OVERHAUL

Components

SEC. 311•313•327•381

- Differential side bearing adjusting shim
- Pinion mate gear thrust washer
- Pinion mate gear
- Lock pin
- Side gear thrust washer
- Speedometer drive gear
- Pinion mate shaft
- Differential case
- Differential side bearing (ATF)
- Oil pump cover
- Gasket
- Oil seal
- Seal ring
- Oil pump assembly

- Vehicle speed sensor
- O-ring
- Bolt
- Differential side oil seal
- Converter housing
- Differential lubricant tube
- Clip
- Input shaft O-ring

- Torque converter
- (4.5 - 6.0, 33 - 43)
- Oil seal
- Seal lip
- Oil pump housing

- Inner gear
- Outer gear

- N•m (kg-m, in-lb)
- N•m (kg-m, ft-lb)
- Apply ATF
- Apply petroleum jelly
- Select with proper thickness
**Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings**

### Outer diameter of thrust washers

<table>
<thead>
<tr>
<th>Item number</th>
<th>Outer diameter mm (in)</th>
<th>Parts number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]</td>
<td>76.0 (2.992)</td>
<td>31508 80X13 - 31508 80X20</td>
</tr>
<tr>
<td>[K]</td>
<td>80.0 (3.150)</td>
<td>31438 80X60 - 31438 80X70</td>
</tr>
</tbody>
</table>

### Outer and inner diameter of needle bearings

<table>
<thead>
<tr>
<th>Item number</th>
<th>Outer diameter mm (in)</th>
<th>Inner diameter mm (in)</th>
<th>Parts number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A]</td>
<td>50.0 (1.969)</td>
<td>35.1 (1.382)</td>
<td>31407 80X10</td>
</tr>
<tr>
<td>[B]</td>
<td>42.0 (1.654)</td>
<td>23.7 (0.933)</td>
<td>31407 80X01</td>
</tr>
<tr>
<td>[C]</td>
<td>70.0 (2.756)</td>
<td>50.0 (1.969)</td>
<td>31407 80X09</td>
</tr>
<tr>
<td>[D]</td>
<td>51.0 (2.008)</td>
<td>33.1 (1.303)</td>
<td>31407 80X02</td>
</tr>
<tr>
<td>[E]</td>
<td>48.0 (1.880)</td>
<td>30.0 (1.181)</td>
<td>31407 80X03</td>
</tr>
<tr>
<td>[F]</td>
<td>50.0 (1.969)</td>
<td>35.1 (1.382)</td>
<td>31407 80X10</td>
</tr>
<tr>
<td>[G]</td>
<td>56.5 (2.224)</td>
<td>38.5 (1.516)</td>
<td>31407 80X08</td>
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<tr>
<td>[H]</td>
<td>87.0 (3.425)</td>
<td>69.0 (2.717)</td>
<td>31407 80X07</td>
</tr>
<tr>
<td>[I]</td>
<td>108.0 (4.252)</td>
<td>85.15 (3.3524)</td>
<td>31407 80X06</td>
</tr>
</tbody>
</table>

**Outer & inner diameter of bearing races, adjusting shims and adjusting spacer**

<table>
<thead>
<tr>
<th>Item number</th>
<th>Outer diameter mm (in)</th>
<th>Inner diameter mm (in)</th>
<th>Parts number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>[L]</td>
<td>51.0 (2.008)</td>
<td>36.0 (1.417)</td>
<td>31435 80X00 - 31439 80X14</td>
</tr>
<tr>
<td>[M]</td>
<td>38.0 (1.496)</td>
<td>28.1 (1.106)</td>
<td>31439 85X01 - 31439 85X06 - 31439 83X11 - 31439 83X24 - 31439 81X00 - 31439 81X24 - 31439 81X46 - 31439 81X49 - 31439 81X60 - 31439 81X74</td>
</tr>
<tr>
<td>[N]</td>
<td>75.0 (2.953)</td>
<td>67.0 (2.638)</td>
<td>31438 80X00 - 31439 80X11</td>
</tr>
</tbody>
</table>

**Outer diameter of snap rings**

<table>
<thead>
<tr>
<th>Item number</th>
<th>Outer diameter mm (in)</th>
<th>Parts number*</th>
</tr>
</thead>
<tbody>
<tr>
<td>[O]</td>
<td>150 (5.91)</td>
<td>31506 80X13</td>
</tr>
<tr>
<td>[P]</td>
<td>119.1 (4.689)</td>
<td>31506 80X06</td>
</tr>
<tr>
<td>[Q]</td>
<td>182.8 (7.197)</td>
<td>31506 80X08</td>
</tr>
<tr>
<td>[R]</td>
<td>144.8 (5.701)</td>
<td>31506 80X03</td>
</tr>
<tr>
<td>[S]</td>
<td>173.8 (6.843)</td>
<td>31506 80X09</td>
</tr>
<tr>
<td>[T]</td>
<td>133.9 (5.272)</td>
<td>31506 80X01</td>
</tr>
</tbody>
</table>

* : Select proper thickness.
* : Always check with the Parts Department for the latest parts information.
Disassembly

1. Drain ATF through drain plug.
2. Remove torque converter.

3. Check torque converter one-way clutch using check tool.
   a. Insert check tool into the groove of bearing support built into one-way clutch outer race.
   b. When fixing bearing support with check tool, rotate one-way clutch spline using screwdriver.
   c. Check that inner race rotates clockwise only. If not, replace torque converter assembly.

4. Remove A/T fluid charging pipe and fluid cooler tube.
5. Set manual shaft to position P.
6. Remove park/neutral position (PNP) switch.

7. Remove oil pan and oil pan gasket.
   - Always replace oil pan bolts as they are self-sealing bolts.

8. Check foreign materials in oil pan to help determine causes of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and can inhibit pump pressure.
   - If frictional material is detected, replace radiator after repair of A/T. Refer to CO-34, "RADIATOR".

9. Remove control valve assembly according to the following procedures.
   a. Remove control valve assembly mounting bolts I, X and ●.
   b. Remove snap ring from terminal cord assembly connector.
   c. Push terminal body into transmission case and draw out solenoid harness.
10. Remove manual valve from control valve assembly.

11. Remove return spring from servo release accumulator piston.

12. Remove servo release accumulator piston with compressed air.

13. Remove O-rings from servo release accumulator piston.

14. Remove N-D accumulator piston and return spring with compressed air.

15. Remove O-rings from N-D accumulator piston.
16. Check accumulator pistons and contact surface of transmission case for damage.

17. Check accumulator return springs for damage and free length.
18. Remove lip seals.

19. Remove L & R oil tube and oil sleeve.

20. Remove converter housing according to the following procedures.
   a. Remove converter housing mounting bolts.
   b. Remove converter housing by tapping it lightly.
c. Remove O-ring from differential oil port.

21. Remove final drive assembly from transmission case.

22. Remove differential side bearing outer race and side bearing adjusting shim from transmission case.

23. Remove differential side bearing adjusting shim from transmission case.

24. Remove differential side bearing outer race from converter housing.
25. Remove oil seal with screwdriver from converter housing.
   ● **Be careful not to damage case.**

26. Remove differential lubricant tube from converter housing.

27. Remove oil pump according to the following procedures.
   a. Remove O-ring from input shaft.
   b. Remove oil pump assembly, baffle plate and gasket from transmission case.
c. Remove thrust washer and bearing race from oil pump assembly.

