WORKSHOP MANUAL

TF SERIES

TRANSMISSION

AW30-40LE MODEL

SECTION 7A

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ISUZU

ISUZU
International Service & Parts
Tokyo, Japan

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TRANSMISSION

TRANSMISSION CONTROL SYSTEM (AW30–40LE) (V6 3.5L)

CONTENTS

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Service Precaution

WARNING: THIS VEHICLE HAS A SUPPLEMENTAL RESTRAINT SYSTEM (SRS). REFER TO THE SRS COMPONENT AND WIRING LOCATION VIEW IN ORDER TO DETERMINE WHETHER YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING. WHEN YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING, REFER TO THE SRS SERVICE INFORMATION. FAILURE TO FOLLOW WARNINGS COULD RESULT IN POSSIBLE AIR BAG DEPLOYMENT, PERSONAL INJURY, OR OTHERWISE UNNEEDED SRS SYSTEM REPAIRS.

CAUTION: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. ISUZU will call out those fasteners that require a replacement after removal. ISUZU will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (Paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and the joint clamping force, and may damage the fastener. When you install fasteners, use the correct tightening sequence and specifications. Following these instructions can help you avoid damage to parts and systems.

General Description

The AW30-40LE is a 4–speed fully automatic transmission. It uses a microcomputer as a control unit to judge running conditions including throttle opening rate and vehicle speed, then it sets the shifting point in the optimum timing so that best driving performance can be achieved.

In addition, the built–in shift mode select function can select three shift modes according to the driver's preference:

- Normal mode –Normal shift pattern.
- 3rd Start mode –Starts in 3rd gear to reduce slippage on ice or snow.
- Power mode has a delayed up shift when more powerful acceleration is required.

Also, the built–in fail–safe function (“backup mode") assures driving performance even if the vehicle speed sensor, throttle signal or any solenoid fails.

Further, the self–diagnostic function conducts diagnosis in a short time when the control system fails, thus improving serviceability.

The major features of AW30-40LE are as follows:

- A compact structure consisting of 2 sets of planetary gears and flat torque converter.
- Electronic control selects the optimum shift mode according to the driving conditions.
- Electronic control maintains the optimum hydraulic pressure for clutch, band brake as well as transmission so that shift feeling is improved.
- Two sets of planetary gears reduce friction of power train.

  Also, a lockup mechanism in the torque converter reduces fuel consumption.
- Wide gear ratio and high torque rate of torque converter provide excellent starting performance.

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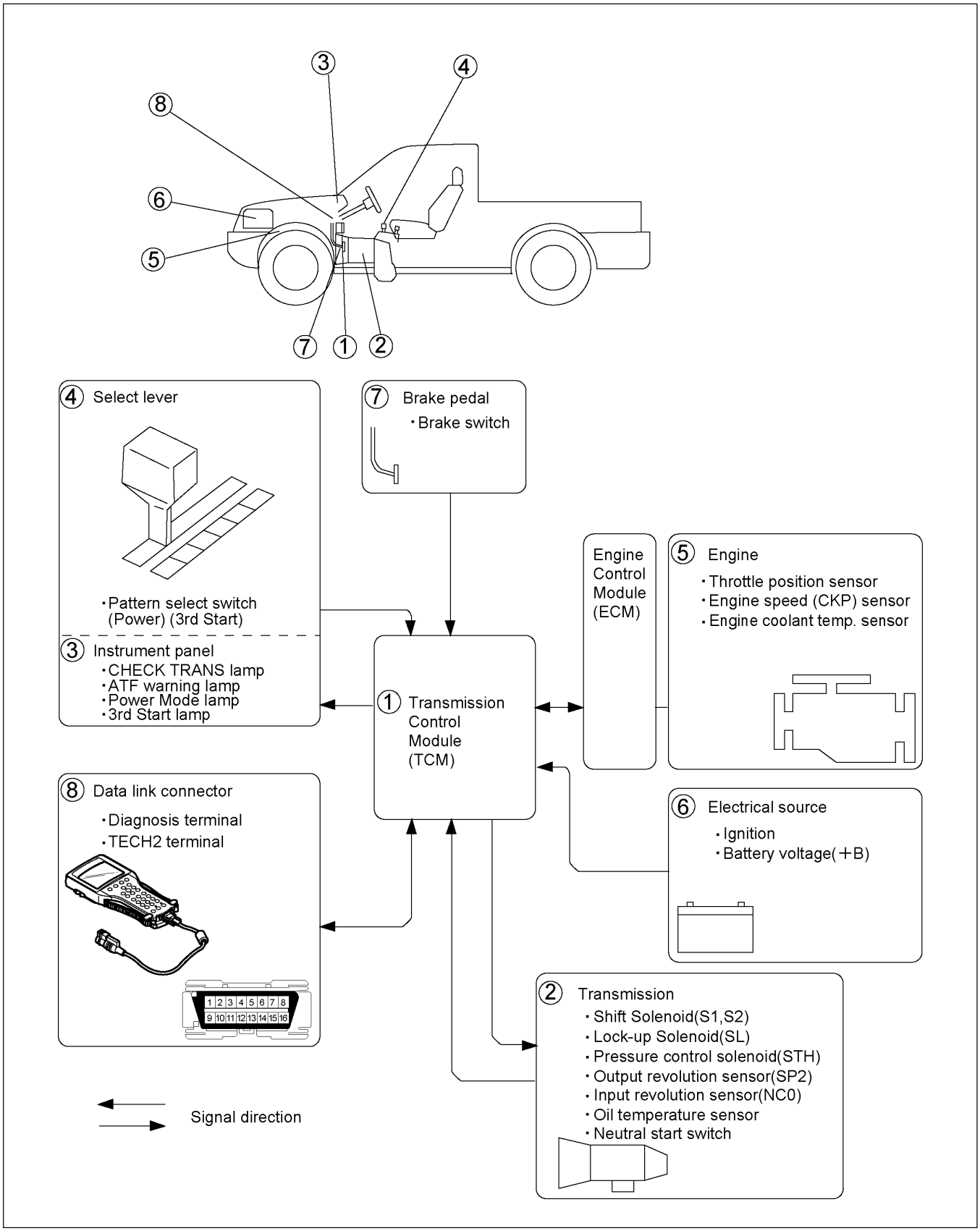
Electronic Control Diagram



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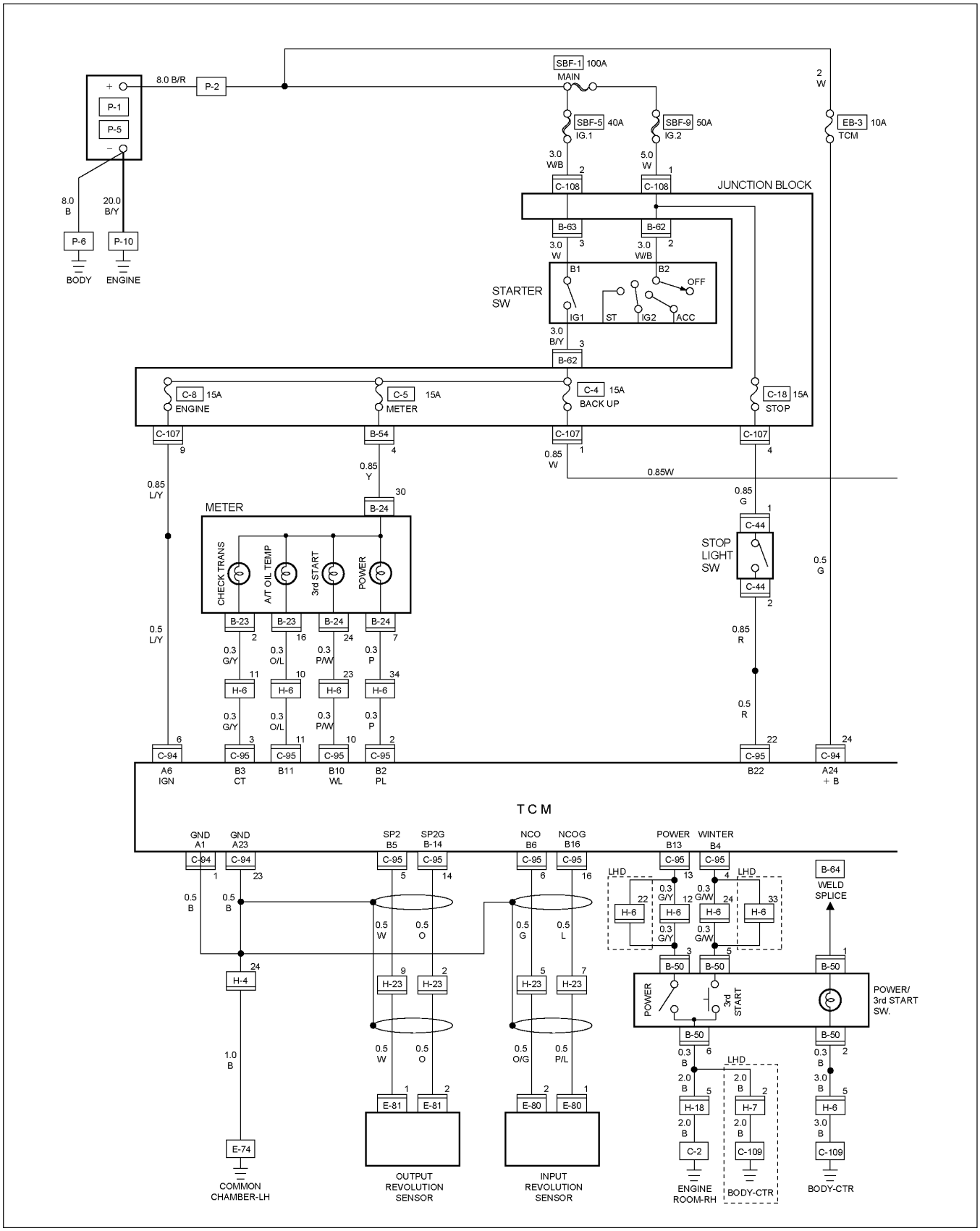
Transmission Control Module (TCM) (1/2)



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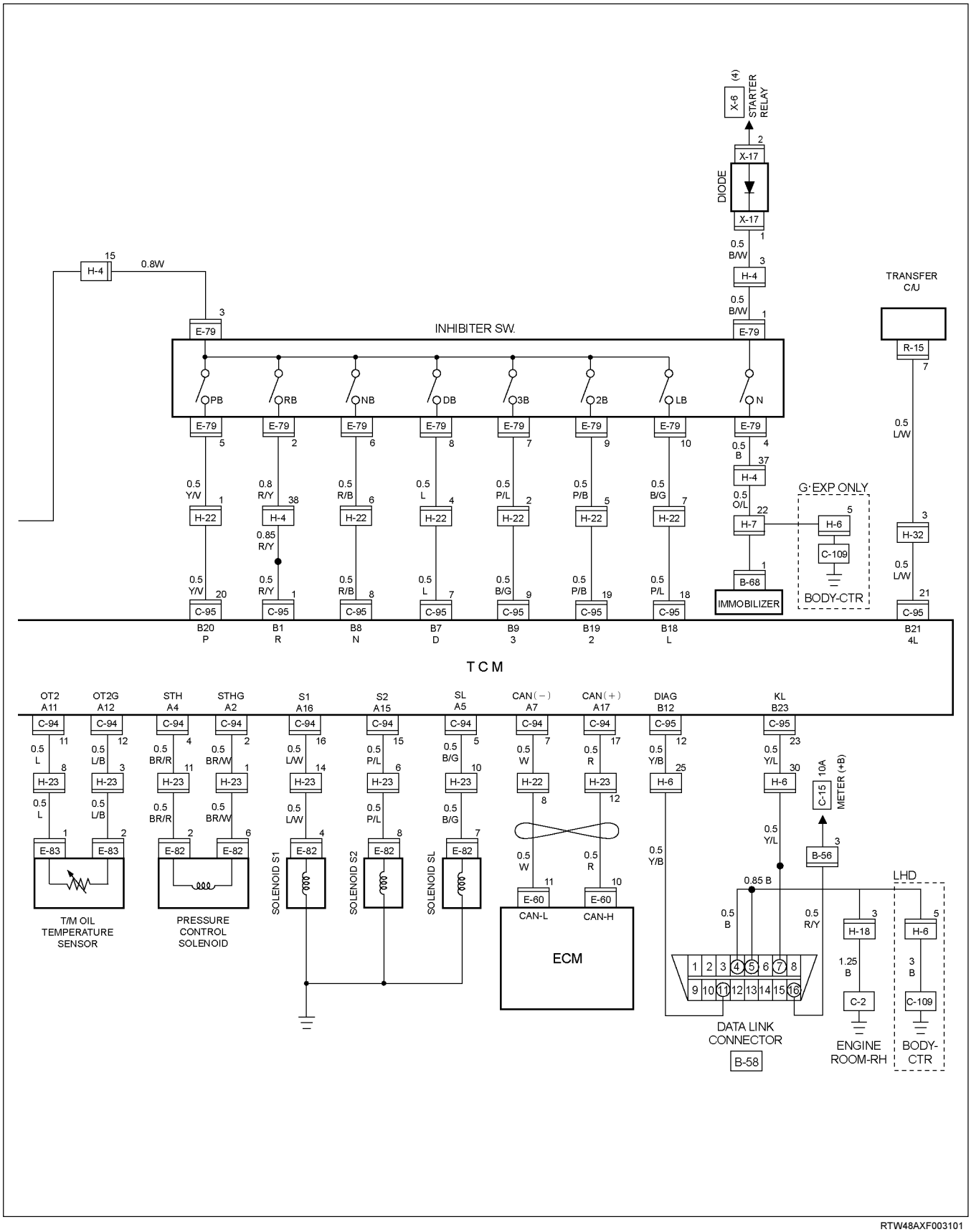
Transmission Control Module (TCM) (2/2)



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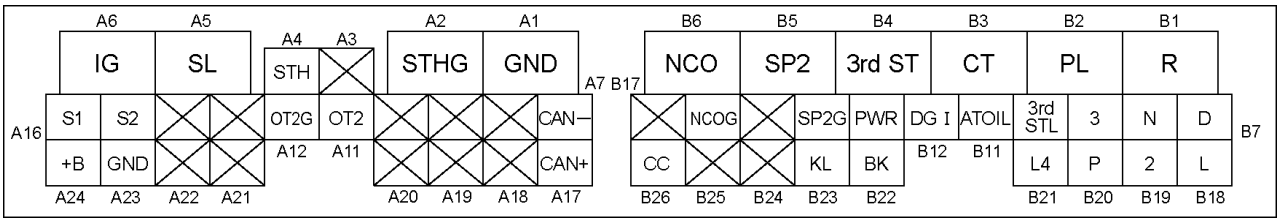
TCM Point Table



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PIN No.	SIGNAL NAME
A1	GND
A2	PRESSURE CONTROL SOLENOID GND
A3	—
A4	PRESSURE CONTROL SOLENOID
A5	L-up SOLENOID
A6	STARTER SW(IG1)
A7	CAN COMMUNICATION (-)
A8	—
A9	—
A10	—
A11	T/M OIL TEMPERATURE SENSOR
A12	T/M OIL TEMPERATURE SENSOR GND
A13	—
A14	—
A15	SHIFT SOLENOID (S2)
A16	SHIFT SOLENOID (S1)
A17	CAN COMMUNICATION (+)
A18	—
A19	—
A20	—
A21	—
A22	—
A23	GND
A24	BATTERY

PIN No.	SIGNAL NAME
B1	NEUTRAL START SW (R)
B2	POWER LAMP
B3	CHECK TRANS LAMP
B4	PATTERN SELECT SW (3rd START)
B5	SPEED SENSOR (+)
B6	INPUT REVOLUTION SENSOR (+)
B7	NEUTRAL START SW (D)
B8	NEUTRAL START SW (N)
B9	NEUTRAL START SW (3)
B10	3rd START LAMP
B11	OIL TEMPERATURE WARNING LAMP
B12	DIAGNOSIS TERMINAL
B13	PATTERN SELECT SW (POWER)
B14	SPEED SENSOR (-)
B15	—
B16	INPUT REVOLUTION SENSOR (+)
B17	—
B18	NEUTRAL START SW (L)
B19	NEUTRAL START SW (2)
B20	NEUTRAL START SW (P)
B21	TRANSMISFER LOW 4 SW
B22	BRAKE LAMP SW
B23	DIAGNOSIS OUT PUT
B24	—
B25	—
B26	CRUISE CONTROL UNIT

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TCM Voltage & Resistance Check Sheet

CHECK ITEM	PIN No.	VALUE		NOTE
VIGN	A6–A1	VIGN		Key “ON”
	A6–A23	VIGN		Key “ON”
Backup Power Supply	A24–A1	+B (Always)		Key “ON”
Inhibitor (Select) SW P	B20–A1	“P” Range	VIGN	Key “ON”
		Except “P”	0V	
Inhibitor (Select) SW R	B1–A1	“R” Range	VIGN	Key “ON”
		Except “R”	0V	
Inhibitor (Select) SW N	B8–A1	“N” Range	VIGN	Key “ON”
		Except “N”	0V	
Inhibitor (Select) SW D	B7–A1	“D” Range	VIGN	Key “ON”
		Except “D”	0V	
Inhibitor (Select) SW 2	B19–A1	“2” Range	VIGN	Key “ON”
		Except “2”	0V	
Inhibitor (Select)SW 1	B18–A1	“1” Range	VIGN	Key “ON”
		Except “1”	0V	
Inhibitor (Select) SW 3	B9–A1	“3” Range	VIGN	Key “ON”
		Except “3”	0V	
Power SW	B13–A1	ON	0V	Key “ON”
		OFF	VIGN	
3rd Start SW	B4–A1	ON	0V	Key “ON”
		OFF	VIGN	
Brake SW	B22–A1	ON	VIGN	Key “ON”
		OFF	0V	
AT Oil Temperature Sensor	A11–A12	20°C	4.6V	Engine run.
		155°C	1.1V	
4L Signal	B21–A1	4L	0V	Key “ON”
		2H/4H	VIGN	
Diag SW	B12–A1	ON	VIGN	Key “ON”
		OFF	0V	
Shift Solenoid A (S1)	A16–A1	P	VIGN	Engine run.
		R	VIGN	
		N	VIGN	
		D–1	VIGN	
		D–2	VIGN	
		D–3	0V	
		D–4	0V	

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CHECK ITEM	PIN No.	VALUE		NOTE
Shift Solenoid B (S2)	A15–A1	P	0V	Engine run.
		R	0V	Engine run. (Without the Reverse range lock out)
		N	0V	Engine run.
		D–1	0V	
		D–2	VIGN	
		D–3	VIGN	
		D–4	0V	
Lock-up Solenoid	A5–A1	ON	VIGN	(ex.) It is “ON” when the vehicle speed is more than 65km/h.
		OFF	0V	
Check Trans Lamp	B3–A1	ON	0V	Key “ON” (The lamp is “ON” for 3 second after key “ON”)
		OFF	VIGN	
AT Oil Temperature Lamp	B11–A1	ON	0V	Key “ON” (The lamp is “ON” for 3 second after key “ON”)
		OFF	VIGN	
Power Lamp	B2–A1	ON	0V	Key “ON” (The lamp is “ON” when the Power switch is “ON”)
		OFF	VIGN	
3 rd Start Lamp	B10–A1	ON	0V	Key “ON” (The lamp is “ON” when the 3rd Start switch is “ON”)
		OFF	VIGN	
AT Oil Temp Sensor Resistance	A11–A12	20°C	12kΩ	Key “OFF”
		50°C	1.5kΩ	
		155°C	293Ω	
Pressure Control Solenoid Resistance	A4–A2	About 4–7Ω(20°C)		Key “OFF”
Speed Sensor Resistance	B5–B14	About 560Ω–120Ω(20°C)		Key “OFF”
Input Revolution Sensor Resistance	B6–B16	About 560Ω–120Ω(20°C)		Key “OFF”
Lock-up Solenoid Resistance	A5–A1	About 10Ω–15Ω(20°C)		Key “OFF”
Shift Solenoid A (S1) Resistance	A16–A1	About 10Ω–15Ω(20°C)		Key “OFF”
Shift Solenoid B (S2) Resistance	A15–A1	About 10Ω–15Ω(20°C)		Key “OFF”

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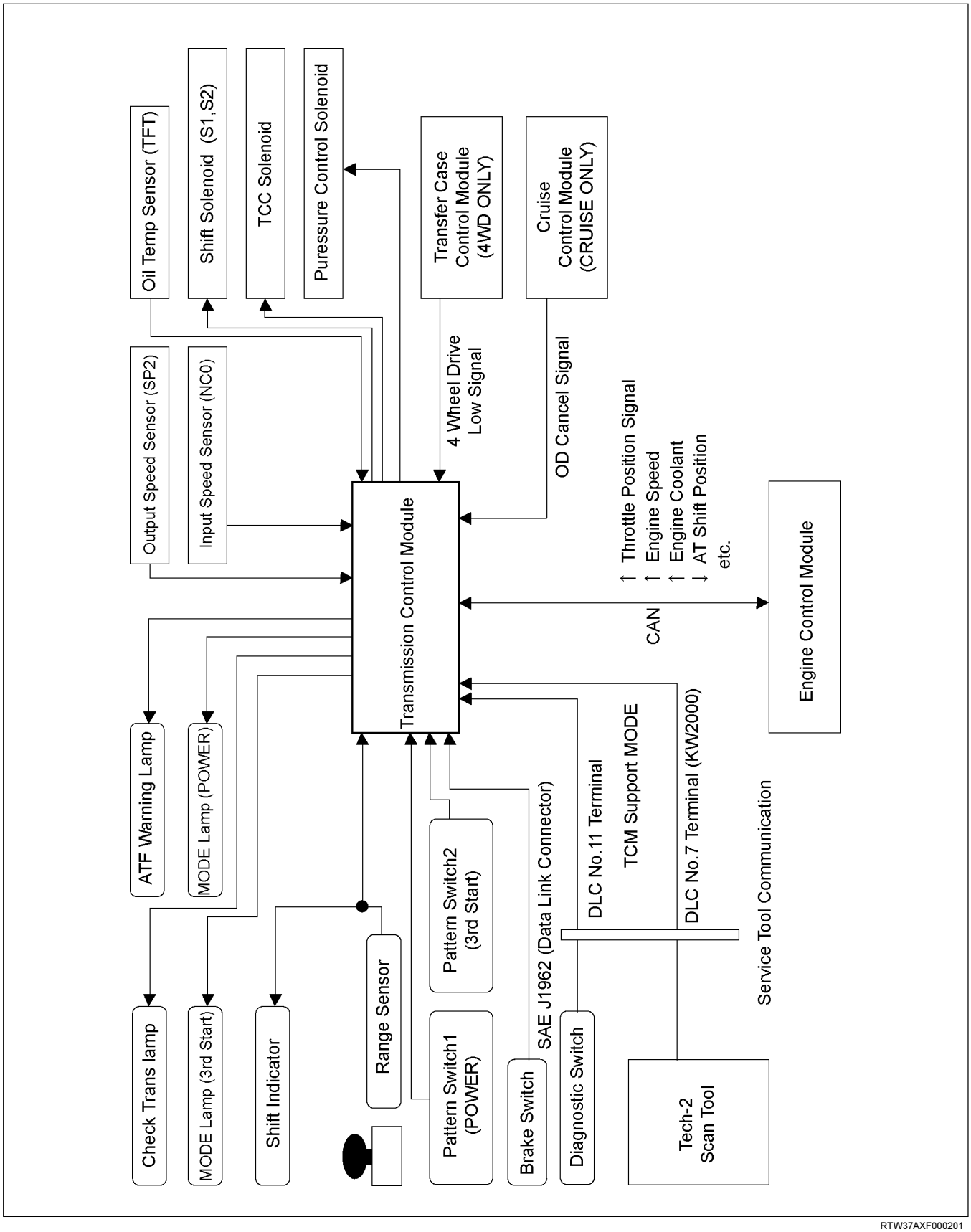
Control System Diagram



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Control and Functions

Shift Control

The transmission gear is shifted according to the shift pattern selected by the driver. In shifting gears, the gear ratio is controlled by the ON/ OFF signal using the shift solenoid S1 and the shift solenoid S2.

Band Apply Control

The band apply is controlled when in the 3–2 downshift (engine overrun prevention) and the garage shift (shock control).

The band apply solenoid is controlled by the signal from the Pulse Width Modulation (PWM) to regulate the flow of the oil.

Torque Converter Clutch Control

The clutch ON/OFF is controlled by moving the converter clutch valve through shifting Torque Converter Clutch (TCC) solenoid using the ON/OFF signal.

Line Pressure Control

The throttle signal allows the current signal to be sent to the force motor. After receiving the current signal, the force motor activates the pressure regulator valve to regulate the line pressure.

On–Board Diagnostic System

Several malfunction displays can be stored in the Transmission Control Module (TCM) memory, and read out of it afterward.

The serial data lines, which are required for the testing of the final assembly and the coupling to other electronic modules, can be regulated by this function.

Fail–Safe Mechanism

If there is a problem in the transmission system, the TCM will go into a “backup" mode.

The vehicle can still be driven, but the driver must use the select lever to shift gears.

Torque Management Control

The transmission control side sends the absolute spark advance signal to the engine control side while the transmission is being shifted. This controls the engine spark timing in compliance with the vehicle running condition to reduce the shocks caused by the change of speed.

ATF Warning Control

The oil temperature sensor detects the ATF oil temperature to control the oil temperature warning, TCC, and the 3rd start mode.

Reverse Lock Out Control

With the selector lever in reverse position, the TCM will not close the PWM solenoid until the vehicle is below 15 km/h (9.3 mph), thus preventing reverse engagement above this speed.

Downhill Control

This mode is automatically activated from NORMAL mode only when downhill conditions are recognized.

The shift pattern is identical to NORMAL mode except 3-4 and 4-3 shift lines at low throttle modified to get engine braking on a larger speed range.

Uphill Control

When uphill condition are recognized the 2-3 and 3-4 shift and TCC apply are down only when the engine torque is sufficient in order to avoid shift hunting.

Gear Shift Control 3rd start

SELECT LEVER RANGE	SHIFT PATTERN
D(Drive)	1⇔2TCC⇔3TCC⇔4TCC
3(Third)	1⇔2TCC⇔3TCC
2(Second)	1⇔2(←3)
L(First)	1(←2)

TCC: Torque Converter Clutch

(Notice1): “( )" means over-revving prevention control.

Mode Type

Mode Type	Select lever position
Normal drive mode (NOR)	Entire range (excluding “R")
Power drive mode (PWR)	Entire range (excluding “R")

Mode Selection

Mode Type	SWITCH(SW)		LAMP	
	PWR/NOR.S	3RD START SW	POWER DRIVE LAMP	3RD START LAMP
Normal drive mode (NOR)	OFF	OFF	OFF	OFF
Power drive mod (PWR)	ON	OFF	ON	OFF
3rd Start mode	OFF	ON	OFF	ON

However, the 3rd start switch prevails over the PWR/NOR switch.

The mode become normal drive mode when the 3rd start switch is operated from ON to OFF.

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Comparison of mode

1. The normal drive mode is set at the normal shift points.
2. The shift points of the power drive mode are shifted to the higher speed side, compared to the normal drive mode.
3. The 3rd start mode is a special mode used exclusively for starting in third gear.

3rd start Mode

1. The 3rd start switch will operate when switched on after all of the following conditions are present:
   a. The gear select position is “D" range only.
   b. Vehicle speed is 11 km/h (7 mph) or less.
   c. Transmission oil temperature is 120°C (248°F) or less.
   d. Accelerator opening is at 8% or less.
2. **Cancel Release**
   1. Cancellation by driver
      a. Turning off the 3rd start mode switch
      b. Shifting select position to “3", “2", or “L" (3rd start mode is not canceled by selecting “N", “R", or “P")
      c. Ignition key is turned off.
   2. Automatic cancellation
      a. When vehicle runs at 34 km/h (21mph) or more for 1 second or more
      b. When transmission oil temperature reaches 120°C (284°F) or above

NOTE: The mode returns to normal drive mode or power drive mode after the 3rd start mode is canceled.

Backup Mode

If a major system failure occurs which could affect safety or damage the transmission under normal vehicle operation, the diagnostic system detects the fault and overrides the Transmission Control Module (TCM).

The “CHECK TRANS" light flashes to alert the driver, and the transmission must be manually shifted as follows:

Select lever position	Gear Ratio Selected
D	4 (Fourth)
Manual 3	4 (Fourth)
Manual 2	3 (Third)
Manual L	3 (Third)
R	Reverse

Shifts are firmer to prevent clutch slip and consequent wear. The fault should be corrected as soon as possible.

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Functions of Input / Output Components

Component		Function
Input	Transfer low signal	Detects the transfer High/Low position.
	OD Cancel signal	Detects whether the cruise control unit is judged OD cancel mode.
	Output revolution sensor (Transmission)	Detects the vehicle speed.
	Input revolution sensor (Transmission)	Detects the input revolution (OD direct clutch drum revolution).
	Engine revolution sensor	Detects the engine revolution with CAN.
	Throttle position signal	Detects the throttle opening rate with CAN.
	Neutral start switch	Detects the select lever position.
	Pattern select switch	Detects whether the driver has selected "NORMAL" or "POWER" mode.
	Brake lamp switch	Detects whether the driver has pressed the brake pedal or not.
	Oil temperature sensor	Detects the oil temperature.
	Diagnostic start switch	Starts self-diagnosis and displays a code for faulty part if any.
Input/Output	Data link connector	When connected with Tech2 or tester, can communicate the data for function check, etc.
Output	Shift solenoid S1, S2	Selects shift point and gear position suited to the vehicle running condition on the basis of TCM output.
	Lock-up control solenoid SL	Control the lock-up clutch suited to the vehicle running condition on the basis of TCM output.
	Pressure control solenoid STH	Adjusts throttle pressure by energizing current of linear pressure control solenoid to prevent the shift shock and to obtain shift smoothly.
	"CHECK TRANS" lamp	When trouble has occurred to throttle position sensor, vehicle speed sensor, or solenoid, "CHECK TRANS" lamp is blinked to warn the driver. If also displays the trouble code.
	A/T OIL TEMP warning lamp	Lights when ATF oil temperature rises. (Turned on at greater than 146°C (295°F). Turned off at less than 132°C (270°F).
	POWER lamp	Lights when POWER MODE detected.
	3rd Start lamp	Lights when 3rd Start MODE detected.
Computer	Transmission Control Module (TCM)	Based on the signal from each switch and sensors, judges necessary shift point and lock-up operation, and send signal to each solenoid.

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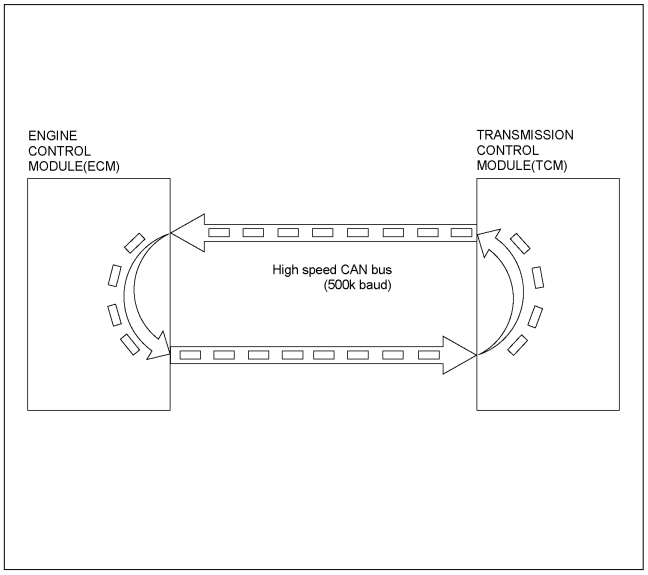
CAN bus systems in automatic transmission control (AW30-40LE)

The automatic transmission control system in AW30-40LE uses high speed CAN bus system .The individual CAN bus systems are connected via two interfaces and can exchange information and data. This allows control modules that are connected to different CAN bus systems to communicate.

High speed CAN bus

Transmission control modules in the vehicle that require continuous, rapid communication are connected to the high speed CAN bus. For example, the automatic transmission is continuously notified of the current engine load status. Since the automatic transmission control module has to react immediately to load status changes, rapid communication is required between the engine control module and the automatic transmission control module. The high speed CAN bus in the AW30-40LE is designed as a two-wire CAN bus (twisted pair). The wires are shielded and twisted. The transfer rate is 500 K baud.



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Diagnosis

Electronic Diagnosis

How To Diagnose The Problem

1. To avoid incorrect diagnostics, this book needs to be followed accurately. Unless stated, **do not jump directly to a section that could contain the solution. Some important information may be missed.**
2. The sections in CAPITALS and bold are the main sections that can be found in the contents.
3. The go to **"SECTION"** means to continue to check going to the "section".
4. The go through **"SECTION"** means to go through the "section" and then to go back to the place the go through was written.
5. BASIC ELECTRIC CIRCUITS:
   You should understand the basic theory of electricity. This includes the meaning of voltage, amps, ohms, and what happens in a circuit with an open or shorted wire. You should also be able to read and understand wiring diagrams.

Check Trans Indicator

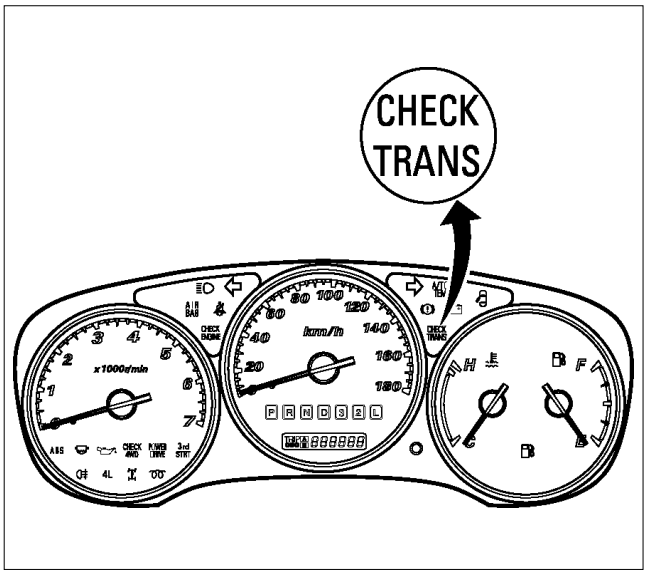
Find CHECK TRANS indicator and verify if it is

A. Flashing: Go to **DIAGNOSTIC CHECK.**

B. Staying on: Go through **CHECK TRANS CHECK**.

C. Is never ON when the ignition key is turned on: Go through **CHECK TRANS CHECK**

D. Is ON during 3 seconds at ignition but OFF after: Normal operation. No DTC or malfunction.



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On Board Diagnostic Check

This test determines if the transmission or its input or output connections or sensors are failing.

1. Connect the Tech 2: Go through **Tech 2 OBD CONNECTION**.
2. Turn on the ignition but not the engine.
3. Push "F0" on Tech 2 to see the Diagnostic Trouble Code (DTC):

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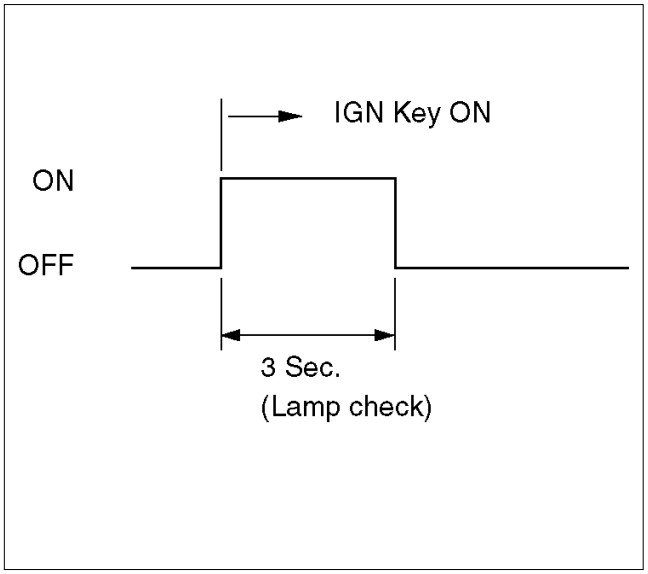
4. Do you have a DTC?
   YES: write down all code numbers and do the **DTC CHECK**
   NO: the DTC can not help you find the problem.
   1. Go through **"CHECK TRANS" CHECK**
   2. If it is flashing and the flash is 0.4 seconds ON and 0.4 seconds OFF, this means that you should have a DTC stored. Please recheck go to **DIAGNOSTIC CHECK** and if you find the same problem, replace the Powertrain Control Module (TCM).

Normal



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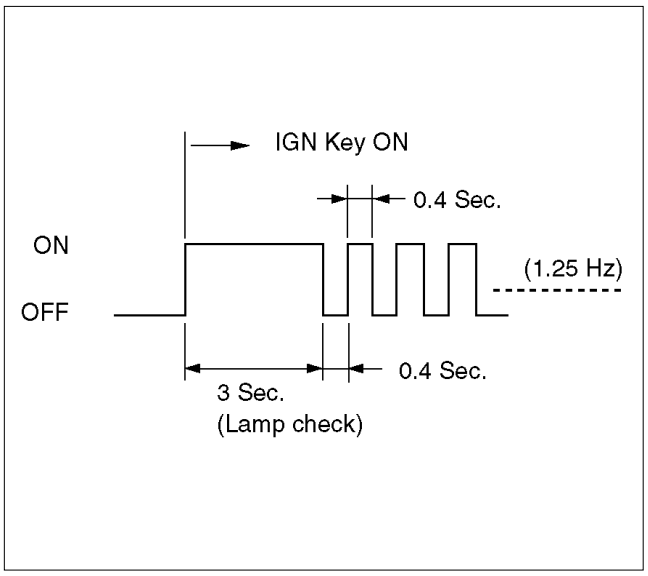
Abnormal



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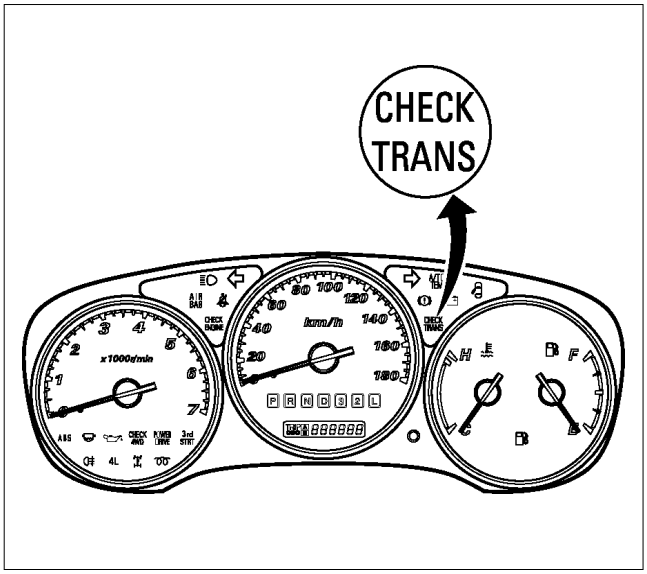
"Check Trans" Check

1. Indicator is ON during 3 seconds at ignition but it is OFF after the engine starts. The indicator is working normally go to **DIAGNOSTIC CHECK**.



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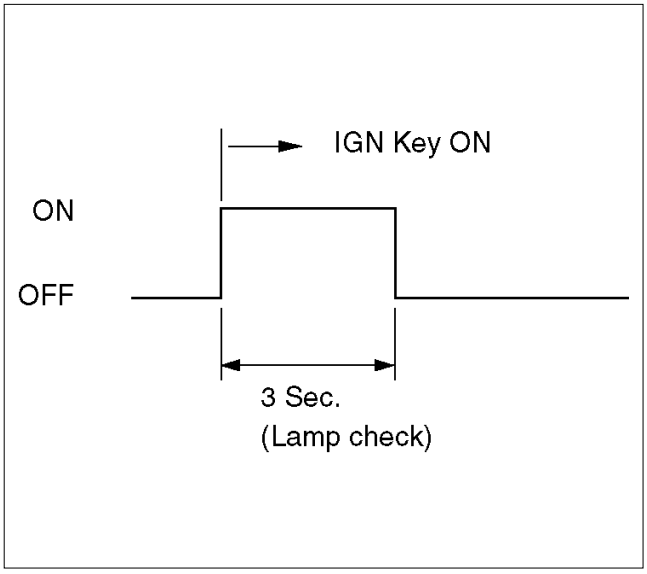
Normal



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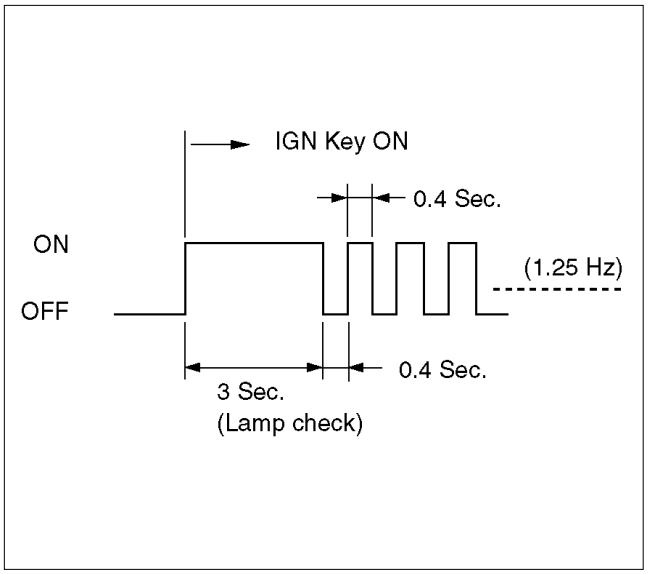
2. Indicator is flashing and the flash is 0.4 seconds ON and 0.4 seconds OFF always when ignition is on (engine cranked or not). This means that there is a malfunction. Go to **DIAGNOSTIC CHECK**.

Abnormal



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3. Indicator is staying ON always when Ignition is ON.
    1. This means that connection between the lamp and the indicator control unit is shorted to ground.
    2. Verify if instrument panel terminal 2 of connector B–23 is shorted to ground.
    3. Verify if the indicator control unit connector C–95 terminal 3 is shorted to ground.
    4. Verify that the instrument panel terminal 30 of connector B–24 is connected to battery.
    5. If problem solved: Go to **CHECK TRANS INDICATOR**.

       NO: Replace Transmission Control Module (TCM).
4. Indicator is staying OFF with the ignition ON (engine OFF).
    1. This means that connection between the lamp and the indicator control unit is shorted to battery or opened.
    2. Verify if instrument panel terminal 2 of connector B–23 is shorted to battery or open.
    3. Verify if the indicator control unit connector C–95 terminal 3 is shorted to battery or open.
    4. Verify that the instrument panel terminal 2of connector B–23 is connected to battery. If not, check the fuses and the connections (terminal 11 of connector H–6) voltage.

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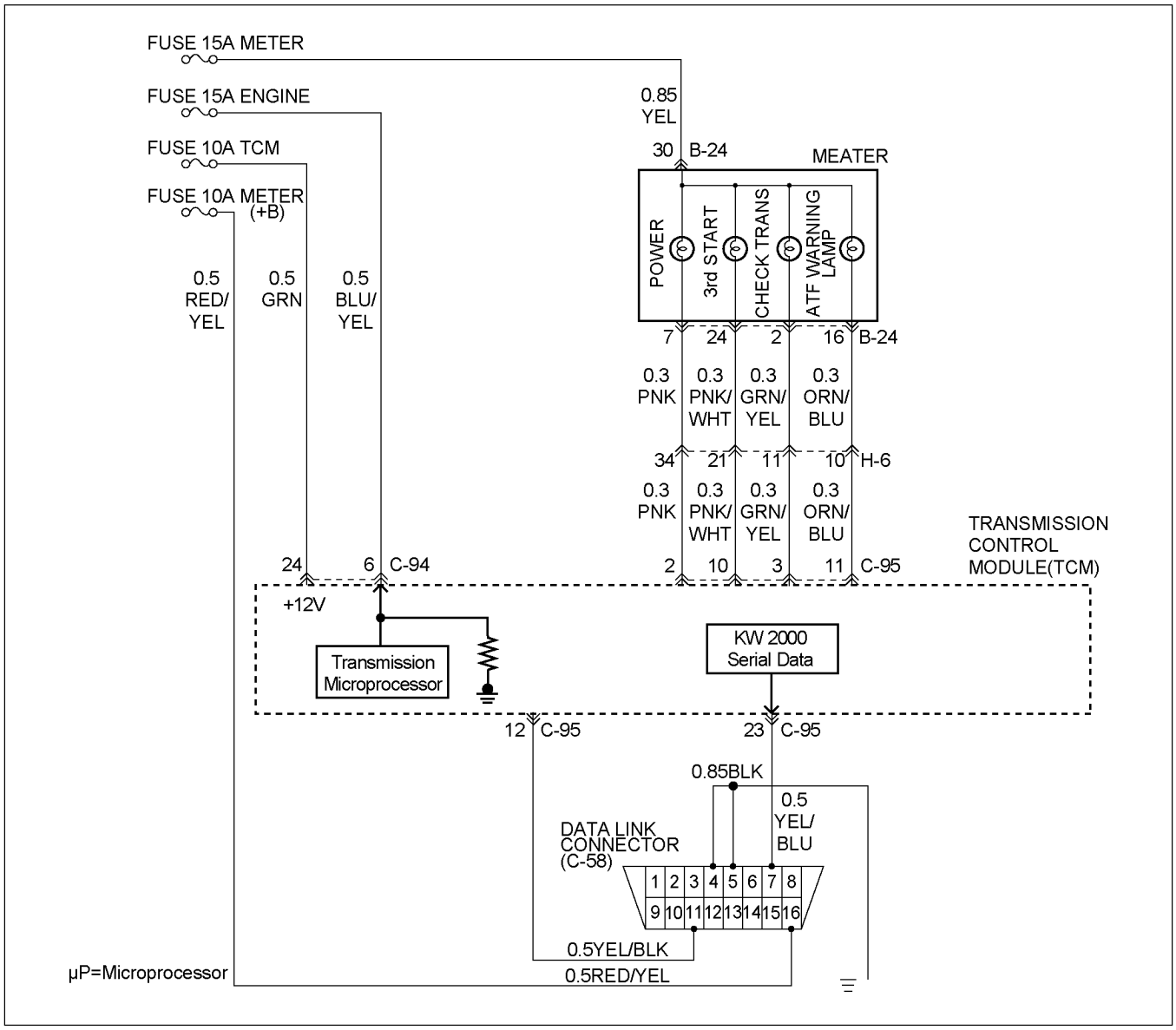
5. If problem solved: Go to **CHECK TRANS INDICATOR**.
   NO: Replace Transmission Control Module (TCM).



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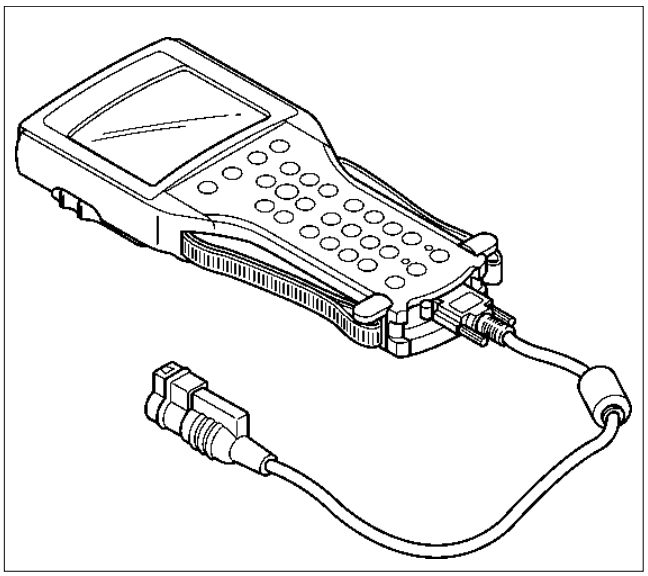
Tech 2 OBD Connection

In order to access OBD Transmission Control Module (TCM) data, use of the Tech 2 scan tool kit (7000086) is required.

1. The electronic diagnosis equipment is composed of:
    1. Tech 2 hand held scan tool unit (7000057) and DLC cable (3000095).



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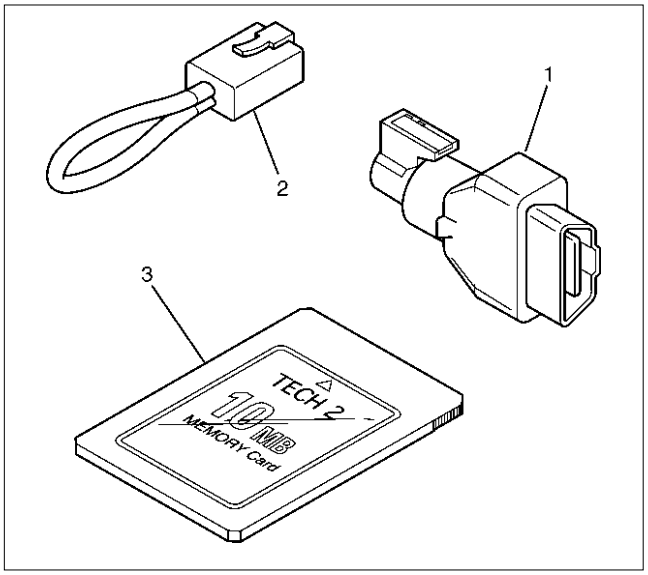
    2. SAE 16/19 Pin Adapter (3000098)(1), RS232 Loop Back Connector (3000112)(2), and PCMCIA Card (3000117)(3).



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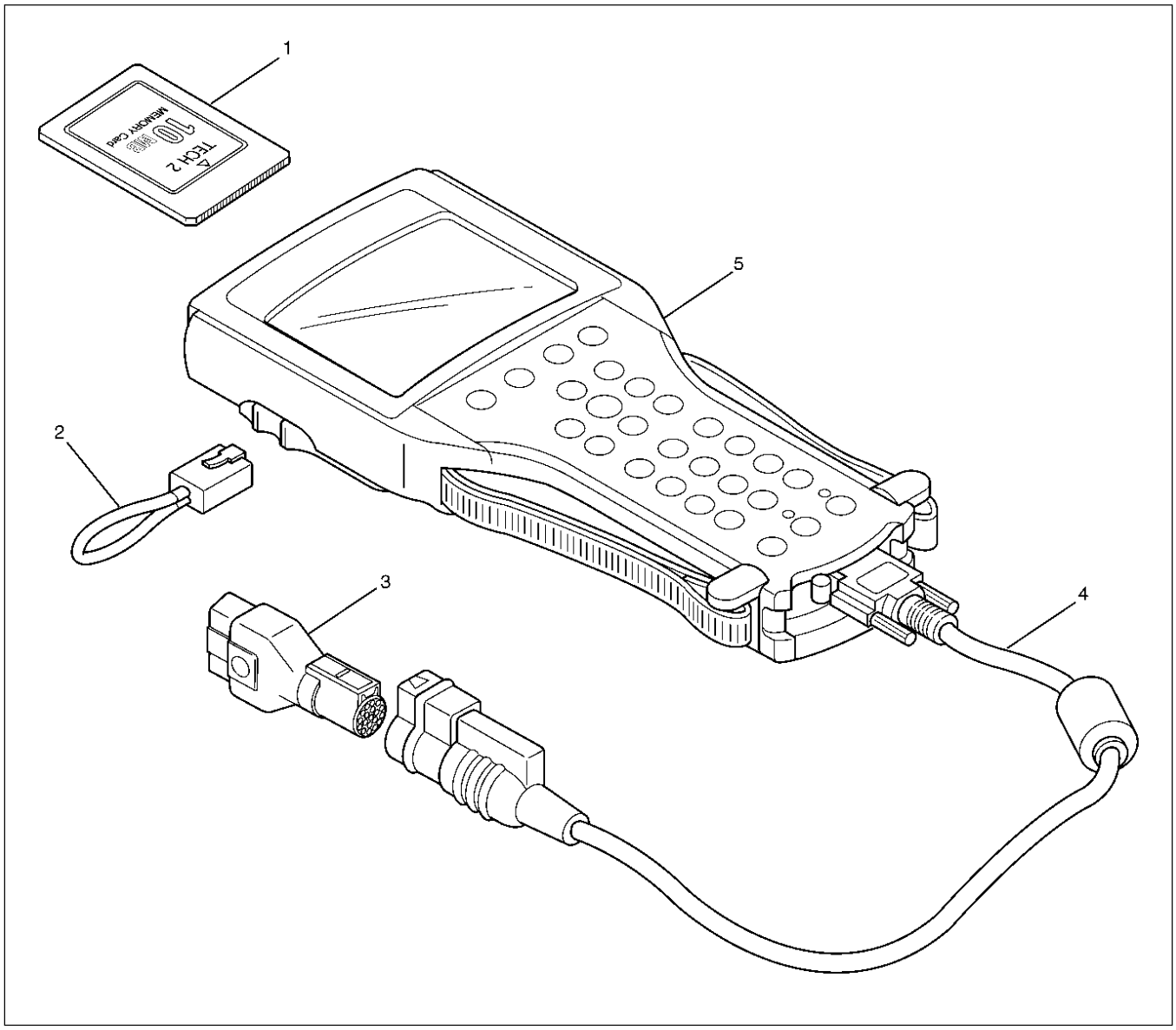
2. Connecting the Tech 2



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Legend

(1) PCMCIA Card
(2) RS 232 Loop Back Connector
(3) SAE 16/19 Adapter
(4) DLC Cable
(5) Tech 2

- Before operating the Isuzu PCMCIA card with the Tech 2, the following steps must be performed:

1. The Isuzu System PCMCIA card (1) inserts into the Tech 2 (5).
2. Connect the SAE 16/19 adapter (3) to the DLC cable (4).
3. Connect the DLC cable to the Tech 2 (5)
4. Mark sure the vehicle ignition is off.

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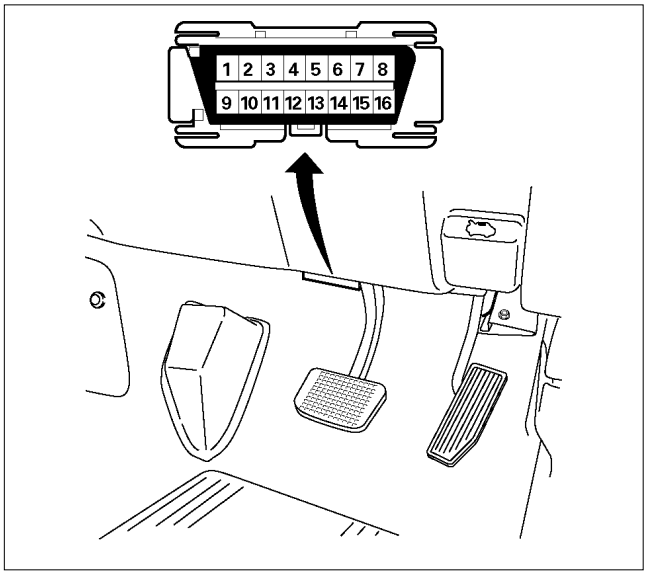
5. Connect the Tech 2 SAE 16/19 adapter to the vehicle DLC (1).



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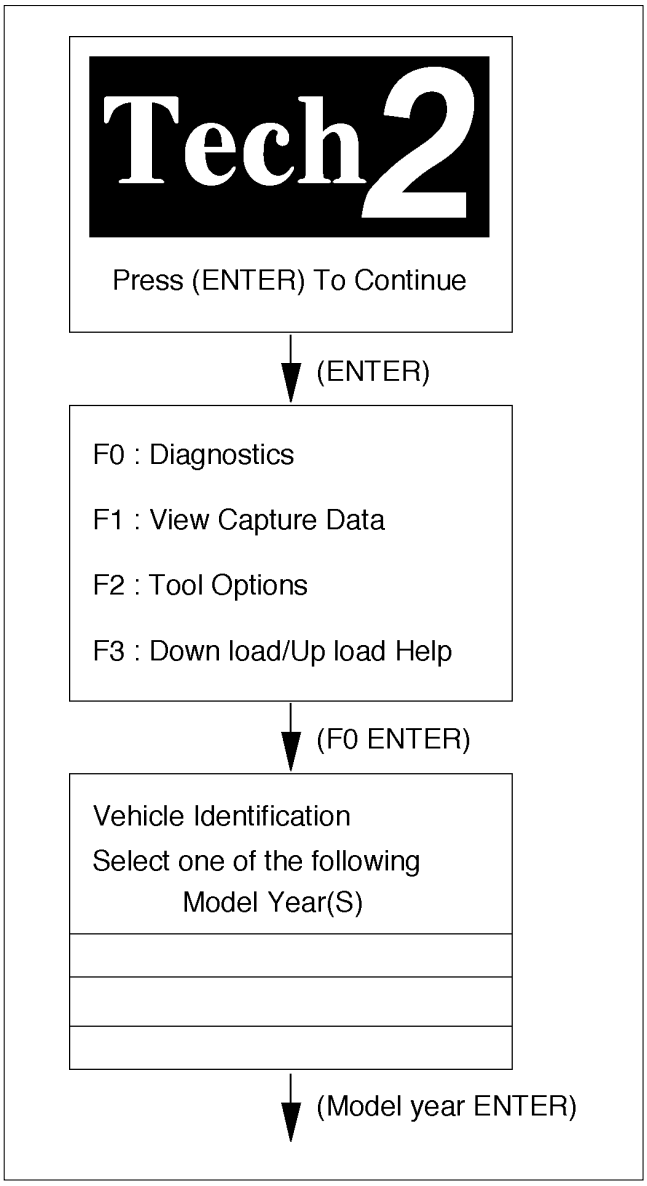
6. The vehicle ignition turns on.
7. Verify the Tech 2 power up display.

060RW009

NOTE: The RS232 Loop back connector is only to use for diagnosis of Tech 2 and refer to user guide of the Tech 2.

8. The power up screen is displayed when you power up the tester with the Isuzu systems PCMCIA card. Follow the operating procedure below.



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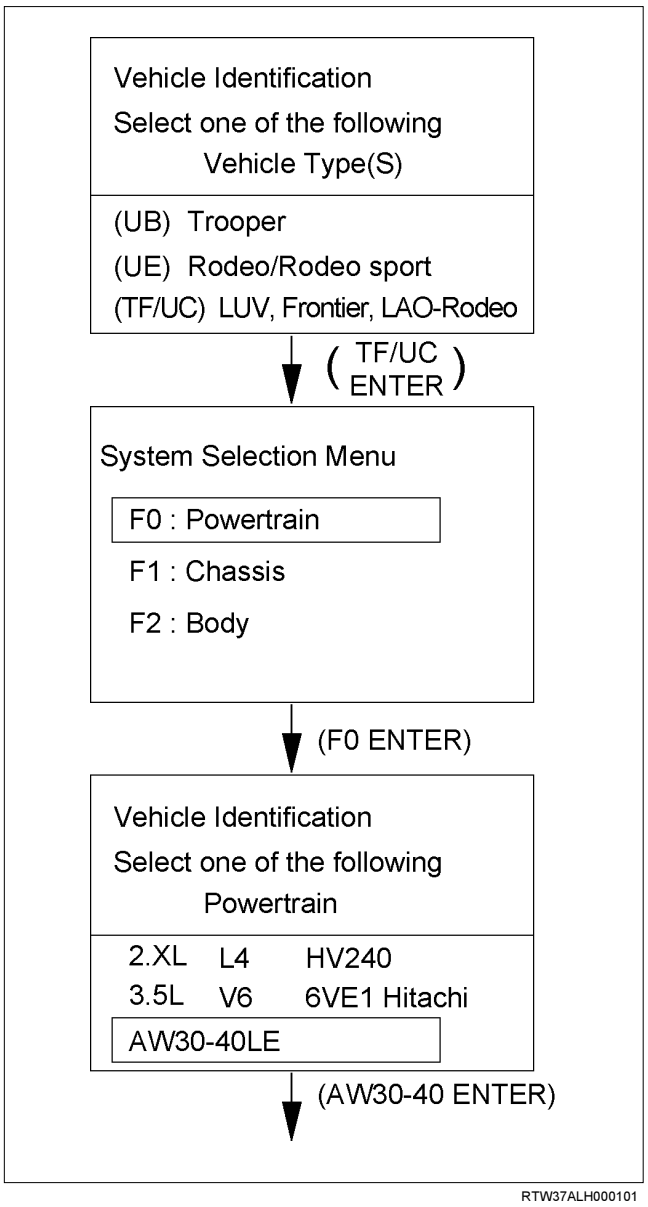

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Once the test vehicle has been identified an “Application (Powertrain) Menu" screen appears. Please select the appropriate application.

The following table shows, which functions are used for the available equipment versions.

- F0: Diagnostic Trouble Codes
  - F0: Read DTC Info As stored By ECU
  - F1: Clear DTC Information
  - F2: DTC Information
- F1: Data Display
- F2: Snap Shot
- F3: Miscllaneous Tests
  - F0: Lamps
    - F0: Power Lamp Test
    - F1: 3rd start Lamp Test
    - F2: AT Oil Temperature Lamp
    - F3: Check Light
  - F1: Solenoids
    - F0: Shift solenoid A (S1)
    - F1: Shift Solenoid B (S2)
    - F2: Pressure Control Solenoid (PCS)

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Diagnostic Trouble Codes

The purpose of the “Diagnostic Trouble Codes" mode is to display stored TCM trouble codes.

When “Diagnostic Trouble Codes" is selected an “Application Menu" screen appears.

Clear DTC Information

The purpose of the “Clear DTC Information" mode is to command the clearing of stored TCM trouble codes.

When “Clear DTC Information" is selected, a “Clear DTC Information", warning screen appears. This screen informs you that by cleaning DTC's, “all stored DTC information in controller will be erased".

Do you want to clear DTC's (Yes/No).

Press either the Yes or No key when answering.

After clearing codes, confirm system operation by test driving the vehicle.

Allow the vehicle to shift through all four forward gears in a manner which attempts to repeat the failure condition.

NOTE: When the trouble has not been repaired and the trouble code cannot be erased, check the vehicle again.

DTC Information

When “DTC Information" is selected, an “Application Menu" appears with a list of DTC information function keys addressing DTC specifics and their origins.

Function key selections may vary for particular vehicle and/or system.

Data Display

The purpose of the “Data Display" mode is to continuously monitor data parameters.

The current actual values of all important sensors and signals in the system are display through F1 mode.

When “Data Display" is selected an “Application Menu" appears. Please select either “Engine" or “Transmission Data Display".

See “Transmission Data" on next page.

Snapshot

When “Snapshot" is selected an “Application Menu" appears.

When “Transmission Snapshot" application is selected from the “Application Menu", a “Snapshot Menu" appears, displaying several options. “Snapshot" options may vary from one system to another.

“Snapshot" allows a recording of all vehicle parameters. There parameters may then be replayed at a future point in time.

This action allows you to focus on making the condition occur, rather than trying to view all of the data in anticipation of the fault. The snapshot will collect parameter information around a trigger point that you select.

When a snapshot is taken. It is recorded onto the PCMCIA memory card. When the Tech 2 is powered down. Snapshots are not lost.

Actuator Tests

The purpose of “Actuator Tests" mode is to check for correct operation of electronic system actuators.

Lamps

You can operate the lamps by pressing the “ON" and “OFF" buttons.

Preconditions: none

Solenoid

Solenoid A(S1), Solenoid B(S2)

You can operate the solenoids by pressing the “ON" and “OFF" buttons.

Preconditions: P–N position, no vehicle speed, no engine speed

Pressure Control Solenoid (PCS)

You can set desired PCS Current using the “ON" (+20) and “OFF" (-20) button. The PC Solenoid Data informs about PCS Current, Pressure and Duty Cycle.

Preconditions: P–N position, no engine speed, no vehicle speed

NOTE:

Freeze Frame

Freeze Frame is an element of the Diagnostic Management System which stores various vehicle information at the moment an emission-related fault is stored in memory and when the Check Transe Lamp is commanded on. These data can help to identity the cause of a fault. Refer to *Storing And Erasing Freeze Frame Data for more detailed information.*

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TRANSMISSION DATA

ITEM	UNIT	ENGIN RUNNING AT IDLE
Current Gear	1 st/2 nd/3 rd/4 th	1 st
Target Gear	1 st/2 nd/3 rd/4 th	1 st
Vehicle Speed	km/h	0 km/h
AT Output Speed (Automatic Transmission)	RPM	0 RPM
AT Input Speed (Automatic Transmission)	RPM	675~725 RPM
Engine Speed	RPM	675~725 RPM
Throttle Position Sensor Signal	%	0.00~7.00%
AT Oil Temperature (Automatic Transmission)	°C	Depends on conditions
TCM Status	Transfer Low /Transfer High	Transfer HI
Desired PC Solenoid Pressure (STH)	kPa	34.3~97.0 kPa
Desired PC Solenoid Current (STH)	mA	835~1020 mA
PC Solenoid Actual Current (STH)	mA	835~1020 mA
Gear Ratio	: 1	Depends on uper hood
TCC Slip Speed	RPM	0 RPM
Shift Position Actual	P/R/N/L/2/3	P
Inhibitor Switch	P/R/N/L/2/3	P
Transmission Check Light	On/Off	Off
AT Oil Temperature Lamp (Automatic Transmission)	On/Off	Off
3 rd Start Lamp	On/Off	Off
Power Lamp	On/Off	Off
Shift Solenoid S1	On/Off	On
Shift Solenoid S2	On/Off	On
Shift Solenoid S3	On/Off	Off
Diag Switch Condition	On/Off	Off
Power Switch	On/Off	Off
Brake Switch	On/Off	Off
Cruise Switch	On/Off	Off
4L Signal	On/Off	Off
3 rd Start Switch	On/Off	Off
Coolant Temperature	°C	Depends on conditions
Torque Request (timing Retard)	°CA	0 °CA
Garage Shift Mode	On/Off	Off
CAN TPS	%	0.00%
CAN Signal Valid Counter (ECM)	—	0 ~ 255
CAN Signal Valid Counter (TCM)	—	0 ~ 255

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SNAPSHOT DISPLAY WITH TIS2000

Procedures for transferring and displaying Tech2 snapshot data by using TIS2000 [Snapshot Upload] function is described below.

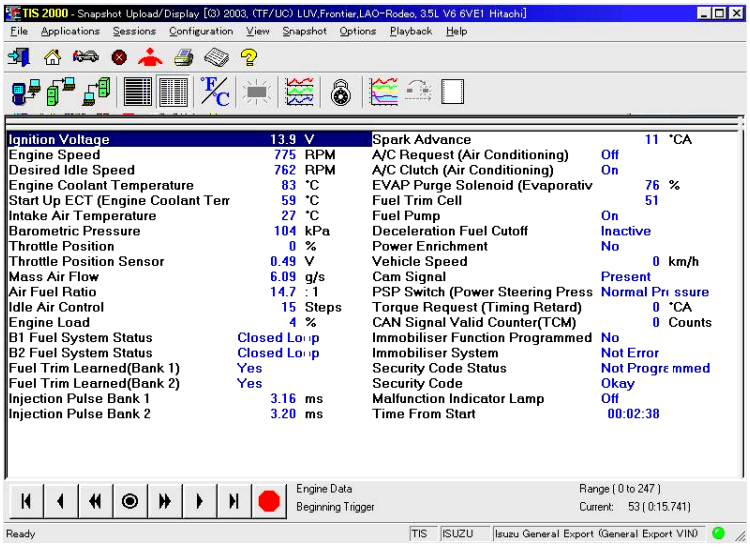
Snapshot data can be displayed with [Snapshot Upload] function included in TIS2000.

By analyzing these data in various methods, trouble conditions can be checked.

Snapshot data is displayed by executing the three steps below shown:

1. Record the snapshot data, in Tech2.

2. Transfer the snapshot data to PC.



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After recording the snapshot in Tech2, transfer the data from Tech2 to PC by the below procedures.

1. Start TIS2000.
2. Select [Snapshot Upload] on the TIS2000 start screen.
3. Select [Upload from trouble diagnosis tool (transfer from diagnosis tester)] or click the corresponding icon of the tool bar.
4. Select Tech2, and transfer the recorded snapshot information.
5. Select the transferred snapshot.
6. After ending transfer of the snapshot, data parameter list is displayed on the screen.

3. Snapshot data is displayed with TIS2000 [Snapshot Upload] function.

Snapshot is stored in the PC hard disk or floppy disk, and can be displayed any time.

Stored snapshot can be displayed by the below procedures.

1. Start TIS2000.
2. Select [Snapshot Upload] on the TIS2000 start screen.
3. Select [Open the existing files] or click the corresponding icon of the tool bar.
4. Select the transferred snapshot.
5. Open the snapshot, to display the data parameter list on the screen.

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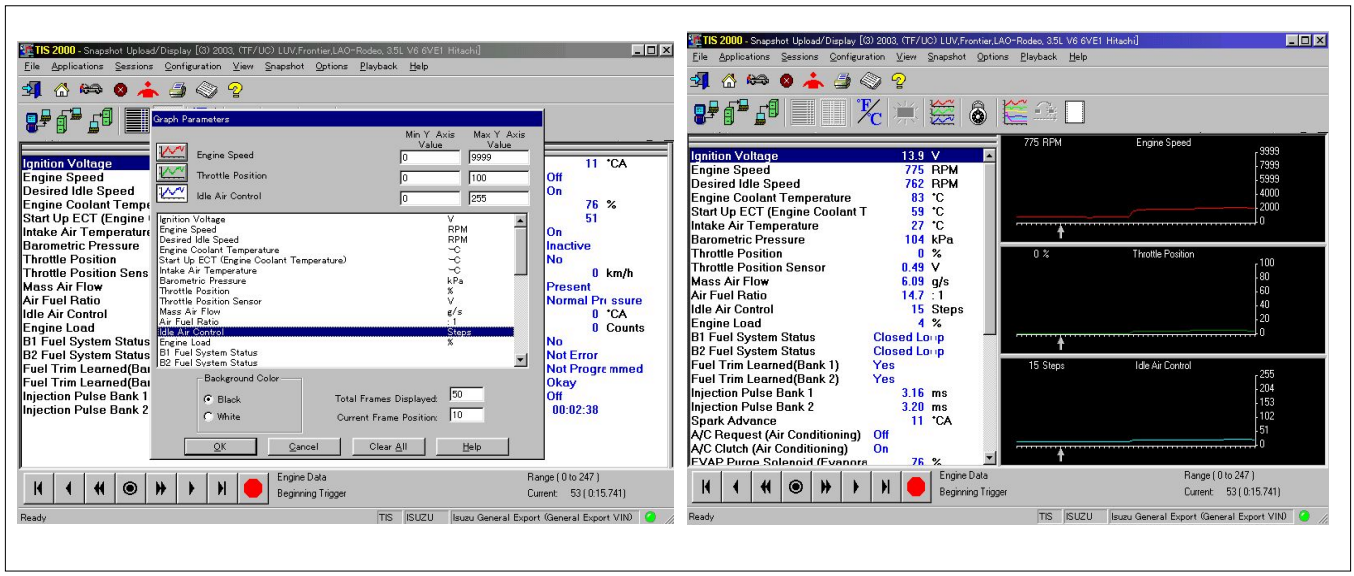
Graph display Values and graphs (Max. 3 graphs):



1. Click the icon for graph display. [Graph Parameter] window opens.
2. Click the first graph icon of the window upper part, and select one parameter from the list of the window lower part. Selected parameter is displayed nest to the graph icon. Graph division can be selected in the field on the parameter right side.
3. Repeat the same procedures with the 2nd and 3rd icons.
4. After selecting all parameters to be displayed (Max. 3 parameters), click [OK] button.
5. Parameter selected is displayed in graph form on the right of the data parameter on the screen.
6. Graph display can be moved with the navigation icon.
7. For displaying another parameter by graph, click the parameter of the list, drug the mouse to the display screen while pressing the mouse button and release the mouse button. New parameter is displayed at the position of the previous parameter. For displaying the graph display screen in full size, move the cursor upward on the screen. When the cursor is changed to the magnifying glass form, click the screen. Graph screen is displayed on the whole screen.

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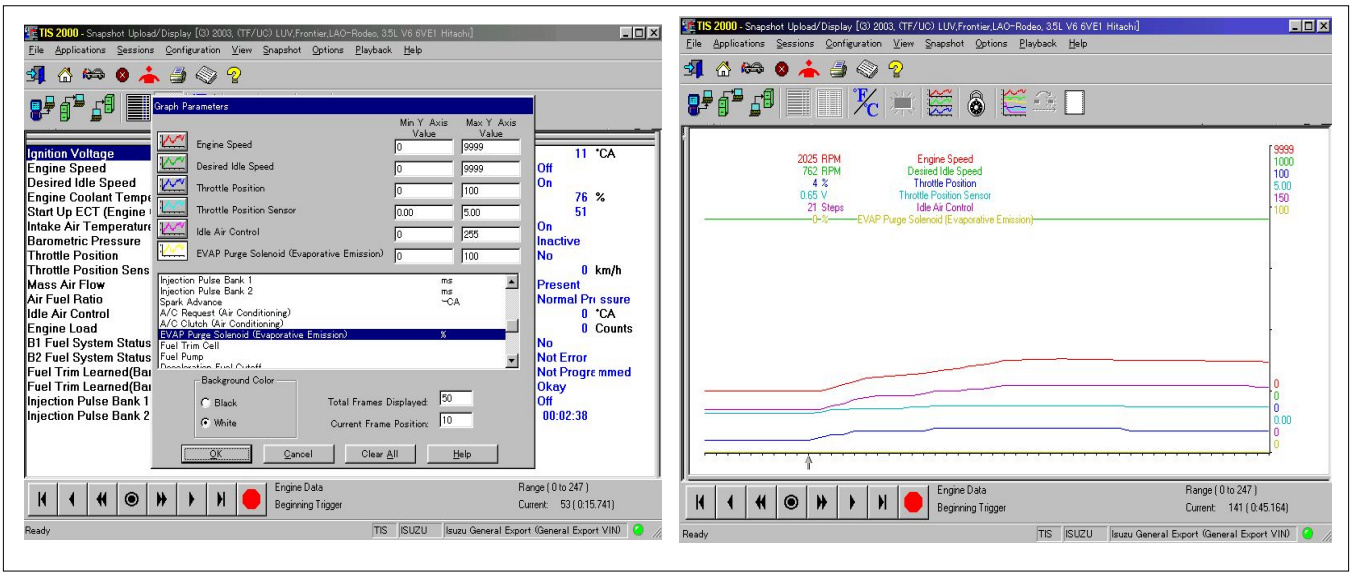
Display of graphs on one screen (Max. 6 graphs):



1. Click the 6 graph icon. [Graph Parameter] window opens.
2. Click the graph icon, select the parameter to be displayed from the list and change divisions according to necessity.
3. Repeat the same procedures with the graph icons, from the 2nd to 6th.
4. Click the [OK] button to display.
5. In this case, parameters are displayed only in graph form. All parameters are displayed in one graph.
6. The graph display screen can be moved with the navigation icon.

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SERVICE PROGRAMMING SYSTEM (SPS)

The procedure to program the control unit by using the Service Programming System (SPS) software contained in TIS2000 is explained below.

NOTE:

- **Should Tech2 display "SPS Procedure was not successful", engine will not start, but no DTCs are present, low battery voltage or poor electrical connections should be the primary suspects. Perform the SPS procedure again after rectifying the fault/s.**

IMPORTANT:

Perform the following checks before attempting to program the control unit:

- **The Tech2 PCMCIA card is programmed with the latest software release.**
- **The latest release of TIS2000 is loaded on the PC.**
- **The vehicle battery is fully charged.**
- **The control unit to be programmed is connected to the vehicle.**

1. Preparations of TIS 2000

1. Connect Tech 2 to P/C.
2. Check to see if Hardware Key is plugged into Port.
3. Activate TIS 2000 by P/C.
4. On the activating screen of TIS2000, choose "Service Programming System"

5. On the screen of "Diagnostic Tester and Processing Program Selection", choose the one that will comply with the following.

- Diagnostic tester in use
- New programming by the existing module or new programming by the replaced/new module.
- Fixing position of the control unit.

6. Upon completion of the selection, push the button of "Continue".

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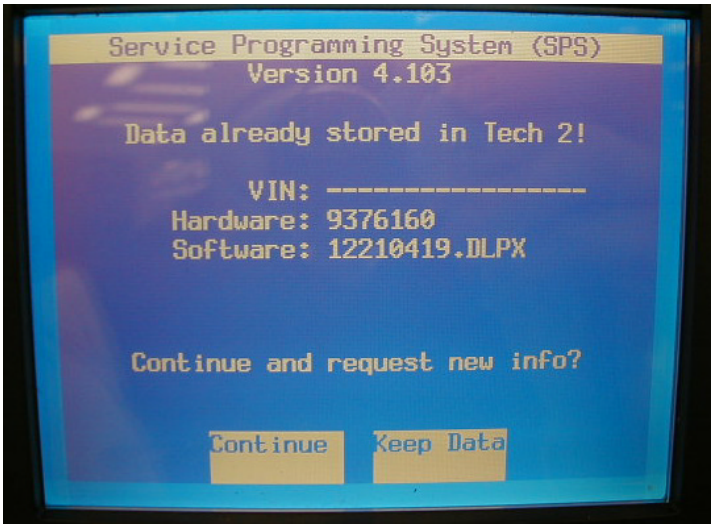
2.Demand of Data

1. Connect Tech-2 to the vehicle. When activated by turning on the power of Tech-2, push the "Enter" switch.
2. Turn on the ignition switch (without starting the engine)
3. In the main menu of Diagnostic Tester, push "F1: Service Programming System (SPS)".
4. Push "F0: Request Info" of Tech-2.
5. Where vehicle data has been already saved in Tech-2, the existing data come on display. In this instance, as Tech-2 starts asking whether to keep the data or to continue obtaining anew data from the control unit, choose either of them.



6. If you select “continue”, you have to select “Model Year”, “Vehicle Type”, “Controller Type (Engine)”.
7. After that. then push button and turn Ignition switch tuned on, off, on following Tech-2 display. Tech-2 will read information from controller after this procedure.
8. During obtaining information, Tech-2 is receiving information from the control unit chosen. In replacing the control unit, please be sure to undertake "Obtaining Information" from the new unit. With VIN not being programmed into the new control unit at the time of shipment, "obtaining information" is not complete (because the vehicle model, engine model and model year are specified from VIN). For the procedure get additional information on vehicles, instruction will be provided in dialog form, when TIS2000 is in operation.
9. Following instructions by Tech-2, push the "Exit" switch of Tech-2, turn off the ignition of the vehicle and turn off the power of Tech-2, thereby removing from the vehicle.

3.Data Exchange

1. Connect Tech-2 to P/C, turn on the power and click the "Next" button of P/C.
2. Check VIN of the vehicle and choose "Next".
3. When a lack of data is asked from among the following menu, enter accordingly.
   Select following Menu
   - Model Year
   - Model
   - Engine type
   - Transmission type
   - Destination code (vehicles for general export)*1
   - Immobiliser

* 1: How to read the destination code

"Destination code can be read from ID Plate affixed on vehicles, while on VIN plate the destination code is described at the right-hand edge of Body Type line. In Fig.-3, the destination code can be read as "EK4" (Europe).

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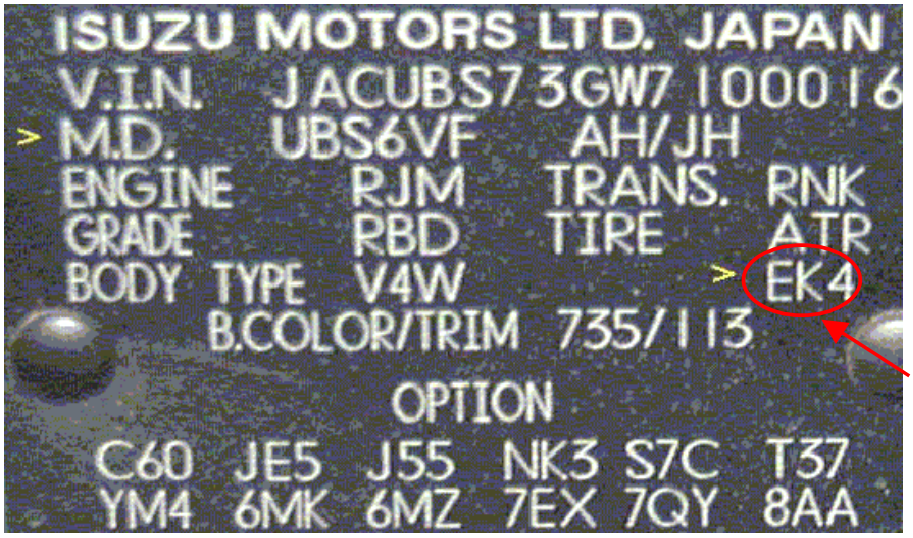

4. After choosing the data, click the "Next" button.
5. When all the necessary information is entered, the "details" of software within the database that match the entered data will appear for confirmation. Click the "Program" switch and then download the new software onto Tech-2.
6. "Data Transfer" comes on display. The progress of downloading will be displayed on the screen in the form of bar graph.
7. Upon finishing the data transfer, turn off the power of Tech-2, removing from P/C.

4. Programming of ECM

1. Check to see if batteries are fully charged, while ABS connectors shall be removed from the vehicle.
2. Connect Tech-2 to Vehicle Diagnostic Connectors.
3. Turn on the power of Tech-2 and the title screen comes on display.
4. Turn on the ignition (without allowing the engine to start)
5. On the title screen of Tech-2, push the "Enter" button.
6. Choose "F: Service Programming System" on the main screen and then choose "FI: Programming".
7. While data is being transferred, "Downloading" will be displayed on the Tech-2 screen.
8. Upon finishing the data transfer, Tech-2 will display "Reprogramming Successful". Push the "Exit" button to bring program to completion.
9. Following "Procedure 2: Demand of Data", try over again "Information Obtaining" and check to confirm if the data has been correctly re-loaded.
10. Upon finishing confirmation, turn off the ignition of the vehicle and then turn off the power of Tech-2, removing from the vehicle.

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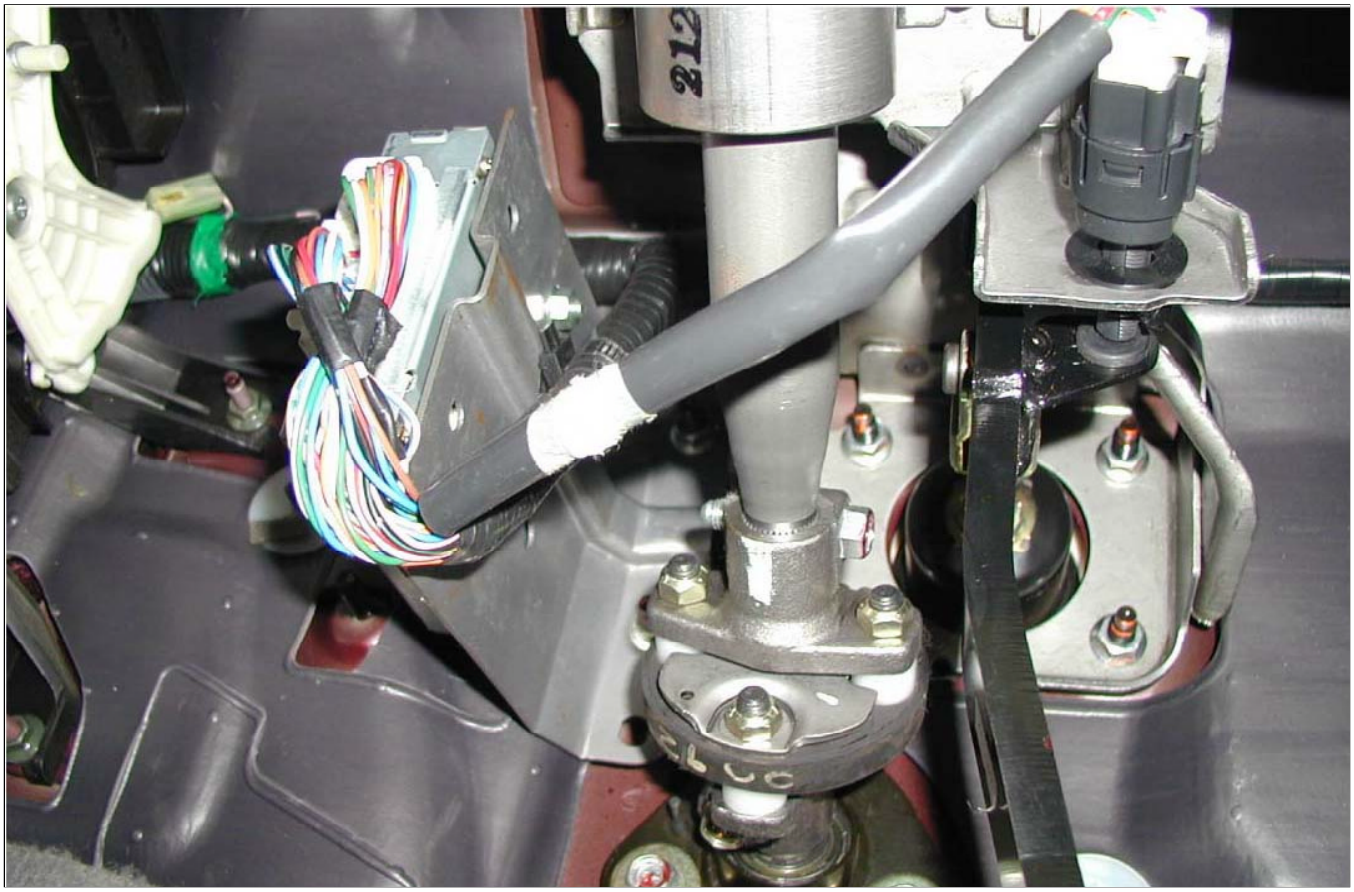
OBD Diagnostic Management System

Transmission Control Module (TCM) Location



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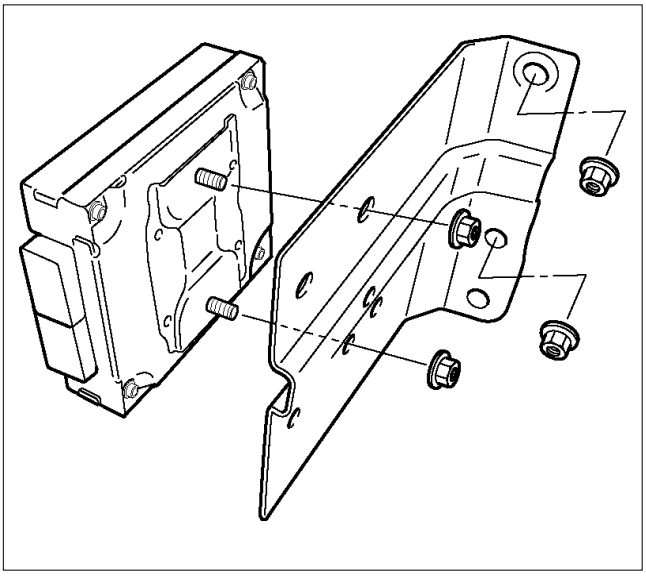

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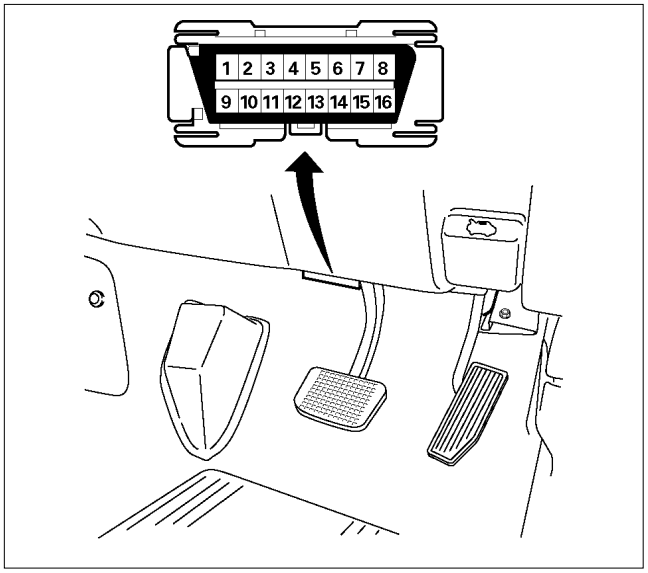
16 – Terminal Data Link Connector (DLC)

OBD standardizes Data Link Connector (DLC) configurations. The DLC, formerly referred to as the ALDL, will be a 16–terminal connector found on the lower right side of the driver's side instrument panel. All manufacturers must conform to this 16–terminal standard.



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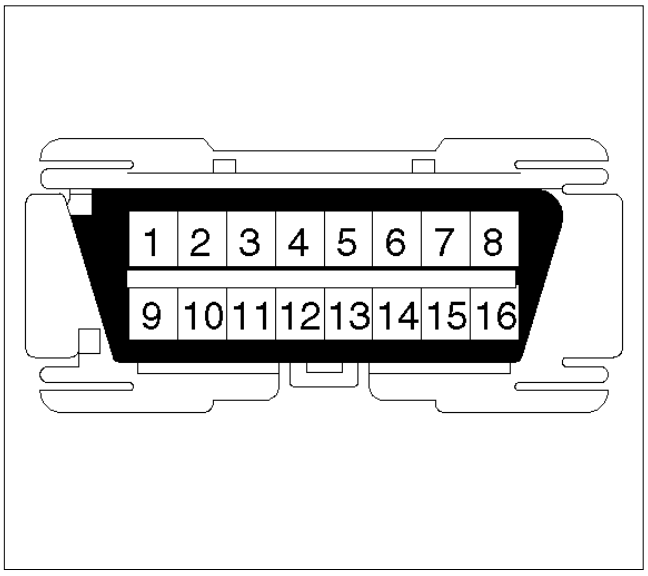

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PIN 1 – uart
PIN 2 – J1850 Bus + L line on 2–wire systems, or single wire (ECM)
PIN 3 – (Not used)
PIN 4 – Chassis ground pin
PIN 5 – Chassis ground pin
PIN 6 – ECM diagnostic enable
PIN 7 – KW2000
PIN 8 – (Not used)
PIN 9 – Primary UART
PIN 10 – (Not used)
PIN 11 – TCM diagnostic enable
PIN 12 – ABS diagnostic or CCM diagnostic enable
PIN 13 – SIR diagnostic enable
PIN 14 – (Not used)
PIN 15 – (Not used)
PIN 16 – Battery power from vehicle unswitched (4 AMP MAX.)

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Clear DTC

NOTE: If you clear the DTC (Diagnostic Trouble Codes) you will not be able to read any codes recorded during the last occurrence.

NOTE: To use the DTC again to identify a problem, you will need to reproduce the fault or the problem. This may require a new test drive or just turning the ignition on (this depends on the nature of the fault).

1. IF you have a Tech 2:
    1. Connect the Tech 2 if it is still not connected go through **Tech 2 OBD CONNECTION.**
    2. Push “F1: Clear DTC Information" in the Application Menu and answer “Yes" to the question “Do you want to clear DTC's?"
        a. When a malfunction still exists and the Tech 2 displays “AW30-40 CODES NOT CLEARED". This means that the problem is still there or that the recovery was not done. Please go to **DTC CHECK.**
        b. When a malfunction has been repaired and the recovery is done the Tech 2 displays “AW30-40LE CODES CLEARED".
2. When you have no Tech 2, the storaged trouble codes can be cleared by shorting the terminals No.11 and No.4 or 5 (ground) of data link connector with a lead wire for 1 ~ 6 seconds.

DTC Check

1. Diagnostic Trouble Codes (DTC) have been identified by Tech 2.
2. You have written the list of the DTCs. The order of the malfunctions has no meanings for this TCM. Usually only one or two malfunctions should be set for a given problem.
3. Check directly the DTCs you identified. The DTCs are sorted by number. Refer to Diagnostic Trouble Code (DTC) Identification in this section.

TCM Precaution

The TCM can be damaged by:

1. The electrostatic discharge
2. The short circuit of some terminals to voltage or to ground.

Electrostatic Discharge Damage Description:

1. Electronic components used to control systems are often designed to carry very low voltage, and are very susceptible to damage caused by electrostatic discharge. It is possible for less than 100 volts of static electricity to cause damage to some electronic components. By comparison, it takes as much as 4,000 volts for a person to even feel the zap of a static discharge.
2. There are several ways for a person to become statically charged. The most common methods of charging are by friction and induction. An example of charging by friction is a person sliding across a car seat, in which a charge of as much as 25,000 volts can build up. Charging by induction occurs when a person with well insulated shoes stands near a highly charged object and momentarily touches ground. Charges for the same polarity are drained off, leaving the person highly charged with the opposite polarity. Static charges of either type can cause damage, therefore, it is important to use care when handling and testing electronic components.

NOTE: To prevent possible electrostatic discharge damage:

1. Do not touch the TCM connector pins or soldered components on the TCM circuit board.
2. Be sure to follow the guidelines listed below if servicing any of these electronic components:
3. Do not open the replacement part package until it is time to install the part.
4. Avoid touching electrical terminals of the part.
5. Before removing the part from its package, ground the package to a known good ground on the vehicle.
6. Always touch a known good ground before handling the part. This step should be repeated before installing the part if the part has been handled while sliding across the seat, while sitting down from a standing position or while walking some distance.

Information On TCM

1. The Transmission Control Module (TCM) is located in the place of a clutch pedal and is the control center of the electronic transmission control system.
2. The TCM must be maintained at a temperature below 85°C (185°F) at all times. This is most essential if the vehicle is put through a paint baking process. The TCM will become inoperative if its temperature exceeds 85°C (185°F). Therefore, it is recommended that the TCM be removed or that temporary insulation be placed around the TCM during the time the vehicle is in a paint oven or other high temperature process.
3. The TCM is designed to process the various inputs and then respond by sending the appropriate electrical signals to control transmission upshift, downshift, shift feel and torque converter clutch engagement.
4. The TCM constantly interprets information from the various sensors, and controls the systems that affect transmission and vehicle performance. By analyzing operational problems, the TCM is able to

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perform a diagnostic function by displaying DTC(s) and aid the technician in making repairs.

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TCM Diagnostic Trouble Codes

The following table lists the diagnostic trouble codes supported by this vehicle application. If any DTCs not listed here are displayed by a scan tool, the scan tool data may by faulty; notify the scan tool manufacture of any DTCs displayed that are not included in the following table.

DTC NUMBER	FLASH CODE	DTC NAME	"CHECK TRANS"
P0560	25	System Voltage Error	—
P0602	63	Transmission Control Module (TCM) Programming Error	—
P0705	17	Transmission Range Sensor Circuit Malfunction	ON
P0712	15	Transmission Oil Temperature Sensor Circuit Low Input	ON
P0713	16	Transmission Oil Temperature Sensor Circuit Hight Input	ON
P0717	14	Input Speed Sensor Signal Error	ON
P0722	11	Output Speed Sensor Signal Error	ON
P0743	33	Torque Converter Clutch Electrical	ON
P0748	35	Pressure Control Solenoid Electrical	ON
P0753	31	Shift Solenoid S1 Electrical	ON
P0758	32	Shift Solenoid S2 Electrical	ON
P1767	67	ECM CAN (Control Area Network) Invalid	ON
P1790	61	Transmission Control Module ROM Checksum Error	ON
P1791	62	Transmission Control Module RAM Error	ON
U2104	65	CAN (Control Area Network) BUSS OFF	ON

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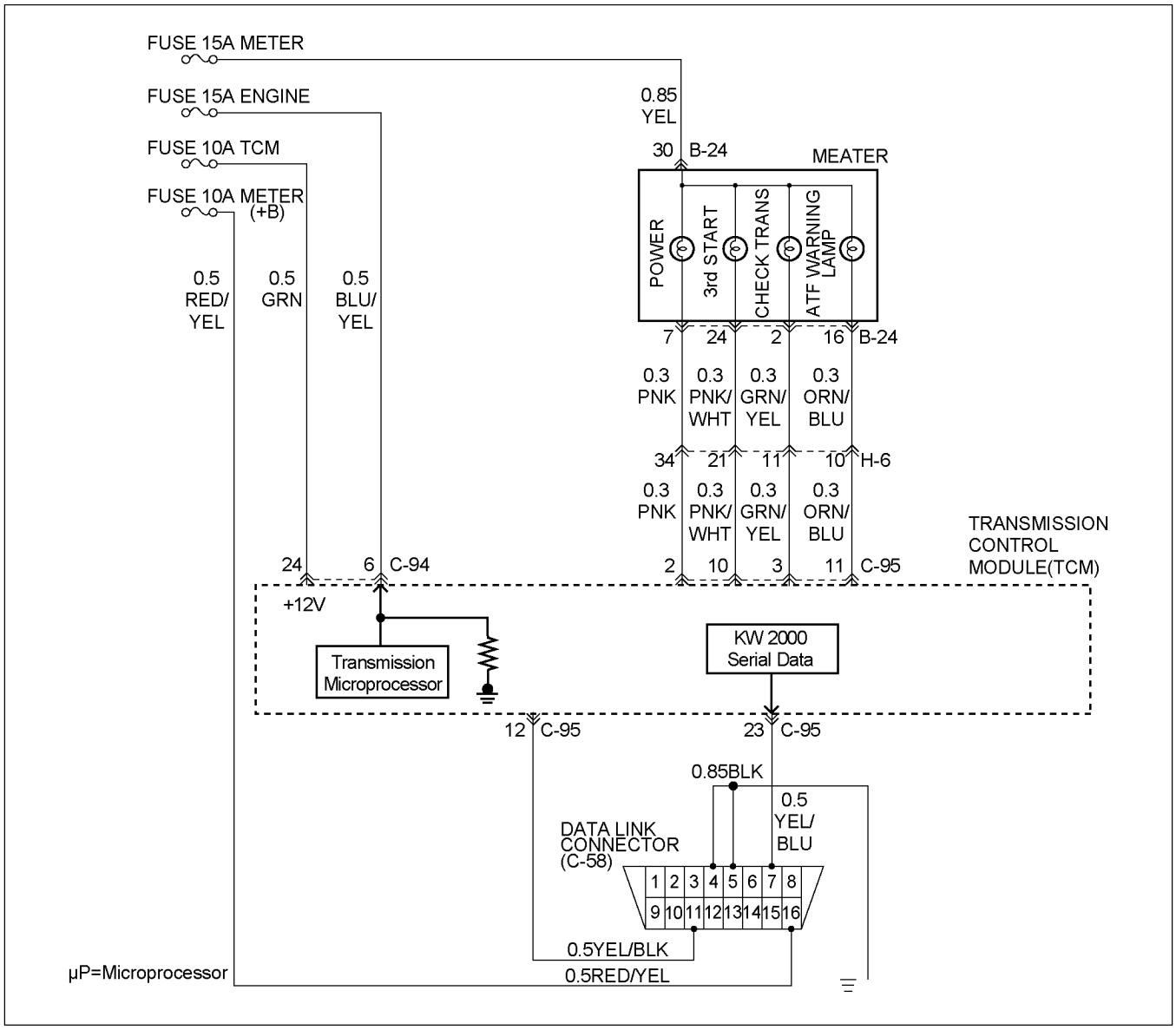
DTC P0560 (FLASHING CODE 25) System Voltage Error



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Circuit Description

The Transmission Control Module (TCM) monitors the system voltage on the ignition feed terminal to the TCM. A system voltage DTC will set whenever the voltage is below or above a calibrated value.

Condition for setting the DTC

When the TCM detects following conditions.

- Ignition voltage is less than 9V or more than 18V.
- Engine speed is more than 600 rpm.

Action Taken When The DTC Sets

- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

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Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.

  Inspect for a broken wire inside the insulation.

DTC P0560 – System Voltage Error

Step	Action	Value(s)	YES	NO
1	Was the powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to *OBD System Check*
2	Using a DVM, measure the battery voltage at the battery. Is the battery voltage greater than the specified value?	11.5 V	Go to *Step 3*	Charge battery, then go to *Step 3*
3	1. Install a Tech 2. 2. Select “Ignition Volts" on the Tech 2. 3. Start the engine and raise the engine speed to the specified value. 4. Load the electrical system by turning on the headlights, high blower, etc. Is the ignition voltage approximately equal to the specified value?	2000 RPM 12.8-14.1 V	Go to *Step 4*	Go to *Starting/Charging*
4	1. Ignition “OFF". 2. Disconnect the TCM connector at the TCM. 3. Using a DVM, measure the battery voltage at the TCM connector C-94. Is it approximately equal to battery voltage?	—	Check for excessive curren draw with ignition “OFF" engine “OFF".	Go to *Step 5*
5	1. Check for faulty connections at the TCM harness terminals. 2. Repair as necessary. Was a repair necessary?	—	Verify repair	Go to *Step 6*
6	Check for an open battery feed circuit to the TCM. Is the action complete?	—	Verify repair	Go to *Step 7*
7	Replace the TCM. **Important:** The replacement TCM must be programmed. (Refer to *SPS* for procedure.) Is the action complete?	—	Verify repair	—

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DTC P0602 (FLASHING CODE 63) Transmission Control Module (TCM) Programming Error

Circuit Description

The Service Programming System (SPS) updates the flash calibration files that are stored in a Transmission Control Module (TCM). The calibration file custom-tailors a module to a certain vehicle. The calibration file contains data for things such as spark curves and fuel control. When troubleshooting a driveability problem, diagnosis may call for reprogramming the controller with newer calibration information to correct a customer concern and Vehicle Identification Number (VIN).

Condition for setting the DTC

When the TCM is not written VIN No.

Action Taken When The DTC Sets

- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

DTC P0602 is indicated when the TCM does not written VIN No. A security lock is performed by SPS. And not replace the TCM when DTC P0602 can repair by SPS.

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DTC P0602 (FLASHING CODE 63) Transmission Control Module (TCM) Programming Error

Step	Action	Value(s)	YES	NO
1	Was the “On-Board Diagnostic (OBD) System Check" performed?	—	Go to *Step 2*	Go to *OBD System Check*
2	1. Install the scan tool. 2. Key “ON". 3. Check the Vehicle Identification Number (VIN) by the scan tool. Is VIN on the scan tool same as VIN of vehicles?	—	Go to *Step 4*	Go to *Step 3*
3	Write a VIN by the scan tool. (Refer to SPS for procedure.) Is the action complete?	—	Go to *Step 4*	—
4	Clear the DTC P0602 by the scan tool. Is the action complete?	—	Go to *Step 5*	—
5	Perform the SPS and perform security lock. (Refer to SPS for procedure) Is the action complete?	—	Go to *Step 6*	—
6	Recheck the DTC by the scan tool. 1. Key “OFF". 2. Wait a few seconds. 3. Key “ON". 4. Review and record scan tool data. 5. Operate the vehicle with in scan tool data. Is the action complete?	—	Go to *Step 7*	Verify repair
7	Replace the TCM. **Important:** The replacement TCM must be programmed. (Refer to *SPS* for procedure.) Is the action complete?	—	Verify repair	—

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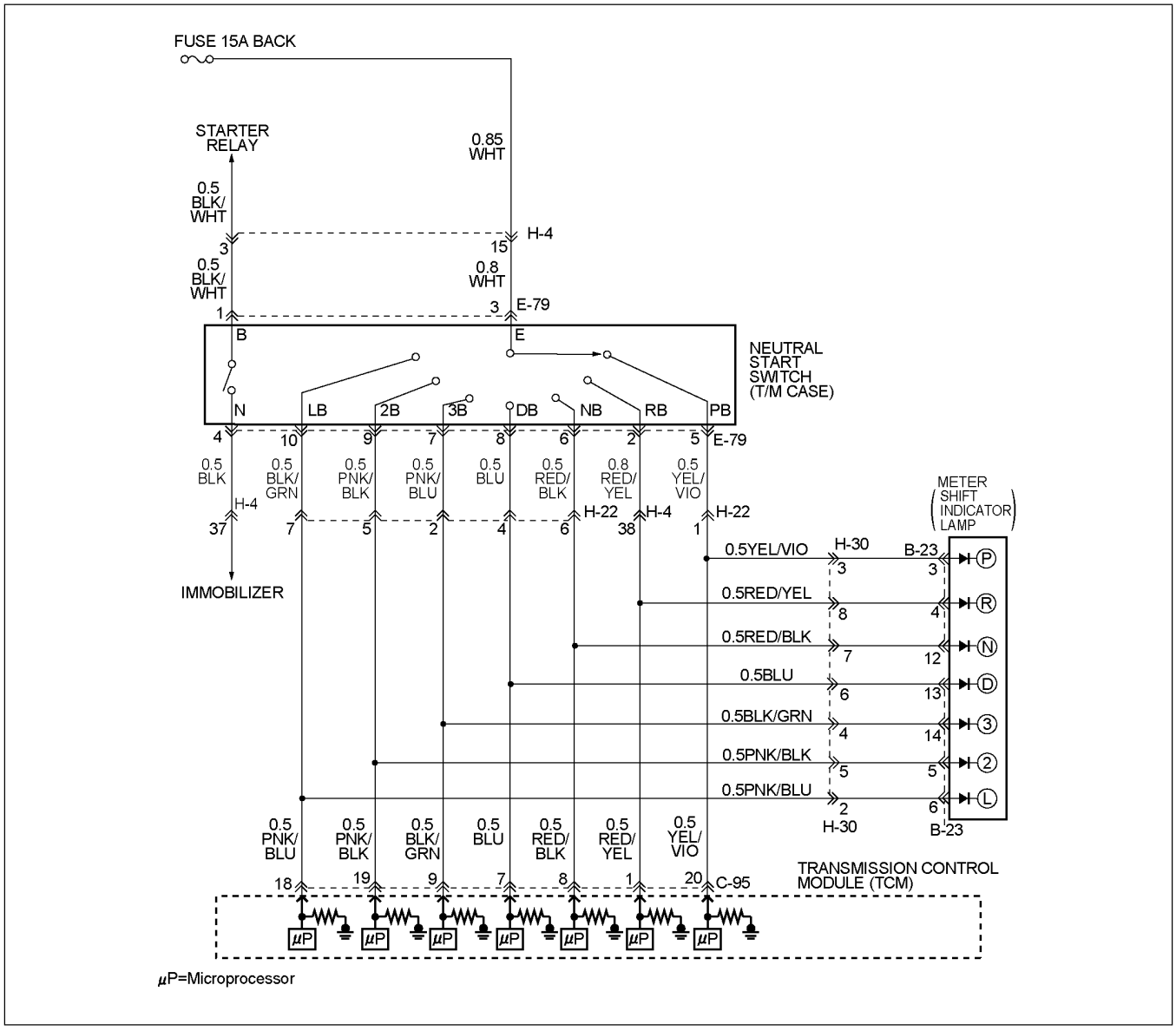
DTC P0705 (FLASHING CODE 17) Transmission Range Sensor Circuit Malfunction



RTW37ALF000501

Circuit Description

The neutral start switch gives the signals related to the selector lever position (PRND32L) to the Transmission Control Module (TCM). The neutral start switch turns on when the select lever is shifted to the P, R, N, D, 3, 2 or L range. The neutral start switch, which is connected to the starter switch circuit, is available only when the select lever is in the P or N range (Engine run).

The neutral start switch is connected to the transmission manual shaft and installed in the transmission case.

Condition for setting the DTC

- The TCM detects following "Condition 1" for 30 sec continuously.
- The TCM detects following "Condition 2" for 10 sec continuously.

  Condition 1("Open"):

  When the TCM detects no signal of range sensor more than 2.0 sec at following conditions.

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Condition 2 ("Short"):

When the TCM detects 2 times or more signals of range sensor more than 0.025 sec at following conditions.

- Vehicle speed is more than 19 mph.
- Engine speed is more than 1500 rpm.

Action Taken When The DTC Sets

- No 3rd start mode.
- No slope control.
- The TCM judges always D range position of range sensor at "Condition 1".
- The TCM judges the position of range sensor with following priority at "Condition 2".
- There is a priority in order of D, 3, 2, L, R, N, and P.
- Check Trans ON.
- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.

  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.
- Check range sensor for proper mounting and adjustment.

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DTC P0705 (FLASHING CODE 17) Transmission Range Sensor Circuit Malfunction

Step	Action	Value(s)	YES	NO
1	Was the powertrain On-Board Diagnostics (OBD) System check performed ?	—	Go to *Step 2*	Go to *OBD System Check*
2	1. Install the scan tool. 2. Key “ON" 3. Review and record scan tool data. 4. Operate the vehicle with in scan tool data. Does the scan tool indicate DTC P0705 ?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Measure the voltage shifting the select lever every position, between TCM connector terminals and ground which performed selecting to every position. 1. Key “OFF" 2. Disconnect the TCM connector. 3. Key “ON" 4. Connect the DMM to the TCM connector terminal and ground. Is the displayed voltage at every position normal ?	7—16V	Go to *Step 7*	Go to *Step 4*
4	Measure the voltage between terminal the neutral start switch and ground. 1. Key“OFF" 2. Disconnect the neutral start switch connector. 3. Key“ON" 4. Connect the J39200 DMM to the each terminal of the neutral start switch connector E79-3 and ground. If the problem found repair as necessary. Was the problem found?	7—16V	Verify repair	Go to *Step 5*
5	Measure the resistance shifting the select lever to every position, between terminal neutral start switch connector E79-3 and E79other terminal. 1. Key“OFF" 2. Disconnect the neutral start switch connector. 3. Key“ON" 4. Connect the DMM to the each terminal of the neutral start switch connector E79-3 and E79-5 or E79-2 or E79-6 E79-8 or E79-7 or E79-9 or E79-10. If the problem found repair as necessary. Was the problem found?	Less than 1Ω	Verify repair	Go to *Step 6*

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Step	Action	Value(s)	YES	NO
6	Check the wire between terminal C-95 and E-79 for open. 1. Connect the J39200 DMM to the each terminal of the TCM connector and neutral start switch. If the problem found repair as necessary. Was the problem found?	∞	Verify repair	—
7	Replace the TCM. IMPORTANT; The replacement TCM must be programmed. (Refer to SPS for procedure.) Is the action complete?	—	Verify repair	—

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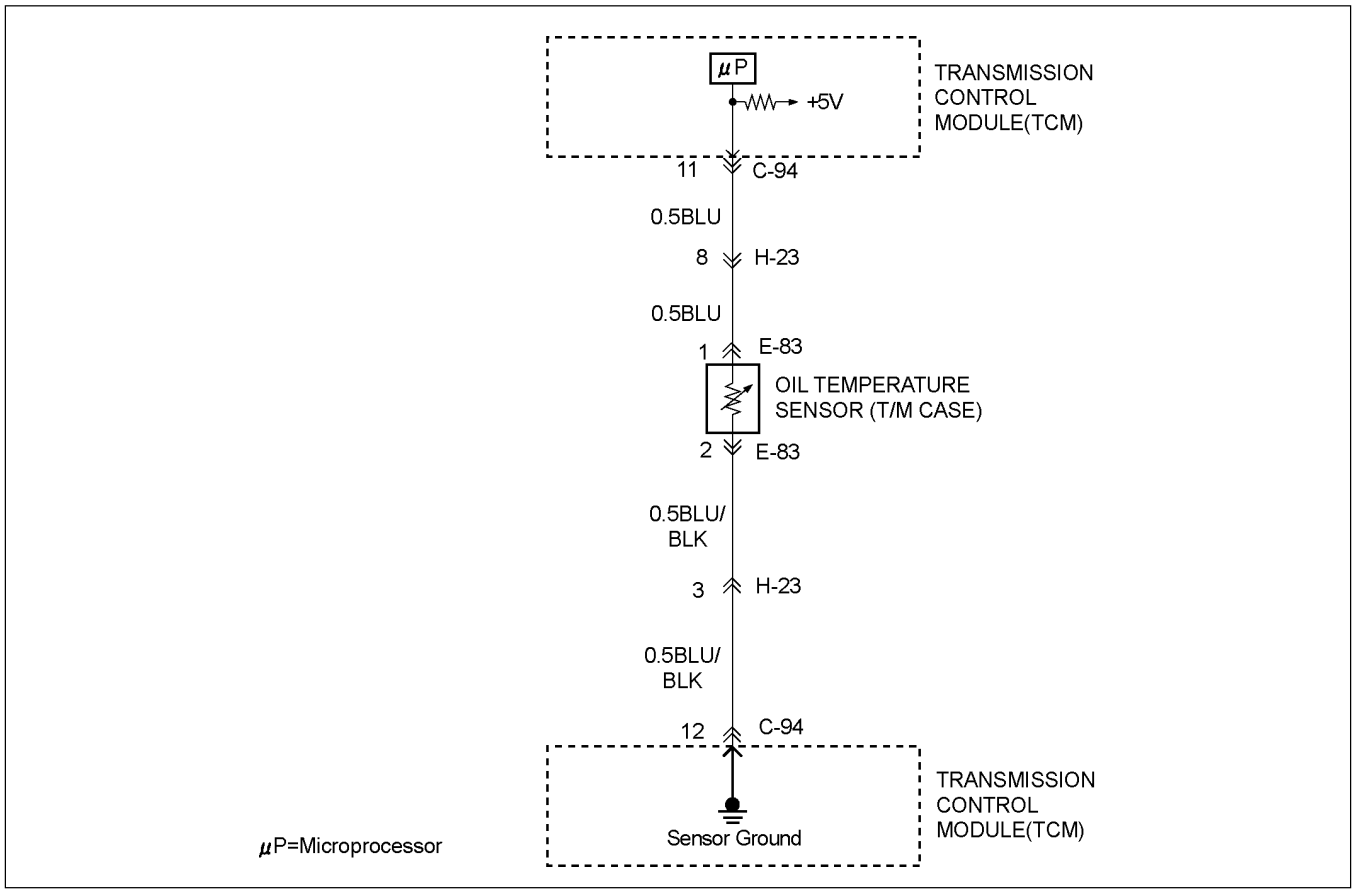
DTC P0712 (FLASHING CODE 15) Transmission Oil Temperature Sensor Circuit Low Input



RTW37AMF000201

Circuit Description

The oil temperature sensor is a thermistor sensor that is installed in the transmission case and converts temperature changes into continuous electric signals, then outputs them to the Transmission Control Module (TCM). When the ATF temperature is low, the resistance of the sensor (thermistor) goes up, so that the voltage of the TCM signal becomes high.

As the ATF is gradually warmed, the resistance of the sensor goes down and the voltage becomes low. At the normal operating ATF temperature (80°C/176°F) of the transmission, the voltage of the TCM is about 3.7V.

Condition for setting the DTC

- The TCM detects following "Condition" for 5 min continuously.

  Condition ("Short"):

  - Oil temperature is more than 220°C (428°F).

Action Taken When The DTC Sets

- The TCM judges oil temperature is 100°C (212°F).
- Check Trans ON.
- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

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Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring. Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.
- Check oil temperature sensor for proper mounting and adjustment.

DTC P0712 (FLASHING CODE 15) Transmission Oil Temperature Sensor Circuit Low Input

Step	Action	Value(s)	YES	NO
1	Was the powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to *OBD System Check*
2	Perform the transmission fluid checking procedure. Refer to checking Transmission Fluid level and Condition in Automatic Transmission 7A section. Was the fluid checking procedure performed ?	—	Go to *Step 3*	Refer to Checking Transmission Fluid level and Condition in Automatic Transmission (AW30-40LE) section
3	1. Install the scan tool. 2. Key “ON" 3. Review and record scan tool data. 4. Operate the vehicle with in scan tool data. Does the scan tool indicate DTC P0712 ?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Measure the voltage of the transmission fluid temperature sensor by the J39200 DMM. 1. Key “OFF". 2. Disconnect the oil temperature sensor connector. 3. Key “ON". 4. Connect the J39200 DMM to the each terminal of the oil temperature sensor connector E83-2 and E83-1. Does the scan tool indicate less than specified value ?	5V	Go to *Step 5*	Go to *Step 6*
5	Replace the transmission fluid temperature sensor. Is the action complete ?	—	Verify repair	—

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Step	Action	Value(s)	YES	NO
6	Measure the resistance of the wire by the J39200 DMM. 1. Key “OFF". 2. Disconnect the TCM connector. 3. Install a jumper wire from terminal E83-1 and E83-2 on the mission harness. 4. Connect the j39200 DMM to the each terminal of the TCM connector C94-11 and C94-12. If a problem is found, repair as necessary. Was the problem found ?	less than 1Ω	Verify repair	Go to *Step 7*
7	Replace the TCM. **Important:** The replacement TCM must be programmed. (Refer to SPS for procedure.) Is the action complete ?	—	Verify repair	—

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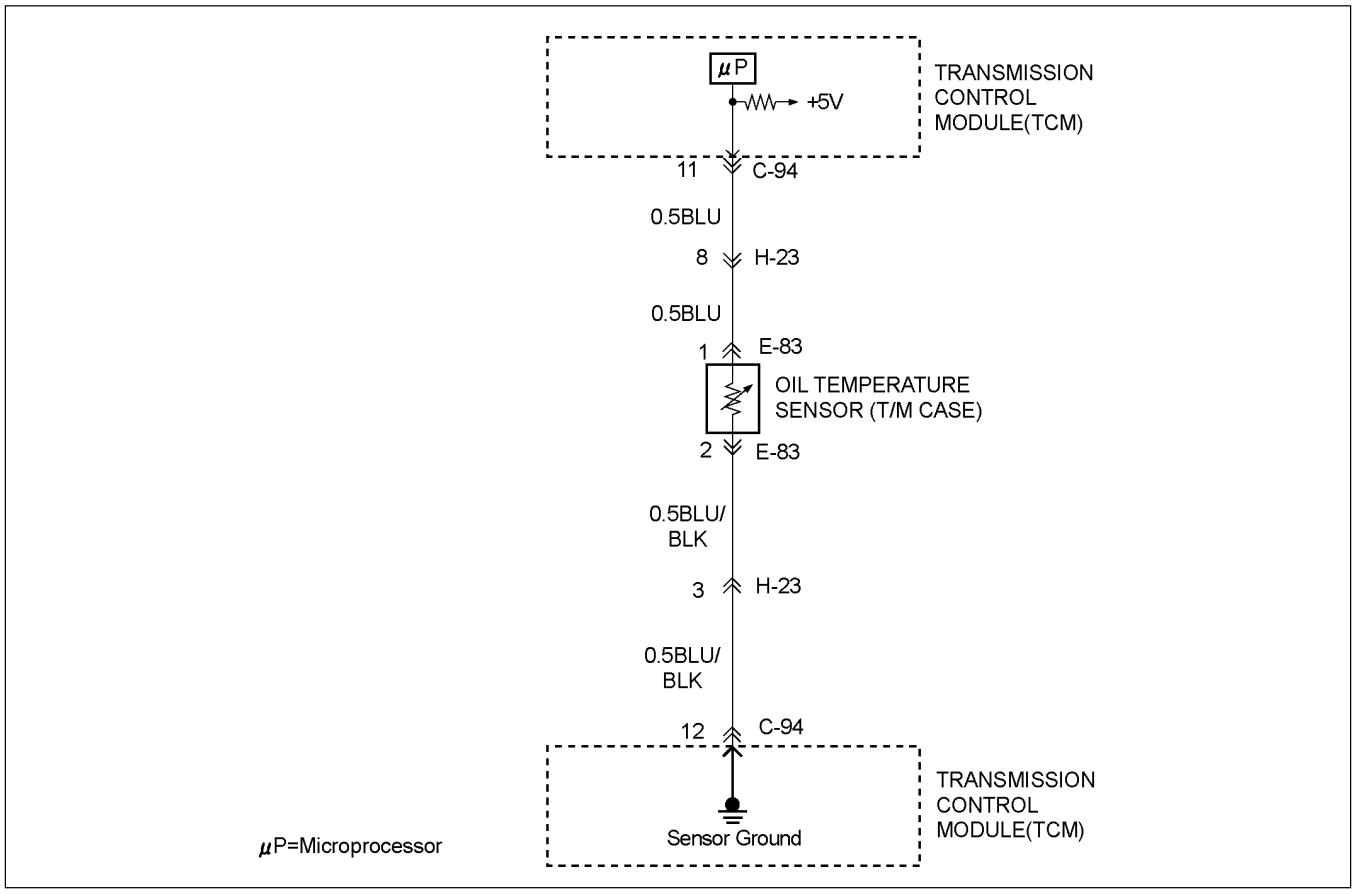
DTC P0713 (FLASHING CODE 16) Transmission Oil Temperature Sensor Circuit Hight Input



RTW37AMF000201

Circuit Description

The oil temperature sensor is a thermistor sensor that is installed in the transmission case and converts temperature changes into continuous electric signals, then outputs them to the Transmission Control Module (TCM). When the ATF temperature is low, the resistance of the sensor (thermistor) goes up, so that the voltage of the TCM signal becomes high.

As the ATF is gradually warmed, the resistance of the sensor goes down and the voltage becomes low. At the normal operating ATF temperature (80°C/176°F) of the transmission, the voltage of the TCM is about 3.7V.

Condition for setting the DTC

- The TCM detects following "Condition" for 15 min from ignition ON.

  Condition ("Open"):

  - Fluctuation of high temperature fixed value is 2.3°C (36°F).
  - Fluctuation of low temperature fixed value is -10°C (14°F).

Action Taken When The DTC Sets

- The TCM judges oil temperature is 100°C (212°F).
- Check Trans ON.
- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 • (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

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Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring. Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.
- Check oil temperature sensor for proper mounting and adjustment.

