FOREWORD

This manual explains the service points for the above-indicated automotive system. This manual covers all models with the above-indicated automotive system, not any one specific model.

In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing.

As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers.

This manual should be kept up-to-date.

Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

All rights reserved.

No part of this book may be reproduced or used in any form or by any means, electronic or mechanical-including photocopying and recording and the use of any kind of information storage and retrieval system-without permission in writing.

Mazda Motor Corporation
HIROSHIMA, JAPAN
FEATURES
05–17 AUTOMATIC TRANSAXLE

AUTOMATIC TRANSAXLE
FEATURES ................................................. 05–17–2
AUTOMATIC TRANSAXLE
SPECIFICATIONS .......................... 05–17–2
AUTOMATIC TRANSAXLE
CROSS-SECTIONAL VIEW ............... 05–17–3
OUTLINE OF OPERATION .............. 05–17–4
EC-AT OPERATION CHART .......... 05–17–6
TORQUE CONVERTER OUTLINE ...... 05–17–8
TORQUE CONVERTER STRUCTURE .... 05–17–9
POWER FLOW OUTLINE ...... 05–17–10
POWER FLOW STRUCTURE .... 05–17–10
POWER FLOW OPERATION .... 05–17–11
Component description .... 05–17–11
FORWARD CLUTCH, 3-4 CLUTCH,
REVERSE CLUTCH, DIRECT CLUTCH,
LOW AND REVERSE BRAKE,
REDUCTION BRAKE OUTLINE .... 05–17–26
FORWARD CLUTCH, 3-4 CLUTCH,
REVERSE CLUTCH, DIRECT CLUTCH,
LOW AND REVERSE BRAKE,
REDUCTION BRAKE OPERATION .... 05–17–27
CENTRIFUGAL BALANCE CLUTCH
OUTLINE .................................................. 05–17–29
CENTRIFUGAL BALANCE CLUTCH
STRUCTURE .......................................... 05–17–29
CENTRIFUGAL BALANCE CLUTCH
OPERATION ........................................... 05–17–29
2-4 BRAKE BAND OUTLINE ........ 05–17–30
2-4 BRAKE BAND STRUCTURE ...... 05–17–30
2-4 BRAKE BAND OPERATION .... 05–17–30
ONE-WAY CLUTCH OUTLINE ...... 05–17–30
One-Way Clutch No.1 ............ 05–17–30
One-Way Clutch No.2 ............ 05–17–30
ONE-WAY CLUTCH STRUCTURE .... 05–17–30
One-Way Clutch No.1 ............ 05–17–30
One-Way Clutch No.2 ............ 05–17–30
ONE-WAY CLUTCH OPERATION .... 05–17–31
One-Way Clutch No.1 ............ 05–17–31
One-Way Clutch No.2 ............ 05–17–32
PLANETARY GEAR OUTLINE ...... 05–17–33
PLANETARY GEAR STRUCTURE .... 05–17–33
PLANETARY GEAR OPERATION .... 05–17–34
Gear ratio of each range .......... 05–17–34
First gear .......................... 05–17–35
Second gear ......................... 05–17–36
Third gear .......................... 05–17–38
Fourth gear .......................... 05–17–39
Fifth gear ............................ 05–17–40
Reverse ............................. 05–17–41
PARKING MECHANISM OUTLINE .... 05–17–42
PARKING MECHANISM
STRUCTURE .................. 05–17–42
PARKING MECHANISM
OPERATION .................. 05–17–42
OUTPUT GEAR OUTLINE .... 05–17–43
OIL PUMP OUTLINE .............. 05–17–44
OIL PUMP STRUCTURE .... 05–17–44
OIL PUMP OPERATION .... 05–17–44
FORWARD CLUTCH, 3-4 CLUTCH
HYDRAULIC CIRCUIT OUTLINE .... 05–17–45
CONTROL VALVE BODY OUTLINE .... 05–17–46
CONTROL VALVE BODY
CONSTRUCTION .............. 05–17–46
Primary Control Valve Body .... 05–17–46
Secondary Control Valve Body .... 05–17–47
SHIFT SOLENOID A, B AND C
(DUTY-CYCLE TYPE) OUTLINE .... 05–17–48
SHIFT SOLENOID A, B AND C
(DUTY-CYCLE TYPE) FUNCTION .... 05–17–48
SHIFT SOLENOID A, B AND C
(DUTY-CYCLE TYPE) OPERATION .... 05–17–48
SHIFT SOLENOID D, E AND F
(ON/OFF TYPE) OUTLINE .... 05–17–49
SHIFT SOLENOID D, E AND F
(ON/OFF TYPE) FUNCTION .... 05–17–49
SHIFT SOLENOID D, E AND F
(ON/OFF TYPE) OPERATION .... 05–17–49
PRESSURE CONTROL SOLENOID A
(LINEAR TYPE) OUTLINE .... 05–17–50
PRESSURE CONTROL SOLENOID A
(LINEAR TYPE) OPERATION .... 05–17–50
PRESSURE CONTROL SOLENOID B
(DUTY-CYCLE TYPE) OUTLINE .... 05–17–51
PRESSURE CONTROL SOLENOID B
(DUTY-CYCLE TYPE) FUNCTION .... 05–17–51
PRESSURE CONTROL SOLENOID B
(DUTY-CYCLE TYPE) OPERATION .... 05–17–51
AUTOMATIC TRANSAXLE

AUTOMATIC TRANSAXLE FEATURES

Realization of excellent shift quality
- Electronic pressure-adjusting control of line pressure by a liner type solenoid (pressure control solenoid A) adopted
- Electronic control (direct electric shift control) of clutch pressure by duty-cycle type solenoids (shift solenoid A, B, and C, pressure control solenoid B) adopted

Superior shift quality
- Centrifugal balance clutch chamber adopted

High efficiency, compactness, lightweight
- Miniature trochoid gear oil pump with torque converter direct drive adopted

Improved reliability
- Variable resistor type TR switch has been adopted

Improved marketability
- Sport AT adopted
- Sub-shifting mechanism has been adopted

Improved reliability, reduced noise and vibration
- A double arranged gear with a single planetary gear unit is has been adopted as the main shifting mechanism
- A single planetary gear unit is has been adopted as the sub-shifting mechanism

AUTOMATIC TRANSAXLE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine type</td>
<td>L3</td>
</tr>
<tr>
<td>Automatic transaxle type</td>
<td>FS5A-EL</td>
</tr>
<tr>
<td>Gear ratio</td>
<td></td>
</tr>
<tr>
<td>1GR</td>
<td>3.620</td>
</tr>
<tr>
<td>2GR</td>
<td>1.925</td>
</tr>
<tr>
<td>3GR</td>
<td>1.285</td>
</tr>
<tr>
<td>4GR</td>
<td>0.939</td>
</tr>
<tr>
<td>5GR</td>
<td>0.692</td>
</tr>
<tr>
<td>Reverse</td>
<td>3.405</td>
</tr>
<tr>
<td>Final gear ratio</td>
<td>3.863</td>
</tr>
<tr>
<td>ATF</td>
<td>Type M-V</td>
</tr>
<tr>
<td>Capacity (Approx. quantity)</td>
<td>8.14 (8.60, 7.16)</td>
</tr>
<tr>
<td>Torque converter stall torque ratio</td>
<td>1.84</td>
</tr>
<tr>
<td>Hydraulic system</td>
<td></td>
</tr>
<tr>
<td>(Number of drive/driver gear plates)</td>
<td></td>
</tr>
<tr>
<td>Forward clutch</td>
<td>4/4</td>
</tr>
<tr>
<td>3-4 clutch</td>
<td>3/3</td>
</tr>
<tr>
<td>Reverse clutch</td>
<td>2/2</td>
</tr>
<tr>
<td>Direct clutch</td>
<td>2/3</td>
</tr>
<tr>
<td>Low and reverse brake</td>
<td>5/5</td>
</tr>
<tr>
<td>Reduction brake</td>
<td>3/5</td>
</tr>
<tr>
<td>Band servo</td>
<td></td>
</tr>
<tr>
<td>Servo diameter (Piston outer dia.)</td>
<td>64.6 (2.54)</td>
</tr>
<tr>
<td>Front planetary gear (Number of teeth)</td>
<td>49</td>
</tr>
<tr>
<td>Front sun gear</td>
<td></td>
</tr>
<tr>
<td>Front pinion gear</td>
<td>20</td>
</tr>
<tr>
<td>Front internal gear</td>
<td>89</td>
</tr>
<tr>
<td>Rear planetary gear (Number of teeth)</td>
<td>37</td>
</tr>
<tr>
<td>Rear sun gear</td>
<td></td>
</tr>
<tr>
<td>Rear pinion gear</td>
<td>30</td>
</tr>
<tr>
<td>Rear internal gear</td>
<td>96</td>
</tr>
<tr>
<td>Primary gear (number of teeth)</td>
<td>86</td>
</tr>
<tr>
<td>Secondary gear (number of teeth)</td>
<td>82</td>
</tr>
<tr>
<td>Secondary planetary gear (Number of teeth)</td>
<td>31</td>
</tr>
<tr>
<td>Secondary sun gear</td>
<td></td>
</tr>
<tr>
<td>Secondary pinion gear</td>
<td>29</td>
</tr>
<tr>
<td>Secondary internal gear</td>
<td>89</td>
</tr>
<tr>
<td>Output gear (number of teeth)</td>
<td>22</td>
</tr>
<tr>
<td>Ring gear (number of teeth)</td>
<td>85</td>
</tr>
</tbody>
</table>

05–17–2
AUTOMATIC TRANSAXLE

OUTLINE OF OPERATION

- The operation of the electronic automatic transaxle is classified into three systems: the electronic control mechanism, the hydraulic pressure control mechanism, and the powertrain mechanism (includes the torque converter mechanism). The operation of each system is as follows:
  - Electronic control mechanism
    - According to the signals from the switches and sensors in the input system, the TCM outputs the signal which matches the present driving condition to the linear type solenoid, ON/OFF type solenoids and the duty-cycle type solenoids in the hydraulic pressure control mechanism.
  - Hydraulic pressure control mechanism
    - According to the signals from the TCM, each solenoid operates to switch the hydraulic passages in the control valve body and controls the clutch engagement pressure.
    - The line pressure is adjusted by the linear type pressure control solenoid A and duty-cycle type pressure control solenoid B. The hydraulic passages are switched by the ON/OFF type solenoids (shift solenoid D and E.) And the clutch engagement pressure is controlled by the duty-cycle type solenoids (shift solenoid A, B, and C) and ON/OFF type solenoid (shift solenoid F).
  - Powertrain mechanism
    - The driving force from the engine is transmitted through the torque converter to the transaxle.
    - Shift solenoid A, B, and C (duty-cycle type), pressure solenoid B (duty-cycle type), shift solenoid F (ON/OFF type) or clutch engagement pressure control by the control valve enable the transmitted input driving force to be converted to optimum output driving force via the differential.
AUTOMATIC TRANSMISSION

POWERTRAIN MECHANISM

TORQUE CONVERTER

CLUTCHES, BRAKES

PLANETARY GEAR

HYDRAULIC PRESSURE
CONTROL MECHANISM

SECONDARY CONTROL
VALVE BODY

SHIFT SOLENOID D, E
(ON/OFF TYPE)

PRIMARY CONTROL
VALVE BODY

SHIFT SOLENOID
A, B, C (DUTY-
CYCLE TYPE)

ECU

SHIFT SOLENOID
F (ON/OFF TYPE)

PRESSURE CONTROL
SOLENOID A

PRESSURE CONTROL
SOLENOID B

(DUTY-CYCLE TYPE)

SHIFT SOLENOID
D, E (ON/OFF TYPE)

OIL PUMP

ELECTRONIC
CONTROL
MECHANISM

VEHICLE
SPEED

ATF TEMPERATURE

ENGINE
REVOLUTION
SPEED

THROTTLE
POSITION
SIGNAL

SECONDARY GEAR
REVOLUTION
SPEED

FORWARD CLUTCH DRUM
REVOLUTION SPEED

OIL PRESSURE
SWITCH SIGNAL

HYDRAULIC PRESSURE
CONTROL SIGNAL

E6U517A0002
<table>
<thead>
<tr>
<th>Mode</th>
<th>Gear position</th>
<th>Position/Range</th>
<th>Shift pattern</th>
<th>Transaxle</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shift</td>
<td>TCC</td>
<td>Engine brake</td>
</tr>
<tr>
<td>P</td>
<td>Neutral</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R</td>
<td>Reverse</td>
<td>3.405</td>
<td>-</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>N</td>
<td>Neutral</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>POWER/ NORMAL</td>
<td>1GR: 3.650</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2GR: 1.905</td>
<td></td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3GR: 1.285</td>
<td></td>
<td>x</td>
<td>××</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4GR: 0.933</td>
<td></td>
<td>×</td>
<td>××</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1GR**: 0.933</td>
<td></td>
<td>x</td>
<td>××</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5GR: 0.692</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5GR**: 0.692</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1GR**: 0.692</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2GR**: 0.692</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4GR**: 0.692</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6GR**: 0.692</td>
<td></td>
<td>x</td>
<td>×</td>
</tr>
</tbody>
</table>

1: Automatic shift according to set speed and throttle opening angle
2: Manual shift based on selector lever operation
3: Automatic shift by tapping selector lever two times in the down-shift (−) direction or up-shift (+) direction
4: Consecutively shifts between POWER and NORMAL modes according to accelerator pedal depressing speed
5: Performs TCC operation in NORMAL mode
6: Indicates operation although the band servo remains deactivated due to the large area of the release pressure side.
7: Operating
8: Transmits the torque only when driving
### AUTOMATIC TRANSAXLE

<table>
<thead>
<tr>
<th>Position/Range</th>
<th>Mode</th>
<th>Gear position</th>
<th>Shift pattern</th>
<th>Operation of shift solenoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Neutral</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>R</td>
<td>Reverse</td>
<td>3.405</td>
<td>x</td>
<td>OPEN, OPEN, OPEN, OFF, OFF, ON</td>
</tr>
<tr>
<td>N</td>
<td>Neutral</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### D
- **POWER/NORMAL**
  - 1GR: 3.620
  - 2GR: 1.925
  - 3GR: 1.285
  - 4GR: 0.933
  - 4GR/TCC: 0.933
  - 5GR: 0.692
  - 5GR/TCC: 0.692

#### M
- **MANUAL**
  - 1GR: 3.620
  - 2GR: 1.925
  - 3GR: 1.285
  - 4GR: 0.933
  - 4GR/TCC: 0.933
  - 5GR: 0.692
  - 5GR/TCC: 0.692

---

- **Operation of shift solenoid**
  - **Solenoid valve (duty-cycle type)**
  - **Solenoid valve (ON/OFF type)**

---

- : Automatic shift according to set speed and throttle opening angle
- : Manual shift based on selector lever operation
- **: Consecutive shift by tapping selector lever two times in the down-shift (-) direction or up-shift (+) direction**
- : Automatically switches between POWER and NORMAL modes according to accelerator pedal depressing speed
- **: Performs TCC operation in NORMAL mode**
- : Operating

OPEN: Engages the line pressure to the clutch pressure (Solenoide de-energized)
CLOSE: Drains the clutch pressure (Solenoide energized)
ON: Engages the output port and the supply port (Solenoide reducing pressure)
OFF: Engages the output port and the drain port (Drains the output port)
The torque converter clutch mechanism mechanically engages the pump impeller and the turbine runner under a specified condition, and transmits the power, not through the fluid, but directly, preventing the slip loss of the torque converter.

The torque converter has obtained sufficient transaxle efficiency and torque converting ratio that matches the output characteristic of each engine.
The torque converter with the TCC control consists of the turbine runner, pump impeller, stator, and the TCC piston as shown in the figure. The TCC piston engages with the turbine runner and slides on the turbine hub to be pushed and contacts with the torque converter cover during the TCC control operation. In the TCC piston, a spring for torsion damper is installed to absorb the engine torque fluctuation during TCC control.
AUTOMATIC TRANSAXLE

POWER FLOW OUTLINE

- In the powertrain mechanism, hydraulic pressure is transmitted from the control valves or shift solenoid A, B, C (duty-cycle type), pressure control solenoid B (duty-cycle type) or shift solenoid F (ON/OFF type) operate the clutches and brakes, and the planetary gear changes the gear ratio according to the vehicle driving condition.

POWER FLOW STRUCTURE

- The powertrain mechanism of the FSSA-EL type consists of four pairs of clutches, two pairs of brakes, band brake, two pairs of one-way clutches, and three pairs of single type planetary gears.
### POWER FLOW OPERATION

#### Component description

<table>
<thead>
<tr>
<th>Component</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward clutch</td>
<td>• Transmits the input torque from the turbine shaft to the front sun gear.</td>
</tr>
<tr>
<td></td>
<td>• Operates in the forward range of the first, second, or third gear position.</td>
</tr>
<tr>
<td>3-4 clutch</td>
<td>• Transmits the input torque from the turbine shaft to the rear planetary carrier.</td>
</tr>
<tr>
<td></td>
<td>• Operates in the forward range of the third, fourth or fifth gear position.</td>
</tr>
<tr>
<td>Reverse clutch</td>
<td>• Transmits the input torque from the turbine shaft to the rear sun gear.</td>
</tr>
<tr>
<td></td>
<td>• Operates when the vehicle is backing up.</td>
</tr>
<tr>
<td>Direct clutch</td>
<td>• Engage the secondary planetary carrier and the secondary sun gear.</td>
</tr>
<tr>
<td></td>
<td>• Operates in the fifth gear position.</td>
</tr>
<tr>
<td>2-4 brake band</td>
<td>• Locks rotation of the reverse drum and fixes the rear sun gear.</td>
</tr>
<tr>
<td></td>
<td>• Operates in the second or fourth gear position.</td>
</tr>
<tr>
<td>Low and reverse brake</td>
<td>• Fixes the rotation of the front internal gear.</td>
</tr>
<tr>
<td></td>
<td>• Operates when the vehicle is backing up or in the first gear position (M range 1GR).</td>
</tr>
<tr>
<td>Reduction brake</td>
<td>• Fixes the rotation of the secondary sun gear.</td>
</tr>
<tr>
<td></td>
<td>• Operates when the vehicle is backing up.</td>
</tr>
<tr>
<td></td>
<td>• Operates in the first, second, third or fourth gear position.</td>
</tr>
<tr>
<td>One-way clutch No.1</td>
<td>• Locks the counterclockwise rotation of the front internal gear in the first gear position.</td>
</tr>
<tr>
<td>One-way clutch No.2</td>
<td>• Operates in the first, second, third or fourth gear position.</td>
</tr>
<tr>
<td>Front planetary gear</td>
<td>• The front planetary gear and rear planetary gear functions as a transmission due to the engagement/disengagement of clutches and/or brakes, converts the transmitted driving force of the turbine shaft and transmits it to the primary gear.</td>
</tr>
<tr>
<td>Rear planetary gear</td>
<td></td>
</tr>
</tbody>
</table>
Note

- All directions of rotation are viewed from the torque converter.

### 1GR (D range)

<table>
<thead>
<tr>
<th>Component</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary planetary gear</td>
<td>- The secondary planetary gear functions as a transmission due to the engagement/disengagement of clutches and/or brakes, converts the transmitted driving force of the turbine shaft and transmits it to the output gear.</td>
</tr>
</tbody>
</table>
AUTOMATIC TRANSAXLE

INPUT

REVERSE CLUTCH

LOW AND REVERSE BRAKE

REAR INTERNAL GEAR

PRIMARY GEAR

FRONT PLANETARY CARRIER

REAR SUN GEAR

REAR PINION GEAR

REDUCTION BRAKE

SECONDARY INTERNAL GEAR

SECONDARY PLANETARY CARRIER

SECONDARY PINION GEAR

SECONDARY SUN GEAR

SECONDARY GEARS

OUTPUT

OUTPUT GEAR
Each multi-disc type clutch and brake has the following function and operates in the gear position(s) as shown in the figure.

<table>
<thead>
<tr>
<th>Component</th>
<th>Function</th>
<th>Gear position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward clutch</td>
<td>Transmits input torque from turbine shaft to front sun gear.</td>
<td>1GR, 2GR, 3GR</td>
</tr>
<tr>
<td>3-4 clutch</td>
<td>Transmits input torque from turbine shaft to rear planetary carrier.</td>
<td>3GR, 4GR, 5GR</td>
</tr>
<tr>
<td>Reverse clutch</td>
<td>Transmits input torque from turbine shaft to rear sun gear.</td>
<td>Reverse</td>
</tr>
<tr>
<td>Direct clutch</td>
<td>Engage the secondary planetary carrier and the secondary sun gear.</td>
<td>5GR</td>
</tr>
<tr>
<td>Low and reverse brake</td>
<td>Fixes rotation of front internal gear or rear planetary carrier.</td>
<td>Reverse, 1GR (M range)</td>
</tr>
<tr>
<td>Reduction brake</td>
<td>Fixes rotation of secondary sun gear.</td>
<td>1GR, 2GR, 3GR, 4GR</td>
</tr>
</tbody>
</table>

![Diagram of Automatic Transaxle](image-url)
The basic structure is as shown in the figure below. In figure A, the fluid is in the clutch plates (drive plates, driven plates) and the power is not transmitted because of the fluid slippage on each plate. Figure B shows the clutch condition with the hydraulic pressure acted on the piston; the drive plates and the driven plates are pressed tightly together to transmit the clutch drum rotation speed to the hub. When the hydraulic pressure in the piston is drained, the clutches are separated because of the return spring and return to the condition in figure A.
The dished plates used for the reverse clutch and the low and reverse brake reduce the shock caused by the sudden clutch engagement. The piston check ball built in the 2-4 brake drum (reverse clutch) drains the ATF only during freewheel to prevent the hydraulic pressure from increasing to half-engage the clutches because of the residual ATF. In the forward clutch, the 3-4 clutch and the direct clutch, the centrifugal balance chamber is installed opposite the general clutch chamber. The centrifugal balance chamber of forward clutch, 3-4 clutch is always filled with the ATF from the exclusive lubrication passage of the turbine shaft. The centrifugal balance chamber of Direct clutch is always filled with the ATF from the exclusive lubrication passage of the counter shaft.
**CENTRIFUGAL BALANCE CLUTCH OUTLINE**

- A centrifugal balance clutch mechanism, which cancels the centrifugal oil pressure, has been adopted to improve clutch control.
- A bonded seal piston (press-worked component of a piston and a seal) has been adopted for each clutch and brake to reduce the piston size and weight.

**CENTRIFUGAL BALANCE CLUTCH STRUCTURE**

- The centrifugal balance clutch chambers are installed opposite the clutch chamber. The centrifugal balance clutch chambers are constantly filled with ATF from an exclusive hydraulic passage of the turbine shaft.

