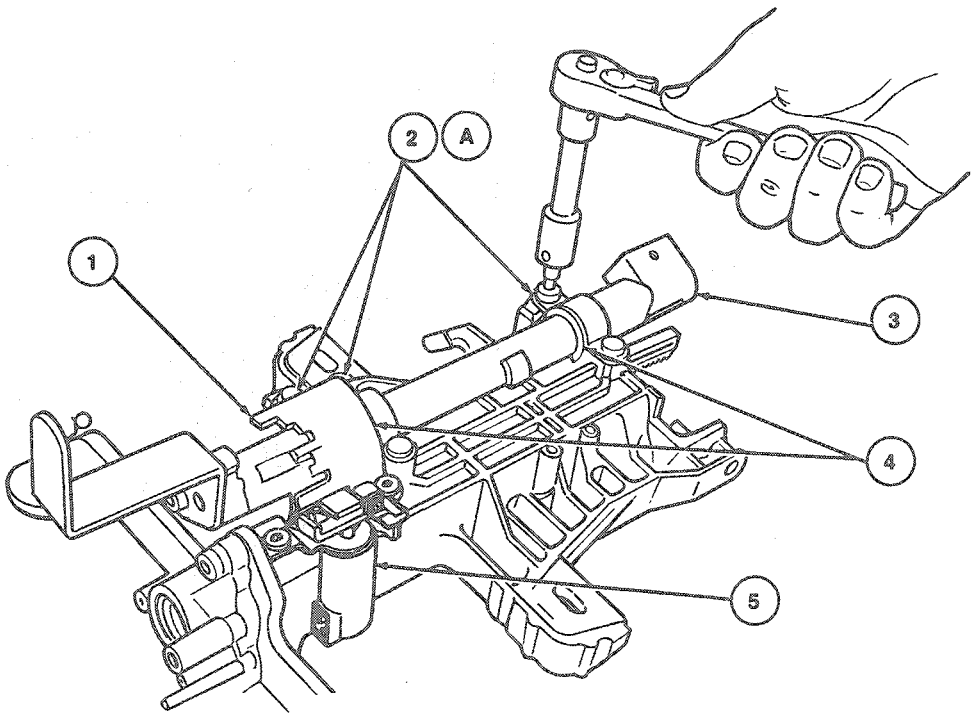
7. Remove upper snap ring and coil spring.



G5531-A

8. Remove steel sleeve and ring.
9. Remove shift control assembly and shift control bracket (column shift).
10. Remove brake shift interlock solenoid (column shift).
11. Remove shift cable bracket (column shift).

Column Shift

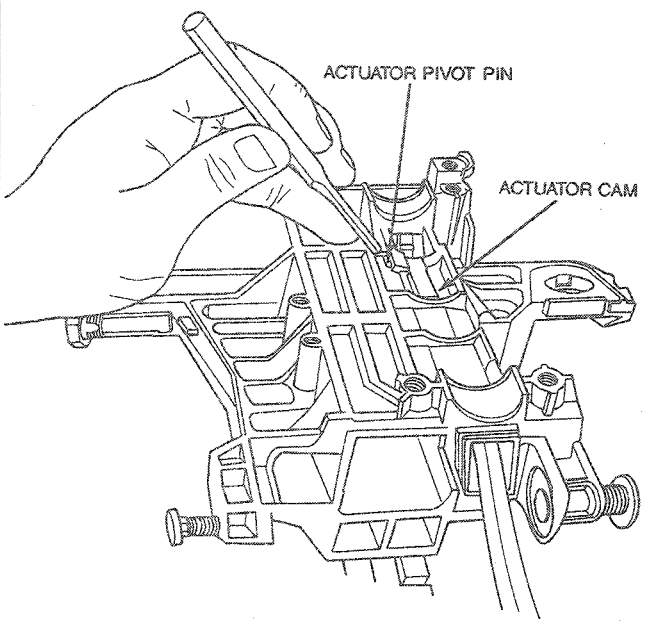


G5540-D

DISASSEMBLY AND ASSEMBLY (Continued)

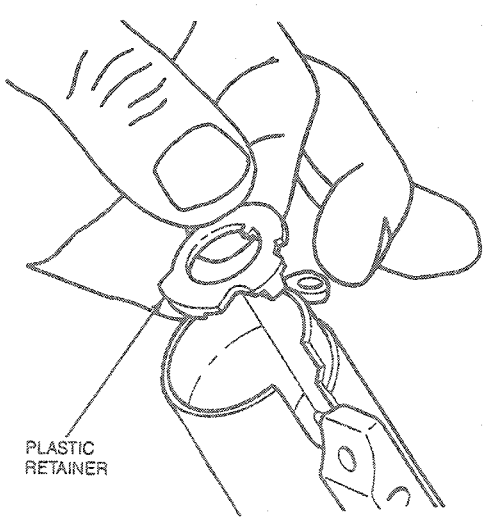
Item	Part Number	Description
1	7A216	Shift Control Selector Bracket
2	N805858	Screws (6 Req'd)
3	7212	Shift Control Assy
4	7L278	Bushings
5	3Z719	Brake Shift Interlock Solenoid
A		Tighten to 7-11 N·m (5-8 Lb-Ft)

12. Using a drift tap lock actuator cam pivot pin loose. Remove with diagonal pliers.



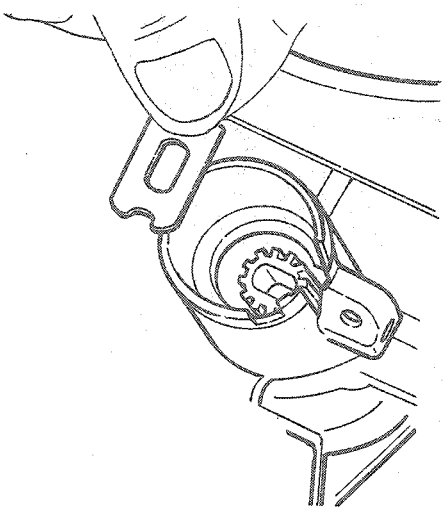
G5561-A

13. Remove plastic bearing retainer from lock cylinder bore.



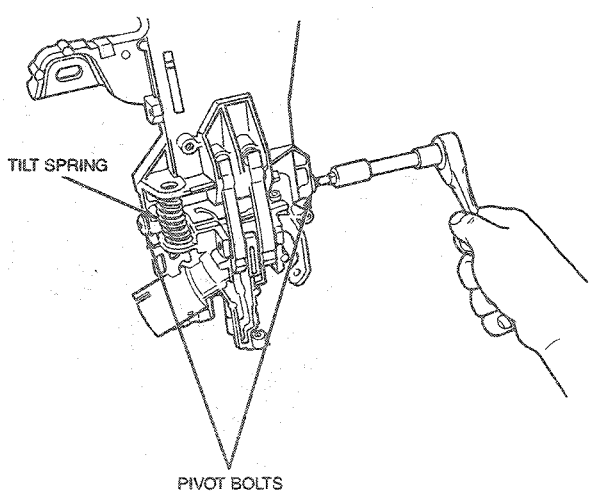
G5447-A

14. Remove metal bearing from lock cylinder bore.



G5448-A

15. Remove ignition lock gear.
16. Remove two tilt pivot bolts. Use caution as tilt spring will release when bolts are removed. Remove lock cylinder housing.