DTC P0713 (FLASHING CODE 16) Transmission Oil Temperature Sensor Circuit Hight Input

Step	Action	Value(s)	YES	NO
1	Was the powertrain On-Board Diagnostic (OBD) System Check performed ?	—	Go to *Step 2*	Go to OBD System check
2	Perform the transmission fluid checking procedure. Refer to Checking Transmission Fluid Level and condition Automatic Transmission7A section. Was the fluid checking procedure performed ?	—	Go to *Step 3*	Refer to checking Transmission Fluid Level and Condition Automatic Transmission (AW30-40LE) section
3	1. Install the scan tool ? 2. Key “ON" 3. Review and record scan tool date. 4. Operate the vehicle with in scan tool data. Does the scan tool indicator DTC P0713 ?	—	Go to *Step 4*	Go to Diagnostic Aids
4	Observe the voltage of the transmission fluid temperature sensor on the TECH2 data. 1. Key “OFF". 2. Disconnect the transmission fluid temperature sensor connector E-83 3. Install a fused jumper wire from terminal E83-2 to E83-1 on the mission harness. 4. Key “ON". Does the scan tool indicate more than specified value ?	0.4V	Go to *Step 5*	Go to *Step 6*
5	Replace the transmission fluid temperature sensor . If the action complete ?	—	Verify repair	—

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Step	Action	Value(s)	YES	NO
6	Measure the resistance of wire by the J39200 DMM. 1. Key “OFF". 2. Disconnect the TCM connector 3. Install a fused jumper wire from terminal E83-1 and E83-2 on the mission harness. Does the scan tool indicate less than specified value ?	less than 1Ω	Go to *Step 8*	Go to *Step 7*
7	Repair an open circuit. Was the problem found ?	—	Verify repair	—
8	Replace the TCM IMPORTANT ; The replacement TCM must be programmed. (Refer to SPS for procedure.) Is the action complete ?	—	Verify repair	—

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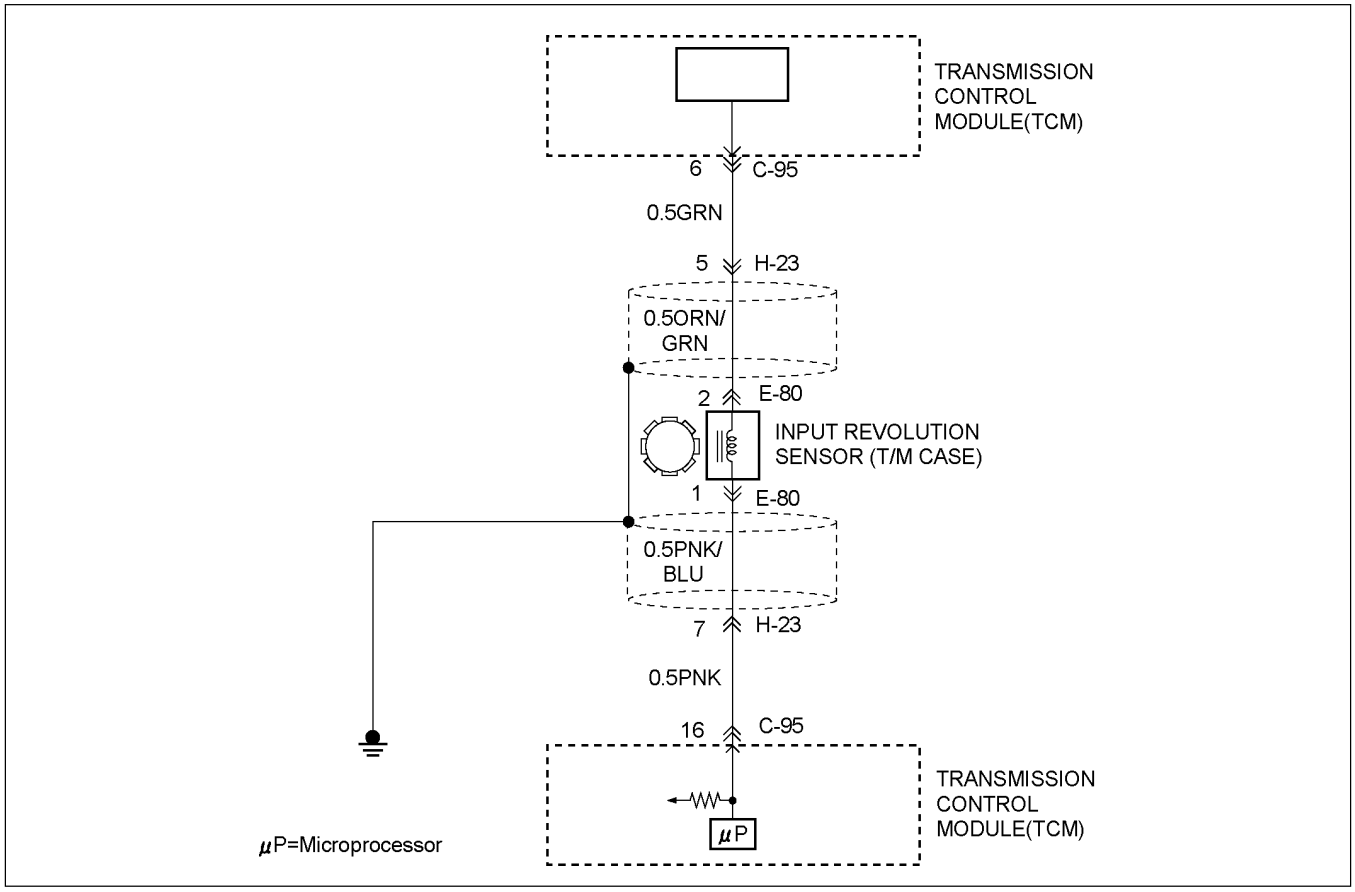
DTC P0717 (FLASHING CODE 14) Input Speed Sensor Signal Error



MAW060MF001501

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Circuit Description

Input revolution information is provided to TCM by the input revolution sensor. This sensor is located in the transmission case.

The input revolution sensor is an electromagnetic pulse pickup type that generates a speed signal according to the revolution of the transmission OD direct clutch drum. As a result, the sensor sends a sine wave signal (AC) to the TCM, which converts this sine wave signal (pulse voltage) to a RPM signal.

Condition for setting the DTC

The TCM detects following conditions at 1000 times continuously.

- When the TCM detects following conditions at the same time.
- When output speed is over 775 rpm (16 mph) at gear position is 1st or 2nd or 3rd.
- Input speed signal is no pulse while output speed signal are 12 pulses.

OR

- When the TCM output 2nd gear.
- The TCM detects no pulse of input speed sensor circuit signal after 3.5 sec.
  (detection time: 0.03 sec at vehicle speed is 36 mph)

Action Taken When The DTC Sets

- No engine torque control.
- No line pressure control.
- No lock-up control.
- No slope control.
- Check Trans ON.
- DTC stored.
- No detect DTC P0722.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.

- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.
  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent shortor open condition, move the wiring harness while observing test equipment for a change.
- Check input speed sensor for proper mounting and adjustment.

DTC P0717 (FLASHING CODE 14) Input Speed Sensor Signal Error

Step	Action	Value(s)	YES	NO
1	Was the powertrain On-Board Diagnostic (OBD) System check performed ?	—	Go to *Step 2*	Go to OBD system check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data 4. Operate the vehicle with in scan tool data. Does the scan tool indicator DTC0717 ?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Measure voltage of the input revolution sensor by the J39200 DMM. 1. Key “ON". 2. Engine run. 3. Disconnect the input revolution sensor connector . 4. Measure the voltage between terminal the input revolution sensor connector E80-1 and E80-2. Does the scan tool indicate less than specified value ?	3V	Refer to *Diagnostic Aids*	Go to *Step 4*

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Step	Action	Value(s)	YES	NO
4	Measure the resistance of wire by the J39200 DMM. 1. Key “OFF". 2. Disconnect the TCM connector. 3. Connect the input revolution sensor connector. 4. Measure the resistance between the TCM connector terminal C95-6 and C95-16. Does the scan tool indicate specified value ?	560~680Ω (20°C)	Go to *Step 5*	Go to *Step 6*
5	1. Replace the TCM. 2. Install the scan tool(TECH2). 3. Make a road running test for the vehicle. **Important:** The replacement TCM must be programmed. (Refer to SPS for procedure.) Dose the scan tool indicate DTC P0717 ?	—	Go to *Step 7*	Go to *Step 8*
6	Measure the resistance of input revolution sensor by the J39200 DMM. 1. Key “OFF". 2. Disconnect the input revolution sensor connector. 3. Measure the resistance between terminal input revolution sensor side connector E80-1 and E80-2. Does the scan tool indicate specified ?	560~680Ω (20°C)	Go to *Step 9*	Go to *Step 7*
7	Replace the input revolution sensor. Is the action complete ?	—	Verify repair	—
8	Replace the TCM. IMPORTANT; The replacement TCM must be programmed. (Refer to SPS for procedure.) Is the action complete ?	—	Verify repair	—
9	Check the wire between terminal C95-6 and E80-2 or C95-16 and E80-1. 1. 1.Connect the J39200 DMM to the each of the TCM connector and input revolution sensor. If the problem found repair as necessary. Was the found problem ?	—	Verify repair	—

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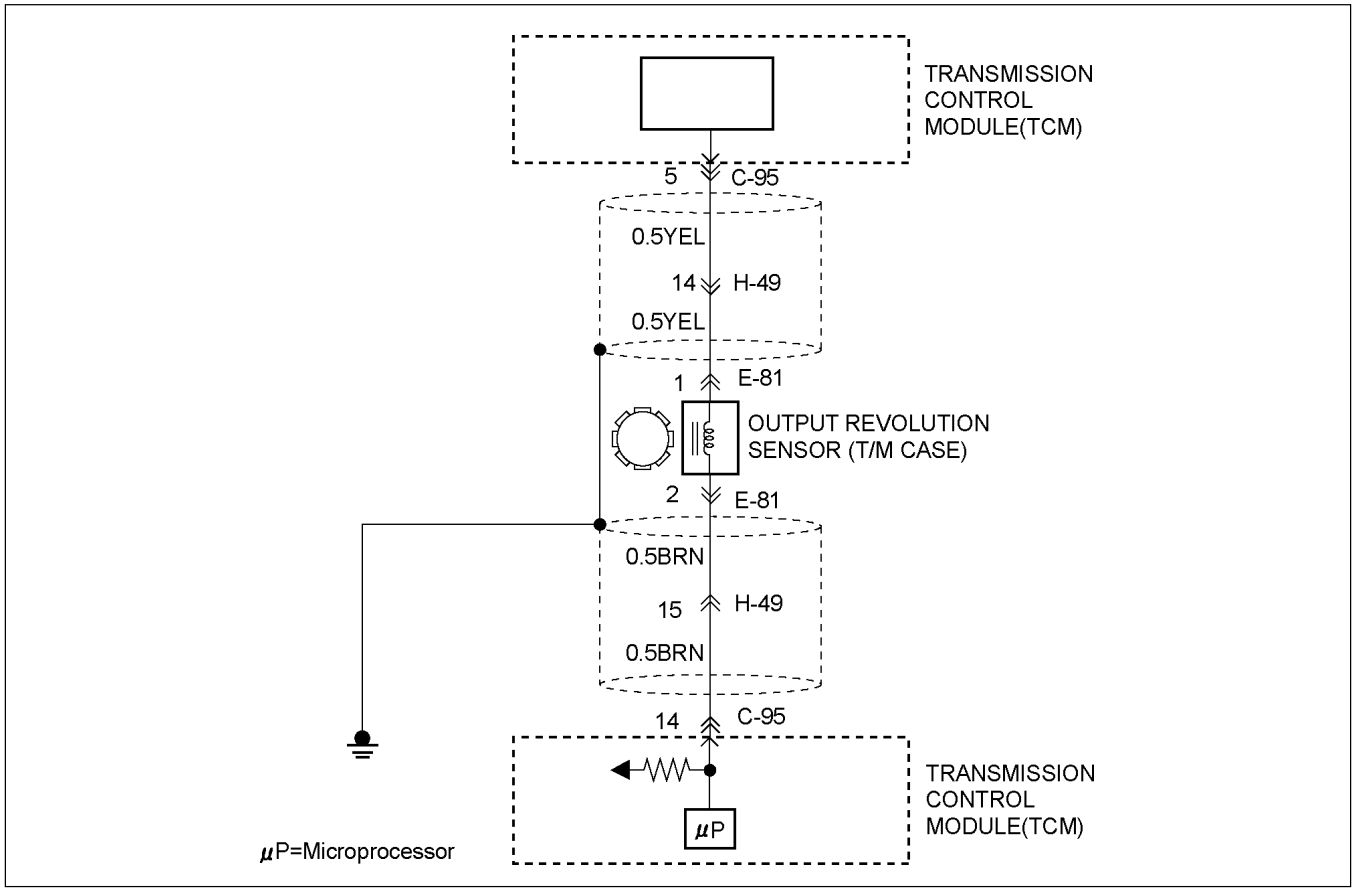
DTC P0722 (FLASHING CODE 11) Output Speed Sensor Signal Error



RTW37AMF000501

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Circuit Description

Vehicle speed information is provided to the TCM by the output revolution sensor. This sensor is located in the transmission adapter housing.

The output revolution sensor is an electromagnetic pulse pickup type that generates a speed signal according to the revolution of the transmission output shaft. As a result, the sensor sends a sine wave signal (AC) to the TCM, which converts this sine wave signal (pulse voltage) to a RPM signal.

Condition for setting the DTC

The TCM detects following conditions at 500 times continuously.

(When gear positions are 1st, 2nd and 3rd.)

When the TCM detects following conditions at the same time.

- Output speed signal is no pulse while input speed signal are 45 pulses.
  (Detection time, 1st: 0.031 sec, 2nd: 0.057 sec, 3rd: 0.087 sec, at vehicle speed is 38 mph.)

Action Taken When The DTC Sets

- The TCM uses input speed sensor as a vehicle speed.
- No squat control.
- No engine torque control.
- No line pressure control.
- No use 4th gear.
- No lock-up control.
- No slope control.
- Check Trans ON.
- DTC stored.
- No reverse lockout control.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.

- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.
  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.
- Check output speed sensor for proper mounting and adjustment.

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DTC P0722 (FLASHING CODE 11) Output Speed Sensor Signal Error

Step	Action	Value(s)	YES	NO
1	Was the powertrain On-Board Diagnostic (OBD) System check performed ?	—	Go to *Step 2*	Go to OBD system check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data 4. Operate the vehicle with in scan tool data. Does the scan tool indicator DTC 0722 ?	—	Go to *Step 3*	Refer to Diagnotic Aids
3	Measure the voltage of the output revolution sensor by the J39200 DMM. 1. Key “OFF" 2. Lift the driving wheels. 3. Disconnect the output revolution sensor connector. 4. With engine idling in gear. 5. Measure the voltage between the output revolution sensor connector terminal E81-1 and E81-2. Does the scan tool indicate less than specified value ?	3V	Refer to *Diagnostic Aids*	Go to *Step 4*

Step	Action	Value(s)	YES	NO
4	Measure the resistance of wire by the J39200 DMM. 1. Key “OFF". 2. Disconnect the TCM connector. 3. Connect the output revolution sensor connector. 4. Measure the resistance between the TCM terminal C95-5 and C95-14 Does the scan tool indicate specified value ?	560~680Ω(20°C)	Go to *Step 5*	Go to *Step 6*
5	1. Replace the TCM 2. Install the scan tool (TECH2). 3. Make a road running test for the vehicle. **Important:** The replacement TCM must be programmed. (Refer to SPS for procedure.) Does the scan tool indicate DTC P0722 ?	—	Go to *Step 7*	Go to *Step 8*
6	Measure the resistance of output revolution sensor by the J39200 DMM. 1. Key “OFF" 2. Disconnect the output revolution sensor connector. 3. Measure the resistance between terminal output revolution sensor side connector E81-1 and E81-2. Does the scan tool indicate specified ?	560~680Ω(20°C)	Go to *Step 9*	Go to *Step 7*
7	Replace the output revolution sensor. Is the action complete ?	—	Verify repair	—
8	Replace the TCM. **Important:** The replacement TCM must be programmed. (Refer to SPS for procedure.) Is the action complete ?	—	Verify repair	—
9	Check the wire between terminal C95-5 and E81-1 or C95-14 and E81-2. 1. Connect the J39200 DMM to the each the TCM connector and output revolution sensor. If the problem found repair as necessary. Was the found problem ?	—	Verify repair	—

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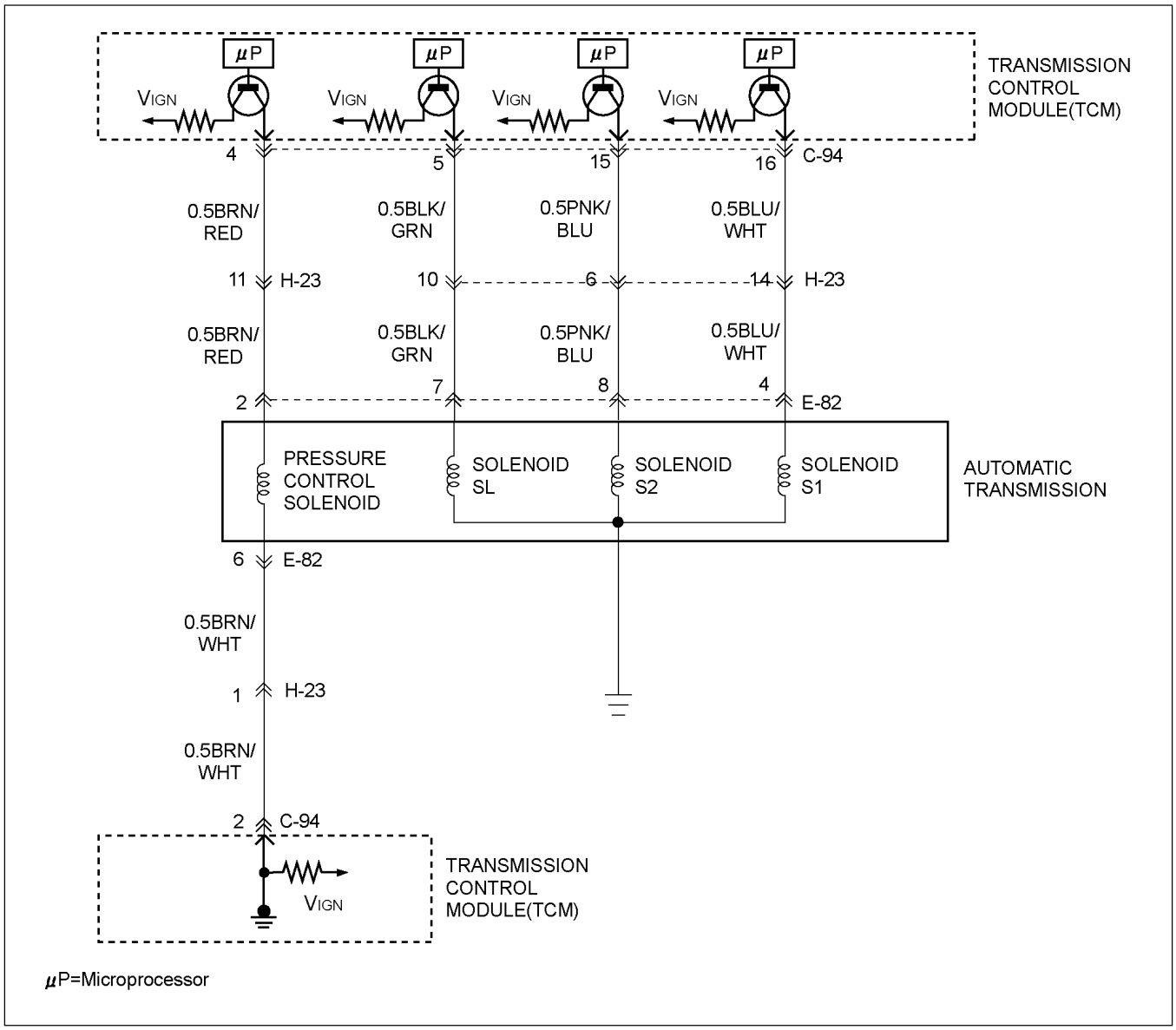
DTC P0743 (FLASHING CODE 33) Torque Converter Clutch Electrical



RUW37ALF000601

Circuit Description

The lock-up solenoid SL of the torque converter clutch (TCC) controls the lock-up clutch by a signal according to the lock-up range judgment of the TCM when the vehicle runs.

This function can improve the fuel consumption to almost the same extent as the manual transmission. The lock-up solenoid SL is put into B+ by the TCM, so that the solenoid is actuated with the result of lock-up.

Condition for setting the DTC

The TCM detects following conditions both "Condition 1" and "Condition 2" occur 2 times or more than it.

Condition 1 ("GND short"):

- Voltage at connector pin is 0V for 0.3 sec continuously when solenoid is “ON".

Condition 2 ("Open or IG short"):

- Voltage at connector pin is ignition voltage for 0.5 sec continuously when solenoid is “OFF".

Action Taken When The DTC Sets

- No lock-up control.
- The TCM fixes to 1st gear when the vehicle speed is less than 6 mph.
- Check Trans ON.
- DTC stored.

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Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.5 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.

  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short oropen condition, move the wiring harness while observing test equipment for a change.

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DTC P0743 (FLASHING CODE 33) Torque Converter Clutch Electrical

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data. 4. Operate the vehicle within scan tool data. Does the scan tool indicate DTC P0743?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	1. Key “ON", engine run. 2. Place the selector lever in the "P" range. 3. Measure the voltage between terminal C94-5 and terminal C94-1 on the TCM pigtail connector by J39200 DMM. Is the voltage specified value?	8~16V	Go to *Step 4*	Go to *Step 10*

Step	Action	Value(s)	YES	NO
4	1. Key "OFF". 2. Disconnect the TCM connector (C-94). 3. Key "ON". 4. Measure the voltage between terminal C94-5 and terminal C94-1 by J39200 DMM. Is the voltage specified value?	0V	Go to *Step 5*	Go to *Step 7*
5	1. Key "OFF". 2. Measure the resistance between terminal C94-5 and body ground by J39200 DMM. Is the resistance specified value?	11~15Ω	Go to *Step 9*	Go to *Step 6*
6	1. Disconnect the automatic transmission connector (E-82). 2. Measure the resistance between terminal E82-7 and body ground by J39200 DMM. Is the resistance specified value?	11~15Ω	Go to *Step 7*	Go to *Step 8*
7	1. Check for open or short in the wire between terminal C94-5 and terminal E82-7. 2. Repair or replace the wire between terminal C94-5 and terminal E82-7. Is the action complete?	—	Verify repair	—
8	Replace the SL solenoid. Is the action complete?	—	Verify repair	—
9	1. Clear the DTC. 2. Perform the test-driving. 3. Check the DTC. Was DTC P0743 stored?	—	Go to *Step 10*	Refer to *Diagnostic Aids*
10	Replace the TCM. Is the action complete?	—	Verify repair	—

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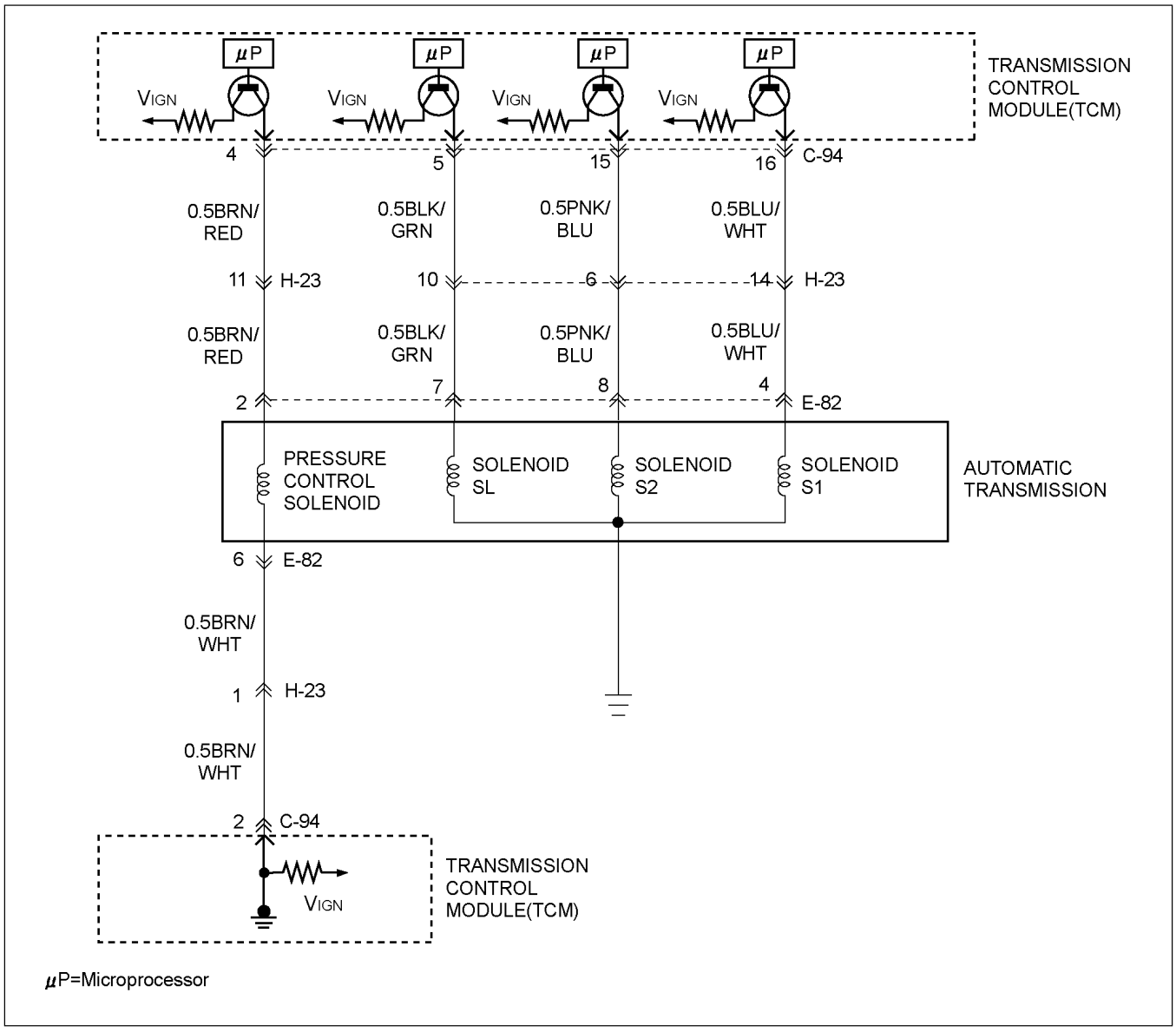
DTC P0748 (FLASHING CODE 35) Pressure Control Solenoid Electrical



RTW37ALF000601

Circuit Description

The pressure control solenoid is a PWM duty control solenoid located in the valve body.

The pressure control solenoid is a TCM-controled device used to regulate transmission throttle pressure by energizing current from the TCM.

Condition for setting the DTC

The TCM detects following "Condition 1" and "Condition 2".

Condition 1("Ignition short"):

- When the TCM detects following condition for 0.5 sec continuously.
- Monitor A/D value is more than 1000 (1.36A).

Condition 2("Open or GND short"):

- When the TCM detects following condition for 70 msec continuously.
- Monitor A/D value is less than 15 (20mA).

Action Taken When The DTC Sets

- No squat control.
- No line pressure control.
- No lock-up control.
- No slope control.
- Check Trans ON.

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- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.
  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.

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DTC P0748 (FLASHING CODE 35) Pressure Control Solenoid Malfunction

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data. 4. Operate the vehicle within scan tool data. Does the scan tool indicate DTC P0748?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Perform the transmission fluid checking procedure. Refer to checking Transmission Fluid level and Condition in Automatic Transmission 7A section. Was the fluid checking procedure performed?	—	Go to *Step 4*	Refer to checking Transmission Fluid level and Condition in Automatic Transmission (AW30-40LE) section

Step	Action	Value(s)	YES	NO
4	Measure the resistance of pressure control solenoid. 1. Key “OFF". 2. Disconnect the automatic transmission connector and TCM connector. 3. Measure the resistance between automatic transmission terminal E82-2 and automatic transmission terminal E82-6. Is the resistance specified value?	5 to 5.6Ω at 68°F (20°C)	Go to *Step 5*	Go to *Step 8*
5	Measure the resistance of wire between terminal C94-2 and terminal C94-4 1. Key “OFF". 2. Connect the automatic transmission connector. 3. Disconnect the TCM connector. 4. Measure the resistance between terminal C94-2 and terminal C94-4. Is the resistance specified value?	5 to 5.6Ω at 68°F (20°C)	Go to *Step 7*	Go to *Step 6*
6	Repair or Replace the wire between terminals C94-2,4 and terminals E82-6,2. Is the action complete?	—	Verify repair	—
7	Observe the pressure control solenoid valve data on the scan tool data. 1. Key “ON". Does the scan tool indicate is specified value?	1.0-	Verify repair	Go to *Step 9*
8	Replace the pressure control sorenoid. Is the action complete?	—	Verify repair	—
9	Replace the TCM. **Important:** The replacement TCM must be programmed (Refer to SPS for procedure). Is the action complete?	—	Verify repair	—

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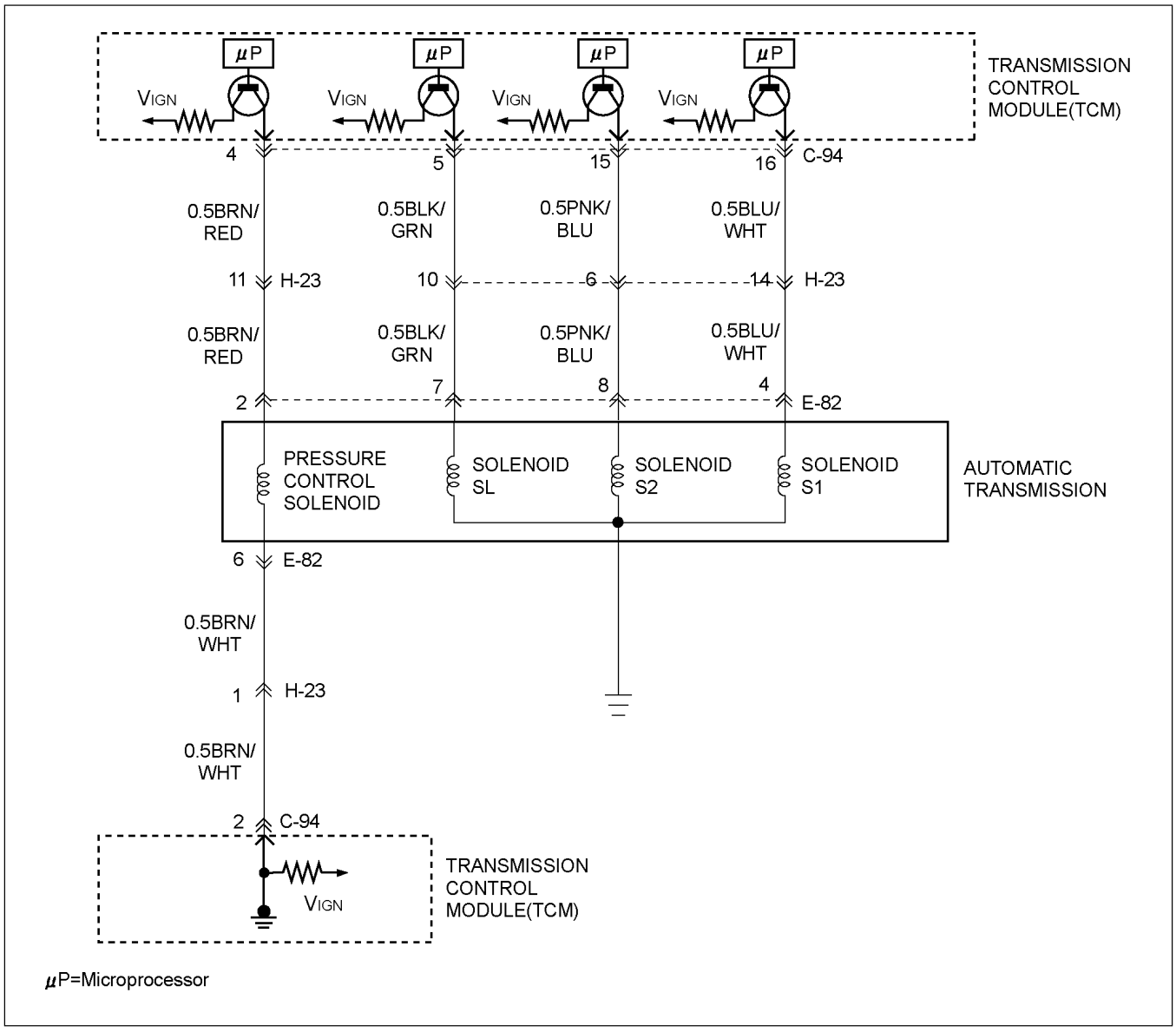
DTC P0753 (FLASHING CODE 31) Shift Solenoid S1 Electrical



RTW37ALF000601

Circuit Description

The shift solenoi S1 changes the hydraulic route with the signals from the TCM according to the vehicle speed and the throttle opening to control shifting. When the solenoid S1 or S2 fails, the hydraulic circuit is mechanically operated as a backup.

Condition for setting the DTC

The TCM detects following "Condition 1" and " Condition 2" for 2 times continuously at shifting.

Condition 1("GND short"):

- Voltage at connector pin is 0V for 0.3 sec continuously when solenoid is “ON".

Condition 2("Open or Ignition short"):

- Voltage at connector pin is ignition voltage for 0.5 sec continuously when solenoid is “OFF".

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Action Taken When The DTC Sets

- The TCM operates shifting as following pattern.

Normal	Fail	S1	S2
1	3	-	on
2	3	-	on
3	3	-	on
4	4	-	off

- No squat control.
- No engine torque control.
- No line pressure control.
- No lock-up control.
- No slope control.
- Check Trans ON.
- DTC stored.
- No detect DTC P0722
- No detect DTC P0717

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring.

  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.

DTC P0753 (FLASHING CODE 31) Shift Solenoid S1 Electrical

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data. 4. Operate the vehicle within scan tool data. Does the scan tool indicate DTC P0753?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	1. Key “ON", engine run. 2. Place the selector lever in the "P" range. 3. Measure the voltage between terminal C94-16 and terminal C94-1 on the TCM pigtail connector by J39200 DMM. Is the voltage specified value?	8~16V	Go to *Step 4*	Go to *Step 10*

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Step	Action	Value(s)	YES	NO
4	1. Key "OFF". 2. Disconnect the TCM connector (C-94). 3. Key "ON". 4. Measure the voltage between terminal C94-16 and terminal C94-1 by J39200 DMM. Is the voltage specified value?	0V	Go to *Step 5*	Go to *Step 7*
5	1. Key “OFF". 2. Measure the resistance between terminal C94-5 and body ground by J39200 DMM. Is the resistance specified value?	11~15Ω	Go to *Step 9*	Go to *Step 6*
6	1. Disconnect the automatic transmission connector (E-82). 2. Measure the resistance between terminal E82-4 and body ground by J39200 DMM. Is the resistance specified value?	11~15Ω	Go to *Step 7*	Go to *Step 8*
7	1. Check for open or short in the wire between terminal C94-16 and terminal E82-4. 2. Repair or replace the wire between terminal C94-16 and terminal E82-4. Is the action complete?	—	Verify repair	—
8	Replace the SL solenoid. Is the action complete?	—	Verify repair	—
9	1. Clear the DTC. 2. Perform the test-driving. 3. Check the DTC. Was DTC P0753 stored?	—	Go to *Step 10*	Refer to *Diagnostic Aids*
10	Replace the TCM. Is the action complete?	—	Verify repair	—

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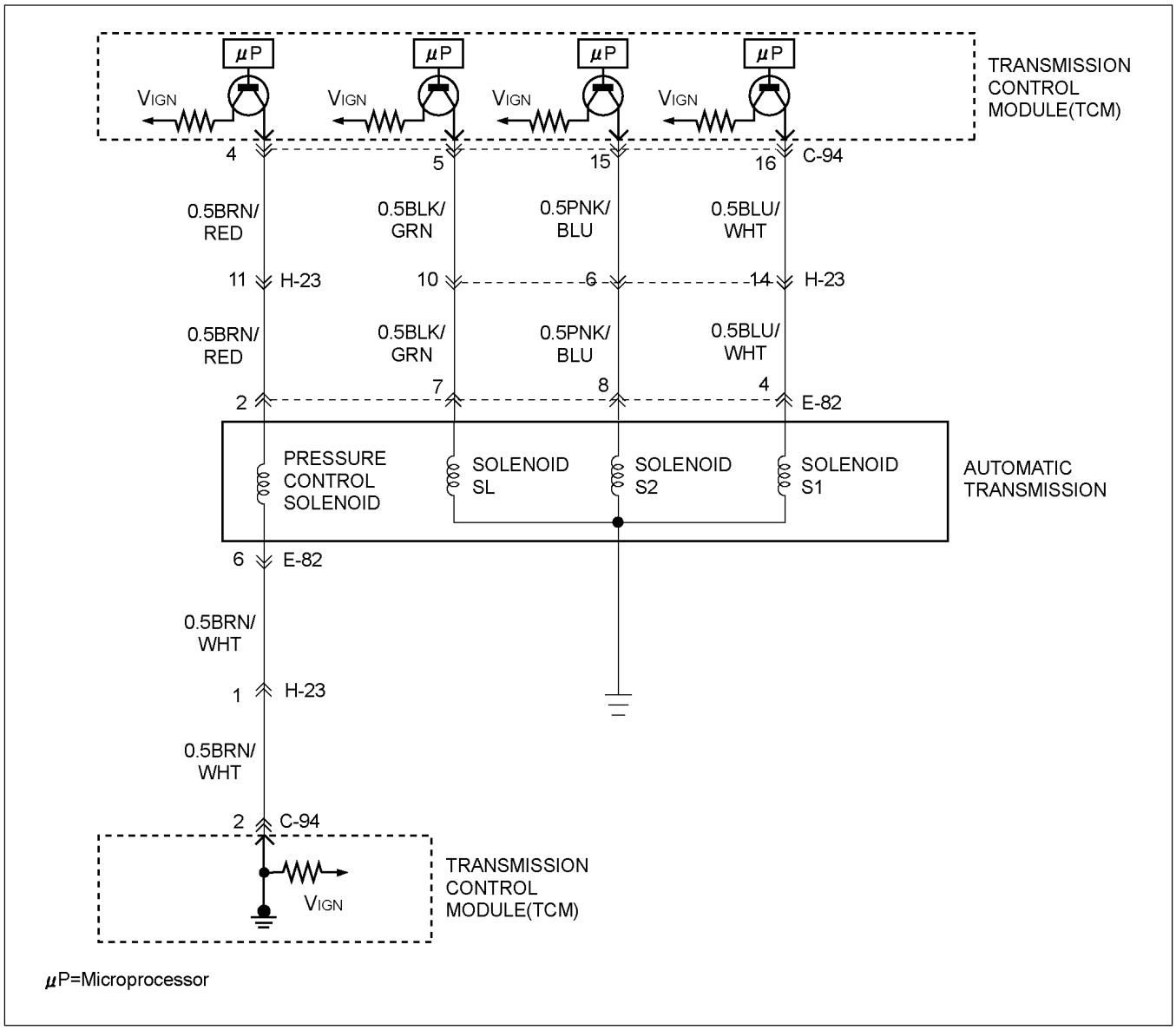
DTC P0758 (FLASHING CODE 32) Shift Solenoid S2 Electrical



RTW37ALF000601

Circuit Description

The solenoid S2 changes the hydraulic route with the signals from the TCM according to the vehicle speed and the throttle opening to control shifting. When the solenoid S1 or S2 fails, the hydraulic circuit is mechanically operated as a backup.

Condition for setting the DTC

The TCM detects following "Condition 1" and "Condition 2" for 2 times continuously at shifting.

Condition 1 ("GND short"):

- Voltage at connector pin is 0V for 0.3 sec continuously when solenoid is “ON".

Condition 2 ("Open or Ignition short"):

- Voltage at connector pin is ignition voltage for 0.5 sec continuously when solenoid is “OFF".

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Action Taken When The DTC Sets

The TCM operates shifting as following patterns.

Normal	Fail	S1	S2
1	3	-	on
2	3	-	on
3	3	-	on
4	4	-	off

- No squat control.
- No engine torque control.
- No line pressure control.
- No lock-up control.
- No slope control.
- No torque reduction.
- Check Trans ON.
- DTC stored.
- No detect DTC P0722.
- No detect DTC P0717.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring .
  Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.

DTC P0758 (FLASHING CODE 32) Shift Solenoid S2 Electrical

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data. 4. Operate the vehicle within scan tool data. Does the scan tool indicate DTC P0758?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	1. Key “ON", engine run. 2. Place the selector lever in the "P" range. 3. Measure the voltage between terminal C94-15 and terminal C94-1 on the TCM pigtail connector by J39200 DMM. Is the voltage specified value?	8~16V	Go to *Step 4*	Go to *Step 10*

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Step	Action	Value(s)	YES	NO
4	1. Key "OFF". 2. Disconnect the TCM connector (C-94). 3. Key "ON". 4. Measure the voltage between terminal C94-15 and terminal C94-1 by J39200 DMM. Is the voltage specified value?	0V	Go to *Step 5*	Go to *Step 7*
5	1. Key “OFF". 2. Measure the resistance between terminal C94-15 and body ground by J39200 DMM. Is the resistance specified value?	11~15Ω	Go to *Step 9*	Go to *Step 6*
6	1. Disconnect the automatic transmission connector (E-82). 2. Measure the resistance between terminal E82-8 and body ground by J39200 DMM. Is the resistance specified value?	11~15Ω	Go to *Step 7*	Go to *Step 8*
7	1. Check for open or short in the wire between terminal C94-15 and terminal E82-8. 2. Repair or replace the wire between terminal C94-15 and terminal E82-8. Is the action complete?	—	Verify repair	—
8	Replace the SL solenoid. Is the action complete?	—	Verify repair	—
9	1. Clear the DTC. 2. Perform the test-driving. 3. Check the DTC. Was DTC P0758 stored?	—	Go to *Step 10*	Refer to *Diagnostic Aids*
10	Replace the TCM. Is the action complete?	—	Verify repair	—

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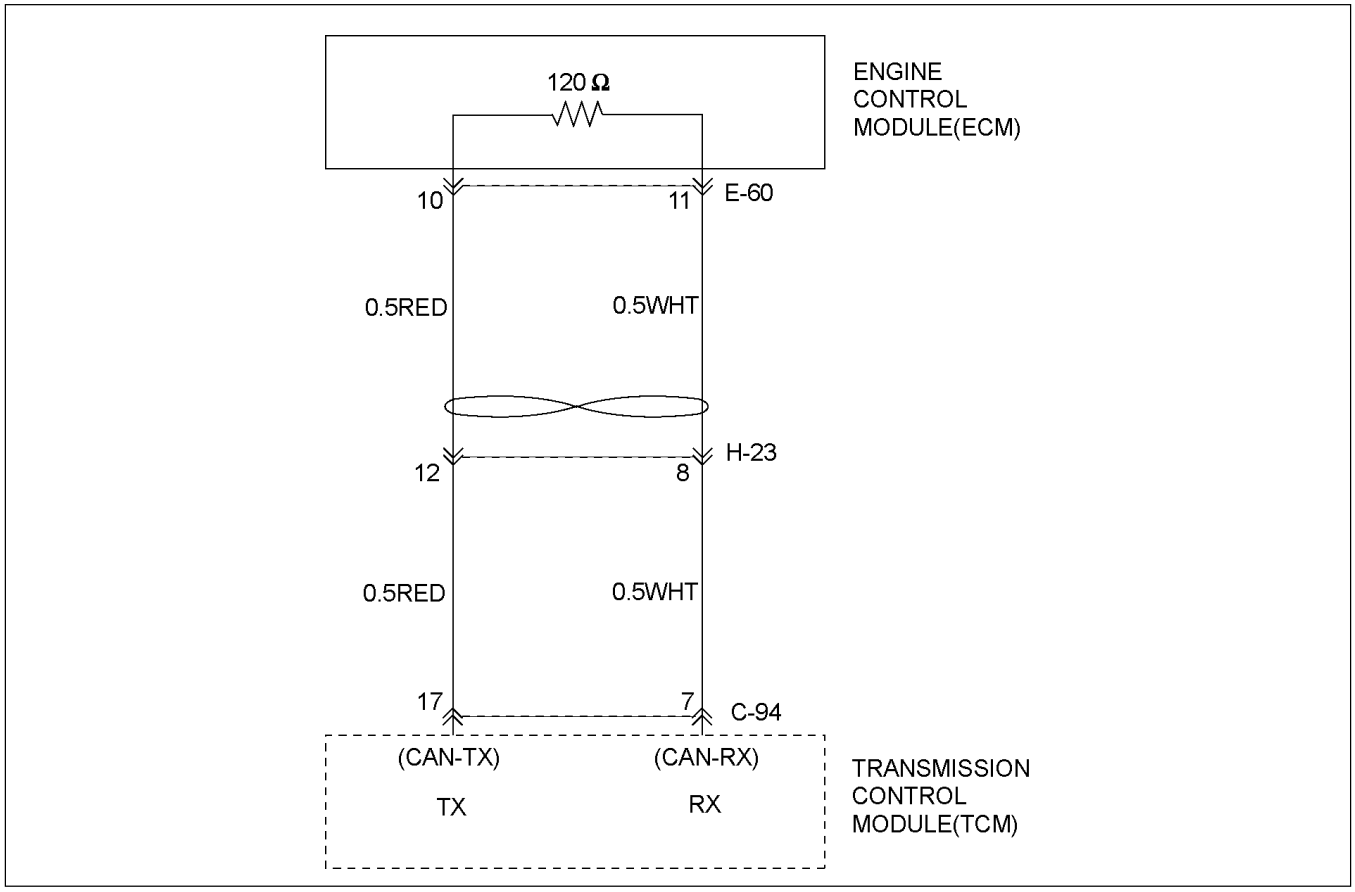
DTC P1767 (FLASHING CODE 67) ECM CAN Invalid



RTW37AMF000401

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Circuit Description

The automatic transmission control system in AW30-40LE uses high speed CAN bus system. The individual CAN bus systems are connected via two interfaces and can exchange information and data. This allows control modules that are connected to different CAN bus systems to communicate. Transmission control modules in the vehicle that require continuous, rapid communication are connected to the high speed CAN bus. The automatic transmission is continuously notified of the current engine load status. Since the automatic transmission control module has to react immediately to load status changes, rapid communication is required between the engine control module and the automatic transmission control module. The high speed CAN bus in the AW30-40LE is designed as a two-wire CAN bus (twisted pair). The wires are shielded and twisted. The transmission rate is 500K band.

Condition for setting the DTC

The TCM detects invalid signal for 0.18 sec. (After the TCM leaves a communication start with the ECM for 0.64 sec)

The TCM detects above condition for 2.0 sec continuously.

Action Taken When The DTC Sets

- The line pressure is max.
- The TCM judges APS(Accelerator Position Sensor) angle is 0% at the time of shift operation.
- No line pressure control.
- No engine torque control.
- No lock-up control.
- No slope control.
- Check Trans ON.
- DTC stored.
- No squat control.

- Engine REV is 7000 rpm.
- Coolant tempreature is 80°C.
- No detect DTC P0712, 0713.
- No detect DTC P0560.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring. Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.
- Inspect the wiring for EMI (Erectro-Magnetic Interference). Check that all wires are properly routed away from coil, and generator. Also check for improperly installed electrical options. When this test is performed, turn “OFF" on electronic autoparts switches to improperly for a noise preventing.

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DTC P1767 (FLASHING CODE 67) ECM CAN Invalid

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data. 4. Operate the vehicle within scan tool data. Does the scan tool indicate DTC P1767?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Observe the valid data of the ECM on the scan tool. Was the valid data of the ECM fixed or did not synchronized?	—	Go to *Step 4*	Refer to *Diagnostic Aids*
4	Check the wire between the TCM connector and the ECM connector by J39200 DMM. 1. Key “OFF". 2. Disconnect the TCM connector. 3. Measure the resistance between terminal C94-7 and terminal C94-17. Is the resistance specified value?	About 120Ω	Go to *Step 5*	Go to *Step 7*
5	Check the resistance of the ECM.. 1. Key “OFF". 2. Disconnect the ECM connector. 3. Measure the resistance between the ECM terminal E60-70 and the ECM terminal E60-71. Is the resistance specified value?	About 120Ω	Go to *Step 6*	Go to *Step 8*
6	Replace or Repair the wire between the TCM connector C94-7,17 and the ECM connector E60-70,71. Is the action complete?	—	Verify repair	—
7	Replace the TCM. **Important:** The replacement TCM must be programmed (Refer toSPS for procedure). Is the action complete?	—	Verify repair	—
8	Replace the ECM. **Important:** The replacement ECM must be programmed (Refer to SPS for procedure). Is the action complete?	—	Verify epair	—

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DTC P1790 (FLASHING CODE 61) Transmission Control Module ROM Checksum Error

Circuit Description

The electrically erasable programable read only memory (EEPROM) is a permanent memory chip that is physically solenoid within the TCM. The EEPROM contans the program and the calibration information that the TCM needs to control powertrain operation.

Unlike the PROM used in past applications, the EEPROM is not replace able. If the TCM is replaced, the new TCM will need to be programmed. Equipment containing the correct program and calibration for the vehicle is required to program the TCM.

Condition for setting the DTC

The TCM detects incorrect value of ROM checksum.

Action Taken When The DTC Sets

- Check Trans ON.
- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.5 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring. Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.

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DTC P1790 (FLASHING CODE 61) Transmission Control Module ROM Checksum Error

Step	Action	Value(s)	YES	NO
1	Was the Powertrain ON-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “OFF" and keep the position for more than 30 seconds. 3. Key “ON". 4. Check the DTC on the scan tool. Does the scan tool indicate DTC P1791?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Perform the SPS for the TCM. Is the action complete?	—	Go to *Step 4*	—
4	Recheck the DTC on the scan tool. Does the scan tool indicate DTC P1790?	—	Go to *Step 5*	Verify repair
5	Replace the TCM. **Important:** The replacement TCM must be programmed (Refer to SPS for procedure). Is the action complete?	—	Verify repair	—

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DTC P1791 (FLASHING CODE 62) Transmission Control Module RAM Error

Circuit Description

DTC P1791 is recorded by TCM when there is malfunction in the RAM.

Condition for setting the DTC

When the TCM can not detect all RAM from following step in initialize routine.

Step 1: The TCM writes FFh to the RAM .

Step 2: The TCM reads FFh from the RAM.

Step 3: The TCM writes 00h to the RAM.

Step 4: The TCM reads 00h from the RAM.

Action Taken The DTC Sets

- Check Trans ON.
- DTC stored.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring. Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.

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DTC P1791 (FLASHING CODE 62) Transmission Control Module RAM Error

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “OFF" and keep the position for more than 30 seconds. 3. Key “ON" 4. Check the DTC on the scan tool. Does the scan tool indicate DTC P1791?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Replace the TCM. **Important:** The replacement TCM must be programmed (Refer to SPS for procedure). Is the action complete?	—	Verify repair	—

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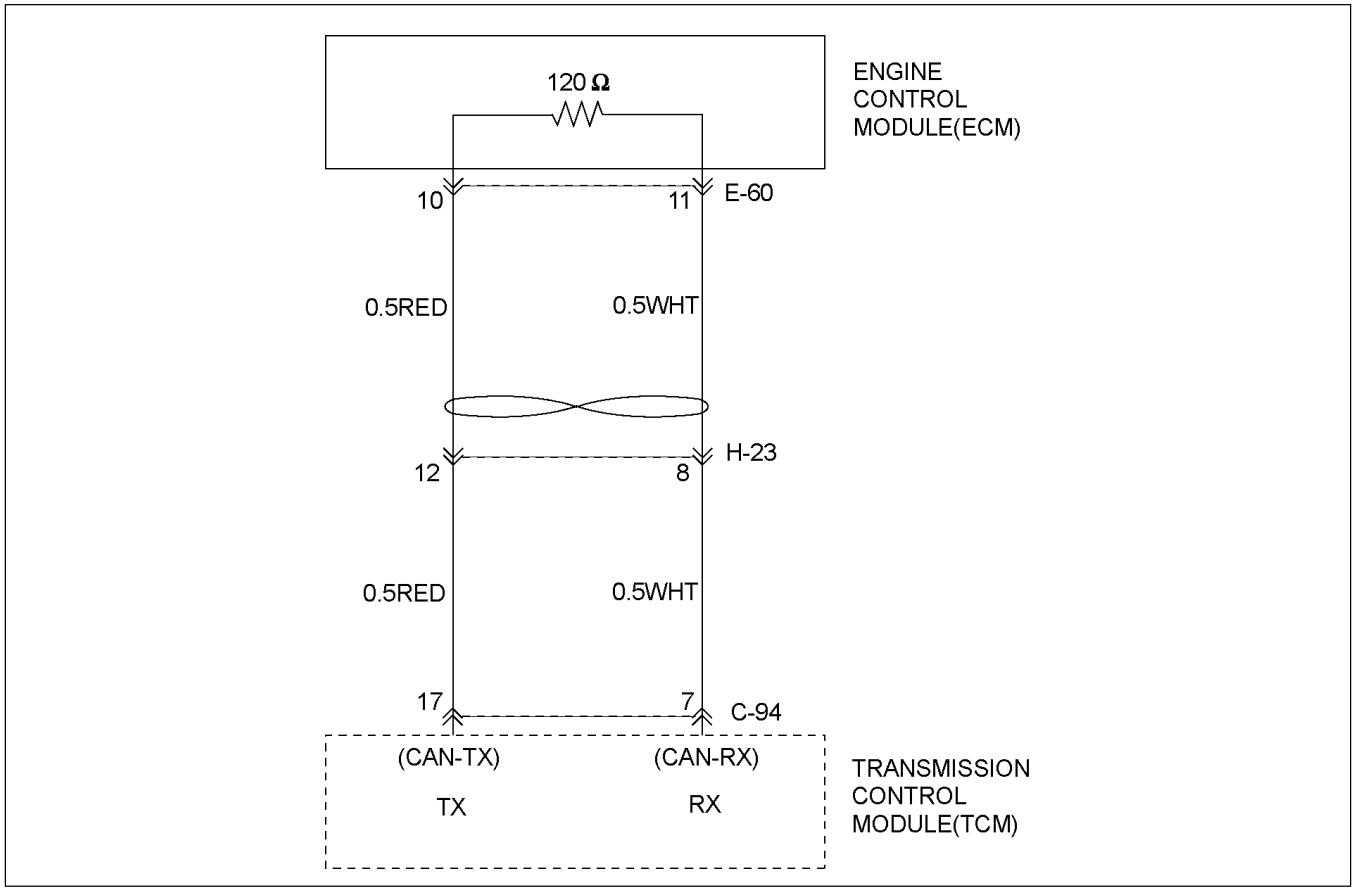
DTC U2104 (FLASHING CODE 65) CAN BUSS OFF



RTW37AMF000401

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Circuit Description

The automatic transmission control system in AW30-40LE uses high speed CAN bus system. The individual CAN bus systems are connected via two interfaces and can exchange information and data. This allows control modules that are connected to different CAN bus systems to communicate. Transmission control modules in the vehicle that require continuous, rapid communication are connected to the high speed CAN bus. The automatic transmission is continuously notified of the current engine load status. Since the automatic transmission control module has to react immediately to load status changes, rapid communication is required between the engine control module and the automatic transmission control module. The high speed CAN bus in the AW30-40LE is designed as a two-wire CAN bus (twisted pair). The wires are shielded and twisted. The transmission rate is 500K band.

Condition for setting the DTC

The TCM detects CAN BUS OFF for 0.18 sec (After the TCM leaves a communucation start with the ECM for 0.64 sec) continously..

Action Taken When The DTC Sets

- The throttle pressure is max.
- The TCM judges APS(Accelerator Position Sensor) angle is 0% at the time of shift operation.
- No throttle pressure reduction.
- No torque reduction.
- No lock-up control.
- No slope control.
- No squat control.
- Check Trans ON.
- DTC stored.
- Engine REV is 7000 rpm.
- Coolant tempreature is 80°C.

- No detect DTC P1767.
- No detect DTC P0560.
- No detect DTC P0712, 0713.

Conditions For Clearing The DTC

- The DTC can be cleared from the TCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warm-up cycles without a failure reported.
- After more than 1 second has elapsed after the ignition key has been turned “ON", short between No.11 and No.4 (ground) of DLC (Data Link Connector). Then, after 1 second, but within 6 seconds, discontinue shorting.

Diagnostic Aids

- Inspect the wiring for poor electrical connection at the TCM. Look for possible bent, backed out, deformed or damaged terminals. Check for weak terminal tension as well. Also check for a chafed wire that could short to bare metal or other wiring. Inspect for a broken wire inside the insulation.
- When diagnosing for a possible intermittent short or open condition, move the wiring harness while observing test equipment for a change.
- Inspect the wiring for EMI (Erectro-Magnetic Interference). Check that all wires are properly routed away from coil, and generator. Also check for improperly installed electrical options. When this test is performed, turn “OFF" on electronic auto parts switches to improperly for a noise preventing.

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DTC U2104 (FLASHING CODE 65) CAN BUSS OFF

Step	Action	Value(s)	YES	NO
1	Was the Powertrain On-Board Diagnostic (OBD) System Check performed?	—	Go to *Step 2*	Go to OBD System Check
2	1. Install the scan tool. 2. Key “ON". 3. Review and record scan tool data. 4. Operate the vehicle within scan tool data. Does the scan tool indicate DTC U2104?	—	Go to *Step 3*	Refer to *Diagnostic Aids*
3	Observe the valid data of the ECM on the scan tool. Was the valid data of the ECM fixed or did not synchronized?	—	Go to step 4	Refer to *Diagnostic Aids*
4	Check the wire between the TCM connector and the ECM connector by J39200 DMM. 1. Key “OFF". 2. Disconnect the TCM connector. 3. Measure the resistance between terminal C94-7 and terminal C94-17. Is the resistance specified value?	About 120Ω	Go to *Step 7*	Go to *Step 5*
5	Check the resistance of the ECM.. 1. Key "OFF". 2. Disconnect the ECM connector. 3. Measure the resistance between the ECM terminal E60-70 and the ECM terminal E60-71. Is the resistance specified value?	About 120Ω	Go to step 6	Go to step 8
6	Replace or Repair the wire between the TCM connector C94-7,17 and the ECM connector E60-70,71. Is the action complete?	—	Verify repair	—
7	Replace the TCM. **Important:** The replacement TCM must be programmed (Refer to SPS for procedure). Is the action complete?	—	Verify repair	—
8	Replace the ECM. **Important:** The replacement ECM must be programmed (Refer to SPS for procedure). Is the action complete?	—	Verify repair	—

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TRANSMISSION

ON-VEHICLE SERVICE (AW30–40LE)

CONTENTS

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Service Precaution

WARNING: THIS VEHICLE HAS A SUPPLEMENTAL RESTRAINT SYSTEM (SRS). REFER TO THE SRS COMPONENT AND WIRING LOCATION VIEW IN ORDER TO DETERMINE WHETHER YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING. WHEN YOU ARE PERFORMING SERVICE ON OR NEAR THE SRS COMPONENTS OR THE SRS WIRING, REFER TO THE SRS SERVICE INFORMATION. FAILURE TO FOLLOW WARNINGS COULD RESULT IN POSSIBLE AIR BAG DEPLOYMENT, PERSONAL INJURY, OR OTHERWISE UNNEEDED SRS SYSTEM REPAIRS.

CAUTION: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. ISUZU will call out those fasteners that require a replacement after removal. ISUZU will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (Paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and the joint clamping force, and may damage the fastener. When you install fasteners, use the correct tightening sequence and specifications. Following these instructions can help you avoid damage to parts and systems.

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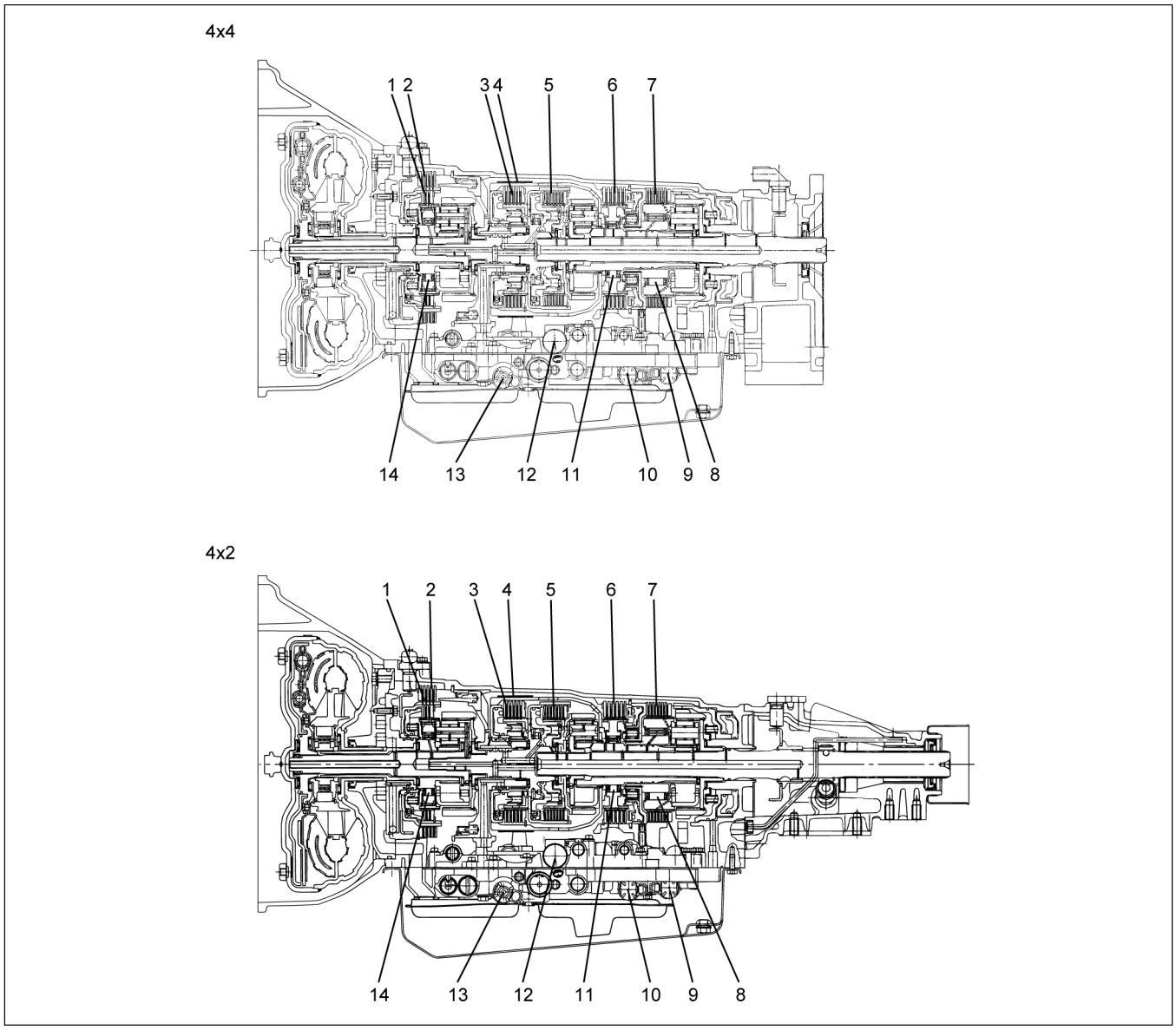
Location of Clutch, Brake, One-Way Clutch and Solenoid



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Legend

(1) Overdrive direct clutch (C–0)
(2) Overdrive brake (B–0)
(3) Direct clutch (C–2)
(4) Second coast brake (B–1)
(5) Forward clutch (C–1)
(6) Second brake (B–2)
(8) One-way clutch (No.2) (F–2)
(9) Shift solenoid (S–1)
(10) Shift solenoid (S–2)
(11) One-way clutch (No.1) (F–1)
(12) Pressure control solenoid (STH)
(13) Lock-up solenoid (SL)
(14) Overdrive one-way clutch (F–0)

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Operation of Clutch, Brake and One-Way Clutch

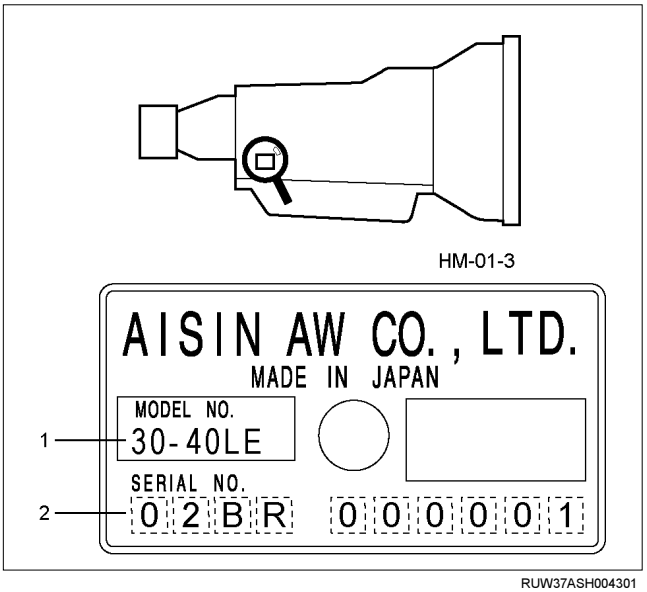
○ :Operating ⊗ :Free at coast down ◎ :Operating at Lock-up

Shift lever position	Gear position	C-0	C-1	C-2	B-0	B-1	B-2	B-3	F-0	F-1	F-2	S-1	S-2	SL
P	Parking	○										○		
R	Reverse	○		○				○	○			○		
N	Neutral	○										○		
D	1st	○	○						○		⊗	○		
	2nd	○	○				○		○	⊗		○	○	◎
	3rd	○	○	○			○		○				○	◎
	O/D		○	○	○		○							◎
2	1st	○	○						○		⊗	○		
	2nd	○	○			○	○		○	○		○	○	
	(2*) 3rd	○	○	○			○		○				○	
L	1st	○	○					○	○		○	○		
	(1*) 2nd	○	○			○	○		○	○		○	○	

(1*): Downshift only in the L range and 2nd gear - no upshift
(2*): Downshift only in the 2 range and 3rd gear - no upshift

Transmission Identification

The identification plate is located on the right rear side of the transmission.



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Legend

(1) Transmission Model Number
(2) Production Serial Number

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Speed Change and Lock-Up Pattern

If you select a speed as shown below by specifying respective positions of transmission shift lever, transfer switch and pattern select switch, the transmission control computer controls speed change and lock-up operations based on the specified pattern in accordance with the degree of throttle opening and vehicle speed.

Pattern select sw. position	Transmission shift position			
	D	3	2	L
NORMAL, POWER	1st⇔[2nd]⇔[3rd]⇔[O/D]	1st⇔[2nd]⇔[3rd]	1st⇔2nd⇐(3rd)	1st⇐(2nd)
3rd START	3rd fixing	—	—	

[ ]: The lock-up operation is available.

( ): Transmission is shifted at high speed to prevent overrun.

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Overdrive and Lock-Up Operating Conditions

The overdrive and lock-up clutch operate if the following conditions are satisfied.

		Overdrive	Lock-up clutch
Shift pattern position		NORMAL	NORMAL
Transmission shift position		D range	←
Brake lamp switch		—	OFF
Throttle opening		Fully closed	Except fully closed
Vehicle speed	Accelerator	About 52 km/h (32 mph) or more	2nd: About 76 km/h (47 mph) or more
	Deceleration	About 42 km/h (26 mph) or more	3rd: About 56 km/h (35 mph) or more
			O/D: About 67 km/h (42 mph) or more

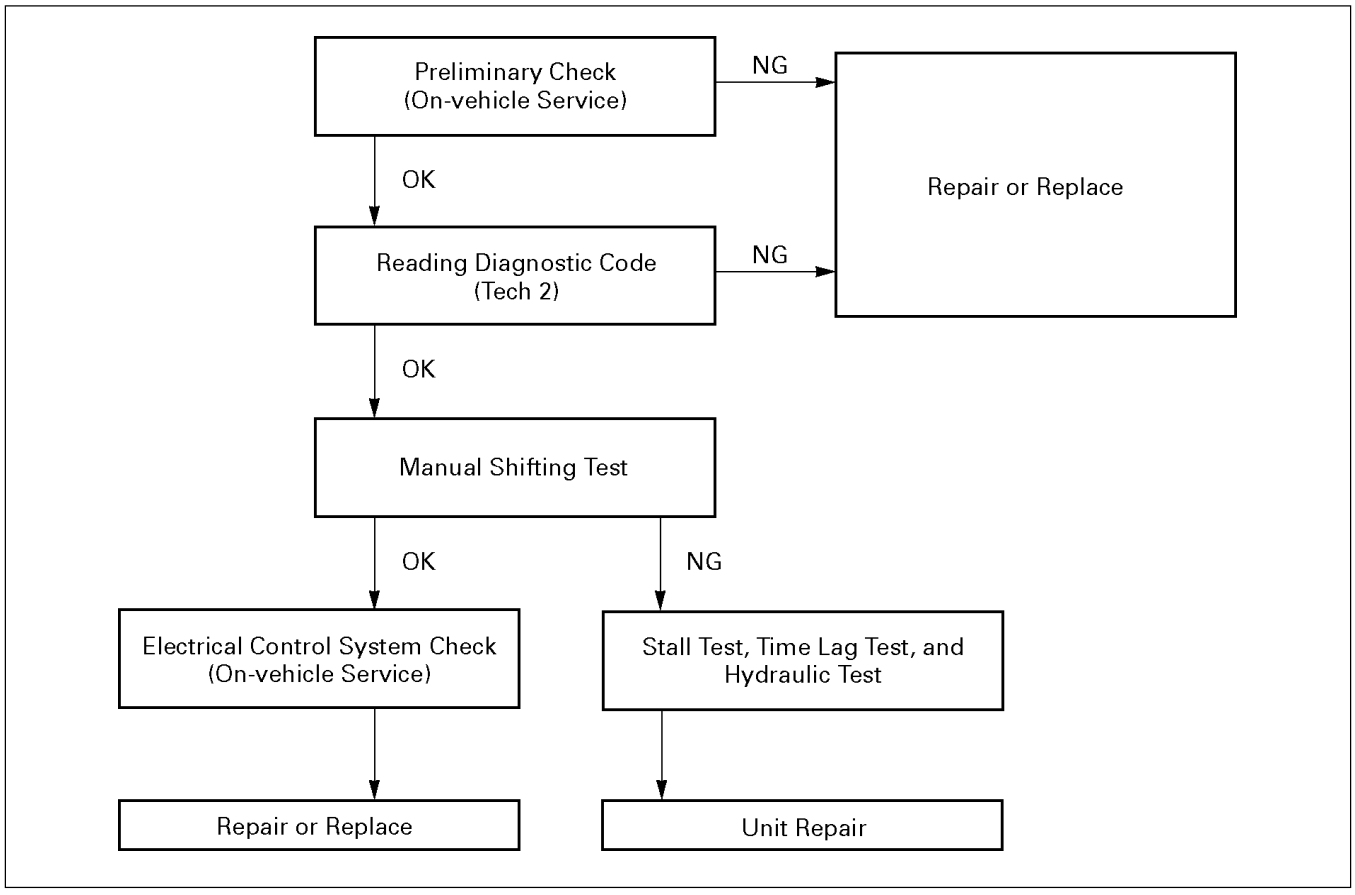
Diagnosis

Basic Troubleshooting

AW30–40LE transmission, with Transmission Control Module (TCM), differs from the Mechanical – Hydraulic control type transmissions. Accordingly, its troubleshooting procedure differs also.

Before troubleshooting an TCM, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flowchart provided below.

If the cause is already known, using the basic troubleshooting chart below along with the troubleshooting chart should speed the procedure.



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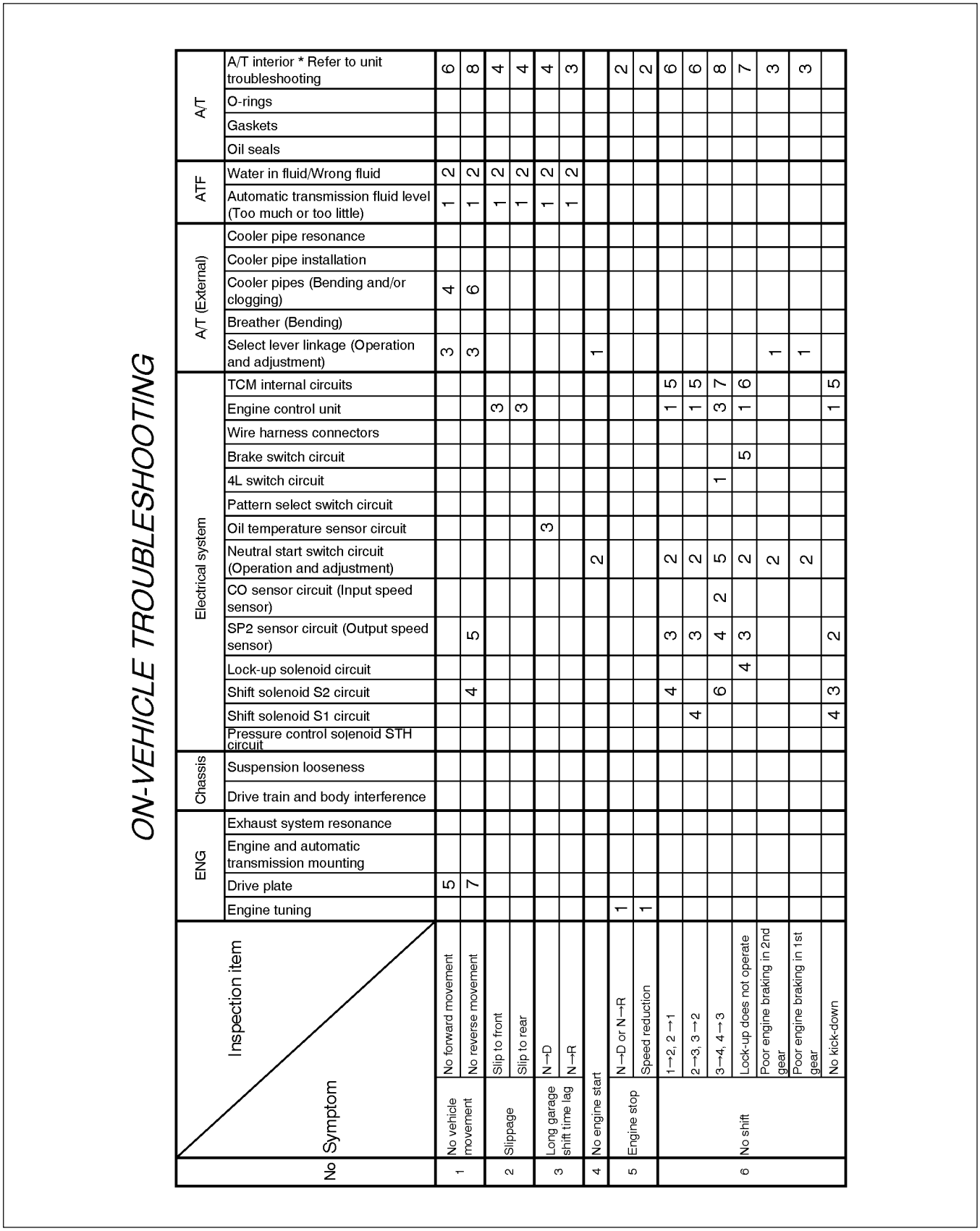
Troubleshooting Chart

Numbers are arranged in order of probability.

Perform inspections starting with number one and working up.



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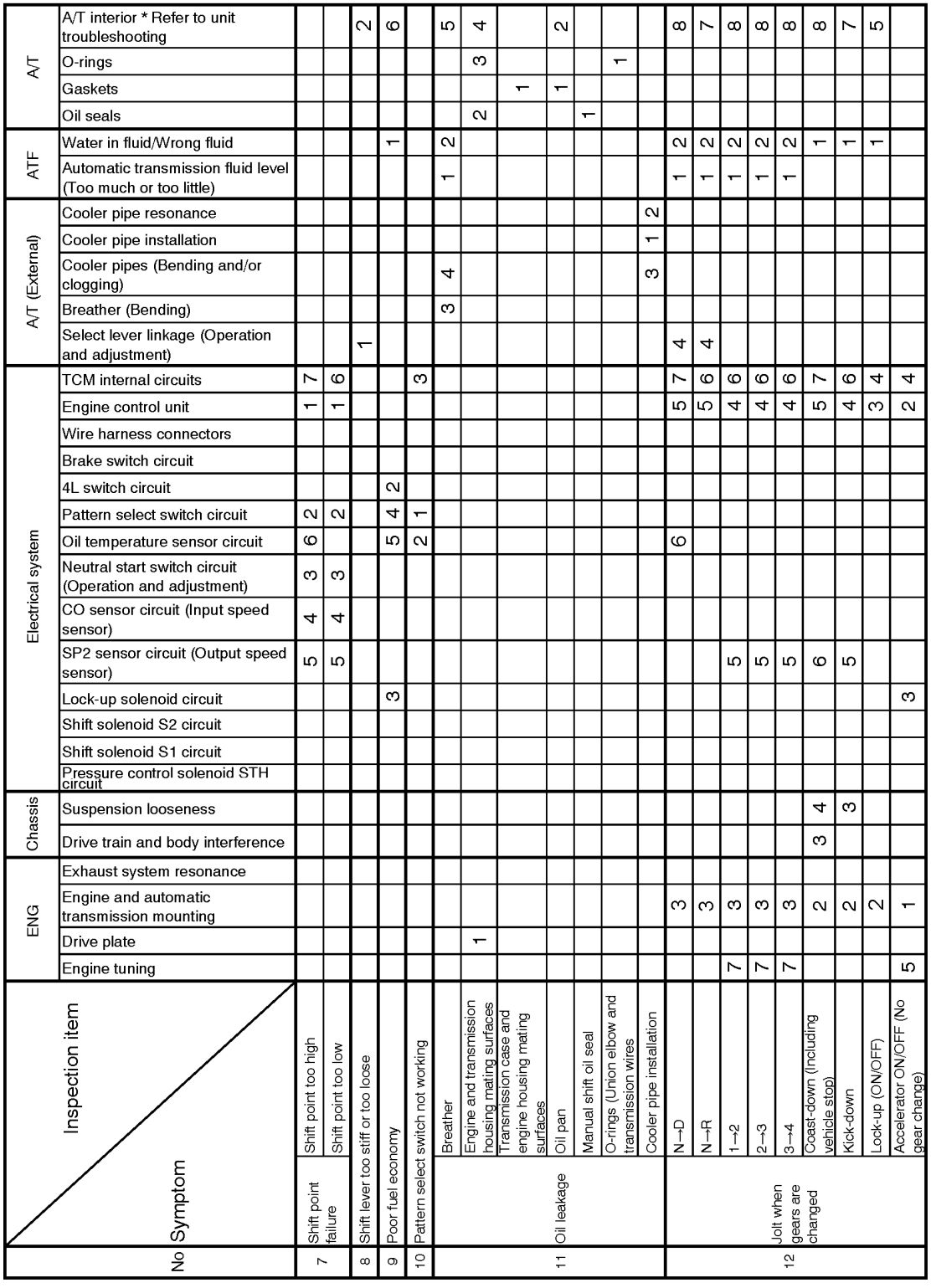

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ON-VEHICLE TROUBLESHOOTING

No	Symptom	Inspection item	ENG				Chassis		Electrical system														A/T (External)					ATF		A/T			
			Engine tuning	Drive plate	Engine and automatic transmission mounting	Exhaust system resonance	Drive train and body interference	Suspension looseness	Pressure control solenoid STH circuit	Shift solenoid S1 circuit	Shift solenoid S2 circuit	Lock-up solenoid circuit	SP2 sensor circuit (Output speed sensor)	CO sensor circuit (Input speed sensor)	Neutral start switch circuit (Operation and adjustment)	Oil temperature sensor circuit	Pattern select switch circuit	4L switch circuit	Brake switch circuit	Wire harness connectors	Engine control unit	TCM internal circuits	Select lever linkage (Operation and adjustment)	Breather (Bending)	Cooler pipes (Bending and/or clogging)	Cooler pipe installation	Cooler pipe resonance	Automatic transmission fluid level (Too much or too little)	Water in fluid/Wrong fluid	Oil seals	Gaskets	O-rings	A/T interior * Refer to unit troubleshooting
13	Excessive vibration	Running	3	7	6	4	5																					1	2				8
14	Abnormal noise	Idling	3																								2	1					4
		Garage shift			1																												
		Running	2		1	1	1																				1						3
		Gear change	2		1	1	1																										3
		Accelerator ON/OFF (No gear change)	2		1	1	1																										
15	DTC	31(P0753)								1										1		2											
		32(P0758)									1									1		2											
		33(P0743)										1								1		2											
		35(P0748)							1											1		2											
		11(P0722)											1							1		2											
		25(P0560)																		1		2											
		14(P0717)												1						1													
		15(P0712)														1				1													
		16(P0713)														1				1													
		17(P0705)													1					1													
		61(P1790)																				1											
		62(P1791)																				1											
		65(U2104)																		1	1												
		67(P1767)																		1	1												

UNIT TROUBLESHOOTING

Symptom	Inspection item	T/C: Internal problem	T/C: External problem	Oil pump	Oil strainer	Transmission case	Shift solenoid S1 (Stick)	Shift solenoid S2 (Stick)	Lock-up solenoid (Stick)	Valve body (Internal)	Accumulator (C0, C2, B0, and B2)	Clutch: Overdrive direct clutch (C0)	Clutch: Forward clutch (C1)	Clutch: Direct clutch (C2)	Brake: Overdrive brake (B0)	Brake: 2nd coast brake (B1)	Brake: 2nd brake (B2)	Brake: 1st and reverse brake (B3)	One-way clutch: Overdrive one-way clutch (F0)	One-way clutch: One-way clutch No. 1 (F1)	One-way clutch: One-way clutch No. 2 (F2)	Overdrive front and rear planetary gears	Bearing races	Detent spring
1 No vehicle movement	No forward movement	6		2	1					7			3					4			4	5		
	No reverse movement	5		2	1					6				3				4						
2 Slippage	Slip to front	6		2	1					7			3								4	5		
	Slip to rear	5		2	1					6				3				4						
3 Long garage shift time lag	N→D			1						4			2								3			
	N→R			1						4				2				3						
4 Engine stop	N→D or N→R	2							1	3														
	Speed reduction								1	2														
5 No shift	1→2							1		4							2			3				
	2→3						1			3				2										
	3→4							1		3					2									
	4→3							1		4		2			3				2					
	3→2						1			4				2						3				
	2→1							1		5							2			3	4			
	Lock-up does not operate	2							1	3														
	Poor engine braking in 2nd gear									2						1								
	Poor engine braking in 1st gear									2						1								
6 Shift lever too stiff or too loose																								1
7 Poor fuel economy		2							1	3														
8 Oil leakage	Breather									1														
	Engine and transmission housing mating surfaces		1	2																				
	Oil pan					1																		

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UNIT TROUBLESHOOTING

	Symptom / Inspection item		T/C		Oil pump	Oil strainer	Transmission case	Shift solenoid S1 (Stick)	Shift solenoid S2 (Stick)	Lock-up solenoid (Stick)	Valve body (Internal)	Accumulator (C0, C2, B0, and B2)	Clutch			Brake				One-way clutch			Overdrive front and rear planetary gears	Bearing races	Detent spring
			Internal problem	External problem									Overdrive direct clutch (C0)	Forward clutch (C1)	Direct clutch (C2)	Overdrive brake (B0)	2nd coast brake (B1)	2nd brake (B2)	1st and reverse brake (B3)	Overdrive one-way clutch (F0)	One-way clutch No. 1 (F1)	One-way clutch No. 2 (F2)			
9	Jolt when gears are changed	N→D									2			1											
		N→R									3	1			2										
		1→2									3	1						2							
		2→3									3	1			2										
		3→4									3	1				2									
		Coast-down									2	1													
		Kick-down									2	1													
		Lock-up								1	2														
10	Excessive vibration	Running	2			1					3														
11	Abnormal noise	Idling	4		2	1																		3	
		Garage shift												2	1										
		Running	5		2	1					6												3	4	
		Gear change											1	5	3	2	4	6	7						

Manual Shifting Test

NOTE: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. Disconnect TCM connector
   Inspect manual driving operation
2. Inspect manual driving operation
   Check that the shift and gear positions correspond with the table.
   If the “L", “2", “3" and “D" range gear positions are difficult to distinguish, do perform the following road test.
   While driving, shift through the “L", “2", “3" and “D" ranges. Check that the gear change corresponds to the gear position.
   If any abnormality is found in the above test, do perform the stall, time lag or gear change tests.

Position	Transmission		
Shift	"D" range	"3" range	"2" range
Gear	OD	OD	3rd

Transmission		
"L" range	"R" range	"P" range
3rd	Reverse	Pawl Lock

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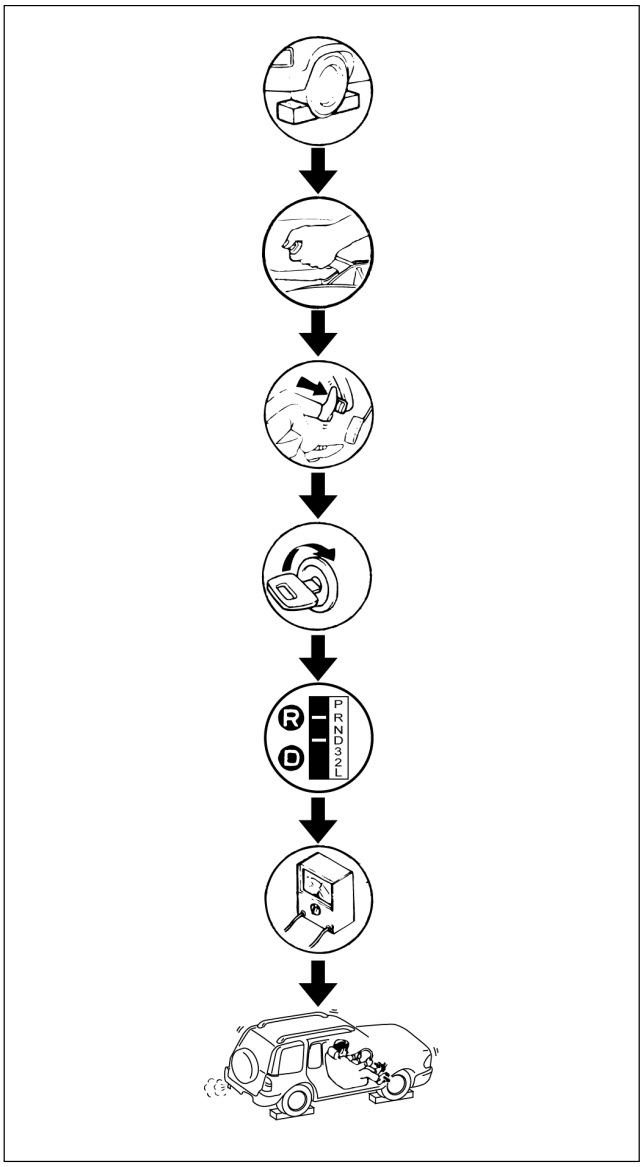
3. Connect TCM connector
   With the engine off, connect the TCM connector.

Stall Test



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The object of this test is to check the overall performance of the transmission and engine by measuring the maximum engine speeds at the “D" and “R" ranges.

NOTE:

1. Perform the test at normal operation fluid temperature (50 – 80°C or 122 – 176°F).
2. Do not continuously run this test longer than 5 seconds.

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Measure Stall Speed

1. Chock the four wheels.
2. Mount an engine tachometer.
3. Fully apply the parking brake.
4. Step down strongly on the brake pedal with your left foot.
5. Start the engine.
6. Turn off the A/C.
7. Shift into the “D" range. Step all the way down on the accelerator pedal with your right foot. Quickly read the highest engine rpm.

   Stall speed: 2100±150 rpm

8. Perform the same test in the “R" range.

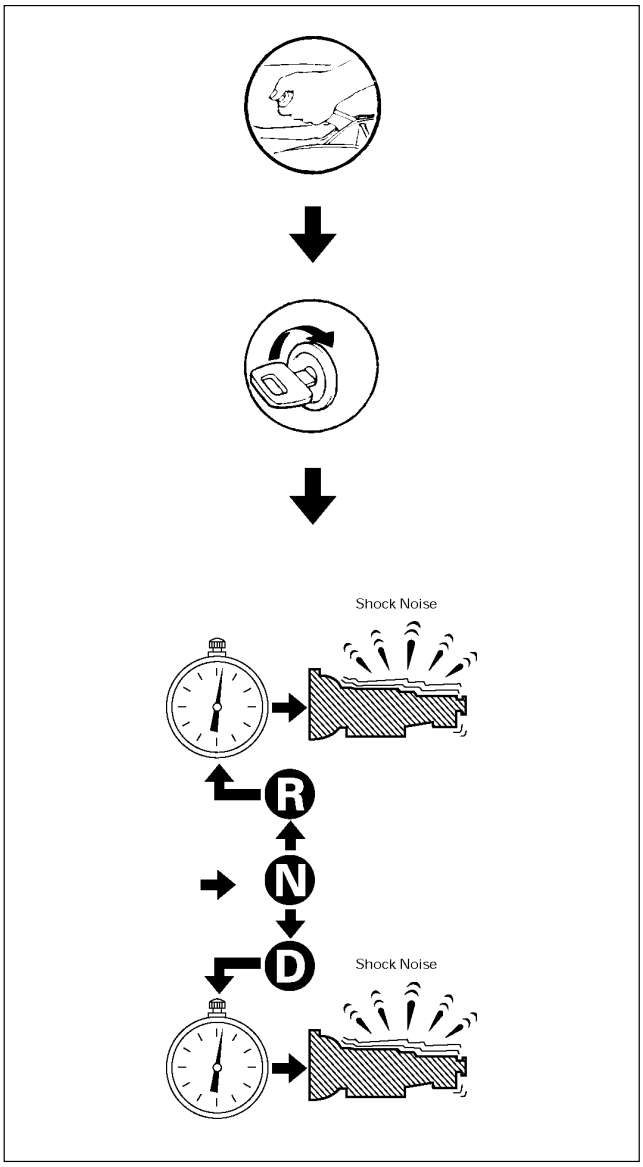
Evaluation

1. If the engine speed is the same for both ranges but lower than the specified value:
   - Engine output is insufficient.
   - Stator one-way clutch is not operating properly.

NOTE: If more than 600 rpm below the specified value, the torque converter could be faulty.

2. If the stall speed in “D" range is higher than specified:
   - Line pressure too low
   - Forward clutch slipping
   - No.2 one-way clutch not operating properly
3. If the stall speed in “R" range is higher than specified:
   - Line pressure too low
   - Direct clutch slipping
   - No.3 brake slipping
4. If the stall speed in the “R" and “D" ranges are higher than specified:
   - Line pressure too low
   - Improper fluid level

Time Lag Test



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If the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the forward clutch, direct clutch, No.3 brake, and No.2 one-way clutch.

NOTE:

1. Perform the test at normal operation fluid temperature (50 – 80°C or 122 – 176°F)
2. Be sure to allow one minute interval between tests.
3. Make three measurements and take the average value.

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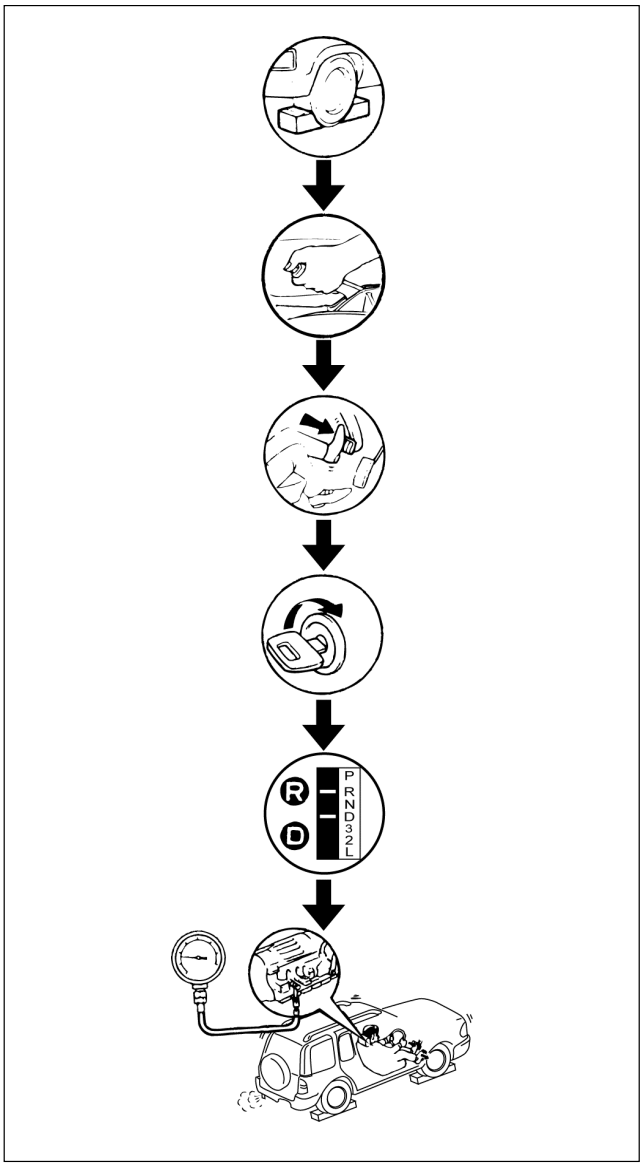
Measure Time Lag

1. Fully apply the parking brake.
2. Start the engine.
   Check idling speed (A/C OFF).
3. Shift the shift lever from “N" to “D" range. Using a stopwatch, measure the time it takes from shifting the lever until the shock is felt.
   Time lag: Less than 0.7 seconds
4. In same manner, measure the time lag for “N" → “R".
   Time lag: Less than 1.2 seconds

Evaluation

1. If “N" → “D" time lag is longer than specified:
   - Line pressure too low
   - Forward clutch malfunction
   - No.2 one-way clutch not operating properly
2. If “N" → “R" time lag is longer than specified:
   - Line pressure too low
   - Direct clutch malfunction
   - No.3 brake malfunction
3. If both time lag is longer than specified:
   - Line pressure too low

Hydraulic Test



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Preparation

1. Warm up the transmission fluid.
2. Remove the transmission case test plug and mount the hydraulic pressure gauge.

   Oil pressure gauge: J–29770–A

NOTE: Perform the test at normal operation fluid temperature (50 – 80°C or 122 – 176°F).

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Measure Line Pressure

1. Fully apply the parking brake and chock the four wheels.
2. Start the engine and check idling rpm.
3. Shift into “D" range, step down strongly on the brake pedal with your left foot and, while manipulating the accelerator pedal with the right foot, measure the line pressures at the engine speeds specified in the table.
4. In the same manner, perform the test in “R" range.

Engine speed	Line pressure kPa (kg/cm^2/psi)	
	“D" range	“R" range
Idling	323 – 382 (3.3 – 3.9/47 – 55)	500 – 598 (5.1 – 6.1/73 – 87)
Stall	1,137 – 1,274 (11.6–13.0/165–185)	1,499 – 1,833 (15.3–18.7/218–266)

Evaluation

1. If the measured values at all ranges are higher than specified:
   - Pressure control solenoid defective
   - Primary regulator valve defective
2. If the measured values at all ranges are lower than specified:
   - Primary regulator valve defective
   - Oil pump defective
   - Pressure control solenoid defective
3. If pressure is low in “D" range only:
   - “D" range circuit fluid leakage
4. If pressure is low in “R" range only:
   - “R" range circuit fluid leakage

Road Test

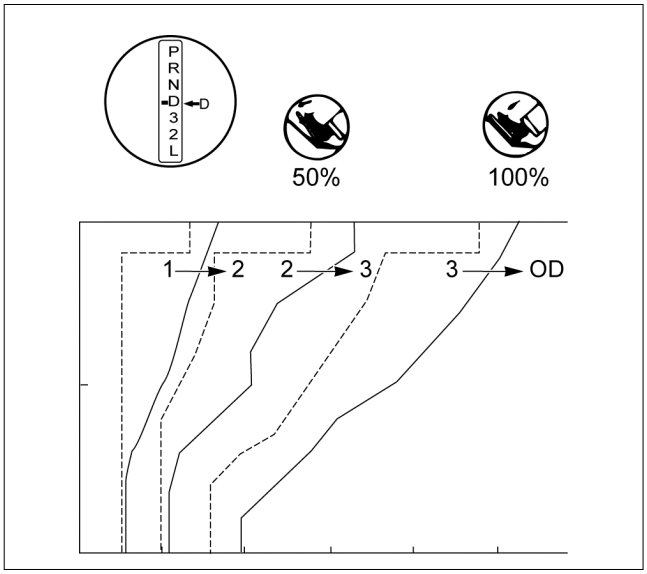
NOTE: Perform the test at normal operation fluid temperature (50 – 80°C or 122 – 176°F).

“D" Range Test in “NORMAL", and “POWER" Pattern Ranges

Shift into the “D" range and hold the accelerator pedal constant at the 50% and 100% throttle valve opening positions.

Push in one of the pattern selector buttons and check the following:

1. 1–2, 2–3, 3–OD and lock-up, up-shifts should take place, and shift points should conform to those shown in the automatic shift diagram.



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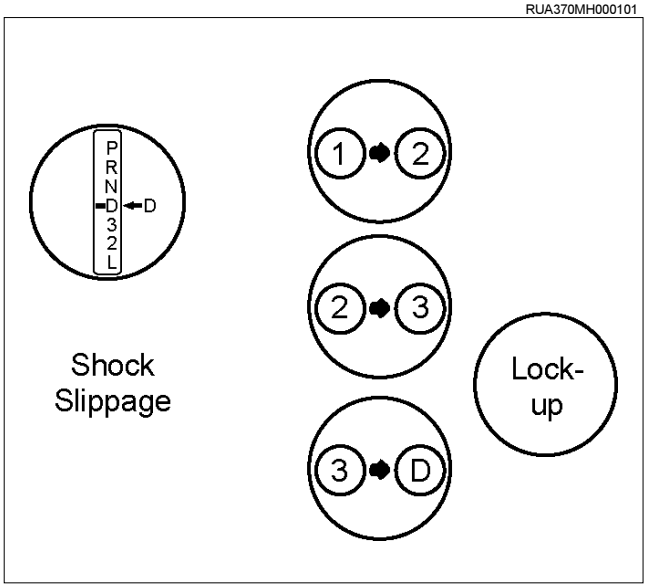

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Evaluation

i. If there is no 1→2 upshift:
   - Solenoid S2 is stuck
   - 1–2 shift valve is stuck

ii. If there is no 2→3 upshift:
   - Solenoid S1 is stuck
   - 2–3 shift valve is stuck

iii. If there is no 3→OD upshift (throttle valve opening 1/2):
   - Solenoid S2 is stuck
   - 3–OD shift valve is stuck

iv. If the shift point is defective:
   Refer to *TROUBLESHOOTING CHART* in this section.

v. If the lock-up is defective:
   Refer to *TROUBLESHOOTING CHART* in this section.

2. In the same manner, check the shock and slip at the 1→2, 2→3 and 3→OD upshifts.

NOTE: Drive the vehicle on level ground.

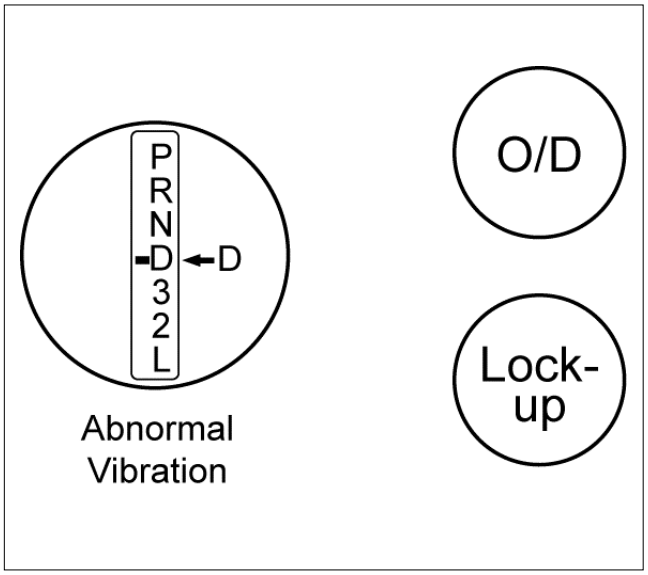
Evaluation

If the shock is excessive:

Refer to *TROUBLESHOOTING CHART* in this section.

3. Run at “D" range lock-up or OD gear and check for abnormal noise and vibration.

NOTE: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, the torque converter, etc. or insufficient bending, rigidity, etc. in the power train.



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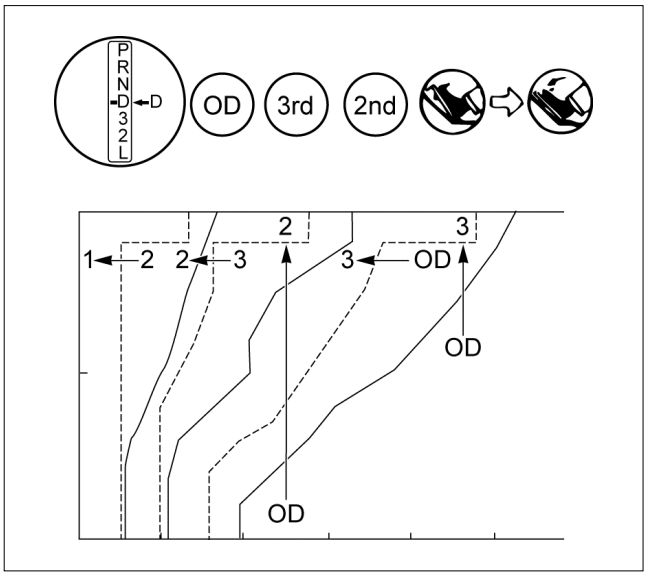
4. While running in “D" range, 2nd, 3rd gears and OD, check to see that the possible kick-down vehicle speed limits for 2→1, 3→1, 3→2, OD→3 and OD→2 kick-downs conform to those indicated on the automatic shift diagram.



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5. Check for abnormal shock and slip at kick-down.
6. While running in “D" range, OD gear or “lock-up", shift to “2" and “L" ranges and check the engine braking effect at each of these ranges.
7. Also check to see that downshift is made from 3→2 or from OD to 3 and then to 2 immediately and that 2→1 downshift point is within the limits shown in the diagram when tested by releasing the accelerator pedal and shifting into position of “L" while driving in the third gear or in overdrive.

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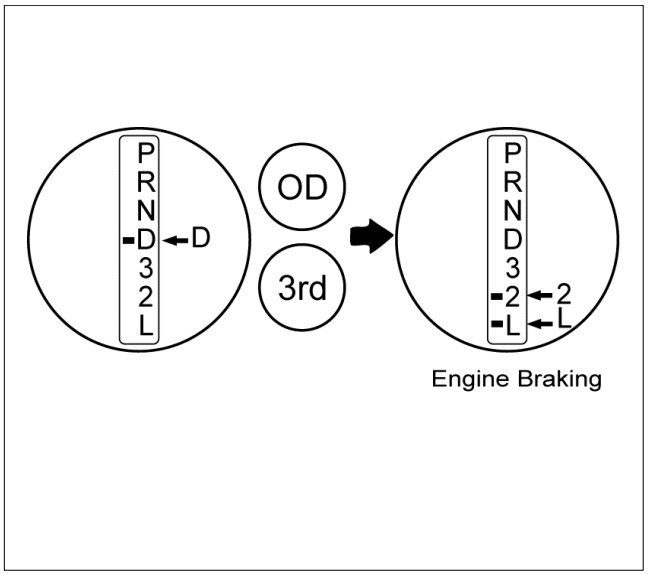
Evaluation

i. If there is no engine braking effect in the “2" range:
   • Second coast (No.1) brake is defective.

ii. If there is no engine braking effect in the “L" range:
   • First and reverse (No.3) brake is defective.



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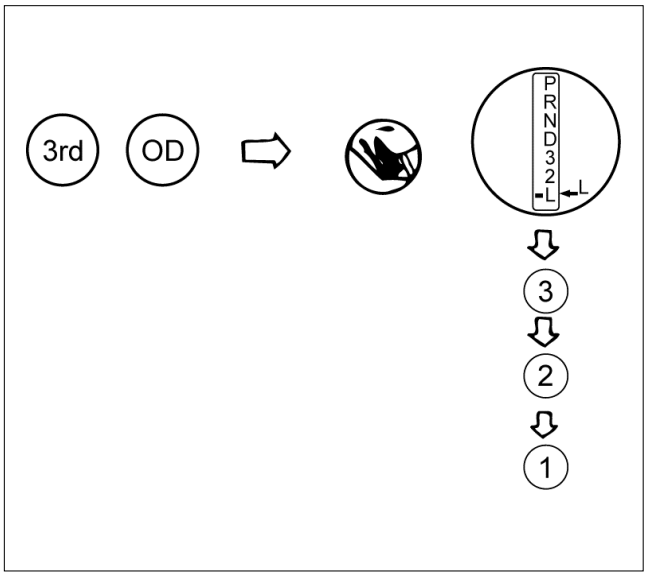
iii. Also check to see that downshift is made from 3→2 or from OD to 3 and then to 2 immediately and that 2→1 downshift point is within the limits shown in the diagram when tested by releasing the accelerator pedal and shifting into “L" position while driving in the third gear or in overdrive.



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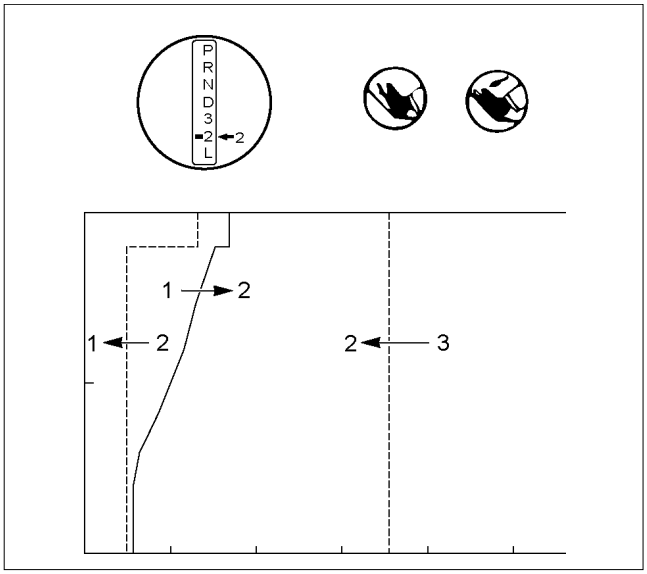
“2" Range Test

Shift into “2" range and, while driving with the accelerator pedal held constantly at the specified point (throttle valve opening 50% and 100%), push in one of the pattern selectors (only for 4∴4) and check on the following points.

1. At each of the above throttle openings, check to see that the 1→2 upshift takes place and that the shift points conform to those shown on the automatic shift diagram.

NOTE: There is no OD and no lock-up in the “2" range.



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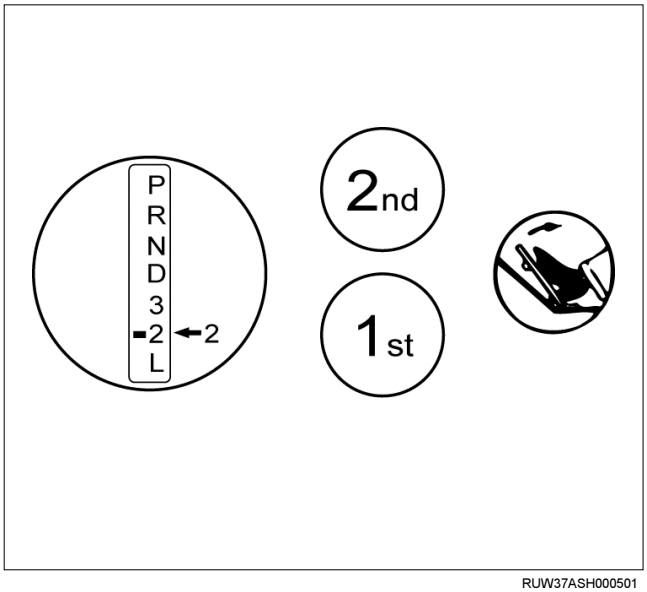
2. While running in the “2" range and 2nd gear, release the accelerator pedal and check the engine's braking effect.
3. Check for 2→1 downshift and abnormal noise at acceleration and deceleration, and for shock at upshift and downshift.



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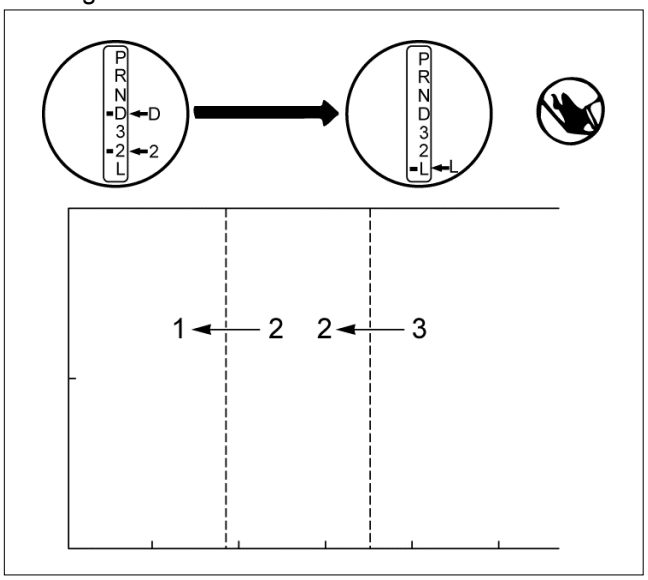
“L" Range Test

1. While running above 80 km/h (50 mph) in the “D" range, release your foot from the accelerator pedal and shift into the “L" range.
   Then check to see that the 2→1 downshift occurs at the specified point shown on the automatic shift diagram.



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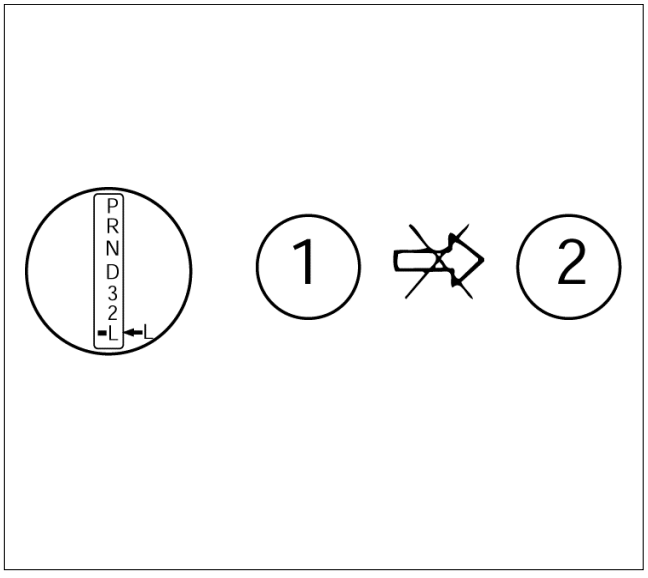
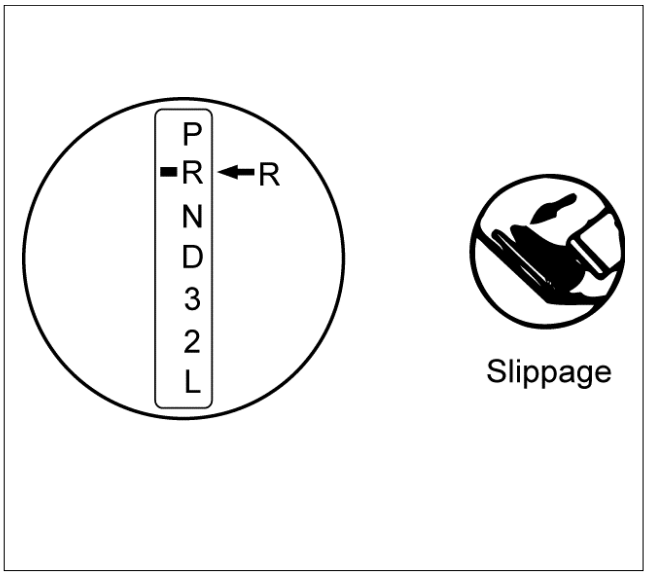
2. While running in the “L" range, check to see that there is no upshift to 2nd gear.
3. While running in the “L" range, release the accelerator pedal and check the engine braking effect.
4. Check for abnormal noise during acceleration and deceleration.



RUW37ASH000701

“R" Range Test

Shift into the “R" range and, while starting at full throttle, check for slipping.



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“P" Range Test

Stop the vehicle on a grade (more than 9%) and after shifting into the “P" range, release the parking brake.

Then check to see that the parking lock pawl holds the vehicle in place.

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Shift Point Chart and Lock-Up Point Chart

Shift Point Chart

(H2, H4)

(REAR AXLE RATIO: 4.555)

(RADIUS OF TIRE: 0.350m)

"NORMAL" mode

Up shift **km/h (mph)**

Range	Throttle Opening	1→2	2→3	3→4
D	Fully opened	48 – 54 (30 – 34)	104 – 110 (65 – 68)	177 – 183 (110 – 114)
	Half throttle	32 – 38 (20 – 24)	59 – 65 (37 – 40)	114 – 120 (71 – 75)
3	Fully opened	48 – 54 (30 – 34)	104 – 110 (65 – 68)	—
	Half throttle	32 – 38 (20 – 24)	59 – 65 (37 – 40)	—
2	Fully opened	48 – 54 (30 – 34)	—	—
	Half throttle	32 – 38 (20 – 24)	—	—

Down shift **km/h (mph)**

Range	Throttle Opening	1→2	2→3	3→4
D	Fully opened	37 – 43 (23 – 27)	94 – 100 (58 – 62)	155 – 161(96 – 100)
	Half throttle	15 – 21 (9 – 13)	33 – 39 (21 – 24)	65 – 71 (40 – 44)
	Fully closed	9 – 15 (6 – 9)	20 – 26 (12 – 16)	39 – 45 (24 – 28)
3	Fully opened	37 – 43 (23 – 27)	94 – 100 (58 – 62)	—
	Half throttle	15 – 21 (9 – 13)	33 – 39 (21 – 24)	—
	Fully closed	9 – 15 (6 – 9)	20 – 26 (12 – 16)	—
2	Fully opened	37 – 43 (23 – 27)	94 – 100 (58 – 62)	—
	Half throttle	15 – 21 (9 – 13)	94 – 100 (58 – 62)	—
	Fully closed	9 – 15 (6 – 9)	94 – 100 (58 – 62)	—
L	—	37 – 43 (23 – 27)	—	—

"POWER" mode

Up shift **km/h (mph)**

Range	Throttle Opening	1→2	2→3	3→4
D	Fully opened	48 – 54 (30 – 34)	104 – 110 (65 – 68)	177 – 183 (110 – 114)
	Half throttle	38 – 44 (24 – 27)	74 – 80 (46 – 50)	128 – 134 (80 – 83)
3	Fully opened	48 – 54 (30 – 34)	104 – 110 (65 – 68)	—
	Half throttle	38 – 44 (24 – 27)	74 – 80 (46 – 50)	—
2	Fully opened	48 – 54 (30 – 34)	—	—
	Half throttle	38 – 44 (24 – 27)	—	—

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Down shift **km/h (mph)**

Range	Throttle Opening	1→2	2→3	3→4
D	Fully opened	39 – 45 (24 – 28)	94 – 100 (58 – 62)	155 – 161(96 – 100)
	Half throttle	21 – 27 (13 – 17)	50 – 56 (31 – 35)	95 – 101 (59 – 63)
	Fully closed	13 – 19 (8 – 12)	24 – 30 (15 – 19)	47 – 53 (29 – 33)
3	Fully opened	39 – 45 (24 – 28)	94 – 100 (58 – 62)	—
	Half throttle	21 – 27 (13 – 17)	50 – 56 (31 – 35)	—
	Fully closed	13 – 19 (8 – 12)	24 – 30 (15 – 19)	—
2	Fully opened	39 – 45 (24 – 28)	94 – 100 (58 – 62)	—
	Half throttle	21 – 27 (13 – 17)	94 – 100 (58 – 62)	—
	Fully closed	13 – 19 (8 – 12)	94 – 100 (58 – 62)	—
L	—	39 – 45 (24 – 28)	—	—

“3rd START" mode

km/h (mph)

Derange, winter mode ON→OFF	32 – 38 (20 – 24)

Lock-Up Point Chart

(H2, H4)

(REAR AXLE RATIO: 4.555)

(RADIUS OF TIRE: 0.350m)

km/h (mph)

Range	A/T Mode	Throttle Opening: 20 %			
		Lock-up ON		Lock-up OFF	
		3rd	4th	3rd	4th
D	NORMAL	53 – 59 (33 – 37)	64 – 70 (40 – 43)	45 – 51 (28 – 32)	60 – 66 (37 – 41)
	POWER	78 – 84 (49 – 52)	81 – 87(50 – 54)	68 – 74 (42 – 46)	73 – 79 (45 – 49)

Lock-up points in 2nd are following figures regardless of throttle opening, whether NORMAL or POWER mode.

Lock-up ON: 73 – 79 km/h (45 – 49 mph)

Lock-up OFF: 68 – 74 km/h (42 – 46 mph)

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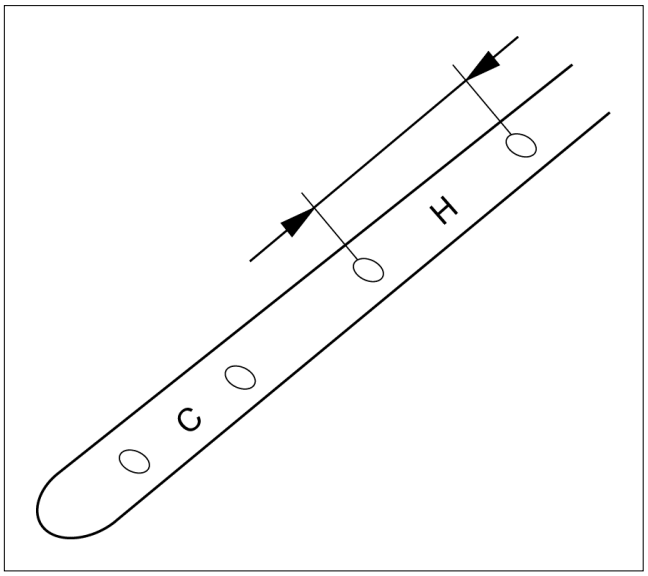
Transmission Fluid Level and Condition

Inspection

Park vehicle on level ground and set parking brake. With the engine idling, move the shift lever through all positions from “P" to “L", then return to position “P". Check to see if the level of fluid comes to “HOT" range of about 80°C (176°F) on the dipstick gauge.

If the level of fluid is too low, replenish to bring it to maximum level in “HOT" range.

Inspection of fluid condition. If the ATF is black or smells burnt, replace it.



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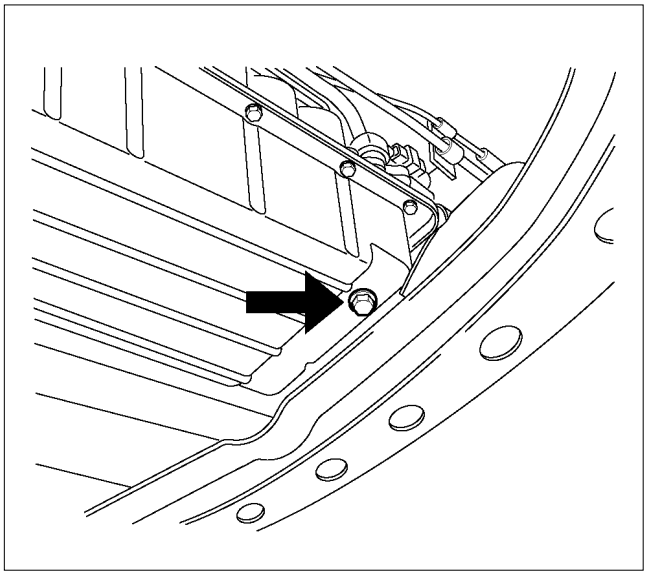
ATF Replacement

Inspection

NOTE: Do not overfill.

1. Remove the drain plug from oil pan and drain the fluid.



RUW17ASH013401

2. Reinstall the drain plug securely.

   Torque: 19 N·m (14 lb ft)

3. With the engine OFF, add new fluid through the filler tube.

Drain and refill	5.2 liter
Dry fill	8.7 liter
Fluid	BESCO ATF III

4. Start the engine and shift the selector into all position from “P" through “L", and then shift into “P".
5. With the engine idling, check the fluid level. Add fluid up to the “COLD" level on the dipstick.
6. The ATF level must be checked again for correct level with the “HOT" level.

NOTE: To prevent fluid leaks, the drain plug gasket must be replaced each time this plug is removed.

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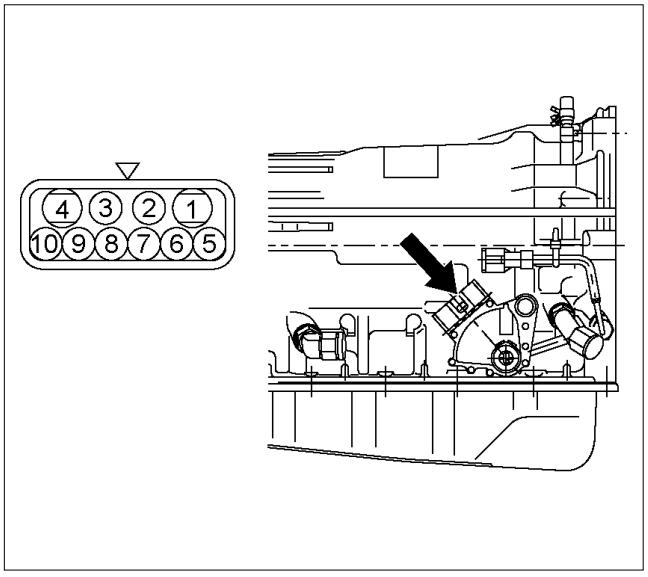
Neutral Start Switch (Mode Switch)

Inspection

With a circuit tester, make a continuity test on the neutral start switch with the moving piece set in each position.

Terminal Position	1	4	3	5	2	6	8	7	9	10
P	○	○	○	○						
R			○		○					
N	○	○	○			○				
D			○				○			
3			○					○		
2			○						○	
L			○							○

○—○ Continuity



RTW37BSH000101

Removal

Preparation:

Disconnect negative (–) battery cable.

1. Remove the rear side ATF cooler pipe from the transmission elbow.
2. Disconnect neutral start switch connector.
3. Unstake the lock washer, and then remove the shaft nut.
4. Remove the neutral start switch.

Installation

To install, follow the removal steps in the reverse order, noting the following points;

If a engine starts at any selector position except “N” or “P”, the neutral start switch (mode switch) should be adjusted.

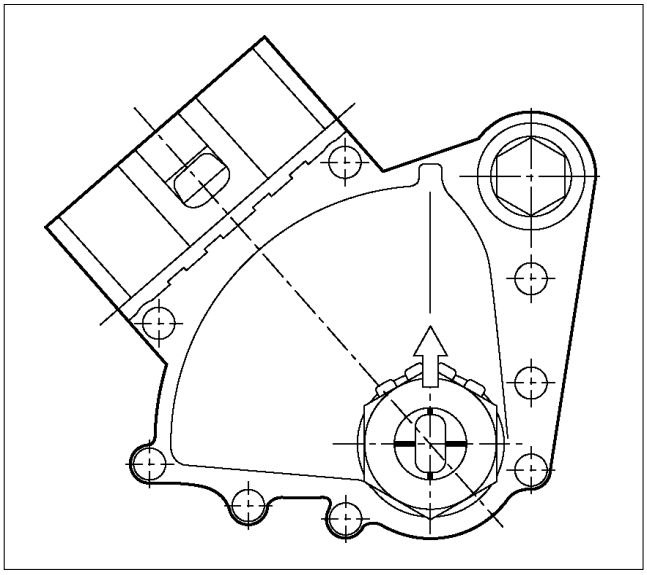
1. Loosen the neutral start switch bolt and set the shift selector to the “N" range.
2. Align the groove and neutral basic line.
3. Hold in position and tighten the bolt and nut.

Torque:

Nut – 7 N·m (61 lb in)

Bolt – 13 N·m (113 lb in)

4. Lock the nut with the lock washer tubs at two points.



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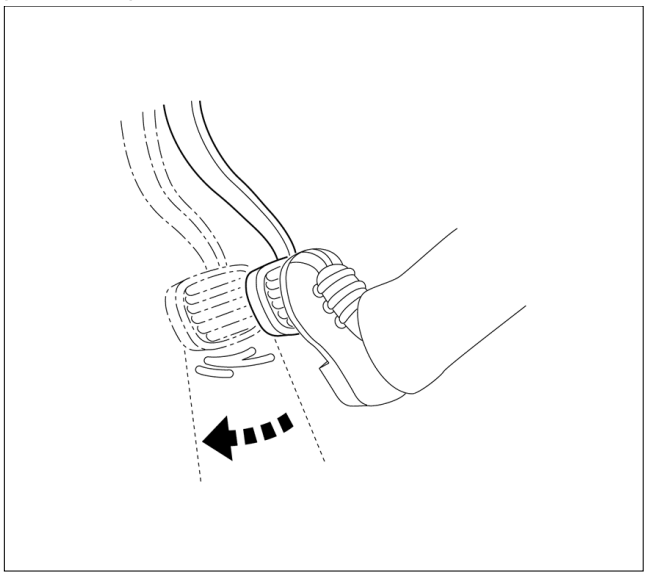
Brake Signal

Inspection

Check that the brake light comes on when the brake pedal is depressed.



