TRANSFER CASE 2D

SECTION INDEX

GENERAL INFORMATION

GENERAL

Three transfer case models are used in Jeep vehicles. They are models 208, 219 and 300. Models 208 and 219 are aluminum case chain drive units and are used in Cherokee, Wagoneer and Truck models exclusively. Model 300 is a cast iron case gearbox type unit and is used in CJ models only. All three models have an integral four-wheel low range.

Model 208 is a four position unit providing four-wheel drive high and low ranges, a two-wheel high range and a neutral position. Model 208 is a part-time four-wheel drive unit. Torque input in four-wheel high and low ranges is undifferentiated. The range positions on the model 208 are selected by a floor mounted gearshift lever. Refer to the model 208 section for shift patterns. Model 208 is the standard equipment transfer case for Cherokee, Wagoneer and Truck models. Front drive hubs are also standard equipment on Jeep models equipped with this transfer case.

The model 219 Quadra-Trac, full time four-wheel drive transfer case is available as an option on Cherokee, Wagoneer and Truck models with automatic transmission only. This transfer case is also a four position unit providing four-wheel high and low ranges, a neutral position for towing and a four-high lock position for use only when the vehicle is immobile due to excessive wheel spin.

The model 219 provides fully differentiated operation in four-wheel high range. This is accomplished through a torque biasing viscous coupling.

The 219 is a chain drive unit employing two drive sprockets and an interconnecting drive chain. The 219 range positions are selected by a floor mounted gearshift lever. Refer to the model 219 section for shift patterns.

NOTE: *Front drive hubs are not available nor recommended for vehicles equipped with the model 219 Quadra-Trac transfer case.*

Model 300 is a cast iron case, four position gearbox type transfer case. It is used in CJ models only and provides four-wheel high and low ranges, a neutral position and a two-wheel drive high range. Model 300 is a part-time unit. Torque input in four-wheel high and low ranges is undifferentiated.

TOWING

Emergency Towing

If the vehicle is disabled and is to be towed with the front or rear wheels off the ground, towing speed should be limited to 30 mph (48 km/h) for a distance no greater than 15 miles (24 km).

Towing Vehicles with Manual Transmission and Model 208 or 300 Transfer Case

Ignition Key Available: Shift transmission and transfer case into Neutral. Vehicle can now be towed with all four wheels on the ground or with front or rear wheels raised. Turn front drive hubs to 4 x 4 or Lock position. Turn ignition key to Off position to unlock steering column.

Ignition Key Not Available and Vehicle is Unlocked: Shift transmission and transfer case into Neutral and tow vehicle with front wheels raised.

Ignition Key Not Available and Vehicle is Locked: Place dolly under rear wheels and tow vehicle with front end raised. Or, disconnect rear propeller shaft at rear axle yoke (be sure to mark the shaft and yoke for proper alignment at reassembly), secure shaft to underside of vehicle, and tow with front end raised.

NOTE: *On CJ models, when towing vehicle over 200 miles (300 km), stop towing every 200 miles (300 km). With the transfer case still in N (Neutral) and transmission in gear, start engine and rev engine for about one minute to circulate oil in the transfer case.*

Towing Vehicle with Automatic Transmission and Model 208 or 300 Transfer Case

Ignition Key Available: Turn ignition key to Off position to unlock steering column and gearshift selector linkage. Move gearshift lever to Park and transfer case shift lever to Neutral.

Ignition Key Not Available: Place dolly under rear wheels and tow vehicle with front end raised. Or, disconnect rear propeller shaft at rear axle yoke (index mark yoke for correct assembly), secure shaft to underside of vehicle, and tow with front wheels raised.

NOTE: *On CJ models, when towing vehicle over 200 miles (300 km), stop towing every 200 miles (300 km) and with the transfer case still in N (Neutral), start engine, place automatic transmission in D (Drive), and rev engine for about one minute to circulate oil in the transfer case.*

Towing Vehicle with Automatic Transmission and Model 219 Quadra-Trac Transfer Case

Ignition Key Available: Vehicle can be towed with all four wheels on the ground without disconnecting propeller shafts. Turn ignition key to Off position to unlock steering wheel. Move gearshift lever to Park and shift transfer case shift lever to Neutral position.

Ignition Key Not Available: Place dolly under rear wheels and tow vehicle with front wheels raised. Or, disconnect rear propeller shaft at rear axle (mark yoke for correct assembly), secure shaft to underside of vehicle, and tow with front wheels raised.

Recreational Towing

Jeep vehicles can be towed behind a recreational vehicle such as a motor home, but the following instructions must be followed to avoid damaging drive line components. Also be sure to check and comply with federal, state and local laws or ordinances regarding this type of towing.

With Manual Transmission and Model 208 or Model 300 Transfer Case

(1) Turn ignition switch to Off position to unlock steering wheel.

(2) Shift transmission into gear and the transfer case into Neutral.

(3) Turn selective drive hubs to 4 x 4 or Lock position, for axle lubrication.

With Automatic Transmission and Model 208 or Model 300 Transfer Case

(1) Turn ignition switch to Off position to unlock steering wheel.

(2) Shift automatic transmission into Park.

(3) Shift transfer case into Neutral position.

(4) Turn selective drive hubs to 4 x 4 or Lock position for axle lubrication.

With Automatic Transmission and Model 219 Quadra-Trac Transfer Case

(1) Turn ignition switch to Off position to unlock steering wheel.

(2) Shift automatic transmission into Park.

(3) Shift transfer case into Neutral position.

Trailer Towing and Campers

The Jeep Corporation new vehicle warranty includes conditions and limitations for vehicles used in towing trailers or campers or installation of slide-in campers on Jeep Trucks. The requirements and recommendations in this manual and other factory literature must be followed in order to maintain this coverage.

In addition to the vehicle maintenance and servicing requirements set forth in this manual, the GVW and GAW ratings are of special significance. When a Jeep vehicle is to be used for trailer or camper towing, or slide-in camper installations in Jeep Trucks, it is extremely important that the GVW or GAW ratings not be exceeded by the addition of:

- The tongue weight of a trailer.
- The weight transferred to a Truck model by the mounting of a fifth-wheel trailer.
- The weight of a slide-in camper or any other type of truck camper.
- The weight of any other type of vehicle put in or on the towing vehicle.

Remember that additional items placed in or on the trailer or mounted camper will add to the load.

CAUTION: *Jeep Corporation will not be responsible for brake performance if the Jeep vehicle and trailer hydraulic brake systems are interconnected in any way. A separate brake system is recommended, and actually required in some states, for all trailers weighing 1,000 pounds (454 kg) or more.*

TRANSFER CASE SERVICE

All three transfer case models are fully serviceable units and can be disassembled for cleaning, inspection, overhaul and adjustment procedures. In-vehicle and out-of-vehicle servicing procedures are outlined in this chapter. Refer to the necessary subsection for service diagnosis, principles of operation and all servicing, lubrication, and adjustment procedures.

TRANSFER CASE SHIFT LINKAGE

Cherokee-Wagoneer-Truck with Manual Transmission

Removal

(1) Raise vehicle.

(2) Disconnect shift lever link from operating lever and transfer case shift lever (fig. 2D-1). Do not lose washers, grommets, and bushings that retain link in levers.

(3) Lower vehicle.

(4) Remove screws attaching shift lever boot to floorpan and slide boot upward on shift lever.

(5) Remove screws attaching shift lever support bracket to floorpan (fig. 2D-1).

(6) Remove knob from transfer case shift lever.

(7) Slide shift lever out of boot and remove lever and support bracket as assembly.

(8) Remove shoulder bolt from support bracket and remove shift lever from bracket. Do not lose shift lever bushing or spring washer.

(9) Inspect lever, link, support bracket, shoulder bolt and bushings. Replace any component that is bent, cracked, broken, scored or excessively worn.

Installation

(1) Install shift lever bushing in shift lever (fig. 2D-1).

(2) Install shift lever in support bracket.

(3) Align lever bushing with holes in support bracket and install spring washer and shoulder bolt. Tighten bolt securely.

(4) Slide shift lever into boot and into floorpan hole.

(5) Position lever support bracket on floorpan and install bracket attaching screws.

(6) Install knob on shift lever.

(7) Raise vehicle.

(8) Install grommet in operating lever, if removed.

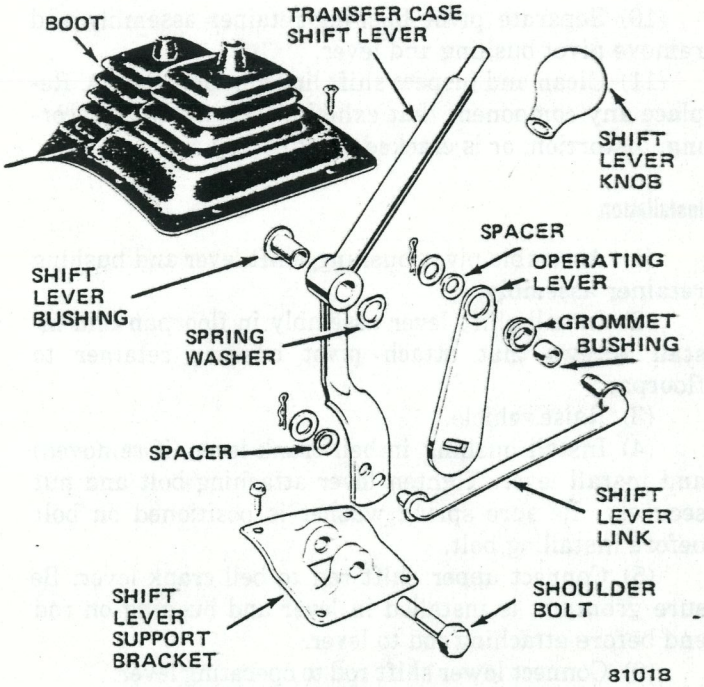

Fig. 2D-1 Transfer Case Shift Linkage—Cherokee-Wagoneer-Truck with Manual Transmission

(9) Install bushing on end of shift lever link that attaches to operating lever.

(10) Connect shift lever link to operating lever and shift lever using spacers and washers removed previously, and new cotter pins.

(11) Lower vehicle.

(12) Install screws that attach shift lever boot to floorpan.

Cherokee-Wagoneer-Truck with Automatic Transmission

Removal

(1) Remove screws attaching pivot bushing retainer assembly to floorpan (fig. 2D-2).

(2) Raise vehicle.

(3) Disconnect lower shift rod at operating lever (fig. 2D-2). Retain flat washer, wave washer and push-on retainer that attach rod end to lever.

(4) Disconnect upper shift rod at shift lever. Retain cotter pin, spacer, and washer that attach rod end to shift lever.

(5) Disconnect lower shift rod at bell crank lever. Retain cotter pin, spacer and washer that attach lower shift rod trunnion to bell crank (fig. 2D-2).

(6) Disconnect upper shift rod at bell crank lever. Retain bushing, cotter pin, spacer, and washer that attach rod end to bell crank.

(7) Remove bolt, nut and spring washer that attach bell crank lever (fig. 2D-2). Remove lever and bushing.

(8) Lower vehicle.

(9) Remove shift lever, pivot bushing and bushing retainer as assembly.

(10) Separate pivot bushing retainer assembly and remove pivot bushing and lever.

(11) Clean and inspect shift linkage components. Replace any component that exhibits excessive wear, scoring, distortion, or is cracked, bent or broken.

Installation

(1) Assemble pivot bushing, shift lever and bushing retainer assembly.

(2) Install shift lever assembly in floorpan and install screws that attach pivot bushing retainer to floorpan.

(3) Raise vehicle.

(4) Install bushing in bell crank lever (if removed) and install lever. Tighten lever attaching bolt and nut securely. Be sure spring washer is positioned on bolt before installing bolt.

(5) Connect upper shift rod to bell crank lever. Be sure grommet is installed in lever and bushing on rod end before attaching rod to lever.

(6) Connect lower shift rod to operating lever.

(7) Connect lower shift rod trunnion to bell crank lever.

(8) Connect upper shift rod to transfer case shift lever.

(9) Lower vehicle.

(10) Check linkage operation. If adjustment is necessary, adjust linkage at lower shift rod trunnion. Loosen trunnion jamnuts and position trunnion on rod as required to obtain desired adjustment.

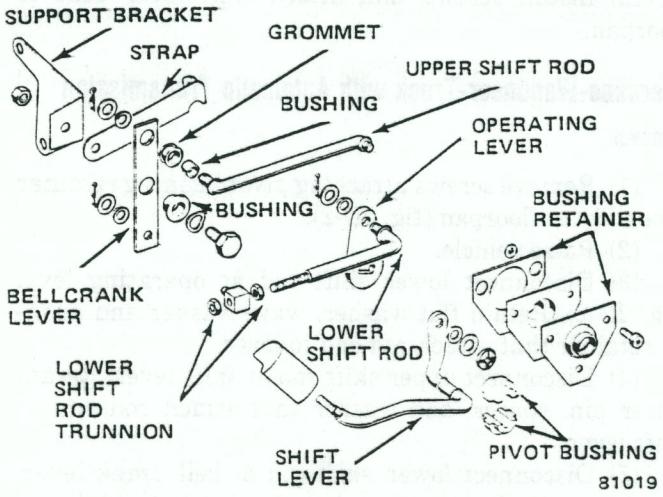

Fig. 2D-2 Transfer Case Shift Linkage—Cherokee-Wagoneer-Truck with Automatic Transmission

CJ Models—With Manual or Automatic Transmission

Removal

(1) Remove screws that attach shift lever boot to floorpan.

(2) Remove shift lever knob and slide boot up and off lever.

(3) Raise vehicle.

(4) Remove shifter shaft retaining nut (fig. 2D-3).

(5) Remove cotter pins that retain link pins in shift rods and remove link pins. Discard old cotter pins.

(6) Remove shifter shaft from shift lever.

NOTE: *On some models, the shifter shaft is treaded into the shift lever and must be unthreaded to remove it. On other models, the shaft is removed simply by sliding it out of the lever and front cover bosses.*

(7) Remove shift lever.

(8) Remove shift and shift control links from shift rods.

(9) Clean and inspect linkage components. Replace any component that is broken, bent, cracked, or excessively worn or scored.

Installation

(1) Install shift and shift control links.

(2) Install shift lever.

(3) Install shifter shaft in front cover bosses and shift lever.

(4) Install and tighten shifter shaft retaining nut.

(5) Install link pins in shift rods. Secure pins with new cotter pins.

(6) Lower vehicle.

(7) Install boot on shift lever.

(8) Install knob on shift lever.

(9) Position boot on floorpan and install boot attaching screws.

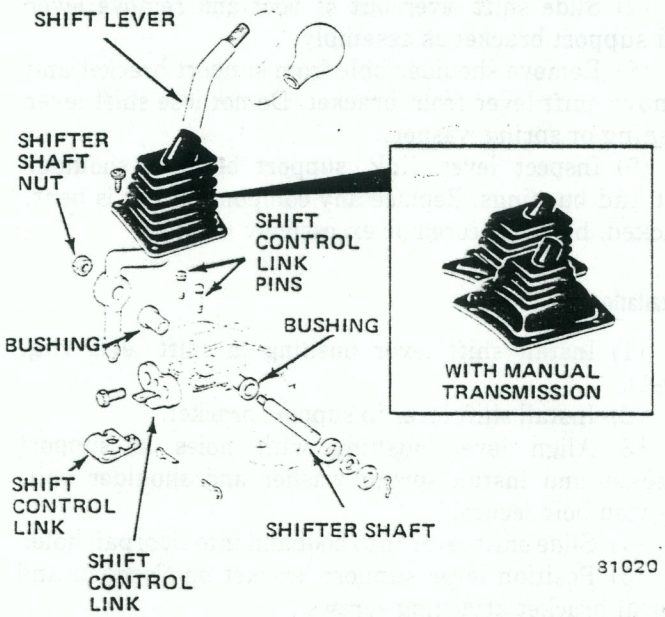

Fig. 2D-3 Transfer Case Shift Linkage—CJ Models with Manual or Automatic Transmission

TRANSFER CASE REMOVAL

Removal—Cherokee-Wagoneer-Truck Models

(1) Raise vehicle.

(2) Drain lubricant from transfer case.

(3) Disconnect speedometer cable and indicator switch wires and disconnect transfer case shift lever link at operating lever.

(4) Place support stand under transmission and remove rear crossmember.

(5) Mark transfer case front and rear output shaft yokes and propeller shafts for assembly alignment reference.

(6) Disconnect front and rear propeller shafts at transfer case yokes. Secure shafts to frame rails with wire.

(7) Disconnect parking brake cable guide from pivot located on right frame rail, if necessary.

(8) Remove bolts attaching exhaust pipe support bracket-to-transfer case, if necessary.

(9) Remove transfer case-to-transmission bolts.

(10) Move transfer case assembly rearward until free of transmission output shaft and remove assembly.

(11) Remove all gasket material from rear of transmission adapter housing.

Removal—CJ Models

(1) On models with automatic transmission, remove shift lever knob, trim ring, and boot from transfer case shift lever.

(2) On models with manual transmission, remove shift lever knob, trim ring and boot from transmission and transfer case shift levers.

(3) Remove floor covering, if equipped, and remove transmission access cover from floorpan.

(4) Raise vehicle and drain lubricant from transfer case.

(5) Position support stand under clutch housing to support engine and transmission and remove rear crossmember.

(6) Disconnect front and rear propeller shafts at transfer case. Mark propeller shaft yokes for assembly reference.

(7) Disconnect speedometer cable at transfer case.

(8) If necessary, disconnect parking brake cable at equalizer. Disconnect exhaust pipe support bracket at transfer case, if equipped.

(9) Remove bolts attaching transfer case to transmission and remove transfer case.

TRANSFER CASE INSTALLATION

Installation—Cherokee-Wagoneer-Truck Models

(1) Align and install transfer case assembly on transmission. Be sure transfer case input gear splines are aligned with transmission output shaft. Align splines by rotating transfer case rear output shaft yoke, if necessary.

NOTE: *Do not install any transfer case attaching bolts until the transfer case is completely seated against the transmission.*

(2) Align and install transfer case attaching bolts. Tighten bolts to 40 foot-pounds (54 N•m) torque.

(3) Attach exhaust pipe support bracket to transfer case, if removed.

(4) Align and connect propeller shafts.

(5) Connect parking brake cable guide to pivot bracket on frame rail, if removed.

(6) Connect speedometer cable and indicator switch wires and connect transfer case shift lever link to operating lever.

(7) Install rear crossmember and remove transmission support stand.

(8) Fill transfer case with 10W-30 motor oil.

(9) Lower vehicle.

Installation—CJ Models

(1) Shift transfer case to 4L position.

(2) Rotate transfer case output shaft (by turning yoke) until transmission output shaft gear engages transfer case input shaft. Move transfer case forward until case seats against transmission.

CAUTION: *Be sure the transfer case is flush against the transmission. Severe damage to the transfer case will result if the attaching bolts are tightened while the transfer case is cocked or in a bind.*

(3) Install transfer case attaching bolts. Tighten bolts to 30 foot-pounds (41 N•m) torque.

(4) Fill transfer case with gear lubricant.

(5) Connect speedometer driven gear to transfer case. Also connect transfer case shift lever and control links to transfer case shift rods.

(6) Connect front and rear propeller shafts to transfer case. Be sure to align shafts-to-yokes using reference marks made during removal. Tighten shaft-to-yoke clamp strap nuts to 16 foot-pounds (21 N•m) torque.

(7) Install rear crossmember and remove support stand from under clutch housing.

(8) Connect parking brake cable to equalizer and connect exhaust pipe support bracket to transfer case if disconnected.

(9) Lower vehicle.

(10) Install transmission access cover plate on floorpan. Install floor covering, if equipped.

(11) Install boots, trim rings, and shift knobs.

MODEL 208 TRANSFER CASE

GENERAL

The model 208 transfer case provides four-wheel high and low ranges, a two-wheel high range and a neutral position. The model 208 is used in Cherokee, Wagoneer and Truck models only. Models equipped with the 208 transfer case are also equipped with manual locking front drive hubs as standard equipment.

The model 208 is a chain drive unit consisting of a two-piece aluminum case containing front and rear output shafts, two drive sprockets, a shift mechanism and a planetary gear assembly. The drive sprockets are connected and operated by the drive chain. The planetary assembly which consists of a four pinion carrier and an annulus gear provide the four-wheel drive low range when engaged. Reduction ratio is 2.61:1 in low range.

Transfer Case Shift Pattern

A floor mounted shift lever is used to select the various operating ranges on all 208 models. The shift lever is located on the floorpan transmission tunnel adjacent to the transmission gearshift lever. Although the transfer case shift pattern is in a straight line for all 208 models, the range positions are different for manual and automatic transmission applications (figs. 2D-4 and 2D-5).

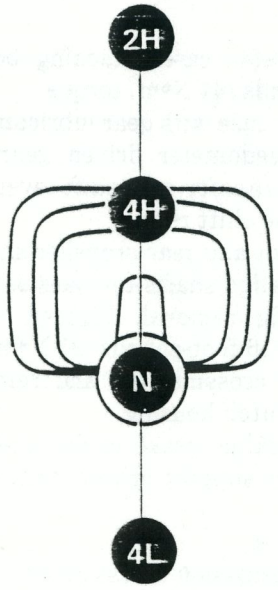

Fig. 2D-4 Model 208 Shift Pattern—Manual Transmission

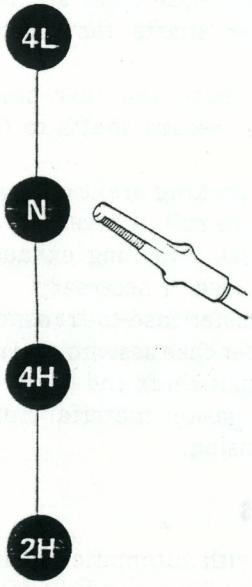

Fig. 2D-5 Model 208 Shift Pattern—Automatic Transmission

Four-Wheel Drive Indicator Lamp

An indicator lamp is mounted in the instrument panel to alert the driver whenever the vehicle is being operated in four-wheel high range. The lamp is controlled by an indicator switch in the transfer case (fig. 2D-6). The switch is a ball and plunger unit that is activated by the transfer case range sector when four-wheel high range is selected. The indicator lamp is illuminated in the four-wheel high range position only.

IDENTIFICATION

An identification tag is attached to the rear half of the transfer case (fig. 2D-6). This tag provides the transfer case model number, low range reduction ratio, and assembly number. The information on this tag is necessary for servicing information. If the tag is removed or becomes dislodged during service operations, it should be reattached using an adhesive sealant such as Loctite 312, or equivalent.

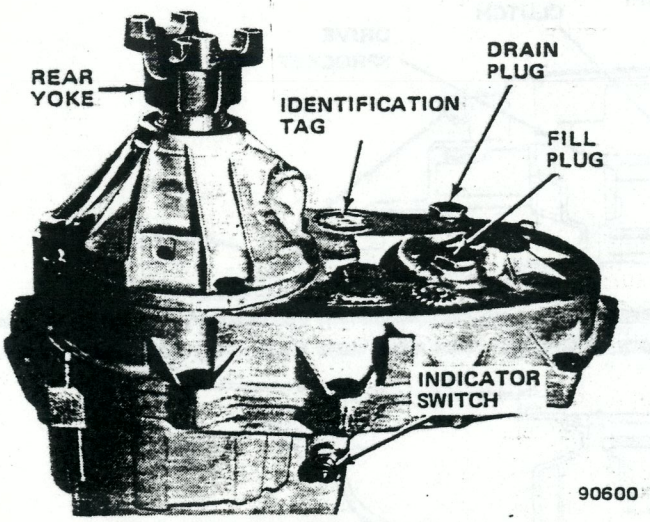

Fig. 2D-6 Model 208 Indicator Switch, Identification Tag and Drain and Fill Plug Location

LUBRICATION

The model 208 transfer case lubricant should be changed at the intervals specified in the Maintenance Schedule. When adding lubricant to or refilling the transfer case after service, use a quality grade 10W-30 motor oil only. Do not use any type of anti-friction type additives or similar substance. Use the specified grade of motor oil only. Refer to the In-Vehicle Service section for lubricant change procedures and fill level. Model 208 lubricant capacity is 6 pints (3 liters).

POWER FLOW

In all drive range positions input torque is transmitted to the transfer case geartrain through the transfer case input gear (fig. 2D-7).

In 2H range, torque flows from the input gear to the planetary assembly and annulus gear which rotate as a unit. Torque is transferred to the mainshaft through the planetary carrier which is splined to the mainshaft. Torque flow continues through the mainshaft and rear yoke which is splined to the mainshaft, and finally to the rear propeller shaft and axle. In 2H range, the sliding clutch remains in a neutral position and does not lock the drive sprocket to the mainshaft. As a result, torque is not transferred to the driven sprocket.

In 4H range, input torque from the input gear is transmitted through the planetary and annulus gear and through the mainshaft in exactly the same fashion as in 2H range. However, in 4H position, the sliding clutch is shifted forward and into engagement with the mainshaft clutch gear. This locks the drive sprocket to the mainshaft through the sliding clutch. Torque is now transmitted through the drive sprocket to the driven sprocket by the connecting drive chain. Since the front output shaft is splined to the driven sprocket, torque now flows through the front output shaft to the front propeller shaft and axle resulting in high range four-wheel drive.

In 4L range, the path of torque through the transfer case is exactly the same as in 4H range but with one major difference. In 4L range, the annulus gear is shifted forward and into engagement with the lockplate. Since the lockplate is fixed in the case, the annulus gear is held stationary and does not rotate. This causes the planetary pinions to rotate about the annulus gear internal teeth producing a gear reduction ratio of 2.61:1.

SERVICE DIAGNOSIS

Before attempting to repair a suspected transfer case malfunction, check all other drive line components beforehand. The actual cause of a problem may be related to such items as the front hubs, axles, propeller shafts, wheels and tires, transmission, or clutch instead. If all other drive line components are in good condition and operating properly, refer to the Service Diagnosis charts for further information.

IN-VEHICLE SERVICE

Changing Lubricant

(1) Raise vehicle.
(2) Position drain pan under transfer case.
(3) Remove drain and fill plugs, and drain lubricant completely.
(4) Install drain plug. Tighten plug to 35 foot-pounds (47 N•m) torque.
(5) Remove drain pan.
(6) Fill transfer case to edge of fill plug opening with 10W-30 motor oil (only).
(7) Install fill plug. Tighten plug to 35 foot-pounds (47 N•m) torque.
(8) Lower vehicle.

Speedometer Gear, Shaft Seal, Rear Bearing and Retainer, Oil Pump and Pump Seal Replacement

NOTE: *The front and rear yokes, output shaft seals, rear retainer and bearing, oil pump, pump seal, and speedometer drive gear can all be serviced with the transfer case in the vehicle. The following combined procedure outlines removal and installation of these components.*

Removal

(1) Raise vehicle.
(2) Remove fill and drain plugs and drain oil from transfer case.
(3) Mark propeller shaft and transfer case yoke for assembly alignment reference.

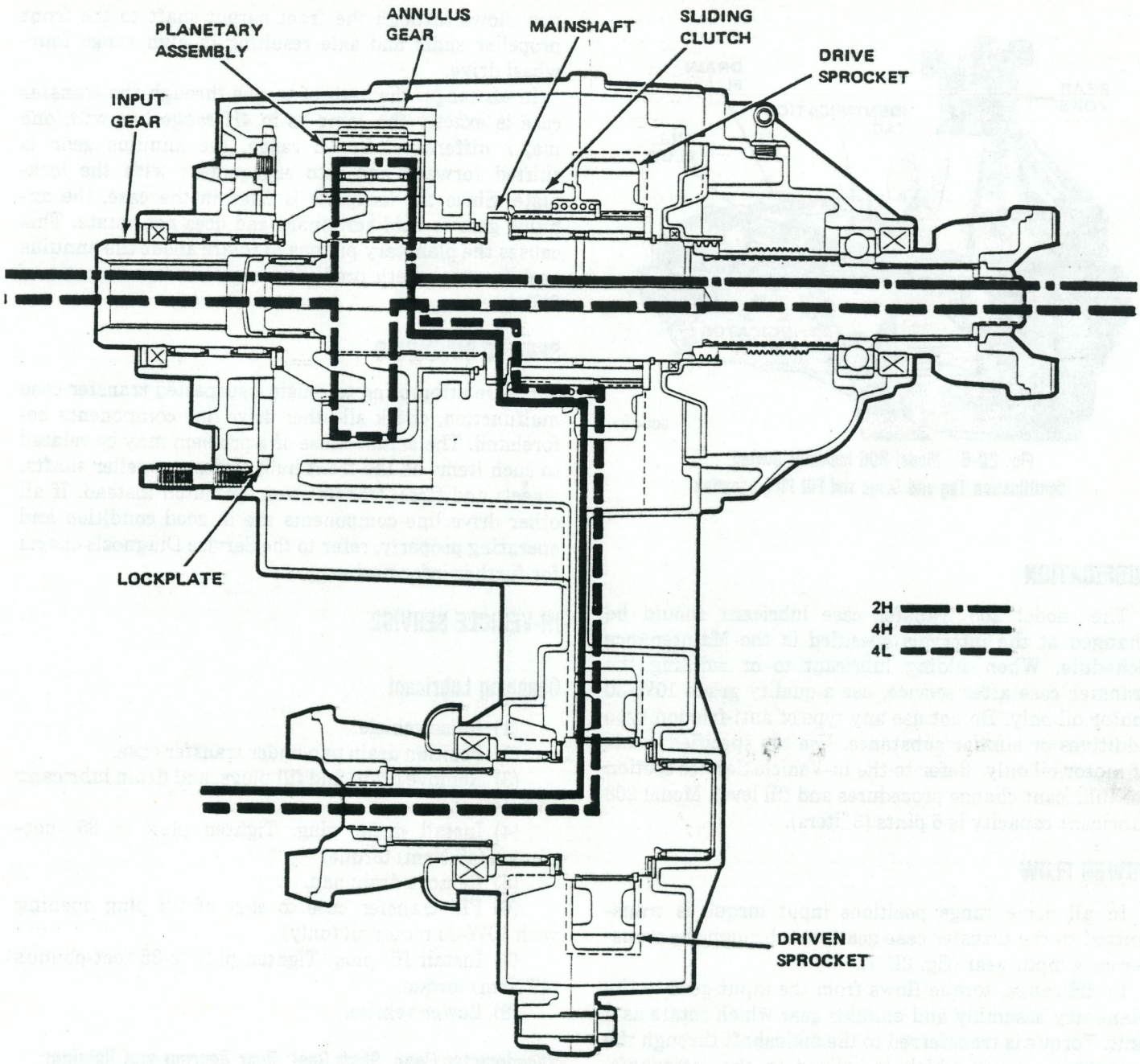

Fig. 2D-7 Power Flow—Model 208 Transfer Case

(4) Disconnect propeller shaft. Secure shaft to underside of vehicle.

(5) Remove and discard transfer case yoke retaining nut and yoke seal washer. Use Tool J-8614-01 to hold yoke while removing nut.

(6) Remove yoke. If necessary, remove yoke using Tools J-8614-01, -02 and -03.

(7) Remove speedometer driven gear sleeve and driven gear from rear retainer.

(8) Mark rear retainer for assembly alignment reference.

(9) Remove retainer attaching bolts and remove retainer. Tap retainer with rawhide or plastic mallet to remove it.

CAUTION: *Do not attempt to pry the retainer off the rear case. Tap the retainer loose using a rawhide or plastic mallet only.*

(10) Remove speedometer drive gear.

(11) Remove pump housing from retainer and remove seal from housing (fig. 2D-8).

(12) If retainer or bearing are to be replaced, remove bearing retaining snap ring from rear retainer and tap bearing out of retainer using plastic mallet.

(13) Remove oil pump from mainshaft (fig. 2D-5).

(14) Remove output shaft seal if seal is to be replaced.

Service Diagnosis

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Vehicle speed too great to permit shifting.	(1) Stop vehicle and shift into desired range. Or reduce speed to 2-3 mph (3-4 km/h) before attempting to shift.
	(2) If vehicle was operated for extended period in 4H mode on dry paved surface, driveline torque load may cause difficult shifting.	(2) Stop vehicle, shift transmission to neutral, shift transfer case to 2H mode and operate vehicle in 2H on dry paved surfaces.
	(3) Transfer case external shift linkage binding.	(3) Lubricate or repair or replace linkage, or tighten loose components as necessary.
	(4) Insufficient or incorrect lubricant.	(4) Drain and refill to edge of fill hole with 10W-30 motor oil having API classification SE only.
	(5) Internal components binding, worn, or damaged.	(5) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE MODES	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with 10W-30 motor oil only. Check for leaks and repair if necessary. Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.
NOISY IN — OR JUMPS OUT OF FOUR WHEEL DRIVE LOW RANGE	(1) Transfer case not completely engaged in 4L position.	(1) Stop vehicle, shift transfer case in Neutral, then shift back into 4L position.
	(2) Shift linkage loose or binding.	(2) Tighten, lubricate, or repair linkage as necessary.
	(3) Range fork cracked, inserts worn, or fork is binding on shift rail.	(3) Disassemble unit and repair as necessary.
	(4) Annulus gear or lockplate worn or damaged.	(4) Disassemble unit and repair as necessary.

Service Diagnosis (Continued)

Condition	Possible Cause	Correction
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clear or replace vent if necessary.
	(3) Output shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores, nicks with fine sandpaper or replace yoke(s) if necessary.
ABNORMAL TIRE WEAR	(1) Extended operation on dry hard surface (paved) roads in 4H range.	(1) Operate in 2H on hard surface (paved) roads.

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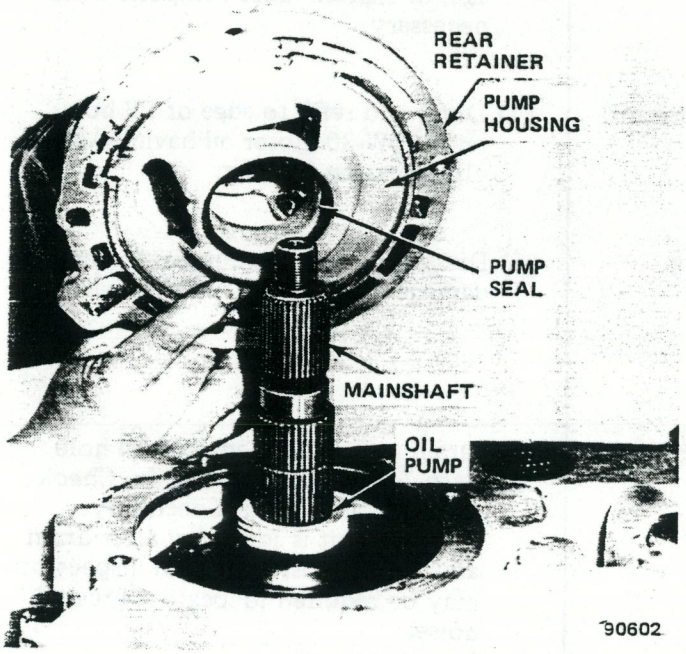


Fig. 2D-8 Rear Retainer Removal/Installation

Installation

(1) Install oil pump on mainshaft.

(2) Install seal in pump housing. Be sure to install seal so lip faces case interior. Lubricate seal lip with petroleum jelly or 10W-30 motor oil before installation.

(3) Install speedometer driven gear.

(4) Install rear output bearing in rear retainer and install snap ring. Be sure shielded side of bearing faces interior of transfer case.

(5) Install pump housing in rear retainer.

(6) Apply Loctite 515, or equivalent sealant, to mating surface of rear retainer.

(7) Align retainer and case reference marks and install retainer on case.

(8) Install and tighten retainer attaching bolts to 23 foot-pounds (31 N•m) torque.

(9) Install output shaft seal.

(10) Install yoke, yoke seal washer and yoke nut. Tighten nut to 120 foot-pounds (163 N•m) torque.

(11) Install speedometer driven gear and sleeve.

(12) Install drain plug. Tighten plug to 35 foot-pounds (47 N•m) torque.

(13) Fill transfer case to edge of fill plug opening with 10W-30 motor oil (only).

(14) Install fill plug. Tighten plug to 35 foot-pounds (47 N•m) torque.

(15) Connect propeller shaft. Tighten clamp strap bolts to 16 foot-pounds (21 N•m) torque.

(16) Lower vehicle.

DISASSEMBLY

(1) Remove fill and drain plugs (fig. 2D-9).

(2) Remove front and rear yokes. Discard yoke seal washers and yoke nuts.

(3) Turn transfer on end and position front case on wood blocks. Cut "V" notches in wood blocks to clear mounting studs in front case if necessary.

(4) Remove lock mode indicator switch and washer (fig. 2D-9).

(5) Remove detent bolt, spring and ball (fig. 2D-10).

(6) Mark rear retainer and case for assembly alignment reference.

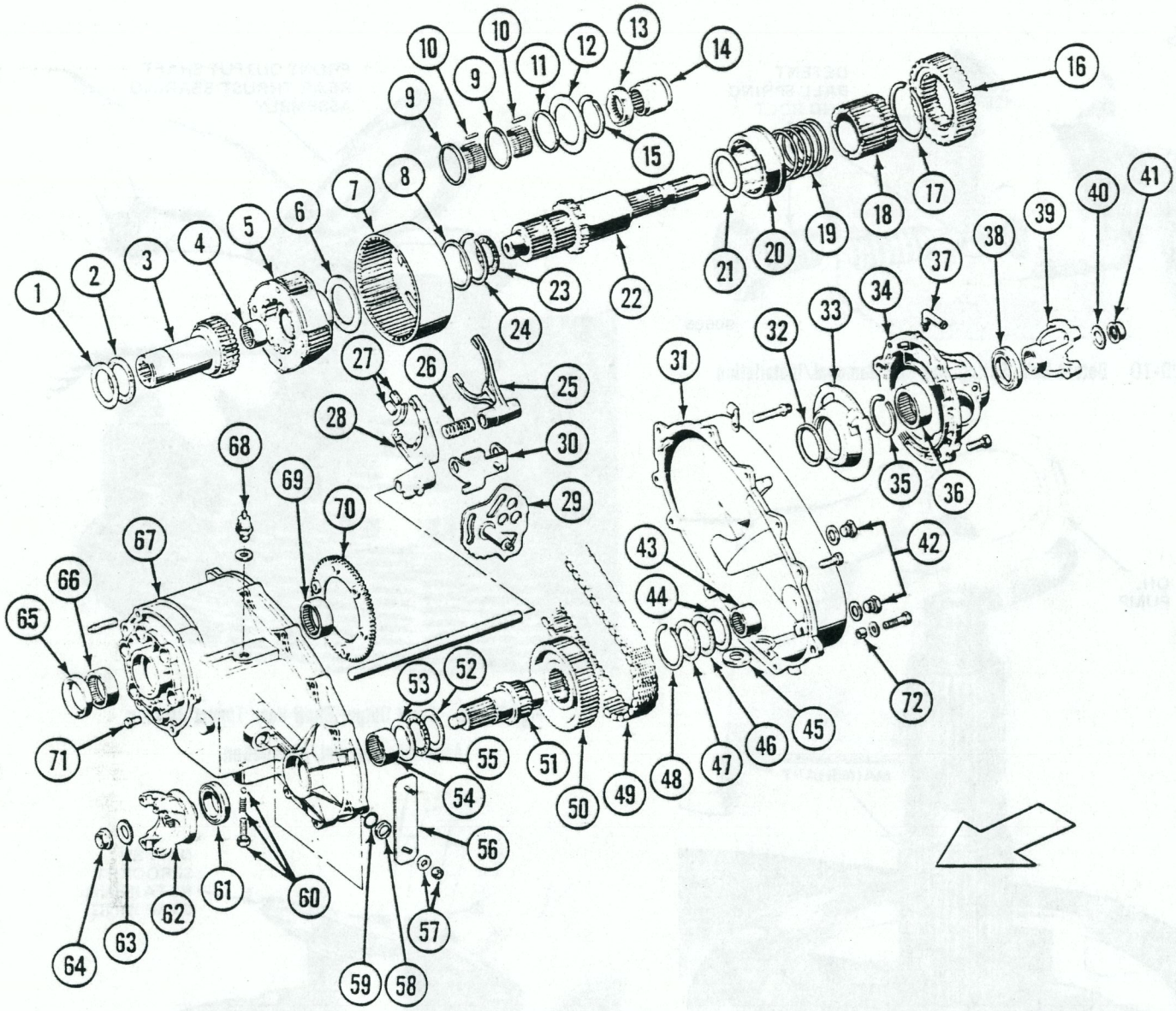
(7) Remove rear retainer attaching bolts and remove retainer and pump housing as assembly (fig. 2D-8). Tap retainer from case using plastic mallet only. Do not pry.

(8) Remove pump housing from retainer and remove pump seal from housing (fig. 2D-8). Discard seal.

(9) Remove speedometer drive gear from mainshaft.

(10) Remove oil pump from mainshaft. Note position of pump for assembly reference. Side facing case interior has recess in it (fig. 2D-11).

(11) Remove bolts attaching rear case to front case and remove rear case.



1. INPUT GEAR THRUST WASHER
2. INPUT GEAR THRUST BEARING
3. INPUT GEAR
4. MAINSHAFT PILOT BEARING
5. PLANETARY ASSEMBLY
6. PLANETARY THRUST WASHER
7. ANNULUS GEAR
8. ANNULUS GEAR THRUST WASHER
9. NEEDLE BEARING SPACERS
10. MAINSHAFT NEEDLE BEARINGS (120)
11. NEEDLE BEARING SPACER
12. THRUST WASHER
13. OIL PUMP
14. SPEEDOMETER GEAR
15. DRIVE SPROCKET RETAINING RING
16. DRIVE SPROCKET
17. SPROCKET CARRIER STOP RING
18. SPROCKET CARRIER
19. CLUTCH SPRING
20. SLIDING CLUTCH
21. THRUST WASHER
22. MAINSHAFT
23. MAINSHAFT THRUST BEARING
24. ANNULUS GEAR RETAINING RING
25. MODE FORK
26. MODE FORK SPRING
27. RANGE FORK INSERTS
28. RANGE FORK
29. RANGE SECTOR
30. MODE FORK BRACKET
31. REAR CASE
32. SEAL
33. PUMP HOUSING
34. REAR RETAINER
35. REAR OUTPUT BEARING
36. BEARING SNAP RING
37. VENT TUBE
38. REAR SEAL
39. REAR YOKE
40. YOKE SEAL WASHER
41. YOKE NUT
42. DRAIN AND FILL PLUGS
43. FRONT OUTPUT SHAFT REAR BEARING
44. FRONT OUTPUT SHAFT REAR THRUST BEARING RACE (THICK)
45. CASE MAGNET
46. FRONT OUTPUT SHAFT REAR THRUST BEARING
47. FRONT OUTPUT SHAFT REAR THRUST BEARING RACE (THIN)
48. DRIVEN SPROCKET RETAINING RING
49. DRIVE CHAIN
50. DRIVEN SPROCKET
51. FRONT OUTPUT SHAFT
52. FRONT OUTPUT SHAFT FRONT THRUST BEARING RACE (THIN)
53. FRONT OUTPUT SHAFT FRONT THRUST BEARING RACE (THICK)
54. FRONT OUTPUT SHAFT FRONT BEARING
55. FRONT OUTPUT SHAFT FRONT THRUST BEARING
56. OPERATING LEVER
57. WASHER AND LOCKNUT
58. RANGE SECTOR SHAFT SEAL RETAINER
59. RANGE SECTOR SHAFT SEAL
60. DETENT BALL, SPRING AND RETAINER BOLT
61. FRONT SEAL
62. FRONT YOKE
63. YOKE SEAL WASHER
64. YOKE NUT
65. INPUT GEAR OIL SEAL
66. INPUT GEAR FRONT BEARING
67. FRONT CASE
68. LOCK MODE INDICATOR SWITCH AND WASHER
69. INPUT GEAR REAR BEARING
70. LOCKPLATE
71. LOCKPLATE BOLTS
72. CASE ALIGNMENT DOWELS

Fig. 2D-9 Model 208 Transfer Case

90601

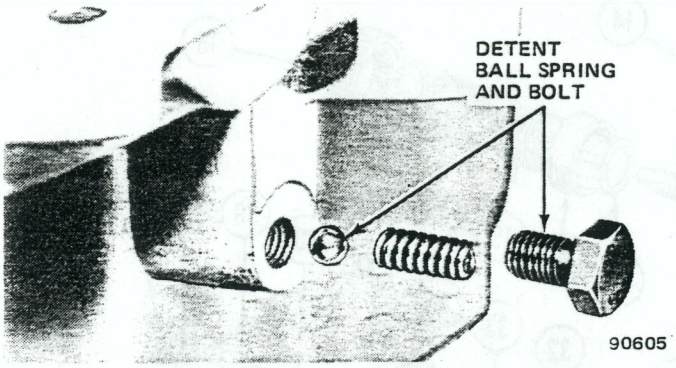


Fig. 2D-10 Detent Ball, Spring and Bolt Removal/Installation

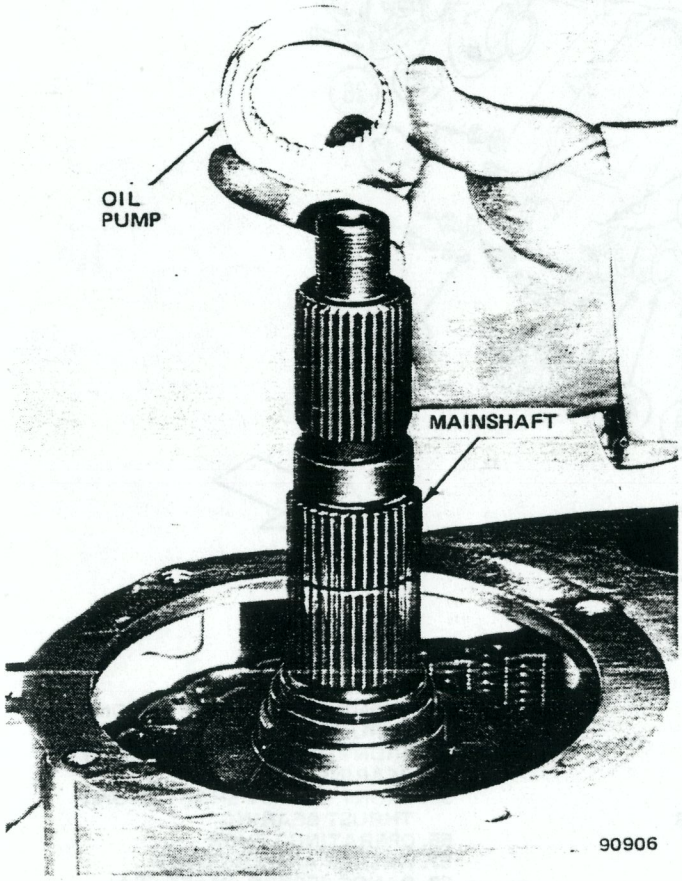


Fig. 2D-11 Oil Pump Removal/Installation

CAUTION: *To remove the rear case, insert screwdrivers into the slots cast in the case ends and gently pry upward. Do not attempt to wedge the case halves apart at any point on the mating surfaces.*

(12) Remove front output shaft rear thrust bearing assembly (fig. 2D-12). Note position of bearing and races for assembly reference.

(13) Remove driven sprocket retaining snap ring (fig. 2D-13).

(14) Remove drive sprocket retaining snap ring and remove thrust washer and spacer washer, if equipped (fig. 2D-14).

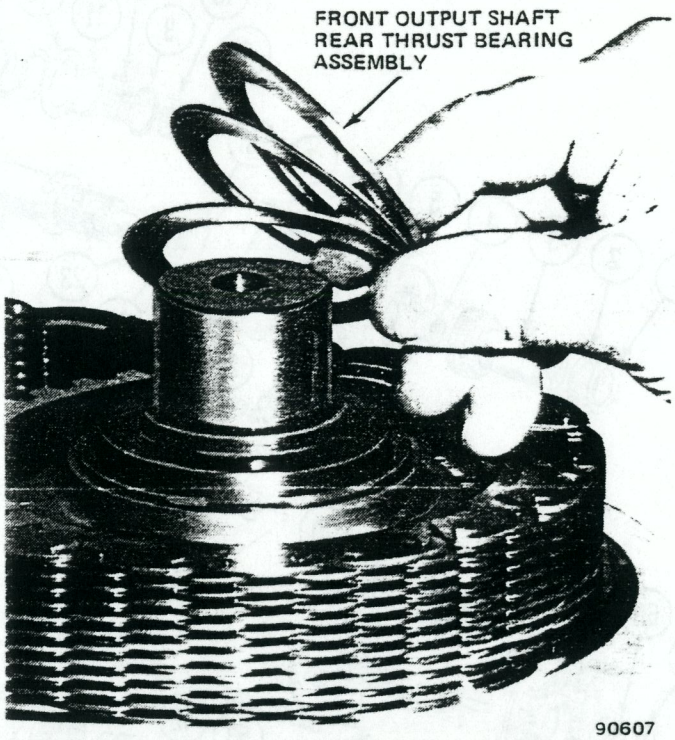


Fig. 2D-12 Front Output Shaft Rear Thrust Bearing Assembly Removal/Installation

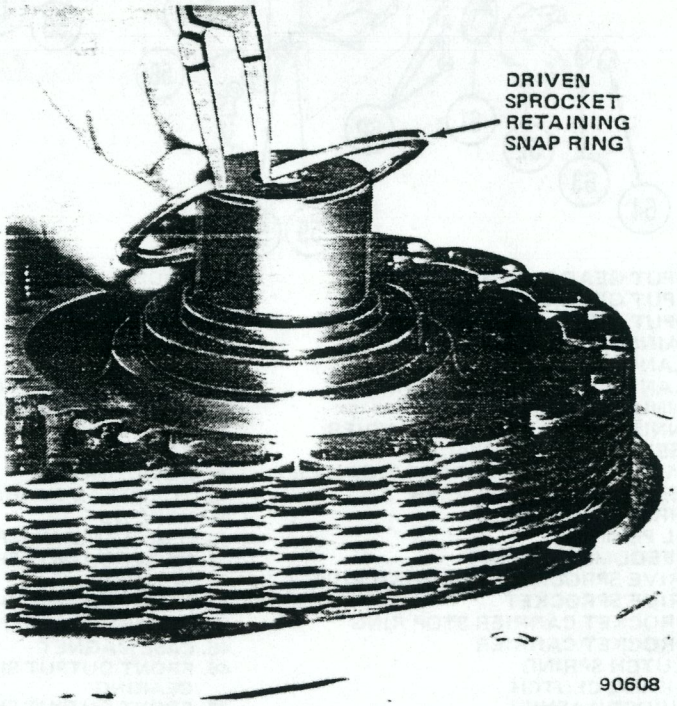


Fig. 2D-13 Driven Sprocket Retaining Snap Ring Removal/Installation

(15) Remove drive and driven sprockets and drive chain as assembly (fig. 2D-15). Lift evenly on both sprockets to remove assembly.

(16) Remove front output shaft and front thrust bearing assembly (fig. 2D-16).

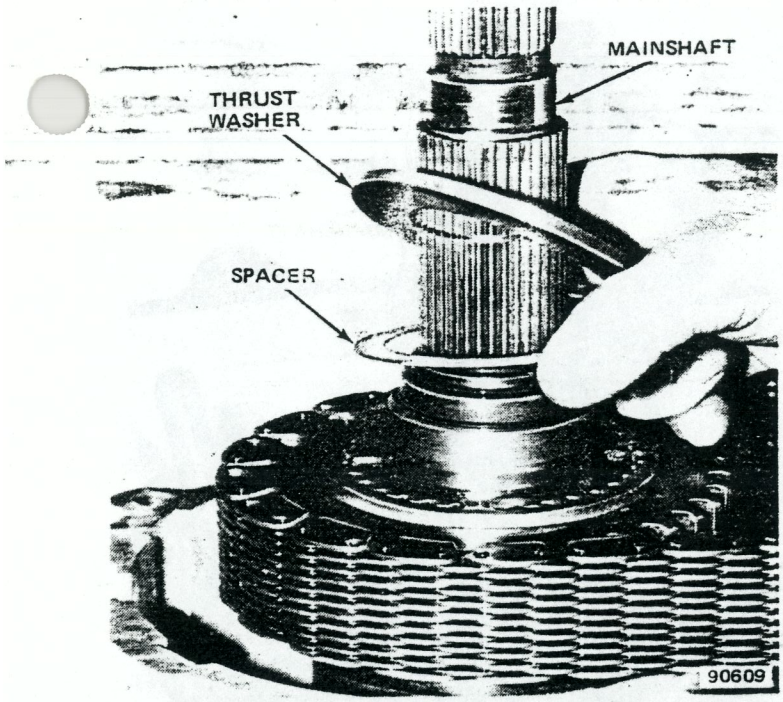


Fig. 2D-14 Drive Sprocket Thrust Washer and Spacer Removal/Installation

(17) Remove sprocket carrier stop ring (fig. 2D-17).

(18) Remove clutch spring (fig. 2D-17).

(19) Remove sliding clutch, mode fork, mode fork spring and bracket as assembly (fig. 2D-18). Remove shift rail.

(20) Remove sprocket carrier, needle bearing upper retainer, thrust washer and mainshaft needle bearings as assembly (fig. 2D-19).

(21) Remove mainshaft (fig. 2D-20).

(22) Remove annulus gear retaining ring and thrust washer (fig. 2D-20).

(23) Remove annulus gear and range fork as assembly. Turn fork counterclockwise to disengage fork lug from range sector and lift assembly out of case (fig. 2D-21).

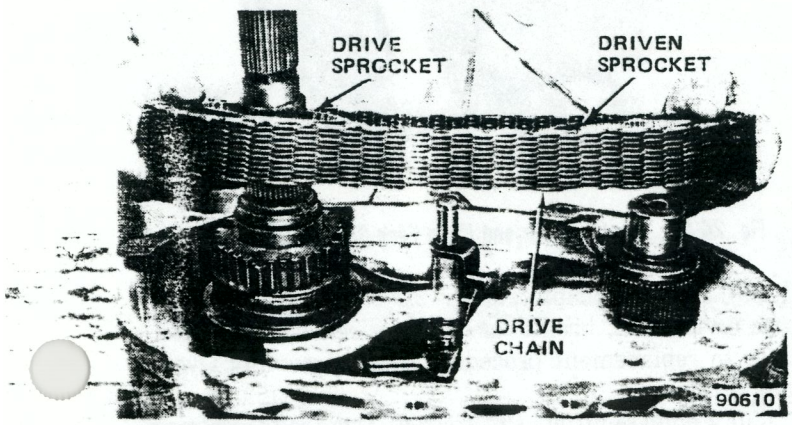


Fig. 2D-15 Sprocket and Chain Removal/Installation

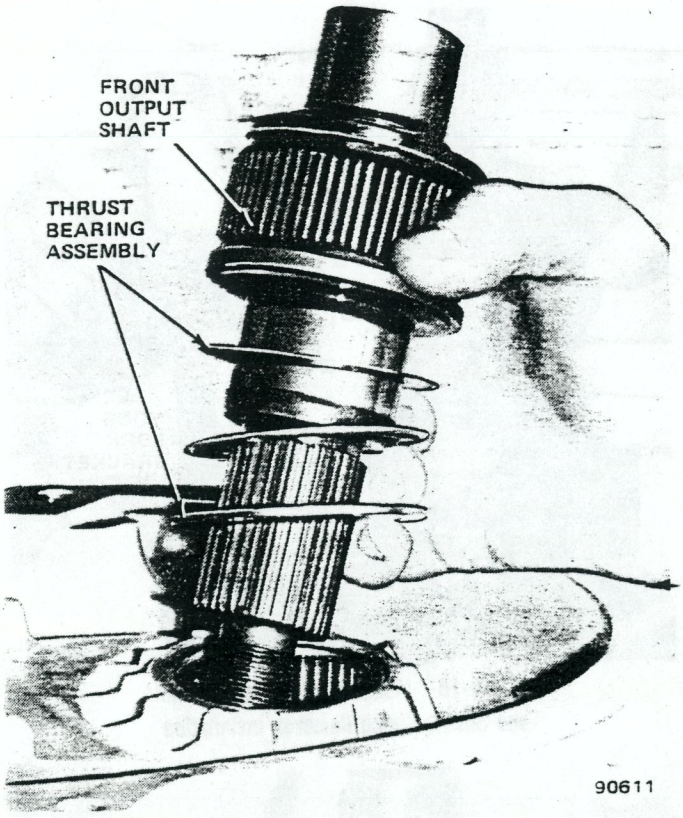


Fig. 2D-16 Front Output Shaft and Front Thrust Bearing Assembly Removal/Installation

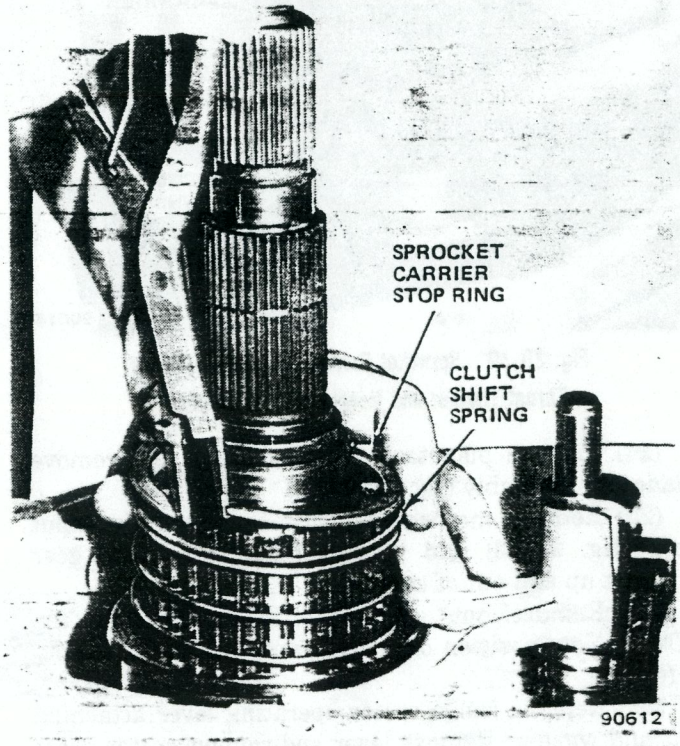


Fig. 2D-17 Sprocket Carrier Stop Ring and Clutch Spring Removal/Installation

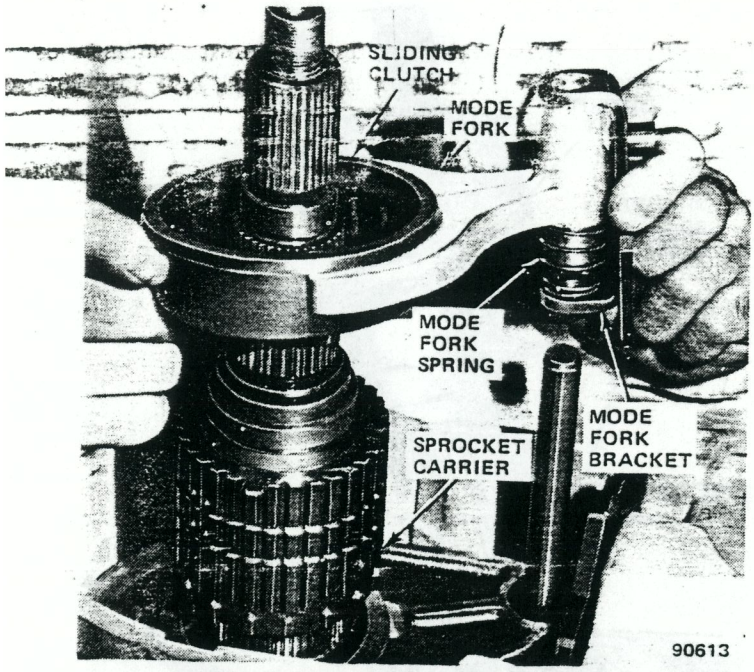


Fig. 2D-18 Mode Fork, Spring, Bracket and Sliding Clutch Removal/Installation

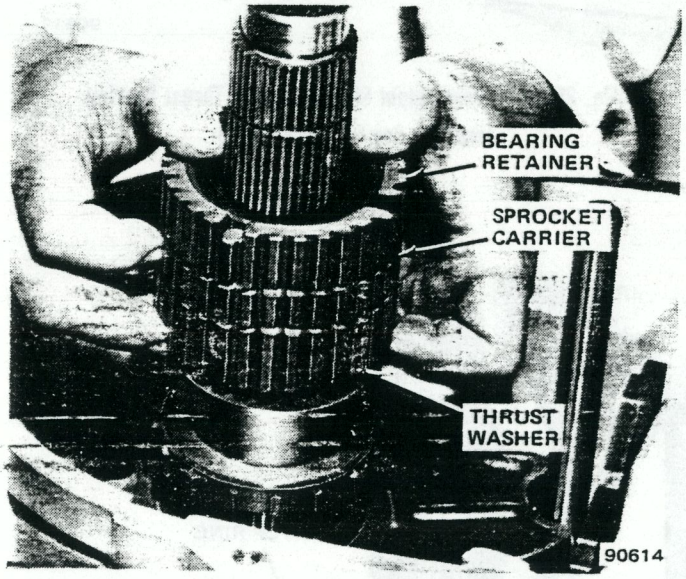


Fig. 2D-19 Sprocket Carrier, Bearing Retainers, Thrust Washer and Needle Bearing Removal

(24) Remove planetary thrust washer and remove planetary assembly (fig. 2D-22).

(25) Remove mainshaft thrust bearing from input gear (fig. 2D-23) and remove input gear. Lift gear straight up and out of case.

(26) Remove input gear thrust bearing and race (fig. 2D-24). Note position of bearing and race for assembly reference.

(27) Remove range sector operating lever attaching nut and washer. Remove lever and remove sector shaft seal and seal retainer (fig. 2D-9).

(28) Remove range sector.

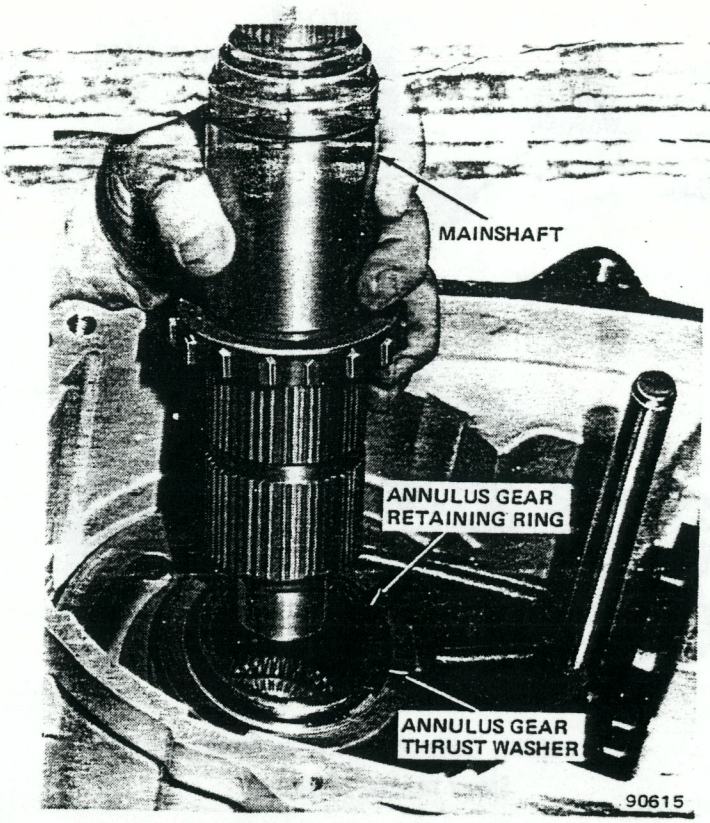


Fig. 2D-20 Mainshaft Removal/Installation

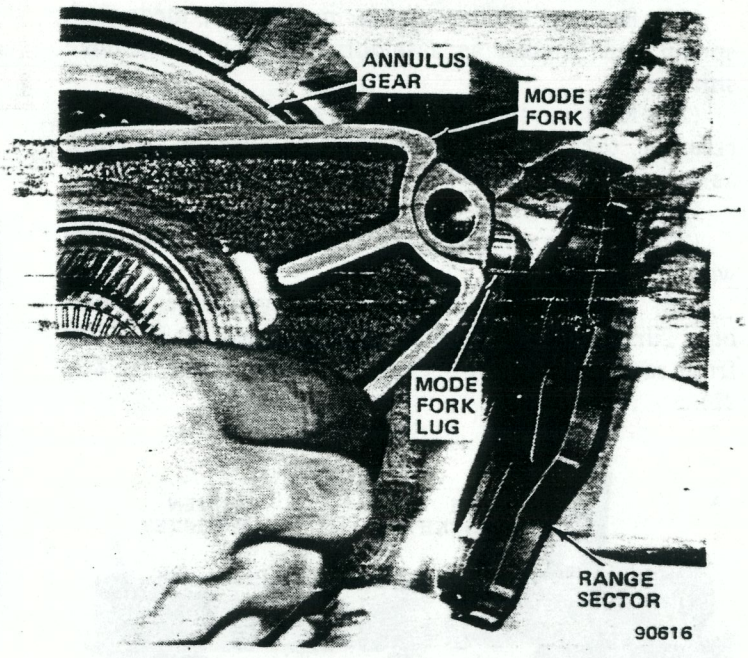


Fig. 2D-21 Annulus Gear and Mode Fork Removal/Installation

(29) Inspect lockplate (fig. 2D-24). If lockplate is loose or is worn, broken or cracked, remove lockplate. Refer to replacement procedure in Subassembly Overhaul section.

(30) Remove output shaft seals from front and rear case seal bores.