28. Remove brake band according to the following procedures.
   a. Loosen lock nut, then back off anchor end pin.
      ● Do not reuse anchor end pin.

   b. Remove brake band and strut from transmission case.

   ● To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown. Leave the clip in position after removing the brake band.
c. Check brake band facing for damage, cracks, wear or burns.

29. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.
   a. Remove input shaft assembly (high clutch) with reverse clutch.
   b. Remove input shaft assembly (high clutch) from reverse clutch.
   c. Remove needle bearings from high clutch drum and check for damage or wear.
   d. Remove high clutch hub and front sun gear from transmission case.
e. Remove front sun gear and needle bearing from high clutch hub and check for damage or wear.

f. Remove bearing race from front sun gear and check for damage or wear.

30. Remove needle bearing from transmission case and check for damage or wear.

31. Apply compressed air and check to see that low and reverse brake operates.

32. Remove low one-way clutch and front planetary carrier assembly according to the following procedures.
   a. Remove snap ring with flat-bladed screwdriver.
b. Remove low one-way clutch with a hook made of wire.

c. Remove snap ring with flat-bladed screwdriver.

d. Remove front planetary carrier with low and reverse brake piston and retainer.

e. Remove low and reverse brake spring retainer.
   • Do not remove return springs from spring retainer.
f. Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.

![Low one-way clutch diagram](SAT048D)

b. Remove needle bearing, low and reverse brake piston and retainer from front planetary carrier.

c. Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.

![Front planetary carrier diagram](SAT024F)

i. Check clearance between planetary gears and planetary carrier with feeler gauge.

- **Standard clearance**: 0.20 - 0.70 mm (0.0079 - 0.0276 in)
- **Allowable limit**: 0.80 mm (0.0315 in)

Replace front planetary carrier if the clearance exceeds allowable limit.

![Feeler gauge diagram](SAT025F)

33. Remove rear planetary carrier assembly and rear sun gear according to the following procedures.

a. Remove rear planetary carrier assembly from transmission case.

![Rear planetary carrier diagram](SAT026F)
b. Remove rear sun gear from rear planetary carrier.

c. Remove needle bearings from rear planetary carrier assembly.

d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.

e. Check clearance between pinion washer and rear planetary carrier with feeler gauge.

- **Standard clearance**: 0.20 - 0.70 mm (0.0079 - 0.0276 in)
- **Allowable limit**: 0.80 mm (0.0315 in)

Replace rear planetary carrier if the clearance exceeds allowable limit.

34. Remove rear internal gear and forward clutch hub from transmission case.
35. Remove overrun clutch hub from transmission case.

36. Remove needle bearing from overrun clutch hub and check for damage or wear.

37. Remove forward clutch assembly from transmission case.

38. Remove needle bearing from transmission case.

39. Remove output shaft assembly according to the following procedures.
   a. Remove side cover bolts.
      - Do not mix bolts A and B.
      - Always replace bolts A as they are self-sealing bolts.
b. Remove side cover by lightly tapping it with a soft hammer.
   - Be careful not to drop output shaft assembly. It might come out when removing side cover.

c. Remove adjusting shim.

d. Remove output shaft assembly.
   - If output shaft assembly came off with side cover, tap cover with a soft hammer to separate.
e. Remove needle bearing.

40. Disassemble reduction pinion gear according to the following procedures.
   a. Set manual shaft to position P to fix idler gear.
   b. Unlock idler gear lock nut using a pin punch.

   c. Remove idler gear lock nut.
      - Do not reuse idler gear lock nut.

   d. Remove idler gear with puller.

   e. Remove reduction pinion gear.
   f. Remove adjusting shim from reduction pinion gear.
41. Remove return spring from parking shaft with screwdriver.
42. Draw out parking shaft and remove parking pawl from transmission case.
43. Check parking pawl and shaft for damage or wear.

44. Remove parking actuator support from transmission case.
45. Check parking actuator support for damage or wear.

46. Remove side oil seal with screwdriver from transmission case.
REPAIR FOR COMPONENT PARTS

Manual Shaft COMPONENTS

REMOVAL
1. Remove detent spring from transmission case.
2. Drive out manual plate retaining pin.
3. Drive and pull out parking rod plate retaining pin.
4. Remove parking rod plate from manual shaft.
5. Draw out parking rod from transmission case.

6. Pull out manual shaft retaining pin.
7. Remove manual shaft and manual plate from transmission case.

8. Remove manual shaft oil seal.

**INSPECTION**
- Check component parts for wear or damage. Replace if necessary.

**INSTALLATION**
1. Install manual shaft oil seal.
   - Apply ATF to outer surface of oil seal.
2. Install manual shaft and manual plate.

3. Align groove of manual shaft and hole of transmission case.
4. Install manual shaft retaining pin up to bottom of hole.

5. Install parking rod to parking rod plate.
6. Set parking rod assembly onto manual shaft and drive retaining pin.
   - Both ends of pin should protrude.

7. Drive manual plate retaining pin.
   - Both ends of pin should protrude.

8. Install detent spring. Tighten detent spring bolts to the specified torque. Refer to AT-665, "COMPONENTS".
REPAIR FOR COMPONENT PARTS

Oil Pump COMPONENTS

DISASSEMBLY

1. Remove seal rings.

2. Loosen bolts in a crisscross pattern and remove oil pump cover.

3. Remove inner and outer gear from oil pump housing.
4. Remove O-ring from oil pump housing.

5. Remove oil pump housing oil seal.

**INSPECTION**

**Oil Pump Housing, Oil Pump Cover, Inner Gear and Outer Gear**

- Check for wear or damage.

**Side Clearances**

- Measure side clearance of inner and outer gears in at least four places around each outside edge. Maximum measured values should be within specified positions.

  **Standard clearance**: 0.030 - 0.050 mm (0.0012 - 0.0020 in)

- If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.

  **Inner and outer gear**: Refer to AT-751, "OIL PUMP".

- If clearance is more than standard, replace whole oil pump assembly except oil pump cover.
Measure clearance between outer gear and oil pump housing.

- **Standard clearance**: 0.111 - 0.181 mm (0.0044 - 0.0071 in)
- **Allowable limit**: 0.181 mm (0.0071 in)
- If not within allowable limit, replace whole oil pump assembly except oil pump cover.

**SEAL RING CLEARANCE**

- Measure clearance between seal ring and ring groove.

  - **Standard clearance**: 0.1 - 0.25 mm (0.0039 - 0.0098 in)
  - **Allowable limit**: 0.25 mm (0.0098 in)
- If not within allowable limit, replace oil pump cover assembly.

**ASSEMBLY**

1. Install oil seal on oil pump housing.

2. Install O-ring on oil pump housing.
   - **Apply ATF to O-ring.**
3. Install inner and outer gears on oil pump housing.
   - Be careful of direction of inner gear.

4. Install oil pump cover on oil pump housing.
   a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.
   b. Tighten bolts in a crisscross pattern. Tighten oil pump cover bolts to the specified torque. Refer to AT-668, "COMPONENTS".