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Input and Output Revolution Sensor

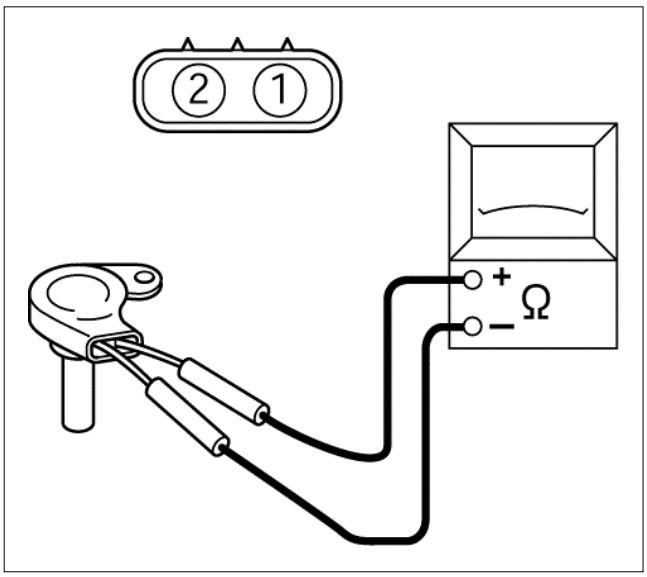
Inspection

1. Disconnect the input and output revolution sensor connector.
2. Use an ohmmeter to measure the resistance between terminals 1 and 2.

Standard resistance

Input revolution sensor: 387 – 473 Ω (at 20°C, 4∴2), 560 – 680 Ω (at 20°C, 4∴4)

Output revolution sensor: 560 – 680 Ω (at 20°C)



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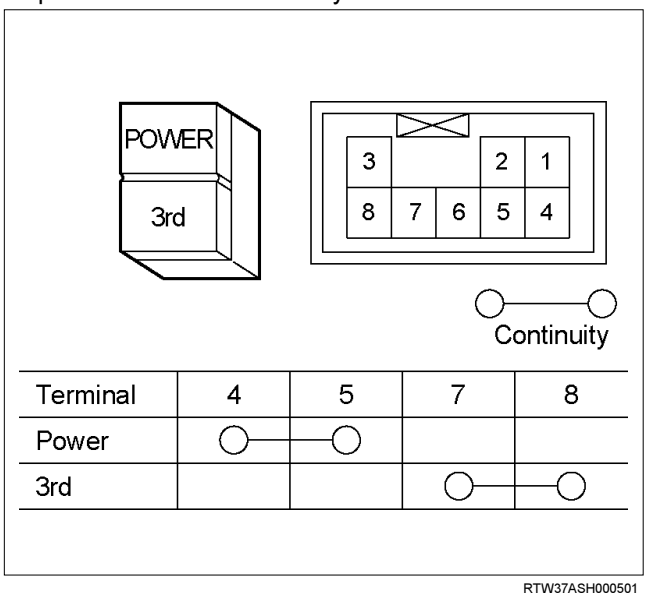
Pattern Select Switch

Inspection

Inspect that there is continuity between each terminals.



Terminal	4	5	7	8
Power	○—○			
3rd			○—○	

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Solenoid

Inspection

1. Resistance check
   - Using an ohmmeter, check the resistance between each terminals (S1/S2/SL) and body.

     Solenoid S1, S2 and lock-up solenoid SL resistance:

     11 – 15 Ω (at 20°C)

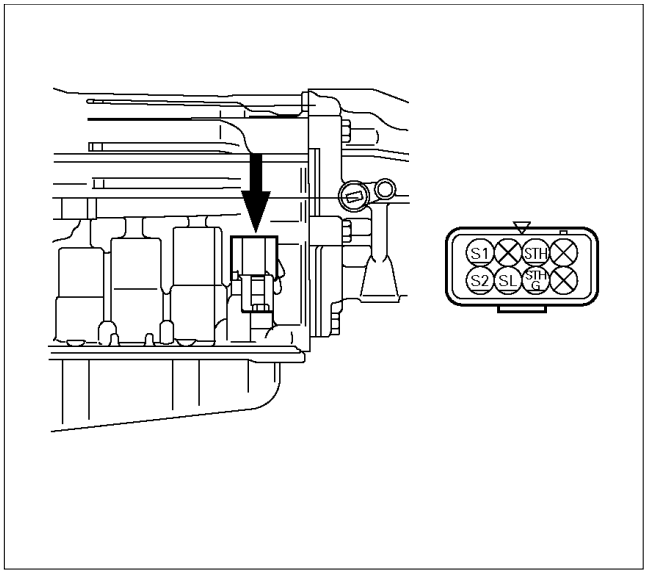
     (Reference) 12 – 16 Ω (at 40°C)

   - Using an ohmmeter, check the resistance between each terminals (STH) and (STHG).

     Pressure control solenoid resistance:

     5 – 5.6Ω (at 20°C)

     (Reference) 5.4– 6.1Ω (at 40°C)



220L100001

NOTE: If the pressure control solenoid resistance is not within speciation, replace the valve body assembly.

2. Operation check

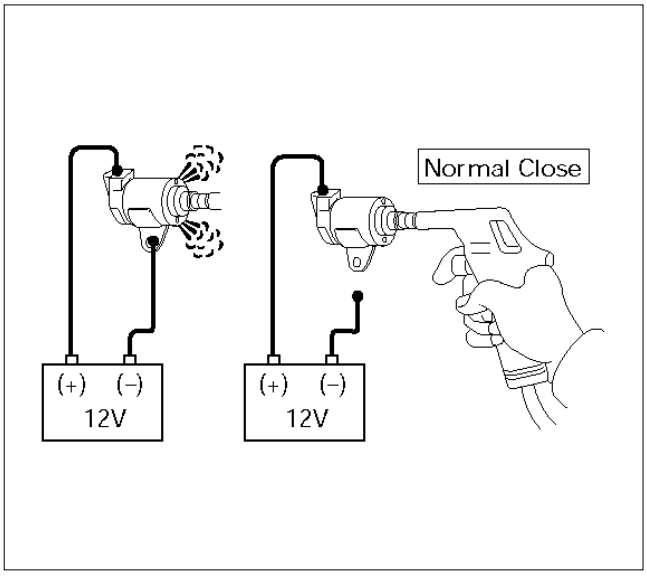
   Check the solenoid operation by blowing into an oil hole as shown in the figure.

Solenoid S1 and S2 (Normal close type)

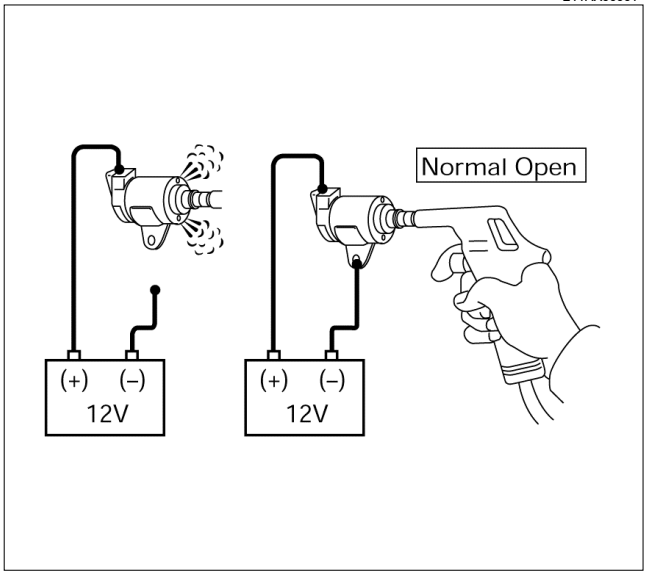
When battery terminal is disconnected	No air leaks
When battery terminal is connected	Air passes through

Lock-up solenoid SL (Normal open type)

When battery terminal is disconnected	Air passes through
When battery terminal is connected	No air leaks



244RX00001



244RY00005

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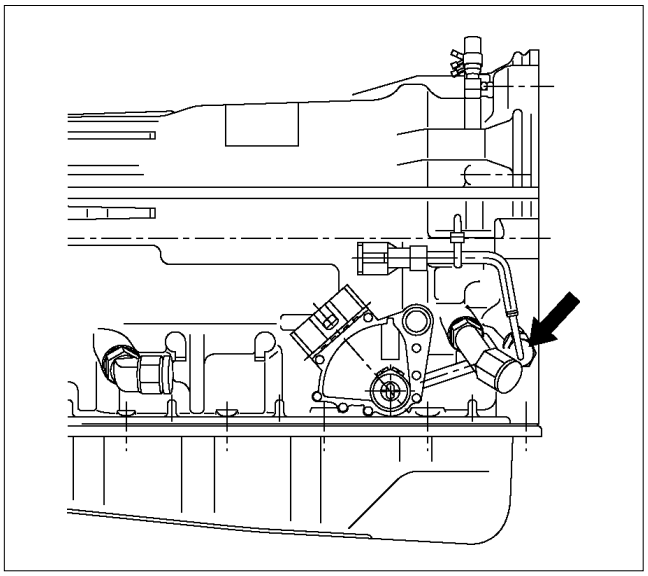
ATF Temperature Sensor

Inspection

1. Disconnect the front side ATF cooler pipe from the elbow and remove the elbow.
2. Remove the ATF temperature sensor from the transmission case.
3. Place the ATF temperature sensor in a container of ATF.



RUW37ASH004001

4. Measure the resistance between each terminals, while warming ATF.

Resistance: 0.5 – 30 kΩ (at 0°C – 120°C)

5. If either of the measured values exceeds the specified value, replace the ATF temperature sensor.

Torque: 15 N·m (11 lb ft)

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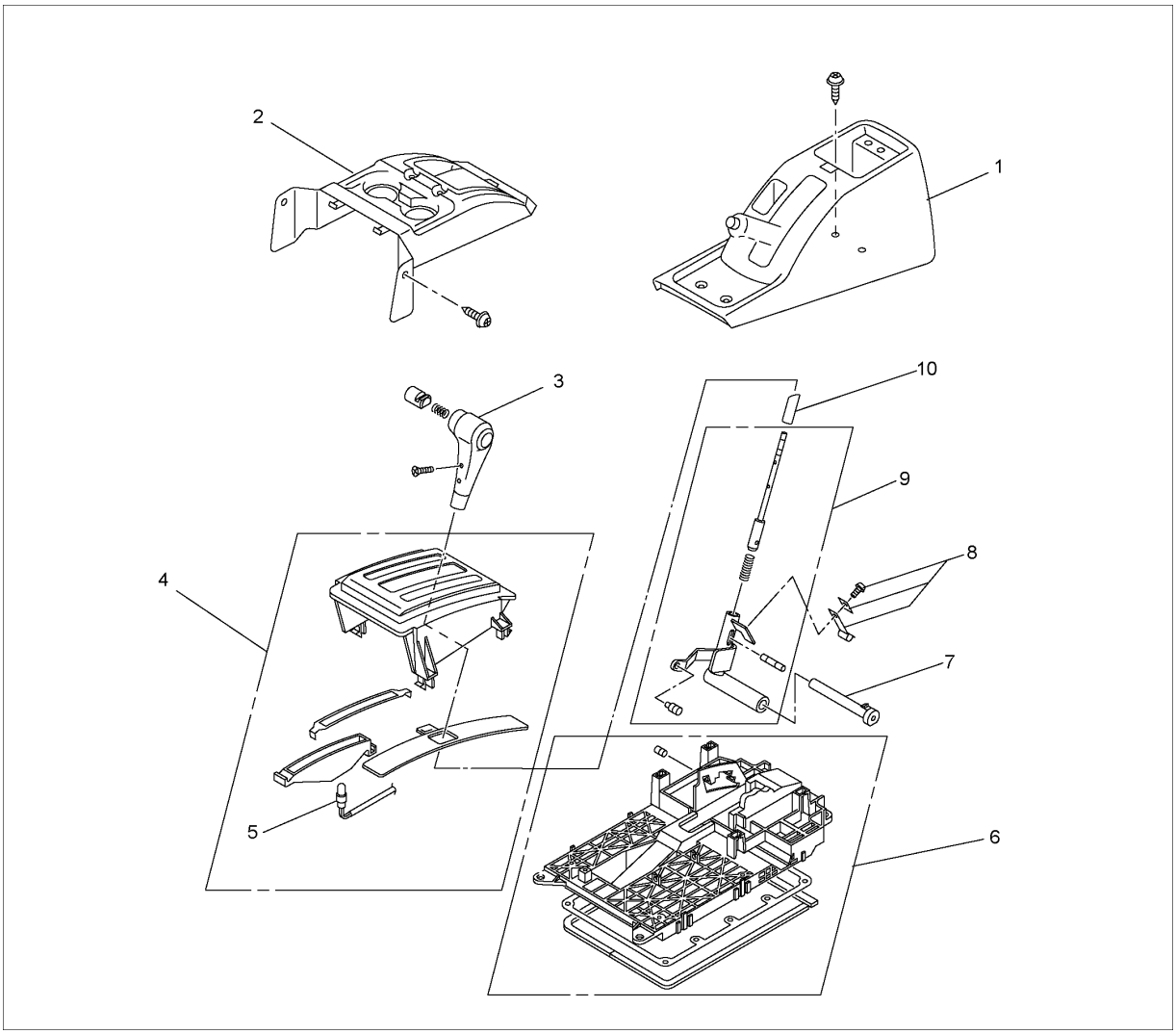
Select Lever



RTW37ALF001101

Legend

(1) Rear console
(2) Front console
(3) Select lever knob
(4) Upper housing
(5) Lamp assembly
(6) Base plate
(7) Grooved pin
(8) Spring plate
(9) Lever assembly
(10) Sleeve

Remove or Disconnect

1. Block the wheels.
2. Disconnect the negative battery cable.
3. Remove the rear console and the front console.
4. Remove the 2 screws fixing the select lever knob.
5. Remove the knob together with the knob button and spring from the lever.
6. Turn the sleeve counterclockwise to remove it. Make a note of the number of turns required to free the sleeve.
7. Remove the harness connectors from the base plate.

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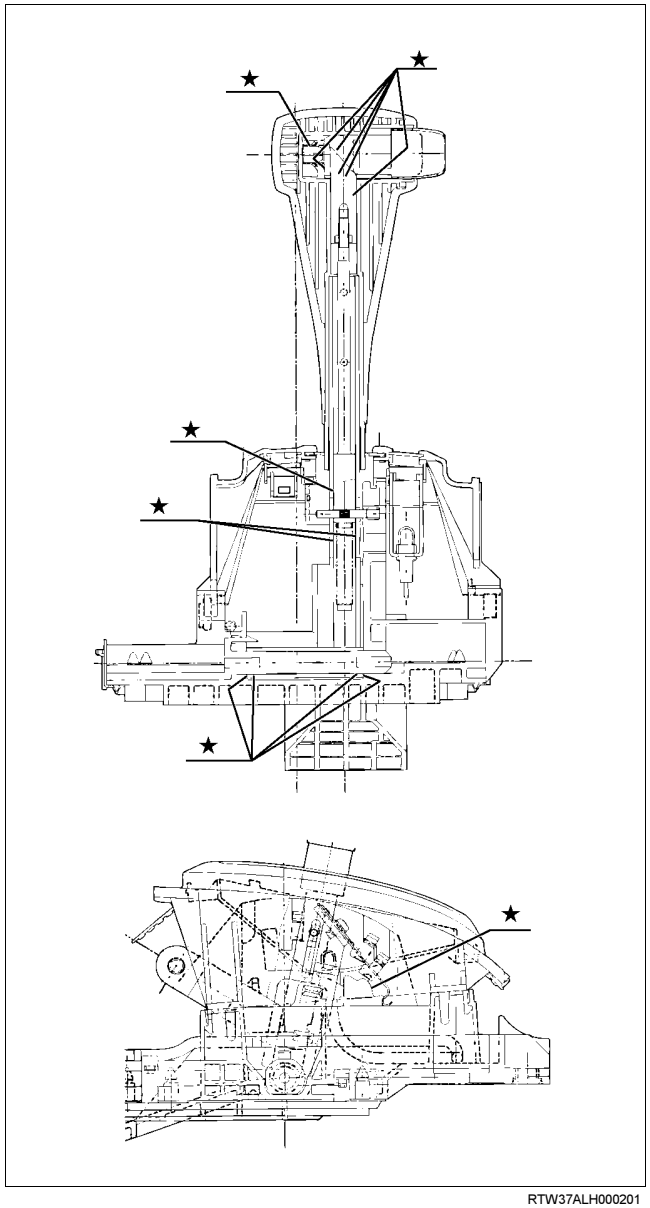
8. Remove the upper housing (held in place by 4 latched fasteners).
9. Remove the spring plate.
10. Remove the grooved pin.
11. Remove the lever assembly by pressing the rod down (lever in N position).
12. If lamp replacement is required, remove the lamp assembly from the lamp socket (align the socket grooved portion and the lamp assembly protruding portion).

Install or Connect

NOTE

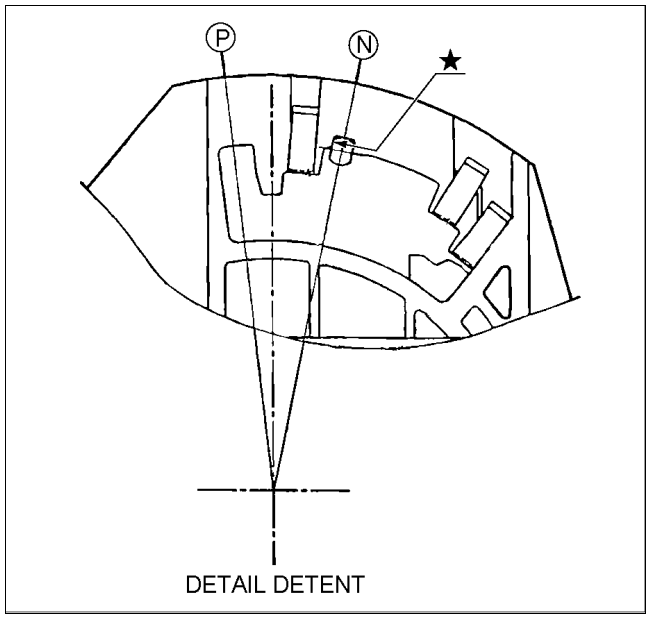
Apply MULTEMP No. 2 grease (or equivalent) to the select lever. Refer to the illustration.



RTW37ALH000201

1. Install the lever assembly to the base plate.
   a. Insert and secure shaft.
   b. Insert paw led end of shaft into base plate hole.
   c. Insert grooved pin of shaft into detente aperture (lever assembly in N position).

2. Install the spring plate.
   a. Insert the grooved pin into the base plate detente groove until it touches the front wall (lever assembly in N position).



RTW37ASH001001

   b. Install the spring plate tighten the screws to the specified torque.

Screw torque	2 N·m (0.2 kg·m/17 lb in)

   c. Check that the grooved pin moves smoothly in the detente groove (shift knob temporarily installed).

3. Temporarily install the sleeve.
4. Install the lamp assembly to the lamp socket (if removed at disassembly).
   a. Align the recessed portion of the lamp socket with the protruding portion of the lamp assembly.
   b. Insert the lamp assembly into the lamp socket and rotate it 90 degrees clockwise.
5. Attach the harness connectors to the base plate.
6. Move the lever to the “P” position.
7. Install the sleeve (rotate the sleeve clockwise the same number of turns it was rotated counterclockwise at disassembly).
8. Install the knob, the knob button, and the knob spring.

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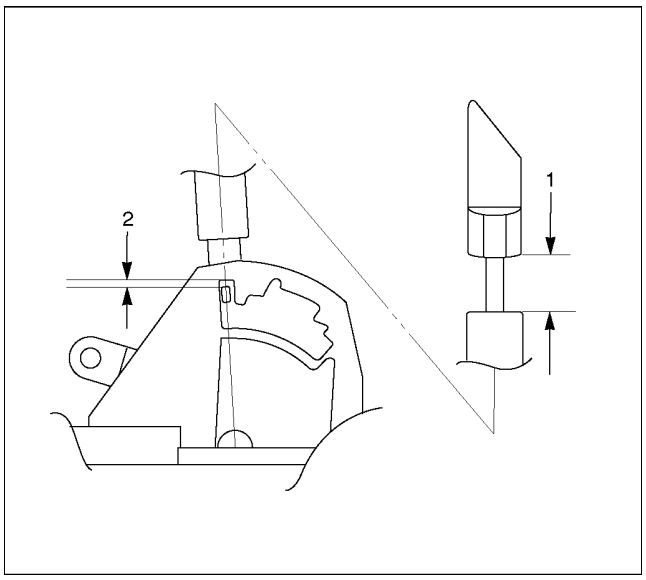
9. Adjust the clearance (2) between the detente plate and the pin by moving the select lever knob sleeve (1).

Detente plate and pin clearance	mm(in)
0.2 - 1.0 (0.01 - 0.04)	



255R300002

10. Install the 2 screws securing the knob and tighten them to the specified torque.

    Screw torque: 2 N·m (0.2kg·m/17 lb in)

11. Install the upper housing. Make sure that the 4 latched fasteners are securely closed.

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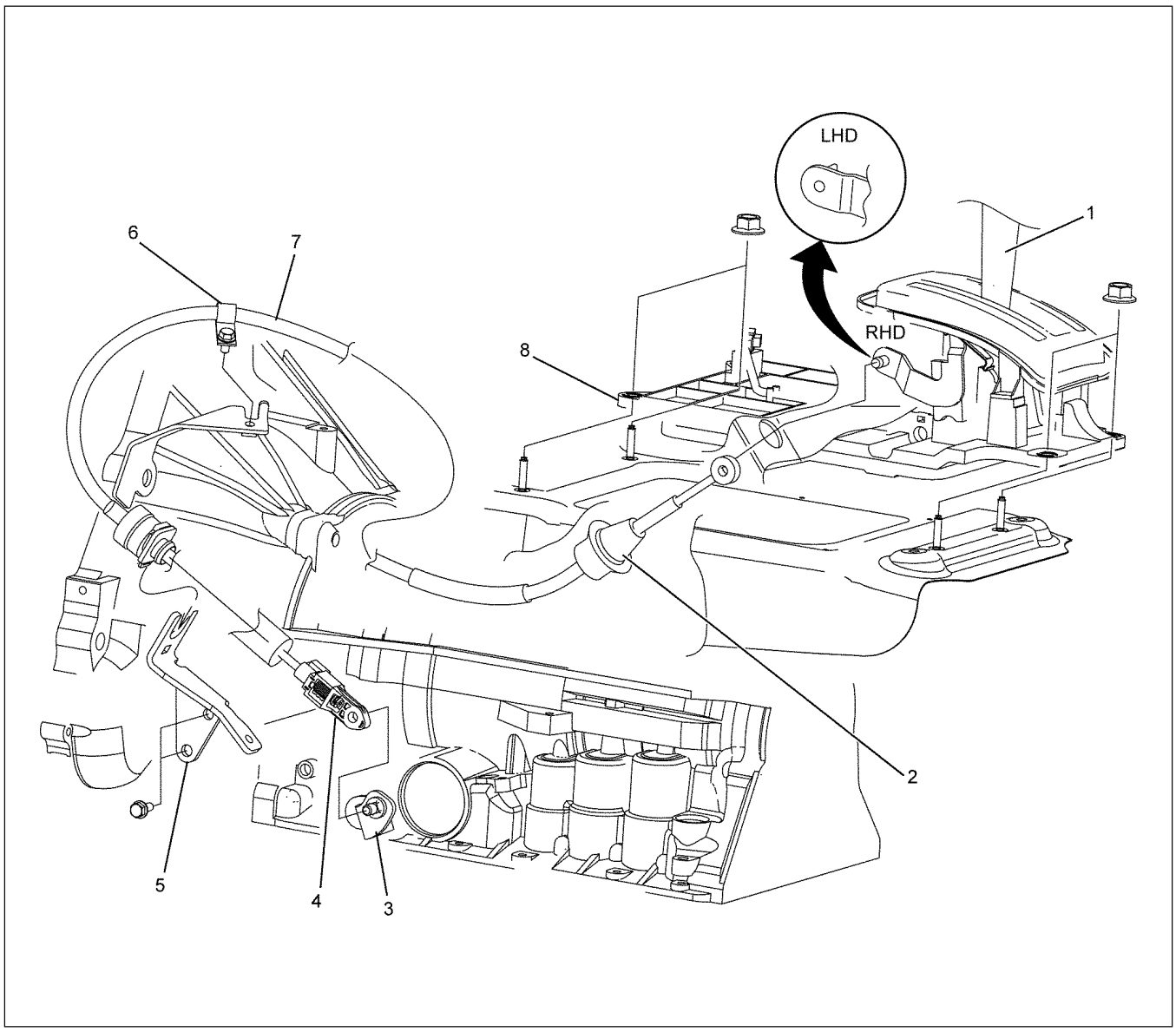
Shift Cable



RTW47ALF000101

Legend

(1) Select lever
(2) Shift cable retaining pawl
(3) Manual shaft select lever
(4) Adjuster
(5) Bracket
(6) Clip
(7) Shift cable
(8) Select lever base

Remove or Disconnect

1. Block the wheels.
2. Disconnect the negative battery cable.
3. Move the select lever to the “N” position.
4. Remove the rear console and front console.
5. Disconnect the shift cable from the select lever.
6. Press on the shift cable retaining pawl to remove the cable from the select lever base.
7. Disconnect the shift cable from the transmission side.
8. Remove the shift cable from the bracket.
9. Pull the shift cable free from the bottom of the vehicle.

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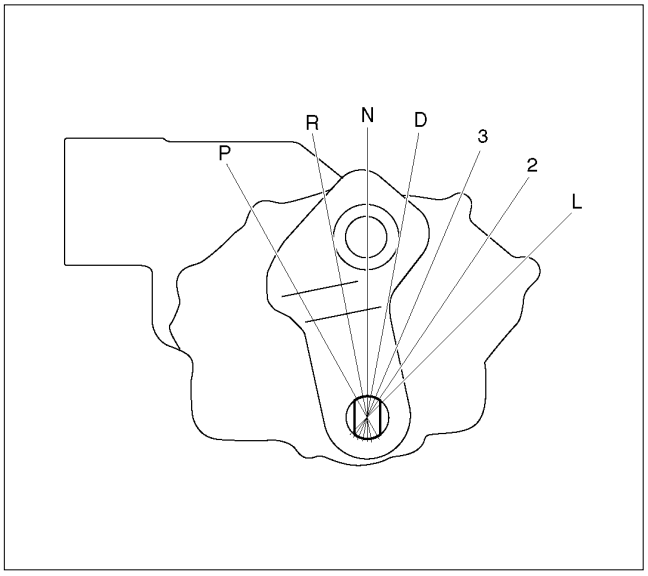
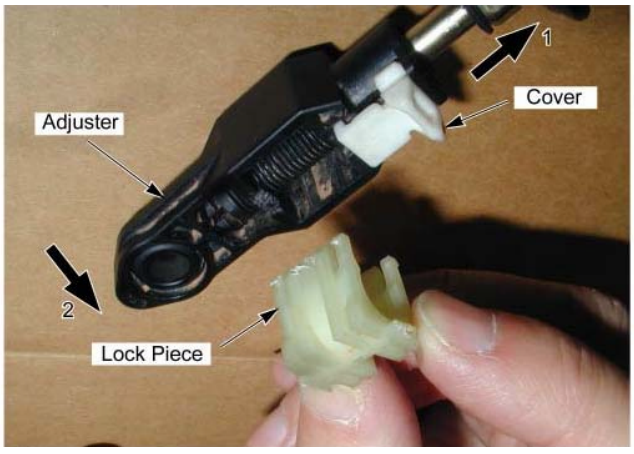
Install or Connect

1. Install the shift cable toward the inside of the cabin from the bottom of the vehicle.
2. Push the shift cable into the select lever base.
3. Connect the shift cable to the select lever.
4. Fix the shift cable to the bracket.
   Install the clip on the marking of shift cable.
5. Check that the select lever is in the “N” position.
6. Check that the transmission is in the “N” position.



249R300002

7. Slide the cover in the direction shown by the arrow (1).
8. Use an ordinary screwdriver to move the lock piece from the position indicated by the arrow (2). Continue to move the lock piece until the adjuster position begins to change.



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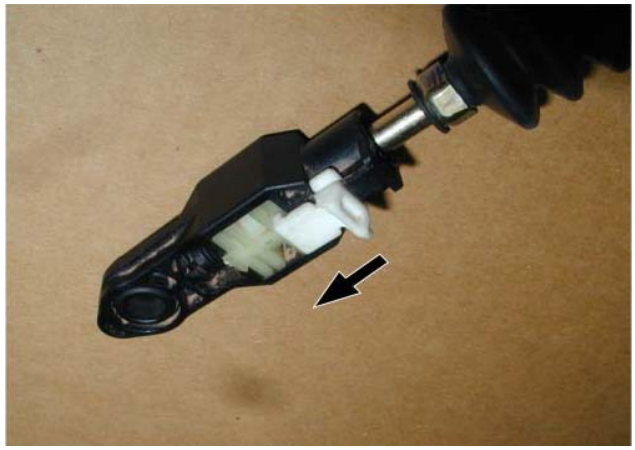
9. Connect the shift cable to the manual shaft select lever at the transmission side.
10. Insert the lock piece to the adjuster (cable length adjustment).
11. Slide the cover on the adjuster and secure lock piece.



P1010016-2

11. Press the select lever knob button 5 times.
    Then check that the select lever moves smoothly to each of its positions.
13. Check that the shift position indicated by the select lever and the actual shift position are the same.
14. Install the front console and rear console.
15. Connect the negative battery cable.
16. Remove the wheel blocks.

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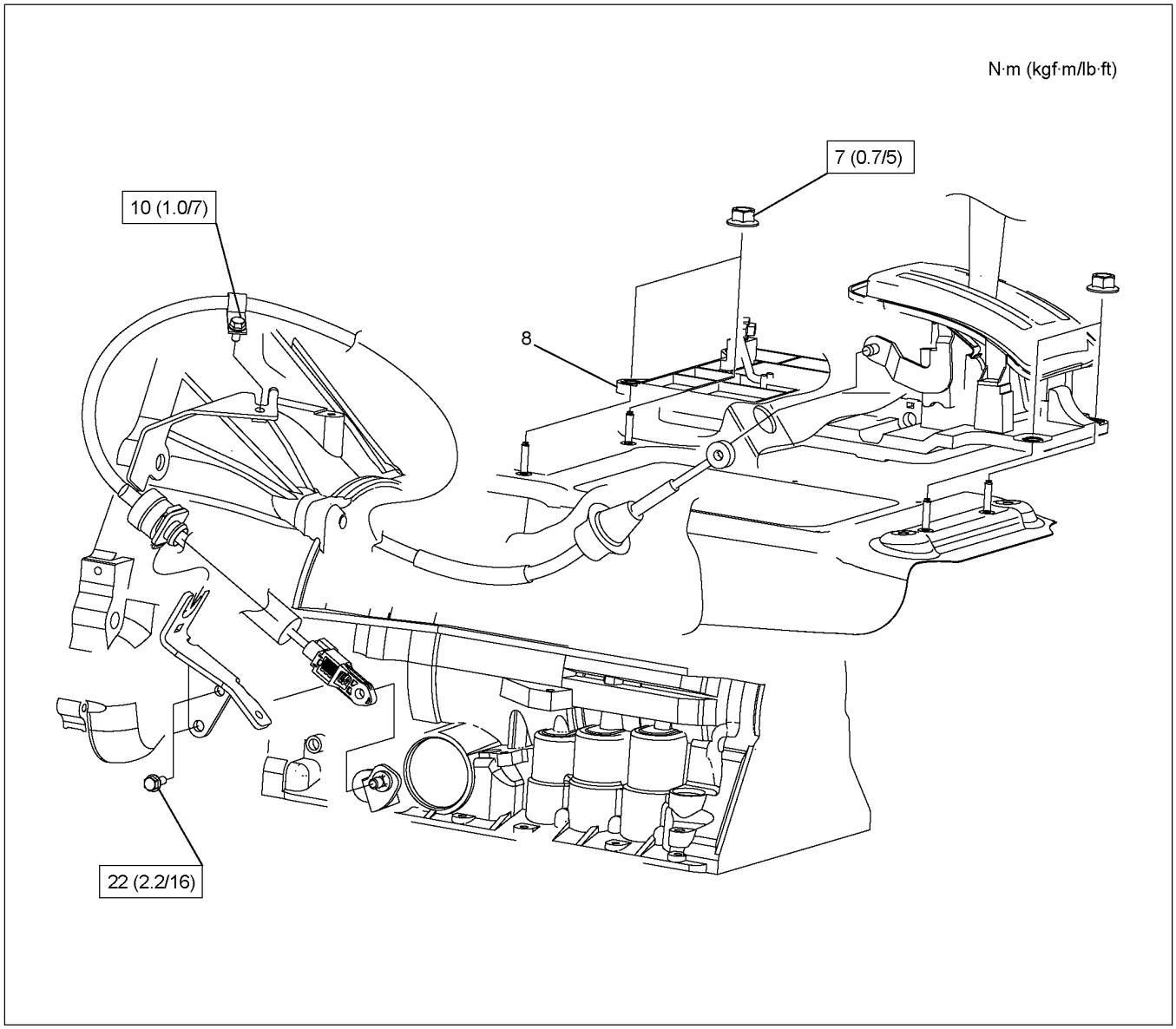
Torque Specifications



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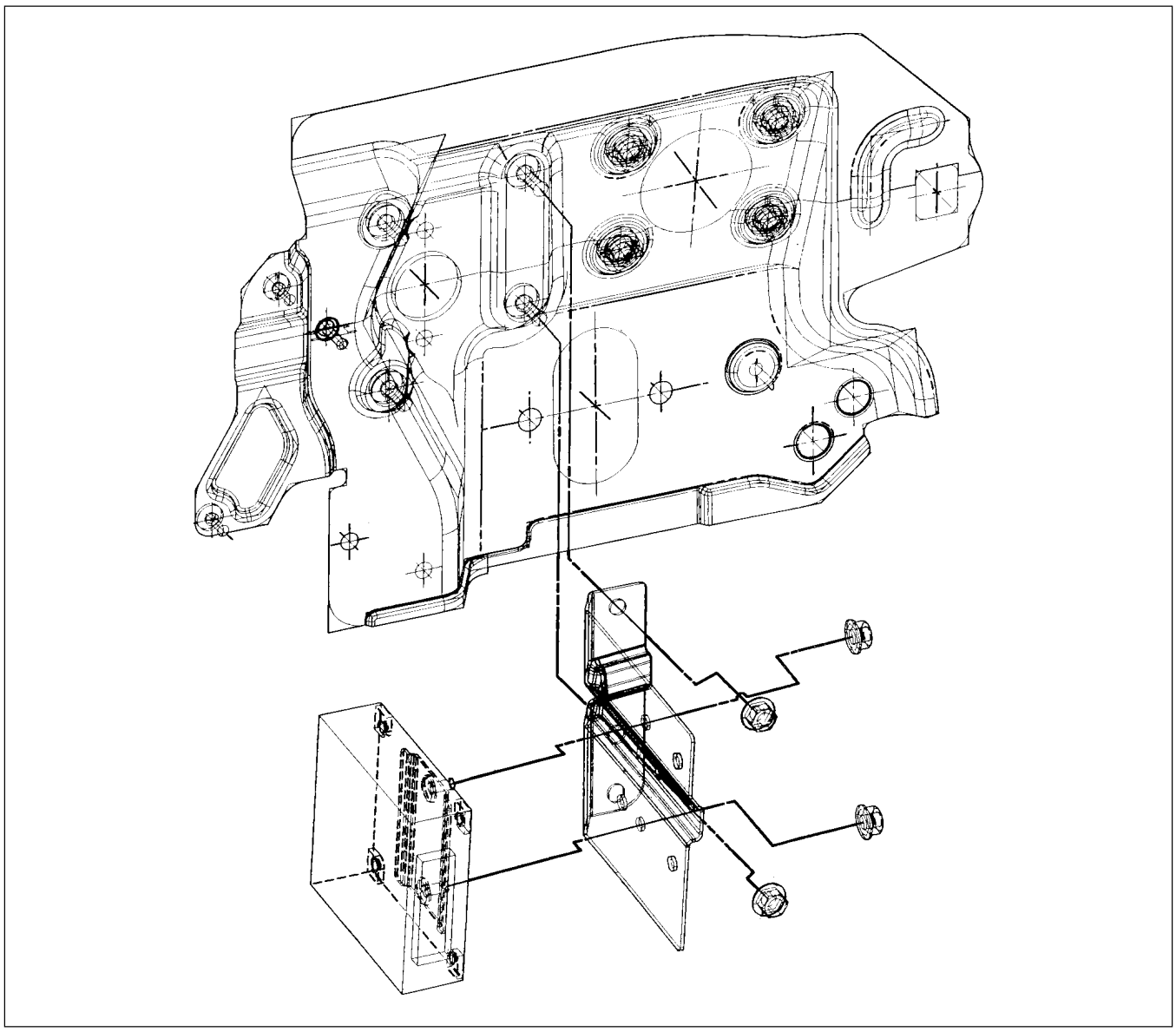
Transmission Control Module (TCM)



RTW37ALF001801

Removal

Preparation:

Disconnect negative (–) battery cable.

1. Disconnect the TCM harness connectors.
2. Remove fixing nuts (2 pieces) and TCM with bracket from the car.

NOTE: The TCM is fitted under instrument panel of the driver's compartment by means of two stud bolts.

3. Remove fixing nuts (2 pieces) and remove TCM from bracket.

Installation

To install, follow the removal steps in reverse order.

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Shift Solenoid and Lock-Up Solenoid

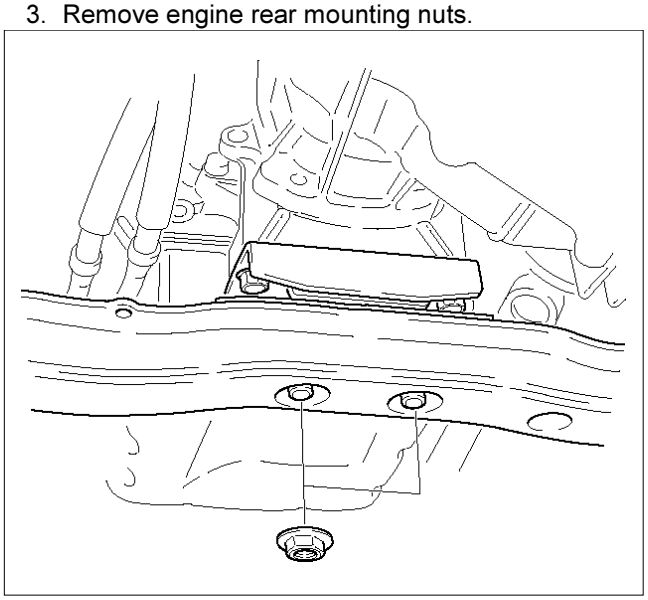
Removal

Preparation:

- Disconnect negative (–) battery cable.
- Drain the fluid.

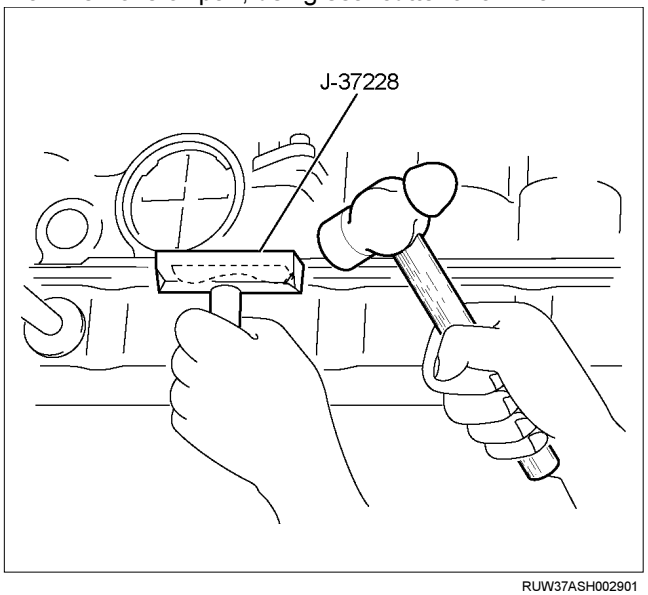
Refer to *ATF REPLACEMENT* in this section.

1. Remove oil lever gage and oil filler tube.
2. Support transfer case (4×4) or rear cover (4×2) with a transmission jack.
3. Remove engine rear mounting nuts.



F07RW008

4. Remove fule pipe heat protector on tansmission corssmenber.
5. Remove fuel pipe from the crossmenber.
6. Remove transmission crossmenber.
7. Remove the nineteen bolts.
8. Remove oil pan, using seal cutter J–37228.



RUW37ASH002901

NOTE: Do not turn over the transmission as this will contaminate the valve body with foreign materials in the bottom of the oil pan.

Remove oil pan by lifting the transmission case.

Oil pan seal cutter: J–37228

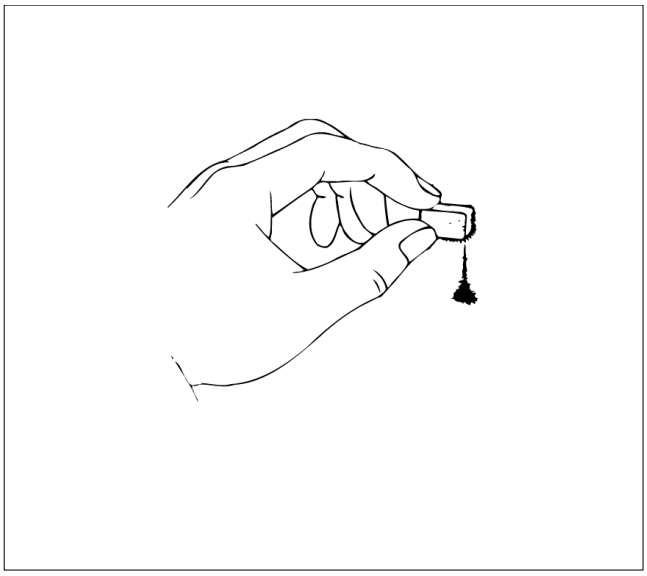
Examine particles in oil pan

Remove the magnet and use it to collect any steel chips.

Look carefully at the chips and particles in the oil pan and on the magnet to anticipate what type of wear you will find in the transmission:

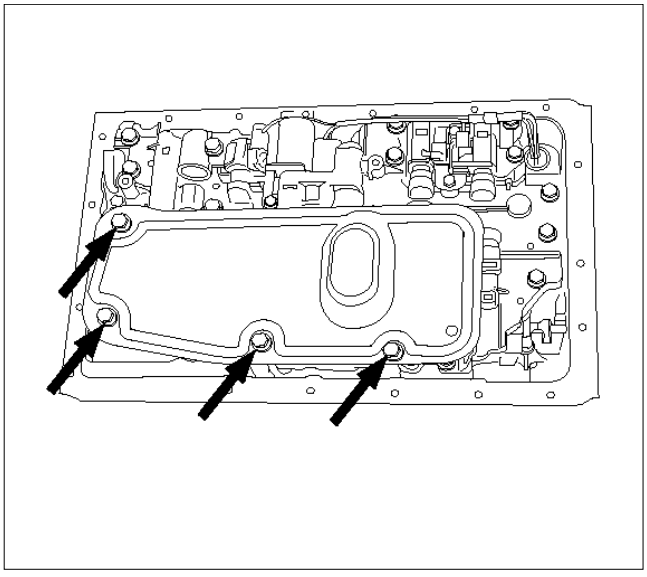
Steel (magnetic) .....bearing, gear and clutch plate wear

Brass (non-magnetic).....bushing wear



240RY00008

9. Remove the oil strainer assembly.



244RY00003

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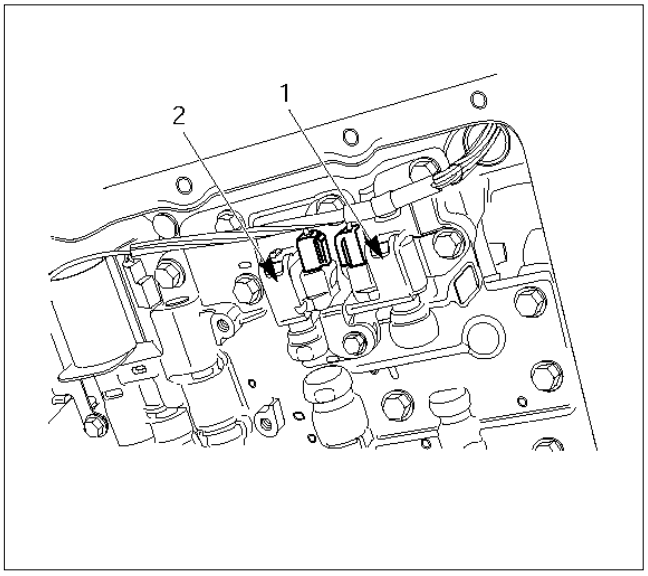
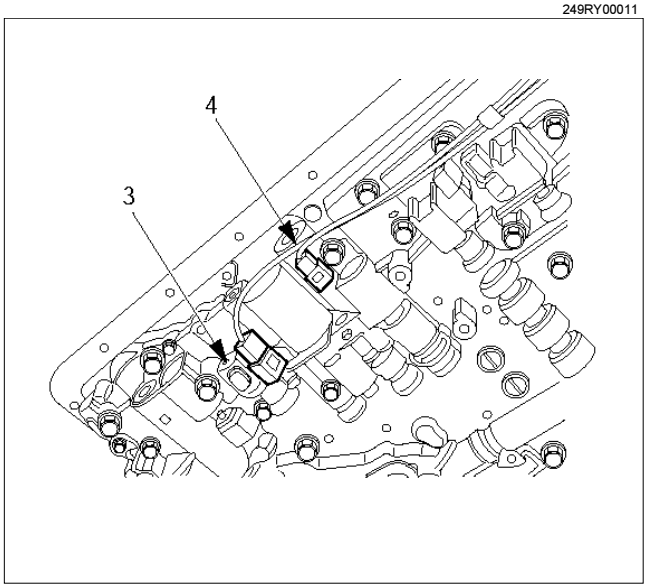
10. Disconnect the solenoid wiring connectors from the shift solenoid S1(1), S2(2), lock-up solenoid(3) and pressure control solenoid(4).



249RY00011



249RY00012

11. Remove each retaining bolts and solenoids. (Except pressure control solenoid:)

    Pressure control solenoid cannot be removed.

Installation

To install, follow the removal steps in reverse order noting the following point;

Refer to the section *Reassembly of Major Components(2)* and *Transmission Removal and Installation*.

Torque:

Solenoid S1, S2 bolt – 7 N·m (61 lb in)

Lock-up solenoid bolt – 10 N·m (87 lb in)

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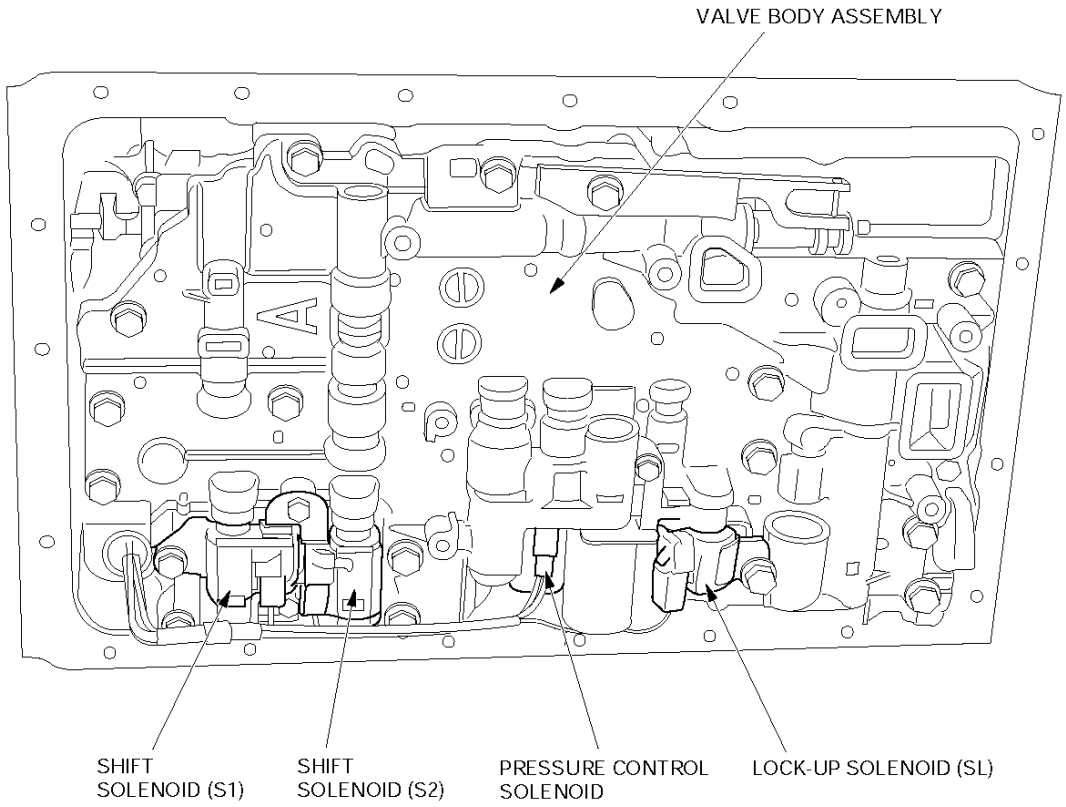
Valve Body Assembly and Pressure Control Solenoid



244RY00009

Removal

Preparation:

- Disconnect negative (–) battery cable.
- Drain the fluid.
  Refer to *ATF REPLACEMENT* in this section.

1. Remove the nineteen bolts and oil pan.

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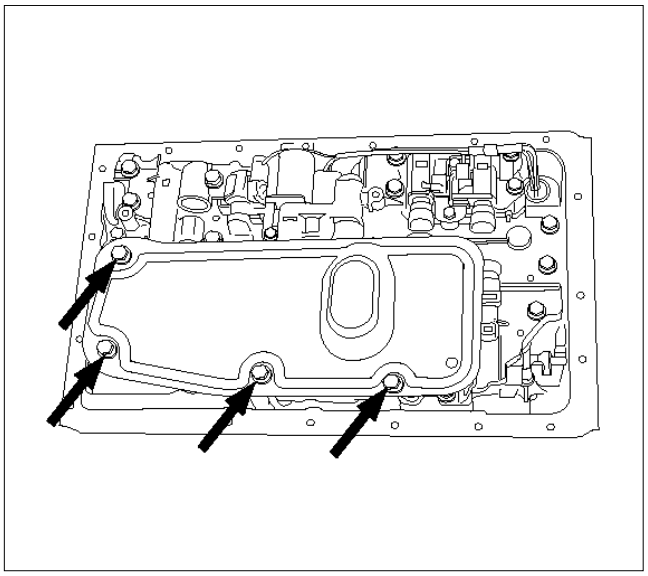
2. Remove the oil strainer assembly.



244RY00003

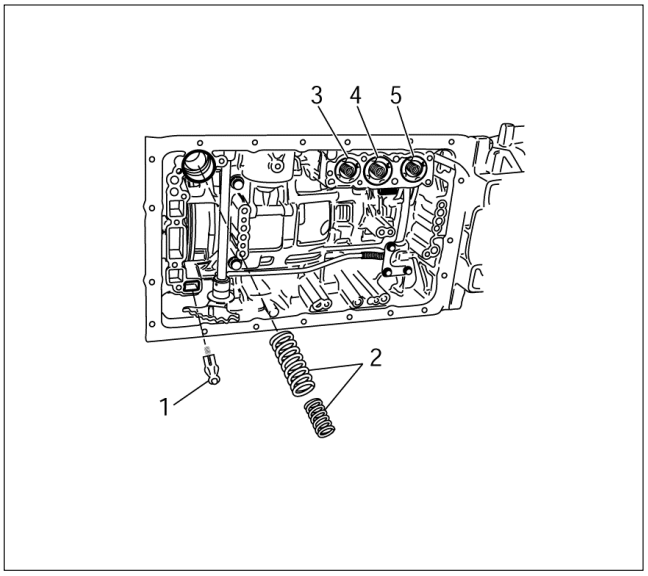
3. Disconnect the solenoid wiring connectors from the solenoids.
4. Remove the twenty bolts from the valve body.
5. Remove the valve body assembly and pressure control solenoid.
   - After removing valve body assembly from the transmission case, loosen the solenoid clamp bolt and remove the pressure control solenoid from the upper valve body assembly.

     Also disconnect the harness connector from the pressure control solenoid.

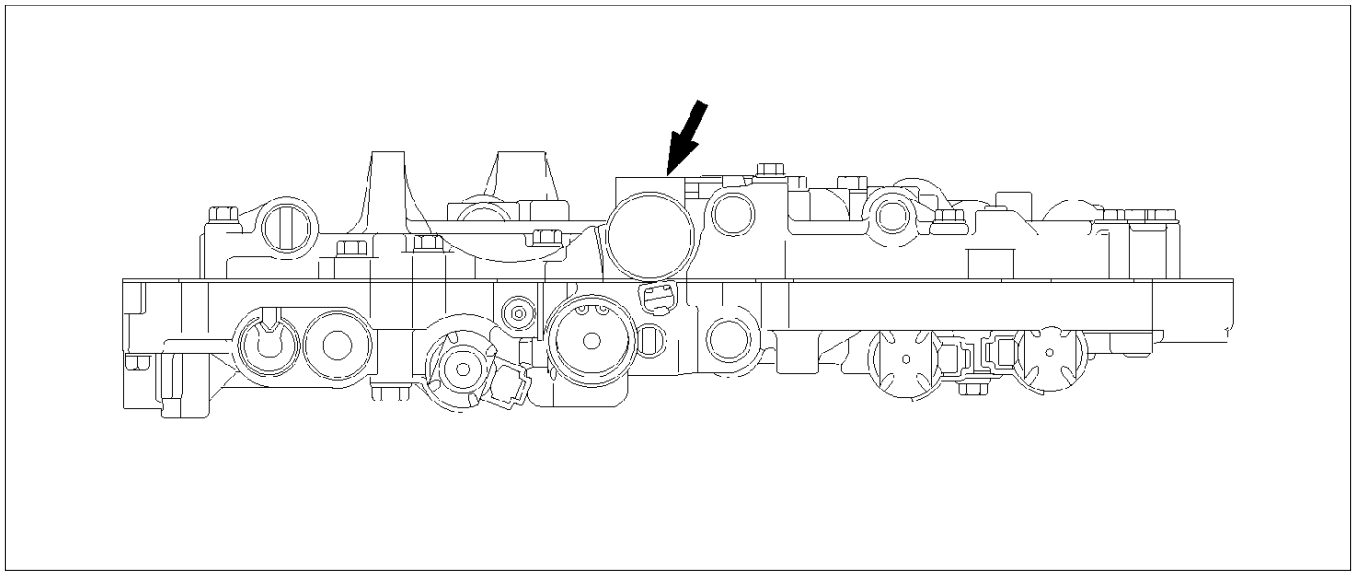
NOTE:

- Two or more persons are required for removal and installation of the valve body assembly and pressure control solenoid.
- The check valve assembly (1) and the C0 accumulator piston springs (2) will fall from the transmission case during removal of valve body assembly.

  Protect these parts from damage. The B0 (3), C2 (4), and B2 (5) accumulator piston and springs may also fall free and must be protected.



244RY00018



244RY00006

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Installation

To install, follow the removal steps in reverse order noting the following point;

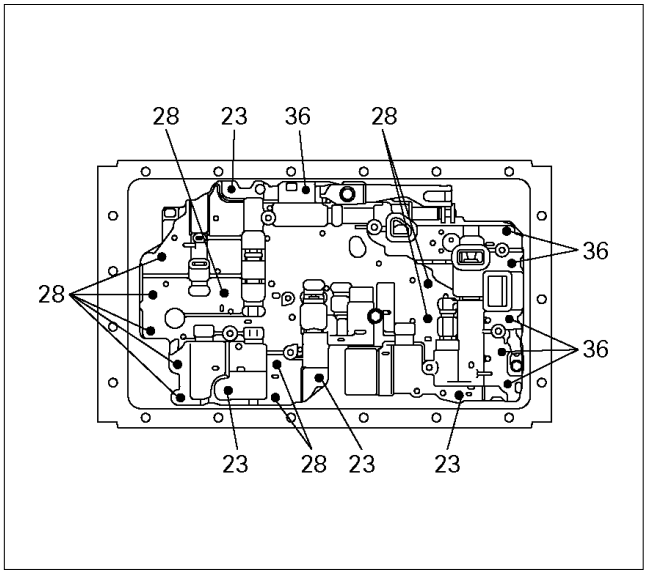
1. Reinstall the parts removed with the valve body assembly to their assigned positions in the transmission case (check valve assembly, C0 accumulator pistons, etc). Install the valve body assembly to the transmission case.
   Refer to *REASSEMBLY OF MAJOR COMPONENTS (2).*
2. Solenoid clamp bolt

   Torque : 7 N·m (61 lb in)

3. Valve body fixing bolts
   Each bolt location and length (mm) is indicated in the figure.

   Torque : 10 N·m (87 lb in)

NOTE: Tighten the bolts toward outside equally.



244R200078

4. Oil strainer fixing bolts

   Torque : 10 N·m (87 lb in)

5. Oil pan fixing bolts

   Torque : 8 N·m (69 lb in)

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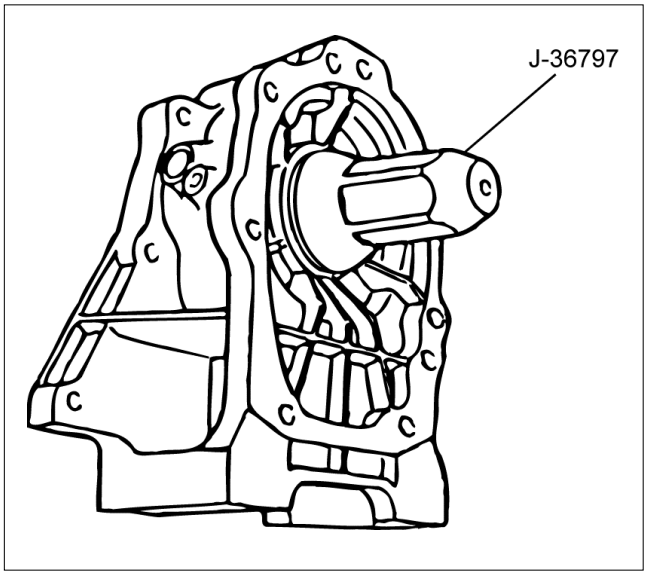
Rear Oil Seal (Adapter Housing, 4×4)

Removal

1. Remove the front and rear propeller shaft assembly from the transfer case.
2. Remove the transfer case assembly from the transmission case.
   Refer to Section 4 *DRIVELINE/AXLE*.
3. Using a screwdriver, remove the rear oil seal.

Installation

1. Apply ATF to a new rear oil seal lip.
2. Using oil seal installer, install the rear oil seal to the adapter housing.
   Oil seal installer : J–36797



RUW37ASH002401

3. Install the transfer case assembly.
   Refer to section 4 DRIVE/AXLE.
4. Install the front and rear propeller shaft assembly.

Torque (Propeller shaft flange bolt) : 63 N·m (46 lb ft)

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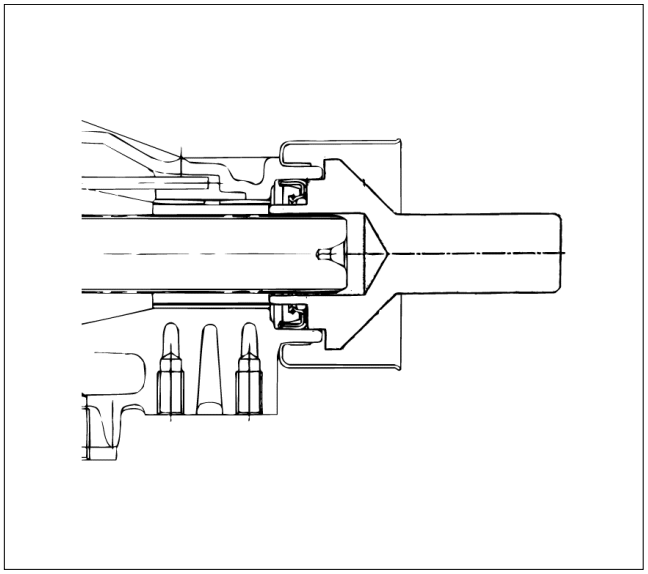
Rear Oil Seal (Extension Housing, 4×2)

Removal

1. Remove the rear propeller shaft assembly.
2. Using a screwdriver, remove the rear oil seal.

Installation

1. Apply ATF to a new rear oil seal lip.
2. Using oil seal installer, install the rear oil seal to the extension housing.
   Oil seal installer : J–46197



249L100005

3. Install the rear propeller shaft.

Torque (Flange bolt) : 63 N·m (46 lb ft)

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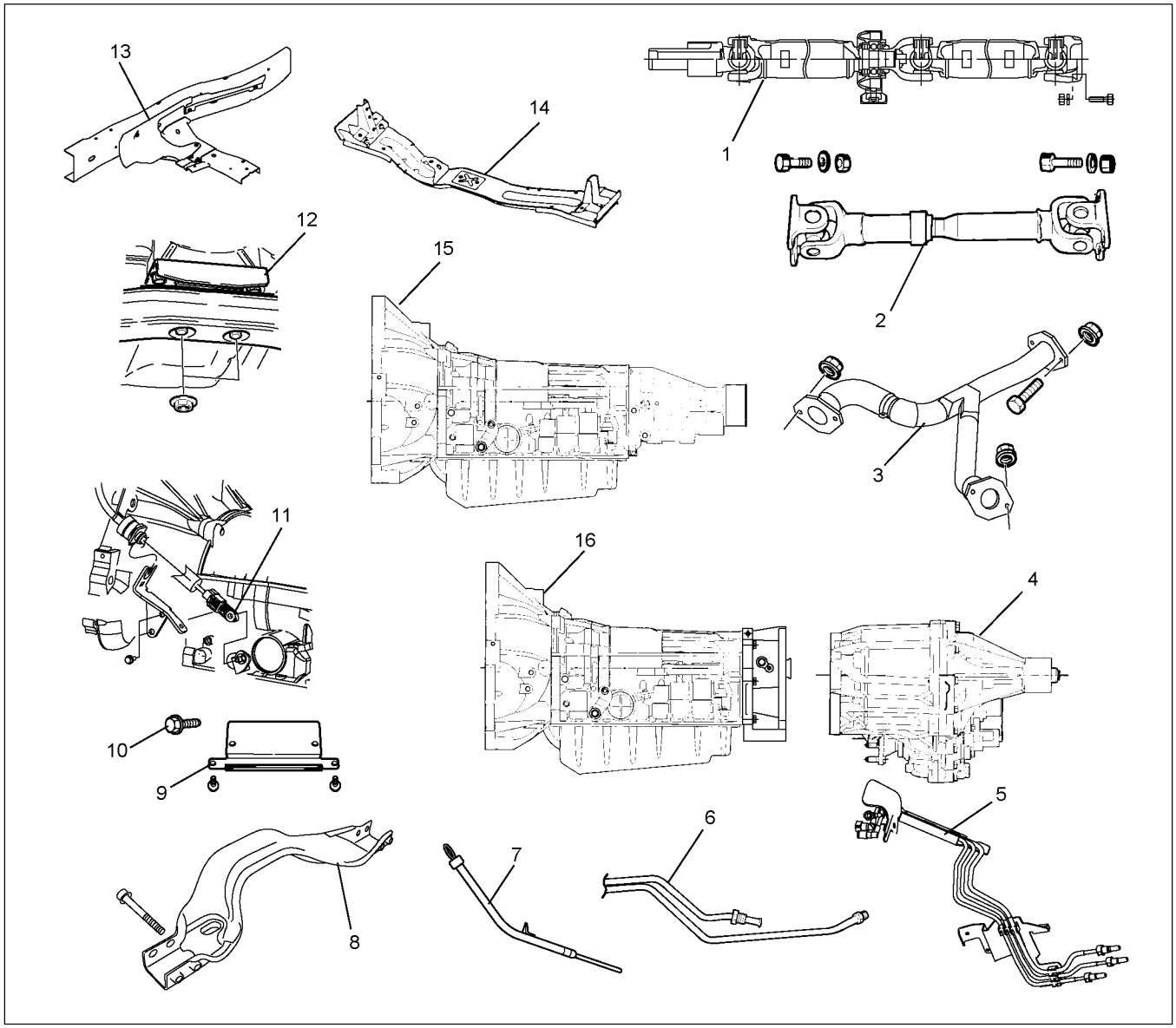
Transmission Assembly

Transmission and Associated Parts



Legend

(1) Rear Propeller Shaft
(2) Front Propeller Shaft (4WD only)
(3) Middle Exhaust Pipe
(4) Transfer Case Assembly (4WD only)
(5) Fuel Pipe Clip and Bracket
(6) ATF Pipe and Clip
(7) Oil Level Gauge and Guide Tube
(8) Suspension Crossmember
(9) Under Cover
(10) Flex Plate Torque Converter bolt
(11) Shift Cable
(12) Rear Mount Rubber
(13) Heat Protector
(14) Transmission Crossmember
(15) Transmission Assembly (2WD)
(16) Transmission Assembly (4WD)

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Removal

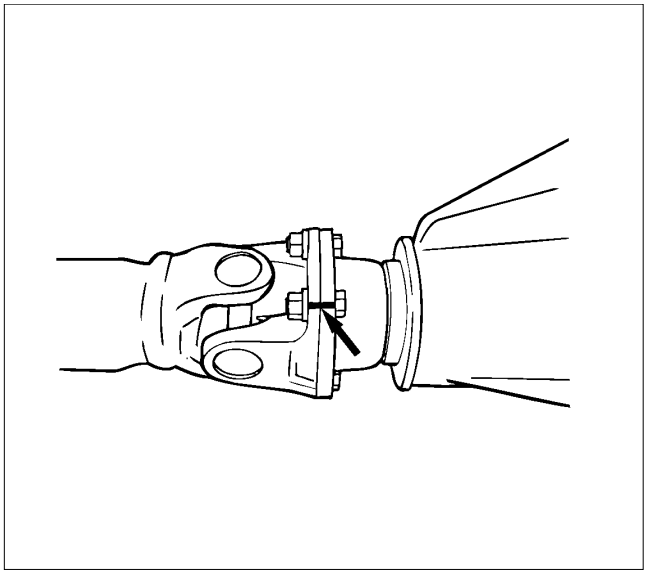
NOTE: Before removing transmission and transfer assembly from vehicle, change the transfer mode to 2WD using the 4WD push button switch on dash panel.

1. Disconnect battery ground cable.
2. Raise and support vehicle with suitable stands.
3. Remove front propeller shaft.(4WD only)

NOTE: Apply alignment marks on the flange at both front and rear sides.

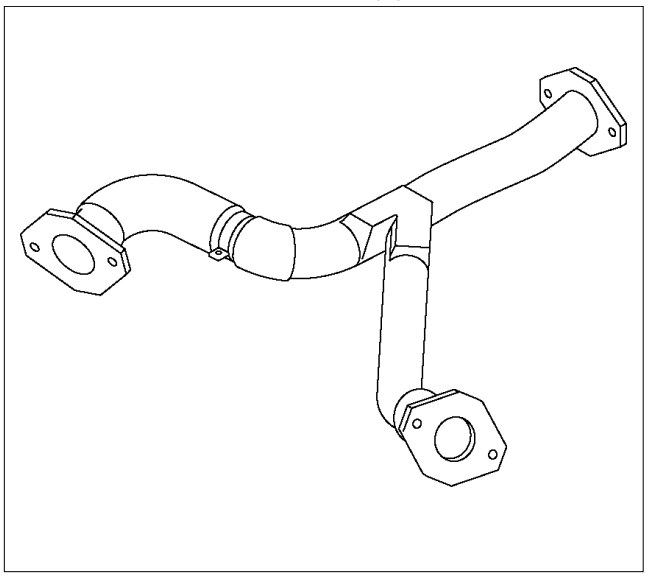
4. Remove rear propeller shaft.

NOTE: Apply alignment marks on the flange at the differential side.



401RS023

5. Remove the middle exhaust pipe.



RTW37ASH0001

6. Disconnect the transfer harness connectors and the clips.(4WD only)
   - Speed sensor
   - 2W-4W shift actuator

NOTE: Avoid turning the vehicle ignition switch to the ON position when the 2WD-4WD connector is removed (battery connected).
If the ignition switch must be turned to the ON position, the controller must first be removed (memory must be cleared because the CHECK 4WD INDICATOR will light).

7. Support transfer case with a transmission jack.(4WD only)
8. Remove the transfer case assembly from the transmission.(4WD only)
9. Disconnect the shift cable.
10. Remove the fuel pipe clips with the fuel pipes from the brackets and put aside it. Remove the fuel pipe brakets from the transmission.

P1010010

11. Discinnect the transmission harness connectors and clips.
12. Remove the oil level gauge and the guide tube.
13. Remove the suspension crossmember.

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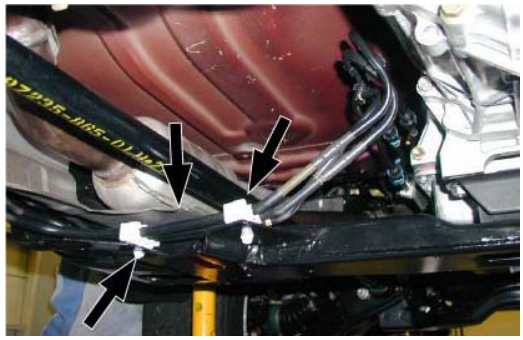
14. Remove the under covers.

P1010012

15. Remove the flex plate torque converter bolts by turning the crank shaft.

P1010005

16. Remove the heat protector and the fuel pipe clips with fuel pipes on the transmission crossmember.



P1010005B

17. Disconnect the ATF pipes.

18. Remove the ATF pipe clips.

P1010024

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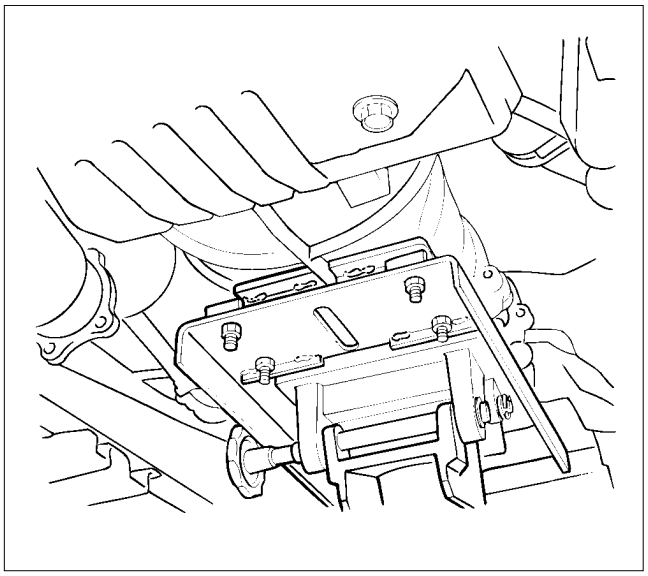
19.Support the transmission with a transmission jack.



220RS0001

20.Remove the transmission crossmember.

- Remove engine rear mount nuts fixing on transmission crossmember.

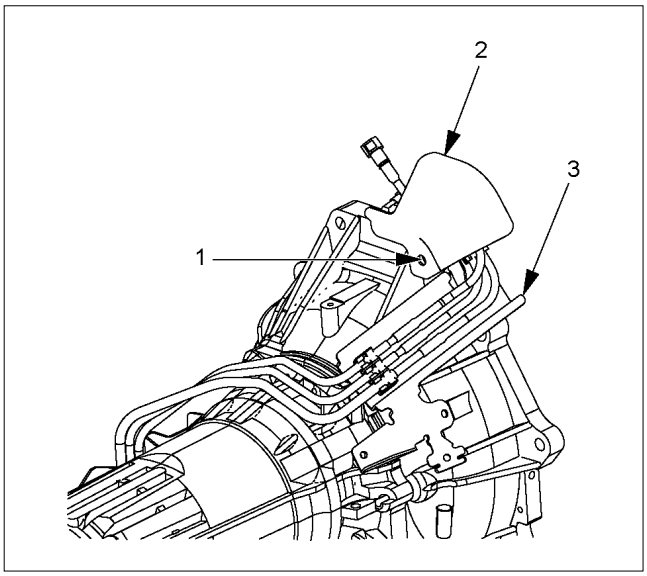
P1010018

- Remove the transmission crossmember by removing four fixing bolts.
- If necessary, remove the rear mount rubber from the transmission.

21. Disconnect the air bleezer hose at the transmission.

22.Remove the protector and fuel pipe bracket.

- Loosen the nut (1) and remove the protector (2).
- Remove the bracket with the fuel pipes (3) and put aside it.



RTW37ASH001201

23.Remove the transmission assembly.

- Remove transmission retaining nuts and bolts.
- Remove transmission assembly from the vehicle.

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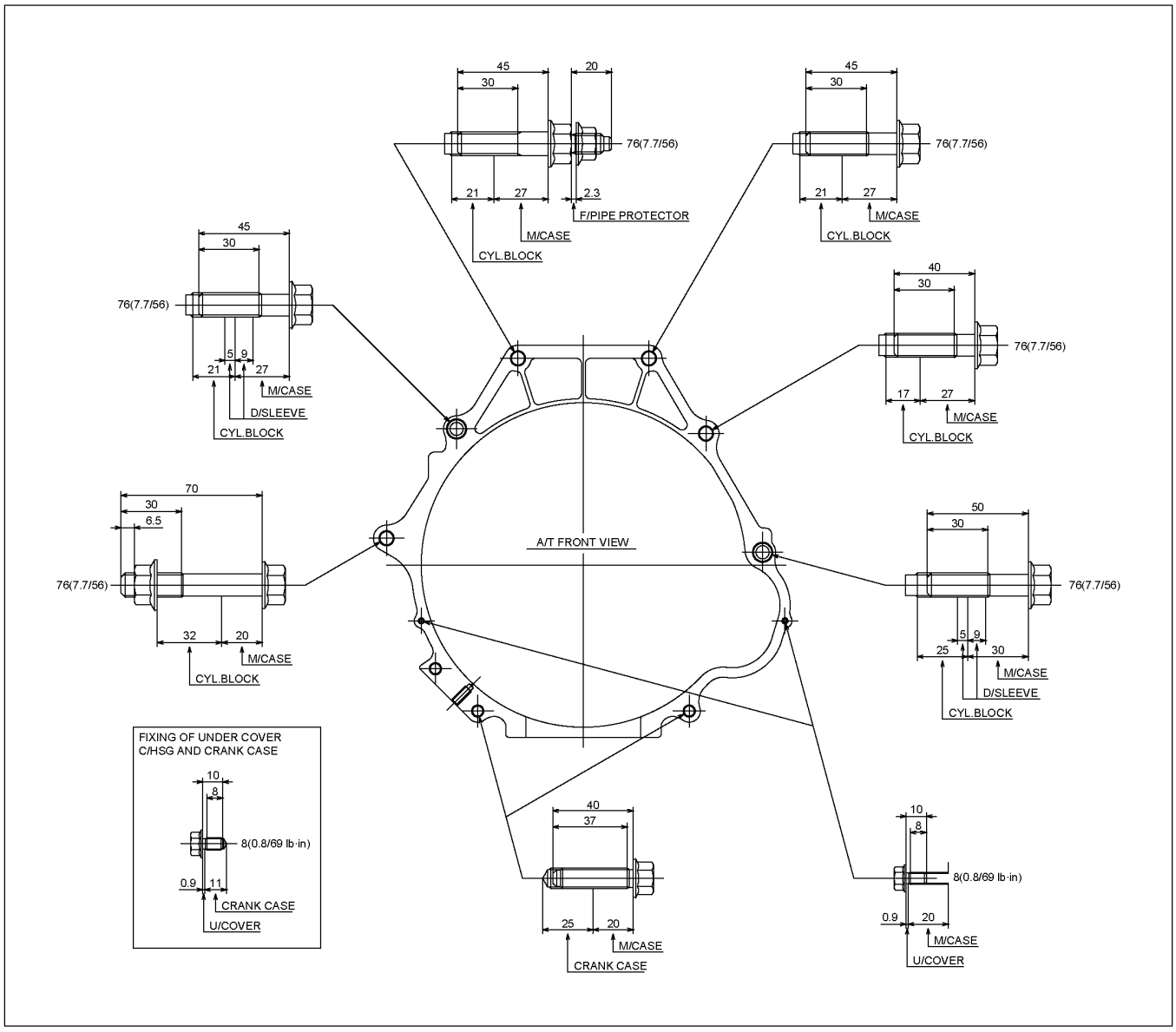
Installation

1. Install the rear mounting rubber on the transmission.

   Torque: 50 N·m (5.1 kg·m/36 lb ft)

2. Attach the transmission to the engine.
   - Slowly raise transmission jack until front of the transmission is aligned with rear of the engine.
   - Attach the transmission to the engine.
   - Tighten engine transmission bolts as shown in the figure.



RTW37ALF000301

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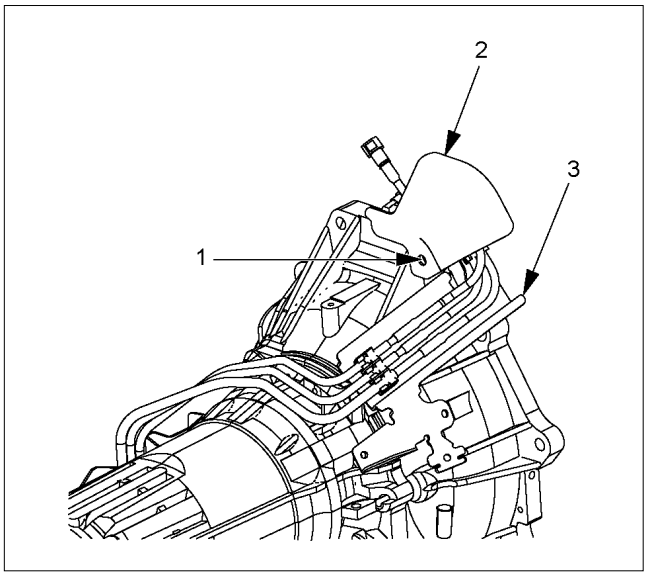
3. Install the protector and fuel pipe bracket.
   - Install the bracket with the fuel pipes (3) to the transmission.
   - Install the protector (2) and tighten nuts (1).



RTW37ASH001201

4. Connect the air bleezer hose on the transmission.
5. Install the transmission crossmember.

Torque: 67 N·m (6.8 kg·m/49 lb ft)

6. Install the heat protector and the fuel pipe clips with fuel pipes on the transmission crossmember.

P1010005B

7. Install rear mount nuts.

Torque: 50 N·m (5.3 kg·m/37 lb ft)

8. Remove a transmission jack.
9. Install flex plate torque converter bolts.
   - Align the flex plate torque converter bolt boss with flex plate hole by turning the torque converter.
   - Install flex plate torque converter bolts (6 pieces) by turning the crankshaft.

Torque: 54 N·m (54 kg·m/40 lb ft)

NOTE: Do not reuse the flex plate torque converter bolt.

P1010005

10. Install the under covers to the transmission and engine.

Torque: 8 N·m (0.8 kg·m/69 lb in)

P1010012

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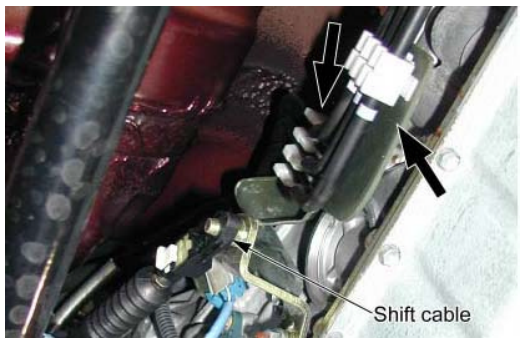
11. Install the suspension crossmember.

    Torque: 65 N·m (6.6 kg·m/48 lb ft)

12. Install filler tube and insert oil level gage.

    Torque: 22 N·m (2.2 kg·m/16 lb ft)

13. Install select cable by connecting inner cable to select lever and installing outer cable with bracket.
14. Install the fuel pipe brackets to the transmission.
    Install the fuel pipe clips with the pipes to the bracket.

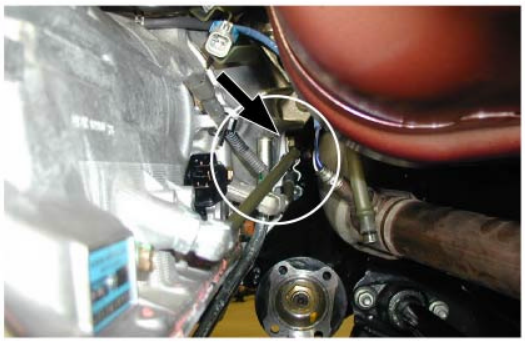


P1010010

15. Connect the transmission harness connectors and clips.
16. Connect transmission oil cooler pipes to A/T.

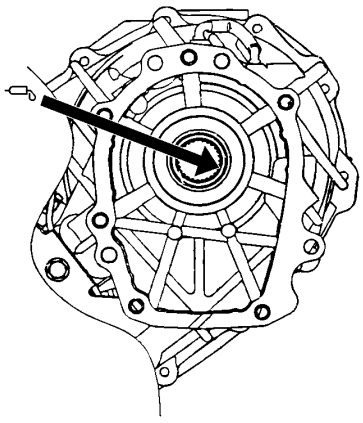
    Torque: 44 N·m (4.5 kg·m/33 lb ft)

17. Install oil cooler pipe clamp and bracket to the converter housing.
18. Tighten oil cooler pipe clamp bolt at the engine mount side.



P1010024

19. Install the transfer case assembly.(4WD only)
    - Apply a thin coat of molybdenum disulfide grease to the input shaft spline as shown in the figure.



260R300001

    - Install the transfer case assembly.

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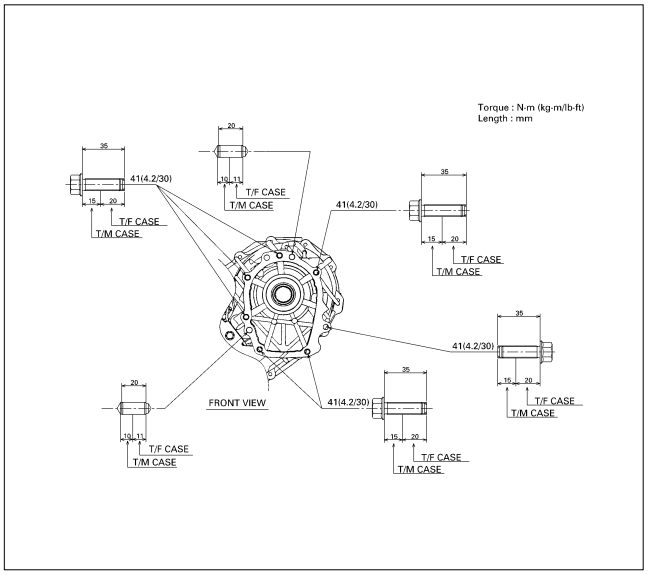
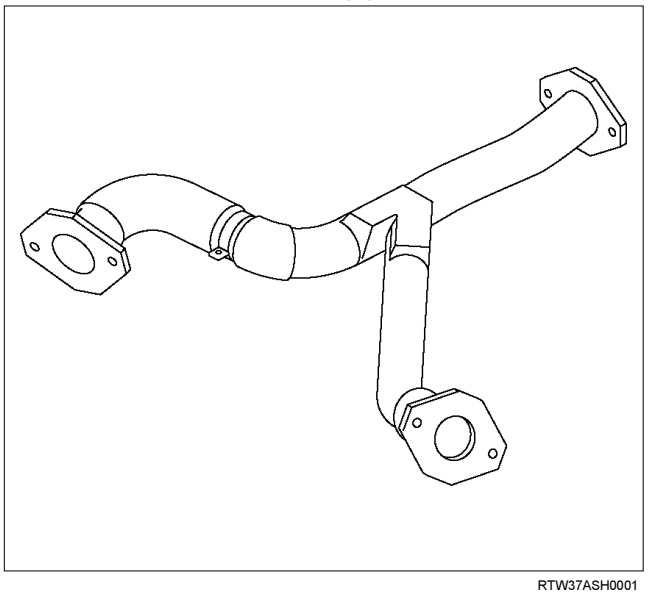
- Tighten transmission transfer bolts as shown in the figure.(4WD only)



261R300002

20. Connect transfer harness connectors and clips.(4WD only)
    - Speed sensor
    - 2W-4W shift actuator
21. Install the middle exhaust pipe.



RTW37ASH0001

22. Install the rear propeller shaft.

    Torque: 63 N·m (6.4 kg·m/46 lb ft)

NOTE: Align alignment marks on the flange.

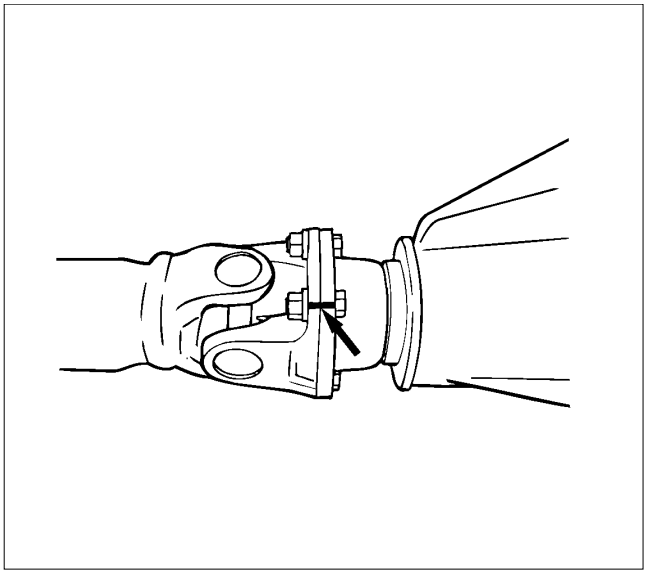
23. Install the center bearing on crossmember.

    Torque: 69 N·m (7.0 kg·m/51 lb ft)

24. Install the front propeller shaft.(4WD only)

    Torque: 63 N·m (6.4 kg·m/46 lb ft)

NOTE: Align alignment marks on the flange.



401RS023

25. Connect battery ground cable.

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Major Components

Disassembly, inspection and reassembly of each component group is indicated in the following chapter. Before reassembly, make sure, again, that all component groups are assembled correctly.

If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

General Assembly Notes:

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

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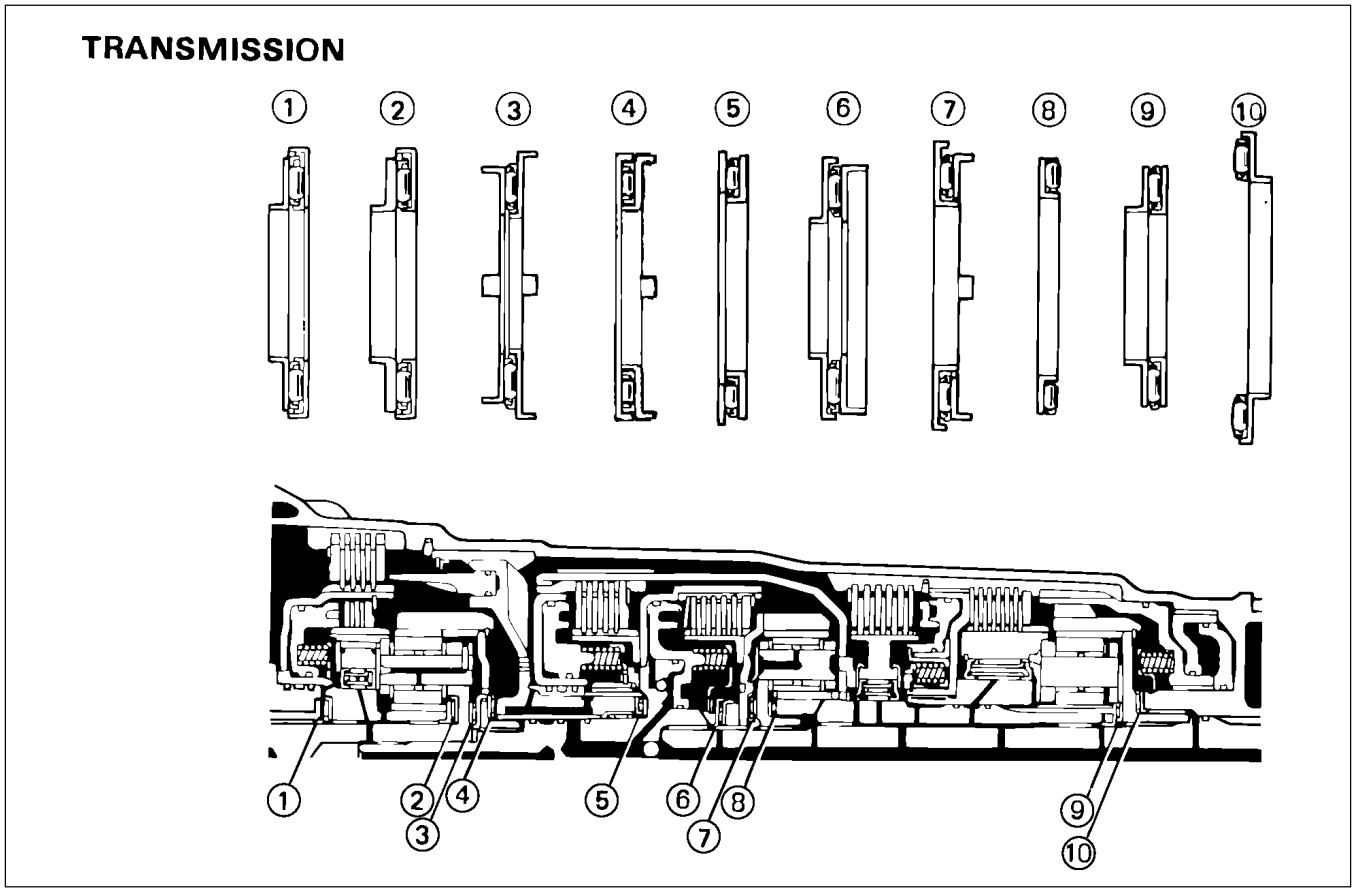
Bearing and Race



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Mark	Front Race Diameter Inside/Outside	Thrust Bearing Diameter Inside/Outside	Rear Race Diameter Inside/Outside
1	28.6 (1.13) / 46.5 (1.83)	28.9 (1.14) / 50.2 (1.98)	—
2	28.45 (1.12) / 47.23 (1.86)	29.1 (1.15) / 50.2 (1.98)	—
3	24.7 (0.97) / 41.8 (1.65)	24.2 (0.95) / 47.8 (1.88)	—
4	37.2 (1.46) / 58.8 (2.31)	33.7 (1.33) / 50.1 (1.97)	—
5	36.7 (1.44) / 50.85 (2.00)	33.7 (1.33) / 47.8 (1.88)	—
6	26.0 (1.02) / 48.9 (1.93)	26.0 (1.02) / 46.7 (1.84)	26.8 (1.06) / 47.0 (1.85)
7	—	35.15 (1.38) / 53.65 (2.11)	34.3 (1.35) / 47.8 (1.88)
8	33.7 (1.33) / 47.6 (1.87)	35.6 (1.40) / 47.7 (1.88)	—
9	28.5 (1.12) / 44.2 (1.74)	27.7 (1.09) / 44.2 (1.74)	—
10	—	39.38 (1.55) / 58.15 (2.29)	—

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MEMO

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TRANSMISSION

UNIT REPAIR (AW30–40LE)

CONTENTS

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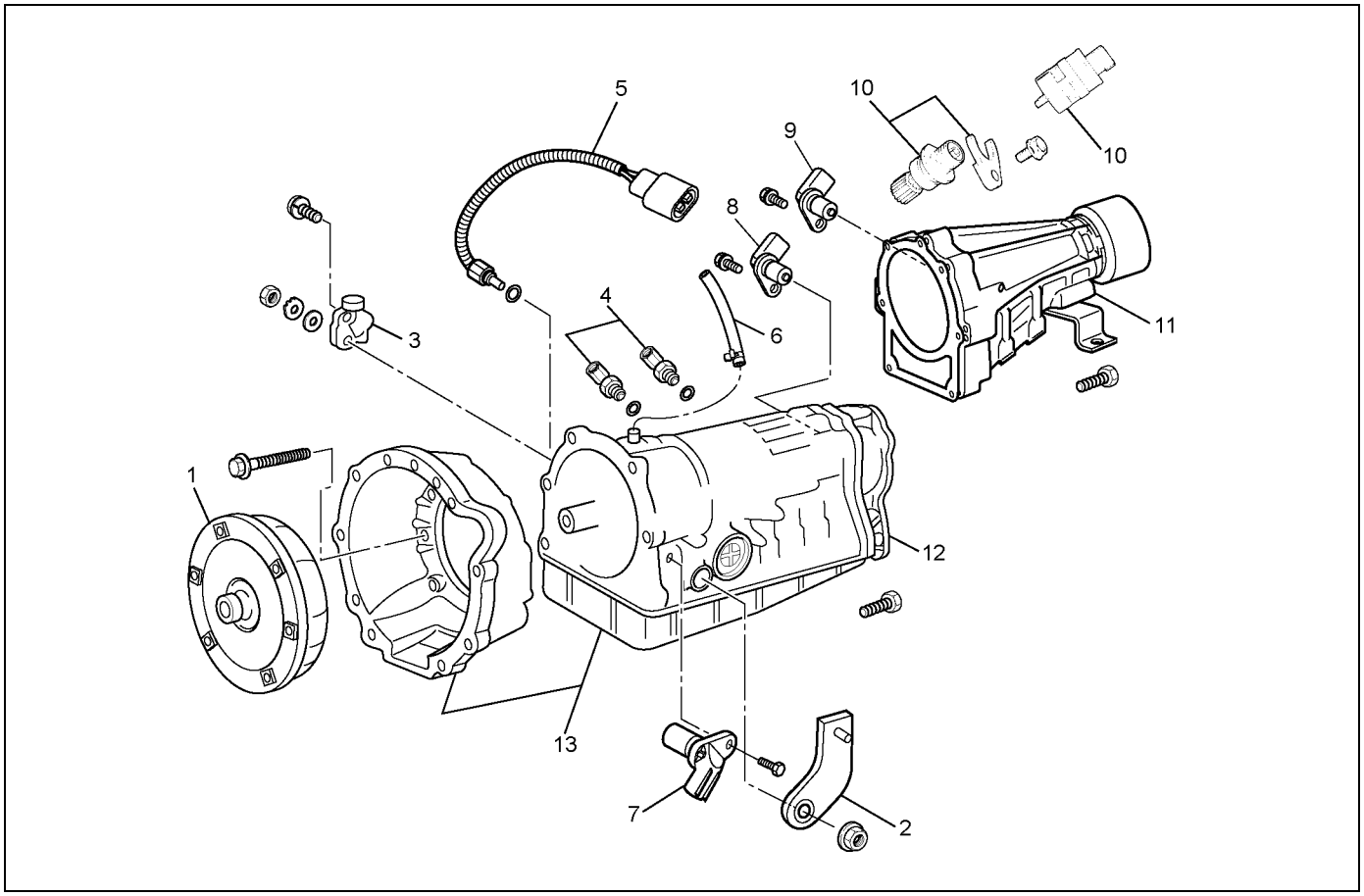
Major Components (1)

Major Components (1) and Associated parts



RTW37AMF000601

Legend

(1) Torque converter
(2) Select lever
(3) Neutral start switch (Mode switch)
(4) Elbow
(5) Oil temperature sensor
(6) Breather hose
(7) Input revolution sensor
(8) Output revolution sensor (4×4)
(9) Output revolution sensor (4×2)
(10) Speedometer sensor, speedometer driven gear and plate (4×2)
(11) Extension housing (4×2)
(12) Adapter housing (4×4)
(13) Transmission assembly

Disassembly steps

1. Remove the torque converter.
2. Remove the select lever.

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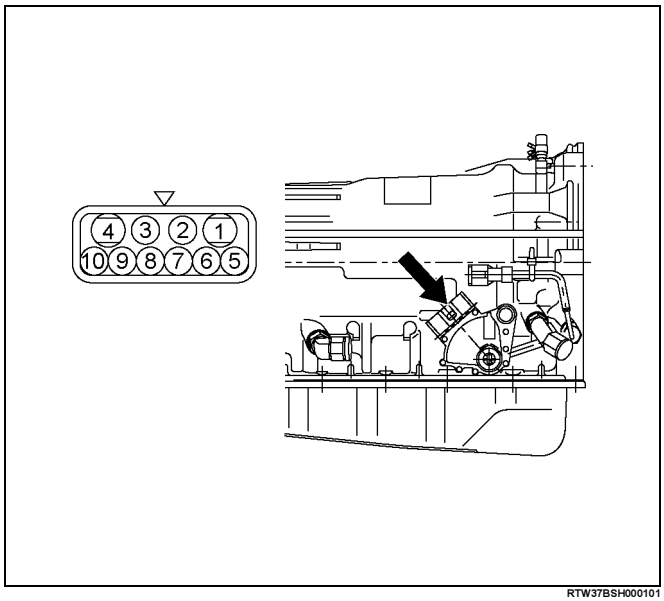
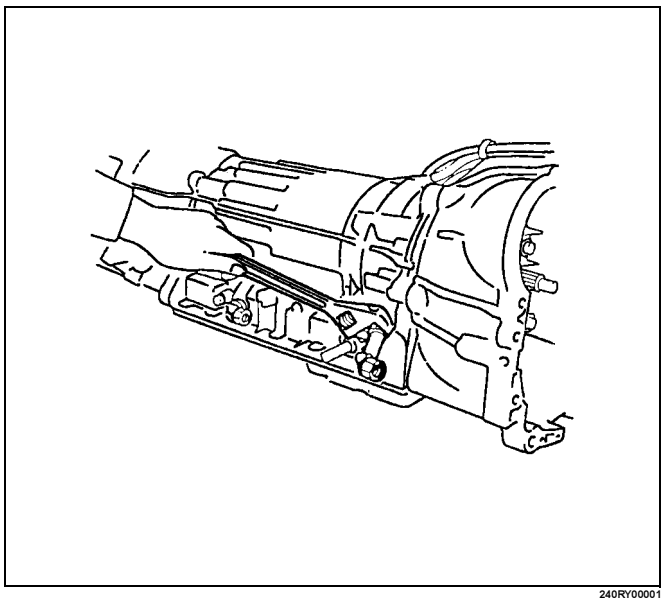
3. Remove the neutral start switch (Mode switch).
   - Unstake the lock washer.
   - Remove the nut and bolt, and then remove the neutral start switch.
   - Remove the lock washer.

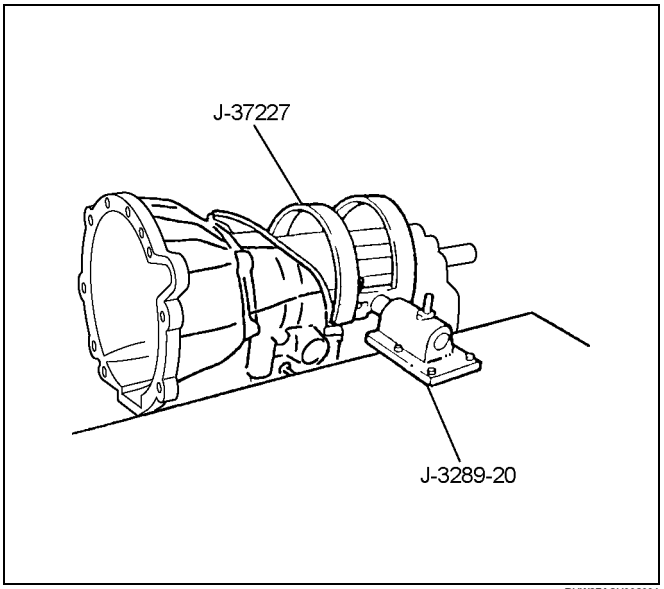


RTW37BSH000101

4. Remove the two elbows from transmission case.


240RY00001

5. Remove the oil temperature sensor.
6. Remove the breather hose.
7. Remove the Input revolution sensor.
8. Remove the output revolution sensor (4×4).
9. Remove the output revolution sensor (4×2).
10. Remove the speedometer sensor, speedometer driven gear and plate (4×2).
11. Remove the extension housing (4×2).
12. Remove the adapter housing (4×4).
13. Remove the transmission assembly.
    - Install special tool to the transmission unit.
      Holding fixture: J–37227
      Holding fixture base: J–3289–20



RUW37ASH003001

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Components (1)

Reassembly

1. Install a new gasket and the extension housing (4×2) to the transmission case.

Torque: 36N·m (27lbft)

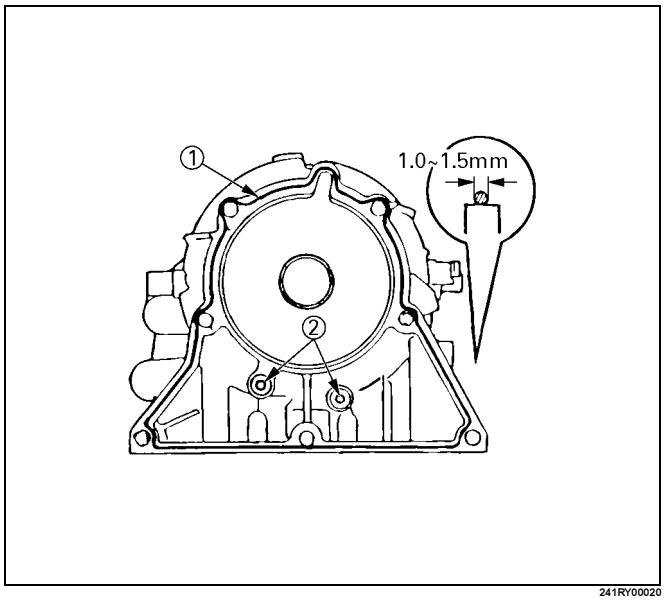
2. Install the speedometer driven gear, plate, and speedometer sensor (4×2).

Torque:

Plate bolt – 15 N·m (11 lbft)

Speedometer sensor – 25 N·m (18lbft)

3. Install the adapter housing (4×4).
   - Remove any gasket material on the contacting surfaces of the adapter housing and transmission case.



241RY00020

   - Apply liquid gasket (TB1281–B or its equivalent) (1) and install the apply gaskets (2) to the adapter housing as shown in the figure.
   - Install the adapter housing to the transmission case.

Torque: 34N·m (25lbft)

4. Install the neutral start switch.
   - Using the transmission select lever, fully turn the manual valve lever shaft back and return two notches.
     It is now in neutral.
   - Insert the neutral start switch onto the manual valve lever shaft and temporarily tighten the adjusting bolt.
   - Install the lock washer and nut.

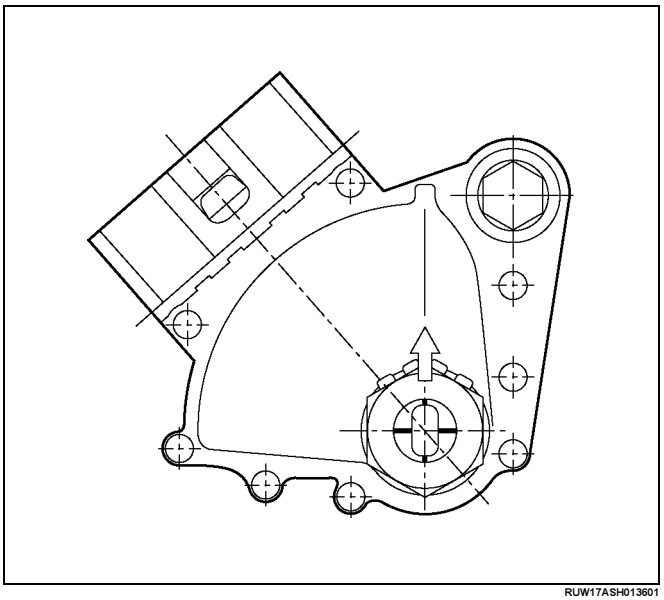
Torque: 7N·m (61lbin)

   - Align the neutral standard line and the switch groove and tighten the adjusting bolt.

Torque: 13N·m (113lbin)

   - Bend the tabs of the lock washer.

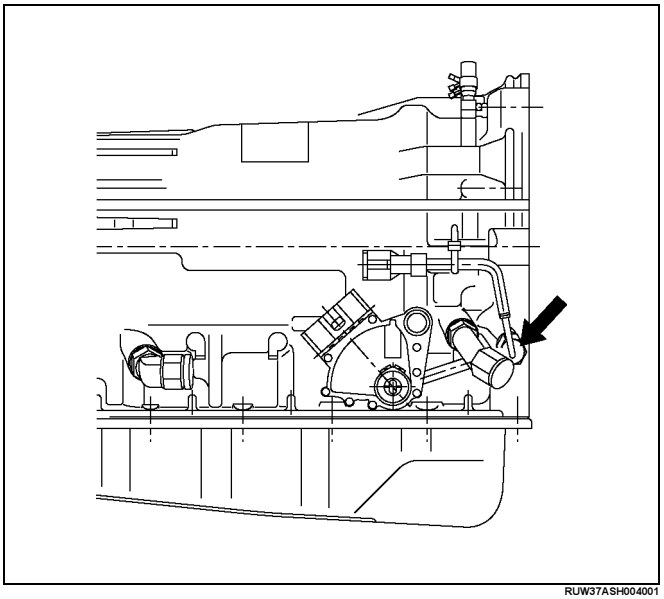
NOTE: Bend at least two of the lock washer tabs.



RUW17ASH013601

5. Install the oil temperature sensor to the transmission case.

Torque: 15N·m (11lbft)



RUW37ASH004001

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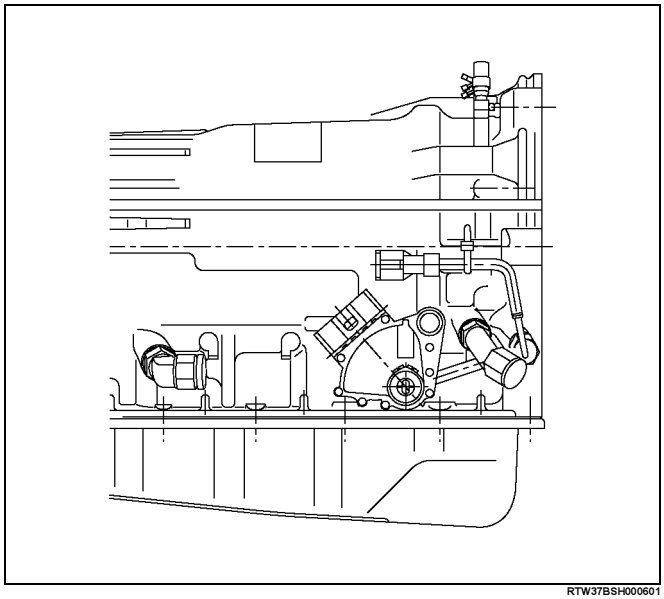
6. Install the elbow.
   - Coat new O-rings with ATF, install them to the two elbows.
   - Install the two elbows as shown in the figure.

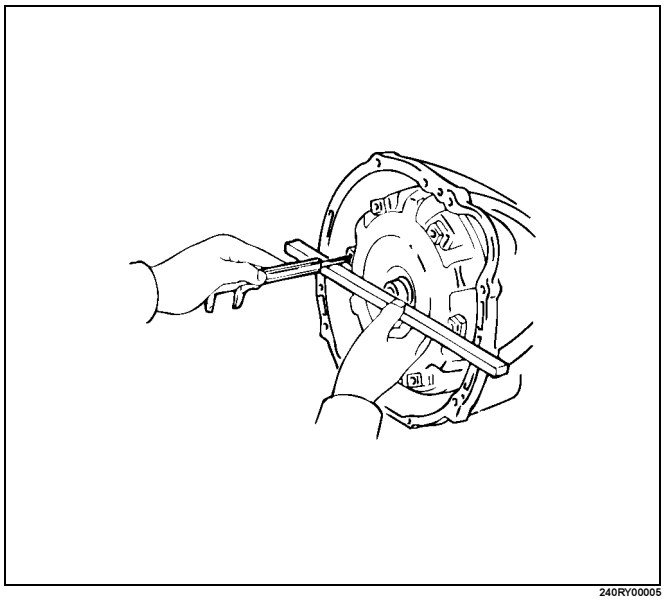
Torque: 29N·m (3.0kg·m/22lbft)



RTW37BSH000601

7. Install the select lever.
8. Install the output revolution sensor (4×2).
9. Install the output revolution sensor (4×4).
10. Install the input revolution sensor.
11. Install the breather hose.
12. Install the torque converter.
    Using calipers and a straightedge, measure the distance from the installed surface of the transmission housing to top of the torque converter nut.

Correct distance: 13.5mm (0.53in)



240RY00005

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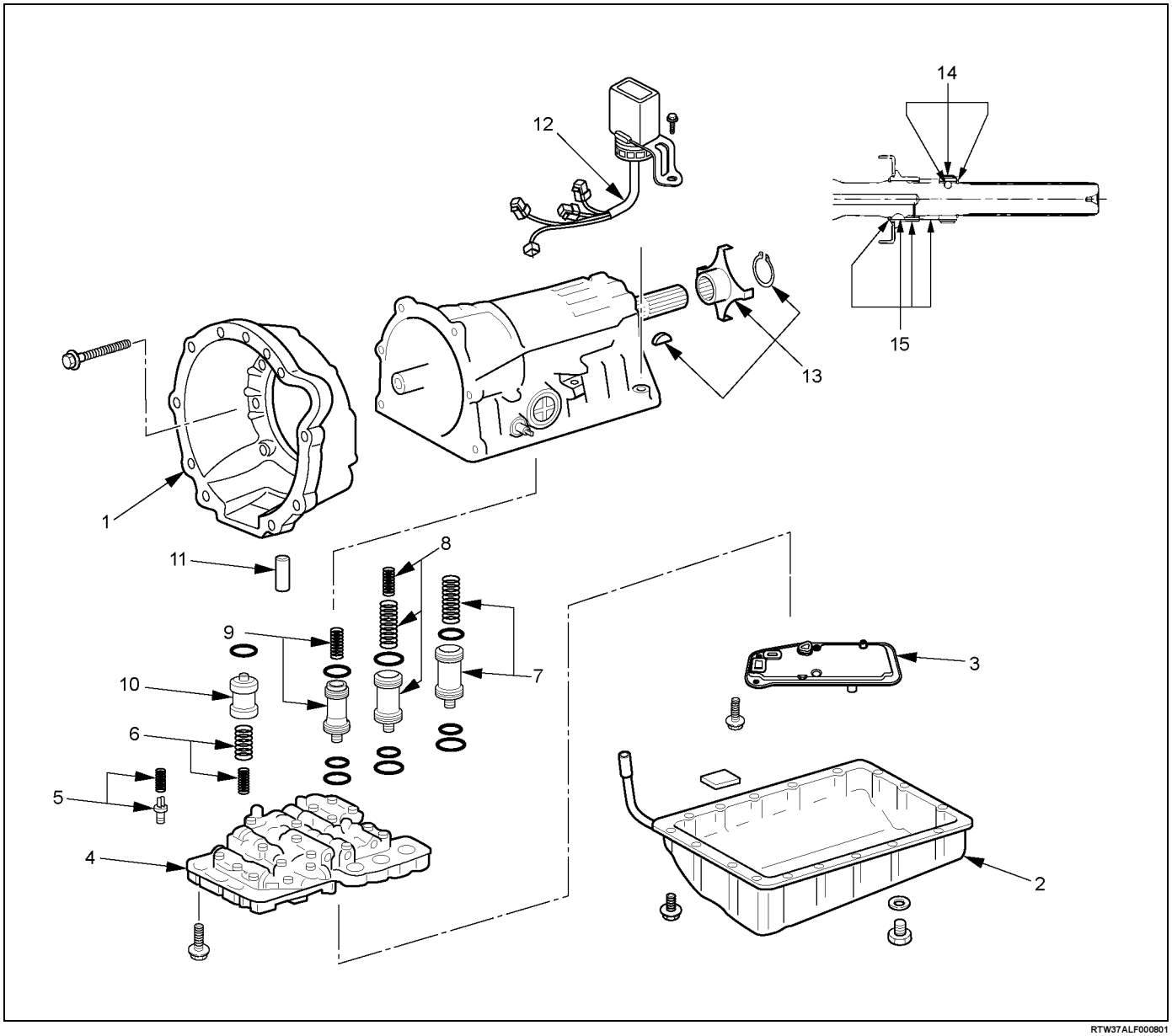
Major Components (2)

Major Componets (2) and Associated Parts



RTW37ALF000801

Legend

(1) Converter housing
(2) Oil pan
(3) Oil strainer assembly
(4) Valve body
(5) Check valve, spring
(6) Spring
(7) Accumulator piston (B–2)
(8) Accumulator piston (C–2)
(9) Accumulator piston (B–0)
(10) Accumulator piston (C–0)
(11) Second brake drum gasket
(12) Solenoid wiring
(13) Snap ring, rotor, key (4×4)
(14) Snap ring, speedometer sensor drive gear, ball (4×2)
(15) Spacer, rotor, key, snap ring (4×2)

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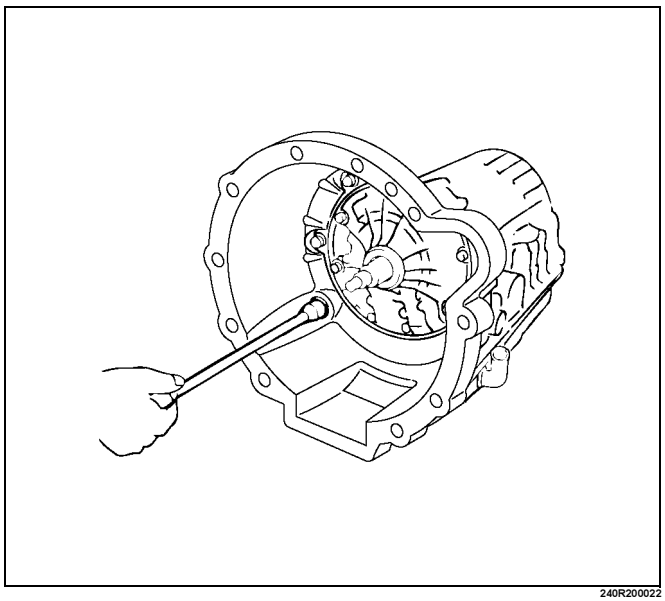
Disassembly

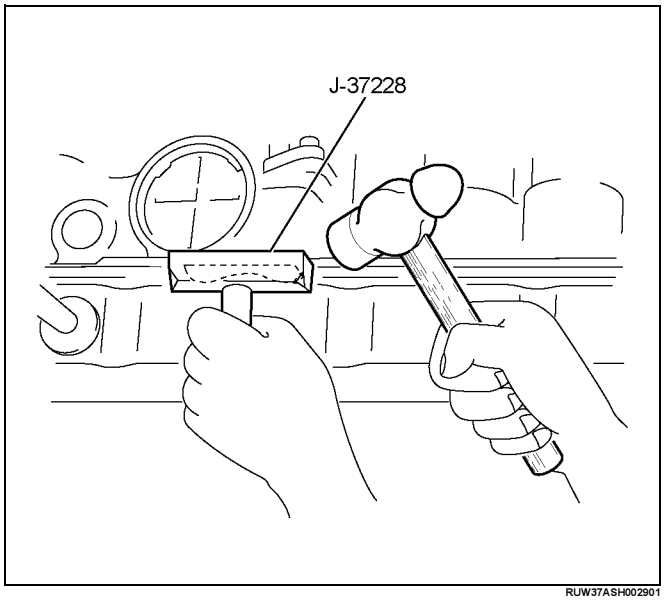
1. Remove the six bolts and remove the converter housing.


240R200022

2. Remove the oil pan.

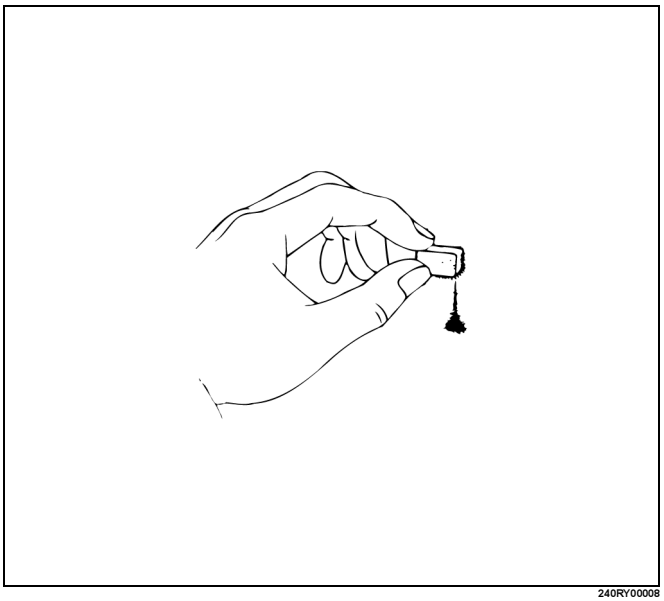
NOTE: Do not turn over the transmission as this will contaminate the valve body with foreign materials in the bottom of the oil pan.

- Remove the nineteen bolts.
- Remove oil pan by lifting the transmission case.
  Oil pan seal cutter: J–37228

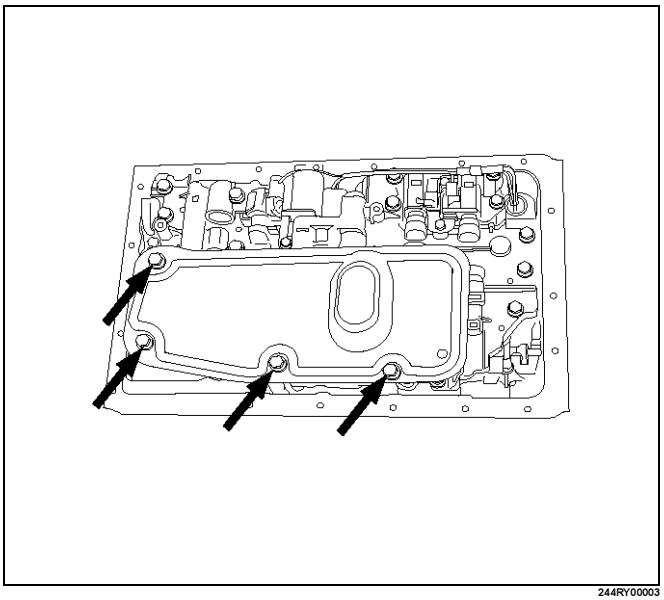


RUW37ASH002901

3. Examine particles in oil pan.
   - Remove the magnet and use it to collect any steel chips.
   - Look carefully at the chips and particles in the oil pan and on the magnet to anticipate what type of wear you will find in the transmission:
     Steel (magnetic) ..... bearing, gear and clutch plate wear
     Brass (non-magnetic)... bushing wear


240RY00008

4. Remove the oil strainer assembly.
   Remove four bolts holding the oil strainer.


244RY00003

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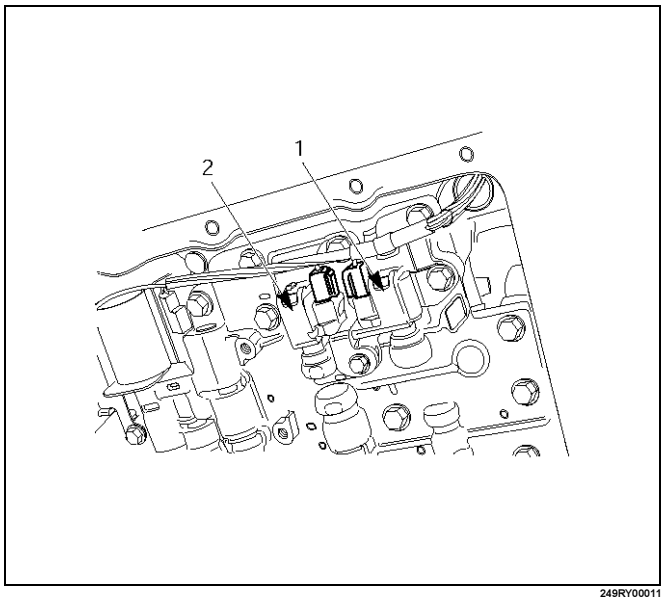
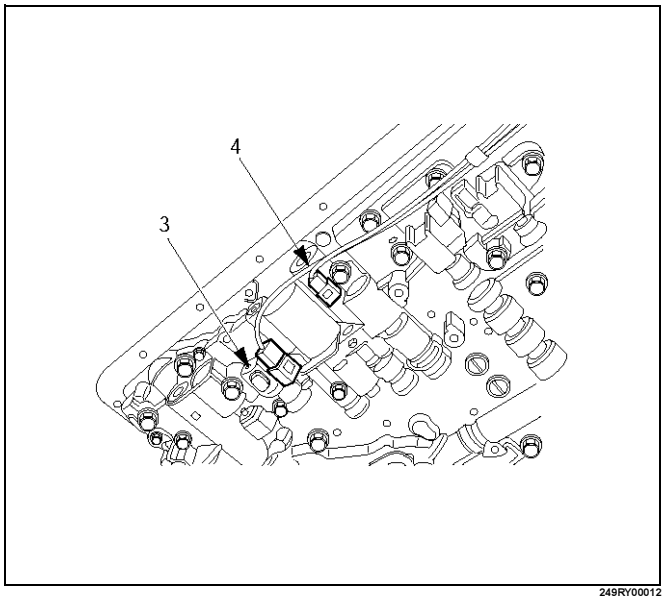
5. Remove the valve body.
   - Disconnect the connectors from the solenoid S1 (1), S2 (2), lock-up solenoid (3) and pressure control solenoid (4).

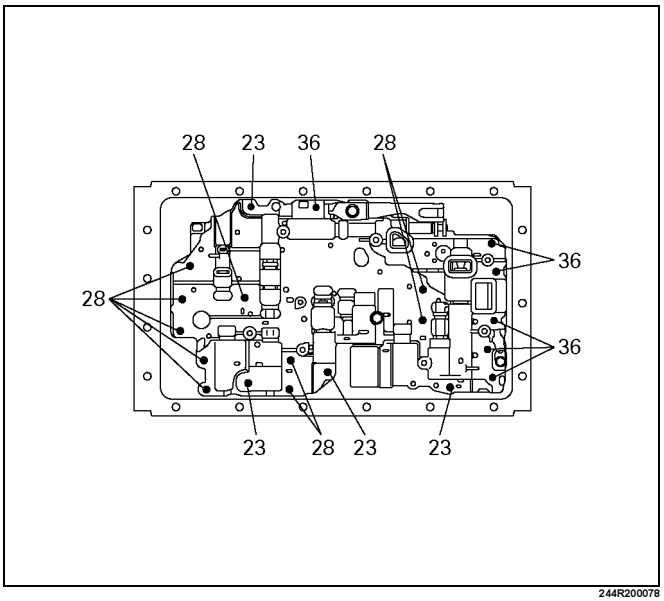


249RY00011



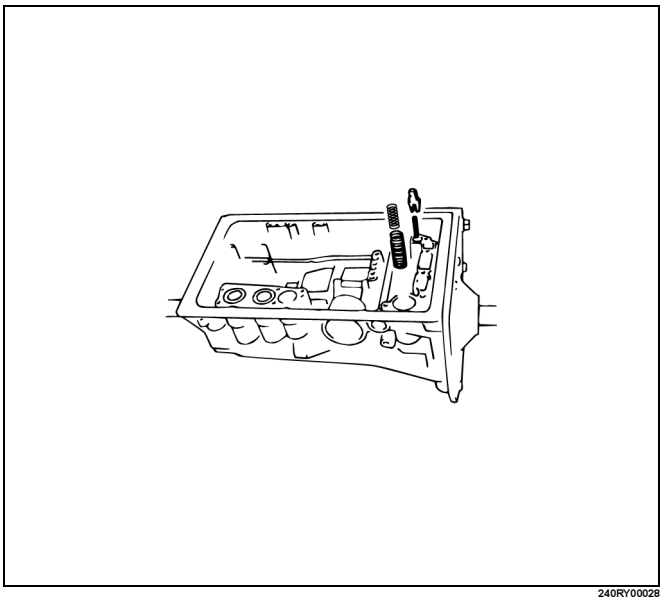
249RY00012

   - Remove the twenty bolts from valve body.