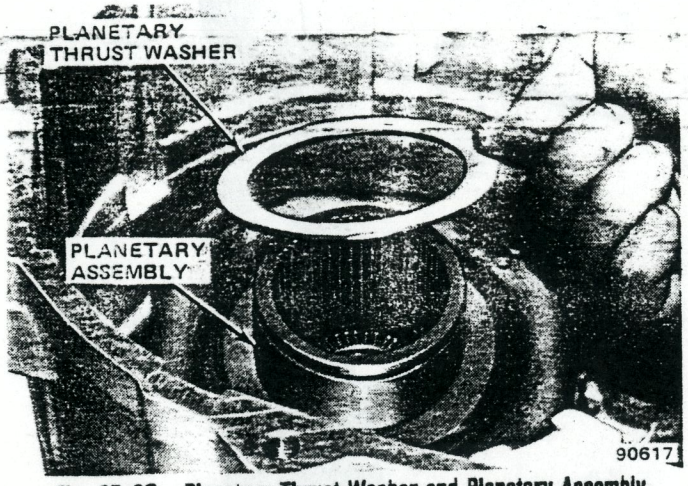


Fig. 2D-22 Planetary Thrust Washer and Planetary Assembly

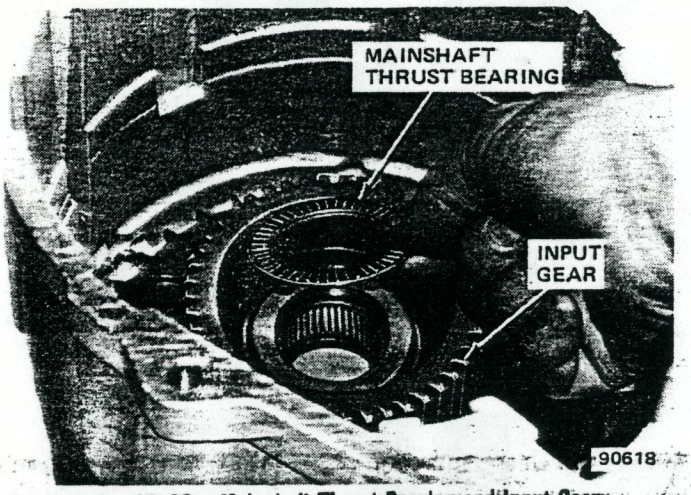


Fig. 2D-23 Mainshaft Thrust Bearing and Input Gear

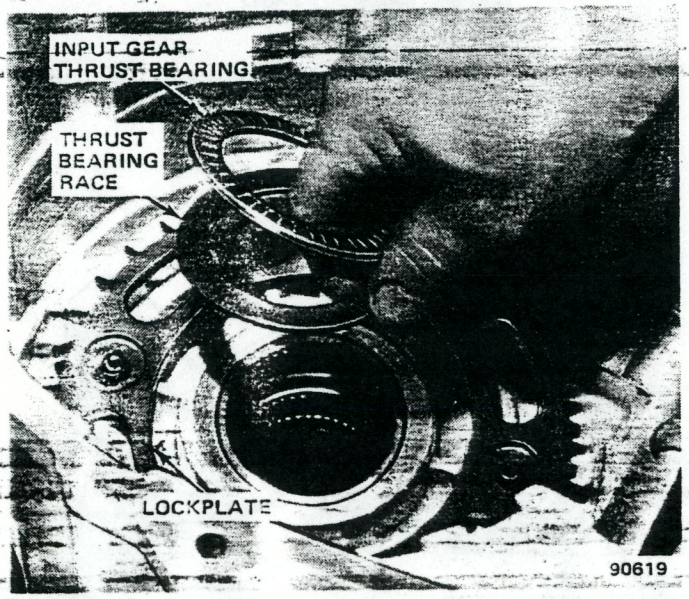


Fig. 2D-24 Input Gear Thrust Bearing and Race Removal—Installation

CLEANING AND INSPECTION

Wash all parts thoroughly in clean solvent. Be sure all old lubricant, metallic particles, dirt, or foreign material are removed from the surfaces of every part. Apply compressed air to each oil feed port and channel in each case half to remove any obstructions or cleaning solvent residue.

Inspect all gear teeth for signs of excessive wear or damage and check all gear splines for burrs, nicks, wear or damage. Remove minor nicks or scratches on oil stone. Replace any part exhibiting excessive wear or damage.

Inspect all snap rings and thrust washers for evidence of excessive wear, distortion, or damage. Replace any of these parts if they exhibit these conditions.

Inspect the two case halves for cracks, porosity, damaged mating surfaces, stripped bolt threads, or distortion. Replace any part that exhibits these conditions.

Inspect the low range lockplate in the front case. If the lockplate teeth or the plate hub is cracked, broken, chipped, or excessively worn, replace the lockplate and the lockplate attaching bolts. Refer to the Low Range Lockplate Replacement procedure in the Subassembly Overhaul section.

Inspect the condition of all needle, roller, ball and thrust bearings in the front and rear case halves and the input gear. Also check the condition of the bearing bores in both cases and in the input gear, rear output shaft, side gear, and rear retainer. Replace any part that exhibits signs of excessive wear or damage. If the case or input gear bearings require replacement, refer to Bearing Replacement in the Subassembly Overhaul section.

SUBASSEMBLY OVERHAUL

Lockplate Replacement

(1) Remove and discard lockplate attaching bolts.

(2) Remove lockplate from case.

(3) Coat case and lockplate surfaces around bolt holes with Loctite 515, or equivalent sealant.

(4) Position new lockplate in case and align bolt holes in lockplate and case.

(5) Coat new lockplate attaching bolts with Loctite 271, or equivalent adhesive sealant.

(6) Install and tighten lockplate attaching bolts to 30 foot-pounds (41 N•m) torque.

Bearing/Bushing Replacement

CAUTION: *All of the bearings used in the transfer case must be correctly positioned to avoid covering the bearing oil feed holes. After replacing any bearings check the bearing position to be sure the feed hole is not obstructed or blocked by the bearing.*

Rear Output Bearing and Rear Seal Replacement

(1) Remove bearing retaining snap ring and tap bearing out of retainer using mallet or brass drift.

(2) Remove rear seal using screwdriver or brass drift.

(3) Install new bearing using Tool J-7818 (fig. 2D-25). Be sure shielded side of bearing faces interior of case.

(4) Install bearing retaining snap ring.

(5) Install new rear seal using Tools J-8092 and J-29162 (fig. 2D-26).

Front Output Shaft Front Bearing Replacement

(1) Remove bearing using Tools J-8092 and J-29168 (fig. 2D-27).

(2) Install new bearing using Tools J-8092 and J-29167 (fig. 2D-28).

(3) Remove installer tools and check bearing position to be sure oil feed hole is not covered.

Front Output Shaft Rear Bearing Replacement

(1) Remove bearing using Remover J-26941 and Slide Hammer J-2619-01 (fig. 2D-29).

(2) Install new bearing using Driver Handle J-8092 and Installer J-29163 (fig. 2D-30).

(3) Remove installer tools and check bearing position to be sure oil feed hole is not covered. Also be sure bearing is seated flush with edge of case bore to allow room for thrust bearing assembly.

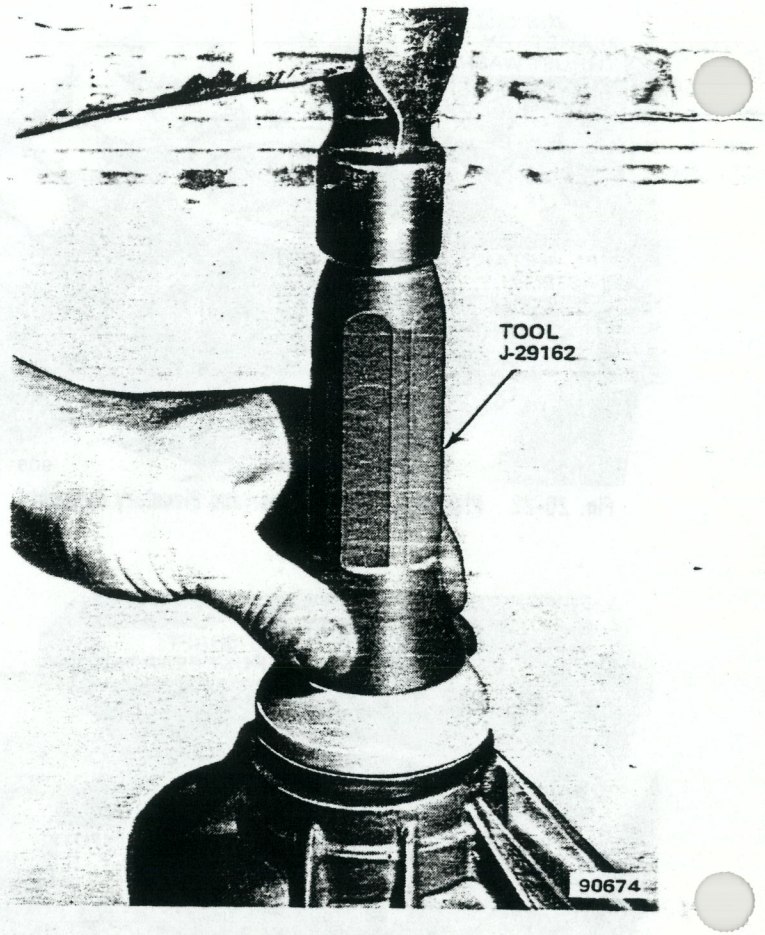


Fig. 2D-26 Rear Seal Installation

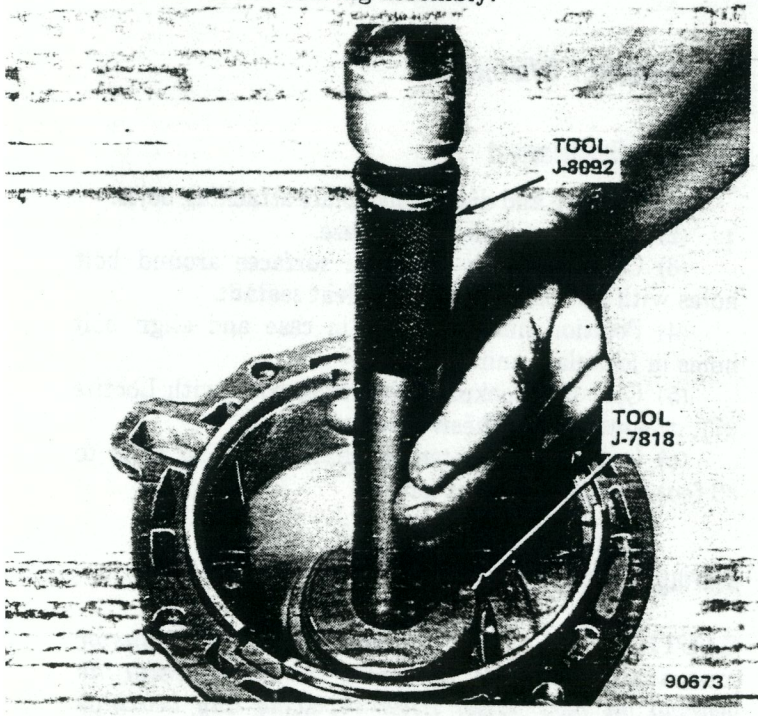


Fig. 2D-25 Rear Output Bearing Installation

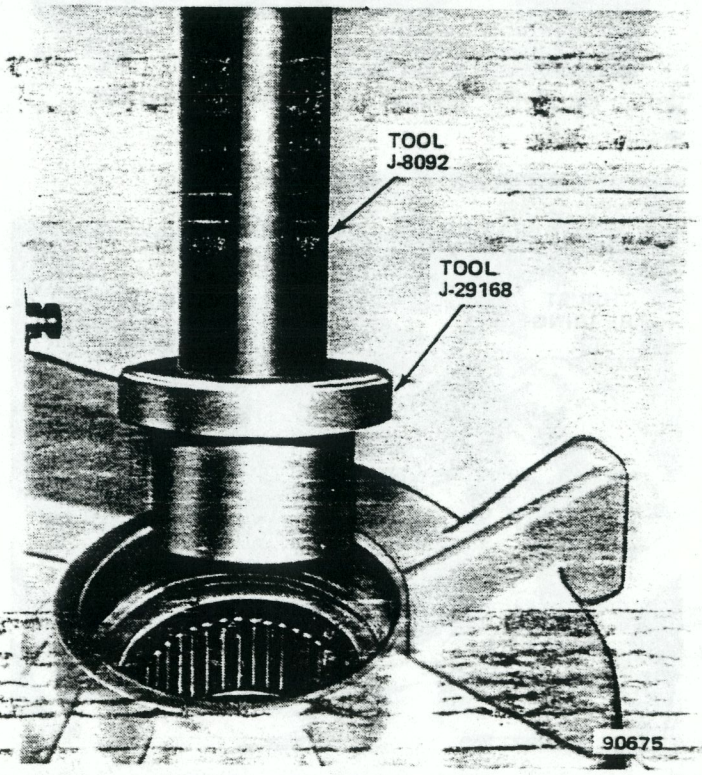


Fig. 2D-27 Front Output Shaft Front Bearing Removal

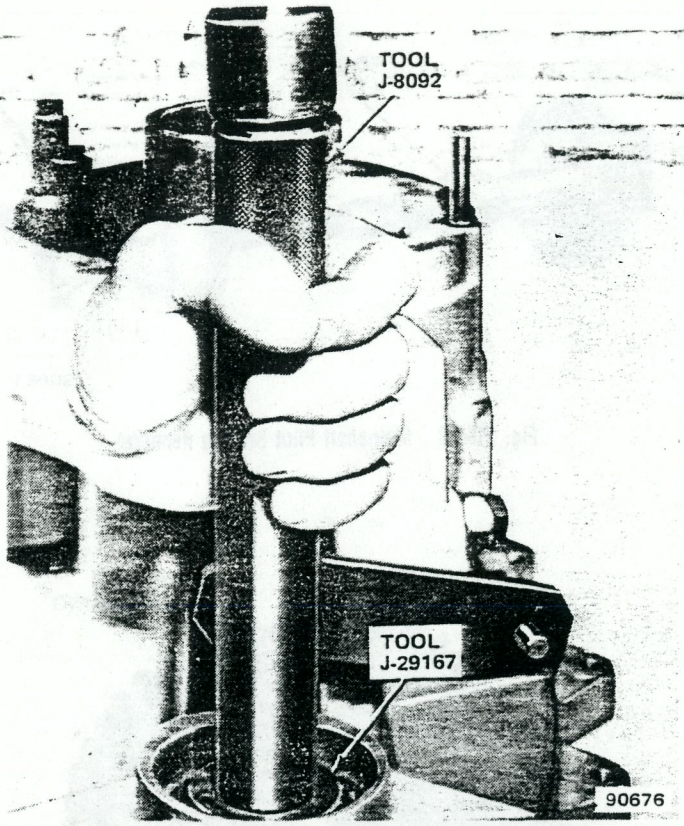


Fig. 2D-28 Front Output Shaft Front Bearing Installation

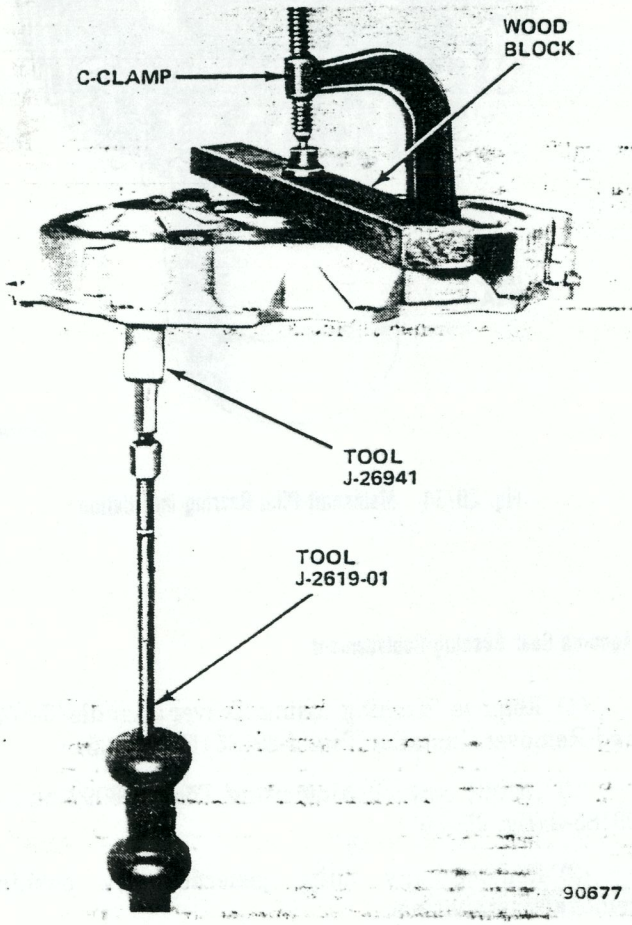


Fig. 2D-29 Front Output Shaft Rear Bearing Removal

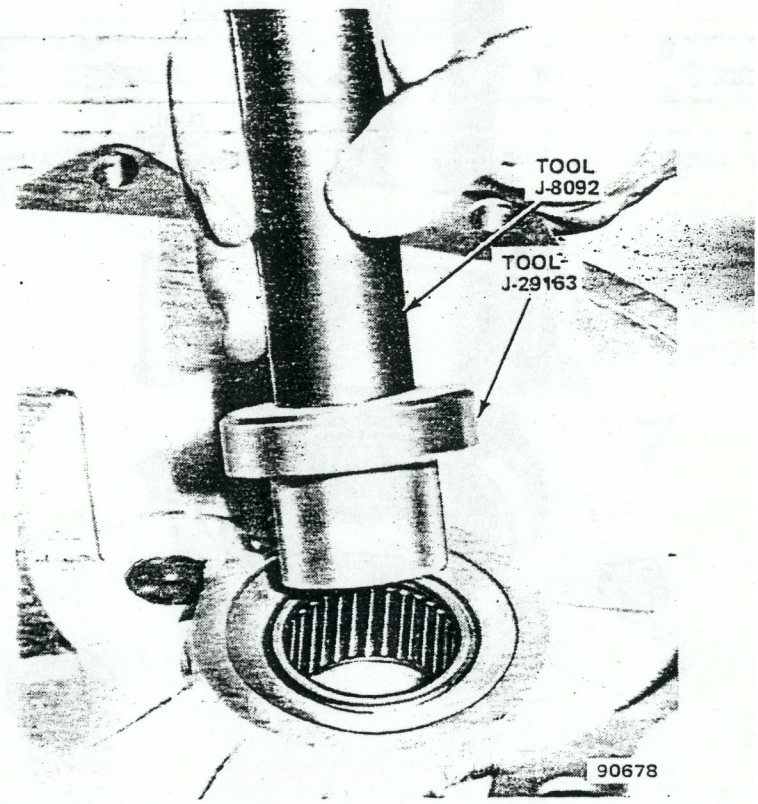


Fig. 2D-30 Front Output Shaft Rear Bearing Installation

Input Gear Front/Rear Bearing Replacement

(1) Remove both bearings simultaneously using Driver Handle J-8092 and Remover J-29170 (fig. 2D-31).

(2) Install new bearings one at a time. Install rear bearing first; then install front bearing. Use Driver Handle J-8092 and Installer J-29169 (fig. 2D-32).

(3) Remove installer tools and check bearing position to be sure oil feed holes are not covered. Also be sure bearings are flush with case bore surfaces.

Mainshaft Pilot Bearing Replacement

(1) If bearing cannot be removed by hand, remove it using Slide Hammer J-2619-01 and Remover J-29369-1 or similar internal type blind hole bearing puller (fig. 2D-33).

(2) If necessary, install new bearing using Driver Handle J-8092 and Installer J-29174 (fig. 2D-34).

(3) If bearing was seated using installer tools, check bearing position to be sure hole feed hole is not covered. Also be sure bearing is seated flush with edge of bearing bore.

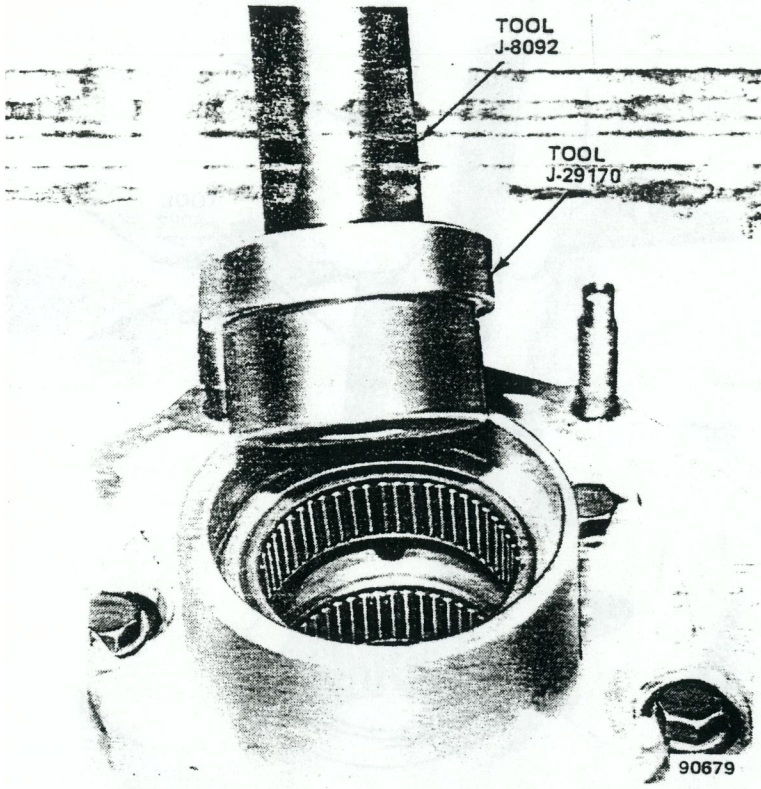


Fig. 2D-31 Input Gear Bearing Removal

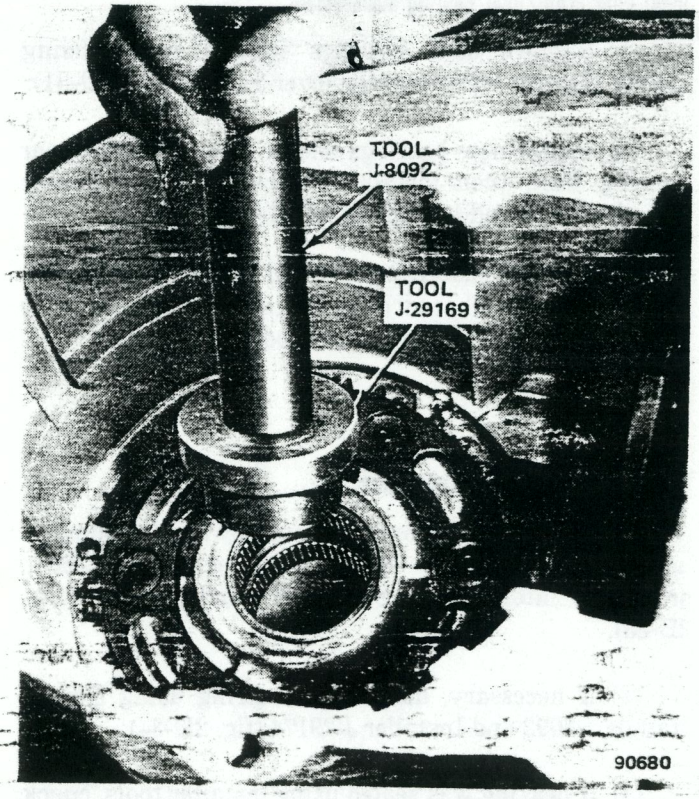


Fig. 2D-32 Input Gear Bearing Installation

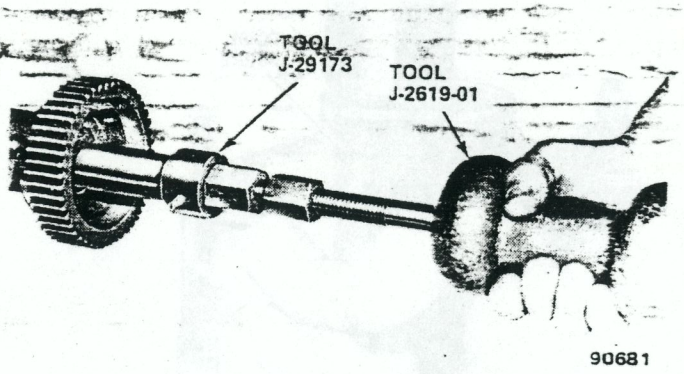


Fig. 2D-33 Mainshaft Pilot Bearing Removal

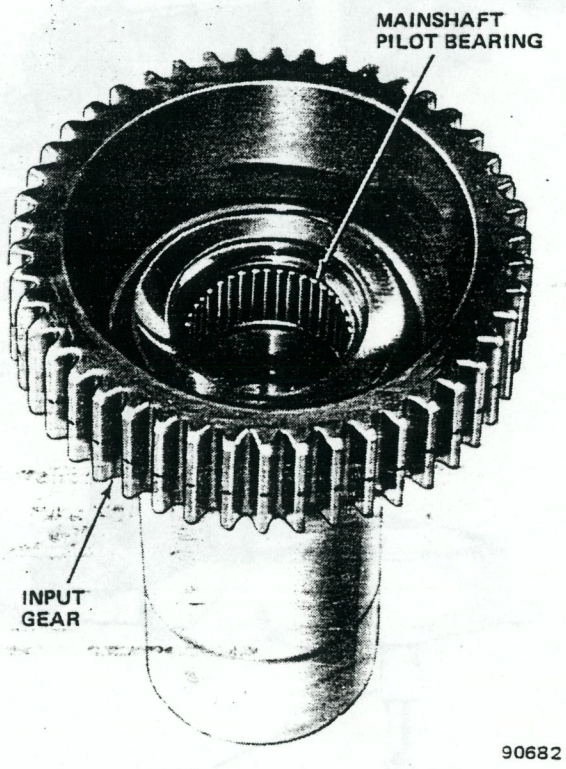


Fig. 2D-34 Mainshaft Pilot Bearing Installation

Annulus Gear Bushing Replacement

(1) Remove bushing using Driver Handle J-8092 and Remover/Installer Tool J-29185 (fig. 2D-35).

(2) Install new bushing using Tools J-8092 and J-29185-2 (fig. 2D-36).

(3) Remove any chips generated by bushing removal/installation.

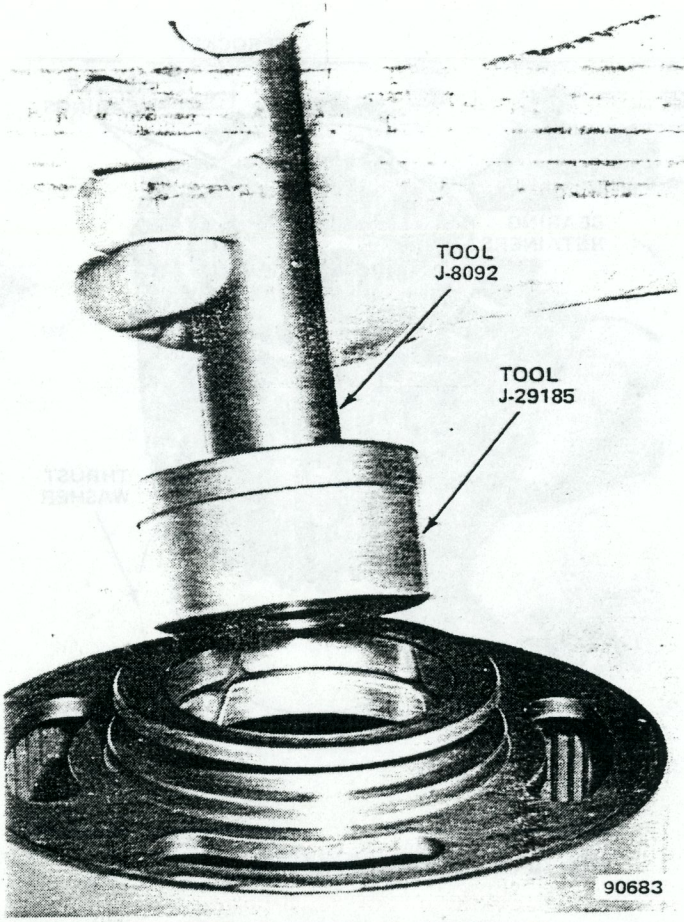


Fig. 2D-35 Annulus Gear Bushing Removal

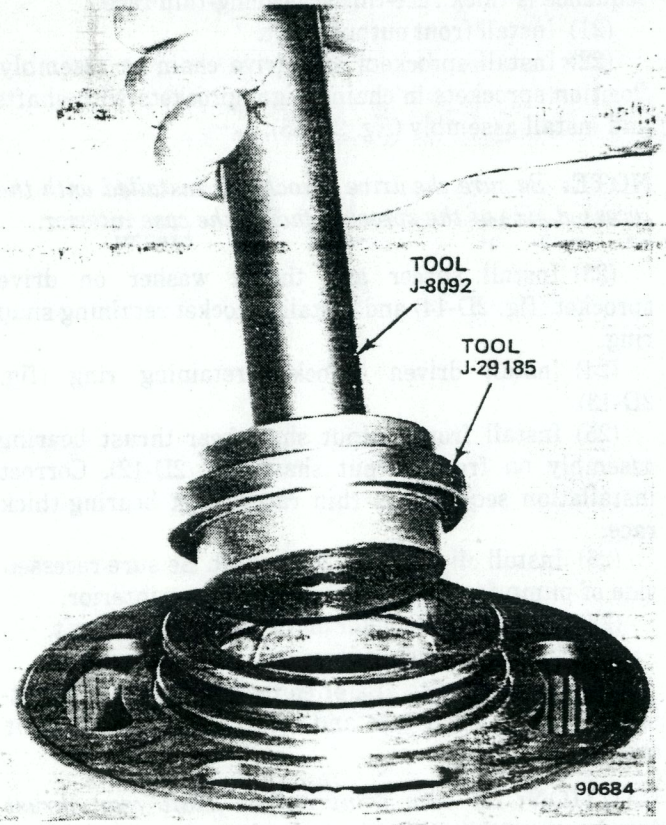


Fig. 2D-36 Annulus Gear Bushing Installation

ASSEMBLY

NOTE: *During assembly, lubricate all components with 10W-30 motor oil or petroleum jelly where indicated only. Do not use any other type of lubricants.*

(1) Install input gear race and thrust bearing in front case (fig. 2D-24).

(2) Install input gear.

(3) Install mainshaft thrust bearing in input gear (fig. 2D-37).

(4) Install range sector shaft seal and seal retainer (fig. 2D-9).

(5) Install range sector.

(6) Install operating lever on range sector shaft. Install and tighten shaft washer and locknut to 18 foot-pounds (24 N•m) torque.

(7) Install planetary assembly over input gear (fig. 2D-37). Be sure planetary is fully seated and meshed with gear.

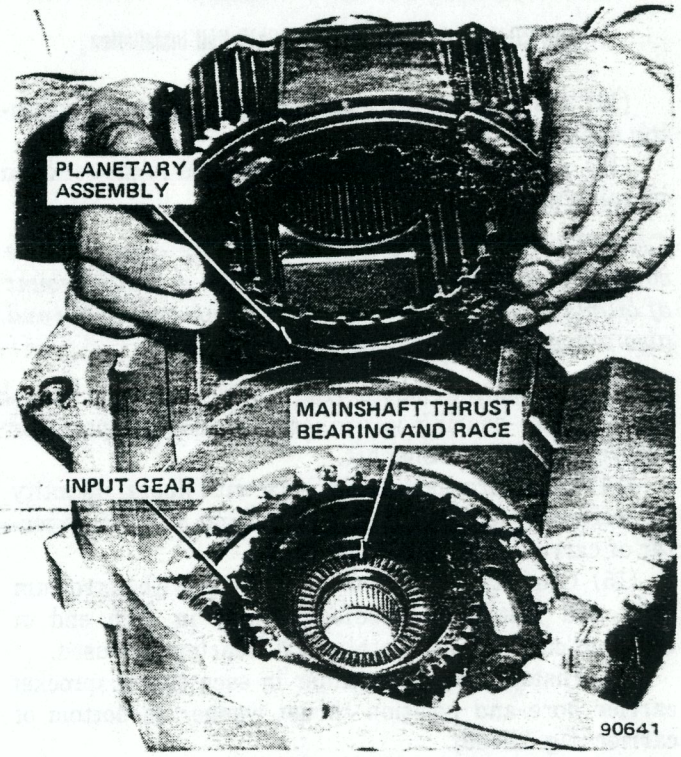


Fig. 2D-37
Input Gear, Mainshaft Thrust Bearing and Planetary Installation

(8) Install planetary thrust washer on planetary hub (fig. 2D-22).

(9) Install inserts in range fork, if removed.

(10) Engage range fork in annulus gear and install annulus gear over planetary assembly (fig. 2D-38).

NOTE: *Be sure the range fork lug is fully inserted in the range sector slot (fig. 2D-21).*

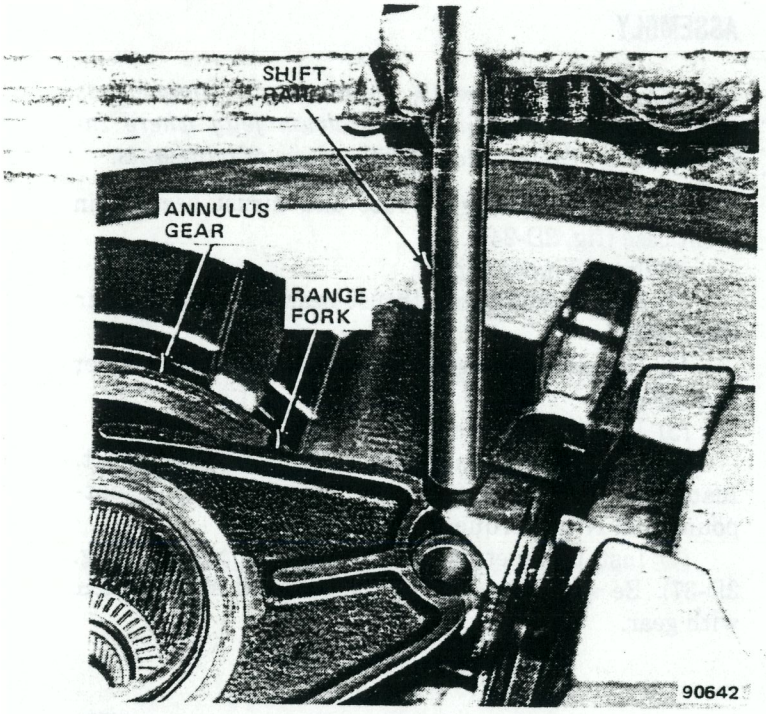


Fig. 2D-38 Annulus Gear and Shift Rail Installation

(11) Install annulus gear thrust washer and retaining snap ring (fig. 2D-20).

(12) Align shift rail bores in case and range fork and install shift rail (2D-38).

CAUTION: *The shift rail bore in the case must be completely dry and not contain any oil. A small amount of oil may prevent the rail from seating completely and also prevent front case installation.*

(13) Install mainshaft (fig. 2D-20). Be sure mainshaft thrust bearing is properly seated in input gear before installing mainshaft.

(14) Coat sprocket carrier bore with liberal quantity of petroleum jelly and position bearing retainer at center of carrier bore.

(15) Coat mainshaft needle bearings with petroleum jelly and install 60 needle bearings in each end of sprocket carrier bore. Total of 120 bearings are used.

(16) Install bearing retainer in each end of sprocket carrier bore and position thrust washer on bottom of carrier (fig. 2D-39).

(17) Align assembled carrier and needle bearings with mainshaft and install assembly on mainshaft (fig. 2D-16). Take care to avoid displacing needle bearings during installation.

(18) Assemble mode fork, fork spring and bracket. Engage fork in sliding clutch and install assembly on shift rail and mainshaft (fig. 2D-18).

(19) Install clutch spring and stop ring on sprocket carrier (fig. 2D-17).

NOTE: *If the sprocket carrier has two ring grooves, install the stop ring in the upper groove only.*

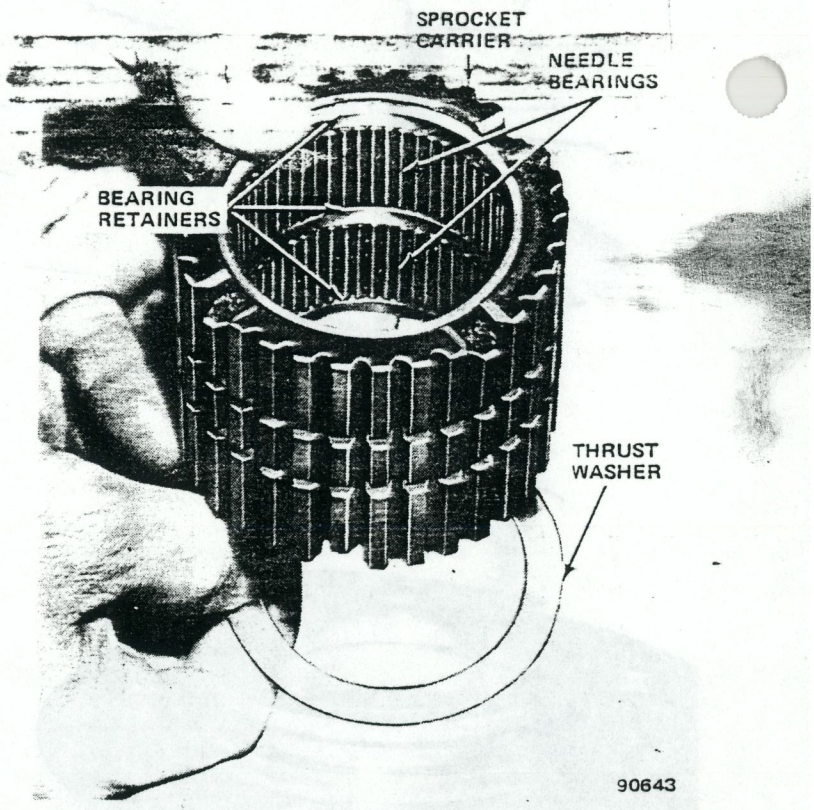


Fig. 2D-39 Assembling Sprocket Carrier Components

(20) Install front output shaft front thrust bearing assembly in front case (fig. 2D-16). Correct installation sequence is thick race-thrust bearing-thin race.

(21) Install front output shaft.

(22) Install sprockets and drive chain as assembly. Position sprockets in chain, align sprockets with shafts and install assembly (fig. 2D-15).

NOTE: *Be sure the drive sprocket is installed with the recessed side of the sprocket facing the case interior.*

(23) Install spacer and thrust washer on drive sprocket (fig. 2D-14) and install sprocket retaining snap ring.

(24) Install driven sprocket retaining ring (fig. 2D-13).

(25) Install front output shaft rear thrust bearing assembly on front output shaft (fig. 2D-12). Correct installation sequence is thin race-thrust bearing-thick race.

(26) Install oil pump on mainshaft. Be sure recessed side of pump faces downward toward case interior.

(27) Install speedometer drive gear on mainshaft.

(28) Install magnet in front case, if removed.

(29) Apply Loctite 515, or equivalent sealant, to mating surface of front case and install rear case on front case.

CAUTION: *Be sure front output shaft rear thrust bearing assembly is seated in the rear case.*

(30) Align case bolt holes and alignment dowels and install bolts. Tighten bolts alternately and evenly to 23 foot-pounds (31 N•m) torque.

NOTE: *Be sure to install flat washers on the two bolts installed at the opposite ends of the case.*

(31) Install rear output bearing in rear retainer and install snap ring.

(32) Install seal in pump housing. Apply petroleum jelly to pump housing tabs and install housing in rear retainer.

(33) Apply Loctite 515, or equivalent sealant, to mating surface of rear retainer.

(34) Align rear retainer and case index marks and install retainer. Install and tighten retainer bolts to 23 foot-pounds (23 N•m) torque.

(35) Install oil seal in rear retainer bore. Coat seal lip with petroleum jelly before installation.

(36) Install washer and indicator switch. Tighten switch to 18 foot-pounds (24 N•m) torque.

(37) Apply small quantity of Loctite 515, or equivalent sealant, to detent retainer bolt and install detent ball, spring and bolt (fig. 2D-10). Tighten bolt to 23 foot-pounds (31 N•m) torque.

(38) Install drain plug and gasket. Tighten plug to 35 foot-pounds (47 N•m) torque.

(39) Install oil seal in front case output shaft bore.

(40) Install front and rear yokes. Be sure to install yoke, with collar on it, on front output shaft.

(41) Install yoke seal washers and yoke nuts. Tighten nuts to 120 foot-pounds (163 N•m) torque.

(42) Pour 6 pints (3 liters) of 10W-30 motor oil into transfer case through fill plug hole and install and tighten fill plug to 18 foot-pounds (24 N•m) torque.

SPECIFICATIONS

Specifications—Model 208 Transfer Case

Transfer Case Type	4-position, dual range, part-time 4-wheel drive unit with integral low range
Torque Transmittal Mode	Dual sprockets with interconnecting drive chain
Low Range Reduction Ratio and Mode	2.6:1 through annulus gear and planetary carrier assembly
Drive positions and shift controls	2H, 4H, 4L, Neutral — Ranges selected via floor-mounted shift lever. (4-wheel drive ranges are undifferentiated)
Case Configuration	Two-piece aluminum casting with removable rear retainer
Lubricant Capacity and Type	6 pints (3 liters) 10W-30 motor oil (only).

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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
Detent Retainer Bolt	23	20-25	31	27-34
Drain and Fill Plugs	35	30-40	47	40-54
Front/Rear Yoke Nuts	120	90-130	163	122-176
Indicator Switch	18	15-20	24	20-34
Operating Lever Locknut	18	14-20	24	19-27
Rear Case-to-Front Case Bolts (All)	23	20-25	31	27-34
Rear Retainer Bolts	23	20-25	31	27-34

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

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MODEL 219 QUADRA-TRAC TRANSFER CASE

GENERAL

The model 219 Quadra-Trac transfer case provides four-wheel high and low ranges, a neutral position and a four-wheel high-lock position for use when the vehicle is immobile due to excessive wheel spin.

Model 219 provides full-time, fully differentiated operation in 4H range only. The 4L and Lock ranges provide undifferentiated drive modes. In 4H range, differentiation is accomplished through a torque biasing viscous coupling and an open differential connected to the coupling. Two drive sprockets and an interconnecting drive chain are used to distribute input torque.

Drive range selection is by means of a floor mounted shift lever. A straight line shift pattern is used for all models equipped with the 219 (fig. 2D-40).

Fig. 2D-40 Model 219 Shift Pattern

Four-Wheel High-Lock Position Indicator Lamp

An indicator lamp is mounted in the instrument panel to alert the driver whenever the vehicle is being operated in four-wheel high-lock range. The lamp is controlled by an indicator switch in the transfer case. The switch is a ball and plunger unit that is activated by the transfer case range sector when four-wheel high-lock range is selected. The indicator lamp is illuminated in the four-wheel high-lock position only.

IDENTIFICATION

An identification tag is attached to the rear half of the transfer case (fig. 2D-3). This tag provides the transfer case-model number, low range reduction ratio, and assembly number. The information on this tag is necessary for servicing information. If the tag is removed or becomes dislodged during service operations, it should be reattached using an adhesive sealant such as Loctite 312, or equivalent.

LUBRICATION

The model 219 transfer case lubricant should be changed at the intervals specified in the Maintenance Schedule. When adding lubricant to or refilling the transfer case after service, use a quality grade 10W-30 motor oil only. Do not use any type of anti-friction type additives or similar substance. Use the specified grade of motor oil only. Refer to the In-Vehicle Service section for lubricant change procedures and fill level. Model 219 lubricant capacity is 4 pints (2 liters).

POWER FLOW

Four-Wheel High (4H) Range

In all drive range positions, input torque is transmitted to the transfer case geartrain through the input gear (fig. 2D-41).

In four high range (4H), torque flows from the input gear to the planetary assembly and annulus gear which rotate as a unit. Torque is transferred to the mainshaft through the planetary carrier which is splined to the mainshaft (fig. 2D-41).

In 4H range, the clutch sleeve is not engaged with the mainshaft. Torque flows through the mainshaft to the differential pinions which are splined to the mainshaft. Torque is then transmitted through the pinions to the gear teeth on the side gear and rear output shaft. Since the side gear is splined to the drive sprocket, torque is also transmitted to the front output shaft through the driven sprocket which is connected to the drive sprocket by the drive chain (fig. 2D-41).

Viscous Coupling and Differential Operation in 4H Range

The differential assembly consists of the side gear, rear output shaft and the viscous coupling and differential pinion gear assembly. The differential operates in the same fashion as an open-type axle differential. In straight-ahead driving, the differential and coupling rotate as a unit. On turns, the differential allows the front and rear axles to operate at their own speeds. This occurs because the pinions are then free to rotate around the side gear and rear output shaft gear teeth at differing speeds.

The viscous coupling functions as a torque biasing slip limiting unit. If consists of an enclosed housing containing two sets of fixed clutch plates and a special silicone fluid. The differential pinion gears are located in the open center section of the coupling.

The coupling is connected to the front propeller shaft through the side gear and drive sprocket which operates the driven sprocket and front output shaft via the drive chain. The rear propeller shaft is connected to the coupling through the rear output shaft side gear teeth which are meshed with the differential pinions. In normal operation, the coupling is not active. Front/rear

The coupling does not provide limited slip operation in 4L or Lock positions. In these ranges the coupling is locked to the shafts and torque flow bypasses the differential. Transfer case operation is undifferentiated in these drive modes.

Four-Wheel Low (4L) Range

In 4L range, the torque path through the transfer case is similar to 4H range (fig. 2D-41). However, in 4L the clutch sleeve is engaged with the mainshaft and the annulus gear is shifted forward into engagement with the fixed (stationary) lockplate. This prevents the annulus gear from rotating. The planetary pinions are forced to rotate around the annulus internal teeth producing a gear reduction ratio of 2.61:1. Because the mainshaft, side gear and sprocket and coupling are all locked together in 4L position, the differential is bypassed resulting in undifferentiated four-wheel drive.

Lock Position

In Lock position, the clutch sleeve is moved forward into engagement with the mainshaft. Since the sleeve is still engaged with the side gear clutch, it locks the side gear and drive sprocket, which is splined to the side gear, to the mainshaft as well. Torque now flows through the side gear directly to the viscous coupling housing through the clutch gear which is splined to the side gear. Because the rear output shaft is also splined to the coupling housing, the differential is bypassed resulting in an undifferentiated four-wheel drive-lock mode. This range should be used only when the vehicle is immobile due to excessive wheel spin.

SERVICE DIAGNOSIS

Before attempting to repair a suspected transfer case malfunction, check all other drive line components beforehand. The actual cause of a problem may be related to such items as the front hubs, axles, propeller shafts, wheels and tires, transmission, or clutch instead. If all other drive line components are in good condition and operating properly, refer to the service diagnosis charts for further information.

Torque Bias Check—Model 219

A method for checking viscous coupling operation, both in and out of the vehicle, has been developed. The procedure involves measuring the torque required to rotate the coupling when it is in a static (at rest) condition. Whenever diagnosis indicates a possible coupling malfunction, check coupling torque bias (static rotating torque) as outlined in the following two procedures.

In-Vehicle Torque Bias Check

(1) Place vehicle on level surface. Stop engine.

(2) Place transmission shift lever in NEUTRAL and transfer case shift lever in 4 HIGH position.

(3) Raise one front wheel off floor.

(4) Remove hub cap from wheel just raised.

(5) Assemble socket and torque wrench and install on any lug nut of wheel just raised.

(6) Rotate wheel using torque wrench and measure torque required to rotate wheel.

(7) If coupling is operating properly, it should require minimum of 45 foot-pounds (61 N•m) to rotate wheel.

(8) If rotating torque is at or above specified limit, remove wrench, install hub cap and lower wheel.

(9) If rotating torque is below specified limit, remove wrench, install hub cap, lower wheel and refer to On-Bench Torque Bias Check.

On-Bench Torque Bias Check

NOTE: *The following procedure can be used as both a diagnostic procedure and a means of verifying coupling operation prior to reassembly and installation of the transfer case.*

(1) Remove and disassemble transfer case as outlined in 1980 Jeep Technical Service Manual.

(2) Install clutch gear on side gear (fig. 2D-42).

(3) Install assembled clutch gear and side gear in viscous coupling.

(4) Mount assembled coupling and gears in vise. Place wood blocks between vise jaws and side gear and clamp side gear firmly (fig. 2D-43).

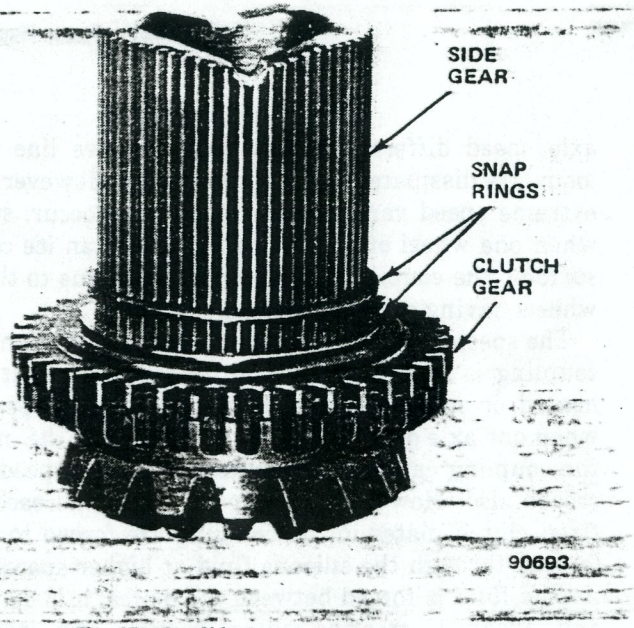

Fig. 2D-42 Side Gear Components

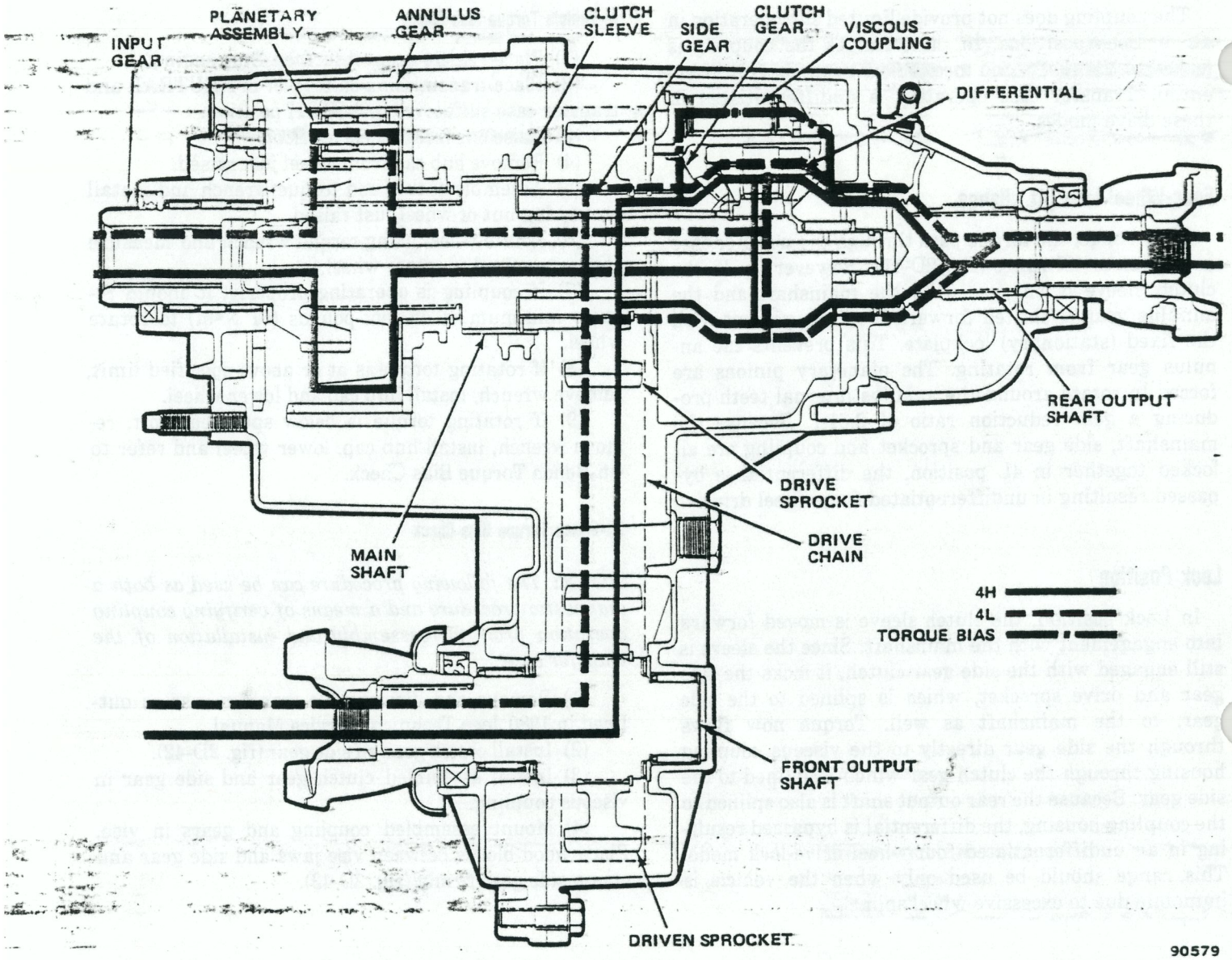

Fig. 2D-41 Power Flow—Model 219 Quadra-Trac Transfer Case

axle speed differences that produce drive line torque loads are dissipated by the differential. However, when extreme speed variations between axles occur, such as when one wheel or set of wheels spin on an ice covered surface, the coupling acts to transfer torque to the axle wheels having greater traction.

The special silicone fluid in the enclosed portion of the coupling is quite viscous and does not thin out when heated or subjected to high shear forces. In operation, when one axle overspeeds due to wheel slip, the input to the coupling causes the coupling rotational speed to increase also. However, as coupling speed increases, the fixed clutch plates in the coupling are forced to rotate (shear) through the silicone-fluid at higher speeds also. As the fluid is forced between the plates, it is displaced and expands, creating shear friction and increased resistance to further increases in input speed. This resistance to rotating speed increases in direct proportion to the increase in input speed from the front or rear axle through the propeller shaft.

In situations where the coupling becomes operational, the coupling does not lock the axles together to produce undifferentiated four-wheel drive. The coupling merely limits (controls) the amount of slippage while delivering maximum torque to the axle having greater traction.

NOTE: *The coupling and pinion assembly is not a serviceable component. It is a sealed unit and is not refillable. If the coupling or pinions become damaged in some way, it must be replaced as an assembly only. Do not attempt to disassemble the unit.*

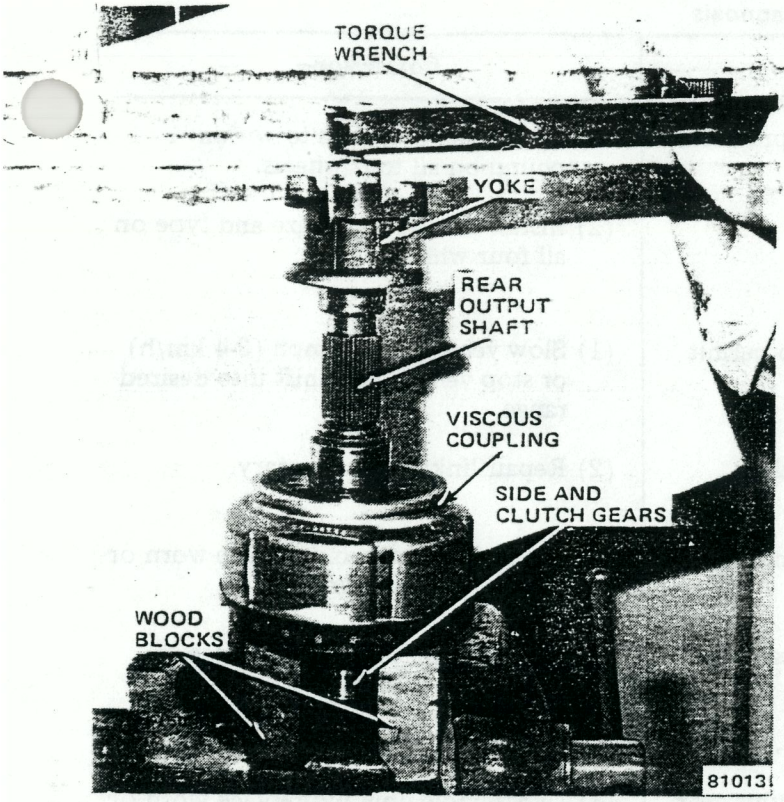

Fig. 2D-43 Torque Bias Check—On-Bench

CAUTION: *Wood blocks must be placed between the vise jaws and side gear to avoid damaging the gear.*

(5) Check engagement of clutch gear in viscous coupling. Be sure gear is fully engaged in coupling before proceeding. If necessary, loosen vise and reposition wood blocks so they support gear in coupling.

(6) Install rear output shaft in viscous coupling (fig. 2D-43).

(7) Install yoke on rear output shaft and install yoke retaining nut.

(8) Assemble and install socket and torque wrench on yoke retaining nut (fig. 2D-43).

(9) Rotate rear output shaft using torque wrench and measure torque required to rotate shaft in coupling.

(10) Torque required to rotate shaft in coupling should be minimum of 25 foot-pounds (34 N•m) torque.

(11) If rotating torque is less than specified, coupling has malfunctioned. If torque is at or above specified limit, coupling is in good condition.

IN-VEHICLE SERVICE

Changing Lubricant

(1) Raise vehicle.

(2) Position drain pan under transfer case.

(3) Remove fill and drain plugs and drain lubricant.

(4) Install drain plug. Tighten plug to 35 foot-pounds (47 N•m) torque.

(5) Fill transfer case to bottom edge of fill plug hole with 10W-30 motor oil only.

(6) Install and tighten fill plug to 35 foot-pounds (47 N•m) torque.

(7) Remove drain pan and lower vehicle.

Speedometer Gear, Rear Bearing, Rear Seal, and Shaft Yoke Replacement

NOTE: *The front and rear yokes, seals, rear retainer and bearing and speedometer gear can all be serviced in the vehicle. The following combined procedure outlines replacement of these components.*

Removal

(1) Raise vehicle.

(2) Position drain pan under transfer case.

(3) Remove fill and drain plugs. Drain oil from transfer case.

(4) Mark propeller shaft and transfer case yoke for assembly reference.

(5) Disconnect propeller shaft. Secure shaft to underside of vehicle.

(6) Remove and discard transfer case yoke nut and seal washer. Use Tool J-8614-01 to hold yoke while removing nut.

(7) Remove yoke. Use Tools J-8614-01, -02, -03 to remove yoke, if necessary.

(8) Mark rear retainer for assembly reference and remove retainer.

(9) Remove differential shims and speedometer driven gear.

(10) Remove rear output bearing snap ring and remove bearing from retainer.

(11) Remove rear seal from retainer using punch or screwdriver.

(12) Install bearing in retainer. Be sure shielded side of bearing is facing case interior. Install bearing snap ring.

(13) Install rear yoke seal using Tool J-29162 (fig. 2D-26).

(14) Install speedometer gear and differential shim.

(15) Apply Loctite 515, or equivalent sealant, to mating surface of rear retainer and install retainer. Tighten retainer bolts to 23 foot-pounds (31 N•m) torque.

(16) Install yoke, seal washer and yoke nut. Tighten nut to 120 foot-pounds (163 N•m) torque.

(17) Connect propeller shaft.

(18) Install drain plug and fill transfer case to bottom edge of fill plug hole with 10W-30 motor oil only.

(19) Install fill plug. Tighten fill and drain plugs to 18 foot-pounds (24 N•m) torque.

(20) Remove drain pan and lower vehicle.

Service Diagnosis

Condition	Possible Cause	Correction
FRONT OR REAR OF VEHICLE TENDS TO PULL OR WANDER OCCASIONALLY WHEN DRIVING IN STRAIGHT DIRECTION	(1) Incorrect or unequal tire pressures	(1) Adjust tire pressures to within ½ - 1 pound on all four wheels.
	(2) Mismatched tires	(2) Install tires of equal size and type on all four wheels.
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Vehicle speed too great to permit shifting.	(1) Slow vehicle to 2-3 mph (3-4 km/h) or stop vehicle and shift into desired range
	(2) External shift linkage binding, bent, loose.	(2) Repair linkage as necessary.
	(3) Internal components worn, binding or damaged.	(3) Disassemble unit and replace worn or damaged components.
NOISY IN – OR JUMPS OUT OF 4L RANGE	(1) Transfer case not completely engaged in 4L.	(1) Stop vehicle, shift transfer case to neutral; then shift back into 4L.
	(2) Shift linkage binding bent, loose.	(2) Repair linkage as necessary.
	(3) Range fork, shift rail, annulus gear, or clutch sleeve lockplate, worn or damaged.	(3) Disassemble unit and replace worn or damaged components.
NOISY IN ALL DRIVE MODES	(1) Insufficient or incorrect lubricant.	(1) Drain and refill with 10W-30 motor oil. Check for leaks if fluid level was low and repair as necessary. NOTE: If unit is still noisy after drain and refill, disassembly and inspection may be necessary to locate source of noise.
SEVERE LOW SPEED SHUDDER NOTED DURING ROAD TEST ON 219 TRANSFER CASE	(1) Indicates low or loss of viscous silicone fluid.	(1) Check transfer case lubricant for burnt fluid containing viscous silicone fluid.
		(2) If verified remove transfer case and disassemble. Check viscous coupling for case cracks, blown seal.
		(3) Replace as necessary.
		(4) Inspect front and rear axle for correct ratio.
LUBRICANT LEAKS FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clean or replace vent.
	(3) Shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also check yoke seal surfaces for nicks, scratches. Use crocus cloth to remove minor surface irregularities.

DISASSEMBLY

(1) Remove fill and drain plugs. Drain lubricant from transfer case.

(2) Remove front and rear output shaft yokes (fig. 2D-44). Discard yoke seal washers and yoke nuts.

(3) Mark rear retainer and rear case for assembly alignment reference.

(4) Remove rear retainer attaching bolts and remove retainer. Use plastic mallet to loosen retainer if necessary. Do not pry retainer off rear case.

(5) Remove differential shim(s) and speedometer drive gear from rear output shaft (fig. 2D-45). Tag shim(s) for assembly reference.

NOTE: *The speedometer gear fits on the shaft one way only. The long end should face the case. Note gear position for assembly reference.*

(6) Remove rear output bearing snap ring and remove bearing from retainer using plastic mallet.

NOTE: *The rear output bearing has one side shielded. Note bearing position for assembly reference.*

(7) Remove rear output shaft seal from rear retainer using screwdriver or punch.

(8) Position front case assembly on wood blocks (fig. 2D-46).

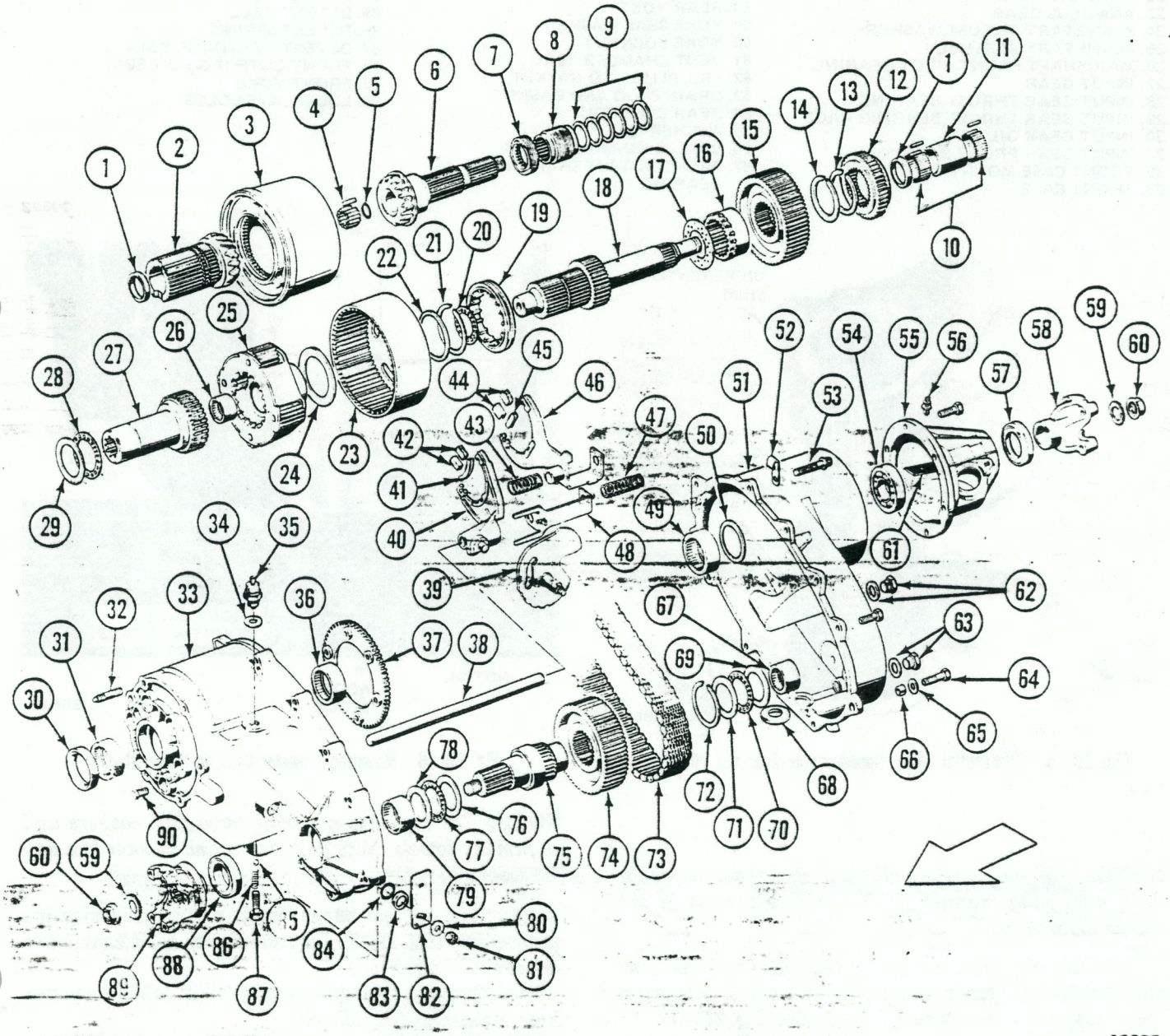

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Fig. 2D-44 Model 219 Quadra-Trac Transfer Case

1. MAINSHAFT REAR BEARING SPACER – SHORT (2)
2. SIDE GEAR
3. VISCOUS COUPLING AND DIFFERENTIAL ASSEMBLY
4. MAINSHAFT REAR PILOT ROLLER BEARINGS (15)
5. MAINSHAFT O-RING
6. REAR OUTPUT SHAFT
7. OIL PUMP
8. SPEEDOMETER GEAR
9. DIFFERENTIAL END PLAY SHIMS (SELECTIVE)
10. MAINSHAFT NEEDLE BEARINGS (82)
11. MAINSHAFT REAR BEARING SPACER
12. CLUTCH GEAR
13. CLUTCH GEAR LOCATING RING
14. DRIVE SPROCKET LOCATING RING
15. DRIVE SPROCKET
16. SIDE GEAR CLUTCH
17. MAINSHAFT THRUST WASHER
18. MAINSHAFT
19. CLUTCH SLEEVE
20. MAINSHAFT THRUST BEARING
21. ANNULUS GEAR RETAINING RING
22. ANNULUS GEAR THRUST WASHER
23. ANNULUS GEAR
24. PLANETARY THRUST WASHER
25. PLANETARY ASSEMBLY
26. MAINSHAFT FRONT PILOT BEARING
27. INPUT GEAR
28. INPUT GEAR THRUST BEARING
29. INPUT GEAR THRUST BEARING RACE
30. INPUT GEAR OIL SEAL
31. INPUT GEAR FRONT BEARING
32. FRONT CASE MOUNTING STUD (6)
33. FRONT CASE
34. LOCK MODE INDICATOR SWITCH GASKET
35. LOCK MODE INDICATOR SWITCH
36. INPUT GEAR REAR BEARING
37. LOW RANGE LOCKPLATE
38. SHIFT RAIL
39. RANGE SECTOR
40. RANGE FORK
41. RANGE FORK INSERT
42. RANGE FORK PADS
43. MODE FORK SPRING
44. MODE FORK PADS
45. MODE FORK INSERT
46. MODE FORK
47. SHIFT RAIL SPRING
48. MODE FORK BRACKET
49. REAR OUTPUT SHAFT BEARING
50. REAR OUTPUT SHAFT BEARING SEAL
51. REAR CASE
52. WIRING CLIP
53. SPLINE BOLT
54. REAR OUTPUT BEARING
55. REAR RETAINER
56. VENT
57. OUTPUT SHAFT OIL SEAL
58. REAR YOKE
59. YOKE SEAL WASHER
60. YOKE LOCKNUT
61. VENT CHAMBER SEAL
62. FILL PLUG AND GASKET
63. DRAIN PLUG AND GASKET
64. REAR CASE BOLT
65. WASHER (2)
66. CASE ALIGNMENT DOWEL
67. FRONT OUTPUT SHAFT REAR BEARING
68. MAGNET
69. FRONT OUTPUT SHAFT REAR THRUST BEARING RACE (THICK)
70. FRONT OUTPUT SHAFT REAR THRUST BEARING
71. FRONT OUTPUT SHAFT REAR THRUST BEARING RACE (THIN)
72. DRIVEN SPROCKET RETAINING SNAP RING
73. DRIVE CHAIN
74. DRIVEN SPROCKET
75. FRONT OUTPUT SHAFT
76. FRONT OUTPUT SHAFT FRONT THRUST BEARING RACE (THIN)
77. FRONT OUTPUT SHAFT FRONT THRUST BEARING
78. FRONT OUTPUT SHAFT FRONT THRUST BEARING RACE (THICK)
79. FRONT OUTPUT SHAFT FRONT BEARING
80. WASHER
81. LOCKNUT
82. OPERATING LEVER
83. RANGE SECTOR SHAFT SEAL RETAINER
84. RANGE SECTOR SHAFT SEAL
85. DETENT BALL
86. DETENT SPRING
87. DETENT RETAINING BOLT
88. FRONT OUTPUT SHAFT SEAL
89. FRONT YOKE
90. LOCKPLATE BOLTS

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Fig. 2D-45 Differential Shim, Speedometer Gear and Oil Pump

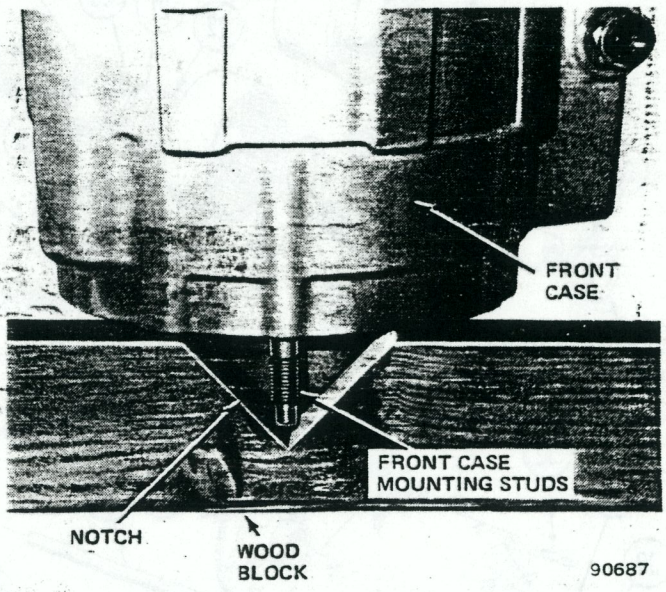

Fig. 2D-46 Mounting Transfer Case on Wood Blocks

NOTE: The wood blocks will support the case assembly in a more solid manner if "V" notches are cut in the blocks beforehand.