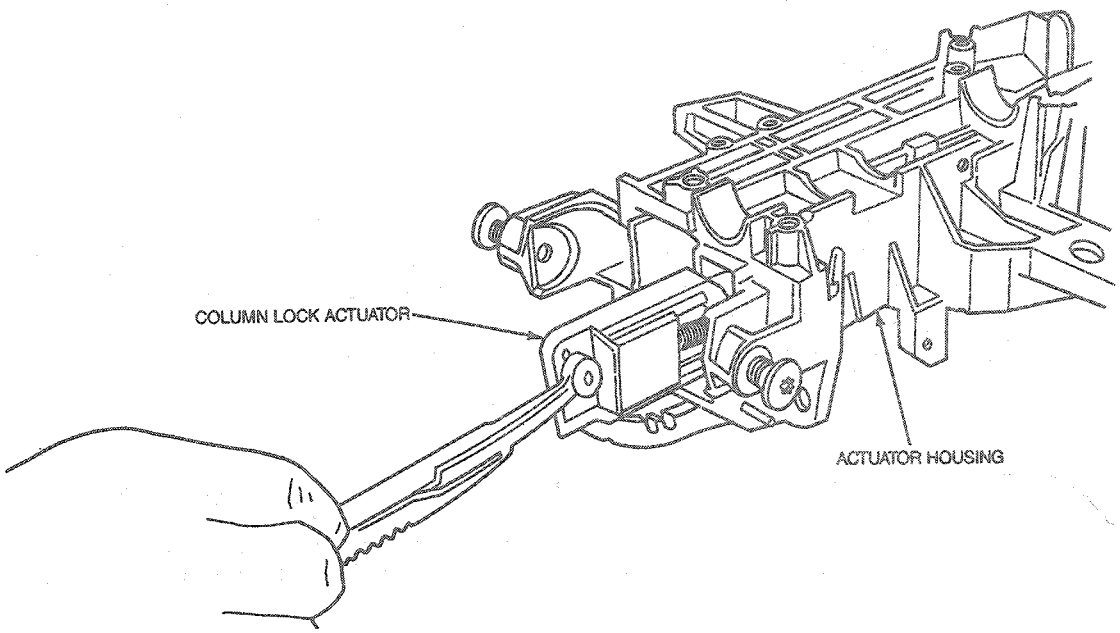


G5539-A

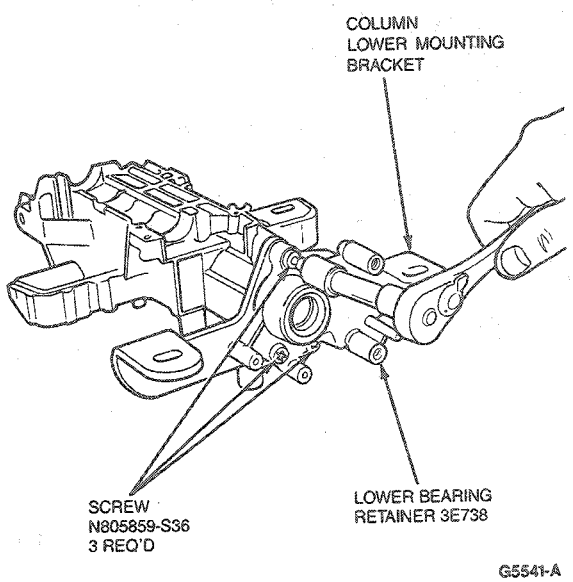
17. Remove steering shaft from column assembly.

DISASSEMBLY AND ASSEMBLY (Continued)

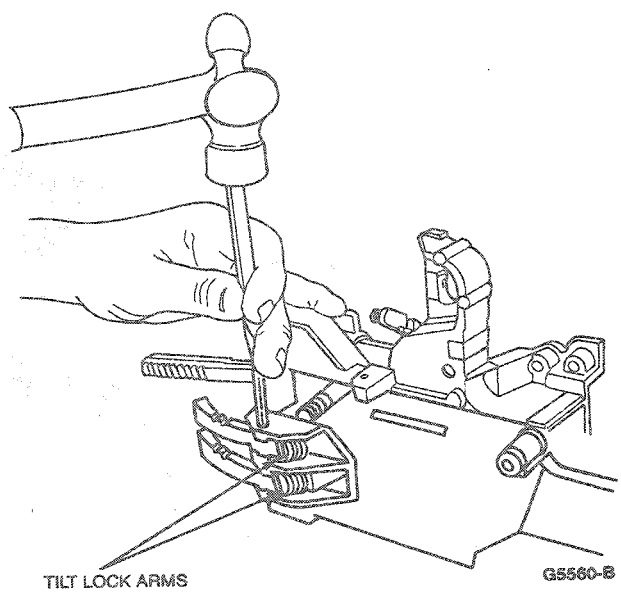
18. Remove column lock actuator.



19. Remove lower bearing and mounting bracket.



20. Remove tilt position lever arm pivot pin using a drift. Remove lever lock arms and springs.

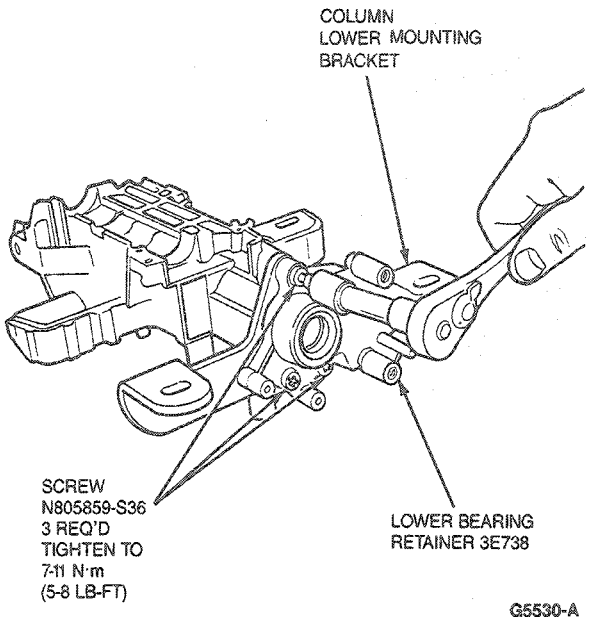


Assembly

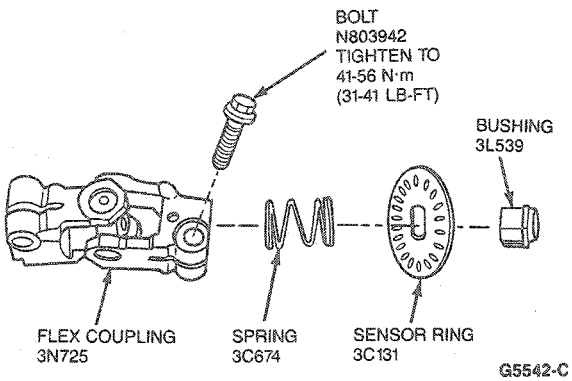
1. Install steering shaft into housing.

DISASSEMBLY AND ASSEMBLY (Continued)

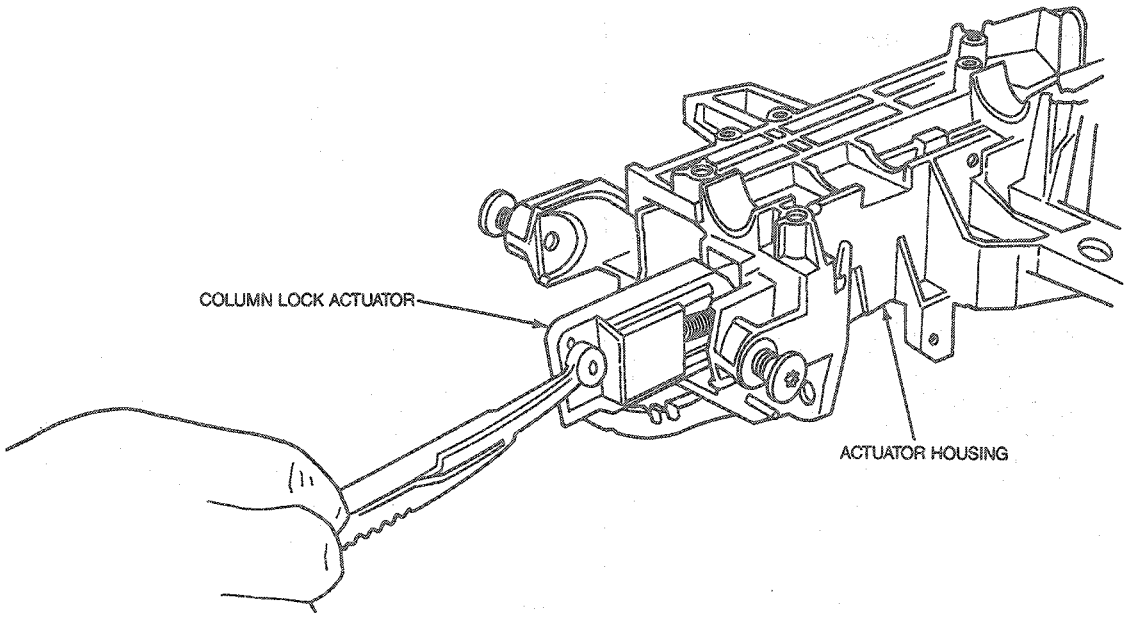
2. Install lower bearing and column mounting bracket. Tighten screws to 7-11 N·m (5-8 lb-ft).



