

STEERING COLUMNS

2J

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GENERAL

Three different steering column designs are used on Jeep vehicles. Models with automatic transmission use a nontilt column with column mounted gearshift mechanism. Models with manual transmission use a nontilt column with ignition key release lever. A six position tilt column is available as an option on all models.

All steering columns used on Jeep vehicles have anti-theft and energy absorbing features. Each column is designed to compress under impact.

The ignition lock cylinder and ignition switch are mounted on the column. When the lock cylinder is turned to LOCK position, the ignition switch and steering shaft cannot be operated. On models with automatic

transmission, the lock mechanism also prevents operation of the column mounted gearshift mechanism.

A center slip-type (telescoping) intermediate shaft is used on all models. It is attached to the steering gear with a flexible coupling and to the steering column with a universal joint.

SERVICE DIAGNOSIS

When diagnosing steering column malfunctions, refer to the Service Diagnosis Charts for the probable cause and correction procedures. To simplify chart use, they are divided into the various sub-systems within the column such as ignition system, lock mechanism, turn signal switch and electrical.

Service Diagnosis—Lock System

Condition	Possible Cause	Correction
WILL NOT LOCK	(1) Lockbolt spring broken or defective.	(1) Replace lock bolt spring.
HIGH EFFORT (REQUIRED TO TURN IGNITION KEY AND LOCK CYLINDER.)	(1) Lock cylinder defective.	(1) Replace lock cylinder.
	(2) Ignition switch defective.	(2) Replace ignition switch.
	(3) Rack preload spring broken or deformed.	(3) Replace preload spring.

Service Diagnosis—Lock System

Condition	Possible Cause	Correction
HIGH EFFORT (REQUIRED TO TURN IGNITION KEY AND LOCK CYLINDER) (CON'T)	(4) Burr on lock sector, lock rack, housing, support or remote rod coupling. (5) Bent sector shaft. (6) Defective lock rack. (7) Remote rod bent, deformed. (8) Ignition switch mounting bracket bent. (9) Distorted coupling slot in lock rack (tilt column).	(4) Remove burr. (5) Replace shaft. (6) Replace lock rack. (7) Replace rod. (8) Straighten or replace. (9) Replace lock rack.
WILL STICK IN "START"	(1) Remote rod deformed. (2) Ignition switch mounting bracket bent.	(1) Straighten or replace. (2) Straighten or replace.
KEY CANNOT BE REMOVED IN "OFF-LOCK"	(1) Ignition switch is not adjusted correctly. (2) Defective lock cylinder.	(1) Adjust switch. (2) Replace lock cylinder.
LOCK CYLINDER CAN BE REMOVED WITHOUT DEPRES- SING RETAINER	(1) Lock cylinder with defective retainer. (2) Burr over retainer slot in housing cover or on cylinder retainer.	(1) Replace lock cylinder. (2) Remove burr.
HIGH EFFORT ON LOCK CYLINDER BETWEEN "OFF" AND "OFF-LOCK"	(1) Distorted lock rack. (2) Burr on tang of shift gate (automatic column). (3) Gearshift linkage not adjusted.	(1) Replace lock rack. (2) Remove burr. (3) Adjust linkage.

Service Diagnosis—Steering Column

Condition	Possible Cause	Correction
NOISE IN COLUMN	<ol style="list-style-type: none"> (1) One click when in "off-lock" position and the steering wheel is moved (all except automatic column). (2) Coupling bolts not tightened. (3) Lack of grease on bearings or bearing surfaces. (4) Upper shaft bearing worn or broken. (5) Lower shaft bearing worn or broken. (6) Column not correctly aligned. (7) Coupling pulled apart. (8) Broken coupling lower joint. (9) Steering shaft snap ring not seated. (10) Shroud loose on shift bowl. Housing loose on jacket—will be noticed with ignition in "off-lock" and when torque is applied to steering wheel. 	<ol style="list-style-type: none"> (1) Normal—lock bolt is seating. (2) Tighten pinch bolts. (3) Lubricate with chassis grease. (4) Replace bearing assembly. (5) Replace bearing. Check shaft and replace if scored. (6) Align column. (7) Replace coupling. (8) Repair or replace joint and align column. (9) Replace snap ring. Check for proper seating in groove. (10) Position shroud over lugs on shift bowl. Tighten mounting screws.
HIGH STEERING SHAFT EFFORT	<ol style="list-style-type: none"> (1) Column misaligned. (2) Defective upper or lower bearing. (3) Tight steering shaft universal joint. (4) Flash on I.D. of shift tube at plastic joint (tilt column only). (5) Upper or lower bearings siezed. 	<ol style="list-style-type: none"> (1) Align column. (2) Replace as required. (3) Repair or replace. (4) Replace shift tube. (5) Replace bearings.
LASH IN MOUNTED COLUMN ASSEMBLY	<ol style="list-style-type: none"> (1) Column mounting bracket bolts loose. (2) Broken weld nuts on column jacket. (3) Column capsule bracket sheared. (4) Column bracket to column jacket mounting bolts loose. (5) Loose lock shoes in housing (tilt column only). 	<ol style="list-style-type: none"> (1) Tighten bolts. (2) Replace column jacket. (3) Replace bracket assembly. (4) Tighten to specified torque. (5) Replace shoes.

Service Diagnosis—Steering Column (Continued)

Condition	Possible Cause	Correction
HOUSING LOOSE (TILT COLUMN ONLY)	<ul style="list-style-type: none"> (6) Loose pivot pins (tilt column only). (7) Loose lock shoe pin (tilt column only). (8) Loose support screws (tilt column only). (1) Excessive clearance between holes in support or housing and pivot pin diameters. (2) Housing support-screws loose. 	<ul style="list-style-type: none"> (6) Replace pivot pins and support. (7) Replace pin and housing. (8) Tighten screws. (1) Replace pivot pins and support. (2) Tighten screws.
STEERING WHEEL LOOSE—EVERY OTHER TILT POSITION (TILT COLUMN ONLY)	<ul style="list-style-type: none"> (1) Loose fit between lock shoe and lock shoe pivot pin. 	<ul style="list-style-type: none"> (1) Replace lock shoes and pivot pin.
STEERING COLUMN NOT LOCKING IN ANY TILT POSITION (TILT COLUMN ONLY)	<ul style="list-style-type: none"> (1) Lock shoe seized on pivot pin. (2) Lock shoe grooves have burrs or are filled with foreign material. (3) Lock shoe springs weak or broken. 	<ul style="list-style-type: none"> (1) Replace lock shoes and pin. (2) Clean or replace lock shoes. (3) Replace springs.
NOISE WHEN TILTING COLUMN (TILT COLUMN ONLY)	<ul style="list-style-type: none"> (1) Upper tilt bumpers worn. (2) Tilt spring rubbing in housing. 	<ul style="list-style-type: none"> (1) Replace tilt bumper. (2) Lubricate with chassis grease.
ONE CLICK WHEN IN "OFF-LOCK" POSITION AND THE STEERING WHEEL IS MOVED	<ul style="list-style-type: none"> (1) Seating of lock bolt. 	<ul style="list-style-type: none"> (1) None. Click is normal characteristic sound produced by lock bolt as it seats.
HIGH SHIFT EFFORT (AUTOMATIC AND TILT COLUMN ONLY)	<ul style="list-style-type: none"> (1) Column not correctly aligned. (2) Lower bearing not aligned correctly. (3) Lack of grease on seal or lower bearing areas. 	<ul style="list-style-type: none"> (1) Align column. (2) Assemble correctly. (3) Lubricate with chassis grease.
IMPROPER TRANS- MISSION SHIFTING— AUTOMATIC AND TILT COLUMN ONLY	<ul style="list-style-type: none"> (1) Sheared shift tube joint. (2) Improper transmission gearshift linkage adjustment. (3) Loose lower shift lever. 	<ul style="list-style-type: none"> (1) Replace shift tube. (2) Adjust linkage. (3) Replace shift tube.

Service Diagnosis—Ignition System

Condition	Possible Cause	Correction
IGNITION SWITCH ELECTRICALLY INOPERATIVE	(1) Loose or defective switch connector. (2) Feed wire open (fusible link). (3) Defective ignition switch.	(1) Tighten or replace connector. (2) Repair or replace. (3) Replace ignition switch.
ENGINE WILL NOT CRANK	(1) Ignition switch not adjusted properly.	(1) Adjust switch.
IGNITION SWITCH WILL NOT ACTUATE MECHANICALLY	(1) Defective ignition switch. (2) Defective lock sector. (3) Defective remote rod.	(1) Replace switch. (2) Replace lock sector. (3) Replace remote rod.
IGNITION SWITCH CANNOT BE ADJUST- ED CORRECTLY	(1) Remote rod deformed.	(1) Repair, straighten or replace.

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Service Diagnosis—Turn Signal

Condition	Possible Cause	Correction
TURN SIGNAL WILL NOT CANCEL	(1) Loose switch mounting screws. (2) Switch or anchor bosses broken. (3) Broken, missing or out of position detent, or cancelling spring.	(1) Tighten screws. (2) Replace switch. (3) Reposition springs or replace switch as required.

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Service Diagnosis — Turn Signal (Continued)

Condition	Possible Cause	Correction
TURN SIGNAL DIFFICULT TO OPERATE	<ul style="list-style-type: none"> (1) Turn signal lever loose. (2) Switch yoke broken or distorted. (3) Loose or misplaced springs. (4) Foreign parts and/or materials in switch. (5) Switch mounted loosely. 	<ul style="list-style-type: none"> (1) Tighten mounting screw. (2) Replace switch. (3) Reposition springs or replace switch. (4) Remove foreign parts and/or material. (5) Tighten mounting screws.
TURN SIGNAL WILL NOT INDICATE LANE CHANGE	<ul style="list-style-type: none"> (1) Broken lane change pressure pad or spring hanger. (2) Broken, missing or misplaced lane change spring. (3) Jammed wires. 	<ul style="list-style-type: none"> (1) Replace switch. (2) Replace or reposition as required. (3) Loosen mounting screws, reposition wires and retighten screws.
TURN SIGNAL WILL NOT STAY IN TURN POSITION	<ul style="list-style-type: none"> (1) Foreign material or loose parts impeding movement of switch yoke. (2) Defective switch. 	<ul style="list-style-type: none"> (1) Remove material and/or parts. (2) Replace switch.
HAZARD SWITCH CANNOT BE PULLED OUT	<ul style="list-style-type: none"> (1) Foreign material between hazard support cancelling leg and yoke. 	<ul style="list-style-type: none"> (1) Remove foreign material. <ul style="list-style-type: none"> (a) No foreign material impeding function of hazard switch—replace turn signal switch.

Service Diagnosis — Turn Signal (Continued)

Condition	Possible Cause	Correction
NO TURN SIGNAL LIGHTS	<p>(1) Inoperative turn signal flasher.</p> <p>(2) Defective or blown fuse.</p> <p>(3) Loose chassis to column harness connector.</p> <p>(4) Disconnect column to chassis connector. Connect new switch to chassis and operate switch by hand. If vehicle lights now operate normally, signal switch is inoperative.</p> <p>(5) If vehicle lights do not operate check chassis wiring for opens, grounds, etc.</p>	<p>(1) Replace turn signal flasher.</p> <p>(2) Replace fuse.</p> <p>(3) Connect securely.</p> <p>(4) Replace signal switch.</p> <p>(5) Repair chassis wiring as required.</p>
INSTRUMENT PANEL TURN INDICATOR LIGHTS ON BUT NOT FLASHING	<p>(1) Burned out or damaged front or rear turn signal bulb.</p> <p>(2) If vehicle lights do not operate, check light sockets for high resistance connections, the chassis wiring for opens, grounds, etc.</p> <p>(3) Inoperative flasher.</p> <p>(4) Loose chassis to column harness connection.</p> <p>(5) Inoperative turn signal switch.</p> <p>(6) To determine if turn signal switch is defective, substitute new switch into circuit and operate switch by hand. If the vehicle's lights operate normally, signal switch is inoperative.</p>	<p>(1) Replace bulb.</p> <p>(2) Repair chassis wiring as required.</p> <p>(3) Replace flasher.</p> <p>(4) Connect securely.</p> <p>(5) Replace turn signal switch.</p> <p>(6) Replace turn signal switch.</p>

Service Diagnosis—Turn Signal (Continued)

Condition	Possible Cause	Correction
STOP LIGHT NOT ON WHEN TURN INDICATED	<p>(1) Loose column to chassis connection.</p> <p>(2) Disconnect column to chassis connector. Connect new switch into system without removing old. Operate switch by hand. If brake lights work with switch in the turn position, signal switch is defective.</p> <p>(3) If brake lights do not work check connector to stop light sockets for grounds, opens, etc.</p>	<p>(1) Connect securely.</p> <p>(2) Replace signal switch.</p> <p>(3) Repair connector to stop light circuits using service manual as guide.</p>
TURN INDICATOR PANEL LIGHTS NOT FLASHING	<p>(1) Burned out bulbs.</p> <p>(2) High resistance to ground at bulb socket.</p> <p>(3) Opens, grounds in wiring harness from front turn signal bulb socket to indicator lights.</p>	<p>(1) Replace bulbs.</p> <p>(2) Replace socket.</p> <p>(3) Locate and repair as required.</p>
TURN SIGNAL LIGHTS FLASH VERY SLOWLY	<p>(1) High resistance ground at light sockets.</p> <p>(2) Incorrect capacity turn signal flasher or bulb.</p> <p>(3) If flashing rate is still extremely slow, check chassis wiring harness from the connector to light sockets for high resistance.</p>	<p>(1) Repair high resistance grounds at light sockets.</p> <p>(2) Replace turn signal flasher or bulb.</p> <p>(3) Locate and repair as required.</p>

Service Diagnosis — Turn Signal (Continued)

Condition	Possible Cause	Correction
TURN SIGNAL LIGHTS FLASH VERY SLOWLY (CON'T.)	<p>(4) Loose chassis to column harness connection.</p> <p>(5) Disconnect column to chassis connector. Connect new switch into system without removing old. Operate switch by hand. If flashing occurs at normal rate, the signal switch is defective.</p>	<p>(4) Connect securely.</p> <p>(5) Replace turn signal switch.</p>
HAZARD SIGNAL LIGHTS WILL NOT FLASH—TURN SIGNAL FUNCTIONS NORMALLY	<p>(1) Blown fuse.</p> <p>(2) Inoperative hazard warning flasher.</p> <p>(3) Loose chassis-to-column harness connection.</p> <p>(4) Disconnect column to chassis connector. Connect new switch into system without removing old. Depress the hazard warning lights. If they now work normally, turn signal switch is defective.</p> <p>(5) If lights do not flash, check wiring harness "K" lead for open between hazard flasher and connector. If open, fuse block is defective.</p>	<p>(1) Replace fuse.</p> <p>(2) Replace hazard warning flasher in fuse panel.</p> <p>(3) Connect securely.</p> <p>(4) Replace turn signal switch.</p> <p>(5) Repair or replace brown wire or connector as required.</p>

STEERING COLUMN ALIGNMENT

- (1) Loosen all toe plate screws.
- (2) Remove instrument panel lower trim.
- (3) Loosen column mounting bracket-to-instrument-panel attaching bolts.
- (4) Pull steering column upward. Maintain upward pressure and tighten instrument panel-to-column mounting bracket bolts to 20 foot-pounds (27 N•m) torque.
- (5) Install lower clamp bracket and tighten bolts to 20 foot-pounds (27 N•m) torque.
- (6) Tighten toe plate screws to 10 foot-pounds (14 N•m) torque.
- (7) Install instrument panel lower trim.
- (8) On vehicles with automatic transmission, check gearshift manual linkage for proper operation. Refer to Chapter 2C—Automatic Transmission.

STEERING WHEEL REMOVAL**CJ Models**

- (1) Disconnect battery negative cable.
- (2) Place front wheels in straight ahead position.
- (3) Remove horn button. Pull button straight up to remove.
- (4) Remove steering wheel nut and washer.
- (5) Remove receiver bushing attaching screws and remove bushing.
- (6) Remove horn button receiver and contact plate.
- (7) Paint or scribe alignment marks on steering wheel and steering shaft for assembly reference.
- (8) Remove steering wheel using Puller J-21232 (fig. 2J-1).

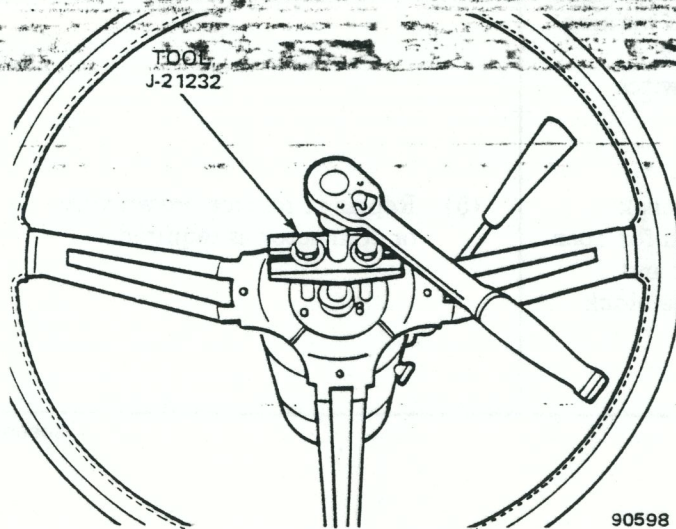


Fig. 2J-1 Steering Wheel Removal

Cherokee-Wagoneer-Truck Models

- (1) Disconnect battery negative cable.
- (2) Place front wheels in straight ahead position.

(3) On models with standard steering wheel, remove horn cover attaching screws from underside of wheel and remove cover. On models with sport steering wheel, remove horn button by pulling button upward.

(4) On models with standard steering wheel, remove horn wire. Disconnect wire at steering wheel switch. Unseat retainer that holds horn wire and spring in canceling cam yoke and remove wire, retainer, and spring as assembly.

(5) Remove steering wheel nut and washer.

(6) On models with sport steering wheel, remove receiver bushing attaching screws and remove bushing, horn button receiver, and contact plate.

(7) Paint or scribe alignment marks on steering wheel and steering shaft for assembly reference.

(8) Remove steering wheel using Puller J-21232 (fig. 2J-1).

STEERING WHEEL INSTALLATION

CAUTION: Some steering shafts have metric steering wheel nut threads. Inspect and identify the shaft thread-type before installing a replacement nut. Metric shafts have an identifying groove in the steering wheel splines (fig. 2J-2). American thread shafts do not have this groove.

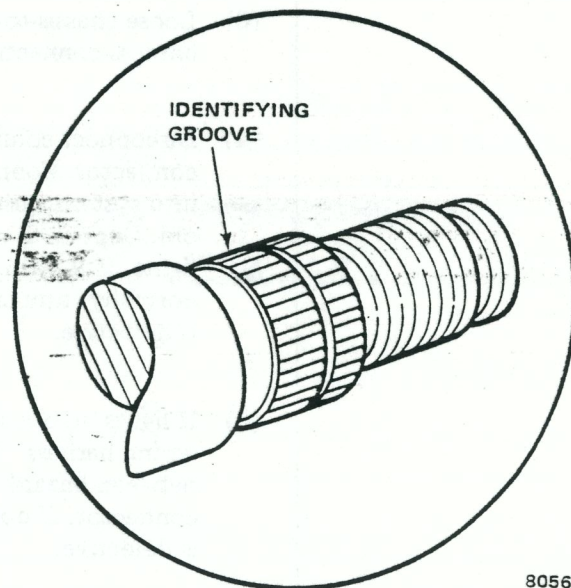


Fig. 2J-2 Metric Steering Shaft Identification

CJ Models

(1) Align reference marks on steering shaft and steering wheel and install wheel.

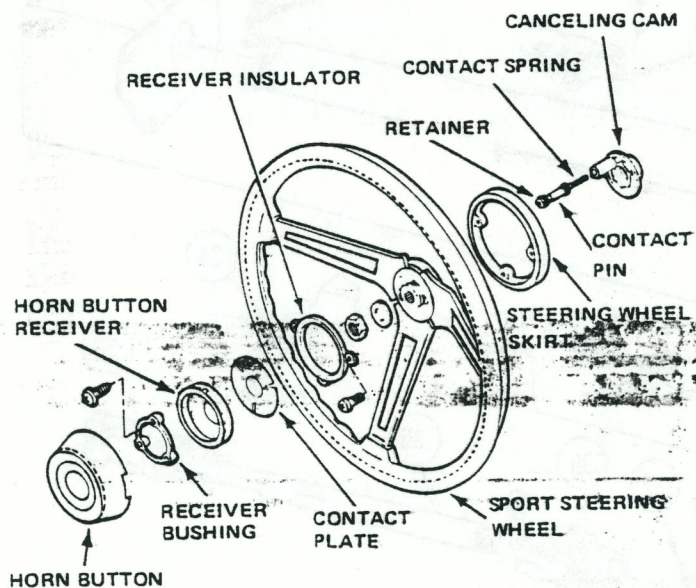
(2) Install contact plate and horn button receiver. Install receiver so horn button locating notch is at 12 o'clock position.

(3) Install receiver bushing and bushing attaching screws.

- (4) Install steering wheel washer and nut. Tighten nut to 30 foot-pounds (41 N•m) torque.
- (5) Install horn button.
- (6) Connect battery negative cable.
- (7) Reset clock, if equipped.

Cherokee-Wagoneer-Truck Models

- (1) Align reference marks on steering shaft and steering wheel and install wheel.
- (2) On models with sport steering wheel (fig. 2J-3), install contact plate, horn button receiver, and receiver bushing. Be sure to install receiver so horn button locating notch is at 12 o'clock position.
- (3) Install steering wheel washer and nut. Tighten nut to 30 foot-pounds (41 N•m) torque.
- (4) On models with standard steering wheel, insert spring and horn wire in canceling cam yoke. Seat horn wire retainer in cam yoke and connect opposite end of wire to steering wheel switch.
- (5) Install horn button.
- (6) Connect battery negative cable.
- (7) Reset clock, if equipped.



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Fig. 2J-3 Sport Steering Wheel Assembly

SPORT STEERING WHEEL SKIRT REPLACEMENT

- (1) Disconnect battery negative cable.
- (2) Place wheels in straight-ahead position.
- (3) Remove horn button. Pull straight up on button to remove.
- (4) Remove steering wheel nut and washer.
- (5) Remove receiver bushing attaching screws and remove bushing, horn button receiver, and contact plate (fig. 2J-3).

(6) Remove steering wheel using tool J-21232 (fig. 2J-1).

(7) Remove receiver insulator attaching screws and remove insulator and skirt (fig. 2J-3).

(8) Color coat replacement skirt. Refer to Chapter 3B—Metal Repair and Painting for color coat procedure.

(9) Align and install replacement skirt and receiver insulator on steering wheel and install insulator attaching screws.

(10) Align reference marks on steering shaft and wheel and install wheel.

(11) Install contact plate and horn button receiver. Install receiver so horn button locating notch is at 12 o'clock position.

(12) Install receiver bushing and bushing attaching screws.

(13) Install steering wheel washer and nut. Tighten nut to 30 foot-pounds (41 N•m) torque.

(14) Install horn button. Align button tab with receiver notch and press button downward until seated.

(15) Connect battery negative cable.

(16) Reset clock, if equipped.

STEERING COLUMN REMOVAL

CAUTION: Handle the steering column with special care after it is removed from the vehicle. Sharp blows on the end of the steering shaft or shift lever, leaning on the column assembly, or dropping the assembly could shear or loosen the plastic fasteners that maintain column rigidity.

(1) Disconnect battery negative cable.

(2) On vehicles with automatic transmission, disconnect transmission shift rod at steering column shift lever.

NOTE: On Cherokee and Wagoneer models with automatic transmission and power brakes, the gearshift lever must be moved to the "1" range position to gain access to the shift rod-to-shift lever retaining clip.

(3) Remove steering column-to-intermediate shaft U-joint pinch bolt.

CAUTION: Do not attempt to separate the intermediate shaft and steering column at this time. If separated, the plastic connector injected into the intermediate shaft could be damaged.

(4) On Cherokee and Wagoneer models with air conditioning, remove left air duct extension.

(5) Remove steering column-to-instrument panel bezel. On Cherokee, Wagoneer, and Truck models, screws attaching two halves of bezel are located behind lower bezel half.

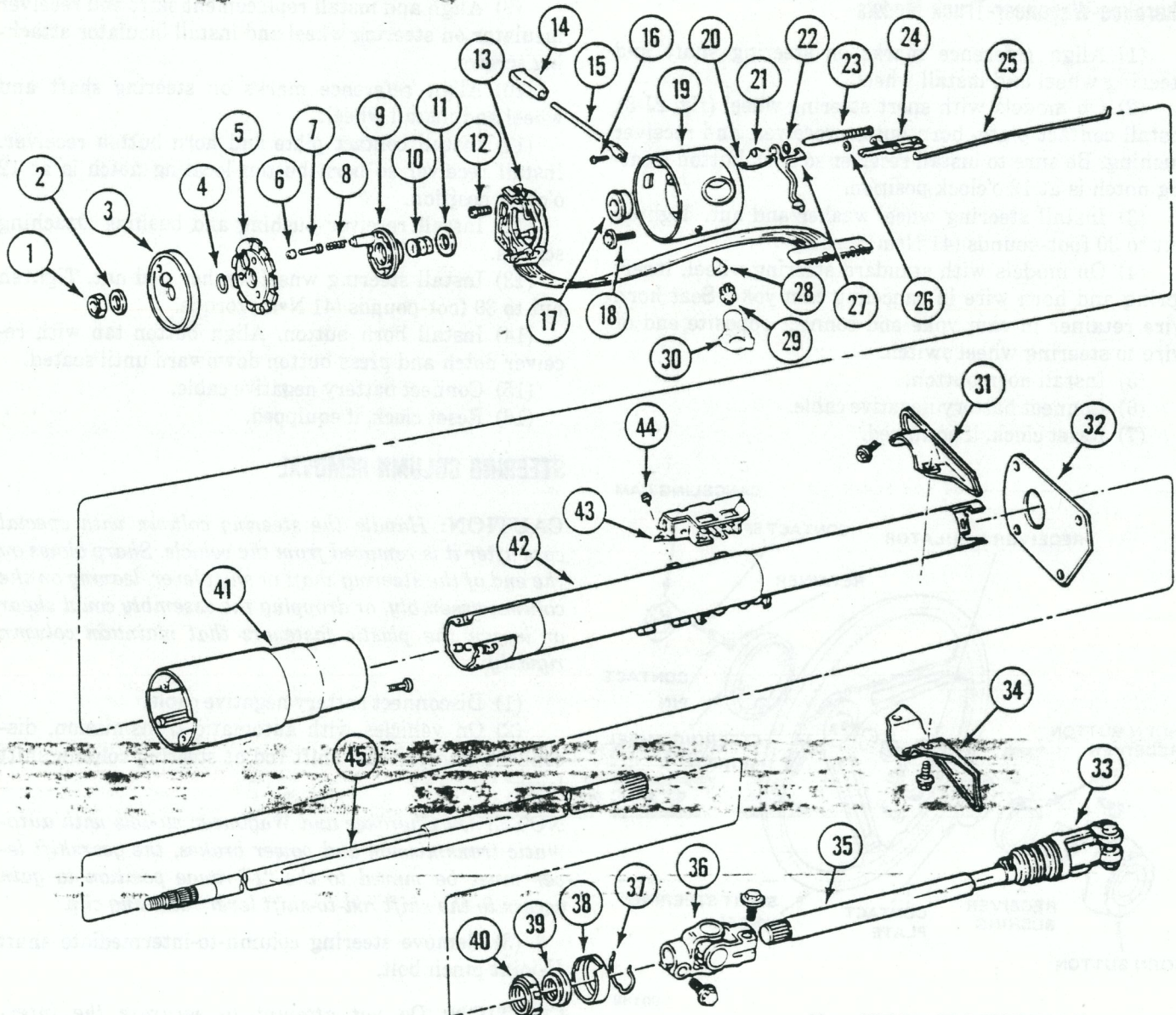
(6) Remove bolts attaching steering column mounting bracket to instrument panel.

(7) Remove bolts attaching steering column mounting bracket to steering column and remove bracket.

CAUTION: To avoid damaging the mounting bracket breakaway capsules, store the bracket in a safe place until service operations are completed.

(8) Remove top and bottom toe plates.

(9) Disconnect wiring harness at ignition switch.
 (10) Disconnect Cruise Command wiring harness connector, if equipped.
 (11) Separate steering column from intermediate shaft and remove steering column.



- 1. STEERING WHEEL NUT
- 2. WASHER
- 3. LOCK PLATE COVER
- 4. STEERING SHAFT SNAP RING
- 5. LOCKPLATE
- 6. RETAINER
- 7. HORN CONTACT PIN
- 8. SPRING
- 9. CANCELING CAM
- 10. UPPER BEARING PRELOAD SPRING
- 11. THRUST WASHER
- 12. TURN SIGNAL SWITCH SCREW (3)
- 13. TURN SIGNAL SWITCH
- 14. TURN SIGNAL LEVER

- 16. TURN SIGNAL LEVER SCREW
- 17. UPPER BEARING
- 18. HOUSING RETAINING SCREW (4)
- 19. HOUSING
- 20. RACK PRELOAD SPRING
- 21. KEY RELEASE LEVER SPRING
- 22. WAVE WASHER
- 23. LOCK BOLT
- 24. LOCK RACK
- 25. REMOTE ROD
- 26. SPRING WASHER
- 27. KEY RELEASE LEVER
- 28. HAZARD WARNING SWITCH KNOB
- 29. LOCK SECTOR
- 30. LOCK CYLINDER

- 31. TOE PLATE (UPPER HALF)
- 32. SEAL
- 33. INTERMEDIATE SHAFT COUPLING
- 34. TOE PLATE (LOWER HALF)
- 35. INTERMEDIATE SHAFT
- 36. INTERMEDIATE SHAFT-TO-STEERING SHAFT U-JOINT
- 37. SNAP RING
- 38. RETAINER
- 39. LOWER BEARING
- 40. LOWER BEARING ADAPTER
- 41. SHROUD
- 42. JACKET
- 43. IGNITION SWITCH
- 44. IGNITION SWITCH SCREW (2)
- 45. STEERING SHAFT

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Fig. 2J-4 Steering Column—Manual Transmission

STEERING COLUMN INSTALLATION

CAUTION: Use only the specified screws, bolts, and nuts when servicing the column. Do not use any substitute fasteners. Tighten all fasteners to the specified torque only to maintain the energy-absorbing (compression) action of the column. Bolts and screws longer than specified must not be used as they may prevent the column from compressing under impact. The bolts or nuts securing the column mounting bracket to the instrument panel must be tightened to the proper torque so that the bracket will break away under impact.

- (1) Install steering column in vehicle and connect column to intermediate shaft.
- (2) Install intermediate shaft-to-column U-joint pinch bolt. Tighten bolt to 45 foot-pounds (61 N•m) torque.
- (3) Connect Cruise Command wire harness connector, if equipped.
- (4) Connect wiring harness connectors to ignition switch. Install white connector first—black connector last.
- (5) Install top and bottom toe plates but do not tighten attaching bolts completely.
- (6) Install mounting bracket on steering column and tighten bracket attaching bolts to 20 foot-pounds (27 N•m) torque.
- (7) Align steering column mounting bracket and instrument panel and loosely install mounting bracket-to-instrument panel bolts.
- (8) Pull steering column upward and tighten column mounting bracket-to-instrument panel bolts to 20 foot-pounds (27 N•m) torque. Be sure to maintain upward pressure on column when tightening bolts.
- (9) Tighten toe plate bolts to 10 foot-pounds (14 N•m) torque.
- (10) Install both halves of steering column-to-instrument panel bezel.
- (11) On Cherokee, Wagoneer and Truck models with air conditioning, install left air duct extension.
- (12) Connect transmission shift rod to steering column shift lever.
- (13) On vehicles with automatic transmission, check operation of gearshift manual linkage and adjust linkage if necessary. Refer to Chapter 2C—Automatic Transmission.
- (14) Connect all electrical components and check for proper operation.
- (15) Install instrument panel trim and left side air conditioning duct, if equipped.
- (16) Connect battery negative cable.
- (17) Reset clock, if equipped.

STANDARD COLUMN OVERHAUL— MANUAL TRANSMISSION

Column Disassembly

NOTE: Steering column removal is not necessary if only the lock plate cover, lock plate, steering shaft snap ring, canceling cam, turn signal switch, upper bearing preload spring, or lock cylinder are to be serviced (fig. 2J-4). However, the column must be removed in order to service any of the remaining components. If the column is removed, remove the column-to-instrument panel mounting bracket and install Support Fixture J-23074 (fig. 2J-5). Mount the column in a vise by clamping the support fixture flange in the vise.

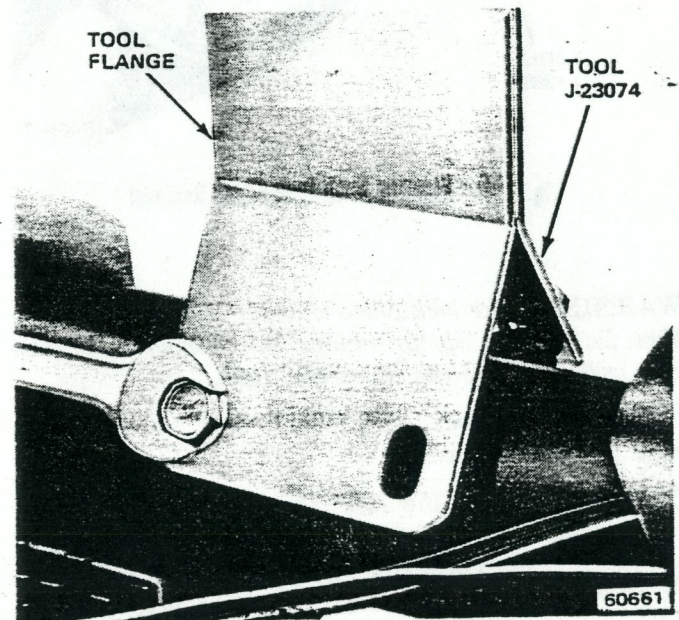


Fig. 2J-5 Steering Column—Manual Transmission

- (1) Place front wheels in straight-ahead position.
- (2) Disconnect battery negative cable.
- (3) Cover painted areas of column.
- (4) Remove steering wheel.
- (5) Remove lock plate cover. Use two screwdrivers to pry cover off lock plate and out of column.
- (6) Compress lock plate and unseat steering shaft snap ring as follows:
 - (a) Inspect and identify steering shaft nut thread type. Metric shafts have identifying groove in steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.
 - (b) If shaft has American threads, use tool J-23653 as is to compress lock plate and unseat snap ring (fig. 2J-6).
 - (c) If shaft has metric threads, replace compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing tool on steering shaft.

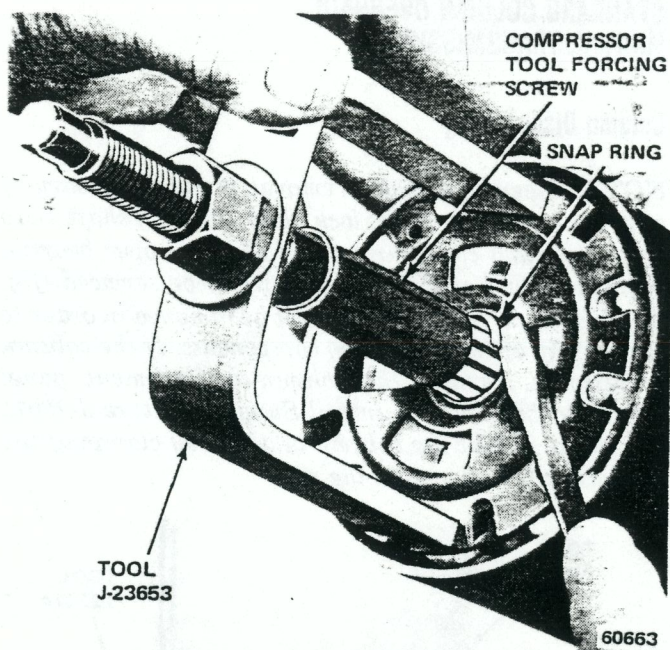


Fig. 2J-6 Steering Shaft Snap Ring Removal

WARNING: The lock plate is under strong spring tension. Do not attempt to remove the steering shaft snap ring without using the compressor tool.

(7) Remove lock plate compressor tool and snap ring. Discard snap ring.

CAUTION: When the steering shaft snap ring is removed, the shaft is free in the column. During bench overhaul, remove the shaft by pulling it out from the lower end of column. Do not allow the shaft to fall out whenever the column is removed from the vehicle.

(8) Remove lock plate, canceling cam, upper bearing preload spring, and thrust washer from shaft.

(9) Remove hazard warning switch knob. Press knob inward and unthread knob from column.

(10) On vehicles without Cruise Command, remove turn signal lever attaching screw and remove lever.

(11) On vehicles with Cruise Command, disconnect two of four wires at switch connector. Fold wires back along harness. Tape wires to harness and tape length of string to harness to aid removal.

(12) Unhook turn signal switch wire harness connector from bracket at lower end of steering column.

(13) Disconnect instrument panel harness connector from turn signal switch harness connector by lifting plastic lock tab on connector and separating connectors (fig. 2J-7).

(14) Wrap tape around turn signal switch harness connector to prevent snagging during removal.

(15) Remove turn signal switch attaching screws and remove switch. Pull switch and harness straight up and out of housing (fig. 2J-8).

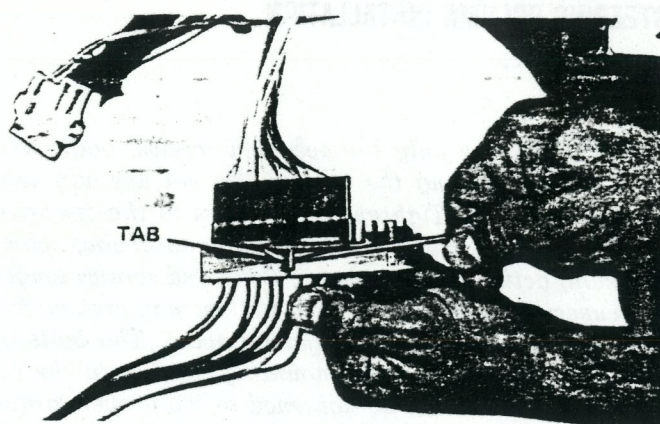


Fig. 2J-7 Turn Signal Switch Removal/Installation

(16) On vehicles with Cruise Command, remove turn signal lever and switch and remove switch harness using string previously taped in place.

(17) Turn ignition lock cylinder (clockwise) two detent positions beyond Off-LOCK position.

(18) Compress lock cylinder retaining tab using thin-bladed screwdriver and remove lock cylinder from column.

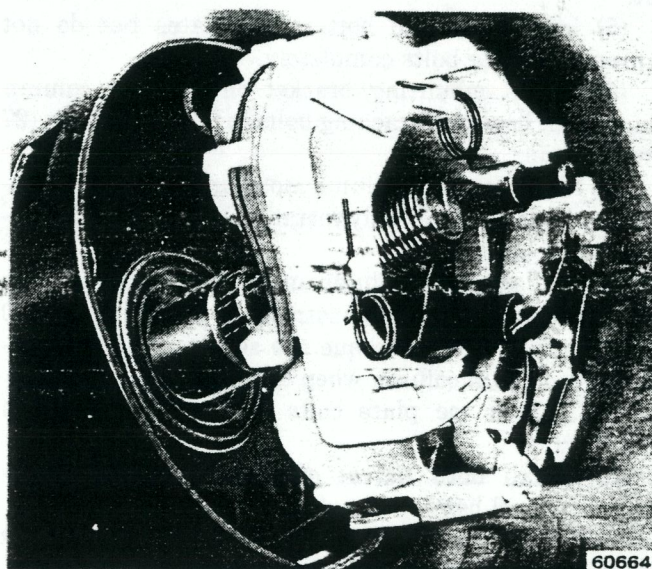


Fig. 2J-8 Disconnecting Turn Signal Switch Harness

NOTE: The lock cylinder retaining tab is accessible through the slot adjacent to the turn signal switch mounting boss (fig. 2J-9). If the retaining tab is not visible through the slot, scrape or knock any casting flash out of the slot to provide access.

(19) Remove ignition switch from lower end of column (fig. 2J-10).

(20) Remove screws attaching housing and shroud to column jacket (fig. 2J-11) and remove housing and shroud.

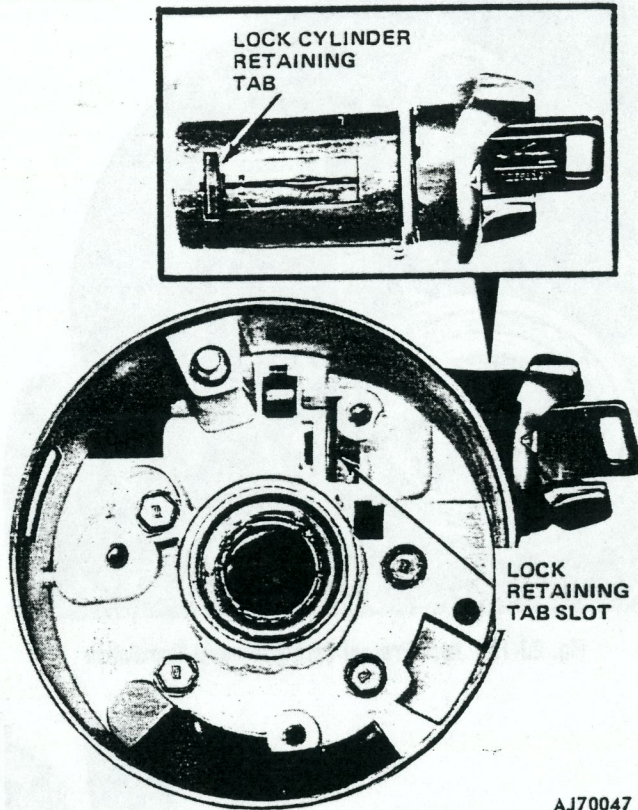


Fig. 2J-9 Lock Cylinder Retaining Tab Location

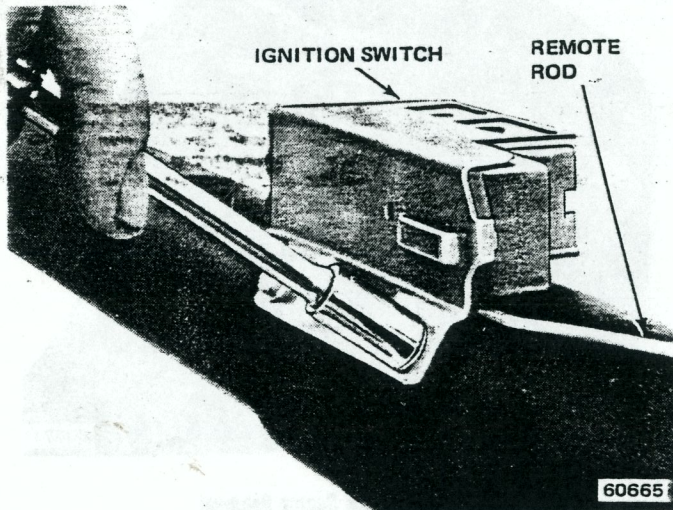


Fig. 2J-10 Ignition Switch Removal/Installation

- (21) Disengage remote rod from lock rack.
- (22) Remove screws attaching shroud to housing (fig. 2H-12) and remove housing from shroud.
- (23) Remove wave washer from key release lever pivot and remove key release lever and spring (fig. 2J-13).
- (24) Remove lock rack and lock bolt assembly (fig. 2J-14).

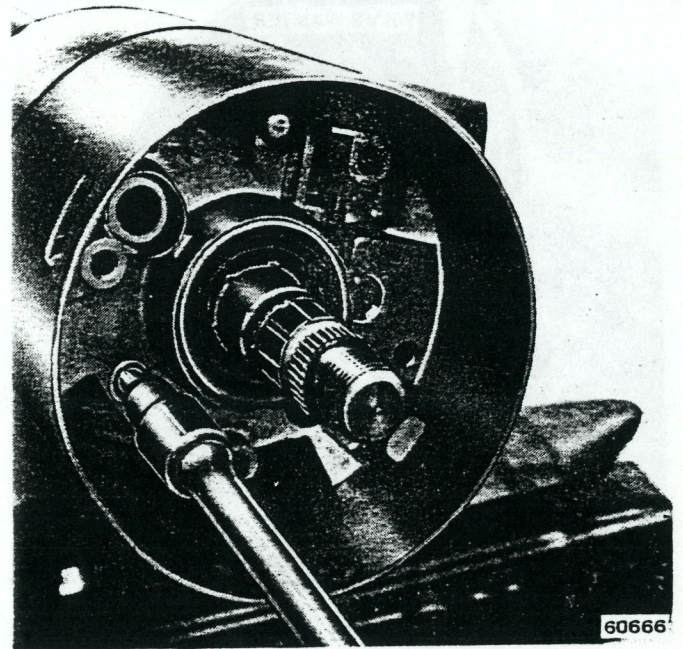


Fig. 2J-11 Housing and Shroud Removal/Installation

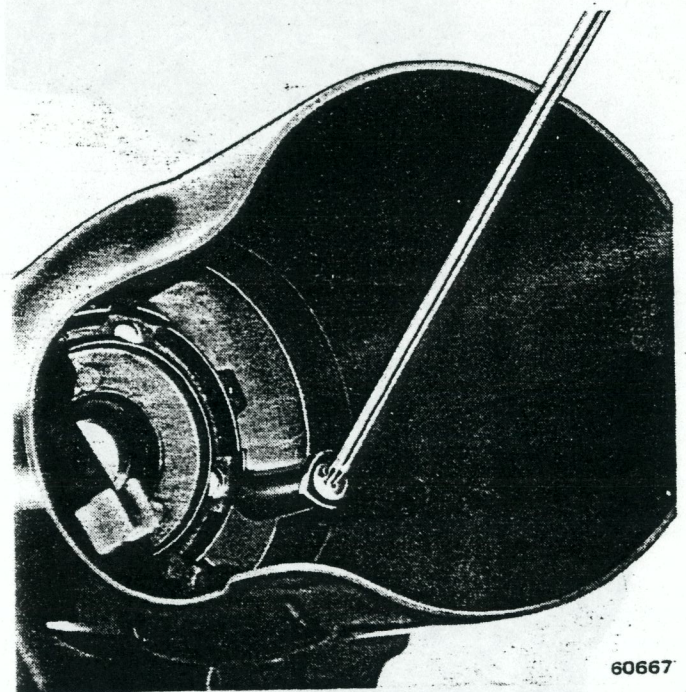


Fig. 2J-12 Removing Shroud From Housing.

- (25) Remove rack preload spring (fig. 2J-15).
 - (26) Remove lock sector through lock cylinder hole in housing. Push on block tooth of sector with blunt punch to remove (fig. 2J-16).
- NOTE:** Although the preceding steps can be performed with the column mounted in the vehicle, the following steps can be performed only after the column has been removed.



Fig. 2J-13 Wave Washer Position



Fig. 2J-15 Rack Preload Spring Removal/Installation

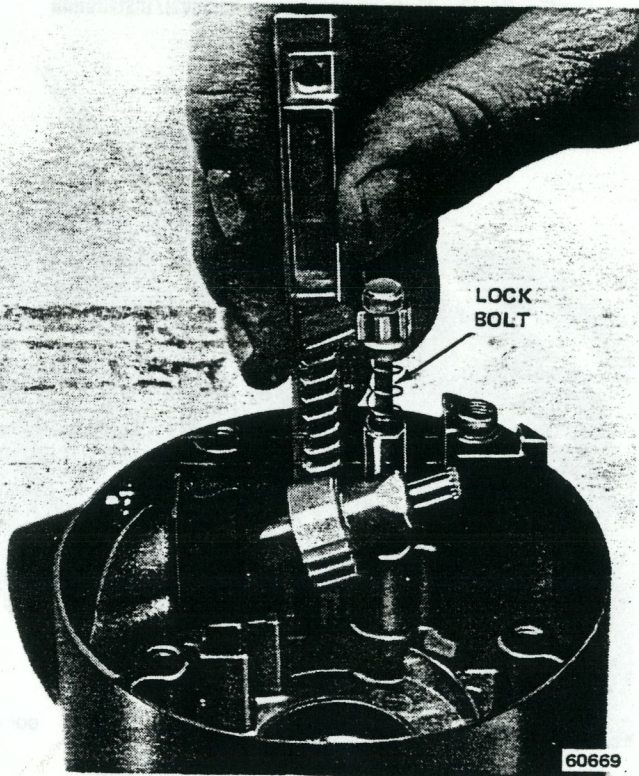


Fig. 2J-14 Lock Rack and Lock Bolt Removal

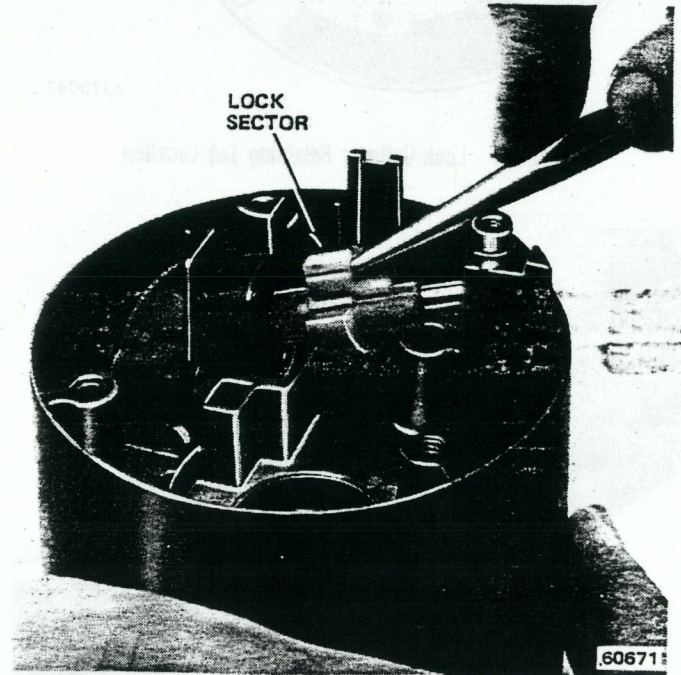


Fig. 2J-16 Lock Sector Removal

(29) Remove spring clip from lower bearing retainer and remove retainer, bearing, and adapter.

Column Assembly

CAUTION: Use only the specified screws, bolts, and nuts when servicing the column and tighten all fasteners to recommended torque values only to maintain the energy-absorbing (compressing) action of the column.

(27) Remove column from vehicle, if necessary, and mount column in vise using Support Fixture Tool J-23074 (fig. 2J-5).

(28) Remove steering shaft if not removed previously.

Incorrect length screws or bolts can prevent the column from compressing under impact. The bolts and nuts that attach the column mounting bracket to the column and instrument panel must also be tightened to the proper torque so that the bracket will break away under impact.

(1) Coat all friction and bearing surfaces with chassis grease before assembly.

(2) Install lock sector on sector shaft. Install sector through lock cylinder hole in housing (fig. 2J-17). Use blunt tool to press sector onto shaft. Be sure sector turns freely after installation.

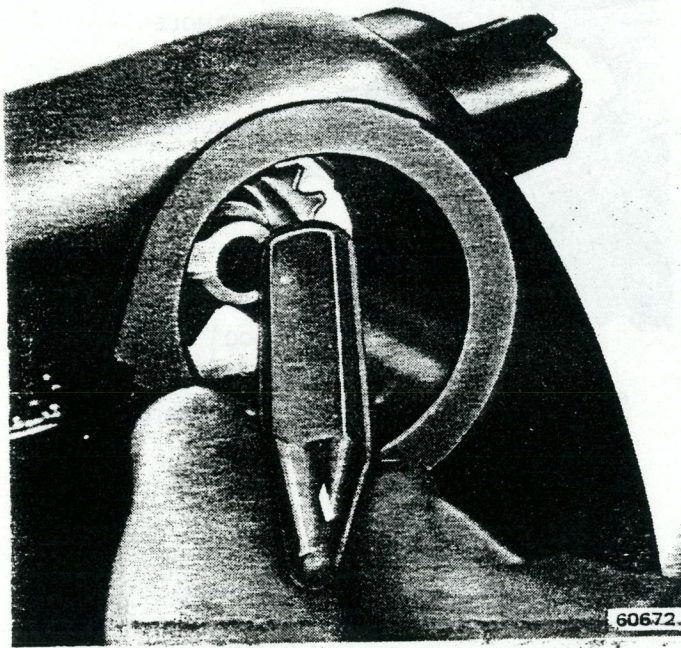


Fig. 2J-17 Sector Installation

(3) Install rack preload spring (fig. 2J-15). Bowed side of spring must bear against lock rack when rack is installed.

