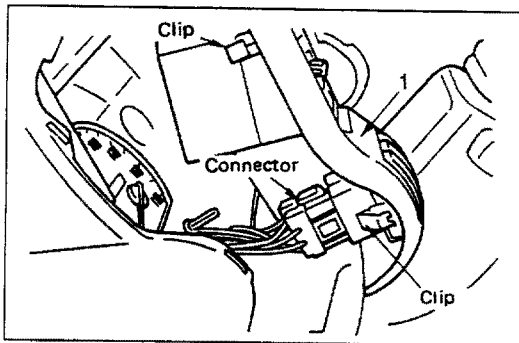


TROUBLESHOOTING

MANUAL TRANSMISSION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Abnormal Noise	<ul style="list-style-type: none"> • Insufficient or improper lubricant • Flywheel pilot bearing worn or broken • Bearing(s) worn or broken (Top gear shaft, main shaft, counter shaft, and reverse idler gear) • Gear tooth contact surfaces worn or scuffed (Top gear, main shaft, counter shaft, and reverse idler gear) • Spline worn (main shaft, synchronizer clutch hub) • Floating gear on main shaft or bearing thrust face seized • Transmission misalignment • Lack of backlash between mating gears, or improper shimming of P.T.O UNITS • Vibration in power train (Engine, propeller shafts, joint angle, rear axle, differential, transfer) 	<ul style="list-style-type: none"> • Replenish or replace lubricant • Replace flywheel pilot bearing • Replace bearing(s) • Replace gear(s) • Replace worn parts • Replace gear(s) • Realign transmission • Replace gear(s) • Check and correct
Hard Shifting	<ul style="list-style-type: none"> • Insufficient or improper lubricant • Clutch improperly adjusted • Hard operating of change lever caused insufficient grease • Change lever sliding portions worn • Control cable worn • Shift linkage improperly adjusted • Shift shaft and/or bearing worn • Power assister and/or air line malfunctioning • Shift rod and/or quadrant box sliding face worn • Shift arm and synchronizer sleeve groove worn • Synchronizer parts worn • Thrust washer, collar, and/or gear thrust faces worn (main shaft and counter shaft thrust play) 	<ul style="list-style-type: none"> • Replenish or replace lubricant • Readjust clutch linkage • Regrease • Repair or replace applicable parts and regrease • Replace control cable • Readjust shift linkage • Replace worn parts • Correct or replace • Replace worn parts • Replace worn parts • Replace worn parts • Replace worn parts



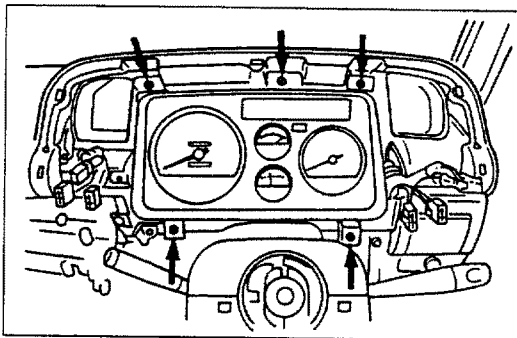
CLUTCH PEDAL TRAVEL AND FREE PLAY ADJUSTMENT

Clutch Pedal Height and Stroke



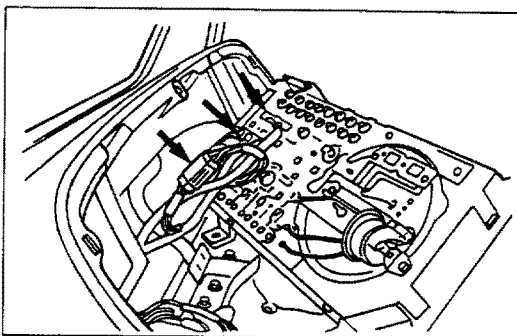
1. Remove the meter cluster.

- Pull out the meter cluster and disconnect the harness connectors.

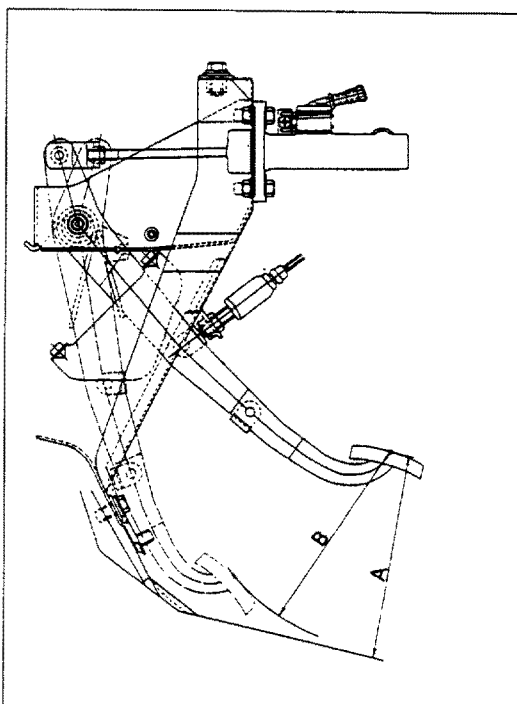


2. Remove the meter assembly.

- Remove the 5 fixing screws.



- Disconnect the harness connectors.



3. Loosen the lock nut of the clutch booster plunger or clutch master cylinder push rod.

4. Adjust the pedal height by turning plunger or push rod.

Clutch Pedal Height and Stroke mm (in)

Height(A)	160 - 170 (6.299 - 6.693)
Stroke(B)	159 - 169 (6.260 - 6.654)