3. Install sensor ring, bushing, spring and flex coupling to steering shaft. Tighten pinch bolt to 41-56 N·m (31-41 lb-ft).

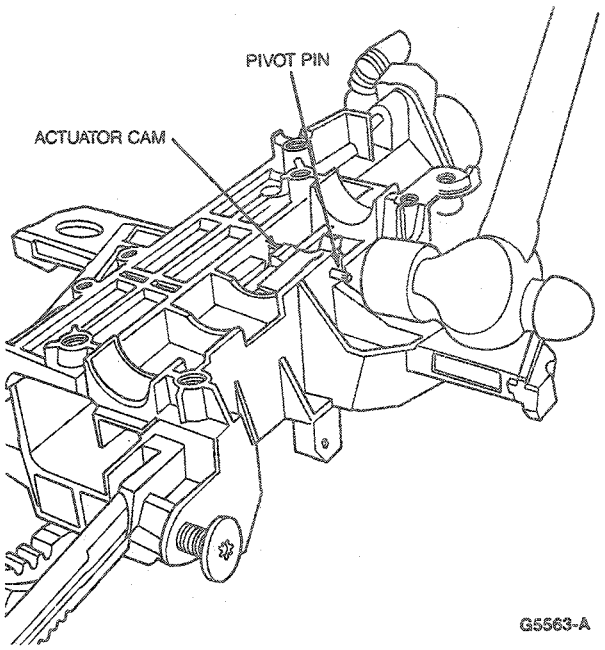


4. Position lock actuator assembly in housing. Spray upper and lower actuators with Multi-Purpose Grease D7AZ-19584-AA (ESR-M1C159-A, ESB-M1C106-B) or equivalent.



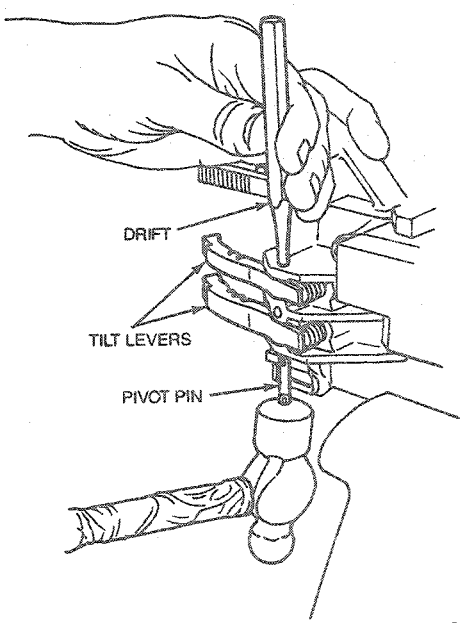
DISASSEMBLY AND ASSEMBLY (Continued)

5. Position actuator cam in lock housing and install cam pivot pin with small hammer. Tap pin in until flush with housing.



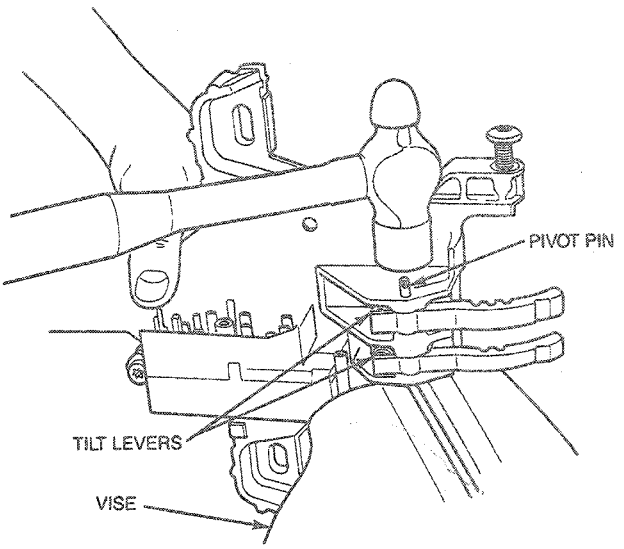
G5563-A

6. Install one tilt lever spring and arm into housing using a drift to hold in place.
7. Install the other lever spring and arm with pivot pin. Tap pin into place while driving out drift.



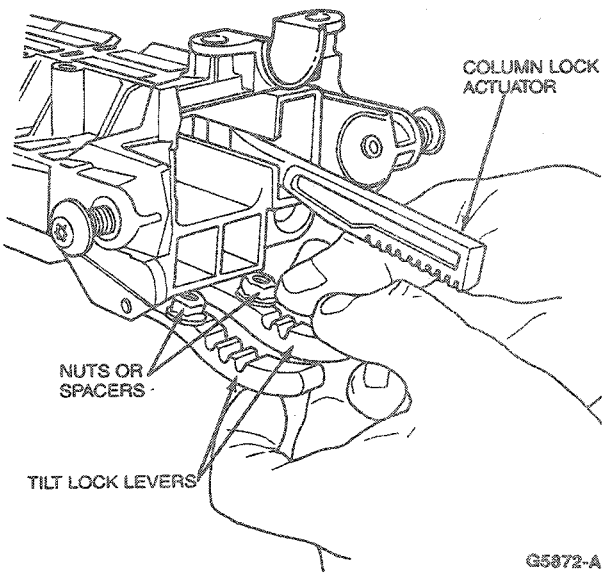
G5564-A

8. Support housing in a vise and drive pin flush with housing.



G5565-A

9. Place two nuts or spacers to hold tilt lock arms away from housing.

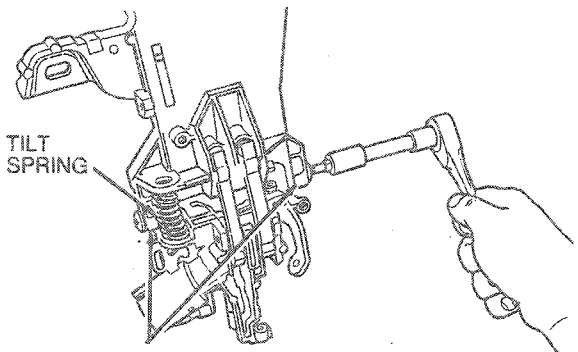


G5872-A

DISASSEMBLY AND ASSEMBLY (Continued)

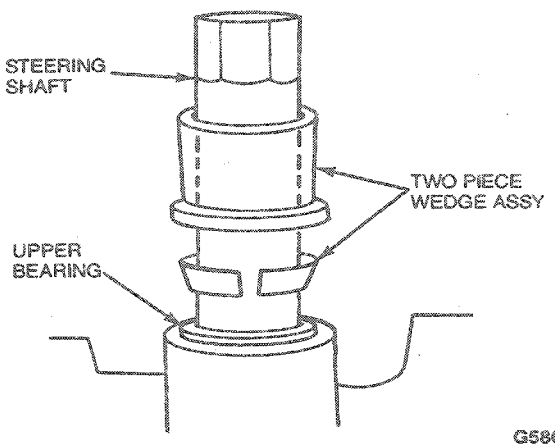
10. Position tilt spring on lock housing. With assistant, install lock housing and pivot bolts. Tighten to 20-28 N·m (14-20 lb-ft).

    NOTE: Lube pivot bolts with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A, ESB-M1C93-A) or equivalent before installing.