(4) Assemble lock bolt and lock rack (fig. 2J-18).

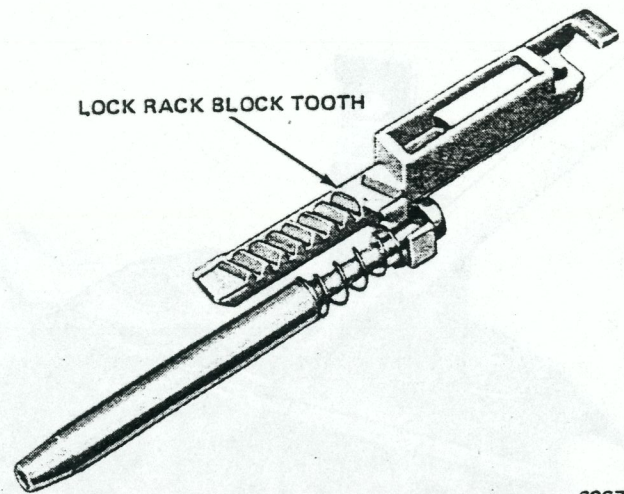
(5) Install assembled lock bolt and lock rack in housing. Mate block tooth of lock rack with block tooth of sector (fig. 2J-19).

(6) Install key-release lever return spring over post in housing (fig. 2J-20). Insert release lever finger in lock rack slot and position hole in lever over threaded hole in housing post (fig. 2J-21). Be sure inner end of spring contacts release lever.

(7) Raise key-release lever slightly and install end of release lever spring between lever and housing boss (fig. 2J-22).

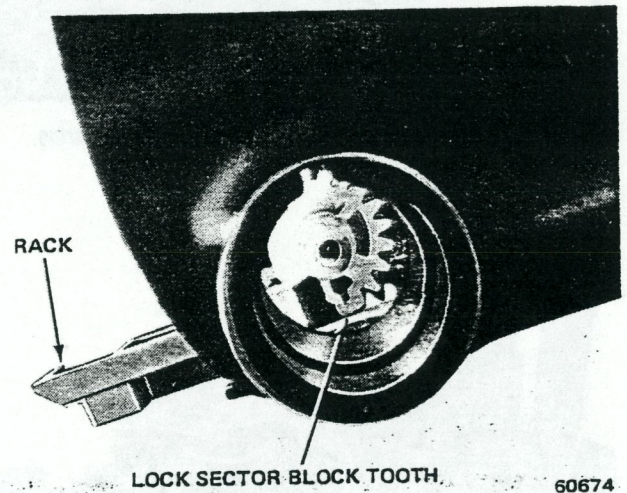
(8) Coat wave washer with chassis grease and install washer on post and over release lever (fig. 2J-13).

(9) Position shroud on housing and install attaching screws. Tighten screws to 18 inch-pounds (2 N·m) torque. Do not displace release lever wave washer when assembling shroud and housing.



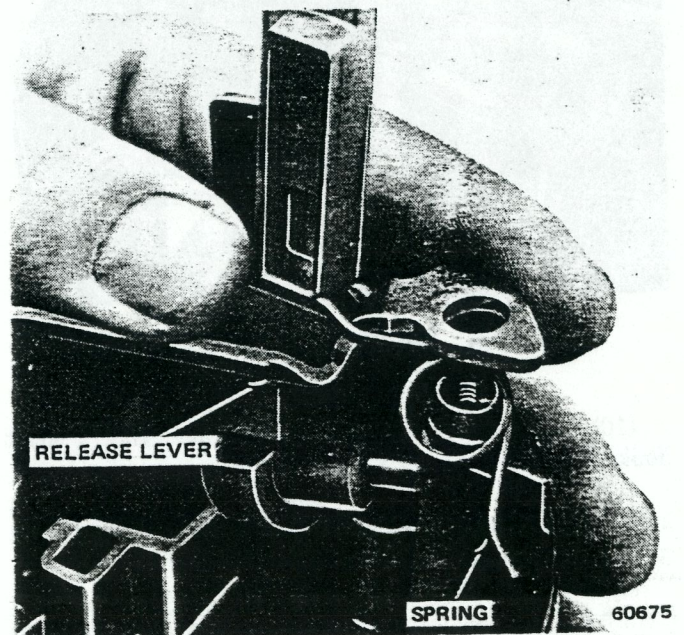
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Fig. 2J-18 Assembling Lock Bolt and Lock Rack



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Fig. 2J-19 Lock Bolt and Lock Rack Installation



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Fig. 2J-20 Key Release Lever and Spring Installation

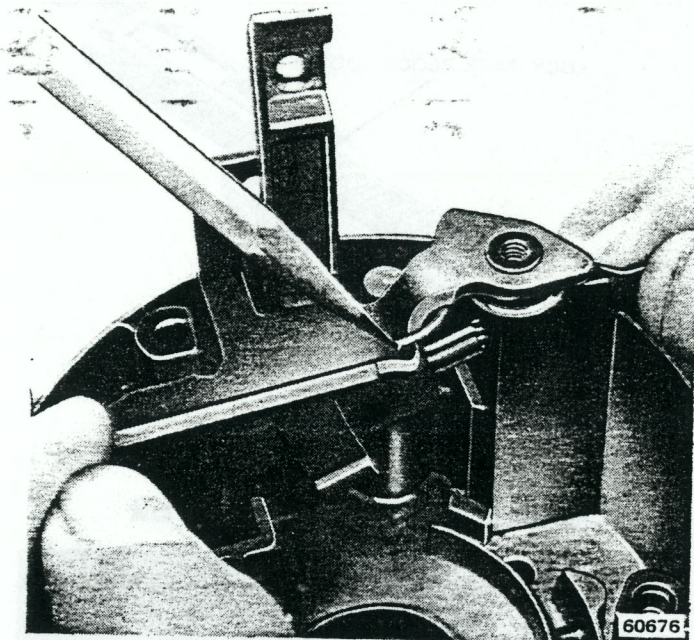


Fig. 2J-21 Positioning Key Release Lever Spring

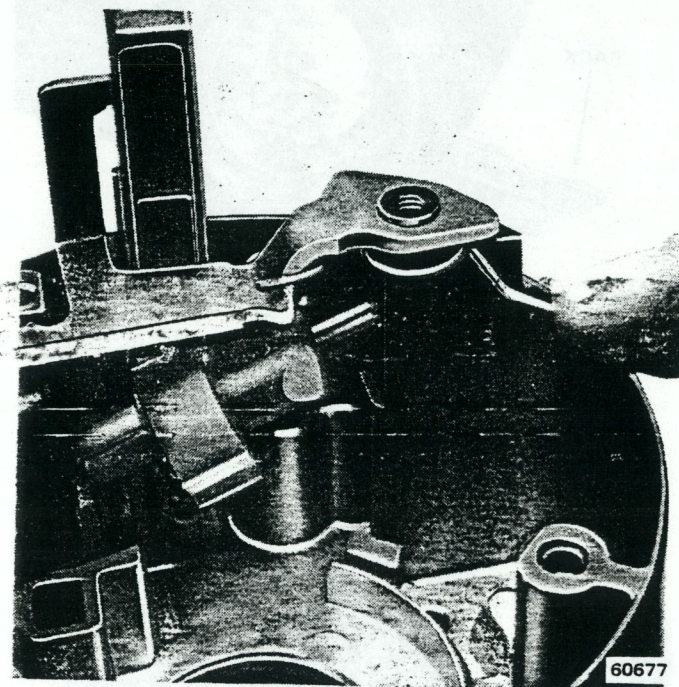


Fig. 2J-22 Securing Key Release Lever Spring

(10) Install remote rod on lock rack. Insert short hooked end of rod in lock rack.

(11) Install assembled shroud and housing on column and install attaching screws (fig. 2J-11). Tighten screws to 60 inch-pounds (7 N•m) torque.

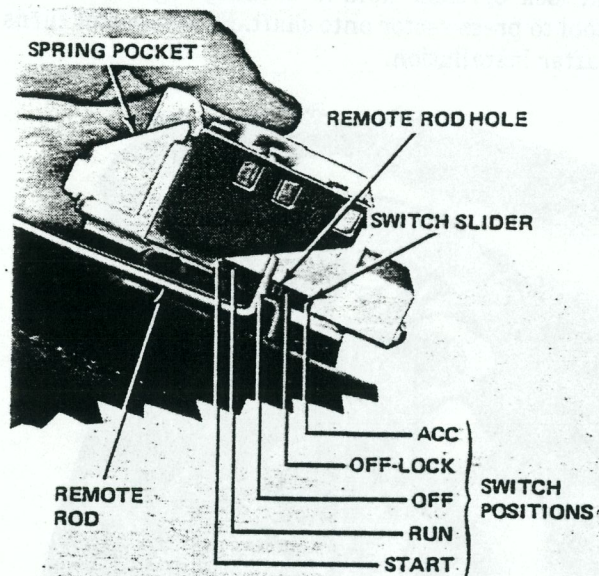
(12) Install lock cylinder in housing. Insert key in lock, hold cylinder sleeve, and rotate key clockwise until key-stops (this retracts actuator).

(13) Insert lock cylinder in housing bore with cylinder tab aligned with keyway in housing. Push cylinder inward until it bottoms. Rotate key counterclockwise until drive section of cylinder mates with sector. Push cylinder in fully until tab engages in housing groove.

(14) Turn lock cylinder clockwise to stop, then counterclockwise to Off-Unlock position.

(15) Install ignition switch as follows:

(a) Position switch on column jacket (fig. 2J-23).



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Fig. 2J-23 Positioning Ignition Switch

(b) Move switch slider to extreme left to Accessory position.

(c) Move slider two positions to right from Accessory position to Off-Unlock position.

(d) Insert remote rod into hole in switch slider.

(e) Position switch on column and install attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque.

(16) Install lower bearing, bearing adapter, retainer, and snap ring in lower end of column.

(17) Install steering shaft through lower end of column and into upper bearing in housing.

(18) Install turn signal switch and wire harness. Fold wires against connector, and feed connector through housing and shroud.

(19) Align turn signal switch in housing and install switch attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque.

(20) On vehicles without Cruise Command, install turn signal lever. Tighten lever attaching screw to 35 inch-pounds (4 N•m) torque.

(21) On vehicles with Cruise Command, install lever and switch assembly. Use string previously taped in

place to guide wires into housing. Remove string and tape. Connect wires to switch terminal and install lever attaching screw. Tighten screw to 35 inch-pounds (4 N•m) torque.

(22) Install thrust washer, upper bearing preload spring, and canceling cam on steering shaft. Position canceling cam as shown in figure 2J-24.

(23) Place turn signal switch in neutral position and install hazard warning switch knob.

(24) Position lock plate on steering shaft.

(25) Install replacement steering shaft snap ring on sleeve of Compressor Tool J-23653 and install tool on steering shaft (fig. 2J-25).

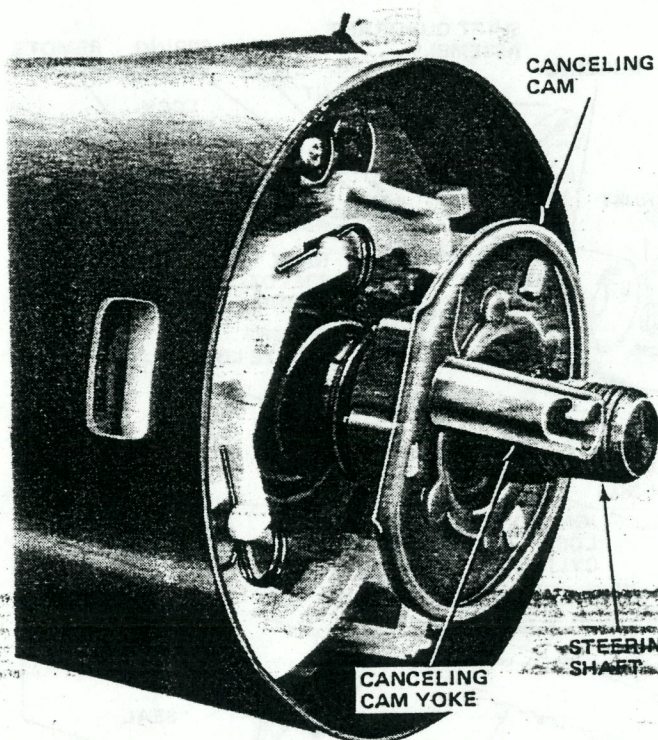


Fig. 2J-24 Positioning Canceling Cam

CAUTION: Identify the steering shaft nut thread type before using the compressor tool. If the shaft has American threads, use the compressor tool as is. However, if the shaft has metric threads (fig. 2J-2), replace the compressor tool forcing screw with Metric Forcing Screw J-23653-4 before using the tool.

(26) Compress lock plate and install snap ring in steering shaft groove (fig. 2J-25).

(27) Remove compressor tool. Be sure snap ring is fully seated before removing tool.

(28) Install lock plate cover.

(29) Remove Support Fixture Tool J-23074 if installed.

(30) Install column mounting bracket. Tighten bracket attaching bolts to 20 foot-pounds (27 N•m) torque.

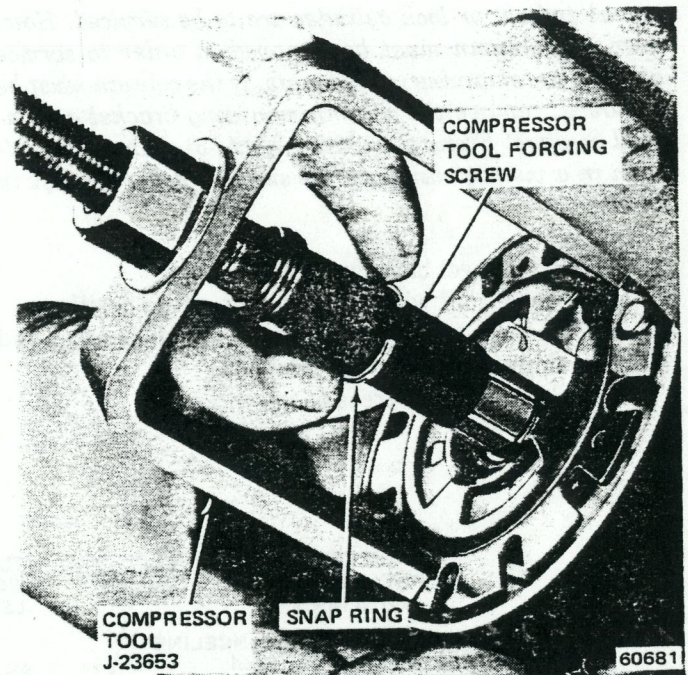


Fig. 2J-25 Steering Shaft Snap Ring Installation

(31) Connect column wiring harness connectors and install harness protector.

(32) Install steering wheel.

(33) Install and tighten steering wheel nut to 30 foot-pounds (41 N•m) torque.

CAUTION: Some steering shafts have metric size steering wheel nut threads. If a replacement nut is being installed, identify the shaft thread-type before installation. Metric shafts have an identifying groove in the steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.

(34) Install column bezel.

(35) Install and tighten column bracket-to-instrument panel bolts to 20 foot-pounds (27 N•m) torque.

(36) Tighten toe plate bolts to 10 foot-pounds (14 N•m) torque.

(37) Remove protective covering from column painted areas.

(38) Connect battery negative cable.

STANDARD COLUMN OVERHAUL—AUTOMATIC TRANSMISSION

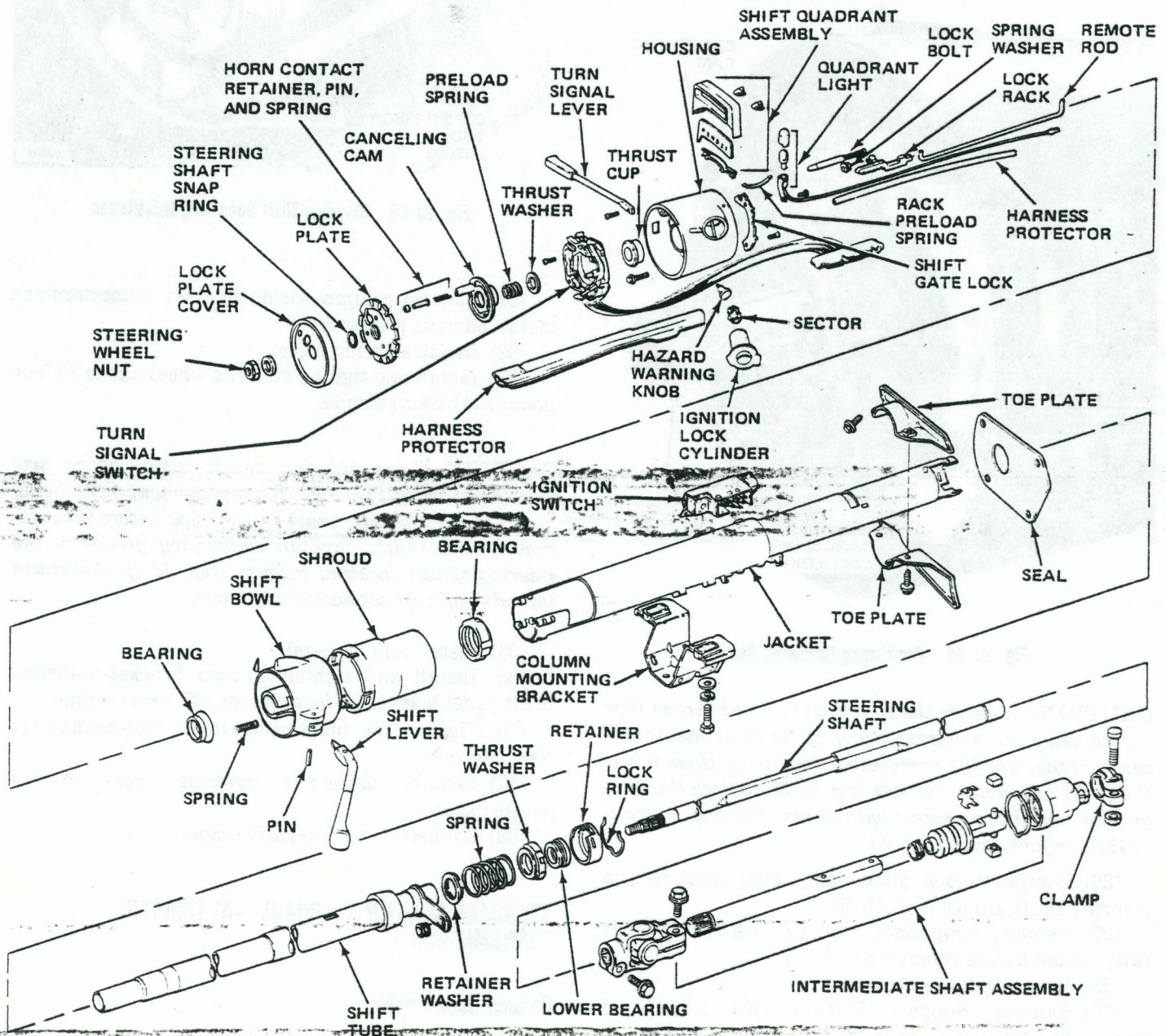
Column Disassembly

NOTE: Steering column removal is not necessary if only the lock plate cover, lock plate, steering shaft snap ring, upper bearing preload spring, canceling cam, turn

signal switch, or lock cylinder are to be serviced. However, the column must be removed in order to service any of the remaining components. If the column must be removed, remove the column mounting bracket and install Support Fixture J-23074 (fig. 2J-5). Mount the column in a vise by clamping the support fixture flange in the vise.

- (1) Disconnect battery negative cable.
- (2) Place front wheels in straight-ahead position.
- (3) Remove column-to-instrument panel bezel and left air conditioning duct, if equipped.
- (4) Cover painted areas of column.

- (5) Remove steering wheel (fig. 2J-1).
- (6) Remove lock plate cover (fig. 2J-26). Use two screwdrivers to pry cover off lock plate and out of housing.
- (7) Compress lock plate and unseat steering shaft snap ring as follows:
 - (a) Inspect and identify steering shaft nut thread type. Metric shafts have identifying groove in steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.
 - (b) If shaft has American threads, use Compressor Tool J-23653, as is, to compress lock plate and unseat snap ring (fig. 2J-6).



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Fig. 2J-26 Steering Column—Automatic Transmission

(c) If shaft has metric nut threads, replace compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing tool on steering shaft.

WARNING: The lock plate is under strong spring tension. Do not attempt to remove the snap ring without using the compressor tool.

(8) Remove lock plate compressor tool and remove steering shaft snap ring. Discard snap ring.

CAUTION: When the snap ring is removed, the steering shaft is free in the column. If the column is removed for bench overhaul, do not let the shaft fall out when the column is moved.

(9) Remove lock plate, canceling cam, upper bearing preload spring, and thrust washer (fig. 2J-26).

(10) On vehicles without Cruise Command, remove turn signal lever attaching screw and remove lever.

(11) On vehicles with Cruise Command, remove wires from switch terminal. Fold two of four wires back along harness. Tape wires in place and tape length of string to harness to aid removal.

(12) Push inward on hazard warning switch knob and unthread knob in counterclockwise direction.

(13) Place gearshift lever in Park position. Remove lever retaining pin using punch and remove lever.

(14) Unhook turn signal switch wire harness connector from column.

(15) Disconnect turn signal switch harness connector from instrument panel harness connector (fig. 2J-7). Lift connector lock tab to separate connectors.

(16) Using stiff wire or paper clip, compress lock tab retaining shift quadrant light wire in connector block and disconnect wire.

(17) Remove column lower bracket and plastic harness protector.

(18) Remove column-to-instrument panel mounting bracket if turn signal switch is to be removed with column mounted in vehicle.

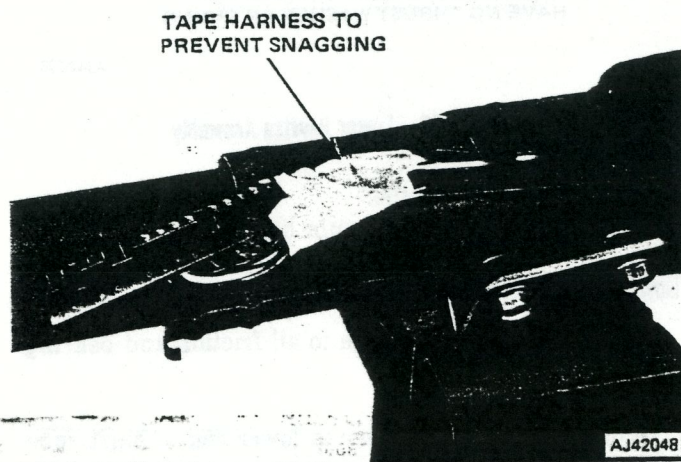


Fig. 2J-27 Turn Signal Switch Harness Removal

(19) Wrap tape around turn signal switch harness connector to prevent snagging (fig. 2J-27).

(20) Remove turn signal switch attaching screws and remove switch and harness. Pull switch straight up and out of column.

(21) On vehicles with Cruise Command, remove turn signal lever attaching screw and remove lever and switch as assembly. Guide switch harness out of column using string previously taped to harness.

(22) Place lock cylinder in LOCK position. Compress lock cylinder retaining tab and remove lock cylinder (fig. 2J-9).

NOTE: The retaining tab is accessible through the tab slot in the housing (fig. 2J-9). If the tab is not visible through the slot, scrape or knock all casting flash from the slot.

(23) Remove ignition switch from lower end of column.

(24) Remove upper housing attaching screws and remove upper housing.

NOTE: The remote rod and shift quadrant light wire, if equipped, will be removed as an assembly along with the upper housing.

(25) Remove thrust cup from upper housing (fig. 2J-28).

(26) Remove lock bolt and lock rack and remove rack preload spring (fig. 2J-29).

(27) Remove lock sector from sector shaft using blunt punch (fig. 2J-19). Note lock sector position for assembly reference and remove sector through lock cylinder hole in housing.

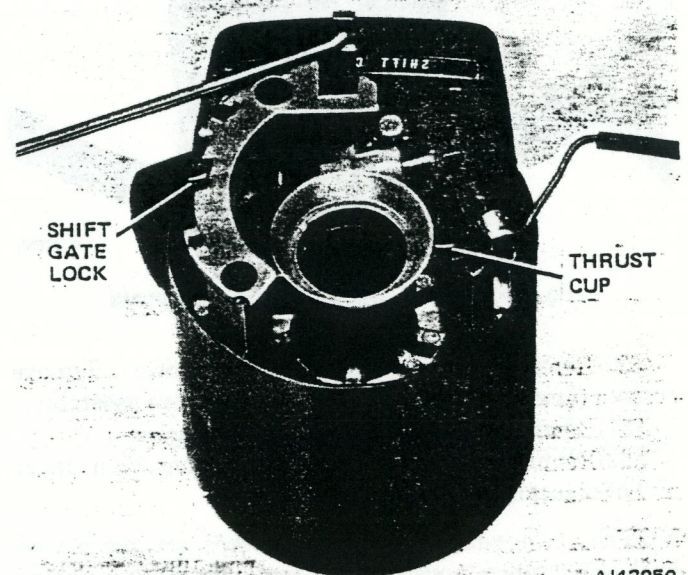


Fig. 2J-28 Thrust Cup Position

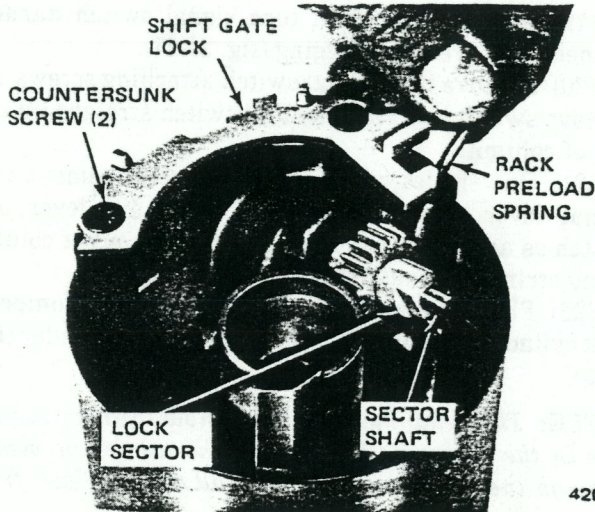


Fig. 2J-29 Housing Components

(28) Remove shift gate lock from upper housing. Examine shift gate lock detents for wear. Replace lock if excessively worn.

(29) Remove shift quadrant. Quadrant is retained by two clips which must be pried out with small punch (fig. 2J-30).

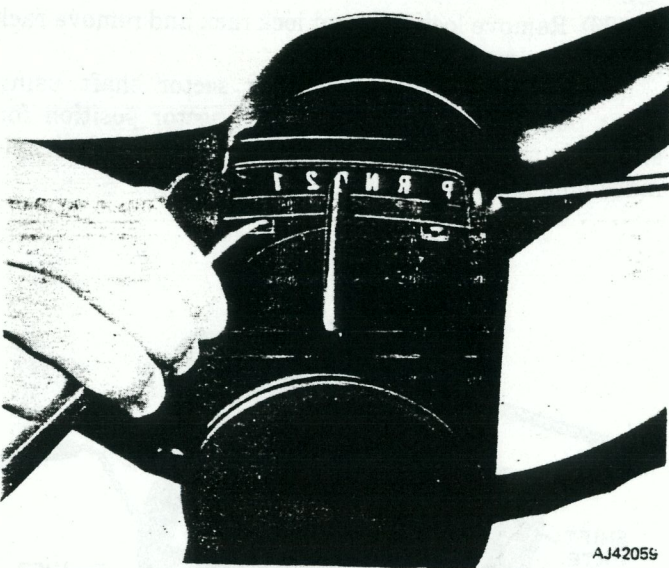


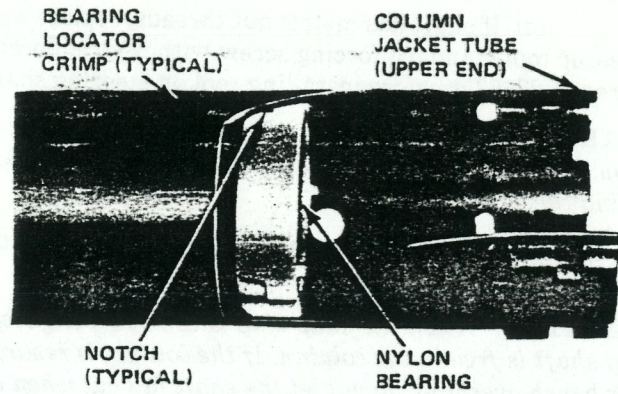
Fig. 2J-30 Shift Quadrant Retainer Clip Removal

(30) Remove shift quadrant light cover. Remove screw retaining socket assembly and remove assembly.

(31) Remove shift bowl from column jacket.

(32) Remove nylon lower bowl bearing from upper end of column tube (fig. 2J-31).

NOTE: Although the preceding steps are performed with the column mounted in the car, the following steps can be performed only after the column has been removed.



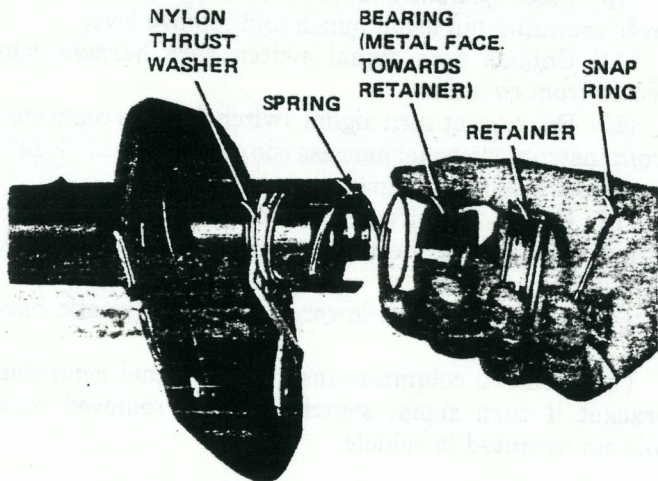
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Fig. 2J-31 Shift Bowl Lower Bearing Position

(33) Remove column from vehicle. Refer to Steering Column Removal.

(34) Remove steering shaft from lower end of column.

(35) Remove lower bearing retainer, retainer ring, lower bearing preload spring, and nylon washer (fig. 2J-32).



NOTE: FLOOR SHIFT STEERING COLUMNS HAVE NO THRUST WASHER OR SPRING

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Fig. 2J-32 Lower Bearing Assembly

(36) Remove shift tube.

(37) Remove nylon shift tube bearing from tube.

Column Assembly

(1) Apply chassis grease to all friction and bearing surfaces.

(2) Install shift tube.

(3) Install nylon washer in lower end of shift tube with flat side of washer facing upper end of tube (fig. 2J-32).

(4) Install preload spring, lower bearing (with metal face toward retainer), bearing retainer, and retainer ring.

(5) Install nylon lower bowl bearing in upper end of jacket.

NOTE: The bearing must be installed with the smaller inside diameter facing the lower end of the jacket, and with the bearing notches engaged in the three locator crimps in the column (fig. 2J-31).

(6) Align shift bowl with shift tube spline and install bowl.

(7) Install rack preload spring in upper housing (fig. 2J-29).

(8) Position large end of sector on sector shaft and press sector in place using blunt punch (fig. 2J-17).

(9) Install shift gate lock and install two countersunk attaching screws (fig. 2J-28). Tighten screws to 45 inch-pounds (5 N•m) torque.

(10) Install shift quadrant lamp and lamp cover.

(11) Install shift quadrant indicator and press retainer clips into place with flat side toward bowl.

(12) Assemble lock bolt and lock rack (fig. 2J-18).

(13) Install assembled lock bolt and lock rack in shift bowl (fig. 2J-33).

NOTE: The block tooth of the lock rack must engage the block tooth of the sector (fig. 2J-19).

(14) Install nylon thrust cup in upper housing with flared end of cup facing outward (fig. 2J-28).

(15) Rotate shift bowl counterclockwise to stop and install upper housing. Tighten housing attaching screws to 60 inch-pounds (7 N•m) torque.

NOTE: The shift bowl must be in the Park position and the rack pulled downward before the upper housing can be installed.

(16) Guide shift quadrant lamp wire and remote lock rod into position between shift bowl and column jacket.

(17) Install turn signal switch and harness assembly in column.

(18) Remove tape from turn signal switch wire harness connector and position harness in protector and protector-to-column jacket.

(19) Install turn signal switch retaining screws. Be sure switch actuating lever pivot is correctly aligned and seated in upper housing pivot boss before installing screws.

(20) On vehicles without Cruise Command, install turn signal lever and lever attaching screw. Tighten screw to 35 inch-pounds (4 N•m) torque.

(21) On vehicles with Cruise Command, install turn signal lever and switch assembly. Guide wires into housing using string previously taped in place. Remove string and tape. Connect wires to switch terminals. Install lever attaching screw and tighten screw to 35 inch-pounds (4 N•m) torque.

(22) Install steering shaft if removed. Install shaft through lower end of column and into upper bearing.

(23) Install thrust washer, upper bearing preload spring, and canceling cam on upper end of steering shaft.

(24) Align lock plate splines with steering shaft splines and install lock plate. Be sure canceling cam shaft protrudes through opening in lock plate (fig. 2J-34).

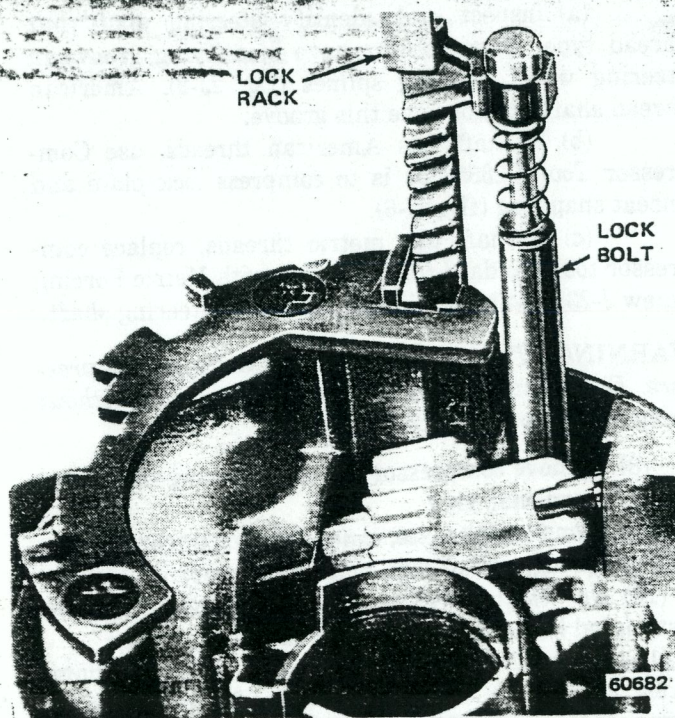


Fig. 2J-33 Lock Rack and Lock Bolt Installation

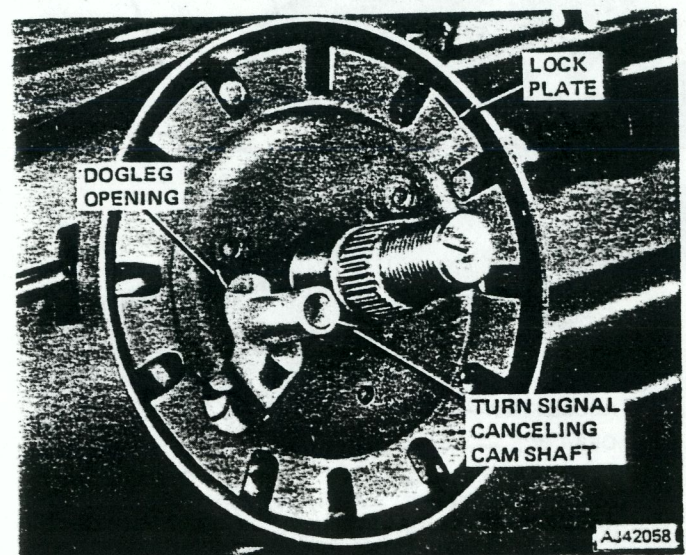


Fig. 2J-34 Canceling Cam and Lock Plate Position

(25) Install replacement steering shaft snap ring on sleeve of Lock Plate Compressor Tool J-23653 and install tool on steering shaft (fig. 2J-25).

CAUTION: *Inspect and identify the steering shaft nut thread type before installing the compressor tool. If the shaft has metric threads (fig. 2J-2), be sure to replace the compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing the tool on the shaft.*

(26) Compress lock plate and seat snap ring in steering shaft groove.

(27) Remove compressor tool.

(28) Install lock plate cover.

(29) Align canceling cam and index marks on steering shaft and steering wheel and install steering wheel. Tighten steering wheel nut to 30 foot-pounds (41 N•m) torque.

CAUTION: *Some steering shafts have metric threads. Be sure to obtain and install the proper thread-type nut. Metric thread shafts have an identifying groove in the steering wheel locating splines (fig. 2J-2).*

(30) Install hazard warning light switch knob and steering wheel trim cover.

(31) Install gearshift lever.

(32) Install lock cylinder in housing.

(33) Place shift bowl in any position except Park and rotate bowl counterclockwise until lock rack bottoms against lower surface of bowl.

(34) Install ignition switch on column:

(a) Move switch slider toward left to Accessory position.

(b) Move slider two positions toward right to Off-Unlock position (fig. 2J-35).

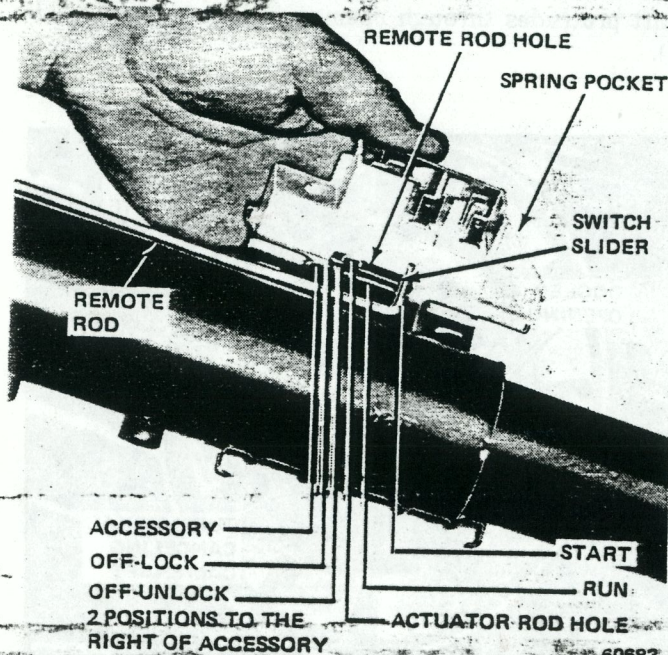


Fig. 2J-35 Positioning Ignition Switch

(c) Insert remote rod into slider hole and attach ignition switch to column. Tighten switch attaching screws to 35 inch-pounds (4 N•m) torque.

(35) Install column if removed. Refer to Steering Column Installation.

(36) Install lower finish panel, air conditioning duct if equipped, and column-to-instrument panel bezel.

(37) Remove protective covering from painted areas of column.

(38) Connect battery negative cable.

TILT COLUMN OVERHAUL—CHEROKEE-WAGONEER-TRUCK MODELS

Column Disassembly

NOTE: *Although it is possible to disassemble the tilt steering column down to the housing with the column in the vehicle, the column must be removed if more extensive disassembly is necessary. If the column is removed, use Steering Column Support Fixture J-23074 to mount the column assembly in a vise (fig. 2J-5).*

(1) Place front wheels in straight-ahead position.

(2) Disconnect battery negative cable.

(3) Cover painted areas of column.

(4) Remove steering wheel.

(5) Remove gearshift lever retaining pin and remove gearshift lever.

(6) Remove lock plate cover. Use two screwdrivers to pry cover off lock plate and out of housing.

(7) Compress lock plate and unseat steering shaft snap ring as follows:

(a) Inspect and identify steering shaft nut thread type. Metric shafts have identifying groove in steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.

(b) If shaft has American threads, use Compressor Tool J-23653 as is to compress lock plate and unseat snap ring (fig. 2J-6).

(c) If shaft has metric threads, replace compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing tool on steering shaft.

WARNING: *The lock plate is under strong spring pressure. Do not attempt to remove the lock plate without using the compressor tool.*

(8) Remove compressor tool and steering shaft snap ring. Discard snap ring.

(9) Remove lock plate, canceling cam, upper bearing preload spring, spring seat, and bearing race.

(10) On vehicles without Cruise Command, remove turn signal lever attaching screw and remove lever.

(11) On vehicles with Cruise Command, remove wires from switch terminal in lever. Fold two of four switch wires back, along harness and tape wires in place. Tape length of string to harness to aid removal.

(12) Press hazard warning light switch knob inward and remove knob by turning counterclockwise.

(13) Unhook turn signal switch wire harness connector from mounting bracket on lower right side of column jacket.

(14) Loosen toeplate bolts.

(15) Remove bolts attaching column mounting bracket to steering column.

(16) Remove bolts attaching mounting bracket to instrument panel and remove mounting bracket.

(17) Remove wire harness plastic protector from column jacket.

(18) Wrap tape around harness connector to prevent snagging (fig. 2J-27).

(19) Remove turn signal switch retaining screws and remove switch and wire harness. Pull switch straight up and out of column.

(20) On vehicles with Cruise Command, remove turn signal lever attaching screw and remove lever and switch. Guide switch wire harness out of column using string previously taped to harness.

(21) Insert ignition key in lock cylinder and turn cylinder to LOCK position.

(22) Compress lock cylinder retaining tab and remove lock cylinder (fig. 2J-9).

NOTE: The retaining tab is accessible through the tab slot in the housing (fig. 2J-9). If the tab is not visible through the slot, remove all casting flash from the slot.

(23) Remove spring clips retaining shift quadrant using punch or long needlenose pliers and remove quadrant (fig. 2J-30).

(24) Remove shift quadrant mounting bracket and light socket.

(25) Remove tilt lever.

(26) Remove cover retaining screws and remove cover from column.

(27) Remove lock sector tension spring retaining screw. Unhook spring from lock sector shaft and remove spring.

(28) Remove snap ring from lock sector shaft and remove lock sector, sector shaft, and retaining ring.

(29) Install tilt lever and place upper housing in full upward tilt position.

(30) Insert screwdriver in tilt spring retainer slot and compress retainer approximately 3/16 inch (4.7 mm). Rotate retainer 1/8 turn counterclockwise and remove retainer and spring.

WARNING: The tilt spring is under strong spring tension.

(31) Place housing in center (nontilt) position.

(32) Remove housing pivot pins using tool J-21854-1 (fig. 2J-36).

(33) Lift tilt lever to disengage lock shoes and remove housing. Remove both ball bearing assemblies from housing if bearings are to be replaced.

(34) Remove tilt lever.

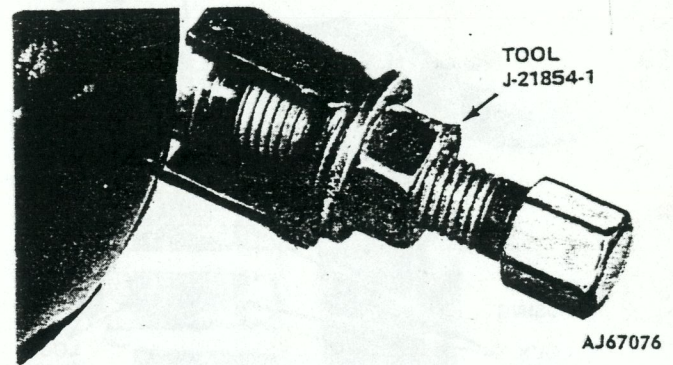


Fig. 2J-36 Pivot Pin Removal

(35) Remove release lever pin from housing using pin punch or tool J-22635 (fig. 2J-37).

NOTE: When removing the release lever pin, compress the lock shoe springs to relieve spring tension on the pin.

(36) Remove lock shoe pin from housing using pin punch or tool J-22635 (fig. 2J-38).

NOTE: When removing the lock shoe pin, compress the lock shoe springs to relieve spring tension on the pin (fig. 2J-38).

(37) Remove lock shoes and lock shoe springs.

(38) Disconnect steering shaft at intermediate shaft coupling. Remove steering shaft through upper end of column.

(39) Disassemble steering shaft by folding shaft at 90° and separating upper and lower halves of shaft at flexible joint (fig. 2J-39).

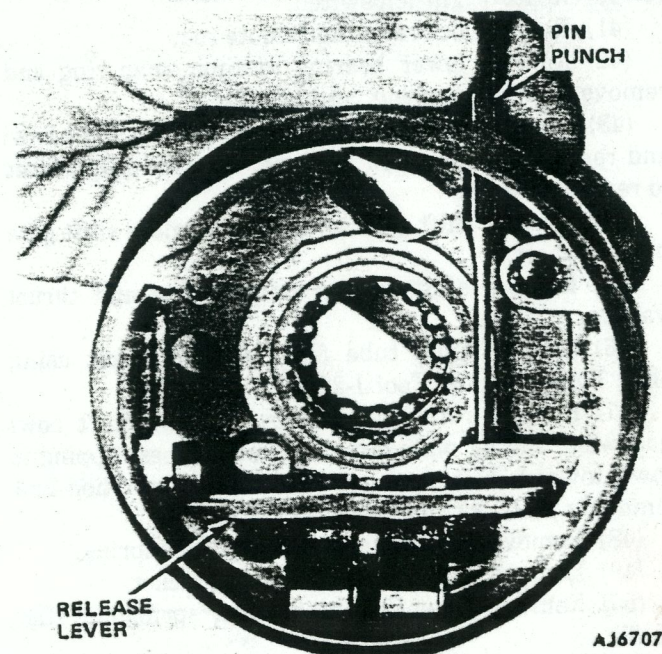


Fig. 2J-37 Release Lever Pin Removal

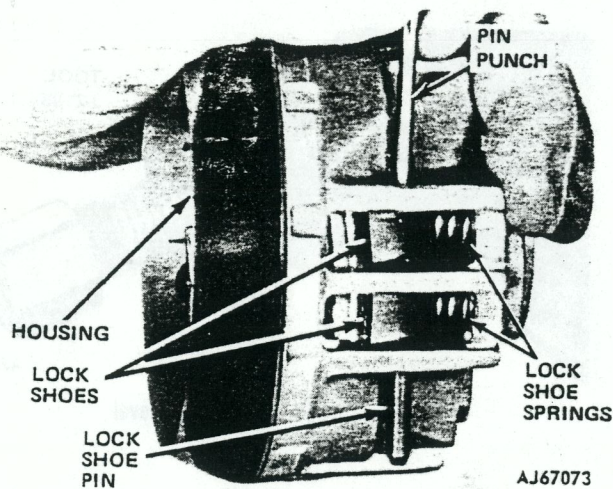


Fig. 2J-38 Lock Shoe Pin Removal

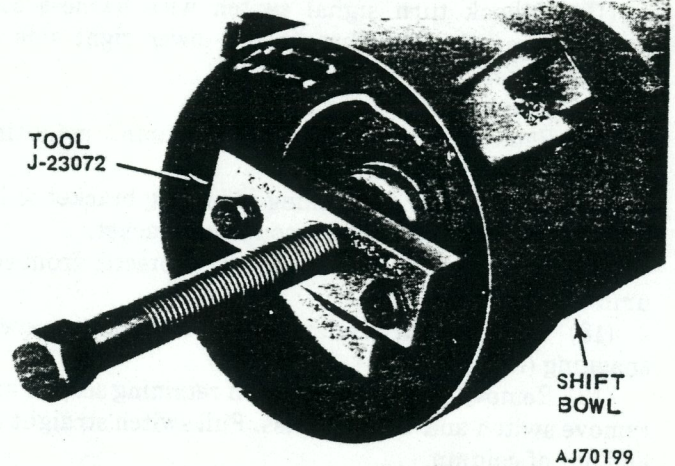


Fig. 2J-40 Shift Tube Removal

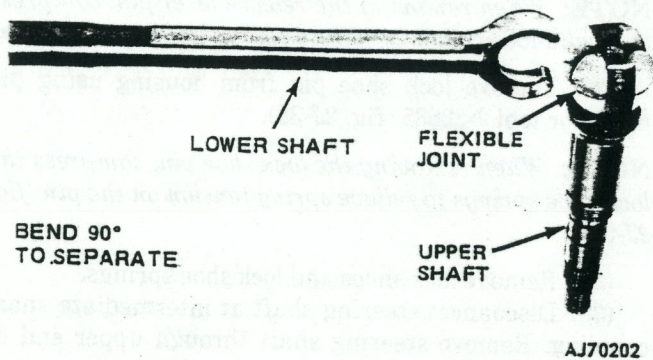


Fig. 2J-39 Steering Shaft Assembly

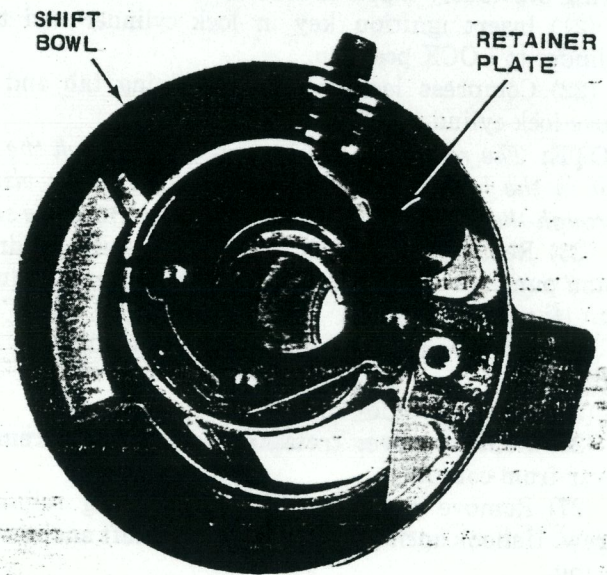


Fig. 2J-41 Retainer Plate Removal

- (40) Remove ignition switch.
- (41) Remove lock rack and remote rod.
- (42) Remove lower bearing retainer snap ring and remove retainer, bearing, and adaptor.
- (43) Remove screws attaching support to shift bowl and remove support. Use 1/4-inch, 12-point deep socket to remove screws.
- (44) Remove shift gate screws and remove shift gate from support.
- (45) Remove shift tube retaining ring and thrust washer.
- (46) Remove shift tube from column jacket using Shift Tube Remover Tool J-23072 (fig. 2J-40).
- (47) Remove retainer plate by rotating shift bowl clockwise, sliding plate out of jacket notches, tipping it down toward shift bowl hub at 12 o'clock position and removing plate-bottom side first (fig. 2J-41).
- (48) Remove wave washer and shift tube spring.
- (49) Remove shift bowl from column jacket.
- (50) Remove lower bearing retainer spring clip (fig. 2J-42).
- (51) Remove lower bearing retainer and remove lower bearing, and bearing adaptor assembly.

Column Assembly

- (1) Coat all bearing and friction surfaces with chassis grease.
- (2) Mount shift bowl on column jacket.
- (3) Install shift tube spring, wave washer, and retainer plate in shift bowl.
- (4) Install shift tube through lower end of column jacket and align tube spline with shift bowl keyway.
- (5) Insert Installer Tools J-23073-2 and -4 in shift tube (fig. 2J-43). Spring-loaded lower foot of tool must engage shift tube inner shoulder and tool guide must be seated in shift tube.
- (6) Tighten tool spring tension nut to snug fit.

