

Chapter 10

Manual Transmission

Part 1. Transmission

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Specifications

Type	5 speed synchromesh with reverse brake
Model	R150F
Lubricant:	
Type	SAE 75W – 90 GL 4 or GL 5
Capacity	2.2 litres
Gear ratios:	
First	3.830:1
Second	2.062:1
Third	1.436:1
Fourth	1.000:1
Fifth	0.838:1
Reverse	4.220:1
Gear end float:	
Standard —	
First	0.15 – 0.45 mm
Second and third	0.10 – 0.25 mm
Fifth	0.10 – 0.35 mm
Maximum —	
First	0.50 mm
Second and third	0.30 mm
Fifth	0.40 mm
Gear oil clearance:	
Standard —	
First	0.020 – 0.073 mm
Second and third	0.015 – 0.068 mm
Fifth	0.015 – 0.068 mm
Reverse idler gear	0.040 – 0.082 mm
Maximum —	
First, second, third and fifth	0.160 mm
Reverse idler gear	0.130 mm
Synchroniser ring to gear clearance	0.80 mm
Shift fork to hub sleeve clearance	1.00 mm
Reverse idler to shift arm clearance:	
Standard	0.05 – 0.35 mm
Maximum	0.50 mm

Mainshaft:

Minimum journal diameters —	
First gear	38.86 mm
Second gear	46.86 mm
Third gear	37.86 mm
Minimum flange thickness	4.70 mm
Maximum runout	0.06 mm
Counter gear minimum rear bearing journal diameter	27.86 mm
Snap ring thicknesses in increments of 0.05 mm:	
Input shaft	2.10 – 2.45 mm
Mainshaft —	
First/second gear synchroniser hub	2.30 – 2.65 mm
Third/fourth gear synchroniser hub	1.80 – 2.15 mm
Fifth gear	2.65 – 3.50 mm
Counter gear front	2.00 – 2.30 mm
Counter gear rear	2.80 – 3.15 mm

TORQUE WRENCH SETTINGS

Brace nuts and bolts	65 Nm
Clutch housing cover bolts	18 Nm
Clutch housing to engine bolts	72 Nm
Clutch housing to transmission case bolts	36 Nm
Detent spring plugs	19 Nm
Engine pipe to resonator flange bolts	52 Nm
Engine pipes to manifold nuts	45 Nm
Filler and drain plugs	37 Nm
Front bearing retainer bolts	17 Nm
Oil separator to intermediate plate bolts	20 Nm
Oil separator to shift fork shaft bolts	13 Nm
Propeller shaft flange nuts and bolts	74 Nm
Rear bearing retainer to intermediate plate bolts	18 Nm
Rear crossmember to chassis nuts and bolts	65 Nm
Rear crossmember to rear mounting bolts	18 Nm
Rear mounting to transmission bolts	65 Nm
Resonator to rear muffler flange bolts	52 Nm
Restrict pin	37 Nm
Reverse lamp switch	44 Nm
Reverse shift arm bracket bolt	18 Nm
Roll pin plug	19 Nm
Shift fork to shift fork shaft bolts	20 Nm
Shift lever housing to shift and select lever bolt	38 Nm
Shift lever retainer to transfer adaptor bolts	18 Nm
Slave cylinder to clutch housing bolts	12 Nm
Starter motor retaining bolts	39 Nm
Transfer case to transmission	24 Nm
Transmission case to transfer adaptor bolts	37 Nm

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Description

The R150F transmission has five forward gears and one reverse gear. The input shaft is driven by the engine and in turn, drives a counter gear. First, second, and third are mounted on needle roller bearings on the mainshaft and fifth gear is splined to the mainshaft. Reverse gear is mounted on first/second synchro hub. Full synchromesh is available on all forward gears, which are helical cut and in constant mesh with the counter gear to provide smooth and quiet operation. Reverse gear is straight cut. First/second, third/fourth synchroniser assemblies are splined to the mainshaft.

The synchro rings fitted to second and fifth gear are of a double synchro cone and intermediate ring type. The synchro rings fitted to first, third and fourth gears are of a single synchro ring construction. The counter shaft fifth gear synchromesh assembly also incorporates a reverse brake.

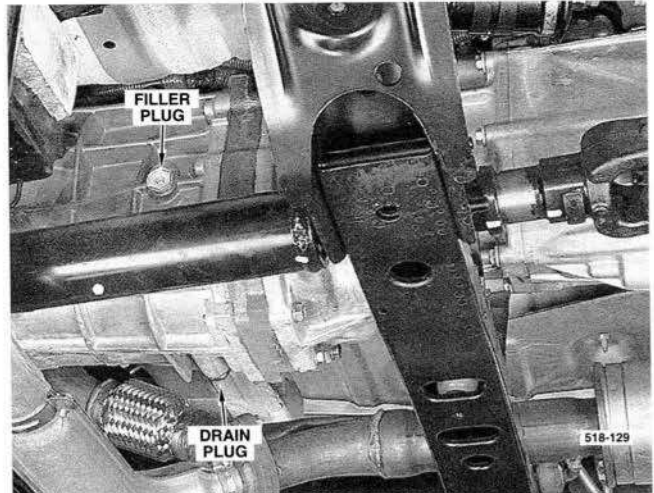
The synchroniser assemblies couple the selected gear to the shaft by way of the teeth on the inside of the synchroniser sleeve which mesh with the corresponding teeth on the gear. Synchronisation is achieved when the synchroniser ring engages the cone on the side of the gear and brings the gear and the synchroniser assembly to the same speed, providing quiet engagement.

The gear change mechanism is held by spring loaded detent balls, which engage grooves in the shift rails. The load of the detent balls must be overcome before the rails can be moved to select or disengage a gear. The gearshift has an interlock mechanism, which prevents the selection of two gears simultaneously.

Routine Maintenance

TO CHECK OR RENEW TRANSMISSION OIL

The transmission and transfer case have separate lubricating systems. When checking the transmission oil always check the transfer case oil level as described in Part 2 of this chapter.



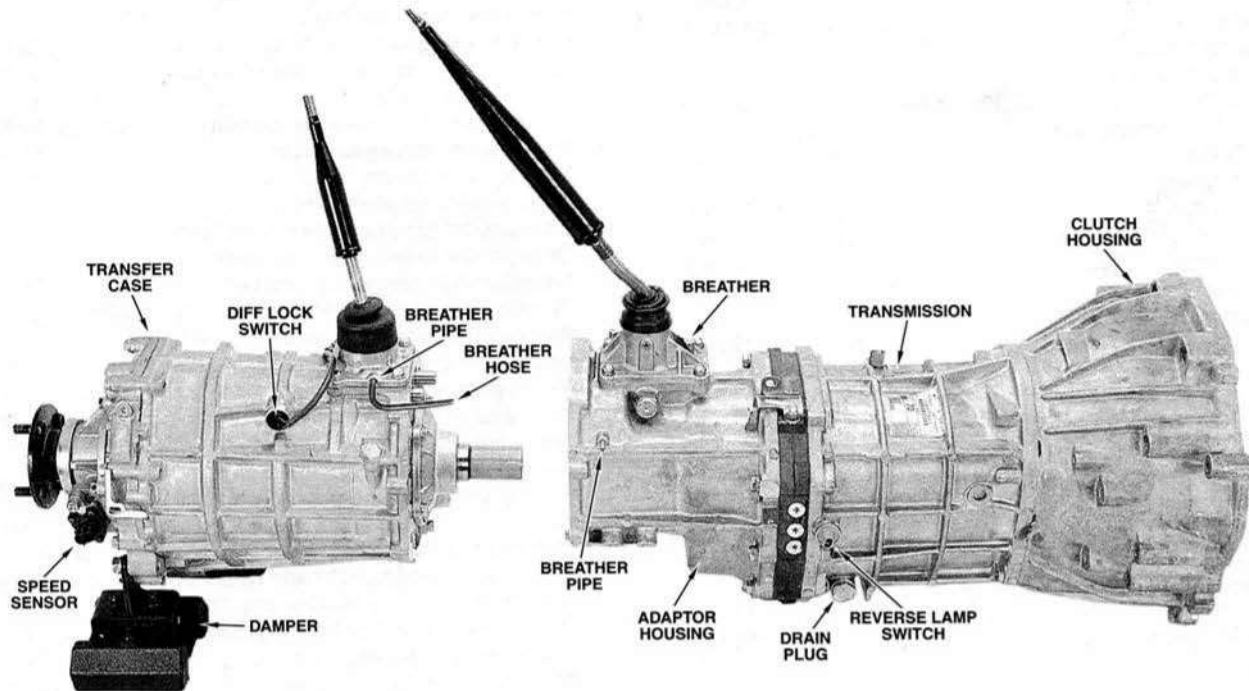
Transmission drain and filler plug locations.

- 1 If extra clearance is required, raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.



It is important that the vehicle is level when checking the transmission oil level.

- 2 Clean the area around the transmission drain and filler plugs with a cloth.
- 3 Remove the filler plug from the transmission and, using a finger or a bent piece of wire, check the oil level. The level is correct when the oil is level with or less than 5 mm below the bottom of the plug hole. Overfilled units should be drained until the oil is level with the bottom of the plug hole.



Transmission with transfer case separated.