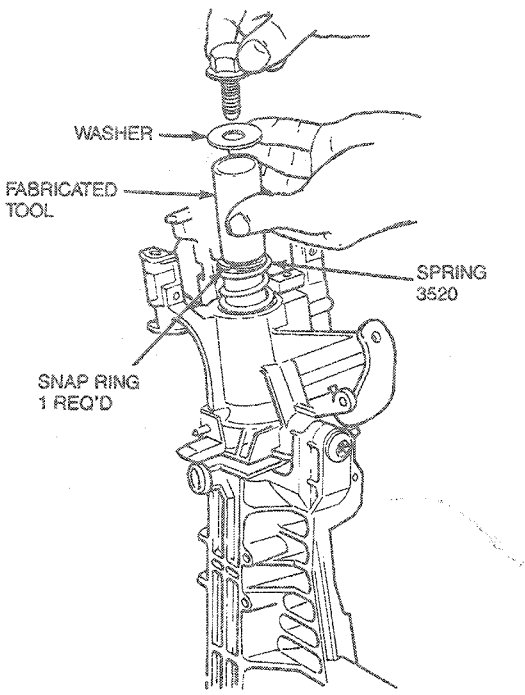
G5528-C

11. Install steel sleeve and ring over steering shaft to upper bearing.



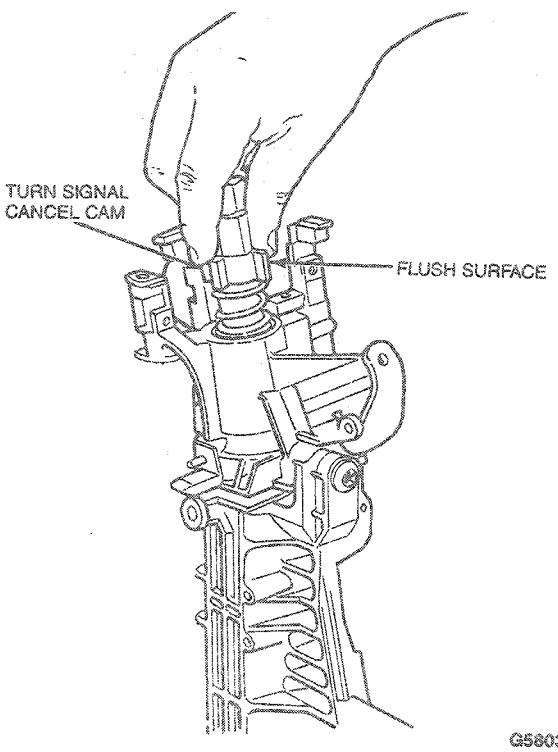
G5865-A

12. Install spring and new snap ring on top side of spring using a 3/4-inch by 2-1/4 inch PVC pipe.



G5802-A

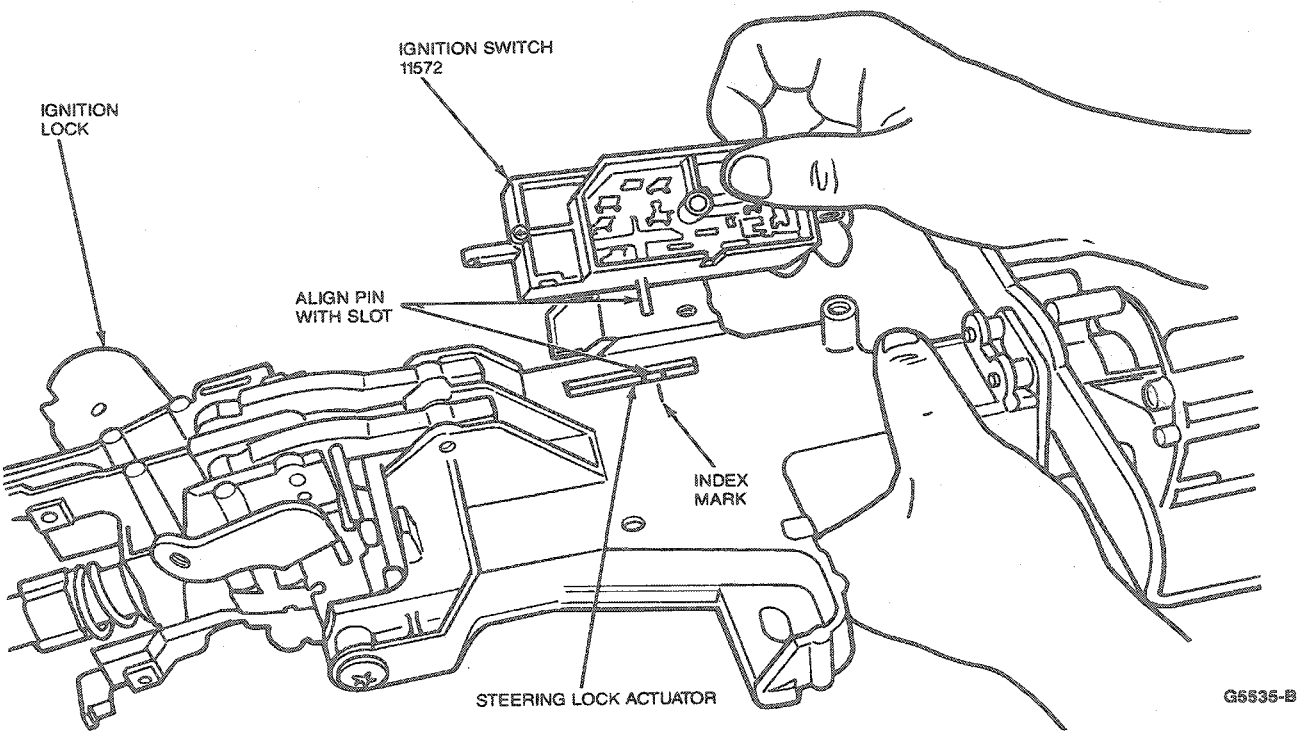
13. Install turn signal cancel cam, flush surface "up".

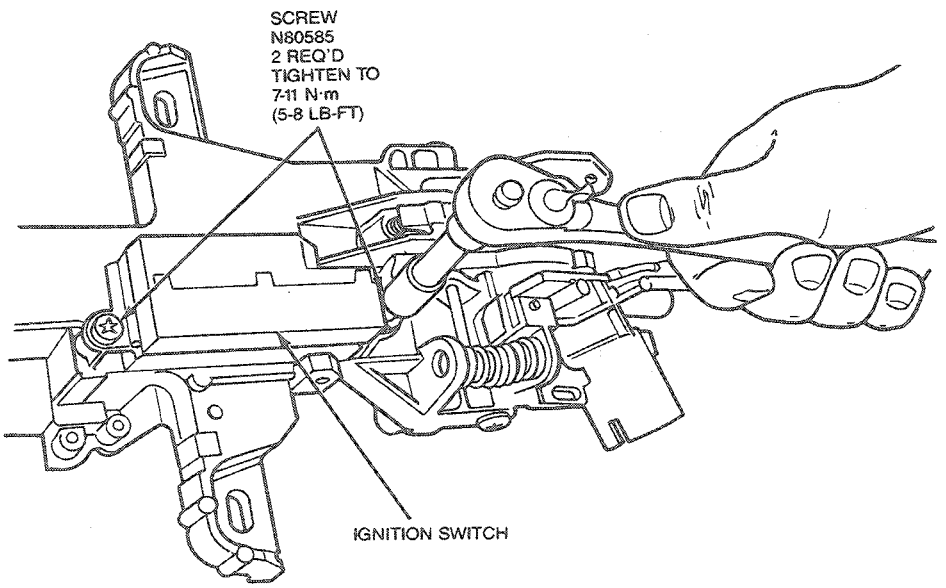


G5803-A

DISASSEMBLY AND ASSEMBLY (Continued)

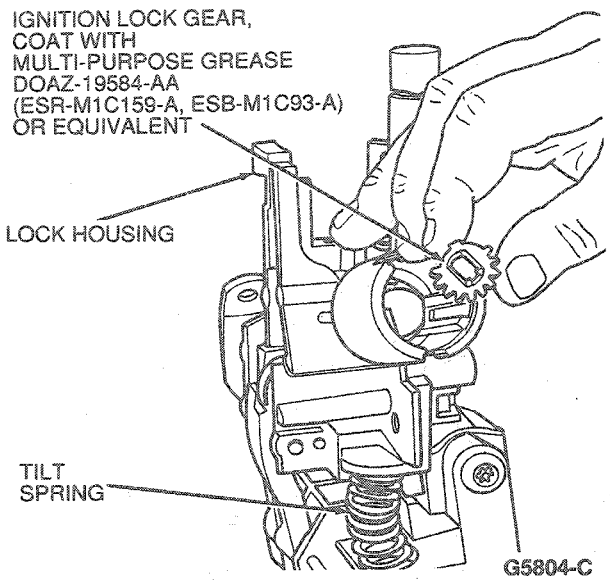
14. Install ignition switch. Align pin from switch with slot in lock / column assembly. Position slot in lock / column assembly with index mark on casting. Tighten two retaining screws to 7-11 N·m (5-8 lb-ft).



