

SERVICE MANUAL

Datsun

MODEL 510 SERIES
CHASSIS and BODY



SECTION TM

TRANSMISSION

TM

GENERAL DESCRIPTION	TM- 1
3-FORWARD SPEED TRANSMISSION	TM- 3
4-FORWARD SPEED TRANSMISSION	TM-14
AUTOMATIC TRANSMISSION	TM-19
TRANSMISSION GEAR CONTROL	TM-19
SERVICE DATA AND SPECIFICATIONS	TM-24
TROUBLE DIAGNOSES AND CORRECTIONS	TM-26

TRANSMISSION

GENERAL DESCRIPTION

The 510 series Datsun can be equipped with either of three manual transmissions or a three speed automatic transmission. The manual units are designed and built by Nissan Motor Corporation and the automatic transmission is manufactured by Borg-Warner.

Service and repair instructions for the Borg-Warner automatic transmission are given in a separate manual.

The designs of the three manual transmissions are almost the same. The transmission case and the rear extension housing manufactured from cast aluminum alloy and the clutch housing and transmission case are integral.

The rear extension housing is detachable from the transmission case. At the bottom of the transmission case a cover is provided for easy servicing.

The main shaft and main drive gear are supported by two ball bearings. A spline at the end of the main shaft allows fore and aft movement of the propeller shaft.

All transmissions use a Borg-Warner type synchronize mechanism except for the Datsun Sports Sedan which utilizes a Servo type synchronizer.

APPLICATION OF TRANSMISSION MODELS

Type of transmission	Operating method and synchro. system	Vehicle model	Speedometer gear	Final gear ratio
3-Forward speed (R3W65L)	Column shift Borg-Warner type synchro.	510-(S)U	19/5	4.375
		L510-(S)	19/5	4.375
		P510-(S)U	17/5	3.900
		PL510-(S)	17/5	3.900
		WP510-U	17/5	3.889
		WPL510	17/5	3.889
4-Forward speed (F4W63L)	Floor shift Borg-Warner type synchro.	P510-(S)UT	16/5	3.700
		PL510-(S)T	16/5	3.700
		PL510-UT	16/5	3.700
		WP510-UT	16/5	3.700
		WPL510-T	16/5	3.700
		WPL510-UT	16/5	3.700
4-Forward speed (F4C63L)	Floor shift Servo type synchro.	P510-UTK	16/5	3.700
		PL510-TK	16/5	3.700
BW automatic transmission (AS18-35EC)	Column shift	P510-UA	17/5	3.900
		PL510-A	17/5	3.900
		PL510-UA	17/5	3.900