5. Install new seal rings carefully after packing ring groove with petroleum jelly.
   - Do not spread gap of seal ring excessively while installing. The ring may be deformed.
Control Valve Assembly
COMPONENTS

SEC. 317

Terminal body 5. O-rings 6. Control valve lower body
7. Oil cooler relief valve spring 8. Check ball 9. Separating plate
16. Control valve upper body

DISASSEMBLY
Disassemble upper, inter and lower bodies.
Bolt length, number and location:

<table>
<thead>
<tr>
<th>Bolt symbol</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt length “ℓ” mm (in)</td>
<td>13.5 (0.531)</td>
<td>58.0 (2.283)</td>
<td>40.0 (1.575)</td>
<td>66.0 (2.598)</td>
<td>33.0 (1.299)</td>
<td>78.0 (3.071)</td>
<td>18.0 (0.709)</td>
</tr>
<tr>
<td>Number of bolts</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

f: Reamer bolt and nut.

1. Remove bolts a, d and nut f and remove oil strainer from control valve assembly.

2. Remove solenoid valve assembly and line pressure solenoid valve from control valve assembly.
3. Remove O-rings from solenoid valves and terminal body.

4. Place upper body facedown, and remove bolts b, c and nut f.

5. Remove inter body from lower body.

6. Turn over lower body, and remove accumulator support plate.

7. Remove bolts e, separating plate and separating gasket from lower body.

8. Remove check balls and oil cooler relief valve springs from lower body.
   ● Be careful not to lose check balls and oil cooler relief valve springs.
9. Remove inter body from upper body.

10. Check to see that steel balls are properly positioned in inter body and then remove them.
   - Be careful not to lose steel balls.

11. Check to see that steel balls are properly positioned in upper body and then remove them.
   - Be careful not to lose steel balls.

**INSPECTION**

**Lower and Upper Bodies**
- Check to see that retainer plates are properly positioned in lower body.
REPAIR FOR COMPONENT PARTS

- Check to see that retainer plates are properly positioned in upper body.
- Be careful not to lose these parts.

**Oil Strainer**
- Check wire netting of oil strainer for damage.

**Shift Solenoid Valves “A” and “B”, Line Pressure Solenoid Valve, Torque Converter Clutch Solenoid Valve and Overrun Clutch Solenoid Valve**
- Measure resistance.
- For shift solenoid valve A, refer to AT-548.
- For shift solenoid valve B, refer to AT-553.
- For line pressure solenoid valve, refer to AT-542.
- For torque converter clutch solenoid valve, refer to AT-529.
- For overrun clutch solenoid valve, refer to AT-563.

**Oil Cooler Relief Valve Spring**
- Check springs for damage or deformation.
- Measure free length and outer diameter.
  
  **Inspection standard**: Refer to AT-748, "CONTROL VALVE AND PLUG RETURN SPRINGS".

**ASSEMBLY**
1. Install upper, inter and lower body.
   a. Place oil circuit of upper body face up. Install steel balls in their proper positions.
b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.

c. Install reamer bolts from bottom of upper body. Using reamer bolts as guides, install separating plate and gaskets as a set.

d. Install pilot filter.

e. Place lower body as shown in illustration (side of inter body face up). Install steel balls in their proper positions.

f. Install inter body on upper body using reamer bolts as guides. Be careful not to dislocate or drop steel balls.
REPAIR FOR COMPONENT PARTS

[RE4F04B]

- Install check balls and oil cooler relief valve springs in their proper positions in lower body.

- Install lower separating gasket, lower inter separating gasket and lower separating plate in order shown in illustration.

- Install bolts e from bottom of lower body. Using bolts e as guides, install separating plate and gaskets as a set.

- Temporarily install support plates on lower body.

- Install lower body on inter body using reamer bolts f as guides and tighten reamer bolts f slightly.
2. Install O-rings to solenoid valves and terminal body.
   - Apply ATF to O-rings.

3. Install and tighten bolts.

   **Bolt length, number and location:**

<table>
<thead>
<tr>
<th>Bolt symbol</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt length &quot;l&quot; mm (in)</td>
<td>13.5 (0.531)</td>
<td>58.0 (2.283)</td>
<td>40.0 (1.575)</td>
<td>66.0 (2.598)</td>
<td>33.0 (1.299)</td>
<td>78.0 (3.071)</td>
<td>18.0 (0.709)</td>
</tr>
<tr>
<td>Number of bolts</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

   a. Install and tighten bolts **b** to specified torque.

      : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)
b. Install solenoid valve assembly and line pressure solenoid valve to lower body.

c. Set oil strainer, then tighten bolts a, c, d and nuts f to specified torque.
   SAT062F: 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

d. Tighten bolts e to specified torque.
   SAT083FA: 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 30.4 - 39.1 in-lb)

Control Valve Upper Body
COMPONENTS
Apply ATF to all components before installation.
1. Upper body
2. Cooler check valve
3. Return spring
4. Plug
5. Retainer plate
6. 1-2 accumulator valve
7. Return spring
8. Plug
9. Retainer plate
10. Torque converter clutch control valve
11. Return spring
12. Torque converter clutch control plug
13. Torque converter clutch control sleeve
14. Retainer plate
15. Torque converter relief valve
16. Return spring
17. Retainer plate
18. Return spring
19. Overrun clutch reducing valve
20. Plug
21. Retainer plate
22. Retainer plate
23. Return spring
24. Pilot valve
25. Retainer plate
26. Plug
27. 1-2 accumulator piston
28. Return spring
29. 1-2 accumulator retainer plate
30. Retainer plate
31. Plug
32. 1st reducing valve
33. Return spring
34. Retainer plate
35. Return spring
36. 3-2 timing valve

DISASSEMBLY
1. Remove valves at retainer plates.
   - Do not use a magnetic pick-up tool.
a. Use a screwdriver to remove retainer plates.

b. Remove retainer plates while holding spring, plugs or sleeves.
   - Remove plugs slowly to prevent internal parts from jumping out.

c. Place mating surface of valve body face down, and remove internal parts.
   - If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.
   - Be careful not to drop or damage valves and sleeves.

**INSPECTION**

**Valve Spring**
- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

  **Inspection standard**: Refer to AT-748, "CONTROL VALVE AND PLUG RETURN SPRINGS".

- Replace valve springs if deformed or fatigued.

**Control Valves**
- Check sliding surfaces of valves, sleeves and plugs.
ASSEMBLY

- Lay control valve body down when installing valves. Do not stand the control valve body upright.

1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.
   - Be careful not to scratch or damage valve body.

- Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

1-2 Accumulator Valve
- Install 1-2 accumulator valve. Align 1-2 accumulator retainer plate from opposite side of control valve body.
- Install return spring, 1-2 accumulator piston and plug.
1. Install retainer plates.
   ● While pushing plug or return spring, install retainer plate.

