WORKSHOP MANUAL

TF SERIES

AUTOMATIC TRANSMISSION

AW30-40LE

(For 4×2 MODEL)

SECTION 7A

ISUZU

ISUZU

International Service & Parts

Tokyo, Japan

NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section - OA under the headings "GENERAL REPAIR INSTRUCTIONS" and "HOW TO USE THIS MANUAL".

All material contained in this Manual is based on the latest product information available at the time of publication.
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SECTION 7A

AUTOMATIC TRANSMISSION (AW30-40LE)

⚠ CAUTION

When fasteners are removed, always reinstall them at a the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used.

Fasteners that are not reused, and those requiring thread locking compound, will be called out. The correct torque values must be used when installing fasteners that require torque. If the above conditions are not followed, parts or system damage could result.

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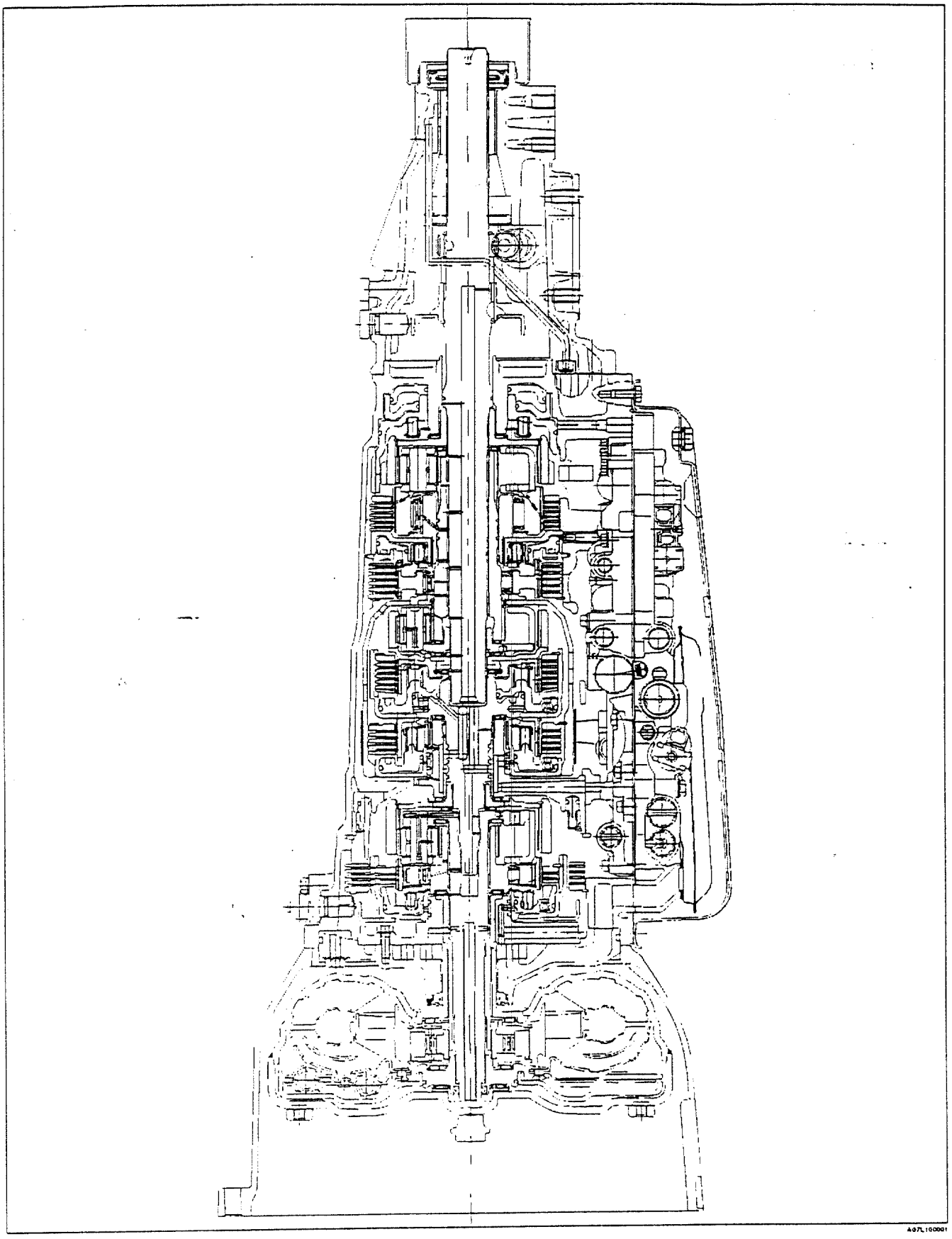
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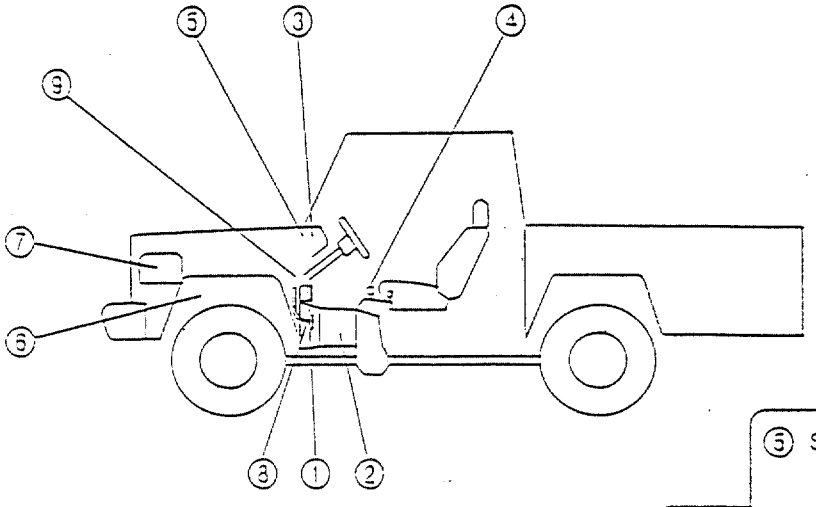
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GENERAL DESCRIPTION

CONSTRUCTION



ELECTRONIC CONTROL COMPONENTS



5 Speedometer

Vehicle speed sensor(SP1)

4 Select lever

- Overdrive switch
- Pattern select switch

8 Brake pedal
- Brake switch

3 Instrument panel
- CHECK TRANS lamp
- A/T OIL TEMP lamp

6 Engine
- Throttle position sensor
- Water temp switch

1 Transmission Control Module (TCM)

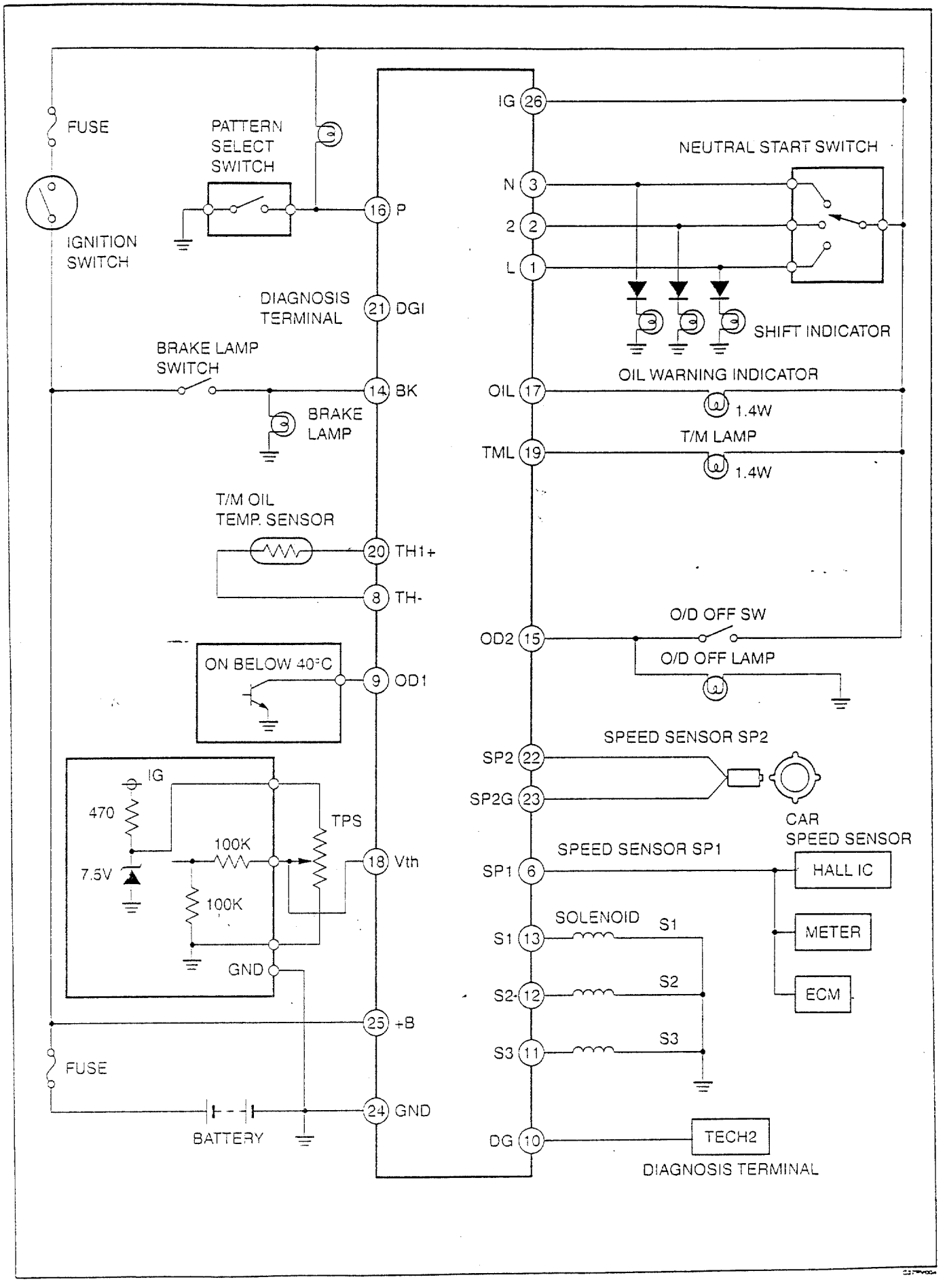
9 Data link connector
- TECH 2 terminal

7 Electrical source
- Ignition
- Battery voltage(+B) (Memory back-up)

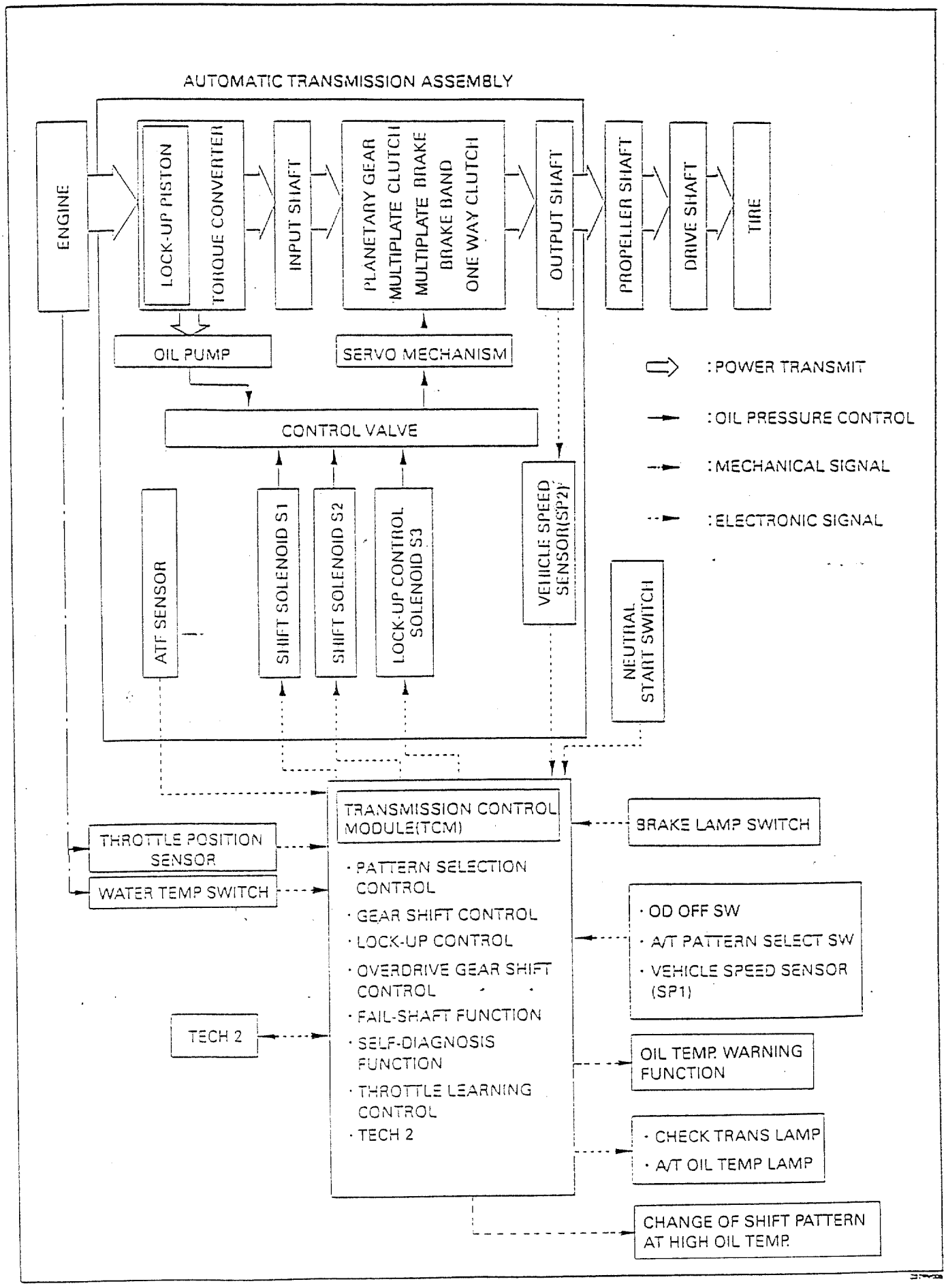
2 Transmission
- Solenoid (S1,S2,S3,SL)
- Vehicle speed sensor(SP2)
- Neutral start switch
- ATF sensor

Signal direction

TRANSMISSION CONTROL MODULE (TCM)



CONTROL SYSTEM DIAGRAM



CONTROL AND FUNCTIONS

Item	Description
Pattern selection control	• In D range, speed change point and Lock-up point can be changed by setting pattern selection switch to "POWER" or "NORMAL" mode.
Gear shift control (Speed change point Speed change timing)	• Gear shift position in the conditions made up of transmission shift positions (D.2.L) combined with pattern selection switch (POWER & NORMAL) can be controlled in accordance with vehicle speed and the opening of throttle valve. • Prevention of overrun When vehicle speed is over 128 km/h, even if O/D OFF sw on, the 4th cut is not conducted. It is conducted at the point of time when vehicle speed becomes 126 km/h or lower. After conducting 4th cut, the 4th is not gained until O/D sw is set on.
Lock-up control	• In D range, 2nd, 3rd, or O/D lock-up is conducted in "POWER" or "NORMAL" mode. • In 2, L range, lock-up is off in the whole area. • Lock-up timing is controlled to reduce gear shift shock using kind of gear shift (shift up, etc.) lock-up status at the time of gear shift judgement, gear step and throttle opening after gear shift. • When the brake is switched on, lock-up is discontinued. • Lock-up is prohibited when idling is defected by throttle position sensor.
Overdrive gear shift control	• If O/D switch is set on in D range, gear shift to O/D is not effected.
Throttle learning control	• Variation in throttle position sensor voltage is corrected in TCM thereby to ensure a constant gear shift control.
Fail-safe function	• When trouble occurs to vehicle sensor and each solenoid, TCM automatically exerts fail-safe control not to spoil driveability. • This control is exerted when sensor or actuator is in trouble, while TCM works normally.
Self-diagnosis function	• If there is an abnormality in vehicle sensors, each solenoid (S1-S3), or throttle position sensor, "CHECK TRANS" lamp is actuated to warn the driver. But when the abnormality items have been restored to normal, the light does not blink. • Faulty parts are memorized in TCM. If self-diagnosis start signal is inputted, "CHECK TRANS" lamp is blinked and results of diagnosis are indicated. A history of faults remains recorded even when IGN switch is off. If TCM fuse is removed, the records can be erased.
TECH 2	• Output of control data in the TCM • Actuator (Solenoid) operation check • Erasure of trouble code
OIL TEMP. WARNING FUNCTION	• T/M at high oil temp (more than 146°C), lamp is on.
CHANGE OF SHIFT PATTERN AT HIGH OIL TEMP.	• T/M change of shift pattern at high oil temp.

FAIL-SAFE FUNCTION

Vehicle speed sensor 1 (Attached to the transfer case)	If the vehicle speed sensor 1 goes wrong while traveling, it holds the transfer HI/LO judgement just before the break down until the vehicle speed sensor 2 detects the vehicle speed of 0 kilometer per hour, and the vehicle continues running with the gear engaged to the shift map of 4L mode (change to the fourth gear is prohibited). After the speed of 0 kilometer per hour is detected, the vehicle is controlled on the assumption that the transfer Low gear is selected.
Vehicle speed sensor	The vehicle speed is detected by two systems, one from a sensor fitted to the transmission (output shaft revolution sensor) and another from the speedometer. In case of malfunction in one of two, the speed signal from the other is used for control.
Neutral start switch	In case "2" and "L" range signals are on, priority is given "L".
Shift solenoid S1 and S2	If there is an abnormality is one or both of solenoids, TCM automatically exerts fail-safe control, thereby maintaining driveability.
Lock-up control solenoid S3	This keeps lock-up control solenoid S3 off.

SHIFT SOLENOID S1, S2 (FAIL-SAFE FUNCTION)

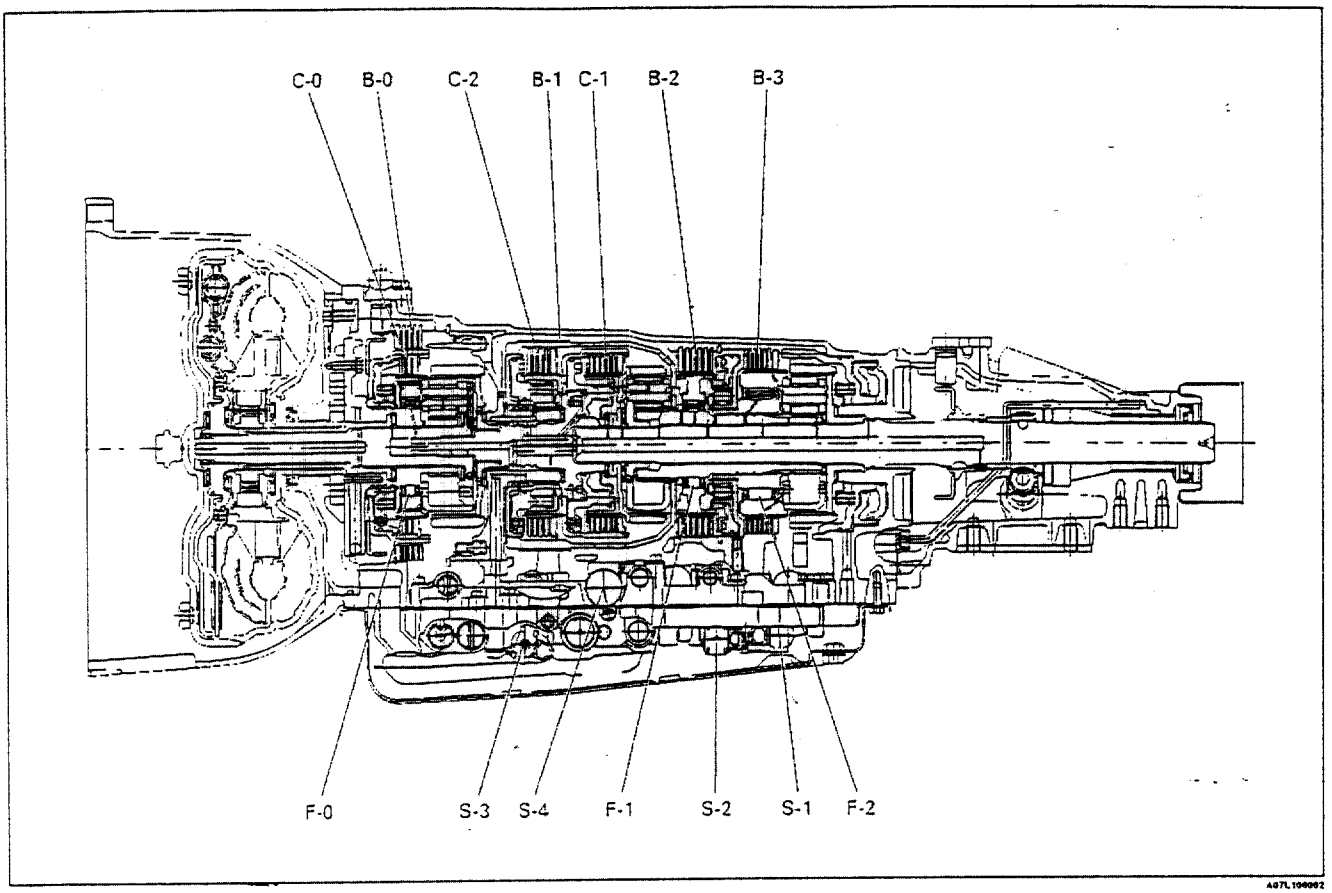
Range	NORMAL			SOLENOID S1 MALFUNCTIONING			SOLENOID S2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid		Gear position	Solenoid		Gear position	Solenoid		Gear position	Solenoid		Gear position
	S1	S2		S1	S2		S1	S2		S1	S2	
"D" range	ON	OFF	1st	X	ON ← (OFF)	3rd	ON	X	1st	X	X	OD
	ON	ON	2nd	X	ON	3rd	OFF ← (ON)	X	OD	X	X	OD
	OFF	ON	3rd	X	ON	3rd	OFF	X	OD	X	X	OD
	OFF	OFF	OD	X	OFF	OD	OFF	X	OD	X	X	OD
"2" range	ON	OFF	1st	X	ON ← (OFF)	3rd	ON	X	1st	X	X	3rd
	ON	ON	2nd	X	ON	3rd	OFF ← (ON)	X	3rd	X	X	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	X	X	3rd
"L" range	ON	OFF	1st	X	OFF	3rd	ON	X	1st	X	X	3rd
	ON	ON	2nd	X	OFF ← (ON)	3rd	ON	X	1st	X	X	3rd

( ) : Fail-safe function X : Malfunctions

MAJOR INPUT/OUTPUT COMPONENTS

	Component	Function
Input	Vehicle speed sensor (Speedometer)	Detects the vehicle speed
	Vehicle speed sensor (Transmission)	Detects the vehicle speed
	Throttle position sensor	Detects the injection pump lever opening rate
	Neutral start switch	Detects the select lever position
	Pattern select switch	Detects whether the driver has selecte "NORMAL" or "POWER" mode.
	Engine water temp switch	Detects the engine water temperature is less than 40°C.
	AT Fluid temperature sensor	Detects the A/T Fluid temperature
	Overdrive switch	Detects whether the driver has selected O/D
	Brake lamp switch	Detects whether the driver has pressed the brake pedal or not
	Diagnostic start switch	Starts self-diagnosis and displays a code for faulty part if any.
Input/ Output	Data link connector	When connected with TECH 2 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 S3	Control the lock-up clutch suited to the vehicle running condition on the basis of TCM output.
	"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.
	"AT oil TEMP" lamp	When A/T Fluid temperature is high, "AT Oil TEMP" lamp is on to be warm the driver.
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.

LOCATION OF CLUTCH, BRAKE, ONE-WAY CLUTCH AND SOLENOID



Legend

C-0: Overdrive direct clutch
C-1: Forward clutch
C-2: Direct clutch
B-0: Overdrive brake
B-1: Second coast brake
B-2: Second brake
B-3: First and reverse brake
F-0: Overdrive one-way clutch
F-1: One-way clutch (No.1)
F-2: One-way clutch (No.2)
S-1: Shift solenoid S1
S-2: Shift solenoid S2
S-3: Lock-up solenoid SL
S-4: Pressure control solenoid STH

OPERATION OF CLUTCH, BRAKE AND ONE-WAY CLUTCH

○ : Operating ◎ : 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-3
P	Parking	○										
R	Reverse	○		○				○	○			
N	Neutral	○										
D	1st	○	○						○		○	
	2nd	○	○				○		○	○		◎
	3rd	○	○	○			○		○			◎
	O/D		○	○	○		○					◎
2	1st	○	○						○		○	
	2nd	○	○			○	○		○	○		
	3rd	○	○	○			○		○			
L	1st	○	○					○	○		○	
	(1*) 2nd	○	○			○	○		○	○		
	(2*) 3rd	○	○	○			○		○			

(1*) Down-shift only in the L range and 2nd gear - no up-shift.
(2*) Down-shift only in the L range and 3rd gear

SPEED CHANGE AND LOCK-UP PATTERN

If you select a speed range and a lock-up pattern as shown below by specifying respective positions of transmission shift lever, transfer shift lever 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		2	L
	Overdrive switch ON	Overdrive switch OFF		
NORMAL POWER	1st ↔ [2nd] ↔ [3rd] ↔ [O/D]	1st ↔ [2nd] ↔ [3rd] ← [O/D]	1st ↔ 2nd ↔ (3rd)	1st ← 2nd ← 3rd

[ ] : The lock-up operation is available.
( ) : Transmission is shifted at high speed to prevent overrun.

OVERDRIVE AND LOCK-UP OPERATING CONDITIONS

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

	Overdrive	Lock-up clutch
Transmission shift position	D range	←
Transmission O/D switch	ON (O/D OFF lamp OFF)	—
Stop lamp switch	—	OFF
Throttle opening	—	Except fully closed
Vehicle speed	About 58 km/h or more	2nd: About 31 km/h or more 3rd: About 55 km/h or more O/D: About 58 km/h or more

MAIN DATA AND SPECIFICATIONS

				Remarks
Model			AW30-40LE	
Engine			4JB1-T	
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 II or III /DEXRON® II, II D, III	
	Q'ty (ℓ)		8	
Torque converter			2100	Stall speed (rpm)
Friction element	Forward clutch	C-1	5	Number of discs
	Direct clutch	C-2	4	
	O/D direct clutch	C-0	2	
	2nd coast brake	B-1	40mm	Band width or No. of discs
	2nd brake	B-2	5	No. of discs
	1st & reverse brake	B-3	6	
	Overdrive brake	B-0	4	
Clutch	One-way clutch No.1	F-1	22	Number of sprags
	One-way clutch No.2	F-2	28	
	O/D 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	

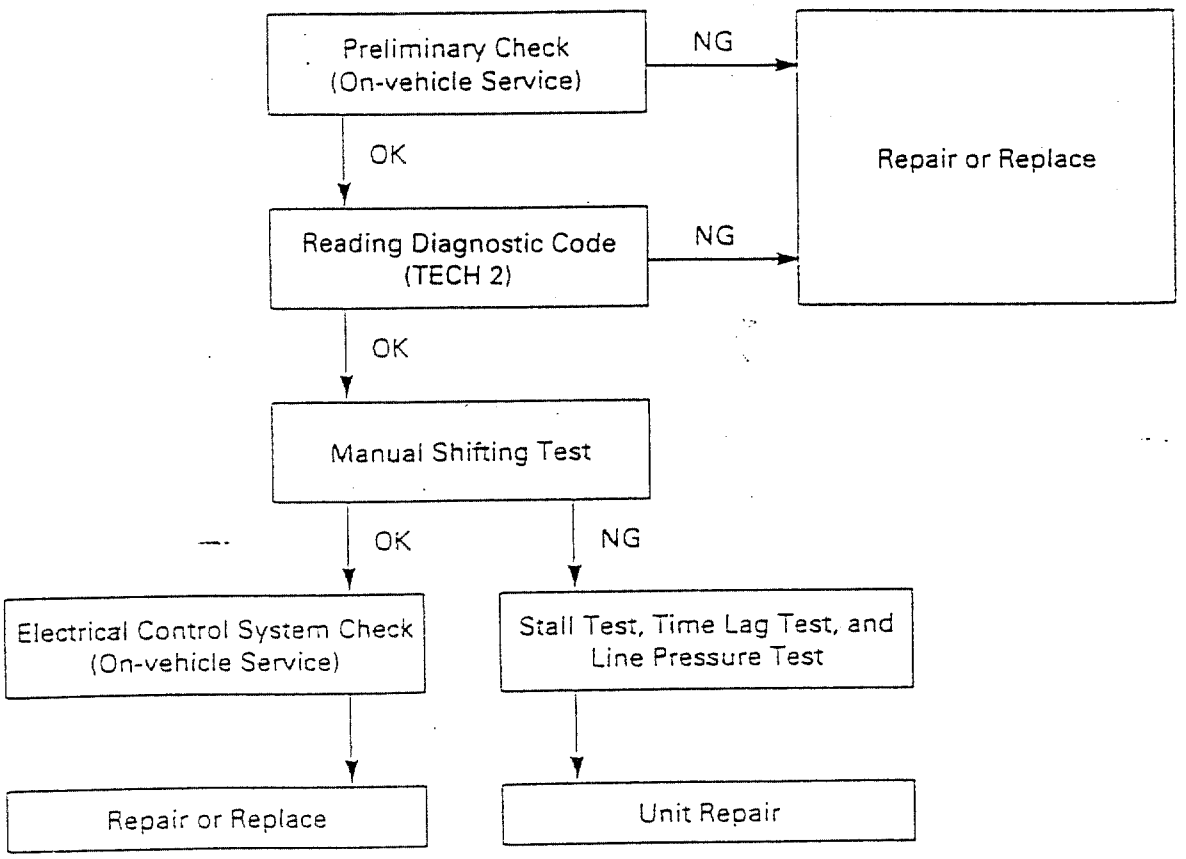
DIAGNOSIS

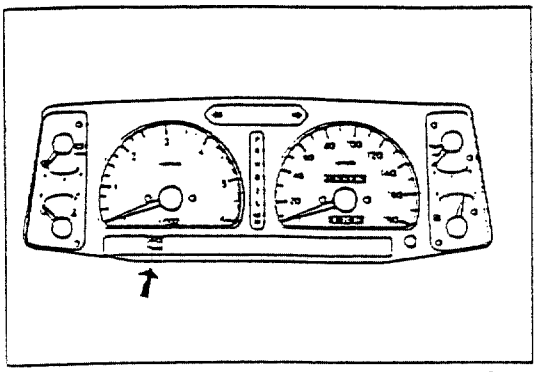
BASIC TROUBLESHOOTING

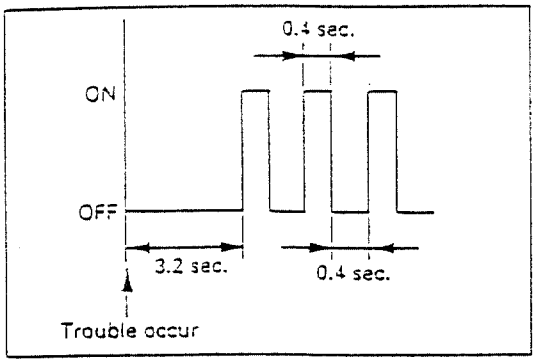
AW30-40LE transmission, called Electronic Controlled Transmission (ECT), differs from oil pressure control type transmissions in that it is controlled by a microcomputer. Accordingly, its troubleshooting procedure differs also.

Before troubleshooting an ECT, 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 general troubleshooting chart on the following page should speed the procedure.



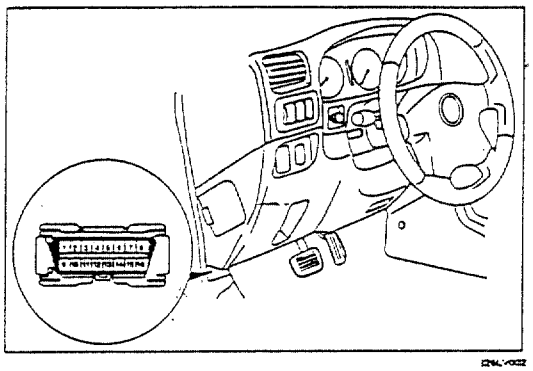




SELF-DIAGNOSIS

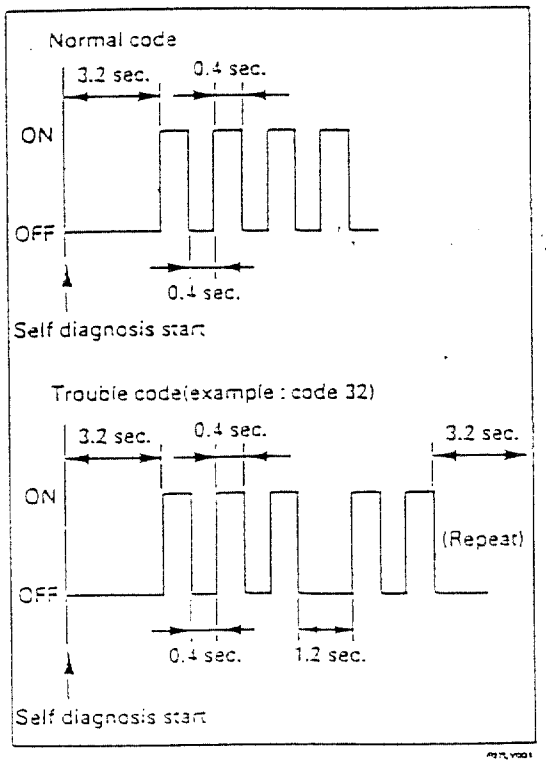
Warning to the driver

- When trouble has occurred to throttle position sensor, vehicle speed sensor, or solenoid, "CHECK TRANS" lamp is blinked (1.25 Hz) even during driving to warn the driver.
- The trouble is recorded by trouble code in TCM.
- When temporary trouble has been shooted, the "CHECK TRANS" lamp stops blinking. This blinking can be stopped by setting the ignition key off. But the trouble code remains memorized in TCM.



Self-diagnosis code display

- For quick search for faulty parts, 6 different items of trouble code are indicated by "CHECK TRANS" lamp blinking.
- The storaged trouble codes can be identified by shorting the terminals No. 11 and No. 4 (earth) of Data Link Connector with a lead wire.



Indication Method:

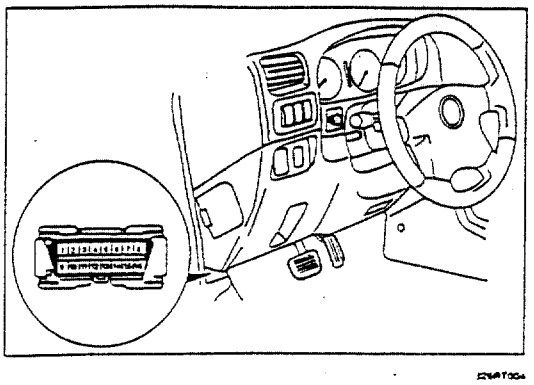
(1) Terminals No. 11 and No. 4 of Data Link Connector are short circuited.

(2) Turn the ignition key to the ON position.

(3) In case there no trouble, normal code is indicated.

(4) In case a plurality of trouble codes have occurred at a time, each code is indicated three times in numerical order.

NOTE:
Power line runs through Data Link Connector.
Be careful shorting with a lead wire, etc.
(The vehicle side of control module may be damaged.)
For identification of trouble code, connect Diagnosis Select Box and TECH 2 to Data Link Connector.



Clear of trouble code memory

1. Clear the trouble code memory using F4 function for TECH2.
2. Shorting terminals for 3-4 seconds between No.11 and No.4 or 5 (ground) of diagnosis connectors after the ignition key tuned to the on position for 1 second or longer.

- After erasing trouble code, check to see if the normal code is outputted through running test.

Trouble code

Trouble Code	Mode	Diagnostic area and Failure	See page
11		Vehicle speed sensor 2 (Transmission mounting) Open or shorted circuit	7A-26
21		Throttle position sensor input Open or shorted circuit	7A-28
24		Vehicle speed sensor 1 (In speedometer) Open or shorted circuit	7A-30
31		Solenoid S1 Open or shorted circuit	7A-32
32		Solenoid S2 Open or shorted circuit	7A-34
33		Solenoid S3 Open or shorted circuit	7A-36

DIAGNOSIS WITH TECH 2

In this AW30-40LE transmission, troubleshooting can be performed for electrical faults using the TECH 2 scan tool. If the CHECK TRANS lamp blinks, or if an electrical fault in the transmission may ptobably exist, check trouble codes using the TECH 2 scan tool.

In the diagnostic procedures described in this manual, first repair the faulty positions indicated by trouble code in the order of numbers and then perform troubleshooting for the faulty positions that are not indicated by trouble code. For correct troubleshooting, it is necessary to first repair the trouble codes of lower-order numbers, then to repair the trouble codes of higher-order numbers in sequence.

How to Use This Manual:

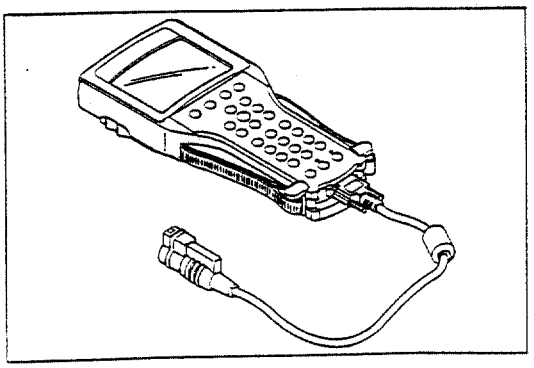
Check trouble codes using the TECH 2 scan tool.

If no codes are set:

- Refer to F1: Data List Quick Check (page 7A-24) and identify the electrical faults that are not indicated by trouble code.

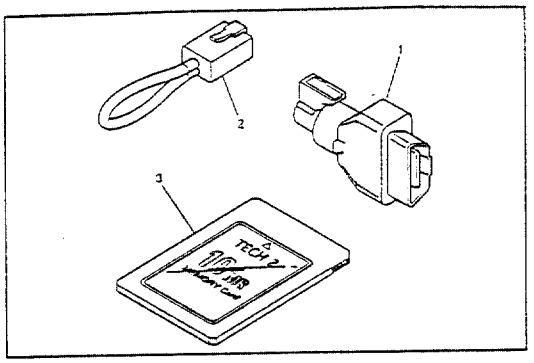
If codes are set:

- Record all the codes displayed by the TECH 2 and check if the codes are intermittent (intermittent faults).
- Clear the codes.
- Drive the vehicle for a test to reproduce the faulty status.
- Check trouble codes again using the TECH 2.
- If no code is displayed by test driving, the faults is intermittent. In this case, refer to the cautions on intermittent conditions (page 7A-33).
- If a code is present, refer to (page 7A-16) for diagnosis.
- Because a code of high-order number may be set for the reason that a code of low-order number has been set after occurrence of a fault, perform repair work starting with a lower-order number is ascending order.



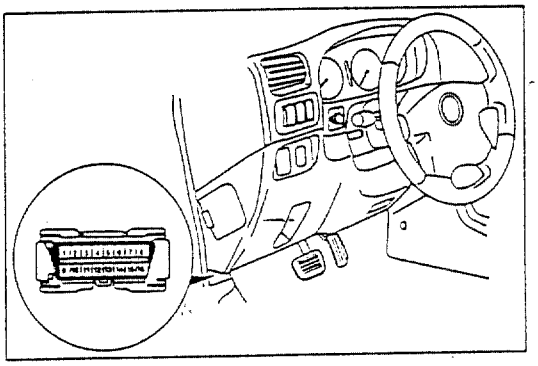
TECH 2 Connection

The TECH 2 scanning tool is used to electrically diagnose the automatic transmission system and to check the system. The TECH 2 enhances the diagnosis efficiency though all the troubleshooting can be done without the TECH2.
The TECH 2 is a portable, compact, and light tester. When it is connected to the diagnosis connector of the vehicle, you can perform a variety of diagnoses and tests by communicating with the Electric Control Unit (ECU) of the vehicle.



1. Configuration of TECH 2

(1) TECH 2 scanning tool (No.3000094) and DLC cable (No.3000095)
(2) SAE16/19 adapter (No.3000098) (1) ,RS232 loop back connector (No.3000112) (2), and PCMCIA card (No. 3000117) (3)

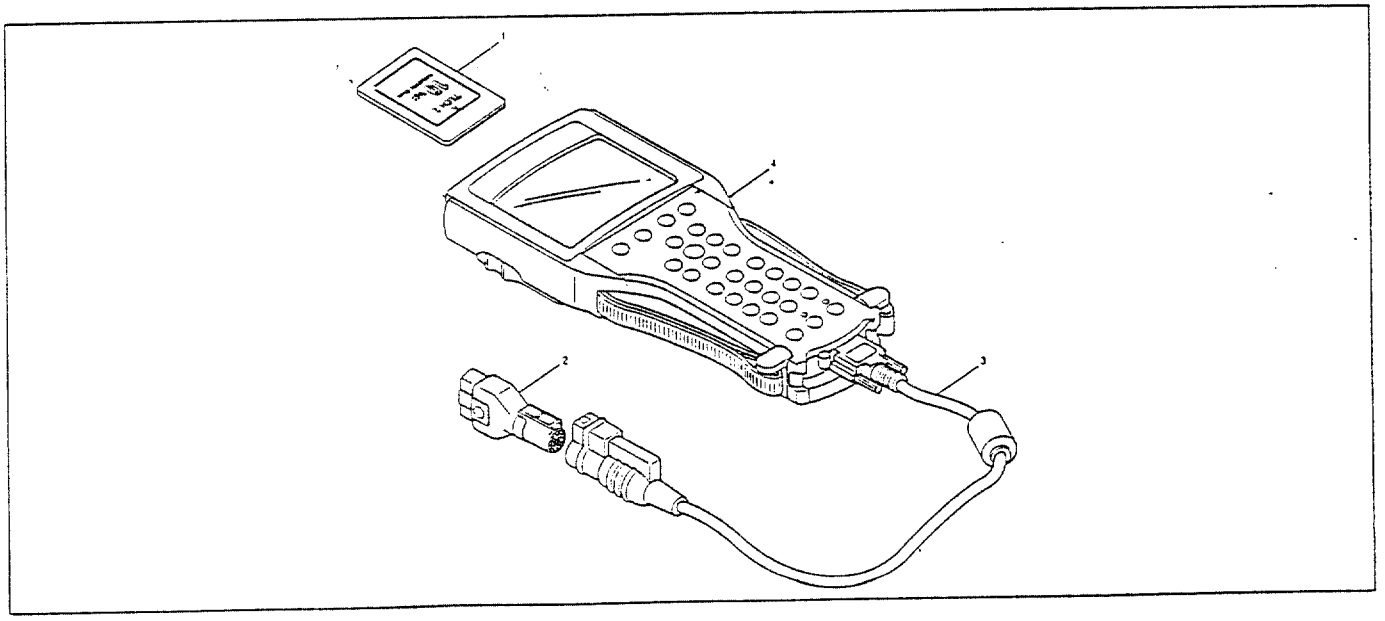


2. TECH 2 Connection
Observe the TECH 2 User Guide.

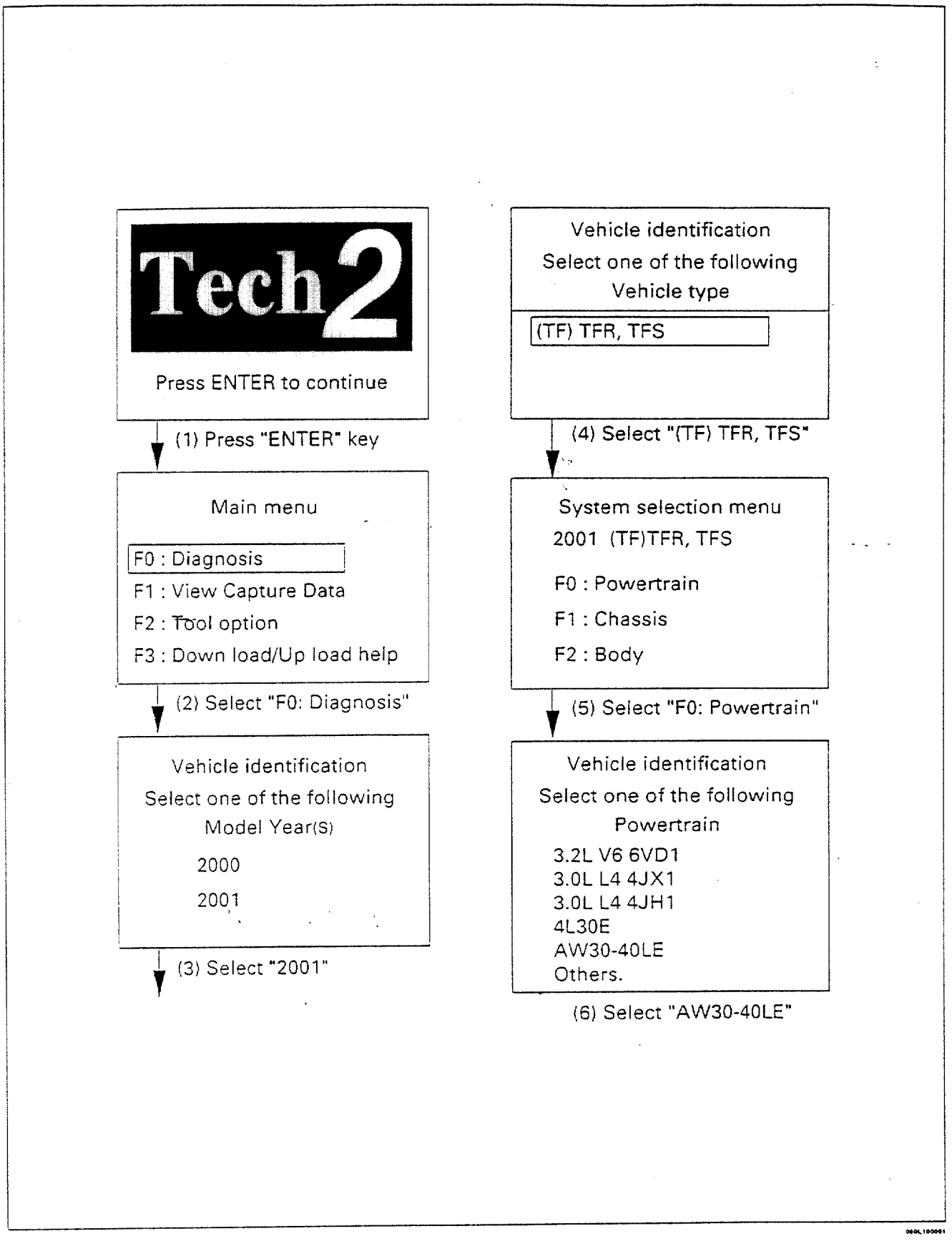
(1) Check the ignition is OFF.
(2) Insert the ISUZU 98 system PCMCIA card (1) into the TECH 2 (4).
(3) Connect the SAE16/19 adapter (2) to the DLC cable (3).
(4) Connect the DLC cable (3) to the TECH2 (4).
(5) Connect the SAE16/19 adapter (2) to the diagnosis connector of the vehicle.
(6) Turn the ignition of the vehicle ON and press the "PWR" key of the TECH2.

Check the display of the TECH2.

Note:
Be sure to check that the power is not supplied to the TECH2 when attaching or removing the PCMCIA card.



TECH2 OPERATING FLOW CHART (START UP)



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 Ordered By Priority
  - F1: Clear DTC Information
  - F2: DTC Information
    - F0: History
    - F1: MIL SVS or Message Requested
    - F2: Last Test Failed
    - F3: Test Failed Since Code Cleared
    - F4: Not Ran Since Code Cleared
    - F5: Failed This Ignition
- F1: Data Display
  - F0: Transmission Data
  - F1: TCC Data
- F2: Snapshot
- F3: Actuator Tests
  - F0: Lamps
    - F0: Check Light Test
    - F1: (Not used)
    - F2: (Not used)
    - F3: AT Oil Temperature Lamp Test
  - F1: Solenoids
    - F0: Solenoid 2-3 Test
    - F1: Solenoid 1-2/3-4 Test
    - F2: TCC Solenoid Test
    - F3: Pressure Control Solenoid (PCS)

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.
See "TRANSMISSION DATA" and "TCC 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 Tech2 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: P or N position

Solenoid

Solenoid S1(1-2/3-4), S2(2-3) and TCC Solenoid (Torque Converter Clutch)
You can operate the solenoids by pressing the ON and OFF buttons.
Preconditions: P or N position, no vehicle speed, no engine speed

Pressure Control Solenoid (PCS)
You can operate the PC Solenoid by pressing the ON and OFF buttons. ON will command a maximum current of 1000 mA and OFF a minimum of 200 mA.
Preconditions: P or N position, no vehicle speed, engine running

TRANSMISSION DATA

Item	Unit	Engine running at idle
Current Gear		1
Lock Up	Inactive, Active	Inactive
Selector Position		Park
AT Output Speed (Automatic Transmission)	RPM	0 RPM
Output Speed (Meter Signal Side)	RPM	0 RPM
AT Input Speed (Automatic Transmission)	RPM	0 RPM
Engine Speed	RPM	675 ~ 725 RPM
Vehicle Speed (Output Side)	km/h	0 km/h
Throttle Position	%	0 %
Throttle Position Duty	%	10 %
AT Oil Temperature (Automatic Transmission)	°C, °F	70 ~ 80°C (158 ~ 176°F)
Shift Pattern		
Desired PCS Pressure (Pressure Control Solenoid)	kPa	
PCS Desired Current (Pressure Control Solenoid)	mA	
PCS Actual Current (Pressure Control Solenoid)	mA	
Overdrive Off Switch	Off, On	
Brake Switch	Open 0V, Closed 12V	Closed 12V
Winter Switch	Not used	—
Power Switch	Open, Closed 0V	Open
Diagnostic Request	Open, Closed	Open
Winter Lamp	Not used	—
Power Lamp	Not used	—
Check Light	Inactive 12V, Active 0V	Inactive 12V
AT Oil Temperature Lamp (Automatic Transmission)	Inactive 12V, Active 0V	Inactive 12V
Solenoid 2-3	Inactive 0V, Active 12V	Inactive 0V
Solenoid 1-2/3-4	Inactive 0V, Active 12V	Active 12V
TCC Solenoid (Torque Converter Clutch)	Inactive 0V, Active 12V	Inactive 0V

TCC DATA

Item	Unit	Engine running at idle
Current Gear		1
Lock Up	Inactive, Active	Inactive
AT Output Speed (Automatic Transmission)	RPM	0 RPM
Output Speed (Meter Signal Side)	RPM	0 RPM
AT Input Speed (Automatic Transmission)	RPM	0 RPM
Engine Speed	RPM	625 ~ 725 RPM
Vehicle Speed (Output Side)	km/h	0 km/h
Throttle Position	%	0 %
Gear Ratio	:1	2.804
AT Oil Temperature (Automatic Transmission)	°C, °F	70 ~ 80°C (158 ~ 176°F)
TCC Slip Speed	RPM	695 ~ 745 RPM
TCC Solenoid Pressure Desired	kPa	0 kPa
Desired TCC Solenoid Current	mA	0 mA
Actual TCC Solenoid Current	mA	0 mA

INTERMITTENT CONDITIONS

If the TECH 2 displays a code as intermittent, or if after a test drive a code does not reappear, the problem is most likely a faulty electrical connection or loose wiring. Terminals should always be the prime suspect. Intermittent rarely occur in sophisticated electronic components such as the Transmission Control Module (TCM).

When an intermittent problem is encountered, check suspect circuits for:

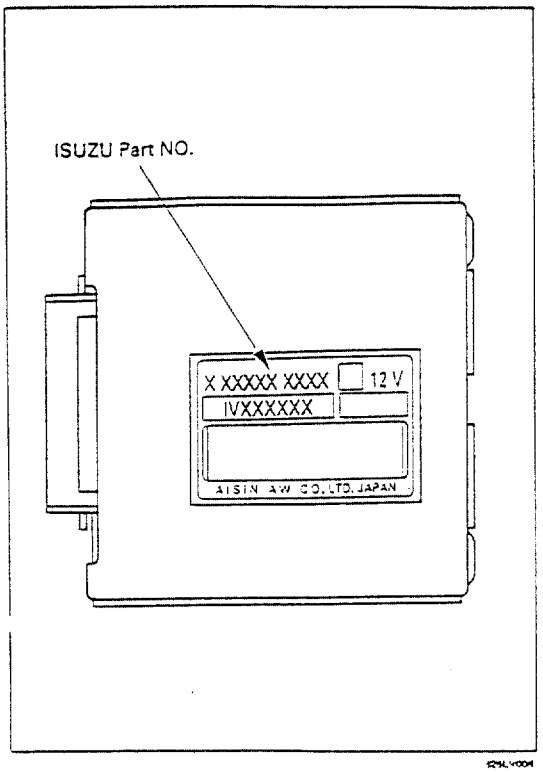
- Poor terminal to wire connection.
- Terminals not fully seated in the connector body (backed out).
- Improperly formed or damaged terminals.
- Loose, dirty, or corroded ground connections.
  HINT: Any time you have an intermittent in more than one circuit, check whether the circuits share a common ground connection.
- Pinched or damaged wires.
- Electro-Magnetic Interference (EMI)
  HINT: Check that all wires are properly routed away from spark plug wires, distributor wires, coil, and generator. Also check for improperly installed electrical options, such as lights, 2-way radios, etc.

Use the F3: SNAPSHOT mode of the TECH 2 to help isolate the cause of an intermittent fault. The snapshot mode will record information before and after the problem occurs. Set the snapshot to "trigger" on the suspect code (or codes) or, if you notice the reported symptom during test drive, trigger the snapshot manually.

After the snapshot has been triggered, command the TECH 2 to play back the flow of data recorded from each of the various sensors. Signs of an intermittent fault in a sensor circuit are a sudden unexplainable jump in data values out of the normal range.

F1: DATA LIST QUICK CHECK

Item	Status and reference value
BRAKE SWITCH	ON/CLOSED 12V OFF/OPEN 0V
COOLANT TEMP. SW	ON/CLOSED 0V OFF/OPEN 12V
SOLENOID 1-2/3-4 (SOLENOID S1)	ACTIVE 12V INACTIVE 0V
SOLENOID 2-3 (SOLENOID S2)	ACTIVE 12V INACTIVE 0V
TCC SOLENOID (SOLENOID S3)	ACTIVE 12V INACTIVE 0V
SPEED SENSOR 1	0 - 254 KPH (km/h) 0 - 11430 p/min
SPEED SENSOR 2	0 - 254 KPH (km/h) 0 - 48006 p/min
TIME FROM START	0:00 - 4:15 (hr:min:sec)
TRANSM.OIL TEMP.	HIGH LOW
OIL LAMP	ON 0V OFF 12V
OIL TEMPERATURE	-40 - 140°C
PROGRAM SWITCH	ACTIVE 0V (POWER mode) INACTIVE 12V (NORMAL mode)
OVERDRIVE SWITCH	ON 12V OFF 0V
SELECTOR POS.	- P/R/D - or - 1 - or - 2 - or - N - FAULT -
SELECTOR POS.2	ACTIVE 12V INACTIVE 0V
SELECTOR POS.1	ACTIVE 12V INACTIVE 0V
TPS SIGNAL	0.00 - 9.99V 0 - 99%, θ0 - θ7
ACTUAL GEAR	- 1 -, - 2 -, - 2L/U -, - 3 -, - 3L/U -, - 4 -, - 4L/U -
SELECTOR POS. N	ACTIVE 12V INACTIVE 0V



IDENTIFICATION OF TRANSMISSION CONTROL MODULE (TCM) (CHART 3)

ISUZU Part No: 8-97300-159-0

DIAGNOSTIC TROUBLE CODES (DTC) CHECK

CODE 11
VEHICLE SPEED SENSOR 2
(OPEN/SHORTED CIRCUIT)

Circuit Description:
Vehicle speed information is provided to the TCM by the vehicle speed sensor 2. This sensor is located in the transmission rear cover.
The speed 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 km/h signal.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

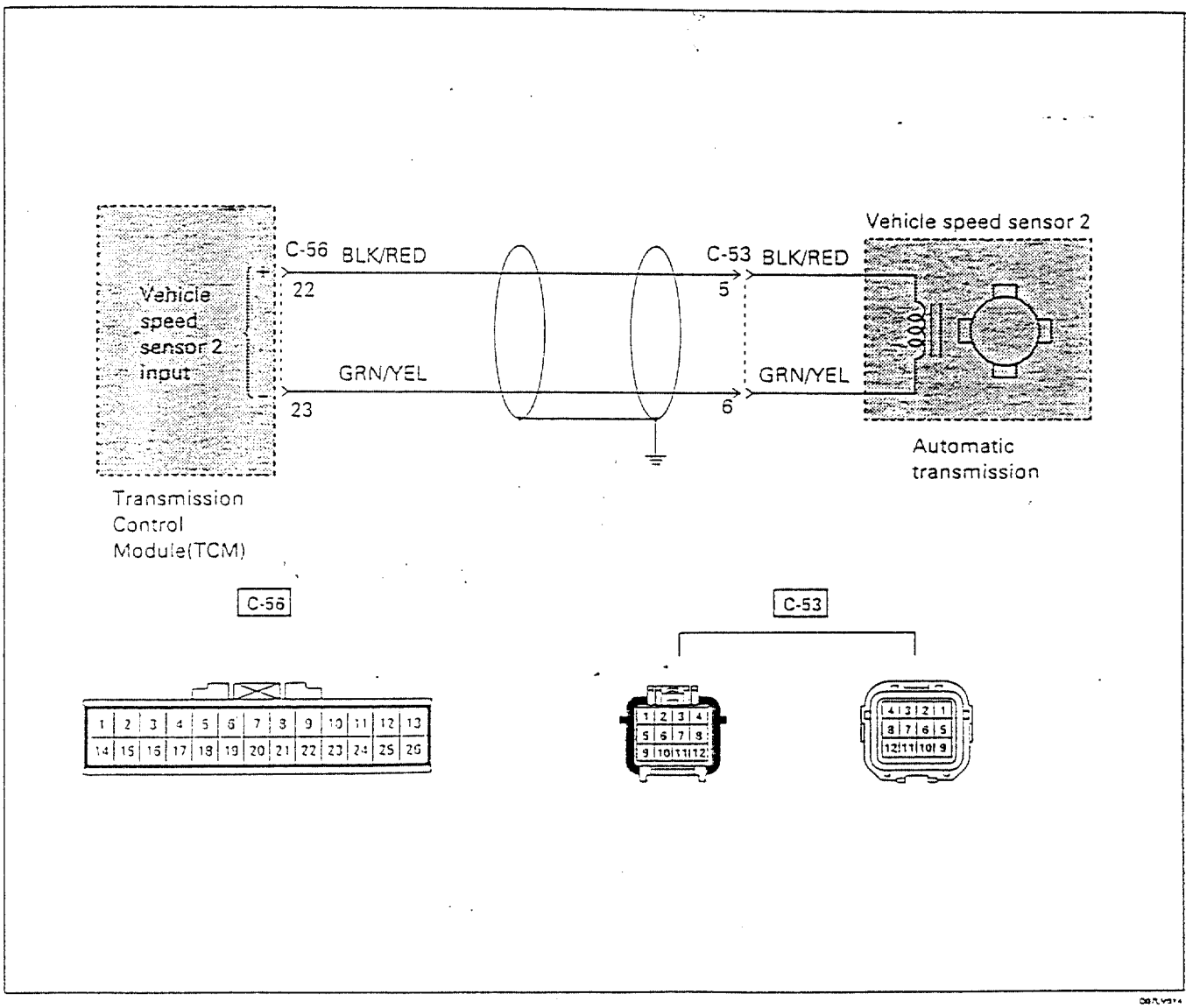
(1) When the vehicle is running, a speed signal is input from the vehicle speed sensor 2 to the TCM.

(2) At this test, the continuity of circuit wiring and the vehicle speed sensor 2 is checked.

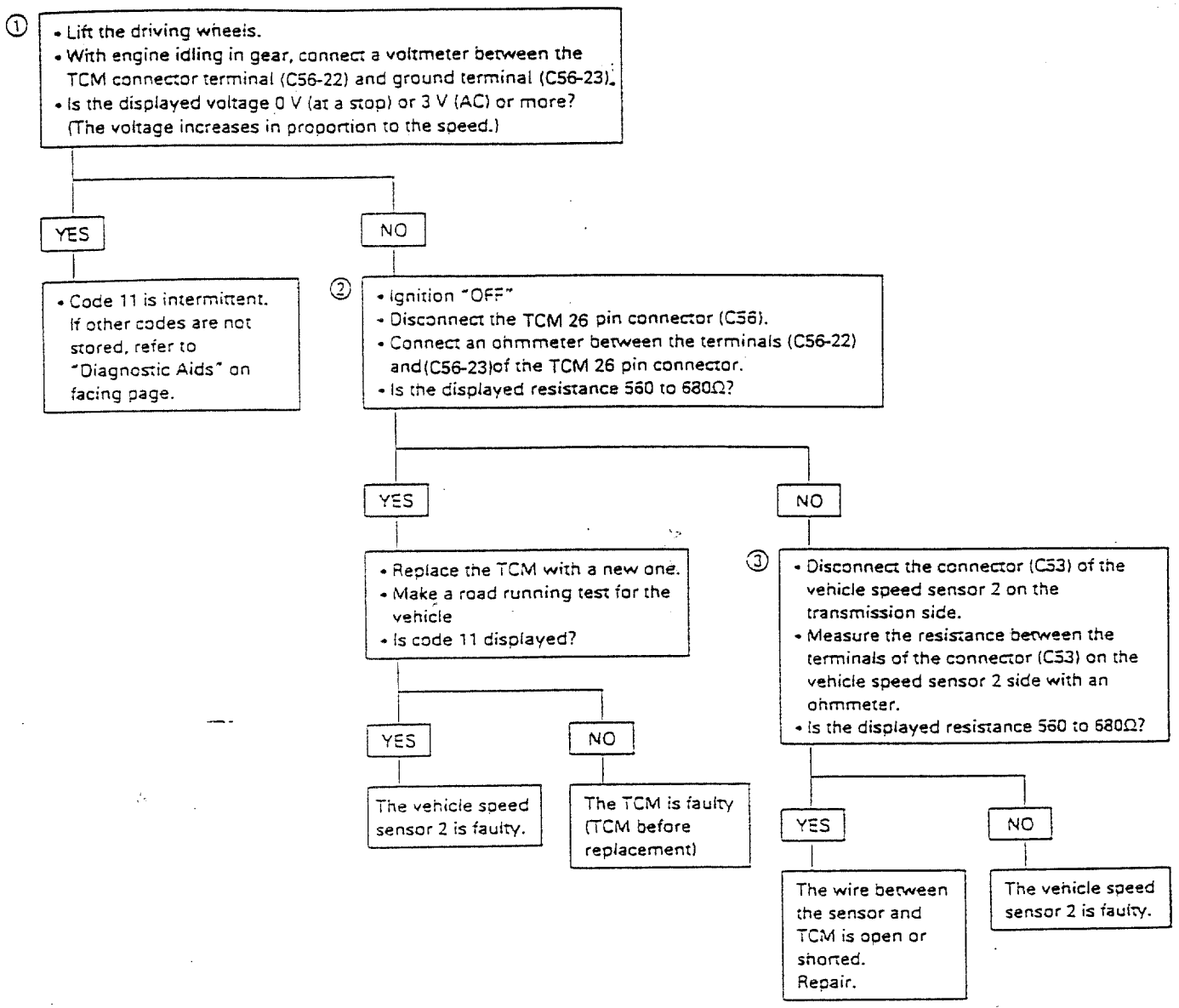
(3) At this test, the continuity of the vehicle speed sensor 2 is checked.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-63.



CODE 11
VEHICLE SPEED SENSOR 2
(OPEN/SHORTED CIRCUIT)



CODE 21
THROTTLE POSITION SENSOR (TPS)
(OPEN/SHORTED CIRCUIT)

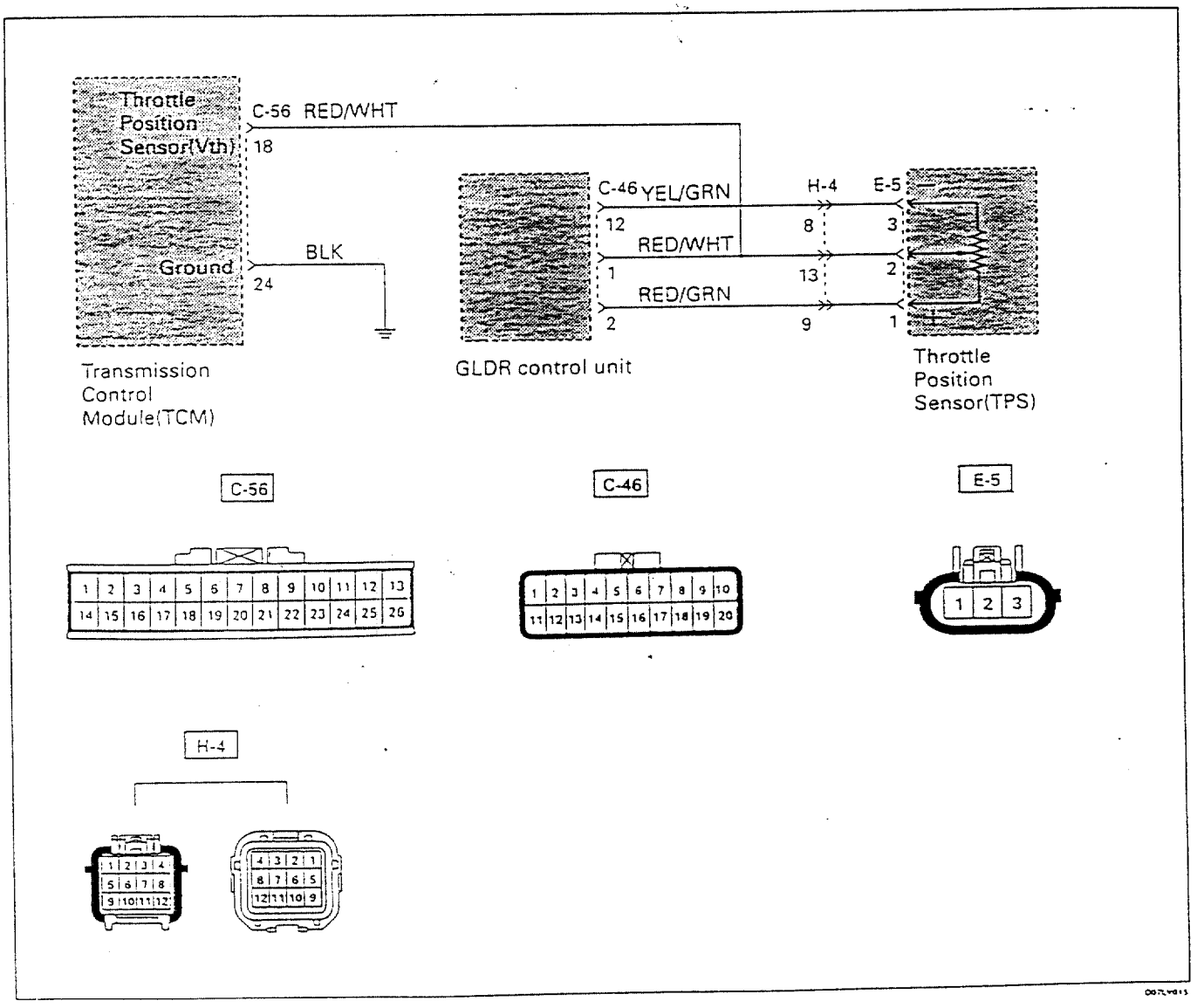
Circuit Description:
When the signal of the engine throttle position sensor is located on the injection pump is supplied to the transmission TCM, the TCM judges the opening condition of the throttle.
The shift point of the transmission is determined by this opening condition of the throttle.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

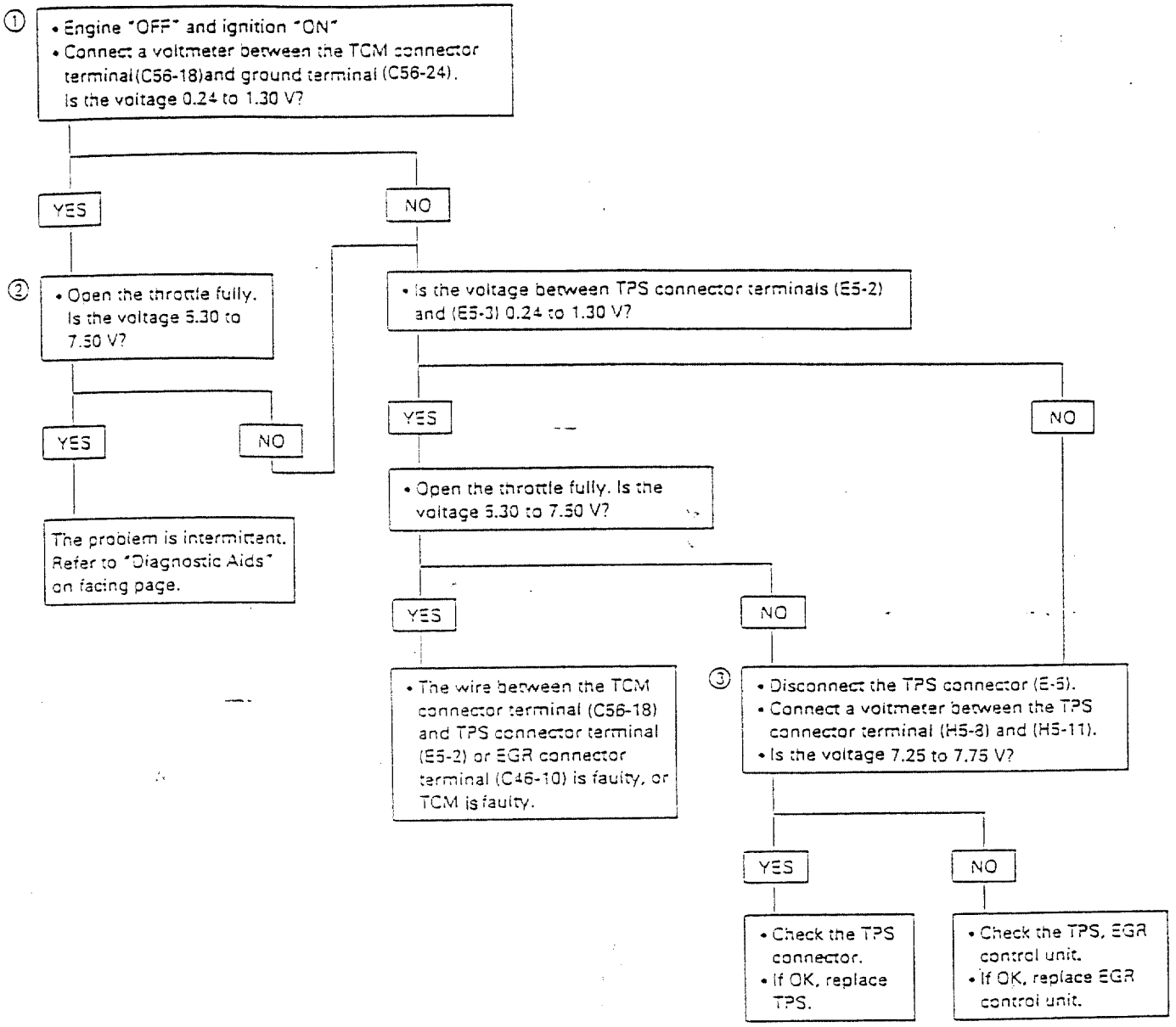
(1) Check that the throttle input voltage is 0.24 to 1.30 V.
(2) At this test, check that as the throttle opens, the voltage goes up and that the voltage reaches 5.30 to 7.50V at the full open status.
(3) Check the power supply voltage (7.0-8.0 V) of the throttle position sensor.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-63.



CODE 21
THROTTLE POSITION SENSOR (TPS)
(OPEN/SHORTED CIRCUIT)



CODE 24
VEHICLE SPEED SENSOR 1
(OPEN/SHORTED CIRCUIT)

Circuit Description:
Speed information is provided by the vehicle speed sensor 1 to the meter.
In the meter, the pulses of the speed sensor are converted to speed signals (pulses), and these signals are output to the TCM. The TCM converts these pulse voltages to km/h signals.

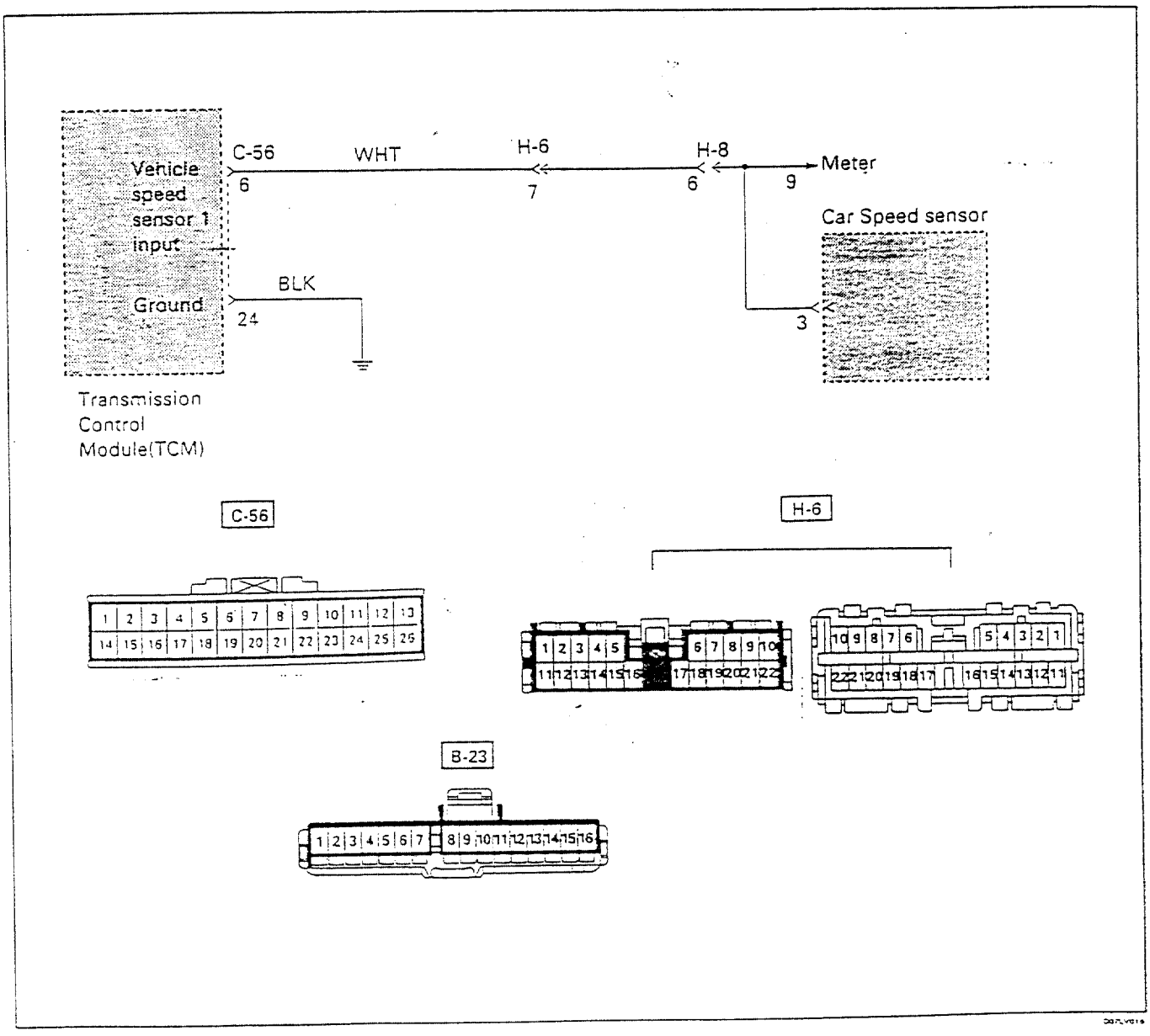
Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

(1) The cause of code 24 setting is due to the operation fault of the speedometer.

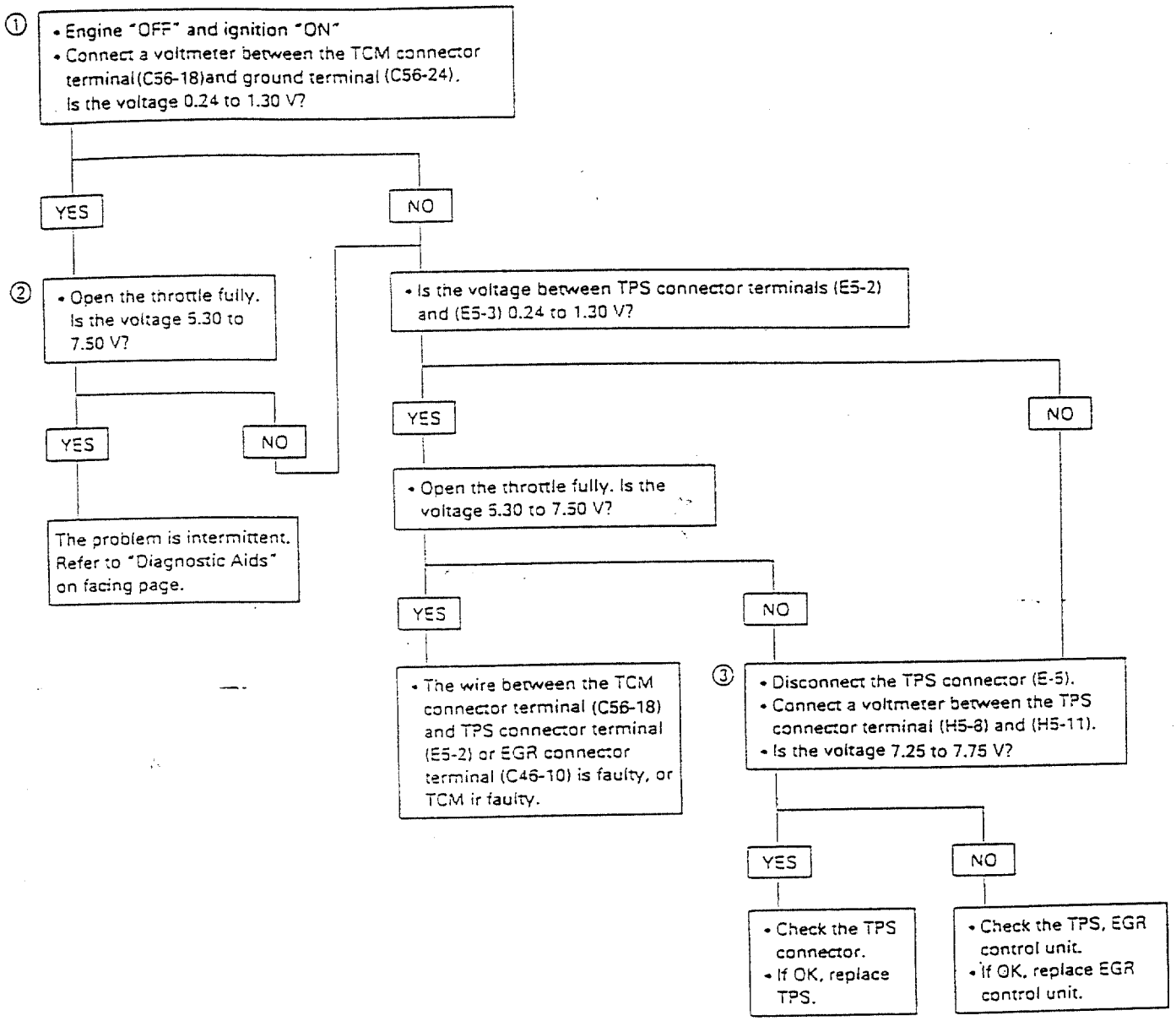
(2) Speed signals are output from the meter. The sensor power supply is given from the TCM.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-63.



CODE 21
THROTTLE POSITION SENSOR (TPS)
(OPEN/SHORTED CIRCUIT)



CODE 24
VEHICLE SPEED SENSOR 1
(OPEN/SHORTED CIRCUIT)

Circuit Description:
Speed information is provided by the vehicle speed sensor 1 to the meter.
In the meter, the pulses of the speed sensor are converted to speed signals (pulses), and these signals are output to the TCM. The TCM converts these pulse voltages to km/h signals.

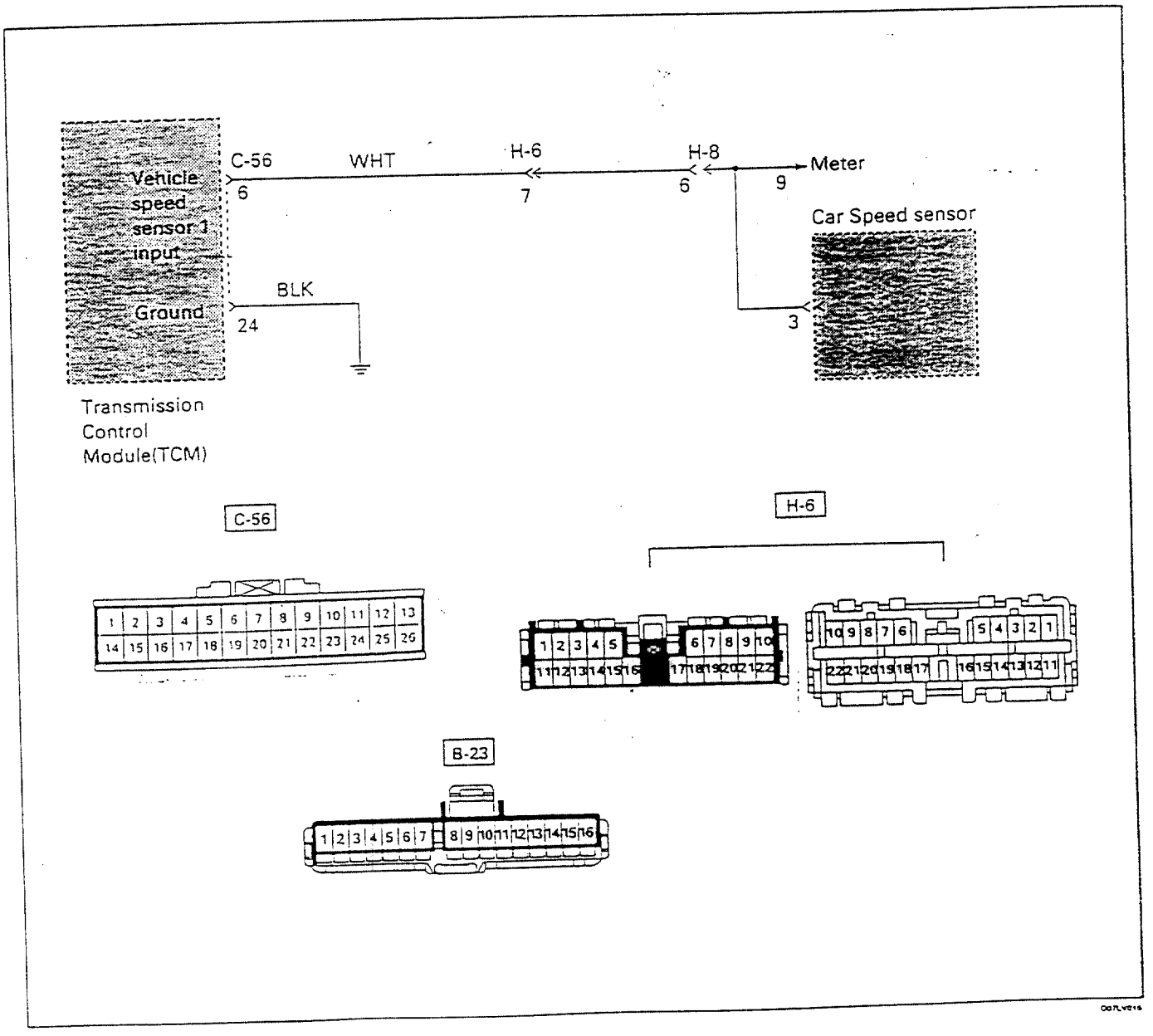
Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

(1) The cause of code 24 setting is due to the operation fault of the speedometer.

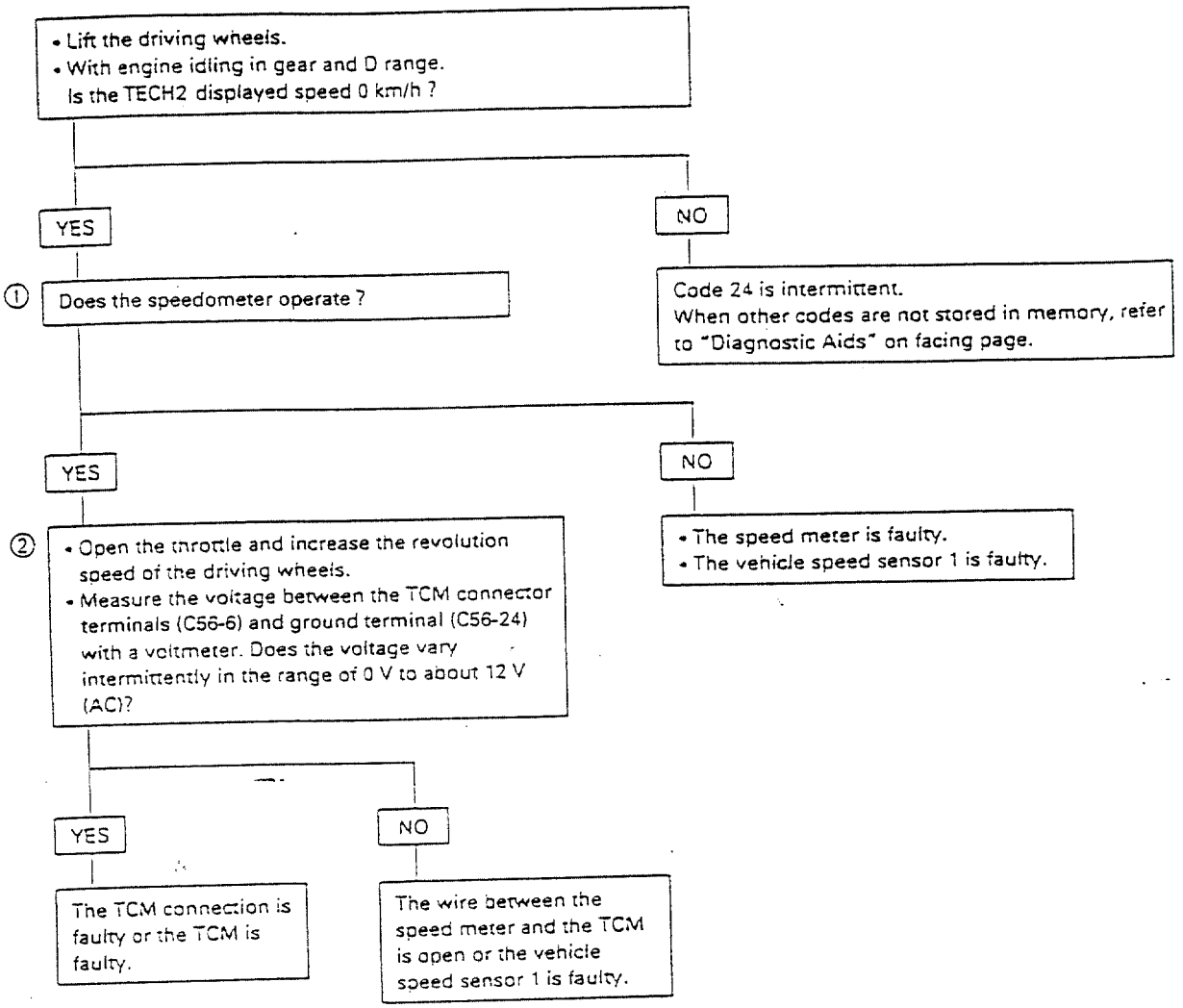
(2) Speed signals are output from the meter. The sensor power supply is given from the TCM.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-63.



CODE 24
VEHICLE SPEED SENSOR 1
(OPEN/SHORTED CIRCUIT)



CODE 31
SHIFT SOLENOID S1
(OPEN/SHORTED CIRCUIT)

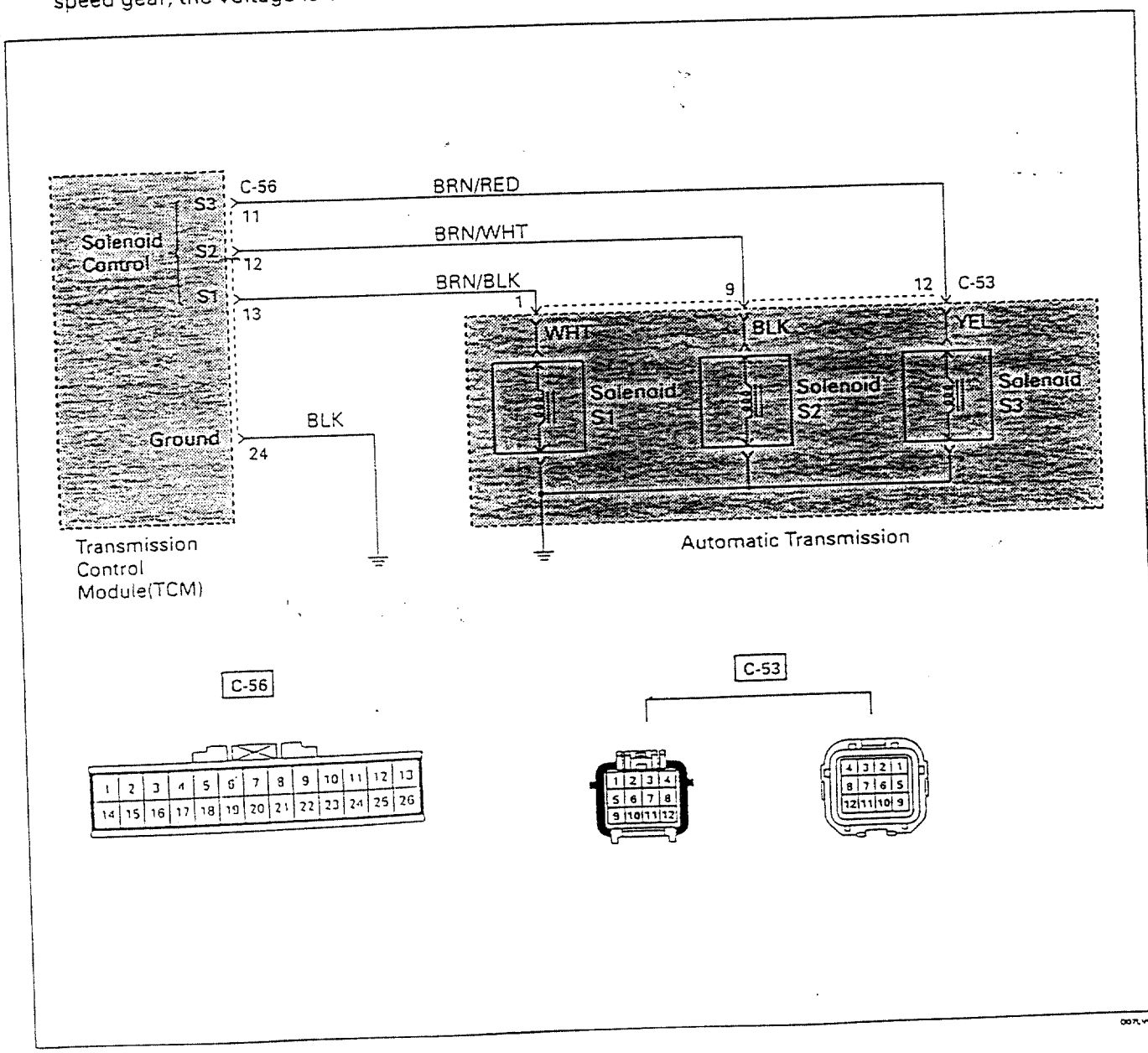
Circuit Description:
The shift solenoid S1 changes the hydraulic route with the signals from the TCM according to the vehicle speed and the throttle opening to control shifting. When the solenoid S1 or S2 fails, the hydraulic circuit is mechanically operated as a backup.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

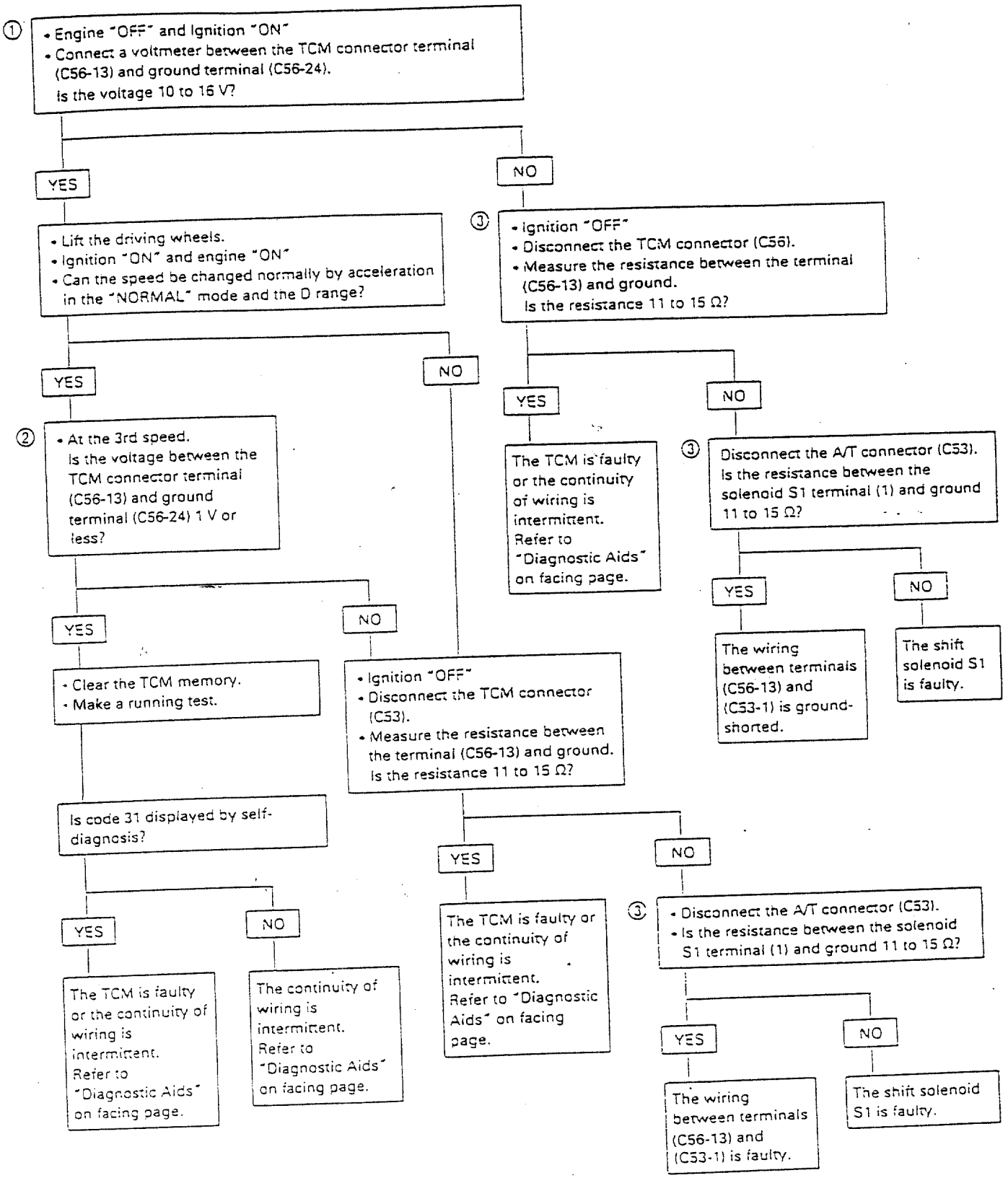
(1) With the key "ON", the voltage between the TCM terminals (C56-13) and (C56-24) is 10 to 16V.
(2) When the driving wheels revolve with the 3rd speed gear, the voltage is 1 V or less.
(3) The solenoid resistance is within the range of 11 to 15Ω.

Diagnostic Aids:
In case of faulty connection, open or shorted circuit to the TCM terminal (C56-13), code 31 is displayed. A intermittent failure may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

TCM Voltage Check:
Refer to page 7A-63.



CODE 31
SHIFT SOLENOID S1
(OPEN/SHORTED CIRCUIT)



CODE 32
SHIFT SOLENOID S2
(OPEN/SHORTED CIRCUIT)

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.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

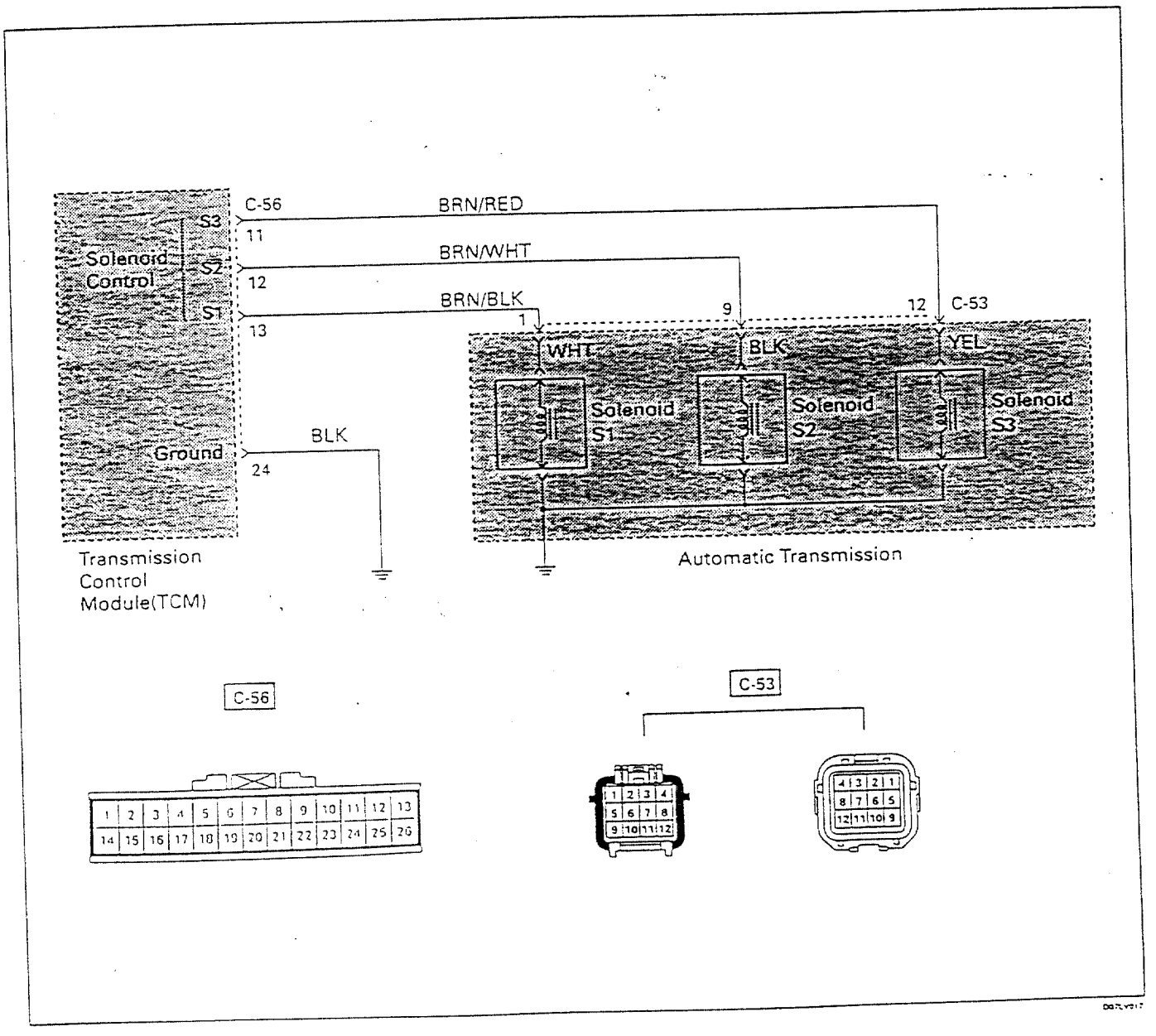
(1) With the key "ON", the voltage between the TCM terminals (C56-12) and (C56-24) is 1 V or less.

(2) When the driving wheels revolve with the 2nd speed gear, the voltage is 10 to 16 V.

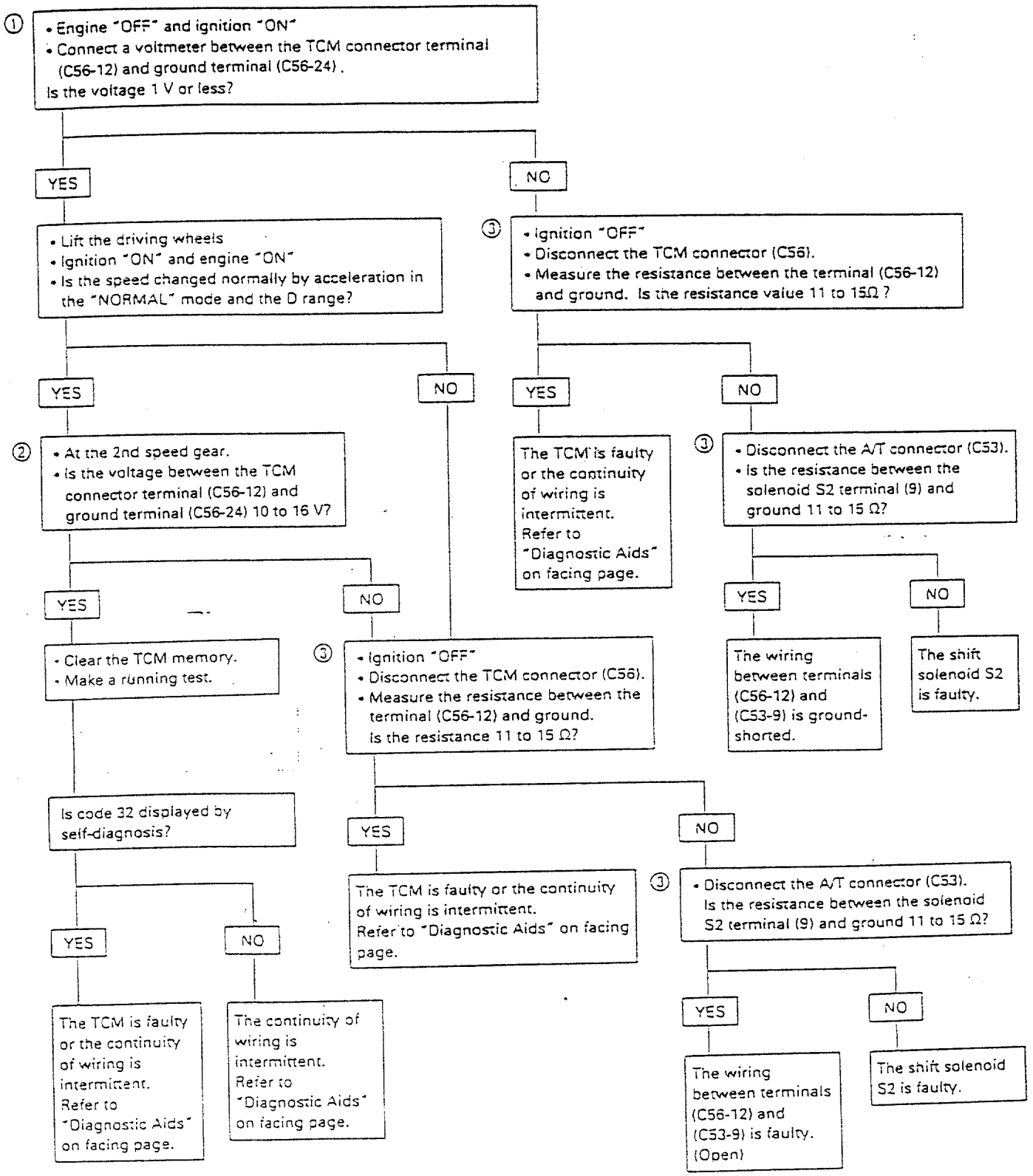
(3) The resistance of the solenoid is in the range of 11 to 15Ω.

Diagnostic Aids:
In case of faulty connection, open or shorted circuit to the TCM terminal (C56-12), code 32 is displayed. A intermittent failure may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

TCM Voltage Check:
Refer to page 7A-63.



CODE 32
SHIFT SOLENOID S2
(OPEN/SHORTED CIRCUIT)



CODE 33
LOCKUP SOLENOID S3
(OPEN/SHORTED CIRCUIT)

Circuit Description:
The lockup duty solenoid S3 of the torque converter clutch (TCC) controls the lockup clutch by a signal according to the lockup range judgement of the TCM when the vehicle runs.
This function can improve the fuel consumption to almost the same extent as the manual transmission.
The lockup solenoid S3 is put into B+ by the TCM, so that the solenoid is actuated with the result of lockup.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

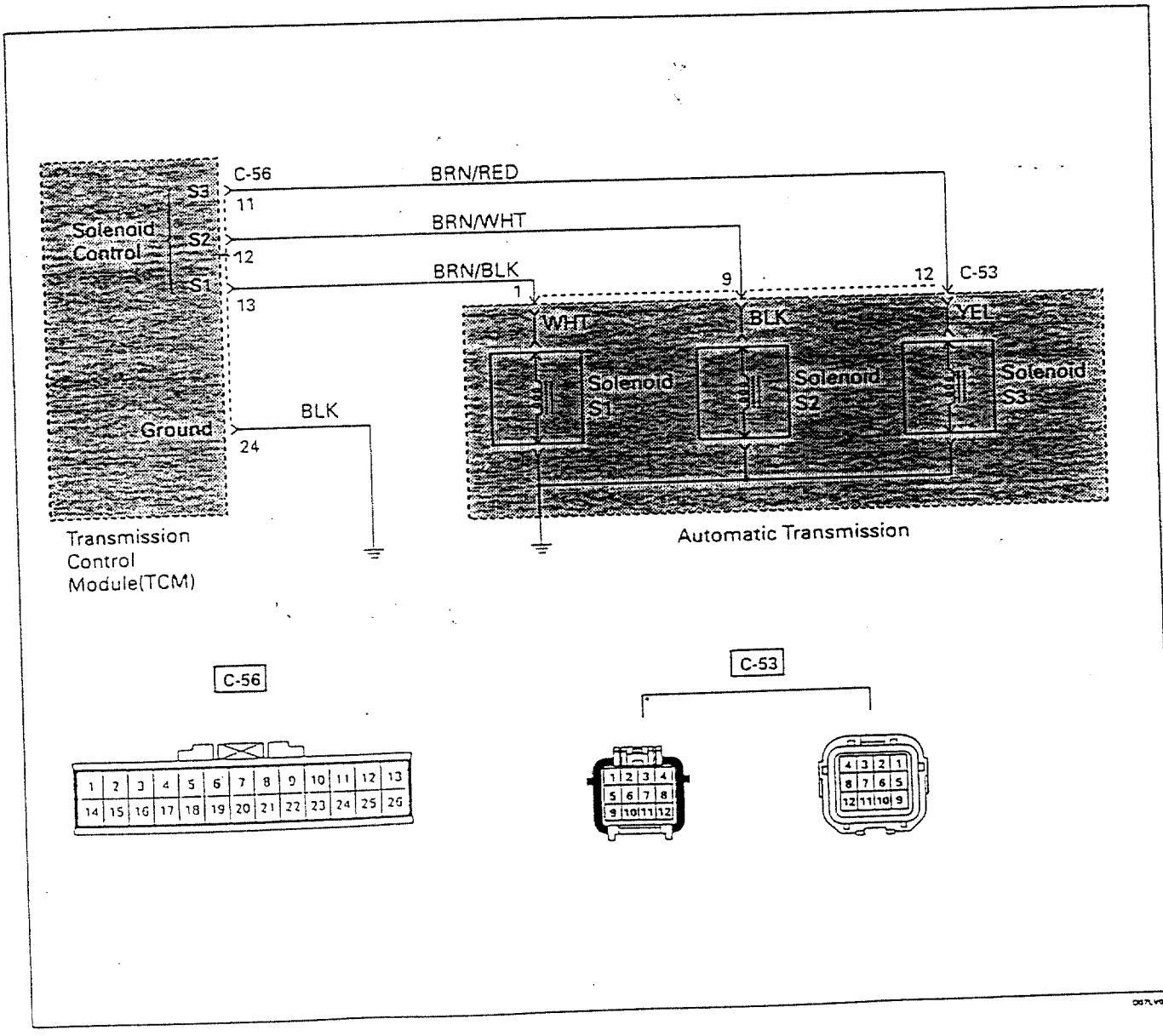
(1) When the key is ON, the voltage between the TCM connector terminals (C56-11) and (C56-24) is 1.0 V or less.

(2) When the gear is of the 2nd speed in the D range and the throttle opening is about 50% at a higher speed than about 40 km/h, the TCM supplies 10 to 16 V, so that the solenoid is actuated with the result of lockup.

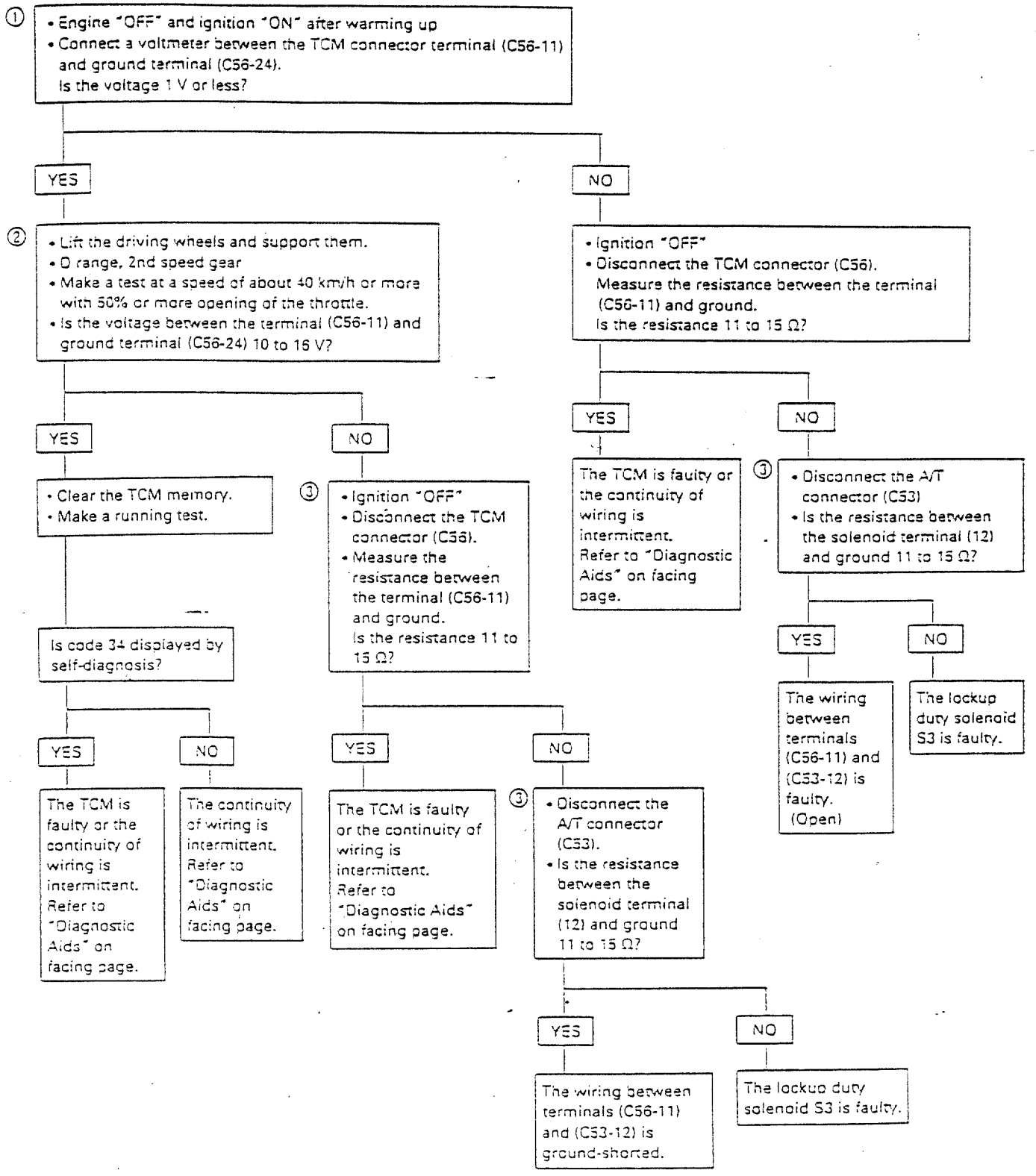
(3) The resistance range of the solenoid is 11 to 15Ω.

Diagnostic Aids:
In case of faulty connection, open or shorted circuit to the TCM terminal (C56-11), code 34 is displayed.
A intermittent failure may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

TCM Voltage Check:
Refer to page 7A-63.



CODE 33
LOCKUP SOLENOID S3
(OPEN/SHORTED CIRCUIT)



SYMPTOM DIAGNOSIS

Trouble 1. No Shifting

Warm up engine

↓

Read diagnostic trouble code → Trouble codes → Proceed to diagnostic trouble code

↓ No trouble code

- Connect a voltmeter to TCM connector. terminals 18 (Vth) and 24 (GND). Does the voltage vary with changes in throttle opening?

	Idle	WOT
Voltage (V)	0.24 – 1.30	5.30 – 7.50

↓ YES

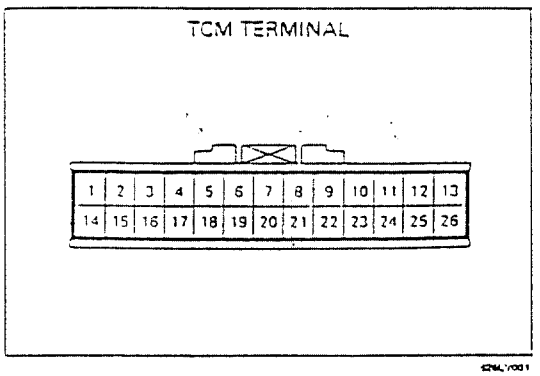
NO → Throttle position signal faulty

- Disconnect the TCM connector (C-56).
- Make a road test (manual shifting test).
- Check the shift and gear positions correspond with follows?
  - D range. . . . . overdrive (O/D SW ⊓)
  - 2 range . . . . . 3rd gear
  - L range . . . . . 3rd gear

↓ YES

Continued on next page

NO → Transmission faulty



TCM voltage check:
Refer to page 7A-63.

Continued from previous page

- Connect TCM connector (B-56) to TCM.
- Make a road test in the D range.

Is the voltage from TCM to each solenoid as follows?

Terminal	Gear / Solenoid	1st	2nd	2nd L-up	3rd	3rd L-up	O/D	O/D L-up
11 (S1) 24 (GND)	S1 Voltage (V)	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0	OFF 0	OFF 0
12 (S2) 24 (GND)	S2 Voltage (V)	OFF 0	ON 8–16	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0
13 (S3) 24 (GND)	S3 Voltage (V)	OFF 0	OFF 0	ON 8–16	OFF 0	ON 8–16	OFF 0	ON 8–16

Solenoid S3 voltage is 0 V. (Not lock-up) → Proceed to trouble 4

All gear OK → • Transmission faulty • Solenoid faulty

Up-shift until 3rd gear → Proceed to trouble 3

1st gear only OK

- Are there 8 – 16 V between TCM connector terminal B56-1(L) and B56-24 (GND) in D range?

YES
- Neutral start switch circuit faulty
- Neutral start switch faulty

NO
- Does the signal from vehicle speed sensor 1 and 2 input to TCM?

YES → TCM faulty

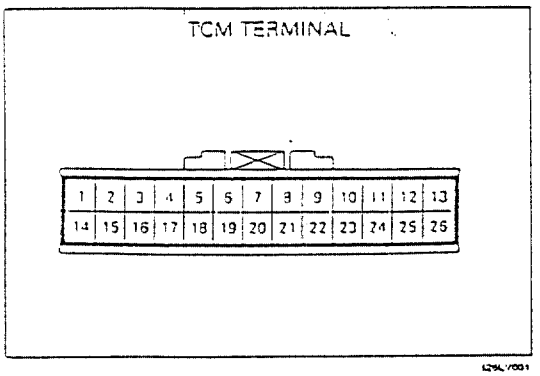
NO
- Vehicle speed sensor 1 and 2 faulty
- Wiring between vehicle speed sensor and TCM is open or shorted.

Up-shift until 2nd gear

- Are there 8 – 16 V between TCM connector terminal B56-21(2) and B56-19 (GND) in D range?

YES
- Neutral start switch circuit faulty
- Neutral start switch faulty

NO → TCM faulty



TCM voltage check: Refer to page 7A-63.

Trouble 2. Shift point too high or too low

Warm up engine

↓

Read diagnostic trouble code → Trouble codes → Proceed to diagnostic trouble code

↓ No trouble code

- Connect a voltmeter to TCM connector terminal C56-18 (Vth) and C56-24 (GND).
  Does the voltage vary with changes in throttle opening?

	Idle	WOT
Voltage (V)	0.24 – 1.30	5.30 – 7.50

YES ↓

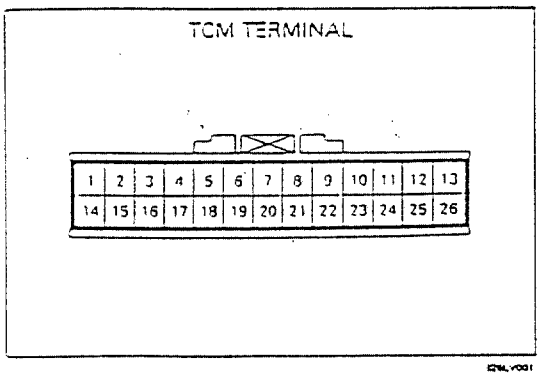
- Check the voltage between TCM connector terminal C56-16 (P) and C56-24 (GND).
  Is the voltage as follows?
  9 – 16 V : NORMAL mode
  0 V : POWER mode

NO → Throttle position signal faulty

YES ↓

- TCM faulty
- Transmission faulty

NO → Pattern select switch system faulty



TCM voltage check:
Refer to page 7A-63.

Trouble 3. No up-shift to overdrive

Warm up engine

• Road test while shifting manually with TCM connector pulled out.
Is there overdrive up-shift in D range?

YES

NO

Transmission faulty

• Connect TCM connector C-56 to TCM.
• Make a road test in D range.
Is the voltage from TCM to each solenoid as follows?

Terminal	Gear / Solenoid	1st	2nd	2nd L-up	3rd	3rd L-up	O/D	O/D L-up
11 (S1) 24 (GND)	S1 Voltage (V)	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0	OFF 0	OFF 0
12 (S2) 24 (GND)	S2 Voltage (V)	OFF 0	ON 8–16	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0
13 (S3) 24 (GND)	S3 Voltage (V)	OFF 0	OFF 0	ON 8–16	OFF 0	ON 8–16	OFF 0	ON 8–16

All gear OK → • Transmission faulty • Solenoid faulty

Up-shift until 2nd gear → • Are there 8 – 16 V between TCM connector terminal C56-2 (2) and C56-24 (GND) in D range?

YES → • Neutral start switch circuit faulty • Neutral start switch faulty

NO → TCM faulty

Up-shift until 3rd gear → Continued on next page

1st gear only OK → • Are there 8 – 16 V between TCM connector terminal C56-1 (L) and C56-24 (GND) in D range?

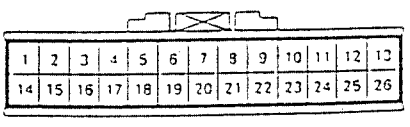
YES → • Neutral start switch circuit faulty • Neutral start switch faulty

NO → • Does the signal from vehicle speed sensor 1 and 2 input to TCM?

YES → TCM faulty

NO → • Vehicle speed sensor 1 and 2 faulty • Wiring between vehicle speed sensor and TCM is open or shorted.

TCM TERMINAL



TCM voltage check:
Refer to page 7A-63.

Continued from previous page

- Check the voltage between TCM connector terminal C56-15 (O/D2) and C56-24 (GND).
  Is the voltage as follow ?
  10 – 16V : O/D switch (⊥ O/D ON)
  0 – 2V : O/D switch (⊥ O/D OFF)

YES

Is the voltage between the TCM connector terminal C56-9 (OD1) and ground terminal (24) 10 to 16V?

YES

The TCM is faulty.

NO

Disconnect the glow control unit (C46).
Is the voltage between the TCM connector terminal C56-9 (OD1) and ground terminal (24) 10 to 16V?

YES

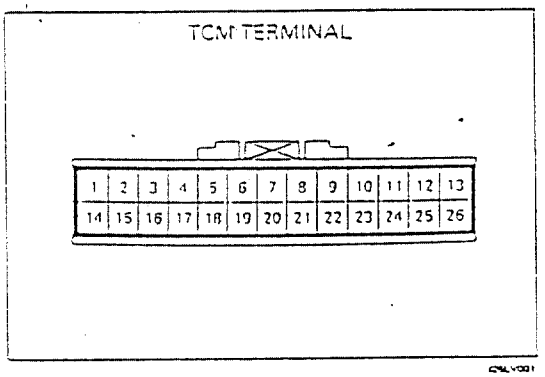
The TCM is faulty if the water temperature of engine is more than 40C.

NO

The wiring between TCM connector terminal C56-9 (OD1) and ground terminal(C-46) of glow control unit is ground-shorted or TCM is faulty.

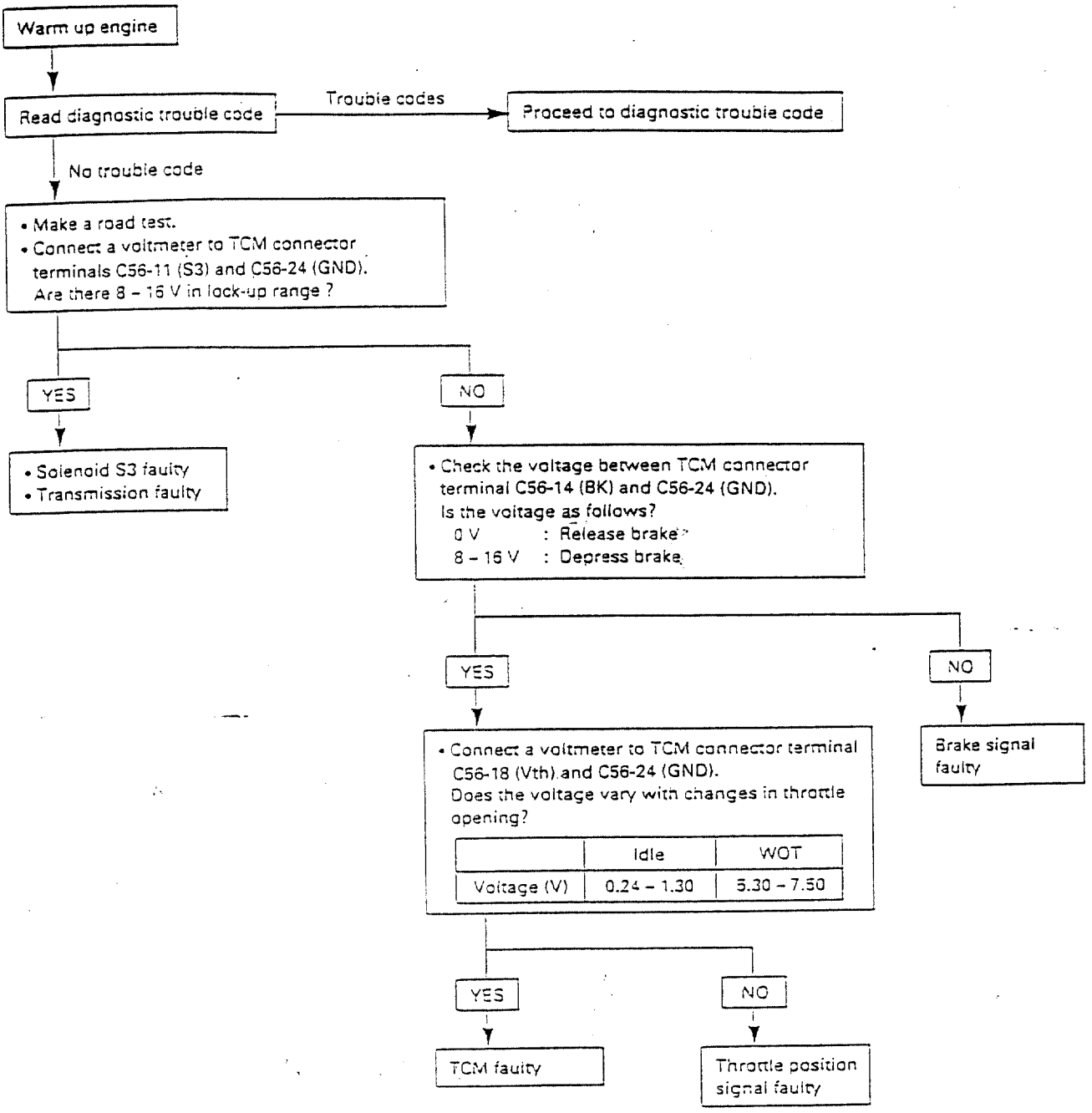
NO

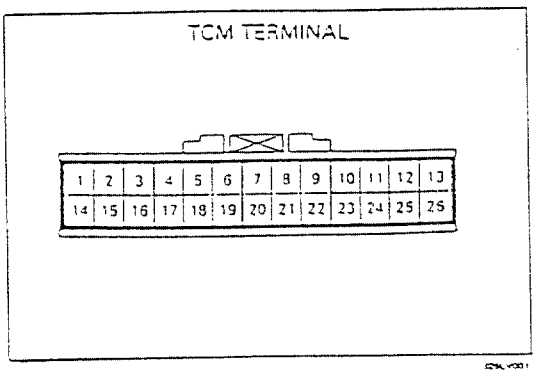
- O/D switch circuit faulty
- O/D switch faulty



TCM voltage check:
Refer to page 7A-63.

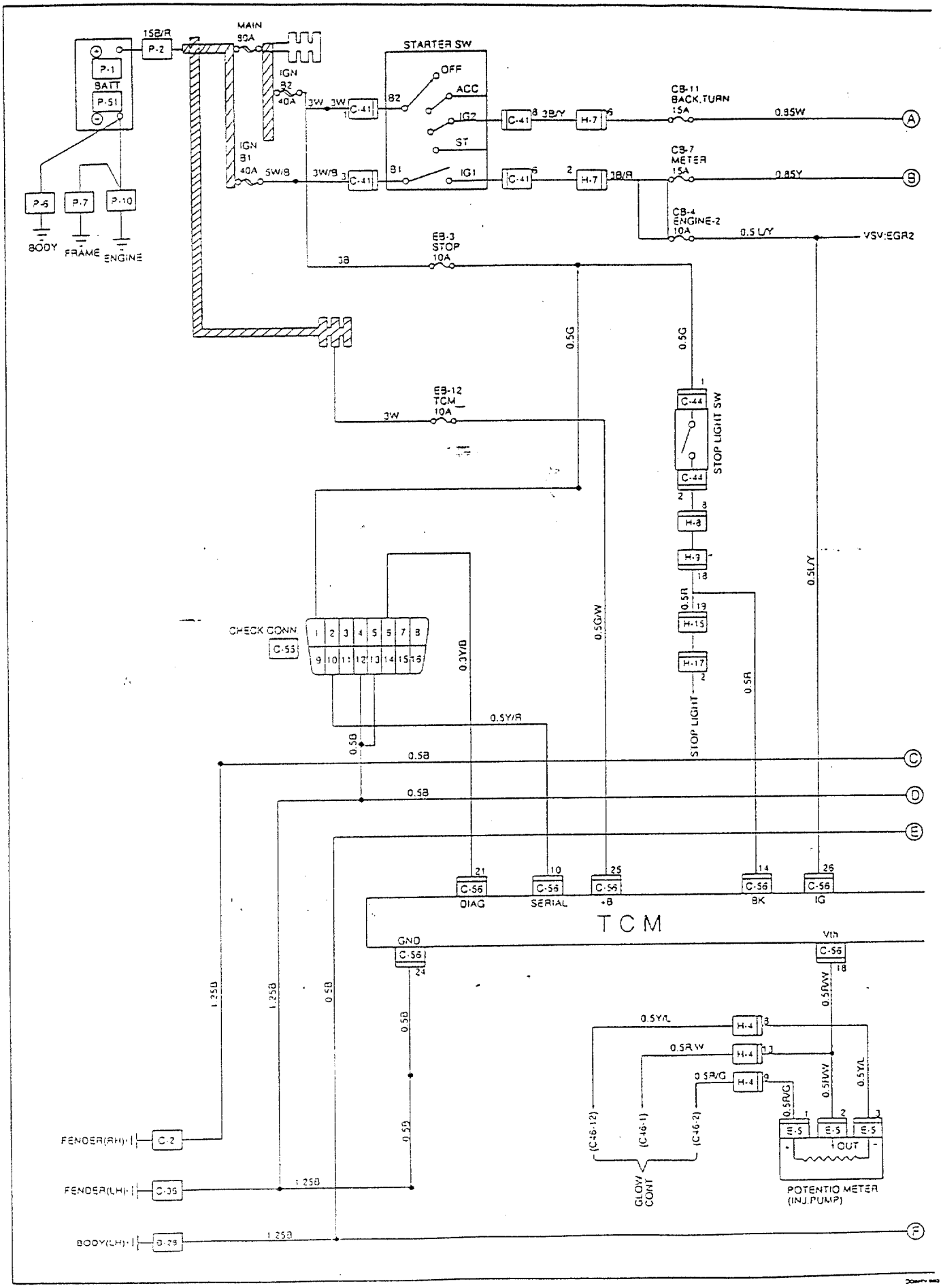
Trouble 4. No lock-up



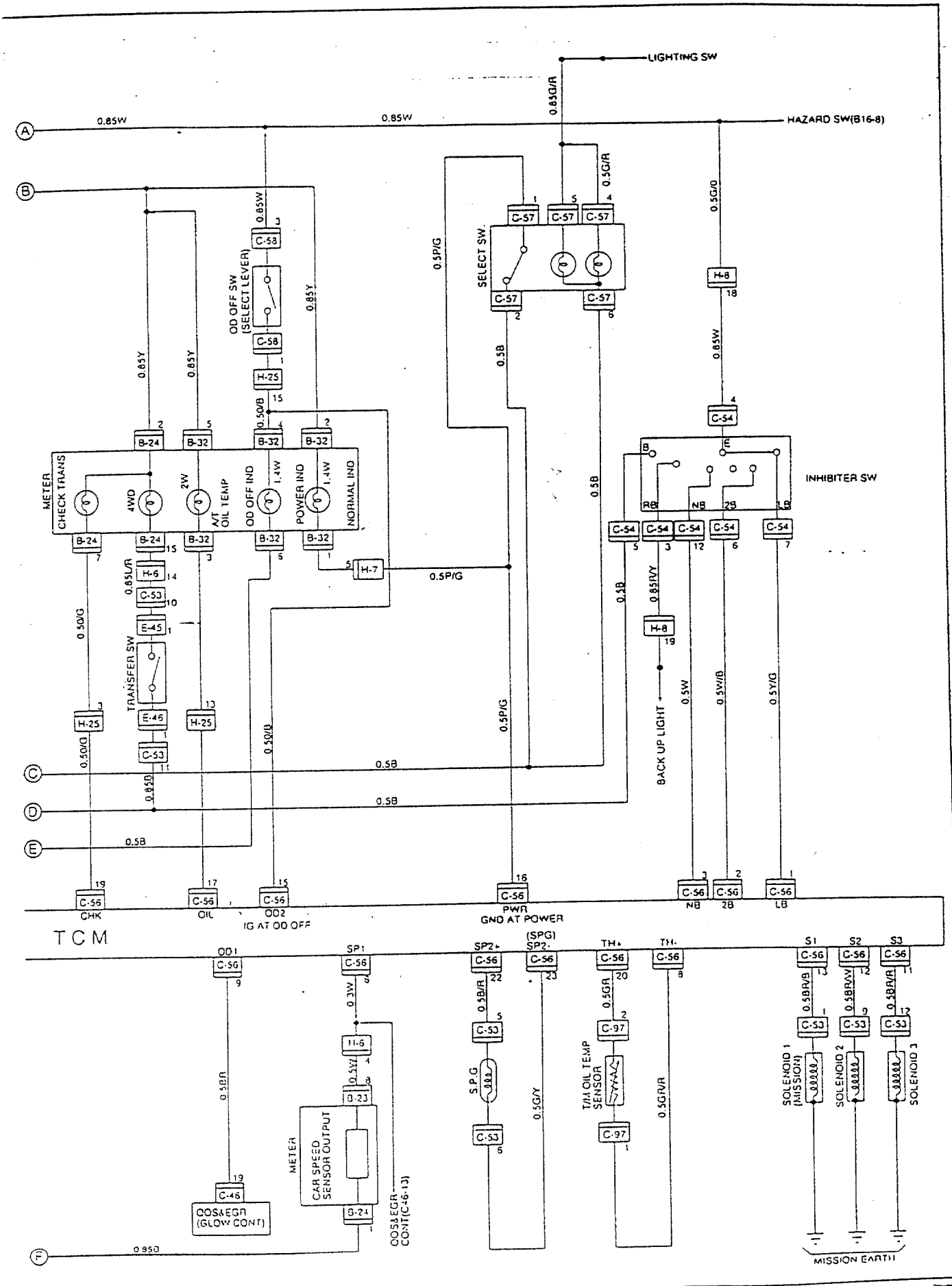


TCM voltage check:
Refer to page 7A-63.

WIRING DIAGRAM



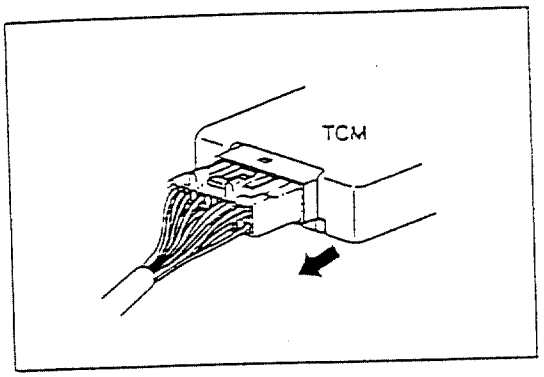
WIRING DIAGRAM



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
   1) With the engine OFF, disconnect the TCM connector.

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

Transmission	
"R" range	"P" range
Reverse	Pawl Lock

2. INSPECT MANUAL DRIVING OPERATION

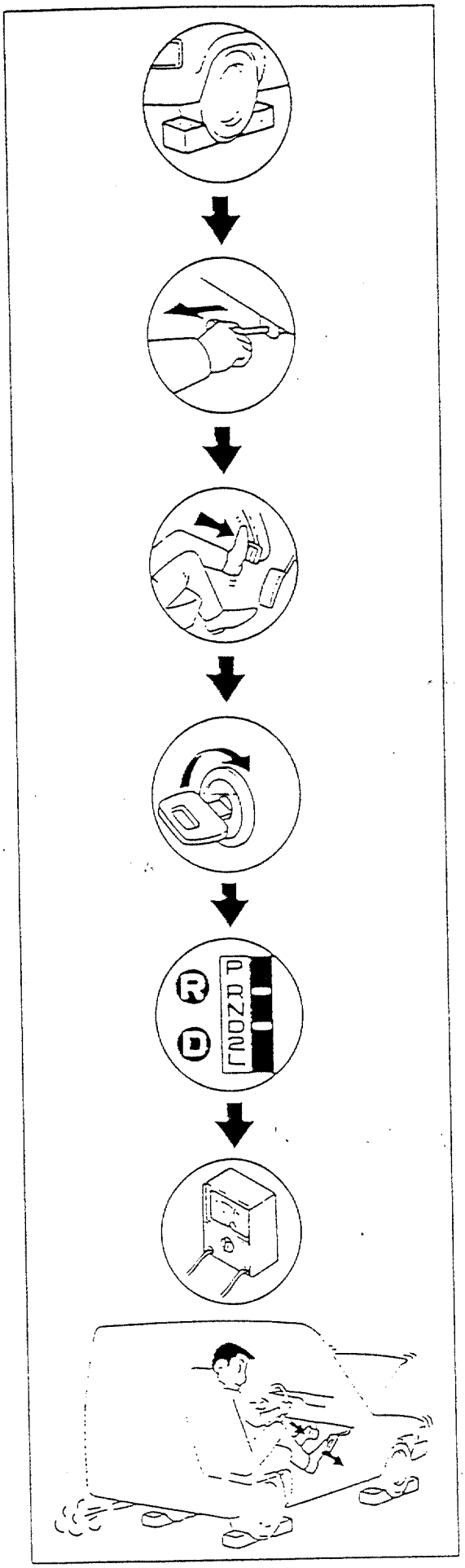
   Check that the shift and gear positions correspond with the table below.

   If the "L", "2" and "D" range gear positions are difficult to distinguish, do not perform the following road test.

   While driving, shift through the "L", "2" and "D" ranges. Check that the gear change corresponds to the gear position.

   If any abnormality is found in the above test, do not perform the stall, time lag or gear change tests.

3. CONNECT TCM CONNECTOR
   1) With the engine off, connect the TCM connector.



STALL TEST

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.

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) 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 rpm

7) Perform the same test in the "R" range.

EVALUATION

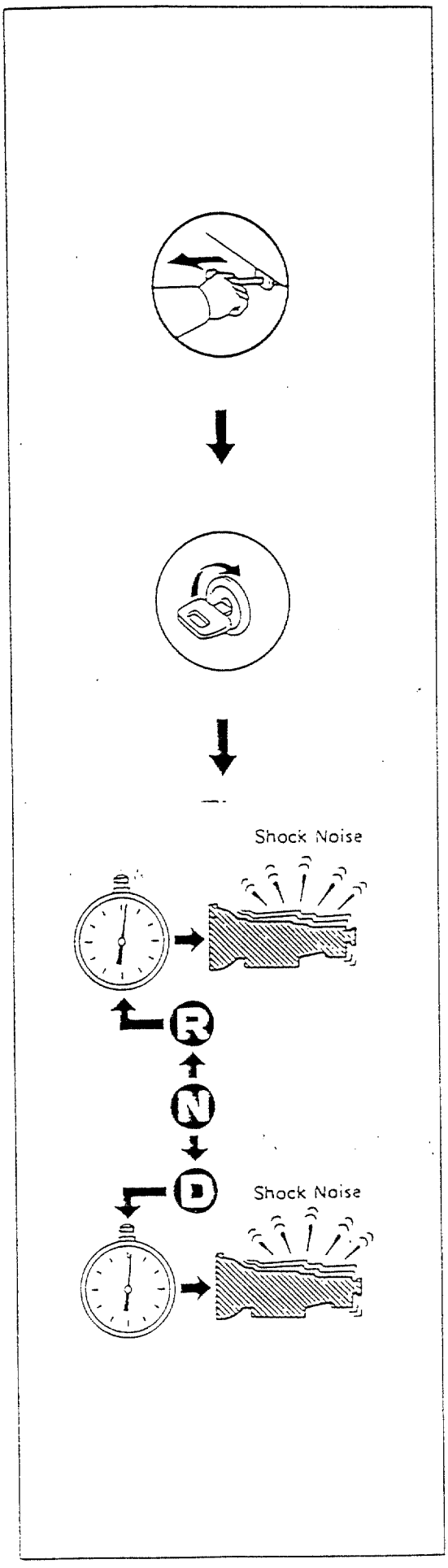
1) If the engine speed is the same for both ranges but lower than the specified value:
   - Engine output is insufficient.
   - Stator one-way clutch is not operating properly.

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

2) If the stall speed is "D" range is higher than specified:
   - Line pressure too low
   - Forward clutch slipping
   - No. 2 one-way clutch not operating properly
   - OD 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
   - OD one-way clutch not operating properly

4) If the stall speed in the "R" and "D" ranges are higher than specified:
   - Line pressure too low
   - Improper fluid level
   - OD one-way clutch not operating properly



TIME LAG TEST

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 OD clutch, front clutch, rear clutch and No. 3 brake.

Note:

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

(2) Be sure to allow a one minute interval between tests.

(3) Make three measurements and take the average value.

MEASURE LAG TIME

1) Fully apply the parking brake.

2) Start the engine.

   Check idling speed (A/C OFF)

"N" range	825 - 875 rpm

3) Shift the shift lever from "N" to "D" range. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Lag time	Less than 0.7 seconds

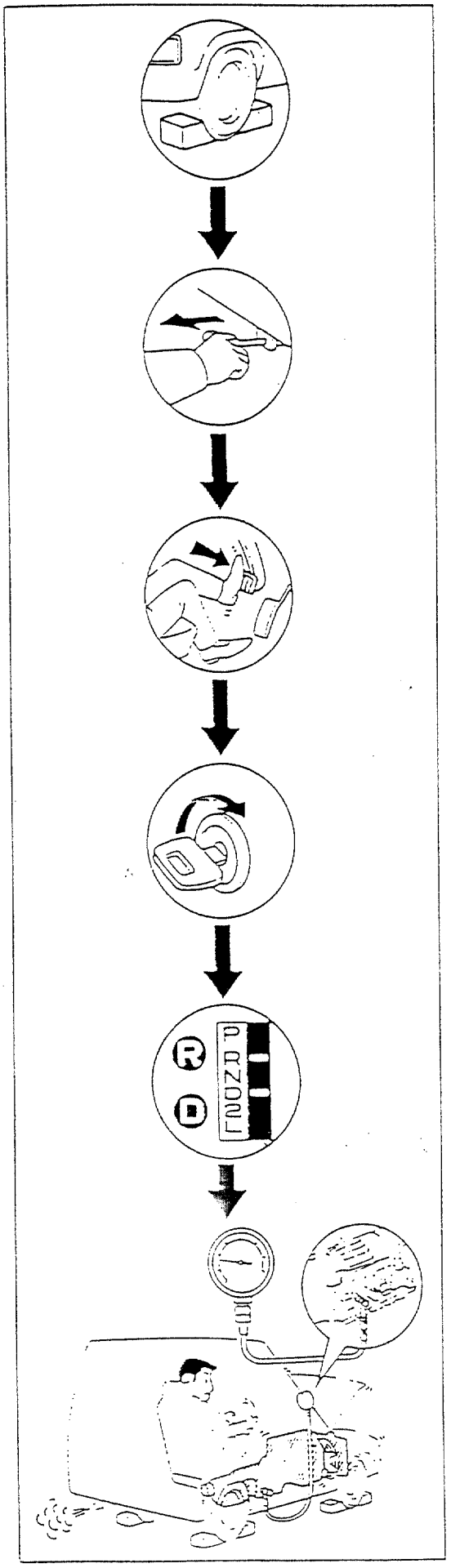
4) In same manner, measure the time lag for "N" → "R".

Lag time	Less than 1.2 seconds

EVALUATION

1) If "N" → "D" time lag is longer than specified:
   - Line pressure too low
   - Forward clutch worn
   - OD one-way clutch not operating properly

2) If "N" → "R" time lag is longer than specified:
   - Line pressure too low
   - Direct clutch worn
   - No. 3 brake worn
   - OD one-way clutch not operating properly



HYDRAULIC TEST

PREPARATION

1) Warm up the transmission fluid.
2) Remove the transmission case test plug and mount the hydraulic pressure gauge.
   Oil pressure gauge: 5-8840-0093-0

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

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.