CHASSIS

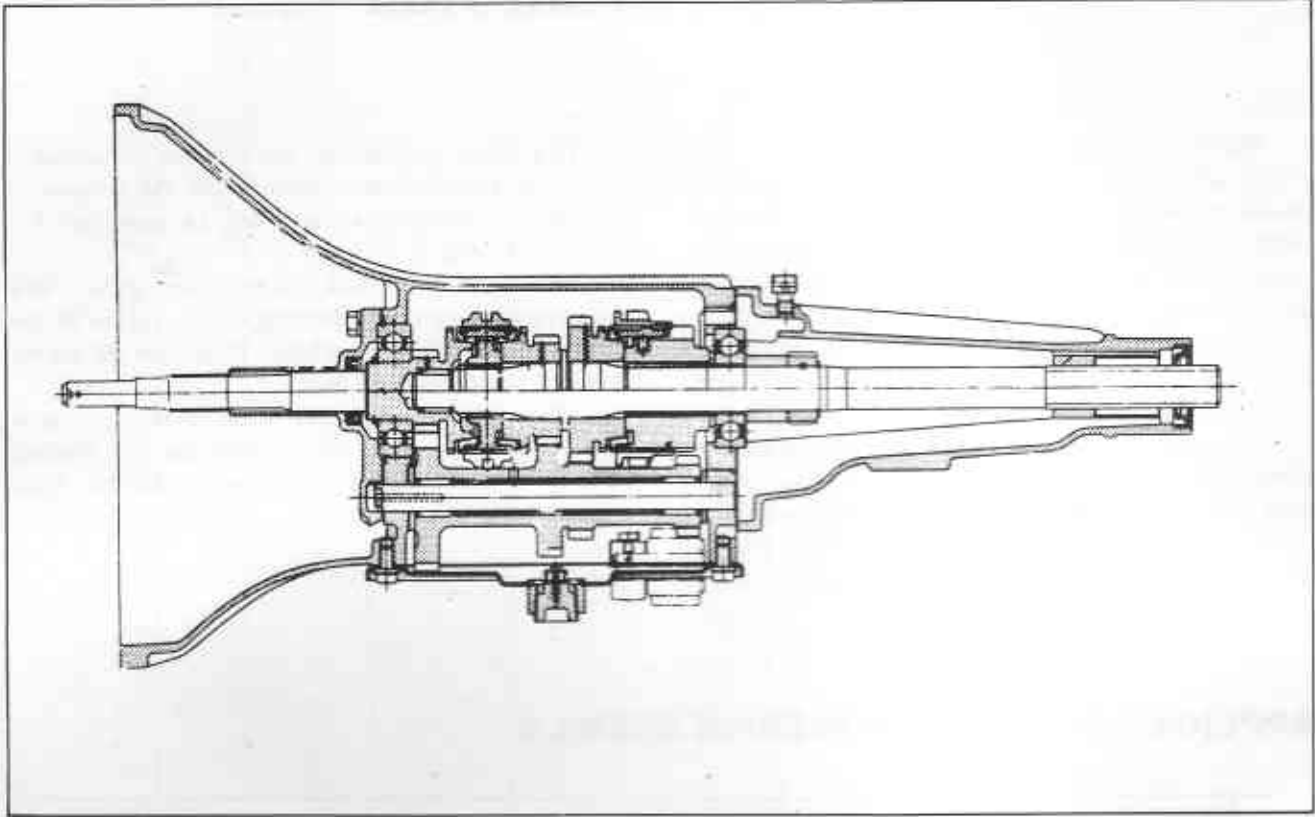


Fig. TM-1 3-Forward speed transmission

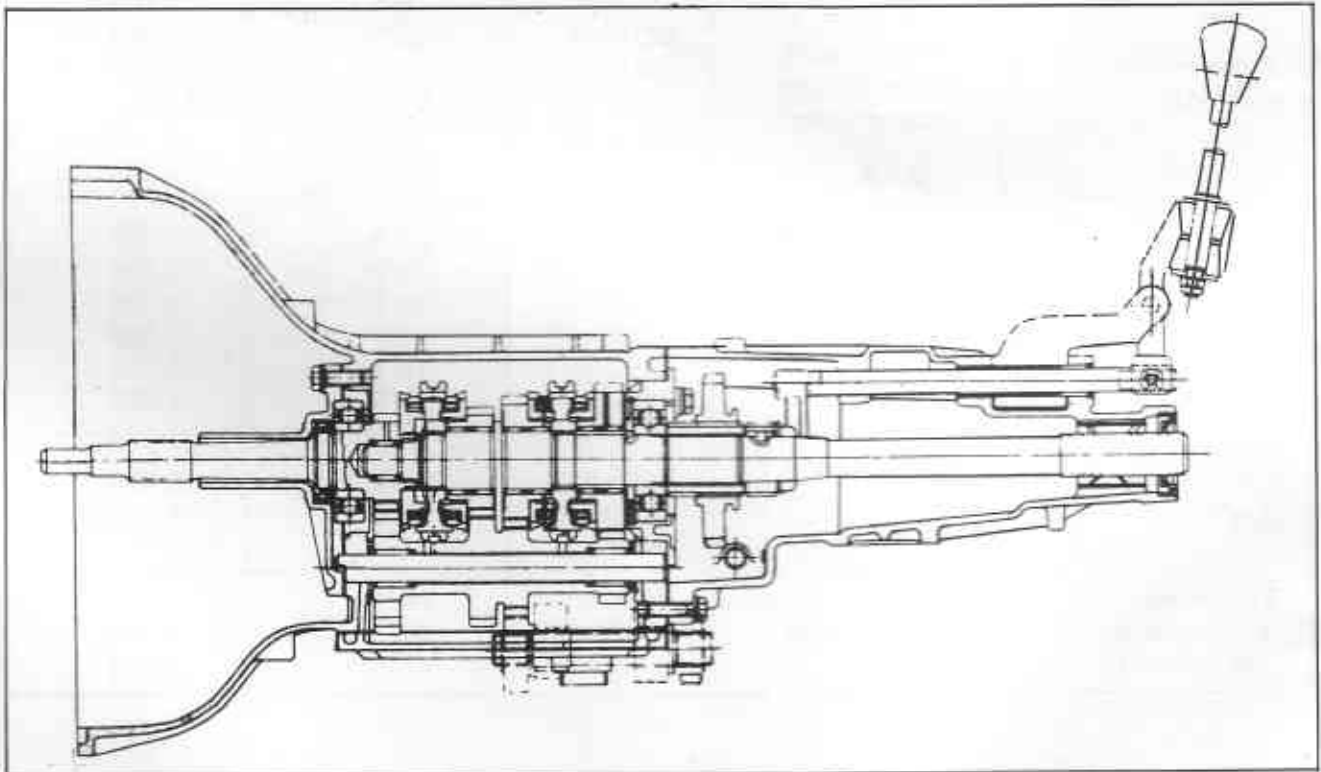


Fig. TM-2 4-Forward speed transmission

TRANSMISSION

3-FORWARD SPEED TRANSMISSION

CONTENTS

REMOVAL	TM-4	Oil seals	TM-10
DISASSEMBLY	TM-5	ASSEMBLY	TM-10
INSPECTION AND REPAIR	TM-9	Main drive gear	TM-10
Transmission case and rear extension housing	TM-9	Synchronizer assembly	TM-10
Bearings	TM-9	Main shaft assembly	TM-12
Gears and shafts	TM-9	Gear assembly transmission case and rear extension housing	TM-12
Baulk rings	TM-9	INSTALLATION	TM-13
Selector and shifting mechanism	TM-9		

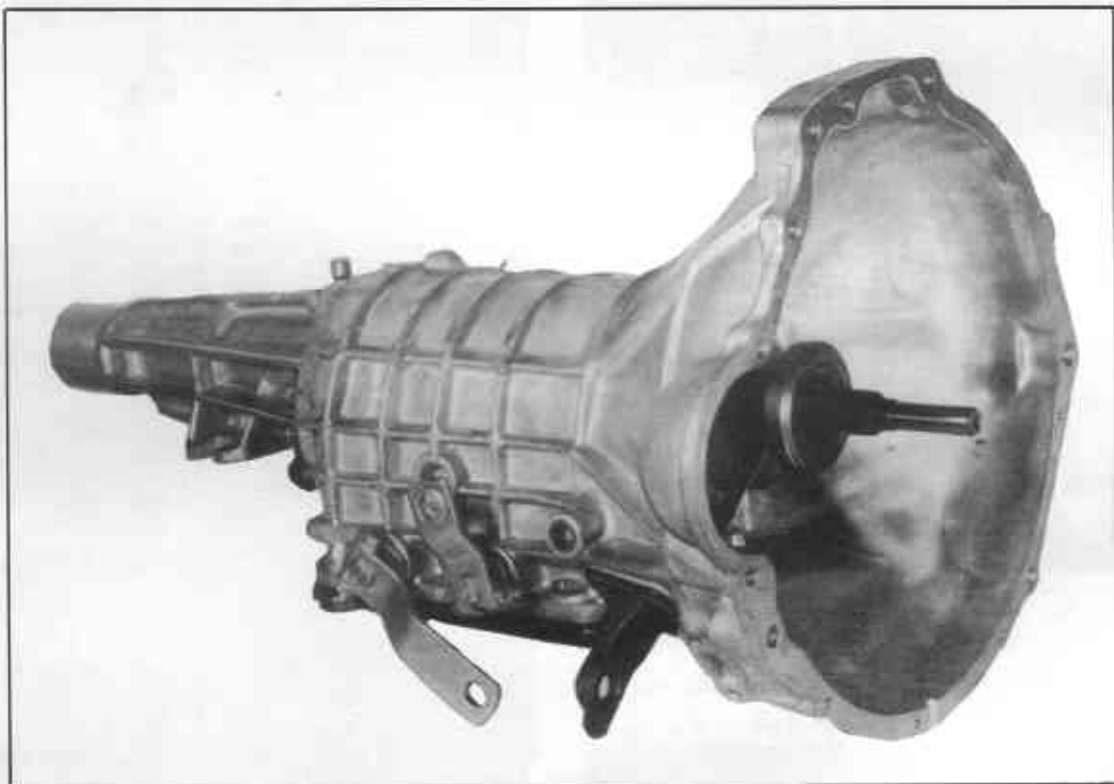


Fig. TM-3 3-Forward speed transmission

CHASSIS

REMOVAL

When removing the transmission from the vehicle it is necessary to follow the undermentioned procedure.