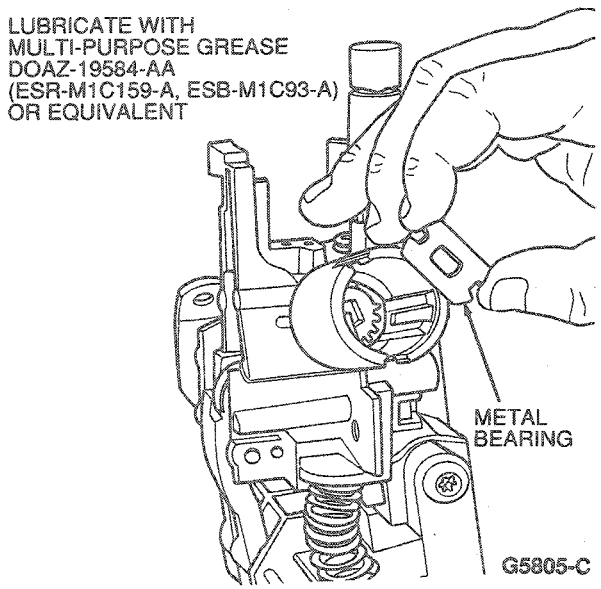


DISASSEMBLY AND ASSEMBLY (Continued)

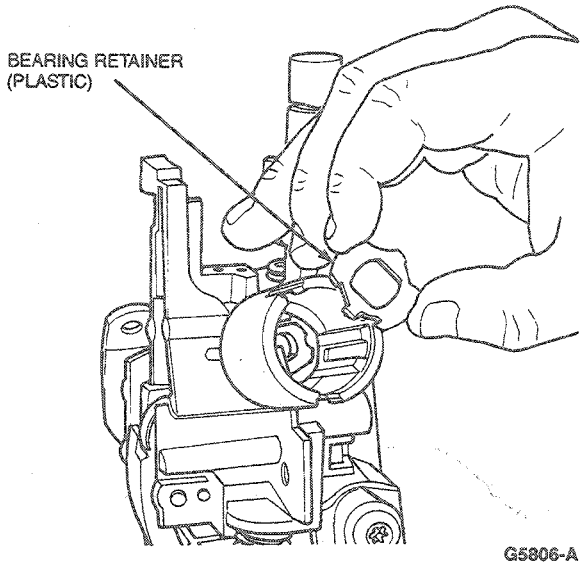
15. Install ignition lock gear. Coat gear with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A, ESB-M1C93-A) or equivalent.



16. Install metal bearing. Lubricate with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A, ESB-M1C93-A) or equivalent.



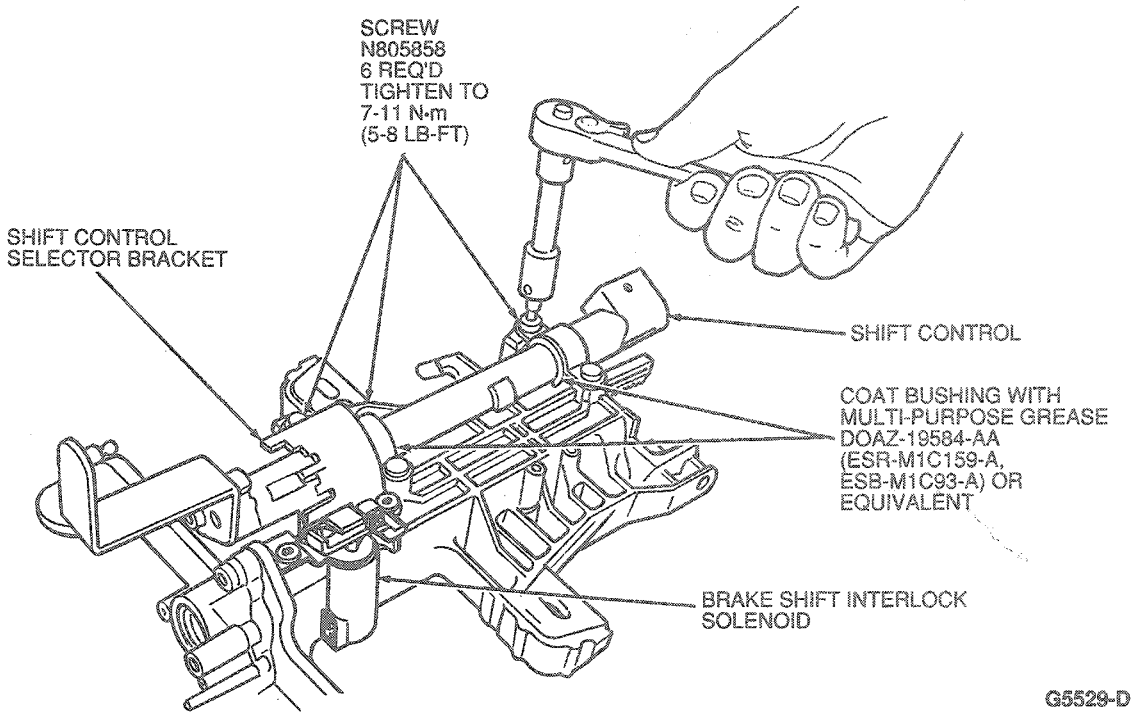
17. Install plastic bearing retainer.



18. Install shift control tube assembly (column shift only). Coat bushings with Multi-Purpose Grease D0AZ-19584-AA (ESR-M1C159-A, ESB-M1C93-A) or equivalent. Tighten screws to 7-11 N·m (5-8 lb-ft).
19. Install shift control selector bracket.
20. Install brake shift interlock solenoid.

DISASSEMBLY AND ASSEMBLY (Continued)

Column Shift

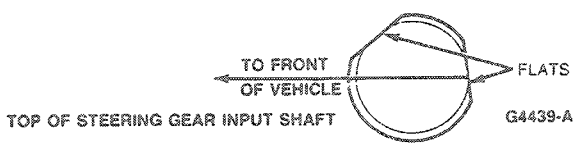


21. Install shift cable bracket on lower column bearing assembly with two bolts (column shift).
22. Install column in vehicle as outlined.
23. Install air bag clockspring contact as outlined.
24. Install steering wheel as outlined.
25. Install air bag module. Refer to Section 01-20B.
26. Connect battery ground strap and air bag backup power supply.
27. Verify air bag warning indicator.

ADJUSTMENTS

Steering Wheel Spoke Position

When the flats on the steering gear input shaft are positioned as shown, the front wheels should be in the straight-ahead position and the steering wheel spokes should be in their normal position. They can be repositioned by adjusting the tie rods or adjusting toe. Refer to Section 04-00. The steering wheel 12 o'clock mark must be aligned with steering shaft 12 o'clock mark when toe is adjusted.

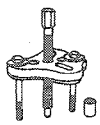


SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-Ft
Steering Wheel Retaining Bolt	31-48	22-33
Contact Assembly Screw	2-3	18-26 (Lb-in)
Steering Column Mounting Nut	13-19	9-14
Steering Shaft Yoke Coupling Bolt	41-56	31-41
Column Lower Mounting Bracket Bolt	7-11	5-8
Lock Housing Pivot Bolt	20-28	14-20
Ignition Switch Screw	7-11	5-8
Shift Control Tube Screw	7-11	5-8
Air Bag Module Nuts	4-5.4	36-47 (Lb-in)
Lower Column Bearing Bolt	7-11	5-8
Intermediate Shaft Screw	41-56	31-41
Air Bag Screw	4-5.4	36-47 (Lb-in)
Tilt Lever	3.5-5	28-44 (Lb-in)
Steering Boot Nut	5-7	44-61 (Lb-in)

SPECIAL SERVICE TOOLS

Tool Number / Description	Illustration
T67L-3600-A Steering Wheel Puller	 T67L-3600-A

SECTION 11-05 Steering Column Switches

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

Switch, Ignition

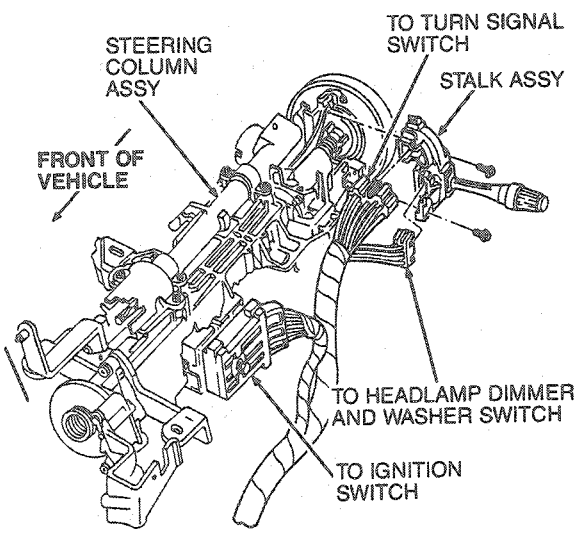
The ignition switch is mounted on the lock cylinder housing and is controlled by the lock cylinder through a pin which is part of the ignition switch.