(9) Remove bolts attaching rear case to front case and remove rear case. Insert screwdrivers in notches at case ends to pry rear case off front case (fig. 2D-47).

NOTE: *The two case-end bolts have flat washers and alignment dowels. Note bolt, dowel and washer location for assembly reference (fig. 2D-44).*

(10) Remove rear output shaft and viscous coupling as assembly (fig. 2D-48). Tap shaft with plastic mallet to remove it, if necessary.

(11) Remove O-ring seal and pilot roller bearings from mainshaft (fig. 2D-48).

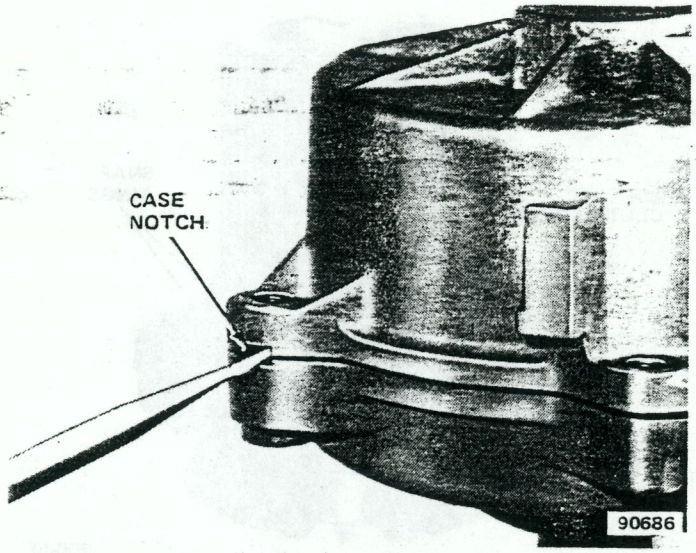

Fig. 2D-47 Rear Case Removal

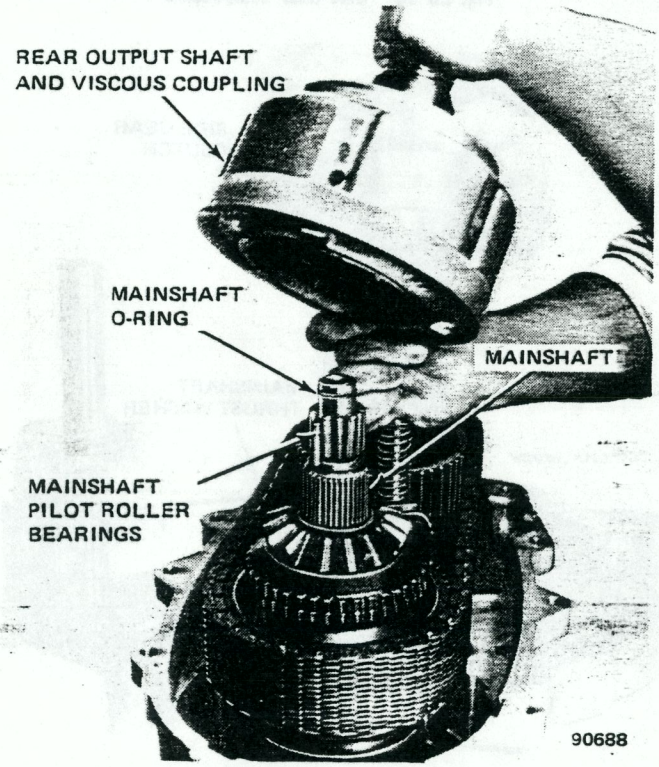

Fig. 2D-48 Viscous Coupling and Rear Output Shaft Removal/Installation

(12) Remove rear output shaft from viscous coupling.

(13) Remove shift rail spring from rail.

(14) Remove plastic oil pump from shaft bore in rear case. Note pump position for assembly reference. End with recess in it must face shaft bore when installed.

(15) Remove rear output shaft bearing seal from case. Use screwdriver to pry seal out of seal bore.

(16) Remove front output shaft thrust bearing assembly (fig. 2D-49). Remove thick washer, bearing and thin washer. Tag assembly for installation reference.

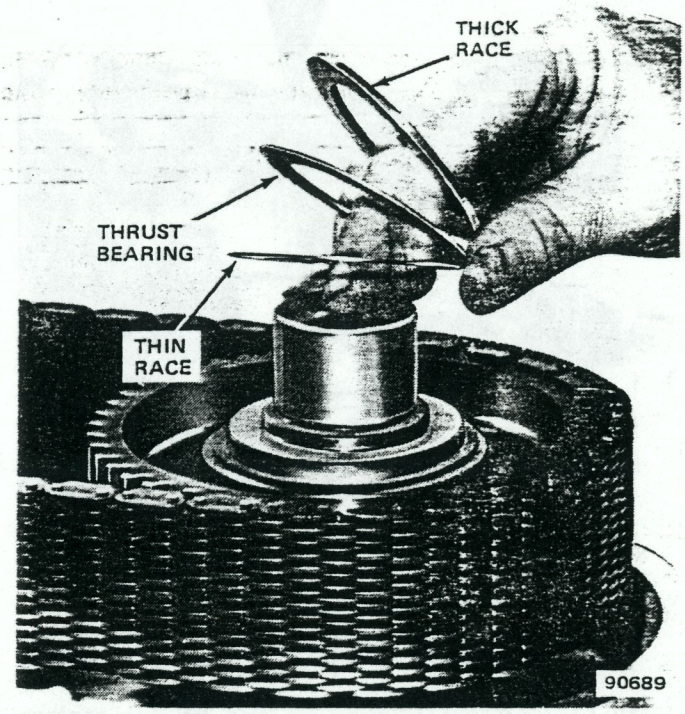

Fig. 2D-49 Front Output Shaft Rear Thrust Bearing Assembly Removal/Installation

(17) Remove driven sprocket retaining snap ring (fig. 2D-50).

(18) Remove drive sprocket, drive chain, driven sprocket, side gear clutch and clutch gear as assembly (fig. 2D-51). Place assembly on workbench and mark components for assembly installation reference, especially sprockets.

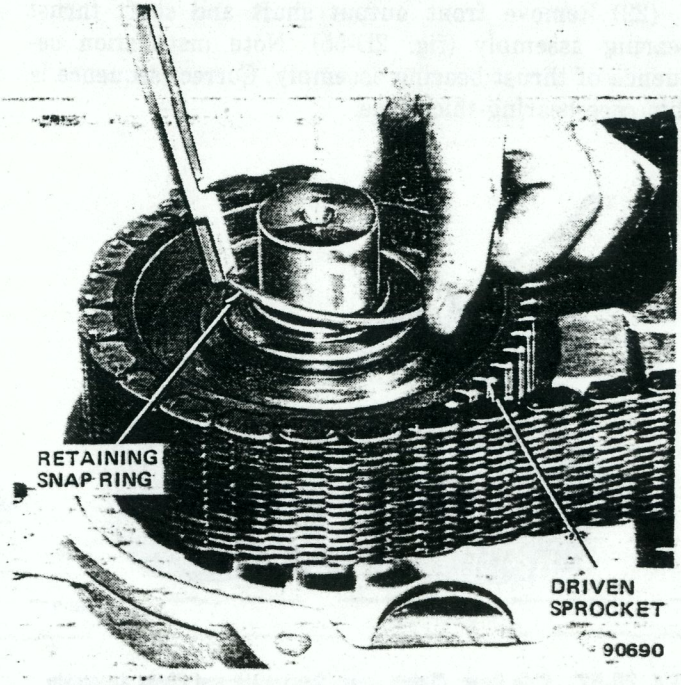

Fig. 2D-50 Driven Sprocket Retaining Snap Ring Removal/Installation

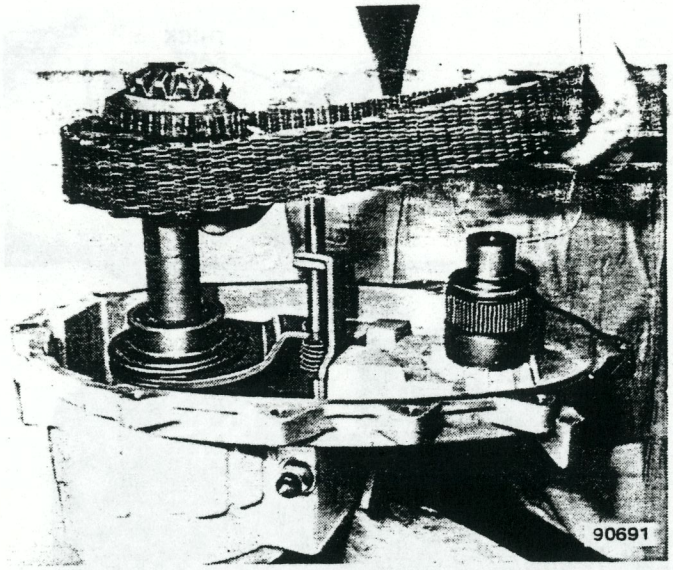

Fig. 2D-51 Sprocket and Chain Removal—Installation

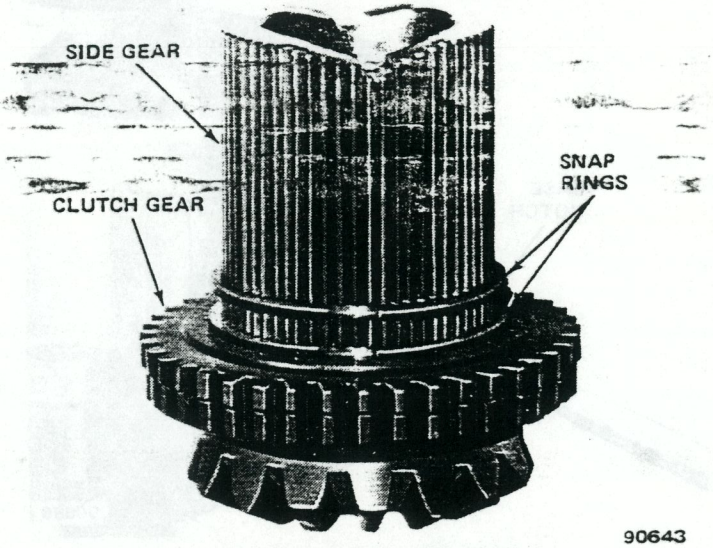

Fig. 2D-53 Side Gear Components

(19) Remove needle bearings and bearing spacers from mainshaft or side gear bore. Total of 82 needle bearings and three spacers are used.

(20) Remove side gear/clutch gear assembly from drive sprocket (fig. 2D-52). Remove two snap rings and remove clutch gear from side gear. Note position of snap rings and gears for assembly reference (fig. 2D-53).

(21) Remove side gear clutch (fig. 2D-54), mainshaft thrust washer and remaining (short) mainshaft needle bearing spacer.

(22) Remove front output shaft and shaft thrust bearing assembly (fig. 2D-55). Note installation sequence of thrust bearing assembly. Correct sequence is thin race-bearing-thick race.

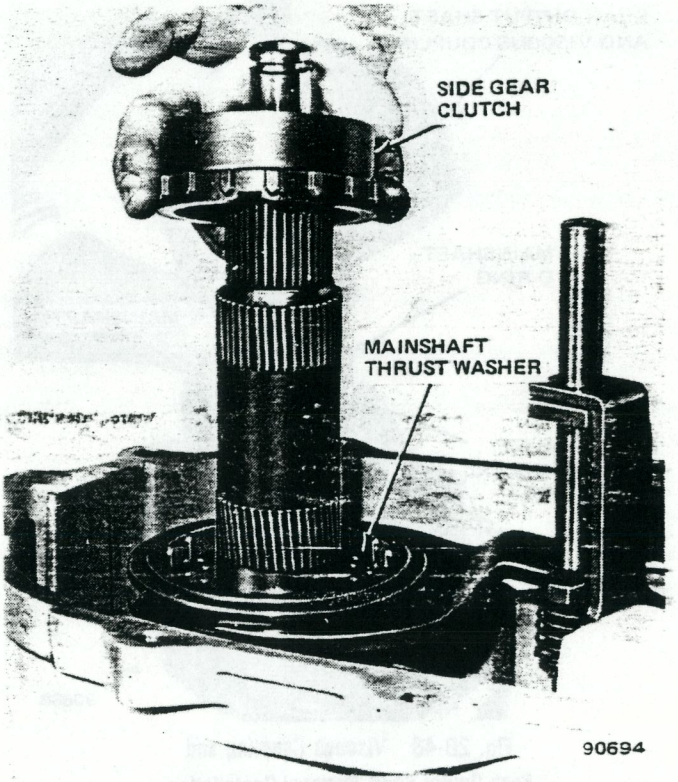

Fig. 2D-54 Side Gear Clutch Removal/Installation

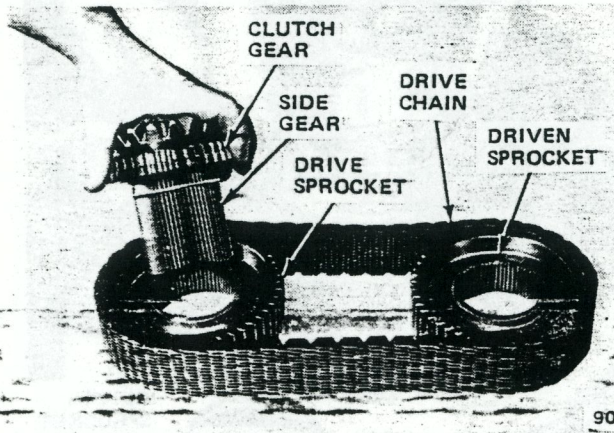

Fig. 2D-52 Side Gear, Clutch Gear, Sprockets and Chain Assembly

(23) Remove front output shaft seal from front case using screwdriver or punch.

(24) Remove shift rail spring from shift rail if not already removed. Tag spring for assembly reference.

(25) Remove clutch sleeve, mode fork and mode fork spring as assembly (fig. 2D-56). Note position of components for assembly reference. Disassemble components for cleaning and inspection.

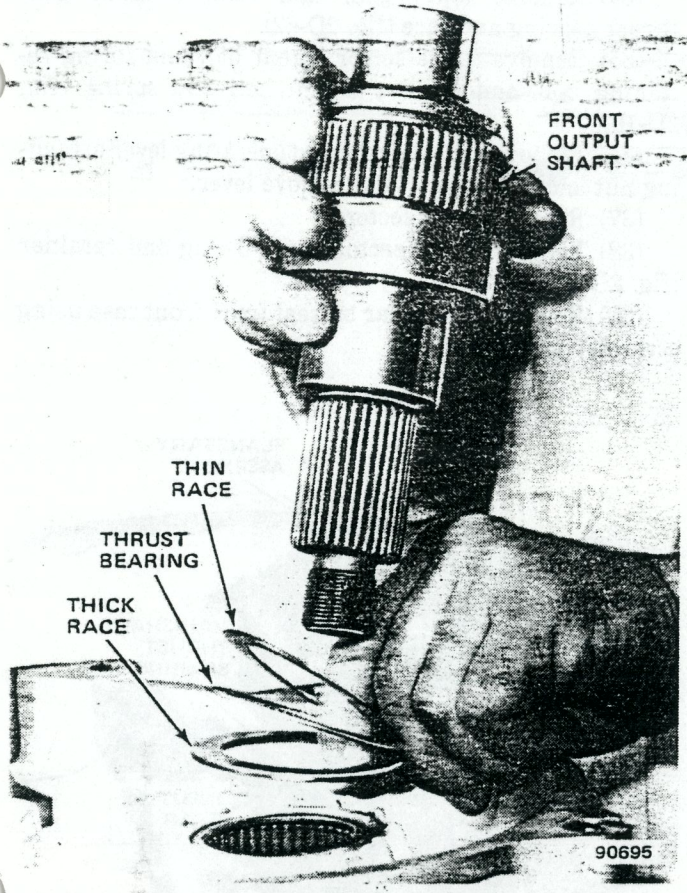

Fig. 2D-55 Front Output Shaft and Shaft Front Thrust Bearing Removal/Installation

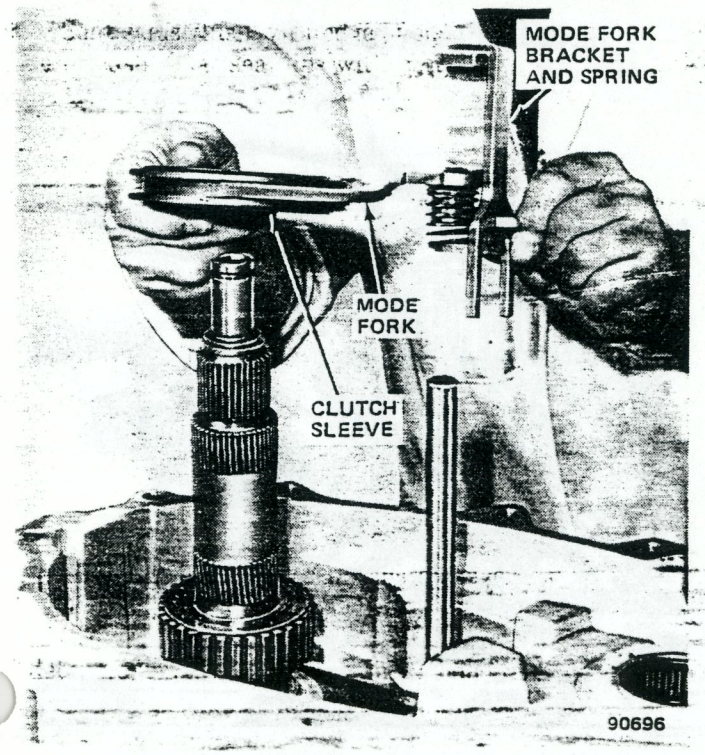

Fig. 2D-56 Clutch Sleeve and Mode Fork Removal/Installation

(26) Remove mainshaft thrust washer and remove mainshaft (fig. 2D-57). Grasp shaft and pull straight up to remove.

(27) Move range operating lever downward to last detent position.

(28) Disengage range fork lug from range sector slot (fig. 2D-21).

(29) Remove annulus gear retaining snap ring and thrust washer (fig. 2D-58).

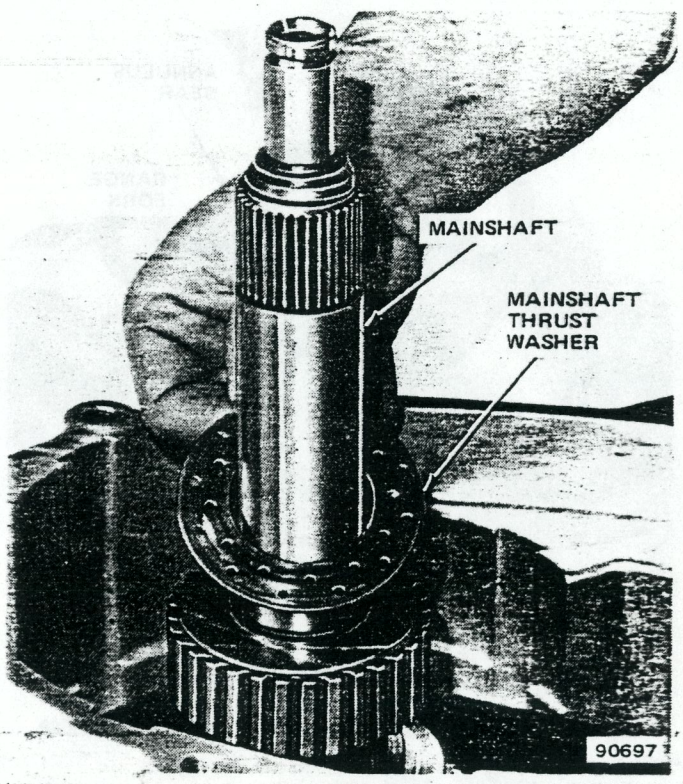

Fig. 2D-57 Mainshaft and Thrust Washer

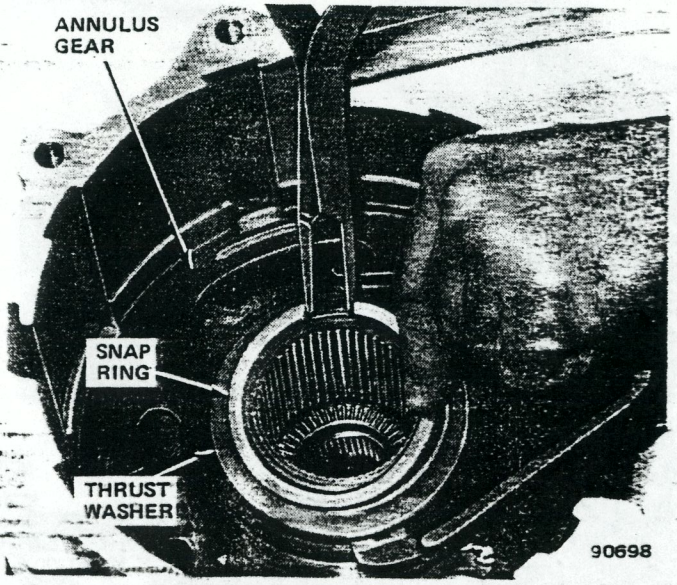

Fig. 2D-58 Annulus Gear Snap Ring and Thrust Washer Removal/Installation

(30) Remove annulus gear and range fork as assembly (fig. 2D-59). Separate components for cleaning and inspection.

(31) Remove planetary thrust washer from planetary assembly hub (fig. 2D-60).

(32) Remove planetary assembly (fig. 2D-61). Grasp planetary hub and lift assembly upward to remove it.

(33) Remove mainshaft thrust bearing from input gear (fig. 2D-61).

(34) Remove input gear and remove input gear thrust bearing and race (fig. 2D-62).

(35) Remove range sector detent ball and spring retaining bolt and remove detent ball and spring (fig. 2D-10).

(36) Remove range sector and operating lever attaching nut and lockwasher and remove lever.

(37) Remove range sector.

(38) Remove range sector shaft O-ring and retainer (fig. 2D-44).

(39) Remove input gear oil seal from front case using screwdriver or punch.

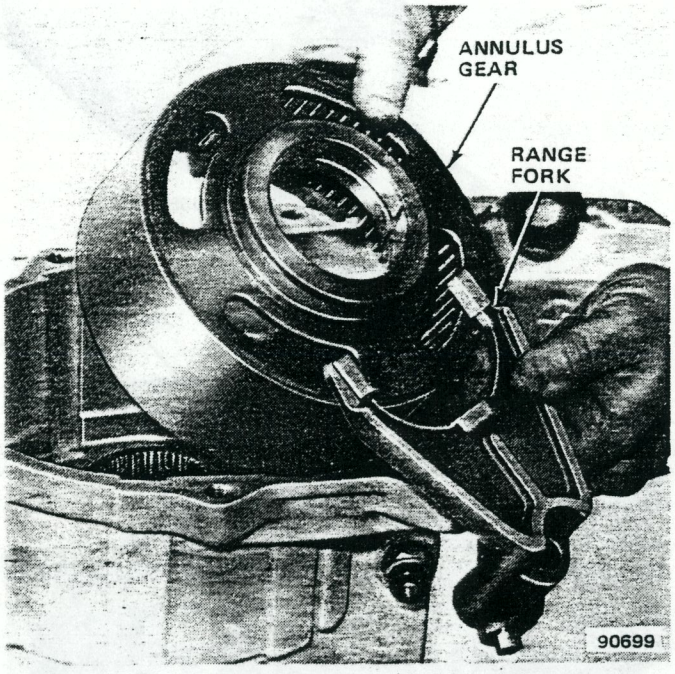

Fig. 2D-59 Annulus Gear and Range Fork Removal/Installation

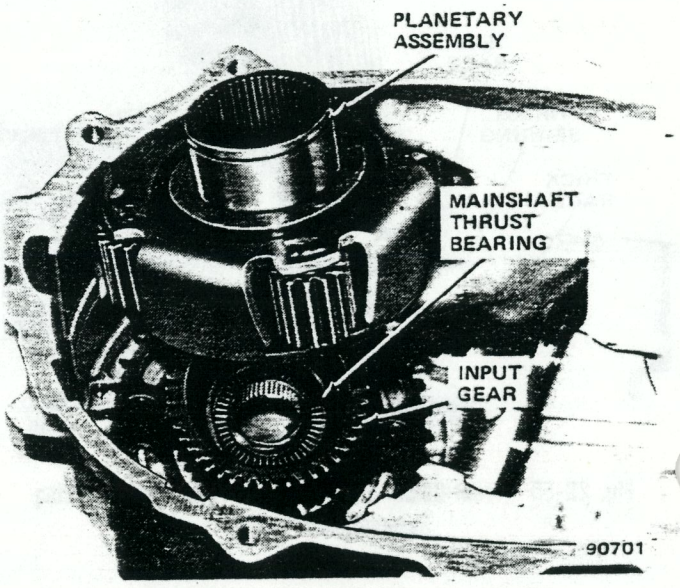

Fig. 2D-61 Planetary Assembly Removal/Installation

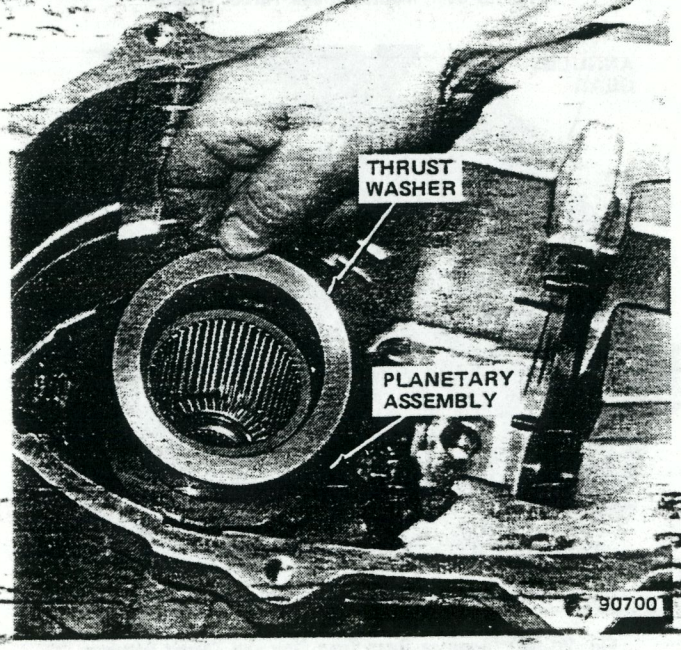

Fig. 2D-60 Planetary Thrust Washer Removal/Installation

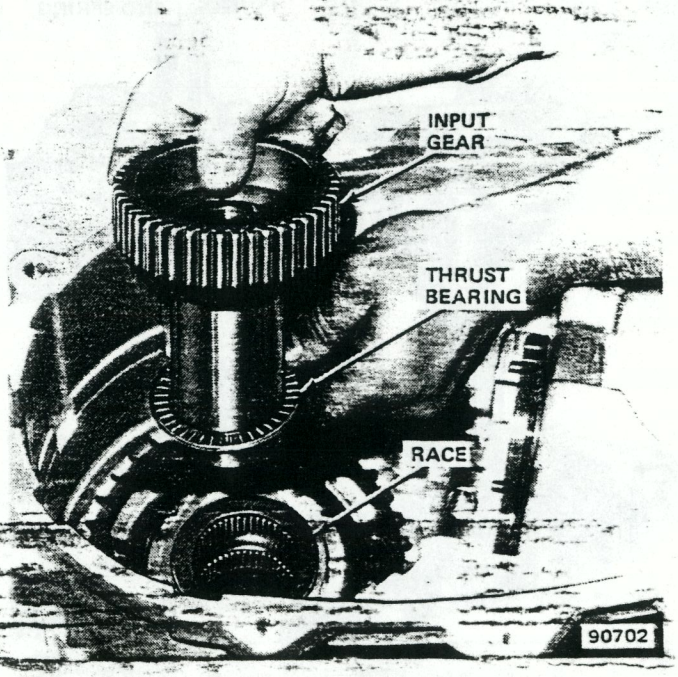

Fig. 2D-62 Input Gear and Thrust Bearing Removal/Installation

CLEANING AND INSPECTION

Wash all parts thoroughly in clean solvent. Be sure all old lubricant, metallic particles, dirt, or foreign material are removed from the surfaces of every part. Apply compressed air to each oil feed port and channel in each case half to remove any obstructions or cleaning solvent residue.

Inspect all gear teeth for signs of excessive wear or damage and check all gear splines for burrs, nicks, wear or damage. Remove minor nicks or scratches with an oilstone. Replace any part exhibiting excessive wear or damage.

Inspect all snap rings and thrust washers for evidence of excessive wear, distortion, or damage. Replace any of these parts if they exhibit these conditions.

Inspect the two case halves for cracks, porosity, damaged mating surfaces, stripped bolt threads, or distortion. Replace any part that exhibits these conditions.

Inspect the low range lockplate in the front case. If the lockplate teeth or the plate hub is cracked, broken, chipped, or excessively worn, replace the lockplate and the lockplate attaching bolts. Refer to the Low Range Lockplate Replacement procedure in the Subassembly Overhaul section.

Inspect the condition of all needle, roller, ball and thrust bearings in the front and rear case halves, and the input gear. Also check the condition of the bearing bores in both cases and in the input gear, rear output shaft, side gear, and rear retainer. Replace any part that exhibits signs of excessive wear or damage. If the case or input gear bearings require replacement, refer to Bearing Replacement in the Subassembly Overhaul section.

Inspect the coupling and pinion gears. If the coupling is leaking fluid or the gears are worn or damaged in any way, replace the coupling as an assembly only. Do not attempt to service the unit.

SUBASSEMBLY OVERHAUL

Lockplate Replacement

(1) Remove and discard lockplate attaching bolts.
(2) Remove lockplate from case.
(3) Coat case and lockplate surfaces around bolt holes with Loctite 515, or equivalent sealant.
(4) Position new lockplate in case and align bolt holes in lockplate and case.
(5) Coat new lockplate attaching bolts with Loctite 271, or equivalent adhesive sealant.
(6) Install and tighten lockplate attaching bolts to 30 foot-pounds (41 N•m) torque.

Bearing and Bushing Replacement

CAUTION: *All of the bearings used in the transfer case must be correctly positioned to avoid covering the bearing oil feed holes. After replacing any bearing, check the bearing position to be sure the feed hole is not covered by the bearing.*

Rear Output Shaft Bearing

(1) Remove bearing using Driver Handle J-8092 and Remover J-29165. Refer to figure 2D-27 for similar tool setup.
(2) Install bearing using Driver Handle J-8092 and Installer J-29166.
(3) Remove bearing installer tools and check bearing position to be sure the bearing oil feed hole is not covered.

Front Output Shaft Front Bearing

(1) Remove bearing using Driver Handle J-8092 and Remover J-29168 (fig. 2D-27).
(2) Install new bearing using Driver Handle J-8092 and Installer J-29167 (fig. 2D-28).
(3) Remove installer tools and check bearing position to be sure oil feed hole is not covered.

Front Output Shaft Rear Bearing

(1) Remove bearing using Remover J-26941 and Slide Hammer J-2619-01 (fig. 2D-29).
(2) Install new bearing using Driver Handle J-8092 and Installer J-29163 (fig. 2D-30).
(3) Remove installer tools and check bearing position to be sure oil feed hole is not covered. Also be sure bearing is seated flush with edge of bore in case to allow room for thrust bearing assembly.

Input Gear Front/Rear Bearings

(1) Remove both bearings simultaneously using Driver Handle J-8092 and Remover J-29170 (fig. 2D-31).
(2) Install new bearings one at a time. Install rear bearing first; then install front bearing. Use Driver Handle J-8092 and Installer J-29169 (fig. 2D-32).
(3) Remove installer tools and check bearing position to be sure oil feed holes are not covered. Also be sure bearings are flush with case bore surfaces.

Mainshaft Front Pilot Bearing

(1) If bearing cannot be removed by hand, remove it using Slide Hammer J-2619-01 and Remover J-29369-1 or similar internal type blind hole bearing puller (fig. 2D-33).
(2) If necessary, install new bearing using Driver Handle J-8092 and Installer J-29174. Be sure bearing is flush with bore (fig. 2D-34).

(3) If bearing was seated using installer tools, check bearing position to be sure hole feed hole is not covered. Also be sure bearing is seated flush with edge of bearing bore.

Rear Output Bearing and Seal

(1) Remove snap ring and remove bearing using rawhide mallet or brass punch.

(2) Install new bearing using Tools J-8092 and J-7818 (fig. 2D-25).

CAUTION: *Be sure the shielded side of the bearing faces the interior of the transfer case after installing it.*

(3) Install bearing snap ring.

(4) Install seal using Tool J-29162 (fig. 2D-26).

Annulus Gear Bushing Replacement

(1) Remove bushing using Driver Handle J-8092 and Remover—Installer Tool J-29185 (fig. 2D-35).

(2) Install new bushing using Tools J-8092 and J-29185 (fig. 2D-36).

(3) Remove any chips generated by bushing removal/installation.

ASSEMBLY

NOTE: *During assembly, prelubricate all transfer case internal components with 10W-30 motor oil or petroleum jelly where indicated. Do not use chassis lubricant or similar "heavy" type lubricants.*

(1) Install new input gear and rear output shaft bearing oil seals. Seat seals flush with edge of seal bore or in seal groove in case. Coat seal lips with petroleum jelly after installation.

(2) Install input gear thrust bearing race in case counterbore (fig. 2D-62).

(3) Install input gear thrust bearing on input gear and install gear and bearing in case (fig. 2D-62).

(4) Install mainshaft thrust bearing in bearing recess in input gear (fig. 2D-61).

(5) Install planetary assembly on input gear. Be sure planetary pinion teeth mesh fully with input gear (fig. 2D-61).

(6) Install planetary thrust washer on planetary hub (fig. 2D-60).

(7) Install new sector shaft O-ring and retainer in shaft bore in case.

(8) Install range sector in front case (fig. 2D-63). Install operating lever on sector shaft and install lever attaching washer and locknut on shaft. Tighten locknut to 17 foot-pounds (23 N•m) torque.

(9) Install detent spring, ball and retaining bolt in front case detent bore. Tighten bolt to 22 foot-pounds (30 N•m) torque (fig. 2D-10).

(10) Move range sector to last detent position.

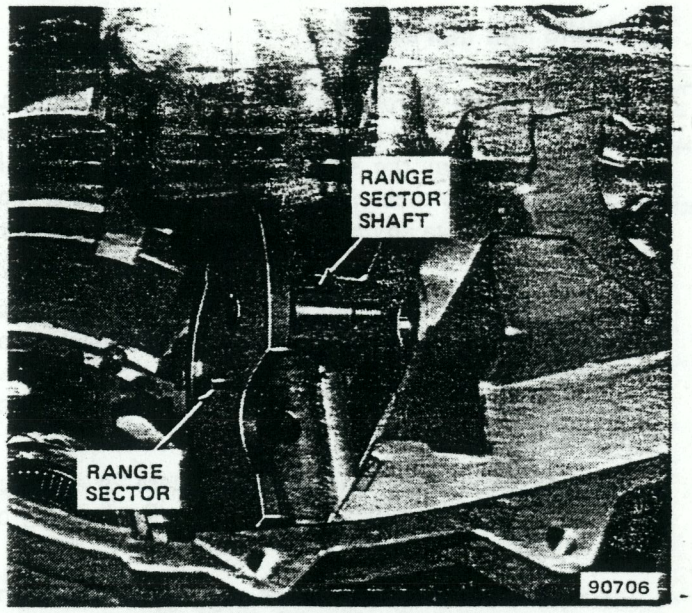

Fig. 2D-63 Range Sector Installation

(11) Assemble annulus gear and range fork. Install assembled fork and gear on and over planetary assembly. Be sure annulus gear is fully meshed with planetary pinions (fig. 2D-59).

(12) Insert range fork lug in range sector detent slot (fig. 2D-21).

(13) Install annulus thrust washer and annulus retaining ring on annulus gear hub (fig. 2D-58).

(14) Align mainshaft thrust washer in input gear, if necessary.

(15) Install mainshaft. Be sure shaft is fully seated in input gear.

(16) Install mainshaft thrust washer on mainshaft (fig. 2D-64).

(17) Install short mainshaft needle bearing spacer on shaft.

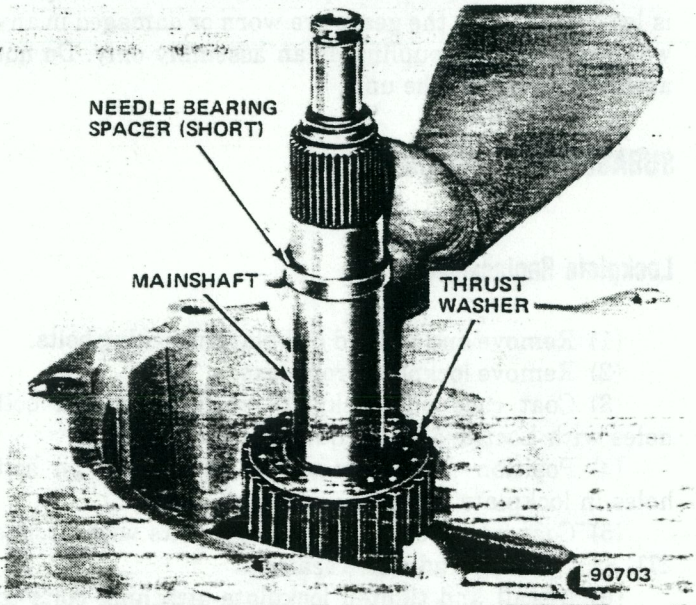

Fig. 2D-64 Mainshaft and Thrust Washer Installation

(18) Apply liberal coating of petroleum jelly to mainshaft needle bearing surface and to all 82 needle bearings. Install 41 bearings on shaft. Be sure bearings are in vertical position and seat on short spacer. Use additional petroleum jelly to hold bearings in place if necessary (fig. 2D-65).

(19) Install long mainshaft needle bearing spacer on shaft (fig. 2D-65). Lower spacer onto previously installed needle berings carefully to avoid displacing bearings.

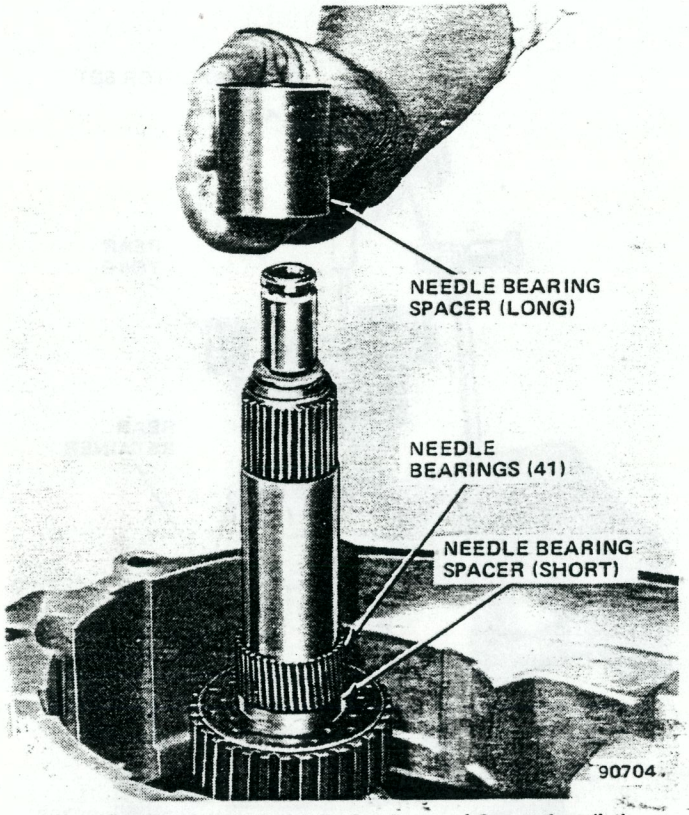

Fig. 2D-65 Mainshaft Needle Bearings and Spacer Installation

(20) Align shift rail bore in case with bore in range fork and install shift rail.

NOTE: *Remove all traces of oil from the case shift rail bore before installing the rail. Oil in the case bore may prevent the rail from seating completely and prevent rear case installation.*

(21) Assemble mode fork, mode fork spring and mode fork bracket (fig. 2D-66).

(22) Install clutch sleeve in mode fork (fig. 2D-56). Be sure sleeve is positioned so I.D. numbers on sleeve face upward after sleeve is installed.

(23) Align clutch sleeve and mode fork assembly with shift rail and install assembly on shift rail and mainshaft. Be sure clutch sleeve is meshed with mainshaft gear.

(24) Lubricate remaining 41 mainshaft needle bearings and position bearings on shaft. Use additional petroleum jelly to hold bearings on shaft, if necessary.

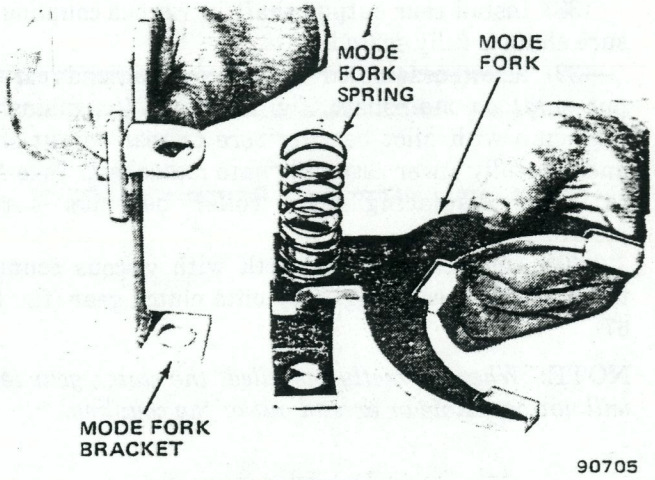

Fig. 2D-66 Assembling Mode Fork, Spring and Bracket

(25) Install side gear clutch on mainshaft with clutch gear teeth facing downward (fig. 2D-54). Be sure gear teeth mesh with clutch sleeve.

(26) Install remaining short mainshaft needle bearing spacer. Install spacer carefully to avoid displacing previously installed bearings.

(27) Install front output shaft front thrust bearing assembly in front case. Correct installation sequence is thick race-thrust bearing-thin race.

(28) Install front output shaft in front case (fig. 2D-55).

(29) Install clutch gear on side gear (fig. 2D-53). Tapered side of clutch gear teeth must face side gear teeth.

(30) Install clutch gear and drive sprocket locating snap rings on side gear. Install snap rings so snap rings face each other (fig. 2D-53).

(31) Position drive and driven sprockets in drive chain and install assembled side and clutch gears in drive sprocket (fig. 2D-52).

(32) Install assembled drive chain, sprockets and side gear on mainshaft and front output shaft (fig. 2D-51). Align sprockets with shafts, keep assembly level and carefully lower assembly onto both shafts simultaneously. Take care to avoid displacing mainshaft needle bearings during installation.

(33) Install driven sprocket retaining snap ring (fig. 2D-50).

(34) Install front output shaft rear thrust bearing assembly on front output shaft. Correct installation sequence is thin race-thrust bearing-thick race (fig. 2D-49).

(35) Install shift rail spring on shift rail.

(36) Install new O-ring on mainshaft pilot bearing hub (fig. 2D-48).

(37) Coat mainshaft pilot roller bearing hub and pilot roller bearings with liberal quantity of petroleum jelly and install rollers on shaft. Use enough petroleum jelly to hold bearing rollers on shaft (fig. 2D-48).

(38) Install rear output shaft in viscous coupling. Be sure shaft is fully seated.

(39) Install assembled viscous coupling and rear output shaft on mainshaft (fig. 2D-48). Align mainshaft pilot hub with pilot bearing bore in rear output shaft and carefully lower assembly onto mainshaft. Take care to avoid displacing pilot roller bearings during installation.

(40) Align clutch gear teeth with viscous coupling teeth and seat coupling fully onto clutch gear (fig. 2D-67).

NOTE: *When correctly installed, the clutch gear teeth will not be visible or extend out of the coupling.*

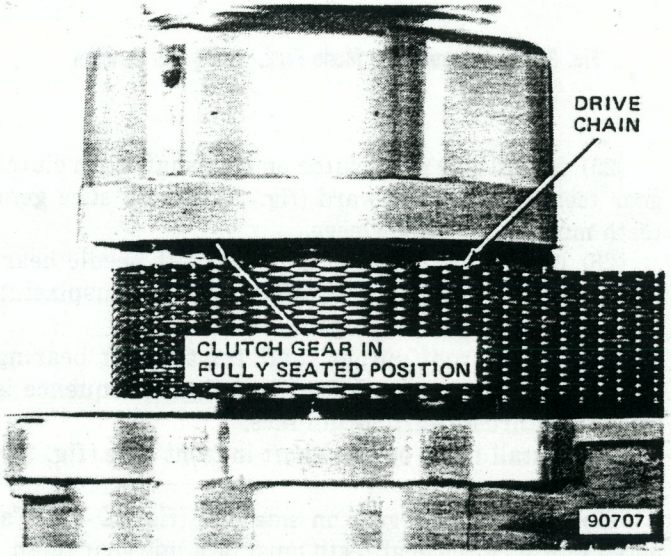

Fig. 2D-67 Seating Viscous Coupling on Clutch Gear

(41) Install magnet in front case, if removed.

(42) Clean mating surfaces of front and rear cases thoroughly.

(43) Apply Loctite 515, or equivalent sealant, to mating surface of front case and to all case attaching bolts.

(44) Install rear case on front case. Align case dowels and install case attaching bolts. Tighten bolts to 22 foot-pounds (30 N•m) torque.

NOTE: *The two case-end dowel bolts require flat washers.*

(45) Install oil pump on rear output shaft and seat it in case. Install pump so side with recess faces interior of case (fig. 2D-45).

(46) Install speedometer drive gear and differential shim on output shaft (fig. 2D-45).

(47) Install vent chamber seal in rear retainer, if removed.

(48) Align and install rear retainer on rear case. Tighten retainer bolts finger-tight only.

(49) Install yoke on rear output shaft. Tighten yoke nut finger-tight only.

(50) Mount Dial Indicator J-8001 on rear retainer. Position indicator stylus so it contacts top of yoke nut (fig. 2D-68).

(51) Install yoke on front output shaft and rotate front shaft ten complete revolutions.

(52) Rotate front output shaft again and note end play registered on dial indicator. End play should be 0.002 to 0.010 inches (0.05 to 0.25 mm). If end play is correct, go to next step. If end play must be adjusted, remove rear retainer, add or subtract differential shims as required, and check end play again.

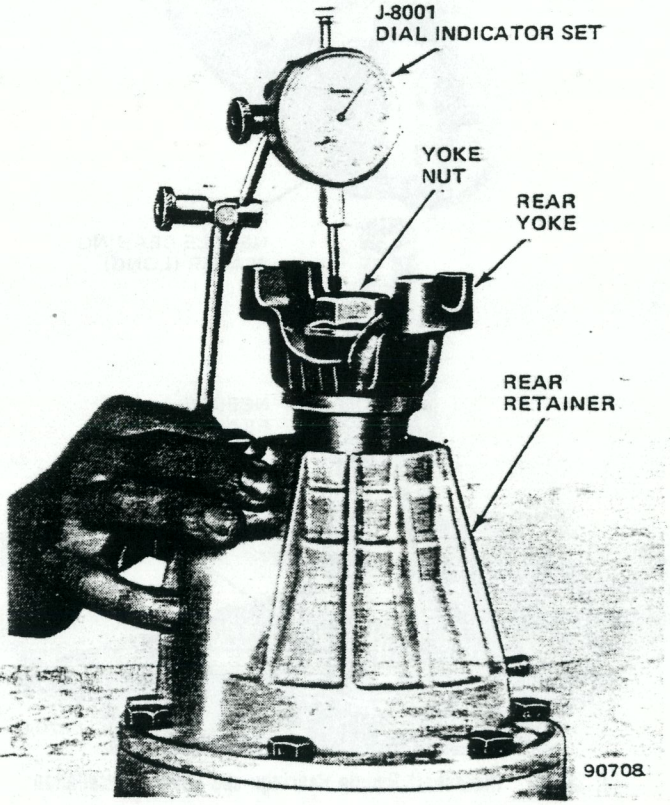

Fig. 2D-68 Checking Differential End Play

(53) Remove both output shaft yokes. Discard old yoke nuts.

(54) Install new front and rear yoke seals if not installed previously.

(55) Remove rear retainer bolts, apply Loctite 515, or equivalent sealant, to mating surface of retainer and to bolts and reinstall bolts. Tighten bolts to 22 foot-pounds (30 N•m) torque.

(56) Install new yoke seal washers on output shafts, install yokes on shafts and install new yoke nuts. Tighten nuts to 110 foot-pounds (149 N•m) torque.

(57) Install drain plug. Tighten plug to 35 foot-pounds (47 N•m) torque.

(58) Pour 4 pints (1.9 liters) of 10W-30 motor oil into transfer case through fill plug hole, and install fill plug. Tighten plug to 35 foot-pounds (47 N•m) torque.

SPECIFICATIONS

Specifications—Model 219 Quadra-Trac Transfer Case

Transfer Case Type	4 position, dual range, full time 4-wheel drive unit with integral low range and a neutral and lock position
Torque Transmittal Mode	Dual sprockets with connecting drive chain and an interaxle differential — viscous coupling unit
Low Range Reduction Ratio and Mode	2.61:1 through annulus gear and planetary carrier assembly
Drive Positions and Shift Controls	4H, 4L, Neutral, Lock. Ranges selected via floor mounted shift lever (4H range is fully differentiated. 4L and Lock ranges are undifferentiated
Lubricant Capacity and Type	4 pints (1.9 liters) 10W-30 motor oil (only)

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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
Detent Retainer Bolt	23	20-25	31	27-34
Drain and Fill Plugs	35	30-40	47	40-54
Front/Rear Yoke Nuts	120	90-130	163	122-176
Indicator Switch	18	15-20	24	20-34
Operating Lever Locknut	18	14-20	24	19-27
Rear Case-to-Front Case Bolts (All)	23	20-25	31	27-34
Rear Retainer Bolts	23	20-25	31	27-34

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

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MODEL 300 TRANSFER CASE

GENERAL

The model 300 transfer case is used in CJ models only. It is a gearbox unit having the gears positioned in a layshaft-type of arrangement. The 300 has a cast iron case, four gear positions and employs an external floor mounted gearshift linkage for range control. The 300 is a part-time four-wheel drive unit providing four-wheel high and low ranges, a neutral position and two-wheel high range. The four-wheel high and low ranges are undifferentiated. Manual locking front hubs are standard equipment with this transfer case. In addition, the 300 is used with both manual and automatic transmission applications. In four-wheel low range, reduction ratio is 2.6:1.

Transfer Case Shift Pattern

Transfer case shifting is controlled by a floor-mounted shift lever located on the floorpan transmission tunnel. The shift pattern is in a straight line for all CJ models (fig. 2D-69). Shift knob sequence is 4H (four-wheel high), 2H (two-wheel high), N (neutral) and 4L (four-wheel low).

IDENTIFICATION

An identification tag that displays the vendor and Jeep part numbers is attached to the intermediate shaft lockplate bolt. This information is necessary to obtain correct service replacement parts.

LUBRICATION

The model 300 lubricant should be changed and the level inspected at the intervals specified in the Maintenance Schedule. When adding lubricant or refilling the transfer case after service, use SAE 85W-90, API grade GL-5 gear lubricant only. Lubricant capacity of the model 300 is 4 pints (1.9 liters).

POWER FLOW

In all drive ranges, incoming torque from the transmission is transmitted to the geartrain through the input shaft and rear output shaft gear (fig. 2D-70).

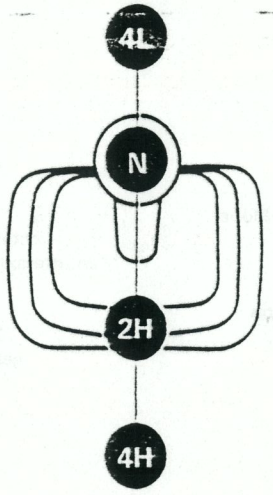

Fig. 2D-69 Transfer Case Shift Pattern—Model 300

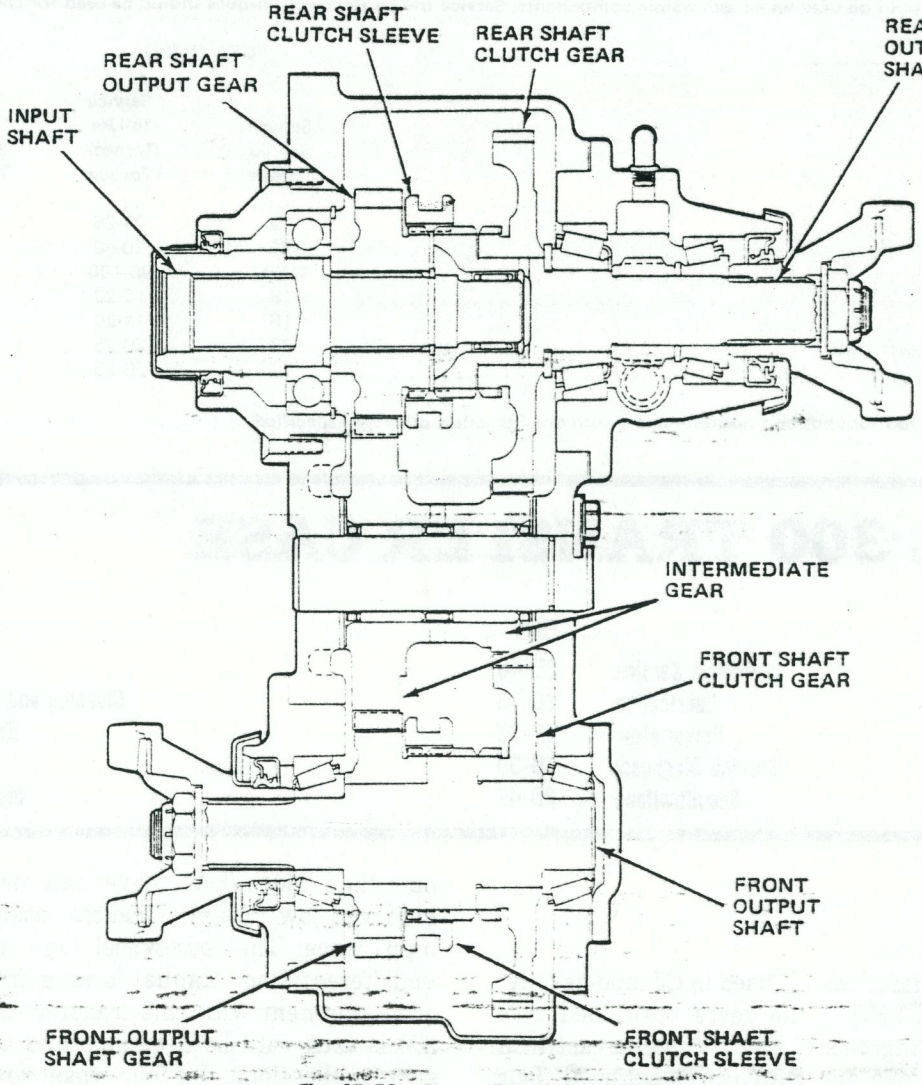

Fig. 2D-70 Power Flow—Model 300

In 2H range, the front output shaft clutch sleeve is not shifted and remains in a neutral position. The rear output shaft clutch sleeve is shifted into engagement with the input gear. Torque flows from the input shaft and gear through the sleeve and to the rear output shaft and yoke. The intermediate gear idles on the input gear but does not transfer torque to the front output shaft. This occurs because the front shaft sleeve is in neutral and the front output gear idles on the intermediate gear.

In 4H range, both clutch sleeves are shifted into engagement with the front and rear output shaft gears. Torque flows through the input shaft and rear output shaft gear to the larger intermediate gear. This intermediate gear transmits torque to the front output shaft through the front output shaft gear which is meshed with the larger intermediate gear.

In 4L range, the path of torque is similar to 4H range but with one major exception. In this range, the clutch sleeves are shifted into engagement with the front and rear output shaft clutch gears. Torque transfer now flows from the input shaft to the front and rear output shafts through the clutch gears. The clutch gears are now meshed with the smaller intermediate gear to produce a gear reduction ratio of 2.6:1.

SERVICE DIAGNOSIS

Before attempting to repair a suspected transfer case malfunction, check all other drive line components beforehand. The actual cause of a problem may be related to such items as the front hubs, axles, propeller shafts, wheels and tires, transmission, engine, or clutch instead. If all drive line components are in good condition and operating properly, refer to the Service Diagnosis charts for further information.

Service Diagnosis

Condition	Possible Cause	Correction
TRANSFER CASE DIFFICULT TO SHIFT OR WILL NOT SHIFT INTO DESIRED RANGE	(1) Vehicle speed too great to permit shifting.	(1) Stop vehicle and shift into desired range. Or reduce speed to 2-3 mph (3-4 km/h) before attempting to shift.
	(2) If vehicle was operated for extended period in 4H mode on dry paved surface, driveline torque load may cause difficult shifting.	(2) Stop vehicle, shift transmission to neutral, shift transfer case to 2H mode and operate vehicle in 2H on dry paved surfaces.
	(3) Transfer case external shift linkage binding.	(3) Lubricate or repair or replace linkage, or tighten loose components as necessary.
	(4) Insufficient or incorrect lubricant.	(4) Drain and refill to edge of fill hole with 10W-30 motor oil having API classification SE only.
	(5) Internal components binding, worn, or damaged.	(5) Disassemble unit and replace worn or damaged components as necessary.
TRANSFER CASE NOISY IN ALL DRIVE MODES	(1) Insufficient or incorrect lubricant.	(1) Drain and refill to edge of fill hole with 10W-30 motor oil only. Check for leaks and repair if necessary. Note: If unit is still noisy after drain and refill, disassembly and inspection may be required to locate source of noise.
NOISY IN — OR JUMPS OUT OF FOUR WHEEL DRIVE LOW RANGE	(1) Transfer case not completely engaged in 4L position.	(1) Stop vehicle, shift transfer case in Neutral, then shift back into 4L position.
	(2) Shift linkage loose or binding.	(2) Tighten, lubricate, or repair linkage as necessary.
	(3) Shift fork cracked, inserts worn, or fork is binding on shift rail.	(3) Disassemble unit and repair as necessary.

Service Diagnosis (Cont'd.)

Condition	Possible Cause	Correction
LUBRICANT LEAKING FROM OUTPUT SHAFT SEALS OR FROM VENT	(1) Transfer case overfilled.	(1) Drain to correct level.
	(2) Vent closed or restricted.	(2) Clear or replace vent if necessary.
	(3) Output shaft seals damaged or installed incorrectly.	(3) Replace seals. Be sure seal lip faces interior of case when installed. Also be sure yoke seal surfaces are not scored or nicked. Remove scores, nicks with fine sandpaper or replace yoke(s) if necessary.
ABNORMAL TIRE WEAR	(1) Extended operation on dry hard surface (paved) roads in 4H range.	(1) Operate in 2H on hard surface (paved) roads.

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IN-VEHICLE SERVICE

Shift Rod Oil Seal Replacement

(1) If left-side shift rod seal is to be replaced, shift transfer case into 4L position.

(2) Raise vehicle.

(3) Remove clevis pins connecting control links to transfer case shift rods.

(4) Remove shift rod oil seal using Tool J-25175 (fig. 2D-71).

(5) Install replacement seal using Thimble and Driver Tool J-25167 (fig. 2D-72).

(6) Install clevis pins connecting control links to transfer case shift rods. Use replacement cotter pins to secure pins.

(7) Lower vehicle.

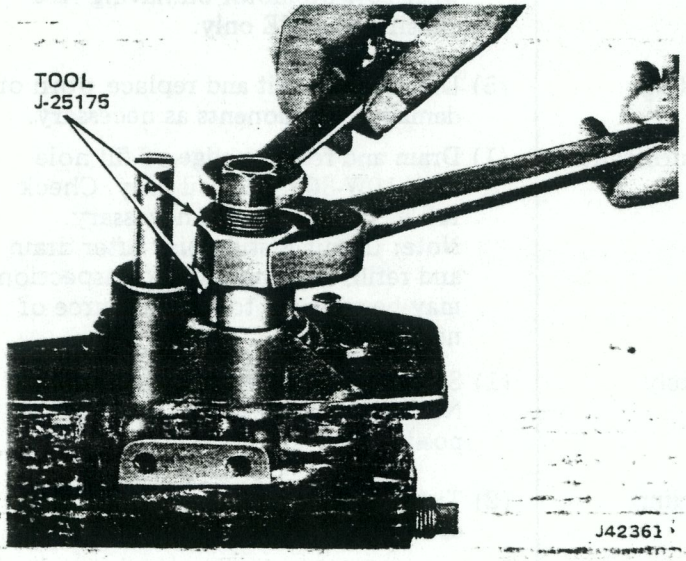


Fig. 2D-71 Shift Rod Oil Seal Removal

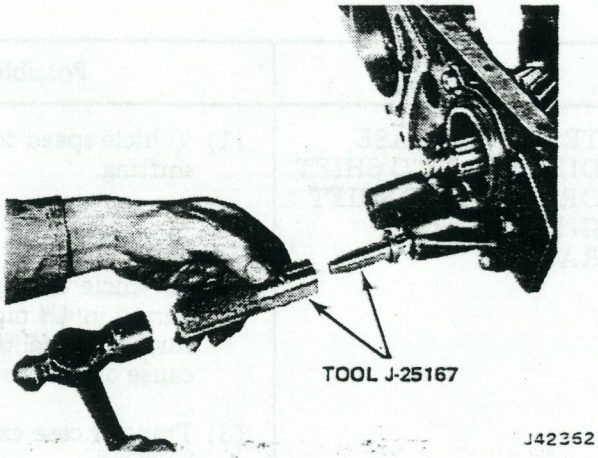


Fig. 2D-72 Shift Rod Oil Seal Installation

Front—Rear Yoke Oil Seal Replacement

(1) Raise vehicle.

(2) Place support stand under transmission and remove rear crossmember.

(3) Disconnect front or rear propeller shaft at the transfer case yoke. Place alignment marks on shaft and yoke for assembly reference before disconnecting shaft.

(4) Remove transfer case yoke nut and washer using Tool J-8614-01 (fig. 2D-73).

(5) Remove transfer yoke using Tools J-8614-01, 02, 03, (fig. 2D-74).

(6) Remove oil seal using Tool J-25180 (fig. 2D-75).

(7) Install replacement seal using Tool J-25160.

(8) Install yoke, washer and nut. Tighten nut to 120 foot-pounds (163 N•m) torque. Use Tool J-8614-01 to hold yoke while tightening nut.