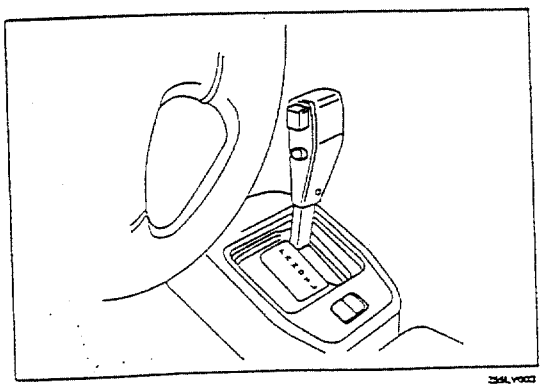
Engine speed	Line pressure Kpa (Kgf/cm²/psi)	
	"D" range	"R" range
Idling	421 – 480 (4.3 – 4.9/ 61 – 70)	510 – 608 (5.2 – 6.2/ 74 – 88)
Stall	1117 – 1362 (11.4 – 13.9/ 162 – 198)	1372 – 1715 (14 – 17.5/ 199 – 249)

5) If the measured pressures are not up to specified values, recheck the throttle cable adjustment and preform a retest.

EVALUATION

1) If the measured values at all ranges are higher than specified.
   - Throttle cable out of adjustment
   - Throttle valve defective
   - Regulator valve defective
2) If the measured values at all ranges are lower than specified:
   - Throttle cable out of adjustment
   - Throttle valve defective
   - Regulator valve defective
   - Oil pump defective
   - OD clutch defective

3) If pressure is low in "D" range only:
   - "D" range circuit fluid leakage
   - Forward clutch defective
4) If pressure is low in "R" range only:
   - "R" range circuit fluid leakage
   - Direct clutch defective
   - No. 3 brake defective



ROAD TEST

Note:
Perform the test at normal operating 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.

Note:
There is no OD up-shift or lock-up when the coolant temp, is below 70°C (158°F) or if there is a 10 km/h (6 mph) difference between the set cruise control speed and real speed.

EVALUATION

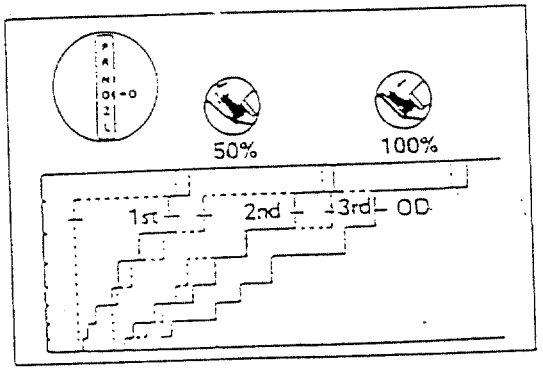
(1) If there is no 1 → 2 up-shift:
- No. 2 solenoid is stuck
- 1-2 shift valve is stuck

(2) If there is no 2 → 3 up-shift:
- No. 1 solenoid is stuck
- 2-3 shift valve is stuck

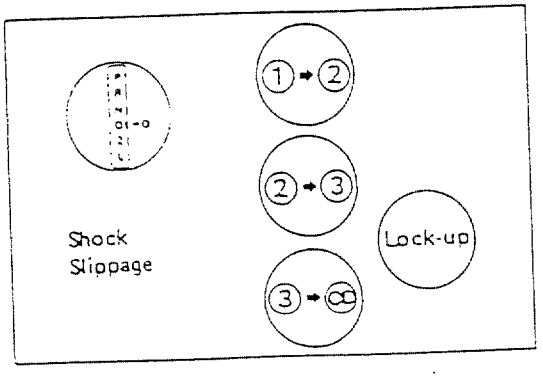
(3) If there is no 3 → OD up-shift (throttle valve opening 1/2):
- 3-OD shift valve is stuck

(4) If the shift point is defective:
- Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-OD shift valve etc., are defective.

(5) If the lock-up is defective:
- No 3 solenoid is stuck
- Lock-up relay valve is stuck

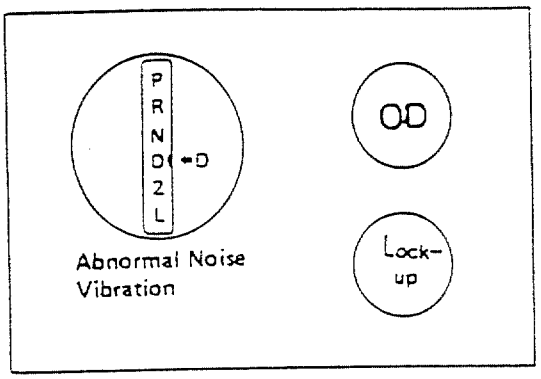


2) In the same manner, check the shock and slip at the 1 → 2, 2 → 3 and 3 → OD up-shifts.



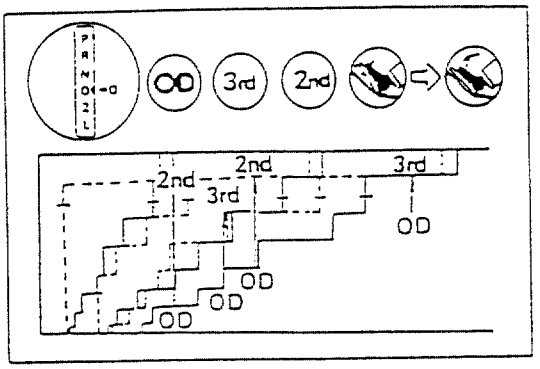
EVALUATION

If the shock is excessive:
- Line pressure is too high
- Accumulator is defective
- Check ball is defective



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.

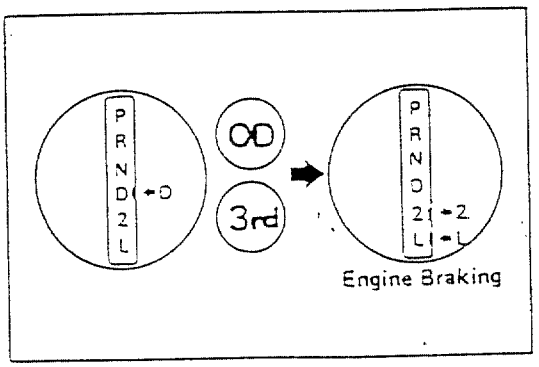


4) While running in "D" range, 2nd, 3rd gears and OD, check to see that the possible kick-down vehicle speed limits for 2 → 1, 3 → 1, 3 → 2, OD → 3 and OD → 2 kick-downs conform to those indicated on the automatic shift diagram.

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.

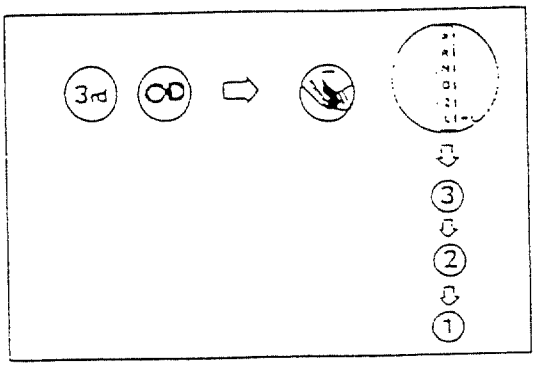
7) Also check to see that downshift is made from 3→ 2 or from O.D. to 3 and then to 2 immediately and that 2 → 1 downshift point is within the limits shown in the diagram when tested by releasing the accelerator pedal and shifting into position of "L" while driving in the third gear or in overdrive.



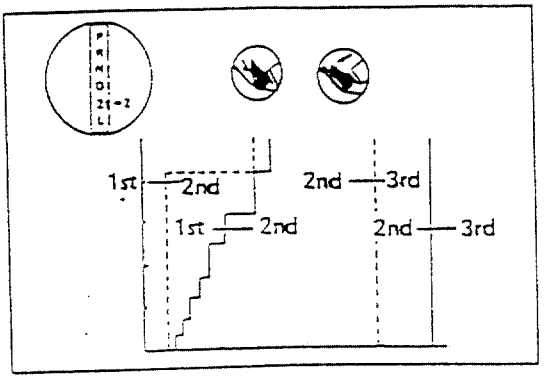
EVALUATION

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

(2) If there is no engine braking effect in the "L" range:
- First and reverse (No. 3) brake is defective
- Second coast (No. 1) brake is defective



(3) Also check to see that downshift is made from 3→ 2 or from O.D. 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.

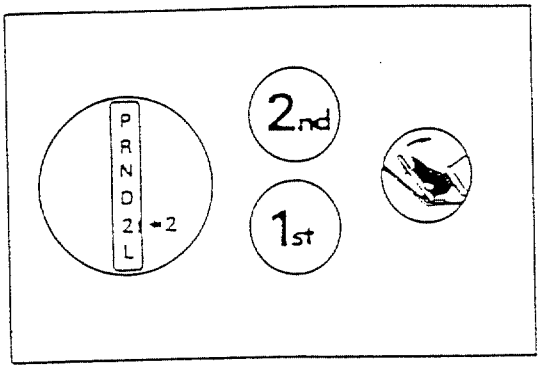


"2" RANGE TEST

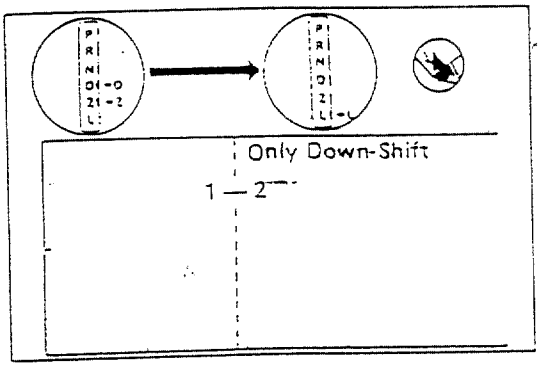
Shift into "2" range and, while driving with the accelerator pedal held constantly at the specified point (throttle valve opening 50% and 100%), push in one of the pattern selectors (only for 4x4) and check on the following points.

1) At each of the above throttle openings, check to see that the 1 → 2 up-shift 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.

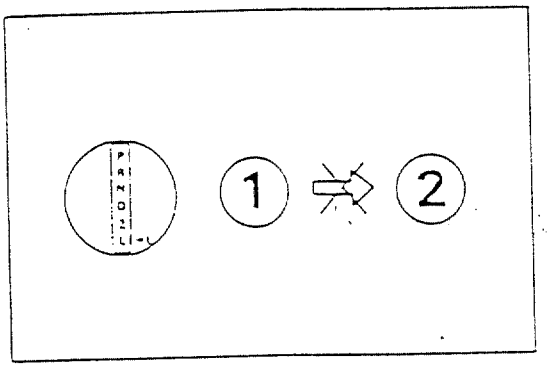


2) While running in the "2" range and 2nd gear, release the accelerator pedal and check the engine's braking effect.
3) Check for 2 → 1 down-shift and abnormal noise at acceleration and deceleration, and for shock at upshift and down-shift.

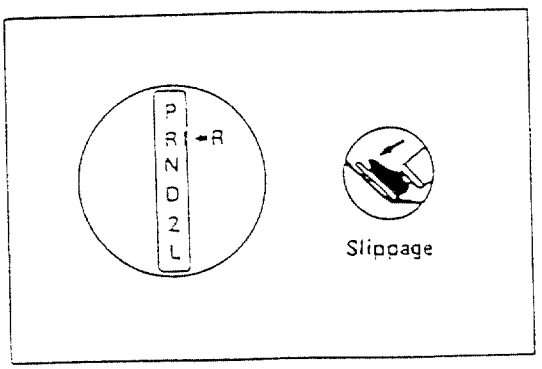


"L" RANGE TEST

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 down-shift occurs at the specified point shown on the automatic shift diagram.



2) While running in the "L" range, check to see that there is no up-shift 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.



"R" RANGE TEST

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

"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.

SHIFT POINT CHART AND LOCK-UP POINT CHART

SHIFT POINT CHART
(REAR AXLE RATIO: 4.555)
"NORMAL" mode

Up shift

Km/h

Range	Throttle Opening	1 → 2	2 → 3	3 → 4
D	Fully opened	28 – 34	68	106
	Half throttle	14	40	63
2	Fully opened	29	90	———
	Half throttle	14	90	———

Down shift

Km/h

Range	Throttle Opening	1 → 2	2 → 3	3 → 4
D	Fully opened	19	57	86
	Half throttle	12	27	43
	Fully closed	12	18	31
2	Fully opened	19	87	———
	Half throttle	12	87	———
	Fully closed	12	87	———

"POWER" mode
Up shift

Km/h

Range	Throttle Opening	1 → 2	2 → 3	3 → 4
D	Fully opened	34	68	106
	Half throttle	19	43	71
2	Fully opened	29	90	———
	Half throttle	14	90	———

Down shift

Km/h

Range	Throttle Opening	1 → 2	2 → 3	3 → 4
D	Fully opened	25	57	87
	Half throttle	12	31	40
	Fully closed	12	18	31
2	Fully opened	19	87	———
	Half throttle	12	87	———
	Fully closed	12	87	———

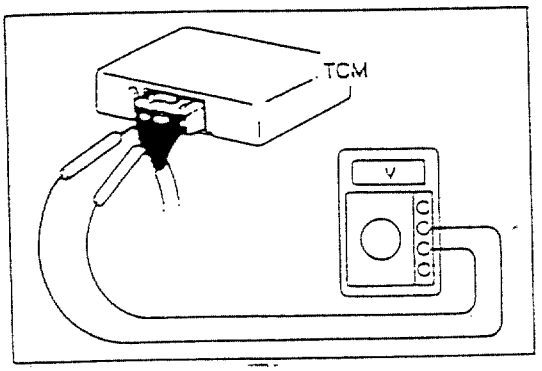
LOCK-UP POINT CHART
(REAR AXLE RATIO: 4.555)

Km/h

Range	A/T Mode	Throttle Opening : Half throttle (40 – 50%)					
		Lock-up ON			Lock-up OFF		
		2nd	3rd	4th	2nd	3rd	4th
D	NORMAL & POWER	31	52 – 60 (NORMAL: 55 POWER: 57)	57 – 73 (NORMAL: 58 POWER: 61)	28	41	56

TCM VOLTAGE CHECK

TCM voltage check is done to check for transmission and transmission control module (TCM) problems which cannot be detected by self-diagnosis.
Additionally, it serves as a back-up check for self-diagnosis.
Measure the voltage drop and make a continuity test for each of the sensors, solenoids, and switches.
If the voltage is within the specified range and continuity exists, that particular area of the TCM and automatic transmission assembly is normal.
If voltage deviation or lack of continuity is discovered, disconnect the applicable parts and check each of them individually.
This will allow you to determine the trouble location (TCM, automatic transmission unit, or another area of the vehicle).



Inspection Tool

Use a circuit tester to measure voltage and circuit continuity.
Insert the test probes from the connector wiring side.
TCM terminals are extremely small.
Wrap a piece of thin wire (1) around the probe of tester (2).
This will make measurement easier.

TCM Voltage Check Procedure

1. Remove the TCM.
2. Turn the ignition switch on. Do not start the engine.
3. Measure the voltage at the terminal.
   Refer to the following table for the specified voltage ranges.

TCM STANDARD VOLTAGE
[24 PIN CONNECTOR]

Check circuit	Terminal +	Terminal –	Measuring condition	Voltage (V)
Throttle position sensor	18	24	Throttle fully opened	5.3 – 7.5
			Throttle fully closed (idling)	0.24 – 1.3
Vehicle speed sensor 1	6	24	Vehicle speed 10 – 20 km/h	Less than 2 ↔ About 5
Vehicle speed sensor 2	22	23	Vehicle speed 10 – 20 km/h	0 ↔ 3
2 range switch	2	24	Selector "2" range	8 – 16
			Selector all ranges except "2"	Less than 1
L range switch	1	24	Selector "L" range	8 – 16
			Selector all ranges except "L"	Less than 1
Pattern select switch	16	24	Pattern select switch OFF (NORMAL)	9 – 16
			Pattern select switch ON (POWER)	Less than 1
Brake switch	14	24	Depress brake	8 – 16
			Release brake	Less than 1
O/D switch	15	24	O/D switch (O/D OFF)	10 – 16
			O/D switch (O/D ON)	0 – 2
Shift solenoid S1	13	24	OFF (3rd or O/D)	Less than 1
			ON (1st or 2nd)	8 – 16
Shift solenoid S2	12	24	OFF (1st or O/D)	Less than 1
			ON (2nd or 3rd)	8 – 16
Lock-up control solenoid S3	11	24	OFF (Lock-up OFF)	Less than 1
			ON (Lock-up ON)	8 – 16
Diagnosis terminal	21	24	Self-diagnosis ON	0 – 1.5
Electrical source (Battery)	25	24	———	10 – 16
Electrical source (ignition)	26	24	Key switch ON	10 – 16

Check circuit	Terminal		Measuring condition	Voltage (V)
	+	–		
N range switch	3	24	Selector "N" range	8 – 16
			Selector all ranges except "N"	Less than 1
Engine water temp switch	9	24	Engine water temperature is less than 40°C.	Less than 1
			Engine water temperature is higher than 40°C.	8 – 16
ATF Fluid Temperature sensor	20	8	ATF temperature 20°C	4.70
			ATF temperature 80°C	3.65

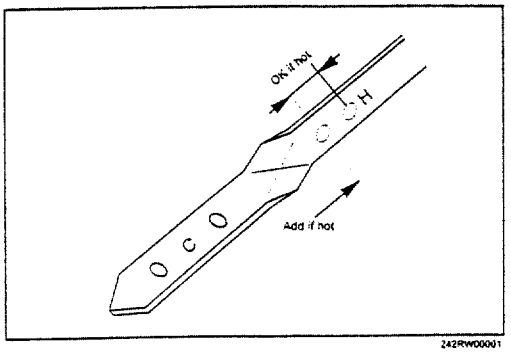
GENERAL TROUBLESHOOTING

Problem	Possible cause	Remedy
Fluid discolored or smells burnt	Fluid contaminated Torque converter faulty Transmission faulty	Replace fluid Replace torque converter Disassemble and inspect transmission
Vehicle does not move in any forward range or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Park lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect park pawl Replace torque converter Replace drive plate Clean screen Disassemble and inspect transmission
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission
Harsh engagement into any drive range	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission
Delayed 1-2, 2-3, or 3-OD up-shift, or down shifts from 4-3, or 3-2 and shifts back to 4 or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect valve body
Slips on 1-2, 2-3 or 3-OD up-shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect valve body Disassemble and inspect transmission
Drag, binding or tie-up on 1-2, 2-3, or 3-OD up-shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission

GENERAL TROUBLESHOOTING

Problem	Possible cause	Remedy
No. lock-up in 2nd, 3rd or OD	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect valve body Disassemble and inspect transmission
Harsh down-shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission
No down-shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control
Down-shift occurs too quickly or too late while coasting	Throttle cable out of adjustment Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Adjust throttle cable Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control
No OD-3, 3-2 or 2-1 kickdown	Solenoid valve faulty Electronic control faulty Valve body faulty Throttle cable out of adjustment	Inspect solenoid valve Inspect electronic control Inspect valve body Adjust throttle cable
No engine braking in "2" or "L" range	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission
Vehicle does not hold in "P"	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring

ON-VEHICLE SERVICE



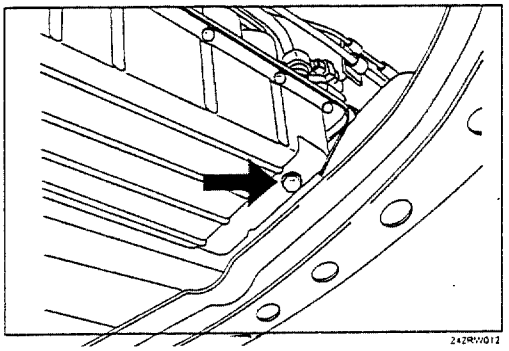
TRANSMISSION FLUID LEVEL AND CONDITION

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.

ATF REPLACEMENT



NOTE:

Do not overfill.

1) Remove the drain plug from oil pan and drain the fluid.
2) Reinstall the drain plug securely.

N·m (kg·m/lb·ft)

Torque	20 (2.0 / 14.8)

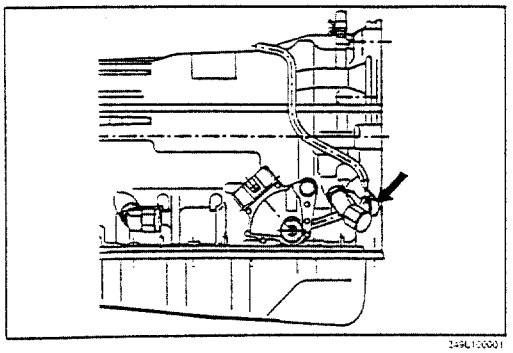
3) With the engine OFF, add new fluid through the filler tube.

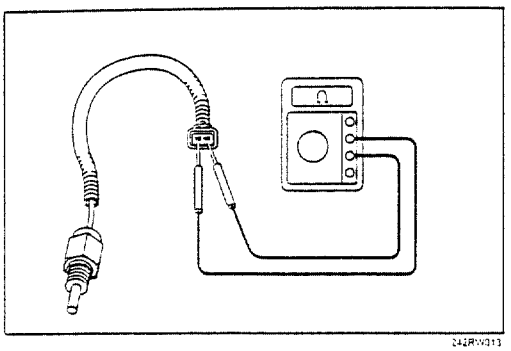
	Transmission
Drain and refill	4.5L
Dry fill	8L
Fluid	BESCO ATF II or III / DEXRON® II, II D, III

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 lever. 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.





ATF TEMPERATURE SENSOR INSPECTION

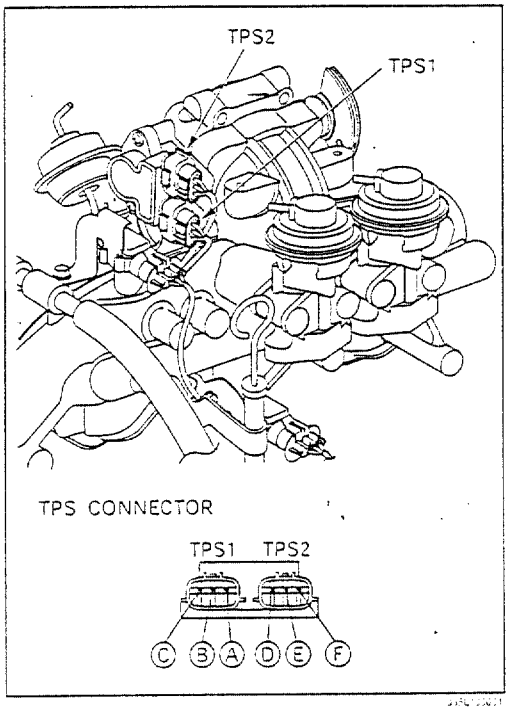
1. Disconnect the front side ATF cooler pipe from the elbow and remove the elbow.
2. Remove the ATF temperature sensor from the transmission case.
3. Place the ATF temperature sensor in a container of ATF.
4. Measure the resistance between each terminals.

Temperature	Resistance (Ω)	Measurement current (mA)
25	(10000)	(0.1)
120	615.6	1
145	357.4	1
155	292.5	1

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

N·m (kg·m/lb·ft)

Torque	15 (1.5/11)



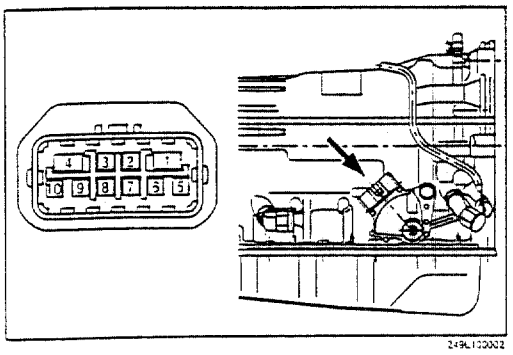
THROTTLE POSITION SENSOR INSPECTION

1. Turn the starter switch to the " ON" position.
2. Measure the voltage between TPS1 connector terminals Ⓐ (output) and Ⓒ (ground), and TPS2 connector terminals Ⓓ (outout) and Ⓔ (ground).

NOTE:

- **Do not remove the sensor connector.**
- **Make sure that power source (5.0±0.01V) is measured between TPS1 connector terminals Ⓑ and Ⓒ, and TPS2 connector terminals Ⓕ and Ⓔ before measurement at step 2.**

Throttle position	Voltage (V)	
	TPS1	TPS2
Idling	0.55 - 0.65	0.2 - 0.4
WOT	3.1 - 3.3	1.5 - 1.6



NEUTRAL START SWITCH INSPECTION

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

REMOVAL

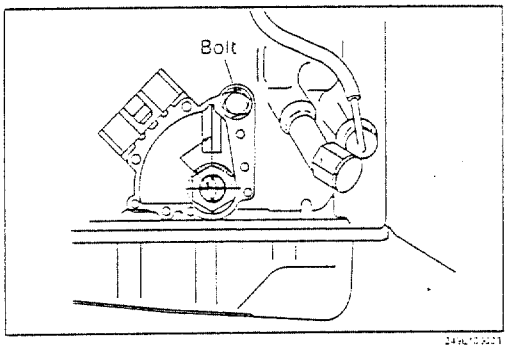
Preparation:

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

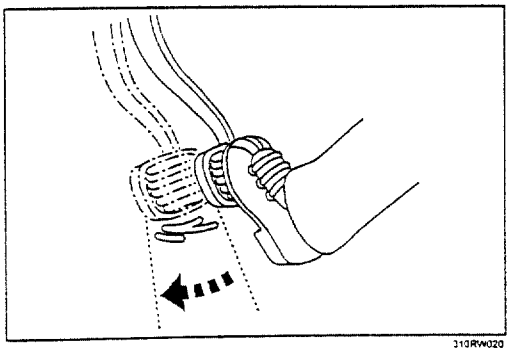
To install, follow the removal steps in the reverse order, noting the following points;



ADJUSTMENT

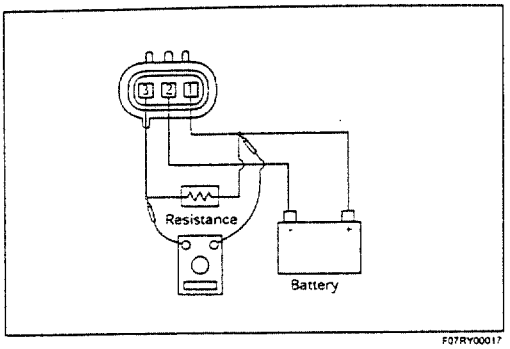
1) Loosen the neutral start switch bolt and set the shift selector to the " N" range.
2) Align the groove and neutral basic line.
3) Hold in position and tighten the bolt.

Torque	N·m (kg·m/lb·in)
Nut	7 (0.7/61)
Bolt	13 (1.3/113)



BRAKE SIGNAL INSPECTION

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



VEHICLE SPEED SENSOR 1 INSPECTION

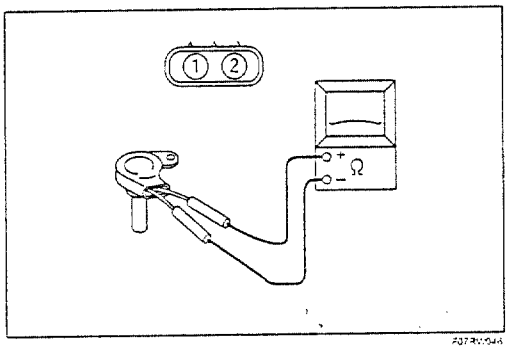
1. Connect the Vehicle speed sensor connector terminal (1) to the batter (+) terminal and terminal (2) to the battery (-) terminal.
2. Connect a resistance of 1.3k ohm to 5k ohm (1.4W or more) between terminals (1) and (3).

NOTE:

Be extremely careful not to connect the battery (+) terminal to the terminal (3).
This may damage the vehicle speed sensor.

3. Rotate the shaft of the vehicle speed sensor slowly and measure the voltage at both ends with a digital tester.

The voltage, with one rotation of shaft, fluctuates four times, in the following range: 10 to 14V ⇔ 2V or less.
Replace the sensor when the result of inspection is found abnormal.

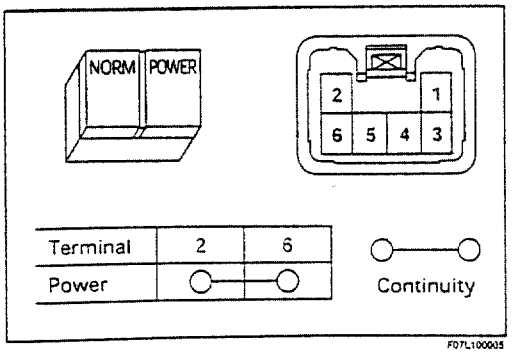


INPUT AND OUTPUT REVOLUTION SENSOR INSPECTION

Use an ohmmeter to measure the resistance between terminals 1 and 2.

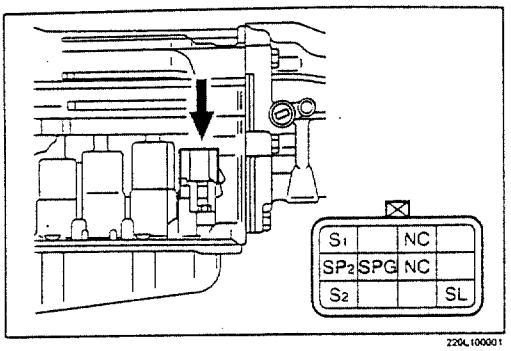
Standard resistance

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



PATTERN SELECT SWITCH INSPECTION

Inspect that there is continuity between each terminals.



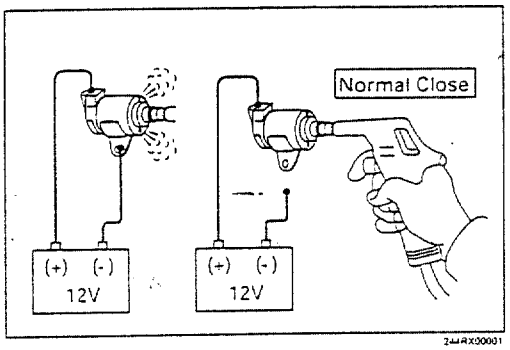
SOLENOID INSPECTION

1. Resistance check
   - Using an ohmmeter, check the resistance between each terminals (S1/S2/S3/SL) and body.

Solenoid S1, S2, S3 and SL and lock-up solenoid resistance	11 – 15Ω (20°C)

NOTE:

If the pressure control solenoid resistance is not within specification, replace the valve body assembly.

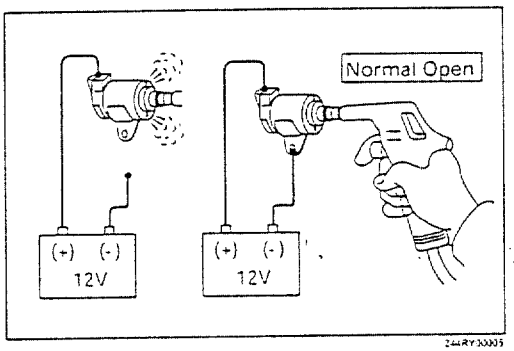


2. Operation Check

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

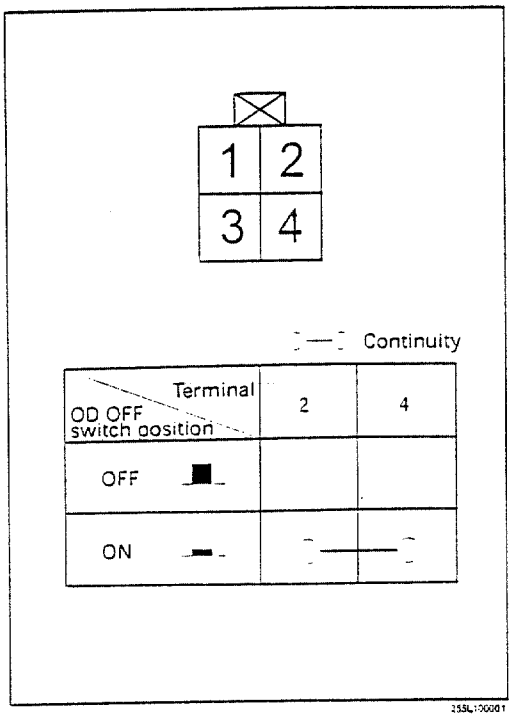
Solenoid S1 and S2 (Normal close type)

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



Lock-up solenoid (Normal open type)

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



OVERDRIVE OFF SWITCH INSPECTION

Inspect that there is continuity between terminals 2 and 4.

REAR OIL SEAL

REMOVAL

1. Disconnect the center bearing bracket, and remove rear propeller shaft.
2. Remove the rear oil seal from the transmission extension housing.

INSTALLATION

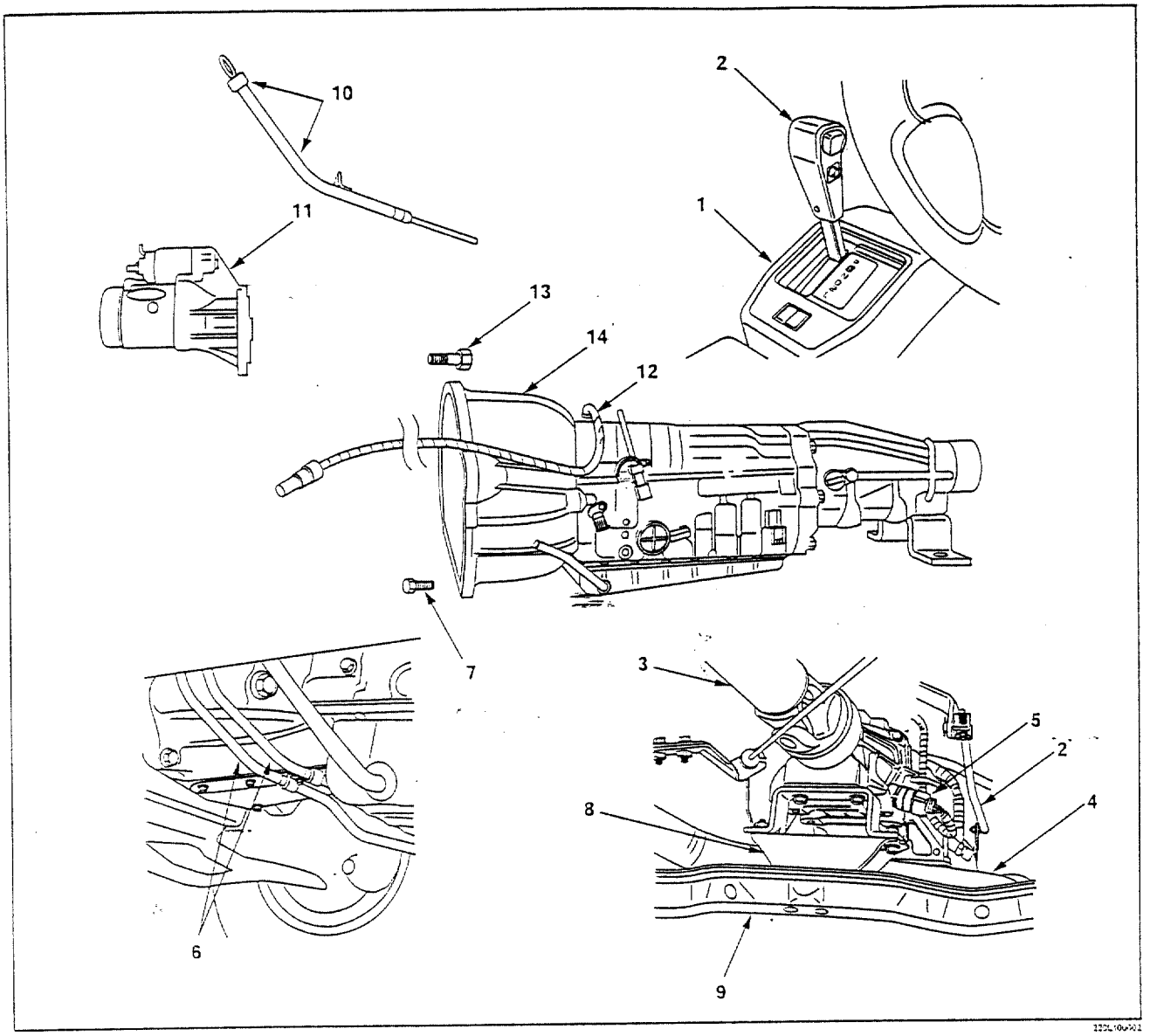
1. Using installer 5-8840-2702-0, install the new oil seal to the extension housing.

NOTE:

The oil seal can be installed without removing the dust deflector.

2. Install the rear propeller shaft.

TRANSMISSION REMOVAL AND INSTALLATION



Removal Steps

1. Front console assembly
2. Select lever assembly
3. Rear propeller shaft
4. Exhaust pipe
5. Transmission harness connector
6. ATF cooler pipe
7. Torque converter bolt
8. Rear mounting
9. 3rd crossmember
10. Oil level gauge and tube
11. Starter
12. Breather hose
13. Engine - transmission bolt
14. Transmission assembly

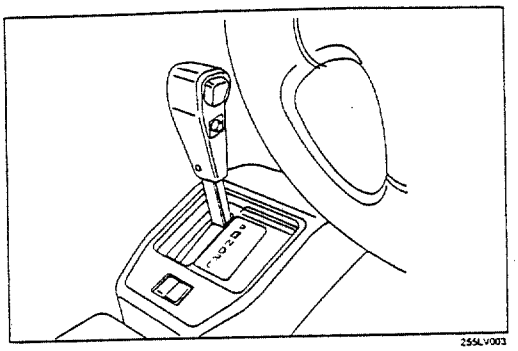
Installation steps

To install, follow the removal steps in reverse order.

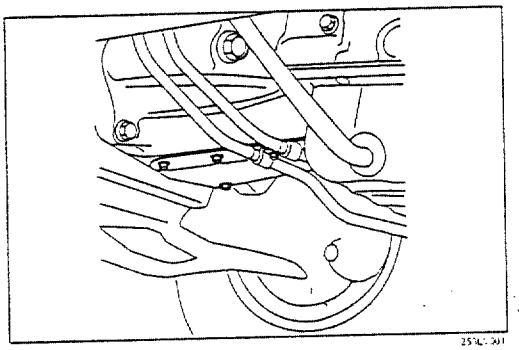
REMOVAL

Preparation:

- Remove engine hood
- Disconnect negative (-) battery cable.



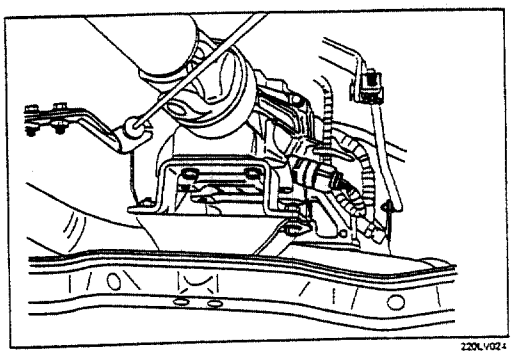
1. **Front console assembly**
2. **Select lever assembly**
   - Disconnect the harness connector.
   - Disconnect the control rod from the select lever assembly.
3. **Rear propeller shaft**
   Disconnect the center bearing bracket, and remove rear propeller shaft.
4. **Exhaust pipe**
5. **Transmission harness connector**
   - Disconnect the engine harness connectors from A/T side.



6. **ATF cooler pipe**
   - Disconnect two ATF cooler pipes from A/T side.
   - Remove oil pipe clamp from the under cover and torque converter housing side.
7. **Torque converter bolt**
   - Remove the under cover.
   - Turn the crankshaft to gain access to each bolt. Remove the six torque converter fixing bolts.

NOTE:

New fixing bolts should be replaced for reassembly.



8. **Rear mounting**
   - Support transmission with a jack.
   - Remove two rear mounting nuts from the 3rd crossmember.
   - Remove the rear mounting from the transmission.
9. **3rd crossmember**
10. **Oil level gauge and tube**
11. **Starter**
    - Remove the mounting bolts, and pull the starter toward the front of the vehicle.
      Lay the starter alongside the engine.
12. **Breather hose**
    - Disconnect the breather hose from the A/T side.
13. **Engine-transmission bolt**
    - Hoist engine with a chain block.
      Remove engine-transmission fixing bolts.
14. **Transmission assembly**

NOTE:

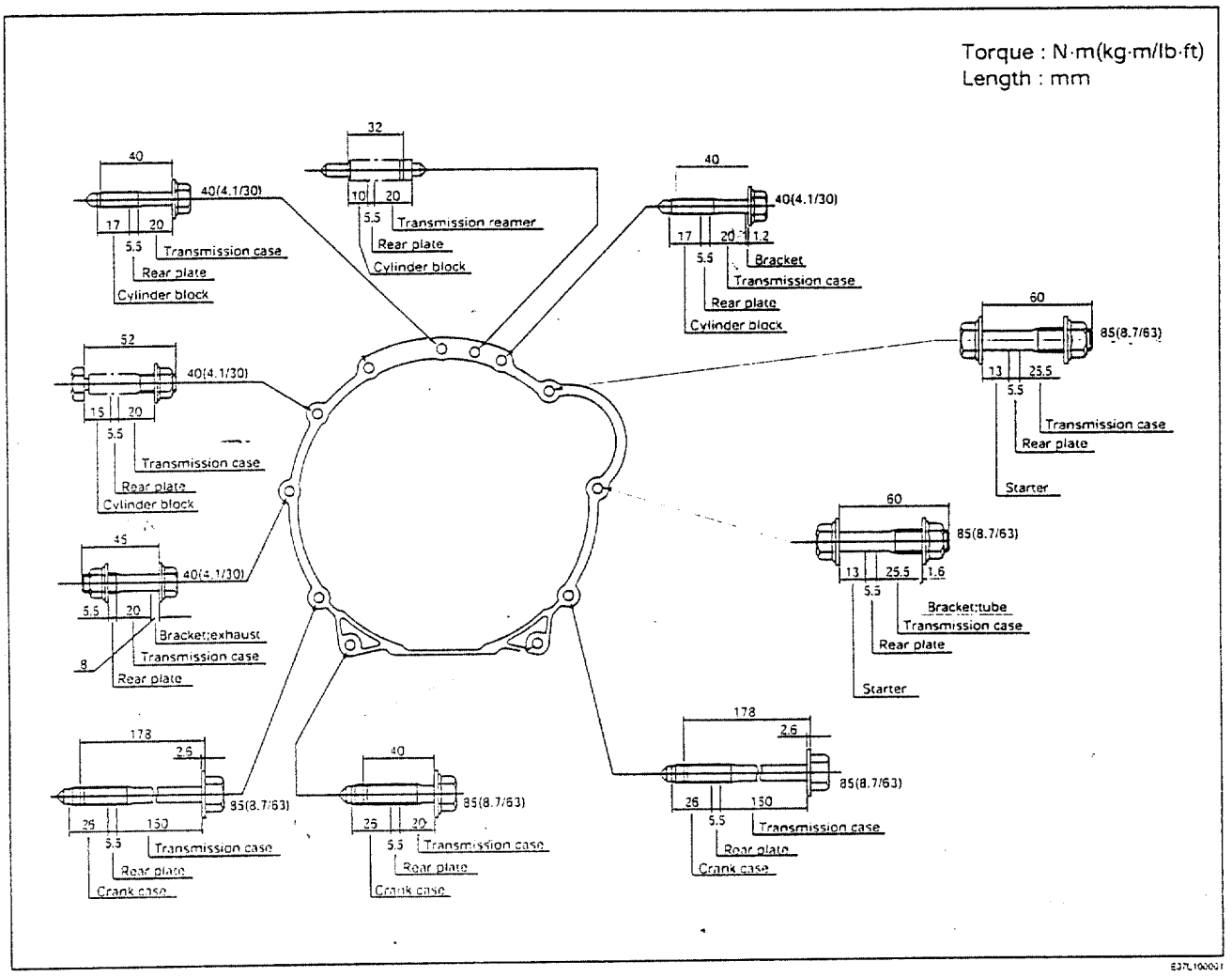
Keep the oi pan positioned down. Be careful not to let the torque converter slide out.

INSTALLATION

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

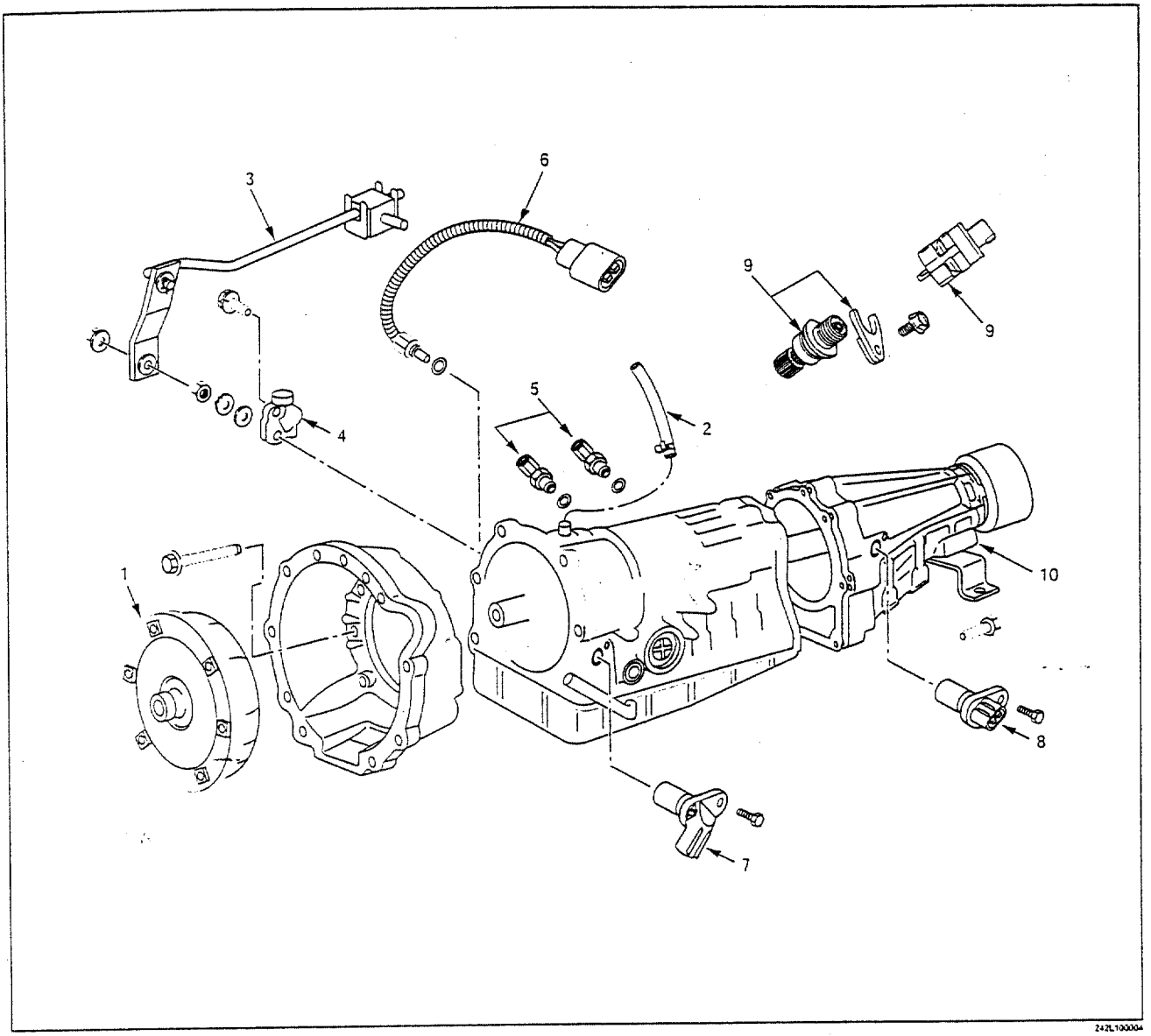
1. Torque

	N·m (kg·m/lb·ft)
Rear mounting to crossmember	41 (4.2/30)
Rear mounting to transmission	41 (4.2/30)
Torque converter bolt	29 (3.0/22)
ATF cooler pipe to transmission	44 (4.5/33)
Exhaust pipe flange to flange	43 (4.4/32)
Exhaust pipe to exhaust manifold	67 (6.8/49)
Engine to transmission	See below



UNIT REPAIR

DISASSEMBLY OF MAJOR COMPONENTS (1)



Disassembly steps

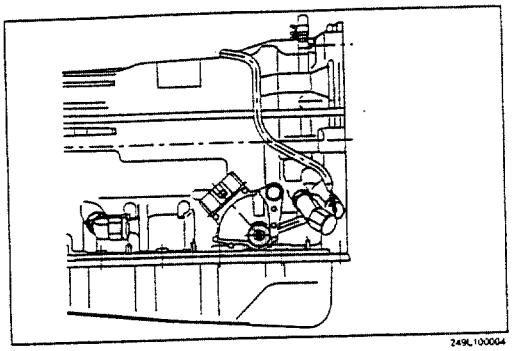
1. Torque converter
2. Breather hose
▲3. Transmission control rod and select lever
▲4. Neutral start switch
▲5. Elbow
6. Oil temperature sensor
7. Input revolution sensor
8. Output revolution sensor
9. Speed meter sensor, speed meter driven gear and plate
10. Extension housing

NOTE:

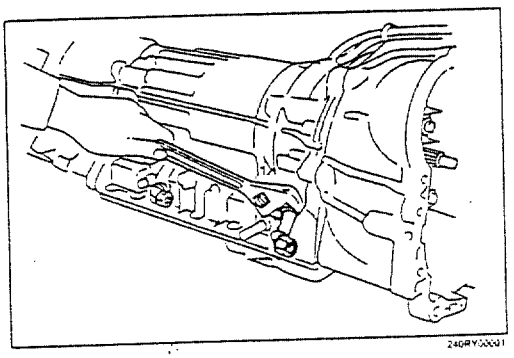
Steps marked with a triangle (▲) are important operations. Detailed information appears in the text.

Important operations

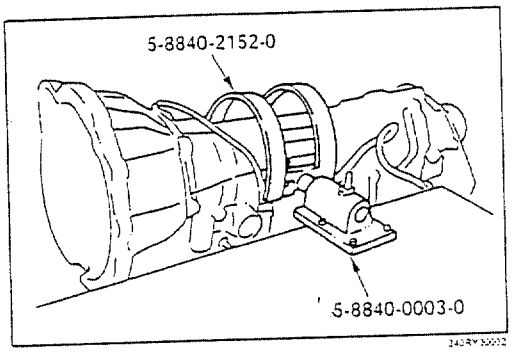
3. **Transmission control rod and select lever**
   Remove the transmission control rod and select lever.



4. **Neutral start switch**
   Unstake the lock washer.
   Remove the nut and bolts, and then remove the neutral start switch.
   Remove the lock washer and grommet.

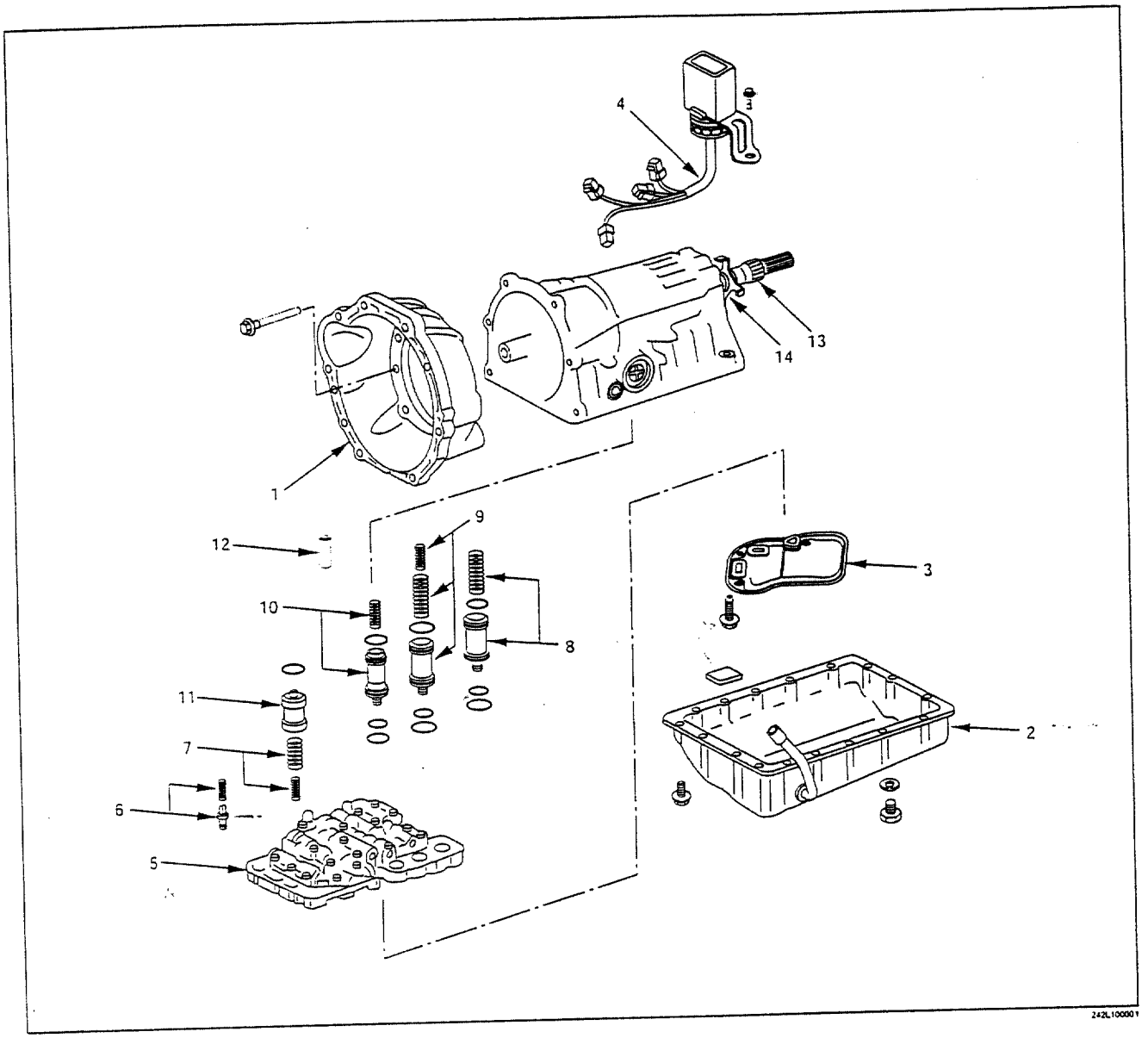


5. **Elbow**
   Remove two elbows from transmission case.



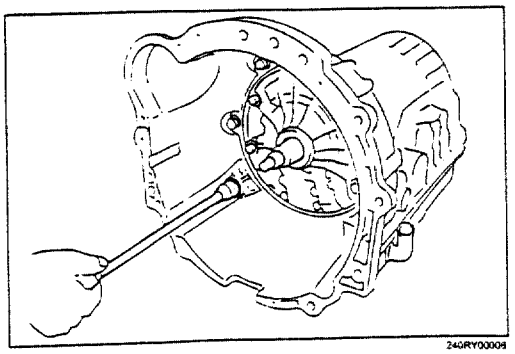
Install special tool to the transmission unit.
Holding fixture: 5-8840-2152-0 (J-37227)
Fixture base: 5-8840-0003-0 (J-3289-20)

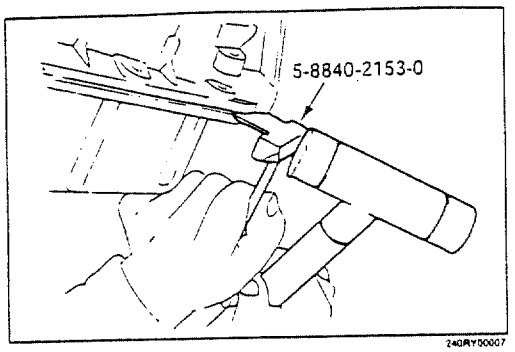
DISASSEMBLY OF MAJOR COMPONENTS (2)

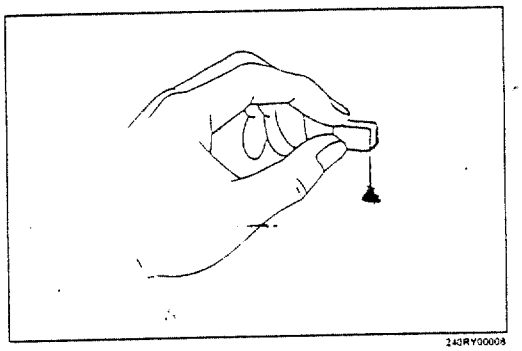


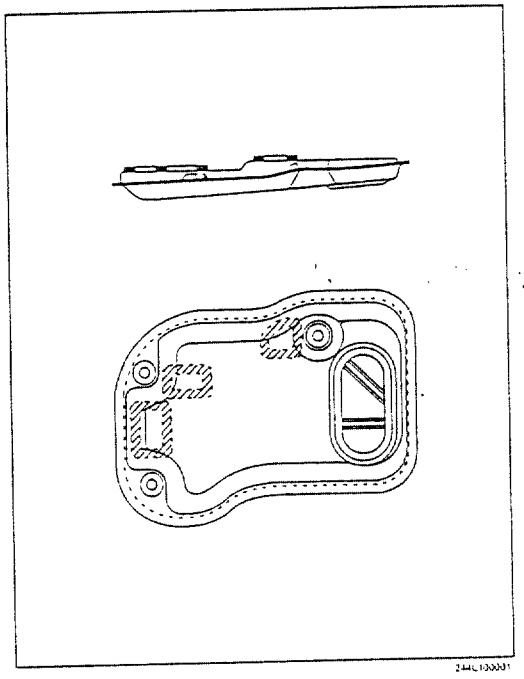
Disassembly steps

▲1. Converter housing
▲2. Oil pan
▲3. Oil strainer assembly
▲4. Solenoid wiring
▲5. Valve body
▲6. Check valve, spring
▲7. Spring
▲8. Accumulator piston (B-2)
▲9. Accumulator piston (C-2)
▲10. Accumulator piston (B-0)
▲11. Accumulator piston (C-0)
12. Second brake drum gasket
▲13. Snap ring, speed meter sensor drive gear, ball, spacer
▲14. Rotor, key, snap ring









Important operations

1. **Converter housing**
   Remove the six bolts.
   Remove the transmission housing.

2. **Oil pan**

NOTE:

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

Remove the nineteen bolts.
Remove pan by lifting the transmission case.
Seal cutter: 5-8840-2153-0 (J-37228)

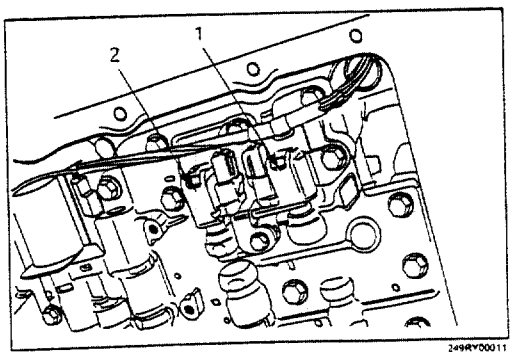
Examine particles in pan

Remove the magnet and use it to collect any steel chips. Look carefully at the chips and particles in the 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

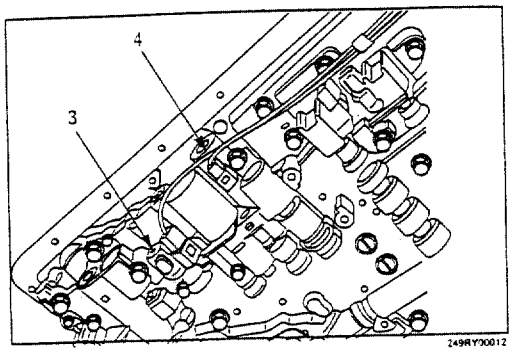
3. **Oil strainer assembly**
   Remove three bolts holding the oil strainer.

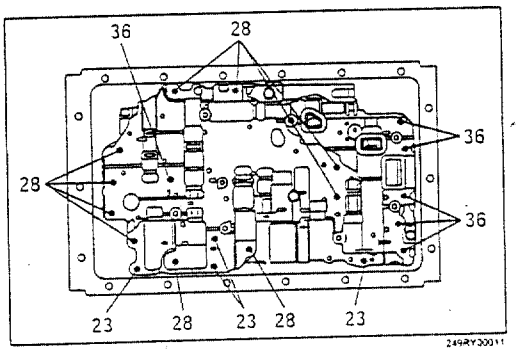
NOTE:

When reassembling components, install a new oil strainer assembly.

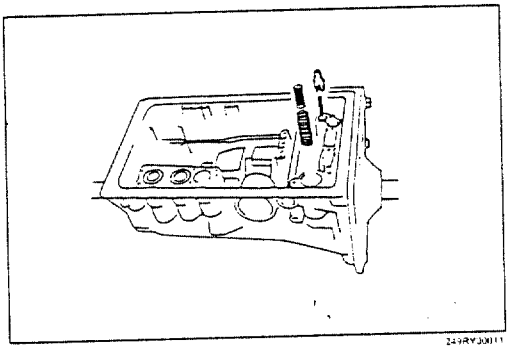


4. **Solenoid wiring**
   Disconnect the connectors from the solenoid S1(1), S2(2), lock-up solenoid (3) and pressure control solenoid (4). Turn over transmission, remove the solenoid wiring stopper plate from the case.
   Pull the wiring out of the transmission case.

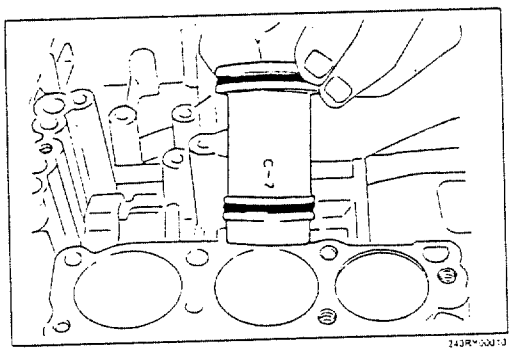




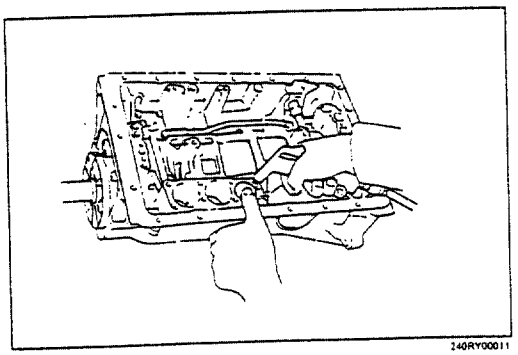
5. **Valve body**
   Remove the twenty bolts from valve body.



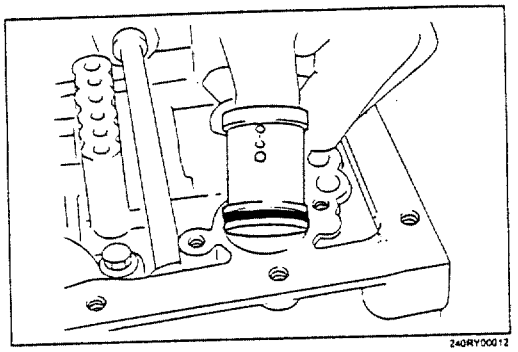
6. **Check valve, spring**
7. **Spring**
   Remove the check valve and spring.
   Remove two springs from C-0 accumulator piston.



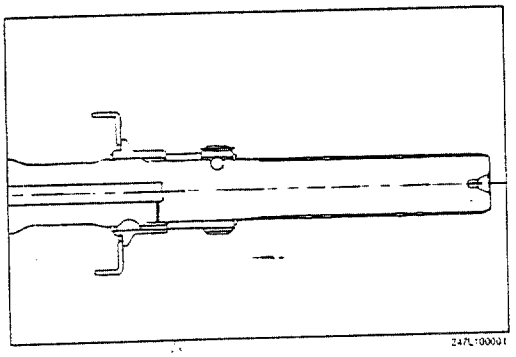
8. **Accumulator piston (B-2)**
9. **Accumulator piston (C-2)**
   Remove accumulator pistons and springs from transmission case.



10. **Accumulator piston (B-0)**
Applying compressed air to the oil hole, remove the B-0 accumulator piston and spring.



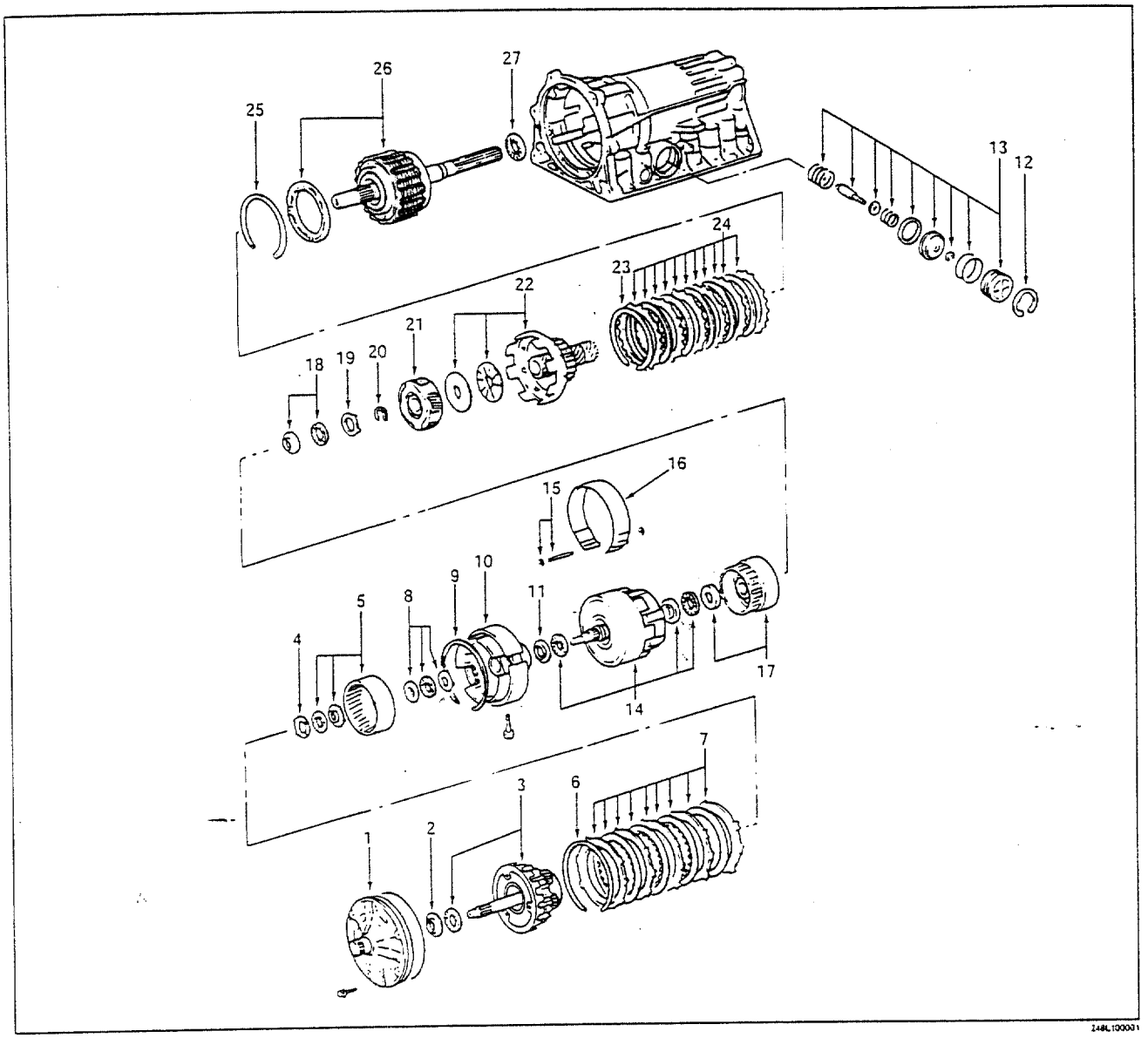
11. **Accumulator piston (C-0)**
Remove the C-0 accumulator piston.



13. **Snap ring, speed meter sensor drive gear, ball, spacer**
Remove the snap ring from the output shaft.
Remove the speed meter sensor drive gear, ball and spacer

14. **Rotor, key, snap ring**
Remove the rotor and key.
Remove the snap ring from the output shaft.

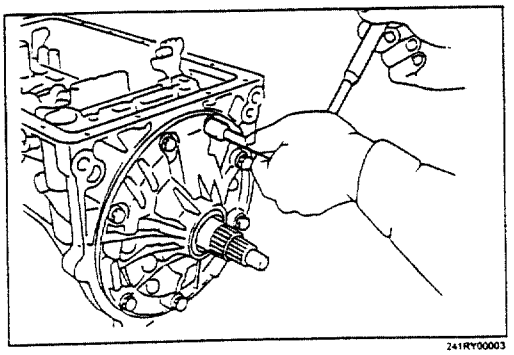
DISASSEMBLY OF MAJOR COMPONENTS (2)



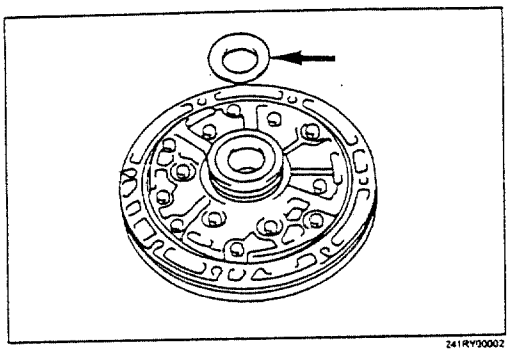
Disassembly steps

▲1. Oil pump
▲2. Race
▲3. OD planetary gear and OD direct clutch (C-0)
▲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 (C-2) and forward clutch (C-1)
▲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

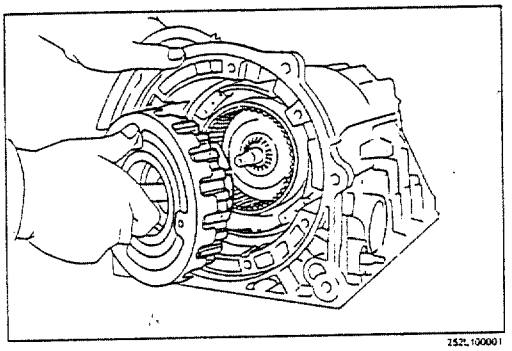
Important operations



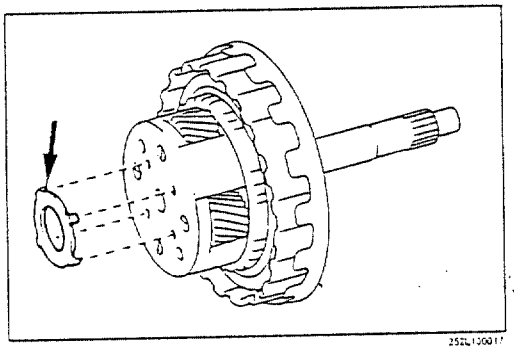
1. **Oil pump**
   Remove seven bolts fixing the oil pump to the transmission case.
   Remove the oil pump.



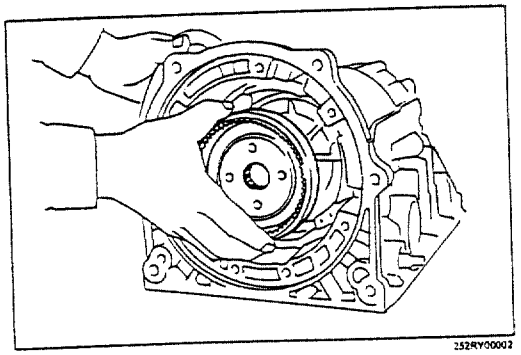
2. **Race**
   Remove race from oil pump.



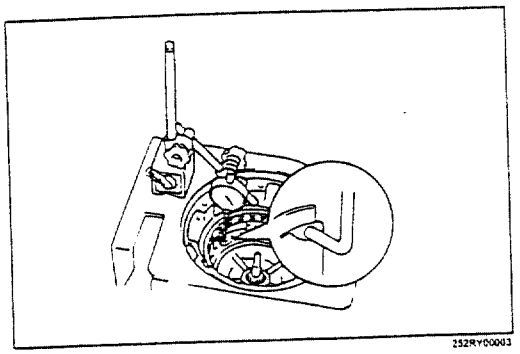
3. **OD planetary gear and OD direct clutch (C-0)**
   Remove the overdrive planetary gear and overdrive direct clutch with thrust needle bearing from the transmission case.



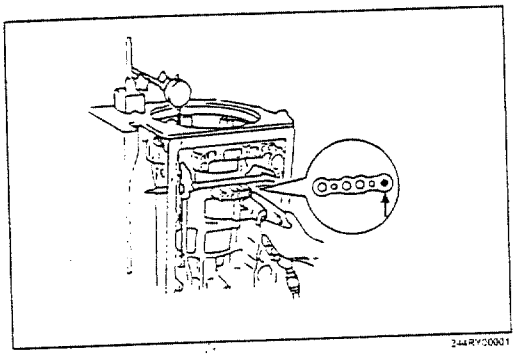
4. **Race**
   Remove the race from OD planetary gear.



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



Check piston stroke of overdrive brake (B-0)
Place a dial indicator onto the overdrive brake piston as shown in the figure.



Measure the stroke applying and releasing the compressed air (392 - 785kPa or 4 - 8kg/cm^2) as shown in the figure.

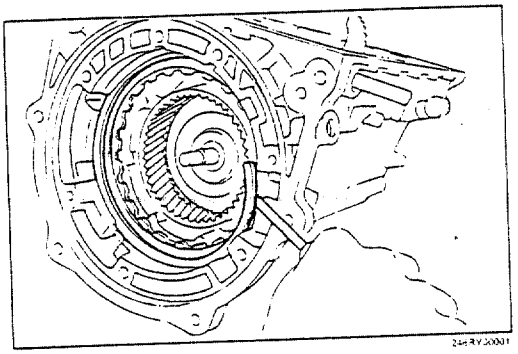
mm (in.)

Piston stroke	1.40-1.70 (0.0551-0.0669)

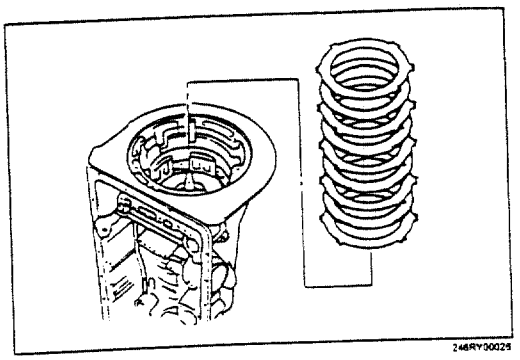
If the values are nonstandard, select another flange.

Available flange sizes — mm (in.)

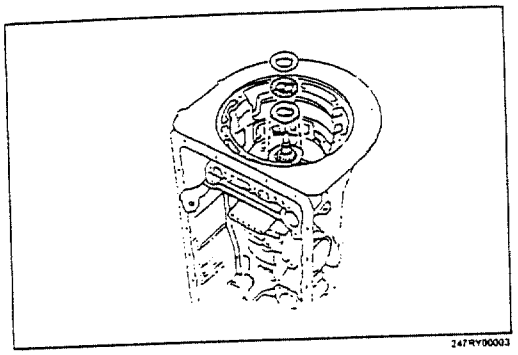
3.3 (0.130)	3.8 (0.150)
3.5 (0.138)	3.9 (0.154)
3.6 (0.142)	4.0 (0.158)
3.7 (0.146)	



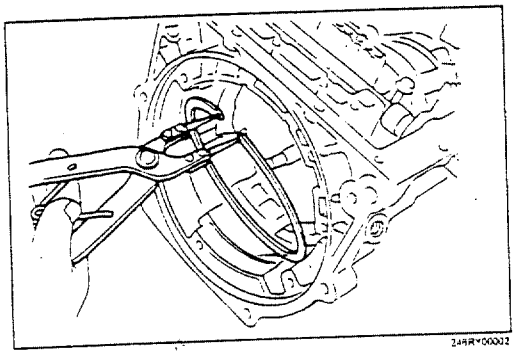
6. **Snap ring**
   Remove the snap ring.



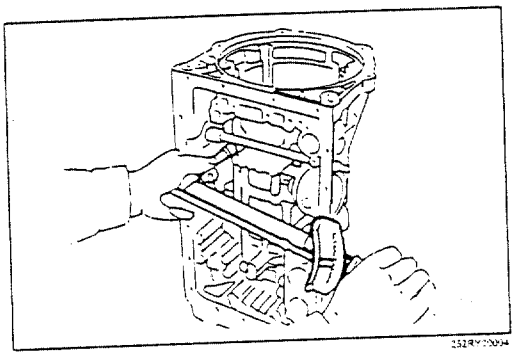
7. **Flange, plate and disc (B-0)**
   Remove two flanges, three plates and four discs.



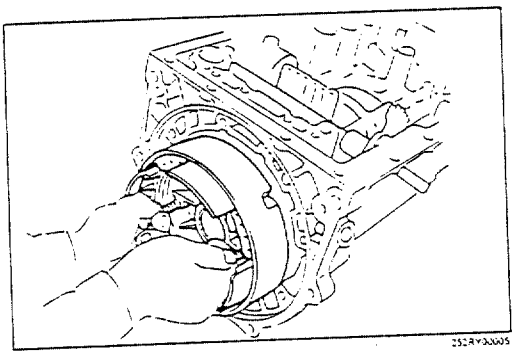
8. **Bearing and race**
   Remove the thrust bearing and two races.



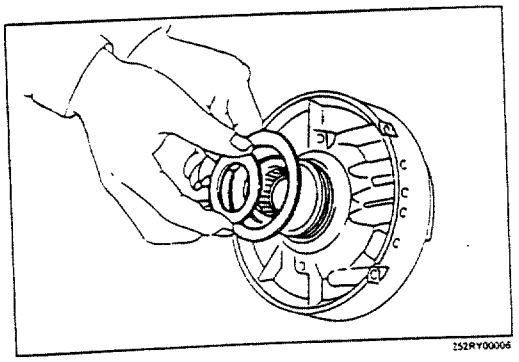
9. **Snap ring**
   Using snap ring pliers, remove the snap ring.



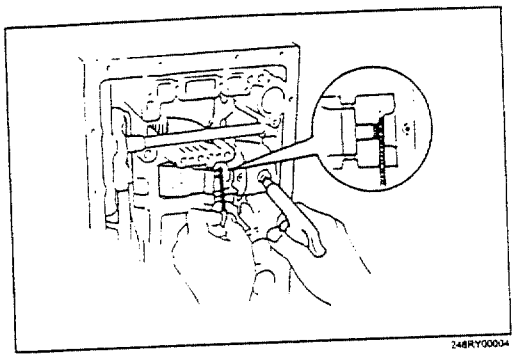
10. **OD support**
    Remove two bolts fixing the overdrive support assembly to the case.



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



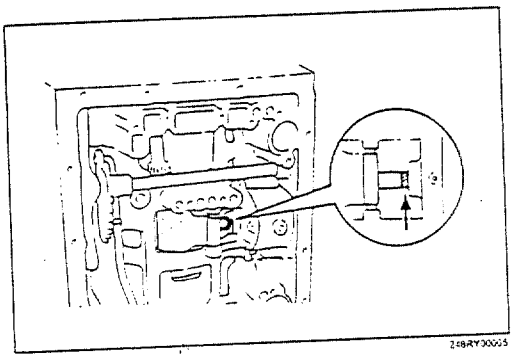
11. **Race**
Remove two races from OD support.



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 (392 - 785 kPa or 4 - 8kg/cm^2) as shown in the figure.

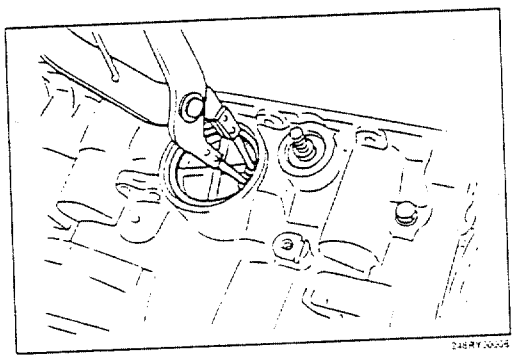
mm (in.)

Piston stroke	1.5 - 3.0 (0.059 - 0.118)

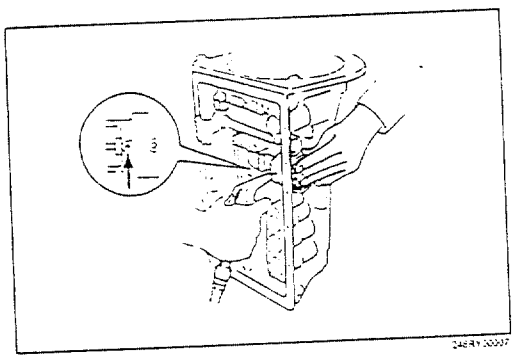


If the values are nonstandard, replace piston rod and recheck piston stroke. If piston stroke is nonstandard, replace brake band.
There are two piston rods.

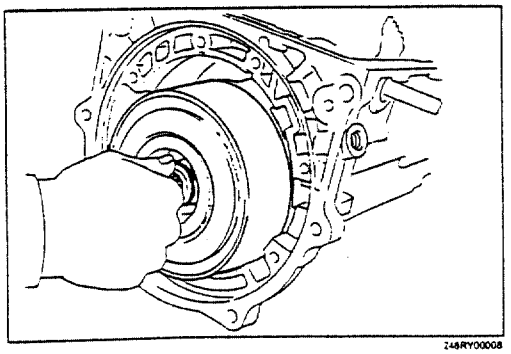
Rod length	71.4mm (2.811 in.)
	72.9mm (2.870 in.)



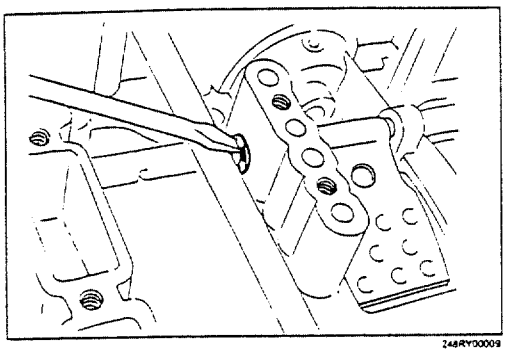
12. **Snap ring**
Using snap ring pliers, remove the snap ring.



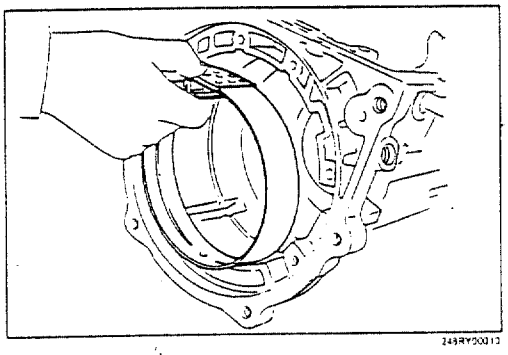
13. **Second coast brake piston assembly**
Applying compressed air to the oil hole, remove the second coast brake piston assembly.



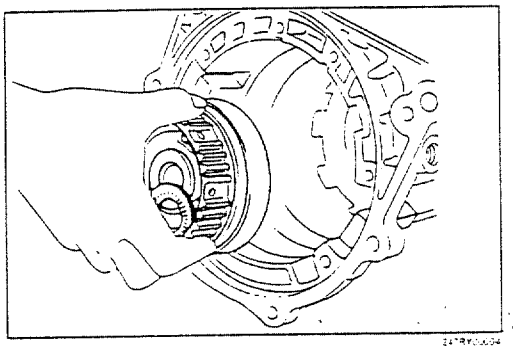
14. **Direct clutch (C-2) and forward clutch (C-1)**
Remove the direct clutch and forward clutch from the case.



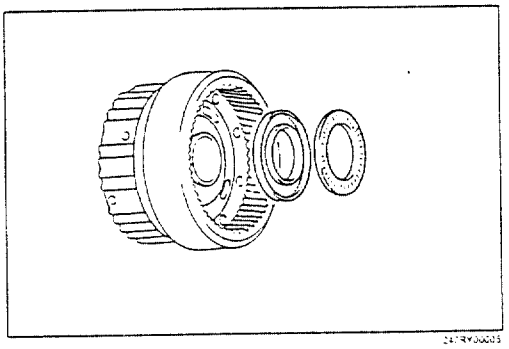
15. **E-ring and pin**
Remove the E-ring from the pin.
Remove the pin from the brake band.



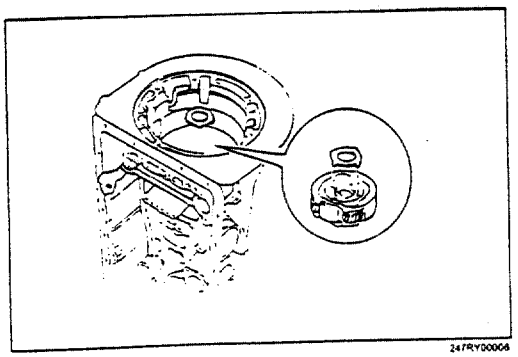
16. **Second coast brake band**
Remove the second coast brake band from the case.



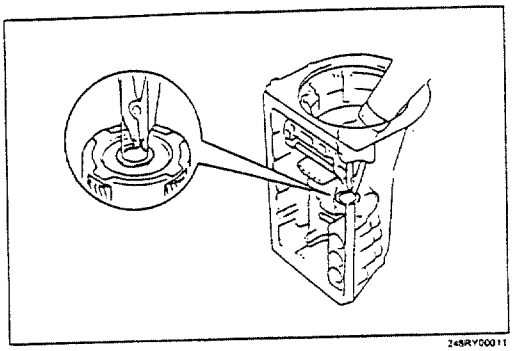
17. **Front planetary ring gear**
Remove the front planetary ring gear from the case.



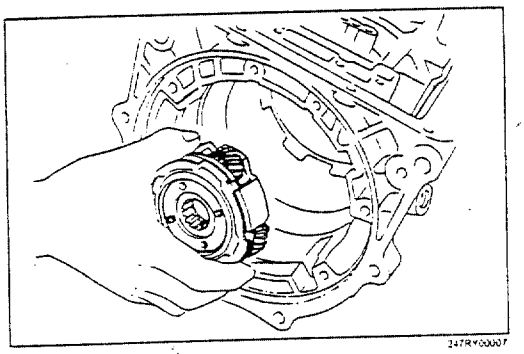
18. **Bearing and race**
Remove the bearing and race.



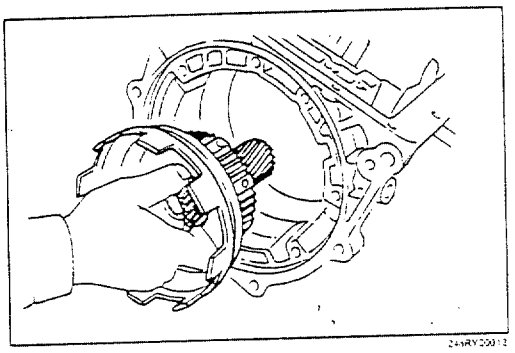
19. **Race**
Remove the race.



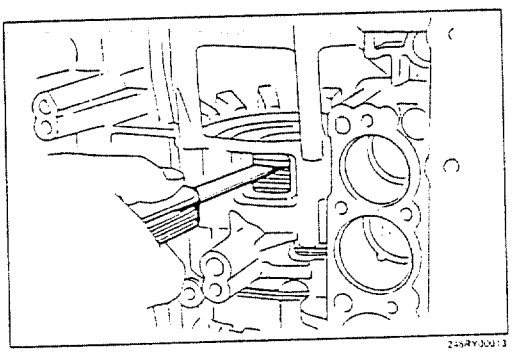
20. **Snap ring**
Using snap ring pliers, remove the snap ring.



21. **Front planetary gear**
Remove the front planetary gear from the case.



22. **Drum and one-way clutch**
Remove sun gear input drum and one-way clutch.

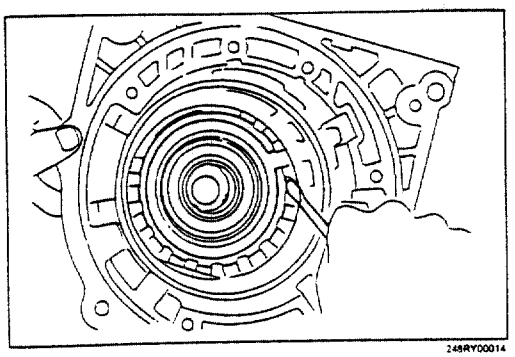


Check pack clearance of second brake (B-2)
Using a feeler gauge, measure the clearance between the snap ring and flange as shown in the figure.

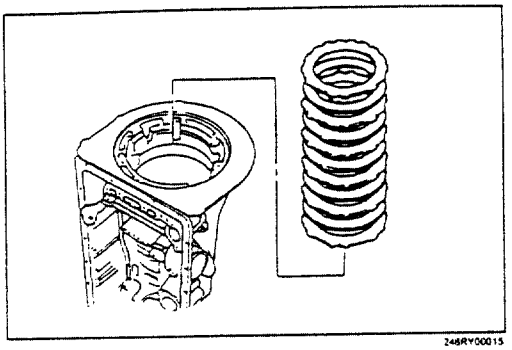
mm (in.)

Clearance	0.62 - 1.98 (0.0244 - 0.0780)

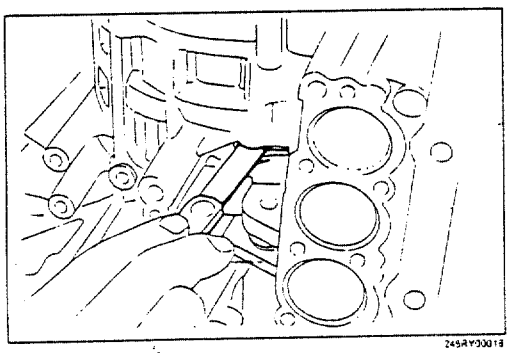
If the values are nonstandard, replace the discs.



23. **Snap ring**
Using two screwdrivers, remove the snap ring.



24. **Flange, plate and disc (B-2)**
Remove the flange, five discs and five plates.



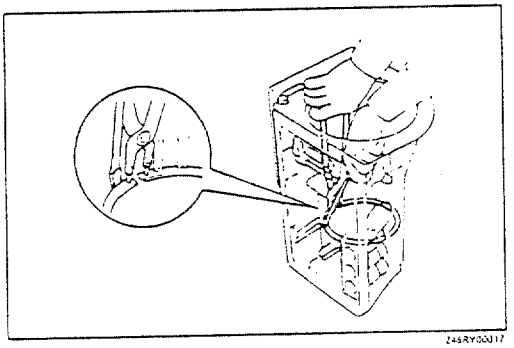
Check pack clearance of first and reverse brake (B-3)
Using a feeler gauge, measure the clearance between the plate and second brake drum as shown in the figure.

mm (in.)

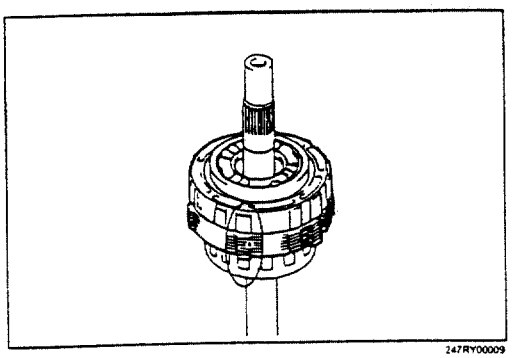
Clearance	0.60 – 1.12 (0.236 – 0.0441)

If the values are nonstandard, select another flange.

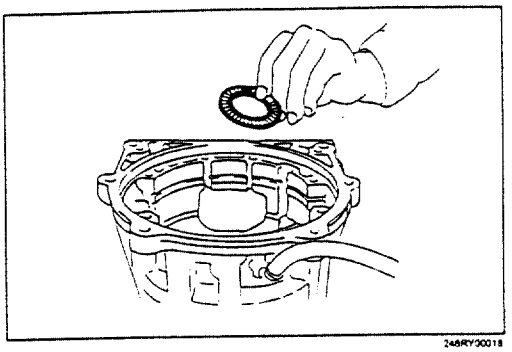
Available flange sizes	mm (in.)
4.0 (0.158)	4.8 (0.189)
4.2 (0.165)	5.0 (0.197)
4.4 (0.173)	5.2 (0.205)
4.6 (0.181)	5.4 (0.213)



25. **Snap ring**
Using snap ring pliers, remove the snap ring.



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



27. **Bearing**
Remove the assembled thrust bearing and race from the case.

DISASSEMBLY, INSPECTION AND REASSEMBLY OF MINOR COMPONENTS

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 a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.
Recommended ATF type BESCO ATF II or III / DEXRON® II, II D, III

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean and any fluid passages and holes 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:

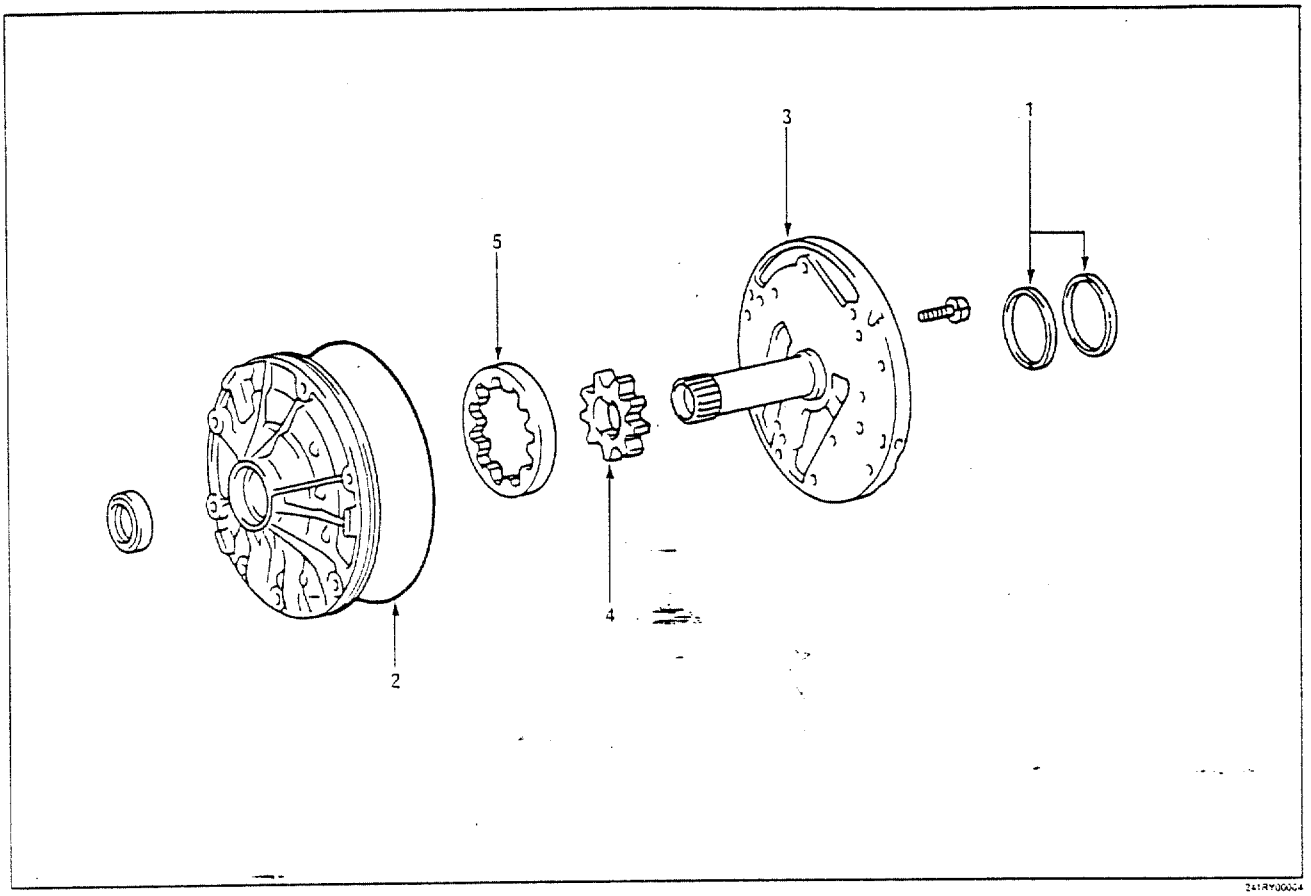
1. After cleaning, the parts should be arranged in proper order to allow performing inspection, repairs, and reassembly with efficiency.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New brakes and clutches that are to be used for replacement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

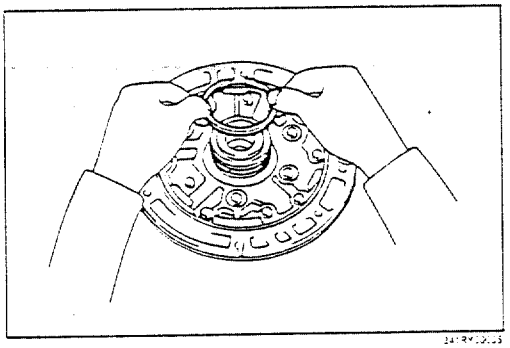
OIL PUMP

DISASSEMBLY



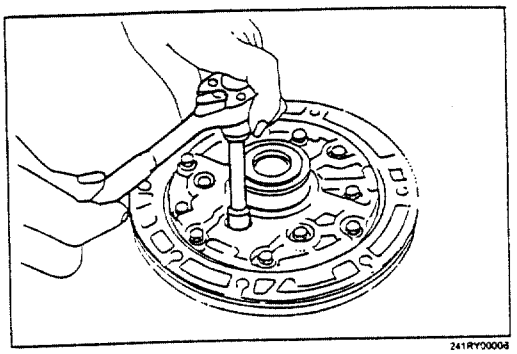
Disassembly steps

▲1. Oil seal ring
▲2. O-ring
▲3. Stator shaft
4. Oil pump drive gear
5. Oil pump driven gear



Important operations

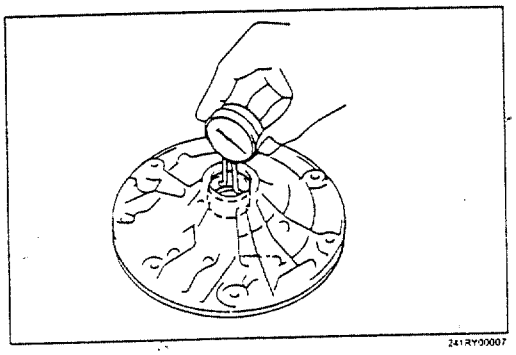
1. **Oil seal ring**
   Use torque converter as work stand.
   Remove 2 oil seal rings from stator shaft.
2. **O-ring**
   Remove O-ring.



3. **Stator shaft**
   Remove 13 bolts, and then remove the stator shaft from oil pump body.
   Then remove drive and driven gear.

INSPECTION AND REPAIR

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



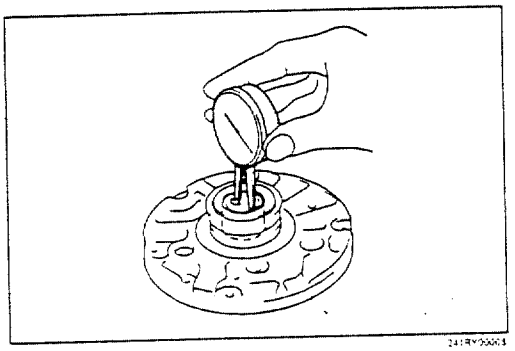
Check oil pump body bushing

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

mm (in.)

Maximum inside diameter	38.19 (1.5035)

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



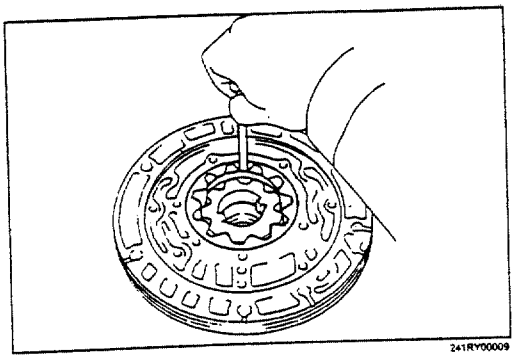
Check stator shaft bushing

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

mm (in.)

Maximum inside diameter	Front side	23.8 (0.9378)
	Rear side	29.12 (1.1465)

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



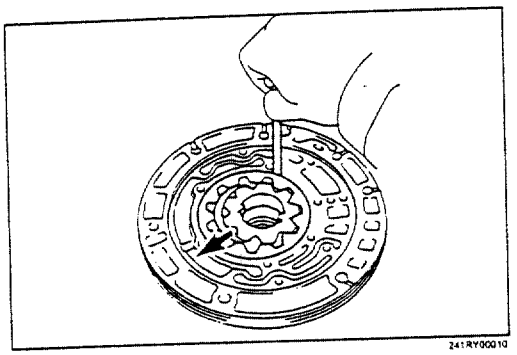
Check tip clearance of both gears

Measure between the gear teeth and the cresent-shaped part of the pump body.

mm (in.)

Standard tip clearance	0.11 - 0.14 (0.0043 - 0.0055)
Maximum tip clearance	0.3 (0.012)

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



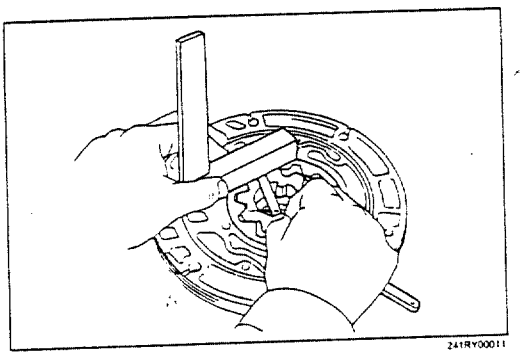
Check body clearance of driven gear

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

mm (in.)

Standard body clearance	0.07 - 0.15 (0.0028 - 0.0059)
Maximum body clearance	0.3 (0.012)

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



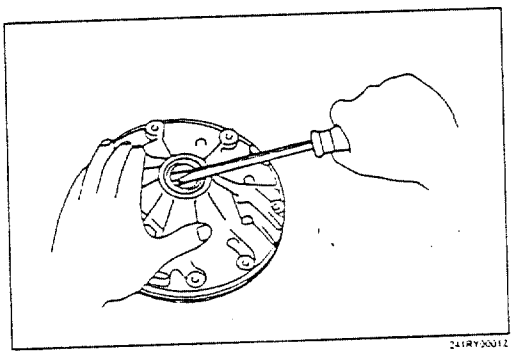
Check side clearance of both gears

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

mm (in.)

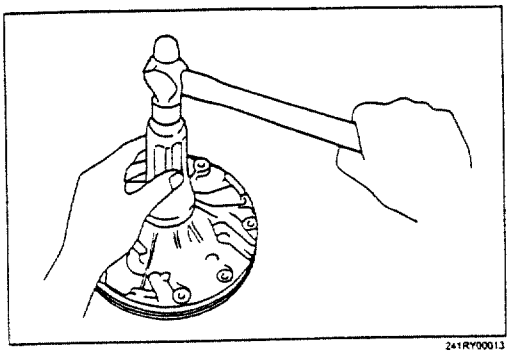
Standard side clearance	0.02 - 0.05 (0.0008 - 0.0020)
Maximum side clearance	0.1 (0.004)

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



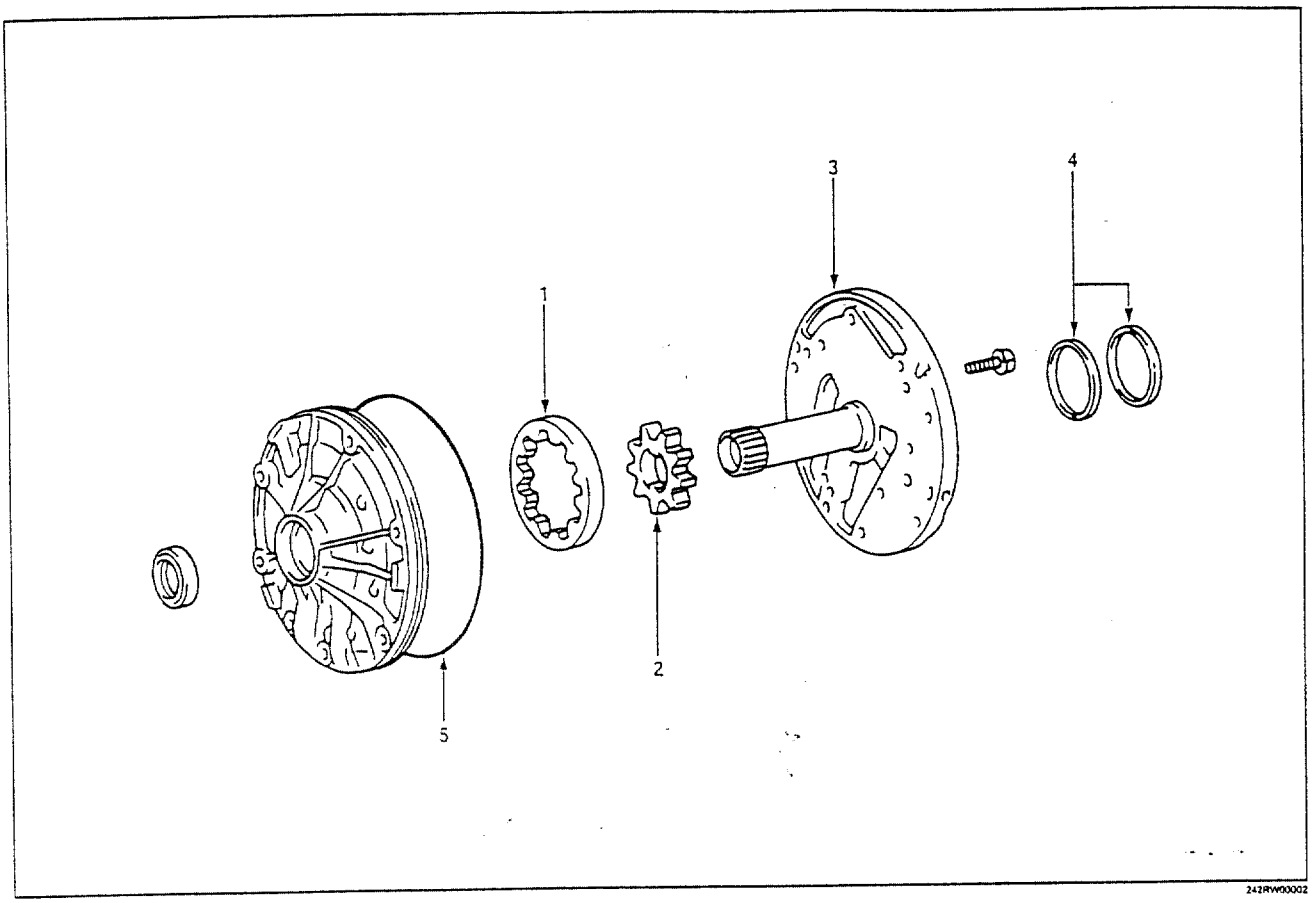
Check oil seal

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



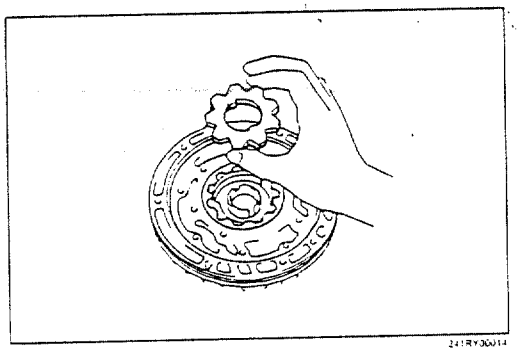
Using special tool, install a new oil seal.
The oil seal end should be flush with the outer edge of the pump body.
Oil seal installer: 5-8840-0123-0 (J-25045)
Coat the oil seal lip with multi purpose grease.

REASSEMBLY



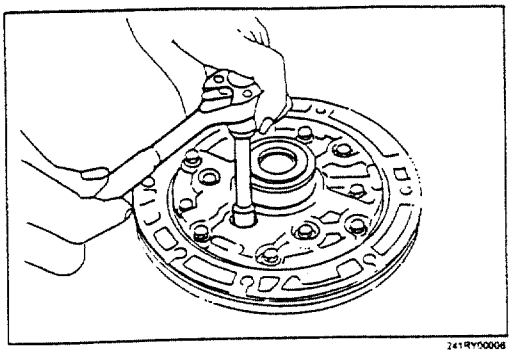
Reassembly steps

- ▲1. Oil pump driven gear
- 2. Oil pump drive gear
- ▲3. Stator shaft
- ▲4. Oil seal ring
- ▲5. O-ring



Important operations

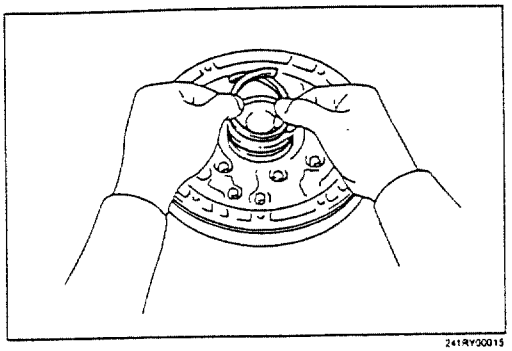
1. **Oil pump driven gear**
   Place the oil pump body on the torque converter.
   Coat the driven gear and drive gear with ATF.
   Install the driven gear and drive gear.



3. **Stator shaft**
   Align the stator shaft with the bolt holes.
   Tighten the thirteen bolts.

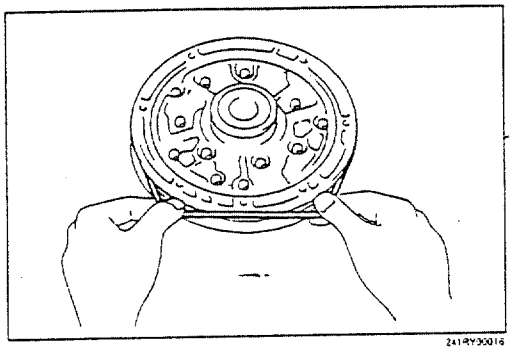
N.m (kg.m/lb in)

Torque	10 (1.0 / 86.74)



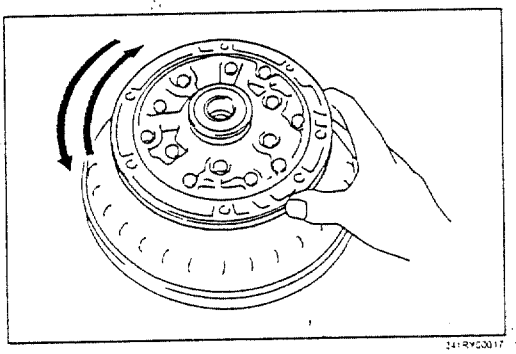
4. **Oil seal ring**
   Coat the oil seal rings with ATF.
   Contract the oil seal rings as shown, and install them onto the stator shaft.

NOTE:
Do not spread the ring ends too much.



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

O-ring size (Reference)	mm (in.)
Inside diameter	204.9 (8.067)
Thickness	3.5 (0.138)

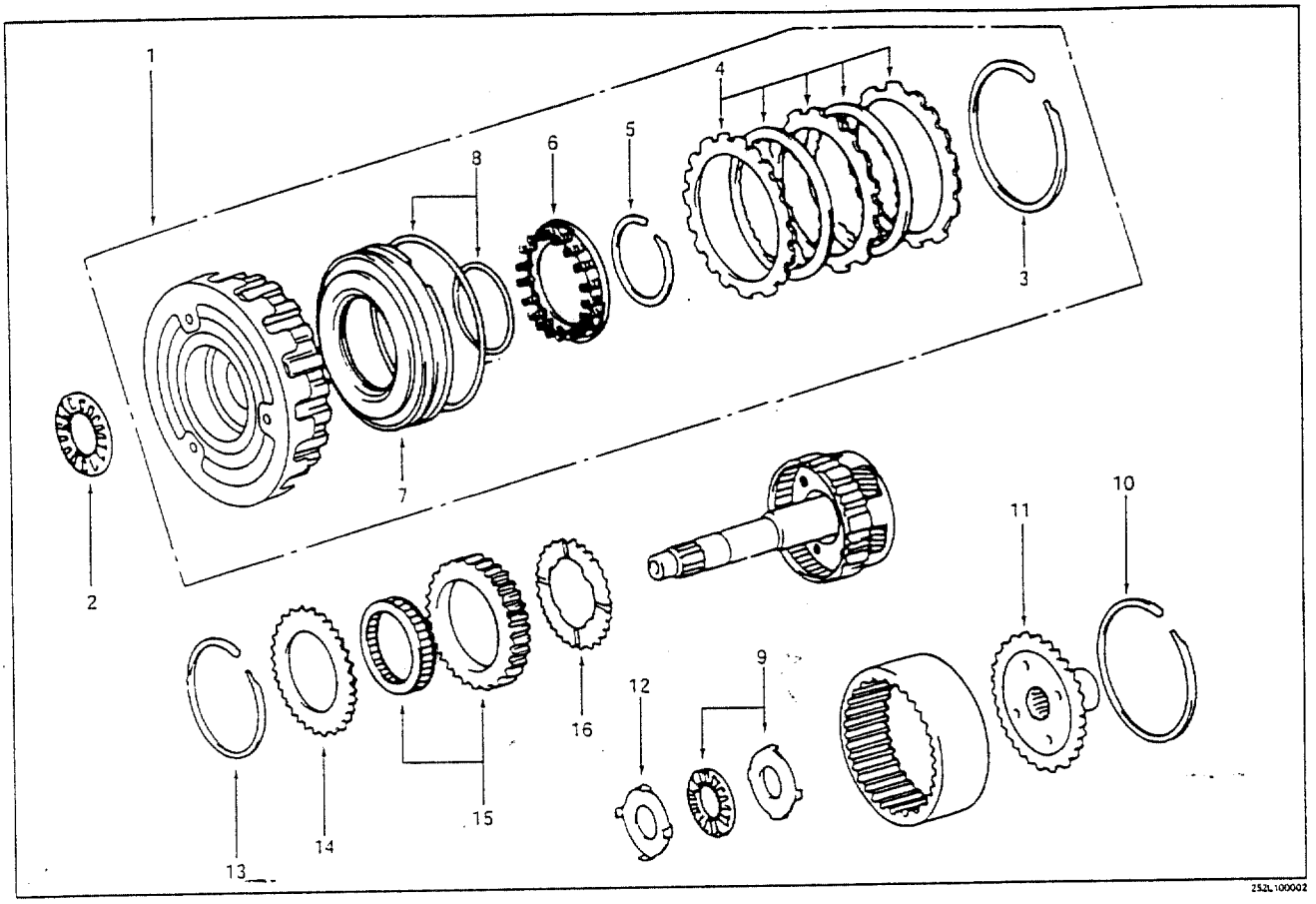


Check oil pump drive gear rotation

Make sure the drive gear rotates smoothly when installed to the torque converter.

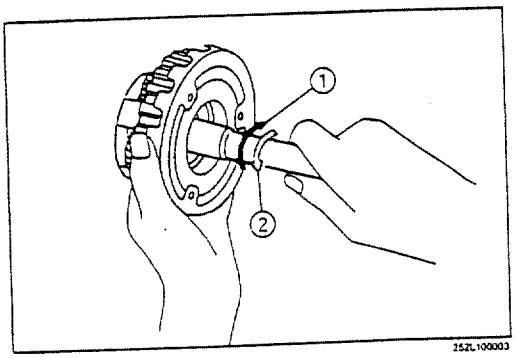
OD PLANETARY GEAR AND OD DIRECT CLUTCH ASSEMBLY (C-0)

DISASSEMBLY



Disassembly steps

▲1. OD direct clutch assembly
▲2. Thrust bearing
▲3. Snap ring
▲4. Flange, disc and plate
▲5. Snap ring
▲6. Piston return spring
▲7. OD direct clutch piston with O-ring
▲8. O-ring
▲9. Thrust bearing
▲10. Snap ring
▲11. Ring gear flange
12. Race
▲13. Snap ring
▲14. Retaining plate
▲15. OD one-way clutch
16. Thrust washer

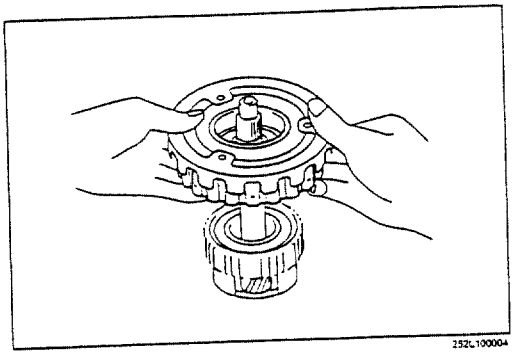


Important operations

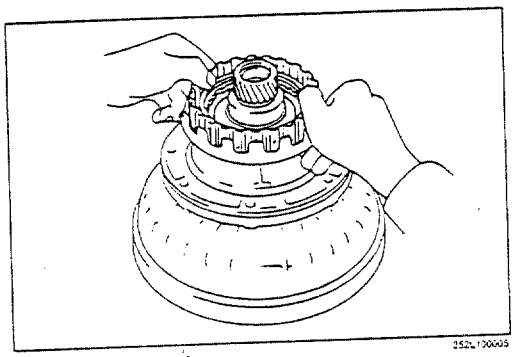
Check operation of one-way clutch

Hold the OD direct clutch drum and turn the input shaft.
The input shaft should turn freely clockwise and should lock counterclockwise.

(1): Free
(2): Lock

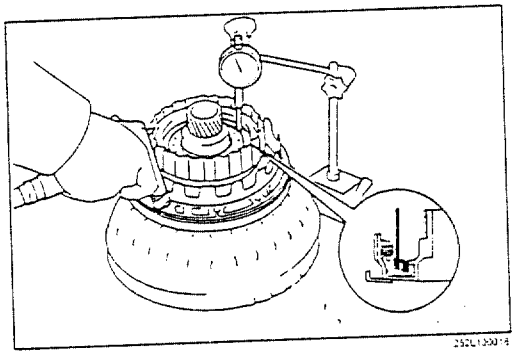


1. **OD direct clutch assembly**
   Remove OD direct clutch assembly from OD planetary gear.
2. **Thrust bearing**
   Then remove thrust bearing with the race from OD direct clutch drum.



Check piston stroke of OD direct clutch (C-O)

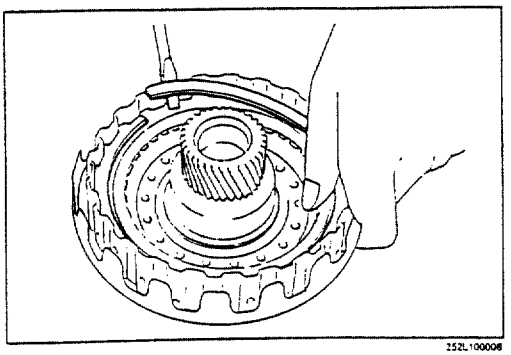
Place the oil pump onto the torque converter, and then place the OD direct clutch assembly onto the oil pump.



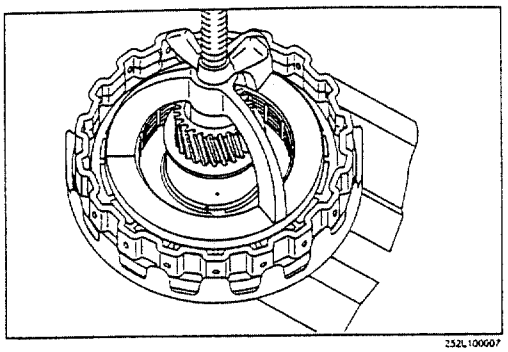
Use a dial indicator, measure the OD direct clutch piston stroke applying and releasing the compressed air (392 - 785 kPa or 4 - 8 kg/cm^2) as shown.

mm (in.)

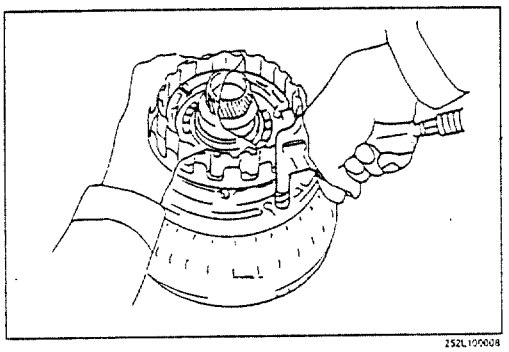
Piston stroke	1.85 - 2.15 (0.0728 - 0.0847)



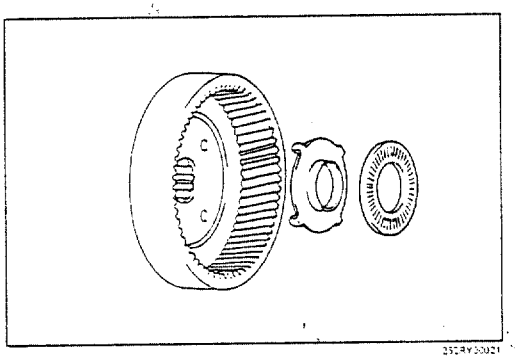
3. **Snap ring**
   Remove snap ring from clutch drum.
4. **Flange, disc and plate**
   Remove flange, two discs and two plates.



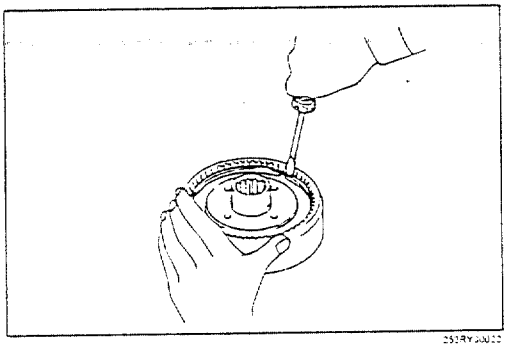
5. **Snap ring**
   Place special tool and a suitable ring on the spring retainer and compress the return spring. Using snap ring pliers, remove the snap ring.
   Spring compressor: 5-8840-0195-0 (J-23327-1)
6. **Piston return spring**
   Remove piston return spring.



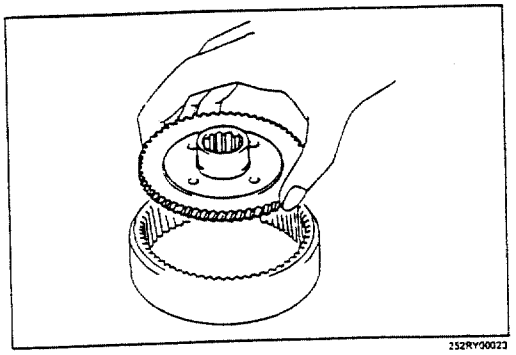
7. **OD direct clutch piston with O-ring**
   Place the oil pump onto the torque converter and then place the OD direct clutch onto the oil pump. Holding the OD direct clutch piston by hand, apply compressed air to the oil pump to remove the OD direct clutch piston.
   Remove the OD direct clutch piston.
8. **O-ring**
   Remove two O-rings from piston.



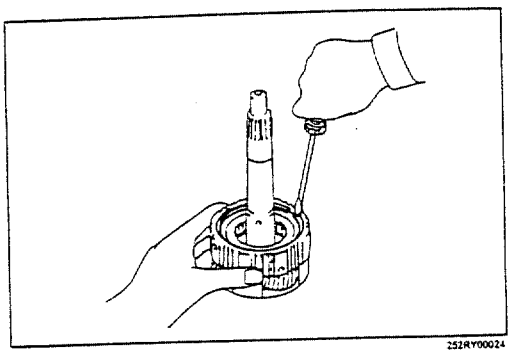
9. **Thrust bearing**
   Remove bearing and race from OD planetary ring gear.



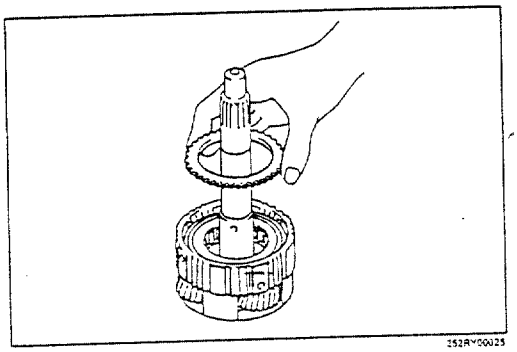
10. **Snap ring**
    Remove snap ring.



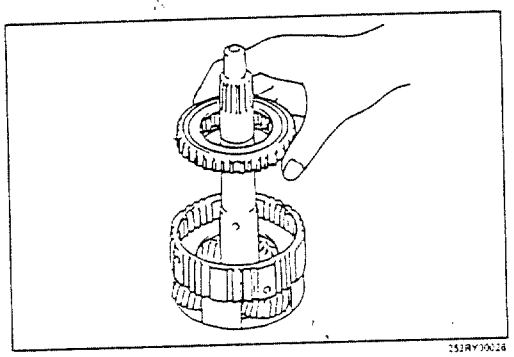
11. **Ring gear flange**
Remove ring flange from OD planetary ring gear.



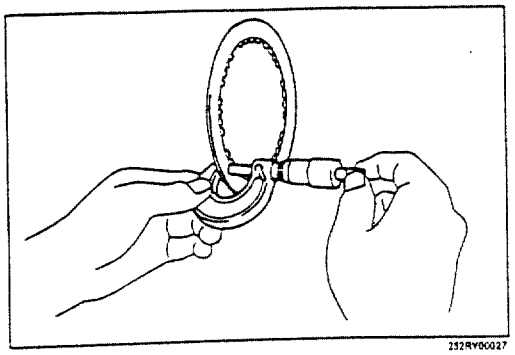
13. **Snap ring**
Remove snap ring, using screwdriver.



14. **Retaining plate**
Remove retaining plate from OD planetary gear.



15. **OD one-way clutch**
Remove OD one-way clutch with outer race.



INSPECTION AND REPAIR

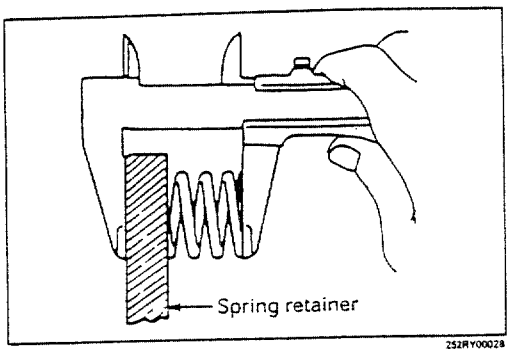
Check discs

Using a micrometer, measure the thickness of the discs.

mm (in.)

Minimum thickness	2.04 (0.0803)

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

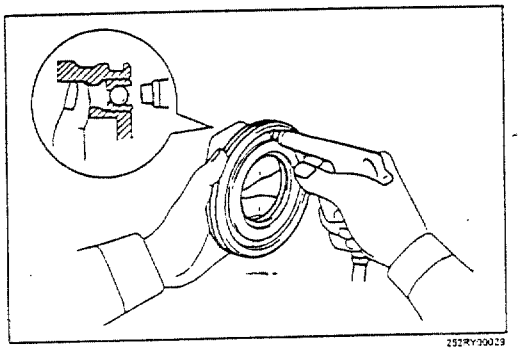


Check piston return spring

Using calipers, measure the free length of the return spring.

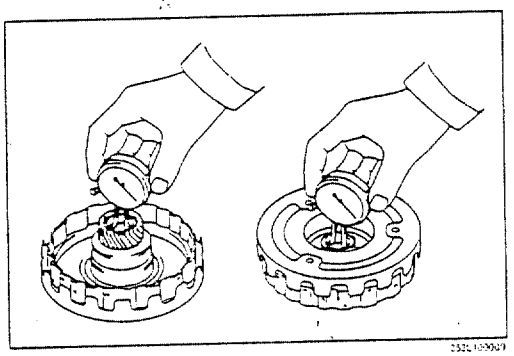
mm (in.)

Standard length	15.8 (0.622)



Check OD 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.



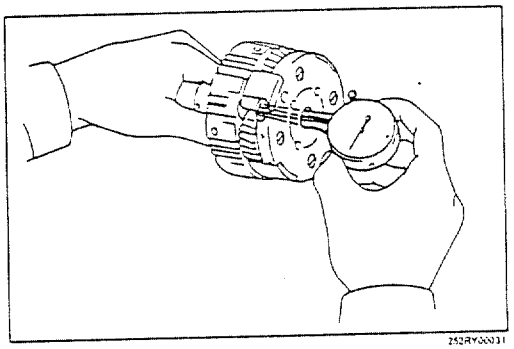
Check OD direct clutch drum bushings

Using a dial indicator, measure the inside diameter of the clutch drum bushings.

mm (in.)

Maximum inside diameter	27.11 (1.0673)

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



Check OD planetary gear bushing

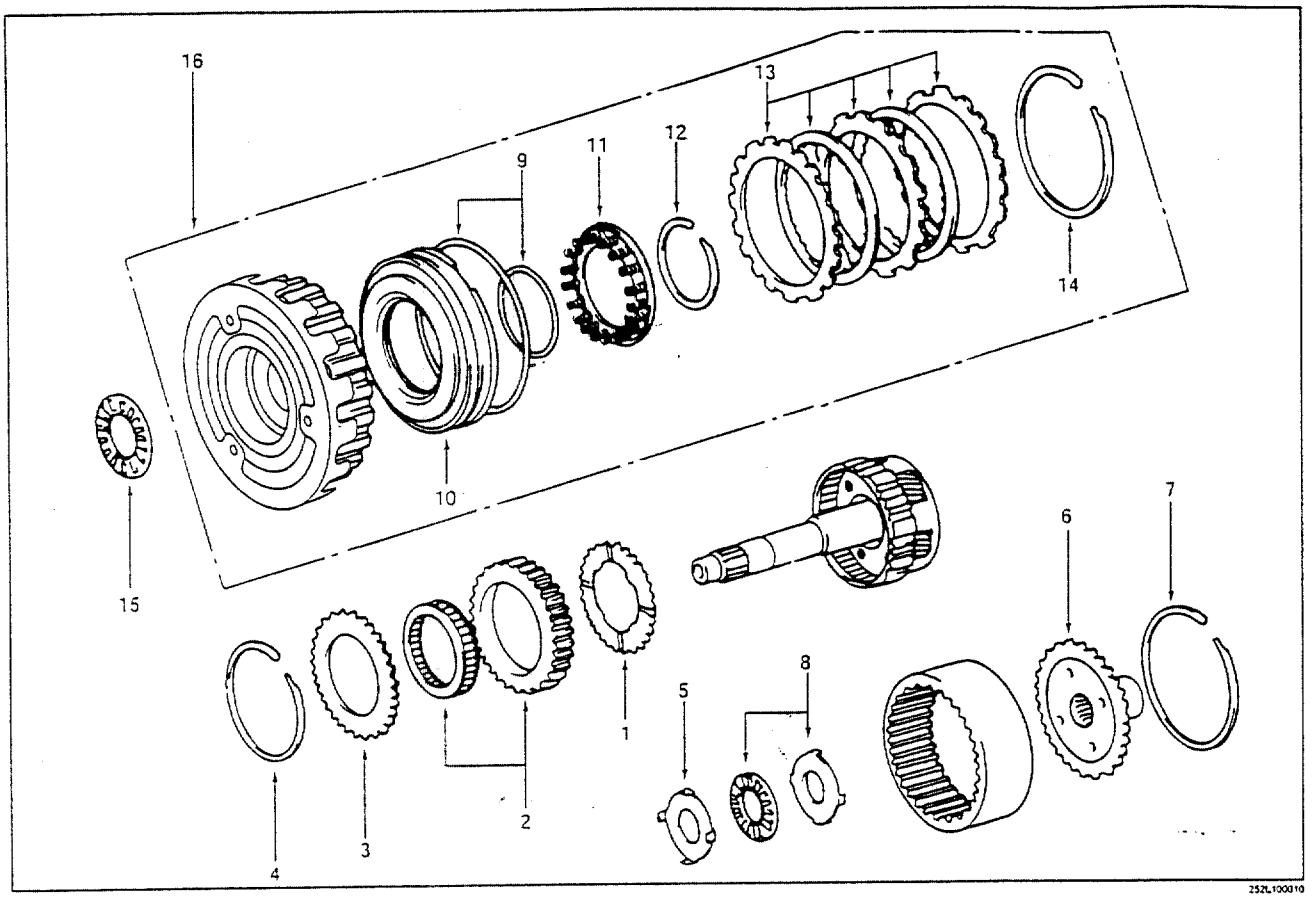
Using a dial indicator, measure the inside diameter of the planetary gear bushing.

mm (in.)

Maximum inside diameter	11.27 (0.4437)

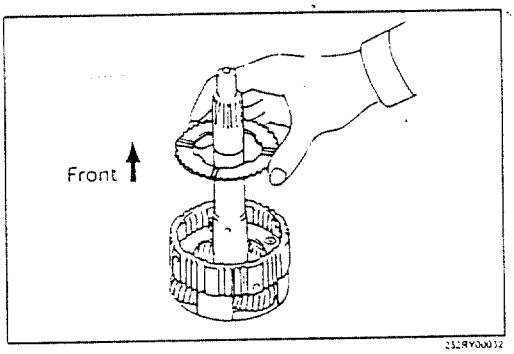
If the inside diameter is greater than the maximum, replace the planetary gear.

REASSEMBLY



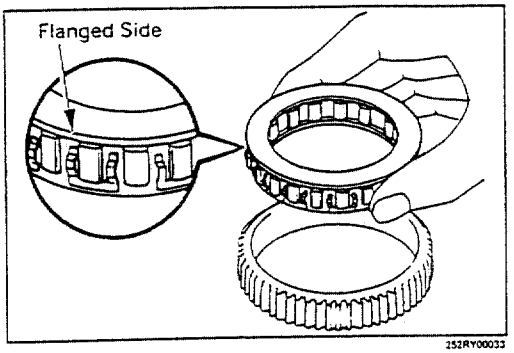
Reassembly steps

- ▲1. Thrust washer
- ▲2. OD one-way clutch
- ▲3. Retaining plate
- ▲4. Snap ring
- ▲5. Race
- ▲6. Ring gear flange
- ▲7. Snap ring
- ▲8. Thrust bearing
- ▲9. O-ring
- ▲10. OD direct clutch piston with O-ring
- ▲11. Piston return spring
- ▲12. Snap ring
- ▲13. Flange, disc and plate
- ▲14. Snap ring
- ▲15. Thrust bearing
- ▲16. OD direct clutch assembly

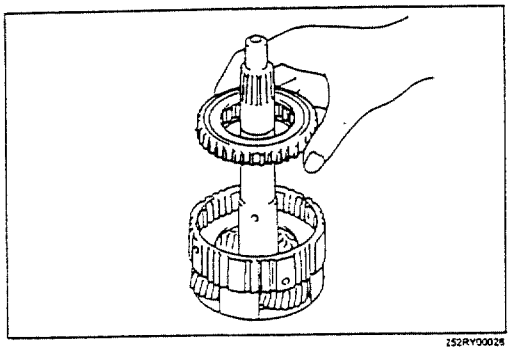


Important operations

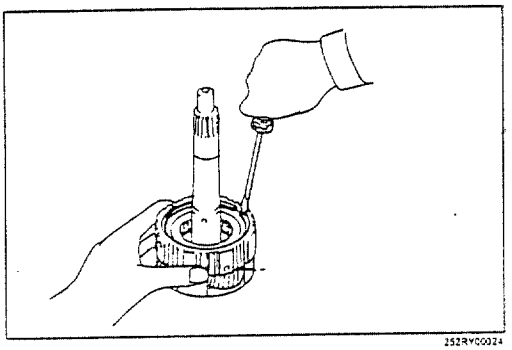
1. **Thrust washer**
   Install the thrust washer to the OD planetary gear, facing the grooved side upward.



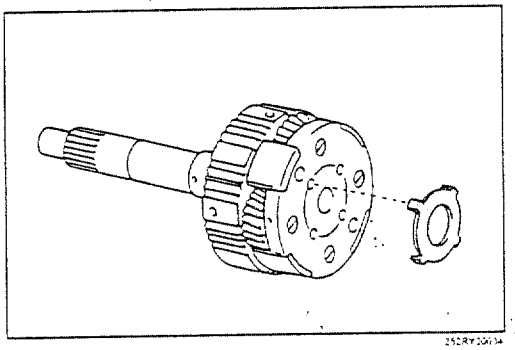
2. **OD one-way clutch**
   Install the one-way clutch into the outer race, with the flanged side of the one-way clutch facing upward.



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

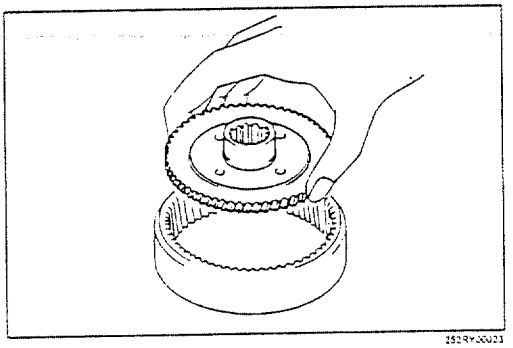


3. **Retaining plate**
4. **Snap ring**
   Install retaining plate, then install snap ring, using a screwdriver.

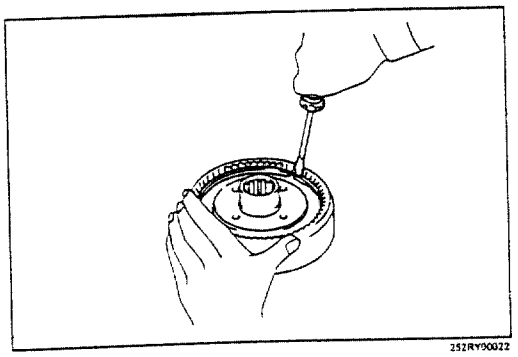


5. **Race**
   Coat the race with petroleum jelly and install it to the planetary gear.

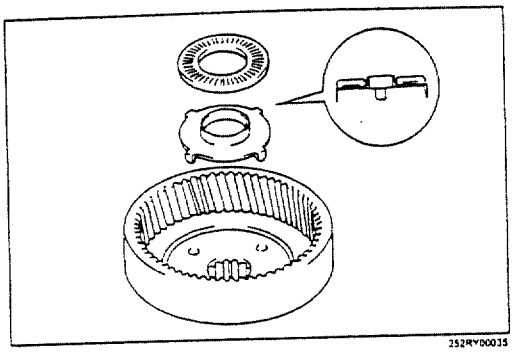
Race diameter (Reference)	mm (in.)
Inside diameter	27.3 (1.075)
Outside diameter	41.8 (1.646)



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



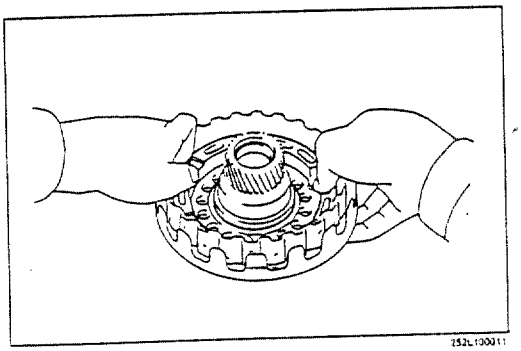
7. **Snap ring**
   Install snap ring, using a screwdriver.



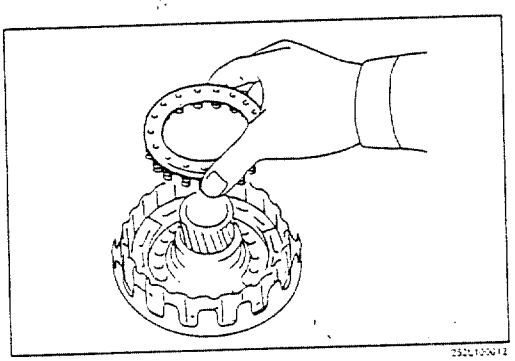
8. **Thrust bearing**
   Coat the race and bearing with petroleum jelly and install them onto the OD planetary ring gear.

Race and bearing diameter (Reference) mm (in.)

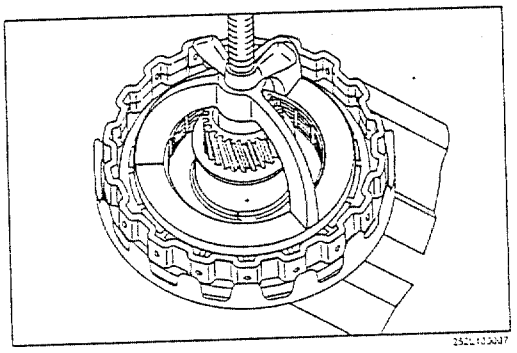
	Inside	Outside
Race	24.2 (0.953)	47.8 (1.882)
Bearing	26.0 (1.024)	46.8 (1.843)



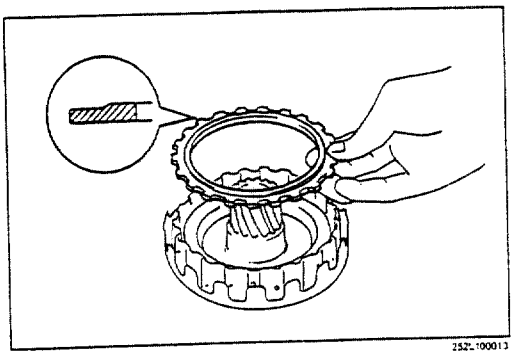
9. **O-ring**
   Coat new O-rings with ATF and install them on the OD direct clutch piston.
10. **OD direct clutch piston with O-ring**
    Being careful not to damage the O-rings, press in the OD direct clutch piston into the clutch drum, using both hands.



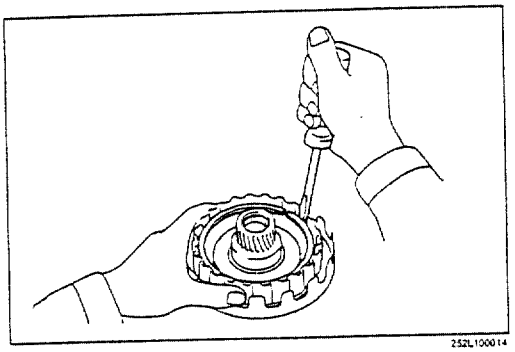
11. **Piston return spring**
    Install piston return spring.



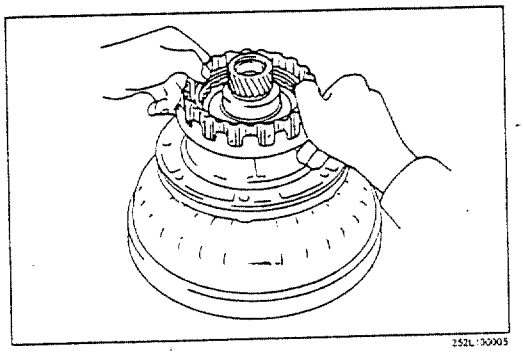
12. **Snap ring**
    Place special tool and a suitable ring on the spring retainer, and compress the return spring.
    Spring compressor: 5-8840-0195-0 (J-23327-1)
    Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



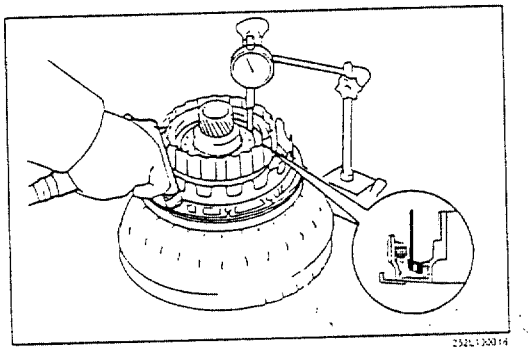
13. Flange, disc and plate
Install two plates and two discs then install the flange, with the flat side facing downward.



14. Snap ring
Install snap ring.



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.



Using a dial indicator, measure the OD direct clutch piston stroke by applying and releasing the compressed air (392 - 785 kPa or 4 - 8 kg/cm^2) as shown.

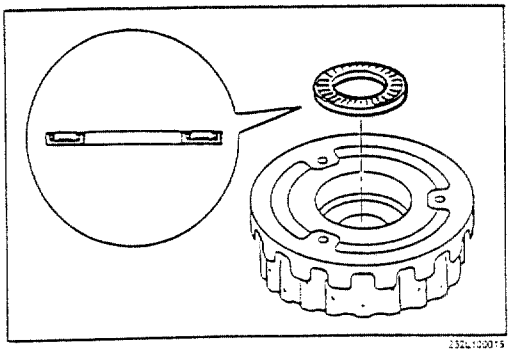
mm (in.)

