This file is available for free download at http://www.iluvmyrx7.com

This file was not scanned to deprive Mazda of any money - it was scanned due to the rareness of the original manuals and the overwhelming need of the RX-7 owner to have this information so that they can accurately troubleshoot problems. Perhaps if Mazda’s dealerships could support the Rotary Engine it wouldn’t be so necessary for the owners to do so.

Many thanks to Lenny Terris for scanning this.
Before beginning any service procedure, refer to the 1994 RX-7 Body Electrical Troubleshooting Manual; see section S for air bag system service warnings and section J1 for audio antitheft system alarm conditions.

# MANUAL TRANSMISSION (R15M-D)

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**OUTLINE**

**SPECIFICATIONS**

<table>
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<th>Item</th>
<th>Model</th>
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| Synchronization mechanism | Forward: Synchronmesh  
Reverse: Synchronmesh                                                      |
| Shift type               | 5-speed, floor shift                                                 |
| Shift pattern            | ![Shift Pattern Diagram]                                              |
| Gear ratio               |                                                                     |
| 1st                      | 3.433                                                               |
| 2nd                      | 2.015                                                               |
| 3rd                      | 1.391                                                               |
| 4th                      | 1.000                                                               |
| 5th                      | 0.719                                                               |
| Reverse                  | 3.288                                                               |
| Grade                    | API service GL-4 or GL-5                                           |
| Viscosity                |                                                       |
| All-season               | SAE 75W-90                                                         |
| Above 10°C (50°F)        | SAE 80W-90                                                         |
| Capacity                 |                                                                     |
| L (US qt)                | 2.5 (2.6, 2.2)                                                      |

**STRUCTURAL VIEW**

1. Main drive gear (4th gear)
2. 3rd gear
3. 2nd gear
4. 1st gear
5. 5th gear
6. Countershaft
7. Counter 5th gear
8. Mainshaft
9. Reverse gear
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11. Counter reverse gear
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<td></td>
<td>Deterioration of oil quality</td>
<td>Replace with specified oil</td>
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<tr>
<td></td>
<td>Worn bearing</td>
<td>Replace</td>
<td>J-24</td>
</tr>
<tr>
<td></td>
<td>Worn contact surface of countershaft gear</td>
<td>Replace</td>
<td>J-16, 20, 24</td>
</tr>
<tr>
<td></td>
<td>Worn contact surface of gears</td>
<td>Replace</td>
<td>J-16, 20, 24</td>
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<tr>
<td></td>
<td>Excessive gear backlash</td>
<td>Replace</td>
<td>J-16, 20, 24</td>
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<td></td>
<td>Damaged gear teeth</td>
<td>Replace</td>
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<td>Object caught in gears</td>
<td>Repair or replace</td>
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<td>Bent shift rod</td>
<td>Replace</td>
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<td></td>
<td>Insufficient oil</td>
<td>Add oil</td>
<td>J-6</td>
</tr>
<tr>
<td></td>
<td>Deterioration of oil quality</td>
<td>Replace with specified oil</td>
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<td></td>
<td>Wear or play of shift fork or shift rod</td>
<td>Replace</td>
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<td></td>
<td>Worn or damaged synchromizer ring (1st, 4th, 5th, Reverse)</td>
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<td></td>
<td>Worn or damaged synchromizer assembly (2nd and 3rd)</td>
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<td>Replace</td>
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<td>Poor contact of synchromizer ring and gear cone</td>
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<td></td>
<td>Excessive longitudinal play of gears</td>
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<td>Worn bearing</td>
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<td></td>
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<td></td>
<td>Weak synchromizer key spring</td>
<td>Replace</td>
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<td>Jumps out of gear</td>
<td>Weak detent ball spring</td>
<td>Replace</td>
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<td></td>
<td>Worn shift fork</td>
<td>Replace</td>
<td>J-16, 24</td>
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<td></td>
<td>Worn clutch hub</td>
<td>Replace</td>
<td>J-16, 24</td>
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<tr>
<td></td>
<td>Worn clutch hub sleeve</td>
<td>Replace</td>
<td>J-16, 24</td>
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<tr>
<td></td>
<td>Worn gears</td>
<td>Replace</td>
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<tr>
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<td>Excessive gear backlash</td>
<td>Replace</td>
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<td>Worn bearing</td>
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<td>Tighten</td>
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TRANSMISSION OIL

INSPECTION
1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Remove the transmission cover.
3. Remove the filler plug.
4. Verify that the oil is up to the bottom of the filler plug hole.
5. If the oil level is low, add the specified oil through the filler plug port.
6. Install a new filler plug.

Tightening torque:
25-39 N·m (2.5-4.0 kgf·m, 19-28 ft·lbf)

7. Install the transmission cover.

Tightening torque:
7.9-10.7 N·m (80-110 kgf·cm, 70-95.4 in·lbf)

REPLACEMENT
1. Remove the transmission cover.
2. Remove plug A (with washer) and B, and drain the oil into a suitable container.
3. Wipe both plugs clean.
4. Apply sealant to the B plug threads.
5. Install plug A (with new washer) and B.

Tightening torque:
A: 40-58 N·m (4.0-6.0 kgf·m, 29-43 ft·lbf)
B: 21-31 N·m (2.1-3.2 kgf·m, 16-23 ft·lbf)

6. Remove the filler plug and add the specified oil through the filler plug port until the level rises to the bottom of the port.