244R200078

6. Remove the check valve and spring.
7. Remove two springs from C–0 accumulator piston.



240RY00028

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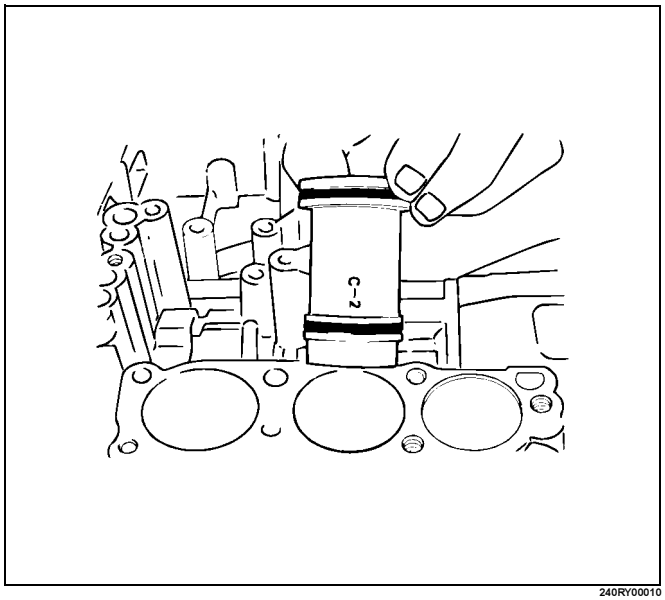
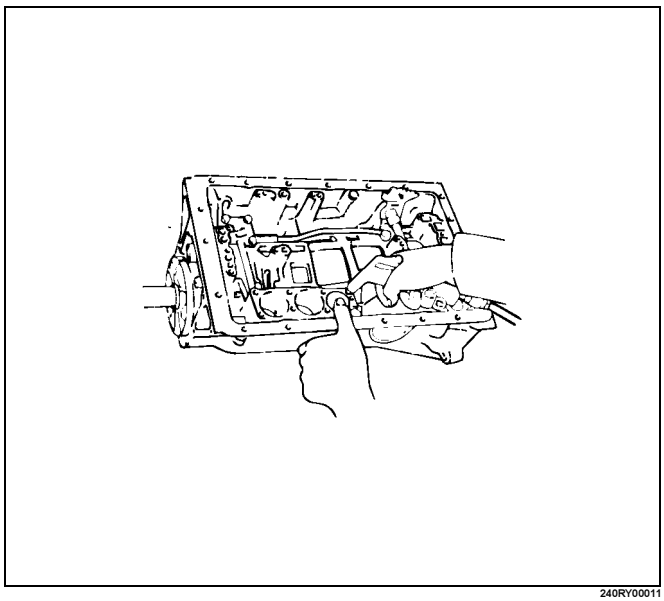
8. Remove the accumulator piston (B–2).
9. Remove the accumulator piston (C–2).
   - Remove accumulator pistons and springs from transmission case.

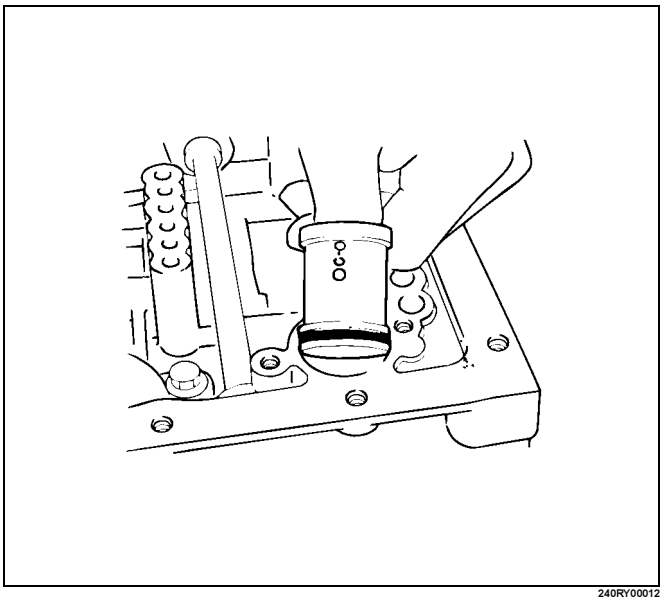


240RY00010

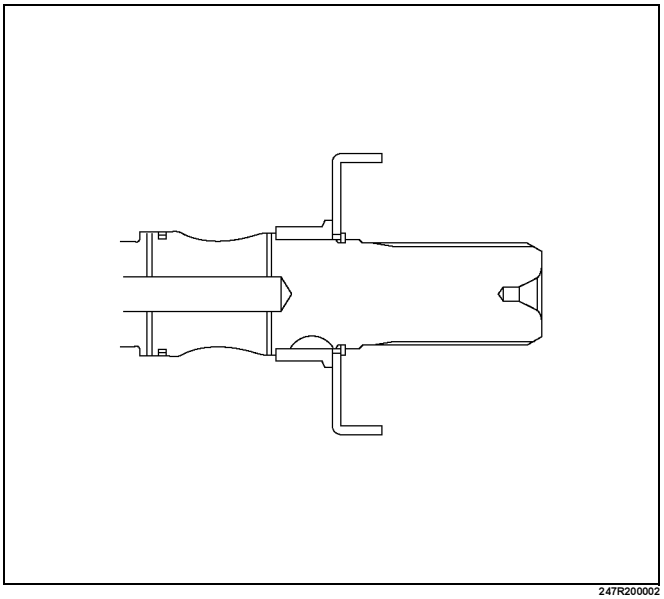
10. Applying compressed air to the oil hole, remove the B–0 accumulator piston and spring.


240RY00011

11. Remove the C–0 accumulator piston.


240RY00012

12. Remove the second brake drum gasket.
13. Remove the solenoid wiring.
   - Turn over transmission, remove the solenoid wiring stopper plate from the case.
   - Pull the wiring out of the transmission case.
14. Remove the snap ring, rotor and key (4×4).
   - Remove the snap ring from the output shaft.
   - Remove the rotor and key.


247R200002

15. Remove the snap ring, speedometer sensor drive gear and ball (4×2).
   - Remove the snap ring from the output shaft.
   - Remove the speedometer sensor drive gear, and ball.

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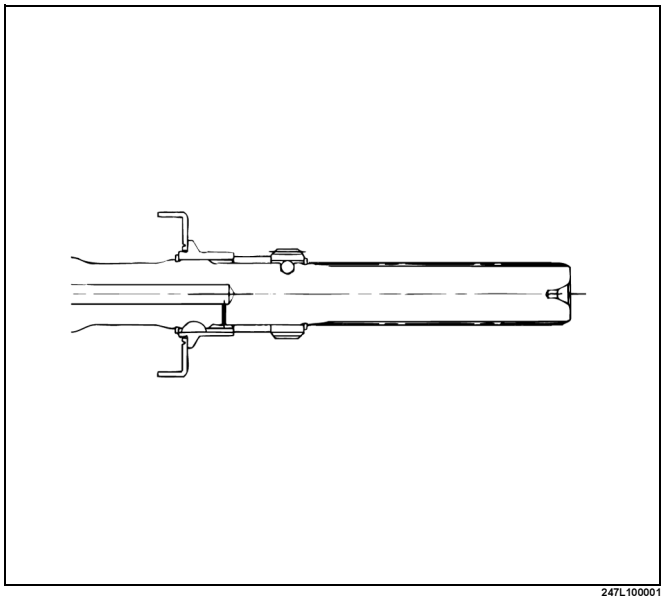
16. Remove the spacer, rotor, key and snap ring (4×2).
    - Remove the spacer, rotor and key.
    - Remove the snap ring from the output shaft.



247L100001

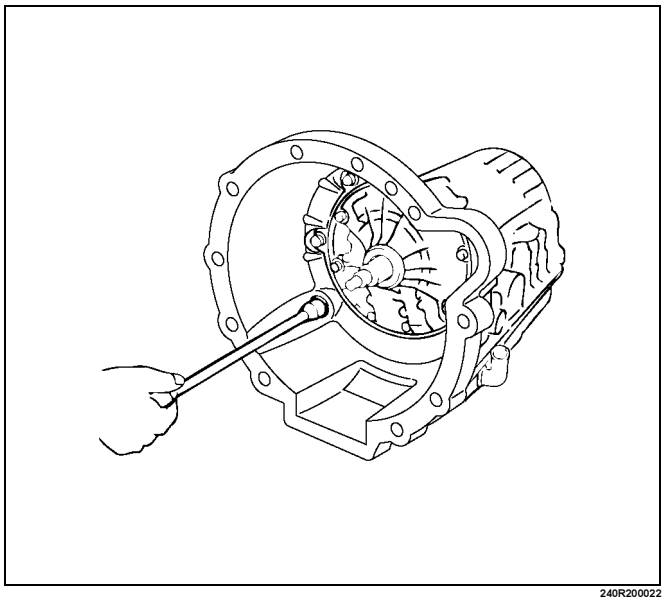
Reassembly

1. Install the converter housing.

   Torque:

   M10 – 34 N·m (25 lbft)

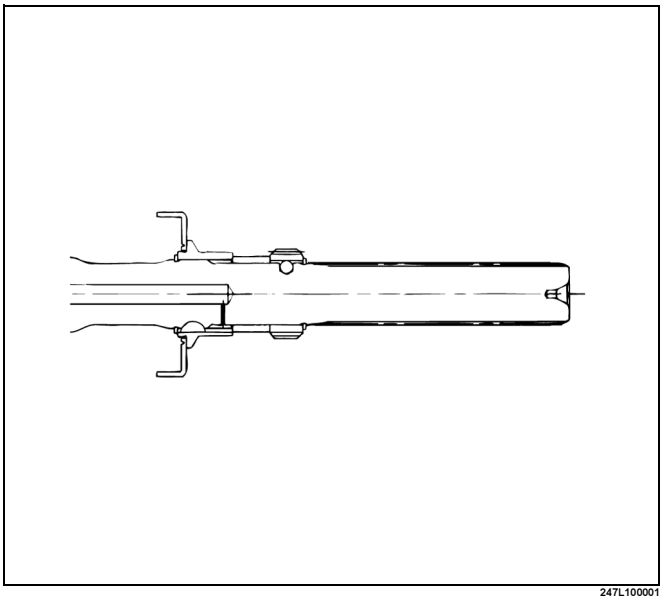
   M12 – 57 N·m (42 lbft)



240R200022

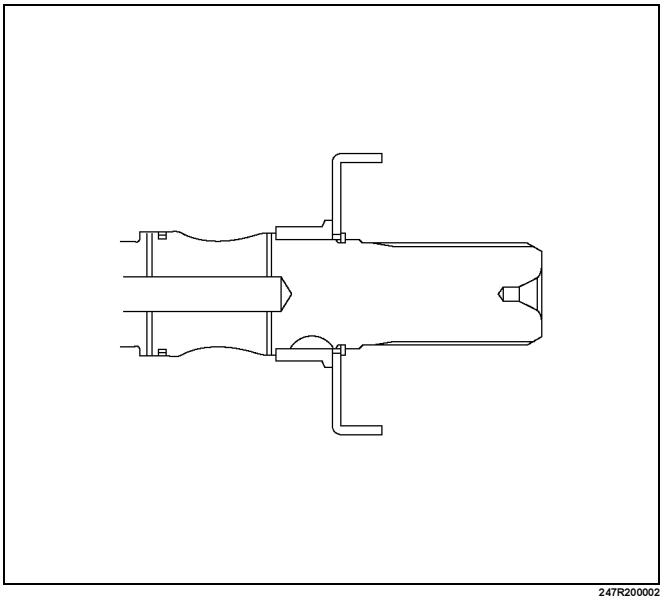
2. Install the snap ring, key and rotor (4×2).
    - Install the snap ring to the output shaft.
    - Install the key and rotor.

3. Install the spacer, ball, speedometer sensor drive gear and snap ring (4×2).
    - Install the spacer, ball and speedometer sensor drive gear.
    - Install the snap ring to the output shaft.



247L100001

4. Install the key, rotor and snap ring (4×4).
    - Install the key and rotor.
    - Install the snap ring to the output shaft.



247R200002

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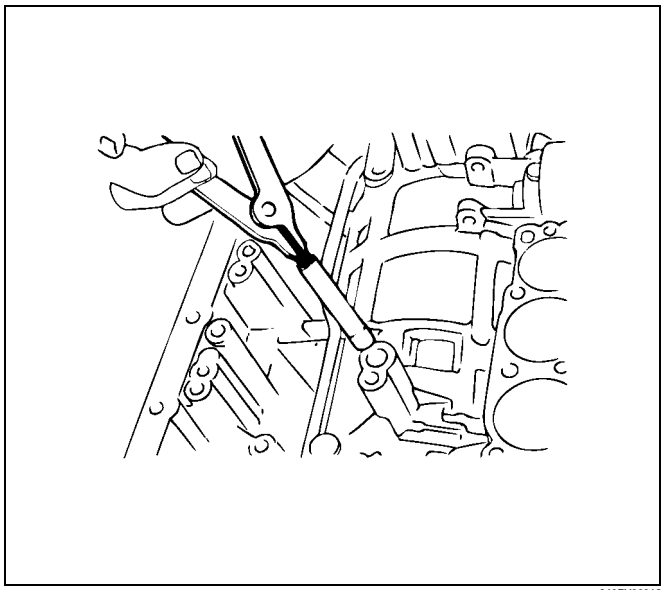
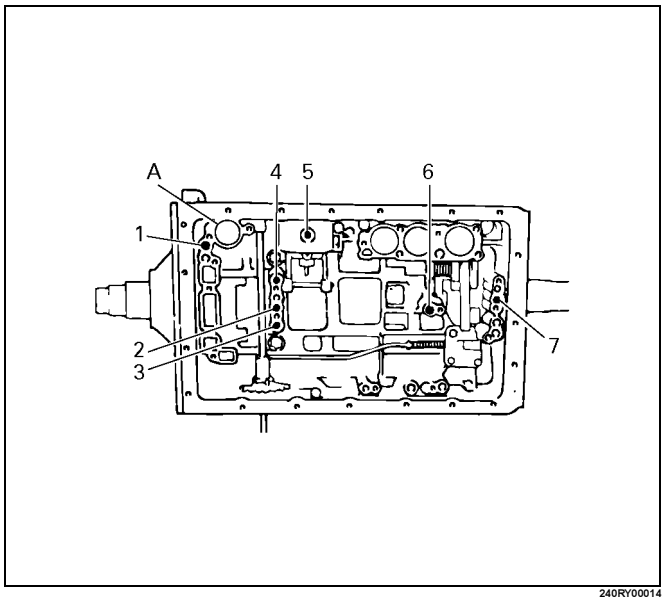
5. Install the second brake drum gasket.
   - Install a new second brake drum gasket to the transmission case.



240RY00013

6. Individual piston operation inspection.
   Check for the sound of operation while injecting compressed air into the oil hole indicated in the figure.



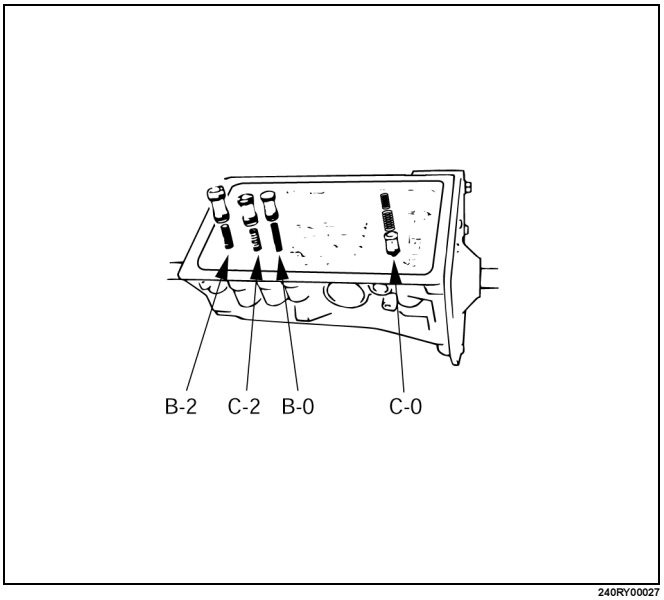
240RY00014

Legend

(1) OD direct clutch
(2) Direct clutch
(3) Forward clutch
(4) OD brake
(5) Second coast brake
(6) Second brake
(7) First and reverse brake
(A) C–0 Accumulator piston hole

NOTE: When inspecting the direct clutch, check with the C–0 accumulator piston hole closed. If there is no noise, disassemble and check the condition of the parts.

7. Install the accumulator pistons.
   - Coat the O–ring with ATF and install it to the piston.
     Install the three springs and four accumulator pistons to the bore as shown in th figure.



240RY00027

Piston	Outer diameter	Height
B–2	36.8 mm (1.449 in)	62.5 mm (2.461 in)
C–2	36.8 mm (1.449 in)	56.6 mm (2.228 in)
B–0	31.8 mm (1.252 in)	52.0 mm (2.047 in)
C–0	29.8 mm (1.173 in)	44.0 mm (1.732 in)

mm (in)

Spring	Free length	Outer diameter	Color
B–2	74.6 (2.93)	19.7 (0.78)	BROWN
C–2 (Outer)	68.5 (2.7)	20.2 (0.80)	BLUE
C–2 (Inner)	42.1 (1.658)	14.7 (0.579)	PINK
B–0	63.6 (2.504)	16.0 (0.630)	RED
C–0 (Outer)	74.6 (2.937)	20.9 (0.823)	ORANGE
C–0 (Inner)	46.0 (1.811)	14.0 (0.551)	YELLOW

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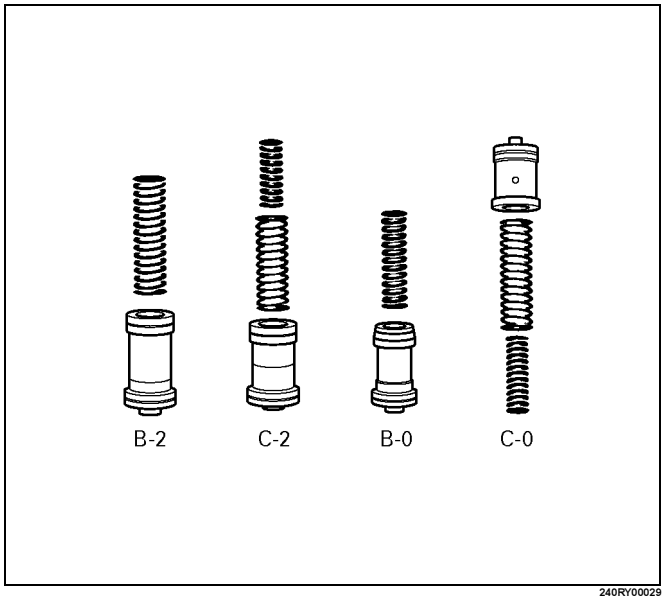
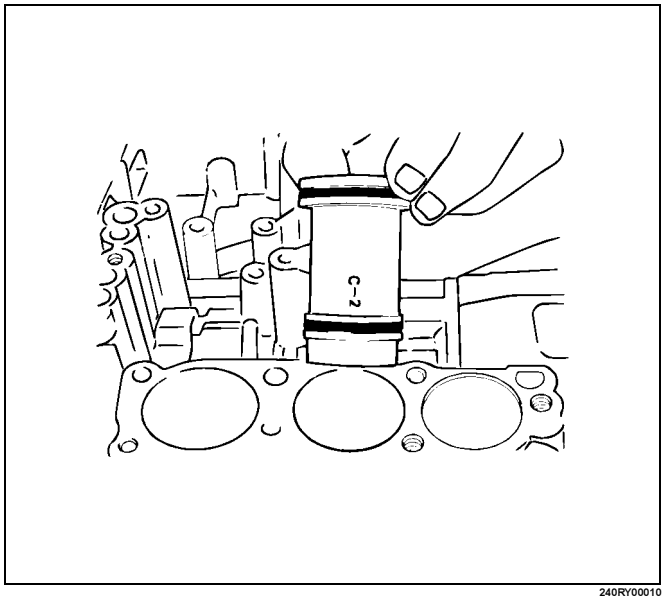
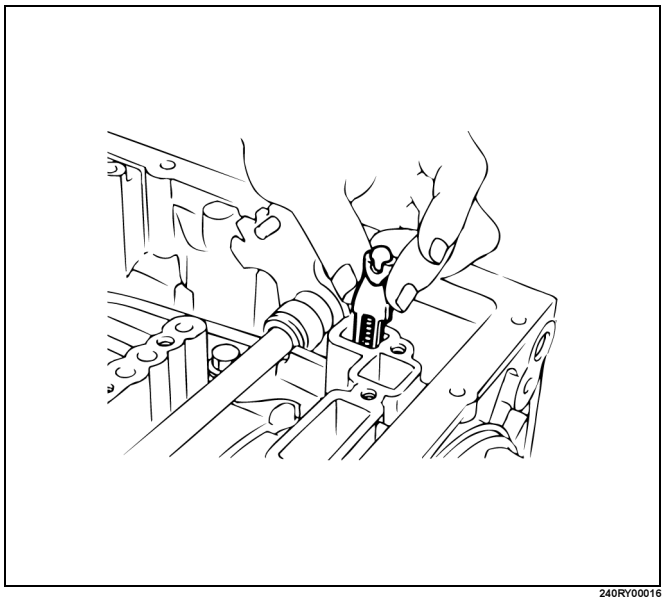


240RY00029



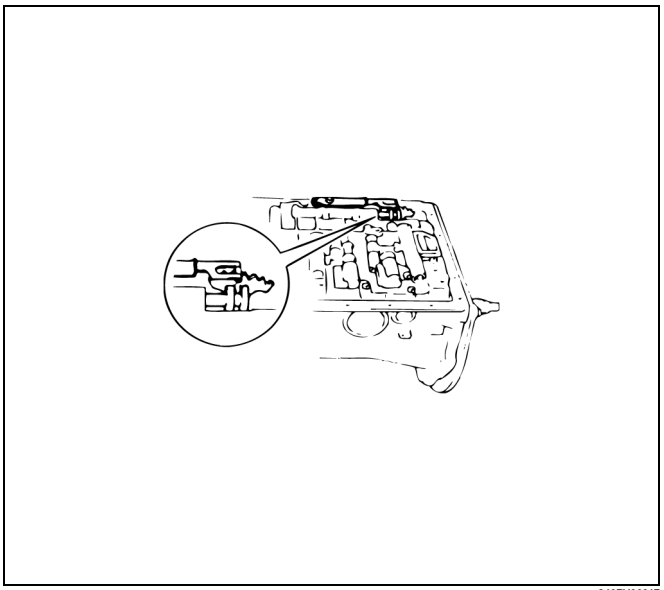
240RY00010

8. Install new check valve and spring.



240RY00016

9. Install the valve body.
   - Align the groove of the manual valve to the pin of the lever.

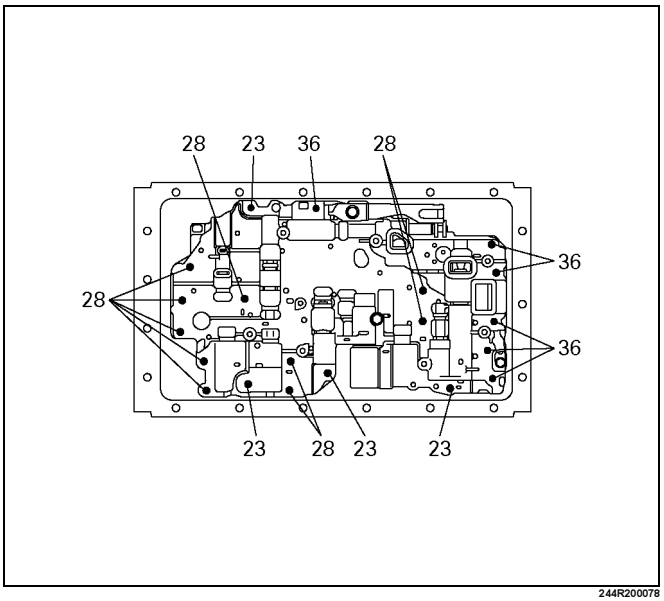


240RY00017

   - Install the twenty bolts.

NOTE: Each bolt length (mm) is indicated in the figure.

Torque: 10N·m (87lbin)



244R200078

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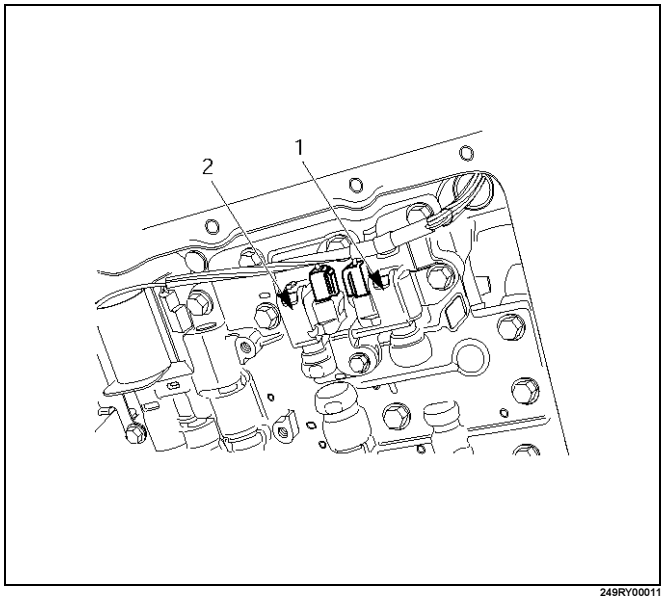
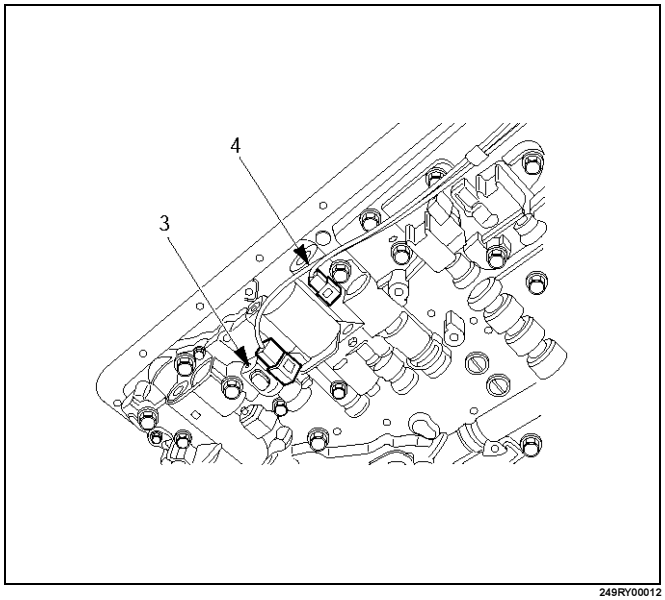
10. Install the solenoid wiring.
    Coat a new O-ring with ATF, and install it to the solenoid wiring.
    Insert the solenoid wiring to the case and install the stopper plate.
    Connect the connectors to the solenoid S1 (1), S2 (2), lock-up solenoid (3), and pressure control solenoid (4).

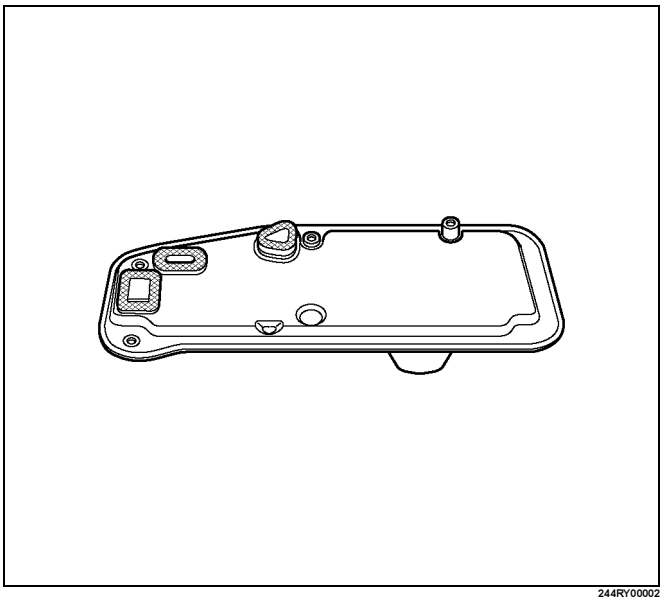


249RY00011



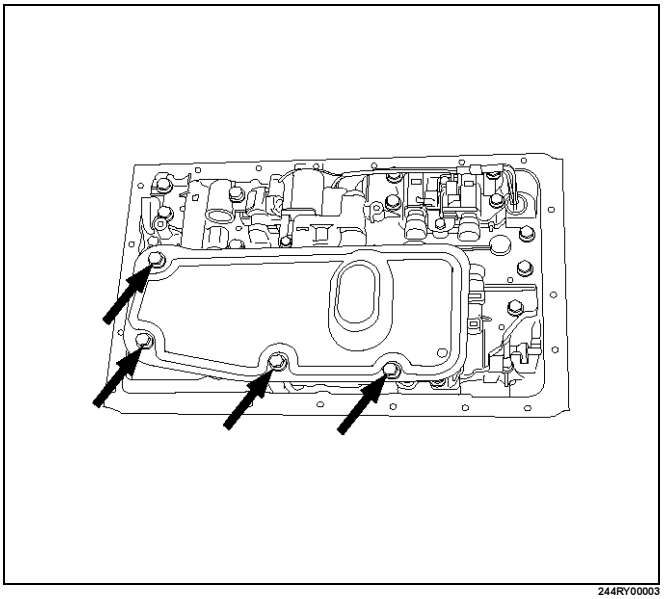
249RY00012

11. Install a new oil strainer assembly with gaskets.


244RY00002

- Install the oil strainer with the gaskets to the valve body. Tighten the four bolts.

Torque: 10 N·m (87 lb in)


244RY00003

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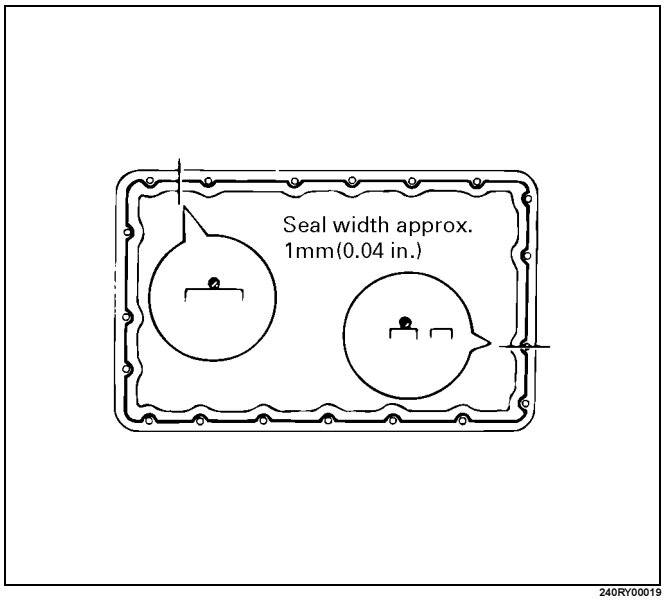
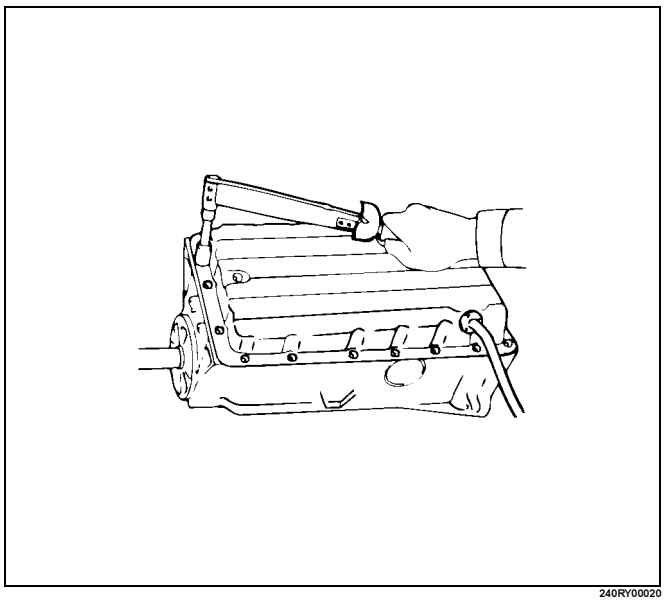
12. Install the oil pan.
    Install two magnets in oil pan.
    Remove any gasket material and be careful not to drop oil on the contacting surfaces of the transmission case and oil pan.
    Apply liquid gasket (TB1281 or its equivalent) to the oil pan as shown in the figure.

NOTE: Install the oil pan as soon as the seal gasket is applied.



240RY00019

- Install and tighten the nineteen bolts.


240RY00020

Torque: 7.4N·m (65lb in)

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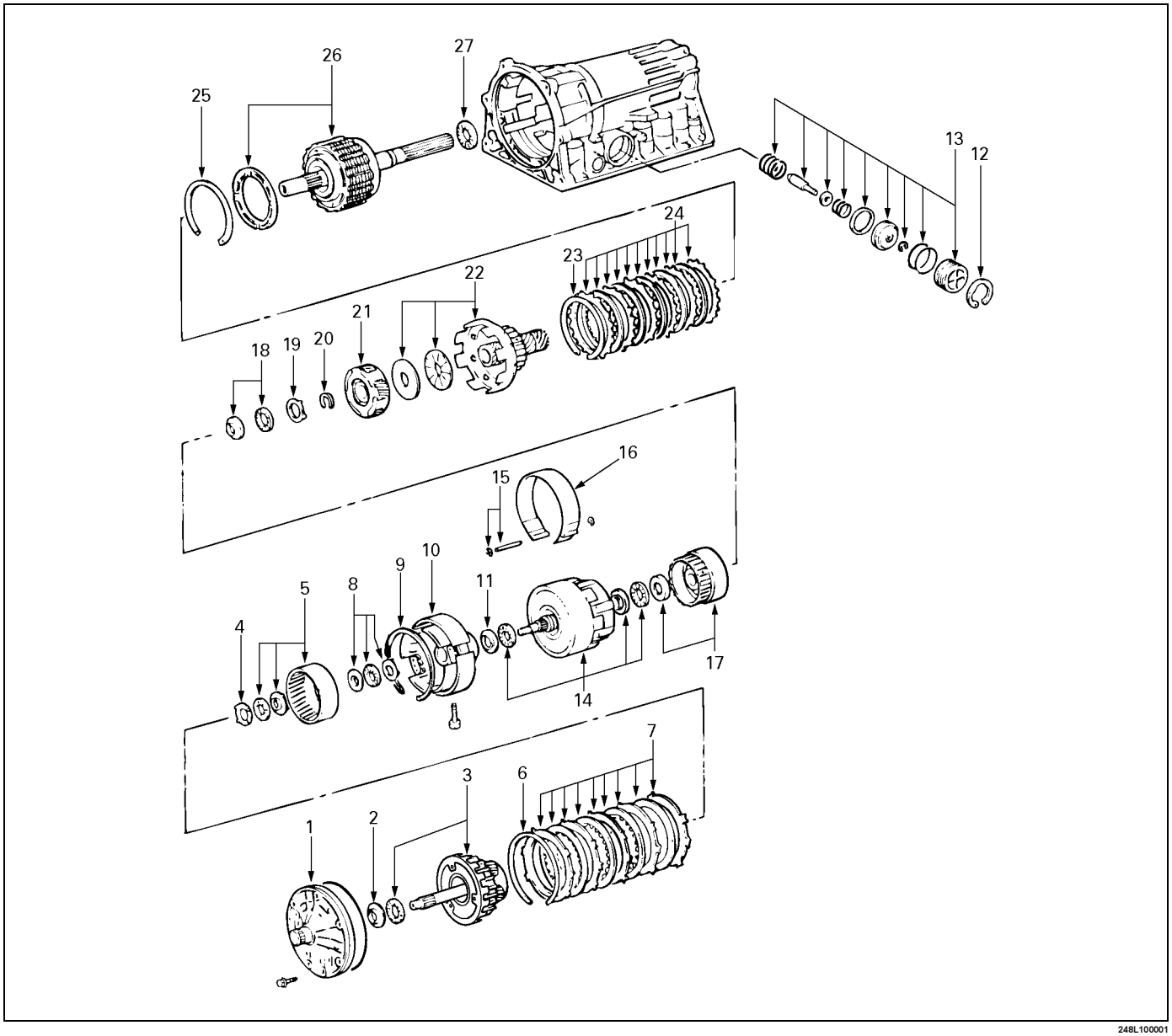
Major Components (3)

Major Components (3) and Associated Parts



248L100001

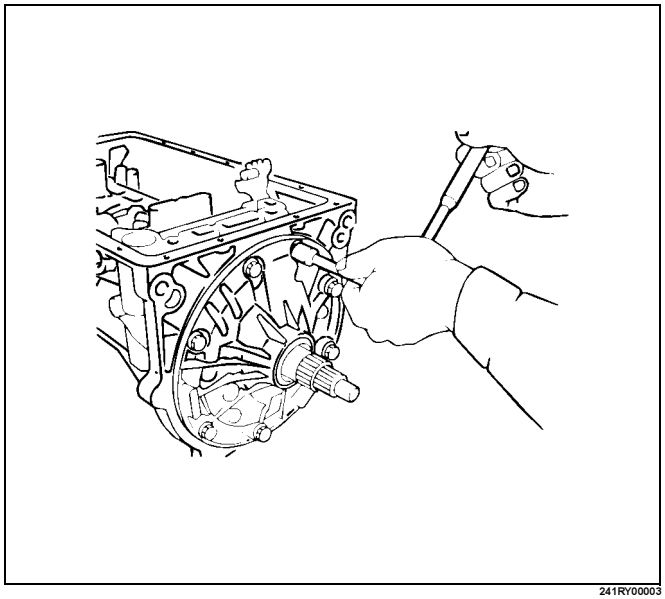
Legend

(1) Oil pump
(2) Race
(3) OD planetary gear and OD direct clutch
(4) Race
(5) OD planetary ring gear
(6) Snap ring
(7) Flange, plate and disc (B–0)
(8) Bearing and race
(9) Snap ring
(10) OD support
(11) Race
(12) Snap ring
(13) Second coast brake piston assembly
(14) Direct clutch and forward clutch
(15) E-ring and pin
(16) Second coast brake band
(17) Front planetary ring gear
(18) Bearing and race
(19) Race
(20) Snap ring
(21) Front planetary gear
(22) Drum and one-way clutch
(23) Snap ring
(24) Flange, plate and disc (B–2)
(25) Snap ring
(26) Rear planetary gear, second brake drum and output shaft
(27) Bearing

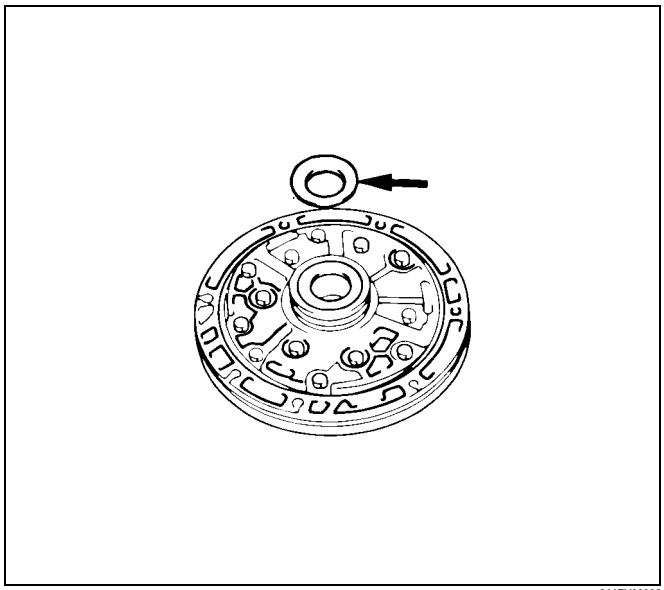
ProCarManuals.com

Disassembly

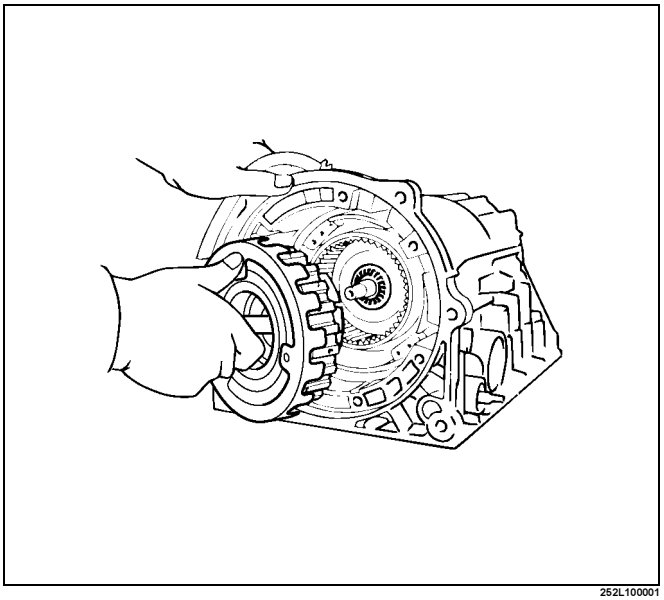
1. Remove seven bolts fixing the oil pump to the transmission case.
   Remove the oil pump.


241RY00003

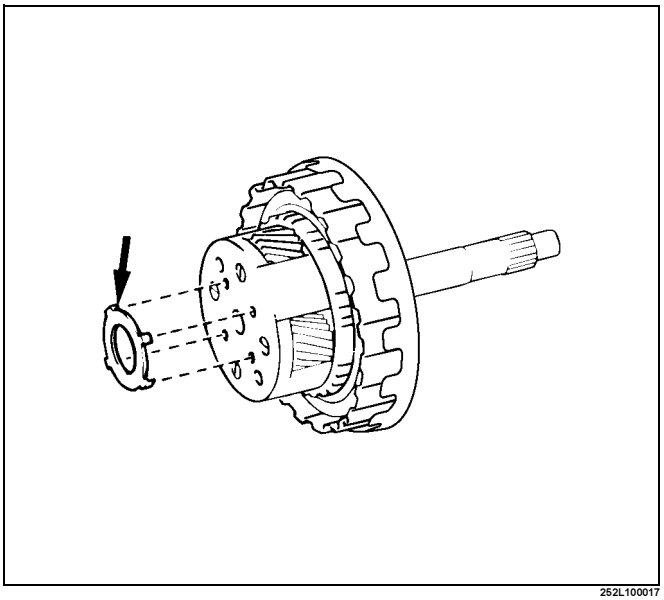
2. Remove race from oil pump.


241RY00002

3. Remove the overdrive planetary gear and overdrive direct clutch with thrust needle bearing from the transmission case.

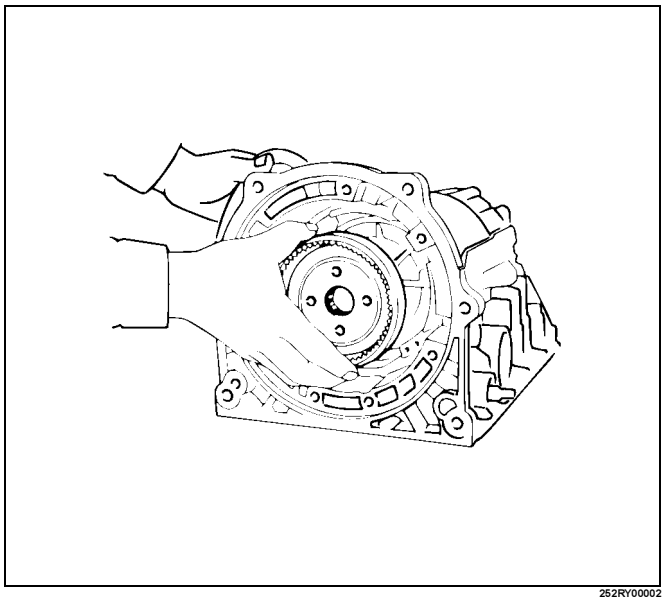

252L100001

4. Remove the race from OD planetary gear.


252L100017

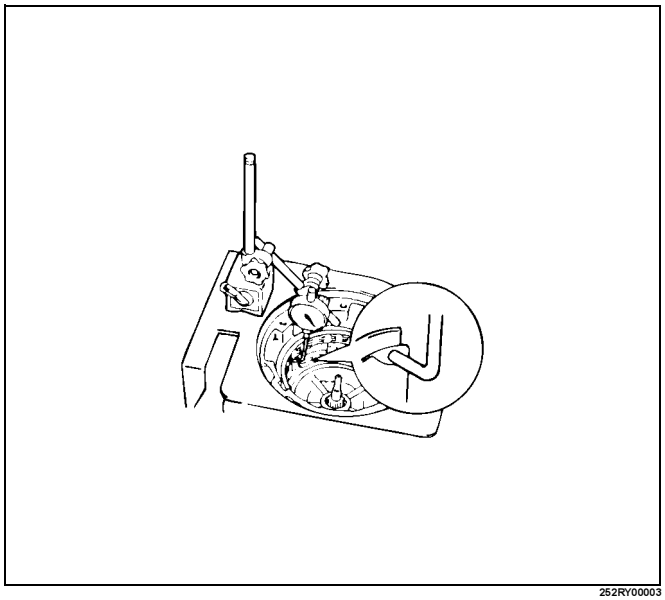
ProCarManuals.com

5. Remove the overdrive planetary ring gear from the transmission case.



252RY00002

6. Check piston stroke of overdrive brake
   Place a dial indicator onto the overdrive brake piston as shown in the figure.



252RY00003

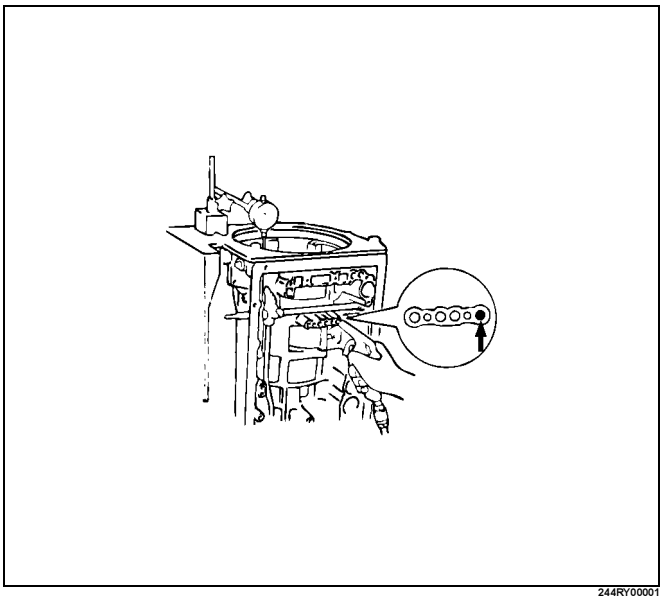
   Measure the stroke applying and releasing the compressed air (390 – 780 kPa or 57 – 114 psi) as shown in the figure.

Piston stroke: 1.40 – 1.70 mm (0.0551 – 0.0669 in)

   If the values are nonstandard, select another flange.

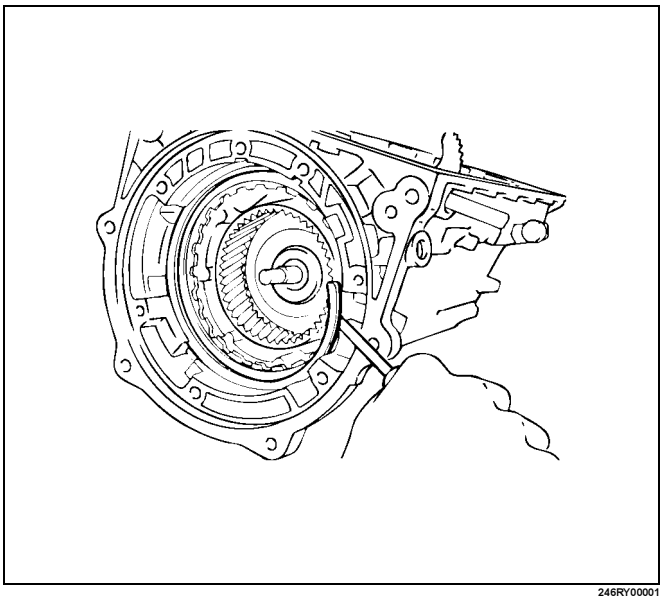
Available flange sizes

3.3 mm (0.130 in)	3.8 mm (0.150 in)
3.5 mm (0.138 in)	3.9 mm (0.154 in)
3.6 mm (0.142 in)	4.0 mm (0.158 in)
3.7 mm (0.146 in)	



244RY00001

7. Remove the snap ring.



246RY00001

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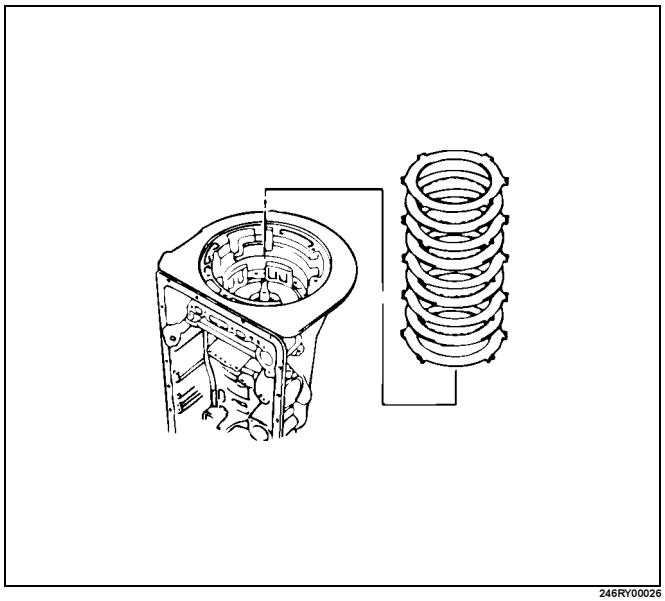
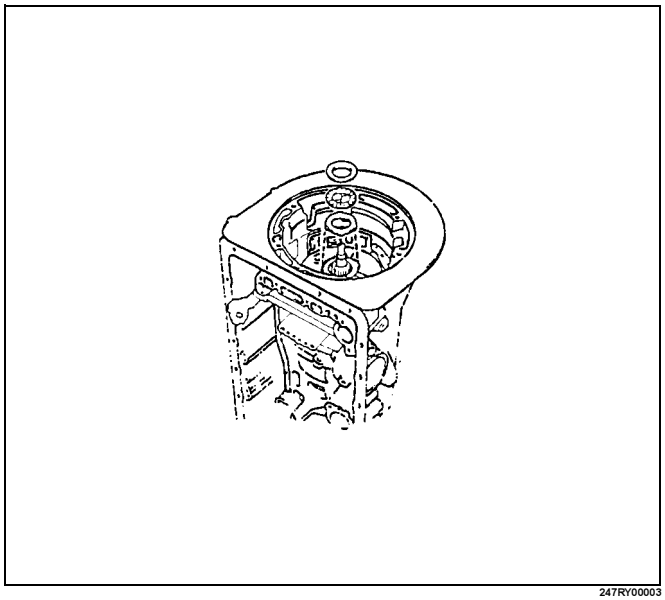
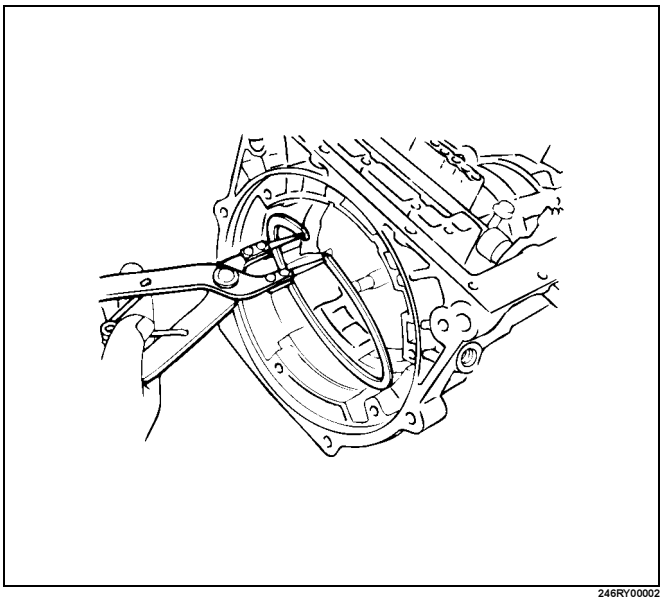
8. Remove one flange, four plates and four discs (B–0).


246RY00026

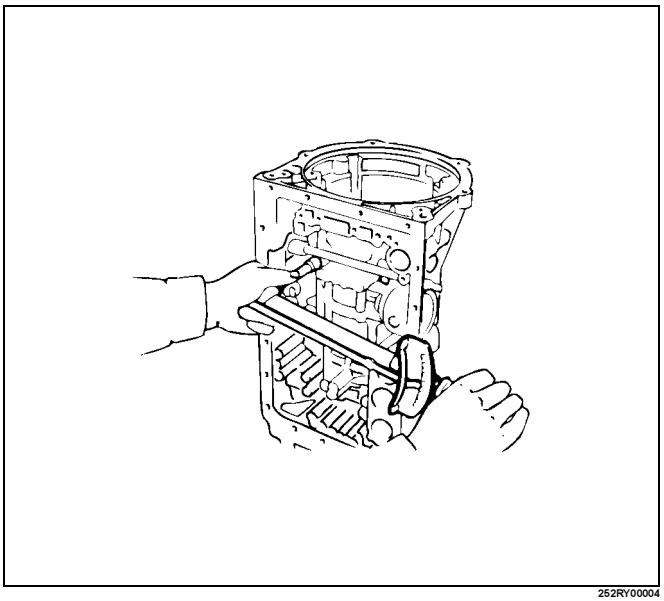
9. Remove the thrust bearing and two races.


247RY00003

10. Using snap ring pliers, remove the snap ring.


246RY00002

11. Remove the OD support.
    - Remove two bolts fixing the overdrive support assembly to the transmission case.


252RY00004

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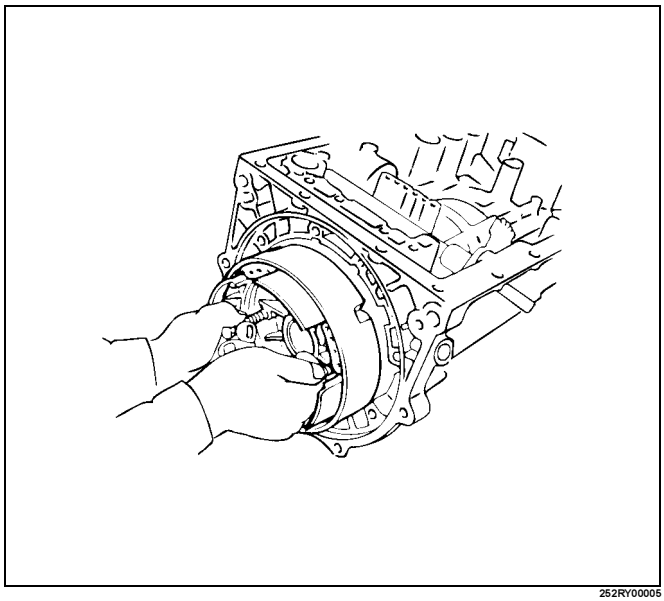
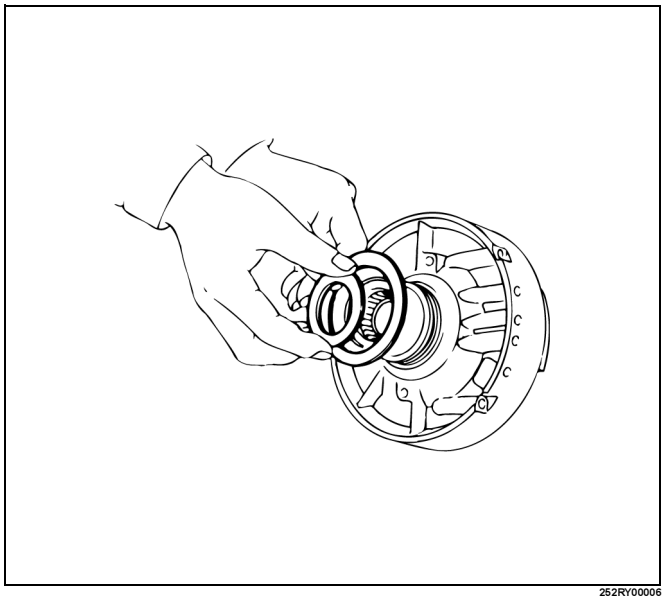
- Install two removed bolts to the OD support, and pull out the OD support assembly.


252RY00005

12. Remove the race from OD support.


252RY00006

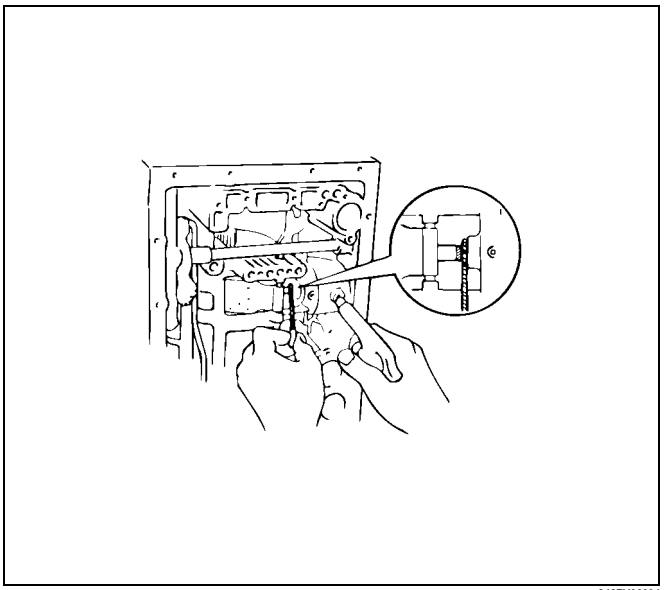
13. Check piston stroke of second coast brake (B–1)
    Place a mark on the second coast brake piston rod as shown in the figure.
    Using feeler gauge, measure the stroke applying the compressed air (390 – 780 kPa or 57 – 114 psi) as shown in the figure.

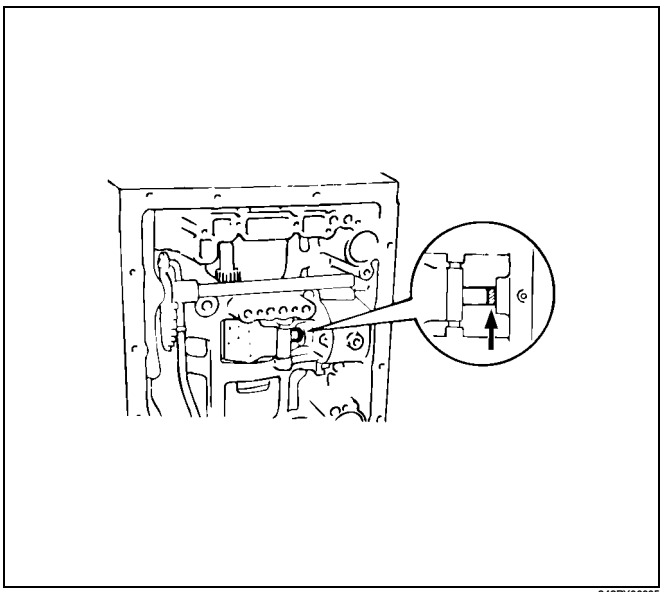
Piston stroke: 1.5 – 3.0mm (0.059 – 0.118in)

If the values are nonstandard, replace piston rod and recheck piston stroke.
If piston stroke is nonstandard, replace brake band.

There are two piston rods.

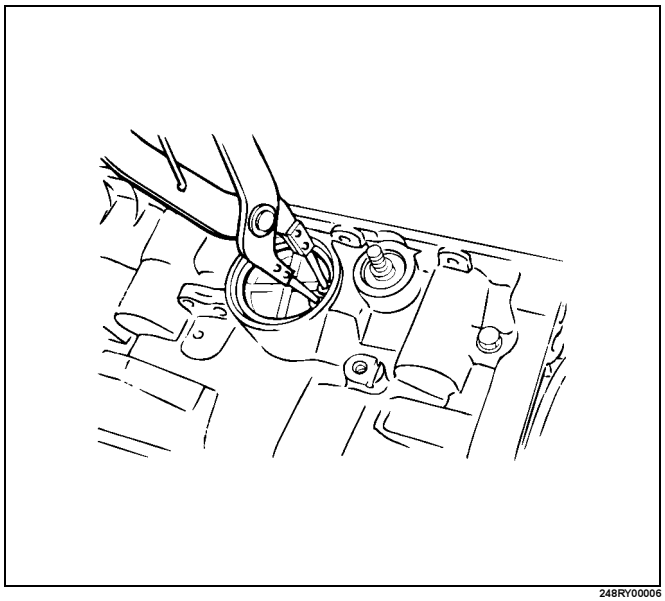
Rod length	78.4 mm (3.09 in) 79.9 mm (3.15 in)


248RY00004


248RY00005

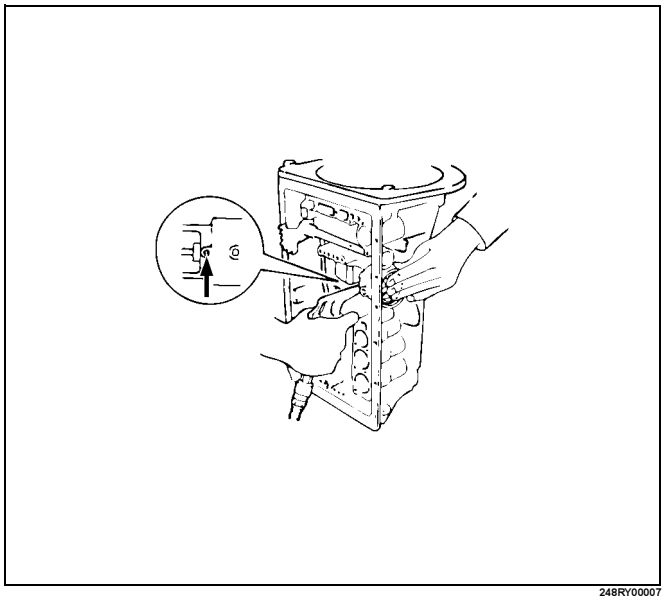
ProCarManuals.com

14. Using snap ring pliers, remove the snap ring.



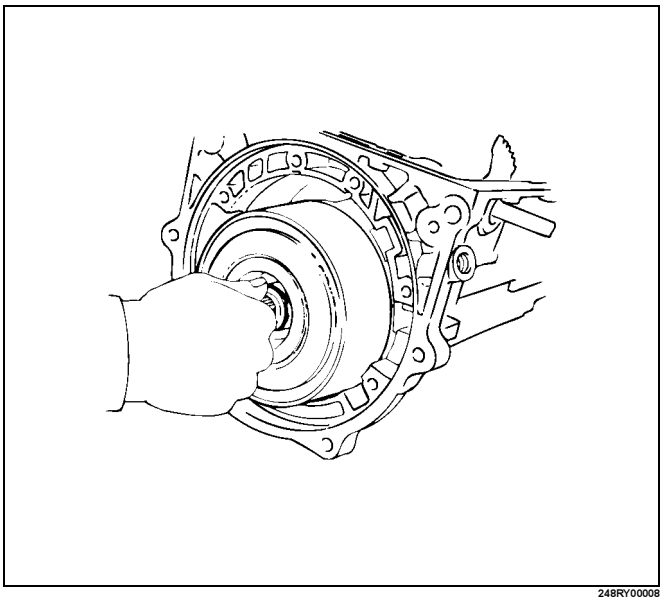
248RY00006

15. Applying compressed air to the oil hole, remove the second coast brake piston assembly.



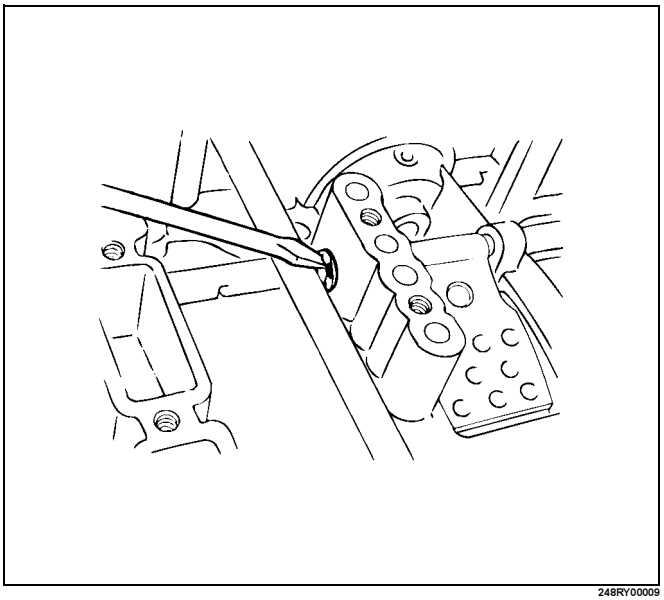
248RY00007

16. Remove the direct clutch and forward clutch from the transmission case.



248RY00008

17. Remove the E-ring from the pin.
Remove the pin from the brake band.



248RY00009

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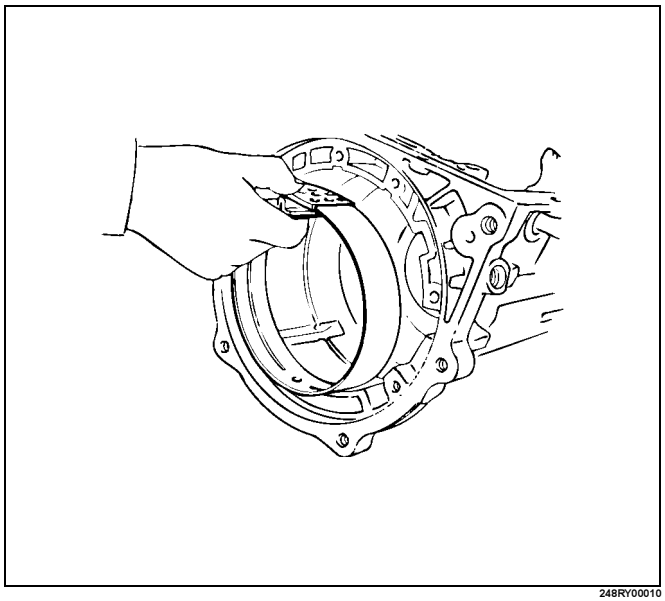
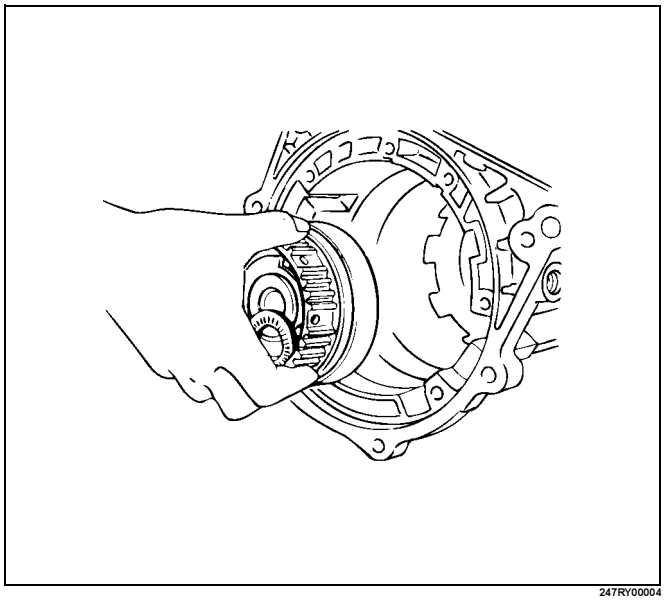
18. Remove the second coast brake band from the transmission case.



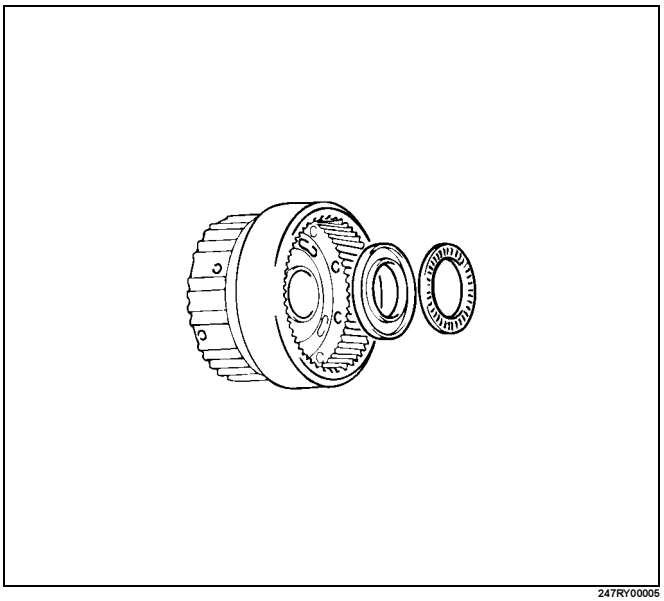
248RY00010

19. Remove the front planetary ring gear from the transmission case.



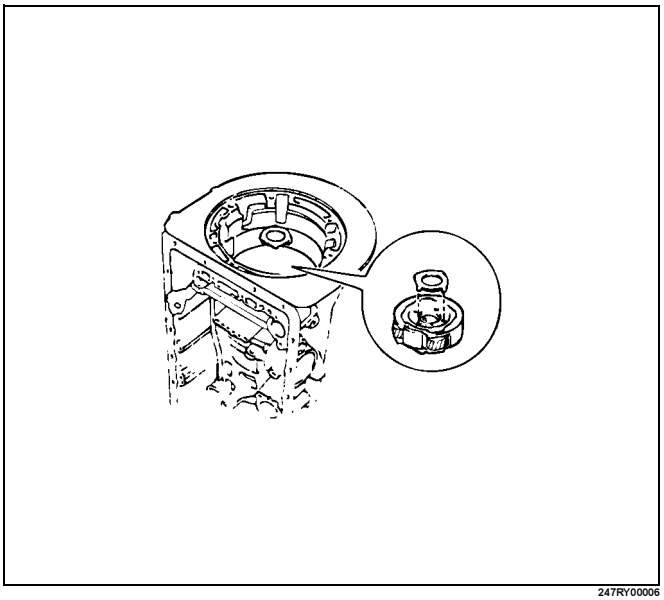
247RY00004

20. Remove the bearing and race.



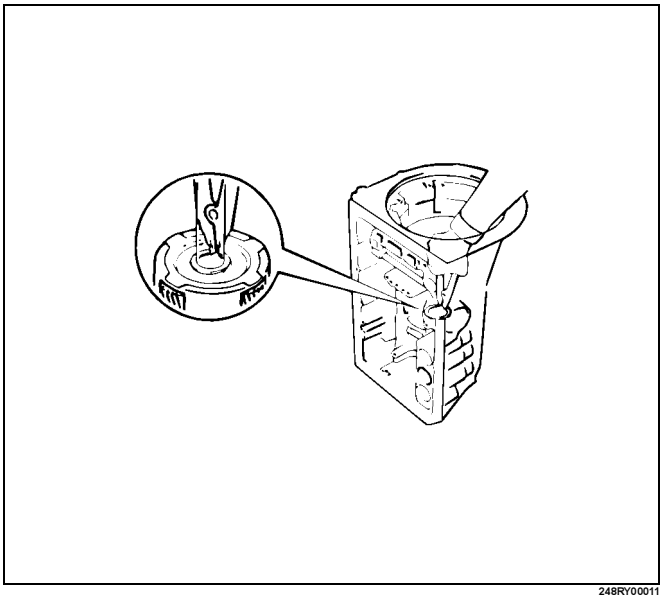
247RY00005

21. Remove the race.



247RY00006

22. Using snap ring pliers, remove the snap ring.

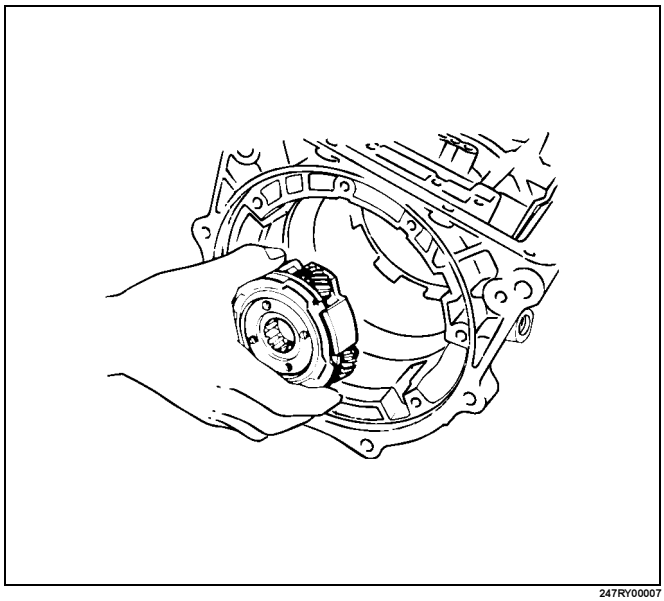


248RY00011

ProCarManuals.com

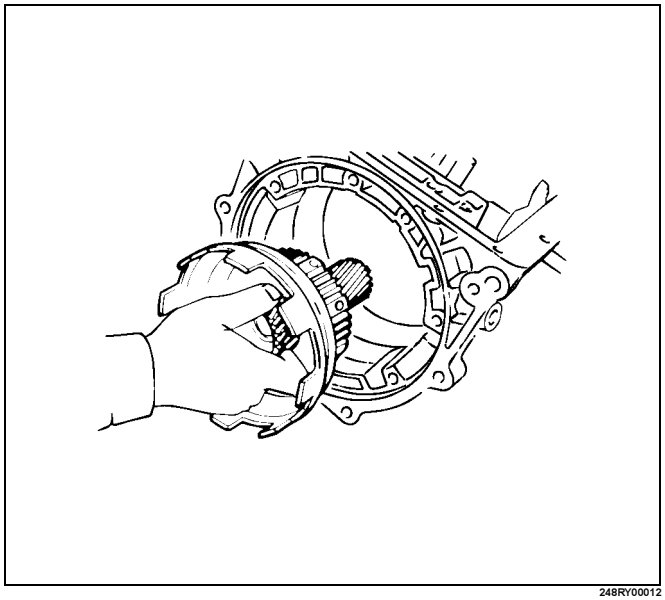
NOTE: Hold the output shaft to prevent it from falling. The output shaft falls when the snap ring is removed.

23. Remove the front planetary gear from the transmission case.



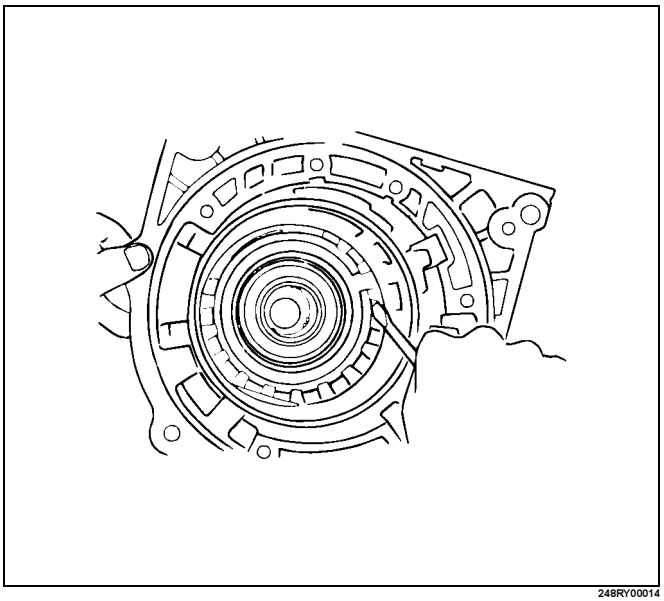
247RY00007

24. Remove sun gear input drum and one-way clutch.



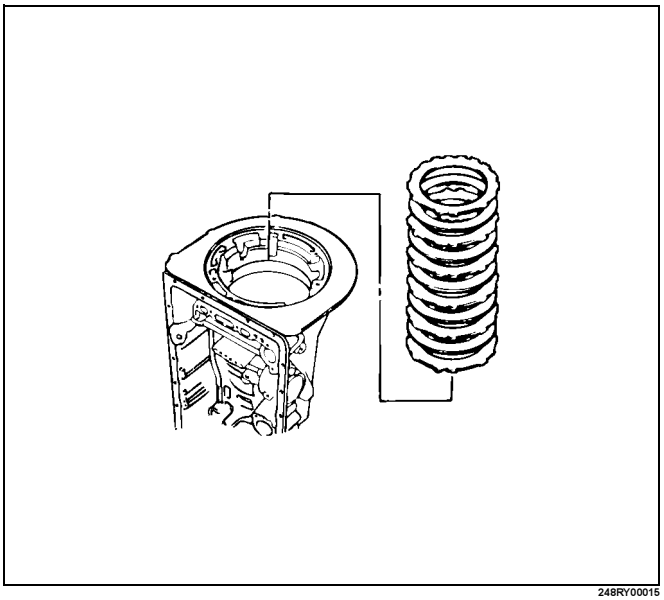
248RY00012

25. Using two screwdrivers, remove the snap ring.



248RY00014

26. Remove, five discs and six plates (B–2).



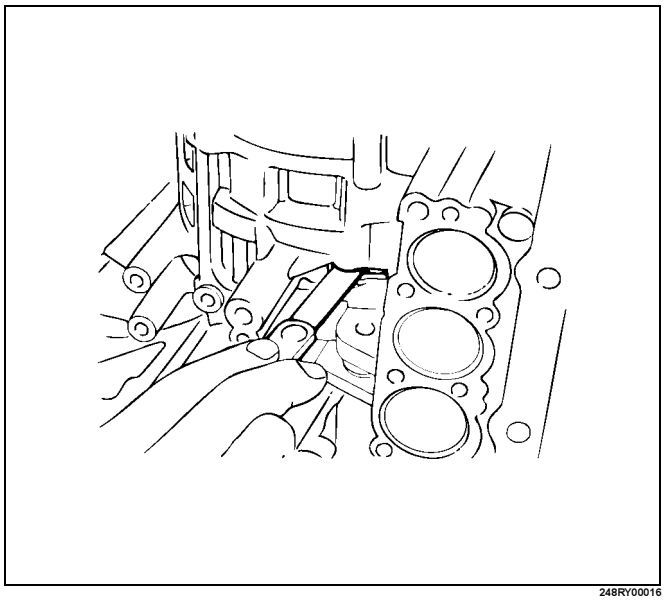
248RY00015

ProCarManuals.com

27. Check pack clearance of first and reverse brake (B–3)
    Using a feeler gauge, measure the clearance between the plate and second brake drum as shown in the figure.

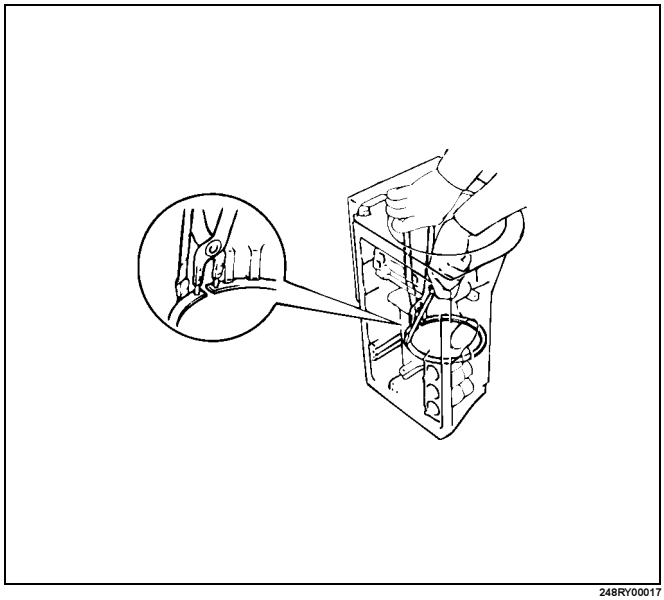
    Clearance: 0.6 – 1.12mm (0.0236 – 0.0440in)

    If the values are nonstandard, replace the discs.



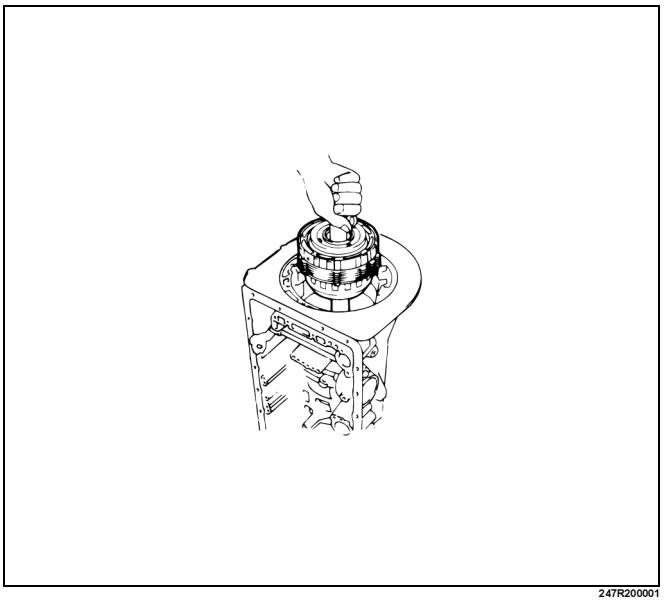
248RY00016

28. Using snap ring pliers, remove the snap ring.



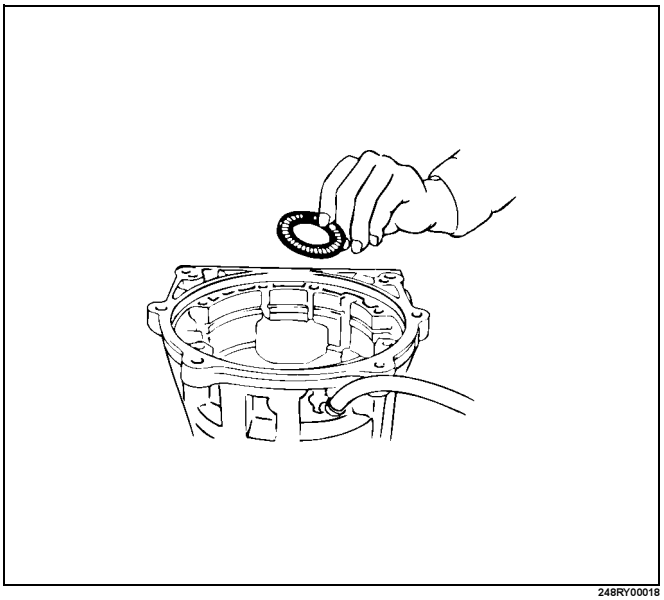
248RY00017

29. Remove the rear planetary gear, second brake drum and output shaft as an assembly.



247R200001

30. Remove the assembled thrust bearing and race from the transmission case.



248RY00018

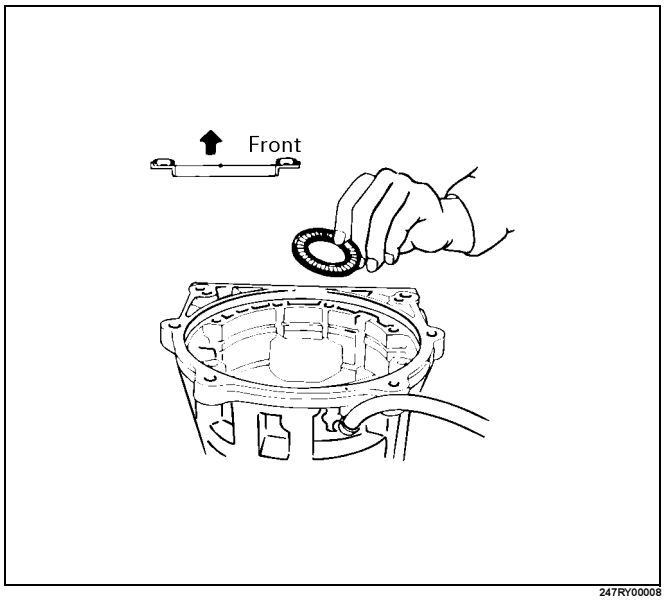
ProCarManuals.com

Reassembly

1. Coat the assembled bearing and race with petroleum jelly and install it onto the transmission case.

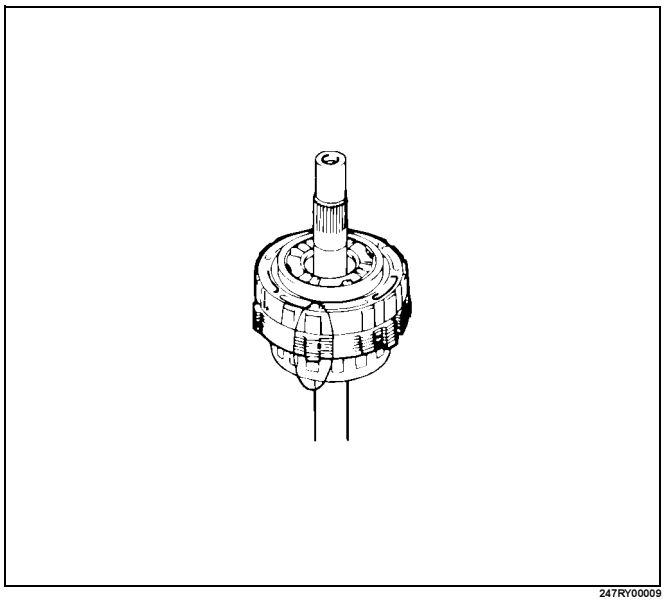
Assembled bearing and race (Reference)

Bearing and race	Diameter
Inside	39.38 mm (1.550 in)
Outside	58.15 mm (2.289 in)



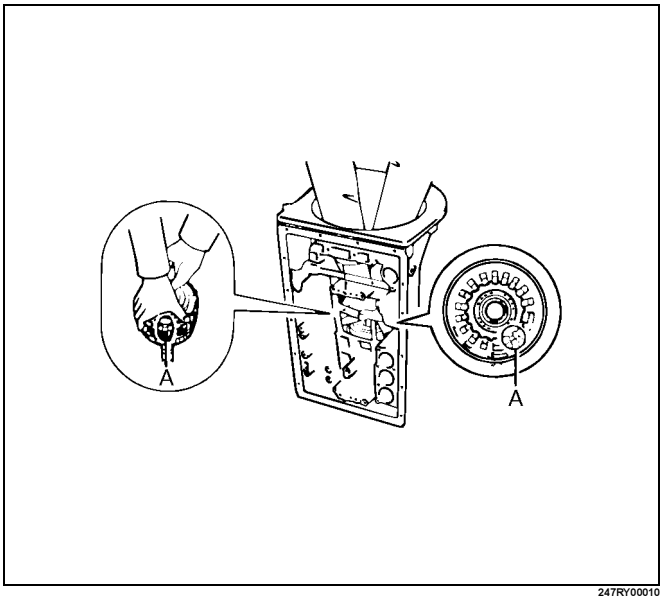
247RY00008

2. Install the rear planetary gear, second brake drum and output shaft.
   - Align the teeth of the second brake drum, flanges, discs and plates as shown in the figure.



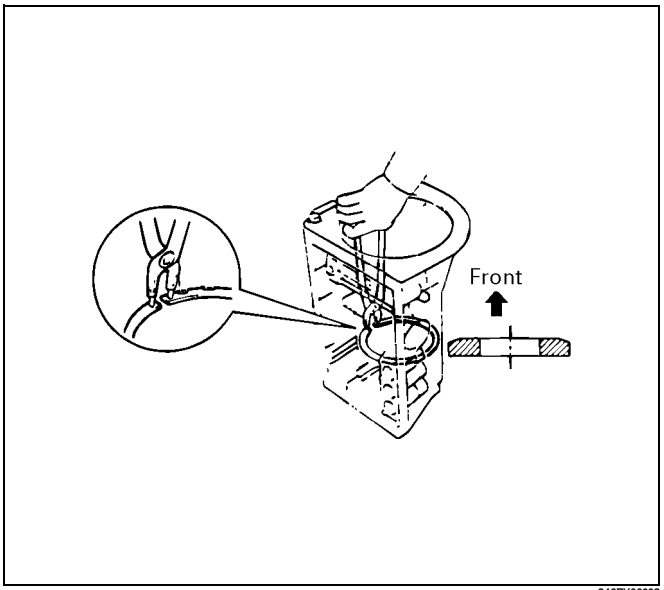
247RY00009

   - Align the splines of the transmission case and the assembled rear planetary gear, second brake drum and output shaft, indicated by A in the figure.



247RY00010

3. Using snap ring pliers, install the snap ring.



246RY00003

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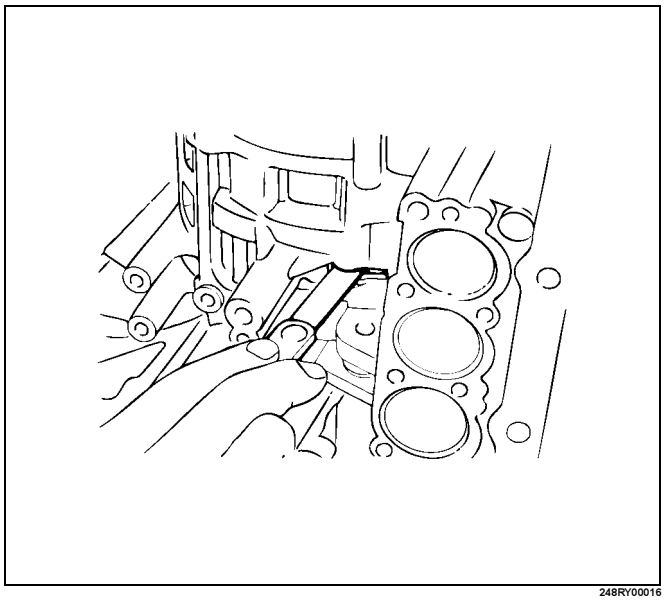
4. Check pack clearance of first and reverse brake.
   Using a thickness gauge, measure the clearance between the plate and second brake drum as shown in the figure.

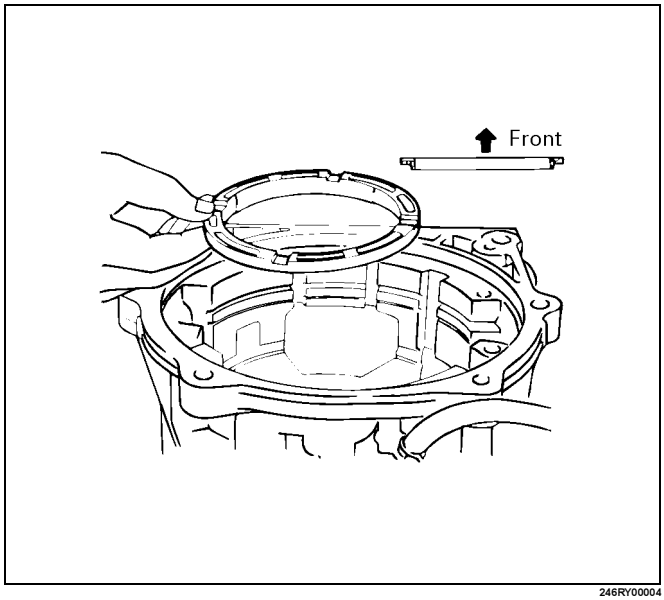
   Clearance: 0.60 – 1.12mm (0.0236 – 0.0440in)

   If the values are nonstandard, check for an improper installation.



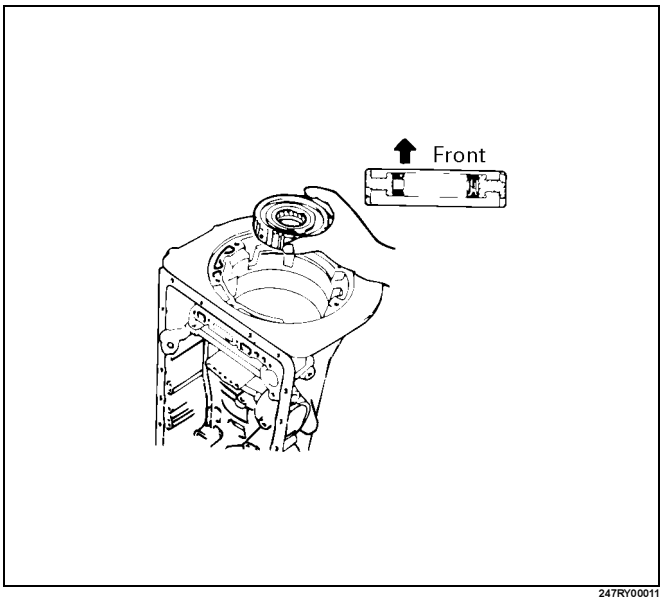
248RY00016

5. Install second brake piston sleeve.



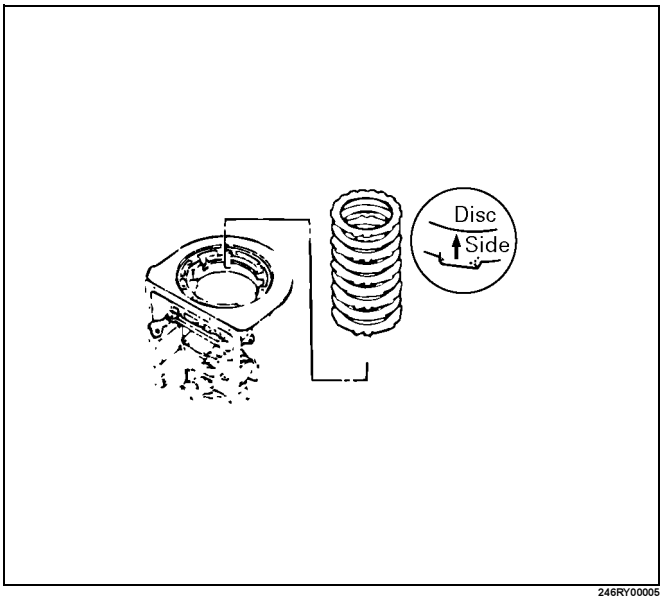
246RY00004

6. Install one-way clutch in the transmission case.



247RY00011

7. Install discs and plates (B–2).
   Instal the 2.5mm (0.098in) thick plate with the rounded edge side of the plate facing the disc.
   Alternately install five discs and six plates (Disc first)



246RY00005

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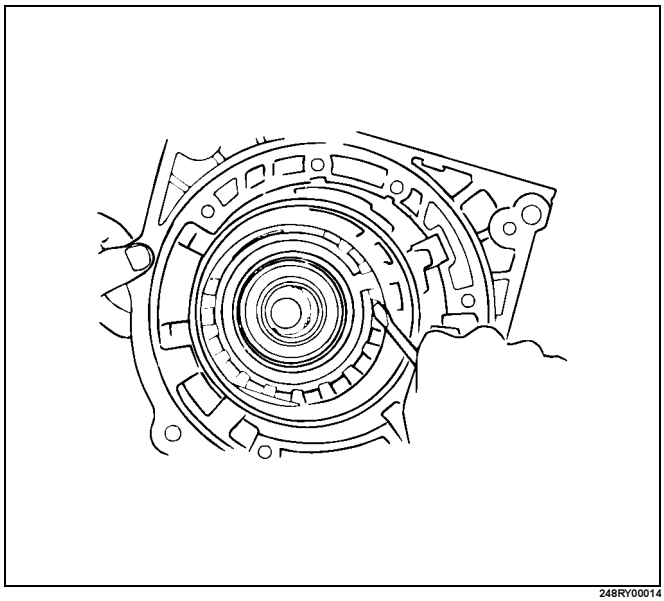
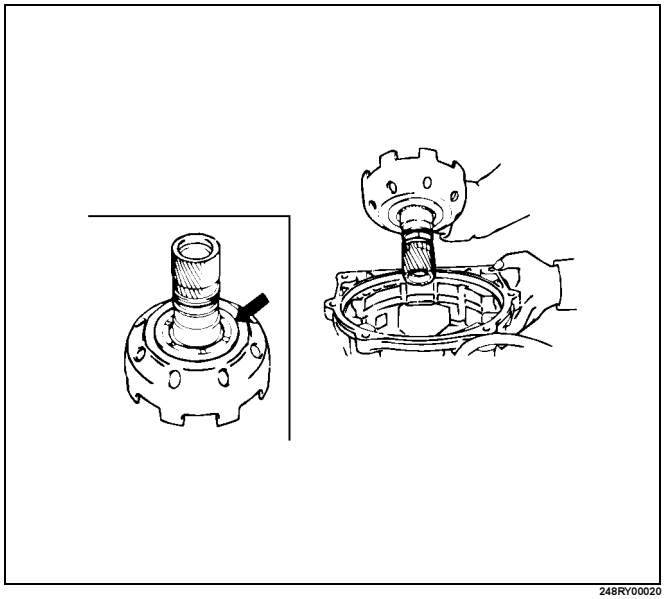
8. Install the snap ring.


248RY00014

9. While turning the sun gear input drum clockwise, install it into the one-way clutch

NOTE: Confirm the thrust washer is installed correctly.

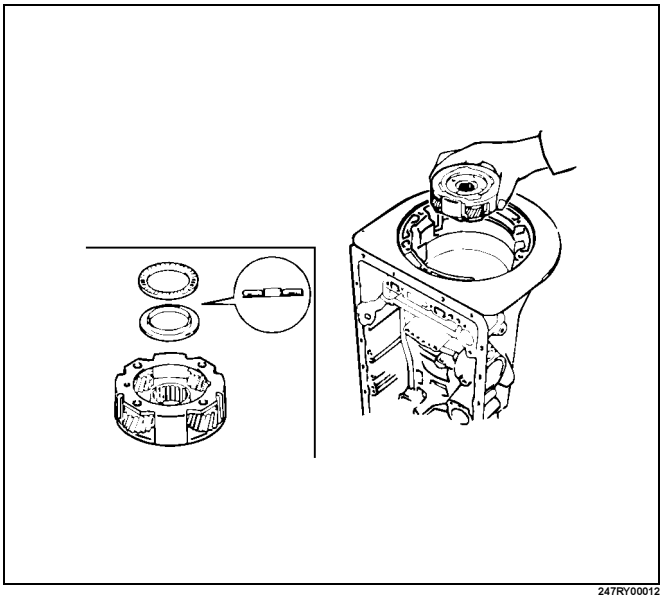

248RY00020

10. Install the front planetary gear and bearing to the sun gear.

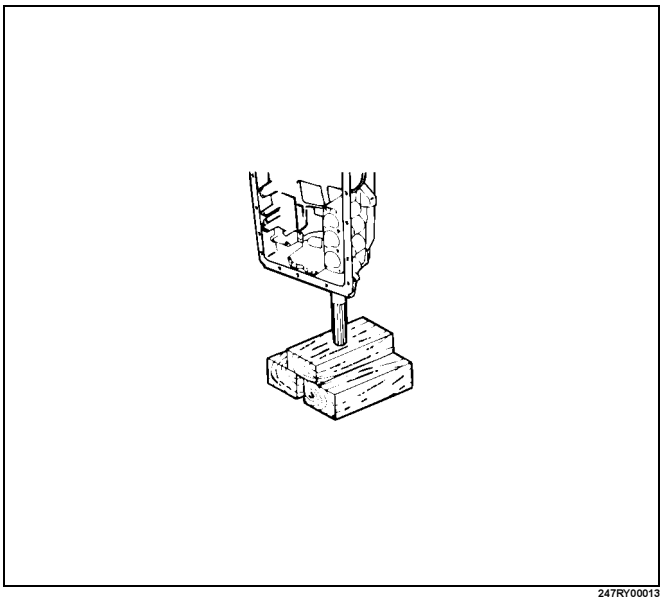
NOTE: Confirm the bearing and race is installed correctly.

Bearing and race diameter (Reference)

	Inside	Outside
Bearing	35.6 mm (1.40 in)	47.7 mm (1.88 in)
Race	33.7 mm (1.33 in)	47.6 mm (1.87 in)

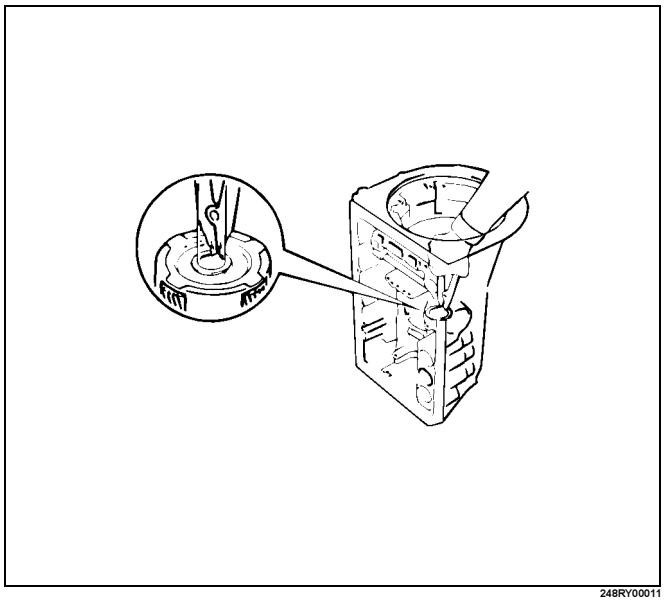

247RY00012

With wooden blocks under the output shaft, stand the transmission on the output shaft.


247RY00013

ProCarManuals.com

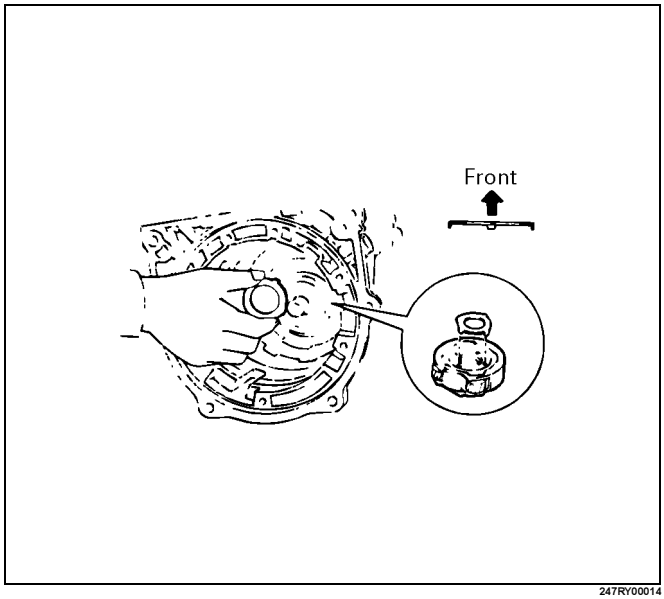
11. Using snap ring pliers, install the snap ring.



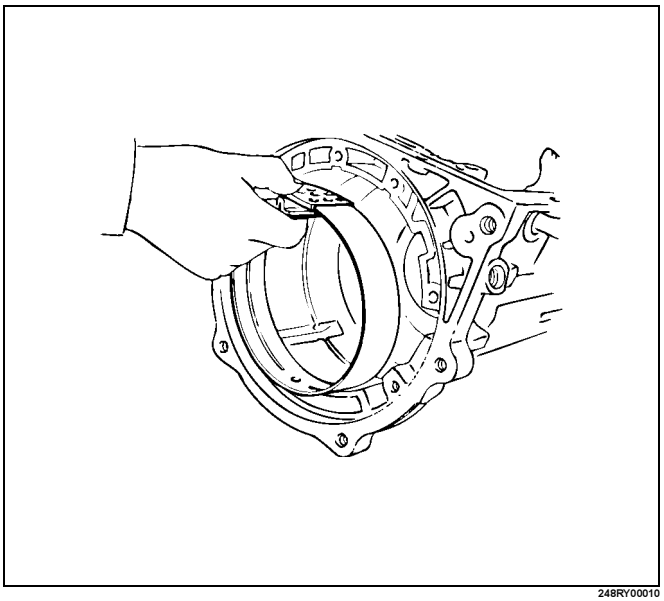
12. Coat the bearing race with petroleum jelly and install it onto the front planetary gear.

Bearing race diameter (Reference)

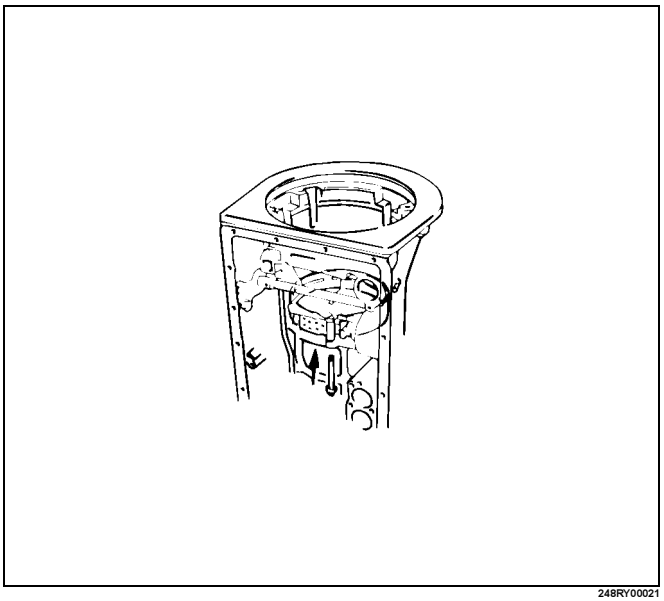
Bearing race	Diameter
Inside	34.3 mm (1.350 in)
Outside	47.8 mm (1.882 in)



13. Insert the second coast brake band to the transmission case.



14. Install the E-ring and pin.
    - Install the pin through the brake band.



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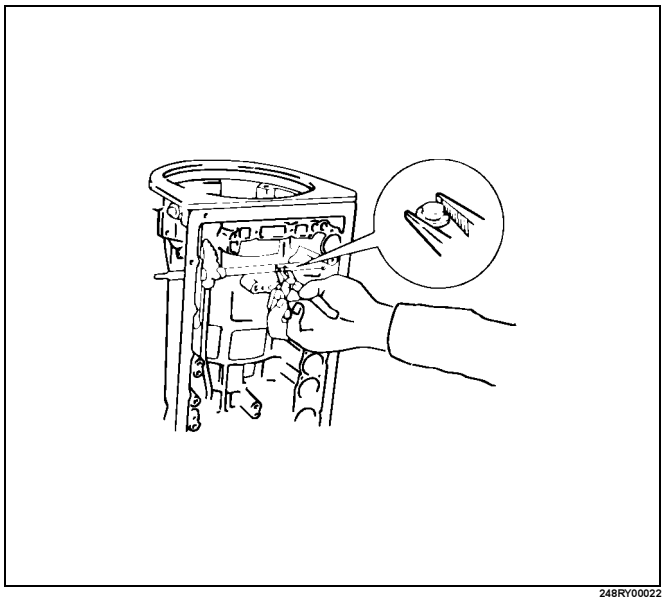
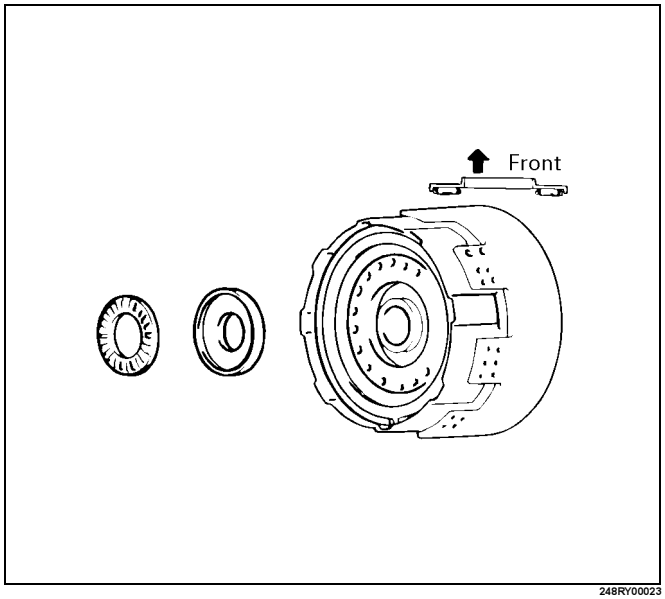
- Install the E-ring to the pin.


248RY00022

15. Coat the bearing and race with petroleum jelly and install them onto the forward clutch.
Bearing and race diameter (Reference)

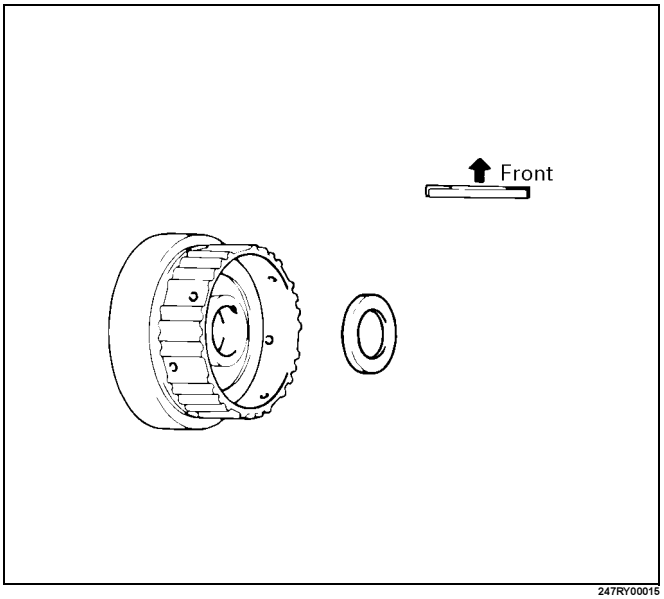
	Inside	Outside
Bearing	26.0 mm (1.024 in)	46.7 mm (1.839 in)
Race	26.0 mm (1.024 in)	48.9 mm (1.925 in)



248RY00023

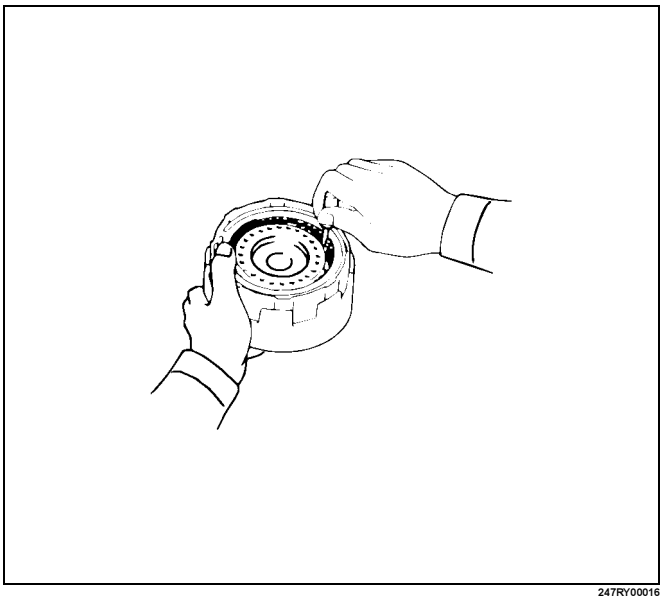
16. Coat the race with petroleum jelly and install it onto the front planetary ring gear.
Race diameter (Reference)

	Inside	Outside
Race	26.8 mm (1.055 in)	47.0 mm (1.850 in)



247RY00015

Align the flukes of the discs in the forward clutch.


247RY00016

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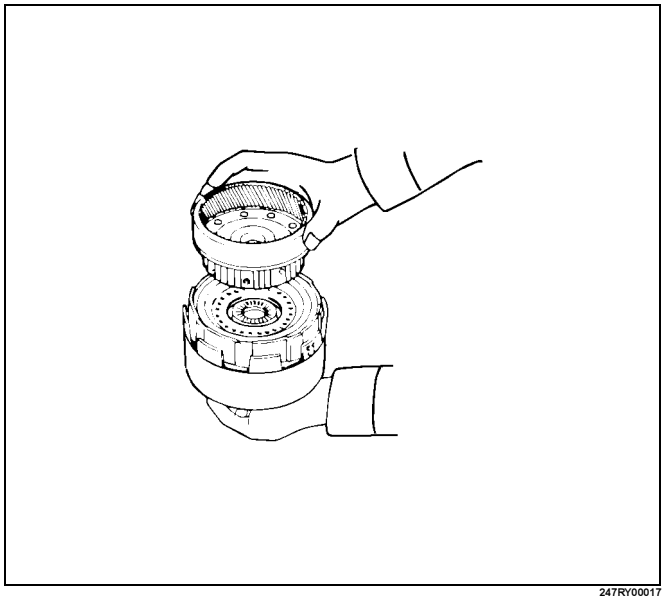
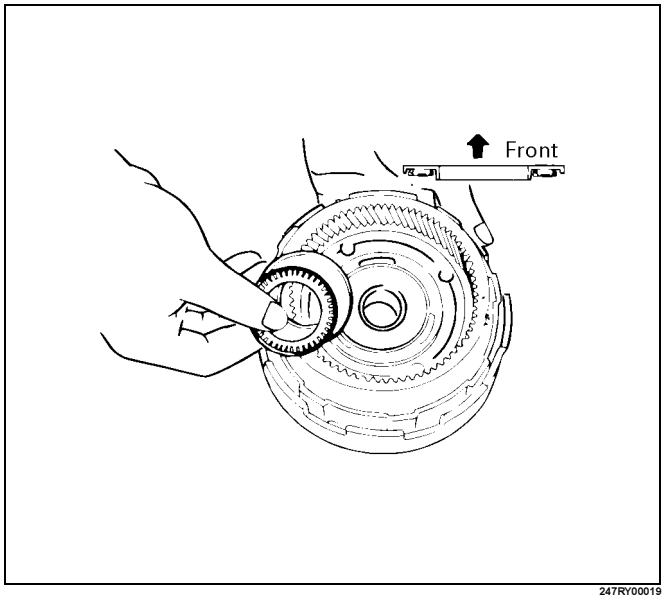
17. Align the spline of the front planetary gear with the flukes of the discs and install the front planetary gear to the forward clutch.


247RY00017

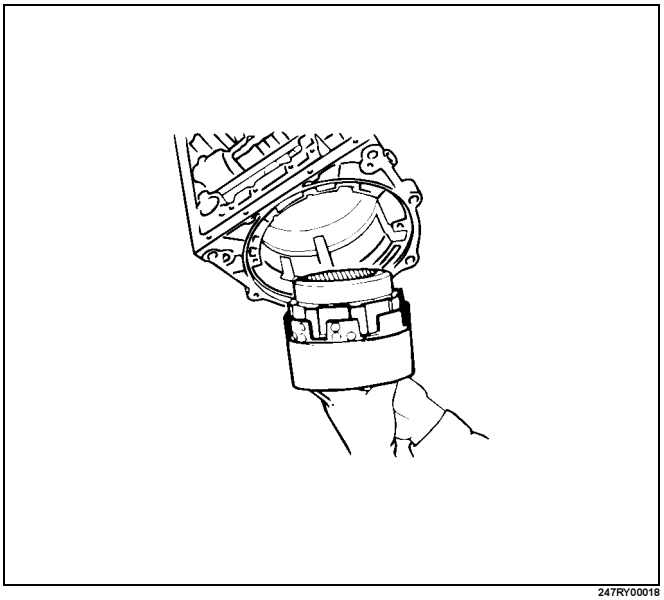
18. Coat the bearing and race with petroleum jelly and install them onto the ring gear.
Bearing and race diameter (Reference)

	Inside	Outside
Bearing	35.15 mm (1.384 in)	53.65 mm (2.112 in)
Race	35.15 mm (1.384 in)	53.65 mm (2.112 in)



247RY00019

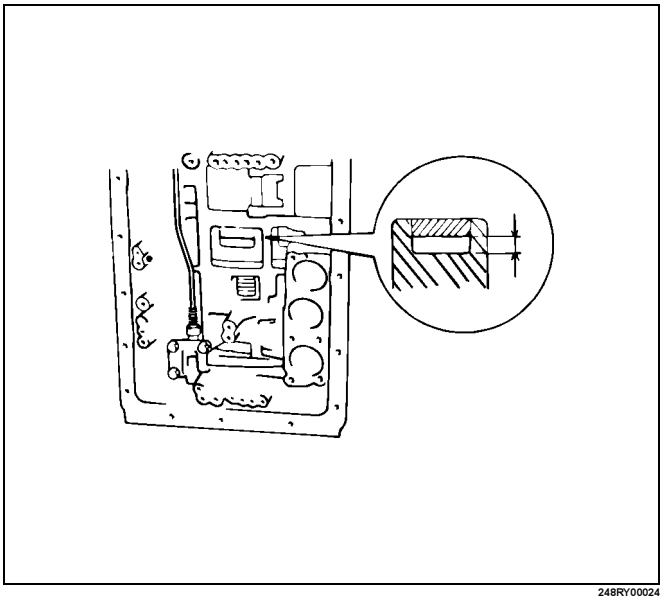
19. Install the assembled direct clutch, forward clutch and front planetary ring gear into the transmission case.


247RY00018

- Using vernier calipers, measure the distance between the sun gear input drum and direct clutch drum as shown in the figure.

Height: 2.5– 4.5 mm (0.098 – 0.177 in)

If the values are nonstandard, check for an improper installation.

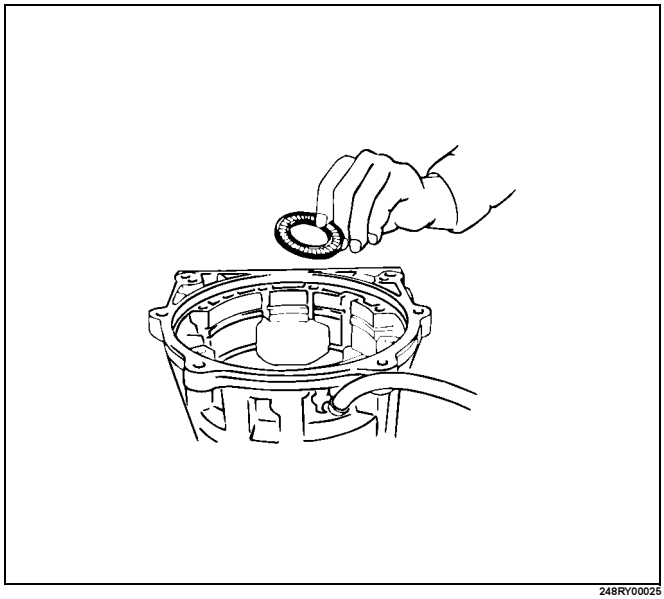

248RY00024

ProCarManuals.com

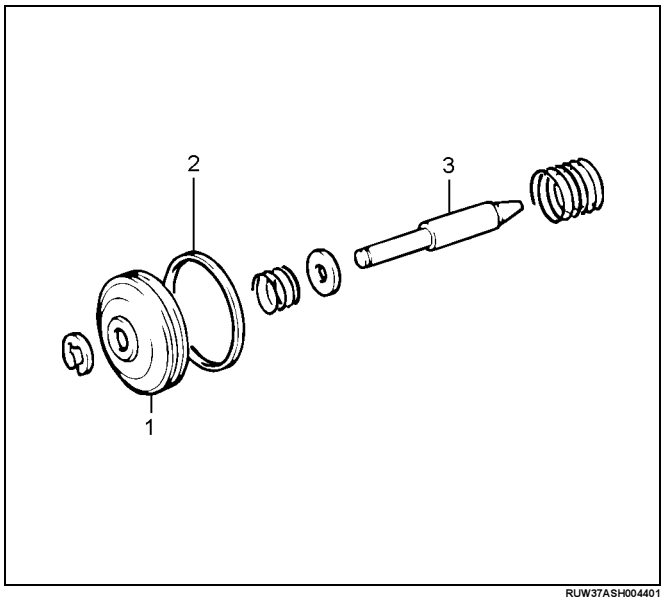
Coat the assembled bearing and race with petroleum jelly and install it onto the forward clutch.

Assembled bearing and race diameter (Reference)

	Inside	Outside
Bearing and race	33.7 mm (1.33 in)	47.8 mm (1.88 in)


248RY00025

20. Assembly second coast brake piston assembly.
    Coat the oil seal ring with ATF and install it to the second coast brake piston.
    Install the washer, spring and piston to the piston rod. Install the E-ring.

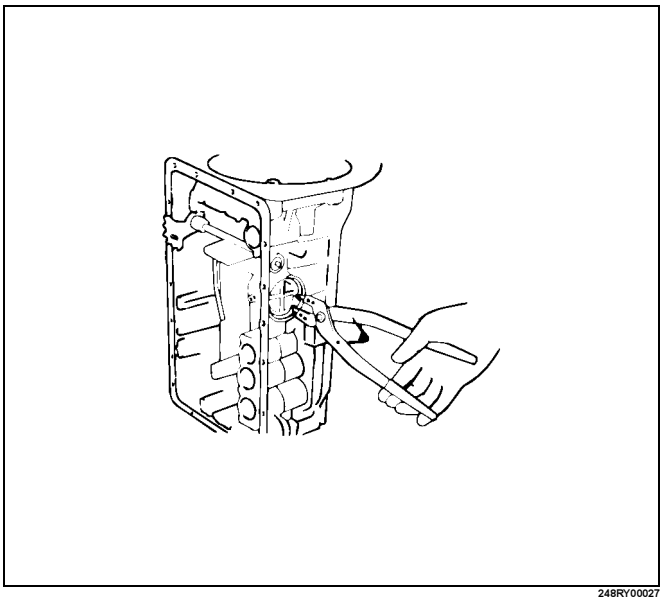


RUW37ASH004401

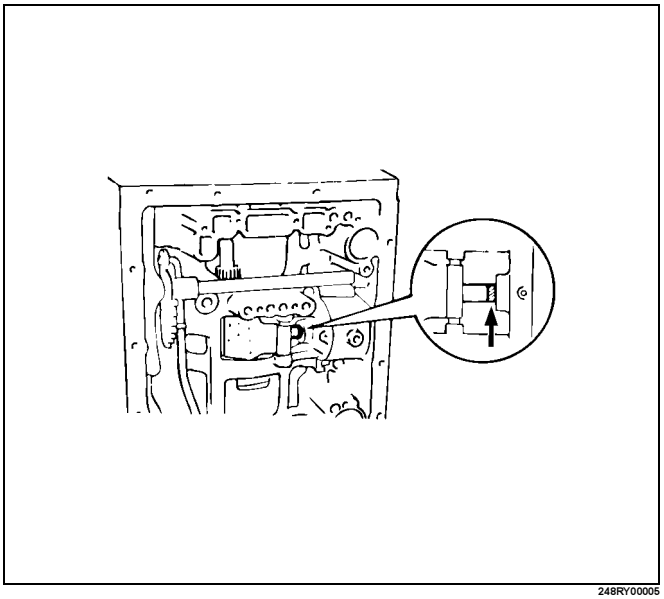
Legend

(1) Second coast brake piston
(2) Oil seal
(3) Piston rod

21. Coat two new oil seals with ATF and install them to the piston cover.
    Install the spring, second coast brake piston assembly and piston cover to the transmission case.
    Using snap ring pliers, install the snap ring.


248RY00027

22. Check piston stroke of second coast brake
    Place a mark on the second coast brake piston rod as shown in the figure.


248RY00005

Using wire gauge, measure the stroke by applying the compressed air (390 – 780 kPa or 57 – 114 psi) as shown in the figure.