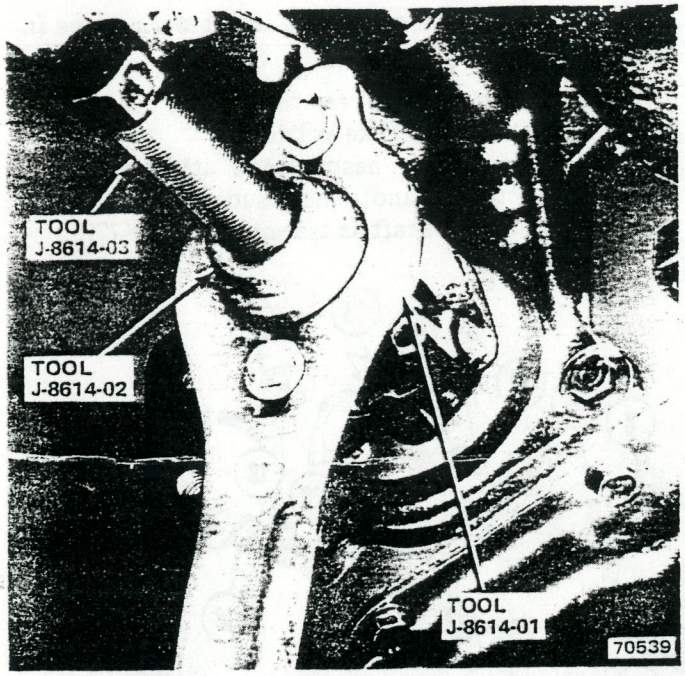


Fig. 2D-73 Output Shaft Yoke Nut Removal

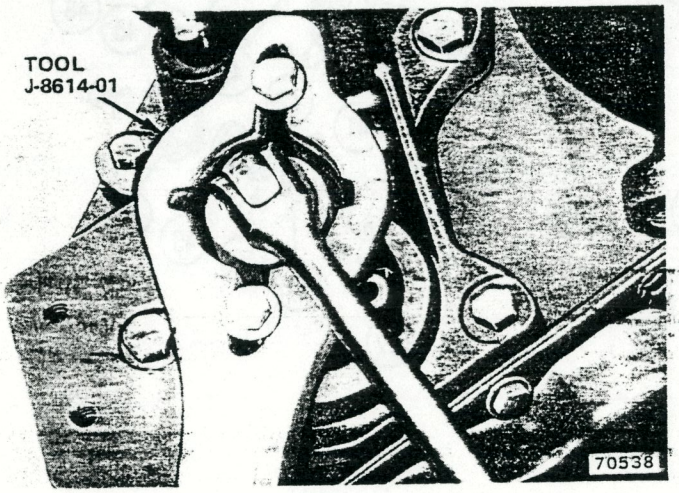


Fig. 2D-74 Yoke Removal

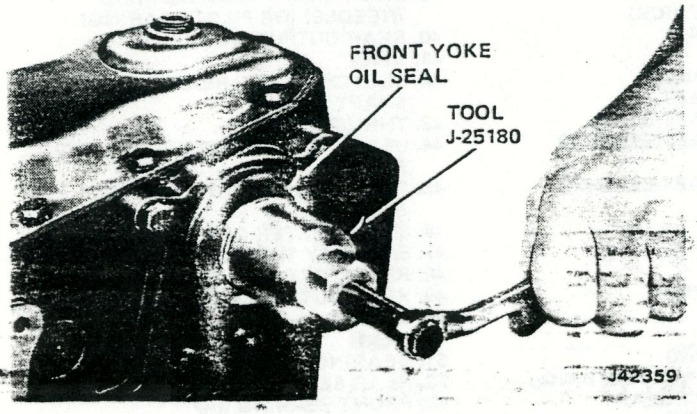


Fig. 2D-75 Yoke Oil Seal Removal

Rear Bearing Cap—Speedometer Drive Gear Service

Removal

(1) Disconnect rear propeller shaft at transfer case yoke. Tie shaft to frame with wire.

(2) Disconnect speedometer cable.

(3) Remove speedometer driven gear sleeve and driven gear.

(4) Remove transfer case vent hose.

(5) Remove output shaft yoke using Tools J-8614-01. -02, -03.

(6) Remove bearing cap-to-transfer case bolts and remove bearing cap.

NOTE: *The bearing cap has been coated with a sealant. Use a putty knife to break the seal, and work the knife around the bearing cap to loosen and remove it.*

(7) Remove shims and speedometer drive gear from output shaft.

NOTE: *Keep the shims together for use in assembly.*

(8) Remove speedometer driven gear bushing from bearing cap, if necessary.

Assembly

(1) Install speedometer driven gear bushing using Tool J-25169 if bushing was removed.

(2) Install speedometer drive gear and shims on shaft.

(3) Apply a bead of Loctite 515, or equivalent sealant, to mating surface of cap and install cap. Use two cap screws to align bolt holes. Use plastic mallet to tap cap into position.

(4) Tighten bearing cap bolts to 35 foot-pounds (47 N•m) torque.

(5) Install output shaft yoke and tighten locknut to 120 foot-pounds (163 N•m) torque. Use Tool J-8614-01 to hold yoke while tightening nut.

(6) Check rear output shaft end play as follows:

(a) Attach Dial Indicator J-8001 to bearing cap and position indicator stylus against output shaft.

(b) Pry output shaft back and forth to check end play. End play should be 0.001 to 0.005 inches (0.025 to 0.127 mm).

(c) If end play is not correct, remove or add shims between speedometer drive gear and output shaft rear bearing.

(7) Install transfer case vent hose.

(8) Install speedometer driven gear sleeve and driven gear.

(9) Install speedometer cable.

(10) Install rear propeller shaft. Tighten clamp strap bolts to 16 foot-pounds (21 N•m) torque.

DISASSEMBLY

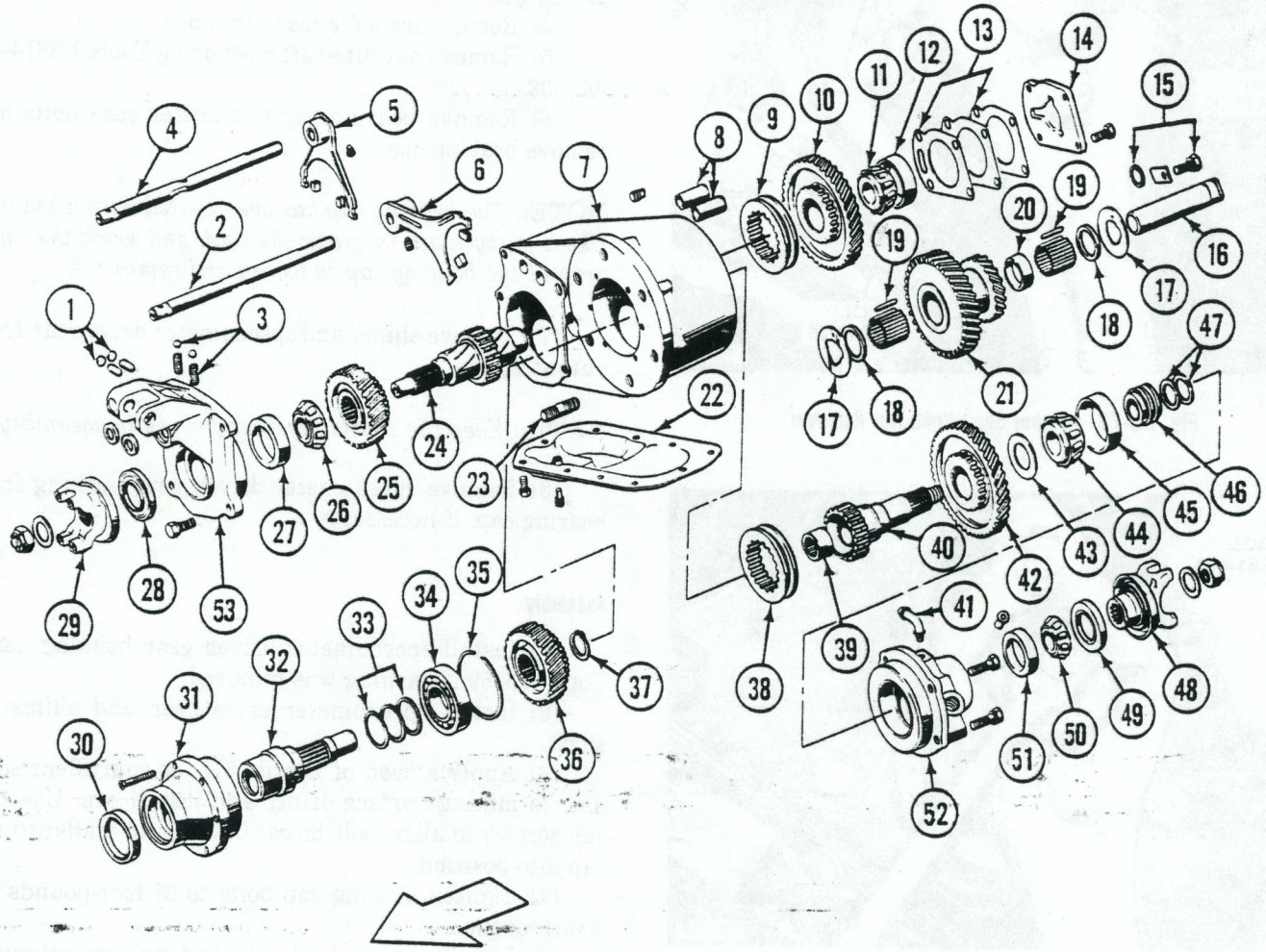
(1) Remove shift lever assembly.

(2) Remove bottom cover (fig. 2D-76).

NOTE: *The bottom cover has been coated with a sealant. Use a putty knife to break the seal, and work the knife around the bottom cover to loosen and remove it. Do not wedge the cover off.*

(3) Remove front and rear yokes using Tool J-8614-01 (fig. 2D-74). Discard yoke locknuts.

(4) Remove socket head screws attaching input shaft support to case and remove support, rear output shaft gear and input shaft as assembly (fig. 2D-77).



1. INTERLOCK PLUGS AND INTERLOCKS
2. SHIFT ROD – REAR OUTPUT SHAFT FORK
3. POPPET BALLS AND SPRINGS
4. SHIFT ROD – FRONT OUTPUT SHAFT FORK
5. FRONT OUTPUT SHAFT SHIFT FORK
6. REAR OUTPUT SHAFT SHIFT FORK
7. TRANSFER CASE
8. THIMBLE COVERS
9. CLUTCH SLEEVE – FRONT OUTPUT SHAFT
10. CLUTCH GEAR – FRONT OUTPUT SHAFT
11. BEARING – FRONT OUTPUT SHAFT REAR
12. RACE – FRONT OUTPUT SHAFT BEARING
13. END PLAY SHIMS – FRONT OUTPUT SHAFT
14. COVER PLATE
15. LOCK PLATE, BOLT AND WASHER
16. INTERMEDIATE GEAR SHAFT
17. THRUST WASHER
18. BEARING SPACER (THIN)
19. INTERMEDIATE GEAR SHAFT NEEDLE BEARINGS
20. BEARING SPACER (THICK)
21. INTERMEDIATE GEAR
22. BOTTOM COVER
23. STUD (CASE-TO-TRANS.)
24. FRONT OUTPUT SHAFT
25. FRONT OUTPUT SHAFT GEAR
26. FRONT OUTPUT SHAFT BEARING (FRONT)
27. FRONT OUTPUT SHAFT BEARING RACE
28. OIL SEAL
29. FRONT YOKE
30. SEAL
31. SUPPORT – INPUT SHAFT
32. INPUT SHAFT
33. SHIMS
34. INPUT SHAFT BEARING
35. INPUT SHAFT BEARING SNAP RING
36. REAR OUTPUT SHAFT GEAR
37. SNAP RING
38. CLUTCH SLEEVE – REAR OUTPUT SHAFT
39. INPUT SHAFT REAR BEARING (NEEDLE) (OR PILOT BEARING)
40. REAR OUTPUT SHAFT
41. VENT
42. CLUTCH GEAR – REAR OUTPUT SHAFT
43. THRUST WASHER
44. BEARING – REAR OUTPUT SHAFT FRONT
45. RACE – REAR OUTPUT SHAFT BEARING
46. SPEEDOMETER DRIVE GEAR
47. END PLAY SHIMS
48. REAR YOKE
49. REAR OUTPUT SHAFT OIL SEAL
50. BEARING – REAR OUTPUT SHAFT REAR
51. BEARING RACE
52. REAR BEARING CAP
53. FRONT BEARING CAP

Fig. 2D-76 Model 300 Transfer Case

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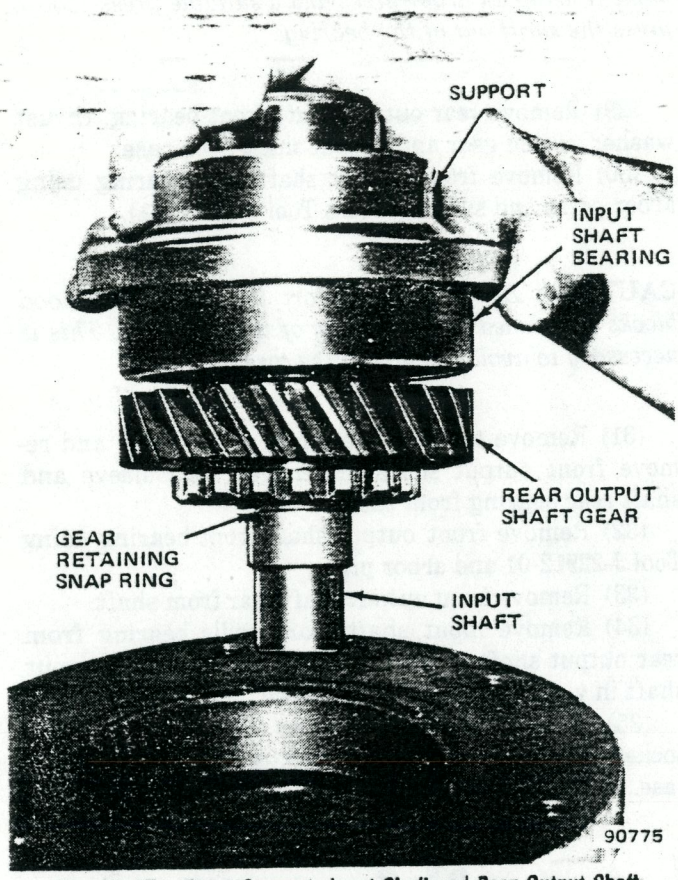


Fig. 2D-77 Front Support, Input Shaft and Rear Output Shaft Gear Removal/Installation

NOTE: *The support has been coated with a sealant. Use a putty knife to break the seal, and work the knife around the support to loosen and remove it.*

(5) Remove rear output shaft clutch sleeve from case.

(6) Remove and discard snap ring retaining rear output shaft gear on input shaft and remove gear.

(7) Remove and discard input shaft bearing snap ring.

(8) Remove input shaft and bearing from support. Tap end of input shaft with plastic mallet to aid removal.

(9) Remove input shaft bearing and end play shims from shaft using arbor press.

(10) Remove input shaft oil seal from support. Discard seal.

(11) Remove intermediate shaft lockplate bolt and lockplate (fig. 2D-76).

(12) Remove intermediate shaft. Tap shaft out of case using brass punch and plastic mallet.

(13) Remove and discard intermediate shaft O-ring seal.

(14) Remove intermediate gear assembly and thrust washers.

NOTE: *Thrust washers have locating tabs which must fit in notches in the case at assembly.*

(15) Remove needle bearings and bearing spacers from intermediate gear.

NOTE: *There are 48 needle bearings and three bearing spacers in the intermediate gear.*

(16) Remove rear bearing cap attaching bolts and remove cap. Use plastic mallet to tap on output shaft to aid cap removal.

NOTE: *The rear bearing cap has been coated with a sealant. Use a putty knife to break the seal, and work the knife around the cap to loosen and remove it.*

(17) Remove end play shims and speedometer drive gear from rear output shaft (fig. 2D-76).

(18) Remove and discard rear output shaft oil seal. Remove bearings and bearing races from rear bearing cap.

(19) Remove setscrews retaining front and rear output shaft shift forks on shift rods (fig. 2D-78).

(20) Remove shift rods. Insert punch through clevis pin holes in rods and rotate rods while pulling them out of case.

NOTE: *When the shift rods are free of the front cap take care to avoid losing the shift rod poppet balls and springs.*

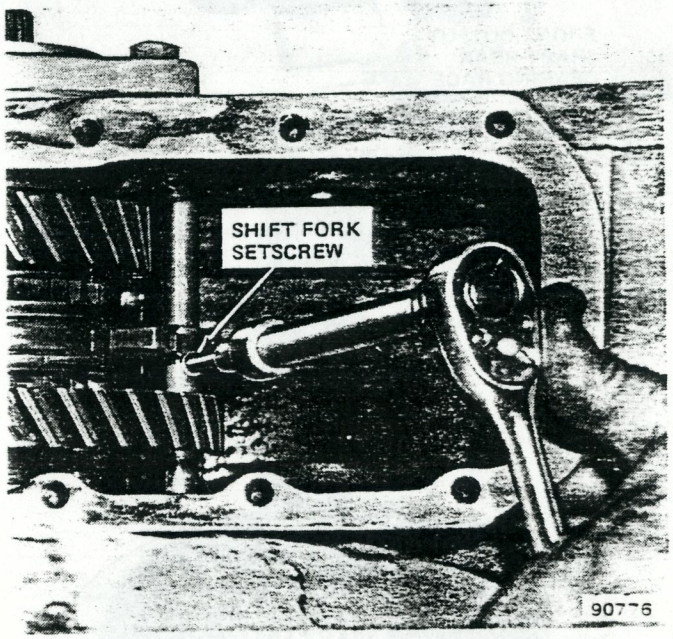


Fig. 2D-78 Shift Fork Setscrew Removal/Installation

(21) Remove shift forks from case.

(22) Remove bolts attaching front cap-to-case and remove front cap.

NOTE: *The front cap has been coated with a sealant. Use a putty knife to break the seal, and work the knife around the cap to loosen and remove it.*

(23) Remove front output shaft and shift rod oil seals from front cap (fig. 2D-76). Discard seals.

(24) Remove front bearing race from front bearing cap using Tool J-29168.

(25) Remove cover plate bolts and remove plate and end play shims from case (fig. 2D-79). Keep shims together for assembly.

(26) Move front output shaft toward front of case.

(27) Remove front output shaft rear bearing race from case (fig. 2D-79).

(28) Remove rear output shaft front bearing. Position case on wood blocks. Seat clutch gear on case interior surface and tap shaft out of bearing using rawhide mallet (fig. 2D-80).

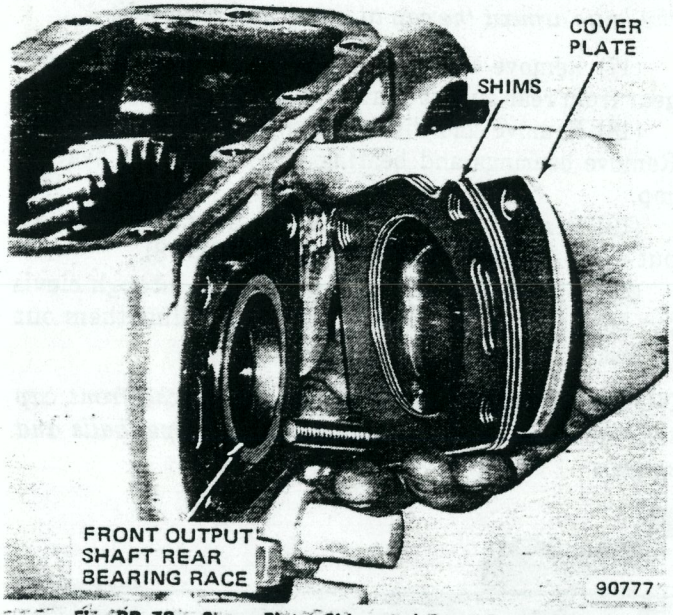


Fig. 2D-79 Cover Plate, Shims and Front Output Shaft Rear Bearing Race

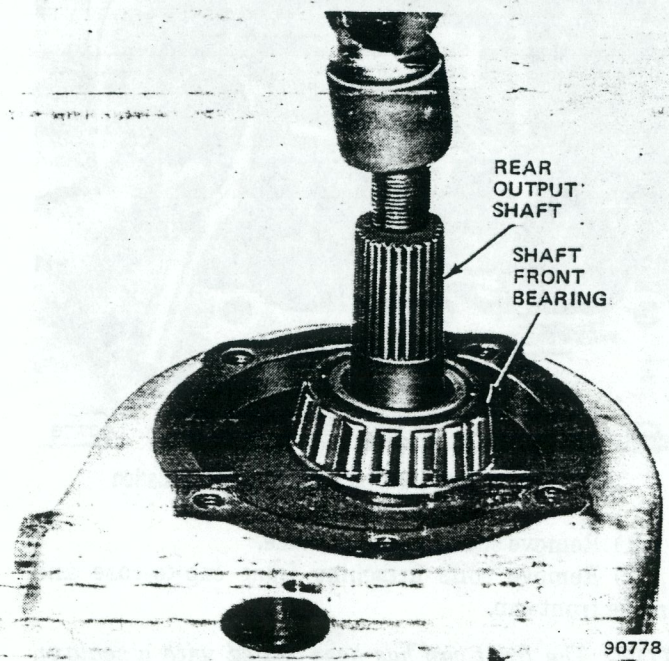


Fig. 2D-80 Rear Output Shaft Front Bearing Removal

NOTE: *If the bearing proves difficult to remove, remove it using an arbor press and a suitable press tool to press the shaft out of the bearing.*

(29) Remove rear output shaft front bearing, thrust washer, clutch gear and output shaft from case.

(30) Remove front output shaft rear bearing using arbor press and suitable press Tool (fig. 2D-81).

CAUTION: *Be sure to support the case with wood blocks positioned at either side of the case bore. This is necessary to avoid damaging the case.*

(31) Remove transfer case from arbor press and remove front output shaft, clutch gear and sleeve and shaft rear bearing from case.

(32) Remove front output shaft front bearing using Tool J-22912-01 and arbor press.

(33) Remove front output shaft gear from shaft.

(34) Remove input shaft rear needle bearing from rear output shaft using Tool J-29369-1. Support output shaft in vise during bearing removal.

(35) Remove shift rod thimbles. Use 3/8 drive, 7/16 socket and extension to tap shift rod thimbles out of case.

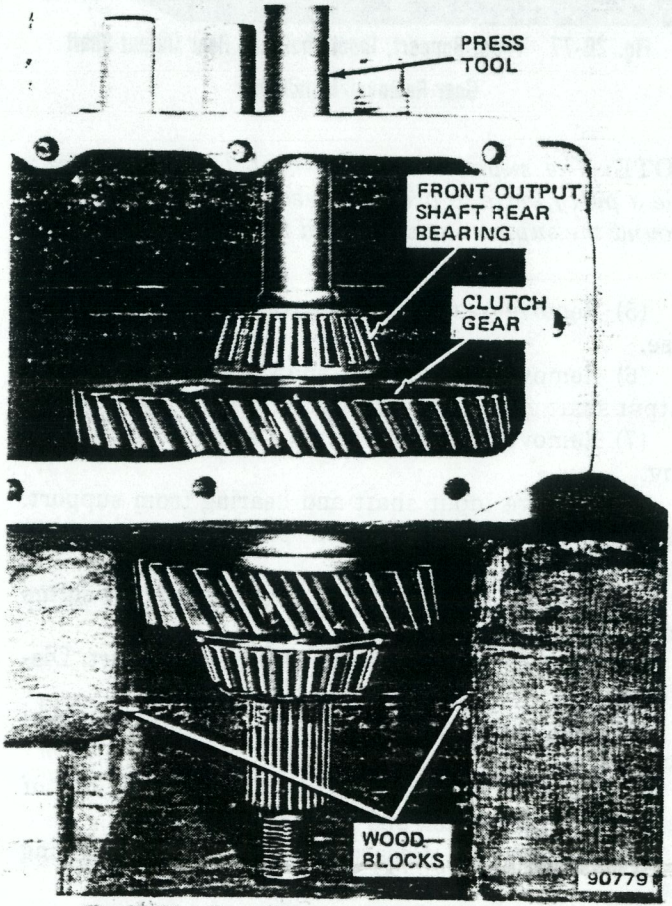


Fig. 2D-81 Front Output Shaft Rear Bearing Removal

CLEANING AND INSPECTION

Clean the case and all components in solvent. Remove all old sealing material from the case and bearing cap mating surfaces. Dry all components except the bearings, using compressed air. Use caution when cleaning the case mating surfaces. Do not scratch or mar these surfaces in any way. However, minor surface irregularities can be removed with sandpaper. Do not dry any bearings with compressed air. Use clean shop towels only.

Inspect all parts for signs of excessive wear or damage. Replace gears that are cracked, chipped broken or excessively worn. Replace any bearings that are worn, pitted, scored, flat-spotted, or brinelled. Replace any shaft that has damaged splines, threads or bearing surfaces. Check the shift rods and rod bores in the case for wear or damage. Minor scratches or nicks on the rods may be cleaned up using crocus cloth.

ASSEMBLY

(1) Install shift rod thimbles. Apply Loctite 220 or equivalent sealant to thimbles before installation.

(2) Install front output shaft gear on front output shaft. Be sure clutch teeth on gear face shaft gear teeth.

(3) Install front bearing on front output shaft using arbor press and suitable press tool. Be sure bearing is seated against gear.

(4) Install front output shaft in case and install clutch sleeve and clutch gear on shaft.

(5) Install front output shaft rear bearing using arbor press and suitable press tool (fig. 2D-82).

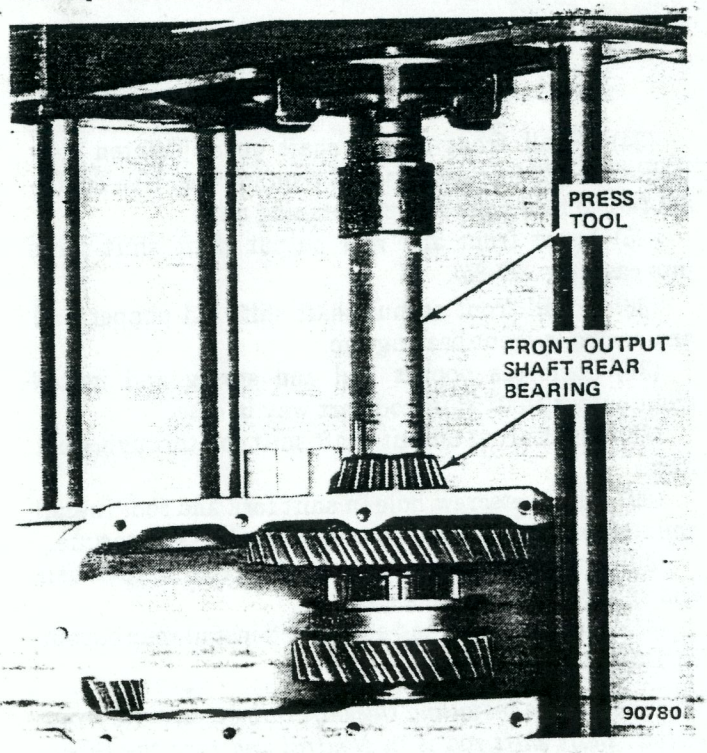


Fig. 2D-82 Front Output Shaft Rear Bearing Installation

NOTE: *Install an old yoke nut on the shaft to avoid damaging the threads.*

(6) Install input shaft rear needle bearing in rear output shaft using Tool J-29179.

(7) Position rear output shaft clutch gear in case and insert rear output shaft into gear.

(8) Install thrust washer and front bearing on rear output shaft using arbor press and suitable press tool.

(9) Install shims and bearing on input shaft using arbor press and suitable press tool.

(10) Install new input shaft oil seal in input shaft support using Tool J-29184.

(11) Install input shaft and bearing in support and install new bearing snap ring.

(12) Install rear output shaft gear on input gear and install new gear retaining snap ring (fig. 2D-77).

(13) Measure clearance between input gear and gear retaining snap ring using feeler gauge. Clearance should not exceed 0.003 inches (0.076 mm). If clearance is over tolerance, disassemble input shaft and add shims between input shaft and shaft bearing (fig. 2D-76).

(14) Install clutch sleeve on rear output shaft.

(15) Apply Loctite 515, or equivalent sealant, to mating surface of input shaft support and install assembled support, shaft and gear in case. Use two support bolts to align support on case and tap support into position using plastic mallet.

(16) Install and tighten socket head screws in support to 10 foot-pounds (14 N•m) torque.

(17) Install rear bearing cap front bearing race using Tool J-9276-3.

(18) Install rear bearing cap rear bearing race using Tool J-29182.

(19) Position rear output shaft rear bearing in rear bearing cap.

(20) Install rear output shaft yoke oil seal using Tool J-25160.

(21) Install speedometer gear and end play shims on rear output shaft.

(22) Install rear bearing cap. Apply Loctite 515, or equivalent sealant, to mating surface of cap. Use two cap bolts to align bolt holes and tap rear cap into place using plastic mallet.

(23) Install and tighten rear bearing cap bolts to 35 foot-pounds (47 N•m) torque.

(24) Install rear output shaft yoke. Tighten new locknut to 120 foot-pounds (163 N•m) torque. Use Tool J-8614-01 to hold yoke while tightening nut.

(25) Check rear output shaft end play as follows:

(a) Clamp Dial Indicator J-8001 onto bearing cap. Position indicator stylus so it contacts end of shaft (fig. 2D-83).

(b) Pry output shaft back and forth to check end play. End play should be 0.001 to 0.005 inches (0.025 to 0.127 mm).

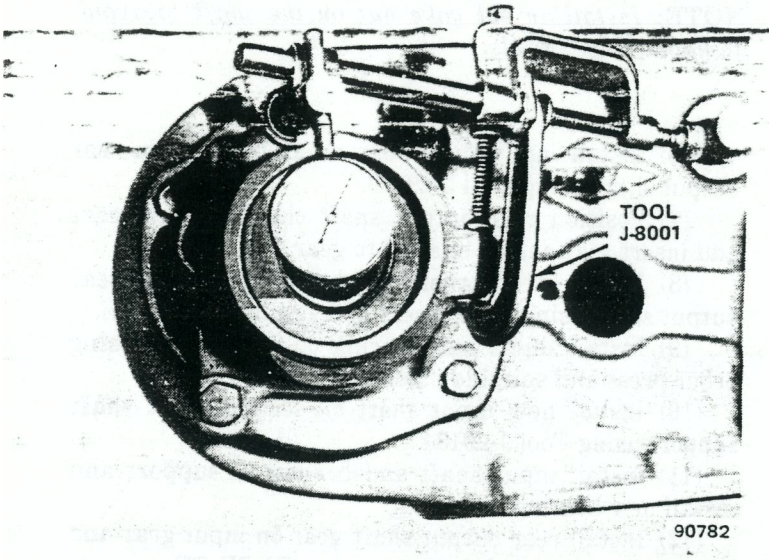


Fig. 2D-83 Checking Rear Output Shaft End Play

(c) If end play is not correct, remove or add shims between speedometer drive gear and output shaft rear bearing (fig. 2D-76).

(26) Install front output shaft rear bearing race (fig. 2D-79).

(27) Install front output shaft end, play shims and cover plate (fig. 2D-79). Tighten cover plate bolts to 35 foot-pounds (47 N•m) torque.

NOTE: *Apply Loctite 220, or equivalent sealant, to bolt threads before installation.*

(28) Install front output shaft front bearing race using Tools J-8092 and J-29181 (fig. 2D-84).

(29) Install front output shaft yoke oil seal using Tool J-25160.

(30) Install shift rod oil seals using Tool J-25167 (fig. 2D-72).

(31) Install front bearing cap. Apply Loctite 515, or equivalent sealant, to mating surface of cap before installation. Use two bolts to align cap and case bolt holes and tap cap into position on case using plastic mallet.

(32) Install and tighten bearing cap bolts to 35 foot-pounds (47 N•m) torque.

(33) Check front output shaft end play as follows:

(a) Seat rear bearing cup against cover plate by tapping end of front output shaft with plastic mallet.

(b) Mount dial indicator on front bearing cap and position indicator stylus against end of output shaft.

(c) Pry shaft back and forth to check end play. End play should be 0.001 to 0.005 inches (0.025 to .129 mm).

(d) If end play is not correct, remove or add shims between cover plate and case. If shims are added, seat rear bearing cup as outlined in step (a) before checking end play again.

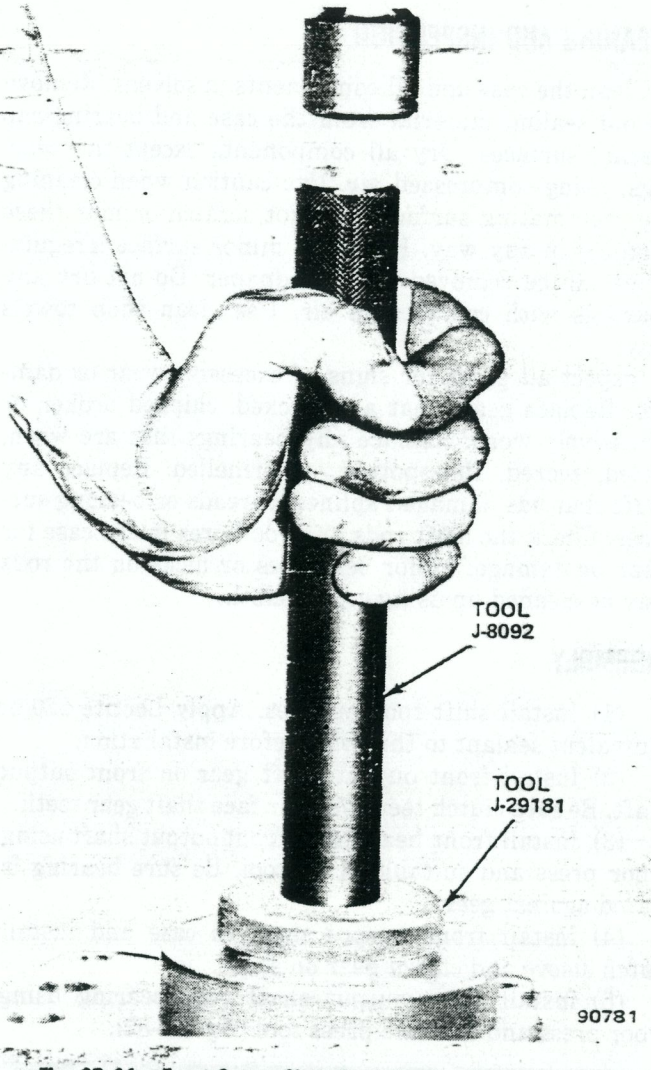


Fig. 2D-84 Front Output Shaft Front Bearing Race Installation

(34) Install front output shaft yoke. Tighten new locknut to 120 foot-pounds (163 N•m) torque. Use Tool J-8614-01 to hold yoke while tightening nut.

(35) Insert front and rear output shaft shift forks into case (fig. 2D-85).

(36) Install front output shaft shift rod poppet ball and spring in front bearing cap.

(37) Compress poppet ball and spring and install front output shaft shift rod part way in case.

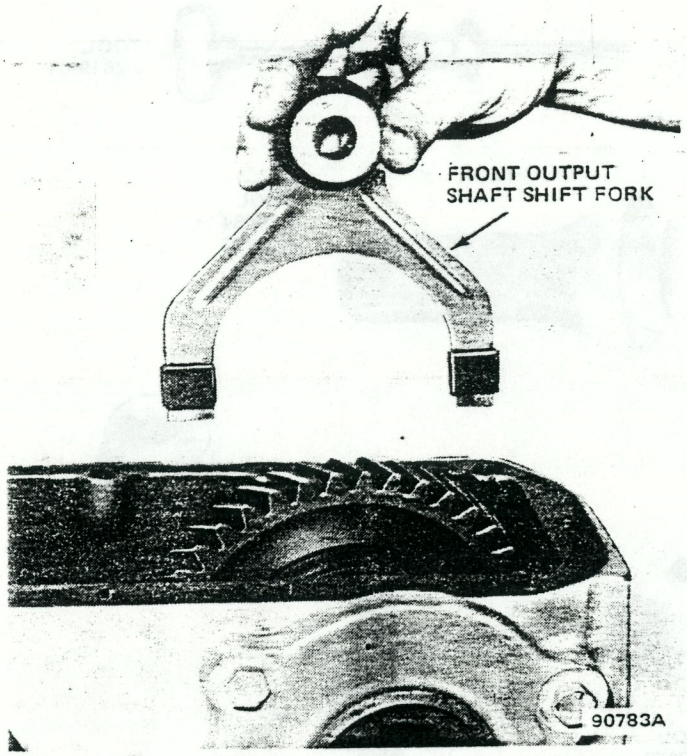
(38) Insert front output shaft shift rod through shift fork.

(39) Align setscrew hole in shift fork and rod. Install and tighten setscrew to 14 foot-pounds (19 N•m) torque.

(40) Install rear output shaft shift rod poppet ball and spring in front bearing cap.

(41) Compress ball and spring and install rear output shaft shift rail part way in case.

NOTE: *Before installing the shift rail, be sure the front output shaft shift rod is in Neutral and that the interlocks are seated in the front bearing cap bore.*



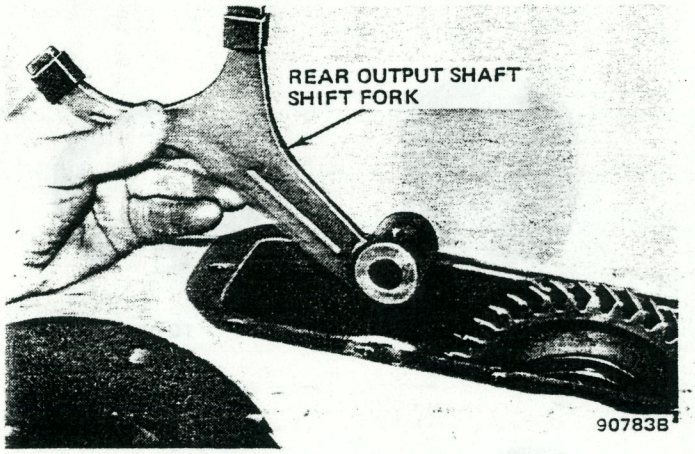


Fig. 2D-85 Shift Fork Installation

(42) Insert rear output shaft shift rod through shift fork.

(43) Align setscrew holes in fork and rod. Install and tighten setscrew to 14 foot-pounds (19 N•m) torque.

(44) Insert Tool J-25142 in intermediate gear and install needle bearings and spacers in gear.

(45) Install intermediate gear thrust washers in case. Be sure washer tangs are aligned with grooves in case.

NOTE: *The thrust washers can be held in place with petroleum jelly.*

(46) Install new O-ring seal on intermediate shaft.

(47) Position intermediate gear in case.

(48) Install intermediate shaft in case bore. Tap shaft into gear until shaft forces Tool J-25142 out of case. Use plastic mallet to tap shaft into place.

(49) Install intermediate shaft lockplate and bolt. Tighten bolt to 23 foot-pounds (31 N•m) torque.

(50) Install bottom cover and replacement gasket. Apply Loctite 515, or equivalent sealant, to mating surface of cover. Install and tighten cover bolts to 15 foot-pounds (20 N•m) torque.

SPECIFICATIONS

Specifications—Model 300 Transfer Case

Transfer Case Type	4 position, dual range part time 4 wheel drive unit with integral low range
Torque Transmittal Mode	Constant mesh gearbox with layshaft gear arrangement.
Low Range Reduction Ratio	2.6:1 gear reduction
Drive Positions and Shift Controls	2H, 4H, 4L and Neutral. Ranges selected via floor mounted shift lever. 4H and 4L ranges are undifferentiated
Case Configuration	One piece cast iron with aluminum front/rear bearing caps
Lubricant Capacity and Type	4 pints (1.9 liters) SAE 85W-90 gear lubricant API grade GL-5

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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
Bottom Cover Bolts	15	10-20	20	14-27
Cover Plate Bolts	35	25-40	47	34-54
Front Bearing Cap Bolts	35	25-40	47	34-54
Front/Rear Yoke Locknuts	120	120-150	163	163-203
Input Shaft Support Screws	10	7-10	14	9-14
Lockplate Bolt	23	20-25	31	27-34
Shift Fork Setscrews	14	12-18	19	16-24

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

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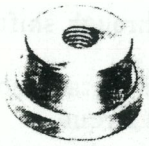
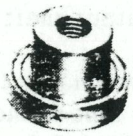
Tools

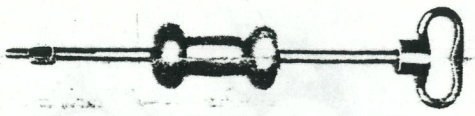


TOOL
J-29181

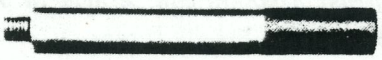


TOOL
J-29163

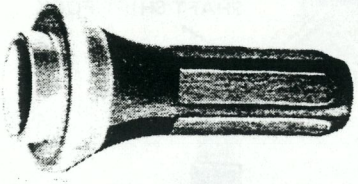
TOOL
J-29174



TOOL
J-2619-01



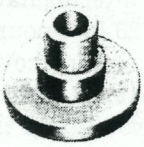
TOOL
J-8092



TOOL
J-29184 or
J-29162

TOOL
J—29170

TOOL
J-9276-3



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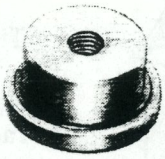
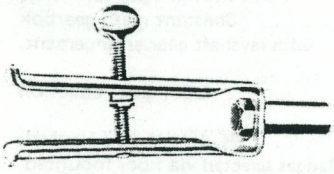


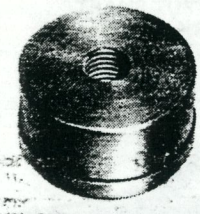
TOOL
J-29169

TOOL
J-8614-03



TOOL
J-26941

TOOL
J-25167



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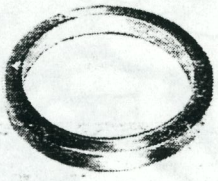

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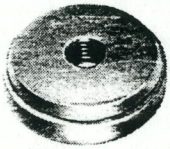
J-29185-2



TOOL
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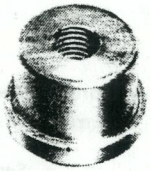

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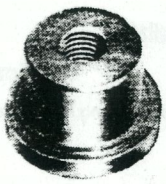
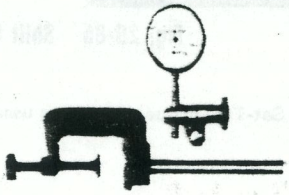
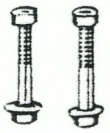
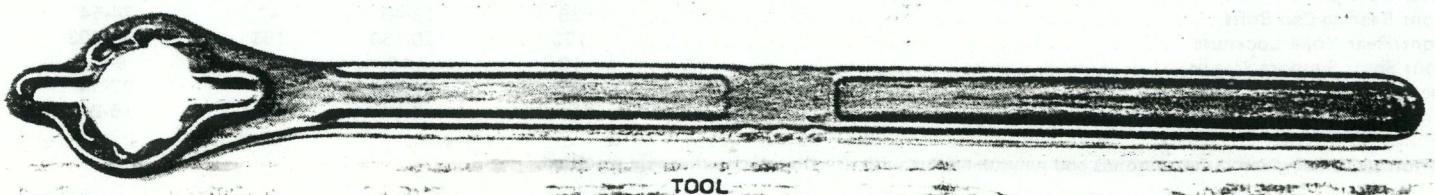


TOOL
J-25167



TOOL
J-8001





TOOL
J-8614-01

PROPELLER SHAFT 2E

SECTION INDEX

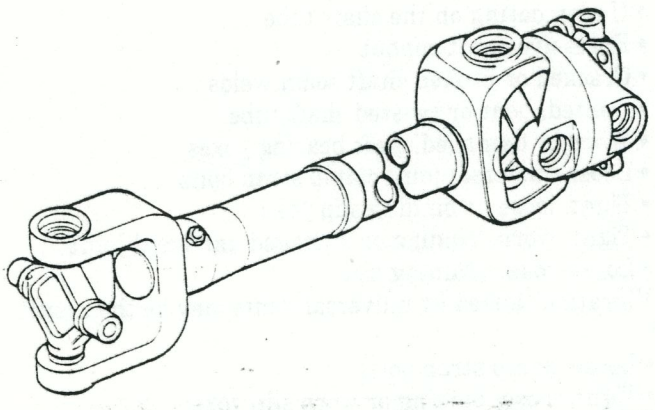
GENERAL

Jeep vehicles use tubular propeller shafts to transmit engine torque from the transfer case to the front and rear axles. Universal joints connect each shaft to the transfer case and axle yokes. A splined slip yoke is used at one end of each propeller shaft to compensate for variations in shaft length caused by suspension spring movement.

Because of the various driveline combinations available on Jeep vehicles, several different propeller shaft and universal joint designs are required.

Propeller Shaft Application

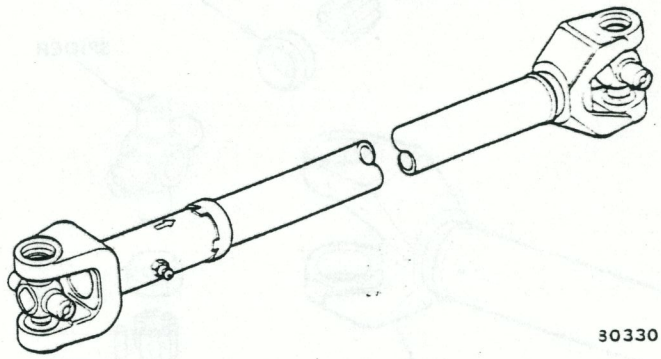
The front propeller shaft on Cherokee, Wagoneer and Truck models is connected to the axle yoke with a single cardan universal joint and to the transfer case yoke with a double cardan universal joint (fig. 2E-1).



80329

Fig. 2E-1 Front Propeller Shaft Assembly—Cherokee, Wagoneer and Truck Models

The front propeller shaft on CJ models is connected to both the axle and transfer case yokes with single cardan universal joints. A slip yoke is used at the axle end of the shaft (fig. 2E-2).



80330

Fig. 2E-2 Front Propeller Shaft Assembly—CJ

The rear propeller shaft on Cherokee, Wagoneer and Truck models is connected to both the axle and transfer case yokes with single cardan universal joints. A slip yoke is used at the transfer case end of the shaft (fig. 2E-3).

The rear propeller shaft on CJ models is similar to the front shaft in appearance and construction. Single cardan universal joints connect the shaft to both the axle and transfer case yokes and the slip yoke is located at the transfer case end of the shaft.

Universal Joint Application

Two different design universal joints are used for the various driveline combinations: a single cardan joint and a double cardan joint.

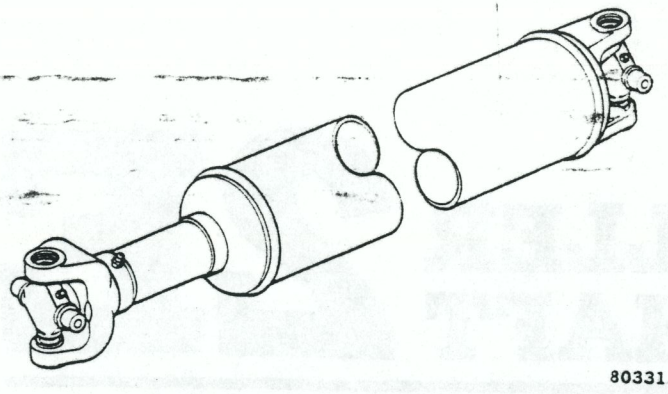


Fig. 2E-3 Rear Propeller Shaft Assembly—Cherokee, Wagoneer and Truck Models

The single cardan joint is used for most applications and consists of a single spider with four sets of needle bearings, and four bearing seals, bearing caps, and bearing cap retainers (fig. 2E-4). Clamp straps are used to attach the joint to the axle and transfer case yokes.

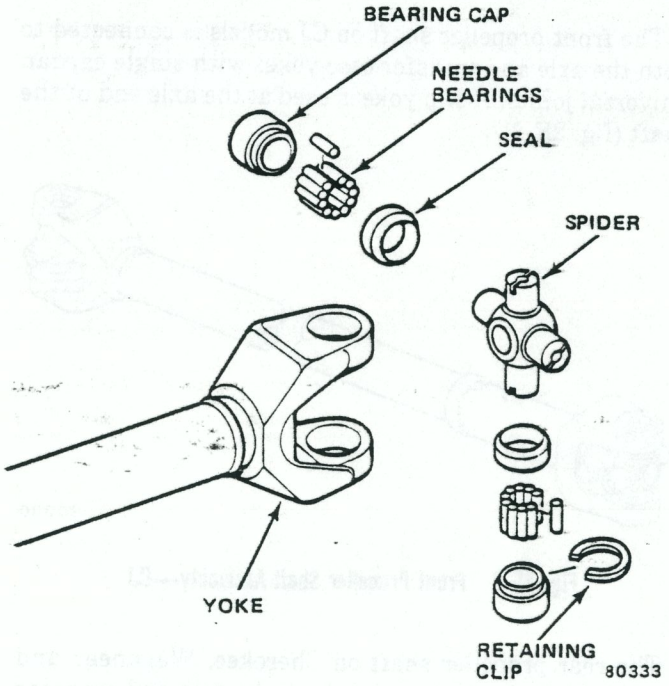


Fig. 2E-4 Single Cardan Universal Joint

The double cardan joint, also referred to as a constant velocity joint, consists of two spiders, a socket ball, a link yoke, a socket spring and dust seal, a socket yoke, and needle bearings, bearing seals, bearing caps and bearing retainers for each spider (fig. 2E-5). The double cardan joint is used for front propeller shaft-to-transfer case yoke applications on all Cherokee, Wagoneer and Truck models.

DRIVELINE VIBRATION

Driveline vibration can be divided into two categories: mechanical or audible. Mechanical vibrations produce

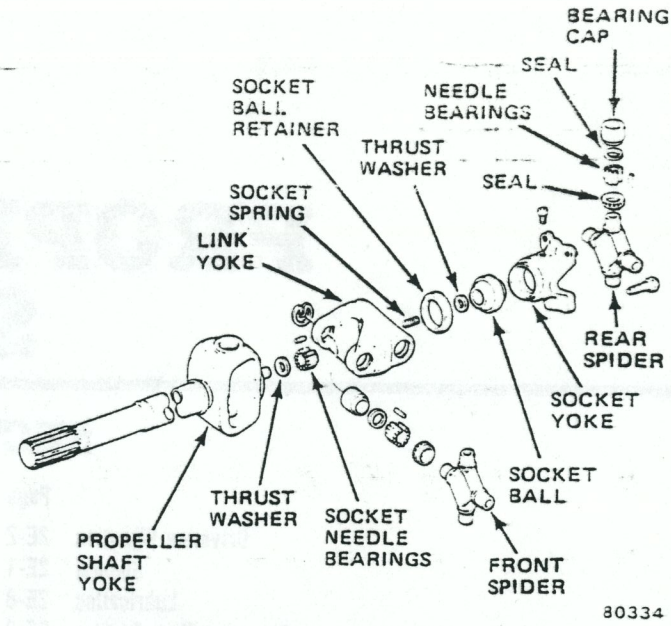


Fig. 2E-5 Double Cardan Universal Joint

visible motion in the fenders, rear view mirror, instrument panel or steering wheel, or can be felt through the seats, floorpan or steering wheel. Audible vibrations are heard or sensed above normal road and background noise and may be accompanied by mechanical vibration. In some cases, audible vibration occurs as a droning or drumming noise while in other cases, it produces a buffeting sensation that is felt or sensed by the driver rather than heard.

Driveline vibration may be caused by the front or rear propeller shafts, axle or transfer case yokes, universal joints, incorrect front or rear pinion angles, loose engine-transmission-transfer case mountings or engine driven accessories. Mechanical vibration is usually caused by a damaged or worn driveline component. Audible vibrations are usually caused by an incorrect universal joint angle or binding universal joints and are most noticeable in the 40-60 mph (64-97 km/h) speed range.

Vibration caused by a propeller shaft may be the result of:

- Undercoating on the shaft tube
- Excessive shaft runout
- Cracked or broken shaft seam welds
- Dented, bent or twisted shaft tube
- Worn or damaged shaft bearing yokes
- Loose universal joint clamp strap bolts
- Tight, loose or binding slip yoke
- Tight, worn, binding or damaged universal joint
- Loose yoke retaining nut

Vibration caused by universal joints may be the result of:

- Loose clamp strap bolts
- Tight, loose, binding or worn slip yoke
- Worn or damaged universal joint spider
- Worn or damaged needle bearings or bearing caps

Vibration caused by axle, transfer case, engine or suspension components may be the result of:

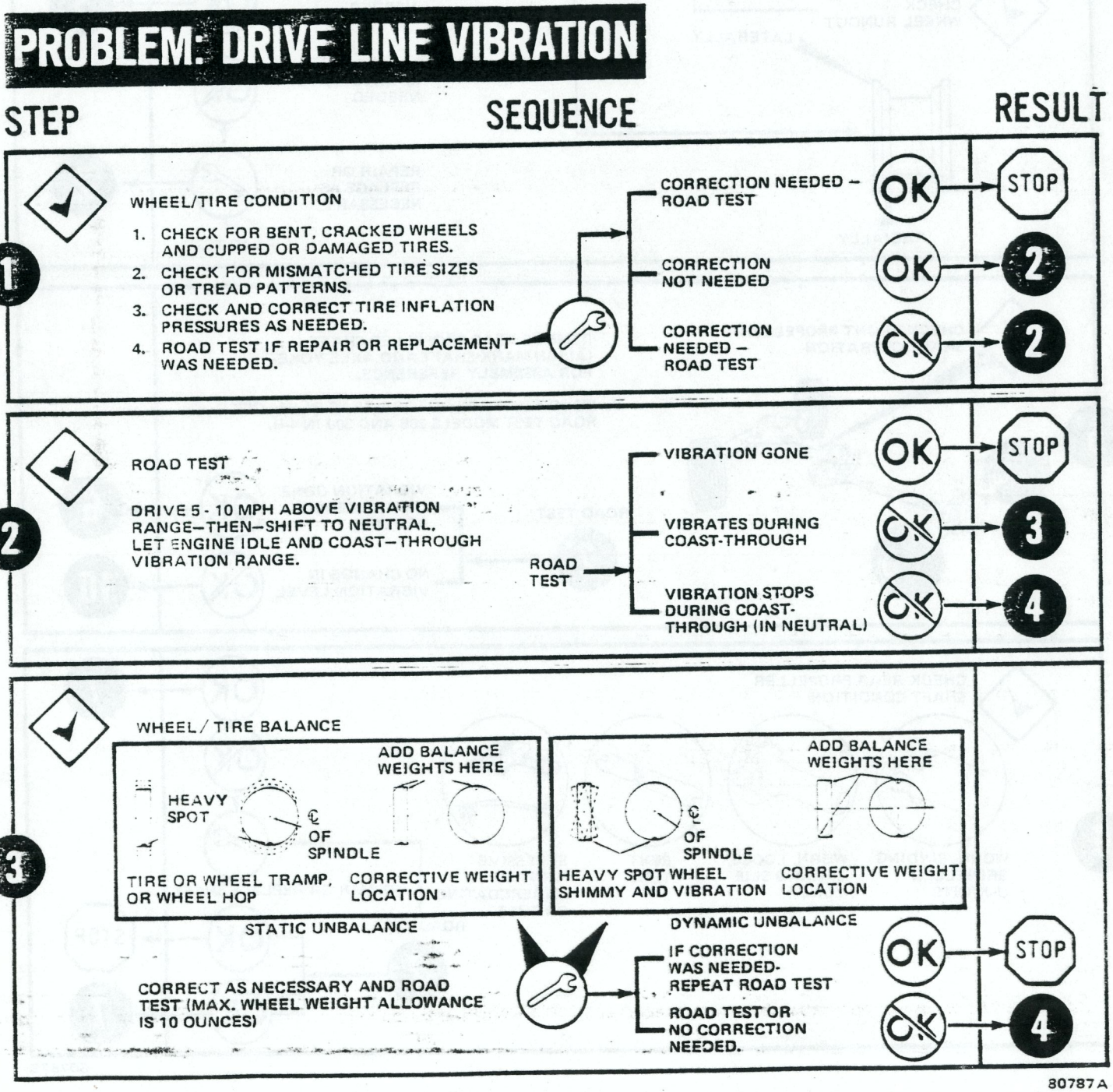
- Loose yoke retaining nut
- Excessive yoke runout
- Incorrect universal joint angle
- Bent, worn, broken, or loose torque reaction bracket or engine rear crossmember
- Damaged or loose suspension springs or suspension components
- Loose engine or transmission/transfer case support cushions or crossmembers, broken spring mounting pad (on axle), broken spring center bolt, or damaged engine driven accessories or drive belts.

Driveline Vibration Diagnosis

If a driveline vibration condition should develop, do not initiate corrective procedures until the vibration source has been determined. This is important in avoiding unnecessary or ineffective repairs. The following Diagnosis and Repair (DARS) Charts will help to isolate the most common causes of driveline vibration:

Driveline Vibration Diagnosis and Repair (DARS) Charts

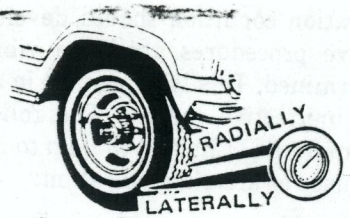
Note: Refer to Chapter A – General Information for details on how to use this DARS chart.



STEP | SEQUENCE | RESULT

4

CHECK TIRE RUNOUT

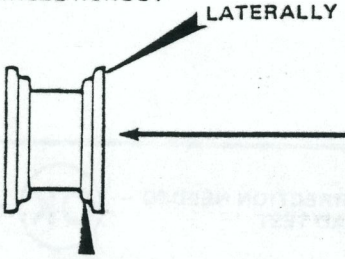


TIRE RADIAL RUNOUT:
RADIAL TIRES 0.080
CONVENTIONAL TIRES . . 0.105

TIRE LATERAL RUNOUT:
ALL TIRES 0.100

WHEEL RUNOUT:
LATERAL/RADIAL 0.045

CHECK WHEEL RUNOUT

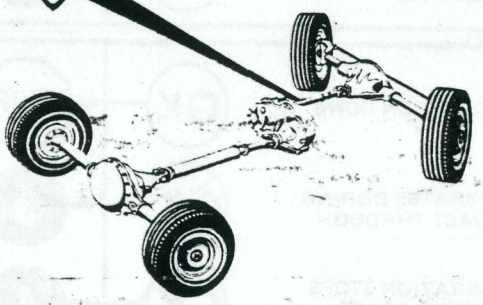


NO CORRECTION NEEDED → OK → 5

CORRECTION NEEDED → O.K → REPAIR OR REPLACE AS NECESSARY → 2 → ROAD TEST

5

CHECK FRONT PROPELLER SHAFT OPERATION

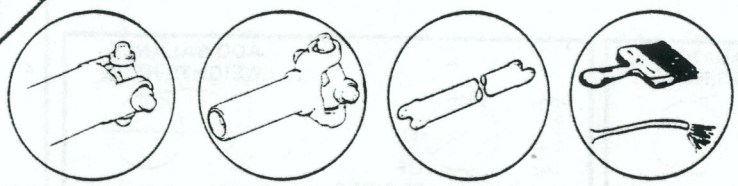


1. REMOVE REAR PROPELLER SHAFT (ALIGN MARK SHAFT AND AXLE YOKE FOR ASSEMBLY REFERENCE.
2. ROAD TEST WITH QUADRA-TRAC IN 4H-LOCK. ROAD TEST MODELS 208 AND 300 IN 4-H.

ROAD TEST → 2 →
- VIBRATION GONE OR NOTICEABLY REDUCED → OK → 6
- NO CHANGE IN VIBRATION LEVEL → O.K → 10

6

CHECK REAR PROPELLER SHAFT CONDITION



OK → 7

O.K → REPAIR OR REPLACE SHAFT

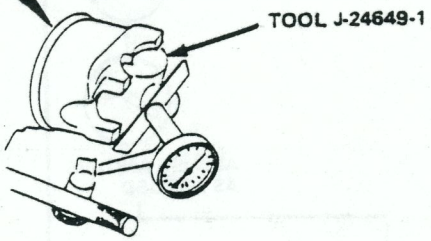
ROAD TEST → 2 →
- OK → STOP
- O.K → 7

80787B

STEP | SEQUENCE | RESULT

7

CHECK FRONT AXLE PINION AND TRANSFER CASE YOKE RUNOUT USING TOOL J-24649-1



MAXIMUM ALLOWABLE RUNOUT AT EITHER YOKE IS 0.006 (0.15 mm)

OK → 8

C.K

IF RUNOUT IS 0.007 OR MORE, REINDEX YOKE, AND RECHECK RUNOUT. REPLACE YOKE IF REINDEXING DOES NOT CORRECT RUNOUT.* REINSTALL PROP SHAFT.

ROAD TEST

2

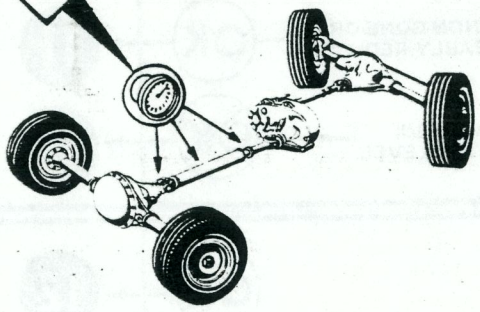
OK → STOP

C.K → 8

*REPLACEMENT YOKE RUNOUT SHOULD BE CHECKED ALSO.

8

CHECK REAR PROPELLER SHAFT RUNOUT USING DIAL INDICATOR.



MAXIMUM ALLOWABLE RUNOUT OF SHAFT IS .015 (INCHES) TOTAL INDICATOR RUNOUT AT ENDS AND CENTER OF SHAFT. AT SHAFT ENDS, MEASURE RUNOUT 3 INCHES FROM SHAFT WELD SEAMS.

OK → 9

C.K

REINDEX SHAFT 180° AND RECHECK RUNOUT.

OK

C.K

REPLACE SHAFT

ROAD TEST

2

OK → STOP

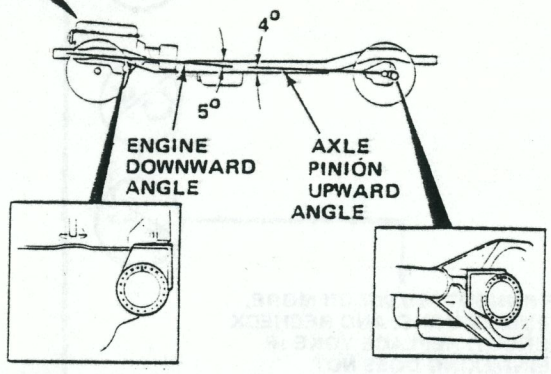
C.K → 9

80787C

STEP | SEQUENCE | RESULT

9

CHECK REAR AXLE PINION UPWARD ANGLE AND ENGINE DOWNWARD ANGLE



REAR AXLE PINION ANGLE MUST BE ½° TO 1½° (1° PREFERRED) BELOW ENGINE ANGLE. USE APPROPRIATE SHIMS TO CORRECT ANGLE

OK → 10

O.K

ADJUST ANGLES AS NEEDED

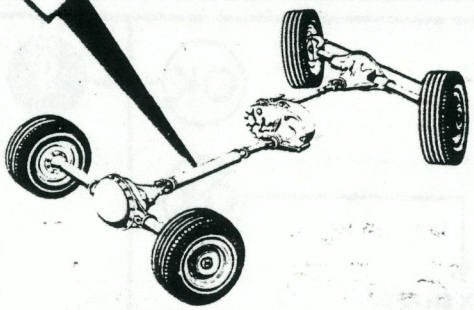
ROAD TEST 2

OK → STOP

O.K → 10

10

CHECK REAR PROPELLER SHAFT OPERATION



1. REMOVE FRONT PROPELLER SHAFT (ALIGN MARK SHAFT AND AXLE YOKES FOR ASSEMBLY REFERENCE).
2. ROAD TEST WITH QUADRA-TRAC IN 4H-LOCK AND MODELS 208 AND 300 IN 4H.

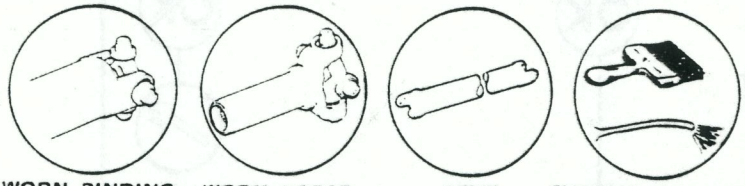
ROAD TEST 2

VIBRATION GONE OR NOTICEABLY REDUCED → OK → 11

NO CHANGE IN VIBRATION LEVEL → O.K → 12

11

CHECK FRONT PROPELLER SHAFT CONDITION



WORN, BINDING BRINELLED U-JOINT | WORN, LOOSE BINDING SLIP YOKE | BENT TUBE | EXCESSIVE PAINT OR UNDERCOATING ON TUBE

OK → 12

O.K

REPAIR OR REPLACE SHAFT

ROAD TEST 2

OK → STOP

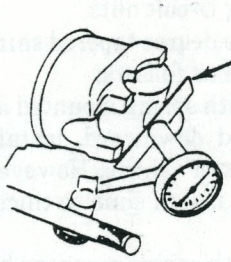
O.K → 13

80787D

STEP | SEQUENCE | RESULT

12

CHECK REAR AXLE PINION AND TRANSFER CASE YOKE RUNOUT USING TOOL J-24649-1



MAXIMUM ALLOWABLE RUNOUT AT EITHER YOKE IS 0.006 (0.15 mm)

IF RUNOUT IS 0.007 OR MORE, REINDEX YOKE AND RECHECK RUNOUT. REPLACE YOKE IF REINDEXING DOES NOT CORRECT RUNOUT. * REINSTALL PROP SHAFT.

OK → 13

O.K. → ROAD TEST → 2

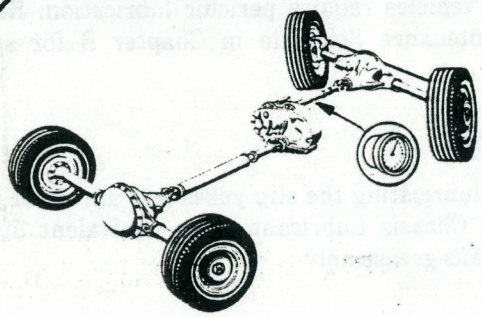
OK → STOP

O.K. → 13

*REPLACEMENT YOKE RUNOUT SHOULD BE CHECKED ALSO

13

CHECK FRONT PROPELLER SHAFT RUNOUT USING DIAL INDICATOR



MAXIMUM ALLOWABLE RUNOUT OF SHAFT IS .015 (INCHES) TOTAL INDICATOR RUNOUT AT ENDS AND CENTER OF SHAFT. AT SHAFT ENDS, MEASURE RUNOUT 3 INCHES FROM SHAFT WELD SEAMS.

OK → 14

O.K. → REINDEX SHAFT 180° AND RECHECK RUNOUT → O.K. → REPLACE SHAFT

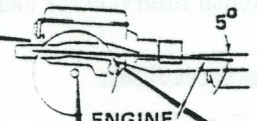
OK → ROAD TEST → 2

OK → STOP

O.K. → 14

14

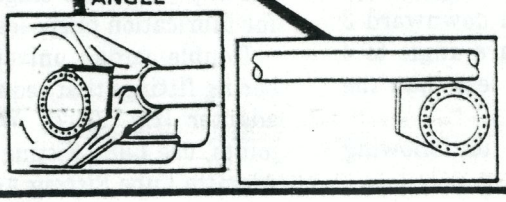
CHECK FRONT AXLE PINION AND FRONT PROPELLER SHAFT ANGLES



NOTE: Front axle pinion angle is measured using same procedure as rear axle pinion angle. Front propeller shaft angle is measured by placing protractor on front driveshaft. [Do not use engine downward angle as base for adjusting front axle pinion angle.] Record readings.

ENGINE DOWNWARD ANGLE

FRONT AXLE PINION ANGLE MUST BE ½° TO 1½° (1° PREFERRED) ABOVE FRONT PROPELLER SHAFT ANGLE. USE APPROPRIATE SHIMS TO OBTAIN CORRECT ANGLE



ROAD TEST → 2 → STOP

80787E

UNIVERSAL JOINT ANGLE MEASUREMENT AND ADJUSTMENT

When torque is transmitted through single cardan universal joints operating at an angle, the rotating speeds of the driving and driven yoke will differ. In operation, the driving yoke rotates at a constant speed while the driven yoke speeds up and slows down twice every revolution.