Specified oil:
Grade: API service GL-4 or GL-5
All-season: SAE 75W-90
Above 10°C (50°F): SAE 80W-90

Capacity: 2.5 L (2.6 US qts, 2.2 imp qts)

7. Install a new filler plug.

Tightening torque:
25-39 N·m (2.5-4.0 kgf·m, 19-28 ft·lbf)

8. Install the transmission cover.

Tightening torque:
7.9-10.7 N·m (80-110 kgf·cm, 70-95.4 in·lbf)
# OIL SEAL (EXTENSION HOUSING)

## PREPARATION

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<th>Description</th>
<th>Part</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>49 G030 795</td>
<td>Installer, oil seal</td>
<td>49 G030 796</td>
<td>Body (Part of 49 G030 795)</td>
</tr>
<tr>
<td>49 G030 797</td>
<td>Handle (Part of 49 G030 795)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## ON-VEHICLE REPLACEMENT

1. Remove the transmission cover.
2. Remove the propeller shaft. (Refer to section L.)
3. Remove the oil seal.

4. Apply the specified oil to the new oil seal.
5. Install the oil seal by using the SST.
6. Install the propeller shaft. (Refer to section L.)
7. Inspect the oil level. (Refer to page J-6)
8. Install the transmission cover.

**Tightening torque:**

- $7.9 - 10.7 \text{ N·m} (80 - 110 \text{ kgf·cm}, 70 - 95.4 \text{ in·lbf})$
## TRANSMISSION

### PREPARATION SST

<table>
<thead>
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<th>Part Number</th>
<th>Description</th>
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<th>Use</th>
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<td>49 G017 5A0</td>
<td>Support, engine</td>
<td></td>
<td>For support of engine</td>
</tr>
<tr>
<td>49 G017 502</td>
<td>Support (Part of 49 G017 5A0)</td>
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<td>For support of engine</td>
</tr>
<tr>
<td>49 S120 440</td>
<td>Holder, mainshaft</td>
<td></td>
<td>For holding mainshaft</td>
</tr>
<tr>
<td>49 G030 795</td>
<td>Installer, oil seal</td>
<td></td>
<td>For installation of oil seal</td>
</tr>
<tr>
<td>49 G030 797</td>
<td>Handle (Part of 49 G030 795)</td>
<td></td>
<td>For installation of oil seal</td>
</tr>
<tr>
<td>49 0636 145</td>
<td>Puller, fan pulley boss</td>
<td></td>
<td>For removal of clutch hub assembly</td>
</tr>
<tr>
<td>49 1243 465A</td>
<td>Wrench, mainshaft locknut</td>
<td></td>
<td>For removal of locknut</td>
</tr>
<tr>
<td>49 0710 520</td>
<td>Puller, bearing</td>
<td></td>
<td>For removal of bearing</td>
</tr>
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</table>

### Parts Diagrams

- **49 G017 501** Bar (Part of 49 G017 5A0)
- **49 G017 503** Hook (Part of 49 G017 5A0)
- **49 0639 425C** Puller set, bearing
- **49 0839 425C** Puller set, bearing
- **49 0862 350** Guide, shift fork
- **49 H017 101** Hook
- **49 F017 101** Holder, synchronizer ring
<table>
<thead>
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<th>Description</th>
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<td>Installer set, bearing</td>
<td>For installation of bearing</td>
<td>For installation of clutch hub assembly</td>
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<tr>
<td>49 F401 335A</td>
<td>Attachment A</td>
<td>For installation of bearing race</td>
<td>For installation of main bearing</td>
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<tr>
<td>49 S017 401</td>
<td>Retaining ring replacer</td>
<td>For removal/installation of retaining ring</td>
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REMOVAL
1. Disconnect the negative battery cable.
2. Remove in the order shown in the figure, referring to Removal Note.

- Shift lever knob
- Console panel assembly
- Insulator assembly
- Shift lever assembly
- Transmission cover
- Right undercover
- Left undercover
- Clutch release cylinder Removal Note
- Secondary air injection pipe
- Catalytic converter assembly
- Tunnel reinforcement (front)
- Tunnel reinforcement (rear)
- Cover
- Propeller shaft Removal section L
- Power Plant Frame (PPF) Removal Note
- Connectors
- Service hole A cover
- Service hole B cover
- Back-up light switch
- Transmission Removal Note
- Dust cover

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**TRANSMISSION**

**Removal Note**

**Clutch release cylinder**

**Caution**

- Bending the clutch pipe can cause kinks or cracks.

1. Loosen the clutch release cylinder installation bolts.
2. Loosen the clutch pipe bracket bolt.
3. Secure the clutch release cylinder/clutch pipe assembly in a place where it will not interfere with transmission removal.

**Power plant frame (PPF)**

1. Hold the engine by using the SST (engine supports).

2. Hold the differential with a transmission jack.
3. Remove the PPF.
4. Remove the back-up light switch from the transmission.

**Transmission**

1. The clutch cover and clutch release collar are joined as shown in the figure.

A: Clutch cover
B: Clutch release collar
C: Wedge collar
D: Wire ring

2. Remove the covers from service holes A and B.
3. Through service hole A, swing the release fork so that the release collar is pushed and held toward the clutch cover (engine side).
4. Insert a screwdriver through service hole B, into the space between the wedge collar and the release collar. Pry and separate the release collar from the clutch cover.

5. Swing the release fork back and forth to make sure that the release collar and clutch cover are separated.

6. If the above procedure does not work, then separate the clutch cover from the flywheel, following the procedure below.
   (1) Through service hole B, gradually loosen the 6 clutch cover installation bolts in a crisscross pattern.
   (2) Remove the clutch cover installation bolts, and separate the clutch cover from the flywheel.

7. Support the transmission with a transmission jack.
8. Loosen the transmission installation bolts.
9. Remove the transmission.

10. Remove the clutch cover.
   (1) Remove the clutch cover from the flywheel.
       (Refer to section H.)
   (2) If the transmission was removed by following step 6, remove the wire ring from the release collar and separate the release collar from the clutch cover.
DISASSEMBLY

Precaution
1. Clean the transmission exterior thoroughly with a steam cleaner or cleaning solvents before disassembly.