- 4 If the oil is being renewed, place a suitable container beneath the drain plug and remove the plug from the bottom of the transmission. Allow the oil to drain from the transmission and then install and tighten the drain plug to the specified torque.
- 5 If the oil level is low or is being renewed, use a clean length of garden hose and a suitable funnel or an oil pump to fill the transmission to the correct level, with the specified oil.
- 6 When satisfied that the level is correct, install the filler plug and tighten to the specified torque. Wipe around the plug/s with a cloth after installation.
- 7 Ensure that the breather is not blocked by wiping around the breather and rotating the cap to dislodge any dirt.

Trouble Shooting

DIFFICULT GEAR CHANGE

- 1 Incorrect lubricant or lubricant level: Drain the transmission and refill to the correct level with the specified lubricant. Refer to the Routine Maintenance heading.
- 2 Faulty clutch or release mechanism: Check and overhaul the clutch or the release mechanism. Refer to Clutch (chapter 9).

i Check the clutch for correct operation. If reverse and first gear can be selected smoothly and the vehicle does not tend to creep on a level surface while the clutch is depressed, it is a good indication that the clutch is disengaging sufficiently.

- 3 Gear lever or lever seat assembly worn or damaged: Check and renew the faulty components as necessary.

TIP If the nylon insert on the end of the gear lever is worn or missing, gear selection will be loose.



A cracked or deteriorated gear lever seat can cause a heavy and difficult gear change.



Shift lever components.

- 4 Worn or damaged transmission internal components: Have the transmission inspected and if necessary overhauled. Alternatively, install an exchange unit.

SLIPPING OUT OF GEAR

- 1 Damaged or loose engine and/or rear mountings: Renew or tighten the mountings as necessary.
- 2 Detent cover plugs loose or detent springs broken: Tighten the plugs or renew the springs as necessary.
- 3 Worn or damaged transmission internal components: Have the transmission inspected and if necessary overhauled. Alternatively, install an exchange unit.

i In most cases, slipping out of gear is caused by wear or damage to internal components of the transmission. However, prior to removing the transmission, check the engine mounting rubbers and the mounting hardware as vibrations caused by deteriorated mountings can cause the transmission to slip out of gear.

GEARS CLASH ON CHANGING DOWN

- 1 Faulty clutch or release mechanism: Check or overhaul the clutch or the release mechanism. Refer to Clutch (chapter 9).
- 2 Lubricating oil too heavy: Drain the transmission and fill with the specified type and quantity of lubricant.
- 3 Worn or damaged transmission internal components: Have the transmission inspected and if necessary overhauled. Alternatively, install an exchange unit.

i Check the clutch for correct operation as previously described under the Difficult Gear Change heading before removing the transmission for inspection. Also check that the correct type of transmission lubricant is being used.

NOISY TRANSMISSION

- 1 Transmission mounting bolts or engine mountings loose: Tighten the transmission mounting bolts and check all the engine mountings.

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- Incorrect lubricant or low lubricant level: Fill to the correct level with the specified lubricant.
- Worn or damaged gears or bearings in the transmission: Have the transmission inspected and if necessary overhauled. Alternatively, install an exchange unit.

i First check the transmission lubricant level. If the level is low, check for signs of leakage and rectify as necessary. To isolate transmission noise in neutral, run the engine, depress the clutch pedal and engage any gear. If the noise ceases with the clutch pedal depressed, it is an indication that the noise is in the transmission.

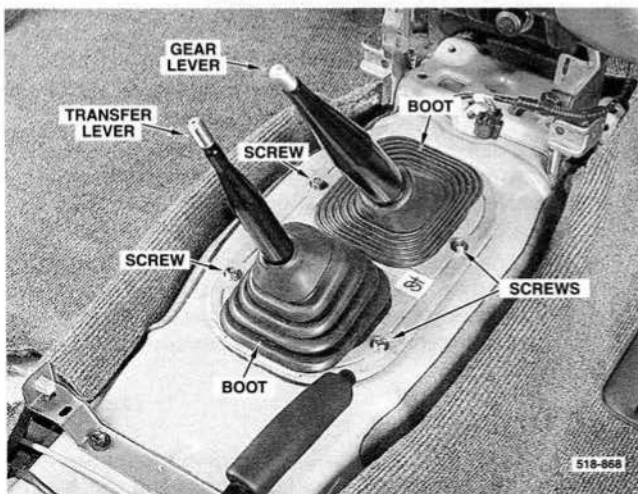
Shift Levers

TO REMOVE AND INSTALL

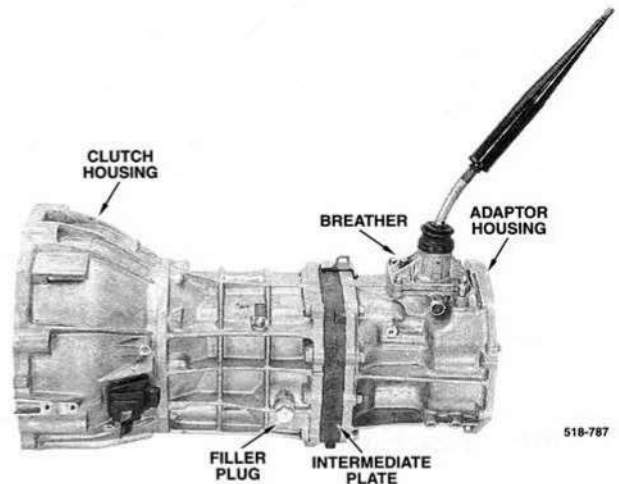
- Remove the centre console. Refer to Body (chapter 17).
- Remove the screws retaining the floor panel and manoeuvre the panel from the gear levers.
- Fold back the boot and remove the shift lever by pressing down on the cap and rotating it anticlockwise. Lift the lever straight up.
- To remove the transfer lever, fold back the boot and with a pair of snapping pliers, remove the snapping retaining the transfer lever in the housing.
- Lift the transfer lever straight from the housing.

Installation is a reversal of the removal procedure with attention to the following points:

- Apply a smear of multipurpose grease around the ball and also to the end of the transfer lever.
- Install the transfer shift lever to the transfer case, ensuring that the grooves in the lever ball align with the pins in the transfer lever housing.
- Press the cover into the housing against the spring and then install the snapping, ensuring it is seated in the groove in the housing. Fold the boot down and around the housing, ensuring it is sitting squarely.
- Apply a smear of multipurpose grease between the end of the gear lever and the nylon insert and also around the outside of the insert and the ball.

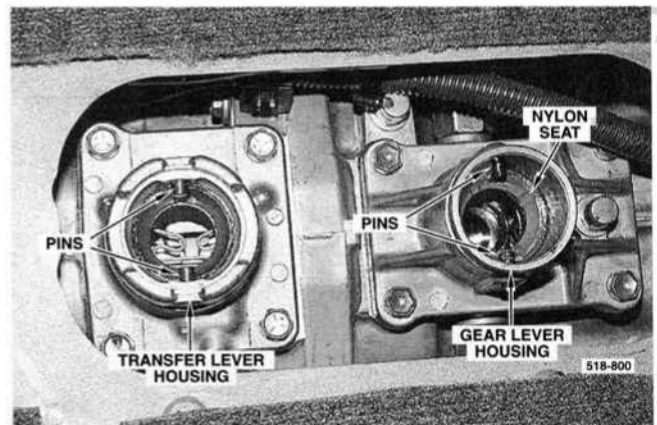


Location of the floor panel retaining screws.



Left hand side of the transmission showing the filler plug and breather.

- Align the grooves in the lever ball with the pins in the gear lever housing.
- Press the cap down and rotate it clockwise.
- Ensure that the boot sits squarely around the gear lever housing.
- Install the floor panel over the levers and tighten the screws securely.
- Install the centre console and the gear and transfer lever knobs. Refer to Body (chapter 17).

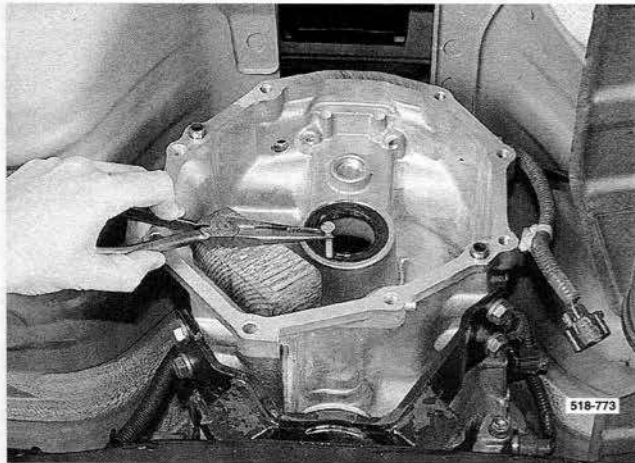


Align the grooves in the shift lever ball with the pins when installing the shift lever.

Oil Seals

TO RENEW REAR TRANSMISSION OIL SEAL

- Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.
- Remove the propeller shafts as described under the Propeller Shaft heading in Part 3 of this chapter.
- Remove the transfer case as described in Part 2 of this chapter.
- After noting the installed depth of the seal, drill a small hole in the seal being careful not to drill to far and partially install



Removing the rear transmission oil seal using a self tapping screw and a wood block.

a small self tapping screw. Using pliers pulling on the screw, remove the seal.