1. Jack up the vehicle and support it with four stands. If available a hydraulic hoist or open pit can be utilized.

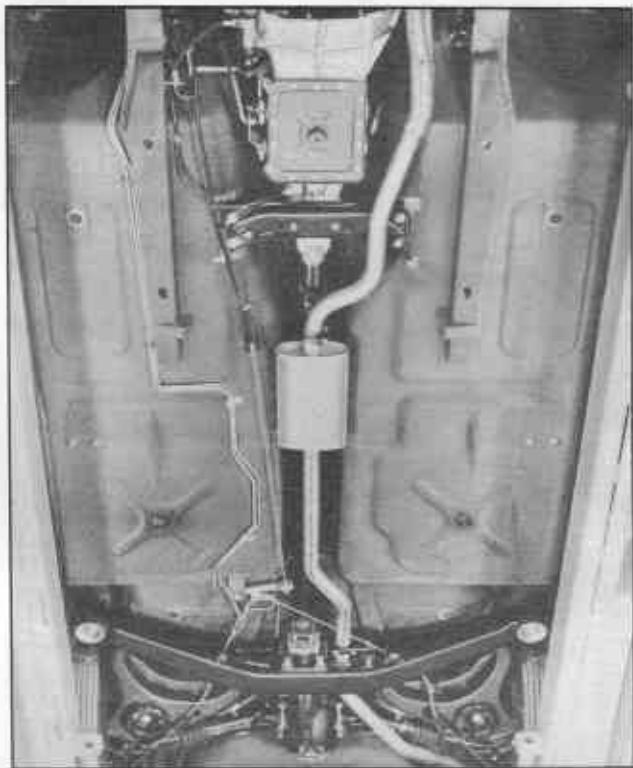


Fig. TM-4 Underside of vehicle

2. Disconnect the hand brake wire at the equalizer pivot as shown in Figure TM-5.

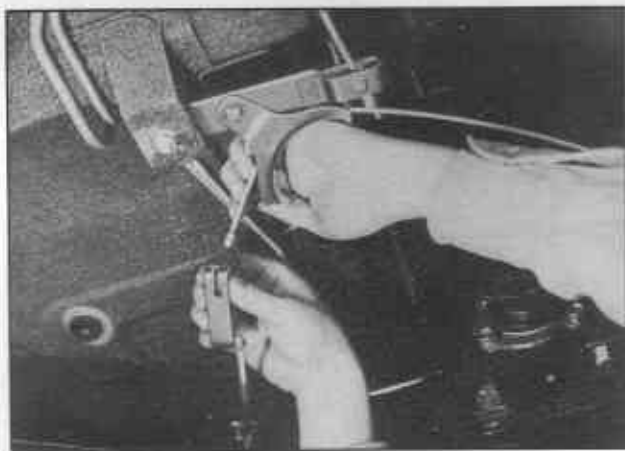


Fig. TM-5 Disconnecting hand brake wire

3. Loosen the two exhaust center pipe clamps and turn the pre-muffler complete with center pipe to the left as shown in Figure TM-6. This will allow sufficient room for the propeller shaft to be removed.

4. Remove the propeller shaft by disconnecting the four securing bolts at the companion flange of the gear carrier. Seal the end of the rear extension housing to prevent oil leakage.

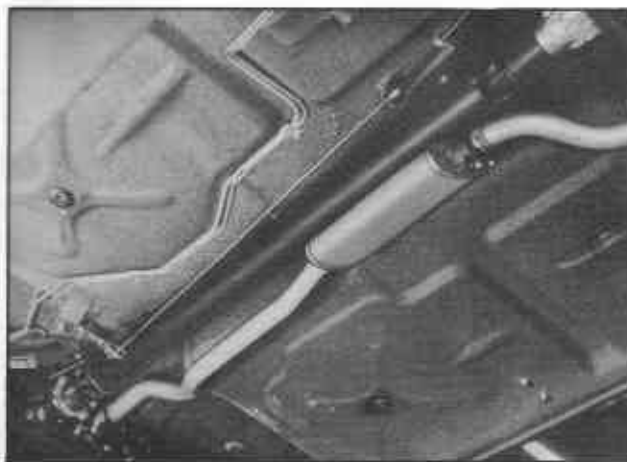


Fig. TM-6 Removing propeller shaft

5. Disconnect the speedometer drive cable from the adapter in the transmission extension housing (See Fig. TM-7).



Fig. TM-7 Disconnecting speedometer cable

6. Disconnect the lower shift rods from the shift levers and remove the cross shaft assembly from the transmission case (See Fig. TM-8).

TRANSMISSION

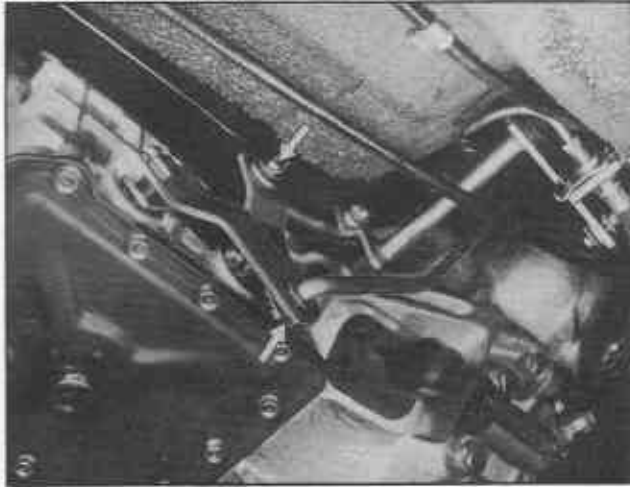


Fig. TM-8 Disconnecting remote control linkage

7. Remove the clutch operating cylinder from the clutch housing.



Fig. TM-9 Detaching clutch operating cylinder

5. Support the engine with a jack placed under the oil pan. Do not locate the jack under the oil pan drain plug. To prevent damage to the oil pan insert a wooden block between the pan and jack.

9. Remove the two bolts attaching the transmission to the rear engine mount. Place a jack under the transmission and remove the four bolts fixing the rear engine mounting cross member to the body.

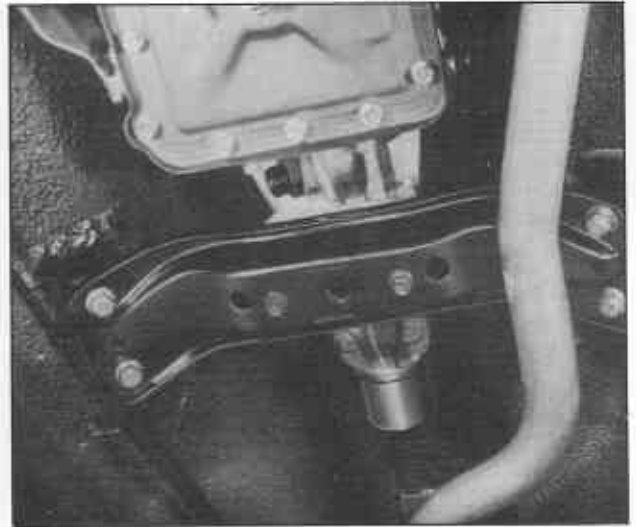


Fig. TM-10 Cross member removal

10. Lower the jack supporting the engine to incline the engine in a rearward direction. This will allow sufficient room for the transmission to be removed.

11. Remove the starting motor and the bolts attaching the clutch housing to the engine.

12. Lower the jack gradually and withdraw the transmission.

DISASSEMBLY

When disassembling the transmission the following procedure should be adopted. Since the casings are manufactured from aluminum alloy care should be taken not to damage any of the castings.