**CENTRIFUGAL BALANCE CLUTCH OPERATION**

**When clutch pressure is not applied**

- When the clutch drum rotates, centrifugal force acts on the residual ATF in the clutch chamber to push against the piston. However, centrifugal force also acts on the ATF filling the centrifugal balance clutch chamber to push back the piston. As a result, the two forces are cancelled out and the piston remains stationary, thus preventing clutch engagement.

**When clutch pressure is applied**

- When clutch pressure is applied to the clutch chamber, the clutch pressure overcomes the oil pressure and spring force in the opposite centrifugal balance clutch chamber, and pushes the piston to engage the clutches. Because the centrifugal force acting on the clutch pressure in the clutch chamber is canceled by another centrifugal force acting on the ATF filling the centrifugal balance clutch chamber, the influence of the centrifugal force created by the clutch drum revolution speed is eliminated. As a result, stable piston pushing force is obtained in all rotation ranges, and smoother shifts can be made.

---

**STRUCTURE**

- SEAL
- BONDED SEAL PISTON
- BALANCE CHAMBER
- CLUTCH
- CLUTCH DRUM
- SEAL PLATE
- LUBRICATION PASSAGE

**OPERATION**

1. CENTRIFUGAL HYDRAULIC PRESSURE OF PISTON CHAMBER
2. CENTRIFUGAL HYDRAULIC PRESSURE OF BALANCE CHAMBER
3. CHANGES ACCORDING TO THE ROTATION SPEED OF CLUTCH DRUM

- TWO FORCES CANCEL OUT
- SPRING FORCE
- PISTON PUSHING FORCE

**PISTON PUSHING FORCE REQUIRED TO OBTAIN SHIFT QUALITY**

- DRUM REVOLUTION SPEED
AUTOMATIC TRANSAXLE

2-4 BRAKE BAND OUTLINE
- The 2-4 brake band locks the 2-4 brake drum and fixes the rear sun gear. The 2-4 brake band operates in 2GR, 4GR or 5GR.

2-4 BRAKE BAND STRUCTURE
- The 2-4 brake band is set to wind the 2-4 brake drum and one end of the 2-4 brake band is fixed with a band strut. The servo piston is in the transaxle case.

2-4 BRAKE BAND OPERATION
- When the hydraulic pressure acts between the servo retainer and the servo piston (2-4 brake band engagement side), the servo piston acts on the 2-4 brake band to lock the 2-4 brake drum. At the same time, the servo return spring also works as resistance to obtain the optimal 2-4 brake band engagement force.

- When the hydraulic pressure acts between the servo piston and the transaxle case (2-4 brake band release side), the servo piston is pushed to the servo retainer side. This causes the 2-4 brake band to extend by its own spring force and unlock the 2-4 brake drum.

- When the hydraulic pressure acts between the servo retainer and the servo piston and between the servo piston and the transaxle case simultaneously, the servo piston is pushed to the servo retainer side and the 2-4 brake drum is unlocked because of the difference in the two areas and spring force.

ONE-WAY CLUTCH OUTLINE

One-Way Clutch No.1
- The one-way clutch No.1 locks the counterclockwise rotation (seen from the torque converter side) of the front internal gear. The one-way clutch No.1 operates in D, and M range of the 1GR.

One-Way Clutch No.2
- The one-way clutch No.2 locks the clockwise rotation (seen from the torque converter side) of the direct clutch drum. The one-way clutch No.2 operates in D, and M range of the 1GR, 2GR, 3GR and 4GR.

ONE-WAY CLUTCH STRUCTURE

One-Way Clutch No.1
- The one-way clutch outer race is integrated with the front internal gear, and the one-way clutch inner race is fixed to the transaxle case.

One-Way Clutch No.2
- The one-way clutch outer race is integrated with the direct clutch drum, and the one-way clutch inner race is fixed to the transaxle case.

05–17–30
AUTOMATIC TRANSAXLE

ONE-WAY CLUTCH OPERATION

One-Way Clutch No.1

- The one-way clutch outer race (front internal gear) rotates clockwise (seen from the torque converter side) freely, but the sprags rise to lock the rotation when the outer race tries to rotate counterclockwise.
- The one-way clutch No.1 locks the counterclockwise rotation of the front internal gear, and also locks the counterclockwise revolution of the rear planetary gear via the rear planetary carrier.

Note

- All direction of rotation are viewed from the torque converter.
AUTOMATIC TRANAXLE

One-Way Clutch No.2
- The one-way clutch outer race (direct clutch) rotates counterclockwise (view from torque converter) freely, however, the roller moves to the right (view from torque converter) and locks the rotation when it tries to rotate clockwise.
- One-way clutch No.2 locks the clockwise rotation of the direct clutch, and also locks the clockwise rotation of the secondary sun gear via the direct clutch.
AUTOMATIC TRANSAXLE

PLANETARY GEAR OUTLINE

- The planetary gear is a transaxle which converts the driving force of the turbine shaft to the optimal driving force and transmits it to the output gear through the operation of each clutch and brake.
- A double arranged gear with a single planetary gear unit is adopted as the main shifting mechanism for the planetary gear; they are the front planetary gear and the rear planetary gear (from converter side).
- A single planetary gear unit is adopted as the sub-shifting mechanism.
- The planetary gear consists of the internal gear, planetary carrier (pinion gears), and the sun gear.

PLANETARY GEAR STRUCTURE

- The front planetary gear is integrated with the one-way clutch outer race and engaged with the drive plate of the low and reverse brake. Because of this, when the front planetary gear rotates, the one-way clutch outer race and the drive plate of the low and reverse brake also rotate together.
- The front sun gear is installed inside of the front pinion gears, and the front internal gear is installed outside of the front pinion gears. The front sun gear is engaged with the forward clutch hub, and the front internal gear is engaged with the rear planetary carrier.
- The rear planetary gear and the rear pinion gear have the rear sun gear installed inside and the rear internal gear outside. The rear sun gear is engaged with the turbine shaft via the 2-4 brake drum, and the rear internal gear is engaged with the primary gear via the front planetary carrier.
- For the secondary planetary gear, the secondary sun gear is built inside the secondary pinion gear, and the secondary internal gear is built externally. The secondary sun gear is connected to the direct clutch drum, and the secondary gear is connected to the secondary internal gear. The secondary planetary carrier is combined with the counter shaft, and also connected with the drive plate of the clutch.
• The planetary gear works as a transaxle when the sun gear and the internal gear are engaged.
• The sun gear, installed inside of the pinion gears, and the internal gear, installed outside of the pinion gears, are engaged with their respective gears. The sun gear and the internal gear rotate on the center of the planetary gear.

• The pinion gears turn in the following two ways:
  — On their own centers (rotation)
  — On the center of the planetary gear (revolution)

#### Gear ratio of each range
• The relation between each element of the planetary gear set and the rotation speed is generally indicated in the formula below.
  \[(Z_R+Z_S)N_C=Z_RN_R+Z_SN_S\]: formula (1)
  
  In this formula Z stands for the number of teeth, N stands for the rotation speed, and R, S, C stand for each gear element (refer to the table below).
Number of teeth and symbol of each gear

<table>
<thead>
<tr>
<th>Planetary gear unit</th>
<th>Planetary gear element</th>
<th>Number of teeth</th>
<th>Unit identification symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td>Internal gear</td>
<td>89</td>
<td>R F</td>
</tr>
<tr>
<td></td>
<td>Planetary carrier (part of pinion gear)</td>
<td>20</td>
<td>C F</td>
</tr>
<tr>
<td></td>
<td>Sun gear</td>
<td>49</td>
<td>S F</td>
</tr>
<tr>
<td>Rear</td>
<td>Internal gear</td>
<td>98</td>
<td>R R</td>
</tr>
<tr>
<td></td>
<td>Planetary carrier (part of pinion gear)</td>
<td>30</td>
<td>C R</td>
</tr>
<tr>
<td></td>
<td>Sun gear</td>
<td>37</td>
<td>S R</td>
</tr>
<tr>
<td>Secondary</td>
<td>Internal gear</td>
<td>89</td>
<td>R S</td>
</tr>
<tr>
<td></td>
<td>Planetary carrier (part of pinion gear)</td>
<td>29</td>
<td>C S</td>
</tr>
<tr>
<td></td>
<td>Sun gear</td>
<td>31</td>
<td>S S</td>
</tr>
</tbody>
</table>

First gear

Gear rotation speed

<table>
<thead>
<tr>
<th>Planetary gear unit</th>
<th>Front</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal gear</td>
<td>0 (fix)</td>
<td></td>
</tr>
<tr>
<td>Planetary carrier</td>
<td>(N_{CF}) (output)</td>
<td>(N_{RS}) (input)</td>
</tr>
<tr>
<td>Sun gear</td>
<td>(N_{SF}) (input)</td>
<td>0 (fix)</td>
</tr>
</tbody>
</table>

- Suppose the reduction ratio on the main shifting side is \(i_1\).
- From the result \(N_{SF}=0\) in formula (1), the rotation speed of the front planetary gear unit can be calculated using the following formula:
  \[i_1 = \frac{N_{SF}}{N_{CF}} = \frac{(Z_{RF}+Z_{SP})N_{CF}}{Z_{SP}N_{SF}}\]
  Therefore, \(i_1 = \frac{N_{SF}}{N_{CF}} = \frac{(89+49)}{49} = 2.8163\).
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear \(A = \frac{\text{number of primary gear teeth}}{\text{number of secondary gear teeth}}\)
  Therefore, \(A = \frac{82}{86} = 0.9535\)
- Suppose the reduction ratio on the sub-shifting side is \(ii_1\):
  \(ii_1 = \frac{N_{RS}}{N_{CS}}\).
From the result $N_{SS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.

\[(Z_{RS}+Z_{SS})N_{CS}=Z_{SS}N_{RS}\]

Therefore,

\[i_{i1}=\frac{N_{RS}}{N_{CS}}=\frac{(Z_{RS}+Z_{SS})}{Z_{RS}}=\frac{(89+31)}{89}=1.3483\]

And the reduction ratio of 1st gear\(= i_{1} \times A \times i_{i1}=2.8163 \times 0.9535 \times 1.3483=3.620\)

As a result, the reduction ratio of 1st gear is 3.620.
AUTOMATIC TRANSAXLE

<table>
<thead>
<tr>
<th>Gear rotation speed</th>
<th>Planetary speed</th>
<th>Rear</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal gear</td>
<td>N&lt;sub&gt;RF&lt;/sub&gt;=N&lt;sub&gt;C&lt;/sub&gt;</td>
<td>N&lt;sub&gt;RR&lt;/sub&gt; (output) =N&lt;sub&gt;R&lt;/sub&gt;</td>
<td>N&lt;sub&gt;RS&lt;/sub&gt; (input)</td>
</tr>
<tr>
<td>Planetary carrier</td>
<td>N&lt;sub&gt;CR&lt;/sub&gt;=N&lt;sub&gt;C&lt;/sub&gt;</td>
<td>N&lt;sub&gt;CR&lt;/sub&gt;=N&lt;sub&gt;C&lt;/sub&gt;</td>
<td>N&lt;sub&gt;CS&lt;/sub&gt; (output)</td>
</tr>
<tr>
<td>Sun gear</td>
<td>N&lt;sub&gt;SR&lt;/sub&gt; (input)</td>
<td>0 (fix)</td>
<td>0 (fix)</td>
</tr>
</tbody>
</table>

Note
- The front internal gear and the rear planetary carrier are integrated.
- The front planetary carrier and the rear internal gear rotate at the same speed.

- Suppose the reduction ratio on the main shifting side is \( i_2 \).
- From formula (1), the relation between the gear ratio in second gear and the rotation speeds of the front and the rear planetary gear sets is indicated in formulas (2) and (3).
  \[
  \frac{Z_{RF} + Z_{SF}}{N_C} = N_FZ_R + Z_{SR}N_S \quad (2) \quad \text{(Front planetary gear set)}
  \]
  \[
  \frac{Z_{RR} + Z_{SR}}{N_C} = N_CZ_R + Z_{SR}N_S \quad (3) \quad \text{(Rear planetary gear set)}
  \]
- From the result \( N_{SR} = 0 \) in formula (3).
  \[
  N_C = \frac{Z_{RR}}{Z_{RR} + Z_{SR}} N_R \quad (4)
  \]
- Here we substitute formula (4) in formula (2).
  \[
  Z_{SR}N_S = \left( \frac{(Z_{RF} + Z_{SF})}{(Z_{RR} + Z_{SR})} - Z_{RF}Z_R \right) N_R
  \]
  Therefore,
  \[
  i_2 = \frac{N_{SR}}{N_{RS}} = \left( \frac{(Z_{SR} + Z_{SF})}{(Z_{SR} + Z_{SF})} - Z_{SR}Z_R \right) N_R
  \]
  \[
  = \left( \frac{98 + 37}{98 + 49} - 98 \times 98 \right) / \left( 49 \times (98 + 37) \right) = 1.4978
  \]
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear \( A = \) the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  \[
  A = \frac{82}{86} = 0.9535
  \]
- Suppose the reduction ratio on the sub-shifting side is \( i_{i2} \).
- From the result \( N_{SS} = 0 \) in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.
  \[
  (Z_{RS} + Z_{SS})N_C = Z_{SS}N_R
  \]
  Therefore,
  \[
  i_{i2} = \frac{N_{RS}}{N_{CS}} = (Z_{RS} + Z_{SS}) / (Z_{RS} + Z_{SS})\frac{(89 + 31)}{89} = 1.3483
  \]
  And the reduction ratio of 2nd gear = \( i_2 \times A \times i_{i2} = 1.4978 \times 0.9535 \times 1.3483 = 1.925 \)
  As a result, the reduction ratio of 2nd gear is 1.925.
Here we have the result on NRF=NSF.

Suppose the reduction ratio on the main shifting side is $i_3$,

$$i_3 = \frac{N_{RF}}{N_{CF}}.$$

From the result of $N_{RF}=N_{SF}$ in formula (1), the relation between the gear ratio in 3rd gear and the rotation speed of the front planetary gear set is indicated in the following formula:

$$(N_{RF}+Z_{SF}) \frac{N_{CF}}{N_{RF}} = (Z_{RF}+Z_{SF}) N_{RF}.$$

Therefore,

$$i_3 = \frac{N_{RF}}{N_{CF}} = \frac{(Z_{RF}+Z_{SF})}{(Z_{RF}+Z_{SF})} = \frac{89+49}{89+49} = 1.000.$$

Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:

The reduction ratio of the primary/secondary gear $A = \frac{\text{number of primary gear teeth}}{\text{number of secondary gear teeth}}$

Therefore,

$$A = \frac{82}{86} = 0.9535.$$

Suppose the reduction ratio on the sub-shifting side is $i_{3b}$,

$$i_{3b} = \frac{N_{RS}}{N_{CS}}.$$

From the result $N_{CS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.

$$(Z_{RS}+Z_{SS}) N_{CS} = Z_{SS} N_{RS}.$$

Therefore,

$$i_{3b} = \frac{N_{RS}}{N_{CS}} = \frac{(Z_{RS}+Z_{SS})}{Z_{RS}} = \frac{89+31}{89} = 1.3483.$$

And the reduction ratio of 3rd gear $i_3 \times A \times i_{3b} = 1.000 \times 0.9535 \times 1.3483 = 1.285$

As a result, the reduction ratio of 3rd gear is 1.285.
Fourth gear

INTERNAL GEAR Nsw (OUTPUT)

SUN GEAR (FIX)

PINION GEAR

PLANETARY CARRIER

Ncr (INPUT)

INTERNAL GEAR Nsw (INPUT)

SUN GEAR (FIX)

PINION GEAR

PLANETARY CARRIER

Ncr (OUTPUT)

REAR PLANETARY GEAR

SECONDARY PLANETARY GEAR

Gear rotation speed

<table>
<thead>
<tr>
<th>Planetary gear</th>
<th>Rear</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal gear</td>
<td>Nrr  (output)</td>
<td>Nrs  (input)</td>
</tr>
<tr>
<td>Planetary carrier</td>
<td>Ncr  (input)</td>
<td>Ncs  (output)</td>
</tr>
<tr>
<td>Sun gear</td>
<td>0 (fix)</td>
<td>0 (fix)</td>
</tr>
</tbody>
</table>

- Suppose gear ratio in fourth gear is $i_4$,
  $i_4 = \frac{Ncr}{Nrr}$
- From the result of $N_{ss}=0$ in formula (2), the relation between the gear ratio in fourth gear and the rotation speed of the rear planetary gear set is indicated in the following formula:
  $(Z_{rr}+Z_{sr}) N_{cr} = Z_{rr} N_{rr}$
  Therefore,
  $i_4 = \frac{Ncr}{Nrr} = \frac{Z_{rr}+Z_{sr}}{Z_{rr}} = 98/ (98+37) = 0.7259$
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear $A$ = the number of primary gear teeth/the number of secondary gear teeth
  Therefore,
  $A = \frac{82}{86} = 0.9535$
- Suppose the reduction ratio on the sub-shifting side is $i_{ii}$,
  $i_{ii} = \frac{Nrs}{Ncs}$
- From the result $N_{ss}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula:
  $(Z_{ss}+Z_{ss}) N_{cs} = Z_{ss} N_{rs}$
  Therefore,
  $i_{ii} = \frac{Nrs}{Ncs} = \frac{Z_{rs}+Z_{ss}}{Z_{rs}} = 89/ (89+31) = 1.3483$
And the reduction ratio of 4th gear $i_4 \times A \times i_{ii} = 0.7259 \times 0.9535 \times 1.3483 = 0.933$
As a result, the reduction ratio of 4th gear is 0.933.
Fifth gear

**Gear rotation speed**

<table>
<thead>
<tr>
<th>Planetary gear</th>
<th>Rear</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal gear</td>
<td>( N_{RR} ) (output)</td>
<td>( N_{RS} ) (input)</td>
</tr>
<tr>
<td>Planetary carrier</td>
<td>( N_{CR} ) (input)</td>
<td>( N_{CS} ) (output)</td>
</tr>
<tr>
<td>Sun gear</td>
<td>0 (fix)</td>
<td>( N_{SS} ) (input)</td>
</tr>
</tbody>
</table>

- Suppose gear ratio in fifth gear is \( i_5 \),
  \[ i_5 = \frac{N_{CR}}{N_{RR}} \]
- From the result of \( N_{SS} = 0 \) in formula (2), the relation between the gear ratio in fourth gear and the rotation speed of the rear planetary gear set is indicated in the following formula:
  \[ \frac{Z_{RR} + Z_{SR}}{N_{CR}} = Z_{RR} \frac{N_{RR}}{N_{RS}} \]
  Therefore,
  \[ i_5 = \frac{N_{CR}}{N_{RR}} = \frac{Z_{RR}}{Z_{RR} + Z_{SR}} = \frac{98}{98 + 37} = 0.7259 \]
- Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:
  The reduction ratio of the primary/secondary gear \( A = \frac{\text{the number of primary gear teeth}}{\text{the number of secondary gear teeth}} \)
  Therefore,
  \[ A = \frac{82}{86} = 0.9535 \]
- Suppose the reduction ratio on the sub-shifting side is \( ii_5 \),
  \[ ii_5 = \frac{N_{RS}}{N_{CS}} \]
- From the result \( N_{SS} = N_{SS} \) in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula:
  \[ \frac{Z_{RS} + Z_{SS}}{N_{CS}} = Z_{RS} \frac{N_{SS}}{N_{SS}} \]
  Therefore,
  \[ ii_5 = \frac{N_{RS}}{N_{CS}} = \frac{Z_{RS} + Z_{SS}}{Z_{RS} + Z_{SS}} = \frac{89 + 31}{89 + 31} = 1.000 \]
  And the reduction ratio of 5th gear \( i_5 \times A \times ii_5 = 0.7259 \times 0.9535 \times 1.000 = 0.692 \)
  As a result, the reduction ratio of 5th gear is 0.692.
Reverse

Suppose gear ratio in reverse gear is $i_{\text{REV}}$.

$$i_{\text{REV}} = \frac{N_{SR}}{N_{RR}}$$

From the result of $N_{SS}=0$ in formula (2), the rotation speed of the planetary gear set is indicated in the formula below.

$$0 = Z_{RR}N_{RR} + Z_{SR}N_{SR}$$

Therefore,

$$i_{\text{REV}} = \frac{N_{SR}}{N_{RR}} = \frac{Z_{RR}}{Z_{SR}} = \frac{-98}{37} = -2.6486$$

Because the reduction ratio on the main shifting side is transmitted from the primary gear to the secondary gear, it can be calculated using the following formula:

The reduction ratio of the primary/secondary gear $A = \frac{\text{number of primary gear teeth}}{\text{number of secondary gear teeth}}$

Therefore,

$$A = \frac{82}{86} = 0.9535$$

Suppose the reduction ratio on the sub-shifting side is $i_{\text{REV}}$.

$$i_{\text{REV}} = \frac{N_{RS}}{N_{CS}}$$

From the result $N_{SS}=0$ in formula (1), the rotation speed of the secondary planetary gear unit can be calculated using the following formula.

$$0 = Z_{RS}N_{RS} + Z_{SS}N_{SR}$$

Therefore,

$$i_{\text{REV}} = \frac{N_{RS}}{N_{CS}} = \frac{Z_{RS} + Z_{SS}}{Z_{SS}N_{RS}}$$

And the reduction ratio of reverse gear:

$$i_{\text{REV}} = \frac{N_{SR}}{N_{RR}} = -2.6486$$

As a result, the reduction ratio of reverse gear is $-3.405$. 

<table>
<thead>
<tr>
<th>Gear rotation speed</th>
<th>Rear</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal gear</td>
<td>$N_{RR}$ (output)</td>
<td>$N_{RS}$ (input)</td>
</tr>
<tr>
<td>Planetary carrier</td>
<td>0 (fix)</td>
<td>$N_{CS}$ (output)</td>
</tr>
<tr>
<td>Sun gear</td>
<td>$N_{SR}$ (input)</td>
<td>0 (fix)</td>
</tr>
</tbody>
</table>

### Planetary gear Rear Secondary

<table>
<thead>
<tr>
<th>Rear</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>N_{RR} (output)</td>
<td>N_{RS} (input)</td>
</tr>
<tr>
<td>0 (fix)</td>
<td>N_{CS} (output)</td>
</tr>
<tr>
<td>$N_{SR}$ (input)</td>
<td>0 (fix)</td>
</tr>
</tbody>
</table>
AUTOMATIC TRANSAXLE

PARKING MECHANISM OUTLINE
- When the selector lever is shifted to P position, the parking pawl engages the parking gear and locks the output gear (i.e., rotation of the driving wheels).

PARKING MECHANISM STRUCTURE
- The parking pawl is installed in the transaxle case via the parking pawl shaft and pushed to the support actuator by the return spring except in P position.
- The parking rod component is designed to slide on the support actuator and connected to the manual plate.