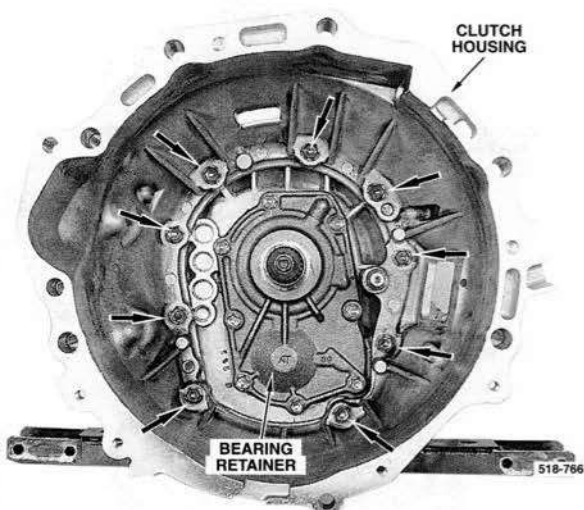
- 5 Apply a light coat of transmission oil to the lip of the new seal.
- 6 Using a pipe or a large socket, carefully tap the new seal squarely into the housing to the depth noted prior to removal.

The seal is correctly installed when the distance between the seal and the mating face of the transmission housing is 45.5 ± 0.5 mm.

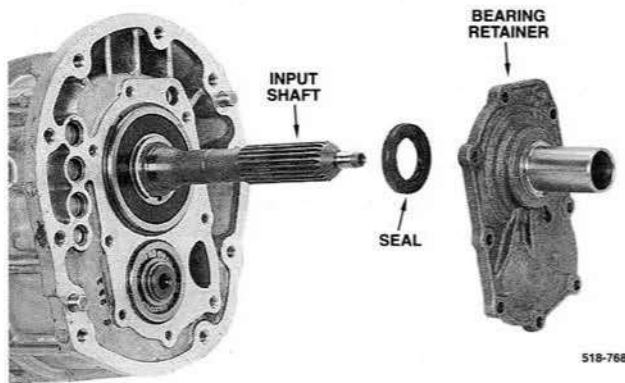
- 7 Install the transfer case as described in Part 2 of this chapter.
- 8 Install the propeller shafts as described in Part 3 of this chapter.
- 9 Check the transmission and transfer case oil level and if necessary top up.

TO RENEW FRONT OIL SEAL

- 1 Remove the transmission assembly as described later in this chapter.
- 2 Remove the dust boot from the release lever and withdraw the release lever from the pivot.



To remove the clutch housing, remove the bolts indicated by the arrows.



The input shaft seal is located in the rear of the bearing retainer.

- 3 Slide the release bearing from the bearing guide and manoeuvre the release lever from the clutch housing.
- 4 Remove the clutch housing retaining bolts and remove the clutch housing from the front of the transmission.
- 5 Remove the retaining bolts and remove the input shaft bearing retainer from the front of the transmission.
- 6 Place the bearing retainer in a vice equipped with soft jaws and after noting the installed depth of the seal, carefully lever the seal from the retainer.
- 7 Lubricate the lips of the new oil seal with transmission oil and place the seal into the retainer with the lip of the seal facing toward the rear of the retainer. Carefully tap the seal into the bearing retainer to the depth noted prior to removal.
The seal is correctly installed when the distance between the end of the seal and the machined face of the bearing retainer is 11.5 ± 0.5 mm.
- 8 Apply Permatex Auto Gasket or equivalent to the bearing retainer mating face and the threads of the retaining bolts. Install the bearing retainer to the transmission case and tighten the retaining bolts to the specified torque.
- 9 Apply a smear of high temperature grease to the release lever pivot ball contact and the inside of the release bearing. Install the bearing with the clip to the release lever.
- 10 Install the bearing to the retainer while guiding the lever through the opening in the clutch housing and onto the pivot ball. Ensure the clip in the lever engages the pivot ball.
- 11 Install the dust boot.
- 12 Install the transmission as described later in this chapter.
- 13 Check and top up the transmission oil as necessary.

Transmission Assembly

TO REMOVE AND INSTALL

The following procedure describes how to remove and install the transmission as an assembly with the transfer case attached. The transmission can be removed separately from the transfer case, however the assembly balances well on a trolley jack.

Procedures to remove the transfer case separately are described in Part 2 of this chapter.

- 1 Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.

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- 2 Disconnect the negative battery terminal.
- 3 Drain the oil from the transmission and transfer case into clean containers. Check the oil for foreign particles to assist in locating worn components if either unit is to be dismantled and overhauled.
- 4 Working inside the vehicle, remove the transmission and transfer case shift levers as previously described.
- 5 Remove the stoneguards from beneath the engine and the left hand chassis rail beside the transmission.
- 6 Remove the engine pipes as described in Engine (chapter 4).
- 7 Remove the propeller shafts as described later in this chapter.
- 8 Remove the bolts retaining the clutch slave cylinder and hydraulic pipe and secure the slave cylinder with the hydraulic pipe attached clear of the work area.



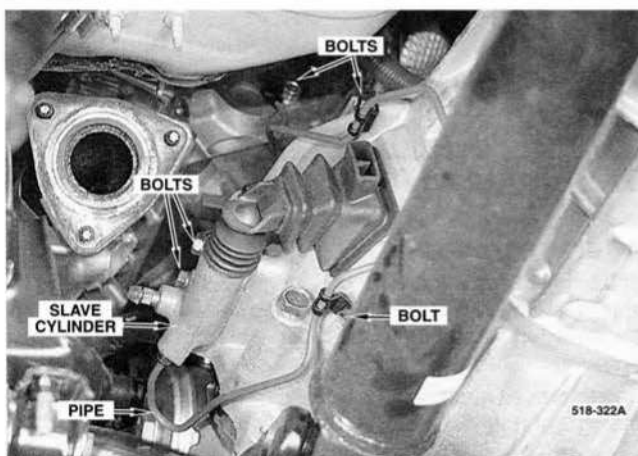
Do not depress the clutch pedal while the slave cylinder is removed or the piston will eject from the slave cylinder.

- 9 Disconnect the earth lead from the rear of the transfer case.
- 10 Remove the starter motor. If necessary refer to Engine Electrical (chapter 6).
- 11 Remove the clutch housing cover plate from the front of the clutch housing.
- 12 Remove retaining bolts and manoeuvre the brace from the chassis at the rear of the transfer case.

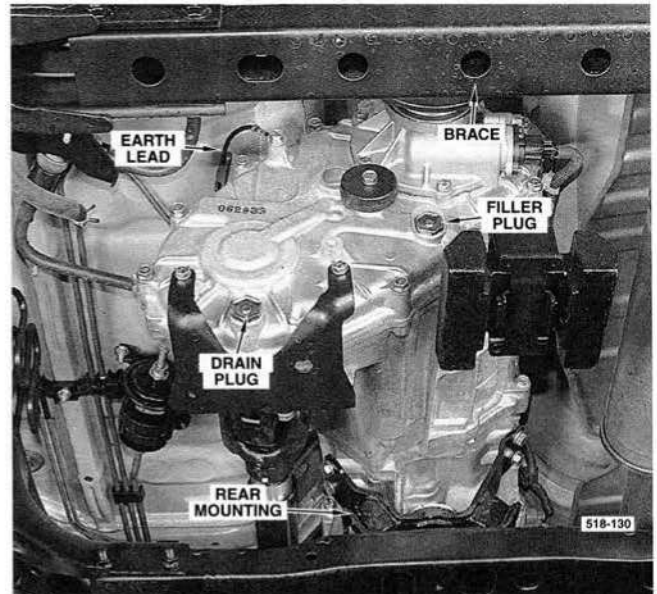


To avoid personal injury or damage to the transmission, it is recommended that the help of an assistant is sought while carrying out the following operations.

- 13 Place a trolley jack under the transmission just forward of the crossmember and slightly raise the transmission. Secure the transmission to the jack using chain.
- 14 Remove the bolts retaining the rear mounting to the transmission.
- 15 Remove the bolts retaining the rear crossmember to the chassis and manoeuvre the crossmember and mounting from the vehicle.
- 16 Lower the transmission slightly, disconnect the reverse lamp switch, centre diff lock position switch, and speed sensor. Disconnect the wiring harness from the brackets.



Location of the clutch slave cylinder and hydraulic pipe retaining bolts.



Transfer case installed showing brace.

- 17 Remove the bolts retaining the clutch housing to the engine.

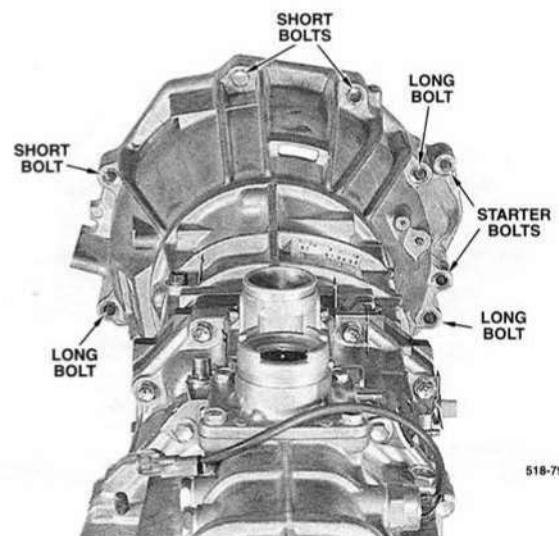


Do not allow the weight of the transmission to hang on the clutch driven plate at any time during removal as damage may occur.