1. Drain gear oil from the transmission.

2. Remove the dust cover, and release the retainer spring securing the withdrawal lever and remove the lever complete with release bearing from the clutch housing.

CHASSIS

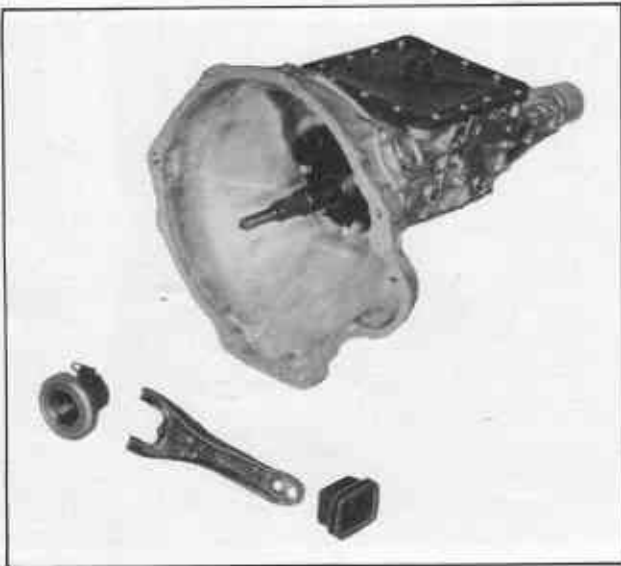


Fig. TM-11 Withdrawal lever and release bearing

3. Remove the fourteen bolts attaching the bottom cover to the transmission case and remove the bottom cover.

4. Remove the speedometer pinion assembly.

5. Remove the six bolts securing the rear extension housing and remove the housing (See Fig. TM-12).

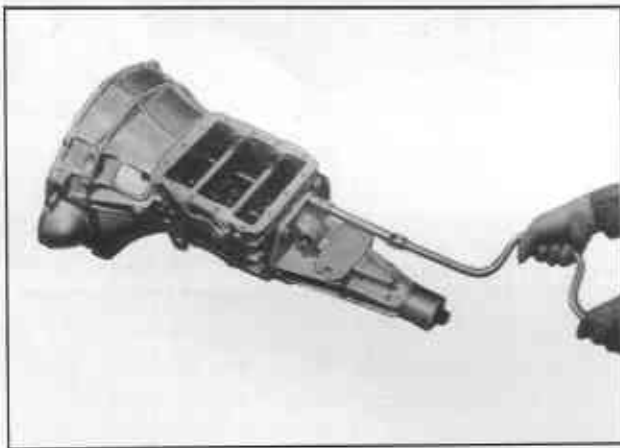


Fig. TM-12 Removing the rear extension housing

6. Take out the retaining ring of securing the cross shaft (See Fig. TM-35 item 5).

7. Unscrew the nuts securing the operating lever lock pins. With the use of a hammer and punch, drive pins out of position then remove both cross shafts.

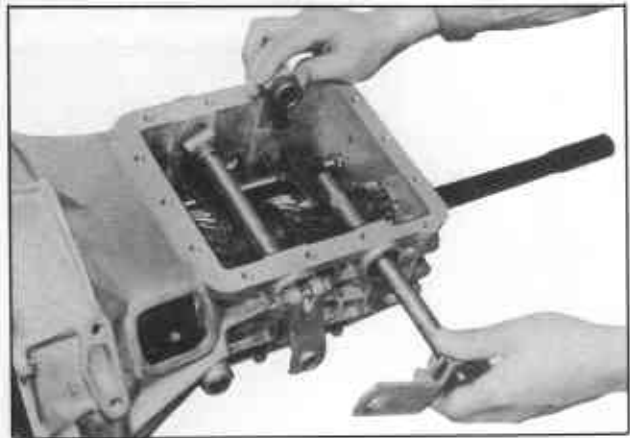


Fig. TM-13 Cross shaft removal

8. Remove the transmission front cover.

9. Withdraw the counter shaft and remove the counter gear with the two needle roller bearings and spacers.



Fig. TM-14 Counter gear removal

10. Remove the lock bolt securing the reverse idler shaft.

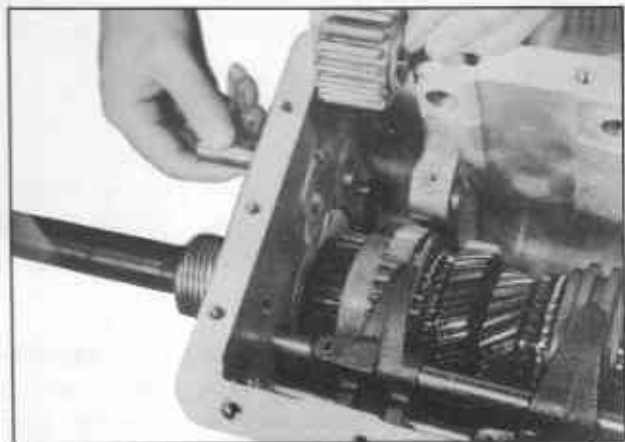


Fig. TM-15 Reverse idler gear removal

TRANSMISSION

11. Remove the reverse idler shaft and gear.
12. Drive out the pins securing the forks to the fork rods.
13. Unscrew the inter-lock plug and remove the check ball and spring as shown in Figure TM-16.

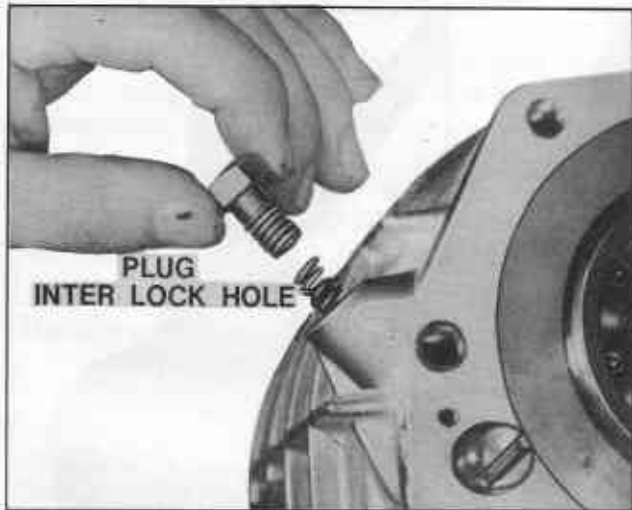


Fig. TM-16 Removing the inter-lock plug

14. Remove the 1st and reverse fork rod and 2nd and 3rd speed fork rod and withdraw both forks.
15. Withdraw the main shaft gear assembly as shown in Figure TM-17.