Piston stroke	1.85 - 2.15 (0.0728 - 0.0847)

If the piston stroke is not within specification, replace the disc and recheck the piston stroke.
If the piston stroke is non standard, select another flange.
There are six flange sizes.

mm (in.)

No.	Flange thickness	No.	Flange thickness
14	3.8 (0.150)	18	3.4 (0.134)
15	3.7 (0.146)	19	3.3 (0.130)
16	3.6 (0.142)	20	3.2 (0.126)
17	3.5 (0.138)	21	3.1 (0.122)

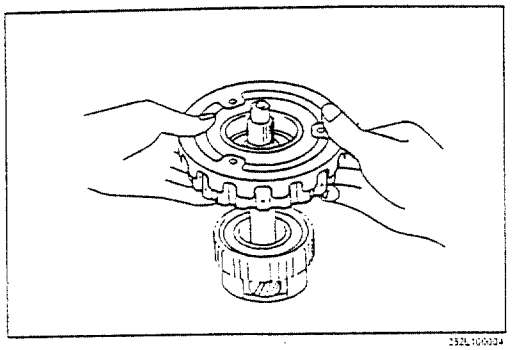


15. Thrust bearing

Coat the assembled bearing and race with petroleum jelly and install it with the race side facing downward.

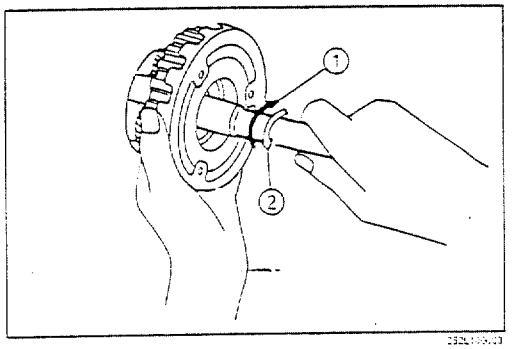
Assembled bearing and race (Reference) mm (in.)

Inside diameter	29.1 (1.146)
Outside diameter	50.2 (1.976)



16. OD direct clutch assembly

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



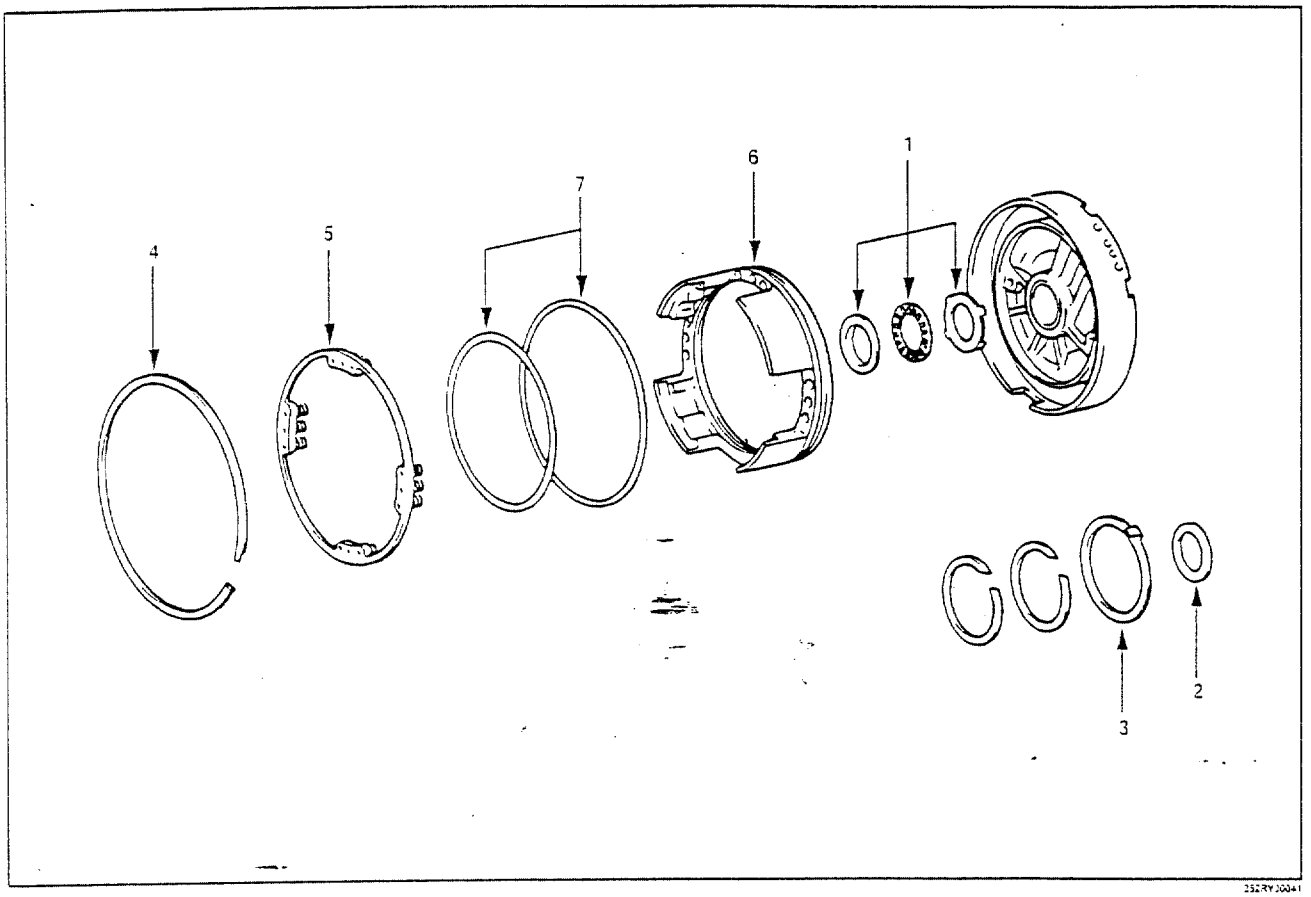
Check operation of one-way clutch.

Hold the OD direct clutch drum and turn the input shaft.
The input shaft should turn freely clockwise and should lock counterclockwise.

(1): Free
(2): Lock

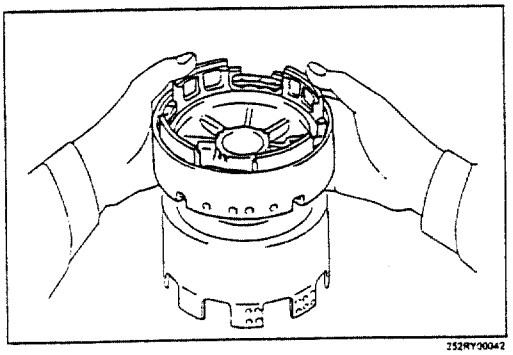
OD SUPPORT ASSEMBLY

DISASSEMBLY



Disassembly steps

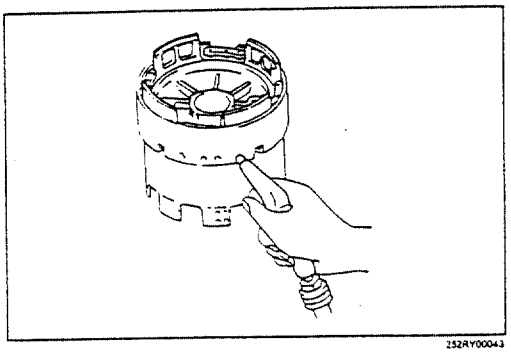
1. Thrust bearing
2. Race
3. Thrust washer (plastic)
▲4. Snap ring
5. Piston; return spring
▲6. OD brake piston
7. O-ring



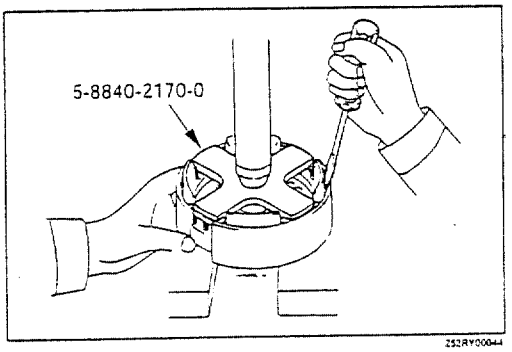
Important operations

Check OD brake piston

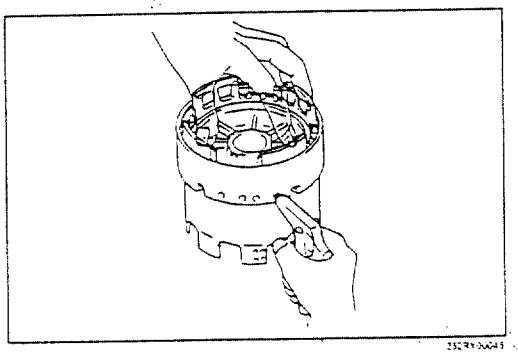
Place the OD support assembly onto the direct clutch assembly.



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



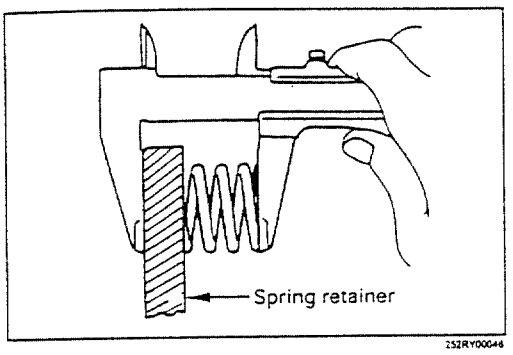
4. **Snap ring**
   Place special tool on the spring retainer, and compress the return spring with a shop press.
   Spring compressor: 5-8840-2170-0 (J-37233)
   Remove the snap ring with a screwdriver.



6. **OD brake piston**
   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.

INSPECTION AND REPAIR

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



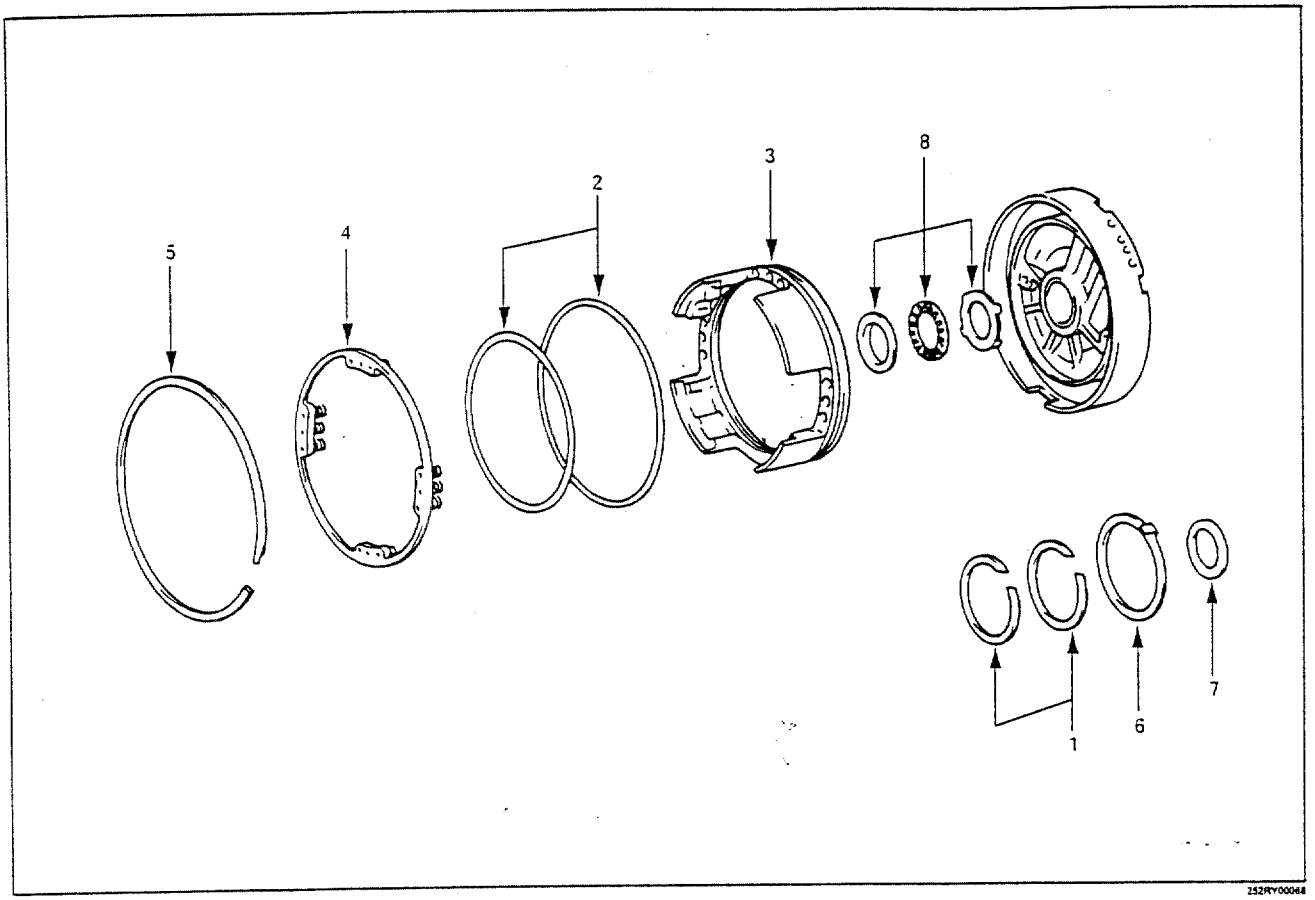
Check piston return spring

Using calipers, measure the free length of the return spring.

mm (in.)

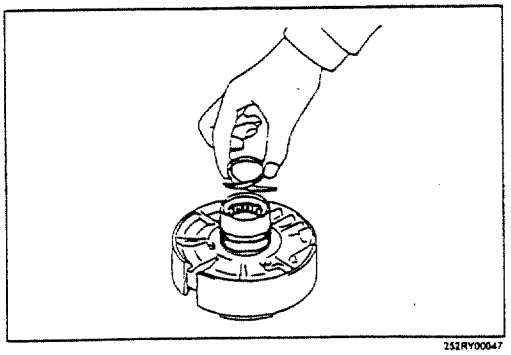
Standard	17.03 (0.670)

REASSEMBLY



Reassembly steps

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

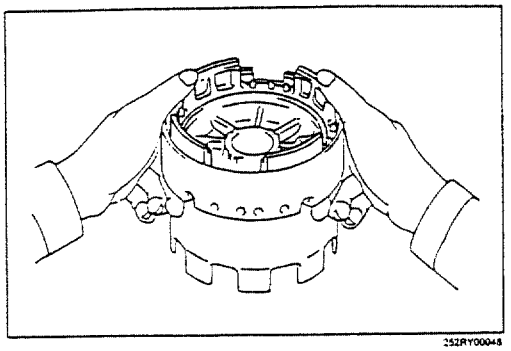


Important operations

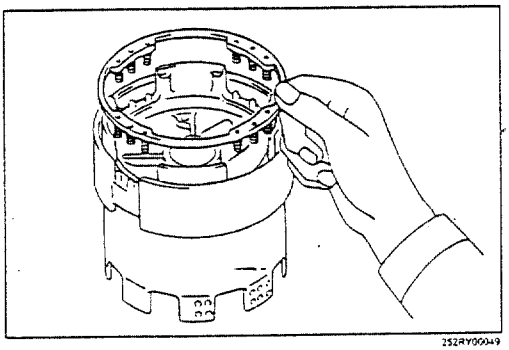
1. **Oil seal ring**
   Coat the two oil seal rings with ATF.
   Contract the oil seals as shown, and install them onto the OD support.

NOTE:

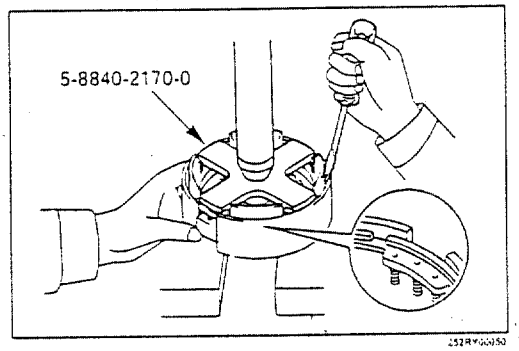
Do not spread the ring ends more than necessary.



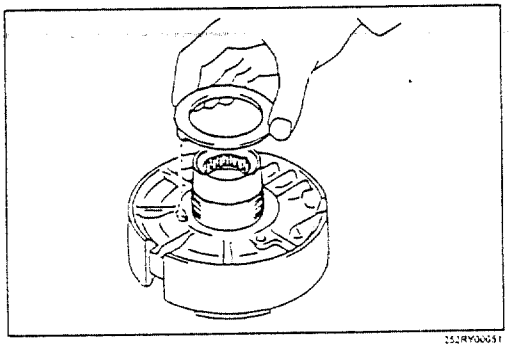
2. **O-ring**
   Coat two new O-rings with ATF and install them on the OD brake piston.
3. **OD brake piston**
   Being careful not to damage the O-rings, press in the brake piston into the OD support, using both hands.



4. **Piston return spring**
   Install piston return spring.



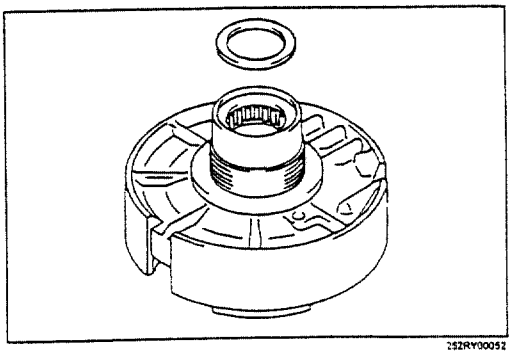
5. **Snap ring**
   Place special tool on the spring retainer, and compress the return spring with a shop press.
   Spring compressor: 5-8840-2170-0 (J-37233)
   Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with cutout portion of the OD support.



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

NOTE:

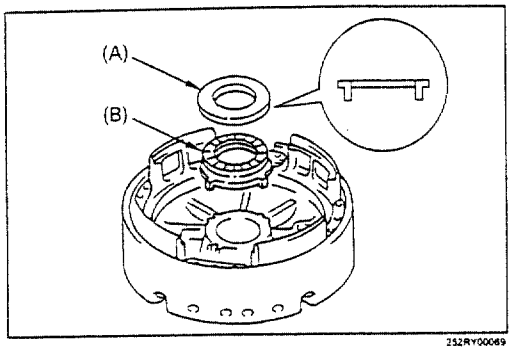
Make sure that the lug fits into the hole on the OD support.



7. **Race**
   Coat the race with petroleum jelly, and install it onto the OD support.

Race diameter (Reference) mm (in.)

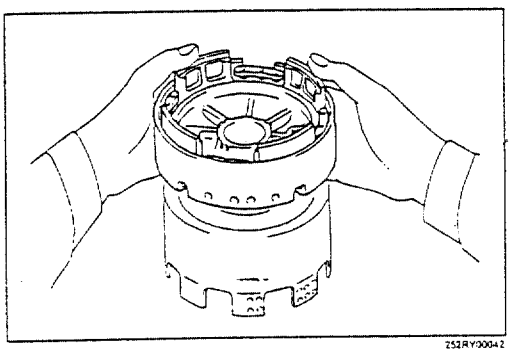
Inside diameter	36.8 (1.449)
Outside diameter	50.9 (2.004)



8. **Thrust bearing**
   Turn over OD support.
   Coat the two races with petroleum jelly, and install them onto the OD support.

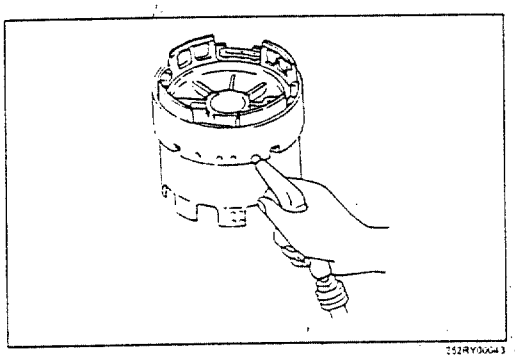
Race and bearing diameter (Reference) mm (in.)

	Inside	Outside
Race (A)	37.2 (1.465)	58.8 (2.315)
Bearing	36.5 (1.437)	48.5 (1.910)
Race (B)	33.7 (1.327)	50.1 (1.973)



Check OD brake piston

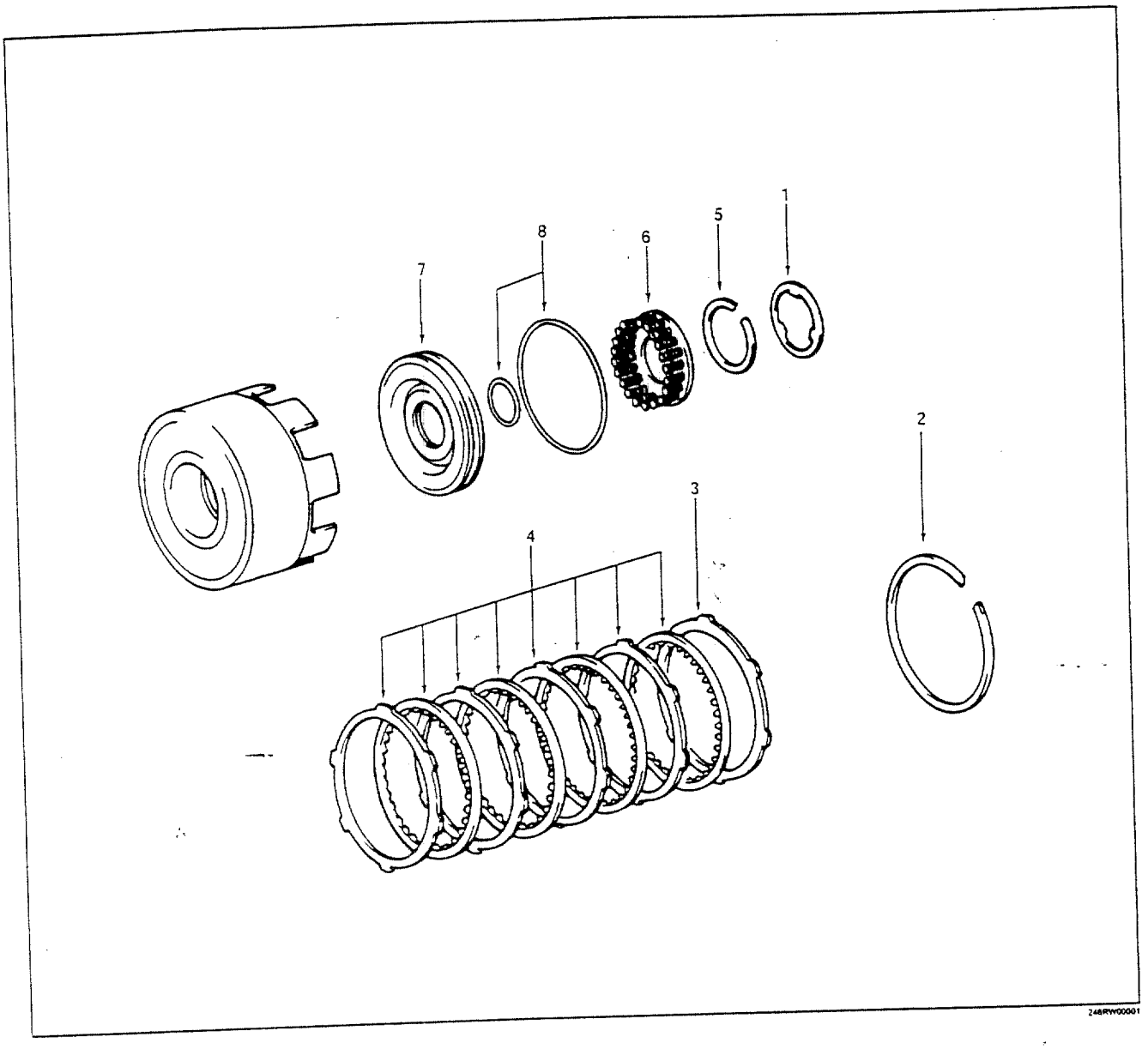
Place the OD support assembly onto the direct clutch assembly.



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

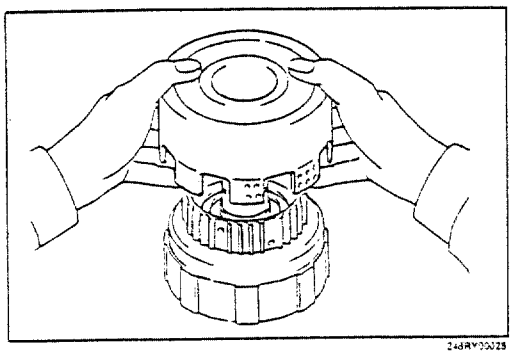
DIRECT CLUTCH ASSEMBLY (C-2)

DISASSEMBLY



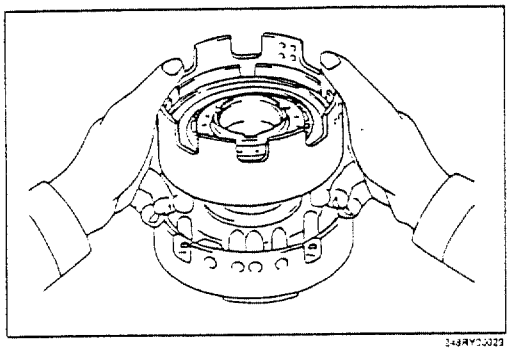
Disassembly steps

1. Clutch drum thrust washer
2. Snap ring
3. Flange
4. Plate and disc
▲5. Snap ring
6. Piston return spring
▲7. Direct clutch piston
8. O-ring



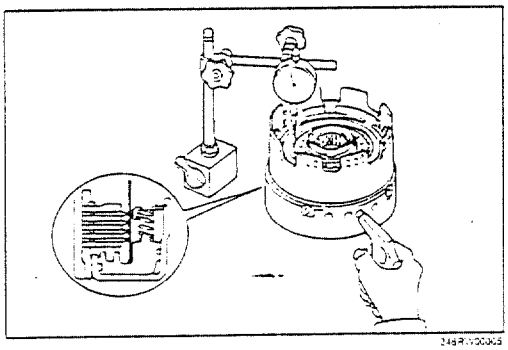
Important operations

Remove direct clutch drum assembly from forward clutch assembly.



Check piston stroke of direct clutch (C-2)

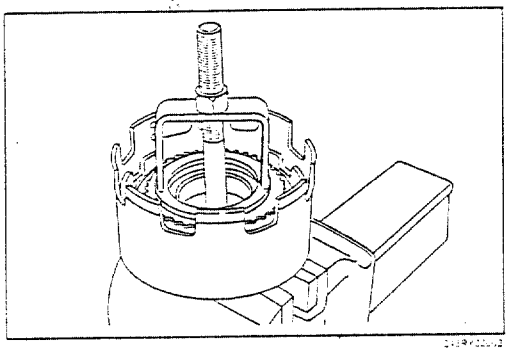
Place the direct clutch assembly onto the OD support assembly.



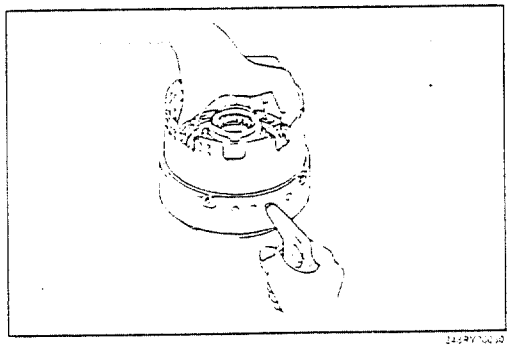
Using a dial indicator, measure the direct clutch piston stroke by applying and releasing compressed air (392 - 785 kPa or 4 - 8 kg/cm^2) as shown.

mm (in.)

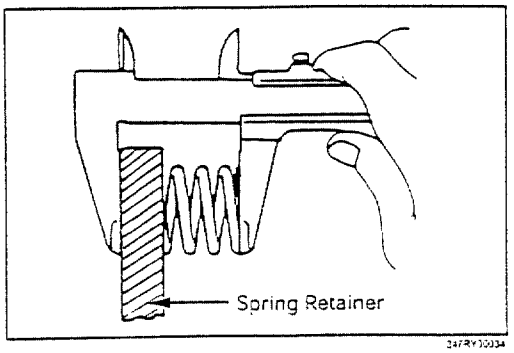
Piston stroke	1.37 – 1.60 (0.0539 – 0.0630)

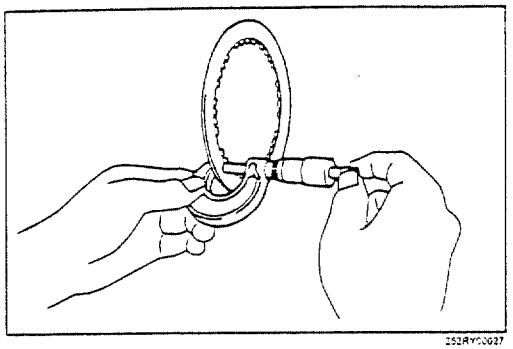


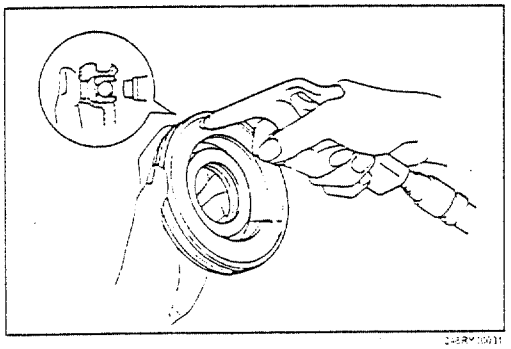
5. Snap ring
   Place special tool and a suitable ring on the spring retainer and compress the return spring. Using snap ring pliers, remove the snap ring.
   Spring compressor: 5-8840-0254-0 (J-25048)

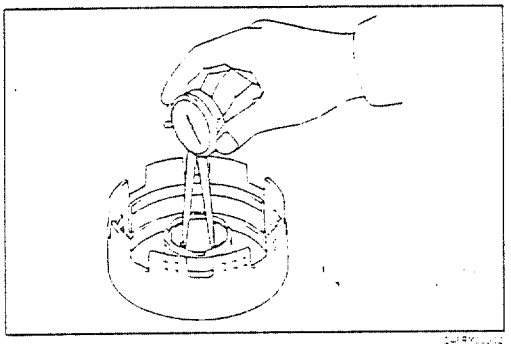


7. Direct clutch piston
   Place the direct clutch drum onto the OD support.
   Holding the direct clutch piston by hand, apply compressed air to the OD support to remove the direct clutch piston.
   Remove the direct clutch piston.
   Remove two O-ring from piston.









INSPECTION AND REPAIR

Check piston return spring

Using calipers, measure the free length of the return spring.

mm (in.)

Standard	21.3 (0.839)

Check discs

Using a micrometer, measure the thickness of the discs.

mm (in.)

Minimum thickness	2.04 (0.0803)

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

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.

Check direct clutch drum bushing

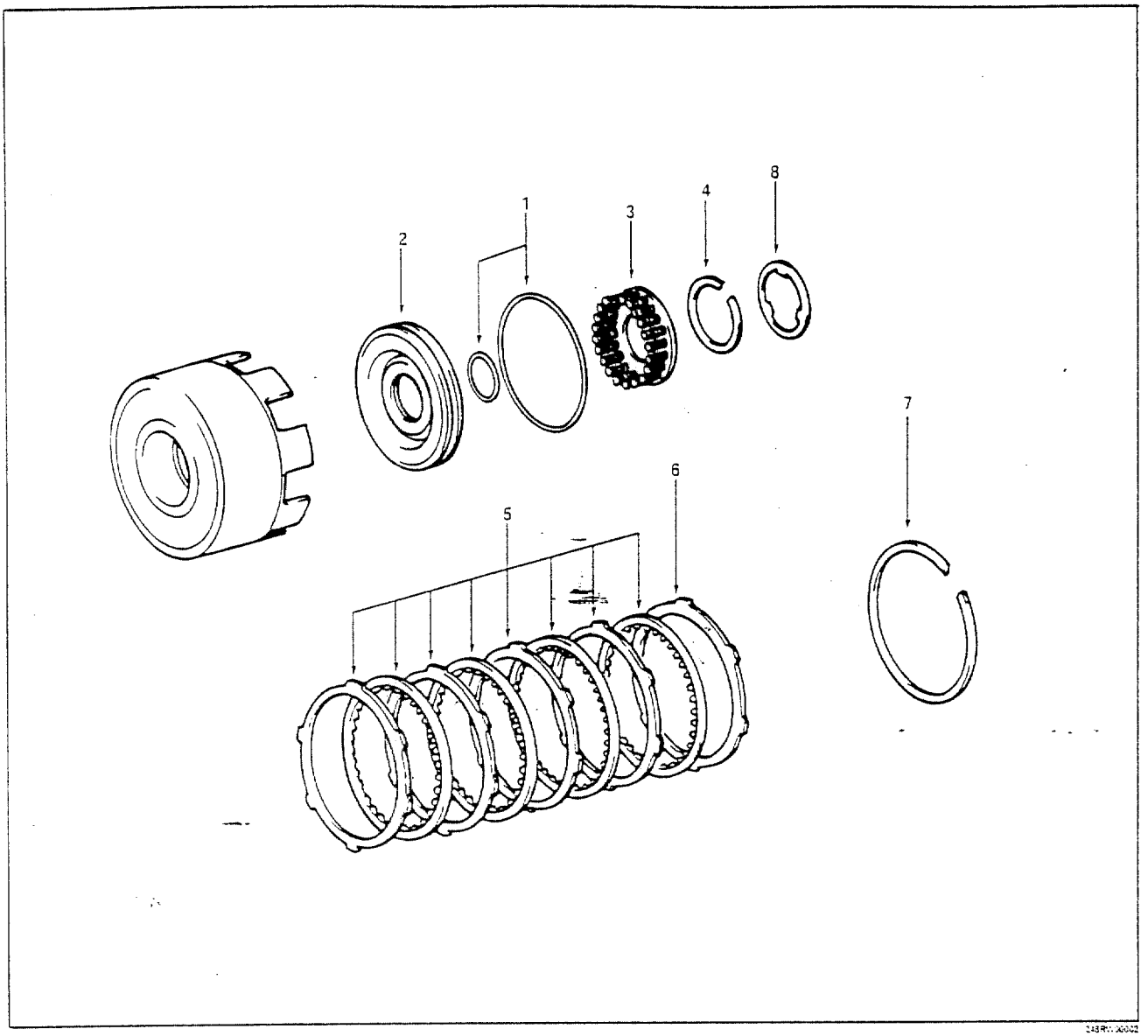
Using a dial indicator, measure the inside diameter of the clutch drum bushing.

mm (in.)

Maximum inside diameter	53.93 (2.1232)

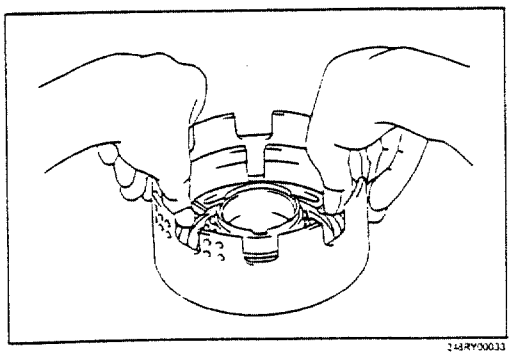
If the inside diameter is greaterthan maximum, replace the clutch drum.

REASSEMBLY



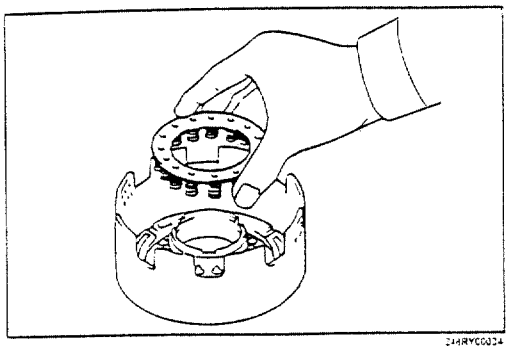
Reassembly steps

- ▲1. O-ring
- ▲2. Direct clutch piston
- ▲3. Piston return spring
- ▲4. Snap ring
- ▲5. Disc and plate
- ▲6. Flange
- ▲7. Snap ring.
- ▲8. Clutch drum thrust washer (plastic)

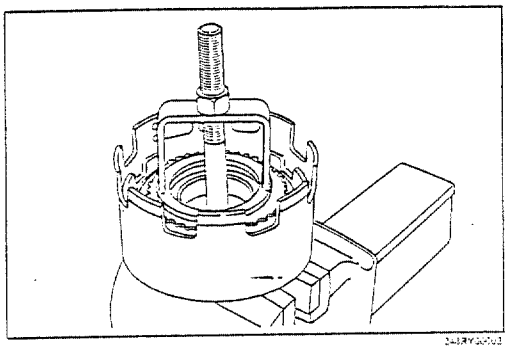


Important operations

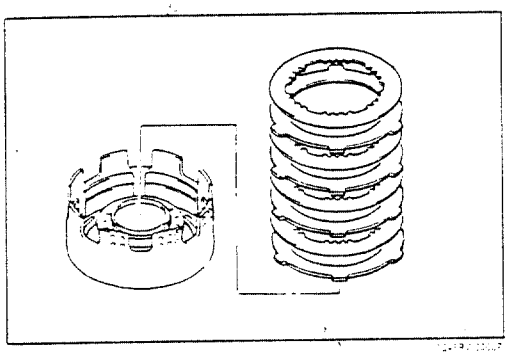
1. **O-ring**
   Coat new O-rings with ATF and install them on the direct clutch piston.
2. **Direct clutch piston**
   Install direct clutch piston to direct clutch drum.
   Being careful not to damage the O-rings, press in the direct clutch piston into the clutch drum, using both hands.



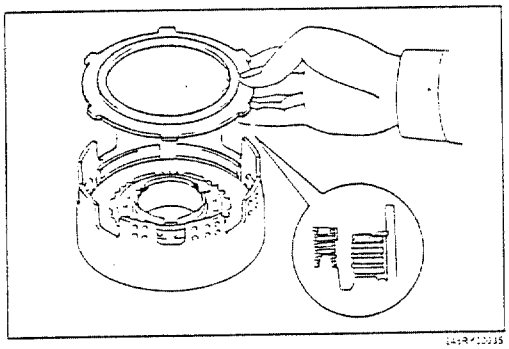
3. **Piston return spring**
   Install piston return spring.



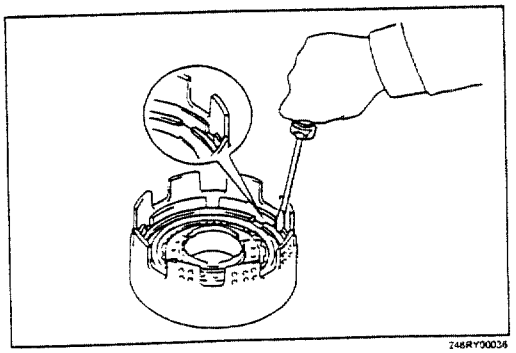
4. **Snap ring**
   Compress piston return spring and install snap ring in groove.
   Place special tool and a suitable ring on the spring retainer, and compress the return spring.
   Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.
   Spring compressor: 5-8840-0254-0 (J-25048)



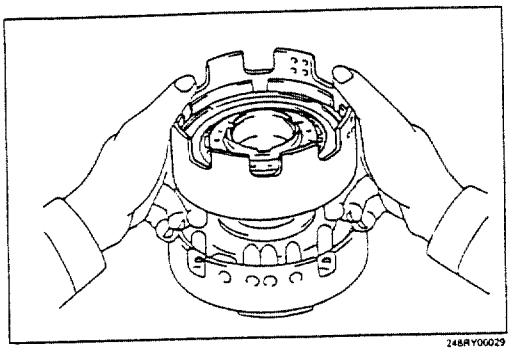
5. **Disc and plate**
   Install plates and discs.
   Install in order: P - D - P - D - P - D - P - D
   P: Plate, D: Disc



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

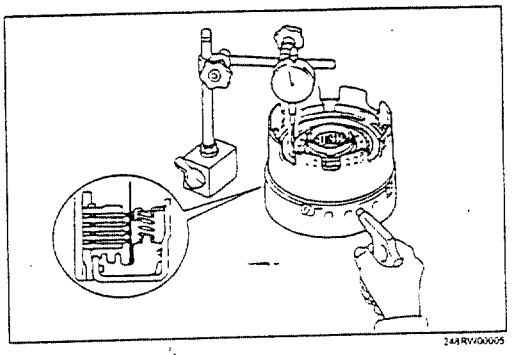


7. **Snap ring**
   Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with the cutout portion of the direct clutch drum.



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 (392 - 785 kPa or 4 - 8 kg/cm^2) as shown.

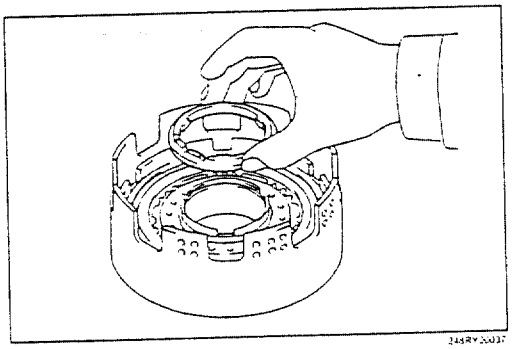
mm (in.)

Piston stroke	1.37 – 1.60 (0.0539 – 0.0630)

If the piston stroke is not within specification, replace the discs and recheck the piston stroke.
If the piston stroke is non standard, select another flange.
There are eight flanges.

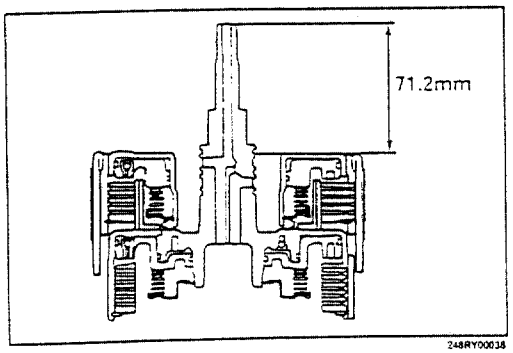
mm (in.)

No.	Flange thickness	No.	Flange thickness
33	3.3 (0.130)	38	3.8 (0.150)
34	3.4 (0.134)	39	3.9 (0.154)
35	3.5 (0.138)	40	4.0 (0.158)
36	3.6 (0.142)	41	
37	3.7 (0.146)	42	



8. **Clutch drum thrust washer (plastic)**
   Coat the thrust washer 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.

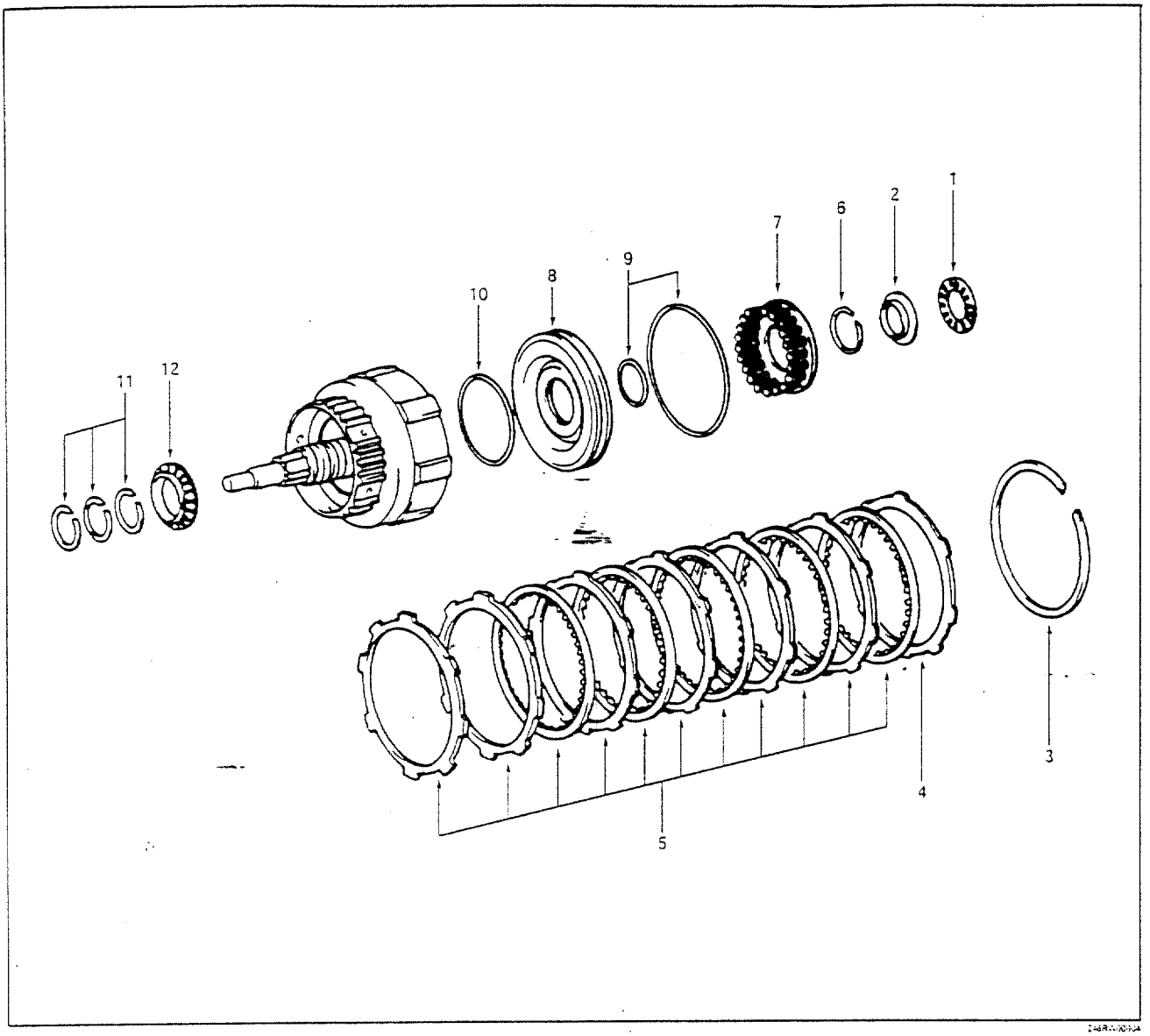


Install direct clutch assembly

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 71.2 mm (2.803 in.).

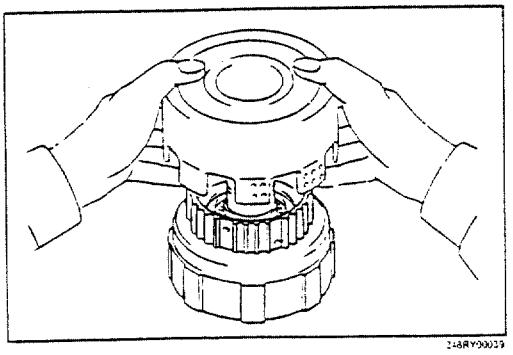
FORWARD CLUTCH ASSEMBLY (C-1)

DISASSEMBLY



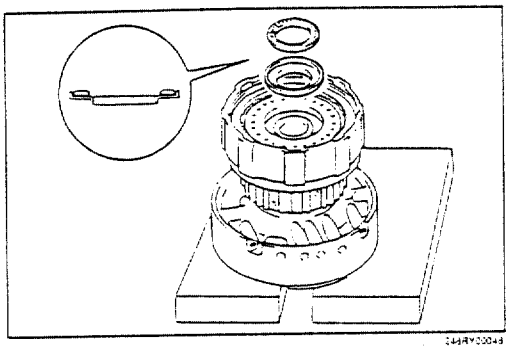
Disassembly steps

▲1. Thrust bearing
2. Race
▲3. Snap ring
4. Flange
5. Disc and plate
▲6. Snap ring
7. Piston return spring
▲8. Piston
9. O-ring
10. O-ring
11. Oil seal ring
12. Thrust bearing

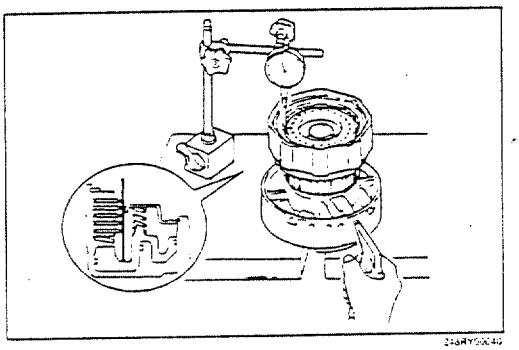


Important operations

Remove forward clutch assembly from direct clutch assembly.



1. **Thrust bearing**
   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.

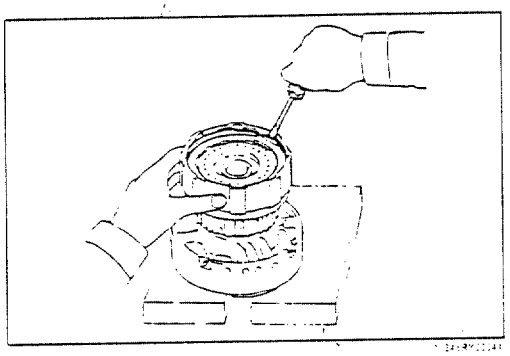


Check piston stroke of forward clutch (C-1)

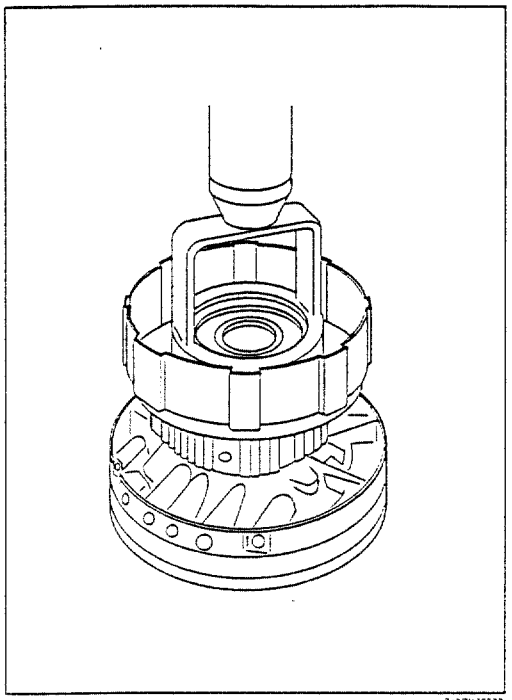
Using a dial indicator, measure the forward clutch piston stroke by applying and releasing compressed air (392 - 785 kPa or 4 - 8 kg/cm^2) as shown.

mm (in.)

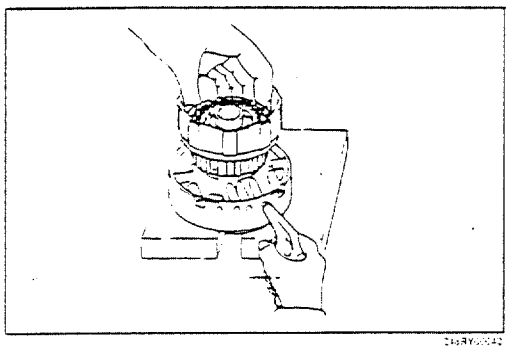
Piston stroke	0.5 - 0.9 (0.0197 - 0.0354)



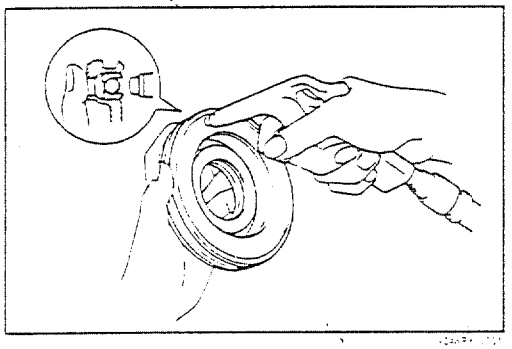
3. **Snap ring**
   Remove snap ring from clutch drum.



6. **Snap ring**
   Place special tool on the spring retainer and compress the return spring. Using snap ring pliers, remove the snap ring.
   Spring compressor : 5-8840-0254-0 (J-25048)



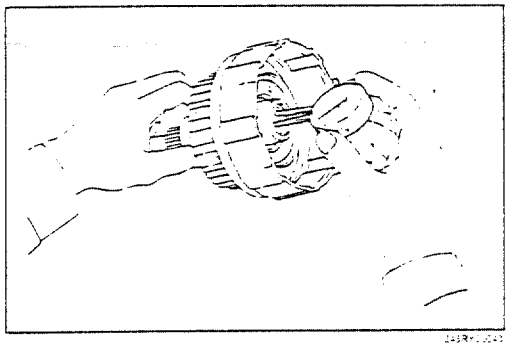
8. **Piston**
   Place the forward clutch drum onto the OD support. Holding the forward clutch piston by hand, apply compressed air to the OD support to remove the forward clutch piton.



INSPECTION AND REPAIR

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.



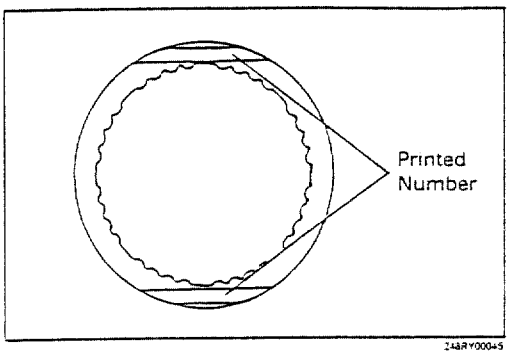
Check forward clutch drum bushing

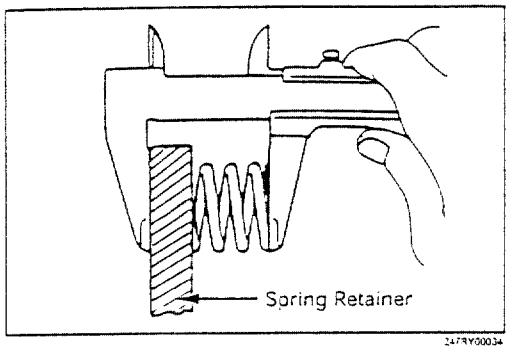
Using a dial indicator, measure the inside diameter of the forward clutch drum bushing.

mm (in.)

Maximum inside diameter	24.013 (0.945)

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





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.

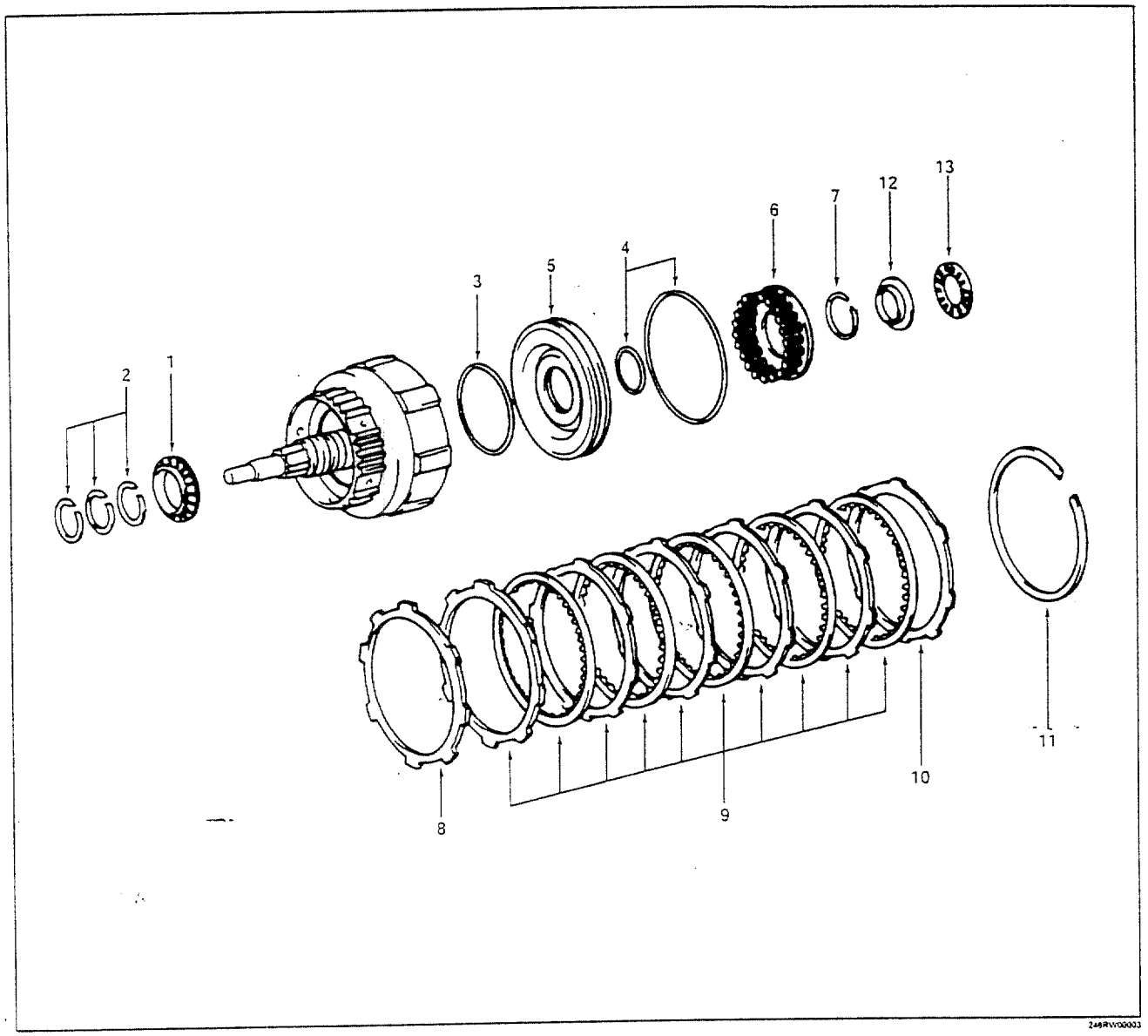
Check piston return spring

Using calipers, measure the free length of the return spring.

mm (in.)

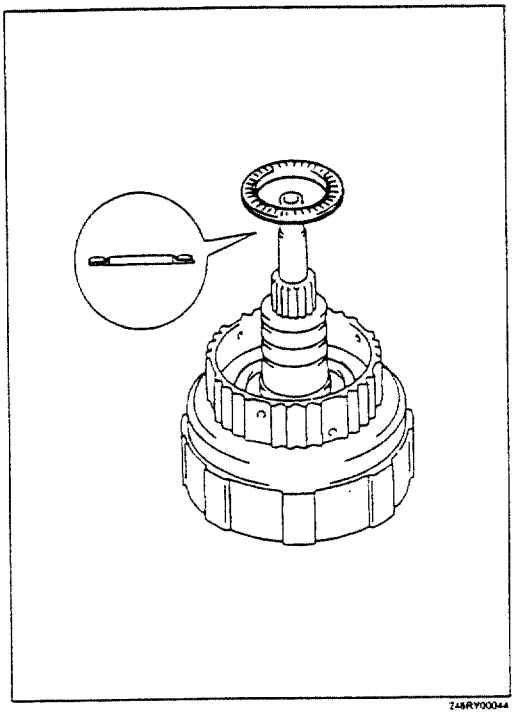
Standard length	19.47 (0.7665)

REASSEMBLY



Reassembly steps

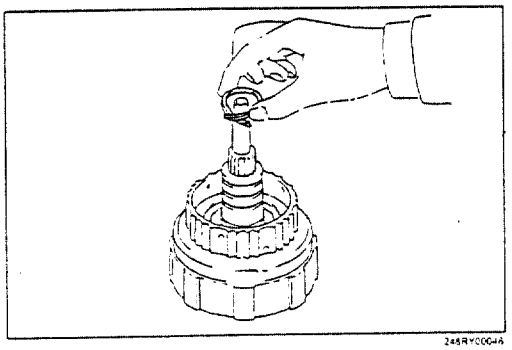
▲1. Thrust bearing
▲2. Oil seal ring
▲3. O-ring
▲4. O-ring
▲5. Forward clutch piston
▲6. Piston return spring
▲7. Snap ring
▲8. Cushion plate
▲9. Disc and plate
▲10. Flange
▲11. Snap ring
▲12. Race
▲13. Thrust bearing



Important operations

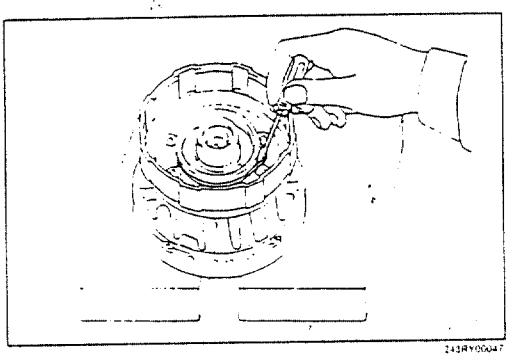
1. **Thrust bearing**
   Coat the assembled bearing and race with petroleum jelly and install it onto the forward clutch drum, with the race side facing downward.

Assembled bearing and race (Reference)	mm (in.)
Inside diameter	33.7 (1.327)
Outside diameter	47.8 (1.882)

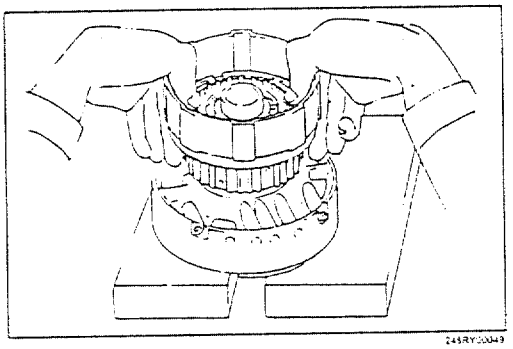


2. **Oil seal ring**
   Coat the three oil rings with ATF.
   Contract the oil seal rings as shown, and install three oil seal rings onto the forward clutch drum.

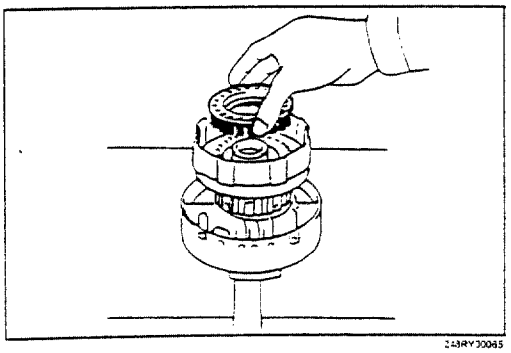
NOTE:
Do not spread the ring ends more than necessary.



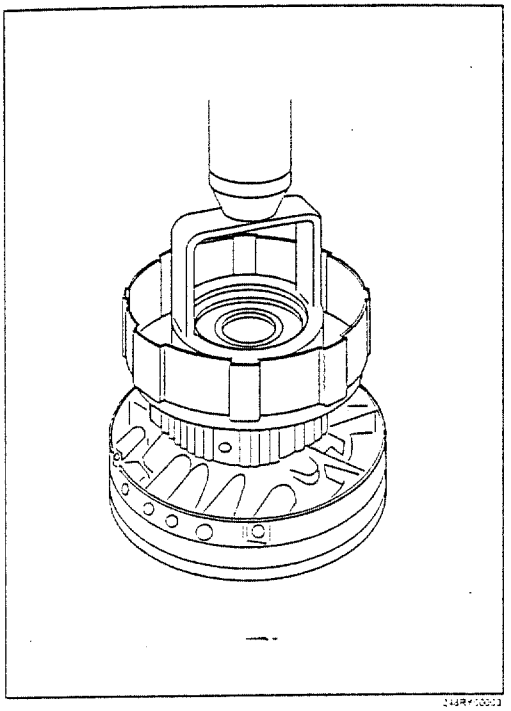
3. **O-ring**
   Coat a new O-ring with ATF and install O-ring on the forward clutch drum.
4. **O-ring**
   Coat new O-rings with ATF and install two O-rings on the forward clutch piston.



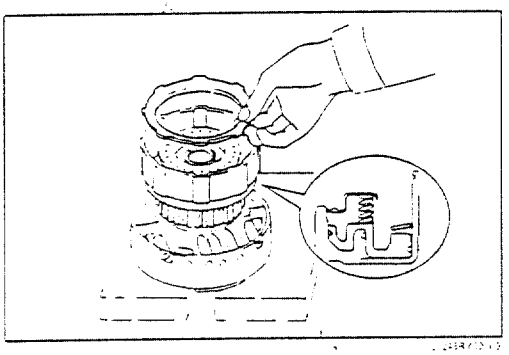
5. **Forward clutch piston**
   Being careful not to damage the O-rings, press the forward clutch piston into the forward clutch drum.



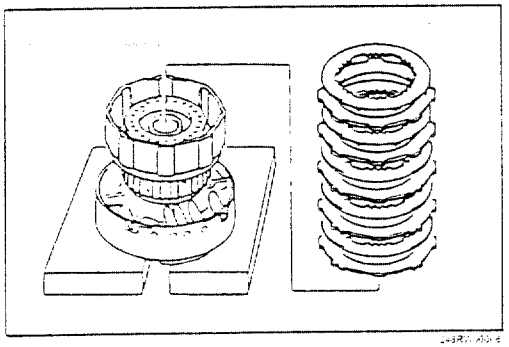
6. **Piston return spring**
   Install piston return spring.



7. **Snap ring**
   Place special tool on the spring retainer, and compress the return spring.
   Spring compressor: 5-8840-0254-0 (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.

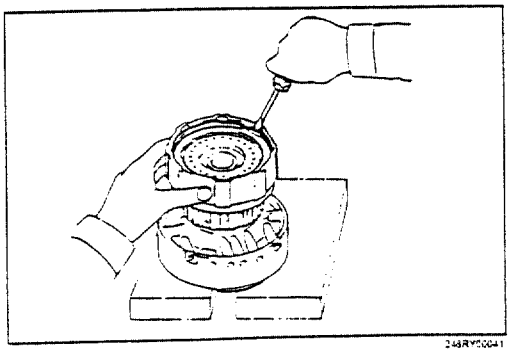


8. **Cushion plate**
   Install cushion plate rounded side down as shown.

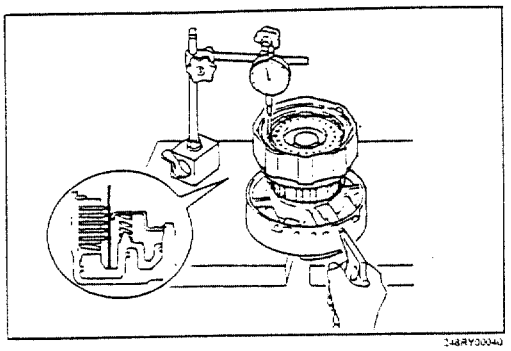


9. **Disc and plate**
   Install discs, plates and flange.
   Install in order: P- D- P- D- P- D- P- D- P- D

10 **Flange**
   And then install the flange, with the rounded edge facing downward.



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



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 (392 - 785kPa or 4 - 8kg/cm^2) as shown.

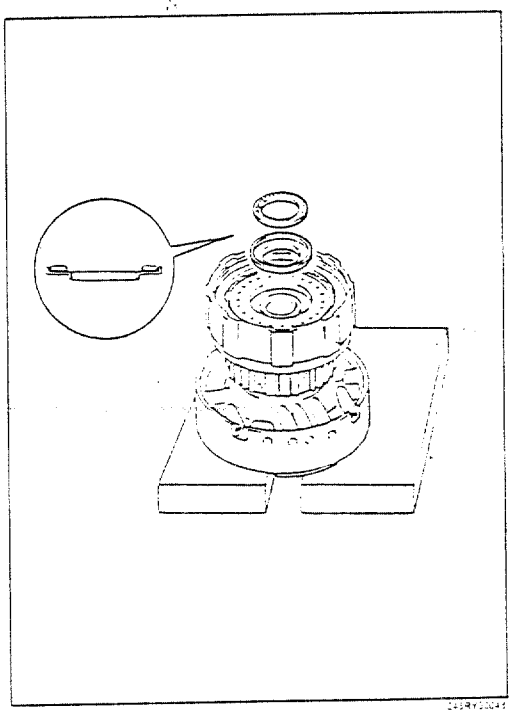
mm(in.)

Piston stroke	0.5 - 0.9 (0.0197 - 0.0354)

If the Piston stroke is not within specification , select another flange , and recheck the piston storke.
There are eight flanges.

mm (in.)

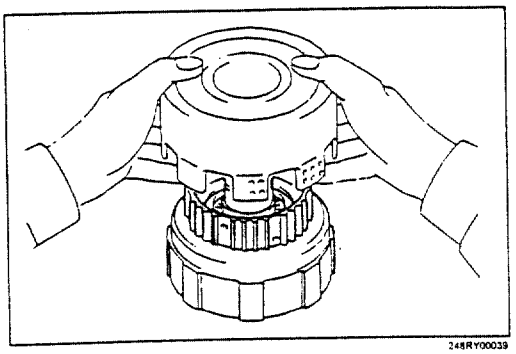
No.	Flange thickness	No.	Flange thickness
61	3.0 (0.118)	92	3.4 (0.134)
63	4.2 (0.165)	93	3.6 (0.142)
64	4.4 (0.173)	94	3.8 (0.150)
91	3.2 (0.126)	95	4.0 (0.158)



12. **Race**
13. **Thrust bearing**
Coat the race and bearing with petroleum jelly, and install them onto the forward clutch drum.

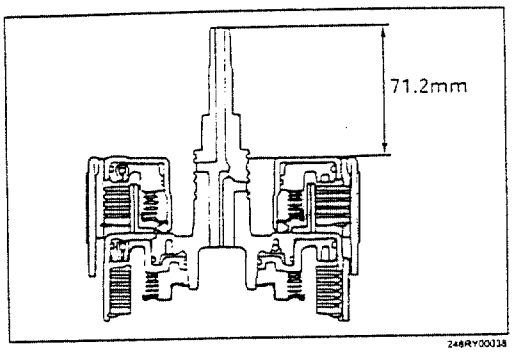
Race and bearing diameter (Reference) mm(in.)

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



Install direct clutch assembly to forward clutch assembly

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

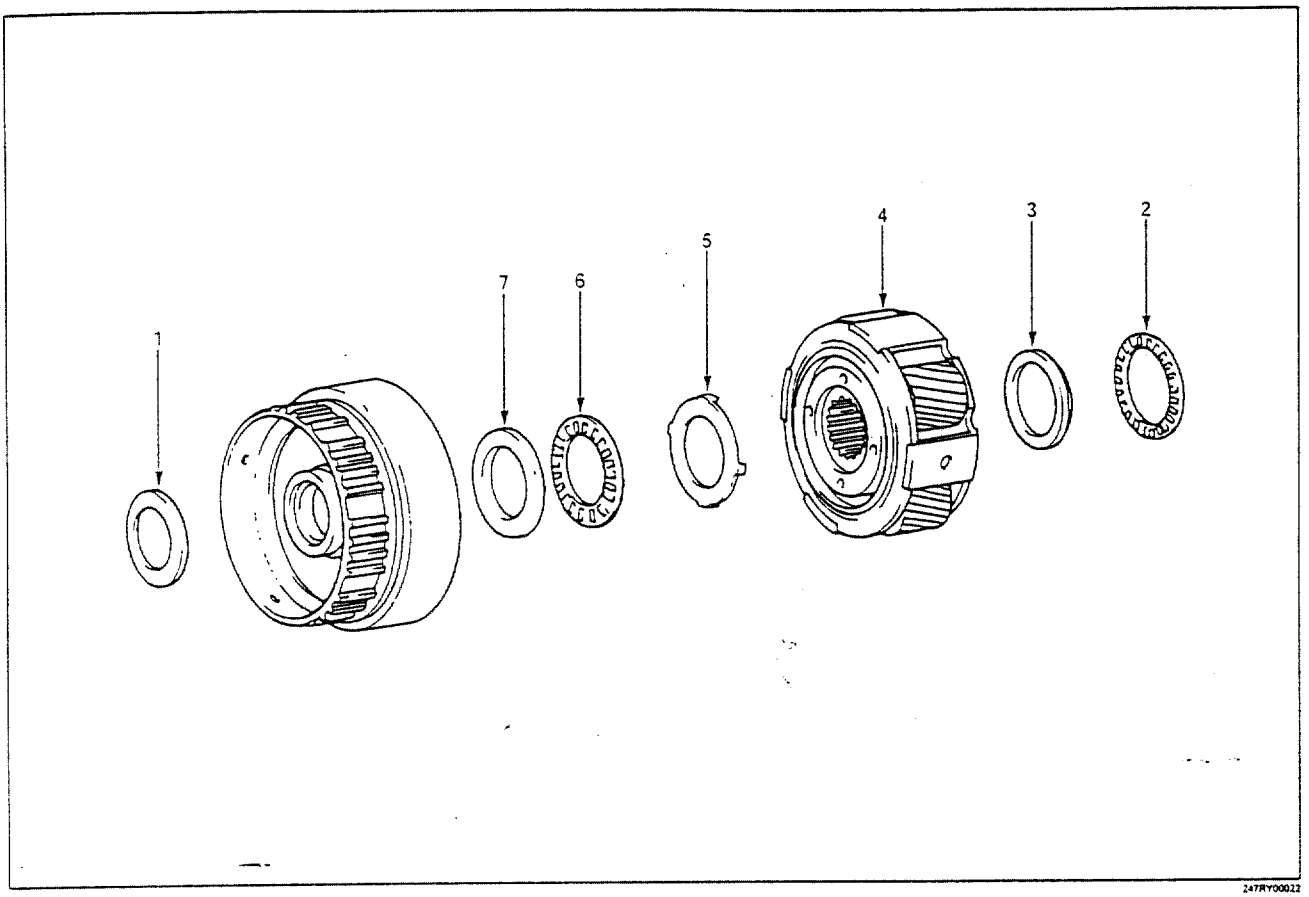


Check that distance from the direct clutch end to the forward clutch end is 71.2 mm (2.803 in.).

	mm (in.)
71.2 (2.803)	

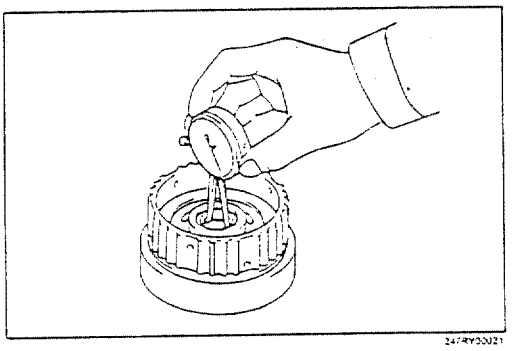
FRONT PLANETARY GEAR

DISASSEMBLY



Disassembly steps

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



INSPECTION AND REPAIR

Check front planetary ring gear bushing

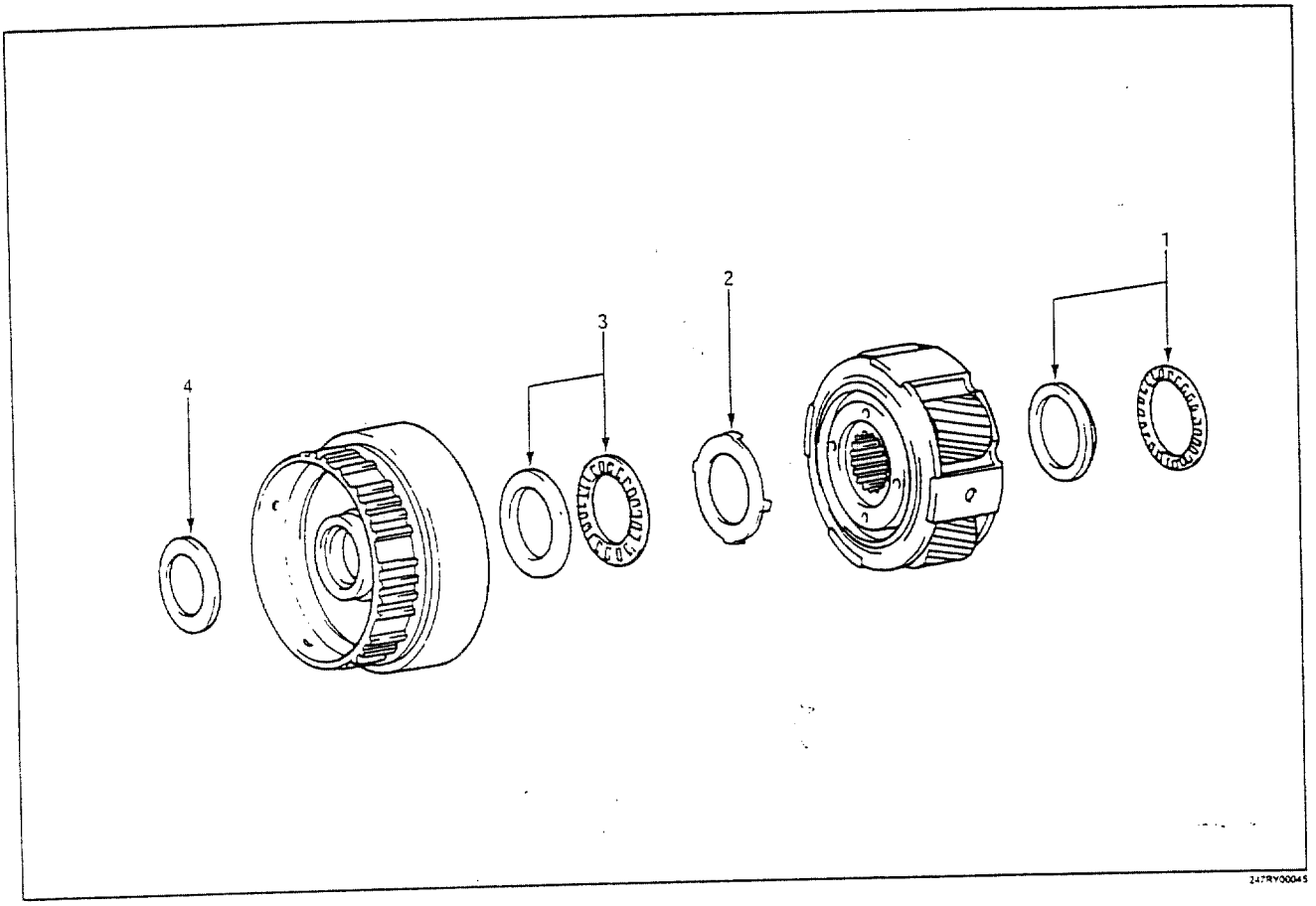
Using a dial indicator, measure the inside diameter of the planetary ring gear bushing.

mm (in.)

Maximum inside diameter	24.08 (0.9480)

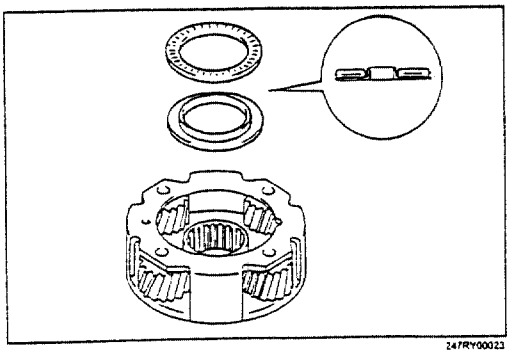
If the inside diameter is greater than the maximum, replace the planetary ring gear.

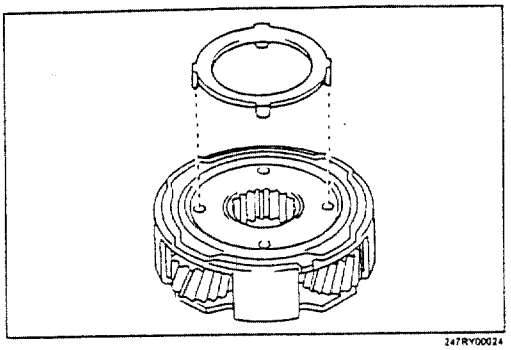
REASSEMBLY

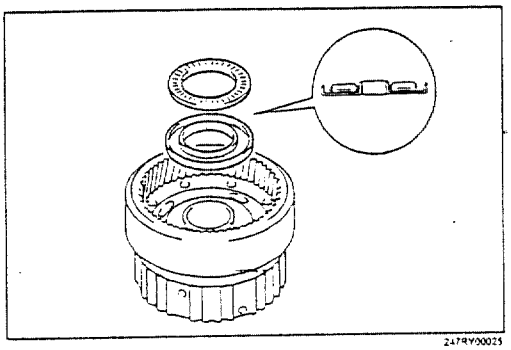


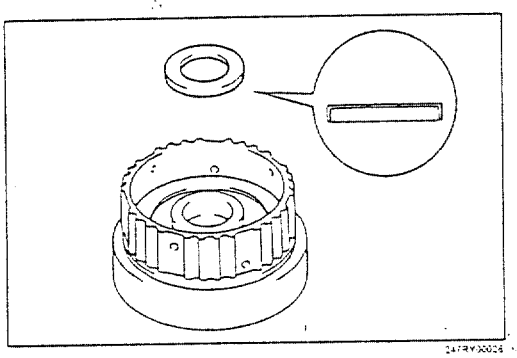
Reassembly steps

▲1. Thrust bearing and race
▲2. Race (Metal)
▲3. Thrust bearing and race
▲4. Race









Important operations

1. **Thrust bearing and race**
   Coat the races and bearing with petroleum jelly. Install the race and bearing to the rear side of the planetary gear.

mm (in.)

	Inside	Outside
Bearing	35.4 (1.394)	48.0 (1.890)
Race	33.7 (1.327)	47.6 (1.874)

2. **Race (Metal)**
   Turn over the planetary gear and install the race. Make sure that the lugs fit into the holes on the planetary gear.

Bearing and races diameter (Reference) mm (in.)

	Inside	Outside
Race	34.3 (1.350)	47.8 (1.882)

3. **Thrust bearing and race**
   Coat the races and bearing with petroleum jelly. Install the race and bearing onto the rear side of the planetary ring gear.

mm (in.)

	Inside	Outside
Race	30.6 (1.205)	53.6 (2.110)
Bearing	32.7 (1.287)	47.7 (1.878)

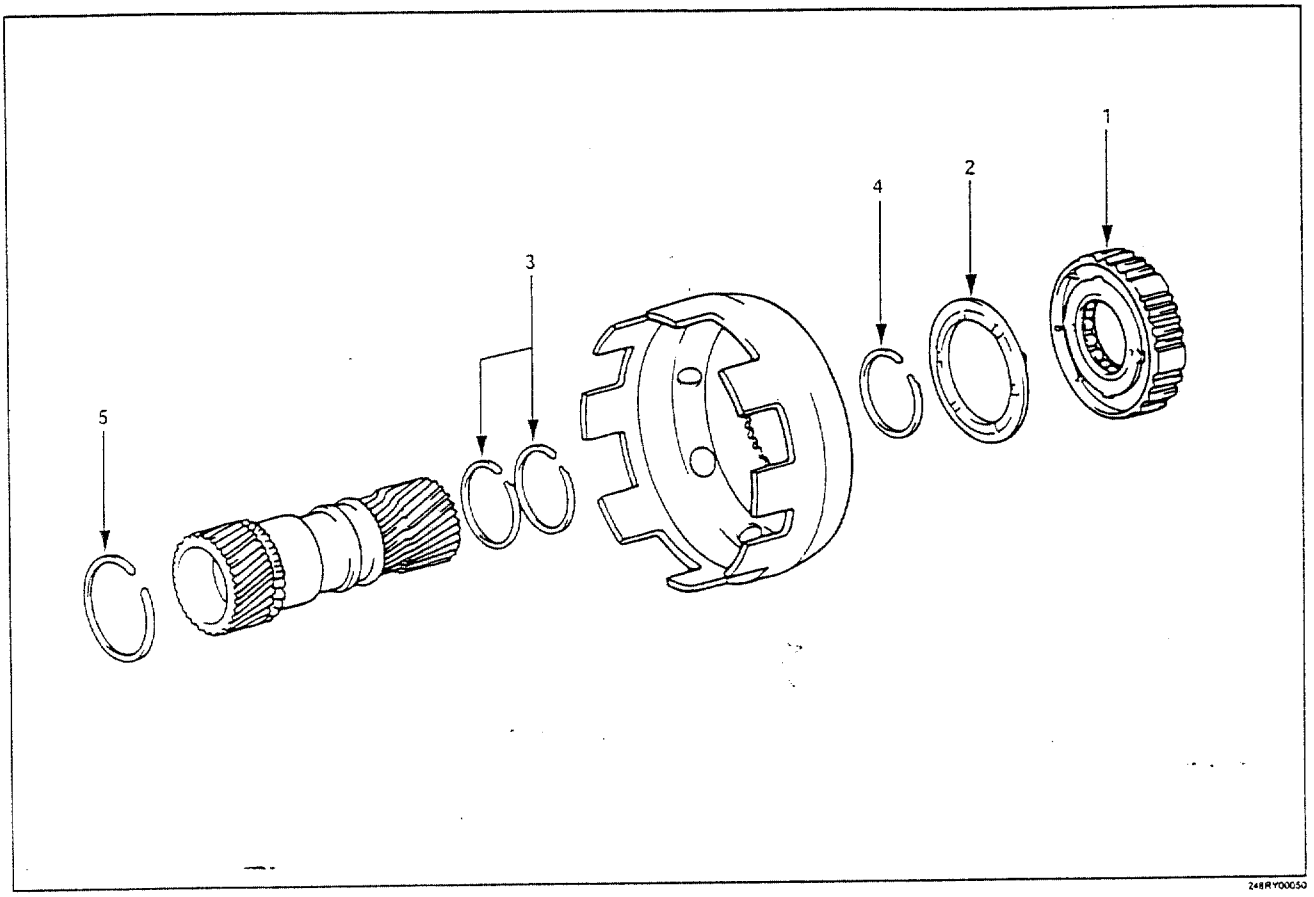
4. **Race**
   Turn over the planetary ring gear and install the race onto the front side of the planetary ring gear.

Races and bearing diameter (Reference) mm (in.)

	Inside	Outside
Race	26.5 (1.043)	47.0 (1.850)

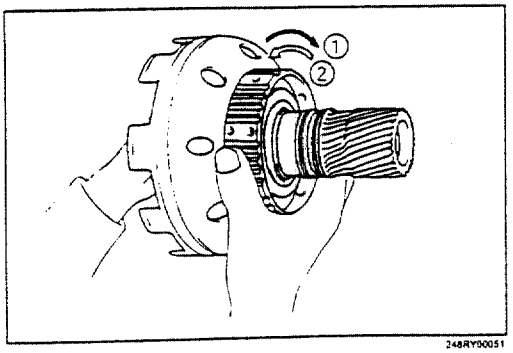
PLANETARY SUN GEAR AND NO.1 ONE-WAY CLUTCH

DISASSEMBLY



Disassembly steps

1. One-way clutch and second brake hub
2. Thrust washer (Plastic)
▲3. Oil seal ring (Metal)
▲4. Snap ring
5. Snap ring

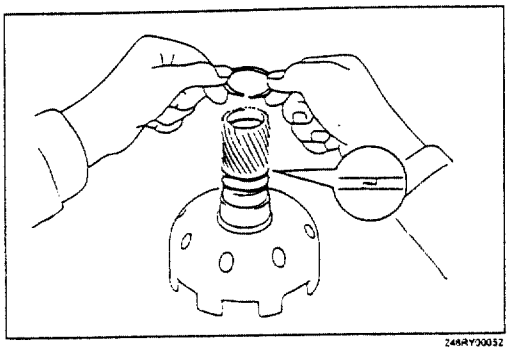


Important operations

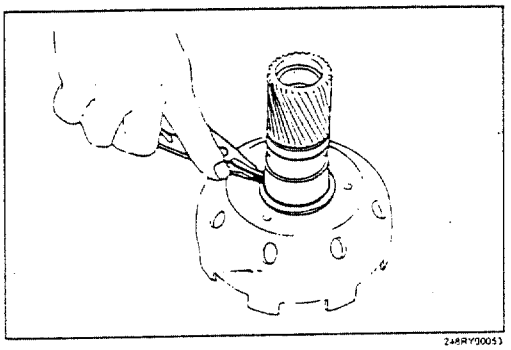
Check operation of No.1 one-way clutch

Hold the planetary sun gear and turn the second brake hub. The second brake hub should turn freely clockwise and should lock counterclockwise.

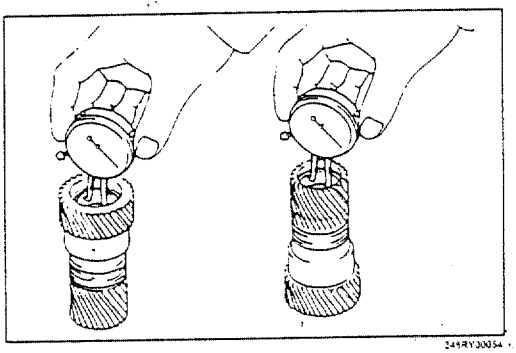
(1) : Free
(2) : Lock



3. **Oil seal ring (Metal)**
   Remove two oil seal rings.



4. **Snap ring**
   Remove the snap ring with snap ring pliers.



INSPECTION AND REPAIR

Check planetary sun gear bushing

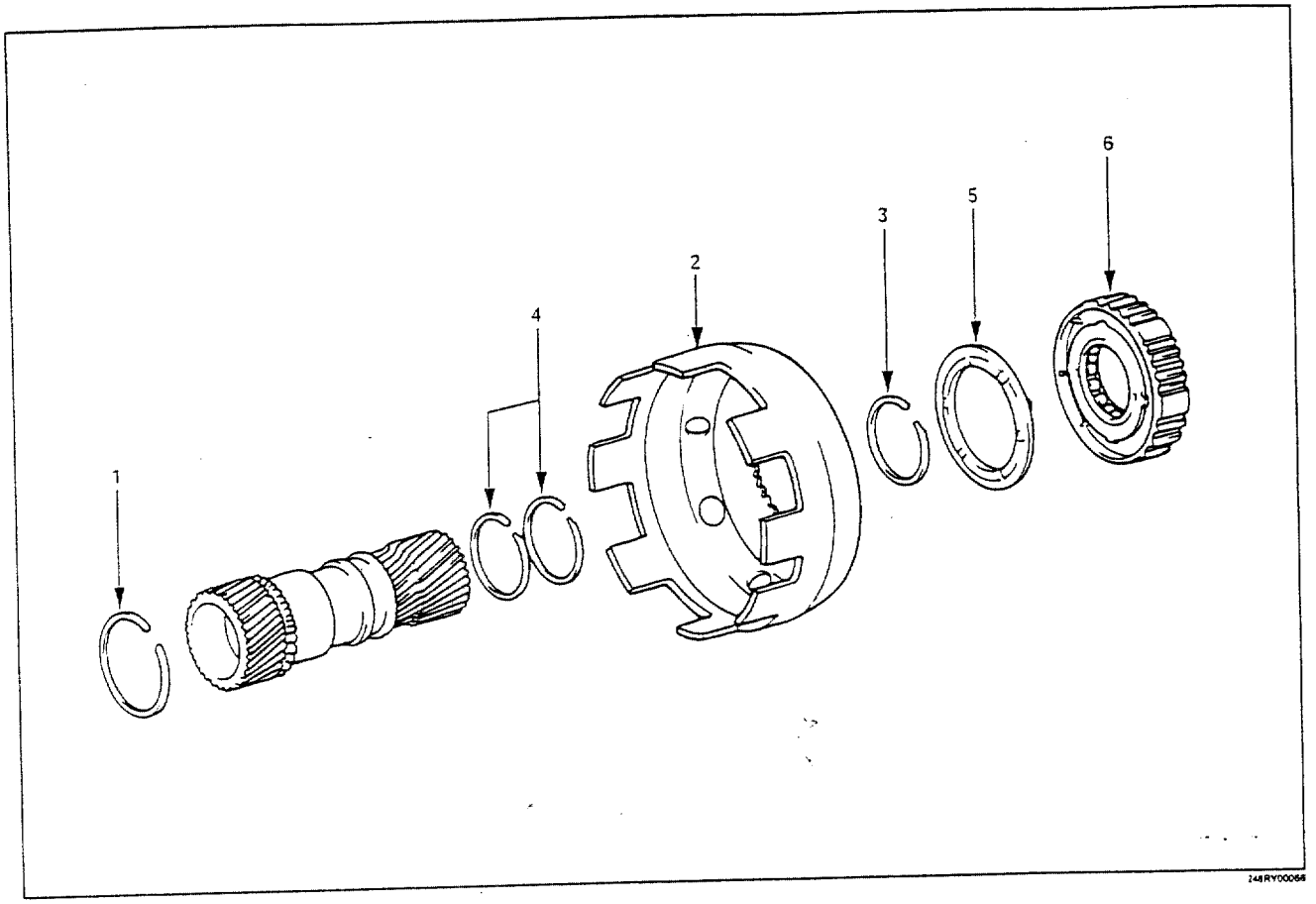
Using a dial indicator, measure the inside diameter of the planetary sun gear bushing.

mm (in.)

Maximum inside diameter	27.013 (1.0635)

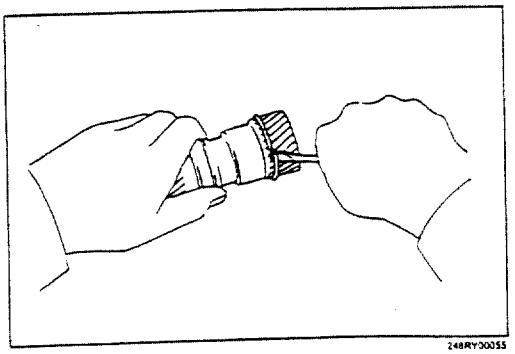
If the inside diameter is greater than the maximum, replace the planetary sun gear.

REASSEMBLY



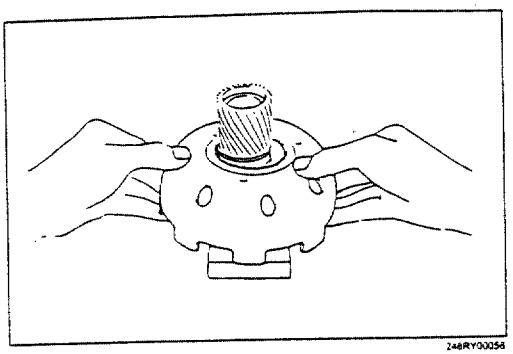
Reassembly steps

▲1. Snap ring
▲2. Sun gear input drum
▲3. Snap ring
▲4. Oil seal ring (Metal)
▲5. Thrust washer (Plastic)
▲6. One-way clutch and second brake hub

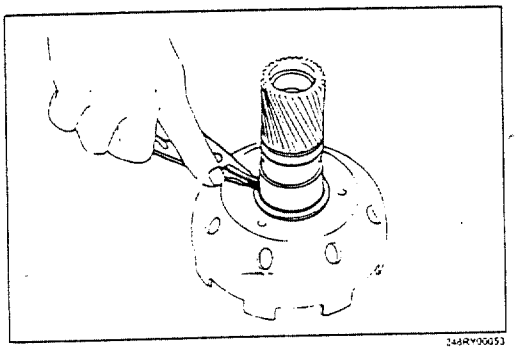


Important operations

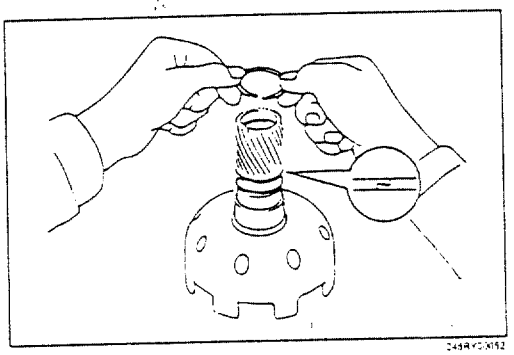
1. **Snap ring**
   Install snap ring to planetary sun gear.



2. **Sun gear input drum**
   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.

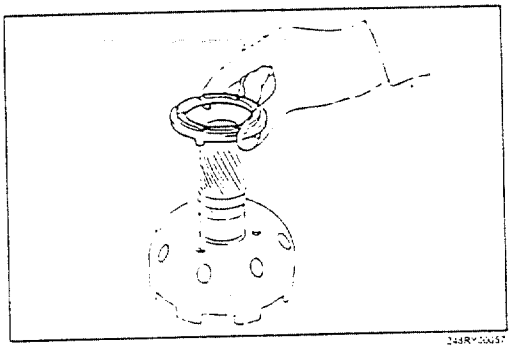


3. **Snap ring**
   Install snap ring with snap ring pliers.



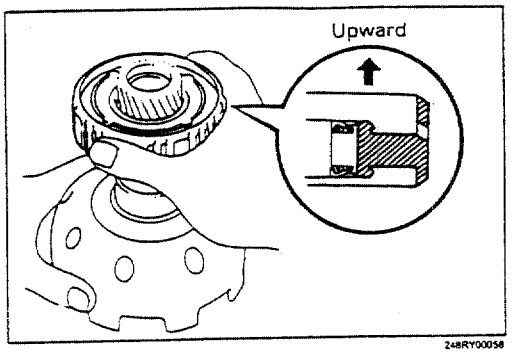
4. **Oil seal ring (Metal)**
   Coat the two oil seal rings with ATF.

NOTE:
Do not spread the ring ends too much.

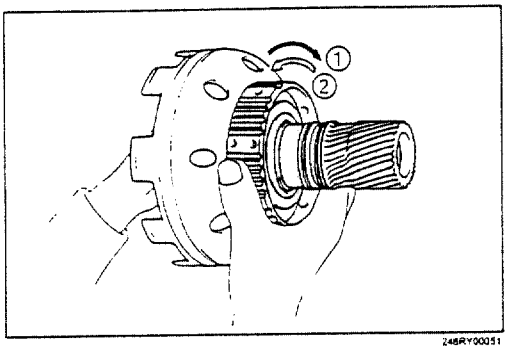


5. Thrust washer (plastic)
   Install thrust washer.

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



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



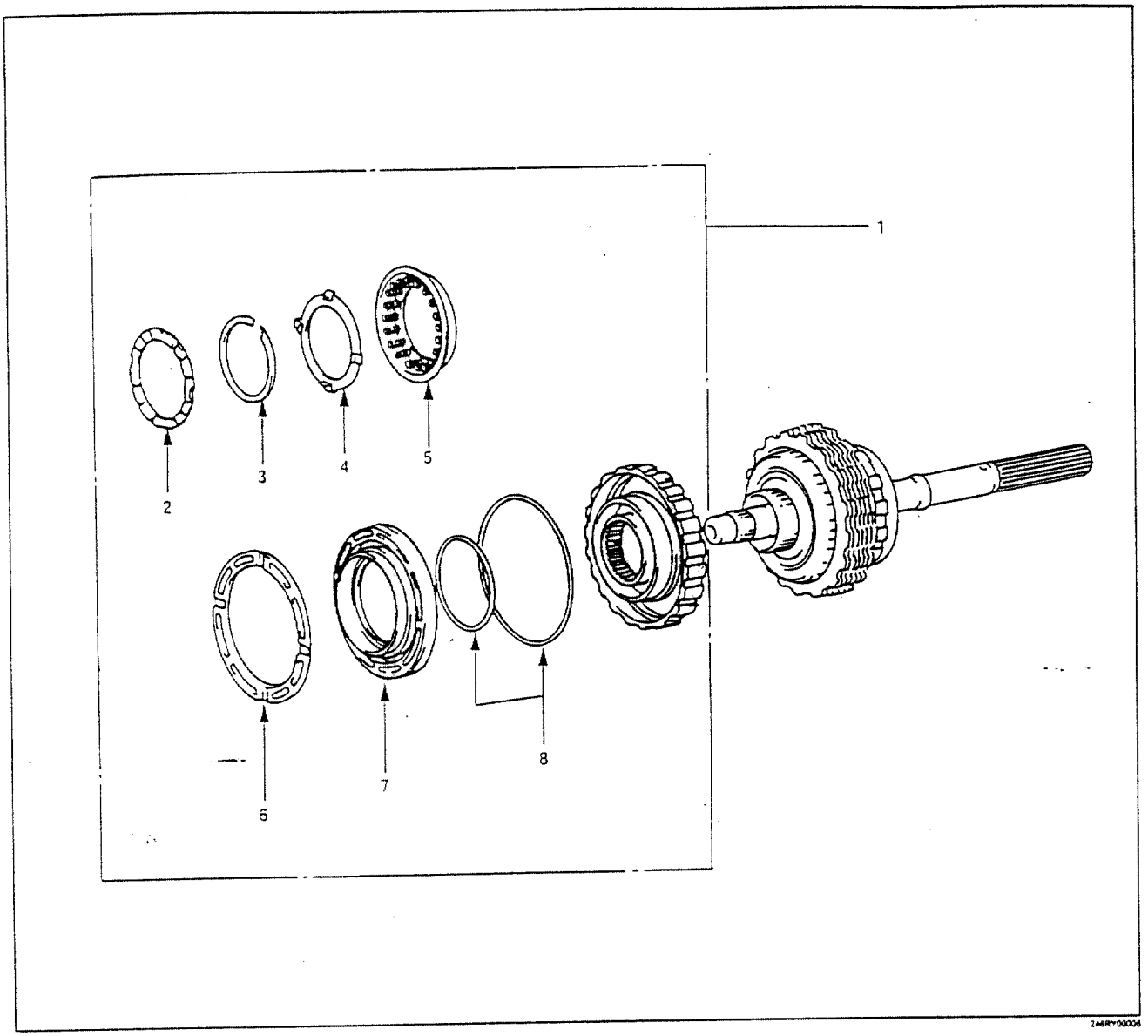
Check operation of No.1 one-way clutch

Hold the planetary sun gear and turn the second brake hub. The second brake hub should turn freely clockwise and should lock counterclockwise.

(1) : Free
(2) : Lock

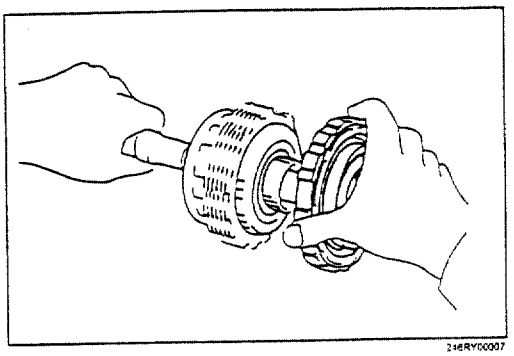
SECOND BRAKE ASSEMBLY (B-2)

DISASSEMBLY



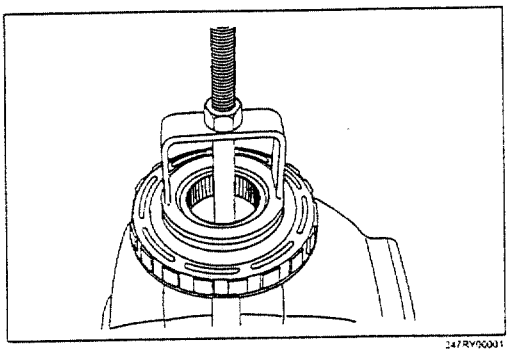
Disassembly steps

▲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

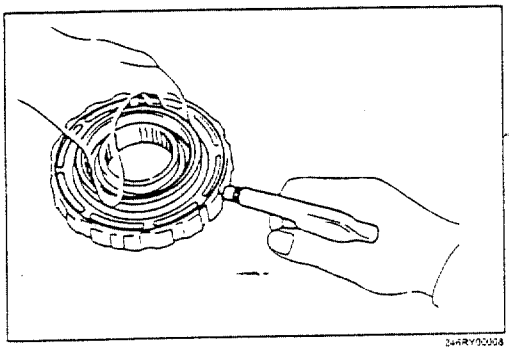


Important operations

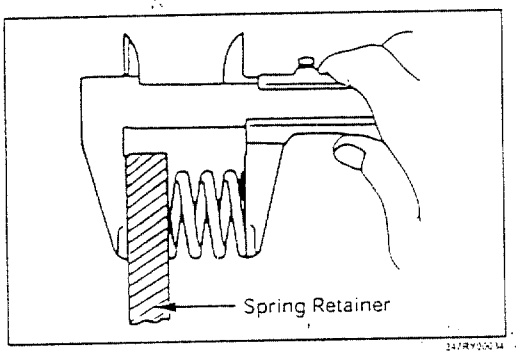
1. **Second brake assembly**
   Remove second brake assembly from output shaft.



2. **Snap ring**
   Place special tool on the spring retainer, and compress the return spring.
   Spring compressor : 5-8840-0254-0 (J-25048)
   Remove the snap ring with snap ring pliers.



7. **Second brake piston**
   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.



INSPECTION AND REPAIR

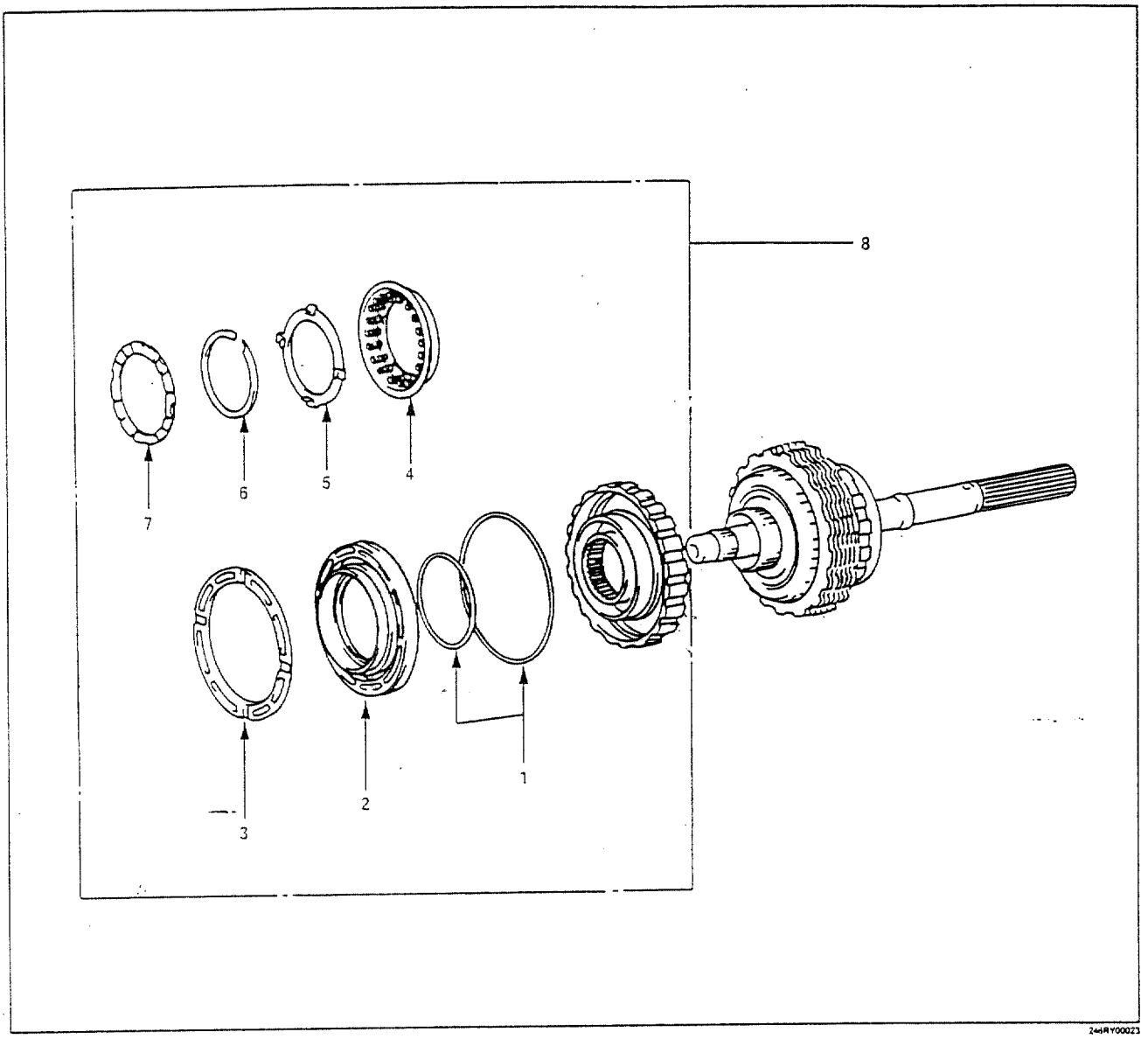
Check piston return spring

Using calipers, measure the free length of the return spring.

mm (in.)

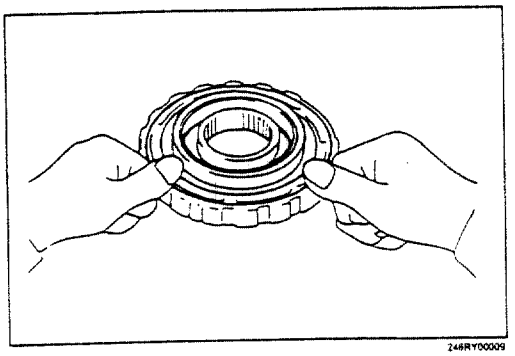
Standard length	16.05 (0.6319)

REASSEMBLY



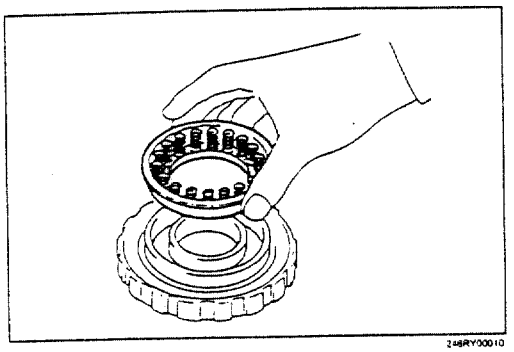
Reassembly steps

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

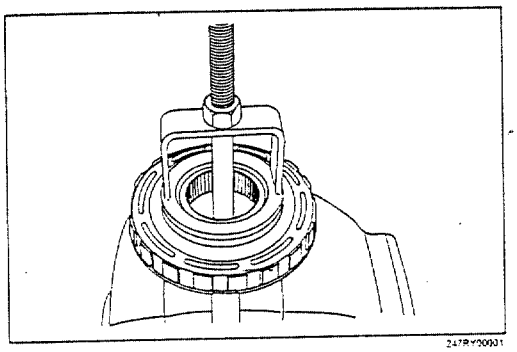


Important operations

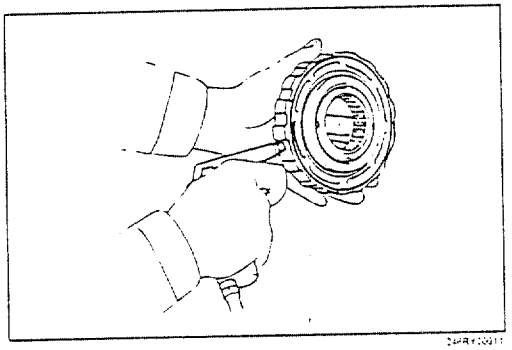
1. **O-ring**
   Coat new O-ring with ATF and install them on the second brake piston.
2. **Second brake piston**
   Being careful not to damage the O-rings, press in the second brake piston into the second brake drum.
3. **Piston sleeve**
   Install piston sleeve.



4. **Piston return spring**
   Install piston return spring.
5. **Spring retainer**
   Install spring retainer.

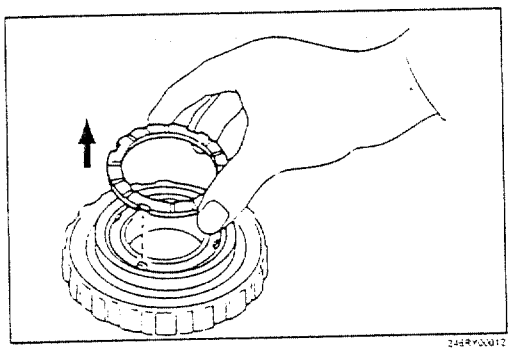


6. **Snap ring**
   Place special tool on the spring retainer, and compress the return spring.
   Spring compressor : 5-8840-0254-0(J-25048)
   Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



Check second brake piston movement

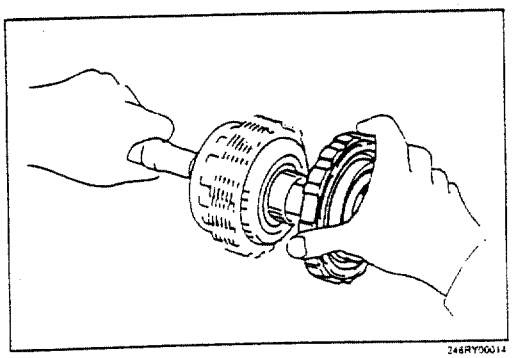
Make sure the second brake piston moves smoothly when applying and releasing the low compressed air to the second brake drum.



7. **Thrust washer (Plastic)**
   Coat the thrust washer with petroleum jelly and install it to the second brake piston, with the grooved side facing upward.

NOTE:

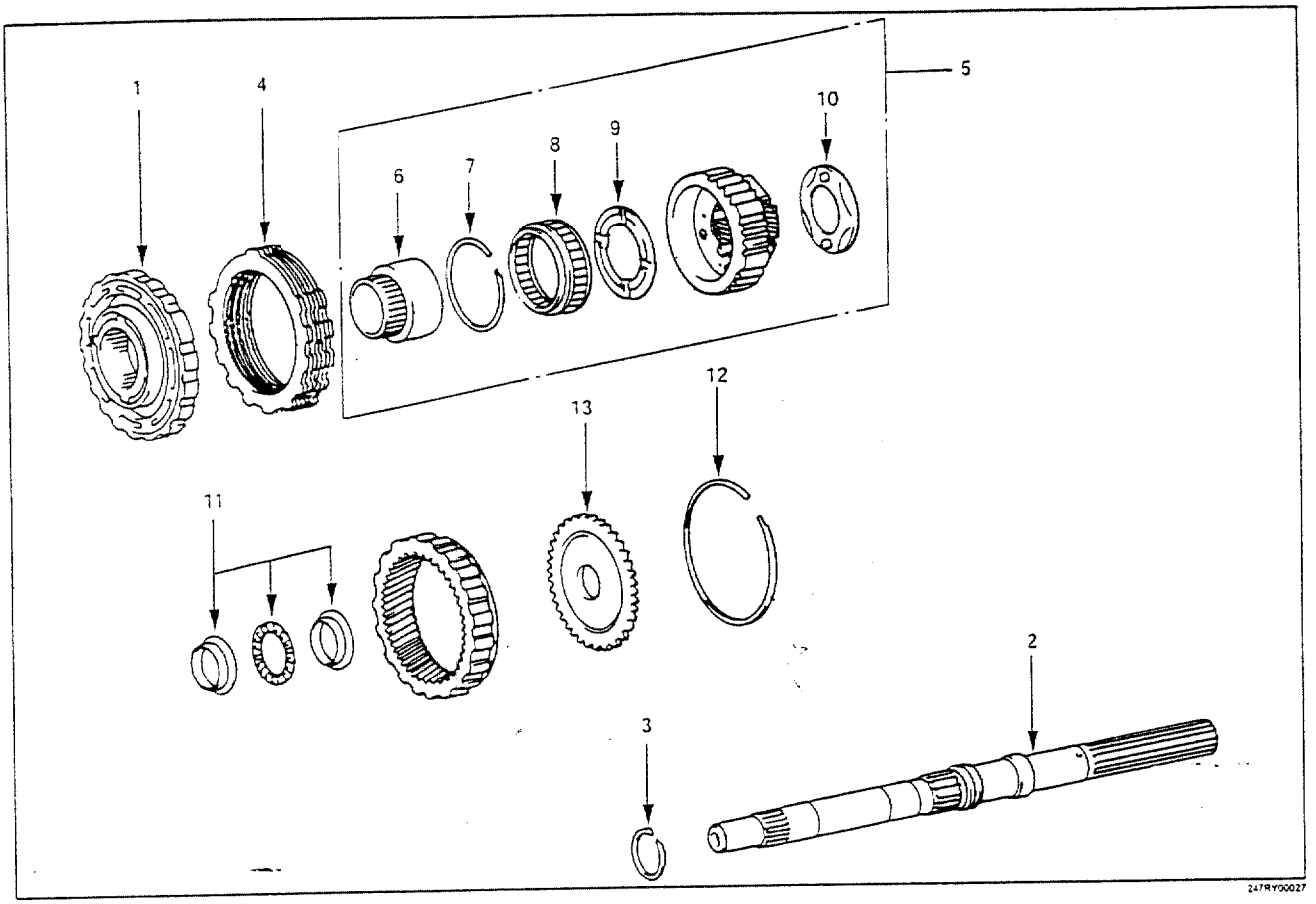
Make sure that the cutout portions of the thrust washer match the teeth of the spring retainer.



8. **Second brake assembly**
   Install second brake assembly to output shaft.

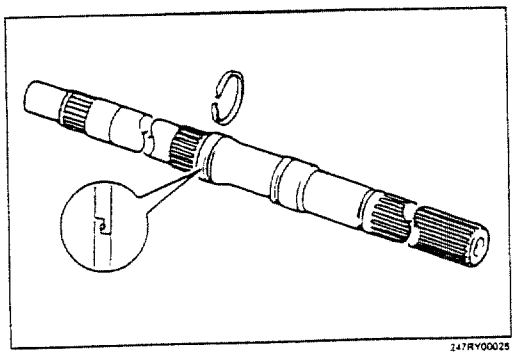
REAR PLANETARY GEAR ASSEMBLY AND OUTPUT SHAFT

DISASSEMBLY



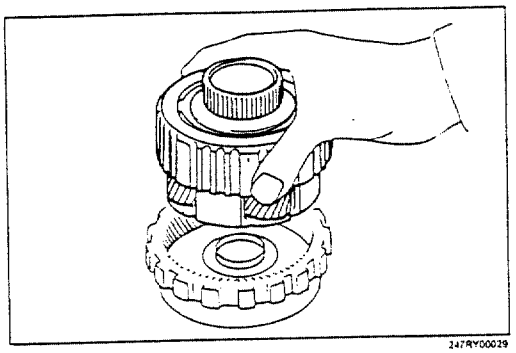
Disassembly steps

1. Second brake assembly
2. Output shaft
▲3. Oil seal ring
4. Disc, plate and flange
▲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. Thrust bearing and race
12. Snap ring
13. Ring gear flange

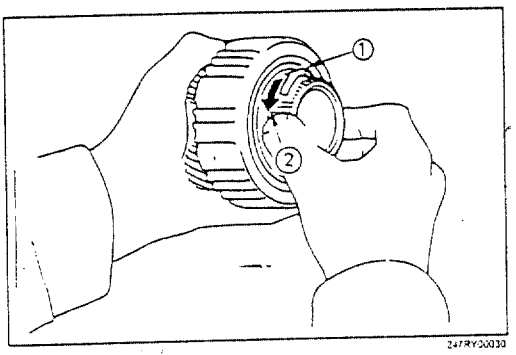


Important operations

3. **Oil seal ring**
   Remove oil seal ring from output shaft.



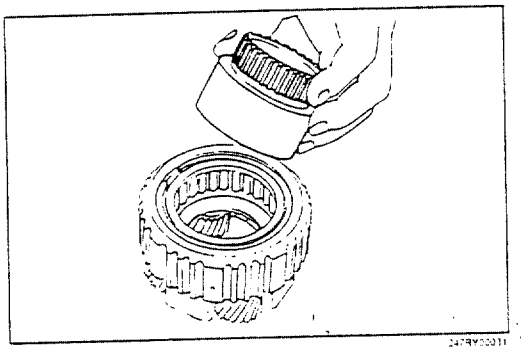
5. **Rear planetary gear assembly**
   Remove rear planetary gear from rear planetary ring gear.



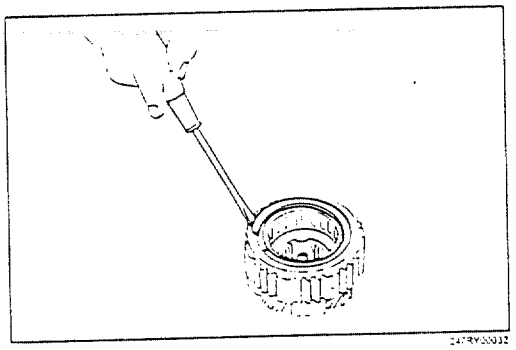
Check operation of No.2 one-way clutch

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.

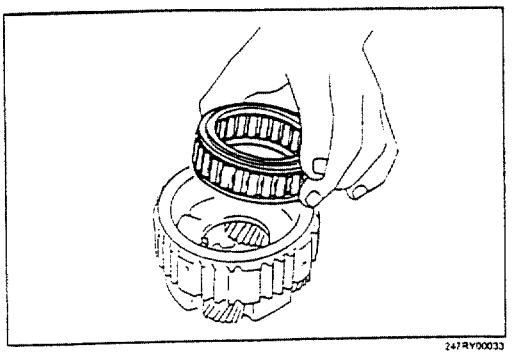
(1) : Lock
(2) : Free



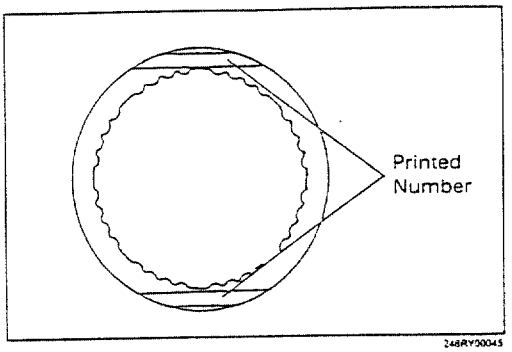
6. **One-way clutch inner race**
   Remove the one-way clutch inner race from the rear planetary gear.



7. **Snap ring**
   Remove the snap ring with a screwdriver.



8. **One-way clutch**
   Remove the one-way clutch with retainers from the planetary gear.

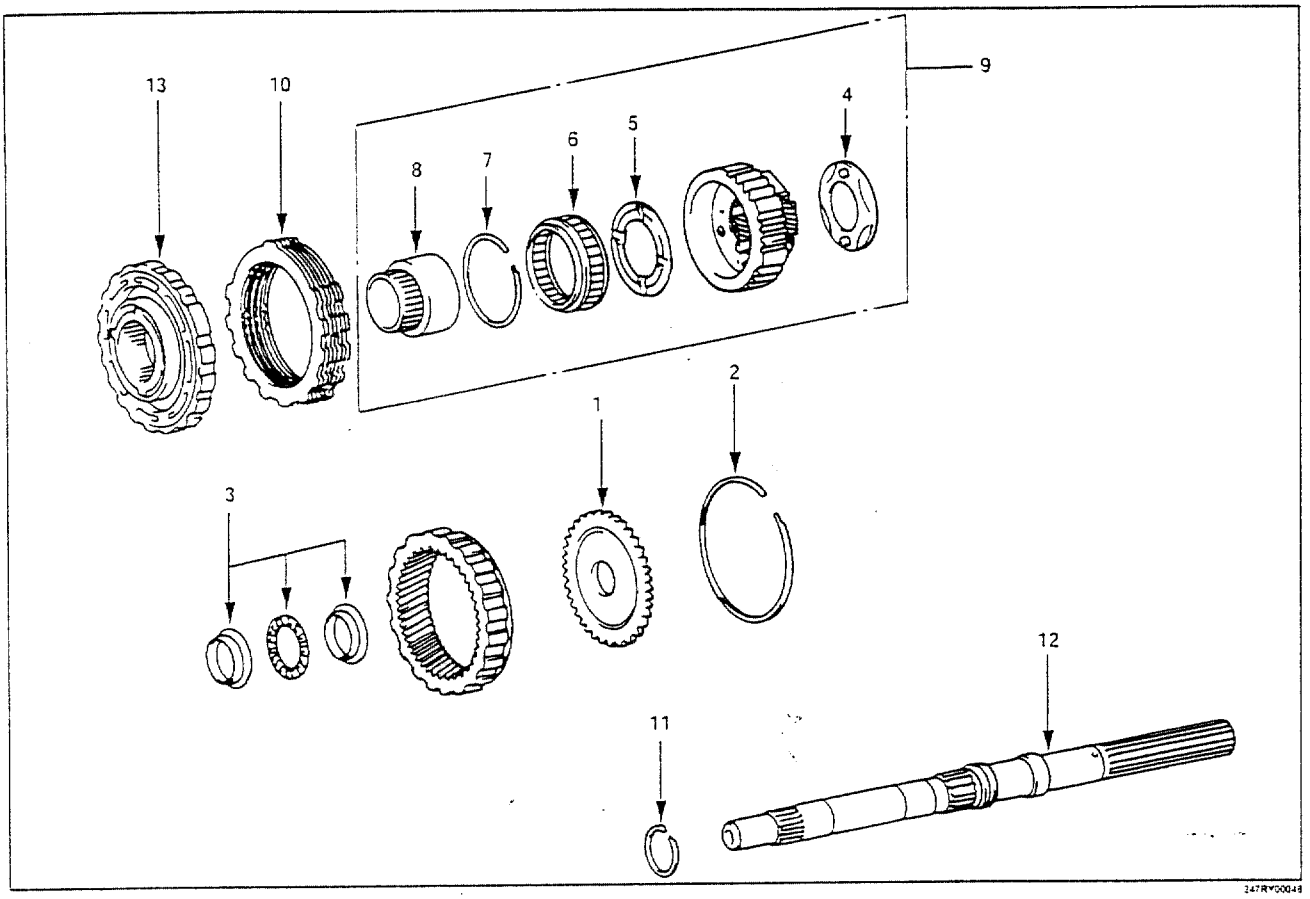


Check disc, plate and flange

Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

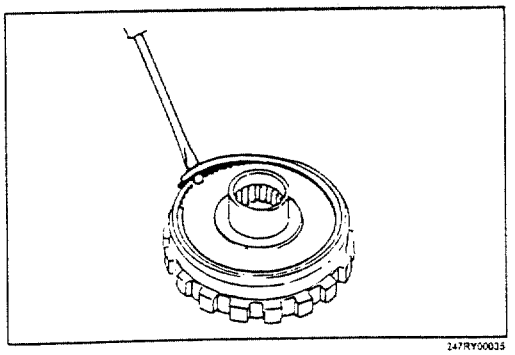
- If the lining of the disc is peeling off or discolored, or even if parts of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

REASSEMBLY



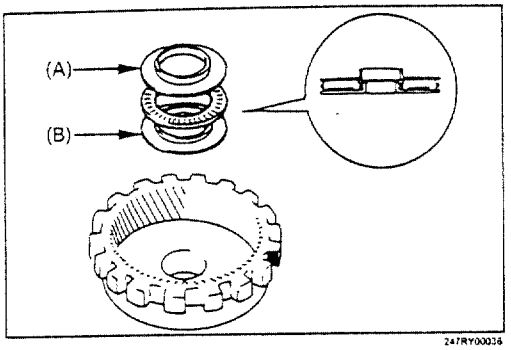
Reassembly steps

▲1. Ring gear flange
▲2. Snap ring
▲3. Thrust bearing and race
▲4. Thrust washer (Plastic)
▲5. Thrust washer (Plastic)
▲6. One-way clutch
▲7. Snap ring
▲8. One-way clutch inner race
▲9. Rear planetary gear assembly
▲10. Disc, plate, and flange (B-3)
▲11. Oil seal ring
▲12. Output shaft
▲13. Second brake assembly



Important operations

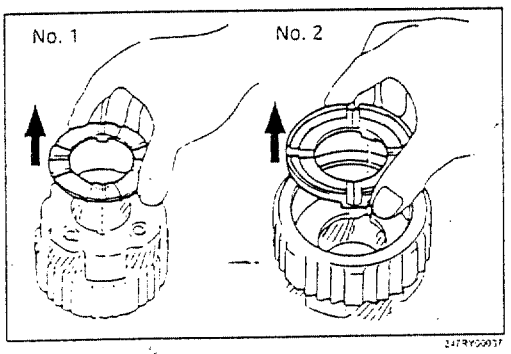
1. **Ring gear flange**
   Install ring gear flange to the ring gear.
2. **Snap ring**
   Install snap ring to the ring gear.



3. **Thrust bearing and race**
   Coat the races and bearing with petroleum jelly, and install them onto the rear planetary ring gear.

Races and bearing diameter (Reference) mm (in.)

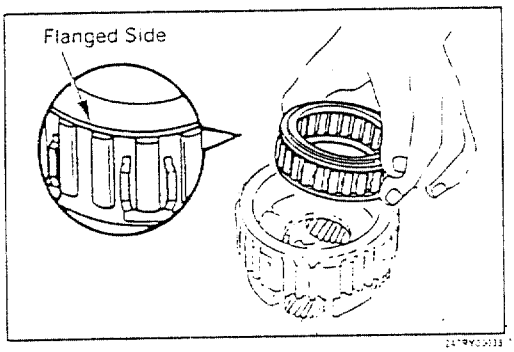
	Inside	Outside
Race (A)	28.8 (1.134)	44.8 (1.764)
Bearing	30.1 (1.185)	44.7 (1.760)
Race (B)	27.8 (1.095)	44.8 (1.764)



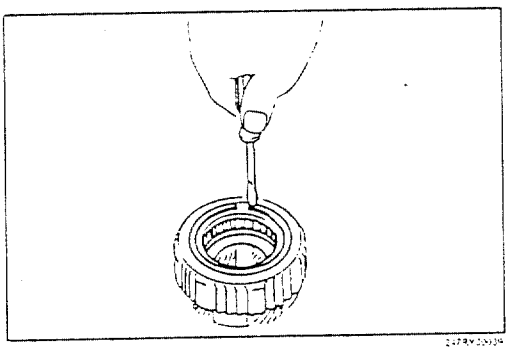
4. **Thrust washer (Plastic)**
5. **Thrust washer (Plastic)**
   Coat the thrust washer with petroleum jelly.
   Install the thrust washer onto both sides of the rear planetary gear, facing the grooved side upward.

NOTE:

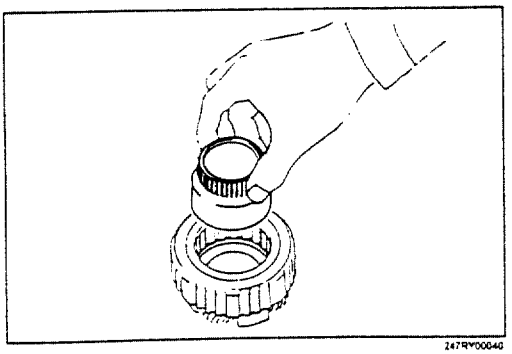
Make sure that the lugs fit into the cutout portions on the rear planetary gear.



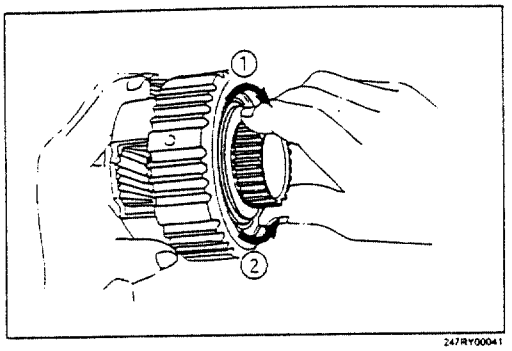
6. **One-way clutch**
   Install the one-way clutch with the flanged side facing upward onto the rear planetary gear.



7. **Snap ring**
   Install snap ring.



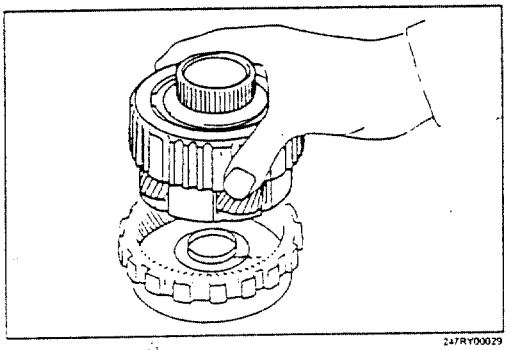
8. **One-way clutch inner race**
   While turning counterclockwise, install one-way clutch inner race to rear planetary gear.



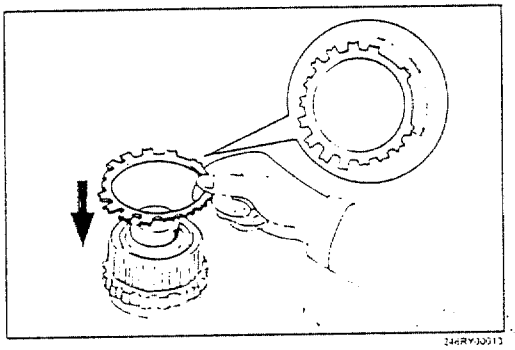
Check operation of one-way clutch

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.

(1) : Lock
(2) : Free



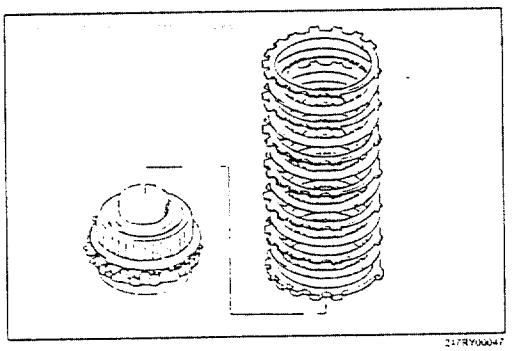
9. **Rear planetary gear assembly**
   Install rear planetary gear onto rear planetary ring gear.



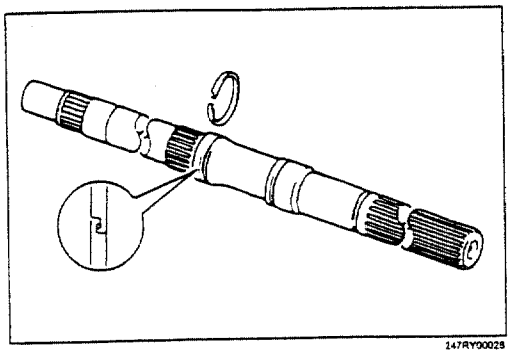
10. **Disc, plate, and flange (B-3)**
    Install a clutch plate onto the rear planetary gear assembly.

NOTE:

The claw interval of the plate should be as shown in the figure when viewing the clutch plate from the arrow direction.



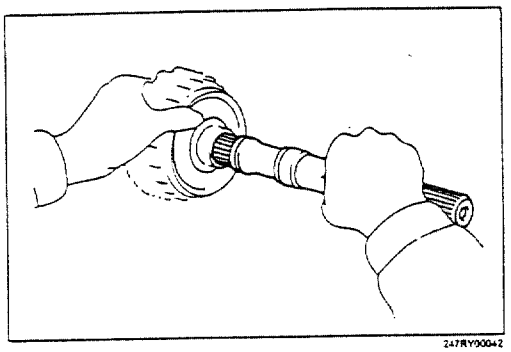
Install a brake flange onto the rear planetary gear assembly.
Install six clutch discs and six brake plates alternately, starting with clutch disc, onto the rear planetary gear assembly.



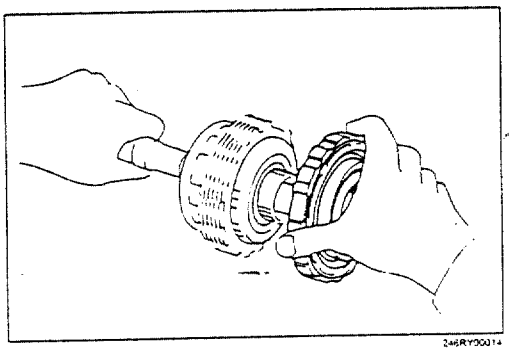
11. **Oil seal ring**
Coat the oil seal ring with ATF and install it to the output shaft.

NOTE:

Do not spread the ring ends too much.



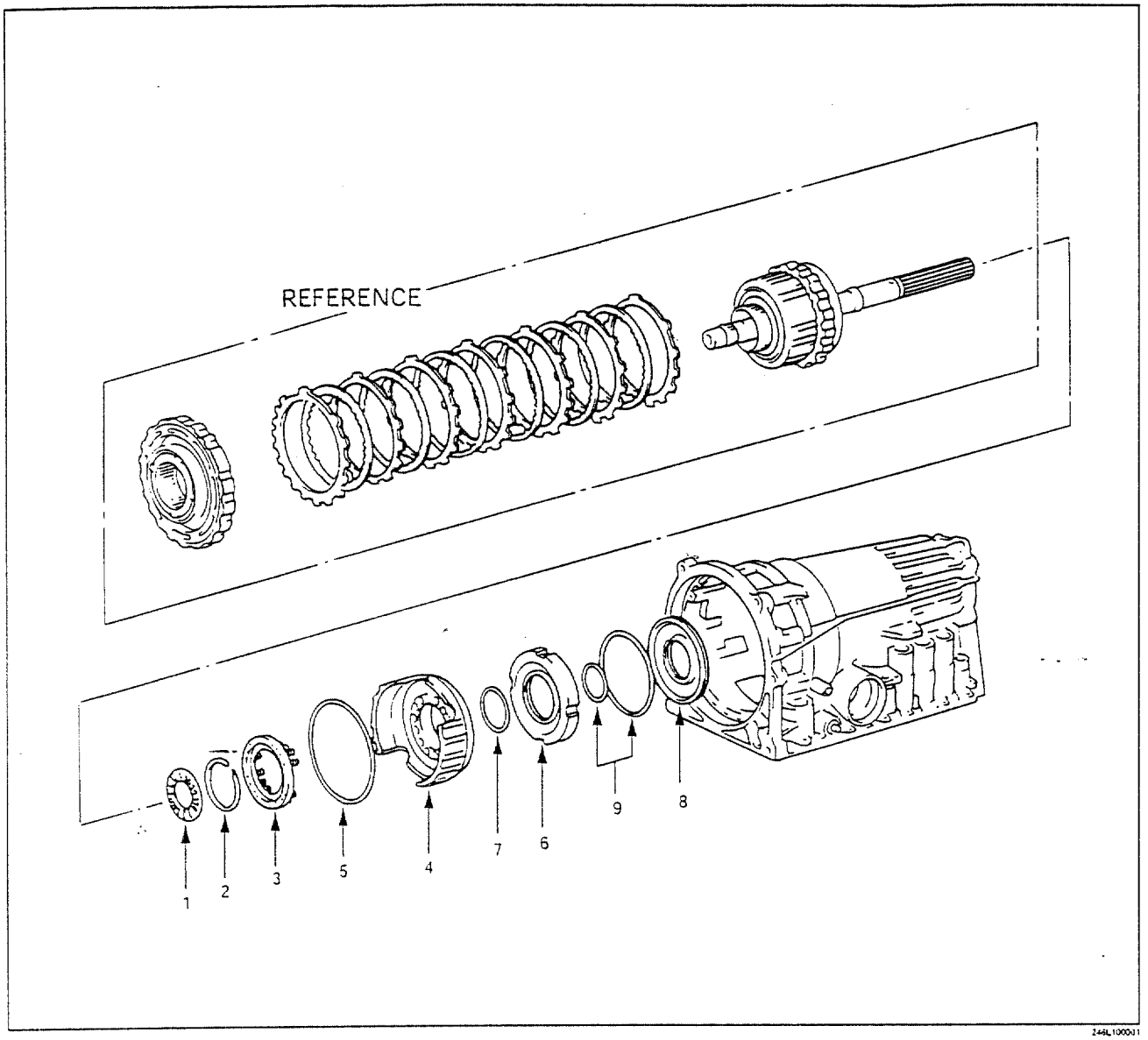
12. **Output shaft**
Install output shaft into rear planetary assembly.



13. **Second brake assembly**
Install second brake assembly to output shaft.

FIRST AND REVERSE BRAKE (B-3)

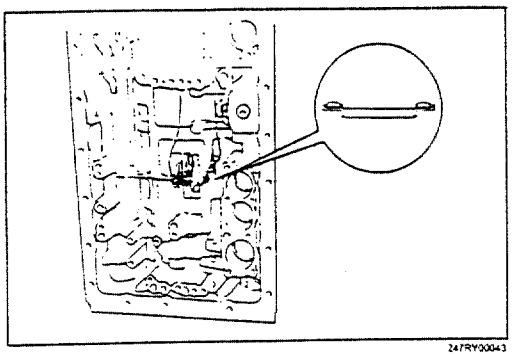
DISASSEMBLY



246L1000U1

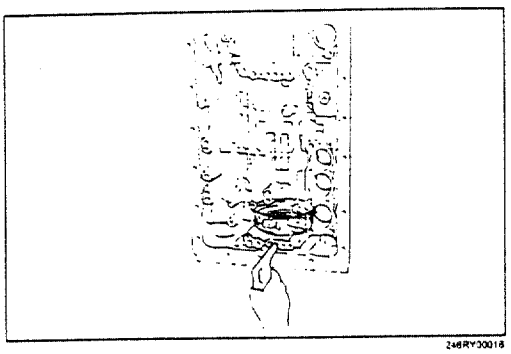
Disassembly steps

▲1. Thrust bearing and race
▲2. Snap ring
3. Piston return spring
▲4. 1st and reverse brake piston No.2
5. O-ring
▲6. Reaction sleeve
7. O-ring
▲8. 1st and reverse brake piston No.1
9. O-ring



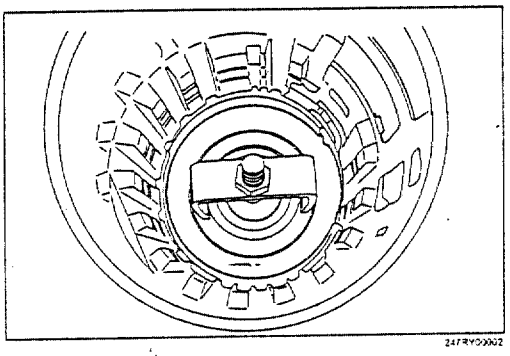
Important operations

1. **Thrust bearing and race**
   Remove assembled bearing and race from transmission case.

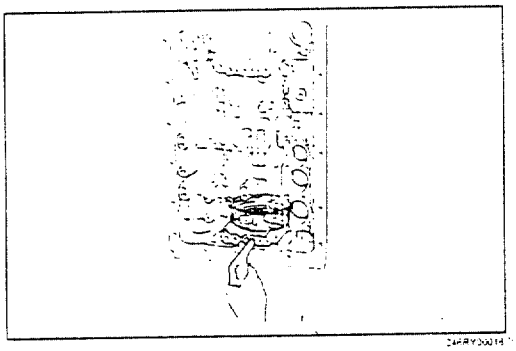


Check first and reverse brake piston movement

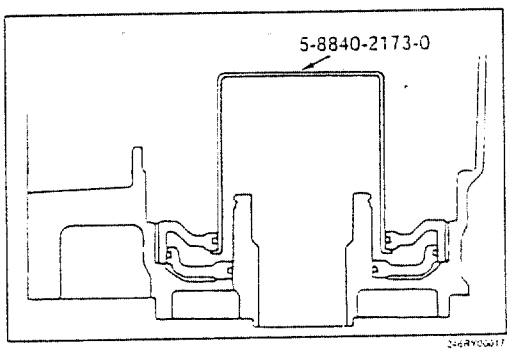
Make sure that first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



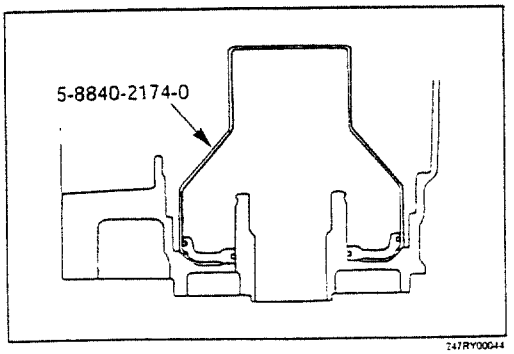
2. **Snap ring**
   Set special tool on the spring retainer, and compress the return spring.
   Spring compressor: 5-8840-0254-0 (J-25048)
   Remove the snap ring with snap ring pliers.



4. **1st and reverse brake piston No.2**
   Holding the No.2 first and reverse brake piston by hand, apply compressed air to the transmission case to remove the No.2 first and reverse brake piston.
   Remove the No.2 first and reverse brake piston.
   If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.