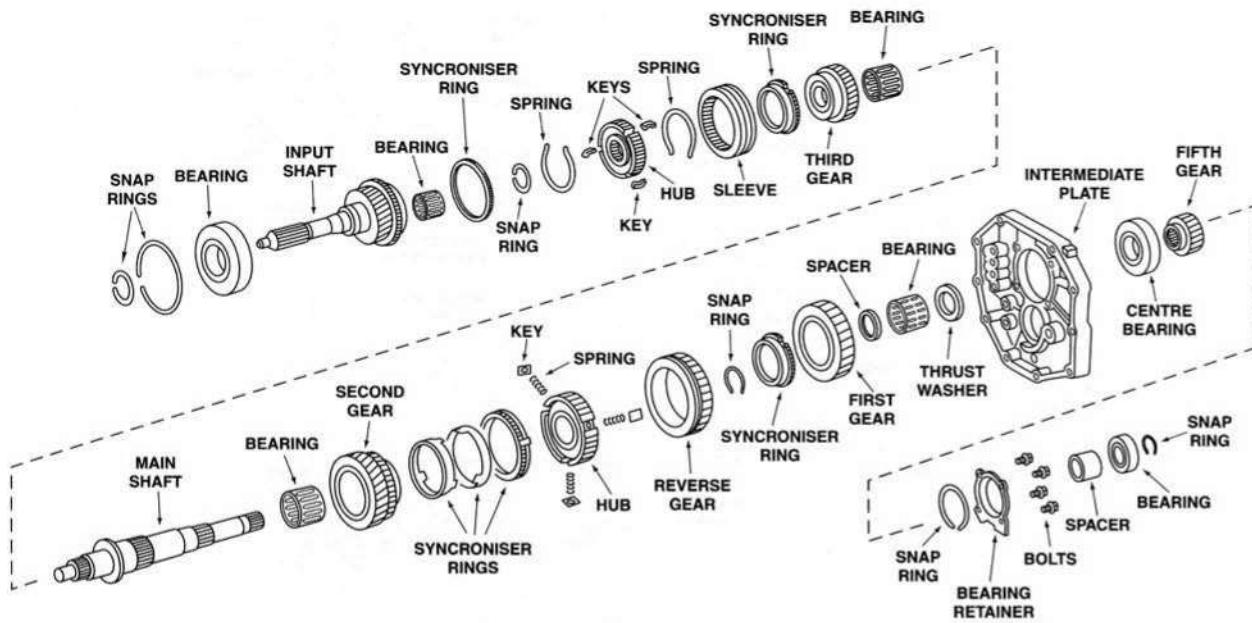
- 18 Move the transmission straight back until the input shaft clears the clutch pressure plate. Carefully lower the transmission ensuring that the stabiliser bar is cleared and manoeuvre the transmission from beneath the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

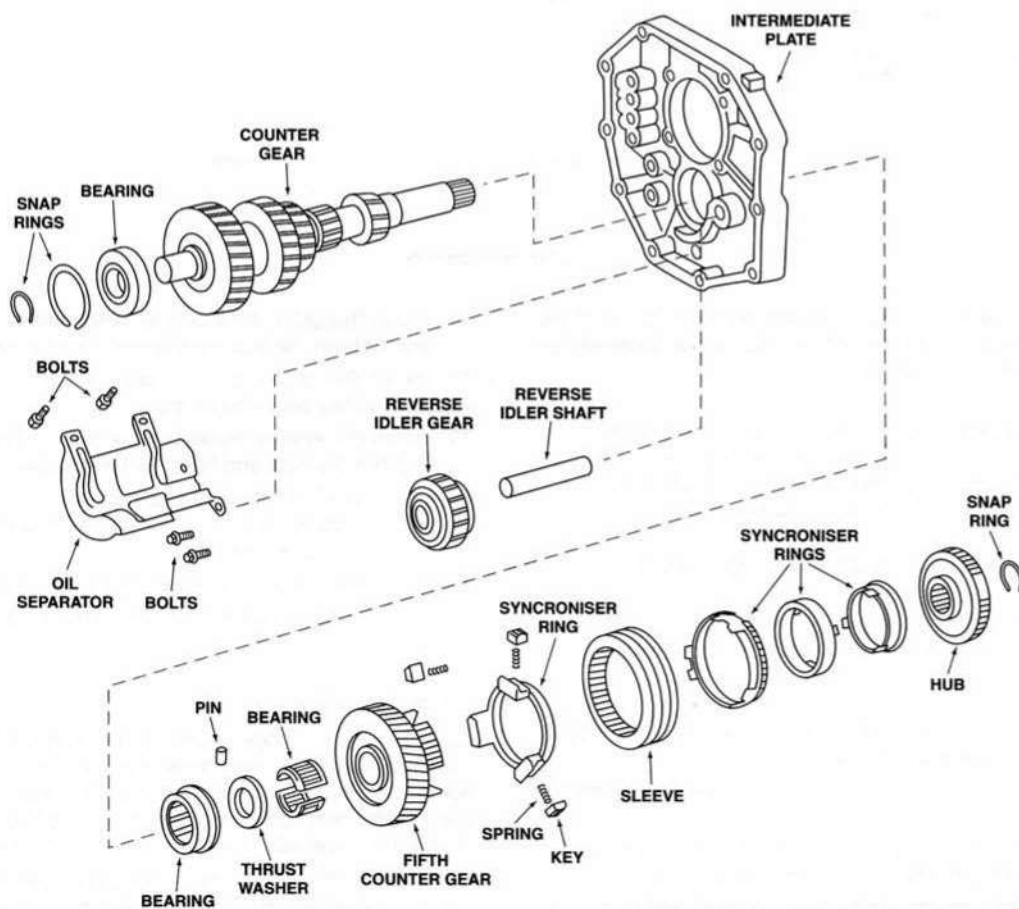
- 1 Sparingly lubricate the input shaft with gear oil. Ensure that the clutch release lever is fully back toward the transmission.
- 2 Carefully position the transmission on a trolley jack ensuring that the transmission is well balanced and can not fall of the jack. Secure the transmission to the jack using chain.



Note the position of the long and short bolts retaining the transmission to the engine.



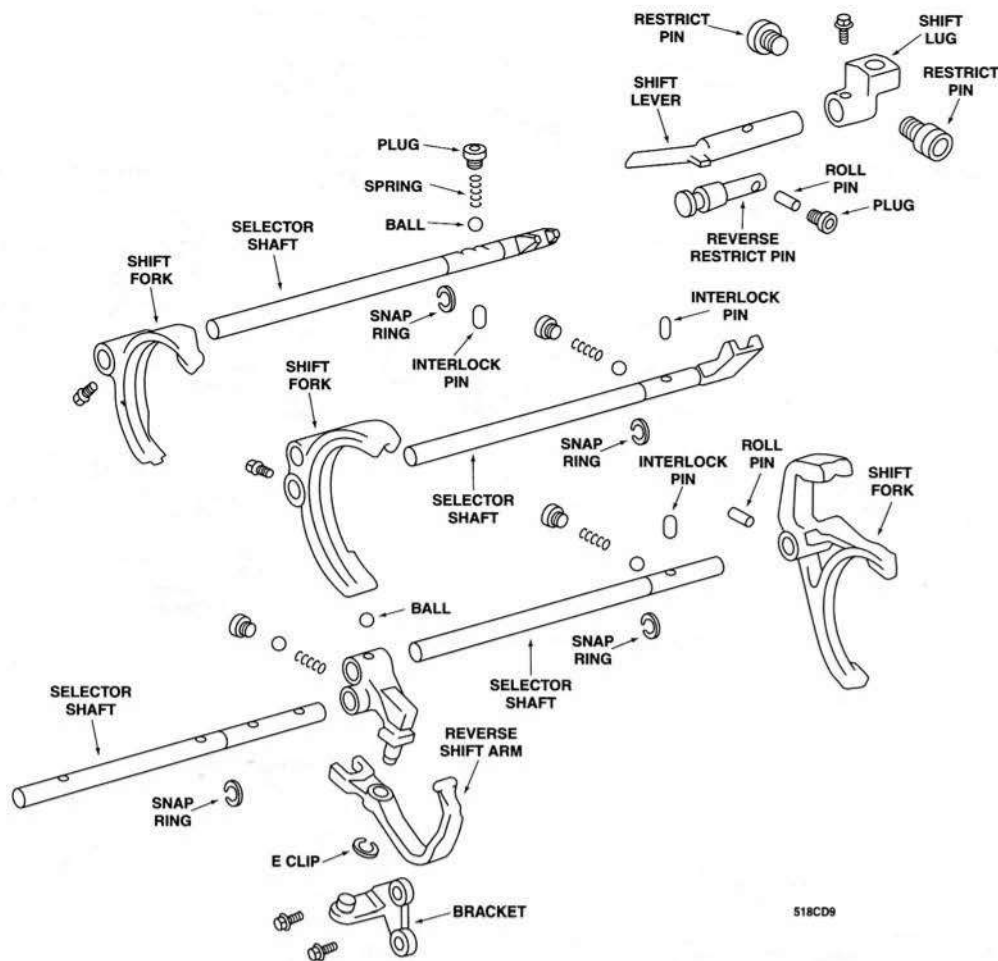
Input and mainshaft components.



Counter gear and associated components.

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Selector components.