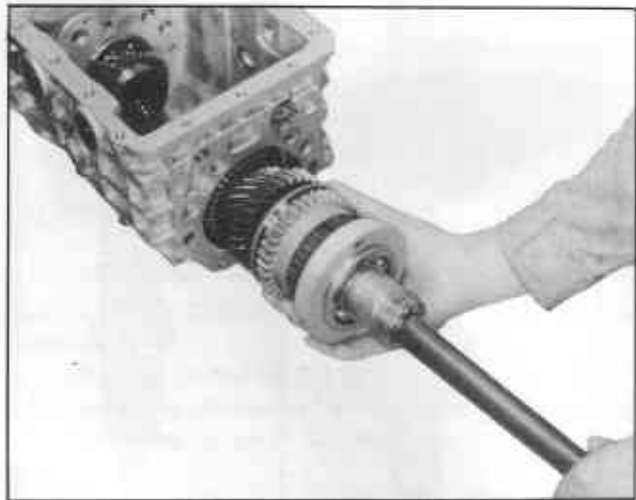


Fig. TM-17 Withdrawing main shaft assembly

16. Remove the main drive gear assembly.

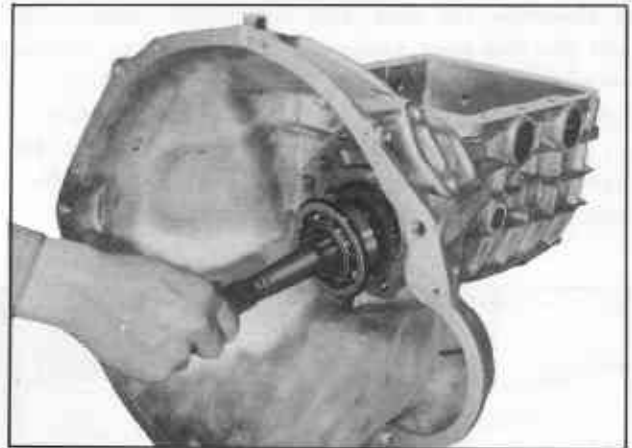


Fig. TM-18 Removing the main drive gear

Disassembly of main shaft gear

1. Release the snap ring located at the front end of the main shaft (See Fig. TM-19).



Fig. TM-19 Releasing 2nd and 3rd speed hub snap ring

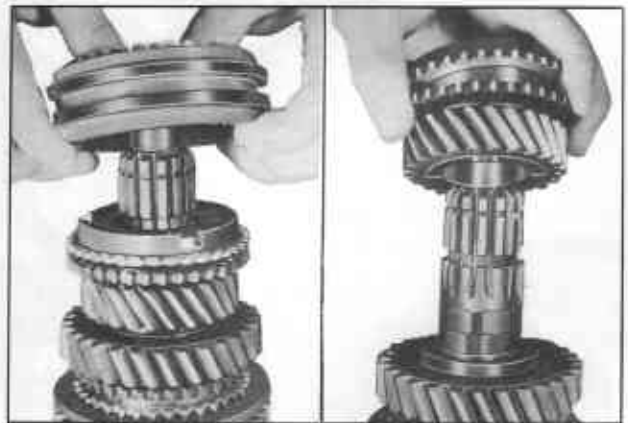


Fig. TM-20 Removing the 2nd and 3rd speed hub

Fig. TM-21 Removing the main shaft 2nd gear

CHASSIS

2. Remove the 2nd and 3rd synchronizer, the hub and 2nd gear assembly.

3. Release the snap ring which secures the speedometer drive gear and remove the gear complete with the steel ball and spacer.

4. Press out the main shaft bearing and retainer as shown in Figure TM-23, item 1.

5. Hold the main shaft reverse gear and strike the end of the main shaft on a small piece of wood. This will release the reverse gear assembly which can then be removed together with the 1st speed gear.