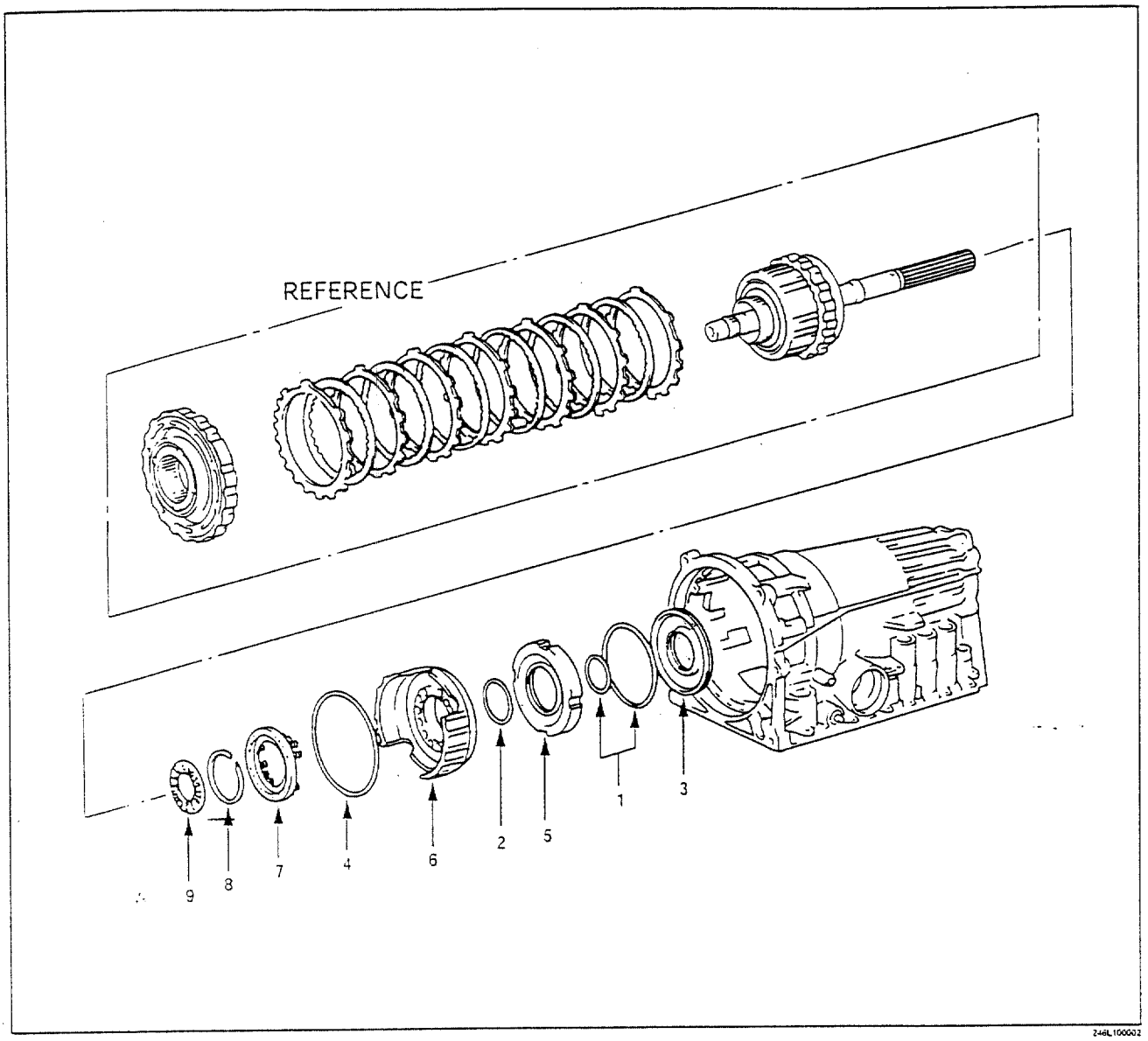


6. **Reaction sleeve**
   Insert special tool behind the reaction sleeve and gradually lift it out of the transmission case.
   Reaction sleeve puller : 5-8840-2173-0 (J-37236)



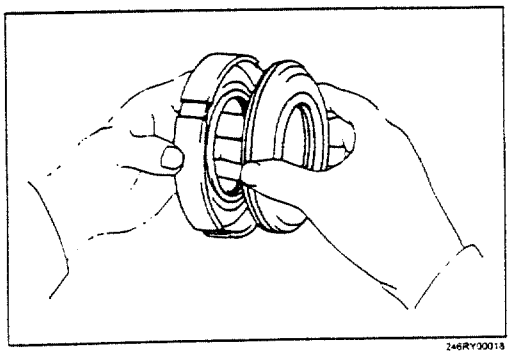
8. **1st and reverse brake piston No.1**
   Insert special tool behind the No.1 brake piston and gradually lift it out of the transmission case.
   Piston puller : 5-8840-2174-0 (J-37237)

REASSEMBLY



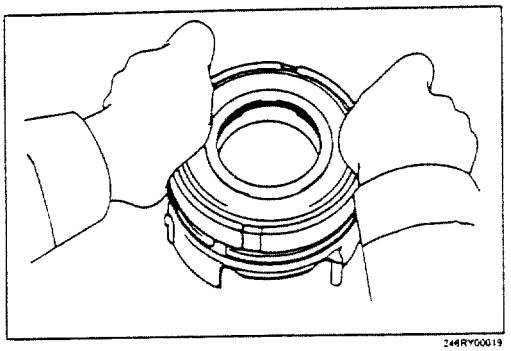
Reassembly steps

▲1. O-ring
▲2. O-ring
▲3. 1st and reverse brake piston No.1
▲4. O-ring
▲5. Reaction sleeve
▲6. 1st and reverse brake piston No.2
▲7. Return spring
▲8. Snap ring
▲9. Thrust bearing and race

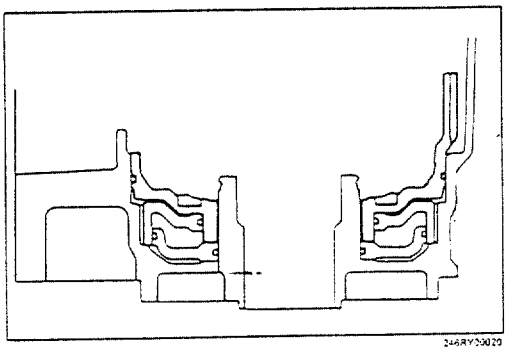


Important operations

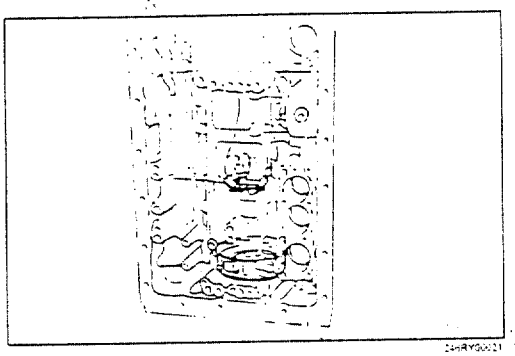
1. **O-ring**
   Coat three new O-rings with ATF.
   Install the two O-ring on the No.1 piston.
2. **O-ring**
   Install the O-ring on the reaction sleeve.
3. **1st and reverse brake piston No.1**
   Install the No.1 piston to the reaction sleeve.



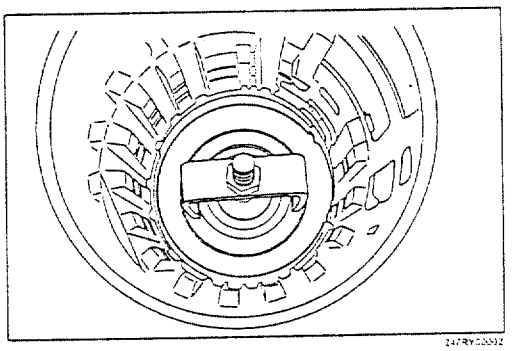
4. **O-ring**
   Coat a new O-ring with ATF and install it on the No.2 piston.
5. **Reaction sleeve**
   Install the No.1 piston with reaction sleeve onto the No.2 piston.



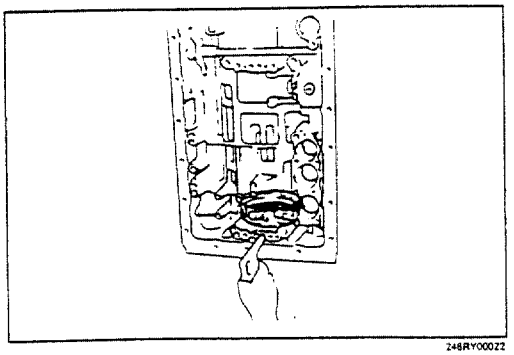
6. **1st reverse brake piston No.2**
   Align the teeth of the No.2 piston into the proper grooves.
   Being careful not to damage the O-rings, press in the No.2 with No.1 first and reverse brake pistons into the transmission case.



7. **Return spring**
   Place piston return spring onto No.2 piston.

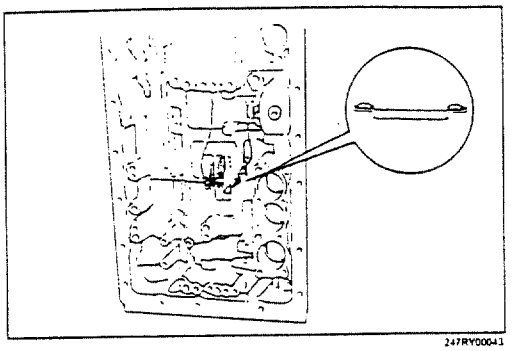


8. **Snap ring**
   Set special tool as shown, and compress the return spring with special tool.
   Spring compressor : 5-8840-0254-0 (J-25048)
   Install the snap ring with snap ring pliers. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



Check first and reverse brake piston

Make sure the first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



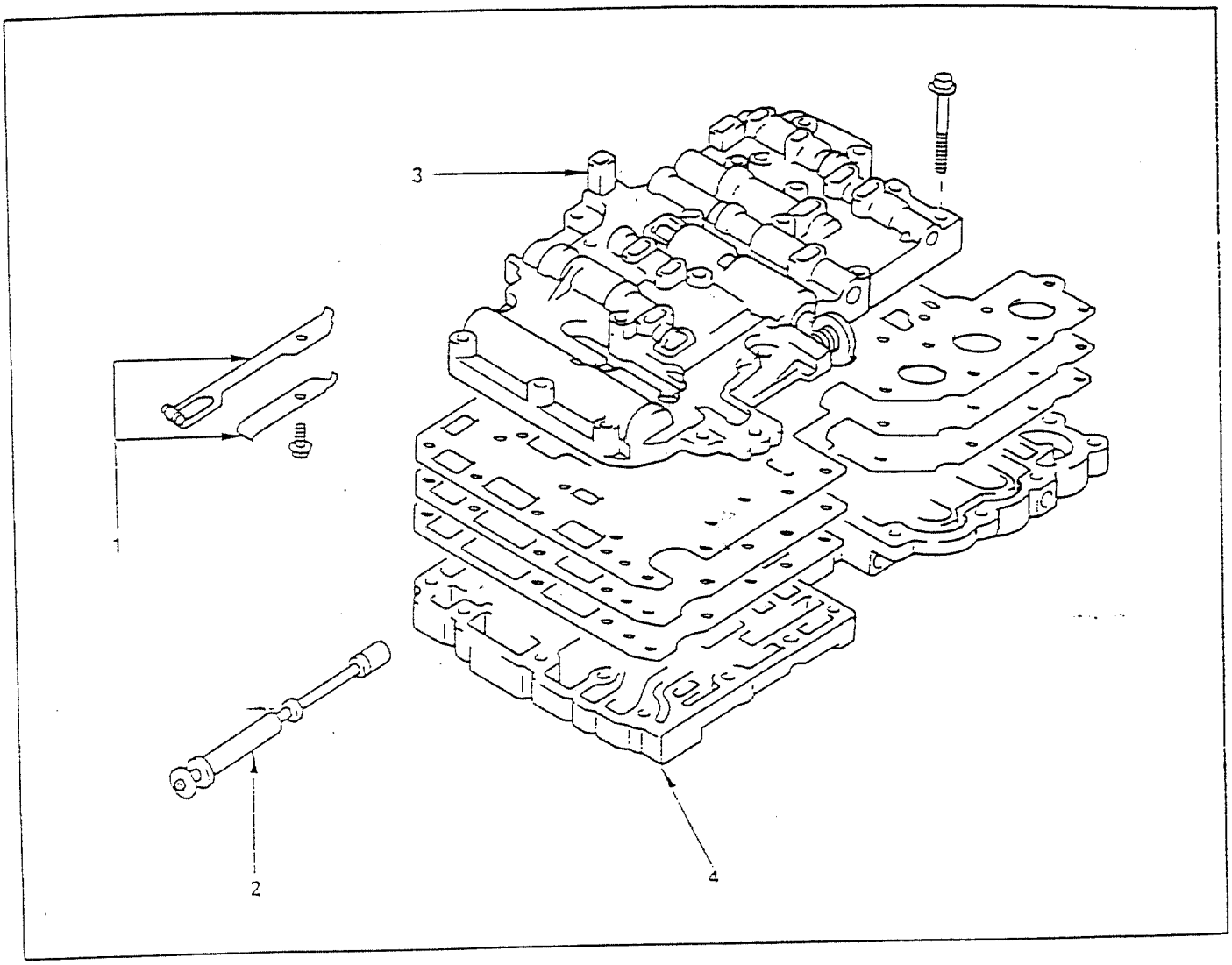
9. **Thrust bearing and race**
   Coat the assembled bearing and race with petroleum jelly.
   Install the assembled bearing and race facing the bearing side upward.

Assembled bearing and race diameter. (Reference) mm (in.)

Inside diameter	39.4 (1.551)
Outside diameter	58.1 (2.287)

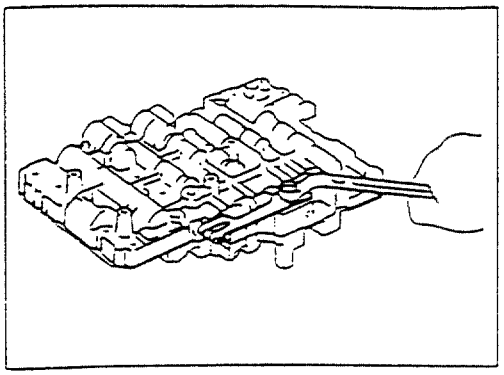
TRANSMISSION VALVE BODY ASSEMBLY

DISASSEMBLY



Disassembly steps

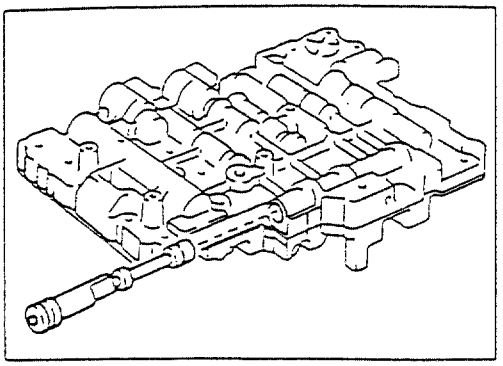
▲ 1. Detent spring
▲ 2. Manual shift valve
▲ 3. Upper valve body and plate
4. Lower valve body



Important operations

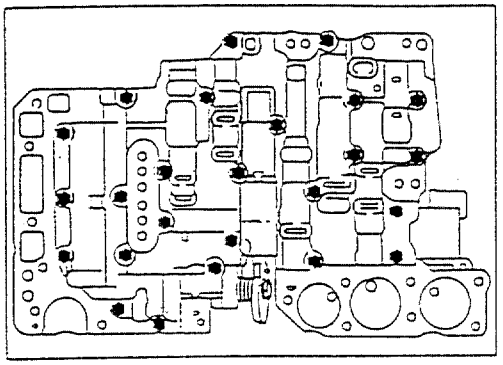
1. Detent spring

   Remove detent spring from valve body.



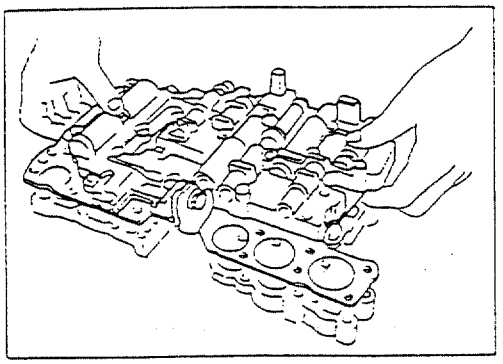
2. Manual shift valve

   Remove manual shift valve



3. Upper valve body and plate

   Turn over assembly and remove twenty five bolts.



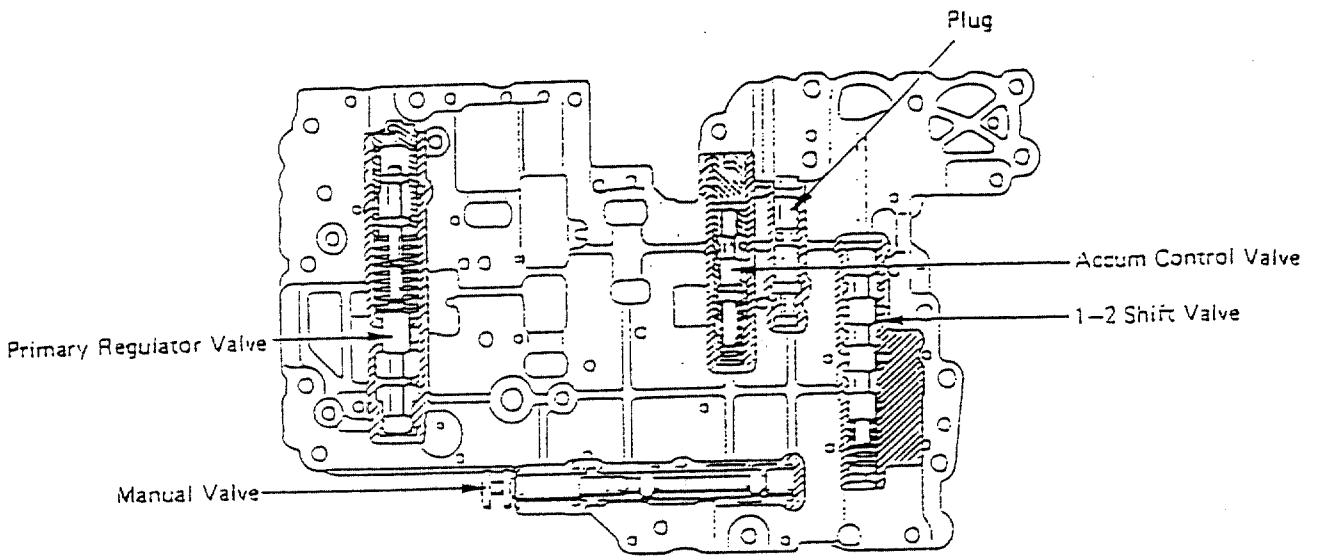
Hold the valve body plate to the upper valve body.

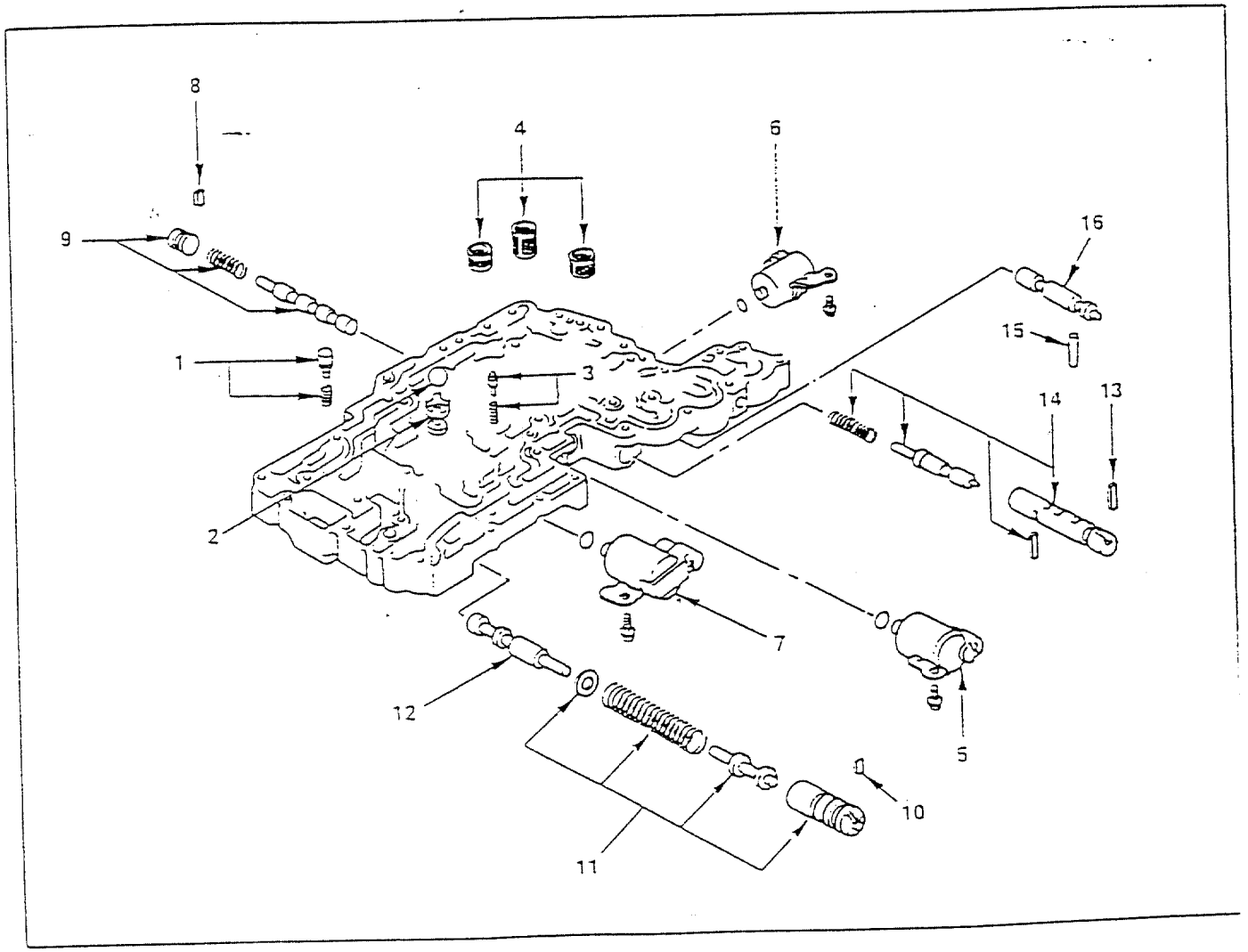
Lift off upper valve body and plate as a single unit.

Note: Be careful that the check balls and strainer do not fall out.

LOWER VALVE BODY

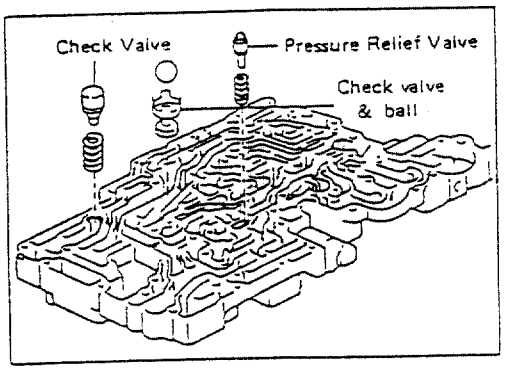
DISASSEMBLY

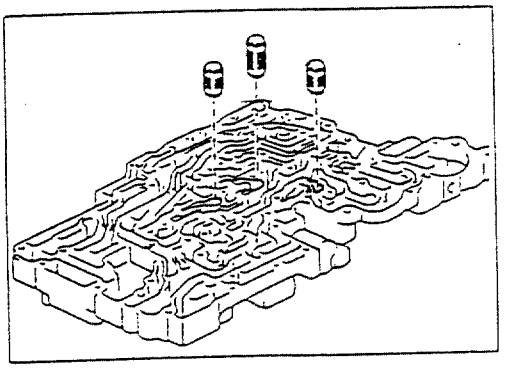


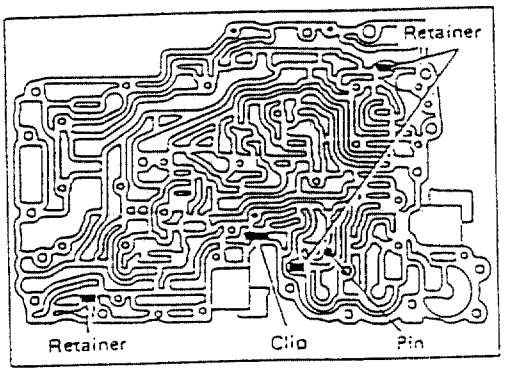


Disassembly steps

- ▲ 1. Check valve
- ▲ 2. Check valve and ball
- ▲ 3. Pressure relief valve
- ▲ 4. Strainer
- ▲ 5. No. 1 solenoid
- ▲ 6. No. 2 solenoid
- ▲ 7. No. 3 solenoid
- ▲ 8. Retainer
- ▲ 9. Plug, spring and 1-2 shift valve
- ▲10. Retainer
- ▲11. Sleeve with plunger, spring and washer
- ▲12. Primary regulator valve
- ▲13. Retainer
- ▲14. Sleeve with accumulator control valve and spring
- ▲15. Pin
- ▲16. Plug







Important operations

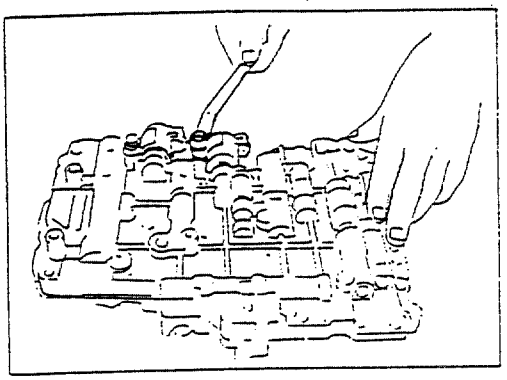
1. Check valve
2. Check valve and ball
3. Pressure relief valve

   Remove check valve, check valve and ball, pressure relief valve and springs.

4. Strainer

   Remove three strainers.

Confirm clip and three retainers are installed correctly

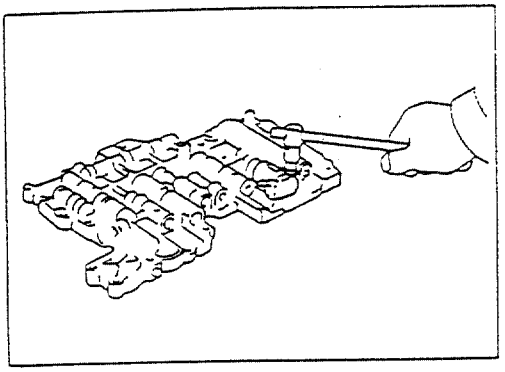


5. No. 1 solenoid
6. No. 2 solenoid

Remove each fixing bolt.

Remove the No. 1 and NO. 2 solenoid from each bore.

Remove the O-rings from solenoid.

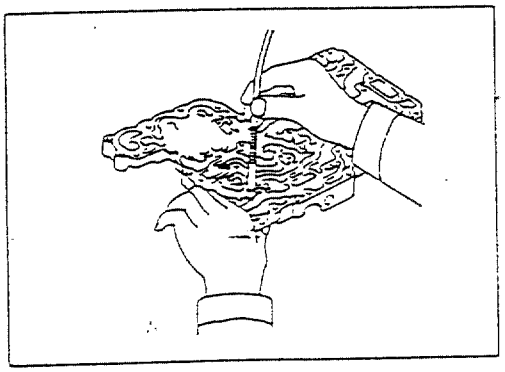


7. No. 3 solenoid

Remove the fixing bolt.

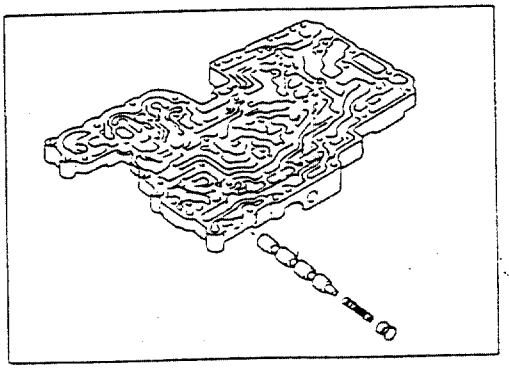
Remove the solenoid from the bore.

Remove the O-ring.



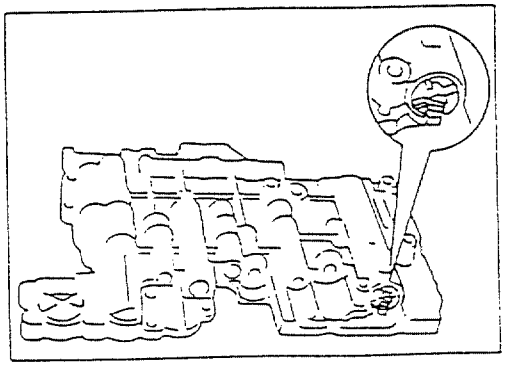
8. Retainer

Remove the retainer with a magnetic finger by pushing in the sleeve.



9. Plug, spring and 1-2 shift valve

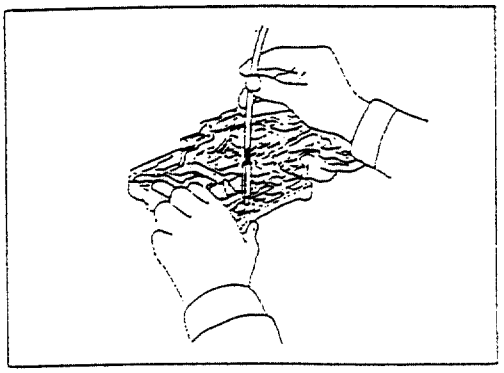
Remove the plug, spring and 1-2 shift valve.



10. Retainer

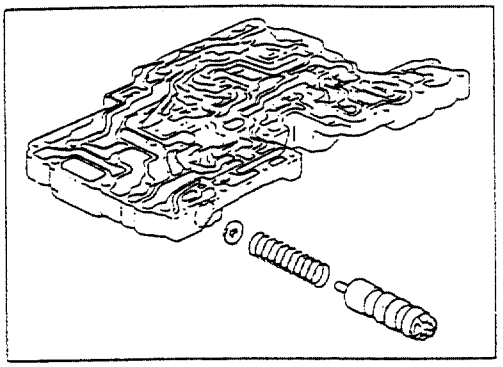
Place a mark on the bevel when the retainer is positioned.

Note: When reassembling, position the retainer in the same position.



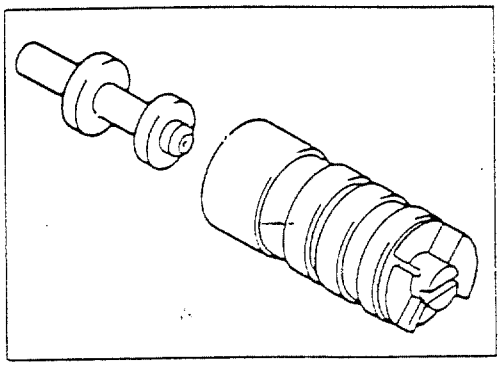
Remove the retainer with a magnetic finger by pushing in the sleeve.

WARNING: There is a highly compressed spring inside—keep away from your face.

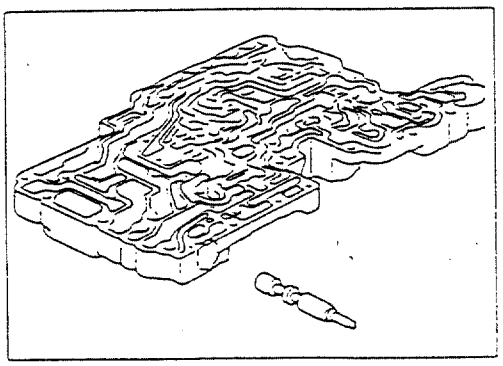


11. **Sleeve with plunger, spring and washer**

Remove the sleeve with the plunger, spring and washer.

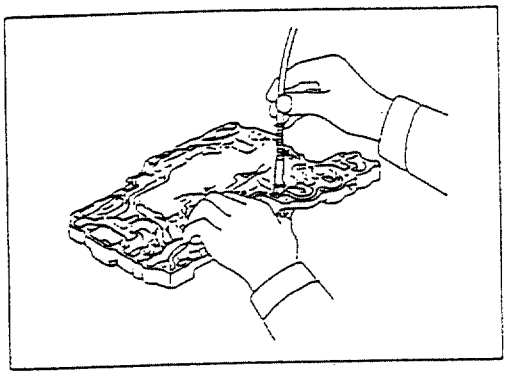


Remove the plunger from the sleeve.



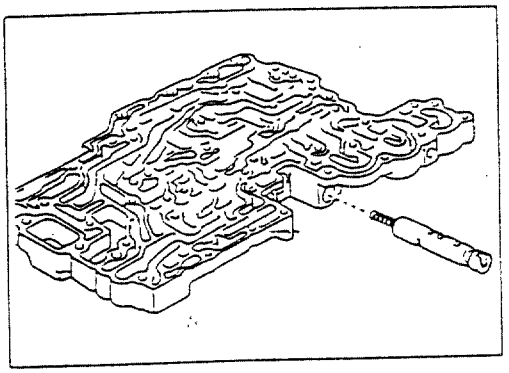
12. **Primary regulator valve**

Remove the primary regulator valve from the valve body.



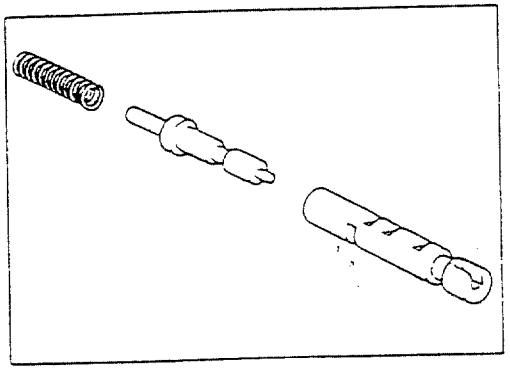
13. Retainer

    Remove the retainer with a magnetic finger by pushing in the sleeve.



14. Sleeve with accumulator control valve and spring

    Remove the sleeve with the accumulator control valve and spring.



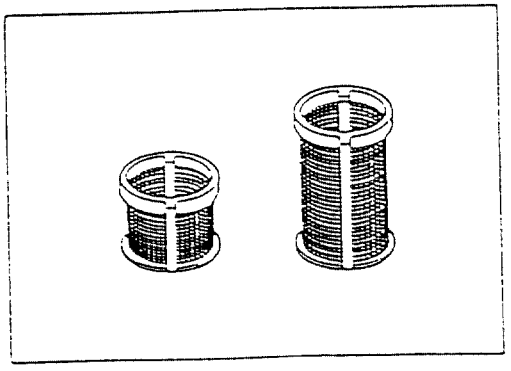
Remove the accumulator control valve and spring from the sleeve.

15. Pin

    Remove the pin with a magnetic finger.

16. Plug

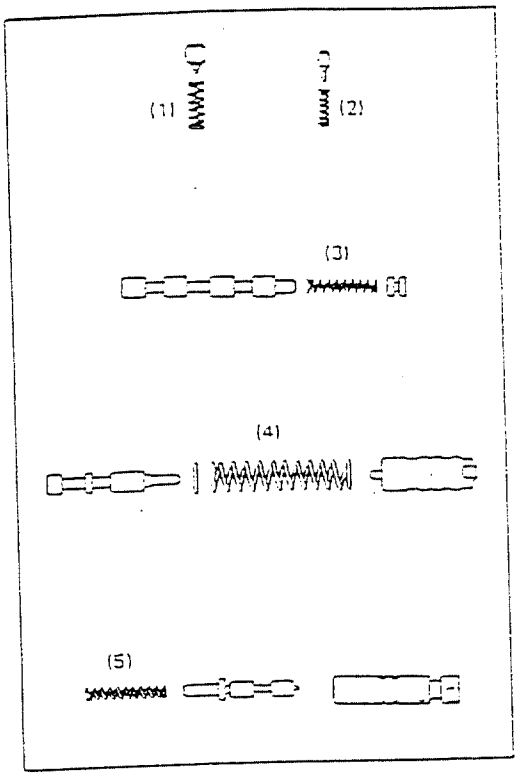
    Remove the plug.



INSPECTION AND REPAIR

Inspect strainer

Inspect strainer for residual adhesive and damage, and clean and replace as necessary.



Inspect valve springs

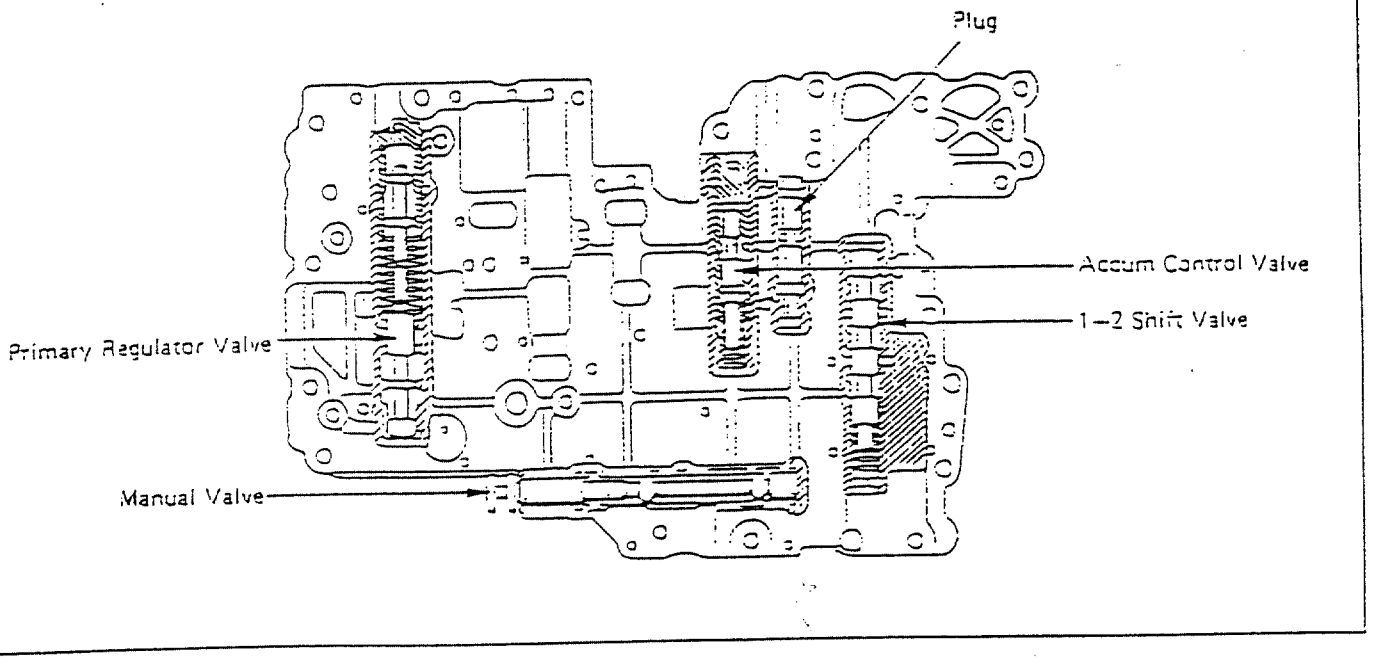
Check for damage, squareness, rust and distorted coils.

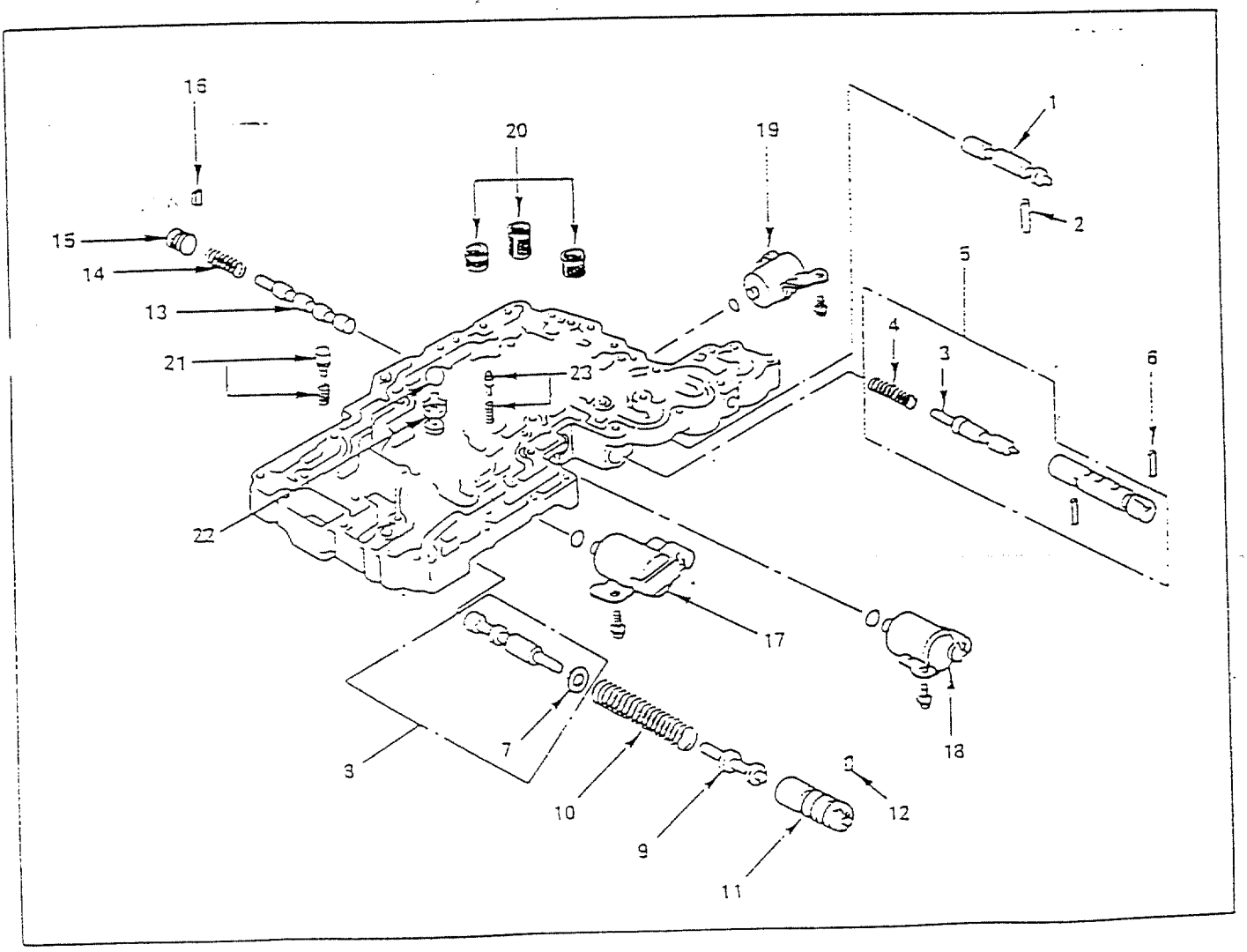
Measure the spring free height and replace if less than shown below.

mm (in.)

Spring	Free length
(1) Check valve	20.2 (0.795)
(2) Pressure relief valve	11.2 (0.441)
(3) 1-2 shift valve	30.8 (1.213)
(4) Primary regulator valve	62.3 (2.453)
(5) Accumulator control valve	33.9 (1.335)

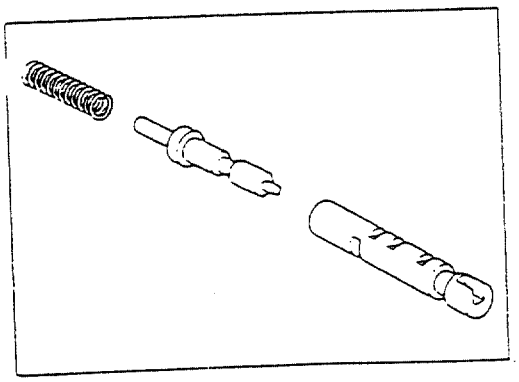
LOWER VALVE BODY REASSEMBLY





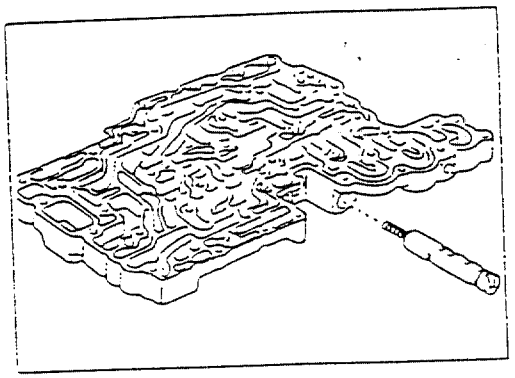
Disassembly steps

▲ 1. Plug
2. Pin
3. Accumulator control valve
▲ 4. Spring
▲ 5. Sleeve with accumulator control valve
▲ 6. Retainer
▲ 7. Washer
▲ 8. Primary regulator valve
▲ 9. Plunger
▲10. Spring
▲11. Sleeve
▲12. Retainer
▲13. 1-2 shift valve
▲14. Spring
▲15. Plug
▲16. Retainer
▲17. No. 3 solenoid
▲18. No. 1 solenoid
▲19. No. 2 solenoid
▲20. Strainer
▲21. Check valve and spring
▲22. Check valve and ball
▲23. Pressure relief valve

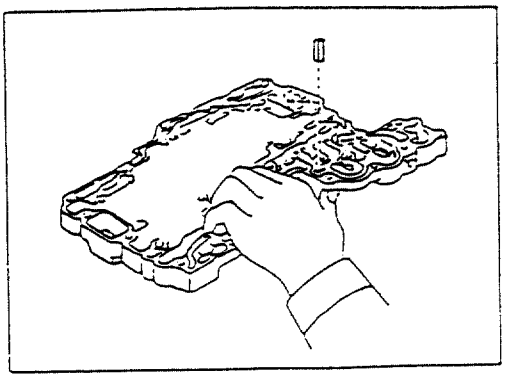


Important operations

1. Plug
   Install the plug.
2. Pin
   Install the pin
3. Accumulator control valve
4. Spring
   Install the accumulator control valve and spring into the sleeve.

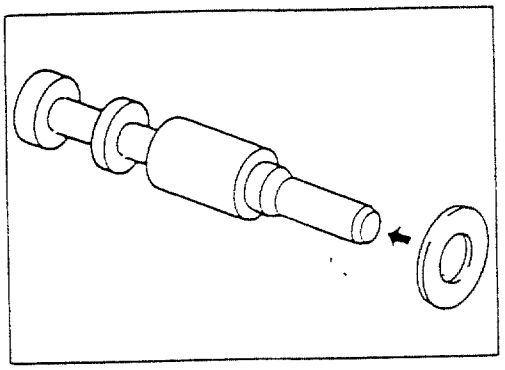


5. Sleeve with accumulator control valve
   Install the sleeve with the accumulator control valve and spring into the bore.



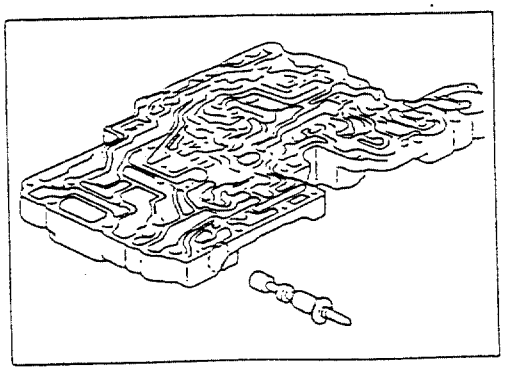
6. Retainer

   Install the retainer by pushing in the sleeve.



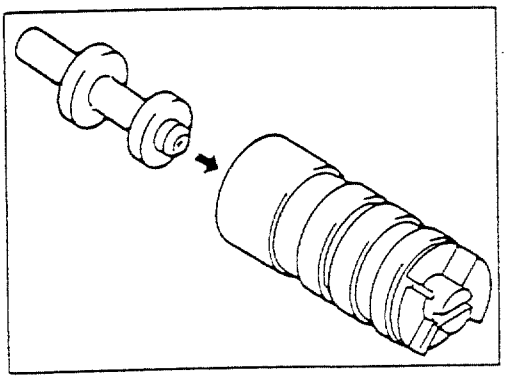
7. Washer

   Install the washer onto the primary regulator valve.



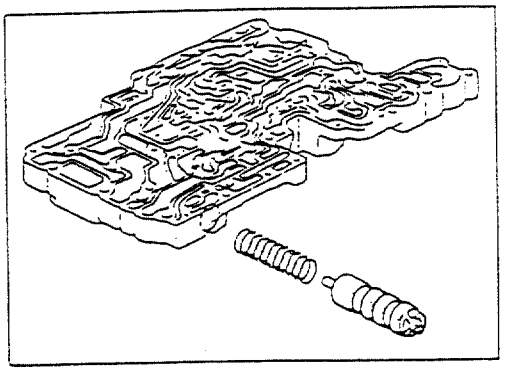
8. Primary regulator valve

   Install the primary regulator valve with the washer into the bore.



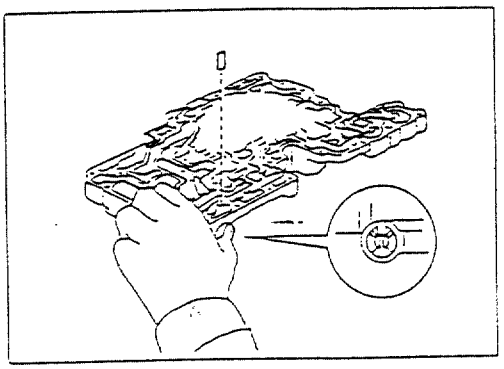
9. Plunger

   Install the plunger into the sleeve.



10. Spring
11. Sleeve with plunger

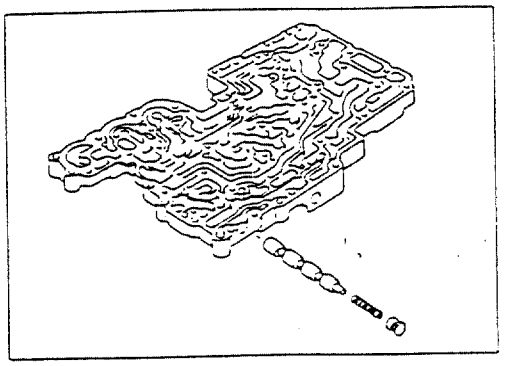
    Install the sleeve with the plunger and spring into the bore.



12. Retainer

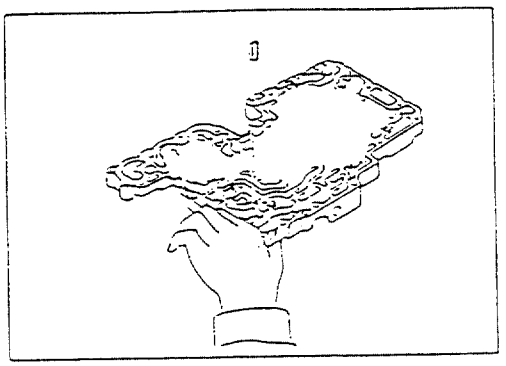
    Install the retainer to the bevel by pushing in the sleeve.

Note: Install the retainer to the same position on the sleeve, as when disassembling.



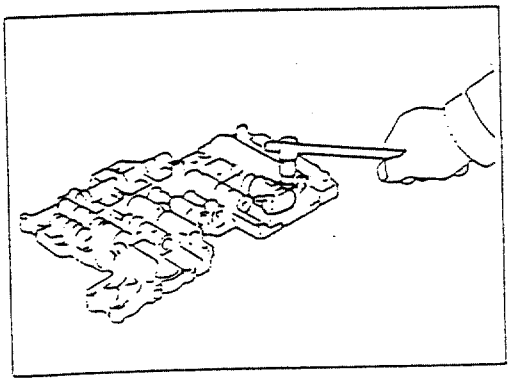
13. 1-2 shift valve
14. Spring
15. Plug

    Install the 1-2 shift valve, spring and plug into the bore.



16. Retainer

    Install the retainer by pushing in the plug.



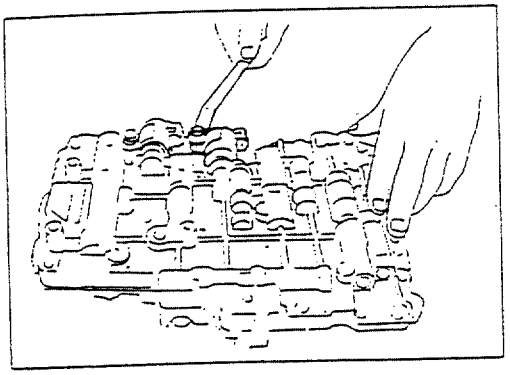
17. **No. 3 solenoid**

Install a new O-ring to the solenoid.

Install the solenoid to the valve body.

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)



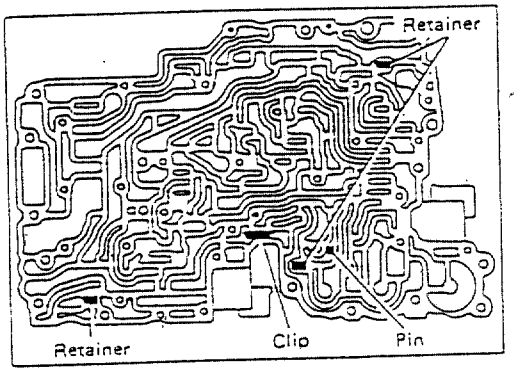
18. **No. 1 solenoid**
19. **No. 2 solenoid**

Install a new O-ring to the solenoid.

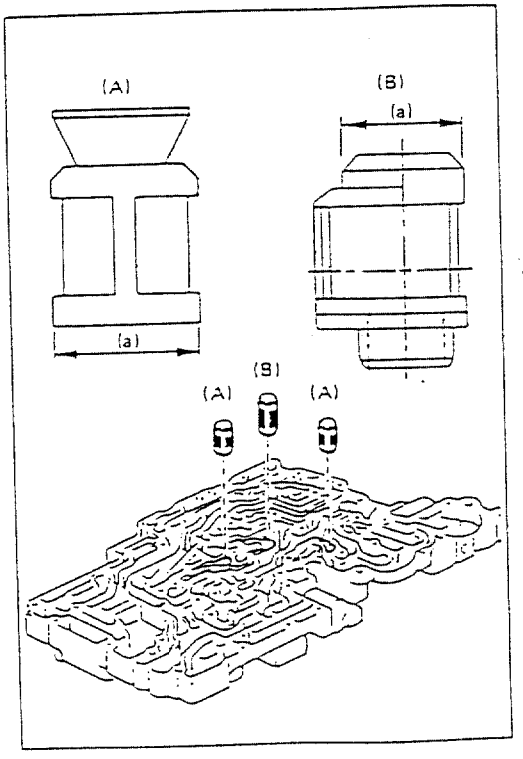
Install the solenoid to the valve body.

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)



Make sure clip and three retainers are installed correctly.

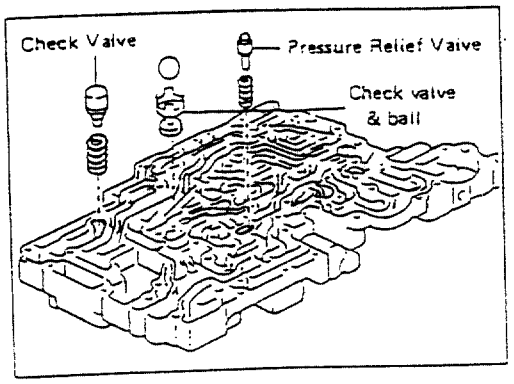


20. **Strainer**

Install the three strainers to the valve body as shown.

mm (in.)

Strainer	Height	Diameter (a)
(A) Solenoid oil strainer	12.3 (0.484)	10.3 (0.406)
(B) Throttle oil strainer	13.6 (0.535)	8.1 (0.319)

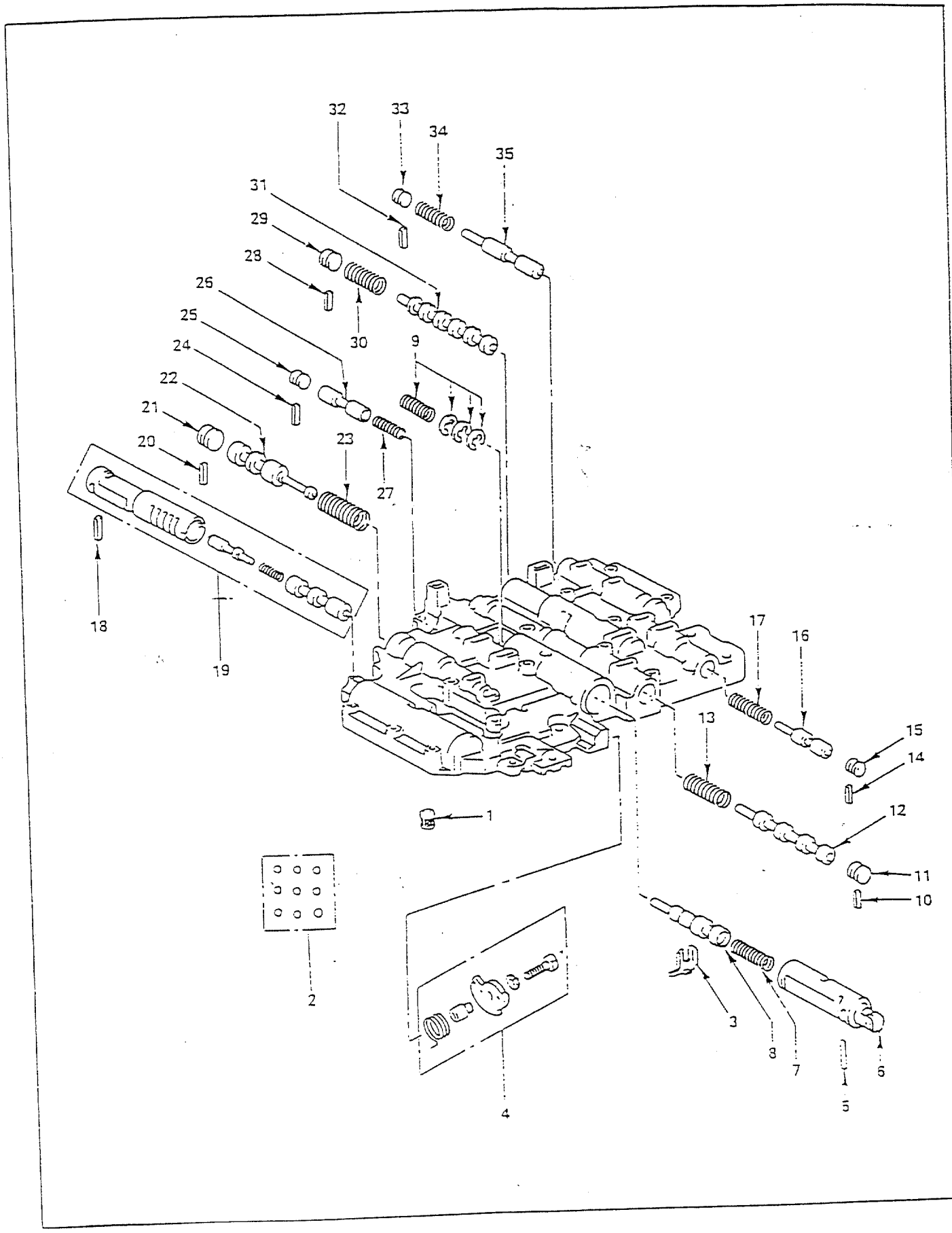


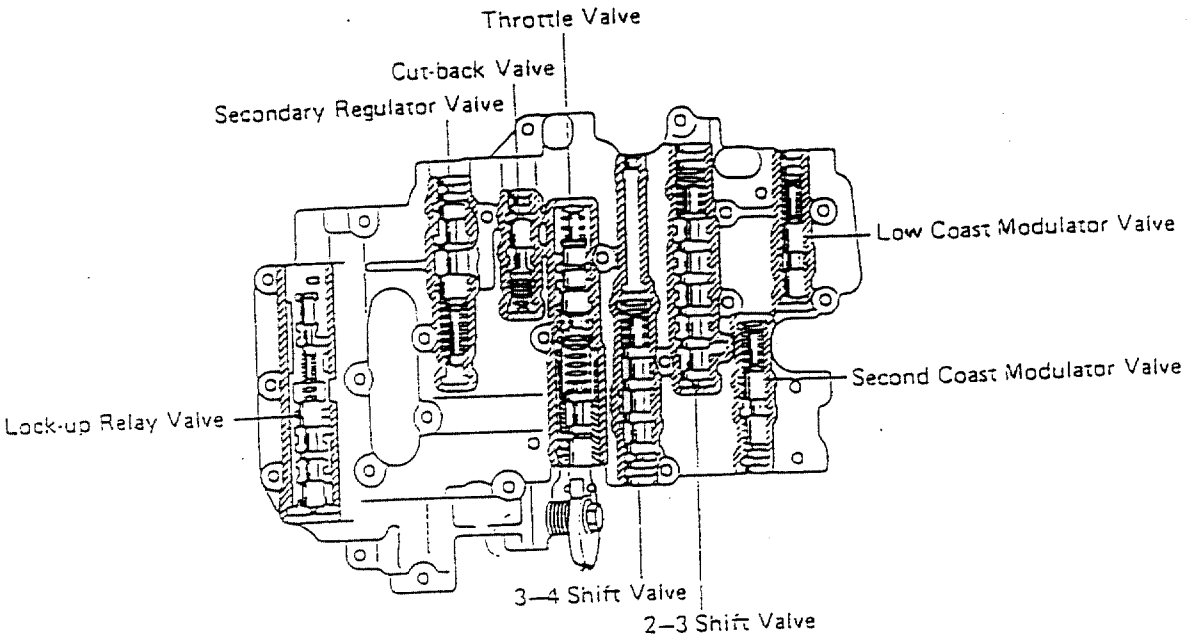
21. Check valve and spring
22. Check valve and ball
23. Pressure relief valve

Install check valve, check valve and ball, pressure relief valve and springs.

UPPER VALVE BODY

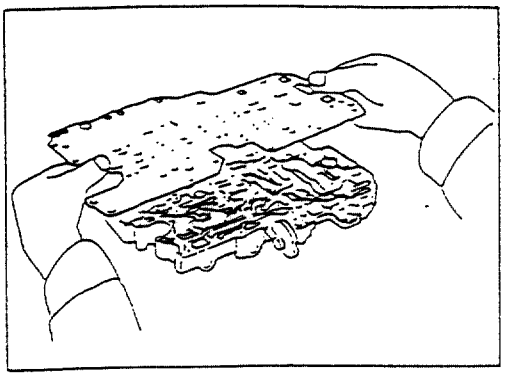
DISASSEMBLY





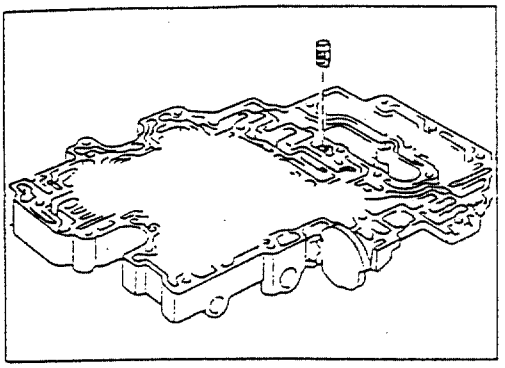
Disassembly steps

▲ 1. Strainer
▲ 2. Check ball
▲ 3. Valve stopper
▲ 4. Throttle valve cam
▲ 5. Pin
▲ 6. Down-shift plug
▲ 7. Spring
▲ 8. Throttle valve
▲ 9. Spring and adjusting ring
▲ 10. Retainer
▲ 11. Plug
▲ 12. 3 - 4 shift valve
▲ 13. Spring
▲ 14. Retainer
▲ 15. Plug
▲ 16. 2nd coast modulator valve
▲ 17. Spring
▲ 18. Retainer
▲ 19. Sleeve with plunger, spring and lock up relay valve
▲ 20. Retainer
▲ 21. Plug
▲ 22. Secondary regulator valve
▲ 23. Spring
▲ 24. Retainer
▲ 25. Plug
▲ 26. Cut-back valve
▲ 27. Spring
▲ 28. Retainer
▲ 29. Plug
▲ 30. Spring
▲ 31. 2 - 3 shift valve
▲ 32. Retainer
▲ 33. Plug
▲ 34. Spring
▲ 35. Low coast modulator valve

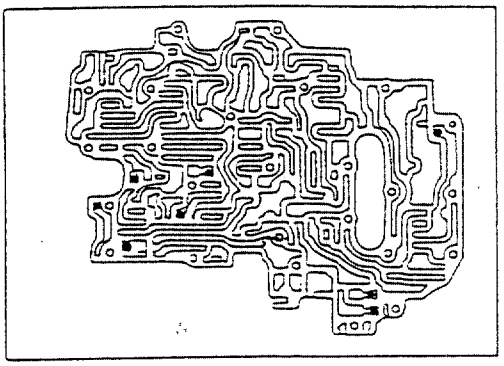


Important operations

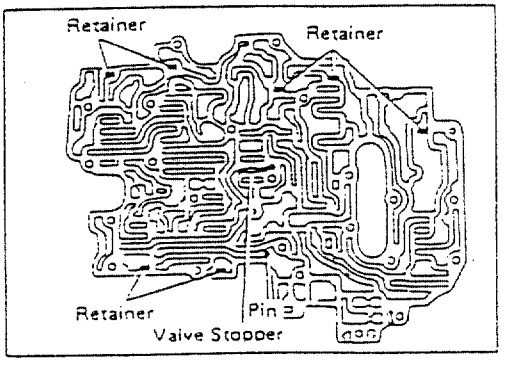
Remove valve body plate and gaskets



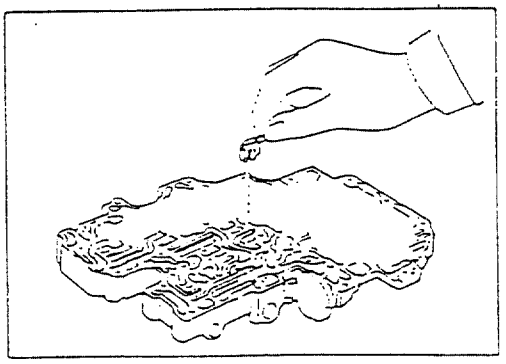
1. Strainer
   Remove strainer.



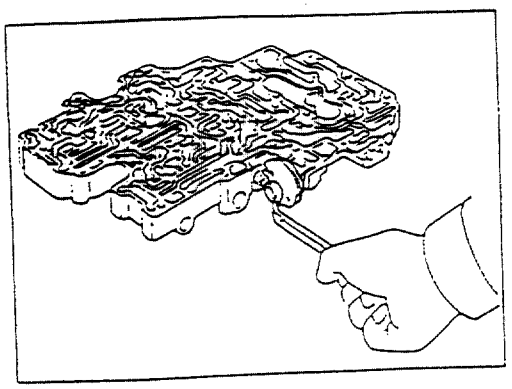
2. Check ball
   Remove eight check balls.



Confirm pin, seven retainers and valve stopper are installed correctly

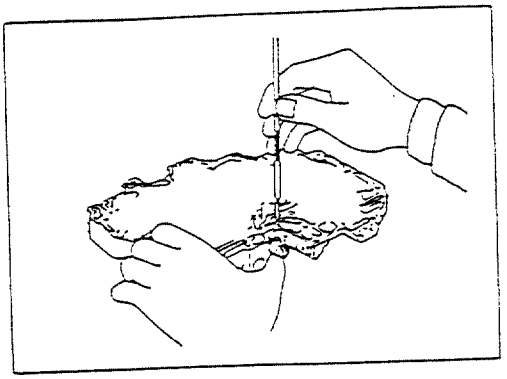


3. Valve stopper
   Remove valve stopper.



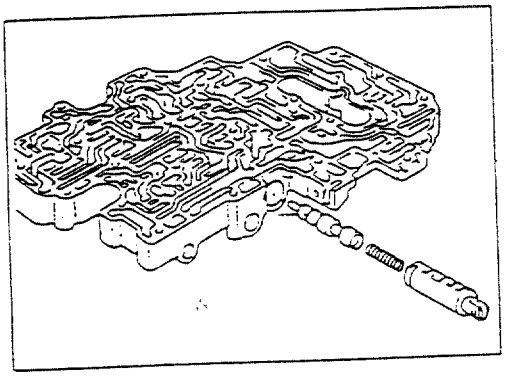
4. Throttle valve cam

   Remove throttle valve cam.



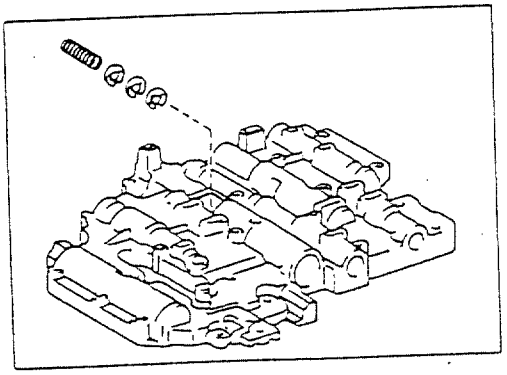
5. Pin

   Remove the pin with a magnetic finger by pushing in the down-shift plug.



6. Down-shift plug
7. Spring
8. Throttle valve

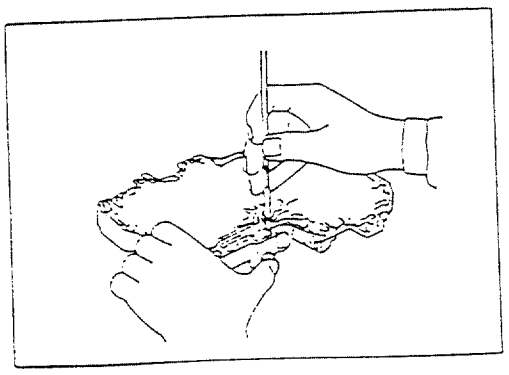
   Remove the down-shift plug, spring and throttle valve.



9. Spring and adjusting ring

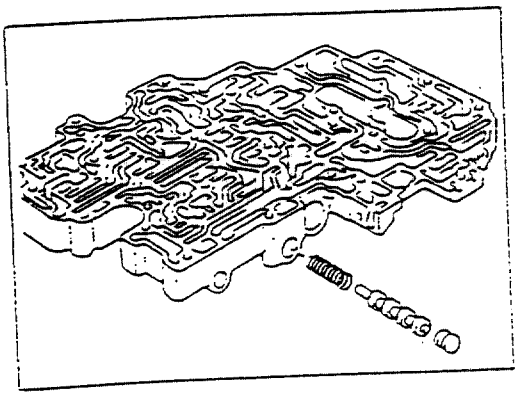
   Turn over assembly, and remove the spring and adjusting rings.

Note: Note the number of adjusting rings installed. (Sometimes adjusting rings will not be used.)



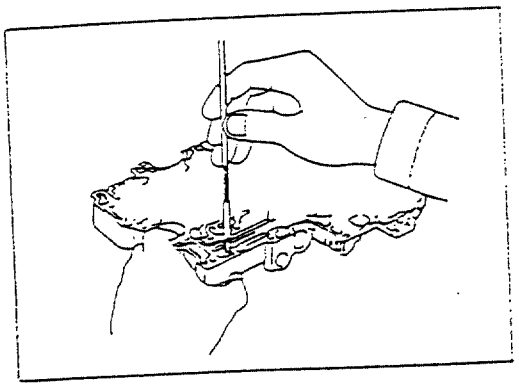
10. Retainer

    Remove the retainer with a magnetic finger by pushing in the plug.



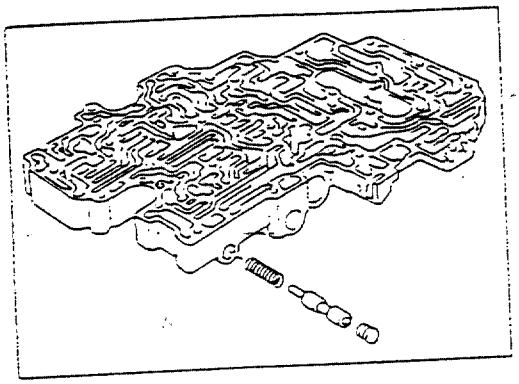
11. Plug
12. 3 - 4 shift valve
13. Spring

    Remove the plug, 3 - 4 shift valve and spring.



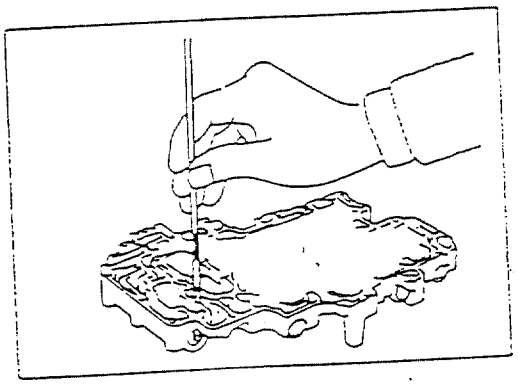
14. Retainer

    Remove the retainer.



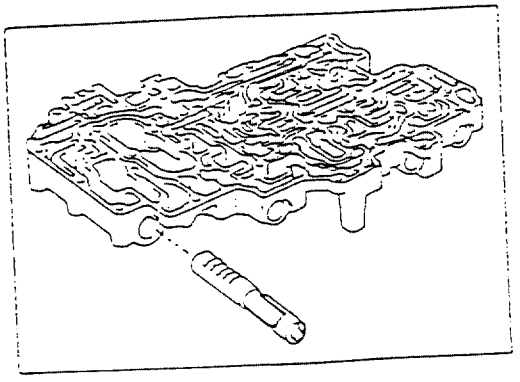
15. Plug
16. 2nd coast modulator valve
17. Spring

    Remove the plug, second coast modulator valve and spring.



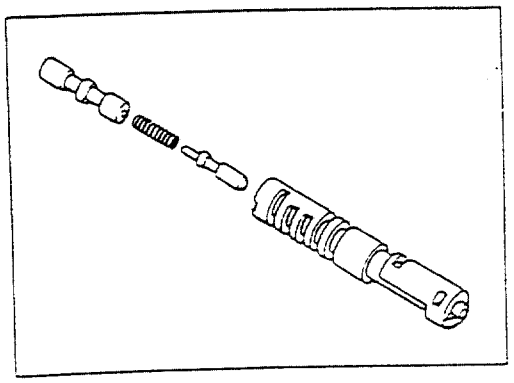
18. Retainer

    Remove the retainer with the magnetic finger.

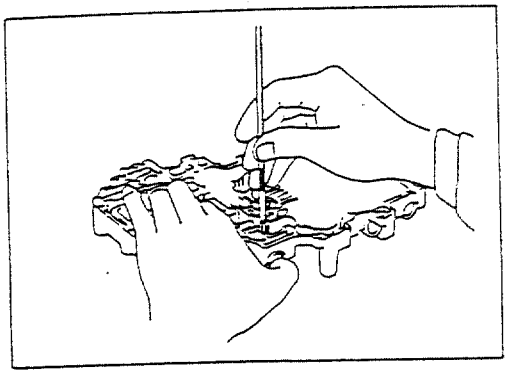


19. Sleeve with plunger, spring and lock up relay valve

    Remove the sleeve with the plunger, spring and lock up relay valve.

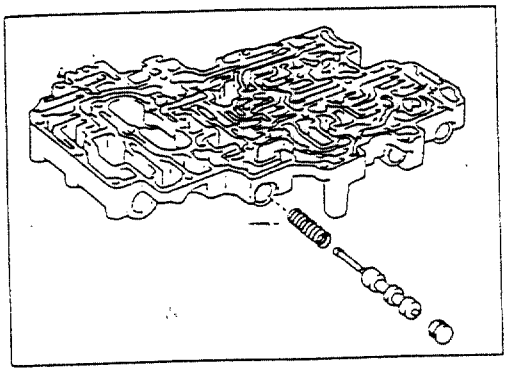


Remove the lock-up relay valve, spring and plunger from the sleeve.



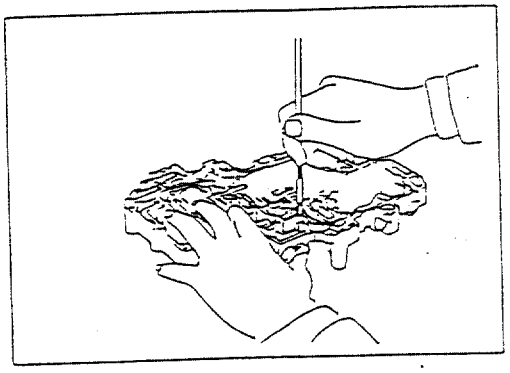
20. Retainer

Remove the retainer with a magnetic finger by pushing in the plug.



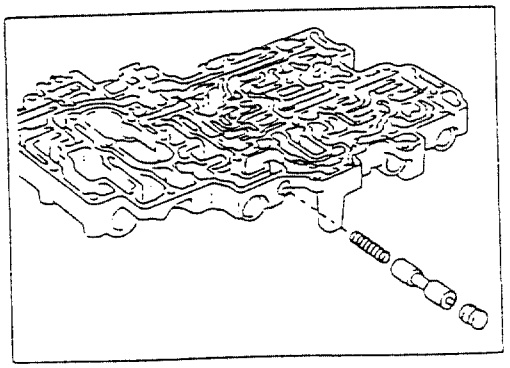
21. Plug
22. Secondary regulator valve
23. Spring

Remove the plug, secondary regulator valve and spring.



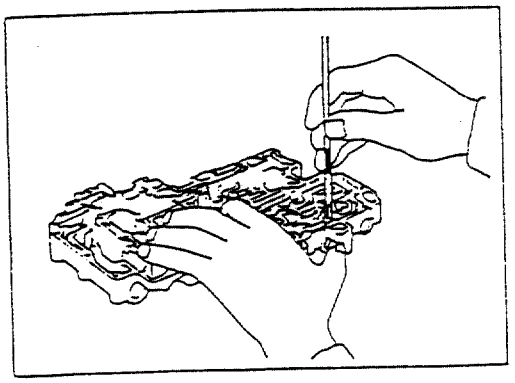
24. Retainer

Remove the retainer with a magnetic finger by pushing in the plug.



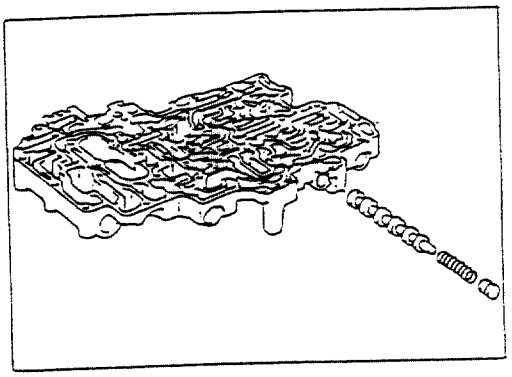
25. Plug
26. Cut-back valve
27. Spring

Remove the plug, cut-back valve and spring.



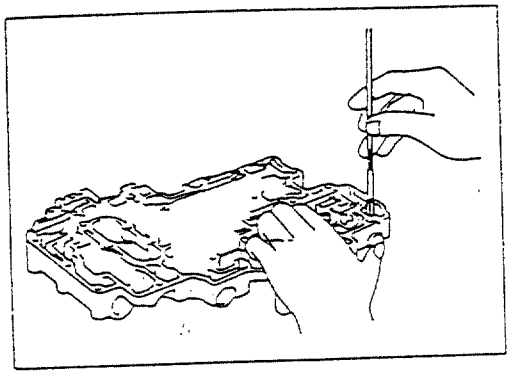
28. Retainer

    Remove the retainer with a magnetic finger by pushing in the plug.



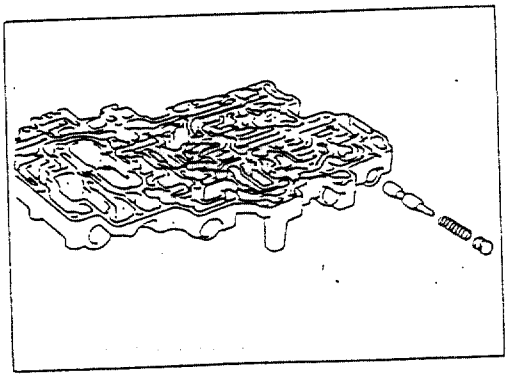
29. Plug
30. Spring
31. 2 - 3 shift valve

    Remove the plug, spring and 2 - 3 shift valve.



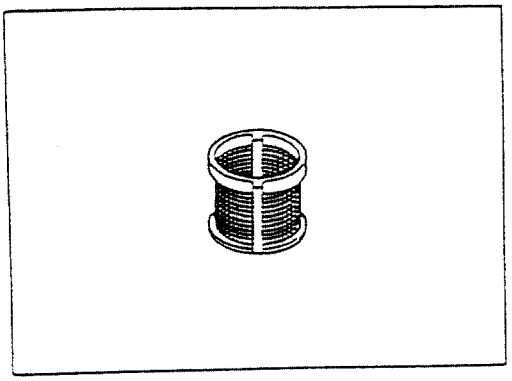
32. Retainer

    Remove the retainer with a magnetic finger by pushing in the plug.



33. Plug
34. Spring
35. Low coast modulator valve

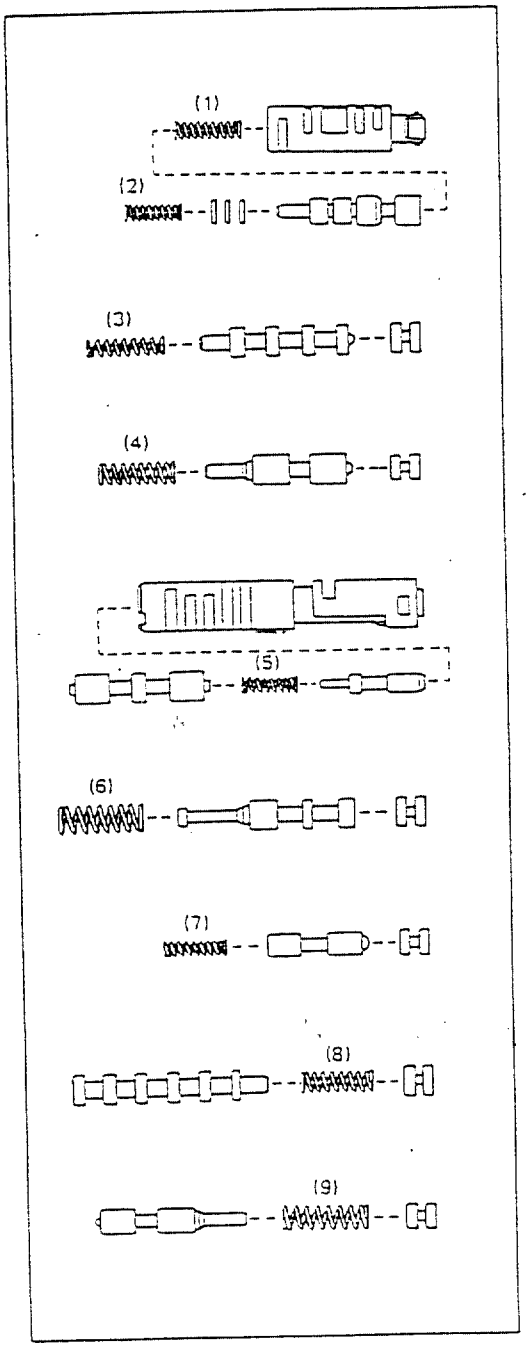
    Remove the plug, spring and low coast modulator valve.



INSPECTION AND REPAIR

Inspect strainer

Inspect strainer for residual adhesive and damage. and clean and replace as necessary.



Inspect valve springs

Check for damage, squareness, rust and distorted coils.

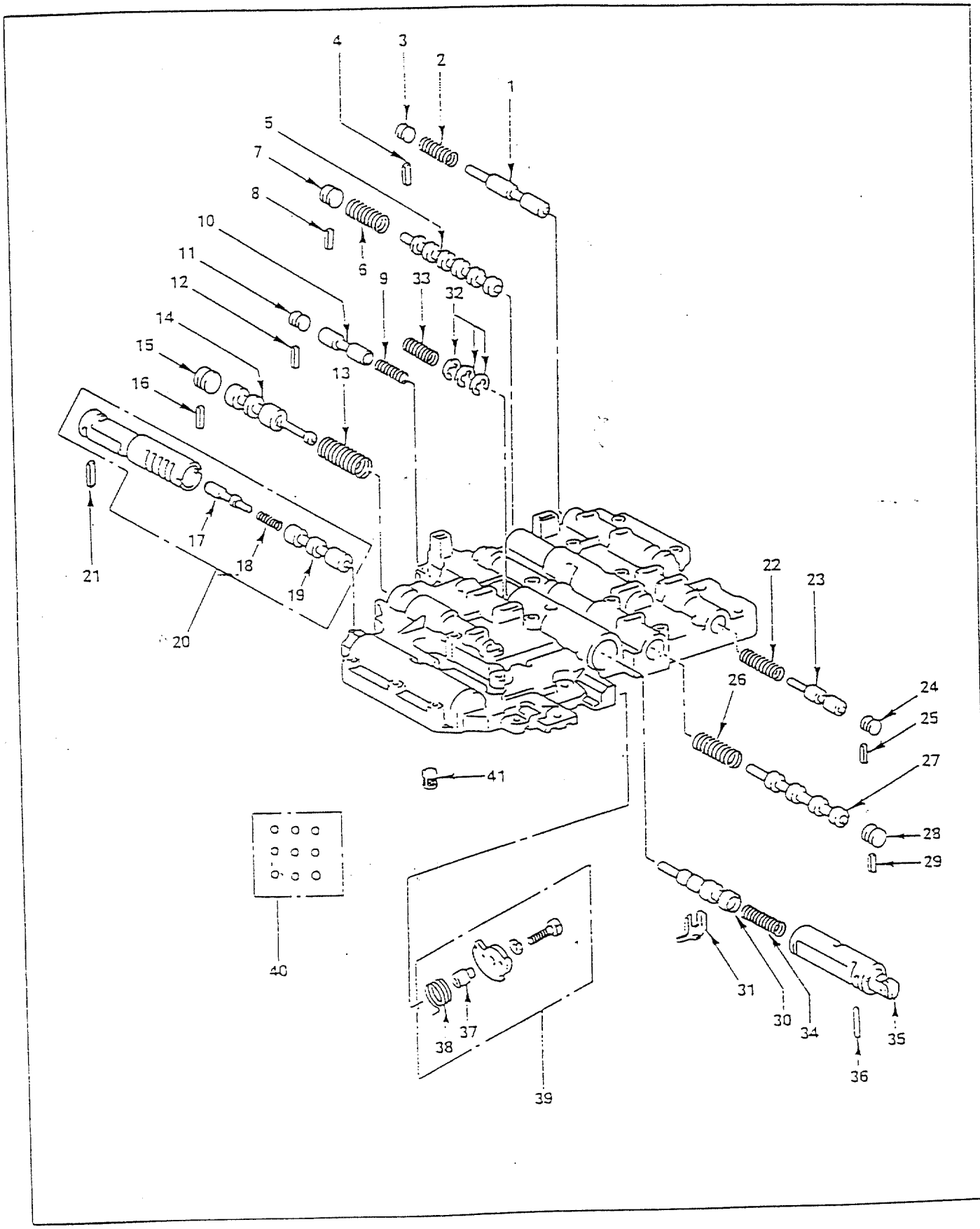
Measure the spring free height and replace if less than that shown below.

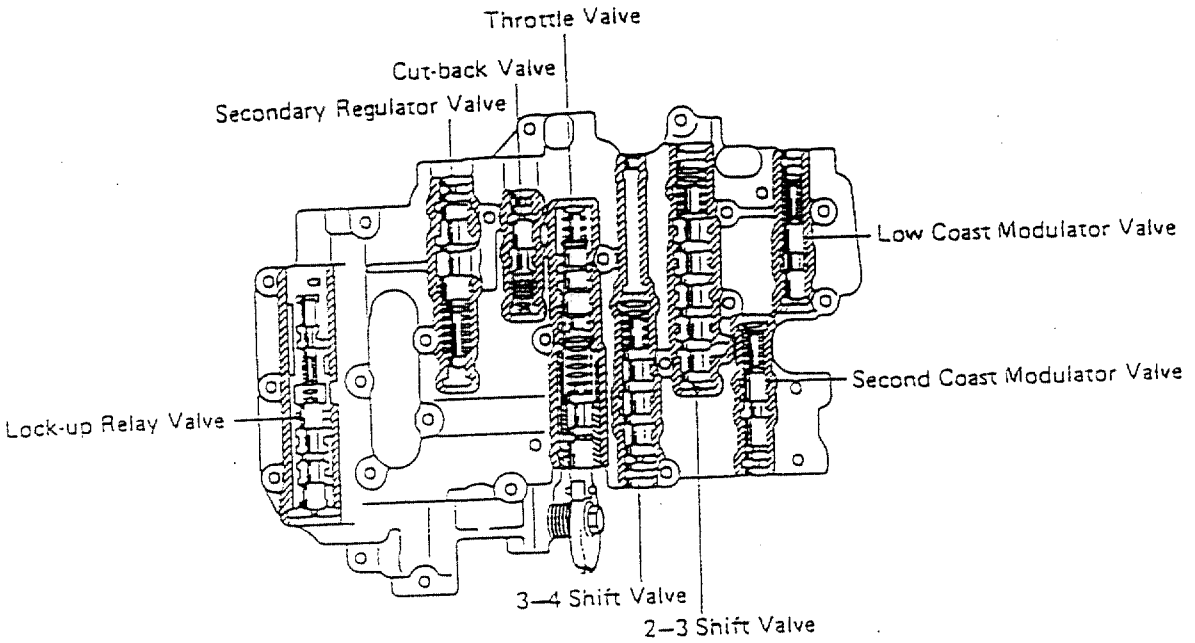
mm (in.)

Spring	Free length
(1) Down-shift plug	27.3 (1.075)
(2) Throttle valve	20.6 (0.811)
(3) 3 - 4 shift valve	30.8 (1.212)
(4) Second coast modulator valve	30.9 (1.217)
(5) Lock-up relay valve	21.4 (0.843)
(6) Secondary regulator valve	30.9 (1.217)
(7) Cut-back valve	21.8 (0.858)
(8) 2 - 3 shift valve	30.8 (1.212)
(9) Low coast modulator valve	30.4 (1.197)

UPPER VALVE BODY

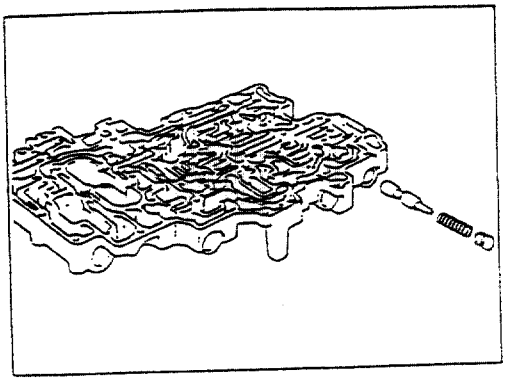
REASSEMBLY





Reassembly steps

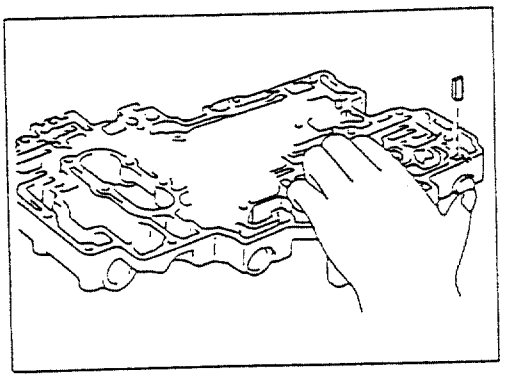
▲ 1. Low-coast modulator valve
▲ 2. Spring
▲ 3. Plug
▲ 4. Retainer
▲ 5. 2 - 3 shift valve
▲ 6. Spring
▲ 7. Plug
▲ 8. Retainer
▲ 9. Spring
▲ 10. Cut-back valve
▲ 11. Plug
▲ 12. Retainer
▲ 13. Spring
▲ 14. Secondary regulator valve
▲ 15. Plug
▲ 16. Retainer
▲ 17. Plunger
▲ 18. Spring
▲ 19. Lock-up relay valve
▲ 20. Sleeve with plunger, spring and lock-up relay valve
▲ 21. Retainer
▲ 22. Spring
▲ 23. Second coast modulator valve
▲ 24. Plug
▲ 25. Retainer
▲ 26. Spring
▲ 27. 3 - 4 shift valve
▲ 28. Plug
▲ 29. Retainer
▲ 30. Throttle valve
▲ 31. Valve stopper
▲ 32. Adjusting ring
▲ 33. Spring
▲ 34. Spring
▲ 35. Down-shift plug
▲ 36. Pin
▲ 37. Sleeve
▲ 38. Spring
▲ 39. Throttle cam assembly
▲ 40. Check ball
▲ 41. Strainer



Important operations

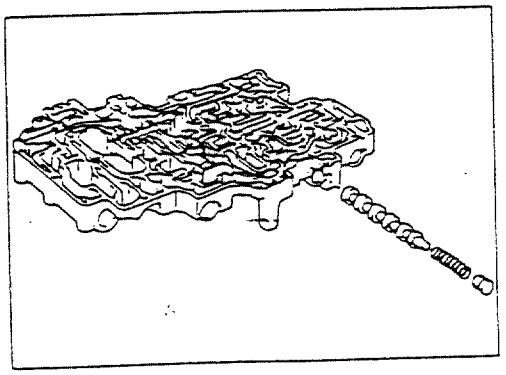
1. Low coast modulator valve
2. Spring
3. Plug

   Install the low coast modulator valve, spring and plug into the bore.



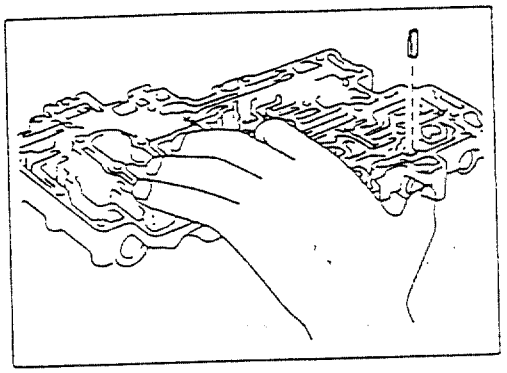
4. Retainer

   Install the retainer by pushing in the plug.



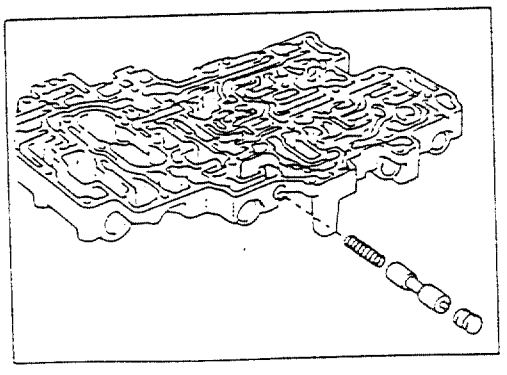
5. 2 - 3 shift valve
6. Spring
7. Plug

   Install the 2 - 3 valve, spring and plug into the bore.



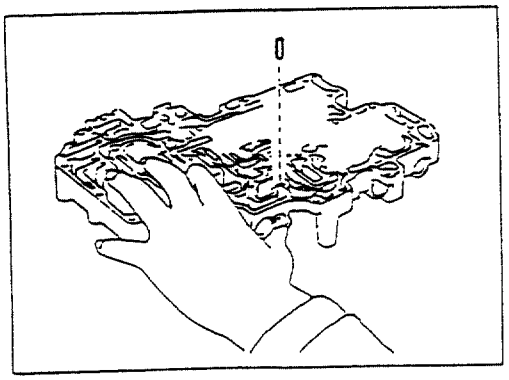
8. Retainer

   Install the retainer by pushing in the plug.



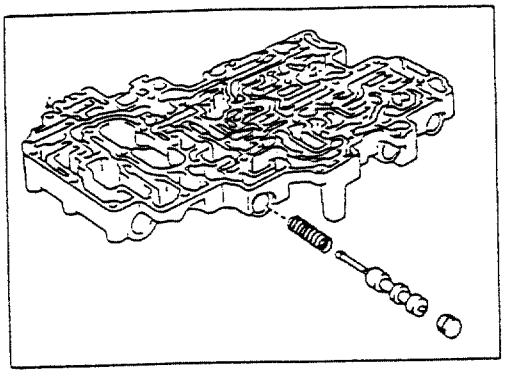
9. Spring
10. Cut-back valve
11. Plug

    Install the spring, cut-back valve and plug into the bore.



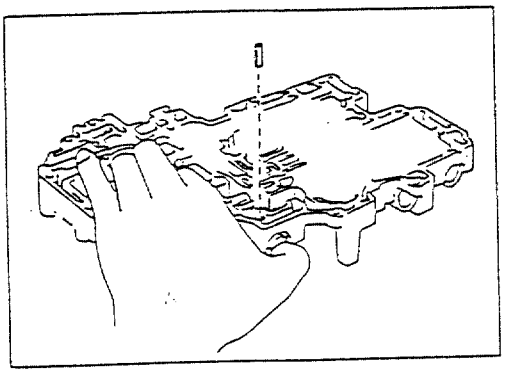
12. Retainer

Install the retainer by pushing in the plug.



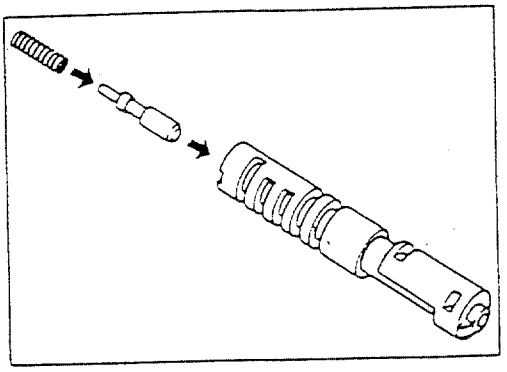
13. Spring
14. Secondary regulator valve
15. Plug

Install the spring, secondary regulator valve and plug into the bore.



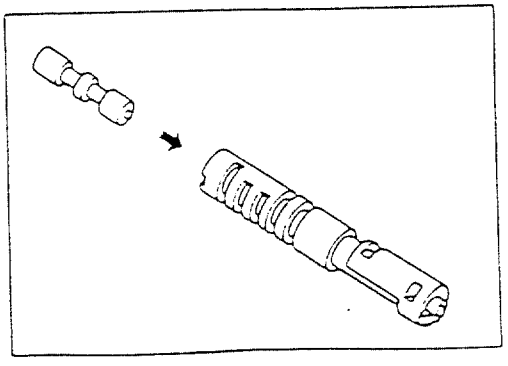
16. Retainer

Install the retainer by pushing in the plug.



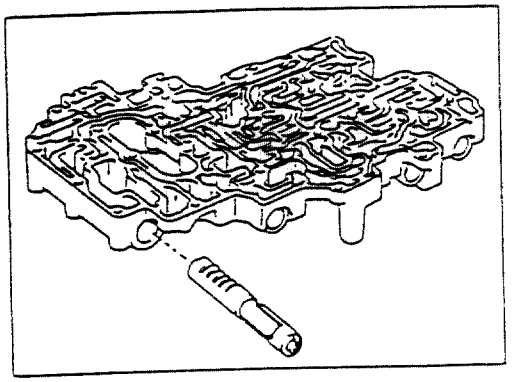
17. Plunger
18. Spring

Install the plunger and spring into the sleeve.



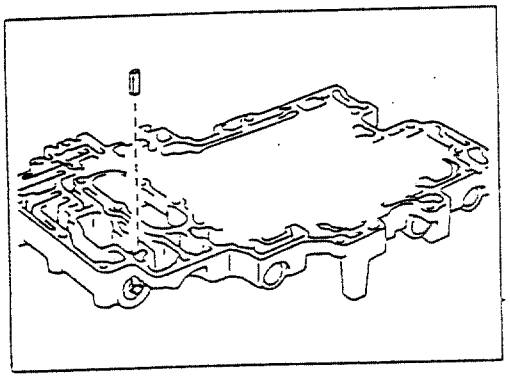
19. Lock-up relay valve

Install the lock-up relay valve into the sleeve.



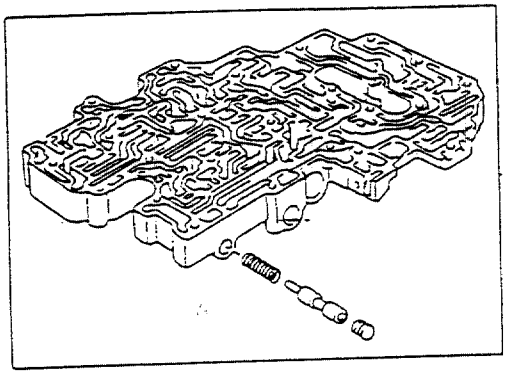
20. **Sleeve with plunger, spring and lock-up relay valve**

    Install the sleeve with the plunger, spring and lock-up relay valve into the bore.



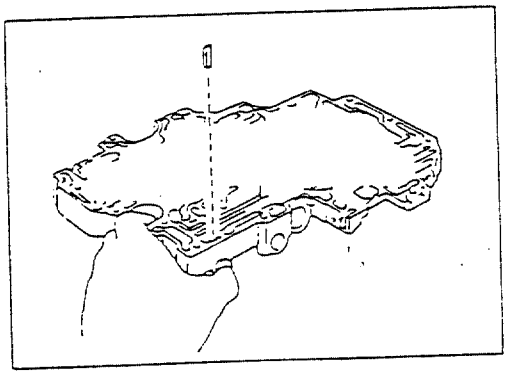
21. Retainer

    Install the retainer.



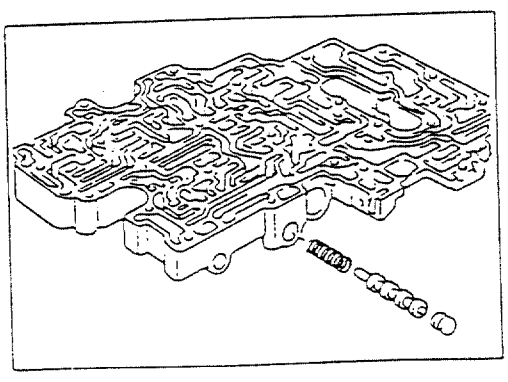
22. Spring
23. Second coast modulator valve
24. Plug

    Install the spring, second coast modulator valve and plug into the bore.



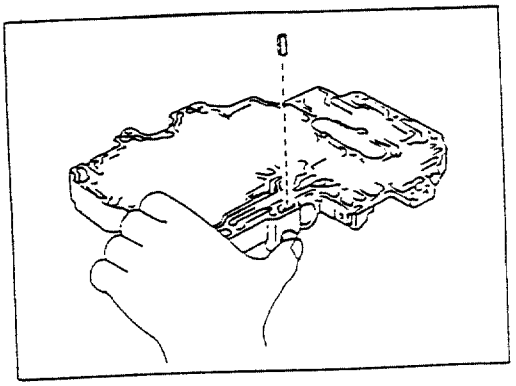
25. Retainer

    Install the retainer by pushing in the plug.



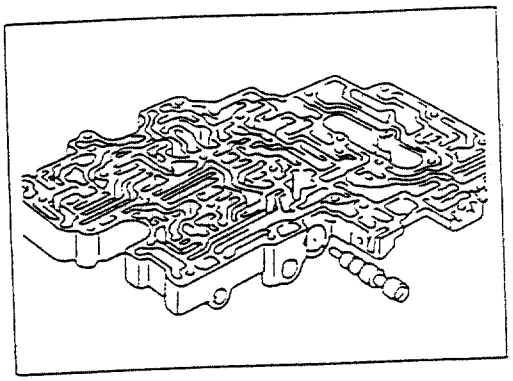
26. Spring
27. 3 - 4 shift valve
28. Plug

    Install the spring, 3 - 4 shift valve and plug into the bore.



29. Retainer

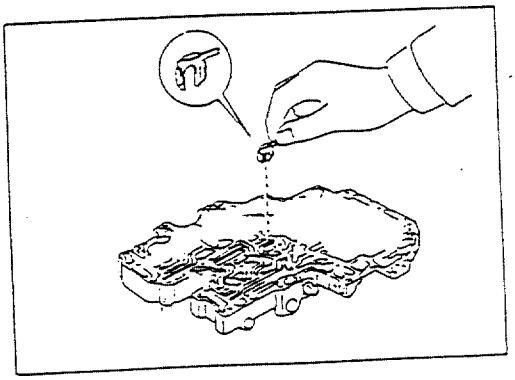
Install the retainer by pushing in the plug.



30. Throttle valve

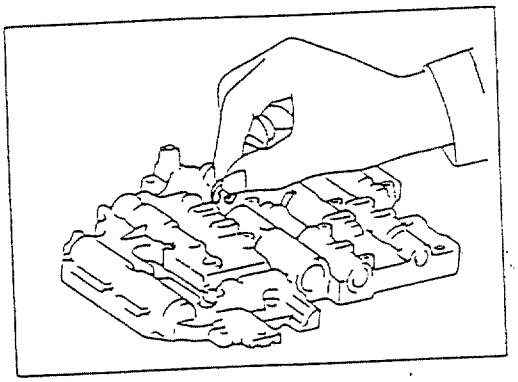
Insert the throttle valve into the bore.

Note: Check that the valve is fully inserted into the bore.



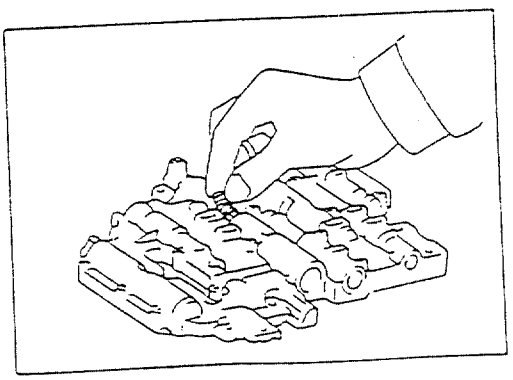
31. Valve stopper

Install the valve stopper as shown.



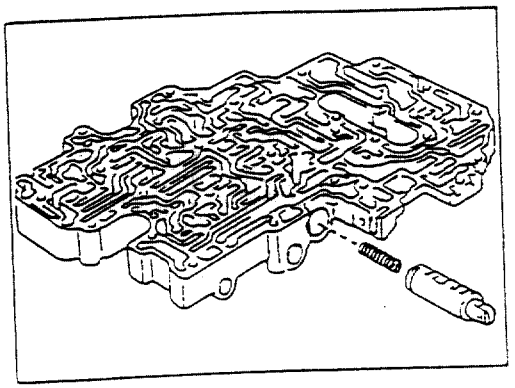
32. Adjusting ring

Turn over valve body, and install the same number of adjusting rings as were removed during disassembly.



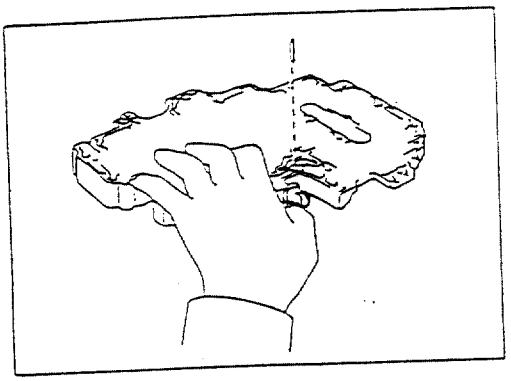
33. Spring

Install the spring onto the end of the valve shaft.



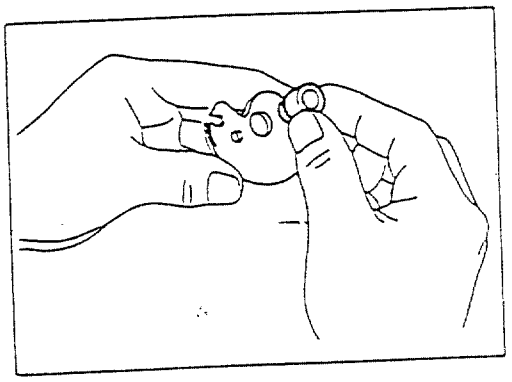
34. Spring
35. Down-shift plug

Install the spring and down-shift plug into the bore.



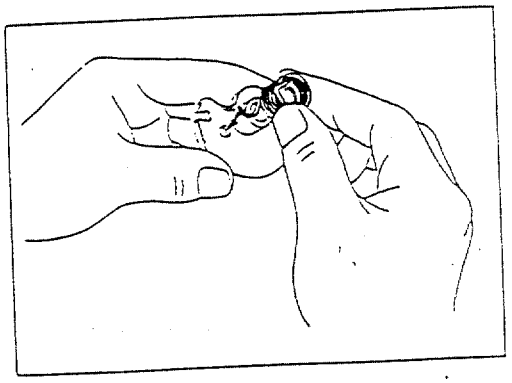
36. Pin

Install the retainer by pushing in the plug.



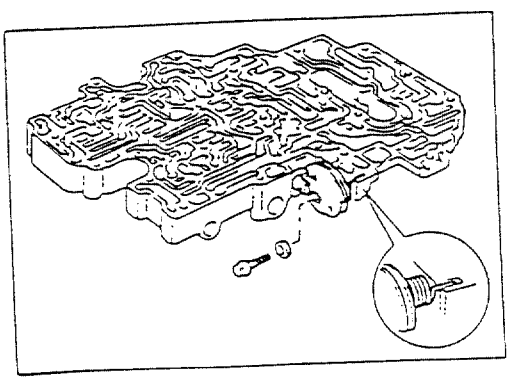
37. Sleeve

Insert the sleeve through one side of the cam.



38. Spring

Install the spring with the hook through the hole in the cam.



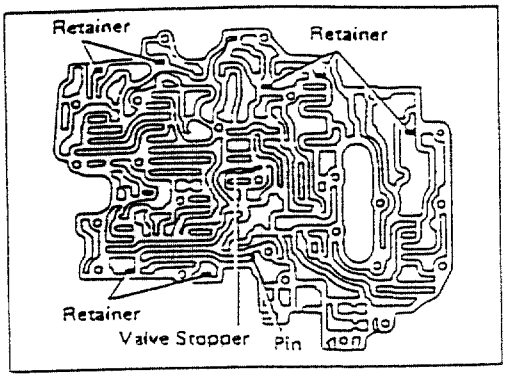
39. Throttle cam assembly

Check that position of the spring end is positioned as shown in the figure.

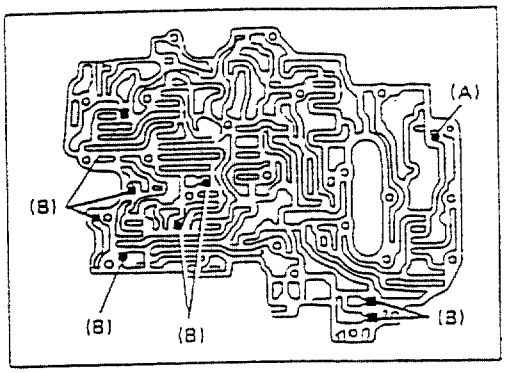
Tighten bolt.

N.m (kgf.m/lb.ft)

Torque	8.8 (0.897 / 77.89)



Make sure pin, seven retainers and valve stopper are installed correctly

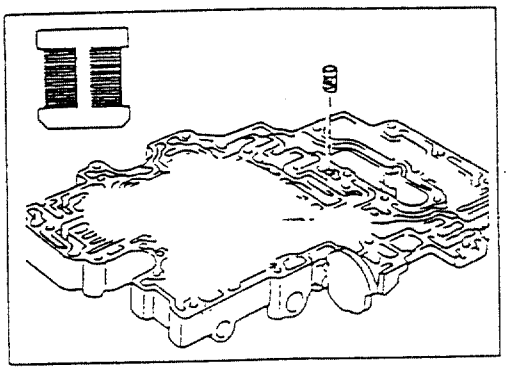


40. Check ball

Install the two types of check balls (total 9 pcs.) to the valve body.

mm (in.)

Check ball		Diameter
(A)	Rubber ball	6.35 (0.2500)
(B)	Rubber ball	5.54 (0.2181)

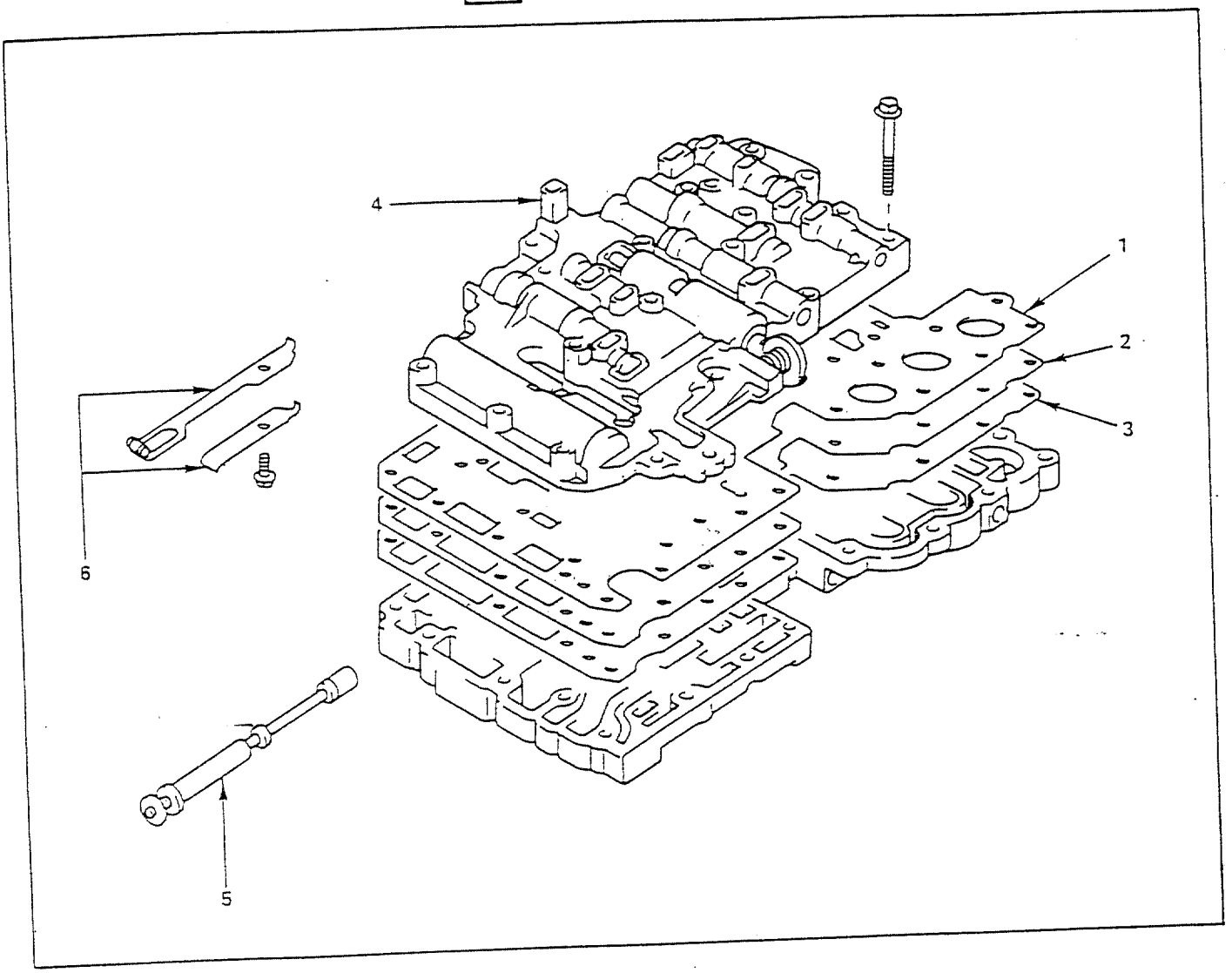


41. Strainer

Install strainer.

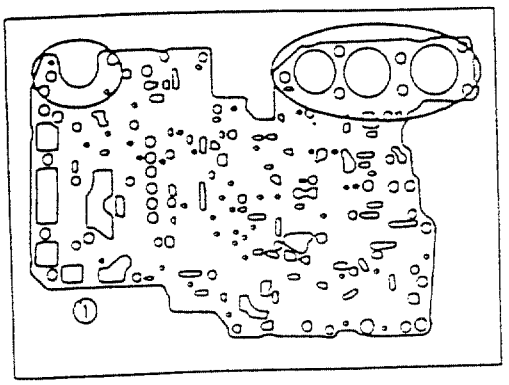
TRANSMISSION VALVE BODY ASSEMBLY

REASSEMBLY



Reassembly steps

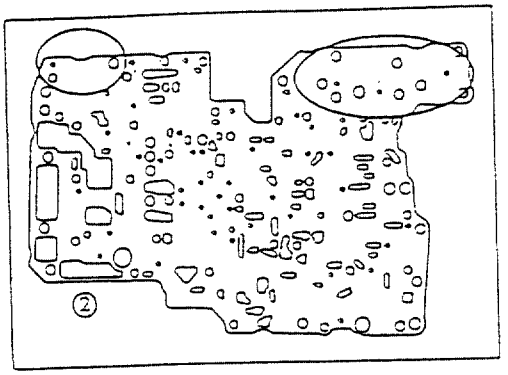
- ▲ 1. No. 1 gasket (Upper valve body side)
- ▲ 2. Valve body plate
- ▲ 3. No. 2 gasket (Lower valve body side)
- ▲ 4. Upper valve body
- ▲ 5. Manual shift valve
- ▲ 6. Detent spring



Important operations

1. No. 1 gasket (Upper valve body side)

   Position new No. 1 gasket ① on upper valve body.
   Align a new No. 1 gasket at each bolt hole.

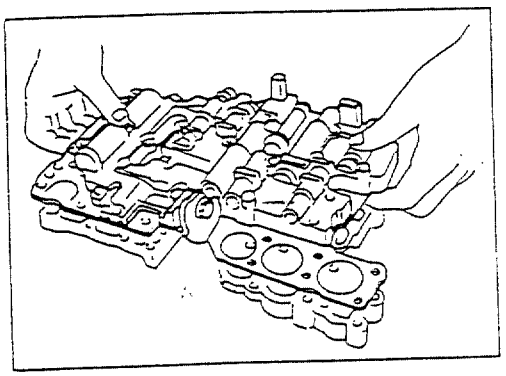


2. Valve body plate

   Position valve body plate ② on No. 1 gasket.
   Align the plate at each bolt hole.

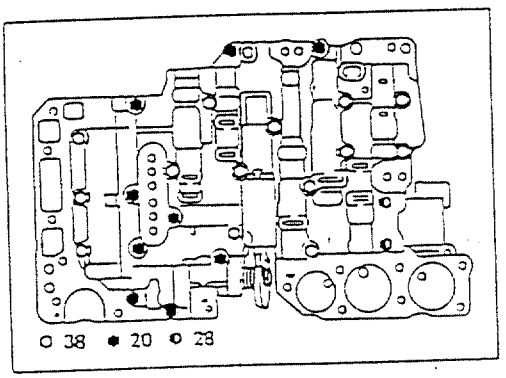
3. No. 2 gasket (Lower valve body side)

   Position new No. 2 gasket 2 on plate.
   Align a new No. 2 gasket at each bolt hole.



4. Upper valve body

   Place upper valve body with plate and gaskets on top lower valve body.
   Align each bolt hole and gasket in the valve body.

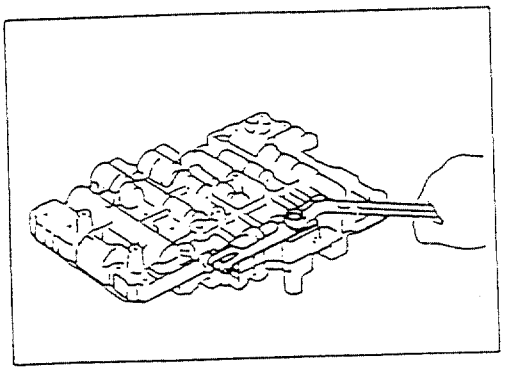


Install twenty-five bolts to upper valve body.

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

N.m (kgf.m/lb.ft)

Torque	6.4 (0.65 / 56.64)



5. Manual shift valve

   Install manual shift valve.

6. Detent spring

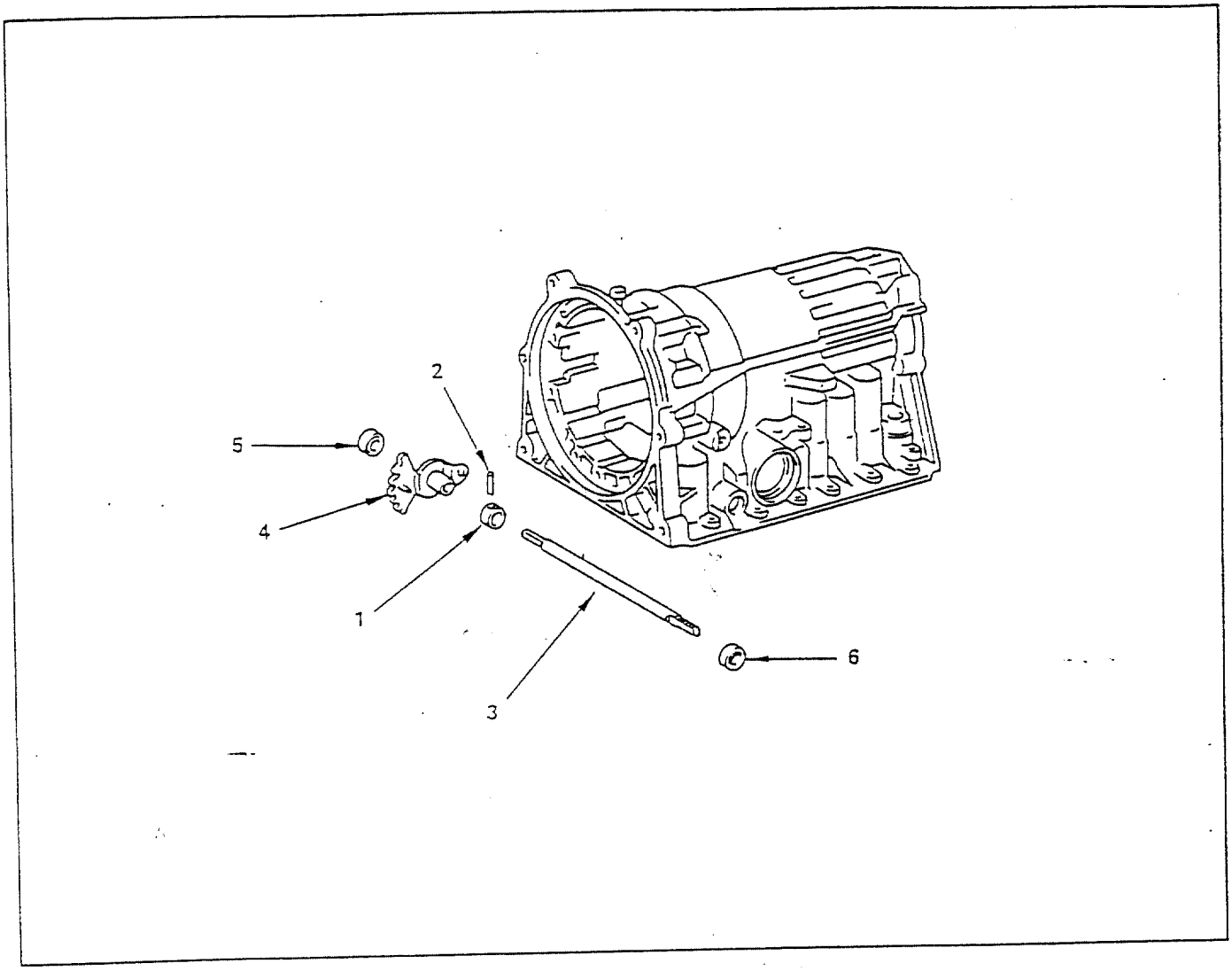
   Install detent spring.

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)

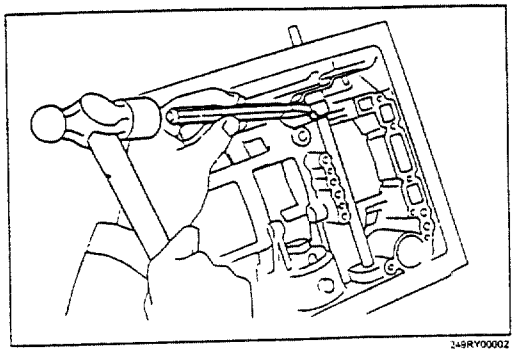
TRANSMISSION CASE

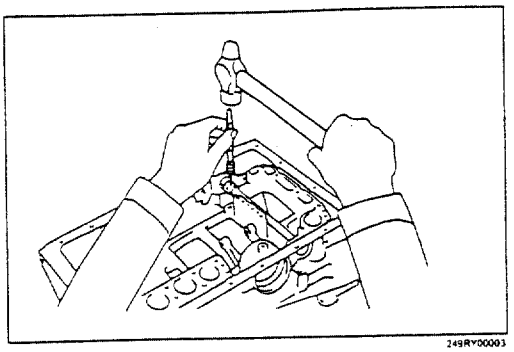
DISASSEMBLY

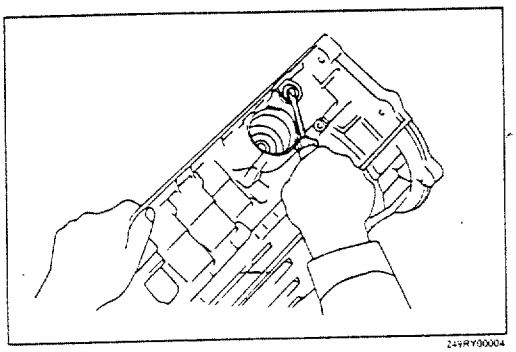


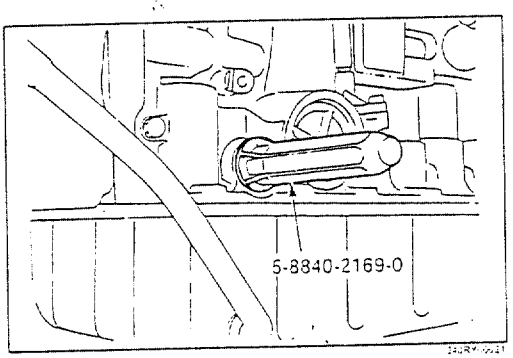
Disassembly steps

- ▲ 1. Spacer
- ▲ 2. Pin
- ▲ 3. Manual valve lever shaft
- ▲ 4. Manual valve lever
- ▲ 5. Oil seal
- ▲ 6. Oil seal









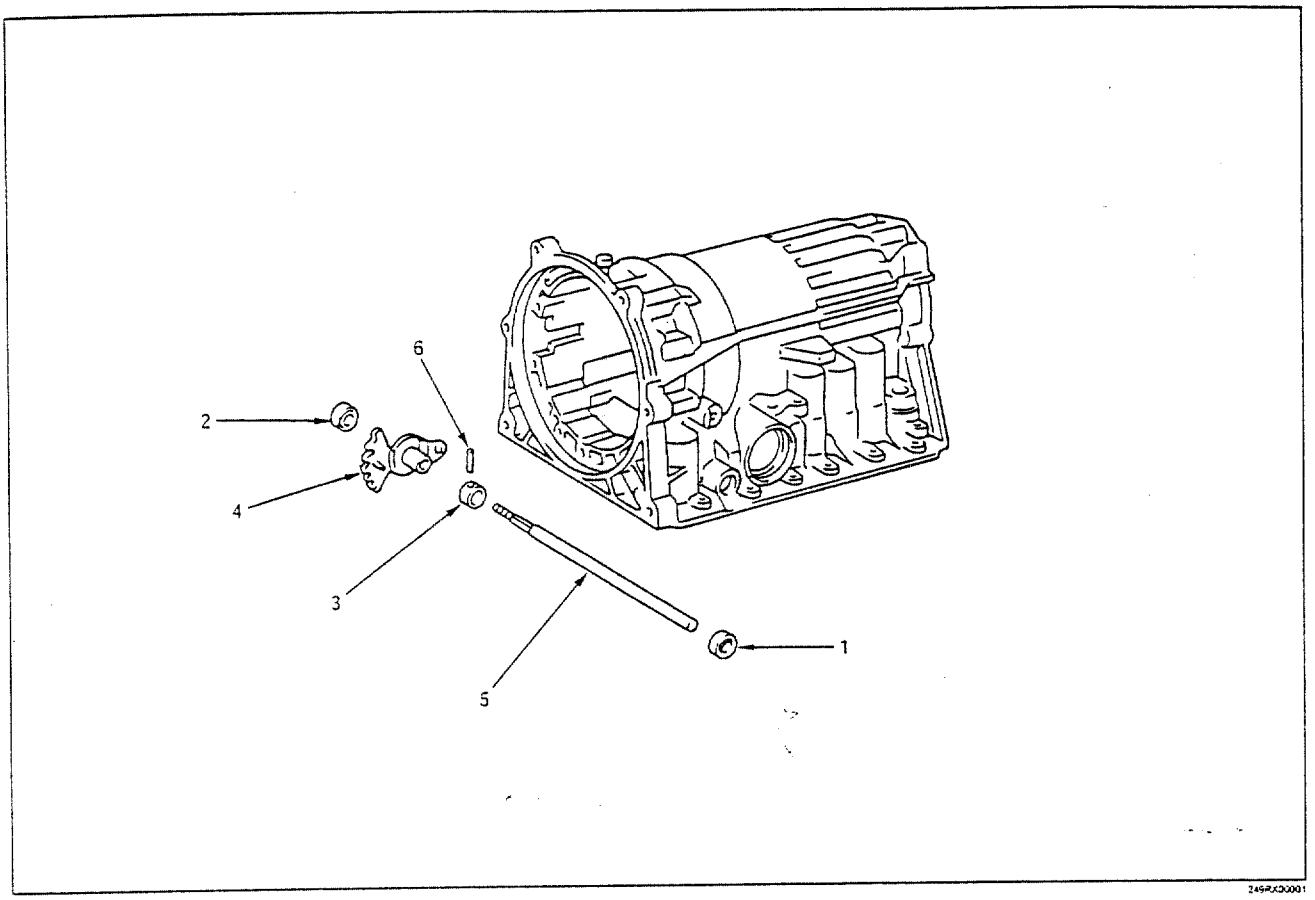
Important operations

1. **Spacer**
   Using a chisel, cut off the spacer and remover it from the shaft.
2. **Pin**
   Using a punch, drive out the pin.
3. **Manual valve lever shaft**
4. **Manual valve lever**
   Pull the manual valve lever shaft out through the case by the threads.
5. **Oil seal**
6. **Oil seal**
   Using a screwdriver, remove the oil seal.

On-vehicle replacement of oil seal

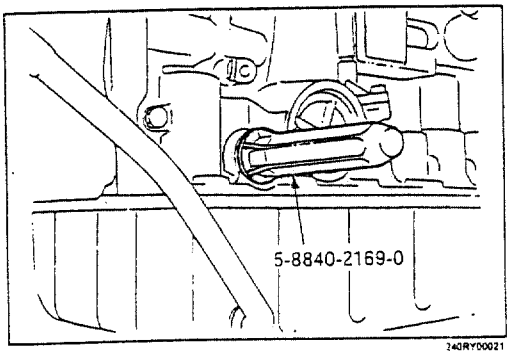
Using special tool, install the oil seal.
Installer : 5-8840-2169-0 (J-37232-2)

REASSEMBLY



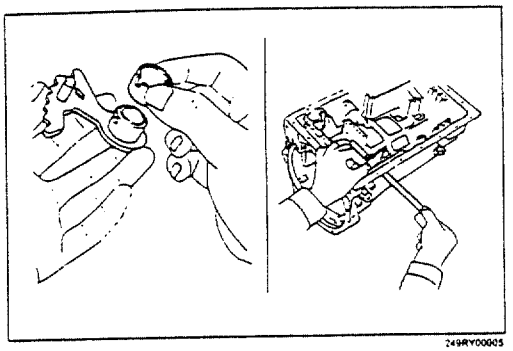
Reassembly steps

- ▲1. Oil seal
- ▲2. Oil seal
- ▲3. Spacer
- ▲4. Manual valve lever
- ▲5. Manual valve lever shaft
- ▲6. Pin

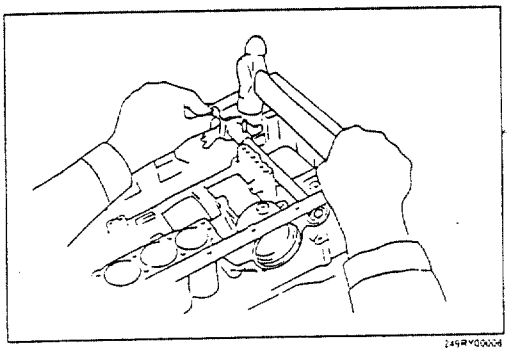


Important operations

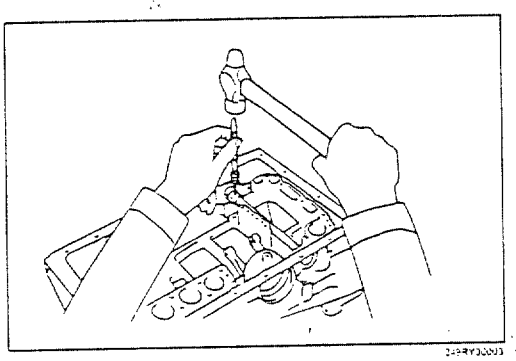
1. **Oil seal**
2. **Oil seal**
   Coat a new oil seal lip with multi purpose grease.
   Using special tool, drive in the oil seal.
   Oil seal installer : 5-8840-2169-0 (J-37232-2)



3. **Spacer**
4. **Manual valve lever**
   Assemble a new spacer to the manual valve lever.
5. **Manual valve lever shaft**
   Install the manual valve lever shaft to the transmission case through the manual valve lever by the threads.



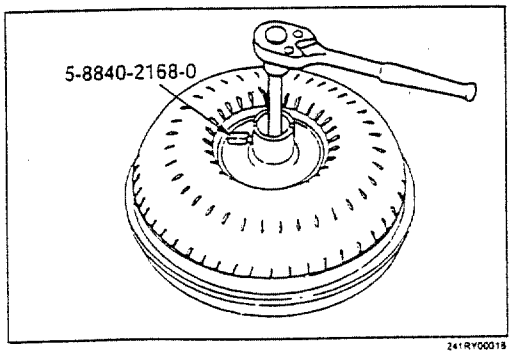
6. **Pin**
   Drive in the pin with the slot at a right angle to the shaft.



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.

TORQUE CONVERTER

INSPECTION AND REPAIR



Insert special tool in end of torque converter

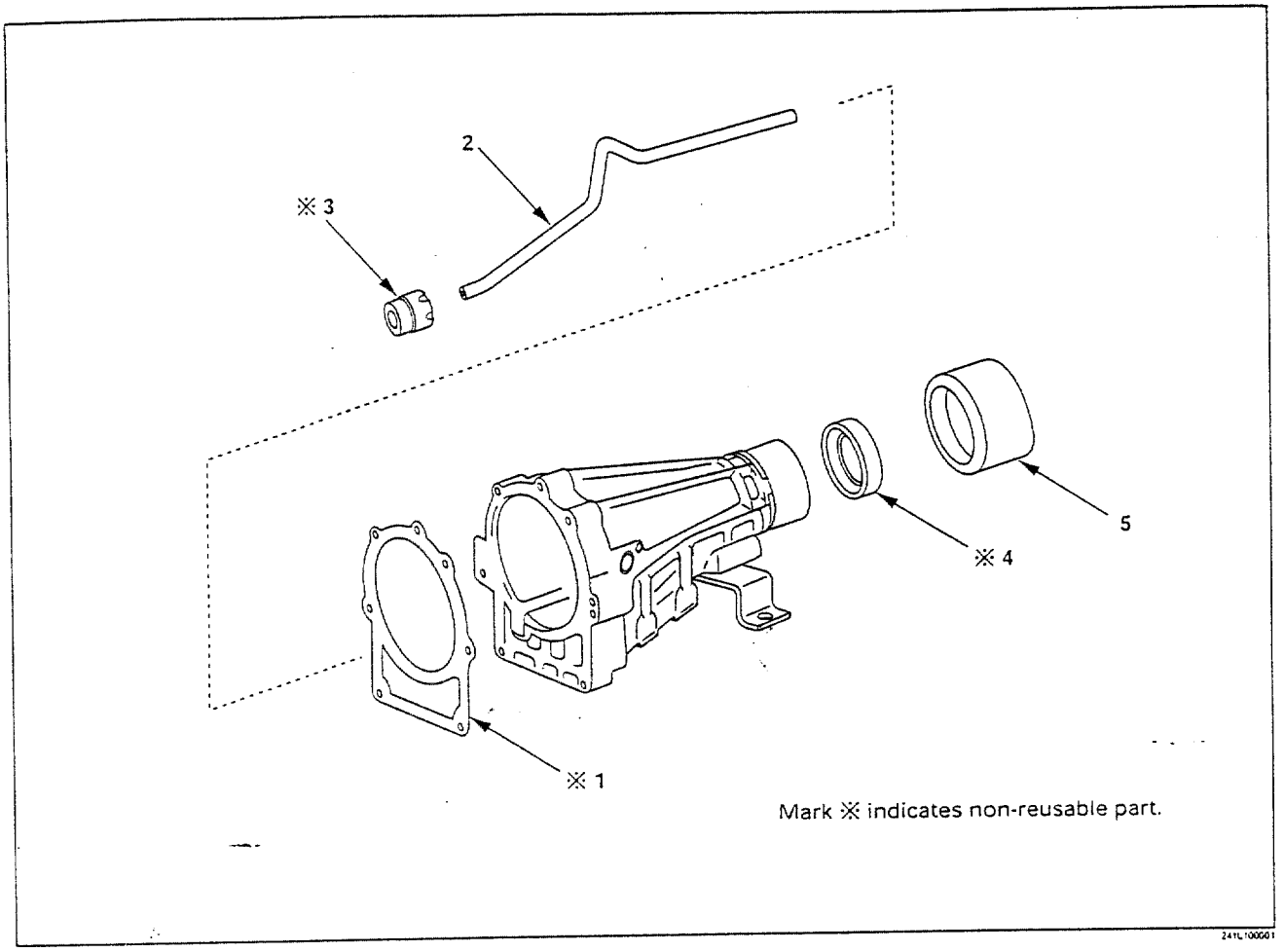
Insert a turning tool into the inner race of the one-way clutch.
One-way clutch testing tool : 5-8840-2168-0 (J-35467)
Insert the stopper so that it fits in the notch of the converter hub and outer race of the one-way clutch.

Test one-way clutch

The clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise. Less than 25kg.cm (22 lb.in) 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.

EXTENSION HOUSING

DISASSEMBLY



Disassembly steps

1. Gasket
2. Tube
3. Tube packing
▲4. Oil seal
5. Dust deflector

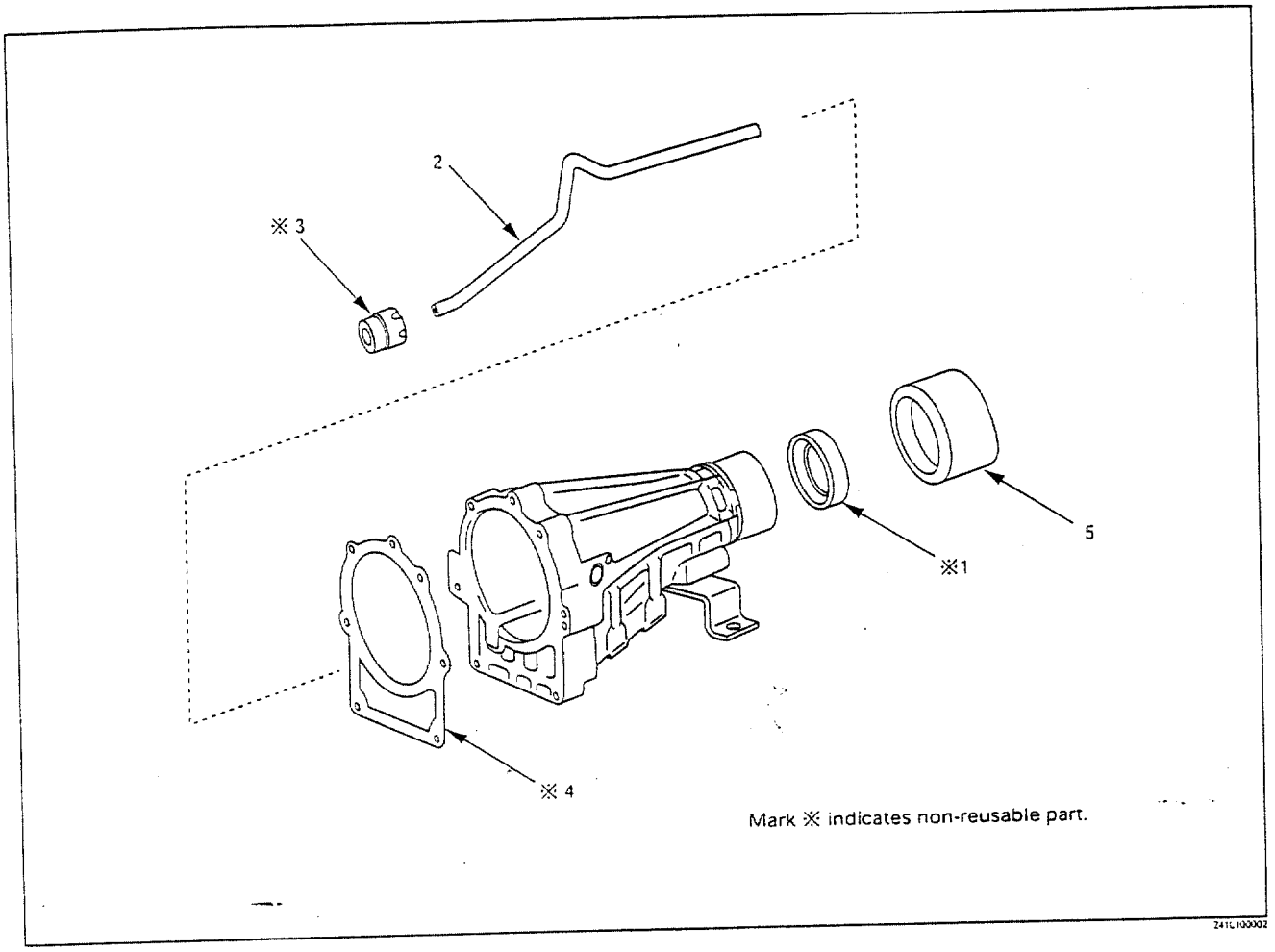
Important operations

4. **Oil seal**
   Using a screwdriver, remove the oil seal.

NOTE:

The oil seal can be removed without removing the dust deflector.

REASSEMBLY



Reassembly steps

▲1. Gasket
2. Tube
3. Tube packing
4. Gasket
5. Dust deflector

Important operations

1. **Oil seal**
   Using installer 5-8840-2702-0 tool, install the new oil seal to the extension housing.

NOTE:
The oil seal can be installed without removing the dust deflector.