This difference in driven yoke rotating speed is proportional to the operating angle of the universal joint. In effect, the greater the universal joint operating angle, the greater the speed fluctuation of the driven yoke.

If fluctuation is excessive, driveline vibration will occur. As a result, the universal joint operating angles must be controlled to minimize this effect.

On some Jeep models with Quadra-Trac, an incorrect rear propeller shaft universal joint angle will generate an audible-type vibration. The vibration occurs as a constant booming or drone-like sound most noticeable in the 40-60 mph (64-97 km/h) speed range.

If a vehicle exhibits this condition, the rear propeller shaft universal joint and engine angles must be checked. If the angles are not within specified limits, shims must be installed between the rear axle spring pads and rear spring to correct the angles. Shims are available in one, two and three degree increments for this purpose. The angle measurement and correction procedure is as follows:

(1) Place vehicle on level surface.

(2) Measure engine downward angle as follows:

(a) Position protractor on left side of engine block at transmission mounting ear. Place protractor in fore and aft direction. Use mirror to view protractor if necessary.

(b) Record engine downward angle, remove protractor and proceed to next step.

(3) Measure pinion upward angle as follows:

(a) Place protractor on left side of rear axle housing on flat machined surface of housing that is next to welded plug. Be sure this surface is free of weld flash.

(b) Record pinion upward angle, remove protractor and proceed to next step.

(4) If pinion upward angle is one degree less than engine downward angle, pinion angle is within specified limits. Check for other causes of vibration.

(5) If pinion upward angle is greater than engine downward angle by more than one degree, pinion angle must be adjusted as follows.

EXAMPLE: If the engine angle measures 5 degrees downward and the pinion angle measures 7 degrees upward, the pinion angle must by adjusted downward 3 degrees. This changes the pinion downward angle to 4 degrees which is the required one degree less than the engine downward angle.

(6) Adjust pinion angle as outlined in following steps.

(7) Raise rear of vehicle and place support stands under frame rails.

(8) Position hydraulic jack under axle housing and raise jack just enough to support weight of axle.

(9) Remove rear wheels.

(10) Loosen rear spring U-bolt nuts.

(11) Install appropriate degree tapered shim between spring and axle spring pad as follows:

(a) On vehicles with spring mounted above axle, if angle must be adjusted downward, install shim so thickest end is facing front of vehicle. However, if angle must be adjusted upward, install shim so thickest end is facing rear of vehicle.

(b) On vehicles with spring mounted below axle, if angle must be adjusted downward, install shims so thickest end is facing rear of vehicle. However, if angle must be adjusted upward, install shims so thickest end is facing front of vehicle.

(12) Tighten U-bolt nuts to 100 foot-pounds (135 N•m) torque.

(13) Install rear wheels.

(14) Remove support stands and lower vehicle.

LUBRICATION

The propeller shaft slip yoke and universal joints on all Jeep vehicles require periodic lubrication. Refer to the Maintenance Schedule in Chapter B for specific details.

Lubricant Type

When lubricating the slip yokes and universal joints, use Jeep Chassis Lubricant or an equivalent lithium-base chassis grease only.

Lubrication Intervals

On Cherokee, Wagoneer and Truck models, the slip yokes and universal joints must be lubricated at 10,000 mile (16 000 km) or 10 month intervals in normal service and at 5,000 mile (8 000 km) or 5 month intervals for heavy duty service.

On CJ models, the slip yoke and universal joints must be lubricated at 5,000 mile (8 000 km) or 5 month intervals in normal service and at 3,000 mile (4 800 km) or 3 month intervals for heavy duty service.

Lubrication Fittings

Externally mounted lubrication fittings are located in the slip yokes and single cardan universal joint spiders for lubrication purposes.

Double cardan universal joints have special ball and spring fittings that require a needle-type lube gun nozzle adapter (fig. 2E-7). When lubricating double cardan joints, use Lube Fitting Adapter J-25512-2 (fig. 2E-8) or Alemite Lube Fitting Adapter 6783 or equivalent.

CAUTION: *It is important that the recommended lubricant and lubrication schedule be adhered to. Failure to comply with lubrication requirements may result in premature wear of propeller shaft components.*

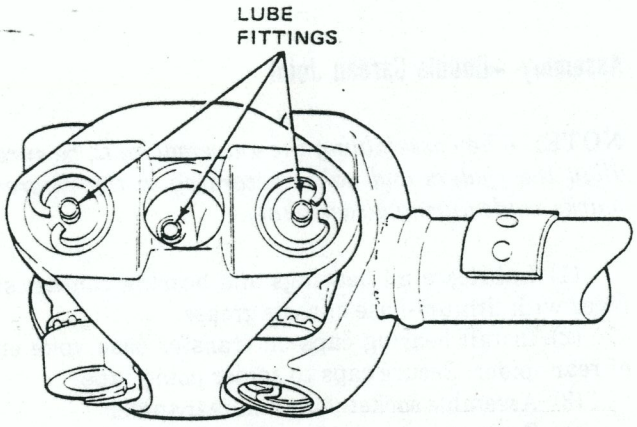


Fig. 2E-6 Double Cardan Joint Lube Fittings

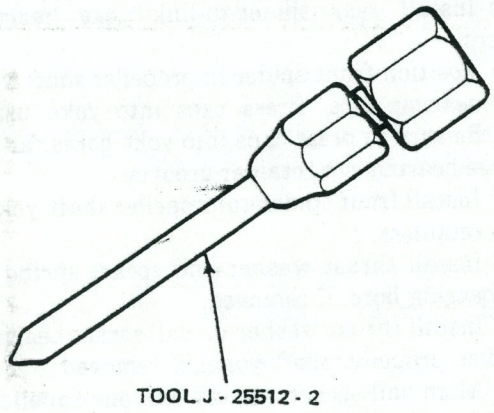


Fig. 2E-7 Double Cardan Lube Fitting Adapter

PROPELLER SHAFT SERVICE

Removal—Front Shaft

(1) Raise vehicle.

(2) Mark propeller shaft yokes, transfer case output shaft yoke, and axle yoke for assembly alignment reference.

(3) Disconnect propeller shaft at axle and transfer case yokes and remove shaft.

Installation—Front Shaft

(1) Align reference marks on propeller shaft and yokes and install propeller shaft.

(2) Tighten clamp strap bolts to 15 foot-pounds (20 N•m) torque.

(3) Lower vehicle.

Removal—Rear Shaft

(1) Raise vehicle.

(2) Mark propeller shaft, transfer case yoke or flange, and axle yoke for assembly alignment reference.

(3) Disconnect shaft at transfer case and axle yokes and remove shaft.

Installation—Rear Shaft

(1) Align reference marks on propeller shaft yokes and install shaft.

(2) Tighten clamp strap bolts to 15 foot-pounds (20 N•m) torque.

(3) Lower vehicle.

UNIVERSAL JOINT SERVICE

The single and double cardan universal joints are serviced as assemblies. Both universal joint types can be disassembled for inspection and replacement purposes.

Disassembly—Single Cardan Joint

(1) If slip yoke universal joint is to be replaced, paint alignment marks on slip yoke and propeller shaft for assembly reference and remove slip yoke from shaft.

(2) Remove loose bearing caps from spider and apply penetrating oil to bearing caps seated in shaft yoke.

(3) Mount propeller shaft or slip yoke in vise.

CAUTION: *Do not clamp the propeller shaft tube in the vise. Clamp the forged portion of the slip yoke or propeller shaft yoke in the vise only. Also, to avoid distorting either of the yokes, do not overtighten the vise.*

(4) Remove bearing cap retainers (fig. 2E-4). Tap ends of bearing caps with hammer to relieve pressure on retainers if necessary.

(5) Reposition shaft in vise so yoke is supported on vise jaws.

(6) Tap end of one bearing cap with hammer until opposite bearing cap is driven out of yoke.

(7) Reposition shaft yoke in vise and tap exposed end of spider to drive remaining bearing cap out of yoke.

(8) Remove spider from yoke.

Cleaning and Inspection

Clean the yoke bearing cap bores with solvent and a wire brush. Be sure to remove all rust, corrosion or dirt. Wash the bearing caps, bearings and spiders in solvent and wipe them dry with a shop cloth.

Inspect the bearing caps, needle bearings and bearing surfaces of the spider for evidence of brinneling, excessive wear, flat spots, scoring or cracks. Replace the complete assembly if any part exhibits these conditions.

Assembly—Single Cardan Joint

(1) Lubricate all needle bearings, bearing caps and bearing surfaces of spider with chassis grease. Also apply thin film of grease to exterior surface of bearing caps.

(2) Install bearing cap seals on spider.

(3) Install one bearing and needle bearing assembly part-way into shaft yoke.

(4) Position spider in shaft yoke and install opposite bearing cap and needle bearing assembly in yoke.

(5) Support yoke on vise jaws and seat both bearing caps in yoke using hammer.

(6) Install bearing cap retainers. Tap ends of bearing caps to seat caps fully if retainers are difficult to install.

(7) Install two remaining bearing cap and needle bearing assemblies on spider. Use rubber band or tape to retain these caps on spider until shaft is to be installed.

Disassembly—Double Cardan Joint

NOTE: *The socket yoke, ball, spring, needle bearings, retainer and thrust washers are serviced as an assembly only (fig. 2E-6). When servicing the double cardan joint, do not disassemble these components. If any one component is damaged, replace the assembly.*

(1) Remove all bearing cap retainers.

(2) Mark bearing caps, spiders, propeller shaft yoke, link yoke and socket yoke for assembly alignment reference.

(3) Remove bearing caps attaching front spider to propeller shaft yoke as follows (fig. 2E-5):

(a) Use 5/8 socket as bearing cap driver and 1-1/16 socket as bearing cap receiver.

(b) Place 5/8 socket on one bearing cap and 1-1/16 socket over opposite bearing cap.

(c) Mount assembly in vise so vise jaws bear directly against sockets positioned on bearing caps.

(d) Tighten vise to press first bearing cap out of link yoke.

(e) Loosen vise, reposition sockets and press opposite bearing cap out of link yoke.

(4) Disengage propeller shaft yoke from link yoke.

(5) Remove bearing caps attaching front spider to propeller shaft yoke as outlined in step (3).

(6) Remove front spider from yoke.

(7) Remove bearing caps attaching rear spider to link yoke as outlined in step (3) and remove rear spider and socket yoke from link yoke.

Cleaning and Inspection

Clean the yoke bearing cap bores with solvent and a wire brush. Be sure to remove all rust, dirt and corrosion from the bores. Wash the universal joint components in solvent and wipe them dry with a shop cloth.

Inspect all bearings and bearing surfaces for excessive wear, galling, brinneling, scoring, flat spots or cracks. Inspect the yokes for distortion, cracks or worn bearing cap bores. Replace the complete assembly if any component exhibits these conditions.

Assembly—Double Cardan Joint

NOTE: *When assembling the universal joint, be sure to align the spiders and yokes according to the reference marks made during disassembly.*

(1) Lubricate all bearings and bearing contact surfaces with lithium-base chassis grease.

(2) Install bearing caps on transfer case yoke ends of rear spider. Secure caps to spider using tape.

(3) Assemble socket yoke and rear spider.

(4) Position rear spider in link yoke and install bearing caps. Press caps into yoke using 5/8 socket. Be sure to press caps into yoke bores far enough to expose bearing cap retainer grooves.

(5) Install rear spider-to-link yoke bearing cap retainers.

(6) Position front spider in propeller shaft yoke and install bearing caps. Press caps into yoke using 5/8 socket. Be sure to press caps into yoke bores far enough to expose bearing cap retainer grooves.

(7) Install front spider-to-propeller shaft yoke bearing cap retainers.

(8) Install thrust washer and socket spring in ball socket bearing bore, if removed.

(9) Install thrust washer on ball socket bearing boss (located on propeller shaft yoke), if removed.

(10) Align ball socket bearing boss on propeller shaft yoke with ball socket bearing bore and insert boss into bore.

(11) Align front spider with link yoke bearing cap bores and install bearing caps. Press caps into yoke using 5/8 socket. Be sure to press caps into yoke bores far enough to expose bearing cap retainer grooves.

(12) Install front spider-to-link yoke bearing cap retainers.

SPECIFICATIONS

Universal Joint Angle Chart

	Front		Rear	
	OK Range	Set-To	OK Range	Set-To
Cherokee Wagoneer Truck	6°-8°	7°	4°-6°	5°
CJ	3°-5°	4°	4°-6°	5°

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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
Pinion Yoke Nut:				
Model 30-44 Axle	210	200-220	285	271-298
Model 60 Axle	260	250-270	352	339-366
AMC—Jeep Axle	Add 5 in-lbs. (0.56 N·m) torque measured at disassemble. Refer to Pinion Seal and Yoke Replacement, Chapter 2F- AMC—Jeep Axle.			
Universal Joint Clamp Strap Bolt	15	13-18	20	18-24

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

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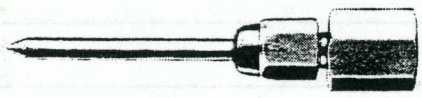
Tools



LUBE FITTING ADAPTER TOOL J-25512-2

J-24649-1 YOKE RUNOUT GAUGE

NOTES

AXLES — FRONT HUBS 2F

SECTION INDEX

AXLE TESTING AND DIAGNOSIS

GENERAL

When diagnosing an axle or front drive hub noise condition, obtain a complete description of the noise and driving conditions when the noise occurred. A preliminary road test with the owner demonstrating the complaint condition is recommended.

The action of transmitting engine torque to the wheels will produce some noise in all axles. Slight axle noises confined to a brief speed range or specific period are considered normal.

Noises produced by the engine, transfer case, transmission, tires, wheel bearings, exhaust system, propeller shaft, or the action of wind on the body or grille may be incorrectly diagnosed as axle noise. It is important to test the vehicle thoroughly in order to isolate the problem component and avoid unnecessary repair.

During the road test, stop the vehicle, shift the transmission into neutral, and operate the engine at various speeds. If the noise is heard during this test, the noise is being produced by the engine, exhaust system, clutch, transmission, transfer case, or by engine driven accessory equipment.

Before road testing, check and correct the tire inflation pressures and axle lubricant levels.

TIRE NOISE DIAGNOSIS

Because certain types of tire tread wear or tread patterns may produce objectionable noises, drive the vehicle on various types of road surfaces and listen for a change in the noise. If the noise varies with the type of road surface, the tires may be causing the noise.

WHEEL BEARING DIAGNOSIS

Worn, loose, or damaged wheel bearings can be confused with axle noises. Wheel bearing noise is usually more noticeable when coasting at lower vehicle speeds. Applying the brakes gently while the vehicle is moving will usually change wheel bearing noise. Another test involves turning the vehicle alternately left and right while moving straight ahead at relatively low speed. This manuever side-loads the bearings and should cause the problem bearing to become noisier.

AXLE TEST AND DIAGNOSIS

Before testing the axle, drive the vehicle a distance sufficient to warm the axles and axle lubricant. During the test, operate the transmission and transfer case in every gear combination.

Axle noises are usually related to vehicle speed rather than engine rpm or transmission gear range.

Axle noises may be classified into two types: gear noise and bearing noise.

Gear noise is often described as a whine or high-pitched resonating sound. It is usually more pronounced at certain vehicle speeds and within a narrow speed range under a drive (accelerating load), coast (decelerating load), or float (constant speed) condition.

Axle bearing noise is usually constant and the pitch is related to vehicle speed.

Since the pinion gear rotates faster than the ring gear, the pinion bearings produce a higher pitch sound than the differential bearings. The pinion bearings are usually heard at lower vehicle speeds of 20 to 30 mph (32 to 48 km/h).

Differential bearings produce a lower pitch sound because they are rotating at the same speed as the wheels. Differential bearing noise will not vary when the vehicle is turned alternately left and right or when the brakes are gently applied.

Axle Noisy On Pull and Coast

- Excessive ring and pinion backlash.
- Excessive pinion end play.
- Worn pinion bearings.
- Incorrect pinion depth adjustment.
- Incorrect lubricant (Trac-Lok differential).

Axle Noisy On Pull

- Incorrect ring and pinion backlash or depth adjustment.
- Damaged or worn pinion bearings.
- Incorrect pinion bearing preload.

AXLE NOISY ON COAST

- Excessive ring and pinion backlash.
- Excessive pinion end play.
- Worn or damaged pinion or differential bearings.
- Excessive differential bearing preload.

Backlash

Excessive driveline backlash may be the result of backlash in the transmission, transfer case, propeller shaft yokes or slip joint splines, universal joints, ring and pinion gears, differential gears, front axle shaft splines or universal joints, or rear axle shaft splines.

Chatter—Trac-Lok Differential

Trac-Lok chatter is usually caused by using non-recommended lubricants. If chatter occurs, drain and refill the axle with Jeep Axle lubricant or equivalent only.

Other Axle Conditions

A knocking noise heard at low speed or when coasting may be caused by loose fitting differential side gears. If this condition is encountered, operate the vehicle at the speed where noise is loudest and apply the brakes lightly. If loose fitting gears are causing the problem, the noise level will usually decrease when the brakes are applied.

Differential gear noise is considered normal when spinning a wheel with an on-the-vehicle wheel balancer, or when the wheels are spinning on icy or other types of low traction surface.

Whenever axle noise is caused by worn or damaged bearings, do not replace the gears unless they are also worn or damaged. Similarily, if axle gears are causing noise, do not replace the bearings unless they are worn or damaged.

FRONT AXLE

GENERAL

A drive-type front axle with steering knuckles and hypoid differential gears is used on all Jeep models.

Engine torque is transmitted to the wheels through full-floating, two-piece axle shafts which have connecting universal joints (fig. 2F-1). The axle shafts revolve within and are supported by the steering knuckles. Open

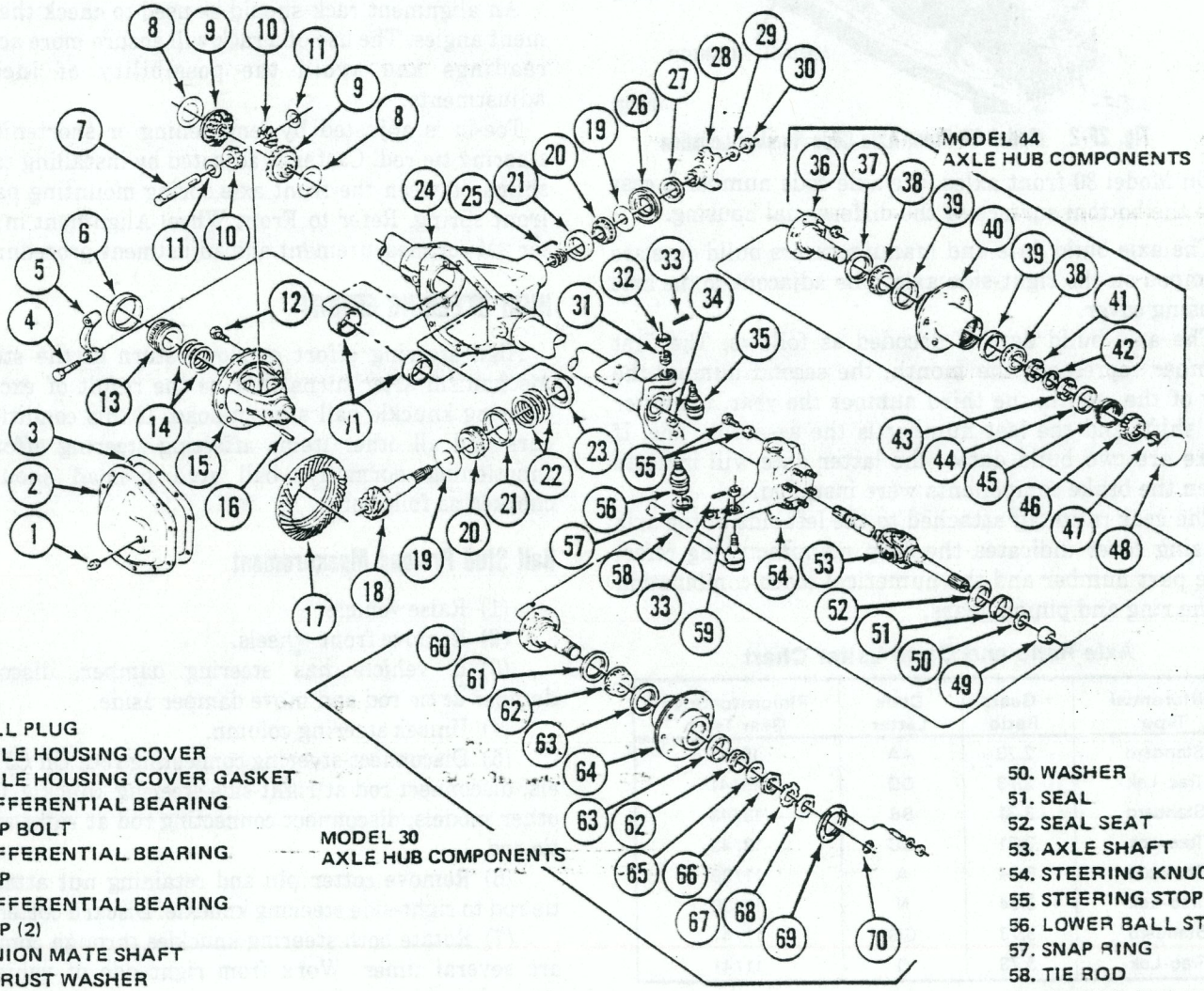
end steering knuckles which pivot on ball studs are used on all Jeep front axles.

The Model 30 front axle is used on all CJ models. The Model 44 front axle is used on all Cherokee, Wagoneer and Truck models. Service procedures for the two axle models are the same.

On all front axles, toe-in and caster are the only adjustable alignment angles. Camber is built into the axle and cannot be adjusted. Refer to Front End Alignment for adjustment methods.

AXLE IDENTIFICATION

On Model 44 front axles, the axle code number is cast into the upper surface of the reinforcing rib at the left side of the axle housing (fig. 2F-2).



1. FILL PLUG
2. AXLE HOUSING COVER
3. AXLE HOUSING COVER GASKET
4. DIFFERENTIAL BEARING CAP BOLT
5. DIFFERENTIAL BEARING CAP
6. DIFFERENTIAL BEARING CUP (2)
7. PINION MATE SHAFT
8. THRUST WASHER
9. DIFFERENTIAL SIDE GEAR
10. DIFFERENTIAL PINION GEAR
11. THRUST WASHER
12. RING GEAR MOUNTING BOLTS
13. DIFFERENTIAL BEARING (2)
14. DIFFERENTIAL BEARING PRELOAD SHIMS
15. DIFFERENTIAL CASE
16. PINION MATE SHAFT PIN
17. RING GEAR
18. PINION GEAR
19. SLINGER
20. PINION BEARING
21. PINION BEARING CUP
22. PINION DEPTH SHIMS
23. BAFFLE
24. AXLE HOUSING
25. PINION PRELOAD SHIMS
26. OIL SEAL
27. DUST CAP
28. YOKE
29. WASHER
30. PINION NUT
31. UPPER BALL STUD SPLIT RING SEAT
32. UPPER BALL STUD NUT
33. COTTER PIN
34. LOWER BALL STUD JAMNUT
35. UPPER BALL STUD
36. SPINDLE
37. SEAL
38. BEARING
39. BEARING CUP
40. HUB
41. INNER LOCKNUT
42. WASHER
43. OUTER LOCKNUT
44. SPRING CUP*
45. PRESSURE SPRING*
46. DRIVE GEAR*
47. SNAP RING
48. HUB CAP*
49. SPINDLE BEARING
50. WASHER
51. SEAL
52. SEAL SEAT
53. AXLE SHAFT
54. STEERING KNUCKLE
55. STEERING STOP BOLT
56. LOWER BALL STUD
57. SNAP RING
58. TIE ROD
59. TIE ROD END NUT
60. SPINDLE
61. SEAL
62. BEARING
63. BEARING CUP
64. HUB
65. TABBED WASHER
66. INNER LOCKNUT
67. LOCK WASHER
68. OUTER LOCKNUT
69. GASKET
70. SNAP RING
71. INNER OIL SEAL

* NOT USED WITH FRONT DRIVE HUBS

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Fig. 2F-1 Front Axle Assembly

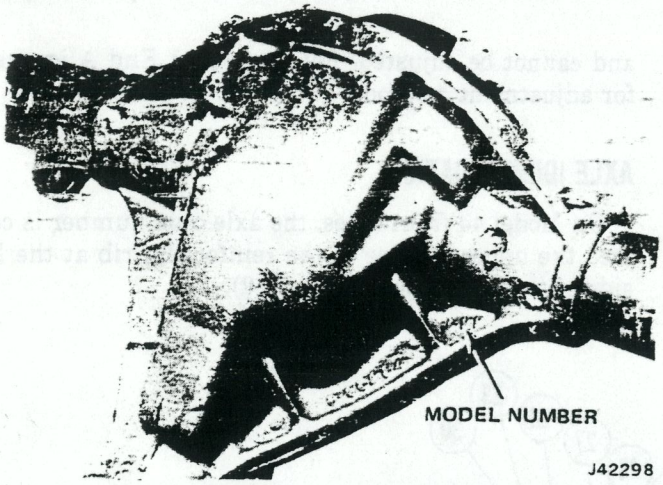

Fig. 2F-2 Model 44 Front Axle Code Number Location

On Model 30 front axles, the axle code number is cast into the bottom surface of the differential housing.

The axle build date and manufacturers build date are stamped on the right-side axle tube adjacent to the axle housing cover.

The axle build date is decoded as follows: The first number represents the month, the second number the day of the month, the third number the year, the letter the shift, and the last number is the assembly line. If there are two build dates, the latter date will indicate when the brake components were installed.

The gear ratio tag attached to the left side of the axle housing cover indicates the Jeep manufacturing reference part number and the numerical tooth combination of the ring and pinion gears.

Axle Ratio and Code Letter Chart

Differential Type	Gear Ratio	Code Letter	Pinion-to-Drive Gear Teeth
Standard	2.73	AA	15/41
Trac-Lok	2.73	DD	15/41
Standard	3.31	BB	13/43
Trac-Lok	3.31	CC	13/43
Standard	3.54	A	11/39
Trac-Lok	3.54	N	11/39
Standard	3.73	GG	11/41
Trac-Lok	3.73	Q	11/41

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AXLE HOUSING SERVICE

The front axle housing should be inspected periodically for weld cracks or other damage that could cause loss of lubricant, affect driving characteristics, or result in front end misalignment.

NOTE: *If the vehicle is driven through water that is deep enough to cover the front hubs, steering knuckles and brake components should be disassembled and inspected for water-dirt contamination and water damage. All components should be cleaned thoroughly, examined carefully, and lubricated as necessary before assembly. During the inspection, pay particular attention to the axle bearings, spindle bearings and brake components. Damaged or contaminated parts should be replaced.*

FRONT WHEEL ALIGNMENT

Toe-in and caster are the only adjustable front alignment angles. Camber is built into the axle during manufacture and cannot be adjusted.

An alignment rack should be used to check the alignment angles. The use of a rack will ensure more accurate readings and avoid the possibility of incorrect adjustments.

Toe-in is adjusted by lengthening or shortening the steering tie rod. Caster is adjusted by installing tapered shims between the front axle spring mounting pad and front spring. Refer to Front Wheel Alignment in Chapter 2M for measurement and adjustment procedures.

HIGH STEERING EFFORT

High steering effort or slow return of the steering mechanism after turns may be the result of excessive steering knuckle ball stud preload. If this condition occurs and all other items affecting steering effort are functioning normally, ball stud preload should be checked as follows:

Ball Stud Preload Measurement

(1) Raise vehicle.

(2) Remove front wheels.

(3) If vehicle has steering damper, disconnect damper at tie rod and move damper aside.

(4) Unlock steering column.

(5) Disconnect steering connecting rod. On CJ models, disconnect rod at right-side steering knuckle. On all other models, disconnect connecting rod at right-side of tie rod.

(6) Remove cotter pin and retaining nut attaching tie rod to right-side steering knuckle. Discard cotter pin.

(7) Rotate both steering knuckles through complete arc several times. Work from right-side of vehicle to rotate knuckles.

(8) Assemble socket and 0-50 foot-pound (68 N•m) capacity torque wrench and install wrench on tie rod retaining nut.

NOTE: *The torque wrench must be positioned at a 90 degree angle to the steering knuckle arm to obtain an accurate reading.*

(9) Rotate knuckles slowly and steadily through a complete arc and measure torque required to rotate knuckles.

(a) If reading is less than 25 foot-pounds (34 N•m), turning effort is within specifications and fault is

not in steering knuckle. Check steering gear, pump, and column.

(b) If reading is more than 25 foot-pounds (34 N•m), turning effort is excessive. Proceed to next step.

(10) Disconnect tie rod from both steering knuckles.

(11) Install 1/2 x 1 inch bolt, flat washer, and nut in tie rod stud mounting hole in one steering knuckle. Tighten bolt and nut securely.

(12) Assemble and install socket and 0-50 foot-pound (68 N•m) capacity torque wrench on bolt previously installed in steering knuckle.

NOTE: *The torque wrench must be positioned at a 90 degree angle to the steering knuckle arm.*

(13) Rotate steering knuckle slowly and steadily through complete arc and measure torque required to turn knuckle.

(14) Install bolt, flat washer, nut, torque wrench and socket on opposite steering knuckle and measure torque required to rotate knuckle.

(a) If reading is less than 10 foot-pounds (14 N•m), steering effort is within specifications and fault is not in knuckle ball studs. Check for tight or damaged tie rod ends, lubricate or replace as necessary, and proceed to next step.

(b) If torque reading is more than 10 foot-pounds (14 N•m), turning effort is excessive. Proceed to Ball Stud Preload Correction procedure.

(15) Install tie rod. Tighten tie retaining nuts to 35 foot-pounds (47 N•m) torque and install replacement cotter pins.

(16) Install connecting rod. Tighten connecting rod retaining nuts to 60 foot-pounds (81 N•m) torque on CJ models and 75 foot-pounds (102 N•m) torque on all other models. Install replacement cotter pins.

(17) Install front wheels.

(18) Lower vehicle.

Ball Stud Preload Correction

(1) Remove front axle shafts as outlined in this chapter.

(2) Loosen lower ball stud jamnut.

(3) Remove cotter pin and slotted nut from upper ball stud.

(4) Unseat upper and lower ball studs by striking studs with lead hammer.

(5) Remove upper ball stud split ring seat using Tool J-23447. Discard seat after removal.

(6) Remove lower ball stud jamnut and remove steering knuckle. Discard jamnut after removal.

(7) Clean upper ball stud split ring seat threads, lower ball stud taper in steering knuckle, threads and tapered surfaces of ball studs, and upper ball stud retaining nut threads.

(8) Position steering knuckle on axle and install replacement lower ball stud jamnut finger tight (only).

(9) Install and tighten upper ball stud slotted nut to 10-20 foot-pounds (13-27 N•m) torque to draw lower ball stud into tapered hole in axle yoke. Do not install upper ball stud split ring seat at this time.

(10) Tighten replacement lower ball stud jamnut to 80 foot-pounds (108 N•m) torque.

(11) Remove upper ball stud slotted nut and install replacement split ring seat using Tool J-23447. Tighten seat to 50 foot-pounds (68 N•m) torque.

(12) Install slotted nut on upper ball stud. Tighten nut to 100 foot-pounds (136 N•m) torque. Align and install cotter pin without loosening slotted nut.

NOTE: *If the cotter pin holes in the nut and stud are not aligned, tighten the nut (only) to align the holes. Never loosen the nut to align the holes.*

(13) Install front axle shafts and steering spindles loosely and measure turning effort of each steering knuckle as described in Ball Stud Preload Measurement.

(a) If turning effort is less than 10 foot-pounds (14 N•m) torque, proceed to next step.

(b) If turning effort is more than 10 foot-pounds (14 N•m) torque, replace upper and lower ball studs and repeat Ball Stud Preload Correction procedure.

NOTE: *If the Ball Stud Preload Correction Procedure is repeated, tighten split ring seat to 50 foot-pounds (68 N•m) torque. Also, tighten the slotted nut on the upper ball stud to 80 foot-pounds (108 N•m) torque.*

(14) Install front axle shafts.

(15) Connect tie rod to steering knuckle arms. Tighten tie rod end retaining nuts to 45 foot-pounds (61 N•m) torque and install replacement cotter pins.

(16) Attach connecting rod to tie rod. Tighten connecting rod end retaining nut to 60 foot-pounds (81 N•m) torque on CJ models and 75 foot-pounds (102 N•m) torque on all other models.

(17) Connect steering damper to tie rod, if equipped.

(18) Install front wheels. Tighten wheel retaining nuts to 80 foot-pounds (108 N•m) torque.

(19) Lower vehicle.

PINION SEAL AND YOKE

Removal

(1) Raise vehicle.

(2) Mark propeller shaft and yoke for assembly alignment reference and disconnect propeller shaft from yoke.

(3) Remove pinion nut and washer using socket, breaker bar, and Tool J-8614-01 (fig. 2F-3).

(4) Remove yoke using Tools J-8614-01, -02, -03 (fig. 2F-4).

(5) Remove pinion seal using Tool J-25180.

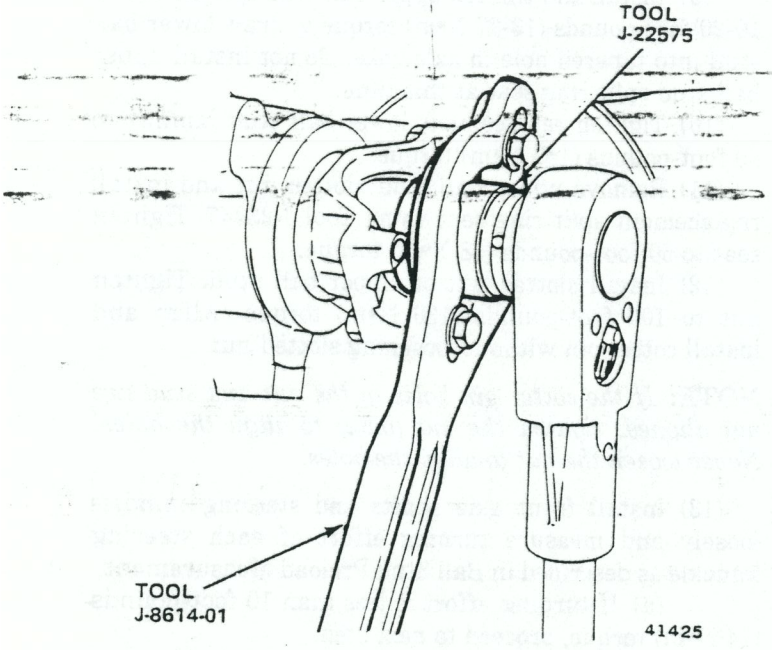

Fig. 2F-3 Pinion Nut Removal

Installation

(1) Install replacement seal using Tool J-25104.

(2) Install yoke.

(3) Install pinion washer and nut. Tighten nut to 210 foot-pounds torque.

(4) Align reference marks on propeller shaft and yoke and connect shaft to yoke. Tighten shaft-to-yoke attaching bolts or nuts to 16 foot-pounds (22 N•m) torque.

(5) Lower vehicle.

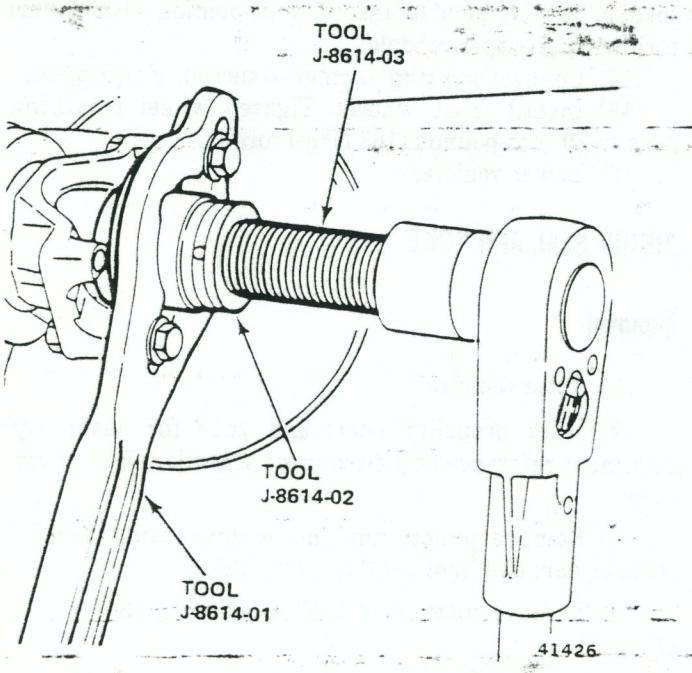

Fig. 2F-4 Pinion Yoke Removal

AXLE SHAFT

Removal—CJ Models

(1) Raise vehicle.

(2) Remove disc brake caliper. Refer to Chapter 2G.

(3) Remove bolts attaching front hub to axle and remove hub body and gasket.

(4) Remove retaining ring from axle shaft.

(5) Remove hub clutch and bearing assembly from axle.

(6) Straighten lip of lock washer.

(7) Remove outer locknut, lock washer, inner locknut, and tabbed washer. Use Tool J-25103 to remove locknuts.

(8) Remove outer bearing and remove disc brake rotor.

(9) Remove disc brake caliper adapter and splash shield.

(10) Remove axle spindle.

(11) Remove axle shaft and universal joint assembly.

Installation—CJ Models

(1) Clean all parts thoroughly.

(2) Install axle shaft and universal joint assembly. Insert splined end of axle shaft into differential side gear and push shaft into place.

(3) Install axle spindle.

(4) Install splash shield and disc brake caliper adapter.

(5) Lubricate and install outer bearing in disc brake rotor.

(6) Install disc brake rotor on spindle.

(7) Install tabbed washer and inner locknut. Tighten locknut to 50 foot-pounds (68 N•m) torque; then back off locknut 1/6 turn (45°-65°). Rotate wheel while tightening inner locknut to seat bearings evenly. Use Tool J-25103 to tighten locknut.

(8) Install lock washer and outer locknut. Tighten locknut to 50 foot-pounds (68 N•m) torque and bend lip of lock washer over nut.

(9) Install hub clutch and bearing assembly on axle shaft.

(10) Install retaining ring on axle shaft.

(11) Install gasket and hub body on axle and install hub attaching bolts. Tighten bolts to 30 foot-pounds (41 N•m) torque. Tighten bolts alternately and evenly.

(12) Install disc brake caliper. Refer to Chapter 2G.

(13) Lower vehicle.

Removal—Cherokee-Wagoneer-Truck

(1) Raise vehicle.

(2) Remove disc brake caliper. Refer to Chapter 2G.

(3) On models without front hubs:

(a) Remove rotor hub cap.

(b) Remove axle shaft snap ring, drive gear, pressure spring, and spring retainer.

(4) On models with front hubs:

(a) Remove socket head screws from hub body and remove body and large retaining ring.

(b) Remove small retaining ring from axle shaft.

(c) Remove hub clutch assembly from axle.

(5) Remove outer locknut, washer, and inner locknut using Tool J-6893.

(6) Remove rotor. Spring retainer and outer bearing are removed with rotor.

(7) Remove nuts and bolts attaching spindle and support shield and remove spindle and shield. If necessary, tap spindle with rawhide mallet to remove it from knuckle (fig. 2F-5).

(8) Remove axle shaft.

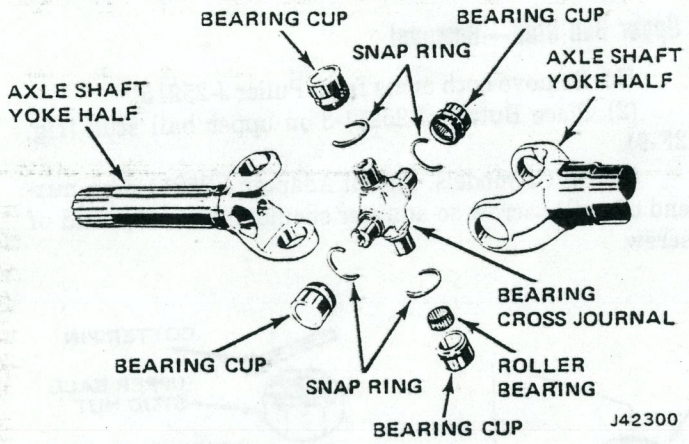

Fig. 2F-5 Axle Shaft Universal Joint

Installation—Cherokee-Wagoneer-Truck

(1) Install axle shaft. Insert splined end of axle shaft in differential side gear and push shaft into place.

(2) Install spindle.

(3) Install support shield and rotor.

(4) Install inner wheel bearing locknut (nut has peg on one side). Tighten locknut just enough to remove end play.

(5) Install wheel and tire but do not tighten wheel nuts completely.

(6) Tighten inner locknut to 50 foot-pounds (68 N•m) torque; then back off locknut 1/6-turn (45°-65°). Rotate wheel while tightening locknut to seat bearings evenly.

(7) Install washer so inner tab is aligned with spindle keyway. Also be sure peg on inner locknut engages in nearest hole in washer.

(8) Install and tighten outer locknut to minimum of 50 foot-pounds (68 N•m) torque.

(9) Remove wheel and tire.

(10) On models without front hubs:

(a) Install spring retainer, pressure spring, and drive gear.

CAUTION: *Install the spring retainer with the cupped side of the retainer facing toward the center of the vehicle.*

(b) Push drive gear inward to provide clearance for axle shaft snap ring and install snap ring.

(c) Coat rotor hub cap rim with Permatex Adhesive-Sealant number 3, or equivalent, and install hub cap in rotor.

(11) On models with front hubs:

(a) Install hub clutch assembly in axle.

(b) Install small retaining ring on axle shaft. Install large retaining ring in axle hubs.

(c) Install replacement O-ring on hub body if necessary.

(d) Install hub body. Install and tighten socket head screws to 30 inch-pounds (3 N•m) torque.

(12) Install disc brake caliper. Refer to Chapter 2G.

(13) Install wheel and tire.

(14) Lower vehicle.

AXLE SHAFT UNIVERSAL JOINT

Replacement

(1) Remove axle shaft.

(2) Remove snap rings from universal joint bearing cups (fig. 2F-5).

(3) Press on end of one bearing cup to press opposite bearing from yoke half.

(4) Turn yoke over and press remaining bearing cup out of yoke by pressing on exposed end of bearing cross journal.

CAUTION: *To avoid damaging the bearing, remove the bearing using a brass drift having a flat face that is approximately 1/32-inch smaller in diameter than the hole in the axle shaft yoke.*

(5) Repeat above step to remove remaining bearing cups. Remove bearing cross journal by sliding it to one side and lifting out.

(6) Clean parts in solvent. Inspect parts after cleaning. Replace any part that exhibits excessive wear or damage.

(7) Pack bearing cups 1/3 full of bearing lubricant and install bearing rollers.

(8) Install bearing cross journal. Hold bearing cups in vertical position to prevent bearings from dropping out.

(9) Install bearing cups in axle shaft yoke halves and seat them firmly against bearing shoulders.

(10) Press bearing cups on journal from opposite side until firmly seated.

(11) Repeat previous steps to install opposite bearing cups on cross journal.

(12) Install snap rings on bearing cups.

NOTE: *If the universal joint binds when assembled, tap the yoke lightly to relieve any pressure on the bearings at each end of the journal.*

(13) Install axle shaft.

STEERING KNUCKLE REMOVAL

NOTE: *The open-end steering knuckle pivots on ball studs. Ball stud replacement requires removal of the axle shaft and steering knuckle (fig. 2F-6).*

(1) Remove axle shaft.

(2) Disconnect tie-rod end at steering knuckle arm.

(3) Remove and discard lower ball stud jamnut (fig. 2F-7).

(4) Remove cotter pin from upper ball stud and loosen stud nut until top edge of nut is flush with top of stud.

(5) Unseat upper and lower ball studs using lead hammer.

(6) Remove upper ball stud nut and steering knuckle.

(7) Remove upper ball stud split ring seat using Tool J-25158.

STEERING KNUCKLE BALL STUDS

Lower Ball Stud Removal

(1) Remove lower ball stud snap ring.

(2) Clamp knuckle assembly securely in vise with upper ball stud pointing downward (fig. 2F-8).

(3) Attach Plate J-25211-1 to spindle mating surface of knuckle assembly (fig. 2F-8).

(4) Position Button J-25211-3 on lower ball stud (fig. 2F-8).

(5) Assemble and install Puller J-25215 on steering knuckle (fig. 2F-8). Hook one puller arm in Plate J-25211-1 and hook opposite arm in knuckle.

(6) Tighten puller screw to press lower stud out of knuckle.

(7) Remove tools used to press stud from knuckle.

Upper Ball Stud—Removal

(1) Remove both arms from Puller J-25215.

(2) Place Button J-25211-3 on upper ball stud (fig. 2F-9).

(3) On CJ models, install Adapter J-25211-4 on nut-end of puller screw so adapter shoulder faces nut-end of screw.

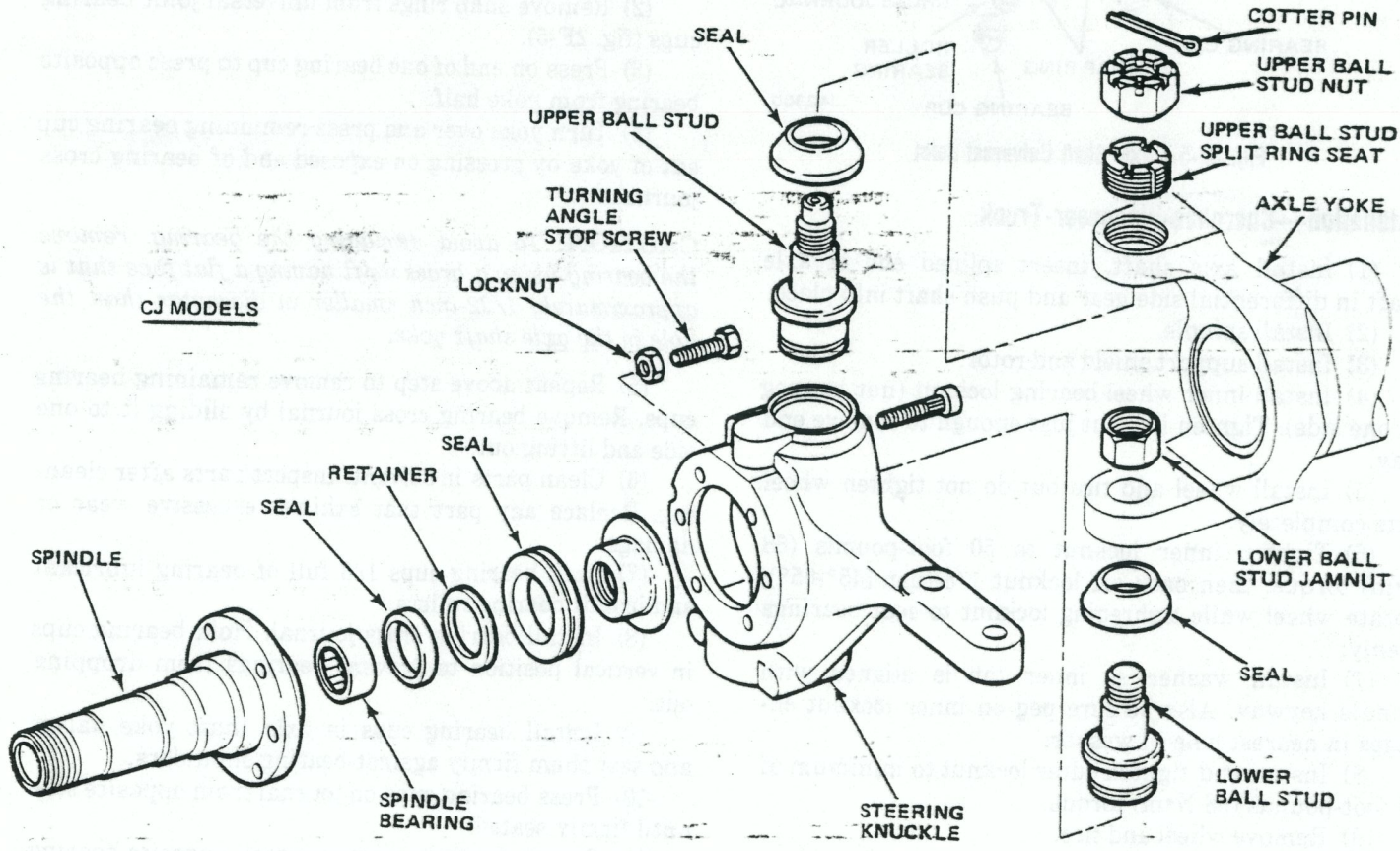

Fig. 2F-6 Steering Knuckle Components

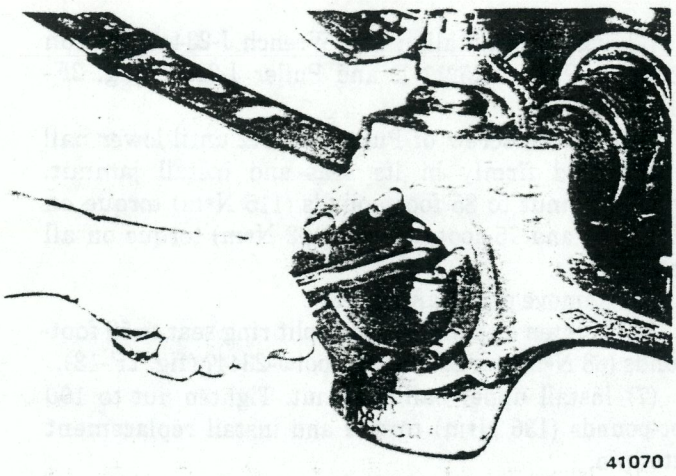

Fig. 2F-7 Lower Ball Stud Jamnut Removal

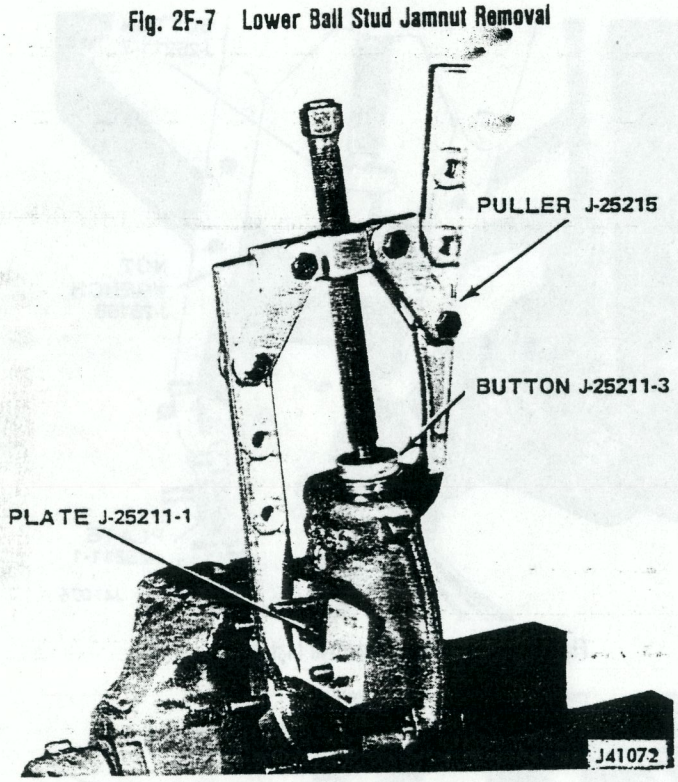

Fig. 2F-8 Lower Ball Stud Removal

(4) On all models, thread puller frame halfway onto puller screw. Insert nut-end of screw through lower ball stud hole in steering knuckle. Position puller frame against knuckle and puller screw against Button J-25211-3 (fig. 2F-9). On CJ models, be sure Adapter J-25211-4 is positioned between puller frame and steering knuckle.

(5) Tighten puller screw to press upper ball stud out of knuckle.

(6) Remove tools used to press upper ball stud from knuckle. Do not disassemble screw and frame of Puller J-25215 at this time. Tools will be used, as assembled, to install lower ball stud.

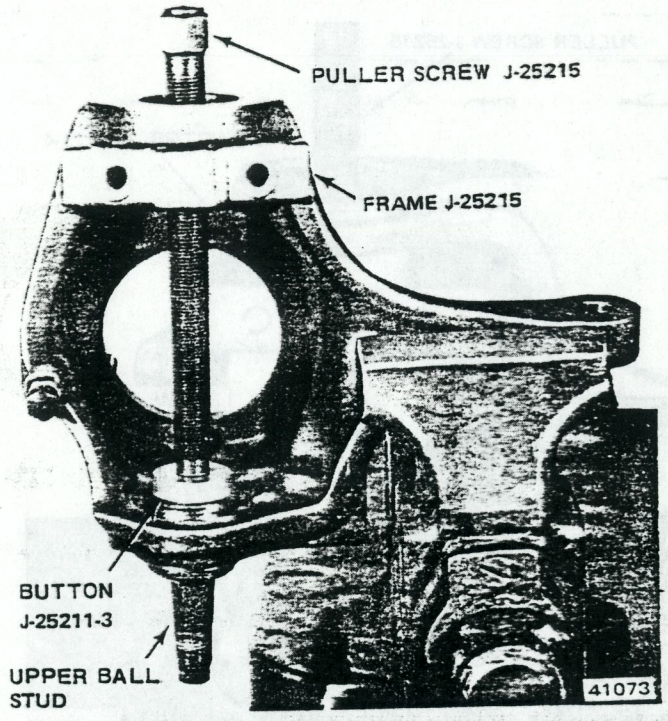

Fig. 2F-9 Upper Ball Stud Removal

Lower Ball Stud—Installation

(1) Invert steering knuckle in vise.

(2) Position replacement lower ball stud in steering knuckle.

(3) Place Adapter J-25211-4 over nut-end of puller screw and against puller frame (fig. 2F-10).

(4) Insert nut-end of puller screw through upper ball stud hole in knuckle and hold adapter and frame against knuckle (fig. 2F-10).

(5) Place Installer Cup J-25211-2 on ball stud (fig. 2F-10).

(6) Tighten puller screw to press lower ball stud into steering knuckle (fig. 2F-10).

(7) Install replacement lower ball stud retaining snap ring.

(8) Remove tools used to install lower ball stud.

Upper Ball Stud Installation

(1) Install both arms on Puller J-25215 (fig. 2F-11).

(2) Position replacement upper ball stud in steering knuckle.

(3) Install Plate J-25211-1 on spindle mounting studs (fig. 2F-11).

(4) Position Installer Cup J-25211-2 on upper ball stud (fig. 2F-11).

(5) Install assembled Puller J-25215 on steering knuckle. Hook one puller arm in plate and hook opposite arm in knuckle (fig. 2F-11). Be sure puller screw is centered on installer cup.

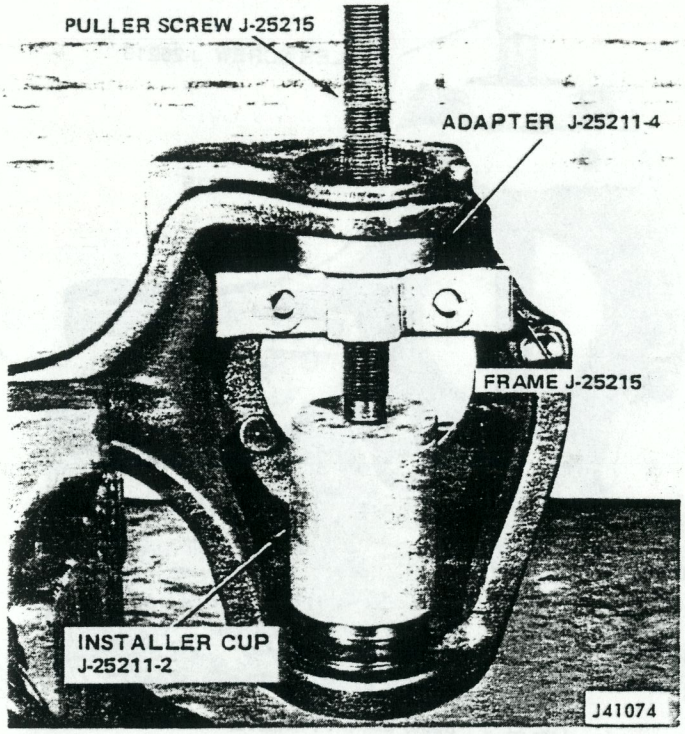

Fig. 2F-10 Lower Ball Stud Installation

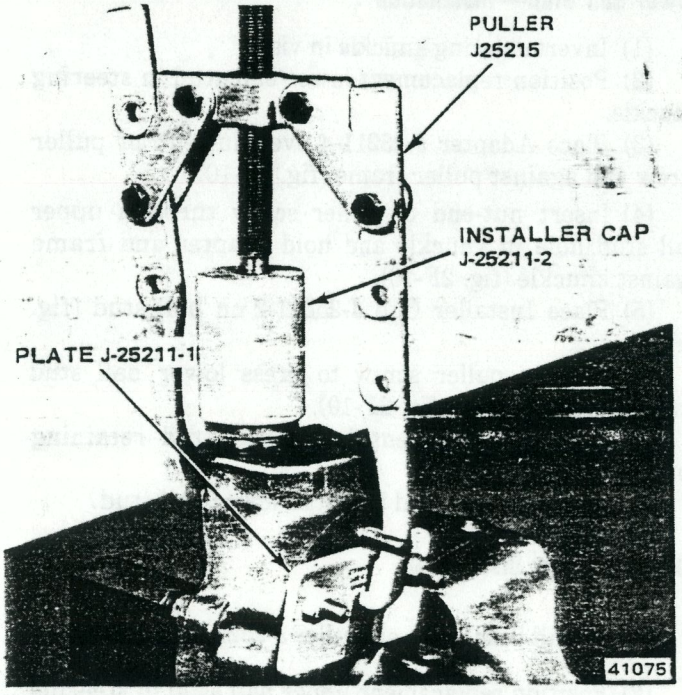

Fig. 2F-11 Upper Ball Stud Installation

(6) Tighten puller screw to press ball stud into steering knuckle (fig. 2F-11).

(7) Remove upper ball stud installation tools.

STEERING KNUCKLE INSTALLATION

(1) Install upper ball stud split ring seat in axle yoke. Top of seat should be flush with top of yoke.

(2) Install steering knuckle on axle yoke and install lower ball stud stud jamnut finger-tight only.

(3) Position and align Nut Wrench J-23447, Button J-25211-3, Plate J-25211-1, and Puller J-25212 (fig. 2F-12).

(4) Tighten screw of Puller J-25212 until lower ball stud is held firmly in its seat and install jamnut. Tighten jamnut to 85 foot-pounds (115 N•m) torque on CJ models and 75 foot-pounds (102 N•m) torque on all other models.

(5) Remove puller and plate.

(6) Tighten upper ball stud split ring seat to 50 foot-pounds (68 N•m) torque using Tool J-23447 (fig. 2F-13).

(7) Install upper ball stud nut. Tighten nut to 100 foot-pounds (136 N•m) torque and install replacement cotter pin.

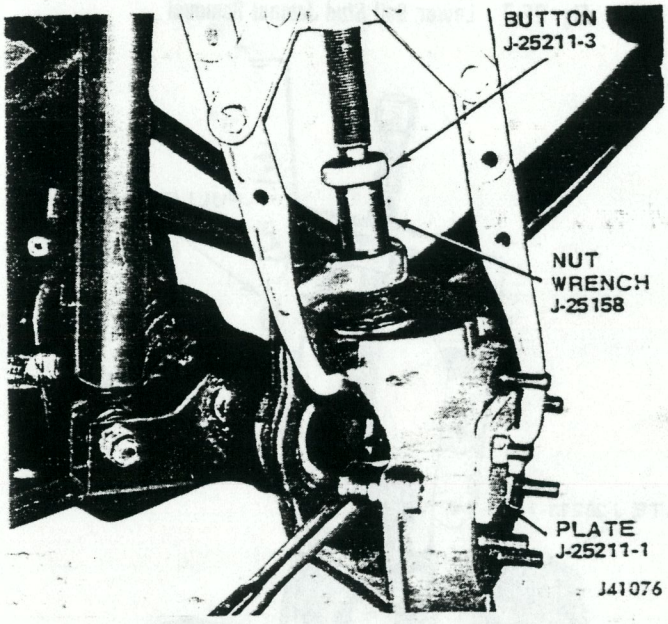

Fig. 2F-12 Steering Knuckle Installation

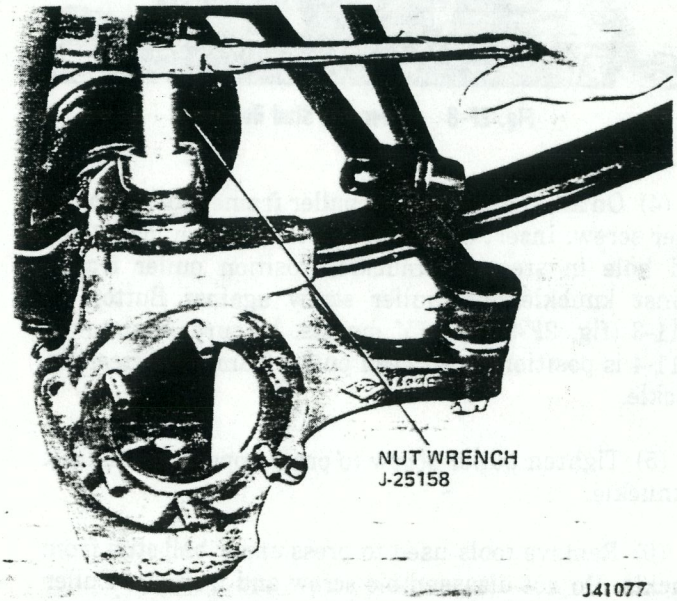

Fig. 2F-13 Tightening Upper Ball Stud Seat

NOTE: *If the cotter pin holes do not align, tighten the nut until the holes are aligned. Never loosen the nut to align the holes.*

(8) Connect steering tie rod. Tighten tie rod endnuts to 50 foot-pounds (68 N•m) torque and install replacement cotter pins.

(9) Check and correct front axle turning angle as necessary. Refer to Turning Angle Adjustment.

AXLE SHAFT SEAL

Replacement

(1) Remove axle shaft. Refer to Axle Shaft-Removal procedure.

(2) Remove seal from axle shaft (fig. 2F-14).

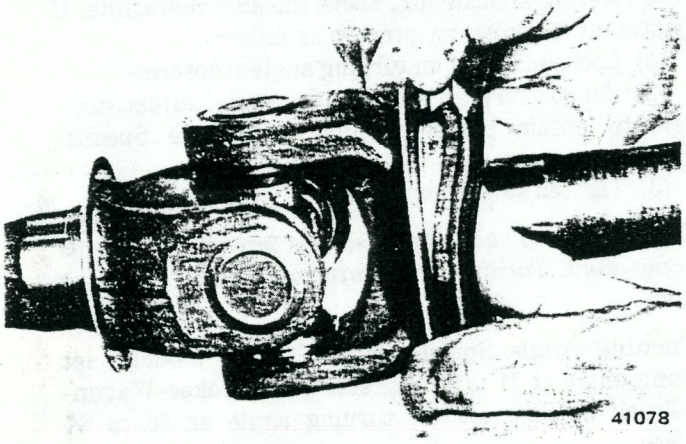

Fig. 2F-14 Axle Shaft Seal Installation

(3) Remove bronze thrust washer. If washer is worn, replace it.

(4) Clean dirt and foreign matter from seal area.

(5) Install bronze washer with chamfered side toward axle shaft seal.

(6) Install replacement seal with seal lip facing spindle (fig. 2F-14).

(7) Pack wheel bearing lubricant around thrust face of shaft and seal and fill seal area of spindle with wheel bearing lubricant also.

(8) Install axle shaft. Refer to Axle Shaft-Installation procedure.

SPINDLE BEARING

Replacement

NOTE: *Front axle spindles are equipped with a needle roller bearing that is located in the spindle flange bore (fig. 2F-15).*

(1) Wrap machined surfaces of spindle with tape and mount spindle in vise. Do not clamp spindle in vise until protective tape is applied to spindle surfaces.

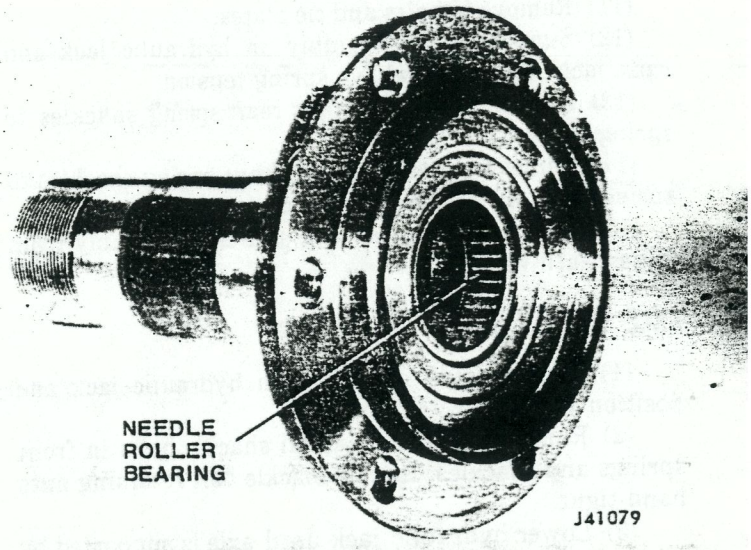

Fig. 2F-15 Spindle Bearing Location

(2) Remove needle bearing using internal-type puller.

(3) Clean dirt and foreign matter from spindle bearing surface.

(4) Install replacement bearing using bearing driver.

(5) Pack needle bearing with wheel bearing lubricant.

AXLE HOUSING INNER OIL SEAL

Model 30 and 44 front axles have inner oil seals that are located inside the housing. The seals are installed in counterbores machined into the shaft bores in the housing center section.

The axle housing inner seals are serviceable items but require differential removal in order to replace them. Refer to Differential Overhaul—Model 30-44-60 Axle in the Standard Differential section for removal/installation procedures.

AXLE REMOVAL

(1) Raise and support front end. Position frame stands under frame rails at rear of front springs.

(2) Remove wheels.

(3) Mark propeller shaft and axle yoke for assembly alignment reference.

(4) Disconnect propeller shaft at axle yoke. Secure shaft to frame rail using wire.

(5) Disconnect connecting rod at steering knuckles.

(6) Disconnect shock absorbers at axle housing.

(7) On vehicles equipped with stabilizer bar, remove nuts attaching stabilizer bar connecting links to spring tie plates.

(8) Disconnect breather tube at axle housing.

(9) Disconnect stabilizer bar link bolts at spring clips.

(10) Remove disc brake calipers, rotors, and brake shields. Refer to Chapter 2G.

(11) Remove U-bolts and tie plates.

(12) Support axle assembly on hydraulic jack and raise jack slightly to relieve spring tension.

(13) Loosen nuts attaching rear spring shackles to springs.

(14) Remove bolts attaching front spring shackles to springs and lower springs to floor.

(15) Remove hydraulic jack and axle assembly from underneath vehicle.

AXLE INSTALLATION

(1) Support axle assembly on hydraulic jack and position axle under vehicle.