Piston stroke: 1.5 – 3.0mm (0.059 – 0.118in)

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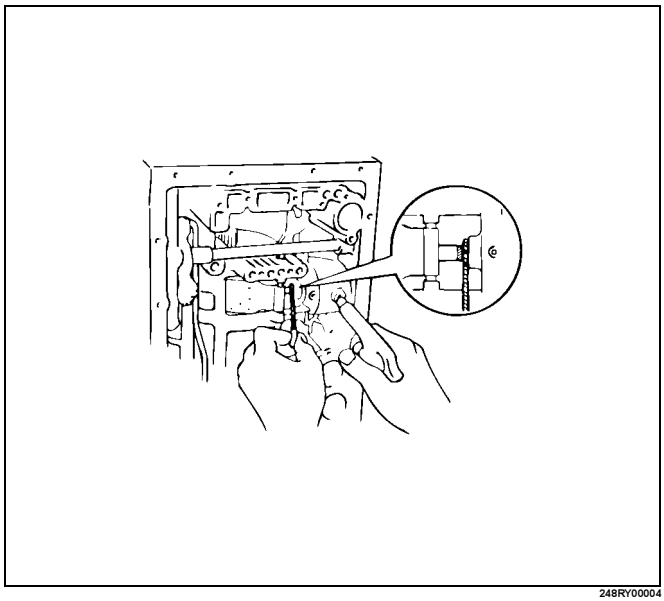
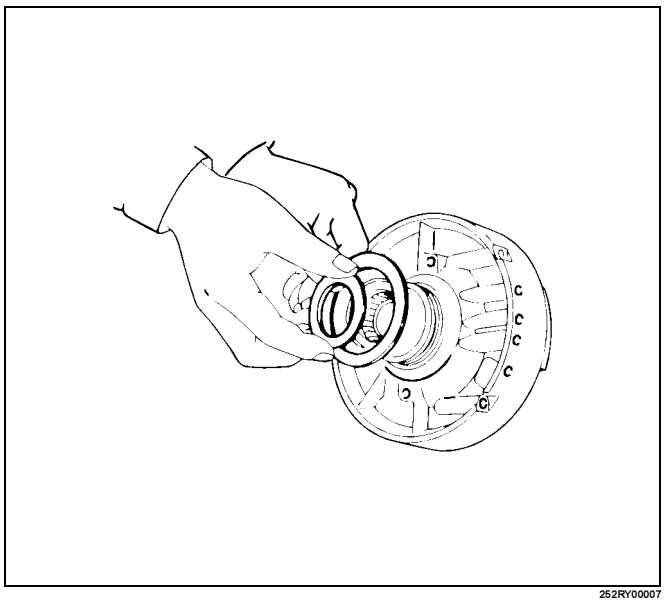
If the values are nonstandard, check for an improper installation.


248RY00004

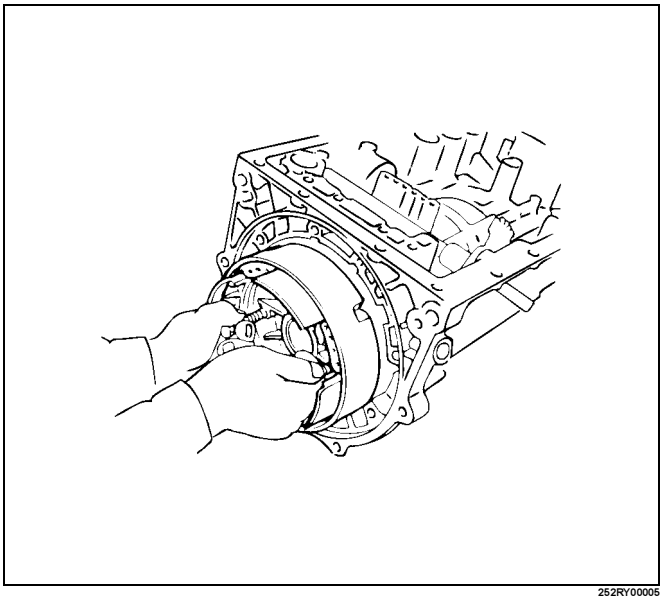
23. Coat the race with petroleum jelly and install it onto the overdrive support assembly.

Race diameter (Reference)

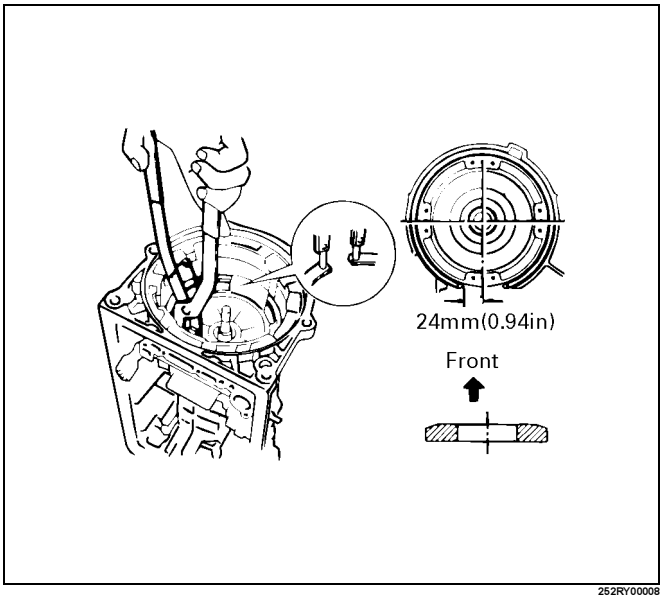
	Inside	Outside
Race	36.7 mm (1.44 in)	50.8 mm (2.00 in)


252RY00007

24. Aim the bolt and oil holes of the overdrive support toward the valve hole side, and align them with the bolt hole of the transmission case and insert the overdrive support.


252RY00005

25. Using snap ring pliers, install the snap ring as shown in the figure.



252RY00008

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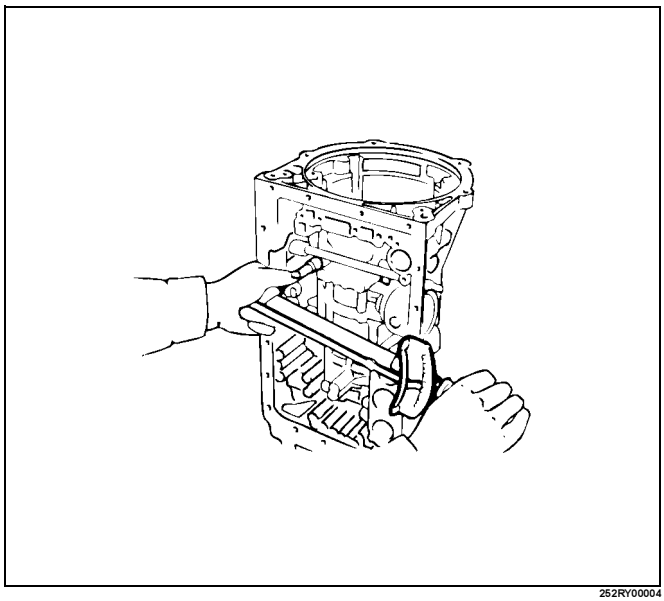
- Install and tighten the two bolts.

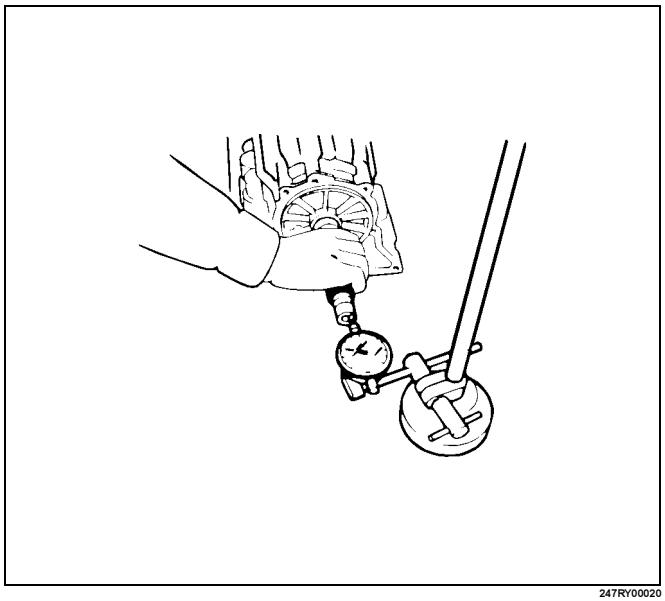
Torque: 25N·m (19lbft)



252RY00004

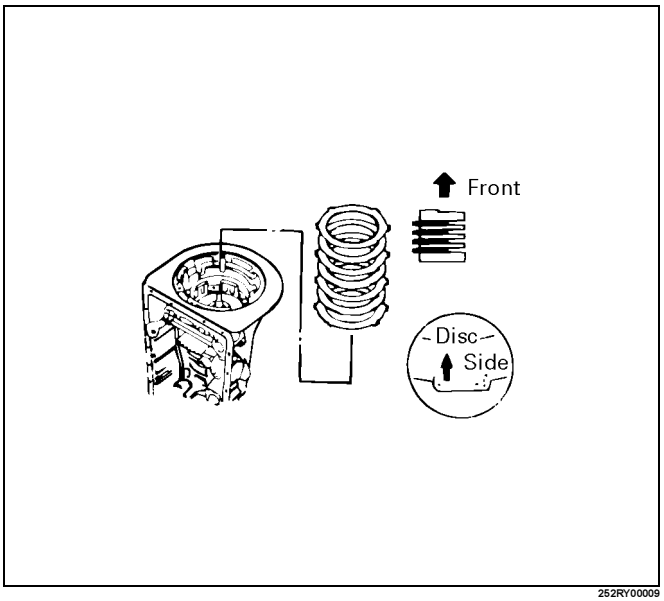
26. Check end of output shaft.
    Using a dial indicator, measure the end play of the output shaft by hand.

End play: 0.27 – 0.86 mm (0.0106 – 0.0339 in)



247RY00020

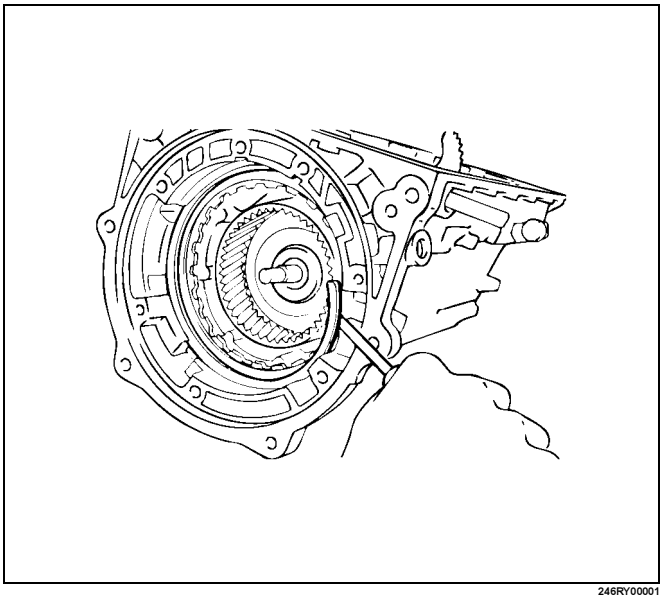
27. Install the (flat ring) 4.0 mm (0.157 in) thick flange with the rounded edge side of the flange facing the disc.
    Alternately install four discs and four plates. (Disc first)



252RY00009

28. Install the (stepped ring) flange with the flat side of the flange facing the disc.
    Install the snap ring.
    Snap ring (Reference)

Inside diameter	167.9 mm (6.61 in)



246RY00001

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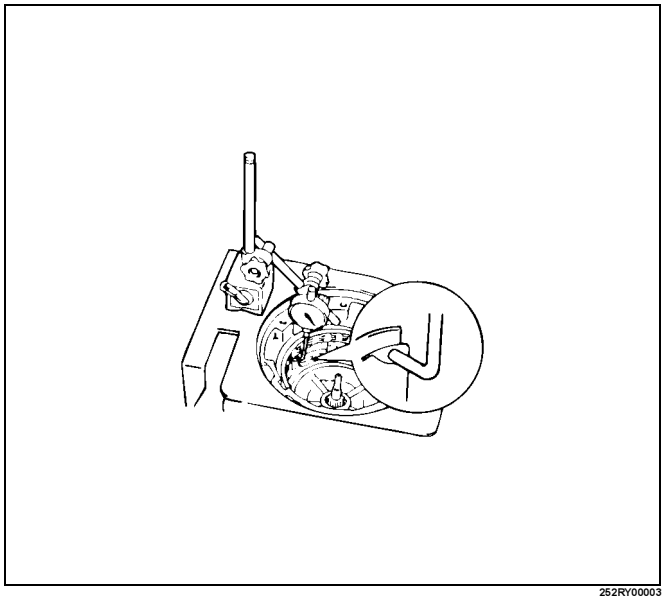
29. Check piston stroke of overdrive brake.
    Place a dial indicator onto the overdrive brake piston as shown in the figure.



252RY00003

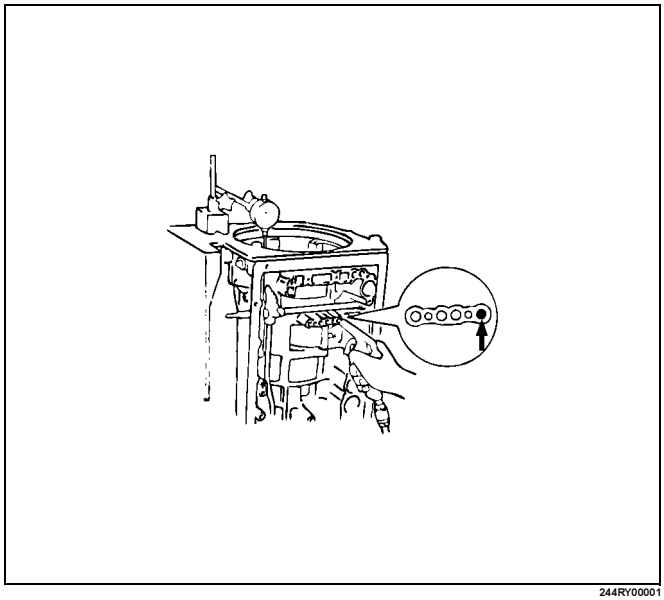
Measure the stroke by applying and releasing the compressed air (390 – 780 kPa or 57 – 114 psi) as shown in the figure.

Piston stroke: 1.40 – 1.70 mm (0.0551 – 0.0669 in)

If the values are nonstandard, check for an improper installation.

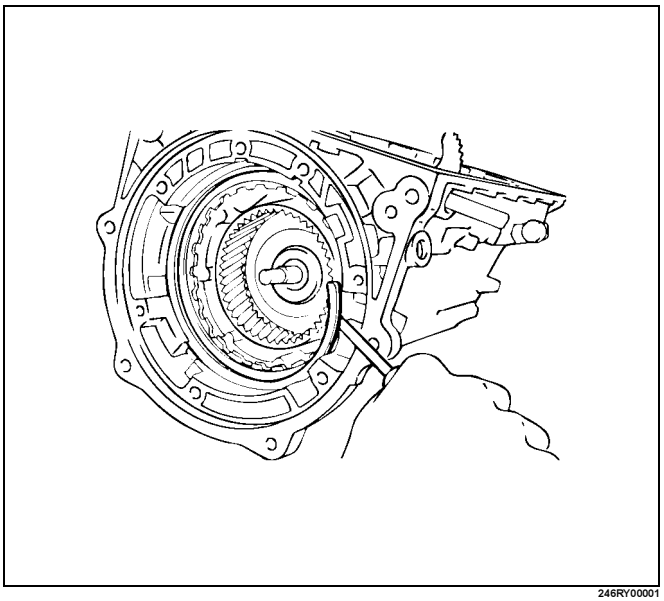
Available flange size

3.3 mm (0.130 in)	3.8 mm (0.150 in)
3.5 mm (0.138 in)	3.9 mm (0.154 in)
3.6 mm (0.142 in)	4.0 mm (0.158 in)
3.7 mm (0.146 in)	



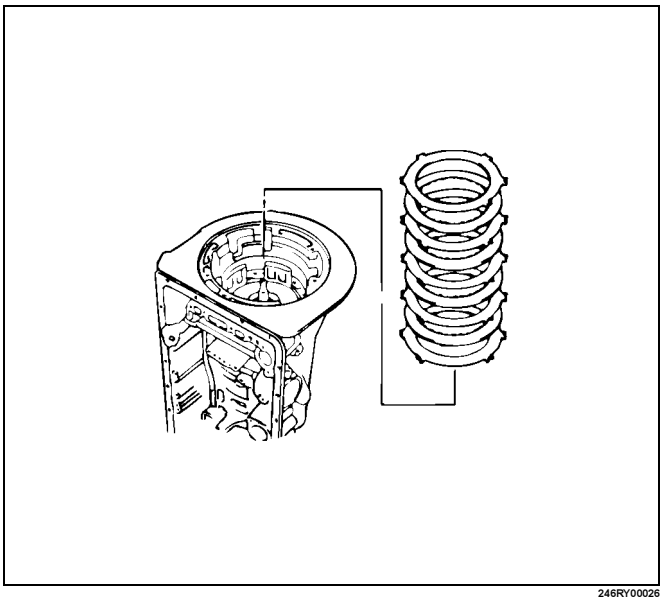
244RY00001

Remove the snap ring.



246RY00001

Remove one flange, four plates and four discs.



246RY00026

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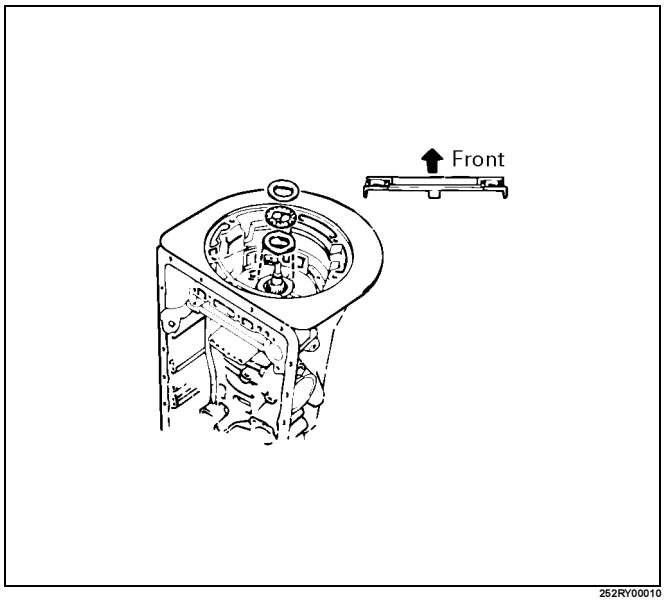
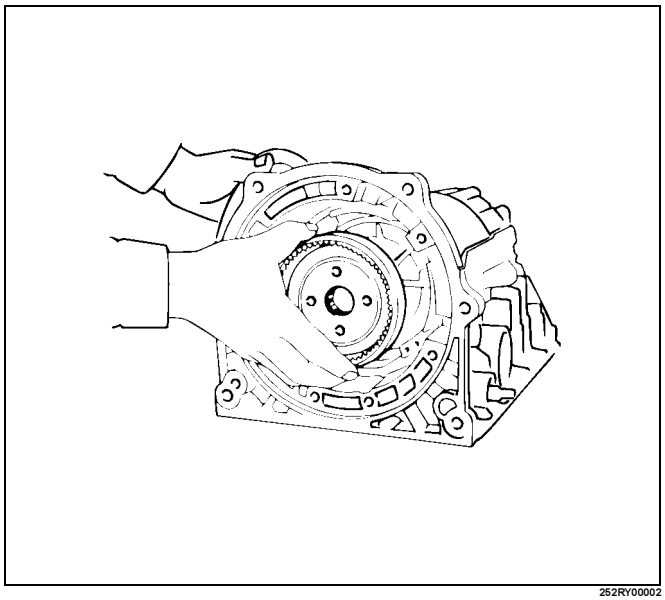
30. Coat the bearing and races with petroleum jelly and install them onto the overdrive support.
Bearing and races diameter (Reference)

	Inside	Outside
Race (Front)	37.2 mm (1.465 in)	58.8 mm (2.315 in)
Bearing and race (Rear)	33.7 mm (1.327 in)	50.1 mm (1.972 in)



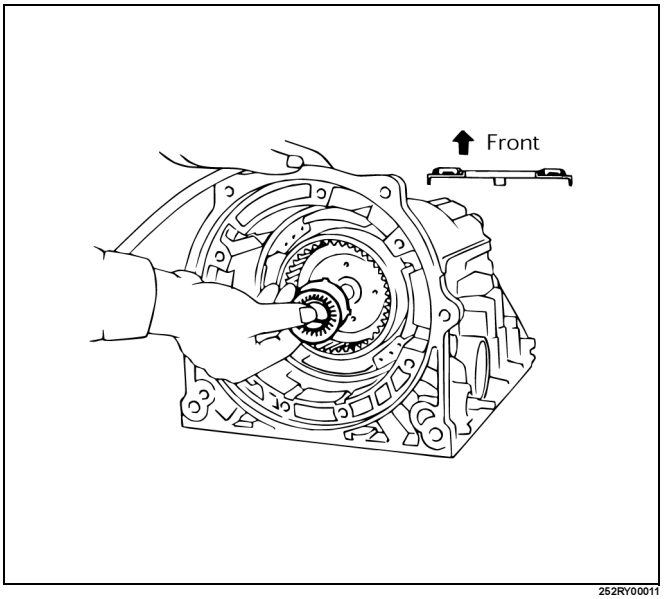
252RY00010

31. Install the overdrive planetary ring gear.


252RY00002

32. Coat the bearing and race with petroleum jelly and install them onto the planetary ring gear.
Bearing and race diameter (Reference)

	Inside	Outside
Bearing and race	24.2 mm (0.953 in)	47.8 mm (1.882 in)

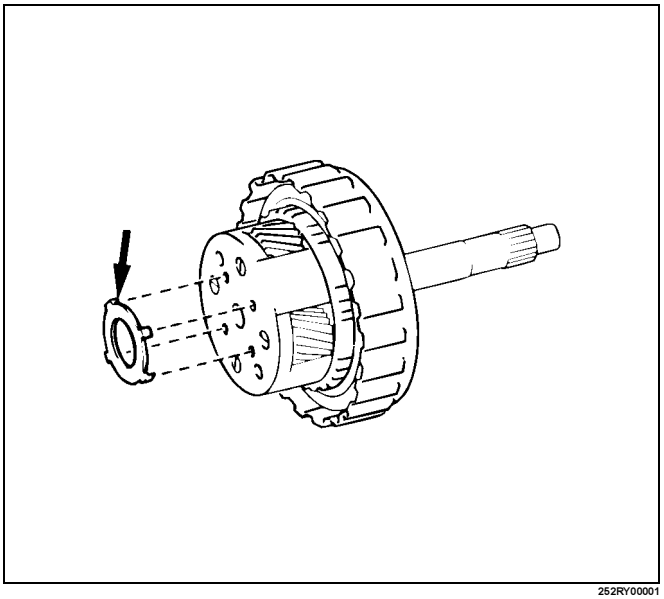


252RY00011

Install the (flat ring) 4.0 mm (0.157 in) thick flange with the rounded edge side of the flange facing the disc.
Alternately install four discs and three plates. (Disc first)
Install the (stepped ring) flange with the flat side of the flange facing the disc.
Install the snap ring.

33. Coat the race with petroleum jelly and install it onto the planetary gear.
Race diameter (Reference)

	Inside	Outside
Race	24.7 mm (0.972 in)	41.8 mm (1.646 in)


252RY00001

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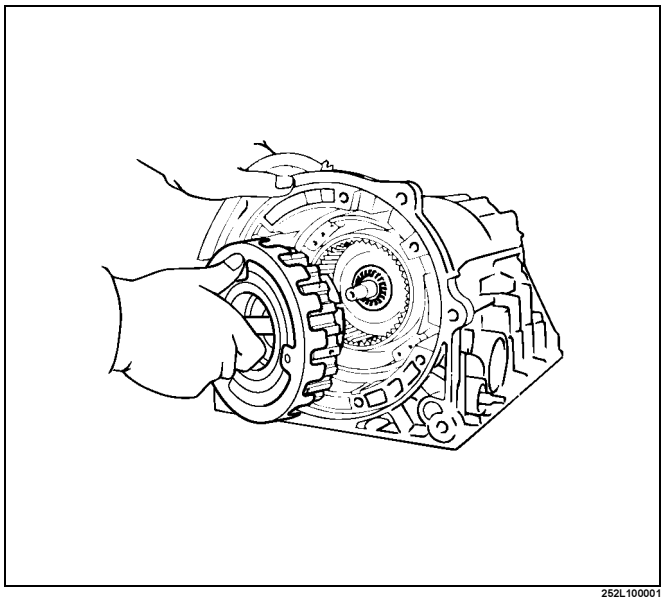
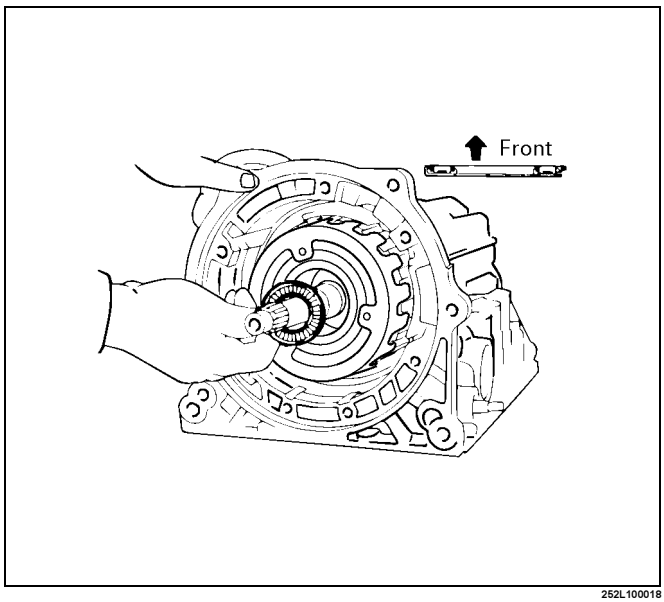
34. Install the overdrive planetary gear and direct clutch.


252L100001

35. Coat the assembled bearing and race with petroleum jelly and install it onto the direct clutch.
Bearing and race diameter (Reference)

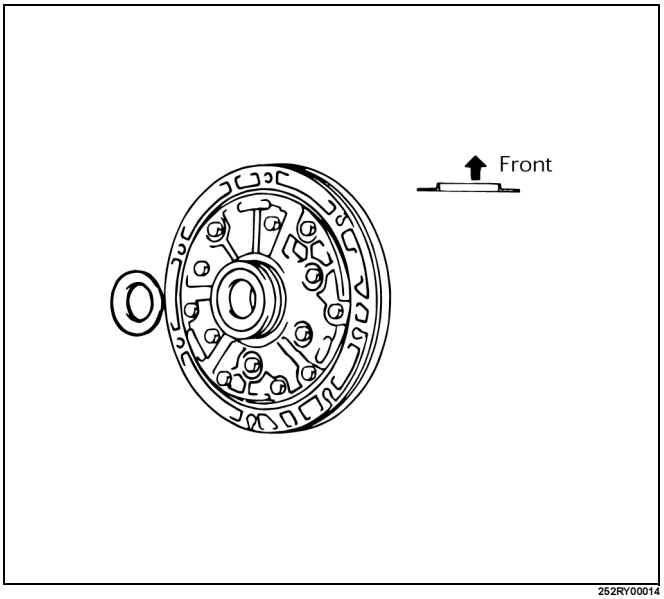
	Inside	Outside
Bearing and race	28.9 mm (1.138 in)	50.2 mm (1.976 in)



252L100018

36. Coat the race with petroleum jelly and install it onto the oil pump.
Race diameter (Reference)

	Inside	Outside
Race	28.6 mm (1.126 in)	46.5 mm (1.831 in)

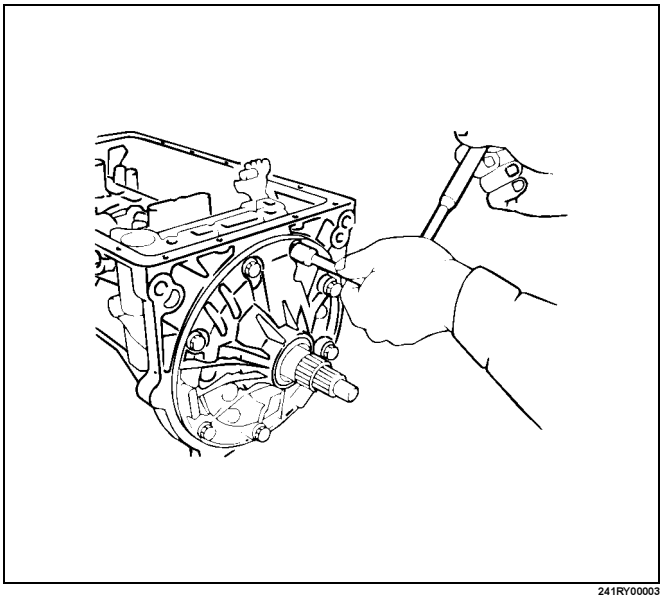


252RY00014

37. Coat the O-ring with ATF and install it around the pump body.
Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.
Hold the input shaft, and lightly press the oil pump body to slide the oil seal rings on the stator shaft through the direct clutch drum.
CAUTION:
Do not push on the oil pump strongly or the oil seal ring will stick to the direct clutch drum.
Install the seven bolts.

Torque: 22 N·m (16 lbft)

38. Check input shaft rotation.
Make sure the input shaft rotates smoothly.


241RY00003

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Diaassembly, Inspection and Reassembly of minor Components

NOTE: The instructions here are organized so that you work on only one component group at a time.
This will help avoid confusion from similar-looking parts of different subassemblies being on your workbench at the same time.
The component groups are inspected and repaired from the converter housing side.
As much as possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a component group cannot be reassembled because parts are being ordered, be sure to keep all parts of that group in separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.
Recommended ATF type DEXRON III.

General Cleaning Notes:

1. All disassembled parts should be washed clean and any fluid passages and holes should be blown through with compressed air.
2. When using compressed air to dry parts, always aim away from yourself to prevent accidentally spraying automatic transmission fluid in your face.
3. The recommended automatic transmission fluid should be used for cleaning.

Parts Arrangement:

1. After cleaning, the parts should be arranged in proper order to allow performing inspection, repairs, and reassembly with efficiency.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New brakes and clutches that are to be used for replacement must be soaked in transmission fluid for at least thirty minutes before assembly.

General Assembly:

1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. All gaskets and rubber O-ring should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the subassembly containing that bushing must be replaced.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly or vaseline to keep parts in place.

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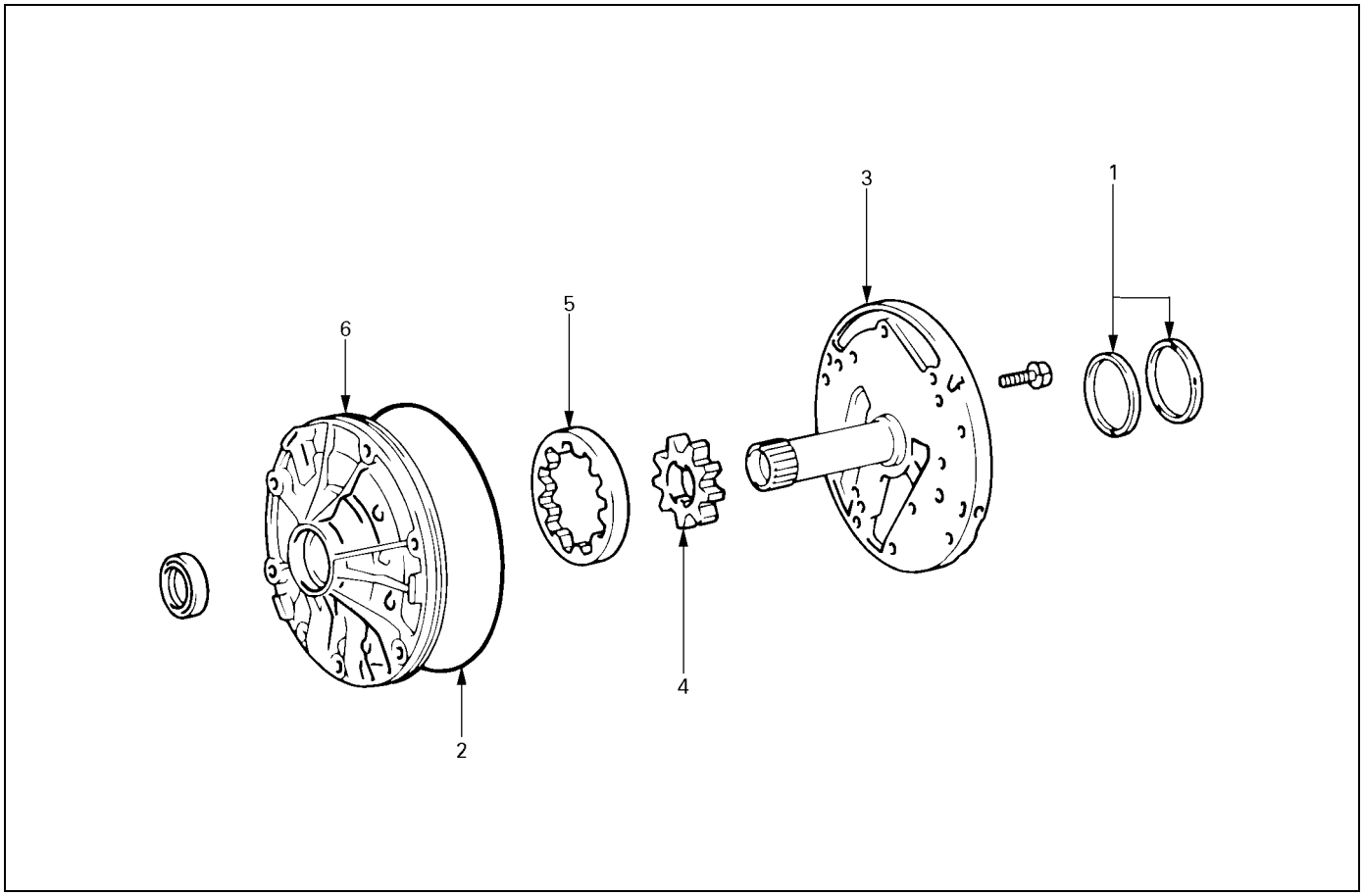
Oil Pump

Disassembly View



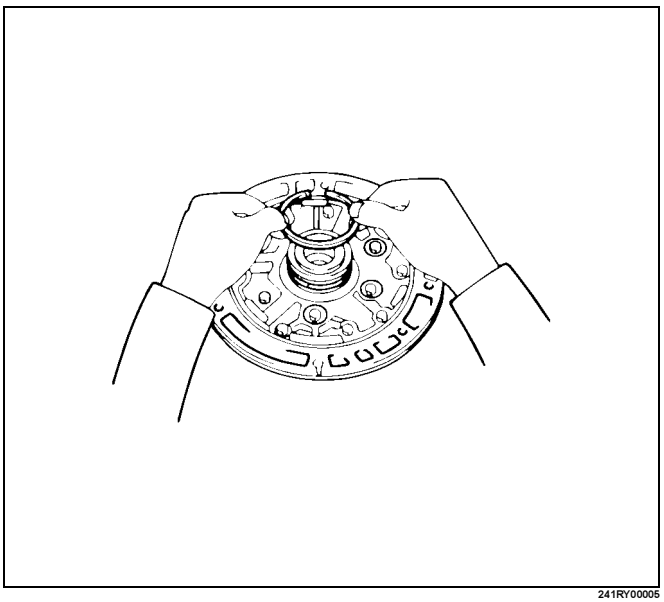
241R200003

Legend

(1) Oil seal ring
(2) O-ring
(3) Stator shaft
(4) Oil pump drive gear
(5) Oil pump driven gear
(6) Oil pump body

Disassembly

1. Use torque converter as work stand.
   Remove 2 oil seal rings from stator shaft.



241RY00005

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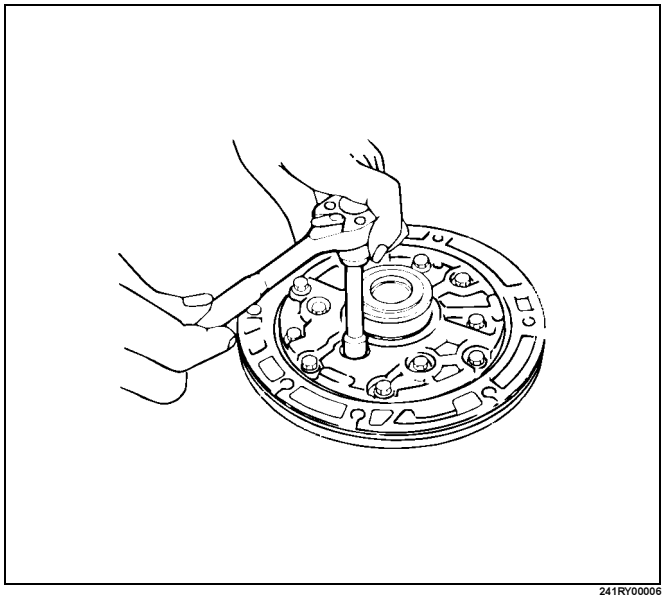
2. Remove the O-ring.
3. Remove the stator shaft.
4. Remove the oil pump drive gear.
5. Remove the oil pump driven gear.
6. Remove the oil pump body.
   Remove 13 bolts, and then remove the stator shaft from oil pump body.
   Then remove drive and driven gear.


241RY00006

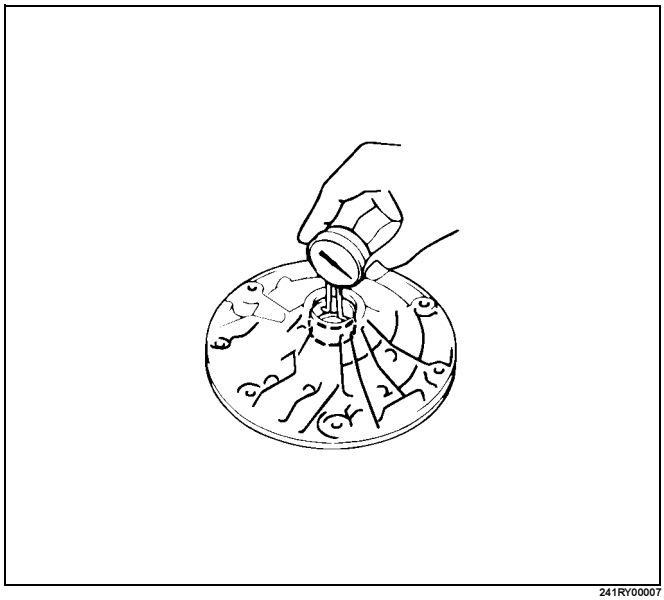
Inspection and Repair

Make necessary correction or parts replacement if wear, damage or any abnormal conditions are found through inspection.

1. Check oil pump body bushing.
   Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Maximum inside diameter: 38.19mm (1.5035in)

If the inside diameter is greater than the maximum, replace the oil pump body.

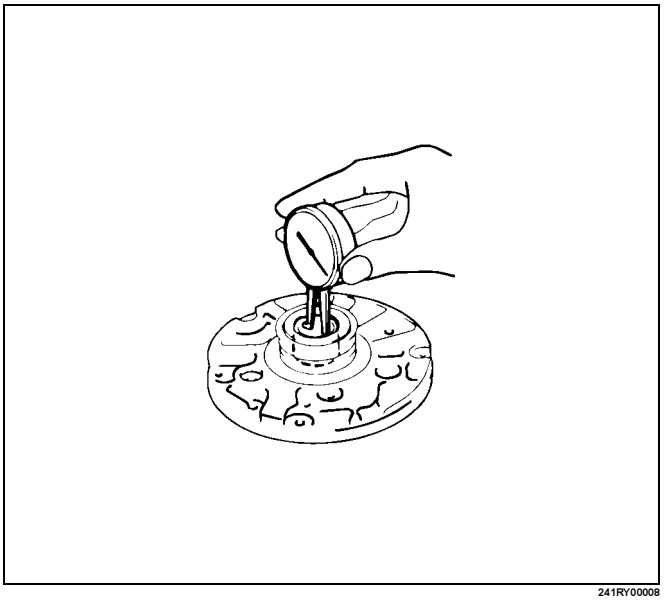

241RY00007

2. Check stator shaft bushing.
   Using a dial indicator, measure the inside diameter of the stator shaft bushing.

Maximum inside diameter: Front side: 21.58mm (0.8496in)

Maximum inside diameter: Rear side: 27.08mm (1.0661in)

If the inside diameter is greater than the maximum, replace the stator shaft.

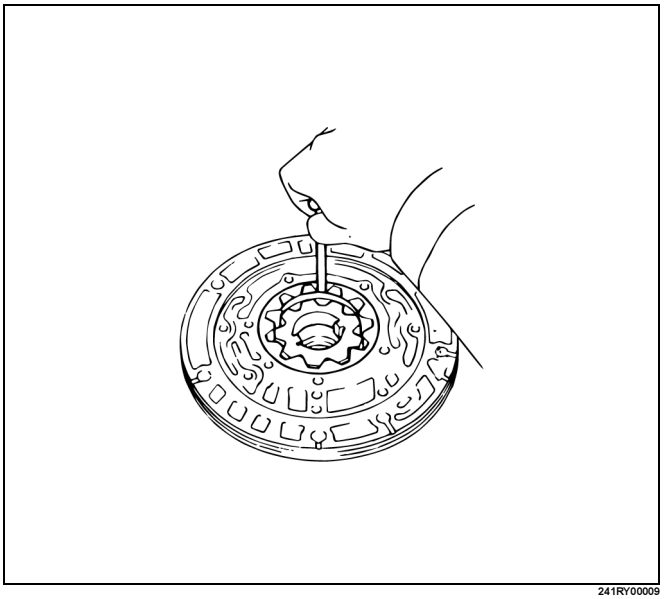

241RY00008

3. Check tip clearance of both gears.
   Measure between the gear teeth and the cresent-shaped part of the pump body.

Standard tip clearance: 0.11 – 0.14mm (0.0043 – 0.0055in)

Maximum tip clearance: 0.19mm (0.0075in)

If the tip clearance is greater than the maximum, replace the drive gear, driven gear or pump body.


241RY00009

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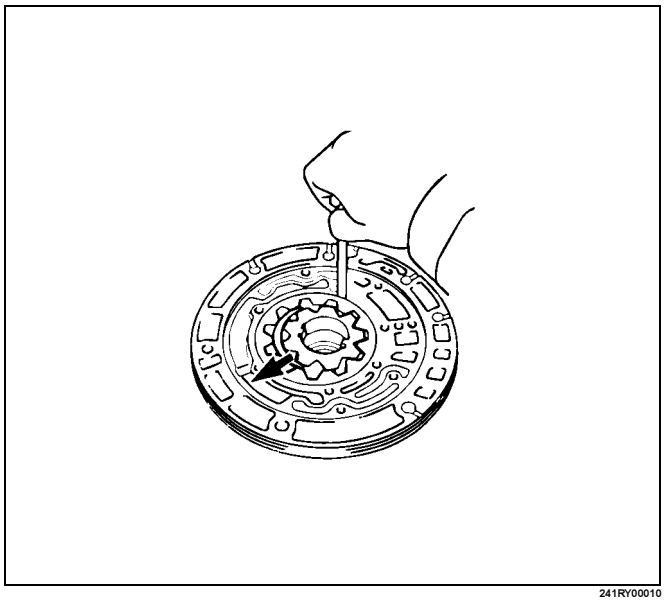
4. Check body clearance of driven gear.
   Push the driven gear to one side of the body.
   Use a feeler gauge, measure the clearance.

Standard body clearance: 0.07 – 0.15mm (0.0028 – 0.0059in)

Maximum body clearance: 0.2mm (0.0079in)

If the body clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



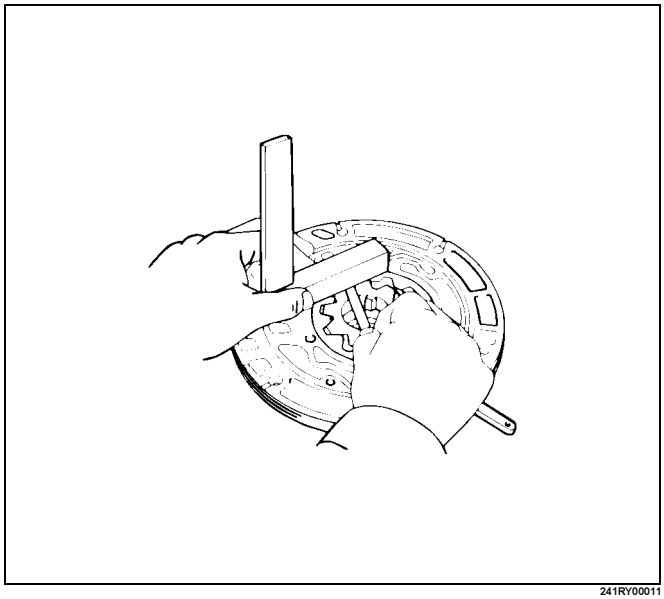
241RY00010

5. Check side clearance of both gears.
   Using a steel straightedge and a feeler gauge, measure the side clearance of both gears.

Standard side clearance: 0.02 – 0.05mm (0.0008 – 0.0020in)

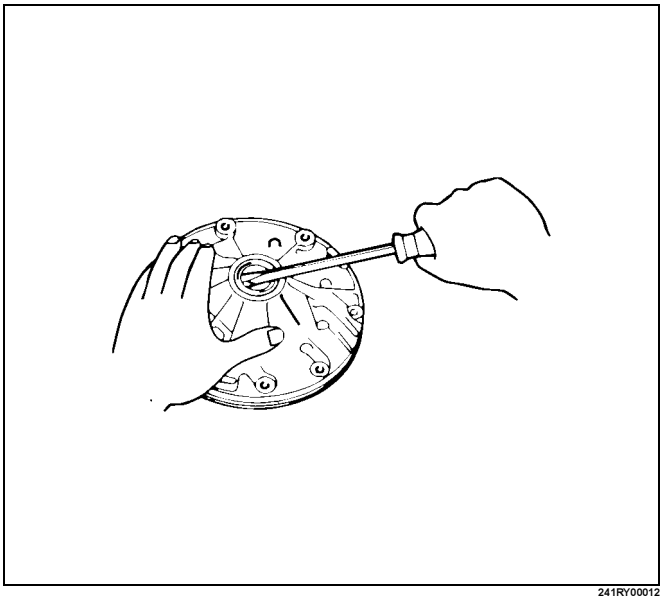
Maximum side clearance: 0.1mm (0.004in)

If the side clearance is greater than the maximum, replace the drive gear, driven gear or pump body.



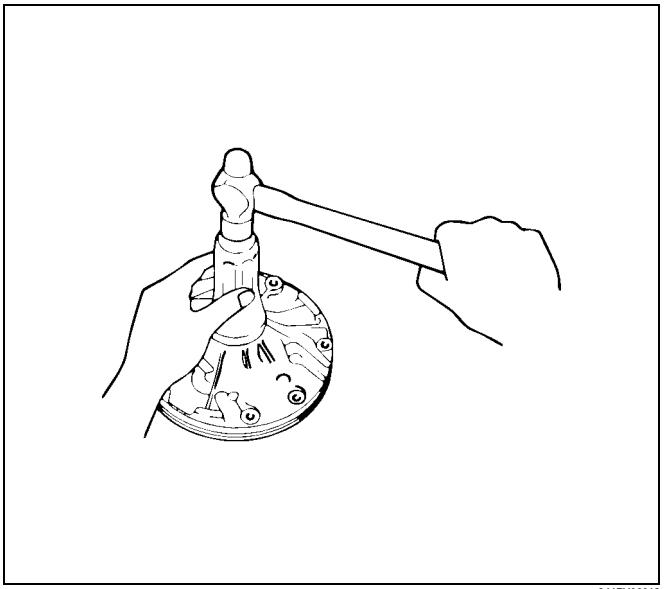
241RY00011

6. Check oil seal.
   Check for wear, damage or cracks.
   If necessary, replace oil seal.
   Pry off the oil seal with a screwdriver.



241RY00012

Using special tool, install a new oil seal.
The oil seal end should be flush with the outer edge of the pump body.
Oil seal installer : J–9617
Coat the oil seal lip with multipurpose grease.



241RY00013

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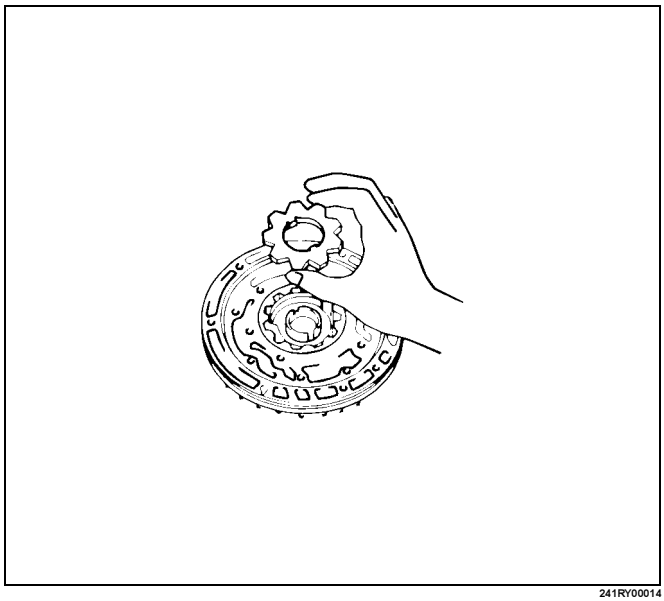
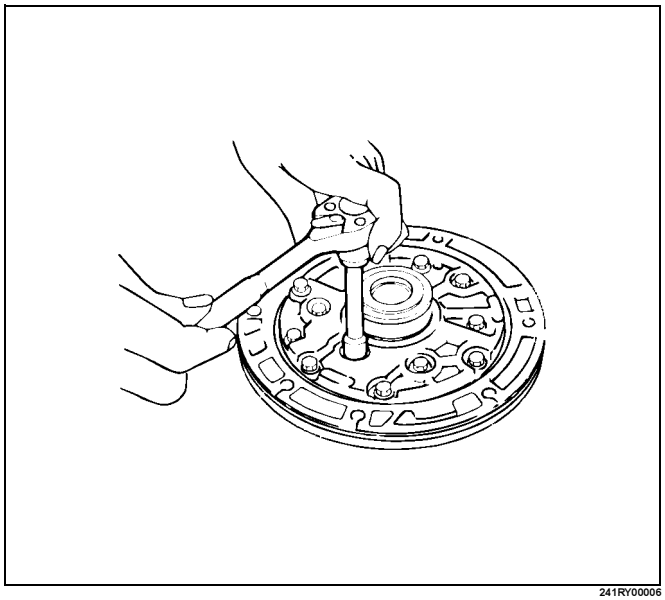
Reassembly

1. Place the oil pump body on the torque converter.
2. Coat the driven gear and drive gear with ATF.
3. Install the driven gear and drive gear.


241RY00014

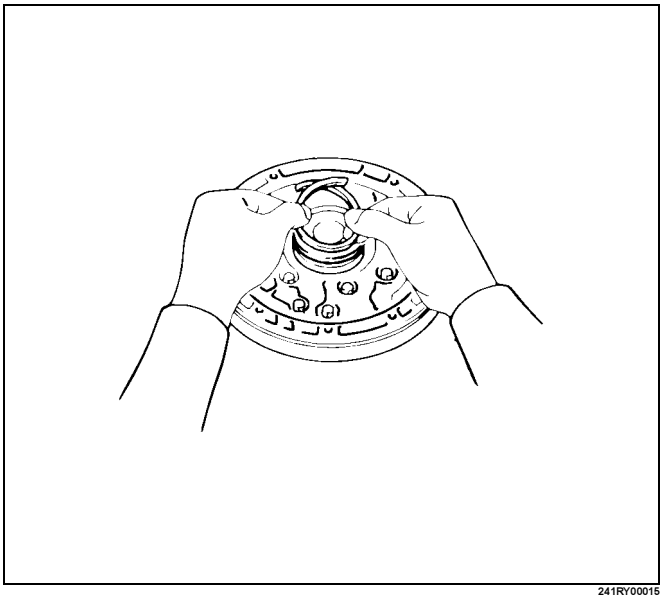
4. Align the stator shaft with the bolt holes. Tighten the thirteen bolts.

Torque: 10 N·m (87 lb in)


241RY00006

5. Install the oil seal ring.
   - Coat the oil seal rings with ATF.
   - Contract the oil seal rings as shown, and install them onto the stator shaft.

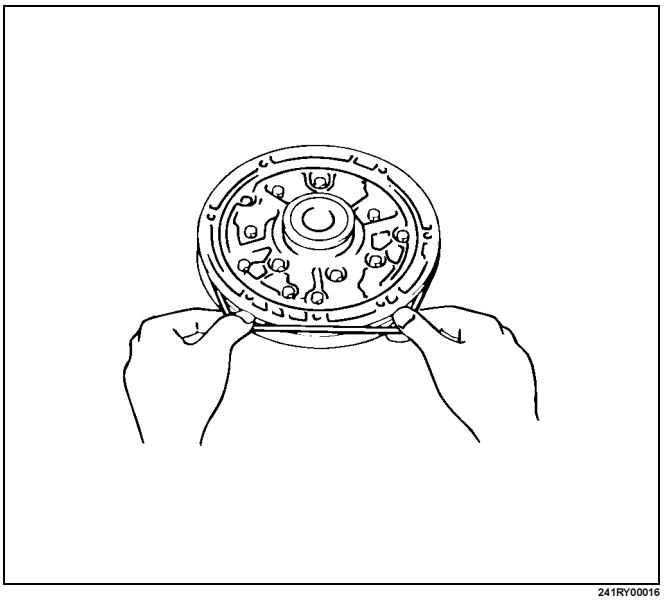
NOTE: Do not spread the ring ends too much.


241RY00015

6. Coat a new O-ring with ATF and install it to the oil pump body.

O-ring size (Reference)

Inside diameter	204.9 mm (8.067 in)
Thickness	3.5 mm (0.138 in)


241RY00016

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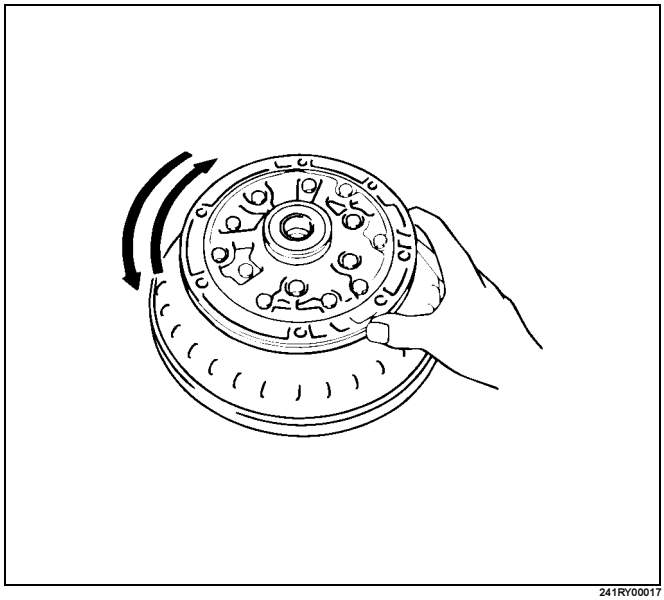
7. Check oil pump drive gear rotation.
   Make sure the drive gear rotates smoothly when installed to the torque converter.



241RY00017

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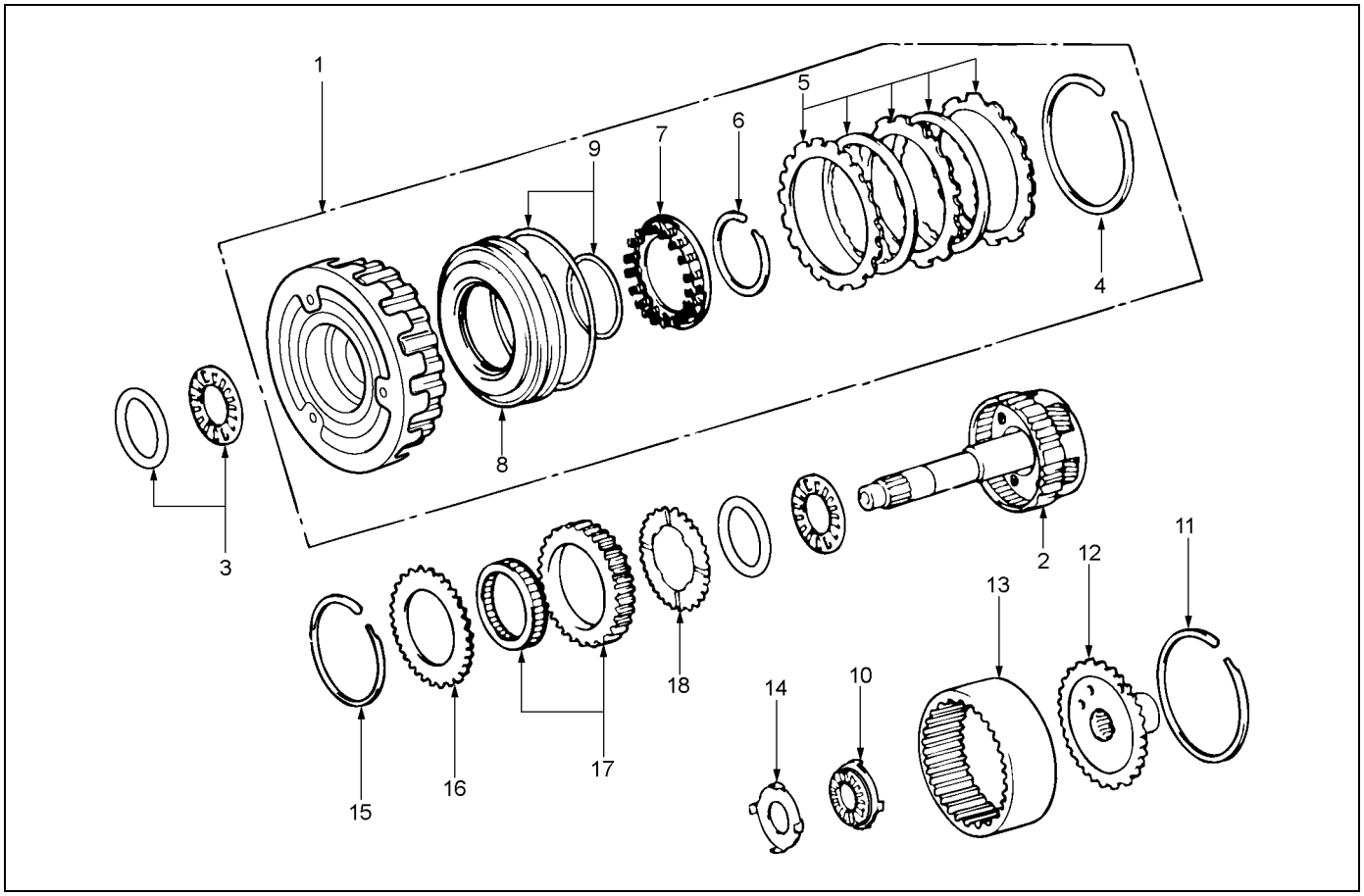
OD Planetary Gear and OD Direct Clutch Assembly (C–0)

Disassembled View



RTW37AMF000701

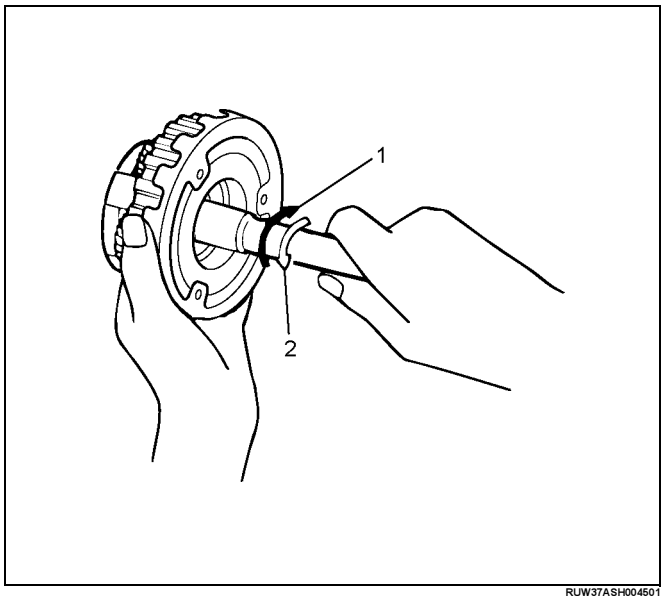
Legend

(1) OD direct clutch assembly
(2) OD planetary gear assembly
(3) Thrust bearing
(4) Snap ring
(5) Flange, disk and plate
(6) Snap ring
(7) Piston return spring
(8) OD direct clutch piston
(9) O-ring
(10) Race and bearing asm
(11) Snap ring
(12) Ring gear flange
(13) OD planetary ring gear
(14) Race
(15) Snap ring
(16) Retaining plate
(17) OD one-way clutch
(18) Thrust washer

ProCarManuals.com

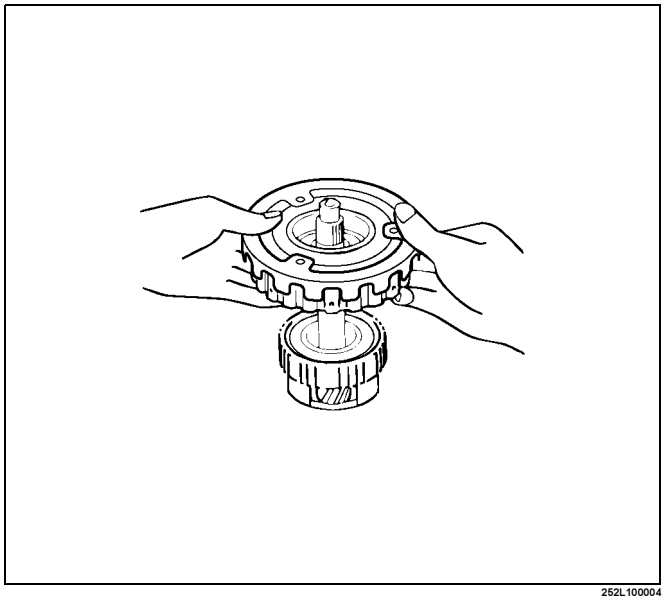
Disassembly

1. Check operation of one-way clutch.
   Hold the OD direct clutch drum and turn the input shaft.
   The input shaft should turn freely clockwise and should lock counterclockwise.



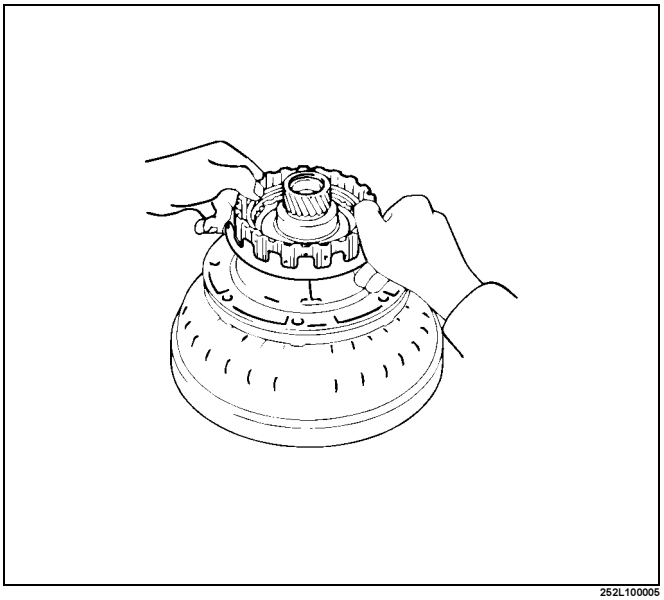
RUW37ASH004501

2. Remove OD direct clutch assembly from OD planetary gear assembly.


252L100004

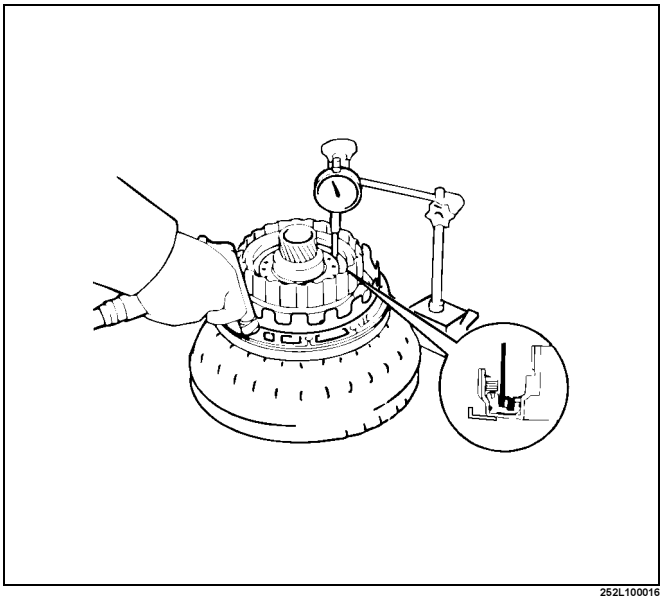
3. Then remove thrust bearing with the race from OD direct clutch drum.

4. Check piston stroke of OD direct clutch (C–0).
   Place the oil pump onto the torque converter, and then place the OD direct clutch assembly onto the oil pump.


252L100005

Use a dial indicator, measure the OD direct clutch piston stroke applying and releasing the compressed air (390 – 780 kPa or 57 – 114 psi) as shown.

Piston stroke: 1.85 – 2.15mm (0.0728 – 0.0846in)


252L100016

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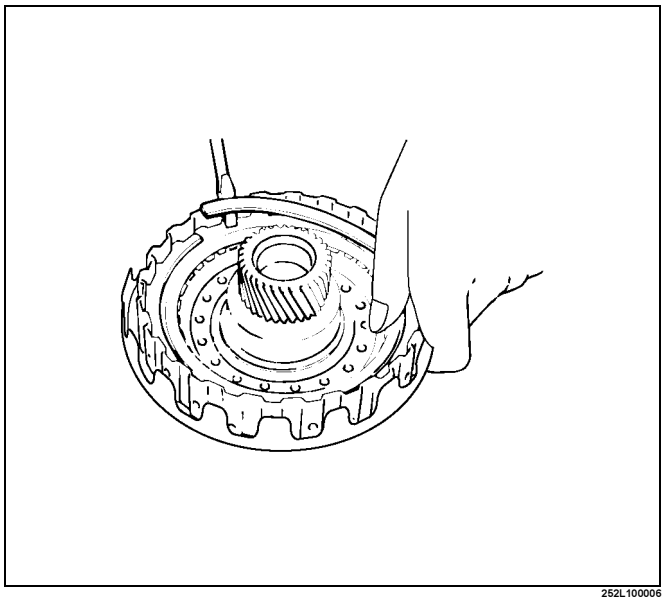
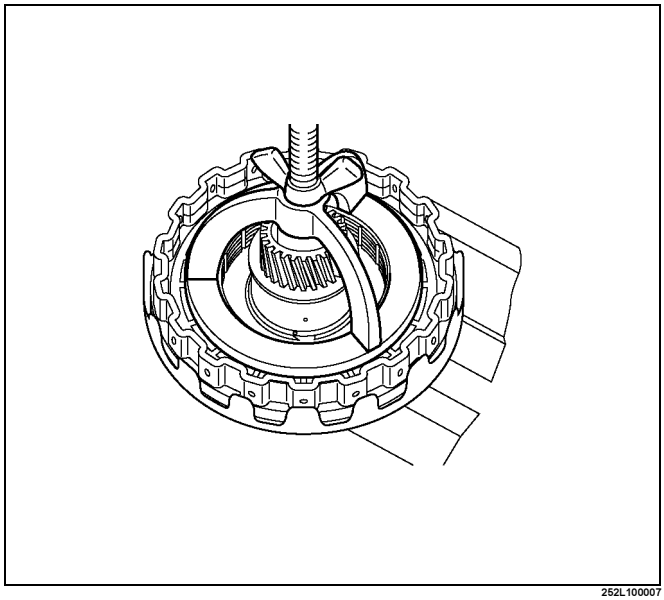
5. Remove snap ring from clutch drum.



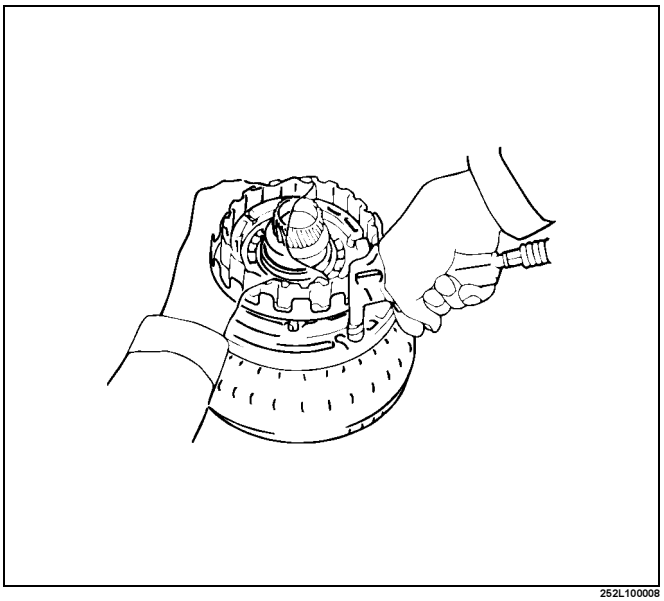
252L100006

6. Remove flange, two discs and two plates.
7. Place special tool on the spring retainer and compress the return spring.
   Using snap ring pliers, remove the snap ring.
   Spring compressor : J–23327–1



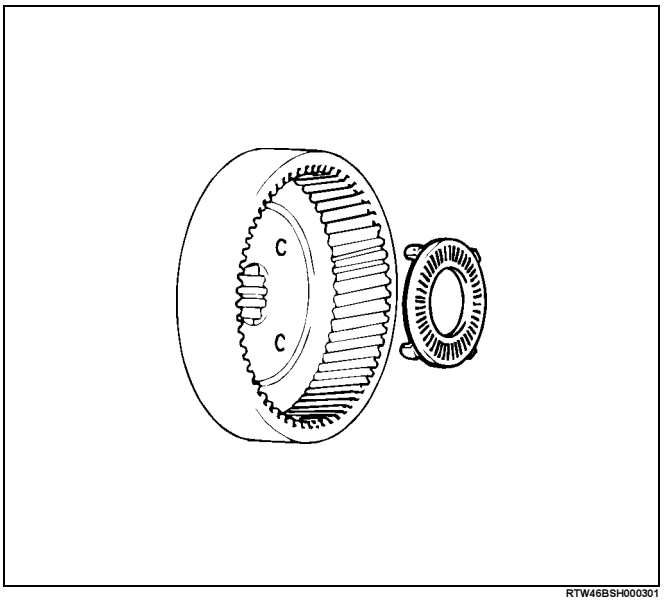
252L100007

8. Remove piston return spring
9. Remove the OD direct clutch piston with O-ring.
   - Place the oil pump onto the torque converter and then place the OD direct clutch onto the oil pump.
   - Holding the OD direct clutch piston by hand, apply compressed air to the oil pump to remove the OD direct clutch piston.
   - Remove the OD direct clutch piston.



252L100008

10. Remove two O–rings from piston.
11. Remove bearing and race from OD planetary ring gear.



RTW46BSH000301

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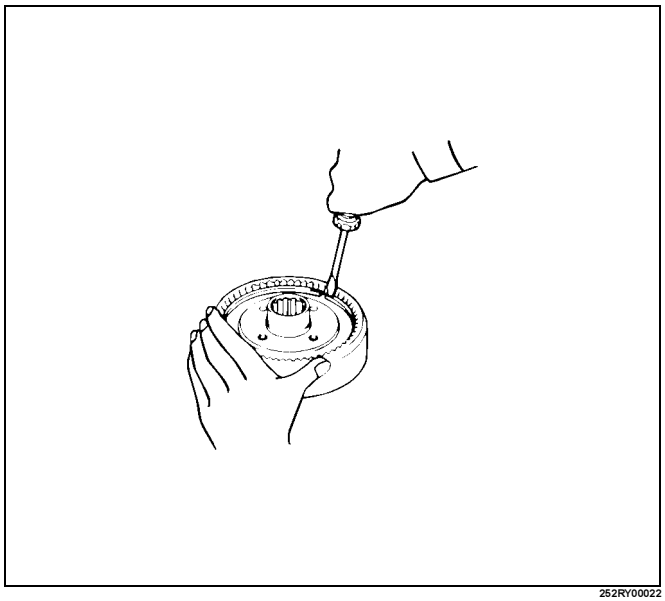
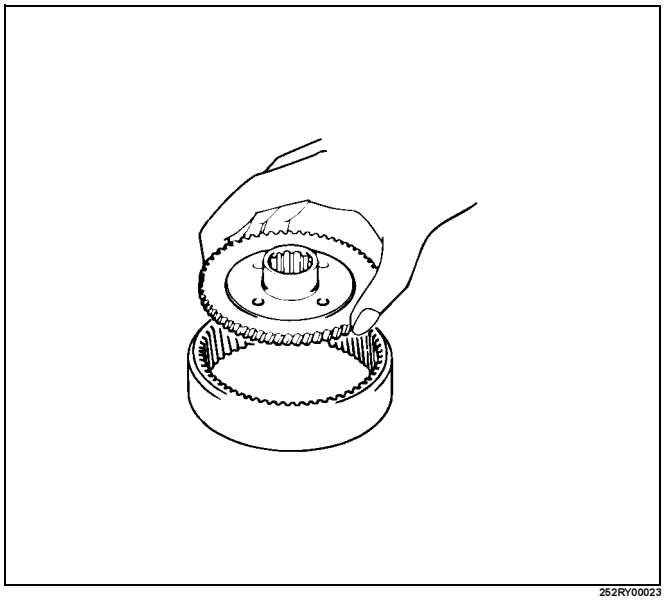
12. Remove snap ring.

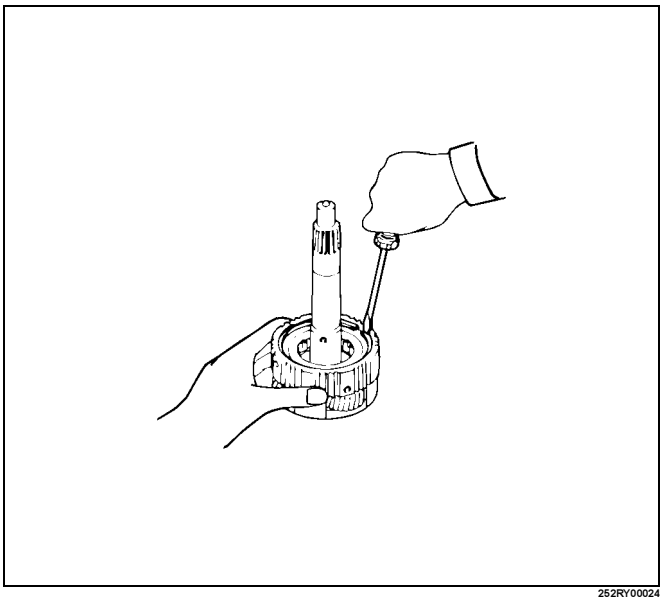

252RY00022

13. Remove ring gear flange from OD planetary ring gear.

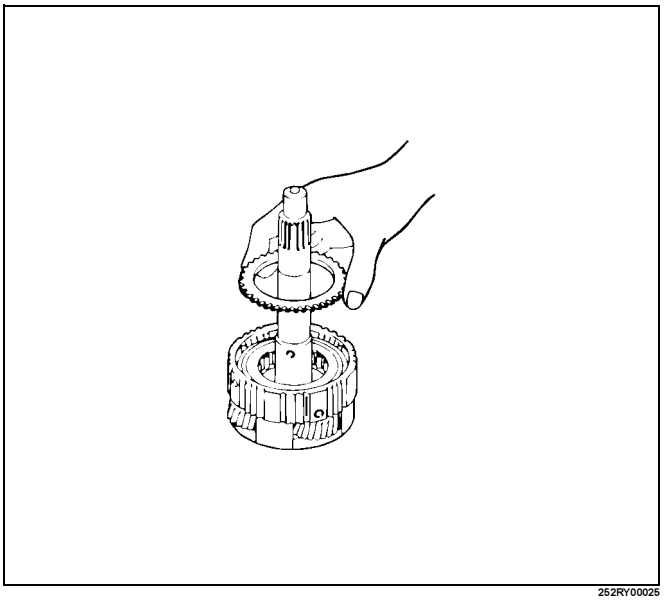

252RY00023

14. Remove the Race.

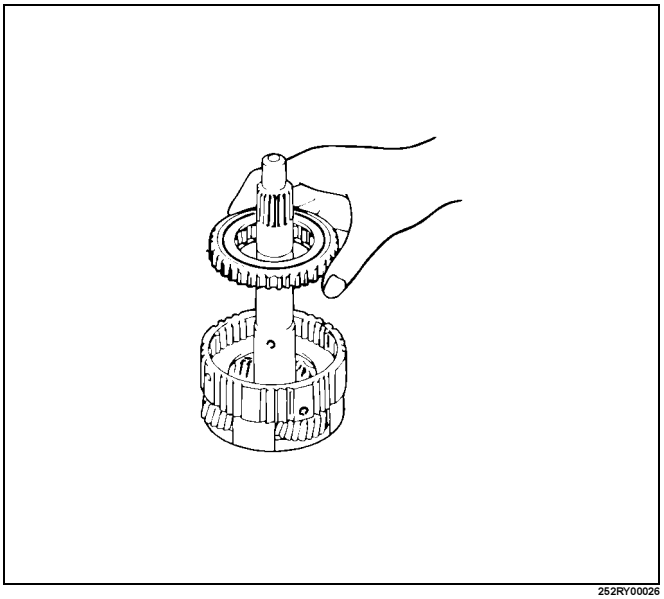
15. Remove snap ring, using screwdriver.


252RY00024

16. Remove retaining plate from OD planetary gear.


252RY00025

17. Remove OD one-way clutch with outer race.


252RY00026

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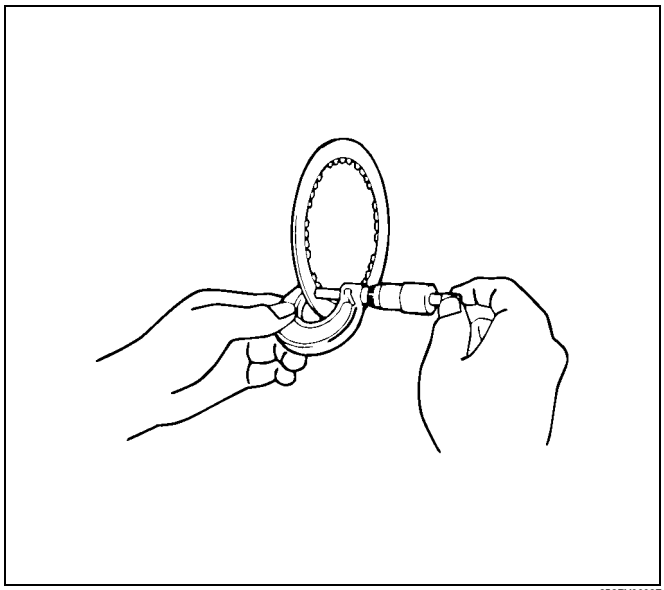
18. Remove the thrust washer.

Inspection and Repair

1. Check discs.
   Using a micrometer, measure the thickness of the discs.

   Minimum thickness: 2.04mm (0.0803in)

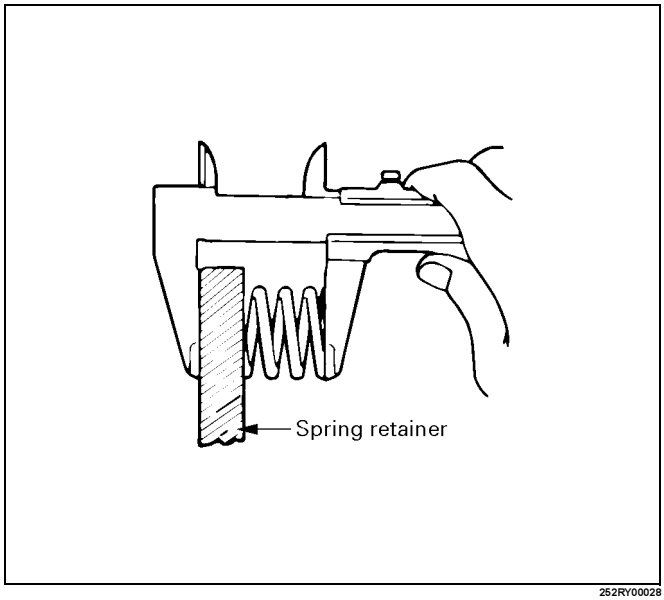
   If the thickness is less than the minimum, replace the disc.



252RY00027

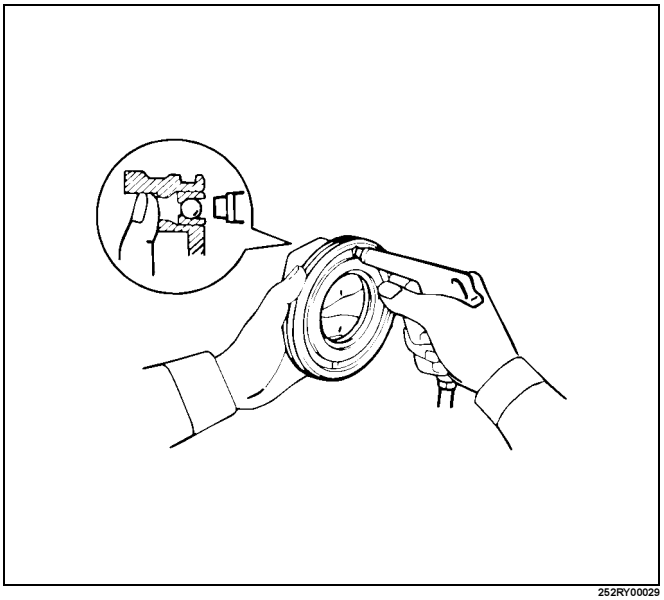
2. Check piston return spring
   Using calipers, measure the free length of the return spring.

   Standard length: 15.8mm (0.622in)



252RY00028

3. Check OD direct clutch piston.
   Check that the check ball is free by shaking the piston. Check that the valve does not leak by applying low-pressure compressed air.

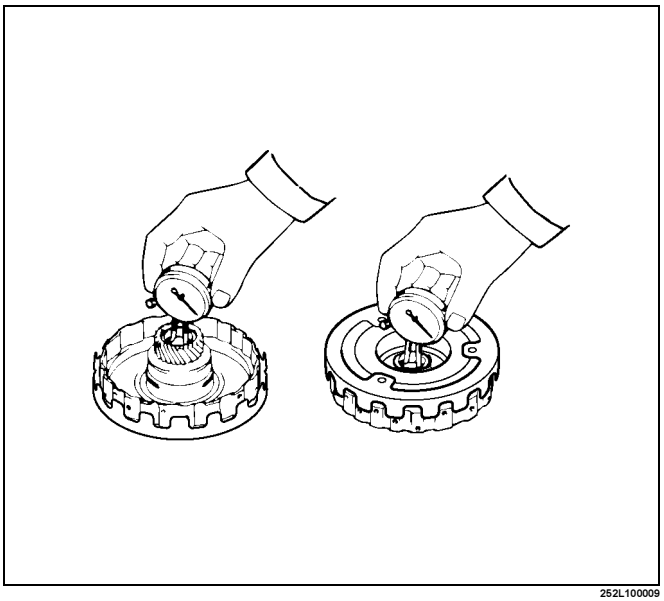


252RY00029

4. Check OD direct clutch drum bushings.
   Using a dial indicator, measure the inside diameter of the OD direct clutch drum bushings.

   Maximum inside diameter: 27.11mm (1.0673in)

   If the inside diameter is greater than the maximum, replace the OD direct clutch drum.



252L100009

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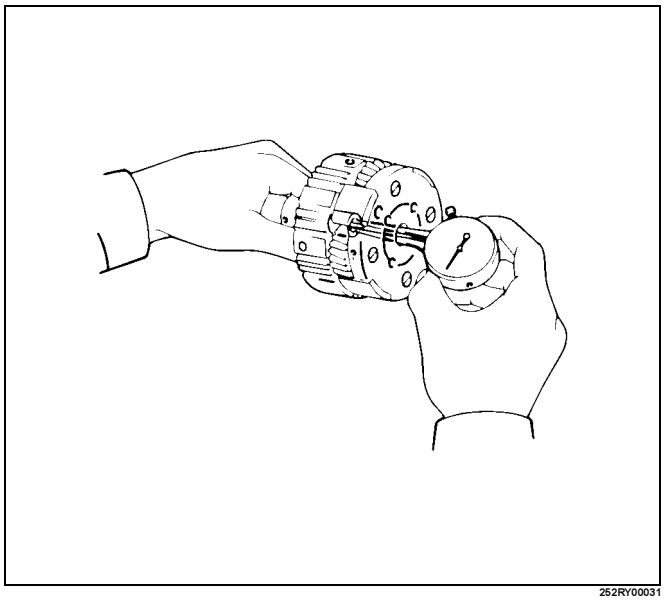
5. Check OD planetary gear bushing.
   Using a dial indicator, measure the inside diameter of replace the OD planetary gear bushing.

   Maximum inside diameter: 11.27mm (0.4437in)

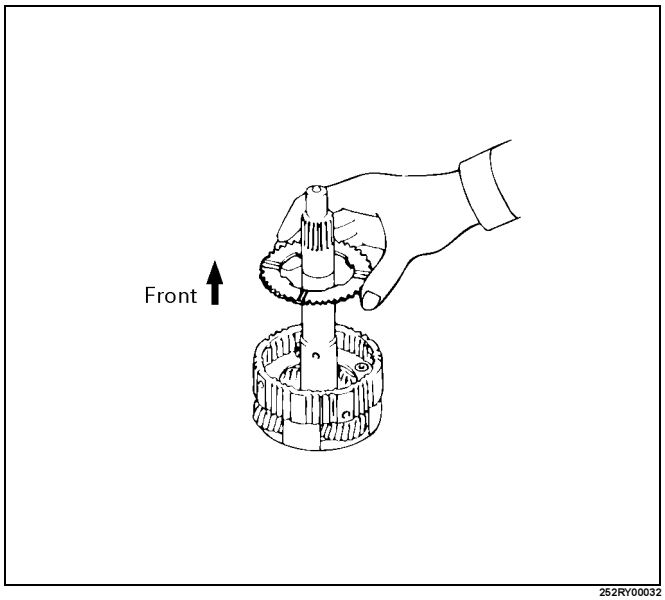
   If the inside diameter is greater than the maximum, replace the OD planetary gear.



252RY00031

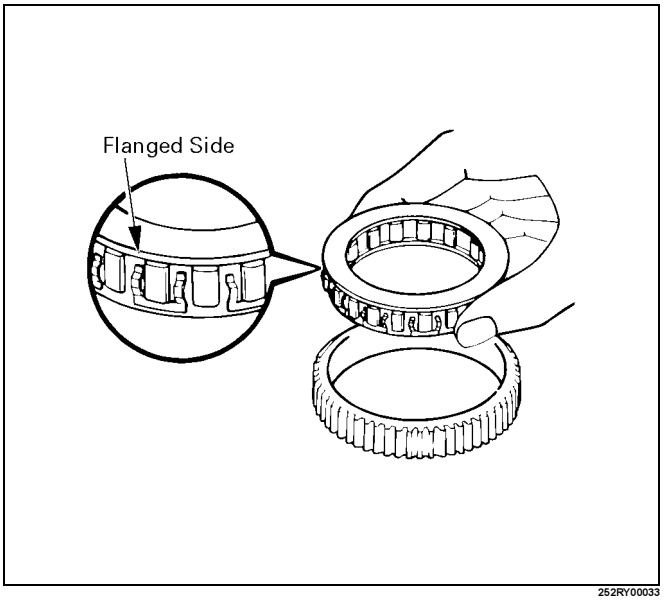
Reassembly

1. Install the thrust washer to the OD planetary gear, facing the grooved side upward.



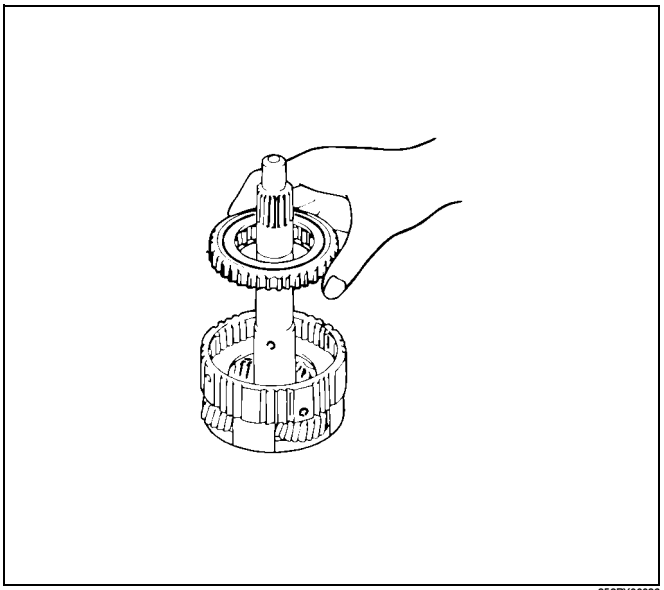
252RY00032

2. Install the one-way clutch into the outer race, with the flanged side of the one-way clutch facing upward.



252RY00033

3. Install OD one-way clutch with outer race to overdrive planetary gear.



252RY00026

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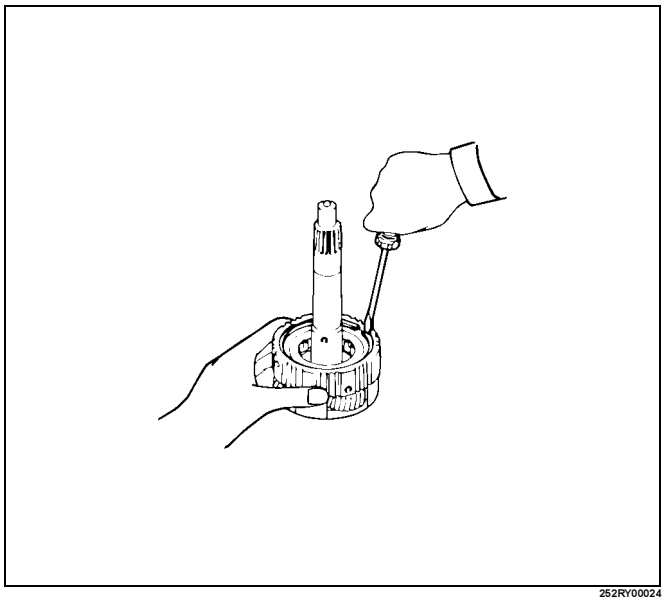
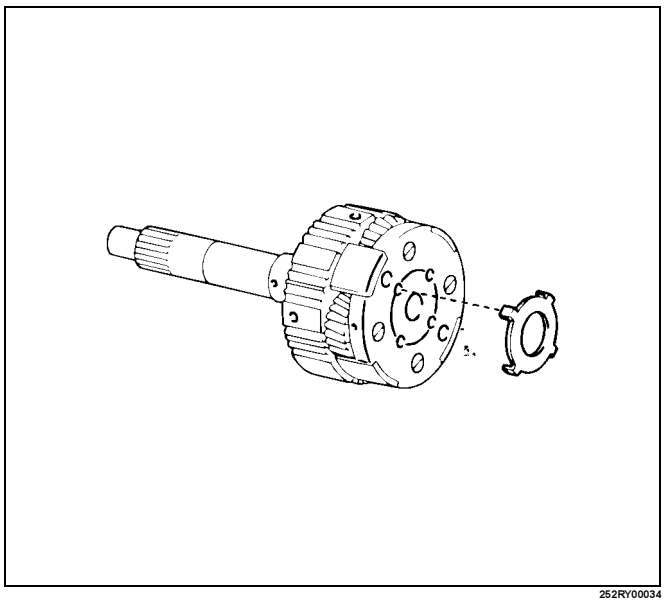
4. Install retaining plate, then install snap ring, using a screwdriver.

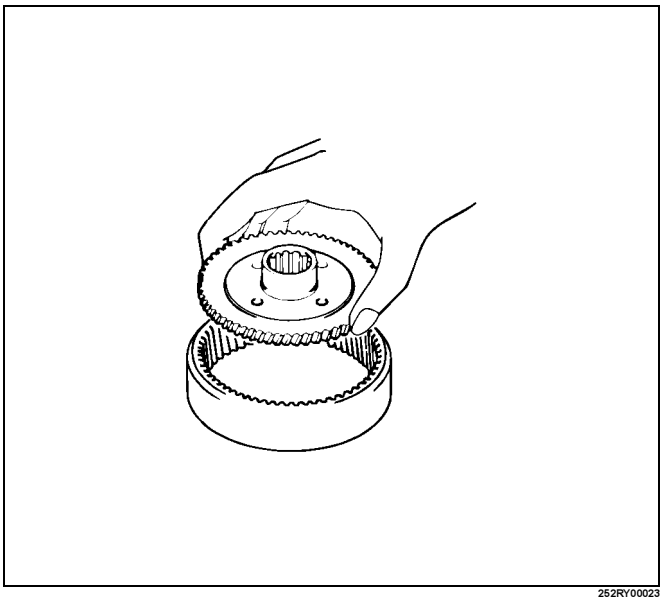

252RY00024

5. Coat the race with petroleum jelly and install it to the planetary gear.
Race diameter (Reference)

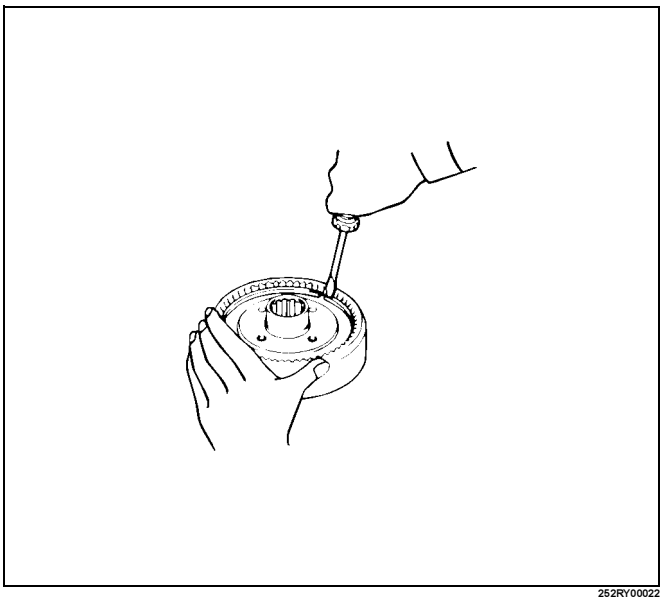
Inside diameter	24.7 mm (0.972 in)
Outside diameter	41.8 mm (1.646 in)


252RY00034

6. Install ring gear flange to OD planetary ring gear.


252RY00023

7. Install snap ring, using a screwdriver.


252RY00022

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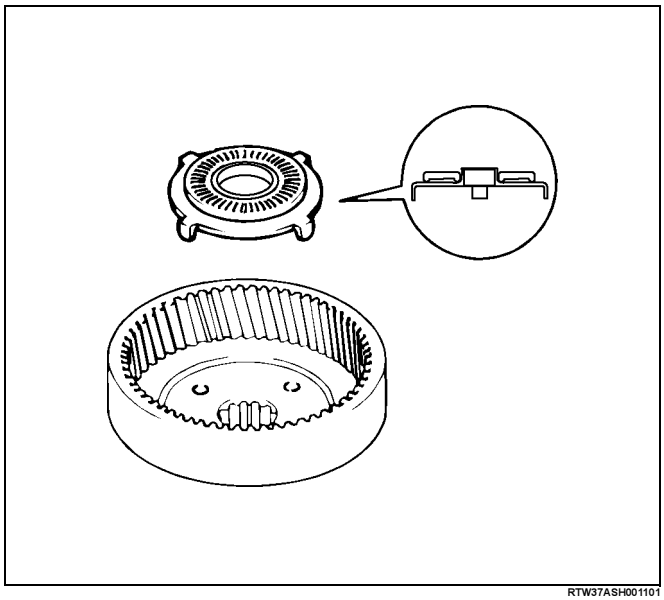
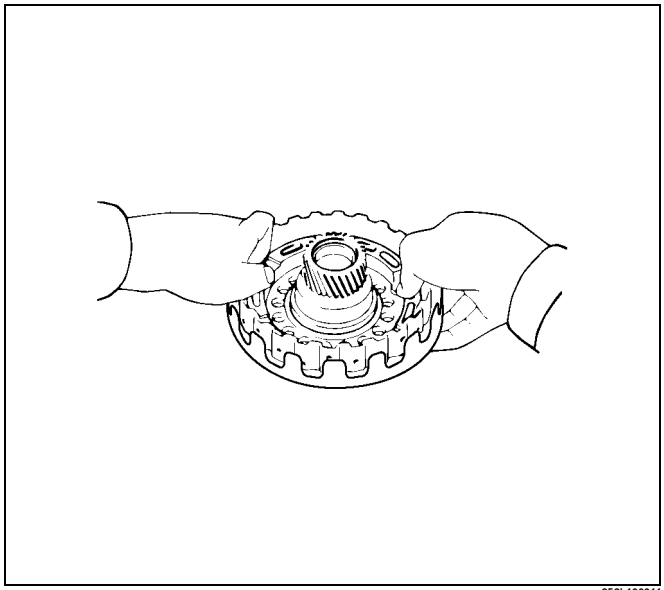
8. Install the race and bearing asm onto the OD planetary ring gear.
   Race and bearing asm diameter (Reference)

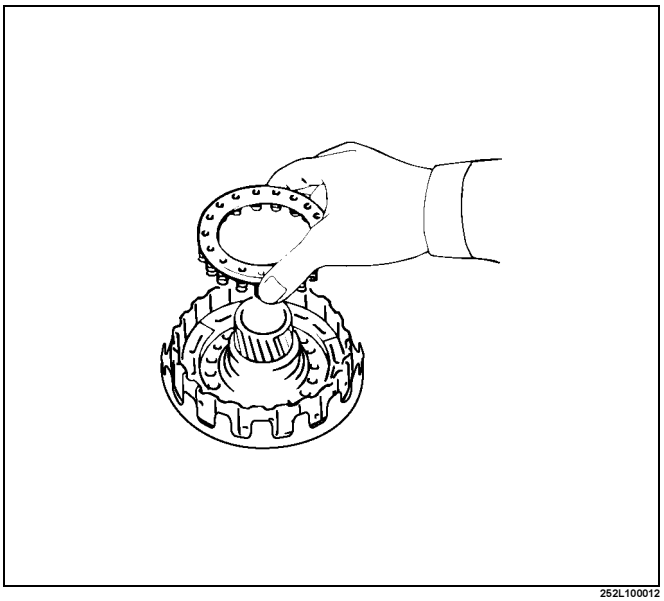
	Inside	Outside
Bearing and race	24.2mm (0.953in)	47.8mm (1.882in)


RTW37ASH001101

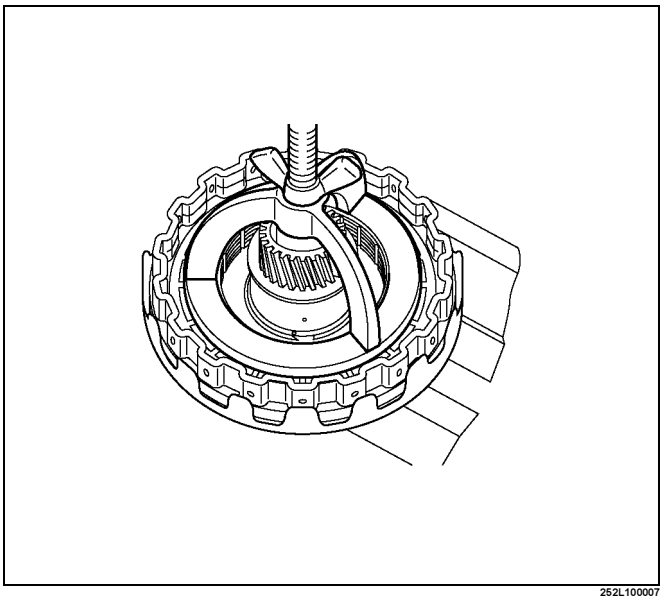
9. Coat new O-rings with ATF and install them on the OD direct clutch piston.
10. Being careful not to damage the O-rings, press in the OD direct clutch piston into the clutch drum, using both hands.


252L100011

11. Install piston return spring.


252L100012

12. Place special tool on the spring retainer, and compress the return spring.
    Spring compressor : J–23327–1
    Install the snap ring with snap ring pliers.
    Be sure the end gap of the snap ring is not aligned with the spring retainer claw.


252L100007

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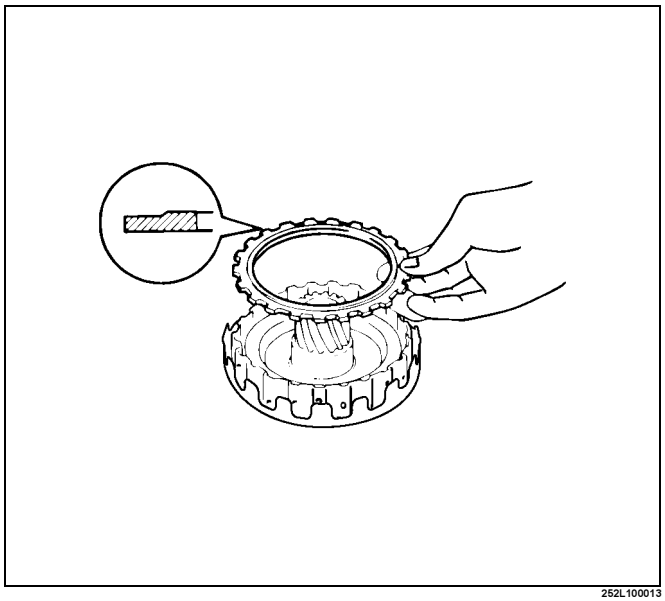
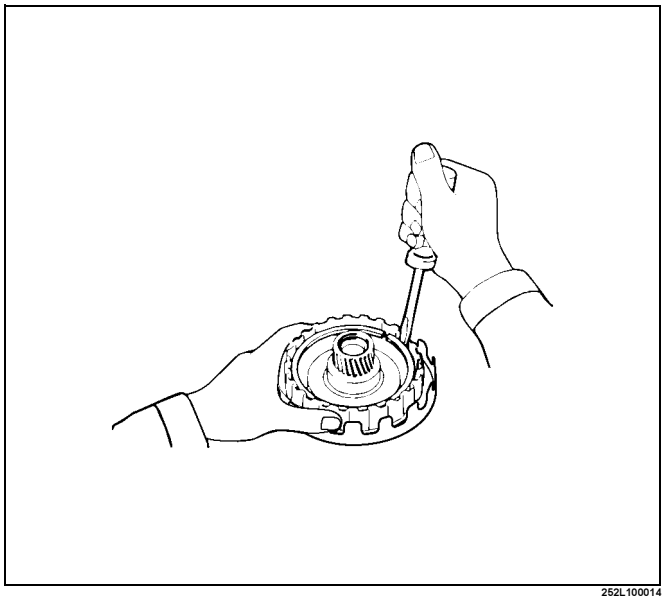
13. Install two plates and two discs then install the flange, with the flat side facing downward.



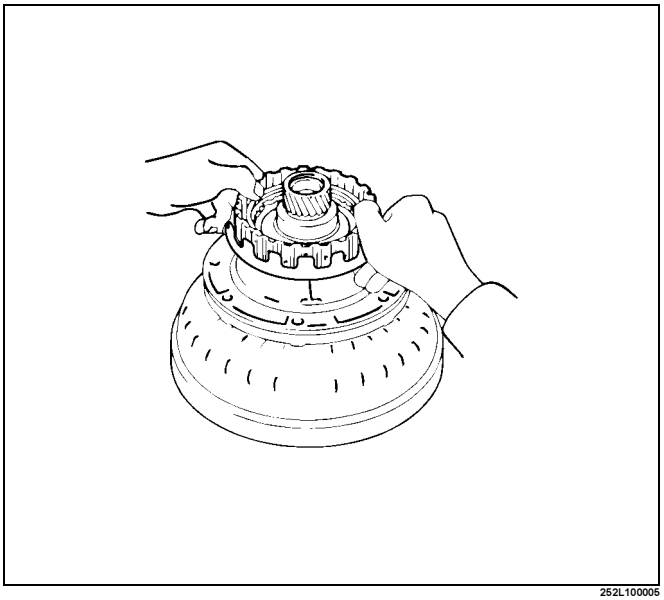
252L100013

14. Install snap ring.



252L100014

15. Check piston stroke of OD direct clutch (C–0)
Place the oil pump onto the torque converter, and then place the OD direct clutch assembly onto the oil pump.



252L100005

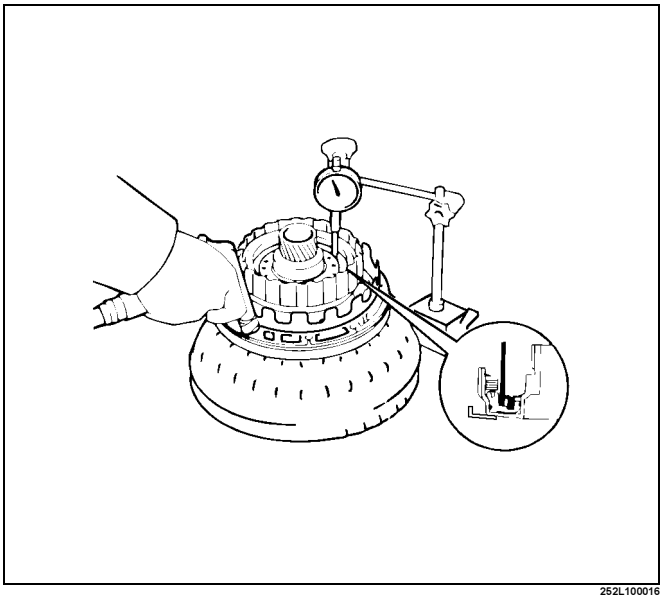
Using a dial indicator, measure the OD direct clutch piston stroke by applying and releasing the compressed air (390 – 780 kPa or 57 – 114 psi) as shown.

Piston stroke: 1.85 – 2.15mm (0.0729 – 0.0847in)

If the piston stroke is not within specification, replace the disc and recheck the piston stroke.
If the piston stroke is nonstandard, select another flange.

Flange sizes

Flange thickness	Flange thickness
3.8mm (0.150in)	3.4mm (0.134in)
3.7mm (0.146in)	3.3mm (0.130in)
3.6mm (0.142in)	3.2mm (0.126in)
3.5mm (0.138in)	3.1mm (0.122in)



252L100016

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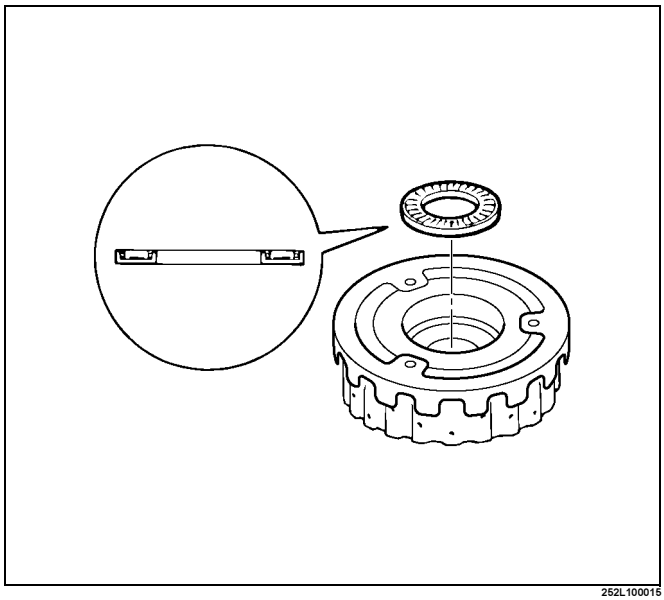
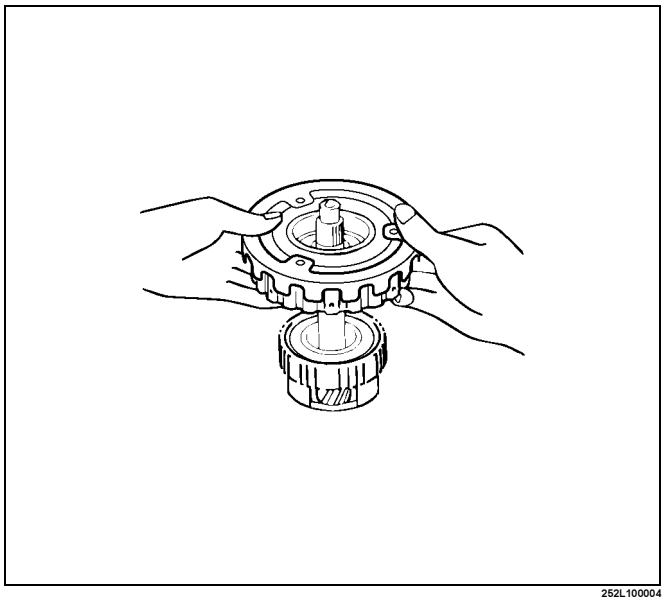
16. Coat the assembled bearing and race with petroleum jelly and install it with the race side facing downward.
Bearing and race (Reference)

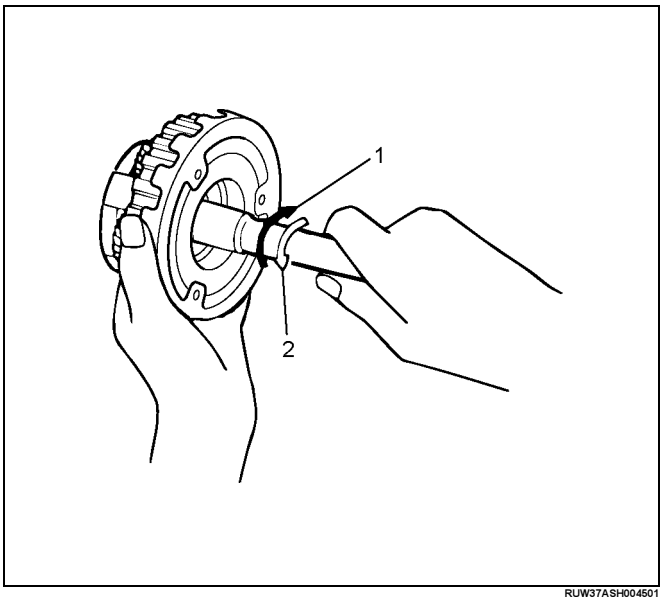
Inside diameter	28.9mm (1.138in)
Outside diameter	50.2mm (1.976in)


252L100015

17. Align the flukes of discs in the direct clutch.
Install the OD direct clutch assembly onto the OD planetary gear.


252L100004

18. Check operation of one-way clutch
Hold the OD direct clutch drum and turn the input shaft.
The input shaft should turn freely clockwise and should lock counterclockwise.



RUW37ASH004501

Legend
(1) Free
(2) Lock

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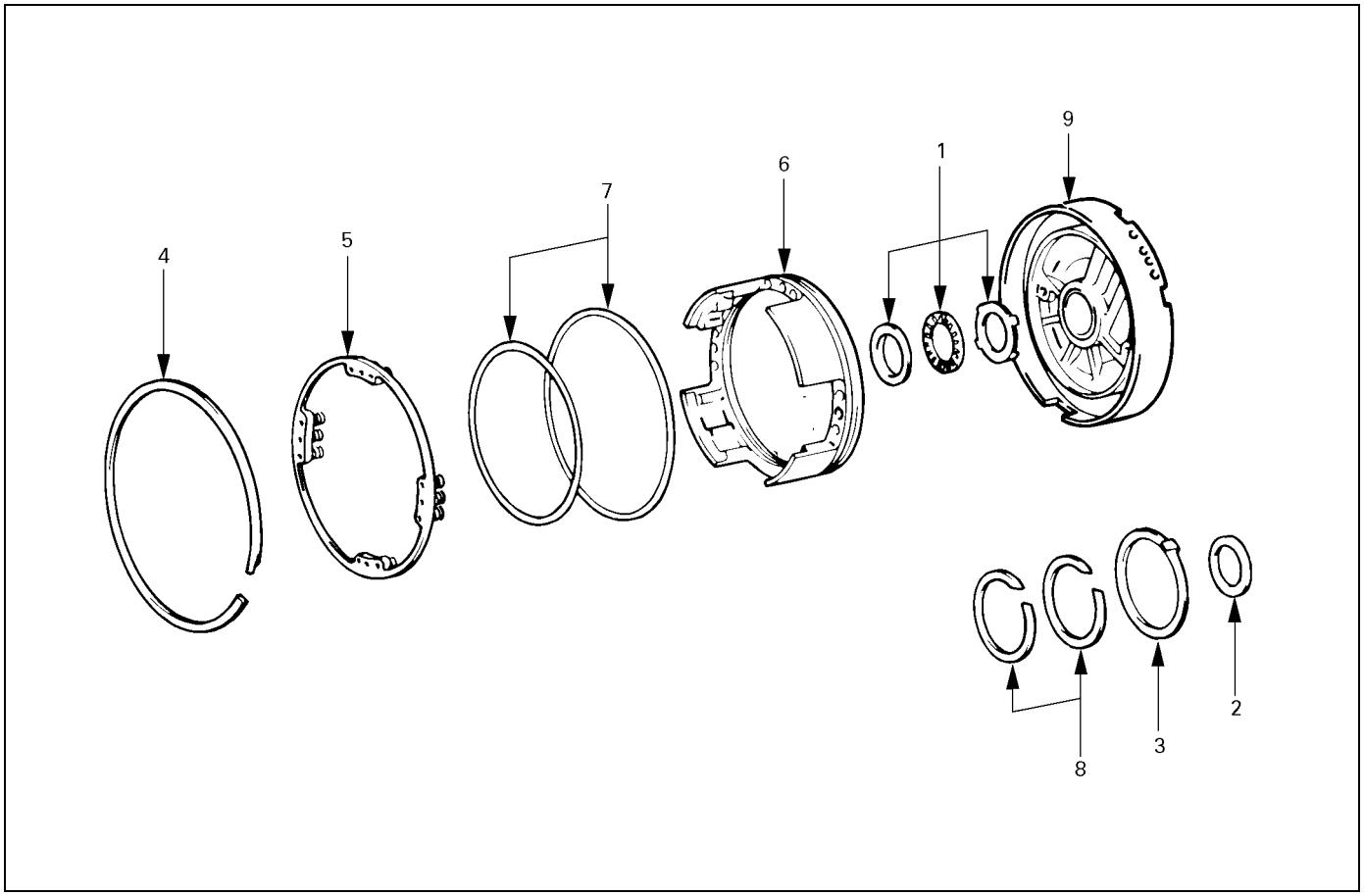
OD Support Assembly

Disassembled View



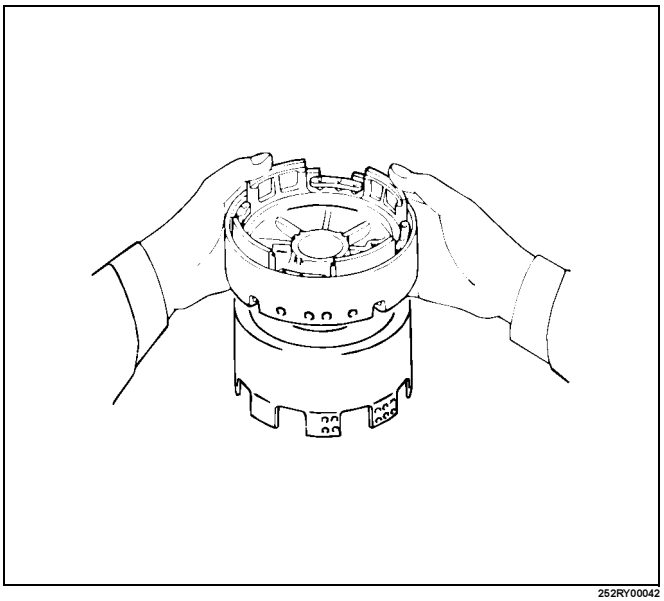
252R200003

Legend

(1) Thrust bearing
(2) Race
(3) Thrust washer (plastic)
(4) Snap ring
(5) Piston return spring
(6) OD brake piston
(7) O-ring
(8) Oil seal ring
(9) OD support

Disassembly

1. Check OD brake piston movement.
   Place the OD support assembly onto the direct clutch assembly.



252RY00042

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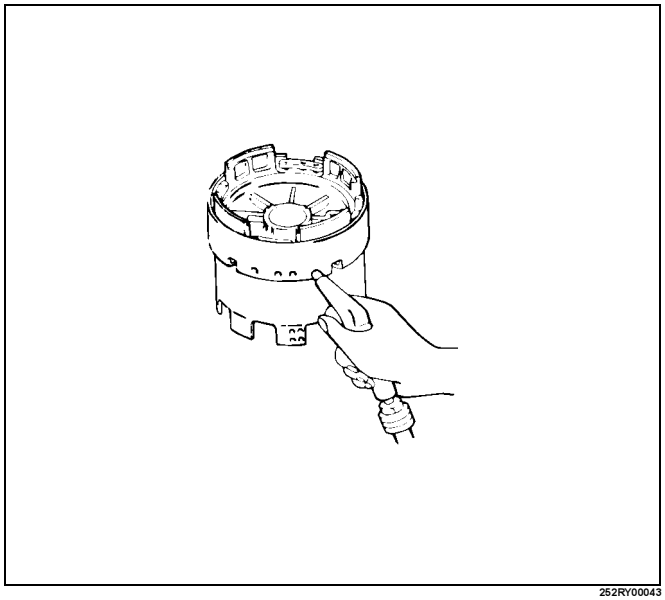
Apply compressed air into the oil passage as shown, and be sure that the OD brake piston moves smoothly.

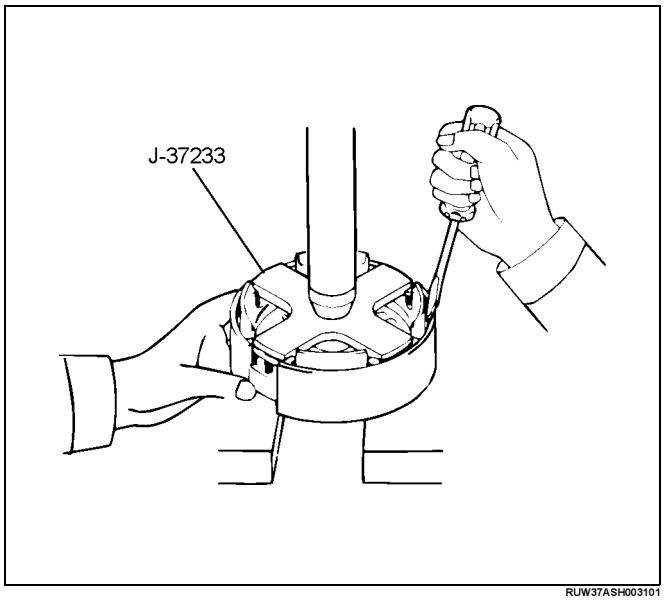


252RY00043

2. Remove the thrust bearing.
3. Remove the race.
4. Remove the thrust washer (plastic).
5. Place special tool on the spring retainer, and compress the return spring with a shop press.

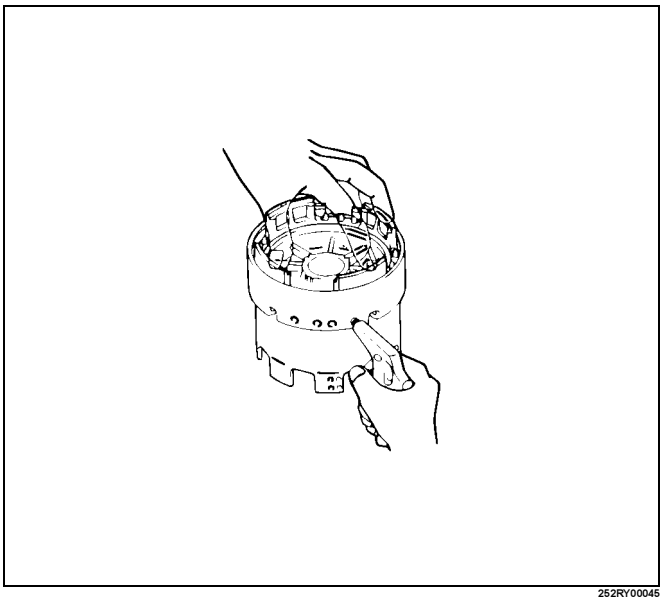
Spring compressor : J–37233

Remove the snap ring with a screwdriver.



RUW37ASH003101

6. Romove the piston return spring.
7. Place the OD support onto the direct clutch assembly.
   Hold the OD brake piston so it is not slanted and apply compressed air into the passage to remove the OD brake piston.
   Remove the OD brake piston.



252RY00045

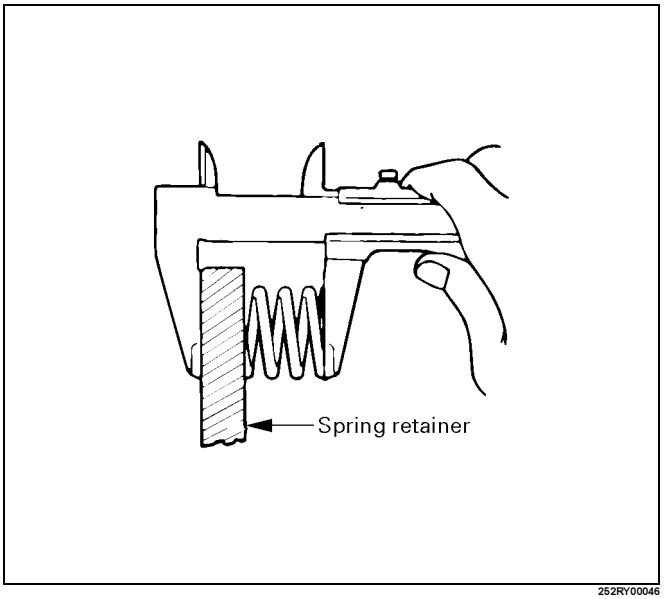
8. Remove the O-ring and oil seal rings from OD support.

Inspection and Repair

Make necessary correction or parts replacement if wear, damage or any abnormal conditions are found through inspection.