PARKING MECHANISM OPERATION
- When the selector lever is moved to P position, the manual shaft and the manual plate move in the direction of the arrow A to the position as shown in the figure below. Then the parking rod component moves in the direction of the arrow B, the parking rod component cam pushes up the parking pawl, and the parking pawl engages the parking gear.
- If the parking pawl hits the tooth of the parking gear, the parking pawl cannot be pushed up, so only the parking rod component is able to move. The cam presses the spring onto the parking pawl and the actuator. If the vehicle runs even a little under this condition, the wheels rotate and parking gear also rotates slightly. As a result, the parking pawl slides into the groove, and engages the parking gear.
- Thus, the parking mechanism prevents the vehicle from moving in P position.
The two-step final drive mechanism has been adopted by arranging the secondary gear and the output gear on the output gear shaft to miniaturize the transaxle.
The light-weight, compact, and quiet trochoid gear type oil pump has been adopted to reduce the pump driving torque.

The direct drive type oil pump has been adopted and placed behind the torque converter.

The outer rotor and the inner rotor are installed in the oil pump housing.

The inner rotor in the oil pump housing is driven by the torque converter.

When the inner rotor in the oil pump rotates, the ATF is drawn to the oil pump and then discharged from the oil pump. The discharge amount is proportional to the rotating speed of the torque converter. The ATF discharge amount is controlled by the pressure regulator valve and the pressure control solenoid.
By designing exclusive passages for the forward clutch and the 3-4 clutch in the transaxle case, via the oil pump and end cover the hydraulic pressure passages are shortened and control during clutch engagement is improved.
The primary control valve body has been adopted as the main shifting mechanism.
The secondary control valve body has been adopted as the sub-shifting mechanism.
Because the clutch engagement pressure is controlled electronically, the hydraulic circuits are simplified, the valve types are reduced, and the control valve body is miniaturized.
The nonwoven fabric oil strainer is installed in the primary control valve body to prevent contamination.

Primary Control Valve Body
- The primary control valve body is composed of three bodies: the upper control valve body, main control valve body, and the solenoid control valve body.
Secondary Control Valve Body

The secondary control valve body is composed of two bodies: the secondary lower control valve body, and secondary main control valve body.
A clutch pressure direct control, which supplies the clutch pressure directly to each clutch and/or brake, has been adopted. A three-way duty-cycle type solenoids with excellent controllability have been adopted, to improve response.

The duty-cycle type shift solenoid adjusts the amount of output pressure according to the signal from the TCM, and controls the pressure of each clutch. The duty-cycle type shift solenoid, which switches on/off at 50 Hz (20 ms cycle) and controls the output pressure, is adopted. By changing the on time ratio a cycle (0—100%), the solenoid adjusts the time ratio of the open (supply) and close (drain), and maintains the clutch pressure at the designated hydraulic pressure. As a result, the clutch pressure rises when the duty ratio (50 Hz on time ratio) is reduced, and falls when the duty ratio is raised.

Open: When the electrical current does not flow, the supply port (line pressure) in the solenoid opens and is engaged with the output port (clutch pressure). As a result, hydraulic pressure is supplied to the hydraulic passage for the clutch pressure. Close: When the electrical current flows, the supply port (line pressure) in the solenoid closes and the output port (clutch pressure) and the drain port are engaged to drain the clutch pressure.
AUTOMATIC TRANSMISSION

SHIFT SOLENOID D, E AND F (ON/OFF TYPE) OUTLINE
- A compact, light-weight three-way solenoid has been adopted for shift solenoids D, E and F to reduce consumption discharge amount.

<table>
<thead>
<tr>
<th>Shift solenoid</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shift solenoid D</td>
<td>Switches the bypass valve and 3-4 shift valve.</td>
</tr>
<tr>
<td>Shift solenoid E</td>
<td>Switches the low and reverse shift valve and TCC control valve.</td>
</tr>
<tr>
<td>Shift solenoid F</td>
<td>Switches the hydraulic passages for each clutch on the sub-shifting side and the brake.</td>
</tr>
</tbody>
</table>

SHIFT SOLENOID D, E AND F (ON/OFF TYPE) FUNCTION
- An on/off type solenoid valve switches the supply drain of output port according to the electrical current flow switching.

SHIFT SOLENOID D, E AND F (ON/OFF TYPE) OPERATION
On: When the electrical current flows, the output port and the supply port (solenoid reducing pressure or line pressure) are engaged in the solenoid, and the output pressure becomes equivalent to the solenoid reducing pressure.
Off: When the electrical current does not flow, the output port and the drain port are engaged in the solenoid, and the output pressure is drained.
AUTOMATIC TRANSAXLE

PRESSURE CONTROL SOLENOID A (LINEAR TYPE) OUTLINE

- A pressure control solenoid A with high stability in hydraulic pressure has been adopted for the line pressure control.
- Because the pressure control solenoid controls the hydraulic pressure according to the current value, the degree of freedom in control increases. The controllability is maintained even under aeration, and pressure variation can be reduced.

PRESSURE CONTROL SOLENOID A (LINEAR TYPE) OPERATION

- By changing the electrical current value (0 A—1 A) inside the solenoid, the pressure control solenoid A adjusts the hold power of the hold pressure valve, controlling the pressure control solenoid pressure to the prescribed hydraulic pressure.
AUTOMATIC TRANSAXLE

PRESSURE CONTROL SOLENOID B (DUTY-CYCLE TYPE) OUTLINE
- A clutch pressure direct control, which supplies the clutch pressure directly to each clutch and/or brake, has been adopted. A three-way duty-cycle type solenoid with excellent controllability have been adopted, to improve response.

PRESSURE CONTROL SOLENOID B (DUTY-CYCLE TYPE) FUNCTION
- The duty-cycle type shift solenoid adjusts the amount of output pressure according to the signal from the TCM, and controls the pressure of each clutch.
- The duty-cycle type shift solenoid, which switches on/off at 50 Hz (20 ms cycle) and controls the output pressure, is adopted. By changing the on time ratio a cycle (0—100%), the solenoid adjusts the time ratio of the open (supply) and close (drain), and maintains the 4-5 duty solenoid pressure at the designated hydraulic pressure. As a result, the clutch pressure rises when the duty ratio (50 Hz on time ratio) is reduced, and falls when the duty ratio is raised.

PRESSURE CONTROL SOLENOID B (DUTY-CYCLE TYPE) OPERATION
1GR to 4 GR or 5GR (Open): When driving in 1GR to 4GR or 5GR, the supply port (line pressure) in the solenoid opens and is engaged with the output port (4-5 duty solenoid pressure). As a result, hydraulic pressure is supplied to the hydraulic passage for the 4-5 duty solenoid.
Shifted from 4GR to 5GR or from 5GR to 4GR (Close): When the gear is shifted from 4GR to 5GR or from 5GR to 4GR, the line pressure is regulated to the optimum hydraulic pressure for the driving condition by energizing for a specified time.
SERVICE
### GENERAL INFORMATION

#### HOW TO USE THIS MANUAL
- **Range of Topics**: 00–00–2
- **Service Procedure**: 00–00–2
- **Symbols**: 00–00–4
- **Advisory Messages**: 00–00–4

#### UNITS
- Conversion to SI Units: 00–00–5
- (Système International d'Unités): 00–00–5
- Rounding Off: 00–00–5
- Upper and Lower Limits: 00–00–5

#### FUNDAMENTAL PROCEDURES
- Preparation of Tools and Measuring Equipment: 00–00–6
- Special Service Tools: 00–00–6
- Disassembly: 00–00–6
- Inspection During Removal, Disassembly: 00–00–6
- Arrangement of Parts: 00–00–7
- Cleaning of Parts: 00–00–7
- Reassembly: 00–00–7
- Adjustment: 00–00–7
- Rubber Parts and Tubing: 00–00–8
- Hose Clamps: 00–00–8
- Torque Formulas: 00–00–8
- Vise: 00–00–8
- ELECTRICAL SYSTEM: 00–00–9
- Connectors: 00–00–9
- SAE STANDARDS: 00–00–10
- ABBREVIATIONS: 00–00–11
GENERAL INFORMATION

HOW TO USE THIS MANUAL

Range of Topics
- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  - Removal/Installation
  - Disassembly/Assembly
  - Replacement
  - Inspection
  - Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts, and visual inspection) have been omitted.

Service Procedure
Inspection, adjustment
- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.

Repair procedure
1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.
3. Procedure steps are numbered and the part that is the main point of that procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.
**Lower Trailing Link, Upper Trailing Link**

**Removal/Installation**

1. Jack up the rear of the vehicle and support it with safety stands.
2. Remove the undercover. (See 01-10-4 Undercover Removal)
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Inspect the rear wheel alignment and adjust if necessary.

**Removal/Installation Note**

Remove the ball joint using the SSTs.

**Service Items**

- **Lower Trailing Link**
  - Ball Joint Removal Note
  - SSTs
- **Upper Trailing Link**
  - Ball Joint Removal Note
  - SSTs

**Tightening Torque Specifications**

- N·m: 44–60 {4.4–6.2, 32–44}
- kgf·m: 118–156 {12.0–16.0, 87–115}
- ft·lbf: 94–116 {9.5–11.9, 69–86}

**Grease Points**

- Indicates any relevant references which need to be followed during installation.
- Shows special service tool (SST) for service operation.
- Shows application points of grease, etc.
- Shows non-reusable parts.
- Shows details.
- Shows tightening torque units.
- Shows there are referral notes for service.
- Shows the procedure order for service.

**Service Notes**

- Shows there are referral notes for service.
- Shows special service tool (SST) no.
- Shows referral notes for service.
- Shows application points of grease, etc.
GENERAL INFORMATION

Symbols
- There are eight symbols indicating oil, grease, fluids, sealant, and the use of SST or equivalent. These symbols show application points or use of these materials during service.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apply oil</td>
<td>New appropriate engine oil or gear oil</td>
</tr>
<tr>
<td></td>
<td>Apply brake fluid</td>
<td>New appropriate brake fluid</td>
</tr>
<tr>
<td></td>
<td>Apply automatic transaxle/ transmission fluid</td>
<td>New appropriate automatic transaxle/ transmission fluid</td>
</tr>
<tr>
<td></td>
<td>Apply grease</td>
<td>Appropriate grease</td>
</tr>
<tr>
<td></td>
<td>Apply sealant</td>
<td>Appropriate sealant</td>
</tr>
<tr>
<td></td>
<td>Apply petroleum jelly</td>
<td>Appropriate petroleum jelly</td>
</tr>
<tr>
<td></td>
<td>Replace part</td>
<td>O-ring, gasket, etc.</td>
</tr>
<tr>
<td>SST</td>
<td>Use SST or equivalent</td>
<td>Appropriate tools</td>
</tr>
</tbody>
</table>

Advisory Messages
- You will find several Warnings, Cautions, Notes, Specifications and Upper and Lower Limits in this manual.

Warning
- A Warning indicates a situation in which serious injury or death could result if the warning is ignored.

Caution
- A Caution indicates a situation in which damage to the vehicle or parts could result if the caution is ignored.

Note
- A Note provides added information that will help you to complete a particular procedure.

Specification
- The values indicate the allowable range when performing inspections or adjustments.

Upper and lower limits
- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.
Conversion to SI Units (Système International d’Unités)
• All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding Off
• Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and Lower Limits
• When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm² in the following specifications:

- 210—260 kPa (2.1—2.7 kgf/cm², 30—38 psi)
- 270—310 kPa (2.7—3.2 kgf/cm², 39—45 psi)

- The actual converted values for 2.7 kgf/cm² are 264 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.
FUNDAMENTAL PROCEDURES

Preparation of Tools and Measuring Equipment
- Be sure that all necessary tools and measuring equipment are available before starting any work.

Special Service Tools
- Use special service tools or equivalent when they are required.

Disassembly
- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.

Inspection During Removal, Disassembly
- When removed, each part should be carefully inspected for malfunction, deformation, damage and other problems.
Arrangement of Parts
- All disassembled parts should be carefully arranged for reassembly.
- Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.

Cleaning of Parts
- All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.

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

Reassembly
- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, the following parts should be replaced with new ones:
  - Oil seals
  - Gaskets
  - O-rings
  - Lockwashers
  - Cotter pins
  - Nylon nuts

- Depending on location:
  - Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  - Oil should be applied to the moving components of parts.
  - Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.
GENERAL INFORMATION

Adjustment
- Use suitable gauges and testers when making adjustments.

Rubber Parts and Tubing
- Prevent gasoline or oil from getting on rubber parts or tubing.

Hose Clamps
- When reinstalling, position the hose clamp in the original location on the hose and squeeze the clamp lightly with large pliers to ensure a good fit.

Torque Formulas
- When using a torque wrench-SST or equivalent combination, the written torque must be recalculated due to the extra length that the SST or equivalent adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

<table>
<thead>
<tr>
<th>Torque Unit</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>N·m</td>
<td>N·m × [L / (L + A)]</td>
</tr>
<tr>
<td>kgf·m</td>
<td>kgf·m × [L / (L + A)]</td>
</tr>
<tr>
<td>kgf·cm</td>
<td>kgf·cm × [L / (L + A)]</td>
</tr>
<tr>
<td>ft·lb</td>
<td>ft·lb × [L / (L + A)]</td>
</tr>
<tr>
<td>in·lb</td>
<td>in·lb × [L / (L + A)]</td>
</tr>
</tbody>
</table>

A : The length of the SST past the torque wrench drive.
L : The length of the torque wrench.

00–00–8
Vise
- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.

ELECTRICAL SYSTEM
Connectors
Disconnecting connectors
- When disconnecting connector, grasp the connectors, not the wires.
- Connectors can be disconnected by pressing or pulling the lock lever as shown.

Locking connector
- When locking connectors, listen for a click indicating they are securely locked.
GENERAL INFORMATION

Inspection
- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.
- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution
- To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.

SAE STANDARDS
- In accordance with new regulations, SAE (Society of Automotive Engineers) standard names and abbreviations are now used in this manual. The table below lists the names and abbreviations that have been used in Mazda manuals up to now and their SAE equivalents.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>SAE Standard</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP</td>
<td>Accelerator Pedal</td>
<td></td>
</tr>
<tr>
<td>APP</td>
<td>Accelerator Pedal Position</td>
<td></td>
</tr>
<tr>
<td>ACL</td>
<td>Air Cleaner</td>
<td></td>
</tr>
<tr>
<td>A/C</td>
<td>Air Conditioning</td>
<td></td>
</tr>
<tr>
<td>A/F</td>
<td>Air Fuel Ratio</td>
<td></td>
</tr>
<tr>
<td>BARO</td>
<td>Barometric Pressure</td>
<td></td>
</tr>
<tr>
<td>B+</td>
<td>Battery Positive Voltage</td>
<td></td>
</tr>
<tr>
<td>CMP sensor</td>
<td>Camshaft Position Sensor</td>
<td></td>
</tr>
<tr>
<td>LOAD</td>
<td>Calculated Load Value</td>
<td></td>
</tr>
<tr>
<td>CAC</td>
<td>Charge Air Cooler</td>
<td></td>
</tr>
<tr>
<td>CLS</td>
<td>Closed Loop System</td>
<td></td>
</tr>
<tr>
<td>CTP</td>
<td>Closed Throttle Position</td>
<td></td>
</tr>
<tr>
<td>CPP</td>
<td>Clutch Pedal Position</td>
<td></td>
</tr>
<tr>
<td>CIS</td>
<td>Continuous Fuel Injection System</td>
<td></td>
</tr>
<tr>
<td>CKP sensor</td>
<td>Crankshaft Position Sensor</td>
<td></td>
</tr>
<tr>
<td>DLC</td>
<td>Data Link Connector</td>
<td></td>
</tr>
<tr>
<td>DTM</td>
<td>Diagnostic Test Mode</td>
<td>#1</td>
</tr>
<tr>
<td>DTC</td>
<td>Diagnostic Test Code(s)</td>
<td></td>
</tr>
<tr>
<td>DI</td>
<td>Distributor Ignition</td>
<td></td>
</tr>
<tr>
<td>DLJ</td>
<td>Distributorless Ignition</td>
<td></td>
</tr>
<tr>
<td>EI</td>
<td>Electronic Ignition</td>
<td>#2</td>
</tr>
<tr>
<td>ECT</td>
<td>Engine Coolant Temperature</td>
<td></td>
</tr>
<tr>
<td>EM</td>
<td>Engine Modification</td>
<td></td>
</tr>
<tr>
<td>EVAP</td>
<td>Evaporative Emission</td>
<td></td>
</tr>
<tr>
<td>EGR</td>
<td>Exhaust Gas Recirculation</td>
<td></td>
</tr>
<tr>
<td>FC</td>
<td>Fan Control</td>
<td></td>
</tr>
<tr>
<td>MAP</td>
<td>Manifold Absolute Pressure</td>
<td></td>
</tr>
<tr>
<td>MAF</td>
<td>Mass Air Flow</td>
<td></td>
</tr>
<tr>
<td>MAF sensor</td>
<td>Mass Air Flow Sensor</td>
<td></td>
</tr>
<tr>
<td>MFL</td>
<td>Multiport Fuel Injection</td>
<td></td>
</tr>
<tr>
<td>OBD</td>
<td>On-board Diagnostic System</td>
<td></td>
</tr>
<tr>
<td>OL</td>
<td>Open Loop</td>
<td></td>
</tr>
<tr>
<td>OC</td>
<td>Oxidation Catalytic Converter</td>
<td></td>
</tr>
<tr>
<td>O2S</td>
<td>Oxygen Sensor</td>
<td></td>
</tr>
<tr>
<td>PNP</td>
<td>Park/Neutral Position</td>
<td></td>
</tr>
<tr>
<td>PID</td>
<td>Parameter Identification</td>
<td></td>
</tr>
<tr>
<td>PSP</td>
<td>Power Steering Pressure</td>
<td></td>
</tr>
<tr>
<td>PCM</td>
<td>Powertrain Control Module</td>
<td>#3</td>
</tr>
<tr>
<td>PAIR</td>
<td>Pulsed Secondary Air Injection</td>
<td>Pulsed injection</td>
</tr>
<tr>
<td>AIR</td>
<td>Secondary Air Injection</td>
<td>Injection with air pump</td>
</tr>
<tr>
<td>SAPV</td>
<td>Secondary Air Pulse Valve</td>
<td></td>
</tr>
<tr>
<td>SFI</td>
<td>Sequential Multiport Fuel Injection</td>
<td></td>
</tr>
<tr>
<td>3GR</td>
<td>Third Gear</td>
<td></td>
</tr>
<tr>
<td>TWC</td>
<td>Three Way Catalytic Converter</td>
<td></td>
</tr>
<tr>
<td>TB</td>
<td>Throttle Body</td>
<td></td>
</tr>
<tr>
<td>TP</td>
<td>Throttle Position</td>
<td></td>
</tr>
<tr>
<td>TP sensor</td>
<td>Throttle Position Sensor</td>
<td></td>
</tr>
<tr>
<td>TCC</td>
<td>Torque Converter Clutch</td>
<td></td>
</tr>
</tbody>
</table>

00–00–10
### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Name</th>
<th>Remark</th>
<th>Abbreviation</th>
<th>Name</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF</td>
<td>Flexible Fuel</td>
<td></td>
<td>TCM</td>
<td>Transmission (Transaxle) Control Module</td>
<td></td>
</tr>
<tr>
<td>4GR</td>
<td>Fourth Gear</td>
<td></td>
<td>TR</td>
<td>Transmission (Transaxle) Range</td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>Generator</td>
<td></td>
<td>TC</td>
<td>Turbocharger</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
<td></td>
<td>VSS</td>
<td>Vehicle Speed Sensor</td>
<td></td>
</tr>
<tr>
<td>HO2S</td>
<td>Heated Oxygen Sensor With heater</td>
<td></td>
<td>VR</td>
<td>Voltage Regulator</td>
<td></td>
</tr>
<tr>
<td>IAC</td>
<td>Idle Air Control</td>
<td></td>
<td>VAF sensor</td>
<td>Volume Air Flow Sensor</td>
<td></td>
</tr>
<tr>
<td>IAT</td>
<td>Intake Air Temperature</td>
<td></td>
<td>WU-TWC</td>
<td>Warm Up Three Way Catalytic Converter</td>
<td>#4</td>
</tr>
<tr>
<td>KS</td>
<td>Knock Sensor</td>
<td></td>
<td>WOP</td>
<td>Wide Open Throttle</td>
<td></td>
</tr>
<tr>
<td>MIL</td>
<td>Malfunction Indicator Lamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#1 : Diagnostic trouble codes depend on the diagnostic test mode.
#2 : Controlled by the PCM
#3 : Device that controls engine and powertrain
#4 : Directly connected to exhaust manifold

### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>SST</td>
<td>Special Service Tools</td>
</tr>
<tr>
<td>TFT</td>
<td>Transaxle Fluid Temperature</td>
</tr>
<tr>
<td>ATF</td>
<td>Automatic Transaxle Fluid</td>
</tr>
</tbody>
</table>
### AUTOMATIC TRANSMAXLE