5. Tighten the lock nut.

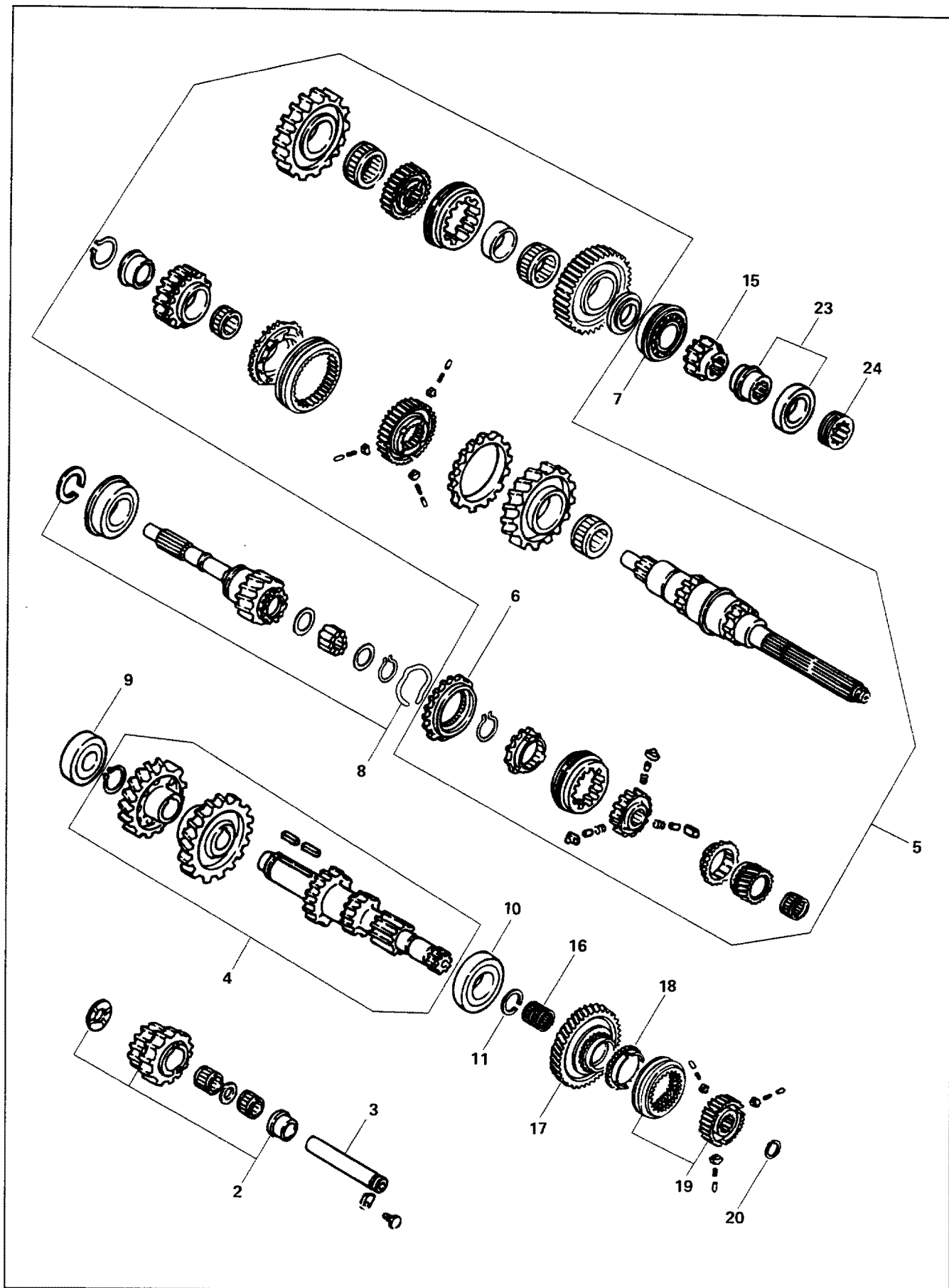
Lock Nut Torque N-m (kg-m / lb-ft)

Plunger	20 (2.0 / 14)
Push Rod	13 (1.3 / 10)

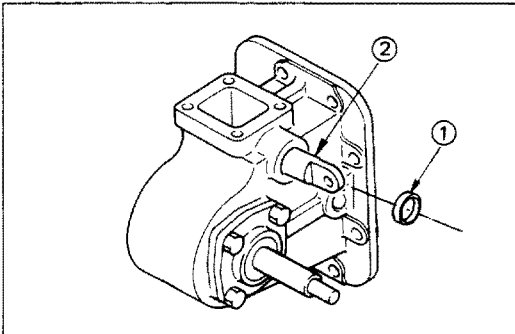


6. Install the meter assembly and meter cluster.

7B - 24 MANUAL TRANSMISSION

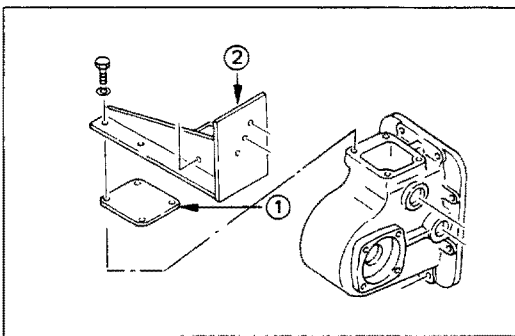


- 19. Spring Pin
- 20. Spring Pin
- 21. Snap Ring, Plate and Pin



22. Cover

1. Apply liquid gasket to the cover outer circumference ①.
2. Use the installer and a hammer to install the cover to the gear case from the front side.



23. Shift Rod and O-ring

24. Upper Cover Plate and Gasket

25. Control Lever Bracket

1. Apply liquid gasket (LOCTITE FMD-127 or equivalent) to the upper cover ① .
2. install the upper cover ① to the control level bracket ②.
3. Tighten the control lever bracket ③ along with the upper cover ① to the specified torque.

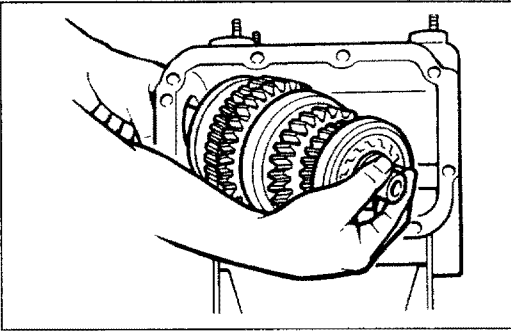
Bolts Torque N·m (kg·m / lb·ft)

37 (3.8 / 27)

- 26. Control Lever
- 27. Bushing
- 28. Distance Collar
- 29. Bolt
- 30. Pin
- 31. Cotter Pin and Washer