(2) Raise springs and install shackle bolts in front springs and shackles. Install shackle bolt retaining nuts hand-tight.

(3) Lower hydraulic jack until axle is supported by front springs and rotate axle into position on springs.

(4) Install spring U-bolts and tie plates.

(5) On vehicles equipped with sway bar, mount sway bar connecting links on tie plates.

(6) Tighten spring shackle bolts to 24 foot-pounds (33 N•m) torque on CJ models and 100 foot-pounds (136 N•m) torque on all other models.

(7) On vehicles equipped with stabilizer bar, install nuts attaching stabilizer bar connecting links to tie plates.

(8) Tighten spring pivot bolts to 100 foot-pounds (136 N•m) torque on all models.

(9) Install brake shields, rotors, and brake calipers. Refer to Chapter 2G.

(10) Connect breather tube.

(11) Connect shock absorbers.

(12) Connect steering connecting rod at steering knuckles. Use replacement cotter pins to secure nuts.

(13) Connect propeller shaft to yoke. Align shaft and yoke using alignment marks made during removal.

(14) Install wheels.

(15) Remove support stands and lower vehicle.

(16) Tighten wheel retaining nuts and install wheel covers.

(17) Check front wheel alignment.

(18) Check turning angle.

TURNING ANGLE ADJUSTMENT

The turning angle stopscrews are located at the rear of the steering knuckle just above the axle centerline. If adjustment is necessary, proceed as follows.

(1) Loosen locknut on turning angle stopscrew.

(2) Using a turntable to measure angle, adjust stopscrew to obtain proper turning angle (see Specifications).

(3) Tighten stopscrew locknut.

NOTE: *Turning adjusting screw inward increases turning angle. Turning screw outward decreases turning angle.*

Turning Angle Specifications: On CJ models, set turning angle at 31 to 32 degrees. On Cherokee-Wagoneer-Truck models, set the turning angle at 36 to 37 degrees.

SPECIFICATIONS

Front Axle Specifications

Axle Type:	
Model 30/44	Drive-type, full-floating axle with open end steering knuckles mounted on ball studs.
Axle Application:	
Model 30 Front Axle	CJ-5, CJ-7
Model 44 Front Axle	Cherokee, Wagoneer, Truck
Axle Ring Gear Diameter:	
Model 30	7.125-inches (18.09 cm)
Model 44	8.500-inches (21.59 cm)
Front Axle Lubricants:	Jeep Axle Lubricant or equivalent of SAE 85W-90, A.P.I. Grade GL-5 quality, Grade MIL-L-2105C.
Lubricant Capacity:	
Model 30	2.5 Pints (1.18 liters)
Model 44	3.0 Pints (1.41 liters)
Turning Angle:	
CJ-5, CJ-7	31-32 degrees
Cherokee, Wagoneer, Truck	36-37 degrees

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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
Axle Housing Cover Bolts	20	15-25	27	20-34
Connecting Rod-End Nut:				
CJ	40 min.	–	54 min.	–
Cherokee-Wagoneer-Truck	70 min.	–	95 min.	–
Lower Ball Stud Jam Nut:				
CJ	85	–	115 min.	–
Cherokee-Wagoneer-Truck	75	–	102 min.	–
Tie Rod-End Nut:				
CJ	40 min.	–	54 min.	–
Cherokee-Wagoneer-Truck	60 min.	–	81 min.	–
Shock Absorber Lower Mounting Stud Nut	45	35-50	61	48-68
Spring Pivot Bolts	100	80-120	136	109-163
Spring Shackle Bolts/Nuts:				
CJ	24	18-30	33	24-41
Cherokee-Wagoneer-Truck	100	80-120	136	109-163
Spring Clip U-Bolt Nuts:				
9/16-18	100	85-105	163	115-142
1/2-20	55	45-65	75	61-81
Upper Ball Stud Split Ring Seat	50	–	68	–
Upper Ball Stud Retaining Nut	100	–	136	–
Universal Joint Strap Bolt	16	15-19	22	20-26
Wheel Retaining Nuts	80	65-90	109	88-122

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

Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

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REAR AXLE

GENERAL

CJ models are equipped with the AMC/Jeep semi-floating rear axle with tapered axle shafts. This axle has an 8-7/8 inch (23 cm) diameter ring gear.

Cherokee, Wagoneer, and J-10 Truck models use an AMC/Jeep semi-floating rear axle which has flanged axle shafts. This axle has an 8-7/8 (23 cm) diameter ring gear. J-20 Truck models use the Model 60 full-floating rear axle.

IDENTIFICATION

On AMC/Jeep rear axles, the axle code letters are stamped on the right-side axle housing tube boss (fig. 2F-16). On Dana model 60 rear axles, the axle ratio is stamped on an I.D. tag attached to the axle housing cover. In addition to the ratios listed in the ratio and letter code chart, J-20 Truck models are also available with 3.73 ratio axles. The ring and pinion tooth combination for this ratio is 11/41.

J-20 Truck Axle

On the Model 60 rear axle, the model number is cast into a boss on the lower right side of the housing, adjacent to the housing cover.

The axle build date and manufacturer's part numbers are stamped on the right-hand axle tube, adjacent to the cover (fig. 2F-17). The build date of the axle is as follows. First number is the month, second number is the day of the month, third number is the year, the alpha-letter is the shift and the last number is the assembly line. If

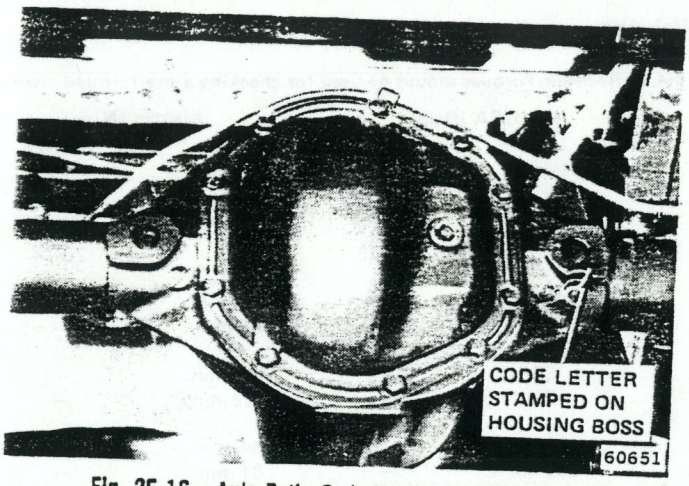

Fig. 2F-16 Axle Ratio Code Location—AMC/Jeep Axle

Axle Ratio and Code Letter Chart

Differential Type	Gear Ratio	Code Letter	Pinion-to-Drive Gear Teeth
Standard	2.73	AA	15/41
Trac-Lok	2.73	DD	15/41
Standard	3.31	BB	13/43
Trac-Lok	3.31	CC	13/43
Standard	3.54	A	11/39
Trac-Lok	3.54	N	11/39
Standard	3.73	GG	11/41
Trac-Lok	3.73	Q	11/41

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there are two build dates, the latter will be the date in which the brake components were installed.

AXLE HOUSING

The rear axle housing should be checked periodically for weld cracks and other damage that may cause loss of lubricant or affect driving characteristics.

If the vehicle is driven through water deep enough to cover the hubs, the wheel ends should be disassembled and inspected for water damage or contamination.

Examine, clean, and replace damaged parts before lubricating and assembling the wheel end components. Pay particular attention to the axle bearings, front spindle bearings and brake components.

AXLE HUB—CJ MODELS

Removal

(1) Remove axle shaft dust cap.
(2) Remove axle shaft nut and washer.
(3) Raise and support vehicle.
(4) Remove wheel and tire.
(5) Remove screws attaching brake drum to rear hub and remove drum.
(6) Install Puller Tool J-25109-01 on axle hub and remove hub (fig. 2F-18).

CAUTION: *Do not use a knockout or slide hammer-type puller to remove the hub. This type of puller may damage axle bearings, axle shaft, or differential thrust block.*

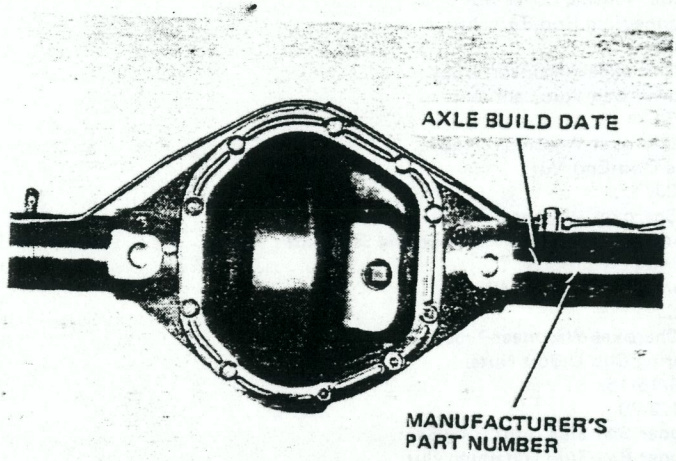

Fig. 2F-17 Axle Part Number and Build Date Code Location—Model 60 Axle

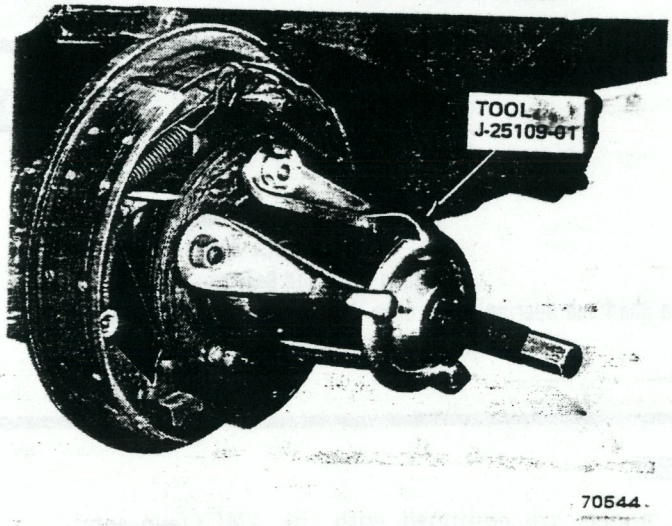

Fig. 2F-18 Axle Hub Removal—CJ Axle

Inspection

Inspect the hub for loose or distorted wheel lug studs. Inspect the keyway and tapered center bore for wear, damaged serrations, or cracks. Replace the hub if worn or damaged.

Installation

NOTE: *The procedures for installing an original hub and for installing a replacement hub are different. The installation procedures for both hub-types are as follows:*

Original Hub Installation

(1) Align keyway in hub with axle shaft key.
(2) Slide hub onto axle shaft as far as possible.
(3) Install axle shaft nut and washer.
(4) Install drum, drum retaining screws, and road wheel.
(5) Lower vehicle onto wheels.
(6) Tighten axle shaft nut to 250 foot-pounds (339 N•m) torque. If cotter pin hole is not aligned, tighten nut to the next castellation and install cotter pin. Do not loosen nut to align cotter pin hole.

NOTE: *When a replacement axle shaft is installed, a replacement hub must also be installed. However, a replacement hub may be installed on an original axle shaft if the serrations on the shaft are not worn or damaged.*

Replacement Hub Installation

(1) Align keyway in hub with axle shaft key.
(2) Lubricate two thrust washers with liberal amount of chassis lubricant and install washers on axle shaft.
(3) Install axle shaft nut.
(4) Install brake drum, drum retaining screws, and wheel.
(5) Lower vehicle onto wheels. Tighten axle shaft nut until distance from hub outer face to axle shaft outer end is 1-5/16 inches (33 mm) (fig. 2F-19).

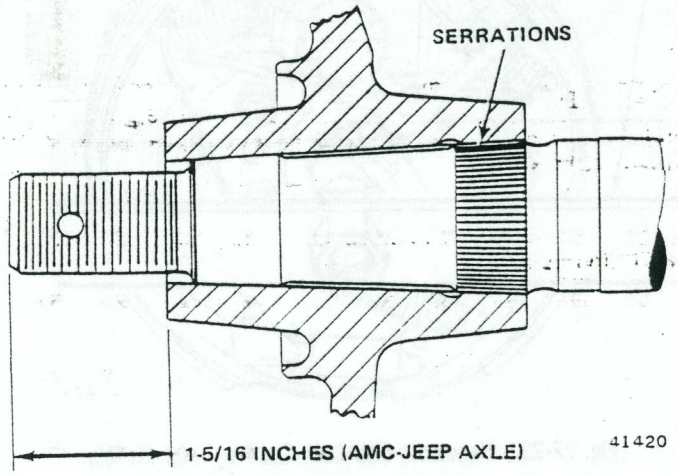

Fig. 2F-19 Replacement Hub Installation Measurement—CJ Axle

NOTE: *The hub must be pressed onto the axle shaft to the specified dimension in order to form the hub serrations properly.*

(6) Remove axle shaft nut and one thrust washer.

(7) Install axle shaft nut and tighten to 250 foot-pounds (339 N•m) torque. If cotter pin hole is not aligned, tighten nut to next castellation and install cotter pin. Do not loosen nut to align cotter pin hole.

AXLE SHAFT AND BEARING—CJ AXLE

Removal

(1) Remove rear wheel, drum, and hub as outlined under Axle Hub—CJ Models.
(2) Disconnect parking brake cable at equalizer.
(3) Disconnect brake line at wheel cylinder and remove brake support plate assembly, oil seal, and shims from axle shaft.

NOTE: *If both axle shafts are removed, keep the shims separated. Axle shaft end play is adjusted on the left side only.*

(4) Remove axle shaft and bearing using Tool J-2498 (fig. 2F-20).

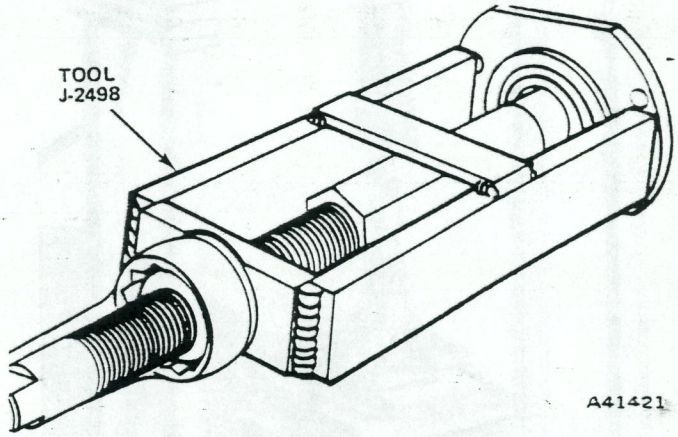

Fig. 2F-20 Axle Shaft Removal—CJ Models

CAUTION: *On models equipped with a Trac-Lok differential, do not rotate the differential gears unless both axle shafts are in place. If one shaft is removed and remaining shaft is rotated, the side gear splines will become misaligned and prevent installation of the replacement shaft.*

(5) Remove and discard axle shaft inner oil seal.
(6) Remove axle shaft bearing if bearing is worn or damaged.

NOTE: *The bearing is a press-fit on the axle shaft and must be removed using an arbor press only (fig. 2F-21). Do not attempt to remove the bearing by any other method.*

Installation

NOTE: *Tapered shaft axle bearings do not have any provision for lubrication after assembly and must be packed with a high quality wheel bearing lubricant before installation.*

(1) If axle shaft bearing is to be replaced, pack bearing with generous amount of wheel bearing lubricant

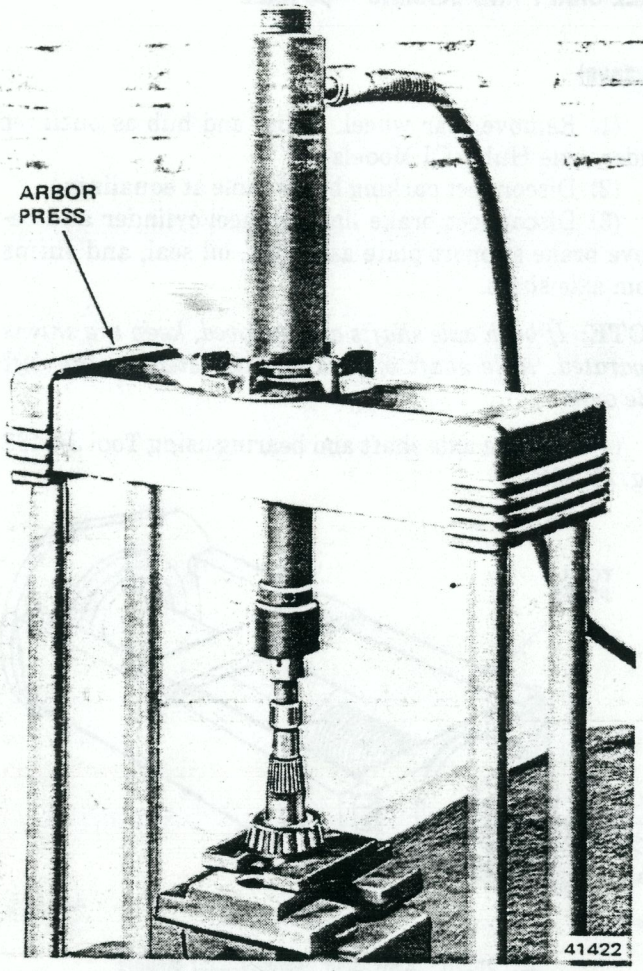

Fig. 2F-21 Axle Shaft Bearing Removal—CJ Models

and press bearing onto shaft. Small diameter of bearing must face toward outer tapered end of shaft.

(2) Coat inner seal with oil.

(3) Coat outer surface of seal metal retainer with nonhardening sealer.

(4) Install inner oil seal using Seal Installer J-21788 (fig. 2F-22).

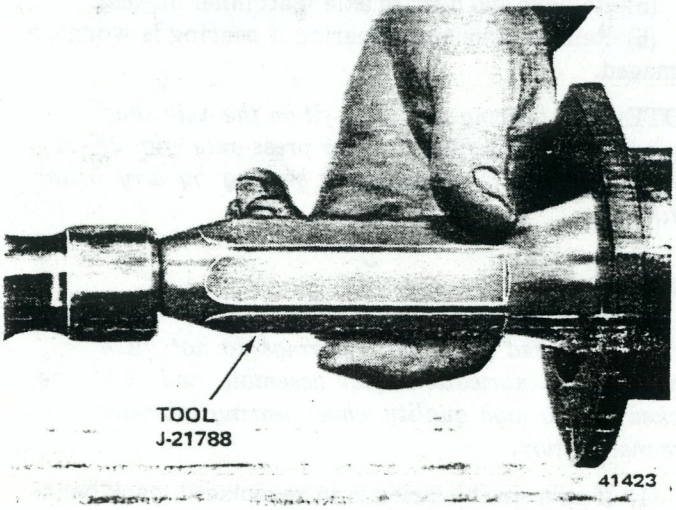

Fig. 2F-22 Inner Oil Seal Installation—CJ Models

(5) Install axle shaft. Align shaft splines with differential side gear splines and insert shaft into gear.

(6) Install outer bearing cup.

(7) Inspect brake support plate for elongated bolt holes. Replace support plate if necessary.

NOTE: *During assembly, apply a silicone-type sealer to the axle tube flange and brake support plate mounting area to prevent entry of dust and water.*

(8) Install original axle end play shims, oil seal assembly, and brake support plate. Tighten attaching bolts to 35 foot-pounds (47 N•m) torque.

NOTE: *The oil seal and retainer are located on the outside of the brake support plate.*

End Play Adjustment—CJ Axle Shaft

Axle shaft end play is adjusted at the left side axle shaft only.

(1) Strike end of each axle shaft with lead hammer to seat bearing cups against support plate.

(2) Attach Axle Shaft End Play Tool J-2092 to end of left side axle shaft. Mount dial indicator on support plate or tool, and check end play while pushing and pulling on axle shaft (fig. 2F-23).

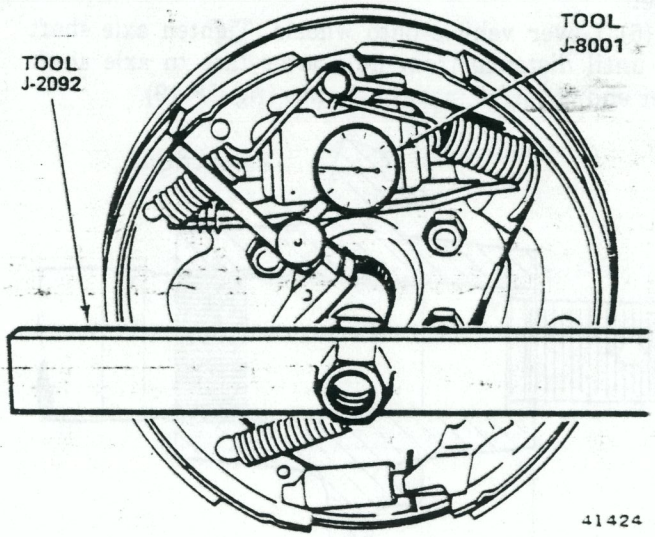

Fig. 2F-23 Measuring Axle Shaft End Play—CJ Models

(3) End play should be 0.004 to 0.008 inch (0.10 to 0.20 mm), 0.006 inch (0.15 mm) is desired.

(4) Add shims to increase end play, or remove shims to decrease end play.

(5) Install axle hub and brakedrum as outlined under Rear Axle Hub—Installation.

(6) After axle shaft end play is checked and corrected, adjust brakes. Refer to Chapter 2G.

AXLE SHAFT AND BEARING—CHEROKEE-WAGONEER-TRUCK AXLES

Removal—Cherokee-Wagoneer-J-10 Truck

(1) Raise and support vehicle and remove wheels.

(2) Remove brakedrum.

(3) Remove nuts attaching support plate and retainer to axle tube flange using access hole in axle shaft flange.

(4) Assemble Adapter Tool J-21579 and Slide Hammer J-2619-01, install tools on axle shaft flange, and remove axle shaft (fig. 2F-24).

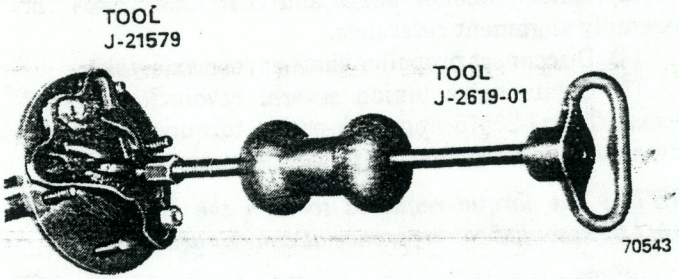

Fig. 2F-24 Axle Shaft Removal—Cherokee-Wagoneer-J-10 Truck

(5) If cup portion of wheel bearing assembly remains in axle housing after axle shaft is removed, remove bearing cups using Tools J-2619-01 and J-26941.

(6) Remove axle shaft oil seal from axle housing tube.

Axle Shaft Bearing Replacement

CAUTION: *Under no circumstances should the axle shaft retaining ring or bearing be removed using a torch. Heat will transfer into the axle shaft bearing journal and weaken it.*

(1) Mount axle shaft in vise. Use protective jaws on vise to prevent scratching or damaging shaft.

(2) Drill 1/4 inch (6 mm) diameter hole in retaining ring. Hole depth should be approximately 3/4 of ring thickness.

CAUTION: *Do not allow drill to contact axle shaft.*

(3) Position chisel over drilled hole in retaining ring. Cut deep groove in retaining ring using chisel. This will enlarge ring, or split it, allowing ring to be removed from axle shaft (fig. 2F-25).

(4) Slide retaining plate and oil seal toward axle shaft. This provides room for bearing removal tool between seal and bearing.

(5) Remove axle shaft bearing using arbor press and Tool J-22912-01 or J-23674 (fig. 2F-26).

(6) Inspect axle shaft bearing and seal surfaces for scratches. Remove scratches using crocus cloth.

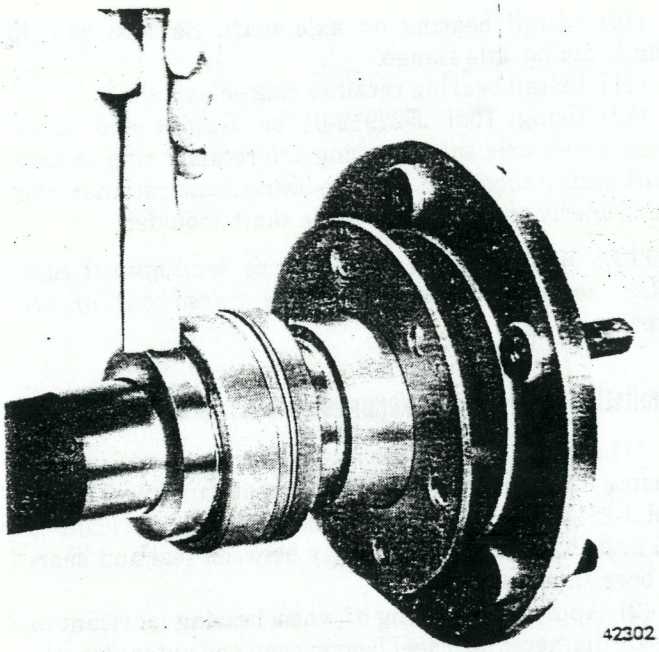

Fig. 2F-25 Notching Bearing Retaining Ring—Cherokee-Wagoneer-J-10 Truck Axle

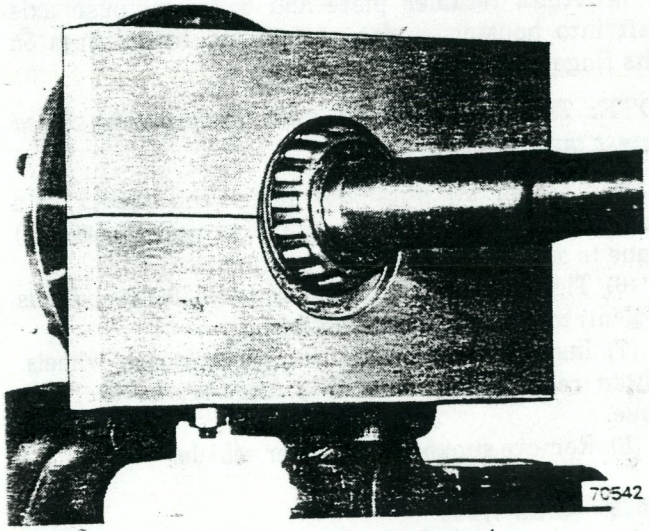

Fig. 2F-26 Axle Shaft Bearing Removal—Cherokee-Wagoneer-J-10 Truck Axle

(7) Install retainer plate on axle shaft.

(8) Pack wheel bearing lubricant in oil seal cavity and between seal lips and install seal on axle shaft seal seat. Outer face of seal must face axle flange.

NOTE: *Prevent damage to the seal by lubricating seal lips before installation. The seal lips, when seal is installed, must contact the machined portion of the axle shaft only.*

(9) Pack replacement bearing with wheel bearing lubricant. Force lubricant through cup rib ring end until it appears at opposite end, around bearing.

(10) Install bearing on axle shaft. Be sure cup rib ring is facing axle flange.

(11) Install bearing retainer ring on axle shaft.

(12) Using Tool J-22912-01 or J-23674 and arbor press, press axle shaft bearing and retainer ring on axle shaft simultaneously. Be sure bearing and retainer ring are properly seated against axle shaft shoulder.

NOTE: *When the seal and bearing seat against each other, some lubricant should be forced out of the bearing.*

Installation—Cherokee-Wagoneer-J-10 Truck

(1) Clean inner oil seal and bearing bores in axle housing tube and install replacement inner seal using Tool J-25135-01. Next, apply wheel bearing lubricant to seal and to bottom 1/3 of cavity between seal and bearing bore shoulder.

(2) Apply thin coating of wheel bearing lubricant to outside diameter of wheel bearing cup and outer oil seal.

CAUTION: *Take care to avoid damaging the oil seal when installing the shaft.*

(3) Insert splined end of shaft into differential side gears and start cup rib rings and seals into axle tube.

(4) Align retainer plate and bolts and push axle shaft into housing as far as possible. Install nuts on bolts finger tight only.

NOTE: *The outer oil seal must be squarely seated against the bearing.*

(5) Tighten all nuts alternately and evenly in a cross pattern to approximately 15 foot-pounds (20 Nm) torque to seal the cup rib ring evenly in axle tube.

(6) Tighten nuts to final torque of 50 foot-pounds (68 N•m) torque in a cross pattern.

(7) Install rear brake drum, locknuts and wheels. Tighten rear wheel nuts to 72 foot-pounds (98 N•m) torque.

(8) Remove supports and lower vehicle.

Removal—J-20 Truck

NOTE: *It is not necessary to raise the wheels in order to remove the axle shafts on Model 60 full-floating rear axles.*

(1) Remove axle flange nuts, lockwashers, and split washers retaining axle shaft flange.

(2) Remove axle shaft from housing.

Installation—J-20 Truck

(1) Be sure axle flange mating area on hub and axle are clean and free of old gasket material.

(2) Install replacement flange gasket on hub studs.

(3) Insert axle shaft into housing.

NOTE: *It will be necessary to rotate the axle shaft to simultaneously align the shaft splines with the differential gear splines and the flange attaching holes with the hub studs.*

(4) Install split washers, lockwashers, and flange bolts. Tighten bolts.

PINION SEAL AND YOKE—CJ-CHEROKEE-WAGONEER-J-10 TRUCK

Removal

(1) Raise and support vehicle.

(2) Remove rear wheels and brake drums.

(3) Mark propeller shaft and rear axle yokes for assembly alignment reference.

(4) Disconnect propeller shaft at rear axle yoke.

(5) Rotate drive pinion several revolutions using Socket Tool J-22575 and inch-pound torque wrench to measure torque required to turn drive pinion.

NOTE: *The torque required to turn the drive pinion must be recorded for reference at time of assembly.*

(6) Remove pinion nut using Tool J-8614-01 (fig. 2F-3). Discard pinion nut.

(7) Mark yoke and pinion for alignment reference at time of assembly.

(8) Remove yoke using Tools J-8614-01, -02, -03 (fig. 2F-4).

(9) Inspect seal surface of yoke. If surface is damaged or grooved, replace yoke.

(10) Remove pinion seal using Tool J-9233 (fig. 2F-27).

(11) Before installing replacement seal, coat seal lip with rear axle lubricant.

(12) Install seal using Tool J-22661 (fig. 2F-28).

(13) Install yoke on pinion. Note alignment marks.

(14) Install replacement pinion nut. Tighten nut using Tools J-8614-01 and J-22575 to remove pinion bearing end play only. **Do not overtighten nut.**

(15) Check torque required to turn pinion gear. Pinion gear must be turned several revolutions to obtain accurate torque reading. Refer to torque reading recorded during disassembly and add 5 inch-pounds (0.56 N•m) more torque to this amount for correct preload torque.

(16) If preload torque is less than desired amount, which should equal disassembly torque reading plus 5 inch-pounds (0.56 N•m), tighten pinion nut slightly and recheck torque.

(17) Repeat gradual tightening procedure until desired torque is attained. **Do not loosen and retighten nut.**

CAUTION: *Do not overtighten the pinion nut. If the desired torque is exceeded, a replacement collapsible pinion spacer sleeve must be installed and the pinion gear preload reset. Refer to Differential Overhaul.*

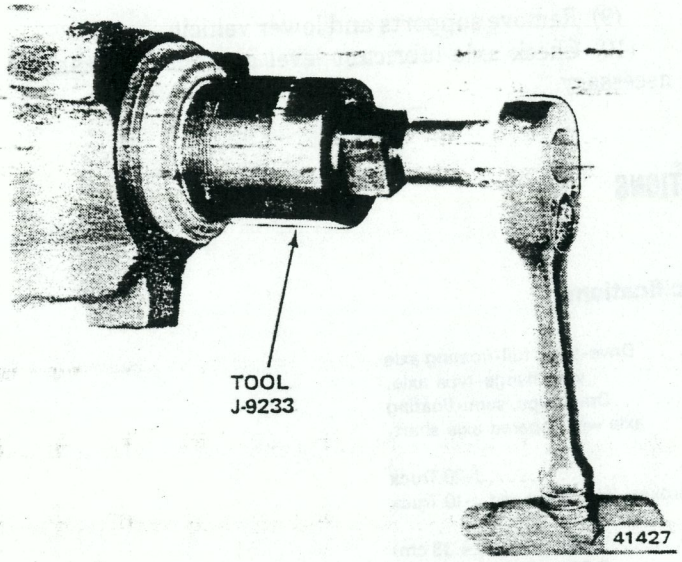

Fig. 2F-27 Pinion Seal Removal

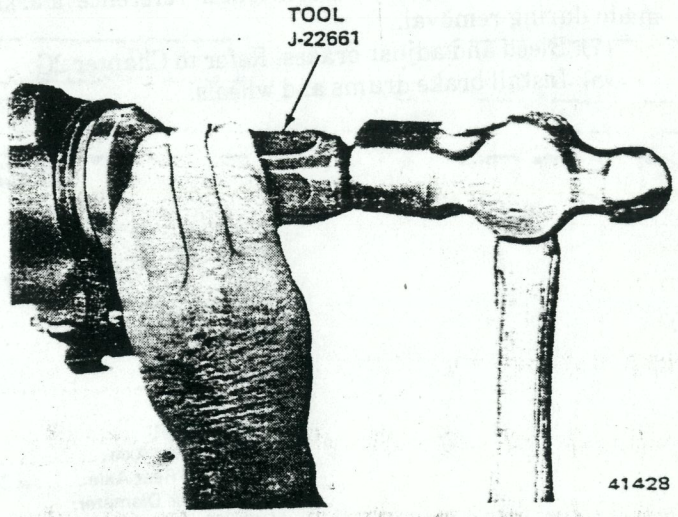

Fig. 2F-28 Pinion Seal Installation

(18) Install propeller shaft. Align index marks made at disassembly

(19) Install rear brake drums and wheels.

(20) Remove supports and lower vehicle.

PINION SEAL AND YOKE—MODEL 44 AND 60 AXLE

Removal

(1) Raise and support vehicle.

(2) Index propeller shaft to front yoke for assembly reference and disconnect shaft at yoke.

(3) Remove pinion nut and washer using Tool J-8614-01 (fig. 2F-3).

(4) Remove yoke using Tools J-8614-01, -02, -03 (fig. 2F-4).

(5) Remove pinion seal using Tool J-25180 on Model 44 axle or Tool J-25144 on Model 60 axle.

Installation

(1) Install replacement pinion seal using Tool J-25104.

(2) Install yoke on pinion.

(3) Install pinion washer and nut. Tighten nut to 210 foot-pounds (285 N•m) torque on Model 44 axle and 260 foot-pounds (352 N•m) torque on Model 60 axle.

(4) Align index marks on propeller shaft and yoke and install shaft. Tighten strip clamp bolts to 16 foot-pounds (22 N•m) torque or tighten flange bolts to 35 foot-pounds (47 N•m) torque.

(5) Remove supports and lower vehicle.

REAR AXLE REMOVAL

(1) Raise vehicle and position support stands under frame rails just forward of rear springs.

(2) Remove wheels.

(3) Mark propeller shaft and axle for assembly alignment reference.

(4) Disconnect propeller shaft at rear axle yoke.

(5) Disconnect shock absorbers at axle tubes.

(6) Disconnect brake hydraulic hose at rear axle tee fitting. Tape ends of hose and fitting to prevent dirt entry.

(7) Disconnect parking brake cable at equalizer.

(8) Support axle using hydraulic jack.

(9) Remove U-bolts. On vehicle with spring-mounted above axle, disconnect spring at rear shackle.

(10) Slide axle from under vehicle.

REAR AXLE INSTALLATION

NOTE: *All service replacement axle assemblies are shipped from the factory without lubricant in the differential. Lubricant must be added to the differential before the axle is installed. Use Jeep Axle Lubricant, or equivalent, marked SAE 85W-90 gear lubricant, grade API GL-5.*

When adding differential lubricant, be sure the pinion bearings receive lubricant. Suspend the axle so the axle shafts are in a horizontal position and the yoke end of the pinion housing is facing downward. Then, turn the pinion gear several times so lubricant will reach the pinion bearings.

(1) Support axle assembly on hydraulic jack and position assembly under vehicle.

(2) Align springs with axle spring pads, and install U-bolts and nuts. On vehicles with spring mounted above axle, position spring on shackles and install bolts but do not tighten bolts completely.

(3) Attach brake line hose at tee fitting on top of housing.

(4) Connect parking brake cables.

(5) Connect shock absorbers to axle tubes.

(6) Install propeller shaft. Align reference marks made during removal.

(7) Bleed and adjust brakes. Refer to Chapter 2G.

(8) Install brake drums and wheels.

(9) Remove supports and lower vehicle.

(10) Check axle lubricant level and add lubricant as necessary.

SPECIFICATIONS

Rear Axle Specifications

Axle Type:	
Model 60	Drive-type, full-floating axle with flange-type axle.
AMC/Jeep	Drive-type, semi-floating axle with tapered axle shaft.
Axle Application:	
Model 60 Rear Axle	J-20 Truck
AMC/Jeep Rear Axle	CJ, Cherokee, Wagoneer and J-10 Truck
Axle Ring Gear Diameter:	
Model 60	9.750-inches (24.38 cm)
AMC/Jeep	8.875-inches (22.19 cm)
Rear Axle Lubricants:	Jeep Axle Lubricant or equivalent of SAE 85W-90 A.P.I. Grade GL-5 quality, or axle lubricant grade MIL-L-2105 C
Lubricant Capacity:	
Model 60	6.0 Pints (2.84 liters)
AMC/Jeep	4.75 Pints (2.25 liters)

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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 (in-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Axle Hub-To-Shaft Nut (AMC-Jeep Axle)-CJ	205 min.	—	339 min.	—
Axle Housing Cover Bolts	20	15-25	27	20-34
Brake Support Plate Bolts:				
AMC/Jeep-Cherokee, Wagoneer and J-10 Truck	30	25-35	41	34-47
Model 60	50	45-55	68	61-75
AMC/Jeep	32	25-40	43	34-47
Pinion Nut:				
Model 60	260	250-270	353	339-366
AMC/Jeep	17-25 in-lbs	—	2-3	—
Shock Absorber Lower Stud Nut	45	35-50	61	47-68
Spring Clip U-Bolt Nut:				
9/16-18	100	85-105	136	115-142
1/2-20	55	45-65	75	61-88
Spring Shackle Bolt/Nuts:				
CJ	24	18-30	33	24-41
Cherokee-Wagoneer-Truck	100	80-120	136	115-163
Spring Pivot Bolts/Nuts (All)	100	80-120	136	115-163
Styled Wheel Hub Cap	32 in-lbs	24-40 in-lbs	4	3-5
Universal Joint Clamp Strap Bolts	16	15-19	22	20-26
Universal Joint Flange Bolts/Nuts	35	25-45	47	34-61
Wheel Retaining Nuts:				
Model 60	120	110-150	163	149-203
AMC/Jeep	80	65-90	108	88-108

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

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STANDARD DIFFERENTIAL

GENERAL

CJ models use the Model 30 front axle and an AMC/Jeep rear axle which has tapered axle shafts.

Cherokee, Wagoneer, and J-10 Truck models use the Model 44F front axle and an AMC/Jeep rear axle with flanged axle shafts. Truck models rated at 6800 GVWR (3084 kg) and up use the Model 44F front axle and the Model 60 rear axle with full-floating axle shafts.

The AMC/Jeep rear axles are semi-floating type axles. Only the Model 60 is a full-floating type unit.

DIFFERENTIAL OPERATION

The differential gear system divides the torque between the axle shafts and allows them to rotate at different speeds when turning corners.

Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows: The pinion gear rotates the ring gear. The ring gear, which is bolted to the differential case, rotates the case. The differential pinion gears, which are mounted on the pinion mate shaft, which is fitted in the case, rotate the side gears. The side gears, which are splined to the axle shafts, rotate the shafts.

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (fig. 2F-29).

When turning corners, the outside wheel must travel a greater distance than the inside wheel in order to complete the turn. This difference must be compensated for in order to prevent the wheels from scuffing and sliding through the turn. To accomplish this, the differential becomes effective allowing the axle shafts to rotate at unequal speeds (fig. 2F-30). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

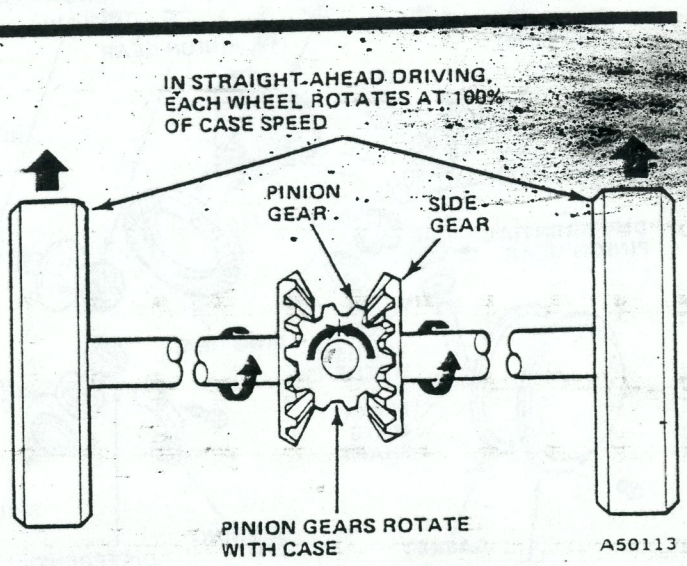

Fig. 2F-29 Differential Operation—Straight Ahead Driving

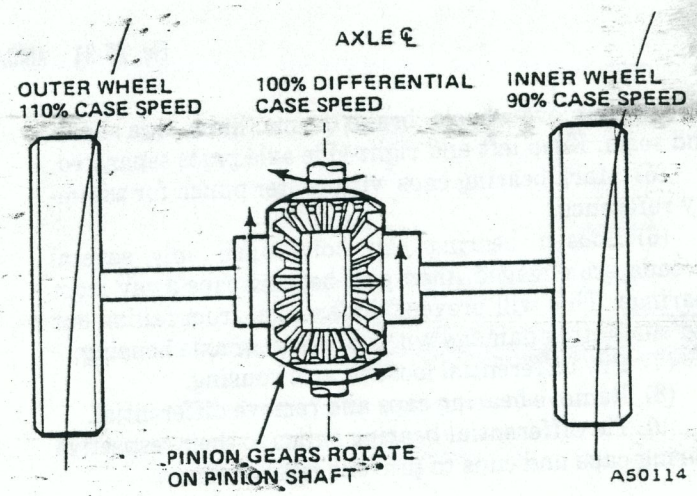

Fig. 2F-30 Differential Operation—On Turns

DIFFERENTIAL OVERHAUL—AMC/JEEP REAR AXLES

Differential Disassembly

NOTE: *It is not necessary to remove the rear axle assembly in order to overhaul the differential. Refer to figure 2F-31 for parts nomenclature during overhaul.*

(1) Remove axle shaft dust caps and retaining nuts.
(2) Raise and support vehicle.
(3) Remove axle housing cover and drain lubricant.

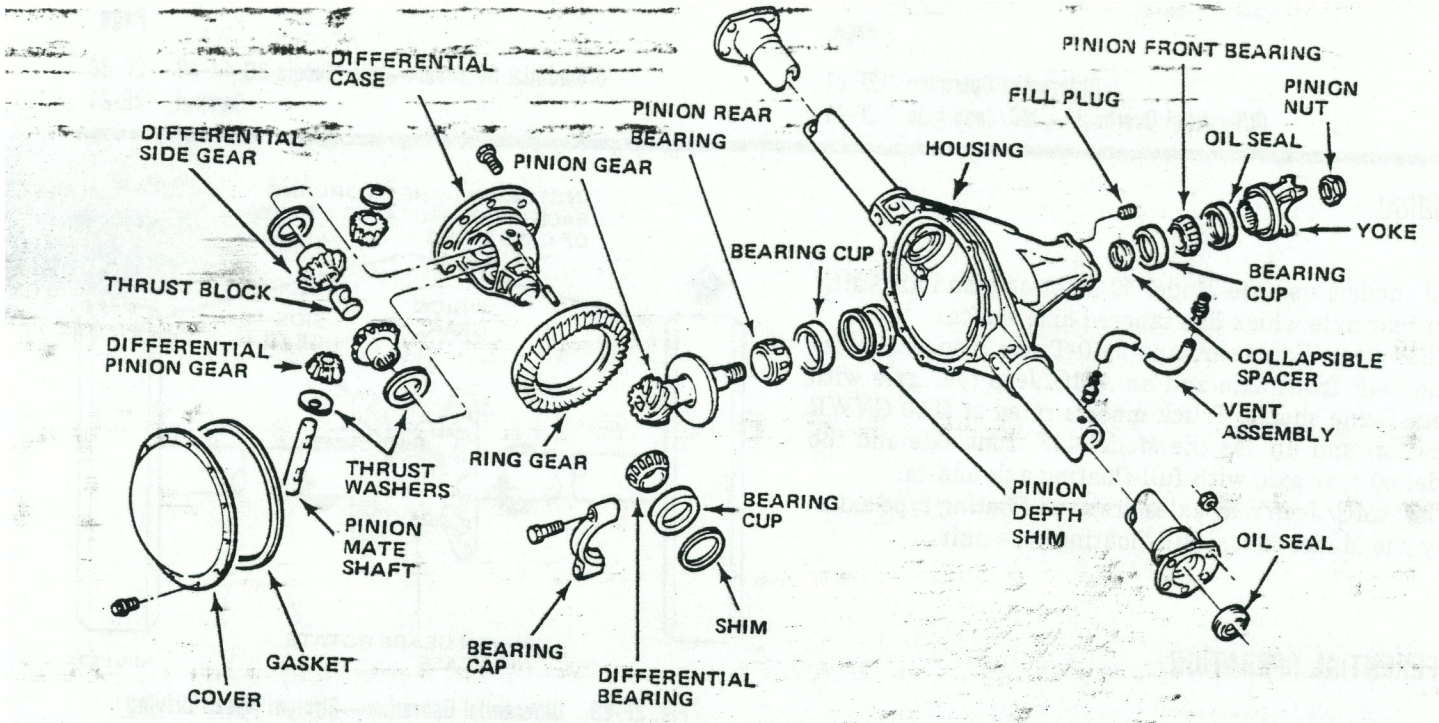

Fig. 2F-31 AMC/Jeep Rear Axle

(4) Remove wheels, brake drums, hubs, axle shafts, and seals. Keep left and right-side axle parts separated.

(5) Mark bearing caps with center punch for assembly reference.

(6) Loosen bearing cap bolts until only several threads are engaged, then pull bearing caps away from bearings. This will prevent differential from falling out and sustaining damage when pried from axle housing.

(7) Pry differential loose in axle housing.

(8) Remove bearing caps and remove differential.

(9) Tie differential bearing shims to their respective bearing caps and cups to prevent misplacement.

Differential Bearing Removal

Use Puller J-2497-01 to remove the differential bearings (fig. 2F-32). When using this tool, be sure the puller legs do not contact the bearing roller cage. If the puller legs contact the cage, the cage will be damaged.

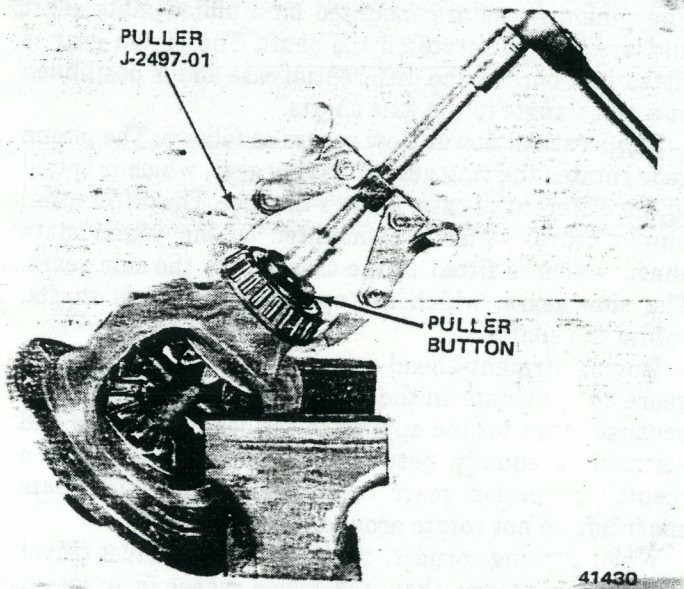

Fig. 2F-32 Differential Bearing Removal

Ring Gear Removal

(1) Remove ring gear-to-differential case bolts.

(2) Remove ring gear from case. Use brass drift and hammer to tap ring gear from case. Do not nick ring gear face of differential case or drop gear.

CAUTION: *Do not chisel or wedge the gear from the case.*

Pinion Mate Shaft Removal

(1) Remove pinion mate shaft lockpin using 3/16-inch (5 mm) diameter drift at least 3 inches (8 cm) long (fig. 2F-33).

(2) Remove pinion mate shaft and remove thrust block (fig. 2F-34).

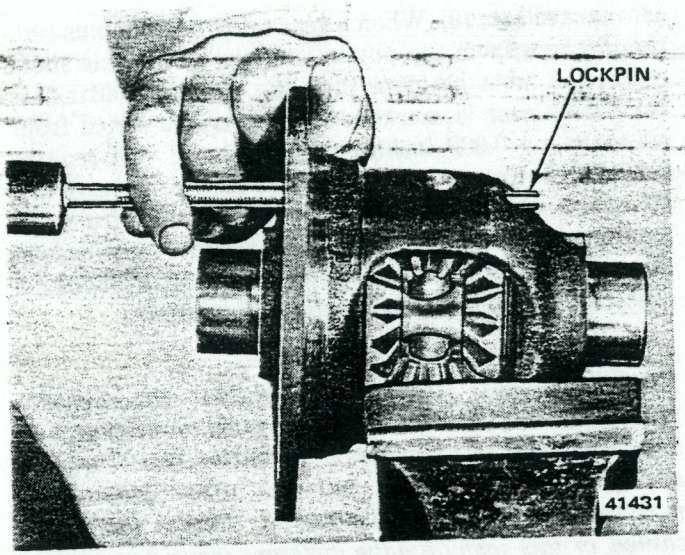

Fig. 2F-33 Pinion Mate Shaft Lockpin Removal

Fig. 2F-34 Pinion Mate Shaft and Thrust Block Removal

(3) Rotate pinion gears on side gears until pinion gears are aligned with case opening. Remove pinion gears and thrust washers and remove side gears and thrust washers.

Pinon Gear Removal

(1) Remove pinion nut using Tool J-8614-01 (fig. 2F-3).

(2) Remove yoke using Tools J-8614-01, -02, -03 (fig. 2F-4).

(3) Reinstall axle housing cover to prevent pinion gear from falling out when gear is driven out of bearings and housing. Loosely attach cover using two bolts.

(4) Remove pinion seal.

(5) Tap end of pinion gear with rawhide mallet to drive pinion gear out of front bearing. Remove front bearing and collapsible spacer. Discard spacer.

CAUTION: *The collapsible spacer is used to control pinion bearing preload. Discard this spacer after removal, it is not reusable.*

(6) Remove axle housing cover and remove pinion gear and rear bearing from housing.

Pinion Bearing Cup Removal

(1) Remove rear bearing cup using Tools J-8092 and J-21786.

NOTE: *The pinion gear depth adjustment shims are located under the rear bearing cup. Tag these shims for assembly reference.*

(2) Remove front bearing cup using Tools J-8092 and J-21787.

CAUTION: *Keep the bearing cup remover tool seated squarely on the cup to prevent damaging the cup bores during removal.*

Cleaning and Inspection

Clean all parts in solvent. Allow bearings to air dry. Dry other parts with compressed air.

Inspect the differential bearing cones, cups, and rollers for pitting, galling, flat spots, or cracks.

Inspect the differential case for an elongated or enlarged pinion mate shaft hole. The machined thrust washer surface areas and counterbores must be smooth and free of nicks, gouges, cracks, or burrs. Inspect the differential case for cracks or other visible damage which would necessitate replacement.

Inspect the pinion mate shaft for excessive wear in the contact area of the differential pinions. The shaft should be smooth and concentric and not scored or galled.

Inspect the differential side gears and pinions; they should have smooth teeth with a uniform contact pattern but not display excessive wear or broken surfaces. The side gear and pinion thrust washers should be smooth and free from any scoring or metal pickup.

Inspect the pinion mate shaft lockpin for damage or looseness in the case. Replace the pin or case as necessary.

Inspect the ring and pinion gears for worn or chipped teeth or damaged attaching bolt threads. If replacement is necessary, replace the ring gear and pinion as a matched set only.

Inspect the pinion bearing cones, cups, and rollers for pitting, galling, excessive wear, or other visible damage. Replace any part that exhibits any of these conditions.

Inspect the axle housing for cracks, porosity, bent or loose tubes, or other damage. In addition, if raised metal was created on the pinion bearing cup bore shoulders during cup removal, flatten it using a blunt punch.

Inspect the pinion gear for damaged bearing journals, damaged shim surfaces, or excessively worn splines. If pinion replacement is necessary, replace both the pinion gear and ring gear as a matched set only.

Inspect the pinion yoke for cracks, worn splines, and a pitted, rough, or corroded oil seal contact surface. Repair or replace the yoke as necessary.

Inspect the pinion gear depth adjustment shims for being broken, damaged, or distorted. Replace the shims as necessary before adjusting pinion gear depth.

Differential Assembly

Pinion Gear Installation and Depth Adjustment

Pinion gear depth is the distance (measured in inches) from the end (button) face of the pinion gear to the centerline of the axle shafts (fig. 2F-35). This dimension is controlled by shims installed between the pinion gear rear bearing cup and axle housing (fig. 2F-35).

Ring and pinion sets are factory tested to detect machining variances. Tests are started at a standard setting which is then varied to obtain the most desirable tooth contact pattern and quiet operation. When this setting is determined, the ring and pinion gear are etched with identifying numbers (fig. 2F-36).

The ring gear receives one number. The pinion gear receives two numbers which are separated by a plus (+) or minus (-) sign.

The second number on the pinion gear indicates pinion position, in relation to the centerline of the axle shafts, where tooth contact was best and gear operation was quietest. This number represents pinion depth variance and indicates the amount, in thousandths of an inch, that the gear set varied from the standard setting. The number on the ring gear and first number on the pinion gear identify the gears as a matched set. Do not attempt to use a ring and pinion set having differing numbers. This is not a matched set.

The standard setting for AMC/Jeep axles is 2.547 inches (6.46 cm). If the pinion is marked +2, the gear set varied from standard by +0.002 inches (0.05 mm) and will require 0.002 inch (0.05 mm) less shims than a gear set marked zero (0). When a gear set is marked plus (+), the distance from the pinion end face to the axle shaft centerline must be more than the standard setting. If the pinion gear is marked -3, the gear set varied from standard by 0.003 inches (0.07 mm) and will require 0.003 (0.07 mm) more shims than a set marked zero (0). When a set is marked minus (-), the distance from the pinion end face to the axle shaft centerline must be less than the standard setting. Refer to figure 2F-35 for an illustration of the standard setting dimension.

NOTE: *On some factory installed gear sets, an additional 0.010 or 0.020 inches (0.25 or 0.50 mm) may have been machined off the pinion gear button face. This does not affect gear operation but does affect pinion gear marking and depth measurement. Pinion gears machined in this fashion have different identifying numbers. For example, if the pinion is marked +23, the number 2 indicates that 0.020 (0.50 mm) was removed from the pinion button face and the number 3 indicates that variance from the standard setting is +0.003 (0.07 mm). If the pinion is marked +16, the number 1 indicates that 0.010 (0.25 mm) was removed from the pinion button face and the number 6 indicates that variance from the standard setting is +0.006 (0.15 mm). Gear sets with additional amounts machined off the pinion button face are factory installed items exclusively. All service replacement gear sets will be machined to standard settings only. In addition, replacement gear sets marked + or -0.009 (0.22 mm) or more, or sets with mismatched identifying numbers must be returned to the parts distribution center. Do not attempt to install these gear sets.*

Pinion Variance Chart

This chart will help to determine the approximate "starter shim" thickness needed for initial pinion depth measurement. However, the chart will not provide the exact shim thickness required for final adjustment and must not be used as a substitute for an actual pinion depth measurement.

To use the chart, proceed as follows:

(a) Measure thickness of original pinion depth shim.

(b) Note pinion depth variance numbers marked on old and new pinion gears.

(c) Refer to Old and New Pinion Marking columns in chart. Chart box where old and new pinion depth variances intersect will provide approximate amount of change required to achieve desired starter shim thickness.

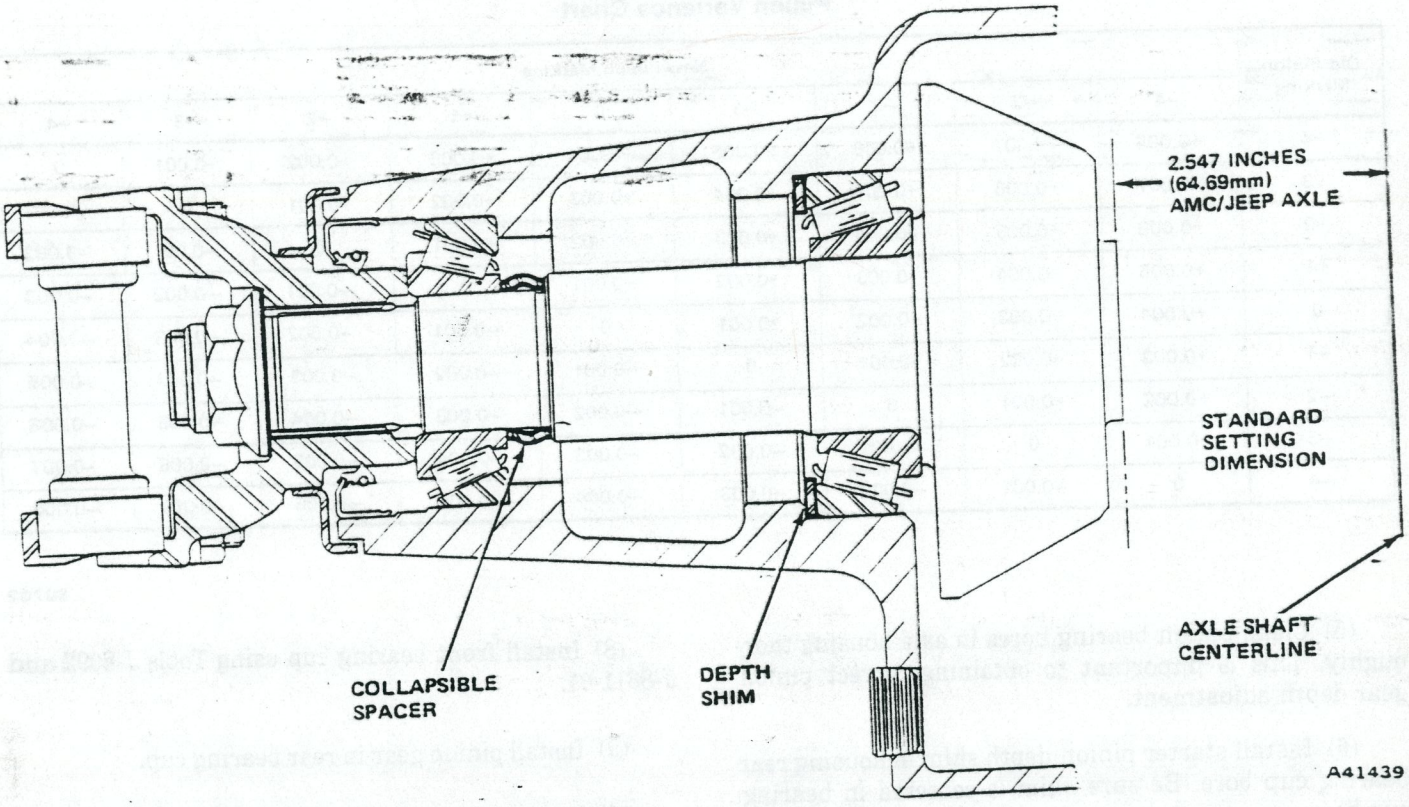

Fig. 2F-35 Standard Setting Dimension and Pinion Depth Shim Location—AMC/Jeep Axle

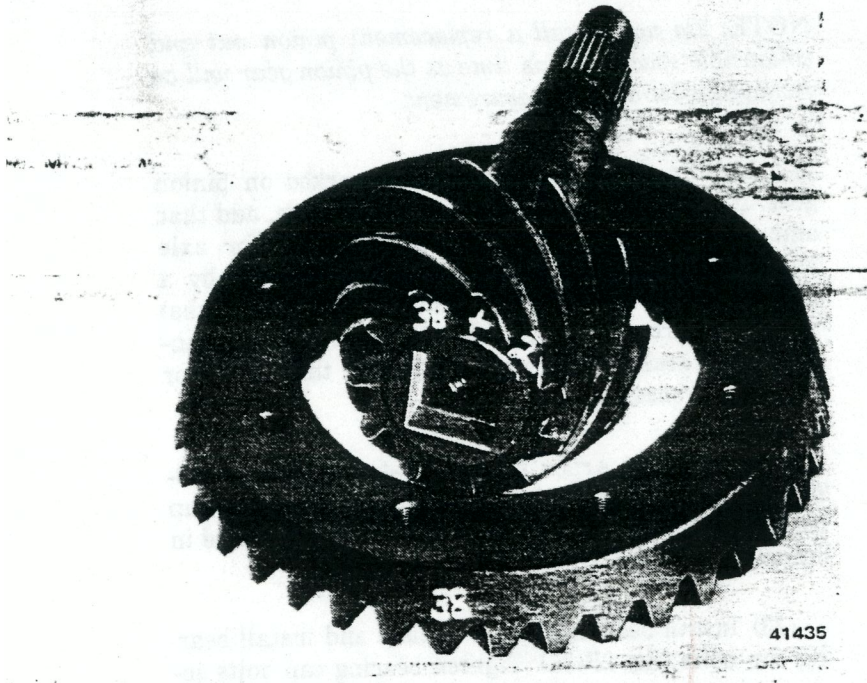

Fig. 2F-36 Ring and Pinion Gear Markings

For example, if the old pinion is marked -3 and the new pinion +2, chart procedure would be as follows: Refer to Old Pinion Marking column at left side of chart and locate -3 figure in this column. Then read to right, across chart, until under +2 figure in New Pinion Marking column. Box where two columns intersect is amount of shim thickness change required. In this case, the number in the intersecting box is -0.005 (0.12 mm) which represents the amount to be subtracted from the old shim thickness. If the box number had been a + figure, this amount would be added to the old shim thickness.

(1) Measure thickness of pinion depth shim removed during disassembly.

(2) Note pinion depth variance numbers marked on old and new pinion gears.

(3) Refer to Pinion Variance Chart and determine amount to be added or subtracted from original shim for desired starter shim thickness.

NOTE: *Do not use the starter shim thickness determined by the pinion variance chart as the final shim setting. The actual pinion depth measurement must be performed and final shim thickness adjusted as necessary.*

(4) Install rear bearing on pinion gear with large diameter of bearing cage facing gear end of pinion. Press bearing against rear face of gear.

Pinion Variance Chart

Old Pinion Marking	New Pinion Marking								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

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(5) Clean pinion bearing bores in axle housing thoroughly. This is important to obtaining correct pinion gear depth adjustment.

(6) Install starter pinion depth shim in housing rear bearing cup bore. Be sure shim is centered in bearing cup bore.

NOTE: *If the shim is chamfered, be sure the chamfered side faces the bottom of the bearing cup bore.*

(7) Install rear bearing cup using Tools J-8092 and J-8608 (fig. 2F-37).

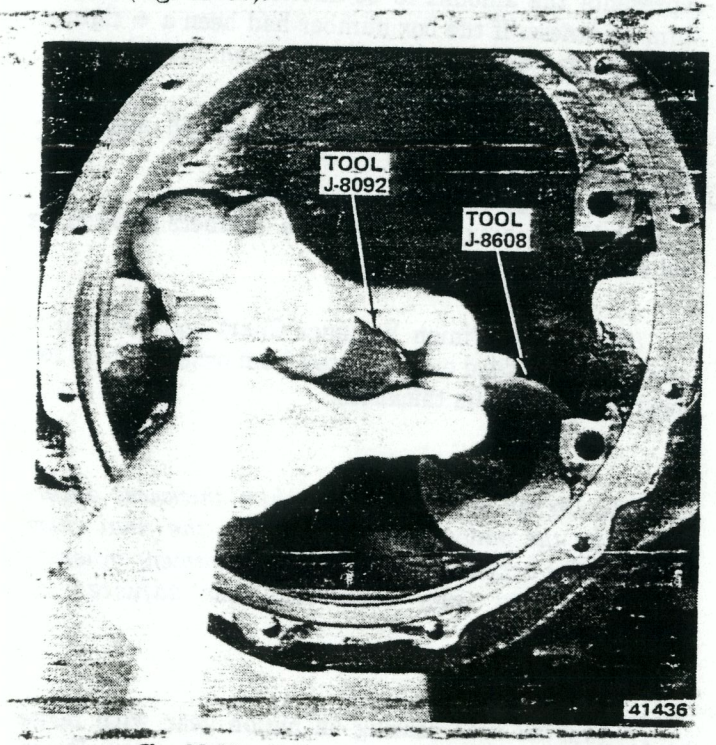

Fig. 2F-37 Pinion Rear Bearing Cup Installation

(8) Install front bearing cup using Tools J-8092 and J-8611-01.

(9) Install pinion gear in rear bearing cup.

(10) Install front bearing, rear universal joint yoke, and original pinion nut on pinion gear. **Tighten pinion nut only enough to remove bearing end play.**

NOTE: *Do not install a replacement pinion nut and collapsible spacer at this time as the pinion gear will be removed after depth measurement.*

(11) Note pinion depth variance marked on pinion gear. If number is preceded by a plus (+) sign, add that amount (in thousands) to standard setting for axle model being overhauled. If number is preceded by a minus (-) sign, subtract that amount (in thousandths) from standard setting. Result of this addition or subtraction is **desired pinion depth.** Record this figure for future reference.

(12) Assemble Arbor Tool J-5223-4 and Discs J-5223-23 and install assembled tools in differential bearing cup bores (fig. 2F-38). Be sure discs are completely seated in bearing cup bores.

(13) Install bearing caps over discs and install bearing cap bolts (fig. 2F-38). Tighten bearing cap bolts securely, but not to specified torque.

(14) Position Gauge Block J-5223-20 on end face of pinion gear with anvil end of gauge block seated on gear and gauge plunger underneath Arbor Tool J-5223-4 (fig. 2F-38).

(15) Assemble and mount Clamp J-5223-14 and Bolt J-5223-24 on axle housing (fig. 2F-38). Use axle housing cover bolt to attach clamp to housing.

(16) Extend clamp bolt until it presses against gauge block with enough force to prevent gauge block from moving.

(17) Loosen gauge block thumbscrew to release gauge block plunger. When plunger contacts arbor tool, tighten thumbscrew to lock plunger in position. Do not disturb plunger position.

(18) Remove clamp and bolt assembly from axle housing.

(19) Remove gauge block and measure distance from end of anvil to end of plunger using a 2 to 3 inch (5 to 8 cm) micrometer (fig. 2F-39). This dimension represents the **measured pinion depth.** Record this dimension for assembly reference.

(20) Remove bearing caps and remove arbor tool and discs from axle housing.