- 3 Ensure that the mating faces of the transmission and the engine are clean and free of burrs. Raise the transmission and align it with the engine.

i It may be necessary to rotate the crankshaft during installation. To do this, use a suitable spanner on the crankshaft pulley bolt to rotate the crankshaft while pushing the transmission towards the engine.

- 4 Ensure that the input shaft splines engage the clutch

i Do not force the transmission or do not allow it to hang on the clutch driven plate at any time as damage will occur.

- 5 Install the bolts retaining the clutch housing to the engine and tighten to the specified torque.
- 6 Install the wiring to the brackets and connect the switches and sensor.
- 7 Raise the jack and install the rear mounting and cross-member. Tighten the bolts to the specified torque.
- 8 Install the starter motor, clutch housing cover and earth lead. Tighten the bolts to the specified torque.
- 9 Install the clutch slave cylinder and hydraulic pipe. Tighten the bolts to the specified torque.

- 10 Install the propeller shafts as described later in this chapter and tighten the bolts to the specified torque.
- 11 Install the brace to the chassis and tighten the retaining bolts to the specified torque.
- 12 Install the engine pipes as described in Engine (chapter 4). Tighten the nuts and bolts to the specified torque.
- 13 Check the fluid level of the transmission and transfer case and top up as necessary. Tighten the drain and filler plugs to the specified torque.
- 14 Install the shift levers as previously described in this chapter.
- 15 Connect the negative battery terminal and road test the vehicle.

TO DISMANTLE

As extensive knowledge and equipment is required to overhaul the transmission, it is not considered a viable repair proposition for the home mechanic. It is usually more economical to install an exchange transmission that comes with warranty or to have the transmission repaired by a specialist, than to overhaul the unit yourself.

However for those with the necessary knowledge and equipment, illustrations showing the various transmission components are included to assist in overhauling the transmission.

Gear endfloat is measured and then adjusted by installing a snap ring of appropriate thickness.

Part 2. Transfer Case

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Specifications

Type	Dual range constant four wheel drive with lockable centre differential
Model:	
Early automatic and all manual transmission	VF3BM
Late automatic transmission	VF3B
Lubricant:	
Type	SAE 75W – 90 GL 4 or GL 5
Capacity	1.2 litres
Gear ratios:	
High range	1.000 : 1
Low range	2.566 : 1
Pinion gear:	
End float	0.11 – 0.84 mm
Oil clearance	0.009 – 0.038 mm
Drive sprocket:	
End float	0.10 – 0.25 mm
Oil clearance	0.010 – 0.055 mm
Planetary gear assembly:	
Back lash	0.15 – 0.70 mm
End float	0.15 – 0.70 mm
Oil clearance	0.009 – 0.038 mm
Pinion gear thrust clearance	0.11 – 0.84 mm
Thrust inner bearing depth	7.7 – 8.3 mm
Oil pump:	
Inner rotor tip clearance	0.05 – 0.15 mm
Outer rotor to body clearance	0.09 – 0.16 mm
Rotor side clearance	0.03 – 0.10 mm
Input shaft:	
Journal outer diameter minimum	47.59 mm
Bush diameter maximum	39.14 mm
Snap ring to thrust bearing clearance	0.05 – 0.15 mm
Snap ring thicknesses in increments of 0.05mm	2.10 – 3.05 mm
Output shaft:	
Journal diameter—	
Narrow section minimum	27.88 mm
Wide section minimum	36.98 mm
Sprocket to bearing clearance	0.10 – 0.25 mm
Snap ring thicknesses in increments of 0.05mm—	
Rear	2.00 – 2.50 mm
Outer bearing	1.45 – 1.70 mm

Synchroniser ring to sprocket clearance:

Minimum	0.80 mm
Standard	1.05 – 1.85 mm
Shift fork to sleeve clearance maximum	1.0 mm

TORQUE WRENCH SETTINGS

Automatic transmission	
control rod to shift lever	13 Nm
Brace to chassis nuts and bolts	65 Nm
Centre differential lock actuator retaining bolt	20 Nm
Centre differential lock indicator switch	37 Nm
Centre differential lock shift fork retaining bolt	24 Nm
Detent spring cover plugs	19 Nm
Extension housing bolts	12 Nm
Filler and drain plugs	37 Nm
Flange locknut	118 Nm
Front bearing retainer bolts	12 Nm
Gear shift lever retainer bolts	18 Nm
Low range position switch A/T	37 Nm
Mass damper bolt	20 Nm
Neutral position switch A/T	37 Nm
Oil pump body to front case	7.5 Nm
Oil pump plate to oil pump body	7.5 Nm
Oil pump relief valve	29 Nm
Rear crossmember to chassis rail nuts and bolts	65 Nm
Separator and oil strainer to front case	7.5 Nm
Speed sensor retaining bolt	12 Nm
Stoneguard bolts	18 Nm
Switch blanking plug	37 Nm
Transfer case to transmission	24 Nm
Transfer rear to front case bolts	28 Nm
Upper cover and oil deflector	18 Nm
Vibration damper bolts	38 Nm

Description

The transfer case provides constant or full time four wheel drive in either high or low range via a lockable centre differential. When the centre differential is locked, it provides equal drive to the front and rear axles irrespective of traction conditions. On manual transmission and early automatic transmission models, the centre differential lock is engaged by placing the transfer shift selector in the HL or LL positions. A switch on the transfer case then activates the warning lamp.

The transfer case can be shifted between H and HL at any speed providing no wheels are slipping. When shifting from high to low range the vehicle must be stopped or travelling less than 8 km/h.

On late automatic transmission models, the centre differential can be locked using the centre differential lock switch on the right hand side of the dashboard. The switch activates the centre

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differential lock electric motor via the centre differential lock ECU. A warning lamp on the instrument cluster illuminates when the centre differential is locked.

The centre differential allows the front and rear wheels to turn at different speeds, such as when cornering or manoeuvring in tight conditions when the front and rear propeller shafts rotate at unequal speeds. Avoid using the centre differential lock on hard surfaces or the resulting high load on the drive train components can lead to component failure.

Automatic transmission models are equipped with a neutral switch which illuminates a lamp on the instrument panel, warning the driver that the transfer case is in neutral and that the vehicle may move when left in Park.

Routine Maintenance

TO CHECK OR RENEW TRANSFER CASE OIL

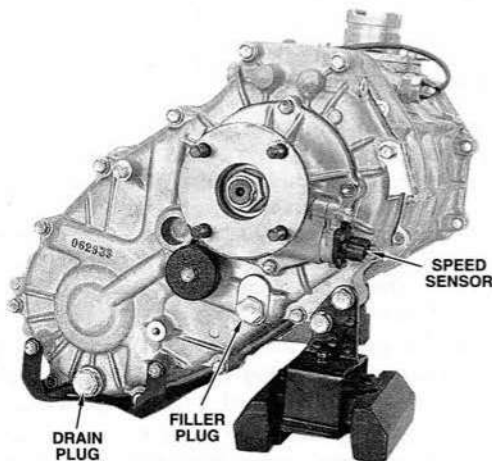
The transmission and transfer case have separate lubricating systems. When checking the transfer case oil level, always check the transmission oil level as described in Part 1 of this chapter.

- 1 If extra clearance is required, raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.



It is important that the vehicle is level when checking the transfer case oil level.

- 2 Remove the filler plug from the transfer case and, using a finger or a bent piece of wire, check the oil level.
The level is correct when the oil is level with or less than 5 mm below the bottom of the plug hole. Overfilled units should be drained until the oil is level with the bottom of the plug hole.
- 3 If the oil is being renewed, place a suitable container beneath the drain plug and remove the plug from the bottom of the transfer case. Allow all of the oil to drain from the transfer case and then install and tighten the drain plug to the specified torque.
- 4 If the oil level is low or the oil is being renewed, use an oil gun to fill the transfer case to the correct level with the specified oil.



Transfer case filler and drain plugs.

- 5 When satisfied that the level is correct, install the filler plug and tighten to the specified torque. Wipe around the plug/s with a cloth after installation.

OIL LEAKAGE

- 1 Check for oil leakage at the oil seals.
- 2 Check for oil leakage from case joints and breather.



Check the transfer case output shaft seals for leakage.

BREATHER

- 1 Regularly check that the breather hose between the transfer case and the transmission is not blocked, cracked or deteriorated.
- 2 Check the transmission breather by rotating the cap and or using compressed air to remove any accumulated dirt.

Trouble Shooting

TRANSFER CASE NOISE (FORWARD GEARS ENGAGED, VEHICLE MOVING)

- 1 Oil level low: Fill the transfer case with the correct quantity and grade of oil and check for leaks. Refer to the Routine Maintenance heading.
- 2 Worn bearings: Overhaul the transfer case and renew the bearings.
- 3 Chipped or pitted gears: Overhaul the transfer case.
- 4 Excessive gear end float: Check and renew the worn gears as necessary.
- 5 Insufficient oil distribution: Check and if necessary overhaul the oil pump.

SLOW OR DIFFICULT RANGE CHANGE

- 1 Oil level low: Fill the transfer case with the correct quantity and grade of oil and check for oil leaks. Refer to the Routine Maintenance heading.
- 2 Worn or sticking transfer shift lever: Remove the shift lever and check the lever ball, seat and housing for damage or wear. Renew components as necessary.
- 3 Worn or damaged selector shaft, detent ball or selector fork: Renew components as necessary.
- 4 Insufficient oil distribution: Check and if necessary overhaul the oil pump.