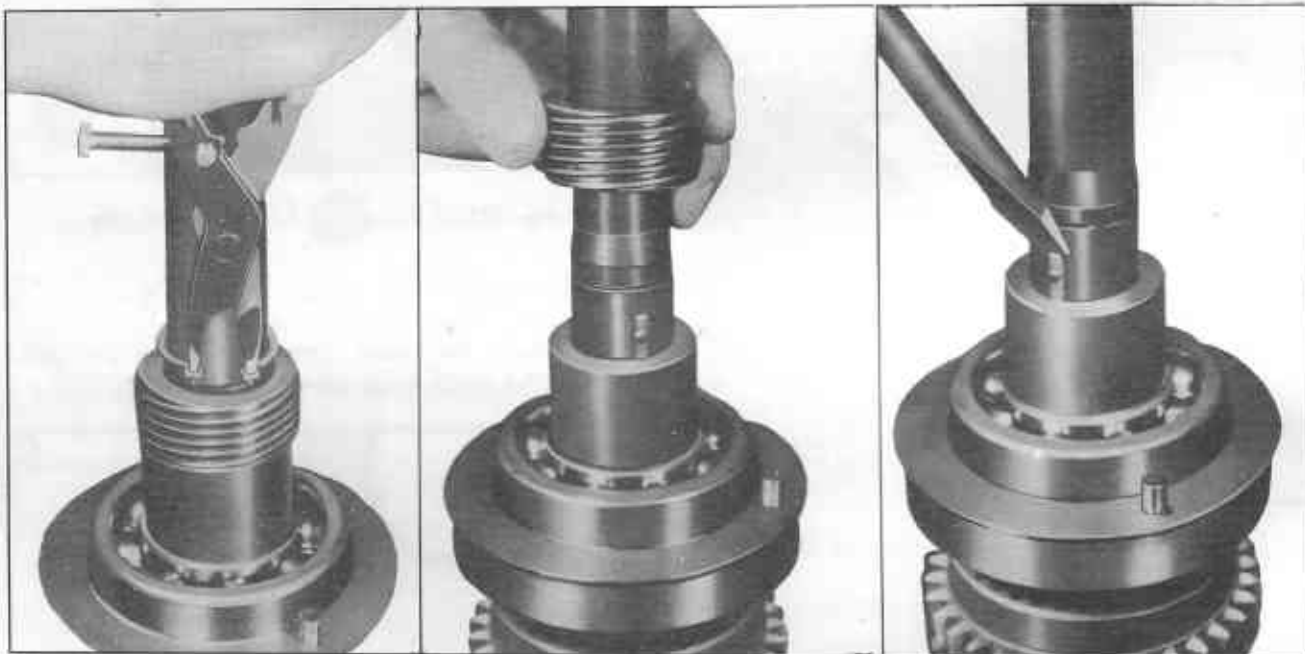


Fig. TM-22 Removing speedometer drive gear and spacer

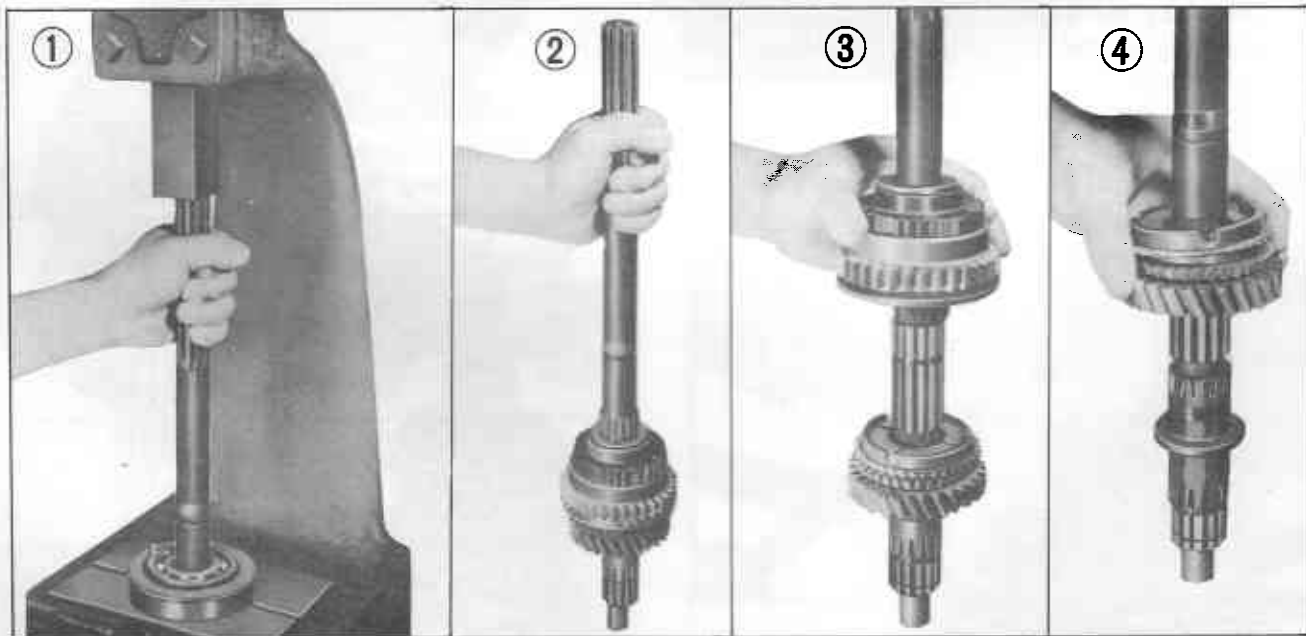


Fig. TM-23 Removing the main shaft bearing and gears

TRANSMISSION

INSPECTION AND REPAIR

After disassembly, clean the parts and check them for wear, damage and other abnormal conditions. Should any excessive wear or damage be evident then the part or component should be replaced.

Transmission case and rear extension housing

1. Thoroughly clean the case and rear extension housing. Check the castings cracks and indentations.

2. Examine the machined surfaces for burrs and indentations. Small surface flaws can be removed by filing.

Bearings

1. Wash the bearings in clean solvent and blow dry with compressed air. Take care not to spin the bearing as this may result in serious damage.

2. Lubricate the ball bearings with light gear oil and check them for wear, scoring, pits or roughness. If any of these conditions exist the bearing should be replaced.

3. Inspect the needle roller bearings for wear or pitting. As wear of the needle rollers is difficult to discern, it is advisable to replace the bearings with new ones where substantial mileage has been accumulated.

In addition inspect the surfaces of the shafts and gears to ensure they are free of scores and burrs.

Gears and shaft

1. Clean and inspect the gear teeth and other machined surfaces for wear, scoring, pitting, and burrs.

Slight scores or burrs may be removed with a fine stone, however, if any gear is chipped or unduly worn, it must be replaced.

2. Check that the synchronizer hubs slide freely on the main shaft splines with minimum clearance.

3. Inspect the main shaft for straightness as shown in Figure TM-24.

If run-out at the rear end of the shaft exceeds the maximum limit the main shaft should be replaced.

Maximum run-out 0.15 mm
(0.0059 in.)

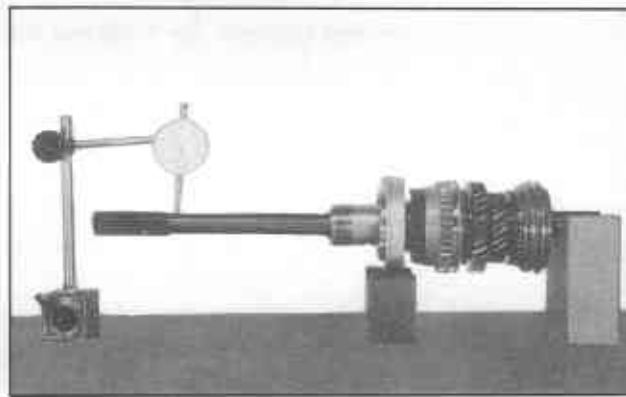


Fig. TM-24 Checking main shaft for straightness

Baulk rings

1. Check the baulk rings for wear, pitting, chips or burrs. If any abnormal conditions are detected, they must be replaced with new ones.

2. Place the baulk ring in position on the cone of each gear. Push the ring to the gear and check the gap between the end face of the baulk ring and the front face of the clutch teeth (See Fig. TM-25).

This should be within 1.2 to 1.6 mm (0.0472 to 0.0630 in.). If it is less than 0.8 mm (0.0315 in.), a worn baulk ring may be the cause and a new ring should be fitted.

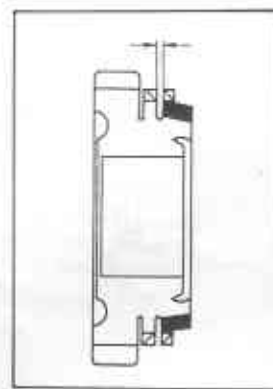


Fig. TM-25 Checking baulk ring for wear

Selector and shifting mechanism

1. Check the fork rods on a flat surface to see whether they are bent.

CHASSIS

A bent fork rod will cause hardshifting and must be replaced.

2. Inspect the fork lock pins and inter-lock check balls for wear and damage. Replace if necessary.

3. Check the clearance between the fork and the groove on the coupling sleeve. The standard dimension is 0.15 to 0.30 mm (0.0059 to 0.0118 in.).

Oil seals

1. Ensure the oil seals show no sign of wear or damage. Check the sealing lips for cuts and replace if any defects are found.

2. O-rings once removed should be replaced and not used again.

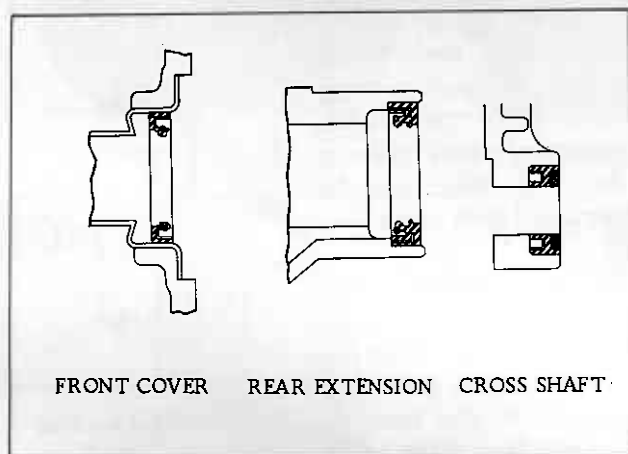


Fig. TM-26 Oil seals

ASSEMBLY

Main drive gear

1. Install the main drive gear bearing on the shaft with the aid of a press.

2. Install the spacer and select a new snap ring so that no play exists between the bearing and the snap ring.

There are seven snap rings available details of which are given below.