1. Check piston return spring
   Using calipers, measure the free length of the return spring.

Standard length: 17.2mm (0.677in)



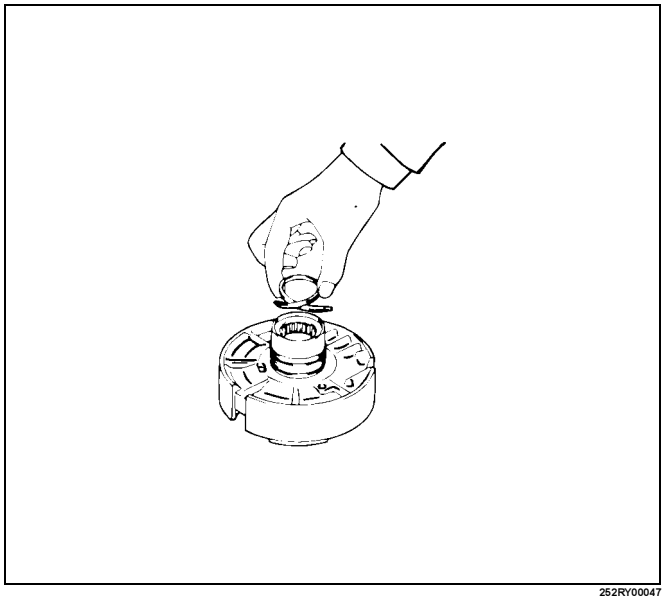
252RY00046

ProCarManuals.com

Reassembly

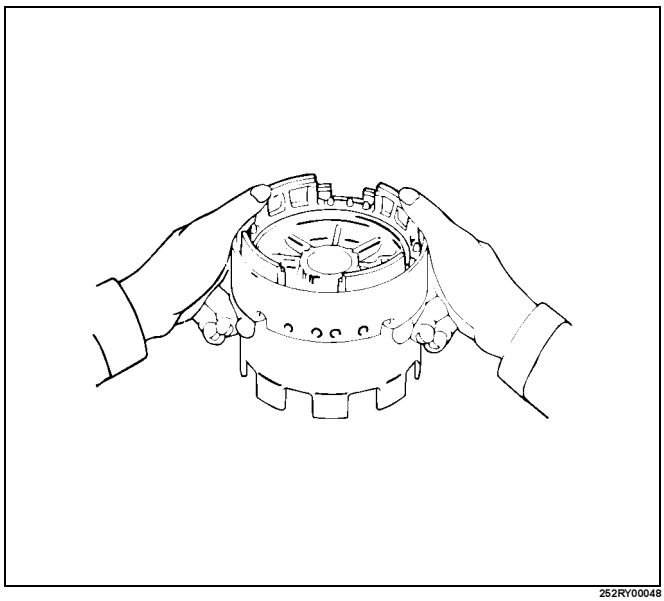
1. Coat the two oil seal rings with ATF.
   Contract the oil seals as shown, and install them onto the OD support.

NOTE: Do not spread the ring ends more than necessary.



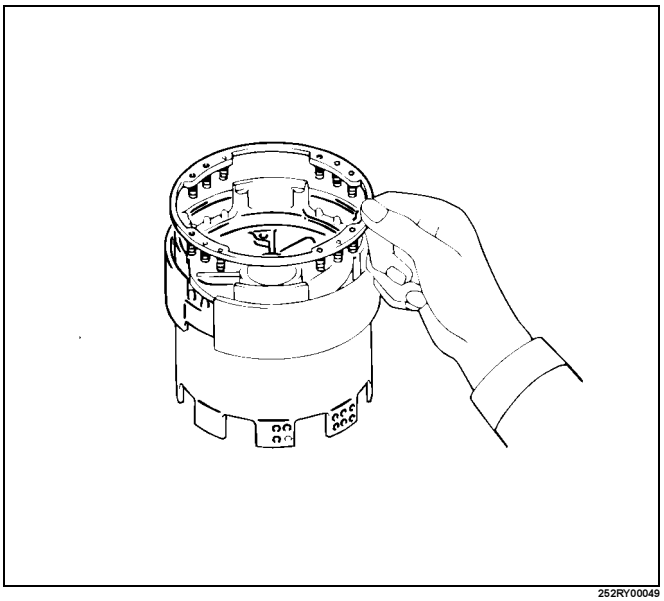
252RY00047

2. Coat two new O-rings with ATF and install them on the OD brake piston.
3. Being careful not to damage the O-rings, press the brake piston into the OD support, using both hands.



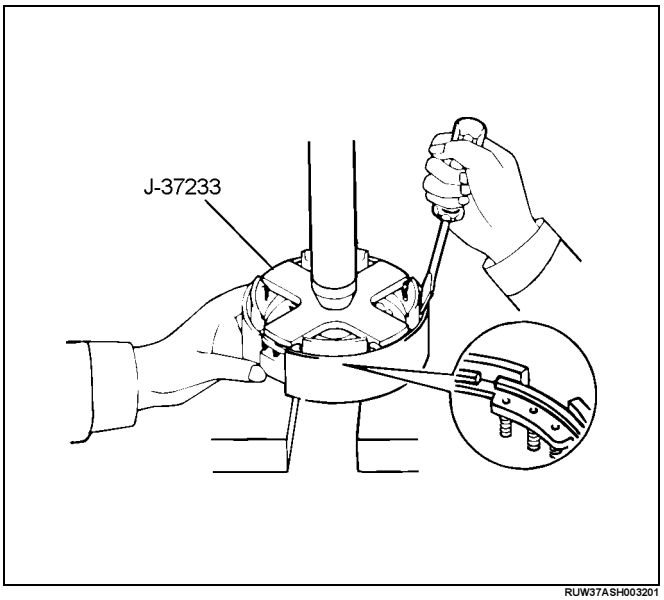
252RY00048

4. Install piston return spring.



252RY00049

5. Place special tool on the spring retainer, and compress the return spring with a shop press.
   Spring compressor : J–37233
   Install the snap ring with a screwdriver.
   Be sure the end gap of the snap ring is not aligned with cutout portion of the OD support.



RUW37ASH003201

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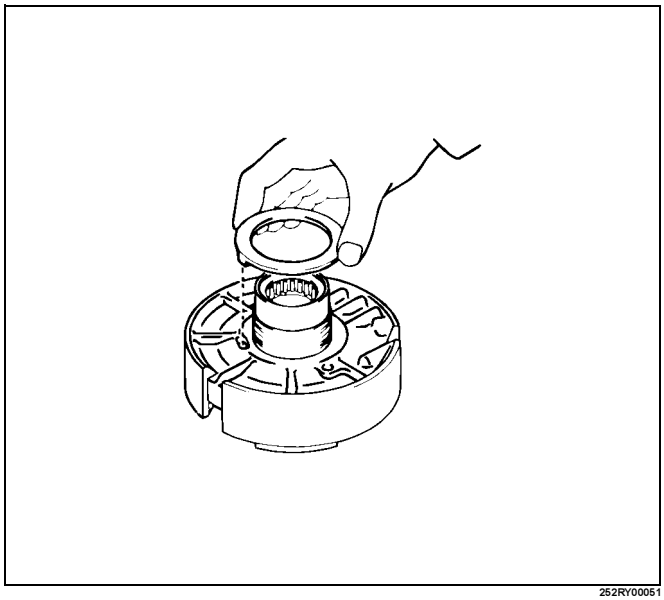
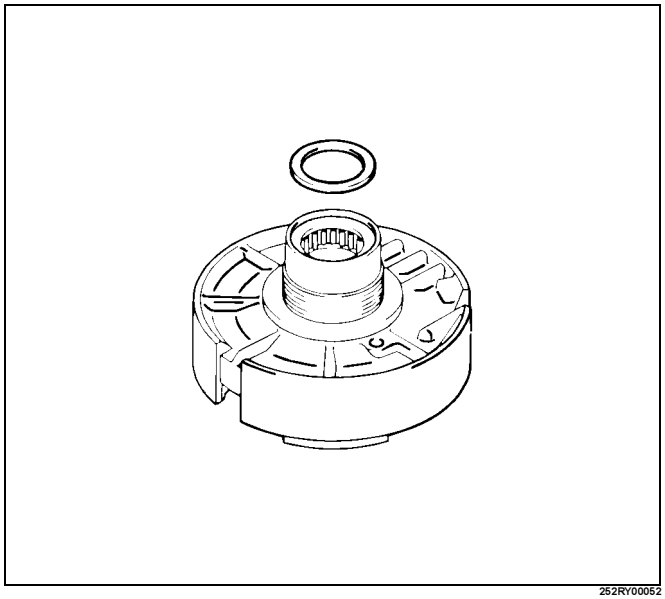
6. Coat the thrust washer (plastic) with petroleum jelly and install it onto the OD support.

NOTE: Make sure that the lug fits into the hole on the OD support.


252RY00051

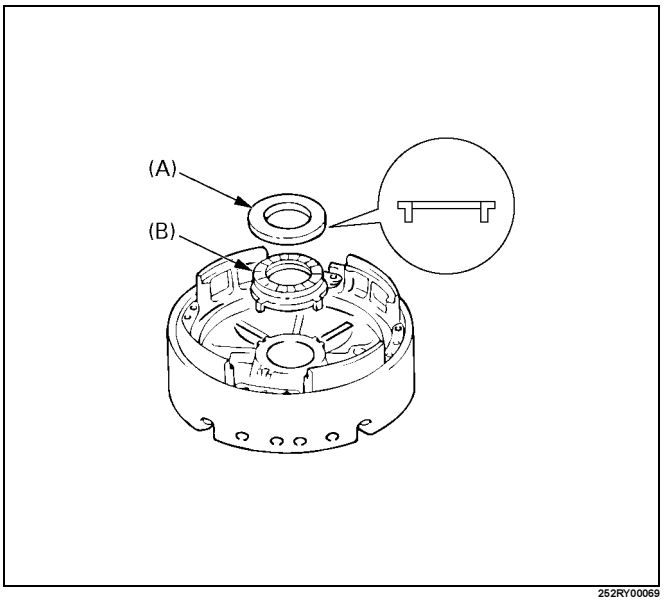
7. Coat the race with petroleum jelly, and install it onto the OD support.
Race diameter (Reference)

Inside diameter	36.7mm (1.44 in)
Outside diameter	50.85 mm (2.00 in)


252RY00052

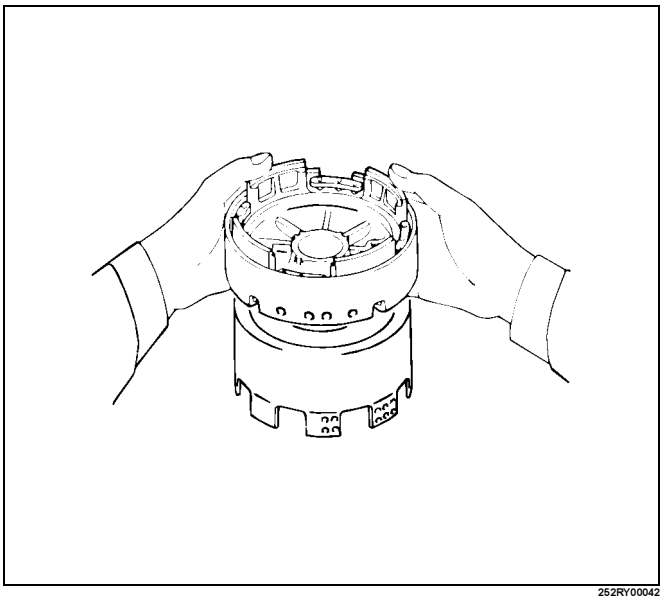
8. Turn over OD support.
Coat the two races with petroleum jelly, and install them onto the OD support.
Race and bearing diameter (Reference)

	Inside	Outside
Race (A)	37.2mm (1.465in)	58.8mm (2.315in)
Bearing and race (B)	33.7mm (1.327in)	50.1mm (1.972in)



252RY00069

9. Check OD brake piston movement.
Place the OD support assembly onto the direct clutch assembly.


252RY00042

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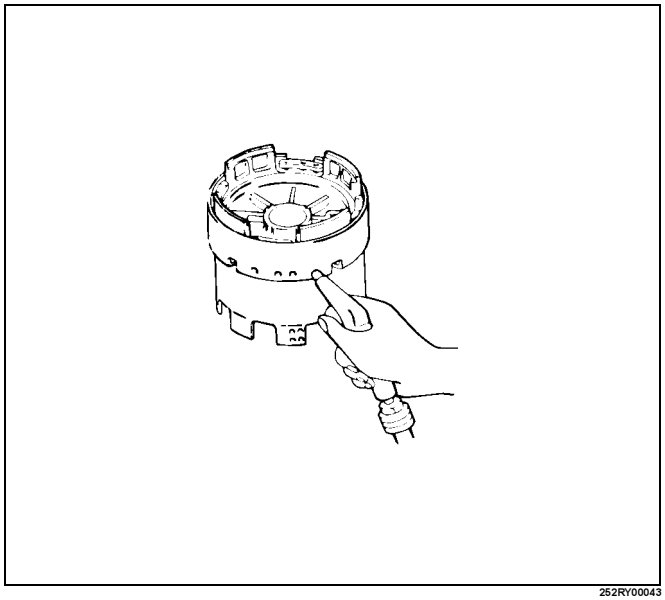
Apply compressed air into the oil passage as shown, and be sure that the OD brake piston moves smoothly.



252RY00043

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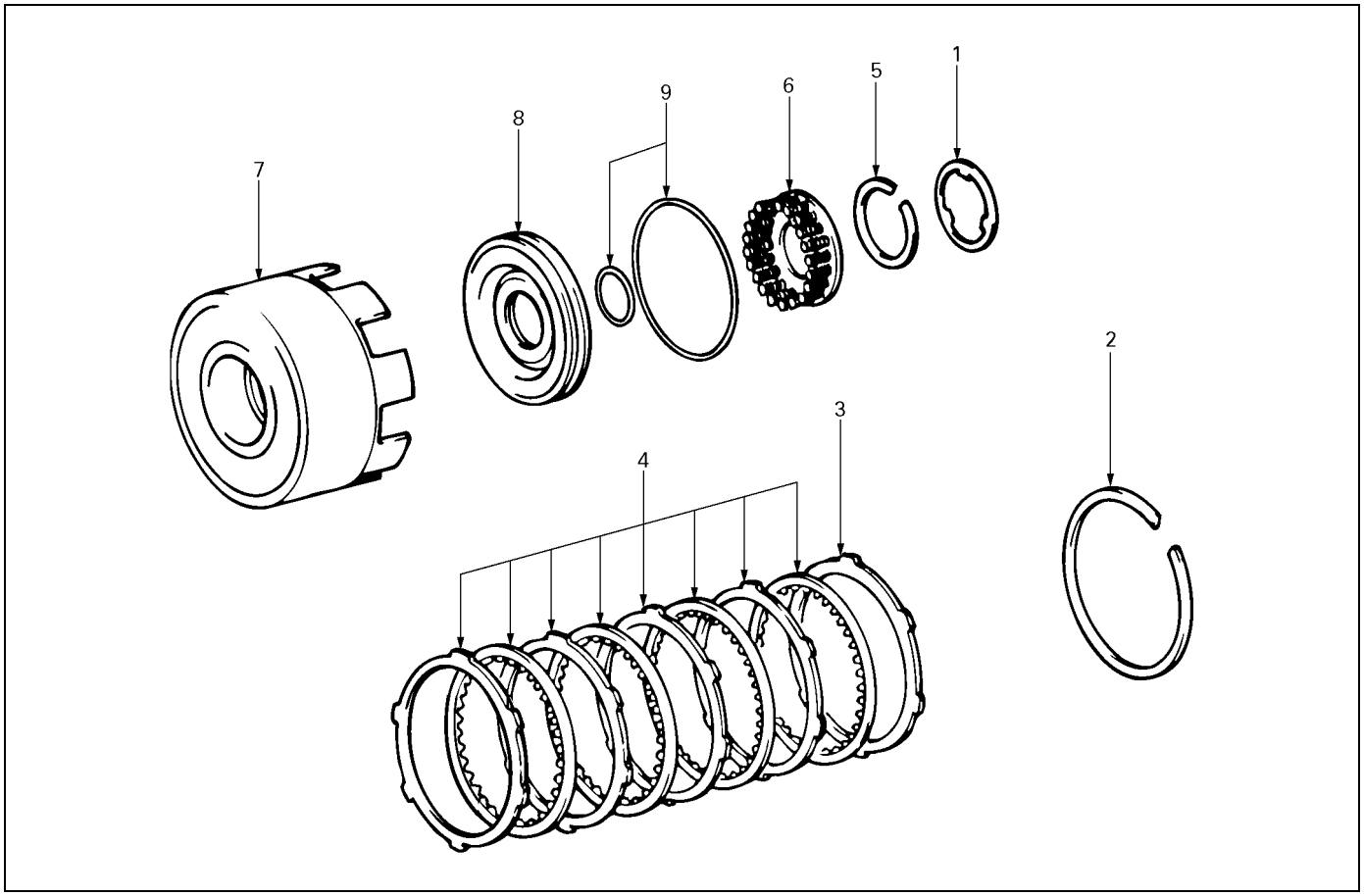
Direct Clutch Assembly (C-2)

Disassembled View



248R200001

Legend

(1) Clutch drum thrust washer (Plastic)
(2) Snap ring
(3) Flange
(4) Plate and disc
Five plates and five discs
(5) Snap ring
(6) Piston return spring
(7) Direct clutch drum
(8) Direct clutch piston
(9) O-ring

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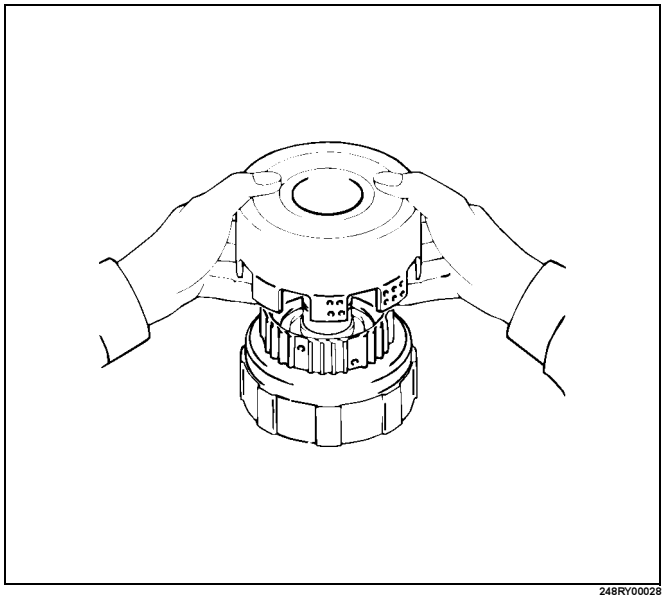
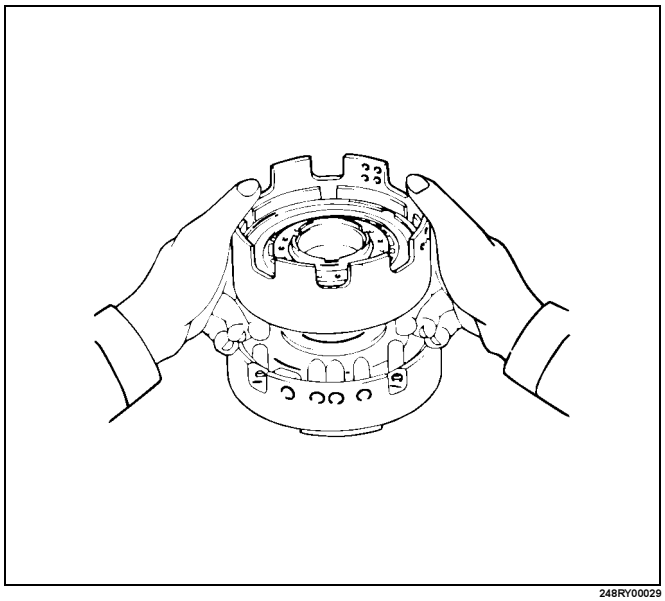
Disassembly

Remove direct clutch drum assembly from forward clutch assembly.

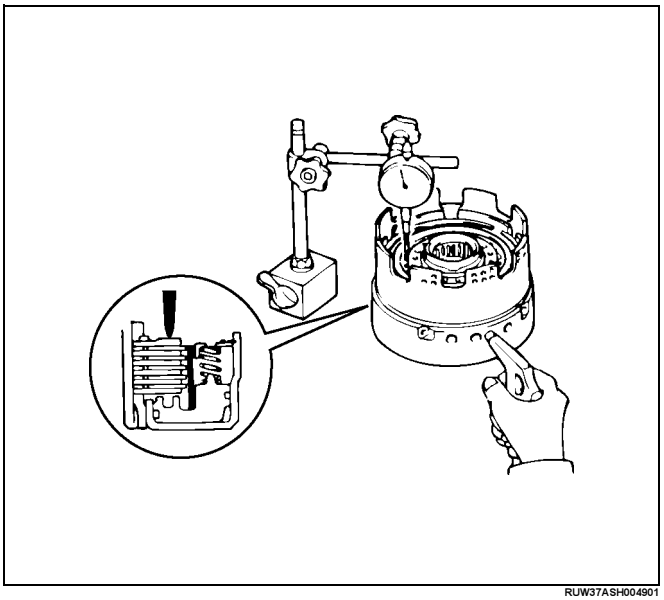


1. Check piston stroke of direct clutch (C–2).
   Place the direct clutch assembly onto the OD support assembly.

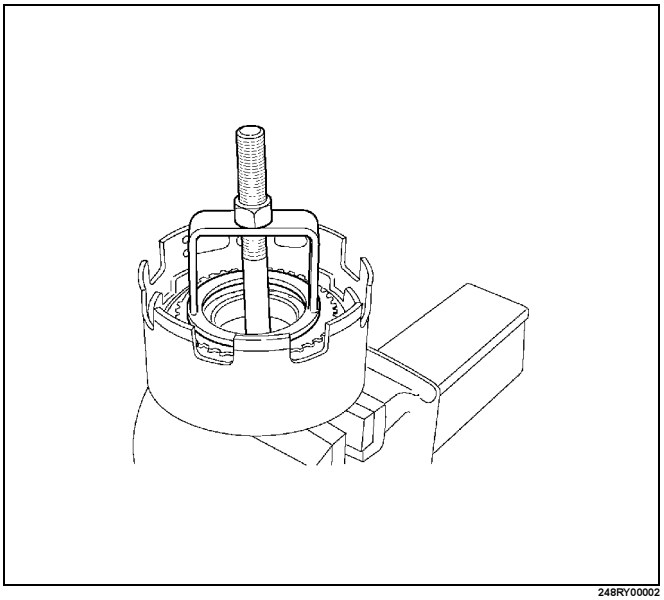


Using a dial indicator, measure the direct clutch piston stroke by applying and releasing compressed air (390 – 780 kPa or 57 – 114 psi) as shown.

Pack clearance: 0.4 – 0.7 mm (0.016 – 0.028 in)



2. Remove the clutch drum thrust washer (Plastic) from the rear end of direct clutch.
3. Remove the snap ring from the direct clutch drum.
4. Remove the flange, plates and discs.
5. Place special tool on the spring retainer and compress the return spring.
   Using snap ring pliers, remove the snap ring.
   Spring compressor : J–25048



6. Remove the piston return spring.

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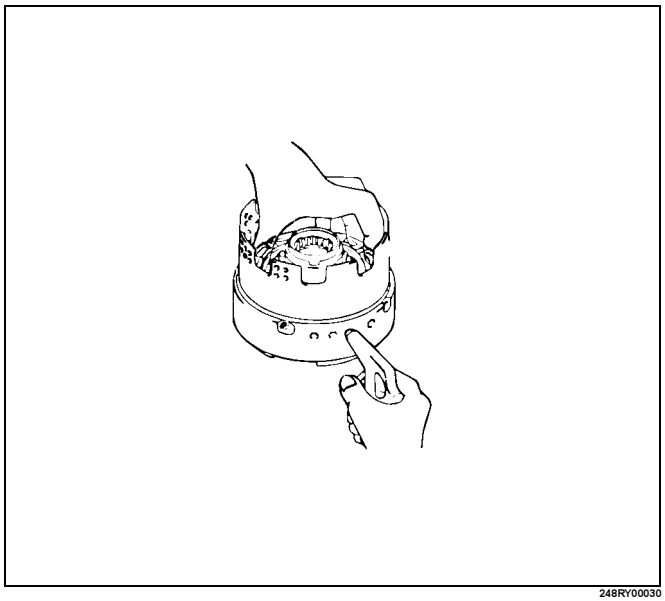
7. Place the direct clutch drum onto the OD support.
   Holding the direct clutch piston by hand, apply compressed air to the OD support to remove the direct clutch piston.
   Remove the direct clutch piston from direct clutch drum.

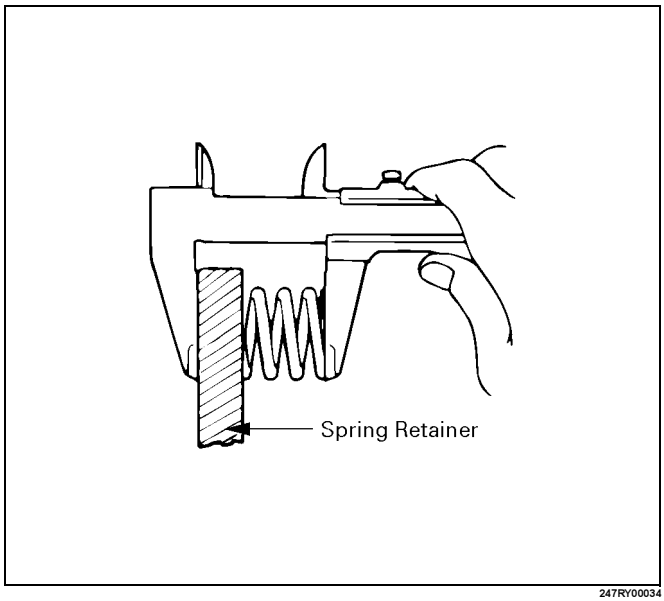

248RY00030

8. Remove two O-rings from piston.

Inspection and Repair

1. Check piston return spring.
   Using calipers, measure the free length of the return spring.

Standard length: 21.3mm (0.839in)

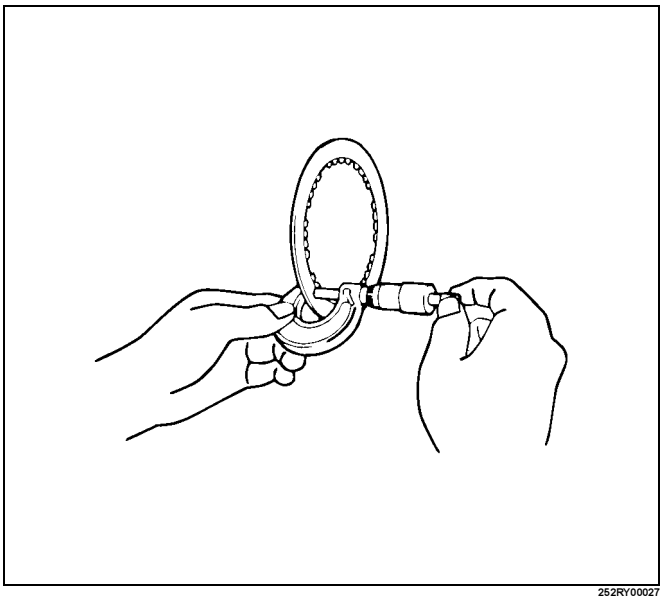


247RY00034

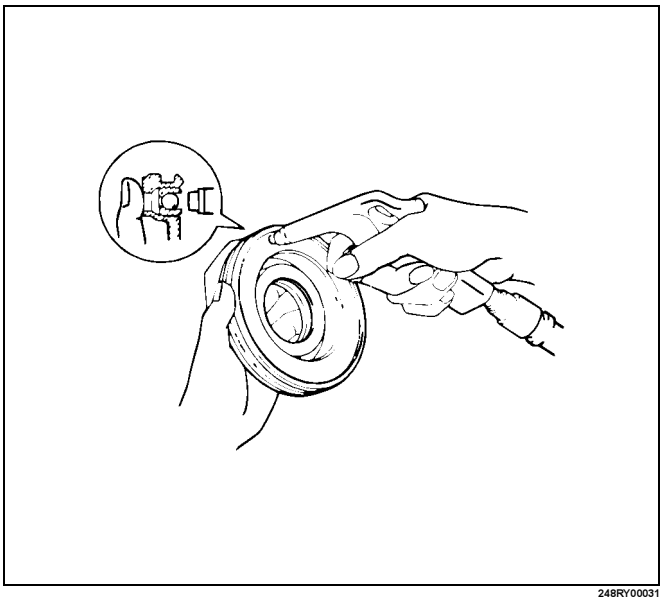
2. Check discs.
   Using micrometer, measure the thickness of the discs.

Minimum thickness: 2.04mm (0.0803in)

If the thickness is less than the minimum, replace the disc.


252RY00027

3. Check direct clutch piston.
   Check that check ball is free by shaking the piston.
   Check that the valve does not leak by applying low-pressure compressed air.


248RY00031

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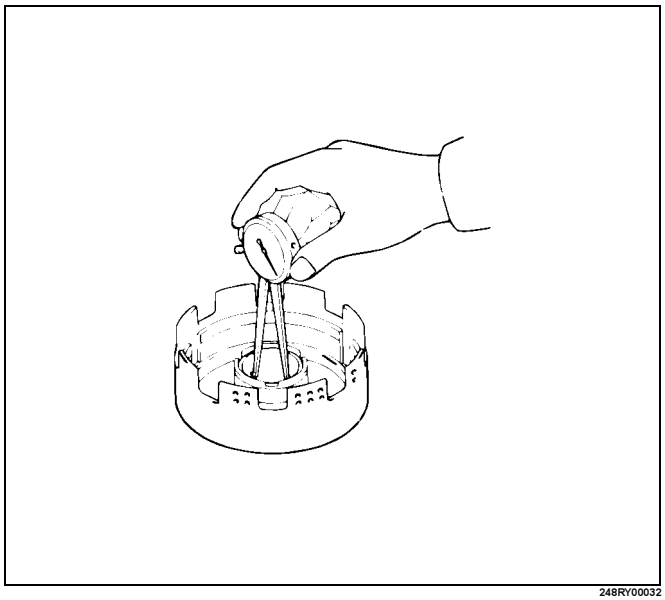
4. Check direct clutch drum bushing.
   Using a dial indicator, measure the inside diameter of the clutch drum bushing.

Maximum inside diameter: 53.99 mm (2.1256 in)

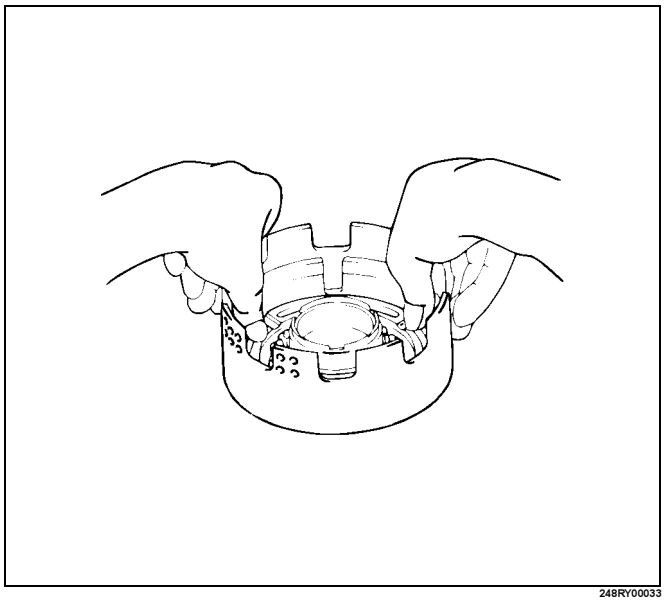
If the inside diamater is greater than the maximum, replace the clutch drum.



248RY00032

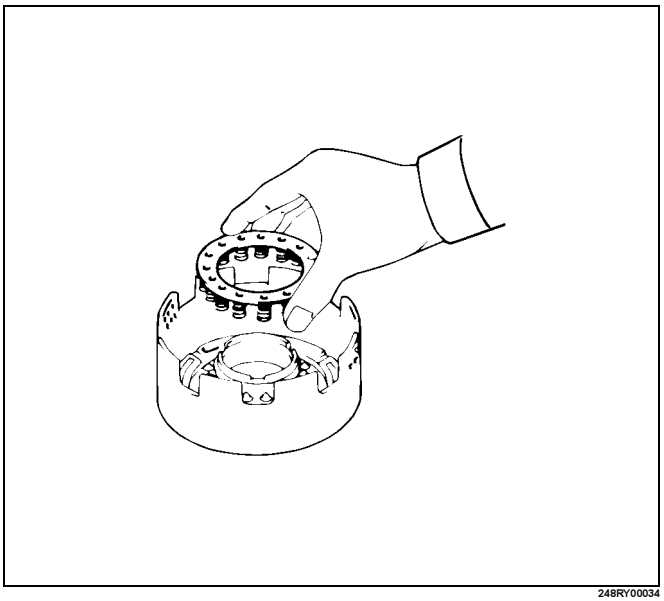
Reassembly

1. Coat new O-rings with ATF and install them on the direct clutch piston.
2. Install direct clutch piston to direct clutch drum.
   Being careful not to damage the O-rings, press in the direct clutch piston into the clutch drum, using both hands.



248RY00033

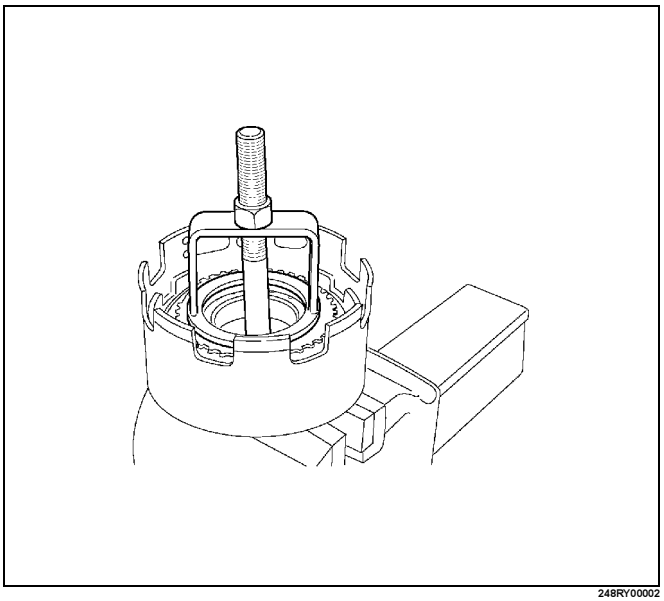
3. Install piston return spring.



248RY00034

4. Compress piston return spring and install snap ring in groove.
   - Place special tool on the spring retainer, and compress the return spring.
   - Install the snap ring with snap ring pliers.
   - Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

Spring compressor: J–25048



248RY00002

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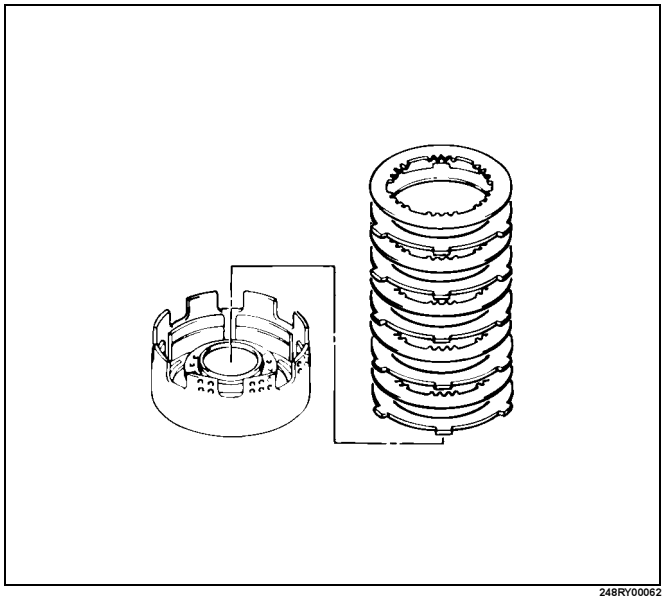
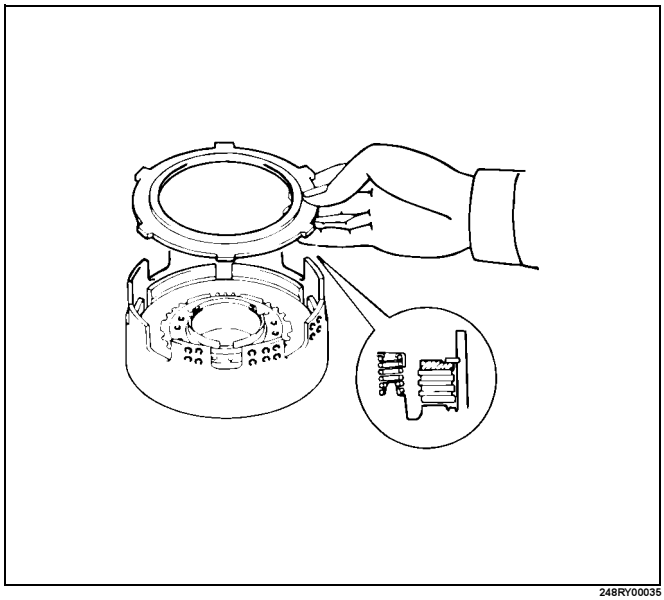
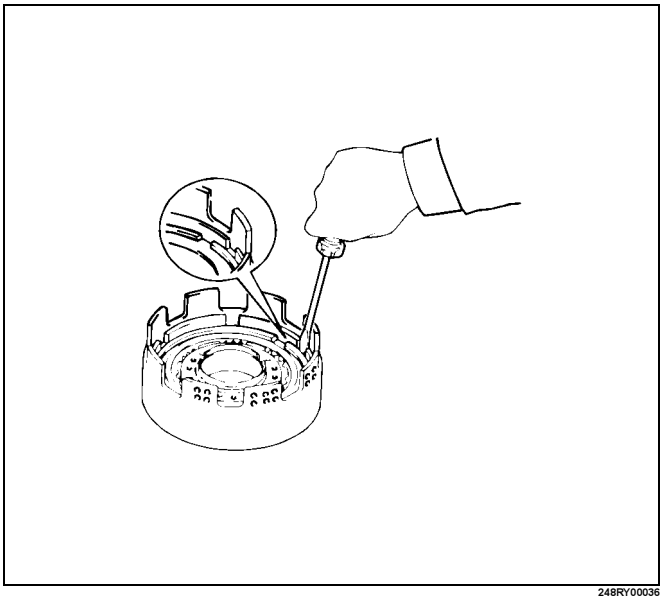
5. Install four plates and four discs.
   Install in order : P–D–P–D–P–D–P–D
   P : Plate, D : Disc


248RY00062

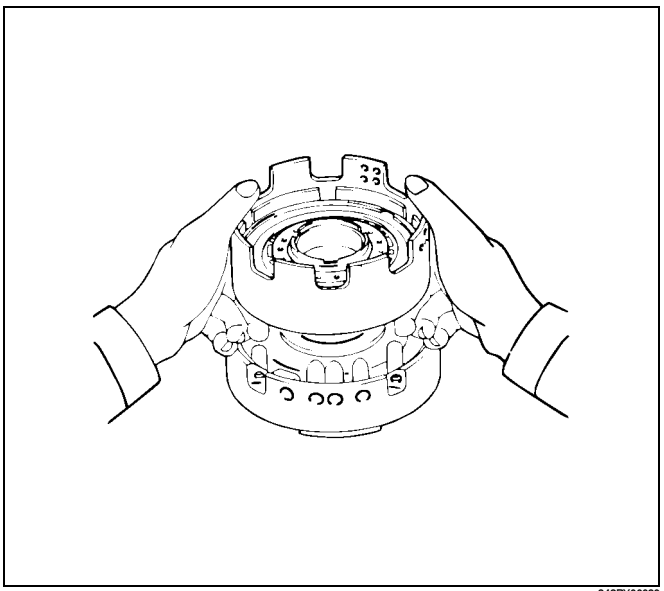
6. Install the flange, with the flat side facing downward.


248RY00035

7. Install the snap ring with a screwdriver.
   Be sure the end gap of the snap ring is not aligned with the cutout portion of the direct clutch drum.


248RY00036

8. Check piston stroke of direct clutch (C–2).
   Place the direct clutch assembly onto the OD support assembly.


248RY00029

   Using a dial indicator, measure the direct clutch piston stroke by applying and releasing compressed air (390 – 780 kPa or 57 – 114 psi) as shown.

Pack clearance: 0.4 – 0.7 mm (0.016 – 0.028 in)

   If the piston stroke is not within specification, replace the discs and recheck the piston stroke.
   If the piston stroke is nonstandard, select another flange.

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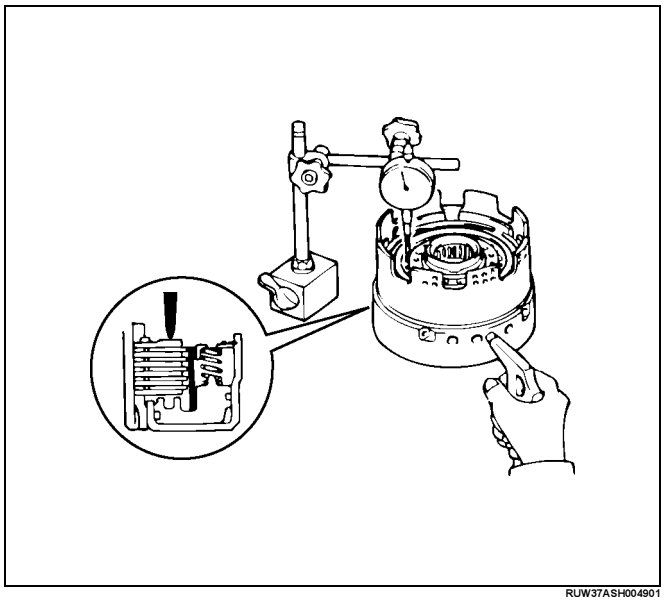
Flange sizes

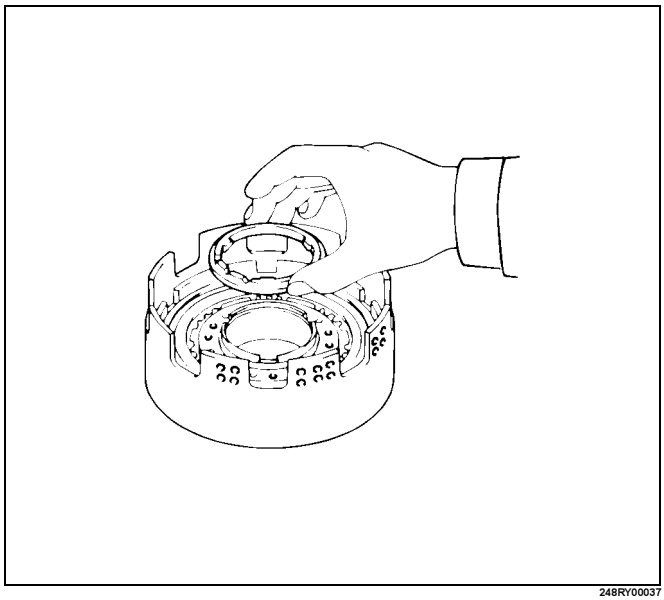
Flange thickness	Flange thickness
3.3mm (0.130in)	3.8mm (0.150in)
3.4mm (0.134in)	—
3.5mm (0.138in)	4.0mm (0.157in)
3.6mm (0.142in)	—
3.7mm (0.146in)	4.2mm (0.165in)



RUW37ASH004901

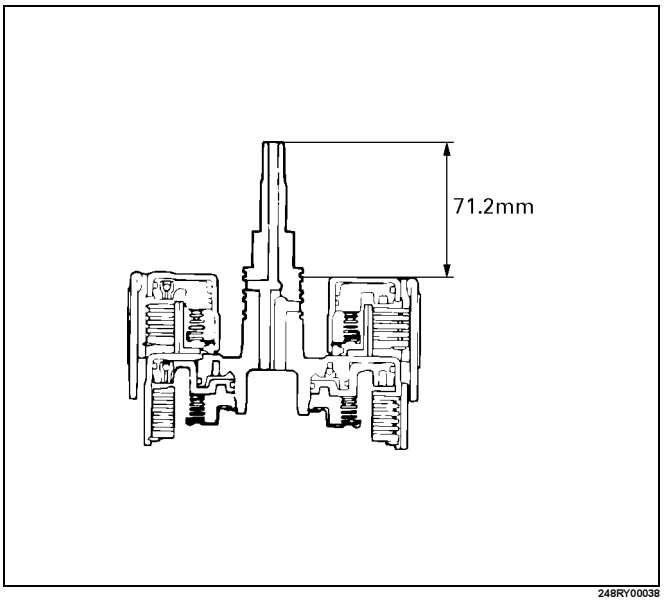
9. Coat the clutch drum thrust washer (plastic) with petroleum jelly and install it onto the direct clutch.

NOTE: Make sure that the lugs fit into the cutout portions on the direct clutch.



248RY00037

Align the flukes of discs in the direct clutch.
Install the direct clutch assembly onto the forward clutch assembly.
Check that the distance from the direct clutch end to the forward clutch end is 71.2mm (2.803in).



248RY00038

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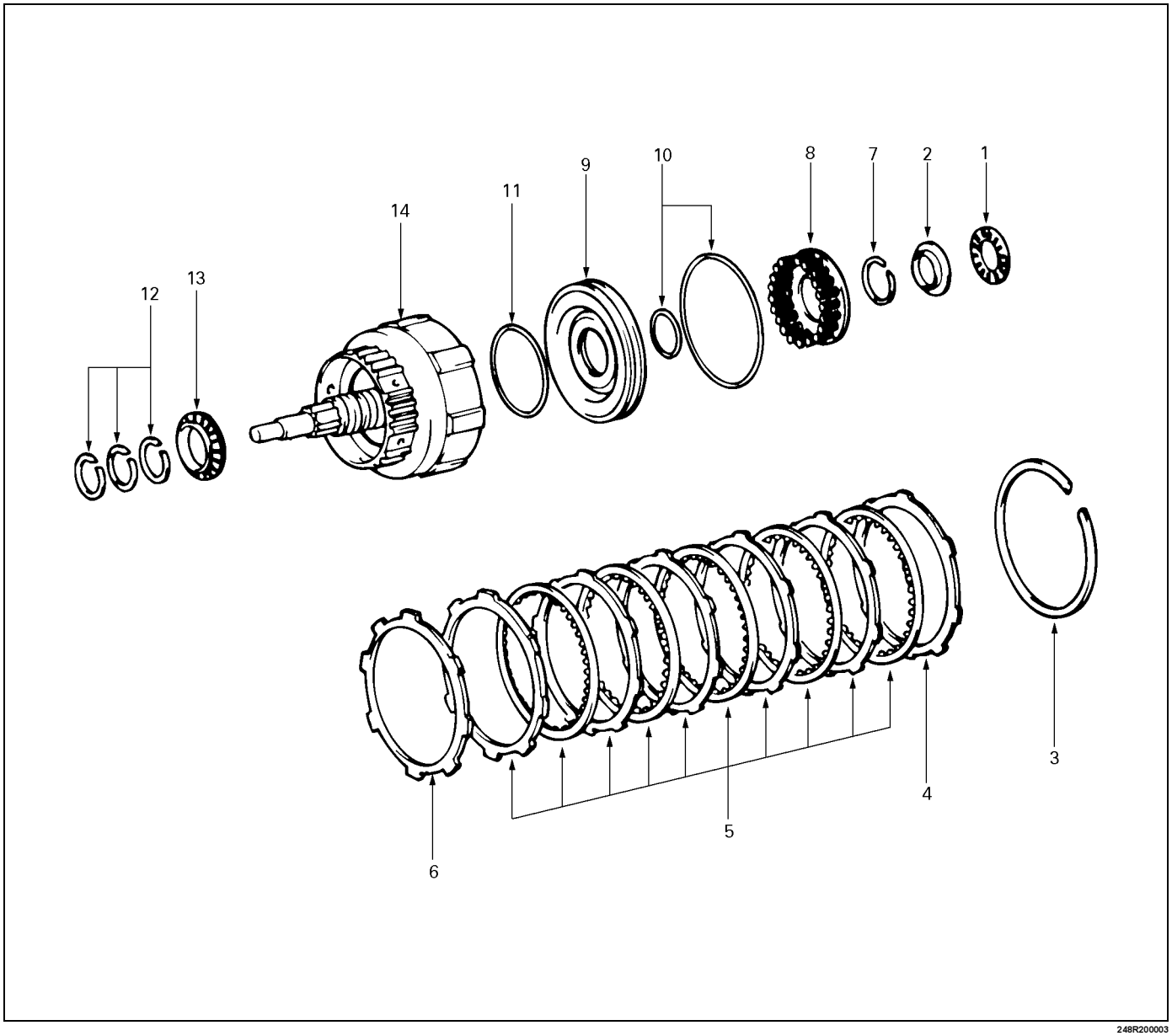
Forward Clutch Asseembly (C-1)

Disassembled View



248R200003

Legend

(1) Thrust bearing
(2) Race
(3) Snap ring
(4) Flange
(5) Disc and plate
Six discs and six plates
(6) Cushion plate
(7) Snap ring
(8) Piston return spring
(9) Piston
(10) O-ring
(11) O-ring
(12 Oil seal ring
(13) Thrust bearing
(14) Forward clutch drum

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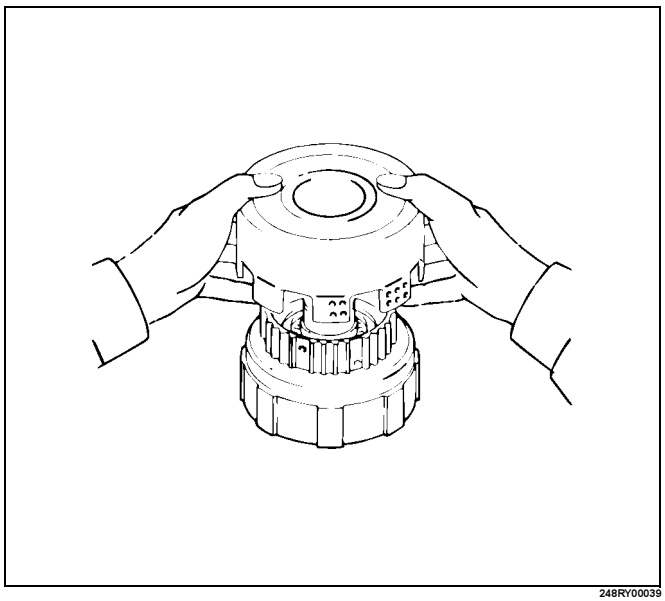
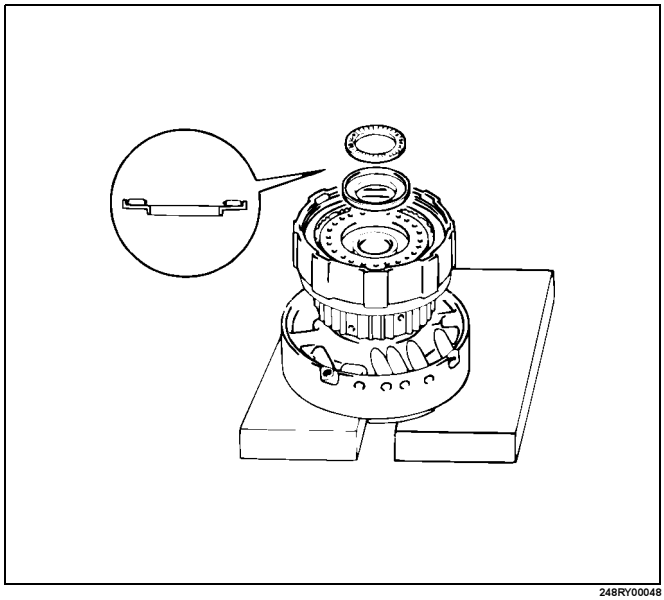
Disassembly

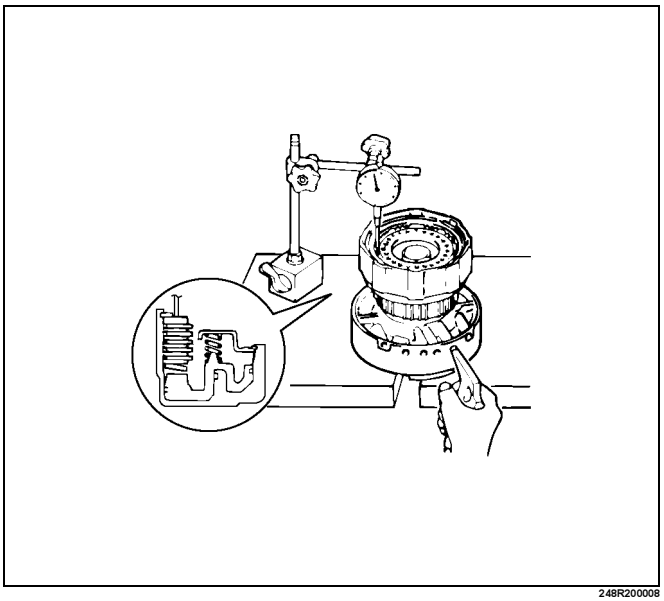
Remove forward clutch assembly from direct clutch assembly.


248RY00039

1. Place wooden blocks, etc. to prevent forward clutch shaft from touching the work stand, and place the OD support on them.
   Place the forward clutch onto the OD support and remove the bearing and race.


248RY00048

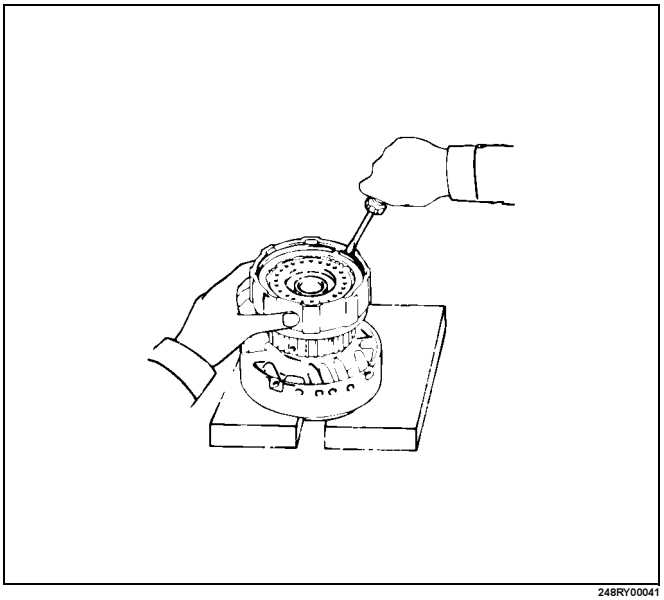
2. Check piston stroke of forward clutch (C–1).


248R200008

   Using a dial indicator, measure the forward clutch piston stroke by applying and releasing compressed air (390 – 780 kPa or 57 – 114 psi) as shown.

Pack clearance: 0.5 – 0.9 mm (0.020 – 0.035 in)

3. Remove snap ring from clutch drum.


248RY00041

4. Remove the flange, disc and plate, and cushion plate.

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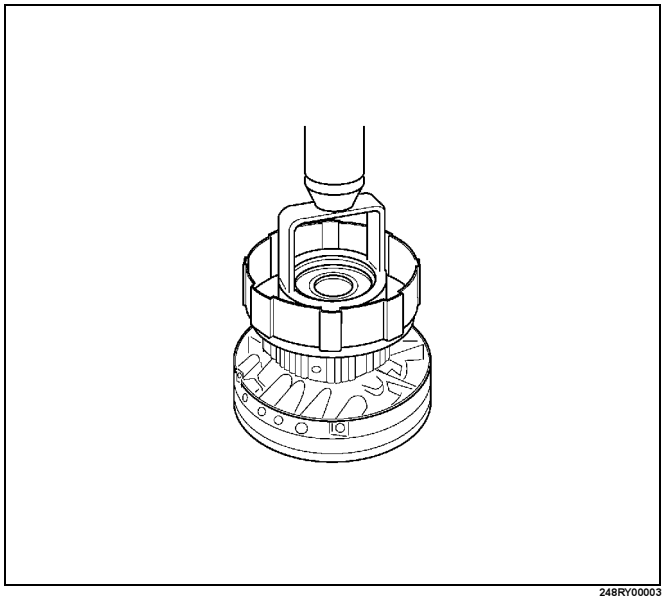
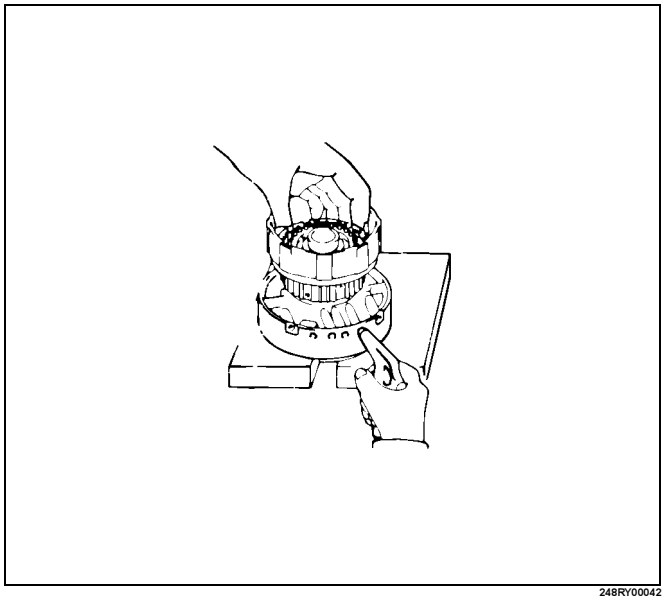
5. Place special tool on the spring retainer and compress the return spring.
   Using snap ring pliers, remove the snap ring.
   Spring compressor : J–25048



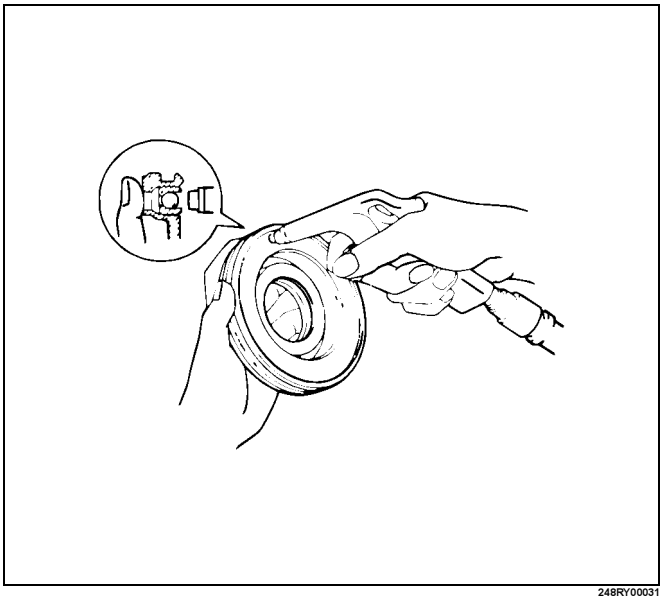
6. Remove the piston return spring.
7. Place the forward clutch drum onto the OD support. Holding the forward clutch piston by hand, apply compressed air to the OD support to remove the forward clutch piston.



8. Remove the O-rings from piston.
9. Remove the O-ring from forward clutch drum.
10. Remove the oil seal rings and thrust bearing from forward clutch drum.

Inspection and Repair

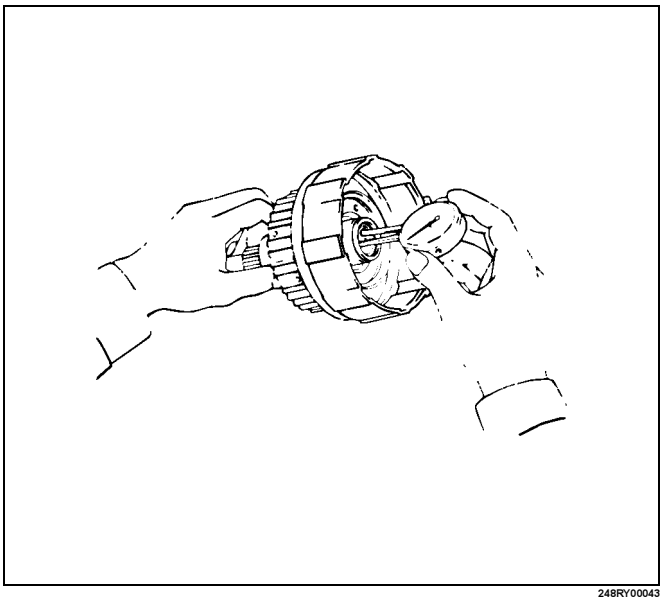
1. Check forward clutch piston
   Check that check ball is free by shaking the piston. Check that the valve does not leak by applying low-pressure compressed air.



2. Check forward clutch drum bushing.
   Using a dial indicator, measure the inside diameter of the forward clutch drum bushing.

Maximum inside diameter: 24.08mm (0.948in)

If the inside diameter is greater then the maximum, replace the forward clutch drum.



3. Check disc, plate and flange.
   Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.
   - If the lining of the disc is peeling off or discolored, or even if parts of the printed numbers are defaced, replace all discs.

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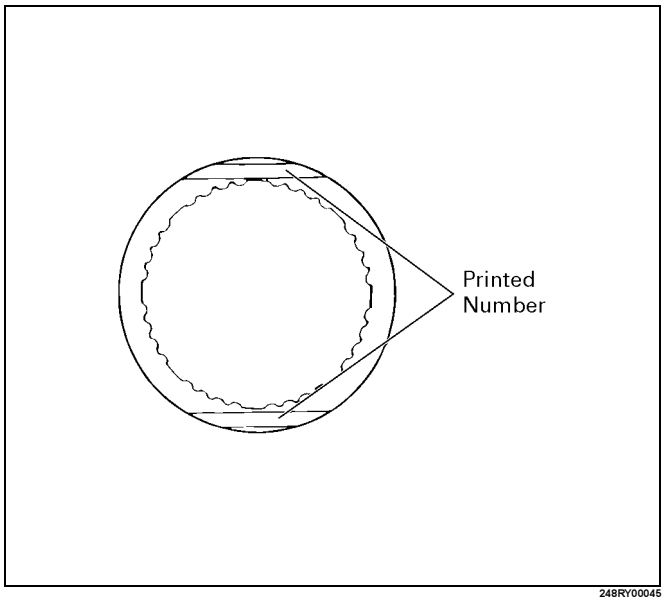
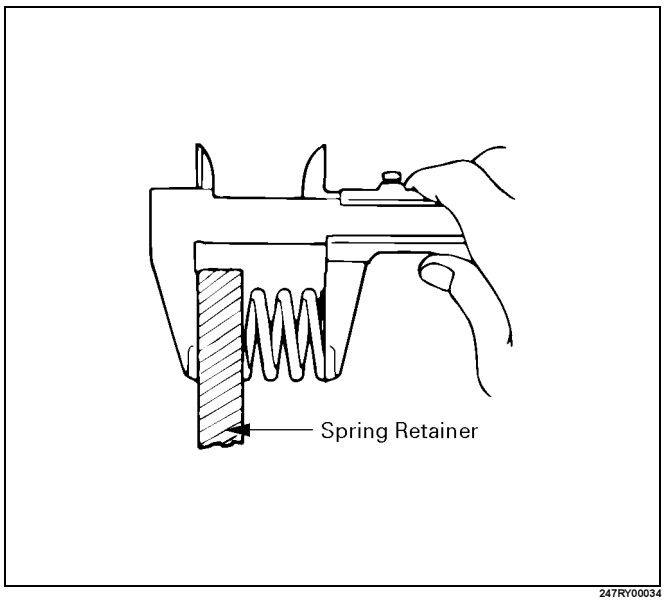
- Before assembling new discs, soak them in ATF for at least fifteen minutes.



248RY00045

4. Check piston return spring.
   Using calipers, measure the free length of the return spring.

Standard length: 19.47mm (0.7665in)

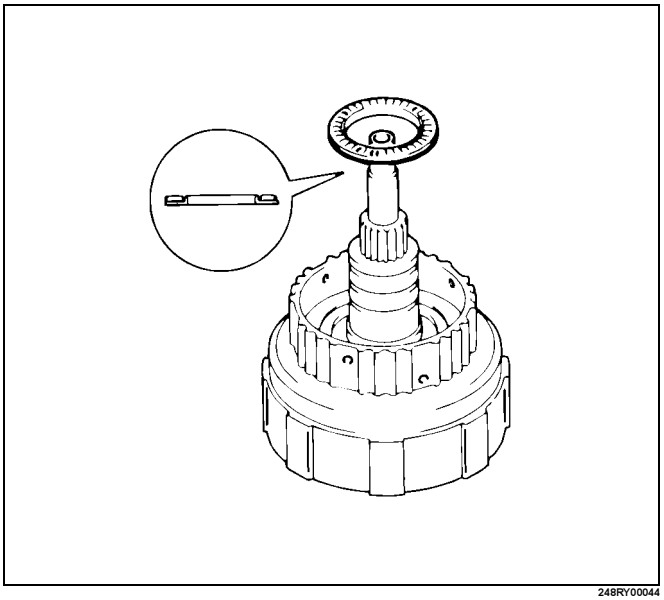


247RY00034

Reassembly

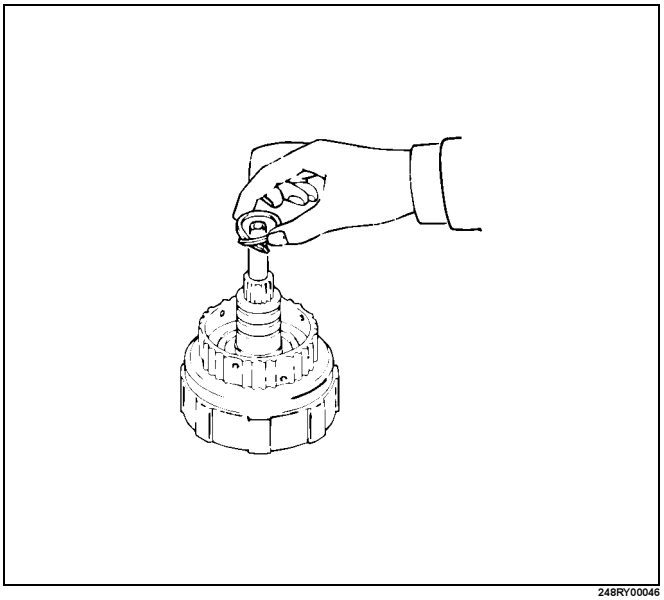
1. Coat the assembled thrust bearing and race with petroleum jelly and install it onto the forward clutch drum, with the race side facing downward.
   Bearing and race (Reference)

Inside diameter	33.7mm (1.327in)
Outside diameter	47.8mm (1.882in)


248RY00044

2. Coat the three oil rings with ATF.
   Contract the oil seal rings as shown, and install three oil seal rings onto the forward clutch drum.

NOTE: Do not spread the ring ends more than necessary.


248RY00046

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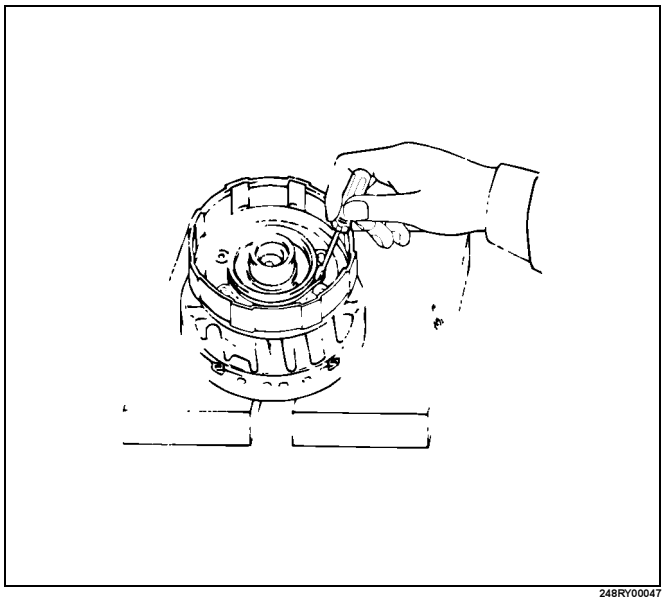
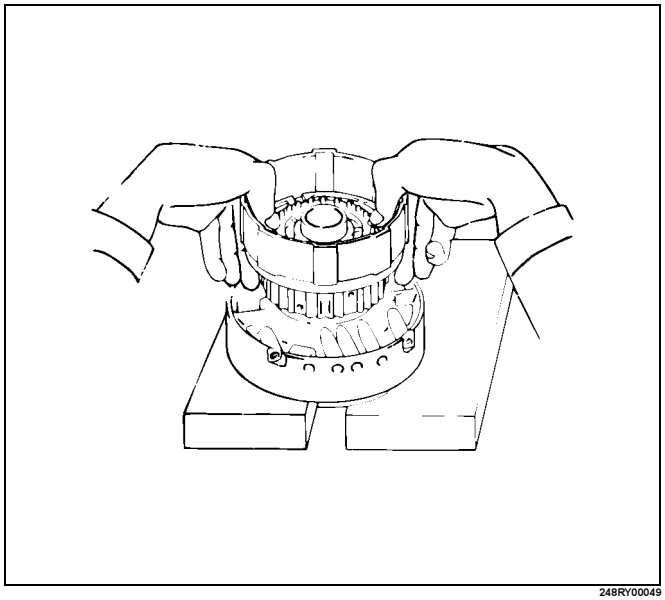
3. Coat a new O-ring with ATF and install O-ring on the forward clutch drum.



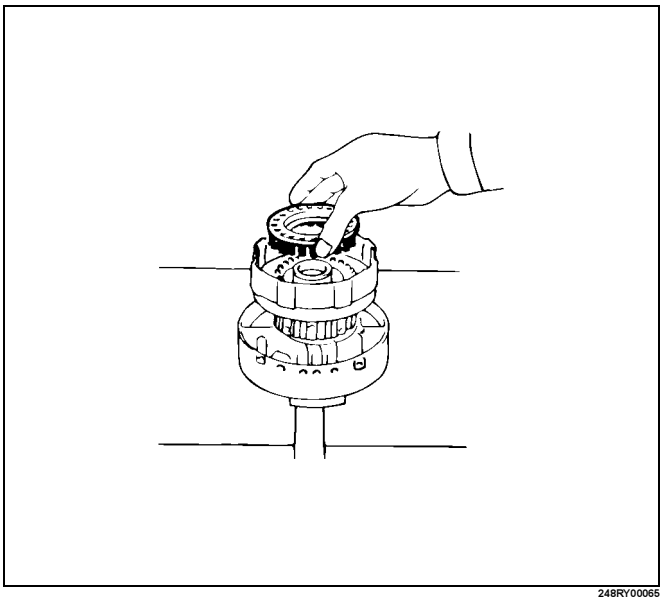
248RY00047

4. Coat new O-rings with ATF and install two O-rings on the forward clutch piston.
5. Being careful not to damage the O-rings, press the forward clutch piston into the forward clutch drum.



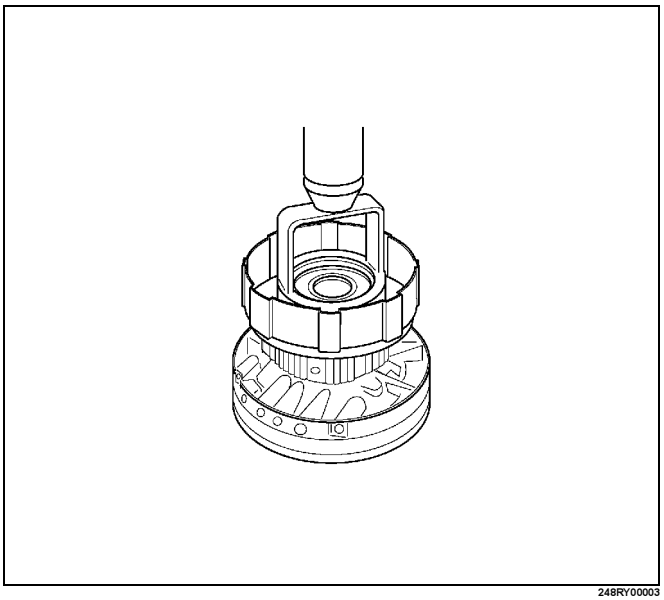
248RY00049

6. Install piston return spring.



248RY00065

7. Place special tool on the spring retainer, and compress the return spring.
   Spring compressor: J–25048
   Install the snap ring with snap ring pliers.
   Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



248RY00003

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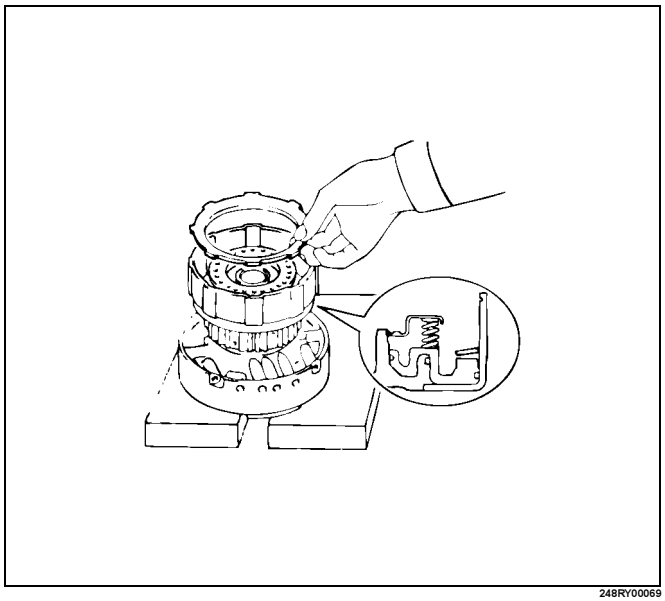
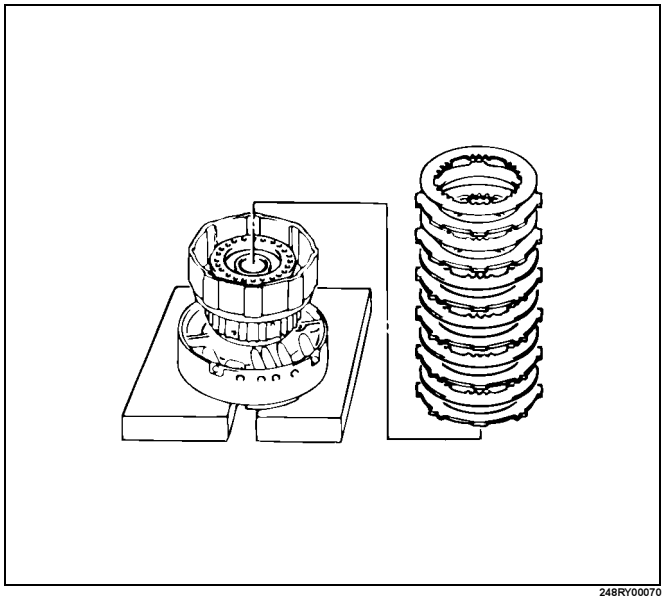
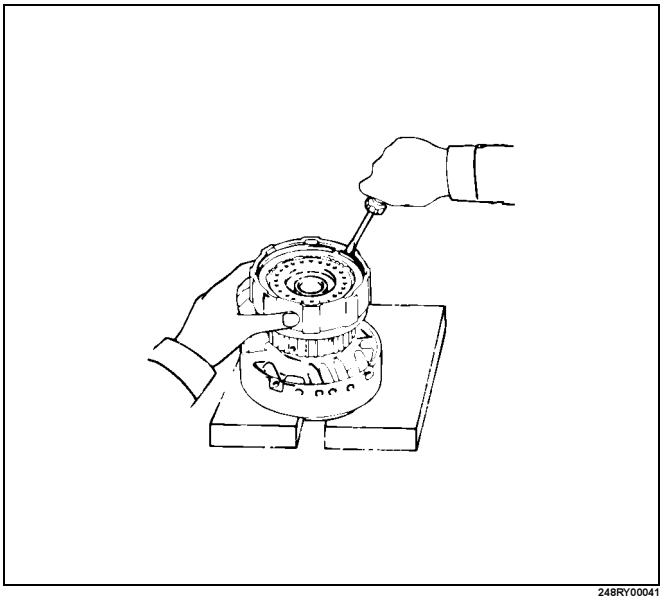
8. Install cushion plate rounded side down as shown.


248RY00069

9. Install five discs and five plates.
   Install in order: P–D–P–D–P–D–P–D–P–D
10. And then install the flange, with the rounded edge facing downward.


248RY00070

11. Install the snap ring with a screwdriver.
    Be sure the end gap of the snap ring is not aligned with the cutout portion of the forward clutch drum.


248RY00041

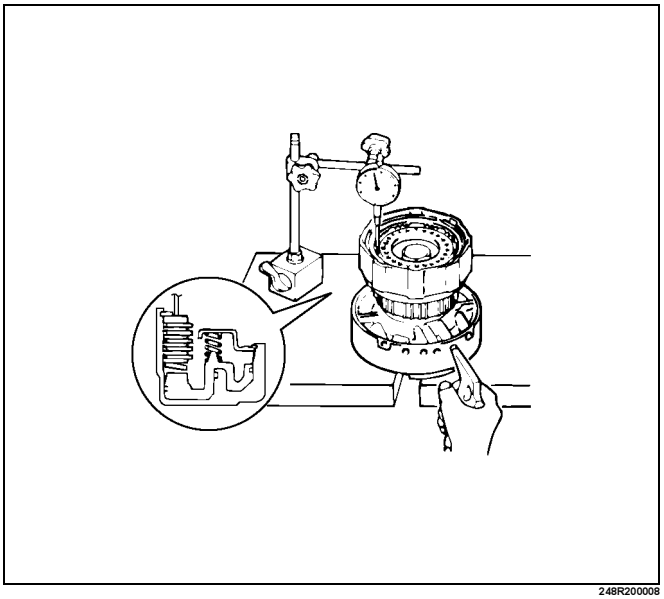
12. Check piston stroke of forward clutch (C–1).
    Using a dial indicator, measure the forward clutch piston stroke by applying and releasing the compressed air (380 – 780 kPa or 57 – 114 psi) as shown.

Pack clearance: 0.5 – 0.9 mm (0.020 – 0.035 in)

If the piston stroke is not within specification, replace the discs, and recheck the piston stroke.

Available flange sizes

3.0mm (0.118in)	3.4mm (0.134in)
4.2mm (0.165in)	3.6mm (0.142in)
4.4mm (0.173in)	3.8mm (0.150in)
3.2mm (0.126in)	4.0mm (0.158in)


248R200008

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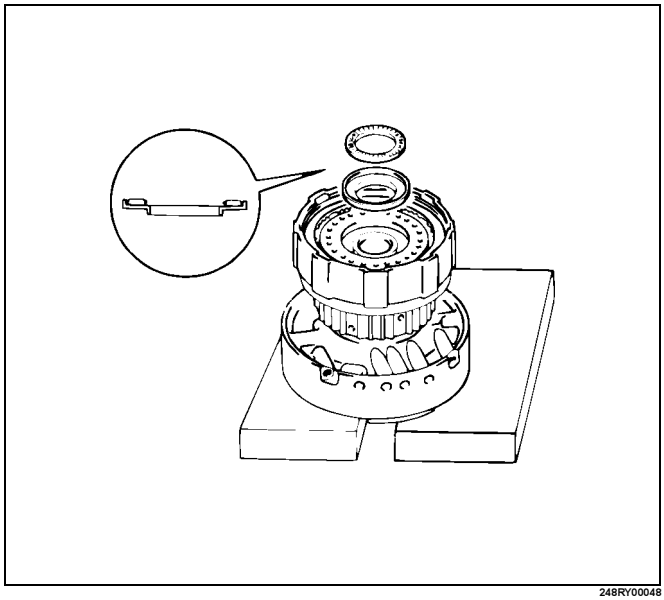
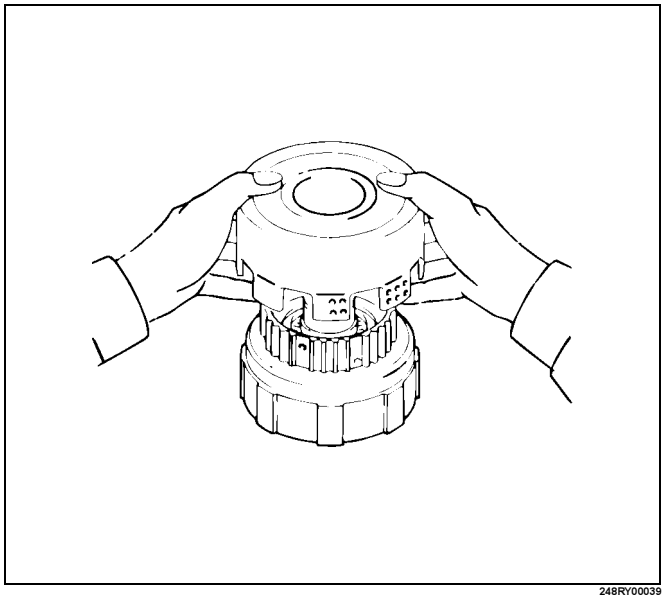
13. Coat the race and thrust bearing with petroleum jelly, and install them onto the forward clutch drum.
Race and bearing diameter (Reference)

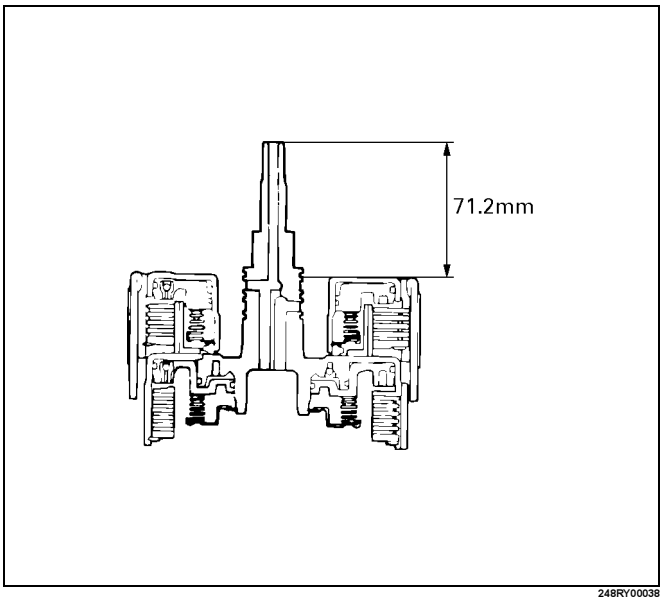
	Inside	Outside
Race	26.0mm (1.024in)	48.9mm (1.925in)
Bearing	26.0mm (1.024in)	46.7mm (1.839in)


248RY00048

14. Align the flukes of discs in the direct clutch.
Install the direct clutch assembly onto the forward clutch assembly.


248RY00039

Check that the distance from the direct clutch end to the forward clutch end is 71.2mm (2.803in).



248RY00038

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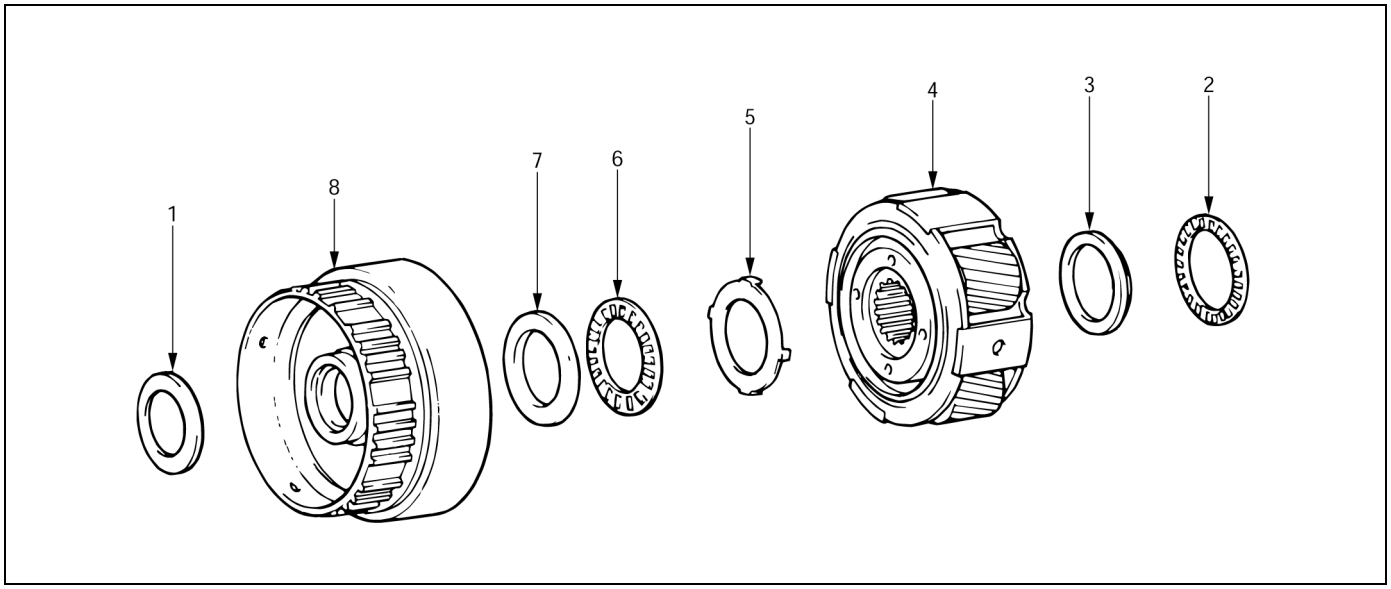
Front Planetary Gear

Disassembled View



247R200003

Legend

(1) Race
(2) Thrust bearing
(3) Race
(4) Front planetary gear
(5) Race (Metal)
(6) Thrust bearing
(7) Race
(8) Front planetary ring gear

Disassembly

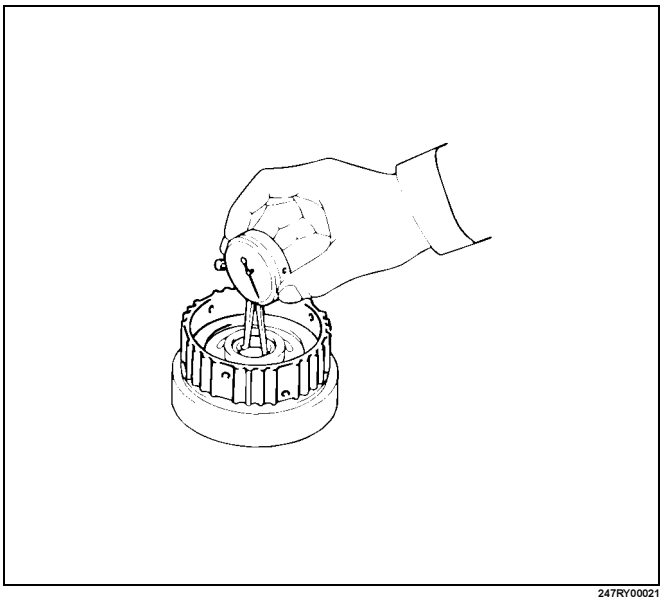
1. Remove the race from front planetary ring gear.
2. Remove the thrust bearing and race from front planetary gear.
3. Remove the race (Metal), thrust bearing and race between front planetary ring gear and front planetary gear.

Inspection and Repair

1. Check front planetary ring gear bushing
   Using a dial indicator, measure the inside diameter of the front planetary ring gear bushing.

   Maximum inside diameter: 24.08 mm (0.9480 in)

   If the inside diameter is greater than the maximum, replace the front planetary ring gear.



247RY00021

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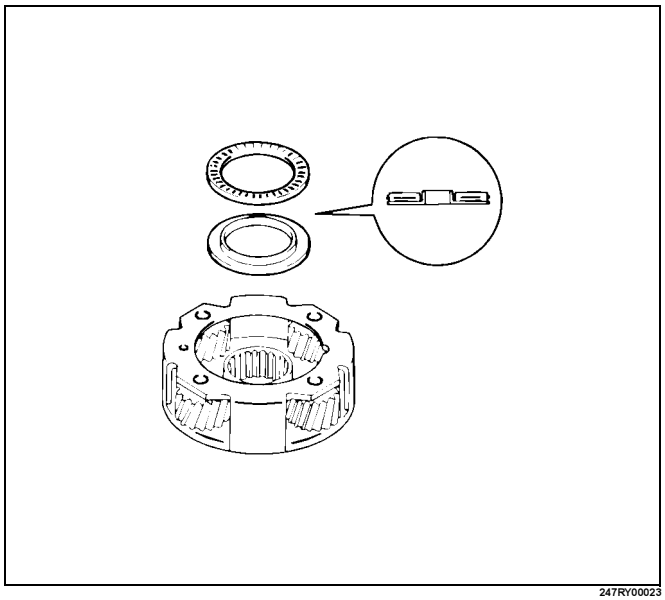
Reassembly

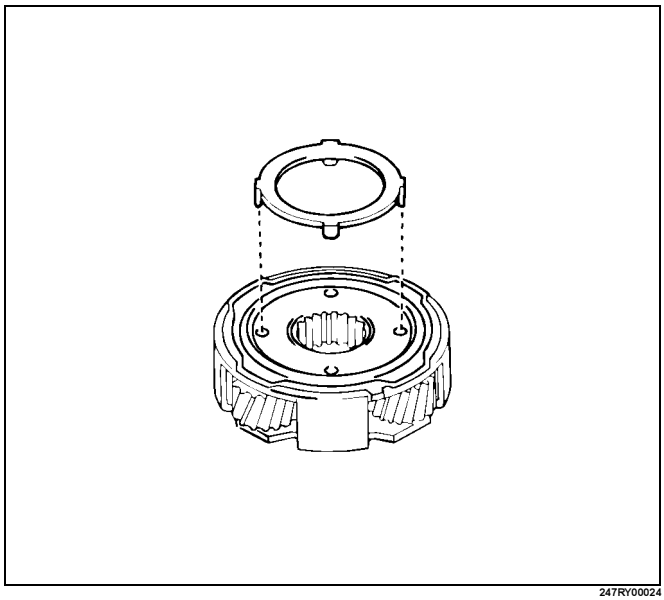
1. Coat the race and thrust bearing with petroleum jelly.
   Install the race and bearing to the rear side of the front planetary gear.
   Race and bearing diameter (Reference)

	Inside	Outside
Bearing	35.6mm (1.402in)	47.7mm (1.878in)
Race	33.7mm (1.327in)	47.6mm (1.874in)


247RY00023

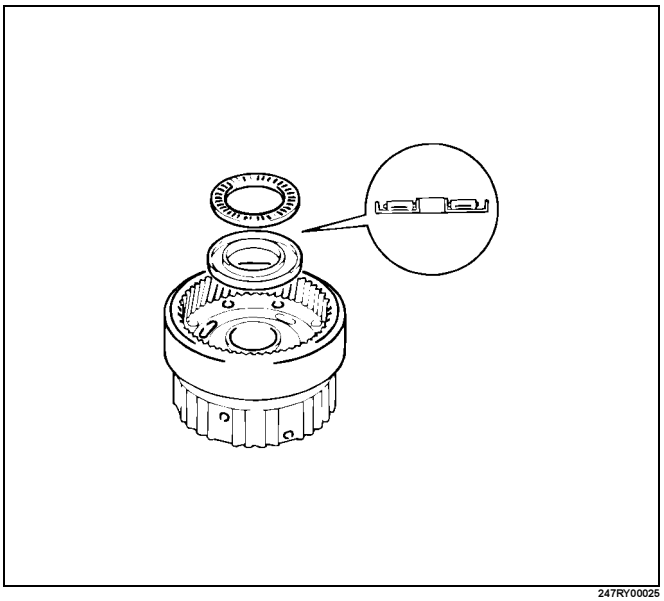
2. Turn over the planetary gear and install the race (metal).
   Make sure that the lugs fit into the holes on the front planetary gear.
   Race diameter (Reference)

	Inside	Outside
Race	34.3mm (1.350in)	47.8mm (1.882in)


247RY00024

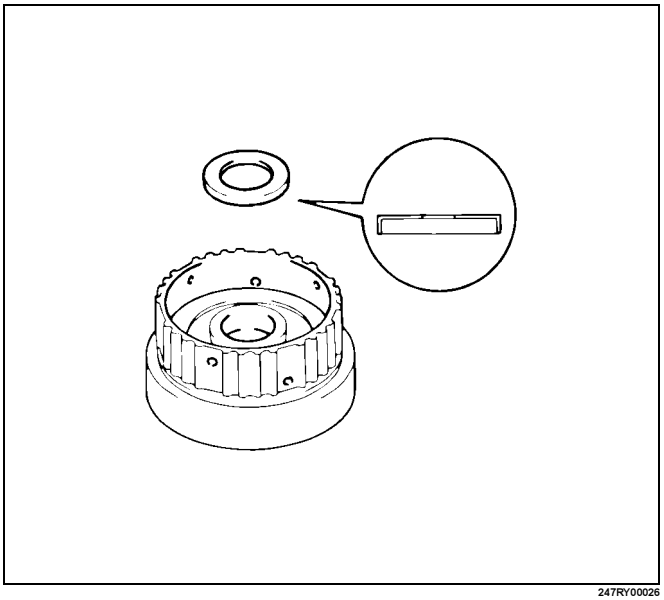
3. Coat the race and thrust bearing with petroleum jelly.
   Install the race and bearing onto the rear side of the front planetary ring gear.
   Race and bearing diameter (Reference)

	Inside	Outside
Race	35.15 mm (1.38 in)	53.65 mm (2.11 in)
Bearing	35.15 mm (1.38 in)	53.65 mm (2.11 in)


247RY00025

4. Turn over the planetary ring gear and install the race onto the front side of the front planetary ring gear.
   Race diameter (Reference)

	Inside	Outside
Race	26.8mm (1.055in)	47.0mm (1.850in)


247RY00026

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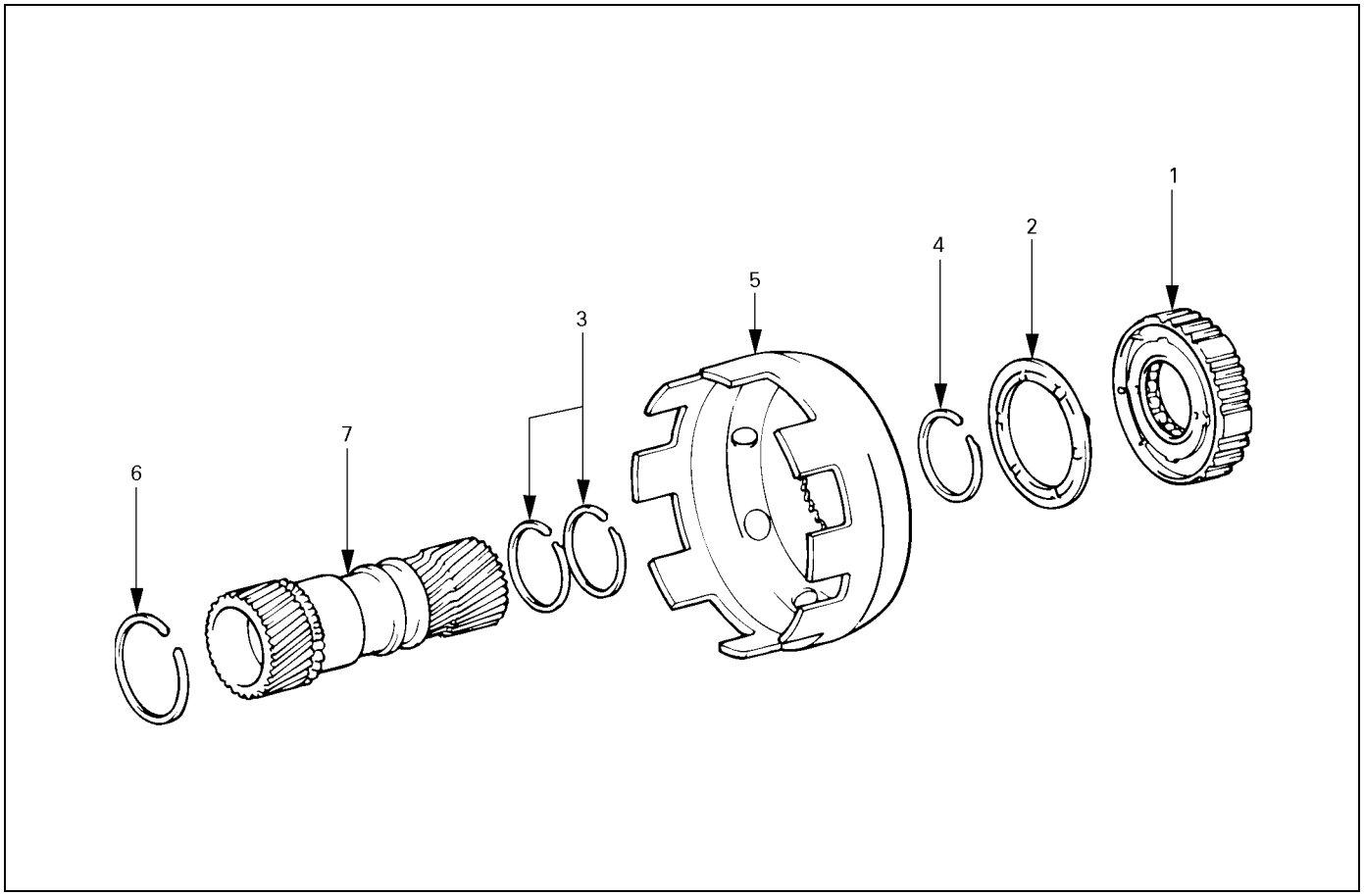
Planetary Sun Gear and No.1 One-Way Clutch

Disassembled View



248R200005

Legend

(1) One-way clutch and second brake hub
(2) Thrust washer (plastic)
(3) Oil seal ring (Metal)
(4) Snap ring
(5) Sun gear input drum
(6) Snap ring
(7) Planetary sun gear

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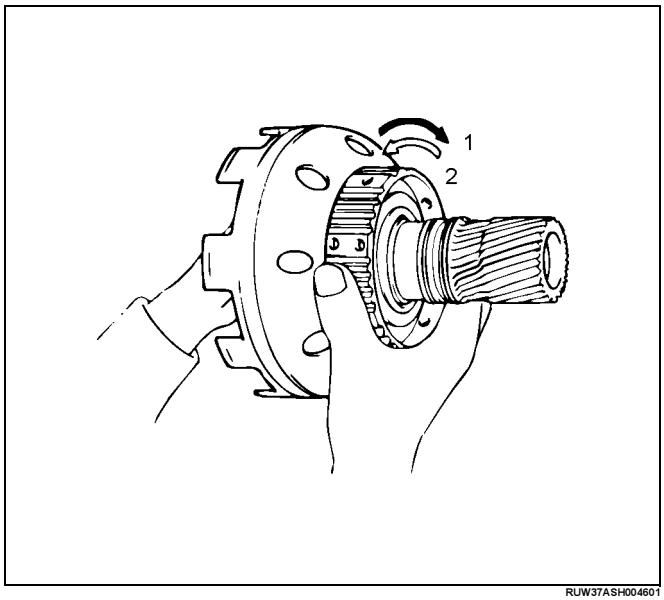
Disassembly

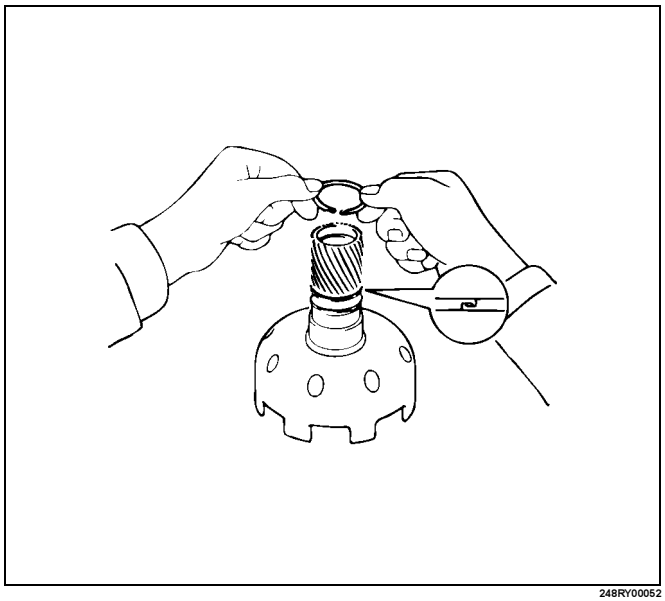
1. Check operation of No.1 one-way clutch
   Hold the planetary sun gear and turn the second brake hub.
   The second brake hub should turn freely clockwise and should lock counterclockwise.



RUW37ASH004601

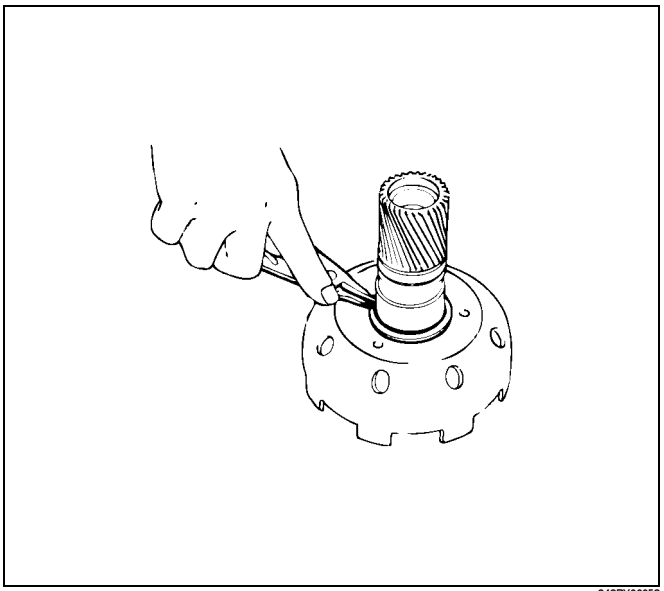
Legend
(1) Free
(2) Lock

2. Remove the one-way clutch and second brake hub.
3. Remove the trust washer (plastic).
4. Remove two oil seal rings (metal).



248RY00052

5. Remove the snap ring with snap ring pliers.



248RY00053

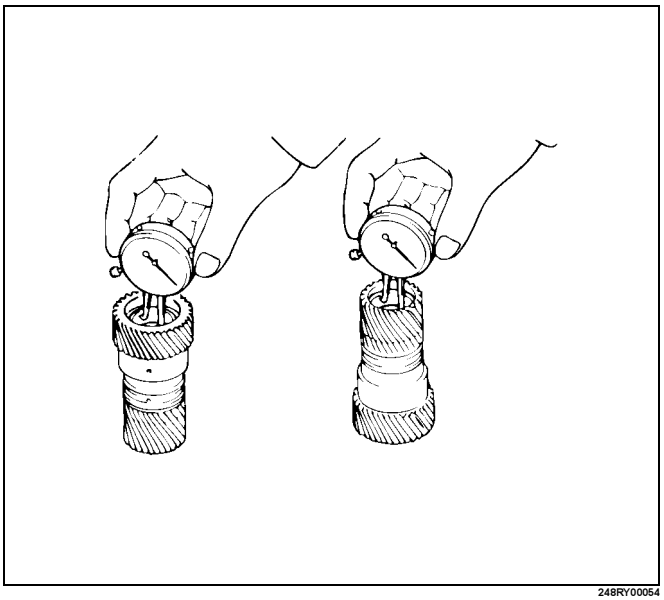
6. Remove the sun gear input drum.
7. Remove the snap ring from planetary sun gear.

Inspection and Repair

1. Check planetary sun gear bushing
   Using a dial indicator, measure the inside diameter of the planetary sun gear bushing.

   Maximum inside diameter: 27.08 mm (1.066 in)

   If the inside diameter is greater than the maximum, replace the planetary sun gear.



248RY00054

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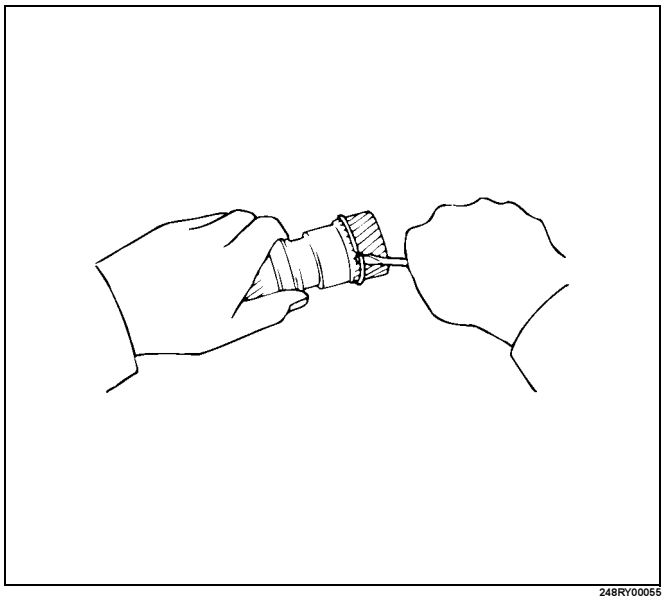
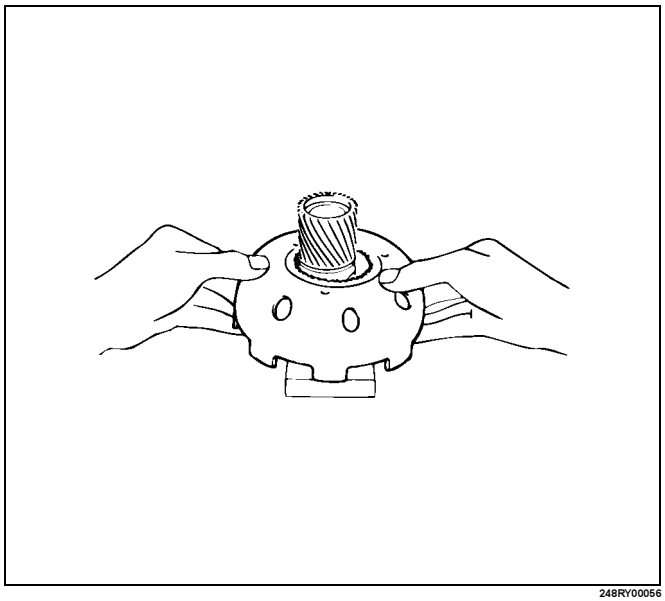
Reassembly

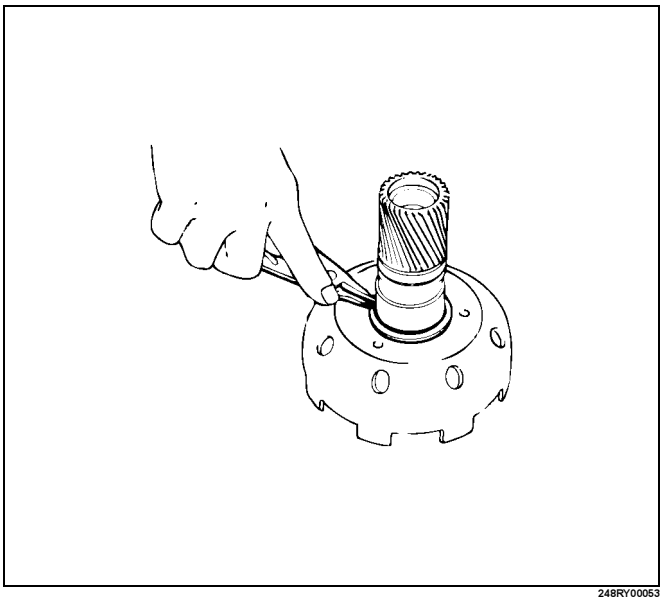
1. Install snap ring to planetary sun gear.


248RY00055

2. Place a wooden block, etc. as a work stand and place the planetary sun gear onto it.
   Install the sun gear input drum onto the planetary sun gear.

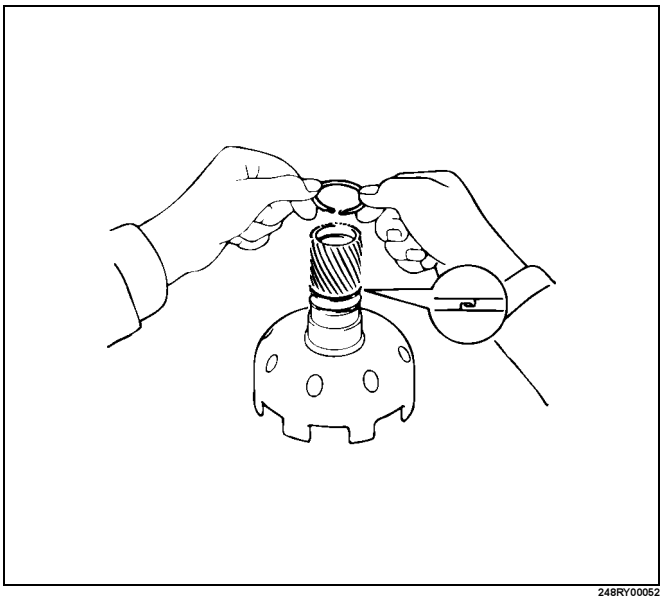

248RY00056

3. Install snap ring with snap ring pliers.


248RY00053

4. Coat the two oil seal rings (metal) with ATF.
   Install the two oil seal rings onto the planetary sun gear.

NOTE: Do not spread the ring ends too much.


248RY00052

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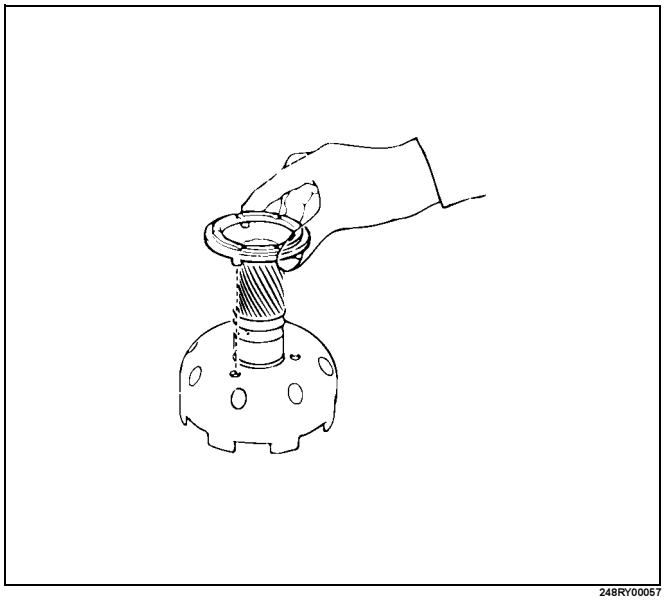
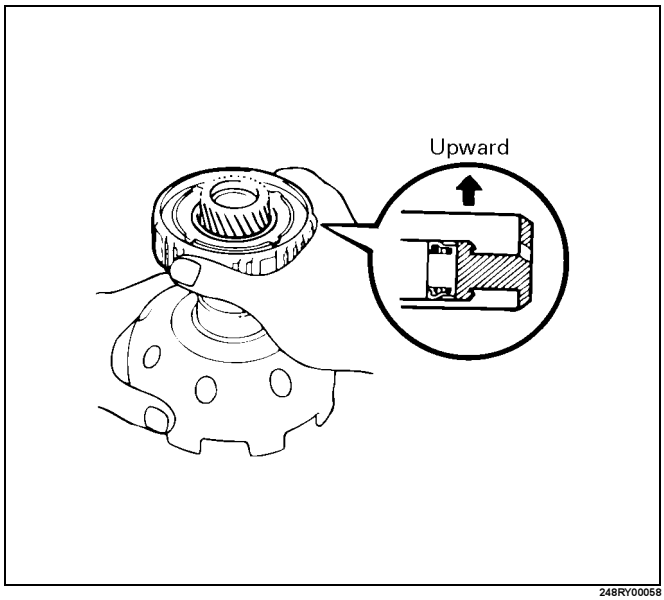
5. Install thrust washer (plastic).

NOTE: Make sure that the lugs fit into the holes on the sun gear input drum.



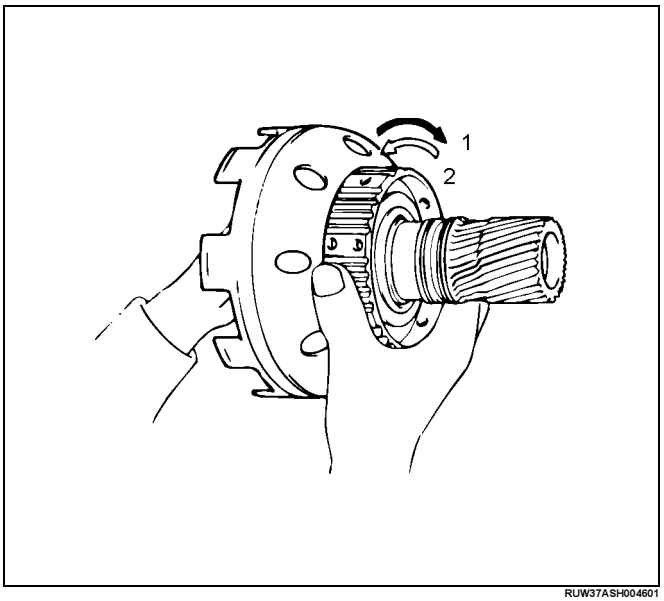
248RY00057

6. Install assembled No.1 one-way clutch and second brake hub onto planetary sun gear as shown.



248RY00058

7. Check operation of No.1 one-way clutch
   Hold the planetary sun gear and turn the second brake hub.
   The second brake hub should turn freely clockwise and should lock counterclockwise.



RUW37ASH004601

Legend

(1) Free
(2) Lock

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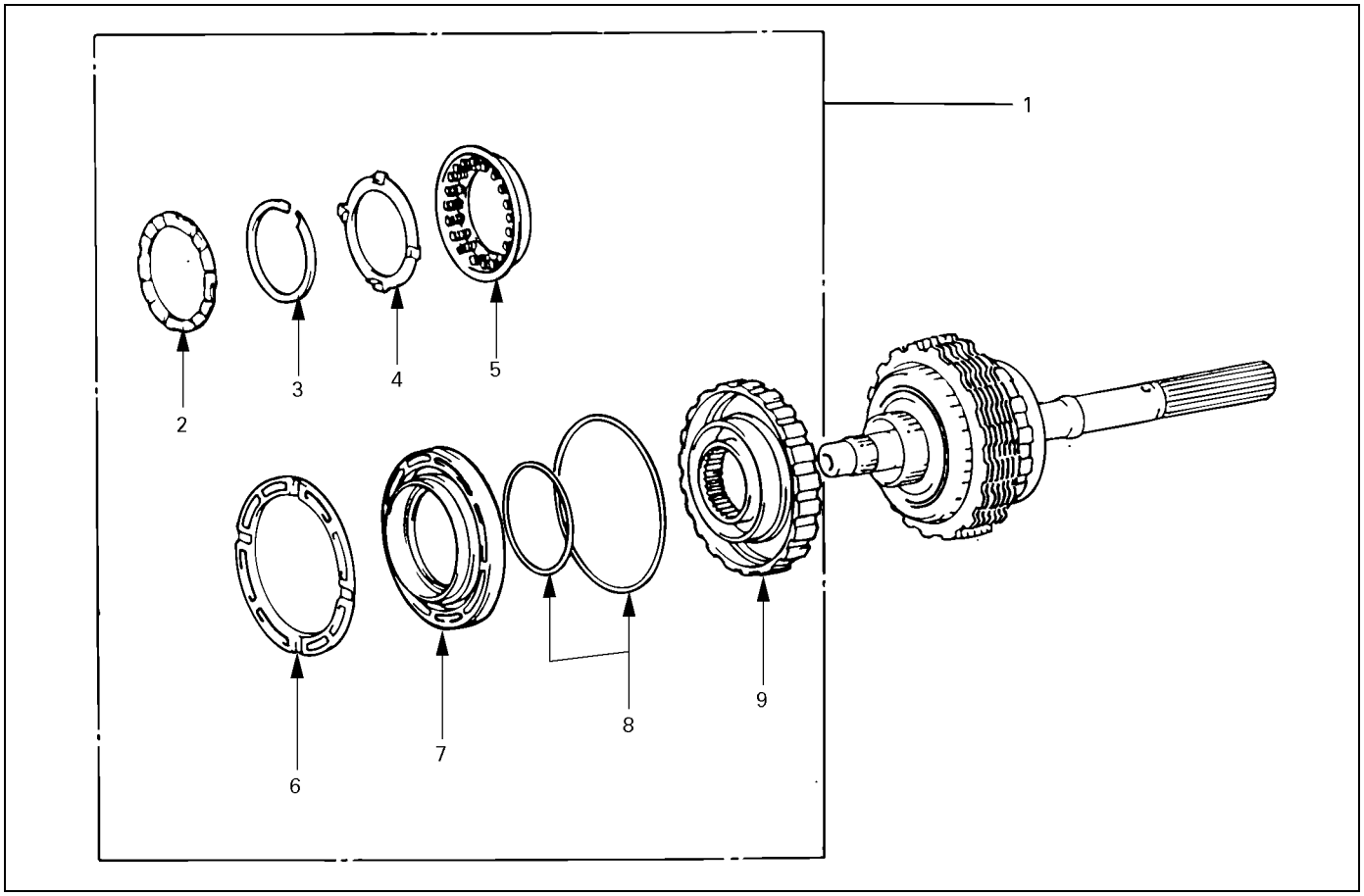
Second Brake Assembly (B–2)

Disassembled View



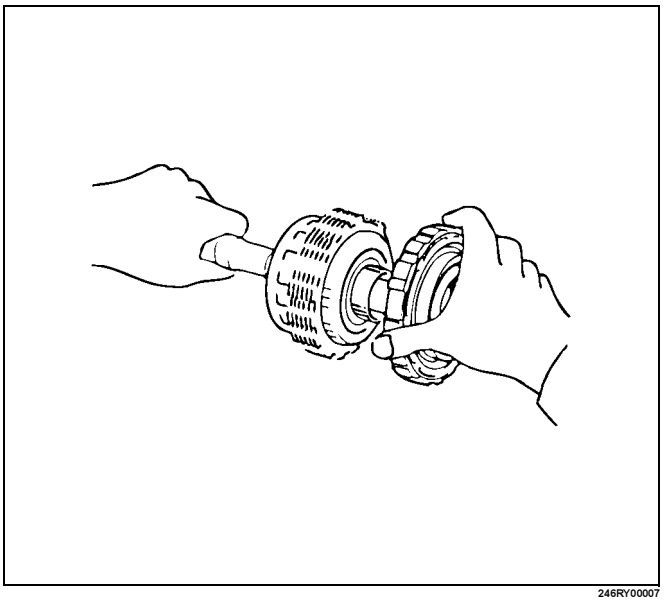
246R200001

Legend

(1) Second brake assembly
(2) Thrust washer (Plastic)
(3) Snap ring
(4) Spring retainer
(5) Piston return spring
(6) Piston sleeve
(7) Second brake piston
(8) O-ring
(9) Second brake drum

Disassembly

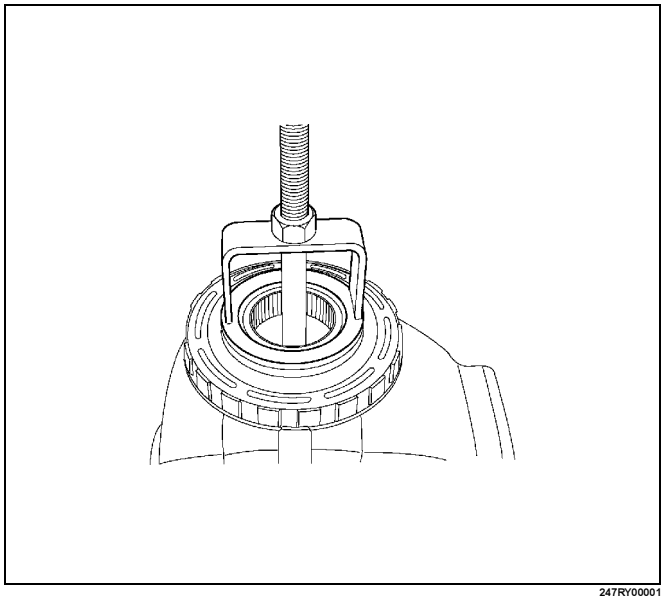
1. Remove second brake assembly from output shaft.



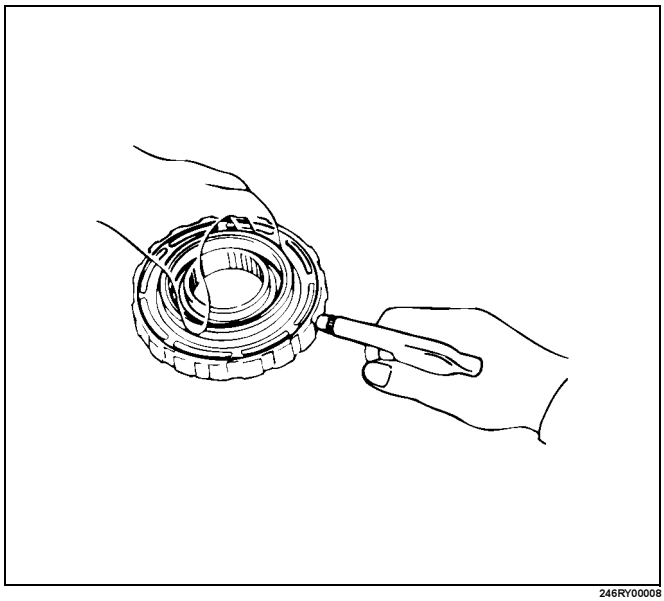
246RY00007

ProCarManuals.com

2. Remove the hrust washer (plastic).
3. Place special tool on the spring retainer, and compress the return spring.
   Spring compressor: J–25048
   Remove the snap ring with snap ring pliers.


247RY00001

4. Remove the spring retainer and piston return spring.
5. Romove piston sleeve.
6. Holding the second brake piston by hand, apply compressed air to the second brake drum to remove the second brake piston.
   Remove the second brake piston from the second brake drum.

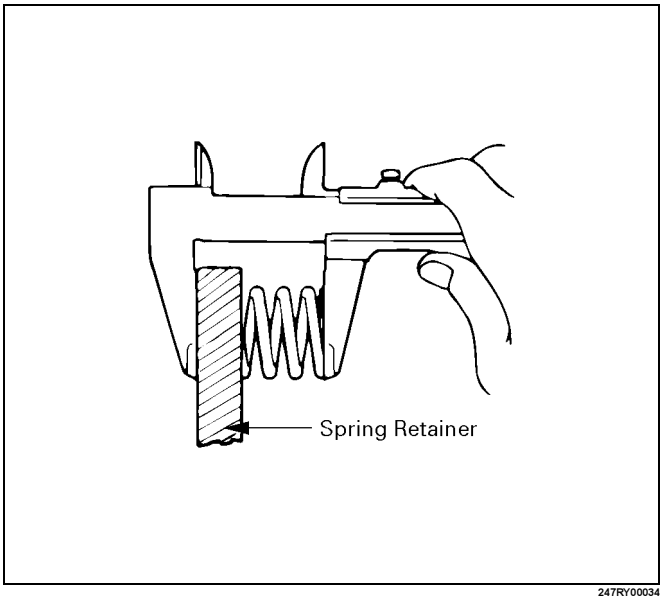

246RY00008

7. Remove the o-rings from the second brake piston.

Inspection and Repair

1. Check piston return spring.
   Using calipers, measure the free length of the return spring.

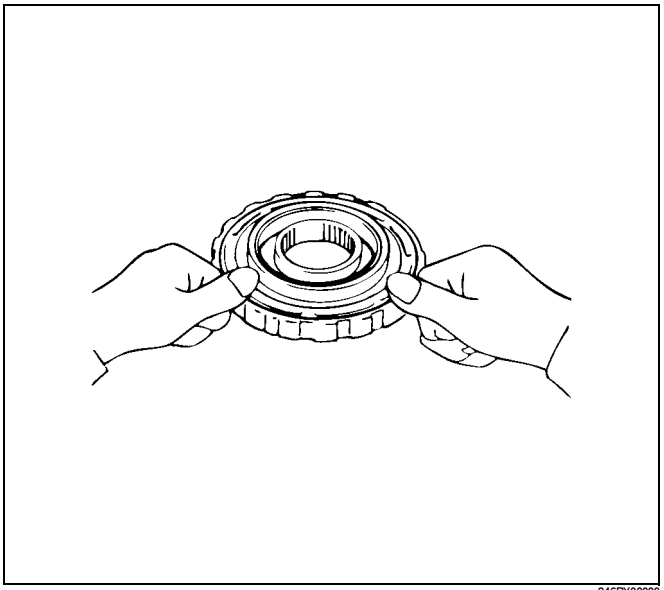
Standard length: 18.38 mm (0.724 in)



247RY00034

Reassembly

1. Coat new O-rings with ATF and install them on the second brake piston.


246RY00009

2. Being careful not to damage the O-rings, press in the second brake piston into the second brake drum.
3. Install piston sleeve.