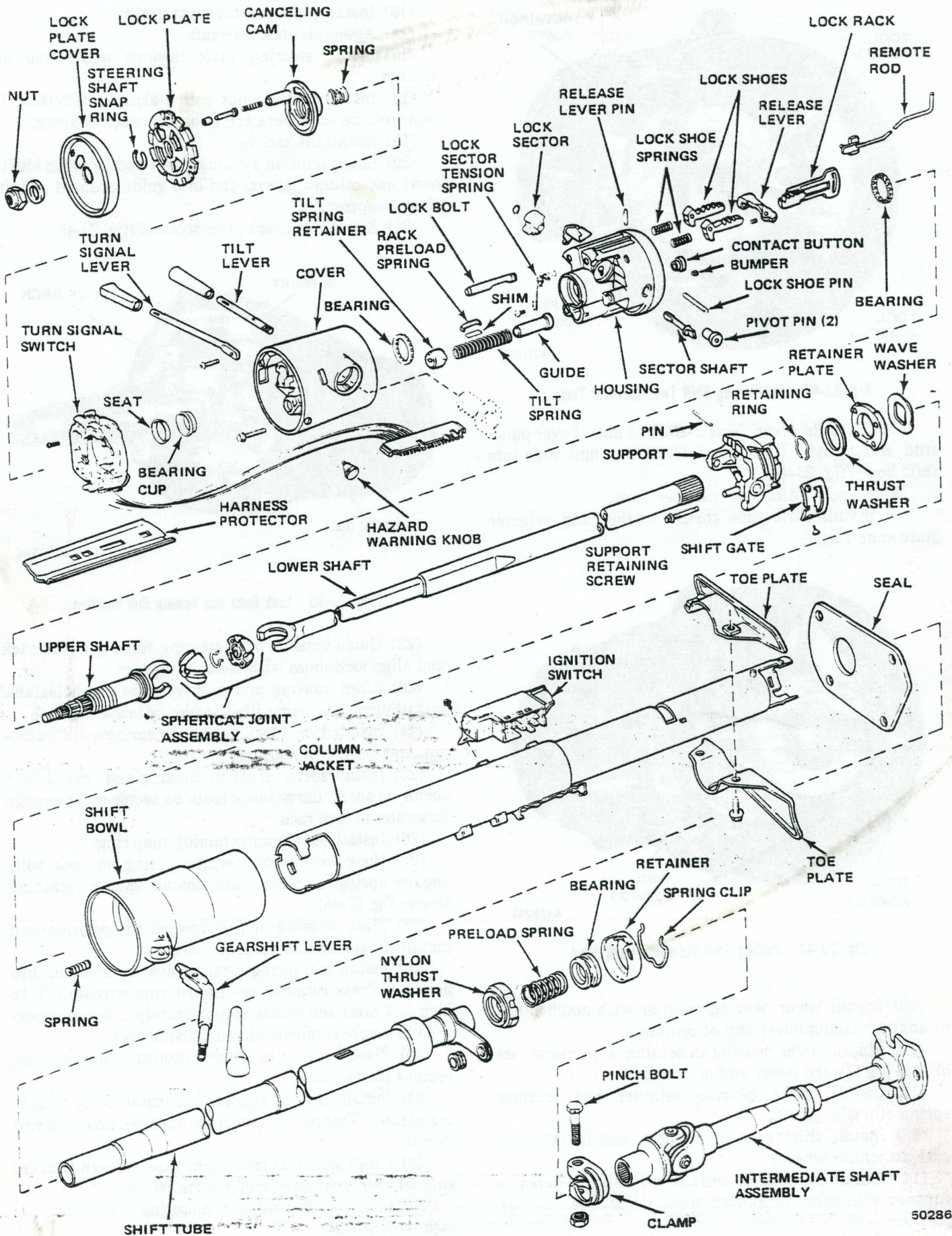


Fig. 2J-42 Tilt Steering Column—Cherokee-Wagoneer-Truck Models

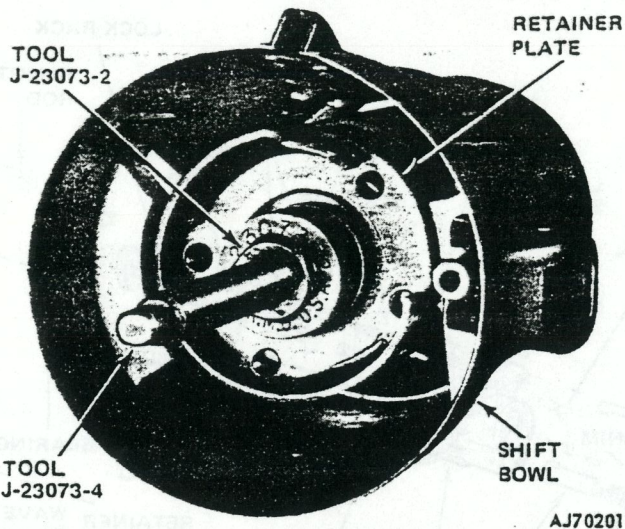


Fig. 2J-43 Positioning Shift Tube Installer Tools

(7) Place Receiver Tools J-23073-3 and -4 over puller stud and tighten Tool Nut J-23073-2 to pull tube into shift bowl (fig. 2J-44).

(8) Remove shift tube installer tools.

(9) Install shift tube thrust washer and retainer plate snap ring.

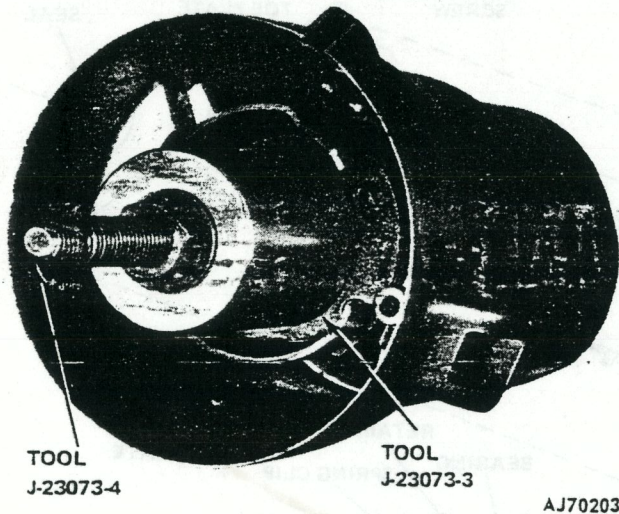


Fig. 2J-44 Pulling Shift Tube into Shift Bowl

(10) Install lower bearing adaptor with notched end of adaptor facing lower end of column.

(11) Install lower bearing in column with metal face of bearing toward lower end of column.

(12) Install lower bearing retainer and retainer spring clip (fig. 2J-42).

(13) Install shift gate in support and install shift gate attaching screws.

(14) Install support in shift bowl. Align V-notch in support with notch in column jacket (located at 9 o'clock position).

(15) Install support attaching screws.

(16) Assemble steering shaft.

(17) Install steering shaft through upper end of column.

(18) Install replacement ball bearings in housing if removed. Be sure there are 14 balls in each bearing.

(19) Install tilt handle.

(20) Insert ignition switch remote rod between shift-bowl and column jacket, and into guide channel in left side of support.

(21) Engage lock rack in remote rod (fig. 2J-45).

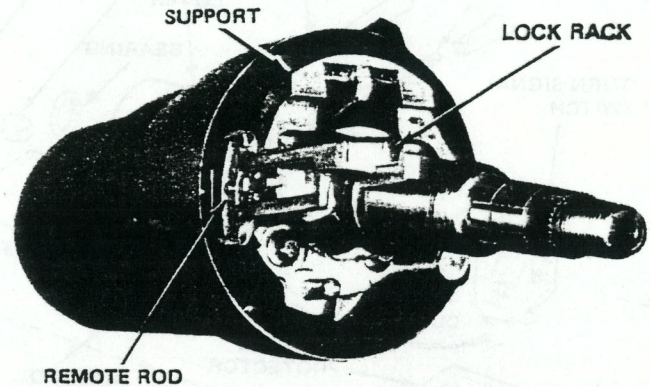


Fig. 2J-45 Lock Rack and Remote Rod Position

(22) Guide housing over steering shaft and lock rack and align lock shoes with teeth in support.

(23) Align housing and support pivot pin holes and install pivot pins using fiber mallet or brass drift.

(24) Install lock shoes, lock shoe springs, tilt bumpers, and lockpin in housing.

(25) Install sector shaft in housing and install lock sector on shaft. Large block tooth on sector must engage large slot in lock rack.

(26) Install lock sector retaining snap ring.

(27) Hook lock sector tension spring on lock bolt, engage spring in sector, and install spring retaining screw (fig. 2J-46).

(28) Place housing in full upward tilt position and install tilt spring and guide in housing.

(29) Install tilt spring retainer over spring and into housing. Press retainer downward approximately 3/16 inch (4.7 mm) and rotate approximately 1/8-turn clockwise to secure retainer tabs in housing lugs.

(30) Place housing in neutral (non-tilt) position and remove tilt handle.

(31) Install cover on housing and install cover attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque.

(32) Guide shift quadrant light wire through housing and between shift bowl and column jacket.

(33) Install shift quadrant mounting bracket and attach light socket.

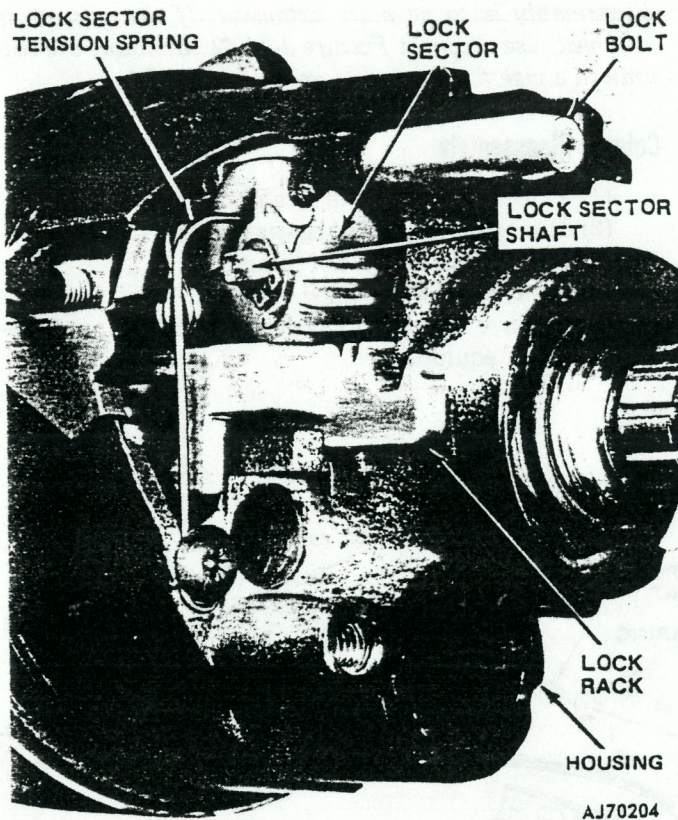


Fig. 2J-46 Lock Sector and Tension Spring Position

(34) Hook base of shift quadrant over tabs on left side of retainer and place in position.

(35) Install shift quadrant pointer in shift bowl and engage pointer in quadrant.

(36) Install quadrant retainer clips so flat side of clips face downward.

(37) Reinstall tilt handle.

(38) Install turn signal switch and switch harness in column. Guide switch wire harness between cover and column jacket.

(39) On vehicles without Cruise Command, install turn signal lever and lever attaching screw. Tighten screw to 35 inch-pounds (4 N•m) torque.

(40) On vehicles with Cruise Command, install turn signal lever and switch assembly. Guide switch wire harness into cover using string previously taped to harness. Remove tape from harness and connect wires to switch terminal. Install lever attaching screw and tighten screw to 35 inch-pounds (4 N•m) torque.

(41) Remove tape from turn signal switch harness connector and position wires in column harness protector.

(42) Align turn signal switch in cover and install switch attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque.

NOTE: Be sure the switch actuating lever pivot is correctly aligned and seated in the housing pivot boss before installing the switch attaching screws.

(43) Install mounting bracket on column. Tighten bracket-to-column bolts to 20 foot-pounds (27 N•m) torque.

(44) Position column mounting bracket on instrument panel and install bracket-to-instrument panel attaching bolts. Tighten bolts to 20 foot-pounds (27 N•m) torque.

(45) Tighten toeplate bolts to 10 foot-pounds (14 N•m) torque.

(46) Install upper bearing race, bearing seat, preload spring, and canceling cam on steering shaft.

(47) Align lock plate splines with steering shaft splines and install lock plate. Canceling cam shaft must protrude through opening in lock plate (fig. 2J-34).

(48) Install replacement steering shaft snap ring on sleeve of Compressor Tool J-23653 and install tool on steering shaft (fig. 2J-25).

CAUTION: Identify the steering shaft nut thread type before installing the compressor tool on the shaft. If the shaft has American threads, use the compressor tool as is. However, if the shaft has metric threads (fig. 2J-2), replace the compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before using the tool.

(49) Compress lock plate and seat snap ring in steering shaft groove (fig. 2J-25).

(50) Connect steering shaft to intermediate shaft coupling.

(51) Install gearshift lever in shift bowl. Guide lever over lock sector tension spring and into bowl. Align lever retaining pin holes with pin punch and install retaining pin using fiber mallet or brass drift.

(52) Install lock cylinder as follows:

(a) Insert ignition key in lock cylinder.

(b) Hold lock cylinder and turn key clockwise until it stops.

(c) Align cylinder retainer tab with keyway in cover and insert cylinder in cover.

(d) Push lock cylinder against lock sector. Rotate cylinder counterclockwise until cylinder engages in sector and push cylinder inward until cylinder retainer tab snaps into place.

(53) Install steering wheel. Tighten steering wheel nut to 30 foot-pounds (41 N•m) torque.

CAUTION: Some steering shafts have metric size steering wheel nut threads. Be sure to install the proper thread-type nut. Metric shafts have an identifying groove in the steering wheel locating splines (fig. 2J-2). Shafts with American threads do not have this groove.

(54) Install column if removed. Refer to Steering Column Installation. However, if column was serviced in vehicle, proceed to following steps.

(55) Install and tighten column mounting bracket bolts to 20 foot-pounds (27 N•m) torque.

(56) Position column mounting bracket on instrument panel and install panel-to-bracket nuts. Tighten nuts to 20 foot-pounds (27 N•m) torque.

- (57) Install column-bezel.
- (58) Tighten toeplate screws to 10 foot-pounds (14 N•m) torque.
- (59) Remove protective covering from column painted areas.
- (60) Connect battery negative cable.

TILT COLUMN OVERHAUL—CJ MODELS

NOTE: Although the tilt column (fig. 2J-47) can be disassembled down to the housing with the column mounted in the vehicle, the column must be removed if

disassembly is to be more extensive. If the column is removed, use Support Fixture J-23074 to mount the column in a vise for service operations (fig. 2J-5).

Column Disassembly

- (1) Place front wheels in straight-ahead position.
- (2) Disconnect battery negative cable.
- (3) Cover painted areas of column.
- (4) Remove steering wheel.
- (5) Remove gearshift lever retaining pin and remove lever, if equipped.

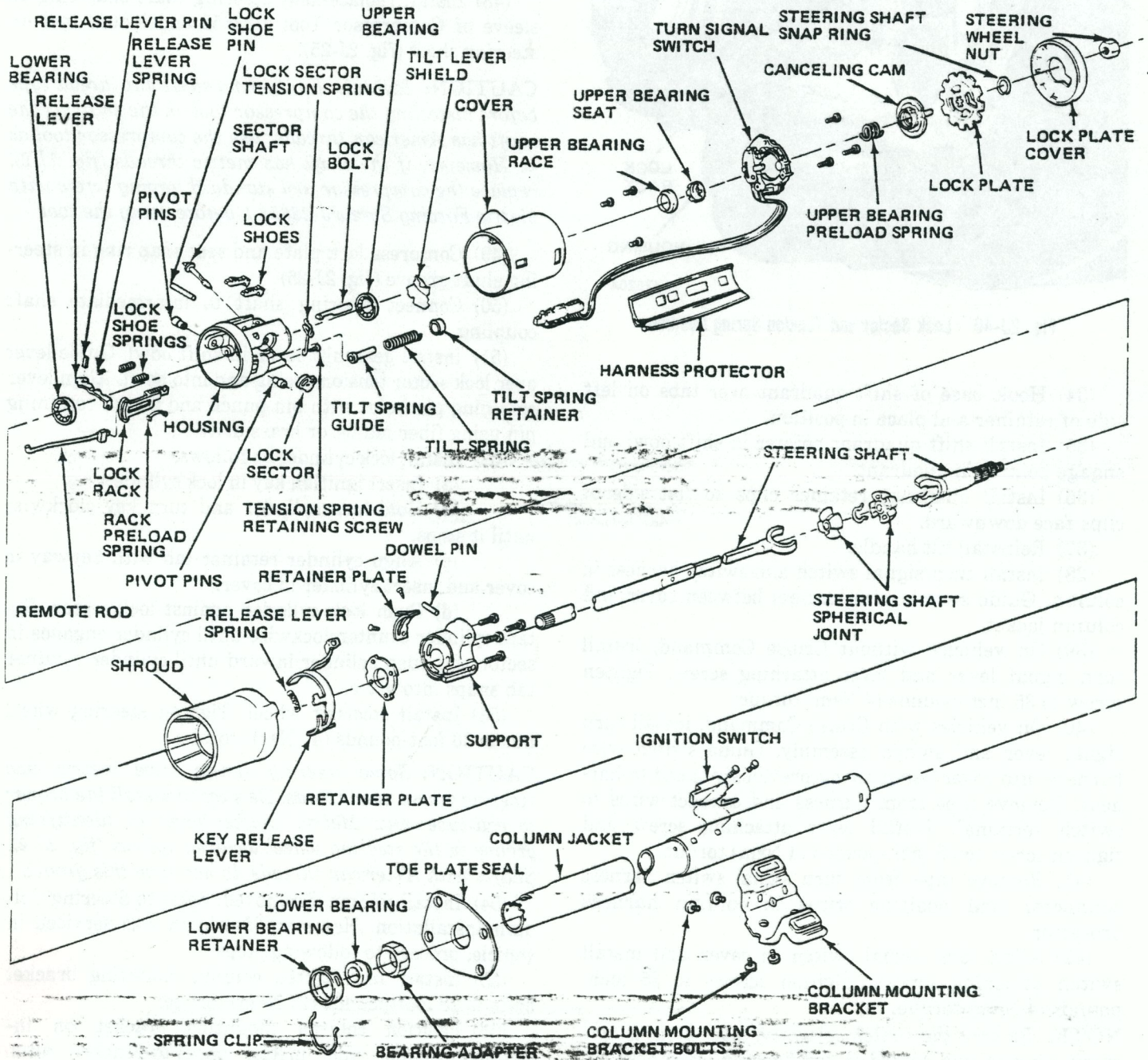


Fig. 2J-47 Tilt Steering Column—CJ Models

(6) Remove lock plate cover. Use two screwdrivers to pry cover off plate and out of column.

(7) Remove tilt and turn signal levers.

(8) Remove hazard warning knob. Press knob inward and turn in counterclockwise direction to remove.

(9) Compress lock plate and unseat steering shaft snap ring as follows:

(a) Inspect and identify steering shaft nut thread type. Metric shafts have identifying groove in steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.

(b) If shaft has American threads, use tool J-23653, as is, to compress lock plate and unseat steering shaft snap ring (fig. 2J-6).

(c) If shaft has metric threads, replace compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before using compressor tool.

WARNING: *The lock plate is under strong spring pressure. Do not attempt to remove the snap ring without using the compressor tool.*

(10) Remove compressor tool and snap ring. Discard snap ring.

(11) Remove lock plate, canceling cam, and upper bearing preload spring (fig. 2J-47).

(12) Disconnect turn signal switch harness at lower right side of column jacket.

(13) Loosen all toeplate screws.

(14) Remove bolts attaching column mounting bracket to column jacket.

(15) Remove nuts attaching column mounting bracket to instrument panel bolts and remove mounting bracket.

(16) Remove wire harness protector from column jacket (fig. 2J-48).

(17) Wrap tape around harness connector to prevent snagging connector when removed (fig 2J-49).

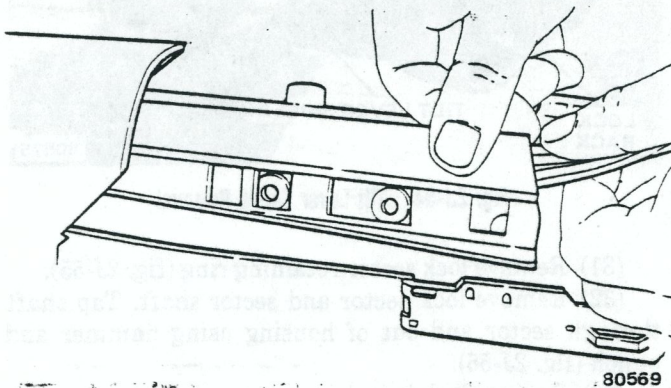


Fig. 2J-48 Harness Protector Removal

(18) Remove turn signal switch attaching screws and remove switch and harness. Pull switch straight up and out of column.

(19) Insert ignition key in ignition lock cylinder and turn cylinder to On position.

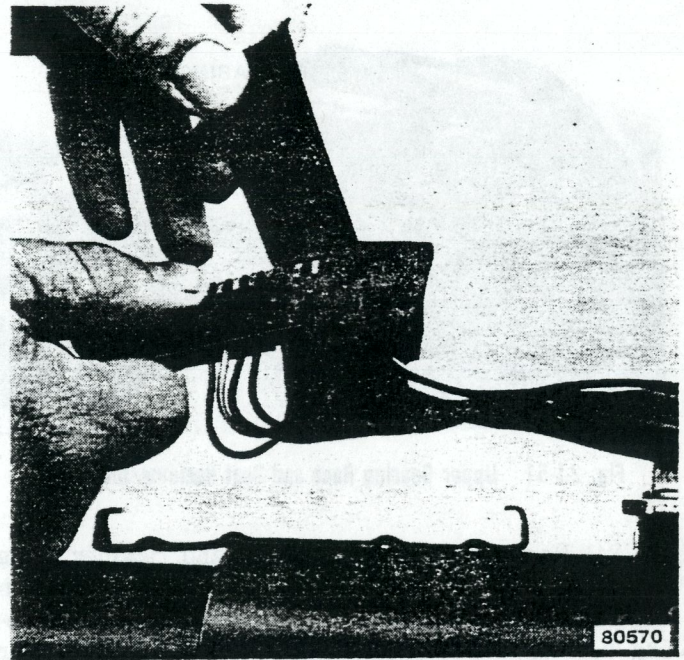


Fig. 2J-49 Taping Harness Connector

(20) Compress ignition lock cylinder retaining tab using thin bladed screwdriver and remove cylinder from column.

NOTE: *The retaining tab is accessible through the slot adjacent to the turn signal switch mounting boss (fig. 2J-9). If the tab is not visible through the slot, scrape or knock any casting flash out of the slot to provide access.*

(21) Remove cover retaining screws and remove cover from column (fig. 2J-50).

(22) Remove upper bearing race and bearing seat from steering shaft (fig. 2J-51).

(23) Reinstall tilt lever and place column in full upward tilt position.

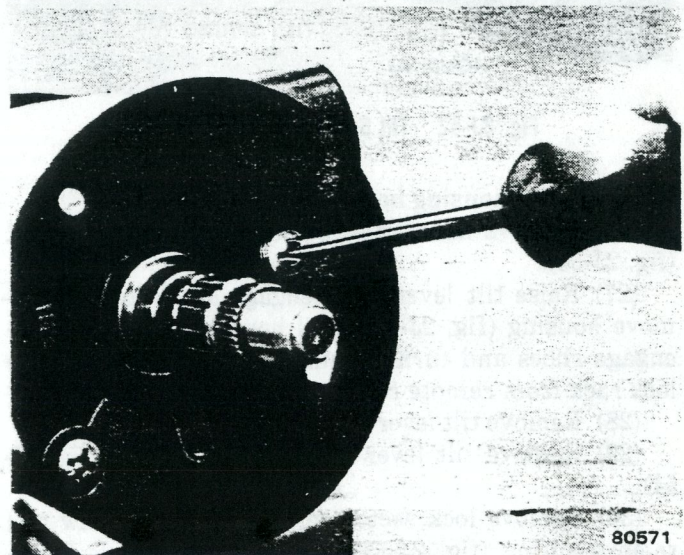


Fig. 2J-50 Cover Removal

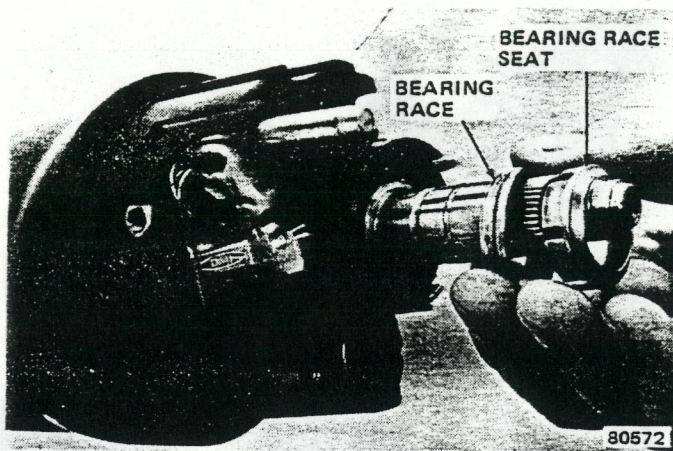


Fig. 2J-51 Upper Bearing Race and Seat Removal/Installation

(24) Remove tilt spring, guide, and retainer using screwdriver (fig. 2J-52). Press retainer inward and turn it counterclockwise until retainer tabs align with housing lugs. Be sure screwdriver blade just fits into retainer slot.

WARNING: The tilt spring guide is under strong spring pressure.

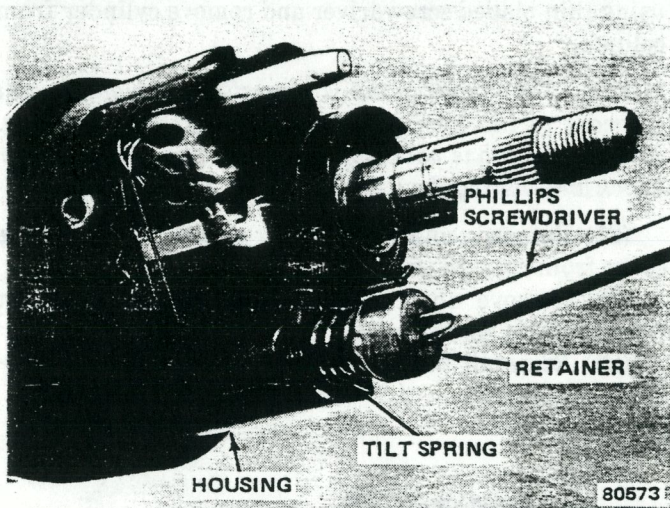


Fig. 2J-52 Tilt Spring and Guide Removal

(25) Place housing in center (nontilt) position.

(26) Remove housing pivot pins using tool J-21854-1 (fig. 2J-36).

(27) Raise tilt lever to disengage lock shoes and remove housing (fig. 2J-53). Pull housing upward to disengage shoes and turn housing to one side to separate lock rack from remote rod.

(28) Remove tilt lever from housing.

(29) Remove tilt lever shield from housing (fig. 2J-54).

(30) Remove lock sector spring retaining screw and remove spring (fig. 2J-55). Rotate spring in clockwise direction to remove it from bolt.

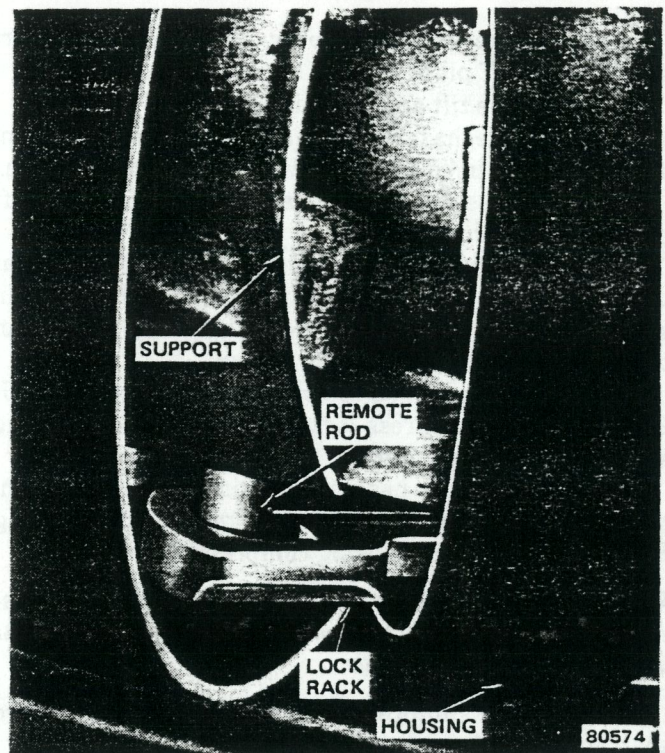


Fig. 2J-53 Housing Removal

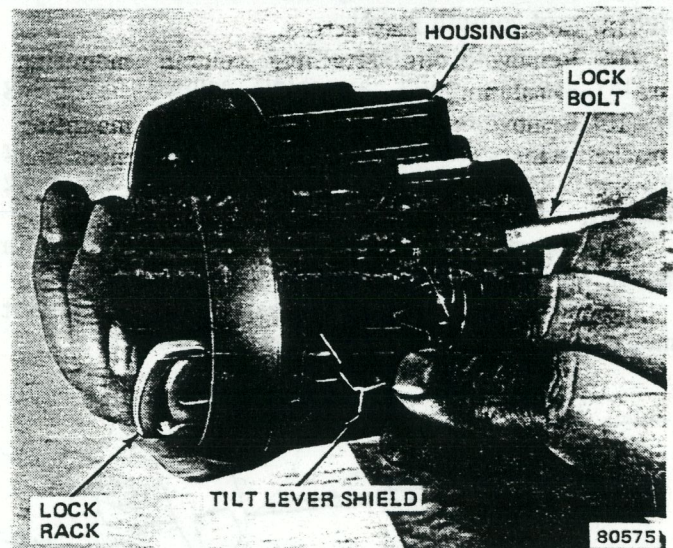


Fig. 2J-54 Tilt Lever Shield Removal

(31) Remove lock sector retaining ring (fig. 2J-55).

(32) Remove lock sector and sector shaft. Tap shaft through sector and out of housing using hammer and punch (fig. 2J-56).

(33) Remove lock bolt, lock rack, rack preload spring, spring shim, if equipped, and remote rod from housing.

(34) Insert wedge between lock shoes and housing to relieve spring tension on tilt and lock shoe pins (fig. 2J-57).

(35) Remove tilt lever pin from housing using tool J-22635 or pin punch (fig. 2J-37).

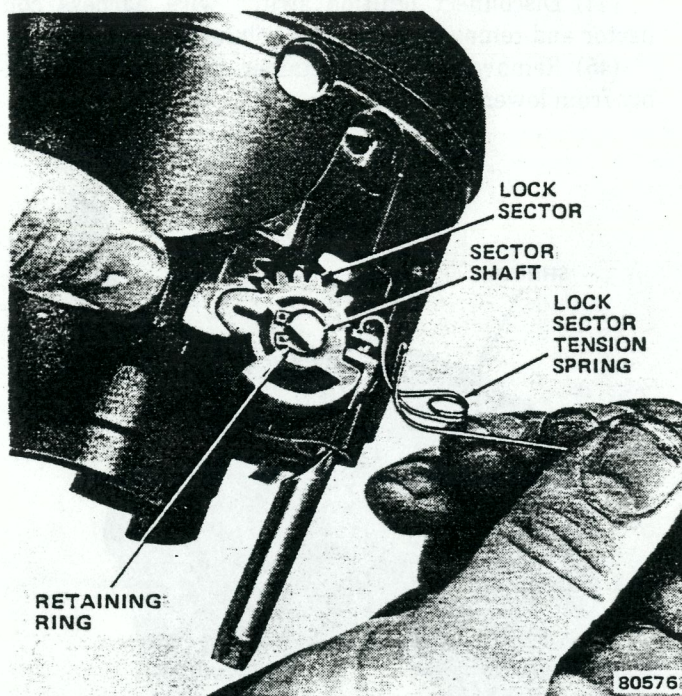


Fig. 2J-55 Lock Sector Tension Spring Removal/Installation

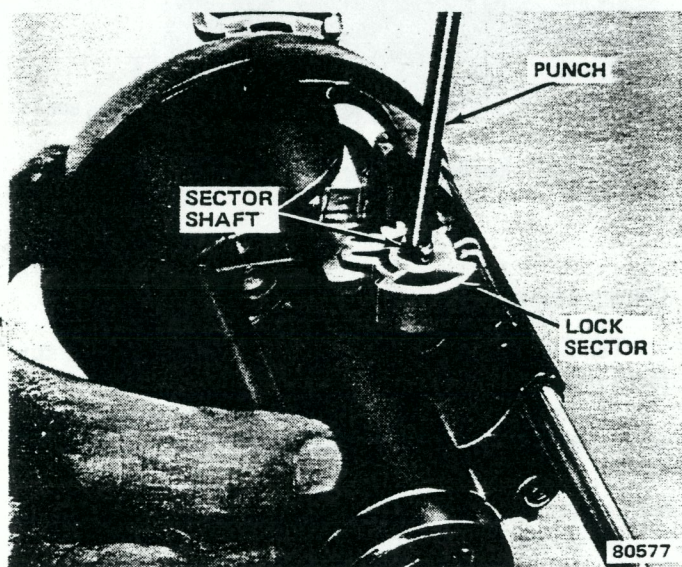


Fig. 2J-56 Lock Sector and Sector Shaft Removal

(36) Remove lock shoe pin from housing using tool J-22635 or pin punch (fig. 2J-38) and remove lock shoes, springs, and wedge.

(37) Remove housing upper and lower bearings and races only if damaged or worn. If bearings and races must be replaced, remove bearings and races using hammer and punch.

NOTE: Discard the housing bearings and races if removed. They are not reusable.

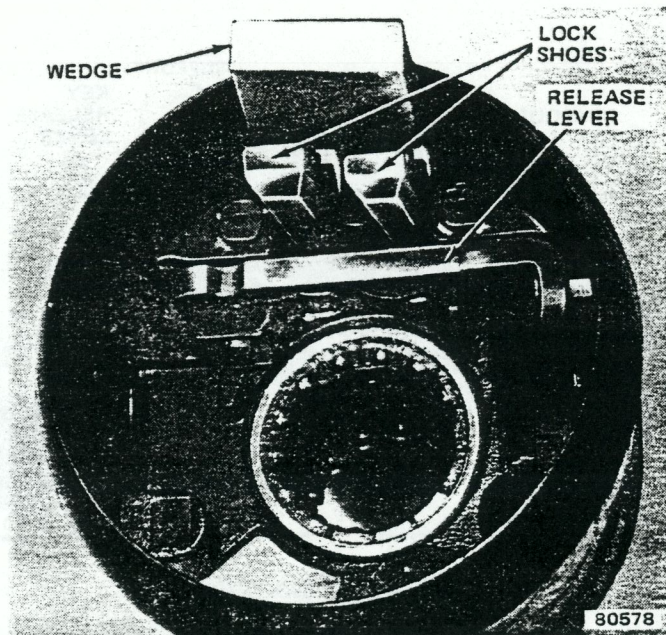


Fig. 2J-57 Relieving Lock Shoe Spring Tension

(38) Disconnect steering shaft at intermediate shaft coupling.

(39) Remove steering shaft through upper end of column (fig. 2J-58).

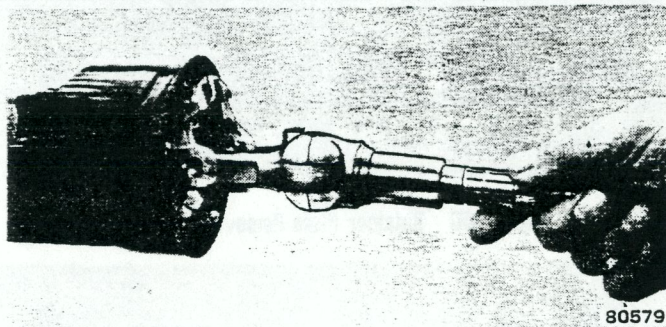


Fig. 2J-58 Steering Shaft Removal/Installation

(40) Remove support attaching bolts and remove support (fig. 2J-59). Use 1/4-inch, 12-point deep socket to remove bolts.

(41) Remove retainer plate (fig. 2J-60). Tip upper end of plate rearward and turn plate counterclockwise to remove.

(42) Remove shroud using twisting-pulling motion (fig. 2J-61).

(43) Remove key release lever and lever spring from shroud (fig. 2J-62). Tip lever forward and lift upward to remove.

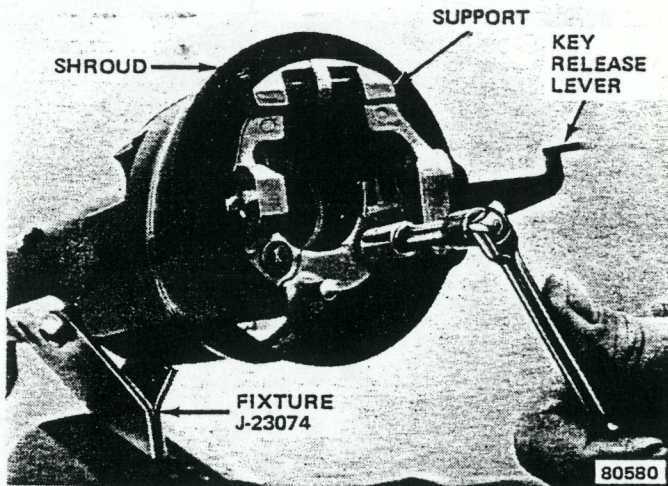


Fig. 2J-59 Support Removal/Installation

(44) Disconnect ignition switch wire harness connector and remove switch from column.

(45) Remove snap ring, retainer, and bearing assembly from lower end of column.

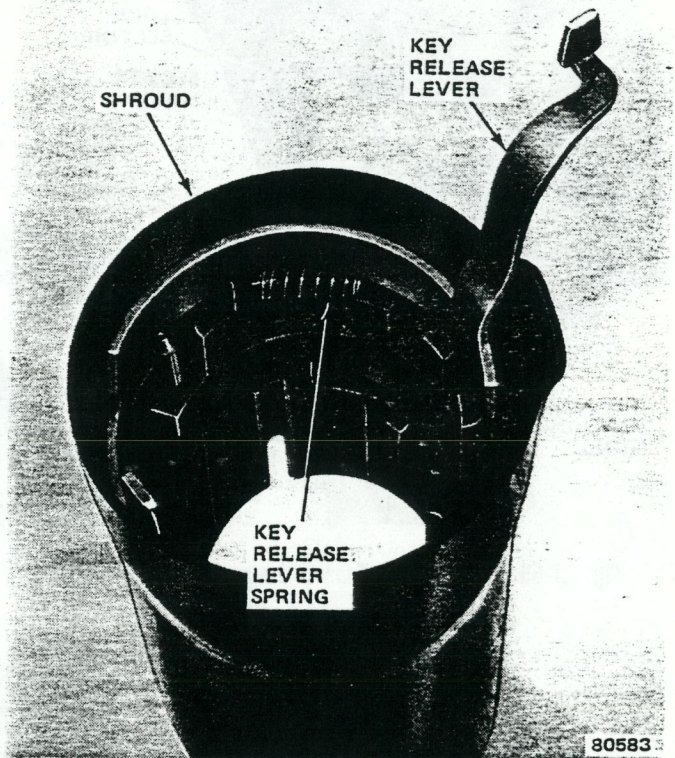


Fig. 2J-62 Key Release Lever and Spring Removal/Installation

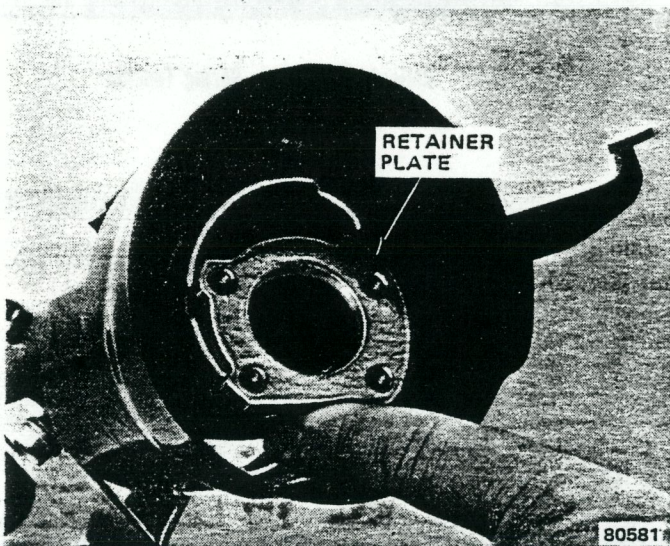


Fig. 2J-60 Retainer Plate Removal/Installation

Column Assembly

(1) Lubricate all bearing, friction, and thrust surfaces with chassis grease.

(2) Install bearing assembly, bearing retainer, and snap ring in lower end of column (fig. 2J-47).

(3) Install key release lever spring on lever and install assembled lever and spring in shroud (fig. 2J-62).

(4) Align and install shroud on column jacket (fig. 2J-61).

(5) Install retainer plate (fig. 2J-60). Tip plate toward 12 o'clock position, slide it under jacket opening, and seat it in column jacket notches.

(6) Align column jacket "V" notch with corresponding "V" on support and install support in column (fig. 2J-63). Press key release lever downward while pressing support into place to seat support fully.

(7) Install all support attaching screws finger tight. Then tighten screws alternately and evenly to 60 inch-pounds (81 N•m) torque (fig. 2J-59).

(8) Install remote rod in support. Guide rod through upper end of shroud and insert it into rod slot in support.

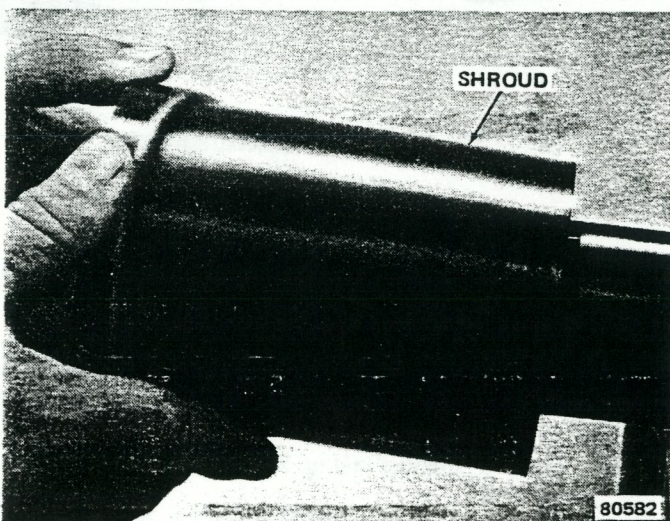


Fig. 2J-61 Shroud Removal/Installation

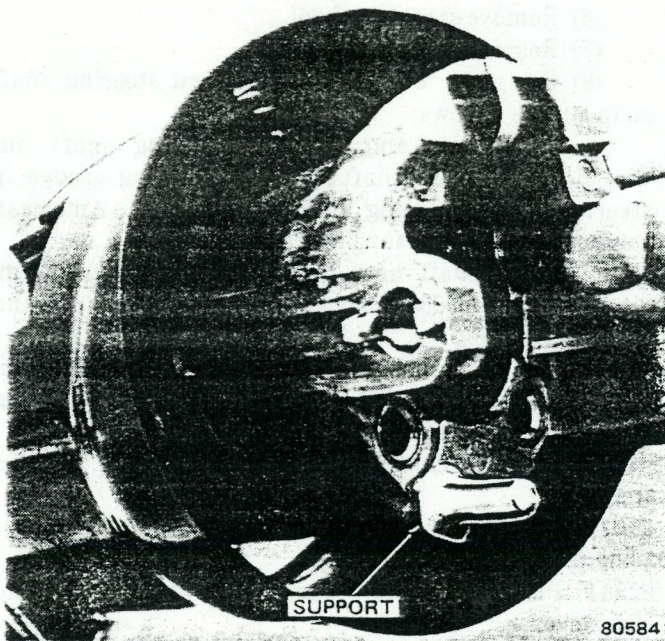


Fig. 2J-63 Support Installation

- (9) Install steering shaft in column (fig. 2J-58).
- (10) Install replacement bearings in housing, if removed. Be sure to lubricate bearings with chassis grease before installation.
- (11) Install lock shoes, lock shoe springs, and lock shoe pin in housing. Use 0.180-inch (4.5 mm) diameter rod to align lock shoes and pin during installation.
- (12) Install release lever, lever spring, and lever pin in housing. Insert wedges between housing and lever to relieve spring tension and ease pin installation (fig. 2J-57).
- (13) Install sector shaft in housing. Lightly tap shaft into housing using punch.
- (14) Install lock sector on shaft. Lightly tap sector onto shaft until shaft snap ring groove is exposed and install sector retaining snap ring.
- (15) Install lock bolt in housing and engage bolt in lock sector cam surface (fig. 2L-56).
- (16) Install lock rack, rack preload spring, and replacement shim (if used) in housing. Square block tooth of rack must engage square block tooth of sector (fig. 2J-56).
- (17) Install lock spring and spring retaining screw (fig. 2J-55). Tighten screw to 35-inch pounds (4 N•m) torque.
- (18) Align and install assembled housing on support (fig. 2J-53). Hold lock shoes in disengaged position to ease housing installation.
- (19) Align pivot pin holes in housing and support and install pivot pins. Press housing downward when first installing pins to prevent damaging pin holes in support. When pins are started in both housing and support, seat pins fully using hammer and punch.

- (20) Insert tilt lever in housing and place housing in full upward tilt position.
 - (21) Lubricate tilt guide and spring liberally with chassis grease and install tilt spring on guide.
 - (22) Insert assembled tilt spring and guide in housing and install guide retainer on spring (fig. 2J-52). Engage retainer lock tabs with housing lugs by pressing retainer downward and turning clockwise using screwdriver.
 - (23) Install tilt lever shield in housing.
 - (24) Remove tilt lever.
 - (25) Install cover on housing. Align and install cover attaching screws. Tighten screws to 60 inch-pounds (7 N•m) torque.
 - (26) Install turn signal switch. Guide switch harness and connector through column and position switch in housing. Do not install switch screws at this time.
 - (27) Insert hazard warning knob in signal switch, press knob inward, and align and install signal switch attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque. Be sure signal switch is properly seated before tightening screws.
 - (28) Thread hazard warning knob into signal switch and pull knob outward.
 - (29) Install upper bearing race and seat in housing (fig. 2J-51).
 - (30) Install upper bearing preload spring, canceling cam, and lock plate (fig. 2J-47).
 - (31) Install replacement steering shaft snap ring on sleeve of Compressor Tool J-23653 and install tool on steering shaft (fig. 2J-25).
- CAUTION:** Identify the steering shaft nut thread type before installing the compressor tool. If the shaft has American threads, use the compressor tool as is. However, if the shaft has metric threads (fig. 2J-2), replace the compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing the tool.
- (32) Compress lock plate and seat snap ring in steering shaft groove (fig. 2J-25).
 - (33) Remove compressor tool. Be sure snap ring is completely seated before removing tool.
 - (34) Install tilt and turn signal levers. Tighten turn signal lever attaching screw to 15 inch-pounds (2 N•m) torque.
 - (35) Install shift lever and lever retaining pin, if equipped.
 - (36) Install ignition lock cylinder. Hold cylinder sleeve, turn knob clockwise against stop, align cylinder tab with housing keyway and insert cylinder in housing. Turn cylinder knob counterclockwise until cylinder mates with lock sector and push cylinder inward until retainer snaps into place.
 - (37) Insert key in lock cylinder and turn cylinder to Off-Unlock position.

(38) Install ignition switch as follows:

(a) Move switch slider to Accessory position then back two clicks to Off-Lock position. Remote rod hole in slider should be almost at center (fig. 2J-64).

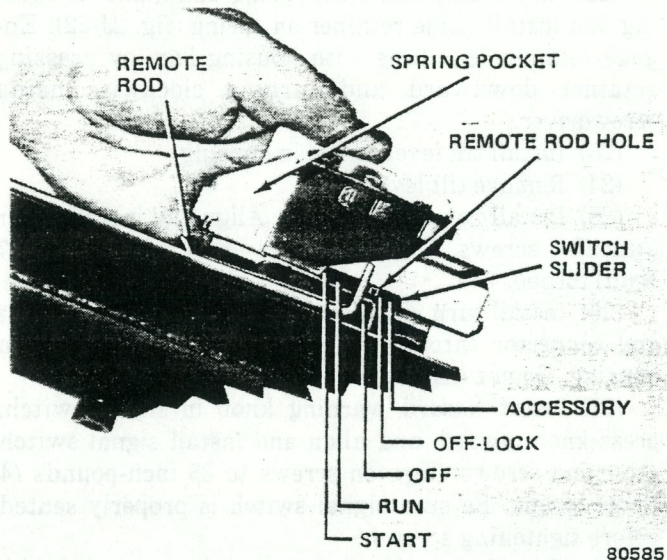


Fig. 2J-64 Ignition Switch Installation

(b) Insert remote rod into slider hole and install switch on column jacket.

(c) Move switch downward to eliminate switch-to-remote rod lash and tighten switch attaching screws to 35 inch-pounds (4 N•m) torque.

(39) Position switch harness protectors, if equipped, over harness and snap protectors into place on column.

(40) Install lock plate cover.

(41) Install steering wheel. Tighten steering wheel nut to 30 foot-pounds (41 N•m) torque.

CAUTION: Some steering shafts have metric size steering wheel nut threads. Identify the shaft nut thread type before installing a replacement nut. Metric shafts have an identifying groove in the steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.

(42) Remove column support fixture and install column mounting bracket. Tighten bracket attaching bolts to 20 foot-pounds (27 N•m) torque.

(43) Install column if removed. Refer to Steering Column Installation.

TURN SIGNAL AND CRUISE COMMAND SWITCH

Removal

- (1) Disconnect battery negative cable.
- (2) Cover painted areas of column.
- (3) Remove column-to-instrument panel bezel.
- (4) Loosen toeplate screws.
- (5) On vehicles with tilt column, place column in neutral (nontilt) position.

(6) Remove steering wheel.

(7) Remove lock plate cover.

(8) Compress lock plate and unseat steering shaft snap ring as follows:

(a) Inspect and identify steering shaft nut thread type. Metric shafts have identifying groove in steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.

(b) If shaft has American threads, use Compressor Tool J-23653 as is to compress lock plate and unseat snap ring.

(c) If shaft has metric threads, replace compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing tool on shaft.

(9) Remove compressor tool and snap ring. Discard snap ring.

(10) Remove lock plate, canceling cam, and upper bearing preload spring.

(11) Place turn signal lever in right turn position and remove lever.

(12) Remove hazard warning knob. Press knob inward and turn counterclockwise to remove.

(13) Remove column wiring harness protectors, if equipped.

(14) Disconnect column wiring harness connectors at base of column.

(15) If Cruise Command switch is to be serviced, remove switch and harness by removing turn signal lever attaching screw and removing lever, switch, and switch harness as assembly.

(16) If turn signal switch is to be serviced, remove hazard warning knob and turn signal lever. Remove switch attaching screws and remove switch from column.

Installation

(1) If turn signal switch was serviced, install switch in housing and install attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque. Install hazard warning knob and install turn signal lever. Tighten lever attaching screw to 15 inch-pounds (2 N•m) torque.

(2) If Cruise Command switch was serviced, install signal lever and switch assembly and install attaching screws. Tighten screws to 35 inch-pounds (4 N•m) torque.

(3) Install upper bearing preload spring, canceling cam, and lock plate on steering shaft.

(4) Install replacement steering shaft snap ring on sleeve of Compressor Tool J-23653 and install tool on steering shaft.

CAUTION: Identify the steering shaft nut thread type before installing the compressor tool. If shaft has American threads, use tool J-23653 as is. However, if the shaft has metric threads (fig. 2J-2), replace the compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before using the tool.

(5) Compress lock plate and seat steering shaft snap ring in shaft groove. Remove compressor tool after snap ring installation.

(6) Install lock plate cover.

(7) Install steering wheel and install replacement steering wheel nut. Tighten nut to 30 foot-pounds (41 N•m) torque.

CAUTION: *Some steering shafts have metric size steering wheel nut threads. Be sure to install the proper thread-type nut. Metric shafts have an identifying groove in the steering wheel locating splines (fig. 2J-2).*

(8) Connect signal switch or Cruise Command switch harness connectors at base of column and install harness protector.

(9) Install and tighten column-to-mounting bracket bolts to 20 foot-pounds (27 N•m) torque.

(10) Install and tighten column mounting bracket-to-instrument panel bolts to 20 foot-pounds (27 N•m) torque.

(11) Install column bezel.

(12) Tighten toeplate bolts to 10 foot-pounds (14 N•m) torque.

(13) Remove protective covering from painted areas of column.

(14) Connect battery negative cable.

IGNITION SWITCH

Removal

(1) Insert key in lock cylinder and turn cylinder to Off-Unlock position.

(2) Disconnect battery negative cable.

(3) Disconnect harness connectors at switch.

(4) Remove switch attaching screws.

(5) Disengage remote rod from switch slider and remove switch from column.

Installation

(1) Move switch slider to Accessory position (fig. 2J-64).

(2) Move switch slider back two clicks to Off-Unlock position (fig. 2J-64).

(3) Engage remote rod in switch slider and position switch on column. Do not move slider when positioning switch on column jacket.

(4) Install and tighten switch attaching screws to 35 inch-pounds (4 N•m) torque.

(5) Connect harness connectors to switch.

(6) Connect battery negative cable.