Retainer Plate (Upper Body)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of control valve</th>
<th>Width A</th>
<th>Length B</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Pilot valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1st reducing valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>3-2 timing valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Torque converter relief valve</td>
<td>6.0 (0.236)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1-2 accumulator valve</td>
<td></td>
<td>38.5 (1.516)</td>
</tr>
<tr>
<td>25</td>
<td>1-2 accumulator piston valve</td>
<td></td>
<td>24.0 (0.945)</td>
</tr>
<tr>
<td>21</td>
<td>Overrun clutch reducing valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cooler check valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Torque converter clutch control valve</td>
<td></td>
<td>28.0 (1.102)</td>
</tr>
</tbody>
</table>

● Install proper retainer plates.
   Refer to AT-680, "Control Valve Upper Body".

Control Valve Lower Body

COMPONENTS

Apply ATF to all components before installation.
DISASSEMBLY

- Remove valves at retainer plate.
  For removal procedures, refer to AT-681, "DISASSEMBLY".
AT-686

REPAIR FOR COMPONENT PARTS

[RE4F04B]

INSPECTION

Valve Springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.

  Inspection standard: Refer to AT-748, "CONTROL VALVE AND PLUG RETURN SPRINGS".

- Replace valve springs if deformed or fatigued.

Control Valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

ASSEMBLY

- Install control valves.
  For installation procedures, refer to AT-683, "ASSEMBLY".

Retainer Plate (Lower Body)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of control valve and plug</th>
<th>Width A</th>
<th>Length B</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Pressure regulator valve</td>
<td>6.0 (0.236)</td>
<td>28.0 (1.102)</td>
<td>I</td>
</tr>
<tr>
<td>27</td>
<td>Accumulator control valve</td>
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<tr>
<td>23</td>
<td>Overrun clutch control valve</td>
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<tr>
<td>25</td>
<td>Pressure modifier valve</td>
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<tr>
<td>35</td>
<td>Shuttle valve</td>
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<tr>
<td>9</td>
<td>Shift valve B</td>
<td>—</td>
<td>—</td>
<td>II</td>
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</table>

- Install proper retainer plates.
  Refer to AT-684, "Control Valve Lower Body".
Reverse Clutch COMPONENTS

DISASSEMBLY

1. Check operation of reverse clutch
   a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not contact snap ring:
      • D-ring might be damaged.
      • Oil seal might be damaged.
      • Fluid might be leaking past piston check ball.

2. Remove snap ring.
3. Remove drive plates, driven plates, retaining plate, and dish plates.

4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
   • Set Tool directly over springs.
   • Do not expand snap ring excessively.

5. Remove spring retainer and return springs.
6. Remove piston from reverse clutch drum by turning it.
7. Remove D-ring and oil seal from piston.

INSPECTION

Reverse Clutch Snap Ring, Spring Retainer and Return Springs
- Check for deformation, fatigue or damage.
  If necessary, replace.

Reverse Clutch Drive Plates
- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  
  Thickness of drive plate:
  Standard value : 1.6 mm (0.063 in)
  Wear limit : 1.4 mm (0.055 in)
- If not within wear limit, replace.

Reverse Clutch Dish Plates
- Check for deformation or damage.
- Measure thickness of dish plate.
  
  Thickness of dish plate : 3.08 mm (0.1213 in)
- If deformed or fatigued, replace.

Reverse Clutch Piston
- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.
ASSEMBLY

1. Install D-ring and oil seal on piston.
   - Take care with the direction of oil seal.
   - Apply ATF to both parts.

2. Install piston assembly by turning it slowly.
   - Apply ATF to inner surface of drum.

3. Install return springs and spring retainer on piston.

4. Set Tool on spring retainer and install snap ring while compressing return springs.
   - Set Tool directly over return springs.

5. Install drive plates, driven plates, retaining plate and dish plates.
   - Take care with order of plates.

6. Install snap ring.
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

   **Specified clearance**
   Standard : 0.5 - 0.8 mm (0.020 - 0.031 in)
   Allowable limit : 1.2 mm (0.047 in)
   Retaining plate : Refer to AT-749, "REVERSE CLUTCH".

8. Check operation of reverse clutch.
   Refer to AT-687, "DISASSEMBLY".

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**High Clutch COMPONENTS**

SEC. 315

- Driven plate [Thickness: 1.4 mm (0.055 in)]
- Driven plate [Thickness: 2.0 mm (0.079 in)]
- Snap ring
- Drive plate
- Retaining plate
- For the number of clutch plates (drive and driven plates), refer to the cross-section.

- Seal ring
- Piston return spring
- D-ring
- Spring retainer
- Snap ring
- Drive plate
- Snap ring
- Input shaft assembly (high clutch drum)
- ATI : Apply petroleum jelly.
- ATI : Apply ATF.
- ★ : Select proper thickness.

---

**DISASSEMBLY**

1. Check operation of high clutch.
   a. Apply compressed air to oil hole of input shaft with nylon cloth.
      - *Stop up hole on opposite side of input shaft with nylon cloth.*
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not contact snap ring:
      - D-ring might be damaged.
      - Oil seal might be damaged.
      - Fluid might be leaking past piston check ball.
2. Remove seal rings from input shaft.
   ● Always replace when removed.

3. Remove snap ring.
4. Remove drive plates, driven plates and retaining plate.

5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
   ● Set Tool directly over springs.
   ● Do not expand snap ring excessively.
6. Remove spring retainer and return springs.

7. Remove piston from high clutch drum by turning it.

8. Remove D-rings from piston.
INSPECTION

High Clutch Snap Ring, Spring Retainer and Return Springs

- Check for deformation, fatigue or damage.
  - If necessary, replace.
- When replacing spring retainer and return springs, replace them as a set.

High Clutch Drive Plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.
  
  **Thickness of drive plate:**
  
  **Standard value**: 1.6 mm (0.063 in)
  
  **Wear limit**: 1.4 mm (0.055 in)

- If not within wear limit, replace.

High Clutch Piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.

Seal Ring Clearance

- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.
  
  **Standard clearance**: 0.08 - 0.23 mm (0.0031 - 0.0091 in)
  
  **Allowable limit**: 0.23 mm (0.0091 in)

- If not within allowable limit, replace input shaft assembly.

ASSEMBLY

1. Install D-rings on piston.
   
   - Apply ATF to both parts.
2. Install piston assembly by turning it slowly.
   ● Apply ATF to inner surface of drum.

3. Install return springs and spring retainer on piston.

4. Set Tool on spring retainer and install snap ring while compressing return springs.
   ● Set Tool directly over return springs.
   ● Do not align snap ring gap with spring retainer stopper.

5. Install drive plates, driven plates and retaining plate.
   ● Take care with the order and direction of plates.
6. Install snap ring.
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance
   Standard : 1.8 - 2.2 mm (0.071 - 0.087 in)
   Allowable limit : 2.8 mm (0.110 in)
   Retaining plate : Refer to AT-749, "HIGH CLUTCH".
8. Check operation of high clutch. Refer to AT-690, "DISASSEMBLY".
9. Install seal rings to input shaft.
   - Apply petroleum jelly to seal rings.
   - Always replace when removed.
   - Roll paper around seal rings to prevent seal rings from spreading.
DISASSEMBLY
1. Check operation of forward clutch and overrun clutch.
   a. Install bearing retainer on forward clutch drum.
   b. Apply compressed air to oil hole of forward clutch drum.
   c. Check to see that retaining plate moves to snap ring.
   d. If retaining plate does not contact snap ring:
      ● D-ring might be damaged.
      ● Oil seal might be damaged.
      ● Fluid might be leaking past piston check ball.