Warning
- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eyewear whenever using compressed air.

Caution
- Cleaning sealed bearings with cleaning fluids or a steam cleaner can wash the grease out of the bearing.

2. Clean the removed parts (except sealed bearings) with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and check that there are no obstructions.
3. Use a plastic hammer when disassembling the transmission case and other light alloy metal parts.
Clutch Housing and Extension Housing Components

Note
- The front and rear oil seals do not need to be removed unless you are replacing them.

Disassemble in the order shown in the figure, referring to Disassembly Note.
Disassembly note
Extension Housing
1. Temporarily reinstall the shifter lever, and move the control rod end to the neutral position.
2. Remove the shift lever.
3. Remove the extension housing installation bolts.

Caution
- When removing the extension housing, be careful that the control lever is not pulled into or pushed against the shift rod gates.

4. Lift up on and remove the extension housing from the center housing.
5th/Reverse Gear and Housing Components
Disassemble in the order shown in the figure, referring to Disassembly Note.
1. 5th/Reverse shift rod end inspection .... page J-30
2. 3rd/4th shift rod end inspection .... page J-30
3. 1st/2nd shift rod end inspection .... page J-30
4. Bearing housing disassembly note
5. Snap ring
6. Thrust washer
7. C-washers
8. Retaining ring
9. Mainshaft rear bearing disassembly note
10. C-washers and retaining ring
11. Locknut disassembly note
12. Countershaft rear bearing disassembly note
13. Counter 5th gear inspection .... page J-29
14. Spacer
15. Set bolt and washer
16. Center housing disassembly note
17. Oil guide
18. Blind cover
19. Cap plug, spring, and detent ball
20. Thrust lock washer
21. Steel ball
22. Bearing inspect for damage
23. 5th gear inspection .... page J-29
24. Retaining ring
25. 5th synchronizer ring inspection .... page J-30
26. Retaining ring
27. 5th/Reverse shift rod disassembly note
28. Spring inspection .... page J-31
29. 5th/Reverse shift fork
30. Interlock pin (large)
31. 3rd/4th shift rod disassembly note
32. Interlock pin (small)
33. Interlock pin (large)
34. 1st/2nd shift rod disassembly note
35. Thrust washer
36. Reverse idler gear shaft inspection .... page J-31
37. Reverse idler gear inspection .... page J-31
38. Thrust washer
39. Counter reverse gear inspection .... page J-29
40. Locknut disassembly note
41. 5th/Reverse clutch hub assembly disassembly note
42. Reverse synchronizer ring inspection .... page J-30
43. Reverse gear inspection .... page J-29
44. Bearing inspect for damage
45. Bearing race
46. Thrust washer
47. Bearing cover
48. Oil guide

Disassembly note

Bearing housing

Caution
- The bearing housing is made of aluminum, and is therefore easily dented and scratched by metal tools. When removing the bearing housing, do not use metal tools.

Hit down and outward on the bearing housing with a plastic hammer to remove.

Mainshaft rear bearing
1. Remove the snap ring, washer, retaining ring, and rear C-washers. Keep the rear C-washers together for correct reassembly.
2. Remove the mainshaft rear bearing by using the SST.
3. Remove the retaining ring and the front C-washers. Keep the front C-washers together for correct reassembly.
LOCKNUT AND COUNTERSHAFT REAR BEARING
1. Shift the 1st/2nd shift rod to 1st gear.
2. Uncrimp the tab of the locknut.
3. Hold the mainshaft by using the SST and a vise.
4. Remove the locknut.

5. Remove the countershaft rear bearing by using the SST.

CENTER HOUSING
1. Remove the set bolt and washer from the center housing.
2. Remove the center housing by tapping around its edge with a plastic hammer.

5TH/REVERSE SHIFT ROD
1. Remove the three cap plugs, packings, detent balls, and springs.

2. Drive the roll pin from the 5th/Reverse shift fork.
3. Remove the retaining ring from the 5th/Reverse shift rod by using the SST.
4. Slide the 5th/Reverse shift rod out of the transmission case, and remove the spring.

1st/2nd and 3rd/4th shift rods
1. Shift the transmission into 4th gear to gain access to the roll pin. Drive the roll pin from the 3rd/4th shift fork.
2. Slide the 3rd/4th shift rod and interlock pin (small) out from the rear of the transmission case.
3. Drive the roll pin from the 1st/2nd shift fork. Slide the 1st/2nd shift rod out from the rear of the transmission case, and remove the interlock pin (large).

Locknut
1. Uncrimp the tab of the locknut.
2. Shift into 1st and 4th gears to lock the rotation of the main-shaft.

3. Remove the locknut by using the SST.

5th/Reverse clutch hub assembly
1. Remove the bearing cover installation bolts.
2. Attach the SST to the bearing cover and remove the assembly, which consists of the following parts:
   - 5th/Reverse clutch hub assembly
   - Synchronizer ring
   - Needle bearing
   - Bearing race
   - Reverse gear
   - Thrust washer
Transmission Case Components
Disassemble in the order shown in the figure, referring to Disassembly Note.

1. Snap rings
   Disassembly Note ................................... page J-21
2. Main drive gear bearing
   Disassembly Note ................................... page J-21
   Inspect for damage
3. Countershaft front bearing
   Disassembly Note ................................... page J-21
   Inspect for damage
4. Mainshaft front bearing
   Disassembly Note ................................... page J-22
5. Thrust washer
6. Countershaft center bearing
   Disassembly Note ................................... page J-22
   Inspect for damage
7. Countershaft assembly
8. Main drive gear
   Inspection ............................................ page J-29
9. Bearing
10. Mainshaft gear assembly
    Disassembly Note ................................... page J-22
11. 3rd/4th shift fork
12. 1st/2nd shift fork
13. Transmission case
Disassembly note
Snap rings
Remove the snap rings from the mainshaft and the countershaft by using snap ring pliers.