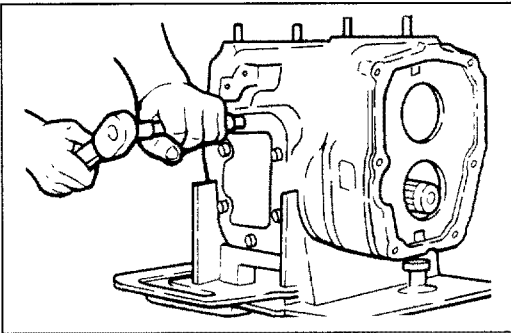
TROUBLESHOOTING TRANSMISSION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Abnormal Noise	<ol style="list-style-type: none"> 1. Flywheel pilot bearing worn. 2. Bearing worn or broken (Main shaft or counter shaft). 3. Anti-lash plate malfunction. 4. Gear tooth contact surface worn or scuffed (Main shaft, counter shaft and/or reverse idle gear). 5. Spline worn (Synchronizer clutch hub). 6. Gear, clutch hub or thrust washer thrust face seized. 7. Lack of backlash between mating gears. 	<ol style="list-style-type: none"> 1. Replace. 2. Repair or replace 3. Repair or replace. 4. Repair or replace. 5. Replace. 6. Replace. 7. Replace.
Hard Shifting	<ol style="list-style-type: none"> 1. Improper clutch pedal free play. 2. Wrong oil in use. 3. Gear control linkage misadjust. 4. Change lever sliding portions worn. 5. Shift block, shift rod and/or control box sliding faces worn. 6. Shift arm and/or synchronizer sleeve groove worn. 7. Synchronizer parts worn or weekend. 8. Thrust washer, collar, and/or gear thrust faces worn (Main shaft and/or counter shaft thrust play). 	<ol style="list-style-type: none"> 1. Readjust. 2. Replace with recommended oil. 3. Readjust. 4. Repair or replace. 5. Repair or replace. 6. Replace. 7. Replace. 8. Replace.
Walking or Jumping out of Gear	<ol style="list-style-type: none"> 1. Gear control linkage misadjust. 2. Detent spring weakened or broken. 3. Detent ball worn. 4. Change lever sliding portions worn. 5. Shift block, shift rod and/or control box sliding faces worn. 6. Shift arm and/or synchronizer sleeve groove worn. 7. Synchronizer parts worn or weakened. 8. Thrust washer, collar, and/or gear thrust faces worn (Main shaft and/or counter shaft thrust play). 9. Spline worn (Synchronizer hub). 10. Bearings worn or broken. 	<ol style="list-style-type: none"> 1. Readjust. 2. Replace. 3. Replace. 4. Repair or replace. 5. Repair or replace. 6. Replace. 7. Replace. 8. Replace. 9. Replace. 10. Replace.

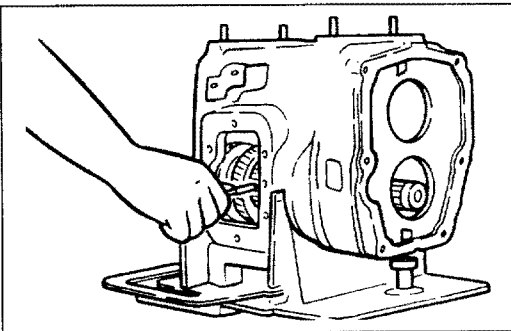


35. Main Shaft Assembly

- Take main shaft assembly out from the transmission case.

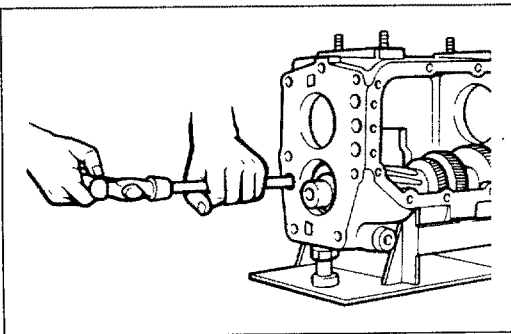


36. Side Cover

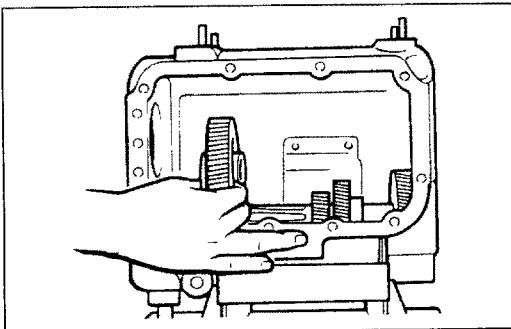


37. Reverse Idle Gear Shaft

- Take out the pin of reverse idle gear shaft from the transmission case.



- Drive out the reverse idle gear shaft inward the transmission case, with a suitable bar at the end of reverse gear shaft.



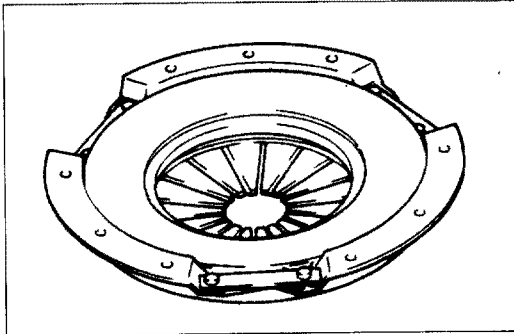
38. Reverse Idle Gear

39. Thrust Washer

40. Conical Spring

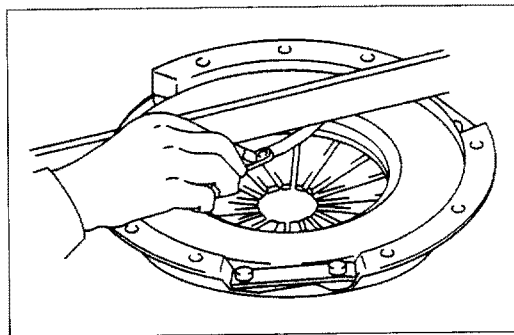
INSPECTION AND REPAIR

Make the necessary adjustments, repairs, and part replacement if excessive wear or damage is discovered during inspection.



Pressure Plate Assembly

- Visually inspect the pressure plate friction surface for excessive wear and heat cracks. If excessive wear or deep heat cracks are present, the pressure plate assembly must be replaced.

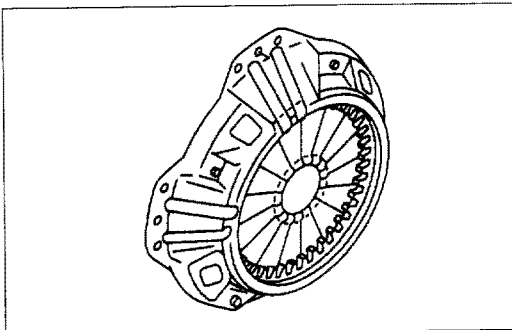


Pressure Plate Warpage

- Use a straight edge and a feeler gauge to measure the pressure plate friction surface flatness in four directions.
If any of the measured values exceed the specified limit, the pressure plate assembly must be replaced.

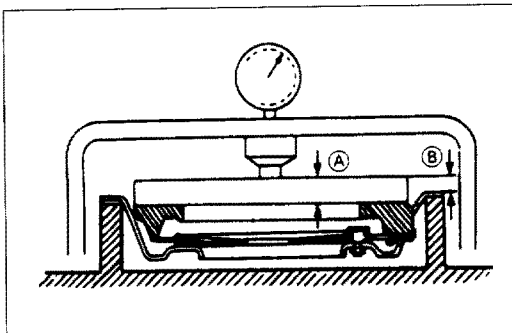


Pressure Plate Warpage	mm (in)
Limit	
0.3 (0.01)	



Clutch Cover

- Visually inspect the entire clutch cover for excessive wear, cracking, and other damage.
The Pressure plate assembly must be replaced if any of these conditions are present.