Thickness	1.52 mm (0.0598 in.)
	1.59 mm (0.0626 in.)
	1.65 mm (0.0649 in.)
	1.71 mm (0.0673 in.)
	1.77 mm (0.0697 in.)
	1.83 mm (0.0720 in.)
	1.89 mm (0.0747 in.)

Synchronizer assembly

Synchromesh device

The synchromesh device consists of a coupling sleeve, baulk ring, spring, synchronizer hub and insert (See Fig. TM-27). The springs for pressing the insert toward the synchronizer sleeve are different between the 1st gear synchronizer and the 2nd-3rd gear synchronizer. The former uses the three coil springs and the latter uses two expanding type springs.

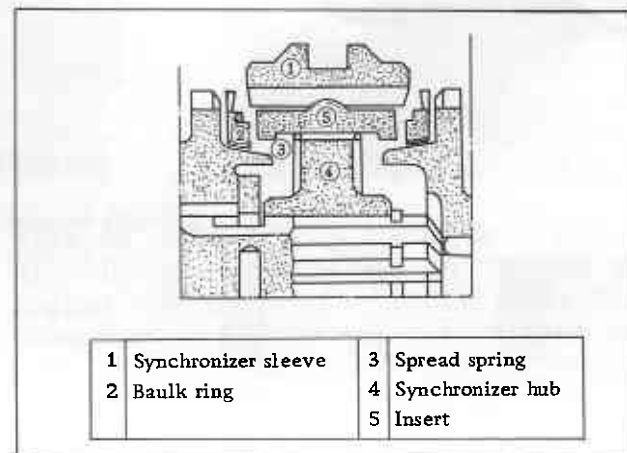


Fig. TM-27 Synchromesh device

The hub is attached to the main shaft by means of splines. Three grooves on its periphery locate the synchronizer inserts. A protrusion on the insert engages with a groove in the coupling sleeve when in the neutral position. Two spring rings apply a radial load to the inserts which hold them in position.

The baulk ring between the hub and the gear has a inside cone that engages with a tapered mating face on the gear and acts as a clutch. The leading edge of the baulk ring

TRANSMISSION

teeth and coupling ring teeth are chamfered to assist engagement.

1st gear synchronizer

1. Install the shifting insert snap ring onto the synchronizer hub as shown in Figure TM-28.

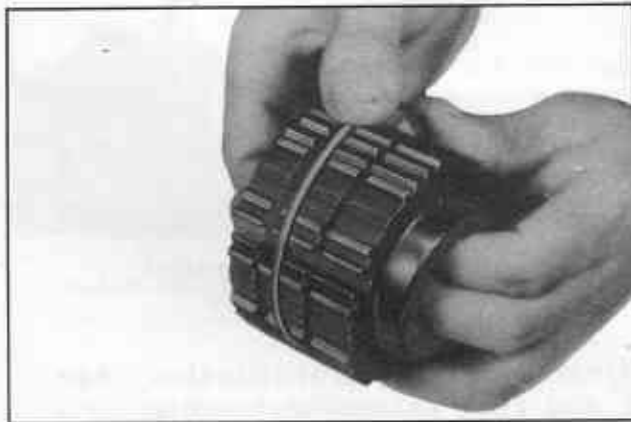


Fig. TM-28 Installing insert snap ring

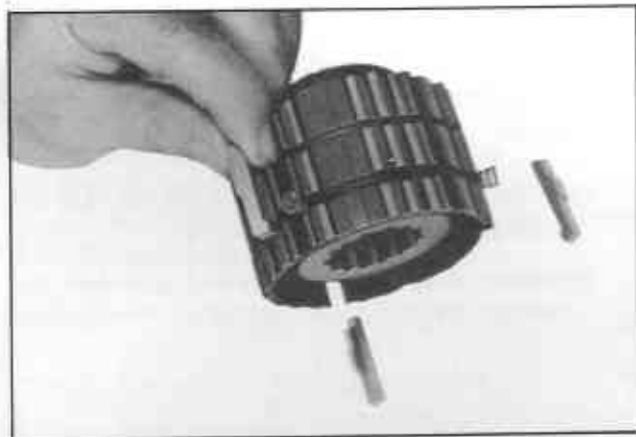


Fig. TM-29 Fitting shifting inserts

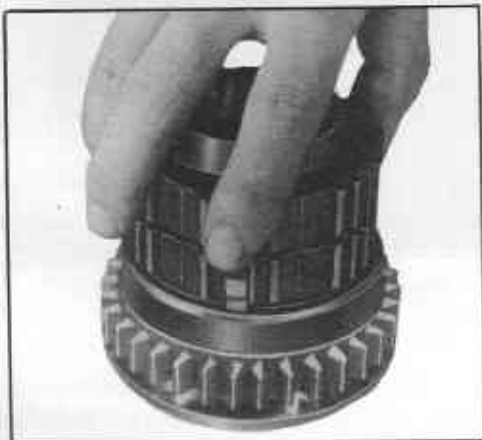


Fig. TM-30 Installing the hub to the main shaft 1st gear

2. Fit the shifting inserts and synchronizer springs in the correct position on the synchronizer hub. Assemble the synchronizer hub complete with inserts into the coupling sleeve (See Fig. TM-30).

2nd and 3rd gear synchronizer

1. Assemble the synchronizer hub and coupling sleeve, ensuring that the sleeve slides freely on the synchronizer hub splines.

2. Fit the three shifting inserts into position and install a spring ring on each side of the hub.



Fig. TM-31 Fitting spring rings



Fig. TM-32 2nd and 3rd synchronizer

CHASSIS

Main shaft assembly

1. Working from the front end of the main shaft, slide the 2nd speed gear on the shaft with the tapered cone facing the front.
2. Install the baulk ring on the 2nd speed gear.
3. Fit the 2nd-3rd speed synchronizer assembly on the front end of the main shaft and retain with one of the following snap rings which will give an end play of 0.05 to 0.25 mm (0.0020 to 0.0087 in.).

Available snap rings

Thickness	1.60 mm (0.0630 in.)
	1.65 mm (0.0650 in.)
	1.70 mm (0.0669 in.)
	1.75 mm (0.0689 in.)
	1.80 mm (0.0709 in.)

4. Install the 1st speed gear and baulk ring on the rear end of the main shaft with the tapered cone facing the rear.
5. Assemble the 1st speed synchronizer and reverse gear assembly onto the main shaft.
6. Fit the spacer and using a suitable press, press the main shaft bearing complete with retainer onto the shaft.
7. Install the spacer, steel ball and speedometer drive gear. Secure the gear with one of the following snap rings. Select a snap ring which will give an end play of 0.05 to 0.22 mm (0.0020 to 0.0087 in.) on the main shaft first gear.