Main drive gear bearing
1. Install the SST between the 4th gear synchronizer ring and main drive synchromesh gear.

2. Turn the bearing snap rings so that the ends are 90° to the transmission case grooves.

3. Install the SST, making sure to hand tighten the side screws as tightly as possible, and remove the main drive gear bearing.

Countershaft front bearing
1. Turn the bearing snap rings so that the ends are 90° to the transmission case grooves.
2. Remove the countershaft front bearing by using the SST.

Mainshaft front bearing
Remove the mainshaft front bearing by using the SST.

Countershaft center bearing
1. Remove the countershaft center bearing by using the SST.

2. Remove the countershaft.

Mainshaft gear assembly
1. Remove the main drive gear from the transmission case.
2. Remove the needle bearing from the mainshaft joint of the main drive gear.
3. Remove the mainshaft gear assembly from the transmission case.
Mainshaft and Countershaft Components

Note
- The countershaft center bearing race does not need to be removed unless you are replacing it.

Disassemble in the order shown, referring to Disassembly Note.
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<th>12. Inner cone</th>
<th>23. Inner cone</th>
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<td>15. Bearing inspect for damage</td>
<td>26. 2nd gear inspection</td>
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<tr>
<td>5. 4th synchronizer ring inspection</td>
<td>16. 3rd gear inspection</td>
<td>27. Bearing inspect for damage</td>
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<td>7. 3rd/4th clutch hub inspection</td>
<td>18. 1st/2nd clutch hub inspection</td>
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<td>10. Synchronizer key spring</td>
<td>22. 2nd synchronizer assembly inspection</td>
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<tr>
<td>11. 3rd synchronizer assembly inspection</td>
<td>page J-31</td>
<td></td>
</tr>
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</table>

**Disassembly note**

**3rd/4th clutch hub assembly**

1. Remove the snap ring from the front of the mainshaft.

2. Position the SST between 2nd and 3rd gears, and hold the mainshaft from underneath.

3. Press the mainshaft out from the 3rd gear, 3rd synchronizer ring assembly, and the 3rd/4th clutch hub assembly.

**1st/2nd clutch hub assembly**

Hold the mainshaft, and press the 1st/2nd clutch hub assembly, 2nd synchronizer ring assembly, and 2nd gear from the mainshaft.
Countershaft center bearing race
Hold the countershaft from underneath, and remove the countershaft bearing race by using the SST.
Extension Housing Components

Note
- The extension housing oil seal does not need to be removed unless you are replacing it.

Disassemble in the order shown, referring to Disassembly Note.
Disassembly note
Control rod
1. Slide the control rod end to the point where the roll pin is directly above the recess in the extension housing.
2. Remove the roll pin from the control rod end by using a pin punch and hammer.

3. Remove the roll pin from the selector by using a pin punch and hammer.
4. Slide the control rod from the extension housing, and remove the control rod end and selector.

Oil seal (extension housing)
Remove the oil seal from the extension housing by using a screwdriver.
INSPECTION
Inspect all parts, and repair or replace as necessary.

Each Gear and Main Drive Gear
1. Inspect synchronizer cones for wear.
2. Inspect individual gear teeth for damage, wear, and cracks.
3. Inspect synchronizer ring matching teeth for damage and wear.
4. Inspect main drive gear splines for damage and wear.

Mainshaft
1. Measure the mainshaft runout.
   Runout: 0.03 mm {0.0012 in} max.
2. Inspect splines for damage and wear.
3. Measure the clearance between mainshaft and gear (or bushing).
   Clearance: 0.15 mm {0.006 in} max.

Countershaft
1. Inspect gear teeth for damage, wear, and cracks.
2. Inspect splines for damage and wear.
Control Rod Lever and Shift Rod
Measure the clearance between the control rod lever and the shift rod gate.

Clearance: 0.8 mm {0.031 in} max.

Each Clutch Hub Assembly
1. Inspect clutch hub sleeve and hub operation.
2. Inspect individual gear teeth for damage, wear, and cracks.
3. Inspect synchronizer keys for damage, wear, and cracks.

4. Measure the clearance between the hub sleeve groove and shift fork.

Clearance:
0.2–0.3 mm {0.008–0.012 in}
Maximum: 0.5 mm {0.020 in}

1st, 4th, 5th, Reverse Synchronizer Rings
1. Inspect individual synchronizer ring teeth for damage, wear, and cracks.
2. Inspect taper surface for wear and cracks.

3. Set the synchronizer ring squarely in the gear.
4. Measure the clearance between the synchronizer ring and flank surface of gear all around the circumference.

Clearance: 1.5 mm {0.059 in}
Minimum: 0.8 mm {0.031 in}
2nd/3rd Synchronizer Assembly
1. Inspect individual synchronizer ring gear teeth for damage, wear, and cracks. Replace the synchronizer assembly if any such damage is found.
2. Inspect for wear and damage to the tapered surfaces of the inner cone, double cone, and synchronizer ring. Replace the synchronizer assembly if any such damage is found.

3. Set the synchronizer assembly squarely in the gear.
4. Measure the clearance between the synchronizer ring and flank surface of gear.

   Clearance: 1.5 mm \{0.059 in\}
   Minimum: 0.8 mm \{0.031 in\}

Reverse Idler Gear and Shaft
1. Inspect gear teeth for damage, wear, and cracks.

2. Measure the clearance between the reverse idler gear bushing and shaft.

   Clearance:
   \[0.02-0.05 \text{ mm} \{0.0008-0.0020 \text{ in}\}\]
   Maximum: 0.15 mm \{0.006 in\}

Spring
Measure the free length of the spring.