IGNITION LOCK CYLINDER

The key-operated lock cylinder is located at the upper end of the steering column and is mounted in the column housing or cover. The lock cylinder is a two-piece assembly and can be removed, disassembled, and repaired or recoded if necessary.

Conditions Requiring Service

Key Lost—Key Code Number Known

The key code may be converted to a five-digit number that determines key bitting. This number may be obtained from the catalogues furnished by manufacturers of key cutting machines or by calling the Jeep zone office.

Defective Ignition Lock—Ignition Key Available—No Key Code Number

New lock cylinders are available from service parts warehouses only as uncoded cylinders without tumblers. Tumblers are ordered under five different part numbers, one for each depth of cut available. Refer to Key Coding.

Key Lost—Key Code Lost Or Not Known

Contact the servicing dealer and provide the dealer with the vehicle identification number. The dealer may have a record of the key codes involved. If not, the key code numbers assigned to the vehicle may be obtained from the Jeep zone office.

Lock Cylinder Removal

(1) Disconnect battery negative cable.

(2) Apply protective material to painted areas of column.

(3) Remove steering wheel.

(4) Remove lock plate cover. Use two screwdrivers to pry cover out of column.

(5) Compress lock plate and unseat steering shaft snap ring as follows:

(a) Inspect and identify steering shaft nut thread-type. Metric shafts have identifying groove in steering wheel locating splines (fig. 2J-2). American thread shafts do not have this groove.

(b) If shaft has American threads, use Compressor Tool J-23653, as is, to compress lock plate and unseat snap ring (fig. 2J-6).

(c) If shaft has metric threads, replace compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing tool on steering shaft.

WARNING: *The lock plate is under strong spring pressure. Do not attempt to remove the steering shaft snap ring without using the compressor tool.*

(6) Remove compressor tool and snap ring. Discard snap ring.

(7) Remove lock plate, canceling cam, and upper bearing preload spring.

(8) Remove turn signal lever attaching screw and remove lever.

(9) Press hazard warning knob inward and turn knob counterclockwise to remove it.

(10) Disconnect turn signal and Cruise Command wire harness connectors at base of column.

(11) Remove turn signal switch attaching screws and move switch aside to provide working clearance. It is not necessary to remove switch and harness completely.

(12) Insert key in lock cylinder. On manual transmission columns, place cylinder in On position. On automatic transmission columns, place cylinder in Off-Lock position.

(13) Compress lock cylinder retaining tab using thin blade screwdriver and remove lock cylinder from column.

NOTE: The lock cylinder retaining tab is accessible through the slot adjacent to the turn signal switch mounting boss (fig. 2J-9). If the tab is not visible through the slot, scrape or knock any casting flash out of the slot to provide access.

Lock Cylinder Installation

(1) Install lock cylinder as follows:

(a) Insert key in lock cylinder.

(b) Hold cylinder sleeve and turn key clockwise until key stops.

(c) Align lock cylinder retaining tab with key-way in housing and insert cylinder into column.

(d) Push cylinder inward until it contacts lock sector. Rotate cylinder to engage it with lock sector, and push cylinder inward until cylinder retaining tab engages in housing groove.

(2) Align and install turn signal switch in column.

(3) Install and tighten switch attaching screws to 35 inch-pounds (4 N•m) torque.

(4) Install hazard warning knob. Tighten knob to 5 inch-pounds (0.56 N•m) torque.

(5) Install turn signal lever. Tighten lever attaching screw to 15 inch-pounds (2 N•m) torque.

(6) Install upper bearing preload spring, canceling cam, and lock plate on steering shaft.

(7) Install replacement steering shaft snap ring on sleeve of Compressor Tool J-23653 and install tool on steering shaft (fig. 2J-6).

CAUTION: Identify the steering shaft nut thread-type before installing the compressor tool. If the shaft has American threads, use the tool as is. However, if the shaft has metric threads (fig. 2J-2), replace the compressor tool standard forcing screw with Metric Forcing Screw J-23653-4 before installing the tool on the shaft.

(8) Compress lock plate with compressor tool and seat snap ring in steering shaft groove (fig. 2J-6).

(9) Remove compressor tool.

(10) Install lock plate cover.

(11) Install steering wheel and tighten steering wheel nut to 30 foot-pounds (41 N•m) torque.

CAUTION: Some steering shafts have metric steering wheel nut threads. Identify the shaft nut thread-type before installing a replacement nut. Metric shafts have an identifying groove in the steering wheel locating splines (fig. 2J-2).

(12) Connect column wiring harness connectors at base of column.

(13) Remove protective covering from column painted areas.

(14) Connect battery negative cable.

(15) Reset clock if equipped.

Lock Cylinder Disassembly

In the following procedures, all references to turning the key clockwise or counterclockwise are made as if the cylinder is being viewed from the key-end.

(1) Insert key in lock cylinder.

(2) Hold lock sleeve and turn cylinder to Lock position.

(3) Fabricate plunger pin compressor tool from paper clip. Make 90° bend in one end of clip about 1/4 inch (6.35 mm) from end (fig. 2J-65).

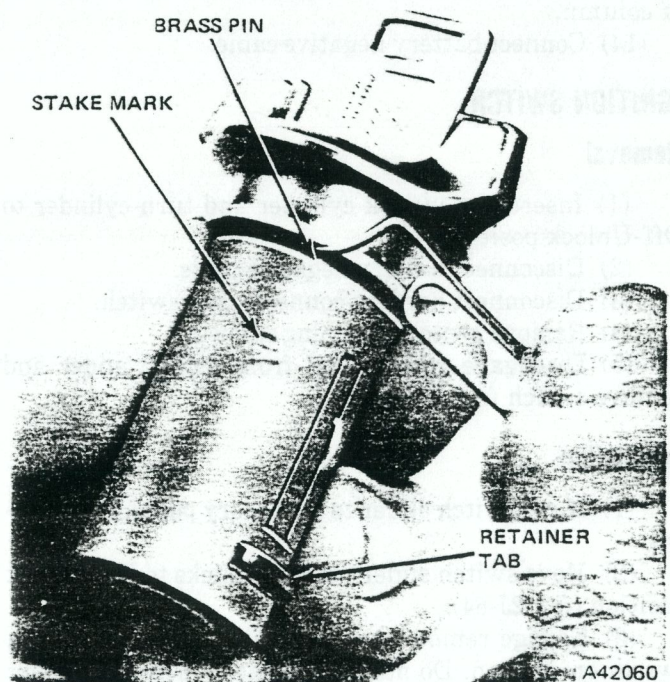


Fig. 2J-65 Compressing Lock Cylinder Plunger Pin

(4) Turn lock cylinder to Accessory position. Brass plunger pins in lock sleeve should now bear against lock cylinder stop lug (fig. 2J-66).

(5) Compress plunger pin using paper clip compressor tool (fig. 2J-65).

NOTE: There are two brass pins and two staking marks on the lock sleeve. The brass pin that must be compressed in order to separate the cylinder and sleeve is located just above the stake mark that is positioned above and to the left of the retaining tab (fig. 2J-65).

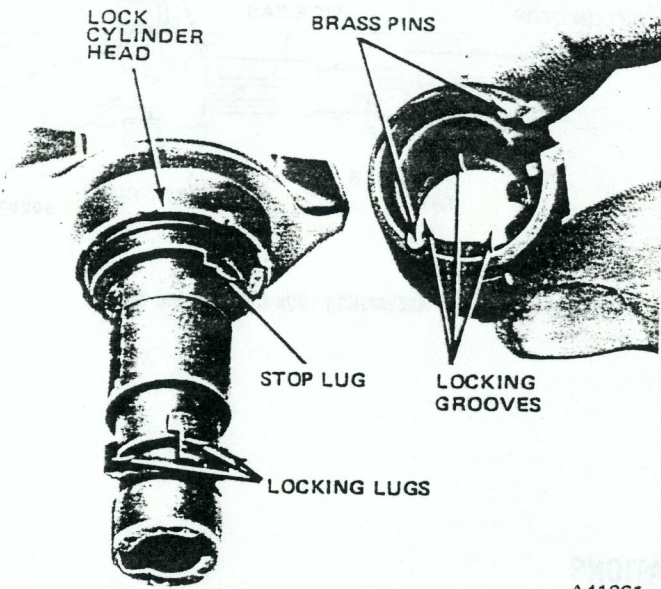


Fig. 2J-66 Lock Cylinder and Sleeve Disassembled

- (6) Hold brass plunger pin in compressed position and turn lock cylinder clockwise using paper clip.
- (7) Stop turning cylinder when it springs upward slightly. Cylinder locking lugs are now aligned with sleeve locking grooves.
- (8) Remove ignition key.
- (9) Turn sleeve and cylinder upside down.
- (10) Fabricate wire hook from additional paper clip.
- (11) Lift nylon stop on lock sleeve using wire hook and separate cylinder from sleeve (fig. 2J-67).

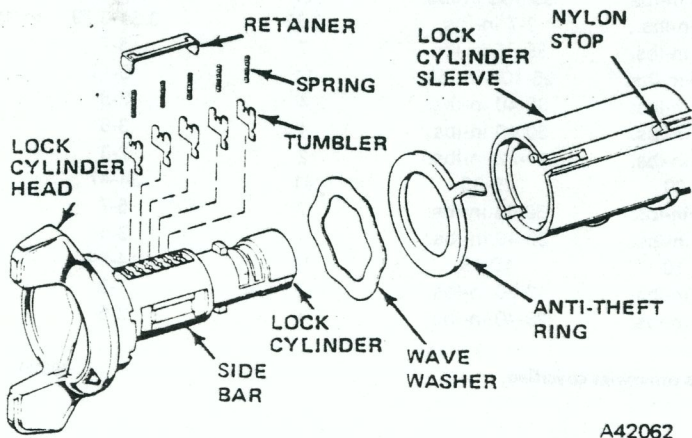


Fig. 2J-67 Ignition Lock Cylinder Assembly

NOTE: If the cylinder does not separate from the sleeve easily, tap the assembly lightly on the workbench to free the sleeve from the cylinder.

- (12) Pry tumbler retainer from cylinder and remove tumbler springs (fig. 2J-67).
- (13) Pull side bar outward slightly and remove tumblers from cylinder (fig. 2J-67).

Key Coding

To determine the tumblers needed when the key code is not available, use the code diagram as follows (fig. 2J-68):

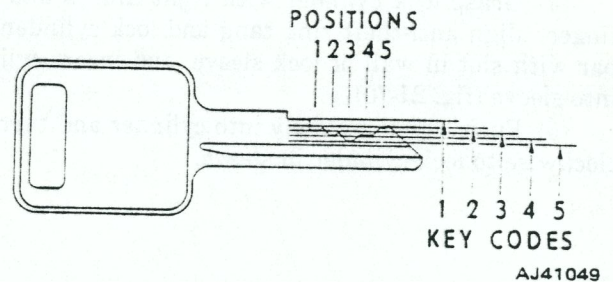


Fig. 2J-68 Key Coding Diagram

- (1) Place key over coding diagram with uncut side of key aligned exactly with diagram. Each of five positions will align with key notches.
- (2) Starting at head of key blade, determine and record lowest level tumbler number that is visible in each position (1 through 5).
- (3) After tumbler number sequence is determined, lock cylinder is ready for assembly.
- (4) Starting at key end of lock cylinder, insert tumblers in proper slots and in order required by key code. Pull side bar outward slightly to allow tumblers to drop completely into place.
- (5) Install a spring on each tumbler.
- (6) Insert tumbler retainer so two end prongs slide into slots in cylinder.
- (7) Press retainer downward until it is seated.
- (8) Insert key in lock cylinder and check tumbler operation. If tumblers are properly installed, side bar will drop downward when key is inserted. If side bar does not move, disassemble cylinder and check for incorrect assembly or coding of key and tumblers.
- (9) If cylinder is correctly assembled and operates properly, stake each end of spring retainer in place using punch (fig. 2J-69).

Assembly

- (1) Insert key completely into lock cylinder, then pull key out two notches.

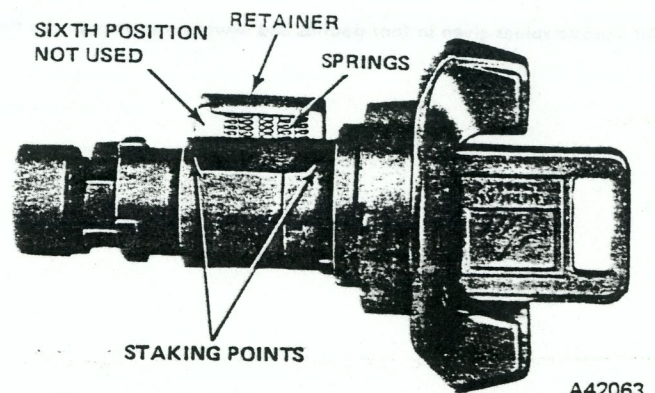


Fig. 2J-69 Tumbler and Spring Installation

- (2) Install wave washer and anti-theft ring on lock cylinder (fig. 2J-70).
- (3) Grasp lock sleeve with left thumb and forefinger and hold nylon stop in lock sleeve upward with forefinger (fig. 2J-70).
- (4) Grasp lock cylinder with right thumb and forefinger, align anti-theft ring tang and lock cylinder side bar with slot in wall of lock sleeve, and insert cylinder into sleeve (fig. 2J-70).
- (5) Push key completely into cylinder and turn key clockwise to lock cylinder in sleeve.

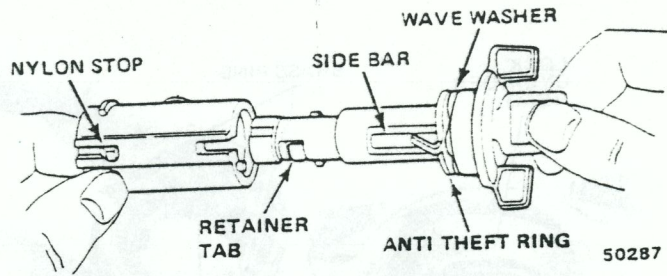


Fig. 2J-70 Assembling Lock Cylinder and Sleeve

SPECIFICATIONS

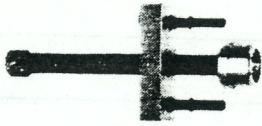
Torque Specifications

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	USA (ft-lbs)		Metric (N-m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Clamp Bolt, Flexible Coupling	30	25-35	41	34-47
Clamp Bolt, Intermediate Shaft	45	40-55	61	54-75
Clamp Bolt, Steering Shaft U-Joint	45	40-55	61	54-75
Column Mounting Bracket Bolt	20	15-25	27	20-34
Column Mounting Bracket-to-Instrument Panel Bolts	20	15-25	27	20-34
Cover Screws (Auto. Col.)	60 in-lbs.	50-65 in-lbs.	7	5-7
Cover Screws (Tilt Col.)	100 in-lbs.	95-105 in-lbs.	11	10-12
Hazard Warning Knob	5 in-lbs.	3-7 in-lbs.	0.56	0.34-0.79
Housing Screws (Std. Col.)	60 in-lbs.	55-65 in-lbs.	7	5-7
Housing Screws (Tilt Col.)	100 in-lbs.	95-105 in-lbs.	11	10-12
Ignition Switch Mounting Screws	35 in-lbs.	30-40 in-lbs.	4	3-5
Lock Sector Tension Spring Screw	35 in-lbs.	30-40 in-lbs.	4	3-5
Shroud Screws (Man. Trans. Col.)	18 in-lbs.	14-22 in-lbs.	2	2-3
Steering Wheel Nut	30	25-35	41	34-47
Support Screws (Tilt Col.)	60 in-lbs.	50-65 in-lbs.	7	5-7
Tilt Lever Screw	35 in-lbs.	30-40 in-lbs.	4	3-5
Toe Plate Screws	10	10-18	14	14-24
Turn Signal Lever Screw	15 in-lbs.	12-20 in-lbs.	2	1-3
Turn Signal Switch Screws	35 in-lbs.	28-40 in-lbs.	4	3-5

All Torque values given in foot-pounds and newton-meters with dry fits unless otherwise specified.

Tools



J-23072
SHIFT TUBE REMOVER



J-22635
PIN REMOVER AND
INSTALLER



J-23653
LOCK PLATE
COMPRESSOR



J-23073
SHIFT TUBE
INSTALLER



J-22569
STEERING SHAFT SNAP RING
REMOVER AND INSTALLER



J-21232
STEERING WHEEL
PULLER

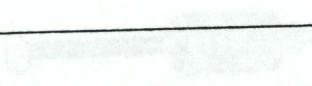


J-23074
STEERING COLUMN
HOLDING FIXTURE

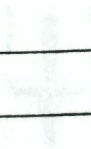


J-21854-1 PIVOT
PIN PULLER

NOTES



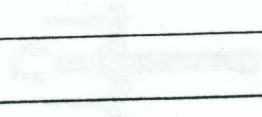
STEERING RACK AND PINION ASSEMBLY



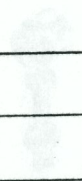
STEERING KNUCKLE AND HUB ASSEMBLY



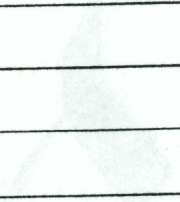
STEERING KNUCKLE AND HUB ASSEMBLY



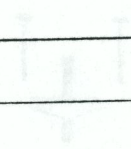
STEERING KNUCKLE AND HUB ASSEMBLY



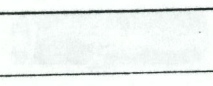
STEERING KNUCKLE AND HUB ASSEMBLY



STEERING KNUCKLE AND HUB ASSEMBLY



STEERING KNUCKLE AND HUB ASSEMBLY



STEERING KNUCKLE AND HUB ASSEMBLY

MANUAL STEERING GEAR

2K

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GENERAL

The manual steering gear used on Jeep vehicles is a recirculating ball design (fig. 2K-1). The steering gear wormshaft and ball nut are in line with the steering shaft in the column. Steering ratio of this unit is 24:1.

The steering gear wormshaft and column steering shaft are connected by a removable flexible coupling. The coupling permits independent removal of the steering gear or column.

The steering gear ball nut is mounted on the wormshaft and is driven through steel ball bearings which circulate in the spiral grooves machined in the wormshaft and ball nut. The bearings act as a rolling thread between the wormshaft and ball nut. The ball nut is directly engaged by the pitman shaft sector teeth.

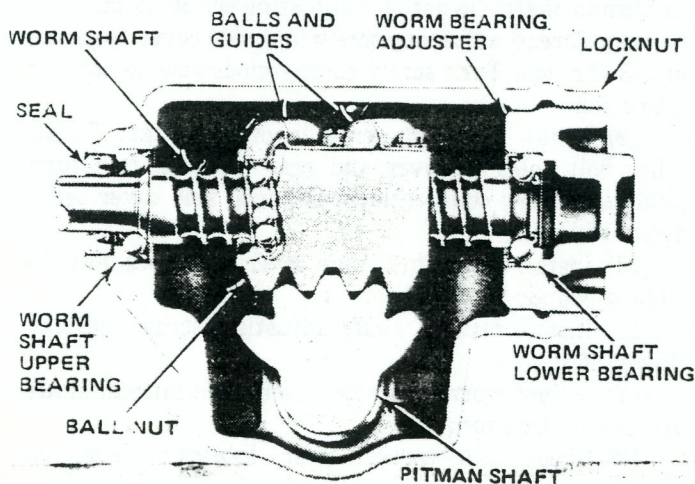


Fig. 2K-1 Recirculating Ball Manual Steering Gear

ON-VEHICLE SERVICE

Steering Gear Adjustment

Adjustments are generally made to compensate for normal wear in the gear or to correct a handling problem caused by improper adjustment. Correct adjustment results in a definite drag or preload but does not cause excessive steering effort through any point of the turn.

CAUTION: Adjust the steering gear in the following sequence only. Failure to do so could result in damage to the gear or improper steering response. Always adjust worm bearing preload first; then adjust pitman shaft overcenter drag torque last.

Worm Bearing Preload and Pitman Shaft Overcenter Drag Torque

- (1) Raise vehicle and remove crossmember cover, if equipped.
- (2) Check and correct steering gear mounting bolt torque if necessary.
- (3) Mark pitman arm and steering gear pitman shaft for assembly reference.
- (4) Remove pitman arm nut and remove pitman arm using Puller J-6632 (fig. 2K-2).
- (5) Loosen pitman adjusting screw locknut and back off adjusting screw 2 or 3 turns.
- (6) Remove horn button and cover.
- (7) Slowly turn steering wheel in one direction until stopped by gear; then turn wheel back 1/2 turn.

CAUTION: Do not turn the steering wheel hard against the stop when the linkage is disconnected. This could result in damage to the steering gear ball return guides.

(8) Install socket and inch-pound torque wrench on steering wheel nut.

(9) Measure worm bearing preload by rotating steering wheel through 90° arc (1/4 turn). Preload should be 5 to 8 inch-pounds (0.6 to 1 N•m).

NOTE: *Steering column misalignment or damage will affect torque readings. If rotating torque is exceptionally high, check the column alignment. If alignment is correct, remove the gear, determine the problem area, and repair as necessary.*

(10) If preload adjustment is necessary, loosen worm bearing adjuster locknut and turn adjuster clockwise to increase preload or counterclockwise to decrease preload.

(11) When desired preload is obtained, tighten adjuster locknut to 90 foot-pounds (122 N•m) torque and check preload again. Correct preload as necessary.

(12) Adjust pitman shaft overcenter drag torque.

CAUTION: *Do not attempt to adjust pitman shaft overcenter drag torque until after worm bearing preload has been adjusted.*

(13) Rotate steering wheel slowly from stop-to-stop and count total number of steering wheel turns.

(14) Turn steering wheel back 1/2 total number of turns to place gear on center; then turn wheel 1/2 turn off center.

(15) Install socket and inch-pound torque wrench on steering wheel nut.

(16) Measure torque required to turn gear through center of travel (this is overcenter drag torque). Drag torque should equal worm bearing preload torque plus 4 to 10 inch-pounds (.5 to 1 N•m) but must not exceed total of 18 inch-pounds (2 N•m).

Example:

Worm bearing preload is adjusted to 6 inch-pounds (0.7 N•m) torque. Over center drag torque is adjusted to 7 inch-pounds (0.8 N•m) in addition to worm bearing preload. This makes a total of 13 inch-pounds (1 N•m) which is acceptable.

(17) If adjustment is required, loosen pitman shaft adjusting screw locknut and loosen or tighten adjusting screw to obtain desired drag torque.

(18) Tighten pitman shaft adjusting screw locknut to 25 foot-pounds (34 N•m) after adjusting drag torque and recheck drag torque again. Correct adjustment if necessary.

(19) Install pitman arm. Index arm to shaft using alignment marks made at disassembly.

(20) Tighten pitman arm nut to 185 foot-pounds (251 N•m) torque and stake nut to shaft threads in one place.

(21) Lower vehicle.

(22) Correct steering wheel-to-steering shaft alignment if necessary and install horn button cover.

Pitman Shaft Seal Replacement

(1) Raise vehicle.

(2) Place front wheels in straight ahead position.

(3) Mark pitman arm and shaft for assembly reference.

(4) Remove pitman arm using Puller J-6632 (fig. 2K-2).

(5) Remove seal using pointed tool or screwdriver with small blade.

(6) Inspect condition of gear lubricant. If contaminated and full of metal particles, remove and overhaul gear.

(7) Wrap pitman shaft splines with shimstock to protect replacement seal during installation.

(8) Lubricate lip of replacement seal with chassis lubricant, slide seal over shimstock and into seal seat in gear housing. Complete seal installation by tapping seal into place using small plastic mallet.

(9) Install pitman arm on shaft. Align arm and shaft using reference marks made at disassembly.

(10) Tighten pitman arm nut to 185 foot-pounds (251 N•m) torque and stake nut to shaft threads in one place.

(11) Lower vehicle.

Side Cover and Gasket Replacement

(1) Raise vehicle.

(2) Remove pitman shaft adjusting screw locknut.

(3) Remove side cover attaching bolts.

(4) Turn pitman shaft adjusting screw clockwise to remove cover from screw.

(5) Inspect condition of gear lubricant. If contaminated and full of metal particles, remove and overhaul gear.

(6) Coat replacement side cover gasket with chassis lubricant and position gasket on replacement side cover.

(7) Slide pitman shaft adjusting screw out of T-slot in pitman shaft. Do not lose adjusting screw shim.

(8) Thread adjusting screw into side cover to depth of 2-3 threads. Turn screw counterclockwise to start it into cover.

(9) Install adjusting screw in pitman shaft T-slot, align bolt holes in cover and gear housing, and turn adjusting screw counterclockwise until side cover seats against housing.

(10) Install and tighten side cover attaching bolts to 30 foot-pounds (41 N•m) torque.

(11) Install pitman shaft adjusting screw locknut finger tight only.

(12) Adjust worm bearing preload and pitman shaft overcenter drag torque.

(13) Check and correct gear lubricant level as necessary.

(14) Lower vehicle.

Service Diagnosis

Condition	Possible Cause	Correction
HARD STEERING	(1) Incorrect tire pressure. (2) Lack of lubrication. (3) Tie rod ends worn. (4) Steering knuckle ball studs tight. (5) Steering gear parts worn. (6) Frozen steering column bearings. (7) Lower coupling flange rubbing against steering shaft. (8) Steering gear adjusted incorrectly. (9) Front spring sag. (10) Frame bent or broken. (11) Steering knuckle bent. (12) Ball stud galled or too tight. (13) Steering knuckle ball studs binding. (14) Steering gear or connections binding.	(1) Adjust. (2) Lubricate steering linkage. (3) Replace rod ends. (4) Adjust or replace. (5) Overhaul gear. (6) Replace bearings. (7) Loosen bolt and assemble properly. (8) Check adjustment. Disconnect pitman arm from gear or disconnect linkage from pitman arm and adjust gear if necessary. (9) Check front end jounce height. It should be approximately the same at both wheels. Replace front springs if sagged. (10) Repair frame as necessary. (11) Replace knuckle. (12) Replace ball stud. (13) Reseat or replace studs. (14) Test steering system with wheels off floor. Adjust and lubricate.
LOOSE STEERING	(1) Tie rod ends worn. (2) Steering knuckle ball studs worn. (3) Steering gear parts worn. (4) Steering gear improperly adjusted.	(1) Replace rod ends. (2) Replace studs. (3) Overhaul gear. (4) Adjust gear.
EXCESSIVE ROAD SHOCK	(1) U-bolts loose. (2) Wheel bearings loose. (3) Shock absorbers worn.	(1) Repair as necessary. (2) Adjust bearings. (3) Replace.
TURNING RADIUS SHORT ONE SIDE	(1) Center bolt in spring sheared off. (2) Axle shifted. (3) Steering arm bent.	(1) Repair as necessary. (2) Repair as necessary. (3) Replace.

REMOVAL

(1) Remove intermediate shaft-to-wormshaft coupling clamp bolt and disconnect intermediate shaft.

(2) Remove pitman arm nut and lockwasher.

(3) Remove pitman arm from steering gear pitman shaft using Tool J-6632 (fig. 2K-2).

(4) On Cherokee, Wagoneer and Truck models, remove bolts attaching steering gear to frame and remove gear.

(5) On CJ models:

(a) Raise left side of vehicle slightly to relieve tension on left front spring and place support stand under frame and remove crossmember cover, if equipped.

(b) Remove bolts attaching steering gear lower bracket to frame (fig. 2K-3).

(c) Remove bolts attaching steering gear upper bracket to frame rail and remove gear.

(d) Remove Torx Head upper bracket bolt using 9 inch (22.86 cm) extension and Torx Bit External Socket Tool J-25359-21 (fig. 2K-3).

(e) Remove remaining bolts attaching upper bracket to tie plate and lower bracket to steering gear and remove brackets from gear.

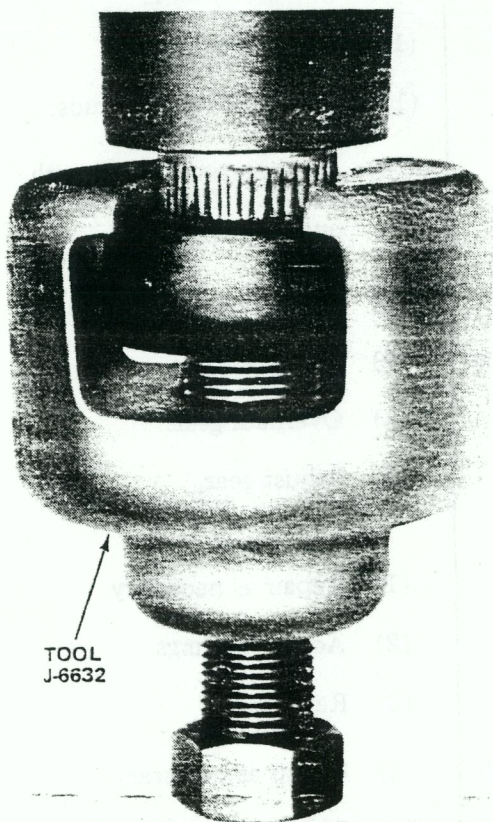


Fig. 2K-2 Pitman Arm Removal

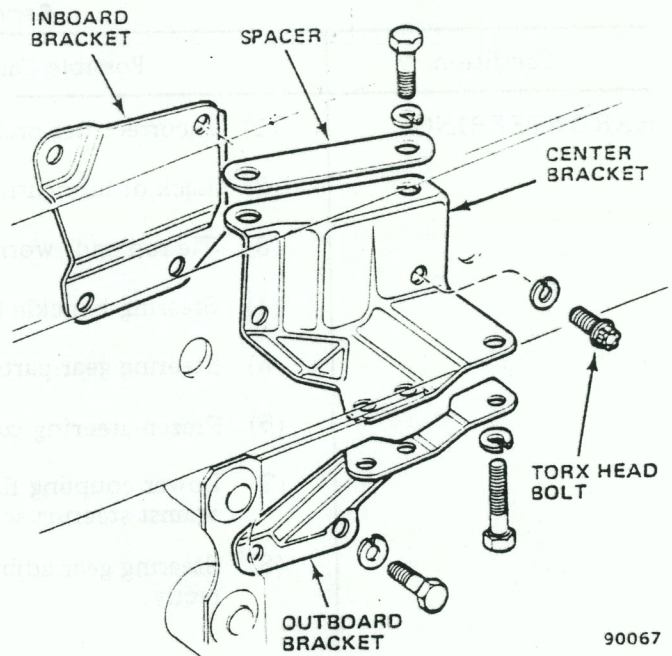


Fig. 2K-3 Steering Gear Mounting Brackets—CJ Models

INSTALLATION

NOTE: Proper retention of the steering gear is important. Some of the following steps in gear installation require the application of Loctite 271 or similar material to attaching bolt threads. Wherever indicated, use Loctite 271 Adhesive/Sealant or equivalent. Before applying this material, first clean all bolt threads thoroughly to remove dirt and grease and apply the material to the bolt threads no more than five minutes before installation.

(1) On Cherokee, Wagoneer and Truck models:

(a) Apply Loctite 271 or equivalent, to steering gear-to-frame mounting bolts.

(b) Align and engage intermediate shaft coupling with splines on steering gear wormshaft.

(c) Position gear on frame and install gear attaching bolts. Tighten bolts to 70 foot-pounds (95 N•m) torque.

(d) Install intermediate shaft coupling pinch bolt and nut. Tighten nut to 45 foot-pounds (61 N•m) torque.

(2) On CJ models:

(a) Apply Loctite 271, or equivalent, to all steering gear mounting bracket attaching bolts.

(b) Position tie plate and upper and lower mounting brackets on steering gear and install mounting bracket-to-gear attaching bolts. Tighten hex-head bolts to 70 foot-pounds (95 N•m) torque. Tighten torx head bolt to 55 foot-pounds (75 N•m) torque using Torx Head External Socket Tool J-25359-21.

(c) Apply Loctite 271, or equivalent, to all steering gear-to-frame and crossmember mounting bolts.

(d) Align and engage intermediate shaft coupling with steering gear wormshaft splines.

(e) Position steering gear on frame and install remaining gear mounting bolts. Tighten bolts to 55 foot-pounds (75 N•m) torque and install crossmember cover, if equipped.

(3) Install intermediate shaft coupling clamp bolt and nut. Tighten nut to 45 foot-pounds (61 N•m) torque.

(4) Install pitman arm on pitman shaft and install lockwasher and pitman arm nut. Tighten nut to 185 foot-pounds (251 N•m) torque.

(5) On CJ models, remove support stand and hydraulic jack.

NOTE: After the steering gear is installed, it may produce a slightly rough feel. To eliminate this roughness, turn the gear full left and right for 10 to 15 complete cycles.

DISASSEMBLY

(1) Mount steering gear in vise. Clamp vise jaws on gear mounting bosses only.

(2) Place ball nut and pitman shaft in centered position. Rotate wormshaft stop-to-stop and count total number of turns. Turn wormshaft back 1/2 total number of turns to center shaft and nut.

(3) Remove pitman shaft adjuster screw locknut (fig. 2K-4).

(4) Remove side cover attaching bolts (2K-5).

(5) Turn pitman shaft adjuster screw clockwise to unthread side cover from screw and remove side cover and gasket.

(6) Slide adjuster screw and shim out of T-slot in pitman shaft (fig. 2K-4). Retain shim and screw for end play measurement at assembly.

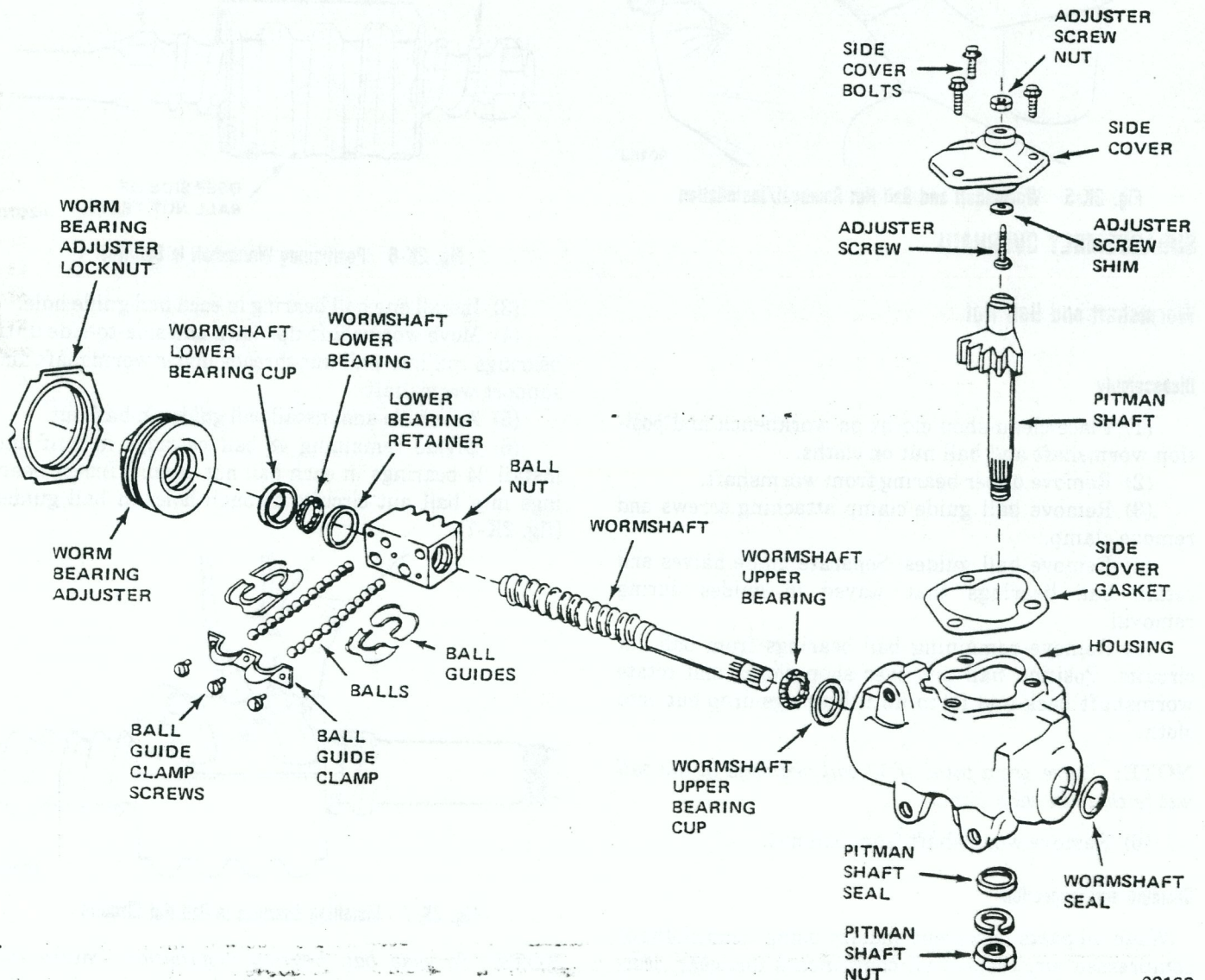


Fig. 2K-4 Manual Steering Gear

- (7) Remove pitman shaft. If necessary, tap shaft lightly with plastic mallet to remove it.
- (8) Remove worm bearing adjuster locknut.
- (9) Remove worm bearing adjuster.
- (10) Remove wormshaft and ball nut (fig. 2K-5).

CAUTION: During service operations, do not allow the ball nut to rotate freely and bottom at either end of the wormshaft. This can damage the tangs at the ends of the ball guides.

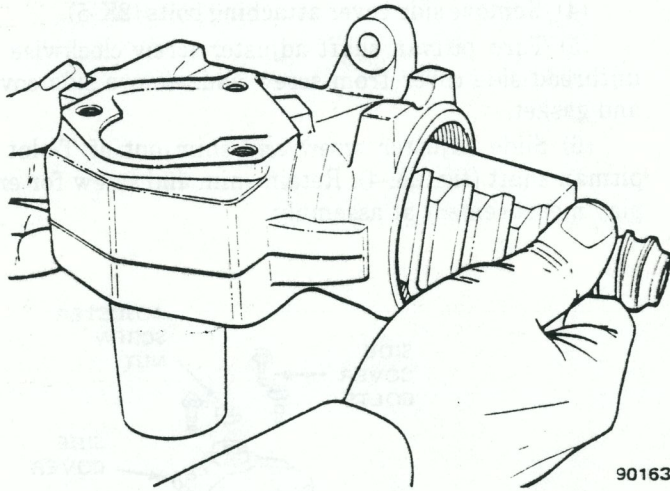


Fig. 2K-5 Wormshaft and Ball Nut Removal/Installation

SUBASSEMBLY OVERHAUL

Wormshaft and Ball Nut

Disassembly

- (1) Place clean shop cloths on workbench and position wormshaft and ball nut on cloths.
- (2) Remove upper bearing from wormshaft.
- (3) Remove ball guide clamp attaching screws and remove clamp.
- (4) Remove ball guides. Separate guide halves and retain ball bearings that stayed in guides during removal.
- (5) Remove remaining ball bearings from ball nut circuits. Position ball nut over shop cloths and rotate wormshaft back and forth until bearings drop out onto cloth.

NOTE: There are a total of 50 ball bearings in the ball nut with 25 in each circuit.

- (6) Remove wormshaft from ball nut.

Cleaning and Inspection

Wash all parts in solvent and dry using clean cloths or compressed air. Inspect all components for wear, scoring, cracks, nicks, or surface pitting and also check the upper bearing and ball bearings for flat spots. If the

upper bearing is damaged, the upper bearing cup must also be replaced.

Assembly

- (1) Position ball nut on workbench with ball guide holes facing upward and deep side of ball nut teeth facing edge of workbench (fig. 2K-6).
- (2) Install wormshaft in ball nut from left side. Thread shaft into nut until equal number of shaft threads are visible at each end of nut (fig. 2K-6).

CAUTION: The ball nut teeth are machined to a greater width and depth on one side. When assembling the wormshaft and ball nut, position the ball nut so the wider-deeper side of the teeth will face the housing side cover opening after installation (fig. 2K-6).

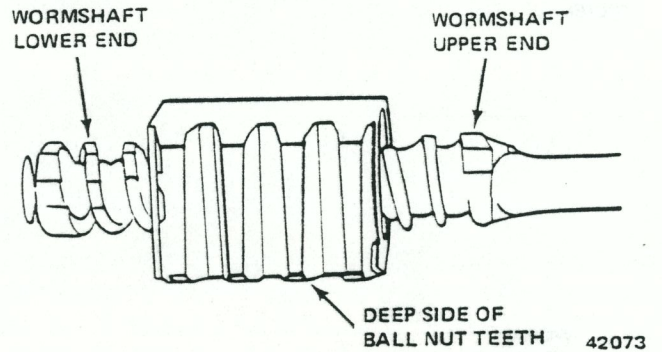


Fig. 2K-6 Positioning Wormshaft in Ball Nut

- (3) Install one ball bearing in each ball guide hole.
- (4) Move wormshaft up/down and side-to-side until bearings roll into ball nut threads under wormshaft and support wormshaft.
- (5) Assemble and install ball guides in ball nut.
- (6) Divide remaining 48 ball bearings in half and install 24 bearings in each ball nut circuit. Insert bearings into ball nut circuits through holes in ball guides (fig. 2K-7).

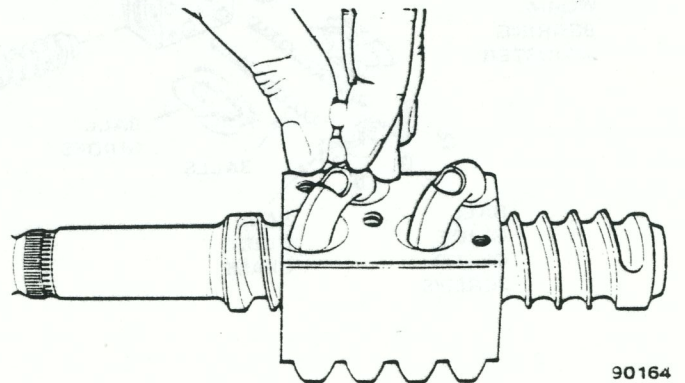


Fig. 2K-7 Installing Bearings in Ball Nut Circuits

NOTE: To ease ball bearing installation, rotate the wormshaft back and forth slightly while inserting the bearings.

(7) Position ball guide clamp on ball nut and install clamp attaching screws. Tighten screws to 4 foot-pounds (6 N•m) torque.

(8) Lubricate wormshaft threads with chassis grease and thread shaft in and out of ball nut to circulate grease.

CAUTION: To avoid damaging the tangs on the ball guide ends, do not allow the wormshaft to bottom in either direction.

(9) Lubricate wormshaft upper bearing with chassis grease and install bearing on wormshaft.

Worm Bearing Adjuster

Disassembly

(1) Remove wormshaft lower bearing retainer from worm bearing adjuster. Use screwdriver to pry retainer out of adjuster (fig. 2K-8).

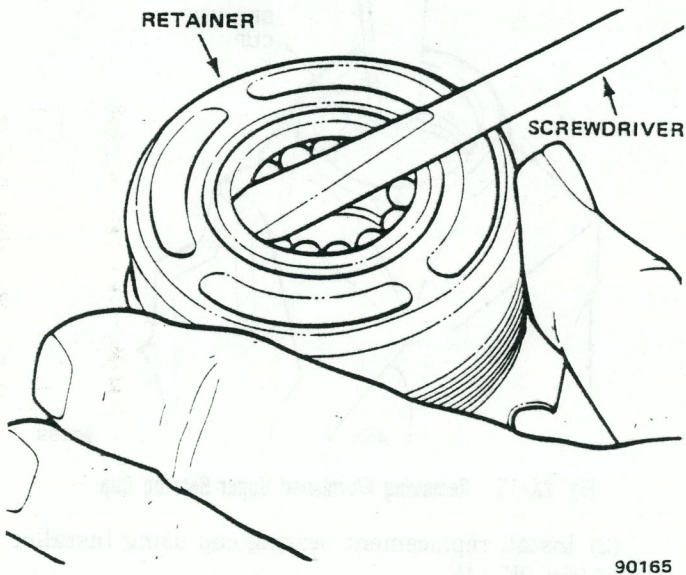


Fig. 2K-8 Removing Wormshaft Lower Bearing Retainer

(2) Remove wormshaft lower bearing from adjuster.

Cleaning and Inspection

Clean parts in solvent and dry using clean cloths only. Inspect all components for wear or damage and also inspect the bearing for flat spots or scoring. If either the lower bearing or bearing cup is damaged, both parts must be replaced.

Assembly

(1) If lower bearing cup is to be replaced, remove old cup and install replacement as follows:

(a) Install spare locknut on worm bearing adjuster and clamp adjuster in vise. Clamp vise jaws on locknut only.

(b) Assemble Puller J-5822 and Slide Hammer J-2619-01 (fig. 2K-9). Position puller legs under bearing cup and tighten puller screw to expand and hold legs in position. Bump outward with slide hammer weight to remove bearing cup.

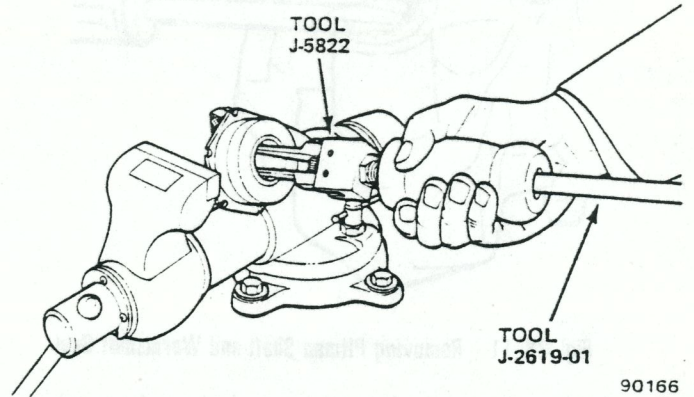


Fig. 2K-9 Removing Wormshaft Lower Bearing Cup

(c) Remove adjuster from vise and remove spare locknut from adjuster.

(d) Install replacement bearing cup in adjuster using Tool J-5755 (fig. 2K-10).

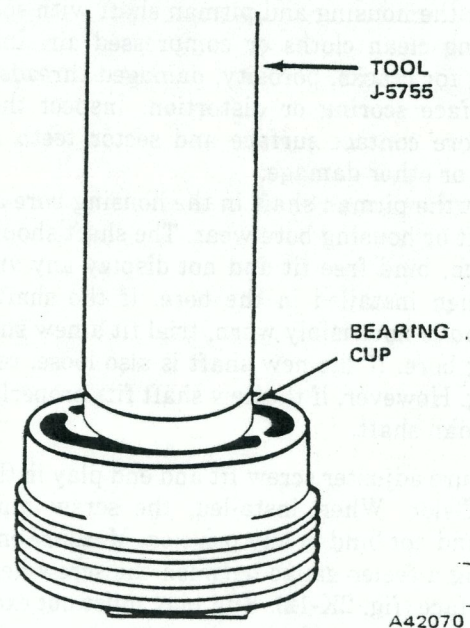


Fig. 2K-10 Installing Wormshaft Lower Bearing Cup

(2) Lubricate lower bearing with chassis grease and install bearing in adjuster.

(3) Install lower bearing retainer in adjuster. If necessary, tap retainer lightly with plastic mallet to seat it.

Steering Gear Housing and Pitman Shaft

Disassembly

(1) Remove pitman shaft and wormshaft seals from housing. Use screwdriver to pry seals out (fig. 2K-11).

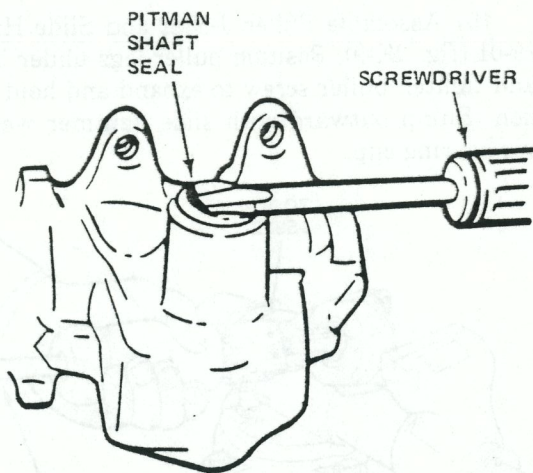


Fig. 2K-11 Removing Pitman Shaft and Wormshaft Seal

(2) Remove adjuster screw and shim from pitman shaft T-slot (if not removed previously). Retain screw and shim for end play check.

Cleaning and Inspection

Clean the housing and pitman shaft with solvent and dry using clean cloths or compressed air. Inspect the housing for cracks, porosity, damaged threads and gasket surface scoring or distortion. Inspect the pitman shaft bore contact surface and sector teeth for wear, pitting, or other damage.

Insert the pitman shaft in the housing bore and check for shaft or housing bore wear. The shaft should exhibit a smooth, bind free fit and not display any visible side play when installed in the bore. If the shaft appears loose and is not visibly worn, trial fit a new shaft in the housing bore. If the new shaft is also loose, replace the housing. However, if the new shaft fits properly, replace the pitman shaft.

Measure adjuster screw fit and end play in the pitman shaft T-slot. When installed, the screw must rotate freely and not bind in any position. Measure end play by inserting a feeler gauge between the screw head and T-slot surface (fig. 2K-12). End play must not exceed 0.002 inches (0.05 mm). If end play exceeds specified limit, select and install a replacement shim that will provide the specified clearance. Shims are furnished in four thicknesses: 0.063, 0.065, 0.067 and 0.069 inch (1.60, 1.65, 1.70 and 1.75 mm) and are available in kit form.

Inspect the wormshaft upper bearing and bearing cup for wear, looseness, flat spots, pitting, cracks, or other damage. If either the bearing or bearing cup is damaged, both parts must be replaced. If the cup is loose in the housing, trial fit a new cup. If the new cup is also loose, replace the housing. If the new cup fits properly, replace only the bearing cup.

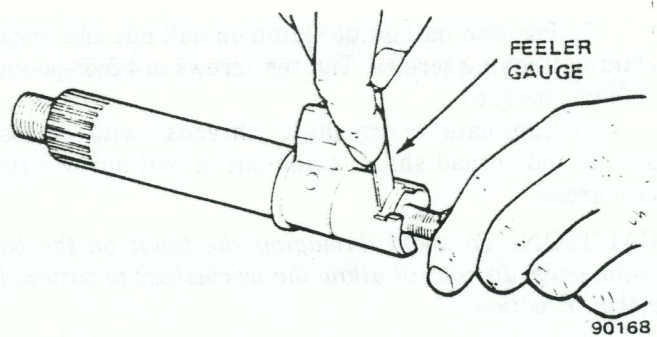


Fig. 2K-12 Measuring Adjuster Screw End Play

Assembly

(1) If wormshaft upper bearing cup is to be replaced, remove old cup using hammer and brass punch (fig. 2K-13).

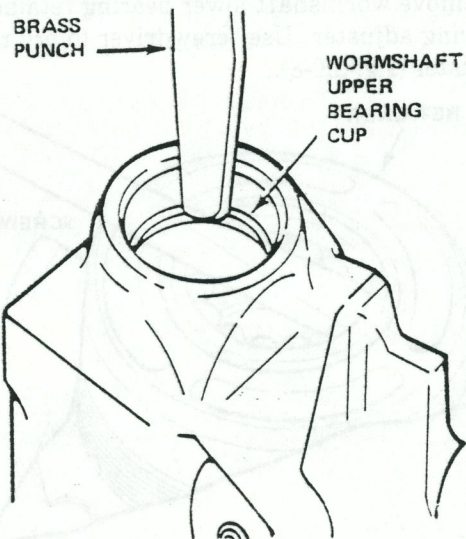


Fig. 2K-13 Removing Wormshaft Upper Bearing Cup

(2) Install replacement bearing cup using Installer J-5755 (fig. 2K-14).

NOTE: Do not install the wormshaft or pitman shaft seals at this time. Refer to Assembly and Adjustment.

ASSEMBLY AND ADJUSTMENT

(1) Lubricate all components with chassis grease if not lubricated previously.

(2) Place gear housing in vise. Clamp vise jaws on housing mounting bosses only.

(3) Install wormshaft and ball nut in housing.

CAUTION: Be sure the ball nut is installed with the deep side of the ball nut teeth facing the side cover opening.

(4) Install worm bearing adjuster in housing and tighten adjuster only enough to remove wormshaft end play.