(21) Remove pinion gear, rear bearing cup, and pinion depth shim from axle housing.

(22) Measure thickness of depth shim used in step (10). Add this dimension to measured pinion depth obtained in step (8). From this total, subtract desired pinion depth. Result represents correct shim thickness required.

NOTE: *The desired pinion depth is the standard setting plus or minus the pinion depth variance.*

(23) Following examples will illustrate procedure for determining correct shim thickness.

Example I—Pinion Depth Variance is Plus (+)

Step 1—Determine desired pinion depth

Add pinion depth variance (marked on pinion gear) to standard setting. Result is desired pinion depth.

Standard Setting	2.547 (6.46 cm)
Pinion Depth Variance	+0.007 (0.17 mm)
Desired Pinion Depth =	2.554 (6.48 cm)

Step 2—Determine total measured pinion depth

Add measured pinion depth to measured shim thickness. Result is total measured pinion depth.

Measured Pinion Depth	2.550 (6.47 cm)
Starter Shim Thickness	+0.098 (2.48 mm)
Total Measured Pinion Depth =	2.648 (6.72 cm)

Step 3—Determine correct shim thickness

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

Total Measured Pinion Depth	2.648 (6.72 cm)
Desired Pinion Depth	-2.554 (6.48 cm)
Correct Shim Thickness =	0.094 (2.38 mm)

Example II—Pinion Depth Variance is Minus (-)

Step 1—Obtain desired pinion depth

Subtract pinion depth variance (marked on pinion gear) from standard setting. Result is desired pinion depth.

Standard Setting	2.547 (6.46 cm)
Pinion Depth Variance	-0.003 (0.07 mm)
Desired Pinion Depth =	2.544 (6.46 cm)

Step 2—Determine total measured pinion depth

Add measured pinion depth to measured shim thickness. Result equals total measured pinion depth.

Measured Pinion Depth	2.542 (6.45 cm)
Starter Shim Thickness	+0.096 (2.43 mm)
Total Measured Pinion Depth =	2.638 (6.70 cm)

Step 3—Determine correct shim thickness

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

Total Measured Pinion Depth	2.638 (6.70 cm)
Desired Pinion Depth	-2.544 (6.46 cm)
Correct Shim Thickness =	0.094 (2.38 mm)

Pinion Gear Bearing Preload Adjustment

(1) Install correct thickness pinion depth shim(s) in axle housing bearing cup bore.

(2) Install rear bearing cup and pinion gear.

(3) Install replacement collapsible spacer and front bearing on pinion gear.

CAUTION: *The collapsible spacer controls pinion bearing preload. Do not reuse the old spacer. Use a replacement spacer only.*

(4) Install pinion oil seal using tool J-22661 (fig. 2F-28).

(5) Install pinion yoke and replacement pinion nut. **Tighten pinion nut finger-tight only.**

(6) Tighten pinion nut **only enough to remove end play and seat pinion bearings.** Use tool J-22575 to tighten nut and use tool J-8614-01 to hold yoke while tightening nut. Rotate pinion while tightening nut to seat bearings evenly.

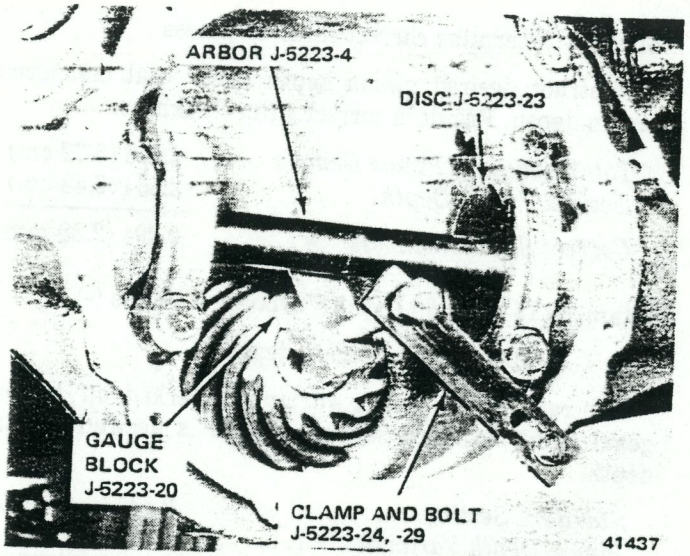

Fig. 2F-38 Installing Pinion Depth Gauge Tools

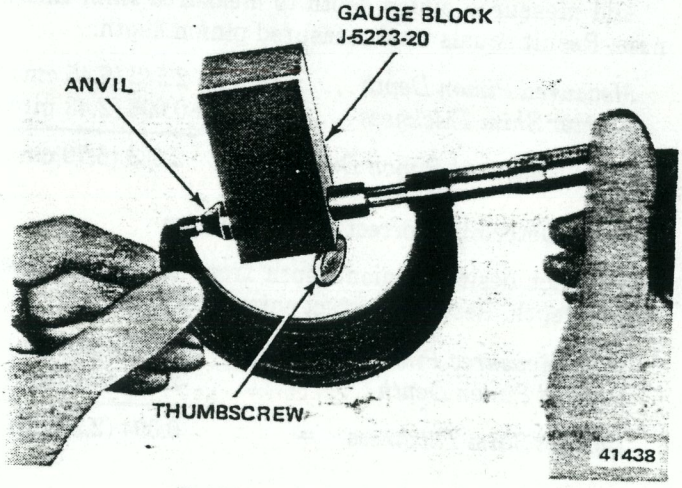

Fig. 2F-39 Measuring Gauge Block

(7) Remove Tools J-8614-01 and J-22575.

(8) Measure torque required to turn pinion gear using an inch-pound torque wrench and Tool J-22575. Correct pinion bearing preload torque is 17 to 25 inch-pounds (2 to 3 N•m) torque. Continue tightening pinion nut until required preload torque is obtained.

CAUTION: *Do not exceed the specified preload torque and do not loosen the nut to reduce preload torque if the specified torque is exceeded.*

(9) If pinion bearing preload torque is exceeded, remove pinion gear, replace collapsible spacer and pinion nut, and adjust preload again.

Differential Case Assembly

(1) Install differential bearings on case using Tools J-21784 and J-8092 (fig. 2F-40).

(2) Install thrust washers on differential side gears and install gears in differential case.

(3) Install differential pinion gears in case. Install thrust washers behind pinion gears and align pinion gear bores.

(4) Rotate differential side and pinion gears until pinion mate shaft bores in pinion gears are aligned with shaft bores in case.

(5) Install thrust block in case. Insert block through side gear bore. Align bore in block with pinion mate shaft bores in pinion gears and case.

(6) Install pinion mate shaft. Align lockpin bore in shaft with bore in case and install shaft lockpin.

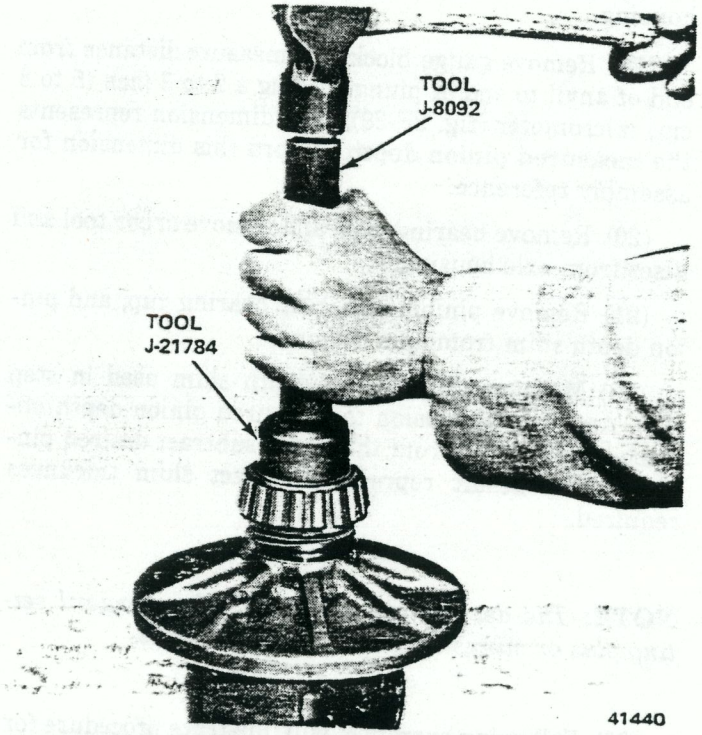

Fig. 2F-40 Differential Bearing Installation

Differential Bearing Adjustment

(1) Place bearing cup over each differential bearing and install differential case assembly in axle housing.

(2) Install shim on each side between bearing cup and housing. Use 0.080 inch (2 mm) shims as starting point (fig. 2F-41).

(3) Install bearing caps and tighten bolts finger-tight. Mount Dial Indicator J-8001 on housing (fig. 2F-42).

(4) Using two screwdrivers, pry between shims and housing. Pry assembly to one side and zero indicator then pry assembly to opposite side and read indicator.

NOTE: *Do not zero or read indicator while prying.*

(5) Amount read on indicator is shim thickness that should be added to arrive at zero preload and zero end play. Repeat procedure to ensure accuracy and adjust if necessary.

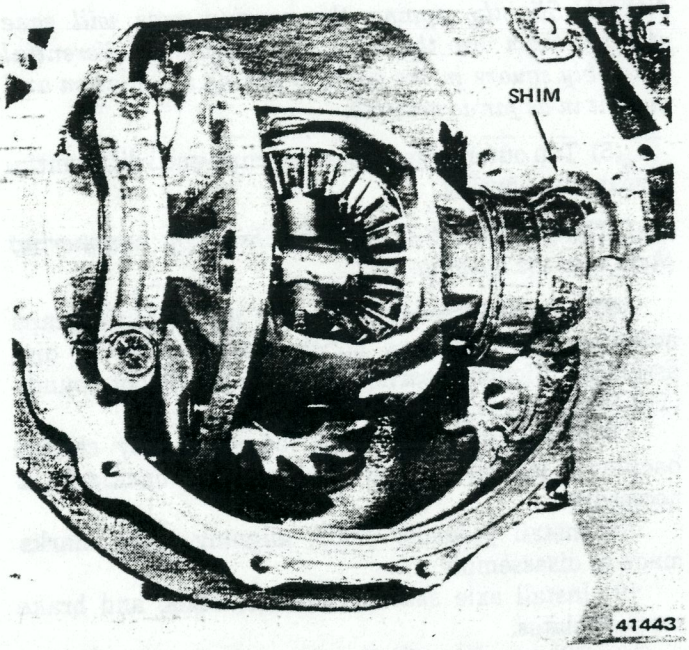

Fig. 2F-41 Adjusting Sideplay

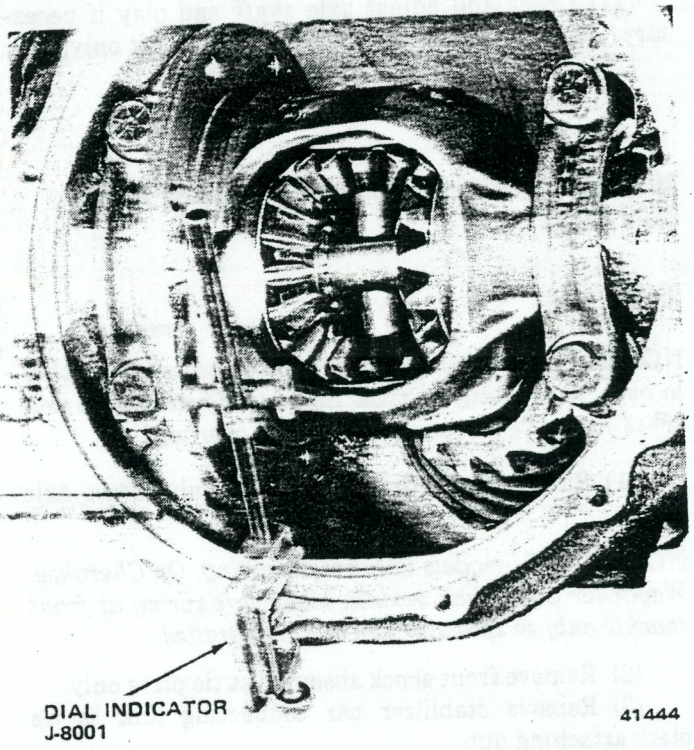

Fig. 2F-42 Checking Ring Gear Mounting Surface of Case for Runout

(6) Shims are available in thicknesses from 0.080 to 0.110 inch (0.25 mm) in 0.002 inch (0.05 mm) increments.

(7) When sideplay is eliminated, a slight bearing drag will be noticed. Install bearing caps and tighten bearing cap bolts to 87 foot-pounds (118 N•m) torque.

(8) Attach dial indicator to axle housing and check ring gear mounting face of differential case for runout (fig. 2F-42). Runout should not exceed 0.002 inch (0.05 mm).

(9) Remove case from housing. Retain shims used to adjust sideplay.

Ring Gear Installation

(1) Position ring gear on differential case.

(2) Install two ring gear bolts in opposite holes and tighten bolts to pull gear into position.

(3) Install remaining ring gear attaching bolts. Tighten bolts to 105 foot-pounds (142 N•m) torque.

Ring and Pinion Gear Backlash Adjustment

(1) Position shims previously selected to remove differential bearing sideplay on bearing cups and install differential assembly in axle housing.

(2) Install bearing cap bolts and tighten bolts to 87 foot-pounds (118 N•m) torque.

(3) Attach dial indicator to housing. Position indicator so indicator stylus contacts drive side of a ring gear tooth and at right angle to tooth (fig. 2F-43).

(4) Move ring gear back and forth and note movement registered on dial indicator. Ring gear backlash should be 0.005 to 0.009 inch (0.12 to 0.22 mm), with 0.008 inch (0.20 mm) desired.

(5) Adjust backlash as follows: to increase backlash, install thinner shim on ring gear side and thicker shim on opposite side. To decrease backlash, reverse procedure, however, do not change total thickness of shims. **Example:** Sideplay was removed using 0.090 inch (2.28 mm) shims on each side totaling 0.180 inch (4.57 mm).

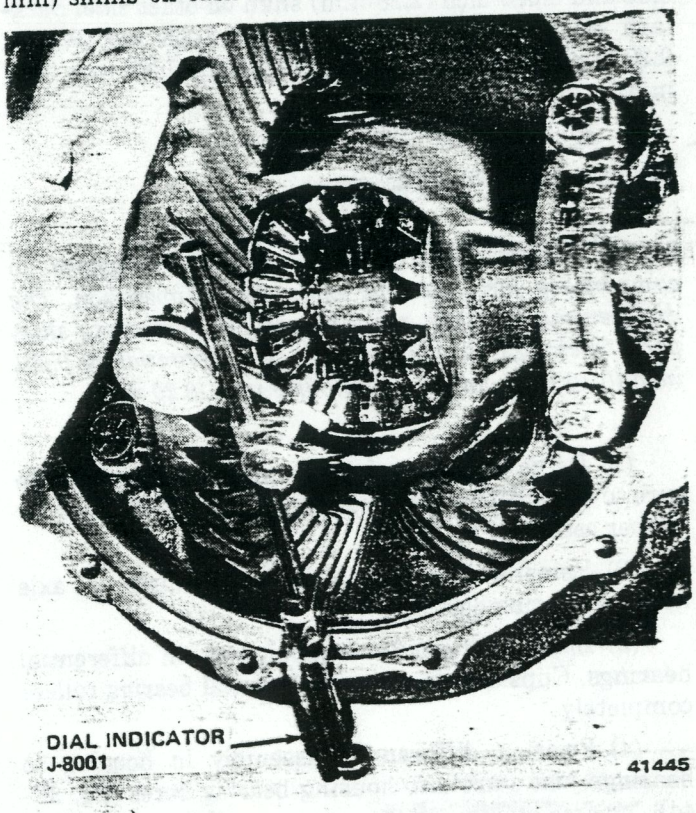

Fig. 2F-43 Checking Backlash

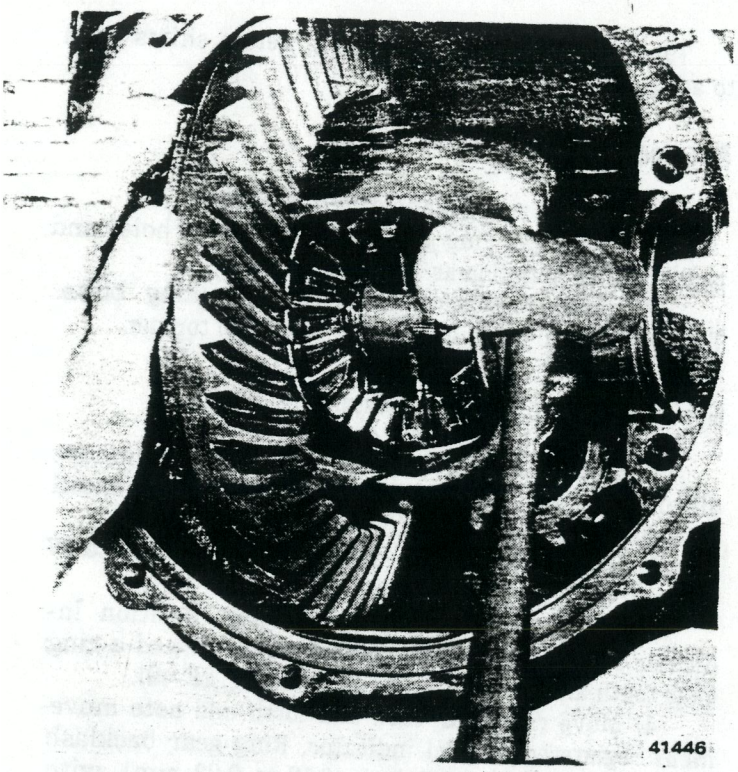

Fig. 2F-44 Differential Installation

Backlash is checked and found to be 0.011 inch (0.27 mm). To correct backlash, add 0.004 inch (0.10 mm) to shim on ring gear side and subtract 0.004 inch (0.10 mm) from shim on opposite side.

This will result in 0.094 inch (2.38 mm) shim on ring gear side and 0.086 inch (2.18 mm) shim on other side. Backlash will be approximately 0.007 to 0.008 inch (0.17 to 0.20 mm). Total shim thickness remains 0.180 inch (4.57 mm).

Differential Bearing Preload Adjustment

NOTE: *Differential bearings must be preloaded to compensate for heat and loads during operation. The differential bearings are preloaded by increasing shim pack thickness at each side of the differential by 0.004 inch (0.10 mm) for a total of 0.008 inch (0.20 mm).*

(1) Remove differential assembly from housing. Be sure to keep differential bearing shim packs together for proper assembly.

(2) Reinstall differential bearing shims in axle housing bearing bores.

(3) Install differential bearing cups on differential bearings. Cups should cover differential bearing rollers completely.

(4) Position differential assembly in housing so bearings just start into housing bearing bores (fig. 2F-44).

NOTE: *Slightly tipping the bearing cups will ease starting them into the bores. also keep the differential assembly square in the housing during installation and push it in as far as possible.*

(5) Tap outer edge of bearing cups until differential is seated in housing.

CAUTION: *Do not distort the shims by hammering them into the housing.*

(6) Install differential bearing caps. Position caps according to alignment punch marks made at disassembly. Tighten bearing cap bolts to 87 foot-pounds (118 N•m) torque.

(7) Preloading differential bearings may change backlash setting. Check and correct backlash if necessary.

(8) Install propeller shaft, aligning index marks made at disassembly.

(9) Install axle shafts, bearings, seals, and brake support plates.

(10) Fill rear axle with Jeep Axle lubricant or equivalent marked SAE 85W-90, grade API GL-5.

(11) Check and adjust axle shaft end play if necessary. Adjust end play at left side of axle shaft only.

(12) Install hubs, drums, and wheels.

(13) Lower vehicle.

DIFFERENTIAL OVERHAUL—MODEL 30-44-60 FRONT/REAR AXLES

Disassembly

NOTE: *It is not necessary to remove the axle assembly to overhaul the differential. Refer to figures 2F-45 and 2F-46 for parts nomenclature during overhaul.*

(1) Raise vehicle, drain lubricant and remove axle shafts.

NOTE: *On CJ models lower right spring. On Cherokee, Wagoneer and Truck models, lower left spring at front shackle only so spreader tool can be installed.*

(2) Remove front shock absorber at tie plate only.

(3) Remove stabilizer bar connecting link to tie plate attaching nut.

(4) Remove U-bolts and tie plate.

(5) Loosen nuts attaching rear spring shackle to spring.

(6) Support axle housing with jackstand.

(7) Remove bolts attaching spring shackle to spring and lower spring.

(8) Remove axle housing cover.

(9) Mark differential bearing caps for assembly alignment reference. Use centerpunch to mark caps.

(10) Loosen but do not remove differential bearing cap bolts.

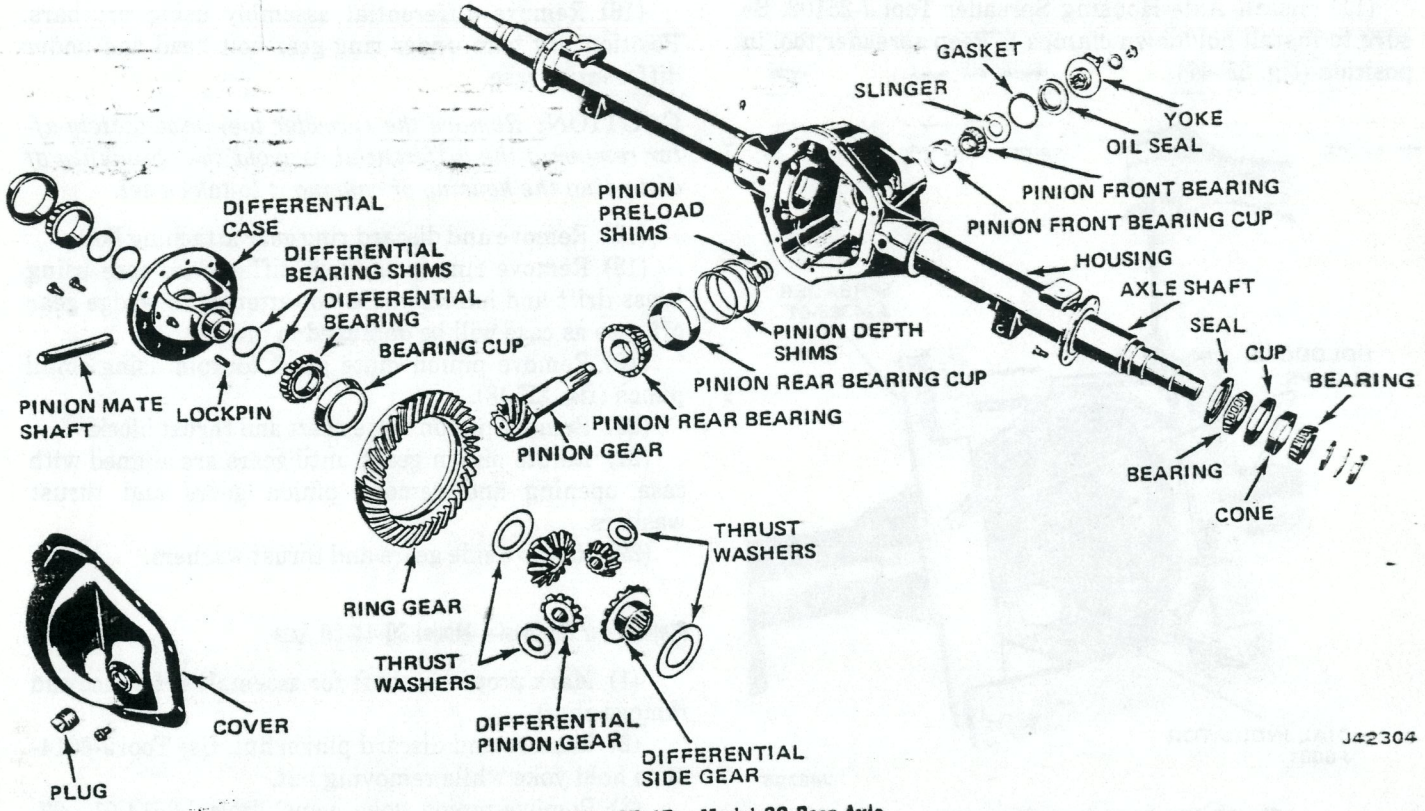

Fig. 2F-45 Model 60 Rear Axle

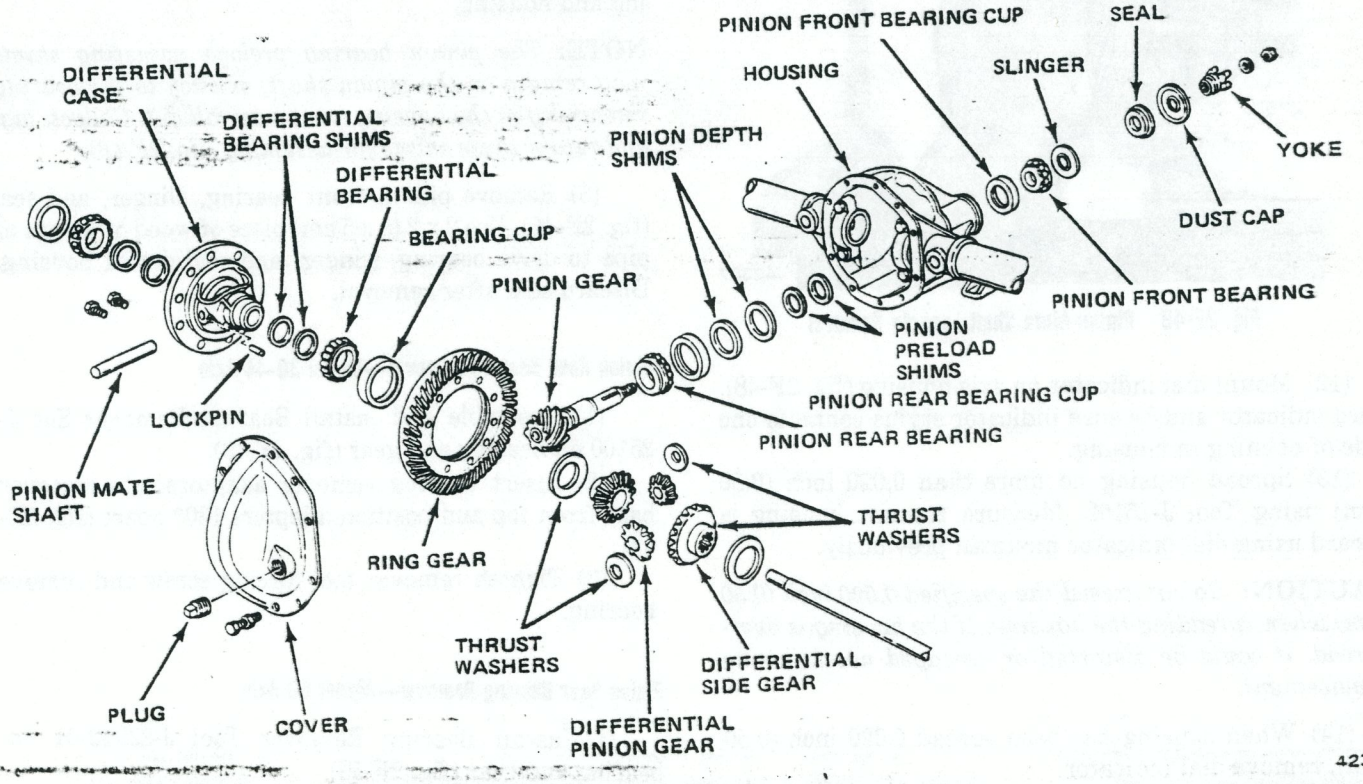

Fig. 2F-46 Model 44 Front Axle

(11) Install Axle Housing Spreader Tool J-25102. Be sure to install holddown clamps to keep spreader tool in position (fig. 2F-47).

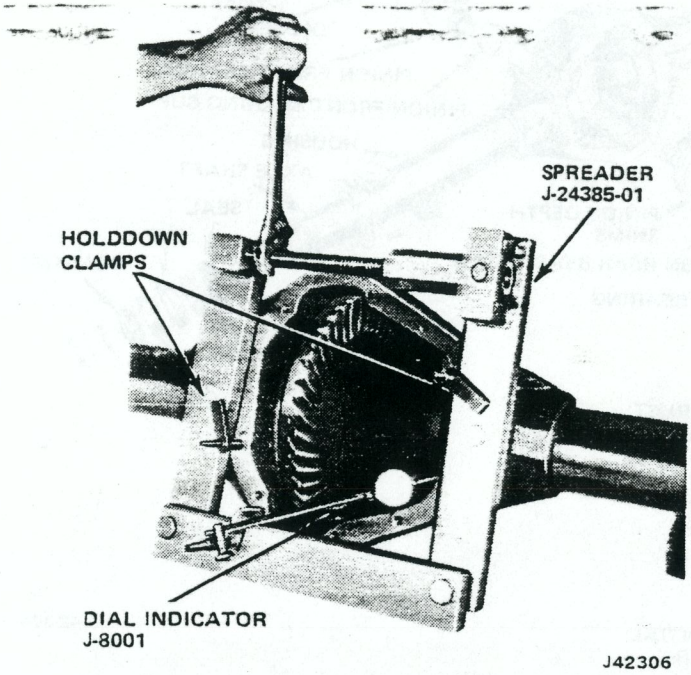

Fig. 2F-47 Spreading Axle Housing

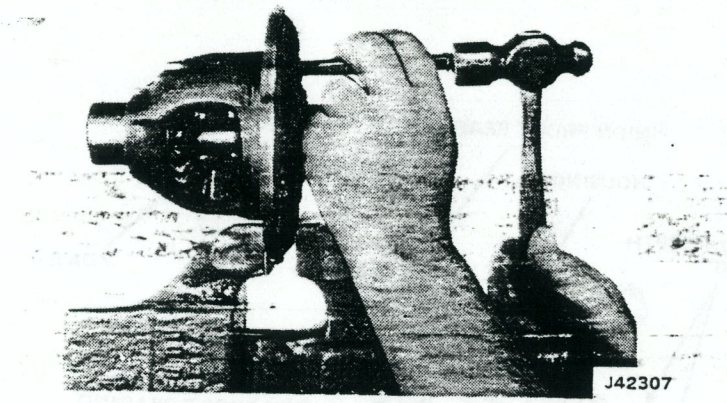

Fig. 2F-48 Pinion Mate Shaft Lockpin Removal

(12) Mount dial indicator on axle housing (fig. 2F-48). Zero indicator and be sure indicator stylus contacts one side of opening in housing.

(13) Spread housing no more than 0.020 inch (0.50 mm) using Tool J-25102. Measure amount housing is spread using dial indicator mounted previously.

CAUTION: *Do not exceed the specified 0.020 inch (0.50 mm) when spreading the housing. If the housing is overspread, it could be distorted or damaged necessitating replacement.*

(14) When housing has been spread 0.020 inch (0.50 mm), remove dial indicator.

(15) Remove differential bearing caps. Tag caps for assembly reference.

(16) Remove differential assembly using pry bars. Position pry bars under ring gear bolt head and under differential case.

CAUTION: *Remove the spreader tool immediately after removing the differential to avoid the possibility of distorting the housing or causing it to take a set.*

(17) Remove and discard ring gear attaching bolts.

(18) Remove ring gear from differential case using brass drift and hammer. Do not attempt to wedge gear off case as case will be damaged in process.

(19) Remove pinion mate shaft lockpin using small punch (fig. 2F-48).

(20) Remove pinion mate shaft and thrust block.

(21) Rotate pinion gears until gears are aligned with case opening and remove pinion gears and thrust washers.

(22) Remove side gears and thrust washers.

Pinion Gear Removal—Model 30-44-60 Axle

(1) Mark propeller shaft for assembly reference and remove shaft.

(2) Remove and discard pinion nut. Use Tool J-8614-01 to hold yoke while removing nut.

(3) Remove pinion yoke using Tools J-8614-01, -02, and -03 (fig. 2F-4).

(4) Remove dust cap from pinion gear.

(5) Remove pinion gear. Strike end of gear using rawhide hammer to force pinion out of pinion rear bearing and housing.

NOTE: *The pinion bearing preload adjusting shims may remain on the pinion shaft, or stick to the bearing remaining in the housing, or it may fall out. Collect, tag, and retain these shims for assembly (fig. 2F-46).*

(6) Remove pinion front bearing, slinger, and seal (fig. 2F-46). Use 2 x 2 (5 x 5 cm) piece of wood or length of pipe to drive bearing, slinger, and seal out of housing. Discard seal after removal.

Pinion Rear Bearing Removal—Model 30-44 Axle

(1) Assemble and install Bearing Remover Set J-25100 on bearing and gear (fig. 2F-49).

(2) Insert bearing remover adaptors into remover base from top and position adapters 180° apart (fig. 2F-49).

(3) Tighten remover tool forcing screw and remove bearing.

Pinion Rear Bearing Removal—Model 60 Axle

(1) Install Bearing Remover Tool J-22912-01 on bearing and gear (fig. 2F-50).

(2) Position chamfered edges of remover tool between bearing inner race and pinion head.

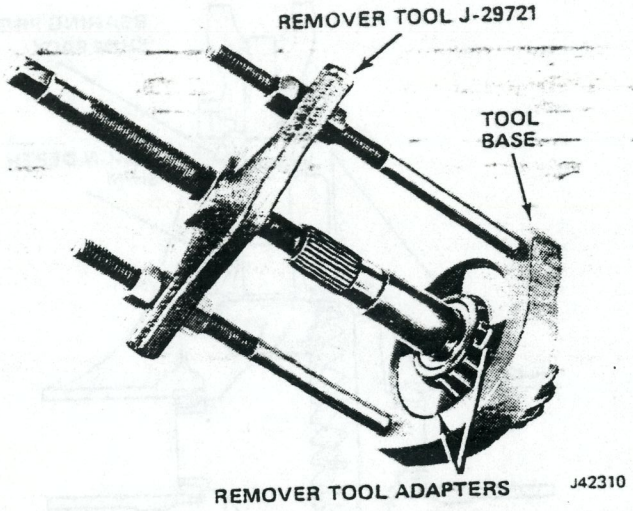

Fig. 2F-49 Pinion Rear Bearing Removal—Model 30-44 Axle

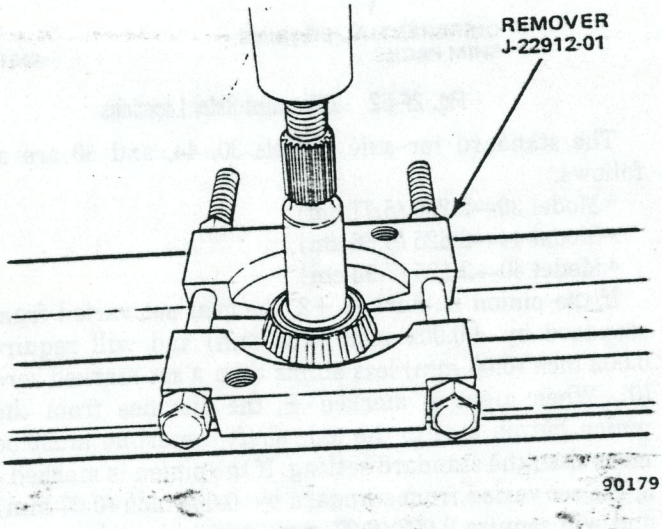

Fig. 2F-50 Pinion Rear Bearing Removal—Model 60 Axle

(3) Tighten remover tool bolts until chamfered edges of tool are well under bearing race.

(4) Position pinion gear and remover tool in arbor press and press pinion out of bearing.

Differential Bearing Removal—Model 30-44 Axle

(1) Assemble and install Bearing Remover Set J-25100 on bearing and case. Remover tools are positioned in manner similar to pinion bearing removal. Refer to figure 2F-49 for tool setup.

(2) Install two bearing adapters in remover tool base. Insert adapters into one side of tool base from top and reposition adapters 180° apart (fig. 2F-49).

(3) Install remover tool button in differential case and center remover tool forcing screw in button.

(4) Tighten remover tool forcing screw and remove bearing.

(5) Repeat operations to remove opposite bearing.

Differential Bearing Removal—Model 60 Axle

(1) Install Bearing Remover Tool J-22912-01 on case and bearing (fig. 2F-51).

(2) Position chamfered edges of remover tool between bearing inner race and case.

(3) Tighten remover tool bolts until chamfered edges of tool are well under bearing race.

(4) Install puller button in case bore.

(5) Install Puller J-22888 on Remover Tool J-22912-01 and center puller forcing screw in puller button (fig. 2F-51).

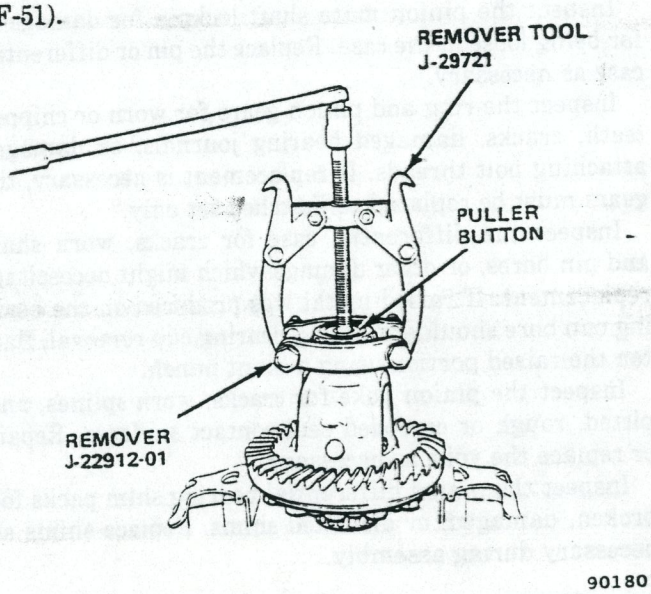

Fig. 2F-51 Differential Bearing Removal—Model 60 Axle

(6) Tighten puller forcing screw and remove bearing.

(7) Repeat operations to remove opposite bearing.

Pinion Bearing Cup Removal—Model 30-44-60 Axle

(1) Remove pinion rear bearing cup. Use brass drift and hammer to tap cup out of housing.

(2) Remove pinion depth shims from rear bearing cup bore in housing. Retain shims for assembly reference even if bent or distorted.

(3) Remove pinion front bearing cup. Use brass drift and hammer to tap cup out of housing.

Cleaning and Inspection

Clean all parts in solvent. Allow bearings to air dry. Dry other parts with compressed air.

Inspect all bearings and cups for pitting, galling, flat spots, or cracks. Replace any bearing or cup that exhibits any of these conditions.

Inspect the differential case for an elongated, or enlarged pinion mate shaft bore. The machined thrust washer surface areas and counterbores must be smooth and free of nicks, gouges, cracks, or burrs. Inspect the case for cracks or other visible damage. Replace the case if it exhibits any of these conditions.

Inspect the pinion mate shaft for excessive wear, scoring, or galling. The shaft must be smooth and concentric. Replace the shaft if worn or damaged.

Inspect the side gears and pinion gears. All gear teeth must display a uniform contact pattern. Inspect the gears and gear teeth for cracks, scoring, excessive wear, or galling. Replace all the gears if any gear exhibits these conditions. Inspect the side gear and pinion gear thrust washers for wear, scoring, galling, or distortion. Replace the washers if they exhibit any of these conditions.

Inspect the pinion mate shaft lockpin for damage or for being loose in the case. Replace the pin or differential case as necessary.

Inspect the ring and pinion gears for worn or chipped teeth, cracks, damaged bearing journals, or damaged attaching bolt threads. If replacement is necessary, the gears must be replaced as matched set only.

Inspect the differential case for cracks, worn shaft and pin bores, or other damage which might necessitate replacement. If raised metal was produced on the bearing cup bore shoulders during bearing cup removal, flatten the raised portion using a blunt punch.

Inspect the pinion yoke for cracks, worn splines, and pitted, rough or corroded seal contact surfaces. Repair or replace the yoke as necessary.

Inspect the pinion differential bearing shim packs for broken, damaged, or distorted shims. Replace shims as necessary during assembly.

Differential Assembly

Pinion Gear Installation and Depth Adjustment

Pinion gear depth is the distance, measured in inches, from the end face of the pinion gear to the axle shaft centerline (fig. 2F-35). This dimension is controlled by shims installed between the pinion rear bearing and axle housing (fig. 2F-52).

Ring and pinion gear sets are factory tested to detect machining variances. Tests are started at a standard setting which is then varied to obtain the most desirable tooth contact pattern and quietest operation. When this setting is determined, identifying numbers are etched on the the ring and pinion (fig. 2F-36).

The ring gear receives one number. The pinion gear receives two numbers which are separated by a + or - sign. The ring gear number and first number on the pinion gear identify the gears as a matched set. Do not attempt to use a set with differing numbers. This is not a matched set.

The second number on the pinion indicates pinion position in relation to the centerline of the axle shafts where tooth contact was best and operation quietest. This number represents pinion depth variance and is the amount, in thousandths of an inch, that the set varied from the standard setting.

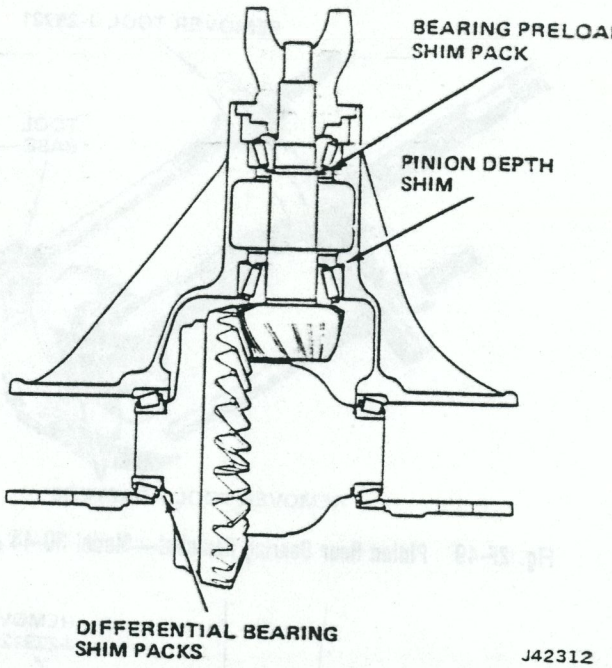

Fig. 2F-52 Differential Shim Locations

The standard for axle Models 30, 44, and 60 are as follows:

- Model 30—2.250 (5.71 cm)
- Model 44—2.625 (6.66 cm)
- Model 60—3.125 (7.93 cm)

If the pinion is marked +2, the gear set varied from standard by +0.002 inch (0.05 mm) and will require 0.002 inch (0.05 mm) less shims than a set marked zero (0). When a set is marked +, the distance from the pinion button face to the axle shaft centerline must be more than the standard setting. If the pinion is marked -3, the set varied from standard by -0.003 inch (0.07 mm) and will require 0.003 (0.07 mm) more shims than a set marked zero. When a set is marked zero, the distance from the pinion button face to the axle shaft centerline must be less than the standard setting. Refer to figure 2F-35 for an illustration of the standard setting dimension.

Pinion Variance Chart

This chart will help determine the approximate starter shim thickness needed for initial pinion depth measurement. However, the chart will not provide the exact shim thickness required for final adjustment and must not be used as a substitute for an actual pinion depth measurement.

To use the chart, proceed as follows:

(a) Measure thickness of original pinion depth shim.

(b) Note pinion depth variance numbers marked on old and new pinion gears.

(c) Refer to Old and New Pinion Marking columns in chart. Chart box where old and new pinion depth columns intersect is approximate amount of

change required to obtain desired starter shim thickness.

For example, if the old pinion is marked -3 and the new pinion +2, chart procedure would be as follows: Refer to Old Pinion Marking column at left side of chart and locate -3 figure in this column. Then read to right, across chart, until under +2 figure in New Pinion Marking column. Box where the two columns intersect will provide amount of shim thickness required. In this case, the number in the intersecting box is -0.005 (0.12 mm) which represents the amount to be subtracted from the original shim thickness. If the box number had been a + figure, this amount would be added to the original shim thickness.

CAUTION: *Front axle differentials use an oil slinger between the pinion rear bearing and the pinion head (fig. 2F-1). This slinger must be installed in order to measure and adjust pinion depth correctly.*

(1) Measure thickness of pinion depth shim removed during disassembly.

(2) Note pinion depth variance numbers on old and new pinion gears.

(3) Refer to pinion variance chart and determine amount to be added to or subtracted from original shim to arrive at starter shim thickness.

CAUTION: *Do not use or assume that the starter shim thickness will be the final shim setting. An actual pinion depth measurement must be performed and the final shim thickness adjusted as necessary.*

(4) Install pinion front bearing cup in housing bore using Driver Handle J-7079-02 and Installer J-25101.

(5) Install starter shim in rear bearing bore of housing. Be sure shim is centered in cup bore. If shim is chamfered, chamfer must face toward housing bore—not toward pinion head.

(6) Install pinion rear bearing cup in housing bore. On Model 30 axles, install cup using Driver Handle J-7079-02 and Installer J-25101. On Model 44 and 60 axles, install cup using Driver Handle J-25122 and Installer J-25157.

(7) On front axle differentials, install oil slinger on pinion gear. Be sure slinger is seated on pinion head before installing rear bearing.

(8) Install rear bearing on pinion. On Model 30 axles install cup using Installer Sleeve J-5590 (fig. 2F-53). On Model 44 and 60 axles, install bearing using Installer Sleeve J-24433 (fig. 2F-53).

(9) Install pinion gear in axle housing.

(10) Install pinion front bearing, pinion yoke, washer, and original pinion nut on pinion. Tighten nut only enough to remove end play and provide 10 to 15 inch-pounds (1 to 2 N•m) of drag torque when pinion is rotated.

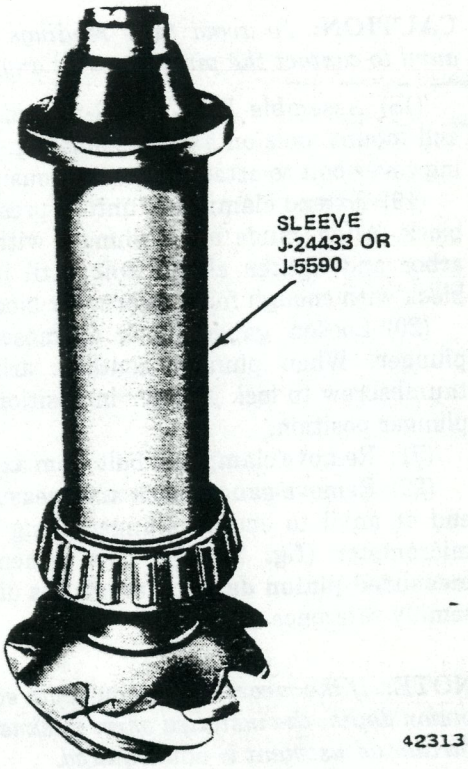

Fig. 2F-53 Pinion Bearing Installation

NOTE: *Do not install the pinion seal, slinger, or dust cap at this time. The pinion will be removed after measuring and adjusting pinion depth.*

(11) Note pinion depth variance marked on pinion gear. If number is preceded by a plus (+) sign, add that amount (in thousands or millimeters) to standard setting for axle model being overhauled. If number is preceded by a minus (-) sign, subtract that amount (in thousands or millimeters) from standard setting. Result of addition or subtraction is desired pinion depth. Record this figure for further reference.

NOTE: *If the gear is marked 0 (zero), use the standard setting.*

(12) Assemble Gauge Arbor J-5223-4 and Discs. On Model 30 axles, use Discs J-5223-26. On Model 44 and 60 axles, use Discs J-5223-25.

(13) Install assembled arbor and discs in differential bearing cup bores (fig. 2F-54). Be sure discs are firmly seated in bearing cup bores.

(14) Install differential bearing caps over discs and tighten cap bolts securely, but not to specified torque.

(15) Remove standard plunger from Gauge Block J-5223-20 and install Plunger J-5223-27.

(16) Compress plunger completely and tighten gauge block thumbscrew securely.

(17) Install Gauge Block J-5223-20. Position block so plunger is directly under Arbor J-5223-4 and flat surface on anvil side of block is seated on end face of pinion (fig. 2F-54).

CAUTION: *To avoid false readings, do not allow the anvil to contact the pinion gear at any point.*

(18) Assemble Bolt J-5223-29 and Clamp J-5223-24 and mount tools on axle housing (fig. 2F-54). Use housing cover bolt to attach clamp to housing.

(19) Extend clamp bolt until it presses against gauge block. Align gauge block plunger with center of gauge arbor and tighten clamp bolt until it presses against block with enough force to prevent block from moving.

(20) Loosen gauge block thumbscrew and release plunger. When plunger contacts arbor tool, tighten thumbscrew to lock plunger in position. Do not disturb plunger position.

(21) Remove clamp and bolt from axle housing.

(22) Remove gauge block and measure distance from end of anvil to end of plunger using 3-inch (7.62 cm) micrometer (fig. 2F-55). This dimension represents **measured pinion depth**. Record this dimemsion for assembly reference.

NOTE: *If the measured pinion depth equals the desired pinion depth, the installed shim thickness is correct and further adjustment is not required.*

(23) Remove bearing caps and remove arbor tool and discs.

(24) Remove pinion gear, rear bearing cup, and depth shim from axle housing.

(25) Measure thickness of depth shim just removed from housing and add this dimension to measured pinion depth obtained in previous step. From this total, subtract desired pinion depth. Result represents shim thickness required to adjust pinion depth.

NOTE: *The desired pinion depth is the standard setting plus or minus the pinion depth variance.*

(26) Following examples illustrate procedure for determining correct shim thickness.

Example I—Pinion Depth Variance is Plus (+) Model 44 Axle

Step 1—Determine desired pinion depth.

Add pinion depth variance (marked on pinion gear) to standard setting. Result is desired pinion depth.

Standard Setting	2.625 (66.6 mm)
Pinion Depth Variance	+0.004 (0.10 mm)
Desired Pinion Depth =	2.629 (66.7 mm)

Step 2—Determine total measured pinion depth.

Add measured pinion depth to measure shim thickness. Result is total measured pinion depth.

Measured Pinion Depth	2.601 (66.0 mm)
Starter Shim Thickness	+0.107 (2.71 mm)
Total Measured Pinion Depth =	2.708 (68.7 mm)

Step 3—Determine correct shim thickness.

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

Total Measured Pinion Depth	2.708 (68.7 mm)
Desired Pinion Depth	-2.629 (66.7 mm)
Correct Shim Thickness =	0.079 (2.00 mm)

Example II—Pinion Depth Variance is Minus (-) Model 60 Axle

Step 1—Obtain desired pinion depth.

Subtract pinion depth variance (marked on pinion gear) from standard setting. Result is desired pinion depth.

Standard Setting	3.125 (79.3 mm)
Pinion Depth Variance	-0.002 (0.05 mm)
Desired Pinion Depth =	3.123 (79.35 mm)

Step 2—Determine total measured pinion depth.

Add measured pinion depth to measured shim thickness. Result equals total measured pinion depth.

Measured Pinion Depth	3.120 (79.2 mm)
Starter Shim Thickness	+0.100 (2.54 mm)
Total Measured Pinon Depth =	3.220 (81.7 mm)

Step 3—Determine correct shim thickness.

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

Total Measured Pinion Depth	3.220 (81.7 mm)
Desired Pinion Depth	-3.123 (79.3 mm)
Correct Shim Thickness =	0.097 (2.46 mm)

(27) Remove pinion gear, rear bearing cup, and starter shim.

(28) Install correct thickness pinion depth shim in housing bearing cup bore and reinstall rear bearing cup.

Pinion Bearing Preload Adjustment

(1) Install pinion bearing preload shims.

(2) Install pinion gear, front bearing, oil slinger, if equipped, yoke, washer, and old pinion nut. Tighten nut to 260 foot-pounds (352 N•m) torque.

(3) Measure torque required to rotate pinion gear using 0-50 inch-pound torque wrench. Rotating torque should be 20-40 inch-pounds with new bearings, or 10-20 inch-pounds (1-2 N•m) with original bearings. Add shims to decrease preload or subtract shims to increase preload.

(4) Remove pinion nut, washer, and yoke when pinion bearing preload is adjusted.

(5) Install new pinion oil seal using Tool J-25104 on Model 30 and 44 axles, or Tool J-24384 on Model 60 axles.

(6) Install yoke and pinion washer.

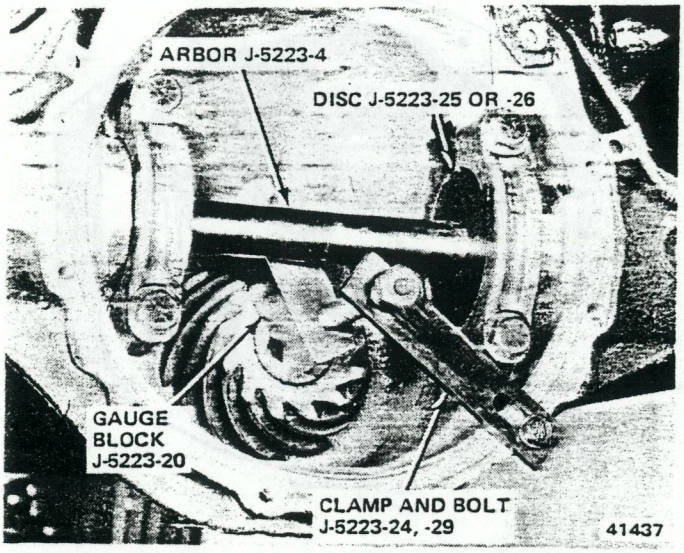

Fig. 2F-54 Installing Pinion Depth Gauge Tools

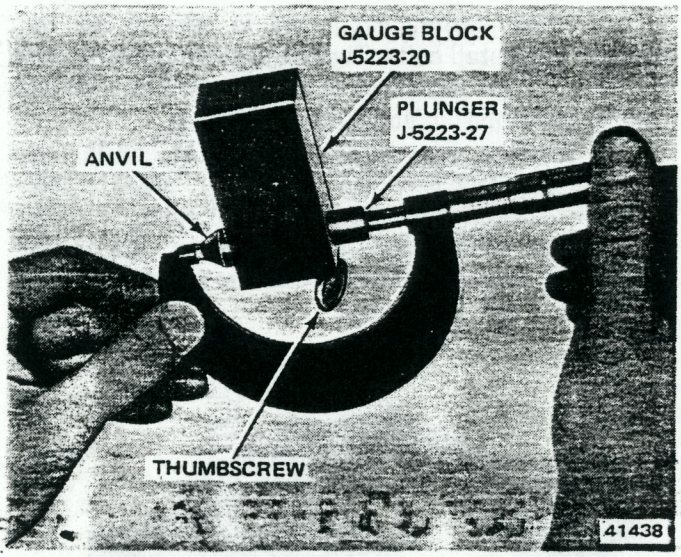

Fig. 2F-55 Measuring Gauge Block

(7) Install new pinion nut. Tighten nut to 210 foot-pounds (285 N•m) torque on Model 30 and 44 axles, and 260 foot-pounds (352 N•m) torque on Model 60 axles.

Differential Side Gear Adjustment

(1) Install thrust washers on side gears and install gears in case.

(2) Install thrust washers on differential pinion gears and install gears in case.

(3) Install thrust block and pinion mate shaft pin in case.

(4) Position differential case on end.

(5) Tap differential case lightly on flat surface to settle gears into position in case.

(6) Measure clearance between case and side gears using feeler gauges (fig. 2F-56). Clearance between gears and case must be 0.000 to 0.006 inch (0.00 to 0.15 mm).

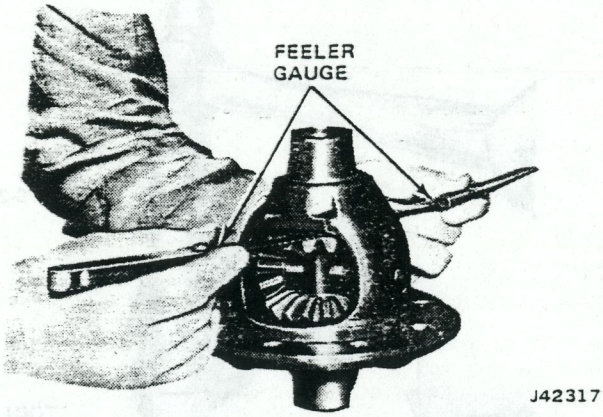

Fig. 2F-56 Checking Side Gear Clearance

(7) If clearance between gears and case exceeds 0.006 inch, replace complete differential case.

NOTE: *Shims are no longer available.*

(8) If differential case is replaced, check side gear clearance again.

(9) Install ring gear on differential case and start two bolts in holes 180 degrees apart. Tighten bolts evenly to seat ring gear.

(10) Install remaining bolts and tighten to 55 foot-pounds (74 N•m) torque.

Differential Bearing Preload and Ring Gear Backlash Adjustment

NOTE: *Differential bearing preload is controlled by shims located between the differential case and bearings.*

(1) Remove old differential bearing shims if not removed previously.

(2) Install differential bearings. On Model 30 and 44 axles, install bearings using Driver Handle J-7079-02 and Installer J-22175 (fig. 2F-57). On Model 60 axles, install bearings using Driver Handle and Installer J-24430.

(3) Install bearing cups on differential bearings.

(4) Install differential in axle housing.

(5) Install bearing caps and tighten cap bolts securely but not to specified torque.

(6) Hold ring gear in contact with pinion gear and pry differential bearing cups toward center of case using screwdriver.

(7) Insert various thickness feeler gauges between each bearing cup and axle housing until ring gear backlash is 0.001 to 0.002 inch (0.02 to 0.05 mm) with feeler gauges installed. Feeler gauges must be installed at both sides of differential and at same time to obtain accurate measurement.

(8) Assemble shim pack that will provide desired backlash. Check backlash again. If OK, tag and retain shims for assembly.

(9) Remove differential case.

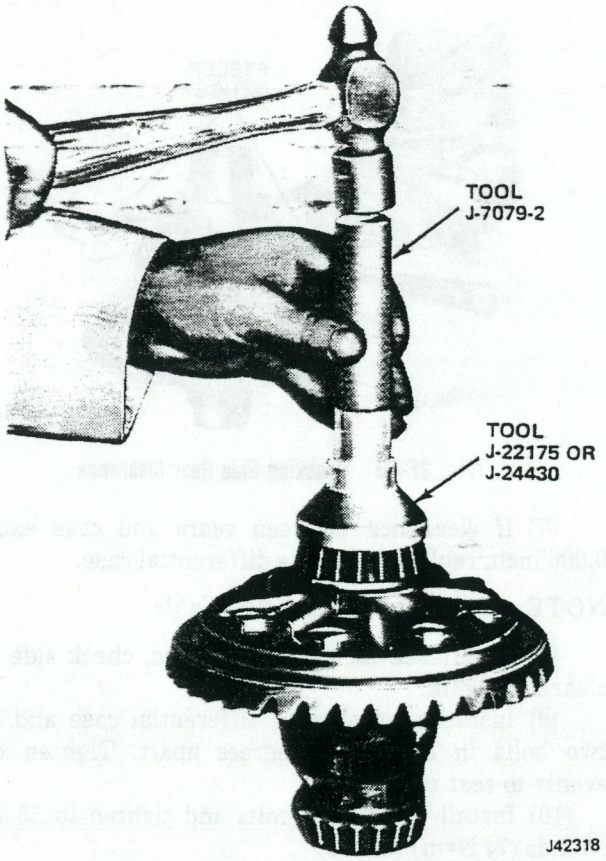

Fig. 2F-57 Differential Bearing Installation

(10) Add additional 0.015 inch (0.38 mm) thickness shim to shim pack to be installed on tooth side of ring gear.

(11) Remove differential bearings. Refer to removal procedures outlined in Differential Assembly.

(12) Install shim packs on appropriate sides of differential case and reinstall differential bearings. On Model 30 and 44 axles, install bearings using Tools J-7079-02 and J-22175. On Model 60 axles, install bearings using Tool J-24430 (fig. 2F-57).

NOTE: *When overhauling a front axle differential, check the axle housing inner oil seals. If seal replacement is required, install replacement seals using Tool J-28648 (fig. 2F-58).*

(13) Mount Spreader Tool J-25102 and Dial Indicator J-8001 on housing. Spread housing no more than 0.020 inch (0.50 mm) (fig 2F-47). Do not exceed 0.020 inch (0.50 mm) to avoid damaging housing.

(14) Remove dial indicator when housing has been spread desired amount.

(15) Lubricate differential bearings with axle lubricant and install differential bearing cups on bearings.

(16) Install differential in housing. Use rawhide mallet to seat differential. Be sure ring and pinion gear teeth mesh completely.

(17) Remove axle housing spreader tool.

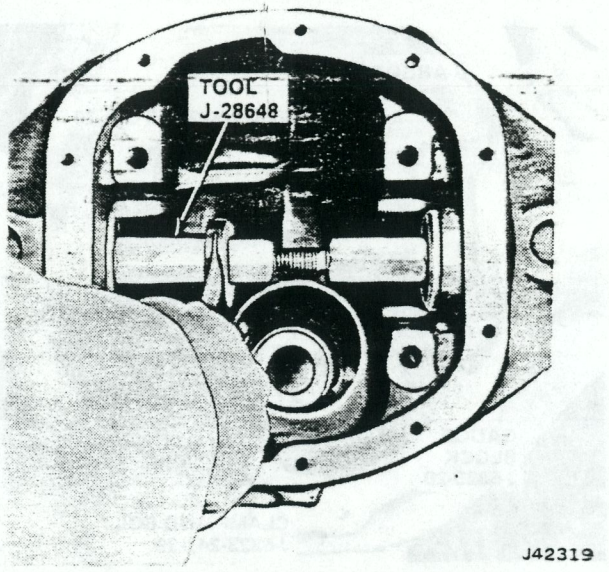

Fig. 2F-58 Front Axle Housing Inner Oil Seal Installation

(18) Apply sealing compound to bearing cap bolt threads and install bolts. Tighten bolts to 40 foot-pounds (54 N•m) torque on Model 30 axle, or to 80 foot-pounds (108 N•m) torque on Model 44 and 60 axles.

(19) Remount Dial Indicator J-8001 on housing and measure ring gear backlash (fig. 2F-59). Measure backlash at two points. Backlash should be 0.005 to 0.010 inch (0.12 to 0.25 mm). If backlash is incorrect, add or subtract shims from differential bearing shim packs until correct backlash is obtained.

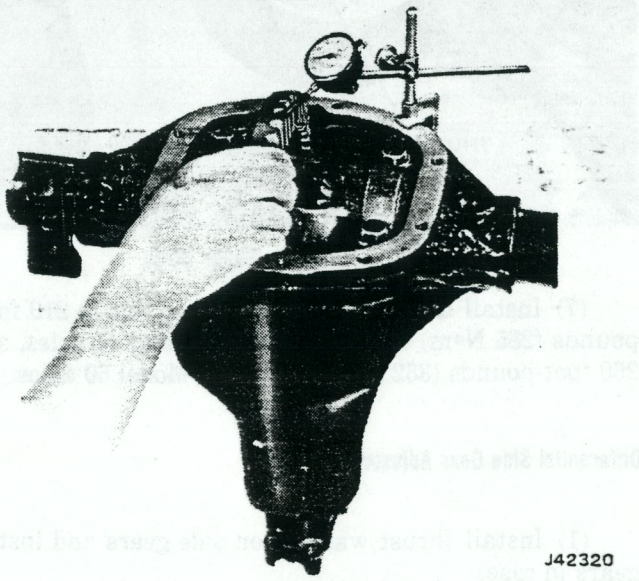

Fig. 2F-59 Measuring Ring Gear Backlash

NOTE: *Changing the position of a 0.005 inch (0.12 mm) shim from one side to the other will change the amount of backlash approximately 0.003 inch (0.07 mm).*

(20) Measure ring gear runout. If runout exceeds 0.006 inch (0.15 mm), case may be distorted, or there is dirt between case and gear, or ring gear bolts are loose. Check and correct as necessary.

(21) Raise spring and install front spring shackle to spring attaching bolts.

(22) Remove jack stand.

(23) Install tie plate and U-bolts. Tighten U-bolt nuts as follows:

1/2-20—55 foot-pounds (75 N•m)
9/16-18—100 foot-pounds (136 N•m)

(24) Tighten spring shackle to spring attaching bolts on CJ models to 24 foot-pounds (33 N•m). Cherokee, Wagoneer and Truck model bolts should be tightened to 100 foot-pounds (136 N•m) torque.

(25) Install stabilizer bar link to tie plate attaching nut.

(26) Install shock absorber. Tighten shock absorber to tie plate retaining nut to 45 foot-pounds (61 N•m) torque.

(27) Install axle shafts.

(28) Install axle housing cover. On Model 44 and 60 axles, clean cover and housing mating surfaces and apply thin bead of Jeep Gasket-In-A-Tube, or equivalent, silicone sealer to housing and cover before installation.

SPECIFICATIONS

Differential Specifications

Model 30 Front Axle	USA	Metric
Differential Bearing Preload	.015 in	0.38 mm
Differential Side Gear-to-Case Clearance	.000-.006 in	0.000-0.15 mm
Ring Gear	.005-.009 in	0.12-0.22 mm
Pinion Bearing Break-Away Preload		
Original Bearings	15-25 in-lbs.	2-3 N·m
New Bearings	20-40 in-lbs.	2-5 N·m
Model 44 Axle		
Differential Bearing Preload	0.15 in	0.38 mm
Differential Side Gear-to-Case Clearance	.000-.006 in	0.000-0.15 mm
Ring Gear Backlash	.005-.010 in	0.12-0.25 mm
Pinion Bearing Break-Away Preload		
Original Bearings	10-20 in-lbs.	1-2 N·m
New Bearings	20-40 in-lbs.	2-5 N·m
Model 60 Axle		
Differential Bearing Preload	.015 in	0.38 mm
Differential Side Gear-to-Case Clearance	.000-.006 in	0.000-0.15 mm
Drive Gear-to-Pinion Backlash	.005-.009 in	0.12-0.15 mm
Drive Pinion Bearing Break-Away		
Original Bearings	10-20 in-lbs.	1-2 N·m
New Bearings	20-40 in-lbs.	2-5 N·m
AMC/Jeep Axle		
Axle Shaft End Play (Shims — Left Side Only) - CJ	.004-.008 in (.006 in desired)	0.10-0.20 mm (0.15 mm desired)
Pinion Bearing Preload (Collapsible Sleeve)	17-25 in-lbs.	2-3 N·m
Differential Bearing Preload (Shims)	.008 in	0.20 mm
Differential Case Flange Runout (Inspection only — no adjustment)	.002 in max.	0.05 mm max.
Ring Gear Backlash (Shims)	.005-.009 in (.008 in desired)	0.12-0.15 mm (0.20 mm desired)
Pinion Gear Standard Setting (Shims)	2.547 in	64-69 mm

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Differential 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
Model 30 Front Axle				
Axle Housing Cover Bolts	20	15-25	27	20-34
Differential Bearing Cap Bolts	40	35-50	54	47-68
Ring Gear-to-Case Bolts	55	45-65	75	61-88
Lower Ball Stud Nut	80 min.	–	108 min.	–
Pinion Nut	210	200-220	271	285-298
Universal Joint U-Bolts	15	13-18	20	18-24
Upper Ball Stud Nut	100 min.	–	136 min.	–
Upper Ball Stud Seat	50 min.	–	68 min.	–
Wheel-to-Hub Nuts	80	65-90	108	88-122
Model 60 Axle				
Axle Housing Cover Bolts	20	15-25	27	20-34
Support Plate Bolts/Nuts	50	45-55	68	61-75
Differential Bearing Cap Bolts	80	70-90	108	95-122
Ring Gear-to-Case Bolts	105	100-110	142	135-149
Pinion Nut	260	250-270	352	339-366
Universal Joint Strap Bolts	15	13-18	20	18-24
Wheel-to-Hub Nuts	120	110-125	163	149-169
AMC/Jeep Axle				
Axle Housing Cover Bolts	170 in-lbs	150-190 in-lbs	19	17-21
Brake Tube-to-Rear Wheel Cylinder	97 in-lbs	90-105 in-lbs	11	10-12
Differential Bearing Cap Bolts	87	80-95	10	9-11
Ring Gear-to-Case Bolt	105	95-115	142	135-149
Rear Brake Support Plate Bolts	32	25-40	43	34-54
Axle Shaft-to-Hub Nuts-CJ	250 min.	250 min.	339 min.	–
Clamp Strap Bolts	16	15-19	18	14-24

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

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TRAC-LOK DIFFERENTIAL

GENERAL

The Trac-Lok limited slip differential is available as an option on Jeep vehicles equipped with the Model 208 or 300 transfer case only. Trac-Lok is used in rear axles only and is not available on vehicles equipped with Quadra-Trac. Two Trac-Lok units are used. Model 60 axles use a slightly different unit than is used in AMC/Jeep rear axles. Refer to the Overhaul section for servicing procedures.