Standard free length
Detent ball spring: 22.5 mm \{0.886 in\}
5th/Reverse retaining spring: 73.00 mm \{2.874 in\}
Select lock spindle spring: 43.25 mm \{1.703 in\}
Extension Housing
1. Inspect the indicated bearings for damage.
2. Replace the extension housing if necessary.
ASSEMBLY
Precaution
1. Make sure each part is cleaned before assembling.
2. Coat all movable parts with the specified oil.
3. Replace parts wherever required.
4. Remove old sealant from contact surfaces before applying new sealant.
5. Assemble the parts within 10 minutes after applying sealant. Allow all sealant to cure at least 30 minutes after assembly before filling the transmission with transmission oil.

Extension Housing Components
Assemble in the order shown, referring to Assembly Note.

1. Extension housing 7. Select lock spindle 13. Wave washer
2. Oil seal (extension housing) 8. Select lock spindle spring 14. Bushing
  Assembly Note 9. Spring cap 15. Bracket
  .............. page J–34 10. Select spindle assembly 16. 1-2 switch
  Assembly Note ........................ page J–34 installation bolts
5. Control rod end 6. Control rod
  Assembly Note 7. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 8. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 9. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 10. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 11. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 12. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 13. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 14. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 15. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 16. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 17. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 18. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 19. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
  .............. page J–34 20. 9–10.7 N·m (80–110 kgf·cm, 70–85.4 in-lbf)
Assembly note
Oil seal (extension housing)
1. Apply clean oil to the lip and outer edge of a new oil seal.
2. Install the oil seal evenly and gradually by using the SST.

Control rod
1. Install the control rod through the selector and the control rod end, into the extension housing.
2. Install new roll pins into the selector and control rod ends as shown in the figure.

Blind cover
1. Apply sealant to the contact surfaces of the blind cover and extension housing.
2. Install the blind cover.

Tightening torque:
19–25 N·m (1.9–2.6 kgf·m, 14–18 ft·lbf)

Control case
1. Apply sealant to the contact surfaces of the extension housing and control case.
2. Install the control case to the extension housing.

Tightening torque:
19–25 N·m (1.9–2.6 kgf·m, 14–18 ft·lbf)
Mainshaft and Countershaft Components
Assemble in the order shown, referring to Assembly Note.

1ST/2ND AND 3RD/4TH CLUTCH HUBS

SNAP RING, NEW
1. Mainshaft  
2. Bearing  
3. 2nd gear  
4. Inner cone  
5. Double cone  
6. Synchronizer ring  
7. 2nd synchronizer assembly  
8. 1st/2nd clutch hub  
9. Synchronizer key  
10. Clutch hub sleeve  
11. Synchronizer key springs  
12. 1st/2nd clutch hub assembly  
13. 3rd gear  
14. Bearing  
15. Inner cone  
16. Double cone  
17. Synchronizer ring  
18. 3rd synchronizer assembly  
19. 3rd/4th clutch hub  
20. Synchronizer key  
21. Clutch hub sleeve  
22. Synchronizer key springs  
23. 3rd/4th clutch hub assembly  
24. 4th synchronizer ring  
25. 1st synchronizer ring  
26. Bearing race  
27. Bearing  
28. 1st gear  
29. Countershaft  
30. Countershaft center  
31. Countershaft front bearing spacer

Assembly note  
2nd, 3rd synchronizer assemblies  
Install the inner cone, double cone, and synchronizer ring as shown in the figure. The 1st synchronizer ring has two teeth fused together at three places around its outer edge.

1st/2nd, 3rd/4th clutch hub assemblies  
1. For the 2nd and 3rd synchronizer assemblies, align the synchronizer ring grooves and keys, and fit the inner cone tabs into the clutch hub slots.

2. For the 1st and 4th synchronizer rings, align the synchronizer ring grooves and synchronizer keys.
Standard key dimensions

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<td>5.45 [0.215]</td>
<td>6.00 [0.236]</td>
</tr>
<tr>
<td>3rd and 4th</td>
<td>17.00 [0.669]</td>
<td>4.25 [0.167]</td>
<td>5.00 [0.197]</td>
</tr>
</tbody>
</table>

3. When installing the gears and clutch hub assemblies in the following procedure, make sure that they are installed in the direction shown in the figure.

4. Set the needle bearing, 2nd gear, 2nd synchronizer assembly, and the 1st/2nd clutch hub assembly on the mainshaft. Press the parts onto the mainshaft while keeping the parts from becoming crooked or misaligned.

5. Set the needle bearing, 3rd gear, 3rd synchronizer assembly, and 3rd/4th clutch hub assembly on the mainshaft. Press the parts onto the mainshaft by using the SST, while keeping the parts from becoming crooked or misaligned.
6. Install a new snap ring on the front of the mainshaft.

Countershaft center bearing race
Press the countershaft center bearing race onto the countershaft by using the SST.

Countershaft front bearing spacer
Install the countershaft front bearing spacer. If the countershaft front bearing or countershaft front bearing spacer is being replaced, replace them as an assembly.
Transmission Case Components
Assemble in the order shown, referring to Assembly Note.

1. Transmission case
   Assembly Note ........................................ page J-41
2. Mainshaft gear assembly
3. 1st/2nd shift fork
4. 3rd/4th shift fork
5. Bearing
6. Main drive gear
7. Countershaft assembly
8. Thrust washer
9. Mainshaft front bearing
   Assembly Note ........................................ page J-42
10. Countershaft center bearing
    Assembly Note ........................................ page J-42
11. Bearing cover
12. Main drive gear bearing
    Assembly Note ........................................ page J-42
13. Countershaft front bearing
    Assembly Note ........................................ page J-43
14. Snap rings

N・m (kgf・m, ft・lbf)
Assembly note

Transmission case
1. Measure the mainshaft front bearing thrust play as follows.
   (1) Measure the depth of the mainshaft front bearing bore in the rear of the transmission case.