REASSEMBLY OF MAJOR COMPONENTS (1)

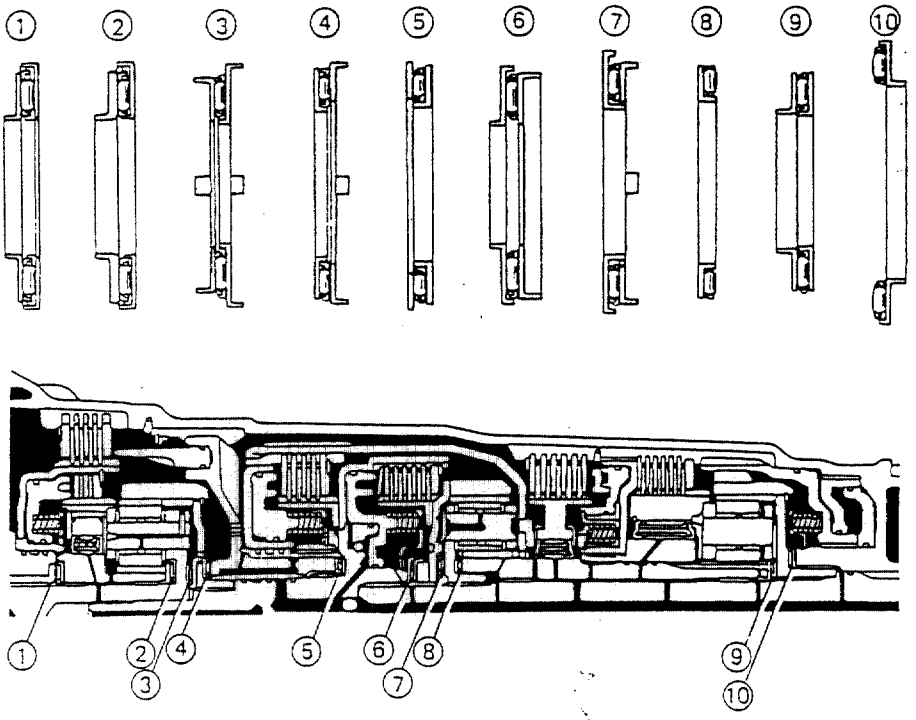
Disassembly, inspection and reassembly of each component group have been indicated in the preceding chapter. Before reassembly, make sure, again, that all component groups are assembled correctly.

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

GENERAL ASSEMBLY NOTES:

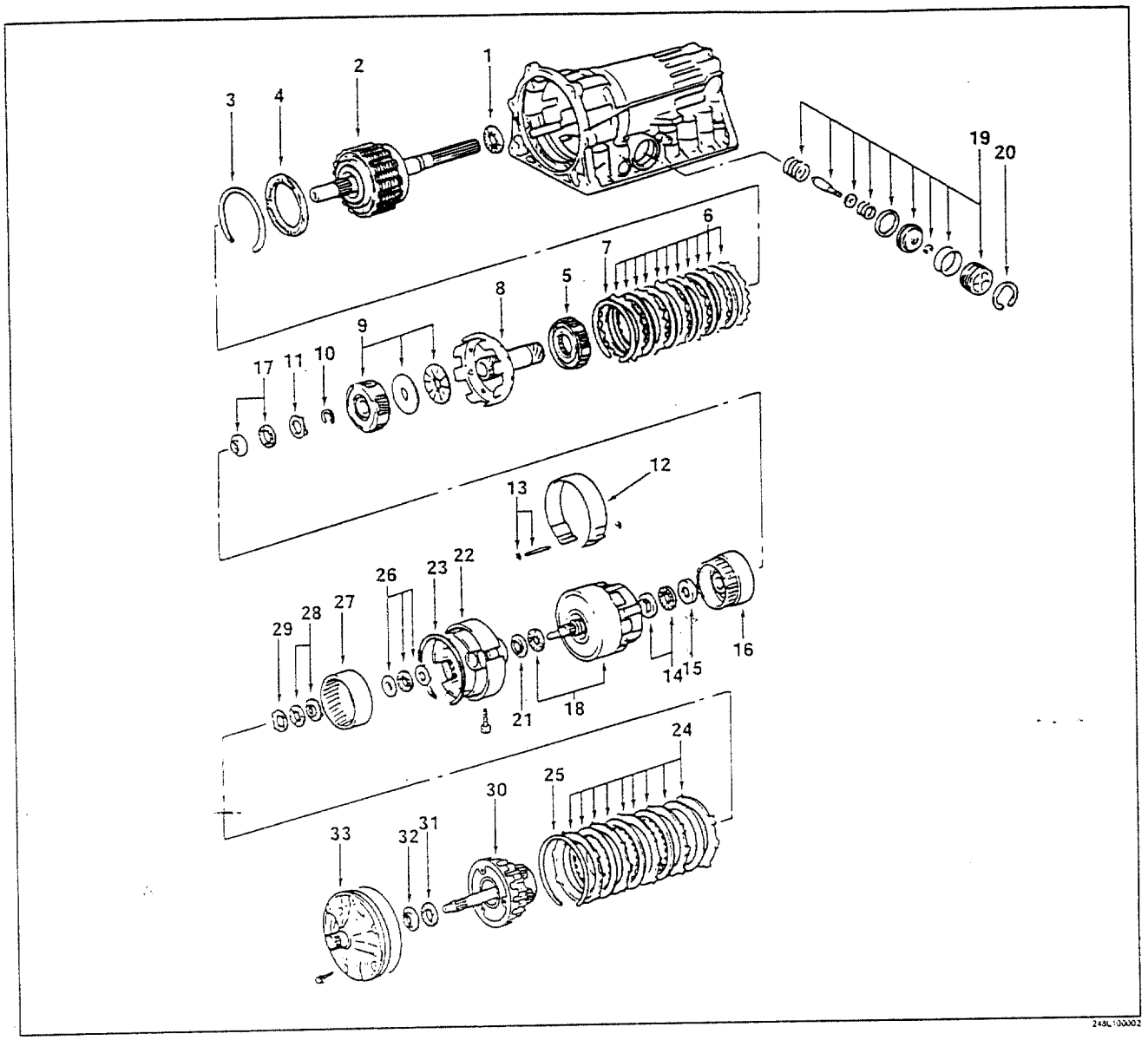
1. The automatic transmission is composed of highly precision-finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs and brake bands, soak them in automatic transmission fluid for 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 places.
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.

TRANSMISSION



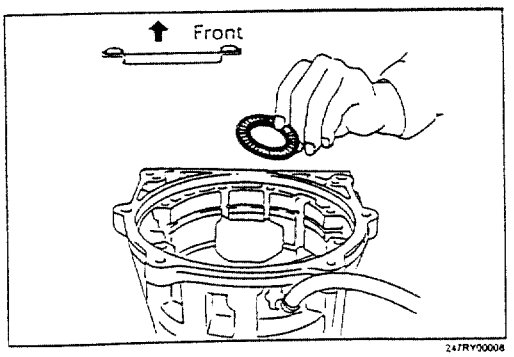
243RY00022

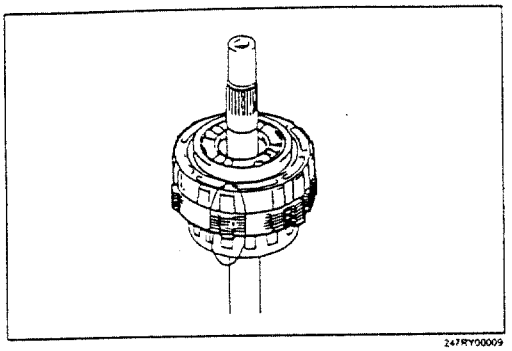
REASSEMBLY OF MAJOR COMPONENTS (2)

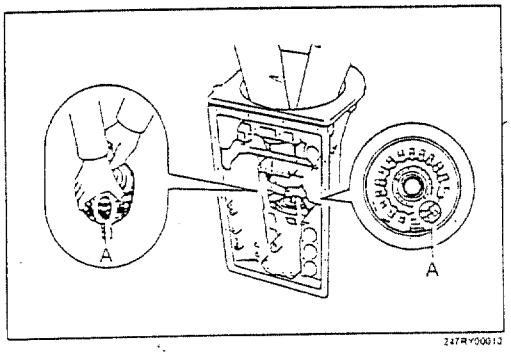


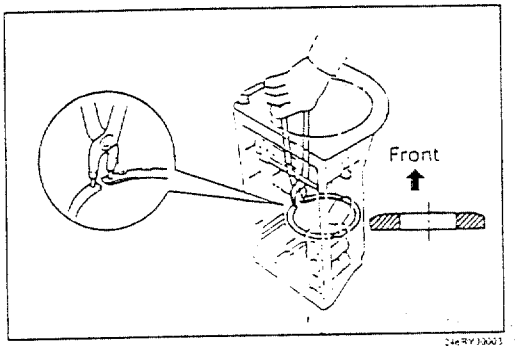
Reassembly steps

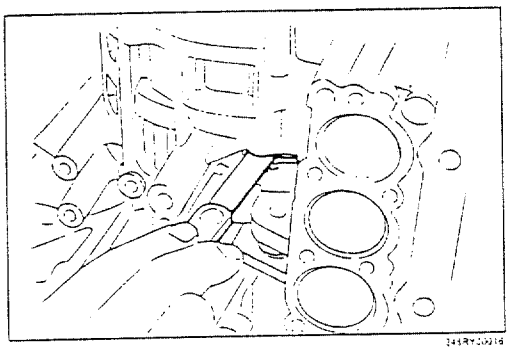
▲1. Bearing
▲2. Rear planetary gear, second brake drum and output shaft
▲3. Snap ring
▲4. Second brake piston sleeve
▲5. One-way clutch
▲6. Flange plate and disc
▲7. Snap ring
▲8. Drum
▲9. Front planetary gear and bearing
▲10. Snap ring
▲11. Race
▲12. Second coast brake band
▲13. E-ring and pin
▲14. Bearing and race
▲15. Race
▲16. Front planetary ring gear
▲17. Bearing and race
▲18. Direct clutch and forward clutch
▲19. Second coast brake piston assembly
▲20. Snap ring
▲21. Race
▲22. OD support
▲23. Snap ring
▲24. Flange, plate and disc
▲25. Snap ring
▲26. Bearing and race
▲27. OD planetary ring gear
▲28. Bearing and race
▲29. Race
▲30. OD planetary gear and OD direct clutch
▲31. Bearing
▲32. Race
▲33. Oil pump











Important operations

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

Assemble bearing and race (reference) mm (in.)

Bearing and race	Diameter
Inside	39.4 (1.551)
Outside	57.7 (2.272)

2. **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.

   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 at left.

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

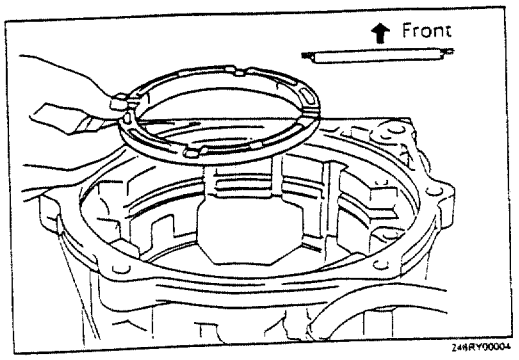
Check pack clearance of first and reverse brake

Using a thickness gauge, measure the clearance between the plate and second brake drum as shown in the figure.

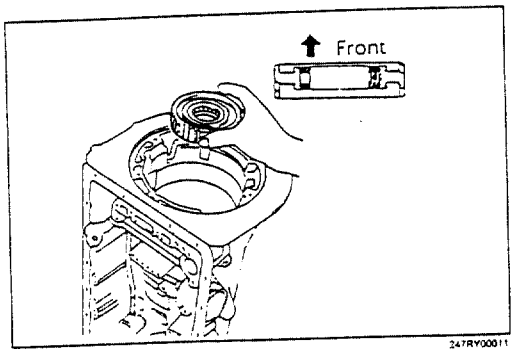
mm (in.)

Clearance	0.60 – 1.12 (0.0236 – 0.0441)

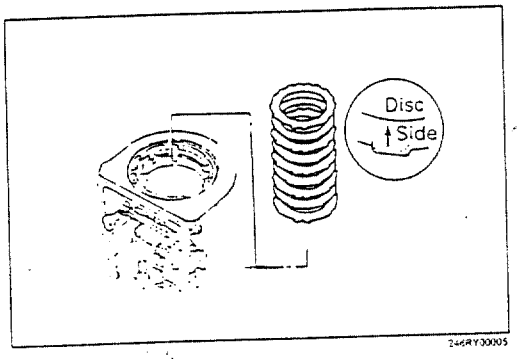
If the values are nonstandard, check for an improper installation.



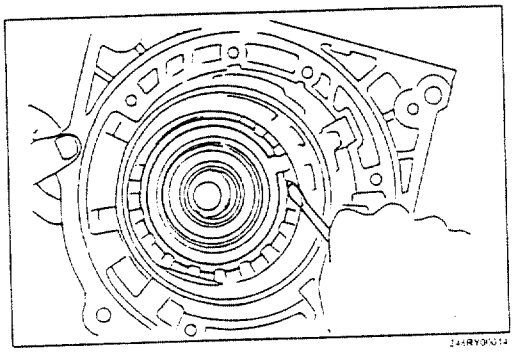
4. **Second brake piston sleeve**
   Install second brake piston sleeve.



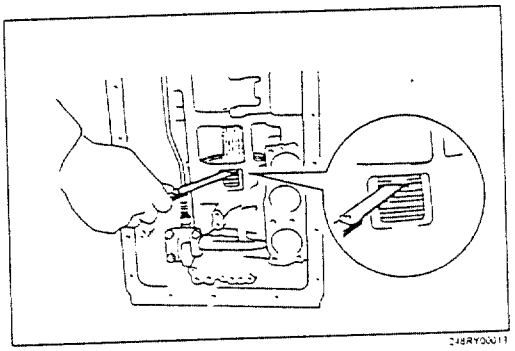
5. **One-way clutch**
   Install one-way clutch.



6. **Flange plate and disc**
   Install flange, discs and plates.
   Install the 2.5mm (0.098in.) thick plate with the rounded edge side of the plate facing the disc.
   Alternately install four discs and three plates (Disc first)
   Install the flange with the rounded edge of the flange facing the disc.



7. **Snap ring**
   Install the snap ring.



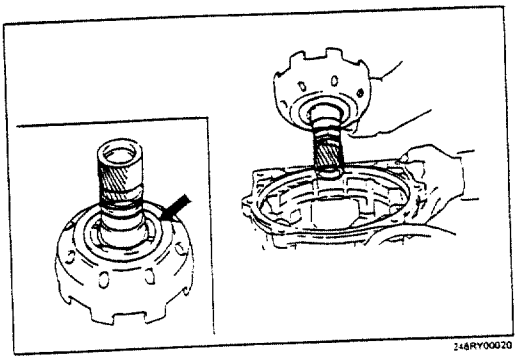
Check pack clearance of second brake

Using a thickness gauge, measure the clearance between the snap ring and flange as shown in the figure.

mm (in.)

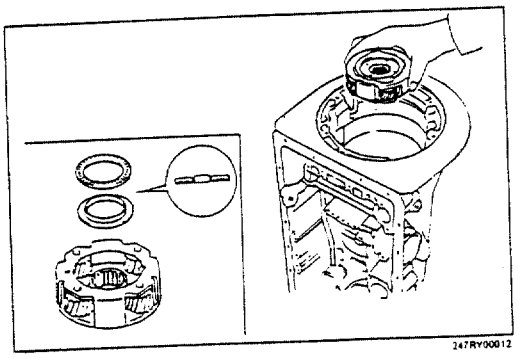
Clearance	0.62 - 1.98 (0.0244 - 0.0780)

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



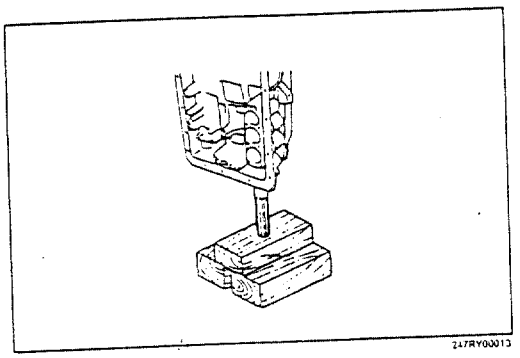
8. **Drum**
   While turning the sun gear input drum clockwise, install it into the one-way clutch.

NOTE:
Confirm the thrust washers are installed correctly.

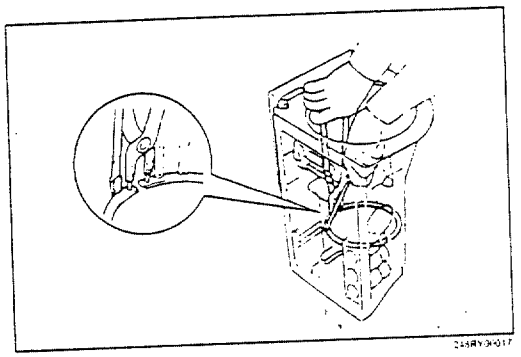


9. **Front planetary gear and bearing**
   Install the front planetary gear to the sun gear.

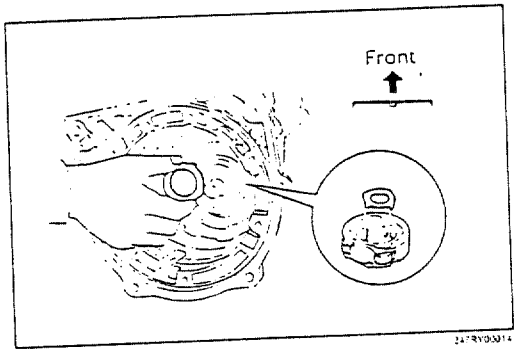
NOTE:
Confirm the bearing and race is installed correctly.



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



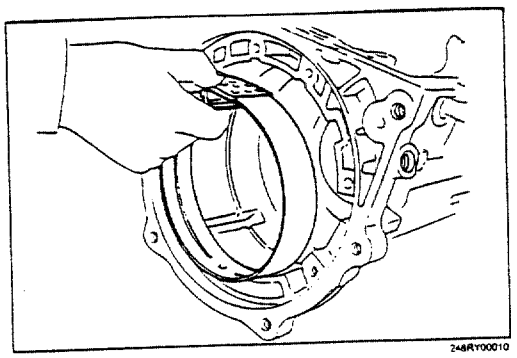
10. **Snap ring**
    Using snap ring pliers, install the snap ring.



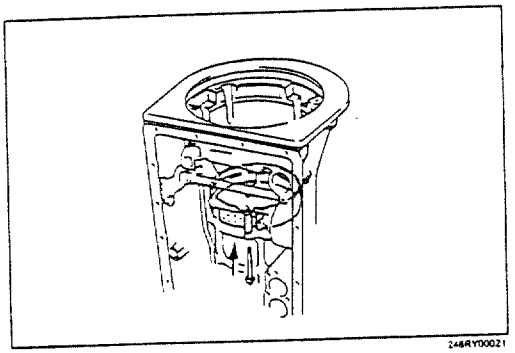
11. **Race**
    Coat the bearing race with petroleum jelly and install it onto the front planetary gear.

Bearing race diameter (Reference) mm (in.)

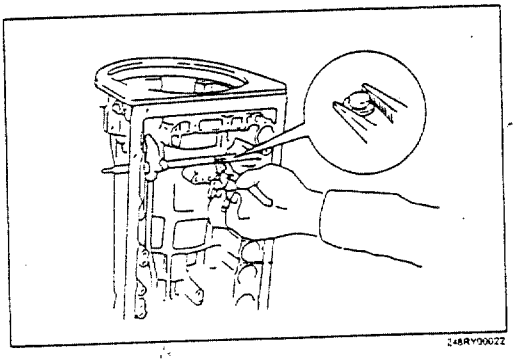
Bearing race	Diameter
Inside	34.3 (1.350)
Outside	47.8 (1.882)



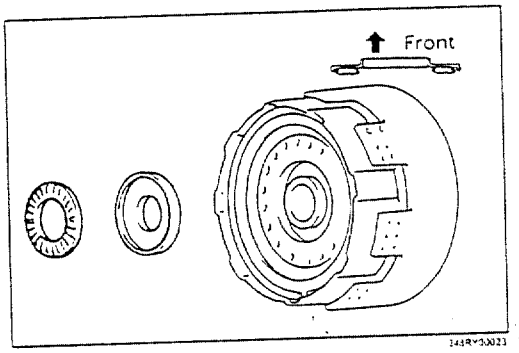
12. **Second coast brake band**
Insert the second coast brake band to the case.



13. **E-ring and pin**
Install the pin through the brake band.



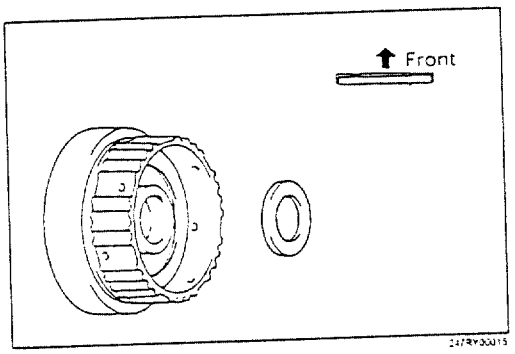
Install the E-ring to the pin.



14. **Bearing and race**
Coat the bearing and race with petroleum jelly and install them onto the forward clutch.

Bearing and race diameter (Reference) mm (in.)

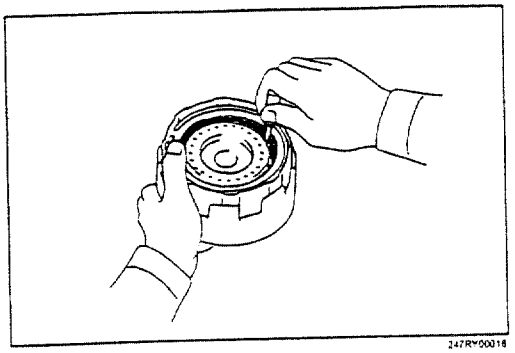
	Inside	Outside
Bearing	26.0 (1.024)	46.7 (1.839)
Race	26.0 (1.024)	48.9 (1.925)



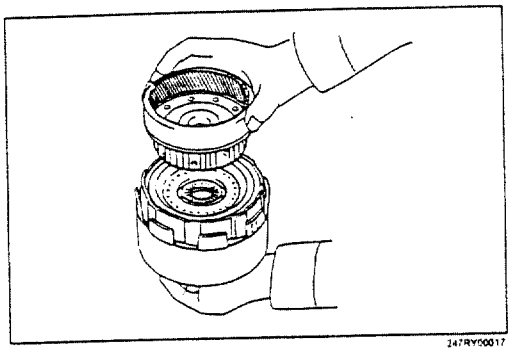
15. **Race**
Coat the race with petroleum jelly and install it onto the front planetary ring gear.

Race diameter (Reference) mm (in.)

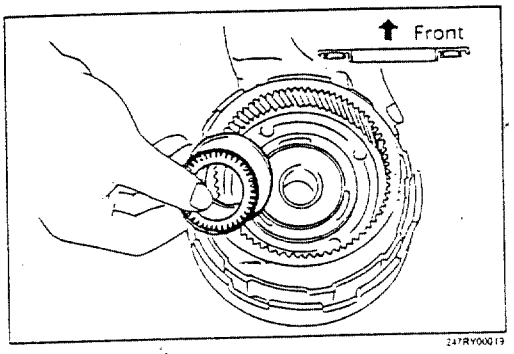
	Inside	Outside
Race	26.5 (1.043)	47.0 (1.850)



Align the flukes of the discs in the forward clutch.



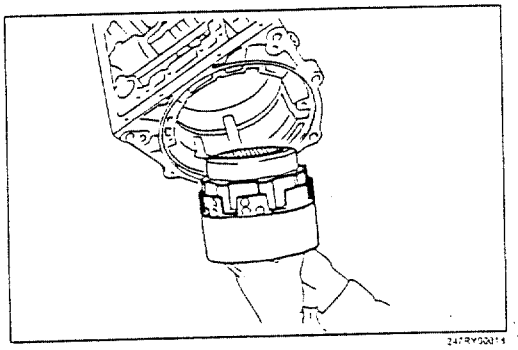
16. **Front planetary ring gear**
Align the spline of th front planetary gear with the flukes of the discs and install the front planetary gear to the forward clutch.



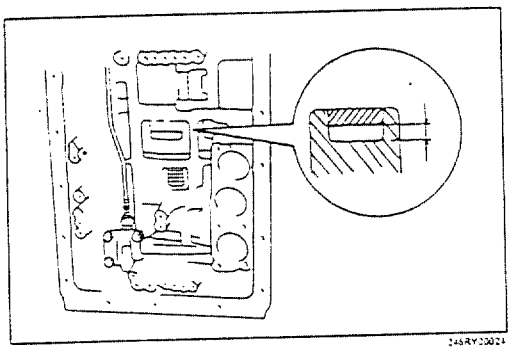
17. **Bearing and race**
Coat the bearing and race with petroleum jelly and install them onto the ring gear.

Bearing and race diameter (Reference) mm (in.)

	Inside	Outside
Bearing	32.6 (1.283)	47.7 (1.878)
Race	30.6 (1.205)	53.6 (2.110)



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

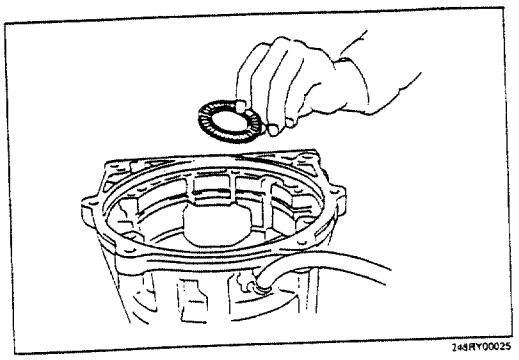


Using vernier calipers, measure the distance between the sun gear input drum and direct clutch drum as shown in the figure.

mm (in.)

Height	9.8 - 11.8 (0.386 - 0.465)

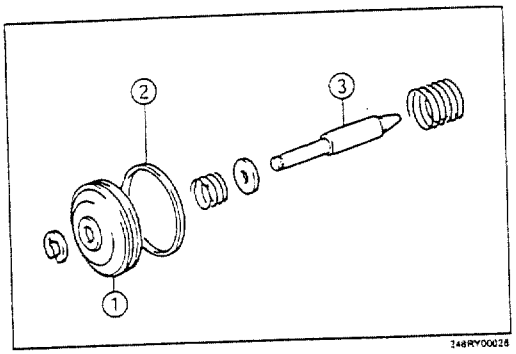
If the values are nonstandard, check for an improper installation.



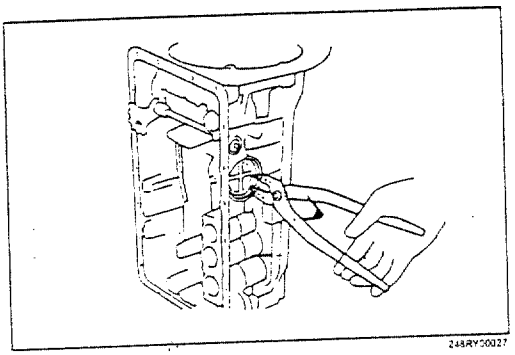
Coat the assembled bearing and race with petroleum jelly and install it onto the forward clutch.

Assembled bearing and race diameter (Reference) mm (in.)

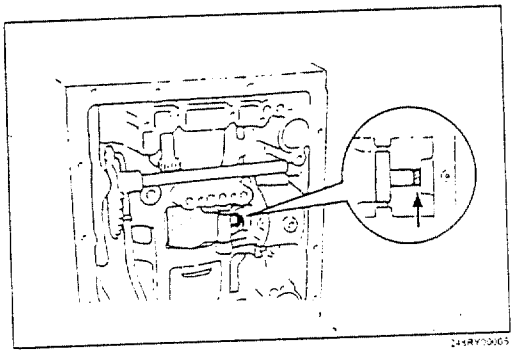
	Inside	Outside
Bearing and race	33.7 (1.327)	47.8 (1.882)



19. **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.
(1): Second coast brake piston
(2): Oil seal
(3): Piston rod

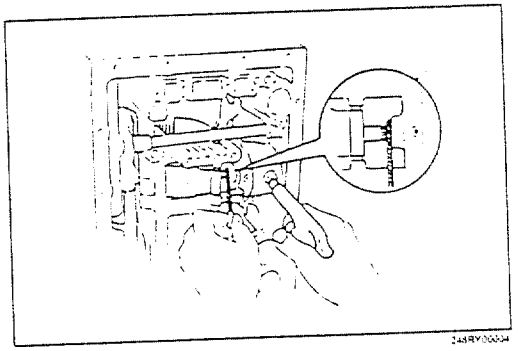


20. **Snap ring**
Coat two new oil seals with ATF and install them to the piston cover.
Install the spring, second coast brake piston assembly and piston cover to the case.
Using snap ring pliers, install the snap ring.



Check piston stroke of second coast brake

Place a mark on the second coast brake piston rod as shown in the figure.

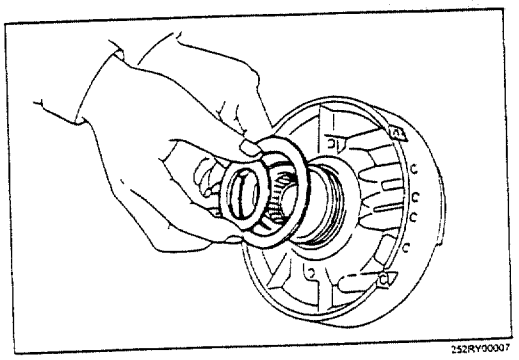


Using wire gage, measure the stroke by applying the compressed air (392 - 785kPa or 4 - 8kg/cm^2) as shown in the figure.

mm (in.)

Piston stroke	1.5 - 3.0 (0.059 - 0.118)

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

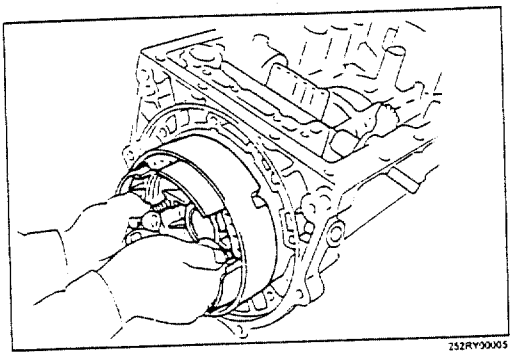


21. Race

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

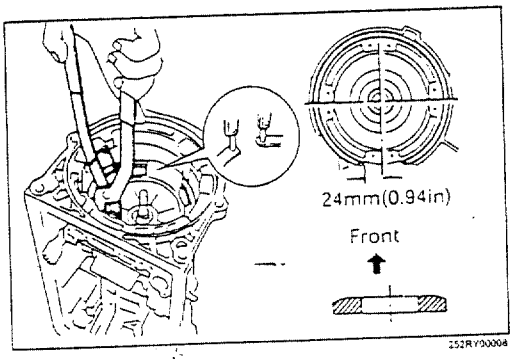
Race diameter (Reference) mm (in.)

	Inside	Outside
Race	36.8 (1.450)	50.9 (2.004)



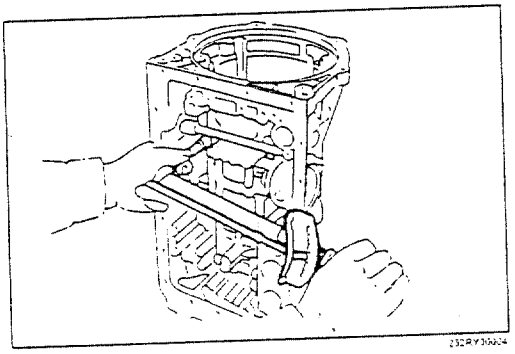
22. OD support

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.



23. Snap ring

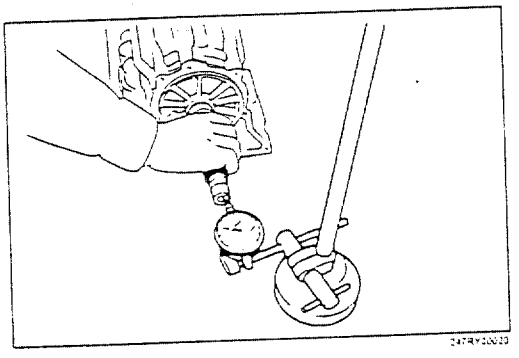
Using snap ring pliers, install the snap ring as shown in the figure.



Install and tighten the two bolts.

N·m (kg·m / lb·ft)

Torque	25 (2.6/19)

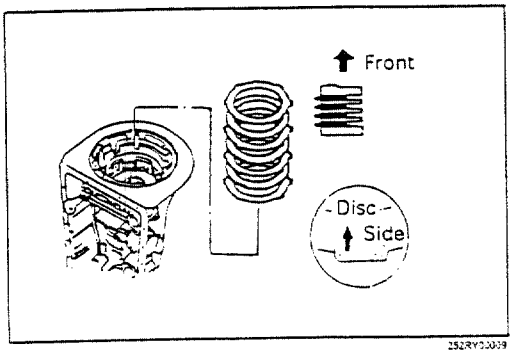


Check end of output shaft

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

mm (in.)

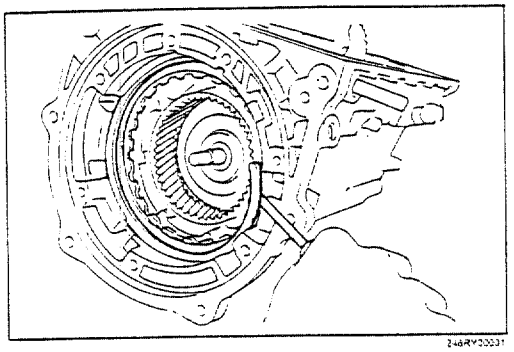
End play	0.27 - 0.86 (0.0106 - 0.0339)



24. Flange, plate and disc

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)

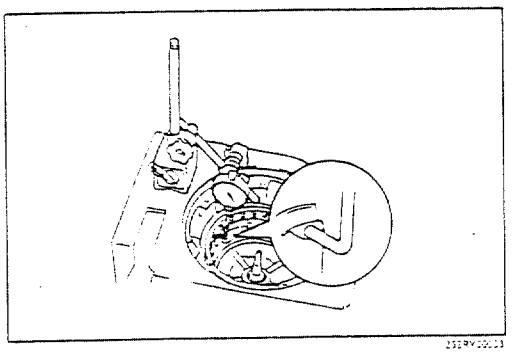


25. Snap ring

Install the (stepped ring) flange with the flat side of the flange facing the disc.

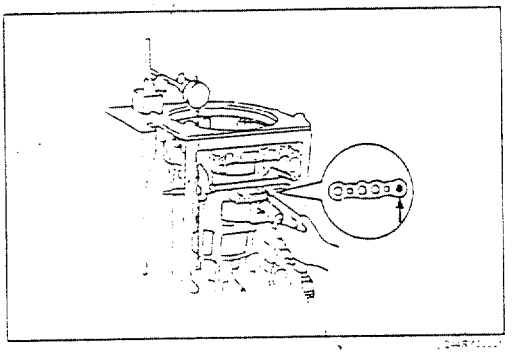
Install the snap ring.

Snap ring (Reference)	mm (in.)
Inside diameter	170.2 (6.70)



Check piston stroke of overdrive brake

Place a dial indicator onto the overdrive brake piston as shown in the figure.

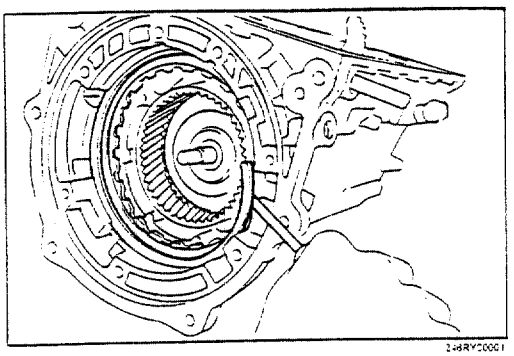


Measure the stroke by applying and releasing the compressed air (392 - 785 kPa or 4 - 8kg/cm^2) as shown in the figure.

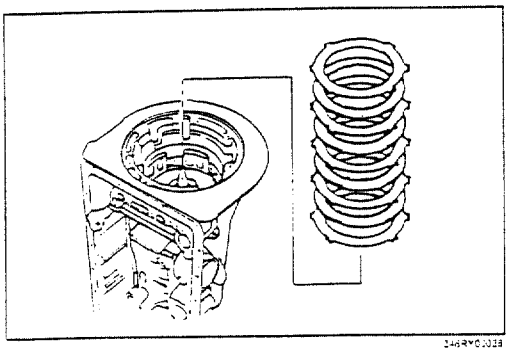
	mm (in.)
Piston stroke	1.40 - 1.70 (0.0551 - 0.0670)

If the values are nonstandard, select another flange.

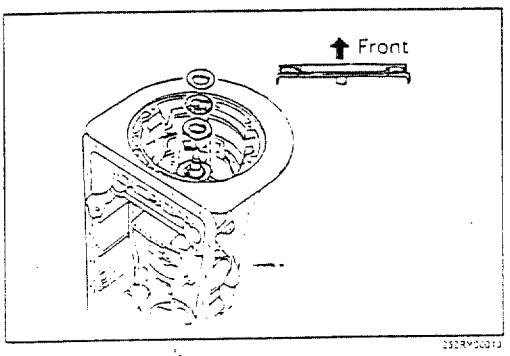
Available Flange size	mm(in.)
3.3 (0.130)	3.8 (0.150)
3.5 (0.138)	3.9 (0.154)
3.6 (0.142)	4.0 (0.158)
3.7 (0.146)	



Remove the snap ring.



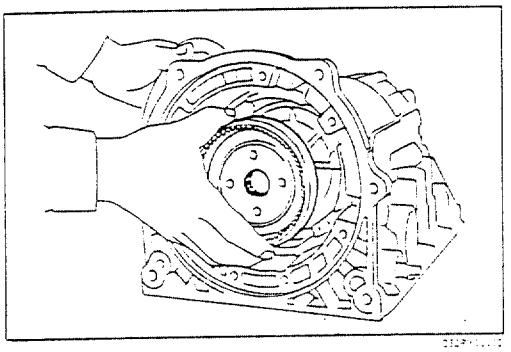
Remove two flanges, three plates and four discs.



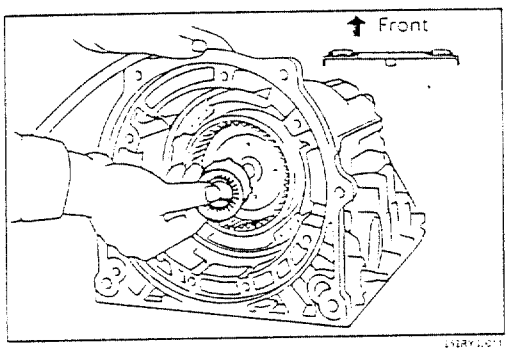
26. Bearing and race
Coat the bearing and races with petroleum jelly and install them onto the overdrive support.

Bearing and races diameter (Reference) mm (in.)

	Inside	Outside
Bearing	36.5 (1.437)	48.5 (1.910)
Race (Front)	37.2 (1.465)	58.8 (2.315)
Race (Rear)	33.7 (1.327)	50.1 (1.973)



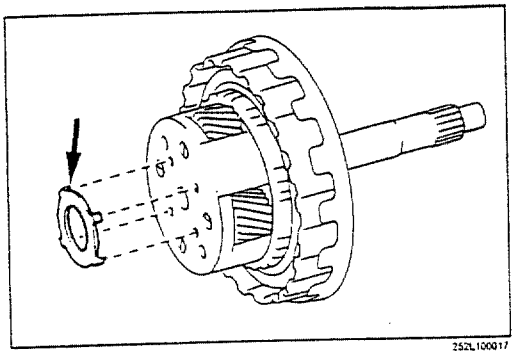
27. OD planetary ring gear
Install the overdrive planetary ring gear.



28. Bearing and race
Coat the bearing and race with petroleum jelly and install them onto the planetary ring gear.

Bearing and race diameter (Reference) mm (in.)

	Inside	Outside
Bearing	26.0 (1.024)	46.8 (1.843)
Race	24.2 (0.953)	47.8 (1.882)

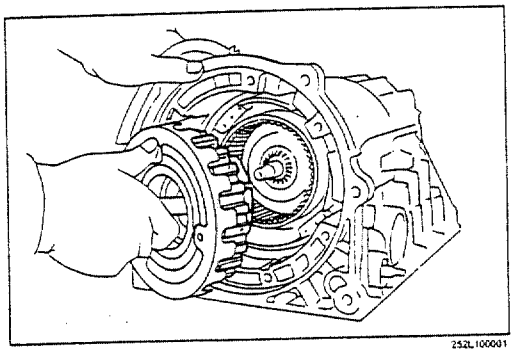


29. Race

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

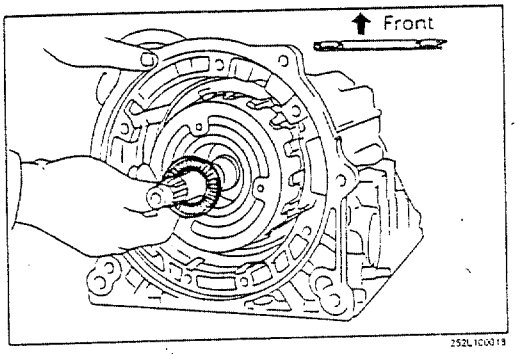
Race diameter (Reference) mm (in.)

	Inside	Outside
Race	27.3 (1.075)	41.8 (1.646)



30. OD planetary gear and OD direct clutch

Install the overdrive planetary gear and direct clutch.

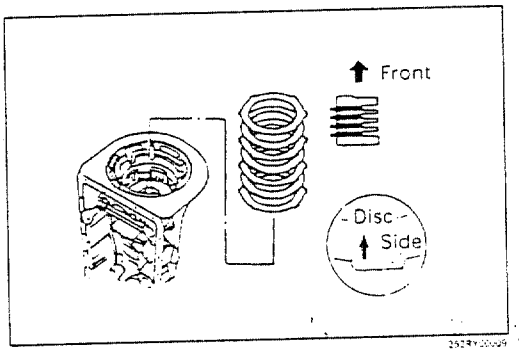


31. Bearing

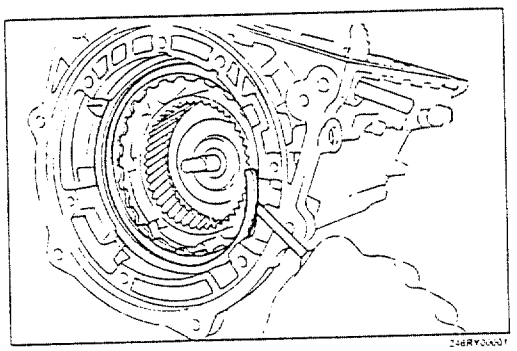
Coat the assembled bearing and race with petroleum jelly and install it onto the direct clutch.

Bearing and race diameter (Reference) mm (in.)

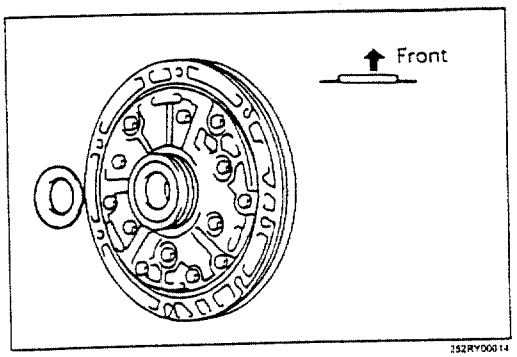
	Inside	Outside
Bearing and race	29.1 (1.146)	50.2 (1.976)



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



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

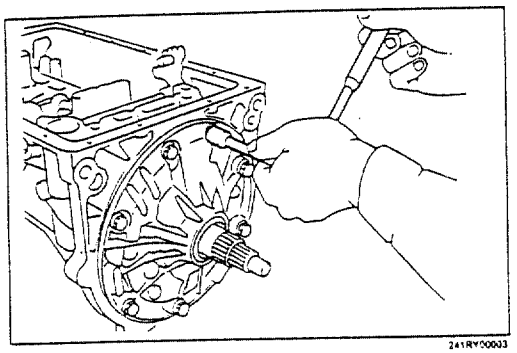


352RY00014

32. **Race**
Coat the race with petroleum jelly and install it onto the oil pump.

Race diameter (Reference) mm (in.)

	Inside	Outside
Race	28.1 (1.106)	47.3 (1.862)



241RY00003

33. **Oil pump**
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.

NOTE:

Do not push on the oil pump strongly or the oil seal ring will stick to the direct clutch drum.

Install the seven bolts.

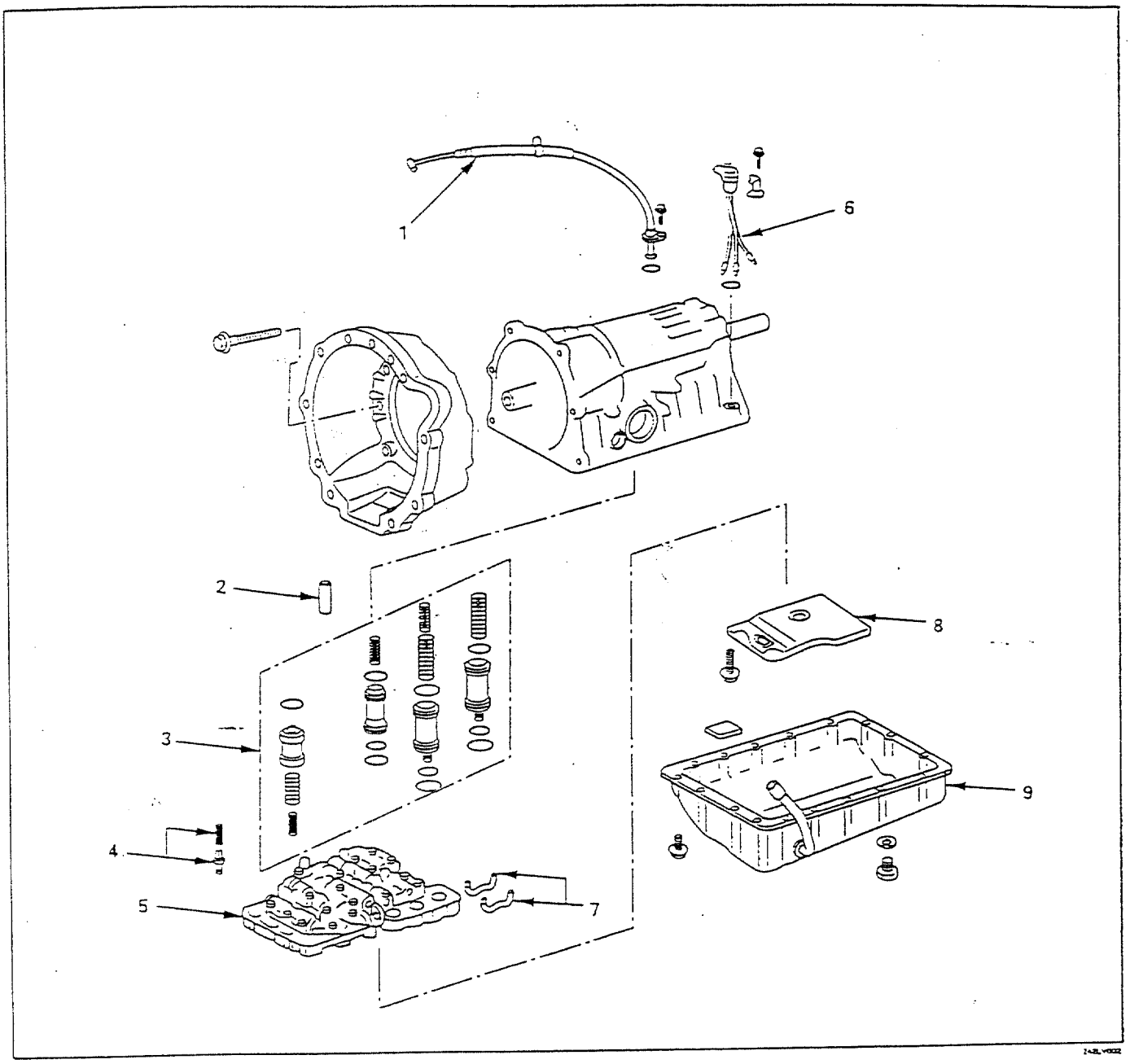
N·m(kg·m / lb·ft)

Torque	22 (2.2/16)

Check input shaft rotation

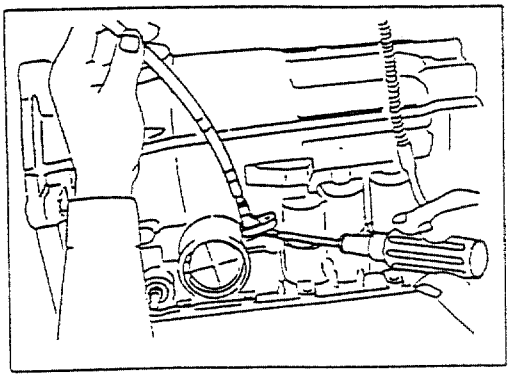
Make sure the input shaft rotates smoothly.

REASSEMBLY OF MAJOR COMPONENTS (3)



Reassembly steps

- ▲ 1. Throttle cable
- ▲ 2. Second brake drum gasket
- ▲ 3. Accumulator piston
- ▲ 4. Check ball body, spring
- ▲ 5. Valve body
- ▲ 6. Solenoid wiring
- ▲ 7. Oil tube
- ▲ 8. Oil strainer assembly
- ▲ 9. Oil pan

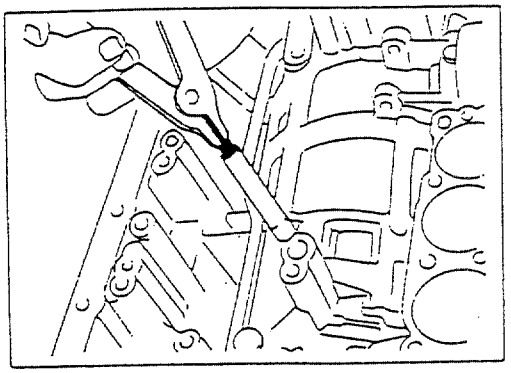


Important operations

1. Throttle cable

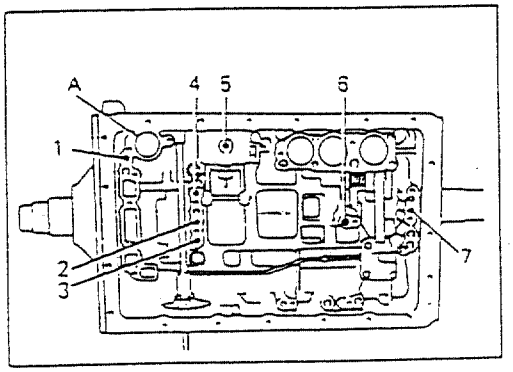
   Coat a new O-ring with the ATF and install it to the cable.

   Install the cable to the case.



2. Second brake drum gasket

   Install a new brake drum gasket to the transmission case.



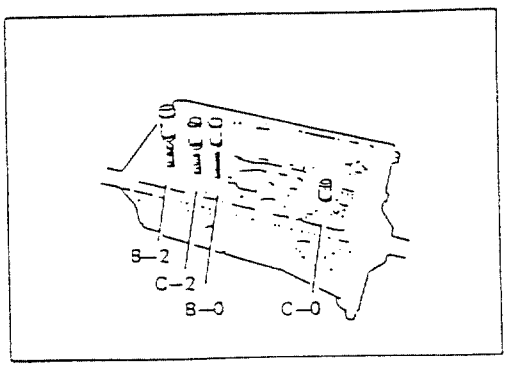
Individual piston operation inspection

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

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

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.

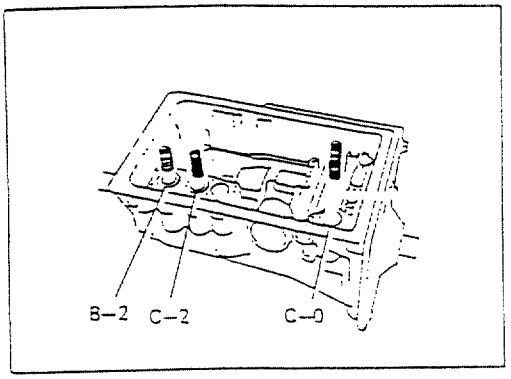
A : C-0 Accumulator piston hole

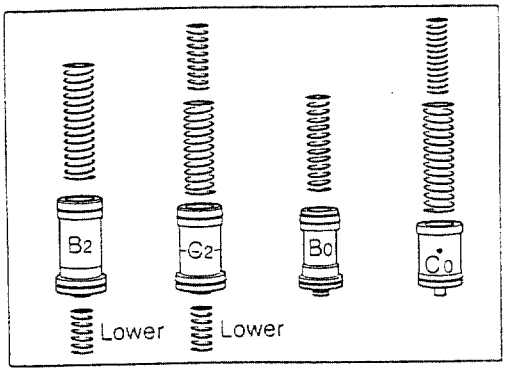


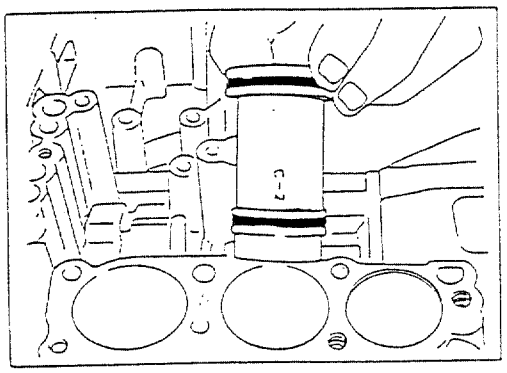
3. Accumulator piston

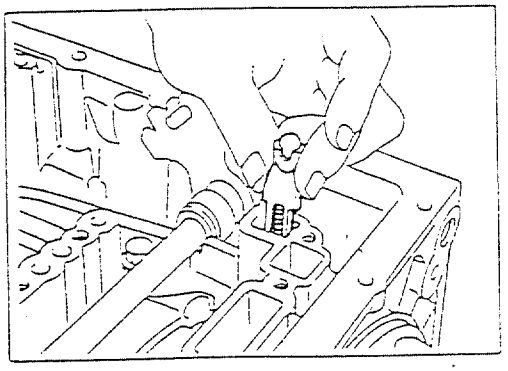
   Coat the O-ring with ATF and install it to the piston.

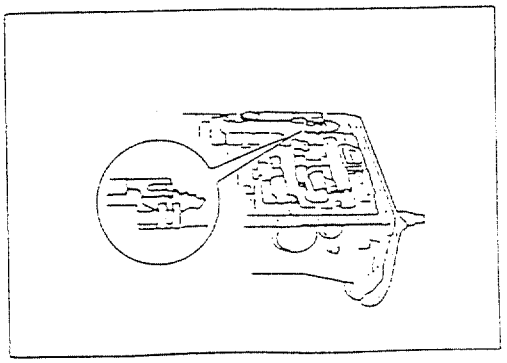
   Install the three springs and four accumulator pistons to the bore as shown in the figure.











mm (in.)

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

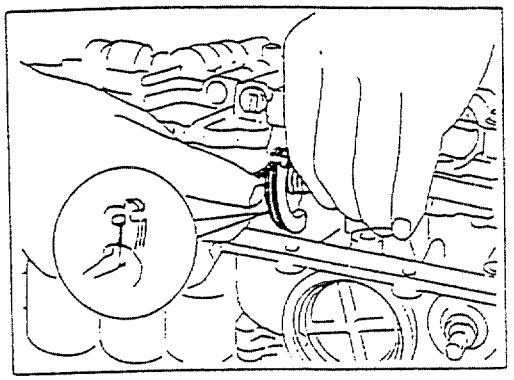
Spring	Free length	Outer diameter
(1) B-2 (Upper)	73.35 (2.888)	19.9 (0.783)
(2) B-2 (Lower)	22.0 (0.866)	14.0 (0.551)
(3) C-2 (Inner)	42.06 (1.656)	14.7 (0.579)
(4) C-2 (Outer)	70.3 (2.768)	20.2 (0.795)
(5) B-0	62.0 (2.441)	16.0 (0.630)
(6) C-0 (Outer)	74.6 (2.937)	20.9 (0.822)
(7) C-0 (Inner)	46.0 (1.811)	14.0 (0.551)
(8) C-2 (Lower)	23.0 (0.906)	11.9 (0.469)

4. Check ball body, spring

   Install new check ball body and spring

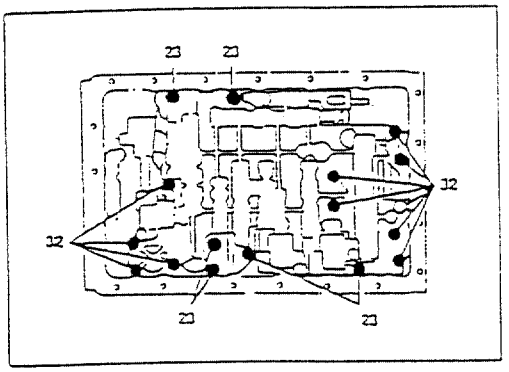
5. Valve body

   Align the groove of the manual valve to the pin of the lever.



Connect the throttle cable to the cam.

Confirm the springs into the accumulator piston are installed correctly.

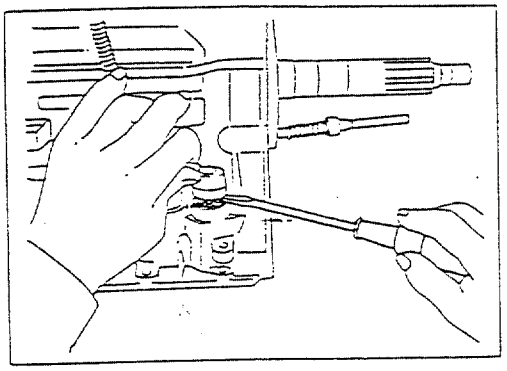


Install the seventeen bolts.

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

N.m (kgf.m/lb.ft)

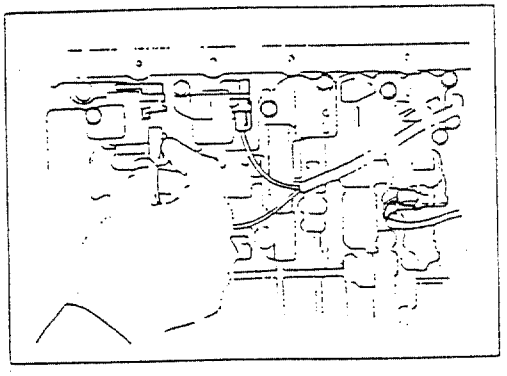
Torque	9 (0.92 / 79.66)



6. Solenoid wiring

Coat a new O-ring with ATF, and install it to the solenoid wiring.

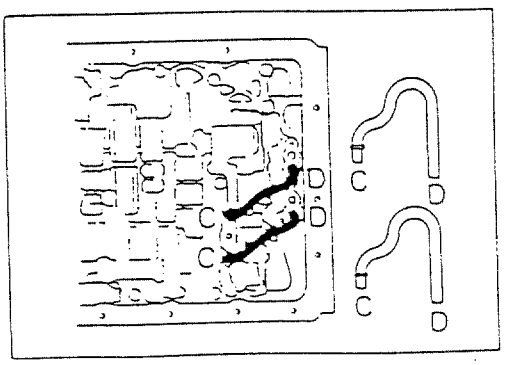
Insert the solenoid wiring to the case and install the stopper plate.



Connect the connectors to the No. 1, No. 2 and No. 3 solenoids.

N.m (kgf.m/lb.ft)

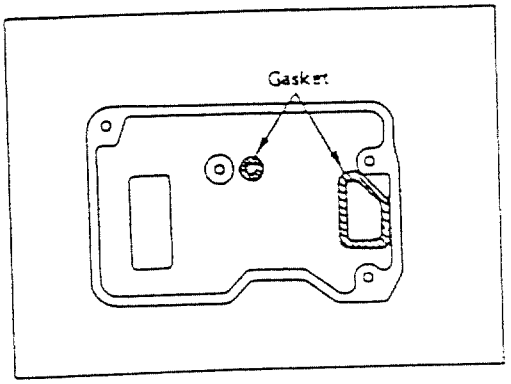
No.1, No.2, No.3, Solenoid	10 (1.0 / 86.74)



7. Oil tube

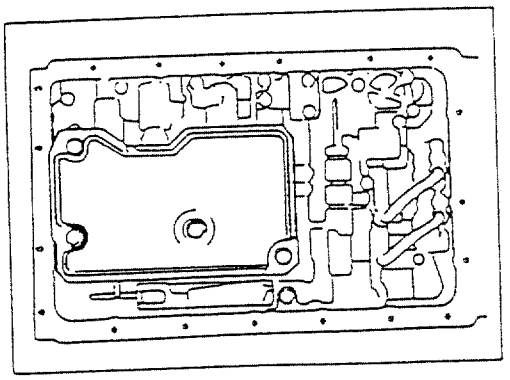
Using a plastic hammer, install the two tubes into the positions shown in the figure.

CAUTION: Be careful not to bend or damage the tubes.



8. Oil strainer assembly

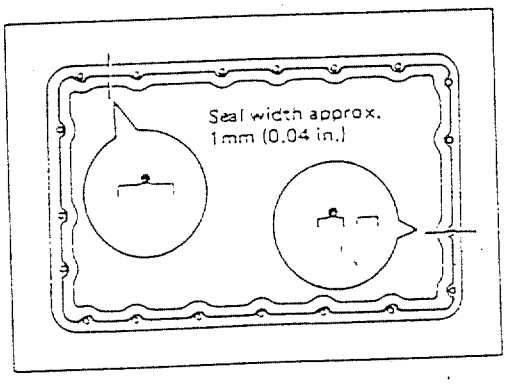
Install two new gaskets to the oil strainer.



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

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)



9. Oil pan

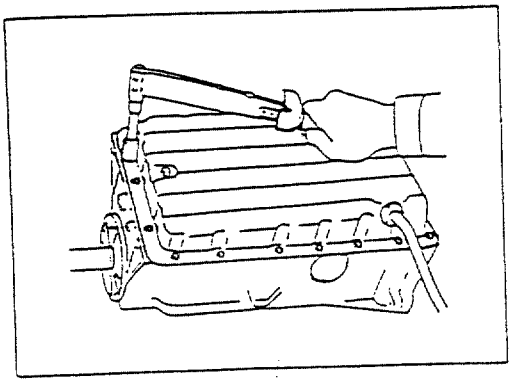
Install magnet in pan.

Note: Make sure that the magnet does not interfere with the oil tubes.

Remove any packing 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 packing is applied.

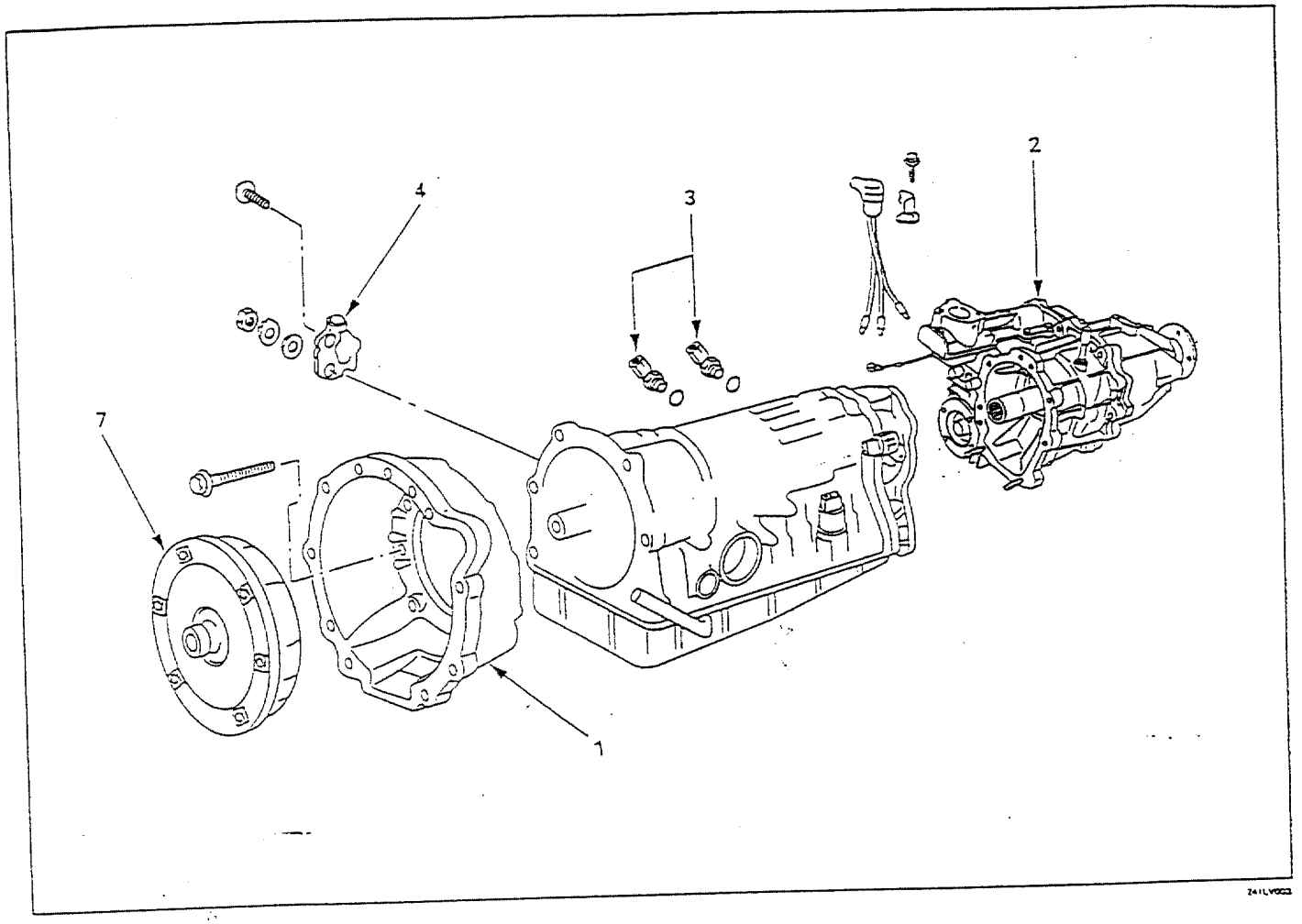


Install and tighten the nineteen bolts.

N.m (kgf.m/lb.ft)

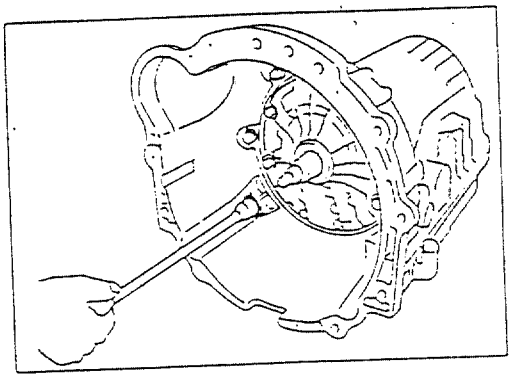
Torque	8 (0.82 / 70.81)

REASSEMBLY OF MAJOR COMPONENTS (3)



Reassembly steps

- ▲ 1. Converter housing
- 2. Extension housing
- ▲ 3. Union
- ▲ 4. Neutral start switch
- ▲ 5. Transmission control shaft lever
- 6. Wire harness
- ▲ 7. Torque converter



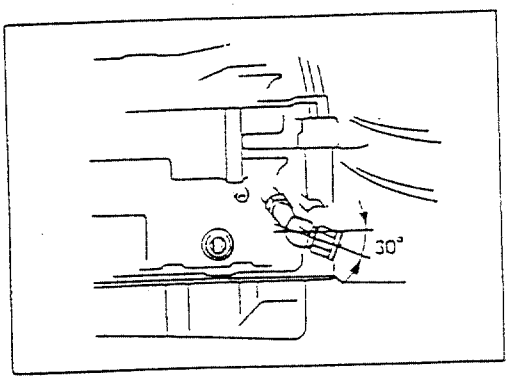
Important operations

1. Converter housing

   Install the converter housing and tighten the bolts.

N.m (kgf.m/lb.ft)

Torque	M10	34 (3.5/25)
	M12	57 (5.8/42)



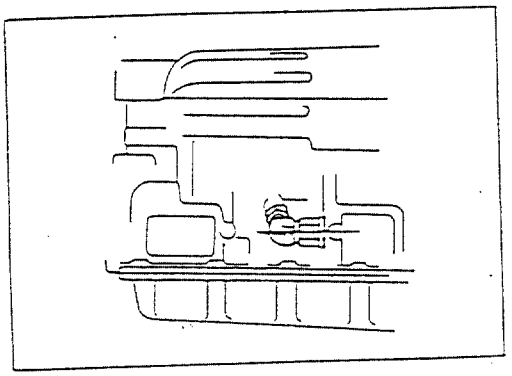
3. Union

Coat new O-rings with ATF, install them to the two unions.

Install the front union as shown in the figure.

N.m (kgf.m/lb.ft)

Torque	30 (3.06 / 265.52)



Install the rear union as shown in the figure.

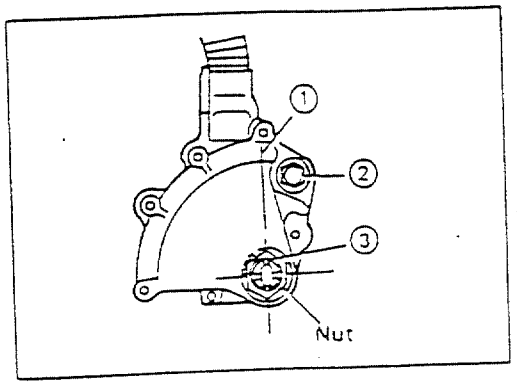
N.m (kgf.m/lb.ft)

Torque	30 (3.06 / 265.52)

4. Neutral start switch

Using the control shaft lever, fully turn the manual lever shaft back and return two notches. It is now in neutral.

Insert the neutral start switch onto the manual valve shaft and temporarily tighten the adjusting bolt.



Install the lock washer and install and torque the nut.

	N.m (kgf.m/lb.ft)
Torque	6.9 (0.7 / 61.07)

Align the neutral standard line ① and the switch groove ③ and tighten the adjusting bolt ②.

	N.m (kgf.m/lb.ft)
Torque	13 (1.33 / 115.06)

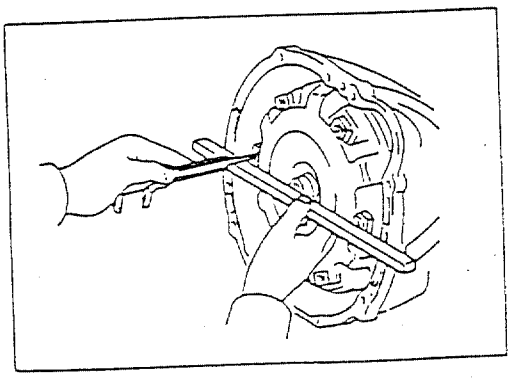
Bend the tabs of the lock washer.

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

5. Control shaft lever

Install control shaft lever.

	N.m (kgf.m/lb.ft)
Torque	1.6 (0.16 / 14.16)



7. Torque converter

Using calipers and a straight edge, measure from the installed surface of the transmission housing.

Correct distance	mm(in.)	67 (2.64) or more

SPECIAL TOOLS

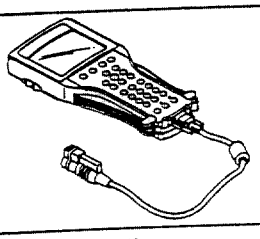
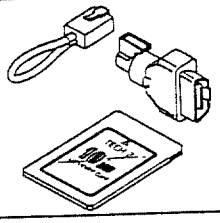
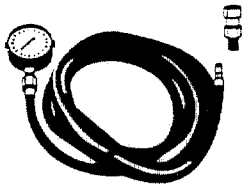
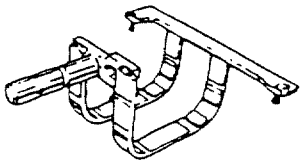
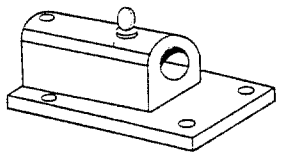
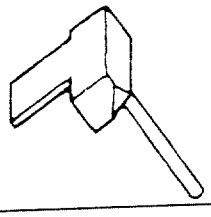
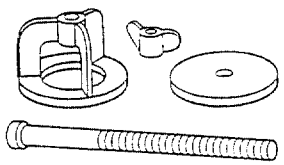
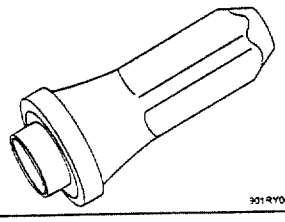
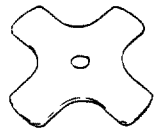
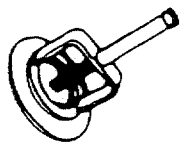
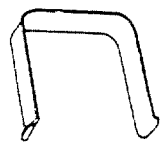
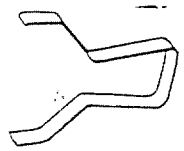
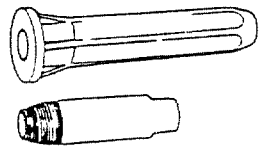
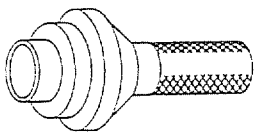
ILLUSTRATION	PART NO.	PART NAME
	7000057 & 3000095	TECH2 unit and DLC cable
	300098, 9000112 & 3000117	SAE 16/19 adapter RS232 loop back connector PCMCIA card
	5-8840-0093-0	Oil pressure gauge
	5-8840-2152-0 (J-37227)	Holding fixture
	5-8840-0003-0 (J-3289-20)	Holding fixture base
	5-8840-2153-0 (J-37228)	Oil pan seal cutter
	5-8840-0195-0 (J-23327-1)	Spring compressor

ILLUSTRATION	PART NO.	PART NAME
	5-8840-0123-0 (J-25045)	Oil pump oil seal installer
	5-8840-2170-0 (J-37233)	OD brake piston spring compressor
	5-8840-0254-0 (J-25048)	Spring compressor (snap ring)
	5-8840-2173-0 (J-37236)	1st/reverse brake puller
	5-8840-2174-0 (J-37237)	1st/reverse brake puller
	5-8840-2169-0 (J-37232-2)	Manual valve shaft seal installer & remover
	5-8840-2168-0 (J-35467)	One-way clutch testing tool; torque converter
	5-8840-2702-0	Rear oil seal installer; extension housing

MEMO

TF40L-WE-0115PH

You are requested to order this manual using the manual number that is shown above.

This manual is applicable for vehicles in all countries except the USA, Canada.

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ISUZU MOTORS LIMITED

INTERNATIONAL SERVICE DEPARTMENT

Tokyo, Japan

First edition Mar., 2001 1103-01A-0.03

WORKSHOP MANUAL

TF SERIES

AUTOMATIC TRANSMISSION

AW30-40LE

(For 4×4 MODEL)

SECTION 7A

ISUZU

ISUZU

International Service & Parts

Tokyo, Japan

NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section - OA under the headings "GENERAL REPAIR INSTRUCTIONS" and "HOW TO USE THIS MANUAL".

All material contained in this Manual is based on the latest product information available at the time of publication.

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TF40L-WE-9891R

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INTERNATIONAL SERVICE DEPARTMENT

Tokyo, Japan

First edition Sep., 1998 8103-11A-0.03

SECTION 7A

AUTOMATICTRANSMISSION (AW30-40LE)

⚠ CAUTION

When fasteners are removed, always reinstall them at a the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used.

Fasteners that are not reused, and those requiring thread locking compound, will be called out. The correct torque values must be used when installing fasteners that require torque. If the above conditions are not followed, parts or system damage could result.

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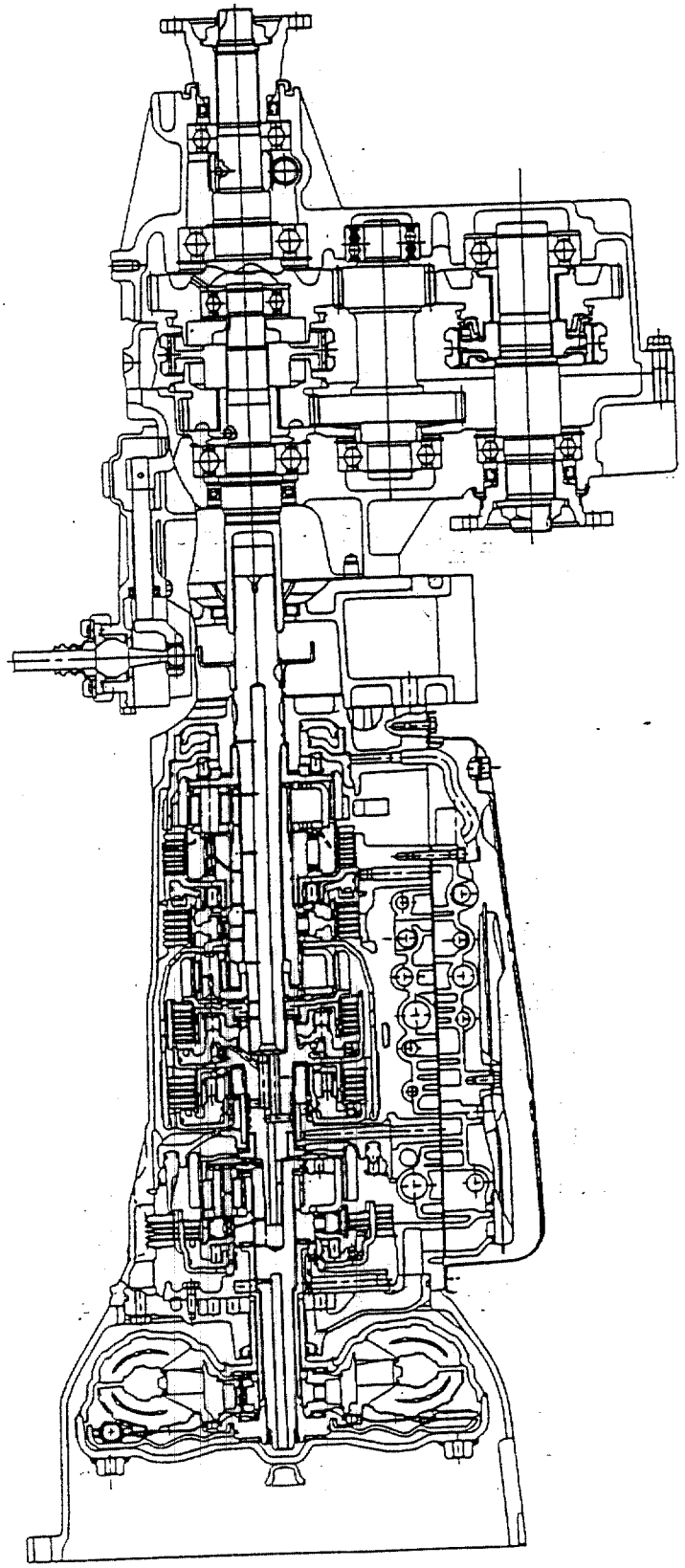
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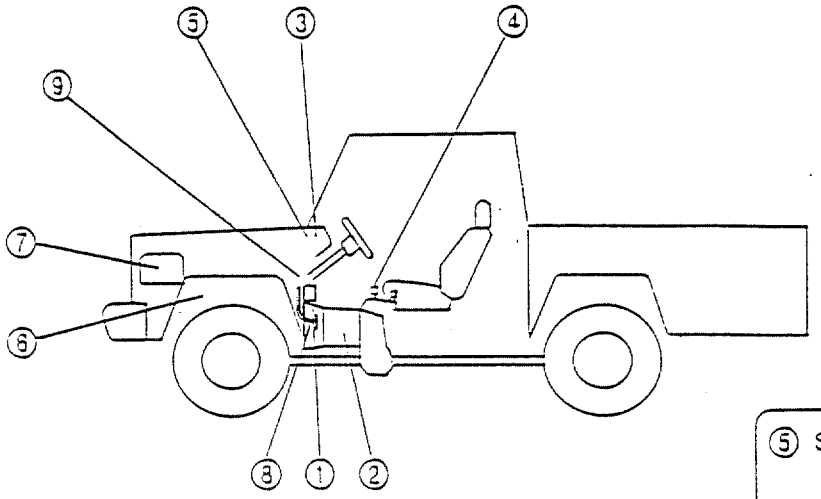
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GENERAL DESCRIPTION

CONSTRUCTION



ELECTRONIC CONTROL COMPONENTS



⑤ Speedometer

Vehicle speed sensor(SP1)

④ Select lever

- Overdrive switch
- Pattern select switch

⑧ Brake pedal
- Brake switch

⑥ Engine
- Throttle position sensor
- Water temp switch

③ Instrument panel
- CHECK TRANS lamp
- A/T OIL TEMP lamp

① Transmission Control Module (TCM)

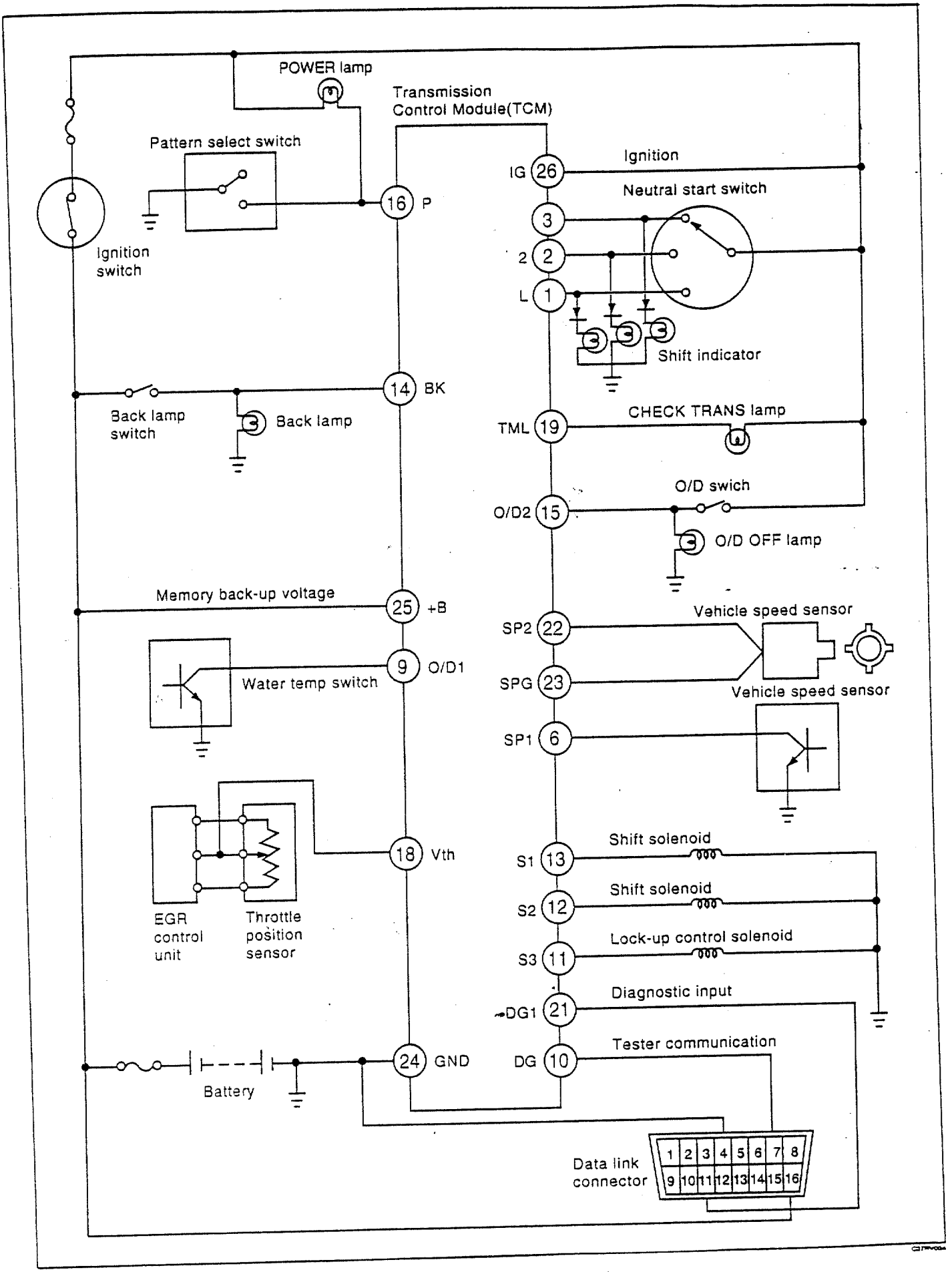
⑨ Data link connector
- Diagnosis terminal
- TECH 2 terminal

⑦ Electrical source
- Ignition
- Battery voltage(+B) (Memory back-up)

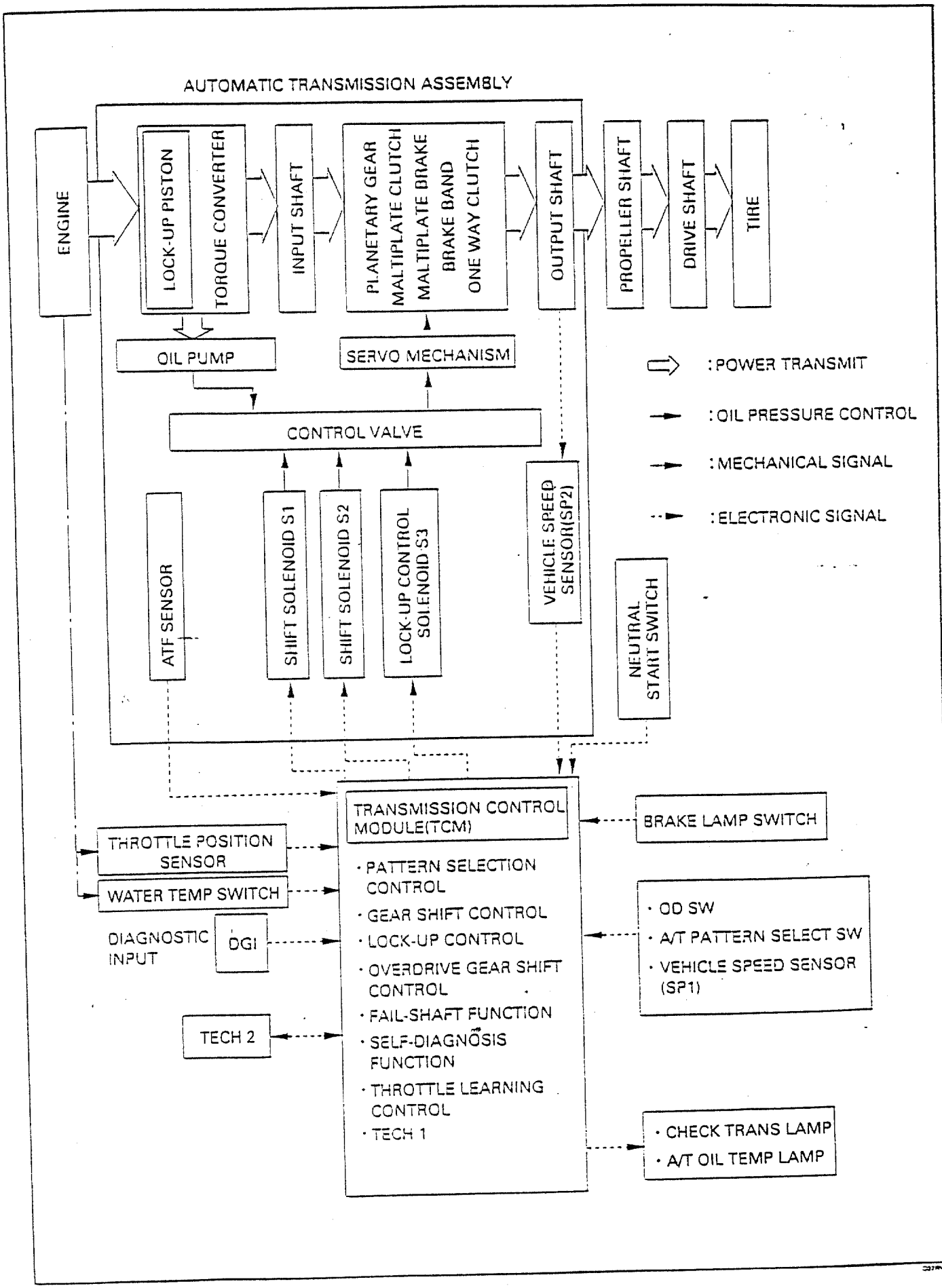
② Transmission
- Solenoid(S1,S2,S3)
- Vehicle speed sensor(SP2)
- Neutral start switch
- ATF sensor

Signal direction

TRANSMISSION CONTROL MODULE (TCM)



CONTROL SYSTEM DIAGRAM



CONTROL AND FUNCTIONS

Item	Description
Pattern selection control	• In D range, speed change point and Lock-up point can be changed by setting pattern selection switch to "POWER" or "NORMAL" mode.
Gear shift control (Speed change point Speed change timing)	• Gear shift position in the conditions made up of transmission shift positions (D.2.L) combined with pattern selection switch (POWER & NORMAL) can be controlled in accordance with vehicle speed and the opening of throttle valve. • Prevention of overrun When vehicle speed is over 128 km/h, even if O/D sw on, the 4th cut is not conducted. It is conducted at the point of time when vehicle speed becomes 126 km/h or lower. After conducting 4th cut, the 4th is not gained until O/D sw is set on.
Lock-up control	• In D range, 2nd, 3rd, or O/D lock-up is conducted in "POWER" or "NORMAL" mode. • In 2, L range, lock-up is off in the whole area. • Lock-up timing is controlled to reduce gear shift shock using kind of gear shift (shift up, etc.) lock-up status at the time of gear shift judgement, gear step and throttle opening after gear shift. • When the brake is switched on, lock-up is discontinued. • Lock-up is prohibited when idling is defected by throttle position sensor.
Overdrive gear shift control	• If O/D switch is set on in D range, gear shift to O/D is not effected.
Throttle learning control	• Variation in throttle position sensor voltage is corrected in TCM thereby to ensure a constant gear shift control.
Fail-safe function	• When trouble occurs to vehicle sensor and each solenoid, TCM automatically exerts fail-safe control not to spoil driveability. • This control is exerted when sensor or actuator is in trouble, while TCM works normally.
Self-diagnosis function	• If there is an abnormality in vehicle sensors, each solenoid (S1-S3), or throttle position sensor, "CHECK TRANS" lamp is actuated to warn the driver. But when the abnormality items have been restored to normal, the light does not blink. • Faulty parts are memorized in TCM. If self-diagnosis start signal is inputted, "CHECK TRANS" lamp is blinked and results of diagnosis are indicated. A history of faults remains recorded even when IGN switch is off. If TCM fuse is removed, the records can be erased.
TECH 2	• Output of control data in the TCM • Actuator (Solenoid) operation check • Erasure of trouble code

FAIL-SAFE FUNCTION

Vehicle speed sensor 1 (Attached to the transfer case)	If the vehicle speed sensor 1 goes wrong while traveling, it holds the transfer HI/LO judgement just before the break down until the vehicle speed sensor 2 detects the vehicle speed of 0 kilometer per hour, and the vehicle continues running with the gear engaged to the shift map of 4L mode (change to the fourth gear is prohibited). After the speed of 0 kilometer per hour is detected, the vehicle is controlled on the assumption that the transfer Low gear is selected.
Vehicle speed sensor	The vehicle speed is detected by two systems, one from a sensor fitted to the transmission (output shaft revolution sensor) and another from the speedometer. In case of malfunction in one of two, the speed signal from the other is used for control.
Neutral start switch	In case "2" and "L" range signals are on, priority is given "L".
Shift solenoid S1 and S2	If there is an abnormality is one or both of solenoids, TCM automatically exerts fail-safe control, thereby maintaining driveability.
Lock-up control solenoid S3	This keeps lock-up control solenoid S3 off.

SHIFT SOLENOID S1, S2 (FAIL-SAFE FUNCTION)

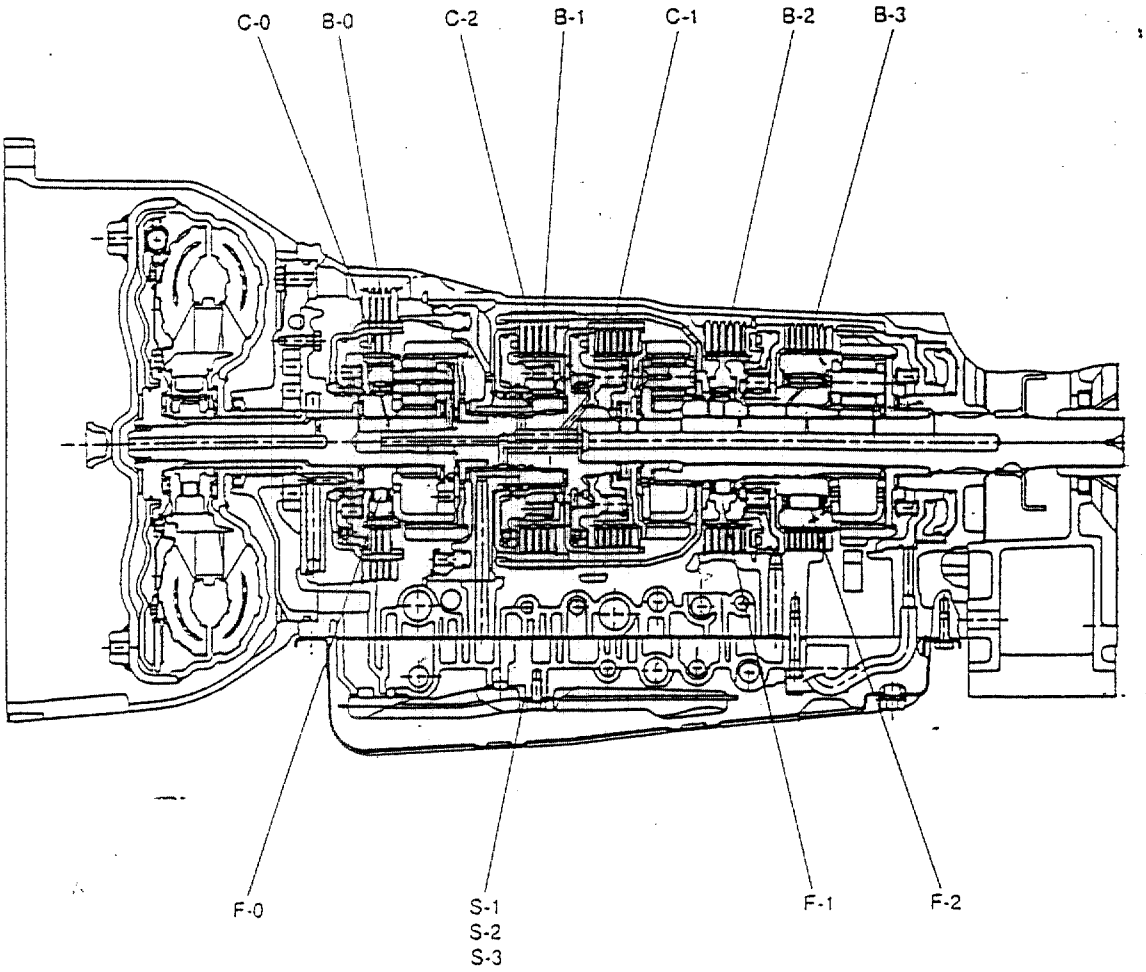
Range	NORMAL			SOLENOID S1 MALFUNCTIONING			SOLENOID S2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid		Gear position	Solenoid		Gear position	Solenoid		Gear position	Solenoid		Gear position
	S1	S2		S1	S2		S1	S2		S1	S2	
"D" range	ON	OFF	1st	X	ON ← (OFF)	3rd	ON	X	1st	X	X	OD
	ON	ON	2nd	X	ON	3rd	OFF ← (ON)	X	OD	X	X	OD
	OFF	ON	3rd	X	ON	3rd	OFF	X	OD	X	X	OD
	OFF	OFF	OD	X	OFF	OD	OFF	X	OD	X	X	OD
"2" range	ON	OFF	1st	X	ON ← (OFF)	3rd	ON	X	1st	X	X	3rd
	ON	ON	2nd	X	ON	3rd	OFF ← (ON)	X	3rd	X	X	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	X	X	3rd
"L" range	ON	OFF	1st	X	OFF	3rd	ON	X	1st	X	X	3rd
	ON	ON	2nd	X	OFF ← (ON)	3rd	ON	X	1st	X	X	3rd

( ) : Fail-safe function X : Malfunctions

MAJOR INPUT/OUTPUT COMPONENTS

	Component	Function
Input	Vehicle speed sensor (Speedometer)	Detects the vehicle speed
	Vehicle speed sensor (Transmission)	Detects the vehicle speed
	Throttle position sensor	Detects the injection pump lever opening rate
	Neutral start switch	Detects the select lever position
	Pattern select switch	Detects whether the driver has selecte "NORMAL" or "POWER" mode.
	Engine water temp switch	Detects the engine water temperature is less than 40°C.
	AT Fluid temperature sensor	Detects the A/T Fluid temperature
	Overdrive switch	Detects whether the driver has selected O/D
	Brake lamp switch	Detects whether the driver has pressed the brake pedal or not
	Diagnostic start switch	Starts self-diagnosis and displays a code for faulty part if any.
Input/ Output	Data link connector	When connected with TECH 2 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 S3	Control the lock-up clutch suited to the vehicle running condition on the basis of TCM output.
	"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.
	"AT oil TEMP" lamp	When A/T Fluid temperature is high, "AT Oil TEMP" lamp is on to be warm the driver.
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.

LOCATION OF CLUTCH, BRAKE ONE-WAY CLUTCH AND SOLENOID



C-0: Overdrive direct clutch
C-1: Forward clutch
C-2: Direct clutch
B-0: Overdrive brake
B-1: Second coast brake
B-2: Second brake
B-3: First and reverse brake
F-0: Overdrive one-way clutch
F-1: One-way clutch (No.1)
F-2: One-way clutch (No.2)
S-1: Shift solenoid S1
S-2: Shift solenoid S2
S-3: Lock-up solenoid S3

OPERATION OF CLUTCH, BRAKE AND ONE-WAY CLUTCH

○ : Operating ◎ : 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-3
P	Parking	○										
R	Reverse	○		○				○	○			
N	Neutral	○										
D	1st	○	○						○		○	
	2nd	○	○				○		○	○		◎
	3rd	○	○	○			○		○			◎
	O/D		○	○	○		○					◎
2	1st	○	○						○		○	
	2nd	○	○			○	○		○	○		
	3rd	○	○	○			○		○			
L	1st	○	○					○	○		○	
	(1*) 2nd	○	○			○	○		○	○		
	(2*) 3rd	○	○	○			○		○			

(1*) Down-shift only in the L range and 2nd gear - no up-shift.
(2*) Down-shift only in the L range and 3rd gear

SPEED CHANGE AND LOCK-UP PATTERN

If you select a speed range and a lock-up pattern as shown below by specifying respective positions of transmission shift lever, transfer shift lever 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		2	L
	Overdrive switch ON	Overdrive switch OFF		
NORMAL POWER	1st ↔ [2nd] ↔ [3rd] ↔ [O/D]	1st ↔ [2nd] ↔ [3rd] ← [O/D]	1st ↔ 2nd ↔ (3rd)	1st ← 2nd ← 3rd

[ ] : The lock-up operation is available.
( ) : Transmission is shifted at high speed to prevent overrun.

OVERDRIVE AND LOCK-UP OPERATING CONDITIONS

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

	Overdrive	Lock-up clutch
Transmission shift position	D range	←
Transmission O/D switch	ON (O/D OFF lamp OFF)	—
Stop lamp switch	—	OFF
Throttle opening	—	Except fully closed
Vehicle speed	About 58 km/h or more	2nd: About 40 km/h or more 3rd: About 44 km/h or more O/D: About 55 km/h or more

MAIN DATA AND SPECIFICATIONS

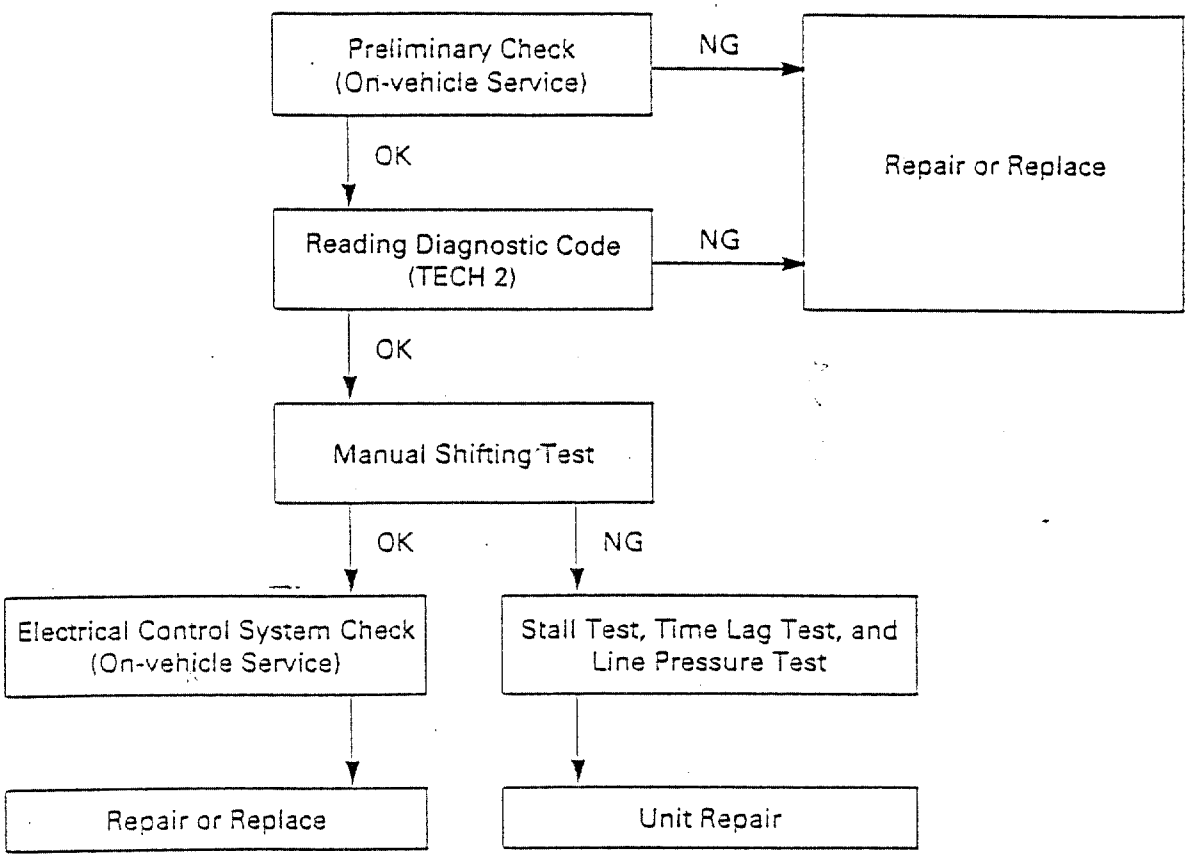
				Remarks
Model			AW30-43LE	
Engine			4JG2-T	
Type			Electronic control planetary gear type	
			3-element 1-stage 2-phase type (with lock-up mechanism)	
Gear ratio	1st		2.804	
	2nd		1.532	
	3rd		1.000	
	4th (O/D)		0.753	
	Reverse		2.394	
Oil used	Name		BESCO ATF II or III	
	Q'ty (ℓ)		8	
Torque converter			2400 ± 150	Stall speed (rpm)
Friction element	Forward clutch	C-1	5	Number of discs
	Direct clutch	C-2	4	
	O/D direct clutch	C-0	2	
	2nd coast brake	B-1	40mm	Band width or No. of discs
	2nd brake	B-2	5	No. of discs
	1st & reverse brake	B-3	6	
	Overdrive brake	B-0	4	
Clutch	One-way clutch No.1	F-1	22	Number of sprags
	One-way clutch No.2	F-2	28	
	O/D 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	

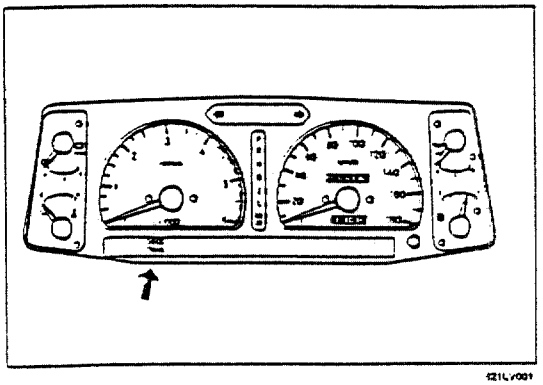
DIAGNOSIS

BASIC TROUBLESHOOTING

AW30-40LE transmission, called Electronic Controlled Transmission (ECT), differs from oil pressure control type transmissions in that it is controlled by a microcomputer. Accordingly, its troubleshooting procedure differs also.

Before troubleshooting an ECT, 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 general troubleshooting chart on the following page should speed the procedure.

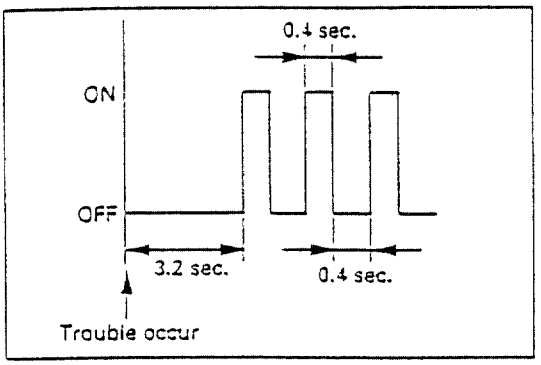




SELF-DIAGNOSIS

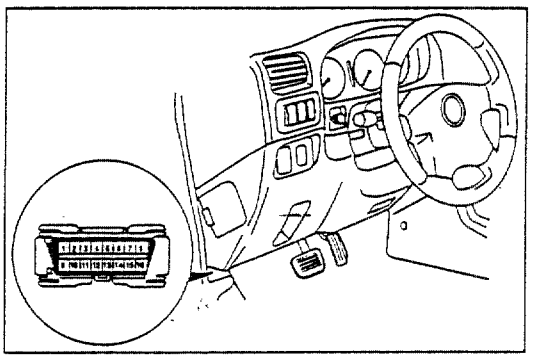
Warning to the driver

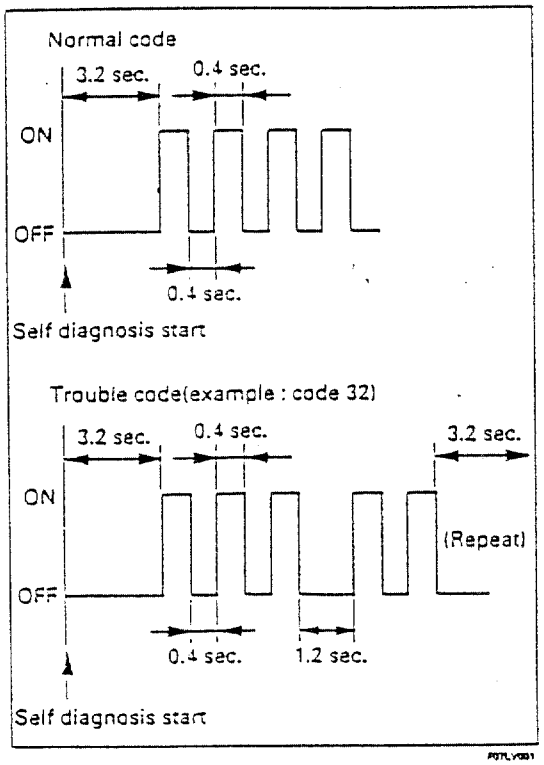
- When trouble has occurred to throttle position sensor, vehicle speed sensor, or solenoid, "CHECK TRANS" lamp is blinked (1.25 Hz) even during driving to warn the driver.
- The trouble is recorded by trouble code in TCM.
- When temporary trouble has been shooted, the "CHECK TRANS" lamp stops blinking. This blinking can be stopped by setting the ignition key off. But the trouble code remains memorized in TCM.



Self-diagnosis code display

- For quick search for faulty parts, 6 different items of trouble code are indicated by "CHECK TRANS" lamp blinking.
- The storaged trouble codes can be identified by shorting the terminals No. 11 and No. 4 (earth) of Data Link Connector with a lead wire.





Indication Method:

(1) Terminals No. 11 and No. 4 of Data Link Connector are short circuited.

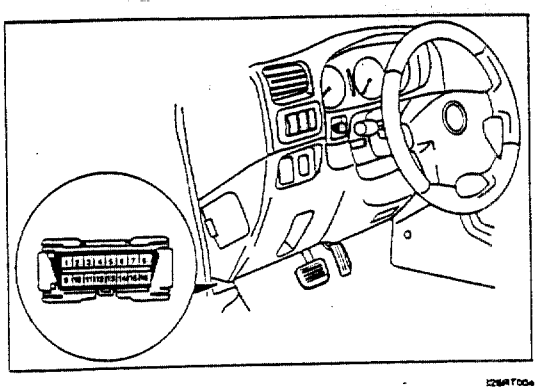
(2) Turn the ignition key to the ON position.

(3) In case there no trouble, normal code is indicated.

(4) In case a plurality of trouble codes have occurred at a time, each code is indicated three times in numerical order.

NOTE:

Power line runs through Data Link Connector.
Be careful shorting with a lead wire, etc.
(The vehicle side of control module may be damaged.)
For identification of trouble code, connect Diagnosis Select Box and TECH 2 to Data Link Connector.

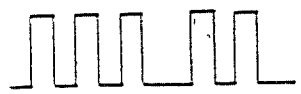


Clear of trouble code memory

1. Clear the trouble code memory using F4 function for TECH2.
2. Shorting terminals for 3-4 seconde between No.11 and No.4 or 5 (ground) of diagnosis connectors after the ignition key tuned to the on position for 1 second or longer.

- After erasing trouble code, check to see if the normal code is outputted through running test.

Trouble code

Trouble Code	Mode	Diagnostic area and Failure	See page
11		Vehicle speed sensor 2 (Transmission mounting) Open or shorted circuit	7A-34
21		Throttle position sensor input Open or shorted circuit	7A-36
24		Vehicle speed sensor 1 (In speedometer) Open or shorted circuit	7A-38
31		Solenoid S1 Open or shorted circuit	7A-41
32		Solenoid S2 Open or shorted circuit	7A-42
33		Solenoid S3 Open or shorted circuit	7A-44

DIAGNOSIS WITH TECH 2

In this AW30-43LE transmission, troubleshooting can be performed for electrical faults using the TECH 2 scan tool. If the CHECK TRANS lamp blinks, or if an electrical fault in the transmission may ptobably exist, check trouble codes using the TECH 2 scan tool.

In the diagnostic procedures described in this manual, first repair the faulty positions indicated by trouble code in the order of numbers and then perform troubleshooting for the faulty positions that are not indicated by trouble code. For correct troubleshooting, it is necessary to first repair the trouble codes of lower-order numbers, then to repair the trouble codes of higher-order numbers in sequence.

How to Use This Manual:

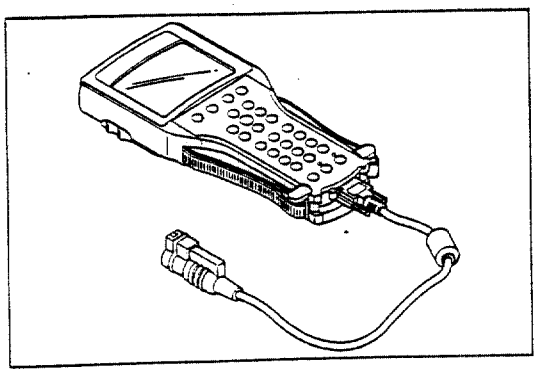
Check trouble codes using the TECH 2 scan tool.

If no codes are set:

- Refer to F1: Data List Quick Check (page 7A-32) and identify the electrical faults that are not indicated by trouble code.

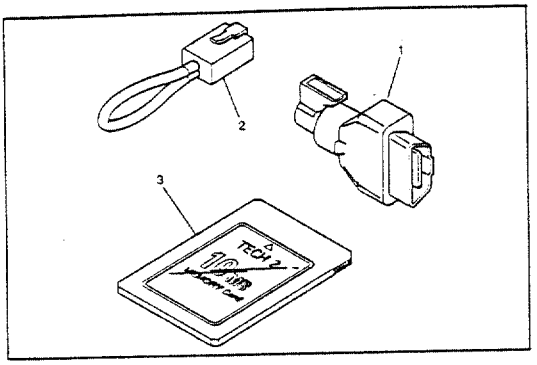
If codes are set:

- Record all the codes displayed by the TECH 2 and check if the codes are intermittent (intermittent faults).
- Clear the codes.
- Drive the vehicle for a test to reproduce the faulty status.
- Check trouble codes again using the TECH 2.
- If no code is displayed by test driving, the fault is intermittent. In this case, refer to the cautions on intermittent conditions (page 7A-31).
- If a code is present, refer to (page 7A-16) for diagnosis.
- Because a code of high-order number may be set for the reason that a code of low-order number has been set after occurrence of a fault, perform repair work starting with a lower-order number is ascending order.

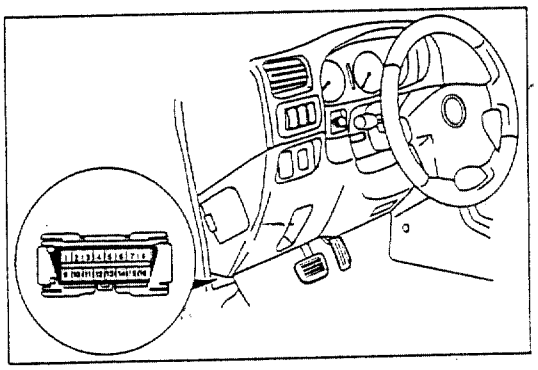


TECH 2 Connection

The TECH 2 scanning tool is used to electrically diagnose the automatic transmission system and to check the system. The TECH 2 enhances the diagnosis efficiency though all the troubleshooting can be done without the TECH2.
The TECH 2 is a portable, compact, and light tester. When it is connected to the diagnosis connector of the vehicle, you can perform a variety of diagnoses and tests by communicating with the Electric Control Unit (ECU) of the vehicle.



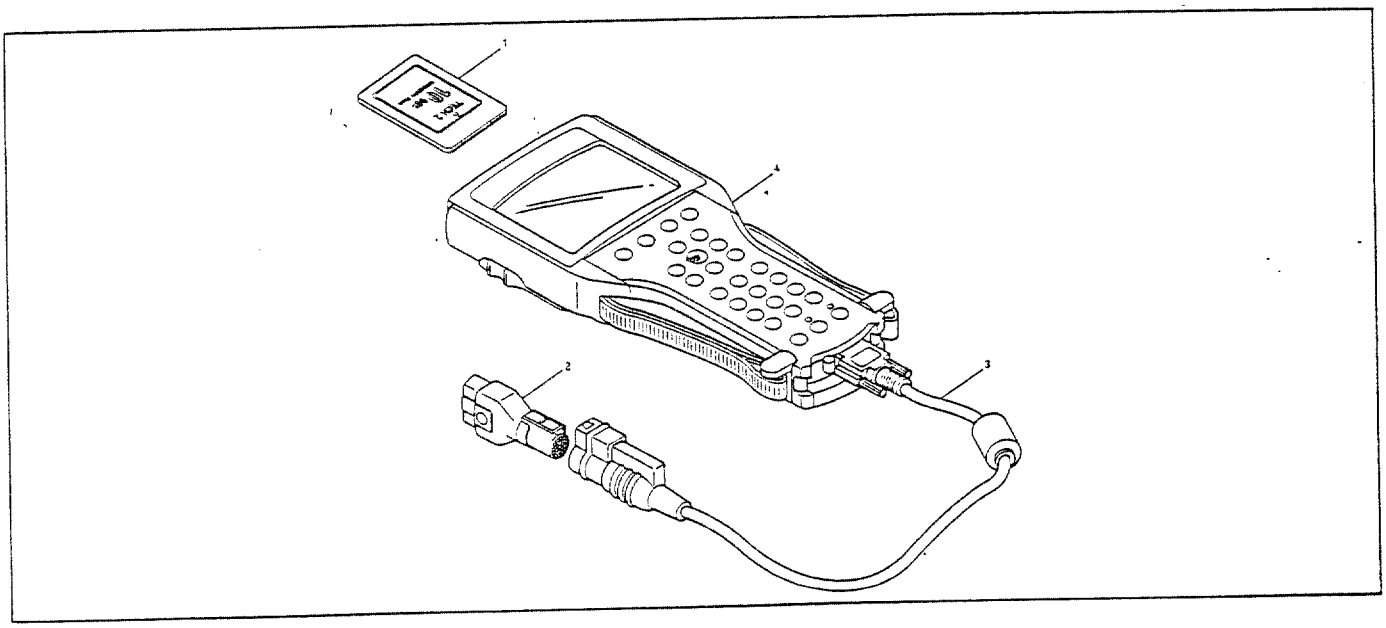
1. Configuration of TECH 2
(1) TECH 2 scanning tool (No.3000094) and DLC cable (No.3000095)
(2) SAE16/19 adapter (No.3000098) (1) ,RS232 loop back connector (No.3000112) (2), and PCMCIA card (No. 3000117) (3)



2. TECH 2 Connection
Observe the TECH 2 User Guide.
(1) Check the ignition is OFF.
(2) Insert the ISUZU 98 system PCMCIA card (1) into the TECH 2 (4).
(3) Connect the SAE16/19 adapter (2) to the DLC cable (3).
(4) Connect the DLC cable (3) to the TECH2 (4).
(5) Connect the SAE16/19 adapter (2) to the diagnosis connector of the vehicle.
(6) Turn the ignition of the vehicle ON and press the "PWR" key of the TECH2.

Check the display of the TECH2.

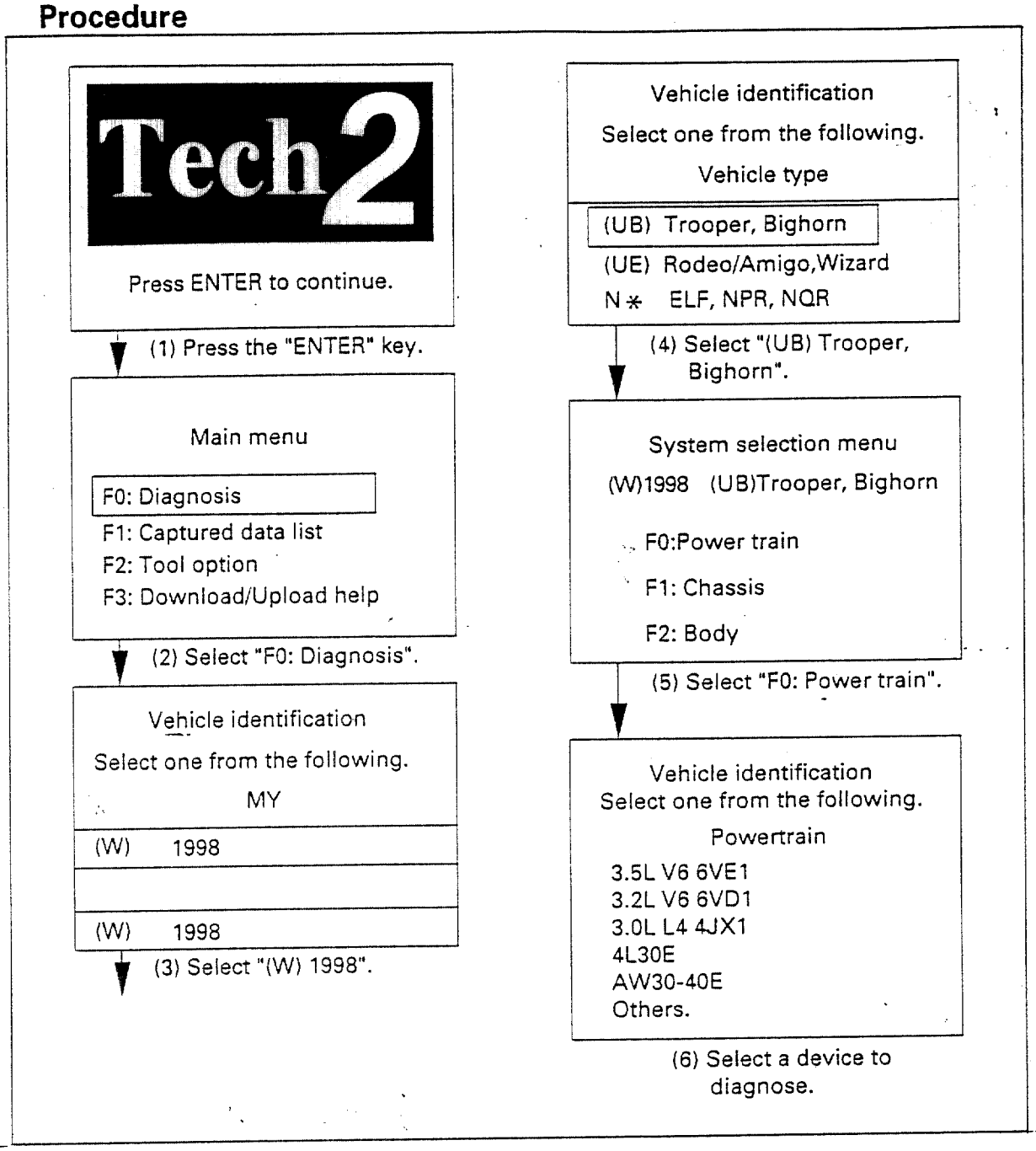
Note:
Be sure to check that the power is not supplied to the TECH2 when attaching or removing the PCMCIA card.



TECH 2 OPERATING FLOW CHART

① TECH 2 START UP

Procedure



INTERMITTENT CONDITIONS

If the TECH 2 displays a code as intermittent, or if after a test drive a code does not reappear, the problem is most likely a faulty electrical connection or loose wiring. Terminals should always be the prime suspect. Intermittent rarely occur in sophisticated electronic components such as the Transmission Control Module (TCM).

When an intermittent problem is encountered, check suspect circuits for:

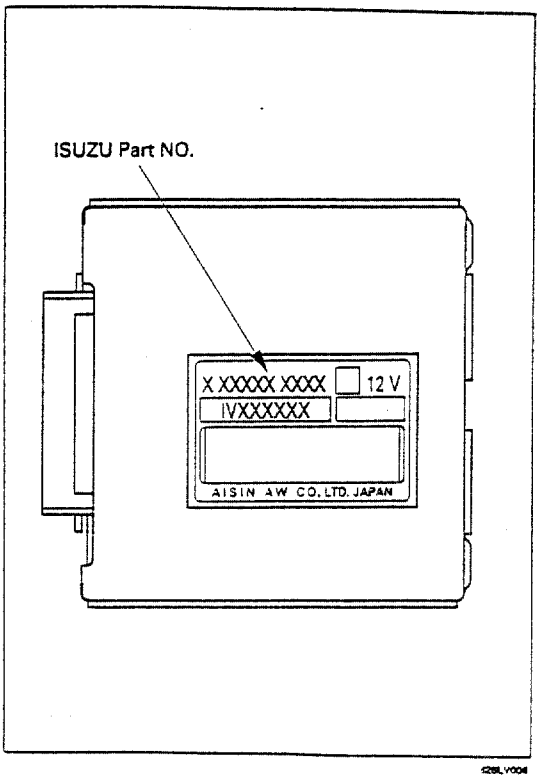
- Poor terminal to wire connection.
- Terminals not fully seated in the connector body (backed out).
- Improperly formed or damaged terminals.
- Loose, dirty, or corroded ground connections.
  HINT: Any time you have an intermittent in more than one circuit, check whether the circuits share a common ground connection.
- Pinched or damaged wires.
- Electro-Magnetic Interference (EMI)
  HINT: Check that all wires are properly routed away from spark plug wires, distributor wires, coil, and generator. Also check for improperly installed electrical options, such as lights, 2-way radios, etc.

Use the F3: SNAPSHOT mode of the TECH 2 to help isolate the cause of an intermittent fault. The snapshot mode will record information before and after the problem occurs. Set the snapshot to "trigger" on the suspect code (or codes) or, if you notice the reported symptom during test drive, trigger the snapshot manually.

After the snapshot has been triggered, command the TECH 2 to play back the flow of data recorded from each of the various sensors. Signs of an intermittent fault in a sensor circuit are a sudden unexplainable jump in data values out of the normal range.

F1: DATA LIST QUICK CHECK

Item	Status and reference value
BRAKE SWITCH	ON/CLOSED 12V OFF/OPEN 0V
COOLANT TEMP. SW	ON/CLOSED 0V OFF/OPEN 12V
SOLENOID 1-2/3-4 (SOLENOID S1)	ACTIVE 12V INACTIVE 0V
SOLENOID 2-3 (SOLENOID S2)	ACTIVE 12V INACTIVE 0V
TCC SOLENOID (SOLENOID S3)	ACTIVE 12V INACTIVE 0V
SPEED SENSOR 1	0 - 254 KPH (km/h) 0 - 11430 p/min
SPEED SENSOR 2	0 - 254 KPH (km/h) 0 - 48006 p/min
TIME FROM START	0:00 - 4:15 (hr:min:sec)
TRANSM.OIL TEMP.	HIGH LOW
OIL LAMP	ON 0V OFF 12V
OIL TEMPERATURE	-40 - 140°C
PROGRAM SWITCH	ACTIVE 0V (POWER mode) INACTIVE 12V (NORMAL mode)
OVERDRIVE SWITCH	ON 12V OFF 0V
SELECTOR POS.	- P/R/D - or - 1 - or - 2 - or - N - FAULT -
SELECTOR POS.2	ACTIVE 12V INACTIVE 0V
SELECTOR POS.1	ACTIVE 12V INACTIVE 0V
TPS SIGNAL	0.00 - 9.99V 0 - 99%, θ0 - θ7
ACTUAL GEAR	- 1 -, - 2 -, - 2L/U -, - 3 -, - 3L/U -, - 4 -, - 4L/U -
SELECTOR POS. N	ACTIVE 12V INACTIVE 0V



IDENTIFICATION OF TRANSMISSION CONTROL MODULE (TCM) (CHART 3)

ISUZU Part No: 8-97300-158-0

MEMO

DIAGNOSTIC TROUBLE CODES (DTC) CHECK

CODE 11
VEHICLE SPEED SENSOR 2
(OPEN/SHORTED CIRCUIT)

Circuit Description:
Vehicle speed information is provided to the TCM by the vehicle speed sensor 2. This sensor is located in the transmission rear cover.
The speed 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 km/h signal.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

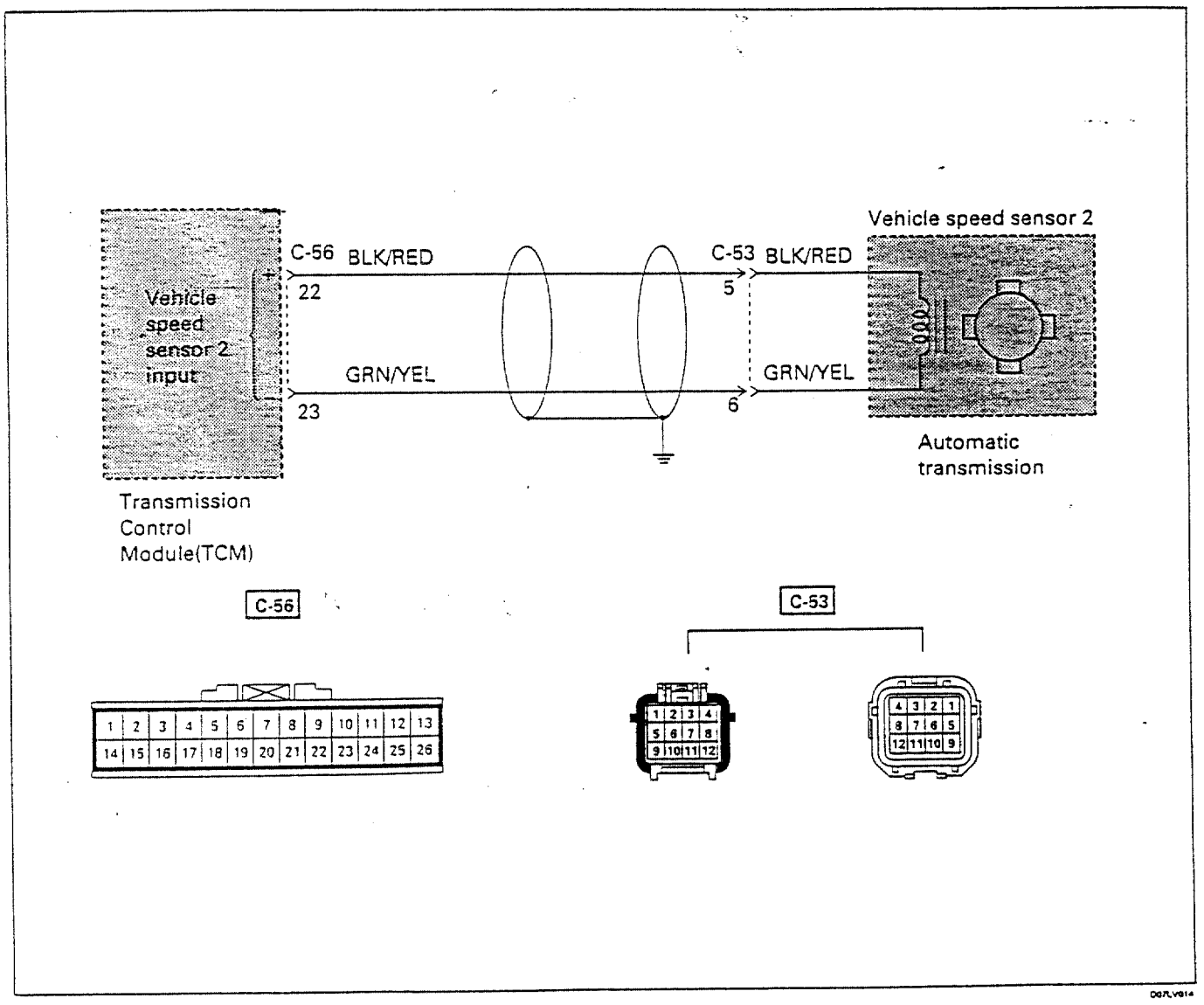
(1) When the vehicle is running, a speed signal is input from the vehicle speed sensor 2 to the TCM.

(2) At this test, the continuity of circuit wiring and the vehicle speed sensor 2 is checked.

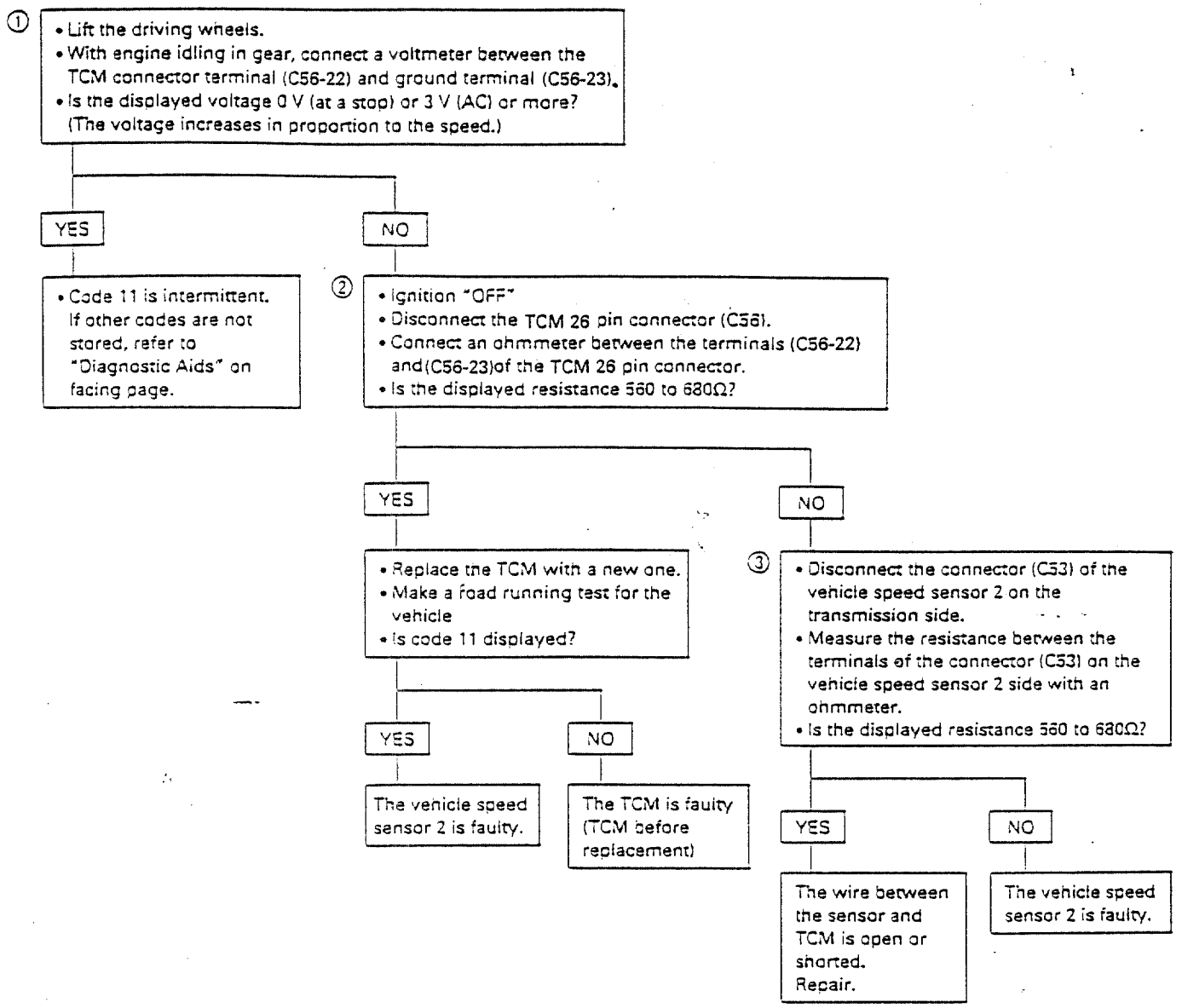
(3) At this test, the continuity of the vehicle speed sensor 2 is checked.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-65.



CODE 11
VEHICLE SPEED SENSOR 2
(OPEN/SHORTED CIRCUIT)



CODE 21
THROTTLE POSITION SENSOR (TPS)
(OPEN/SHORTED CIRCUIT)

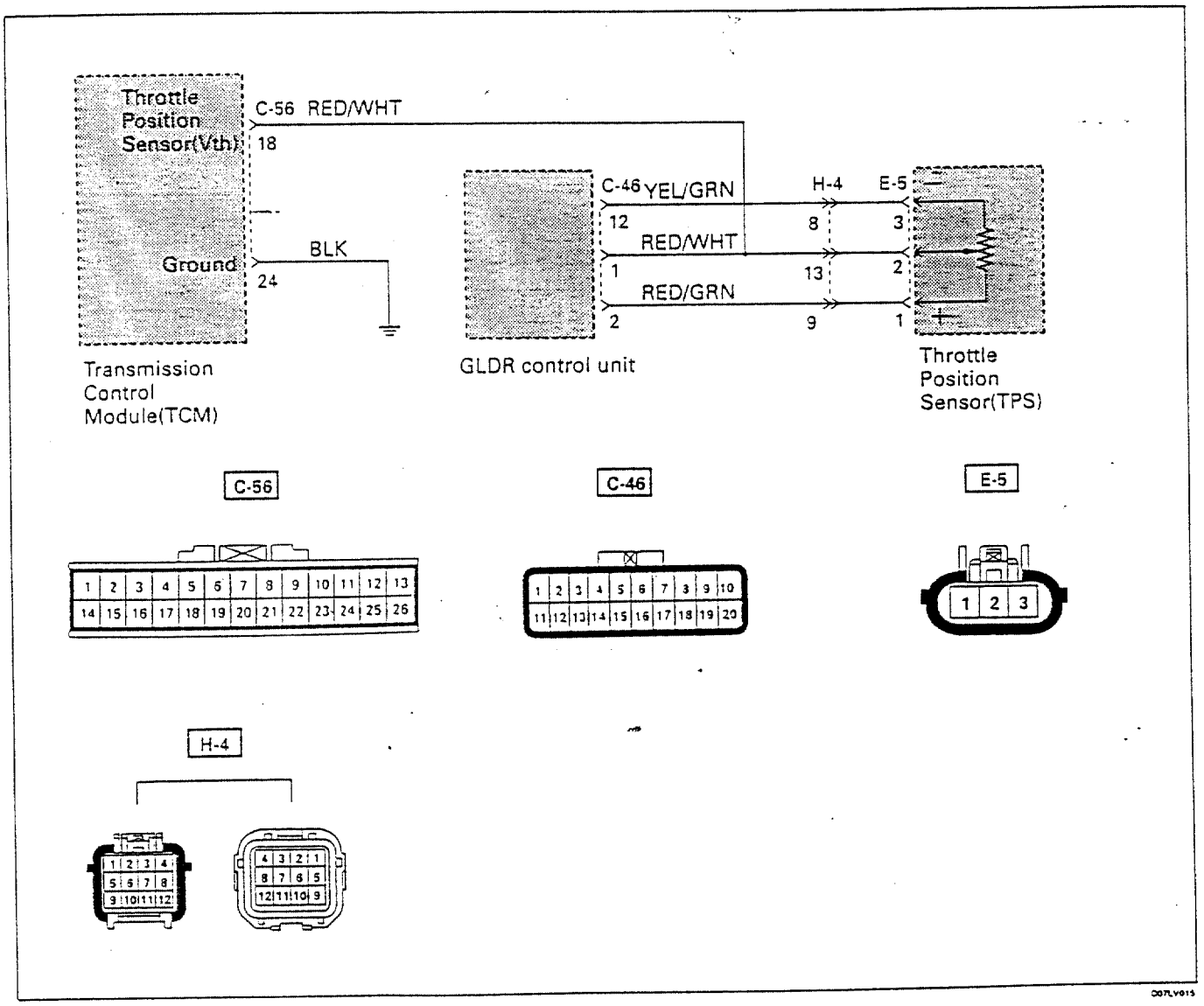
Circuit Description:
When the signal of the engine throttle position sensor is located on the injection pump is supplied to the transmission TCM, the TCM judges the opening condition of the throttle.
The shift point of the transmission is determined by this opening condition of the throttle.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

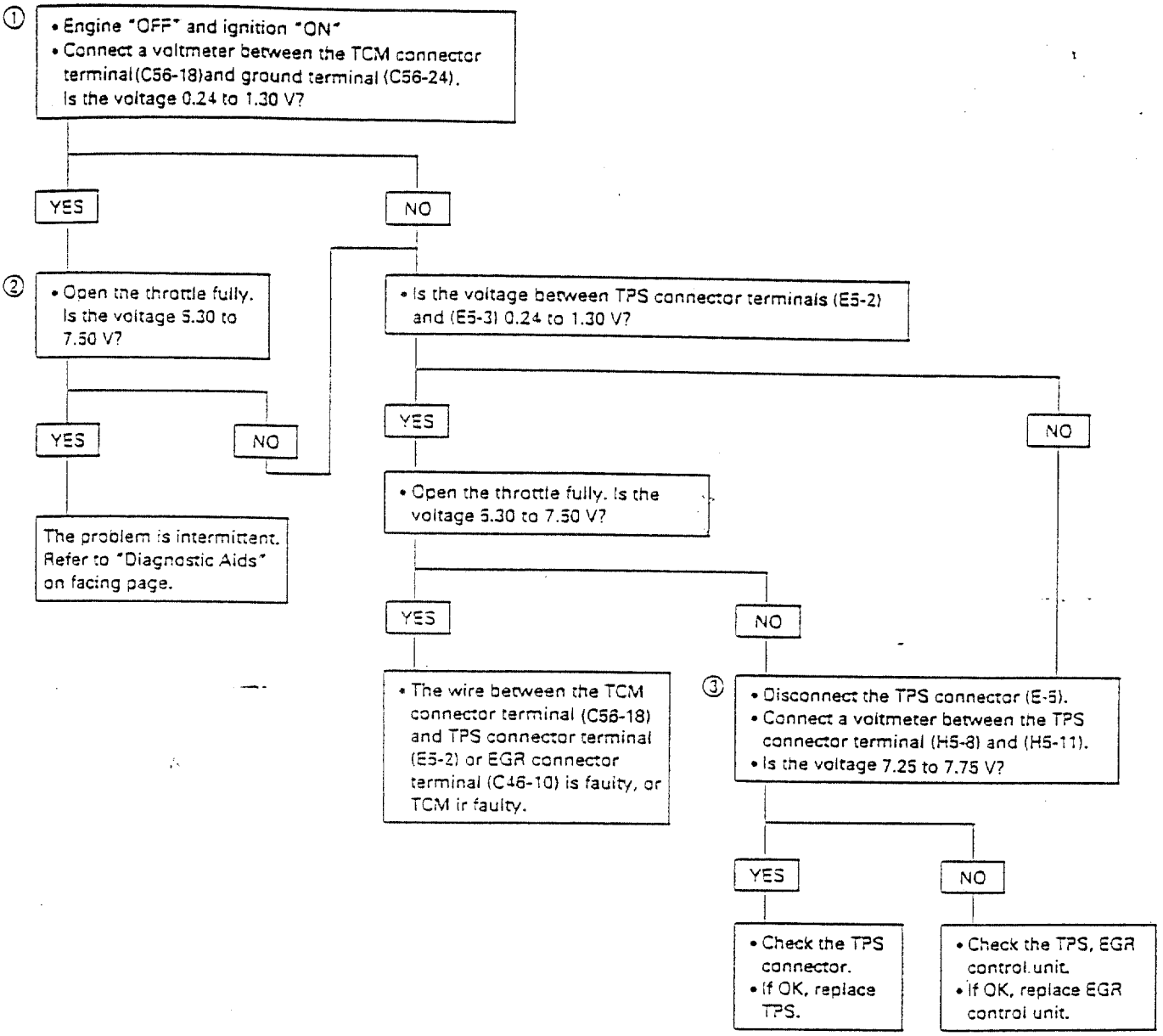
(1) Check that the throttle input voltage is 0.24 to 1.30 V.
(2) At this test, check that as the throttle opens, the voltage goes up and that the voltage reaches 5.30 to 7.50V at the full open status.
(3) Check the power supply voltage (7.0-8.0 V) of the throttle position sensor.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-65.