The lock cylinder also controls the mechanism which provides a positive lock for the transaxle linkage and the steering system. The locking mechanism is located in the lock cylinder housing at the upper end of the steering column.

The lock cylinder positions are ACC, LOCK, OFF, RUN and START. With column shift automatic transaxle, the lock cylinder key can be removed from the lock cylinder only when the shift lever is in PARK position and the key is in LOCK position. The ACC position operates while the steering and transaxle systems remain locked. Turning the key to OFF position shuts off the engine without locking the steering or transaxle systems.

Switch, Blade-Type

The switch has blade-type terminals that engage with one multiple connector. The multiple connector is secured to the switch by an integral connector fastener.



DESCRIPTION AND OPERATION (Continued)

Switch, Multi-Function

The multi-function switch unifies the turn signal, headlamp dimmer, headlamp flash-to-pass, hazard warning, cornering lamps (optional) and windshield washer / wiper. The multi-function switch assembly is mounted to the steering column.

Turn Signal Switching

The turn signal lever is located on the LH side of the upper steering column. To operate the turn signal(s), the key lock cylinder must be in the RUN position. To indicate a normal full turn, move the turn signal lever to the end-of-travel position for the turn desired. The lever will remain in position without effort until the turn is completed, at which time the steering wheel cancel cam will automatically cancel the turn signal.

The turn signal system also has a lane change feature. To operate the lane change feature, move and hold the turn signal lever to the first stop position when changing lanes. When the lane maneuver is completed, release the lever and it will return to its normal position.

Hazard Flasher Switching

The hazard flasher system operates independently from the key lock cylinder. All turn signal lamps can be made to flash in unison by depressing and releasing the hazard actuator located on the top part of the steering column. The switch is identified by a "double triangle" symbol.

The actuator will move out or away from the steering column to the ON position. The hazard flasher system is turned off by first pushing in the actuator and then releasing the actuator. The actuator should remain in or toward the steering column in the OFF position.

NOTE: The turn signal system is deactivated when the hazard flasher system is on and turn signal lever motion does not affect the hazard flasher system.

One flasher unit is used for both the turn signal and the hazard flasher system. Refer to the Wiring and Vacuum Diagram manual.

Headlamp Dimmer / Flash-to-Pass Switching

The turn signal lever also operates the headlamp dimmer switch and the flash-to-pass feature. High beam is selected by pushing the turn signal lever away from the driver to the stop. Releasing the lever will maintain high beams. Low beam is selected by moving the turn signal lever toward the driver from the high beam position. Release of the lever will maintain low beams.

To operate the flash-to-pass feature, pull the lever gently toward the driver. When the lever is released, it will return to the LO beam position. If driving without headlamps on, use of the flash-to-pass feature will turn on the high beams until the turn signal lever is released. If the headlamps are turned on, the low and high beams will be on until the turn signal lever is released.

NOTE: Excessive force used to hold the turn signal lever in the flash-to-pass function followed by quick release may result in incorrect headlamp dimmer selection of high beam. The driver must be cautioned to avoid this condition.

Cornering Lamp Switching

The cornering lamp switch is coordinated with the turn signal function. In order to operate the cornering lamp function, the headlamps must be turned on.

Windshield Washer Switching

The washer switch is located at the end of the turn signal lever. To operate the washer, the key lock cylinder must be in the RUN position. To actuate the washer, push the end of the turn signal lever in toward the steering column. Releasing the turn signal lever will then turn off the washer. The wiper blades will continue to operate for a few wipes and then automatically return to the wiper speed setting (OFF, LO, HI, or INT) previously selected. Washer operation is available in all positions of wiper operation.

Windshield Wiper Switching

Interval

The wiper switch is located in the knob at the end of the turn signal lever. To operate the wiper, the key lock cylinder must be in the RUN position. In addition to OFF, there are two fixed speed wiper positions LO (low) HI (high) and an interval position. The positions are selected by rotating the knob actuator relative to the turn signal lever. If interval position is selected, the time between wiper cycles will decrease as the knob is rotated away from OFF position and will increase as the knob is rotated toward OFF position. The time interval between wipes will vary depending on the knob's position from OFF position. The wiper speed for interval wiper operation is fixed at the LO speed setting.

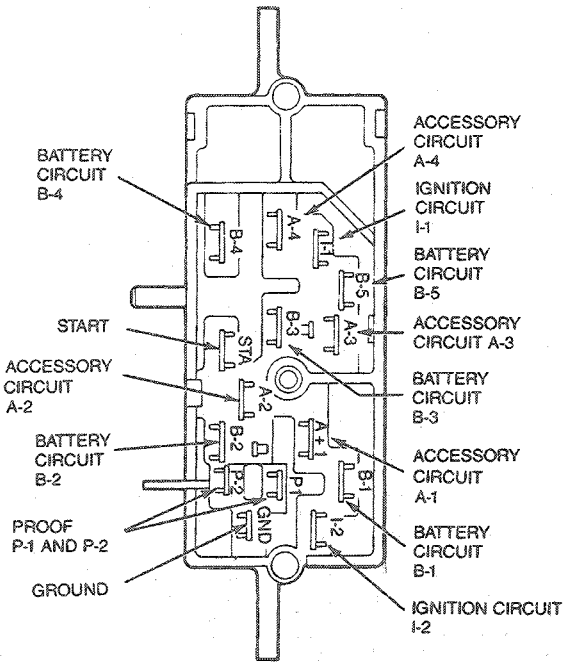
DIAGNOSIS AND TESTING

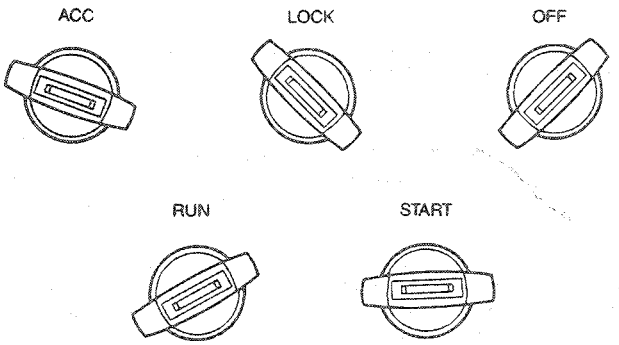
Continuity Test

Disconnect the multiple connector from the ignition switch. Test the switch continuity as described in the following illustration. Connect a self-powered test lamp or ohmmeter between the blade terminals indicated on the chart. No continuity between any blade and chassis ground should exist in any switch position except the proof Circuits, 41 and 977 in the START position only.

For an "engine won't crank" condition, determine if the condition exists with the shift lever in both PARK and NEUTRAL positions before performing the ignition switch continuity test. If the "no-crank" condition occurs in one shift lever position but not the other, a more probable cause is the neutral start switch located on the transaxle.

CONTINUITY TEST





SWITCH POSITION	CONTINUITY SHOULD EXIST ONLY BETWEEN
ACC	A-1 THROUGH B-5
LOCK	NO CONTINUITY
OFF	NO CONTINUITY
RUN	A-1 AND B-1, A-2 AND B-2, A-3 AND B-3, A4 AND B4, I1 AND B5
START	I-1 AND B-5, I-2 AND B-1, STA AND B-4, P-1 AND GRD, P-2 AND GRD.