SLOW CENTRE DIFF LOCK OPERATION

- 1 Oil level low: Fill the transfer case with the correct quantity and grade of oil and check for leaks. Refer to the Routine Maintenance heading.
- 2 Insufficient oil distribution: Check and if necessary overhaul the oil pump.
- 3 Worn centre differential: Overhaul the transfer case and renew components as necessary.
- 4 On late automatic transmission models, faulty centre differential lock motor: Renew the motor.

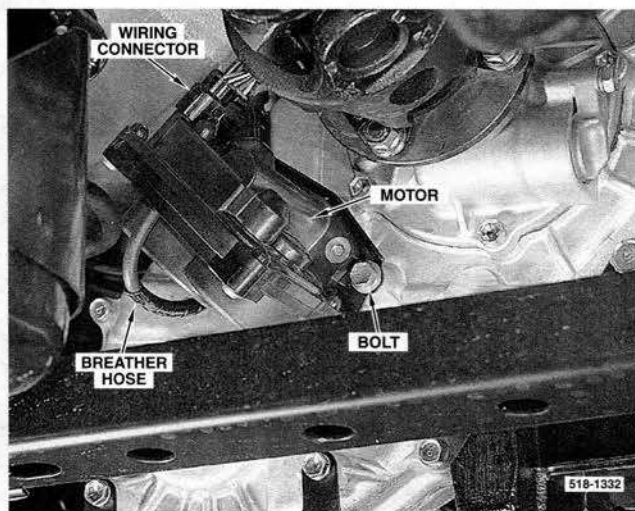
CENTRE DIFF LOCK WON'T ENGAGE — AUTOMATIC TRANSMISSION

- 1 Electrical fault: Using the wiring diagrams in Body Electrical (chapter 16), check the centre differential lock circuit and components.
- 2 On late automatic transmission models, faulty or seized centre differential lock motor: Check and if necessary renew the motor.
- 3 Faulty or damaged splines on the diff lock sleeve or hub: Overhaul the transfer case as necessary or install an exchange unit.

i If a faulty differential lock warning lamp is suspected, firmly apply the handbrake, raise the front of the vehicle and support it on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points. With the differential lock disengaged it should be possible to turn the front propeller shaft. Ensure that the transmission is in Neutral, start the engine and engage the differential lock. Switch the engine Off. If the differential lock is functioning correctly, it should not be possible to turn the front propeller shaft.

CENTRE DIFFERENTIAL LOCK WON'T DISENGAGE

- 1 Transmission wind-up causing problems: Move the vehicle in the opposite direction for several metres and try again. In serious cases it may be necessary to jack up one of the wheels to allow the transmission to unwind.



On transfer cases with an electric shift motor, have an assistant operate the switch inside the vehicle. It should be possible to hear the motor operating from underneath the vehicle when conditions are quiet.

- 2 Any of the problems that could cause the differential lock not to engage, could cause the disengagement problems: Refer to the previous heading.

Shift Lever**TO REMOVE AND INSTALL****Manual Transmission Models**

The procedure to remove and install the transfer shift lever is described under the Shift Lever heading in Part 1 of this chapter.

Automatic Transmission Models

- 1 Remove the transmission selector lever. Refer to Automatic transmission (chapter 11).
- 2 Fold back the boot and using a pair of snap ring pliers, remove the snap ring retaining the transfer lever in the housing.
- 3 Lift the transfer lever straight out from the housing.

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Apply a smear of multipurpose grease around the ball and also to the end of the transfer lever.
- 2 Install the transfer shift lever to the transfer case, ensuring that the grooves in the lever ball align with the pins in the transfer lever housing.
- 3 Press the cover into the housing against the spring and then install the snap ring, ensuring it is seated in the groove in the housing. Fold the boot down and around the housing, ensuring it is sitting squarely.

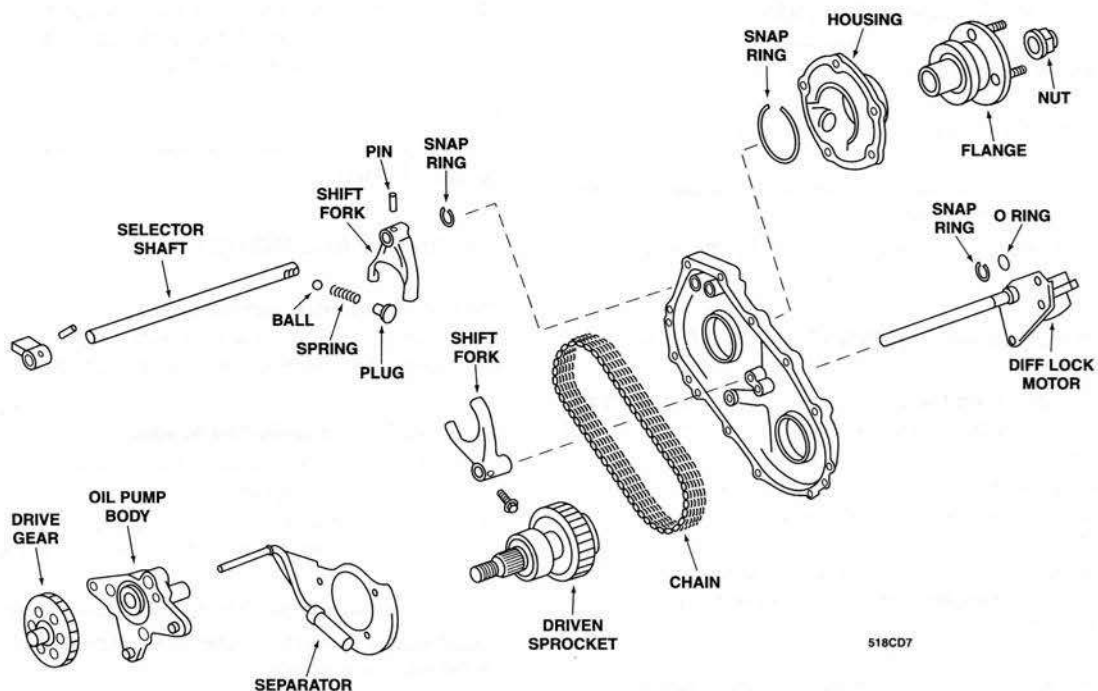
Oil Seals**TO RENEW OUTPUT SHAFT SEALS**

- 1 Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.
- 2 Remove the appropriate propeller shaft as described in Part 3 of this chapter.

i If the front output shaft seal is to be renewed, place a suitable container beneath the transfer case, remove the drain plug and drain the oil from the transfer case.

- 3 Using a small centre punch, dislodge the staked portion of the locking nut.
- 4 Using a large screwdriver to stop the flange from rotating and a suitable spanner, loosen and remove the locknut.
- 5 Remove the flange from the shaft. If the flange is tight, use a suitable puller to remove the flange.
- 6 Note the installed position of the seal. Drill a small hole in the seal being careful not to drill to far and partially install a small self tapping screw. Using pliers pulling on the screw, remove the seal.
- 7 Apply a light coat of transmission oil to the lip of the new seal.

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Transfer case front output shaft, drive chain and selector components. Models with electric center diff lock selection.

- 8 Using pipe or a large socket, carefully tap the new seal squarely into the housing to the position noted on removal..

TO RENEW INPUT SHAFT SEAL

- 1 Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.
- 2 Remove the transfer case from the vehicle as described later in this chapter.
- 3 Note the installed position of the seal, drill a small hole in the seal being careful not to drill too far and partially install a small self tapping screw. Using pliers pulling on the screw, remove the seal.
- 4 Apply a light coat of transmission oil to the lip of the new seal.
- 5 Using pipe or a large socket, carefully tap the new seal squarely into the housing to the position noted on removal.
- 6 Install the transfer case as described later in this chapter.

TO RENEW SELECTOR SHAFT SEALS

- 1 Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.
- 2 Remove the transfer case from the vehicle as described under the Transfer Case Assembly heading.
- 3 Note the installed position of the seal, drill a small hole in the seal being careful not to drill too far and partially install a small self tapping screw. Using pliers pulling on the screw, remove the seal.
- 4 Apply a light coat of transmission oil to the lip of the new seal.
- 5 Using pipe or a large socket, carefully tap the new seal squarely into the housing to the position noted on removal.
- 6 Install the transfer case as described later in this chapter.