<table>
<thead>
<tr>
<th>Component</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEANING</td>
<td>05-17-2</td>
</tr>
<tr>
<td>AUTOMATIC TRANSMAXLE ASSEMBLY</td>
<td>05-17-2</td>
</tr>
<tr>
<td>Precaution</td>
<td>05-17-2</td>
</tr>
<tr>
<td>Disassembly</td>
<td>05-17-3</td>
</tr>
<tr>
<td>ACCUMULATORS DISASSEMBLY/ASSEMBLY</td>
<td>05-17-17</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-17</td>
</tr>
<tr>
<td>OIL PUMP DISASSEMBLY/ASSEMBLY</td>
<td>05-17-18</td>
</tr>
<tr>
<td>Oil Pump Cover Disassembly Note</td>
<td>05-17-18</td>
</tr>
<tr>
<td>Inner Rotor, Outer Rotor Disassembly Note</td>
<td>05-17-19</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-19</td>
</tr>
<tr>
<td>FORWARD CLUTCH DISASSEMBLY/ASSEMBLY</td>
<td>05-17-21</td>
</tr>
<tr>
<td>Snap Ring Disassembly Note</td>
<td>05-17-21</td>
</tr>
<tr>
<td>Forward Clutch Piston Disassembly Note</td>
<td>05-17-22</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-22</td>
</tr>
<tr>
<td>CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY</td>
<td>05-17-25</td>
</tr>
<tr>
<td>Snap Ring (3–4 clutch) Disassembly Note</td>
<td>05-17-26</td>
</tr>
<tr>
<td>3–4 Clutch Piston Disassembly Note</td>
<td>05-17-26</td>
</tr>
<tr>
<td>Snap Ring (Reverse clutch) Disassembly Note</td>
<td>05-17-27</td>
</tr>
<tr>
<td>Reverse Piston Disassembly Note</td>
<td>05-17-27</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-27</td>
</tr>
<tr>
<td>FRONT INTERNAL GEAR ONE-WAY CLUTCH NO.1 COMPONENT DISASSEMBLY/ASSEMBLY</td>
<td>05-17-34</td>
</tr>
<tr>
<td>One-Way Clutch Retainer Disassembly Note</td>
<td>05-17-34</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-34</td>
</tr>
<tr>
<td>BAND SERVO DISASSEMBLY/ASSEMBLY</td>
<td>05-17-35</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-36</td>
</tr>
<tr>
<td>LOW AND REVERSE BRAKE AND ONE-WAY CLUTCH INNER RACE DISASSEMBLY/ASSEMBLY</td>
<td>05-17-37</td>
</tr>
<tr>
<td>Snap Ring Disassembly Note</td>
<td>05-17-37</td>
</tr>
<tr>
<td>Low and Reverse Brake Piston Disassembly Note</td>
<td>05-17-38</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-38</td>
</tr>
<tr>
<td>DIRECT CLUTCH DISASSEMBLY/ASSEMBLY</td>
<td>05-17-41</td>
</tr>
<tr>
<td>Needle Bearing Disassembly Note</td>
<td>05-17-41</td>
</tr>
<tr>
<td>Snap Ring (Direct clutch) Disassembly Note</td>
<td>05-17-42</td>
</tr>
<tr>
<td>Direct Clutch Piston Disassembly Note</td>
<td>05-17-42</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-42</td>
</tr>
<tr>
<td>REDUCTION BRAKE DISASSEMBLY/ASSEMBLY</td>
<td>05-17-46</td>
</tr>
<tr>
<td>Snap Ring Disassembly Note</td>
<td>05-17-46</td>
</tr>
<tr>
<td>Reduction Brake Piston Disassembly Note</td>
<td>05-17-47</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-47</td>
</tr>
<tr>
<td>PARKING MECHANISM DISASSEMBLY/ASSEMBLY</td>
<td>05-17-50</td>
</tr>
<tr>
<td>Assembly Procedure</td>
<td>05-17-51</td>
</tr>
<tr>
<td>SECONDARY GEAR AND OUTPUT GEAR DISASSEMBLY/ASSEMBLY</td>
<td>05-17-52</td>
</tr>
<tr>
<td>Lock nut Disassembly Note</td>
<td>05-17-52</td>
</tr>
<tr>
<td>Output Gear And Inner Race Disassembly Note</td>
<td>05-17-53</td>
</tr>
<tr>
<td>Output gear And Inner Race Assembly Note</td>
<td>05-17-53</td>
</tr>
<tr>
<td>Lock nut Assembly Note</td>
<td>05-17-53</td>
</tr>
<tr>
<td>PRIMARY GEAR DISASSEMBLY/ASSEMBLY</td>
<td>05-17-54</td>
</tr>
<tr>
<td>Bearing Disassembly Note</td>
<td>05-17-54</td>
</tr>
<tr>
<td>Bearing Assembly Note</td>
<td>05-17-54</td>
</tr>
<tr>
<td>PRIMARY CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY</td>
<td>05-17-55</td>
</tr>
<tr>
<td>Primary Control Valve Body Disassembly</td>
<td>05-17-55</td>
</tr>
<tr>
<td>Upper Control Valve Body Disassembly/Assembly</td>
<td>05-17-56</td>
</tr>
<tr>
<td>Assembly procedure</td>
<td>05-17-59</td>
</tr>
<tr>
<td>Main Control Valve Body Disassembly/Assembly</td>
<td>05-17-60</td>
</tr>
<tr>
<td>Assembly procedure</td>
<td>05-17-61</td>
</tr>
<tr>
<td>Primary Control Valve Body Assembly</td>
<td>05-17-63</td>
</tr>
<tr>
<td>Assembly procedure</td>
<td>05-17-64</td>
</tr>
<tr>
<td>SECONDARY CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY</td>
<td>05-17-66</td>
</tr>
<tr>
<td>Secondary Control Valve Body Disassembly</td>
<td>05-17-66</td>
</tr>
<tr>
<td>Disassembly procedure</td>
<td>05-17-68</td>
</tr>
</tbody>
</table>
AUTOMATIC TRANSAXLE

Secondary Main Control Valve Body Disassembly/Assembly ........ 05–17–70
Assembly procedure ........ 05–17–71
Secondary Control Valve Body
Assembly ........ 05–17–71
Assembly procedure ........ 05–17–73
DIFFERENTIAL
DASSEMBLY/ASSEMBLY ........ 05–17–75
Differential Disassembly ........ 05–17–75
Differential Assembly ........ 05–17–76
DIFFERENTIAL BEARING PRELOAD ........ 05–17–79
AUTOMATIC TRANSAXLE
ASSEMBLY ........ 05–17–82
Precaution ........ 05–17–82
Assembly ........ 05–17–83
Components ........ 05–17–84

AUTOMATIC TRANSAXLE
INSPECTION ........ 05–17–106
Torque Converter Inspection ........ 05–17–106
Oil Pump Preinspection ........ 05–17–106
Forward Clutch Preinspection ........ 05–17–107
Clutch Component Preinspection ........ 05–17–108
Reverse clutch clearance ........ 05–17–109
3-4 clutch clearance ........ 05–17–109
Bushing inner diameter inspection ........ 05–17–110
Front Internal Gear and One-Way Clutch
No.1 Component ........ 05–17–111
Low and Reverse Brake
Preinspection ........ 05–17–111
One-Way Clutch No.2 Component ........ 05–17–112
Direct Clutch Preinspection ........ 05–17–113
Reduction Brake Preinspection ........ 05–17–114
Differential Preinspection ........ 05–17–115

AUTOMATIC TRANSAXLE CLEANING

Cleaning Notes
1. Clean the transaxle exterior thoroughly with steam, cleaning solvents, or both, before disassembly.

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

2. Clean the removed parts with cleaning solvent, and dry with compressed air. Clean out all holes and passages with compressed air, and verify that there are no obstructions.

AUTOMATIC TRANSAXLE DISASSEMBLY

Precaution
General notes
• The oil pan could contain small chips, shavings, and other particles which may be helpful in inspecting the condition of the transaxle and diagnosing certain problems.

To ensure that all foreign particles stay in the oil pan, make sure that the transaxle is never tipped completely over while the oil pan is still installed.
1. Disassemble the transaxle in a clean area (dustproof work space) to prevent entry of dust into the mechanisms.
2. Inspect the individual transaxle components in accordance with the QUICK DIAGNOSIS CHART during disassembly.
3. Use only plastic hammers when applying force to separate the light alloy case joints.
4. Never use rags during disassembly; they may leave particles that can clog fluid passage.
5. Several parts resemble one another; arrange them so that they do not get mixed up.
6. Disassemble the control valve component and thoroughly clean it when the clutch or brake band has burned or when the ATF has degenerated.

Warning
• Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transaxle is held in a lopsided position on the stand. This would cause the transaxle to turn suddenly, causing serious injury. Never keep the transaxle tilted to one side. Always hold the rotating handle firmly when turning the transaxle.
AUTOMATIC TRANAXLE

Disassembly Components

1 Torque converter
2 Oil dipstick and oil filler tube
3 Input/turbine speed sensor
4 Oil pressure switch
5 Transaxle range switch
6 Vehicle speed sensor
7 Intermediate sensor
8 Connector pipe
9 Connector bolt
10 Oil pipe
11 Oil cover
12 Secondary control valve body component
13 Oil pan
14 Primary control valve body component
15 Oil pump
16 Thrust washer
17 End cover
18 Bearing race
1 2-4 brake band
2 Needle bearing
3 Clutch component
4 Snap ring
5 Rear planetary gear component
6 Needle bearing
7 Front sun gear
8 Needle bearing
9 Front planetary gear component
10 Front internal gear and one-way clutch
11 Lock nut
12 Bearing
13 Distance piece
14 Snap ring
15 Low and reverse brake
16 Snap ring
17 One-way clutch inner race
18 Piston return spring
19 Low and reverse brake piston
20 Band strut

05–17–4
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manual shaft</td>
</tr>
<tr>
<td>2</td>
<td>Servo apply accumulator</td>
</tr>
<tr>
<td>3</td>
<td>Forward accumulator</td>
</tr>
<tr>
<td>4</td>
<td>Parking rod lever component</td>
</tr>
<tr>
<td>5</td>
<td>Band servo</td>
</tr>
<tr>
<td>6</td>
<td>Differential</td>
</tr>
<tr>
<td>7</td>
<td>Actuator plate</td>
</tr>
<tr>
<td>8</td>
<td>Support actuator</td>
</tr>
<tr>
<td>9</td>
<td>Parking pawl shaft</td>
</tr>
<tr>
<td>10</td>
<td>Parking pawl</td>
</tr>
<tr>
<td>11</td>
<td>Pawl return spring</td>
</tr>
<tr>
<td>12</td>
<td>Needle bearing</td>
</tr>
<tr>
<td>13</td>
<td>Bearing race</td>
</tr>
<tr>
<td>14</td>
<td>Output gear component</td>
</tr>
<tr>
<td>15</td>
<td>Secondary sun gear</td>
</tr>
<tr>
<td>16</td>
<td>Direct clutch component</td>
</tr>
<tr>
<td>17</td>
<td>One-way clutch No.2</td>
</tr>
<tr>
<td>18</td>
<td>Needle bearing</td>
</tr>
<tr>
<td>19</td>
<td>Seal rings</td>
</tr>
<tr>
<td>20</td>
<td>Spacer</td>
</tr>
</tbody>
</table>
Disassembly procedure
1. Remove the torque converter, and immediately turn it so that the hole faces upward. This will help to keep any remaining fluid from spilling.
2. Remove the ATF dipstick and oil filler tube.
3. Remove the O-ring from the oil filler tube.
4. Remove the breather hose.
5. Assemble the SST.

<table>
<thead>
<tr>
<th>21</th>
<th>Snap ring</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Reduction brake</td>
</tr>
<tr>
<td>23</td>
<td>Snap ring</td>
</tr>
<tr>
<td>24</td>
<td>Springs and retainer component</td>
</tr>
<tr>
<td>25</td>
<td>Reduction brake piston</td>
</tr>
<tr>
<td>26</td>
<td>Forward clutch</td>
</tr>
<tr>
<td>27</td>
<td>Forward clutch hub</td>
</tr>
<tr>
<td>28</td>
<td>Primary gear</td>
</tr>
<tr>
<td>29</td>
<td>Bearing race</td>
</tr>
<tr>
<td>30</td>
<td>Oil seal</td>
</tr>
<tr>
<td>31</td>
<td>Transaxle case</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1</th>
<th>Bearing race</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Bearing</td>
</tr>
<tr>
<td>3</td>
<td>Adjustment shim</td>
</tr>
<tr>
<td>4</td>
<td>Oil seal</td>
</tr>
<tr>
<td>5</td>
<td>Converter housing</td>
</tr>
</tbody>
</table>
6. Lift the transaxle and mount it on the SST.
7. Remove the input/turbine speed sensor.
8. Remove the O-ring from the input/turbine speed sensor.
9. Remove the oil pressure switch.
10. Remove the transaxle range switch.
11. Remove the vehicle speed sensor.
12. Remove the O-ring from the vehicle speed sensor.
13. Remove the intermediate sensor.
14. Remove the O-ring from the intermediate sensor.
15. Remove the connector pipe, connector bolt and oil pipe.

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

**Caution**
- Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.
- If any old sealant gets into the transaxle during installation of the oil cover, trouble may occur in the transaxle. Remove any old sealant from the transaxle case and oil cover, and clean with cleaning fluids.

16. Remove the oil cover.
Examine any material found in the pan or on the magnet to determine the condition of the transaxle. If large amounts of material are found, replace the torque converter and carefully inspect the transaxle for the cause.
(1) Clutch facing material
   - Drive plate and brake band wear
(2) Steel (magnetic)
   - Bearing, gear, and driven plate wear
(3) Aluminum (nonmagnetic)
   - Aluminum part wear
17. Disconnect the solenoid valve connector.

18. Remove the bolts as shown in the figure.
19. Remove the secondary control valve body.
20. Remove the coupler component.
21. Remove the O-rings and tubular pins from the transaxle case.

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

Caution
- Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.
- If any old sealant gets into the transaxle during installation of the oil pan, trouble may occur in the transaxle. Remove any old sealant from the transaxle case and oil pan, and clean with cleaning fluids.

22. Remove the oil pan.
Examine any material found in the pan or on the magnet to determine the condition of the transaxle. If large amounts of material are found, replace the torque converter and carefully inspect the transaxle for the cause.
(1) Clutch facing material
- Drive plate and brake band wear
(2) Steel (magnetic)
- Bearing, gear, and driven plate wear
(3) Aluminum (nonmagnetic)
- Aluminum part wear

23. Disconnect the solenoid valve connector, ground, and TFT sensor.
24. Remove the oil strainer.

25. Remove the O-ring from the oil strainer.
AUTOMATIC TRANSAXLE

26. Remove the bolts as shown in the figure.

Note
- Remove the control valve body by removing the head of the manual valve from the port of the parking assist lever component.

27. Remove the Primary control valve body.

28. Remove the coupler component.

29. Remove the accumulator component.
30. Remove the manual shaft.
   (1) Remove the roll pin using a pin punch.

   (2) Remove the manual shaft.
   (3) Remove the O-ring from the manual shaft.

31. Remove the parking rod lever component.

32. Remove the band servo component.
33. Remove the oil pump.

34. Remove the converter housing by tapping lightly with a plastic hammer.

35. Remove the forward clutch component.

36. Remove the differential.

37. Remove the actuator plate.
38. Remove the support actuator.

39. Pull out the parking pawl shaft.
40. Remove the parking pawl.

41. Remove the pawl return spring.

42. Remove the Output gear component.

43. Remove the Secondary sun gear.
44. Remove the direct clutch component and one-way clutch No.2.

45. Remove the Needle bearing, seal rings and spacer.
46. Remove the reduction brake. (See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ASSEMBLY.)

47. Remove the end cover.
48. Remove the O-rings from the transaxle case.

49. Remove the band strut.

50. Remove the 2–4 brake band, and hold it together using a piece of wire as shown in the figure.
51. Remove the clutch component.

52. Remove the snap ring.

53. Remove the rear planetary gear component.

54. Remove the front sun gear by tapping its end with a flathead screwdriver or similar tool, as shown in the figure.

55. Remove the forward clutch hub.

56. Remove the front planetary gear component.
57. Remove the front internal gear and one-way clutch component.

58. Remove the locknut.
   (1) Knock the crimped portion of the locknut outward by using a small chisel and a hammer.

   (2) Install the SST to the primary gear in the order shown.

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

   (3) Install the SST to the locknut in the order shown.

   (4) Remove the locknut.
AUTOMATIC TRANSAXLE

59. Remove the primary gear by tapping it with a flathead screwdriver, etc. as shown in the figure.

60. Remove the bearing and distance piece.
   Caution
   • Removing the bearing race using a flathead screwdriver can damage the inside of the bearing race. Handle the flathead screwdriver carefully.

61. Remove torx screws from the converter housing side.
62. Remove the bearing race.

63. Remove the bearing race using the SST as shown in the figure.

64. Remove the bearing using the SST as shown in the figure.
ACCUMULATORS DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Servo apply accumulator</td>
</tr>
<tr>
<td>2</td>
<td>Servo apply accumulator large spring</td>
</tr>
<tr>
<td>3</td>
<td>Servo apply accumulator small spring</td>
</tr>
<tr>
<td>4</td>
<td>Forward accumulator</td>
</tr>
<tr>
<td>5</td>
<td>Forward accumulator large spring</td>
</tr>
<tr>
<td>6</td>
<td>Forward accumulator small spring</td>
</tr>
</tbody>
</table>

**Assembly Procedure**

1. Measure the spring free length.

**Accumulator spring (standard)**

<table>
<thead>
<tr>
<th>Spring</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo apply accumulator large spring</td>
<td>21.0 (0.827)</td>
<td>67.8 (2.669)</td>
<td>10.3</td>
<td>3.5 (0.138)</td>
</tr>
<tr>
<td>Servo apply accumulator small spring</td>
<td>13.0 (0.512)</td>
<td>67.8 (2.669)</td>
<td>17.1</td>
<td>2.2 (0.087)</td>
</tr>
<tr>
<td>Forward accumulator large spring</td>
<td>21.0 (0.827)</td>
<td>75.0 (2.953)</td>
<td>10.7</td>
<td>2.3 (0.091)</td>
</tr>
<tr>
<td>Forward accumulator small spring</td>
<td>15.6 (0.614)</td>
<td>49.0 (1.929)</td>
<td>7.7</td>
<td>2.4 (0.094)</td>
</tr>
</tbody>
</table>

- If not as specified, replace the spring.
- Install the forward accumulator small spring, forward accumulator large spring and forward accumulator.
- Install the servo apply accumulator small spring, servo apply accumulator large spring and servo apply accumulator.
AUTOMATIC TRANSAXLE

OIL PUMP DISASSEMBLY/ASSEMBLY

1. Perform the preinspection before disassembly. (See 05–17–106 Oil Pump Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

**Oil Pump Cover Disassembly Note**
- Loosen the mounting bolts evenly in the pattern shown and remove the oil pump cover from the oil pump housing.

---

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thrust washer</td>
</tr>
<tr>
<td>2</td>
<td>Seal rings</td>
</tr>
<tr>
<td>3</td>
<td>O-ring</td>
</tr>
<tr>
<td>4</td>
<td>Oil pump cover (See 05–17–18 Oil Pump Cover Disassembly Note.)</td>
</tr>
<tr>
<td>5</td>
<td>Inner rotor (See 05–17–19 Inner Rotor, Outer Rotor Disassembly Note.)</td>
</tr>
<tr>
<td>6</td>
<td>Outer rotor (See 05–17–19 Inner Rotor, Outer Rotor Disassembly Note.)</td>
</tr>
<tr>
<td>7</td>
<td>Oil seal</td>
</tr>
<tr>
<td>8</td>
<td>Oil pump housing</td>
</tr>
</tbody>
</table>
**AUTOMATIC TRANSAXLE**

**Inner Rotor, Outer Rotor Disassembly Note**
- Mark the outer and inner rotors without scratching or denting them, then remove the oil pump housing.

**Assembly Procedure**
1. Apply ATF to new oil seal and install it onto oil pump housing using the SST.

2. Measure the clearance between the end of the oil pump housing and the outer rotor and inner rotor at four places along their circumferences.

   **Clearance between the end of the oil pump housing and the outer rotor and inner rotor**
   - **Standard:** 0.04—0.05 mm (0.0016—0.0019 in)
   - **Maximum:** 0.05 mm (0.002 in)

   - If not as specified, replace the oil pump.

3. Measure the clearance between the outer rotor and the inner rotor.

   **Clearance between the outer rotor and the inner rotor**
   - **Standard:** 0.02—0.11 mm (0.0008—0.0043 in)
   - **Maximum:** 0.12 mm (0.0047 in)

   - If not within the specification, replace the oil pump.

4. Apply ATF to the outer and inner rotors.
5. Align the marks and install the outer and inner rotors.
6. Install the oil pump flange.
7. Mount the oil pump cover onto the oil pump housing.

8. Tighten the bolts evenly and gradually in the order shown.

   **Tightening torque**
   8.1—10.9 N·m (83—111 kgf·cm, 72—96 in·lbf)

9. Apply ATF to new O-ring and install it onto the oil pump housing.

   **O-ring inner diameter**
   209.5 mm (8.248 in)

10. Apply ATF to new seal rings and install them onto the oil pump cover.

   **Seal ring inner diameter**
   47.1 mm (1.854 in)
1. Perform the preinspection before disassembly. (See 05–17–107 Forward Clutch Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

Snap Ring Disassembly Note
1. Install the SST to the forward clutch.

   Caution
   - Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.

   2. Compress the seal plate.
   3. Remove the snap ring.
   4. Remove the SST, then remove the seal plate and spring and retainer component.
AUTOMATIC TRANSAXLE

Forward Clutch Piston Disassembly Note
1. Set the forward clutch drum and turbine shaft onto the oil pump.
2. Remove the forward clutch piston by applying compressed air through the fluid passage.

   Air pressure
   392 kPa \( (4.0 \text{ kgf/cm}^2, 57 \text{ psi} \) max.

Assembly Procedure
1. Measure the facing thickness in three places, and calculate the average value.

   Forward clutch drive plate thickness
   Standard: 1.60 mm \( (0.063 \text{ in}) \)
   Minimum: 1.45 mm \( (0.057 \text{ in}) \)
   • If not within the specification, replace the drive plates.

2. Measure the spring free length.

   Forward clutch springs and retainer component free length
   Standard: 17.2 mm \( (0.677 \text{ in}) \)
   Minimum: 15.2 mm \( (0.598 \text{ in}) \)
   • If not within the specification, replace the spring and retainer component.

3. Verify that there is airflow when applying compressed air through the fluid passage.

   Air pressure
   392 kPa \( (4.0 \text{ kgf/cm}^2, 57 \text{ psi} \) max.

4. Replace the forward clutch drum and turbine shaft if damaged or malfunctioning.

   Caution
   • Installing the forward clutch piston may damage its seal. Carefully install the forward clutch piston by pushing evenly around the circumference.
5. Apply ATF to the circumference of the forward clutch piston seal, and install the piston into the forward clutch drum and turbine shaft.
6. Install the spring and retainer component.

7. Apply ATF to the seal plate, and install it onto the forward clutch drum.

8. Install the SST to the forward clutch drum and turbine shaft as shown.

**Caution**
- Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.

9. Compress the seal plate.
10. Install the snap ring.
11. Remove the SST.

12. Install the drive and driven plates in the following order.
    Driven—Drive—Driven—Drive—Driven—Drive—Driven—Drive
13. Install the retaining plate.
15. Measure the forward clutch clearance.

(1) Install the forward clutch in the oil pump, and set the dial gauge.

(2) Secure the forward clutch by lightly pressing down with a press or similar tool.

(3) Apply compressed air to the part indicated in the figure and let the forward clutch piston stroke three times.

**Air pressure**

392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

(4) Apply compressed air and operate the forward clutch piston. Read the value when the indicator of the dial gauge stops.

(5) Release the compressed air and read the dial gauge when the forward clutch piston is not operating.

(6) Calculate the forward clutch clearance according to the following formula:

\[ \text{Step (4) value} - \text{Step (5) value} = \text{Forward clutch clearance}. \]

(7) Measure the clearances at four locations (90° apart) by following the steps (3) to (6). Verify that the average value is within the specification below:

**Forward clutch clearance**

Standard: 1.50—1.80 mm (0.059—0.070 in)

- If not as specified, remove the snap ring and measure its thickness.