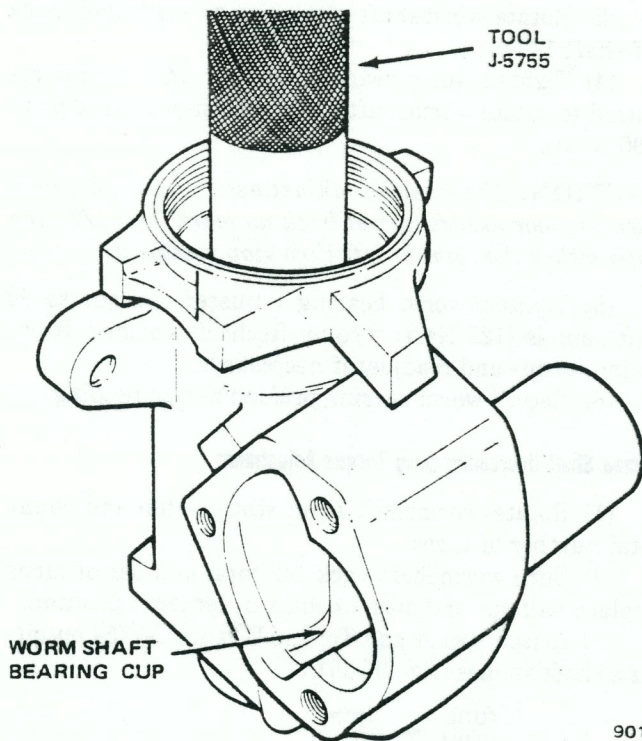


Fig. 2K-14 Installing Wormshaft Upper Bearing Cup

(5) Install locknut on worm bearing adjuster but do not tighten locknut at this time.

(6) Pack steering gear housing with as much chassis grease as possible.

NOTE: In order to pack the maximum amount of grease into the housing, the ball nut must be moved back and forth for better access to the housing interior. Rotate the wormshaft in one direction until ball nut travel ceases. Pack the unobstructed housing end full of grease; then rotate the shaft in the opposite direction and repeat the packing procedure.

(7) Place ball nut in centered position. Rotate wormshaft from stop to stop and count total number of turns. Turn wormshaft back 1/2 number of turns to center ball nut.

(8) Lubricate pitman shaft with chassis grease and install shaft in housing. Engage center tooth of shaft in center groove of ball nut (fig. 2K-15).

(9) Coat replacement side cover gasket with chassis grease and position gasket on housing side cover opening.

(10) Install end play shim on adjuster screw and thread screw into side cover to depth of 2-3 threads.

(11) Slide adjuster screw into pitman shaft T-slot and turn screw counterclockwise to thread it into cover. Stop turning screw when side cover almost contacts gasket.

(12) Align gear housing and side cover bolt holes and install cover attaching bolts finger tight only (do not attempt to seat cover on housing by tightening bolts).

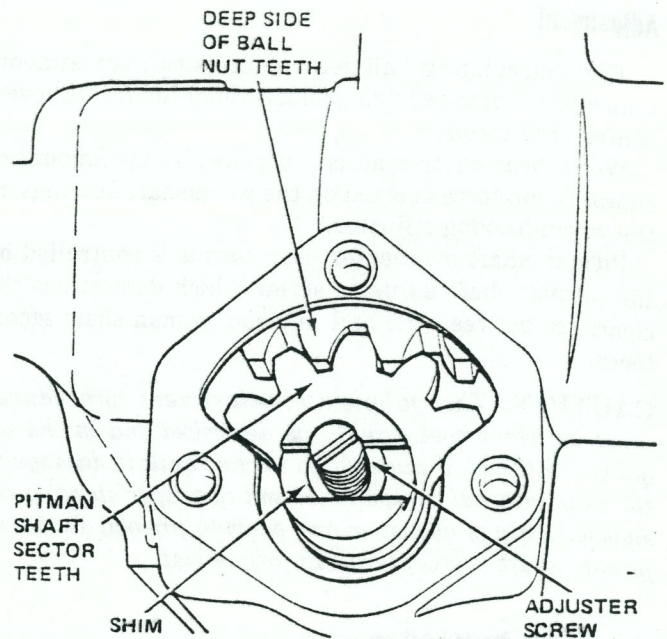


Fig. 2K-15 Pitman Shaft and Ball Nut in Centered Position

(13) Tighten adjuster screw until it bottoms and back off screw 1/2 turn.

(14) Tighten side cover bolts to 30 foot-pounds (41 N•m) torque.

(15) Install pitman shaft and wormshaft seals as follows:

(a) Wrap 0.005 inch (0.1 mm) thick shim stock (or single layer of thinnest tape available) around shaft splines and threads. Shim stock (or tape) will serve as seal protector when seals are installed.

(b) Lubricate seals with chassis grease. Slide each seal over protective material and down shaft until seal contacts housing.

(c) Start seals into housing seal seats by hand. Complete seal installation by tapping seals into place using plastic mallet. Be sure each seal is fully seated in housing.

CAUTION: Some type of protective wrap must be used during seal installation. If the seals are installed over exposed shaft splines or threads, the seal lips could be cut or distorted resulting in leakage after assembly.

(16) Check gear operation. With adjuster screw backed off, wormshaft should rotate freely and without bind in either direction. Also check for grease leaks past seals. If gear binds, repair as necessary and recheck operation. If seals leak, replace them and recheck operation.

(17) Adjust steering gear worm bearing preload and overcenter drag torque. Refer to following adjustment procedure.

Adjustment

The recirculating ball gear requires two adjustments which are, worm bearing preload and pitman shaft overcenter drag torque.

Worm bearing preload is controlled by the amount of compression force exerted on the wormshaft bearings by the worm bearing adjuster.

Pitman shaft overcenter drag torque is controlled by the pitman shaft adjuster screw which determines the clearance between the ball nut and pitman shaft sector teeth.

CAUTION: The following adjustment procedures must be performed exactly as described and in the sequence outlined. Failure to do so can result in damage to the gear internal components and improper steering response. Always adjust worm bearing preload first and pitman shaft overcenter drag torque last.

Worm Bearing Preload Adjustment

- (1) Tighten worm bearing adjuster until it bottoms, then back off adjuster 1/4 turn.
- (2) Install socket and Torque Wrench J-7754 on splined end of wormshaft (fig. 2K-16).

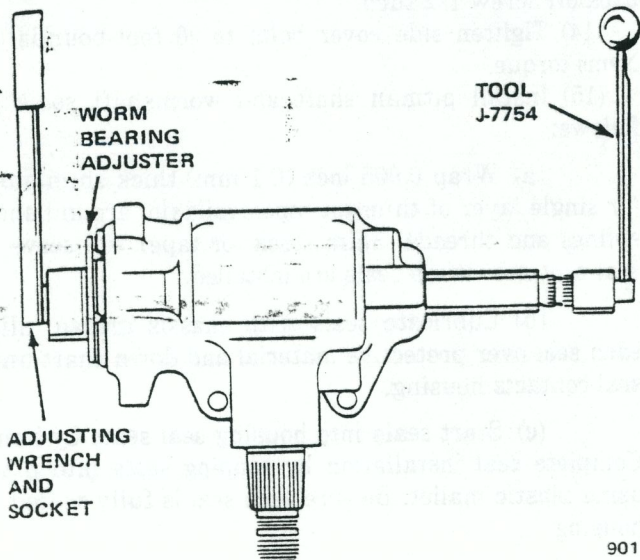


Fig. 2K-16 Adjusting Worm Bearing Preload Torque

- (4) Tighten pitman shaft adjuster screw (while rotating shaft back and forth over center) until torque required to rotate shaft over center equals worm bearing preload setting.

- (5) Rotate shaft over center and continue tightening adjuster screw until drag torque is increased by additional 4 to 10 inch-pounds (0.45 to 1.13 N•m) but do not exceed total of 16 inch-pounds (1.81 N•m).

CAUTION: The total amount of over center drag torque (worm bearing preload setting plus additional 4-10 inch-pounds) must not exceed combined total of 16 inch-pounds (1.81 N•m).

- (3) Rotate wormshaft clockwise to stop; then back off shaft 1/2 turn.

- (4) Tighten worm bearing adjuster until torque required to rotate wormshaft is 5 to 8 inch-pounds (0.60 to 0.90 N•m).

CAUTION: The preload adjustment must be made with the wormshaft turned back no more than 1/2 turn from either the right or left turn stop positions.

- (5) Tighten worm bearing adjuster locknut to 90 foot-pounds (122 N•m) torque. Recheck wormshaft rotating torque and readjust if necessary.

- (6) Record worm bearing preload torque reading.

Pitman Shaft Overcenter Drag Torque Adjustment

- (1) Rotate wormshaft from stop-to-stop and count total number of turns.
- (2) Turn wormshaft back 1/2 total number of turns to place ball nut and pitman shaft in centered position.
- (3) Install socket and Torque Wrench J-7754 on pitman shaft splines (fig. 2K-17).

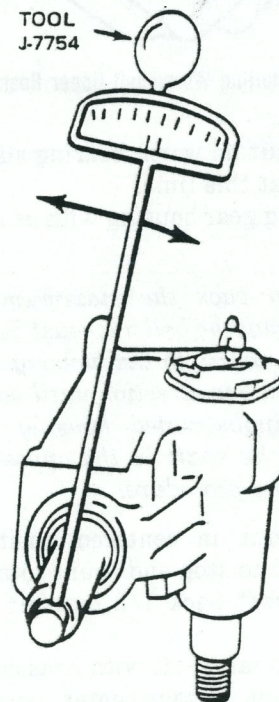


Fig. 2K-17 Adjusting Pitman Shaft Overcenter Drag Torque

- (6) Hold adjuster screw in position using screwdriver and tighten adjuster screw locknut to 23 foot-pounds (31 N•m) torque. Do not allow screw to turn when tightening locknut.

NOTE: If the adjuster screw is allowed to turn when the locknut is tightened, the entire drag torque adjustment procedure will have to be performed once again.

- (7) Recheck overcenter drag torque and readjust if necessary.

SPECIFICATIONS

Manual Steering Gear Specifications

Gear-Type	Recirculating Ball
Ratio	24:1
Bearings	
Upper	Ball
Lower	Ball
Adjustments:	
Worm Bearing Preload	8 in-lbs. (0.90 N·m)
Pitman Shaft Overcenter	
Drag Torque	4-10 in-lbs. (0.45-1.13 N·m) in addition to 8 in-lbs. (0.90 N·m) worm bearing preload for a total of 16 in-lbs. (1.8 N·m) maximum
Adjuster Screw End Play	0.002 in. (0.05 mm)

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Torque Specifications

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	USA (ft-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Intermediate Shaft Coupling Clamp Bolt	45	40-50	61	54-68
Pitman Arm Nut	185	160-210	251	217-285
Steering Gear Mounting Bracket-to-Gear Bolts (CJ)	70	60-80	95	81-108
Steering Gear Mounting Bracket-to-Tie Plate Bolt (CJ)	55	50-60	75	68-81
Steering Gear Mounting Bolts (Cke., Wag., Trk.,)	70	60-80	95	81-108
Side Cover Bolts	30	25-35	41	34-47
Adjuster Screw Locknut	23	18-27	31	24-37
Worm Bearing-Adjuster Locknut	90	70-110	122	95-149

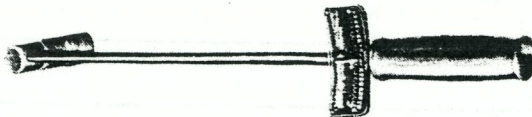
All torque values given in foot-pounds and newton-meters with dry fits unless otherwise specified.

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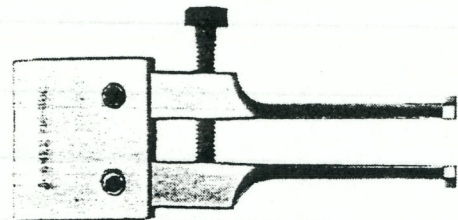
Tools



BEARING CUP
INSTALLER
J-5755



TORQUE WRENCH
J-7754



BEARING CUP
PULLER
J-5822



SLIDE HAMMER
J-2619-01



J-6632
PITMAN ARM
PULLER

NOTES

MANUAL STEERING GEAR

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POWER STEERING GEAR AND PUMP

2L

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GENERAL INFORMATION

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Leak Diagnosis	2L-10		

GENERAL

The power steering system consists of a power steering gear, hydraulic pump, and interconnecting hoses. The system fluid supply is contained in a reservoir mounted on the pump. Fluid from the pump is supplied to the gear through the interconnecting pressure and return hoses. The pump is operated by a drive belt mounted on pulleys attached to the pump shaft and engine crankshaft.

Two different ratio steering gear units are used. CJ models use a constant ratio gear with a 17.5:1 steering ratio. Cherokee, Wagoneer and Truck models use a variable ratio gear with a 16:1 ratio on center and 13:1 ratio at full lock.

Although the steering ratios of the two units differ, exterior appearance and service procedures for both units are the same. However, the internal components of the two gears are not interchangeable.

A vane-type power steering pump with a combination flow control/relief valve is used on all models. Two valve calibrations are used. On CJ models, the valve is calibrated to open at 1100 psi (7 584 kPa). On Cherokee, Wagoneer and Truck models, the valve is calibrated to open at 1500 psi (10 342 kPa).

The power steering gear is designed to operate manually if a system malfunction should ever occur. This feature provides the driver with continued steering control of the vehicle. In this condition, the gear operates

like a manual steering gear; hydraulic fluid is bypassed through the gear valve body to allow manual operation.

NOTE: *The power steering gear and pump form a closed system. Contaminants or foreign material must not be allowed to enter the system at any point. If either the gear or pump become contaminated, or incur damage extensive enough to produce debris, both components must be disassembled, cleaned, and serviced.*

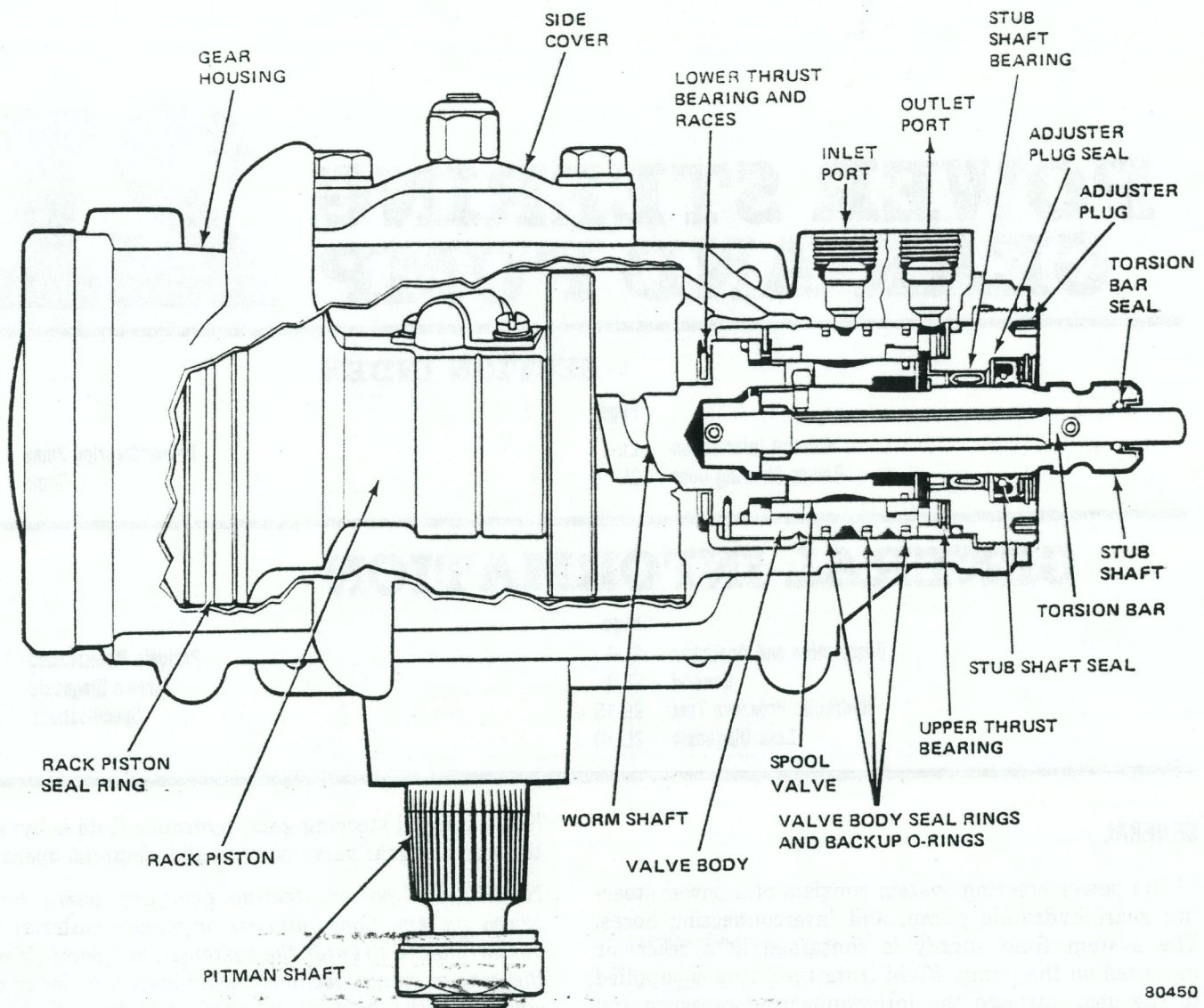
DESCRIPTION AND OPERATION

Steering Gear

The power steering gear is a recirculating ball-type unit (fig. 2L-1). Steel ball bearings act as a rolling thread between the steering gear wormshaft and rack piston.

Two different ratio gears are used. CJ models use a constant ratio gear with 17.5:1 steering ratio. Cherokee, Wagoneer and Truck models use a variable ratio gear with 16:1 steering ratio on center and 13:1 at full lock. Although the two gears have different steering ratios, exterior appearance, diagnosis, and service procedures are the same for both.

Steering gear wormshaft fore and aft thrust is controlled by a bearing and two races at the lower end, and a bearing assembly in the adjuster plug at the upper end. The lower bearing races are conical in shape. This design maintains constant preload on the wormshaft to



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Fig. 2L-1 Power Steering Gear

prevent loss of thrust bearing preload. The adjuster plug provides initial worm bearing preload and service adjustment.

In a right-turn position, the rack piston moves upward within the gear. In a left-turn position, the rack piston moves downward within the gear. The rack piston teeth mesh with the pitman shaft sector teeth. The sector is forged as an integral part of the pitman shaft. Turning the wormshaft also turns the pitman shaft which, through mechanical linkage, turns the wheels.

Power Steering Pump

A vane-type, constant displacement hydraulic pump is used to develop system fluid pressure (fig. 2L-2). The pump has an integral reservoir that contains the system fluid supply.

The reservoir cap is vented to maintain atmospheric pressure within the reservoir and allow air trapped in

the system to escape. A dipstick mounted in the reservoir cap is used to check system fluid level.

System operating pressures are maintained by a combination flow control/relief valve located in the pump (fig. 2L-2). The relief section of the valve prevents excessive system pressure buildup.

Hydraulic Assist

An open center, three position, rotary-type valve body is used to control fluid flow within the gear (fig. 2L-1). Pump supplied fluid enters the valve body through a pressure port in the gear housing. The valve then directs fluid to the rack piston through passages in the housing.

The valve body, spool valve, torsion bar, and stub shaft (which is pinned to the torsion bar) are connected to the front wheels through mechanical linkage.

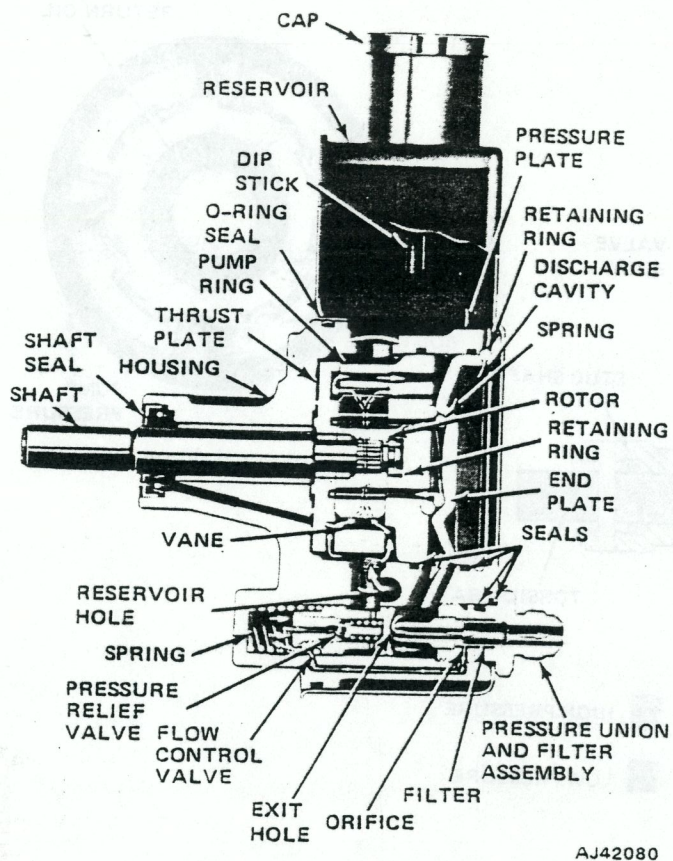


Fig. 2L-2 Power Steering Pump

Because of the pressure exerted on the front wheels by vehicle weight, the wheels and valve body tend to resist any turning effort applied at the steering wheel. As front wheel resistance to turning effort increases, the torsion bar (which is pinned to the stub shaft) deflects. Since the spool valve is connected to the stub shaft by a locating pin, torsion bar deflection causes the spool valve to rotate within the valve body. As the spool valve rotates, fluid directional passages in the valve are brought into alignment with matching passages in the valve body. When these passages are aligned, high pressure fluid from the pump is directed through the passages and against either side of the rack piston to provide hydraulic assist.

Torsion bar deflection provides the required amount of steering gear "road feel." If the bar should ever break, road feel would be lost but the steering system would still function due to auxiliary locking tabs on the stub shaft. In this situation, the gear would operate as a manual-type recirculating ball steering gear.

Neutral (Straight-Ahead) Position

In this position, fluid does not enter the rack piston chamber. Fluid from the pump flows through the open-center valve body and back to the pump reservoir.

The valve body remains in the open center position at all times, except when turning, to reduce fluid and pump friction losses. In addition, the gear is always filled with fluid to lubricate internal components and absorb road shock.

Right Turn Position

The valve body is held in position by the resistance to movement of the front wheels. When the steering wheel is turned to the right, torsion bar deflection causes the spool valve to rotate within the valve body.

As the spool valve rotates, the spool valve fluid return grooves are closed off while the right turn grooves are aligned with high pressure fluid grooves in the valve body (fig. 2L-3). The spool valve left turn grooves are closed off from pump pressure and are aligned with the valve body fluid return grooves. In this position, the valve body directs high pressure fluid into the lower end of the rack piston chamber to force the rack piston upward and apply additional turning effort to the pitman shaft (fig. 2L-3).

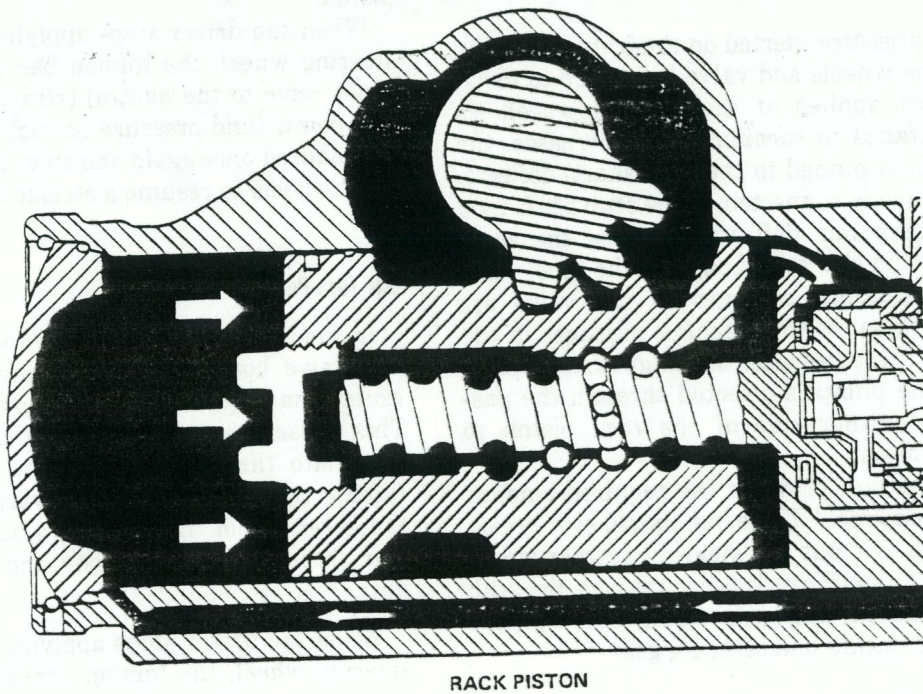
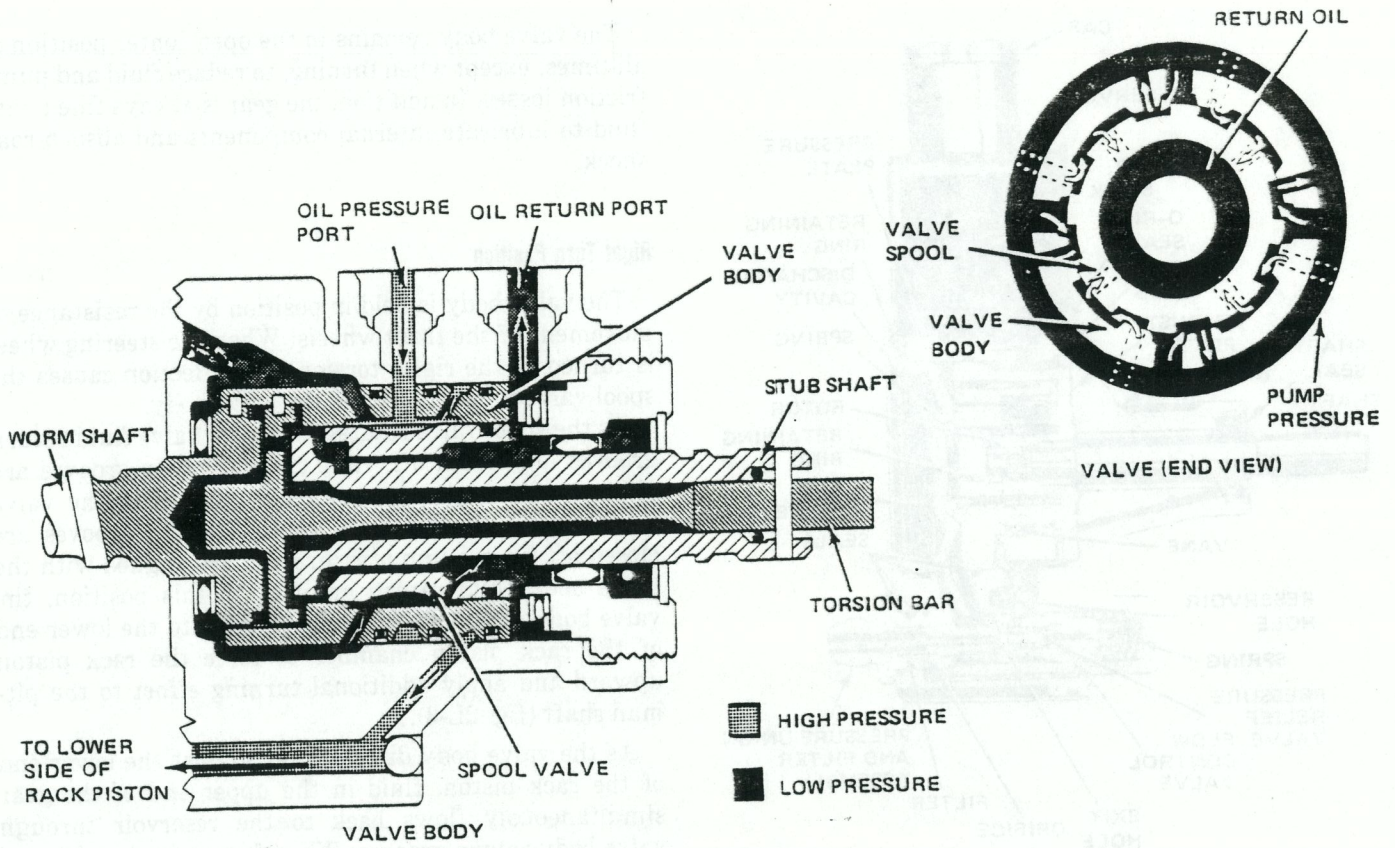
As the valve body directs fluid against the lower end of the rack piston, fluid in the upper end of the gear simultaneously flows back to the reservoir through valve body return grooves. When front wheel resistance to turning effort increases, torsion bar deflection causes additional spool valve rotation. This exposes more of the spool valve right turn grooves to the valve body pressure grooves increasing fluid pressure exerted on the rack piston.

When the driver stops applying turning effort at the steering wheel, the torsion bar unwinds returning the spool valve to the neutral (straight ahead) position. At this point, fluid pressure on each end of the rack piston is equalized once again and steering geometry causes the front wheels to resume a straight ahead position.

Left Turn Position

In the left turn position, the torsion bar, spool valve, and valve body operate the same as in a right turn except that valve rotation is now reversed (fig. 2L-4). This causes the valve body to channel high pressure fluid into the upper end of the rack piston chamber forcing the rack piston downward (fig. 2L-4). Fluid in the lower end of the gear flows back to the pump reservoir through the valve body and steering gear return port.

When the driver stops applying turning effort at the steering wheel, the torsion bar unwinds returning the spool valve to the neutral (straight ahead) position. As in the right turn position, fluid pressure on each end of the rack piston is equalized again and steering geometry causes the front wheels to resume a straight ahead position.



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Fig. 2L-3 - Fluid Flow - Right Turn Position

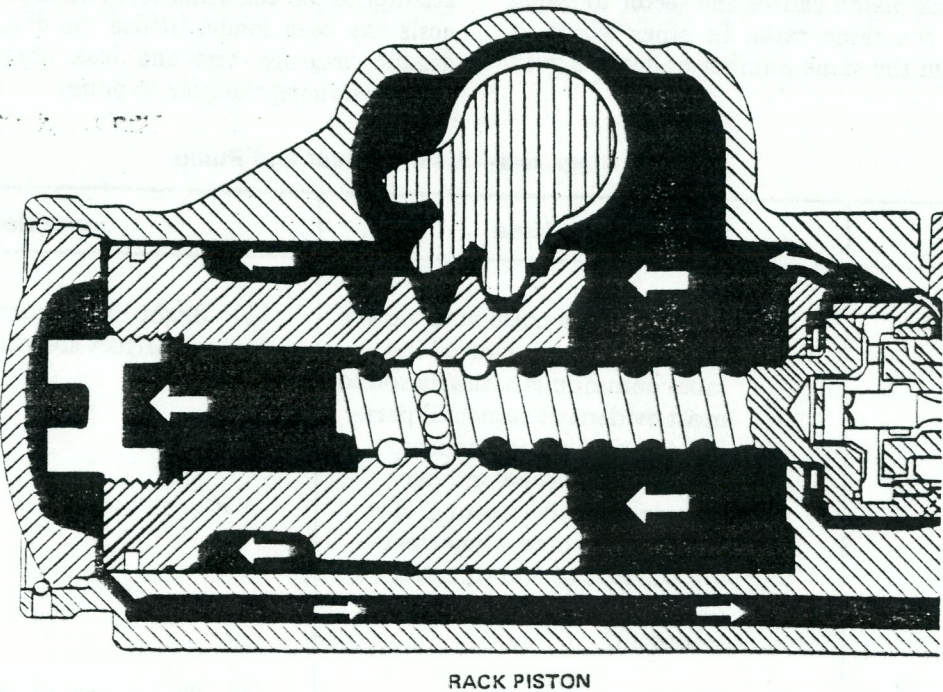
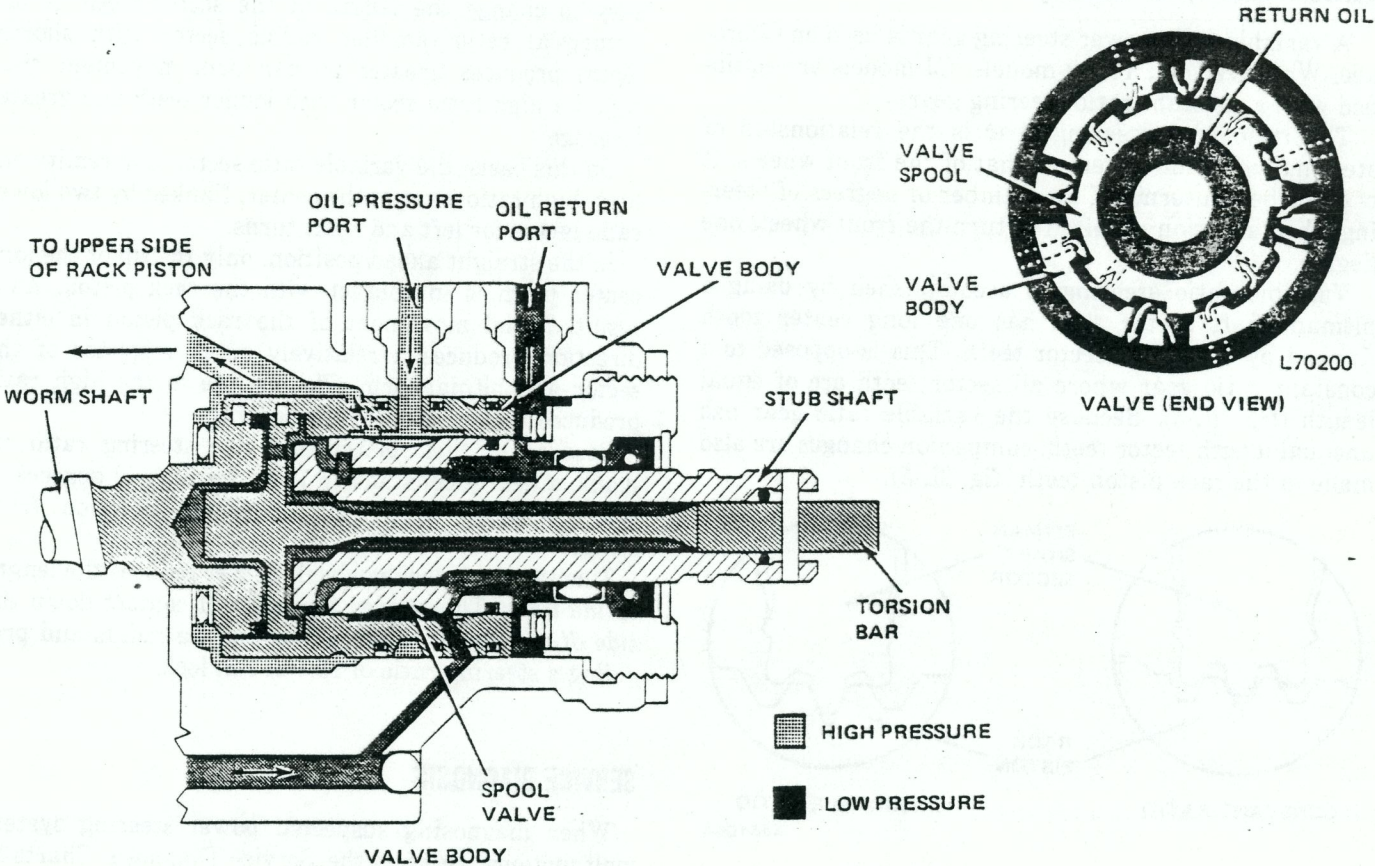


Fig. 2L-4 Fluid Flow—Left Turn Position

Variable Ratio Power Steering

A variable ratio power steering gear is used on Cherokee, Wagoneer and Truck models. CJ models are equipped with a constant ratio steering gear.

The ratio of a steering gear is the relationship of steering wheel movement to that of the front wheels. It is described in terms of the number of degrees of steering wheel rotation required to turn the front wheels one degree.

Variable ratio steering is accomplished by using a pitman shaft sector that has one long center tooth flanked by two short sector teeth. This is opposed to a constant ratio gear where all sector teeth are of equal length (fig. 2L-5). Because the variable ratio gear has unequal length sector teeth, companion changes are also made in the rack piston teeth (fig. 2L-5).

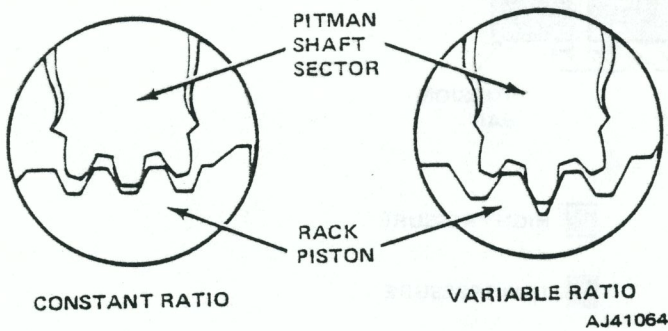


Fig. 2L-5 Rack and Sector Comparison

Since the sector is basically a series of levers, any movement of the rack piston causes the sector to swing the pitman arm in the same ratio. In other words, it turns the pitman arm the same number of degrees with each sector tooth.

To increase or decrease steering ratio, it is only necessary to change the length of the sector teeth. A low numerical ratio (smaller radius sector with shorter teeth) produces greater pitman arm movement than would a high ratio sector with longer teeth and greater leverage.

On this basis, the variable ratio sector is in reality one long, high ratio lever at the center, flanked by two lower ratio levers for left and right turns.

In the straight ahead position, only the tip of the long center tooth is in contact with the rack piston. As a result, initial movement of the rack piston in either direction produces a relatively small response of the sector and pitman arm. This is due to the high ratio produced by a long lever relationship.

Because of this relationship, the steering ratio remains a nearly constant 16:1 for the first 40 degrees of steering wheel movement in either direction from center.

Turning the steering wheel further reduces the length of the lever. This moves the point of contact down the side of the center tooth decreasing the radius and providing a steering ratio of 13:1 at full lock.

SERVICE DIAGNOSIS

When diagnosing suspected power steering system malfunctions, refer to the Service Diagnosis Charts in this section for probable causes and indicated repair procedures.

To avoid ineffective or unnecessary repair, do not attempt to correct a malfunction until an accurate diagnosis has been made. Utilize the diagnosis charts, hydraulic pressure test and leak diagnosis procedures before servicing the gear or pump.

Service Diagnosis—Steering Gear and Pump

Condition	Possible Cause	Correction
HISSING NOISE IN STEERING GEAR	(1) 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 performance of the steering. Hiss may be expected when steering wheel is at end of travel or when slowly turning at standstill.	(1) Slight hiss is normal and does not affect steering.
RATTLE OR CHUCKLE NOISE IN STEERING GEAR	(1) Gear loose on frame.	(1) Tighten gear-to-frame mounting bolts.

Service Diagnosis—Steering Gear and Pump (Continued)

Condition	Possible Cause	Correction
RATTLE OR CHUCKLE NOISE IN STEERING GEAR (CONTINUED)	(2) Steering linkage looseness. (3) Pressure hose touching other parts of vehicle. (4) Insufficient pitman shaft over center drag torque. NOTE: A slight rattle may occur on turns because of increased clearance off the "high point." This is normal and clearance must not be reduced below specified limits to eliminate this slight rattle.	(2) Check linkage pivot points for wear. Replace if necessary. (3) Adjust hose position. Do not bend tubing by hand. (4) Adjust to specifications.
SQUAWK NOISE IN STEERING GEAR WHEN TURNING OR RECOVERING FROM A TURN	(1) Damper O-ring on spool valve cut.	(1) Replace damper O-ring.
CHIRP NOISE IN STEERING PUMP	(1) Loose or damaged belt.	(1) Adjust belt tension or replace belt.
BELT SQUEAL (PARTICULARLY NOTICEABLE AT FULL WHEEL TRAVEL AND STAND STILL PARKING)	(1) Loose or damaged belt.	(1) Adjust belt tension or replace belt.
GROWL NOISE IN STEERING PUMP	(1) Excessive back pressure in hoses or steering gear caused by restriction.	(1) Locate restriction and correct. Replace part if necessary.
GROWL NOISE IN STEERING PUMP (PARTICULARLY NOTICEABLE AT STAND STILL PARKING)	(1) Scored pressure plates, thrust plate or rotor. (2) Extreme wear of cam ring.	(1) Replace parts and flush system. (2) Replace parts.
GROAN NOISE IN STEERING PUMP	(1) Low oil level. (2) Air in the oil or loose pressure hose connection.	(1) Fill reservoir to proper level. (2) Tighten connector to specified torque. Bleed system by operating steering from right to left-full turn.
RATTLE NOISE IN STEERING PUMP	(1) Vanes not installed properly. (2) Vanes sticking in rotor slots.	(1) Install properly. (2) Free up by removing burrs, varnish, or dirt.

Service Diagnosis—Steering Gear and Pump (Continued)

Condition	Possible Cause	Correction
WHINE NOISE IN STEERING PUMP	(1) Pump shaft bearing scored.	(1) Replace housing and shaft. Flush system.
POOR RETURN OF STEERING WHEEL TO CENTER	(1) Tires not properly inflated.	(1) Inflate to specified pressure.
	(2) Lack of lubrication in linkage and ball studs.	(2) Lube linkage and ball studs.
	(3) Lower coupling flange rubbing against steering gear adjuster plug.	(3) Loosen pinch bolt and assemble properly.
	(4) Improper front wheel alignment	(4) Check and adjust as necessary. With front wheels still on alignment pads of front-end machine, disconnect pitman arm from pitman shaft. Turn front wheels by hand. If wheels will not turn or turn with considerable effort, determine if linkage or ball studs are binding.
	(5) Steering linkage binding.	(5) Replace rod ends.
	(6) Ball studs binding.	(6) Replace ball studs.
	(7) Tight or frozen steering shaft bearings.	(7) Replace bearings.
	(8) Sticky or plugged spool valve.	(8) Remove and clean or replace valve.
	(9) Steering gear adjustments over specifications.	(9) Check adjustment with gear out of vehicle. Adjust as required.
	(10) Steering gear poppet valve installed incorrectly.	(10) Inspect and install valve correctly.
	(11) Return hose kinked.	(11) Replace hose.
CAR LEADS TO ONE SIDE OR THE OTHER (KEEP IN MIND ROAD CONDITION AND WIND. TEST CAR IN BOTH DIRECTIONS ON FLAT ROAD)	(1) Incorrect tire pressure.	(1) Check and adjust.
	(2) Front end misaligned.	(2) Adjust to specifications.
	(3) Unbalanced steering gear valve.	(3) Replace valve.
MOMENTARY INCREASE IN EFFORT WHEN TURNING WHEEL FAST TO RIGHT OR LEFT	(1) Low oil level in pump.	(1) Add power steering fluid as required.
	(2) Pump belt slipping.	(2) Tighten or replace belt.
	(3) High internal leakage.	(3) Check pump pressure. (See pressure test)

Service Diagnosis—Steering Gear and Pump (Continued)

Condition	Possible Cause	Correction
<p>STEERING WHEEL SURGES OR JERKS WHEN TURNING WITH ENGINE RUNNING ESPECIALLY DURING PARKING</p>	<ul style="list-style-type: none"> (1) Low oil level. (2) Loose pump belt. (3) Insufficient pump pressure. (4) Flow control valve sticking. 	<ul style="list-style-type: none"> (1) Fill as required. (2) Adjust tension to specification. (3) Check pump pressure. (See pressure test). Replace relief valve if defective. (4) Inspect for varnish or damage, replace if necessary.
<p>LOOSE STEERING</p>	<ul style="list-style-type: none"> (1) Steering gear loose on frame. (2) Steering gear flexible coupling loose on shaft or rubber disc mounting screws loose. (3) Steering linkage rod ends worn. (4) Worn poppet valve (Gear). (5) Insufficient wormshaft bearing preload. (6) Insufficient overcenter drag torque. 	<ul style="list-style-type: none"> (1) Tighten attaching bolts to specified torque. (2) Tighten flange pinch bolts. If serrations are not damaged, tighten upper flange to coupling nuts to specified torque. (3) Replace rod ends. (4) Replace poppet valve. (5) Adjust to specification with gear out of vehicle. (6) Adjust to specification with gear out of vehicle.
<p>HARD STEERING OR LACK OF ASSIST</p>	<ul style="list-style-type: none"> (1) Loose pump belt. (2) Low oil level in pump reservoir. <p>NOTE: Low oil level will also result in excessive pump noise.</p> <ul style="list-style-type: none"> (3) Tires not properly inflated. (4) Sticky flow control valve. (5) Pump pressure low. (6) Pump internal leakage. (7) Gear internal leakage. 	<ul style="list-style-type: none"> (1) Adjust belt tension to specification. (2) Fill to proper level. If excessively low, check all lines and joints for evidence of external leakage. Tighten loose connectors. (3) Inflate to recommended pressure.

NOTE: If checks (1) through (3) do not reveal cause of hard steering, refer to pressure test.

In order to diagnose conditions such as listed in (4), (5), (6), (7) a test of the entire power steering system using pressure test tool J-21567 is required.

Service Diagnosis—Steering Gear and Pump (Continued)

Condition	Possible Cause	Correction
FOAMING AERATED POWER STEERING FLUID, LOW FLUID LEVEL AND POSSIBLE LOW PRESSURE	(1) Air in fluid, and loss of fluid due to pump internal leakage causing overflow.	(1) Check for leak and correct. Bleed system. Extremely cold temperatures will cause system aeration should the oil level be low. If oil level is correct and pump still foams, remove pump from vehicle and separate reservoir from housing. Check welsh plug and housing for cracks. If plug is loose or housing is cracked, replace housing.
LOW PRESSURE DUE TO STEERING PUMP	(1) Flow control valve stuck or inoperative. (2) Pressure plate not flat against cam ring. (3) Extreme wear of cam ring. (4) Scored pressure plate, thrust plate, or rotor. (5) Vanes not installed properly. (6) Vanes sticking in rotor slots. (7) Cracked or broken thrust or pressure plate.	(1) Remove burrs or dirt or replace. Flush system. (2) Correct. (3) Replace parts. Flush system. (4) Replace parts. Flush system. (5) Install properly. (6) Freeup by removing burrs, varnish, or dirt. (7) Replace part.
LOW PRESSURE DUE TO STEERING GEAR	(1) Pressure loss in cylinder due to worn piston ring or badly worn housing bore. (2) Leakage at valve rings, valve body-to-worm seal.	(1) Remove gear for disassembly and inspection of ring and housing bore. (2) Remove gear for disassembly and replace seals.

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LEAK DIAGNOSIS

The actual source of power steering system fluid leaks should always be determined before attempting repair. Because inaccurate diagnosis can lead to ineffective repair, proper inspection procedures are necessary. The most common fluid leak sources are shown in figures 2L-6, 2L-7, and 2L-8.

Inspection Procedure

- (1) Raise front of vehicle.
- (2) Clean exterior surfaces of steering gear, pump, hoses, and fittings thoroughly.
- (3) Check pump fluid level. Add or remove fluid as necessary.
- (4) Check for aerated fluid (orange in color and full of bubbles) which can cause overflow from reservoir and be mistaken for leak.

(5) Check and tighten all hose connections at gear and pump. Do not exceed 30 foot-pounds (41 N•m) torque at any fitting.

(6) Start engine. Have helper turn steering wheel left and right several times while locating source of leak. Contact steering stops momentarily in each direction when turning wheel.

(7) Stop engine when leak source is identified.

Leak Diagnosis and Correction—Steering Gear

NOTE: Refer to figures 2L-6 and 2L-7 for an illustration of steering gear leak sources.

- (1) If leak occurs from hose or hose fittings, replace hose and O-ring if equipped with metric thread fittings. If leak continues to occur at gear housing pressure or return port and hose or O-ring has been replaced, replace hose connector seats in gear housing or hose and O-ring if equipped with metric thread fittings.

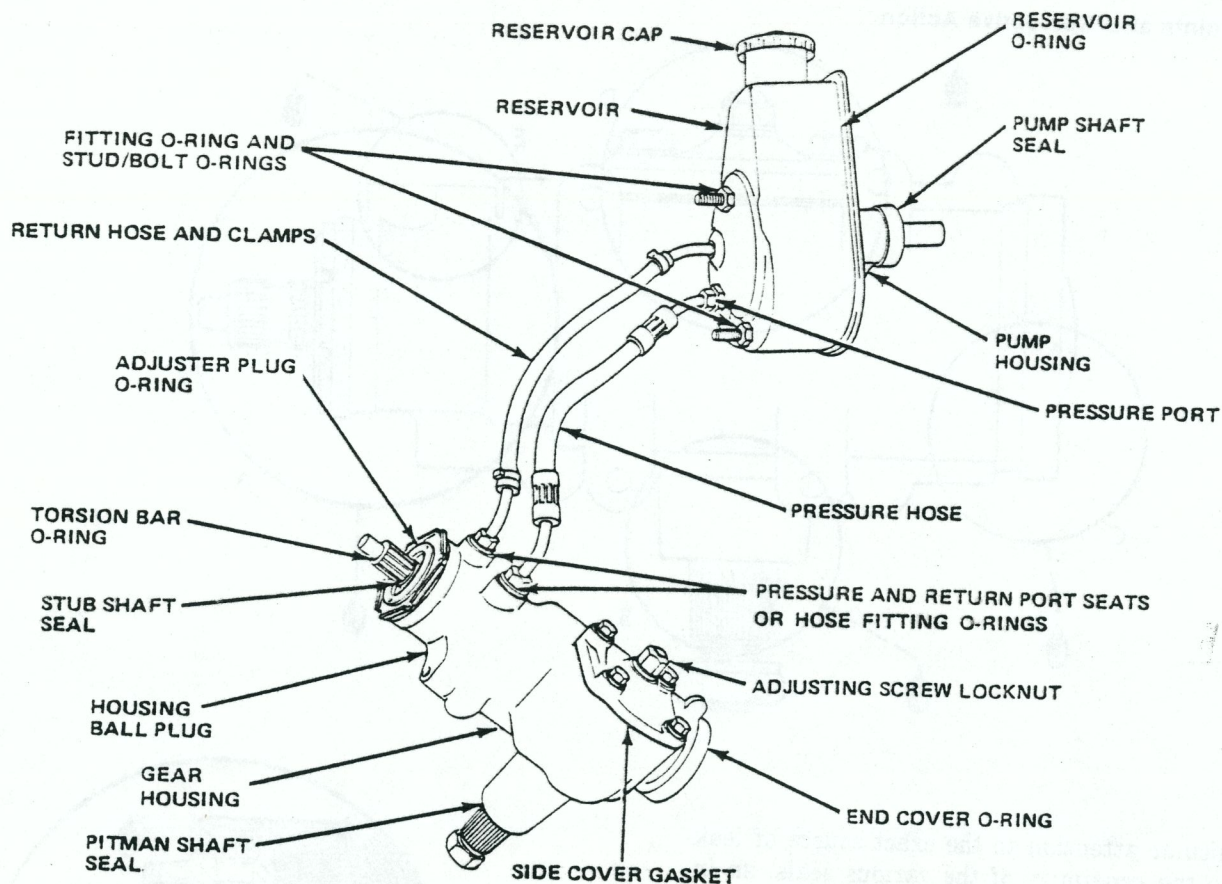


Fig. 2L-6 Power Steering System Leak Points

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CAUTION: Some steering gear units may have metric thread pressure and return port and hose fittings that use an O-ring instead of connector seats (fig. 2L-7).

(2) If leak occurs between adjuster plug and housing, replace adjuster plug O-ring.

(3) If leak occurs between stub shaft and stub shaft seal in adjuster plug, replace seal.

(4) If leak occurs from steering gear housing ball plug, seat plug in housing using blunt punch. Spray ball area with Loctite Solvent 7559, or equivalent.

Dry area using compressed air. Cover ball with Loctite Sealant 290, or equivalent. Allow sealant to cure for approximately two hours before installing housing.

(5) If leak occurs between torsion bar and torsion bar seal, replace entire valve body assembly.

(6) If leak occurs at side cover gasket or locknut, replace gasket or locknut as necessary.

NOTE: The locknut has a left-hand thread.

(7) If leak occurs between pitman shaft and shaft seal, replace seal and check shaft for nicks, scores, burrs, or pitting. Remove minor surface imperfections using crocus cloth. Replace shaft if severely damaged.

(8) If leak occurs between end plug and housing, replace end plug O-ring seal.

(9) If leak is from crack or porous spot in gear housing, replace housing.

Leak Diagnosis and Correction—Pump

NOTE: Refer to figure 2L-8 for an illustration of the various pump leak sources.

(1) If leak occurred between pump union fitting and hose fitting, replace union and hose. If pump has metric thread union fitting, replace O-ring or hose and O-ring if damaged.

(2) If leak occurred between pump union fitting and pump body, replace pump union fitting O-rings.

(3) If leak occurred between reservoir and pump body, replace reservoir O-ring seal.