K14670-B

Mechanical Test

Test the steering column ignition system mechanical operation by rotating the lock cylinder / key through all switch positions. The movement should feel smooth with no sticking or binding. The ignition system should return from the START position back to the RUN position without assistance (spring return). If sticking or binding is encountered, check for the following:

- Burrs on the lock cylinder key
- Binding lock cylinder
- Shroud rubbing against lock cylinder
- Burrs or foreign material around rack-and-pinion actuator in lock cylinder housing
- Insufficient lube on actuator

  NOTE: Do not apply lubricant to the inside of the ignition switch.
- Binding ignition switch

Switch, Multi-Function

The multi-function switch is a combination turn signal, hazard and dimmer switch which has a number of on / off switches packaged as a single unit. Testing for electrical malfunctions can be accomplished with a continuity tester. Malfunctions can be determined by checking continuity between the feed and function terminals of the switch.

Prior to testing, make sure hazard knob is pushed in fully to the OFF position. If the suspect circuit is satisfactory, the concern is elsewhere in the system.

Refer to the diagnostic charts and the illustration to resolve concerns with the multi-function switch.

DIAGNOSIS AND TESTING (Continued)

MECHANICAL MULTI-FUNCTION SWITCH DIAGNOSIS

CONDITION	TEST STEP	ACTION
Hazard Warning Switch Will Not Turn On Warning Lamps	With hazard warning switch in the OFF position, fully depress knob and release.	If knob does not pop up to the ON position, the switch is damaged or worn. Replace switch.
Hazard Warning Switch Will Not Turn Off Warning Lamps	With hazard warning switch in the ON position, fully depress knob and release.	If knob does not pop up to the OFF position, the switch is damaged or worn. Replace switch.
Turn Signal Lever Will Not Stay In The LH/RH Turn Positions	With steering wheel locked in the straight ahead position, move lever to the RH and LH turn positions.	If lever does not stay in either turn position, the switch is damaged or worn. Replace switch. NOTE: If lever stays in the turn position, verify that there is an effort required to manually move the lever from either the LH or RH turn position to the neutral position.
Turn Signal Lever Cancels Before Steering Wheel Returns From the Desired Turn Position	Road test vehicle to verify condition.	If lever cancels before steering wheel return, the switch is damaged or worn. Replace switch.
Turn Signal Lever Will Not Cancel When Steering Wheel Returns From the Desired Turn Position	Check effort to switch from high beam to low beam and the effort to manually cancel turn signal lever from a turn position.	If effort required to switch from HIGH BEAM to LOW BEAM is less than manually cancelling turn signal lever from a turn position, switch is damaged or worn. Replace switch.
Headlamp Dimmer Switch Does Not Stop In LOW BEAM Position After The Flash-to-Pass Function is Operated	Gently pull turn signal lever to the FLASH-TO-PASS position and release.	If lever stops in the LOW BEAM position, switch is good. If lever travels beyond LOW BEAM position, the switch is damaged or worn. Replace switch.
Headlamp Dimmer Switch Does Not Return to LOW BEAM Position After The Flash-to-Pass Function Is Operated	Gently pull turn signal lever to the FLASH-TO-PASS position and release.	If lever does not return to the LOW BEAM position, the switch is damaged or worn. Replace switch.
Windshield Washer Switch Knob Does Not Return From The WASH Position	With ignition lock cylinder in the OFF position, push the washer switch knob to the ON position and release.	If washer switch knob does not return to the OFF position, the switch is damaged or worn. Replace switch.
Windshield Wiper Switch Knob Rotates Past The OFF and/or HI Stops	Slowly turn knob in both directions, observe and feel where the switch knob stops.	If knob rotates past OFF and/or HI, switch is damaged or worn. Replace switch.
Windshield Wiper Switch Knob Rotates Easily From OFF, LO HI or the INTERVAL Position During Turn Signal or Headlamp Dimmer Operation	Position finger on top of knob parallel to steering column. Gently pull finger back toward steering wheel and push down on lever toward LH turn position. Check each position, HI, LO, OFF and INTERVAL positions.	If knob rotates from any of the positions, switch is damaged or worn. Replace switch.

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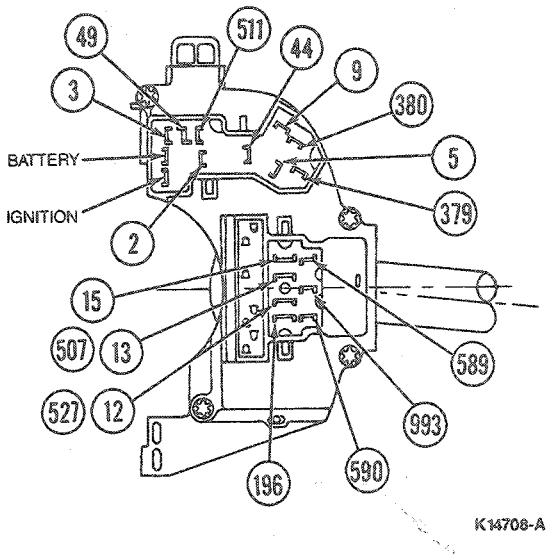
Switch Continuity

Tools Required:

- Rotunda Digital Volt-Ohmmeter 007-00001

DIAGNOSIS AND TESTING (Continued)

Testing for electrical malfunctions can be accomplished using a continuity tester and an ohmmeter, such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent.



MULTI-FUNCTION SWITCH — BENCH CHECK CONTINUITY

SWITCH ACTUATOR POSITION	CONTINUITY BY CIRCUIT NUMBER
Turn Signal Lever in Neutral — Hazard OFF	**Turn Signal:** Closed 511 to 5 and 9; Ignition B+ to 49. Open 511 to 2, 3, 44 and 385: 44 to 2, 3, 5, 9 and 385; 385 to 2 and 3; Battery B+ to 49. **Cornering Lamp:** Open 15 to 379 and 380; 379 to 380.
Turn Signal Lever in Left Turn — Hazard OFF	**Turn Signal:** Closed 511 to 5; 44 to 3 and 9; Ignition B+ to 49. Open 511 to 3, 9, 44 and 385; 44 to 2, 5 and 385; 385 to 2; Battery B+ to 49. **Cornering Lamp:** Closed 15 to 380. Open 15 to 379; 379 to 380.
Turn Signal Lever in Right Turn — Hazard OFF.	**Turn Signal:** Closed 511 to 9; 44 to 2 and 5; Ignition B+ to 49. Open 511 to 2, 5, 44 and 385; 44 to 3, 9 and 385; 385 to 2; Battery B+ to 49. **Cornering Lamp:** Closed 15 to 380. Open 15 to 379; 379 to 380.
Hazard ON	Closed 44 to 2, 3, 5 and 9; Battery B+ to 49. Open 511 to 5, 9, 44, 2 and 3; Ignition B+ to 49.
Hazard OFF Turn Signal Lever, Right Turn	Closed 511 to 9; 44 to 2 and 5; 15 to 379. Open 511 to 2, 5, 44 and 385; 44 to 3, 9 and 385; 385 to 2.
Headlamp Beam Switching:	
●Lever at **High Beam**	Closed 15 to 12. Open 15 to 13 and 196; 196 to 12.
●Lever at **Low Beam**	Closed 15 to 13. Open 15 to 12 and 196; 196 to 13.
●Lever at **FLASH-TO-PASS**	Closed 15 to 13; 196 to 12. Open 15 to 12; 196 to 13.
Auto Dim Switching:	
●Lever in **Auto Dim Position**	Closed 15 to 507. Open 15 to 527 and 196; 527 to 196.
●Lever in **Low Beam**	Closed 15 to 13. Open 15 to 527 and 196; 527 to 196.
●Lever in **Flash-to-Pass**	Closed 196 to 527. Open 15 to 527, 507 and 196; 527 to 507; 507 to 196.