(8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

**Snap ring size for forward clutch clearance**

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.810—3.010 (0.111—0.118)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>3.010—3.210 (0.119—0.126)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>3.210—3.410 (0.127—0.134)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.410—3.610 (0.135—0.142)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.610—3.810 (0.143—0.150)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.810—4.010 (0.150—0.157)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

(9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

05–17–24
AUTOMATIC TRANSAXLE

16. Inspect the forward clutch operation.
   (1) Install the forward clutch drum and turbine shaft to the oil pump.
   (2) Inspect the forward clutch operation by applying compressed air as shown.

   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm², 57—63 psi}

17. Install the forward clutch hub.

CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY

1. Perform the preinspection before disassembly. (See 05–17–108 Clutch Component Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.
AUTOMATIC TRANSAXLE

Snap Ring (3–4 clutch) Disassembly Note
1. Install the SST as shown.
   - Caution
     - Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.
2. Compress the seal plate.
3. Remove the snap ring.
4. Remove the SST, then remove the seal plate and spring and retainer component.

3–4 Clutch Piston Disassembly Note
1. Set the 3–4 clutch drum onto the end cover.
2. Remove the 3–4 clutch piston from the 3–4 clutch drum by applying compressed air through the fluid passage.
   - Air pressure
     - 392 kPa (4.0 kgf/cm², 57 psi) max.
AUTOMATIC TRANSAXLE

Snap Ring (Reverse clutch) Disassembly Note
1. Install the SSTs as shown.

Caution
- Depress the piston return spring only enough to remove the snap ring. Overpressing will damage the piston return spring assembly edges.

2. Compress the piston return spring.
3. Remove the snap ring.
4. Remove the SSTs, then remove the reverse return stopper and return spring.

Reverse Piston Disassembly Note
1. Set the 2–4 brake drum onto the end cover.
2. Remove the reverse piston from the 2–4 brake drum by applying compressed air through the fluid passage.

Air pressure
392 kPa (4.0 kgf/cm², 57 psi) max.

Assembly Procedure
1. Measure the facing thickness in three places and calculate the average value.

Reverse clutch drive plate thickness
Standard: 1.60 mm (0.063 in)
Minimum: 1.45 mm (0.057 in)

3-4 clutch drive plate thickness
Standard: 2.55 mm (0.100 in)
Minimum: 2.40 mm (0.094 in)

3-4 clutch driven plate thickness
Standard: 2.55 mm (0.100 in)
Minimum: 2.40 mm (0.094 in)

- If not within the specification, replace the drive plates.
AUTOMATIC TRANSAXLE

2. Measure the free length of the spring and inspect for deformation.

3-4 clutch springs and retainer component free length
   Standard: 17.2 mm (0.677 in)
   Minimum: 15.2 mm (0.598 in)
   • If not within the specification, replace the spring and retainer.

3. Verify that there is airflow when applying compressed air through the fluid passage of 3–4 clutch drum.
   Air pressure
   392 kPa (4.0 kgf/cm², 57 psi) max.

4. Replace the 3–4 clutch drum if damaged or malfunctioning.

5. Verify that there is airflow when applying compressed air through the fluid passage of 2–4 brake drum.
   Air pressure
   392 kPa (4.0 kgf/cm², 57 psi) max.

6. Replace the 2–4 brake drum if damaged or malfunctioning.

7. Measure the bushing of the rear sun gear.
   Rear sun gear bushing inner diameter
   Standard: 29.900—29.921 mm (1.17717—1.17799 in)
   Maximum: 29.941 mm (1.17878 in)
   • If not as specified, replace the rear sun gear plate.
8. Install the reverse clutch.

**Caution**
- Installing the reverse clutch piston may damage its seal. Carefully install the reverse clutch piston by pushing evenly around the circumference.

1. Apply ATF to the circumference of the reverse clutch piston seal, and install the piston into the 2–4 brake drum.
2. Install the piston return spring and reverse return stopper to the reverse piston.

3. Install the snap ring and the SSTs to the 2–4 brake drum as shown.

**Caution**
- Depress the piston return spring only enough to install the snap ring. Overpressing will damage the piston return spring assembly edges.

4. Compress the piston return spring.
5. Install the snap ring.
6. Remove the SSTs.
7. Install the dish plate.
8. Install the drive and driven plates in the following order.
   - Driven—Drive—Driven—Drive
9. Install the retaining plate.
9. Measure the reverse clutch clearance.
   (1) Install the reverse clutch into the end cover, and set the dial gauge.
   (2) Secure the reverse clutch by lightly pressing down with a press or similar tool.

   (3) Apply compressed air to the part indicated in the figure and let the reverse clutch piston stroke three times.

   **Air pressure**
   392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

   (4) Apply compressed air and operate the reverse clutch piston. Read the value when the indicator of the dial gauge stops.

   (5) Release the compressed air and read the dial gauge when the reverse clutch piston is not operating.

   (6) Calculate the reverse clutch clearance according to the following formula:
   step (4) value – step (5) value = Reverse clutch clearance.

   (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

   **Reverse clutch clearance**
   Standard: 1.00—1.30 mm (0.039—0.051 in)
   - If not within the specification, remove the snap ring and measure its thickness.

   (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

   **Snap ring size for reverse clutch clearance**

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.370—2.570 (0.094—0.101)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>2.570—2.770 (0.102—0.109)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>2.770—2.970 (0.110—0.116)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>2.970—3.170 (0.117—0.124)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.170—3.370 (0.125—0.132)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.370—3.570 (0.133—0.140)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

   (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.
10. Inspect the reverse clutch operation.
   (1) Install the 2–4 brake drum to the end cover.
   (2) Inspect the reverse clutch operation by applying compressed air as shown.

**Air pressure**
392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

11. Install the 3–4 clutch.

**Caution**
- Installing the 3-4 clutch piston may damage its seal. Carefully install the 3–4 clutch piston by pushing evenly around the circumference.

   (1) Apply ATF to the circumference of the 3–4 clutch piston seal, and install the piston into the 3–4 clutch drum.
   (2) Install the spring and retainer.
   (3) Apply ATF to the 3–4 seal plate, and install it onto the 3–4 clutch drum.

   (4) Install the SST as shown.

**Caution**
- Depress the 3–4 seal plate only enough to install the snap ring. Overpressing will damage the 3–4 seal plate assembly edges.

   (5) Compress the spring and retainer component and 3–4 seal plate.
   (6) Install the snap ring.
   (7) Remove the SST.

(8) Install the drive and driven plates in the following order:
   Driven—Drive—Driven—Drive—Driven—Drive

(9) Install the retaining plate.
12. Measure the 3–4 clutch clearance.
   (1) Install the 3–4 clutch in the end cover, and set the dial gauge.
   (2) Secure the 3–4 clutch by lightly pressing down with a press or similar tool.
   (3) Apply compressed air to the part indicated in the figure and let the 3–4 clutch piston stroke three times.

   **Air pressure**
   392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

   (4) Apply compressed air and operate the 3–4 clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the 3–4 clutch piston is not operating.
   (6) Calculate the 3–4 clutch clearance according to the following formula:
   step (4) value – step (5) value = 3–4 clutch clearance.

   (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6).
   Verify that the average value is within the specification below.

   **3-4 clutch clearance**
   **Standard:** 1.10—1.40 mm (0.043—0.055 in)
   - If not within the specification, remove the snap ring and measure its thickness.

   (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

   **Snap ring size for 3-4 clutch clearance**

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.400—2.600 (0.095—0.102)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>2.600—2.800 (0.103—0.110)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>2.800—3.000 (0.111—0.118)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.000—3.200 (0.119—0.125)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.200—3.400 (0.126—0.133)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.400—3.600 (0.134—0.141)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

   (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.
13. Inspect the 3–4 clutch operation.
   (1) Install the 3–4 clutch drum to the end cover.
   (2) Inspect the 3–4 clutch operation by applying compressed air as shown.

   **Air pressure**
   392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)


15. Apply petroleum jelly to the bearing, and secure it onto the 3–4 clutch component.

17. Apply petroleum jelly to the bearing, and secure it onto the 3–4 clutch hub as shown in the figure.
18. Install the rear sun gear plate onto the 2–4 brake drum.
19. Install the snap ring.
1. Perform the preinspection before disassembly.
   (See 05–17–111 Front Internal Gear and One-Way Clutch No.1 Component.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

One-Way Clutch Retainer Disassembly Note
- Remove the one-way clutch retainer using a flathead screwdriver, etc. as shown in the figure.

Assembly Procedure
1. Install the snap ring.
2. Install the one-way clutch No.1 to the front internal gear in the direction of the arrow (on the one-way clutch) as shown in the figure.
3. Install the side race.
4. Install the one-way clutch retainer.
1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

| 1 | Servo retainer |
| 2 | O-ring         |
| 3 | Servo piston   |
| 4 | Servo return spring |
| 5 | Band strut     |
| 6 | 2–4 brake band |

10.8—13.7 N·m (110—140 kgf·cm, 95.5—121 in·lbf)
AUTOMATIC TRANSAXLE

Assembly Procedure
1. Measure the spring free length.

Servo return spring (Standard)

<table>
<thead>
<tr>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.0 (1.340)</td>
<td>36.4 (1.430)</td>
<td>2.5</td>
<td>4.0 (0.160)</td>
</tr>
</tbody>
</table>

- If not as specified, replace the spring.
2. Install the servo return spring to the transaxle case.
3. Install the servo piston to the transaxle case.

4. Apply ATF to new O-ring and install it to the transaxle case.

O-ring inner diameter
70.2 mm (2.76 in)

5. Install the servo retainer by tightening the bolts evenly and gradually.

Tightening torque
11—14 N·m
(113—142 kgf·cm, 97.4—123 in·lbf)
1. Perform the preinspection before disassembly. (See 05–17–111 Low and Reverse Brake Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

**Snap Ring Disassembly Note**
1. Install the SSTs as shown.
   - **Caution**
     - Depress the one-way clutch inner race only enough to remove the snap ring. Overpressing will damage the one-way clutch inner race assembly edges.
2. Compress the one-way clutch inner race.
3. Remove the snap ring.
4. Remove the SSTs and remove one-way clutch inner race and the piston return spring.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Snap ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Retaining plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Drive and driven plates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dish plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Snap ring (See 05–17–37 Snap Ring Disassembly Note.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>One-way clutch inner race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Piston return spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Low and reverse brake piston (See 05–17–36 Low and Reverse Brake Piston Disassembly Note.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AUTOMATIC TRANSAXLE

Low and Reverse Brake Piston Disassembly Note

- Remove the low and reverse brake piston by applying compressed air through the fluid passage.

Air pressure
98.1 kPa {1.0 kgf/cm², 14 psi} max.

Assembly Procedure

1. Measure the facing thickness in three places, and determine the average of the three readings.

Low and reverse brake drive plate thickness
Standard: 1.60 mm (0.063 in)
Minimum: 1.45 mm (0.057 in)

- If not within the specification, replace the drive plates.

Caution
- Installing the low and reverse brake piston may damage its seal. Carefully install the low and reverse brake piston by pushing evenly around the circumference.

2. Apply ATF to the circumference of the low and reverse brake piston seal, and install the piston to the transaxle case.

3. Install the piston return spring and one-way clutch to the transaxle case.

4. Install the SSTs as shown.

Caution
- Depress the one-way clutch inner race only enough to install the snap ring. Overpressing will damage the one-way clutch inner race assembly edges.
5. Compress the one-way clutch inner race.

   **Caution**
   - The transaxle body may be damaged if installed incorrectly. Make sure to install the transaxle body in such a way that the end of the snap ring does not enter the area shown in the figure.

6. Install the snap ring.
7. Remove the SSTs.

8. Install the dish plate.
9. Install the drive and driven plates in the following order:
   Driven—Drive—Driven—Drive—Driven—Drive—Driven—Drive—Driven—Drive
10. Install the retaining plate and the snap ring.

11. Measure the low and reverse brake clearance.
   (1) Set the dial gauge to the low and reverse brake.
   (2) Set the measuring point of the dial gauge to the low and reverse brake piston.
   (3) Apply compressed air to the part indicated in the figure and let the low and reverse brake piston stroke three times.

   **Air pressure**
   98.1 kPa (1.0 kgf/cm², 14 psi)

   (4) Apply compressed air and operate the low and reverse brake piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the low and reverse brake piston is not operating.
   (6) Calculate the low and reverse brake clearance according to the following formula:
       Step (4) value—Step (5) value = low and reverse brake clearance.
(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

**Low and reverse brake clearance**

2.20—2.50 mm (0.087—0.098 in)

- If not within the specification, remove the snap ring and measure its thickness.

(8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

**Snap ring size for low and reverse brake clearance**

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.050—4.250 (0.159—0.167)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>4.250—4.450 (0.167—0.175)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>4.450—4.650 (0.175—0.183)</td>
<td>2.2 (0.087)</td>
</tr>
<tr>
<td>4.650—4.850 (0.183—0.190)</td>
<td>2.4 (0.094)</td>
</tr>
<tr>
<td>4.850—5.050 (0.190—0.199)</td>
<td>2.6 (0.102)</td>
</tr>
<tr>
<td>5.050—5.250 (0.199—0.207)</td>
<td>2.8 (0.110)</td>
</tr>
<tr>
<td>5.250—5.450 (0.207—0.215)</td>
<td>3.0 (0.118)</td>
</tr>
</tbody>
</table>

(9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

12. Inspect the low and reverse brake operation by applying compressed air as shown.

**Air pressure**

98.1 kPa (1.0 kgf/cm², 14 psi)
1. Perform the preinspection before disassembly. (See 05–17–113 Direct Clutch Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

**Needle Bearing Disassembly Note**

1. Remove the needle bearing using the SST as shown in the figure.
AUTOMATIC TRANSAXLE

Snap Ring (Direct clutch) Disassembly Note
1. Install the SST as shown.
   Caution
   • Depress the seal plate only enough to remove the snap ring. Overpressing will damage the seal plate assembly edges.

2. Compress the seal plate.
3. Remove the snap ring.
4. Remove the SST, then remove the seal plate and spring and retainer component.

Direct Clutch Piston Disassembly Note
1. Set the direct clutch drum onto the transaxle case.
2. Remove the direct clutch piston from the direct clutch drum by applying compressed air through the fluid passage.
   Air pressure
   392—441 kPa {4.0—4.5 kgf/cm², 57—63 psi}

Assembly Procedure
1. Measure the facing thickness in three places and calculate the average value.
   Direct clutch drive plate thickness
   Standard: 1.80 mm {0.071 in}
   Minimum: 1.65 mm {0.065 in}
   • If not within the specification, replace the drive plates.

2. Measure the free length of the spring and inspect for deformation.
   Direct clutch springs and retainer component
   free length
   Standard: 17.2 mm {0.677 in}
   Minimum: 15.2 mm {0.598 in}
   • If not within the specification, replace the spring and retainer.
AUTOMATIC TRANSAXLE

3. Verify that there is airflow when applying compressed air through the fluid passage of direct clutch drum. (four locations)

**Air pressure**
392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

4. Replace the direct clutch drum if damaged or malfunctioning.

5. Install the direct clutch.

**Caution**
- Installing the direct clutch piston may damage its seal. Carefully install the direct clutch piston by pushing evenly around the circumference.

(1) Apply ATF to the circumference of the direct clutch piston seal, and install the piston in to the direct clutch drum.
(2) Install the spring and retainer.
(3) Apply ATF to the seal plate, and install it onto the direct clutch drum.
(4) Install the SST as shown.

**Caution**
- Depress the seal plate only enough to install the snap ring. Overpressing will damage the seal plate assembly edges.

(5) Compress the spring and retainer component and seal plate.
(6) Install the snap ring.
(7) Remove the SST.

(8) Install the drive and driven plates in the following order:
    Driven—Drive—Driven—Driven—Drive
(9) Install the retaining plate.
(10) Install the snap ring.
6. Measure the direct clutch clearance.
   (1) Install the direct clutch in the transaxle case, and set the dial gauge.
   (2) Secure the direct clutch by lightly pressing down with a press or similar tool.
   (3) Apply compressed air to the part indicated in the figure and let the direct clutch piston stroke three times.

   **Air pressure**
   392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

   (4) Apply compressed air and operate the direct clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the direct clutch piston is not operating.
   (6) Calculate the direct clutch clearance according to the following formula:
   step (4) value – step (5) value = direct clutch clearance.
   (7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

   **Direct clutch clearance**
   Standard: 1.10—1.40 mm (0.043—0.055 in)

   • If not within the specification, remove the snap ring and measure its thickness.
   (8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

   **Snap ring size for direct clutch clearance**

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.424—2.624 (0.096—0.103)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>2.624—2.824 (0.104—0.111)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>2.824—3.024 (0.112—0.119)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.024—3.224 (0.120—0.126)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.224—3.424 (0.127—0.134)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.424—3.624 (0.135—0.142)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

   (9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.
7. Inspect the direct clutch operation.
   (1) Install the direct clutch drum to the transaxle case.
   (2) Inspect the direct clutch operation by applying compressed air as shown.

   **Air pressure**
   392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

8. Install the needle bearing using the SST as shown in the figure.

   **Distance A**
   A: 0—0.5 mm (0—0.02 in)
1. Perform the preinspection before disassembly.
   (See 05–17–114 Reduction Brake Preinspection.)
2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

**Snap Ring Disassembly Note**

1. Install the SST as shown.

   **Caution**
   - Depress the spring and retainer component only enough to remove the snap ring. Overpressing will damage the spring and retainer component assembly edges.

2. Compress the spring and retainer component.
3. Remove the snap ring.
4. Remove the SST and remove spring and retainer component.
AUTOMATIC TRANSAXLE

Reduction Brake Piston Disassembly Note
- Remove the reduction brake piston by applying compressed air through the fluid passage.
  
  Air pressure
  392 kPa (4.0 kgf/cm², 57 psi) max.

Assembly Procedure
1. Measure the facing thickness in three places, and determine the average of the three readings.

   Reduction brake drive plate thickness
   - Standard: 1.80 mm (0.071 in)
   - Minimum: 1.65 mm (0.065 in)
   - If not within the specification, replace the drive plates.

2. Measure the spring free length.

   Reduction brake springs and retainer component free length
   - Standard: 18.2 mm (0.717 in)
   - Minimum: 16.2 mm (0.638 in)
   - If not within the specification, replace the spring and retainer component.

Caution
- Installing the reduction brake piston may damage its seal. Carefully install the reduction brake piston by pushing evenly around the circumference.

3. Apply ATF to the circumference of the reduction brake piston seal, and install the piston to the transaxle case.
4. Install the spring and retainer component to the transaxle case.
5. Install the SST as shown.

Caution
- Depress the spring and retainer component only enough to install the snap ring.
  Overpressing will damage the spring and retainer component assembly edges.
6. Compress the spring and retainer component.

Caution
- The transaxle body may be damaged if installed incorrectly. Make sure to install the transaxle body in such a way that the end of the snap ring does not enter the area shown in the figure.

7. Install the snap ring.
8. Remove the SST.
9. Install the drive and driven plates in the following order.
   Driven—Drive—Driven—Driven—Drive—Driven—Driven—Drive
10. Install the retaining plate and the snap ring.

11. Measure the reduction brake clearance.
    (1) Set the dial gauge to the reduction brake.
    (2) Set the measuring point of the dial gauge to the retaining plate.
    (3) Apply compressed air to the part indicated in the figure and let the reduction brake piston stroke three times.

   **Air pressure**
   - 392 kPa (4.0 kgf/cm², 57 psi) max.

   (4) Apply compressed air and operate the reduction brake piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the reduction brake piston is not operating.
   (6) Calculate the reduction brake clearance according to the following formula:
      Step (4) value—Step (5) value = reduction brake clearance.
(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

Reduction brake clearance
1.50—1.80 mm (0.059—0.070 in)

- If not within the specification, remove the snap ring and measure its thickness.

(8) Add the thickness to the average value calculated in step (7), and select the snap ring whose range includes the value.

Snap ring size for reduction brake clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.920—3.120 (0.115—0.122)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>3.120—3.320 (0.123—0.130)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>3.320—3.520 (0.131—0.138)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.520—3.720 (0.139—0.146)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.720—3.920 (0.147—0.154)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.920—4.120 (0.155—0.162)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

(9) Install the selected snap ring and perform steps (2) to (7) again. Verify that the calculated value satisfies the clearance specification.

12. Inspect the reduction brake operation by applying compressed air as shown.

Air pressure
392 kPa (4.0 kgf/cm², 57 psi) max.
1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actuator plate</td>
</tr>
<tr>
<td>2</td>
<td>Support actuator</td>
</tr>
<tr>
<td>3</td>
<td>Parking pawl shaft</td>
</tr>
<tr>
<td>4</td>
<td>Parking pawl</td>
</tr>
<tr>
<td>5</td>
<td>Pawl return spring</td>
</tr>
<tr>
<td>6</td>
<td>Manual shaft</td>
</tr>
<tr>
<td>7</td>
<td>Parking rod component</td>
</tr>
<tr>
<td>8</td>
<td>E-ring</td>
</tr>
<tr>
<td>9</td>
<td>Parking assist lever component</td>
</tr>
<tr>
<td>10</td>
<td>Manual plate</td>
</tr>
<tr>
<td>11</td>
<td>Detent bracket component</td>
</tr>
</tbody>
</table>
AUTOMATIC TRANSAAXLE

Assembly Procedure

1. Install the manual plate to the detent bracket component.
2. Install the parking assist lever component to the detent bracket component and the manual plate.
3. Install the E-ring.
4. Install the parking rod component.
AUTOMATIC TRANAXLE

SECONDARY GEAR AND OUTPUT GEAR DISASSEMBLY/ASSEMBLY

1. Remove the following parts. (See 05–17–2 AUTOMATIC TRANAXLE DISASSEMBLY.)
   • Torque converter
   • Oil pump
   • Converter housing
   • Differential

2. Disassemble in the order indicated in the table.
3. Assemble in the reverse order of disassembly.

Lock nut Disassembly Note
1. Rotate the manual shaft to the P position.
2. Knock the crimped portion of the locknut outward by using a small chisel and a hammer.
3. Remove the lock nut.

---

05–17–52
AUTOMATIC TRANSAXLE

Output gear And Inner Race Disassembly Note
1. Remove the output gear component. (See 05–17–2 AUTOMATIC TRANSAXLE DISASSEMBLY.)
2. Remove the output gear and inner race to the secondary gear component using the SST.

Output gear And Inner Race Assembly Note
1. Install the output gear to the secondary gear component using the SST.

Press-in force
20 kN (204 kgf, 450 lbf)

2. Install the inner race to the secondary gear component using the SST.

Press-in force
20 kN (204 kgf, 450 lbf)

Lock nut Assembly Note
1. Install the following parts. (See 05–17–2 AUTOMATIC TRANSAXLE DISASSEMBLY.)
   - Pawl return spring
   - Parking pawl
   - Parking pawl shaft
   - Support actuator
   - Actuator plate
2. Rotate the manual shaft to the P position.
3. Install the locknut.