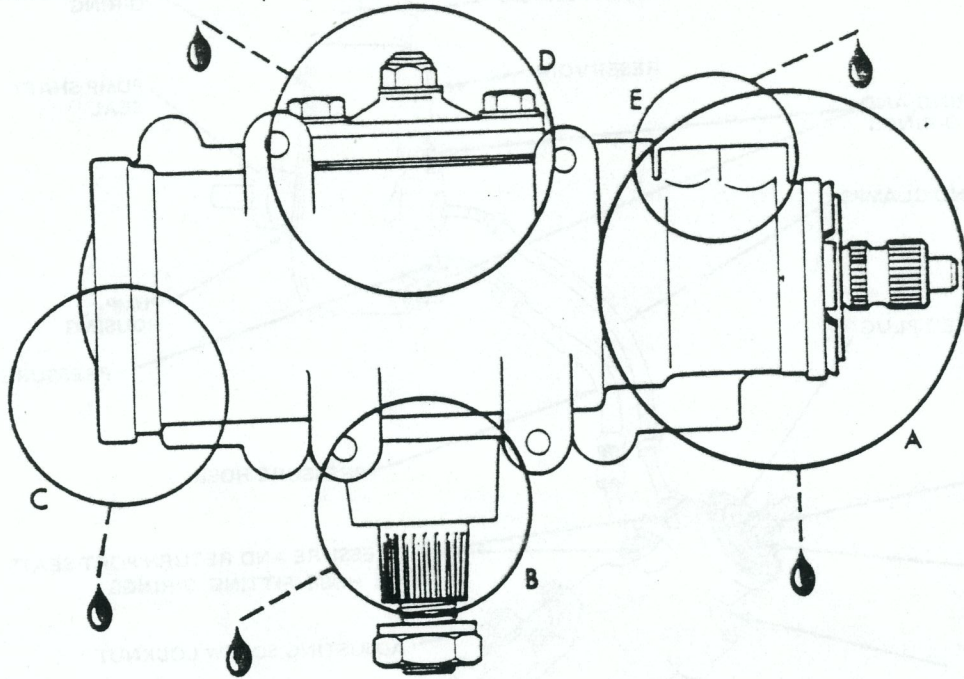
(4) If leak occurred between pump shaft and pump shaft seal, replace seal and check pump shaft for nicks, scores, burrs, or pitting.

(5) If leak is result of overfill condition, drain fluid from reservoir to correct level.

(6) If fluid is aerated, check for overfill condition, or air entering fluid through loose hose connection or reservoir O-ring seal, or perform hydraulic pressure test to check for sticking flow control valve.

(7) If leak occurs from cracked or porous pump body or reservoir, replace pump as assembly.

Gear Leak Points and Corrective Action



Leak Points

Pay particular attention to the exact source of leakage. Due to the proximity of the various seals, an incorrect diagnosis will result in ineffective repair.

Corrective Action

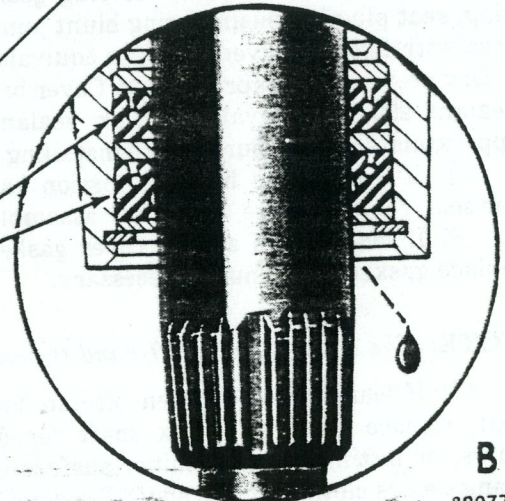
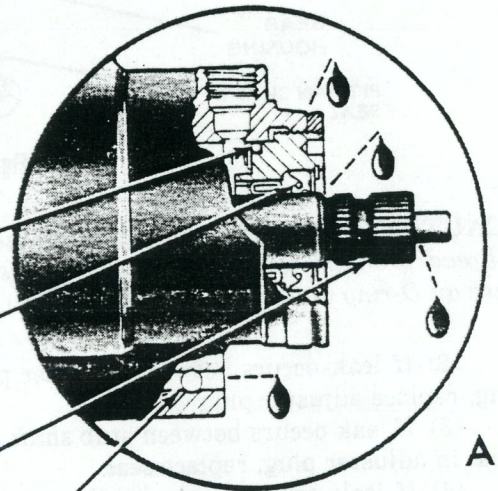
Replace adjuster plug O-ring seal.

Replace Dust and stub shaft seals.

If seepage is observed between the torsion bar and stub shaft, do not attempt repair. The rotary valve assembly must be replaced.

Seat housing ball with blunt punch. Spray ball area with Loctite solvent 75559 or equivalent. Dry ball area with compressed air. Apply Loctite sealent 290 or equivalent to ball area. Allow sealent to cure for approximately two hours before installing housing.

Replace both pitman shaft seals.

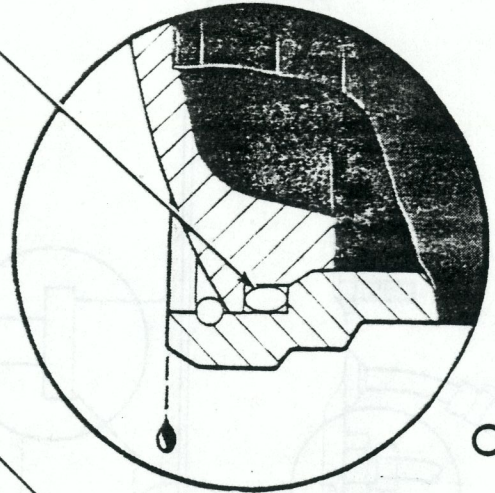


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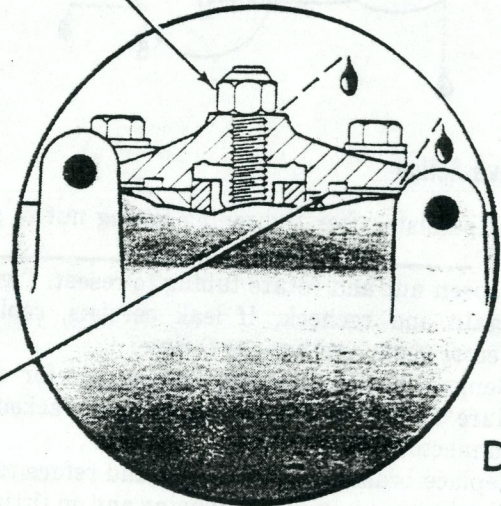
Fig. 2L-7 Steering Gear Leak Diagnosis and Corrective Action (View A)

Corrective Action (cont.)

Replace end plug O-ring seal.



Tighten nut to 35 foot-pounds (47 N·m) torque. Replace nut if leak persists.



Tighten side cover bolts to 50 foot-pounds (68 N·m) maximum. Replace side cover seal if leak persists. If side cover seal replacement is required, discard bolts and install replacement. Whenever the side cover is removed, install bolts supplied in overhaul kit.

If leak continues after tightening fitting nut to specified torque:

- a. Loosen nut and rotate tubing to reseal. Tighten nut again and recheck. If leak persists, replace connector seats.
- b. Remove hose and check sealing face for cracks. If flare is cracked, replace connector seats.
- c. Replace brass connector seats and reface hose flare. Check threads in housing and on fitting nut. If nut threads are damaged, replace nut. If housing threads are damaged, replace both housing and nut.

CAUTION: Some steering gear units may be equipped with metric thread hose fittings that use O-ring seals. Replace the seal if it leaks or replace the hose and seal if the fitting is damaged.

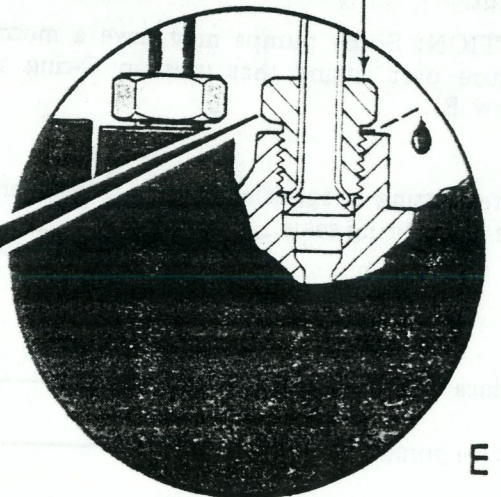
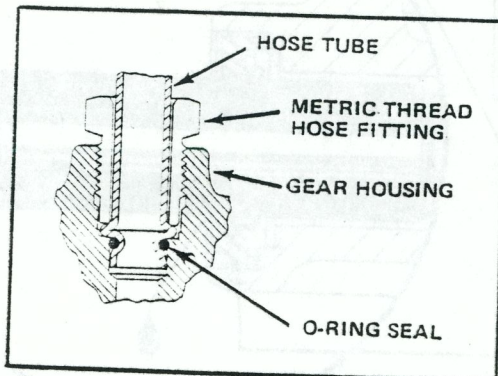
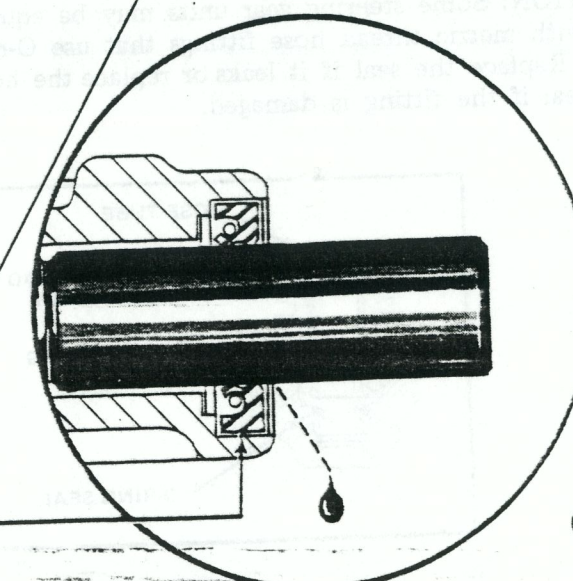
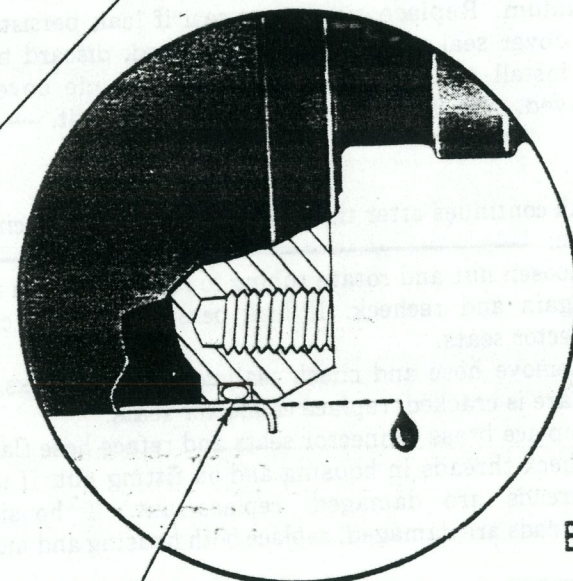
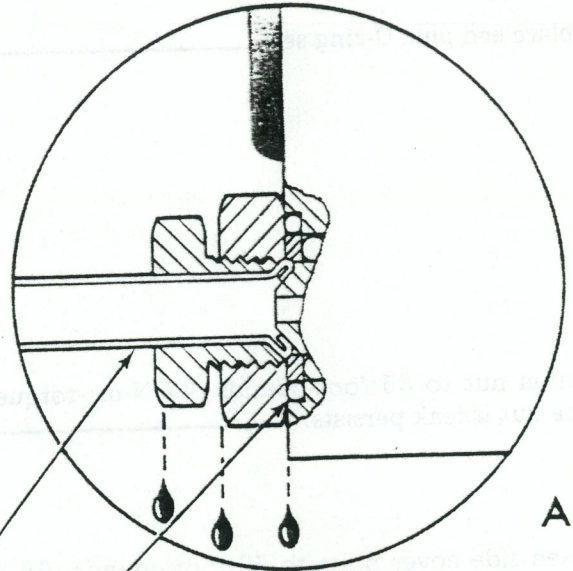
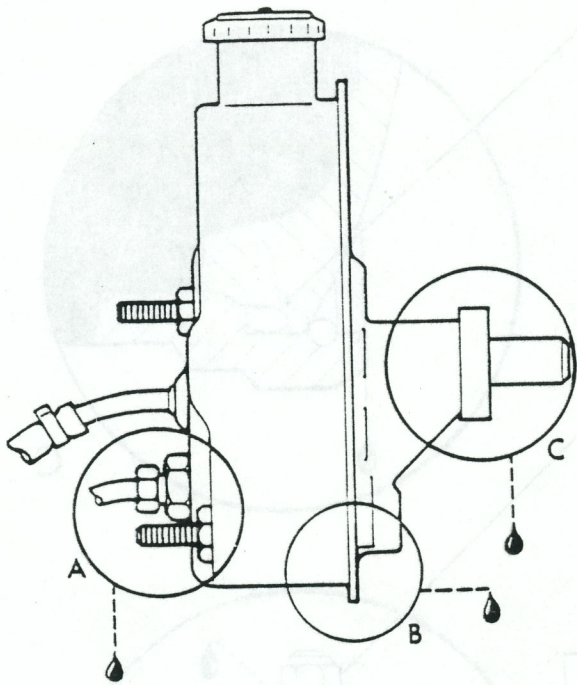


Fig. 2L-7 Steering Gear Leak Diagnosis and Corrective Action (View B)

Pump Leak Points and Corrective Action



Corrective Action

If leak persists after tightening fitting nut to specified torque: _____

- a. Loosen nut and rotate tubing to reseat. Tighten nut again and recheck. If leak persists, replace connector seats and hose or O-ring.
- b. Remove hose and check sealing face for cracks. If flare is cracked, replace hose. If not cracked, replace connector seats.
- c. Replace brass connector seats and reface tube flare. Check threads in pump housing and on fitting nut. If nut threads are damaged, replace both housing and nut.

CAUTION: Some pumps may have a metric thread pressure part fitting that uses an O-ring seal (2L-7 view B).

Tighten fitting to specified torque. If leak persists, Replace both O-ring seals. _____

Replace reservoir O-ring. _____

Replace pump shaft seal. _____

Fig. 2L-8 Power Steering Pump Leak Diagnosis and Corrective Action

HYDRAULIC PRESSURE TEST

The hydraulic pressure test is performed using Test Gauge J-21567. The fittings on the test gauge and gauge valve have 1/4 pipe threads. Any combination of fittings is acceptable for gauge installation and connection can be made at the pump or gear as desired. However, the gauge must be connected in the pressure line circuit between pump and test gauge valve at all times.

CAUTION: Some steering gear and pump units have metric thread fittings and hose fittings which use an O-ring seal (fig. 2L-7, View B). In order to use gauge J-21567, hose fitting adapters J-5176-5, must be installed on the existing gauge hoses before using the test gauge.

Test Procedure

- (1) Check condition of power steering fluid. Drain and replace fluid if it contains small amount of dirt or contaminant. If fluid is exceptionally dirty, contaminated, or full of debris or foreign material, gear and pump should be disassembled and serviced.
- (2) If fluid is full of bubbles, bleed power steering system. Refer to Fluid Level and Initial Operation in Power Steering Pump section.
- (3) Check and adjust pump drive belt tension if necessary.
- (4) Position drip pan under pump.
- (5) Disconnect pressure hose at pump. Keep hose end raised to avoid excessive fluid loss.
- (6) Connect pressure hose to Test Gauge J-21567. Refer to Pump Diagnosis Charts. Install hose fitting adapters J-5176-5 if gear and pump have metric thread fittings.
- (7) Connect test gauge hose to pump. Refer to Pump Diagnosis Charts.
- (8) Open test gauge valve completely. Turn valve counterclockwise to open.
- (9) Fill pump reservoir with power steering fluid.
- (10) Shift transmission into neutral, apply parking brakes, start engine, and operate engine until power steering fluid reaches normal operating temperature.
- (11) Record pump initial output pressure registered on test gauge. Pressure should be 80-125 psi (552-862 kPa) with gauge valve open completely.

NOTE: If the initial output pressure exceeds 200 psi (1 379 kPa), stop the engine and check the test gauge and pressure hoses for restrictions.

- (12) Check pump maximum output pressure as follows: Close gauge valve completely for 2-3 seconds; then open valve completely. Perform this procedure three times in succession and record highest pressure developed each time valve is closed.

CAUTION: Do not hold the gauge valve closed for more than five seconds at a time as pump damage could occur.

- (13) On CJ models, maximum pump output pressures should be in 1000-1100 psi (6 895-7 584 kPa) range and not vary by more than 50 psi (345 kPa). On all other

models, pressures should be in 1400-1500 psi (9 653-10 342 kPa) range and also not vary by more than 50 psi (345 kPa).

For example if recorded pressures on CJ models were 1050-1060-1070 psi (7 240-7 309-7 378 kPa), or 1450-1480-1470 psi (9 998-10 205-10 136 kPa) on Cherokee, Wagoneer and Truck models, maximum pressures are within allowable variance and pump operation is within limits.

(14) If maximum pressures were within specified high ranges but varied by more than 50 psi (345 kPa), flow control valve is sticking. Remove and clean valve and remove any surface imperfections with crocus cloth.

(15) If pump flow control valve was serviced, repeat pressure test to check valve operation before proceeding.

(16) Turn steering wheel right and left. Contact steering stops in both directions and record highest pressure developed when each stop is contacted. If pressures are 1000-1100 psi (6 895-7 584 kPa) on CJ models, or 1400-1500 psi (9 653-10 342 kPa) on all other models, pump is operating properly.

CAUTION: Do not hold the steering wheel against the steering stops for more than five seconds at a time as pump damage could occur.

(17) If pump maximum output pressure cannot be duplicated at each steering stop, steering gear is leaking internally and must be disassembled and serviced.

(18) If pump output pressures were duplicated at each steering stop, proceed to next step.

(19) Stop engine and remove test gauge.

(20) Connect pressure hose to pump. Tighten hose fitting to 30 foot-pounds (41 N•m) torque.

(21) Check and adjust power steering fluid level as necessary.

(22) Remove drain pan.

PERIODIC MAINTENANCE

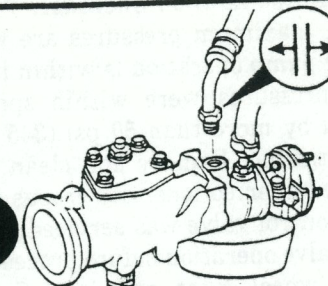
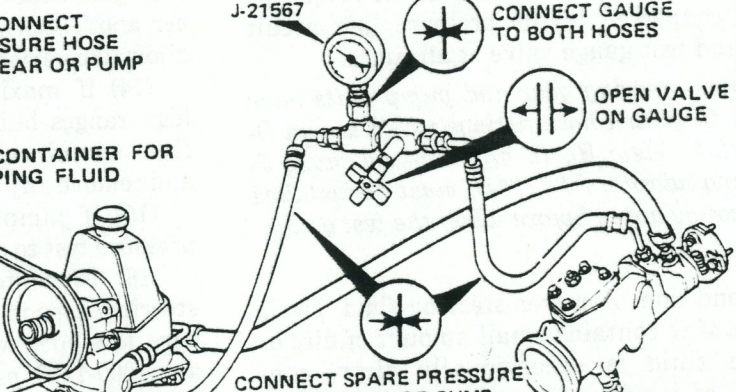


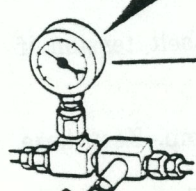
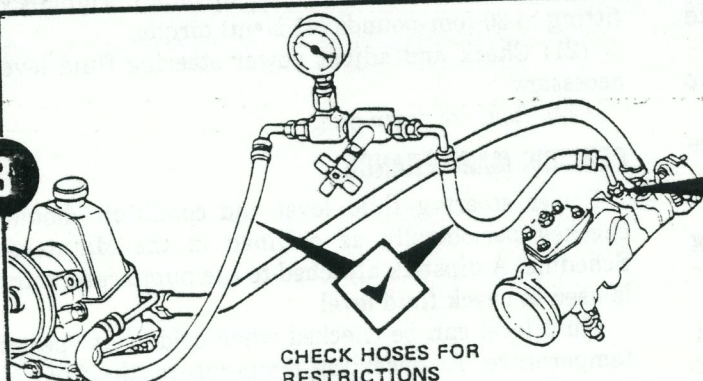

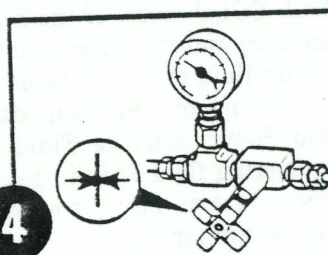
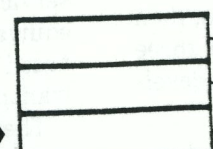
Power steering fluid level and condition should be checked periodically as outlined in the Maintenance Schedule. A dipstick attached to the pump reservoir cap is used to check fluid level.

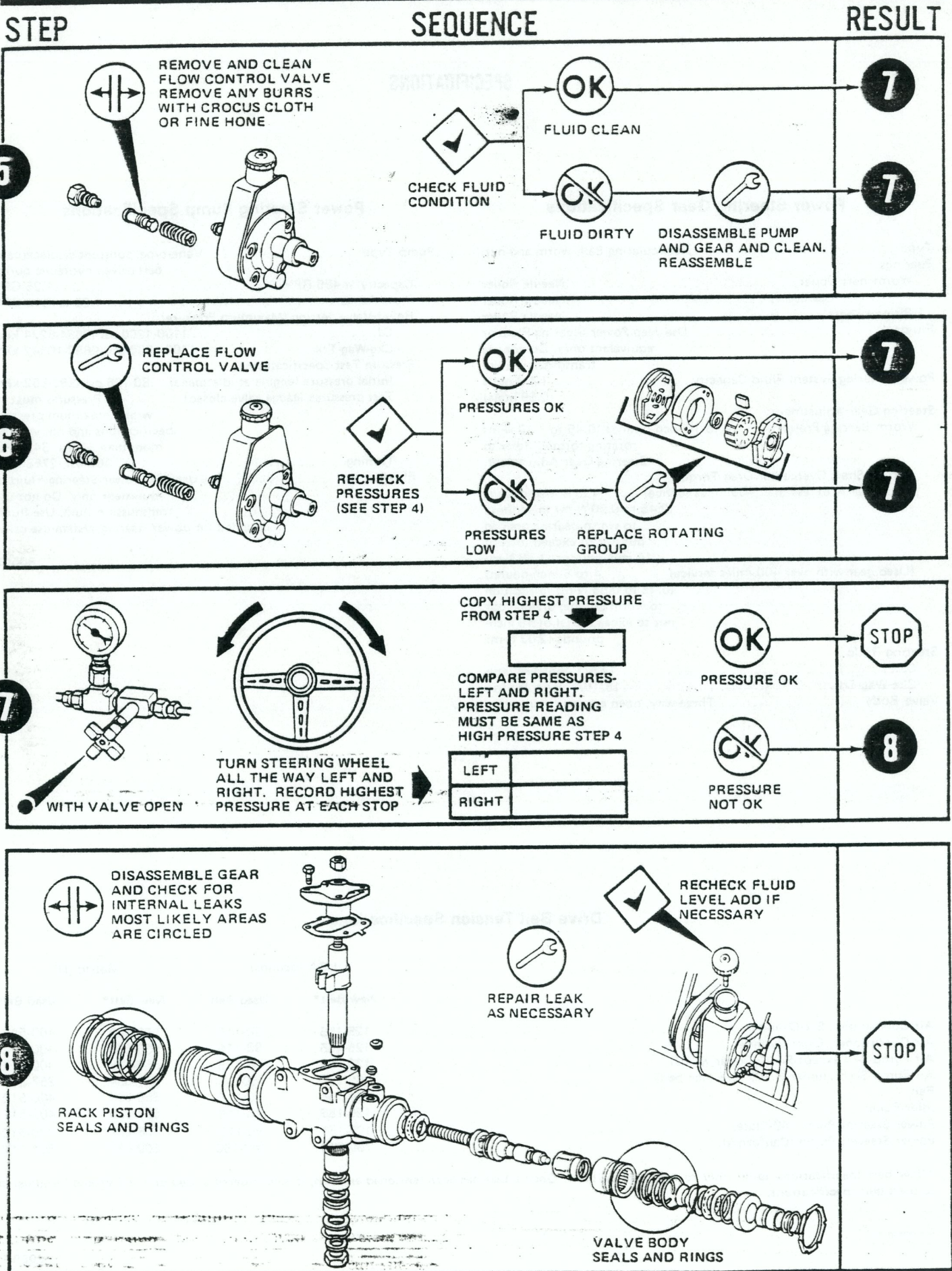
Fluid level can be checked when cold or at operating temperature. At operating temperature, the fluid level should be at the FULL HOT mark on the dipstick. When cold it should be at the FULL COLD mark. If the fluid level is low, add fluid as necessary and check for leaks. If the reservoir is overfilled, drain fluid to correct level.

When adding fluid to or refilling the reservoir after service operations, use Jeep Power Steering Fluid or equivalent only. Use power steering fluid or fluid designated for use in power steering systems only. Do not use transmission fluid, motor oil, or similar fluids.

The pump drive belt tension and condition should be also be checked periodically. Use Tension Gauge J-23600 to measure belt tension. When checking tension with this gauge, position the gauge at the center of the longest belt span to take readings. When checking tension of notched drive belts, be sure the gauge finger is firmly seated in a belt notch before taking readings.

POWER STEERING SYSTEM HYDRAULIC PRESSURE TEST PROCEDURE

STEP	SEQUENCE	RESULT
<p>1</p>  <p>DISCONNECT PRESSURE HOSE AT GEAR OR PUMP</p> <p>USE CONTAINER FOR DRIPPING FLUID</p> <p>CAUTION IF GEAR AND PUMP HAVE METRIC THREAD FITTING USE HOSE FITTING ADAPTERS</p>	<p>J-21567</p>  <p>CONNECT GAUGE TO BOTH HOSES</p> <p>OPEN VALVE ON GAUGE</p> <p>CONNECT SPARE PRESSURE HOSE TO GEAR OR PUMP</p>	<p>2</p>
<p>2</p>  <p>START ENGINE AND LET IDLE</p>	<p>CHECK FLUID LEVEL, ADD FLUID IF NECESSARY</p>  <p>GAUGE SHOULD READ BELOW 150 PSI (1034 kPa)</p>  <p>OK →</p> <p>GAUGE READS OK →</p> <p>GAUGE READS OVER 150 PSI (1034 kPa) →</p>	<p>4</p> <p>3</p>
<p>3</p>  <p>CHECK HOSES FOR RESTRICTIONS</p>	<p>DISCONNECT HOSE AT GEAR AND CHECK POPPET VALVE FOR FREE OPERATION</p>  <p>REPAIR OR REPLACE AS NECESSARY</p>	<p>4</p>
<p>4</p>  <p>CLOSE VALVE FULLY THREE TIMES, RECORDING HIGHEST PRESSURE EACH TIME</p> <p>CAUTION DO NOT LEAVE VALVE CLOSED FOR MORE THAN 5 SECONDS AS THE PUMP COULD BE DAMAGED</p>	<p>ALL THREE READINGS MUST BE ABOVE SPEC. AND WITHIN 50 PSI (345 kPa) OF EACH OTHER</p>  <p>PRESSURES OK →</p> <p>PRESSURES ABOVE SPEC. BUT NOT WITHIN 50 PSI (345 kPa) OF EACH OTHER →</p> <p>PRESSURES WITHIN 50 PSI (345 kPa) OF EACH OTHER, BUT BELOW SPEC. →</p>	<p>7</p> <p>5</p> <p>6</p>



POWER STEERING GEAR

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GENERAL

Although service and adjustment procedures for constant and variable ratio steering gears are the same, do not attempt to interchange gear internal components.

When servicing a gear, perform all repair operations on a clean work surface only. Small amounts of foreign material or contaminants can cause a malfunction after assembly. Clean all parts in clean-filtered solvent only and dry all parts, except bearings, using filtered compressed air. Use lint-free paper towels or cloths only to dry bearings.

During assembly operations, use the recommended torque values and adjustment specifications only. Failure to adhere to these specifications can result in accelerated wear and unsatisfactory gear operation.

IN-VEHICLE SERVICE

Steering Gear Adjustment

Because of the close tolerance involved in adjusting worm bearing preload and pitman shaft overcenter drag torque plus the friction effect of hydraulic fluid, the steering gear must be adjusted off the vehicle only. Refer to Worm Bearing Preload and Pitman Shaft Overcenter Drag Torque Adjustment under Steering Gear Assembly and Adjustment.

CAUTION: Do not attempt on-vehicle adjustment of the power steering gear. Incorrect adjustment could result in accelerated wear of gear internal components and undesirable steering response.

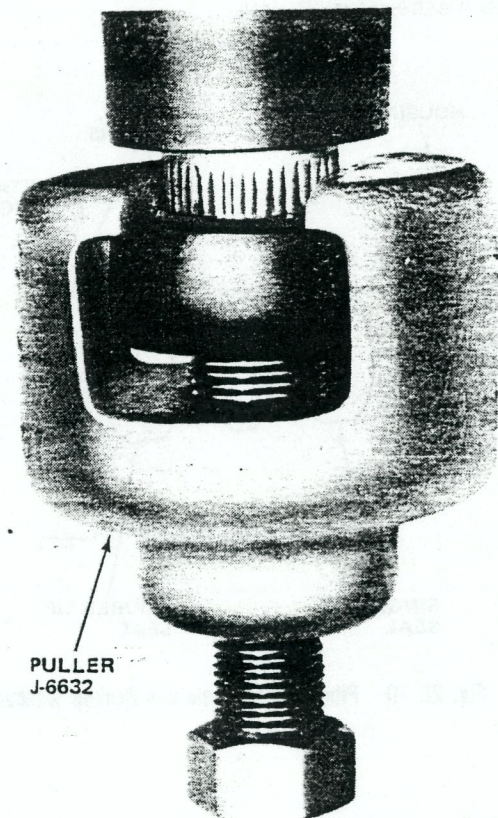
Conditions such as shimmy and hard or loose steering may be caused by wheels and tires or worn or damaged front suspension components. These items should be checked before attempting power steering gear repairs.

Before performing any service operations, check and correct fluid level and condition, belt adjustment, and pump pressures.

CAUTION: Use power steering fluid only in the system.

Pitman Shaft Seal Replacement

- (1) Raise vehicle.
- (2) Disconnect pitman arm using tool J-6632 (fig. 2L-9).



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Fig. 2L-9 Pitman Arm Removal

- (3) Position drain pan under gear.
- (4) Remove seal retaining ring using tool J-4245 and remove outer seal backup washer.
- (5) Start engine and momentarily hold steering wheel in full left turn position to actuate spool valve. This builds pressure on upper end of piston and in pitman shaft chamber to force seals and backup washers out of gear.

CAUTION: To avoid excessive fluid loss and possible pump damage, do not hold the gear in the full left turn position for more than one or two seconds at a time.

(6) Stop engine and remove seals and backup washers from pitman shaft.

(7) Inspect outer diameter of seals for damage. If scored or cut, inspect housing bore for burrs and nicks. Remove any burrs or nicks, before installing replacement seals, using crocus cloth.

(8) Inspect pitman shaft surface for roughness, pitting, scoring, rust, or nicks. Clean dirt, rust or corrosion from shaft seal surfaces using crocus cloth. Replace shaft if pitted or severely corroded.

(9) Lubricate replacement seals and shaft surfaces with power steering fluid.

(10) Apply single layer of thin tape to pitman shaft splines to avoid cutting seals.

(11) Insert single lip seal in bore first; then insert backup washer (fig. 2L-10).

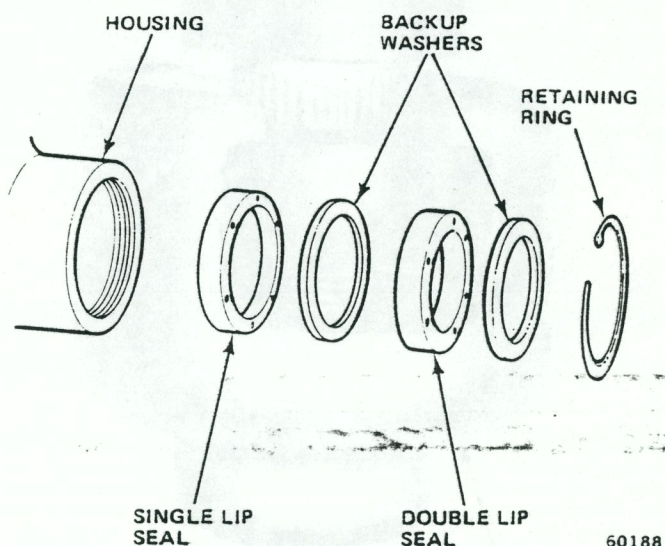


Fig. 2L-10 Pitman Shaft Seals and Backup Washers

(12) Seat single lip seal and washer using Snap Ring Tool J-21553. Install seal and washer only far enough to provide clearance for remaining seal, backup washer, retaining ring, and for clearance between seals. Do not allow seal to bottom in housing bore.

CAUTION: To ensure proper seal action, be sure to allow enough space for clearance between the two seals.

(13) Install double lip seal and backup washer in housing bore using tool J-21553. Install seal only far enough into bore to allow clearance for retaining ring.

(14) Install retaining ring using Snap Ring Tool J-4245. Be sure ring is fully seated.

(15) Install pitman arm on shaft and install replacement pitman arm nut and lockwasher. Tighten nut to 185 foot-pounds (251 N•m) torque. Stake nut in two places to retain it.

(16) Lower vehicle.

(17) Fill power steering pump reservoir to correct level with power steering fluid.

(18) Start and idle engine for at least three minutes. Do not turn steering wheel during this time.

(19) Turn steering wheel left and right and check for leaks. Add additional fluid as necessary.

End Plug O-Ring Seal Replacement

CJ Models

(1) Raise vehicle.

(2) Rotate end plug retaining ring (fig. 2L-11) until one end of ring is positioned over hole in side of housing.

(3) Remove retaining ring by inserting punch through hole in housing and unseating ring.

(4) Remove end plug by turning steering wheel slowly to left until rack piston forces end plug out of housing.

(5) Turn steering wheel back to center position.

CAUTION: Do not turn the steering wheel any farther than necessary or the ball bearings in the rack piston may fall out of the rack piston bearing circuit and drop into the piston chamber.

(6) Remove and discard end plug O-ring seal.

(7) Lubricate replacement seal with power steering fluid and install seal on end plug.

(8) Install assembled end plug and seal in housing.

(9) Install retaining ring.

(10) Lower vehicle.

(11) Check and correct power steering fluid level as necessary.

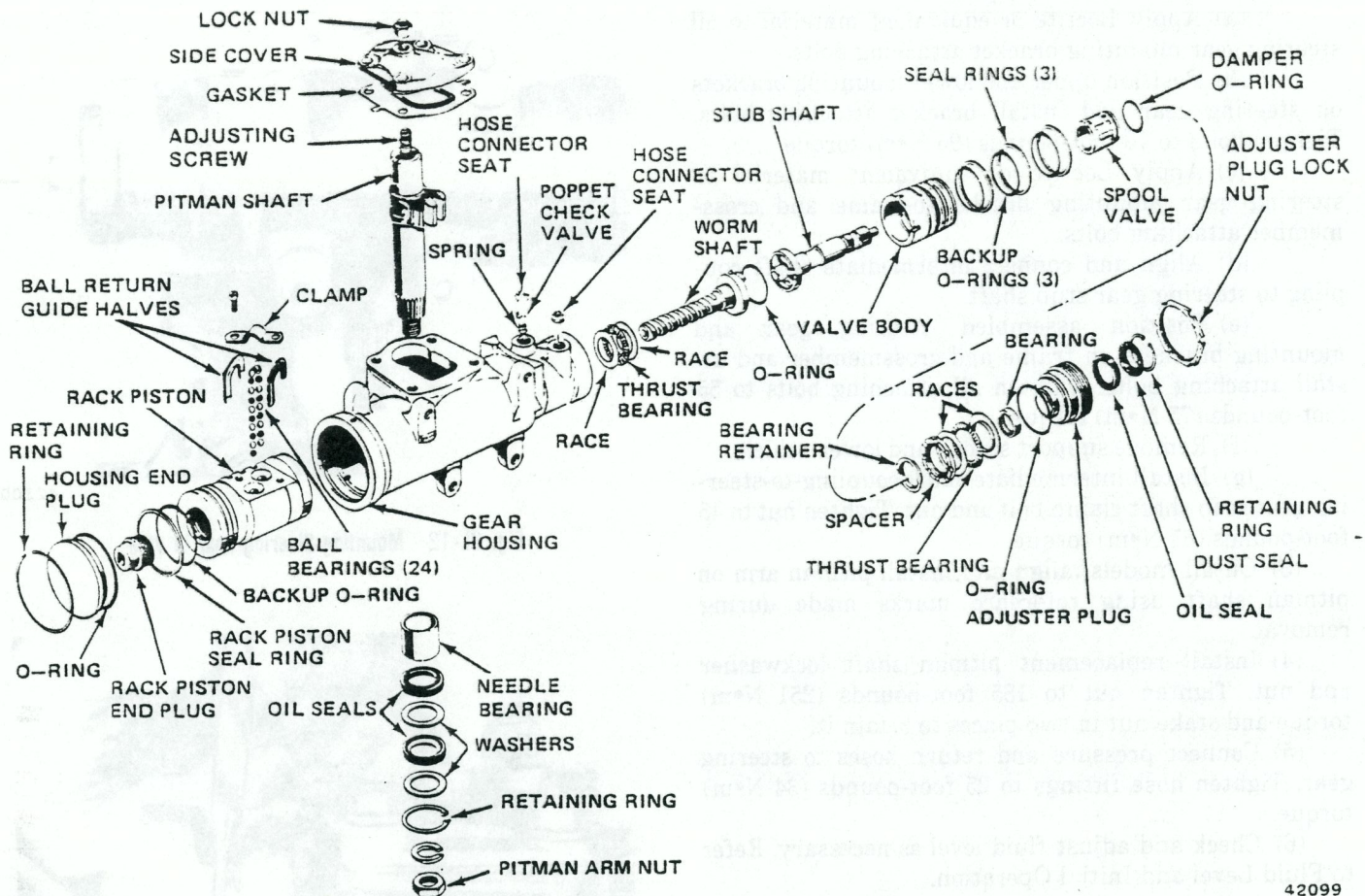
Cherokee-Wagoneer-Truck Models

On Cherokee, Wagoneer and Truck models, the position of the steering gear prevents on-vehicle replacement of the end plug O-ring seal (fig. 2L-11). It is necessary to remove the gear to perform seal replacement.

STEERING GEAR REMOVAL

(1) Disconnect pressure and return hoses at gear. Keep hoses raised to avoid excessive fluid loss and cap hoses to prevent dirt entry.

(2) On Cherokee, Wagoneer and Truck models, remove clamp bolt and nut attaching flexible coupling to steering gear stub shaft and disengage coupling from stub shaft.



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Fig. 2L-11 Power Steering Gear Assembly

(3) On CJ models, remove clamp bolt and nut attaching intermediate shaft coupling to steering gear stub shaft and disconnect intermediate shaft.

(4) Paint alignment marks on pitman shaft and pitman arm for assembly reference.

(5) Remove and discard pitman arm nut and lockwasher.

(6) Remove pitman arm using tool J-6632 (fig. 2L-9).

(7) On Cherokee, Wagoneer and Truck models, remove steering gear-to-frame mounting bolts and remove gear.

(8) On CJ models, remove gear as follows:

(a) Raise left side of vehicle slightly to relieve tension on left front spring and place support stand under frame.

(b) Remove three lower steering gear mounting bracket-to-frame bolts.

(c) Remove two upper steering gear mounting bracket-to-crossmember bolts and remove steering gear and mounting brackets as assembly.

(d) Remove mounting bracket-to-gear attaching bolts and remove upper and lower mounting brackets from steering gear.

STEERING GEAR INSTALLATION

NOTE: Proper retention of the steering gear is important. Some of the following procedural steps in gear installation require the application of Loctite or equivalent material to attaching bolt threads. Wherever indicated, use Jeep Adhesive Sealant or Loctite 271 Adhesive/Sealant, or equivalent. When applying this material, clean all bolt threads thoroughly to remove dirt and grease and apply the material liberally to the bolt threads no more than five minutes before installation.

(1) On Cherokee, Wagoneer and Truck models, install gear as follows:

(a) Align and install flexible coupling on steering gear stub shaft and install clamp bolt. Tighten clamp bolt to 30 foot-pounds (41 N•m) torque.

(b) Apply Loctite or equivalent material to steering gear-to-frame mounting bolts.

(c) Position steering gear on frame and install gear mounting bolts. Tighten mounting bolts to 70 foot-pounds (95 N•m) torque.

(2) On CJ models, install gear as follows:

(a) Apply Loctite or equivalent material to all steering gear mounting bracket attaching bolts.

(b) Position upper and lower mounting brackets on steering gear and install bracket attaching bolts. Tighten bolts to 70 foot-pounds (95 N•m) torque.

(c) Apply Loctite or equivalent material to steering gear mounting bracket-to-frame and cross-member attaching bolts.

(d) Align and connect intermediate shaft coupling to steering gear stub shaft.

(e) Position assembled steering gear and mounting brackets on frame and crossmember and install attaching bolts. Tighten all attaching bolts to 55 foot-pounds (75 N•m) torque.

(f) Remove support stands and lower vehicle.

(g) Install intermediate shaft coupling-to-steering gear stub shaft clamp bolt and nut. Tighten nut to 45 foot-pounds (61 N•m) torque.

(3) On all models, align and install pitman arm on pitman shaft using reference marks made during removal.

(4) Install replacement pitman shaft lockwasher and nut. Tighten nut to 185 foot-pounds (251 N•m) torque and stake nut in two places to retain it.

(5) Connect pressure and return hoses to steering gear. Tighten hose fittings to 25 foot-pounds (34 N•m) torque.

(6) Check and adjust fluid level as necessary. Refer to Fluid Level and Initial Operation.

STEERING GEAR DISASSEMBLY

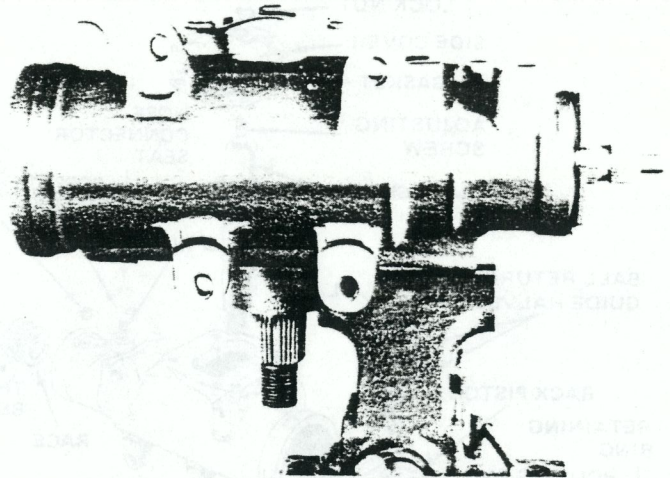
NOTE: In most cases, complete disassembly of the power steering gear will not be necessary. Only those subassemblies that have malfunctioned should be disassembled. In addition, steering gear repair operations must always be performed on a clean work bench. Cleanliness is very important. The work bench, tools, and steering gear component parts must be kept clean at all times to avoid problems after assembly. Clean the gear exterior thoroughly with solvent before disassembly. Refer to figure 2L-11 for parts nomenclature and disassembly/assembly sequence during service operations.

(1) Drain fluid from gear.

(2) Cap all openings in gear and clean gear exterior thoroughly.

(3) Mount steering gear in vise so pitman shaft points downward. Clamp unmachined housing boss portion of gear in vise only (fig. 2L-12).

(4) Rotate end plug retaining ring until one end of ring is aligned with hole in side of housing. Unseat ring using punch inserted through hole in housing and remove ring using screwdriver (fig. 2L-13).



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Fig. 2L-12 Mounting Steering Gear in Vise



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Fig. 2L-13 End Plug Retaining Ring Removal

(5) Remove end plug. Install 12-point deep socket and ratchet handle on stub shaft and slowly rotate shaft counterclockwise until rack piston forces end plug out of housing.

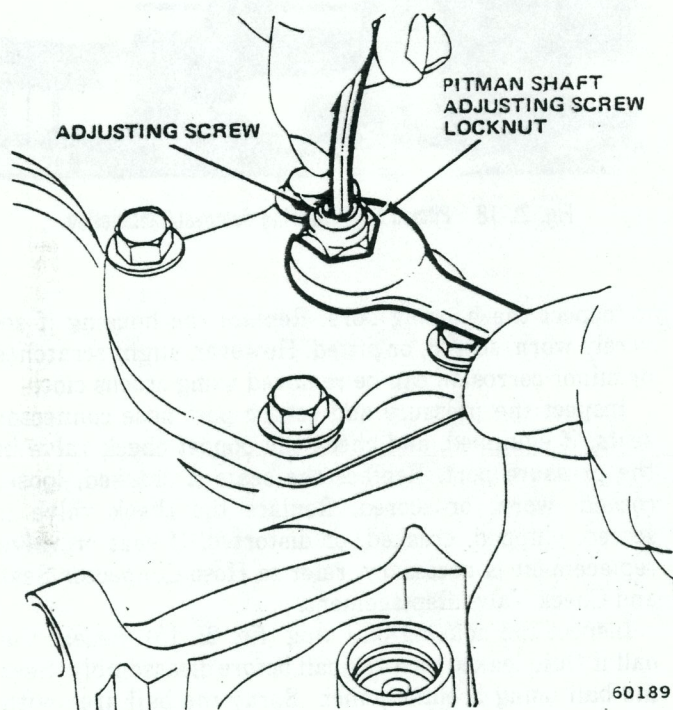
CAUTION: Do not rotate the stub shaft any farther than necessary or the ball bearings will drop out of the rack piston circuits. This causes the rack piston and pitman shaft sector teeth to disengage preventing removal. If disengagement should occur, remove the side cover and pitman shaft and reengage the teeth.

- (6) Remove and discard O-ring seal from housing end plug.
- (7) Turn stub shaft 1/2 turn clockwise.
- (8) Unseat rack piston end plug by tapping it with plastic mallet.
- (9) Remove rack piston end plug.

CAUTION: Do not attempt to remove the rack piston end plug until it has been unseated as the plug could break.

- (10) Remove and discard pitman shaft adjuster screw locknut. Use Allen wrench to prevent adjuster screw from turning when removing locknut (fig. 2L-14).

NOTE: The locknut has left-hand threads.



2L-14 Adjuster Screw Locknut Removal/Installation

- (11) Remove side cover bolts and lockwashers.
- (12) Remove side cover. Unthread cover from adjuster screw by turning screw clockwise.
- (13) Rotate stub shaft until pitman shaft sector teeth are centered in housing.
- (14) Remove pitman shaft from housing by tapping threaded end of shaft with plastic mallet.

NOTE: Do not remove or disassemble any of the pitman shaft component parts. The shaft and component parts are serviced as an assembly only.

- (15) Remove rack piston from housing as follows:

- (a) Insert Arbor Tool J-7539-01 or J-21552 into rack piston until tool contacts end of wormshaft.

- (b) Hold arbor tool tightly against wormshaft and turn stub shaft counterclockwise to force rack piston onto arbor tool.

- (c) Remove rack piston and arbor tool as assembly (fig. 2L-15).

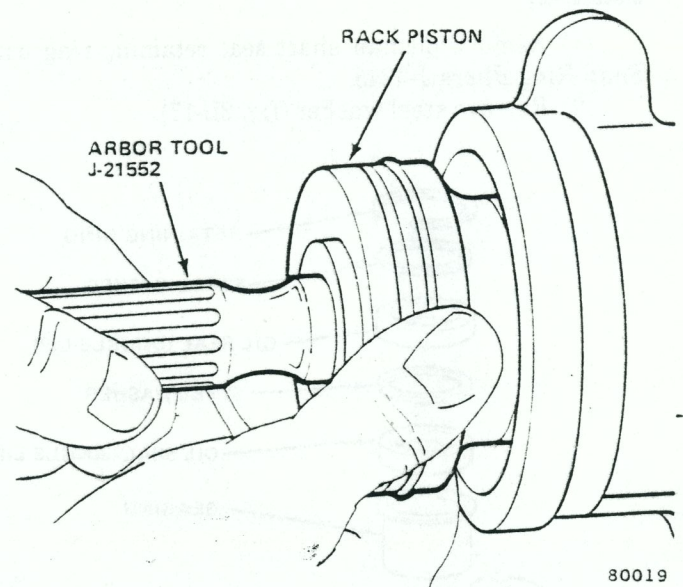


Fig. 2L-15 Rack Piston Removal/Installation

- (16) Remove adjuster plug locknut using brass drift and hammer.

- (17) Remove adjuster plug using Spanner Tool J-7624 (fig. 2L-16).

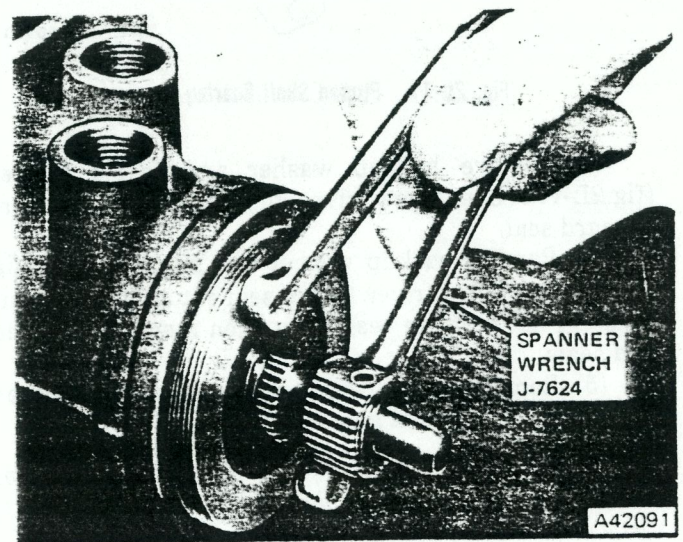


Fig. 2L-16 Adjuster Plug Removal

- (18) Remove valve body from housing. Grasp stub shaft and pull outward to remove.

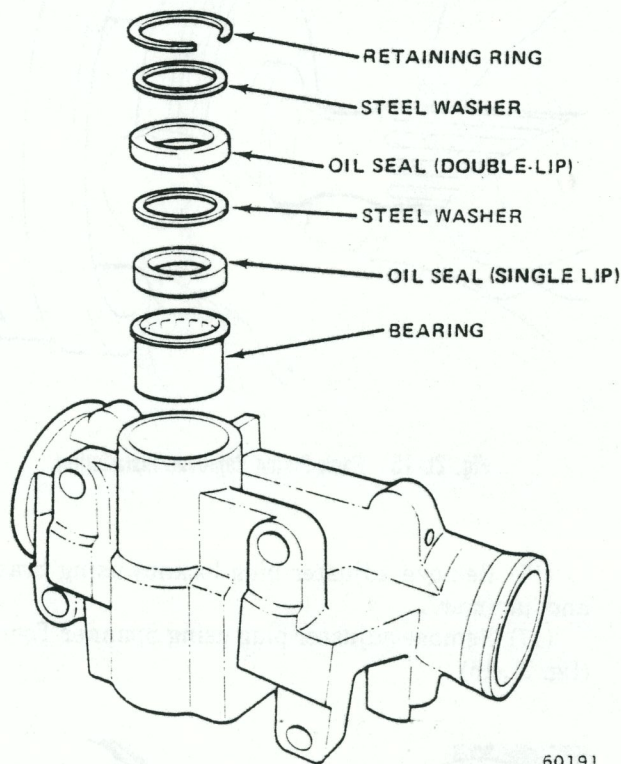
- (19) Remove wormshaft lower thrust bearing and bearing races from housing if not removed previously.

STEERING GEAR SUBASSEMBLY OVERHAUL

Gear Housing

Disassembly

- (1) Remove pitman shaft seal retaining ring using Snap Ring Pliers J-4245.
- (2) Remove steel washer (fig. 2L-17).



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Fig. 2L-17 Pitman Shaft Bearing and Seals

(3) Remove backup washer and double lip seal (fig. 2L-17). Use screwdriver to pry seal out of bore. Discard seal.

(4) Remove backup washer and single lip seal (fig. 2L-17). Use screwdriver to pry seal out of bore. Discard seal. Do not damage seal bore when removing washers and seals.

(5) Remove and discard pitman shaft needle bearing using Tools J-8092 and J-21551 (fig. 2L-18).