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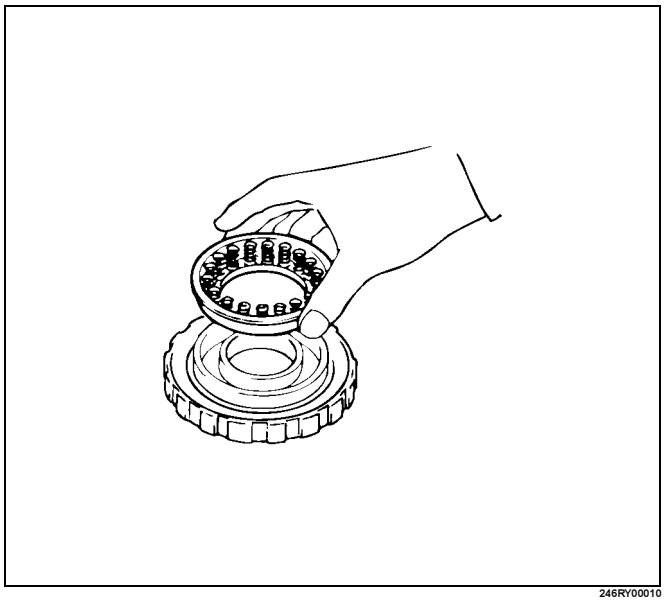
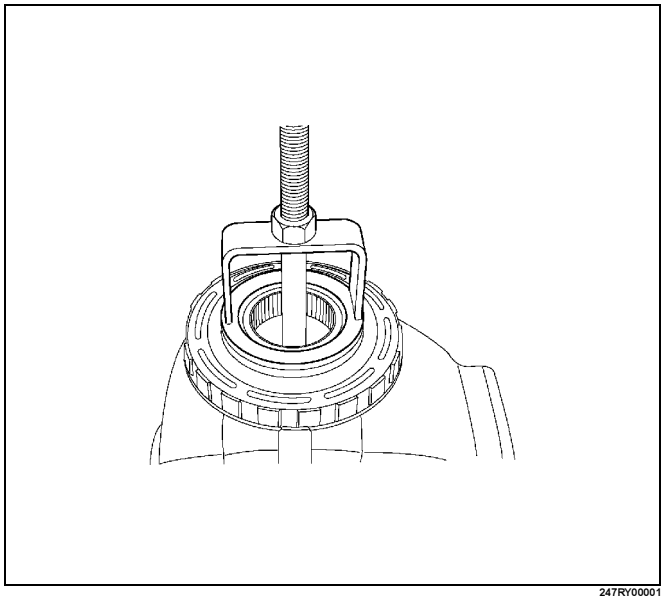
4. Install piston return spring.



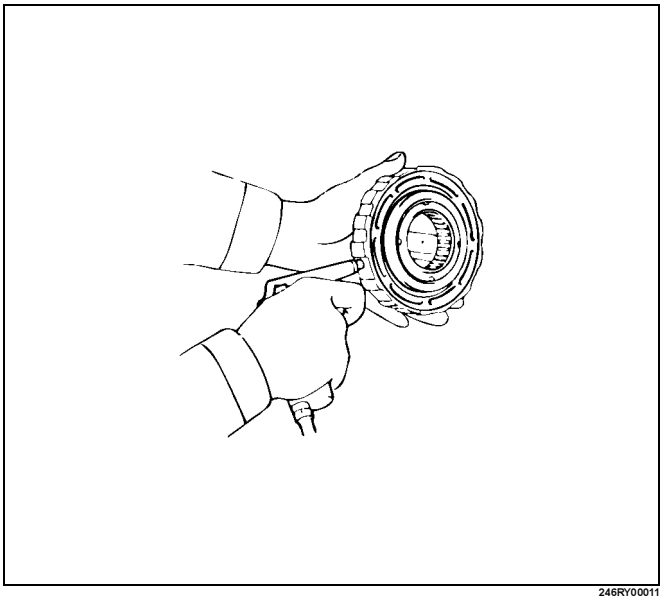
246RY00010

5. Install spring retainer.
6. Place special tool on the spring retainer, and compress the return spring.
   Spring compressor: J–25048
   Install the snap ring with snap ring pliers.
   Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



247RY00001

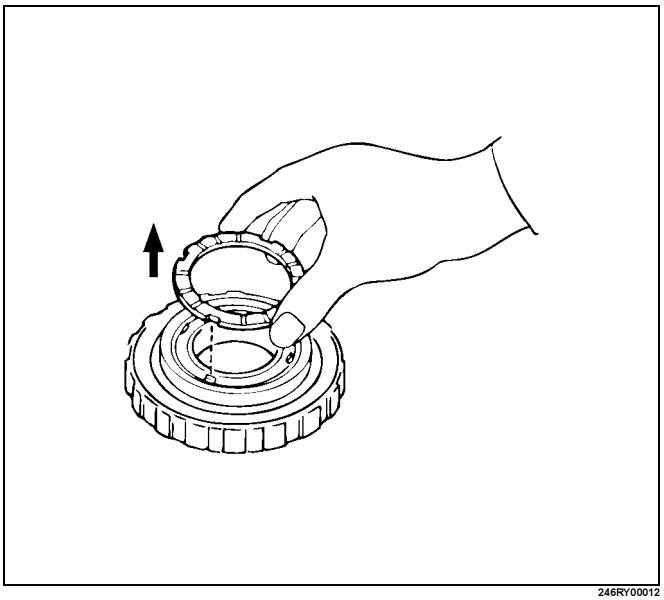
7. Check second brake piston movement.
   Make sure the second brake piston moves smoothly when applying and releasing the low compressed air to the second brake drum.



246RY00011

8. Coat the thrust washer (plastic) with petroleum jelly and install it to the second brake piston, with the grooved side facing upward.

NOTE: Make sure that the cutout portions of the thrust washer match the teeth of the spring retainer.



246RY00012

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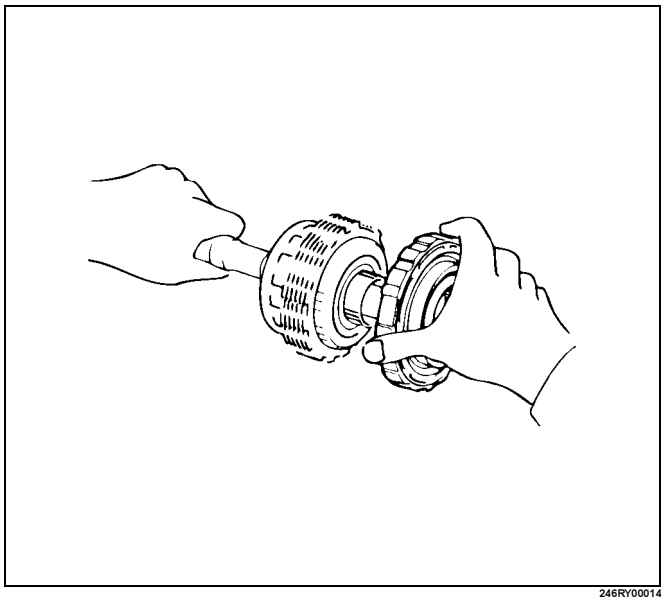
9. Install second brake assembly to output shaft.



246RY00014

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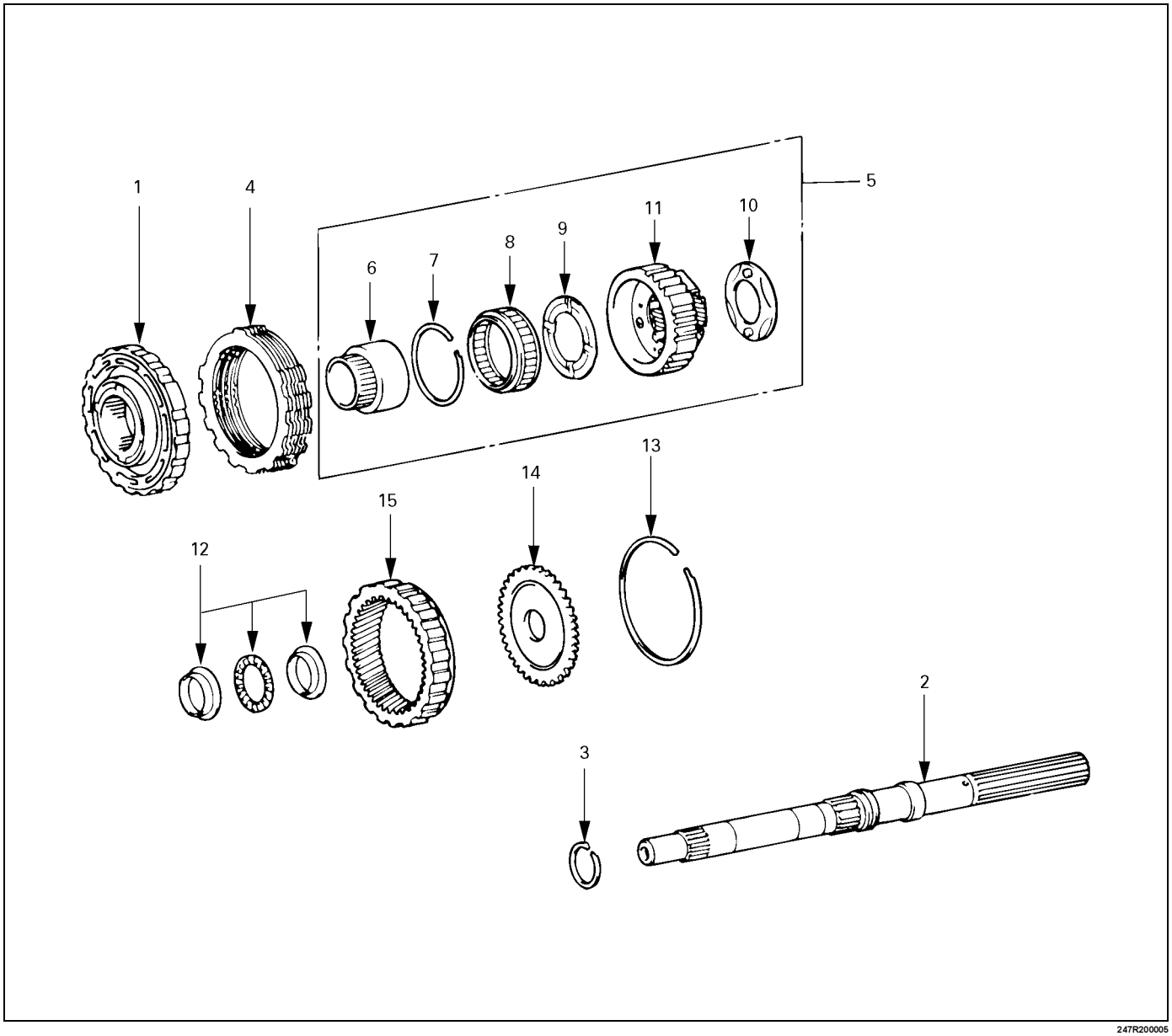
Rear Planetary Gear Assembly and Output Shaft

Disassembled View



247R200005

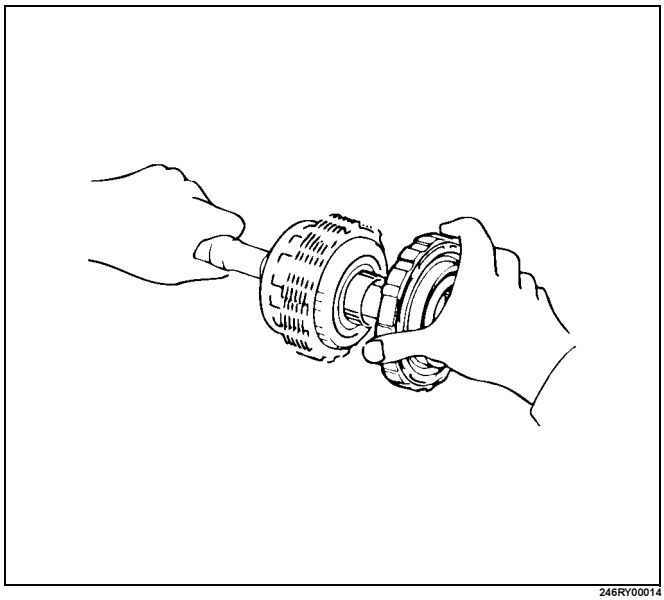
Legend

(1) Second brake assembly
(2) Output shaft
(3) Oil seal ring
(4) Disc, plate and flange (B–3)
Seven discs and seven plates
(5) Rear planetary gear assembly
(6) One-way clutch inner race
(7) Snap ring
(8) One-way clutch
(9) Thrust washer (Plastic)
(10) Thrust washer (Plastic)
(11) Rear planetary gear
(12) Thrust bearing and race
(13) Snap ring
(14) Ring gear flange
(15) Rear planetary ring gear

ProCarManuals.com

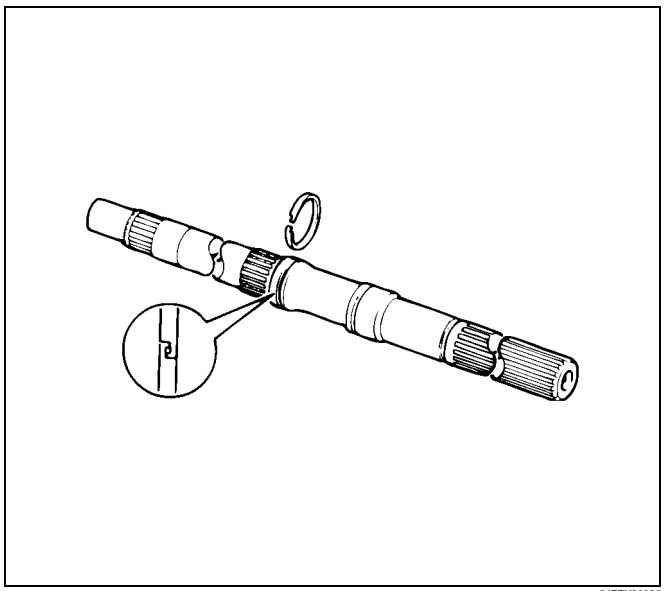
Disassembly

1. Remove second brake assembly from output shaft.



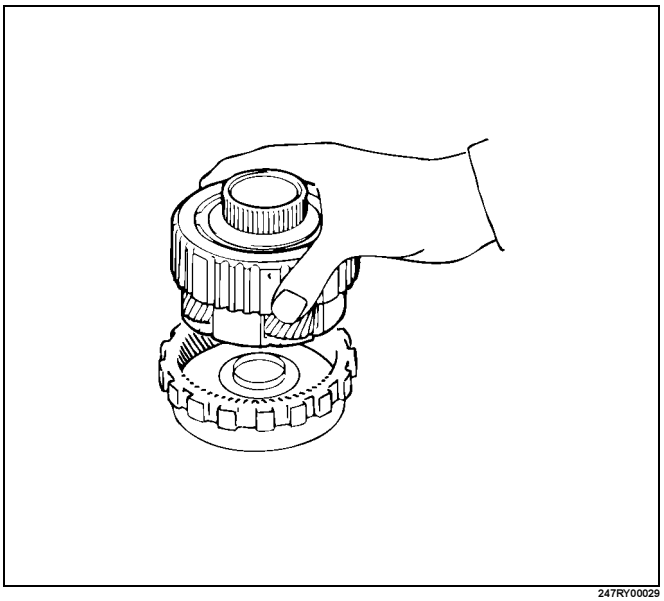
246RY00014

2. Remove oil seal ring from output shaft.



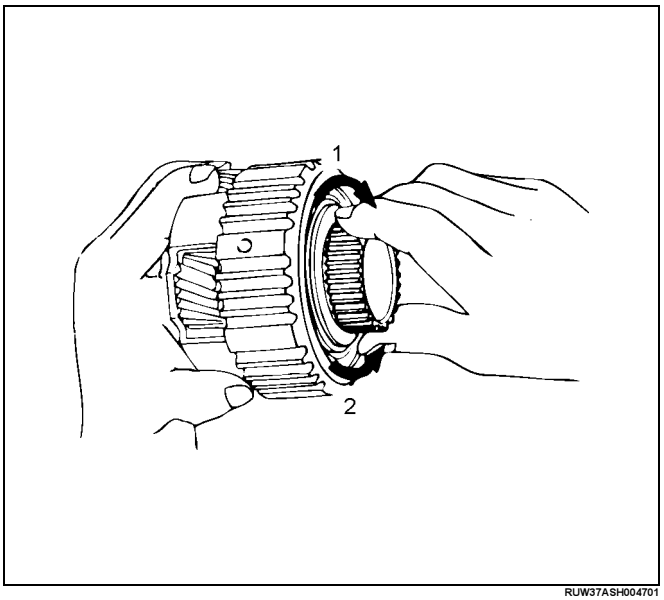
247RY00028

3. Remove the seven discs, seven plates and flange (B–3).
4. Remove rear planetary gear from rear planetary ring gear.



247RY00029

5. Check operation of No.2 one-way clutch.
   Hold the planetary gear and turn the one-way clutch inner race.
   The one-way clutch inner race should turn freely counterclockwise and should lock clockwise.



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Legend

(1) Lock
(2) Free

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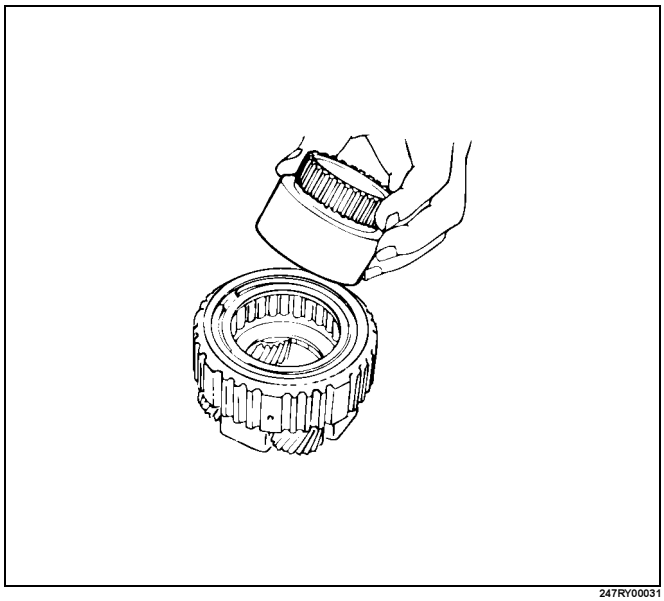
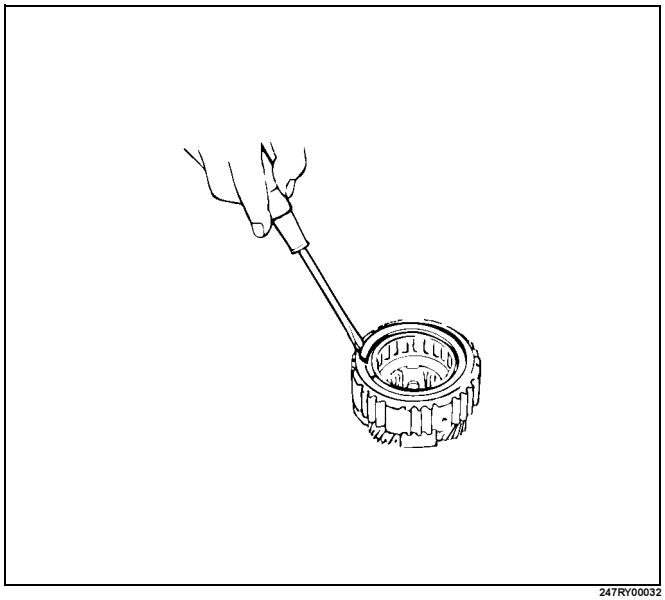
6. Remove the one-way clutch inner race from the rear planetary gear.



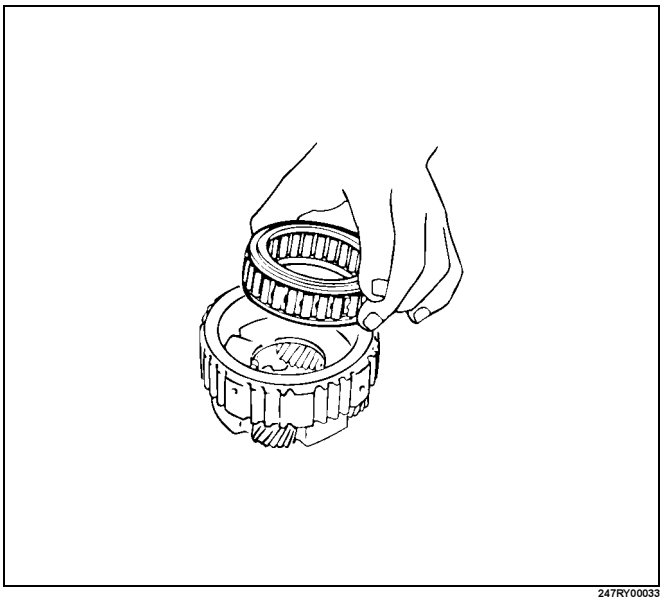
247RY00031

7. Remove the snap ring with a screwdriver.



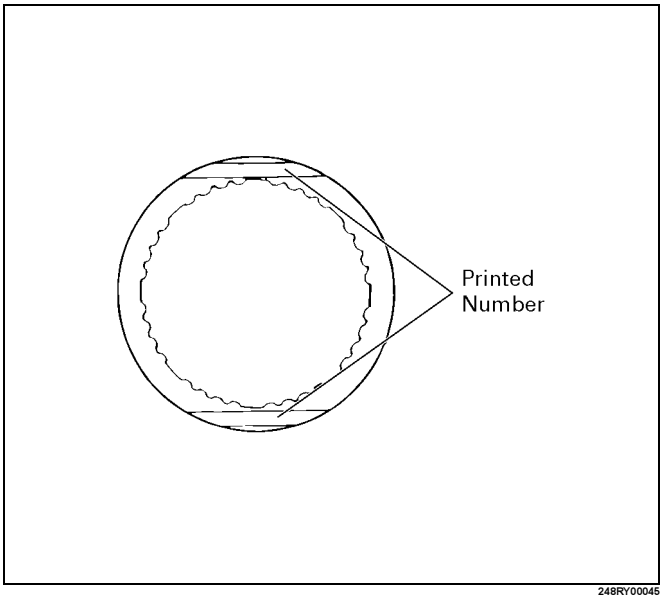
247RY00032

8. Remove the one-way clutch with retainers from the planetary gear.



247RY00033

9. Remove the thrust washer (plastic) from front side of rear planetary gear.
10. Remove the thrust washer (plastic) from rear side of rear planetary gear.
11. Remove the thrust bearing and race from front side of ring gear flange.
12. Remove the snap ring from rear planetary ring gear.
13. Remove the ring gear flange from rear planetary ring gear.
14. Check disc, plate and flange.
    Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.
    - If the lining of the disc is peeling off or discolored, or even if parts of the printed numbers are defaced, replace all discs.
    - Before assembling new discs, soak them in ATF for at least fifteen minutes.



248RY00045

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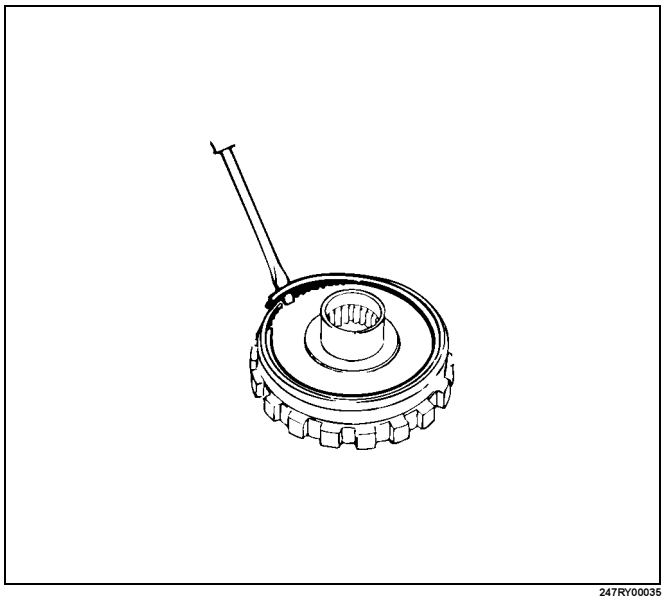
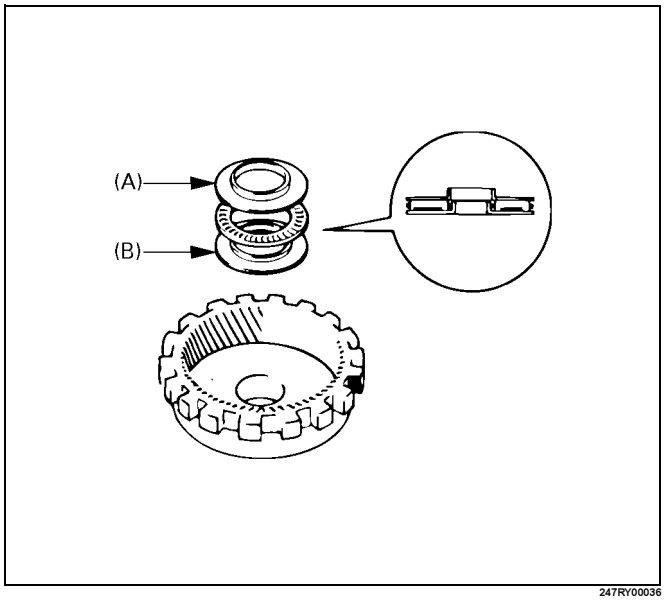
Reassembly

1. Install ring gear flange to the rear planetary ring gear.
2. Install snap ring to the rear planetary ring gear.


247RY00035

3. Coat the races and bearing with petroleum jelly, and install them onto the rear planetary ring gear.
   Races and bearing diameter (Reference)

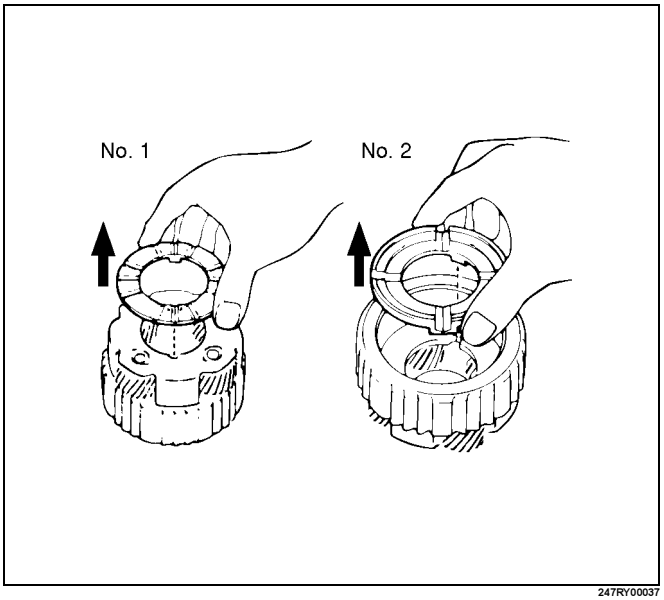
	Inside	Outside
Race (A)	28.5mm (1.122in)	44.2mm (1.740in)
Bearing and race (B)	27.7mm (1.091in)	44.2mm (1.740in)



247RY00036

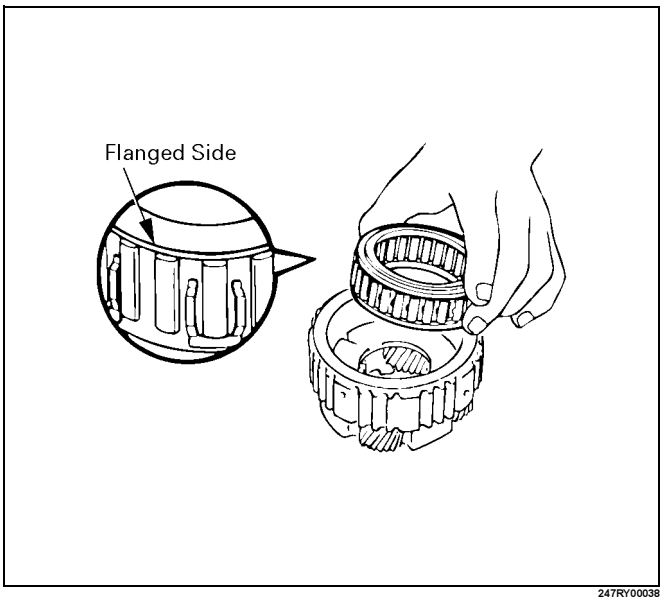
4. Coat the thrust washers (plastic) with petroleum jelly.
   Install the thrust washers onto both sides of the rear planetary gear, facing the grooved side upward.

NOTE: Make sure that the lugs fit into the cutout portions on the rear planetary gear.



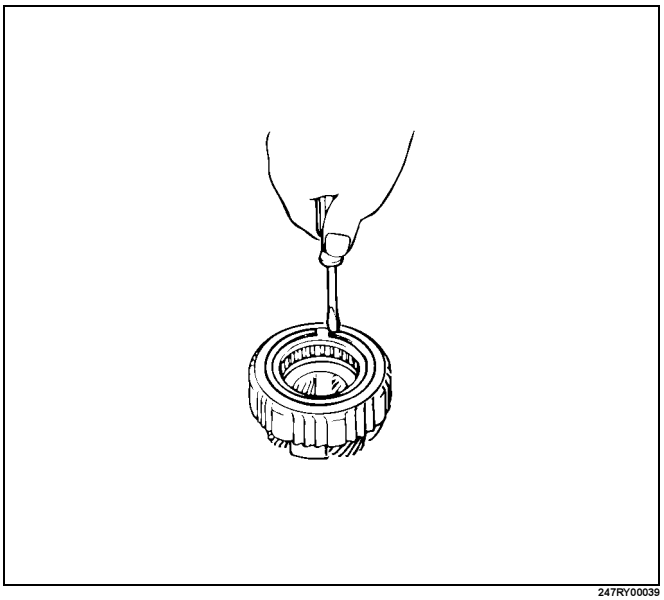
247RY00037

5. Install the one-way clutch with the flanged side facing upward onto the rear planetary gear.



247RY00038

6. Install snap ring.


247RY00039

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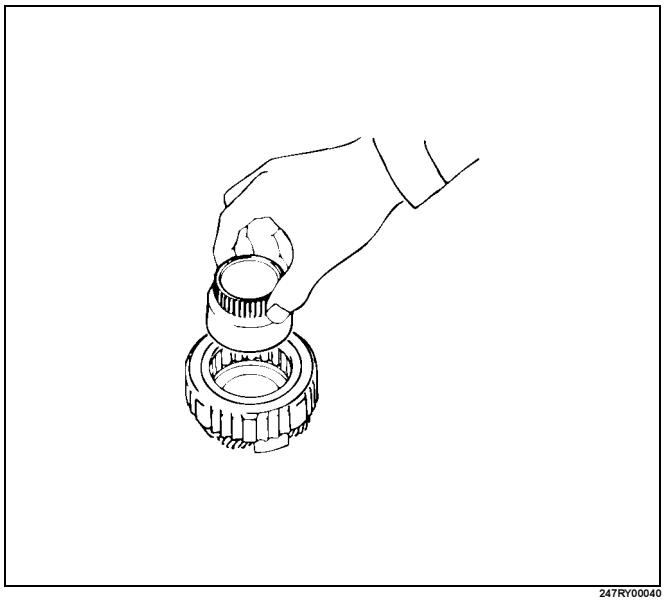
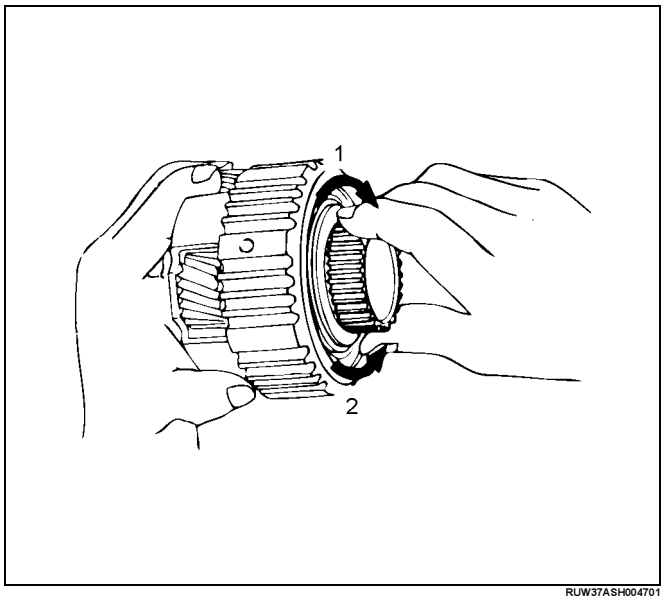
7. While turning counterclockwise, install one-way clutch inner race to rear planetary gear.


247RY00040

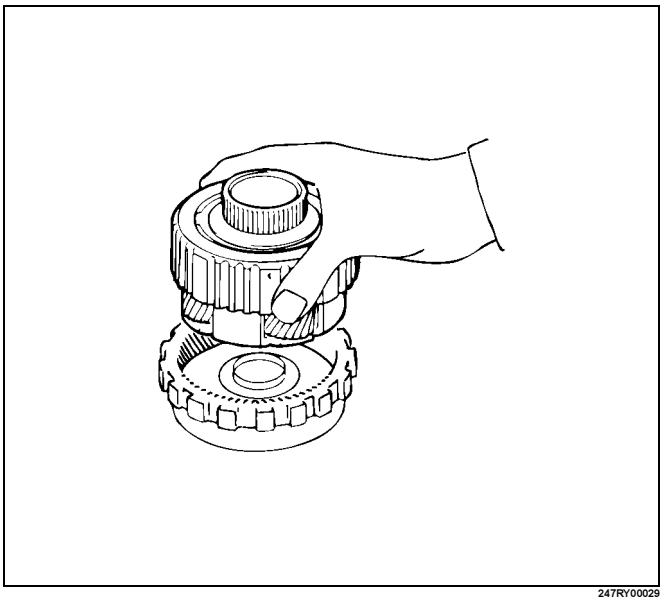
8. Check operation of one-way clutch.
   Hold the planetary gear and turn the one-way clutch inner race.
   The one-way clutch inner race should turn freely counterclockwise and should lock clockwise.



RUW37ASH004701

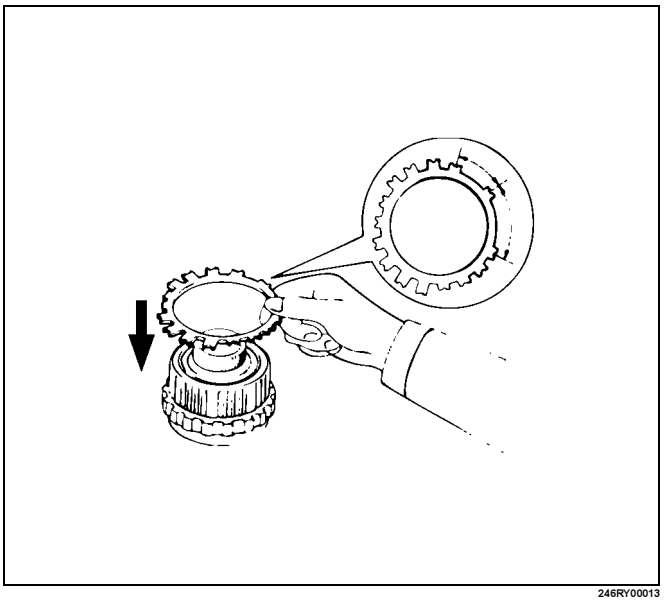
Legend
(1) Lock
(2) Free

9. Install rear planetary gear onto rear planetary ring gear.


247RY00029

10. Install the disc, plate and flange (B–3).
    - Install a brake flange onto the rear planetary gear assembly.
    - Install a clutch disc onto the rear planetary gear assembly.

NOTE: The claw interval of the plate should be as shown in the figure when viewing the clutch plate from the arrow direction.


246RY00013

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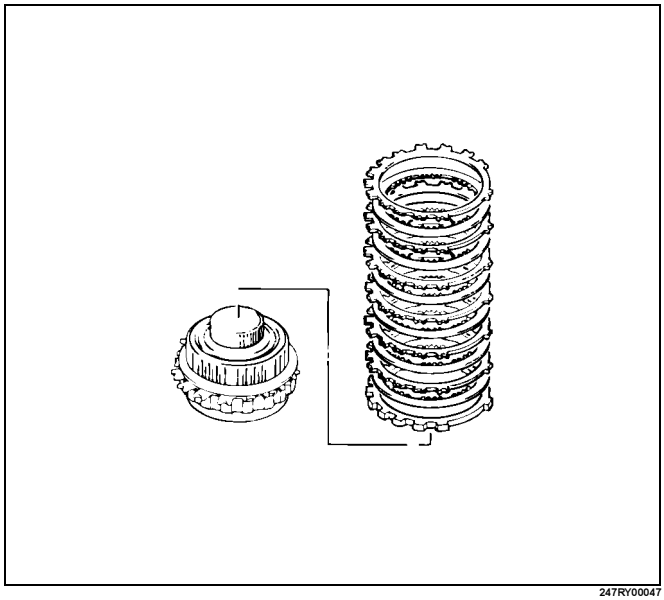
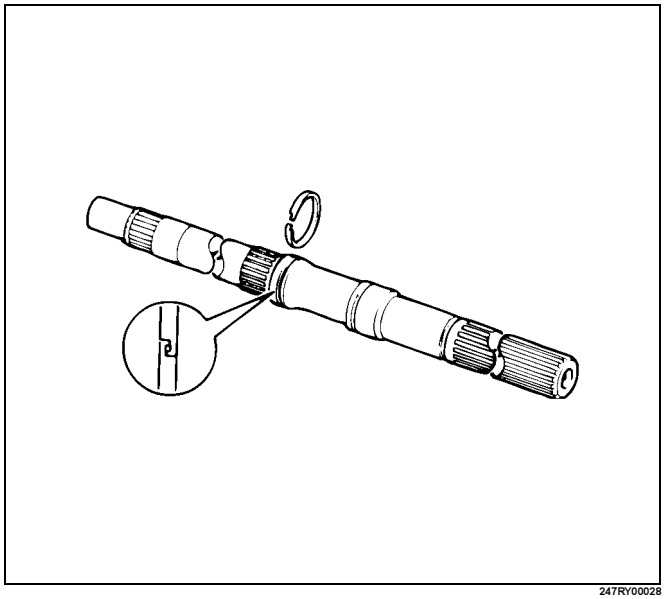
- Install six clutch discs and six brake plates alternately, starting with clutch disc, onto the rear planetary gear assembly.

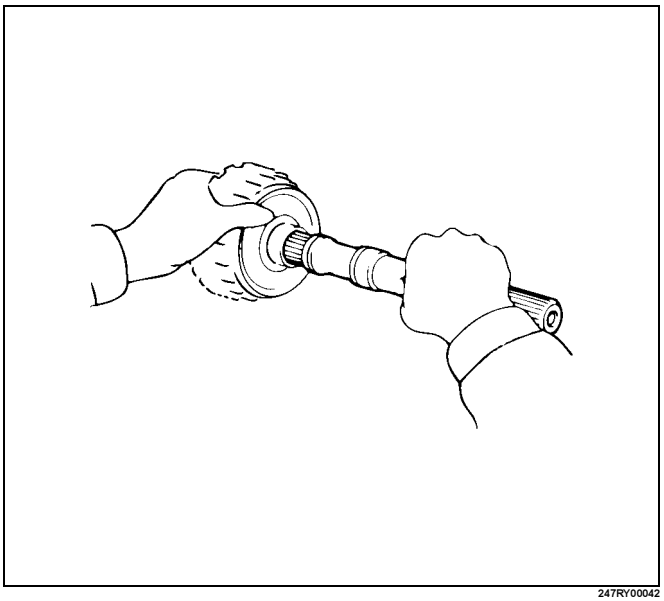

247RY00047

11. Coat the oil seal ring with ATF and install it to the output shaft.

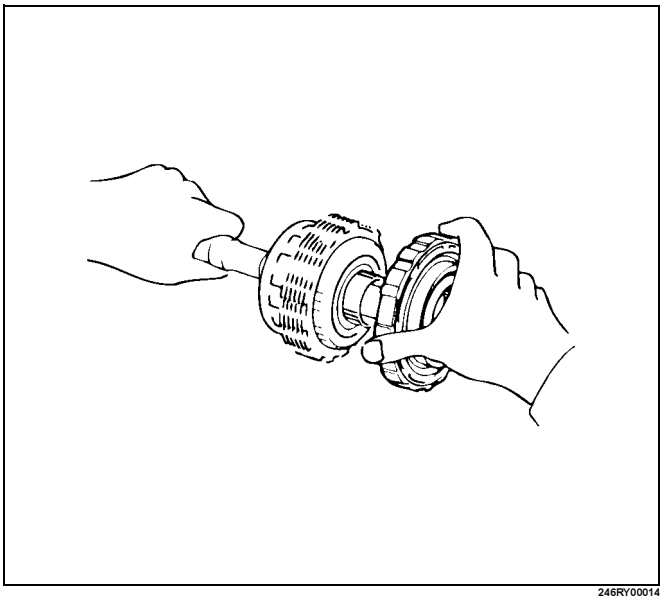
NOTE: Do not spread the ring ends too much.


247RY00028

12. Install output shaft into rear planetary gear assembly.


247RY00042

13. Install second brake assembly to output shaft.


246RY00014

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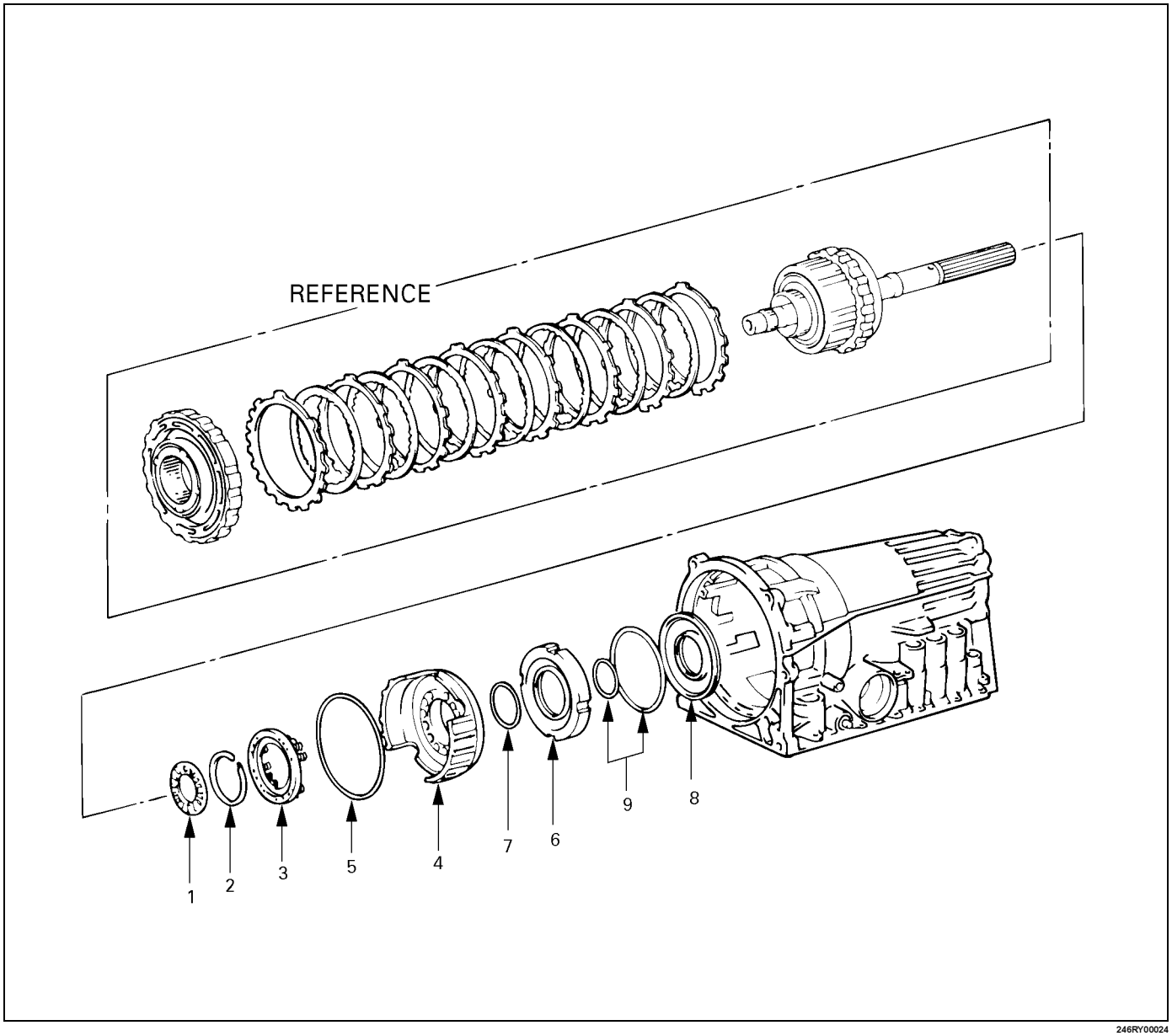
First and Reverse Brake (B–3)

Disassembled View



246RY00024

Legend

(1) Thrust bearing and race
(2) Snap ring
(3) Piston return spring
(4) First and reverse brake piston No.2
(5) O-ring
(6) Reaction sleeve
(7) O-ring
(8) First and reverse brake piston No.1
(9) O-ring

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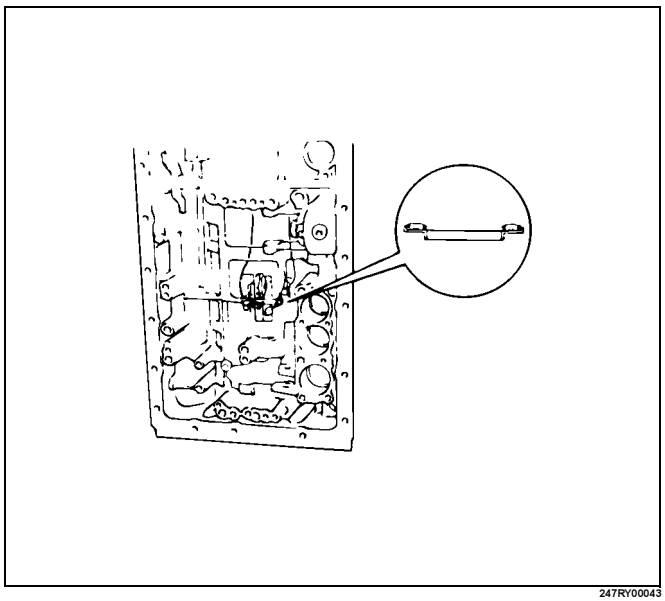
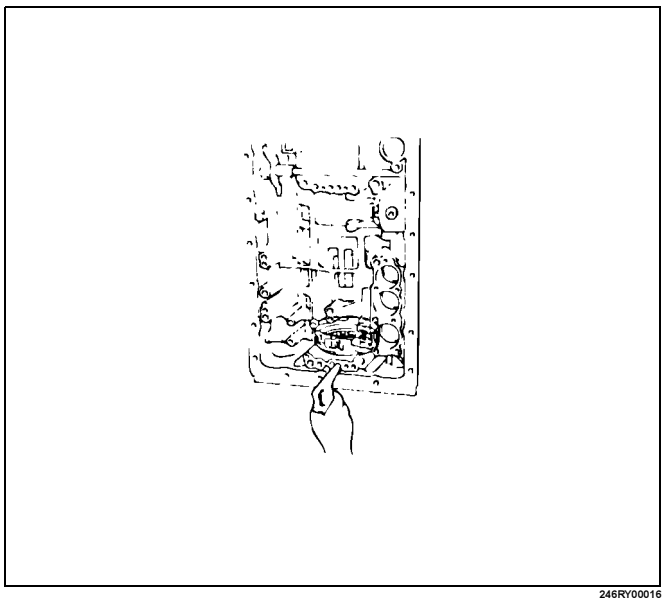
Disassembly

1. Remove assembled thrust bearing and race from transmission case.



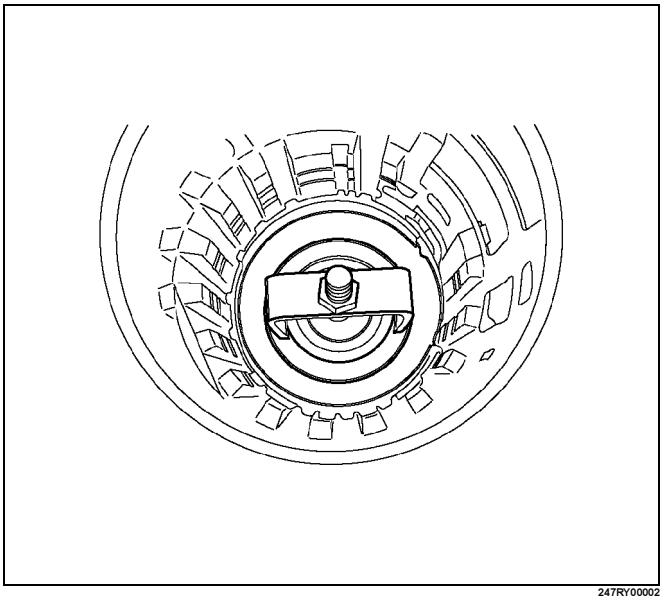
247RY00043

2. Check first and reverse brake piston movement.
   Make sure that first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



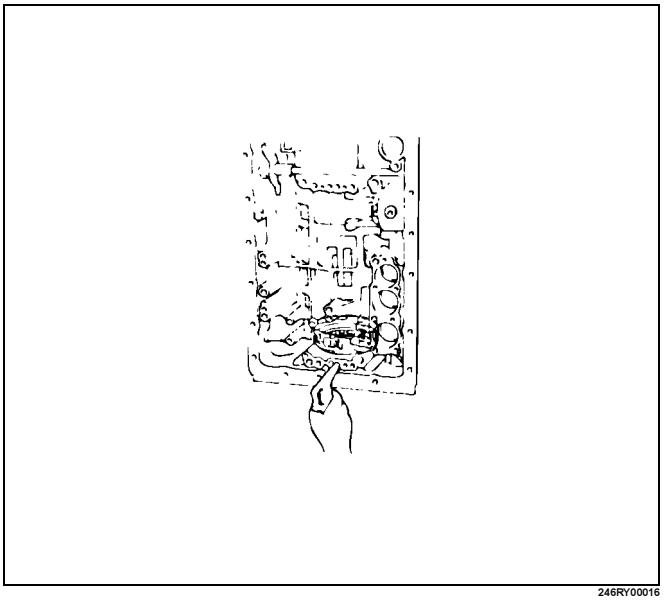
246RY00016

3. Set special tool on the spring retainer, and compress the return spring.
   Spring compressor: J–25048
   Remove the snap ring with snap ring pliers.



247RY00002

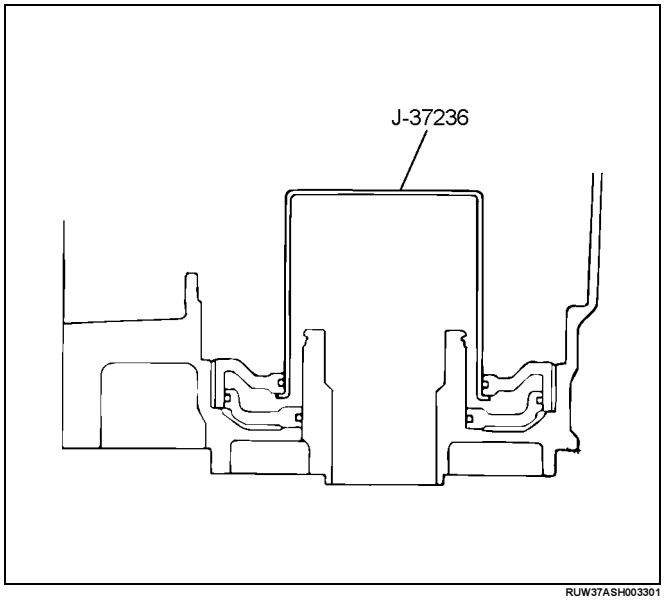
4. Remove the piston return spring.
5. Remove the first and reverse brake piston No.2.
   Holding the first and reverse brake piston No.2 by hand, apply compressed air to the transmission case to remove the first and reverse brake piston No.2.
   Remove the first and reverse brake piston No.2.
   If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.



246RY00016

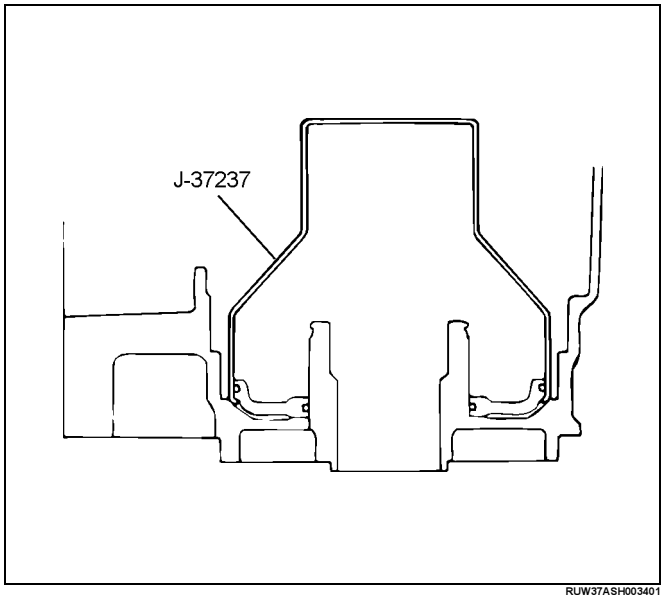
ProCarManuals.com

6. Remove the O-ring from first and reverse brake piston No.2.
7. Remove the reaction sleeve.
   Insert special tool behind the reaction sleeve and gradually lift it out of the transmission case.
   Reaction sleeve puller: J–37236



RUW37ASH003301

8. Remove the O-ring from reaction sleeve.
9. Remove the first and reverse brake piston No.1.
   Insert special tool behind the first and reverse brake piston No.1 and gradually lift it out of the transmission case.
   Piston puller: J–37237

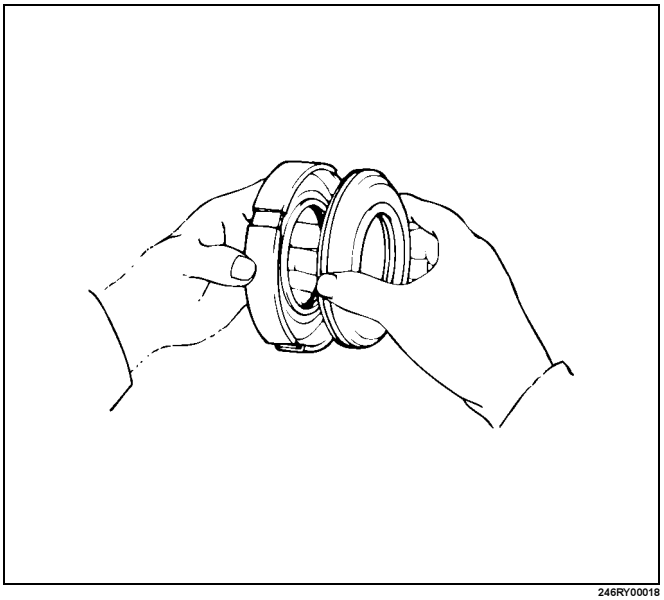


RUW37ASH003401

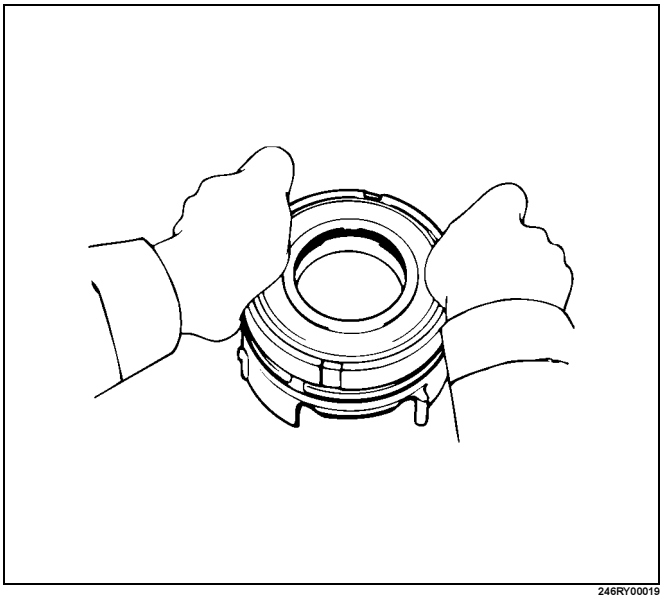
10. Remove the O-rings from first and reverse brake pistion No.1.

Reassembly

1. Coat three new O-rings with ATF.
   Install the two O-rings on the No.1 piston.
2. Install the O-ring on the reaction sleeve.
3. Install the first and reverse brake piston No.1 to the reaction sleeve.


246RY00018

4. Coat a new O-ring with ATF and install it on the first and reverse brake piston No.2.
5. Install the first and reverse brake piston No.1 with reaction sleeve onto the first and reverse brake piston No.2.


246RY00019

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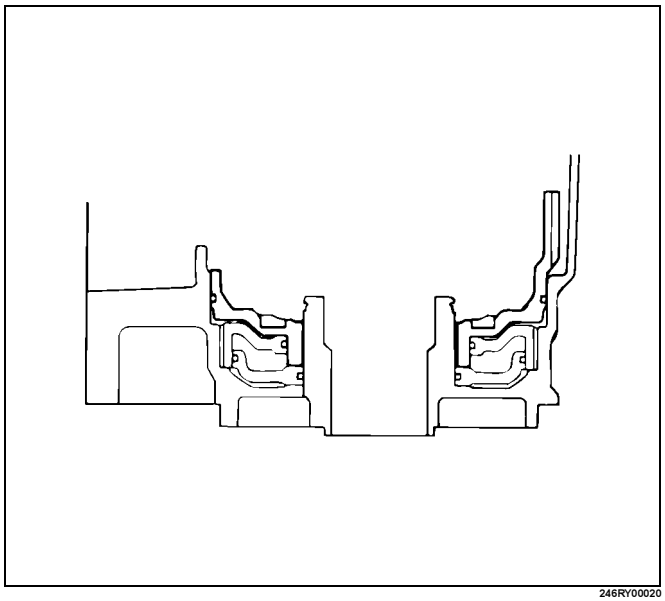
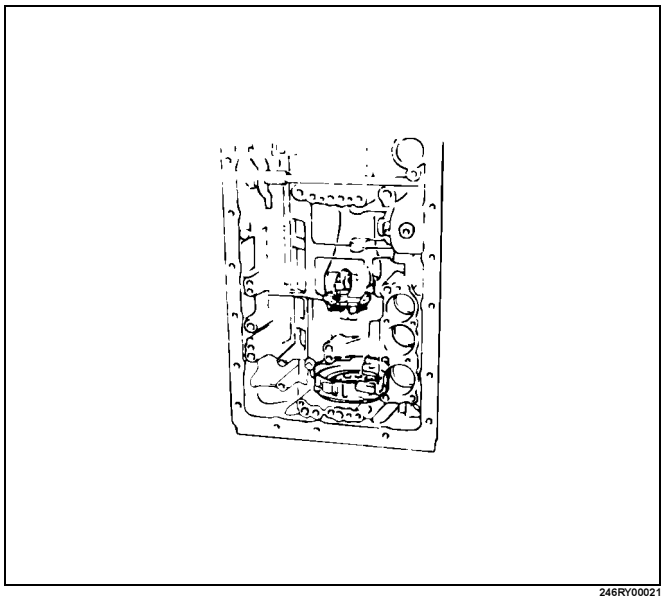
6. Align the teeth of the first and reverse brake piston No.2 into the proper grooves.
   Being careful not to damage the O-rings, press in the first and reverse brake piston No.2 with No.1 into the transmission case.



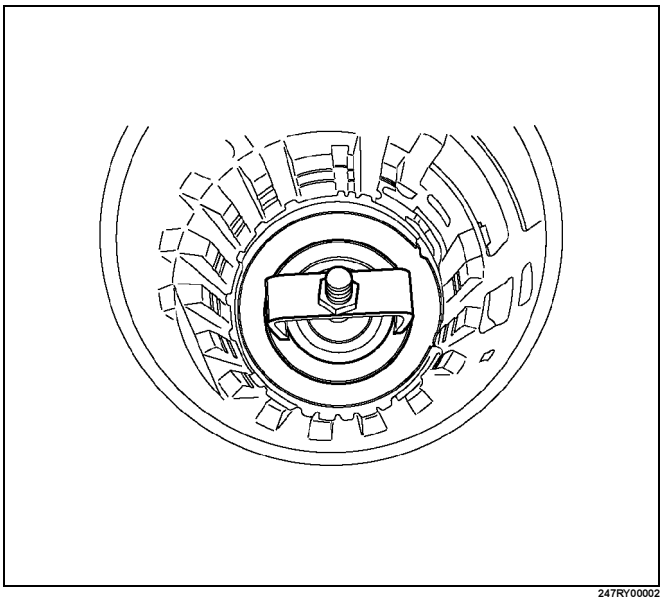
246RY00020

7. Place piston return spring onto first and reverse brake piston No.2.



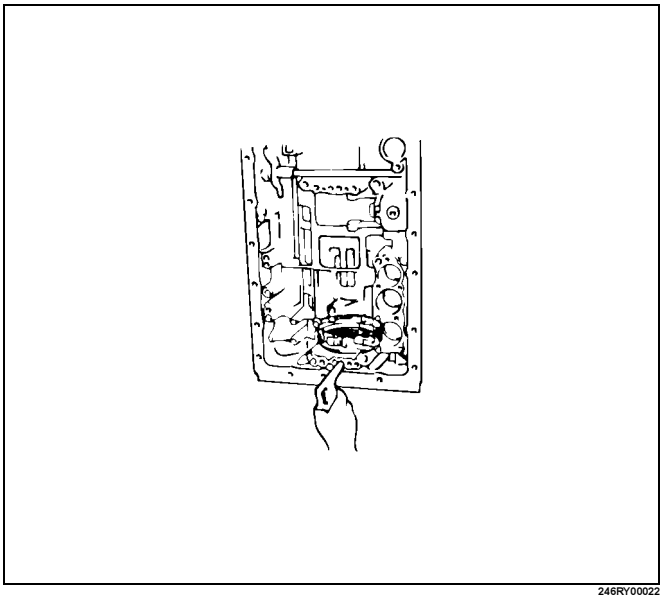
246RY00021

8. Set special tool as shown, and compress the return spring with special tool.
   Spring compressor: J–25048
   Install the snap ring with snap ring pliers.
   Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



247RY00002

9. Check first and reverse brake piston movement.
   Make sure the first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



246RY00022

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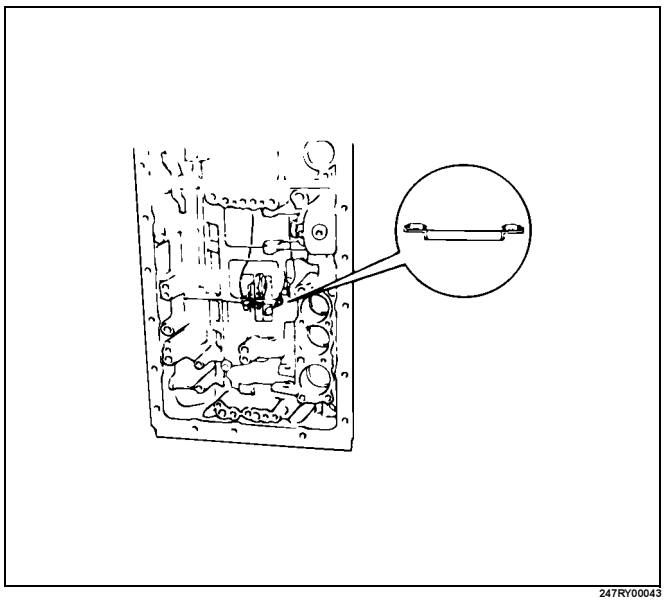
10. Coat the assembled bearing and race with petroleum jelly.
    Install the assembled bearing and race facing the bearing side upward.
    Bearing and race diameter (Reference)

Inside diameter	39.38mm (1.550in)
Outside diameter	58.15mm (2.289in)



247RY00043

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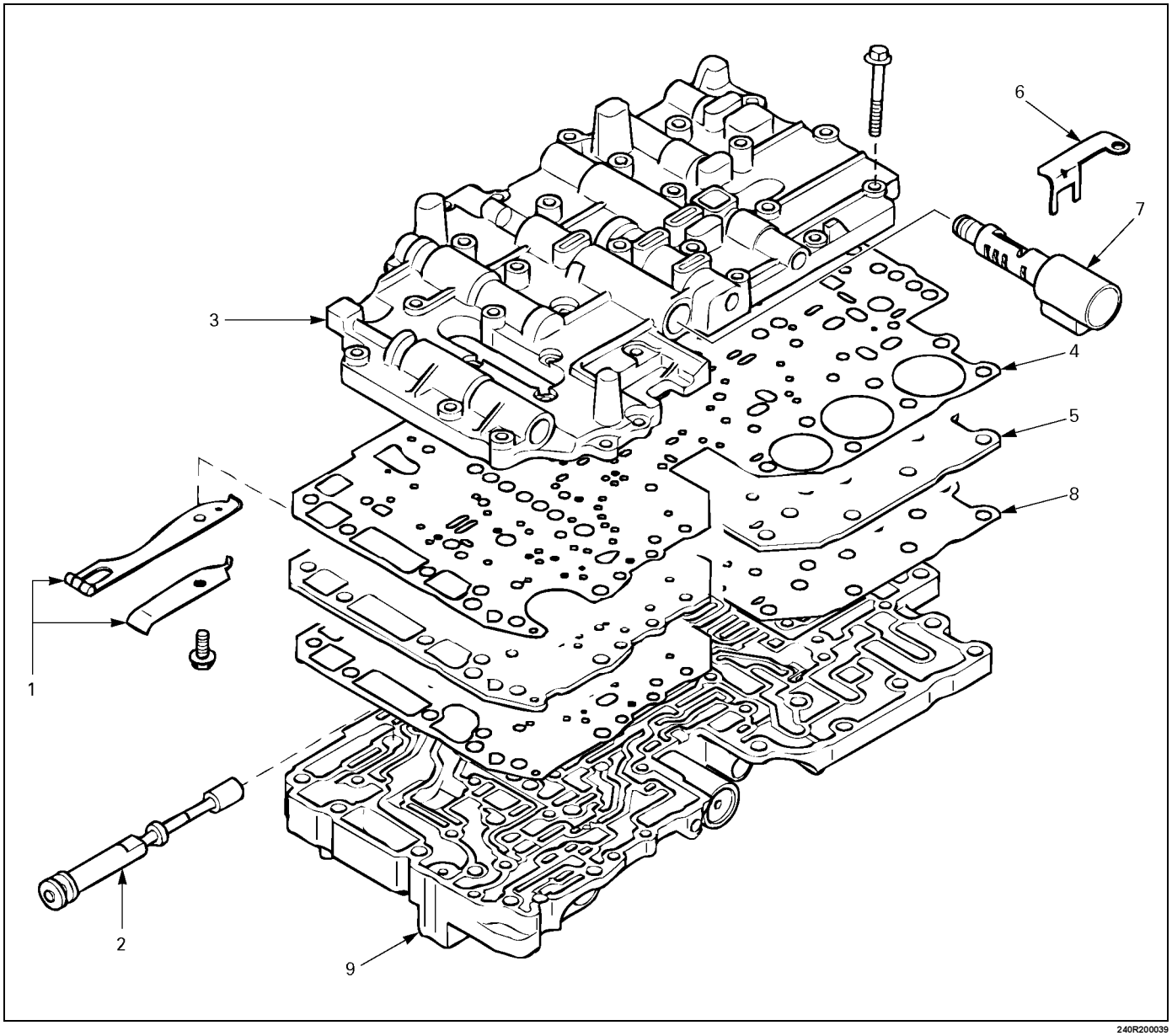
Transmission Valve Body assembly

Disassembled View



240R200039

Legend

(1) Detent spring
(2) Manual shift valve
(3) Upper valve body
(4) No.1 gasket (Upper valve body side)
(5) Valve body plate
(6) Clamp
(7) Pressure control solenoid
(8) No.2 gasket (Lower valve body side)
(9) Lower valve body

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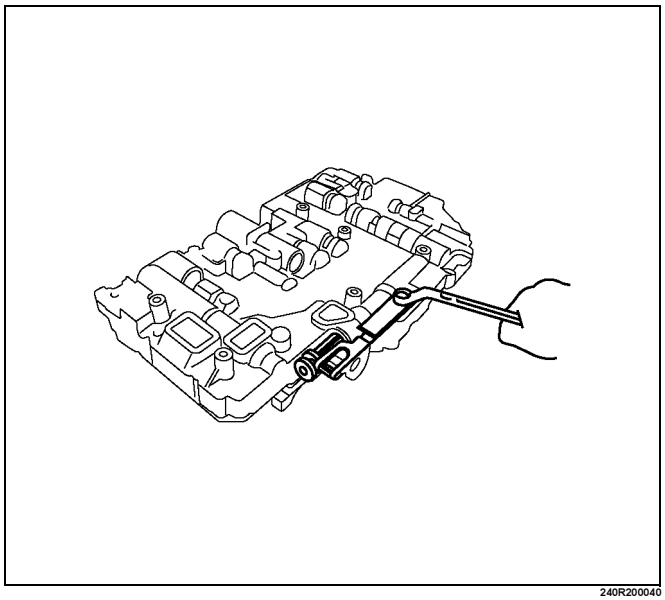
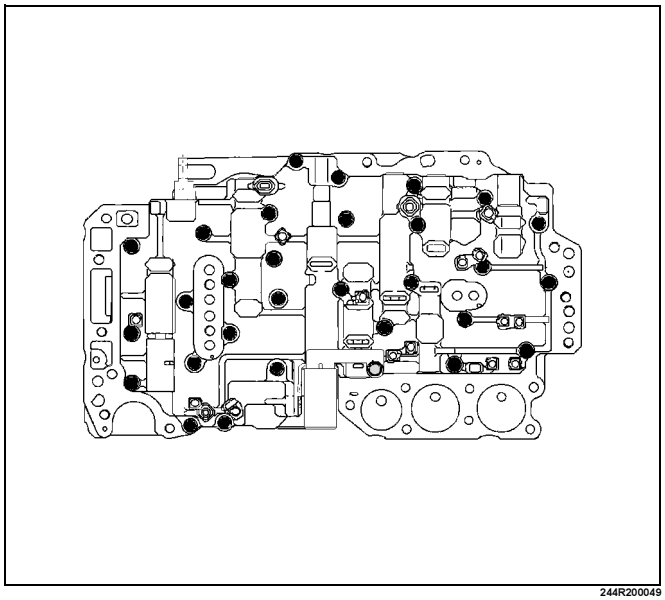
Disassembly

1. Remove detent spring from valve body.

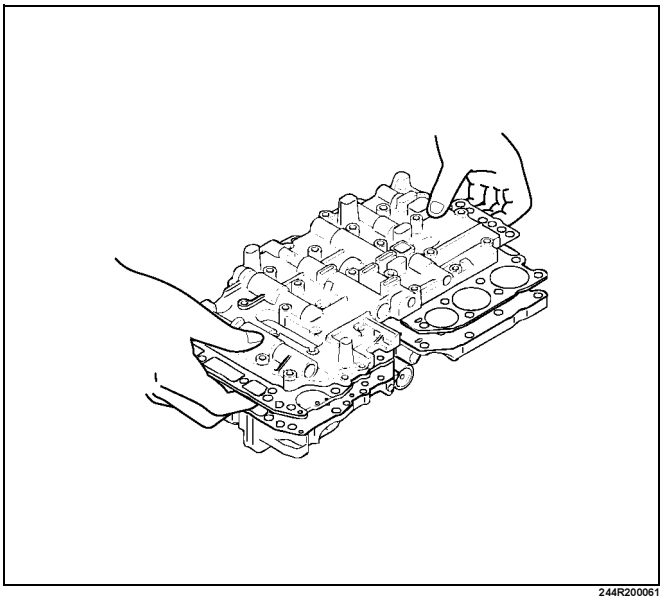

240R200040

2. Remove the manual shift valve.
3. Remove the upper valve body.
4. Remove the no.1 gasket (Upper valve body side).
5. Remove the valve body plate.
   - Turn over assembly and remove thirty bolts.


244R200049

6. Remove the clamp.
7. Remove the pressure control solenoid.
   Hold the valve body plate to the upper valve body.
   Lift off upper valve body and plate as a single unit.

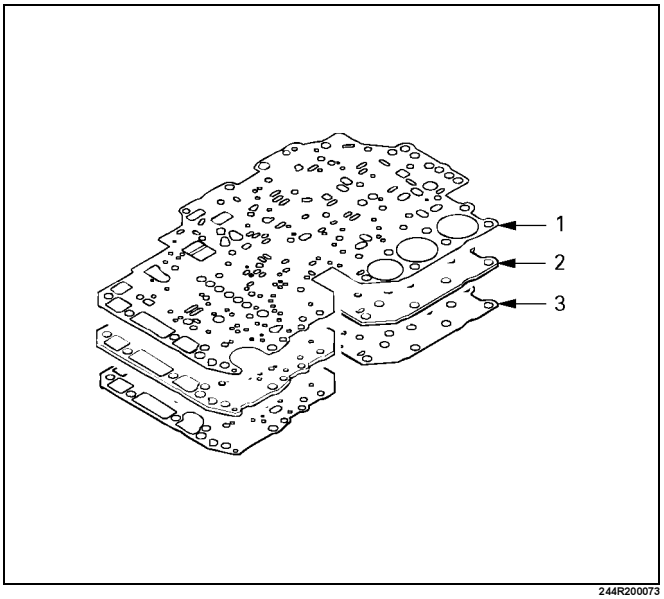
NOTE: Be careful that the check balls and strainers do not fall out.


244R200061

8. Remove the no.2 gasket (Lower valve body side).
9. Remove the lower valve body.

Reassembly

1. Position a new No.1 gasket (1) on upper valve body.
   Align the No.1 gasket at each bolt hole.
2. Position valve body plate (2) on No.1 gasket (1).
   Align the plate at each bolt hole.
3. Position a new No.2 gasket (3) on valve body plate (2).
   Align the No.2 gasket at each bolt hole.



244R200073

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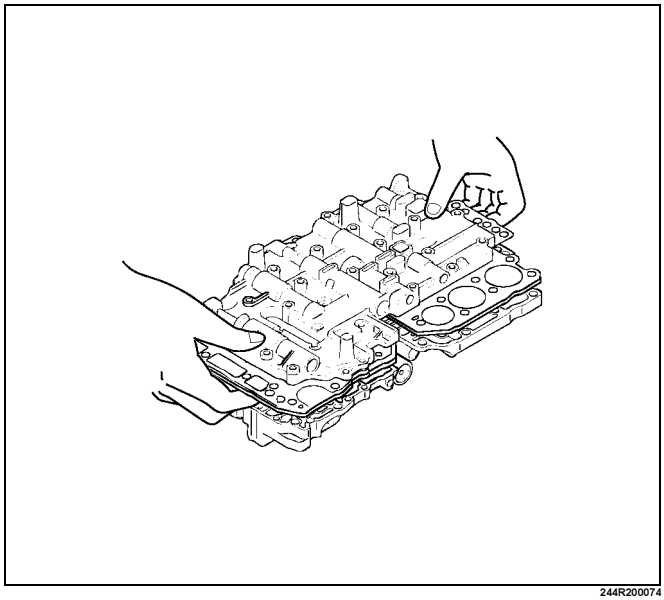
4. Place upper valve body with plate and gaskets on top of lower valve body.
   Align each bolt hole and gasket in the valve body.

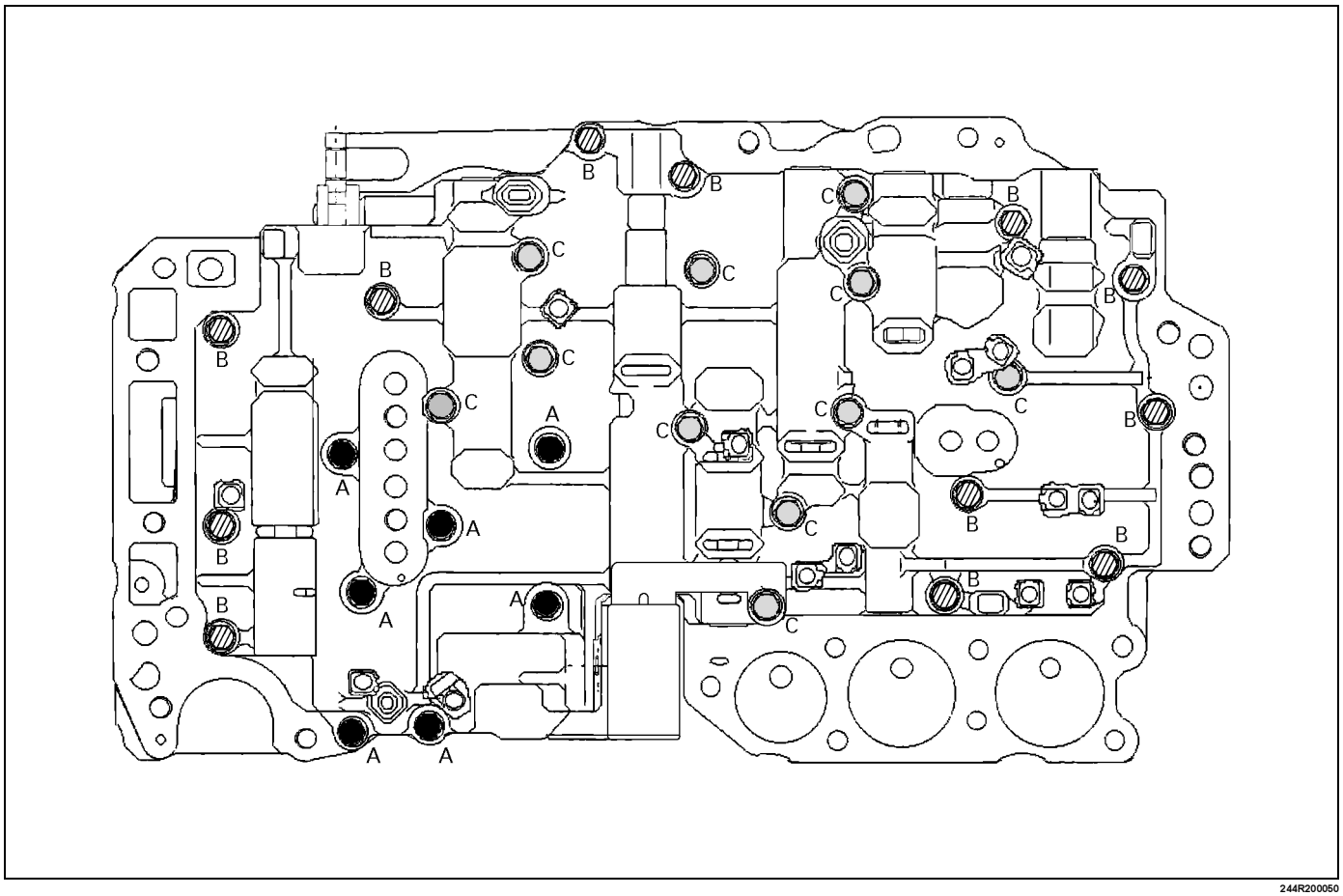


244R200074

5. Install the pressure control solenoid and clamp.
6. Install thirty bolts to upper valve body.
   Each bolt is indicated in the figure.

	Length (mm)	Quantity
A	20	7
B	28	12
C	40	11

Torque: 6.4N·m (57lbin)



244R200050

7. Install manual shift valve.

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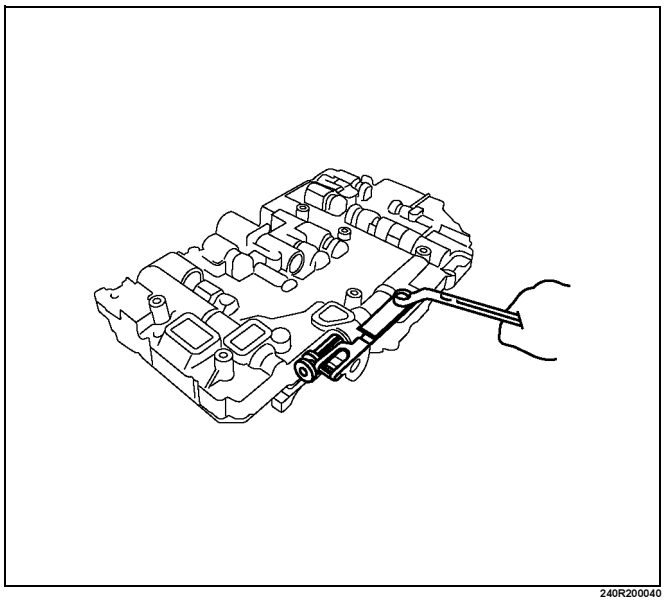
8. Install detent spring.

Torque: 10N·m (87lbin)



240R200040

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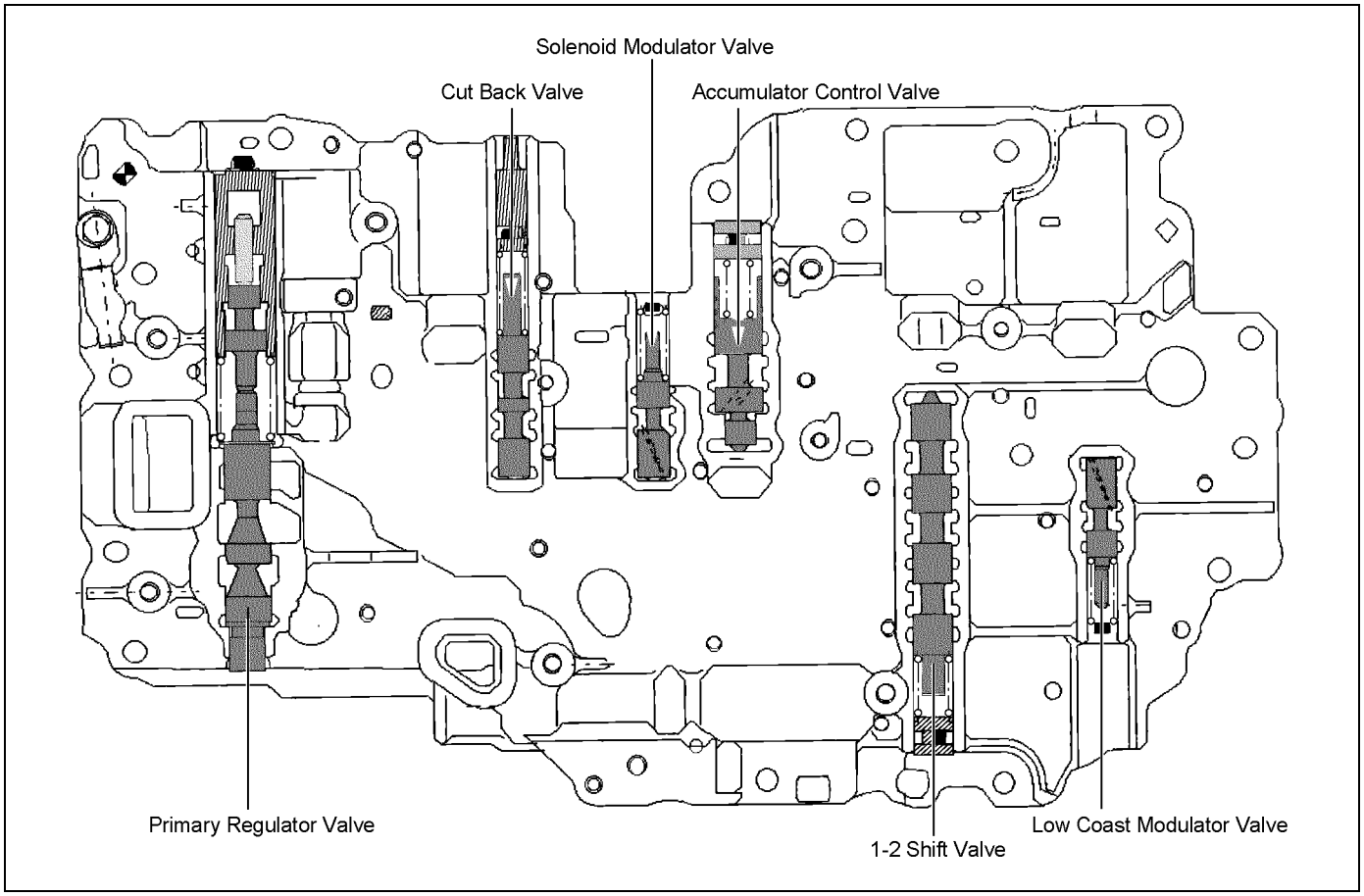
Lower Valve Body

Cross Section



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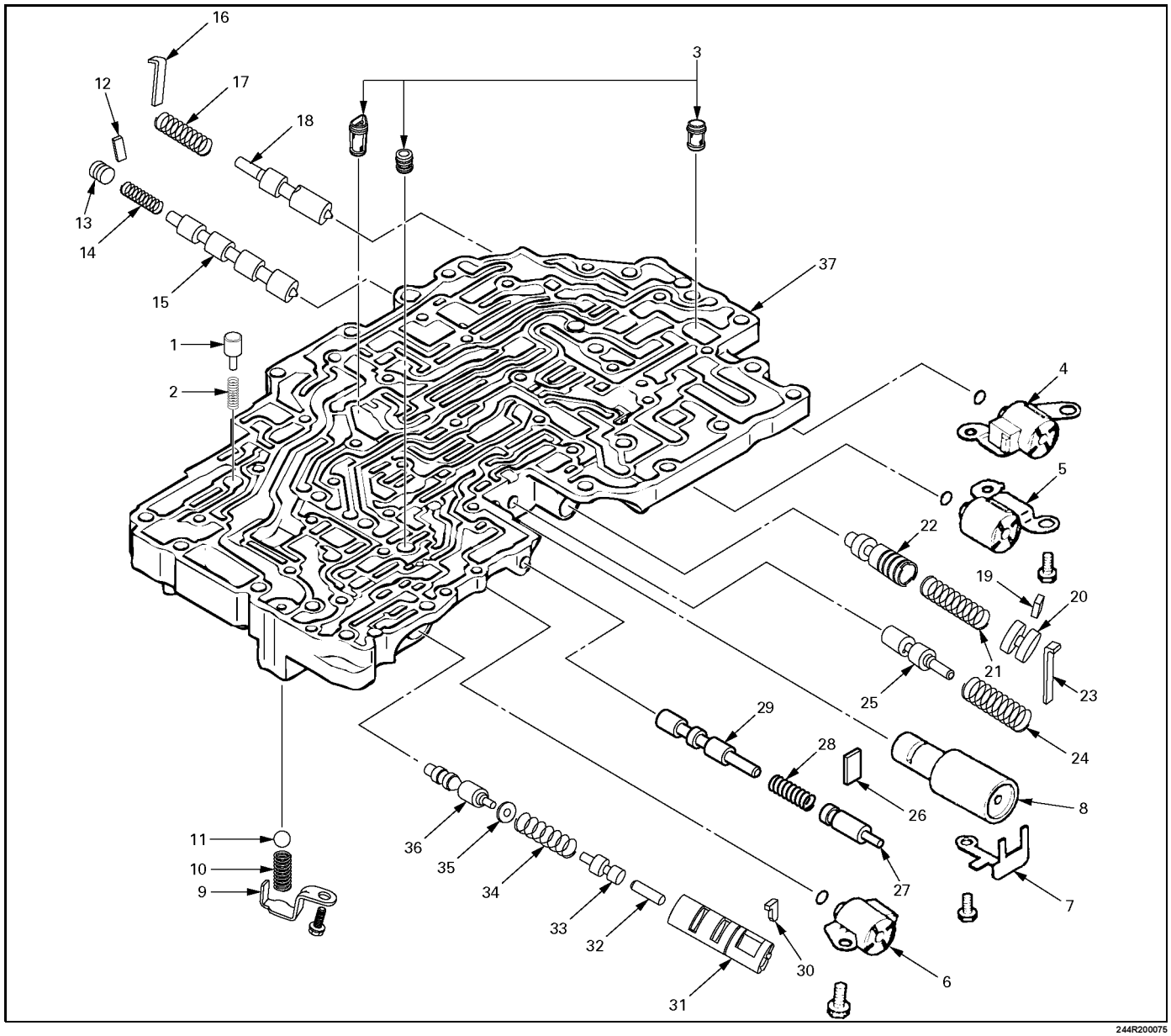
Disassembled View



Legend

(1) By-pass valve
(2) Spring
(3) Strainer
(4) Shift solenoid S1
(5) Shift solenoid S2
(6) Lock-up solenoid SL
(7) Clamp
(8) Accumulator sub-assembly
(9) Retainer
(10) Spring
(11) Ball
(12) Retainer
(13) Plug
(14) Spring
(15) 1–2 shift valve
(16) Retainer
(17) Spring
(18) Low coast modulator valve
(19) Retainer
(20) Plug
(21) Spring
(22) Accumulator control valve
(23) Retainer
(24) Spring
(25) Solenoid modulator valve
(26) Retainer
(27) Plug
(28) Spring
(29) Cut back valve
(30) Retainer
(31) Sleeve
(32) Plunger
(33) Plunger
(34) Spring
(35) Washer
(36) Primary regulator valve

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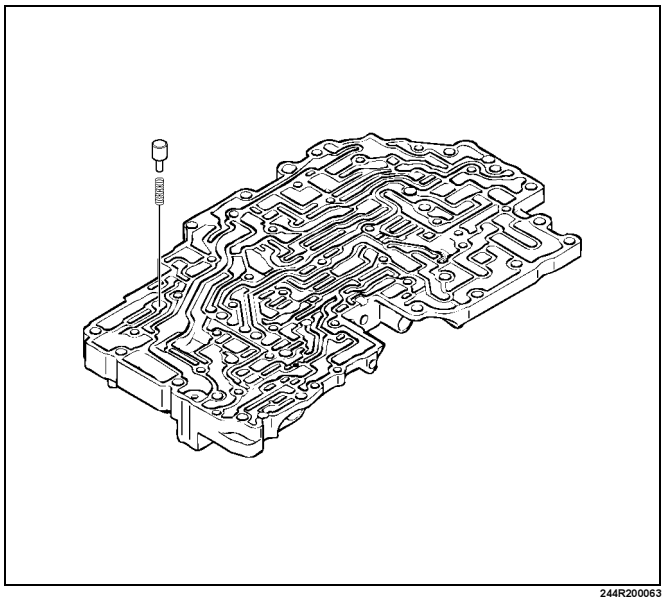
(37) Lower valve body

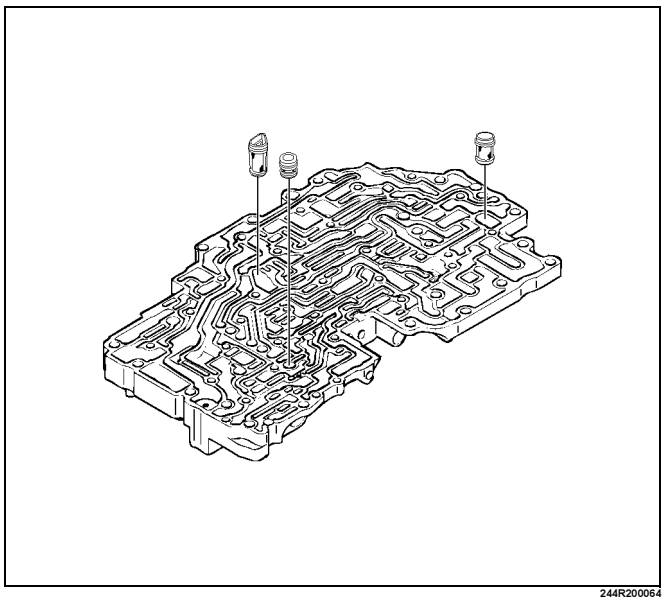
Disassembly

1. Remove by-pass valve and spring.



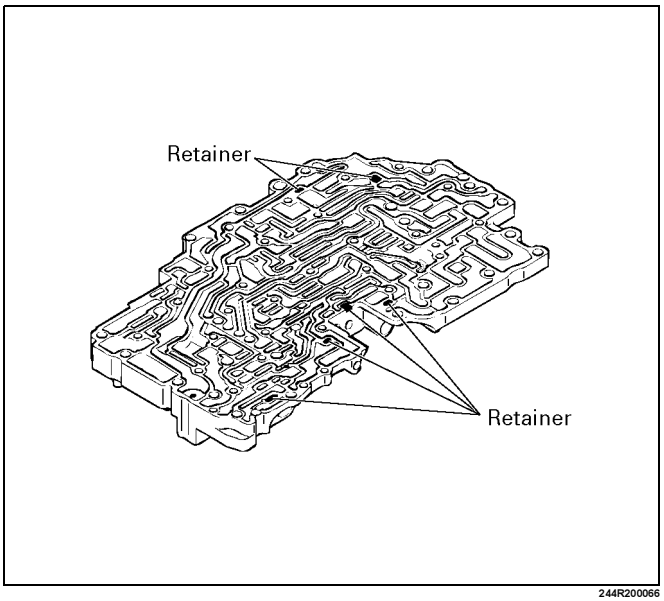
244R200063

2. Remove three strainers.



244R200064

NOTE: Confirm six retainers are installed correctly.



244R200066

3. Remove the shift solenoid S1 and shift solenoid S2.
   - Remove the fixing bolt.
   - Remove the shift solenoid S1 (2) and S2 (1) from each bore.
   - Remove the O-rings from each solenoid.
4. Remove the lock-up solenoid SL
   - Remove the fixing bolt.
   - Remove the lock-up solenoid SL (3) from the bore.
   - Remove the O-ring from solenoid.
5. Remove the accumulator sub-assembly
   - Remove the clamp.
   - Remove the accumulator sub-assembly (4) from the bore.

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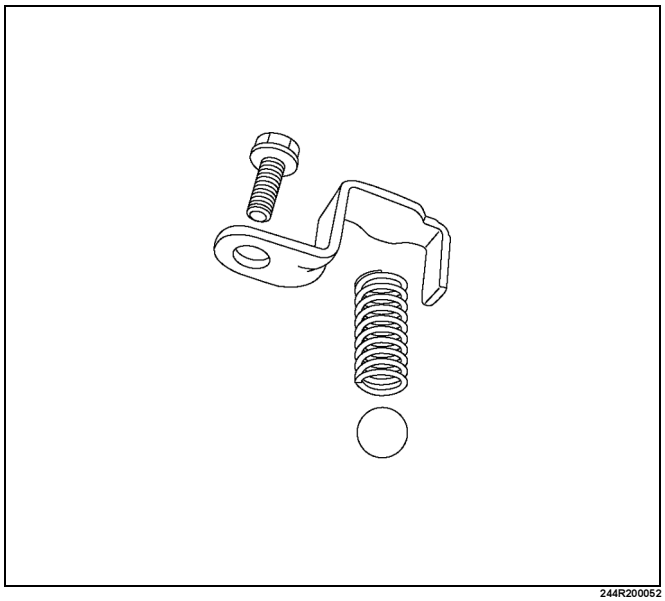
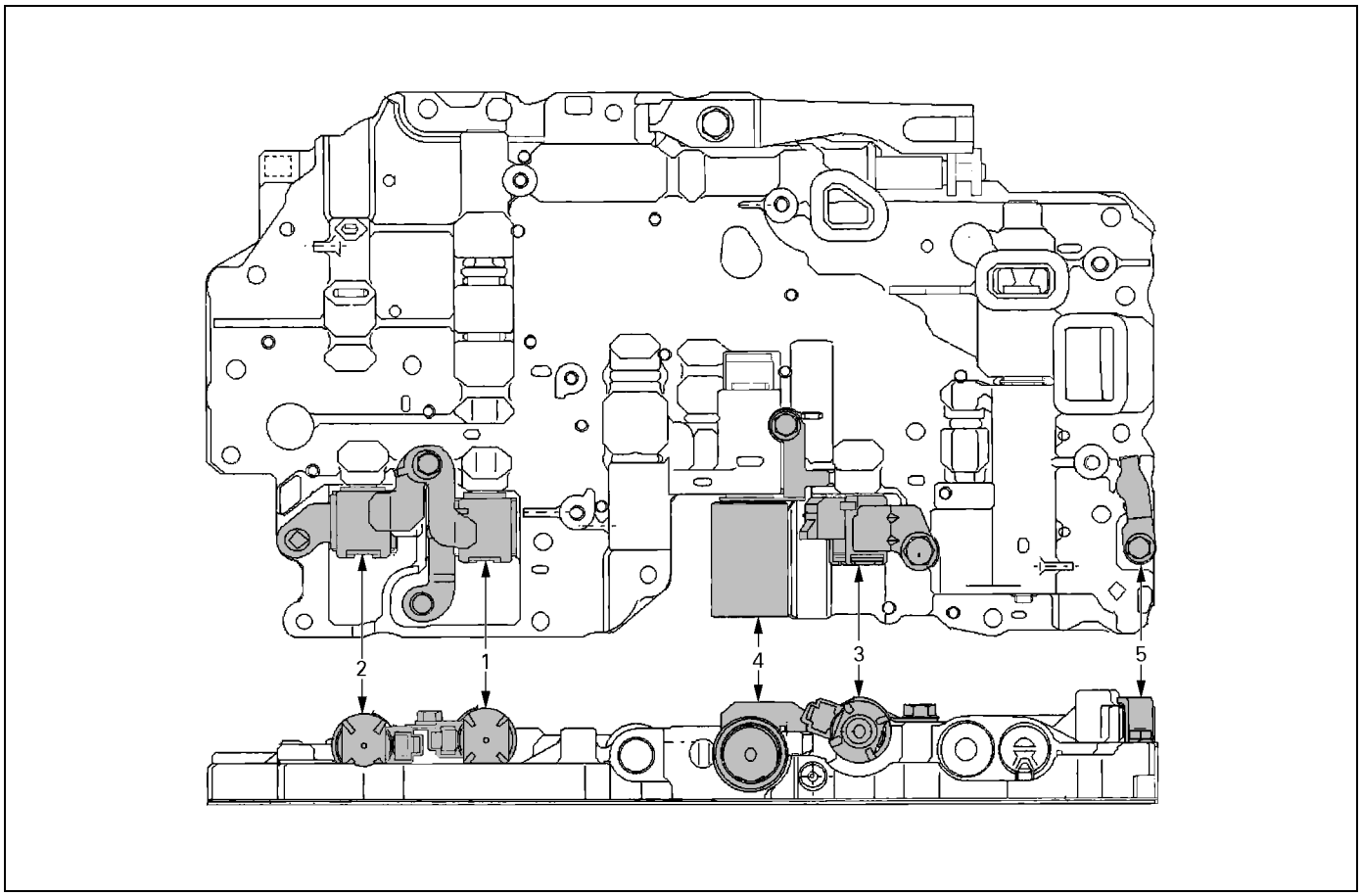
6. Remove the retainer (5).
   Remove the spring and ball from the valve body.



244R200052



240R200042

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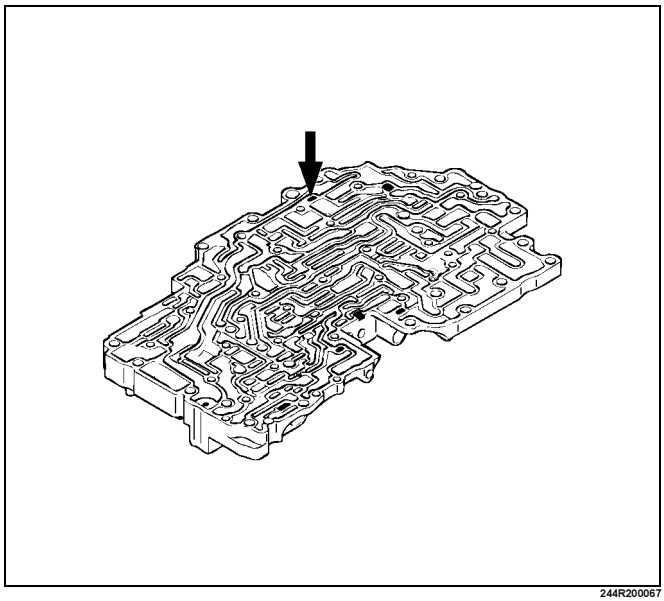
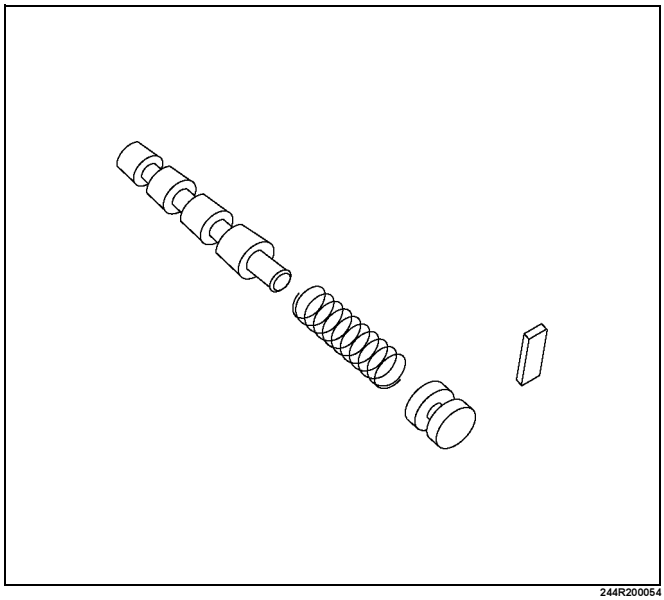
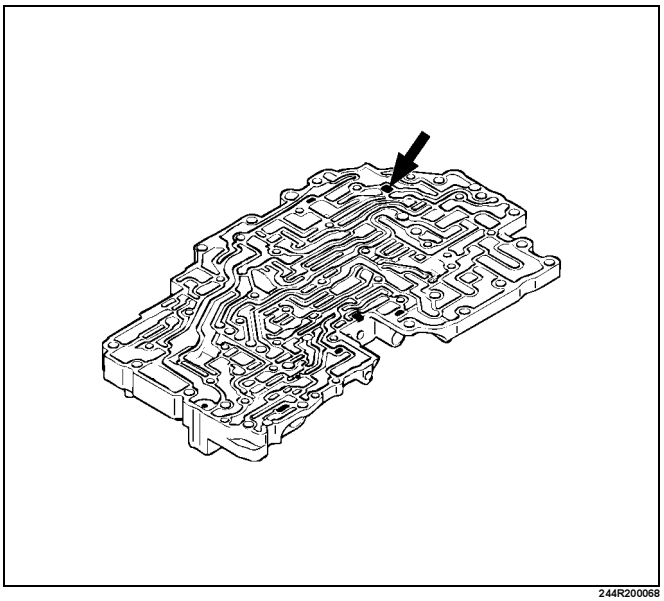
7. Remove the 1–2 shift valve retainer (12) with a magnetic finger by pushing the plug.



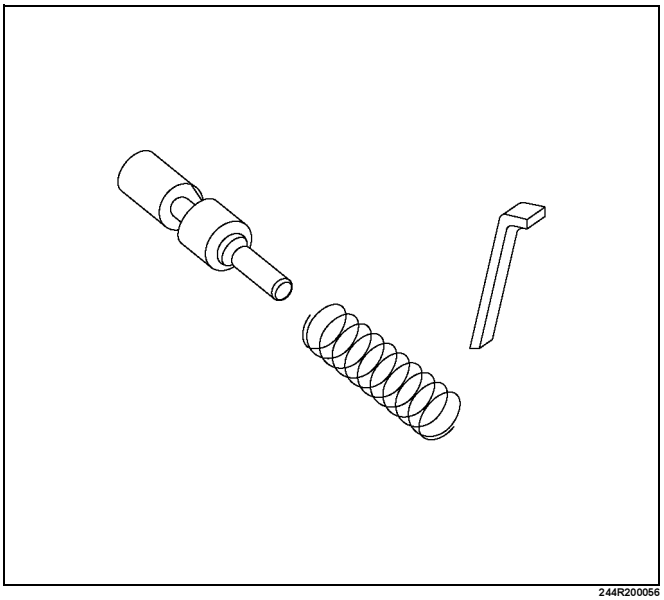
8. Remove the plug, spring and 1–2 shift valve.



9. Remove the retainer (16) for low coast modulator valve by pushing the spring with a screwdriver.



10. Remove the spring and low coast modulator valve.



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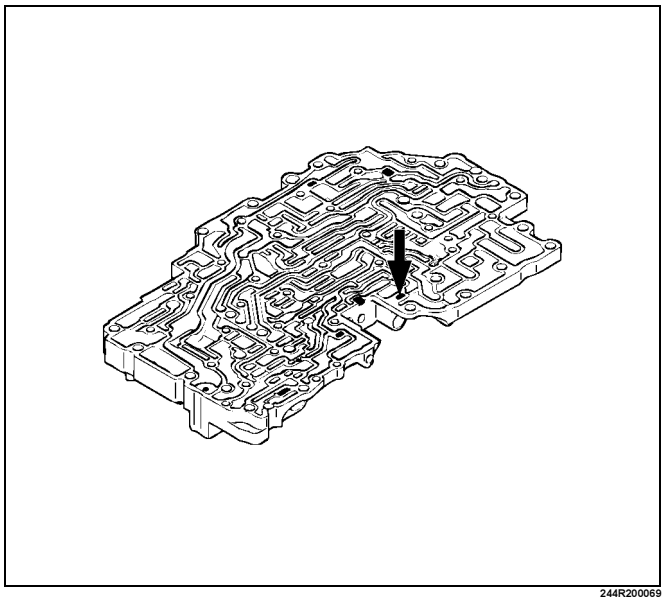
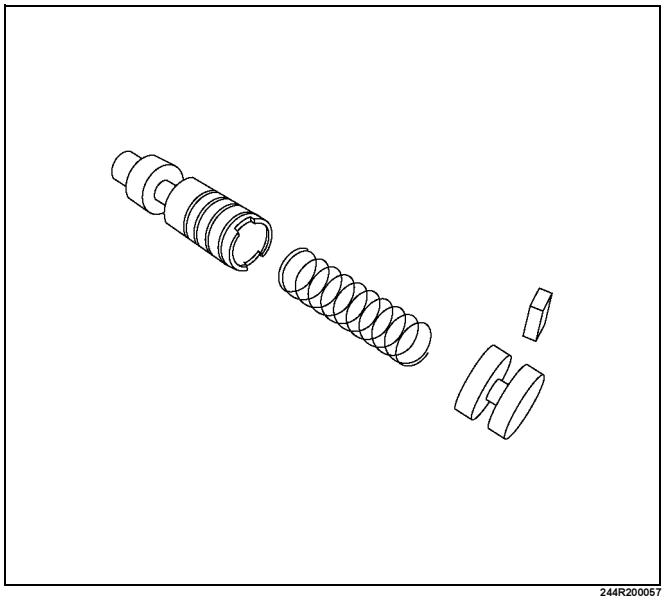
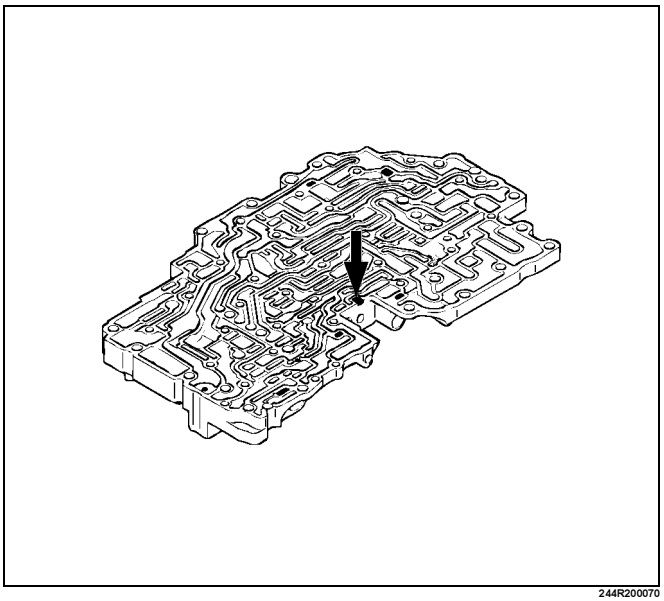
11. Remove the retainer (19) for accumulator control valve with a magnetic finger by pushing the plug.



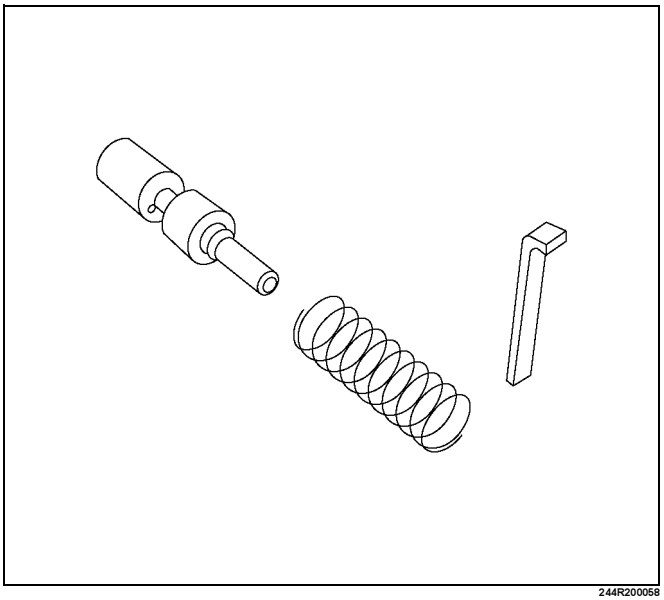
12. Remove the plug(20), spring(21) and accumulator control valve(22).



13. Remove the retainer (23) for solenoid modulator valve(25) by pushing the spring with a screwdriver.



14. Remove the spring(24) and solenoid modulator valve(25).



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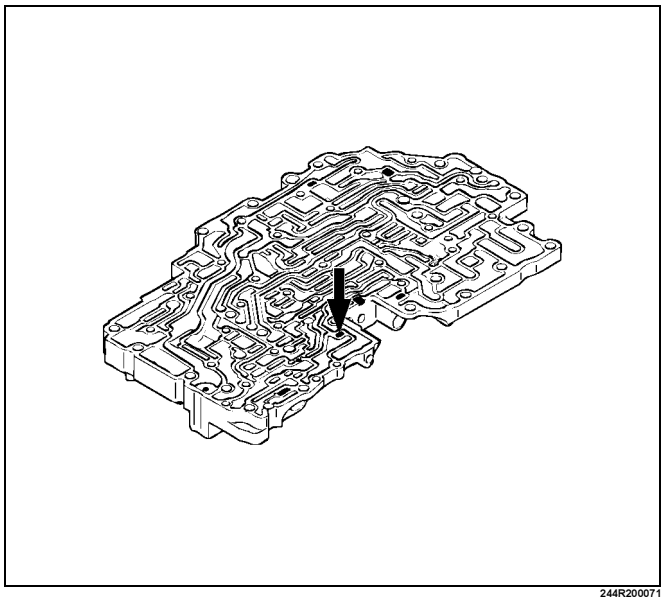
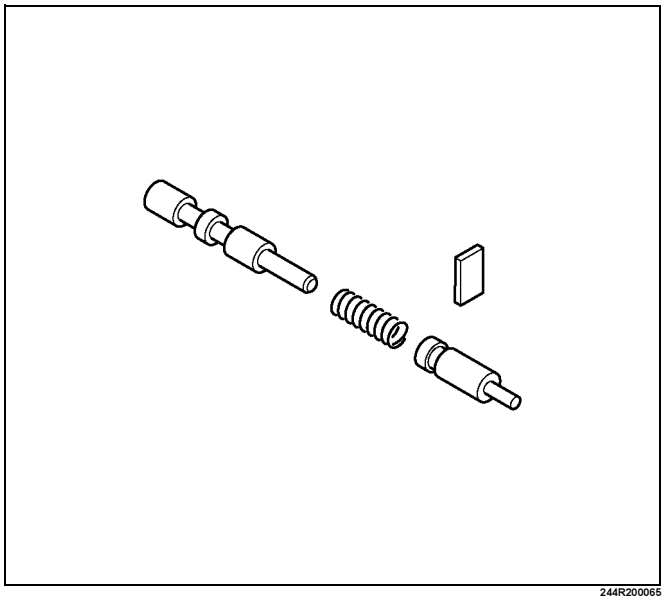
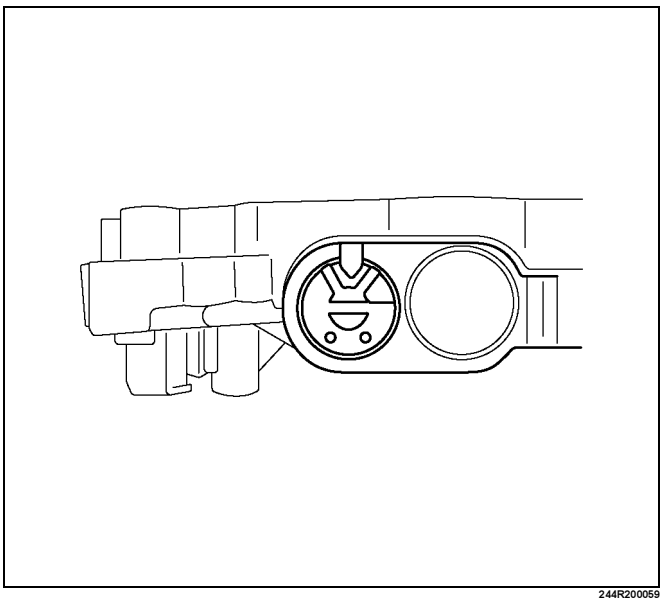
15. Remove the retainer(26) for cut back valve(29) with a magnetic finger by pushing the plug.



16. Remove the plug(27), spring(28) and cut back valve(29).

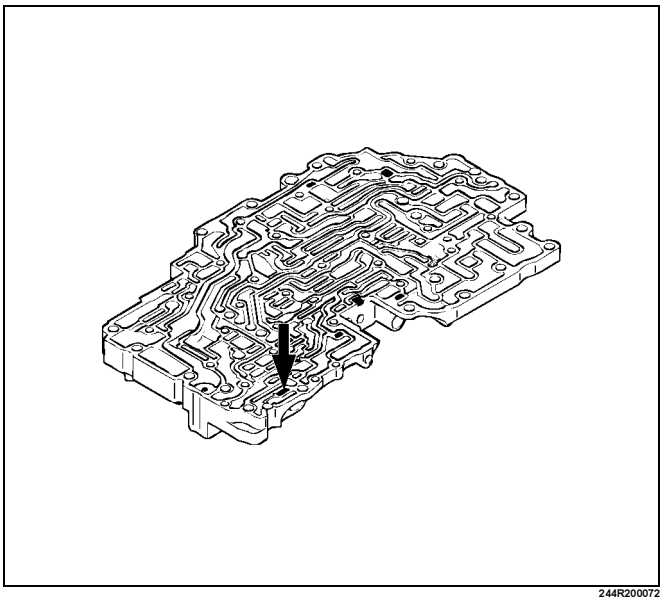


17. Place a mark on the top of sleeve(31) and the retainer (30) for primary requlator valve(36) where they are positioned.



NOTE: When reassembling, position the retainer in the same position.

Remove the retainer(30) with a magnetic finger by pushing the sleeve.



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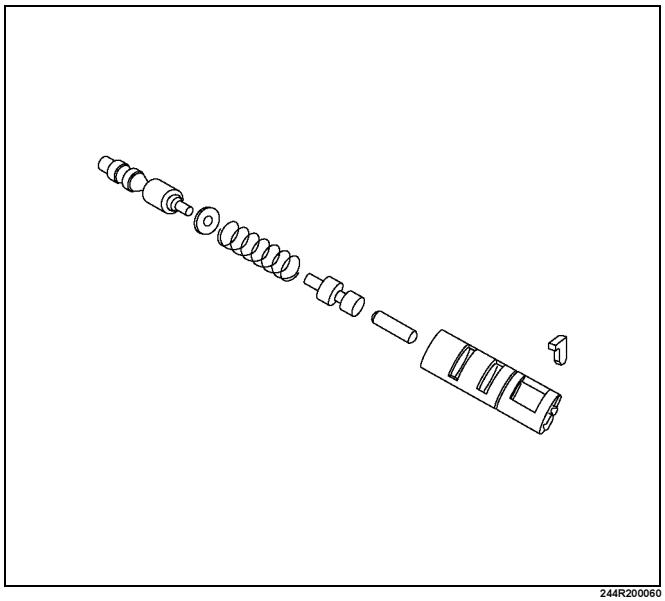
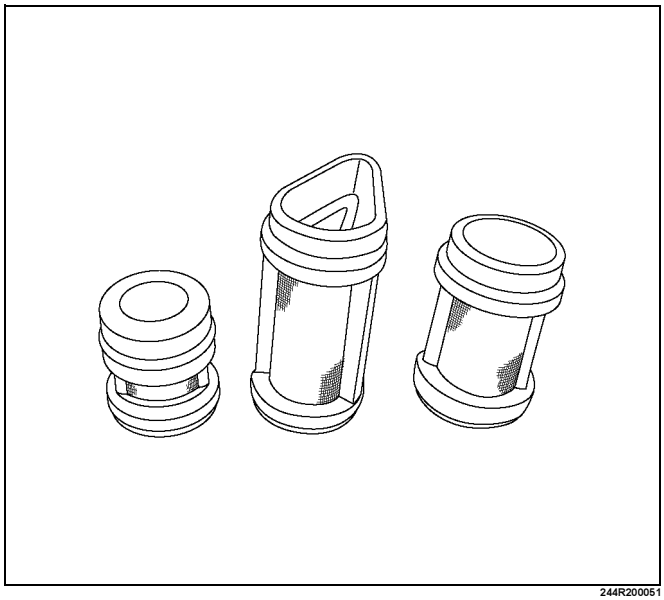
18. Remove the sleeve(31) with the plungers(32)(33), spring(34) and washer.
    Remove the two plungers(32)(33) from the sleeve.
    Remove the primary regulator valve(36) from the valve body(37).



244R200060

Inspection and Repair

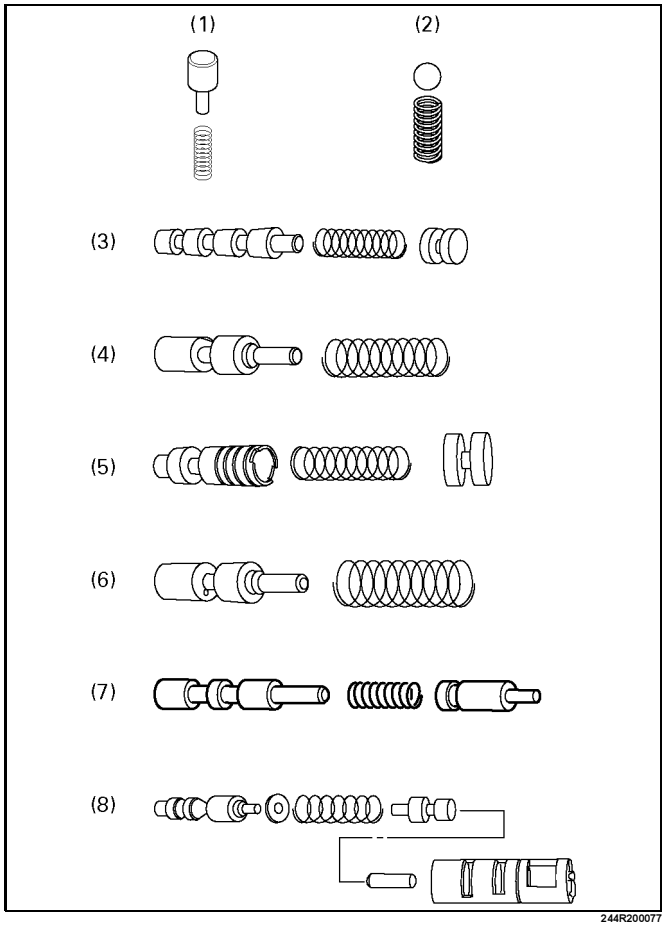
1. Inspect strainer
   Inspect strainer for residual adhesive and damage, and clean and replace as necessary.


244R200051

2. Inspect valve springs
   Check for damage, squareness, rust and distorted coils.
   Measure the spring free length and replace if less than shown below.

mm (in)

Spring	Free length	Color
(1) By-pass valve	21.3 (0.839)	YELLOW
(2) Steel ball	20.5 (0.807)	WHITE
(3) 1–2 shift valve	30.8 (1.213)	PURPLE
(4) Low coast modulator valve	30.4 (1.197)	LIGHT GREEN
(5) Accumulator control valve	33.8 (1.331)	—
(6) Solenoid modulator valve	26.6 (1.047)	LIGHT BLUE
(7) Cut back valve	34.0 (1.339)	DARK BLUE
(8) Primary regulator valve	38.58 (1.519)	WITHE



244R200077

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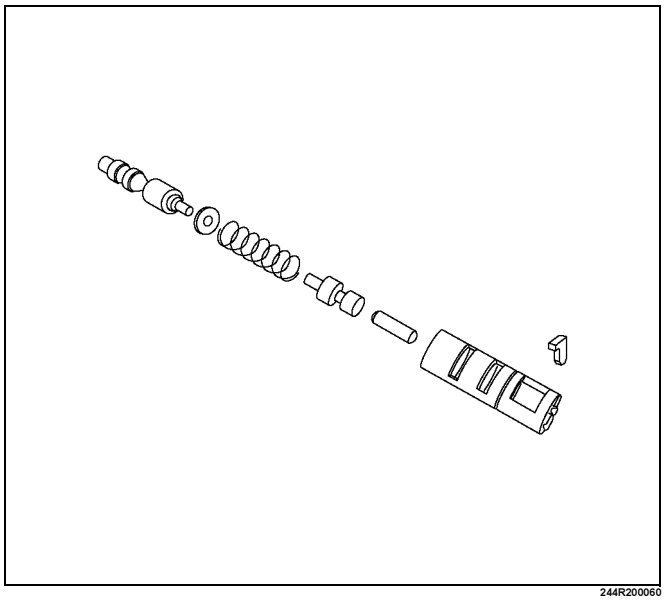
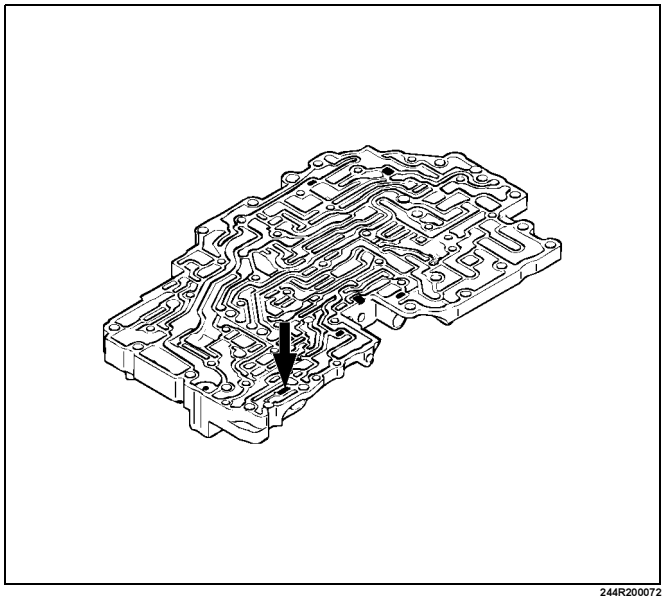
Reassembly

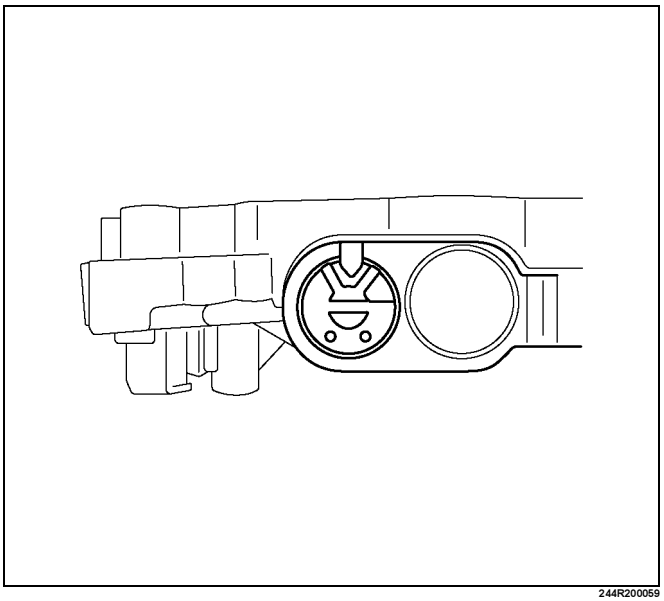
1. Install the washer(35) onto the primary regulator valve(36).
   Install the primary regulator valve(36) with the washer(35) into the bore of lower valve body.
   Install the two plungers(32)(33) into the sleeve(31).
   Align the mark on the top of sleeve(31) with the mark on the retainer(30).
   Install the sleeve(31) with the two plungers(32)(33) and spring(34) into the bore.