CODE 21
THROTTLE POSITION SENSOR (TPS)
(OPEN/SHORTED CIRCUIT)



CODE 24
VEHICLE SPEED SENSOR 1
(OPEN/SHORTED CIRCUIT)

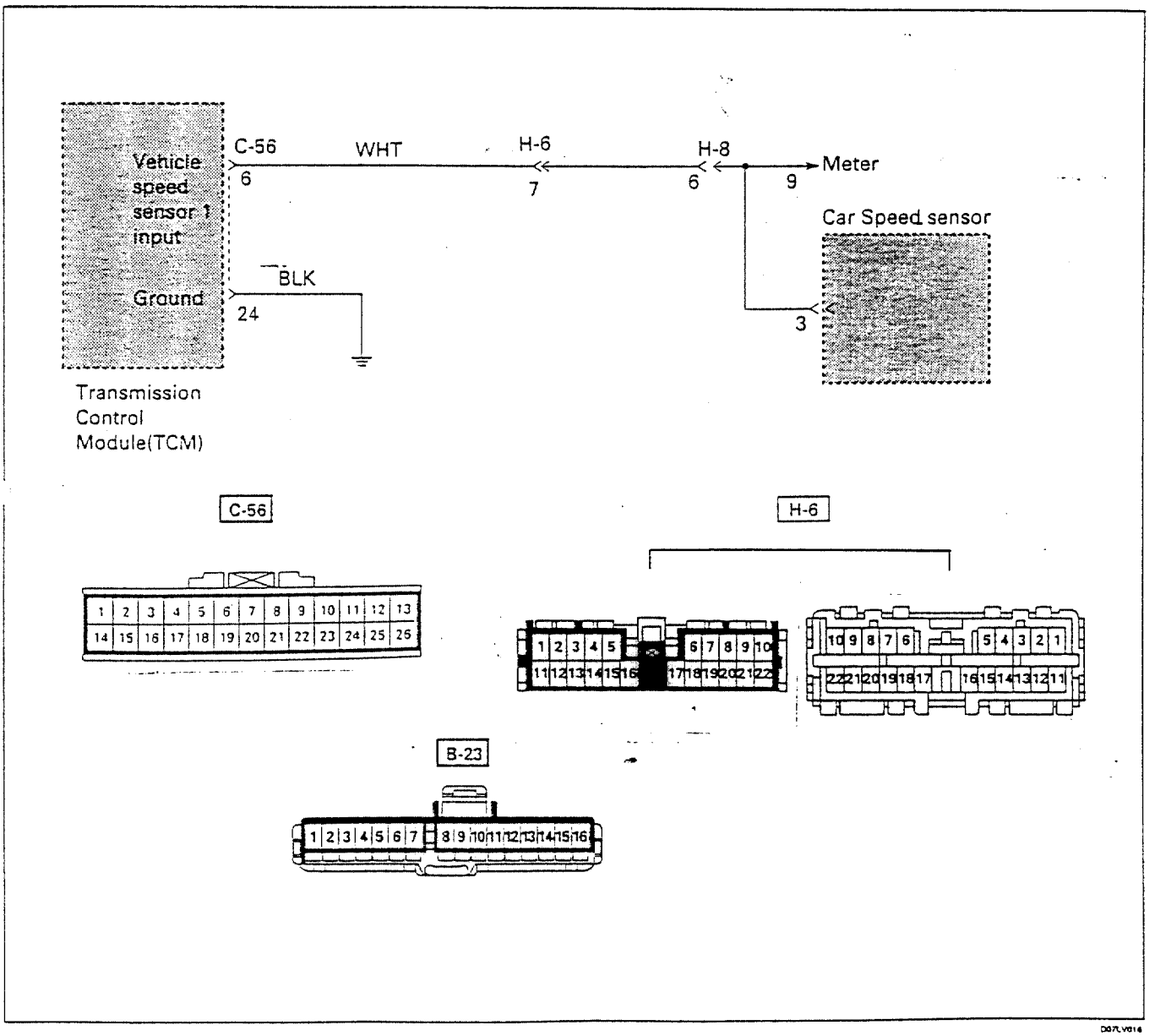
Circuit Description:
Speed information is provided by the vehicle speed sensor 1 to the meter.
In the meter, the pulses of the speed sensor are converted to speed signals (pulses), and these signals are output to the TCM. The TCM converts these pulse voltages to km/h signals.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

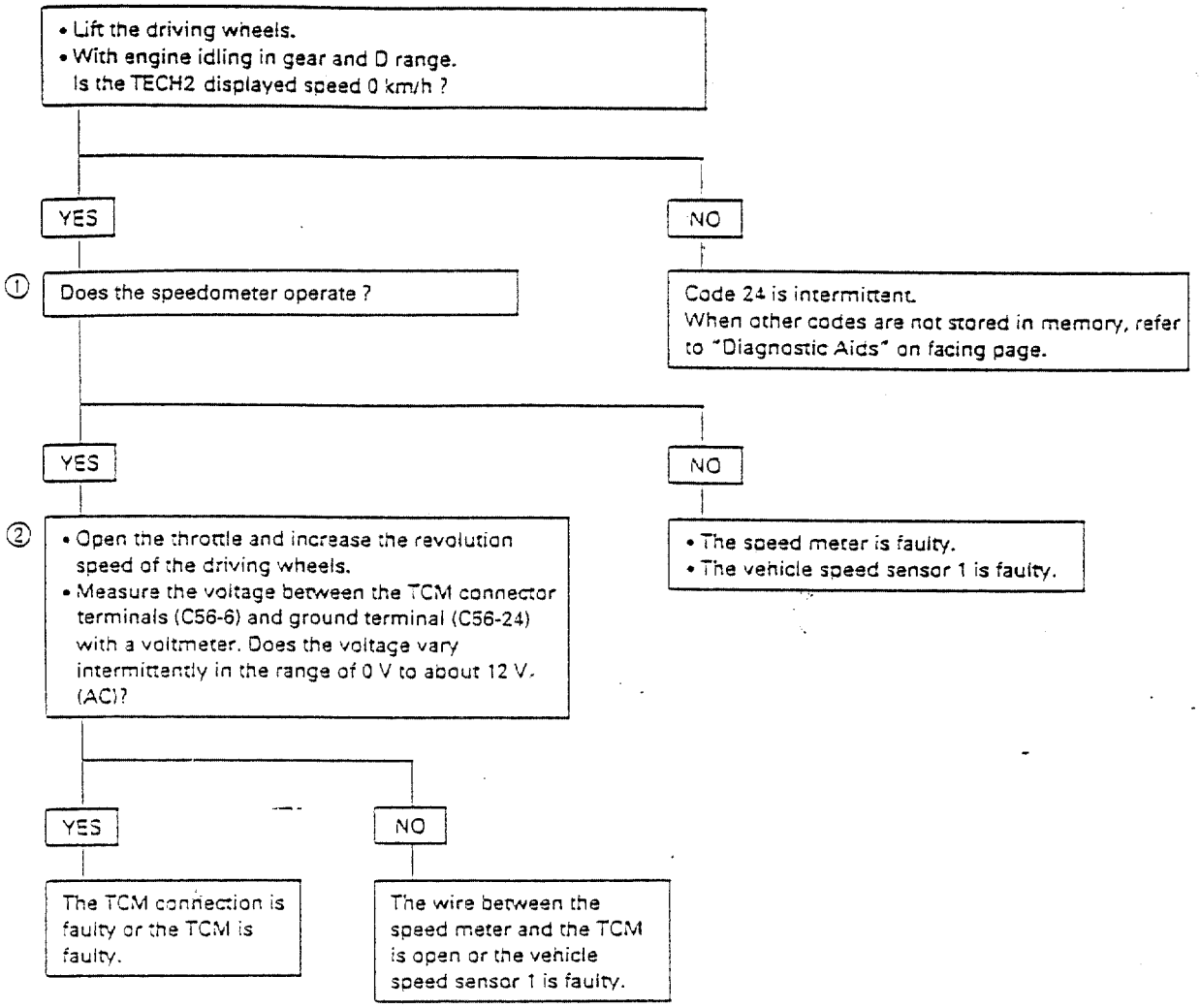
(1) The cause of code 24 setting is due to the operation fault of the speedometer.
(2) Speed signals are output from the meter. The sensor power supply is given from the TCM.

Diagnostic Aids:
An intermittent may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation. Inspect related harness connector for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal to wire connection and damaged harness.

TCM Voltage Check:
Refer to page 7A-65.



CODE 24
VEHICLE SPEED SENSOR 1
(OPEN/SHORTED CIRCUIT)



CODE 31
SHIFT SOLENOID S1
(OPEN/SHORTED CIRCUIT)

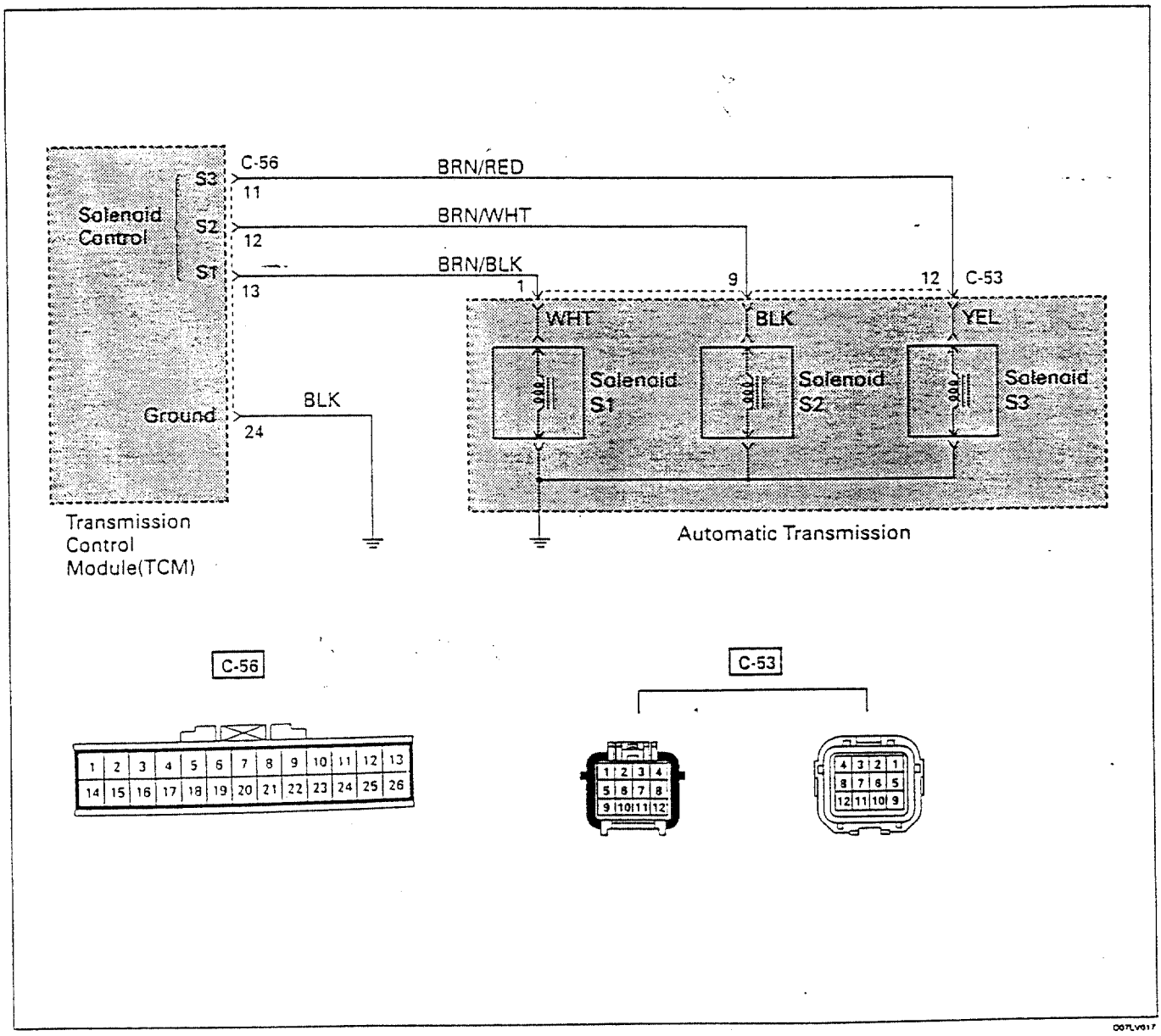
Circuit Description:
The shift solenoid S1 changes the hydraulic route with the signals from the TCM according to the vehicle speed and the throttle opening to control shifting. When the solenoid S1 or S2 fails, the hydraulic circuit is mechanically operated as a backup.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

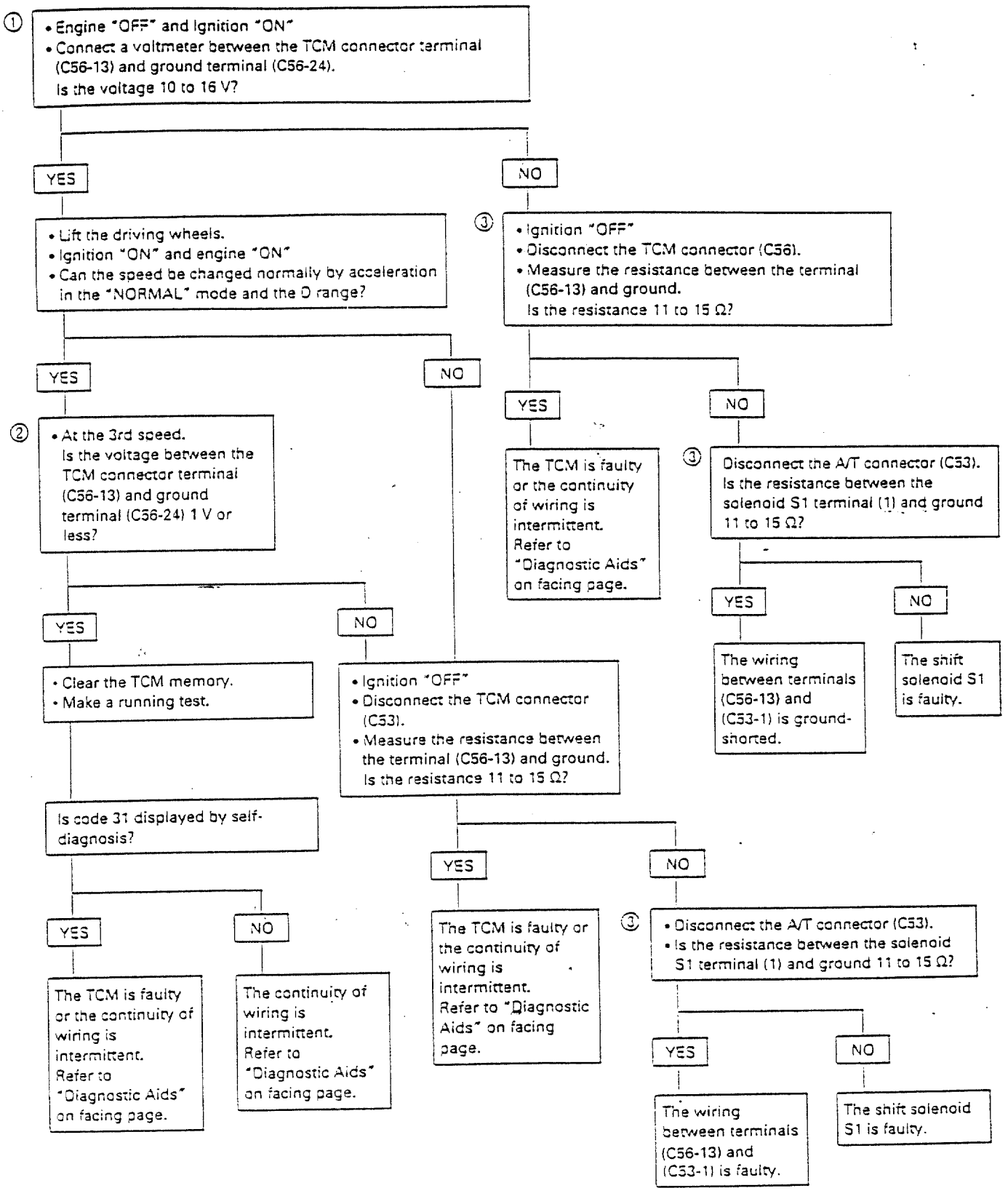
(1) With the key "ON", the voltage between the TCM terminals (C56-13) and (C56-24) is 10 to 16V.
(2) When the driving wheels revolve with the 3rd speed gear, the voltage is 1 V or less.
(3) The solenoid resistance is within the range of 11 to 15Ω.

Diagnostic Aids:
In case of faulty connection, open or shorted circuit to the TCM terminal (C56-13), code 31 is displayed. A intermittent failure may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

TCM Voltage Check:
Refer to page 7A-65.



CODE 31
SHIFT SOLENOID S1
(OPEN/SHORTED CIRCUIT)



CODE 32
SHIFT SOLENOID S2
(OPEN/SHORTED CIRCUIT)

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.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

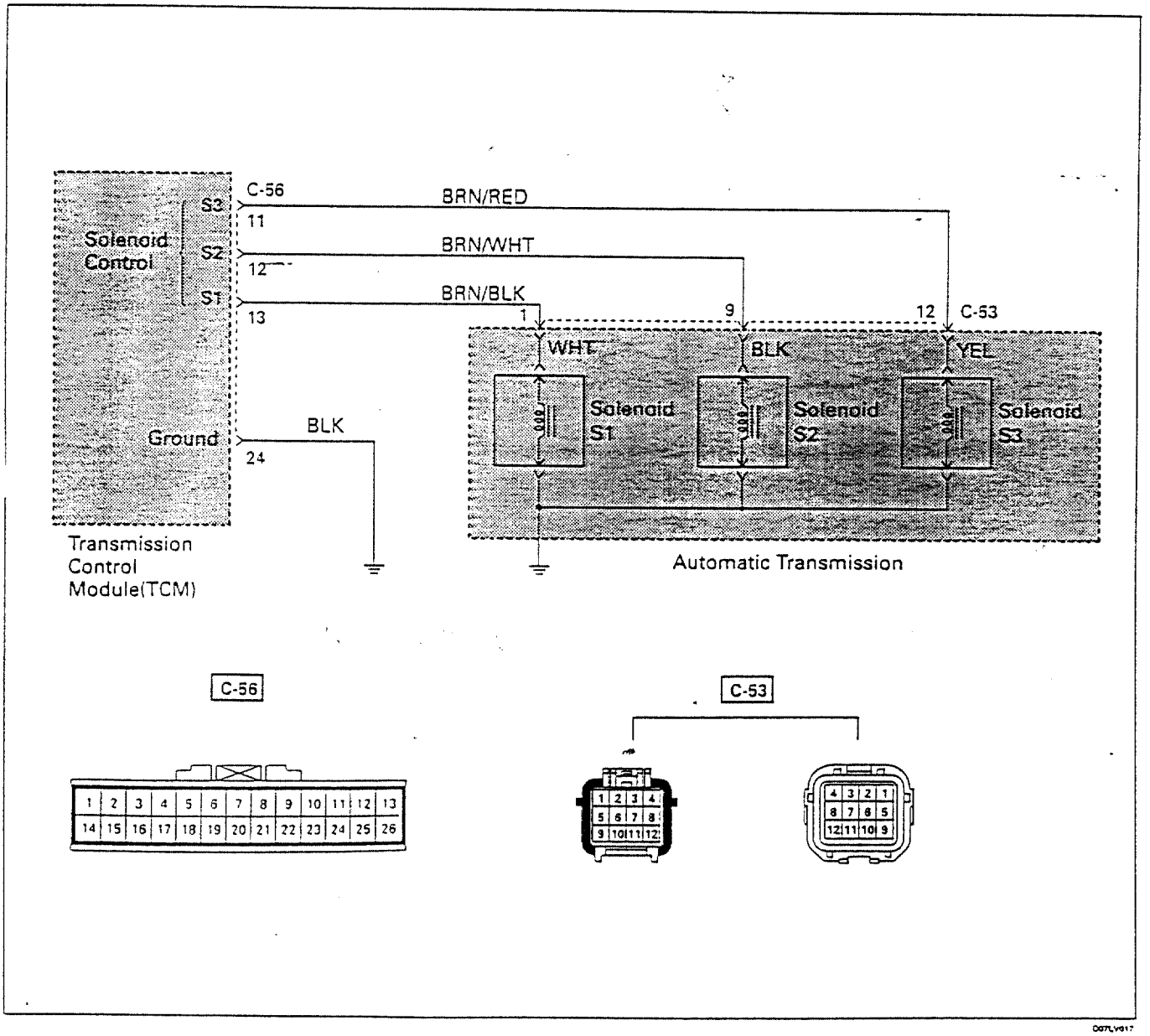
(1) With the key "ON", the voltage between the TCM terminals (C56-12) and (C56-24) is 1 V or less.

(2) When the driving wheels revolve with the 2nd speed gear, the voltage is 10 to 16 V.

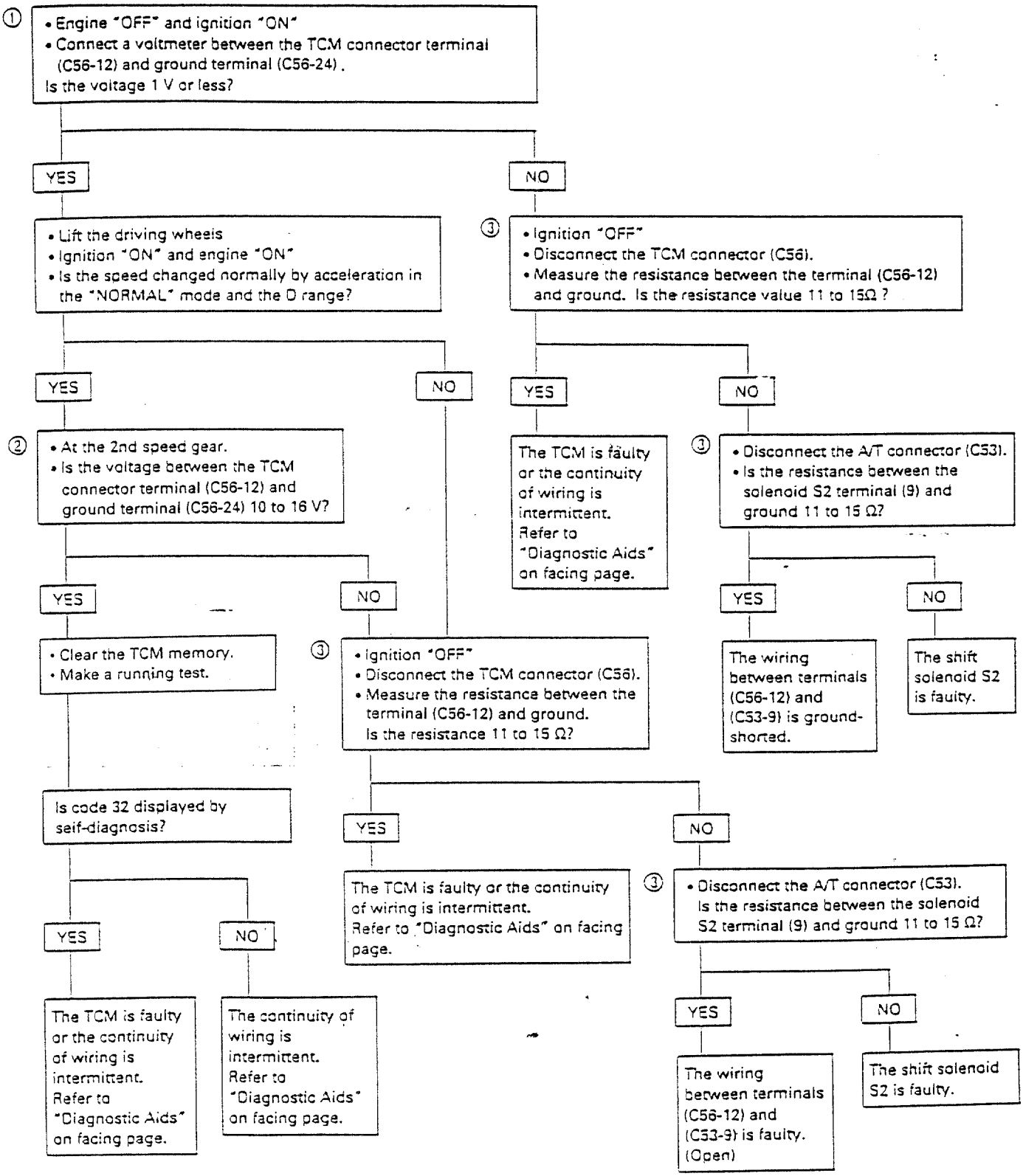
(3) The resistance of the solenoid is in the range of 11 to 15Ω.

Diagnostic Aids:
In case of faulty connection, open or shorted circuit to the TCM terminal (C56-12), code 32 is displayed. A intermittent failure may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

TCM Voltage Check:
Refer to page 7A-65.



CODE 32
SHIFT SOLENOID S2
(OPEN/SHORTED CIRCUIT)



CODE 33
LOCKUP SOLENOID S3
(OPEN/SHORTED CIRCUIT)

Circuit Description:
The lockup duty solenoid S3 of the torque converter clutch (TCC) controls the lockup clutch by a signal according to the lockup range judgement of the TCM when the vehicle runs.
This function can improve the fuel consumption to almost the same extent as the manual transmission.
The lockup solenoid S3 is put into B+ by the TCM, so that the solenoid is actuated with the result of lockup.

Test Description:
The following numbers correspond to circled numbers on the diagnostic chart.

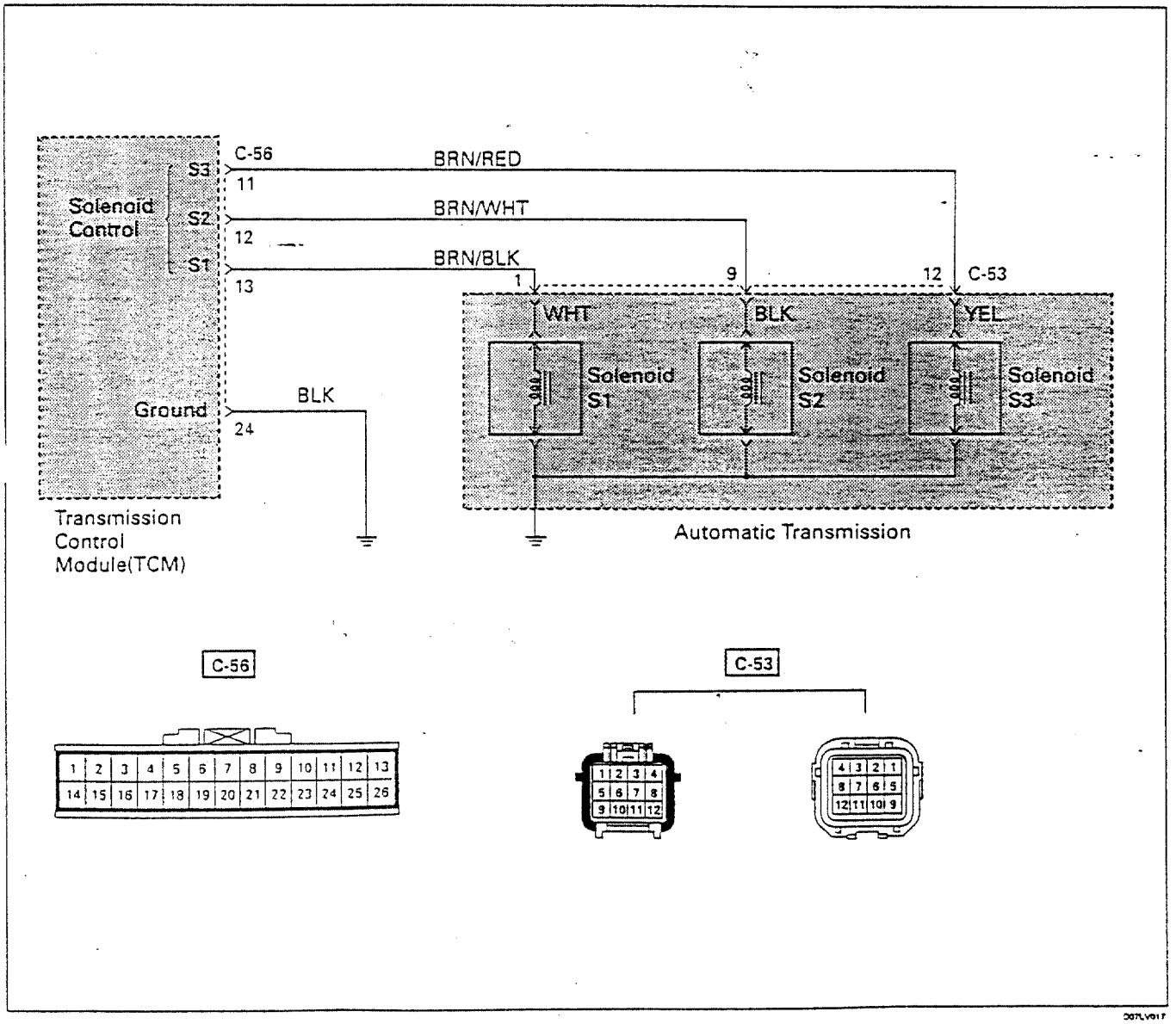
(1) When the key is ON, the voltage between the TCM connector terminals (C56-11) and (C56-24) is 1.0 V or less.

(2) When the gear is of the 2nd speed in the D range and the throttle opening is about 50% at a higher speed than about 40 km/h, the TCM supplies 10 to 16 V, so that the solenoid is actuated with the result of lockup.

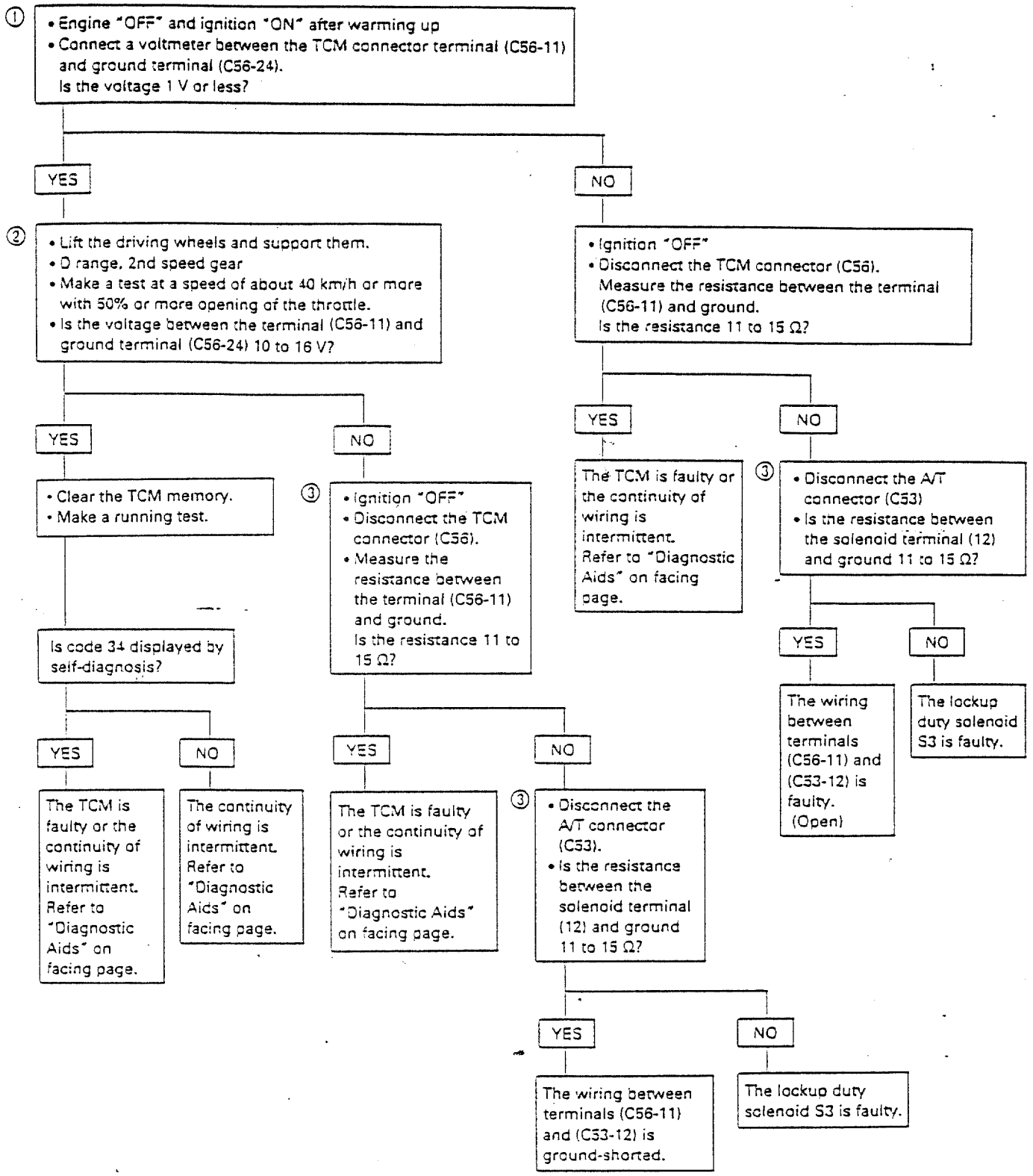
(3) The resistance range of the solenoid is 11 to 15Ω.

Diagnostic Aids:
In case of faulty connection, open or shorted circuit to the TCM terminal (C56-11), code 34 is displayed.
A intermittent failure may be caused by a poor connection, rubbed through wire insulation or a wire broken inside the insulation.

TCM Voltage Check:
Refer to page 7A-65.



CODE 33
LOCKUP SOLENOID S3
(OPEN/SHORTED CIRCUIT)



SYMPTOM DIAGNOSIS

Trouble 1. No Shifting

Warm up engine

Read diagnostic trouble code → Trouble codes → Proceed to diagnostic trouble code

No trouble code

- Connect a voltmeter to TCM connector. terminals 18 (Vth) and 24 (GND). Does the voltage vary with changes in throttle opening?

	Idle	WOT
Voltage (V)	0.24 – 1.30	5.30 – 7.50

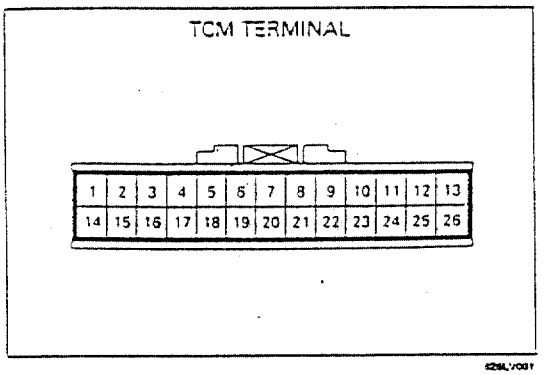
YES →

- Disconnect the TCM connector (C-56).
- Make a road test (manual shifting test).
- Check the shift and gear positions correspond with follows?
  D range. . . . . overdrive (O/D SW ⊓)
  2 range. . . . . 3rd gear
  L range. . . . . 3rd gear

YES → Continued on next page

NO → Throttle position signal faulty

NO → Transmission faulty



TCM voltage check:
Refer to page 7A-65.

Continued from previous page

- Connect TCM connector (B-56) to TCM.
- Make a road test in the D range.

Is the voltage from TCM to each solenoid as follows?

Terminal	Gear / Solenoid	1st	2nd	2nd L-up	3rd	3rd L-up	O/D	O/D L-up
12 (S1) 19 (GND)	S1 Voltage (V)	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0	OFF 0	OFF 0
11 (S2) 19 (GND)	S2 Voltage (V)	OFF 0	ON 8–16	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0
10 (S3) 19 (GND)	S3 Voltage (V)	OFF 0	OFF 0	ON 8–16	OFF 0	ON 8–16	OFF 0	ON 8–16

Solenoid S3 voltage is 0 V. (Not lock-up) → Proceed to trouble 4

All gear OK → • Transmission faulty • Solenoid faulty

Up-shift until 3rd gear → Proceed to trouble 3

1st gear only OK

- Are there 8 – 16 V between TCM connector terminal B56-1(L) and B56-24 (GND) in D range?

YES

- Neutral start switch circuit faulty
- Neutral start switch faulty

NO

- Does the signal from vehicle speed sensor 1 and 2 input to TCM?

YES

TCM faulty

NO

- Vehicle speed sensor 1 and 2 faulty
- Wiring between vehicle speed sensor and TCM is open or shorted.

Up-shift until 2nd gear

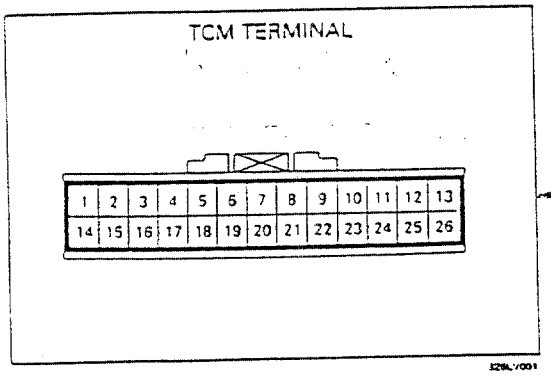
- Are there 8 – 16 V between TCM connector terminal B56-21(2) and B56-19 (GND) in D range?

YES

- Neutral start switch circuit faulty
- Neutral start switch faulty

NO

TCM faulty



TCM voltage check: Refer to page 7A-55.

Trouble 2. Shift point too high or too low

Warm up engine

Read diagnostic trouble code → Trouble codes → Proceed to diagnostic trouble code

No trouble code

- Connect a voltmeter to TCM connector terminal C56-18 (Vth) and C56-24 (GND).
  Does the voltage vary with changes in throttle opening?

	Idle	WOT
Voltage (V)	0.24 – 1.30	5.30 – 7.50

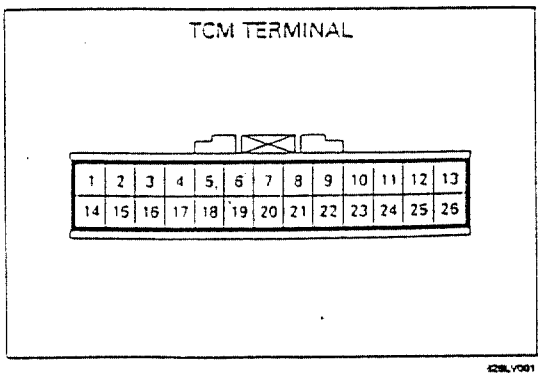
YES →

- Check the voltage between TCM connector terminal C56-16 (P) and C56-24 (GND).
  Is the voltage as follows?
  9 – 16 V : NORMAL mode
  0 V : POWER mode

YES →
- TCM faulty
- Transmission faulty

NO → Pattern select switch system faulty

NO → Throttle position signal faulty



TCM voltage check:
Refer to page 7A-65.

Trouble 3. No up-shift to overdrive

Warm up engine

• Road test while shifting manually with TCM connector pulled out.
Is there overdrive up-shift in D range?

YES

• Connect TCM connector C-56 to TCM.
• Make a road test in D range.
Is the voltage from TCM to each solenoid as follows?

Terminal	Gear / Solenoid	1st	2nd	2nd Lock-up	3rd	3rd Lock-up	O/D	O/D Lock-up
12 (S1) 19 (GND)	S1 Voltage (V)	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0	OFF 0	OFF 0
11 (S2) 19 (GND)	S2 Voltage (V)	OFF 0	ON 8–16	ON 8–16	ON 8–16	ON 8–16	OFF 0	OFF 0
10 (S3) 19 (GND)	S3 Voltage (V)	OFF 0	OFF 0	ON 8–16	OFF 0	ON 8–16	OFF 0	ON 8–16

NO → Transmission faulty

All gear OK → • Transmission faulty • Solenoid faulty

Up-shift until 2nd gear → • Are there 8 – 16 V between TCM connector terminal C56-2 (2) and C56-24 (GND) in D range?

YES- → • Neutral start switch circuit faulty • Neutral start switch faulty

NO → TCM faulty

Up-shift until 3rd gear → Continued on next page

1st gear only OK → • Are there 8 – 16 V between TCM connector terminal C56-1 (L) and C56-24 (GND) in D range?

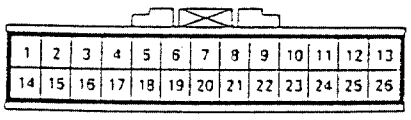
YES → • Neutral start switch circuit faulty • Neutral start switch faulty

NO → • Does the signal from vehicle speed sensor 1 and 2 input to TCM?

YES → TCM faulty

NO → • Vehicle speed sensor 1 and 2 faulty • Wiring between vehicle speed sensor and TCM is open or shorted.

TCM TERMINAL



TCM voltage check: Refer to page 7A-65.

Continued from previous page

- Check the voltage between TCM connector terminal C56-15 (O/D2) and C56-24 (GND).
  Is the voltage as follow ?
  10 – 16V : O/D switch (⊓ O/D ON)
  0 – 2V : O/D switch (⊓ O/D OFF)

YES

Is the voltage between the TCM connector terminal C56-9 (OD1) and ground terminal (24) 10 to 16V?

YES

The TCM is faulty.

NO

Disconnect the grow control unit (C46).
Is the voltage between the TCM connector terminal C56-9 (OD1) and ground terminal (24) 10 to 16V?

YES

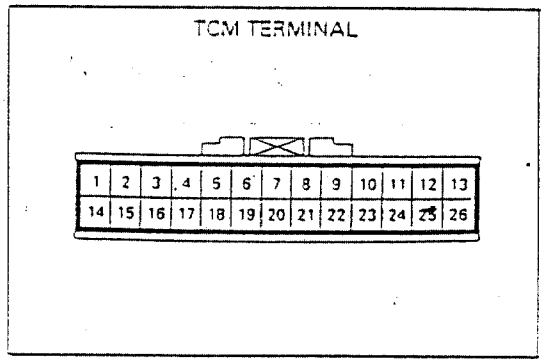
The TCM is faulty if the water temperature of engine is more than 40C.

NO

The wiring between TCM connector terminal C56-9 (OD1) and ground terminal(C-46) of grow control unit is ground-shorted or TCM is faulty.

NO

- O/D switch circuit faulty
- O/D switch faulty



TCM voltage check:
Refer to page 7A-65.

Trouble 4. No lock-up

Warm up engine

Read diagnostic trouble code → Trouble codes → Proceed to diagnostic trouble code

No trouble code

- Make a road test.
- Connect a voltmeter to TCM connector terminals C56-11 (S3) and C56-24 (GND). Are there 8 – 16 V in lock-up range ?

YES

- Solenoid S3 faulty
- Transmission faulty

NO

- Check the voltage between TCM connector terminal C56-14 (BK) and C56-24 (GND). Is the voltage as follows?
  0 V : Release brake
  8 – 16 V : Depress brake

YES

- Connect a voltmeter to TCM connector terminal C56-18 (Vth) and C56-24 (GND). Does the voltage vary with changes in throttle opening?

	Idle	WOT
Voltage (V)	0.24 – 1.30	6.30 – 7.50

YES

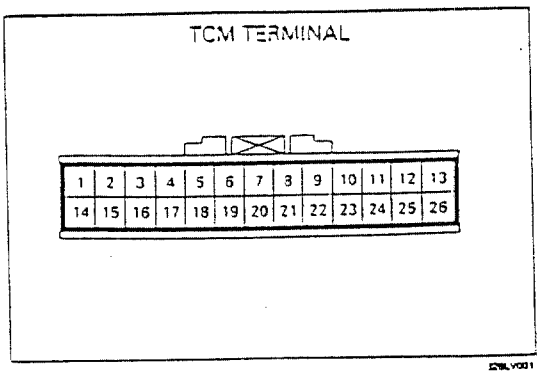
TCM faulty

NO

Throttle position signal faulty

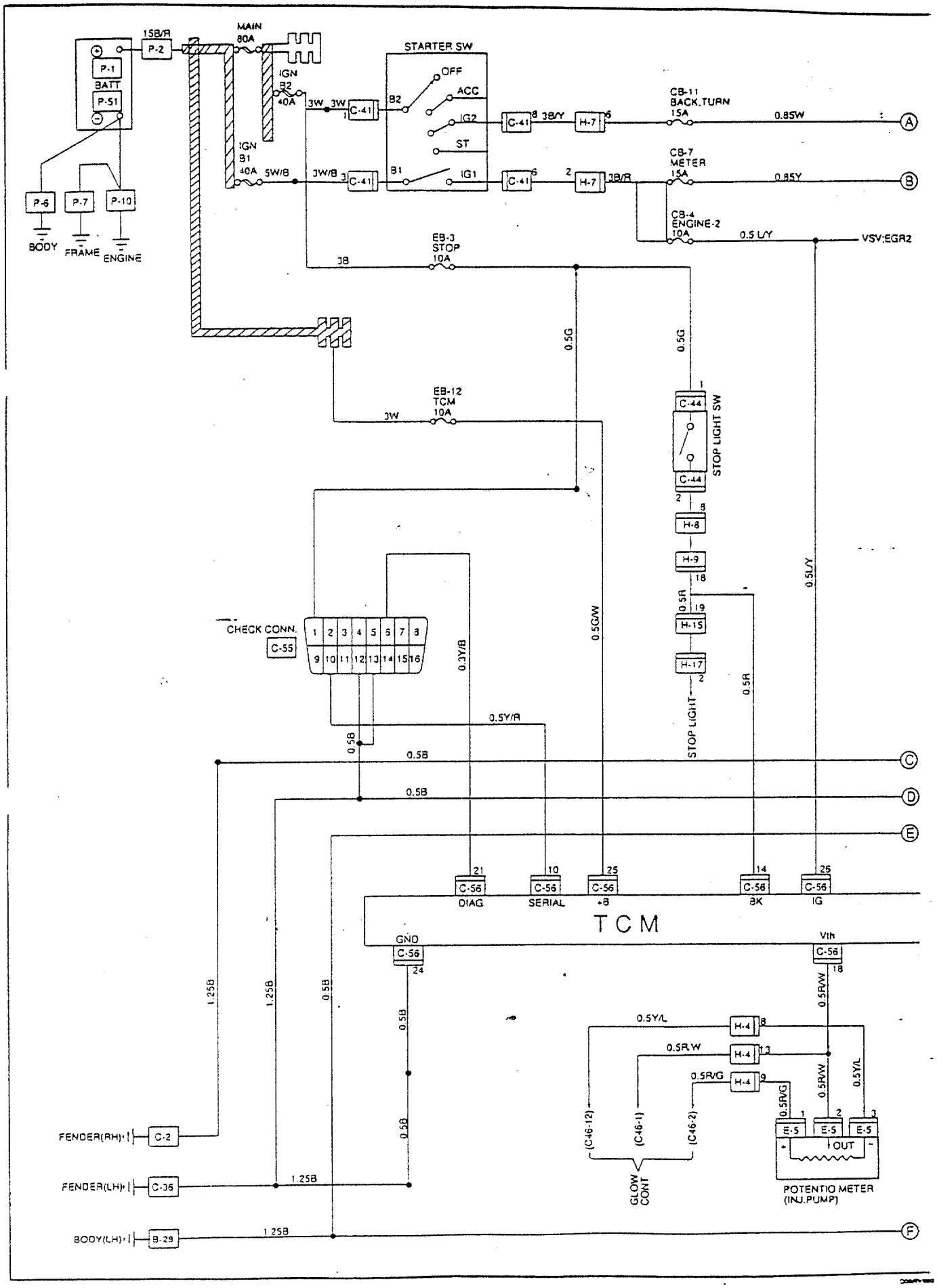
NO

Brake signal faulty

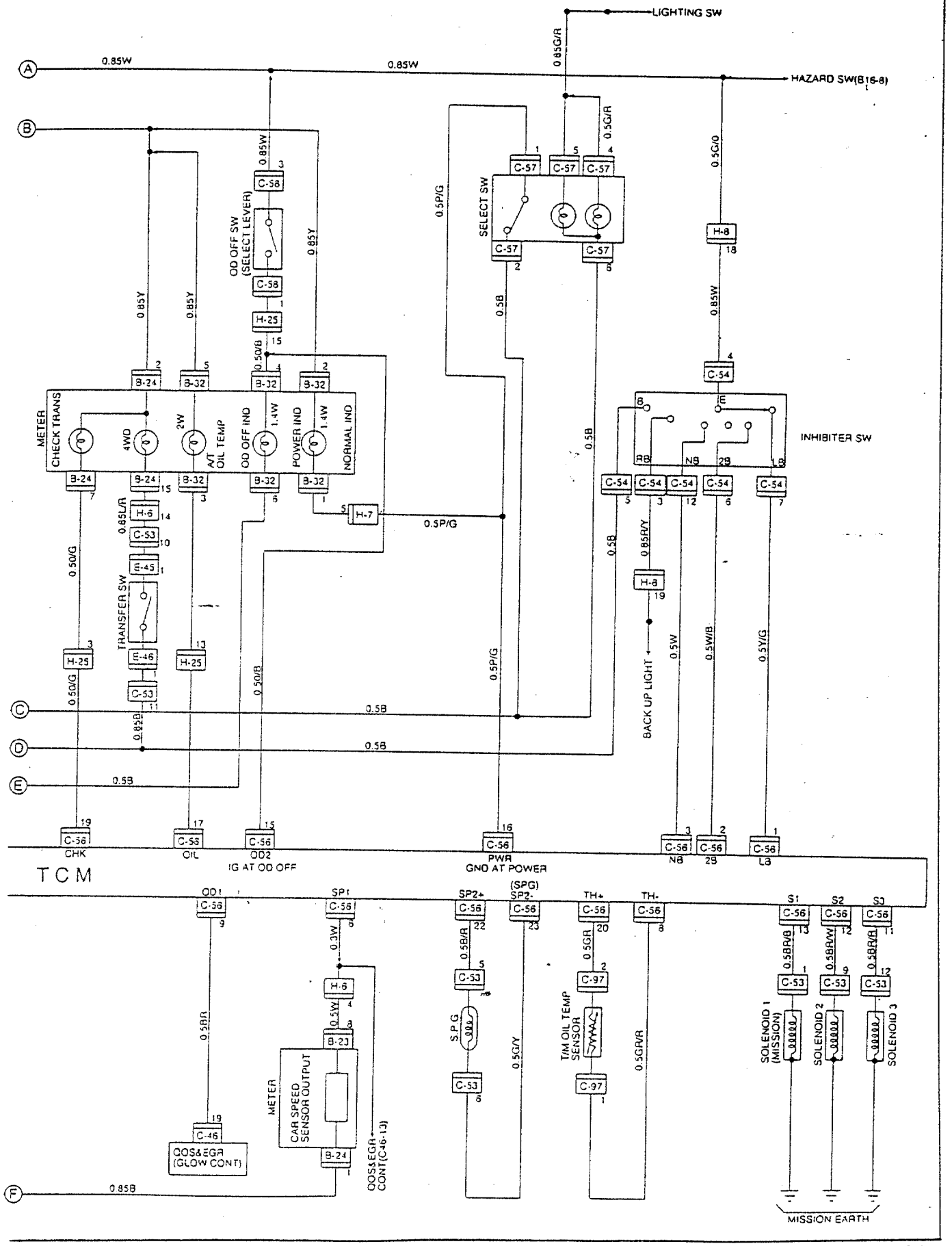


TCM voltage check:
Refer to page 7A-65.

WIRING DIAGRAM



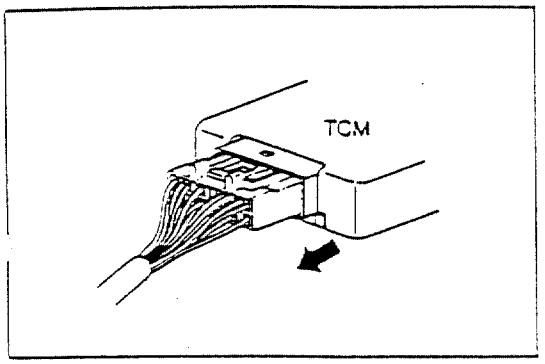
WIRING DIAGRAM



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
   1) With the engine OFF, disconnect the TCM connector.

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

Transmission	
"R" range	"P" range
Reverse	Pawl Lock

2. INSPECT MANUAL DRIVING OPERATION

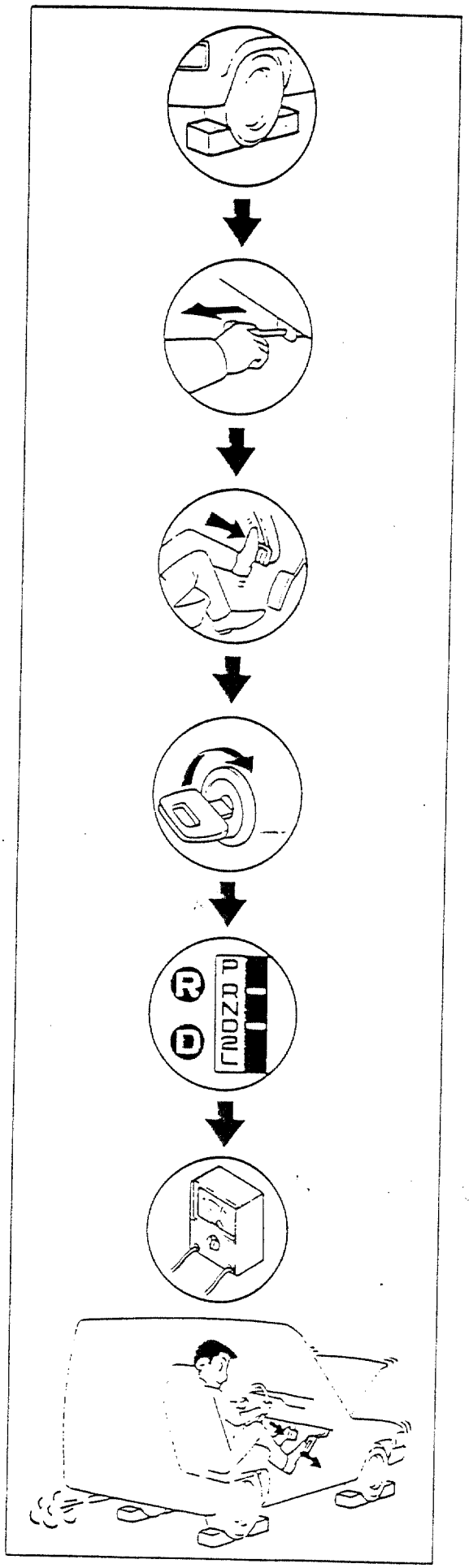
   Check that the shift and gear positions correspond with the table below.

   If the "L", "2" and "D" range gear positions are difficult to distinguish, do not perform the following road test.

   While driving, shift through the "L", "2" and "D" ranges. Check that the gear change corresponds to the gear position.

   If any abnormality is found in the above test, do not perform the stall, time lag or gear change tests.

3. CONNECT TCM CONNECTOR
   1) With the engine off, connect the TCM connector.



STALL TEST

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.**

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) 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	2400 ± 150 rpm

7) 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.

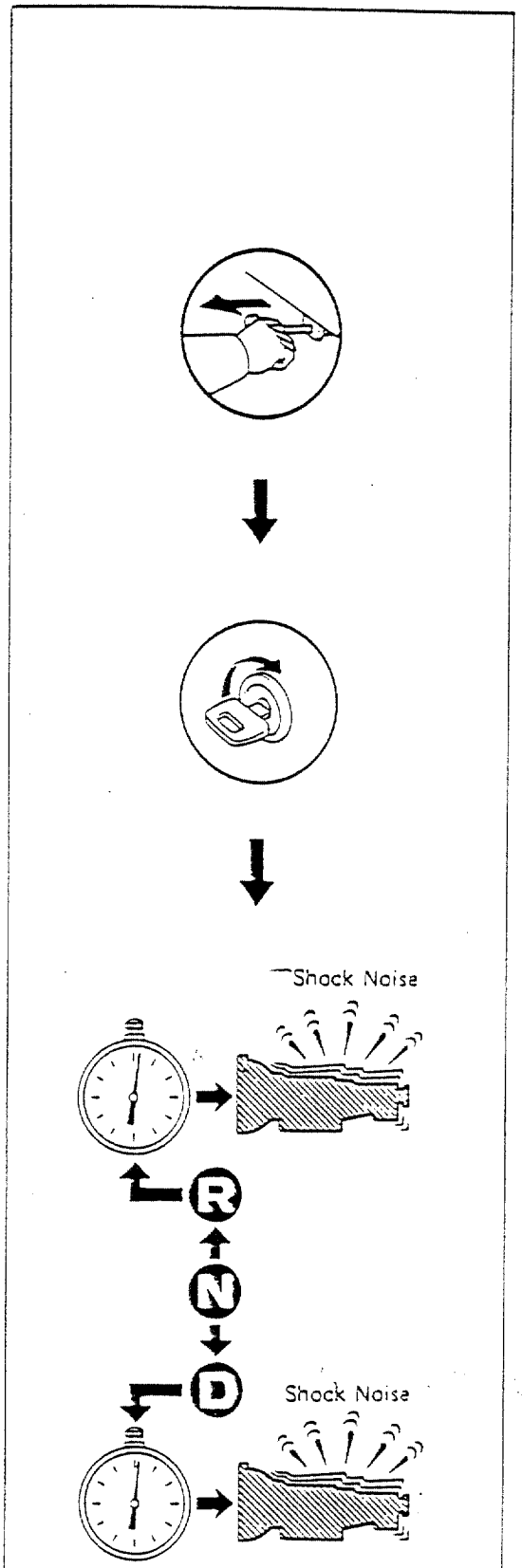
Note:

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

2) If the stall speed is "D" range is higher than specified:
   - Line pressure too low
   - Forward clutch slipping
   - No. 2 one-way clutch not operating properly
   - OD 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
   - OD one-way clutch not operating properly

4) If the stall speed in the "R" and "D" ranges are higher than specified:
   - Line pressure too low
   - Improper fluid level
   - OD one-way clutch not operating properly



TIME LAG TEST

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 OD clutch, front clutch, rear clutch and No. 3 brake.

Note:

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

MEASURE LAG TIME

1) Fully apply the parking brake.
2) Start the engine.
   Check idling speed (A/C OFF)

"N" range	775 - 825 rpm

3) Shift the shift lever from "N" to "D" range. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Lag time	Less than 0.7 seconds

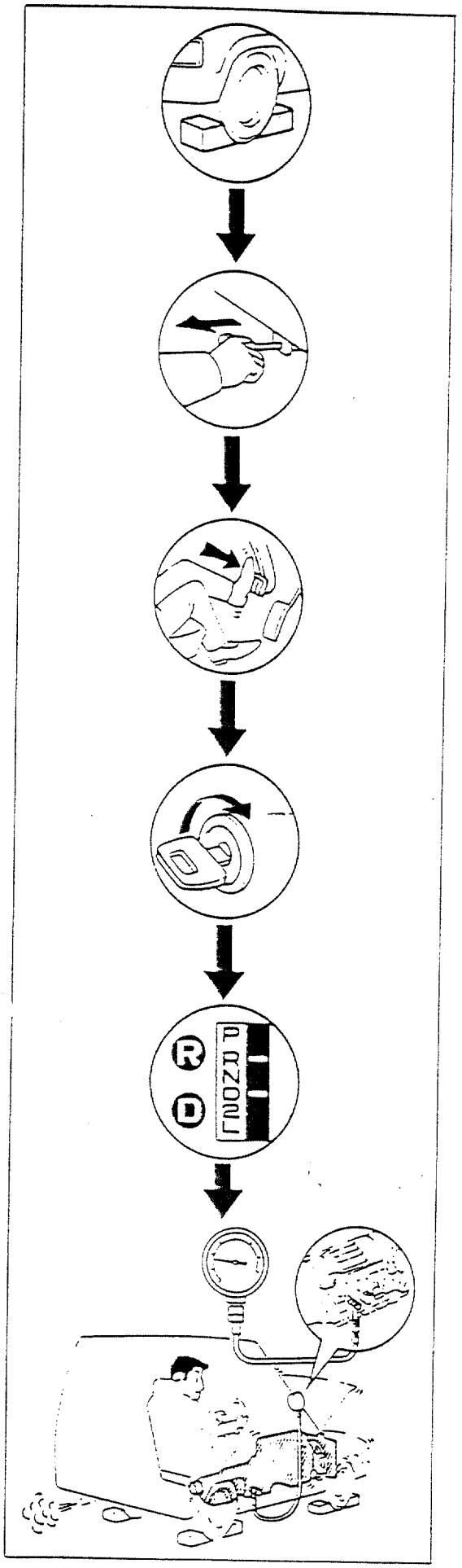
4) In same manner, measure the time lag for "N" → "R".

Lag time	Less than 1.2 seconds

EVALUATION

1) If "N" → "D" time lag is longer than specified:
   - Line pressure too low
   - Forward clutch worn
   - OD one-way clutch not operating properly

2) If "N" → "R" time lag is longer than specified:
   - Line pressure too low
   - Direct clutch worn
   - No. 3 brake worn
   - OD one-way clutch not operating properly



HYDRAULIC TEST

PREPARATION

1) Warm up the transmission fluid.
2) Remove the transmission case test plug and mount the hydraulic pressure gauge.
   Oil pressure gauge: 5-8840-0093-0

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

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.

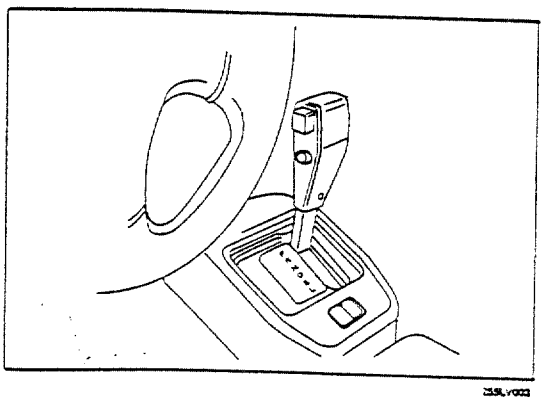
Engine speed	Line pressure Kpa (Kgf/cm²/psi)	
	"D" range	"R" range
Idling	421 – 480 (4.3 – 4.9/ 61 – 70)	510 – 608 (5.2 – 6.2/ 74 – 88)
Stall	1117 – 1362 (11.4 – 13.9/ 162 – 198)	1372 – 1715 (14 – 17.5/ 199 – 249)

5) If the measured pressures are not up to specified values, recheck the throttle cable adjustment and preform a retest.

EVALUATION

1) If the measured values at all ranges are higher than specified.
   - Throttle cable out of adjustment
   - Throttle valve defective
   - Regulator valve defective
2) If the measured values at all ranges are lower than specified:
   - Throttle cable out of adjustment
   - Throttle valve defective
   - Regulator valve defective
   - Oil pump defective
   - OD clutch defective

3) If pressure is low in "D" range only:
   - "D" range circuit fluid leakage
   - Forward clutch defective
4) If pressure is low in "R" range only:
   - "R" range circuit fluid leakage
   - Direct clutch defective
   - No. 3 brake defective



ROAD TEST

Note:
Perform the test at normal operating 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.

Note:
There is no OD up-shift or lock-up when the coolant temp, is below 70°C (158°F) or if there is a 10 km/h (6 mph) difference between the set cruise control speed and real speed.

EVALUATION

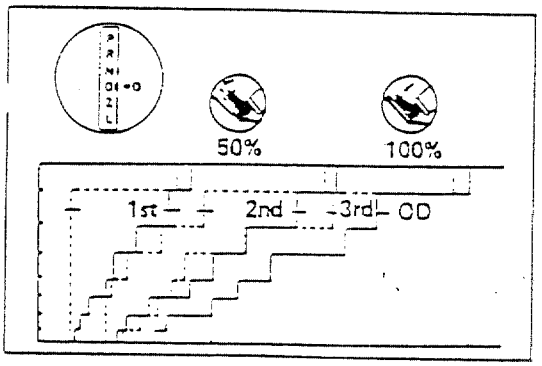
(1) If there is no 1 → 2 up-shift:
- No. 2 solenoid is stuck
- 1-2 shift valve is stuck

(2) If there is no 2 → 3 up-shift:
- No. 1 solenoid is stuck
- 2-3 shift valve is stuck

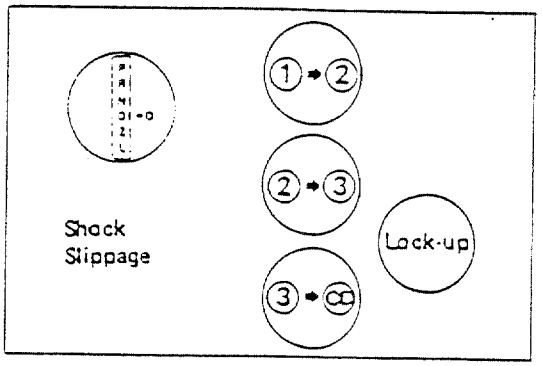
(3) If there is no 3 → OD up-shift (throttle valve opening 1/2):
- 3-OD shift valve is stuck

(4) If the shift point is defective:
- Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-OD shift valve etc., are defective.

(5) If the lock-up is defective:
- No 3 solenoid is stuck
- Lock-up relay valve is stuck

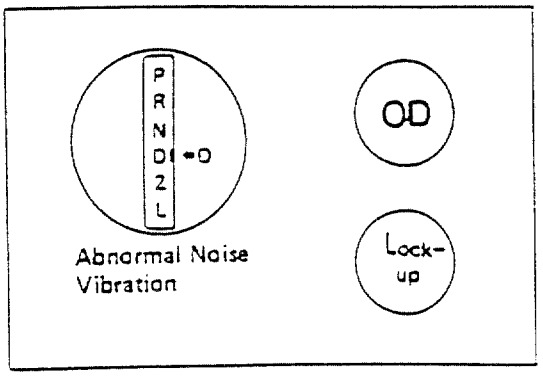


2) In the same manner, check the shock and slip at the 1 → 2, 2 → 3 and 3 → OD up-shifts.



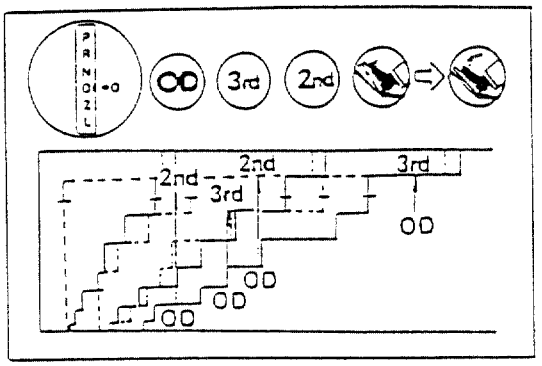
EVALUATION

If the shock is excessive:
- Line pressure is too high
- Accumulator is defective
- Check ball is defective



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.

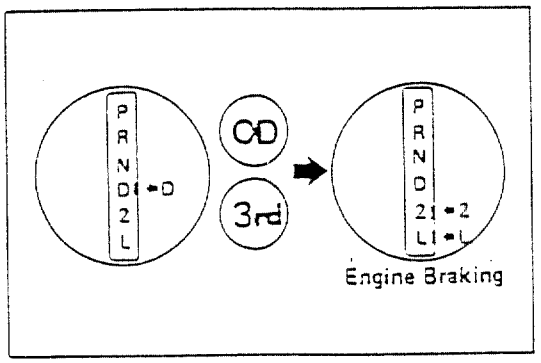


4) While running in "D" range, 2nd, 3rd gears and OD, check to see that the possible kick-down vehicle speed limits for 2 → 1, 3 → 1, 3 → 2, OD → 3 and OD → 2 kick-downs conform to those indicated on the automatic shift diagram.

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.

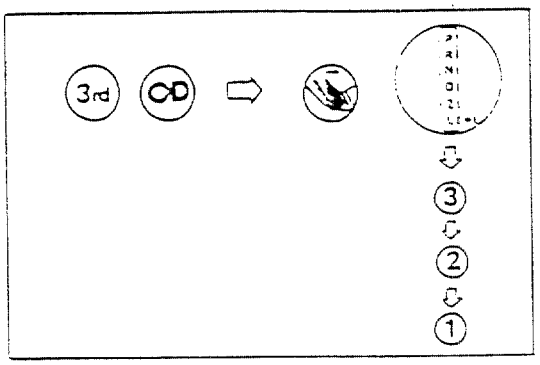
7) Also check to see that downshift is made from 3→ 2 or from O.D. to 3 and then to 2 immediately and that 2 → 1 downshift point is within the limits shown in the diagram when tested by releasing the accelerator pedal and shifting into position of "L" while driving in the third gear or in overdrive.



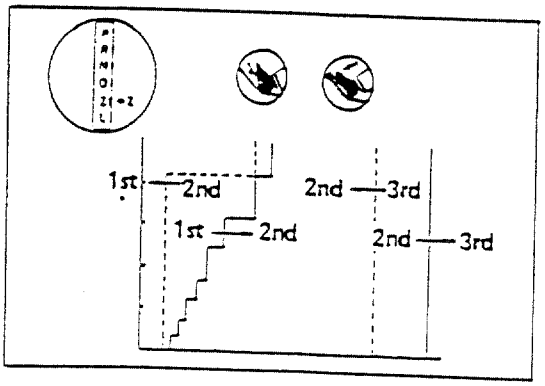
EVALUATION

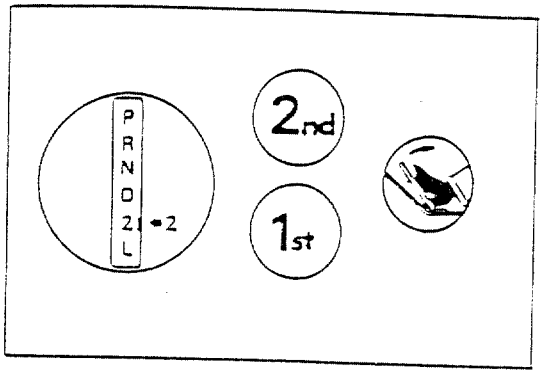
(1) If there is no engine braking effect in the "2" range:
- Second coast (No. 1) brake is defective.

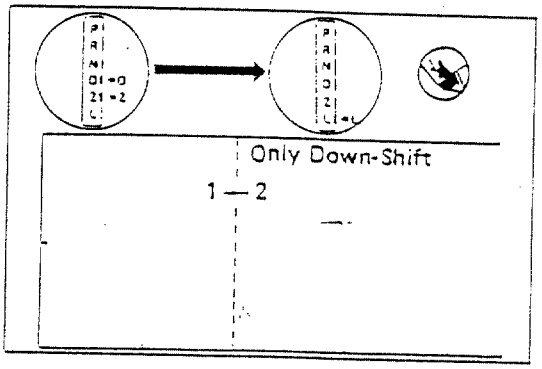
(2) If there is no engine braking effect in the "L" range:
- First and reverse (No. 3) brake is defective
- Second coast (No. 1) brake is defective

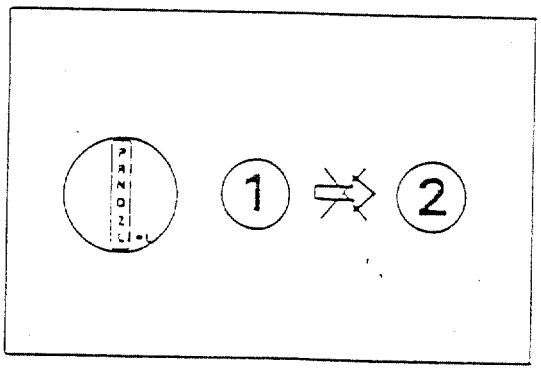


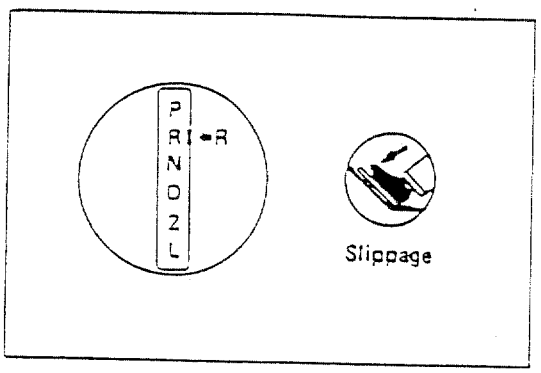
(3) Also check to see that downshift is made from 3→ 2 or from O.D. to 3 and then to 2 immediately and that 2 → 1 downshift point is within the limits shown in the diagram when tested by releasing the accelerator pedal and shifting into "L" position while driving in the third gear or in overdrive.











"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 4x4) and check on the following points.

1) At each of the above throttle openings, check to see that the 1 → 2 up-shift 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.

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 down-shift and abnormal noise at acceleration and deceleration, and for shock at upshift and down-shift.

"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 down-shift occurs at the specified point shown on the automatic shift diagram.
2) While running in the "L" range, check to see that there is no up-shift 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.

"R" RANGE TEST

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

"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.

SHIFT POINT CHART AND LOCK-UP POINT CHART

SHIFT POINT CHART

(REAR AXLE RATIO: 4.300)

"NORMAL" mode

Up shift

Km/h

Range	Throttle Opening	1 → 2	2 → 3	3 → 4
D	Fully opened	28 – 34	69 – 75	111 – 117
	Half throttle	10 – 16	31 – 37	43 – 49
2	Fully opened	28 – 34	81 – 87	———
	Half throttle	10 – 16	8 – 87	———

Down shift

Km/h

Range	Throttle Opening	1 ← 2	2 ← 3	3 ← 4
D	Fully opened	20 – 26	63 – 69	107 – 113
	Half throttle	7 – 13	23 – 29	35 – 41
	Fully closed	7 – 13	15 – 21	31 – 37
2	Fully opened	20 – 26	79 – 85	———
	Half throttle	7 – 13	79 – 85	———
	Fully closed	7 – 13	79 – 85	———

"POWER" mode

Up shift

Km/h

Range	Throttle Opening	1 → 2	2 → 3	3 → 4
D	Fully opened	28 – 34	69 – 75	111 – 117
	Half throttle	13 – 19	40 – 46	53 – 59
2	Fully opened	28 – 34	81 – 87	———
	Half throttle	10 – 16	81 – 87	———

Down shift

Km/h

Range	Throttle Opening	1 ← 2	2 ← 3	3 ← 4
D	Fully opened	20 – 26	63 – 69	107 – 113
	Half throttle	7 – 13	29 – 35	44 – 50
	Fully closed	7 – 13	15 – 21	31 – 37
2	Fully opened	20 – 26	79 – 85	———
	Half throttle	7 – 13	79 – 85	———
	Fully closed	7 – 13	79 – 85	———

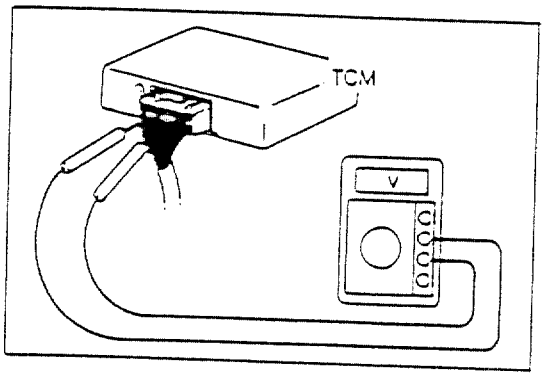
LOCK-UP POINT CHART
(REAR AXLE RATIO: 4.300)

Km/h

Range	A/T Mode	Throttle Opening : Half throttle (40 – 50%)					
		Lock-up ON			Lock-up OFF		
		2nd	3rd	4th	2nd	3rd	4th
D	NORMAL & POWER	32 – 38	52 – 60 (NORMAL: 52 – 58 POWER: 54 – 60)	57 – 73 (NORMAL: 57 – 63 POWER: 67 – 73)	26 – 32	46 – 52	55 – 61

TCM VOLTAGE CHECK

TCM voltage check is done to check for transmission and transmission control module (TCM) problems which cannot be detected by self-diagnosis.
Additionally, it serves as a back-up check for self-diagnosis.
Measure the voltage drop and make a continuity test for each of the sensors, solenoids, and switches.
If the voltage is within the specified range and continuity exists, that particular area of the TCM and automatic transmission assembly is normal.
If voltage deviation or lack of continuity is discovered, disconnect the applicable parts and check each of them individually.
This will allow you to determine the trouble location (TCM, automatic transmission unit, or another area of the vehicle).



Inspection Tool

Use a circuit tester to measure voltage and circuit continuity.
Insert the test probes from the connector wiring side.
TCM terminals are extremely small.
Wrap a piece of thin wire (1) around the probe of tester (2).
This will make measurement easier.

TCM Voltage Check Procedure

1. Remove the TCM.
2. Turn the ignition switch on. Do not start the engine.
3. Measure the voltage at the terminal.
   Refer to the following table for the specified voltage ranges.

TCM STANDARD VOLTAGE
[24 PIN CONNECTOR]

Check circuit	Terminal +	Terminal −	Measuring condition	Voltage (V)
Throttle position sensor	18	24	Throttle fully opened	5.3 – 7.5
			Throttle fully closed (idling)	0.24 – 1.3
Vehicle speed sensor 1	6	24	Vehicle speed 10 – 20 km/h	Less than 2 ↔ About 5
Vehicle speed sensor 2	22	23	Vehicle speed 10 – 20 km/h	0 ↔ 3
2 range switch	2	24	Selector "2" range	8 – 16
			Selector all ranges except "2"	Less than 1
L range switch	1	24	Selector "L" range	8 – 16
			Selector all ranges except "L"	Less than 1
Pattern select switch	16	24	Pattern select switch OFF (NORMAL)	9 – 16
			Pattern select switch ON (POWER)	Less than 1
Brake switch	14	24	Depress brake	8 – 16
			Release brake	Less than 1
O/D switch	15	24	O/D switch (O/D OFF)	10 – 16
			O/D switch (O/D ON)	0 – 2
Shift solenoid S1	13	24	OFF (3rd or O/D)	Less than 1
			ON (1st or 2nd)	8 – 16
Shift solenoid S2	12	24	OFF (1st or O/D)	Less than 1
			ON (2nd or 3rd)	8 – 16
Lock-up control solenoid S3	11	24	OFF (Lock-up OFF)	Less than 1
			ON (Lock-up ON)	8 – 16
Diagnosis terminal	21	24	Self-diagnosis ON	0 – 1.5
Electrical source (Battery)	25	24	———	10 – 16
Electrical source (Ignition)	26	24	Key switch ON	10 – 16

Check circuit	Terminal		Measuring condition	Voltage (V)
	+	–		
N range switch	3	24	Selector "N" range	8 – 16
			Selector all ranges except "N"	Less than 1
Engine water temp switch	9	24	Engine water temperature is less than 40°C.	Less than 1
			Engine water temperature is higher than 40°C.	8 – 16
ATF Fluid Temperature sensor	20	8	ATF temperature 20°C	4.70
			ATF temperature 80°C	3.65

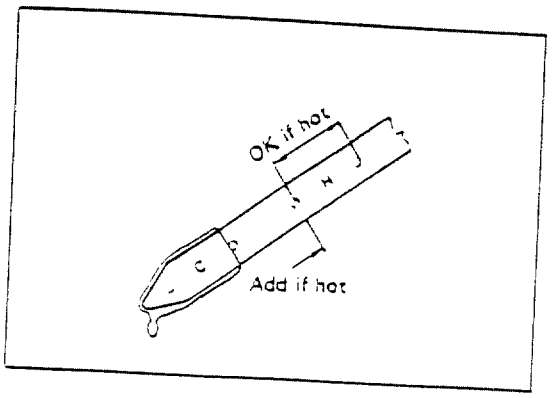
GENERAL TROUBLESHOOTING

Problem	Possible cause	Remedy
Fluid discolored or smells burnt	Fluid contaminated Torque converter faulty Transmission faulty	Replace fluid Replace torque converter Disassemble and inspect transmission
Vehicle does not move in any forward range or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Park lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect park pawl Replace torque converter Replace drive plate Clean screen Disassemble and inspect transmission
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission
Harsh engagement into any drive range	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission
Delayed 1-2, 2-3, or 3-OD up-shift, or down shifts from 4-3, or 3-2 and shifts back to 4 or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect valve body
Slips on 1-2, 2-3 or 3-OD up-shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect valve body Disassemble and inspect transmission
Drag, binding or tie-up on 1-2, 2-3, or 3-OD up-shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission

GENERAL TROUBLESHOOTING

Problem	Possible cause	Remedy
No. lock-up in 2nd, 3rd or OD	Electronic control faulty	Inspect electronic control
	Valve body faulty	Inspect valve body
	Solenoid valve faulty	Inspect valve body
	Transmission faulty	Disassemble and inspect transmission
Harsh down-shift	Throttle cable out of adjustment	Adjust throttle cable
	Throttle cable and cam faulty	Inspect throttle cable and cam
	Accumulator pistons faulty	Inspect accumulator pistons
	Valve body faulty	Inspect valve body
	Transmission faulty	Disassemble and inspect transmission
No down-shift when coasting	Valve body faulty	Inspect valve body
	Solenoid valve faulty	Inspect solenoid valve
	Electronic control faulty	Inspect electronic control
Down-shift occurs too quickly or too late while coasting	Throttle cable out of adjustment	Adjust throttle cable
	Throttle cable faulty	Inspect throttle cable
	Valve body faulty	Inspect valve body
	Transmission faulty	Disassemble and inspect transmission
	Solenoid valve faulty	Inspect solenoid valve
	Electronic control faulty	Inspect electronic control
No OD-3, 3-2 or 2-1 kickdown	Solenoid valve faulty	Inspect solenoid valve
	Electronic control faulty	Inspect electronic control
	Valve body faulty	Inspect valve body
	Throttle cable out of adjustment	Adjust throttle cable
No engine braking in "2" or "L" range	Solenoid valve faulty	Inspect solenoid valve
	Electronic control faulty	Inspect electronic control
	Valve body faulty	Inspect valve body
	Transmission faulty	Disassemble and inspect transmission
Vehicle does not hold in "P"	Manual linkage out of adjustment	Adjust linkage
	Parking lock pawl cam and spring faulty	Inspect cam and spring

ON-VEHICLE SERVICE



TRANSMISSION FLUID LEVEL AND CONDITION

Set parking brake.

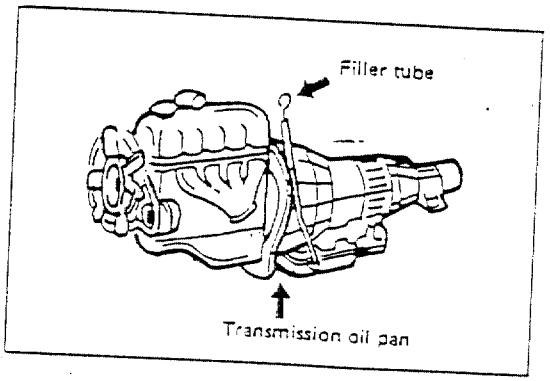
With the engine idling, move the shift lever through all positions from "P" to "L", then return to position "P".

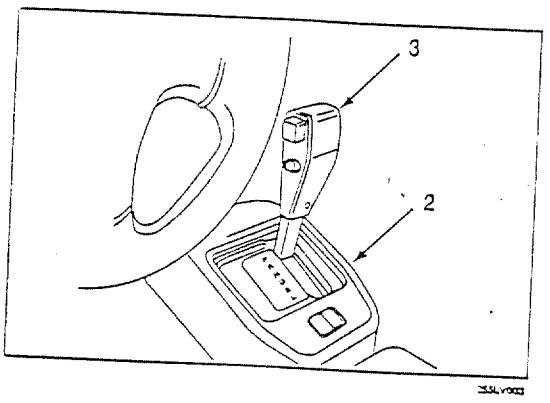
Check to see if the level of fluid comes to "HOT" range on the dipstick gauge.

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.





ATF REPLACEMENT

Note: Do not overfill

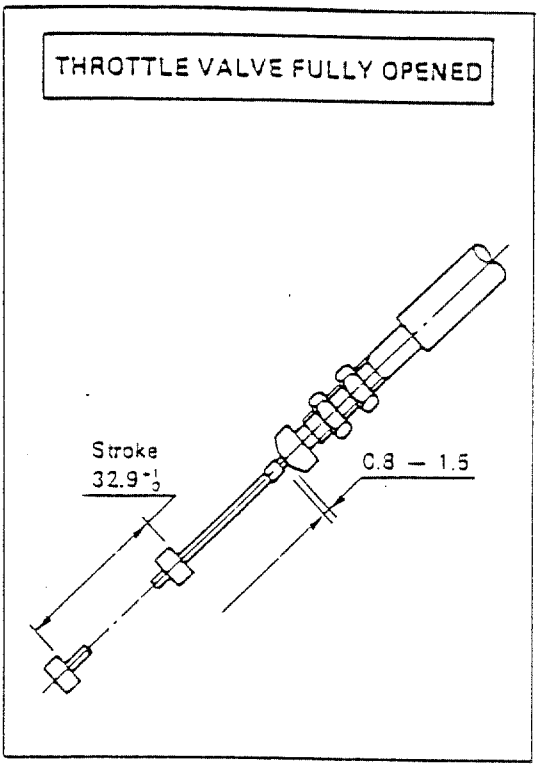
Transmission

1) Remove the drain plug from oil pan and drain the fluid.
2) Reinstall the drain plug securely.
3) With the engine OFF, add new fluid through the filter tube.

liter (US qts, Imp qts)

	Transmission
Drain and refill	4.5 (4.8, 4.0)
Dry fill	8 (8.6, 7.0)
Fluid	BESCO ATF II or 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.



THROTTLE CABLE ADJUSTMENT

1) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

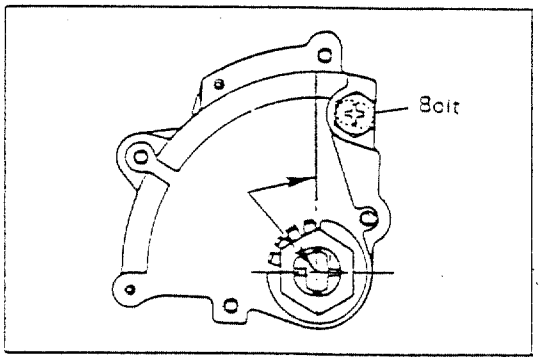
Note:
If the valve does not open fully, adjust the accelerator link.

2) Fully depress the accelerator.
3) Loosen the adjustment nuts.
4) Adjust the cable housing so that the distance between the end of the boot and stopper on the cable is the standard.

mm (in.)

Standard boot and cable stopper distance	0.8 – 1.5 (0.03 – 0.06)
Stroke	32.9 $^{+1}_{0}$ (1.30 $^{+0.04}_{0}$)

5) Tighten the adjusting nuts.
6) Recheck the adjustments.



NEUTRAL START SWITCH ADJUSTMENT

If the engine will start with the shift selector in any range other than "N" or "P" range, adjustment is required.

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.

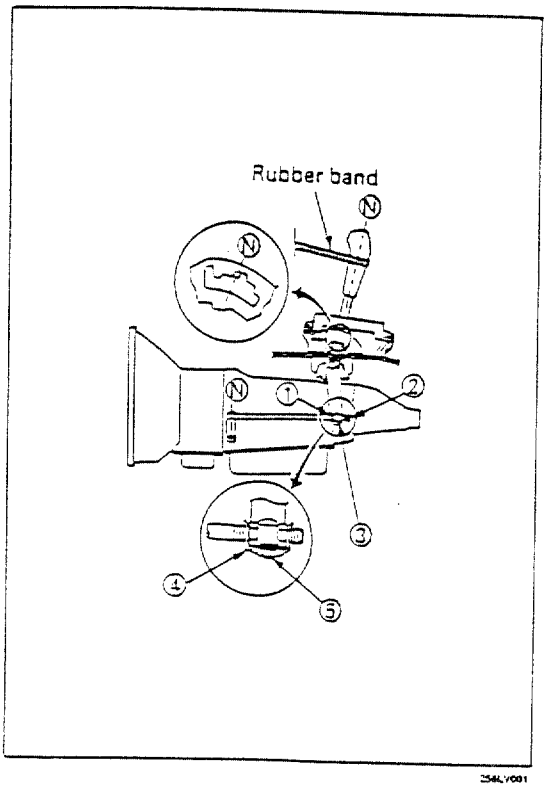
N.m (kgf.m/lb.ft)

Torque	13 (1.3/9)

IDLE SPEED INSPECTION (N RANGE)

Connect a tachometer, inspect the idle speed.

Idle speed	825 – 875 rpm



Installation

To install, follow the removal steps in reverse order.
Adjustment of the select lever and control rod

1. Keep the vehicle horizontal.

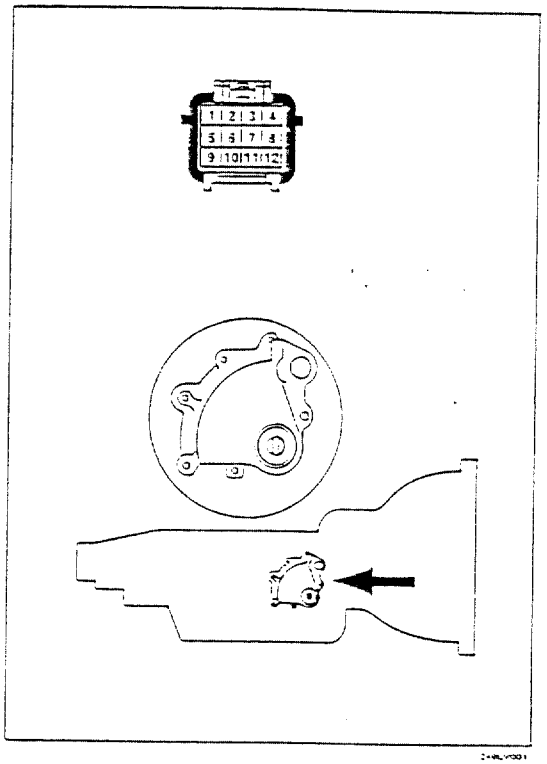
NOTE:
If the vehicle is not kept horizontal, the position of the select set lever may vary by the movement of the engine.

2. After installing the control rod to the select lever on the transmission side, set the select set position to "N".
3. Set the select lever to "N" and remove all play by hand pushing the lever to "R". (or by pushing it forward with rubber band or the like)
4. While keeping the situation, secure the control rod and select lever arm.

Tighten torque = 32 Nm {3.3 kgm}

NOTE:
No oil attached to the screws.

5. After the select lever adjustment, check that you can shift the lever smoothly and the indication of each shift range (red mark indicator) is correct when viewed from the driving position.



NEUTRAL START SWITCH INSPECTION

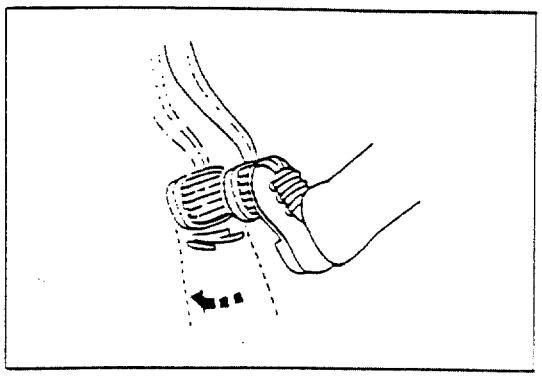
With a circuit tester, make a continuity test on the neutral start switch with the moving piece set in each position.

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

○—○ Continuity

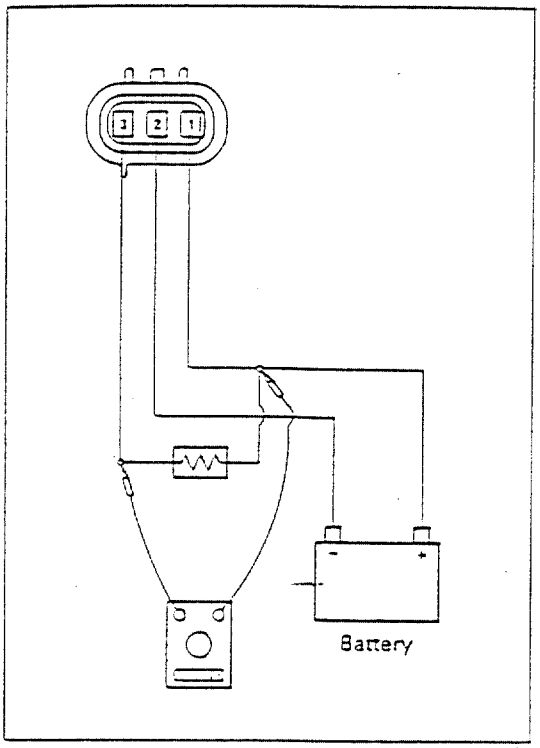
Location

The neutral start switch is installed on the right side of the transmission.



BRAKE SIGNAL INSPECTION

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



VEHICLE SPEED SENSOR 1 INSPECTION

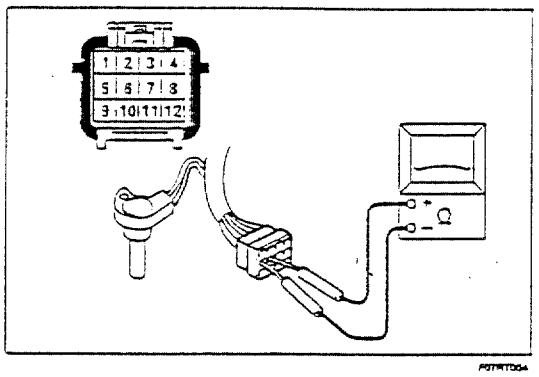
1) Connect the vehicle speed sensor connector terminal (1) to the battery (+) terminal and terminal (2) to the battery (–) terminal.
2) Connect a resistance of 1.3k ohm to 5k ohm (1.4W or more) between terminals (1) and (3).

CAUTION:
Be extremely careful not to connect the battery (+) terminal to the terminal (3).
This may damage the vehicle speed sensor.

3) Rotate the shaft of the vehicle speed sensor slowly and measure the voltage at both ends with a digital tester.

The voltage, with one rotation of shaft, fluctuates four times in the following range: 10 to 14V ↔ 2V or less.

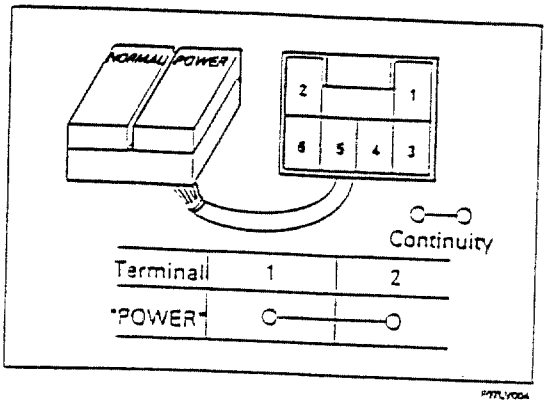
Replace the sensor when the result of inspection is found abnormal.



VEHICLE SPEED SENSOR 2 INSPECTION

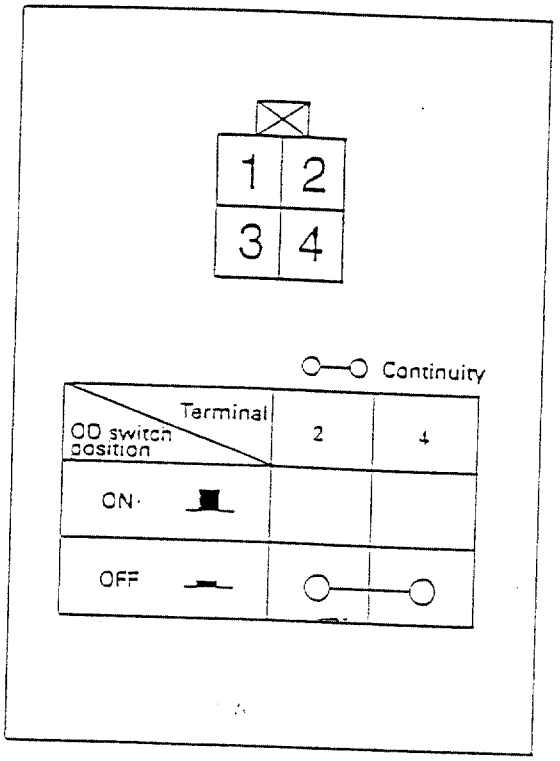
1) Disconnect the vehicle speed sensor 2 connector.
2) Use an ohmmeter to measure the resistance between terminals 5 (SP2) and 6 (SPG).

Standard resistance	560 – 680Ω



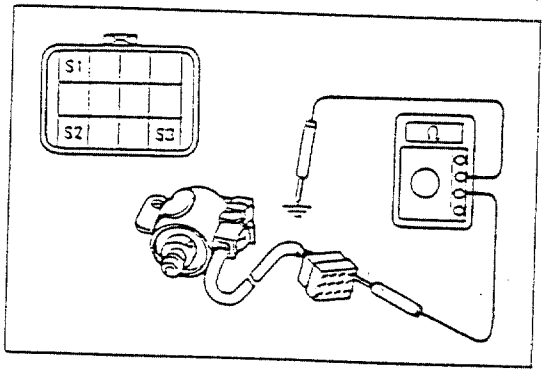
PATTERN SELECT SWITCH INSPECTION

Inspect that there is continuity between terminals 1 and 2.



OVERDRIVE SWITCH INSPECTION

Inspect that there is continuity between terminals 1 and 2.

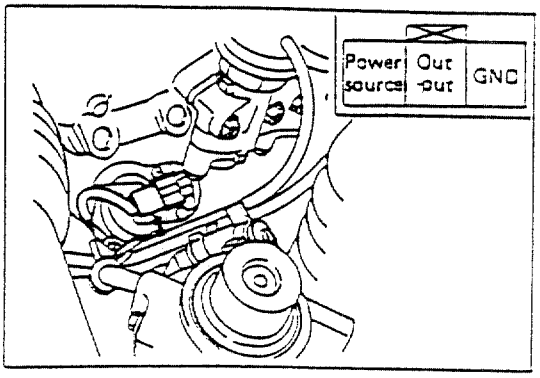


SOLENOID INSPECTION

Using an ohmmeter, check the resistance between terminal and body.

Standard resistance	11 – 15 Ω

Confirm that the solenoid operates when connecting the solenoid terminal to positive terminal of the battery, and solenoid body to negative terminal.



THROTTLE POSITION SENSOR INSPECTION

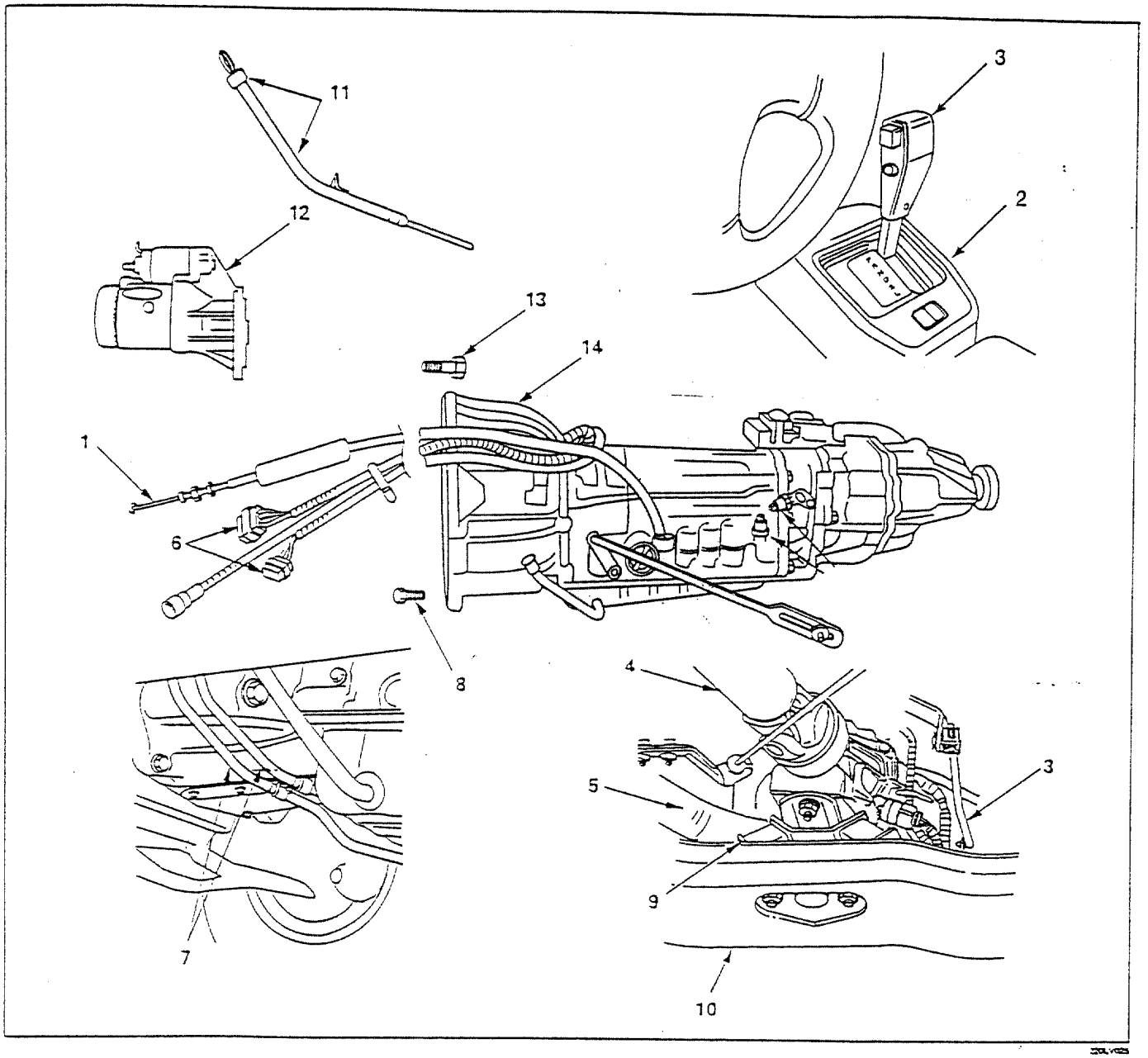
1) Turn the starter switch to the "ON" position.
2) Measure the voltage between throttle position sensor connector terminals 2 (output) and 3 (ground).

NOTE:

- Do not remove the sensor connector.
- Make sure that power source (7-8V) is measured between terminals 1 and 3 before measurement at step 2).

Throttle position	Voltage (V)
Idle	0.24 – 1.30
Full	5.30 – 7.50

TRANSMISSION REMOVAL AND INSTALLATION



Removal Steps

1. Throttle cable
2. Front console assembly
3. Select lever assembly
4. Rear propeller shaft
5. Exhaust pipe
6. Transmission harness connector
7. ATF cooler pipe
8. Torque converter bolt
9. Rear mounting
10. 3rd crossmember
11. Oil level gauge and tube
12. Starter
13. Engine - transmission bolt
14. Transmission assembly

Installation steps

To install, follow the removal steps in reverse order.

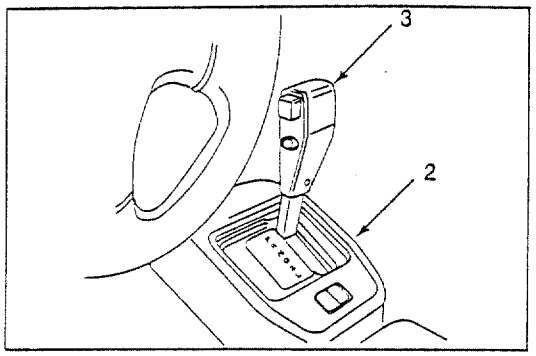
REMOVAL

Preparation

- Remove engine hood
- Disconnect negative (–) battery cable.

1. **Throttle cable**

   Loosen the adjusting nuts, and disconnect the cable housing from the injection pump side bracket.



2. **Front console assembly**
3. **Select lever assembly**
   - Disconnect the harness connector.
   - Disconnect the control rod from the select lever assembly.

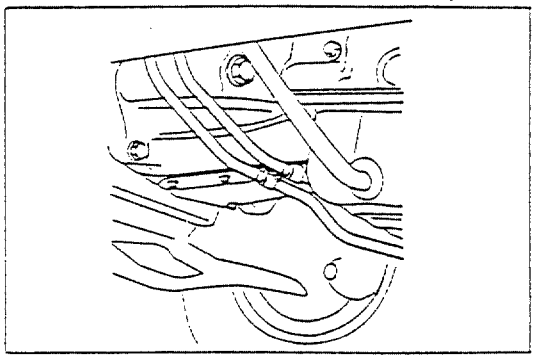
- Refer to Section 4 "Rear Axle" for rear propeller shaft removal procedure.

4. **Rear propeller shaft**

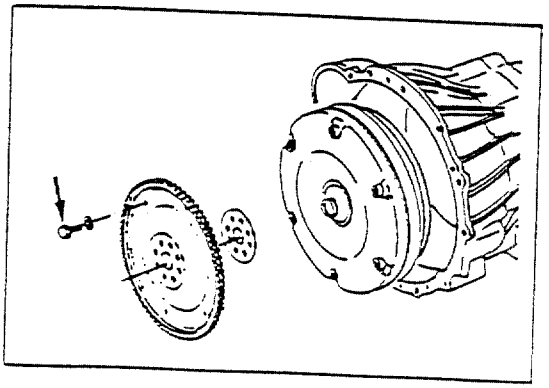
   Disconnect the center bearing bracket, and remove rear propeller shaft.

5. **Exhaust pipe**

6. **Transmission harness connector**
   - Disconnect the transmission harness connectors from the engine room harness connectors.

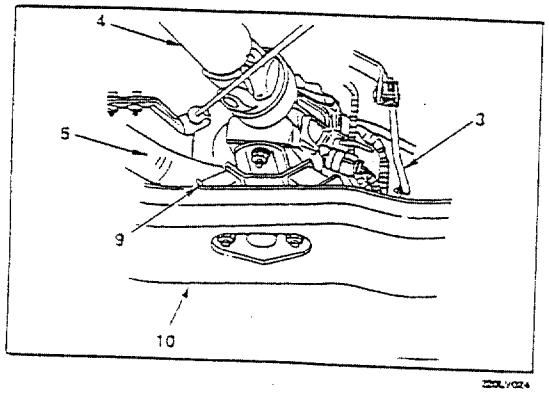


7. **ATF cooler pipe**
   - Disconnect two ATF cooler pipes from A/T side.
   - Remove oil pipe clamp from the under cover and torque converter housing side.



8. Torque converter bolt
   - Remove the under cover.
   - Turn the crankshaft to gain access to each bolt. Remove the six torque converter fixing bolts.

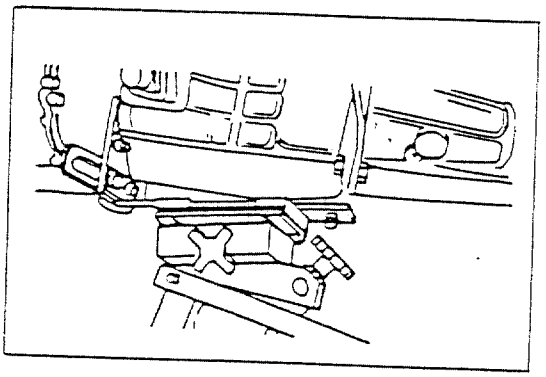
NOTE: New fixing bolts should be replaced for reassembly.



9. Rear mounting
   - Support transmission with a jack.
   - Remove two rear mounting nuts from the 3rd crossmember.
   - Remove the rear mounting from the transmission.
10. 3rd crossmember

11. Oil level gauge and tube
12. Starter
    - Remove the mounting bolts, and pull the starter toward the front of the vehicle. Lay the starter alongside the engine.

13. Engine-transmission bolt
    - Hoist engine with a chain block.
    - Remove engine-transmission fixing bolts



14. Transmission assembly

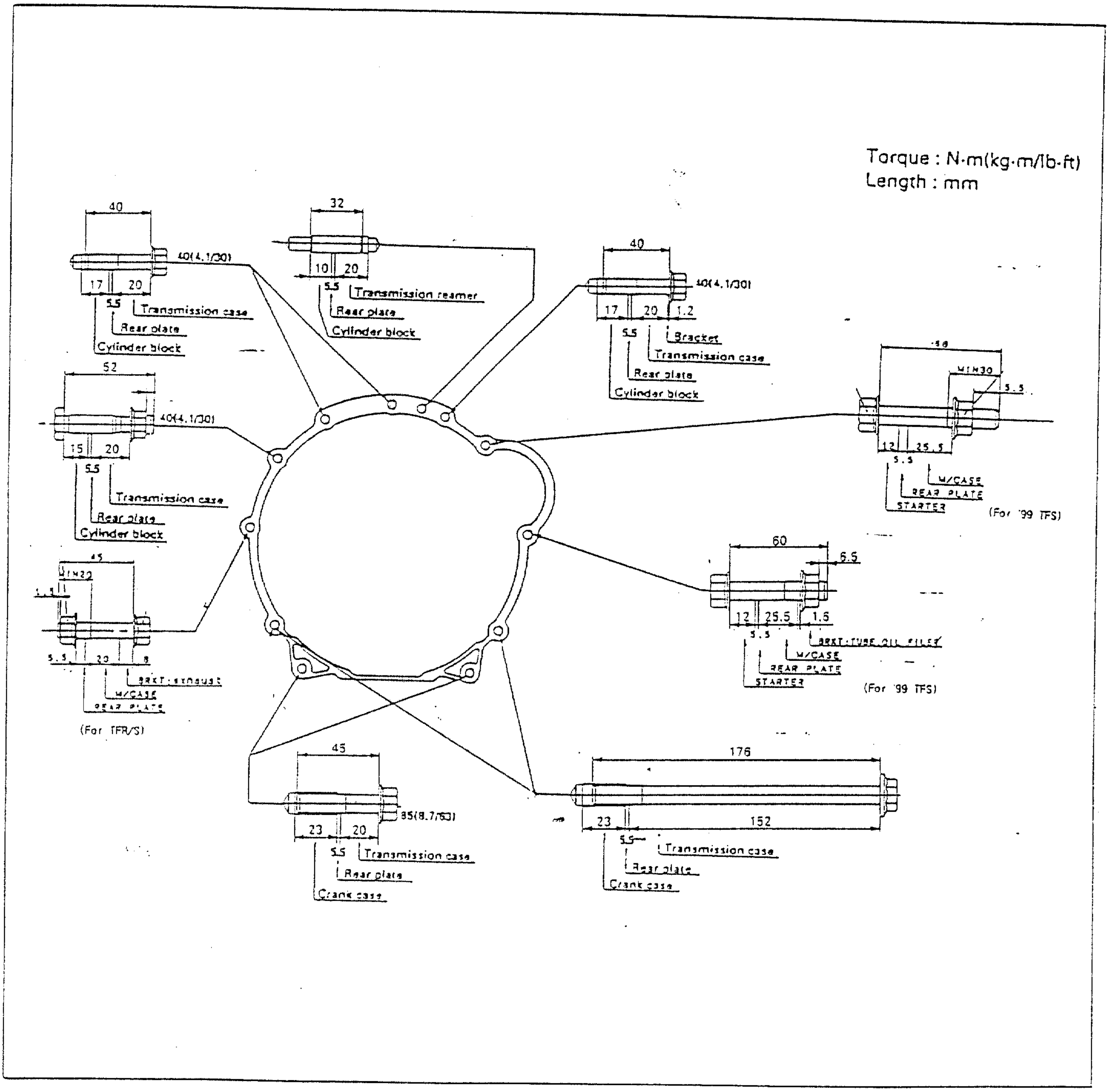
NOTE:
Do not let the throttle cable or neutral start switch cable catch on anything. Keep the oil pan positioned down.
Be careful not to let the torque converter slide out.

INSTALLATION

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

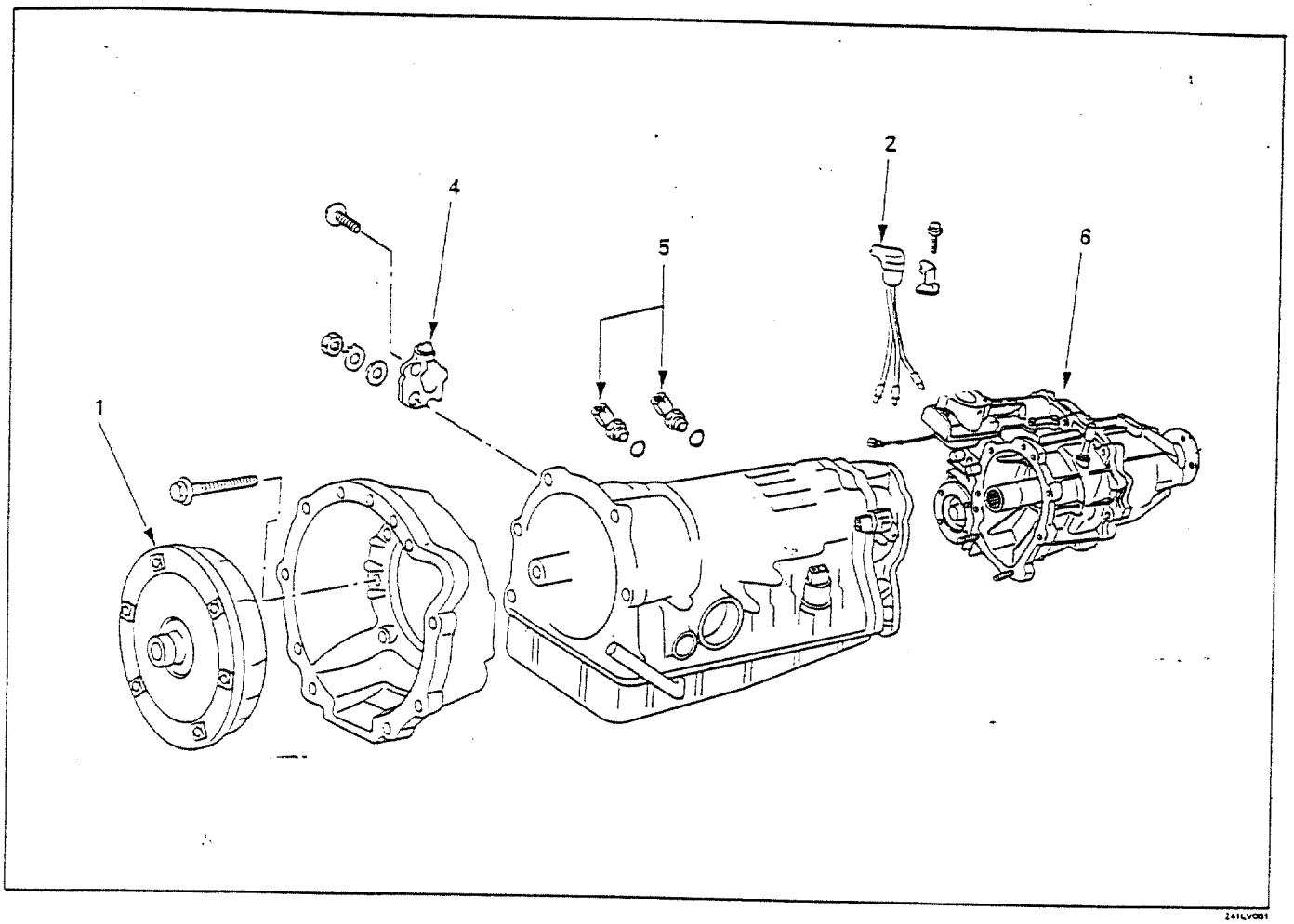
1. Torque

	N.m (kgf.m/lb.ft)
Rear mounting to crossmember	41 (4.2/30)
Rear mounting to transmission	41 (4.2/30)
Torque converter bolt	29 (3.0/22).
ATF cooler pipe to transmission	66 (6.7/48)
Exh. pipe flange to flange	43 (4.4/32)
Exh. pipe to exh. manifold	67 (6.8/4.9)
Engine to transmission	See below



UNIT REPAIR

DISASSEMBLY OF MAJOR COMPONENTS (1)



Disassembly steps

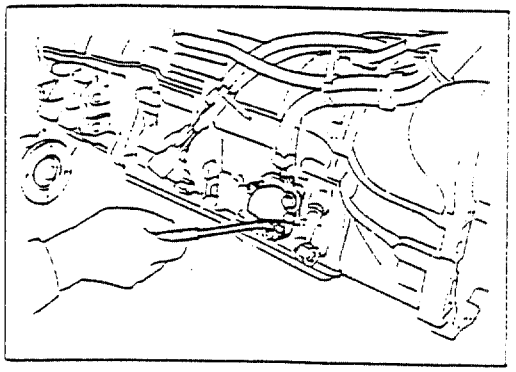
1. Torque converter
▲ 2. Wire harness
▲ 3. Transmission control shaft lever
▲ 4. Neutral start switch
▲ 5. Union
6. Extension housing
7. ATF Temp switch

Important operations

2. Wire harness
Remove wire harness clamp and throttle cable clamp.

3. Transmission control shaft lever

Remove the transmission control shaft lever

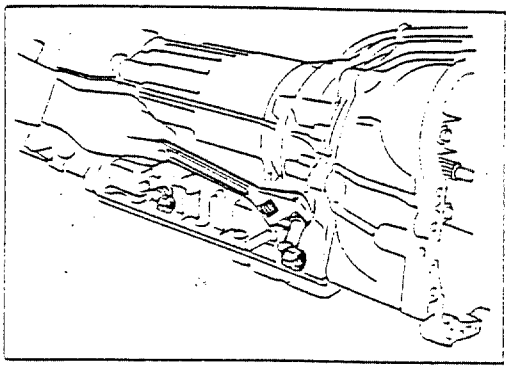


4. Neutral start switch

Unstake the lock washer.

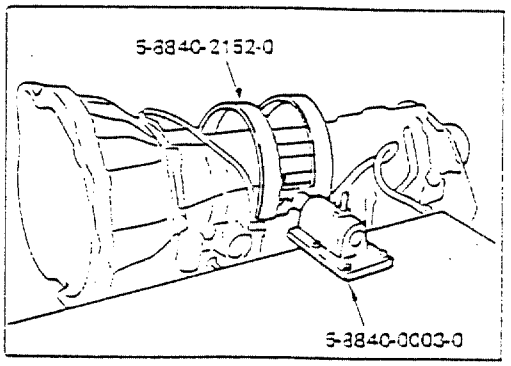
Remove the nut and bolts, and then remove the neutral start switch.

Remove the lock washer and grommet.



5. Union

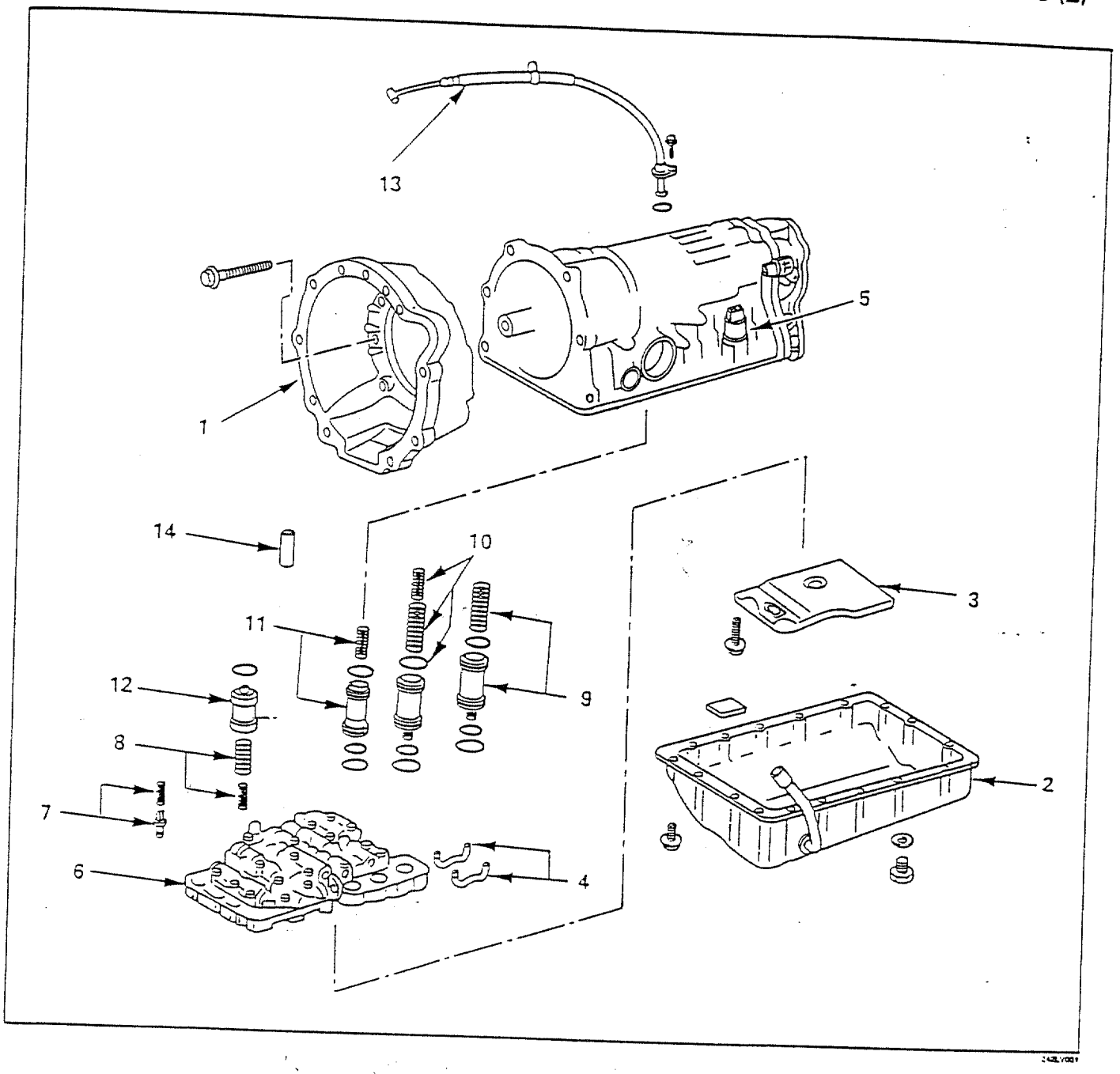
Remove two unions from transmission case.



Install special tool to the transmission unit

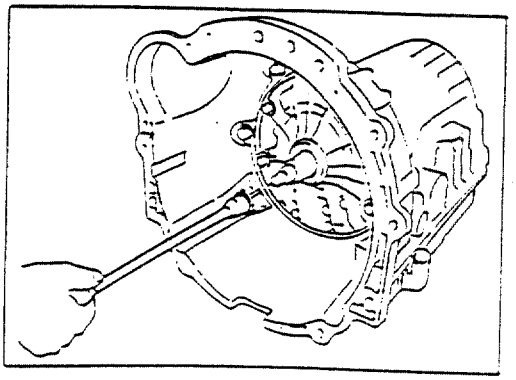
Holding fixture : 5-8840-2152-0 (J-37227)
Fixture base : 5-8840-0003-0 (J-3289-20)

DISASSEMBLY OF MAJOR COMPONENTS (2)



Disassembly steps

- ▲ 1. Converter housing
- ▲ 2. Oil pan
- ▲ 3. Oil strainer assembly
- ▲ 4. Oil tube
- ▲ 5. Solenoid wiring
- ▲ 6. Valve body
- ▲ 7. Check ball body, spring
- ▲ 8. Spring
- ▲ 9. Accumulator piston (B-2)
- ▲10. Accumulator piston (C-2)
- ▲11. Accumulator piston (B-0)
- ▲12. Accumulator piston (C-0)
- ▲13. Throttle cable
- 14. Second brake drum gasket
- 15. Speed Sensor gear

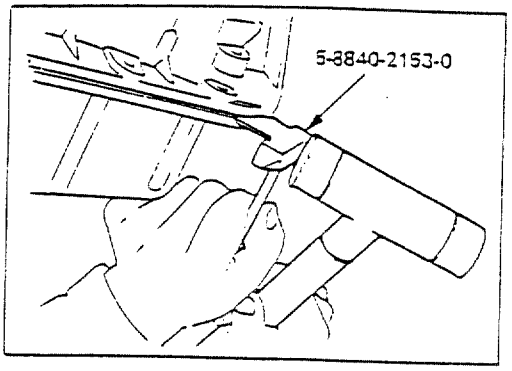


Important operations

1. Converter housing

   Remove the six bolts.

   Remove the transmission housing.



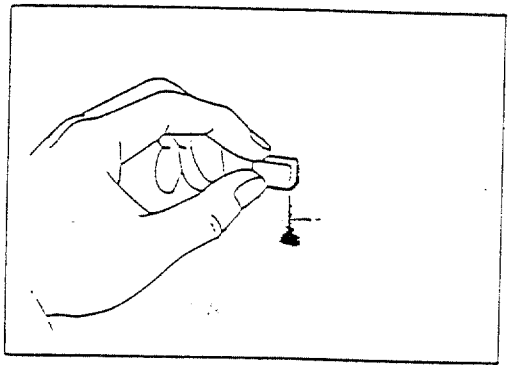
2. Oil pan

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

Remove the nineteen bolts.

Remove pan by lifting the transmission case.

Seal cutter : 5-8840-2153-0 (J-37228) ✓

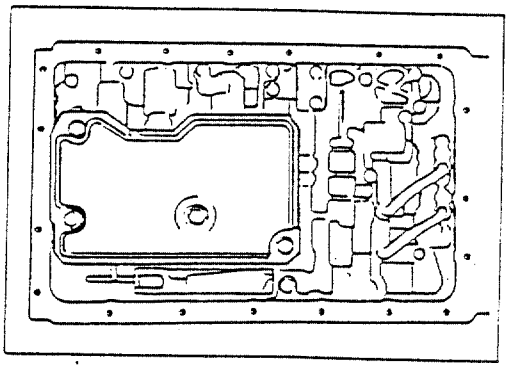


Examine particles in pan

Remove the magnet and use it to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transmission:

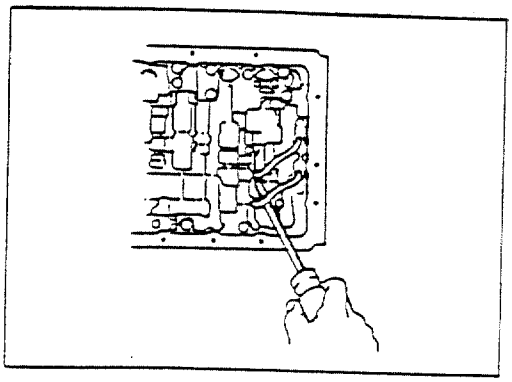
Steel (magnetic) ..... bearing, gear and clutch plate wear

Brass (non-magnetic) .. bushing wear



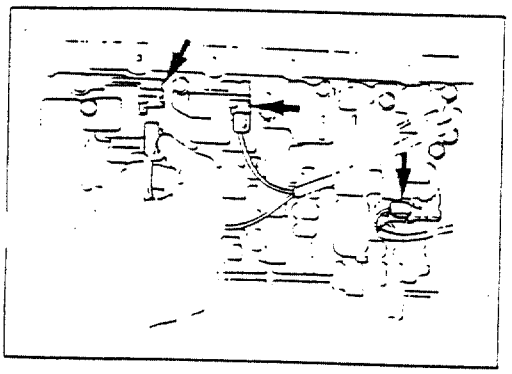
3. Oil strainer assembly

Remove four bolts holding the oil strainer.



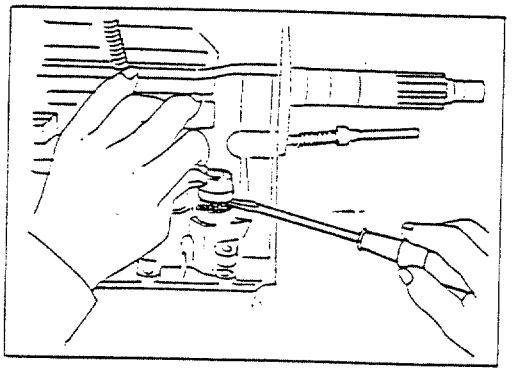
4. Oil tube

Pry up both tube ends with a large screwdriver and remove the two tubes.



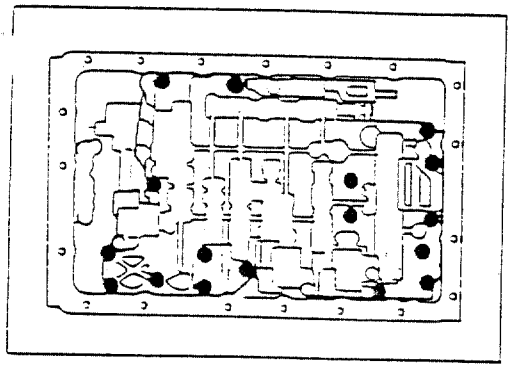
5. Solenoid wiring

Disconnect the connectors from the No. 1, No. 2 and No. 3 solenoids.



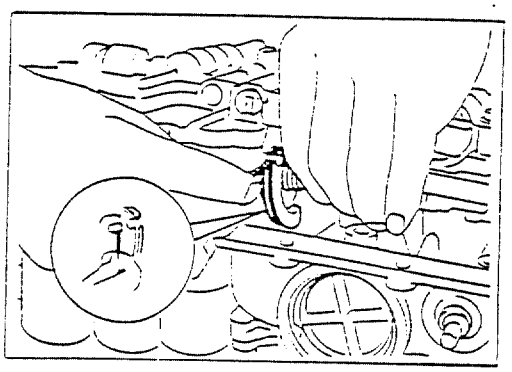
Turn over transmission, remove the solenoid wiring stopper plate from the case.

Pull the wiring out of the transmission case.



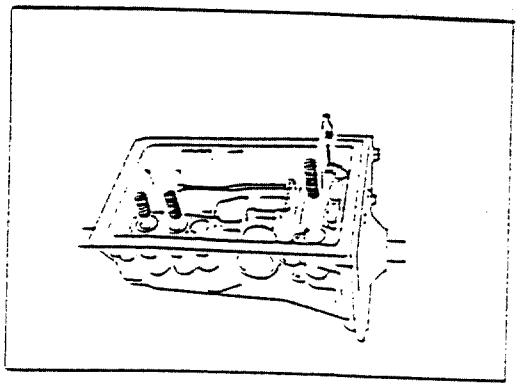
6. Valve body

Remove the seventeen bolts from valve body.



Disconnect the throttle cable from the cam.

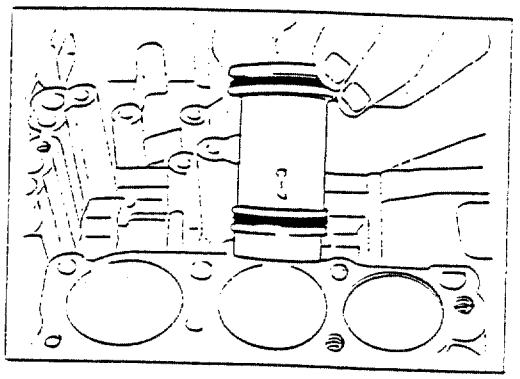
Remove the valve body from transmission case.



7. Check ball body, spring
8. Spring

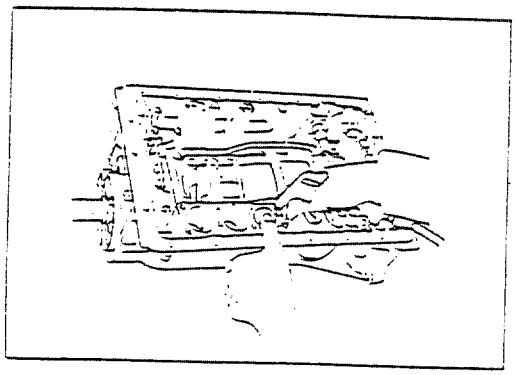
Remove the check ball body and spring.

Remove three springs from accumulator piston.



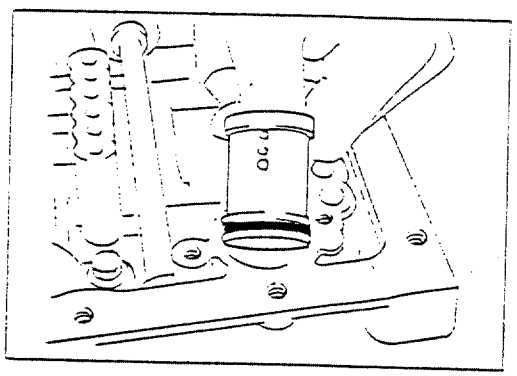
9. Accumulator piston (B-2)
10. Accumulator piston (C-2)

Remove accumulator pistons and springs from transmission case.



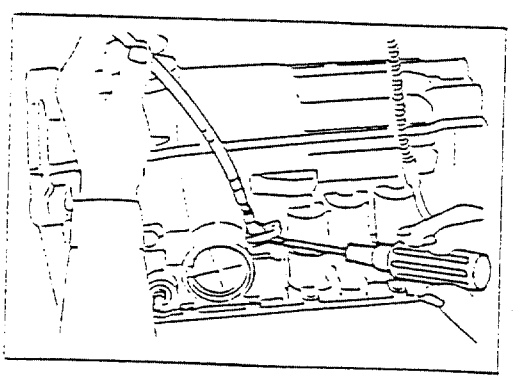
11. Accumulator piston (B-0)

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



12. Accumulator piston (C-0)

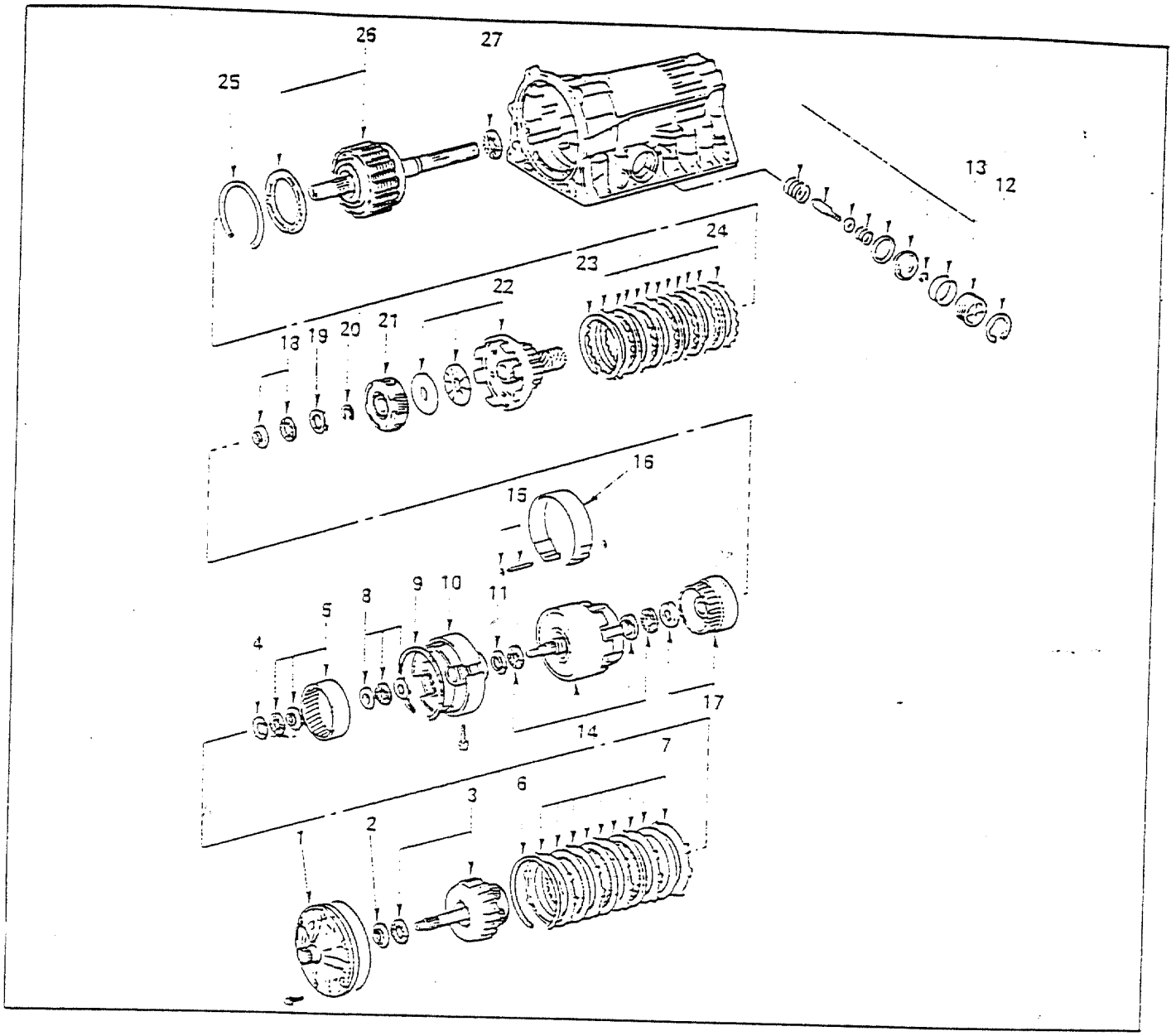
Remove the C-0 accumulator piston.



13. Throttle cable

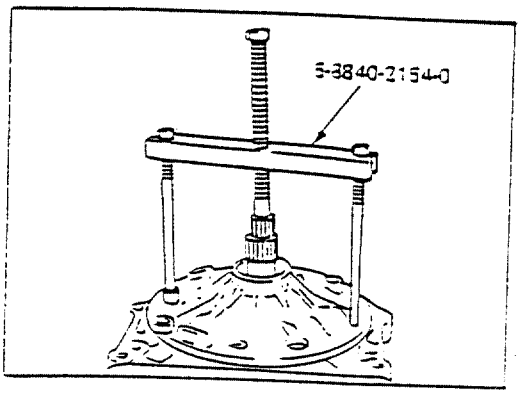
Turn over transmission and remove throttle cable from transmission case.

DISASSEMBLY OF MAJOR COMPONENTS (3)



Disassembly steps

- ▲ 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
- ▲ 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
- ▲ 25. Snap ring
- ▲ 26. Rear planetary gear, second brake drum and output shaft
- ▲ 27. Bearing



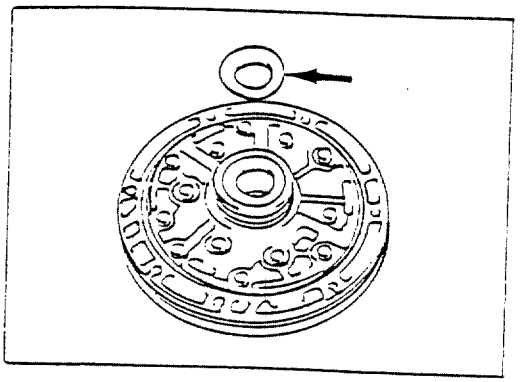
Important operations

1. Oil pump

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

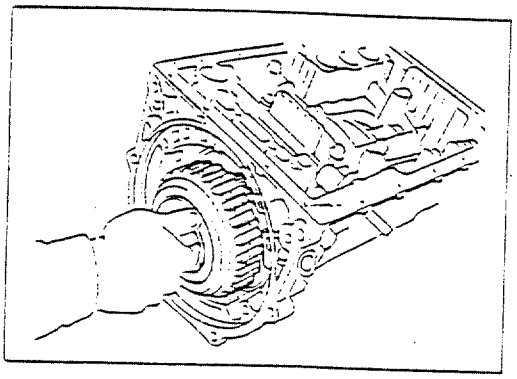
   Then using special tool, remove the oil pump.

   Puller : 5-8840-2154-0 (J-37230)



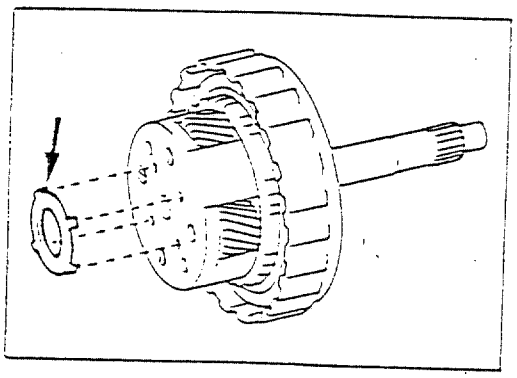
2. Race

   Remove race from oil pump



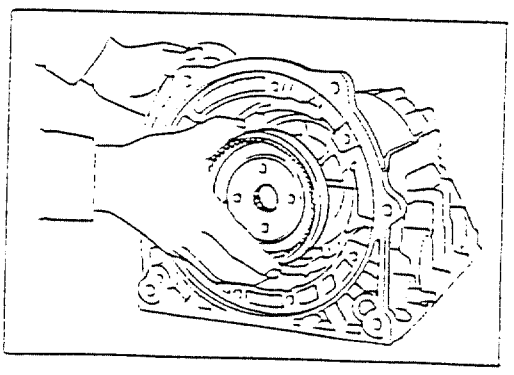
3. OD planetary gear and OD direct clutch

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



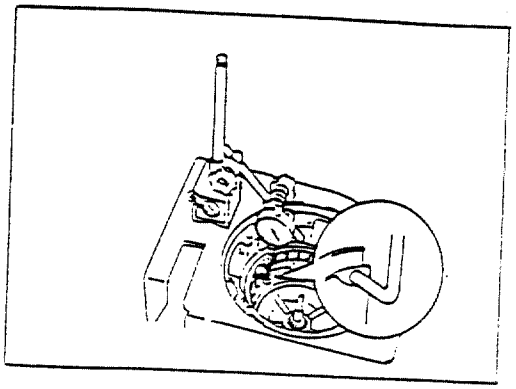
4. Race

   Remove the race from OD planetary gear.



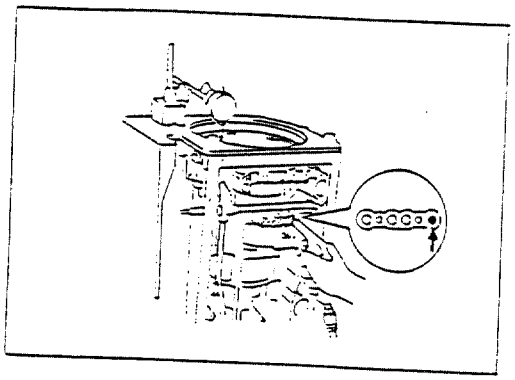
5. OD planetary ring gear

   Remove the overdrive planetary ring gear from the transmission case.



CHECK PISTON STROKE OF OVERDRIVE BRAKE

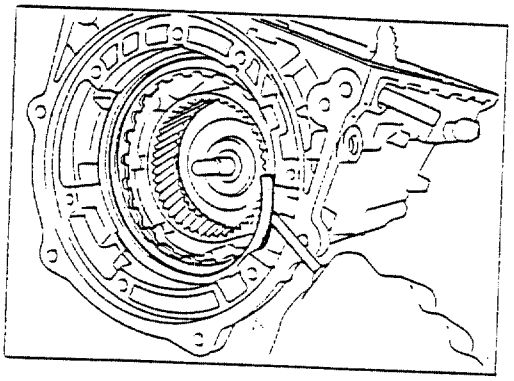
Place a dial indicator onto the overdrive brake piston as shown in the figure.



Measure the stroke applying and releasing the compressed air (4 — 8 kgf/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

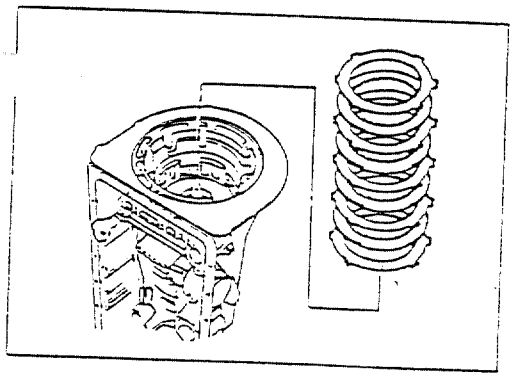
Piston stroke	mm (in.)	1.40 – 1.70 (0.0552 – 0.0697)

If the values are nonstandard, replace the disc or flange.



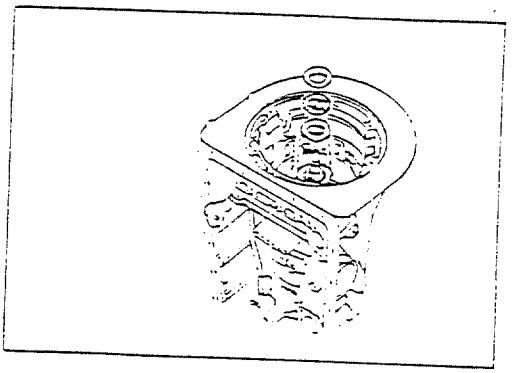
6. Snap ring

Remove the snap ring.



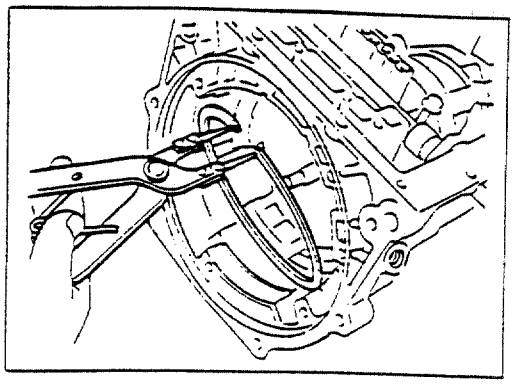
7. Flange, plate and disc

Remove two flanges, three plates and four discs.



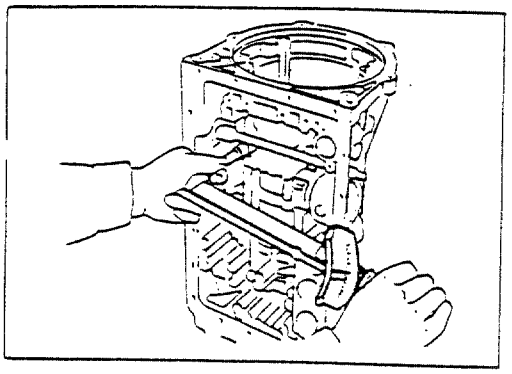
8. Bearing and race.

Remove the thrust bearing and two races.