   (2) Measure the mainshaft front bearing height. The difference between the two measurements indicates the required thickness of the adjustment shim.

   Standard thrust play:
   0–0.05 mm {0–0.002 in}
   Adjustment shim thicknesses:
   0.1 mm {0.004 in}, 0.3 mm {0.012 in}

2. Measure the countershaft front bearing thrust play as follows.
   (1) Measure depth B of the countershaft front bearing bore in the transmission case.

   (2) Measure the countershaft front bearing snap ring height A.

   (3) Choose an adjustment shim that will allow the difference between the two measurements to be equal to the standard bearing height.

   \[ A - B + \text{Adjustment shim(s)} = 0.9–1.0 \text{ mm} \]
   \[ (0.035–0.039 \text{ in}) \]

   Standard bearing height on Installing:
   0.9–1.0 mm {0.035–0.039 in}

   Adjustment shim thicknesses:
   0.1 mm {0.004 in}, 0.3 mm {0.012 in}

3. Position the 1st/2nd and 3rd/4th shift forks into the grooves of the clutch hub and sleeve assemblies.
4. Apply molybdenum grease to the needle bearing and install it in the main drive gear.
5. Install the main drive gear onto the front of the mainshaft.
6. Set the countershaft assembly into the case, making sure the countershaft gears engage each gear of the mainshaft assembly.

Mainshaft front bearing
1. Install the correct shim onto the rear of the mainshaft as determined in the transmission case assembly note (page J-43.)
2. Install the mainshaft front bearing with a suitable pipe.

   **Bearing inner diameter:** 32 mm (1.3 in)
   **Bearing outer diameter:** 75 mm (3.0 in)

Countershaft center bearing
1. Install the countershaft center bearing onto the rear of the countershaft by using the SST.

2. Install the bearing cover.

   **Tightening torque:**
   18–26 N·m (1.8–2.7 kgf·m, 14–19 ft·lbf)

Main drive gear bearing
1. Install the SST between the 4th synchronizer ring and the main drive synchronesh gear.
2. Install the main drive gear bearing by using the SSTs.

Countershaft front bearing
1. Install the correct shim onto the countershaft front bearing as determined in the transmission case assembly note (page J–43.)
2. Install the countershaft front bearing by using the SST. If the countershaft front bearing or countershaft front bearing spacer is being replaced, replace them as an assembly.

3. Install new snap rings to the main drive gear and countershaft gear. Install the smaller snap ring to the countershaft gear, and the larger one to the main drive gear.
5th/Reverse Gear and Housing Components
Assemble in the order shown, referring to Assembly Note.

- 5TH/REVERSE CLUTCH HUB
  - GASKET NEW
  - PACKING NEW

- 7.9–10.7 N·m
  - (80–110 kgf·cm, 70–95.4 in·lbf)

- 40–58
  - (4.0–6.0, 22–43)

- 19–25 (1.9–2.6, 14–18)

- 8.9–13.7 N·m
  - (90–140 kgf·cm, 79–121 in·lbf)

- 128–196
  - (130–220, 95–144)

- NEW SST
  - 157–235
    - (16.0–24.0, 116–173)

- STAKE

- ROLL PIN, NEW

- RETAINING RING

N·m [kgf·m, ft·lbf]
1. Counter reverse gear
2. Thrust washer
3. Reverse idler gear
4. Reverse idler gear shaft
5. Thrust washer
6. Thrust washer
7. Bearing race
8. Bearing
9. Reverse gear
10. Reverse synchronizer ring
11. 5th/Reverse clutch hub assembly
12. Locknut
13. 5th synchronizer ring
14. Retaining ring
15. 5th gear
16. Bearing
17. Steel ball
18. Thrust lock washer
19. C-washers and retaining ring
20. 1st/2nd shift rod
21. Interlock pin (large)
22. Interlock pin (small)
23. 3rd/4th shift rod
24. Interlock pin (large)
25. 5th/Reverse shift fork
26. Spring
27. 5th/Reverse shift rod
28. Retaining ring
29. Cap plug, spring, and detent ball
30. Blind cover
31. Oil guide
32. Center housing
33. Set bolt and washer
34. Spacer
35. Counter 5th gear
36. Countershaft rear bearing
37. Locknut
38. Mainshaft rear bearing
39. Retaining ring
40. C-washers
41. Thrust washer
42. Snap ring
43. Bearing housing
44. 1st/2nd shift rod end
45. 3rd/4th shift rod end
46. 5th/Reverse shift rod end
47. Oil guide

Assembly note

Synchronizer ring (5th/Reverse)
The 5th and Reverse synchronizer rings are differentiated as follows.
(1) The 5th synchronizer ring has 3 places on its circumference with one tooth missing in each place.
(2) The Reverse synchronizer ring has no distinguishing marks.

5th/Reverse clutch hub assembly and locknut
1. Align the 5th/Reverse synchronizer grooves and the synchronizer keys.
2. Install the 5th/Reverse clutch hub assembly onto the mainshaft in the direction shown.

3. Shift the clutch hubs into 1st and 4th gears to lock the rotation of the mainshaft.
4. Install a new locknut and tighten it with the SST.