NOTE: When removing the bearing, drive the bearing out the end of the pitman shaft bore. Do not attempt to drive the bearing out through the housing.

Cleaning and Inspection

Clean all components thoroughly with solvent and dry using compressed air or lint free paper towels or shop cloths.

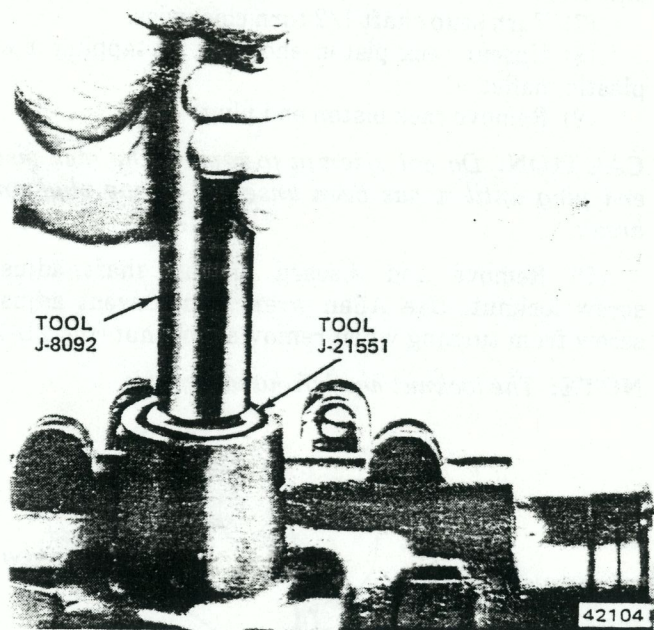


Fig. 2L-18 Pitman Shaft Bearing Removal/Installation

Inspect the housing bore. Replace the housing if severely worn, scored, or pitted. However, slight scratches or minor corrosion can be removed using crocus cloth.

Inspect the pressure and return port hose connector seats, if equipped, and check the poppet check valve in the pressure port. Replace the seats if cracked, loose, cocked, worn, or scored. Replace the check valve if scored, chipped, cracked, or distorted. If seat or valve replacement is necessary, refer to Hose Connector Seat and Check Valve Replacement.

Inspect the housing ball plug (fig. 2L-19). Reseat the ball if fluid leaked past the ball before disassembly. Seat the ball using a blunt punch. Spray the ball area with Loctite Solvent 7559, or equivalent, and dry the area with compressed air. Cover the ball area and ball with Loctite Sealant 290. Allow the sealant to cure for approximately two hours before installing or assembling the gear.

Inspect all retaining ring, bearing, and seal surfaces in the housing. Replace the housing if any surface is worn or damaged.

Hose Connector Seat and Check Valve Replacement

CAUTION: Some steering gear units have metric thread fittings and hose fittings which use O-ring seals instead of connector seats (fig. 2L-7, View B).

CAUTION: If the gear has connector seats, do not attempt connector seat or check valve replacement unless the gear has been removed and disassembled. Connector seat replacement will generate metal chips and shavings which can enter the gear and cause a malfunction after assembly.

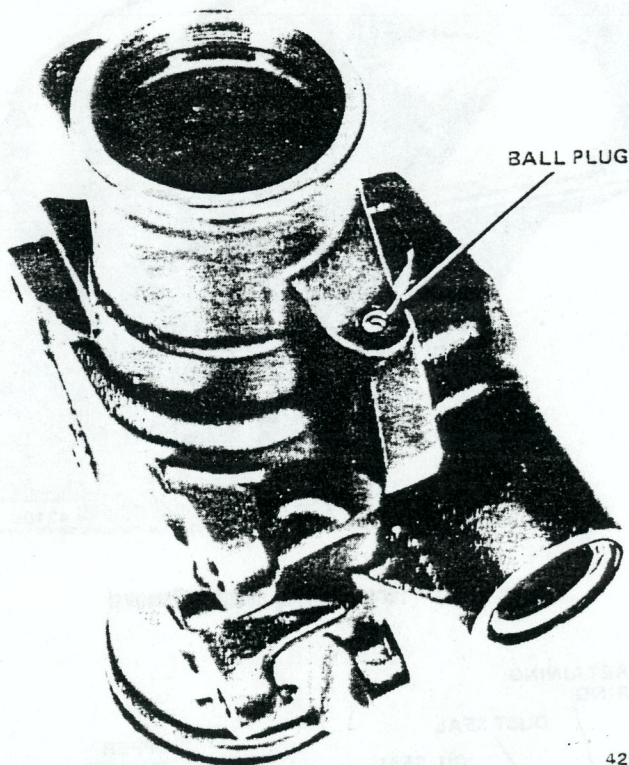


Fig. 2L-19 Housing Ball Plug Location

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- (1) Pack seats and pressure ports with petroleum jelly to prevent chips from lodging in ports.
- (2) Thread connector seats to depth of 2-3 threads (only) using 5/16-18 tap (fig. 2L-20).

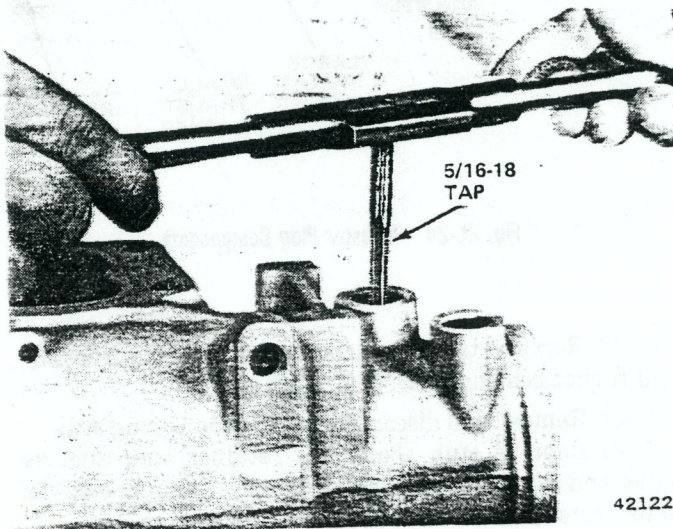
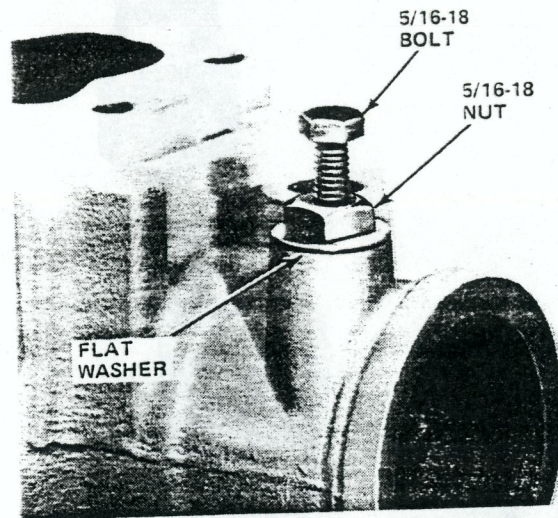


Fig. 2L-20 Threading Hose Connector Seats
(Steering Gear With Non-Metric Fittings Only)

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CAUTION: Do not thread the pressure port seat any more than 2-3 threads deep or the tap may contact the check valve and damage it.

- (3) Assemble 5/16-18 bolt, nut and flat washer and thread bolt into connector seat (fig. 2L-21).



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Fig. 2L-21 Hose Connector Seat Removal
(Steering Gears With Non-Metric Fittings Only)

- (4) Place wrench on bolt to prevent it from turning and tighten nut against housing to remove seat.
- (5) Remove check valve and spring from pressure port and discard both parts, they are not reusable.
- (6) Clean housing thoroughly to remove metal chips and shavings, dirt, and petroleum jelly.
- (7) Install replacement check valve spring in pressure port. Be sure spring is seated in pressure port counterbore and large end of spring faces downward.
- (8) Install replacement check valve over spring so valve tangs face downward. Be sure valve is centered on small end of spring.
- (9) Coat replacement pressure port connector seat with petroleum jelly and position seat on top of check valve.
- (10) Insert replacement return port connector seat in port.
- (11) Install both seats using Tool J-6217 (fig. 2L-22).
- (12) Inspect check valve operation by lightly pressing valve downward with pencil. Valve should reseat itself when pencil pressure is released.
- (13) Clean housing with solvent to remove any remaining chips and petroleum jelly.

Assembly

- (1) Lubricate housing bores and all replacement bearings and seals with power steering fluid.
- (2) Install pitman shaft needle bearing using Tools J-8092 and J-21553 (fig. 2L-18). Install bearing until approximately 1/32 inch (0.79 mm) below shoulder in housing bore.
- (3) Install single lip seal and backup washer (fig. 2L-17). Seat washer and seal using tool J-21553. Install seal and washer only far enough to provide clearance for next seal and washer, steel washer and retaining ring, and to provide small clearance between seals.

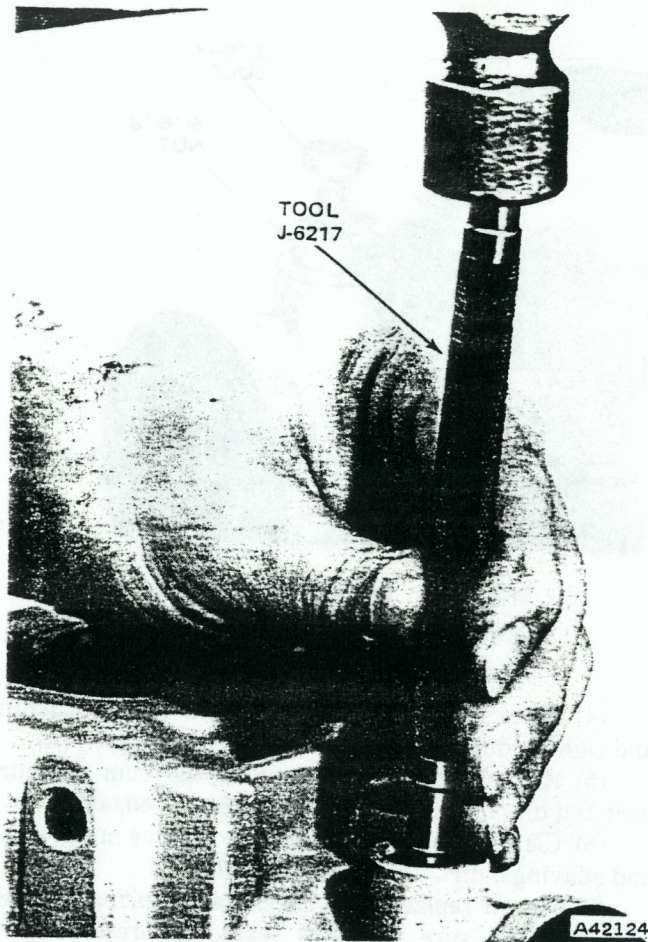
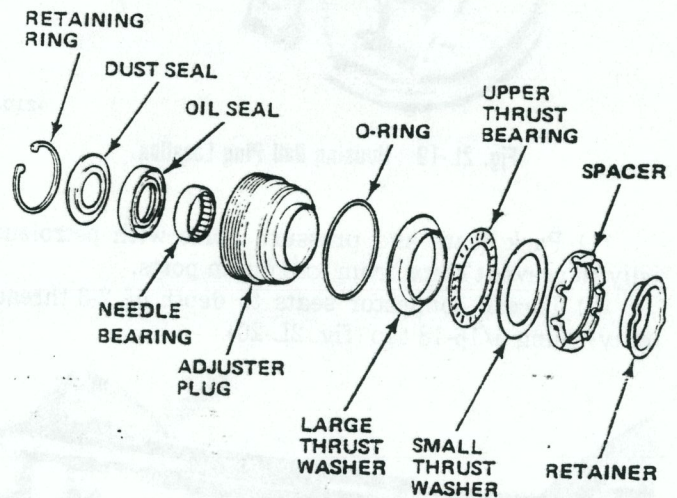


Fig. 2L-22 Hose Connector Seat Installation
(Steering Gears With Non-Metric Fittings Only)



Fig. 2L-23 Thrust Bearing Retainer Removal



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Fig. 2L-24 Adjuster Plug Components

CAUTION: Do not bottom the seal against the housing counterbore.

(4) Install double lip seal and backup washer using tool J-21553. Install seal and washer only far enough to allow clearance for steel washer and retaining ring.

CAUTION: To ensure proper seal action, do not allow the seals to contact one another. Be sure there is clearance between them.

(5) Install steel washer.

(6) Install retaining ring using Snap Ring Pliers J-4245. Be sure ring is seated completely in housing ring groove.

Adjuster Plug

Disassembly

(1) Remove thrust bearing retainer using screwdriver (fig. 2L-23). Discard retainer. Do not damage needle bearing bore when removing retainer.

(2) Remove thrust bearing spacer, thrust bearing, and thrust bearing races (fig. 2L-24).

(3) Remove and discard adjuster plug O-ring seal.

(4) Remove stub shaft seal retainer ring and remove and discard stub shaft dust seal. Use screwdriver to pry retainer and seal out of adjuster plug.

(5) Remove needle bearings using tool J-6221 (fig. 2L-25). Discard bearings after removal.

Cleaning and Inspection

Clean the adjuster components with solvent and dry them using compressed air.

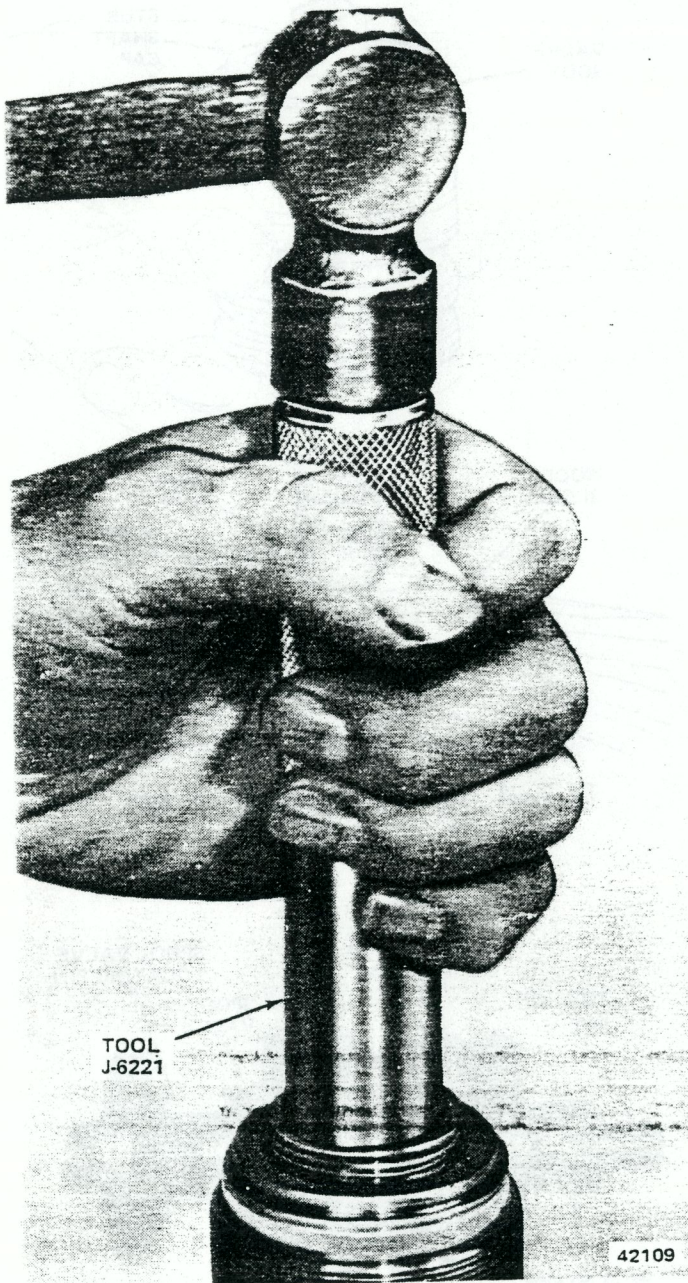


Fig. 2L-25 Adjuster Plug Needle Bearing Removal/Installation

Inspect the adjuster plug bearing and seal surfaces for pitting, nicks, or scoring and inspect the plug threads for damage. Inspect the washers, spacer, and retainer for distortion, and wear. Replace any component that exhibits any of these conditions.

Assembly

(1) Lubricate dust seal and O-ring with petroleum jelly. Lubricate all other components with power steering fluid.

(2) Position needle bearing on Tool J-6221 so bearing manufacturer's identification number is facing tool.

(3) Install bearing in adjuster plug until bearing is flush with bottom surface of stub shaft seal counterbore (fig. 2L-25).

(4) Install stub shaft seal in adjuster plug using Tool J-21554 (fig. 2L-26). Install seal deep enough to provide clearance for dust seal and retaining ring.

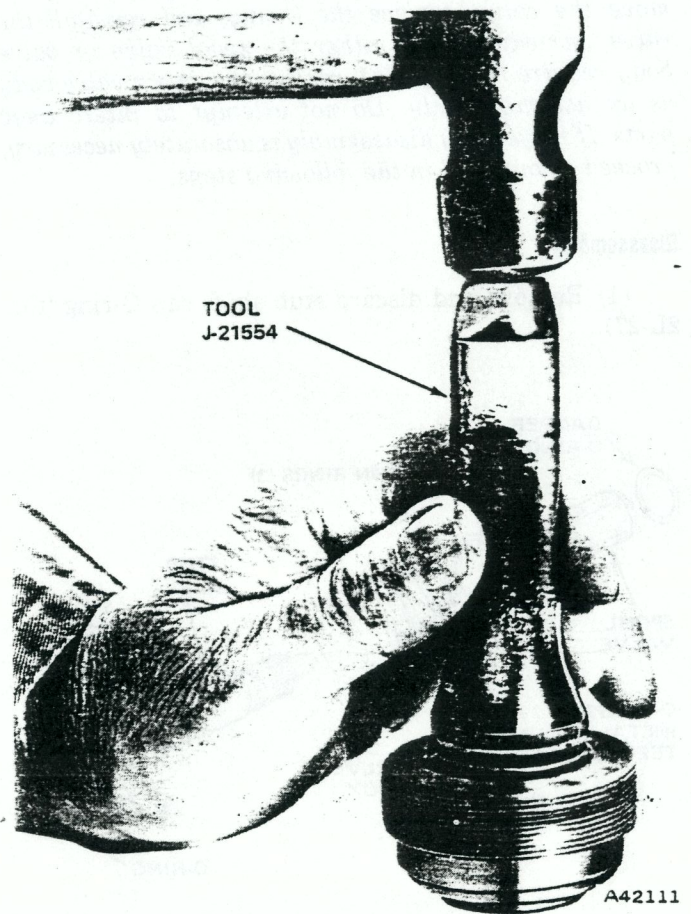


Fig. 2L-26 Stub Shaft Seal Installation

(5) Install dust seal in adjuster plug. Rubber face of seal must face away from plug (outward).

(6) Install retaining ring using Snap Ring Pliers J-4245.

(7) Install O-ring in adjuster plug ring groove.

(8) Install large thrust washer, upper thrust bearing, small thrust washer, and spacer in adjuster plug.

(9) Install retainer. Use brass drift to press retainer into plug.

NOTE: The radial location of the spacer notches are not important. However, do not damage the notches during retainer installation.

Valve Body

CAUTION: The valve body assembly is a precision unit with select fit components that are hydraulically matched and balanced during manufacture. Service repairs to the valve are uncommon with the possible exception of the spool valve damper O-ring. Do not disassemble the valve body unless absolutely necessary as improper disassembly could result in damage. If the spool valve damper O-ring requires replacement, remove the valve, replace the O-ring, and reinstall the valve immediately. If either the spool valve or valve body require replacement, replace the entire valve body as an assembly only. Do not attempt to interchange parts. If valve body disassembly is absolutely necessary, proceed as outlined in the following steps.

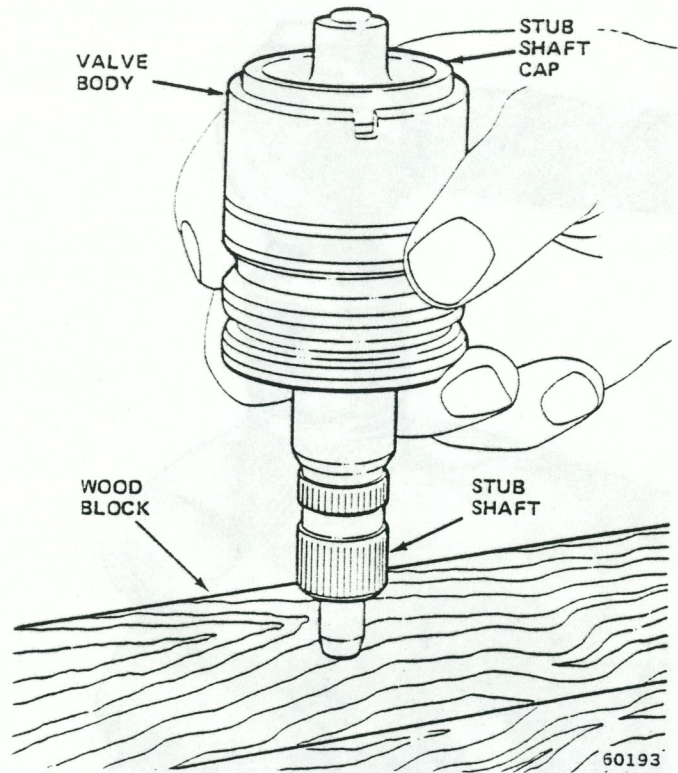


Fig. 2L-28 Separating Stub Shaft and Valve Body

Disassembly

(1) Remove and discard stub shaft cap O-ring (fig. 2L-27).

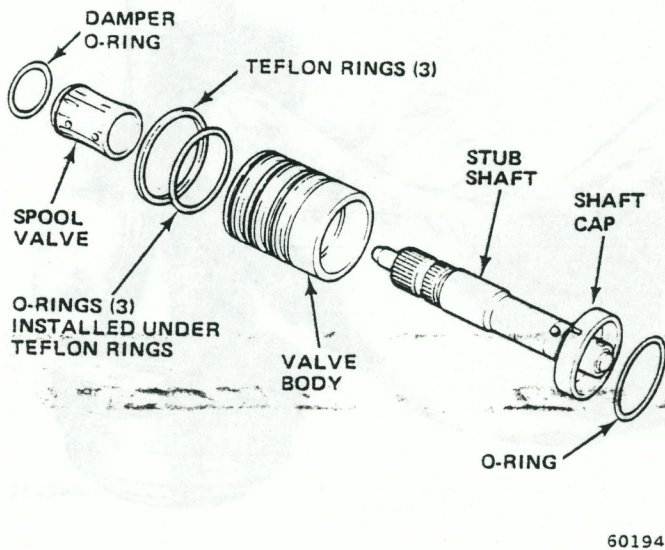


Fig. 2L-27 Valve Body Components

(2) Hold valve body assembly in both hands with stub shaft pointing downward. Tap end of stub shaft lightly against wood block until shaft cap is free of valve body (fig. 2L-28).

(3) Pull stub shaft outward until shaft cap clears valve body by approximately 1/4 inch (6 mm).

CAUTION: Do not pull the stub shaft out of the valve body any farther than 1/4 inch (6 mm) or the spool valve may become cocked in the valve body.

(4) Press spool valve locating pin inward and carefully remove stub shaft from valve body and spool valve (fig. 2L-29).

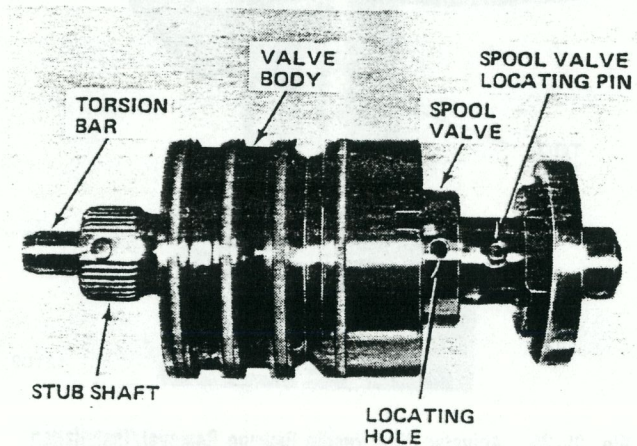


Fig. 2L-29 Valve Body and Spool Valve Disassembly

(5) Remove spool valve from valve body using a push and turn motion. If spool valve becomes cocked, carefully realign valve and try removal again. Do not force spool valve out.

(6) Remove and discard spool valve damper O-ring.

(7) Cut and remove valve body seal rings and backup O-rings (fig. 2L-27). Discard all rings.

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Cleaning and Inspection

Wash the valve body components in clean solvent and blow out all fluid passages using filtered, compressed air.

If the torsion bar is broken or loose, or if the torsion seal leaked prior to disassembly, replace the entire valve body as an assembly.

If the spool valve locating pin is broken or the valve body is cracked, worn, or broken, replace the entire valve body as an assembly.

NOTE: *Tiny flat spots on either side of the spool valve locating pin are normal.*

A slightly polished appearance is normal for all valve body assembly surfaces. However, if there are scores, nicks, or burrs on the valve body and stub shaft surfaces that cannot be cleaned up with crocus cloth, replace the entire valve body as an assembly.

Inspect the valve body-to-wormshaft locating notch in the valve body skirt (fig. 2L-30). Replace the entire valve body as an assembly if this notch is damaged or excessively worn.



Fig. 2L-30 Valve Body

Inspect the spool valve-to-valve body fit. Lubricate the spool valve with power steering fluid and insert it into the valve body. Replace the entire valve body as an assembly if the spool valve is a loose fit, binds or sticks, or does not rotate freely within the valve body.

Assembly

(1) Lubricate all valve body components with power steering fluid.

(2) Install replacement backup O-rings in seal ring grooves.

(3) Install replacement seal rings over backup O-rings (fig. 2L-31). Take care to avoid damaging seal rings during installation.

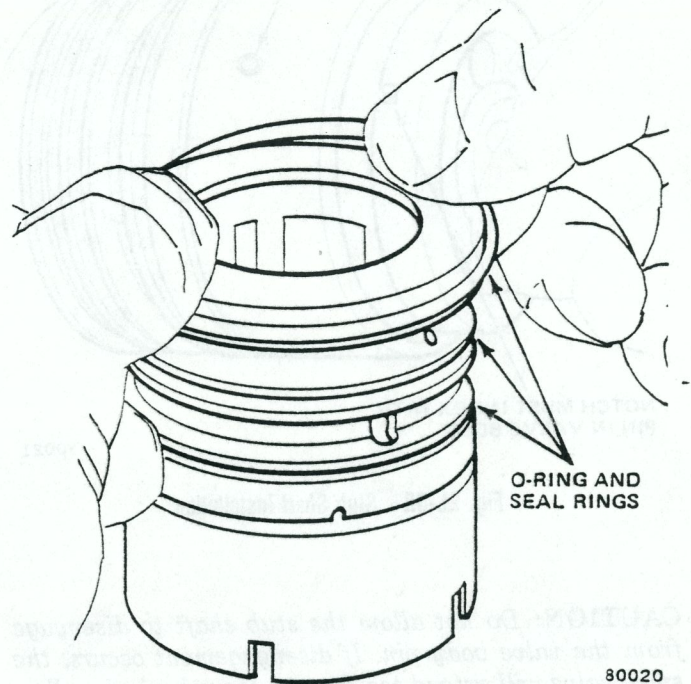


Fig. 2L-31 Valve Body Seal Ring Installation

NOTE: *The teflon seal rings may appear to be distorted after installation. However, the heat generated by power steering fluid during normal operation will straighten them.*

(4) Lubricate replacement spool valve damper O-ring with petroleum jelly and install O-ring on spool valve.

(5) Insert spool valve in valve body. Do not attempt to force spool valve into place.

(6) Push spool valve through valve body until spool valve locating pin hole is visible at opposite end of valve body and spool valve is flush with notched end of valve body.

(7) Install stub shaft in spool valve and valve body. Be sure stub shaft locating pin is aligned with spool valve locating hole (fig. 2L-29).

(8) Align notch in stub shaft cap with stub shaft locating pin in valve body and press stub shaft and spool valve into valve body (fig. 2L-32).

CAUTION: *Before installing the assembled valve body in the gear housing, be sure the valve body stub shaft locating pin is fully engaged in the stub shaft cap notch.*

(9) Lubricate stub shaft cap O-ring with power steering fluid and install O-ring in valve body.

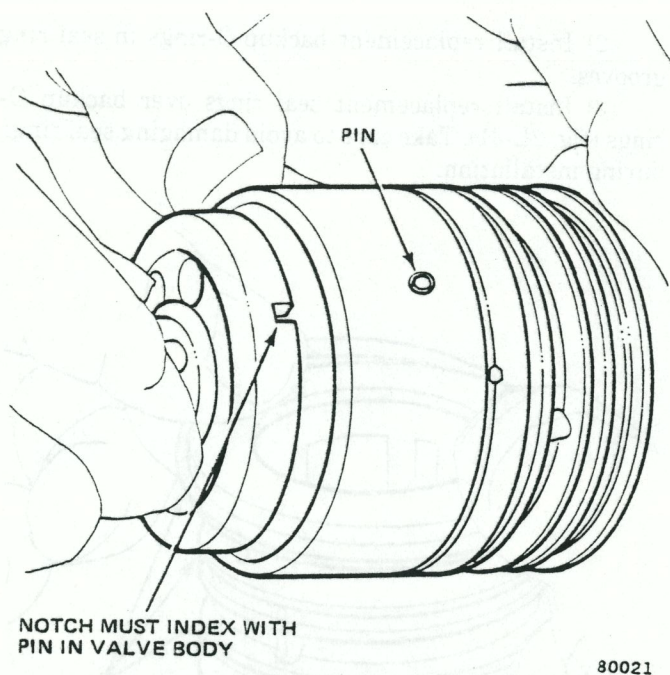


Fig. 2L-32 Stub Shaft Installation

CAUTION: Do not allow the stub shaft to disengage from the valve body pin. If disengagement occurs, the spool valve will extend too far into the valve body, allow the damper O-ring to expand into the valve body grooves and prevent valve withdrawal. If disengagement occurs, attempt to remove the valve using a pull and turn motion. If this fails, proceed as follows: First be sure the spool valve is free to rotate, then place the valve body on a flat surface with the notched end of the valve body facing upward. Tap the spool valve with a wood or plastic rod until the damper O-ring is cut and remove the valve. Replace the damper O-ring and reassemble the valve body. Be sure all pieces of the cut O-ring are removed before assembly.

Pitman Shaft and Side Cover

Cleaning and Inspection

Clean the shaft and cover with solvent and wipe them dry with lint free cloths.

Inspect the side cover bearing and mating surfaces for wear, distortion, scoring, or distortion. Replace the cover if it exhibits any of these conditions.

Inspect the pitman shaft bearing and seal surfaces and sector teeth for cracks, wear, pitting, or scoring (fig. 2L-33). Inspect the adjuster screw for looseness, damaged threads, or distortion. Replace the pitman shaft if any of these conditions are noted. However, light scoring, corrosion, or scratches on the shaft surfaces may be removed using erocus cloth.

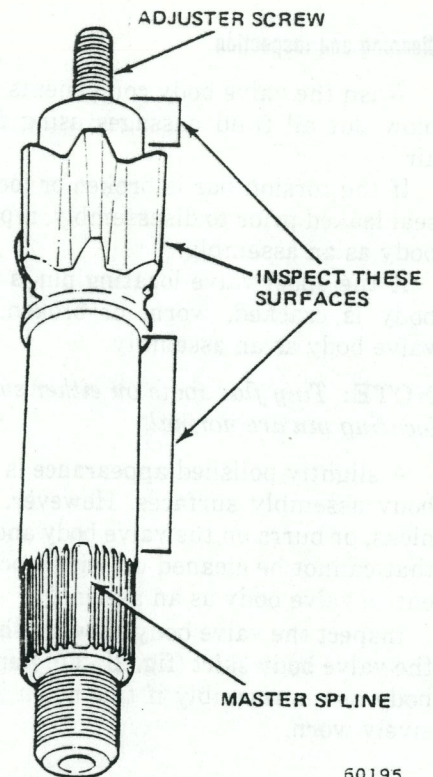


Fig. 2L-33 Pitman Shaft Inspection

Inspect the pitman shaft nut threads and master spline for damage (fig. 2L-33). If either of these surfaces are damaged, replace the shaft.

Rack Piston and Wormshaft

Disassembly

- (1) Remove wormshaft, lower thrust bearing, and bearing races from rack piston.
- (2) Cut and remove seal ring and backup O-ring from rack piston. Discard seal ring and O-ring.
- (3) Remove ball return guide clamp attaching screws and remove return guide clamp.
- (4) Place rack piston on clean cloth and remove two-piece ball return guide, arbor tool, and ball bearings.

Cleaning and Inspection

Clean all components with solvent and dry them using filtered compressed air.

Inspect the wormshaft for wear, scoring, pitting, distortion, nicked threads, or cracks. Replace the wormshaft if it exhibits any of these conditions. Inspect the rack piston for scored, pitted, or nicked ball bearing grooves. Replace the wormshaft and rack piston as an assembly if either part is damaged.

Inspect the exterior surface of the rack piston for wear or scoring and be sure the seal ring seat is clean and free from burrs.

Inspect the rack piston teeth for chips, cracks, dents, or scoring. If either the wormshaft or rack piston are damaged, replace both parts as a matched set only.

Inspect each of the ball bearings for dents, nicks, excessive wear, flaking, or flat spots and replace as necessary. Inspect the ball return guides. Be sure the guide ends, where the bearings enter and leave the guides, are free of burrs or distortion.

Inspect the lower thrust bearing and bearing races for wear or scoring. Replace any parts that are damaged or worn.

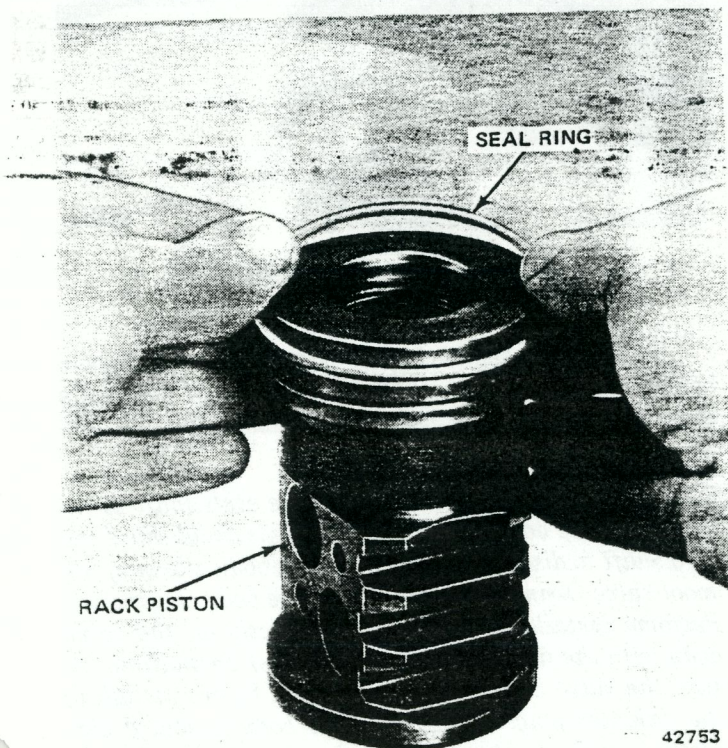
Assembly

(1) Lubricate all components with power steering fluid.

(2) Install backup O-ring in rack piston seal ring groove.

(3) Install seal ring over backup O-ring (fig. 2L-34).

NOTE: The seal ring may appear slightly loose after installation, however, this is normal. The seal ring will tighten when exposed to system fluid at operating temperature.

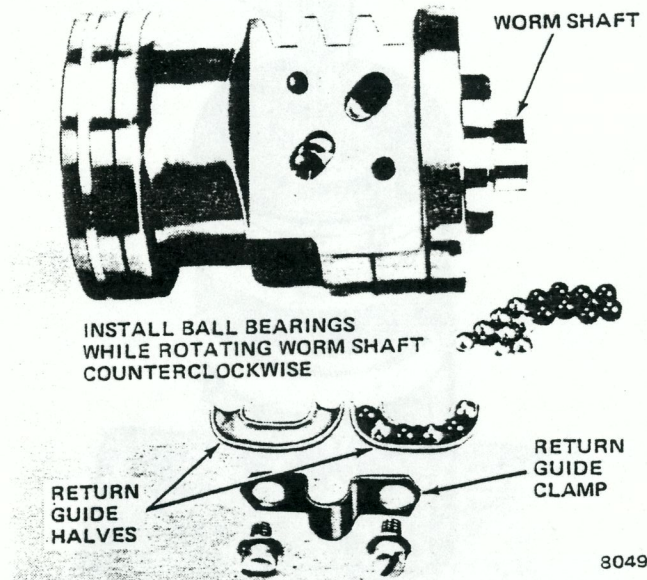


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Fig. 2L-34 Rack Piston Seal Ring Installation

(4) Install wormshaft in rack piston.
 (5) Align ball return guide holes with wormshaft grooves.

(6) Alternately install 18 ball bearings in rack piston bearing circuit hole adjacent to seal ring (fig. 2L-35). Install silver ball bearing followed by black ball bearing until 18 bearings have been installed. Rotate wormshaft slowly in counterclockwise direction when installing bearings and press each bearing downward to make room for following bearing.



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Fig. 2L-35 Rack Piston Ball Bearing Installation

NOTE: The wormshaft will back out of the rack piston when rotated during bearing installation. Do not allow the wormshaft to back completely out of the rack piston.

(7) Fill one ball return guide half with petroleum jelly and install six remaining ball bearings in guide (fig. 2L-35). Be sure bearings in guide are in sequence with bearings in rack piston and that total of 24 ball bearings are installed (18 in rack piston and 6 in return guide).

(8) Assemble both ball return guide halves and insert guides in rack piston. Guides should fit loosely.

(9) Position ball return guide clamp over guides and install clamp attaching bolts and washers. Tighten bolts to 10 foot-pounds (14 N•m) torque.

(10) Insert Arbor Tool J-21552 into rack piston until it contacts wormshaft.

(11) Apply steady pressure against arbor tool to maintain contact with wormshaft and back wormshaft out of rack piston.

NOTE: Do not allow the arbor tool and wormshaft to separate during wormshaft removal. The ball bearings could drop out of their circuits and fall inside the rack piston making another disassembly/assembly procedure necessary.

(12) Position assembled rack piston and arbor tool on end and support assembly on wood blocks until ready to install in housing (fig. 2L-36).

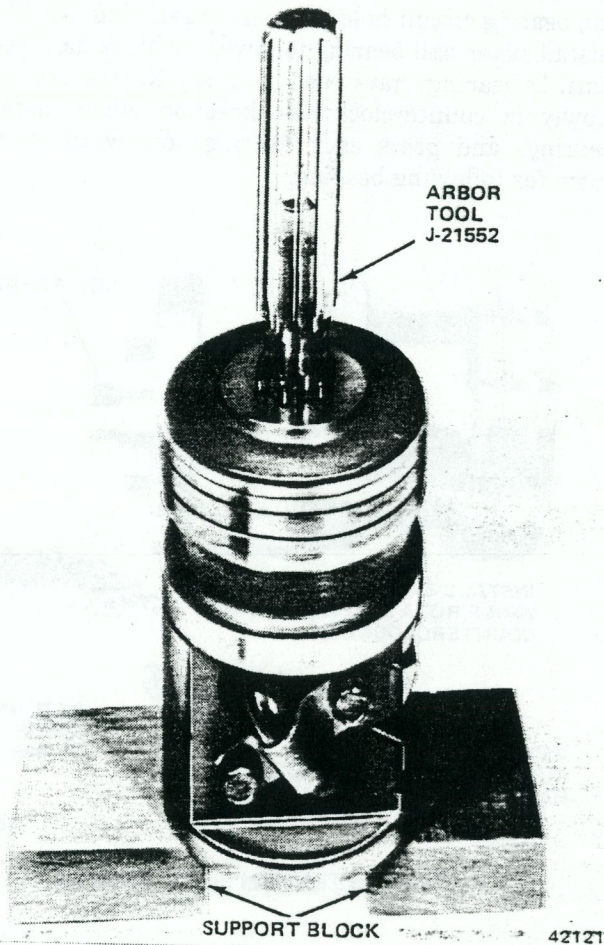


Fig. 2L-36 Arbor Tool Installed in Rack Piston

NOTE: Do not allow the arbor tool to separate from the rack piston.

STEERING GEAR ASSEMBLY AND ADJUSTMENT

- (1) Lubricate all components with power steering fluid.
- (2) Remount steering gear in vise (fig. 2L-12). Clamp unmachined boss portion of housing in vise only.
- (3) Install wormshaft lower thrust bearing and bearing races on wormshaft. Installation sequence is: race—bearing—race (fig. 2L-37). Coned sides of races must face rack piston when installed.
- (4) Install stub shaft cap O-ring in valve body (if not installed previously). Be sure O-ring is seated against edge of stub shaft cap.
- (5) Insert wormshaft into valve body. Rotate wormshaft until drive lugs engage in stub shaft cap and wormshaft locating pin engages in valve body notch (fig. 2L-38).

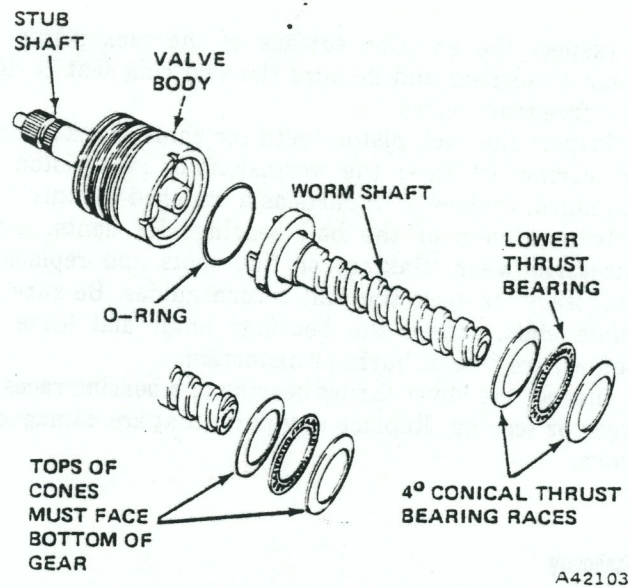


Fig. 2L-37 Wormshaft and Valve Body Assembly

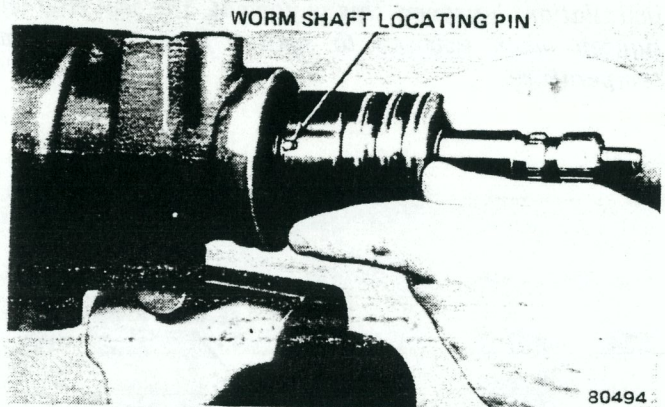
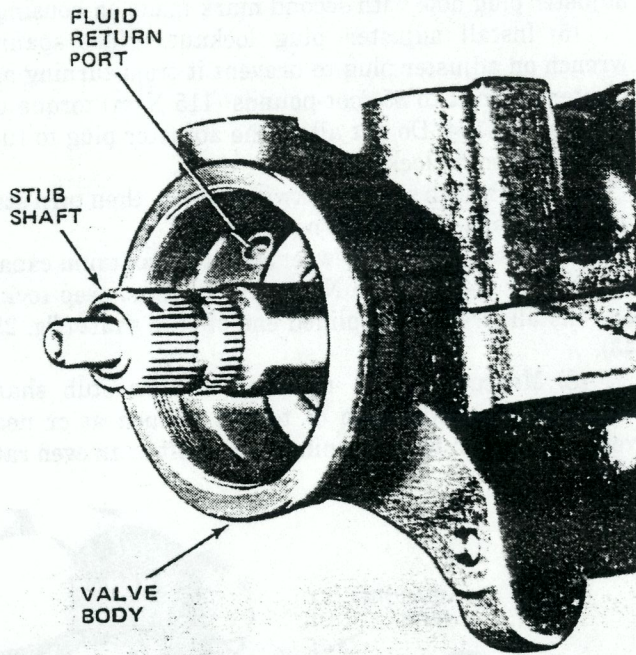


Fig. 2L-38 Valve Body-Wormshaft Installation

(6) Install assembled valve body and wormshaft in housing. Be sure wormshaft locating pin is still fully engaged in valve body notch before installing (fig. 2L-38).

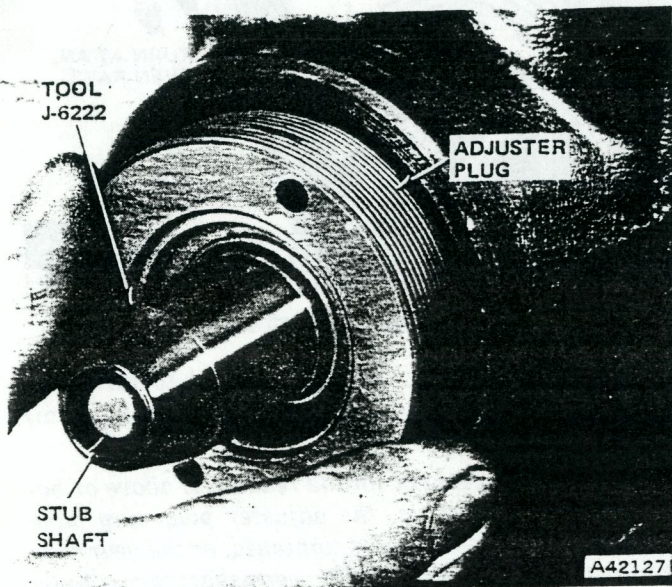
CAUTION: Do not press against the stub shaft to install the valve body and wormshaft. This could cause the stub shaft to disengage from the valve body allowing the spool valve O-ring to slip into the valve body oil grooves. Perform installation by pressing directly on the valve body with the fingertips only (fig. 2L-38). In addition, be sure the valve body is properly seated before installing the adjuster plug. When the valve body is seated correctly, the fluid return port in the gear housing will be fully visible (fig. 2L-39). If the port is not visible, the valve body and wormshaft are misaligned or the thrust bearing and races are improperly installed.



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Fig. 2L-39 Seating Valve Body

(7) Place Seal Protector Tool J-6222 over end of stub shaft and install adjuster plug in housing (fig. 2L-40). Tighten adjuster plug to 20 foot-pounds (27 N•m) torque.



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Fig. 2L-40 Adjuster Plug Installation

(8) Remove seal protector tool from stub shaft.
 (9) Install rack piston in housing. Be sure wormshaft remains engaged with stub shaft. Do not damage rack piston seal ring during installation.

(10) Align wormshaft with rack piston and turn stub shaft clockwise to engage wormshaft in rack piston. Maintain steady pressure on arbor tool until wormshaft is fully engaged in rack piston.

(11) Remove arbor tool when rack piston seal ring is inside housing.

(12) Rotate stub shaft until center tooth groove in rack piston is aligned with center of pitman shaft bore.

(13) Install side cover gasket on side cover. Be sure gasket rubber seal is seated in cover groove.

(14) Install side cover on pitman shaft.

(15) Thread side cover onto pitman shaft adjuster screw until cover bottoms against shaft.

(16) Install pitman shaft in housing and mesh center sector tooth of shaft with center tooth groove in rack piston.

(17) Align side cover on housing and install cover attaching bolts. Tighten bolts to 45 foot-pounds (61 N•m) torque. Be sure cover gasket is properly seated before installing cover bolts.

(18) Thread adjuster screw locknut half-way onto pitman shaft adjuster screw. Use hex wrench to prevent adjuster screw from turning while installing locknut.

NOTE: The locknut has left-hand threads.

(19) Install end plug in rack piston and tighten plug to 75 foot-pounds (102 N•m) torque.

(20) Lubricate housing end plug O-ring with petroleum jelly.

(21) Install housing end plug and seat plug against O-ring. If necessary, tap end plug lightly with plastic mallet to seat it. Do not displace O-ring during installation.

(22) Install housing end plug retainer ring. Position ring end gap one inch (25.4 mm) away from hole in side of housing. Tap end plug lightly to be sure plug and retainer ring are seated.

(23) Adjust wormshaft bearing preload and pitman shaft overcenter drag torque as outlined in Steering Gear Adjustment.

Steering Gear Adjustment

The steering gear requires two adjustments which are: wormshaft bearing preload and pitman shaft overcenter drag torque.

Wormshaft bearing preload is controlled by the amount of compression force exerted on the conical wormshaft thrust bearing races by the adjuster plug.

Pitman shaft overcenter drag torque is controlled by the pitman shaft adjuster screw which determines the clearance between the rack piston and pitman shaft sector teeth.

CAUTION: The following adjustment procedures must be performed exactly as described and in the sequence outlined. Failure to do so can result in damage to

the gear internal components and poor steering response. Always adjust wormshaft bearing preload first; then adjust pitman shaft overcenter drag torque last.

Wormshaft Bearing Preload

- (1) Seat adjuster plug in housing using Spanner Wrench J-7624 (fig. 2L-16). Approximately 20 foot-pounds (27 N•m) torque is required to seat plug.
- (2) Place index mark on gear housing in line with one of the holes in adjuster plug (fig. 2L-41).
- (3) Measure back (counterclockwise) 1/2 inch (13 mm) from first index mark and remark housing (fig. 2L-42).

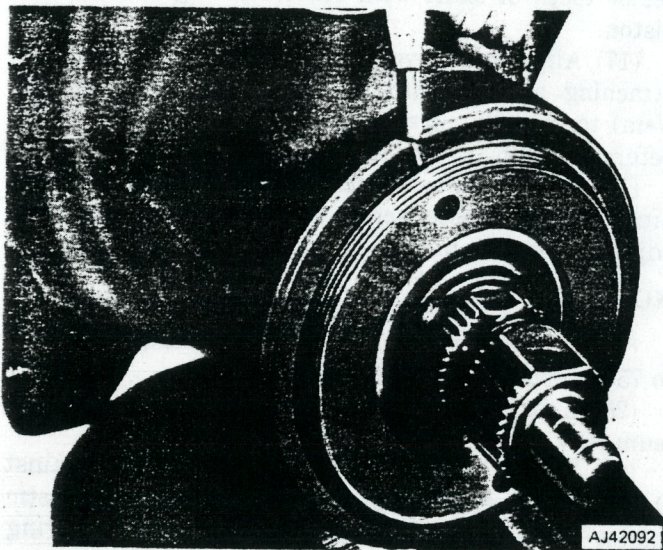


Fig. 2L-41 Marking Housing



Fig. 2L-42 Remarking Housing

- (4) Turn adjuster plug counterclockwise and align adjuster plug hole with second mark made on housing.
- (5) Install adjuster plug locknut. Place spanner wrench on adjuster plug to prevent it from turning and tighten locknut to 85 foot-pounds (115 N•m) torque using tool J-25194. Do not allow the adjuster plug to turn while tightening locknut.
- (6) Turn stub shaft clockwise to stop, then turn stub shaft back one-quarter turn.
- (7) Assemble torque wrench with maximum capacity of 50 inch-pounds (6 N•m) and 12-point deep socket and install wrench on splined end of stub shaft (fig. 2L-43).
- (8) Measure torque required to turn stub shaft. Take reading with beam of torque wrench at or near vertical position while turning stub shaft at an even rate (fig. 2L-43).