Clutch Set Force

- 1) Invert the pressure plate assembly.
- 2) Place a metal sheet with "A" thickness of 8.0 mm (0.31 in) on the pressure plate.
- 3) Compress the pressure plate assembly until the distance "B" becomes specified.

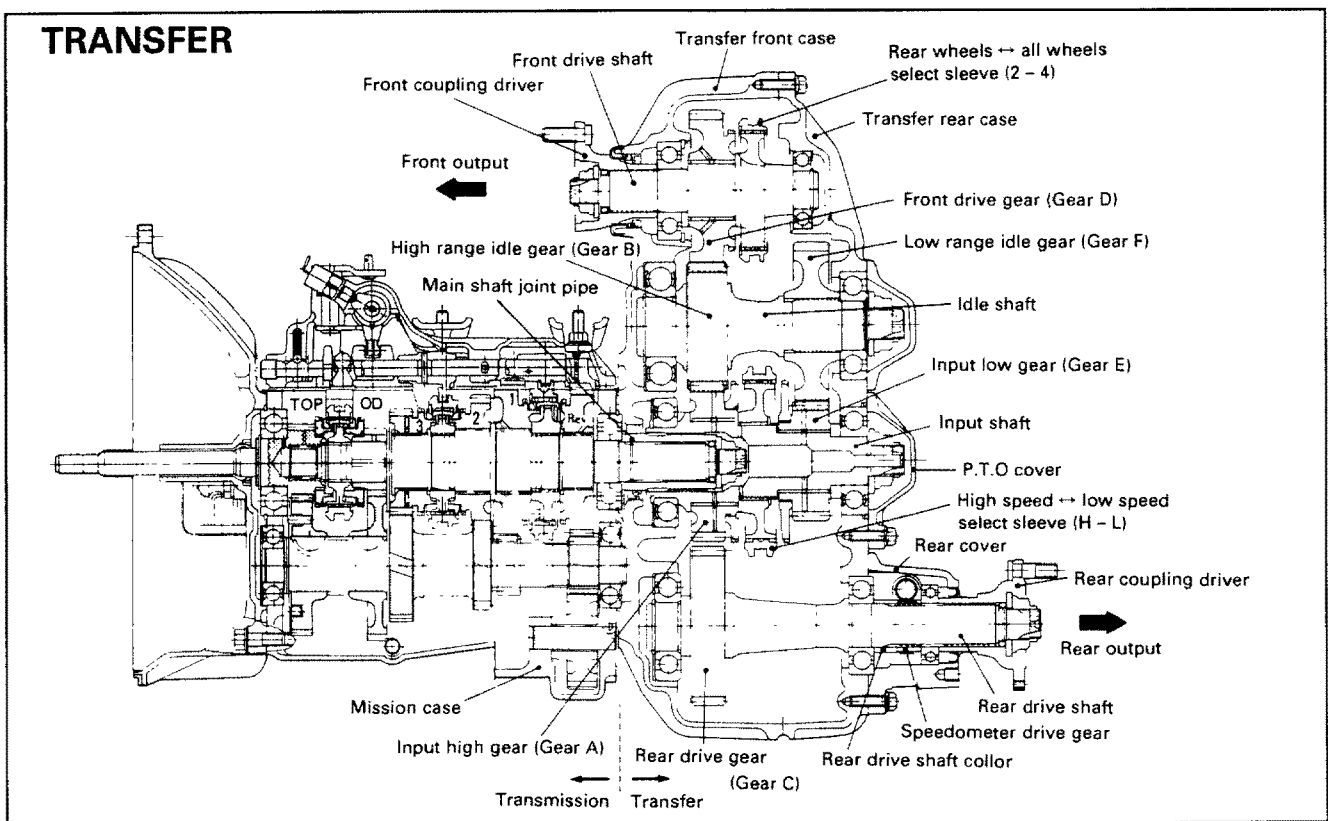
	mm (in)	
	A	B
NHR55, HKR55	7.4 (0.29)	18 (0.71)
NHR69, NKR69, NPR69	8.0 (0.31)	18 (0.71)
NKR17	8.0 (0.31)	4 (0.16)

7B - 4 MANUAL TRANSMISSION

For MXA model transmission, a forward 5 or 6-shift all synchromesh type and a backward 1-shift constant-mesh type transmission are employed. The transmission case is made of a high rigidity cast iron, and the front cover integral with the clutch housing is made of aluminum die-cast. An aluminum die-cast control box containing a gear shift and gear select mechanism is installed on the top of the transmission case. A window for power take-off is also provided on the left side. For all the gears, helical gears are employed to reduce noises. The synchromesh mechanism that employs balking rings use block rings of special brass to obtain improved synchromesh performance.

With the main shaft screwed up at the rear, ball bearings are employed for the bearings on both sides of the main shaft and the counter shaft, and needle roller bearings employed for the bearings at the tip end of the main shaft and also for those of the 1st gear, 2nd gear, 3rd gear, 5th gear, reverse gear and 6th counter gear to secure improved durability and reduced noises.

Furthermore, with the anti-lash mechanism employed for the engagement of the top gear with the counter gear, fine-pitch gears are also employed for the top gear, the 5th and the 6th gear to reduce noises.

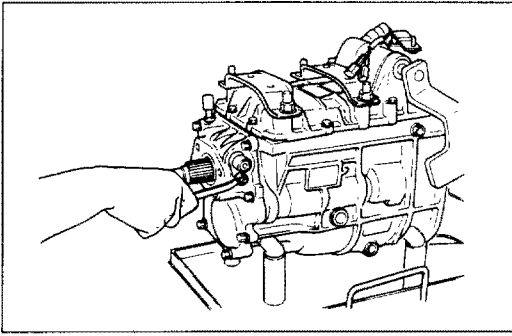


To cope with the 4-wheel drive (4WD), the transmission that contains a sub-transmission (transfer) with a one-step reduction gear for 4WD at the rear of transmission is employed.

The transmission gear ratio employed is the same as that of MXA5R type transmission.

Besides use of M10x1.25 screws to clamp the transmission and transfer, a clutch housing made of cast iron is employed to increase joint rigidity and strength.

In the transfer, selection of rear drive (2WD) or 4-wheel drive (4WD) is done with vacuum actuator by one-touch switch operation, and selection of 4WD high speed range (4H) or 4WD low speed range (4L) is done with cable by column lever operation. Selection of 4-wheel drive low speed range (4L) during rear drive (2WD) causes a drive system trouble or motor trouble. To avoid this, a mechanical interlock system is employed between rear drive (2WD) 4-wheel drive (4WD) select rod and 4-wheel drive high speed range (4H) low speed range (4L) select rod, so that the 4-wheel drive low speed range (4L) cannot be selected during rear drive (2WD).