Tightening torque:
157–235 N·m (16.0–24.0 kgf·m, 116–173 ft·lbf)

5. Check the clearance between the synchronizer key and the exposed edge of the synchronizer ring. If the clearance is not as specified, adjust it by changing the thrust washers on the front and rear of the mainshaft front bearing. The total combined thickness of the front and rear thrust washers must equal 6.0 mm (0.236 in)

Clearance: 0.66–2.00 mm (0.026–0.079 in)

Available thrust washer thicknesses:
2.5 mm (0.098 in), 3.0 mm (0.118 in)
3.5 mm (0.138 in)

6. Stake the locknut into the mainshaft groove.
5th gear
1. Install a new retaining ring to the 5th gear.

2. Install the synchronizer ring, 5th gear, and needle bearing.
3. Install the steel ball and thrust lock washer.
4. Install the 3.0 mm (0.118 in) C-washers and hold them with a retaining ring.

5. Push the C-washers toward 5th gear and measure the clearance between the C-washers and thrust lock washer. If the clearance is not as specified, select the proper thrust lock washer.

Standard: 0.1–0.2 mm (0.004–0.008 in)

Available thrust lock washer thicknesses:
- 6.2 mm (0.244 in), 6.3 mm (0.248 in)
- 6.4 mm (0.252 in), 6.5 mm (0.256 in)
- 6.6 mm (0.260 in), 6.7 mm (0.264 in)

Shift forks and rods
1. Refer to the figure to identify each shift rod. When installing the shift rods in the following procedure, install them so that the detent grooves are facing the detent balls.

2. Slide the 1st/2nd shift rod into the case.
3. Secure the 1st/2nd shift fork to the rod with a new roll pin. The split in the roll pin must be facing in the direction shown in the figure.
4. Install the interlock pins as shown in the figure when doing steps 4 through 8.

5. Slide the two SST into the transmission case to guide the interlock pins, and insert the first pin.
6. Remove the 3rd/4th shift fork guide from the case.
7. Slide the 3rd/4th shift rod containing the interlock pin (small) into the case.
8. Secure the 3rd/4th shift rod onto the fork with the new roll pin.
9. Insert the remaining interlock pin and remove the SST.

10. Install the 5th/Reverse shift fork onto the clutch hub.
11. Install the 5th/Reverse shift rod in the transmission case through the spring.
12. Push back the spring, and install a new clip to the 5th/Reverse shift rod by using the SST.

13. Install a new roll pin into the 5th/Reverse shift fork.

14. Install the two blind covers and two new gaskets.

**Tightening torque:**
7.9-10.7 N·m (80-110 kgf·cm, 70.0-95.4 in·lbf)

15. Install the packings, detent balls, springs, and cap bolts.

**Tightening torque:**
- **A:** 40-58 N·m (4.0-6.0 kgf·m, 29-43 ft·lbf)
- **B:** 19-25 N·m (1.9-2.6 kgf·m, 14-18 ft·lbf)
Center housing
1. Apply sealant to the contact surfaces of the transmission case and center housing.
2. Install the oil guide.
3. Install the center housing.
4. Align the reverse idler gear shaft with the set bolt hole, and install the set bolt and washer.

Tightening torque:
8.9–13.7 N·m (90–140 kgf·cm, 79–121 in·lbf)

5. Install the spacer and counter 5th gear.

Countershaft rear bearing
1. Install the countershaft rear bearing by using the SST.

2. Connect the SST to the mainshaft and mount it securely in a vise.
3. Shift into 1st gear to lock the countershaft.
4. Install the new countershaft locknut.

Tightening torque:
128–196 N·m (13.0–20.0 kgf·m, 95–144 ft·lbf)

5. Stake the locknut into the countershaft groove.
Mainshaft rear bearing
1. Drive on the mainshaft rear bearing with a suitable pipe.

   Bearing diameter (inner): 22 mm (0.87 in)
   Bearing diameter (outer): 56 mm (2.2 in)

2. Install the C-washers and hold them in place with a new retaining ring.
3. With points A and B pressed tightly together, measure the clearance between the C-washers and the groove. If the clearance is not as specified, select the proper C-washers.

   Standard: 0–0.1 mm (0–0.004 in)

   Available C-washer thicknesses:
   2.9 mm (0.114 in), 3.0 mm (0.118 in)
   3.1 mm (0.122 in), 3.2 mm (0.126 in)

Bearing housing
1. Apply sealant to the contact surfaces of the center housing and bearing housing.
2. Install the bearing housing onto the center housing.

Shift rod ends
Install the shift rod ends onto the proper shift rods, and secure them with new roll pins facing as shown in the figure.
Clutch Housing and Extension Housing Components
Assemble in the order shown, referring to Assembly Note.

1. Magnet
2. Oil baffle
3. Undercover
   Assembly Note ................................ page J-52
4. Snap ring
5. Key
6. Speedometer drive gear
7. Snap ring
8. Extension housing
   Assembly Note ................................ page J-52
9. Speedometer sensor
   (Speedometer driven gear)
10. Back-up light switch
11. Assist shim
12. Oil seal (clutch housing)
    Assembly Note ......................... page J-52
13. Clutch housing
    Assembly Note .......................... page J-52
14. Release cylinder support
15. Vent cover
16. Service hole B cover
17. Service hole A cover
18. Dust cover
19. Front cover
20. Release collar
21. Release fork assembly
    Assembly Note .................. page J-53

J-51
**Assembly note**

**Undercover**
1. Install the magnet to the undercover.

   **Tightening torque:**
   \[ 7.9 \sim 10.7 \text{ N} \cdot \text{m} \{80 \sim 110 \text{ kgf} \cdot \text{cm}, 70.0 \sim 95.4 \text{ in} \cdot \text{lbf}\} \]

2. Install the oil baffle to the undercover.

   **Tightening torque:**
   \[ 7.9 \sim 10.7 \text{ N} \cdot \text{m} \{80 \sim 110 \text{ kgf} \cdot \text{cm}, 70.0 \sim 95.4 \text{ in} \cdot \text{lbf}\} \]

3. Apply sealant to the contact surfaces of the undercover and the transmission case.
4. Install the undercover.

   **Tightening torque:**
   \[ 19 \sim 25 \text{ N} \cdot \text{m} \{1.9 \sim 2.6 \text{ kgf} \cdot \text{m}, 14 \sim 18 \text{ ft} \cdot \text{lbf}\} \]

**Extension housing**
1. Apply sealant to the contact surfaces of the extension housing and bearing housing.
2. Install the extension housing.

