Chapter 7 Part A
Manual transmission

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Specifications

Model number

4.2 litre engine	
4 speed	FN4R50A
5 speed	FS5R50A
3.0 litre engine	FS5R30A

FS5R30A

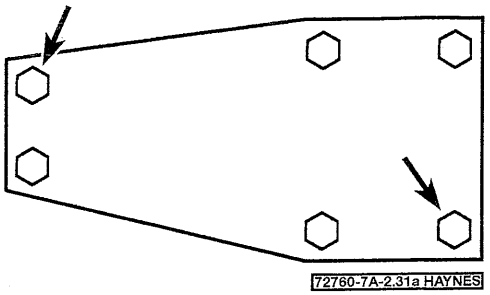
Gear end play	
All except reverse main gear	0.23 to 0.33 mm
Reverse main gear	0.33 to 0.43 mm
Reverse idler shaft end play	0.30 to 0.53 mm

FS5R50A

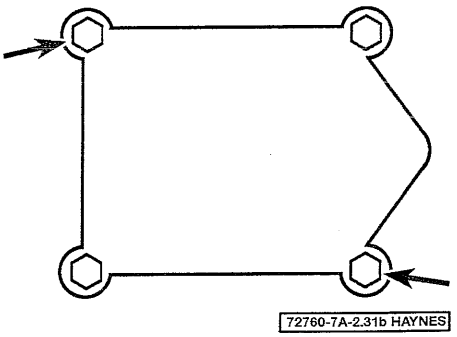
Gear end play	
All except second gear	0.20 to 0.45 mm
Second gear	0.20 to 0.60 mm
Snap-ring clearance limit (except synchro hubs)	0.15 mm
Synchro hub snap-ring clearance limit	
First and second	0.13 mm
Third and fourth	0.10 mm
Baulk ring to gear/cone minimum	0.7 mm

Torque specifications

	Nm
Clutch housing-to-engine bolts	
4.2 litre engine	
65 mm bolts	29 to 39
Except 65 mm bolts	83 to 113
3.0 litre engine	
To 10/94 production date	
65 mm bolts	39 to 49
Except 65 mm bolts	29 to 39
After 10/94 production date	
40 mm bolts	29 to 39
Except 40 mm bolts	39 to 49
Lever housing bolts	19 to 21
Transmission-to-clutch housing bolts	54 to 72
Front cover-to-transmission bolts	
FS5R30A	12 to 15
FS5R50A	19 to 21
Rear extension-to transmission bolts	
FS5R30A	23 to 31
FS5R50A	57 to 72
FS5R50A bearing retainer bolts	16 to 21
FS5R50A control housing bolts	16 to 21



2.31a On 4.2 litre engines, refit the longer bolts in these locations (arrows) in the control housing cover



2.31b On 3.0 litre engines, refit the bolts with the 13 mm heads in these locations (arrows) in the control housing cover. The 12 mm bolts go in the other two holes

1 General information

All vehicles covered in this manual are equipped with either a 4 or 5-speed manual transmission or an automatic transmission. All information on the manual transmission is included in this Part of Chapter 7. Information on the automatic transmission can be found in Part B. Information on the transfer case can be found in Part C.

Due to the complexity, unavailability of replacement parts and the special tools necessary, internal repair of the manual transmission is not recommended for the home mechanic. The information contained within this Section will be limited to general information and removal and refitting procedures.

Depending on the expense involved in having a faulty transmission overhauled, it may be an advantage to consider renewing the unit with either a new or rebuilt one. Your local dealer or transmission shop should be able to supply you with information concerning cost, availability and exchange policy. Regardless of how you decide to remedy a transmission problem, you can still save considerable expense by removing and refitting the unit yourself.

2 Manual transmission - removal and refitting

Removal

1 Disconnect the negative cable at the battery.

2 Raise the vehicle and support it securely with jackstands. It should be as high as possible while still being safe.

3 Remove both front seats and the console (refer to Chapter 11).

4 Remove the door sill covers and remove the front carpet.

5 Remove the knobs from the gear shift lever and the transfer case lever.

6 Remove the floor access panel along with the two lever boots.

7 Remove the gear shift control housing from the top of the transmission. On 3.0 litre engines, use a magnet to draw out the ball and spring from the transmission.

8 Disconnect the parking brake cable from the lever assembly, disconnect it from the retainers and pull it through the floor to the outside of the vehicle.

9 Remove the transfer case from the vehicle (refer to Chapter 7C).

10 Remove the transfer case shift lever from the transmission.

11 Remove the clutch slave cylinder and tie it out of the way with a wire. Do not disconnect the hydraulic line.

12 Remove the starter (refer to Chapter 5).

13 Remove the PTO from the side of the transmission, if equipped.

14 Drain the oil from the transmission (refer to Chapter 1).

15 Disconnect all interfering wiring harnesses and hoses.

16 Remove the rubber mounts from the exhaust bracket.

17 Support the transmission with a jack - preferably a special jack made for this purpose. Safety chains will help steady the transmission on the jack.

18 Remove the bolts securing the transmission mount to the rear crossmember.

19 Raise the transmission slightly, then detach the nuts and bolts securing the rear crossmember to the frame rails. and remove the crossmember.

20 Remove the bolts securing the transmission to the engine.

21 Make a final check that all wires and hoses have been disconnected from the transmission and then move the transmission and jack toward the rear of the vehicle until the clutch housing is clear of the engine dowel pins. Keep the transmission level as this is done.

22 Lower the transmission assembly and remove it from under the vehicle. **Caution:** *Do not depress the clutch pedal while the transmission is removed from the vehicle.*

23 The clutch components now can be inspected (see Chapter 8). In most cases, new clutch components should be refitted as a matter of course if the transmission is removed.

Refitting

Refer to illustrations 2.31a and 2.31b

24 If removed, refit the clutch components (see Chapter 8). Apply sealer to the sealing surface of the clutch housing. Lightly grease the transmission splines and the pilot bearing.

25 With the transmission clutch housing secured to the jack as on removal, raise it into position behind the engine and then carefully slide it forward, engaging the clutch housing over the dowel pins. Do not use excessive force to refit the transmission-if it does not slide into place, readjust the angle of the transmission so it is level.

26 Refit the transmission/clutch housing-to-engine bolts. Tighten the bolts to the specified torque.

27 Refit the crossmember and transmission support. Tighten all nuts and bolts securely.

28 Remove the jacks supporting the transmission and the engine.

29 Refit the various items removed previously, referring to Chapter 8 for the refitting of the driveshafts and Chapter 5 for information regarding the starter.

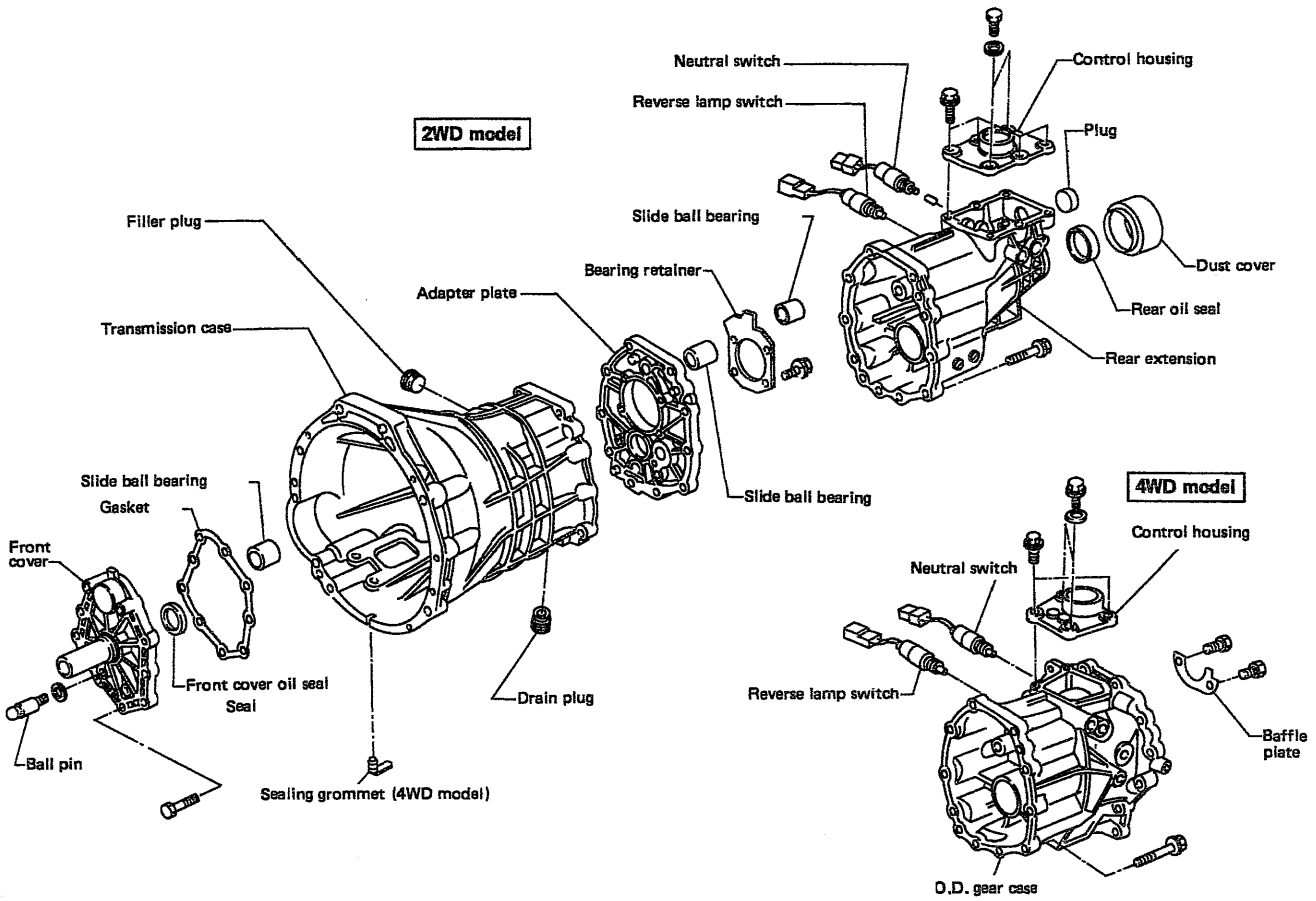
30 Make a final check that all wires, hoses and the speedometer cable have been connected and that the transmission and transfer case have been filled with lubricant to the proper level (see Chapter 1). Lower the vehicle.