2. Remove snap ring for forward clutch.
3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.
4. Remove snap ring for overrun clutch.
5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.

6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
   ● Set Tool directly over return springs.
   ● Do not expand snap ring excessively.

7. Remove spring retainer and return springs.
   ● Do not remove return springs from spring retainer.

8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.

9. Remove overrun clutch piston from forward clutch piston by turning it.
10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.

INSPECTION

Snap Rings, Spring Retainer and Return Springs
- Check for deformation, fatigue or damage.
- Replace if necessary.
- When replacing spring retainer and return springs, replace them as a set.

Forward Clutch and Overrun Clutch Drive Plates
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

  Thickness of drive plate:
  Forward clutch
  Standard value : 1.6 mm (0.063 in)
  Wear limit : 1.4 mm (0.055 in)
  Overrun clutch
  Standard value : 1.6 mm (0.063 in)
  Wear limit : 1.4 mm (0.055 in)

- If not within wear limit, replace.

Forward Clutch and Overrun Clutch Dish Plates
- Check for deformation or damage.
- Measure thickness of dish plate.

  Thickness of dish plate
  Forward clutch : 2.7 mm (0.106 in)
  Overrun clutch : 2.7 mm (0.106 in)

- If deformed or fatigued, replace.

Forward Clutch Drum
- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum. Make sure air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum. Make sure there is no air leakage.
Overrun Clutch Piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side. Make sure that air leaks past ball.

ASSEMBLY

1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
   - Take care with direction of oil seal.
   - Apply ATF to both parts.

2. Install overrun clutch piston assembly on forward clutch piston by turning it slowly.
   - Apply ATF to inner surface of forward clutch piston.

3. Install forward clutch piston assembly on forward clutch drum by turning it slowly.
   - Apply ATF to inner surface of drum.
4. Install return spring on overrun clutch piston.

- Align the mark on spring retainer with check ball in overrun clutch piston.

5. Set Tool on spring retainer and install snap ring while compressing return springs.
- Set Tool directly over return springs.

- Do not align snap ring gap with spring retainer stopper.
6. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.
   ● Take care with order of plates.

7. Install snap ring for overrun clutch.

8. Measure clearance between overrun clutch retaining plate and snap ring.
   If not within allowable limit, select proper retaining plate.
   
   Specified clearance
   Standard : 0.7 - 1.1 mm (0.028 - 0.043 in)
   Allowable limit : 1.7 mm (0.067 in)
   Overrun clutch retaining plate Refer to AT-750, "OVERRUN CLUTCH".

9. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.
   ● Take care with order of plates.

10. Install snap ring for forward clutch.

11. Measure clearance between forward clutch retaining plate and snap ring.
    If not within allowable limit, select proper retaining plate.
    
    Specified clearance
    Standard : 0.45 - 0.85 mm
              (0.0177 - 0.0335 in)
    Allowable limit : 1.85 mm (0.0728 in)
    Forward clutch retaining plate Refer to AT-749, "FORWARD CLUTCH".
12. Check operation of forward clutch. Refer to AT-695, "DISASSEMBLY".

13. Check operation of overrun clutch. Refer to AT-695, "DISASSEMBLY".

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**Low & Reverse Brake COMPONENTS**

For the number of clutch plates (drive and driven plates), refer to the cross-section. For disassembly and assembly, refer to the procedures given in "ASSEMBLY" and "DISASSEMBLY".

**DISASSEMBLY**

1. Check operation of low & reverse brake.
   a. Apply compressed air to oil hole of transmission case.
   b. Check to see that retaining plate moves to snap ring.
   c. If retaining plate does not contact snap ring:
      ● D-ring might be damaged.
      ● Fluid might be leaking past piston check ball.

2. In order to remove piston, apply compressed air to oil hole of retainer while holding piston.
   ● Apply air gradually and allow piston to come out evenly.
3. Remove D-rings from piston.

***INSPECTION***

Low and Reverse Brake Snap Ring, Spring Retainer and Return Springs

- Check for deformation, fatigue or damage.
  - If necessary, replace.
- When replacing spring retainer and return springs, replace them as a set.

Low and Reverse Brake Drive Plate

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

  Thickness of drive plate
  Standard value : 1.8 mm (0.071 in)
  Wear limit : 1.6 mm (0.063 in)

- If not within wear limit, replace.

***ASSEMBLY***

1. Install D-rings on piston.
   - Apply ATF to both parts.

2. Set and align piston with retainer.
   - This operation is required in order to engage the protrusions of piston to return springs correctly.
   Further procedures are given in “ASSEMBLY”. Refer to AT-723, "ASSEMBLY".
3. Install driven plates, drive plates, retaining plate and dish plate on transmission case.
   ● Take care with order of plates and direction of dish plate.

4. Install snap ring.

5. Measure clearance between driven plate and transmission case. If not within allowable limit, select proper retaining plate. (front side)
   - Specified clearance
     Standard : 1.7 - 2.1 mm (0.067 - 0.083 in)
     Allowable limit : 3.3 mm (0.130 in)
   - Retaining plate Refer to AT-750, "LOW & REVERSE BRAKE".
DISASSEMBLY
1. Remove overrun clutch hub and thrust washer from forward clutch hub.

2. Remove forward clutch hub from rear internal gear.
3. Remove bearing from rear internal gear.

4. Remove thrust washer from rear internal gear.

5. Remove bearing from forward one-way clutch.

6. Remove forward one-way clutch from forward clutch hub.
INSPECTION
Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub
- Check rubbing surfaces for wear or damage.

Bearings and Forward One-Way Clutch
- Check bearings for deformation and damage.
- Check forward one-way clutch for wear and damage.

ASSEMBLY
1. Install forward one-way clutch on forward clutch.
   - Take care with the direction of forward one-way clutch.

2. Install bearing on forward one-way clutch.
   - Apply petroleum jelly to bearing.
3. Install thrust washer on rear internal gear.
   - **Apply petroleum jelly to thrust washer.**
   - **Align hooks of thrust washer with holes of rear internal gear.**

4. Install bearing on rear internal gear.
   - **Apply petroleum jelly to bearing.**

5. Install thrust washer and overrun clutch hub.
   - **Apply petroleum jelly to thrust washer.**
   - **Align hooks of thrust washer with holes of overrun clutch hub.**
   - **Align projections of rear internal gear with holes of overrun clutch hub.**

6. Install forward clutch hub on rear internal gear.
   - **Check operation of forward one-way clutch.**
     Hold rear internal gear and turn forward clutch hub. Check forward clutch hub for correct locking and unlocking directions.
   - **If not as shown in illustration, check installation direction of forward one-way clutch.**
DISASSEMBLY

1. Remove seal rings from output shaft and bearing retainer.

2. Remove output shaft bearing with screwdrivers.
   - Always replace bearing with a new one when removed.
   - Do not damage output shaft.
3. Remove snap ring from bearing retainer.

4. Remove needle bearing from bearing retainer.

5. Remove idler gear bearing inner race from idler gear.

6. Remove idler gear bearing outer race from transmission case.
7. Press out reduction pinion gear bearing inner race from reduction pinion gear.