Tightening torque
100—120 N·m (10.2—12.2 kgf·m, 74—88 ft·lbf)
AUTOMATIC TRANSAXLE

4. Stake the locknut.

PRIMARY GEAR DISASSEMBLY/ASSEMBLY

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1 | Bearing  
(See 05–17–54 Bearing Disassembly Note.)  
(See 05–17–54 Bearing Assembly Note.) |
| 2 | Primary gear |

Bearing Disassembly Note

- Remove the bearing from the primary gear using the SSTs and suitable plate.

Bearing Assembly Note

- Install the bearing to the primary gear using the SSTs.

05–17–54
Primary Control Valve Body Disassembly

Caution
- Denting or scratching these components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.

1. Disassemble in the order indicated in the table.
2. Neatly arrange the removed parts to avoid confusing the similar parts.

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

3. Clean the removed parts with cleaning solvent, then use compressed air to dry them. Use compressed air to clean out all holes and passages.

| 1 | Transaxle fluid temperature sensor |
| 2 | Oil strainer |
AUTOMATIC TRANSAXLE

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>O-ring</td>
</tr>
<tr>
<td>4</td>
<td>Packing</td>
</tr>
<tr>
<td>5</td>
<td>Bracket</td>
</tr>
<tr>
<td>6</td>
<td>Shift solenoid A</td>
</tr>
<tr>
<td>7</td>
<td>Shift solenoid B</td>
</tr>
<tr>
<td>8</td>
<td>Shift solenoid C</td>
</tr>
<tr>
<td>9</td>
<td>Pressure control solenoid A</td>
</tr>
<tr>
<td>10</td>
<td>Shift solenoid D</td>
</tr>
<tr>
<td>11</td>
<td>Shift solenoid E</td>
</tr>
<tr>
<td>12</td>
<td>Upper control valve body</td>
</tr>
<tr>
<td>13</td>
<td>Seal plate</td>
</tr>
<tr>
<td>14</td>
<td>Main control valve body</td>
</tr>
<tr>
<td>15</td>
<td>Tubular pin</td>
</tr>
<tr>
<td>16</td>
<td>Pressure modifier accumulator spring</td>
</tr>
<tr>
<td>17</td>
<td>Pressure modifier accumulator</td>
</tr>
<tr>
<td>18</td>
<td>Gasket D</td>
</tr>
<tr>
<td>19</td>
<td>Separator plate</td>
</tr>
<tr>
<td>20</td>
<td>Gasket C</td>
</tr>
<tr>
<td>21</td>
<td>Solenoid control valve body</td>
</tr>
<tr>
<td>22</td>
<td>Tubular pin</td>
</tr>
</tbody>
</table>

Disassembly procedure
1. Remove the oil strainer.
2. Remove the O-ring from the oil strainer.
3. Remove the packing.
4. Remove the bracket.

5. Remove the shift solenoid A, B, C.

6. Remove the pressure control solenoid A, shift solenoid D, E.
7. Loosen the bolts evenly in the pattern shown.

8. Remove the upper control valve body.

9. Remove the seal plate.

10. Remove the main control valve body.
11. Remove the tubular pins, pressure modifier accumulator spring and pressure modifier accumulator from the main control valve body.

12. Remove the gasket D, separator plate and gasket C.

13. Remove the tubular pins.
AUTOMATIC TRANSAXLE

Upper Control Valve Body Disassembly/Assembly

Caution
• Denting or scratching these precisely machined components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.

Note
• If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

1. Disassemble in the order indicated in the table.

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

2. Clean all parts and holes using compressed air and apply ATF to them immediately before assembly.

3. Assemble in the reverse order of disassembly.

| 1 | Manual valve |
| 2 | Retainer |
| 3 | Low and reverse shift valve spring |
| 4 | Low and reverse shift valve |
| 5 | Retainer |
| 6 | Solenoid reducing valve spring |
| 7 | Solenoid reducing valve |
AUTOMATIC TRANSAXLE

Assembly procedure
1. Measure the spring free length.

Primary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and reverse shift valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Solenoid reducing valve spring</td>
<td>8.7 (0.343)</td>
<td>44.2 (1.740)</td>
<td>16.0</td>
<td>1.1 (0.043)</td>
</tr>
</tbody>
</table>

- If not as specified, replace the springs.
2. Install the solenoid reducing valve, solenoid reducing valve spring and retainer.
3. Install the low and reverse shift valve, low and reverse shift valve spring and retainer.

4. Install the manual valve.

Main Control Valve Body Disassembly/Assembly

Caution
- Denting or scratching these precisely machined components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them be careful not to drop or hit them.

Note
- If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

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

1. Disassemble in the order indicated in the table.
2. Clean all parts and holes using compressed air and apply ATF to them immediately before assembly.

05–17–60
3. Assemble in the reverse order of disassembly.

### Assembly procedure

1. Measure the spring free length.

#### Components

<table>
<thead>
<tr>
<th>Number</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Retainer</td>
</tr>
<tr>
<td>2</td>
<td>Stopper plug</td>
</tr>
<tr>
<td>3</td>
<td>Pressure regulator valve spring</td>
</tr>
<tr>
<td>4</td>
<td>Pressure regulator valve</td>
</tr>
<tr>
<td>5</td>
<td>Retainer</td>
</tr>
<tr>
<td>6</td>
<td>Solenoid shift valve spring</td>
</tr>
<tr>
<td>7</td>
<td>Solenoid shift valve</td>
</tr>
<tr>
<td>8</td>
<td>Retainer</td>
</tr>
<tr>
<td>9</td>
<td>Converter relief valve spring</td>
</tr>
<tr>
<td>10</td>
<td>Converter relief valve</td>
</tr>
<tr>
<td>11</td>
<td>Retainer</td>
</tr>
<tr>
<td>12</td>
<td>Torque converter clutch valve spring</td>
</tr>
<tr>
<td>13</td>
<td>Torque converter clutch valve</td>
</tr>
<tr>
<td>14</td>
<td>Retainer</td>
</tr>
<tr>
<td>15</td>
<td>Bypass valve spring</td>
</tr>
<tr>
<td>16</td>
<td>Bypass valve</td>
</tr>
<tr>
<td>17</td>
<td>Retainer</td>
</tr>
<tr>
<td>18</td>
<td>3–4 shift valve spring</td>
</tr>
<tr>
<td>19</td>
<td>3–4 shift valve</td>
</tr>
</tbody>
</table>

---

**SHIFT VALVE LOCATIONS**

- Pressure regulator valve
- Solenoid shift valve
- Converter relief valve
- Bypass valve
- 3–4 shift valve

---

**B3E0517A150**
AUTOMATIC TRANAXLE

Primary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure regulator valve spring</td>
<td>7.9 (0.311)</td>
<td>36.3 (1.429)</td>
<td>13.2</td>
<td>0.9 (0.035)</td>
</tr>
<tr>
<td>Solenoid shift valve spring</td>
<td>8.3 (0.327)</td>
<td>35.1 (1.382)</td>
<td>12.0</td>
<td>0.6 (0.024)</td>
</tr>
<tr>
<td>Converter relief valve spring</td>
<td>9.0 (0.354)</td>
<td>42.5 (1.673)</td>
<td>14.2</td>
<td>1.3 (0.051)</td>
</tr>
<tr>
<td>Torque converter clutch control valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Bypass valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>3–4 shift valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
</tbody>
</table>

- If not as specified, replace the springs.

2. Install the 3–4 shift valve, 3–4 shift valve spring, and retainer.
3. Install the bypass valve, bypass valve spring, and retainer.
4. Install the torque converter clutch control valve, torque converter clutch control valve spring, and retainer.

5. Install the converter relief valve, converter relief valve spring, and retainer.

6. Install the solenoid shift valve, solenoid shift valve spring, and retainer.

7. Install the pressure regulator valve, pressure regulator valve spring, and retainer.
Primary Control Valve Body Assembly
1. Verify that all parts are clean and free of dust and other small particles.
2. Apply ATF to all parts.
3. Assemble in the reverse order of disassembly.

<table>
<thead>
<tr>
<th>1</th>
<th>Solenoid control valve body</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Tubular pin</td>
</tr>
<tr>
<td>3</td>
<td>Gasket C</td>
</tr>
<tr>
<td>4</td>
<td>Separator plate</td>
</tr>
<tr>
<td>5</td>
<td>Gasket D</td>
</tr>
<tr>
<td>6</td>
<td>Main control valve body</td>
</tr>
<tr>
<td>7</td>
<td>Pressure modifier accumulator spring</td>
</tr>
<tr>
<td>8</td>
<td>Pressure modifier accumulator</td>
</tr>
<tr>
<td>9</td>
<td>Tubular pin</td>
</tr>
<tr>
<td>10</td>
<td>Seal plate</td>
</tr>
<tr>
<td>11</td>
<td>Upper control valve body</td>
</tr>
<tr>
<td>12</td>
<td>Shift solenoid E</td>
</tr>
<tr>
<td>13</td>
<td>Shift solenoid D</td>
</tr>
<tr>
<td>14</td>
<td>Pressure control solenoid A</td>
</tr>
<tr>
<td>15</td>
<td>Shift solenoid C</td>
</tr>
<tr>
<td>16</td>
<td>Shift solenoid B</td>
</tr>
<tr>
<td>17</td>
<td>Shift solenoid A</td>
</tr>
<tr>
<td>18</td>
<td>Bracket</td>
</tr>
<tr>
<td>19</td>
<td>Packing</td>
</tr>
<tr>
<td>20</td>
<td>O-ring</td>
</tr>
<tr>
<td>21</td>
<td>Oil strainer</td>
</tr>
<tr>
<td>22</td>
<td>Transaxle fluid temperature sensor</td>
</tr>
</tbody>
</table>

7.8—10.8 N·m (80—110 kgf·cm, 69—95.5 in·lbf)
AUTOMATIC TRANSAXLE

Assembly procedure

1. Install the tubular pins into the solenoid control valve body.

   Caution
   • Do not confuse gaskets C and D.

2. Set the new gasket C, separator plate, and new gasket D on the solenoid control valve body.

3. Install the pressure modifier accumulator and pressure modifier accumulator spring into the main control valve body.

Primary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure modifier</td>
<td>11.0 (0.433)</td>
<td>23.0 (0.906)</td>
<td>6.6</td>
<td>1.5 (0.059)</td>
</tr>
<tr>
<td>accumulator spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Install the tubular pins into the main control valve body.

5. Set the main control valve body onto the solenoid control valve body.
6. Set the seal plate on the main control valve body.

7. Set the upper control valve body onto the main control valve body.

8. Hand-tighten the bolts shown in the figure. Each type of bolt has a different letter on its head. Match the bolt letter with the letter stamped next to its installation hole on the valve body.

<table>
<thead>
<tr>
<th>Identification mark</th>
<th>Length (measured from below the head) mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30 (1.181)</td>
</tr>
<tr>
<td>B</td>
<td>40 (1.575)</td>
</tr>
<tr>
<td>No mark</td>
<td>60 (2.362)</td>
</tr>
</tbody>
</table>

9. Tighten the bolts evenly and gradually in the order shown.

Tightening torque 7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}
10. Install the shift solenoid D, E, and pressure control solenoid A.

\[
\text{Tightening torque} \\
7.8—10.8 \text{ N·m} \\
(80—110 \text{ kgf·cm, } 69—95.5 \text{ in·lbf})
\]

11. Install the shift solenoid A, B, C.

12. Install the bracket.

\[
\text{Tightening torque} \\
7.8—10.8 \text{ N·m} \\
(80—110 \text{ kgf·cm, } 69—95.5 \text{ in·lbf})
\]

13. Install the packing.
14. Apply ATF to new O-ring and install it onto the oil strainer.
15. Install the oil strainer onto the main control valve body.

SECONDARY CONTROL VALVE BODY DISASSEMBLY/ASSEMBLY

Secondary Control Valve Body Disassembly

**Caution**
- Denting or scratching these components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them, be careful not to drop or hit them.

1. Disassemble in the order indicated in the table.
2. Neatly arrange the removed parts to avoid confusing the similar parts.

**Warning**
- Using compressed air can cause dirt and other particles to fly out, causing injury to the eyes. Wear protective eye wear whenever using compressed air.
3. Clean the removed parts with cleaning solvent, then use compressed air to dry them. Use compressed air to clean out all holes and passages.
Disassembly procedure

1. Remove the bracket.

2. Remove the pressure control solenoid B and shift solenoid F.

3. Remove the 4/5 accumulator plate.

4. Remove the 4/5 accumulator large spring, 4/5 accumulator small spring and 4/5 accumulator.
5. Loosen the bolts evenly in the pattern shown.

6. Remove the secondary lower control valve body.

7. Remove the gasket G, separator plate and gasket H.

8. Remove the tubular pins.
AUTOMATIC TRANSAAXLE

Secondary Main Control Valve Body Disassembly/Assembly

Caution
• Denting or scratching these precisely machined components will reduce the ability of the transaxle to shift properly. When handling these components or the valve body that contains them be careful not to drop or hit them.

Note
• If a valve does not slide out under its own weight, place the valve body open-side down and tap on the valve body lightly with a plastic hammer.

1. Disassemble in the order indicated in the table.

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

2. Clean all parts and holes using compressed air and apply ATF to them immediately before assembly.

3. Assemble in the reverse order of disassembly.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Retainer</td>
</tr>
<tr>
<td>2</td>
<td>4-5 shift valve spring</td>
</tr>
<tr>
<td>3</td>
<td>4-5 shift valve A</td>
</tr>
<tr>
<td>4</td>
<td>4-5 shift valve B</td>
</tr>
</tbody>
</table>

SHIFT VALVE LOCATIONS

4—5 SHIFT VALVE B
4—5 SHIFT VALVE A
AUTOMATIC TRANSAXLE

Assembly procedure
1. Measure the spring free length.

Secondary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–5 shift valve spring</td>
<td>8.7 (0.343)</td>
<td>27.0 (1.063)</td>
<td>10.7</td>
<td>0.8 (0.031)</td>
</tr>
</tbody>
</table>

- If not as specified, replace the springs.
2. Install the 4–5 shift valve B, 4–5 shift valve A, 4–5 shift valve spring and retainer.

Secondary Control Valve Body Assembly
1. Verify that all parts are clean and free of dust and other small particles.
2. Apply ATF to all parts.
3. Assemble in the reverse order of disassembly.

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Secondary main control valve body</td>
</tr>
<tr>
<td>2</td>
<td>Tubular pin</td>
</tr>
<tr>
<td>3</td>
<td>Gasket H</td>
</tr>
<tr>
<td>4</td>
<td>Separator plate</td>
</tr>
<tr>
<td>5</td>
<td>Gasket G</td>
</tr>
<tr>
<td>6</td>
<td>Secondary lower control valve body</td>
</tr>
<tr>
<td>7</td>
<td>4/5 accumulator</td>
</tr>
<tr>
<td>8</td>
<td>4/5 accumulator small spring</td>
</tr>
<tr>
<td>9</td>
<td>4/5 accumulator large spring</td>
</tr>
<tr>
<td>10</td>
<td>4/5 accumulator plate</td>
</tr>
<tr>
<td>11</td>
<td>Shift solenoid F</td>
</tr>
<tr>
<td>12</td>
<td>Pressure control solenoid B</td>
</tr>
<tr>
<td>13</td>
<td>Bracket</td>
</tr>
</tbody>
</table>

7.8—10.8 N·m (80—110 kgf·cm, 69—95.5 in·lbf)
AUTOMATIC TRANSMISSION

Assembly procedure

1. Install the tubular pins into the secondary main control valve body.

Caution
Do not confuse gaskets G and H.
2. Set the new gasket H, separator plate, and new gasket G on the secondary main control valve body.

3. Set the secondary lower control valve body onto the secondary main control valve body.

4. Tighten the bolts evenly and gradually in the order shown.

   Tightening torque
   7.8—10.8 N·m
   (80—110 kgf·cm, 69—95.5 in·lbf)

5. Measure the spring free length.
Secondary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter</th>
<th>Free length</th>
<th>No. of coils</th>
<th>Wire diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/5 accumulator large spring</td>
<td>21.2 (0.835)</td>
<td>72.2 (2.843)</td>
<td>14.0</td>
<td>2.6 (0.102)</td>
</tr>
<tr>
<td>4/5 accumulator small spring</td>
<td>15.2 (0.598)</td>
<td>53.7 (2.114)</td>
<td>11.9</td>
<td>3.2 (0.126)</td>
</tr>
</tbody>
</table>

- If not as specified, replace the springs.

6. Install the 4/5 accumulator, 4/5 accumulator small spring and 4/5 accumulator large spring.

7. Install the 4/5 accumulator plate.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

8. Install the shift solenoid F and pressure control solenoid B.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}

9. Install the bracket.

Tightening torque
7.8—10.8 N·m
{80—110 kgf·cm, 69—95.5 in·lbf}
Differential Disassembly

1. Perform the preinspection before disassembly. (See 05–17–115 Differential Preinspection.)
2. Disassemble in the order indicated in the table.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Side gear</td>
</tr>
<tr>
<td>2</td>
<td>Thrust washer</td>
</tr>
<tr>
<td>3</td>
<td>Roll pin</td>
</tr>
<tr>
<td>4</td>
<td>Pinion shaft</td>
</tr>
<tr>
<td>5</td>
<td>Pinion gear</td>
</tr>
<tr>
<td>6</td>
<td>Thrust washer</td>
</tr>
<tr>
<td>7</td>
<td>Bearings</td>
</tr>
<tr>
<td>8</td>
<td>Ring gear</td>
</tr>
<tr>
<td>9</td>
<td>Gear case</td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
</tr>
</tbody>
</table>

Roll pin disassembly note

1. Place the gear case in a vise.
2. Insert a 2.0 mm (0.07 in) punch into the roll pin hole from the ring gear side, and remove the roll pin.

Bearings disassembly note

1. Remove the bearing (speedometer drive gear side) from the gear case using the SSTs.
2. Remove the bearing (ring gear side) from the gear case using the SST.

Differential Assembly
1. Assemble in the reverse order of disassembly.

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gear case</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ring gear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sensor rotor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bearings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Thrust washer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pinion gear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Pinion shaft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Roll pin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Thrust washer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Side gear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

152—176.4 N·m (15.5—17.9 kgf·m, 112—130 ft·lbf)
AUTOMATIC TRANAXLE

Assembly Procedure
1. Install the ring gear to the gear case.

2. Tighten the bolts evenly and gradually in the order shown. (bolt fixed type)

   **Tightening torque**
   152—176.4 N·m
   (15.5—17.9 kgf·m, 112—130 ft·lbf)

   **Note**
   - If the gear case has been newly replaced perform Step (3).

3. Install the sensor rotor to the gear case using the SST and suitable plate.

4. Install a new bearing.
   (1) Press the new bearing (sensor rotor side) onto the gear case using the SST.
   (2) Press on the other new bearing (ring gear side) in the same manner.

5. Apply ATF to the thrust washers and pinion shaft.
6. Install the pinion gear and thrust washers into the gear case.
7. Install the pinion shaft.

8. Install the roll pin, and crimp it to prevent it from coming out of the gear case.
9. Apply ATF to the thrust washers.
10. Install the thrust washers and side gears into the gear case, then turn the side gears and align them with the drive shaft holes.

11. Measure the backlash of the side gears as follows:
   (1) Install the left and right drive shafts in the differential.
   (2) Support the drive shafts on V-blocks.
   (3) Measure the backlash of both side gears.

   **Differential backlash**
   - Standard: 0.05—0.15 mm (0.002—0.005 in)
   - Maximum: 0.5 mm (0.020 in)

   • If not as specified, replace the differential.
DIFFERENTIAL BEARING PRELOAD

1. Remove the bearing race and adjustment shim from the converter housing using the SST.

2. Install the bearing race into the transaxle case.

3. Set the differential on the transaxle case.

4. Install the bearing race removed in Step 1 into the SST.

5. Set the differential on the SST (selector).
6. Turn the selector to eliminate the gap between its two halves.

7. Set the six SSTs (collars) on the transaxle case in the position shown.

8. Set the converter housing on the transaxle case and tighten the SSTs (bolts) to the specified torque.

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

9. Turn the SST (selector) to increase the clearance (arrow) using the SSTs (bars), until it no longer turns. This is to seat the bearing race.

10. Turn the selector in the opposite direction until the preload is eliminated (gap is reduced).

11. Insert the SST through the converter housing and attach it to the pinion shaft.

12. Install the SST and a pull scale or torque wrench.

   Note
   • Read the preload when the differential starts to turn.
   • Measure several times and calculate the average value.
13. Adjust the clearance of the SST (selector) to obtain the specified preload/pull scale reading.

**Differential bearing Preload**
- Preload: 1.4—2.3 N·m (14—24 kgf·cm, 12—20 in·lbf)
- Reading on pull scale: 14—23 N (1.4—2.4 kgf, 3.1—5.3 lbf)

**Note**
- Measure the clearance around the entire circumference, and select a shim based on the maximum clearance.
- The maximum allowable number of adjustment shim is one.

14. Measure the clearance as shown.
15. Take the maximum reading and determine the shim to be used.

**Differential preload adjust shims (mm [in])**

<table>
<thead>
<tr>
<th>Shims</th>
<th>(mm)</th>
<th>(in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50</td>
<td>(0.020)</td>
<td>0.55 (0.022)</td>
</tr>
<tr>
<td>0.65</td>
<td>(0.026)</td>
<td>0.70 (0.028)</td>
</tr>
<tr>
<td>0.80</td>
<td>(0.031)</td>
<td>0.85 (0.033)</td>
</tr>
<tr>
<td>0.95</td>
<td>(0.037)</td>
<td>1.00 (0.039)</td>
</tr>
<tr>
<td>1.10</td>
<td>(0.043)</td>
<td>1.15 (0.045)</td>
</tr>
<tr>
<td>1.25</td>
<td>(0.049)</td>
<td>1.30 (0.051)</td>
</tr>
<tr>
<td>1.40</td>
<td>(0.055)</td>
<td>1.45 (0.057)</td>
</tr>
<tr>
<td>1.55</td>
<td>(0.061)</td>
<td>--</td>
</tr>
</tbody>
</table>

16. Remove the converter housing and SST (selector).
17. Install the required adjustment shim and tap the bearing race into the converter housing.

18. Install the converter housing.

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

19. Install the SST to the pinion shaft through the converter housing.

Note
• Measure several times and calculate the average value.