OPERATION

In a conventional differential, torque applied to the ring gear is transmitted to the axle shafts through the differential gears. During normal operation, torque transmitted to each axle shaft is equal at all times. However, if one wheel slips, the opposite wheel will generate only as much torque as the slipping wheel.

With Trac-Lok, part of the ring gear torque is transmitted through clutch packs located between the differential side gears and case. The clutch packs contain multiple disc clutches which have radial grooves on the plates and concentric grooves on the discs.

In operation, the Trac-Lok clutches are engaged by two concurrent forces. The first being preload force exerted through Belleville springs contained within the clutch packs and the second is from separating forces generated by the side gears as torque is applied through the ring gear.

The Trac-Lok design provides the normal differential action needed for turning corners and for the transmittal of equal torque to both wheels when driving straight ahead. However, when one wheel loses traction and spins, the clutch packs transfer additional torque to the wheel having the most traction. Trac-Lok differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel loses traction. Pulling power is provided continuously until both wheels lose traction. If both wheels slip due to unequal traction, Trac-Lok operation is normal. In extreme cases of differences in traction, the wheel with the least traction may spin after the Trac-Lok has transferred as much torque as possible to the nonslipping wheel.

LUBRICATION

Use Jeep axle lubricant or equivalent marked SAE 85W-90, grade GL-5 in Trac-Lok axles. In addition, the only acceptable method for cleaning the Trac-Lok differential is by disassembling the unit and wiping it clean using shop towels.

NOTE: *The Trac-Lok differential is serviced at the same time intervals as the standard differential.*

Trac-Lok Lubricant Change

(1) Warm axle lubricant. Operate vehicle in gear, on hoist, with wheels off floor for minimum of 5 minutes at 30 mph.

WARNING: *Never attempt to operate a Trac-Lok equipped vehicle in gear with only one wheel raised. The vehicle could propel itself off the jack and cause damage or personal injury.*

(2) Stop engine and raise vehicle on hoist.

(3) Remove axle housing cover drain plug or cover and drain lubricant while it is warm. If cover is removed, discard cover gasket.

(4) Remove any residual lubricant from axle housing using shop cloths.

(5) Install drain plug. If axle housing cover was removed, clean cover and housing mating surfaces and apply Jeep Gasket-In-A-Tube, or equivalent sealer to cover and housing mating surfaces. Install cover and cover bolts. Tighten cover bolts to 20 foot-pounds (27 N•m) torque.

(6) Refill axle housing with specified lubricant only. Refer to Specifications for lubricant capacities of various axle models.

(7) Operate vehicle on road for approximately ten miles (16 km). Make at least ten figure eight turns to flush old lubricant out of clutch packs.

(8) Return vehicle to shop and raise vehicle on hoist.

(9) Drain and replace axle lubricant again. If axle housing cover is removed, be sure to clean cover and housing mating surfaces and reapply Jeep Gasket-In-A-Tube, or equivalent sealer to mating surfaces before reinstalling cover.

(10) Lower vehicle.

(11) Road test vehicle and verify proper Trac-Lok operation.

NOTE: *If a slight chatter occurs after flushing and refilling the Trac-Lok differential, drive the vehicle an additional ten to twenty miles (16 to 32 km) or until chatter stops. If the chatter persists after twenty (32 km) or more miles of driving, an overhaul may be necessary.*

DIAGNOSIS

If noisy or rough operation such as chatter occurs when turning corners, the most probable cause is incorrect or contaminated lubricant. Before removing the Trac-Lok unit for repair, drain, flush, and refill the axle with the specified lubricant. Refer to the lubricant change procedure under Lubrication. A complete lubricant drain and refill with the specified lubricant will usually correct chatter.

Trac-Lok Operational Test

Trac-Lok operation can be checked quickly using the following test.

(1) Position one wheel on solid, dry pavement and opposite wheel on ice, mud, grease, or similiar low traction surface.

(2) Increase engine rpm gradually to obtain maximum traction prior to breakaway. Ability to move vehicle effectively will demonstrate proper performance.

NOTE: *If the test is performed on extremely slick surfaces such as ice or grease coated surfaces, some question may exist as to proper performance. In these extreme cases, a properly performing Trac-Lok will provide greater pulling power by lightly applying the parking brake.*

OVERHAUL

Disassembly

(1) Remove differential from axle housing. Removal procedures are same as outlined for standard differential. Refer to figures 2F-60 and 2F-61 for parts nomenclature.

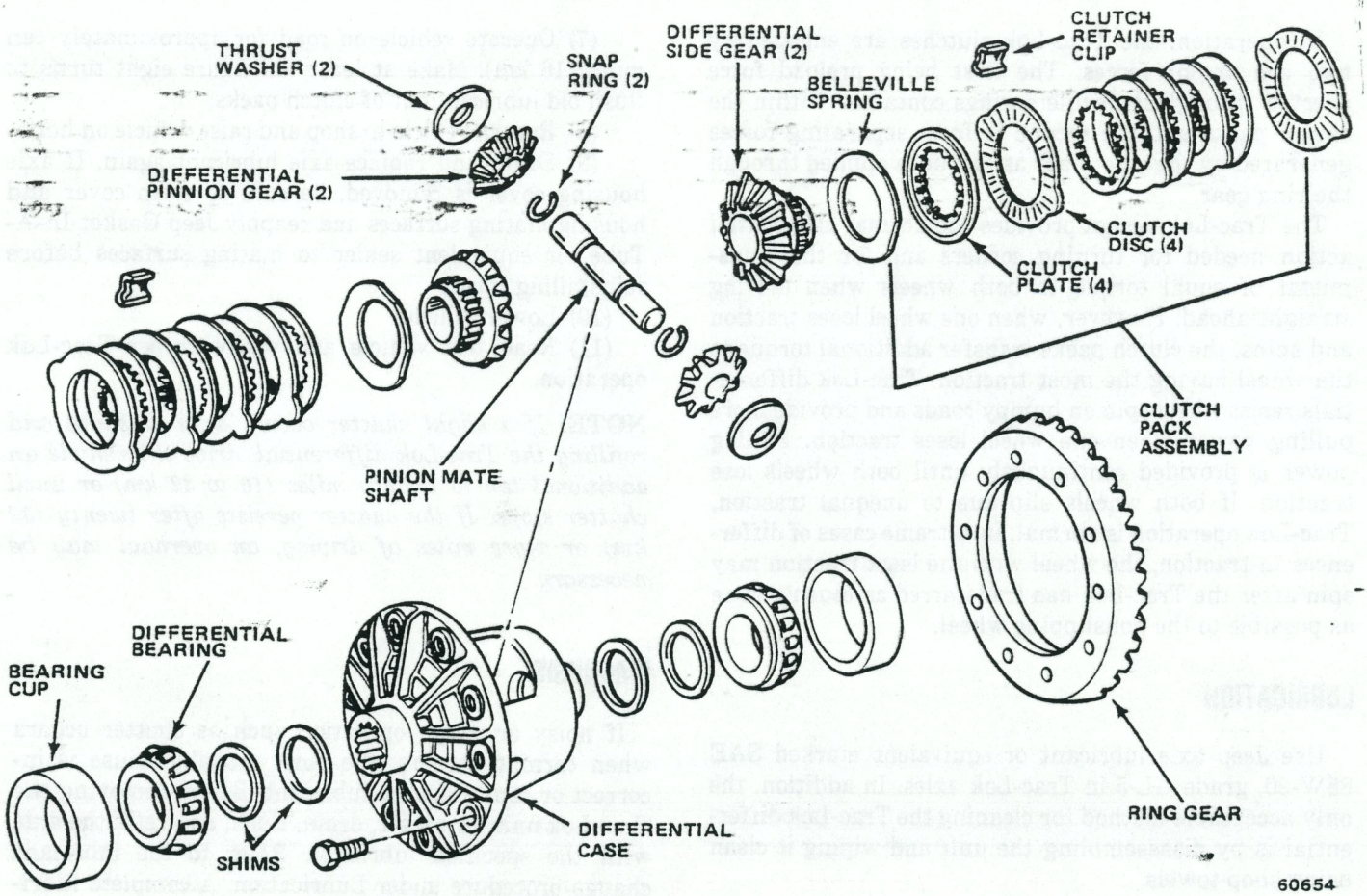


Fig. 2F-60 Trac-Lok Differential—Model 60 Axle

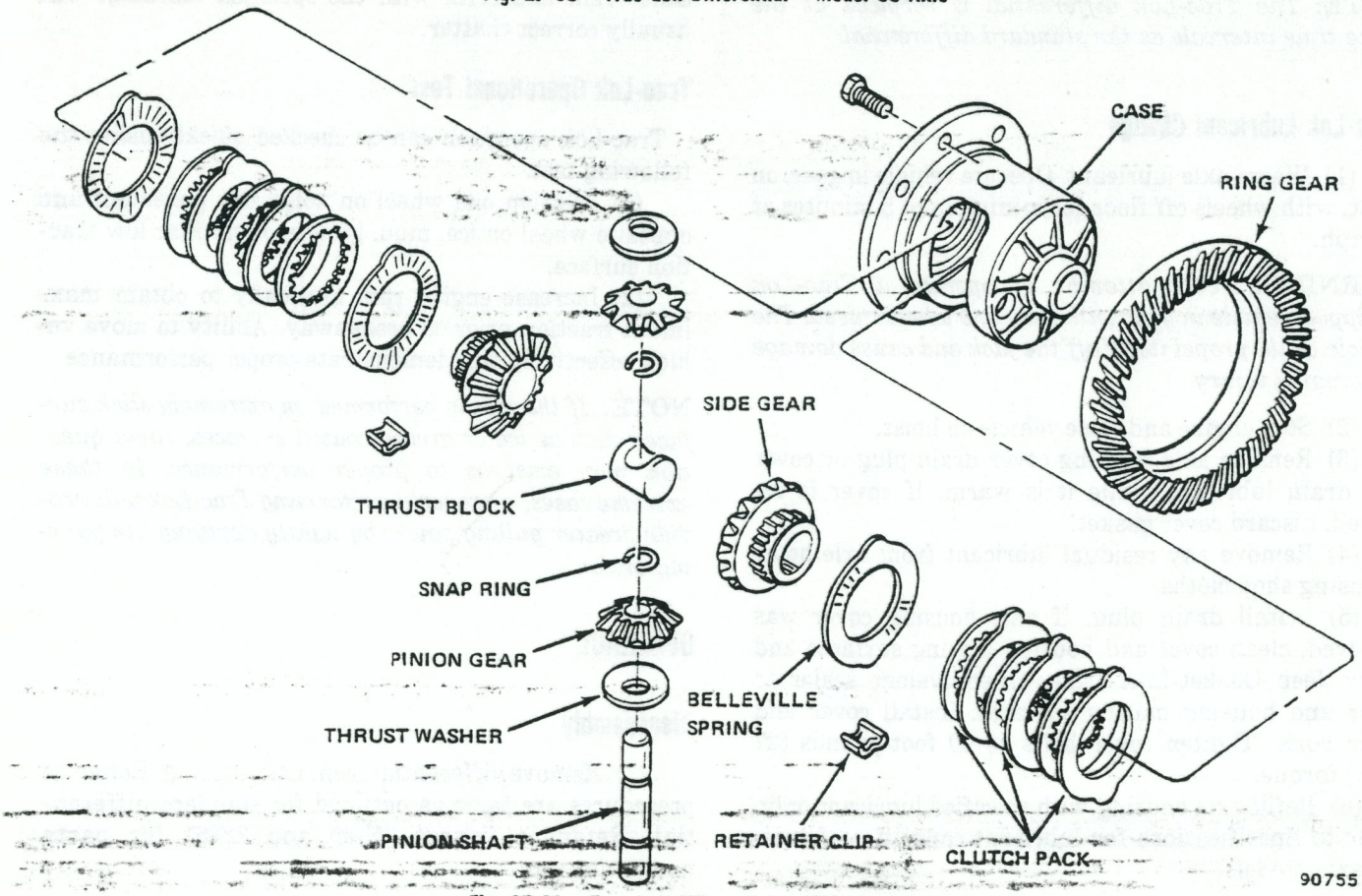


Fig. 2F-61 Trac-Lok Differential—AMC/Jeep Axle

(2) Install one axle shaft in vise with spline end facing upward and tighten vise. Do not allow more than 2-3/4 inch (7 cm) of shaft to extend above top of vise (fig. 2F-62). This prevents shaft from fully entering side gear, causing interference with step plate tool used to remove differential gears.

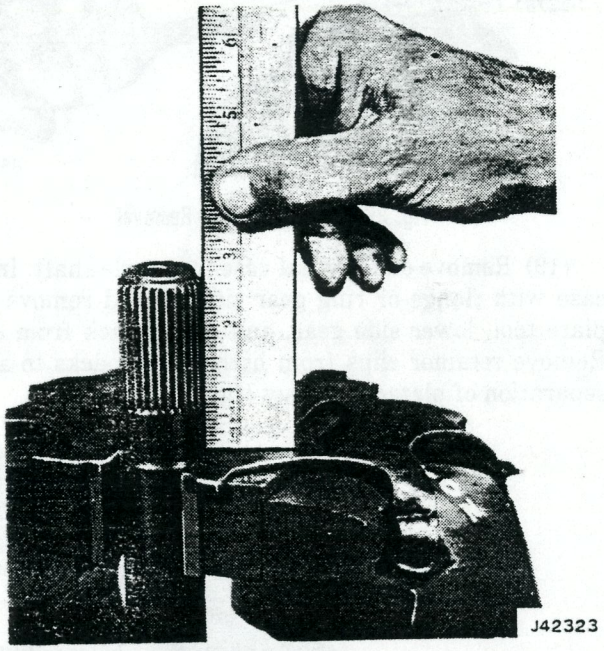


Fig. 2F-62 Axle Shaft Positioned in Vise

(3) Mount differential case on axle shaft with ring gear bolt heads facing upward (fig. 2F-63).

Fig. 2F-63 Differential Mounted on Axle Shaft

(4) Remove and discard ring gear bolts.

(5) Place shop towels under ring gear to protect gear when it is removed from case (fig. 2F-63).

(6) Remove ring gear from case using rawhide hammer.

(7) Remove differential case from axle shaft and remove ring gear.

(8) Remount differential case on axle shaft.

(9) Remove snap rings from pinion mate shaft (fig. 2F-64). Use two screwdrivers to disengage snap rings. Place shop towel on opposite opening of case to prevent snap rings from flying out of case.

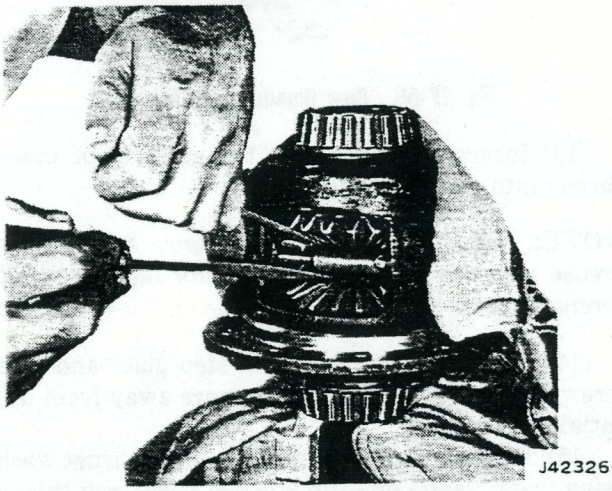


Fig. 2F-64 Pinion Mate Shaft Snap Ring Removal

NOTE: *On the Model 60 Trac-Lok, the pinion mate shaft is retained in the case by a roll pin. Use a 3/16 inch (5 mm) diameter pin punch to remove this pin.*

(10) Remove pinion mate shaft using hammer and brass drift.

NOTE: *Gear Rotating Tool J-23781 is required to perform the following steps. The tool consists of three parts: gear rotating tool, forcing screw, and step plate.*

(11) Install step plate in lower differential side gear (fig. 2F-65).

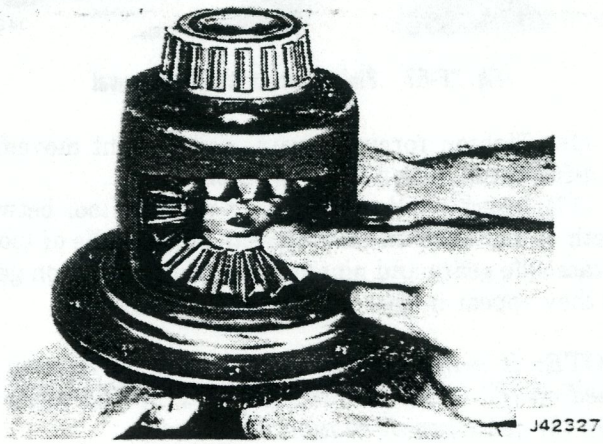


Fig. 2F-65 Step Plate Installation

(12) Position pawl end of gear rotating tool on step plate (fig. 2F-66).

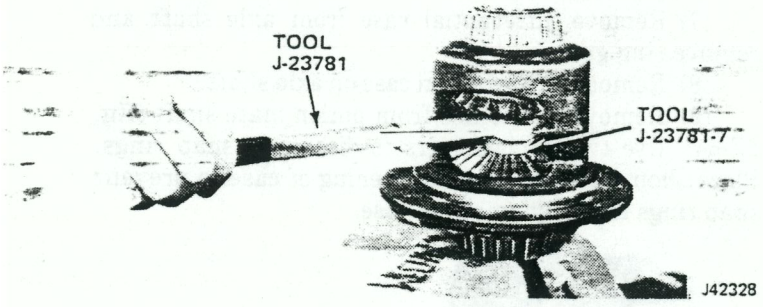


Fig. 2F-66 Gear Rotating Tool Installation

(13) Insert forcing screw through top of case and thread into gear rotating tool.

NOTE: *Before using forcing screw, apply daub of grease to centering hole in step plate and oil threads of forcing screw.*

(14) Center forcing screw in step plate and tighten screw to move differential side gears away from differential pinion gears.

(15) Remove differential pinion gear thrust washers using feeler gauge or shim stock of 0.030 inch thickness (0.76 mm). Insert shim stock or gauge between washer and case and withdraw shim stock and thrust washer (fig. 2F-67).

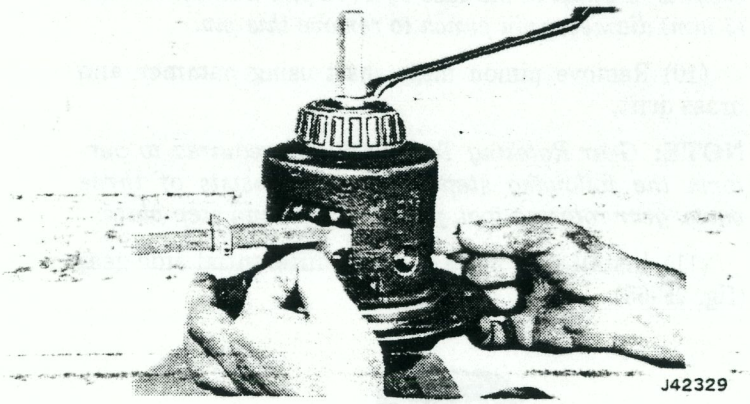


Fig. 2F-67 Pinion Thrust Washer Removal

(16) Tighten forcing screw until a slight movement of differential pinion gears is observed.

(17) Insert pawl end of gear rotating tool between teeth of one differential side gear. Pull handle of tool to rotate side gears and pinion gears. Remove pinion gears as they appear in case opening (fig. 2F-68).

NOTE: *It may be necessary to adjust the tension applied on the Belleville springs by the forcing screw before the gears can be rotated in the case.*

(18) Retain upper side gear and clutch pack in case by holding hand on bottom of rotating tool while removing forcing screw. Remove rotating tool, upper side gear, and clutch pack.

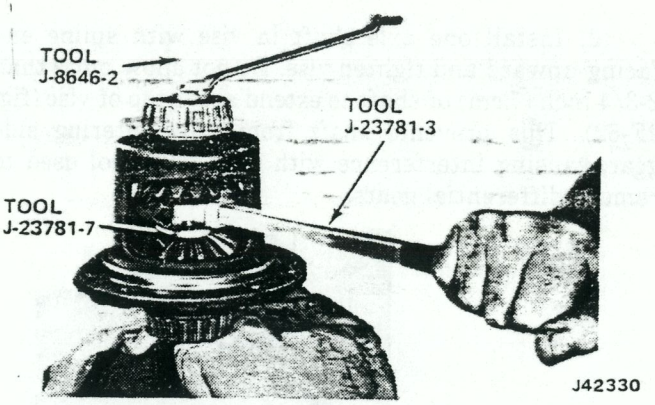


Fig. 2F-68 Pinion Gear Removal

(19) Remove differential case from axle shaft. Invert case with flange or ring gear side up and remove step plate tool, lower side gear, and clutch pack from case. Remove retainer clips from both clutch packs to allow separation of plates and discs (fig. 2F-69).

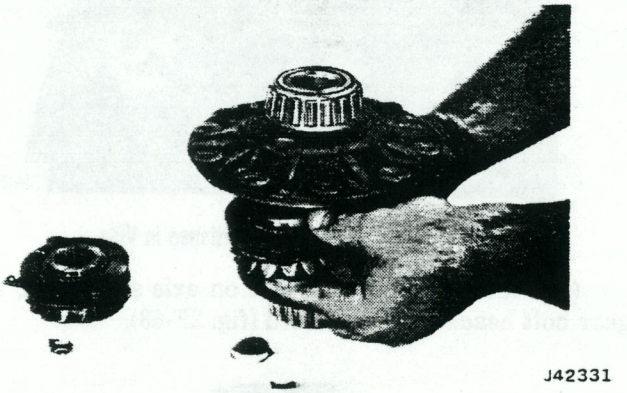


Fig. 2F-69 Side Gear and Clutch Pack Removal

Inspection

Clutch Plates and Disc

If any one member of either clutch pack shows evidence of excessive wear or scoring, the complete clutch pack must be replaced on both sides.

Differential Side and Pinion Gears

The gear teeth should be checked for extreme wear or possible cracks. The external teeth of the side gear which holds the clutch pack also should be checked for wear or cracks. If replacement of one gear is required due to wear, both side gears, pinion gears, and thrust washers must be replaced.

Pinion Mate Shaft

If excessive wear is evident on any one of the retainer clips, all clips should be replaced.

Differential Case

If scoring, wear, or metal pickup is evident on the machined surfaces, then replacement of the case is necessary.

Examples of radial groove clutch plate (A) and the concentric groove disc (B) are shown in figure 2F-70.

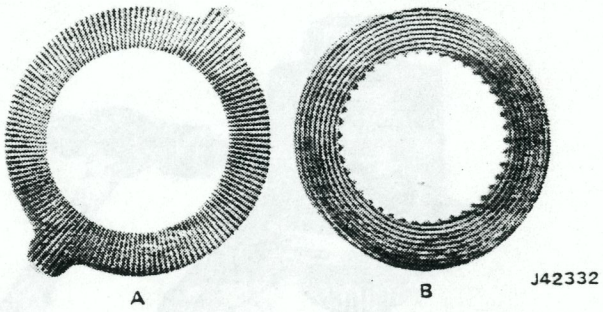


Fig. 2F-70 Clutch Plate and Disc Identification

ASSEMBLY

(1) Lubricate all differential components with Jeep axle lubricant or equivalent marked SAE 85W-90, GL-5.

(2) Assemble clutch packs. Install plates and discs in same position as when removed regardless of whether they are replacement or original parts.

(3) Install clutch retainer clips on ears of clutch plates. Be sure clutch packs are completely assembled and seated on ears of plates.

(4) Install clutch packs on differential side gears and install assembly in case.

NOTE: *Be sure clutch pack stays assembled on side gear splines and that retainer clips are completely seated in case pockets. To prevent pack from falling out of case, it will be necessary to hold them in place by hand while mounting case on axle shaft (fig. 2F-71).*

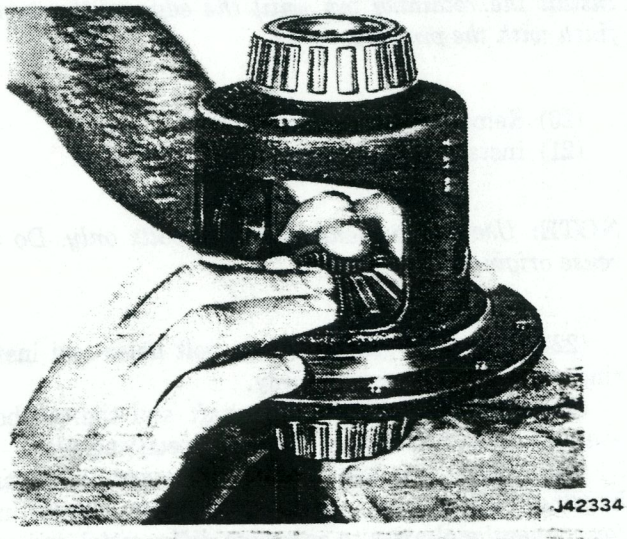


Fig. 2F-71 Mounting Differential Case on Axle Shaft

(5) Mount case assembly on axle shaft (fig. 2F-72).

CAUTION: *When installing differential case on axle shaft, be sure that splines of side gears are aligned with those of axle shaft. Be sure clutch pack is still properly assembled in case after installing case on axle shaft.*

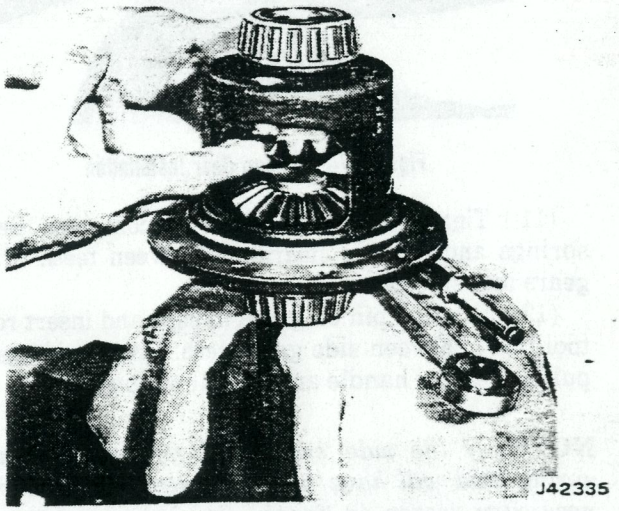


Fig. 2F-72 Clutch Pack and Side Gear Installation

(6) Install step plate tool in side gear. Apply small daub of grease in centering hole of step plate.

(7) Install remaining clutch pack and side gear. Be sure clutch pack stays assembled on side gear splines and that retainer clips are completely seated in pockets of case (fig. 2F-72).

(8) Position gear rotating tool in upper side gear.

(9) Keep side gear and rotating tool in position by holding with hand. Insert forcing screw through top of case and thread into rotating tool (fig. 2F-73).

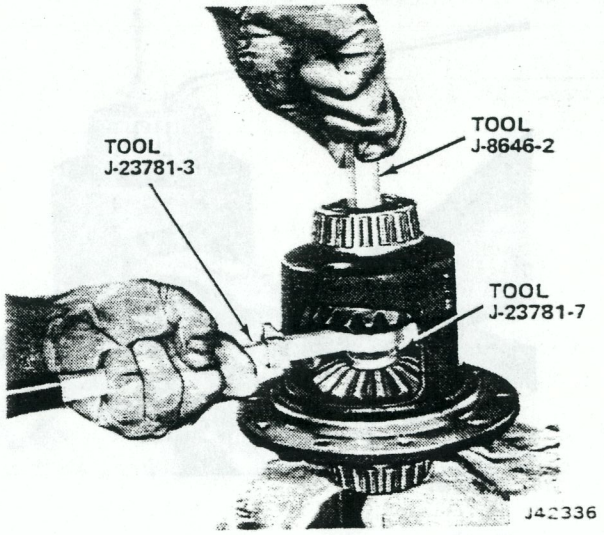


Fig. 2F-73 Threading Forcing Screw into Rotating Tool

(10) Install both differential pinion gears in case. Be sure bores of gears are aligned. Hold gears in place by hand (fig. 2F-74).

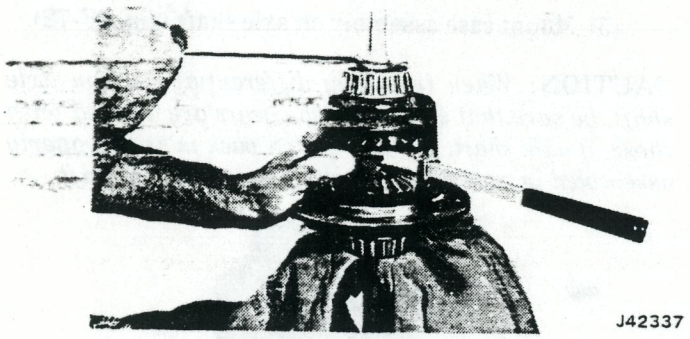


Fig. 2F-74 Pinion Gear Installation

(11) Tighten forcing screw to compress Belleville springs and provide clearance between teeth of pinion gears and side gears.

(12) Position pinion gears in case and insert rotating tool pawl between side gear teeth. Rotate side gears by pulling on tool handle and install pinion gears.

NOTE: *If the side gears will not rotate, Belleville spring load will have to be adjusted. If adjustment is necessary, loosen or tighten the forcing screw slightly until the gears will rotate.*

(13) Continue rotating side gears using rotating tool handle until shaft bores in both pinion gears are aligned with case bores.

(14) Lubricate both sides of pinion gear thrust washers.

(15) Tighten or loosen forcing screw to permit thrust washer installation.

(16) Install thrust washers. Use small screwdriver to guide washers into position (fig. 2F-75).

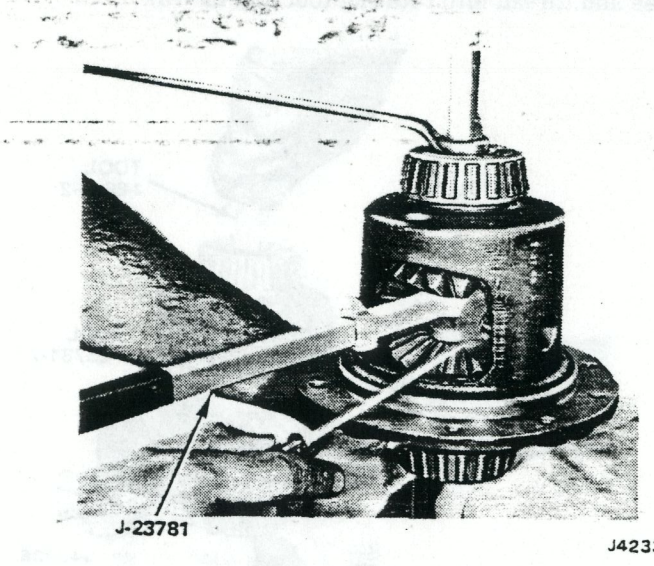


Fig. 2F-75 Pinion Gear Thrust Washer Installation

CAUTION: *Be sure the shaft bores in the washers and gears are aligned with the case bores.*

(17) Remove forcing screw, rotating tool, and step plate.

(18) Lubricate pinion mate shaft and seat shaft in case. Be sure snap ring grooves in shaft are exposed to allow snap ring installation (fig. 2F-76).

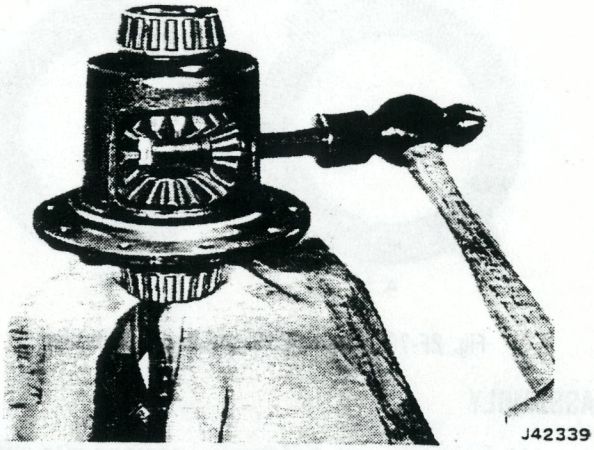


Fig. 2F-76 Pinion Mate Shaft Installation

(19) Install pinion mate shaft snap rings.

NOTE: *On Model 60 Trac-Lok, align the shaft and shaft retaining pin bore and case pin bore. Tap the shaft into position and install the retaining pin. If the case is mounted in a vise with the machined side of the ring gear flange facing upward, use a 5/16 inch (8 mm) diameter punch to install the retaining pin. Seat the pin until the punch bottoms in the case bore. If the case is mounted in a vise with the machined side of the ring gear flange facing downward, wrap a length of tape around a 3/16 inch (5 mm) diameter punch approximately 1-3/4 inch (4 cm) from the end of the punch. Install the retaining pin until the edge of the tape is flush with the pin bore.*

(20) Remove case from axle shaft.

(21) Install ring gear on case.

NOTE: *Use replacement ring gear bolts only. Do not reuse original bolts.*

(22) Align ring gear and case bolt holes and install ring gear bolts finger-tight only.

(23) Remount case on axle shaft and tighten bolts evenly to specified torque. Refer to Specifications.

(24) Install Trac-Lok differential assembly in axle housing. Follow service procedures previously outlined for conventional axles to complete differential and axle assembly servicing.

SERVICE REPLACEMENT

If the Trac-Lok unit must be replaced as an assembly, replace the unit as follows:

(1) Remove differential bearings and shims. Mark or tag each bearing and shim pack for assembly reference.

(2) Remove ring gear from case.

(3) Install original ring gear on replacement differential assembly. Be sure gear flange on replacement case is free of nicks or burrs.

(4) Inspect shims and bearings which were removed. If shims and bearings are worn or damaged, replace them. Be sure shims and bearings are used on same sides of replacement case as on old case.

(5) Install shims and differential bearings. Use step plate on bottom bearing to protect bearing from damage during installation of upper bearing. Seat bearings, using bearing driver tool.

(6) Lubricate differential bearings with 85W-90 gear lubricant and install differential assembly in axle housing.

(7) Follow service procedures previously outlined for conventional axles to complete differential and axle assembly servicing.

SPECIFICATIONS

Axle Specifications

Model 44 Axle

	USA	Metric
Differential Bearing Preload	0.15 in	0.38 mm
Differential Side Gear-to-Case Clearance	.000-.006 in	0.000-0.15 mm
Ring Gear Backlash	.005-.010 in	0.12-0.25 mm
Pinion Bearing Break-Away Preload		
Original Bearings	10-20 in-lbs.	1-2 N·m
New Bearings	20-40 in-lbs.	2-5 N·m

Model 60 Axle

Differential Bearing Preload	.015 in	0.38 mm
Differential Side Gear-to-Case Clearance	.000-.006 in	0.000-0.15 mm
Drive Gear-to-Pinion Backlash	.005-.009 in	0.12-0.15 mm
Drive Pinion Bearing Break-Away		
Original Bearings	10-20 in-lbs.	1-2 N·m
New Bearings	20-40 in-lbs.	2-5 N·m

AMC/Jeep Axle

Axle Shaft End Play (Shims — Left Side Only)	.004-.008 in (.006 in desired)	0.10-0.20 mm (0.15 mm desired)
Pinion Bearing Preload (Collapsible Sleeve)	17-25 in-lbs.	2-3 N·m
Differential Bearing Preload (Shims)	.008 in	0.20 mm
Differential Case Flange Runout (Inspection only — no adjustment)	.002 in max.	0.05 mm max.
Ring Gear Backlash (Shims)	.005-.009 in (.008 in desired)	0.12-0.15 mm (0.20 mm desired)
Pinion Gear Standard Setting (Shims)	2.547 in	64-69 mm

606578

Torque Specifications

Model 30 Front Axle

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
Axle Housing Cover Bolts	20	15-25	27	20-34
Differential Bearing Cap Bolts	40	35-50	54	47-68
Ring Gear-to-Case Bolts	55	45-65	75	61-88
Lower Ball Stud Nut	80 min.	—	108 min.	—
Pinion Nut	210	200-220	271	285-298
Universal Joint U-Bolts	15	13-18	20	18-24
Upper Ball Stud Nut	100 min.	—	136 min.	—
Upper Ball Stud Seat	50 min.	—	68 min.	—
Wheel-to-Hub Nuts	80	65-90	108	88-122

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 (in-lbs)		Metric (N·m)	
	Service Set-To Torque	Service In-Use Recheck Torque	Service Set-To Torque	Service In-Use Recheck Torque
Model 44 Front Axle				
Axle Housing Cover Bolts	20	15-25	27	20-34
Support Plate Bolts/Nuts	30	25-35	41	34-47
Differential Bearing Cap Bolts	80	70-90	108	95-122
Disc Brake Shield Bolt	8	5-10	11	7-14
Disc Brake Shield Nuts	35	30-40	47	41-54
Ring Gear-to-Case Bolts	55	45-65	75	61-81
Lower Ball Stud Nut	80 min.	—	108 min.	—
Pinion Nut	210	200-220	271	285-298
Upper Ball Stud Nut	100 min.	—	136 min.	—
Upper Ball Stud Seat	50 min.	—	68 min.	—
Universal Joint Flange Bolts	35	25-45	47	34-61
Universal Joint Strap Bolts	16	15-19	22	20-26
Wheel-to-Hub Nuts	80	65-90	108	88-122
Model 60 Axle				
Axle Housing Cover Bolts	20	15-25	27	20-34
Support Plate Bolts/Nut	50	45-55	68	61-75
Differential Bearing Cap Bolts	80	70-90	108	95-122
Ring Gear-to-Case Bolts	105	100-110	142	135-149
Pinion Nut	260	250-270	352	339-366
Universal Joint Strap Bolts	16	15-19	22	20-26
Wheel-to-Hub Nuts	120	110-125	163	149-169
AMC/Jeep Axle				
Axle Housing Cover Bolts	170 in-lbs	150-190 in-lbs	19	17-21
Brake Tube-to-Rear Wheel Cylinder	97 in-lbs	90-105 in-lbs	11	10-12
Differential Bearing Cap Bolts	87	80-95	10	9-11
Ring Gear-to-Case Bolt	105	95-115	142	135-149
Rear Brake Support Plate Bolts	32	25-40	43	34-54
Axle Shaft-to-Hub Nuts	250 min.	250 min.	339 min.	—
Clamp Strap Bolts	16	15-19	22	15-19

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

Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

60657A

FRONT DRIVE HUBS

GENERAL

Manual front drive hubs are standard equipment on Jeep vehicles equipped with a Model 208 or 300 part-time four-wheel drive transfer case only.

NOTE: *Front drive hubs are not available nor recommended on Jeep vehicles equipped with the Model 219, Quadra-Trac, full-time four-wheel drive transfer case.*

Two different front drive hub models are used. Hub model M243 is used on CJ models (fig. 2F-77) and hub model M247 is used on Cherokee, Wagoneer and Truck models (fig. 2F-78). Both hub models are manually locked or unlocked.

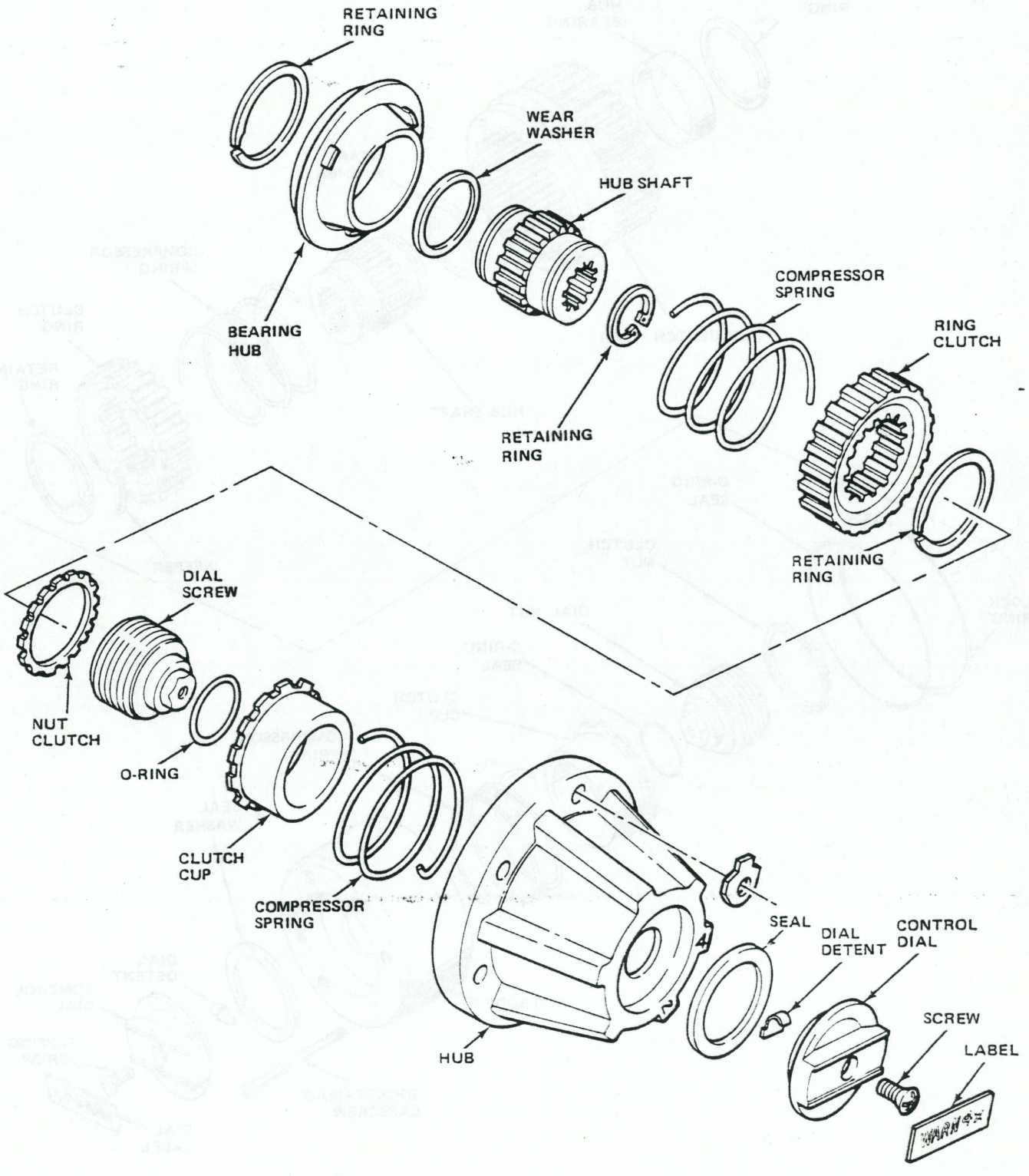


Fig. 2F-77 Model M243 Front Drive Hub—CJ Models

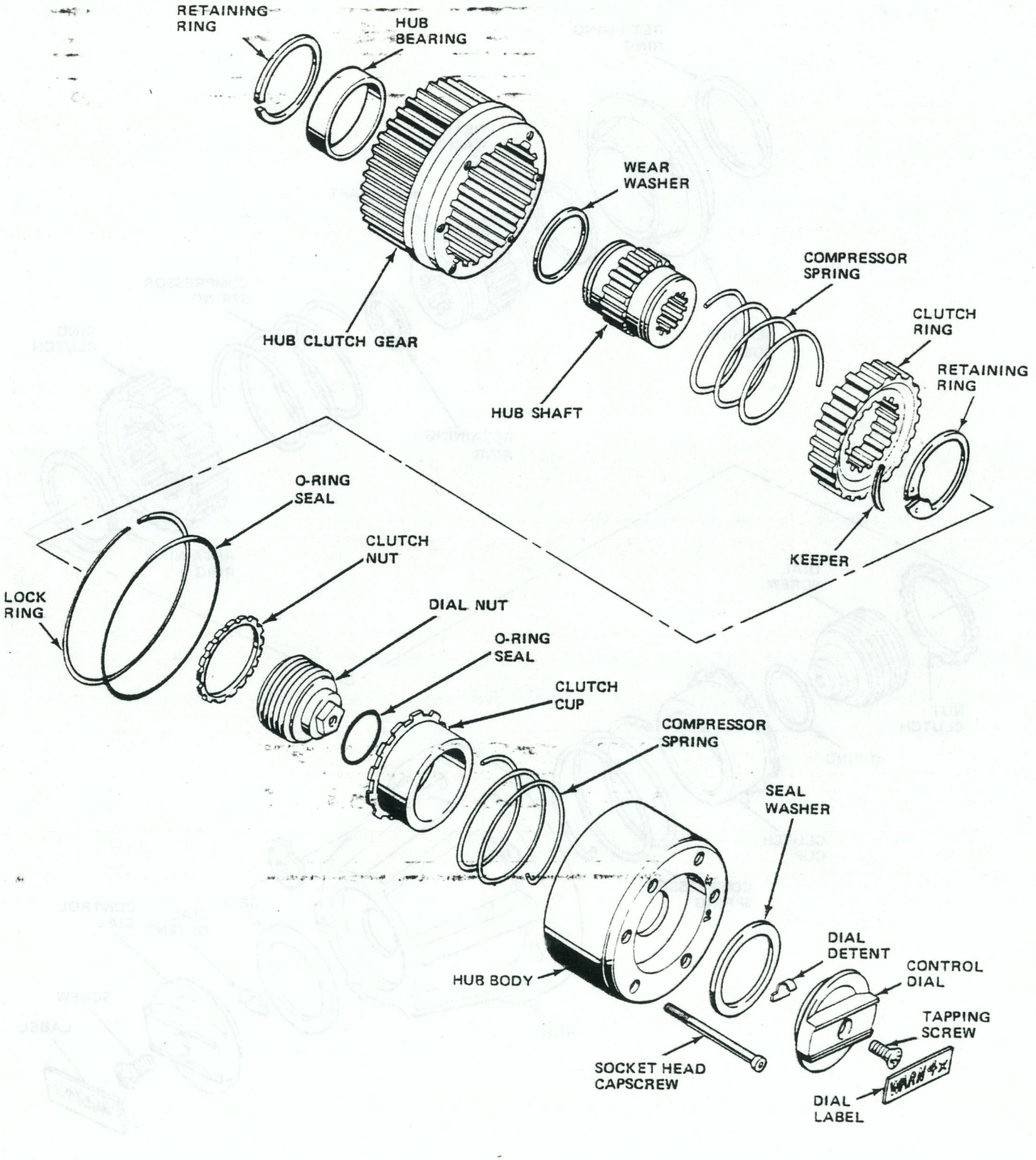


Fig. 2F-78 Model M247 Front Drive Hub—Cherokee-Wagoneer-Truck Models

LUBRICATION

Use Jeep all purpose chassis lubricant or equivalent lithium base, waterproof, EP-type chassis lubricant. When servicing front drive hubs, apply a light coating of chassis lubricant to the hub internal components. Do not pack the hubs full of lubricant, apply a light coating only.

After operation in dusty areas or if the hubs become immersed in water, the hubs, as well as the wheel end components, should be removed, cleaned, and lubricated. This should avoid the possibility of premature wear or damage caused by foreign material in the hubs or by lubricant washout.

FRONT DRIVE HUB DIAGNOSIS

The manual front drive hubs used on Jeep vehicles should provide efficient and satisfactory operation when used and maintained properly. However, if a problem should occur, refer to the following diagnosis and repair procedures.

Control Dials Hard to Turn or Will Not Engage Completely

If the control dials become hard to turn or will not engage completely, the problem is usually due to a lack of lubricant, or dirt, water or foreign material in the hub cavity or in the dials themselves. In these cases, repair involves removing, cleaning and lubricating the hubs. However, in some cases, this condition may simply be the result of driveline torque load on the hub clutch. This situation is remedied by raising the vehicle front end and turning the front wheels forward or reverse to relieve the load.

If the problem is the result of internal damage to the hub body or clutch, the damaged component will have to be replaced to restore proper operation. Refer to Hub Service.

Noisy Operation

Chatter, clicking, grating, or similar type noises from the hubs may be the result of dirt, water or foreign material in the hub. This condition can be caused by a lack of hub maintenance, loose attaching bolts or screws, or damaged hub gaskets. Noise can become especially prevalent after fording streams or after operation in sandy areas. Service correction involves cleaning and lubricating the hubs.

However, if inspection indicates the problem is the result of damaged internal components, the damaged components will have to be replaced to restore proper operation. Refer to Hub Service.

Lubricant Leaks

Generally, lubricant leaks are caused by loose hub attaching bolts or screws, damaged hub gaskets or a damaged hub body or clutch assembly. Leakage may also be caused by over lubricating during service or normal maintenance operations. In each case, the hub should be removed, inspected and repaired as necessary.

Hub Internal Damage

Axle or hub clutch or hub body component damage may be the result of improper hub usage or maintenance. The vehicle should never be moved unless the hub control dials are fully engaged. In addition, on vehicles equipped with manual hubs, the vehicle should not be operated with the transfer case in low range and the hubs in the 4 x 2 or Free position. This places high torque loads on the rear axle.

If the hubs are not maintained properly, full engagement of the control dials may not occur. This can lead to accelerated wear or damage to hub internal components. If the vehicle is driven through water deep enough to cover the hubs or in sandy, dusty areas, the hubs should be cleaned and lubricated thoroughly.

HUB SERVICE

Model M243 and M247 front drive hubs are serviced as either a complete assembly or sub assembly such as the hub body or hub clutch assembly only. Do not attempt to disassemble these units. If the entire hub or a sub assembly has malfunctioned, replace the hub assembly or the problem sub assembly as a unit only.

Although the front drive hubs are serviced as assemblies or sub assemblies only, the hubs may be removed for cleaning inspection and lubrication purposes. Refer to the Hub Removal/Installation procedures for details.

HUB REMOVAL/INSTALLATION

Removal—Model M243

(1) Remove bolts and tabbed lockwashers attaching hub body to axle hub (fig. 2F-79). Retain bolts and washer.

(2) Remove hub body and gasket. Discard gasket.

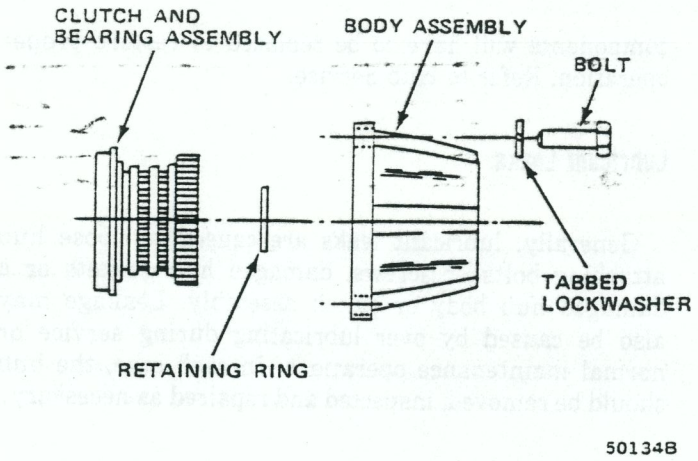


Fig. 2F-79 M243 Hub Removal/Installation

CAUTION: *Do not turn the hub control dial after removing the hub body.*

(3) Remove retaining ring from axle shaft (fig. 2F-78).

(4) Remove hub clutch and bearing assembly.

(5) Clean hub components in solvent. Dry them using compressed air, clean shop towels, or air dry. Be sure old lubricant, dirt, water or other foreign materials are flushed out.

(6) Inspect hub components for signs of wear or damage. Service components as necessary.

Installation—Model M243

CAUTION: *Do not turn the hub control dial until after the hub has been installed. The hub clutch nut and cup can be damaged serverly if the dial is rotated while the hub is off the vehicle.*

(1) Lubricate hub components with Jeep all purpose chassis lubricant or equivalent. Refer to Lubrication section. Apply light coat of lubricant only. Do not pack hub with lubricant.

(2) Install hub clutch and bearing assembly on axle shaft.

(3) Install retaining ring on axle shaft.

(4) Position new gasket on hub body and install hub body and gasket.

(5) Align bolt holes in axle and hub body and install bolts and tabbed lockwashers. Tighten bolts to 30 foot-pounds (41 N•m) torque.

(6) Raise vehicle front end.

(7) Turn hub control dials to 4 x 2 position and rotate wheels. Wheels should rotate freely. If wheels drag, check hub installation. Also, be sure control dials are fully engaged in 4 x 2 position.

(8) Lower vehicle.

Removal—Model M247

(1) Remove socket head screws from hub body assembly (fig. 2F-80).

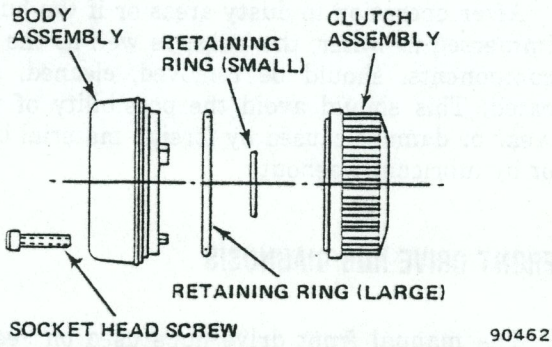


Fig. 2F-80 M247 Hub Removal/Installation

(2) Remove large retaining ring from axle hub. Remove small retaining ring from axle shaft.

(3) Remove hub clutch assembly.

(4) Clean hub components in solvent. Dry them using compressed air, clean shop towels, or air dry. Be sure old lubricant, dirt, water, or other foreign materials are flushed out.

(5) Inspect hub components for signs of wear or damage. Service components as necessary.

Installation—Model M247

(1) Lubricate hub components with Jeep all purpose chassis lubricant, or equivalent. Refer to Lubrication section. Apply light coat of lubricant only. Do not pack hub with lubricant.

(2) Install hub clutch assembly.

(3) Install small retaining ring on axle shaft. Install large retaining ring in axle hub.

(4) Install new O-ring or hub body if O-ring is being replaced.

(5) Position hub body in clutch. Align screw holes in clutch and body assemblies and install socket head screws. Tighten screws to 30 inch-pounds (3 N•m) torque.

(6) Raise vehicle front end.

(7) Turn both control dials to Free Position and rotate wheels. Wheels must rotate freely. If wheels drag, check hub installation. Also be sure control dials are fully engaged in position.

(8) Lower vehicle.

SPECIFICATIONS

Front Drive Hub Specifications

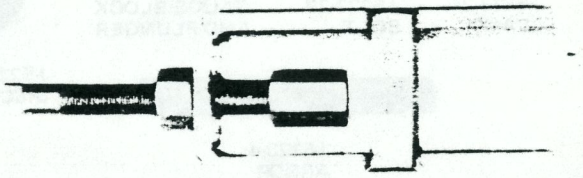
Hub Application	
M253	CJ Models
M247	Cherokee, Wagoneer, Truck
Hub Type:	2-position, manually operated locking hub
Lubricant	Use Jeep All-purpose Chassis Lubricant or equivalent lithium base, waterproof, EP-type chassis lubricant
Torque Values:	
Socket Head Screws (M247)	30 in-pounds (3 N.m)
Hub Bolts (M253)	30 foot-pounds (41 N.m)
Hub Control Dial Positions:	
M247	Lock (4 WD)-Free (2 WD)
M253	4 × 4 (4 WD)-4 × 2 (2 WD)

90591

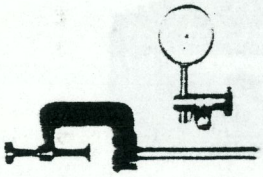
Tools

J-22575
PINION NUT SOCKET

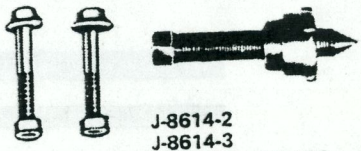
J-25104
J-22661
REAR PINION OIL SEAL INSTALLERS



J-2498
AXLE SHAFT REMOVER



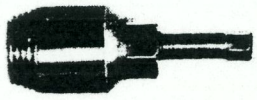
J-8001
DIAL INDICATOR SET



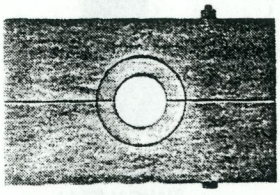
J-8614-2
J-8614-3
YOKE REMOVER TOOLS

J-21788
AXLE SHAFT OIL SEAL INSTALLER

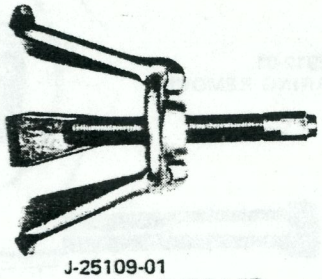
J-2092 AXLE END
PLAY CHECKING TOOL



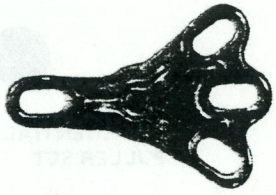
J-9233
PINION OIL SEAL REMOVER



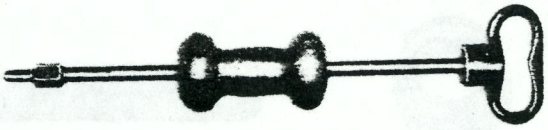
J-23674
AXLE SHAFT BEARING REMOVER-INSTALLER



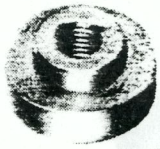
J-25109-01
AXLE HUB PULLER



J-21579
AXLE SHAFT PULLER



J-2619-01 SLIDE HAMMER



J-25135-01

80326

Tools (Continued)

J-21787
PINION FRONT
BEARING CUP
REMOVER

J-21786
PINION REAR
BEARING REMOVER

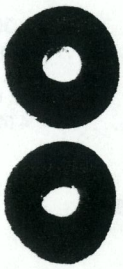
J-8608
PINION REAR BEARING
CUP INSTALLER

J-8611-01
PINION FRONT
BEARING CUP
INSTALLER

J-5223-24
CLAMP

J-5223-29
BOLT

J-5223-20
GAUGE BLOCK
AND PLUNGER



J-5223-25 OR -26
DISCS

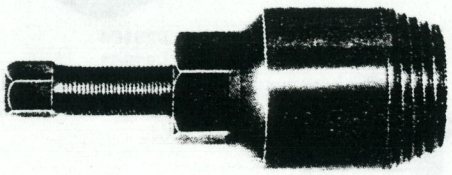
J-24433
PINION BEARING
INSTALLER SLEEVE

J-21784
DIFFERENTIAL
BEARING INSTALLER

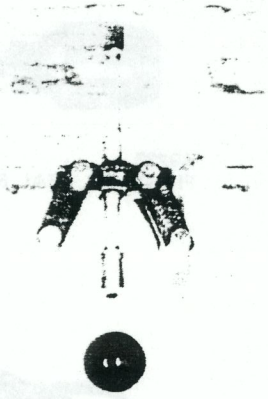
J-5223-4
ARBOR

J-5223-03
PINION DEPTH SETTING GAUGE SET

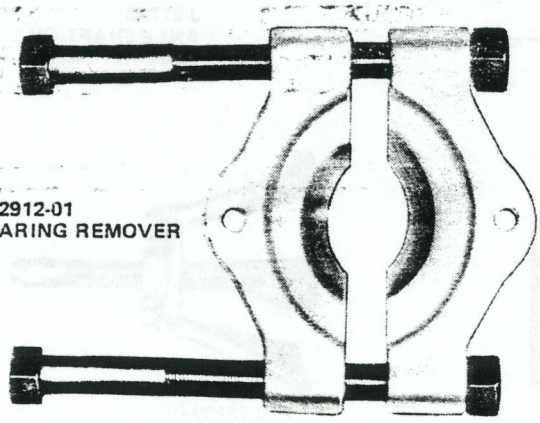
J-22697 PINION REAR
BEARING INSTALLER



J-9233
PINION SEAL REMOVER



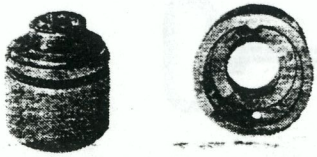
J-2497-01
DIFFERENTIAL BEARING
PULLER SET



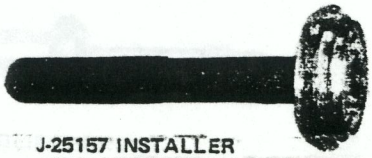
J-22912-01
BEARING REMOVER

J-22661
PINION SEAL
INSTALLER

J-5590
PINION BEARING
INSTALLER SLEEVE



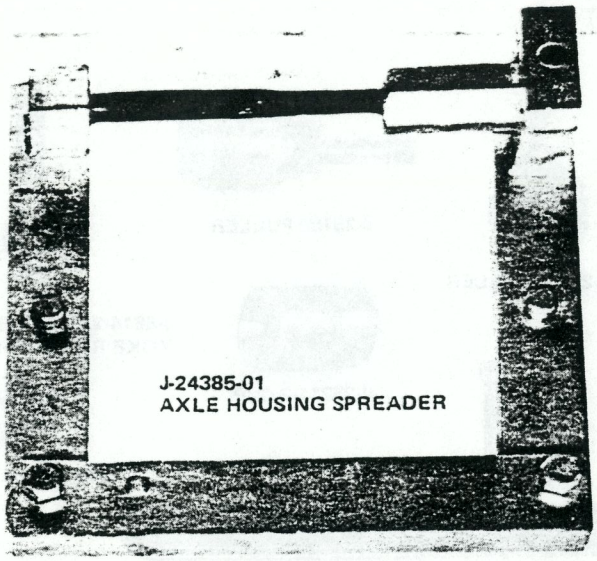
J-28648
SEAL INSTALLER



J-25157 INSTALLER
J-25122 DRIVER HANDLE

80327A

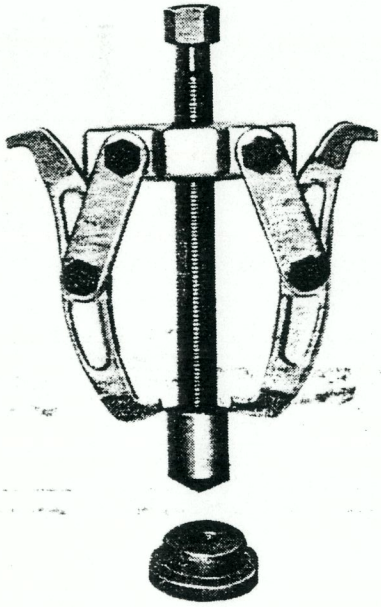
Tools (continued)



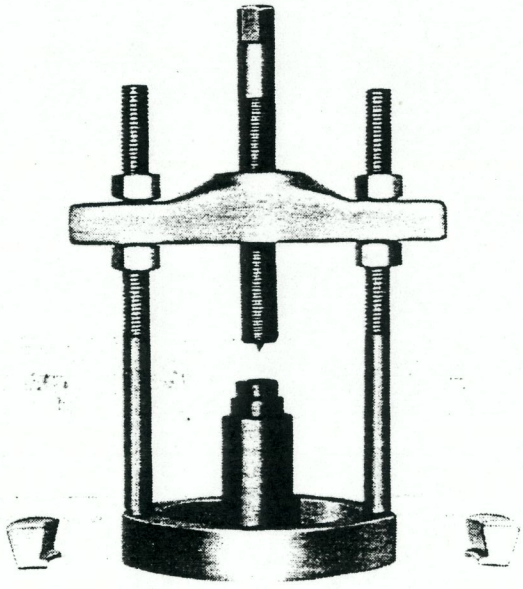
J-24385-01
AXLE HOUSING SPREADER

J-7079-2
DRIVER HANDLE (NON-THREADED)

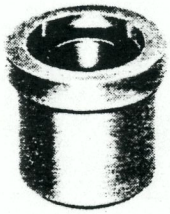
J-8092
DRIVER HANDLE (THREADED)



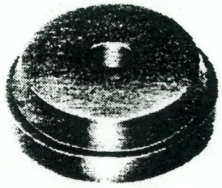
J-22888
BEARING PULLER SET



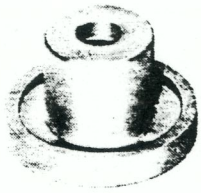
J-29721
BEARING REMOVER TOOL SET



J-25104
BEARING INSTALLER



J-25101
BEARING CUP INSTALLER



J-24430
BEARING INSTALLER

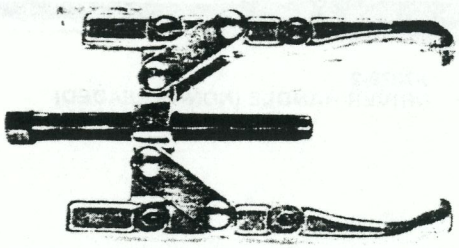
303278

J-8646-2 FORCING SCREW AND
J-23781-3 GEAR ROTATING TOOL

J-23781-7
STEP PLATE

80328

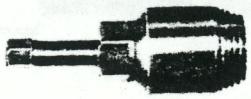
Tools (Continued)



J-25215 PULLER

J-25211-3 BUTTON

J-25133 PULLER



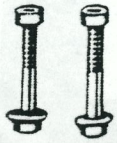
J-25180 PULLER

J-8614-2, J-8614-3
YOKE REMOVER TOOL

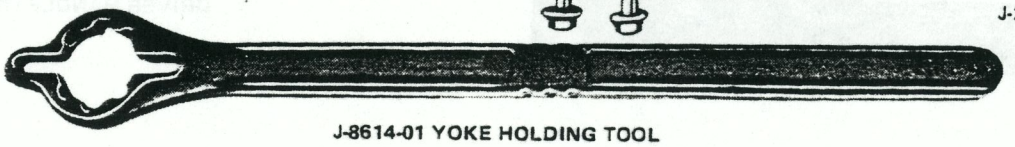
J-25211-2 CUP

J-23447 WRENCH NUT

J-25211-1 PLATE



J-25211-4 ADAPTE



J-8614-01 YOKE HOLDING TOOL

80321