8. Remove reduction pinion gear bearing outer race from transmission case.

INSPECTION
Output Shaft, Idler Gear and Reduction Pinion Gear
- Check shafts for cracks, wear or bending.
- Check gears for wear, chips and cracks.

Bearing
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- When replacing taper roller bearing, replace outer and inner race as a set.

Seal Ring Clearance
- Install new seal rings to output shaft.
- Measure clearance between seal ring and ring groove of output shaft.
  
  **Standard clearance** : 0.10 - 0.25 mm  
  (**0.0039 - 0.0098 in**)  
  **Allowable limit** : 0.25 mm (0.0098 in)

- If not within allowable limit, replace output shaft.
- Install new seal rings to bearing retainer.
- Measure clearance between seal ring and ring groove of bearing retainer.
  
  **Standard clearance** : 0.10 - 0.30 mm  
  (**0.0039 - 0.0118 in**)  
  **Allowable limit** : 0.30 mm (0.0118 in)
If not within allowable limit, replace bearing retainer.

**ASSEMBLY**

1. Press reduction pinion gear bearing inner race on reduction pinion gear.

2. Install reduction pinion gear bearing outer race on transmission case.
   - : 109 - 123 N·m (11.1 - 12.5 kg-m, 80 - 90 ft-lb)

3. Press idler gear bearing inner race on idler gear.

4. Install idler gear bearing outer race on transmission case.
5. Press output shaft bearing on output shaft.

6. Press needle bearing on bearing retainer.

7. Install snap ring to bearing retainer.

8. After packing ring grooves with petroleum jelly, carefully install new seal rings on output shaft and bearing retainer.
● Roll paper around seal rings to prevent seal rings from spreading.

Band Servo Piston Assembly
COMPONENTS

DISASSEMBLY
1. Remove band servo piston fixing bolts.

2. Apply compressed air to oil hole in transmission case to remove O/D servo piston retainer and band servo piston assembly.
   ● Hold band servo piston assembly with a rag or nylon waste.
3. Apply compressed air to oil hole in O/D servo piston retainer to remove O/D servo piston from retainer.
   - Hold O/D band servo piston while applying compressed air.


5. Remove O-rings from O/D servo piston retainer.

6. Remove band servo piston assembly from servo piston retainer by pushing it forward.

7. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.
8. Remove O/D servo return spring, band servo thrust washer and band servo piston stem from band servo piston.

9. Remove O-rings from servo piston retainer.

10. Remove D-rings from band servo piston.

INSPECTION

Pistons, Retainers and Piston Stem
- Check frictional surfaces for abnormal wear or damage.

Return Springs
- Check for deformation or damage.
- Measure free length and outer diameter.

Inspection standard: Refer to AT-753, "RETURN SPRING".
ASSEMBLY

1. Install D-rings to servo piston retainer.
   - **Apply ATF to D-rings.**
   - **Pay attention to position of each O-ring.**

2. Install band servo piston stem, band servo thrust washer, O/D servo return spring and spring retainer to band servo piston.

3. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.

4. Install O-rings to servo piston retainer.
   - **Apply ATF to O-rings.**
   - **Pay attention to position of each O-ring.**
5. Install band servo piston assembly to servo piston retainer by pushing it inward.

6. Install D-ring to O/D servo piston.
   - Apply ATF to D-ring.

7. Install O-rings to O/D servo piston retainer.
   - Apply ATF to O-rings.
   - Pay attention to position of each O-ring.

8. Install O/D servo piston to O/D servo piston retainer.

9. Install band servo piston assembly and 2nd servo return spring to transmission case.
   - Apply ATF to O-ring of band servo piston and transmission case.
10. Install O/D servo piston assembly to transmission case.
   - Apply ATF to O-ring of band servo piston and transmission case.

11. Install O/D servo piston retainer to transmission case.
    Refer to AT-716, "ASSEMBLY".

Final Drive COMPONENTS

DISASSEMBLY
1. Remove final gear.
2. Press out differential side bearings.
   ● **Be careful not to mix up the right and left bearings.**

3. Remove differential side bearing outer race and side bearing adjusting shim from transaxle case.

4. Remove speedometer drive gear.

5. Drive out pinion mate shaft lock pin.
6. Draw out pinion mate shaft lock pin.
7. Remove pinion mate gears and side gears.

### INSPECTION

**Gear, Washer, Shaft and Case**
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.

**Bearings**
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing taper roller bearing, replace outer and inner race as a set.**

### ASSEMBLY

1. Attach side gear thrust washers to side gears, then install pinion mate thrust washers and pinion mate gears in place.
   - **Apply ATF to any parts.**
2. Insert pinion mate shaft.
   - When inserting, be careful not to damage pinion mate thrust washers.

3. Measure clearance between side gear and differential case with washers following the procedure below:
   a. Set Tool and dial indicator on side gear.
      b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.
      
      Clearance between side gear and differential case with washer: 0.1 - 0.2 mm (0.004 - 0.008 in)
      c. If not within specification, adjust clearance by changing thickness of differential side gear thrust washers.
      
      Differential side gear thrust washers: Refer to AT-751, "DIFFERENTIAL SIDE GEAR THRUST WASHERS".

4. Install lock pin.
   - Make sure that lock pin is flush with case.
5. Install speedometer drive gear on differential case.
   - Align the projection of speedometer drive gear with the groove of differential case.

6. Press on differential side bearings.

7. Install final gear and tighten fixing bolts in a crisscross pattern. Tighten final gear bolts to the specified torque. Refer to \textit{AT-718, "COMPONENTS"}.
ASSEMBLY

Assembly (1)

1. Install differential side oil seals on transmission case and converter housing.

2. Install parking actuator support to transmission case. Tighten parking actuator support bolts to the specified torque. Refer to AT-644, “OVERHAUL”.
   ● Pay attention to direction of parking actuator support.

3. Install parking pawl on transmission case and fix it with parking shaft.

4. Install return spring.
Adjustment (1)  
DIFFERENTIAL SIDE BEARING PRELOAD  

1. Install differential side bearing outer race without adjusting shim on transmission case.  
2. Install differential side bearing outer race on converter housing.  
3. Place final drive assembly on transmission case.  
4. Install transmission case on converter housing. Tighten transmission case fixing bolts to the specified torque. Refer to AT-644, "OVERHAUL".  
5. Attach dial indicator on differential case at converter housing side.  
6. Insert Tool into differential side gear from transmission case side.  
7. Move Tool up and down and measure dial indicator deflection.  
8. Select proper thickness of differential side bearing adjusting shim(s).  

Suitable shim thickness = Dial indicator deflection + Specified bearing preload  

Differential side bearing preload adjusting shim  : Refer to AT-751, "DIFFERENTIAL SIDE BEARING PRELOAD ADJUSTING SHIMS".  
Bearing preload  : 0.05 - 0.09 mm (0.0020 - 0.0035 in)
9. Remove converter housing from transmission case.
10. Remove final drive assembly from transmission case.
11. Remove differential side bearing outer race from transmission case.
12. Reinstall differential side bearing outer race and shim(s) selected from SDS table on transmission case.
13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque. Refer to AT-644, "OVERHAUL".