20. Verify that the preload is within the specification. If not, return to Step 1.

Differential bearing Preload
Preload: 1.4—2.3 N·m (14—24 kgf·cm, 12—20 in·lbf)
Reading on pull scale: 14—23 N (1.4—2.4 kgf, 3.1—5.3 lbf)

21. Remove the converter housing.

AUTOMATIC TRANSAXLE ASSEMBLY

Precaution
General notes
1. Select the adjustment shims, referring to Bearing Preload.
2. If the drive plates or 2-4 brake band are replaced with new ones, soak the new part in ATF for at least two hours before installation.
3. Before assembly, apply ATF to all seal rings, rotating parts, O-rings, and sliding parts.
4. All O-rings, seals, and gaskets must be replaced with the new ones included in the overhaul kit.
5. Use petroleum jelly, not grease, when assembling again.
6. When it is necessary to replace a bushing, replace the subassembly that includes that bushing.
7. Assemble the housing within 10 minutes after applying sealant, and allow it to cure for at least 30 minutes after assembly before filling the transaxle with ATF.

Warning
• Although the stand has a self-locking brake system, there is a possibility that the brake may not hold when the transaxle is held in a lopsided position on the stand. This would cause the transaxle to turn suddenly, causing serious injury. Never keep the transaxle tilted to one side. Always hold the rotating handle firmly when turning the transaxle.
Assembly
Bearing and race locations

Note
- The bearing and race at locations 3, 4, 5, 6 and 7 are one-piece units.
### OUTER DIAMETER OF BEARING AND RACE

<table>
<thead>
<tr>
<th>Components</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing (mm (in))</td>
<td>—</td>
<td>40.0</td>
<td>39.0</td>
<td>78.2</td>
<td>52.0</td>
<td>50.0</td>
<td>46.5</td>
<td>—</td>
<td>61.0</td>
</tr>
<tr>
<td>Race (mm (in))</td>
<td>40.2</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>59.0</td>
<td>—</td>
</tr>
</tbody>
</table>

### COMPONENTS

1. Converter housing
2. Oil seal
3. Adjustment shim
4. Bearing race
5. Bearing

\[ \text{DIE517ZA0081} \]
THE AUTOMATIC TRANSAXLE

**Components:***
1. Transaxle case
2. Oil seal
3. Oil pipe
4. Bearing race
5. Primary gear
6. Forward clutch hub
7. Forward clutch
8. Reduction brake piston
9. Springs and retainer component
10. Snap ring
11. Reduction brake
12. Snap ring
13. Spacer
14. Needle bearing
15. Seal rings
16. Needle bearing

**Specifications:**

- **Torque Specification:**
  - 10.8—13.7 N·m (110—140 kgf-cm, 95.5—121 in-lbf)
  - 11—14 N·m (113—142 kgf-cm, 98—123 in-lbf)
  - 19—25 N·m (1.9—2.6, 14—18)

**Dimensions:**

- **D6E517ZA5082**
### AUTOMATIC TRANSAXLE

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>One-way clutch No.2</td>
</tr>
<tr>
<td>18</td>
<td>Direct clutch component</td>
</tr>
<tr>
<td>19</td>
<td>Secondary sun gear</td>
</tr>
<tr>
<td>20</td>
<td>Output gear component</td>
</tr>
<tr>
<td>21</td>
<td>Bearing race</td>
</tr>
<tr>
<td>22</td>
<td>Needle bearing</td>
</tr>
<tr>
<td>23</td>
<td>Pawl return spring</td>
</tr>
<tr>
<td>24</td>
<td>Parking pawl</td>
</tr>
<tr>
<td>25</td>
<td>Parking pawl shaft</td>
</tr>
<tr>
<td>26</td>
<td>Support actuator</td>
</tr>
<tr>
<td>27</td>
<td>Actuator plate</td>
</tr>
<tr>
<td>28</td>
<td>Differential</td>
</tr>
<tr>
<td>29</td>
<td>Parking rod lever component</td>
</tr>
<tr>
<td>30</td>
<td>Band servo</td>
</tr>
<tr>
<td>31</td>
<td>Forward accumulator</td>
</tr>
<tr>
<td>32</td>
<td>Servo apply accumulator</td>
</tr>
<tr>
<td>33</td>
<td>Manual shaft</td>
</tr>
</tbody>
</table>

![Diagram of automatic transaxle components]

**Notes:**
- Selective: 37—52 (3.8—5.3, 28—38)
- N·m (kgf·m, ft·lbf)

**Part Numbers:**
- D6E172A5083
1. Low and reverse brake piston
2. Low and reverse brake return spring
3. One-way clutch inner race
4. Snap ring
5. Low and reverse brake
6. Snap ring
7. Distance piece
8. Bearing
9. Lock nut
10. Front internal gear and one-way clutch No.1

11. Front planetary gear component
12. Needle bearing
13. Front sun gear
14. Needle bearing
15. Rear planetary gear component
16. Snap ring
17. Clutch component
18. Needle bearing
19. 2–4 brake band
20. Band strut

1 Bearing race
2 End cover
3 Thrust washer
4 Oil pump
Assembly procedure

1. Measure the bushing of the front sun gear.
   Front sun gear bushing inner diameter
   Standard: 18.000—18.018 mm (0.70866—0.70936 in)
   Maximum: 18.038 mm (0.71016 in)
   If not as specified, replace the front sun gear.

2. Measure the bushing of the end cover.
   End cover bushing inner diameter
   Standard: 23.600—23.621 mm (0.92913—0.92995 in)
   Maximum: 23.641 mm (0.93075 in)
   If not as specified, replace the end cover.

3. Measure the bushing of the secondary sun gear.
   Secondary sun gear bushing inner diameter
   Standard: 26.000—26.021 mm (1.02362—1.02445 in)
   Maximum: 26.041 mm (1.02524 in)
   If not as specified, replace the secondary sun gear.

4. Assemble the SST.
8. Lift the transaxle case and mount it on the **SST**.

**Note**
- If the transaxle case has been newly replaced perform step (9).

9. Install the oil pipe.

10. Install the bearing race, then tighten torx screws.

**Tightening torque**
10.8—13.7 N·m
(110—140 kgf·cm, 95.5—121 in-lbf)

11. Install the bearing race to the transaxle case.

12. Install the locknut.
(1) Set the primary gear.
(2) Set the distance piece and bearing.

(3) Loosely tighten the locknut.

(4) Set the SSTs in the order shown.

(5) Tighten the locknut from the end cover side to adjust the preload within the specification.

Primary gear preload
0.50—0.90 N-m (5.10—9.17 kgf-cm, 4.42—7.96 in-lbf)
(6) Stake the locknut.
(7) Remove the SST.

13. Install the front internal gear and one-way clutch.
14. Apply petroleum jelly to the bearing, and secure it to the front planetary gear component.

15. Install the front planetary gear component.
16. Apply petroleum jelly to the bearing, and secure it to the front sun gear.

17. Install the front sun gear.
18. Install the rear planetary gear.

**Note**
- Rotate the engine stand so that the oil pan faces downward. Pull the front internal gear and one-way clutch component a little until the groove for the snap ring appears, then install the snap ring.

19. Install the snap ring.
20. Rotate the engine stand so that the end cover faces upward, and verify that the snap ring is installed accurately.

21. Install the band servo component.
   (1) Install the servo return spring and servo piston.
   (2) Apply ATF to the O-ring, and install it to the transaxle case.
   (3) Install the servo retainer.

   **Tightening torque**
   11—14 N·m (113—142 kgf-cm, 98—123 in-lbf)

22. Apply petroleum jelly to the bearing, and secure it to the clutch component.
23. Install the clutch component.

24. Install the 2-4 brake band.

25. Select the band strut.
   (1) Find an appropriate bolt (under head length: 60—70 mm (2.36—2.75 in)), and tighten the 2-4 brake band with the bolt.

   Tightening torque
   4.9 N·m (50 kgf·cm, 43 in·lbf)

   (2) Measure the dimension A shown in the figure.
   (3) Remove the bolt.

   (4) Measure the dimension B shown in the figure.
   (5) Calculate according to the formula below:

   \[ B - A = C \] (The middle of the under head length)
   \[ C - 4 = D \] (The lower limit of under head length)
   \[ C - 4.7 = E \] (The upper limit of under head length)

   (6) Select a band strut whose length should be between D and E.
Band strut length for 2-4 brake band servo stroke (mm (in))

| 36.0 (1.417) | 36.5 (1.437) | 37.0 (1.457) |
| 37.25 (1.467) | 37.5 (1.476) | 37.75 (1.486) |
| 38.0 (1.496) | 38.25 (1.506) | 38.5 (1.516) |
| 39.0 (1.535) | – | – |

7. Install the selected band strut.

Tightening torque
37—52 N·m (3.8—5.3 kgf·m, 28—38 ft·lbf)

26. Use the following procedure to adjust the total end play.

1. Install the thickest bearing race (2.6 mm (0.102 in)) to the end cover.
2. Install the end cover to the clutch component.
3. Measure the clearance A between transaxle case and end cover.
4. Calculate according to the formulas below.
   - Select an appropriate bearing race whose bearing thickness matches the calculated limits.
   - \[ A – 2.6 \text{ mm (0.102)} = B \]
   - \[ B – 0.25 = C \] (The lower limit of bearing thickness)
   - \[ B – 0.50 = D \] (The upper limit of bearing thickness)
5. Select a bearing race whose thickness is between D mm (in) and C mm (in).
6. Remove the end cover, apply petroleum jelly to the selected bearing race, then install it to the end cover.
27. Apply ATF to new seal ring, and install it to the end cover.

**Seal ring inner diameter**
- A: 47.1 mm (1.854 in)
- B: 55.8 mm (2.197 in)

28. Apply a light coat of silicone sealant to the contact surfaces of the transaxle case and the end cover.

29. Apply ATF to the O-ring and install it to the transaxle case.

30. Install the end cover to the transaxle case.

**Tightening torque**
- 19—25 N·m (1.9—2.6 kgf·m, 14—18 ft·lbf)

31. Install the reduction brake to the transaxle case.
(See 05–17–46 REDUCTION BRAKE DIASSEMBLY/ASSEMBLY.)

**Note**
- If the transaxle case has been newly replaced perform Step (32).

32. Install the needle bearing using the SST as shown in the figure.

33. Install the spacer and one-way clutch No.2 to the transaxle case.

34. Apply ATF to new seal ring, and install it to the transaxle case.

35. Apply petroleum jelly to the needle bearing, and secure it to the transaxle case.
36. Install the direct clutch component to the transaxle case.

37. Install the secondary sun gear.

38. Install the output gear component.
39. Install the bearing race to the output gear component.
40. Apply petroleum jelly to the needle bearing, and secure it to the output gear component.

41. Use the following procedure to adjust the total end play.
   (1) Measure clearance A between the installation surface and the hole depth of the converter housing.
   (2) Install the bearing to the output gear component.
   (3) Measure clearance B between the converter housing installation surface and the bearing.
   (4) Calculate the total end play according to the following formula:
       step (1) value – step (3) value = total end play.
   (5) select the snap ring.
AUTOMATIC TRANSAXLE

Adjust shim size for output gear component total end play

<table>
<thead>
<tr>
<th>total end play (in)</th>
<th>Adjust shims sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.431—1.481 (0.057—0.058)</td>
<td>1.20 (0.047)</td>
</tr>
<tr>
<td>1.381—1.431 (0.055—0.056)</td>
<td>1.15 (0.045)</td>
</tr>
<tr>
<td>1.331—1.381 (0.053—0.054)</td>
<td>1.10 (0.043)</td>
</tr>
<tr>
<td>1.281—1.331 (0.051—0.052)</td>
<td>1.05 (0.041)</td>
</tr>
<tr>
<td>1.231—1.281 (0.049—0.050)</td>
<td>1.00 (0.039)</td>
</tr>
<tr>
<td>1.181—1.231 (0.047—0.048)</td>
<td>0.95 (0.037)</td>
</tr>
<tr>
<td>1.131—1.181 (0.045—0.046)</td>
<td>0.90 (0.035)</td>
</tr>
<tr>
<td>1.081—1.131 (0.043—0.044)</td>
<td>0.85 (0.033)</td>
</tr>
<tr>
<td>1.031—1.081 (0.041—0.042)</td>
<td>0.80 (0.031)</td>
</tr>
<tr>
<td>0.981—1.031 (0.039—0.040)</td>
<td>0.75 (0.029)</td>
</tr>
<tr>
<td>0.931—0.981 (0.037—0.038)</td>
<td>0.70 (0.028)</td>
</tr>
<tr>
<td>0.881—0.931 (0.035—0.036)</td>
<td>0.65 (0.027)</td>
</tr>
<tr>
<td>0.831—0.881 (0.033—0.034)</td>
<td>0.60 (0.024)</td>
</tr>
<tr>
<td>0.781—0.831 (0.031—0.032)</td>
<td>0.55 (0.022)</td>
</tr>
<tr>
<td>0.731—0.781 (0.029—0.030)</td>
<td>0.50 (0.020)</td>
</tr>
</tbody>
</table>

(6) Install the selected adjustment shim to the converter housing.

42. Install the bearing using the 
SST
as shown in the figure.

Press-in force
8.8 kN (897 kgf, 1978 lbf)

43. Install the pawl return spring to the transaxle case.

44. Install the packing pawl and parking pawl shaft to the transaxle case.
45. Install the pawl return spring to the parking pawl and parking pawl shaft.

46. Install the support plate to the transaxle case.

47. Install the actuator plate to the transaxle case.

* Tightening torque
  11—14 N·m
  \(113—142 \text{ kgf·cm, } 98—123 \text{ in·lbf}\)

48. Install the differential.
49. Install the forward clutch hub.

50. Install the forward clutch component.
51. Apply a light coat of silicone sealant to the contact surfaces of the converter housing and the transaxle case.

52. Install the converter housing.

   **Tightening torque**
   19—25 N·m
   \(1.9—2.6 \text{ kgf-m, 14—18 ft-lbf}\)

53. Install the SST into the differential side gears.

54. Apply ATF to the new O-ring and install it to the oil pump.

55. Install the oil pump.

   **Tightening torque**
   19—25 N·m
   \(1.9—2.6 \text{ kgf-m, 14—18 ft-lbf}\)

56. Install the parking rod lever component.

   **Tightening torque**
   19—25 N·m
   \(1.9—2.6 \text{ kgf-m, 14—18 ft-lbf}\)
57. Apply ATF to the new O-ring and install it to the manual shaft.
58. Install the manual shaft.
   (1) Install the manual shaft to the manual plate and detent bracket component.
   (2) Install the knock pin.
59. Install the accumulator component.
60. Install the coupler component.

**Caution**
- Make sure that the head of the manual valve and the parking rod are assembled properly. If they are not, the ranges cannot be changed.

61. Install the primary control valve body.

**Tightening torque**
- 7.8—10.8 N·m
  - (80—110 kgf·cm, 69—95.5 in-lbf)

**Bolt length (measured from below the head)**
- B: 40 mm (1.575 in)
- No mark: 70 mm (2.756 in)

62. Apply ATF to the new O-ring and install it to the oil strainer.

63. Install the oil strainer.

64. Match the harness colors, then connect the solenoid connector and TFT sensor.

<table>
<thead>
<tr>
<th>Solenoid valve</th>
<th>Color of connector (harness side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure control solenoid A</td>
<td>Black</td>
</tr>
<tr>
<td>Shift solenoid A</td>
<td>White</td>
</tr>
<tr>
<td>Shift solenoid B</td>
<td>Blue</td>
</tr>
<tr>
<td>Shift solenoid C</td>
<td>Green</td>
</tr>
<tr>
<td>Shift solenoid D</td>
<td>White</td>
</tr>
<tr>
<td>Shift solenoid E</td>
<td>Black</td>
</tr>
</tbody>
</table>
65. Install the ground.

**Tightening torque**
- \( 7.8 - 10.8 \text{ N·m} \)
- \( \{80 - 110 \text{ kgf·cm, } 69 - 95.5 \text{ in·lbf}\} \)

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

**Caution**
- Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.
- If any old sealant gets into the transaxle during installation of the oil pan, trouble may occur in the transaxle case and oil pan, and clean with cleaning fluids.

66. Apply a light coat of silicone sealant to the contact surfaces of oil pan and transaxle case.

67. Install the oil pan.

**Tightening torque**
- \( 6 - 8 \text{ N·m} \)
- \( \{62 - 81 \text{ kgf·cm, } 54 - 70 \text{ in·lbf}\} \)

68. Apply ATF to the new O-ring and install it to the transaxle case.

69. Install the tubular pins.

70. Install the coupler component.

71. Install the secondary control valve body and ground.

**Tightening torque**
- \( 7.8 - 10.8 \text{ N·m} \)
- \( \{80 - 110 \text{ kgf·cm, } 69 - 95.5 \text{ in·lbf}\} \)

**Bolt length (measured from below the head)**
- B: 40 mm (1.575 in)
- C: 50 mm (1.969 in)
AUTOMATIC TRANAXLE

72. Match the harness colors, then connect the solenoid connector.

<table>
<thead>
<tr>
<th>Solenoid valve</th>
<th>Color of connector (harness side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure control solenoid B</td>
<td>White</td>
</tr>
<tr>
<td>Shift solenoid F</td>
<td>Black</td>
</tr>
</tbody>
</table>

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

**Caution**
- Clean the transaxle exterior thoroughly with a steam cleaner or cleaning solvents before removal.
- If any old sealant gets into the transaxle during installation of the oil cover, trouble may occur in the transaxle case and oil pan, and clean with cleaning fluids.

73. Apply a light coat of silicone sealant to the contact surfaces of oil cover and transaxle case.

74. Install the oil cover.

**Tightening torque**
- 7.8—10.8 N·m
  - (80—110 kgf·cm, 69—95.5 in·lbf)

75. Install the oil pipe and connector bolt.

**Tightening torque**
- 24—35 N·m
  - (2.4—3.6 kgf·cm, 18—26 in·lbf)

76. Install the connector pipe.

**Tightening torque**
- 24—35 N·m
  - (2.4—3.6 kgf·cm, 18—26 in·lbf)

77. Apply ATF to the new O-ring and install it to the intermediate sensor.

78. Install the intermediate sensor.

**Tightening torque**
- 8—11 N·m
  - (82—112 kgf·cm, 71—97 in·lbf)

79. Apply ATF to the new O-ring and install it to the vehicle speed sensor.

80. Install the vehicle speed sensor.

**Tightening torque**
- 8—11 N·m
  - (82—112 kgf·cm, 71—97 in·lbf)

81. Apply ATF to the new O-ring and install it to the input/turbine speed sensor.

82. Install the oil pressure switch.

**Tightening torque**
- 17.1—22.1 N·m
  - (1.75—2.25 kgf·m, 12.7—16.2 ft·lbf)

83. Install the input/turbine speed sensor.

**Tightening torque**
- 8—11 N·m
  - (82—112 kgf·cm, 71—97 in·lbf)
84. Install the transaxle range switch.
   (1) Rotate the manual shaft to the N position.

   (2) Turn the protrusion a resistance between the terminals B and C become 750 ohms.

   (3) Install the TR switch while aligning the protrusion and groove as shown.
   (4) Hand-tighten the TR switch mounting bolts.
(5) Inspect the resistance between the terminals B and C.
   - If not as specified, readjust the TR switch.

**Resistance**

750 ohms

(6) Tighten the TR switch mounting bolts

**Tightening torque**

8—11 N·m

(8—112 kgf·cm, 71—97 in·lbf)

**Caution**

- Do not use an impact wrench. Hold the manual shaft lever when removing the manual shaft nut, or the transaxle may be damaged.

(7) Install the manual shaft lever and the washer.

(8) Set the adjustable wrench as shown to hold the manual shaft lever, and tighten the manual shaft nut.

**Tightening torque**

32—46 N·m

(3.2—4.7 kgf·m, 24—33 ft·lbf)

85. Remove the transaxle from the SST.
86. Apply ATF to the new O-ring and install it to the oil filler tube.
87. Install the oil dipstick and oil filler tube to the transaxle.

**Tightening torque**

7.8—10.8 N·m

(80—110 kgf·cm, 69—95.5 in·lbf)

88. Drain any ATF remaining in the torque converter.
89. Pour in solvent (approx. 0.5 L (0.53 US qt, 0.44 imp qt)),
90. Shake the torque converter to clean the inside.
91. Pour out the solvent.
92. Pour the ATF.
93. Install the torque converter by aligning its gap to the oil pump inner rotor gap as shown in the figure.

94. To ensure that the torque converter is installed accurately, measure distance A between the end of the torque converter and the end of the converter housing.

Between the end of the torque converter and the end of the converter housing
Distance A: 21.4 mm (0.84 in)

**AUTOMATIC TRANSAXLE INSPECTION**

**Torque Converter Inspection**

1. Inspect the outer surface of the torque converter for damage or cracks, and replace it if necessary.
2. Inspect for rust on the pilot hub of the torque converter or on the boss. If there is any, remove the rust completely.

**Oil Pump Preinspection**

1. Measure the bushing of the oil pump.

   **Oil Pump bushing inner diameter torque converter side**
   Standard: 40.015—40.040 mm (1.57539—1.57637 in)
   Maximum: 40.060 mm (1.57716 in)

   **Oil Pump bushing inner diameter forward clutch side**
   Standard: 19.000—19.021 mm (0.74803—0.74885 in)
   Maximum: 19.041 mm (0.74964 in)

2. If not as specified, replace the oil pump housing and oil pump cover. (See 05–17–18 OIL PUMP DISASSEMBLY/ASSEMBLY.)
AUTOMATIC TRANSAXLE

Forward Clutch Preinspection

Clutch operation

1. Set the forward clutch onto the oil pump.

   Caution
   - Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.
   Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the clutch operation by applying compressed air through the fluid passages shown.

   Air pressure
   392 kPa (4.0 kgf/cm², 57 psi) max.

3. If not as specified, replace parts as necessary.
   (See 05–17–21 FORWARD CLUTCH DISASSEMBLY/ASSEMBLY.)

Clutch clearance

1. Measure the forward clutch clearance.
   (1) Install the forward clutch in the oil pump, and set the dial gauge.
   (2) Secure the forward clutch by lightly pressing down with a press, etc.
   (3) Apply compressed air to the part indicated in the figure and let the forward clutch piston stroke three times.

   Air pressure
   392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

   (4) Apply compressed air and operate the forward clutch piston. Read the value when the indicator of the dial gauge stops.
   (5) Release the compressed air and read the dial gauge when the forward clutch piston is not operating.
(6) Calculate the forward clutch clearance according to the following formula:
Step (4) value – Step (5) value = Forward clutch clearance.

(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6).
Verify that the average value is within the specification below.

Forward clutch clearance
1.50—1.80 mm (0.059—0.071 in)

2. If not as specified, replace parts as necessary.
(See 05–17–21 FORWARD CLUTCH DISASSEMBLY/ASSEMBLY.)

Clutch Component Preinspection
Clutch operation
1. Set the clutch component onto the end cover.

Caution
• Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.
  Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the clutch operation by applying compressed air as shown.

Air Pressure
392 kPa (4.0 kgf/cm², 57 psi) max.