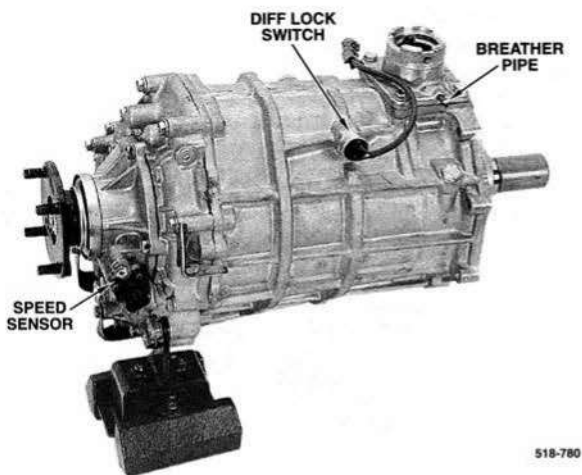
Transfer Case Assembly

TO REMOVE AND INSTALL

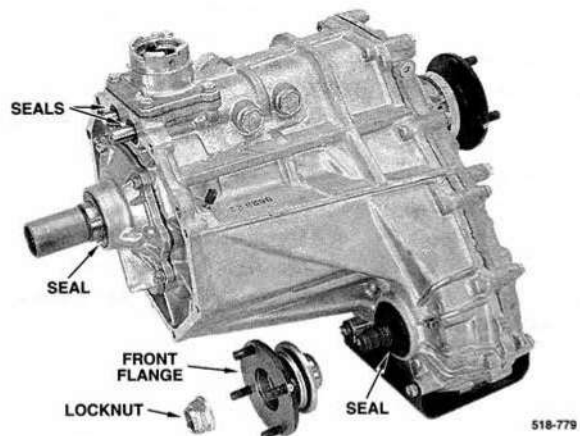
- 1 Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.
- 2 Place a suitable container beneath the transfer case, remove the drain plug and drain the oil from the transfer case. Install and tighten the drain plug to the specified torque.
- 3 Remove the bolt retaining the earth lead to the transfer case.
- 4 Remove the nuts and bolts retaining the propeller shafts to the transfer case flanges and using tie wire or rope, secure the ends of the propeller shafts clear of the work area.
- 5 Disconnect the wiring connectors and the breather hose from the pipe on the transfer case.
- 6 Working inside the vehicle, remove the transfer shift lever as previously described.
- 7 Place a trolley jack under the transfer case and support the weight of the transfer case. Secure the transfer case to the jack using chain.
- 8 Remove the bolts retaining the transfer case to the transmission.
- 9 Ensuring that the transfer case input shaft does not damage the transmission output shaft seal, withdraw the transfer case from the transmission.
- 10 Lower the transfer case and remove it from beneath the vehicle.

Installation is a reversal of the removal procedure with attention to the following points:

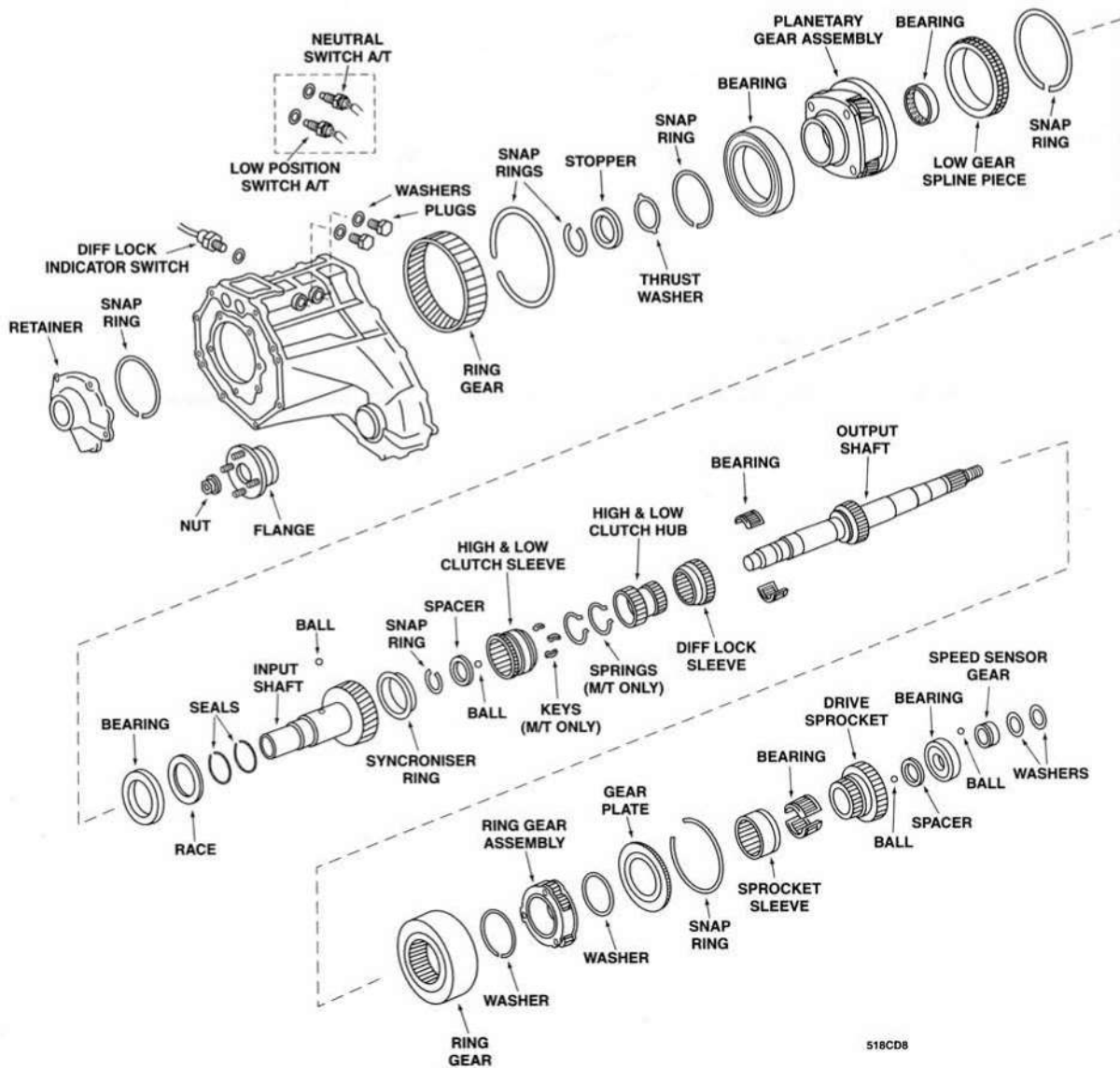
- 1 Check the transmission rear oil seal for damage and signs of leakage. Renew the seal as described in Part 1 of this chapter if any doubt exists to the serviceability of the seal.



Location of the center differential lock indicator switch and the speed sensor.



Location of the seals on the front of the transfer case and output flange components.



Transfer case gear train components. Automatic and manual transmission models.

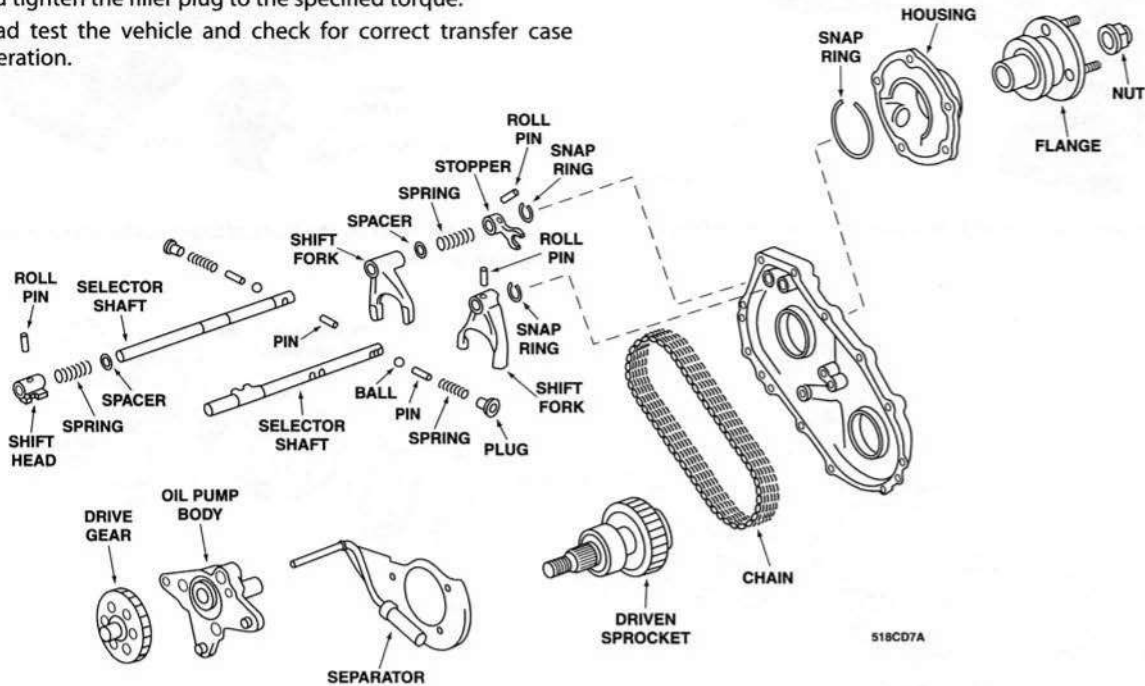
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- 2 Place the transfer case on a trolley jack, secure the transmission to the jack using chain and raise the transfer case so it aligns with the transmission.
- 3 Rotate the output shaft flange to align the input shaft splines with the transmission shaft and install the transfer case to the transmission.
- 4 Tighten the transfer case to transmission retaining bolts to the specified torque.
- 5 Fill the transfer case with the specified oil to the correct level and tighten the filler plug to the specified torque.
- 6 Road test the vehicle and check for correct transfer case operation.

TO DISMANTLE

Due to the complexity and the cost of special tools required, It is often more economically viable to install an exchange unit or have the transfer case repaired by a specialist. The availability and price of an exchange unit should be examined before commencing to dismantle the transfer case.

For those people who have the knowledge and the tools necessary to complete the job satisfactorily, an exploded view of the transfer case and the specifications are provided.



Transfer case front output shaft, drive chain and selector components. Models with lever operated center diff lock selection.