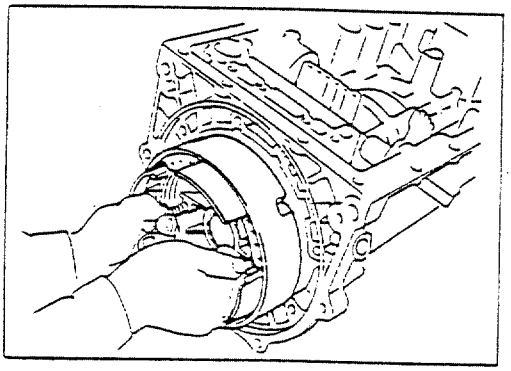
9. Snap ring

Using snap ring pliers, remove the snap ring.

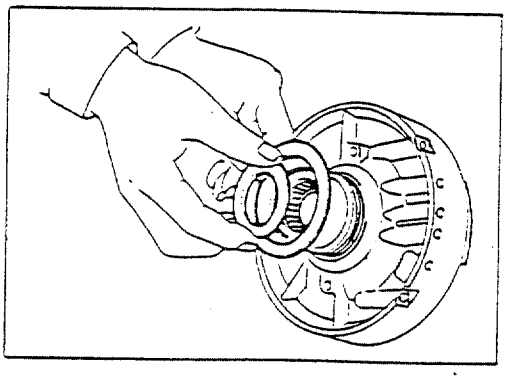


10. OD support

Remove two bolts fixing the overdrive support assembly to the case.

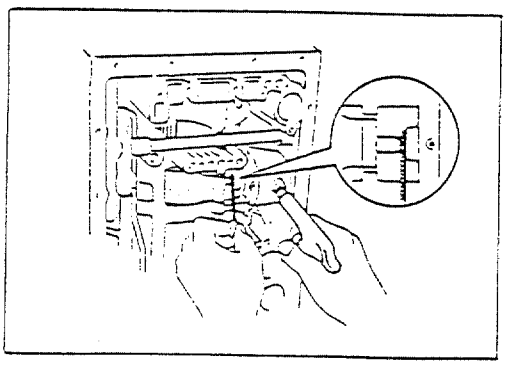


Install two removed bolts to the OD support, and pull out the OD support assembly.



11. Race

Remove the race from OD support.

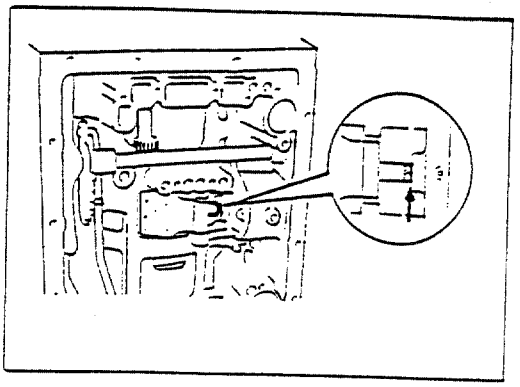


Check piston stroke of second coast brake

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 (4 — 8 kgf/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

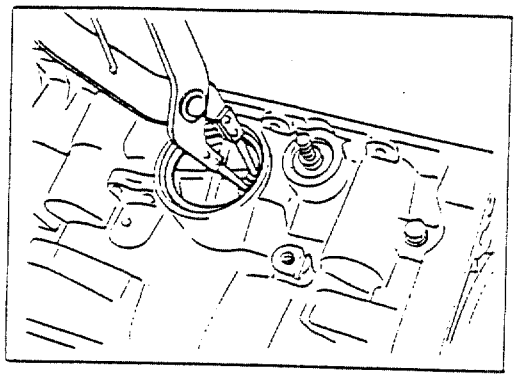
Piston stroke	mm(in.)	1.5—3.0 (0.059—0.118)



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

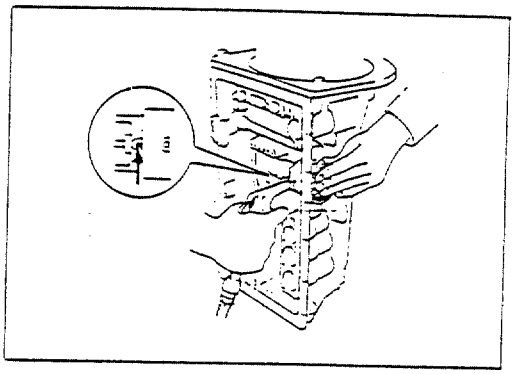
Note: There are two piston rods.

Rod length 71.4 mm (2.811 in.)
72.9 mm (2.870 in.)



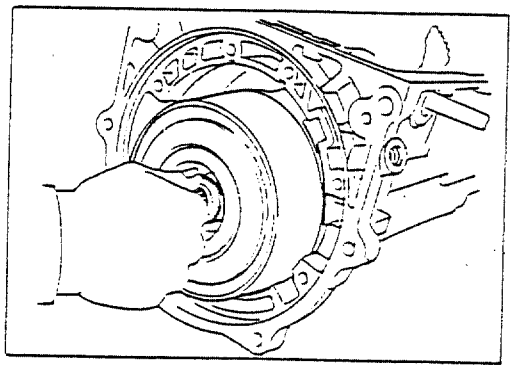
12. Snap ring

Using snap ring pliers, remove the snap ring.



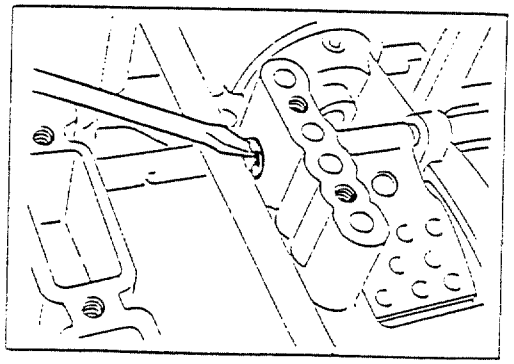
13. Second coast brake piston

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



14. Direct clutch and forward clutch

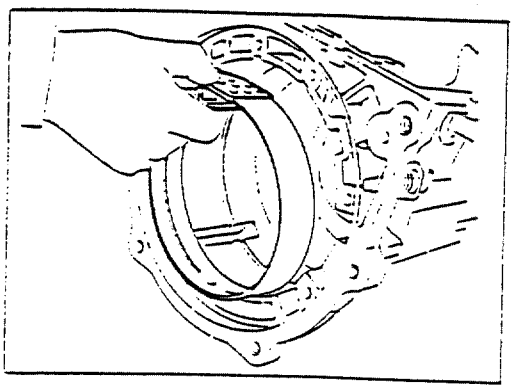
Remove the direct clutch and forward clutch from the case.



15. E-ring and pin

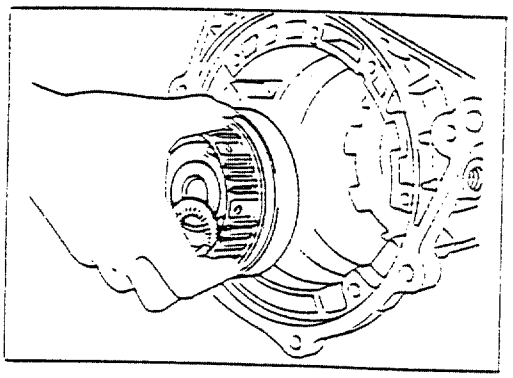
Remove the E-ring from the pin.

Remove the pin from the brake band.



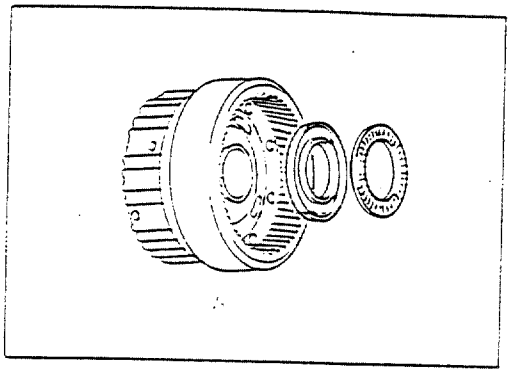
16. Second coast brake band

Remove the second coast brake band from the case.



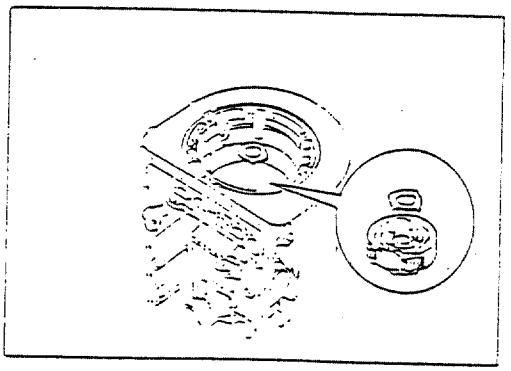
17. Front planetary ring gear

Remove the front planetary ring gear from the case.



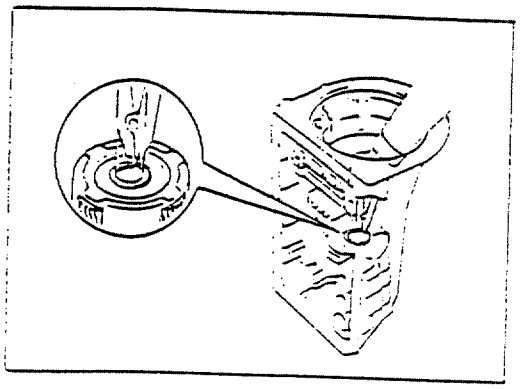
18. Bearing and race

Remove the bearing and race.



19. Race

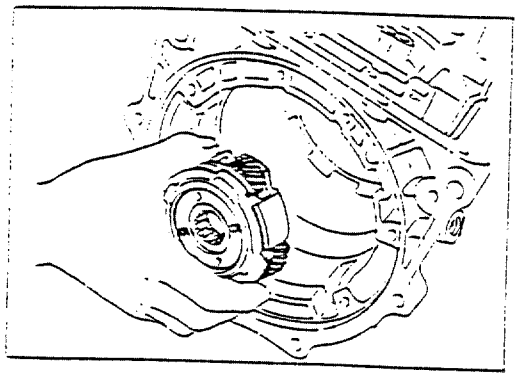
Remove the race.



20. Snap ring

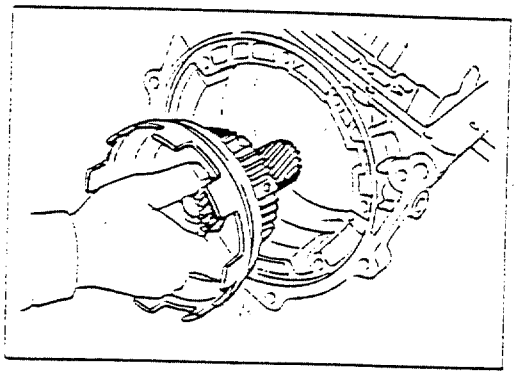
Using snap ring pliers, remove the snap ring.

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



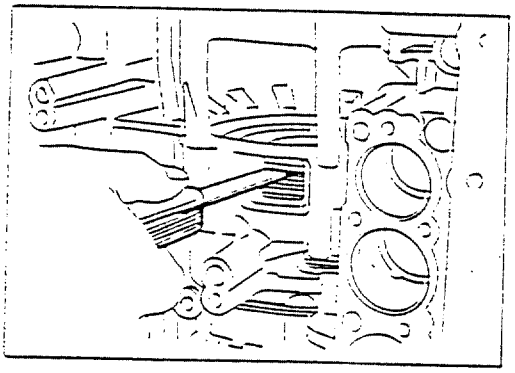
21. Front planetary gear

Remove the front planetary gear from the case.



22. Drum and one-way clutch

Remove sun gear input drum and one-way clutch

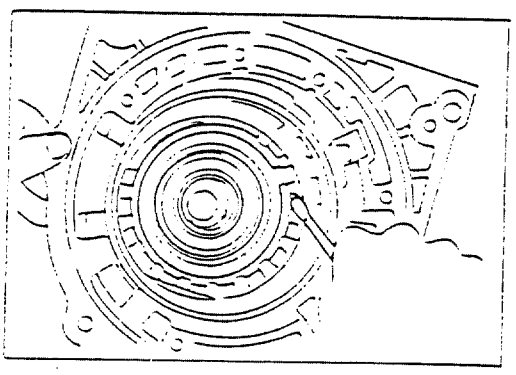


Check pack clearance of second brake

Using a feeler gauge, measure the clearance between the snap ring and flange as shown in the figure.

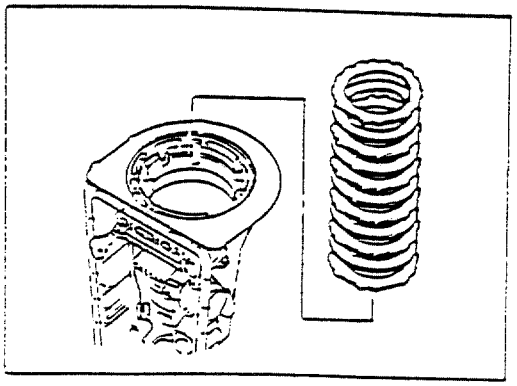
Clearance	mm (in.)	0.62 – 1.98 (0.0244 – 0.0780)

If the values are nonstandard, replace the discs.



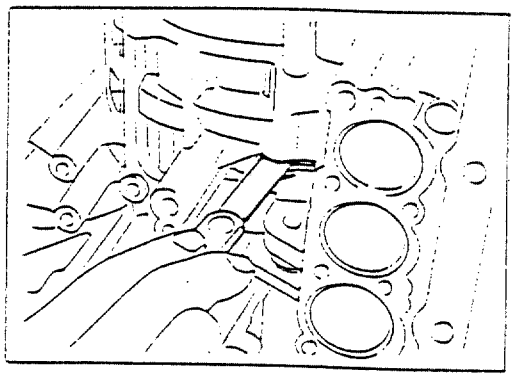
23. Snap ring

Using two screwdrivers, remove the snap ring.



24. Flange, plate and disc

Remove the flange, five discs and five plates.

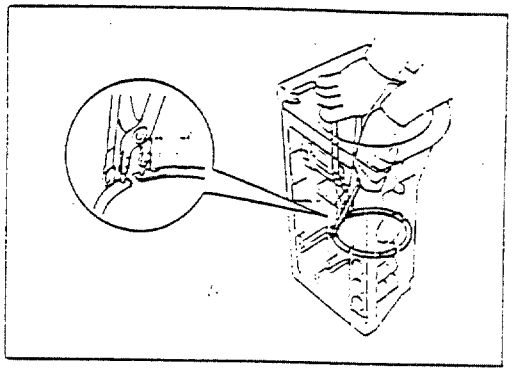


Check pack clearance of first and reverse brake

Using a feeler gauge, measure the clearance between the plate and second brake drum as shown in the figure.

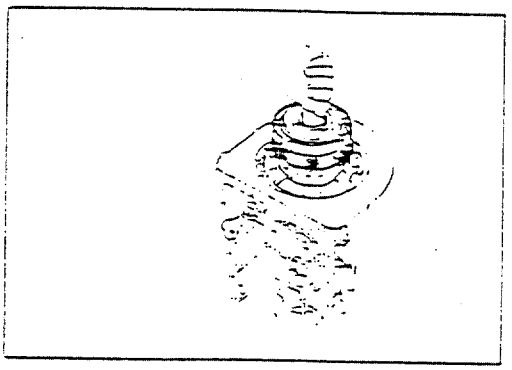
Clearance	mm(in.)	0.5 — 1.78 (0.0197 — 0.0701)

If the values are nonstandard, replace the discs.



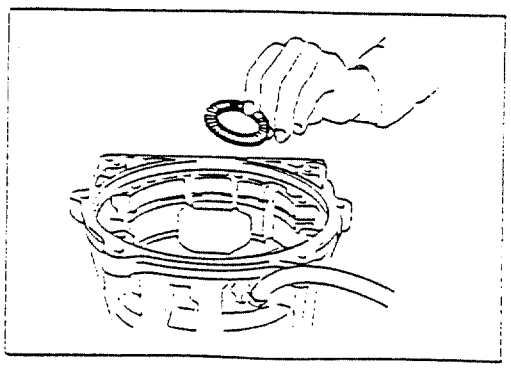
25. Snap ring

Using snap ring pliers, remove the snap ring.



26. Rear planetary gear, second brake drum and output shaft

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



27. Bearing

Remove the assembled thrust bearing and race from the case.

DISASSEMBLY, INSPECTION AND REASSEMBLY OF MINOR COMPONENTS

NOTICE:

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 a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.
Recommended ATF type BESCO ATF II or III.

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean and any fluid passages and holes 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:

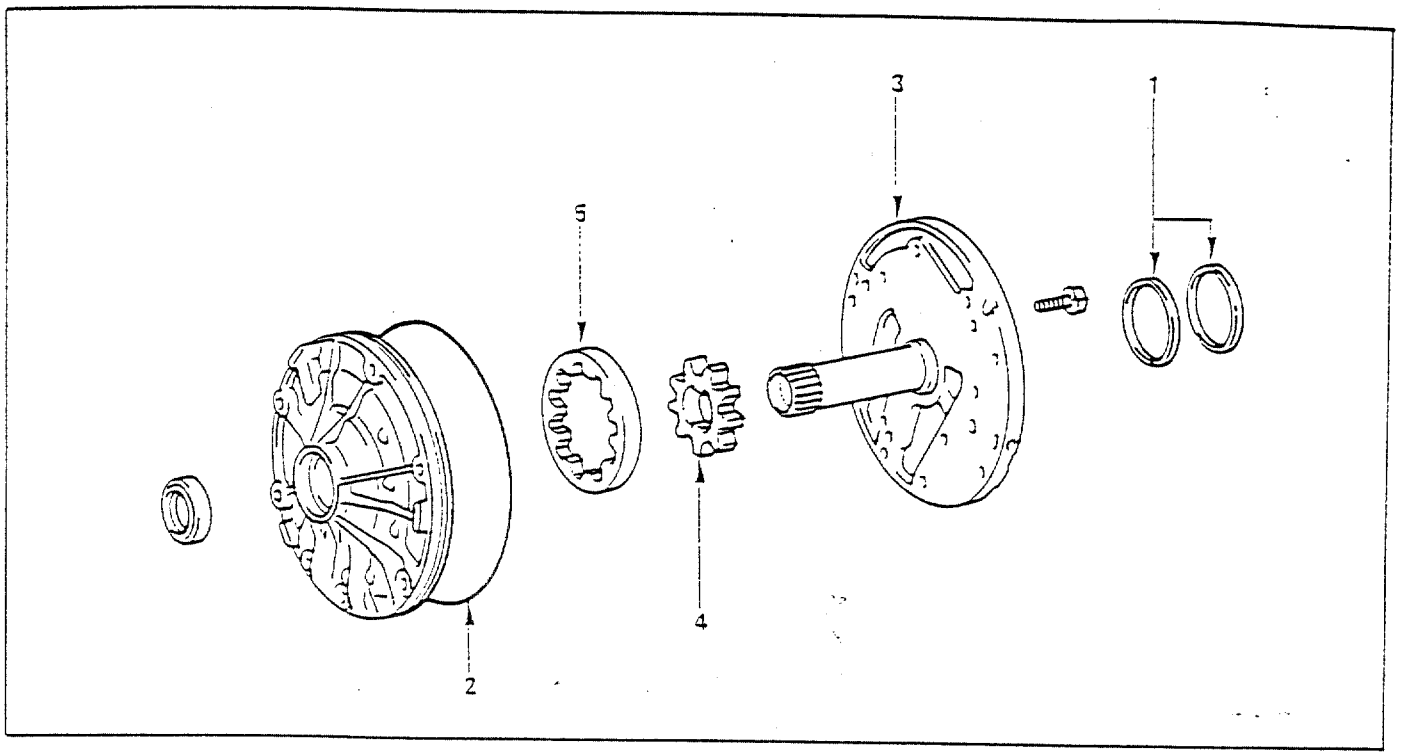
1. After cleaning, the parts should be arranged in proper order to allow performing inspection, repairs, and reassembly with efficiency.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New brakes and clutches that are to be used for replacement 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-rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.
4. If a worn bushing is to be replaced, the 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.

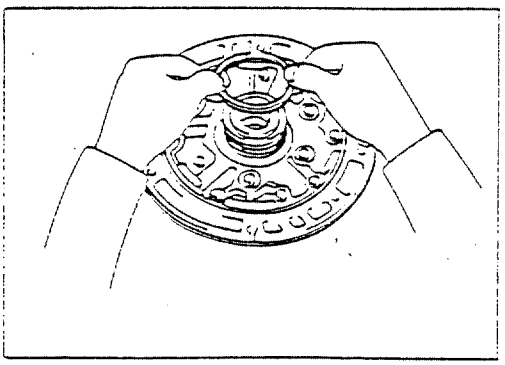
OIL PUMP

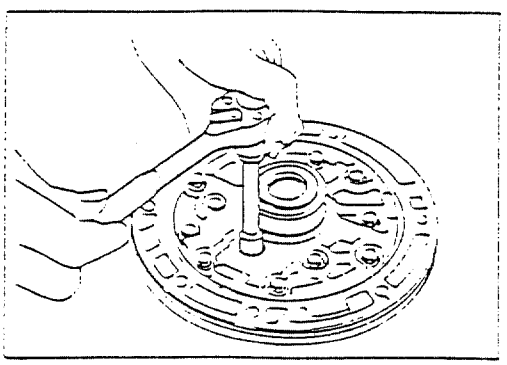
DISASSEMBLY



Disassembly steps

- ▲ 1. Oil seal ring
- ▲ 2. O-ring
- ▲ 3. Stator shaft
- 4. Oil pump drive gear
- 5. Oil pump driven gear





Important operations

1. Oil seal ring

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

2. O-ring

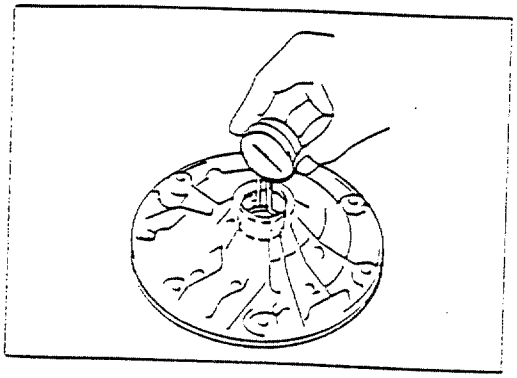
   Remove O-ring.

3. Stator shaft

   Remove 13 bolts, and then remove the stator shaft from oil pump body.
   Then remove drive and driven gear.

INSPECTION AND REPAIR

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

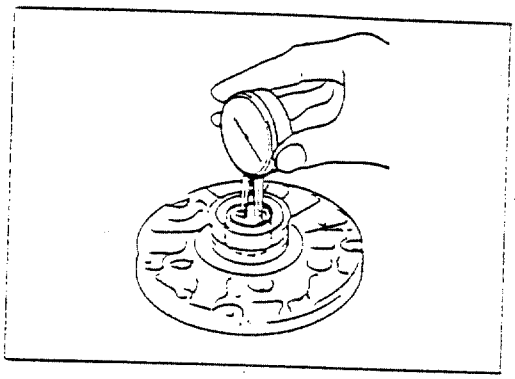


Check oil pump body bushing

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

	mm(in.)
Max. inside diameter	38.19 (1.5035)

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

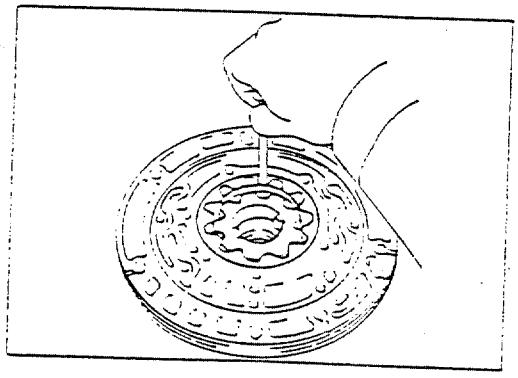


Check stator shaft bushing

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

		mm(in.)
Maximum inside diameter	Front side	21.58 (0.8496)
	Rear side	27.08 (1.0661)

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

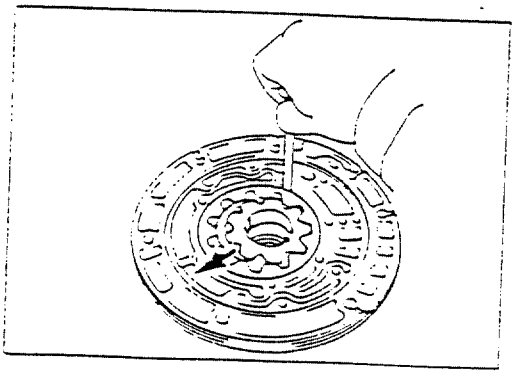


Check tip clearance of both gears

Measure between the gear teeth and the cresent-shaped part of the pump body.

	mm(in.)
Standard tip clearance	0.11 — 0.14 (0.0043 — 0.0055)
Maximum tip clearance	0.3 (0.012)

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

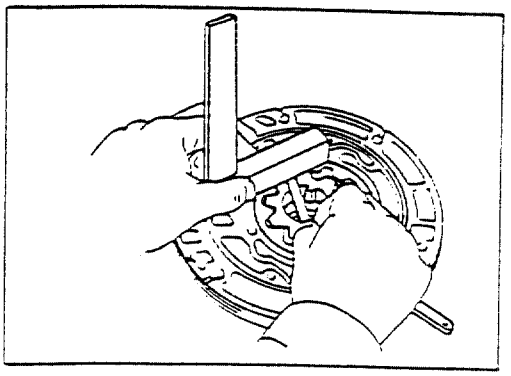


Check body clearance of driven gear

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

	mm(in.)
Standard body clearance	0.07 — 0.15 (0.0028 — 0.0059)
Maximum body clearance	0.3 (0.012)

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



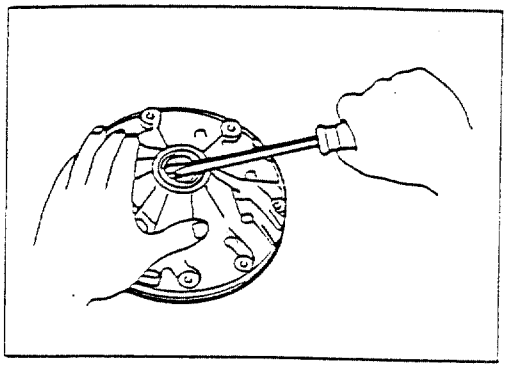
Check side clearance of both gears

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

mm(in.)

Standard side clearance	0.02 — 0.05 (0.0008 — 0.0020)
Maximum side clearance	0.1 (0.004)

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

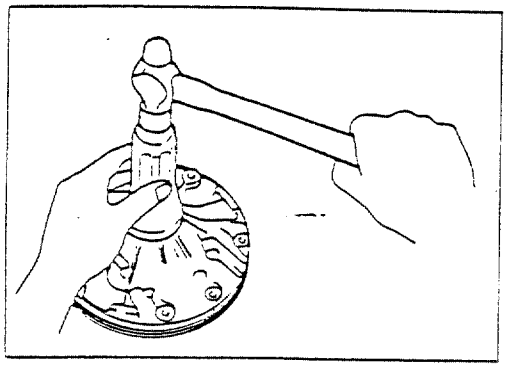


Check oil seal

Check for wear, damage or cracks.

If necessary, replace oil seal

Pry off the oil seal with a screwdriver.

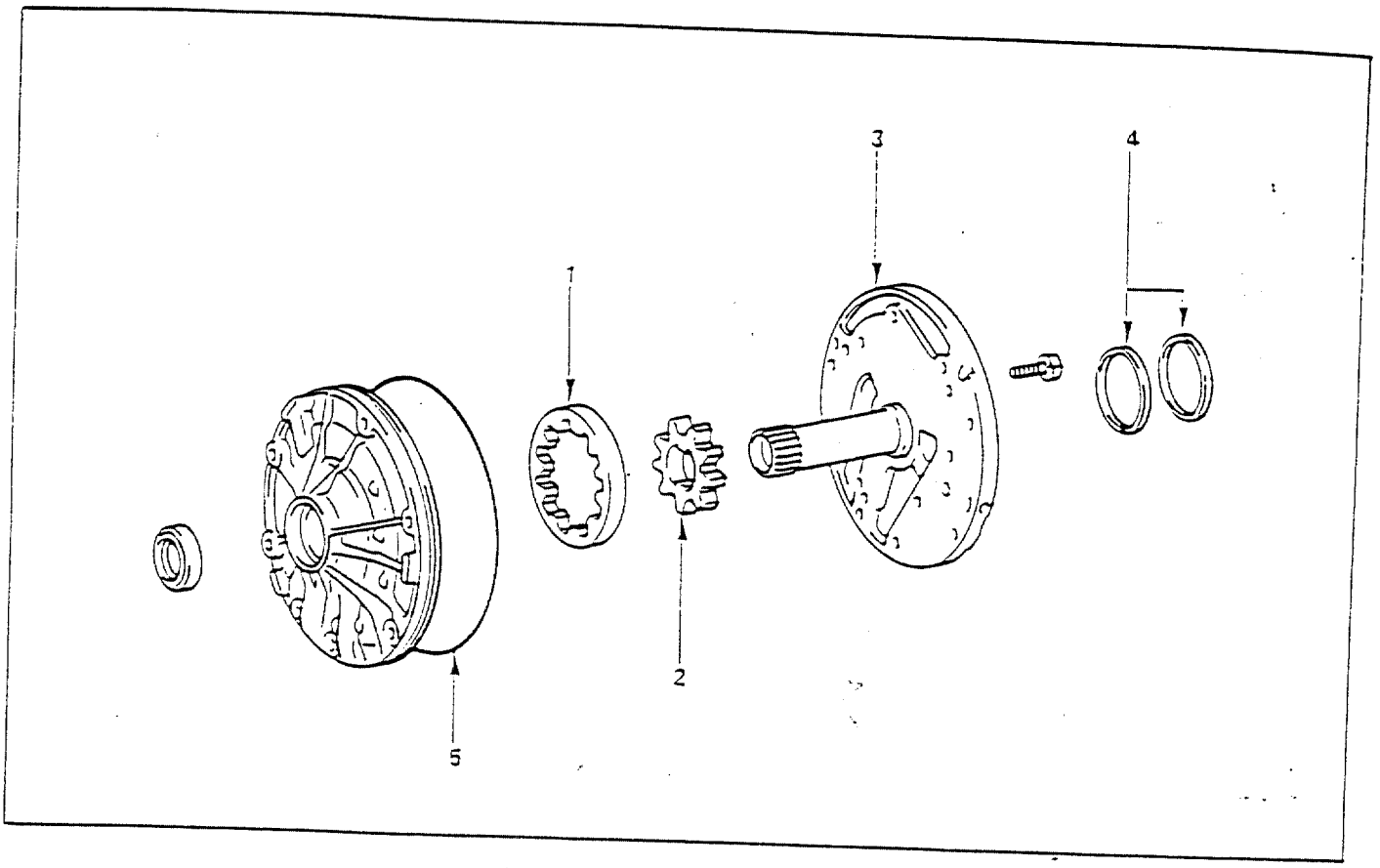


Using special tool, install a new oil seal.
The oil seal end should be flush with the outer edge of the pump body.

Oil seal installer : 5-8840-2256-0 (J-9617)

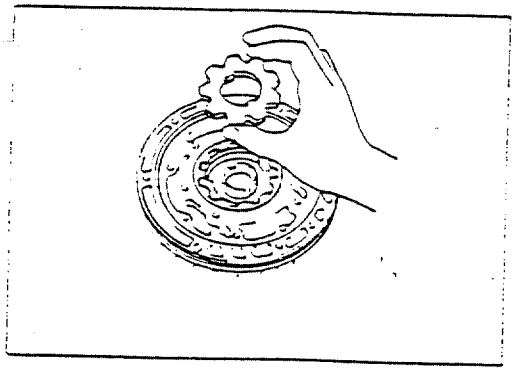
Coat the oil seal lip with multi purpose grease.

REASSEMBLY



Reassembly steps

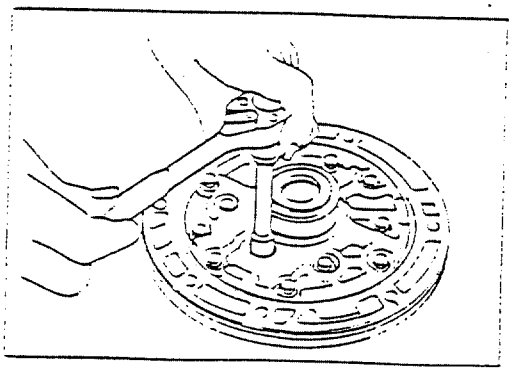
- ▲ 1. Oil pump driven gear
- 2. Oil pump drive gear
- ▲ 3. Stator shaft
- ▲ 4. Oil seal ring
- ▲ 5. O-ring



Important operations

1. Oil pump driven gear

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

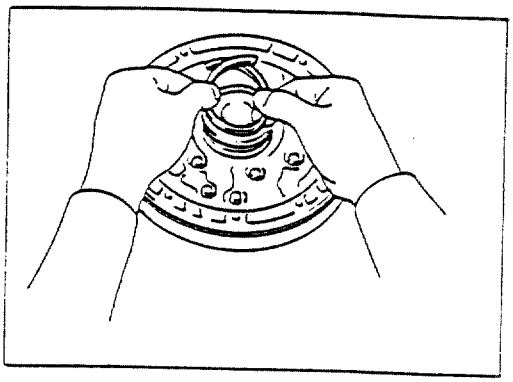


3. Stator shaft

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

N.m (kg.m/lb in)

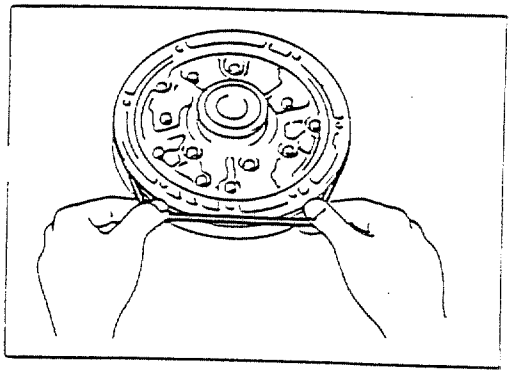
Torque	10 (1.0 / 86.74)



4. **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.

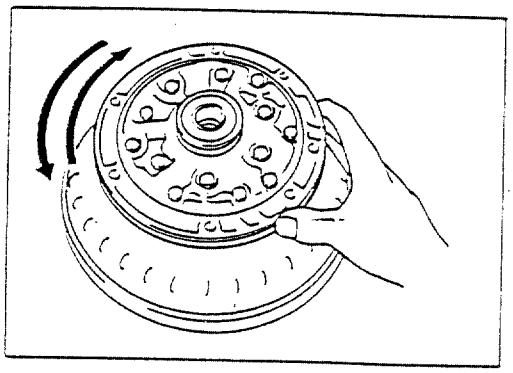


5. **O-ring**

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

mm(in.)

O-ring size (Reference)	Inside diameter	204.9 (8.067)
	Thickness	3.5 (0.138)

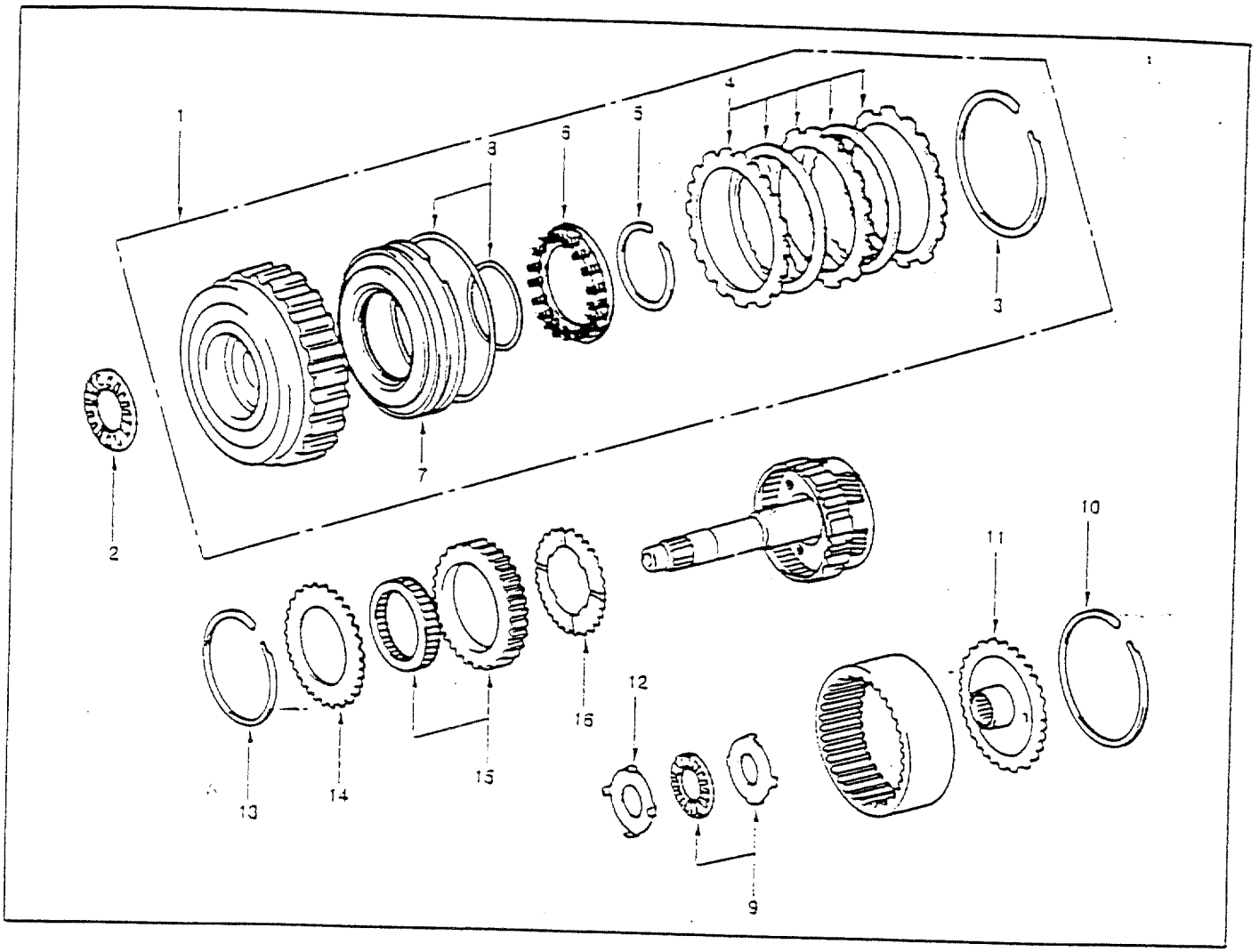


Check oil pump drive gear rotation

Make sure the drive gear rotates smoothly when installed to the torque converter.

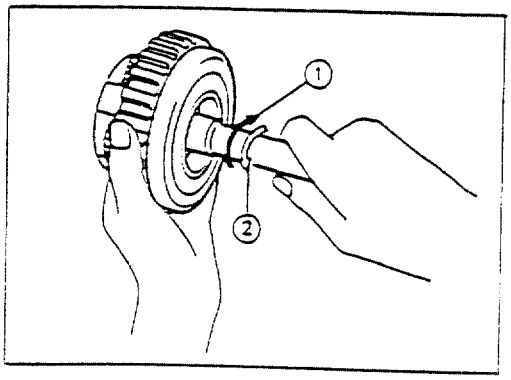
OD PLANETARY GEAR AND OD DIRECT CLUTCH ASSEMBLY (C-O)

DISASSEMBLY



Disassembly steps

- ▲ 1. OD direct clutch assembly
- ▲ 2. Thrust bearing
- ▲ 3. Snap ring
- ▲ 4. Flange, disc and plate
- ▲ 5. Snap ring
- ▲ 6. Piston return spring
- ▲ 7. OD direct clutch piston with O-ring
- ▲ 8. O-ring
- ▲ 9. Thrust bearing
- ▲ 10. Snap ring
- ▲ 11. Ring gear flange
- 12. Race
- ▲ 13. Snap ring
- ▲ 14. Retaining plate
- ▲ 15. OD one way clutch
- 16. Thrust washer

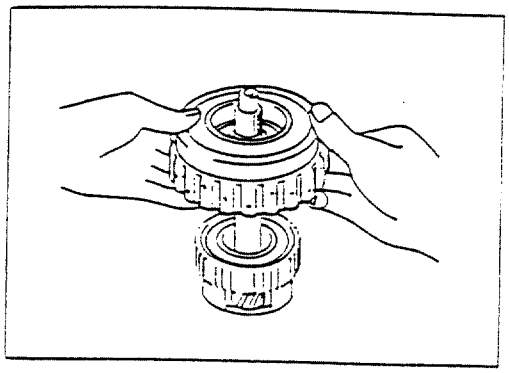


Important operations

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.

① : Free
② : Lock

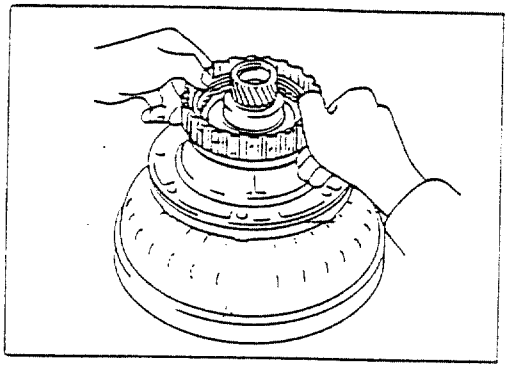


1. **OD direct clutch assembly**

   Remove OD direct clutch assembly from OD planetary gear.

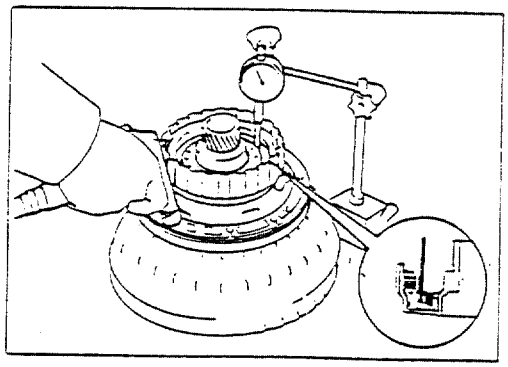
2. **Thrust bearing**

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



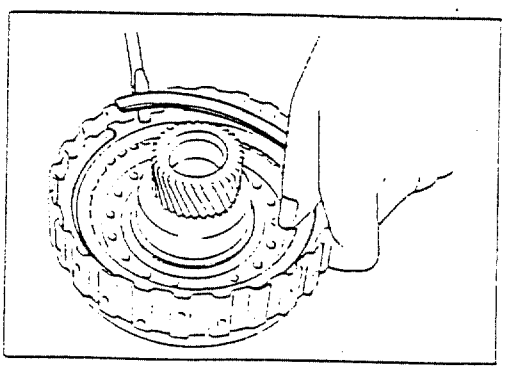
Check piston stroke of OD direct clutch (C-0)

Place the oil pump onto the torque converter, and then place the OD direct clutch assembly onto the oil pump.



Use a dial indicator, measure the OD direct clutch piston stroke applying and releasing the compressed air (4 — 8 kgf/cm², 57 — 114 psi, 392 — 785 kPa) as shown.

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

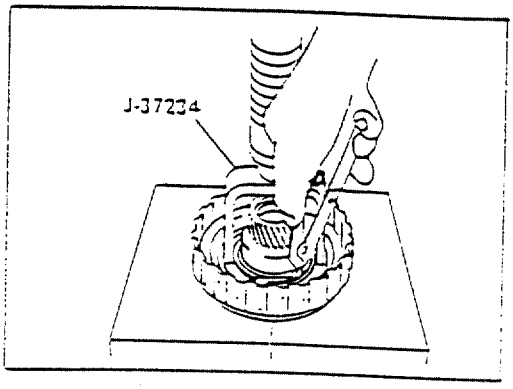


3. **Snap ring**

   Remove snap ring from clutch drum.

4. **Flange, disc and plate**

   Remove flange, two discs and two plates.



(11)

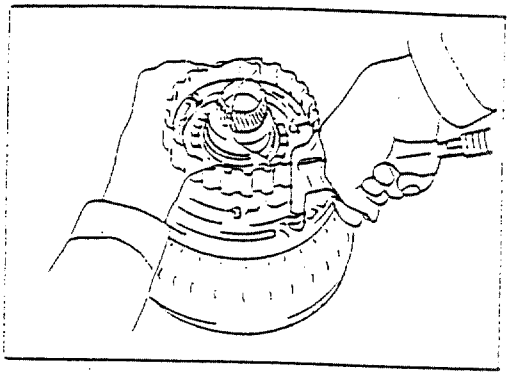
5. Snap ring

Place special tool on the spring retainer and compress the return spring. Using snap ring pliers, remove the snap ring.

Spring compressor : 5-8840-0251-0 (J-25048-1)

6. Piston return spring

Remove piston return spring.



7. OD direct clutch piston

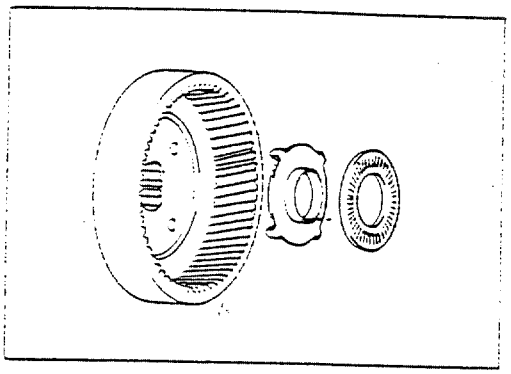
Place the oil pump onto the torque converter and then place the OD direct clutch onto the oil pump.

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.

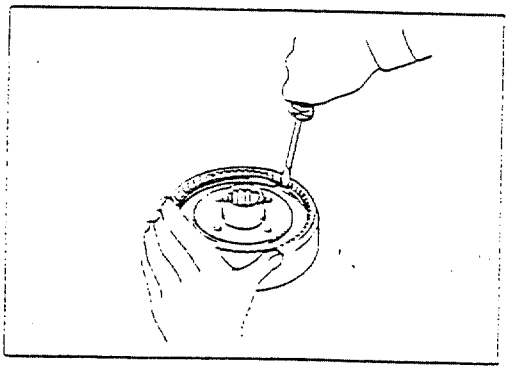
8. O-ring

Remove two O-rings from piston.



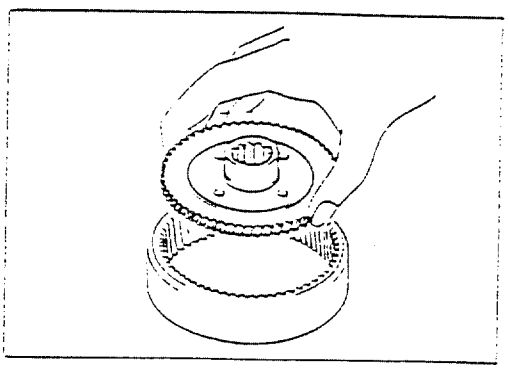
9. Thrust bearing

Remove bearing and race from OD planetary ring gear.



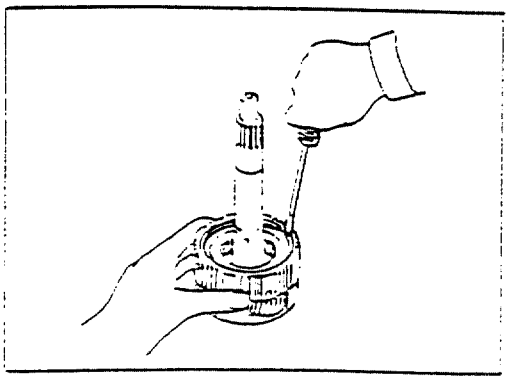
10. Snap ring

Remove snap ring.



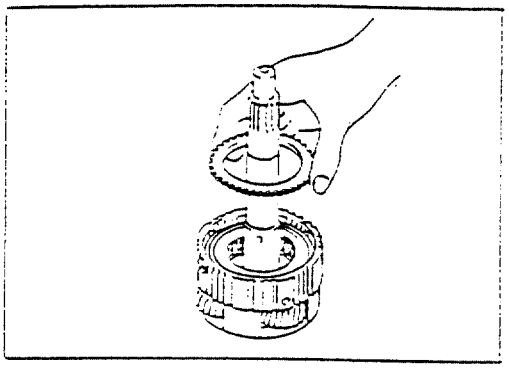
11. Ring gear flange

Remove ring gear flange from OD planetary ring gear.



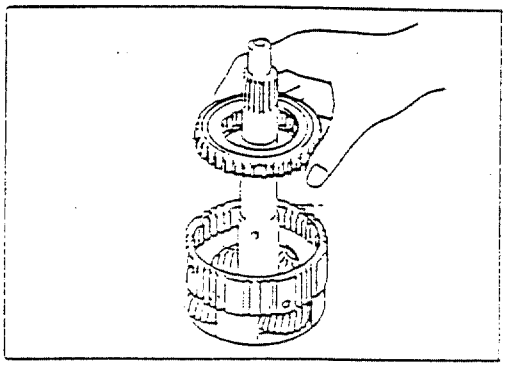
13. Snap ring

Remove snap ring, using screwdriver.



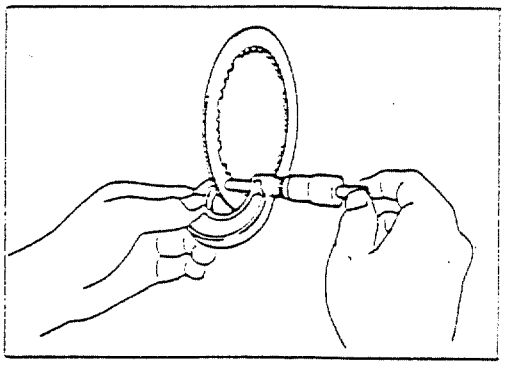
14. Remove retaining plate

Remove retaining plate from OD planetary gear.



15. OD one-way clutch

Remove OD one-way clutch with outer race.



INSPECTION AND REPAIR

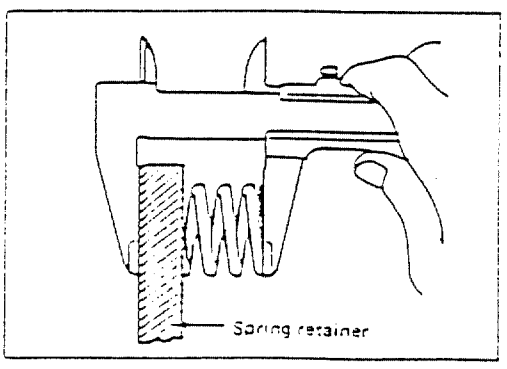
Check discs

Using a micrometer, measure the thickness of the discs.

mm(in.)

Minimum thickness	1.84 (0.0724)

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

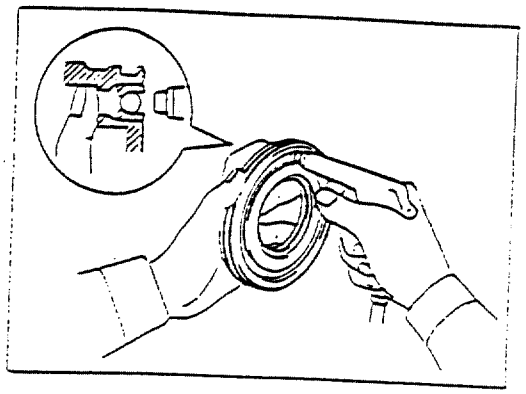


Check piston return spring

Using calipers, measure the free length of the return spring.

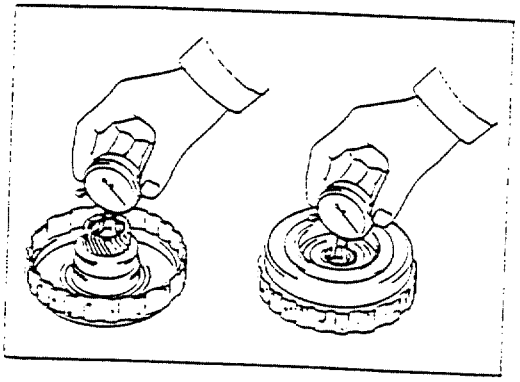
mm(in.)

Standard length	15.8 (0.622)



Check OD 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.

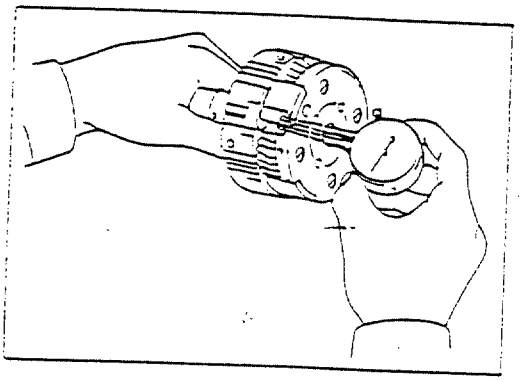


Check OD direct clutch drum bushings

Using a dial indicator, measure the inside diameter of the clutch drum bushings.

	mm(in.)
Maximum inside diameter	27.11 (1.0673)

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



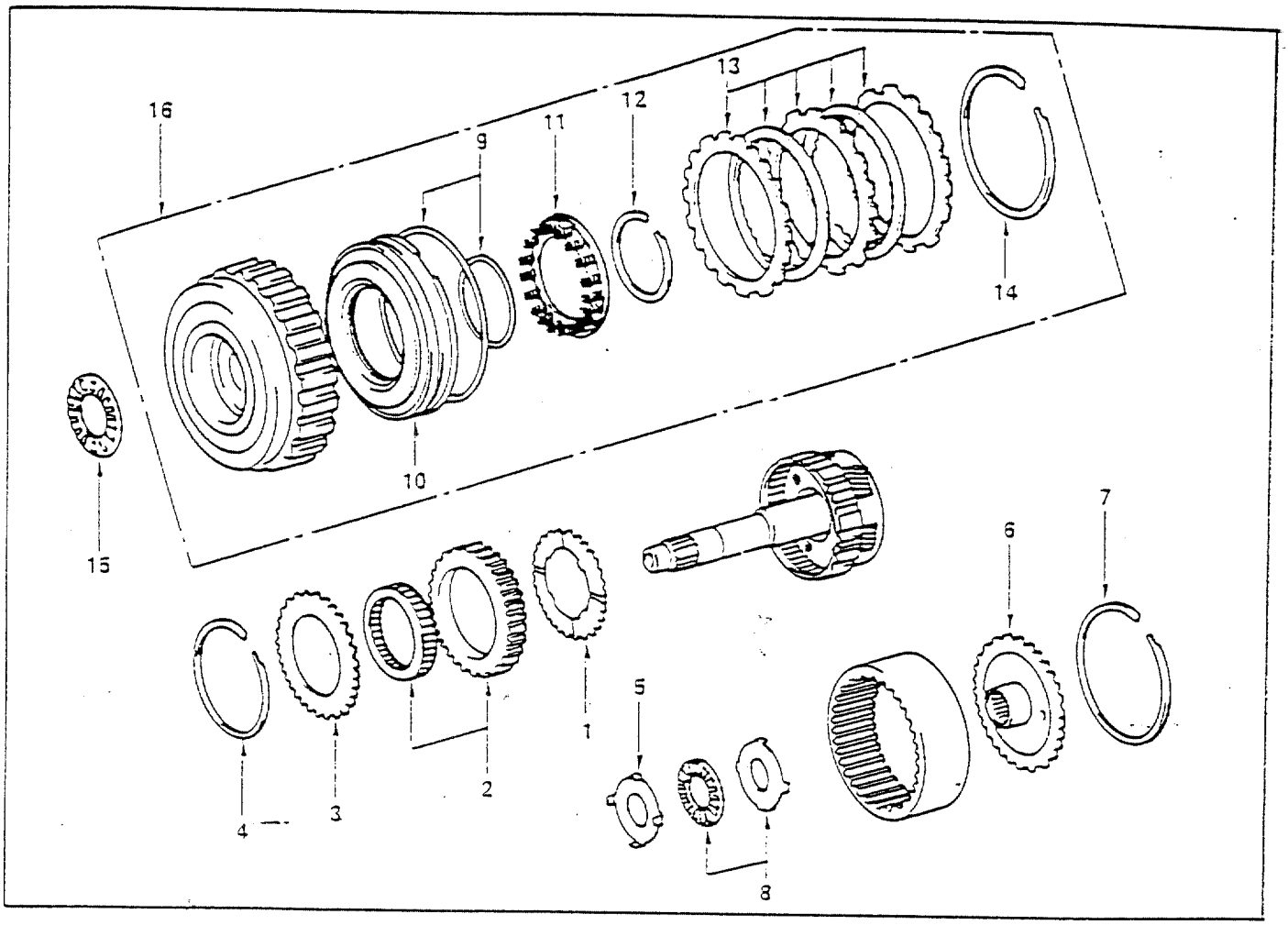
Check OD planetary gear bushing

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

	mm(in.)
Maximum inside diameter	11.27 (0.4437)

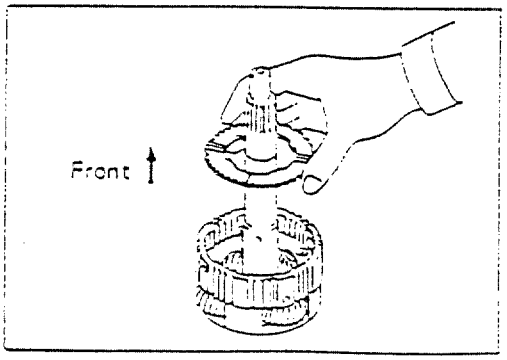
If the inside diameter is geeater than the maximum, replace the planetary gear.

REASSEMBLY



Reassembly steps

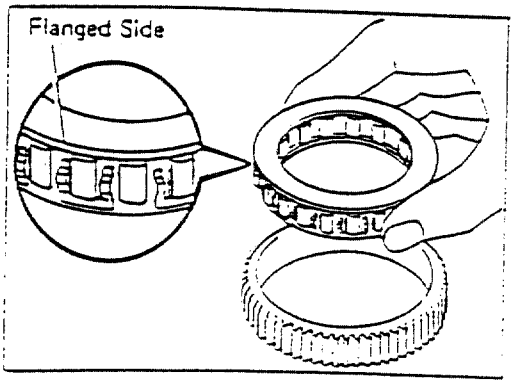
- ▲ 1. Thrust washer
- ▲ 2. OD one way clutch
- ▲ 3. Retaining plate
- ▲ 4. Snap ring
- ▲ 5. Race
- ▲ 6. Ring gear flange
- ▲ 7. Snap ring
- ▲ 8. Thrust bearing
- ▲ 9. O-ring
- ▲ 10. OD direct clutch piston with O-ring
- ▲ 11. Piston return spring
- ▲ 12. Snap ring
- ▲ 13. Flange, disc and plate
- ▲ 14. Snap ring
- ▲ 15. Thrust bearing
- ▲ 16. OD direct clutch assembly



Important operations

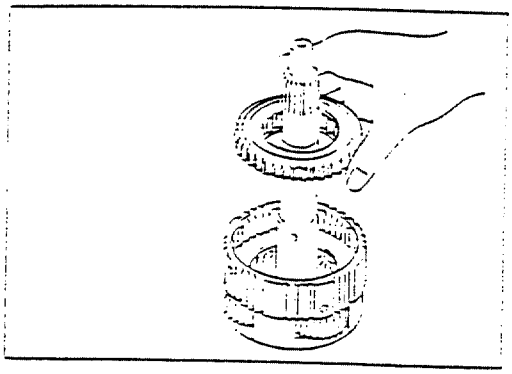
1. Thrust washer

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

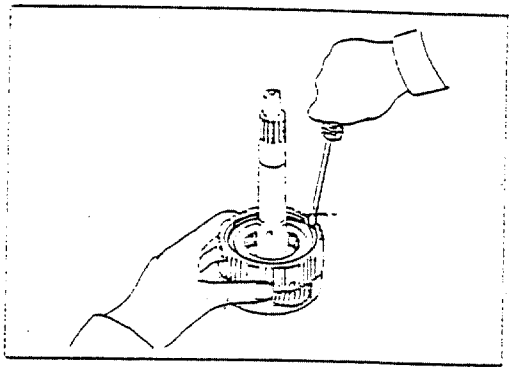


2. OD one-way clutch

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



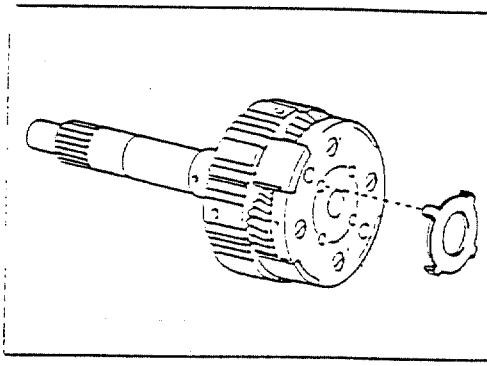
Install OD one-way clutch with outer race to overdrive planetary gear.



3. Retaining plate

4. Snap ring

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

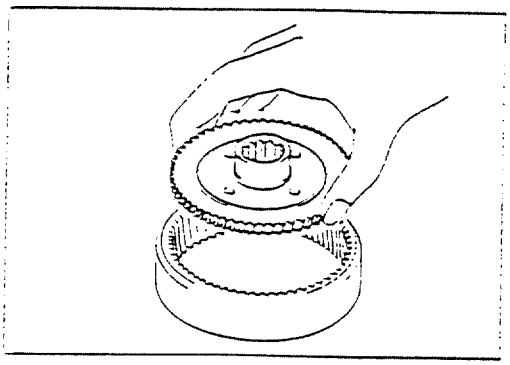


5. Race

Coat the race with petroleum jelly and install it to the planetary gear.

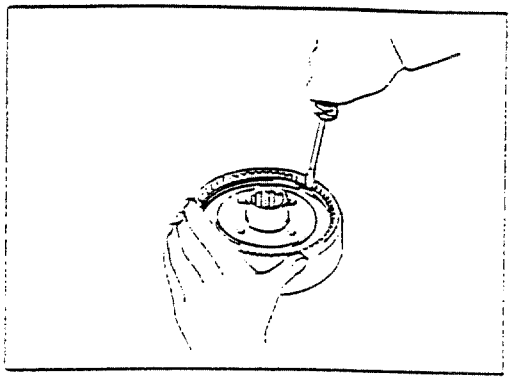
Note: Race diameter (Reference)

	mm (in.)
Inside diameter	27.3 (1.075)
Outside diameter	41.8 (1.646)



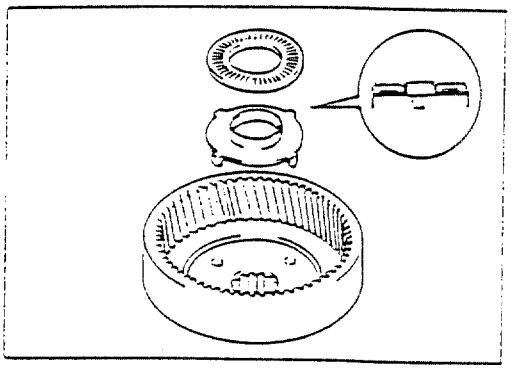
6. Ring gear flange

Install ring gear flange to OD planetary ring gear.



7. Snap ring

Install snap ring, using a screwdriver.



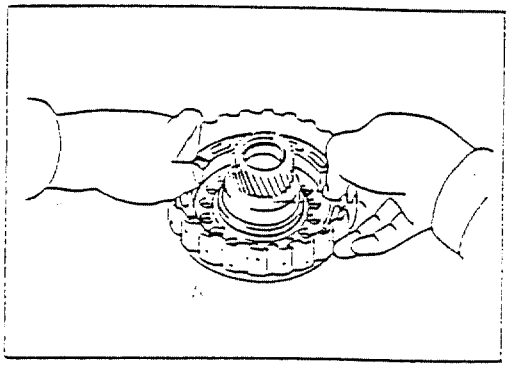
8. Thrust bearing

Coat the race and bearing with petroleum jelly and install them onto the OD planetary ring gear.

Note: Race and bearing diameter (Reference)

mm(in.)

	Inside	Outside
Race	24.2 (0.953)	47.8 (1.882)
Bearing	26.0 (1.024)	46.8 (1.843)

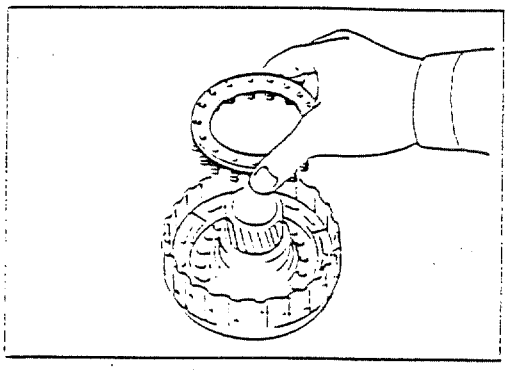


9. O-ring

Coat new O-rings with ATF and install them on the OD direct clutch piston.

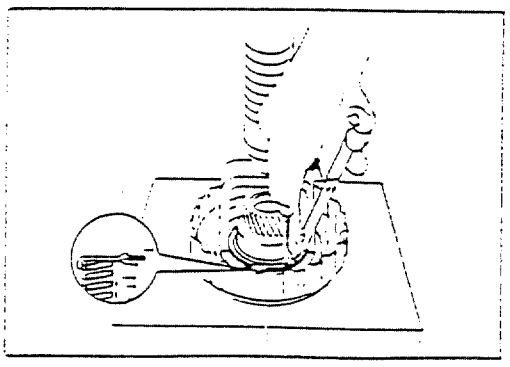
10. OD direct clutch piston with O-ring

Being careful not to damage the O-rings, press in the OD direct clutch piston into the clutch drum, using both hands.



11. Piston return spring

Install piston return spring.

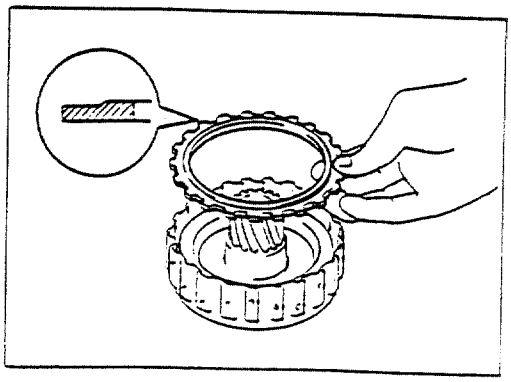


12. Snap ring

Place special tool on the spring retainer, and compress the return spring.

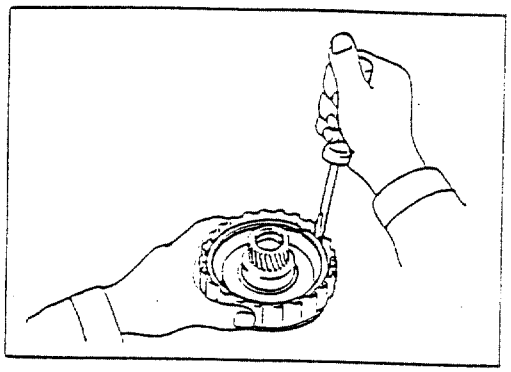
Spring compressor : 5-8840-0251-0 (J-25048-1)

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.



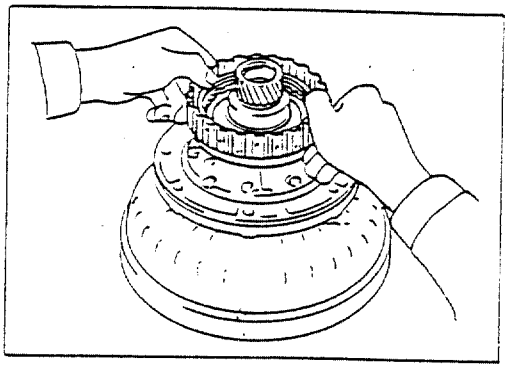
13. **Flange, disc and plate**

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



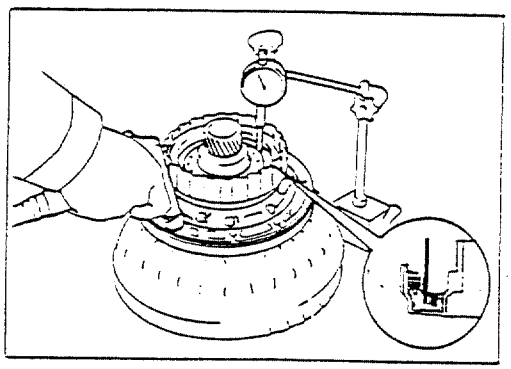
14. Snap ring

Install snap ring.



Check piston stroke of OD direct clutch (C-O).

Place the oil onto the torque converter, and then place the OD direct clutch assembly onto the oil pump.



Using a dial indicator, measure the OD direct clutch piston stroke by applying and releasing the compressed air (4 — 8 kg/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

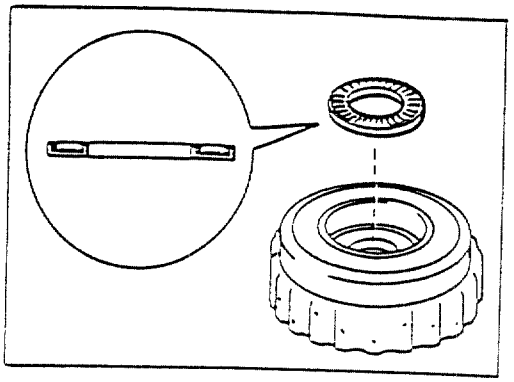
Piston stroke mm (in.)	1.85 – 2.15 (0.0729 – 0.0847)

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

Note: There are six flange sizes.

mm(in.)

No.	Flange thickness	No.	Flange thickness
16	3.6 (0.142)	19	3.3 (0.130)
17	3.5 (0.138)	20	3.2 (0.126)
18	3.4 (0.134)	21	3.1 (0.122)

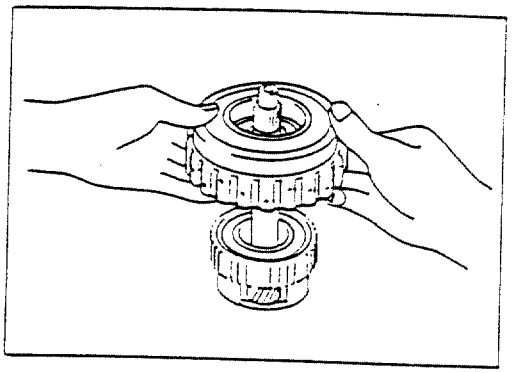


15. Thrust bearing

Coat the assembled bearing and race with petroleum jelly and install it with the race side facing downward.

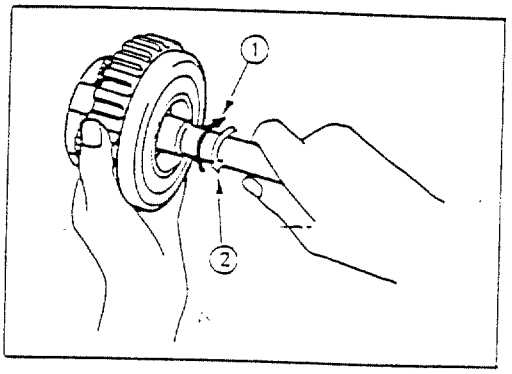
Note: Assembled bearing and race. (Reference)

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



16. OD direct clutch assembly

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



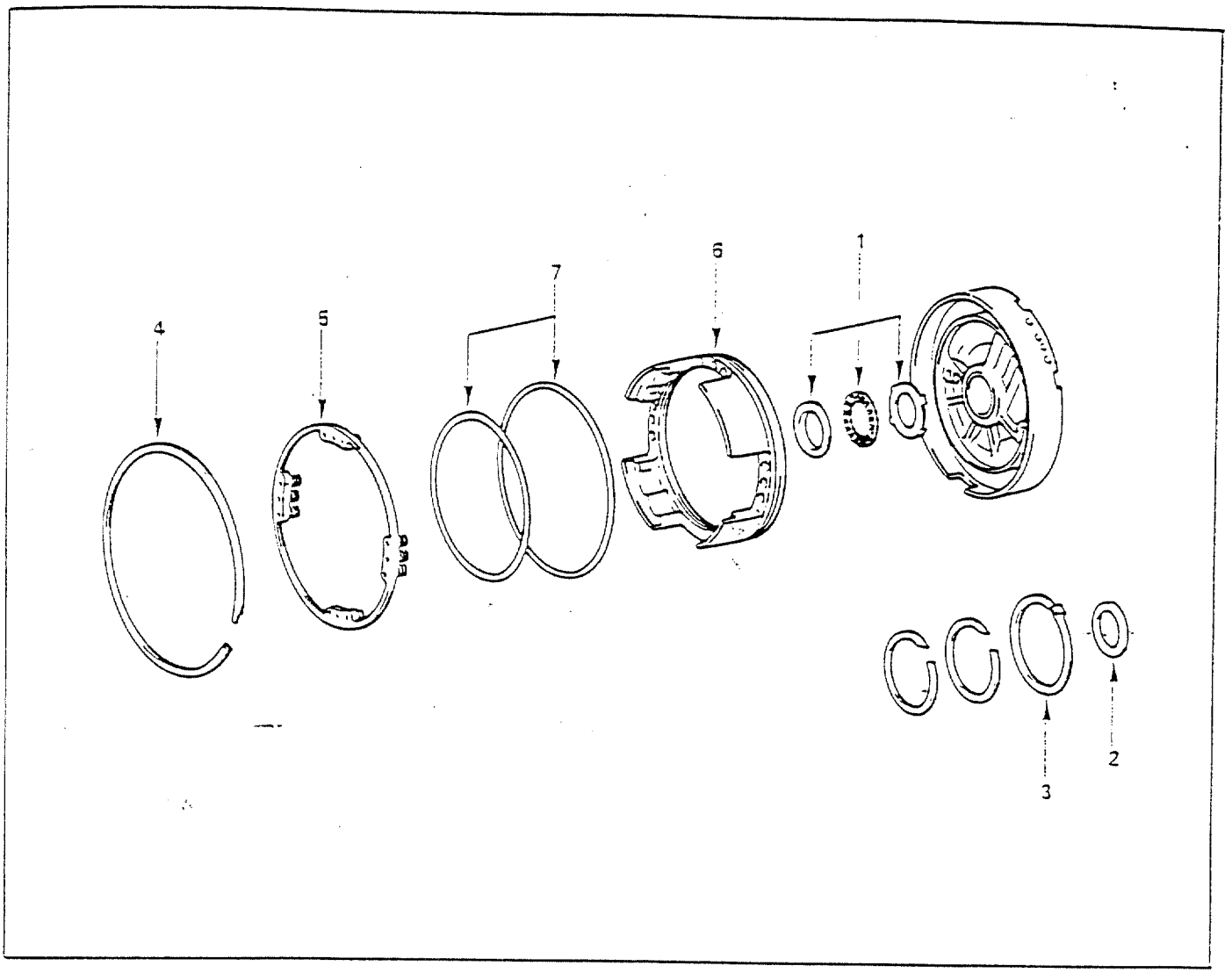
Check operation of one-way clutch.

Hold the OD direct clutch drum and turn the input shaft.
The input shaft should turn freely clockwise and should lock counterclockwise.

① : Free
② : Lock

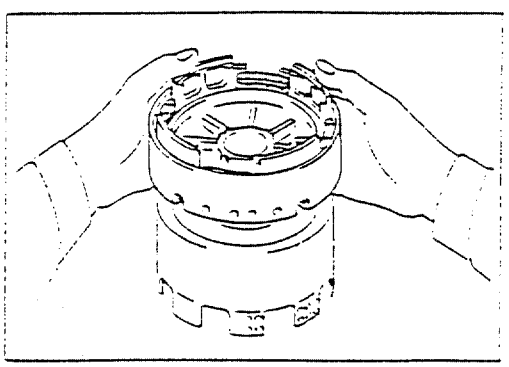
OD SUPPORT ASSEMBLY

DISASSEMBLY



Disassembly steps

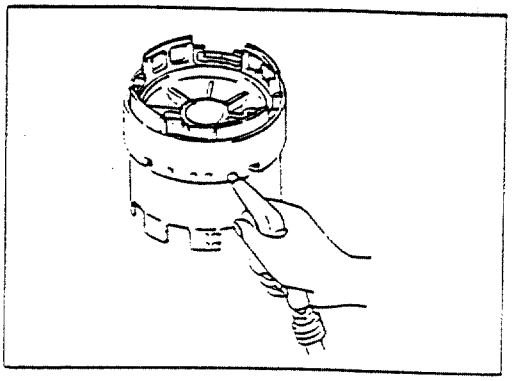
1. Thrust bearing
2. Race
3. Thrust washer (plastic)
▲ 4. Snap ring
5. Piston return spring
▲ 6. OD brake piston
7. O-ring



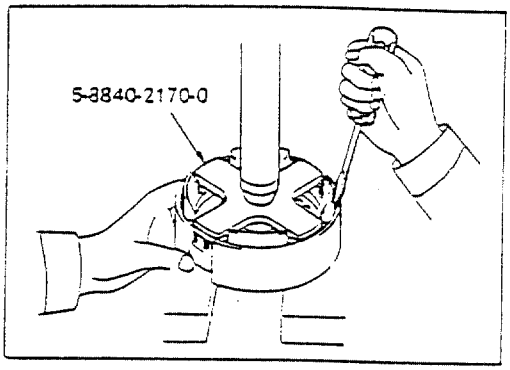
Important operations

Check OD brake piston.

Place the OD support assembly onto the direct clutch assembly.



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

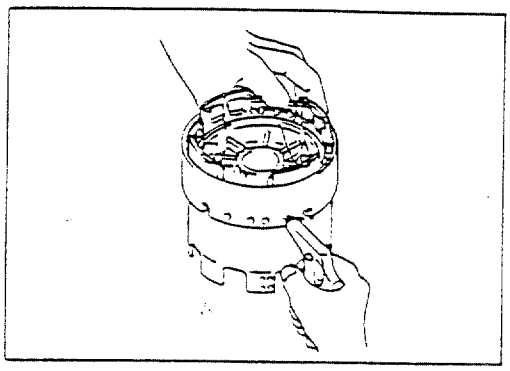


4. Snap ring

Place special tool on the spring retainer, and compress the return spring with a shop press.

Spring compressor : 5-8840-2170-0 (J-37233)

Remove the snap ring with a screwdriver.



6. OD brake piston

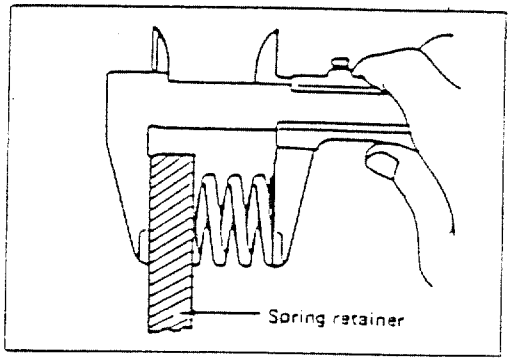
Place the OD support onto the direct clutch assembly.

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.

INSPECTION AND REPAIR

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

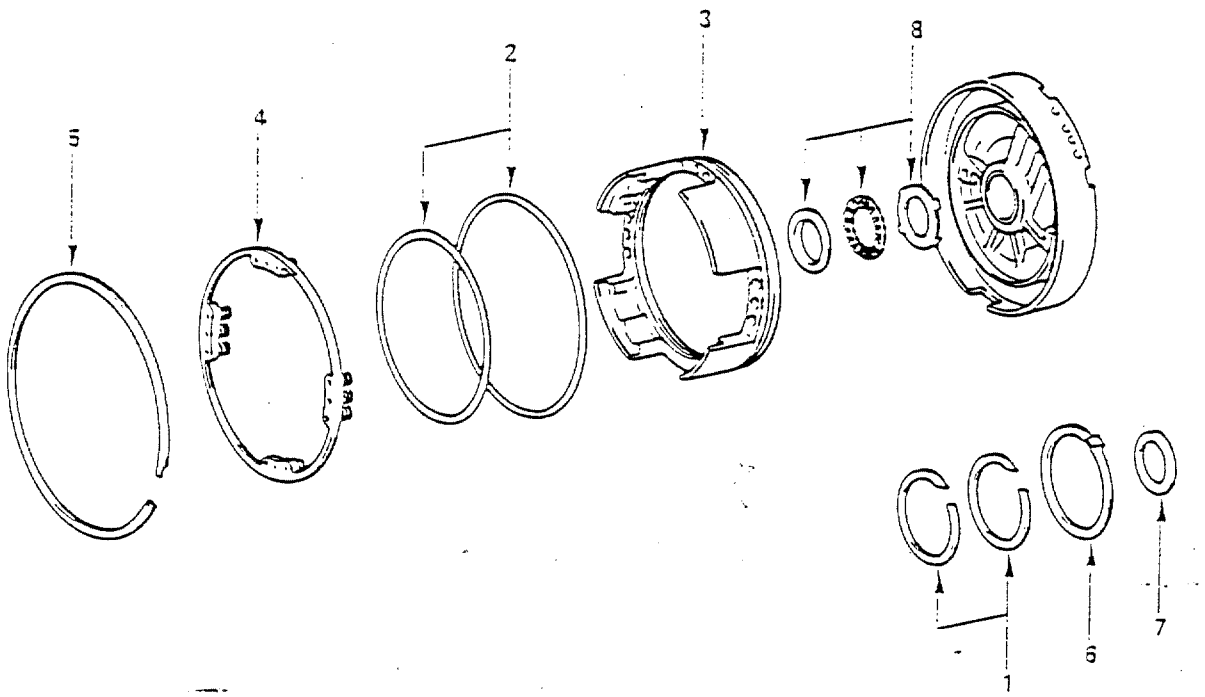


Check piston return spring

Using calipers, measure the free length of the return spring.

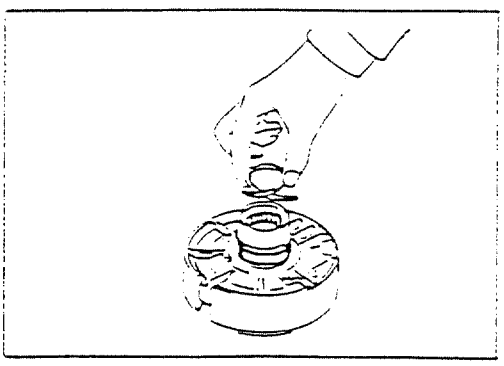
Standard	mm (in.)	17.2 (0.672)

REASSEMBLY



Reassembly steps

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



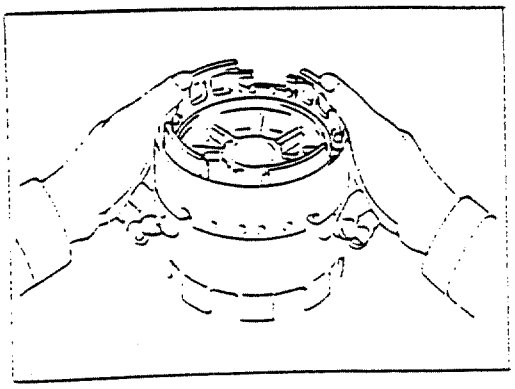
Important operations

1. Oil seal ring

   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.

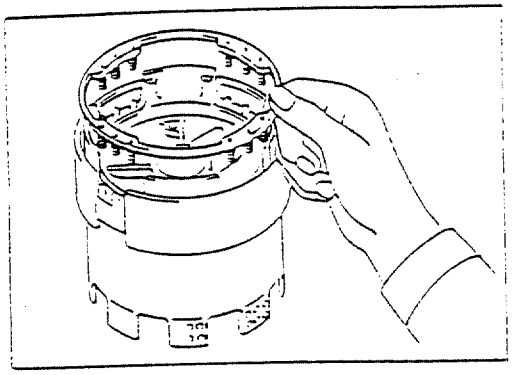


2. O-ring

Coat two new O-rings with ATF and install them on the OD brake piston.

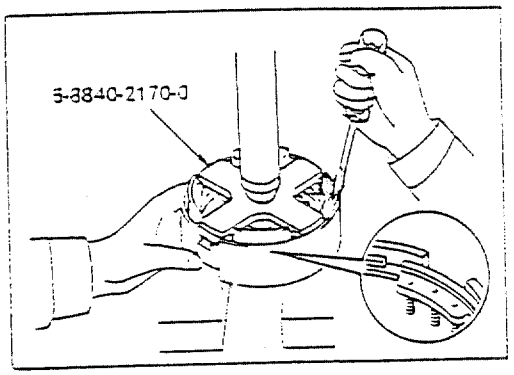
3. OD brake piston

Being careful not to damage the O-rings, press in the brake piston into the OD support, using both hands.



4. Piston return spring

Install piston return spring.

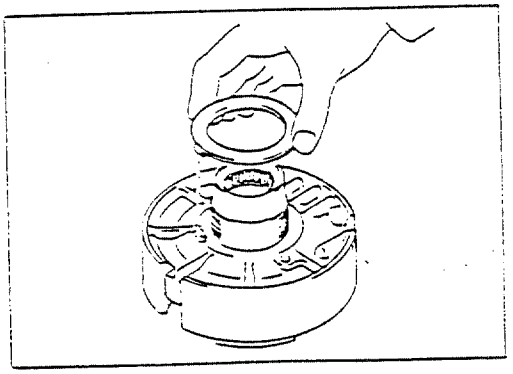


5. Snap ring

Place special tool on the spring retainer, and compress the return spring with a shop press.

Spring compressor : 5-8840-2170-0 (J-37233)

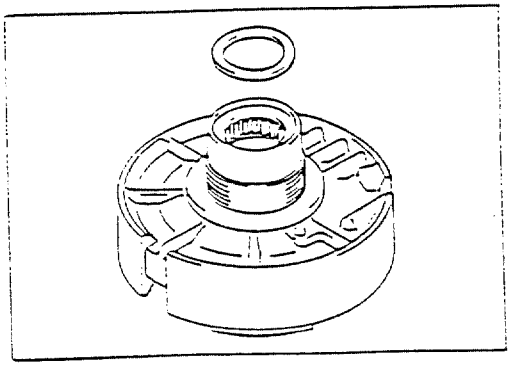
Install the snap ring with a screwdriver. Be sure the end gap of the snap ring is not aligned with cutout portion of the OD suppport.



6. Thrust washer (plastic)

Coat the thrust washer with petroleum jelly and install it onto the OD support.

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



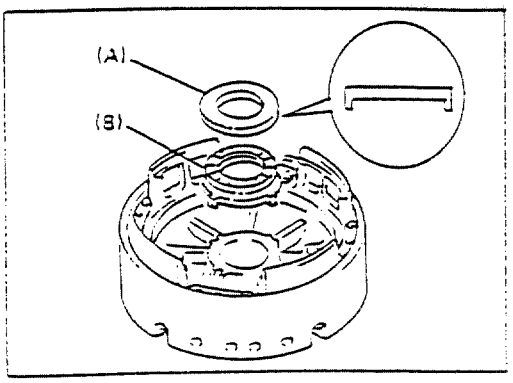
7. Race

Coat the race with petroleum jelly, and install it onto the OD support.

Note: Race diameter (Reference)

mm(in.)

Inside diameter	36.8 (1.450)
Outside diameter	50.9 (2.004)



8. Thrust bearing

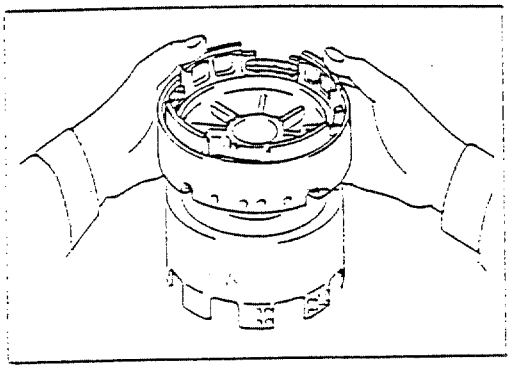
Turn over OD support.

Coat the two races with petroleum jelly, and install them onto the OD support.

Note: Race and bearing diameter (Reference)

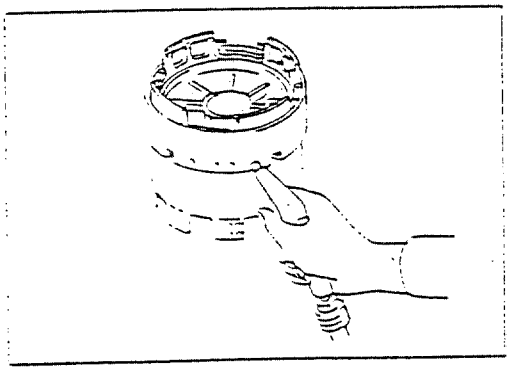
mm(in.)

	Inside	Outside
Race (A)	37.2 (1.465)	58.8 (2.315)
Bearing	36.5 (1.437)	48.5 (1.910)
Race (B)	33.7 (1.327)	50.1 (1.973)



Check OD brake piston.

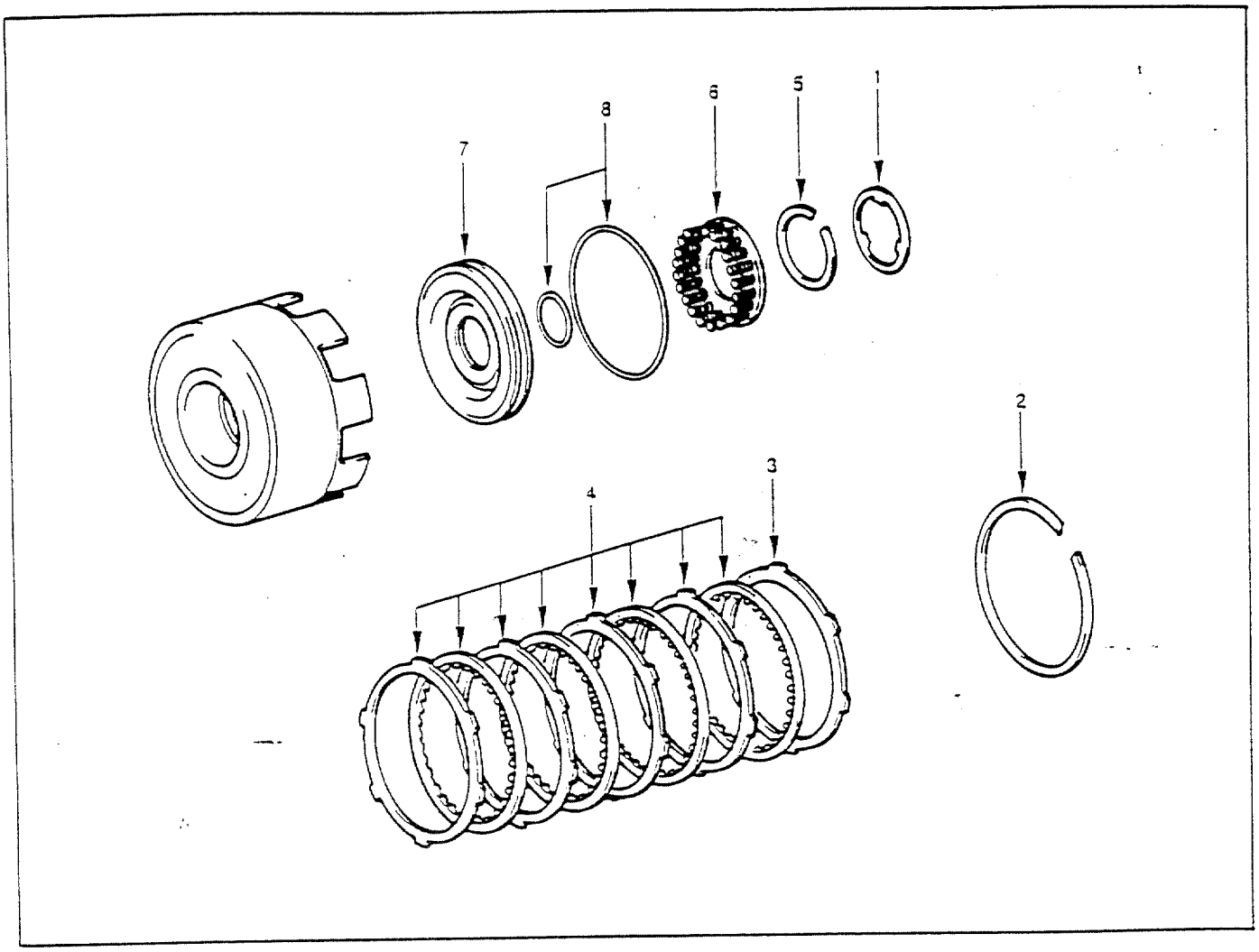
Place the OD support assembly onto the direct clutch assembly.



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

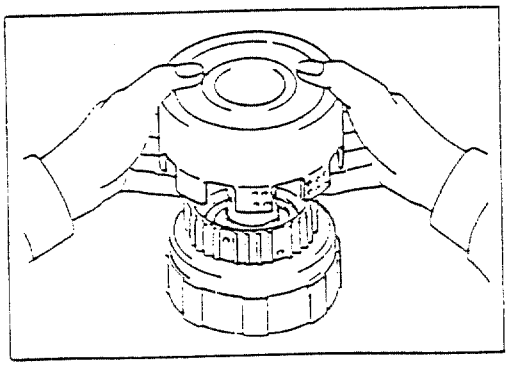
DIRECT CLUTCH ASSEMBLY (C-2)

DISASSEMBLY



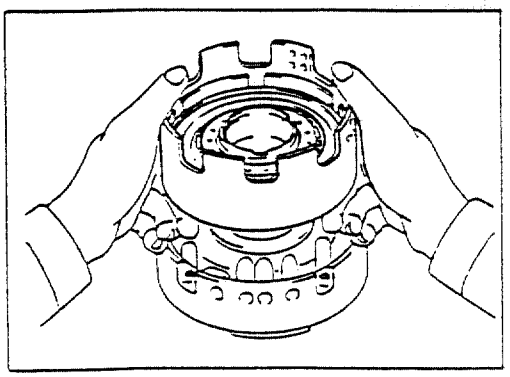
Disassembly steps

1. Clutch drum thrust washer
2. Snap ring
3. Flange
4. Plate and disc
- ▲ 5. Snap ring
6. Piston return spring
- ▲ 7. Direct clutch piston
8. O-ring



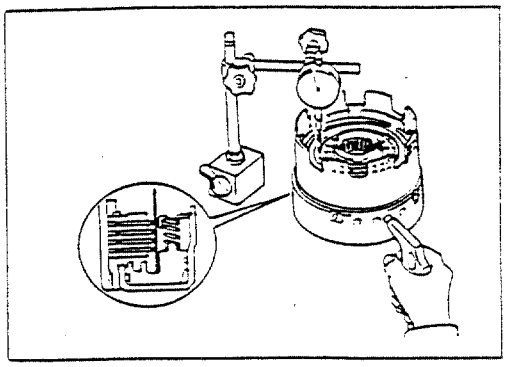
Important operations

Remove direct clutch drum assembly from forward clutch assembly.



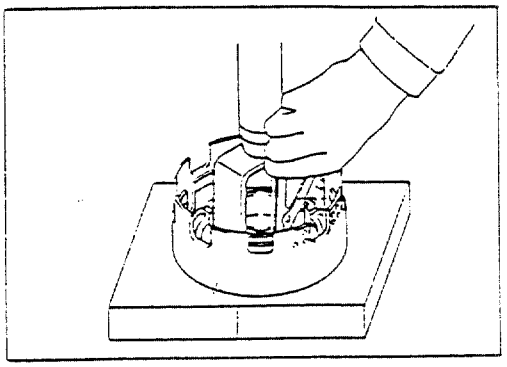
Check piston stroke of direct clutch (C-2)

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 (4 — 8 kgf/cm², 57 — 114 psi, 392 — 785 kPa) as shown.

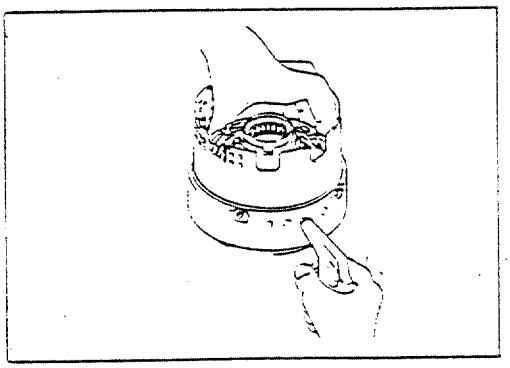
Piston stroke	mm(in.)	1.03 — 1.33 (0.0406 — 0.0524)



5. Snap ring

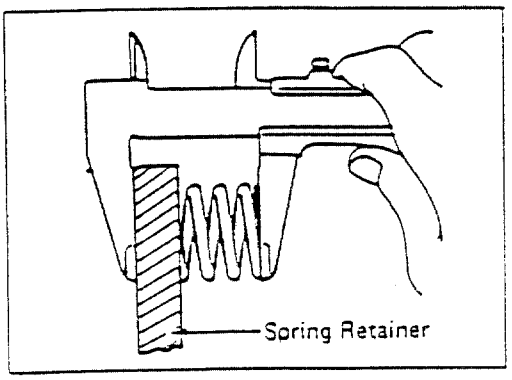
Place special tool on the spring retainer and compress the return spring. Using snap ring pliers, remove the snap ring.

Spring compressor : 5-8840-0251-0 (J-25048-1)



7. Direct clutch piston

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.
Remove two O-rings from piston.

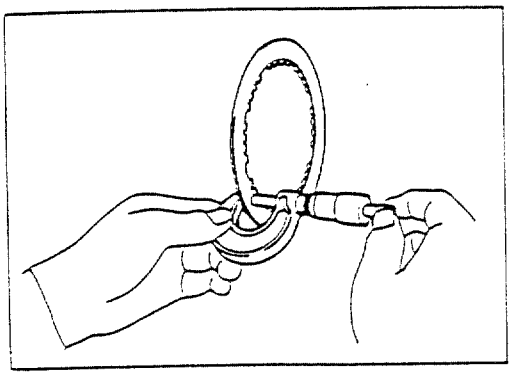


INSPECTION AND REPAIR

Check piston return spring

Using calipers, measure the free length of the return spring.

Standard	mm (in.)	21.3 (0.839)

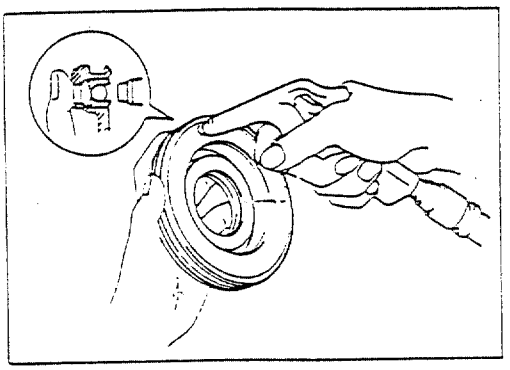


Check discs

Using a micrometer, measure the thickness of the discs.

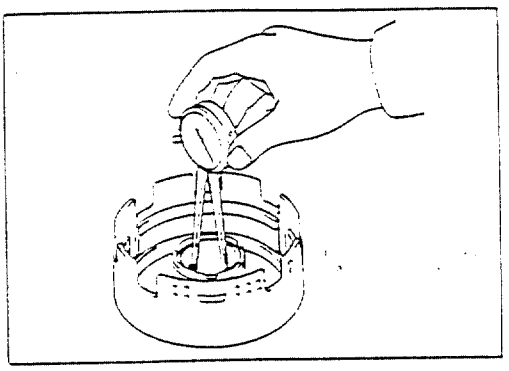
	mm(in.)
Minimum thickness	1.84 (0.0724)

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



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.



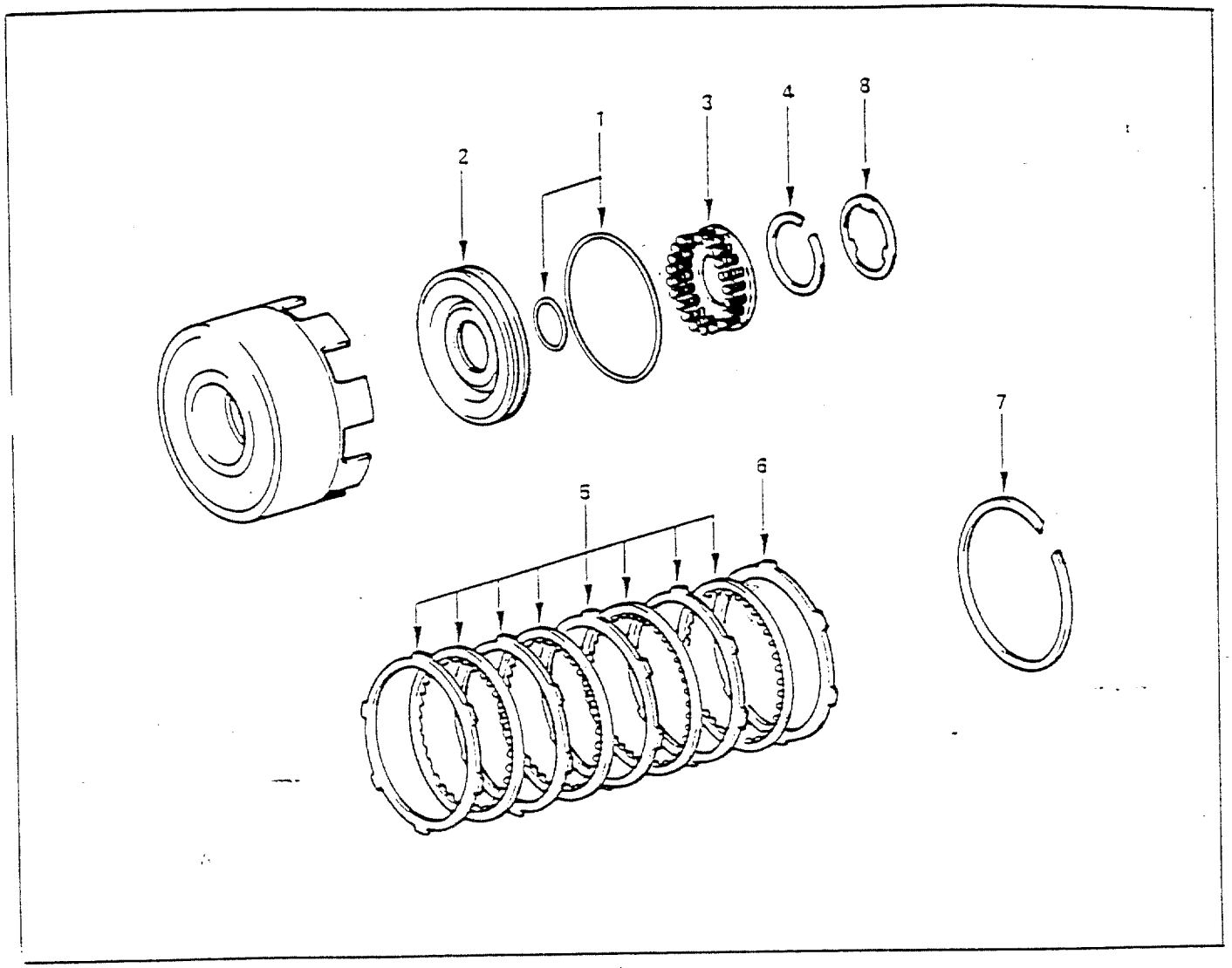
Check direct clutch drum bushing

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

	mm(in.)
Maximum inside diameter	53.97 (2.1248)

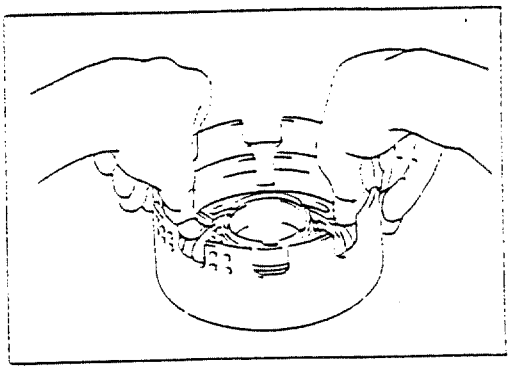
If the inside diameter is greater than the maximum, replace the clutch drum.

REASSEMBLY



Reassembly steps

- ▲ 1. O-ring
- ▲ 2. Direct clutch piston
- ▲ 3. Piston return spring
- ▲ 4. Snap ring
- ▲ 5. Disc and plate
- ▲ 6. Flange
- ▲ 7. Snap ring
- ▲ 8. Clutch drum thrust washer (plastic)



Important operations

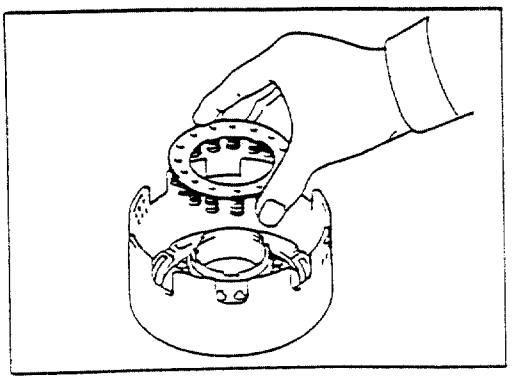
1. O-ring

   Coat new O-rings with ATF and install them on the direct clutch piston.

2. Direct clutch piston

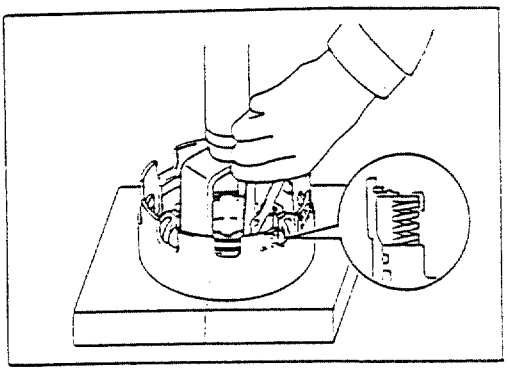
   Install direct clutch piston to direct clutch drum.

   Being careful not to damage the O-rings, press in the direct clutch piston into the clutch drum, using both hands.



3. Piston return spring

Install piston return spring.

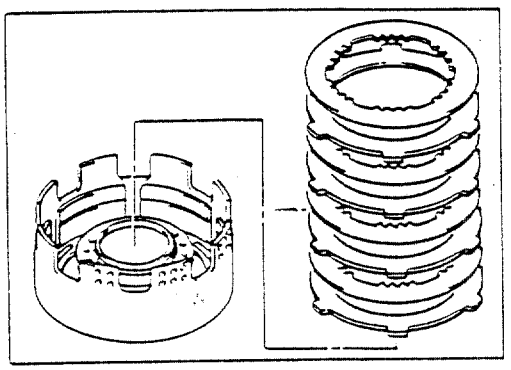


4. Snap ring

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 : 5-8840-0251-0 (J-25048-1)

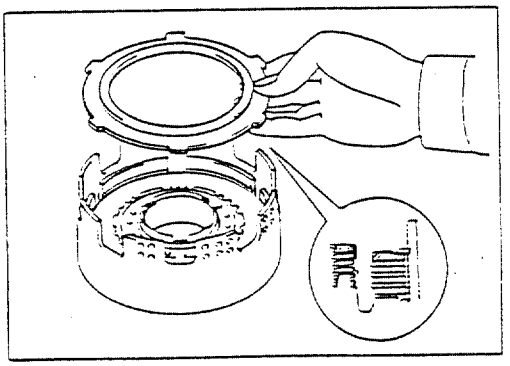


5. Disc and plate

Install plates and discs.

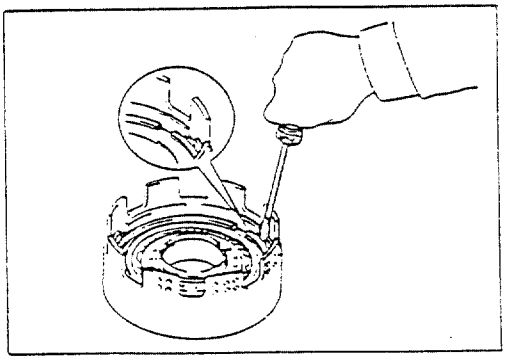
Install in order: P – D – P – D – P – D – P – D – P – D

P : Plate, D : Disc



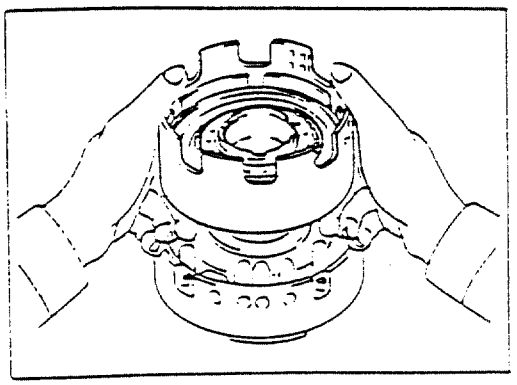
6. Flange

Install the flange, with the flat side facing downward.



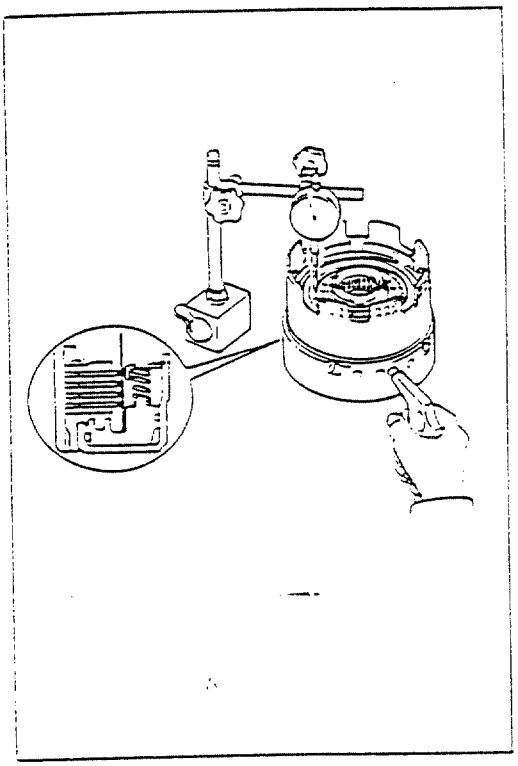
7. Snap ring

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.



Check piston stroke of direct clutch (C-2)

Place the direct clutch assembly onto the OD support assembly.



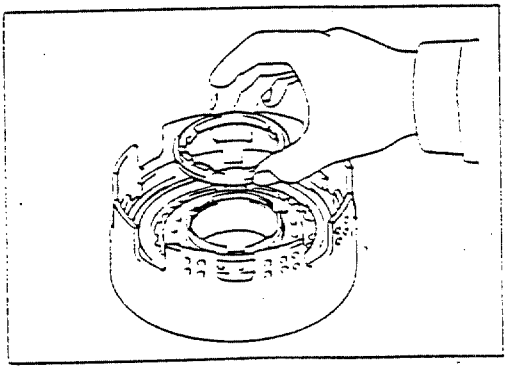
Using a dial indicator, measure the direct clutch piston stroke by applying and releasing compressed air (4 — 8 kgf/cm², 57 — 114 psi, 392 — 785 kPa) as shown.

Piston stroke mm (in.)	1.37 – 1.60 (0.0540 – 0.0630)

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

Note: There are eight flanges. mm(in.)

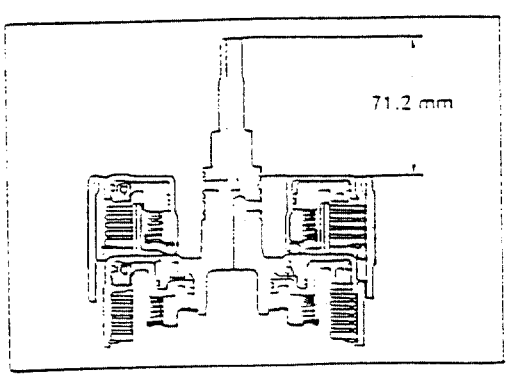
No.	Flange thickness	No.	Flange thickness
8	3.0 (0.118)	4	3.4 (0.134)
7	3.1 (0.122)	3	3.5 (0.138)
6	3.2 (0.126	2	3.6 (0.142)
5	3.3 (0.130)	1	3.7 (0.146)



8. Clutch drum thrust washer (plastic)

Coat the thrust washer 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.



Install direct clutch assembly

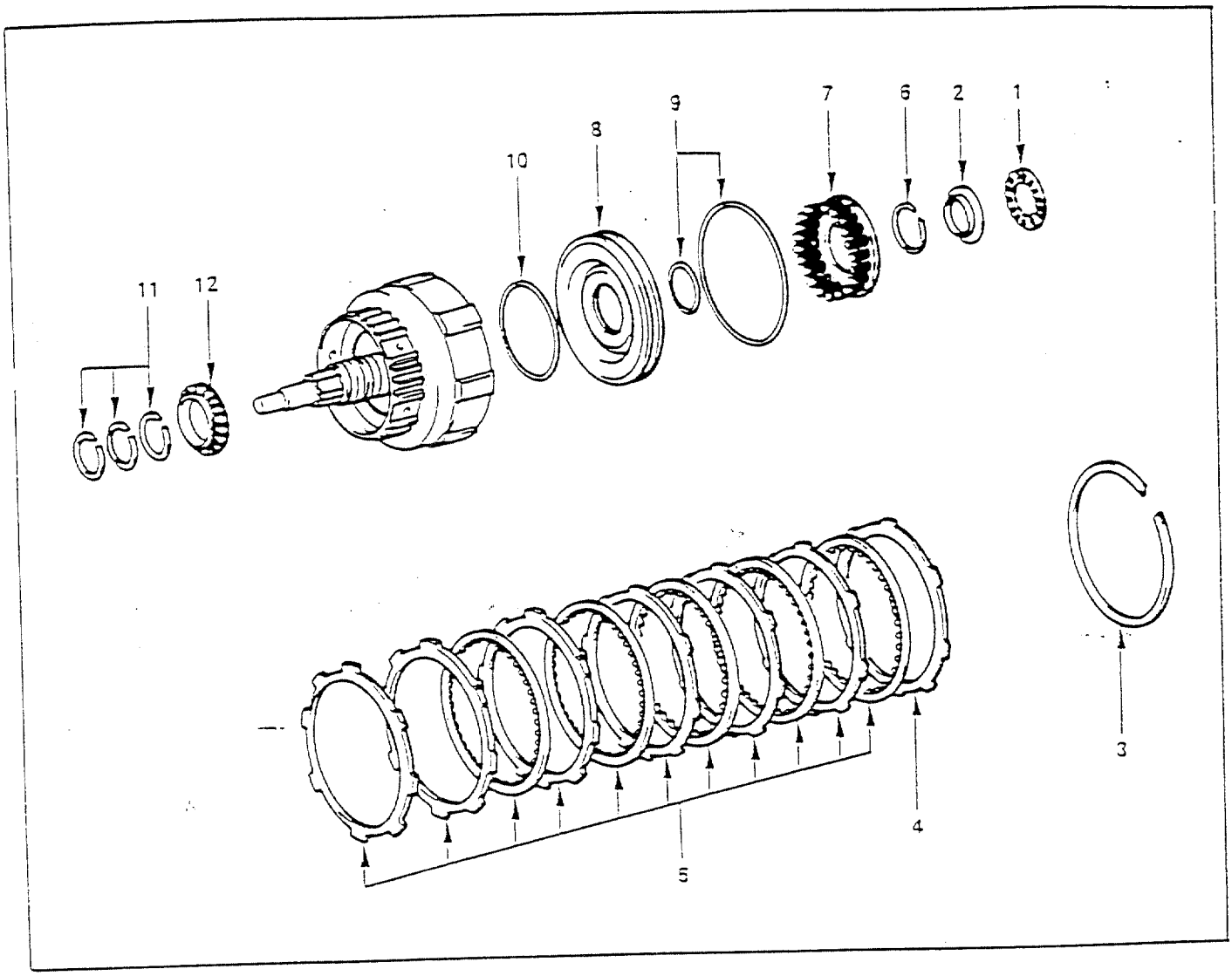
Align the flukes of discs in the direct clutch.

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 71.2 mm (2.803 in.).

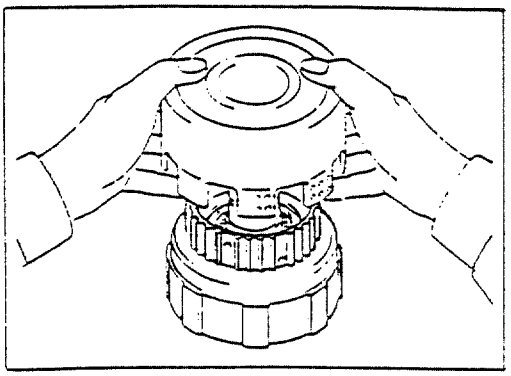
FORWARD CLUTCH ASSEMBLY (C-1)

DISASSEMBLY



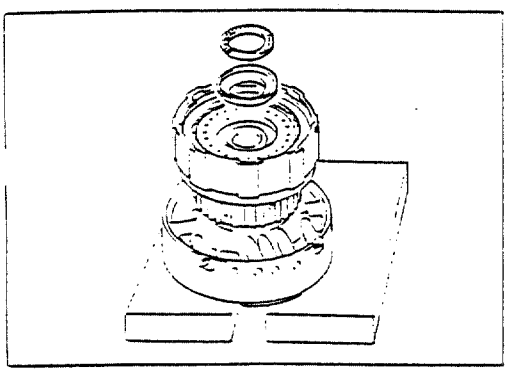
Disassembly steps

▲ 1. Thrust bearing
2. Race
▲ 3. Snap ring
4. Flange
5. Disc and plate
▲ 6. Snap ring
7. Piston return spring
▲ 8. Piston
9. O-ring
10. O-ring
11. Oil seal ring
12. Thrust bearing



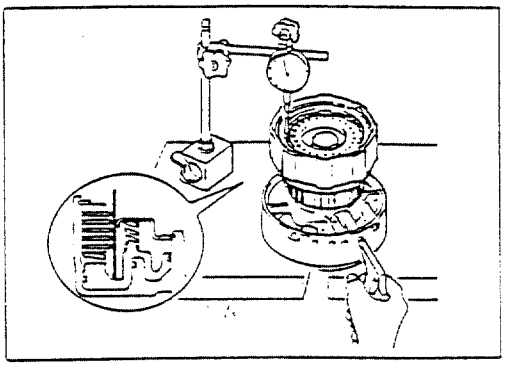
Important operations

Remove forward clutch assembly from direct clutch assembly



1. Thrust bearing

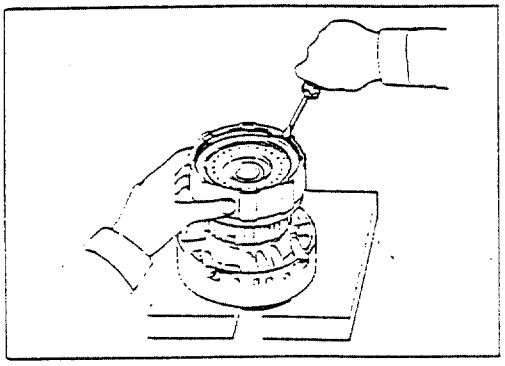
   Place wooden blocks, etc. to prevent forward clutch shaft from touching the work stand, and place the OD support on them.
   Place the forward clutch onto the OD support and remove the bearing and race.



Check piston stroke of forward clutch (C-1)

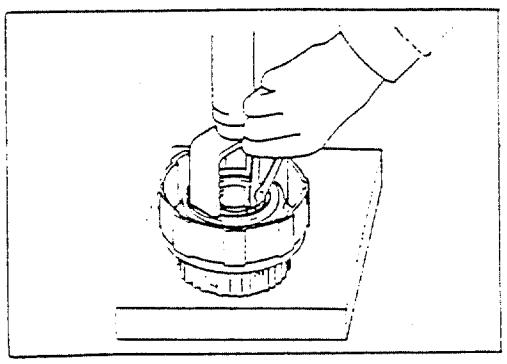
Using a dial indicator, measure the forward clutch piston stroke by applying and releasing compressed air (4 — 8 kgf/cm², 57 — 114 psi, 392 — 785 kPa) as shown.

Piston stroke	mm (in.)	2.65 – 3.98 (0.1044 – 0.1568)



3. Snap ring

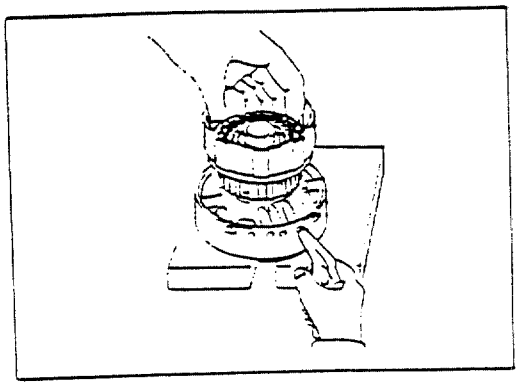
   Remove snap ring from clutch drum.



6. Snap ring

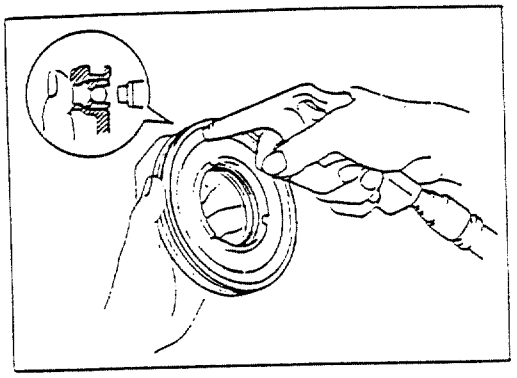
   Place special tool on the spring retainer and compress the return spring. Using snap ring pliers, remove the snap ring.

   Spring compressor : 5-8840-0017-0 (J-23327-1) or (J-37234)



8. Piston

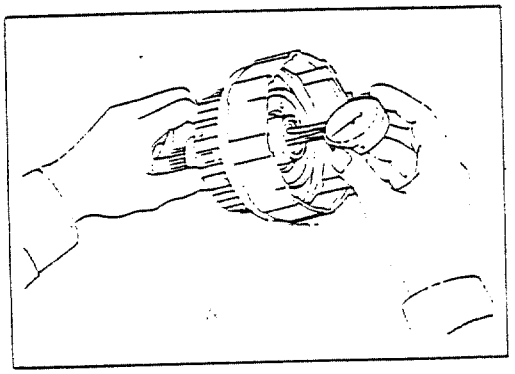
Place the forward clutch drum onto the OD support. Holding the forward clutch piston by hand, apply compressed air to the OD support to remove the forward clutch piston.



INSPECTION AND REPAIR

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.

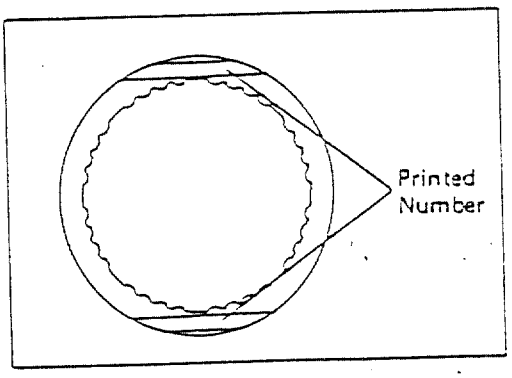


Check forward clutch drum bushing

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

	mm(in.)
Maximum inside diameter	24.08 (0.948)

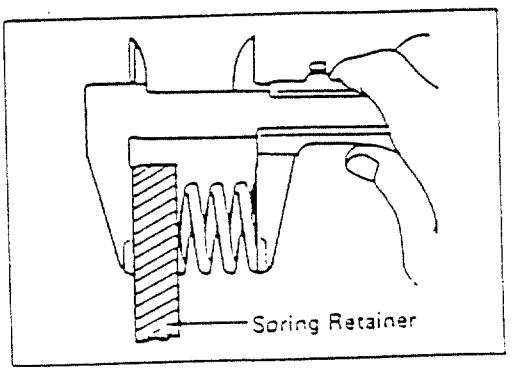
If the inside diameter is greater than the maximum, replace the forward clutch drum.



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.

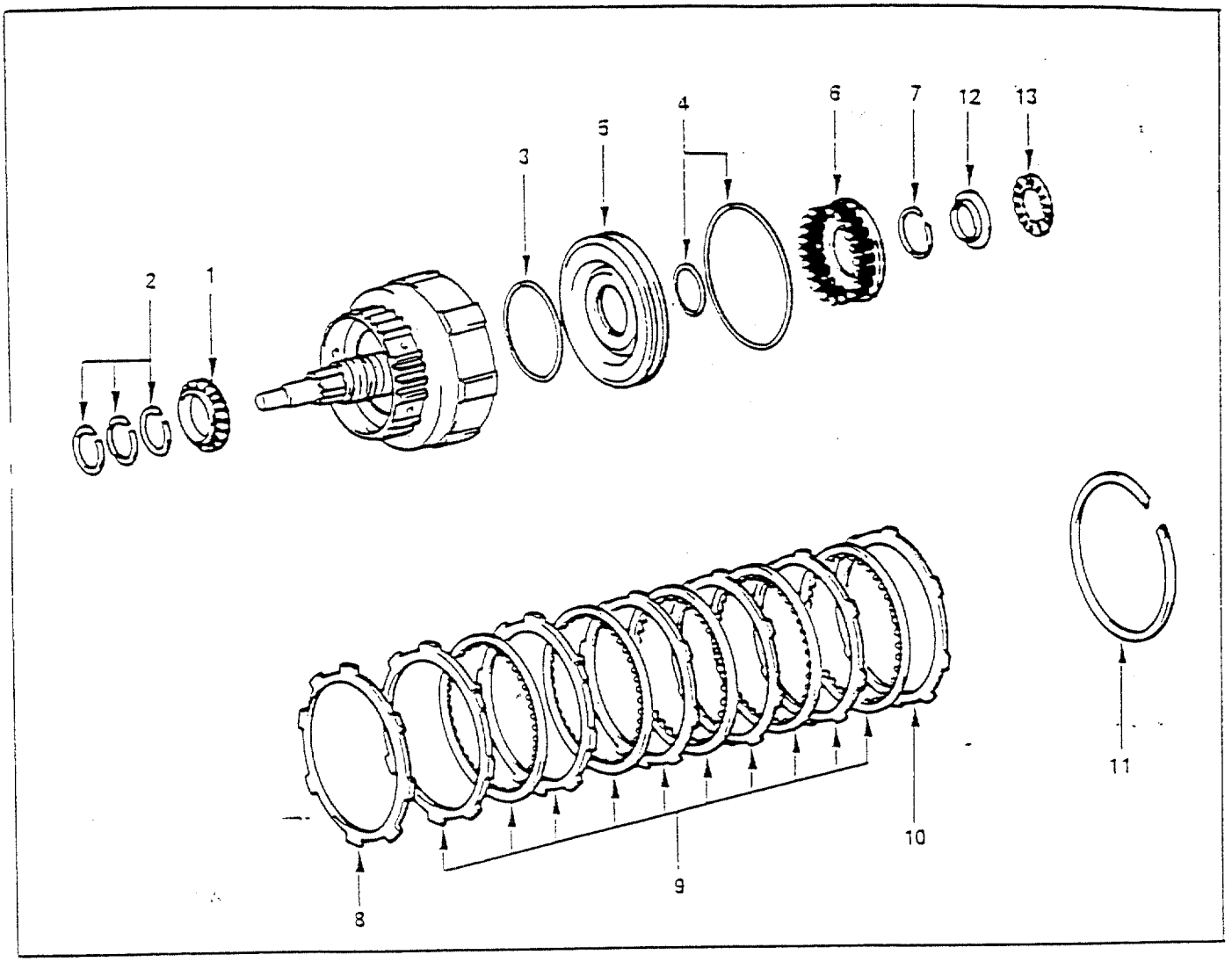


Check piston return spring

Using calipers, measure the free length of the return spring.

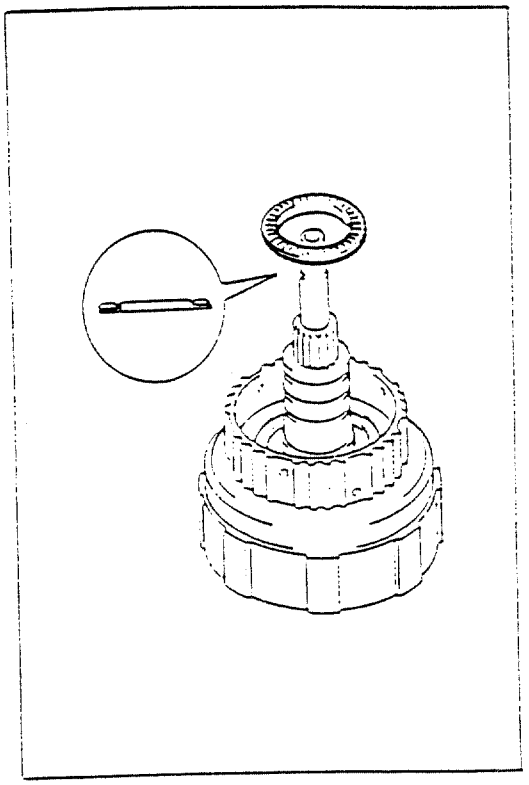
	mm(in.)
Standard length	19.47 (0.7665)

REASSEMBLY



Reassembly steps

- ▲ 1. Thrust bearing
- ▲ 2. Oil seal ring
- ▲ 3. O-ring
- ▲ 4. O-ring
- ▲ 5. Forward clutch piston
- ▲ 6. Piston return spring
- ▲ 7. Snap ring
- ▲ 8. Cushion plate
- ▲ 9. Disc and plate
- ▲ 10. Flange
- ▲ 11. Snap ring
- ▲ 12. Race
- ▲ 13. Thrust bearing



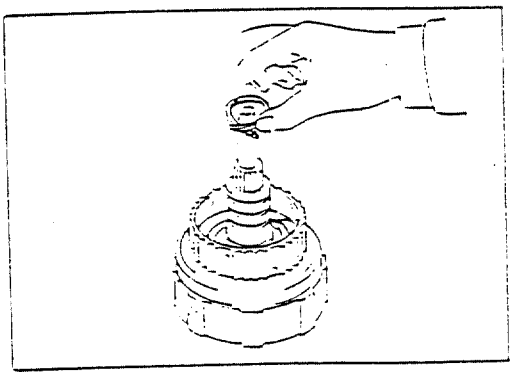
Important operations

1. Thrust bearing

   Coat the assembled bearing and race with petroleum jelly and install it onto the forward clutch drum, with the race side facing downward.

Note: Assembled bearing and race (Reference) mm(in.)

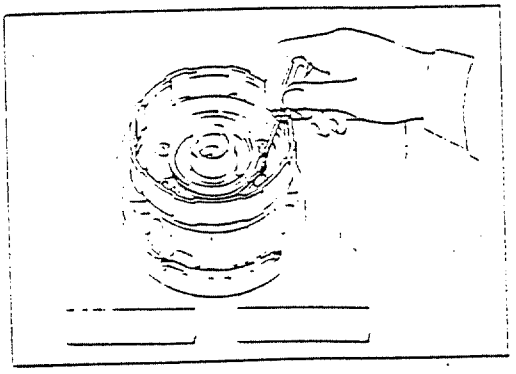
Inside diameter	33.7 (1.327)
Outside diameter	47.8 (1.882)



2. Oil seal ring

   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.

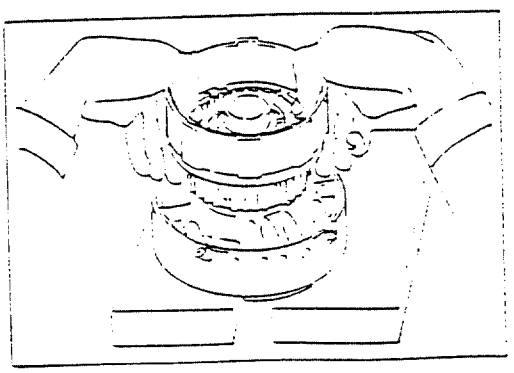


3. O-ring

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

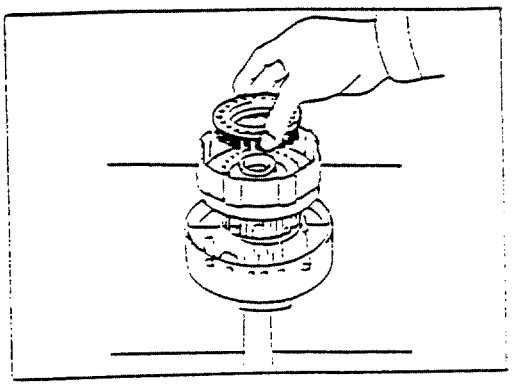
4. O-ring

   Coat new O-rings with ATF and install two O-rings on the forward clutch piston.



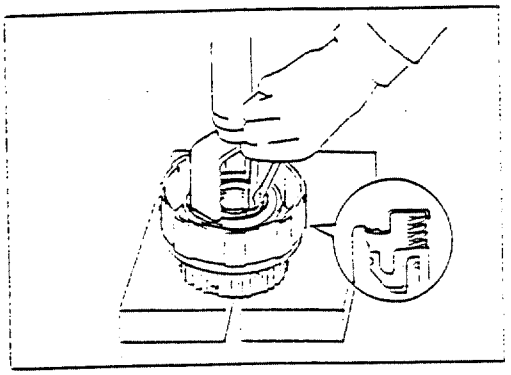
5. Forward clutch piston

   Being careful not to damage the O-rings, press the forward clutch piston into the forward clutch drum.



6. Piston return spring

Install piston return spring.

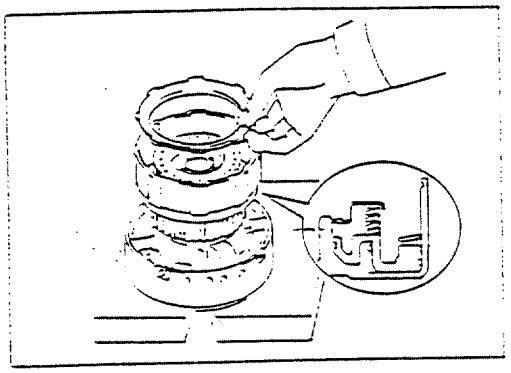


7. Snap ring

Place special tool on the spring retainer, and compress the return spring.

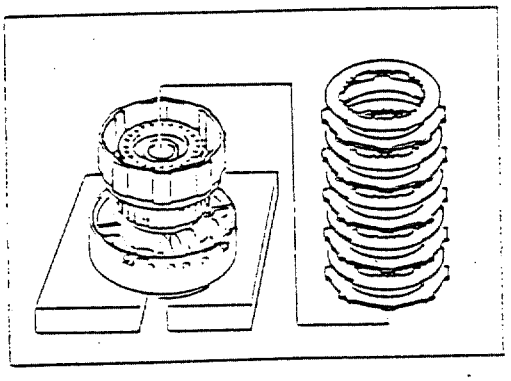
Spring compressor : 5-8840-0017-0 (J-23327-1) or (J-37234)

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.



8. Cushion plate

Install cushion plate rounded side down as shown.



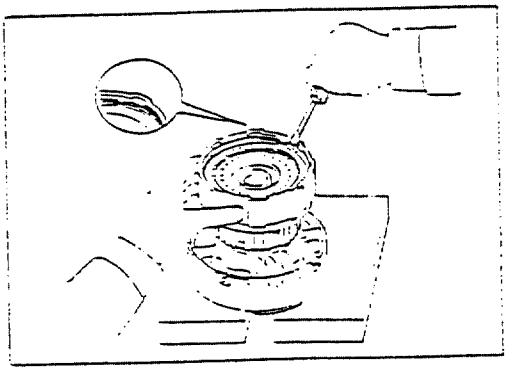
9. Disc and plate

Install discs, plates and flange.

Install in order: P – D – P – D – P – D – P – D – P – D – P – D

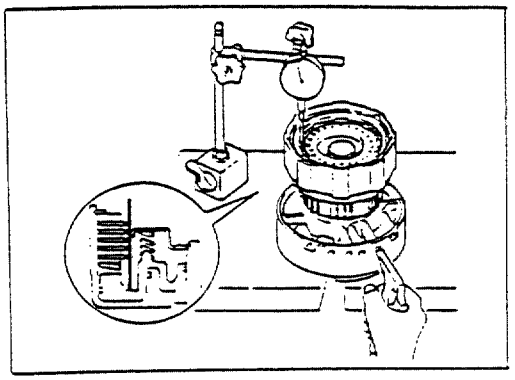
10. Flange

And then install the flange, with the rounded edge facing downward.



11. Snap ring

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



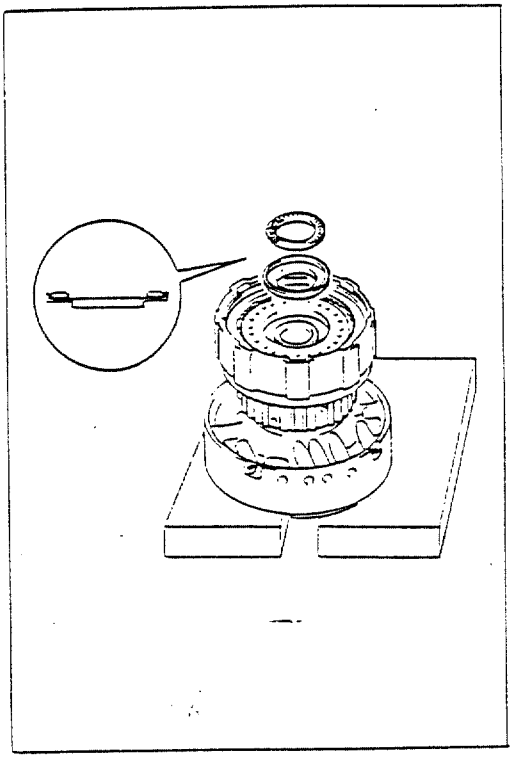
Check piston stroke of forward clutch (C-1)

Using a dial indicator, measure the forward clutch piston stroke by applying and releasing the compressed air (4 — 8 kgf/cm², 57 — 114 psi or 392 — 785 kPa) as shown.

mm(in.)

Piston stroke	mm (in.)	2.65 – 3.98 (0.1044 – 0.1568)

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



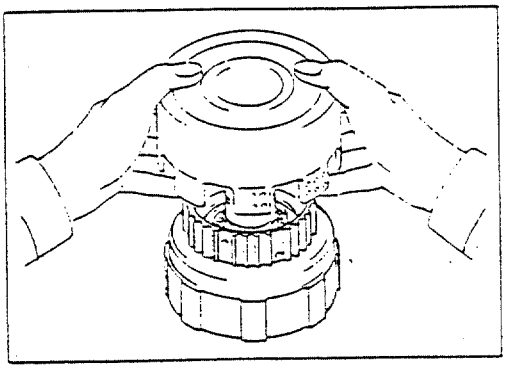
12. Race

13. Thrust bearing

Coat the race and bearing with petroleum jelly, and install them onto the forward clutch drum.

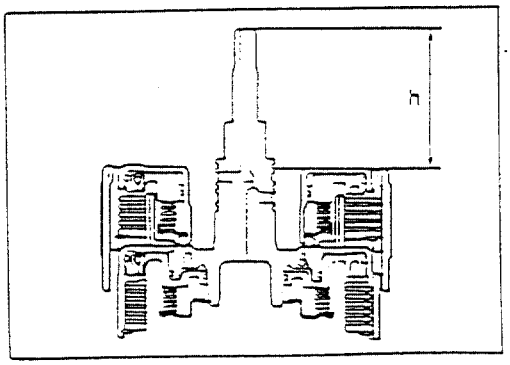
Note: Race and bearing diameter (Reference) mm(in.)

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



Install direct clutch assembly to forward clutch assembly

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



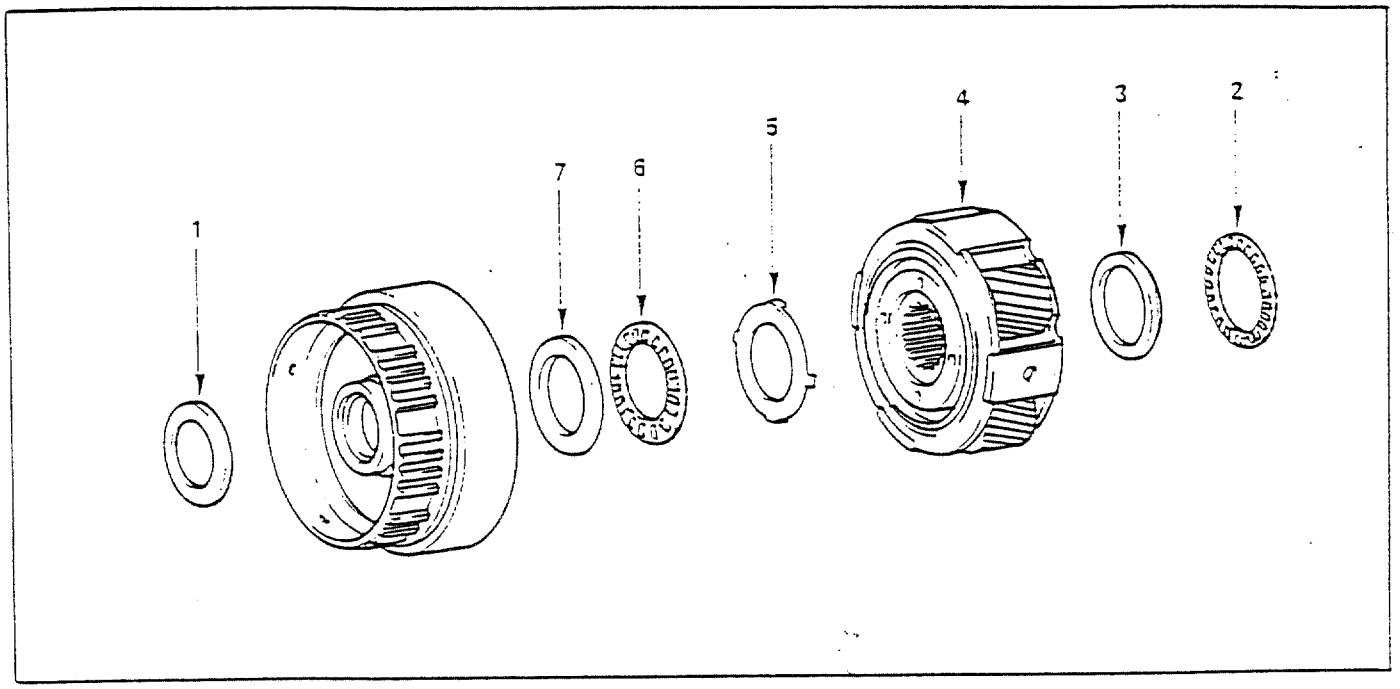
Check that distance from the direct clutch end to the forward clutch end is 71.2 mm (2.803 in.).

mm(in.)

h	71.2 (2.803)

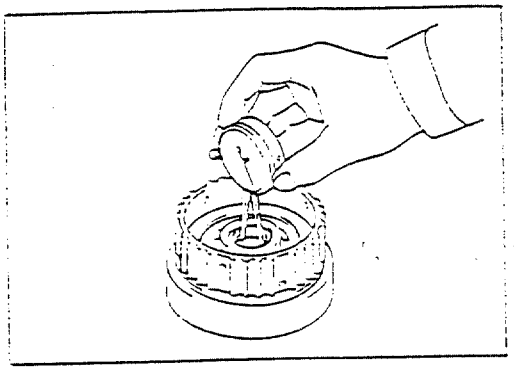
FRONT PLANETARY GEAR

DISASSEMBLY



Disassembly steps

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



INSPECTION AND REPAIR

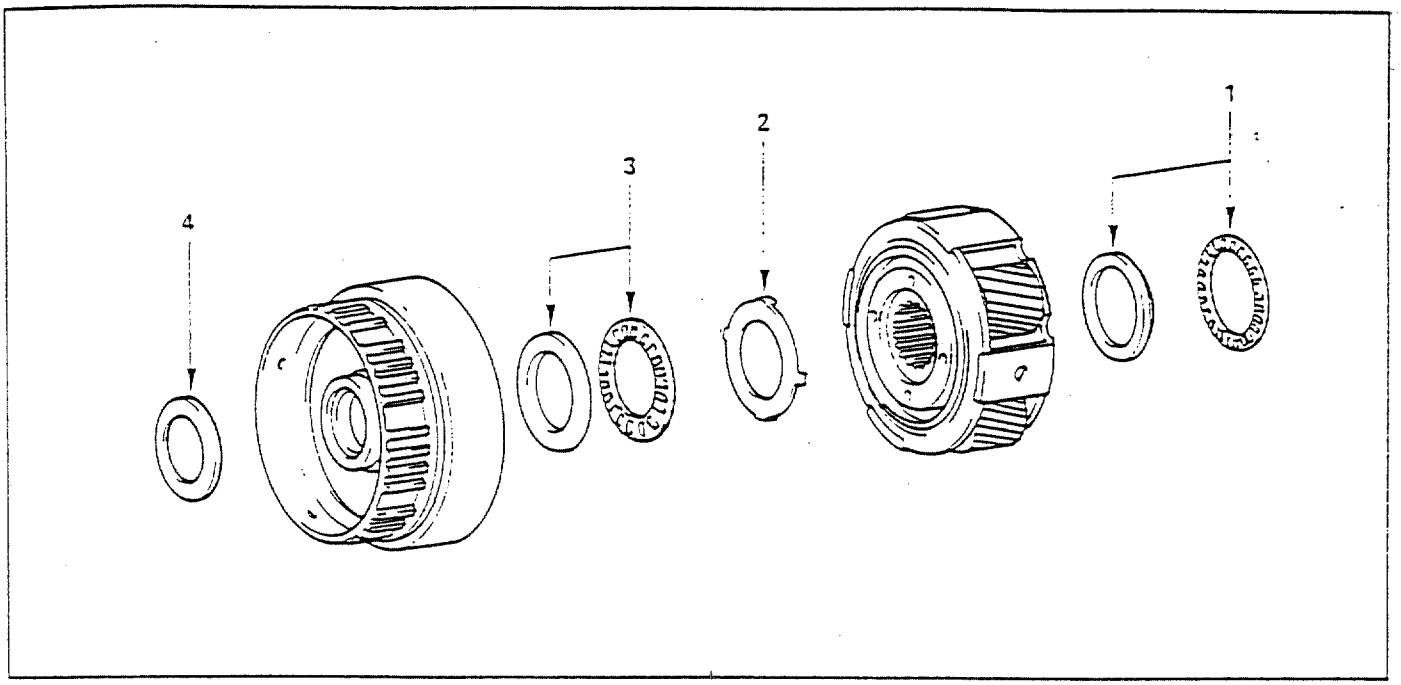
Check front planerary ring gear bushing

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

	mm(in.)
Maximum inside diameter	24.08 (0.9480)

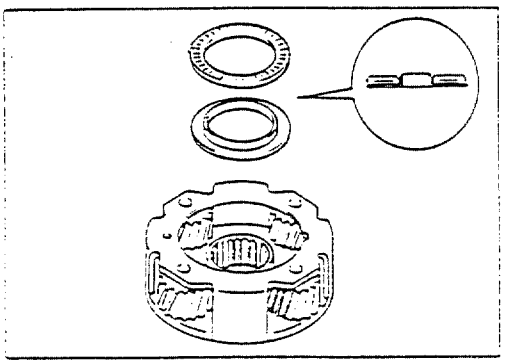
If the inside diameter is greater than the maximum, replace the planetary ring gear.