   - Turn final drive assembly in both directions several times to seat bearing rollers correctly.
     Turning torque of final drive assembly (New bearing) 0.78 - 1.37 N·m (8.0 - 14.0 kg-cm, 6.9 - 12.2 in-lb)
   - When old bearing is used again, turning torque will be slightly less than the above.
   - Make sure torque is close to the specified range.

Preload adapter : J39713

REDUCTION PINION GEAR BEARING PRELOAD
1. Remove transmission case and final drive assembly from converter housing.
2. Select proper thickness of reduction pinion gear bearing adjusting shim using the following procedures.
a. Place reduction pinion gear on transmission case as shown.
b. Place idler gear bearing on transmission case.
c. Measure dimensions “B” “C” and “D” and calculate dimension “A”.
   \[ A = D - (B + C) \]
   “A” : Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction pinion gear.
- Measure dimension “B” between the end of reduction pinion gear and the surface of transmission case.
  - Measure dimension “B” in at least two places.

- Measure dimension “C” between the surface of idler gear bearing inner race and the surface of transmission case.
  - Measure dimension “C” in at least two places.

- Measure dimension “D” between the end of reduction pinion gear and the adjusting shim mating surface of reduction pinion gear.
  - Measure dimension “D” in at least two places.

- Calculate dimension “A”.
  \[ A = D - (B + C) \]

- Measure dimension “E” between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
  - Measure dimension “E” in at least two places.

- Select proper thickness of reduction pinion gear bearing adjusting shim.
  Proper shim thickness = \[ A - E - 0.05 \text{ mm} \ (0.0020 \text{ in})^* \]
  \( (^* \text{: Bearing preload}) \)
  * Refer to AT-752, "REDUCTION PINION GEAR BEARING ADJUSTING SHIMS" .
3. Install reduction gear and reduction gear bearing adjusting shim selected in step 2-e on transmission case.

4. Press idler gear bearing inner race on idler gear.

5. Press idler gear on reduction gear.
   - Press idler gear until idler gear fully contacts adjusting shim.

6. Tighten idler gear lock nut to the specified torque. Refer to AT-644, "OVERHAUL".
   - Lock idler gear with parking pawl when tightening lock nut.

7. Measure turning torque of reduction pinion gear.
   - When measuring turning torque, turn reduction pinion gear in both directions several times to seat bearing rollers correctly.
     Turning torque of reduction pinion gear: 0.05 - 0.39 N·m (0.5 - 4.0 kg-cm, 0.43 - 3.47 in-lb)
   - If turning torque is out of specification, decrease or increase thickness of reduction pinion gear bearing adjusting shim.

8. After properly adjusting turning torque, clinch idler gear lock nut as shown.
OUTPUT SHAFT END PLAY

- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.

1. Install bearing retainer for output shaft.

2. Install output shaft thrust needle bearing on bearing retainer.

3. Install output shaft on transmission case.
4. Measure dimensions "\( l_1 \)" and "\( l_2 \)" at side cover and then calculate dimension "A".
   - Measure dimension "\( l_1 \)" and "\( l_2 \)" in at least two places.
   - "A" : Distance between transmission case fitting surface and adjusting shim mating surface.
     \[ A = l_1 - l_2 \]
   - \( l_2 \) : Height of gauge

5. Measure dimensions "\( l_2 \)" and "\( l_3 \)" and then calculate dimension "B".
   - Measure "\( l_2 \)" and "\( l_3 \)" in at least two places.
   - "B" : Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case.
     \[ B = l_2 - l_3 \]
   - \( l_2 \) : Height of gauge

6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.
   - Output shaft end play (A – B) : 0 - 0.15 mm (0 - 0.0059 in)
   - Output shaft end play adjusting shims : Refer to AT-753, "OUTPUT SHAFT ADJUSTING SHIMS".

7. Install adjusting shim on output shaft bearing.

Assembly (2)

1. Apply anaerobic liquid gasket to transmission case as shown in illustration. Refer to GI-45, "Recommended Chemical Products and Sealants".
2. Set side cover on transmission case.
   - Apply locking sealant to the mating surface of transmission case.

3. Tighten side cover fixing bolts to specified torque. Refer to AT-644, "OVERHAUL".
   - Do not mix bolts A and B.
   - Always replace bolts A as they are self-sealing bolts.

4. Remove paper rolled around bearing retainer.

5. Install thrust washer on bearing retainer.
   - Apply petroleum jelly to thrust washer.

6. Install forward clutch assembly.
   - Align teeth of low & reverse brake drive plates before installing.
   - Make sure that bearing retainer seal rings are not spread.
   - If forward clutch assembly is correctly seated, points 1 and 2 are at almost same level.
7. Install thrust needle bearing on bearing retainer.
   - Apply petroleum jelly to thrust needle bearing.
   - Pay attention to direction of thrust needle bearing.

8. Install overrun clutch hub.
   - Apply petroleum jelly to thrust washers.
   - Align teeth of overrun clutch drive plates before installing.

9. Hold forward clutch hub and turn rear internal gear.
   Check overrun clutch hub for correct directions of lock and unlock.
   - If not shown as illustrated, check installed direction of forward one-way clutch.
10. Install forward clutch hub and rear internal gear assembly.
   - Align teeth of forward clutch drive plates before installing.
   - Check that three hooks of thrust washer are correctly aligned after installing.

11. Install rear planetary carrier assembly and rear sun gear according to the following procedures.
   a. Install needle bearings on rear planetary carrier.
      - Apply petroleum jelly to needle bearings.
      - Pay attention to direction of needle bearings.
   b. Install rear sun gear on rear planetary carrier.
      - Pay attention to direction of rear sun gear.
c. Install rear planetary carrier on transmission case.

12. Install thrust needle bearing on front planetary carrier, then install them together on transmission case.
   - Apply petroleum jelly to thrust needle bearing.
   - Pay attention to direction of thrust needle bearing.

13. Install low and reverse brake piston according to the following procedures.
   a. Set and align return springs to transmission case gutters as shown in illustration.

   b. Set and align piston with retainer.
c. Install piston and retainer assembly on the transmission case.
   - Align bracket to specified gutter as indicated in illustration.

d. Check that each protrusion of piston is correctly set to corresponding return spring as follows.
   - Push piston and retainer assembly evenly and confirm they move smoothly.
   - If they cannot move smoothly, remove piston and retainer assembly and align return spring correctly as instructed in step “a”.

e. Push down piston and retainer assembly and install snap ring.
14. Install low one-way clutch to front planetary carrier by turning carrier in the direction of the arrow shown.

15. Install snap ring with screwdriver.
   - **Forward clutch and bearing must be correctly installed for snap ring to fit into groove of transmission case.**

16. Install needle bearing on transmission case.
   - **Apply petroleum jelly to needle bearing.**
   - **Pay attention to direction of needle bearing.**

17. Install bearing race, needle bearing and high clutch hub on front sun gear.
   - **Apply petroleum jelly to needle bearing.**
   - **Pay attention to direction of needle bearing.**
18. Install needle bearing and high clutch drum on high clutch hub.

19. Install needle bearing on high clutch drum.
   ● Apply petroleum jelly to needle bearing.
   ● Pay attention to direction of needle bearing.

20. Remove paper rolled around input shaft.
21. Install input shaft assembly in reverse clutch.
   ● Align teeth of reverse clutch drive plates before installing.

22. Install reverse clutch assembly on transmission case.
   ● Align teeth of high clutch drive plates before installing.

Adjustment (2)
When any parts listed below are replaced, adjust total end play and reverse clutch end play.

<table>
<thead>
<tr>
<th>Part name</th>
<th>Total end play</th>
<th>Reverse clutch end play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission case</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Overrun clutch hub</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Rear internal gear</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
### TOTAL END PLAY

1. Adjust total end play “T1”.

#### a. With original bearing race installed, place Tool onto oil pump.

   The long ends of legs should be placed firmly on machined surface of oil pump assembly. The gauging cylinder should rest on top of bearing race. Lock gauging cylinder in place with set screw.

#### b. Install gauging plunger into cylinder.

### Table: Part Name, Total End Play, Reverse Clutch End Play

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Total end play</th>
<th>Reverse clutch end play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear planetary carrier</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Rear sun gear</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Front planetary carrier</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Front sun gear</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>High clutch hub</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>High clutch drum</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Oil pump cover</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Reverse clutch drum</td>
<td>—</td>
<td>●</td>
</tr>
</tbody>
</table>
c. With needle bearing installed on high clutch drum, place Tool legs on machined surface of transmission case (with gasket). Then allow plunger to rest on needle bearing.

d. Measure gap between cylinder and plunger. This measurement should give exact total end play.

   Total end play “T₁” : 0.25 - 0.55 mm
   (0.0098 - 0.0217 in)

   • If end play is out of specification, decrease or increase thickness of bearing race as necessary.

   Available bearing race for adjusting total end play: Refer to AT-754, "BEARING RACE FOR ADJUSTING TOTAL END PLAY".

2. Adjust reverse clutch drum end play “T₂”.

   a. Place Tool on machined surface of transmission case (with gasket). Then allow gauging cylinder to rest on reverse clutch drum. Lock cylinder in place with set screw.

   b. Install gauging plunger into cylinder.
c. With original thrust washer installed on oil pump, place Tool legs onto machined surface of oil pump assembly. Then allow plunger to rest on thrust washer.

d. Measure gap between cylinder and plunger with feeler gauge. This measurement should give exact reverse clutch drum end play.

Reverse clutch drum end play “T2” : 0.55 - 0.90 mm (0.0217 - 0.0354 in)

● If end play is out of specification, decrease or increase thickness of thrust washer as necessary.

Available thrust washer for adjusting reverse clutch drum end play : Refer to AT-754, "THRUST WASHERS FOR ADJUSTING REVERSE CLUTCH DRUM END PLAY".

Assembly (3)

1. Install anchor end pin and lock nut on transmission case.

2. Place brake band on outside of reverse clutch drum. Tighten anchor end pin just enough so that brake band is evenly fitted on reverse clutch drum.

3. Place bearing race selected in total end play adjustment step on oil pump cover.

   ● Apply petroleum jelly to bearing race.

4. Place thrust washer selected in reverse clutch end play step on reverse clutch drum.

   ● Apply petroleum jelly to thrust washer.
5. Install oil pump assembly, baffle plate and gasket on transmission case.

6. Tighten oil pump fixing bolts to the specified torque.

7. Install O-ring to input shaft.
   - Apply ATF to O-ring.

8. Adjust brake band.
   a. Tighten anchor end pin to the specified torque.
      - Anchor end pin: Refer to AT-751, "BRAKE BAND".
   b. Back off anchor end pin two and a half turns.
   c. While holding anchor end pin, tighten lock nut.
      - Lock nut: Refer to AT-751, "BRAKE BAND".

9. Apply compressed air to oil holes of transmission case and check operation of brake band.
10. Install final drive assembly on transmission case.

11. Install differential lubricant tube on converter housing. Tighten differential lubricant tube bolts to the specified torque. Refer to AT-644, "OVERHAUL".

12. Install O-ring on differential oil port of transmission case.

13. Install converter housing on transmission case.
   - Apply locking sealant to mating surface of converter housing.
   a. Check contact surface of accumulator piston for damage.

b. Install O-rings on accumulator piston.
   ● **Apply ATF to O-rings.**
   
   Accumulator piston O-rings : Refer to **AT-748, "O-RING"**.

   N-D accumulator piston : Refer to **AT-748, "O-RING"**.

   Servo release accumulator piston
   Contact surface
   N-D accumulator piston

   Return springs : Refer to **AT-748, "RETURN SPRING"**.
15. Install lip seals for band servo oil holes on transmission case.
   - Apply petroleum jelly to lip seals.

16. Install L & R oil tube and oil sleeve. Tighten L & R oil tube bolts to the specified torque. Refer to AT-644, "OVERHAUL".

17. Install control valve assembly.
   a. Insert manual valve into control valve assembly.
      - Apply ATF to manual valve.
   c. Install control valve assembly on transmission case while aligning manual valve with manual plate.
   d. Pass terminal cord assembly connector through transmission case and install terminal body on transmission case by pushing it.
   e. Install snap ring to terminal cord assembly connector.
f. Tighten bolts I, X and ●.

Bolt length, number and location:

<table>
<thead>
<tr>
<th>Bolt</th>
<th>I (mm)</th>
<th>X (mm)</th>
<th>● (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt length “ℓ”</td>
<td>40 (1.57)</td>
<td>33 (1.30)</td>
<td>43.5 (1.713)</td>
</tr>
<tr>
<td>Number of bolts</td>
<td>5</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

18. Install oil pan.
   a. Attach a magnet to oil pan.
   b. Install new oil pan gasket on transmission case.
   c. Install oil pan on transmission case.
      - **Always replace oil pan bolts as they are self-sealing bolts.**
      - **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**
   d. Tighten oil pan bolts and drain plug to the specified torque. Refer to AT-644, "OVERHAUL".

19. Install park/neutral position (PNP) switch.
   a. Set manual shaft in P position.
   b. Temporarily install park/neutral position (PNP) switch on manual shaft.
   c. Move selector lever to N position.
d. Use a 4 mm (0.16 in) pin for this adjustment.
i. Insert the pin straight into the manual shaft adjustment hole.
ii. Rotate park/neutral position (PNP) switch until the pin can also be inserted straight into hole in park/neutral position (PNP) switch.
e. Tighten park/neutral position (PNP) switch fixing bolts. Refer to AT-644, "OVERHAUL".
f. Remove pin from adjustment hole after adjusting park/neutral position (PNP) switch.

20. Install A/T fluid charging pipe and fluid cooler tube to transmission case. Tighten A/T fluid charging pipe and fluid cooler tube bolts to the specified torque. Refer to AT-644, "OVERHAUL".

21. Install torque converter.
a. Pour ATF into torque converter.
   ● Approximately 1 liter (1-1/8 US qt, 7/8 Imp qt) of fluid is required for a new torque converter.
   ● When reusing old torque converter, add the same amount of fluid as was drained.

b. Install torque converter while aligning notches of torque converter with notches of oil pump.
c. Measure distance “A” to check that torque converter is in proper position.

Distance A : 14 mm (0.55 in) or more