31 From inside the vehicle refit the shift lever. Make sure to renew the gasket and refit the bolts in the correct positions **(see illustrations)**.

32 Connect the negative battery cable. Road test the vehicle for proper operation and check for leakage.

3 Manual transmission overhaul - general information

Overhauling a manual transmission is a difficult job for a do-it-yourselfer. It involves the disassembly and reassembly of many small parts. Numerous clearances must be precisely measured and, if necessary, changed with select-fit spacers and snap-



4.3 FS5R30A 5-speed transmission case details

rings. As a result, if transmission problems arise, it can be removed and refitted by a competent do-it-yourselfer, but overhaul should be left to a transmission repair shop. Rebuilt transmissions may be available-check with your dealer parts department and auto parts stores. At any rate, the time and money involved in an overhaul is almost sure to exceed the cost of a rebuilt unit.

Nevertheless, it's not impossible for an inexperienced mechanic to rebuild a transmission if the special tools are available and the job is done in a deliberate step-by-step manner so nothing is overlooked.

The tools necessary for an overhaul include internal and external snap-ring pliers, a bearing puller, a slide hammer, a set of pin punches, a dial indicator and possibly a hydraulic press. In addition, a large, sturdy workbench and a vice or transmission stand will be required.

During disassembly of the transmission, make careful notes of how each piece comes off, where it fits in relation to other pieces and what holds it in place. Exploded views are usually included in the rebuild kit to show how the transmission is assembled, but actually noting how they are refitted when you remove the parts will make it much easier to get the transmission back together.

Before taking the transmission apart for repair, it will help if you have some idea what area of the transmission is malfunctioning. Certain problems can be closely tied to specific areas in the transmission, which can make component examination and renewal easier. Refer to the *Troubleshooting section* at the front of this manual for information regarding possible sources of trouble.

4 FS5R30A 5-speed transmission - overhaul

Initial disassembly

Refer to illustrations 4.3, 4.5, 4.6 and 4.9

1 With the transmission removed (Section 3), thoroughly clean the exterior of the cases.

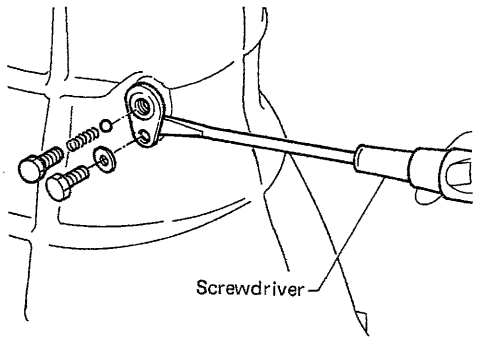
2 Remove the clutch release assembly.

3 Unscrew the electrical switches from the transmission case **(see illustration)**.

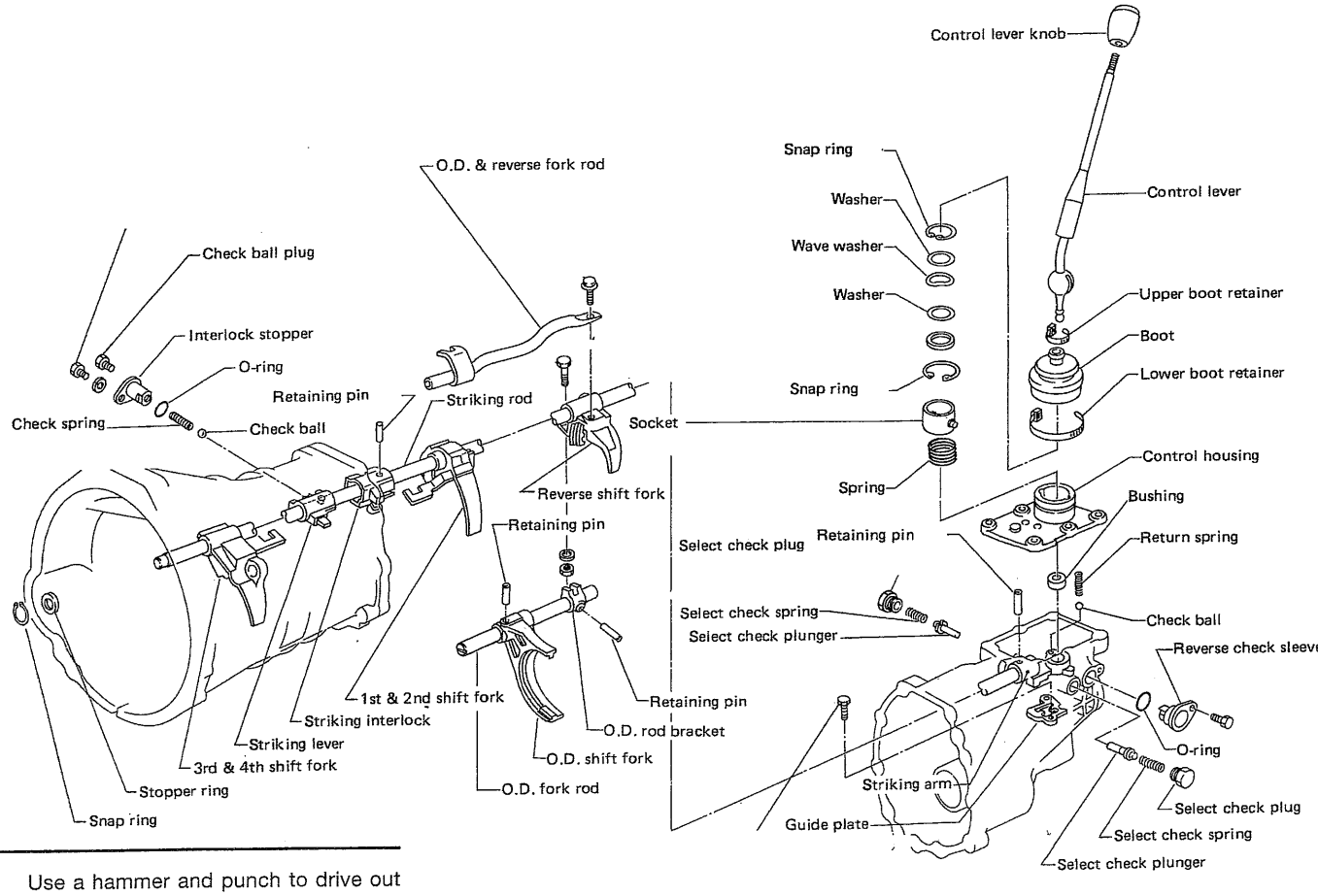
4 With the transmission in Neutral, remove the clamp bolt and lift out the speedometer pinion.

5 Remove the bolts and use a screwdriver to pry the check ball plug, spring and interlock assembly out of the case **(see illustration)**.

6 Remove the shift control housing, return spring and check ball assembly **(see illustration)**.



4.5 FS5R30A transmission interlock assembly removal details



4.6 FS5R30A 5-speed transmission shift assembly details

7 Use a hammer and punch to drive out the striking arm roll pin.

8 Remove the bolts and use a soft faced hammer to tap on the case to separate the extension housing or overdrive gearcase.

9 Remove the bolts and separate the front cover from the case. Remove the stopper ring and use snap-ring pliers to remove the main bearing snap-ring **(see illustration)**.