244R200060

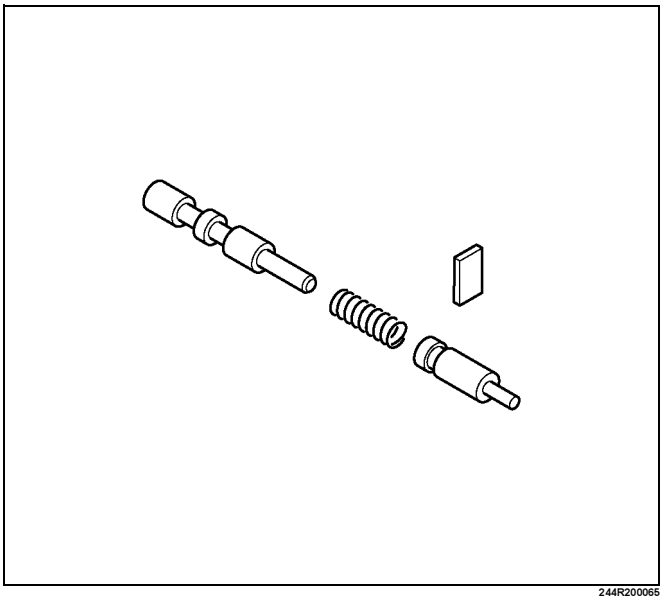
2. Install the retainer(30) by pushing the sleeve.


244R200072

NOTE: Install the retainer (30) to the same position on the top of sleeve(31), as when disassembling.


244R200059

3. Install the cut back valve(29), spring(28) and plug(27) into the bore.


244R200065

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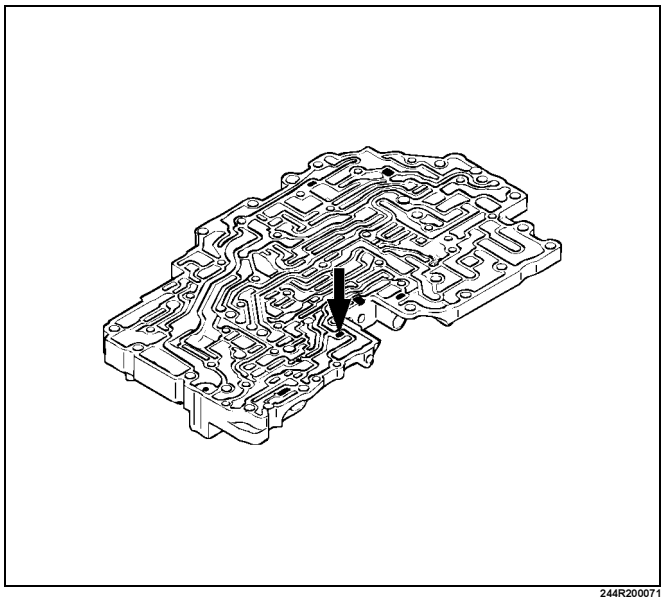
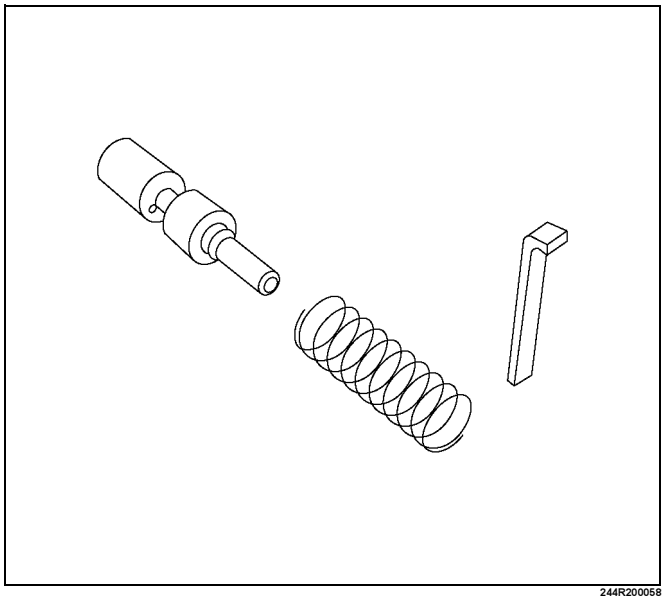
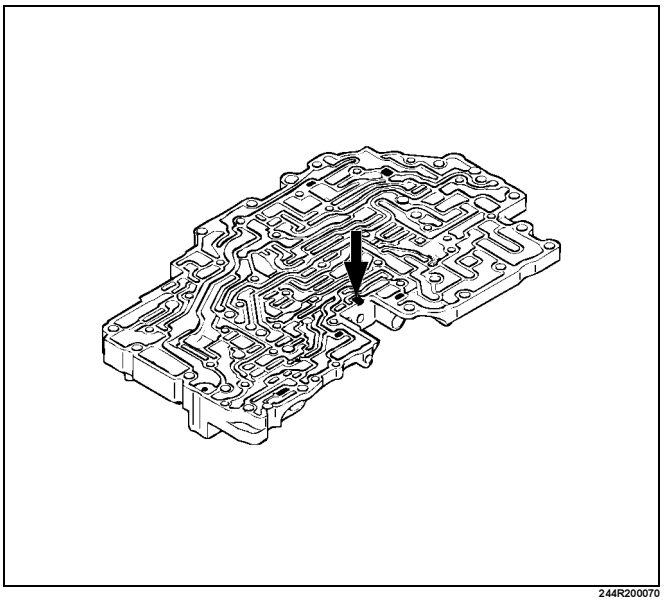
4. Install the retainer(26) by pushing the plug.



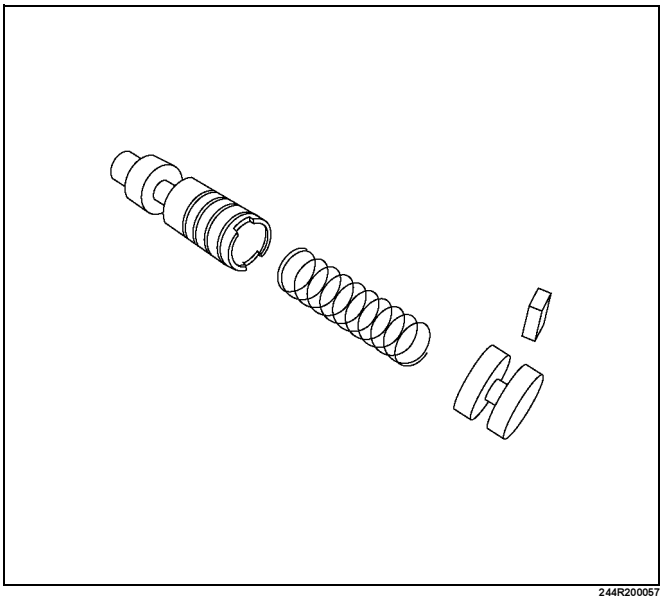
5. Install the coast modulator valve(25) and spring(24) into the bore.



6. Install the retainer(23) by pushing the spring.



7. Install the accumulator control valve(22), spring(21) and plug(20) into the bore.



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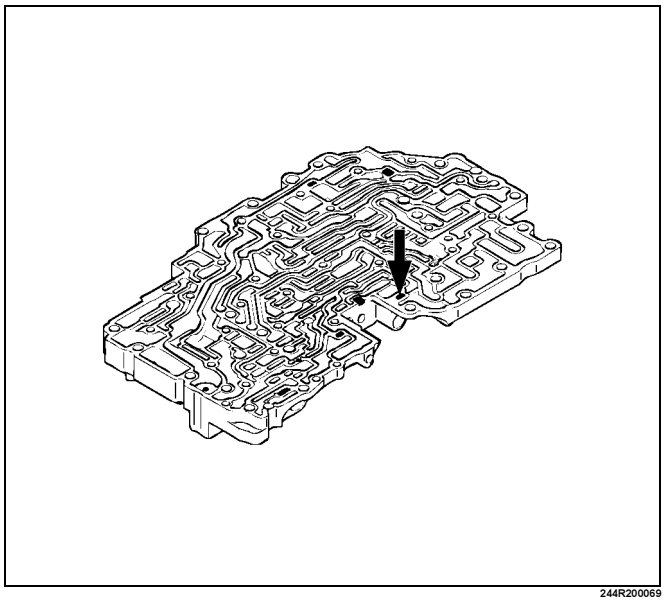
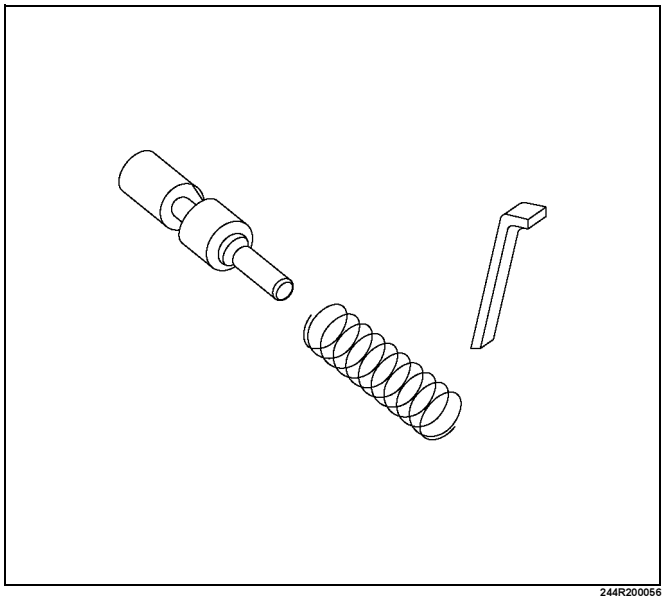
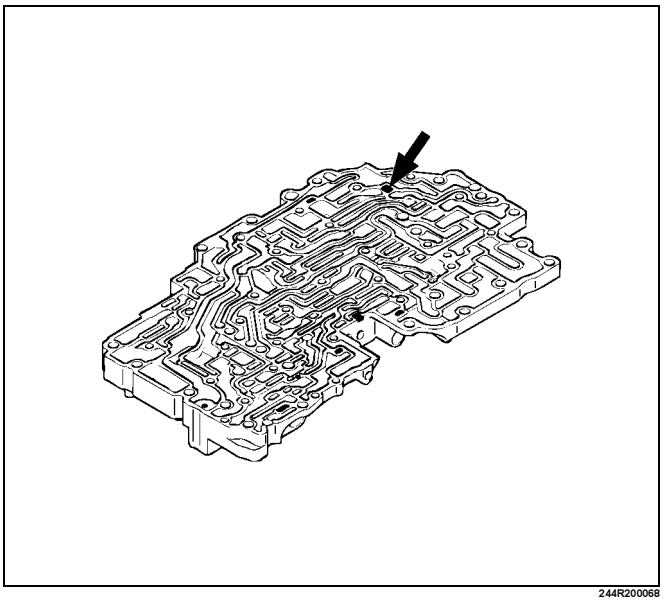
8. Install the retainer(19) by pushing in the plug.



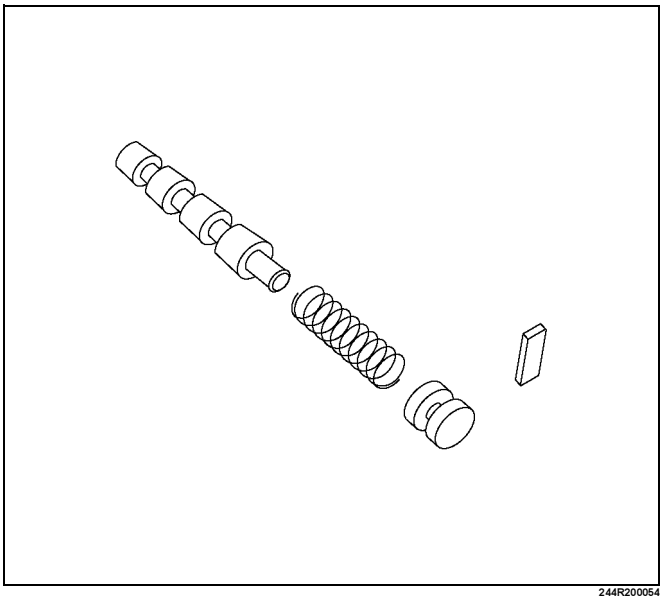
9. Install the low coast modulator valve(18) and spring(17) into the bore.



10. Install the retainer(16) by pushing the spring.



11. Install the 1–2 shift valve(15), spring(14) and plug(13) into the bore.



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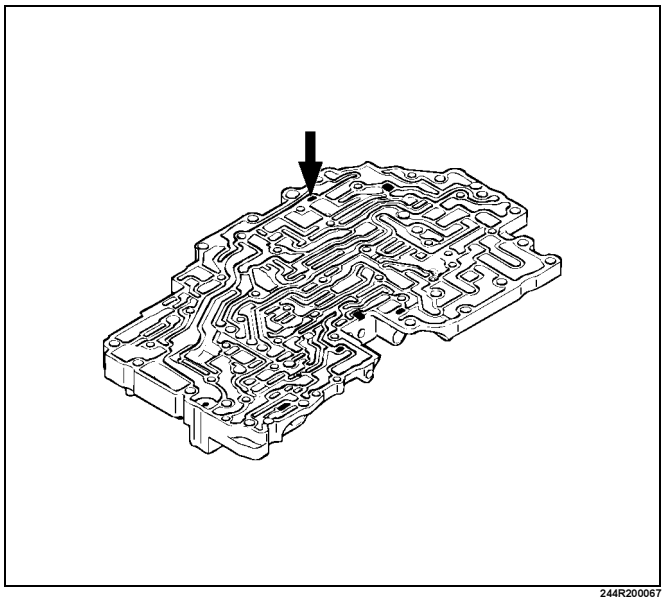
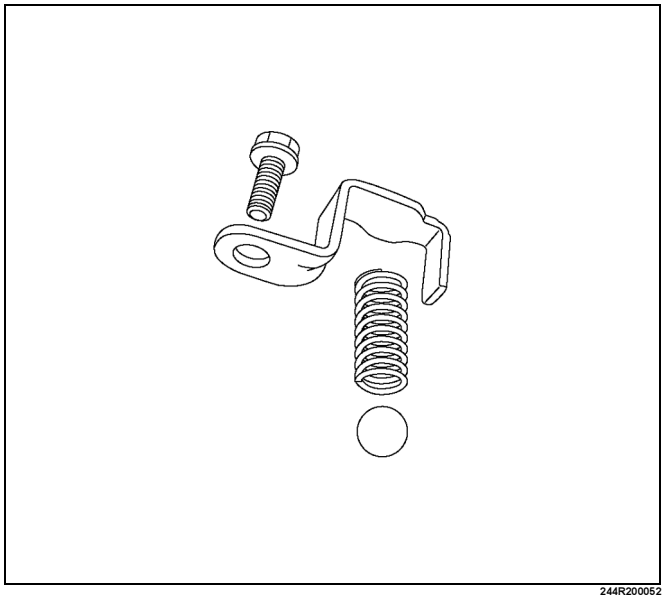
12. Install the retainer(12) by pushing the plug.



13. Install the ball(11), spring(10) and retainer (9) to the valve body.

Torque: 6.9 N·m (60 lb in)



14. Install the accumulator sub-assembly (8) and clamp(7) to the valve body.

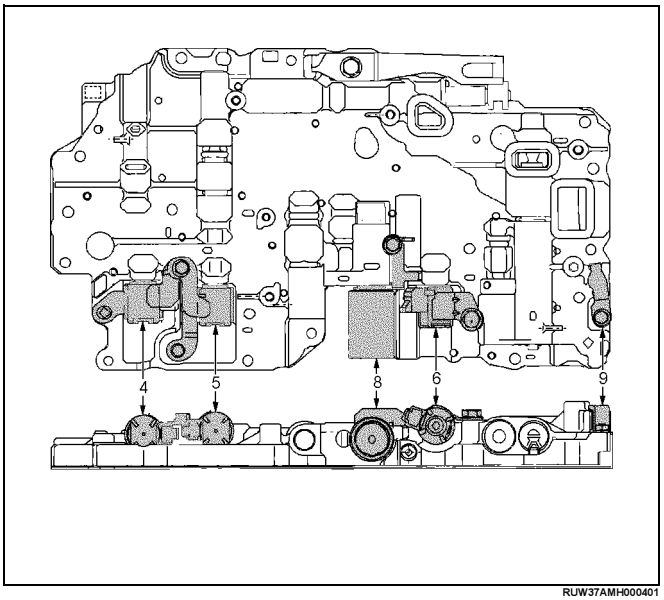
Torque: 10 N·m (87 lb in)

15. Install a new O-ring to the lock-up solenoid SL (6). Install the solenoid to the valve body.

Torque: 10 N·m (87 lb in)

16. Install a new O-ring to the shift solenoid S2 (5) and shift solenoid S1 (4). Install the solenoids to the valve body.

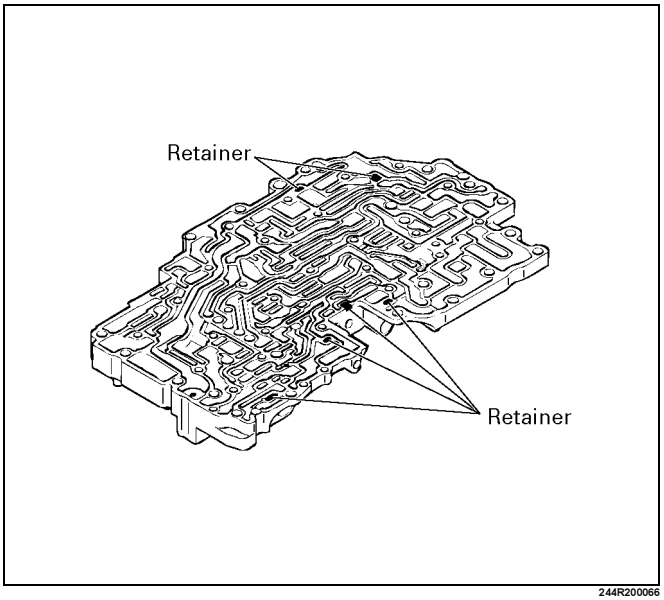
Torque: 10 N·m (87 lb in)



Legend

(4) Shift Solenoid S1
(5) Shift Solenoid S2
(6) Lock-up Solenoid SL
(8) Accumulator Sub-assembly
(9) Retainer

NOTE: Make sure six retainers are installed correctly.



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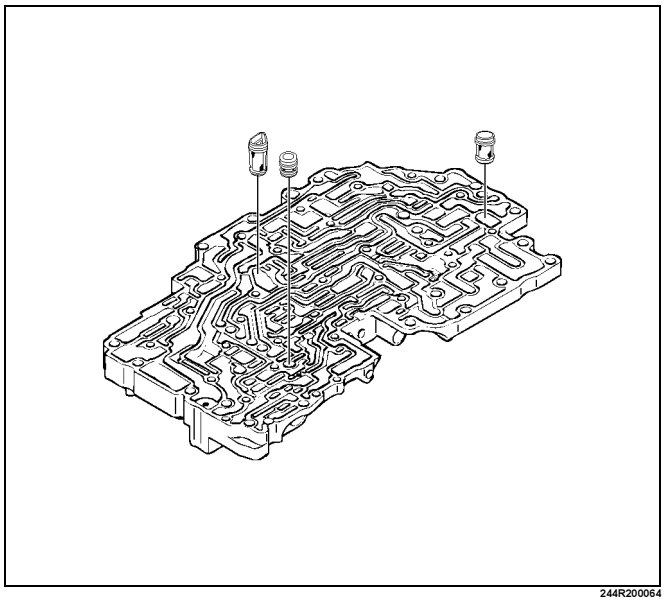
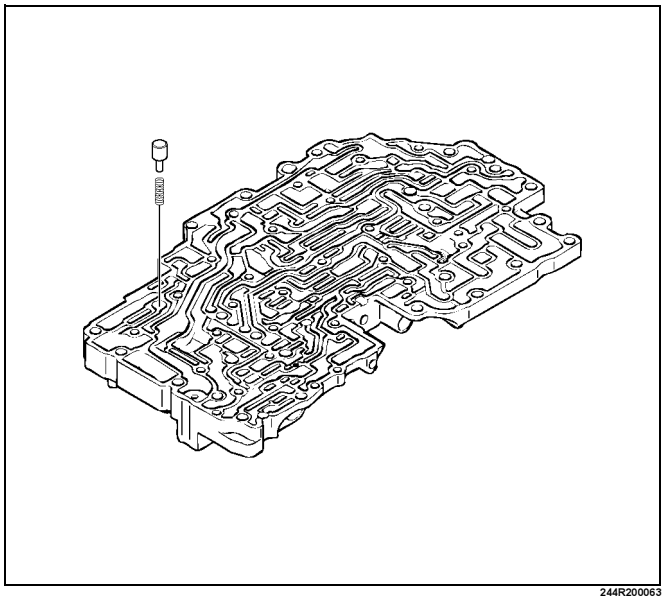
17. Install the three strainers(3) to the valve body as shown.



244R200064

18. Install the spring(2) and by-pass valve(1) to the valve body as shown.



244R200063

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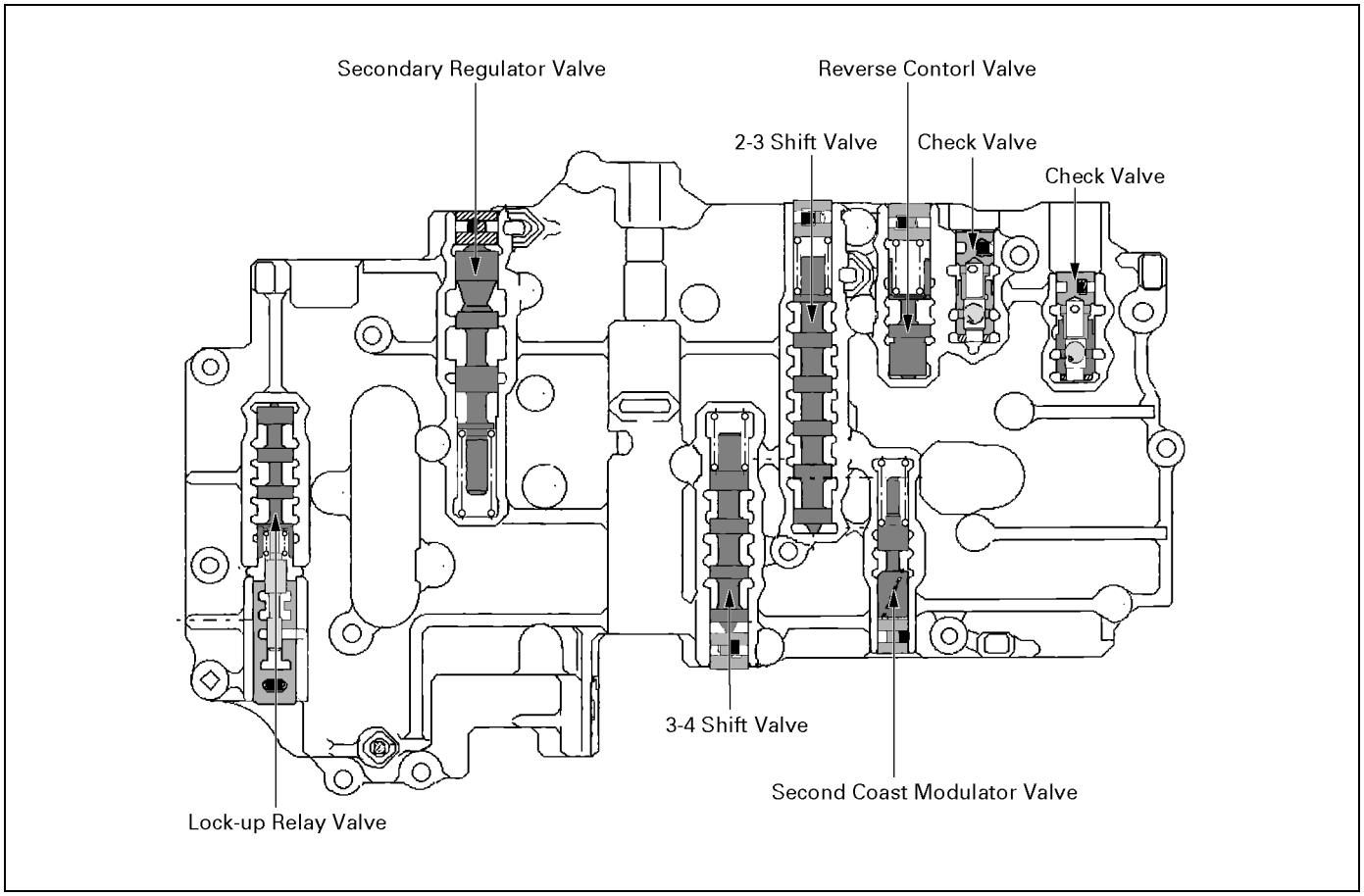
Upper Valve Body

Cross Section



243R200052

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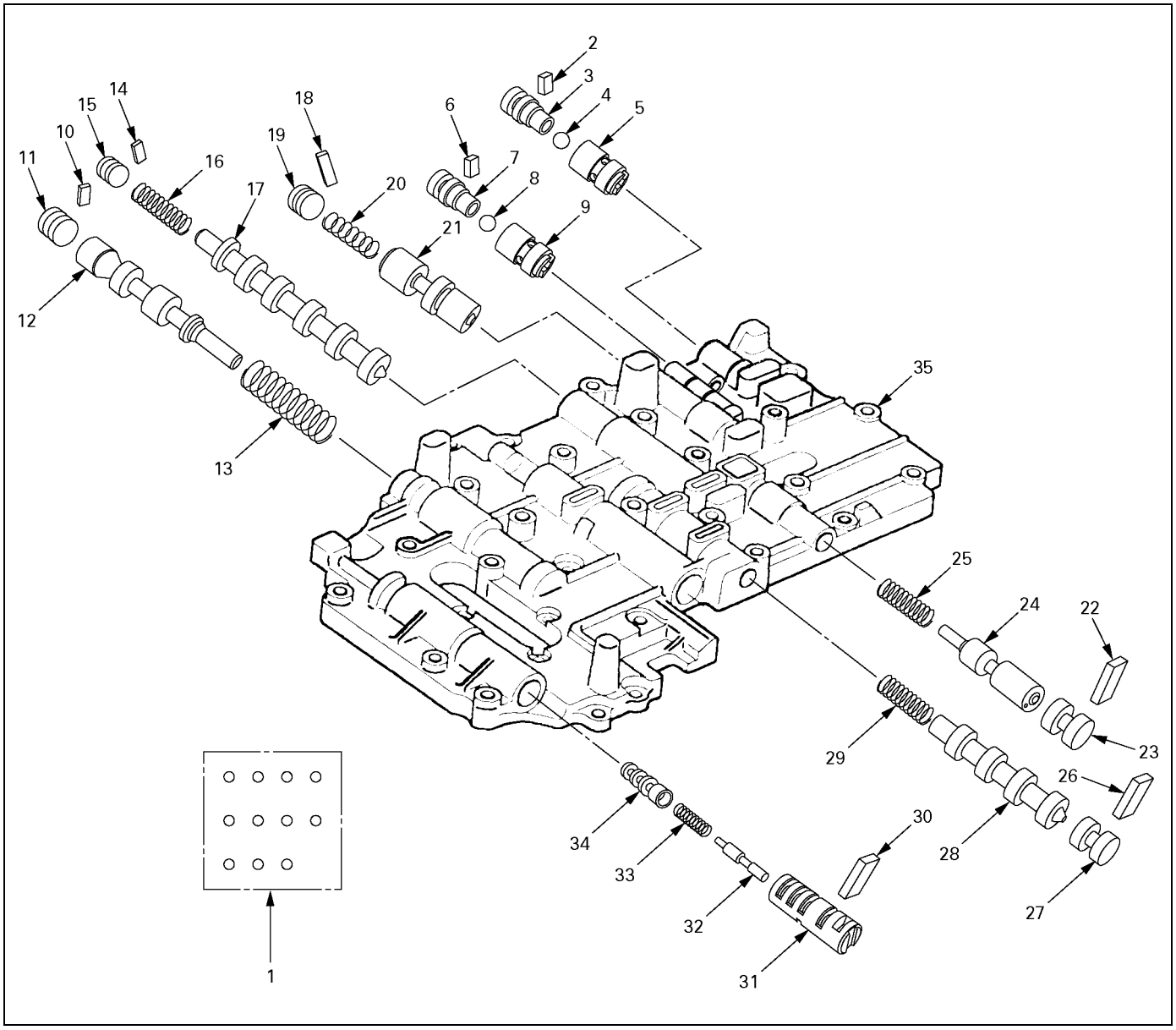
Disassembled View



243R200074

Legend

(1) Check ball
(2) Retainer
(3) Check valve NO.2
(4) Ball
(5) Check valve NO.1
(6) Retainer
(7) Check valve NO.2
(8) Ball
(9) Check valve NO.1
(10) Retainer
(11) Plug
(12) Secondary regulator valve
(13) Spring
(14) Retainer
(15) Plug
(16) Spring
(17) 2–3 shift valve
(18) Retainer
(19) Plug
(20) Spring
(21) Reverse control valve
(22) Retainer
(23) Plug
(24) Second coast modulator valve
(25) Spring
(26) Retainer
(27) Plug
(28) 3–4 shift valve
(29) Spring
(30) Retainer
(31) Sleeve
(32) Plunger
(33) Spring
(34) Lock-up relay valve
(35) Upper valve body

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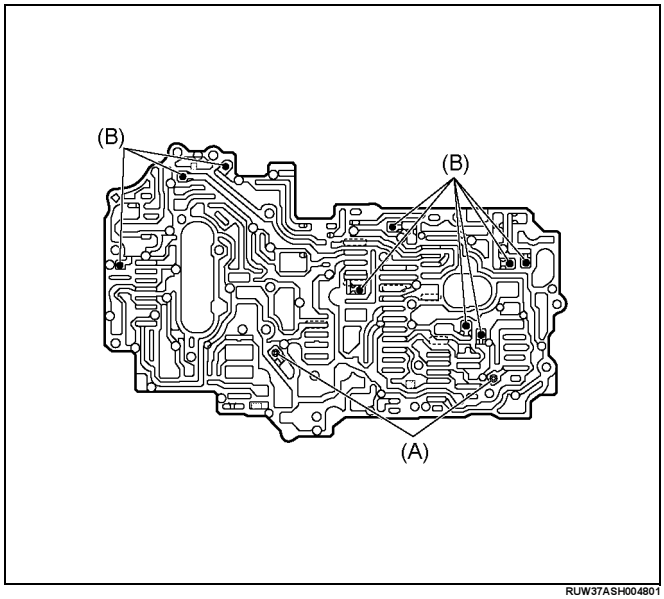
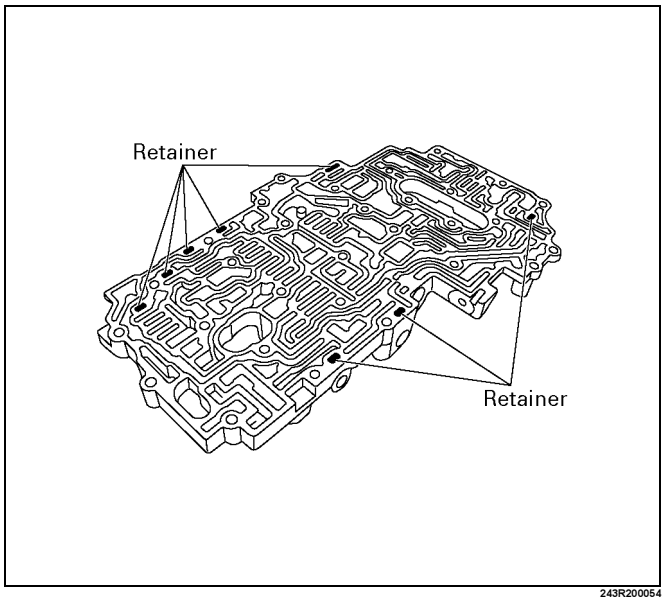
Disassembly

1. Remove the two types of check balls(1) from the valve body.
   Number of check ball : 11



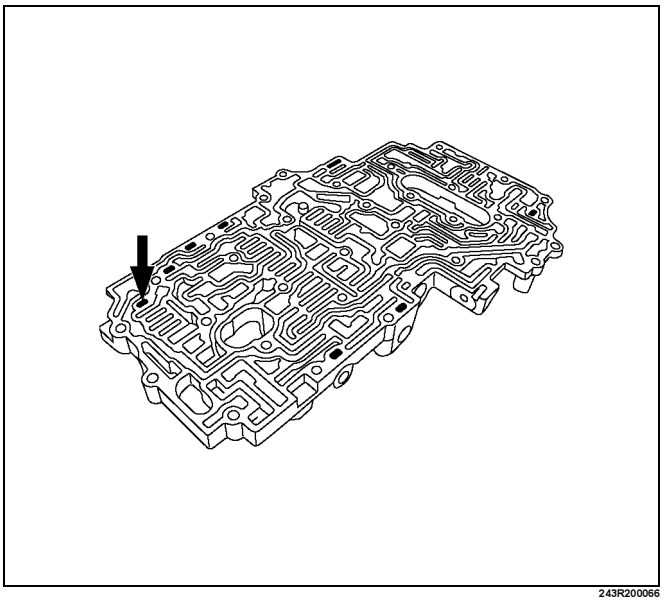
RUW37ASH004801

NOTE: Confirm eight retainers are installed correctly.

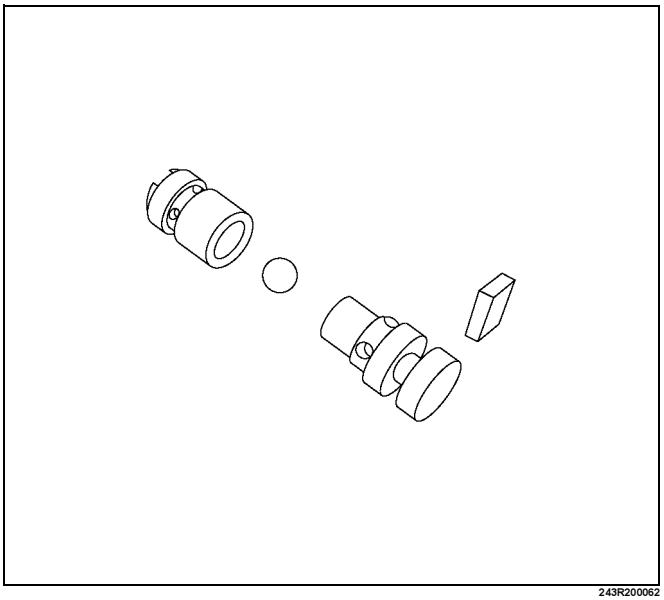


243R200054

2. Remove the ratainer (2) for check valve.


243R200066

3. Remove the check valve NO.2(3), ball(4) and check valve NO.1(5) from the valve body.


243R200062

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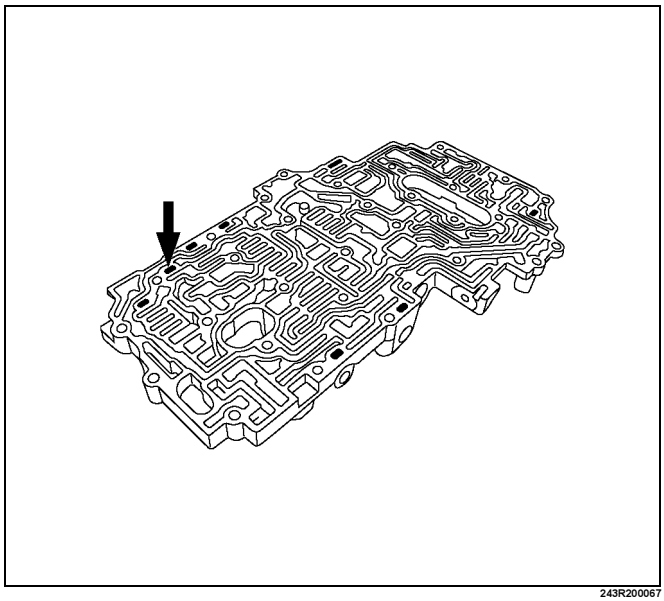
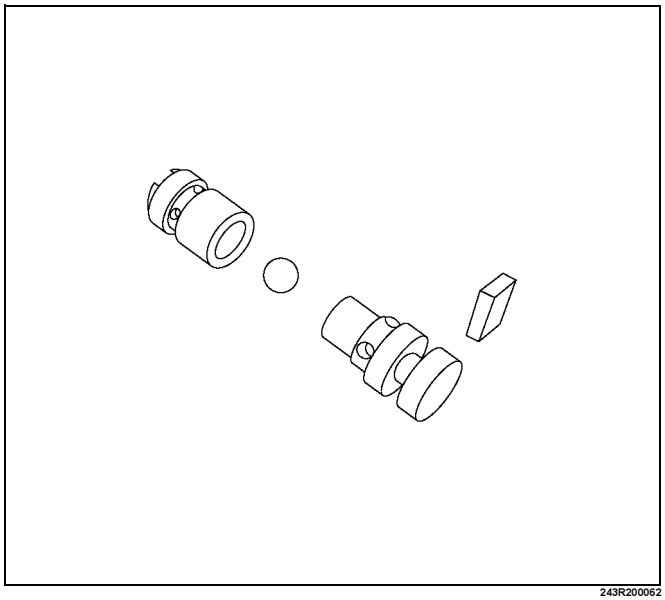
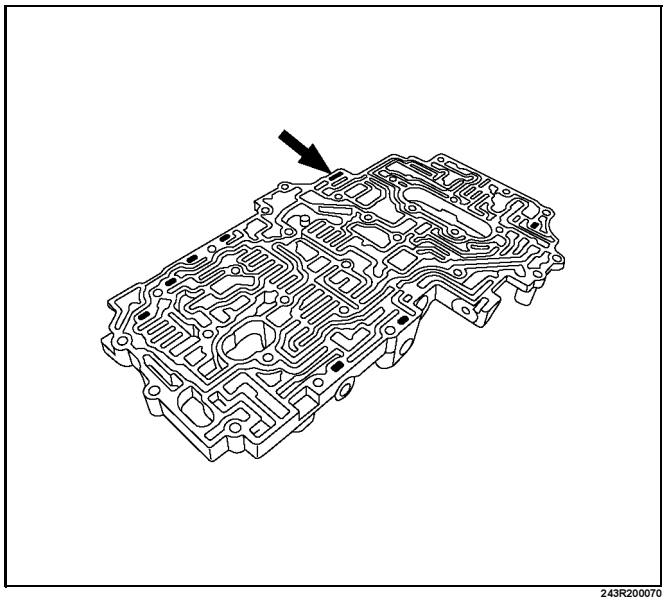
4. Remove the retainer (6) for check valve.



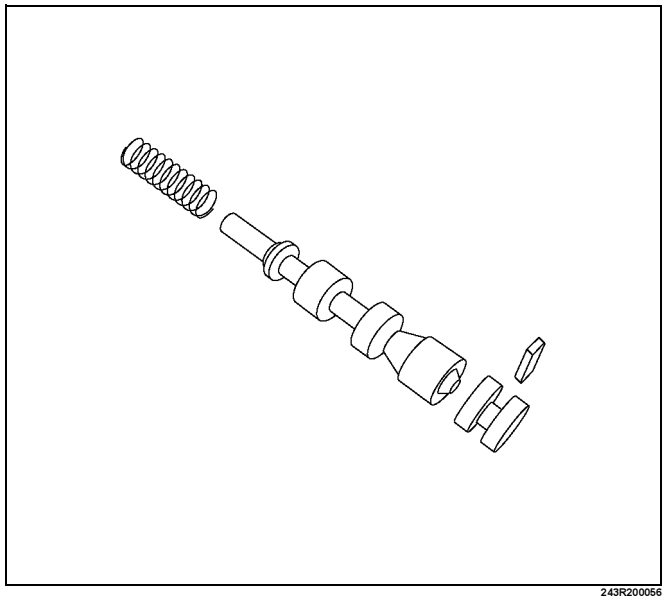
5. Remove the check valve NO.2(7), ball(8) and check valve NO.1(9) from the valve body.



6. Remove the retainer (10) for secondary regulator valve with a magnetic finger by pushing the plug.

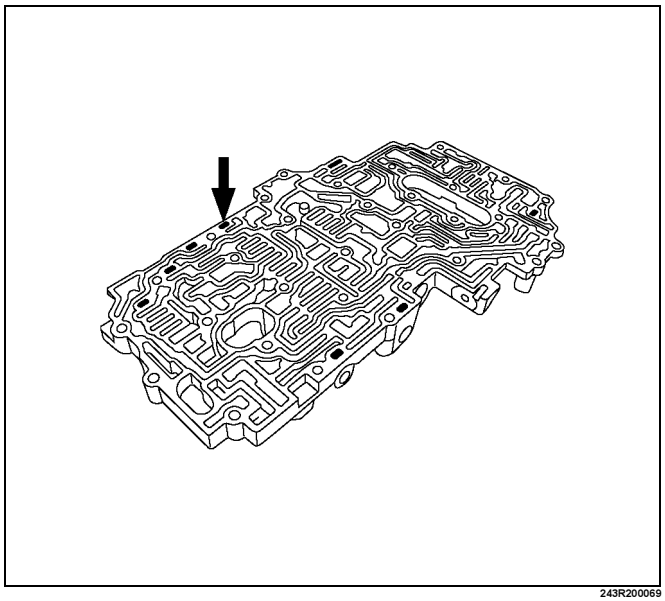


7. Remove the plug(11), secondary regulator valve(12) and spring(13).

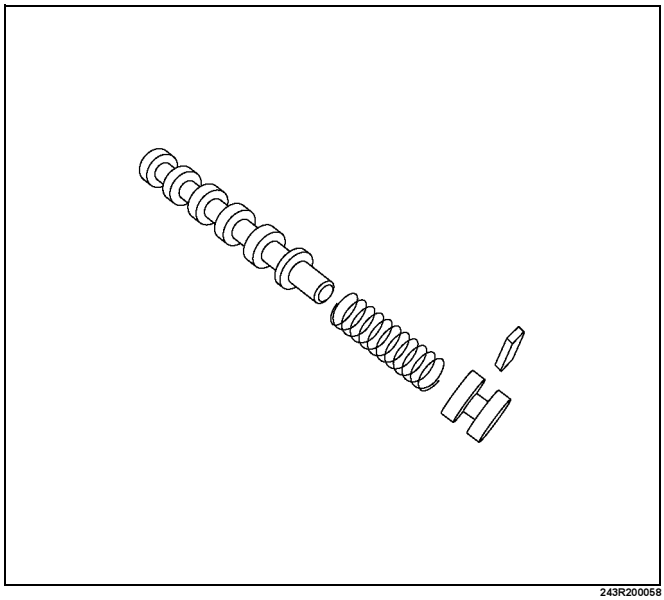


ProCarManuals.com

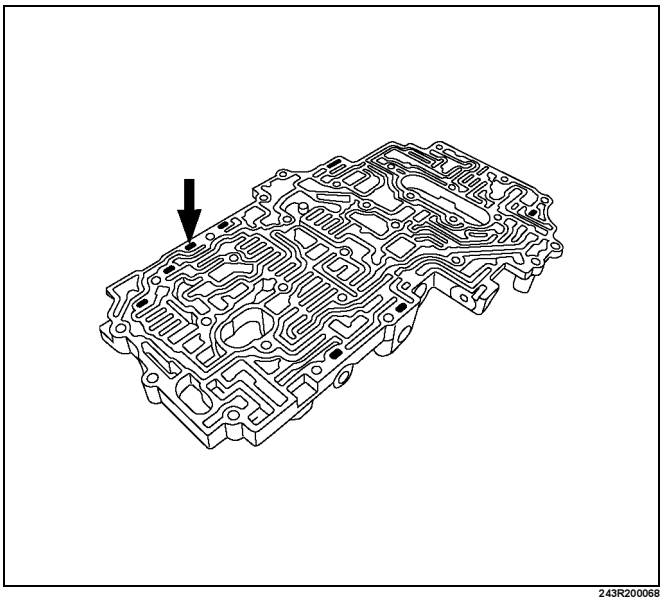
8. Remove the retainer (14) for 2–3 shift valve with a magnetic finger by pushing the plug.



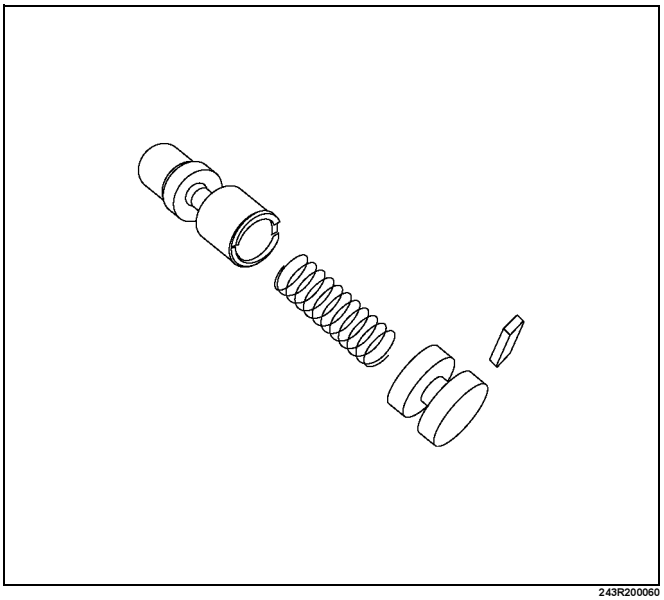
9. Remove the plug(15), spring(16) and 2–3 shift valve(17).



10. Remove the retainer (18) for reverse control valve with a magnetic finger by pushing in the plug.



11. Remove the plug(19), spring(20) and reverse control valve(21).



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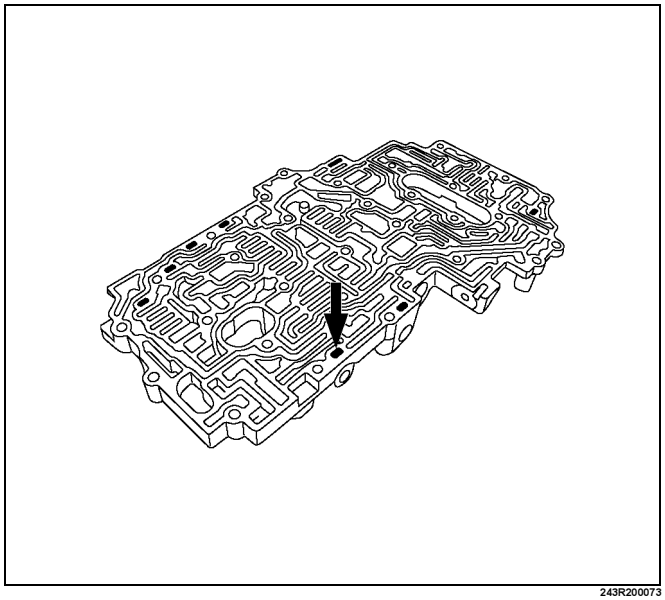
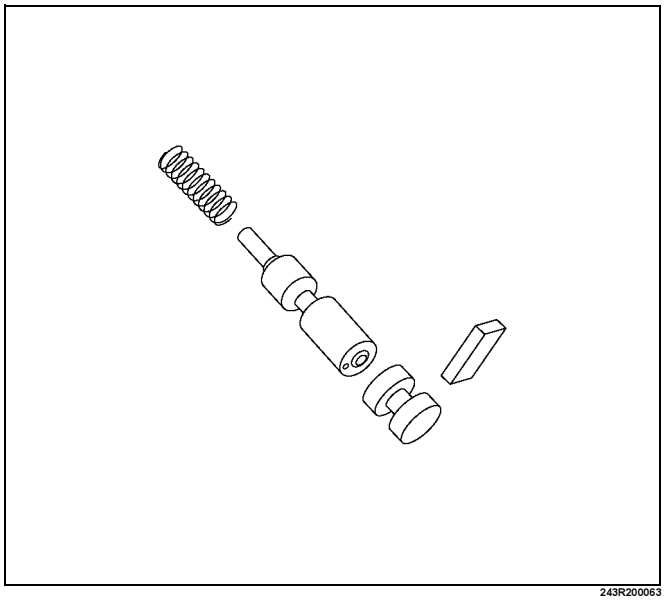
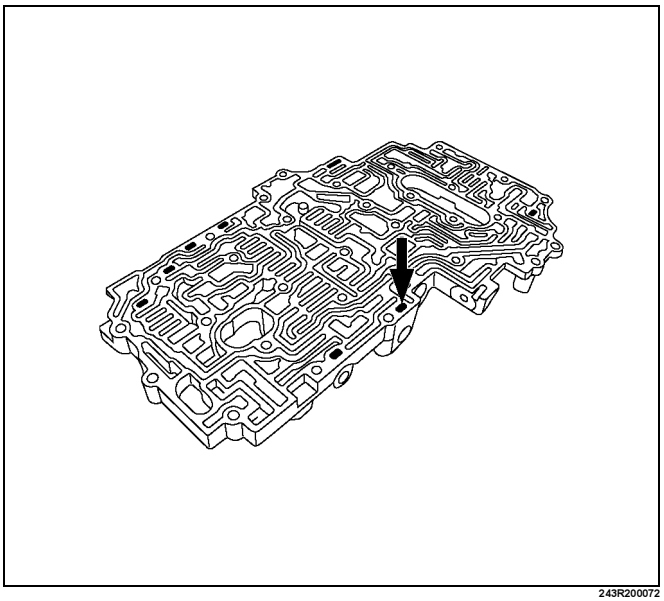
12. Remove the retainer (22) for second coast modulator valve with a magnetic finger by pushing the plug.


243R200073

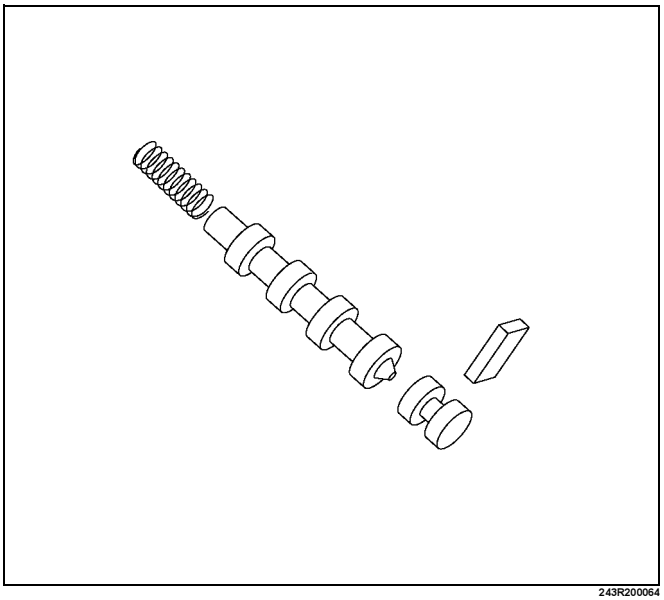
13. Remove the plug(23), second coast modulator valve(24) and spring(25).


243R200063

14. Remove the retainer (26) for 3–4 shift valve with a magnetic finger by pushing the plug.


243R200072

15. Remove the plug(27), 3–4 shift valve(28) and spring(29).


243R200064

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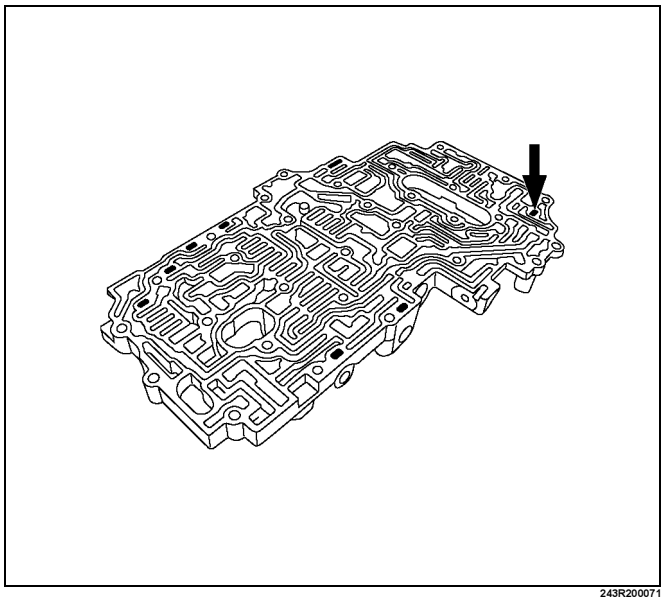
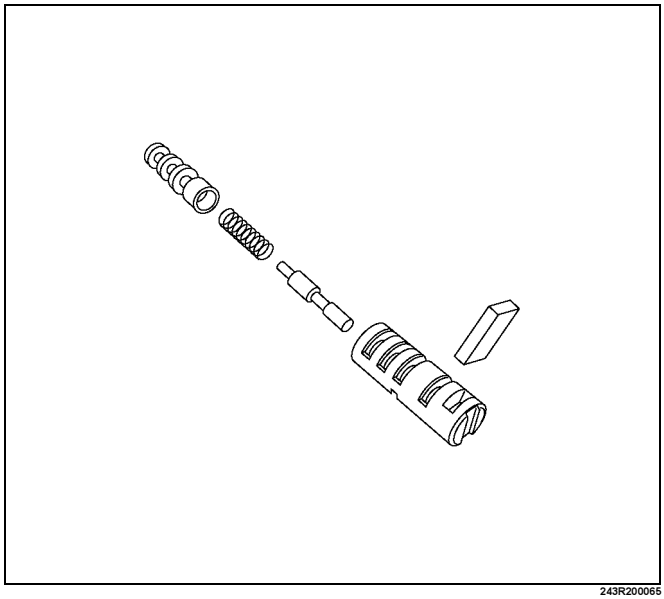
16. Remove the retainer (30) for lock-up relay valve with a magnetic finger by pushing in the sleeve.



243R200071

17. Remove the sleeve(31) with the plunger(32), spring(33) and lock-up relay valve(34).
    Remove the lock-up relay valve(34), spring(33) and plunger(32) from the sleeve(31).



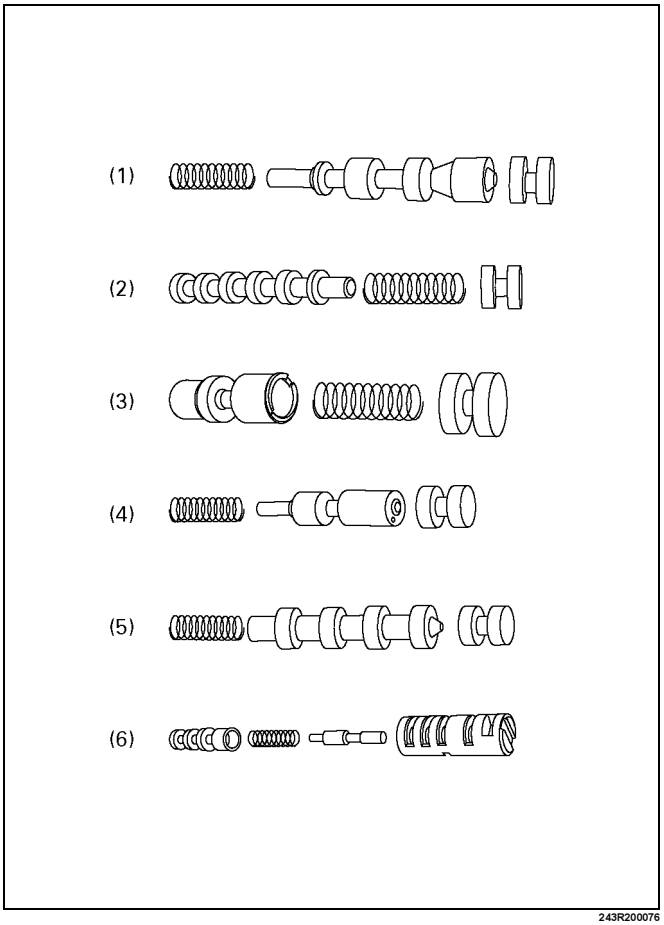
243R200065

Inspection and Repair

1. Inspect valve springs
   Check for damage, squareness, rust and distorted coils.
   Measure the spring free length and replace if less than below.

mm (in)

Spring	Free length	Color
(1) Secondary regulator valve	32.9 (1.295)	PURPLE
(2) 2–3 shift valve	30.8 (1.213)	PURPLE
(3) Reverse control valve	25.6 (1.008)	—
(4) Second coast modulator valve	25.3 (0.996)	ORANGE
(5) 3–4 shift valve	30.8 (1.213)	PURPLE
(6) Lock-up relay valve	23.4 (0.912)	RED



243R200076

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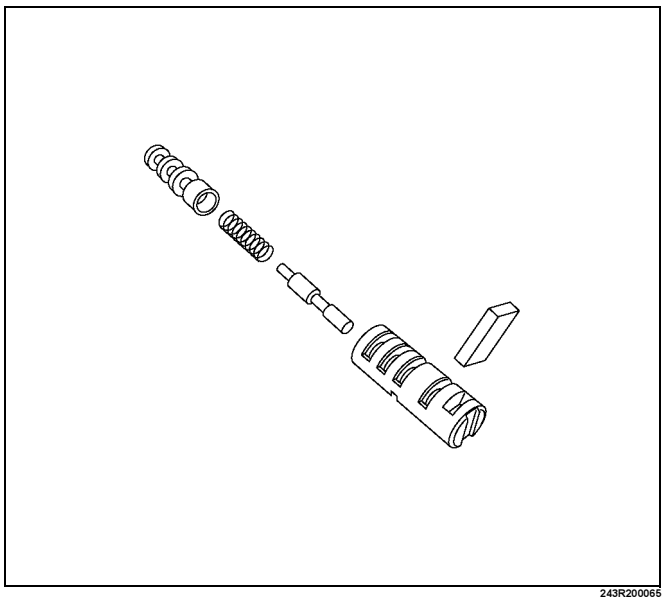
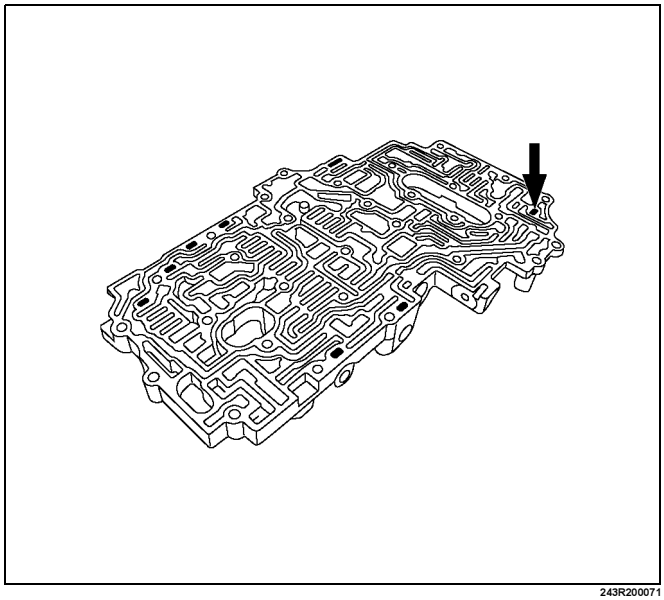
Reassembly

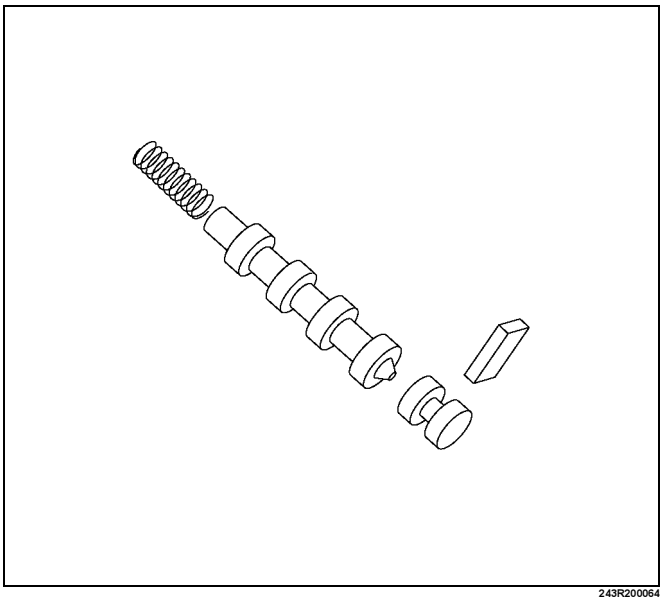
1. Install the plunger(32) and spring(33) into the sleeve(31).
   Install the lock-up relay valve(34) into the sleeve(31).
   Install the sleeve(31) with the plunger(32), spring(33) and lock-up relay valve(34) into the bore.


243R200065

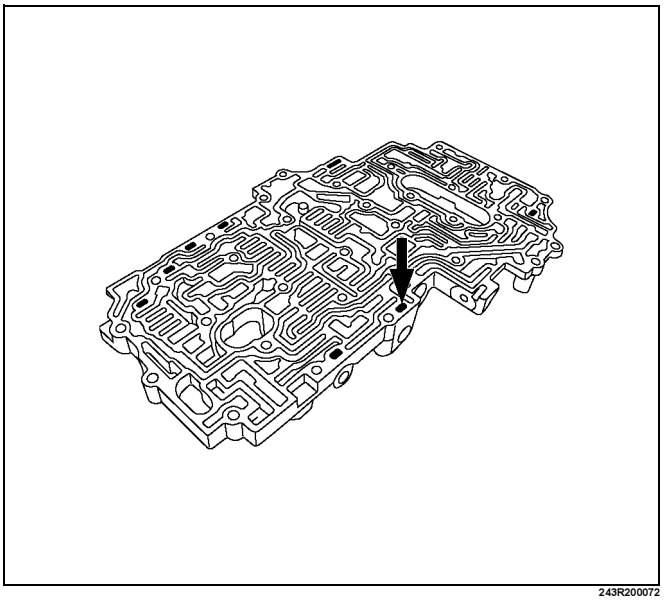
2. Install the retainer(30).


243R200071

3. Install the spring, 3-4 shift valve(28) and plug(27) into the bore.


243R200064

4. Install the retainer(26) by pushing the plug.


243R200072

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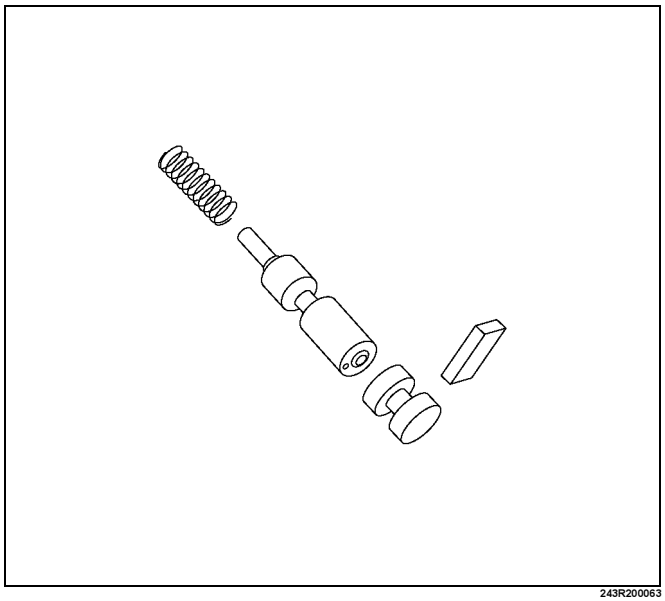
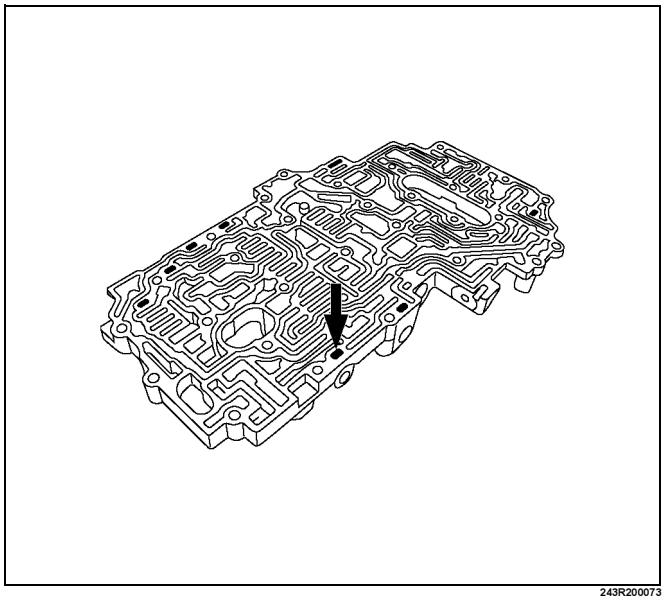
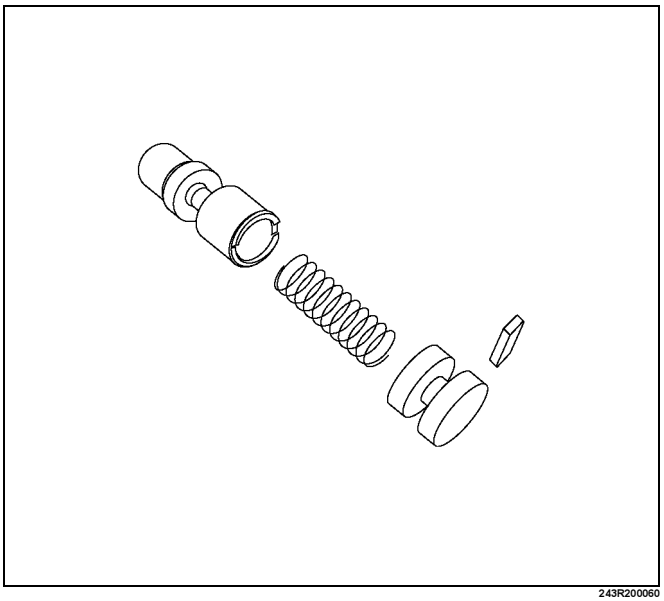
5. Install the spring(25), second coast modulator valve(24) and plug(23) into the bore.



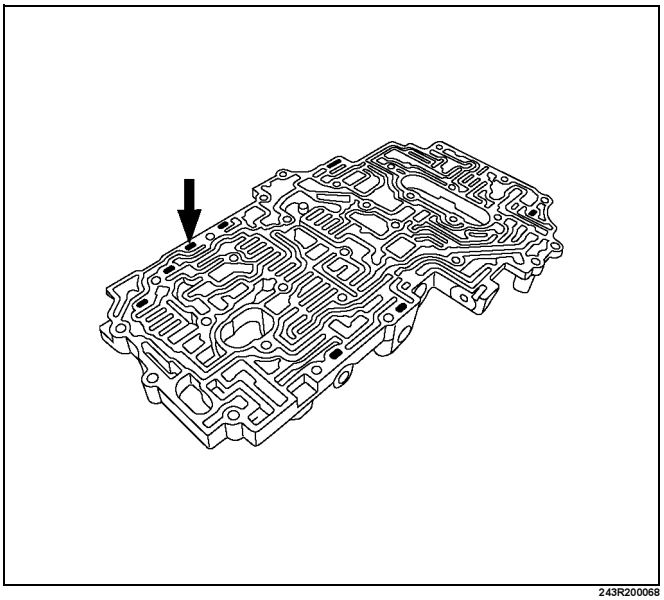
6. Install the retainer(22) by pushing the plug.



7. Install the reverse control valve(21), spring(20) and plug(19) into the bore.



8. Install the retainer(18) by pushing the plug.



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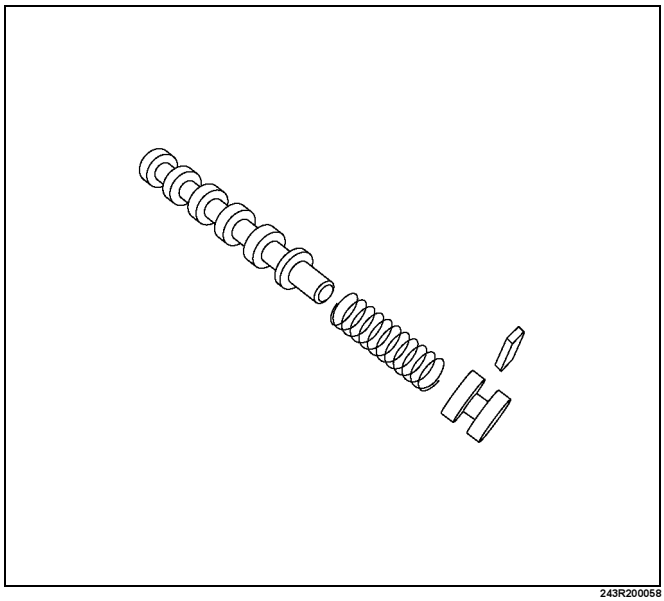
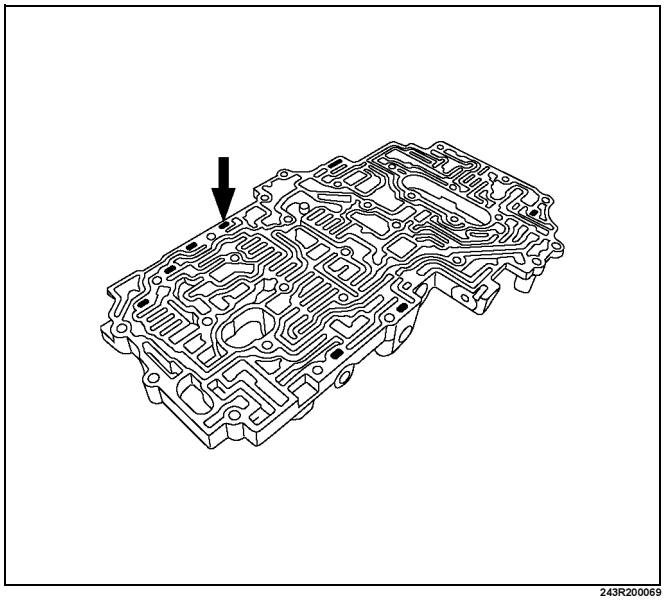
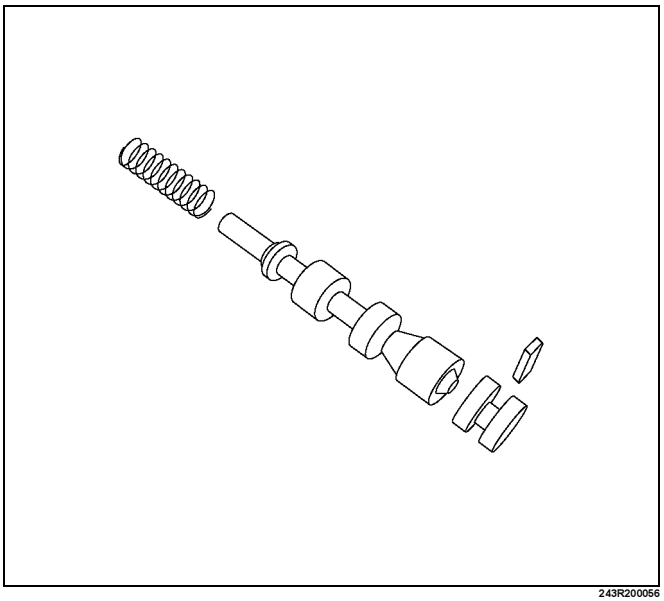
9. Install the 2–3 valve(17), spring(16) and plug(15) into the bore.



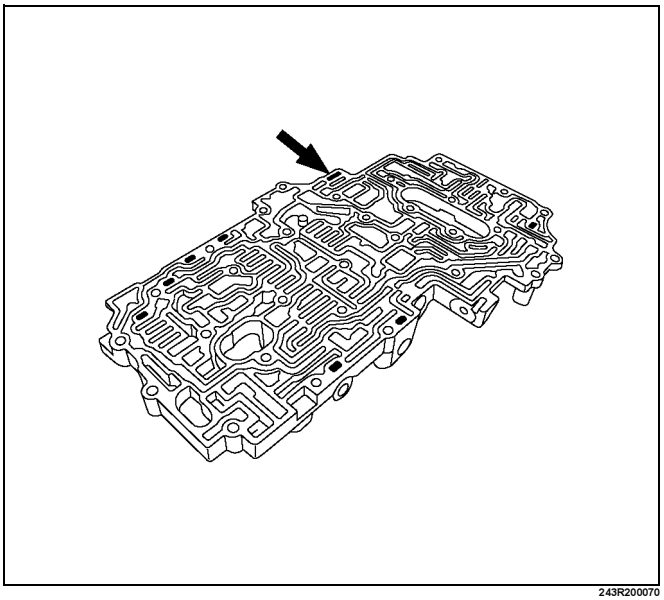
10. Install the retainer(14) by pushing the plug.



11. Install the spring(13), secondary regulator valve(12) and plug(11) into the bore.



12. Install the retainer(10) by pushing the plug.



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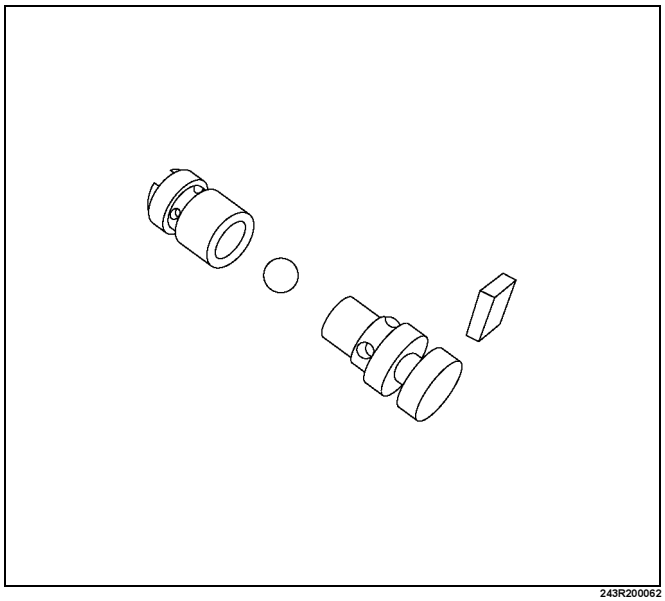
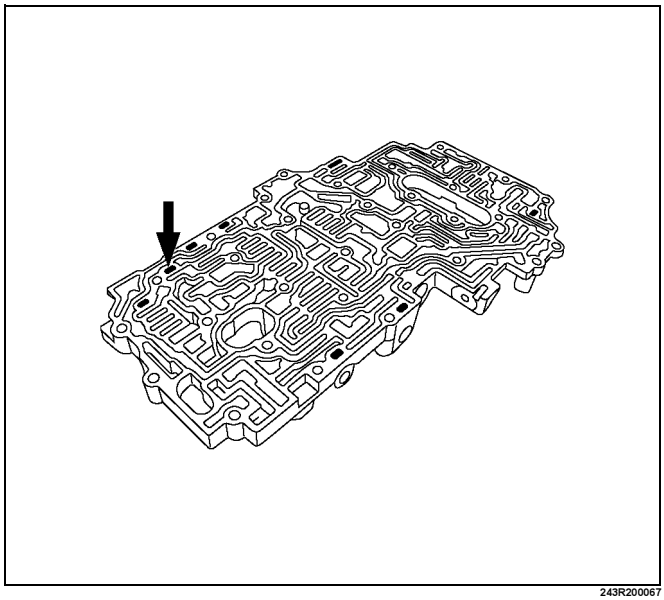
13. Install the check valve NO.1(9), ball(8) and check valve NO.2(7) to valve body.



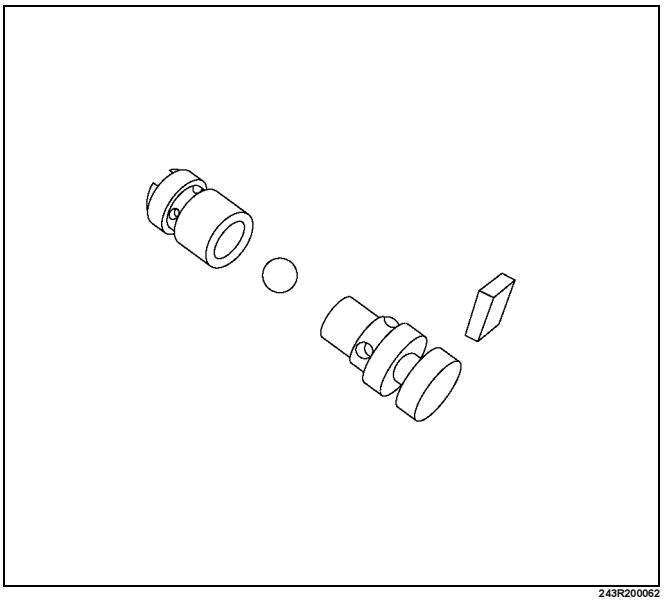
243R200062

14. Install the retainer(6).



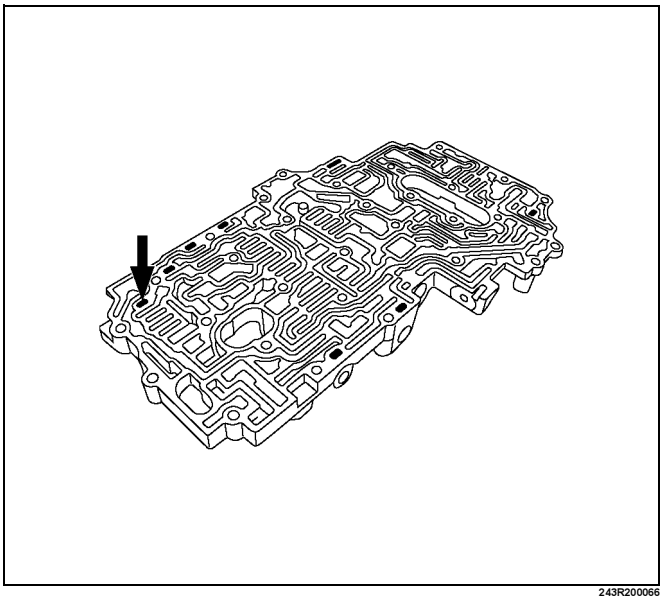
243R200067

15. Install the check valve NO.1(5), ball(4) and check valve NO.2(3) to the valve body.



243R200062

16. Install the retainer(2).



243R200066

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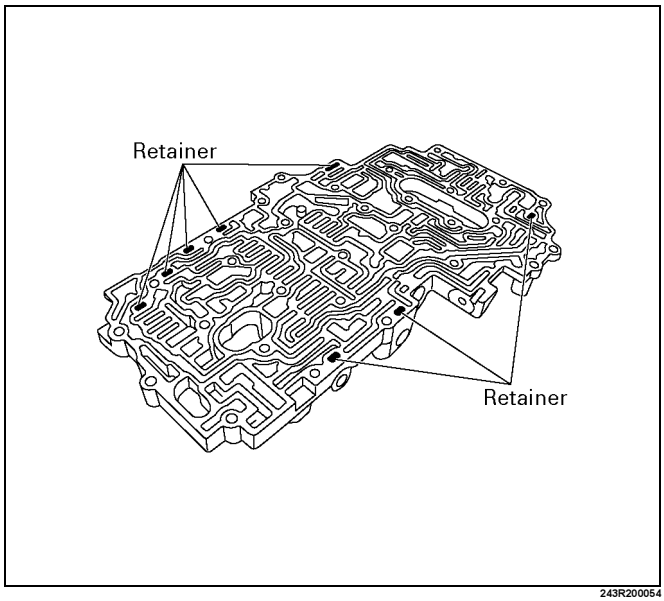
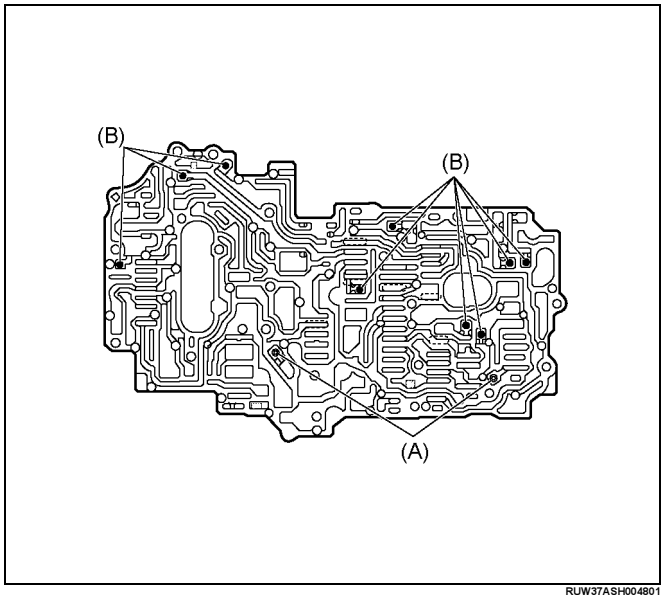
NOTE: Make sure eight retainers are installed correctly



243R200054

17. Install the two types of check balls(1) to the valve body.
    Number of check ball : 11

Check ball	Diameter
(A) Rubber ball	5.535 mm (0.2179 in
(B) Rubber ball	6.35 mm (0.2500 in



RUW37ASH004801

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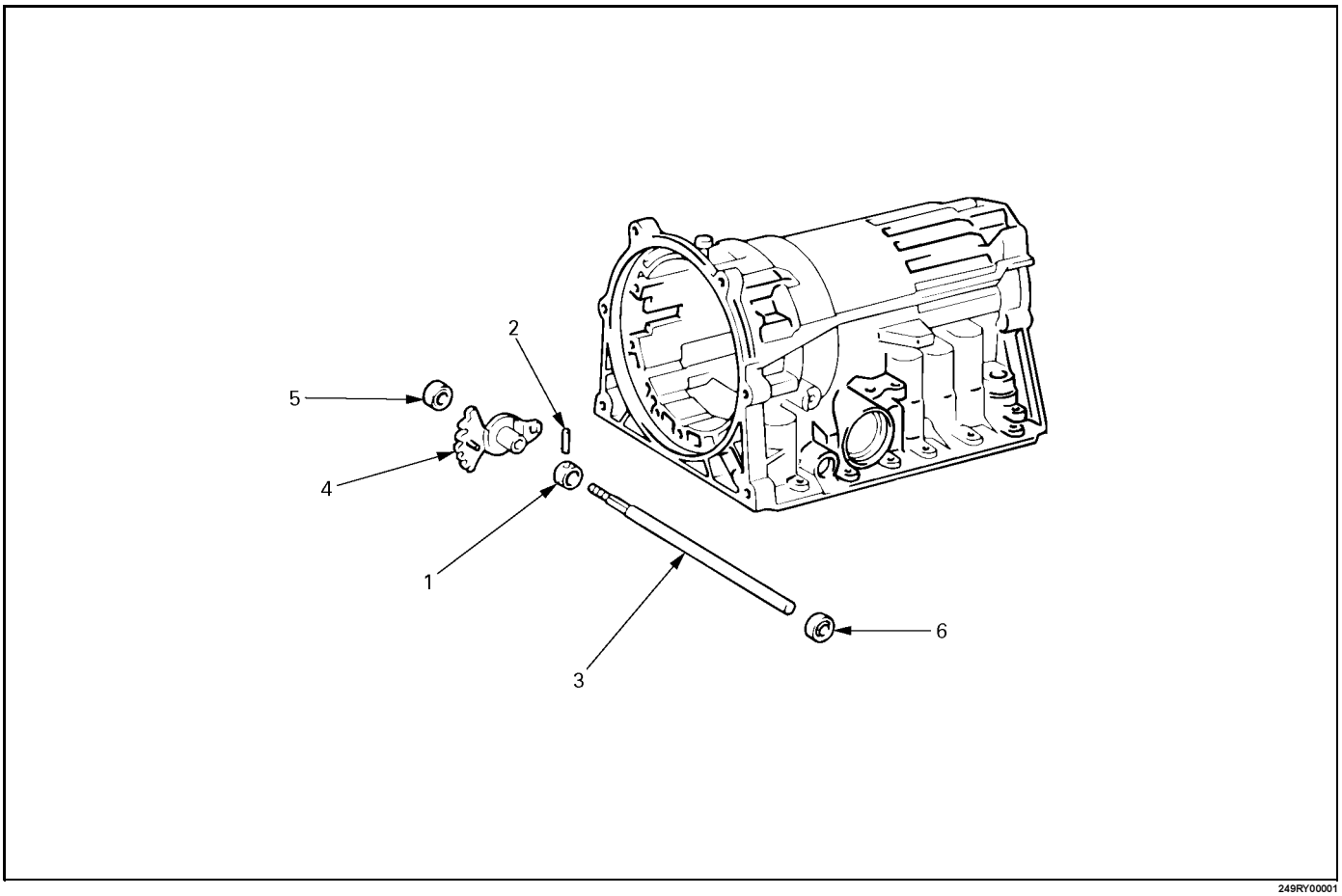
Transmission Case

Disassembled View



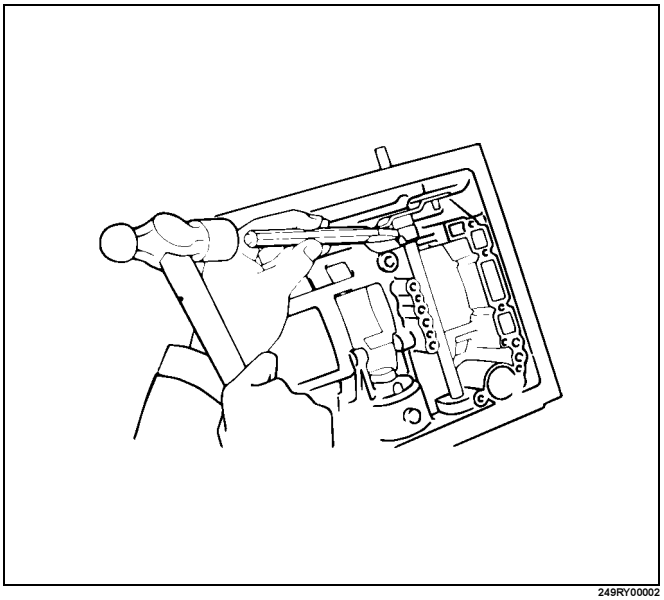
249RY00001

Legend

(1) Spacer
(2) Pin
(3) Manual valve lever shaft
(4) Manual valve lever
(5) Oil seal
(6) Oil seal

Disassembly

1. Using a chisel, cut off the spacer and remove it from the shaft.



249RY00002

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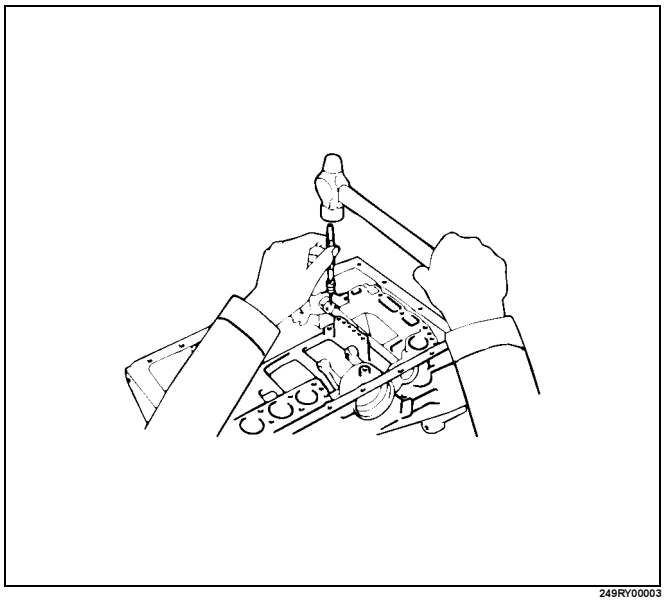
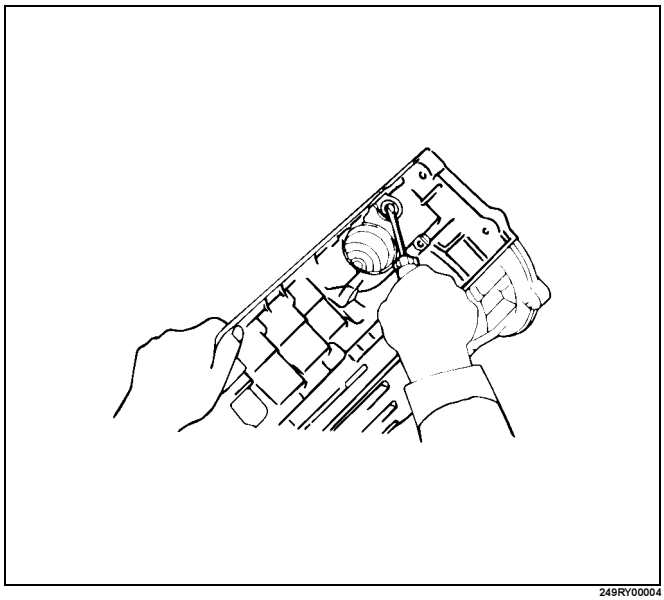
2. Using a punch, drive out the pin.



249RY00003

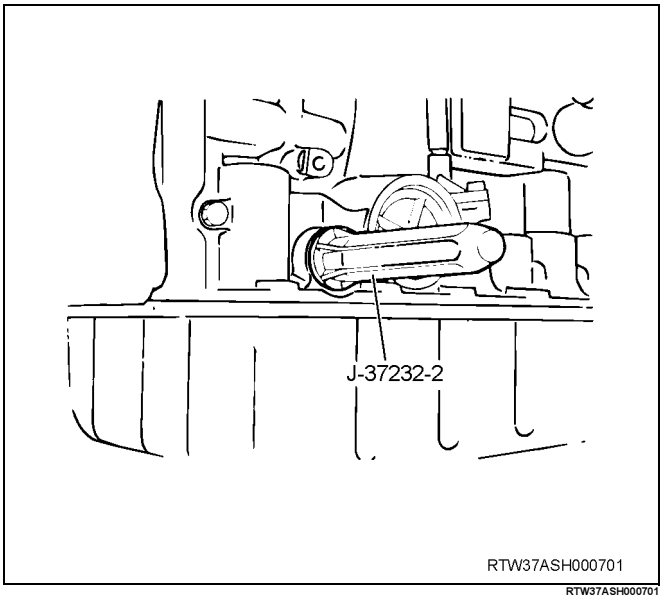
3. Pull the manual valve lever shaft out through the case by the threads.
4. Take out the manual valve lever.
5. Using a screwdriver, remove the oil seals.



249RY00004

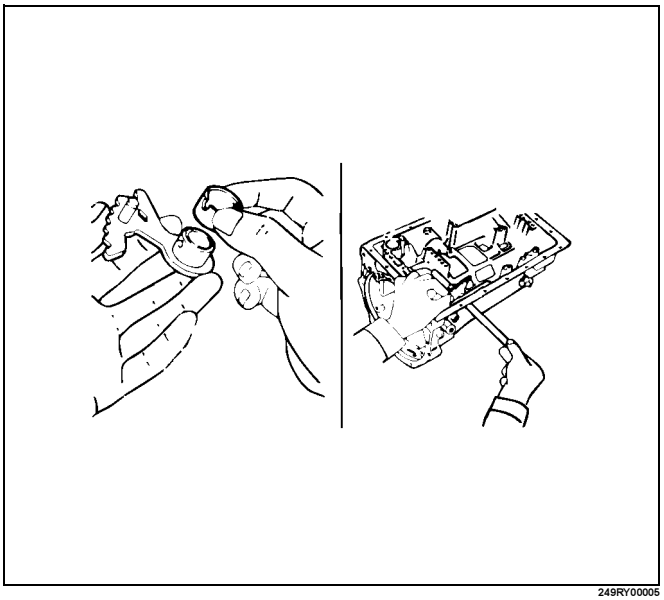
Reassembly

1. Coat a new oil seal lip with multi purpose grease. Using special tool, drive in the oil seal.
   Oil seal installer : J–37232–2



RTW37ASH000701

2. Assemble a new spacer to the manual valve lever.
3. Install the manual valve lever shaft to the transmission case through the manual valve lever by the threads.



249RY00005

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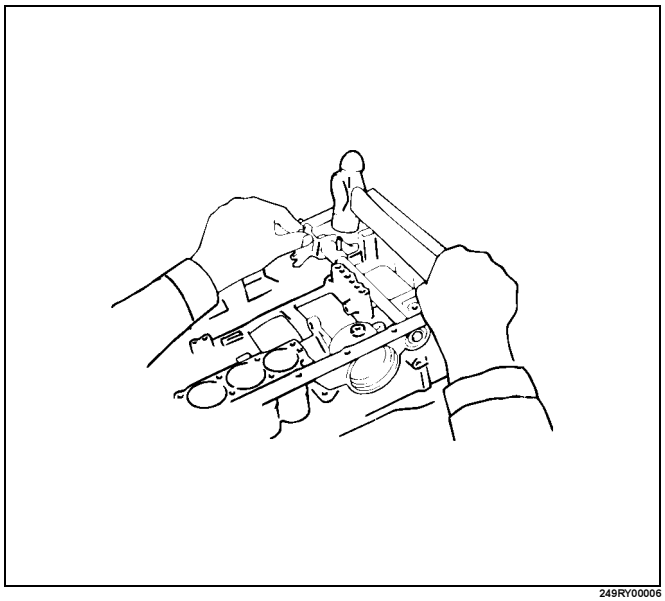
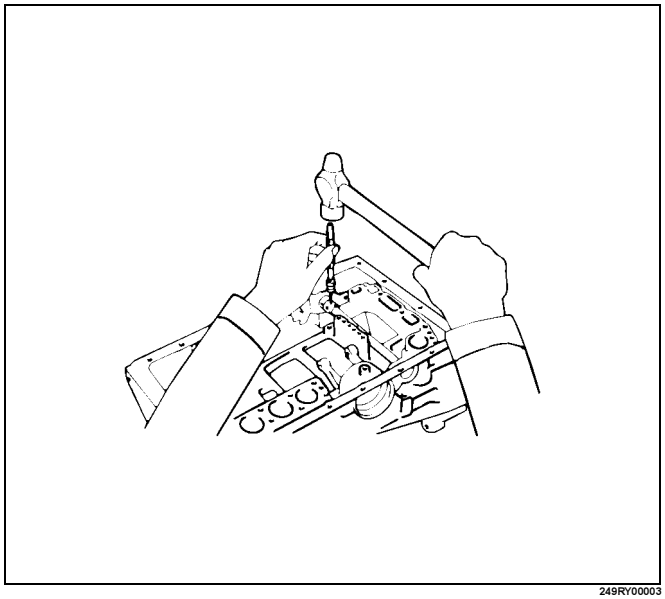
4. Drive in the pin with the slot at a right angle to the shaft.



249RY00006

5. Match the spacer hole to the lever staking hollow and stake the spacer to the lever.
   Make sure the manual valve lever shaft turns smoothly.



249RY00003

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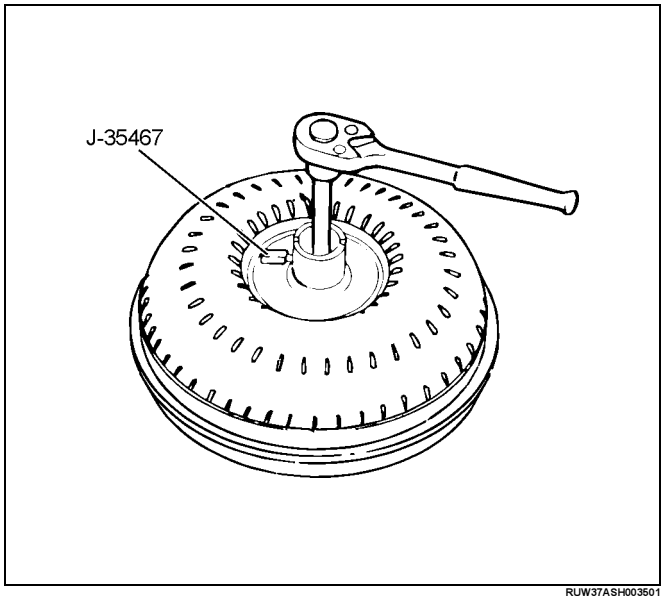
Torque Converter

Inspection and Repair

Insert special tool in end of torque converter.
Insert a turning tool into the inner race of the one-way clutch.
One-way clutch testing tool : J–35467
Insert the stopper so that it fits in the notch of the converter hub and outer race of the one-way clutch.



RUW37ASH003501

1. One-way clutch test.
   The clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise. Less than 2.5N·cm (22lbin) of torque should be required to rotate the clutch clockwise. If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.

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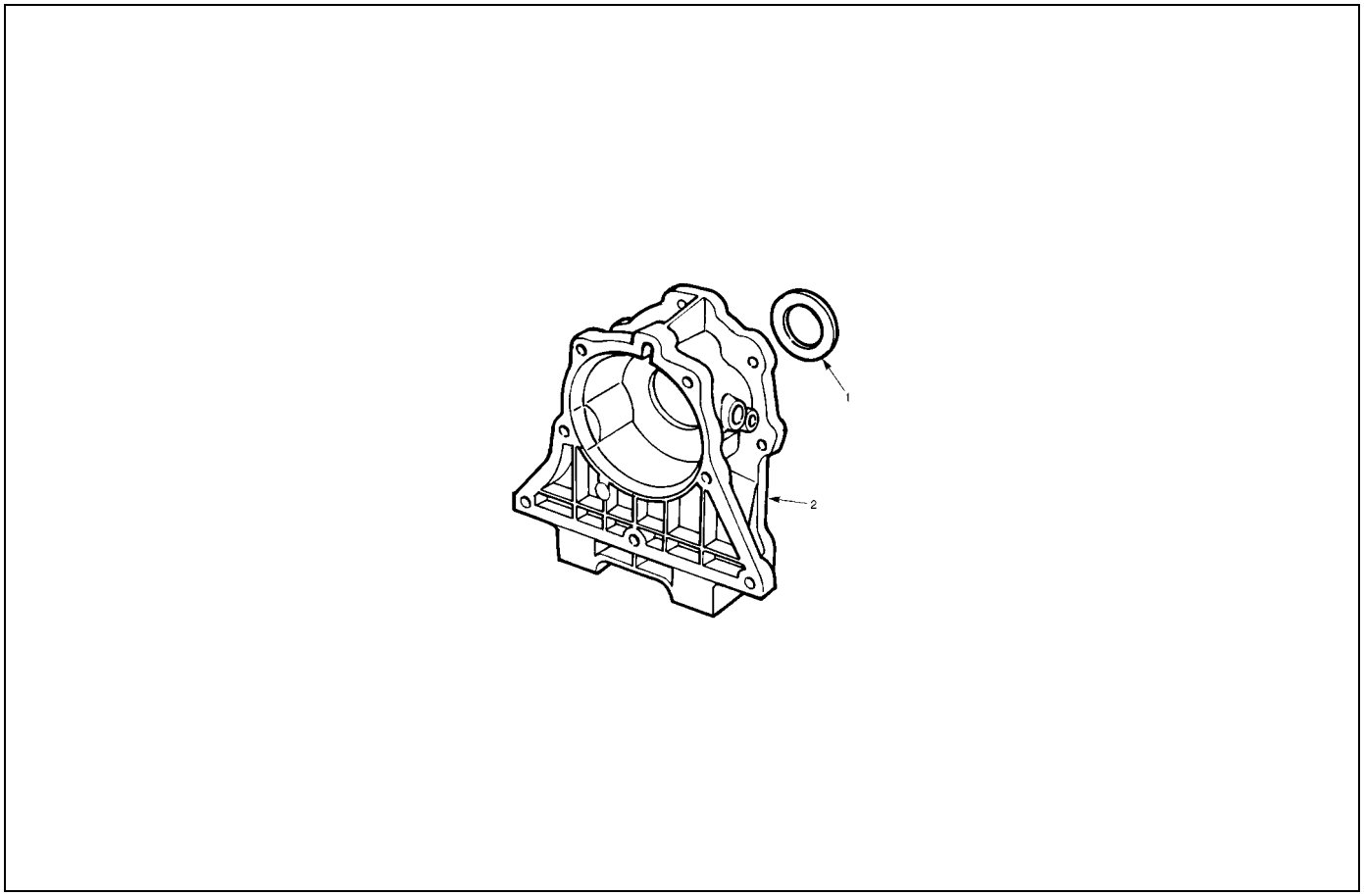
Adapter Housing (4 × 4)

Disassembled View



241R200005

Legend

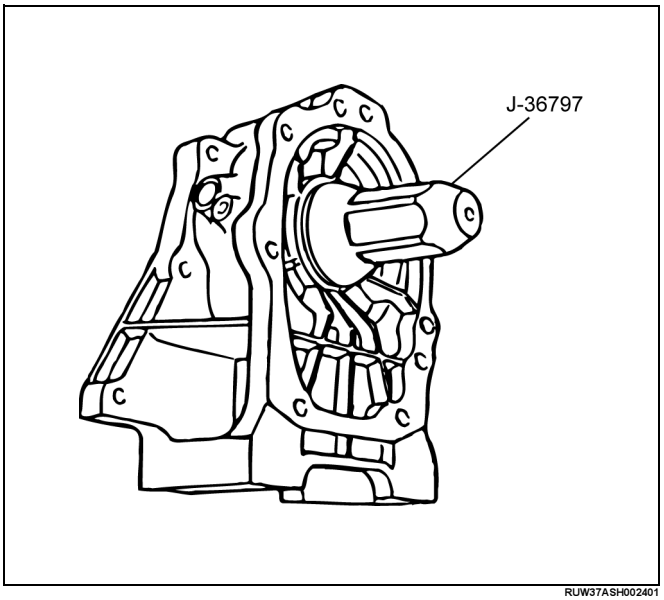
(1) Oil seal
(2) Adapter housing

Disassembly

1. Using a screwdriver, remove the oil seal.

Reassembly

1. Using oil seal installer, install the new oil seal to the adapter housing.
   Oil seal installer : J–36797



RUW37ASH002401

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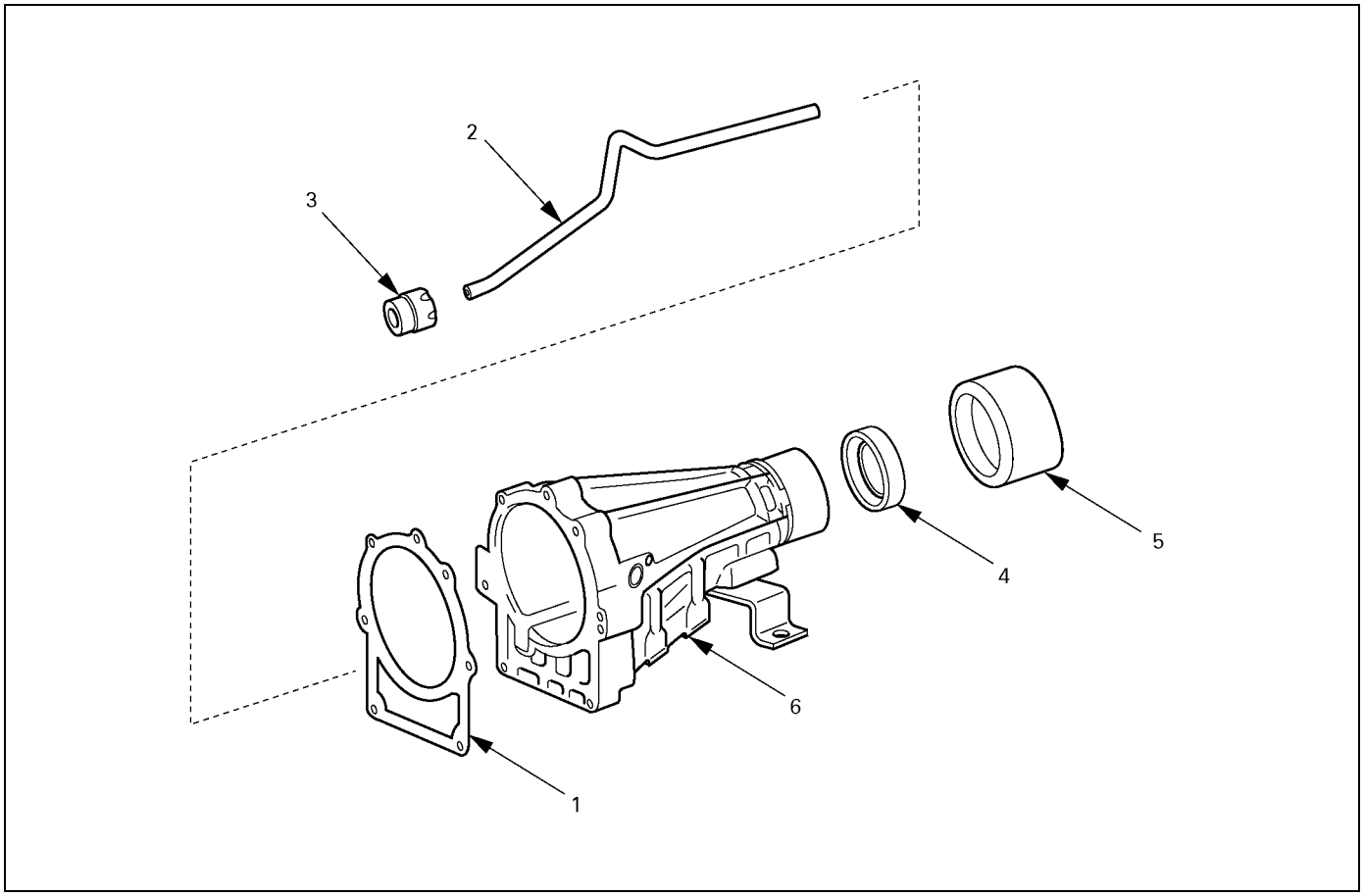
Extension Housing (4 × 2)

Disassembled View



241R200007

Legend

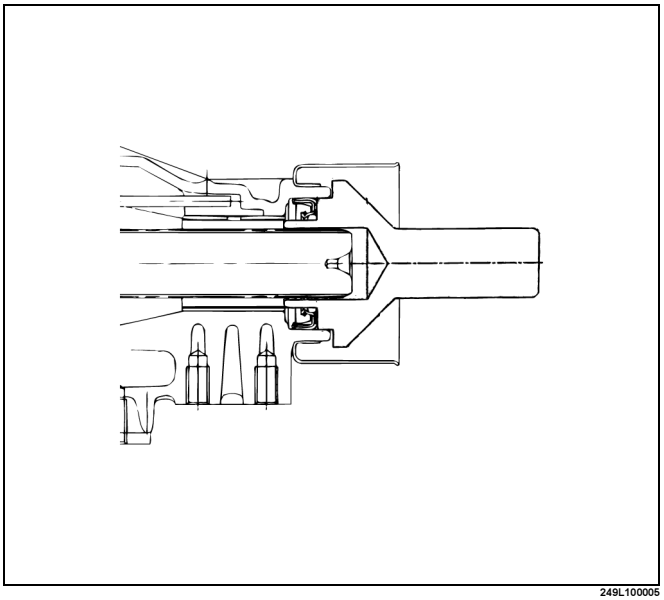
(1) Gasket
(2) Tube
(3) Tube packing
(4) Oil seal
(5) Dust deflector
(6) Extension housing

Disassembly

1. Remove the gasket.
2. Remove the tube.
3. Remove the tube packing.
4. Using a screwdriver, remove the oil seal.

NOTE: The oil seal can be removed without removing the dust deflector.

5. Rrmove the dust deflector from extension housing.



249L100005

Reassembly

1. Using oil seal installer, install the new oil seal to the extension housing.
   Oil seal installer : 5–8840–2702–0

NOTE: The oil seal can be installed without removing the dust deflector.

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2. Install the tube.
3. Install the tube packing.
4. Install the dust deflector.
5. Install the gasket.

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Main Data and Specifications

General Specifications

				Remaks
Model			AW30–40LE	
Engine			6VE1 (3.5L)	
Type			Electronic control planetary gear type	
			3–element 1–stage 2–phase type (with lock-up mechanism)	
Gear ratio	1st		2.804	
	2nd		1.532	
	3rd		1.000	
	4th (O/D)		0.705	
	Reverse		2.394	
Oil used	Name		BESCO ATF III	
	Q'ty (l)		8.7	
Torque converter			2100 ± 150	Stall speed (rpm)
Friction element				
	Forward clutch	C–1	5	Number of discs
	Direct clutch	C–2	4	
	OD direct clutch	C–0	2	
	Second coast brake	B–1	40 mm	Band width or Number of discs
	Second brake	B–2	5	Number of discs
	First and reverse brake	B–3	6	
	Overdrive brake	B–0	4	
Clutch				
	One-way clutch No.1	F–1	22	Number of sprage
	One-way clutch No.2	F–2	28	
	OD one-way clutch	F–0	24	
Planetary gear				
	Front planetary	Sun gear	42	Number of teeth
		Pinion gear	19	
		Ring gear	79	
	Rear planetary	Sun gear	33	
		Pinion gear	23	
		Ring gear	79	
	O/D planetary	Sun gear	33	
		Pinion gear	23	
		Ring gear	79	

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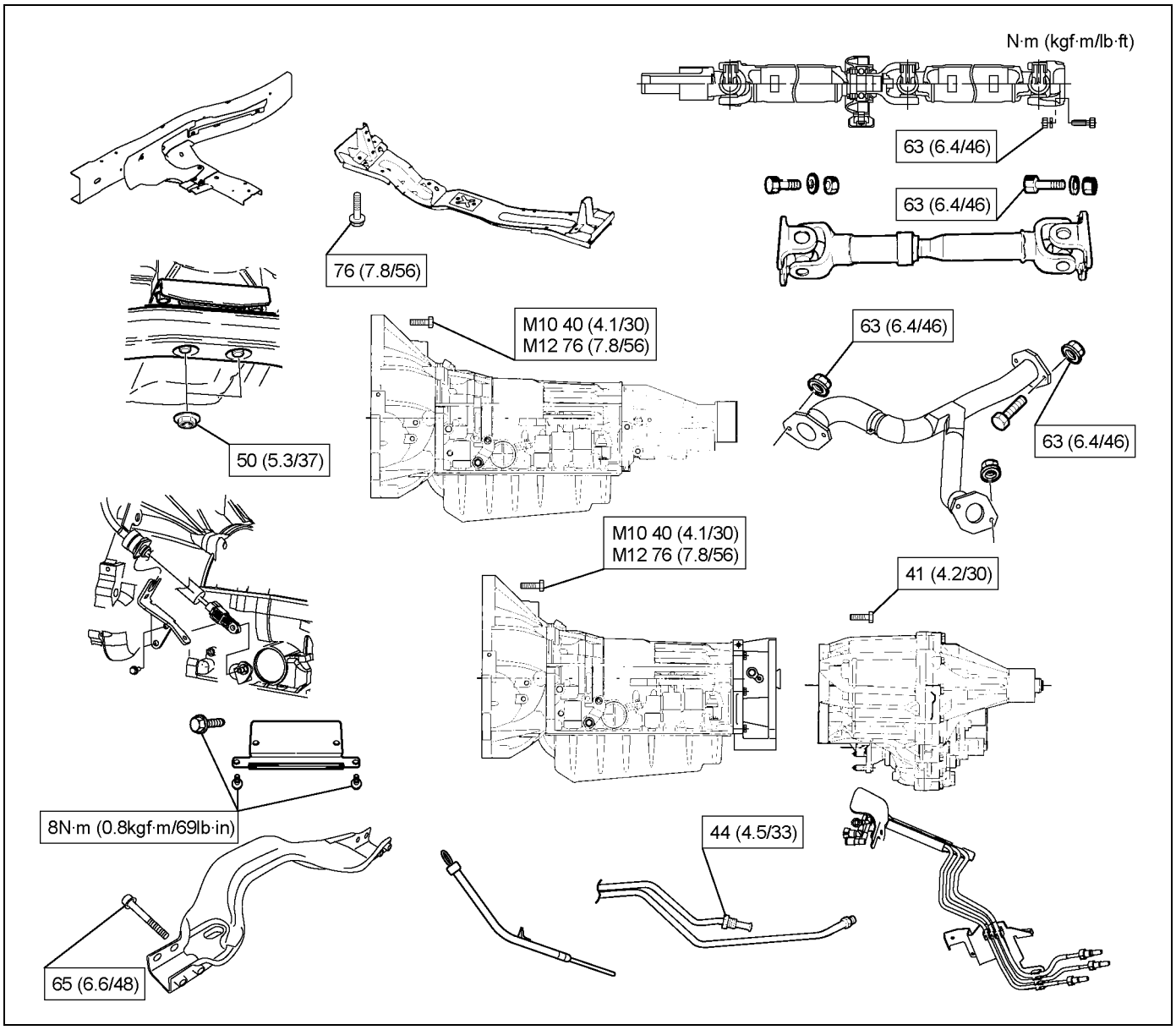
Torque Specifications



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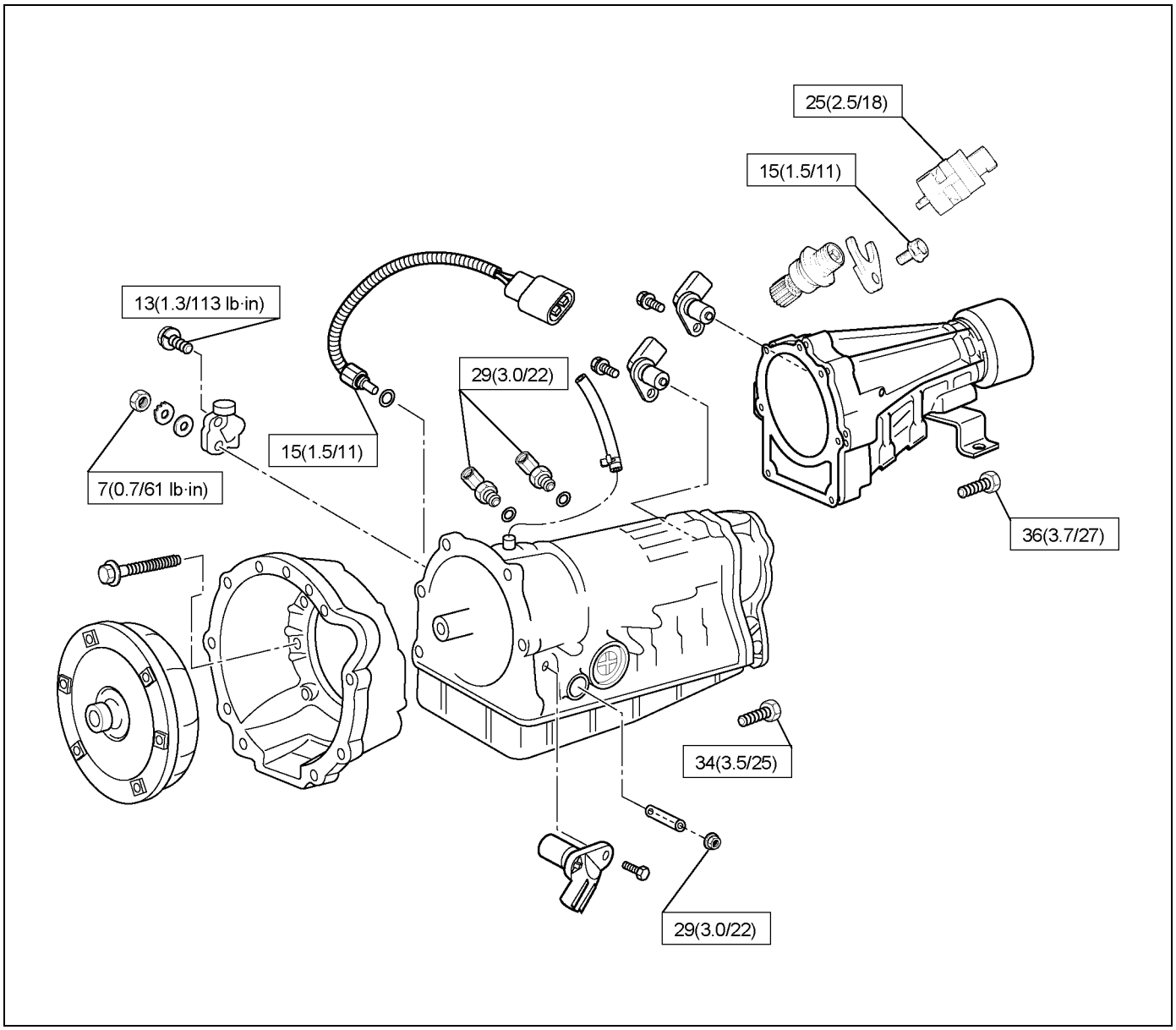
Torque Specifications (Cont'd)

N·m (lbft)



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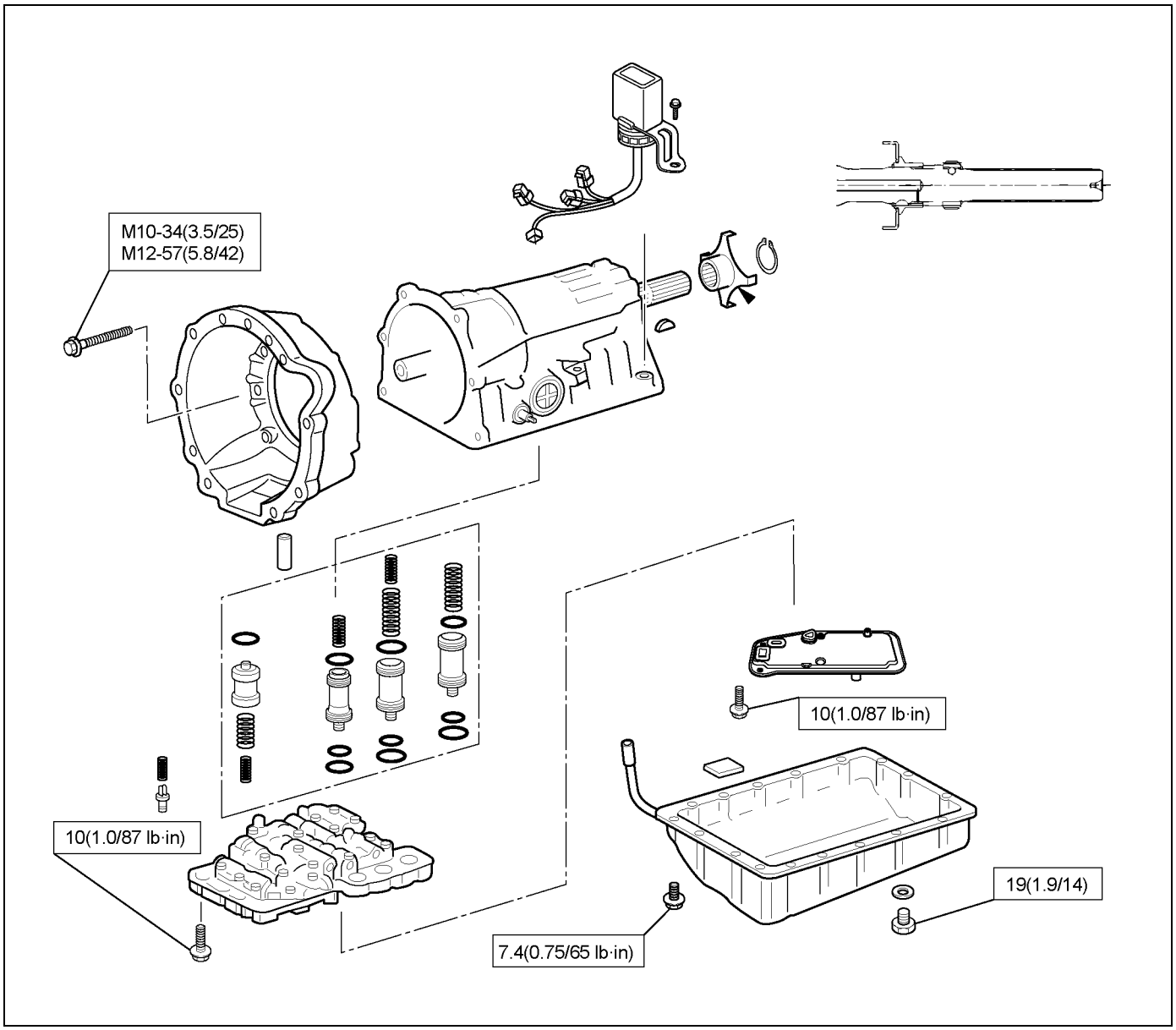
Torque Specifications (Cont'd)

N·m (lbft)



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Special Tools

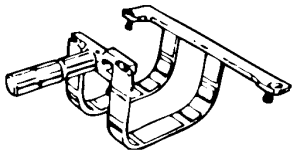
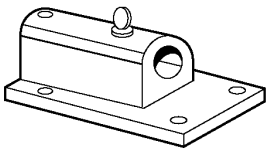
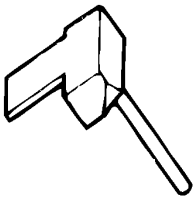
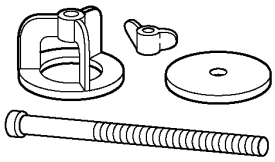
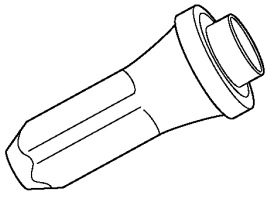
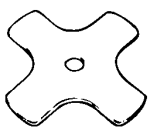
ILLUSTRATION	TOOL NO. TOOL NAME
	J–37227 Holding fixture
	J–3289–20 Holding fixture base
	J–37228 Oil pan seal cutter
	J–23327–1 Spring compressor
	J–9617 Oil seal installer; oil pump
	J–37233 Spring compressor; OD brake piston

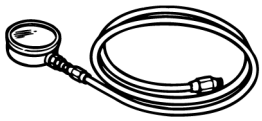
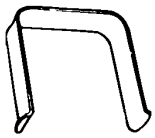
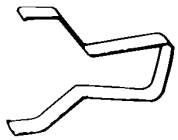
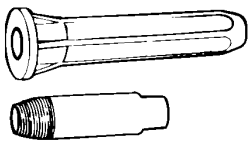
ILLUSTRATION	TOOL NO. TOOL NAME
	J–29770–A Oil pressure gauge
	J–25048 Spring compressor
	J–37236 Reaction sleeve puller; first and reverse brake
	J–37237 Piston puller; first and reverse brake
	J–37232–2 Oil seal installer; manual valve shaft seal installer & remover
	J–35467 Onennway clutch testing tool; torque converter

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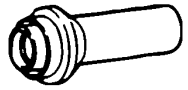
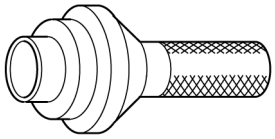
ILLUSTRATION	TOOL NO. TOOL NAME
	**J–36797** **Oil seal installer; adapter housing (4 × 4)**
	**J–46197** **Oil seal installer; extension housing (4 × 2)**

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