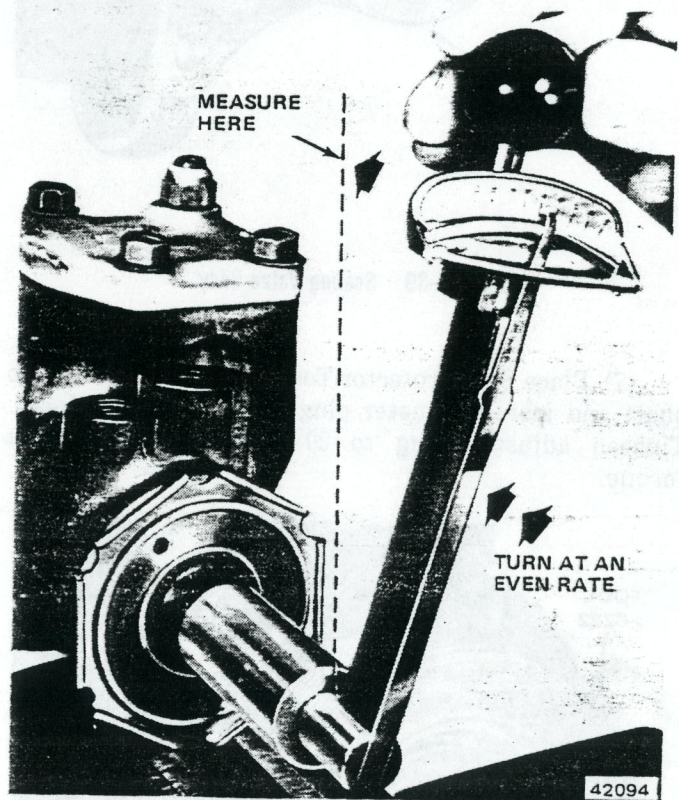


Fig. 2L-43 Measuring Wormshaft Bearing Preload

- (9) Record reading. Torque required to turn stub shaft should be 4 to 10 inch-pounds (0.45 to 1.1 N•m) torque.

NOTE: If the measured torque reading is above or below the specified limits, the adjuster plug may have turned when the locknut was tightened, or the gear may be incorrectly assembled, or the wormshaft thrust bearings and races may be defective. Repair as required and remeasure preload.

Pitman Shaft Overcenter Drag Torque

- (1) Loosen adjuster screw locknut. Turn pitman shaft adjuster screw counterclockwise until screw is

fully extended; then turn screw back one full turn in clockwise direction.

(2) Rotate stub shaft from stop-to-stop and count total number of turns.

(3) Starting from either stop, turn stub shaft back 1/2 total number of turns. This is gear center.

NOTE: When the gear is centered, the flat on the stub shaft should face upward and be parallel with the side cover (fig. 2L-44). In addition, the master spline on the pitman shaft should be in line with the adjuster screw (fig. 2L-45).

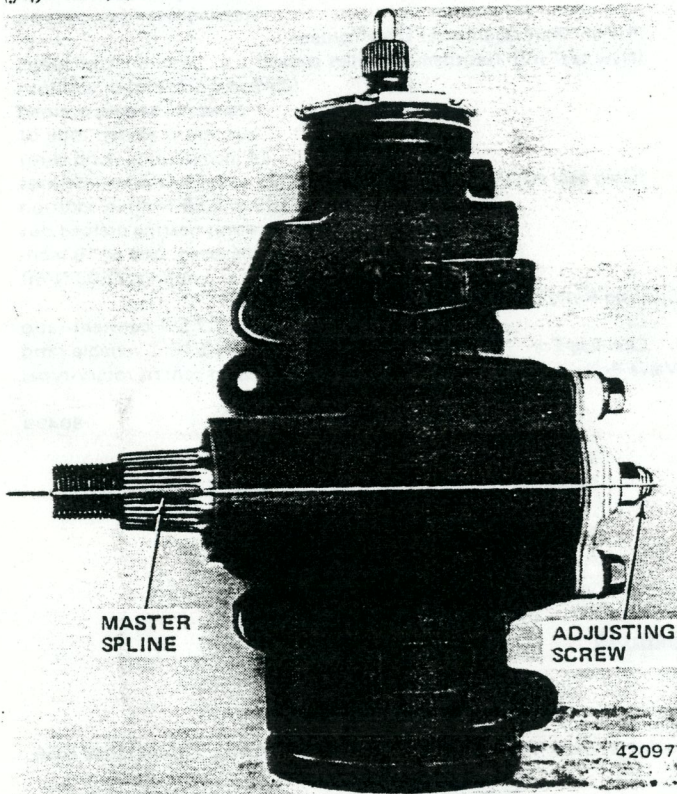


Fig. 2L-44 Stub Shaft Position with Gear Centered

(4) Install 50 inch-pound (6 N•m) torque wrench and deep socket on stub shaft and place wrench in vertical position to take reading (fig. 2L-46).

(5) Rotate torque wrench 45 degrees each side of center and record highest drag torque measured on or near center (fig. 2L-46). Record drag torque reading.

(6) Adjust drag torque by turning pitman shaft adjuster screw clockwise until desired drag torque is obtained. Adjust drag torque to following limits:

On new gears, add 4 to 8 inch-pounds (0.45 to 0.90 N•m) torque to previously measured wormshaft bearing preload but do not exceed a combined total of 14 inch-pounds (2 N•m) drag torque.

On used gears (400 or more miles), add 4 to 5 inch-pounds (0.5 to 0.6 N•m) torque to previously measured wormshaft bearing preload but do not exceed a combined total of 14 inch-pounds (2 N•m) drag torque.

(7) Tighten pitman shaft adjuster screw locknut after adjusting overcenter drag torque. Tighten locknut to

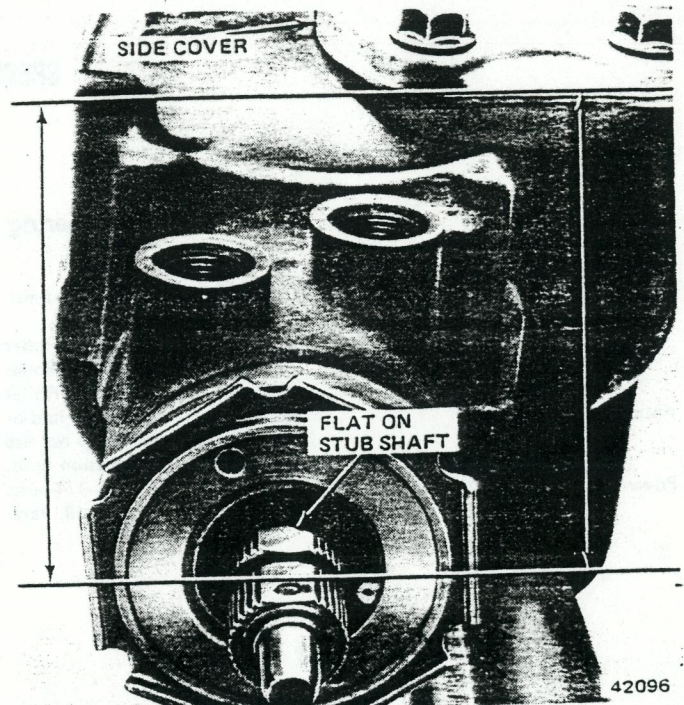


Fig. 2L-45 Pitman Shaft Master Spline Position with Gear Centered

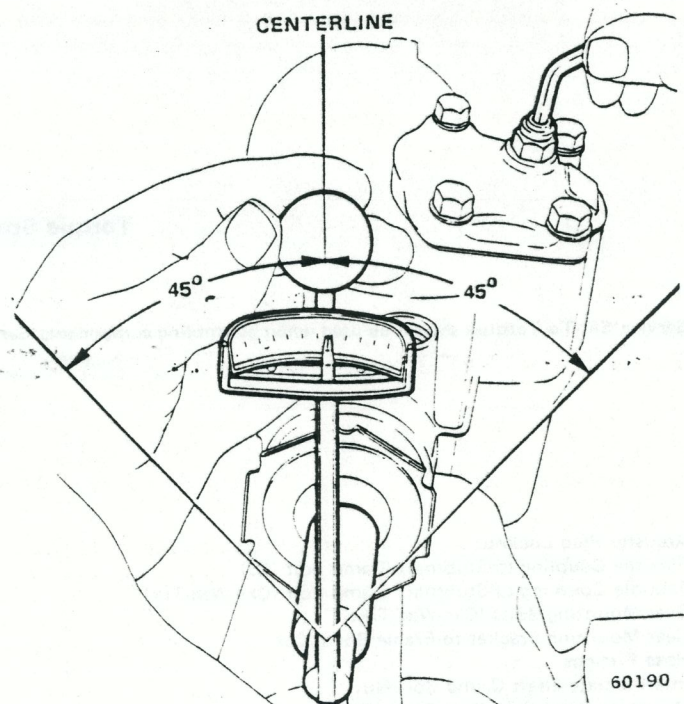


Fig. 2L-46 Measuring Pitman Shaft Overcenter Drag Torque

20 foot-pounds (27 N•m) torque. Use hex wrench to prevent adjuster from turning while tightening adjuster screw (fig. 2L-14).

(8) Install steering gear and fill power steering pump reservoir with Jeep Power Steering Fluid, or equivalent.

(9) Bleed air from power steering system. Refer to Fluid Level and Initial Operation in Power Steering Pump section.

SPECIFICATIONS

Power Steering Gear Specifications

Type	Recirculating Ball, worm and nut.	Steering Gear Adjustment:	
Bearings		Worm Bearing Preload	4 to 10 inch-pounds (0.45 to 1.13 N·m) rotating torque. Refer to Steering Gear Adjustment.
Wormshaft Upper	Needle Roller	Pitman Shaft Overcenter Drag Torque	
Lower	Needle Roller	(New gear with less than 400 miles service)4 to 8 inch-pounds (0.45 to 0.90 N·m) in addition to worm bearing preload but not to exceed total of 14 inch-pounds (1.58 N·m)
Pitman Shaft	Needle Roller	(Used gear with over 400 miles service)4 to 5 inch-pounds (0.45 to 0.56 N·m) in addition to worm bearing preload but not to exceed total of 18 inch- pounds (2.03 N·m)
Fluids	Use Jeep Power Steering Fluid or equivalent only. Do not use transmission fluid.	Steering Ratio	
Power Steering System Fluid Capacity	1-1/4 pints (0.59 liters)	CJ	17.5:1 constant ratio
		Cke-Wag-Trk	13/16:1 variable ratio
		Valve Body	Three-way, open center, rotary-type.

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Torque Specifications

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	USA (ft-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Adjuster Plug Locknut	85	75-95	115	102-129
Flexible Coupling-to-Stubshaft Clamp Bolt (CJ)	45	40-50	61	54-68
Flexible Coupling-to-Stubshaft Clamp Bolt (Cke-Wag-Trk)	30	25-35	41	34-47
Gear Mounting Bolts (Cke-Wag-Trk)	70	60-80	95	81-108
Gear Mounting Bracket-to-Frame Bolts (CJ)	55	50-65	75	68-88
Hose Fittings	30	25-35	41	34-47
Intermediate Shaft Clamp Bolt/Nut	30	25-35	31	34-47
Mounting Bracket-to-Gear Bolts (CJ)	70	60-80	95	81-108
Pitman Arm Nut	185	170-210	251	230-285
Pitman Shaft Adjuster Screw Locknut	20	18-22	27	24-30
Return Guide Clamp Bolt	6	4-10	8	5-14
Rack-Piston End Plug	75	72-77	102	98-104
Side Cover Bolts	40	30-45	54	41-61

All torque values given in foot-pounds and newton-meters with dry fits unless otherwise specified.

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POWER STEERING PUMP

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In-Vehicle Service	2L-37	Pump Removal	2L-40
Pump Assembly	2L-41	Specifications	2L-44
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IN-VEHICLE SERVICE

Pump Shaft Seal and Pump Pulley

Removal

- (1) Loosen pump belt adjusting bolts, push pump toward engine, and remove pump belt.
- (2) Remove pump pulley using tool J-25034 (fig. 2L-47).

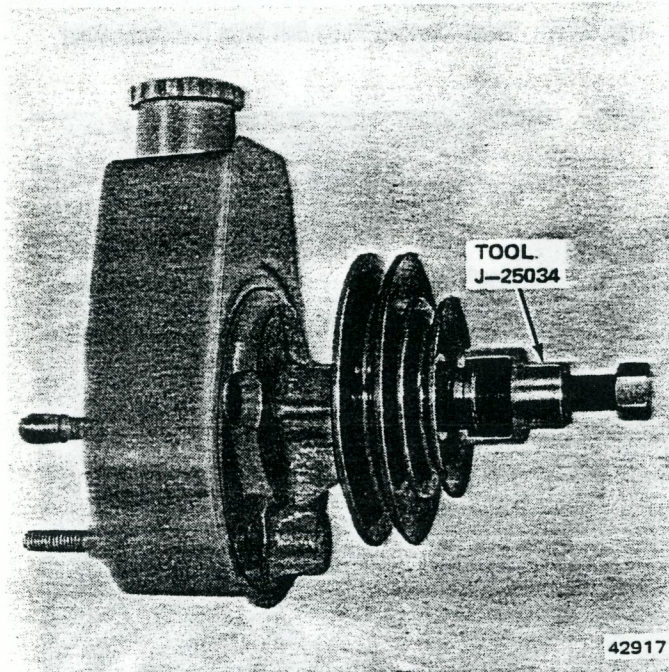


Fig. 2L-47 Pump Pulley Removal

- (3) Remove shaft seal using tool J-8842. Or, if seal remover tool is not available, remove seal as follows:

(a) Wrap length of 0.005-inch (0.12 mm) thick shimstock, approximately 2-1/2 inches (6.35 cm) long, around pump shaft. Work shimstock under and past shaft seal until shimstock bottoms in seal bore (fig. 2L-48).

(b) Cut metal body of shaft seal using sharp chisel and pry seal out of pump body using screwdriver (fig. 2L-48). Do not scratch or nick pump shaft or seal bore during seal removal.

(4) Remove any small nicks, scratches, or corrosion from pump shaft with crocus cloth.

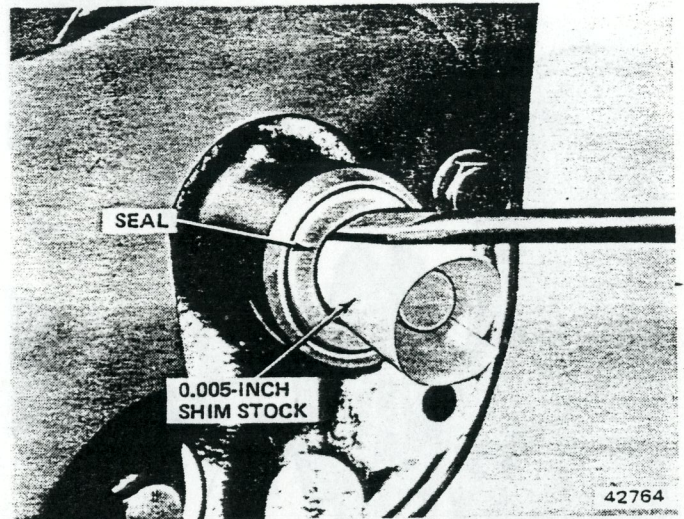


Fig. 2L-48 Pump Shaft Seal Removal

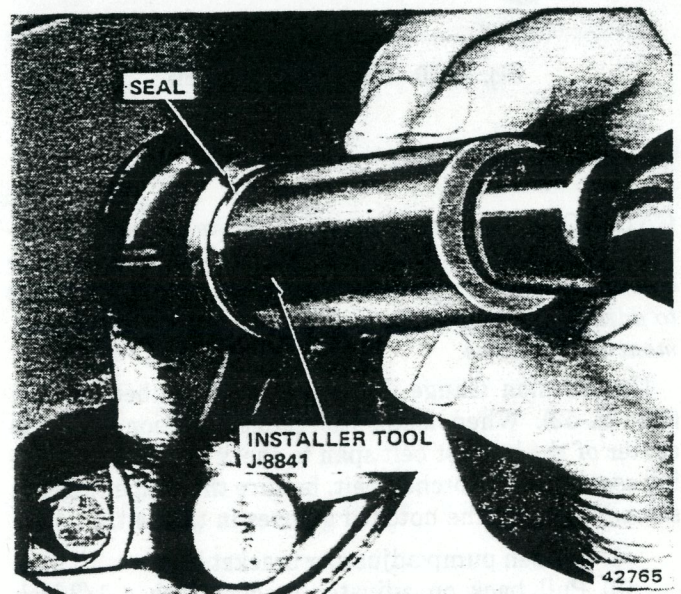


Fig. 2L-49 Pump Shaft Seal Installation

Installation

- (1) Lubricate pump shaft and replacement seal with power steering fluid.
- (2) Install seal on pump shaft and insert seal into pump body seal bore. Be sure spring side of seal faces toward pump body.
- (3) Seat seal using tool J-7728 (fig. 2L-49).

(4) Install pump pulley using Tool J-25033 (fig. 2L-50).

(5) Install pump belt and adjust belt tension. Refer to Belt Tension Adjustment.

(6) Fill pump reservoir with power steering fluid and bleed air from system. Refer to Fluid Level and Initial Operation.

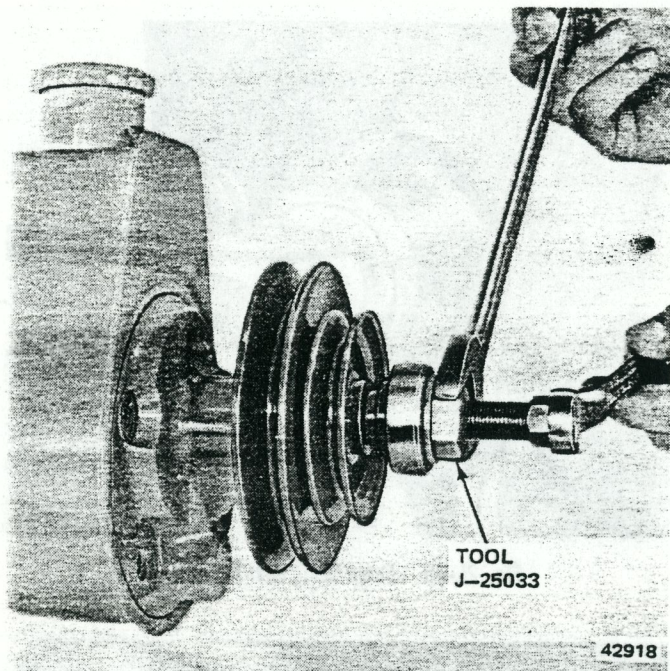


Fig. 2L-50 Pump Pulley Installation

Belt Tension Adjustment

CAUTION: The power steering pump on all automobiles built for sale in California is driven by a Serpentine drive belt. The pump should not be moved in an attempt to adjust the belt. Refer to Chapter 1C for belt adjustment instructions.

Use Tension Gauge J-23600 to measure belt tension (fig. 2L-52). When using the gauge, position it at the center of the longest belt span to check tension. If checking tension on a notched belt, be sure the gauge finger is seated in one of the notched grooves in the belt.

- (1) Loosen pump adjusting bracket bolts.
- (2) Pull back on adjuster bracket with a 1/2-inch drive breaker bar until belt is tight. Tighten adjusting bracket bolts.
- (3) Measure belt tension with Gauge J-23600 (fig. 2L-52).
- (4) Tighten or loosen pump belt until desired belt tension is obtained. Refer to Specifications for belt tension figures for various models.

(5) Tighten all pump mounting and adjusting bracket bolts to 30 foot-pounds (41 N•m) torque after adjusting belt tension.

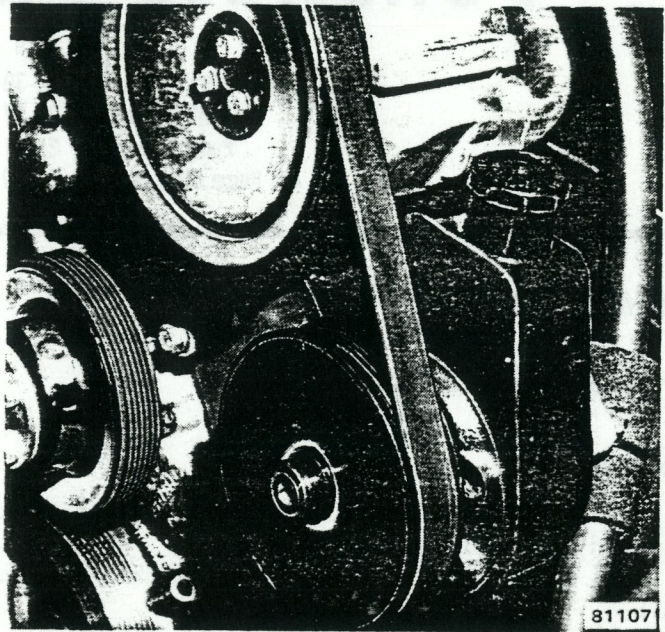


Fig. 2L-51 Power Steering Pump Belt Drive (California Only)



Fig. 2L-52 Checking Belt Tension

Flow Control Valve

Removal

- (1) Position drain pan under engine.
- (2) Disconnect pressure hose at pump. Cap hose to prevent dirt entry and excessive fluid loss.

NOTE: Some power steering pump units may have a metric thread pressure port fitting. This fitting is designed for use with a pressure hose that uses an O-ring seal (fig. 2L-7, View B).

(3) Remove pump union fitting and O-ring (fig. 2L-53). Discard O-ring.

(4) Remove flow control valve and spring using pencil-type magnet.

Installation

(1) Lubricate replacement flow control valve and union fitting O-ring with power steering fluid.

(2) Insert hex-end of flow control valve in replacement valve spring.

(3) Install assembled valve and spring in pump bore, spring-end first.

(4) Install replacement O-ring seal on pump union fitting and install fitting in pump. Tighten fitting to 35 foot-pounds (47 N•m) torque.

(5) If pump pressure hose has metric fitting that uses an O-ring seal, check seal condition before connecting hose to pump. Replace seal if damaged or worn.

(6) Connect pressure hose to pump. Tighten hose fitting to 35 foot-pounds (47 N•m) torque.

(7) Fill pump reservoir with power steering fluid.

(8) Start engine and check for leaks. Repair any leaks as necessary.

(9) Bleed air from power steering system. Refer to Fluid Level and Initial Operation.

(10) Remove drain pan.

FLUID LEVEL AND INITIAL OPERATION

The power steering system must be purged of air whenever service procedures involving pump or gear disassembly or hose removal have been performed. Air must be removed from the system in order to obtain normal steering action and response. When necessary, bleed the power steering system as follows:

(1) Fill pump reservoir with power steering fluid.

(2) Operate engine until fluid reaches normal operating temperature of 170°F (76°C).

(3) Stop engine.

(4) Check and correct pump reservoir fluid level as necessary.

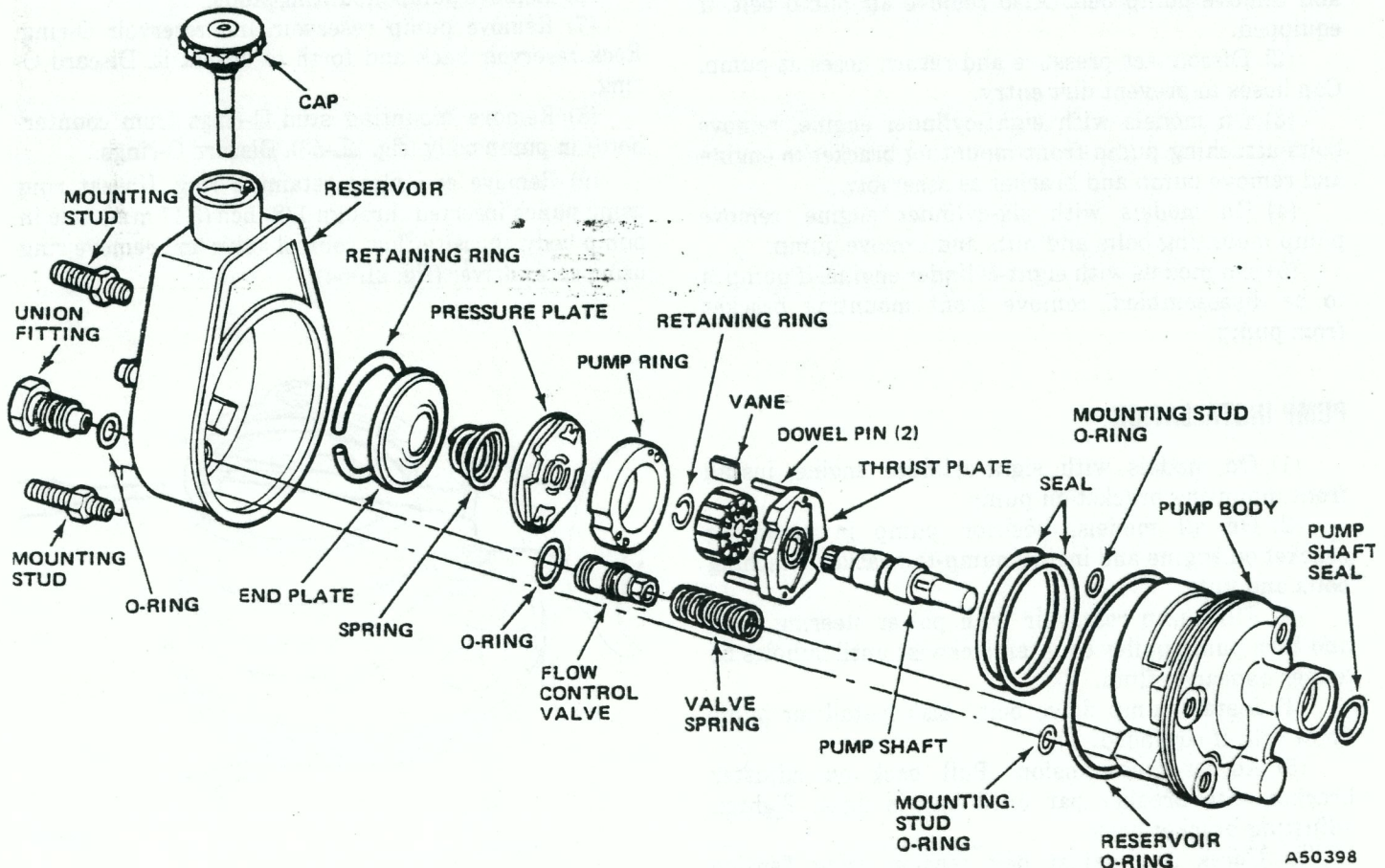


Fig. 2L-53 Power Steering Pump

(5) Turn wheels to full left turn position and add fluid to reservoir until at FULL COLD mark on dipstick.

(6) Start and operate engine at fast idle speed.

(7) Recheck reservoir fluid level and add fluid until at COLD mark on dipstick.

(8) Bleed air from system by turning wheels from side to side without contacting steering stops in either direction. Maintain fluid level just above pump body. Fluid with air in it will be full of bubbles and have light tan or tan-orange coloration.

(9) Continue turning wheels side to side until all air has been bled from system. Air must be eliminated before normal steering action can be obtained.

(10) When air has been purged from system, return wheels to straight-ahead position and operate engine for additional 2-3 minutes then stop engine.

(11) Road test vehicle to check steering action and response.

(12) Recheck fluid level. Level should be at HOT mark on dipstick after system has stabilized at normal operating temperature. Add fluid if necessary but do not overfill.

PUMP REMOVAL

(1) Loosen pump adjusting bracket bolts and nuts and remove pump belt. Also remove air pump belt, if equipped.

(2) Disconnect pressure and return hoses at pump. Cap hoses to prevent dirt entry.

(3) On models with eight-cylinder engine, remove bolts attaching pump front mounting bracket to engine and remove pump and bracket as assembly.

(4) On models with six-cylinder engine, remove pump mounting bolts and nuts and remove pump.

(5) On models with eight-cylinder engine, if pump is to be disassembled, remove front mounting bracket from pump.

PUMP INSTALLATION

(1) On models with eight-cylinder engine, install front mounting bracket on pump.

(2) On all models, position pump in mounting bracket on engine and install pump-to-bracket attaching bolts and nuts.

(3) Fill pump reservoir with power steering fluid and turn pump pulley counterclockwise until bubbles no longer appear in fluid.

(4) Install pump drive belt. Also install air pump drive belt, if equipped.

(5) Adjust belt tension. Pull back on adjuster bracket with breaker bar until belt is tight. Tighten adjusting bracket bolts.

(6) Check and adjust belt tension using Tension Gauge J-23600 (fig. 2L-52). Refer to Belt Tension Adjustment.

(7) Tighten all pump mounting bolts to 30 foot-pounds (41 N•m) torque.

(8) Fill pump reservoir and bleed air from power steering system. Refer to Fluid Level and Initial Operation.

PUMP DISASSEMBLY

(1) Remove reservoir filler cap and drain fluid from pump.

(2) Reinstall filler cap and clean pump with solvent to remove exterior dirt.

(3) Remove pump pulley using tool J-25034 (fig. 2L-47).

CAUTION: *Inspect the exposed surface of the pump shaft. Remove all traces of corrosion or nicks and scratches with crocus cloth before disassembling the pump. This will avoid damaging the pump bushing during disassembly—which might necessitate replacement of the entire pump body.*

(4) Mount pump in vise so pump shaft is pointing downward. Do not overtighten vise as pump body could be distorted.

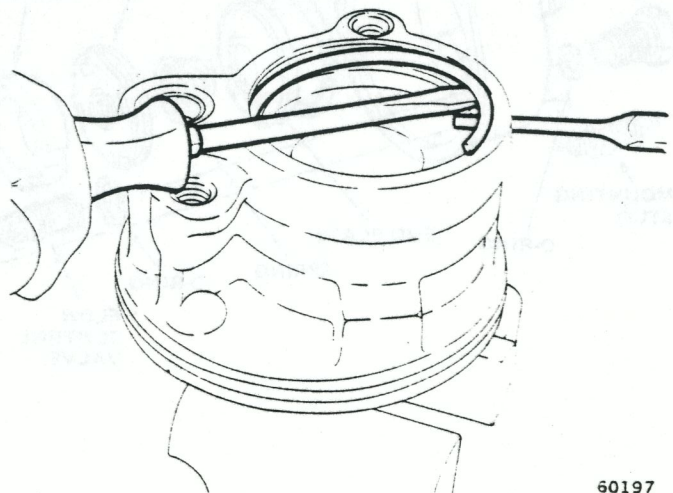
(5) Remove pump union fitting and O-ring (fig. 2L-53). Discard O-ring.

(6) Remove pump mounting studs.

(7) Remove pump reservoir and reservoir O-ring. Rock reservoir back and forth to unseat it. Discard O-ring.

(8) Remove mounting stud O-rings from counterbores in pump body (fig. 2L-53). Discard O-rings.

(9) Remove end plate retaining ring. Unseat ring using punch inserted through 1/8-inch (3.17 mm) hole in pump body opposite flow control valve and remove ring using screwdriver (fig. 2L-54).



60197

Fig. 2L-54 End Plate Retaining Ring Removal

(10) Remove end plate and spring (fig. 2L-53). If plate sticks in pump body, tap plate lightly with plastic mallet to free it.

(11) Remove flow control valve and valve spring from pump using pencil-type magnet. Or, remove pump from vise, invert pump, and allow valve and spring to slide out of pump bore.

(12) Remove pump shaft, thrust plate, rotor and vanes, pump ring, and pressure plate as assembly. Remount pump in vise so shaft bore faces downward and tap end of pump shaft with plastic mallet to remove assembly (fig. 2L-55).

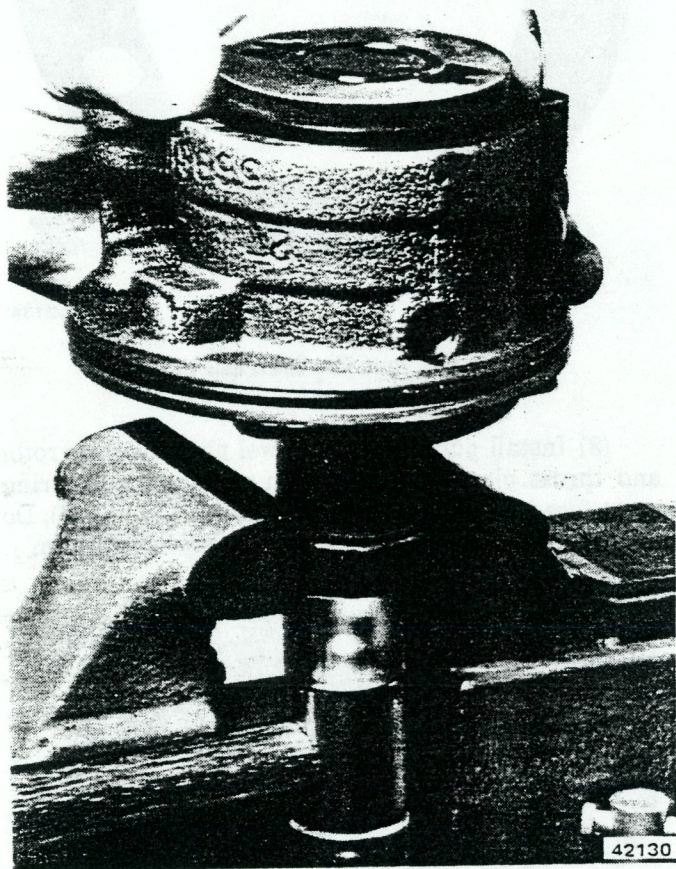


Fig. 2L-55 Pump Shaft Assembly Removal

(13) Remove pump shaft snap ring and remove pressure plate, pump ring, rotor and vanes, and thrust plate from shaft.

(14) Remove end plate O-rings from pump body bore. Discard O-rings.

(15) Remove pump shaft seal from pump shaft bore using tool J-8842.

Cleaning and Inspection

Clean all parts in solvent and dry them using filtered compressed air.

Inspect the flow control valve and valve bore for pitting, scoring, or wear and inspect the valve spring for

distortion or loss of tension. Insert the valve in the valve bore and check for free movement. The valve must not stick or bind. Replace the valve and spring as an assembly only if either part exhibits any of the above conditions. Replace the pump body if the valve bore is damaged.

Check the capscrew located in the end of the flow control valve. If loose, tighten it but take care to avoid scratching or scoring the valve surfaces. Minor surface irregularities can be removed using crocus cloth (only).

NOTE: *The flow control valve and spring are serviced as an assembly only. Do not attempt to disassemble the flow control valve at any time.*

Inspect the pressure plate, pump ring, and thrust plate surfaces for wear, cracks, scoring, or pitting. Also check the surfaces for flatness and for being parallel with the pump ring. Replace any part that is worn or damaged.

NOTE: *A high polish will always be present on the pressure plate surfaces as a result of normal operating contact with the rotor. Do not confuse this polish with wear or scoring.*

Inspect the rotor surfaces for pitting, wear, cracks, or scoring and check all the rotor vanes for free movement in the rotor slots. The vanes must not stick or bind. Replace the rotor if damaged or worn and replace the vanes if scored, worn, cracked, chipped, or if they stick or bind.

Inspect the pump shaft for nicks, scoring, wear, cracks, or worn splines. Replace the shaft if it exhibits any of these conditions.

Inspect the pump body and reservoir for cracks, porosity, or distortion and check the pump body bores and O-ring counterbores for damage. Replace either part if any of these conditions are noted.

PUMP ASSEMBLY

CAUTION: *Do not allow dirt to enter the pump during assembly. All parts must be clean and lubricated before installation. Perform all assembly operations on a clean work surface or a surface covered with clean, lint free shop towels only. Install replacement O-rings, seals, and snap rings only during assembly. Used or worn seals will cause leaks, noise and rapid wear after assembly.*

(1) Lubricate pressure plate, end plate, and all replacement O-ring seals with petroleum jelly. Lubricate all other parts with power steering fluid.

(2) Install one end plate O-ring seal in third (bottom) groove in pump body bore (fig. 2L-56).

(3) Install dowel pins in thrust plate (fig. 2L-57).

(4) Position rotor on thrust plate and align shaft bores in rotor and plate.

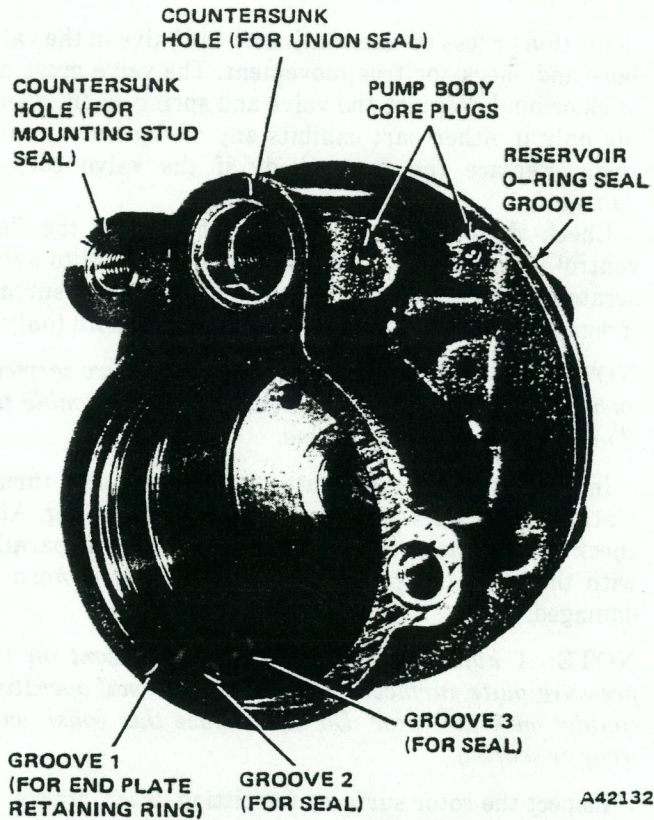


Fig. 2L-56 Pump O-Ring Seal Locations

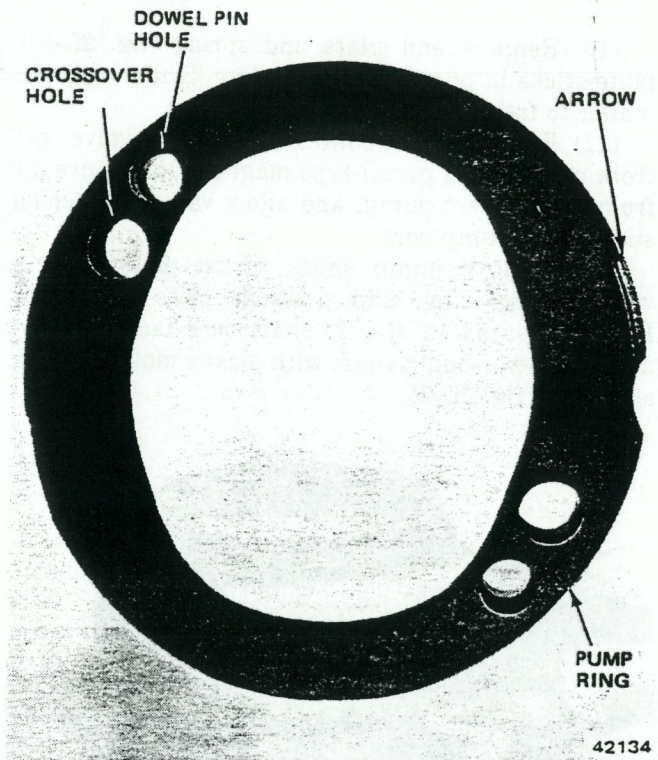


Fig. 2L-58 Pump Ring Dowel Hole Locations

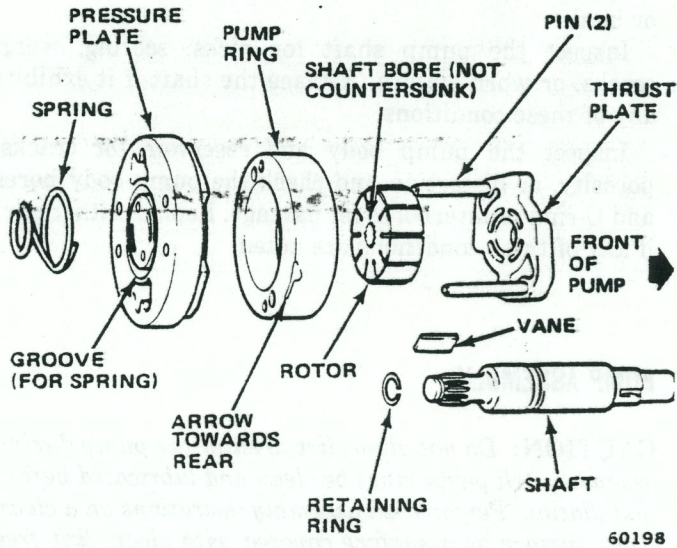


Fig. 2L-57 Pump Shaft Assembly Sequence

(5) Assemble pump shaft, thrust plate, and rotor. Insert splined end of shaft through thrust plate and rotor and install shaft snap ring (fig. 2L-57). Do not overspread snap ring. Open it only enough to install it.

(6) Install assembled thrust plate, rotor, and pump shaft in pump body bore.

(7) Align thrust plate dowel pins with dowel holes in pump ring (fig. 2L-58).

(8) Install pump ring on dowel pins and over rotor and thrust plate. Pump rotation arrow on pump ring must face upward when ring is installed (fig. 2L-59). Do not displace end plate O-ring during ring installation.



Fig. 2L-59 Pump Ring Installation

(9) Install rotor vanes in rotor slots (fig. 2L-60). Rounded edges of vanes must face outward.

(10) Lubricate pressure plate outside diameter and chamfered surface with petroleum jelly.

(11) Install pressure plate on thrust plate dowel pins. Spring groove in plate must face upward when installed (fig. 2L-57).

(12) Seat pressure plate using large socket. Position socket on plate and press downward approximately 1/16 inch (1.58 mm) to seat plate.

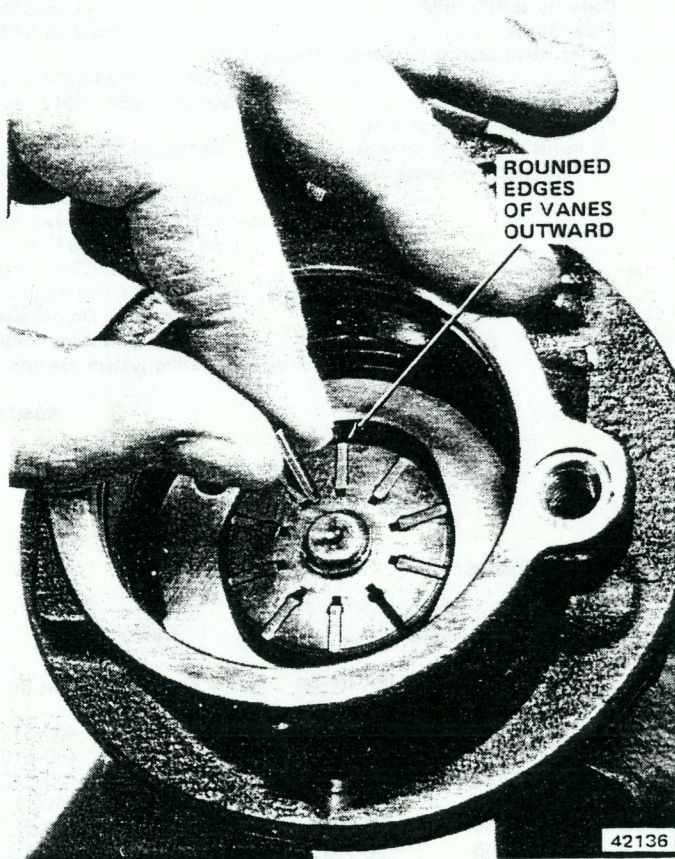


Fig. 2L-60 Rotor Vane Installation

(13) Lubricate remaining end plate O-ring seal with petroleum jelly and install O-ring in second (center) groove in pump body bore (fig. 2L-56).

(14) Install pressure plate spring on pressure plate. Be sure spring is seated in plate spring groove (fig. 2L-57).

(15) Lubricate end plate outside diameter with petroleum jelly and install plate in pump body bore.

(16) Press end plate downward and install end plate retaining ring (fig. 2L-61).

(17) Insert hex-end of flow control valve in valve spring and install assembled valve and spring in pump body valve bore (fig. 2L-62). Install assembly in valve spring-end first.

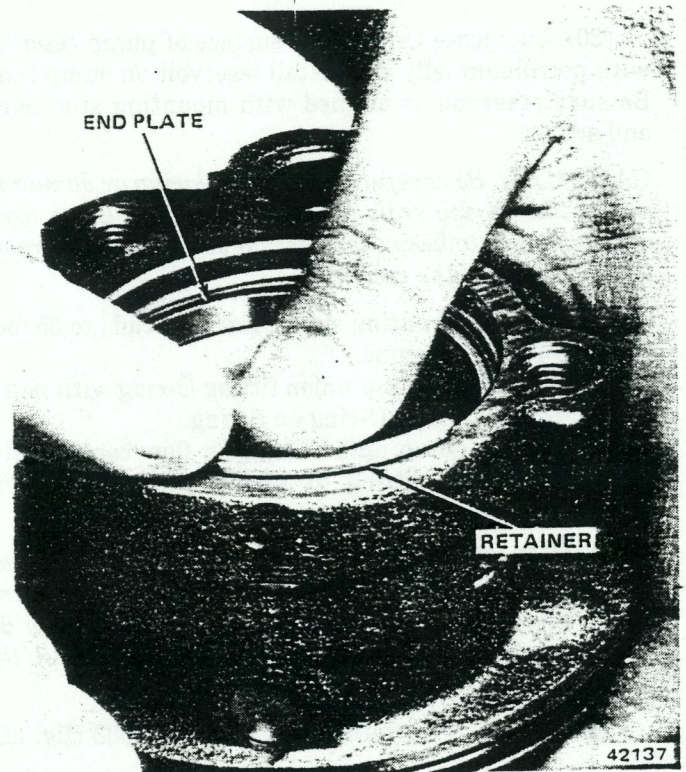


Fig. 2L-61 End Plate and Retaining Ring Installation

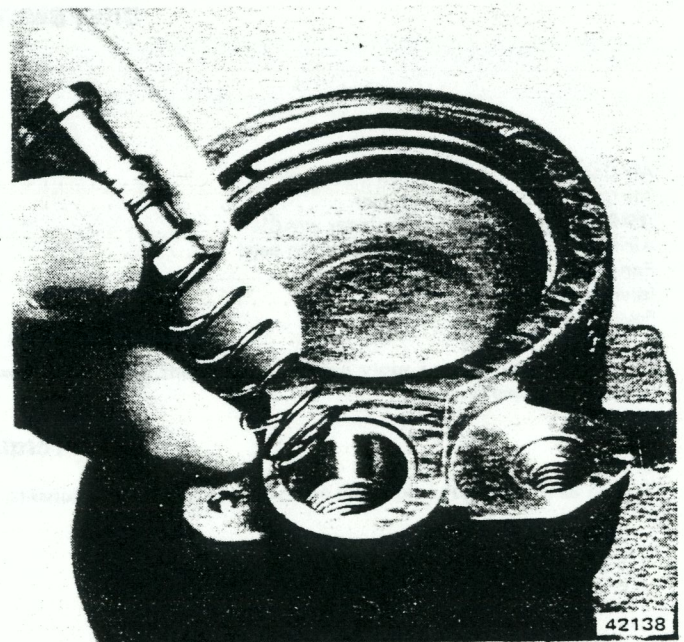


Fig. 2L-62 Flow Control Valve and Spring Installation

(18) Install mounting stud O-ring seals in pump body counterbores (fig. 2L-56). Lubricate O-rings with petroleum jelly before installation.

(19) Lubricate reservoir O-ring seal with petroleum jelly and install seal in pump body seal groove.

2L-44 POWER STEERING GEAR AND PUMP

(20) Lubricate O-ring seal surface of pump reservoir with petroleum jelly and install reservoir on pump body. Be sure reservoir is aligned with mounting stud bores and seals.

CAUTION: *Be careful to avoid displacing or damaging any of the O-ring seals during installation. Use a wood or plastic tool to keep the reservoir seal in its seal groove when installing the reservoir.*

(21) Install mounting studs. Tighten studs to 35 foot-pounds (47 N•m) torque.

(22) Lubricate pump union fitting O-ring with petroleum jelly and install O-ring on fitting.

(23) Install pump union fitting in flow control valve bore and tighten fitting to 35 foot-pounds (47 N•m) torque.

CAUTION: *Some pump units have metric thread union fittings which are designed for use with metric hose fittings that use an O-ring seal (fig. 2L-7, View B). If the union is to be replaced, be sure to install the correct thread-type fitting.*

(24) Install pump pulley using tool J-25033 (fig. 2L-50).

(25) Install pump. Refer to Pump Installation.
 (26) Fill pump reservoir and bleed air from system. Refer to Fluid Level and Initial Operation.

SPECIFICATIONS

Power Steering Pump Specifications

Pump Type	Vane-type, constant displacement, belt-driven hydraulic pump.
Capacity at 465 RPM	1.25 GPM
Flow Range	1.25 to 2.15 GPM
Relief Valve Setting (Maximum Pressure):	
CJ	1100-1200 psi (7584-8274 kPa)
Cke-Wag-Trk	1400-1500 psi (9653-10342 kPa)
Pressure Test Specifications:	
Initial pressure (engine at idle speed)	.80-125 psi (552-862 kPa)
Test pressures (gauge valve closed)	Pressures must be within maximum pressure specifications and not vary by more than 50 psi (345 kPa)
Turning	400 psi (2758 kPa)
Fluids	Use Jeep Power Steering Fluid or equivalent only. Do not use transmission fluid. Use fluids designed for power steering system use only.

80502

Drive Belt Tension Specifications

	USA (pounds)		Metric (N)	
	New Belt*	USA (ft-lbs)	New Belt*	Used Belt
Air Conditioner, Six-Cylinder	125-155	90-115	556-689	400-512
Air Conditioner, Eight-Cylinder	125-155	90-115	556-689	400-512
Air Pump (All except Six-Cylinder w/AC)	125-155	90-115	556-689	400-512
Air Pump Six-Cylinder w/AC (3/8 inch belt)	65-75	60-70	291-334	267-311
Fan	125-155	90-115	556-689	400-512
Idle Pulley	125-155	90-115	556-689	400-512
Power Steering Pump	125-155	90-115	556-689	400-512

*New belt specifications apply only to replacement belts. Once a belt has been tensioned and run, it is considered a used belt and should be adjusted to used belt specifications.

80503

Torque Specifications

Service Set-To Torques should be used when assembling components. Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	USA (ft. lbs.)		Metric (N•m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Hose Fittings	30	25-35	41	34-47
Pump Adjusting Bolts-Nuts	35	30-40	47	41-54
Pump Mounting Bracket Bolts	35	30-40	47	41-54
Pump Mounting Studs	35	30-40	47	41-54
Pump Union Fitting	35	30-40	47	41-54

All torque values given in foot-pounds and newton-meters with dry fits unless otherwise specified.

80504

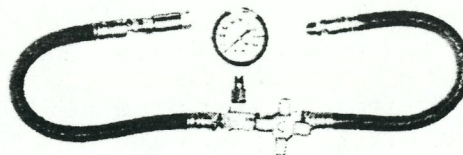
Tools



J-4245
SNAP-RING PLIERS



J-21553
PITMAN SHAFT SEAL
INSTALLER



J-21567
PRESSURE TESTING GAUGE
ASSEMBLY



J-21552
RACK-PISTON ARBOR



J-6222
ADJUSTER PLUG
SEAL PROTECTOR



J-21554
ADJUSTER PLUG
SEAL
INSTALLER



J-6221
ADJUSTER PLUG
BEARING REMOVER
AND INSTALLER



J-6217
CONNECTOR
SEAT INSTALLER



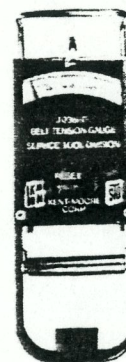
J-8092
HANDLE



J-7754
TORQUE WRENCH
(0-25 INCH POUNDS)



J-8642
SHAFT SEAL
PROTECTOR



J-23600
BELT TENSION
GAUGE



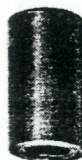
J-21551
PITMAN SHAFT
BEARING REMOVER
AND INSTALLER



J-6632
PITMAN ARM
PULLER



J-7624
SPANNER
WRENCH



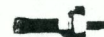
J-8841
SEAL INSTALLER



J-25034
REMOVER



J-8842
SEAL REMOVER



J-25033
INSTALLER

80501

70356

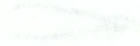
Tools



1-2787
PUMP ASSEMBLY
PUMP ASSEMBLY



1-2788
PUMP SHAFT SEAL
INSTALLER



1-2789
SHIMMING CLIP



1-2790
ADAPTED PUMP
SEAL PROTECTOR



1-2791
JACK PISTON ARMOR

1-2792
BELT TENSION
DAMAGE



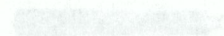
1-2793
SHAFT SEAL
PROTECTOR

1-2794
ADJUSTER PLUG
INSTALLER

1-2795
ADJUSTER PLUG
BEARING REMOVER
AND INSTALLER

1-2796
SEAL INSTALLER

1-2797
CONUSATOR
SEAT INSTALLER



1-2798
TABLE

1-2799
TONGUE WHICH
IS 3/8" HIGH



1-2800
PUMP ARM
PULLER

1-2801
PUMP SHAFT
BEARING REMOVER
AND INSTALLER



1-2802
REMOVER

1-2803
SPANNER
WRENCH

1-2804
INSTALLER

1-2805
BEARING REMOVER