Adapter plate and mainshaft disassembly

Refer to illustrations 4.16, 4.17, 4.19a and 4.19b

10 Place the case securely in a vise, using blocks of wood or cloth to protect the surface.

11 Remove the overdrive/reverse shift rod.

12 Drive out the striking lever roll pin, using a suitable punch and hammer.

13 Remove the striking rod, striking lever and interlock assembly from the adapter plate.

14 Remove the 1st/2nd, 3rd/4th and reverse shift forks.

15 Drive out the overdrive shift fork using a suitable punch and hammer and remove the rod and shift fork.

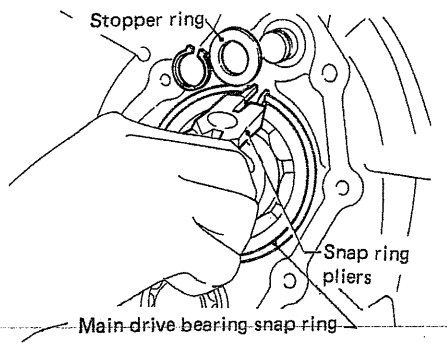
16 Use a feeler gauge to measure the gear end play **(see illustration)**. Compare the end play measurements to Specifications. Selective snap-rings (available from a dealer) are used to correct excessive end play. Inspect the mainshaft thrust washers for damage or wear.

17 Remove the reverse coupling sleeve and components from the main countershaft and countergear rear side **(see illustration)**.

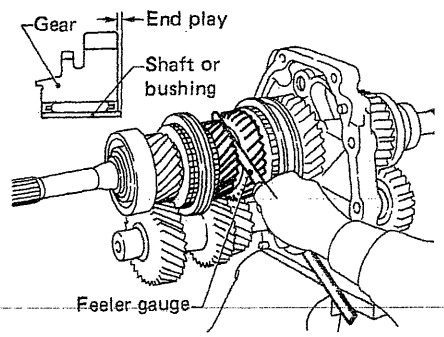
18 Remove the rear mainshaft and countergear snap-rings.

19 Use a hammer and suitable punch to remove the C-ring holder and the mainshaft C-rings **(see illustrations)**.

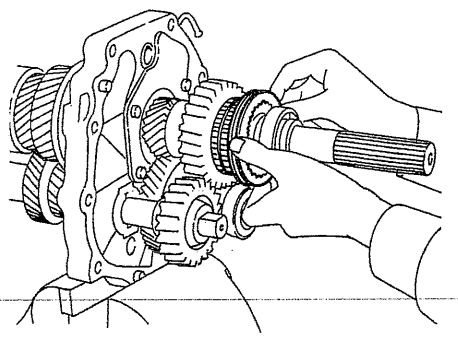
20 Use a suitable gear puller tool to remove the countershaft gear rear bearing and then



4.9 Remove the stopper ring and main drive bearing snap ring with snap ring pliers

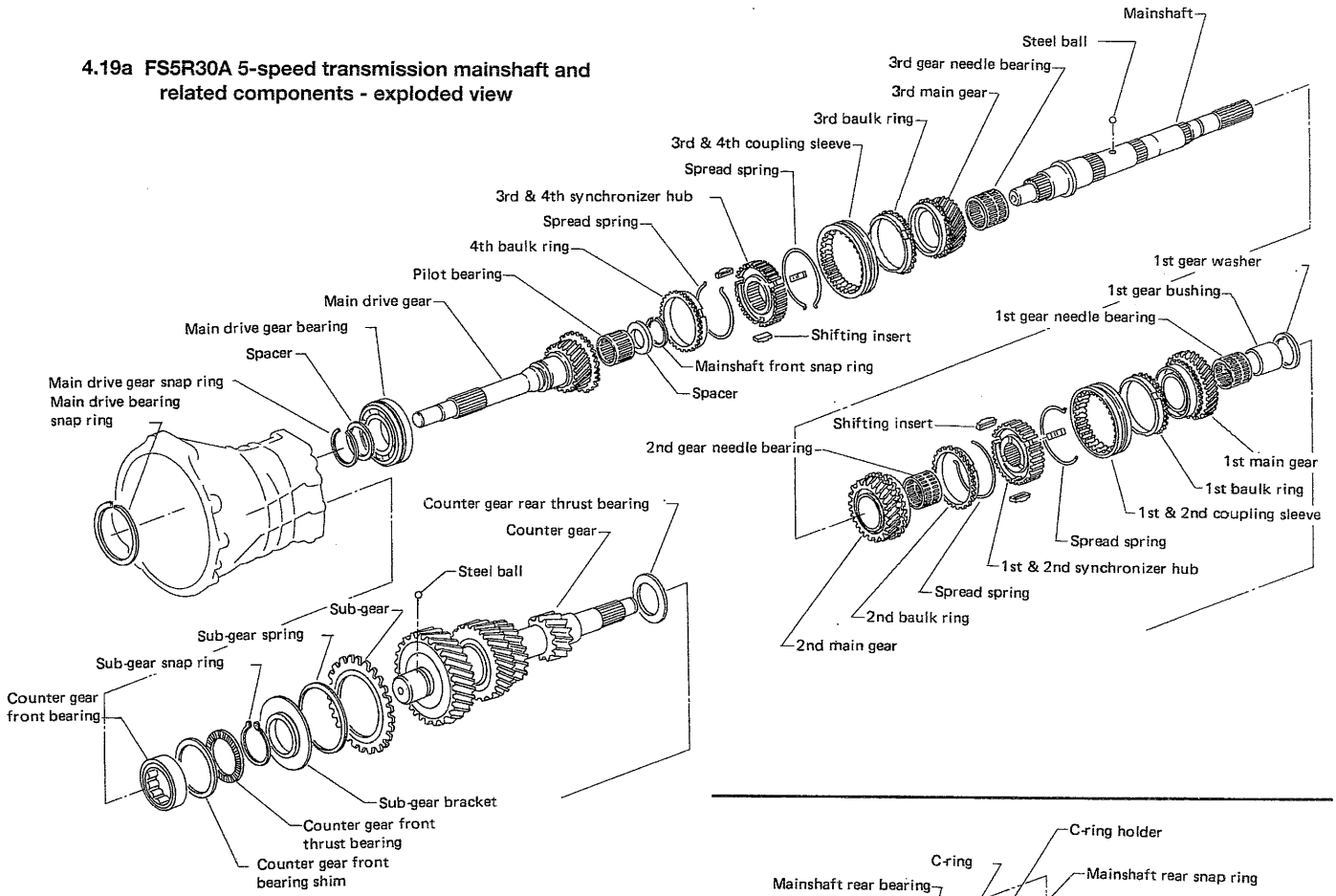


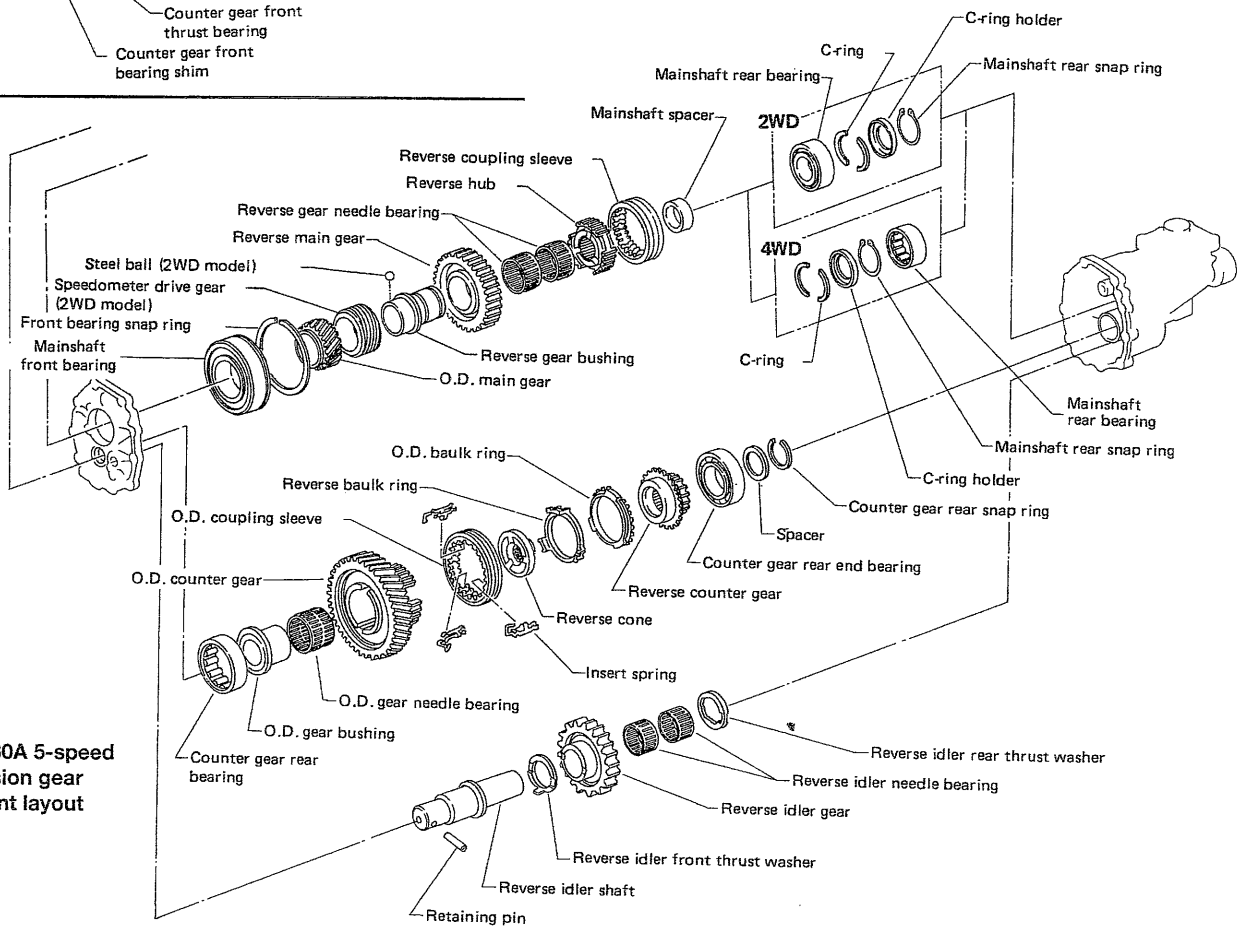
4.16 Check the gear end play with a feeler gauge