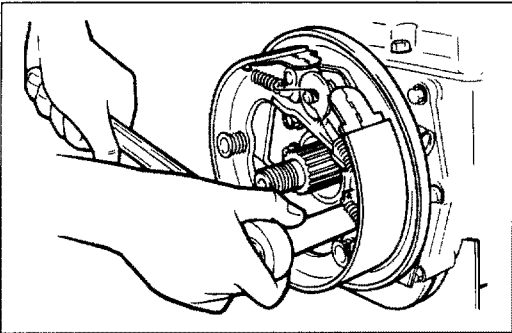


38. Car Speed Sensor Driven Gear Assembly

Driven Gear Lock Plate Bolt Torque	N·m (kg·m/lb·ft)
15 (1.5/11)	

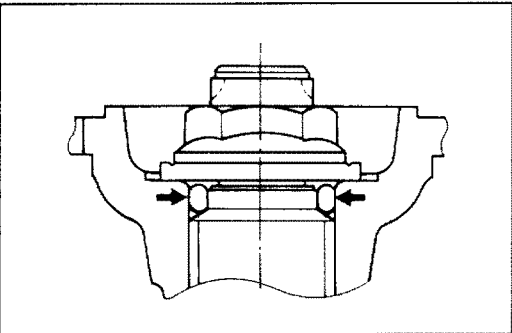
- Install the car speed sensor with key rod.

Car Speed Sensor Torque	N·m (kg·m/lb·ft)
25 (2.5/18)	



39. Parking Brake Assembly

Parking Brake Bolts Torque	N·m (kg·m/lb·ft)
83 (8.5/61)	

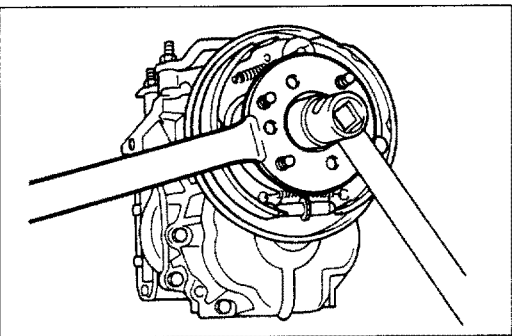


40. Coupling Driver

41. Lock Nut

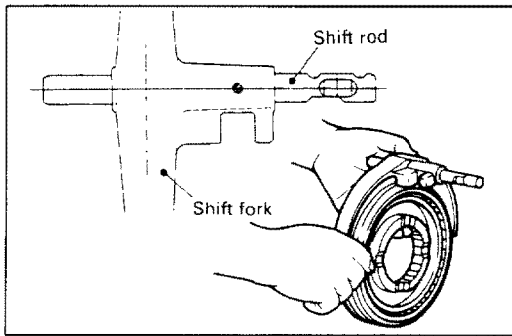
- Install the o-ring and conical washer. The conical washer is to be set up with its identification groove to the nut side.
- Apply the engine oil to the setting face of the new lock nut and tighten it up at the specified torque.
Handle: 5-8840-2043-0

Lock Nut Torque	N·m (kg·m/lb·ft)
226 (23.0/166)	



CAUTION:

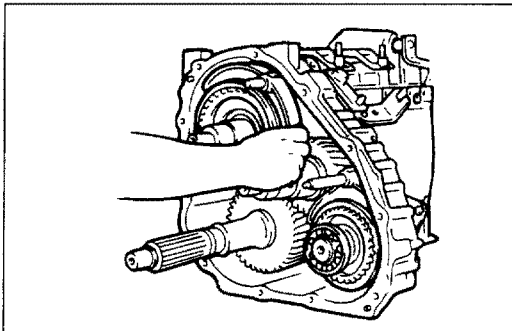
Do not reuse the lock nut.



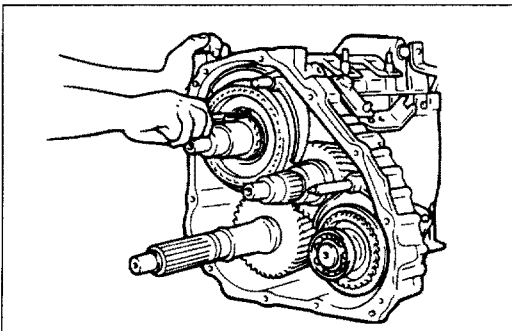
4. Shift Arm and Shift Rod Assembly

- 1) Install the 4WD high speed range (4H) ↔ low speed range (4L) select shift rod and shift arm assembly in the 4WD high speed range (4H) ↔ low speed range (4L) select sleeve hub assembly.

In installing the assembly, the groove of shift arm boss must be positioned on the oil groove side of clutch hub boss.

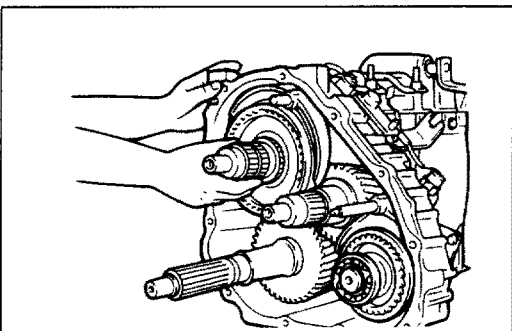


- 2) Moving the 4WD high speed range (4H) ↔ low speed range (4L) select external shift lever to the left or right, insert a spherical part of internal lever into the groove of shift arm, and push in the sleeve, hub and shift arm until they cannot move in axial direction.



5. Clutch Hub Snap Ring

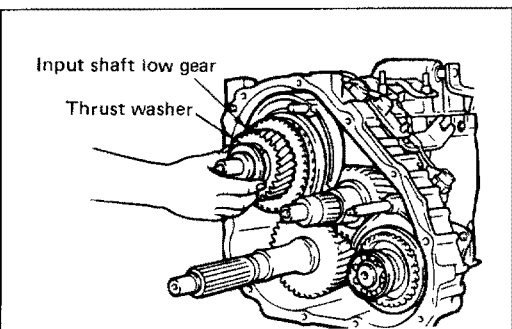
- Insert a snap ring into the input shaft spline using the snap ring pliers.



6. Input Shaft Low Gear Needle Bearing

Insert the input shaft low gear needle bearing into the input shaft.

- Apply engine oil to the input shaft.



7. Input Shaft Low Gear

8. Input Shaft Low Gear Thrust Washer

Insert the input shaft low gear and thrust washer into the input shaft.