Available snap rings

Thickness	1.30 mm (0.0512 in.)
	1.40 mm (0.0551 in.)
	1.45 mm (0.0571 in.)
	1.50 mm (0.0591 in.)
	1.55 mm (0.0610 in.)
	1.60 mm (0.0630 in.)
	1.65 mm (0.0650 in.)
	1.70 mm (0.0669 in.)

8. The end play of the gears should be checked as shown in Figure TM-33.

Gear end play

1st gear	0.05 ~ 0.22 mm (0.0020 ~ 0.0087 in.)
----------	---

2nd gear	0.10 ~ 0.22 mm (0.0039 ~ 0.0087 in.)
----------	---

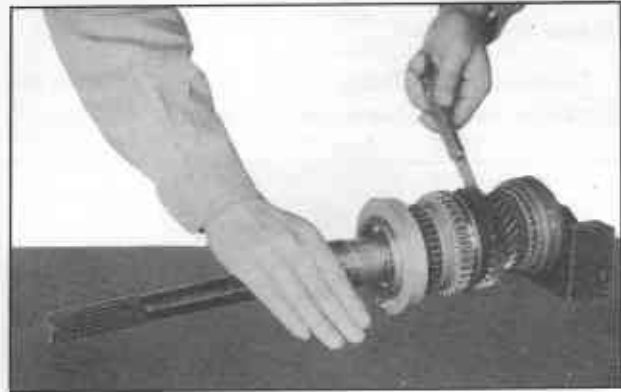


Fig. TM-33 Gear end play check

Gear assembly, transmission case and rear extension housing

1. Install the main drive gear and main shaft assembly into the transmission case.
2. Fit the fork rods and forks into their appropriate positions following the undermentioned procedure.
 - (1) Place the transmission case so as the check ball hole faces upward.
 - (2) Insert a spring and a steel ball into the bottom of the check ball hole.

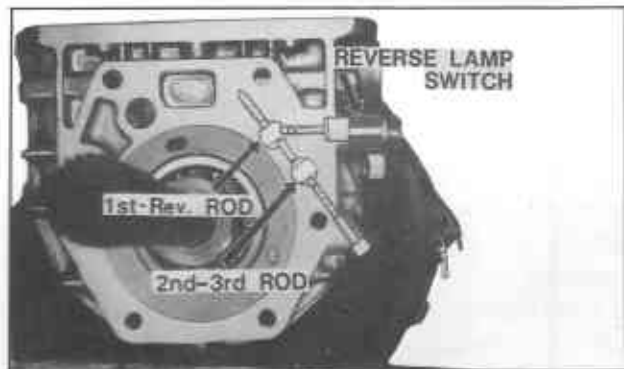


Fig. TM-34 Inter-lock mechanism

- (3) Using a dummy shaft, retain the steel ball and install the 1st-reverse fork and fork rod pushing the dummy shaft out of position.

TRANSMISSION

- (4) Inseat an inter-lock plunger.
- (5) Fit the 2nd - 3rd fork and fork rod.
- (6) Insert a steel ball and spring and screw in the inter-lock plug. Smear the plug threads with sealing compound.
- (7) Secure both forks to the fork rod with the retaining pins.

3. Install the reverse idler shaft and gear and secure the shaft with the lock bolt and plate.

4. Insert the counter gear and shaft, using selected thrust washers which will give the correct end play.

Counter gear end
play 0.04 ~ 0.12 mm
(0.0016 ~ 0.0047 in.)

Available thrust washers

Thickness	3.83 mm (0.151 in.)
	3.88 mm (0.153 in.)
	3.93 mm (0.155 in.)
	3.98 mm (0.157 in.)
	4.03 mm (0.159 in.)

5. Install the cross shafts ①, the thrust washers ② and the operating levers ③. Secure the cross shafts with the retaining rings ④ and lock the operating levers to the shafts with the lock pins ⑤.

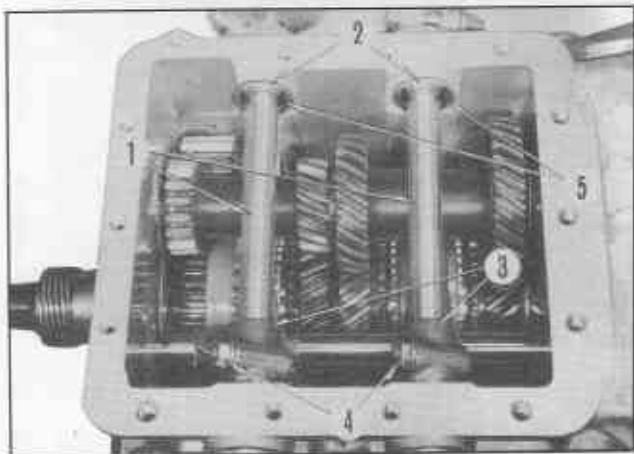


Fig. TM-35 Cross shaft installation

6. Install the rear extension housing to the transmission case and tighten the fixing bolts to 2.2 to 3.0 kg-m (15.9 to 21.7 ft-lb) torque.

7. Insert the speedometer pinion and retain with the set-bolt and locking plate.

8. With the use of a dial indicator check the gear backlash.

Gear backlash 0.08 ~ 0.13 mm
(all gears) (0.0031 ~ 0.0051 in.)



Fig. TM-36 Checking gear backlash

9. Install the transmission front cover and tighten the fixing bolts to 1.1 to 1.7 kg-m (8.0 to 12.3 ft-lb) torque. Be careful not to damage the oil seal.

10. Fit the release bearing and clutch withdrawal lever.

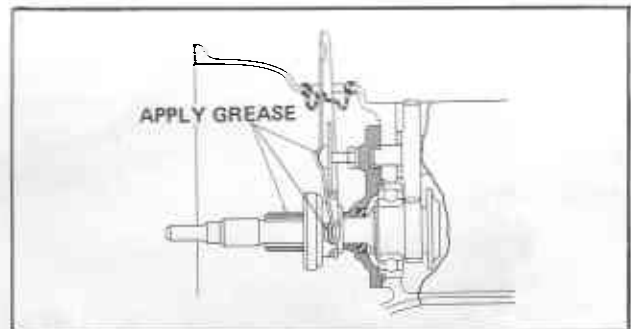


Fig. TM-37 Withdrawal lever and release bearing

11. Install the bottom cover and tighten all bolts to 1.1 to 1.7 kg-m (8.0 to 12.3 ft-lb) to torque.

INSTALLATION

Installation of the transmission is the reversal of the procedure given for removal. However, attention should be given to the following points.

- Note:**
- a. Fill the transmission with the recommend gear oil MP 90.
Oil capacity 1.7 ℓ (0.45 U.S.gal.)
(0.37 Imp.gal.)
 - b. Adjust the clutch operating cylinder at the push rod so that the play at the withdrawal lever will be 2.2 mm (0.087 in.).