4.17 Main countershaft and countergear removal

4.19a FS5R30A 5-speed transmission mainshaft and related components - exploded view





4.19b FS5R30A 5-speed transmission gear component layout

7A

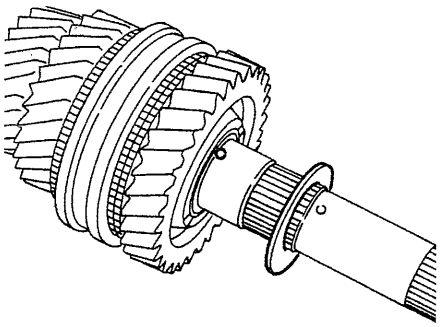
remove the reverse idler gear and thrust washers.
21 On 2WD models, use a puller tool to remove the mainshaft rear bearing.
22 Remove the reverse main gear, spacer and reverse synchroniser hub, using a puller tool. Remove the reverse gear needle bearings.
23 Use a puller tool to remove the reverse countergear, followed by the overdrive synchroniser.
24 Take the adapter plate to a suitable machine shop to have the mainshaft and countergear removed from the plate using a hydraulic press and suitable adapter tool.
25 Remove the 1st gear washer, steel ball and 1st gear and needle bearing from the mainshaft.
26 Have the 2nd gear, 1st gear bushing and 1st/2nd synchroniser pressed off the mainshaft.
27 Remove the front snap ring from the mainshaft.
28 Have the 3rd gear, the 3rd/4th synchroniser and the 3rd gear needle bearing pressed off the mainshaft.

Countershaft and gear disassembly

29 Remove the sub-gear snap ring.
30 Remove the sub-gear spring, sub-gear and the steel ball from the front of the countershaft. Refitting is the reverse of removal.

Input shaft and gear disassembly

31 The input shaft and gear assembly is serviced as a unit and only the bearing is replaceable. If it is necessary to replace the bearing, remove the snap ring and spacer. Take the assembly to a properly equipped machine shop to have the old bearing pressed off and a new one refitted.

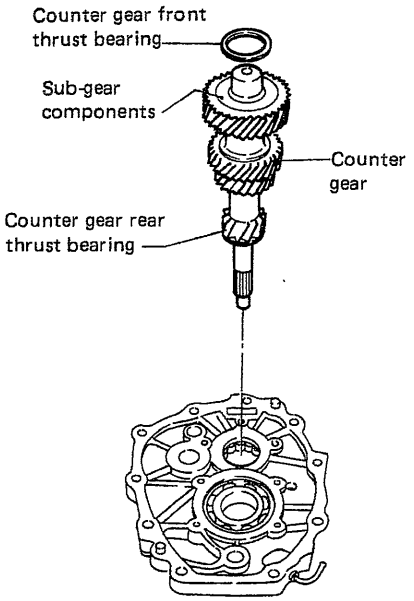


4.35 Lubricate the mainshaft with multipurpose grease at the points shown

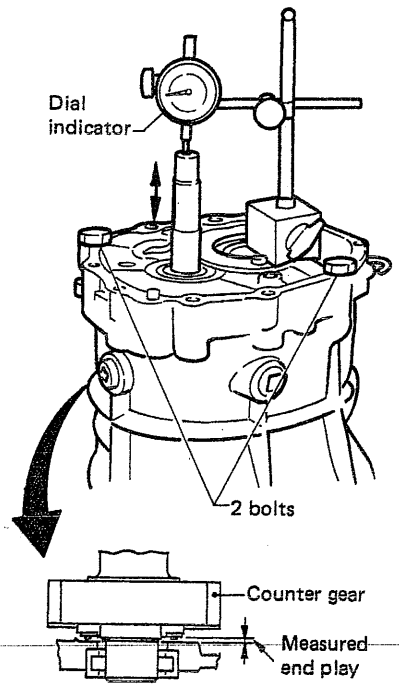
Adapter plate and mainshaft reassembly

Refer to illustrations 4.35, 4.36, 4.37, 4.38, 4.39, 4.42, 4.43, 4.44 and 4.45

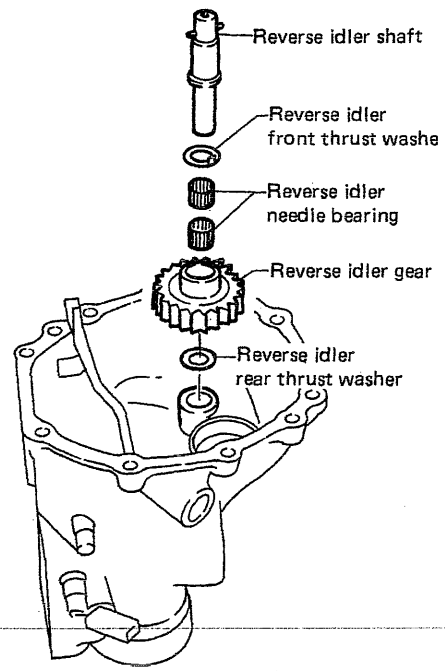
32 Have the 3rd/4th gear synchroniser, 3rd gear and needle bearing pressed on the shaft with a hydraulic press. Refit the thickest selective snap ring which will fit in the groove. Check the snap ring clearance with a feeler gauge to make sure it does not exceed 0.004 inch (0.1 mm).
33 Have the 1st/2nd synchroniser, 2nd gear and needle bearing pressed on the mainshaft with a hydraulic press.
34 Have the 1st gear bushing and washer press on with a hydraulic press and then refit the 1st gear and needle bearing.
35 Coat the steel ball and washer with petroleum jelly or multi-purpose grease and refit on the mainshaft **(see illustration)**.
36 Assemble the countershaft and refit it in the adapter plate **(see illustration)**.
37 Refit the adapter plate on the transmission plate using 2 bolts. Refit a dial indicator, set it a zero and then lift and release the countergear **(see illustration)**. Make a note of the reading and subtract 0.0039 to 0.0098 inch (0.10 to 0.25 mm) to determine the



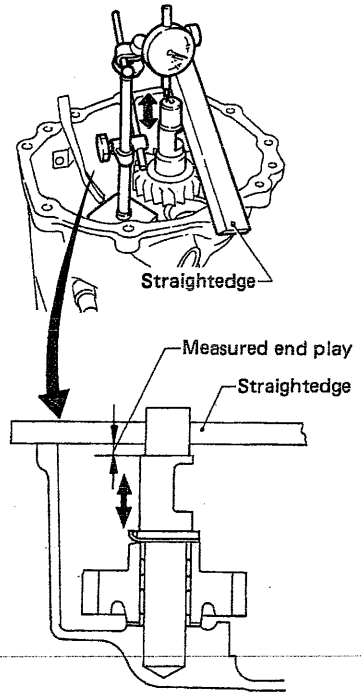
4.36 Countershaft refitting details



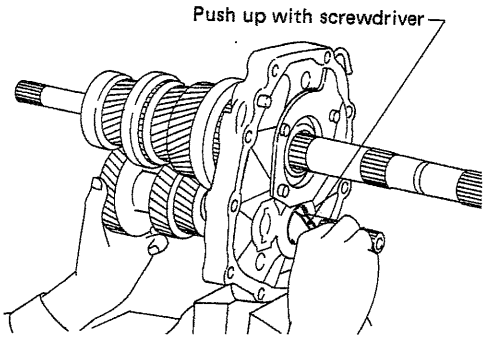
4.37 Use a dial indicator to check the countergear end play



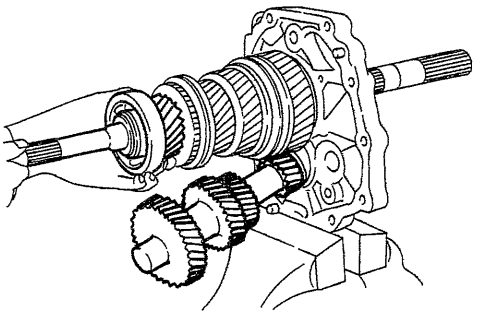
4.38 Reverse idler component layout



4.39 Checking the reverse idler shaft end play



4.42 Use a screwdriver to seat the countergear assembly



4.43 Refitting the input shaft and pilot bearing on the mainshaft

proper size countergear front bearing shim to be refitted.