   **Bolt length (measured from below the head):**
   A: 135 mm \{5.31 in\}
   B: 48 mm \{1.89 in\}
   C: 165 mm \{6.50 in\}

   **Tightening torque:**
   \[ 42 \sim 54 \text{ N} \cdot \text{m} \{4.2 \sim 5.6 \text{ kgf} \cdot \text{m}, 31 \sim 40 \text{ ft} \cdot \text{lbf}\} \]

**Oil seal (clutch housing)**
1. Apply the specified oil to the lip of a new oil seal.
2. Install the oil seal evenly by using the SST.

**Clutch housing**
1. Measure the depth of the main drive gear bearing bore in the clutch housing by using vernier calipers.
2. Measure the main drive gear bearing height.
3. The difference between the measurements in steps 1 and 2 indicates the required thickness of the adjustment shim.

   Standard thrust play: 0–0.1 mm {0–0.004 in}
   Adjustment shim thicknesses:
   0.3 mm {0.012 in}, 0.4 mm {0.016 in}
   0.5 mm {0.020 in}, 0.6 mm {0.024 in}
   0.7 mm {0.028 in}

4. Apply sealant to the contact surfaces of the clutch housing and transmission case.
5. Install the correct adjustment shim on the main drive gear bearing as determined in steps 1 and 2.

6. Install the clutch housing.

   Tightening torque:
   42–54 N·m {4.2–5.6 kgf·m, 31–40 ft·lbf}

7. Install the front cover to the clutch housing.

   Tightening torque:
   19–25 N·m {1.9–2.6 kgf·m, 14–18 ft·lbf}

Release collar and release fork assembly
1. Apply molybdenum grease to the shaded areas of the release bearing and release fork.
2. Install the release bearing and release fork assembly.

Tightening torque:
32–46 N·m (3.2–4.7 kgf·m, 24–33 ft·lb)
1. Install in the order shown, referring to Installation Note.
2. After installation, fill the transmission with the specified oil and do a road test.

1. Dust cover
2. Transmission Installation Note page J-56
3. Service hole A cover
4. Service hole B cover
5. Back-up light switch
6. Connectors
7. Power Plant Frame (PPF) Installation Note page J-57
8. Propeller shaft Installation section L
9. Cover
10. Tunnel reinforcement (rear)
11. Tunnel reinforcement (front)
12. Catalytic converter assembly
13. Secondary air injection pipe
14. Tunnel reinforcement (center)
15. Starter
16. Clutch release cylinder
17. Left undercover
18. Right undercover
19. Transmission cover
20. Shift lever assembly
21. Insulator assembly
22. Console panel assembly
23. Shift lever knob
Installation Note
Transmission
1. Coat the main drive gear splines with grease as shown in the figure.

2. Set the transmission on a transmission jack.

3. Raise the transmission into place and install it to the engine, being careful not to dent or scratch the wedge collar and wiring.
4. Tighten the installation bolts.

Bolt length:
A: 55 mm {2.2 in}
B: 90 mm {3.5 in}

Tightening torque:
38–51 N•m{3.8–5.3 kgf•m, 28–38 ft•lbf}

5. Through service hole A, push the release-cylinder end of the clutch release fork toward the transmission, and connect the clutch release collar to the clutch cover. The clutch release collar should snap into the clutch cover when installed properly.

6. Swing the clutch release fork back and forth to verify that the clutch release collar is connected to the clutch cover.
7. Push the release-cylinder end of the clutch release fork toward the engine, and verify that it does not move past the dotted line.
Power plant frame (PPF)
1. Hold the differential at a 0° angle by using the transmission jack.

2. Hold the PPF in place with a new bolt and 8 new nuts.

3. Tighten the differential-side PPF installation bolt and nuts in the order shown.

Tightening torque:
A, C: 148-176 N·m
{15.0-18.0 kgf·m, 109-130 ft·lbf}
B: 75-93 N·m{7.6-9.5 kgf·m, 55-68 ft·lbf}

4. Tighten the transmission-side PPF installation nuts in the order shown.

Tightening torque:
148-176 N·m{15.0-18.0 kgf·m, 109-130 ft·lbf}

5. Remove the transmission jack.
6. Lower the vehicle to the ground, and remove the SST (engine supports).

7. Place a straightedge on the flat area on the front/left edge of the tunnel mount (A) so that it passes under the PPF installation bolts. Measure from the top of the straightedge to the PPF.

Standard: 75.1 mm {2.96 in}
Acceptable range: 70-77 mm {2.76-3.03 in}

8. If the clearance is not within specification, readjust the PPF.
SHIFT MECHANISM

OVERHAUL
1. Disassemble as shown in the figure.
2. Inspect each part, and replace if necessary.
3. Assemble in the reverse order of disassembly.
4. After assembly, pump the clutch pedal and verify that the shift lever moves smoothly.
Assembly Note
Shift seat
Apply grease to both the inside and outside of the shift seat.

Shift lever
The change control case must be filled with oil after the transmission has been reassembled and installed.

1. Fill the change control case with the specified oil.
   Capacity: 80–95 cm³ (4.9–5.8 cu in)

2. Apply grease to the shift lever ball joint.

3. Align the control case pin with the slots in the change bushings and the shift lever, and install.