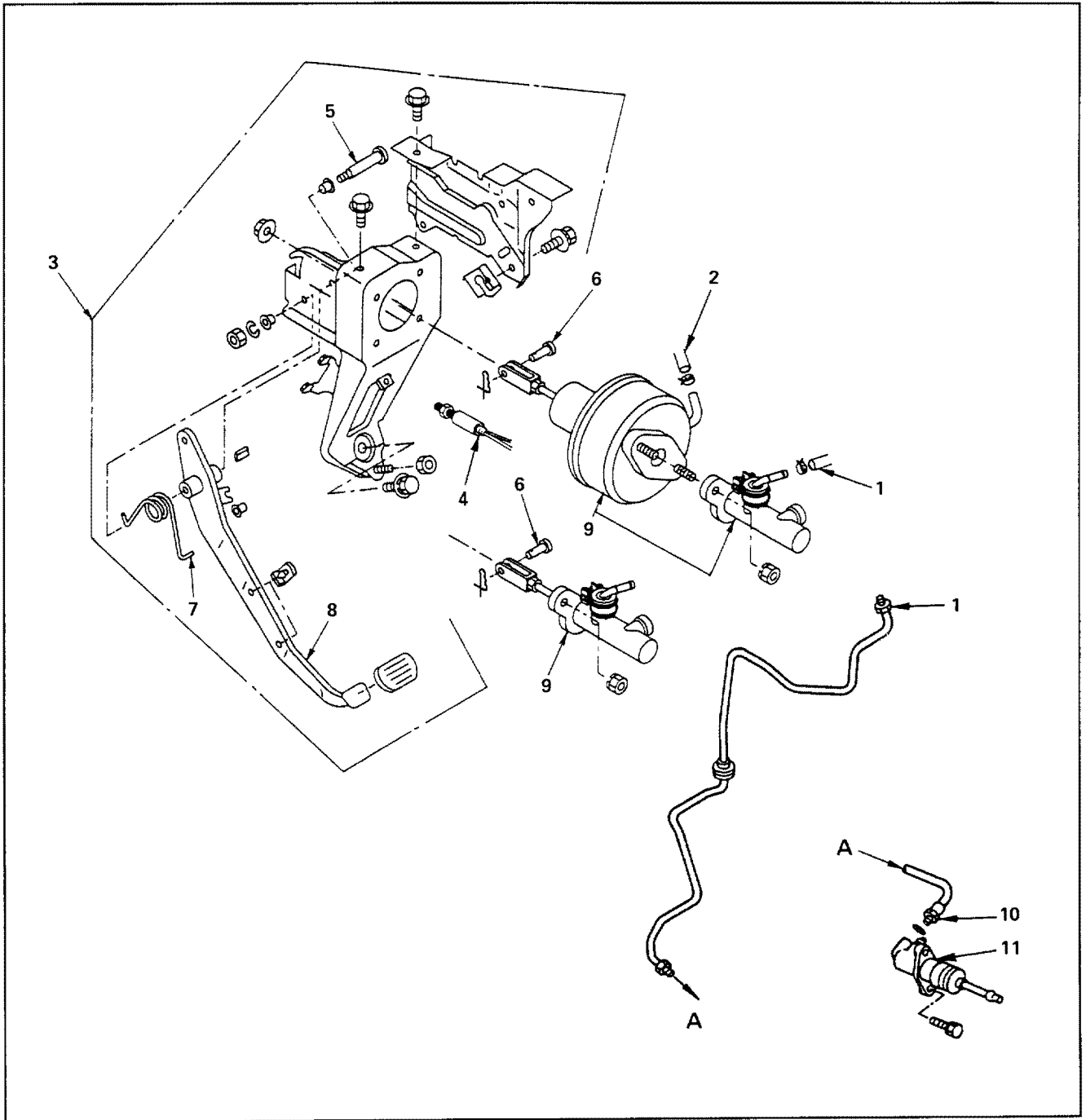
- Installing the input shaft low gear, its dog teeth must be positioned on the rear side (transmission side).



- Apply engine oil to the inner diameter of gear.



CLUTCH CONTROL REMOVAL



Removal Steps

1. Clutch pipe and hose
2. Vacuum hose
3. Clutch pedal and bracket assembly
4. Clutch switch or stopper bolt
5. Shaft
6. Clevis pin
7. Return spring
8. Clutch pedal
9. Clutch booster with master cylinder or master cylinder
10. Flexible hose
11. Slave cylinder

**DIAGNOSTIC TROUBLE CODE (DTC) 33
TIMING SOLENOID (ST)
(Wire Breaking/Short Circuit)**

Explanation of Circuit: When shifting 1st to 2nd, 2nd to 3rd, or 3rd to 2nd, timing solenoid (ST) turns on. It controls the orifice of the 2nd brake (B0) and reduces the shift shock.

Explanation of Test: The following numbers correspond to the numbers enclosed with a circle in the diagnosis chart.

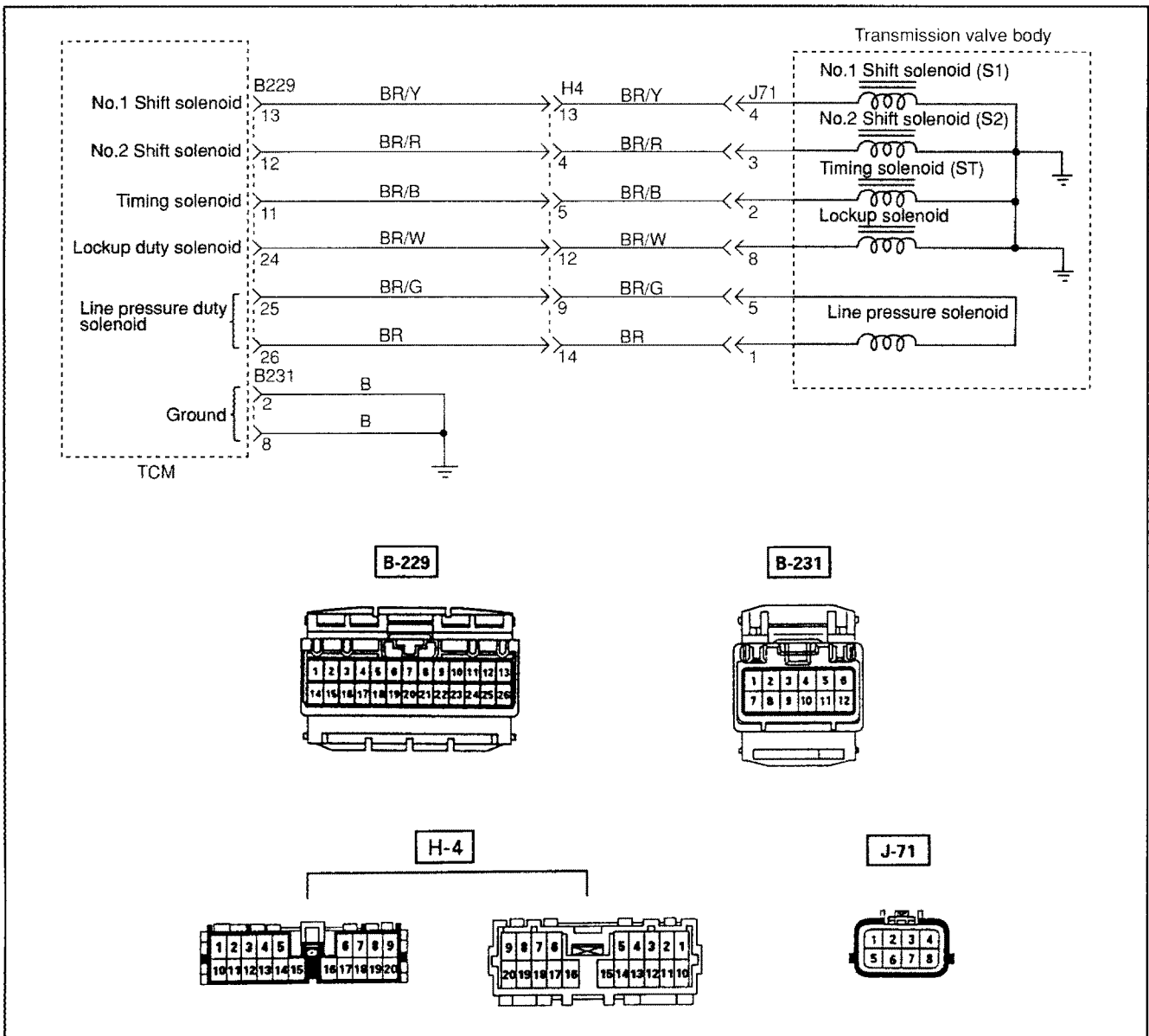
- ① When the timing solenoid (ST) is ON, the voltage between the TCM terminals (B229-11) and (B48-13 or B48-14) is 10 to 16 V.
- ② When the timing solenoid (ST) is OFF, the voltage between the TCM terminals (B229-11) and (B231-2 or B231-8) is 1 V or less.