38 Refit the reverse idler gear, needle bearing, thrust washers and shaft in the extension housing (2WD) or overdrive gearcase (4WD) **(see illustration)**.

39 Refit a dial indicator on the front of the reverse idler shaft and use a ruler or straightedge **(see illustration)**. Set the indicator to zero, lift and release the idler shaft and measure the end play. The end play should be between 0.118 to 0.209 in (0.30 to 0.35 mm). If the end play is not within specification, replace the rear thrust washer with a new one.

40 Unbolt the transmission case from the adapter plate and place it securely in a vise, using blocks of wood or cloths to protect the surface.

41 Lubricate the surface of the countergear rear bearing with multipurpose grease and refit the mainshaft partially on its front bearing in the adapter plate.

42 Refit the countergear on the countergear rear bearing in the adapter plate and then push it upward on the upper roller of the bearing, using a screwdriver to seat the assembly **(see illustration)**.

43 Refit the input shaft with the pilot bearing and spacer on the mainshaft **(see illustration)**.

44 Refit tool J-26349-3 on the adapter plate with the C-ring and C-ring holder on the mainshaft and then refit tool J-34328. Extend the tool to refit the mainshaft and countershaft gear **(see illustration)**.

45 Refit the overdrive gear bushing by tapping it in place with a hammer while pushing on the back of the countergear **(see illustration)**.

46 Refit the overdrive gear.

47 Refit the adapter plate complete with the gear assembly in the transmission case.

48 Refit the overdrive gear needle bearing followed by the overdrive countergear and reverse idler shaft.

49 On 2WD models, refit the reverse gear bushing with the speedometer gear drive.

50 Refit the reverse cone.

51 Refit the overdrive blocker ring on the overdrive countergear.

52 Refit the reverse countergear, needle bearing, reverse main gear, reverse idler gear and thrust washer, followed by the reverse hub.

53 On 2WD models, refit the mainshaft spacer and rear bearing.

54 Refit the countershaft gear rear bearing.

55 Remove the adapter plate assembly from the transmission case and mount it in the vise again.

56 Refit a new mainshaft C-ring and countershaft gear rear snap ring. With the proper ring refitted, the groove clearance should not exceed 0.004 in (0.1 mm).

57 Refit the reverse synchroniser assembly.

58 Measure the gear end play as described in Step 16.

59 Refit the overdrive rod and shift fork, line up the rod and fork holes and refit a new roll pin, using a hammer and suitable punch.

60 Refit the 1st/2nd, 3rd/4th and reverse shift forks on their synchroniser grooves.

61 Refit the striking rod to engage the shift forks, striker lever and interlock. Line up the rod and lever pin holes and refit a new roll pin, using a hammer and suitable punch.

Transmission case assembly

62 Apply suitable sealant to the contact surfaces of the transmission case.

63 Refit the adapter plate and gear assembly on the transmission case.

64 Coat the interlock check ball with multipurpose grease and insert the check ball and spring in the interlock stopper.

65 Apply sealant to the plug threads, refit the plug and tighten it to the specified torque.

66 Refit the stopper ring and secure it with a new main drive bearing snap ring.

67 Refit the front cover, using a new gasket. Coat the threads of the bottom 3 cover bolts with sealer and refit all of the front cover bolts. Tighten the bolts to the specified torque.

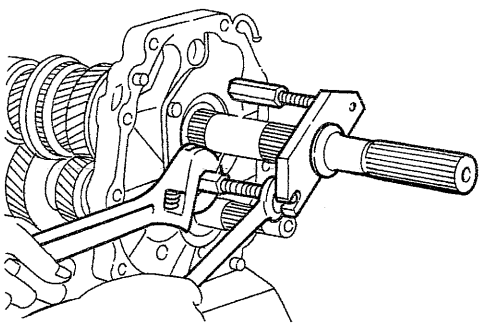
68 Apply suitable sealer to the contact surfaces of the adapter plate.

69 Refit the extension housing (2WD) or overdrive housing (4WD) to the adapter plate with the striking arm.

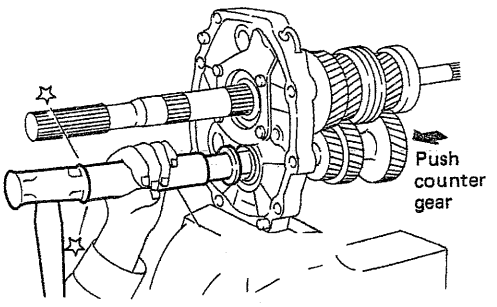
70 Line up the pin holes and refit a new roll pin in the striking arm, using a hammer and suitable size punch.

71 Refit the control housing check ball and return spring (refer to illustration 6.6).

72 Apply sealer to the extension housing or overdrive gearcase mounting surfaces and refit the control housing and bolts. Tighten the bolts to the specified torque.



4.44 Special tools are required for countergear refitting



4.45 Push on the countergear while refitting the bushing by tapping the tool with a hammer

5 FS5R50A 5-speed transmission - overhaul

Note: *The FS4R50A 4-speed transmission is very similar to the FS5R50A unit. Follow the procedures in this Section to overhaul the 4-speed model.*

Disassembly

1 Remove all of the external components from the transmission. These include the Shifter assembly, clutch housing, PTO assembly and the transfer case.
2 Remove the overdrive components from the rear, then remove the overdrive housing.
3 Remove the snap-ring from the rear of the unit, then remove the C-rings and their holder.
4 Use a gear puller to remove the mainshaft rear bearing. Remove the spacer behind it.
5 Remove the countergear snap-ring.
6 Use a puller to remove the overdrive countergear and the overdrive synchro assembly.
7 Use a special puller to extract the overdrive gear bush.
8 Remove the bearing retainer.
9 Remove the overdrive main gear using a gear puller.
10 Remove the mainshaft bearing snap-ring. Remove the mainshaft bearing using a puller.
11 Suspend the mainshaft assembly with two ropes from a secure work bench, then remove the front cover.
12 Remove the countergear front and rear bearing outer races. Allow the countergear assembly to rest on the bottom of the transmission housing.
13 Remove the main drive gear assembly, positioning the flat portion of the clutch gear to the top as you do so.
14 Lift the mainshaft assembly from the case.
15 Lift the countergear assembly from the case.
16 Remove the small lock tab from the end of the reverse idler shaft.
17 Remove the reverse idler assembly components.
18 Use a press and a bearing separator to disassemble the components from the assemblies you have removed.
19 Lay the components of each assembly out in order on a clean work surface. **Caution: Many components must face one direction only!** *It is critical that all components are laid out so that the direction they were facing is maintained.*

Component check

20 Check the endplay of all gears. Refer to the Specifications in this Chapter.
21 Check the clearance between each baulk ring and its gear. Refer to the Specifications in this Chapter.
22 Carefully inspect every component for wear and damage. Renew all components as required.

Assembly

23 Reverse the disassembly procedure to reassemble the transmission.
24 The open areas of the shift insert springs in the synchroniser assemblies must be positioned so that they are not in alignment.
25 The first and second gear baulk rings are different. Do not interchange them.
26 Choose selective-fit snap-rings to minimise groove clearance wherever possible. Refer to the Specifications in this Chapter.
27 Check the clearance between the baulk ring and the synchroniser cone on the countergear. Apply white grease to the steel ball used in the subgear assembly.
28 Apply sealer to the threads of the five lower front cover bolts and the upper three bolts in the overdrive gear (extension) housing.
29 Also apply sealer to the threads of the bolts in the gear selector housing.
30 Renew all seals and fill the unit with the lubricant listed in the Specifications in Chapter 1.

Chapter 7 Part B
Automatic transmission

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Power shift (mode) switch - check and renewal	7
Transmission rear oil seal - renewal	6
Shift linkage - check and adjustment	3
Transmission mount - check and renewal	5

Specifications

Model number	RE4R03A

Torque specifications

	Nm
Transmission-to-engine bolts	50
Torque converter to driveplate bolts	39 to 49
Transmission mount-to-rear crossmember bolts	59
Rear crossmember-to-frame rail bolts	59

1 General information

All models which are equipped with automatic transmissions use an electronically-controlled 4 speed automatic over drive unit with a lock-up torque converter. The operation of the transmission is controlled by several electronic sensors such as the vehicle speed sensor, engine speed sensor, throttle sensor, etc.

Because of the complexity of the clutch mechanisms and the hydraulic control systems, and because of the special tools and expertise needed to rebuild an automatic transmission, this work is usually beyond the scope of the home mechanic. The procedures in this Chapter are therefore limited to general diagnosis, routine maintenance, adjustments and transmission removal and refitting.

Should the transmission require major repair work, take it to a dealer service department or a transmission repair shop. You can, however, save the expense of removing and refitting the transmission by doing it yourself.

2 Diagnosis - general

Note: *Automatic transmission malfunctions may be caused by five general conditions: sensor malfunction, poor engine performance, improper adjustments, hydraulic malfunctions or mechanical malfunctions. Diagnosis of these problems should always begin with a check of the easily repaired items: fluid level and condition* (see Chapter 1)*, shift linkage adjustment and throttle linkage adjustment. Next, perform a road test to determine if the problem has been corrected or if more diagnosis is necessary. If the problem persists after the preliminary tests and corrections are completed, additional diagnosis should be done by a dealer service department or transmission repair shop. Refer to the* Troubleshooting section *at the front of this manual for information on symptoms of transmission problems.*

Preliminary checks

1 Drive the vehicle to warm the transmission to normal operating temperature.

2 Check the fluid level as described in Chapter 1:

a) *If the fluid level is unusually low, add enough fluid to bring the level within the designated area of the dipstick, then check for external leaks* (see below).

b) *If the fluid level is abnormally high, drain off the excess, then check the drained fluid for contamination by coolant. The presence of engine coolant in the automatic transmission fluid indicates that a failure has occurred in the internal radiator walls that separate the coolant from the transmission fluid* (see Chapter 3).

c) *If the fluid is foaming, drain it and refill the transmission, then check for coolant in the fluid or a high fluid level.*

3 Check the engine idle speed. **Note:** *If the engine is malfunctioning, do not proceed with the preliminary checks until it has been repaired and runs normally.*

4 Inspect the shift linkage (see Section 3). Make sure that it's properly adjusted and that the linkage operates smoothly.

Fluid leak diagnosis

5 Most fluid leaks are easy to locate visually. Repair usually consists of renewing a seal or gasket. If a leak is difficult to find, the following procedure may help.

6 Identify the fluid. Make sure it's transmission fluid and not engine oil or brake fluid (automatic transmission fluid is a deep red colour).

7 Try to pinpoint the source of the leak. Drive the vehicle several kilometres, then park it over a large sheet of cardboard. After a minute or two, you should be able to locate the leak by determining the source of the fluid dripping onto the cardboard.

8 Make a careful visual inspection of the suspected component and the area immediately around it. Pay particular attention to gasket mating surfaces. A mirror is often helpful for finding leaks in areas that are hard to see.

9 If the leak still cannot be found, clean the suspected area thoroughly with a degreaser or solvent, then dry it.

10 Drive the vehicle for several kilometres at normal operating temperature and varying speeds. After driving the vehicle, visually inspect the suspected component again.

11 Once the leak has been located, the cause must be determined before it can be properly repaired. If a gasket is renewed but the sealing flange is bent, the new gasket will not stop the leak. The bent flange must be straightened.

12 Before attempting to repair a leak, check to make sure that the following conditions are corrected or they may cause another leak. **Note:** *Some of the following conditions cannot be fixed without highly specialised tools and expertise. Such problems must be referred to a transmission repair shop or a dealer service department.*

Gasket leaks

13 Check the pan periodically. Make sure the bolts are tight, no bolts are missing, the gasket is in good condition and the pan is flat (dents in the pan may indicate damage to the valve body inside).

14 If the pan gasket is leaking, the fluid level may be too high, the vent may be plugged, the pan bolts may be too tight, the pan sealing flange may be warped, the sealing surface of the transmission housing may be damaged, the gasket may be damaged or the transmission casting may be cracked or porous. If sealant instead of gasket material has been used to form a seal between the pan and the transmission housing, it may be the wrong sealant.

Seal leaks

Refer to illustration 2.15

15 If a transmission seal is leaking, the fluid level or pressure may be too high, the vent may be plugged, the seal bore may be damaged, the seal itself may be damaged or improperly refitted, the surface of the shaft protruding through the seal may be damaged or a loose bearing may be causing excessive shaft movement **(see illustration)**.

16 Make sure the dipstick tube seal is in good condition and the tube is properly seated. Periodically check the area around the revolution sensor for leakage. If transmission fluid is evident, check the O-ring for damage.

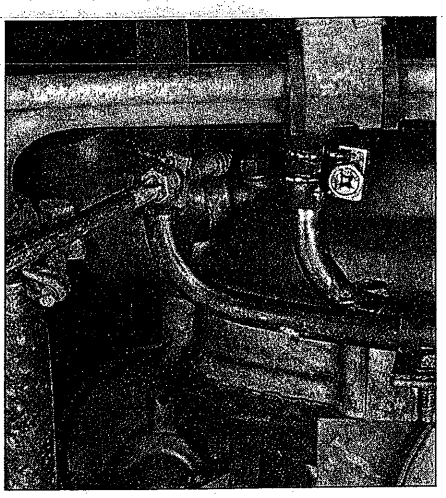
Case leaks

17 If the case itself appears to be leaking, the casting is porous and will have to be repaired or renewed.

18 Make sure the oil cooler hose fittings are tight and in good condition.

Fluid comes out of the vent pipe or fill tube

19 If this condition occurs, the transmission is overfilled, there is coolant in the fluid, the case is porous, the dipstick is incorrect, the vent is plugged or the drain back holes are plugged.



2.15 Many transmission fluid leaks are caused by bad connections, damaged hoses, loose clamps, etc. Always check these fittings before investigating more difficult components

Road test

DRIVE range

20 While stopped, position the lever in the DRIVE range and accelerate. Check for a 1-2 shift, 2-3 shift and 3-OD shift. Also, the converter should lock-up in second, third or OD gear when it is warm, depending on calibration. Check for part throttle downshift by depressing the accelerator 3/4 of the way - the transmission should downshift. Check for full detent downshift by depressing the throttle all the way - the transmission should immediately downshift.

Range 2

21 At speed, shift the transmission to Range 2. The transmission should down shift immediately. It should not shift back to Overdrive. Also check for part throttle and full throttle downshifts in this range.

Low range

22 Position the lever in Low position and check the operation.

Overrun braking

23 This can be checked by manually shifting to a lower range. Engine rpm should increase and a braking effect should be noticed.

Reverse

24 Position the shifter in Reverse and check operation.

25 Verify that the engine is not at fault. If the engine has not received a tune-up recently, refer to Chapter 1 and make sure all engine components are functioning properly.

26 Check the condition of all electrical lines

and fittings at the transmission, or leading to it.

27 Check for proper adjustment of the shift linkage (see Section 3).

28 If at this point a problem remains, there is one final check before the transmission is removed for overhaul. The vehicle should be taken to a transmission specialist who will connect a special oil pressure gauge and check the line pressure in the transmission.

Self diagnosis system

29 The self diagnostic system is built into the electronic control system of the transmission. A malfunction is indicated by the power shift light on the dash.

30 To access the self diagnostic codes for the transmission, start by warming the engine and transmission fully, then turn the ignition OFF.

31 Set the power shift switch to the AUTO position.

32 Select PARK.

33 Turn the key ON. The power shift light should come on for about two seconds. If it does not, go to Step 30 again.

34 If the light came on, turn the key OFF. Select D.

35 Set the power shift switch to POWER. Turn the key ON.

36 Select 2. Set the power shift switch to AUTO.

37 Select 1. Set the power shift switch to POWER.

38 Push the throttle pedal to the floor and then release it fully.

39 Read the power shift light on the dash to check the trouble codes. There will be a long flash which is the start signal, followed by ten shorter flashes. Study the following chart to determine which, if any, trouble code(s) are present in your system.

Problem	Cause
10 short flashes	All systems are functioning properly
First flash is longer than the others	Revolution sensor circuit failure
Second flash is longer than the others	Speed sensor circuit failure
Third flash is longer than the others	Throttle sensor circuit failure
Fourth flash is longer than the others	Shift solenoid A circuit failure
Fifth flash is longer than the others	Shift solenoid B circuit failure
Sixth flash is longer than the others	Overrun clutch solenoid circuit failure
Seventh flash is longer than the others	Lock-up solenoid circuit failure
Eighth flash is longer than the others	Fluid temperature sensor circuit failure
Ninth flash is longer than the others	Engine revolution signal circuit failure
Tenth flash is longer than the others	Line pressure solenoid circuit failure
Five long flashes	Battery is low, connected improperly or has been disconnected a long time
Light stays on steadily	Inhibitor switch, power shift switch, kickdown switch or idle switch circuit is disconnected or the control unit is damaged

40 Most of these trouble codes will require an automatic transmission specialist to properly diagnose and repair the problem. Running the self diagnosis test, however, will allow you to know if the problem is in the electronic controls area or in some other area of the vehicle.

3 Shift linkage - check and adjustment

1 This adjustment should not be considered routine and does not have to be done unless wear in the linkage or misalignment of the shift position indicator occurs.

Check

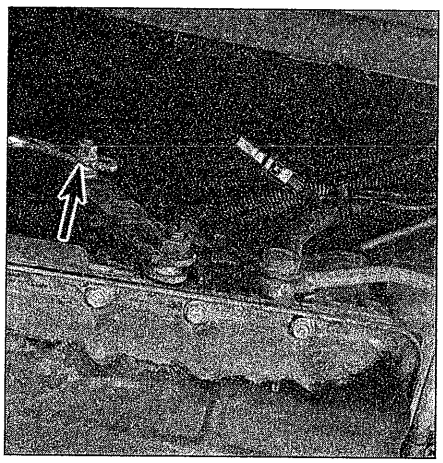
2 Move the shift lever through the gear ranges and make sure the transmission responds accordingly. Position the lever in Neutral and see if the transmission shifts to Neutral. Check to see if the shift position indicator registers correctly with the lever in each detent position.

3 If adjustment is required, the vehicle must be raised and supported securely on jackstands.

Adjustment

Refer to illustration 3.5

4 Select PARK with the gear shift lever in the vehicle.



3.5 Loosen this lock-nut (arrow) to make adjustments to the shift control mechanism. There must be a definite click or detent felt as the lever is moved between all gears

5 Loosen the lock-nut on the linkage at the transmission **(see illustration)**. Make sure that the transmission lever is solidly in the PARK position.

6 Pull the rod to the rear and release it. Make sure that the select lever moves forward a little.

7 Tighten the lock-nut.

8 Make sure that the gear shift handle will move slightly forward and rearward without pushing the button.

9 Operate the vehicle in all gears and check for correct alignment of the indicator and proper transmission operation.

4 Inhibitor switch - check, renewal and adjustment

1 The inhibitor switch is located on the right side of the transmission housing. One of its purposes is to allow the starter to operate only when the selector lever is in Neutral or Park. It also operates the back-up lights when the lever is in Reverse and informs the ECU of the gear selected.

2 If the engine can be started with the shift lever in any position other than Park or Neutral, the inhibitor switch should be checked and adjusted and, if necessary, renewed.

Check

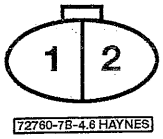
Refer to illustrations 4.6 and 4.7

3 Raise the vehicle and support it securely with jackstands.

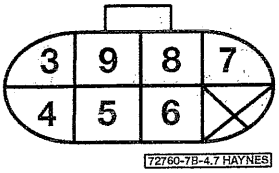
4 Disconnect the negative battery cable.

5 Disconnect the inhibitor switch wiring connectors.

6 Connect an ohmmeter between termi-



4.6 This is the inhibitor switch wiring connector for the neutral start switch



4.7 This other wiring connector is for providing information to the ECU as to the gear which has been selected

nals 1 and 2 as shown **(see illustration)**. There should be zero resistance when the transmission is in NEUTRAL and PARK. There should be infinite resistance in all other gears.

7 Check the resistance between terminal 3 and terminal 4, then terminal 3 and terminal 5, terminal 3 and terminal 6, etc **(see illustration)**.

8 There should be continuity (zero resistance) when the lever is in PARK, REVERSE, NEUTRAL, D, 2 and 1.

9 If the switch does not respond correctly, try the adjustment procedure. If it does not help, renew the switch.

Adjustment

Refer to illustration 4.10

10 Disconnect the shift linkage assembly from the transmission **(see illustration)**.

11 Place the transmission in NEUTRAL.

12 Loosen the switch mounting screws and put a 4 mm drill through the adjustment hole in the lever.

13 Rotate the switch until the drill drops easily into the hole in the switch.

14 Tighten the switch screws and connect the shift linkage rod.

Renewal

15 Disconnect the wiring from the switch.

16 Place the transmission into first gear and then remove the switch.

17 Refitting is the reverse of removal.

5 Transmission mount - check and renewal

Refer to illustration 6.3

1 Insert a large screwdriver or lever into the space between the transmission mount and the bracket and try to prise the transmission up slightly.

2 The transmission should not move away from the bracket very far.

3 If it is necessary to renew the mount, support the transmission with a jack and remove the mount-to-crossmember bolts and nuts, then separate the mount and lower it from the vehicle **(see illustration)**.

4 Refitting is the reverse of removal.

6 Transmission rear oil seal - renewal

1 Remove the transfer case (refer to Chapter 7C).

2 Place a drain pan beneath the rear of the transmission.

3 Use a seal puller or a large screwdriver to remove the seal.

4 Apply transmission fluid to the new seal and use a large socket with a hammer to drive it squarely onto place.

5 The remainder of refitting is the reverse of removal.

7 Power shift (mode) switch - check and renewal

Check

Models with power shift switch on lever

1 Remove the switch from the lever and disconnect the wiring.

2 Connect an ohmmeter to the terminals. With the switch set to POWER, there should be zero resistance. With the switch set to AUTO, there should be infinite resistance.

3 If the readings are not close, renew the unit.

Models with mode switch on dash

4 Remove the switch from the dash and disconnect the wiring.

5 Connect an ohmmeter between terminals 2 and 7. There should be continuity (zero resistance) when the switch is set to POWER.

6 Connect the ohmmeter between terminals 2 and 3. There should be continuity (zero resistance) when the switch is set to HOLD.

7 If the readings are not close, renew the unit.

Note: *On later models with the mode switch in the dash, there is an overdrive switch in the shift lever. This switch can be tested by levering it out of the handle and then using an ohmmeter to verify that it has continuity only in the OFF position.*

Renewal

Models with power shift switch on lever

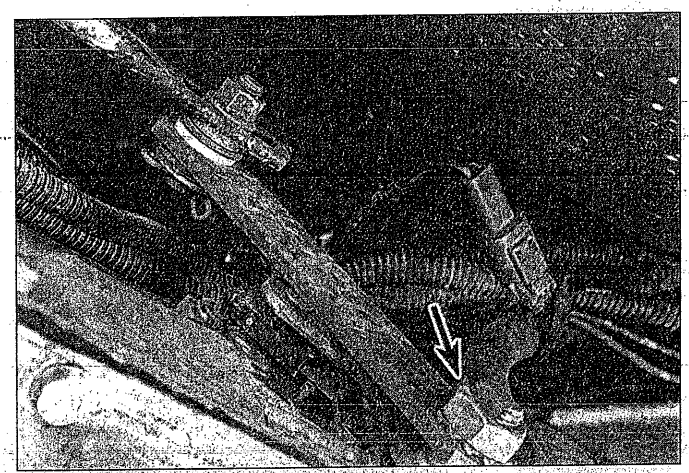
8 Use a small screwdriver to carefully lever the power shift assembly from the shift lever.

9 Disconnect the wiring from the switch and pull it from the lever.

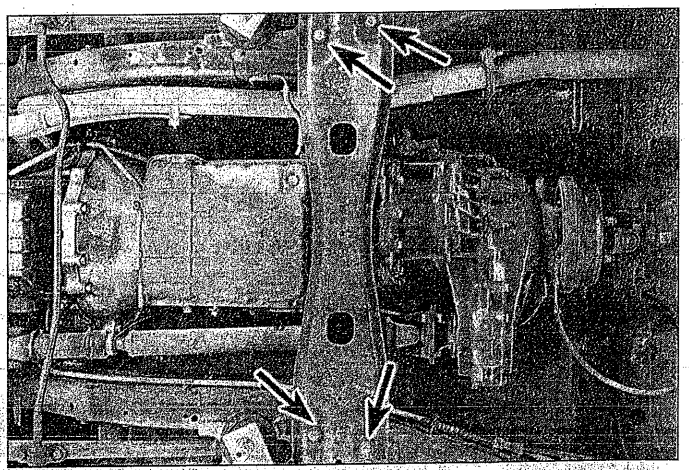
Models with mode switch on dash

10 Use a small screwdriver to carefully lever the switch from the dash.

11 Disconnect the wiring from the switch.



4.10 Remove this nut (arrow) to disconnect the shift linkage and expose the inhibitor switch components



6.3 After the transfer case assembly has been removed, and the transmission supported, remove these bolts (arrows) to release the rear crossmember

8 Automatic transmission - removal and refitting

1 Disconnect the cable from the negative battery terminal.
2 Raise the vehicle and support it securely with jackstands.
3 Remove the console (refer to Chapter 11).
4 Disconnect the parking brake cable from the lever.
5 Disconnect the cable housing from the retainer and push it through the floor.
6 Remove the transfer case (refer to Chapter 7C).
7 Disconnect the interfering wiring and hoses from the transmission.
8 Remove the dipstick tube.
9 Remove the starter (refer to Chapter 5).
10 Remove the rear engine cover plate.
11 Use a dab of paint to mark the alignment of the torque converter to the driveplate. Remove the four torque converter bolts. It will be necessary to rotate the engine with a flywheel turning tool or a ratchet on the front crankshaft pulley in order to reach all four bolts.
12 Disconnect the shift linkage at the transmission.
13 Drain the transmission fluid (refer to Chapter 1).
14 Remove the insulators from the exhaust bracket.
15 Disconnect the transmission fluid cooler lines from the transmission. Plug the lines and the transmission ports to prevent debris from entering.
16 Support the transmission with a jack - preferably a special jack made for this purpose. Safety chains will help steady the transmission on the jack. A flat piece of wood on he jack will prevent the transmission pan from being pushed inward against the valve body.
17 Remove the bolts securing the transmission mount to the rear crossmember.
18 Raise the transmission slightly, then detach the nuts and bolts securing the rear crossmember to the frame rails and remove the crossmember.
19 Remove the remaining bolts securing the transmission to the engine. **Caution:** *The transmission is heavy and awkward. It is best to have an assistant available to help in maneuvering the unit away from the engine and out from under the vehicle. If it is dropped, the case may be cracked and the entire unit may have to be renewed.*
20 Make a final check that all wires and hoses have been disconnected from the transmission and transfer case and then move the transmission and jack toward the rear of the vehicle until the torque converter housing is clear of the engine dowel pins. Make sure the torque converter is detached from the driveplate. Secure the torque converter to the transmission with wire so that it will not fall out during removal. Lower the transmission and remove it from under the vehicle.
21 Make sure the torque converter is fully engaged in the transmission prior to refitting. The faces of the torque converter nuts must be at least 25 mm to the rear of the housing flange. If they are not al least this far recessed, spin the converter while pushing it deeper onto the front pump assembly.
22 The remainder of the refitting the reverse of removal. Be sure to refill the cooling system and the transmission with the required fluids (see Chapter 1). Adjust the shift linkage as described in this Chapter before road testing the vehicle. Refer to the appropriate Chapters for refitting of the starter and other components.