(Continued)

DIAGNOSIS AND TESTING (Continued)

MULTI-FUNCTION SWITCH — BENCH CHECK CONTINUITY (Cont'd)

SWITCH ACTUATOR POSITION	CONTINUITY BY CIRCUIT NUMBER
Wiper / Washer Switching:	
•Wash OFF and Wiper OFF	Resistance 993 to 590, 103.3K ohms ± 10%. Resistance 993 to 589, 47.6K ohms ± 10%.
•Wash ON and Wiper OFF	Closed 993 to 590; Resistance 993 to 589, 47.6K ohms ± 10%.
•Wiper OFF and Wash OFF	Resistance 993 to 590, 103.3K ohms ± 10%. Resistance 993 to 589, 47.6K ohms ± 10%.
•Wiper LO or Low Speed and Wash OFF	Resistance 993 to 590, 3.3K ohms ± 10%. Resistance 993 to 589, 4.08K ohms ± 10%.
•Wiper HI or High Speed and Wash OFF	Resistance 993 to 590, 3.3K ohms ± 10%. Closed 993 to 589.
•Wiper Interval and Wash OFF	Resistance 993 to 589, 11.33K ohms ± 10%. Resistance 993 to 590. Gradually decreasing from 103.3K ohms to 3.3K ohms from Maximum Delay to Minimum Delay.

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REMOVAL AND INSTALLATION

Switch, Ignition

Removal

1. Disconnect battery ground cable. Remove the steering column shroud by removing the four or five self-tapping screws. Remove tilt lever (if so equipped).
2. Remove instrument panel lower steering column cover.
3. Disconnect the ignition switch electrical connector.
4. Rotate ignition key lock cylinder to the RUN position.
5. Remove the two screws retaining ignition switch.
6. Disengage the ignition switch from the actuator.

Installation

NOTE: A new replacement switch assembly will be set in the RUN position as received.

1. Adjust the ignition switch by sliding the carrier to the switch RUN position.
2. Check to ensure that the ignition key lock cylinder is in the RUN position. The RUN position is achieved by rotating the key lock cylinder approximately 90 degrees from the LOCK position.
3. Install the ignition switch pin into the actuator. It may be necessary to move the switch slightly back and forth to align the switch mounting holes with the column lock housing threaded holes.
4. Install retaining screws. Tighten to 5.6-7.9 N•m (50-69 lb-in).
5. Connect electrical connector to ignition switch.
6. Connect battery ground cable. Check ignition switch for proper function, including START and ACC positions. Also, make certain that the column is locked in the LOCK position.
7. Install instrument panel lower steering column cover.
8. Install the steering column trim shrouds and tilt lever (if so equipped).

Switch, Multi-Function

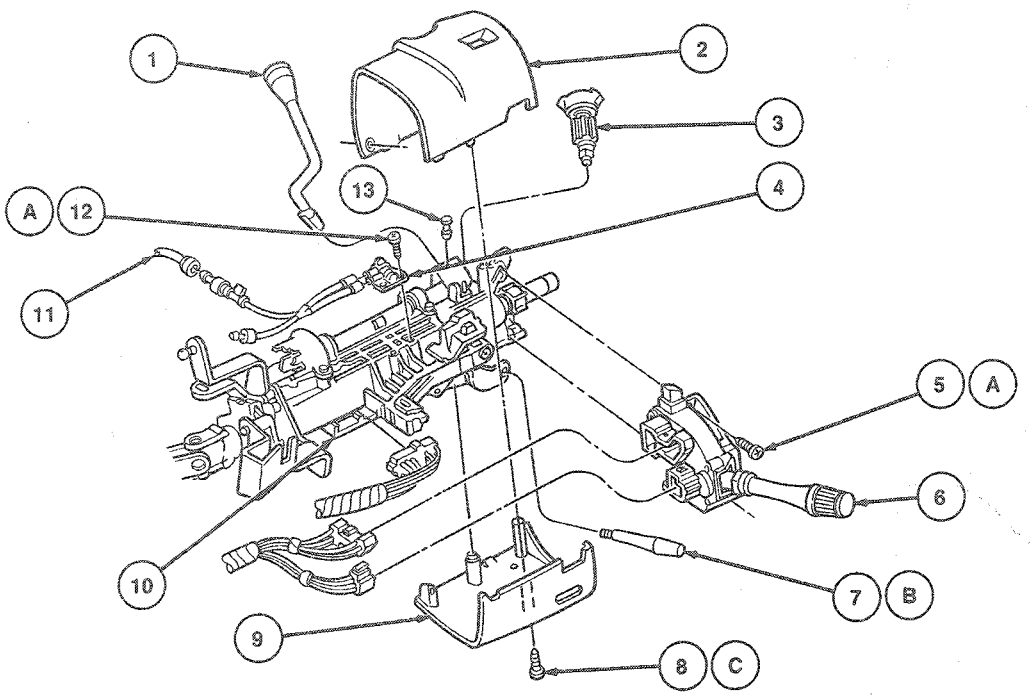
Removal

1. Disconnect battery ground cable.
2. Tilt column to lowest position and remove tilt lever.
3. Remove ignition lock cylinder as outlined.
4. Remove shroud screws and remove upper and lower shroud.
5. Remove two self-tapping screws that attach multi-function switch to steering column casting. Disengage switch from casting.
6. Disconnect the two electrical connectors.

Installation

1. Install two electrical connectors to full engagement.
2. Align multi-function switch mounting holes with corresponding holes in the steering column casting. Install two self-tapping screws making sure to start the screws in the previously tapped holes. Tighten to 2-3 N•m (17-26 lb-in).
3. Install upper and lower steering column shroud with screws.
4. Install ignition lock cylinder as outlined.
5. Attach tilt lever.
6. Connect battery ground cable.
7. Check steering column and switch for proper operation.

REMOVAL AND INSTALLATION (Continued)



K13999-B

Item	Part Number	Description
1	7202	Shift Lever Assy
2	3530	Upper Shroud
3	11A606	Ignition Lock Assy
4	2B623	Park Brake Release Assy
5A	390345-S36	Screw (2 Req'd)
6	13K359	Switch Assy
7B	3F609	Tilt Lever
8C	55929-S2	Screw (4 Req'd)
9	3533	Lower Shroud

(Continued)

Item	Part Number	Description
10	11572	Ignition Switch
11	2B653	Hose
12A	390345-S36	Screw (2 Req'd)
13	7G357	Pin
A		Tighten to 2-3 N·m (17-26 Lb-In)
B		Tighten to 3.5-5.0 N·m (30-44 Lb-In)
C		Tighten to 0.6-1.13 N·m (6-10 Lb-In)

Flasher Unit

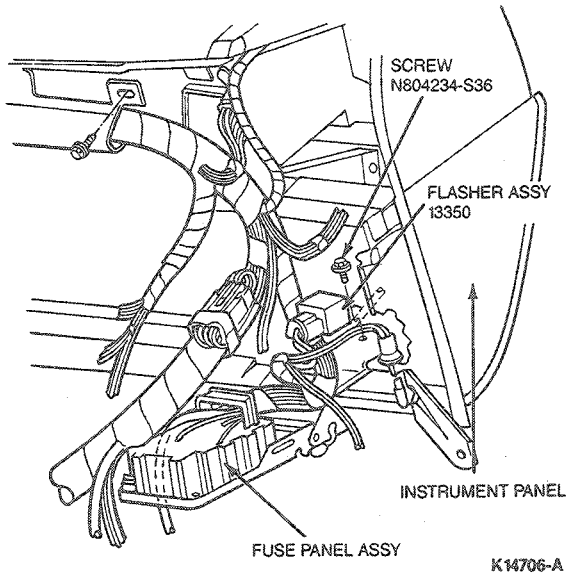
Removal and Installation

The turn signal flasher is located on the LH side of the instrument panel, and is retained by one screw to the lower instrument panel reinforcement.

REMOVAL AND INSTALLATION (Continued)

The combination turn signal and hazard flasher can be removed by tilting and sliding the flasher off the bracket. To install a new flasher, remove the bracket from the new unit, then align the existing bracket to the instrument panel with the track on the flasher housing. Then push the flasher forward until it snaps into the bracket.

NOTE: The electrical wiring connector can be removed before installing a new unit, and engaged into the new unit prior to snapping it into the bracket.



SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Multi-Function Switch -to-Column Bolts	2-3	17-26
Column Shroud Screws	0.6-1.13	6-10
Tilt Lever	3.5-5.0	30-44
Ignition Switch Screws	5.6-7.9	50-69

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter