TRANSMISSION
MANUAL AND AUTOMATIC

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    Gears slip out
    Noise, Vibration
    Oil is leaking
    Shifting gears is hard or troublesome
# AUTOMATIC TRANSMISSION - Specifications

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic transmission and transfer case model</td>
<td>KM148-6-FSI</td>
</tr>
<tr>
<td>Torque converter</td>
<td>3 elements, 1-step 2-phase system</td>
</tr>
<tr>
<td>Type</td>
<td>2.02</td>
</tr>
<tr>
<td>Stall torque ratio</td>
<td>Sprag type</td>
</tr>
<tr>
<td>One-way clutch</td>
<td>Forward 4 gears, reverse 1 gear, single-line planetary gear and Simpson planetary gear</td>
</tr>
<tr>
<td>Transmission</td>
<td>Multiple disc type 3 pairs</td>
</tr>
<tr>
<td>Type</td>
<td>Multiple disc type 4 pairs</td>
</tr>
<tr>
<td>Control elements</td>
<td>Sprag type 3 pairs</td>
</tr>
<tr>
<td>Clutch</td>
<td></td>
</tr>
<tr>
<td>Brake</td>
<td></td>
</tr>
<tr>
<td>One-way clutch</td>
<td></td>
</tr>
<tr>
<td>Gear ratios</td>
<td>2.826</td>
</tr>
<tr>
<td>1st gear</td>
<td>1.493</td>
</tr>
<tr>
<td>2nd gear</td>
<td>1.000</td>
</tr>
<tr>
<td>3rd gear</td>
<td>0.688</td>
</tr>
<tr>
<td>4th gear</td>
<td>2.703</td>
</tr>
<tr>
<td>Reverse</td>
<td>Floor shift type</td>
</tr>
<tr>
<td>Shift control method</td>
<td>P-R-N-D-2-L and overdrive switch</td>
</tr>
<tr>
<td>Select pattern</td>
<td></td>
</tr>
<tr>
<td>Oil pump</td>
<td>Gear type</td>
</tr>
<tr>
<td>Type</td>
<td>Directly coupled to engine via torque converter</td>
</tr>
<tr>
<td>Drive system</td>
<td>Throttle opening and vehicle speed detection</td>
</tr>
<tr>
<td>Hydraulic control system</td>
<td>Air-cooled system + water-cooled system oil cooler</td>
</tr>
<tr>
<td>Oil-cooling system</td>
<td>(secondary cooling method)</td>
</tr>
<tr>
<td>Transfer</td>
<td>Always-engaged type</td>
</tr>
<tr>
<td>Type</td>
<td>Single-lever floor-shift type</td>
</tr>
<tr>
<td>Shift control method</td>
<td></td>
</tr>
<tr>
<td>Shift ratios</td>
<td>1.944</td>
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<tr>
<td>LOW</td>
<td>1.000</td>
</tr>
<tr>
<td>HIGH</td>
<td>26/8</td>
</tr>
<tr>
<td>Speedometer gear ratio</td>
<td></td>
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</tbody>
</table>
Automatic Transmission – Specifications

Transmission number marking position and designation:

- **Serial number per month**
- **Fixed number**
  - (Mitsubishi exclusive head number)
- **Classification of type**
  - N: AW372
- **Manufacturing month**
  - A: January
  - D: April
  - M: December
- **Manufacturing year**
  - 88: 1988

Service Specifications

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
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<tbody>
<tr>
<td>Stall speed (rpm)</td>
<td>2100–2400</td>
<td></td>
</tr>
<tr>
<td>Governor pressure kPa (psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000 rpm</td>
<td>133–163</td>
<td>(19.4–23.6)</td>
</tr>
<tr>
<td>2000 rpm</td>
<td>251–281</td>
<td>(36.4–40.6)</td>
</tr>
<tr>
<td>3000 rpm</td>
<td>400–430</td>
<td>(58–62.2)</td>
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<tr>
<td>Line Pressure kPa (psi)</td>
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<td></td>
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<tr>
<td>“D” range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When idling</td>
<td>510–590</td>
<td>(74–85)</td>
</tr>
<tr>
<td>During stall</td>
<td>1080–1280</td>
<td>(156–185)</td>
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<tr>
<td>“R” range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When idling</td>
<td>770–890</td>
<td>(112–130)</td>
</tr>
<tr>
<td>During stall</td>
<td>1570–1960</td>
<td>(227–285)</td>
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<table>
<thead>
<tr>
<th>Items</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input shaft end play mm (in.)</td>
<td>0.3-0.9</td>
<td>(.012-.035)</td>
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<tr>
<td>Oil pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side clearance mm (in.)</td>
<td>0.02-0.65</td>
<td>(.0008-.0020)</td>
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<tr>
<td>Body clearance mm (in.)</td>
<td>0.07-0.15</td>
<td>(.0028-.0059)</td>
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<tr>
<td>Tip clearance (driven gear) mm (in.)</td>
<td>0.11-0.14</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>(.0043-.0055)</td>
<td>(.012)</td>
</tr>
<tr>
<td>Clutch and brake piston stroke mm (in.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overdrive clutch (C0)</td>
<td>1.56-2.53</td>
<td>(.0614-.0996)</td>
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<tr>
<td>Forward clutch (C)</td>
<td>1.43-2.93</td>
<td>(.0563-.1154)</td>
</tr>
<tr>
<td>Direct clutch (C2)</td>
<td>0.91-1.99</td>
<td>(.0358-.0783)</td>
</tr>
<tr>
<td>No. 1 brake (B0)</td>
<td>0.80-1.73</td>
<td>(.0315-.0681)</td>
</tr>
<tr>
<td>No. 2 brake (B0)</td>
<td>1.01-2.25</td>
<td>(.0398-.0886)</td>
</tr>
<tr>
<td>Brake clearance mm (in.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overdrive brake (B0)</td>
<td>0.65-2.21</td>
<td>(.0256-.0870)</td>
</tr>
<tr>
<td>No. 3 brake (B3)</td>
<td>0.61-2.64</td>
<td>(.0240-.1039)</td>
</tr>
<tr>
<td>Transfer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H-L clutch hub end play mm (in.)</td>
<td>0-0.08</td>
<td>(0-.003)</td>
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<tr>
<td>Input gear bearing end play mm (in.)</td>
<td>0-0.06</td>
<td>(0-.002)</td>
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<tr>
<td>Input gear end play mm (in.)</td>
<td>0-0.06</td>
<td>(0-.002)</td>
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<tr>
<td>Transmission control</td>
<td></td>
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<tr>
<td>Sleeve and selector lever clearance mm (in.)</td>
<td>15.2-15.9</td>
<td>(.60-.62)</td>
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TSB Revision
# AUTOMATIC TRANSMISSION - Specifications

## Spring identification

<table>
<thead>
<tr>
<th>Spring</th>
<th>Free height</th>
<th>Outside diameter</th>
<th>Number of loops</th>
<th>Wire diameter</th>
<th>Identification color</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Valve body springs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lower valve body</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 shift valve spring</td>
<td>34.62</td>
<td>7.56</td>
<td>13.0</td>
<td>0.56</td>
<td>-</td>
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<tr>
<td>Pressure relief valve spring</td>
<td>32.14</td>
<td>13.14</td>
<td>9.0</td>
<td>2.03</td>
<td>-</td>
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<tr>
<td>Primary regulator valve spring</td>
<td>65.56</td>
<td>17.2</td>
<td>13.0</td>
<td>1.8</td>
<td>LIGHT BLUE</td>
</tr>
<tr>
<td>3-4 shift valve spring</td>
<td>35.18</td>
<td>10.6</td>
<td>14.5</td>
<td>1.1</td>
<td>GREEN</td>
</tr>
<tr>
<td>Oil cooler bypass valve spring</td>
<td>28.9</td>
<td>13.8</td>
<td>6.5</td>
<td>1.6</td>
<td>ORANGE</td>
</tr>
<tr>
<td>Damping check valve spring</td>
<td>20.0</td>
<td>4.97</td>
<td>16.0</td>
<td>0.40</td>
<td>-</td>
</tr>
<tr>
<td>Rear upper valve body</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 shift timing valve spring</td>
<td>35.10</td>
<td>8.96</td>
<td>12.5</td>
<td>0.76</td>
<td>WHITE</td>
</tr>
<tr>
<td>Reverse clutch sequence valve spring</td>
<td>37.55</td>
<td>9.2</td>
<td>14.0</td>
<td>1.2</td>
<td>RED</td>
</tr>
<tr>
<td>Low-coast modulator valve spring</td>
<td>42.35</td>
<td>9.24</td>
<td>15.0</td>
<td>0.84</td>
<td>-</td>
</tr>
<tr>
<td>Detent regulator valve</td>
<td>31.39</td>
<td>8.85</td>
<td>13.5</td>
<td>0.90</td>
<td>ORANGE</td>
</tr>
<tr>
<td>Intermediate modulator valve spring</td>
<td>35.43</td>
<td>8.8</td>
<td>14.4</td>
<td>0.90</td>
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<td>Front upper valve body</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Throttle valve spring</td>
<td>21.94</td>
<td>8.58</td>
<td>8.0</td>
<td>0.71</td>
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<tr>
<td>Down shift plug spring</td>
<td>39.76</td>
<td>10.83</td>
<td>11.5</td>
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<td>PURPLE</td>
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<tr>
<td>Secondary regulator valve spring</td>
<td>71.27</td>
<td>17.43</td>
<td>15.0</td>
<td>1.93</td>
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## Clutch and brake return springs

<table>
<thead>
<tr>
<th>Clutch and brake return springs</th>
<th>Free height</th>
<th>Outside diameter</th>
<th>Number of loops</th>
<th>Wire diameter</th>
<th>Identification color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overdrive and forward clutches</td>
<td>15.10</td>
<td>8.0</td>
<td>5.5</td>
<td>1.1</td>
<td>RED</td>
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<tr>
<td>Direct clutch</td>
<td>15.10</td>
<td>8.0</td>
<td>5.5</td>
<td>1.1</td>
<td>RED</td>
</tr>
<tr>
<td>Brake</td>
<td>16.12</td>
<td>8.0</td>
<td>6.0</td>
<td>1.0</td>
<td>-</td>
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TSB Revision
<table>
<thead>
<tr>
<th>Spring</th>
<th>Free height</th>
<th>Outside diameter</th>
<th>Number of loops</th>
<th>Wire diameter</th>
<th>Identification color</th>
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<tbody>
<tr>
<td>Accumulator springs</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>C1 No. 1</td>
<td>64.68</td>
<td>17.5</td>
<td>18.5</td>
<td>4.0</td>
<td>2.0</td>
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<tr>
<td>C1 No. 2</td>
<td>32.2</td>
<td>14.7</td>
<td>6.5</td>
<td>1.6</td>
<td>ORANGE</td>
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<tr>
<td>B2</td>
<td>66.68</td>
<td>20.4</td>
<td>12.0</td>
<td>3.2</td>
<td>LIGHT GREEN</td>
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Identification of clutches, brakes and accumulators

<table>
<thead>
<tr>
<th>Number of discs</th>
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<tbody>
<tr>
<td>Clutch C0</td>
</tr>
<tr>
<td>Clutch C1</td>
</tr>
<tr>
<td>Clutch C2</td>
</tr>
<tr>
<td>Brake B0</td>
</tr>
<tr>
<td>Brake B1</td>
</tr>
<tr>
<td>Brake B2</td>
</tr>
<tr>
<td>Brake B3</td>
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Accumulator piston OD x Length

<table>
<thead>
<tr>
<th>Accumulator piston OD x Length</th>
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<tbody>
<tr>
<td>B2</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>C1</td>
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Accumulator piston spring

<table>
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</thead>
<tbody>
<tr>
<td>B2</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>C1</td>
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## AUTOMATIC TRANSMISSION - Specifications

### TORQUE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Items</th>
<th>Nm</th>
<th>ft.lbs.</th>
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<tbody>
<tr>
<td>Transmission control lever</td>
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<tr>
<td>Transmission control rod (B) to pin</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Cross shaft bracket (A) to body</td>
<td>10-13</td>
<td>7-9</td>
</tr>
<tr>
<td>Selector handle mounting screw</td>
<td>2</td>
<td>0.4</td>
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<tr>
<td>Transmission control arm to bracket</td>
<td>18-24</td>
<td>13-17</td>
</tr>
<tr>
<td>Transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil filler tube to transmission</td>
<td>10-12</td>
<td>7-9</td>
</tr>
<tr>
<td>No. 2 crossmember to frame</td>
<td>55-75</td>
<td>40-54</td>
</tr>
<tr>
<td>Rear engine support member to frame</td>
<td>10-13</td>
<td>7-9</td>
</tr>
<tr>
<td>No. 2 crossmember to transmission</td>
<td>18-25</td>
<td>13-18</td>
</tr>
<tr>
<td>Transmission to engine (A)</td>
<td>65-85</td>
<td>47-61</td>
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<tr>
<td>Transmission to engine (B)</td>
<td>80-100</td>
<td>58-72</td>
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<tr>
<td>Transmission to engine (D)</td>
<td>30-42</td>
<td>22-30</td>
</tr>
<tr>
<td>Transmission to starter motor</td>
<td>27-34</td>
<td>20-25</td>
</tr>
<tr>
<td>Torque converter to drive plate</td>
<td>35-42</td>
<td>25-30</td>
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<tr>
<td>Converter housing installation bolt</td>
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<tr>
<td>10 mm (.39 in.) dia. bolt</td>
<td>27-42</td>
<td>20-30</td>
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<tr>
<td>12 mm (.47 in.) dia. bolt</td>
<td>46-68</td>
<td>35-49</td>
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<tr>
<td>Oil pump assembly installation bolt</td>
<td>18-25</td>
<td>13-18</td>
</tr>
<tr>
<td>Oil pump body and cover-tightening bolt</td>
<td>6-9</td>
<td>4.3-6.5</td>
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<tr>
<td>Center support installation bolt</td>
<td>24-28</td>
<td>17-20</td>
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<tr>
<td>Adapter installation bolt</td>
<td>27-42</td>
<td>20-30</td>
</tr>
<tr>
<td>Cover plate installation screw</td>
<td>6-9</td>
<td>4.3-6.5</td>
</tr>
<tr>
<td>All bolts of valve body</td>
<td>5-6</td>
<td>3.6-4.3</td>
</tr>
<tr>
<td>Throttle cam installation bolt</td>
<td>6-9</td>
<td>4.3-6.5</td>
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<tr>
<td>Valve body assembly installation bolt</td>
<td>8-12</td>
<td>5.8-9</td>
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<tr>
<td>Oil screen installation bolt</td>
<td>5-6</td>
<td>3.6-4.3</td>
</tr>
<tr>
<td>Parking cam plate installation bolt</td>
<td>6-9</td>
<td>4.3-6.5</td>
</tr>
<tr>
<td>Oil pan installation bolt</td>
<td>4-5</td>
<td>2.9-3.6</td>
</tr>
<tr>
<td>Union</td>
<td>30-40</td>
<td>22-29</td>
</tr>
<tr>
<td>Elbow connector</td>
<td>30-40</td>
<td>22-29</td>
</tr>
<tr>
<td>Plug (for hydraulic test)</td>
<td>6-9</td>
<td>4.3-6.5</td>
</tr>
<tr>
<td>Oil pan drain plug</td>
<td>18-23</td>
<td>13-17</td>
</tr>
<tr>
<td>Overdrive solenoid valve installation bolt</td>
<td>10-16</td>
<td>7-12</td>
</tr>
<tr>
<td>Plug</td>
<td>10-16</td>
<td>7-12</td>
</tr>
<tr>
<td>Manual lever installation nut</td>
<td>14-18</td>
<td>10-13</td>
</tr>
<tr>
<td>Transmission oil cooler</td>
<td></td>
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</tr>
<tr>
<td>Transmission oil cooler eye bolts</td>
<td>30-35</td>
<td>22-25</td>
</tr>
<tr>
<td>Transmission oil cooler tube flare nut</td>
<td>40-50</td>
<td>29-36</td>
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<tr>
<td>Transfer</td>
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<tr>
<td>Transfer case installation bolt</td>
<td>30-42</td>
<td>22-30</td>
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<tr>
<td>Transfer case installation nut</td>
<td>30-42</td>
<td>22-30</td>
</tr>
<tr>
<td>Chain cover bolt</td>
<td>31-42</td>
<td>22-30</td>
</tr>
<tr>
<td>Side cover bolt</td>
<td>8-10</td>
<td>5-7</td>
</tr>
<tr>
<td>Rear cover bolt</td>
<td>15-22</td>
<td>11-15</td>
</tr>
<tr>
<td>Cover bolt</td>
<td>15-22</td>
<td>11-15</td>
</tr>
<tr>
<td>Control housing bolt</td>
<td>15-22</td>
<td>11-15</td>
</tr>
</tbody>
</table>
## AUTOMATIC TRANSMISSION - Specifications

<table>
<thead>
<tr>
<th>Items</th>
<th>Nm</th>
<th>ft.lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil filler plug</td>
<td>30–35</td>
<td>22–25</td>
</tr>
<tr>
<td>Drain plug</td>
<td>30–35</td>
<td>22–25</td>
</tr>
<tr>
<td>Select plug</td>
<td>30–35</td>
<td>22–25</td>
</tr>
<tr>
<td>Locking plate bolt</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Rear output shaft lock nut</td>
<td>100–130</td>
<td>72–94</td>
</tr>
<tr>
<td>Speedometer sleeve clamp bolt</td>
<td>1.5–2.2</td>
<td>1.1–1.6</td>
</tr>
<tr>
<td>Seal plug</td>
<td>30–42</td>
<td>22–30</td>
</tr>
<tr>
<td>4WD switch</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>Control shaft set screw</td>
<td>8–10</td>
<td>5–7</td>
</tr>
<tr>
<td>Control lever assembly to control housing</td>
<td>8–10</td>
<td>5–7</td>
</tr>
<tr>
<td>Transfer mounting bracket to transfer</td>
<td>18–25</td>
<td>13–18</td>
</tr>
<tr>
<td>Transfer mounting bracket to pipe</td>
<td>30–42</td>
<td>22–29</td>
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</tbody>
</table>

## LUBRICANTS

<table>
<thead>
<tr>
<th>Items</th>
<th>Specified lubricants</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic transmission fluid</td>
<td>Automatic Transmission Fluid &quot;DEXRON&quot; type</td>
<td>Approx. 7.2 lit. (15.2 pints)</td>
</tr>
<tr>
<td>Transfer oil</td>
<td>Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W or 75W-85W</td>
<td>Approx. 2.2 lit. (4.7 pints)</td>
</tr>
<tr>
<td>Transfer control lever assembly O-ring</td>
<td>Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W or 75W-85W</td>
<td>Small quantity</td>
</tr>
</tbody>
</table>

## SEALANTS AND ADHESIVES

<table>
<thead>
<tr>
<th>Items</th>
<th>Specified sealants and adhesives</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pump installation bolt (threads)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Adaptor gasket (both sides)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Air breather (press-in circumference)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Chain cover gasket (both sides)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Rear cover gasket (both sides)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Cover gasket (both sides)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Control housing gasket (cover side surface only)</td>
<td>3M Adhesive Nut Locking 4171 or equivalent</td>
<td>As required</td>
</tr>
<tr>
<td>Bolt (threads)</td>
<td>3M ART Part No. 8660 or equivalent</td>
<td>As required</td>
</tr>
</tbody>
</table>

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**TSB Revision**

**N21CD-1**

**N21CS-1**
<table>
<thead>
<tr>
<th>Tool</th>
<th>Number</th>
<th>Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MD998330</td>
<td>Oil pressure gauge</td>
<td>Measurement of oil pressure</td>
</tr>
<tr>
<td></td>
<td>(includes</td>
<td>(3000 kPa · 427 psi)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MD998331)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MD999563</td>
<td>Oil Pressure gauge</td>
<td>Measurement of oil pressure</td>
</tr>
<tr>
<td></td>
<td>(includes</td>
<td>(1000 kPa · 142 psi)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MD998331)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MD998206</td>
<td>Adapter</td>
<td>Connection of oil pressure gage</td>
</tr>
<tr>
<td></td>
<td>MD998212</td>
<td>Oil pump puller</td>
<td>Removal of oil pump</td>
</tr>
<tr>
<td></td>
<td>MD998335</td>
<td>Oil pump band</td>
<td>Assembly of oil pump</td>
</tr>
<tr>
<td></td>
<td>MD998412</td>
<td>Guide</td>
<td>Installation of oil pump</td>
</tr>
<tr>
<td></td>
<td>MD998217</td>
<td>Gauge</td>
<td>Check of quality of assembly</td>
</tr>
<tr>
<td></td>
<td>MB998903</td>
<td>Spring compressor</td>
<td>Disassembly and assembly of clutch</td>
</tr>
<tr>
<td></td>
<td>MB998904</td>
<td>Bolt</td>
<td>Disassembly and assembly of No. 3</td>
</tr>
<tr>
<td></td>
<td>MD998904</td>
<td></td>
<td>brake spring</td>
</tr>
</tbody>
</table>
AUTOMATIC TRANSMISSION – Special Tools / Troubleshooting

<table>
<thead>
<tr>
<th>Tool</th>
<th>Number</th>
<th>Name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MD998211</td>
<td>Retainer</td>
<td>Disassembly and assembly of No. 3 brake spring</td>
</tr>
<tr>
<td></td>
<td>MD998353</td>
<td>Torque driver set</td>
<td>Tightening of valve body screw</td>
</tr>
</tbody>
</table>

**TROUBLESHOOTING**

**GENERAL**

Automatic transmission malfunctions may be caused by the following conditions:

1. Improper maintenance and adjustment
2. Mechanical malfunctions
3. Hydraulic malfunctions
4. Poor engine performance

Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known. Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.

**FLUID LEVEL AND ATF CONDITION**

(1) Place the vehicle on a level surface.
(2) Before removing the dipstick, wipe all dirt from area around the dipstick.
(3) With the selector lever in the "P" position and the parking brake applied, start the engine.
(4) The engine should be running at idle and the transmission should be warmed up sufficiently.
(5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then, place the lever in the "N" or "P" position.
(6) Check to see that the fluid level is within the range between “COLD” upper limit and the “HOT” lower limit on the dipstick.

If the fluid level is low, top up until the level rises to within the range between the "HOT" lower and upper limits.

Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and slows down pressure buildup.

If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

Along with the fluid level, it is equally important to check condition of fluid. When fluid smells burned, it is contaminated with metal bushing or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.

TSB Revision
MANUAL LINKAGE
The inhibitor switch is installed on the selector lever. After checking normal operation of this switch, place the selector lever in the "N" position. If the notch of the selector lever on the transmission side faces directly down, the linkage has been adjusted correctly.

THROTTLE CONTROL CABLE
Throttle control cable adjustment is very important to assure normal operation of the transmission. Shift speed control, shift feeling and transmission slip depend greatly on this adjustment. If the throttle outer cable is set too long (namely, the inner cable is too tight), the throttle valve is already in operating state and consequently, presence of hydraulic pressure higher than specified is suspected. The throttle pressure acts on each shift valve and when upshifting, the governor pressure that counteracts against the throttle pressure is higher than normal. Namely, if the outer cable is set too long, upshift takes place at vehicle speed higher than normal. On the other hand, if the outer cable is set too short (the inner cable is slack), upshift takes at vehicle speed lower than normal.

INHIBITOR SWITCH
Check to see that the engine starts only when the selector lever is in the "N" or "P" position and that it does not start when the selector lever is in other positions.

SELECTOR LEVER
1. Check to see that the vehicle moves forward when the selector lever is shifted from the "N" position to the "D" range and that the vehicle reverses when the lever is shifted to the "R" range.
2. Stop the engine.
3. Shift the selector lever from the "N" position to the "D" range and then to the "2" position to check that the lever can be operated smoothly and engage at each position with reasonable firmness.
4. Check to see that shifting to each of the "P", "R", "2" and "L" positions can take place only when the selector lever is pushed in.
ROAD TEST
Prior to performing road test, be sure to make basic checks including check and adjustment of fluid level and condition and adjustment of the throttle cable. For road test, the transfer must be placed in the 2H (2WD-high) position.
In road test, various changes such as slips in transmission and shifting conditions are checked and hence the transmission operation at each shift position must have been checked.

D RANGE TEST

Start with throttle valve opened (50% and full), and check upshift from 1-speed → 2-speed, 2-speed → 3-speed and 3-speed → 4-speed. Check that speed change points match shift pattern. (Refer to P.21-83.)

Will not upshift, 1-speed → 2-speed
- Governor malfunction
- 1-2 shift valve malfunction

Will not upshift, 2-speed → 3-speed
- 2-3 shift valve malfunction
- Governor malfunction

Will not upshift, 3-speed → 4-speed (with throttle valve opening under 85%)
- 3-4 shift valve malfunction
- Governor malfunction
- OD OFF switch or OD solenoid malfunction

Speed change points incorrect
- Line pressure malfunction
- Governor malfunction
- Incorrect throttle cable adjustment

Kickdown traveling at 2-speed, 3-speed and 4-speed. Check that possible kickdown vehicle speed limit at 2-speed → 1-speed, 3-speed → 1-speed, 3-speed → 2-speed, or 4-speed → 1-speed, 4-speed → 2-speed, 4-speed → 3-speed conforms with the shift pattern. (Refer to P.21-83.)

Speed change point incorrect
- Line pressure malfunction
- Governor malfunction
- Detent regulator valve malfunction

Will not downshift
- All shift valves malfunction
- Governor malfunction
- OD OFF switch or OD solenoid malfunction

TSB Revision
When traveling in 3-speed or 4-speed, release accelerator and shift to L. Check that 3-speed → 2-speed or 4-speed → 3-speed takes place immediately and 2-speed → 1-speed downshift conforms with shift pattern. (Refer to P.21-83.)

- Incorrect throttle cable adjustment
- Governor malfunction
- Line pressure malfunction
- Low coast modulator valve malfunction

Will not downshift, 2-speed → 1-speed

- 1-2 shift valve malfunction
- Governor malfunction

When traveling in 3-speed or 4-speed, shift to 2 and L and check engine brake function in each range.

Engine brake will not function in 2.

- Brake No. 1 malfunction

Engine brake will not function in L.

- Brake No. 3 malfunction

Check for abnormal noise(s) during acceleration and deceleration. Check for shocks when slipping and changing speed.

- High line pressure
- Accumulator malfunction
- Check ball malfunction

TSB Revision
Check for abnormal noise(s) or vibration when traveling in 3-speed or 4-speed.

Strong abnormal noise and vibration

- Incorrect torque converter installation
- Oil pump malfunction
- Speed change gear wheel not meshing correctly
- Incorrect drive plate installation

NOTE
Abnormal noises and vibrations are often caused by an unbalanced propeller shaft, differential, tire, torque converter, engine etc. Extremely thorough inspection is therefore required.

Check that lock up ON, OFF and speed change point conforms with shift pattern.

Lock up ON, OFF does not conforms.

- Governor malfunction
- Line pressure malfunction

Lock up does not go ON, OFF.

- Lock up signal valve malfunction
- Lock up relay valve malfunction
- Lock up clutch malfunction

NOTE
(1) Determine the moment when lock up turns ON by decreased engine rpm or by a slight shock back and forth.
(2) Determine the moment when lock up turns OFF by increased engine rpm.
(3) Check lock up condition by pumping the accelerator slightly. If engine rpm rises in accordance with throttle valve opening size, determine that the lock up is OFF, if not, determine if ON.

When lock up is OFF, drive power is transferred through the fluid in the torque converter and therefore, when the accelerator pedal is depressed, slipping occurs inside the torque converter with a resulting large increase in engine rpm.
2 RANGE TEST

Start with throttle valve opening at 50\% and full. Check that speed change points conform with the shift pattern, when upshifting from 1-speed → 2-speed. (Refer to P.21-83.)

- Will not upshift, 1-speed → 2-speed.
  - Governor malfunction
  - 1-2 shift valve malfunction

- Incorrect speed change point
  - Governor malfunction
  - Misadjusted throttle cable
  - Line pressure malfunction

Kickdown and check that possible kickdown vehicle speed limit at 2-speed → 1-speed conforms with shift pattern. (Refer to P.21-83.)

- Will not downshift or incorrect speed change point.
  - Detent regulator pressure malfunction
  - Governor malfunction
  - Misadjusted throttle cable
  - 1-2 shift valve malfunction
  - Line pressure malfunction

L RANGE TEST

Check that it does not upshift to 2-speed

- Upshifts
  - Low coast modulator valve malfunction
  - Governor malfunction
  - Low line pressure
R RANGE TEST

Start with full throttle and check for slippage.

- Brake No. 3 malfunction
- OD clutch or direct clutch malfunction
- OD one-way clutch malfunction
- Low line pressure

P RANGE TEST

Park vehicle on an incline (more than 5°). Release parking and service brakes and check that the vehicle does not move.

- Park mechanism malfunction
- Misadjusted shift lever

TSB Revision
CONVERTER STALL TEST

In this test, the engine maximum speed when the torque converter stalls with the shift lever in the "D" or "R" range is measured to check operation of the torque converter, stator and one-way clutch and check holding performance of the transmission clutch (including brake).

Caution

do not stand in front or at rear of the vehicle during this test.

1. Check the transmission fluid level. The fluid temperature should be at the level after normal operation [50 – 80°C (122 – 176°F)]. The engine coolant temperature should also be at the level after normal operation [80 – 90°C (176 – 194°F)].

2. Apply chocks to the rear wheels (right and left).

3. Mount an engine tachometer.

JUDGMENT OF STALL TEST RESULTS

| Stall speed in "D" and "R" range is equal to each other but lower than the nominal value. | (1) Engine output is low  
(2) Stator one-way clutch is faulty.  
(Faulty torque converter is suspected if it is lower than nominal by more than 600 rpm.) |
| --- | --- |

| Stall speed in "D" range is higher than nominal. | (1) O.D. clutch slipping.  
(2) O.D. one-way clutch faulty  
(3) Forward clutch slipping  
(4) One-way clutch No. 2 faulty  
(5) Low line pressure |
| --- | --- |

| Stall speed in "R" range is higher than nominal. | (1) O.D. clutch slipping.  
(2) O.D. one-way clutch faulty  
(3) Direct clutch slipping  
(4) Brake No. 3 slipping  
(5) Low line pressure |
| --- | --- |

HYDRAULIC PRESSURE TEST

The hydraulic pressure tests (governor pressure and line pressure tests) are important in determining the causes of transmission failures.

Before conducting these tests, fluid level and condition and throttle cable adjustment etc. must be checked for defects or abnormalities. When conducting the tests, the engine and transmission should be at correct operating temperatures, [engine cooling water 80 – 90°C (176 – 194°F), transmission fluid 50 – 80°C (122 – 176°F)].

GOVERNOR PRESSURE TEST

1. Place vehicle on a chassis dynamometer.
2. Remove plug from governor pressure takeoff port.
3. Install special tool as shown in figure and place the meter inside vehicles.

NOTE

When the adapter interferes with the extension housing, repair the tool as shown in figure.

4. Apply parking brake.
5. Start engine.
7. Shift to D and measure governor pressure at each output shaft rpm.

**Standard value:**

<table>
<thead>
<tr>
<th>Output shaft speed (rpm)</th>
<th>Vehicle speed km/h (mph)</th>
<th>Governor pressure kPa (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>28 (17)</td>
<td>133–163 (19.4–23.6)</td>
</tr>
<tr>
<td>2,000</td>
<td>56 (35)</td>
<td>251–281 (36.4–40.6)</td>
</tr>
<tr>
<td>3,200</td>
<td>90 (56)</td>
<td>400–430 (58–62.2)</td>
</tr>
</tbody>
</table>

**JUDGEMENT BY GOVERNOR PRESSURE**

- Governor pressure is not within the standard value
  - Line pressure malfunction
  - Oil leak in governor circuit
  - Governor malfunction

**LINE PRESSURE TEST**

1. Place the vehicle on a chassis dynamometer.
2. Remove the plug from the line pressure takeoff port.
3. Install special tool as shown in the figure and place the meter inside vehicle.
4. Apply the parking brake.
5. Start the engine.
6. Place the selector lever in the “D” range.
7. Depress the brake pedal firmly by the left foot and operates the accelerator pedal by the right foot to measure the line pressure at each engine rpm. If the measured pressure is not nominal, check adjustment of the throttle cable and readjust if necessary before conducting the test again.
8. Place the selector lever in the “R” range and test as above.

**Standard value:**

<table>
<thead>
<tr>
<th>Line pressure</th>
<th>kPa (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“D” range</td>
<td>“R” range</td>
</tr>
<tr>
<td>At idle</td>
<td>510–590 (74–85)</td>
</tr>
<tr>
<td>At stall</td>
<td>1080–1280 (156–185)</td>
</tr>
</tbody>
</table>

**JUDGEMENT BY LINE PRESSURE**

- Hydraulic pressure higher than nominal in all ranges
  - (1) Regulator valve faulty
  - (2) Throttle valve faulty
  - (3) Throttle control cable incorrectly adjusted

- Hydraulic pressure lower than nominal in all ranges
  - (1) Oil pump faulty
  - (2) Regulator valve faulty
  - (3) Throttle valve faulty
  - (4) Throttle control cable incorrectly adjusted
  - (5) O.D. clutch faulty

- Hydraulic pressure lower than nominal in “D” range
  - (1) Large fluid leaks in “D” range hydraulic circuit
  - (2) Forward clutch faulty
  - (3) O.D. clutch faulty

- Hydraulic pressure lower than nominal in “R” range
  - (1) Large fluid leaks in “R” range hydraulic circuit
  - (2) Brake No. 3 faulty
  - (3) Direct clutch faulty
  - (4) O.D. clutch faulty
OVERDRIVE CONTROL SYSTEM CIRCUIT

OPERATION

Automatic transmission oil temperature warning light
- When the ignition switch is placed in the "ON" position without starting the engine, current will flow to fuse No. 3, the automatic transmission oil temperature warning light, diode alternator, and the ground, and the warning lights will light. This is a circuit for the purpose of checking for bulb circuit breakage, and the lights will go out when the engine is started.
- When the engine is started, current flows to the ignition switch, fuse No. 3, and the automatic transmission oil temperature warning light, the battery voltage will go to the oil temperature switch.
- When ATF temperature rises above 50°C (122°F), the oil temperature switch will go on.
- When the oil temperature switch goes on, current will flow to the ignition switch, fuse No. 3, the automatic oil temperature warning light, oil temperature switch and the ground and the warning lights will go on.
Overdrive-off solenoid valve

- When the overdrive-OFF switch is switched ON (with the ignition switch at the ON position), battery voltage is applied, through fuse No. 3 and the overdrive-OFF relay, to the engine coolant temperature switch.
- When the coolant temperature becomes 80°C (176°F) or higher, the engine coolant temperature switch is switched ON.
- When the engine coolant temperature switch is switched ON, current flows to the ignition switch, fuse No. 3, the overdrive-OFF switch, the overdrive-OFF relay, the engine coolant temperature switch, and ground, and the relay is switched ON.
- When the overdrive-OFF relay is switched ON, current flows to the ignition switch, fuse No. 3, the overdrive-OFF switch, the overdrive-OFF relay, and the solenoid valve is activated.
- When the overdrive-OFF switch is switched ON, current flows to the ignition switch, fuse No. 3, the overdrive-OFF switch, the overdrive-OFF indicator, and ground, and the indicator illuminates.

TSB Revision
SERVICE ADJUSTMENT PROCEDURES
TRANSMISSION FLUID CHANGING AND INSPECTION

(1) Check the fluid level (automatic transmission and transfer case).
(2) For the checking procedures of automatic transmission fluid (ATF), see P.21-77.
(3) Check the transfer case oil level with the filler plug removed.
(4) The fluid level is okay if it is at the same level as the lowest point of the filler plug hole.
(5) Install the filler plug and gasket, and tighten to 30-35 Nm (22-25 ft.lbs.).

ATF CHANGING PROCEDURES

Caution
If ATF change is required due to damage to the transmission, be sure to clean the cooler system.

(1) Raise the vehicle on hoist. Place a drain container with large opening under the drain plug (located in bottom of the oil pan).
(2) Remove the drain plug to let ATF drain
(3) Install the drain plug and new gasket and tighten to 18–23 Nm (13–17 ft.lbs.).
(4) Refill ATF through the oil level gauge hole until its level reaches the COLD lower limit of the level gauge.
(5) Start the engine and allow to idle for at least two minutes. Then, with the parking brake and service brake applied, move the selector lever through all positions and finally place in the “N” or “P” position.
(6) After the transmission is warmed up to the normal operating temperature, recheck the fluid level, which must be between the HOT upper limit and HOT lower limit marks.
(7) Insert the dipstick fully to prevent dirt from entering the transmission.
TRANSFER CASE OIL CHANGING PROCEDURES

1. Remove the filler plug.
2. Place a drain container with large opening under the drain plug.
3. Remove the drain plug to let oil drain.
4. Install the drain plug and new gasket and tighten to 30–35 Nm (22–25 ft.lbs.).
5. Refill specified transfer case oil up to specified level.
6. Install the filler plug and gasket and tighten to 30–35 Nm (22–25 ft.lbs.).

THROTTLE CABLE CHECK AND ADJUSTMENT

1. Check for defective or bent throttle lever or throttle cable bracket.
2. Check that the distance between the inner cable stopper and dust cover surface is within the standard value.

Standard value: 0–1 mm (0–.04 in.)

3. If outside the standard value, adjust with adjusting nut.

PROPELLER SHAFT OIL SEALS REPLACEMENT

Refer to P.21-11.

SPEEDOMETER CABLE REPLACEMENT

Refer to P.21-11.
Removal steps

1. Plate B
2. Floor console
3. Overdrive switch connection
4. Selector handle
5. Overdrive switch harness and front wiring harness connection
6. Cover
7. Inhibitor switch and front wiring harness connection
8. Position indicator light and front wiring harness connection
9. Indicator panel
10. Bracket assembly
11. Heat protector
12. Cotter pin
13. Transmission control rod (B)
14. Dust cover
15. Snap ring
16. Spring
17. Cross shaft bushing
18. Cross shaft boot (B)
19. Select cross shaft
20. Transmission control rod (A)
21. Cap
22. Bushing
23. Cross shaft bracket (A)
24. Cross shaft boot
25. Bushing
26. Pin

NOTE
(1) Reverse the removal procedures to reinstall.
(2) Refer to "Service Points of Removal".
(3) Refer to "Service Points of Installation".
(4) Non-reusable parts
SERVICE POINTS OF REMOVAL

4. REMOVAL OF SELECTOR HANDLE

(1) Press the cover downward.
(2) Disconnect the overdrive switch connector from the selector handle.

(3) Remove the selector handle from the shift lever.

13. DISCONNECTION OF TRANSMISSION CONTROL ROD (B)

(1) Disconnect the transmission control rod (B) from the transmission control arm by loosening the nut from under the floor.

(2) Disconnect the select cross shaft from the heat protector.
(3) Disconnect the select cross shaft from transmission control rod B.

19. REMOVAL OF SELECT CROSS SHAFT/20. TRANSMISSION CONTROL ROD (A)

(1) Disconnect the select cross shaft from transmission control rod A.
(2) Remove the dust cover, and then remove the snap ring that holds the spring.
(3) Remove the cross shaft bracket mounting bolts from the transfer assembly.
(4) Detach the cross shaft bracket from the bracket on the No. 1 crossmember side.

(5) Remove transmission control rod A from the transmission.

**SERVICE POINTS OF INSTALLATION**


Apply a coating of the multipurpose grease to the bushing inner surface and the sliding parts shown in the figure.

**13. INSTALLATION OF TRANSMISSION CONTROL ROD (B)**

(1) Move the transmission and shift lever to the "N" position, and then install the transmission control arm and transmission control rod (B) as shown in the figure.
(2) Check, while driving, to be sure that the transmission is set to each range when the selector lever is shifted to each position.
(3) Check, while driving, to be sure that the overdrive is activated and cancelled correctly when the overdrive switch is used.
DISASSEMBLY AND REASSEMBLY

Removal steps

1. Position indicator light
2. Inhibitor switch
3. Overdrive switch
4. Pushbutton
5. Spring
6. Selector handle
7. Bushings
8. Transmission control arm
9. Shift lever
10. Sleeve
11. Spring
12. Rod assembly
13. Bracket

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) Refer to "Service Points of Reassembly".

INSPECTION

- Check for unusual wear of the bracket's detent plate part, rod end pin, each bushing, pushbutton and sleeve contact surface.
- Check for weakness of the spring.
- Check the operation of the overdrive switch. (Check the continuity.)

When the overdrive switch is OFF: continuity
When the overdrive switch is ON: non-continuity

Inhibitor switch

Check the continuity with the select lever at each position.

<table>
<thead>
<tr>
<th>Select lever position</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>P</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>o</td>
</tr>
</tbody>
</table>

NOTE
○○ indicates that there is continuity between the terminals.

TSB Revision
SERVICE POINTS OF REASSEMBLY

12. APPLICATION OF GREASE TO ROD ASSEMBLY
11. SPRING/10. SLEEVE/8. TRANSMISSION CONTROL ARM/7. BUSHINGS/4. PUSHBUTTON

Apply the multipurpose grease to each sliding part of the lever.

10. INSTALLATION OF SLEEVE

Move the selector lever to the "N" position, and turn the sleeve so that the angled surface of the sleeve is at the pushbutton side. At this time, adjust the clearance between the sleeve and the selector lever so that it is the standard value.

Standard value: 15.2–15.9 mm (.60–.62 in.)

NOTE
Move the B part of the sleeve to the pushbutton side (driver's seat side).

2. INSTALLATION OF INHIBITOR SWITCH

(1) Temporarily install the inhibitor switch.
(2) Set the shift lever so that the pin at the end of the rod is at the position shown in the figure.

(3) Using a circuit tester between 2-BY and 2-BY of the inhibitor switch connector, check the continuity when the inhibitor switch is moved back and forth, and mark the bracket.

(4) Tighten the inhibitor switch mounting screws at the position where the clearance between the inhibitor switch and the selector lever is the specified distance.
TRANSMISSION AND TRANSFER ASSEMBLY

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Cross Shaft Protector
- Removal of Transfer Case Protector
- Removal of Front Exhaust Pipe
- Draining of Automatic Transmission Fluid and Transfer Oil (Refer to GROUP O-Maintenance Service)
- Removal of Front and Rear Propeller shaft (Refer to GROUP 16-Propeller shaft)

Post-installation Operation
- Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to GROUP O-Maintenance Service)
- Installation of Front Exhaust Pipe (Refer to GROUP 11-Exhaust Pipe)
- Installation of Front and Rear Propeller shaft (Refer to GROUP 16-Propeller shaft)
- Installation of Cross Shaft Protector
- Installation of Transfer Case Protector
- Checking of Selector Lever Activation

Removal steps
1. Dust seal guard
2. Ground cable
3. Oxygen sensor connector
4. 4WD indicator light switch connector
5. Speedometer cable
6. Overdrive solenoid valve connector
7. Throttle control cable
8. Oil filler tube
9. O-ring
10. Automatic transmission cooler tube

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ** : Refer to "Service Points of Installation".
(3) N : Non reusable parts

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11. Stator cover
12. Stator motor
13. Transmission stay (R.H.)
14. Transmission stay (L.H.)
15. Bell housing cover
16. Transfer mounting bracket
17. Cotter pin
18. Bolts.
19. No. 2 crossmember and rear engine support member with transfer control rod
20. No. 2 crossmember
21. Transmission control rod assembly
22. Transfer control lever mounting bolts
23. Special bolts (six)
24. Transmission and transfer assembly
25. Transfer shift lever knob
26. Front floor console
27. Control lever assembly
28. Control housing gasket
29. Control housing cover

NOTE
(1) Reverse the removal procedures to reinstall.
(2) : Refer to "Service Points of Removal".
(3) : Refer to "Service Points of Installation".
(4) : Non reusable parts

<table>
<thead>
<tr>
<th>Nm</th>
<th>ft.lbs.</th>
<th>O.D. x Length</th>
<th>mm (in.)</th>
<th>Bolt identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>65-85</td>
<td>47-61</td>
<td>12 x 40 (.5 x 1.6)</td>
<td>D x L</td>
</tr>
<tr>
<td>B</td>
<td>80-100</td>
<td>58-72</td>
<td>12 x 55 (.5 x 2.2)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>27-34</td>
<td>20-25</td>
<td>10 x 55 (.4 x 2.2)</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>30-42</td>
<td>22-30</td>
<td>10 x 40 (.4 x 1.6)</td>
<td></td>
</tr>
</tbody>
</table>
SERVICE POINTS OF REMOVAL

12. REMOVAL OF STARTER MOTOR
Refer to P.21-13.

16. REMOVAL OF TRANSFER MOUNTING BRACKET
Refer to P.21-13.

22. REMOVAL OF TRANSFER CONTROL LEVER ASSEMBLY MOUNTING BOLTS
Move the transfer control lever to the "2H" position and remove the control lever assembly mounting bolts.

24. REMOVAL OF TRANSMISSION AND TRANSFER ASSEMBLY
(1) Disconnect the transmission and transfer assembly from the engine by pulling it slowly toward the rear of the vehicle.
(2) When lowering the transmission and transfer assembly, tilt the front of the transmission downward and slowly lower forward, while using care to make sure that the rear of the transmission does not hit the No. 4 crossmember.

NOTE
Detach so that the torque converter does not remain at the engine side.

SERVICE POINTS OF INSTALLATION

28. APPLICATION OF SEALANT TO CONTROL HOUSING GASKET
Apply semi-drying sealant to both surfaces of the control housing gasket.

24. INSTALLATION OF TRANSMISSION AND TRANSFER ASSEMBLY
On the engine side, there are two centering locations. Make sure that the transmission mounting bolt holes are aligned with them before mounting the transmission and transfer assembly to the engine.

21. INSTALLATION OF TRANSMISSION CONTROL ROD ASSEMBLY
(1) Apply a coating of multipurpose grease to the sliding parts.
(2) Confirm the position of the selector lever.
(Refer to P.21-78.)

14. INSTALLATION OF TRANSMISSION STAY (L.H.)/13. TRANSMISSION STAY (R.H.)
Refer to P.21-30.
9. APPLICATION OF LUBRICANT TO O-RING

Apply a small amount of the specified automatic transmission fluid to the O-ring and then install.

Specified transmission fluid: Automatic Transmission Fluid "DEXRON" type

7. CONNECTION OF THROTTLE CONTROL CABLE

Refer to P.21-89.

DISASSEMBLY

Caution

1. When removing the transmission assembly from the vehicle, use care so that the oil pan is not hit by the transmission jack.

2. The automatic transmission is built of accurately machined parts which should be handled during disassembly with utmost care to prevent damage.

3. When separating light alloy metal parts such as the case, do not pry with a screwdriver but tap lightly with a soft headed hammer (plastic hammer).

4. Place rubber mat on the work bench and keep it clean.

5. During disassembly, do not wear cloth gloves or use rags.
   If necessary, use nylon cloth or paper towel.

6. Clean all parts that have been disassembled. Ordinary detergent may be used for cleaning metallic parts but after washing, be sure to dry with air.

7. Wash the clutch disc, brake disc, resin and rubber parts in ATF (automatic transmission fluid) and keep them free from dust.

8. If the transmission itself is damaged, disassemble and clean the cooler system.

   (1) Remove sand and dirt from the outside of the transmission.
   (2) Remove the transfer (P.21-154).
   (3) Place the transmission assembly on a bench with the oil pan down.

   Caution
   Do not place the assembly with the oil pan up before the oil pan is removed. This is necessary to prevent foreign matter in the oil pan from entering the valve body.

   (4) Remove the torque converter.
   (5) Remove the O.D. solenoid valve.
   (6) Remove the oil pump:
      (a) Remove the seven bolts.
      (b) Position the special tool on the shaft in back of the spline.
      (c) Turn bolt of the special tool to free the pump.

   Caution
   • Do not damage the shaft bushing surface.

   (d) Grasp the front pump stator shaft and pull the pump from the case.
(7) Watch for the bearing and race behind the oil pump.

(8) Remove the torque converter housing:
   (a) Remove the two 12-mm bolts and four 10-mm bolts.
   (b) While holding the input shaft, remove the converter housing.

(9) Remove the adapter and gasket.
(10) Remove the governor mounting bolt.
(11) Lift up the governor retaining ring lightly by a screwdriver and remove the governor assembly from the output shaft.

(12) Remove the governor strainer:
   (a) Remove the four screws and plate.
   (b) Remove the strainer from the case.

(13) Remove the oil pan and gasket:
   (a) Remove the fourteen bolts.
   (b) Remove the oil pan with the transmission case lifted.

**Caution**
- Do not turn the transmission over as this will contaminate the valve body by foreign materials collected in the bottom of oil pan.
(14) Examine metallic particles in the oil pan as follows:
Remove the magnet and use it to collect any steel chips.
Look carefully at the chips and particles in the oil pan and on
the magnet to guess where the wear occurs in the
transmission:
Steel (magnetic) = bearing, gear and clutch plate wear.
Brass (nonmagnetic) = bushing wear.

(15) Turn the transmission over and remove the tubes by prying
up both ends of each tube with a large screwdriver.
(16) Remove the strainer.

(17) Remove the seventeen valve body fixing bolts.

(18) Lift slightly the valve body and disconnect the throttle cable
from the cam, then remove the valve body.

(19) Remove the $C_2$ accumulator piston spring.
(20) Using a 10 mm (.39 in.) socket, push the plastic throttle cable retainer out of the transmission case to remove the cable with retainer.

(21) Position a rag to catch each piston. Blow low-pressure compressed air (100 kPa, 14.5 psi) into each of the holes shown to let the piston into the rag. Remove the pistons and springs.

Caution
- Keep face away to avoid injury.
- Do not use high-pressure air.

(22) Remove the parking lock linkage:
   (a) Remove the cam plate.
   (b) Remove the parking lock rod.
   (c) Remove the spring, pivot pin and parking lock pawl.

(23) Remove the manual lever and shaft:
   (a) Using a hammer and punch, drive out the pin.
   (b) Slide the shaft out the case and remove the detent plate.

(24) Place the transmission on a cylindrical stand for more efficient work.

Caution
- Place shop rags between the case and stand to avoid damaging the case.
(25) Set the special tool on the overdrive case and measure the distance between the top of overdrive case and clutch cylinder. Make a note of the distance for reassembly.

(26) Grasp the shaft and pull out the overdrive clutch assembly. Watch for bearings and races on both sides of the assembly.

(27) Remove the overdrive case and brake as follows: Hold both sides of the overdrive case and pull it out from the transmission case. Watch for bearings and races on both sides of the assembly.

(28) Set the special tool in the case. Measure the distance between the top of case flange and the clutch drum. Make a note of the finding for reassembly.

(29) Grasp the shaft and pull out the forward clutch assembly. Watch for bearings and races on both sides of the assembly.
(30) Remove the direct clutch by grasping the clutch hub and pulling it out from the case.

(31) Remove the center support and sun gear:
(a) Remove the two center support bolts.

(b) Grasp the center support assembly and pull out the center support with sun gear.

(32) Remove the reaction plate retaining ring using a long-shank screwdriver.

(33) Remove the No. 3 brake and planetary carrier assembly by pulling out the intermediate shaft.
If the brake apply tube and rear thrust bearing and races do not come out with the assembly, remove them from the case.
REASSEMBLY

Caution
- Before assembly, make sure that all component assemblies are assembled correctly.
- If something wrong is found in a certain component assembly while assembly, inspect and repair this assembly immediately.

GENERAL ASSEMBLY NOTES

1. The automatic transmission is composed of highly precision-finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in ATF for at least two hours.
3. Apply ATF on sliding or rotating surfaces of the parts before assembly.
4. Use petroleum jelly to keep the small parts in their places.
5. Do not use sealant or adhesive cements on gaskets and similar parts.
6. When assembling the transmission, be sure to use new gaskets and O-rings.
7. Dry all parts by blowing with compressed air. Never use shop rags.
8. Be sure to install the thrust bearings and races in the correct direction and position.

(1) Place the transmission on a cylindrical stand for more efficient work.

Caution
- Place shop rags between the case and stand to avoid damaging the case.

(2) Install the thrust bearing #20 and then the race #21 facing the cup side downward.
(3) Install the brake apply tube onto the case, aligning the tube’s locking tab (part A) with part B of the case.

NOTE
Make sure that the tab of the tube is completely fitted in the case.

(4) Insert the output shaft assembly into the case.
(5) With the case in upright position, make sure that the No. 3 brake is lower than the ledge below the retaining snap ring groove.
If the No. 3 brake is not lower than the ledge, components may be misassembled or there may be excess ATF between the disc and plate.

**Standard value:**

- **Dimension A:** 0.61 – 2.64 mm (.024-.104 in.)

(6) Install the reaction plate as follows:
Position the notched tooth of the reaction plate toward the valve body side of the case. Push it into place.

**NOTE**
The reaction plate is correctly installed if the retaining snap ring groove is fully visible.

(7) Install the retaining snap ring as follows:
Use a large screwdriver to compress the snap ring. Push the snap ring into place by hand. Work around the case. Visually check to make sure that the ring is fully seated. Make sure that the ends of the snap ring are between the lugs.

(8) Push the center support assembly into the case while aligning the oil hole and bolt hole of the center support with those of the body side.

(9) Install the two center support bolts with wave washers. Finger tighten the bolts.
(10) Install the direct clutch in the case while turning the clutch to mesh its hub with the center support.

(11) Check for correct installation of the direct clutch. If the direct clutch is fully meshed with the center support, the splined center of the clutch will be flush with the end of the planetary sun gear shaft.

(12) After being coated with petroleum jelly, install the thrust bearing race #16 over the splined end of the direct clutch in case with its lip toward the direct clutch.

(13) After being coated with petroleum jelly, install the thrust bearing #15 and race #14 on the forward clutch, with the race's lip outward.

(14) Install the forward clutch assembly in the case:
(a) Align flukes of the direct clutch discs and mesh them with the forward clutch hub.
(b) Push the forward clutch assembly into the case.

Caution
• Be careful not to let the thrust bearing drop.

(15) Check for correct installation of the forward clutch as follows:
Set the special tool on the transmission case as shown in the figure. Measure the distance between the top surface of the tool and forward clutch assembly. If the distance corresponds to that during disassembly, the forward clutch is installed correctly.
(16) Install the special tool on the case.
(17) After being coated with petroleum jelly, install the thrust bearing #10 on the forward clutch.

(18) After being coated with petroleum jelly, install the thrust race #9 on the overdrive case end with its lip toward the overdrive case.

(19) Insert the overdrive case gently into the transmission case through the two guide pins with the part indicated by arrow facing in the direction shown.

(20) Coat the thrust washers with petroleum jelly. Install the washers on the overdrive planetary gear.
NOTE
The washer lugs should be inserted in the holes.

(21) Install the overdrive clutch in the case as follows:
Align the disc flukes in the overdrive case. Align the flukes with the slots of the overdrive clutch and press the overdrive clutch into the overdrive case.
Caution
• Be careful not to let the thrust washer drop.
(22) Check for correct installation of the overdrive clutch as follows:
Set the special tool on the overdrive case as shown in the figure.
Measure the distance between the top surface of the tool and the overdrive clutch. If the distance corresponds to that during disassembly, the overdrive clutch is installed correctly.

(23) Install the O-ring on the overdrive case.
(24) Install the torque converter housing by using the two 12-mm bolts (B) and four 10-mm bolts (A). Tighten the bolts to specification.

(25) Coat the thrust bearing race #3 with petroleum jelly and install it on the overdrive clutch.
(26) Coat the thrust bearing #2 and race #1 combination with petroleum jelly and install it on the oil pump.

(27) Install the oil pump:
(a) Install the oil pump gently through the two guide bolts, being careful that the thrust washer does not fall out.
(b) Coat the five set bolts with sealant, and finger tighten them.
(c) Using a screwdriver, remove the special tool. In the place of it, install the two set bolts coated with sealant.
   **Specified sealant: 3M ART Part No. 8660 or equivalent**
(d) Tighten the set bolts gradually and evenly to the specified torque.

(28) Tighten the two center support bolts alternately in 7 Nm (5.16 ft.lbs.) increments until the specified torque is reached.

**NOTE**
Firest tighten the accumulator side bolt.
(29) Check the operation of pistons as follows:
Blow low-pressure compressed air into the passages indicated in the figure and listen for noise from piston movement.
1. Overdrive clutch
2. Overdrive brake
3. Forward clutch
4. Direct clutch
5. Brake No. 1
6. Brake No. 2
7. Brake No. 3
If the pistons do not move, disassemble and inspect them.

(30) Check the input shaft and output shaft:
(a) Make sure that the input shaft has play in axial direction and that it turns.
(b) Make sure that the output shaft has an appropriate end play.
End play: 0.3 - 0.9 mm (.012 -.035 in.)

(31) Install the manual valve lever and shaft into the case:
(a) Install the manual valve lever shaft to the transmission case through the manual valve lever.
(b) Drive in a new slotted spring pin with the slot at a right angle to the shaft.

(32) Install the parking pawl, pivot pin and spring in the case.

(33) Install the cam plate on the case with the two bolts. Tighten the bolts to the specified torque. Make sure the pawl moves freely.

NOTE
Be careful, as it is possible for the cam plate to be installed too far forward, where it will bind the pawl.
(34) Check the operation of the parking lock pawl. The planetary gear output shaft must be locked when the manual valve lever is in the "P" range.

(35) Install a new O-ring on the throttle cable fitting.
(36) Install the throttle cable in the case by pushing the cable through the case, being careful not to damage the O-ring. Check for full seating.

Caution
- In subsequent work, do not roll the case over the cable and break the cable fitting.

(37) Install the accumulator piston and springs. Refer to the tables “Spring Identification” (page 21-72) and “Identification of Clutches, Brakes and Accumulators” (page 21-72, 73) for installation of correct springs and accumulator.

(38) Place the valve body on the transmission as follows: Make sure the accumulator pistons are pressed fully into the bore. Align the manual valve with the pin on the manual valve lever, and lower valve body into place.
(39) Lift a side of the valve body and attach the throttle cable.

(40) Make sure that the lower spring is installed on the $B_2$ or $C_2$ piston.

(41) Install the bolts in the valve body and tighten the bolts to specified torque.
The length of each bolt is as shown in the figure <unit: mm (in.)>

(42) Install the detent spring.

(43) Install the oil strainer and tighten the bolts to specified torque.

(44) Using a soft hammer, install the oil pipes into the position indicated in the figure.

Caution
- Be careful not to bend or damage the pipes.
(45) Install the magnet in the oil pan and install the oil pan with a new gasket.

**Caution**
- Make sure that the magnet does not interfere with the oil pipes.

(46) Install the drain plug with a new gasket.

(47) Install the governor line strainer on the transmission case and then install the plate.

(48) Insert a slot screwdriver between the governor retaining ring and governor body and install the governor to the output shaft.

(49) Install the adapter and gasket.

(50) Install the O.D. solenoid.

**Caution**
- Be sure to use two O-rings.

(51) Install torque converter to transmission.

(52) Install the transfer assembly (P.21-162).
GENERAL NOTES ON DISASSEMBLY AND ASSEMBLY OF COMPONENT ASSEMBLIES

GENERAL CLEANING NOTES:
1. All disassembled parts should be washed clean and the fluid passages and holes blown through with compressed air to make sure that they are not clogged.
2. The cleaning solvent used should be the recommended ATF or kerosene.
3. When using compressed air to dry parts, avoid spraying ATF or kerosene in your face.

PARTS HANDLING NOTES:
1. After cleaning, the parts should be arranged in proper order to allow performing the inspection, repairs, and reassembly with efficiency.
2. When disassembling the valve body, be sure to keep each valve together with its own spring.
3. New brake and clutch discs that are to be used for replacement must be soaked in ATF for at least two hours before assembly.

GENERAL ASSEMBLY NOTES:
1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.
2. All gaskets and O-rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the replacement must be made with the component assembly containing that bushing.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly to keep parts in their places.
DISASSEMBLY
(1) Use the torque converter as a work stand.
(2) Remove the two seal rings from the oil pump cover.

(3) Remove the six bolts.
(4) Remove the oil pump cover.
(5) Remove the O-ring from the oil pump body.
(6) Remove the oil pump drive gear and driven gear. Identify their top and bottom by appropriate marking for proper reassembly.

INSPECTION
BODY CLEARANCE CHECK
(1) Push the driven gear to one side of the body. Using a feeler gauge, measure the clearance.
   Standard value: 0.07–0.15 mm (.0029–.0059 in.)
   Limit: 0.3 mm (.012 in.)

TIP CLEARANCE CHECK
(1) Measure the gap between the drive and driven gear teeth and the crescent-shaped part of pump body.
   Standard value: 0.11–0.14 mm (.0043–.0055 in.)
   Limit: 0.3 mm (.012 in.)

SIDE CLEARANCE CHECK
(1) Using a steel straightedge and a feeler gauge, measure the side clearance of drive and driven gears.
   Standard value: 0.02–0.05 mm (.0008–.0020 in.)
   Limit: 0.1 mm (.004 in.)
FRONT OIL SEAL CHECK

(1) Check for wear, damage or cracks.
If necessary, replace the oil seal by the following steps.
(2) Pry off the oil seal with a screwdriver.
(3) Install a new oil seal.

NOTE
The seal end should be flush with outer edge of pump body.

REASSEMBLY

(1) Set the oil pump body on the torque converter.
(2) Install the driven and drive gears on the oil pump body in correct directions according to the marks put during disassembly.
(3) Install the oil pump cover on the body.

(4) Align the bolt holes in cover with those in body.
Install the six bolts with wave washers finger tight.
(5) Install the special tool around the oil pump body and cover.
Tighten the special tool to align the body and cover.
(6) Tighten the six pump cover bolts to the specified torque.
(7) Remove the special tool.

(8) Install the two seal rings on the pump cover by spreading apart and sliding them into the groove.
Hook both ends by hand.
(9) Install a new O-ring on the pump.
Make sure the O-ring is not twisted and is fully seated in the groove.
OVERDRIVE INPUT SHAFT AND CLUTCH

DISASSEMBLY

(1) Pull the overdrive clutch assembly from the input shaft.
(2) Remove the thrust bearing #4 and the race #5.

(3) Remove the snap ring and overdrive brake hub from the overdrive clutch assembly.
(4) Remove the snap ring, flange, clutch disc and plate.
   NOTE
   Do not allow the removed disc to dry out.
(5) Place the special tool on the spring retainer and compress the return springs with a shop press. Using a screwdriver, remove the snap ring.
(6) Remove the spring retainer and eighteen return springs.

(7) Assemble the overdrive clutch cylinder and piston set on the oil pump and blow out the piston:
(a) Slide the overdrive clutch cylinder and piston set onto the oil pump.
(b) Apply compressed air to the oil pump to remove the piston.
(c) Remove the overdrive clutch cylinder from the oil pump.

(8) Remove the O-rings from the overdrive clutch piston.
(9) Remove the snap ring from the overdrive planetary gear assembly.
(10) Remove the one-way clutch retainer, one-way clutch and outer race from the overdrive planetary gear assembly.

(11) Remove the four pinion shaft plugs by a magnet.  
**Caution**
- Keep the four plugs together to prevent losing them.

(12) Remove the one-way clutch from the outer race.
INSPECTION

CLUTCH PISTON CHECK
(1) Check that the check ball is free by shaking the piston.
(2) Check that the valve does not leak by applying low-pressure compressed air.

ASSEMBLY

(1) Install the four pinion shaft plugs.

(2) Install the thrust bearing race #3 and thrust bearing #2 coated with petroleum jelly.

(3) Install the one-way clutch:
   (a) Install the one-way clutch into the outer race.
   (b) Install the one-way clutch retainers on both sides of the one-way clutch.

(4) Install the thrust washer and one-way clutch assembly:
   (a) Install the thrust washer, facing the grooves upward.
   (b) Install the one-way clutch assembly in correct direction.
   (c) Install the thrust washer.
   (d) Install the snap ring.
(5) Install the overdrive clutch piston in the overdrive clutch cylinder.
   (a) Install a new O-ring on the piston. Coat the O-ring with ATF.
   (b) Press piston into the drum with the cup side up.

(6) Install the eighteen return springs and set the spring retainer and snap ring in place.

(7) Compress the return springs and install the snap ring in the groove:
   (a) Place the special tool on the spring retainer, and compress the springs on shop press.
   (b) Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

(8) Install the clutch plate and disc.
   (a) Using low-pressure compressed air, blow all excess ATF from the disc.

   Caution
   • High-pressure air will damage the disc.

   (b) Install the parts in the order shown below. Do not install the thinner snap ring yet.

   NOTE
   A new clutch disc should be seaked in ATF for at least two hours before installation.

(9) Check the piston stroke of the overdrive clutch.
   (a) Install the overdrive clutch hub and snap ring.
   (b) Install the overdrive clutch cylinder onto the oil pump body.

   Using a dial indicator, measure the stroke applying and releasing the compressed air (400–800 kPa, 58–116 psi) as shown.

   Standard value: 1.56–2.53 mm (.0614–.0996 in.)

   If the stroke exceeds the limit, the disc and/or plate are probably worn. If the stroke is less than limit, parts may be misassembled or there may be excess ATF on the discs.

   (c) After the check, remove the snap ring and overdrive brake hub.

(10) Compress and lower the snap ring by hand into the groove in clutch cylinder. Check that the ends of the snap ring are not aligned with one of the cutouts.
(11) Install the overdrive brake hub and snap ring. Check that the ends of the snap ring are not aligned with any of the cutouts.

(12) Assemble the overdrive clutch assembly and overdrive planetary gear assembly while meshing the overdrive brake hub with the disc by twisting or jiggling the hub as required.

(13) Hold the overdrive clutch cylinder and turn the overdrive planetary gear shaft to check the operation of one-way clutch. The shaft should turn freely clockwise and should lock counterclockwise.
**DISASSEMBLY**

1. Remove the snap ring from the overdrive case.
2. Remove the flange, brake discs, brake plates and cushion plate.
   
   **NOTE**
   Do not allow the removed brake discs to dry out.

3. Remove the planetary ring gear and thrust race #6.
4. Remove the thrust bearing #7 and race #8 from the overdrive case.
   
   **Note position of the race.**
5. Remove the snap ring, spring retainer and return springs.
6. Remove the brake piston.
   Blow compressed air through the overdrive case hole indicated in the figure to force out the brake piston.
   If the piston does not come out, lift it out with needle nose pliers.

7. Remove the two oil seal rings from the overdrive case.
8. Remove the O-rings from the piston.

**ASSEMBLY**

1. Install the two seal rings on the overdrive case by spreading apart and sliding them into the groove. Hook both ends by hand.

2. Install new O-rings on piston. Coat the O-rings with ATF.
3. Install the brake piston in the overdrive case with the cup side up, being careful not to damage the O-rings.
4. Install the return springs and set the spring retainer and snap ring in place.
   Check that the ends of the snap ring are not aligned with any of the cutouts.
(5) Install the thrust bearing #7 and races #6 and #8 to the planetary ring gear and set the ring gear in the overdrive case.

NOTE
Make sure that the thrust bearing races are installed in the correct direction.

(6) Install the cushion plate, brake discs, brake plates and flange:
(a) Using low-pressure compressed air, blow all excess ATF from the discs.
(b) Install the parts in the order shown below.

NOTE
New clutch discs should be soaked in ATF for at least two hours before installation.

Cushion plate (rounded end down) → Brake plate → Brake disc → Brake plate → Brake plate → Brake disc → Brake plate → Brake disc → Flange (flat end down)

(7) Install the snap ring.
Check that the ends of the snap ring are not aligned with one of the cutouts.

(8) Measure the distance between snap ring and flange with feeler gauge to check the brake clearance.

Standard value: 0.65–2.21 mm (.0256–.0870 in.)

(9) Install the thrust washer onto the planetary ring gear.
**DISASSEMBLY**

1. Use the extension housing as a work stand.
2. Remove the snap ring from the forward clutch cylinder.
3. Remove the direct clutch hub and forward clutch hub.
4. Remove the thrust bearing #12 and the races #11 and #13.
5. Remove the clutch disc.
   - **NOTE**
     Do not allow the removed disc to dry out.
6. Remove the snap ring.
7. Remove the remaining clutch plates and discs.
   - **NOTE**
     Do not allow the removed discs to dry out.
(8) Set the special tool on the spring retainer and compress the clutch return springs with a shop press. Using a screwdriver, remove the snap ring.

(9) Remove the special tool, then remove the spring retainer and eighteen clutch return springs.

(10) Assemble the forward clutch cylinder and piston on the overdrive case and force out the piston by compressed air:
   (a) Slide the forward clutch cylinder and piston onto the overdrive case.
   (b) Apply compressed air to the overdrive case to remove the piston.
   (c) Remove the forward clutch cylinder from the overdrive case.

(11) Remove the O-rings from the forward clutch piston.

**INSPECTION**

**FORWARD CLUTCH PISTON**

(1) Check that check ball is free by shaking the forward clutch piston.

(2) Check that the valve does not leak by applying low-pressure compressed air.

**NOTE**
Prepare new discs by soaking them at least two hours in ATF.

**ASSEMBLY**

(1) Install new O-rings on the forward clutch piston. Coat the O-rings with ATF.

(2) Press the forward clutch piston into the forward clutch cylinder with the cup side up (check ball down). Be careful not to damage the O-rings.

(3) Install the eighteen clutch return springs, spring retainer and snap ring in place.

(4) Compress the clutch return springs and install snap ring in the groove:
   (a) Set the special tool on the spring retainer, and compress the springs on a shop press.
   (b) Install the snap ring using a screwdriver. Be sure the end gap of snap ring is not aligned with the spring retainer claw.
(5) Install the clutch discs and plates without assembling the snap ring.

NOTE
A new clutch disc should be soaked in ATF for at least two hours before installation.
(a) Using low-pressure compressed air, blow all excess ATF from discs.

Caution
- High-pressure air will damage discs.
(b) Install the clutch plates and discs alternately. Do not install the snap ring (thinner) yet.

(6) Check the piston stroke of forward clutch:
(a) Install the direct clutch hub and snap ring.
(b) Install the forward clutch cylinder assembly onto the overdrive case.
Using a dial indicator, measure the stroke applying and releasing the compressed air (400–800 kPa, 58–116 psi).

Standard stroke: 1.43–2.93 mm (.0563–.1154 in.)
If the stroke exceeds the limit, the clutch discs and/or plates are probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.
(c) After the check, remove the snap ring and direct clutch hub.

(7) Compress and lower the snap ring into the groove by hand. Check that the ends of the snap ring are not aligned with any of the cutouts.

(8) Install the clutch disc.

(9) Install the thrust bearing #12 and the races #11 and #13, all coated with petroleum jelly.

(10) Install the forward clutch hub while aligning the disc lugs with the hub teeth. Make sure the hub meshes with all the discs and is fully inserted.
(11) Install the direct clutch hub and snap ring. Check that the snap ring ends are not aligned with any of the cutouts.

**DIRECT CLUTCH**

**DISASSEMBLY**

1. Remove the snap ring from the direct clutch cylinder.
2. Remove the flange, clutch discs and plates.
   
   **NOTE**
   Do not allow the clutch discs to dry out.

3. Set the special tool on the spring retainer and compress the piston return springs with shop press.
   
   Using snap ring pliers, remove the snap ring.
4. Remove the spring retainer and eighteen piston return springs.
(5) Assemble the direct clutch cylinder and piston set on the center support and force out the piston by compressed air:
   (a) Slide the direct clutch cylinder and piston set onto the center support.
   (b) Apply compressed air to the center support to remove the piston.
   (c) Remove the direct clutch from the center support.
(6) Remove the O-rings from the direct clutch piston.

INSPECTION
DIRECT CLUTCH PISTON
(1) Check that the check ball is free by shaking each piston.
(2) Check that the valve does not leak by applying low-pressure compressed air.

ASSEMBLY
(1) Install new O-rings on the direct clutch piston. Coat the O-rings with ATF.
(2) Install the direct clutch piston in the direct clutch cylinder. To install, press the direct clutch piston into the cylinder with the cup side up, being careful not to damage the O-rings.
(3) Install the eighteen piston return springs and set the retainer with snap ring in place.
(4) Compress the piston return springs and install the snap ring:
   (a) Set the special tool on the spring retainer, and compress the springs on a shop press.
   (b) With snap ring pliers, install the snap ring. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.
(5) Install the clutch discs, plates and flange:
   NOTE
   New clutch discs should be soaked in ATF for at least two hours before installation.
   (a) Using low-pressure compressed air, blow all excess ATF from the clutch discs.
   (b) Install the parts in the following order:
   Clutch plate → Clutch disc → Clutch plate → Clutch disc → Clutch plate → Clutch disc → Flange (flat end down)
(6) Install the snap ring. Check that the snap ring ends are not aligned with any of the cutouts.

(7) Check the piston stroke of direct clutch as follows: Install the direct clutch onto the center support. Using a dial indicator, measure the stroke applying and releasing the compressed air (400 – 800 kPa, 4 – 8 kg/cm², 58 – 116 psi) as shown.

**Standard piston stroke: 0.91–1.99 mm (0.0358–0.0783 in.)**

If the stroke exceeds the limit, the clutch discs and/or plates are probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.
DISASSEMBLY

(1) Remove the snap ring from the end of planetary sun gear shaft.
(2) Pull the center support assembly from the planetary sun gear.

(3) Remove the snap ring from the front of center support assembly (No. 1 brake).
(4) Remove the flange, clutch disc and plate (No. 1 brake).  
   NOTE  
   Do not allow the removed clutch disc to dry out.

(5) Set the special tool on the spring retainer and compress the springs with a shop press.
   Using a screwdriver, remove the snap ring.
(6) Remove the spring retainer and twelve brake return springs.

(7) Blow compressed air through the center support oil hole to remove the No. 1 brake piston.
(8) Remove the No. 1 brake piston O-rings.

(9) Turn the center support assembly over and remove the rear snap ring (No. 2 brake).
(10) Remove the flange, clutch discs and plates (No. 2 brake).  
    NOTE  
    Do not allow the removed clutch discs to dry out.
(11) Set the special tool on the spring retainer and compress the springs with a shop press.
   Using a screwdriver, remove the snap ring.
(12) Remove the spring retainer and twenty brake return springs.

(13) Blow compressed air through the center support oil hole to remove the No. 2 brake piston.
(14) Remove the No. 2 brake piston O-rings.

(15) Remove the three oil seal rings from the center support.

(16) Remove the one-way clutch assembly and oil seal rings from the planetary sun gear.

**INSPECTION**

**ONE-WAY CLUTCH ASSEMBLY**
(1) Hold the No. 2 brake hub and turn the planetary sun gear.
   The sun gear should turn freely counterclockwise and should lock clockwise.
   If the one-way clutch does not operate properly, replace it.
(2) If necessary, replace the one-way clutch:
(a) Bend the tabs back with a tapered punch.
(b) Pry off the retainer with a screwdriver. Leave the other retainer on the hub.
(c) Remove the one-way clutch.

(d) Install the one-way clutch into the brake hub facing the spring cage toward the front.

(e) Hold the brake hub in vise with soft jaws, and bend the tabs with a chisel.
(f) Check to make sure that the retainer is centered.

ASSEMBLY
(1) Install the two seal rings and one-way clutch assembly on the planetary sun gear.

(2) Install the three seal rings in the groove of center support. Hook both ends of ring by hand as shown.
(3) Install new O-rings on piston. Coat the O-rings with ATF.

(4) Press the No. 1 brake piston into the center support with the cup side up, being careful not to damage the O-rings.

(5) Install the twelve piston return springs and set the retainer with snap ring in place.

(6) Set the special tool on the spring retainer, and compress the springs on a shop press.
Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

(7) Install new O-rings on the piston and center support. Coat the O-rings with ATF.

(8) Turn the center support over, then press the No. 2 brake piston into the center support with the cup side up, being careful not to damage the O-rings.

(9) Install the twenty piston return springs and set retainer with snap ring in place.

(10) Set the special tool on the spring retainer, and compress the springs on a shop press.
Install the snap ring with a screwdriver.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

(11) Turn the center support over and install the No. 1 brake piston, clutch plate, disc and flange:

**NOTE**
New clutch discs should be soaked in ATF for at least two hours before installation.

(a) Using low-pressure compressed air, blow all excess ATF from the disc.

**Caution**
- **High-pressure air will damage the disc.**

(b) Install the parts in the following order:

- Clutch plate → Clutch disc → Clutch plates (2 pieces) → Clutch disc → Flange (rounded edge down)
(12) Install the snap ring in the center support. Check that the snap ring ends are not aligned with any of the cutouts.

(13) Check the piston stroke of No. 1 brake as follows:
Using a dial indicator, measure the stroke applying and releasing the compressed air (400–800 kPa, 58–116 psi) as shown.

**Standard piston stroke:** 0.80–1.73 mm (.0315–.0681 in.)

If the stroke exceeds the limit, the clutch discs and/or plates are probably worn. If the stroke is less than the limit, parts may be misassembled or there may be excess ATF on the discs.

(14) Turn the center support over and install the No. 2 brake, clutch plates, discs and flange:

**NOTE**
New clutch discs should be soaked in ATF for at least two hours before installation.

(a) Using low-pressure compressed air, blow all excess ATF from the discs.

**Caution**
- **High-pressure air will damage the disc.**

(b) Install the parts in the following order.
Clutch plate → Clutch disc → Clutch plate → Clutch disc → Clutch plate → Clutch disc → Flange

(15) Install the snap ring in the center support. Check that snap ring ends are not aligned with any of the cutouts.

(16) Check the piston stroke of No. 2 brake as follows:
Using a dial indicator, measure the stroke applying and releasing the compressed air (400–800 kPa, 58–116 psi) as shown.

**Standard piston stroke:** 1.01–2.25 mm (.0398–.0886 in.)

If the stroke exceeds the limit, the clutch discs and/or plates are probably worn. If the stroke is less than limit, parts may be misassembled or there may be excess ATF on the discs.

(17) Assemble the center support and planetary sun gear:
(a) Align the brake No. 2 clutch disc flukes.
(b) Mesh the brake hub with the discs, twisting and jiggling the hub as required.

(18) Install the snap ring on end of the planetary sun gear.
PLANETARY GEAR AND OUTPUT SHAFT

DISASSEMBLY

1. Remove the No. 3 brake discs and plates and the front planetary gears.

2. Remove the steel thrust washer from the front planetary gears.
   
   **NOTE**
   
   The thrust washer may have stuck to the inside of the front planetary gear case.

3. Remove the clutch discs and plates from the front planetary gears.

4. Remove the reaction plate from the front planetary gears.
5. Remove the snap ring and one-way clutch from the front planetary gears.
6. Remove the nylon washer from the front planetary gears.

7. Remove the brake apply tube and pressure plate.
8. Compress the snap ring and remove the front planetary ring gear:
   (a) While pulling up the ring gear, compress the snap ring with needle-nose pliers and remove it from the groove.
   (b) Pull out the front planetary ring gear by hand.

9. Remove the intermediate shaft assembly from the output shaft.
10. Remove the thrust bearing #20 and race #19 from the output shaft.
11. Remove the three seal rings from the output shaft.

12. Remove the nylon thrust washer from the rear planetary gear.
13. Remove the planetary sun gear.
14. Remove the rear planetary gear from the intermediate shaft assembly.
15. Remove the thrust bearing #17 from the intermediate shaft.
   Note the position of the races.

16. Invert the intermediate shaft and remove the set ring.
17. Remove the rear planetary ring gear and thrust bearing race #18 from the intermediate shaft.
   Note the position of the race.
ASSEMBLY

(1) Install the thrust bearing race #18 and rear planetary ring gear on the intermediate shaft as follows:
Slip the thrust bearing race and ring gear onto the intermediate shaft with the exterior splines up, as shown.
(2) Install the set ring on the intermediate shaft.
Make sure the rear planetary ring gear is secure on the intermediate shaft.
(3) Turn over the intermediate shaft and install thrust bearing #17.
(4) Install the pinion gear assembly and nylon thrust washer on the rear planetary carrier.
Install the washer with the lugs down, fitting them into the rear planetary gear carrier.
Caution
- Make sure the different lug shapes match the openings on the plate.
(5) Install the three oil seal rings on the output shaft by spreading apart and sliding them into the groove.
Hook both ends by hand.
(6) Use the extension housing as an assembly stand.
(7) Install the thrust bearing #20 and race #19 on the output shaft.
(8) Install the intermediate shaft assembly in the output shaft.
(9) Install the rear planetary gear in the output shaft.
(10) Install the planetary sun gear in the rear planetary gear.
(11) Install the snap ring on the front planetary ring gear.
(12) Set the front planetary ring gear on the output shaft drum. Align the ends of the snap ring with the wide gap between the teeth.
(13) While pushing down the front planetary ring gear, squeeze the snap ring ends to install it into the groove.

(14) Install the nylon washer in the front planetary gear, facing the lugs downward and aligning them with the slots in back of the planetary gear.

(15) Install the one-way clutch and snap ring into the front planetary gear, facing the spring cage toward the front.

(16) Install the reaction plate on the planetary gear for testing purpose.
(17) Test the one-way clutch. The planetary gear must rotate freely counterclockwise and lock clockwise. If the clutch does not work correctly, it must be replaced.
(18) Remove the reaction plate.

(19) Install the thrust washer (steel washer) coated with petroleum jelly on the front planetary gear.
(20) Install the front planetary gear assembly to the intermediate shaft.
(21) Install the brake apply tube and the pressure plate facing the flat surface toward the intermediate shaft.

(22) Install the No. 3 brake discs and plates.
(a) Using low-pressure compressed air, blow all excess ATF from the discs.

Caution
- High-pressure air will damage the discs.

(b) Install the parts in the following order:
  Clutch disc → Clutch plate → Clutch disc → Clutch plate
  → Clutch disc → Clutch plate → Clutch disc → Clutch plate
  → Clutch disc

**NO. 3 BRAKE PISTON AND TRANSMISSION CASE**

DISASSEMBLY
(1) Install the special tool. Gradually and evenly tighten the bolt to compress the springs, being careful not to damage the transmission case with the special tool.
(2) Using a screwdriver and a hook, remove the snap ring.
(3) Remove the spring retainer and sixteen piston return springs.

(4) With the front end down, place the transmission case on a workbench. Place several clean shop rags under the case to catch the piston and sleeve. Apply compressed air to the primary and secondary piston oil holes to force the piston and sleeve out.

(5) If the piston and sleeve do not come out with the compressed air:
(a) Using needle-nose pliers, lift the primary piston from the case.
(b) Insert two long hooks behind the reaction sleeve and gradually lift it out of the case.
(c) Using hooks, lift the secondary piston out of case in the same manner.
(6) Remove the O-rings from the primary and secondary pistons and the reaction sleeve.

REPLACEMENT OF MANUAL SHAFT OIL SEALS
(1) Remove the manual shaft oil seals with a screwdriver.
(2) Drive in new left and right oil seals with a socket wrench.
ASSEMBLY

1. Install new O-rings on the reaction sleeve and pistons.
   **Caution**
   - The thinner O-ring goes on the outside of the reaction sleeve.

2. Install the primary and secondary pistons in the reaction sleeve:
   - Push the secondary piston into the cupped side of the reaction sleeve.
   - Push the primary piston onto the other side of the reaction sleeve.

3. Hold by hand the assembly with the primary piston up (spring seats visible), and push the assembly into its bore in the case.
   **Caution**
   - Be careful not to damage the O-rings.

4. Install the special tool (MD998211) under the transmission case.

5. Install the sixteen piston return springs and set the spring retainer with snap ring in place.
   **NOTE**
   The piston return springs are visible through the cutout in the case, which helps position them more easily.

6. Carefully position the special tool (MD998903) on the spring retainer.

7. Gradually and evenly tighten the special tool (MD99804) to compress the springs, being careful not to damage the transmission case with the special tool.
   **Caution**
   - Avoid bending the spring retainer by overtightening the special tool.

8. Push the snap ring by hand into place. Visually check to make sure it is fully seated and centered by the three lugs on the spring retainer.

9. Remove the special tool.
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DISASSEMBLY
For disassembly, observe the precautions given below.

(1) Keep the disassembled parts orderly for efficient reassembly operation. Attach tags to springs for identification.
(2) When disassembling the valve, do not attempt to remove the valve with undue force. The valve and valve hole could be damaged or burred, leading to faulty valve operation.
(3) When removing the front upper and rear valve bodies from the lower valve body, use care not to lose check balls and springs.

INSPECTION
Wash the removed parts and dry with air. Then, make the following checks.

Caution
When making checks, use care not to damage valve land outside and valve body holes.

(1) Check the valves for damage and wear.
(2) Insert the valves in the valve body and check smooth rotation and sliding.
(3) Check the valve body for damage and wear of valve hole bores and for clogging of oil holes and oil ways.
(4) Check for damage of the valve body plate wear and damage of check balls.
(5) Check for clogging of the oil strainer.

UPPER FRONT VALVE BODY

[Diagram of upper front valve body with components labeled: Throttle valve, Cut back valve, Kick-down valve, Secondary regulator valve]
(6) Check the springs and replace if broken or excessively deteriorated (See the table on page 21-72.)
REASSEMBLY

Caution
Before reassembly, wash the parts in a clean detergent and dry with air. Do not wipe with rags for drying. Entry of dust could cause faulty valve operation.

1. Install primary regulator valve 1, spring 2, plunger 3 and sleeve 4 in the lower valve body in the order shown and insert retainer 5 to prevent the valve and other parts from coming loose.

2. Install 1-2 shift valve 1 and valve plug and insert retainer 3 to prevent the valve from coming loose.

3. Install 1-2 shift valve spring 1, low coast shift valve 2 and plug 3 and fit low coast shift valve cover 4.

4. Install pressure relief valve 1, spring 2 and retainer 3.

5. Install spring, check valve and check valve spring at illustrated locations.
(6) Install the spring, 3-4 shift valve and plug and then insert the locating pin.

(7) Install the D 2 down timing valve and plug and insert the seat.

(8) Install 2-3 shift valve spring 1, 2-3 shift valve 2, 2-3 shift valve plug 3 and retainer 4 in the upper rear valve body.

(9) Install intermediate coast shift valve 5, plug 6 and retainer 7.

(10) Install detent regulator valve 1, spring 2 and retainer 3 in the order shown.

(11) Install low coast modulator valve 1, plug 2, reverse brake sequence valve 3 and intermediate coast modulator valve 4.

(12) Install valve springs.

(13) Install rear valve cover 5.
(14) Place check balls (rubber) at illustrated locations in oil ways in the bottom of the lower valve body.

(15) When installing the lower valve body cover, use the correct gasket. One with oval holes for check balls is for the lower valve body.

(16) Insert secondary regulator valve spring 1 and secondary regulator valve 2 in the front upper valve body and install front valve end cover 3.

Caution
1. Install same number of E rings as before disassembly for not disturbing throttle valve adjustment.
2. Insertion of the throttle valve key plate at incorrect location could cause faulty valve operation.

(17) Insert throttle valve 1, throttle valve secondary spring 2 and E rings 4 in the order shown and fit key plate 3 in the oil way at illustrated location. Then, install throttle valve primary spring 5 and kickdown valve 6.

Caution
Hook the spring to the correct hole.

(18) Install the throttle cam and spring on the upper front valve body and tighten bolts temporarily. When installing, note the location of the spring end on the body side. Then, hook the other end of the spring to the cam and bolt the cam to the valve body. After installation, check that the throttle cam turns through full stroke smoothly.

Caution
1. Install same number of E rings as before disassembly for not disturbing throttle valve adjustment.
2. Insertion of the throttle valve key plate at incorrect location could cause faulty valve operation.
(19) Install cut back valve 1, valve plug 2 and retainer 3. Install the cut back plug with the larger land end facing out.

(20) Install the check ball (rubber) at the illustrated location.

(21) Place a new lower valve body gasket on the lower valve body.

**NOTE**
Do not use gasket for the upper valve body.

(22) Install the separator plate and tighten bolts at illustrated locations temporarily.

(23) Place a gasket for upper valve body, aligning with the separator plate.

(24) Install the check valve (steel) in the position shown in the figure. The three check valves (rubber) are identical and may be installed in any other positions.
(25) Install the lower valve body onto the rear upper valve body and tighten the bolts (indicated by (A)) temporarily from the lower valve body side.

(26) Remove the two bolts tightened in step (22).

(27) Install the lower valve body onto the rear upper valve body and tighten the bolts (indicated by (B)) temporarily from the lower valve body side.

(28) Install the detent plate.

(29) Install the lower valve body onto the upper front valve body and temporarily tighten the bolts shown at left from the lower valve body side.

(30) Turn the valve body upside down and temporarily tighten the illustrated bolts from the upper valve body side.

(31) Then, temporarily tighten the remaining valve body bolts as illustrated.

(32) Tighten all bolts of the valve body to specified torque.

(33) Install the manual valve.
DISASSEMBLY

(1) Compress the spring by pushing up on the governor valve shaft and down on the governor weight. Remove the E ring with a screwdriver. Lift off the governor weight.

(2) Remove the governor valve by letting it down through the bore.

(3) Remove the governor retaining ring. To remove, disengage the end indicated by an arrow, being careful not to scratch the governor body.
ASSEMBLY

(1) Install the governor retaining ring by fitting the ring end indicated by an arrow in the hole. Be careful not to scratch the governor body.

(2) Install the governor valve, secondary weight, springs and governor valve shaft:
   (a) Install the secondary weight to the governor valve shaft.
   (b) Install the two springs.
   (c) Slide down the governor valve through the bore.
   (d) Slide down the spring and shaft through the bore.

(3) Install the governor weight and E-ring on the governor valve shaft as follows:
Compress the spring, and install the E-ring on the shaft with needle-nose pliers. Make sure that it is fully seated in the groove.

NOTE
Make sure that the valve moves smoothly.

OVERDRIVE SOLENOID VALVE

INSPECTION

(1) Inspect the overdrive solenoid by checking the resistance between the terminal and body.

Standard resistance: About 13 Ω
REMOVAL
(1) Remove the plug from the right side of the transfer case and take out the select spring and select plunger.
(2) Remove the control lever housing assembly, cover and gasket.
(3) Remove the transfer case to adapter attaching bolts and nuts.
(4) Pull the transfer case back to separate from the adapter.

DISASSEMBLY
(1) Remove two 4WD light switches. Take out two steel balls.
(2) Remove the speedometer sleeve clamp and remove the speedometer sleeve assembly.
(3) Remove the rear cover attaching bolts and remove the spacer and gasket.
(4) Remove the cover (front output shaft portion) and take out the wave spring, spacer (if inserted) and gasket.
(5) Remove the side cover and gasket.

(6) Drive out the spring pin from the H-L shift fork by using the special tool or a pin punch (commercially available).

(7) Remove the two seal plugs and take out the two poppet springs and balls.
(8) Pull out the H-L shift rail rearward.
(9) Take out the interlock plunger.
(10) Remove the snap ring from the rear output shaft rear bearing.
(11) Remove the chain cover.
(12) Remove the oil guide.

(13) Remove the countershaft locking plate and pull out the countershaft.
(14) Take out the counter gear, two thrust washers and needle bearings and spacer from the side cover hole.

(15) Remove the snap ring from the 2-4WD shift rail and remove the two spring retainers and spring from the shift rail.

(16) Take out the front output shaft, rear output shaft, 2-4WD shift fork and chain together from the transfer case.

(17) Tap the spring pin out so that the 2-4WD shift rail, distance piece and 2-4WD shift lug can be removed.

(18) Remove the H-L shift fork and clutch sleeve.

(19) Remove the needle bearing from the Input gear.

(20) Remove the snap ring and then remove the input gear assembly.
DISASSEMBLY OF REAR OUTPUT SHAFT

(1) Remove the snap ring from the rear output shaft front end and remove the H-L clutch hub, low speed gear, thrust washer and needle bearing.
(2) Pry up the staked portion of the rear output shaft lock nut and loosen and remove the lock nut.
(3) Remove the ball bearing from the rear end using a bearing puller (commercially available) or a press.
(4) Remove the sprocket spacer and steel ball.
(5) Remove the drive sprocket, two needle bearings, sprocket sleeve and steel ball.
(6) Remove the 2-4WD clutch sleeve, hub and stop plate and pull out the ball bearing using a puller or press.

REASSEMBLY OF REAR OUTPUT SHAFT

For reassembly, follow the disassembly steps in reverse order, paying attention to the following.

(1) Prior to reassembly, wash parts and check sliding and rotating parts for damage. Replace parts if excessively worn or damaged.
(2) Apply transmission oil to rotating and sliding parts before reassembly.
(3) When installing the clutch hub, note the direction. Also check that the sleeve slides smoothly when installed. The clutch sleeve may be installed in either direction.

(4) Install a snap ring for H-L clutch hub on the front end of the rear output shaft. Use the thickest snap ring that fits in the groove.

**H-L clutch hub end play**

Standard value: 0—0.08 mm (0—.003 in.)

(5) Tighten the lock nut to specified torque and then stake at the illustrated location, aligning with the groove.

(6) Check that the low speed gear and drive sprocket ball bearing rotate smoothly.

**REASSEMBLY**

(1) Press fit new oil seals in the input gear portion and front output shaft portion of the transfer case. Fit the baffle plate on the input shaft side. Apply specified oil to the oil seal lips.

**Specified oil:** Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W, 75W-85W
(2) Press fit the ball bearing to the input gear, pushing the inner race. Check that the bearing rotates smoothly.

(3) Fit a snap ring on the front end of the input gear. Use the thickest one that fits in the groove.

**Standard value:** 0 — 0.06 mm (0—.002 in.)

(4) Insert the input gear assembly in the transfer case and fit a snap ring. Use the thickest one that fits in the groove.

**Standard value:** 0 — 0.06 mm (0—.002 in.)

(5) Insert the needle bearing in the input gear.

(6) Install the H-L clutch sleeve and shift fork.

(7) Install the 2-4WD shift lug, distance piece and 2-4WD shift rail in this order, and then tap the spring pin in place.

(8) Engage chain securely with the rear output shaft and front output shaft sprockets. Then, install the rear and front output shafts and chain together, while sliding the 2-4WD shift fork with the clutch sleeve attached over the 2-4WD shift rail.
(9) Install two spring retainers and spring over the 2-4WD shift rail and fit a snap ring.

(10) Insert two needle bearings and spacer in the counter gear and install the assembly in the transfer case. Install a thrust washer on each of the counter gear.

(11) Insert the countershaft and fit the locking plate.

(12) Install the oil guide.

(13) Install the chain cover and gasket, making sure that the oil guide edge is in the chain cover window. Apply sealer to the gasket.

**Specified sealant:** 3M ART Part No. 8660 or equivalent

(14) Tighten the chain cover bolts to specified torque. Apply sealer to threads of bolts fitted in holes that go through the case.

**Specified sealant:** 3M Adhesive Nut Rocking 4171 or equivalent

(15) Fit a snap ring in the groove of the bearing at the rear end of the rear output shaft.
(16) Insert the interlock plunger in the hole of the chain cover.
(17) Insert the H-L shift rail through the H-L shift fork. The H-L shift rail cannot be inserted unless the 2-4WD shift rail is shifted to the 4WD side.
(18) Install poppet balls and springs two each and fit the seal plugs. Face the smaller end of poppet springs toward the ball.

(19) Aligning the spring pin holes of the H-L shift fork and shift rail, drive in the spring pin by using the special tool or a pin punch (commercially available). When installing the spring pin, face its slit toward the shift rail center.

(20) Measure the output shaft rear bearing protrusion A and rear cover recess B to calculate the end play. Select the spacer that gives specified end play.
(21) Apply sealer to a new rear cover gasket and attach it to the chain cover side.

Specified sealant: 3M ART Part No. 8660 or equivalent

(22) Install the selected spacer on the rear of the output shaft rear bearing.
(23) Install the rear cover and tighten the bolts to specified torque. Apply sealant to threads of bolts fitted in holes that go through the case.

Specified sealant: 3M Adhesive Nut Rocking 4171 or equivalent
(24) Measure protrusion A of the front output shaft rear bearing and recess B of the cover and calculate the clearance. If it is more than nominal, place a spacer at illustrated location.

**Standard value : 2 mm (.078 in.)**

(25) Apply sealer to a new cover gasket and attach it to the chain cover.

**Specified sealant:** 3M ART Part No. 8660 or equivalent

(26) Install the wave spring spacer (if necessary) on the rear of the bearing.

(27) Install the cover and tighten the bolts to specified torque. Apply sealer to threads of bolts.

**Specified sealant:** 3M Adhesive Nut Rocking 4171 or equivalent

(28) Insert the speedometer sleeve assembly in the rear cover. Line up the mating mark on the extension housing with the mark corresponding to the speedometer driven gear tooth number range put on the sleeve.

(29) Install the sleeve clamp and tighten the bolt.

(30) Install the two 4WD light switches, making sure that steel balls are fitted.

**REASSEMBLY**

For reassembly, follow the removal steps in reverse order, paying attention to the following.

1. Apply sealer to one side of the two control housing gaskets and attach them to both sides of the control housing cover.

**Specified sealant:** 3M ART Part No. 8660 or equivalent

2. Apply sealer to the adapter gasket.

**Specified sealant:** 3M ART Part No. 8660 or equivalent
### DISASSEMBLY AND REASSEMBLY (Transfer Control)

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#### SERVICE POINTS OF DISASSEMBLY

1. **REMOVAL OF SPRING PIN**
   - (1) Drill 12 mm (.47 in.) diameter hole in the center of the boss 16 mm (.63 in.) diameter on the control housing not to damage the control finger and control lever assembly.
   - (2) Draw out the spring pin using a punch.

#### SERVICE POINTS OF REASSEMBLY

5. **APPLICATION OF LUBRICANT TO O-RING**
   - Install the O-ring to the control lever assembly and apply a small amount of the specified oil on the O-ring.
   - Specified oil: Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80W, 75W-85W

1. **INSTALLATION OF SPRING PIN**
   - (1) Drive the spring pin using a punch so that the cut out portion of the spring pin is in the axial direction of the control lever assembly.
   - (2) Apply the sealant in the inner surface of the worked hole and drive the sealing cap up to the dimension shown in the figure.
Transmission Oil Cooler

Removal and Installation

Removal steps:
1. Eye bolts
2. Gaskets
3. Oil cooler assembly
4. Hose
5. Return tube
6. Feed tube
7. Feed tube
8. Return tube

Pre-removal Operation
- Removal of Under Cover and Under Skid Plate (Refer to GROUP 23-Under Guard)
- Removal of Radiator Grill (Refer to GROUP 23-Radiator Grill)
- Bleeding of the automatic transmission fluid. (Refer to GROUP 0-Maintenance Service)

Post-installation Operation
- Installation of Under Cover and Under Skid Plate (Refer to GROUP 23-Under Guard)
- Installation of Radiator Grill (Refer to GROUP 23-Radiator Grill)
- Supplying of Automatic Transmission Fluid. (Refer to GROUP 0-Maintenance Service)

NOTE
(1) Reverse the removal procedures to reinstall.
(2) Refer to "Service Points of Removal".
(3) Refer to "Service Points of Installation".
(4) Non-reusable parts

Service Points of Removal

1. Removal of Eye Bolts

Caution
Loosen the eye bolts while tightening the weld nut of the oil cooler.

Inspection
- Check the oil cooler fins for bend, damage and foreign matters caught between fins.
- Check the oil cooler tubes for crack, damage, clogging and deterioration.
- Check the gaskets for damage and deformation.
- Check the eye bolts for clogging and deformation.

Service Points of Installation

8. Installation of Return Tube/Feed Tube

For installation of the feed tube and return tube to the transmission, first loosely tighten each coupling and clamp, and then make the final tightening in sequence from the feed tube and return tube coupling.