3. If not as specified, replace parts as necessary.
(See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)
Reverse clutch clearance
1. Measure the reverse clutch clearance.
   (1) Install the reverse clutch into the end cover, and set the dial gauge.
   (2) Secure the reverse clutch by lightly pressing down with a press, etc.
   (3) Apply compressed air to the part indicated in the figure and let the reverse clutch piston stroke three times.

**Air Pressure**
392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

(4) Apply compressed air and operate the reverse clutch piston. Read the value when the indicator of the dial gauge stops.
(5) Release the compressed air and read the dial gauge when the reverse clutch piston is not operating.
(6) Calculate the reverse clutch clearance according to the following formula: Step (4) value – Step (5) value = Reverse clutch clearance.
(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

**Reverse clutch clearance**
1.00—1.30 mm (0.039—0.051 in)

2. If not as specified, replace parts as necessary.
   (See 05–17–25 CLUTCH COMPONENT DISASSEMBLY/ASSEMBLY.)

3-4 clutch clearance
1. Measure the 3-4 clutch clearance.
   (1) Install the 3-4 clutch in the end cover and set the dial gauge.
   (2) Secure the 3-4 clutch by lightly pressing down with a press, etc.
(3) Apply compressed air to the part indicated in
the figure and let the 3-4 clutch piston stroke
three times.

Air pressure
392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

(4) Apply compressed air and operate the 3-4
clutch piston. Read the value when the
indicator of the dial gauge stops.

(5) Release the compressed air and read the dial
gauge when the 3-4 clutch piston is not
operating.

(6) Calculate the 3-4 clutch clearance according
to the following formula:
Step (4) value – Step (5) value = 3-4 clutch clearance.

(7) Measure the clearances at four locations (90°
apart) by following the steps from (3) to (6).
Verify that the average value is within the
specification below.

3-4 clutch clearance
1.10—1.40 mm (0.043—0.055 in)

2. If not as specified, replace parts as necessary.
(See 05—17—25 CLUTCH COMPONENT
DISASSEMBLY/ASSEMBLY.)

Bushing inner diameter inspection
1. Measure the bushing of the 3-4 clutch hub.

3-4 clutch hub bushing inner diameter
Standard: 18.000—18.018 mm (0.70866—
0.70936 in)
Maximum: 18.038 mm (0.71016 in)

2. If not as specified, replace the 3-4 clutch hub.
(See 05—17—25 CLUTCH COMPONENT
DISASSEMBLY/ASSEMBLY.)

3. Measure the bushing of the 2-4 brake drum.

2-4 brake drum bushing inner diameter
Standard: 55.005—55.030 mm (2.16555—
2.16833 in)
Maximum: 55.050 mm (2.16732 in)

4. If not as specified, replace the 2-4 brake drum.
(See 05—17—25 CLUTCH COMPONENT
DISASSEMBLY/ASSEMBLY.)
AUTOMATIC TRANSAXLE

Front Internal Gear and One-Way Clutch No.1 Component Preinspection

1. Set the front internal gear and one-way clutch No.1 component to the one-way clutch inner race. Verify that the one-way clutch rotates smoothly when turned counterclockwise and locks when turned clockwise.
2. If not as specified, replace parts as necessary. (See 05–17–34 FRONT INTERNAL GEAR ONE-WAY CLUTCH NO.1 COMPONENT DISASSEMBLY/ASSEMBLY.)

Low and Reverse Brake Preinspection

Brake operation

Caution
- Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.
- Do not apply compressed air for more than the aforementioned time when testing the system.

1. Inspect the brake operation by applying compressed air as shown.

Air pressure
392 kPa (4.0 kgf/cm², 57 psi) max.

2. If not as specified, replace parts as necessary. (See 05–17–37 LOW AND REVERSE BRAKE AND ONE-WAY CLUTCH INNER RACE DISASSEMBLY/ASSEMBLY.)

Brake clearance

1. Measure the low and reverse brake clearance.
   (1) Set the dial gauge to the low and reverse brake.
   (2) Set the measuring point of the dial gauge to the low and reverse brake piston.
AUTOMATIC TRANSAXLE

(3) Apply compressed air to the part indicated in the figure and let the low and reverse brake piston stroke three times.

Air pressure
98.1 kPa (1.0 kgf/cm², 14 psi)

(4) Apply compressed air and operate the low and reverse brake piston. Read the value when the indicator of the dial gauge stops.

(5) Release the compressed air and read the dial gauge when the low and reverse brake piston is not operating.

(6) Calculate the low and reverse brake clearance according to the following formula:
Step (4) value – Step (5) value = low and reverse brake clearance.

(7) Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below:

Low and reverse brake clearance
2.20—2.50 mm (0.087—0.098 in)

2. If not as specified, replace parts as necessary.
(See 05–17–37 LOW AND REVERSE BRAKE AND ONE-WAY CLUTCH INNER RACE DISASSEMBLY/ASSEMBLY.)

One-Way Clutch No.2 Component
Preinspection

1. Set the one-way clutch No.2 component and direct clutch to the transaxle case. Verify that the one-way clutch rotates smoothly when turned counterclockwise and locks when turned clockwise.

2. If not as specified, replace parts as necessary.
Direct Clutch Preinspection

Clutch operation
1. Set the direct clutch drum onto the transaxle case.

Caution
• Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.
Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the clutch operation by applying compressed air as shown.

Air pressure
392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)

3. If not as specified, replace parts as necessary.
(See 05–17–41 DIRECT CLUTCH DISASSEMBLY/ASSEMBLY.)

Clutch clearance
Measure the direct clutch clearance.
1. Install the direct clutch in the transaxle case, and set the dial gauge.
2. Secure the direct clutch by lightly pressing down with a press or similar tool.

3. Apply compressed air to the part indicated in the figure and let the direct clutch piston stroke three times.

Air pressure
392—441 kPa (4.0—4.5 kgf/cm², 57—63 psi)
AUTOMATIC TRANSMISSION

4. Apply compressed air and operate the direct clutch piston. Read the value when the indicator of the dial gauge stops.
5. Release the compressed air and read the dial gauge when the direct clutch piston is not operating.
6. Calculate the direct clutch clearance according to the following formula:
   step (4) value – step (5) value = direct clutch clearance.
7. Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

   Direct clutch clearance
   Standard: 1.10—1.40 mm (0.043—0.055 in)

8. If not as specified, replace parts as necessary.
   (See 05–17–41 DIRECT CLUTCH DISASSEMBLY/ASSEMBLY.)

Reduction Brake Preinspection
Brake operation
1. Set the direct clutch drum onto the transaxle case.

   Caution
   • Applying compressed air to the assembled clutch pack for longer than 3 s at a time will damage the seal.
   Do not apply compressed air for more than the aforementioned time when testing the system.

2. Inspect the brake operation by applying compressed air as shown.

   Air pressure
   392 kPa (4.0 kgf/cm², 57 psi) max.

3. If not as specified, replace parts as necessary.
   (See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ASSEMBLY.)
Brake clearance
Measure the reduction brake clearance.
1. Set the dial gauge to the reduction brake.
2. Set the measuring point of the dial gauge to the retaining plate.
3. Apply compressed air to the part indicated in the figure and let the reduction brake piston stroke three times.

   **Air pressure**
   392 kPa (4.0 kgf/cm², 57 psi) max.

4. Apply compressed air and operate the reduction brake piston. Read the value when the indicator of the dial gauge stops.
5. Release the compressed air and read the dial gauge when the reduction brake piston is not operating.
6. Calculate the reduction brake clearance according to the following formula:
   Step (4) value—Step (5) value = reduction brake clearance.
7. Measure the clearances at four locations (90° apart) by following the steps from (3) to (6). Verify that the average value is within the specification below.

   **Reduction brake clearance**
   1.50—1.80 mm (0.059—0.070 in)
8. If not as specified, replace parts as necessary. (See 05–17–46 REDUCTION BRAKE DISASSEMBLY/ASSEMBLY.)

Differential Preinspection
Backlash
1. Measure the backlash of the side gear.

   **Differential backlash**
   Standard: 0.05—0.15 mm (0.002—0.005 in)
   Maximum: 0.5 mm (0.020 in)
2. If not specified, replace the differential. (See 05–17–75 DIFFERENTIAL DISASSEMBLY/ASSEMBLY.)
### TECHNICAL DATA

#### TRANSMISSION/TRANSAXLE

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
</table>
| Clearance between the end of the oil pump housing and the outer rotor and inner rotor | Standard: 0.04—0.05 mm (0.0016—0.0019 in)  
Maximum: 0.05 mm (0.002 in) |
| Clearance between the outer rotor and the inner rotor                | Standard: 0.02—0.11 mm (0.0008—0.0043 in)  
Maximum: 0.12 mm (0.0047 in) |
| Forward clutch drive plate thickness                                 | Standard: 1.60 mm (0.063 in)  
Minimum: 1.45 mm (0.057 in) |
| Forward clutch springs and retainer component free length            | Standard: 17.2 mm (0.677 in)  
Minimum: 15.2 mm (0.598 in) |
| Forward clutch clearance                                             | Standard: 1.50—1.80 mm (0.059—0.070 in) |
| Reverse clutch drive plate thickness                                 | Standard: 1.60 mm (0.063 in)  
Minimum: 1.45 mm (0.057 in) |
| 3-4 clutch drive plate thickness                                     | Standard: 2.55 mm (0.100 in)  
Minimum: 2.40 mm (0.094 in) |
| 3-4 clutch driven plate thickness                                    | Standard: 2.55 mm (0.100 in)  
Minimum: 2.40 mm (0.094 in) |
| 3-4 clutch springs and retainer component free length               | Standard: 17.2 mm (0.677 in)  
Minimum: 15.2 mm (0.598 in) |
| Rear sun gear bushing inner diameter                                 | Standard: 29.900—29.921 mm (1.17717—1.17799 in)  
Maximum: 29.941 mm (1.17878 in) |
| Reverse clutch clearance                                             | Standard: 1.00—1.30 mm (0.039—0.051 in) |
| 3-4 clutch clearance                                                 | Standard: 1.10—1.40 mm (0.043—0.055 in) |
| Low and reverse brake drive plate thickness                          | Standard: 1.60 mm (0.063 in)  
Minimum: 1.45 mm (0.057 in) |
| Low and reverse brake clearance                                      | 2.20—2.50 mm (0.087—0.098 in) |
| Direct clutch drive plate thickness                                  | Standard: 1.80 mm (0.071 in)  
Minimum: 1.65 mm (0.065 in) |
| Direct clutch springs and retainer component free length             | Standard: 17.2 mm (0.677 in)  
Minimum: 15.2 mm (0.598 in) |
| Direct clutch clearance                                              | Standard: 1.10—1.40 mm (0.043—0.055 in) |
| Reduction brake drive plate thickness                                | Standard: 1.80 mm (0.071 in)  
Minimum: 1.65 mm (0.065 in) |
| Reduction brake springs and retainer component free length           | Standard: 18.2 mm (0.717 in)  
Minimum: 16.2 mm (0.638 in) |
| Reduction brake clearance                                            | 1.50—1.80 mm (0.059—0.070 in) |
| Differential backlash                                               | Standard: 0.05—0.15 mm (0.002—0.005 in)  
Maximum: 0.5 mm (0.020 in) |
| Differential bearing Preload                                         | Preload: 1.4—2.3 N·m (14—24 kgf·cm, 12—20 in·lbf)  
Reading on pull scale: 14—23 N (1.4—2.4 kgf, 3.1—5.3 lbf) |
| Front sun gear bushing inner diameter                               | Standard: 18.000—18.018 mm (0.70866—0.70936 in)  
Maximum: 18.038 mm (0.71016 in) |
| End cover bushing inner diameter                                     | Standard: 23.600—23.621 mm (0.92913—0.92995 in)  
Maximum: 23.641 mm (0.93073 in) |
| Secondary sun gear bushing inner diameter                           | Standard: 26.000—26.021 mm (1.02362—1.02445 in)  
Maximum: 26.041 mm (1.02524 in) |
| Primary gear preload                                                | 0.50—0.90 N·m (5.10—9.17 kgf·cm, 4.42—7.96 in·lbf) |
| Between the end of the torque converter and the end of the converter housing | 21.4 mm (0.84 in) |
| Oil Pump bushing inner diameter torque converter side                | Standard: 40.015—40.040 mm (1.57539—1.57637 in)  
Maximum: 40.060 mm (1.57716 in) |
| Oil Pump bushing inner diameter forward clutch side                  | Standard: 19.000—19.021 mm (0.74803—0.74885 in)  
Maximum: 19.041 mm (0.74964 in) |
| 3-4 clutch hub bushing inner diameter                               | Standard: 18.000—18.018 mm (0.70866—0.70936 in)  
Maximum: 18.038 mm (0.71016 in) |
| 2-4 brake drum bushing inner diameter                               | Standard: 55.005—55.030 mm (2.16555—2.16653 in)  
Maximum: 55.050 mm (2.16732 in) |
### TECHNICAL DATA

#### Accumulator spring (standard)

<table>
<thead>
<tr>
<th>Spring</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo apply accumulator large spring</td>
<td>21.0 (0.827)</td>
<td>67.8 (2.669)</td>
<td>10.3</td>
<td>3.5 (0.138)</td>
</tr>
<tr>
<td>Servo apply accumulator small spring</td>
<td>13.0 (0.512)</td>
<td>67.8 (2.669)</td>
<td>17.1</td>
<td>2.2 (0.087)</td>
</tr>
<tr>
<td>Forward accumulator large spring</td>
<td>21.0 (0.827)</td>
<td>75.0 (2.953)</td>
<td>10.7</td>
<td>2.3 (0.091)</td>
</tr>
<tr>
<td>Forward accumulator small spring</td>
<td>15.6 (0.614)</td>
<td>49.0 (1.929)</td>
<td>7.7</td>
<td>2.4 (0.094)</td>
</tr>
</tbody>
</table>

#### Snap ring size for forward clutch clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.810—3.010 (0.111—0.118)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>3.010—3.210 (0.119—0.126)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>3.210—3.410 (0.127—0.134)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.410—3.610 (0.135—0.142)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.610—3.810 (0.143—0.150)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.810—4.010 (0.150—0.157)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

#### Snap ring size for reverse clutch clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.370—2.570 (0.094—0.101)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>2.570—2.770 (0.102—0.109)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>2.770—2.970 (0.110—0.116)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>2.970—3.170 (0.117—0.124)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.170—3.370 (0.125—0.132)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.370—3.570 (0.133—0.140)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

#### Snap ring size for 3-4 clutch clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.400—2.600 (0.095—0.102)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>2.600—2.800 (0.103—0.110)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>2.800—3.000 (0.111—0.118)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.000—3.200 (0.119—0.125)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.200—3.400 (0.126—0.133)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.400—3.600 (0.134—0.141)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

#### Servo return spring (Standard)

<table>
<thead>
<tr>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.0 (1.340)</td>
<td>36.4 (1.430)</td>
<td>2.5</td>
<td>4.0 (0.160)</td>
</tr>
</tbody>
</table>

#### Snap ring size for low and reverse brake clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.050—4.250 (0.159—0.167)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>4.250—4.450 (0.167—0.175)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>4.450—4.650 (0.175—0.183)</td>
<td>2.2 (0.087)</td>
</tr>
<tr>
<td>4.650—4.850 (0.183—0.190)</td>
<td>2.4 (0.094)</td>
</tr>
<tr>
<td>4.850—5.050 (0.190—0.199)</td>
<td>2.6 (0.102)</td>
</tr>
<tr>
<td>5.050—5.250 (0.199—0.207)</td>
<td>2.8 (0.110)</td>
</tr>
<tr>
<td>5.250—5.450 (0.207—0.215)</td>
<td>3.0 (0.118)</td>
</tr>
</tbody>
</table>

#### Snap ring size for direct clutch clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.424—2.624 (0.096—0.103)</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>2.624—2.824 (0.104—0.111)</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>2.824—3.024 (0.112—0.119)</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.024—3.224 (0.120—0.126)</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.224—3.424 (0.127—0.134)</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.424—3.624 (0.135—0.142)</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

05–50–2
### TECHNICAL DATA

#### Snap ring size for reduction brake clearance

<table>
<thead>
<tr>
<th>Range mm (in)</th>
<th>Snap ring sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.920—3.120 0.115—0.122</td>
<td>1.2 (0.047)</td>
</tr>
<tr>
<td>3.120—3.320 0.123—0.130</td>
<td>1.4 (0.055)</td>
</tr>
<tr>
<td>3.320—3.520 0.131—0.138</td>
<td>1.6 (0.063)</td>
</tr>
<tr>
<td>3.520—3.720 0.139—0.146</td>
<td>1.8 (0.071)</td>
</tr>
<tr>
<td>3.720—3.920 0.147—0.154</td>
<td>2.0 (0.079)</td>
</tr>
<tr>
<td>3.920—4.120 0.155—0.162</td>
<td>2.2 (0.087)</td>
</tr>
</tbody>
</table>

#### Primary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low and reverse shift valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Solenoid reducing valve spring</td>
<td>8.7 (0.343)</td>
<td>44.2 (1.740)</td>
<td>16.0</td>
<td>1.1 (0.043)</td>
</tr>
<tr>
<td>Pressure regulator valve spring</td>
<td>7.9 (0.311)</td>
<td>36.3 (1.429)</td>
<td>13.2</td>
<td>0.9 (0.035)</td>
</tr>
<tr>
<td>Solenoid shift valve spring</td>
<td>8.3 (0.327)</td>
<td>35.1 (1.382)</td>
<td>12.0</td>
<td>0.6 (0.024)</td>
</tr>
<tr>
<td>Converter relief valve spring</td>
<td>9.0 (0.354)</td>
<td>42.5 (1.673)</td>
<td>14.2</td>
<td>1.3 (0.051)</td>
</tr>
<tr>
<td>Torque converter clutch control valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Bypass valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>3–4 shift valve spring</td>
<td>8.7 (0.343)</td>
<td>31.3 (1.232)</td>
<td>9.0</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Pressure modifier accumulator spring</td>
<td>11.0 (0.433)</td>
<td>23.0 (0.906)</td>
<td>6.6</td>
<td>1.5 (0.059)</td>
</tr>
</tbody>
</table>

#### Secondary control valve body spring (standard)

<table>
<thead>
<tr>
<th>Item</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–5 shift valve spring</td>
<td>8.7 (0.343)</td>
<td>27.0 (1.063)</td>
<td>10.7</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>4/5 accumulator large spring</td>
<td>21.2 (0.835)</td>
<td>72.2 (2.843)</td>
<td>14.0</td>
<td>2.6 (0.102)</td>
</tr>
<tr>
<td>4/5 accumulator small spring</td>
<td>15.2 (0.598)</td>
<td>53.7 (2.114)</td>
<td>11.9</td>
<td>3.2 (0.126)</td>
</tr>
</tbody>
</table>

#### Differential preload adjust shims (mm (in))

<table>
<thead>
<tr>
<th>Size</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.50 (0.020)</td>
<td>0.55 (0.022)</td>
<td>0.60 (0.024)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.65 (0.026)</td>
<td>0.70 (0.028)</td>
<td>0.75 (0.030)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.80 (0.031)</td>
<td>0.85 (0.033)</td>
<td>0.90 (0.035)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.95 (0.037)</td>
<td>1.00 (0.039)</td>
<td>1.05 (0.041)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.10 (0.043)</td>
<td>1.15 (0.045)</td>
<td>1.20 (0.047)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.25 (0.049)</td>
<td>1.30 (0.051)</td>
<td>1.35 (0.053)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.40 (0.055)</td>
<td>1.45 (0.057)</td>
<td>1.50 (0.059)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.55 (0.061)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Band strut length for 2–4 brake band servo stroke (mm (in))

<table>
<thead>
<tr>
<th>Size</th>
<th>Outer diameter mm (in)</th>
<th>Free length mm (in)</th>
<th>No. of coils</th>
<th>Wire diameter mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.0 (1.417)</td>
<td>36.5 (1.437)</td>
<td>37.0 (1.457)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.25 (1.467)</td>
<td>37.5 (1.476)</td>
<td>37.75 (1.486)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38.0 (1.496)</td>
<td>38.25 (1.506)</td>
<td>38.5 (1.516)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.0 (1.535)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## TECHNICAL DATA

Adjust shim size for output gear component total end play

<table>
<thead>
<tr>
<th>total end play (in)</th>
<th>Adjust shims sizes mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.431—1.481 (0.057—0.058)</td>
<td>1.20 (0.047)</td>
</tr>
<tr>
<td>1.381—1.431 (0.055—0.056)</td>
<td>1.15 (0.045)</td>
</tr>
<tr>
<td>1.331—1.381 (0.053—0.054)</td>
<td>1.10 (0.043)</td>
</tr>
<tr>
<td>1.281—1.331 (0.051—0.052)</td>
<td>1.05 (0.041)</td>
</tr>
<tr>
<td>1.231—1.281 (0.049—0.050)</td>
<td>1.00 (0.039)</td>
</tr>
<tr>
<td>1.181—1.231 (0.047—0.048)</td>
<td>0.95 (0.037)</td>
</tr>
<tr>
<td>1.131—1.181 (0.045—0.046)</td>
<td>0.90 (0.035)</td>
</tr>
<tr>
<td>1.081—1.131 (0.043—0.044)</td>
<td>0.85 (0.033)</td>
</tr>
<tr>
<td>1.031—1.081 (0.041—0.042)</td>
<td>0.80 (0.031)</td>
</tr>
<tr>
<td>0.981—1.031 (0.039—0.040)</td>
<td>0.75 (0.029)</td>
</tr>
<tr>
<td>0.931—0.981 (0.037—0.038)</td>
<td>0.70 (0.028)</td>
</tr>
<tr>
<td>0.881—0.931 (0.035—0.036)</td>
<td>0.65 (0.026)</td>
</tr>
<tr>
<td>0.831—0.881 (0.033—0.034)</td>
<td>0.60 (0.024)</td>
</tr>
<tr>
<td>0.781—0.831 (0.031—0.032)</td>
<td>0.55 (0.022)</td>
</tr>
<tr>
<td>0.731—0.781 (0.029—0.030)</td>
<td>0.50 (0.020)</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>49 B019 010A</td>
<td>Transmission Hanger</td>
</tr>
<tr>
<td>49 W032 2A0</td>
<td>Bearing Remover Set</td>
</tr>
<tr>
<td>49 G019 029</td>
<td>Nut</td>
</tr>
<tr>
<td>49 F401 366A</td>
<td>Plate</td>
</tr>
<tr>
<td>49 E032 303</td>
<td>Bearing Installer</td>
</tr>
<tr>
<td>49 G030 455</td>
<td>Diff Side Gear Holder</td>
</tr>
<tr>
<td>49 G030 455</td>
<td>Diff Side Gear Holder</td>
</tr>
<tr>
<td>Service Tool</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>49 T019 007</td>
<td>Attachment</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>