Part 3. Propeller Shafts

Contents

Description	151
Trouble Shooting	151
Universal Joints	152

Specifications

Propeller shaft lubrication:	
Universal joints	Lithium based grease NLGI No2
Sliding yokes and double cardan joints	Molybdenum disulphide lithium based grease NLGI No2
Propeller shaft runout limit maximum	0.8 mm
Trunnion bearing axial play maximum	0.05 mm
Snap ring thickness	2.10 mm – 2.50 mm in 0.05 mm increments

TORQUE WRENCH SETTINGS

Propeller shaft flange nuts and bolts	74 Nm
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Description

The rear propeller shaft is a tubular type consisting of a double cardan joint at the front and a universal joint at the rear. A sliding joint allows the shaft to extend and retract as the rear axle rises and falls.

A mounting flange at either end retains the shaft and transmits drive from the transfer case to the rear axle assembly. The double cardan joint consists of two universal joints linked together by a housing, allowing the propeller shaft to move through greater angles with reduced loads on each universal joint. The double cardan joint is not serviceable and if worn, the complete propeller shaft must be renewed.

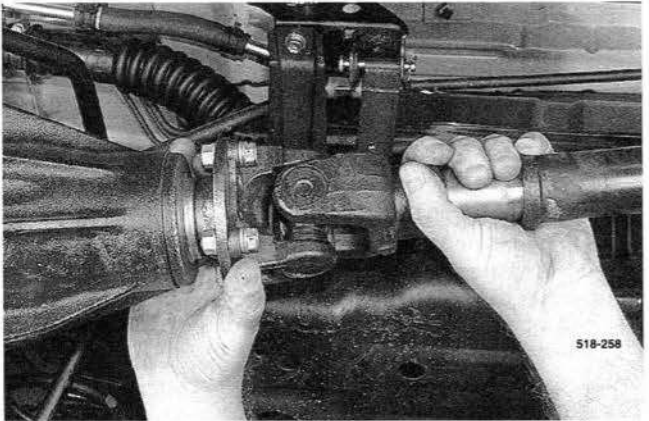
The front propeller shaft is similar to the rear propeller shaft, although it uses universal joints at both the front and rear of the shaft.

The universal joints used consist of a trunnion, four cups that can pivot via needle roller bearings. The universal joints, double cardan joint and sliding joints require periodical lubrication via the grease nipples on each joint.

Trouble Shooting

SHAFT VIBRATION

- 1 Universal joint flange loose: Renew and tighten the loose flange nuts and bolts.
- 2 Excessive wear in the universal joint trunnion and bearings: Renew the universal joint assembly.
- 3 Worn sliding sleeve: Check and renew the sleeve as necessary.



Checking the universal joint for freeplay.

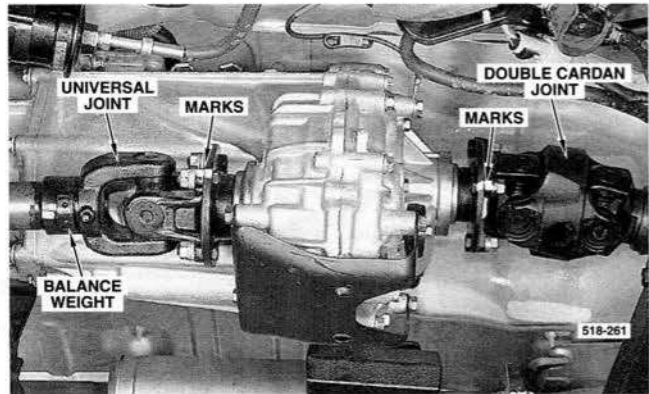
- 4 Bent propeller shaft: Check the propeller shaft runout and renew the propeller shaft as an assembly.
- 5 Propeller shaft out of balance: Balance or renew the propeller shaft.
- 6 Propeller shaft front and rear couplings phasing incorrect: Disconnect the sliding joint from the propeller shaft and align the couplings.

EXCESSIVE BACKLASH

- 1 Worn universal joint trunnion and bearings: Replace the universal joint trunnion and bearings as an assembly.
- 2 Worn slip joint splines: Renew the worn components.
- 3 Loose couplings: Check and tighten the nuts and bolts. If necessary renew the bolts.

TO REMOVE AND INSTALL

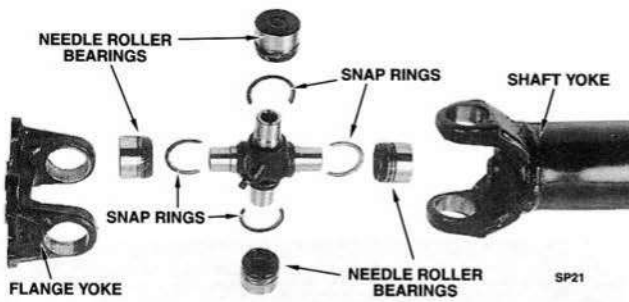
- 1 Raise the front and rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.



Match mark the propeller shaft and transfer case flanges to ensure installation to the original position.

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Part 3



Propeller shaft universal joint components.

- 2 Suitably mark the propeller shaft flange, differential drive pinion flanges and transfer case flanges, to ensure installation to the original location.
- 3 Remove the nuts and bolts, gather the spring washers and separate the propeller shaft flange from the differential and transfer case flanges. It may be necessary to lightly tap the end of the shaft with a soft hammer to free the shaft assembly from the flanges.

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Clean the threads of all nuts and bolts with a wire brush or similar.
- 2 Align the matchmarks between the differential pinion flanges, transfer case flanges and the propeller shaft
- 3 Install the bolts, spring washers and nuts and tighten to the specified torque.

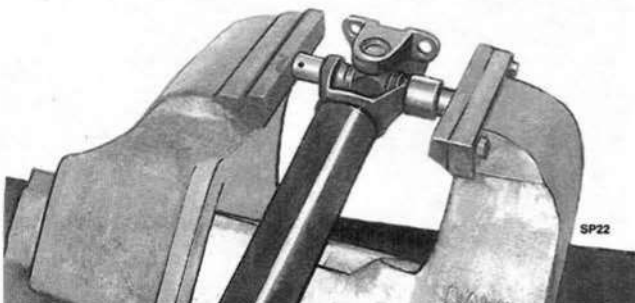
i It is recommended that the universal, double cardan and sliding joints are lubricated immediately after installation.

UNIVERSAL JOINTS

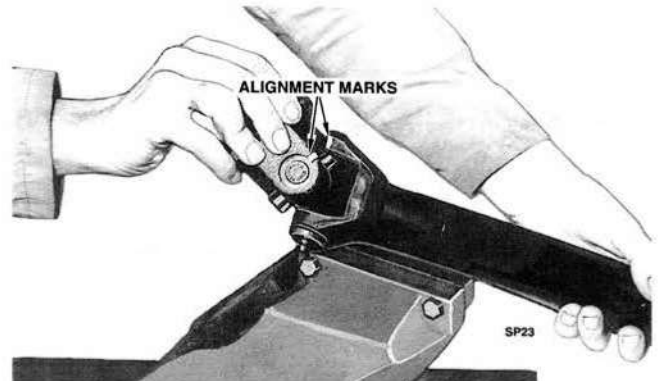
To Remove and Install

i Each universal joint is serviced as a kit which includes trunnion, seals, snap rings and the needle roller bearings and cups.

Do not dismantle a universal joint unless the components are to be renewed. On models with a sliding yoke, do not hold the sleeve of the sliding joint in the unprotected jaws of a vice, otherwise damage will result.



Pressing the needle roller bearing from the propeller shaft yoke.



Installing the flange yoke to the propeller shaft. Note the alignment marks.

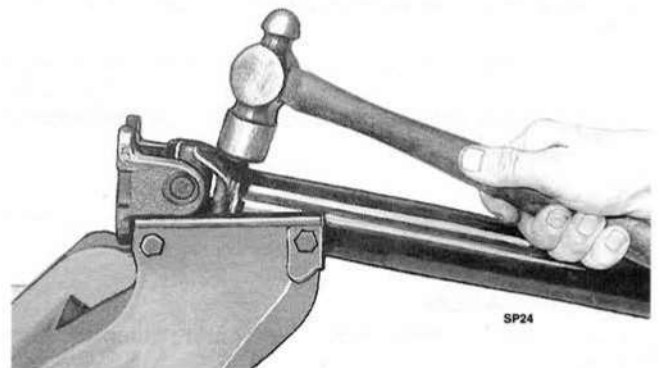
- 1 Remove the propeller shaft assembly from the vehicle as previously described.
- 2 Match mark the front and or rear yoke to the shaft to ensure assembly to the original position.
- 3 Remove the snap rings securing the bearing cups.
- 4 Press one needle roller bearing from the yoke using sockets as shown in the illustration.
- 5 Reverse the position of the sockets and press the other cup back into and then from the yoke.

i The propeller shaft is balanced to fine tolerances and must not be dented or otherwise damaged.

- 6 Manoeuvre the yoke and trunnion out of the propeller shaft.
- 7 Remove the remaining cups in a similar manner.

Installation is a reversal of the removal procedure with attention to the following points:

- 1 Using a file, remove any burrs from the inside of the yokes.
- 2 Ensure that the yoke is installed in the original position as incorrect installation can result in vibrations from the drive line.
- 3 When installation of the snap rings is complete, tap the yokes with a hammer to ensure that all snap rings are seated correctly and that the universal joints are free to move in all directions.



Tap the shaft gently to centralize the needle roller bearings.