- ③ The resistance of the timing solenoid is 10 to 20 Ω .

Diagnostic Aids: In case of faulty wire connection to the TCM terminal (B229-11), wire breaking or short circuit, DTC 33 is displayed.

A temporary failure may be caused by faulty connection, worn-away wire insulator or internal wire breaking of insulator.

TCM Voltage Check: Refer to page 7A2-57.



DIAGNOSIS BY USING SCAN TOOL

TECH 2 SCAN TOOL

In this 450-43LE transmission, diagnosis can be performed for electrical faults by using the diagnosis equipment called "TECH 2".

When the check trans light blinks or when an electrical fault in the transmission may probably exist, check diagnostic trouble codes by using the "TECH 2".

For the operations of "TECH 2", refer to following instruction and the User Guide in the "TECH 2" kit.

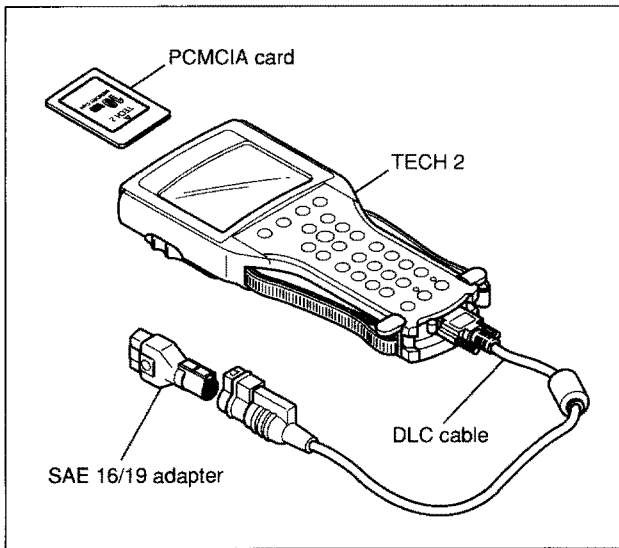


Figure 18. TECH 2 Scan Tool

1. Before operating the Isuzu PCMCIA card with the TECH-2, the following steps must be performed:
 - 1) The Isuzu 99 System PCMCIA card inserts into the TECH-2.
 - 2) Connect the SAE 16/19 adapter to the DLC cable.
 - 3) Connect the DLC cable to the TECH-2.
 - 4) Make sure the vehicle ignition is off.
 - 5) Connect the TECH-2 SAE 16/19 adapter to the vehicle DLC
The DLC is the black 16-pin connector and it is tied to the support bracket locating under the brake and clutch fluid tank.
 - 6) The vehicle ignition turns on.
 - 7) Push the "PWR(Power)" key.
 - 8) Verify the TECH-2 power up display.



Figure 19. TECH 2 Display(1)

7A3-22 ON-VEHICLE SERVICE

16. Center Bearing Bracket (If equipped).

Tighten

- Center bearing bracket bolts 40 N·m (4.1 kg·m / 30 lb-ft)

17. Propeller shaft guard.

18. Oil filler tube with bracket.

19. Negative battery cable.

20. Remove safety stands.

21. Remove wheel blocks.

TORQUE CONVERTER

Remove or Disconnect

1. Remove the transmission assembly from the vehicle.
2. Remove the torque converter from the torque converter housing.

Inspect

Whenever the transmission is replaced, inspect the torque converter and replace it if any of the following conditions exists:

- Line pressure is normal but a stalling test fails (idle in "D" or "R" range).
- Metallic sound is heard from the torque converter during a stall test or when in "N" range.
- The torque converter center piece is deformed.
- The extension sleeve is rusty, has a large vertical scratch, or is worn excessively.
- Debris of paper, bearing or foreign materials is found from the ATF in the torque converter.
- Check the one-way clutch of the torque converter by using the special tools (figure 41).

Tool Required:

5-8840-2168-0 One-way Clutch Test Tool

1. Set the pilot nut in the test tool to the wrench. Insert the wrench to stator shaft fitting face of the torque converter.
2. Insert stator stopper through the sleeve in converter and set it to cutaway portion of the sleeve.
3. If both direction of the one-way clutch are free, or turns counterclockwise and locks clockwise, torque converter should be replaced. The normal one-way clutch turns clockwise and locks counterclockwise.