Notes

Chapter 7 Part C
Transfer case

Contents

	Section		Section
General information	1	Transfer case oil seals - renewal	2
Oil change	See Chapter 1	Transfer case - overhaul	4
Oil level check	See Chapter 1	Transfer case - removal and refitting	3

Specifications

Model number	TX12A
Front drive sprocket endplay	0.20 to 0.35 mm
Low gear endplay	0.20 to 0.35 mm
Baulk ring to gear clearance minimum	0.5 mm
Snap-ring-to-groove clearance maximum	0.15 mm
Countergear endplay	0 to 0.2 mm

Torque specifications

	Nm
Detent plugs	19 to 25
Front companion flange nut	225 to 325
Housing bolts	26 to 36
Input shaft bearing retainer bolts	19 to 21
Mainshaft bearing retainer screws	16 to 21
Parking brake backing plate bolts	42 to 52
Rear companion flange nut	295 to 450
Transfer case-to-engine bolts	32 to 42

1 General information

All models are equipped with a transfer case mounted on the rear of the transmission. Drive is passed from the engine through the transmission and the transfer case to the rear and/or front wheels by the driveshafts.

Because of the special tools and techniques required, disassembly and overhaul of the transfer case should be left to a dealer or properly equipped shop. You can, however, remove and refitting the transfer case yourself and save the expense, even if the repair work is done by a specialist.

2 Transfer case oil seals - renewal

Front and rear oil seals

1 Raise the vehicle and support it on jackstands. Remove the transfer case rock guard (if equipped) and drain the oil.

2 Mark the position of the appropriate driveshaft flange in relation to the transfer case flange. Remove the bolts and disconnect the driveshaft (refer to Chapter 8).

3 Remove the locknut from the transfer case companion flange. To keep the flange from turning, refitting two of the driveshaft mounting bolts and engage a strong lever between them. The nuts are very tight. It may be necessary to use a large breaker bar or a section of pipe on the end of the breaker bar.

4 Using a conventional gear puller, remove the companion flange.

5 Carefully prise the oil seal out with a seal puller or a screwdriver, being sure not to scratch or damage the seal bore in the case. A block of wood placed between the screwdriver and case can provide additional leverage. **Note:** *If available, it is better to use a seal puller specifically designed for this purpose. This type of device uses a screw mechanism and operates similar to a gear puller. Check your local rental facility and obtain one if possible.*

6 Lubricate the lip of the new seal with gear oil and tap it into position with a socket and a hammer.

7 Place the companion flange into position. Refitting the lock-nut and tighten it to the specified torque.

8 Refitting the driveshaft, being sure the flange marks made during removal are aligned.

9 Refill the transfer case with oil, referring to Chapter 1 if necessary.

Shift shaft oil seal

10 Disconnect the control rod from the transfer case outer shift lever.

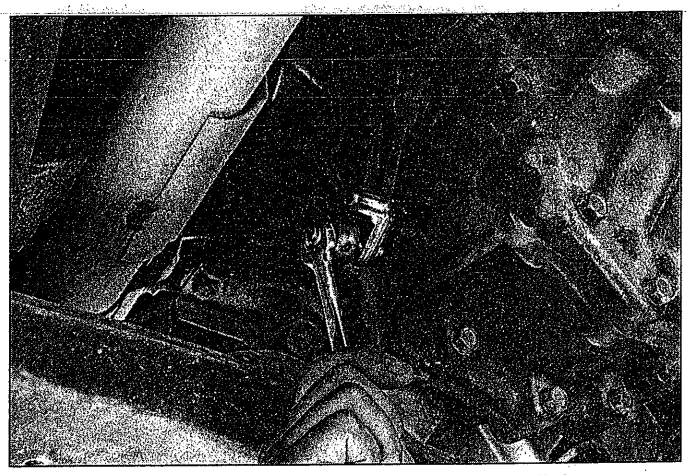
11 Remove the outer shift lever.

12 Carefully prise the oil seal out with a seal puller or a screwdriver, being sure not to scratch or damage the seal bore in the case. A block of wood placed between the screwdriver and case can provide additional leverage.

13 Lubricate the lip of the new seal with gear oil and tap it into position with a socket and a hammer.

14 Refitting the components previously removed.

3.4a Peel back this rubber cover to access the transfer case shift linkage rod connection



3.4b Remove the lock-nut to disconnect the linkage from the transfer case

3 Transfer case - removal and refitting

Refer to illustrations 3.4a and 3.4b

1 Raise the vehicle and support it securely with jackstands.
2 Drain both the transfer case and the transmission (refer to Chapter 1).
3 Remove both driveshafts (refer to Chapter 8).
4 Peel back the rubber boot and disconnect the shift control lever from the transfer case **(see illustrations)**. Do not lose the spacer or washer.
5 Release the parking brake. Remove the parking brake drum.
6 Remove the locknut from the transfer case companion flange. To keep the flange from turning, refitting two of the driveshaft mounting bolts and engage a strong lever between them. The nuts are very tight. It may be necessary to use a large breaker bar or a section of pipe on the end of the breaker bar. Using a conventional gear puller, remove the companion flange.
7 Remove the parking brake assembly and hang it out of the way with a wire.
8 Place a floor jack under the rear of the transmission with a piece of wood between them.
9 Unbolt the rear crossmember from the frame rails.
10 Lower the transmission/transfer case assembly as much as possible.
11 Disconnect any interfering wiring and hoses from the transfer case.
12 Unbolt the transfer case from the transmission. Leave one bolt in to hold the units together temporarily.
13 Jack up the transmission and refitting the bolts in the crossmember.
14 Move the floor jack to the transfer case and tie the transfer case to the jack for safety.
15 Remove the last bolt and remove the transfer case from the vehicle. **Note:** *The unit is heavy and difficult to balance. Get an assistant to help you if possible.*
16 Refitting is the reverse of removal.

4 Transfer case - overhaul

Disassembly

1 Remove the speedometer drive. Remove the nuts from the front and the rear companion flanges. It will be necessary to hold the shafts from turning with a special tool.
2 Remove the parking brake drum.
3 Use a puller to remove both companion flanges.
4 Remove the parking brake components.
5 Carefully separate the rear case using two large screwdrivers.
6 Remove the speedometer drive gear and also the oil tube.
7 Remove the snap-ring from the shift rod.
8 Measure the endplay in the front drive sprocket. Compare your reading to that listed in the Specifications in this Chapter.
9 Use a puller to remove the mainshaft rear bearing.
10 Lift out the two/four shift fork and coupling sleeve assembly.
11 Tap out the entire chain drive assembly complete with the drive shaft and front drive sprocket.
12 Remove the bearing retainer.
13 Unbolt and separate the front and center cases.
14 Use a feeler gauge to measure the low gear endplay. Compare your reading to that listed in the Specifications in this Chapter.
15 Remove the snap-ring from the mainshaft.
16 Use a puller to remove the low gear and low/high hub assembly.
17 Tap the mainshaft out from the front.
18 remove the check balls, springs, plugs and switches from the front case.
19 Lift out the two/four shift rod from the front case.
20 Remove the low/high shift rod and fork assembly.
21 Lift the bearing from the main gear.
22 Remove the front case cover.
23 Use a soft-face hammer to tap out the countergear, main gear and the shift levers.
24 Use a press and a bearing separator as required to disassemble the individual components from the assemblies you have removed.
25 Lay the components of each assembly out in order on a clean work surface. **Caution:** *Many components must face one direction only! It is critical that all components are laid out so that the direction they were facing is maintained.*

Check

26 Check the endplay of low gear and the front drive sprocket. Refer to the Specifications in this Chapter.
27 Check the clearance between the baulk ring and its gear. Refer to the Specifications in this Chapter.
28 Carefully inspect every component for wear and damage. Renew all components as required.

Assembly

29 Reverse the disassembly procedure to reassemble the transfer case.
30 Choose selective-fit snap-rings to minimize groove clearance wherever possible. Refer to the Specifications in this Chapter.
31 Use sealer on the threads of the front cover bolts.
32 Renew all seals and fill the unit with the lubricant listed in the Specifications in Chapter 1.