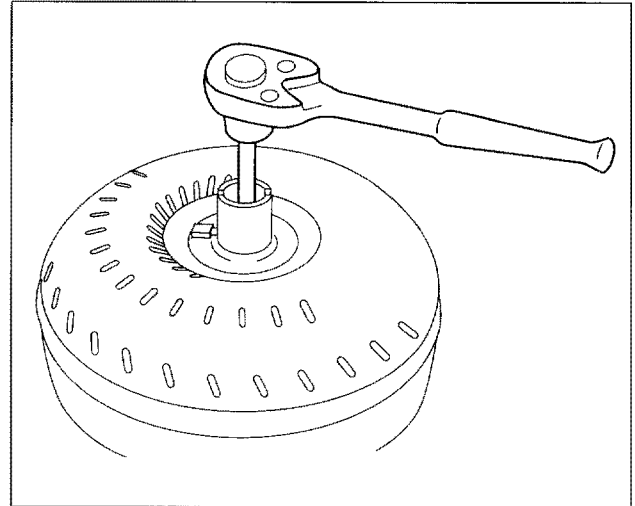


Figure 41. One-way Clutch Test

Install or Connect

1. Pour new ATF (approximately 2 liters) if a new torque converter is being installed.
2. Install the torque converter to the oil pump.
3. Measure the dimension A from the torque converter housing to the torque converter set block and confirm that the torque converter is inserted to the correct position (figure 42).

Measure

- Dimension A: 23.0 mm (0.91 in) or less

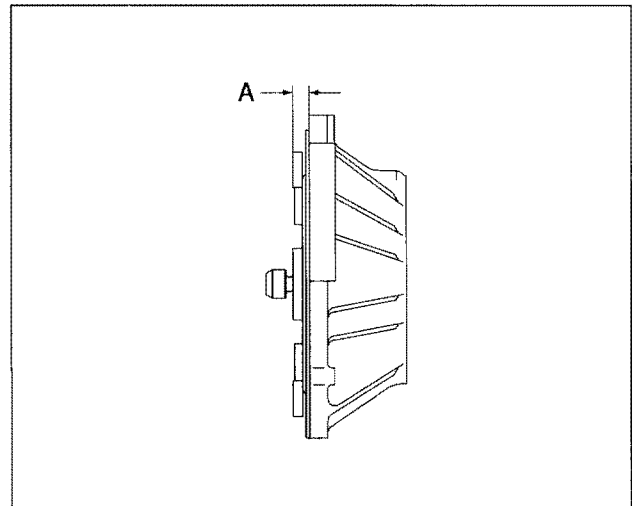


Figure 42. Torque Converter Installation Position

7A4-48 AUTOMATIC TRANSMISSION OVERHAUL

✚ Assemble

1. Install rear clutch piston.
 - a) Coat new O-rings with ATF, and install them in the clutch drum.

O-ring diameters mm (in.)

	Inside	Wire diameter
Inner side	62.9 (2.4767)	2.6 (0.1024)
Outer side	109.7 (4.3189)	3.1 (0.1220)

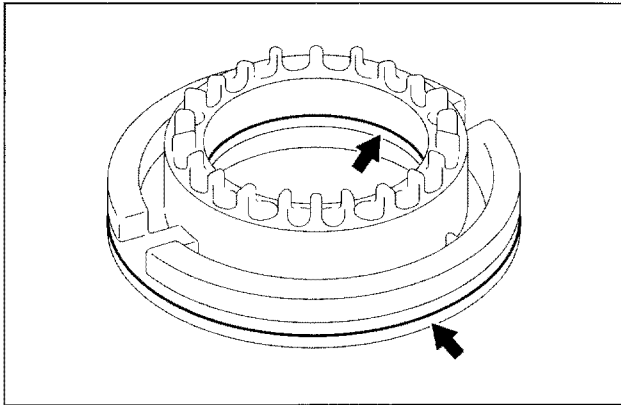


Figure 177. O-ring Location

- b) Push in the clutch piston into the clutch drum with both hands.

CAUTION: Be careful not to damage the O-rings.

NOTICE: Push in the piston uniformly.

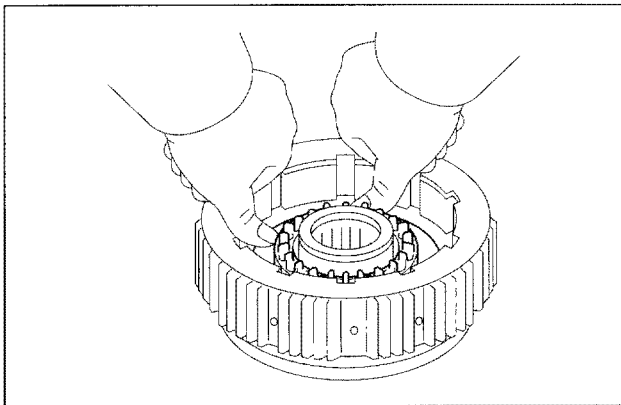


Figure 178. Clutch Piston Installation

2. Install piston return springs.
 - a) Place the piston return spring on the clutch piston.

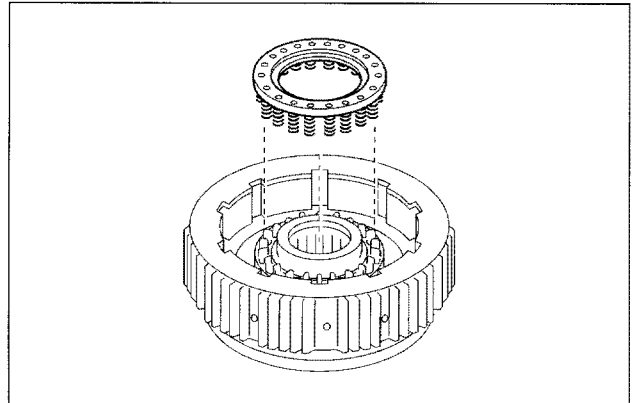


Figure 179. Piston Return Spring Installation (1)

- b) Place No.2 piston spring compressor on the spring seat, and compress the return spring with a shop press.

Tool Required:

5-8840-2641-0 No.2 Piston Spring Compressor

NOTICE: Stop compressing the return spring at the position 1 to 2 mm away from the snap ring to prevent the spring sheet from being deformed.

- c) Using snap ring pliers, install the snap ring. **NOTICE:** Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

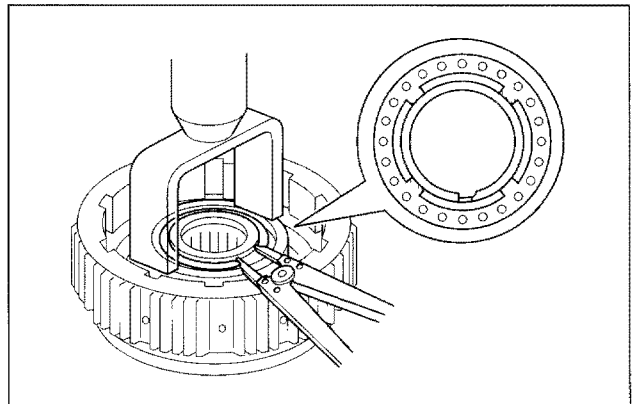


Figure 180. Piston Return Spring Installation (2)

3. Install plates, discs and flange.
 - a) Install the 5 plates and 5 discs in order:
 P = Plate D = Disc
 P - D - P - D - P - D - P - D - P - D