REASSEMBLY



Reassembly steps

- ▲ 1. Thrust bearing and race
- ▲ 2. Race (Metal)
- ▲ 3. Thrust bearing and race
- ▲ 4. Race



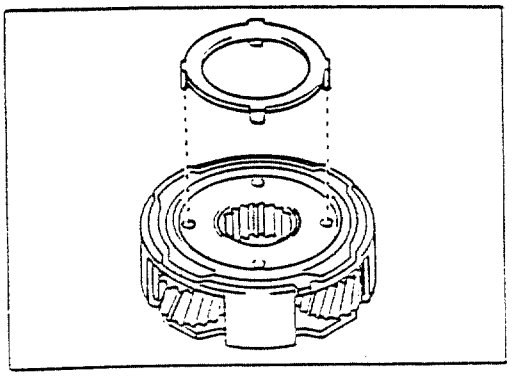
Important operations

1. Thrust bearing and race

   Coat the races and bearing with petroleum jelly. Install the race and bearing to the rear side of the planetary gear.

mm (in.)

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



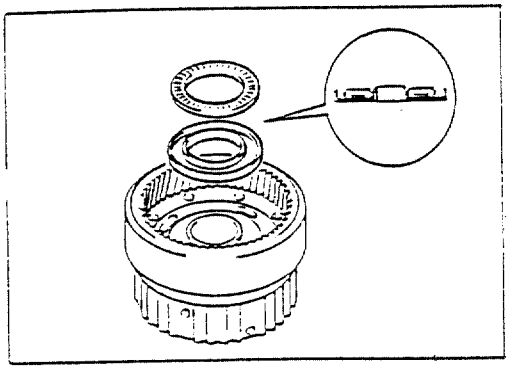
2. **Race (Metal)**

Turn over the planetary gear and install the race. Make sure that the lugs fit into the holes on the planetary gear.

Note: Bearing and races diameter. (Reference)

mm(in.)

	Inside	Outside
Race	34.3 (1.350)	47.8 (1.882)

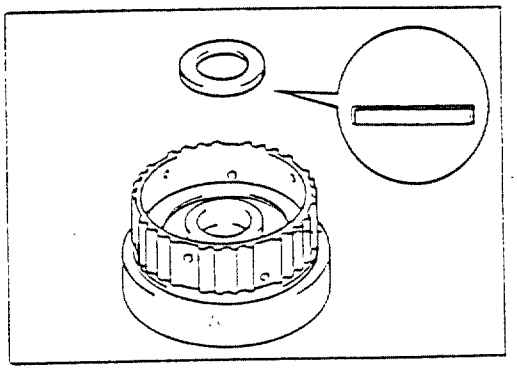


3. **Thrust bearing and race**

Coat the races and bearing with petroleum jelly. Install the race and bearing onto the rear side of the planetary ring gear.

mm (in.)

	Inside	Outside
Race	30.6 (1.205)	53.6 (2.110)
Bearing	32.7 (1.287)	47.7 (1.878)



4. **Race**

Turn over the planetary ring gear and install the race onto the front side of the planetary ring gear.

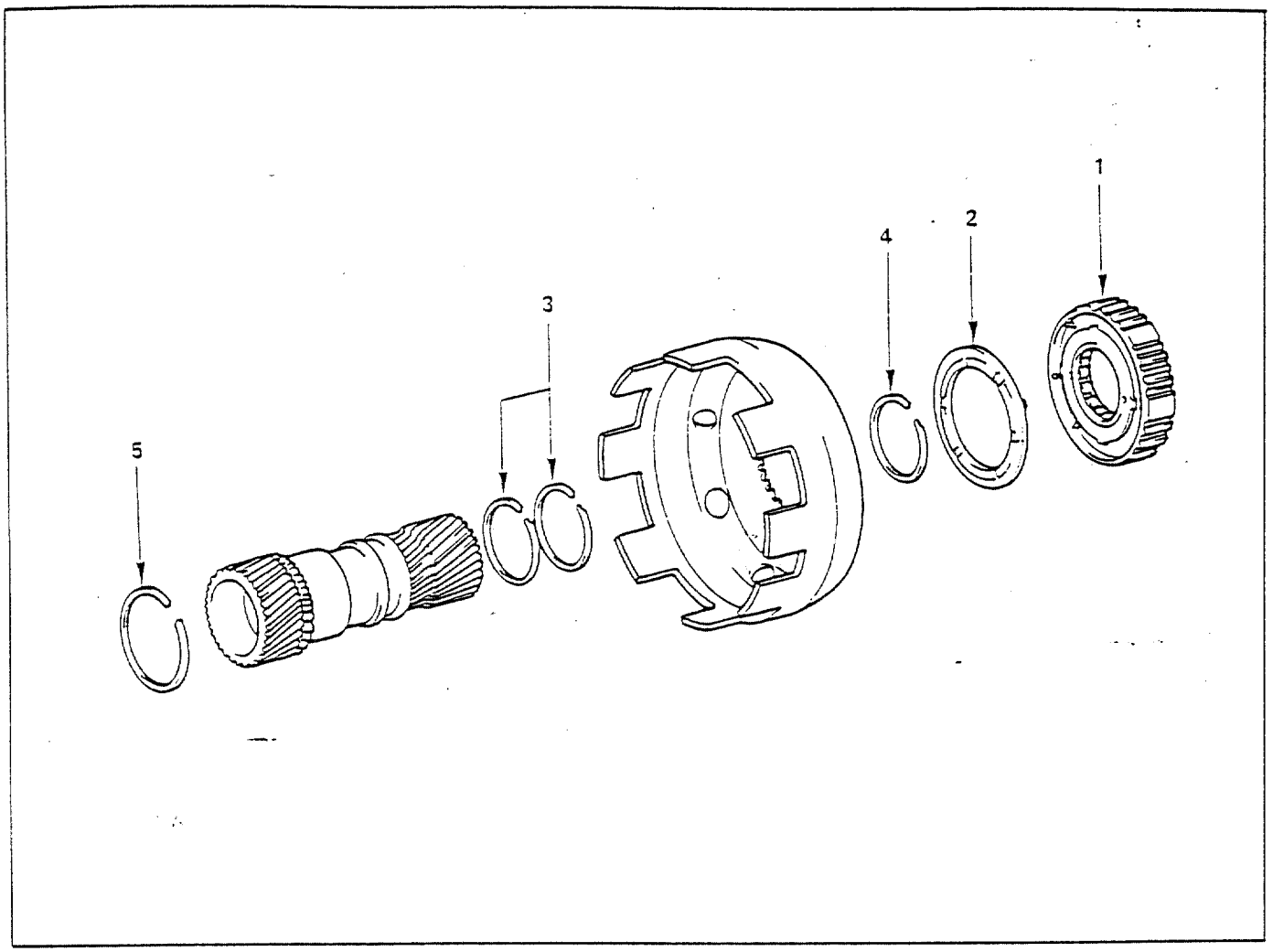
Note: Races and bearing diameter (Reference)

mm (in.)

	Inside	Outside
Race	26.8 (1.055)	547.0 (1.850)

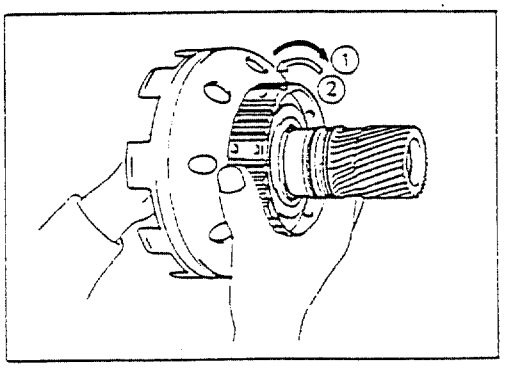
PLANETARY SUN GEAR AND NO.1 ONE-WAY CLUTCH

DISASSEMBLY



Disassembly steps

1. One-way clutch and second brake hub
2. Thrust washer (plastic)
- ▲ 3. Oil seal ring (Metal)
- ▲ 4. Snap ring
5. Snap ring

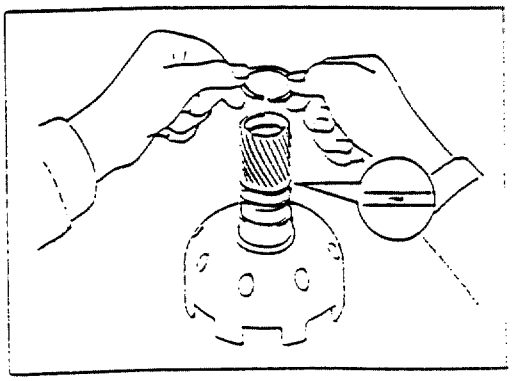


Important operations

Check operation of No.1 one-way clutch

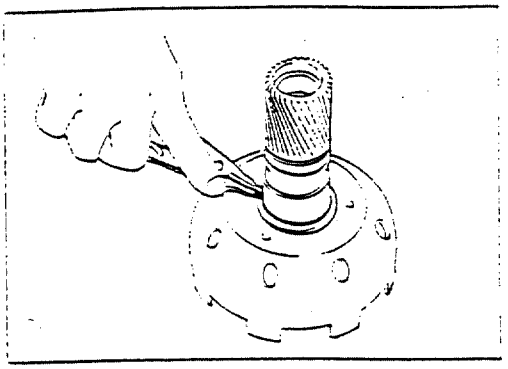
Hold the planetary sun gear and turn the second brake hub. The second brake hub should turn freely clockwise and should lock counterwise.

① : Free
② : Lock



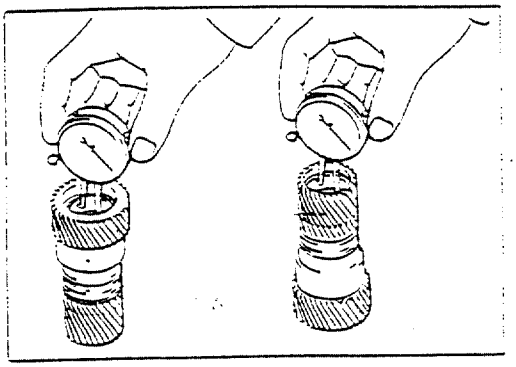
3. Oil seal ring (Metal)

   Remove two oil seal rings.



4. Snap ring

   Remove the snap ring with snap ring pliers.



INSPECTION AND REPAIR

Check planetary sun gear bushing

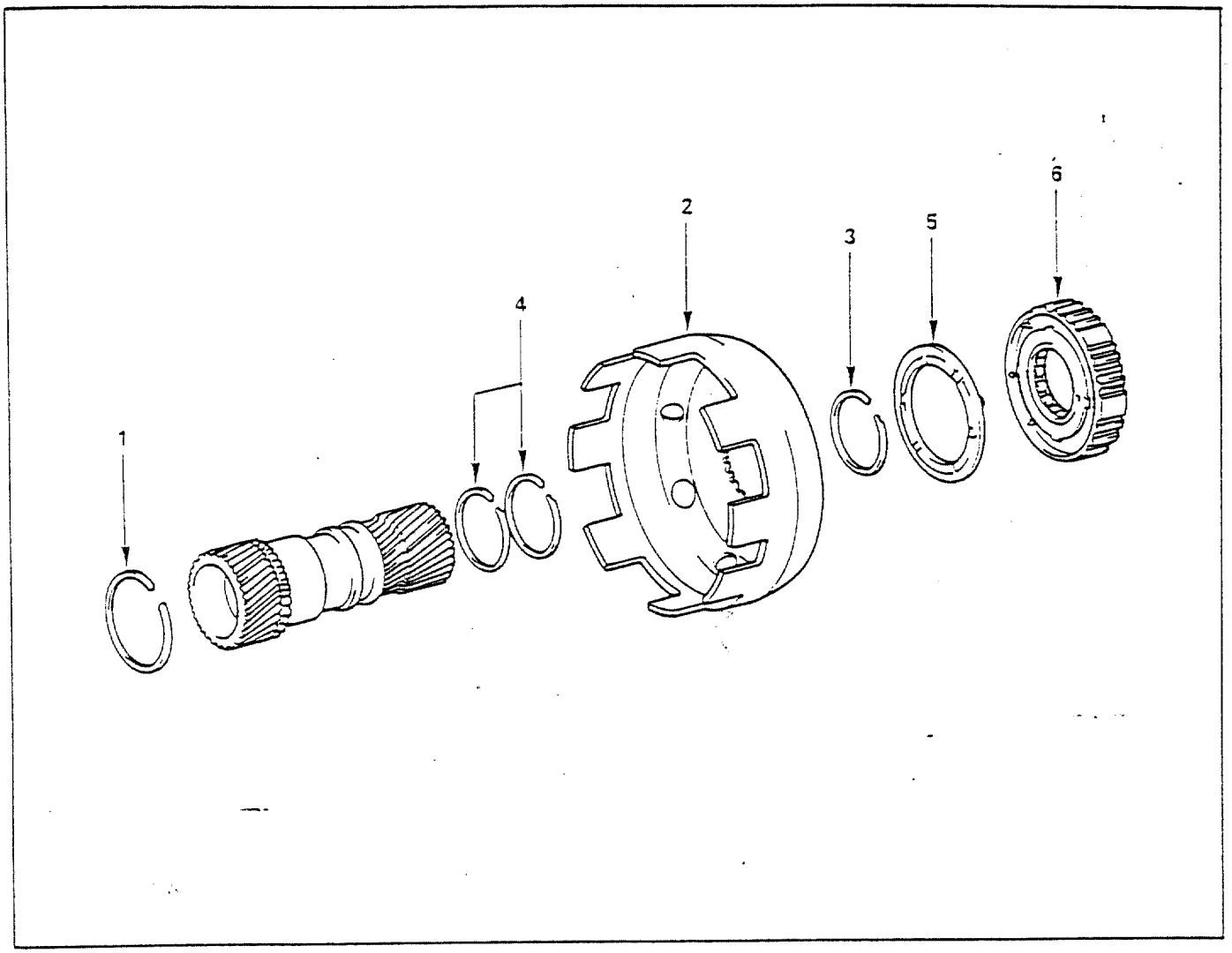
Using a dial indicator, measure the inside diameter of the planetary sun gear bushing.

mm(in.)

Maximum inside diameter	27.08 (1.0661)

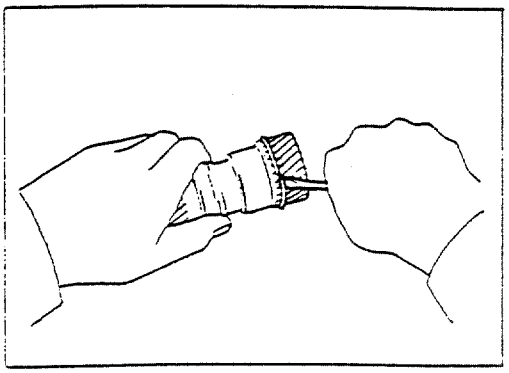
If the inside diameter is greater than the maximum, replace the planetary sun gear.

REASSEMBLY



Reassembly steps

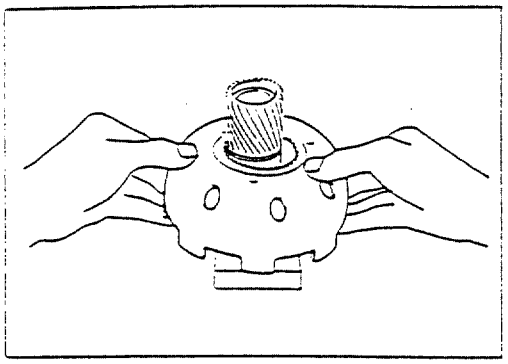
- ▲ 1. Snap ring
- ▲ 2. Sun gear input drum
- ▲ 3. Snap ring
- ▲ 4. Oil seal ring (Metal)
- ▲ 5. Thrust washer (Plastic)
- ▲ 6. One-way clutch and second brake hub



Important operations

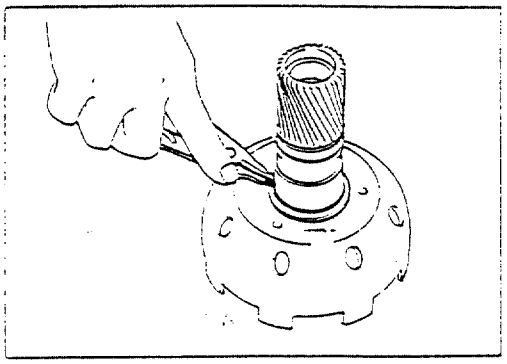
1. Snap ring

   Install snap ring to planetary sun gear.



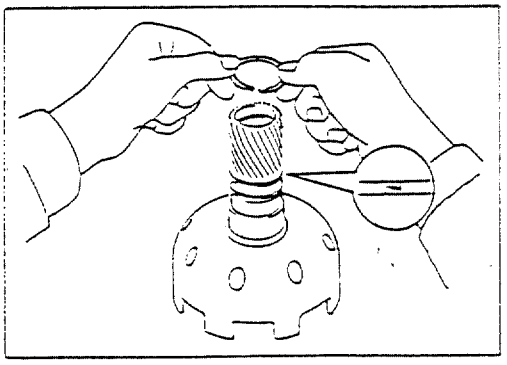
2. Sun gear input drum

   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.



3. Snap ring

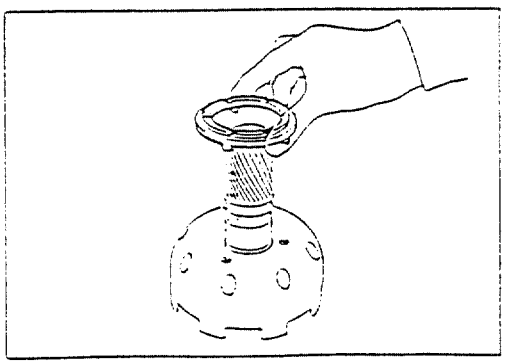
   Install snap ring with snap ring pliers.



4. Oil seal ring (Metal)

   Coat the two oil seal rings with ATF.
   Install the two oil seal rings onto the planetary sun gear.

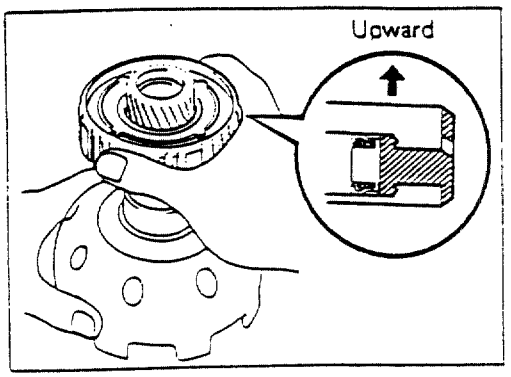
Note: Do not spread the ring ends too much.



5. Thrust washer (Plastic)

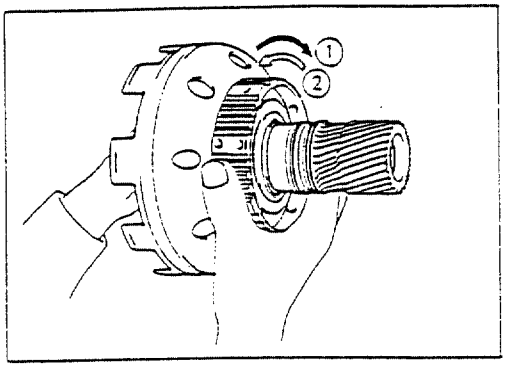
   Install thrust washer.

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



6. One-way clutch and second brake hub

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



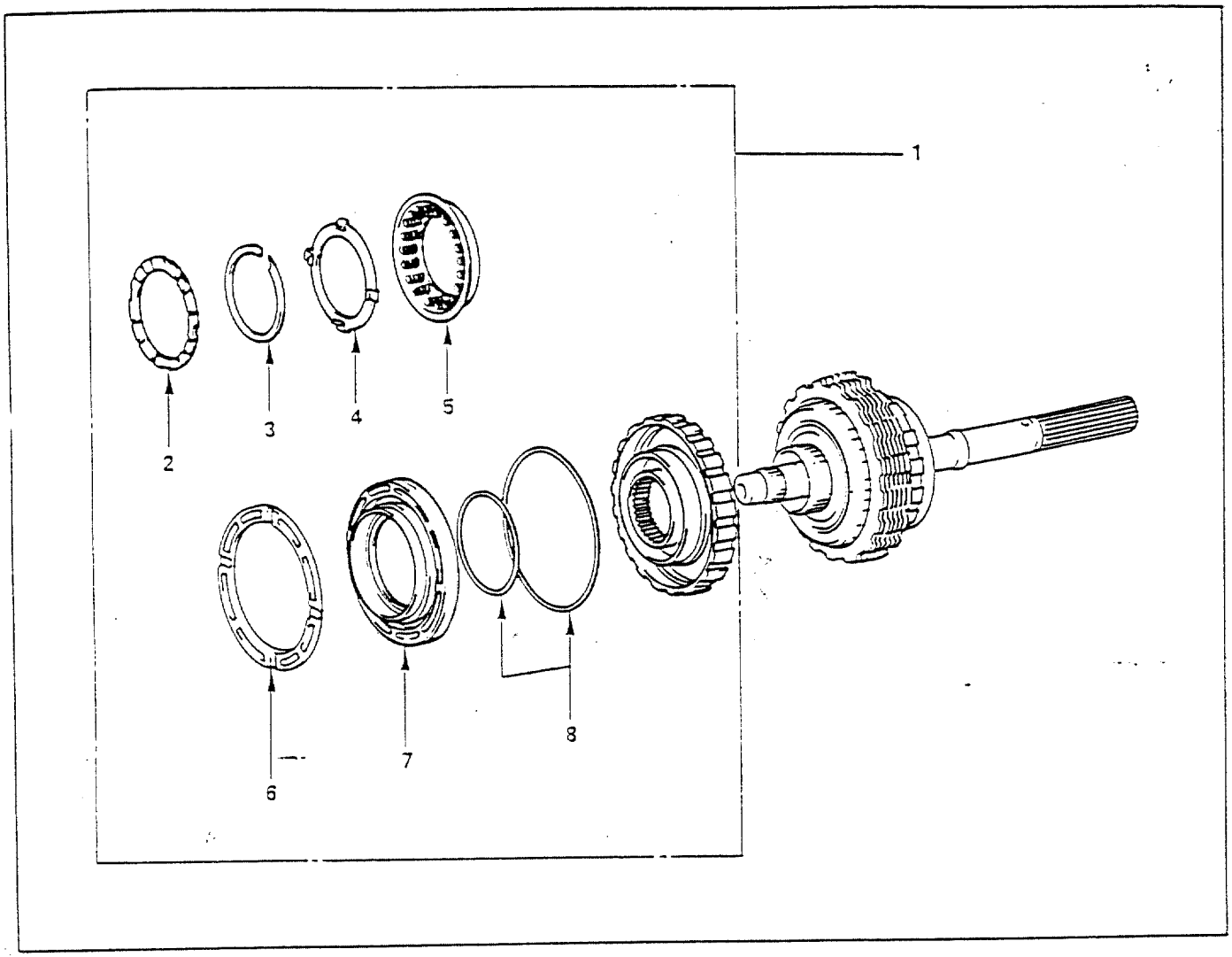
Check operation of No.1 one-way clutch

Hold the planetary sun gear and turn the second brake hub. The second brake hub should turn freely clockwise and should lock counterclockwise.

① : Free
② : Lock

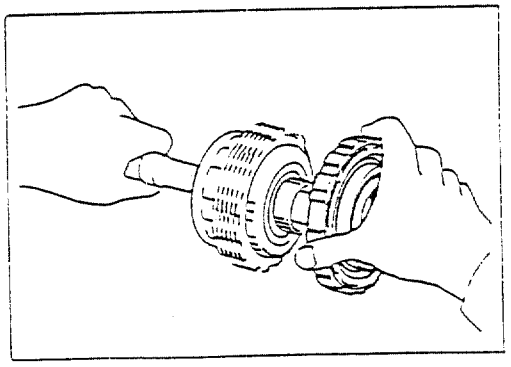
SECOND BRAKE ASSEMBLY (B-2)

DISASSEMBLY



Disassembly steps

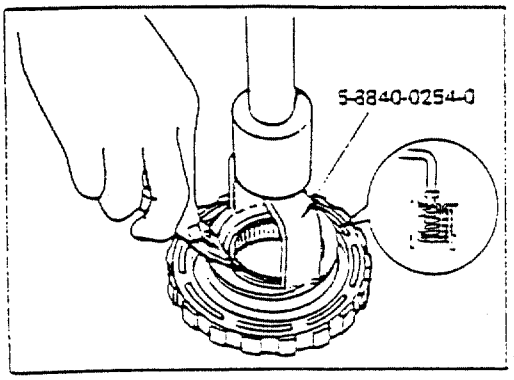
▲ 1. Second brake assembly
2. Thrust washer (Plastic)
▲ 3. Snap ring
4. Spring retainer
5. Piston return spring
6. Piston sleeve
▲ 7. Second brake piston
8. O-ring



Important operations

1. Second brake assembly

   Remove second brake assembly from output shaft.

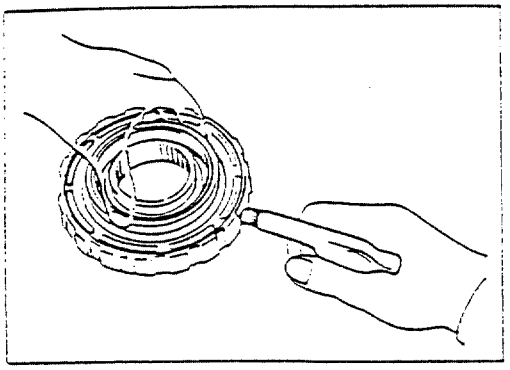


3. Snap ring

Place special tool on the spring retainer, and compress the return spring.

Spring compressor : 5-8840-0254-0 (J-25048)

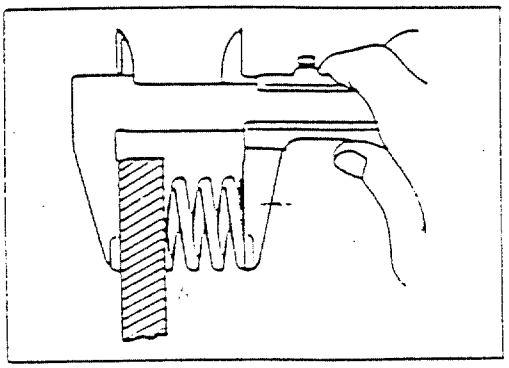
Remove the snap ring with snap ring pliers.



7. Second brake piston

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.



INSPECTION AND REPAIR

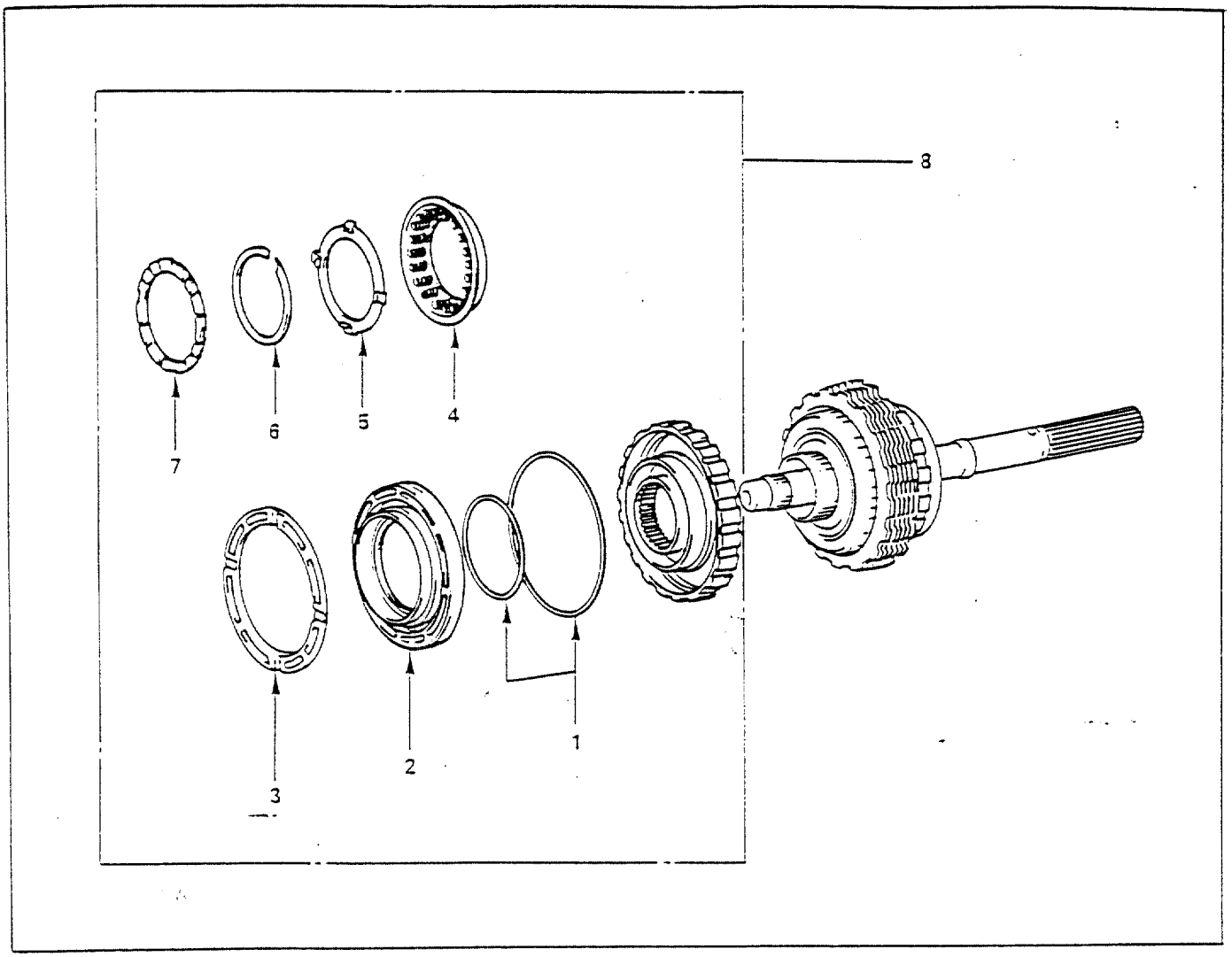
Check piston return spring

Using calipers, measure the free length of the return spring.

mm(in.)

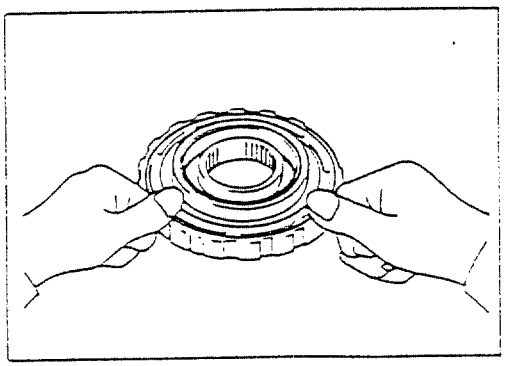
Standard length	16.05 (0.6319)

REASSEMBLY



Reassembly steps

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



Important operations

1. O-ring

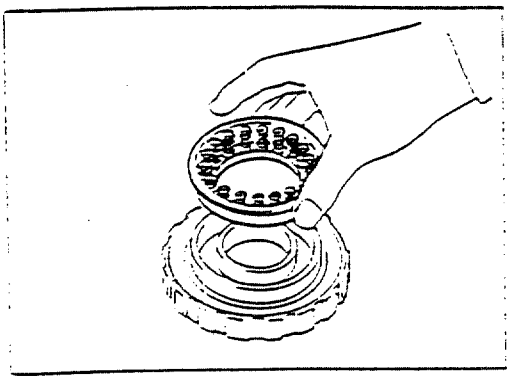
   Coat new O-rings with ATF and install them on the second brake piston.

2. Second brake piston

   Being careful not to damage the O-rings, press in the second brake piston into the second brake drum.

3. Piston sleeve

   Install piston sleeve.

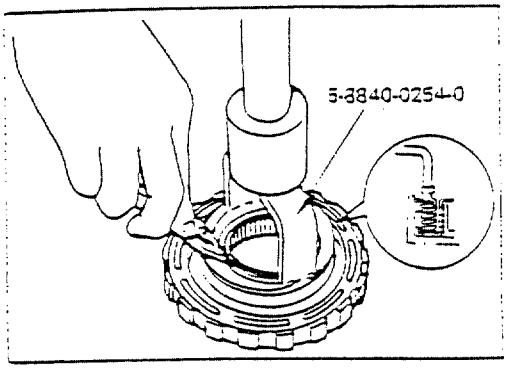


4. Piston return spring

   Install piston return spring.

5. Spring retainer

   Install spring retainer.

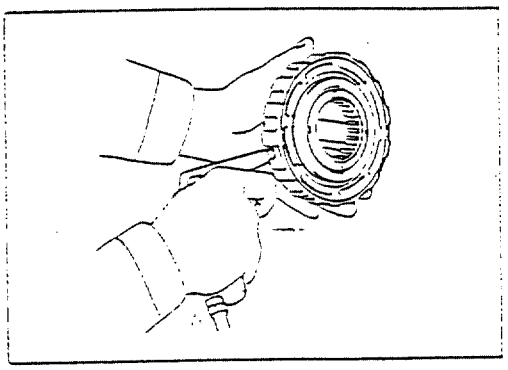


6. Snap ring

   Place special tool on the spring retainer, and compress the return spring.

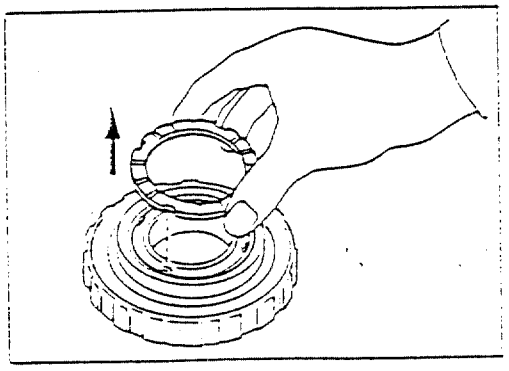
   Spring compressor : 5-8840-0254-0 (J-25048)

   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.



Check second brake piston movement

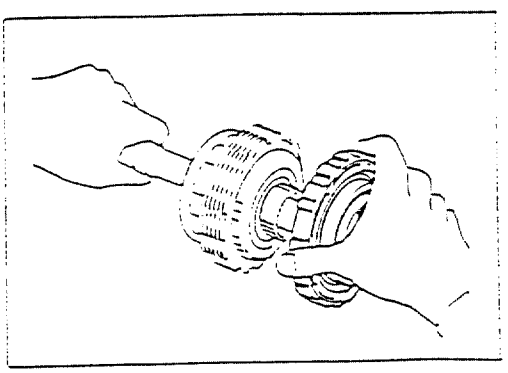
Make sure the second brake piston moves smoothly when applying and releasing the low compressed air to the second brake drum.



7. Thrust washer (plastic)

   Coat the thrust washer 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.

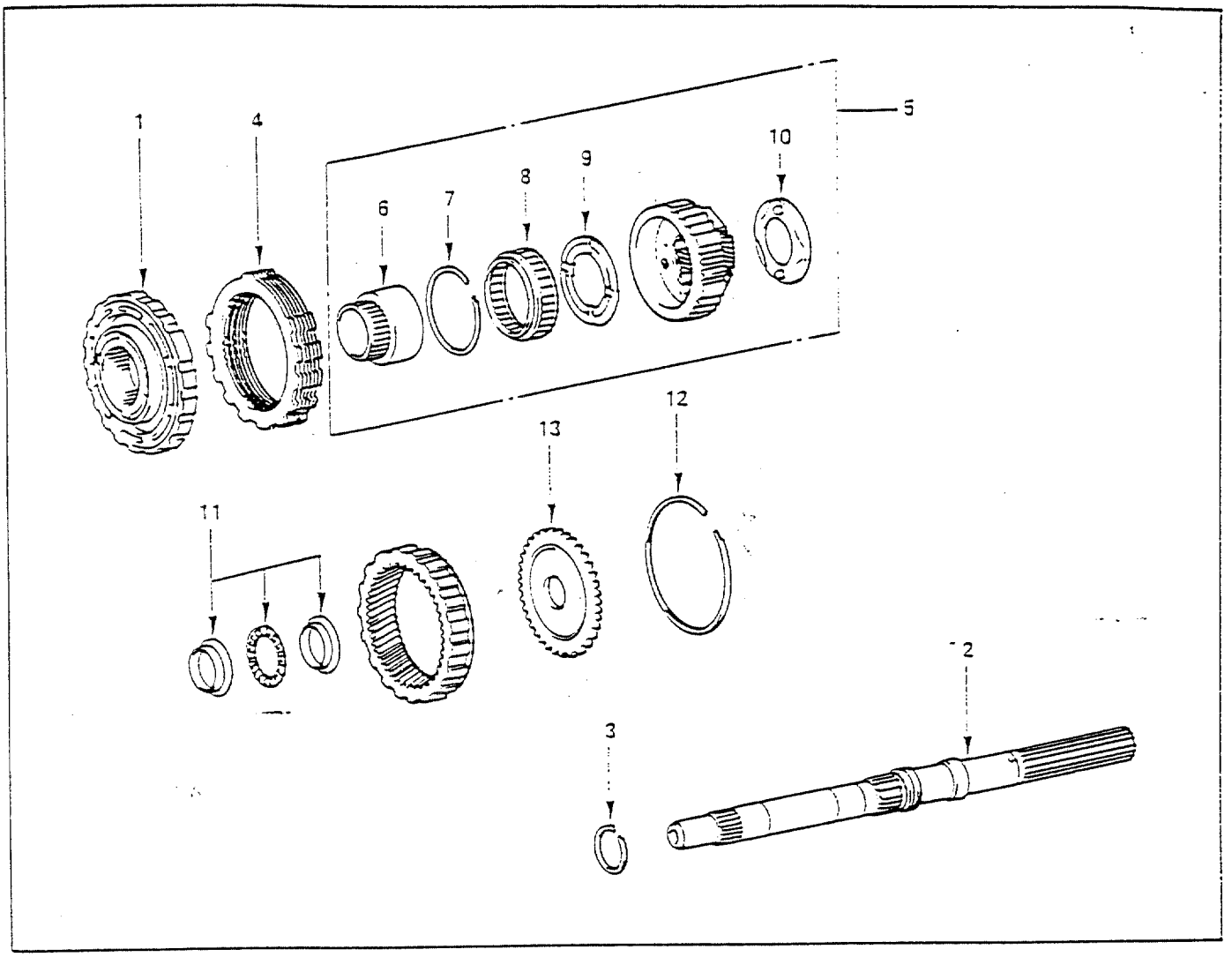


8. Second brake assembly

   Install second brake assembly to output shaft.

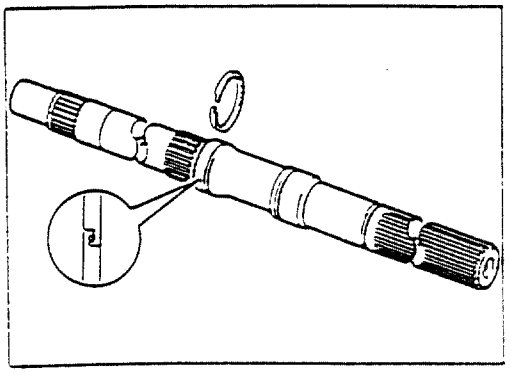
REAR PLANETARY GEAR ASSEMBLY AND OUTPUT SHAFT

DISASSEMBLY



Disassembly steps

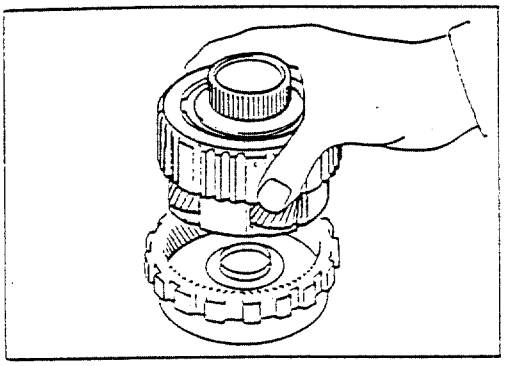
1. Second brake assembly
2. Output shaft
3. ▲ Oil seal ring
4. Disc, plate and flange
5. ▲ Rear planetary gear assembly
6. ▲ One-way clutch inner race
7. ▲ Snap ring
8. ▲ One-way clutch
9. Thrust washer (Plastic)
10. Thrust washer (Plastic)
11. Thrust bearing and race
12. Snap ring
13. Ring gear flange



Important operations

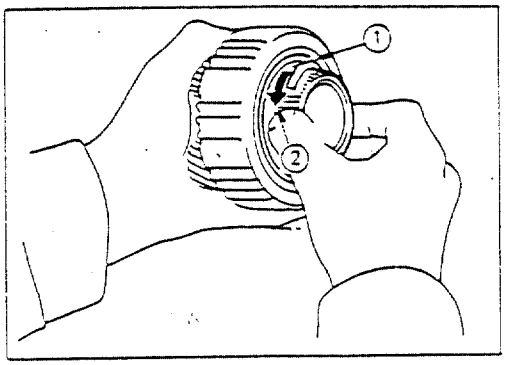
3. Oil seal ring

   Remove oil seal ring from output shaft.



5. Rear planetary gear assembly

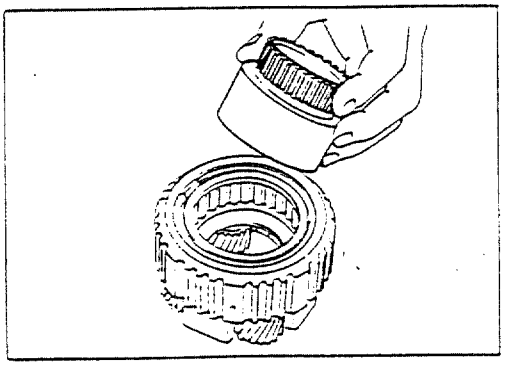
   Remove rear planetary gear from rear planetary ring gear.



Check operation of No.2 one-way clutch

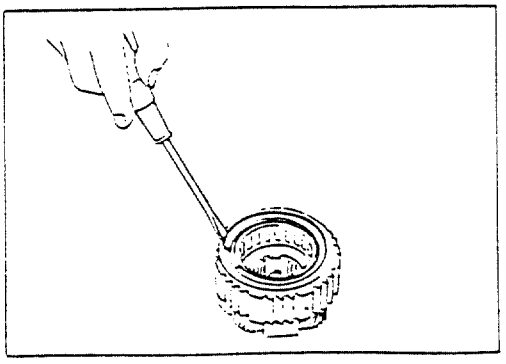
Hold the planetary gear and turn the one-way clutch inner race. The one-way clutch inner race should turn freely counterclockwise and should lock clockwise.

① : Lock
② : Free



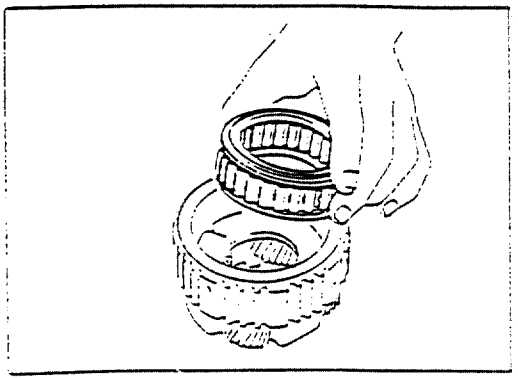
6. One-way clutch inner race

   Remove the one-way clutch inner race from the rear planetary gear.



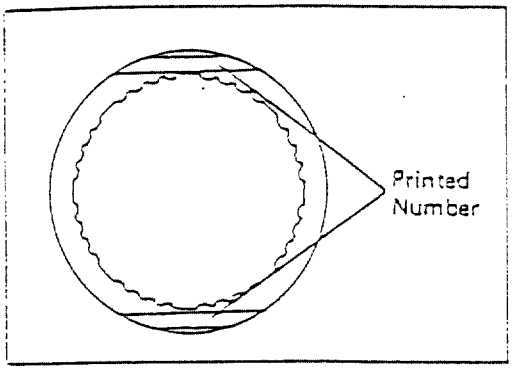
7. Snap ring

   Remove the snap ring with a screwdriver.



8. One-way clutch

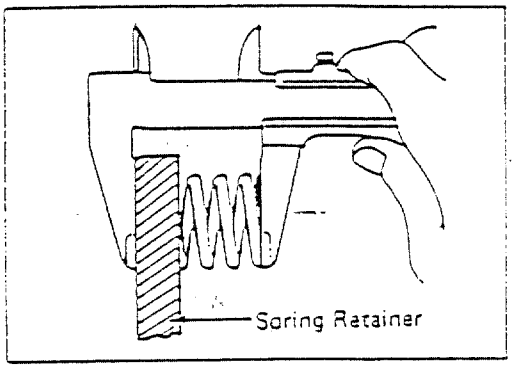
Remove the one-way clutch with retainers from the planetary gear.



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.



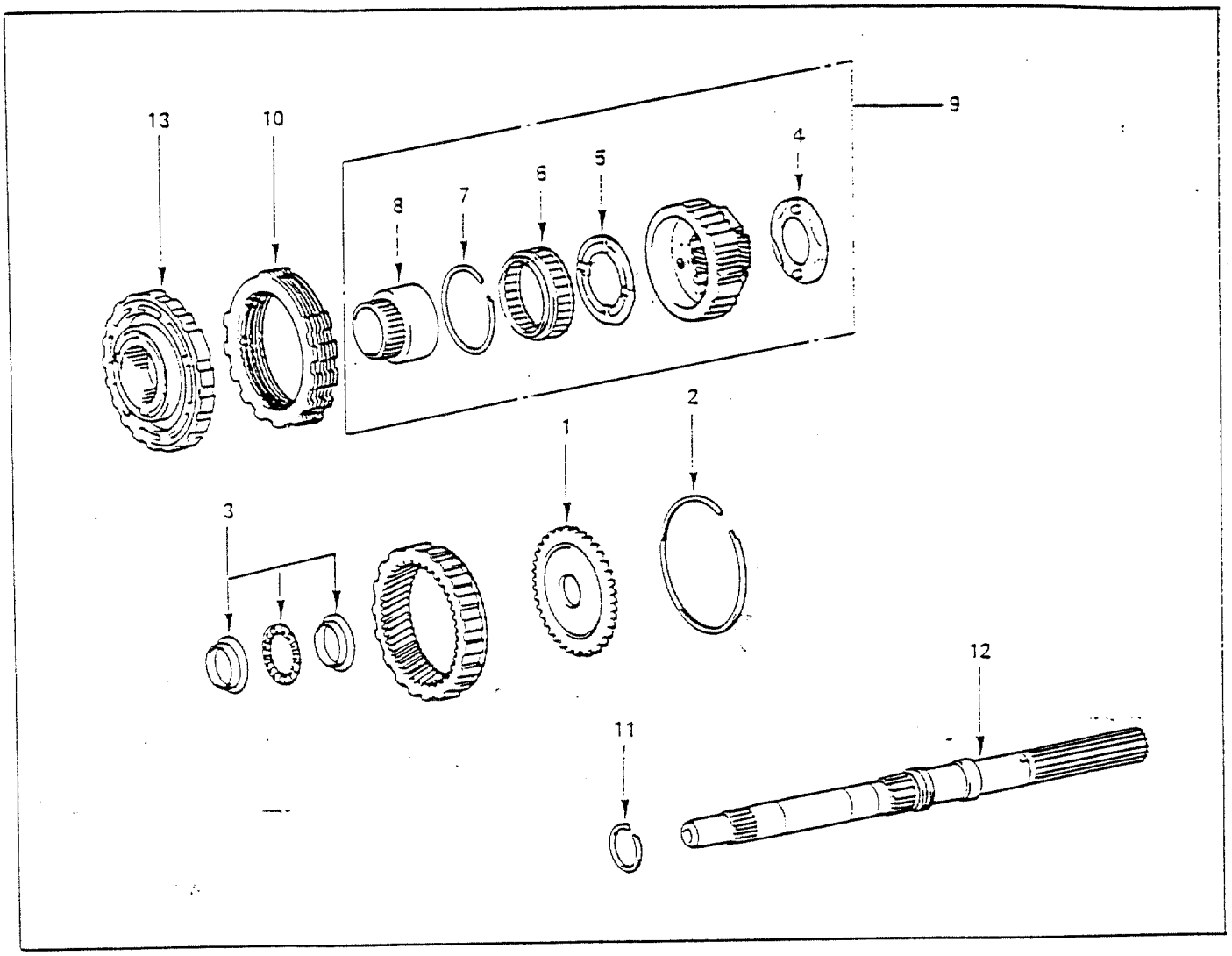
Check piston return spring

Using calipers, measure the free length of the return spring.

mm (in.)

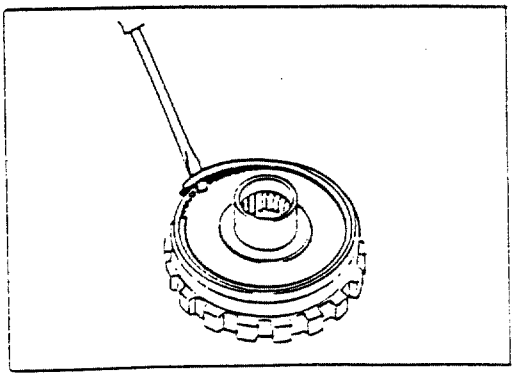
Standard length	19.97 (0.7862)

REASSEMBLY



Reassembly steps

- ▲ 1. Ring gear flange
- ▲ 2. Snap ring
- ▲ 3. Thrust bearing and race
- ▲ 4. Thrust washer (Plastic)
- ▲ 5. Thrust washer (Plastic)
- ▲ 6. One-way clutch
- ▲ 7. Snap ring
- ▲ 8. One-way clutch inner race
- ▲ 9. Rear planetary gear assembly
- ▲ 10. Disc, plate, flange and cushion plate
- ▲ 11. Oil seal ring
- ▲ 12. Output shaft
- ▲ 13. Second brake assembly



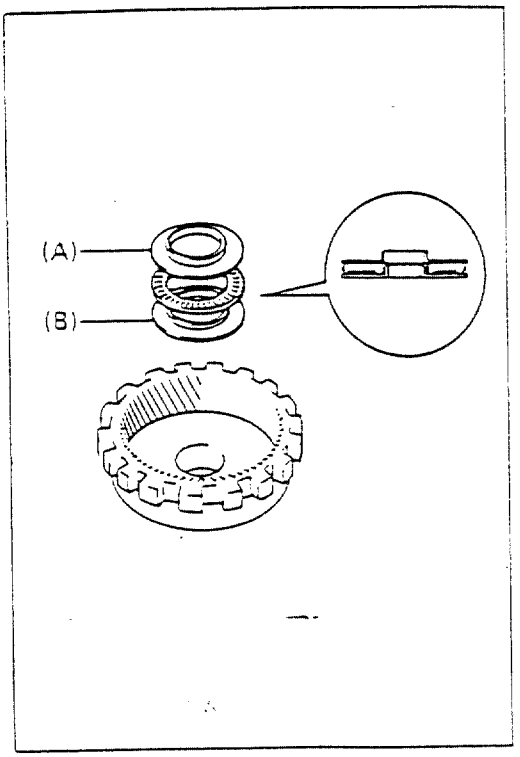
Important operations

1. Ring gear flange

   Install ring gear flange to the ring gear.

2. Snap ring

   Install snap ring to the ring gear.

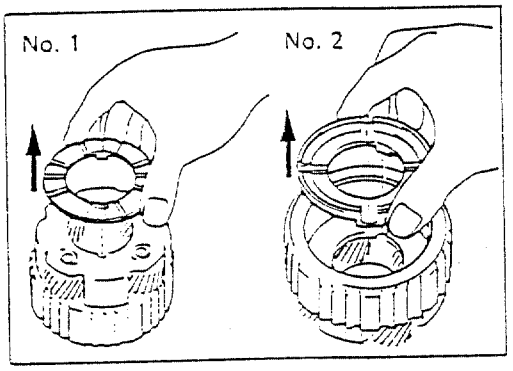


3. Thrust bearing and race

   Coat the races and bearing with petroleum jelly, and install them onto the rear planetary ring gear.

Note: Races and bearing diameter (Reference) mm(in.)

	Inside	Outside
Race (A)	28.8 (1.134)	44.8 (1.764)
Bearing	30.1 (1.185)	44.7 (1.760)
Race (B)	27.8 (1.095)	44.8 (1.764)

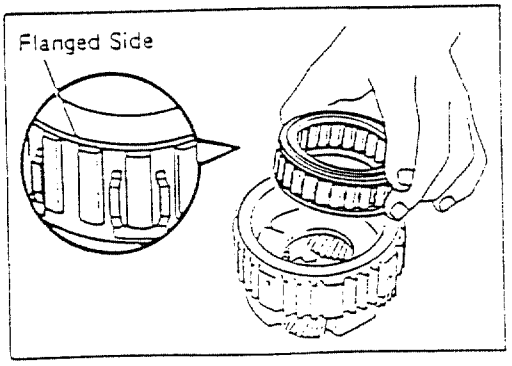


4. Thrust washer (Plastic)

5. Thrust washer (Plastic)

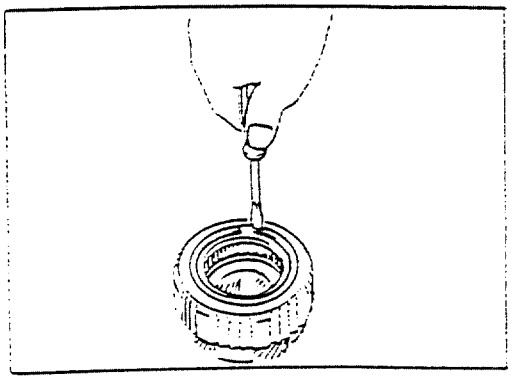
   Coat the thrust washers with petroleum jelly. Install the thrust washers onto both sides of the rear planetary gear, facing the grooved side upward.

Note: Make sure that the lugs fit into the cutout portions on the rear planetary gear.



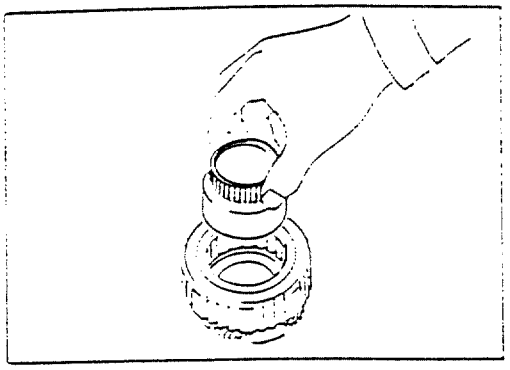
6. One-way clutch

   Install the one-way clutch with the flanged side facing upward onto the rear planetary gear.



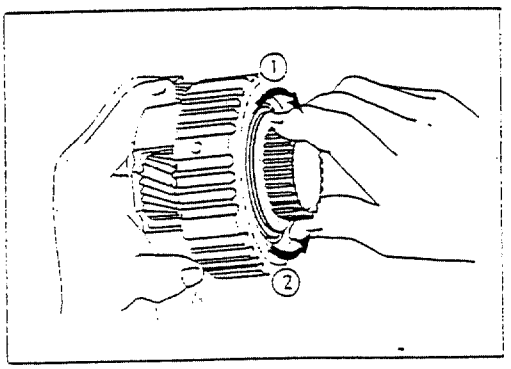
7. Snap ring

Install snap ring.



8. One-way clutch inner race

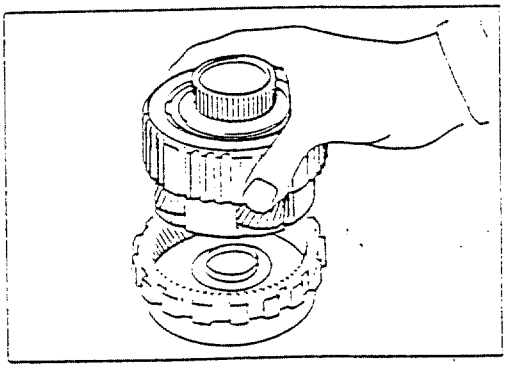
While turning counterclockwise, install one-way clutch inner race to rear planetary gear.



Check operation of one-way clutch

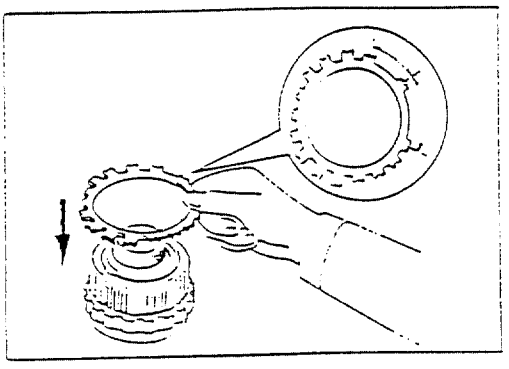
Hold the planetary gear and turn the one-way clutch inner race. The one-way clutch inner race should turn freely counterclockwise and should lock clockwise.

① : Lock
② : Free



9. Rear planetary gear assembly

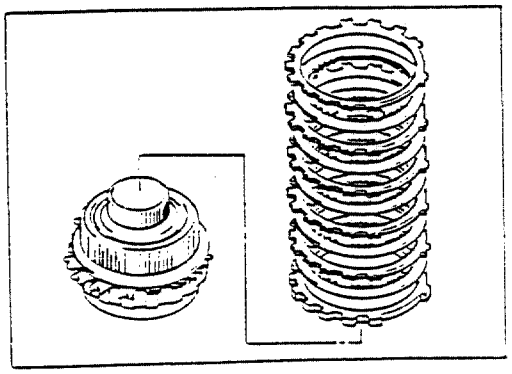
Install rear planetary gear onto rear planetary ring gear.



10. Disc, plate, flange and cushion plate

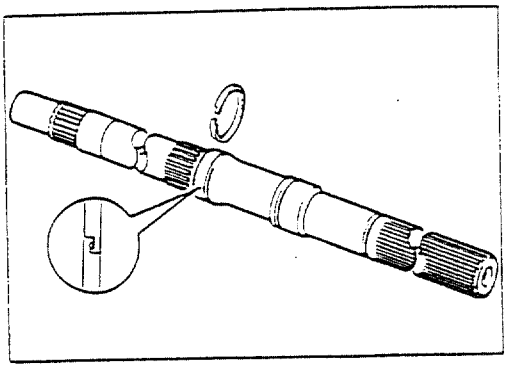
Install a clutch plate onto the rear planetary gear assembly.

Note: The claw interval of the plate should be as shown in the figure when viewing the clutch plate from the arrow direction.



Install a brake flange onto the rear planetary gear assembly.

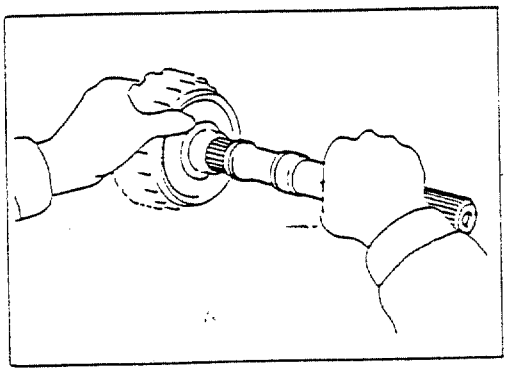
Install seven clutch discs and seven brake plates alternately, starting with clutch disc, onto the rear planetary gear assembly.



11. Oil seal ring

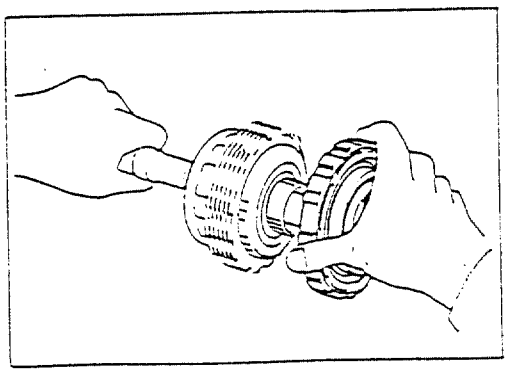
Coat the oil seal ring with ATF and install it to the output shaft.

Note: Do not spread the ring ends too much.



12. Output shaft

Install output shaft into rear planetary gear assembly.

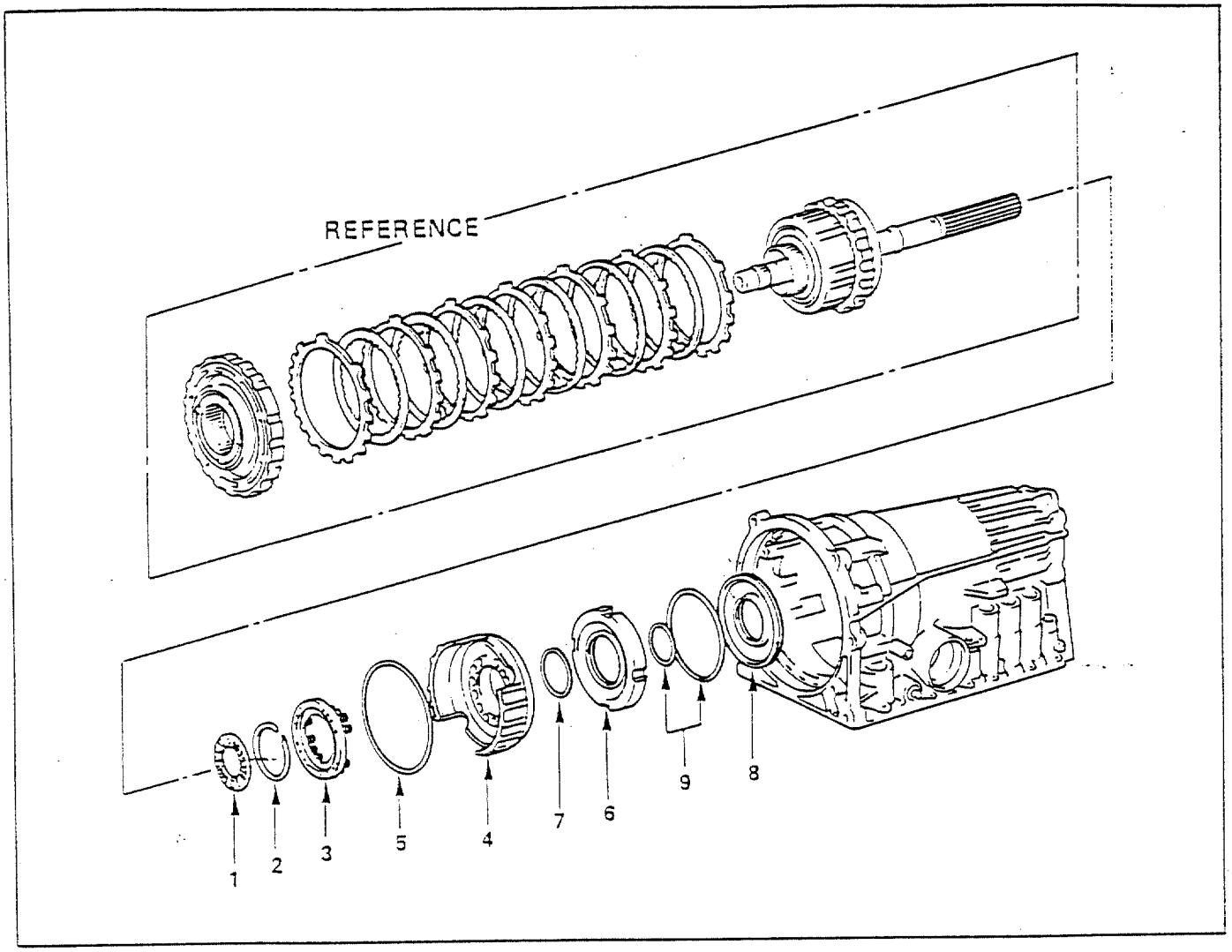


13. Second brake assembly

Install second brake assembly to output shaft.

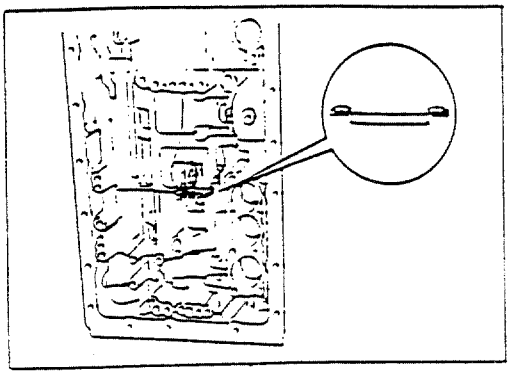
FIRST AND REVERSE BRAKE (B-3)

DISASSEMBLY



Disassembly steps

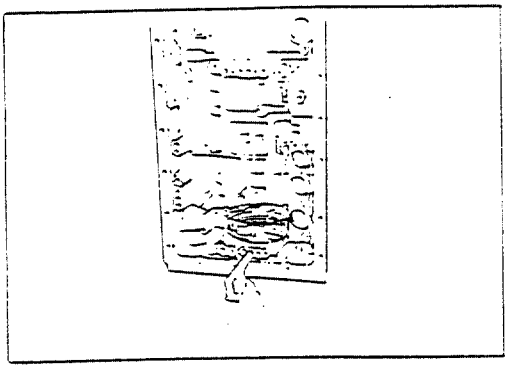
- ▲ 1. Thrust bearing and race
- ▲ 2. Snap ring
- 3. Piston return spring
- ▲ 4. 1st and reverse brake piston No. 2
- 5. O-ring
- ▲ 6. Reaction sleeve
- 7. O-ring
- ▲ 8. 1st and reverse brake piston No. 1
- 9. O-ring



Important operations

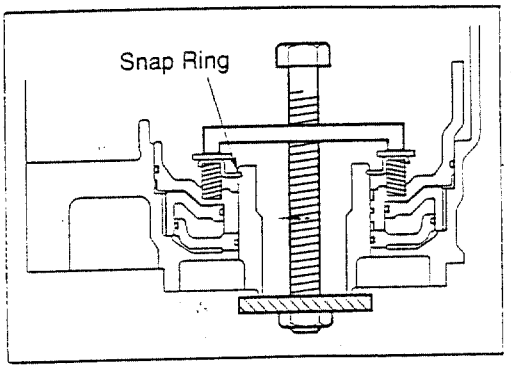
1. **Thrust bearing and race**

   Remove assembled bearing and race from transmission case.



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.

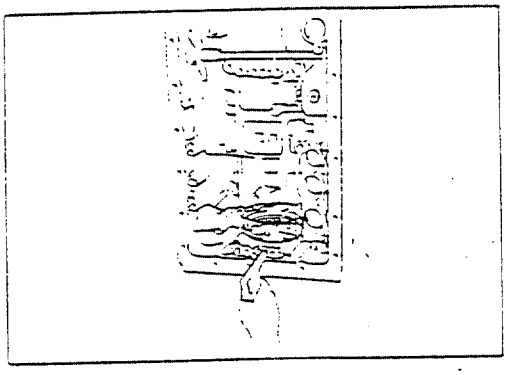


2. **Snap ring**

   Set special tool on the spring retainer, and compress the return spring.

   Spring compressor : 5-8840-0251-0 (J-25048-1)

   Remove the snap ring with snap ring pliers.

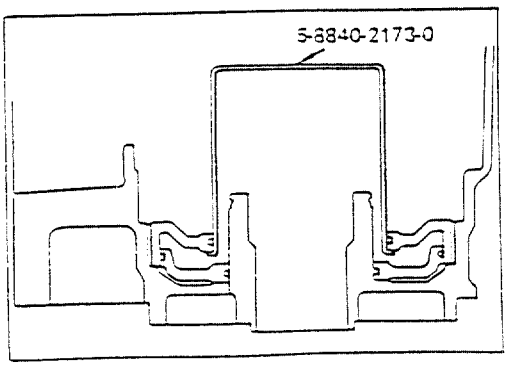


4. **1st and reverse brake piston No. 2**

   Holding the No. 2 first and reverse brake piston by hand, apply compressed air to the transmission case to remove the No. 2 first and reverse brake piston.

   Remove the No. 2 first and reverse brake piston.

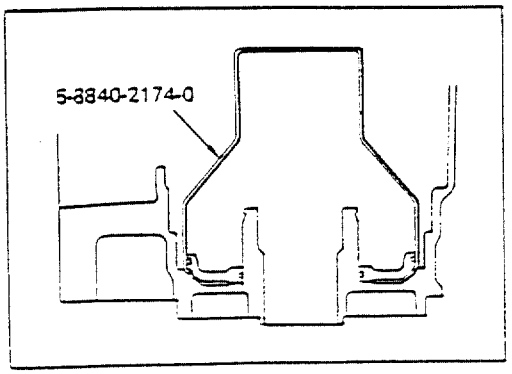
   If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.



6. **Reaction sleeve**

   Insert special tool behind the reaction sleeve and gradually lift it out of the transmission case.

   Reaction sleeve puller : 5-8840-2173-0 (J-37236)

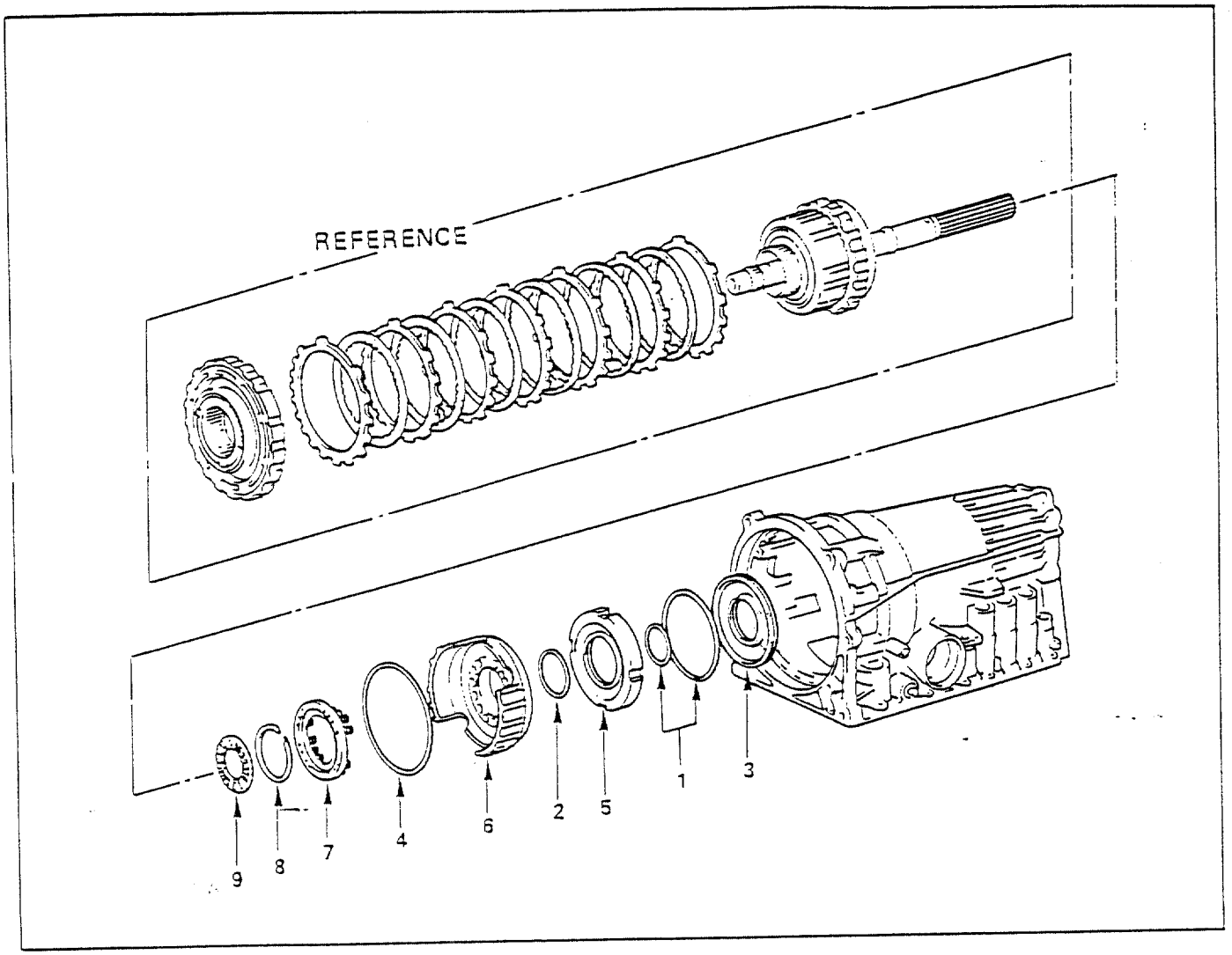


8. **1st and reverse brake piston No. 1**

   Insert special tool behind the No. 1 brake piston and gradually lift it out of the transmission case.

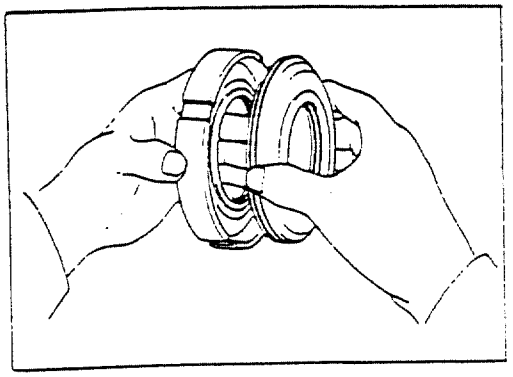
   Piston puller : 5-8840-2174-0 (J-37237)

REASSEMBLY



Reassembly steps

- ▲ 1. O-ring
- ▲ 2. O-ring
- ▲ 3. 1st and reverse brake piston No. 1
- ▲ 4. O-ring
- ▲ 5. Reaction sleeve
- ▲ 6. 1st and reverse brake piston No. 2
- ▲ 7. Return spring
- ▲ 8. Snap ring
- ▲ 9. Thrust bearing and race



Important operations

1. O-ring

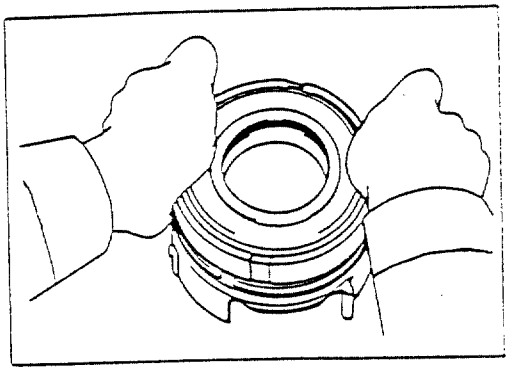
   Coat three new O-rings with ATF.
   Install the two O-rings on the No. 1 piston.

2. O-ring

   Install the O-ring on the reaction sleeve.

3. 1st and reverse brake piston No. 1

   Install the No. 1 piston to the reaction sleeve.

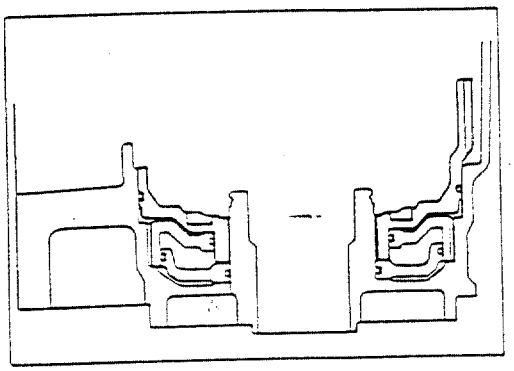


4. O-ring

   Coat a new O-ring with ATF and install it on the No. 2 piston.

5. Reaction sleeve

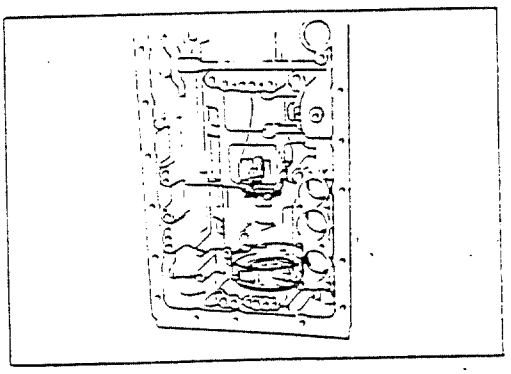
   Install the No. 1 piston with reaction sleeve onto the No. 2 piston.



6. 1st and reverse brake piston No. 2

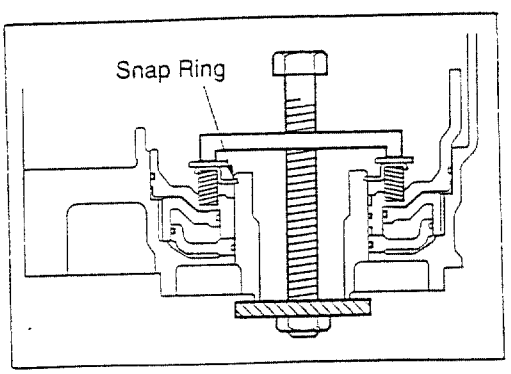
   Align the teeth of the No. 2 piston into the proper grooves.

   Being careful not to damage the O-rings, press in the No. 2 with No. 1 first and reverse brake pistons into the transmission case.



7. Return spring

   Place piston return spring onto No. 2 piston.

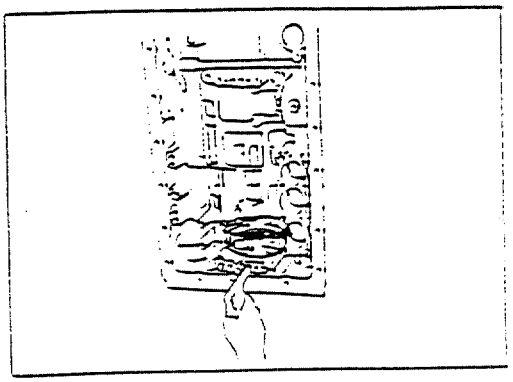


8. Snap ring

   Set special tool as shown, and compress the return spring with special tool.

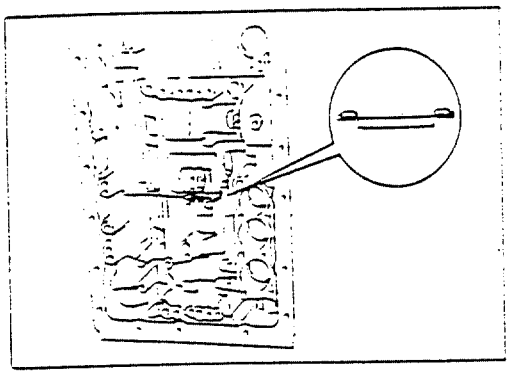
   Spring compressor : 5-8840-0251-0 (J-25048-1)

   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.



Check first and reverse brake piston

Make sure the first and reverse brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



9. Thrust bearing and race

Coat the assembled bearing and race with petroleum jelly.

Install the assembled bearing and race facing the bearing side upward.

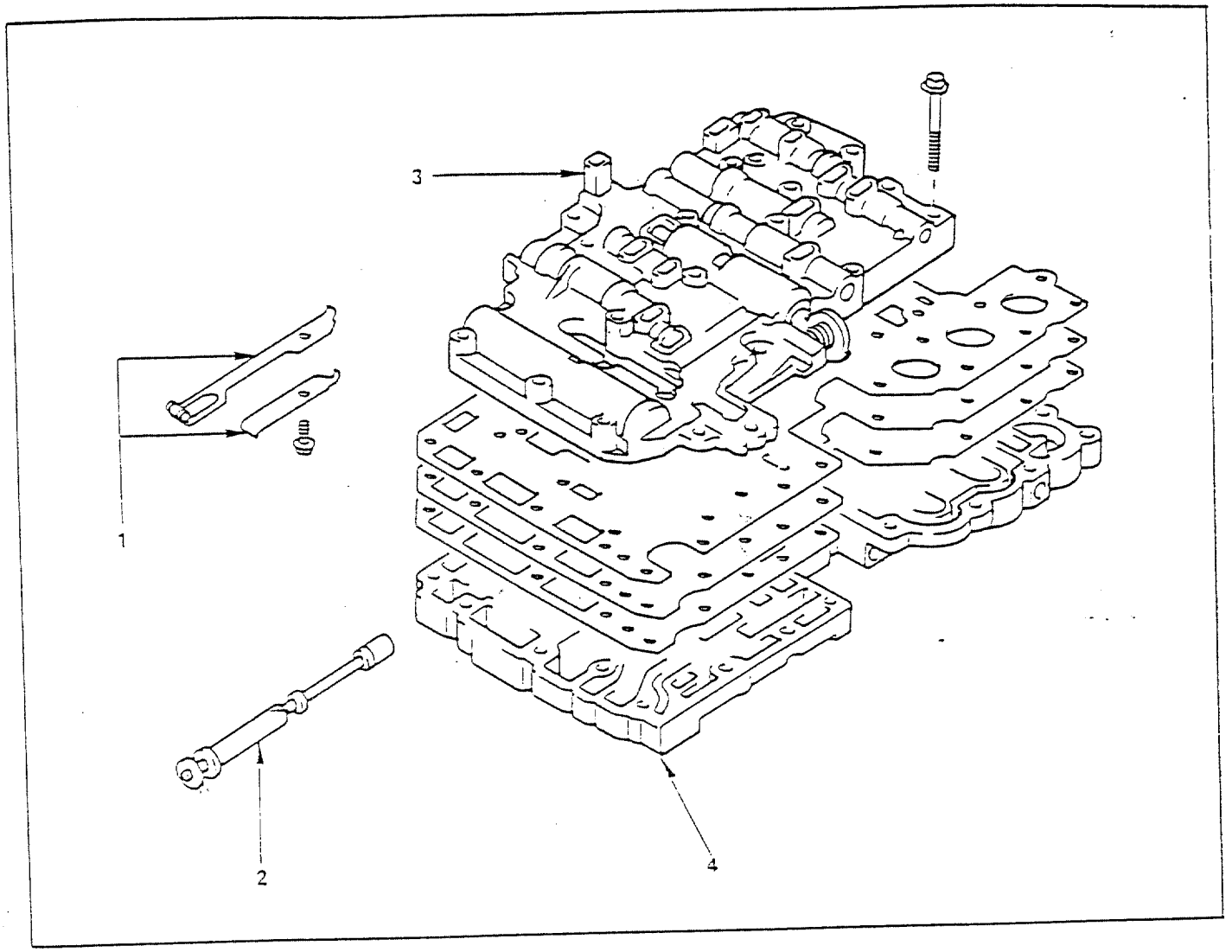
Note: Assembled bearing and race diameter. (Reference)

mm(in.)

Inside diameter	39.2 (1.543)
Outside diameter	57.7 (2.272)

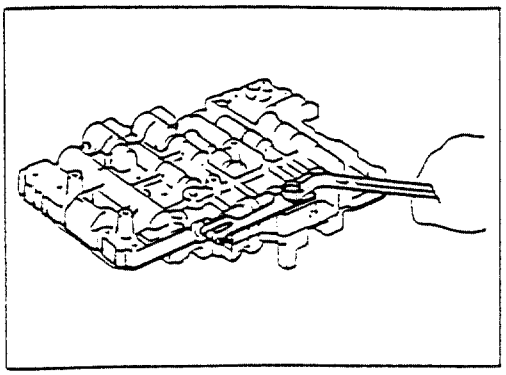
TRANSMISSION VALVE BODY ASSEMBLY

DISASSEMBLY



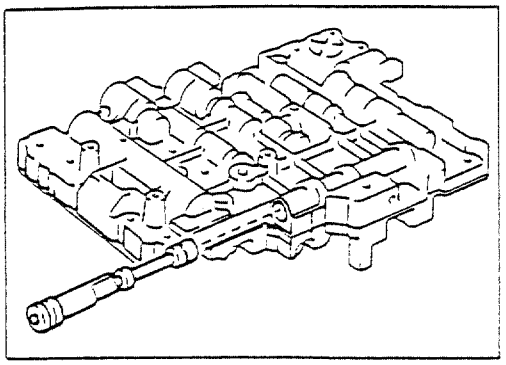
Disassembly steps

▲ 1. Detent spring
▲ 2. Manual shift valve
▲ 3. Upper valve body and plate
4. Lower valve body

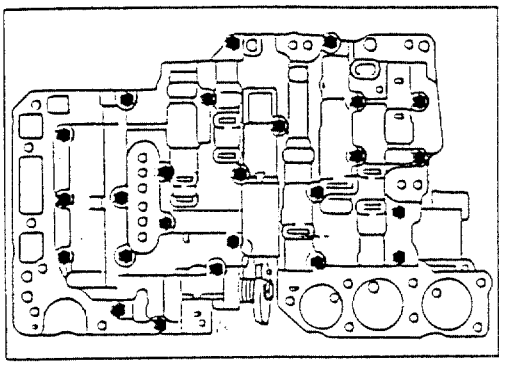


Important operations

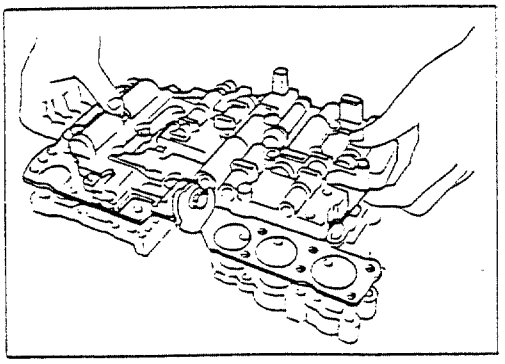
1. **Detent spring**
   Remove detent spring from valve body.



2. **Manual shift valve**
   Remove manual shift valve



3. **Upper valve body and plate**
   Turn over assembly and remove twenty five bolts.

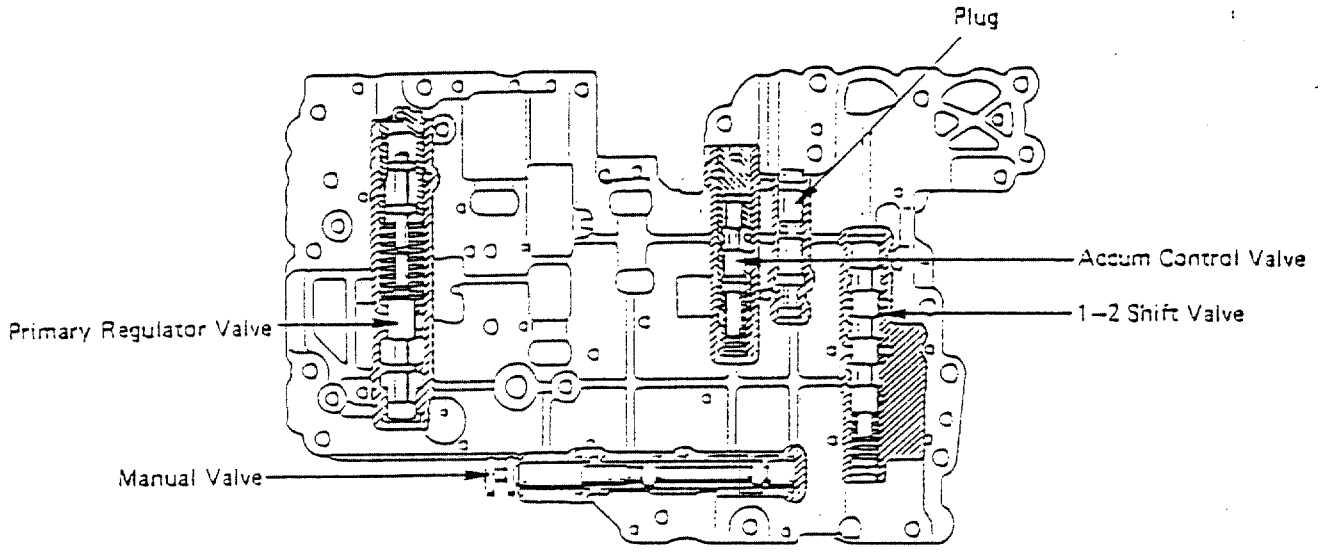


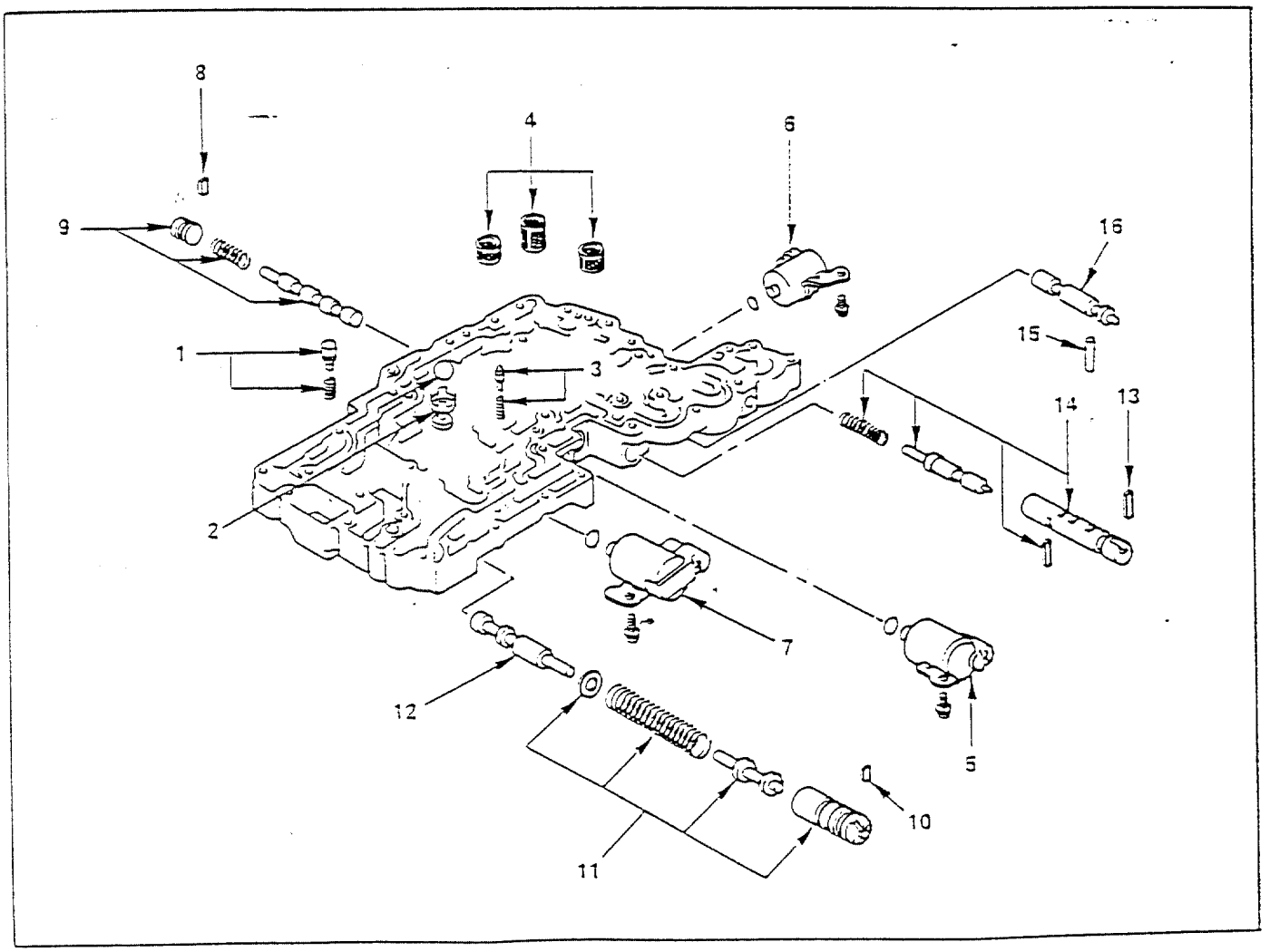
Hold the valve body plate to the upper valve body.
Lift off upper valve body and plate as a single unit.

Note: Be careful that the check balls and strainer do not fall out.

LOWER VALVE BODY

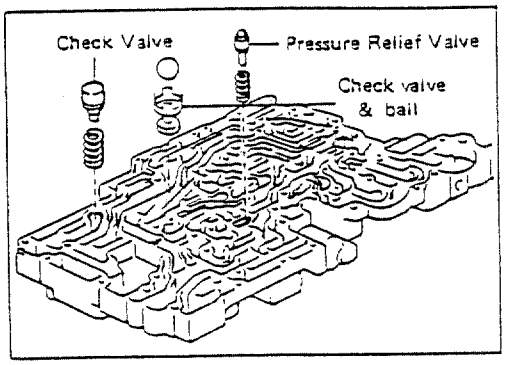
DISASSEMBLY





Disassembly steps

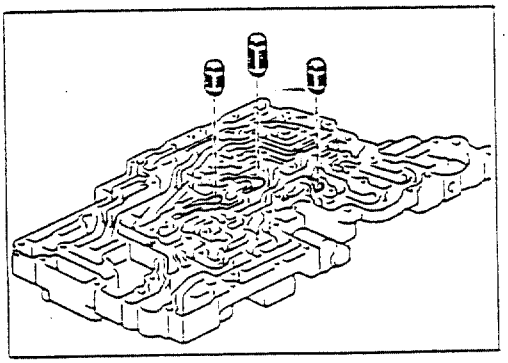
▲ 1. Check valve
▲ 2. Check valve and ball
▲ 3. Pressure relief valve
▲ 4. Strainer
▲ 5. No. 1 solenoid
▲ 6. No. 2 solenoid
▲ 7. No. 3 solenoid
▲ 8. Retainer
▲ 9. Plug, spring and 1-2 shift valve
▲10. Retainer
▲11. Sleeve with plunger, spring and washer
▲12. Primary regulator valve
▲13. Retainer
▲14. Sleeve with accumulator control valve and spring
▲15. Pin
▲16. Plug



Important operations

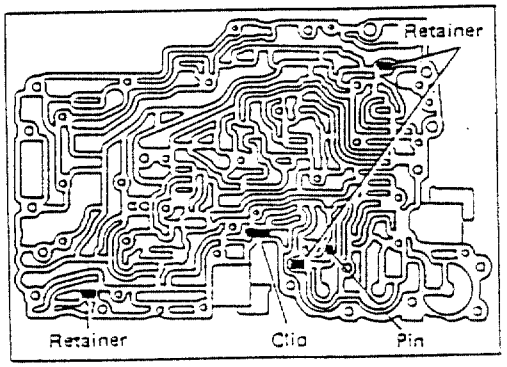
1. **Check valve**
2. **Check valve and ball**
3. **Pressure relief valve**

   Remove check valve, check valve and ball, pressure relief valve and springs.

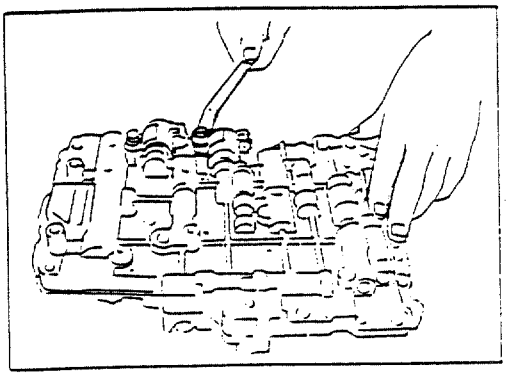


4. **Strainer**

   Remove three strainers.



Confirm clip and three retainers are installed correctly

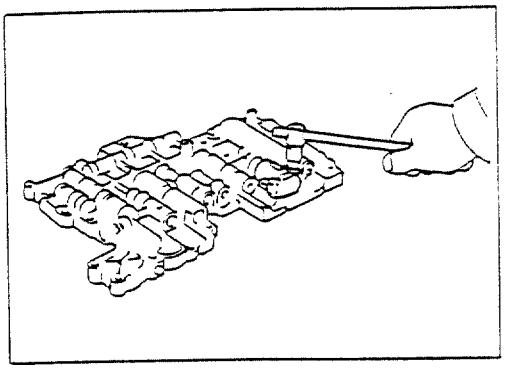


5. **No. 1 solenoid**
6. **No. 2 solenoid**

   Remove each fixing bolt.

   Remove the No. 1 and NO. 2 solenoid from each bore.

   Remove the O-rings from solenoid.

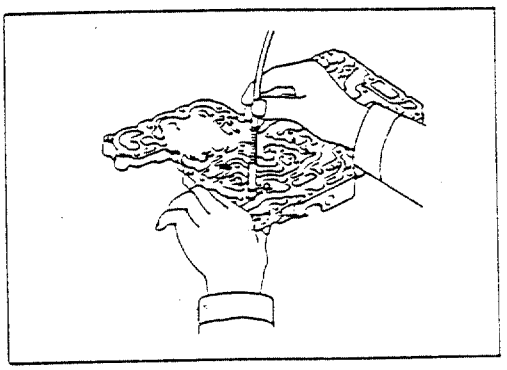


7. **No. 3 solenoid**

   Remove the fixing bolt.

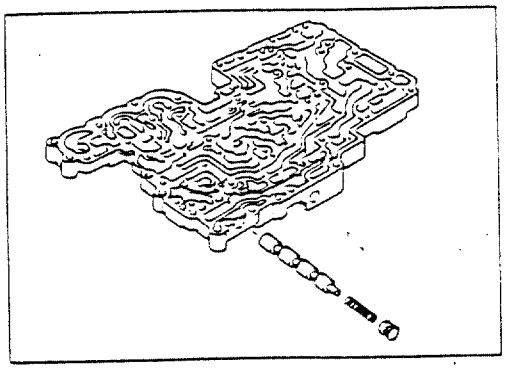
   Remove the solenoid from the bore.

   Remove the O-ring.



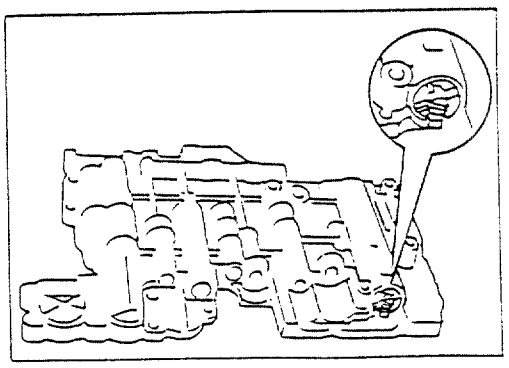
8. **Retainer**

   Remove the retainer with a magnetic finger by pushing in the sleeve.



9. **Plug, spring and 1-2 shift valve**

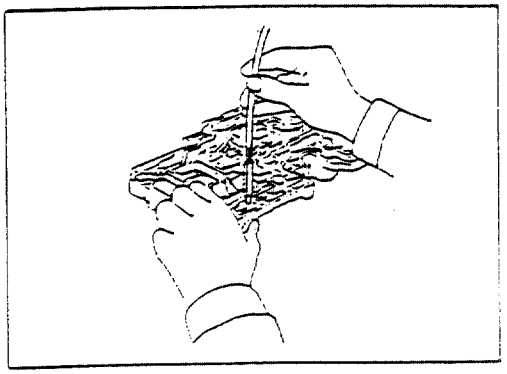
   Remove the plug, spring and 1-2 shift valve.



10. **Retainer**

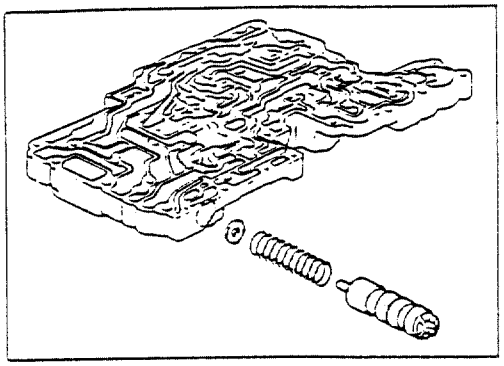
    Place a mark on the bevel when the retainer is positioned.

Note: When reassembling, position the retainer in the same position.



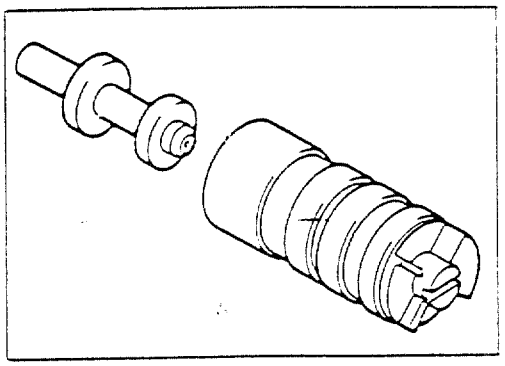
Remove the retainer with a magnetic finger by pushing in the sleeve.

WARNING: There is a highly compressed spring inside—keep away from your face.

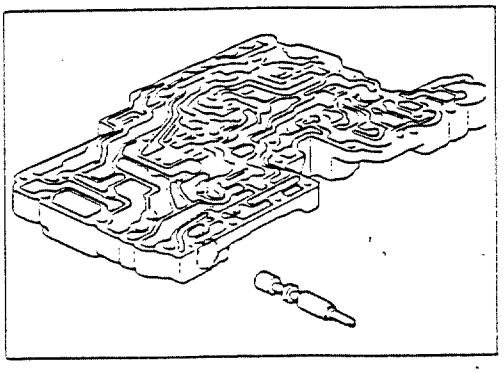


11. **Sleeve with plunger, spring and washer**

Remove the sleeve with the plunger, spring and washer.

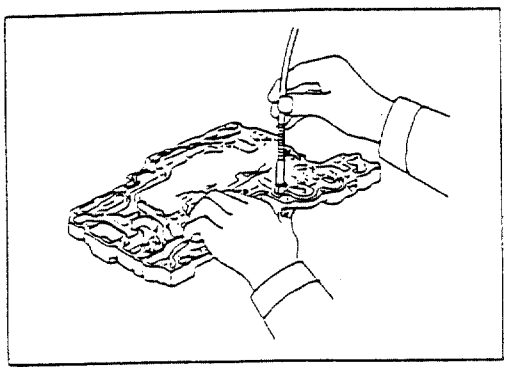


Remove the plunger from the sleeve.



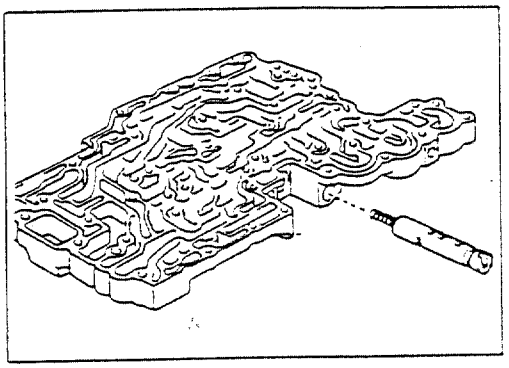
12. **Primary regulator valve**

Remove the primary regulator valve from the valve body.



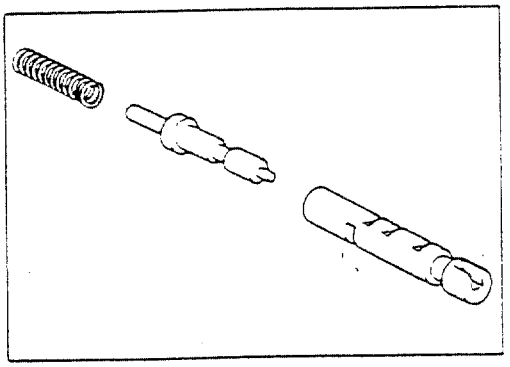
13. **Retainer**

    Remove the retainer with a magnetic finger by pushing in the sleeve.



14. **Sleeve with accumulator control valve and spring**

    Remove the sleeve with the accumulator control valve and spring.



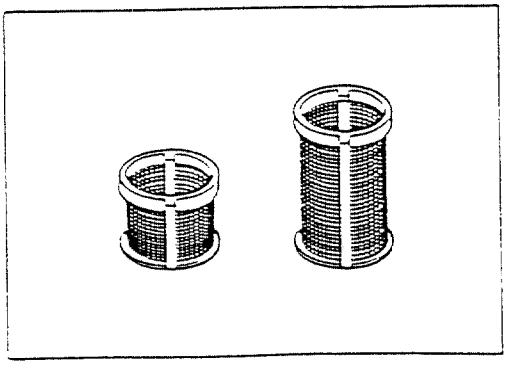
    Remove the accumulator control valve and spring from the sleeve.

15. **Pin**

    Remove the pin with a magnetic finger.

16. **Plug**

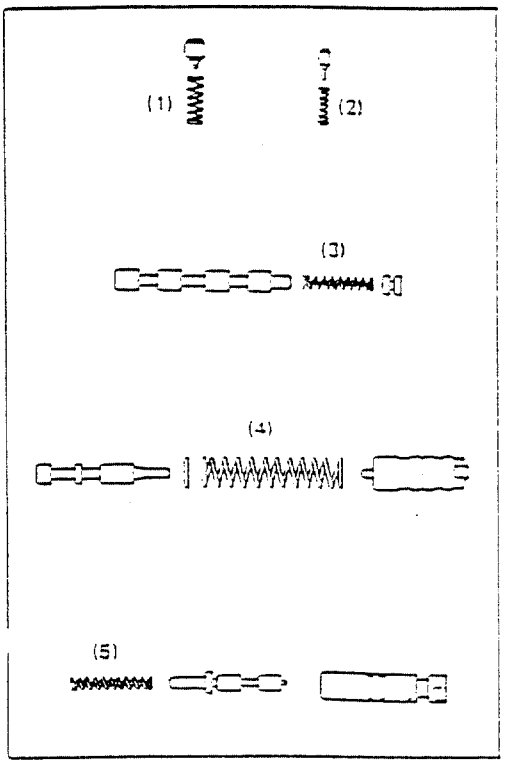
    Remove the plug.



INSPECTION AND REPAIR

Inspect strainer

Inspect strainer for residual adhesive and damage, and clean and replace as necessary.



Inspect valve springs

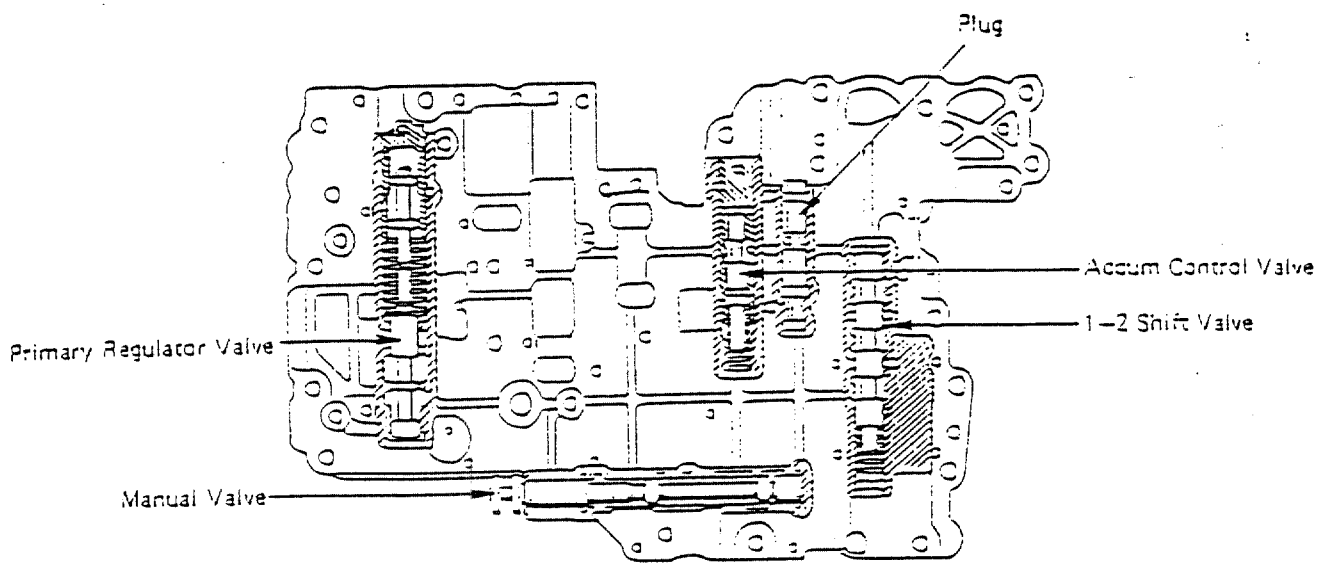
Check for damage, squareness, rust and distorted coils.

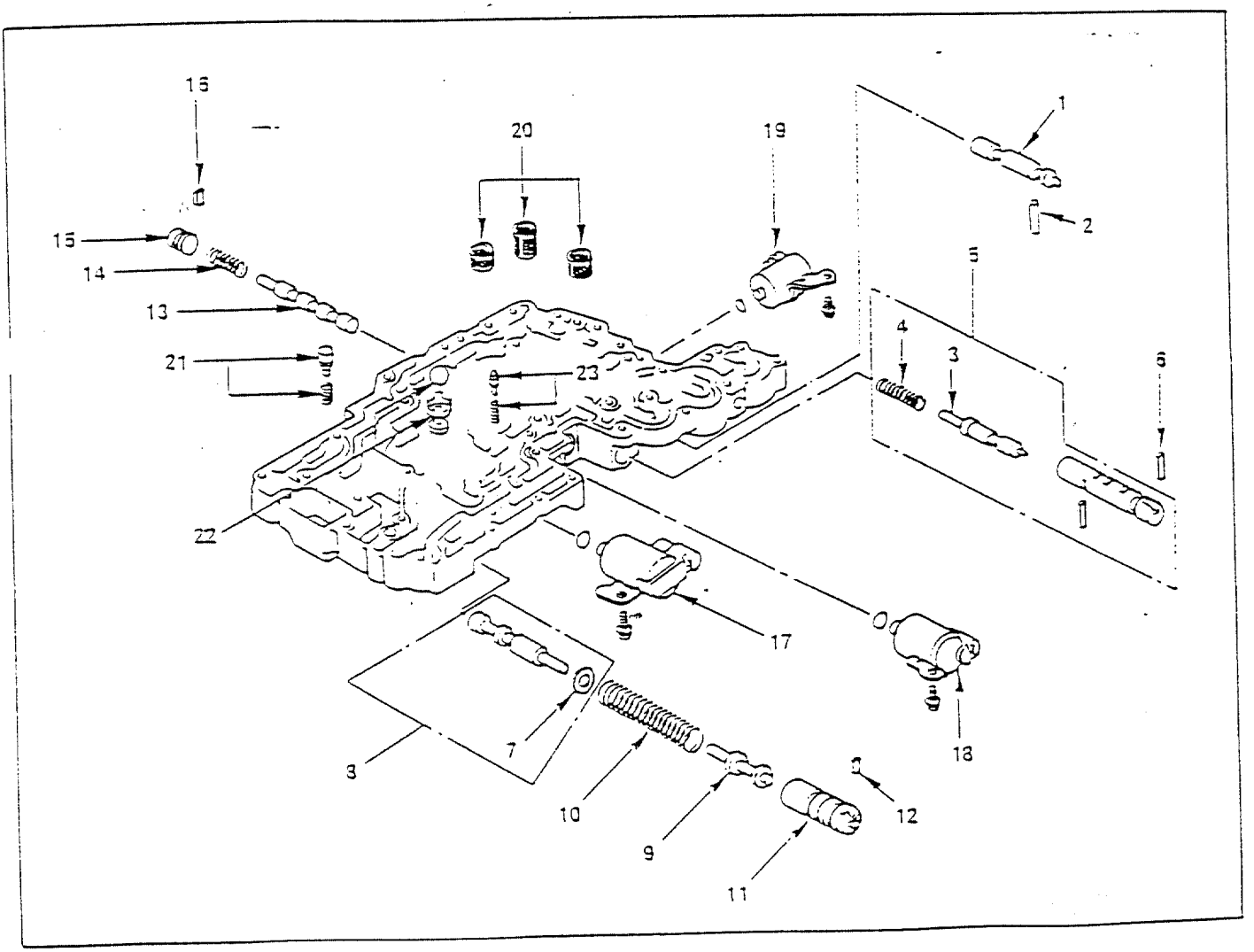
Measure the spring free height and replace if less than shown below.

mm (in.)

Spring	Free length
(1) Check valve	20.2 (0.795)
(2) Pressure relief valve	11.2 (0.441)
(3) 1-2 shift valve	30.8 (1.213)
(4) Primary regulator valve	62.3 (2.453)
(5) Accumulator control valve	33.9 (1.335)

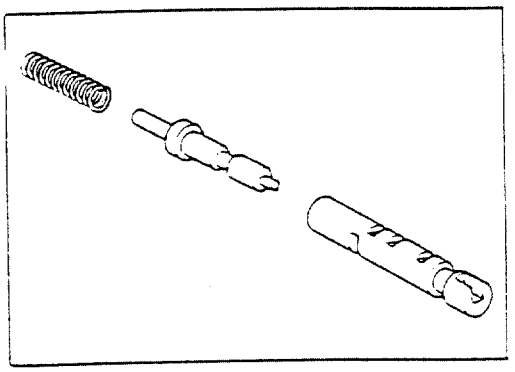
LOWER VALVE BODY REASSEMBLY





Disassembly steps

▲ 1. Plug
2. Pin
3. Accumulator control valve
▲ 4. Spring
▲ 5. Sleeve with accumulator control valve
▲ 6. Retainer
▲ 7. Washer
▲ 8. Primary regulator valve
▲ 9. Plunger
▲10. Spring
▲11. Sleeve
▲12. Retainer
▲13. 1-2 shift valve
▲14. Spring
▲15. Plug
▲16. Retainer
▲17. No. 3 solenoid
▲18. No. 1 solenoid
▲19. No. 2 solenoid
▲20. Strainer
▲21. Check valve and spring
▲22. Check valve and ball
▲23. Pressure relief valve



Important operations

1. Plug

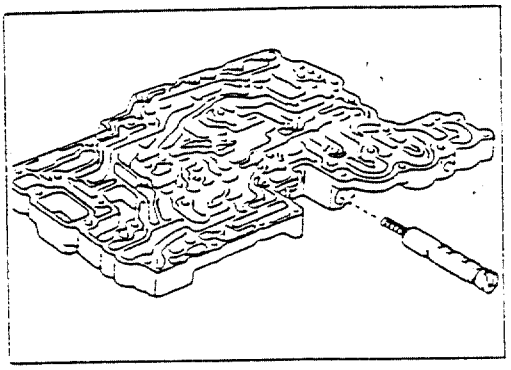
   Install the plug.

2. Pin

   Install the pin

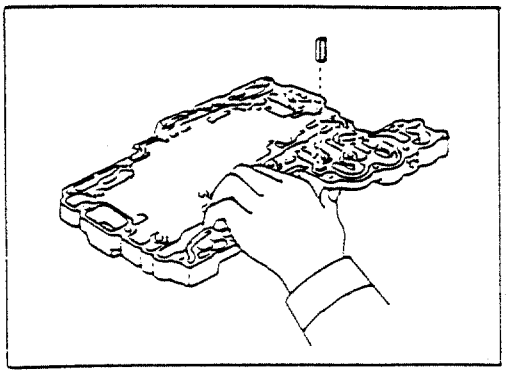
3. Accumulator control valve
4. Spring

   Install the accumulator control valve and spring into the sleeve.



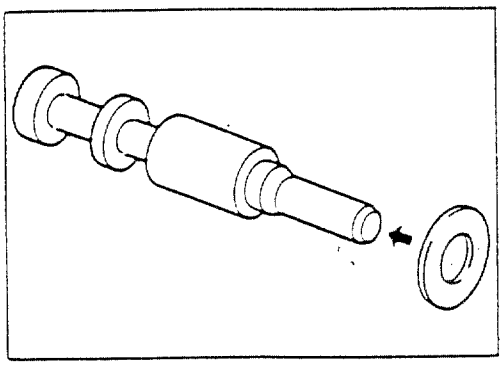
5. Sleeve with accumulator control valve

   Install the sleeve with the accumulator control valve and spring into the bore.



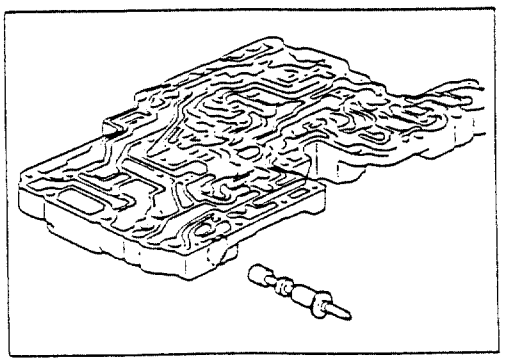
6. Retainer

   Install the retainer by pushing in the sleeve.



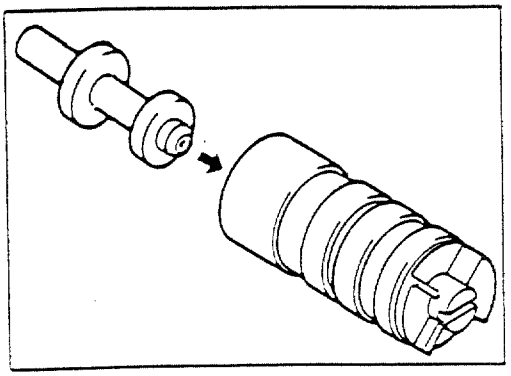
7. Washer

   Install the washer onto the primary regulator valve.



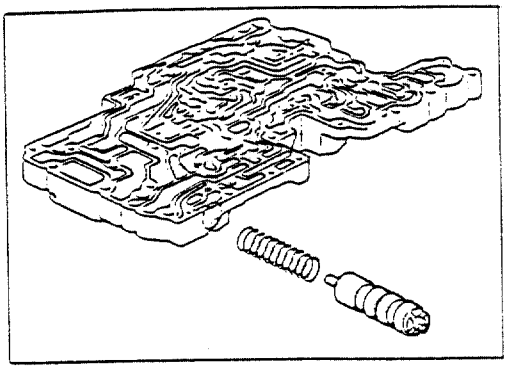
8. Primary regulator valve

   Install the primary regulator valve with the washer into the bore.



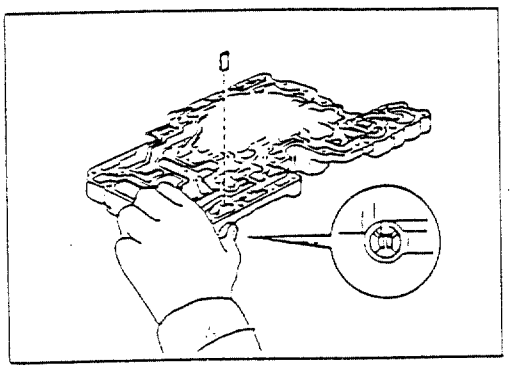
9. **Plunger**

   Install the plunger into the sleeve.



10. **Spring**
11. **Sleeve with plunger**

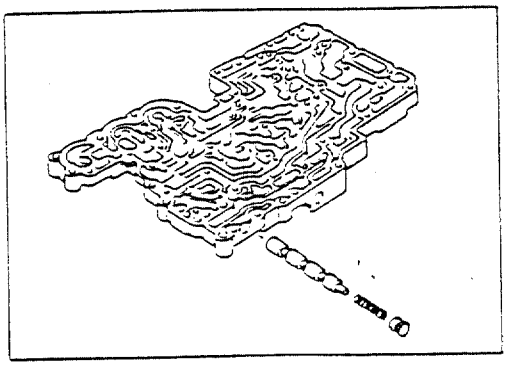
    Install the sleeve with the plunger and spring into the bore.



12. **Retainer**

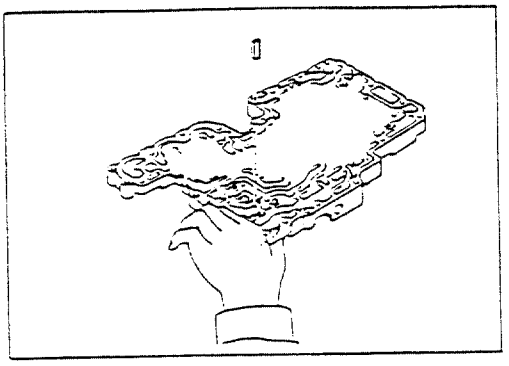
    Install the retainer to the bevel by pushing in the sleeve.

Note: Install the retainer to the same position on the sleeve, as when disassembling.



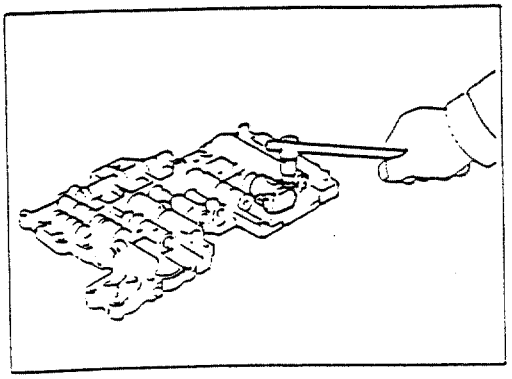
13. **1-2 shift valve**
14. **Spring**
15. **Plug**

    Install the 1-2 shift valve, spring and plug into the bore.



16. **Retainer**

    Install the retainer by pushing in the plug.



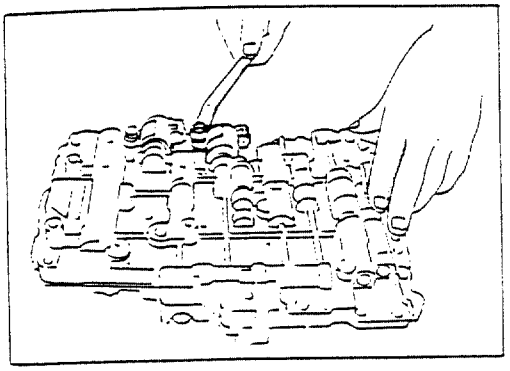
17. **No. 3 solenoid**

Install a new O-ring to the solenoid.

Install the solenoid to the valve body.

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)



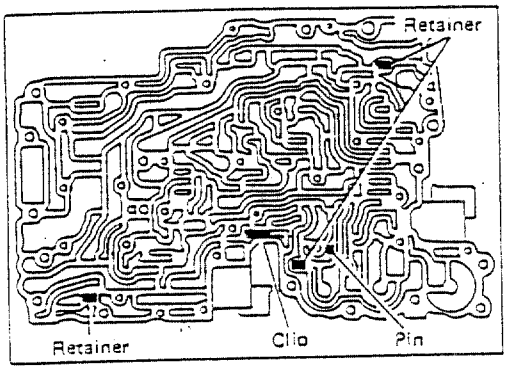
18. **No. 1 solenoid**
19. **No. 2 solenoid**

Install a new O-ring to the solenoid.

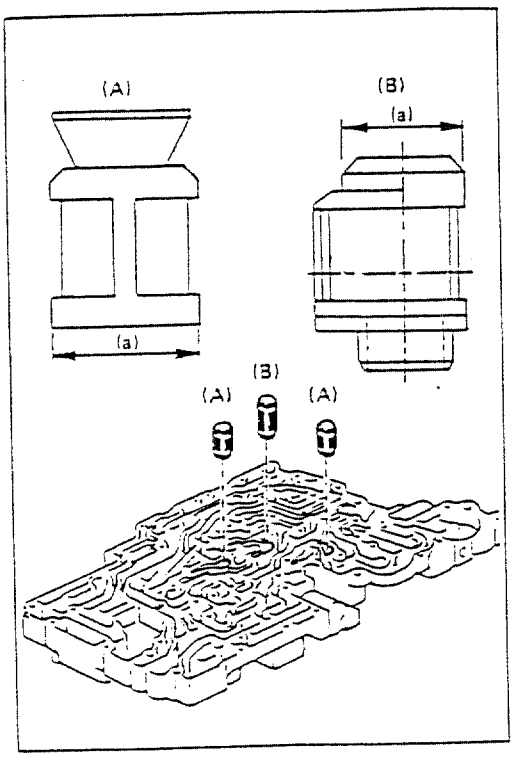
Install the solenoid to the valve body.

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)



Make sure clip and three retainers are installed correctly.

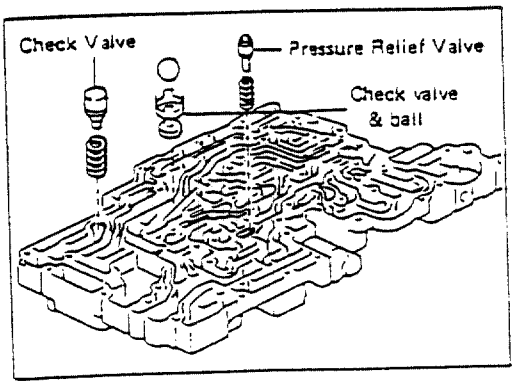


20. **Strainer**

Install the three strainers to the valve body as shown.

mm (in.)

Strainer	Height	Diameter (a)
(A) Solenoid oil strainer	12.3 (0.484)	10.3 (0.406)
(B) Throttle oil strainer	13.6 (0.535)	8.1 (0.319)

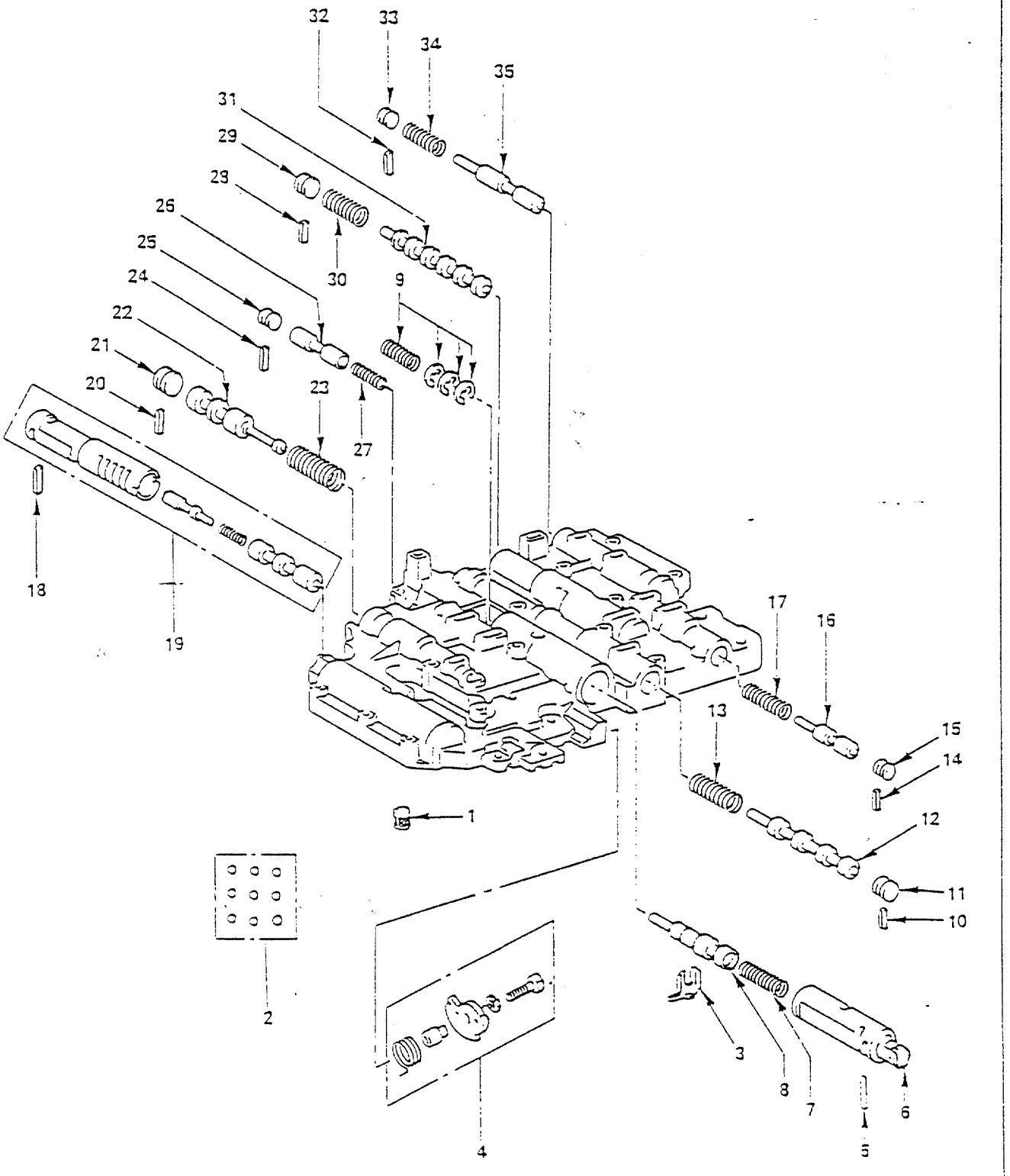


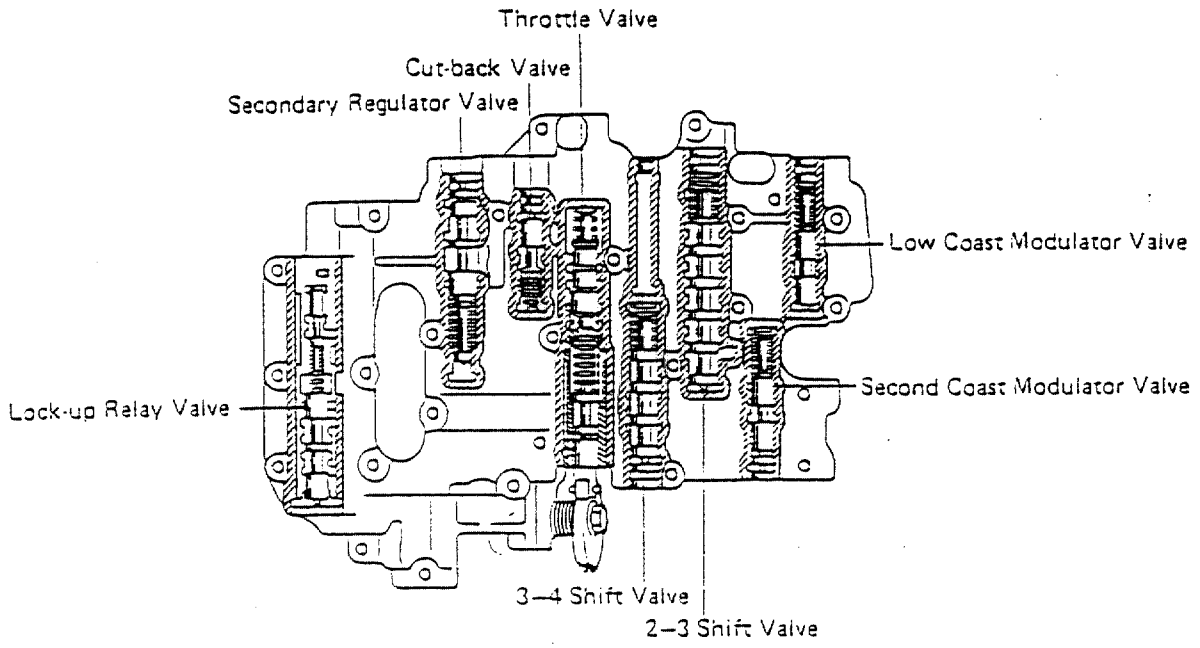
21. **Check valve and spring**
22. **Check valve and ball**
23. **Pressure relief valve**

    Install check valve, check valve and ball, pressure relief valve and springs.

UPPER VALVE BODY

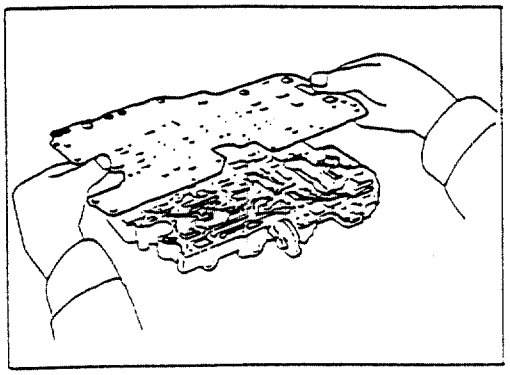
DISASSEMBLY





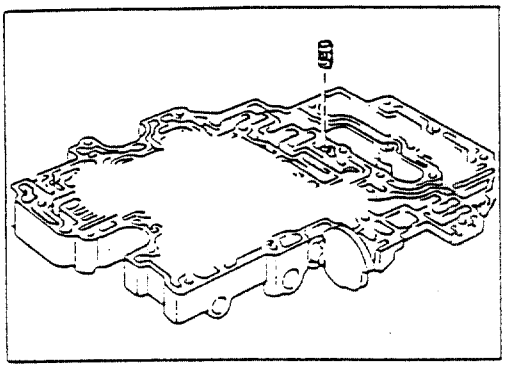
Disassembly steps

- ▲ 1. Strainer
- ▲ 2. Check ball
- ▲ 3. Valve stopper
- ▲ 4. Throttle valve cam
- ▲ 5. Pin
- ▲ 6. Down-shift plug
- ▲ 7. Spring
- ▲ 8. Throttle valve
- ▲ 9. Spring and adjusting ring
- ▲ 10. Retainer
- ▲ 11. Plug
- ▲ 12. 3 - 4 shift valve
- ▲ 13. Spring
- ▲ 14. Retainer
- ▲ 15. Plug
- ▲ 16. 2nd coast modulator valve
- ▲ 17. Spring
- ▲ 18. Retainer
- ▲ 19. Sleeve with plunger, spring and lock up relay valve
- ▲ 20. Retainer
- ▲ 21. Plug
- ▲ 22. Secondary regulator valve
- ▲ 23. Spring
- ▲ 24. Retainer
- ▲ 25. Plug
- ▲ 26. Cut-back valve
- ▲ 27. Spring
- ▲ 28. Retainer
- ▲ 29. Plug
- ▲ 30. Spring
- ▲ 31. 2 - 3 shift valve
- ▲ 32. Retainer
- ▲ 33. Plug
- ▲ 34. Spring
- ▲ 35. Low coast modulator valve

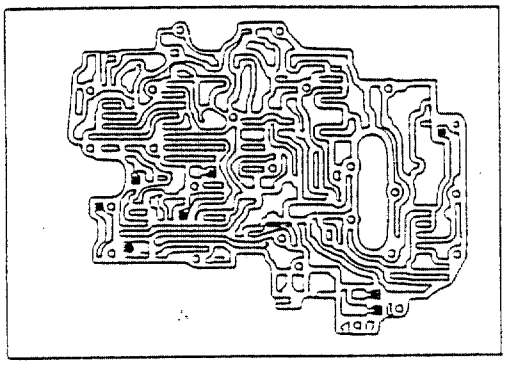


Important operations

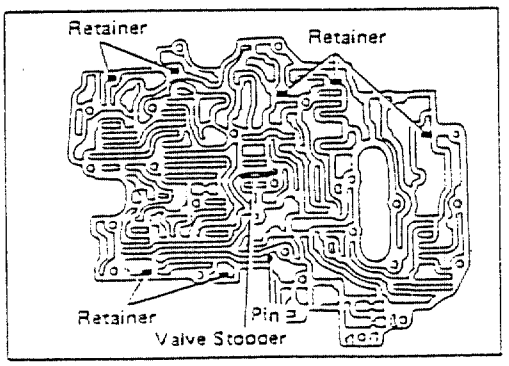
Remove valve body plate and gaskets



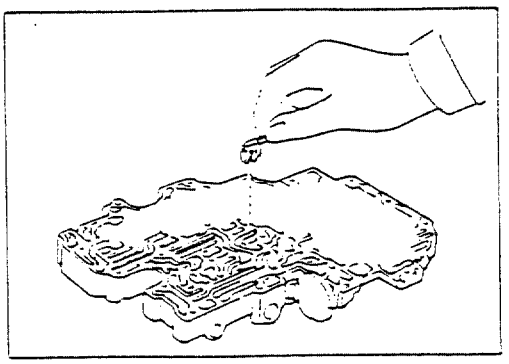
1. Strainer
   Remove strainer.



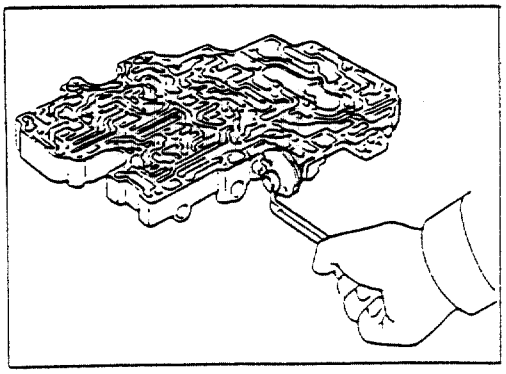
2. Check ball
   Remove eight check balls.



Confirm pin, seven retainers and valve stopper are installed correctly

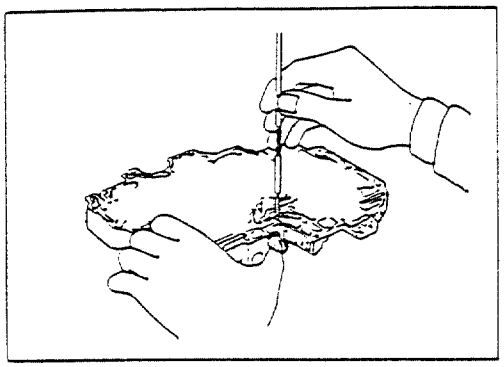


3. Valve stopper
   Remove valve stopper.



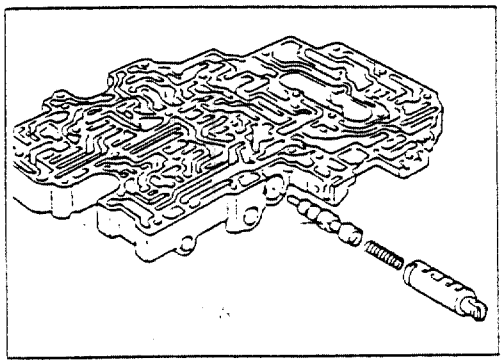
4. Throttle valve cam

   Remove throttle valve cam.



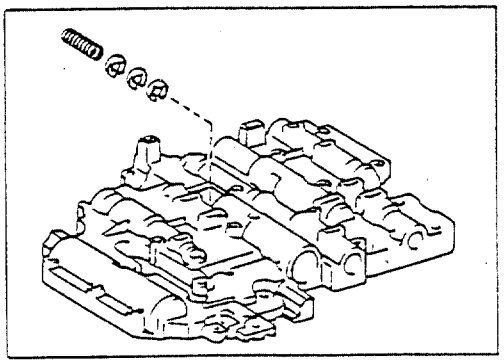
5. Pin

   Remove the pin with a magnetic finger by pushing in the down-shift plug.



6. Down-shift plug
7. Spring
8. Throttle valve

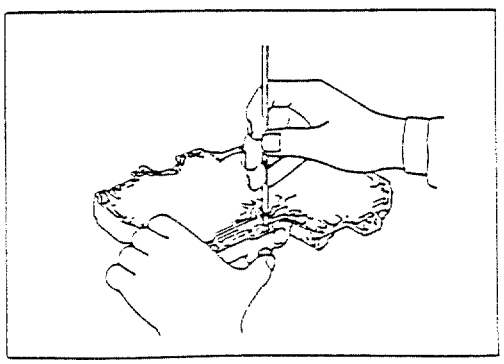
   Remove the down-shift plug, spring and throttle valve.



9. Spring and adjusting ring

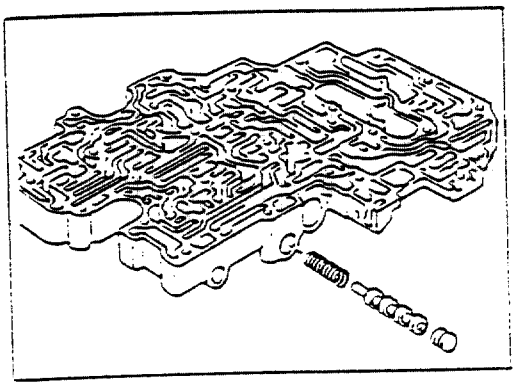
   Turn over assembly, and remove the spring and adjusting rings.

Note: Note the number of adjusting rings installed.
(Sometimes adjusting rings will not be used.)



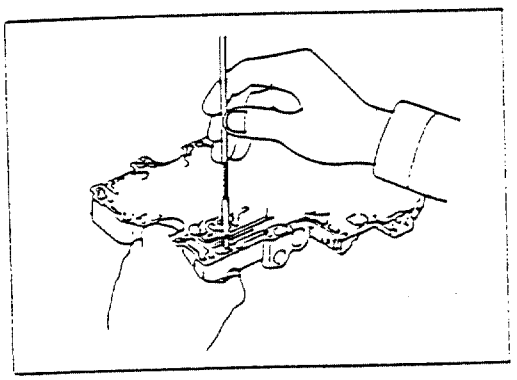
10. Retainer

    Remove the retainer with a magnetic finger by pushing in the plug.



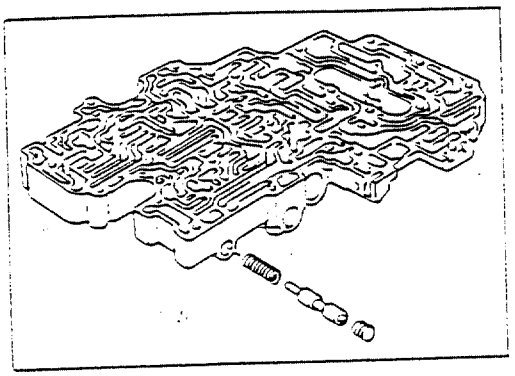
11. Plug
12. 3 - 4 shift valve
13. Spring

    Remove the plug, 3 - 4 shift valve and spring.



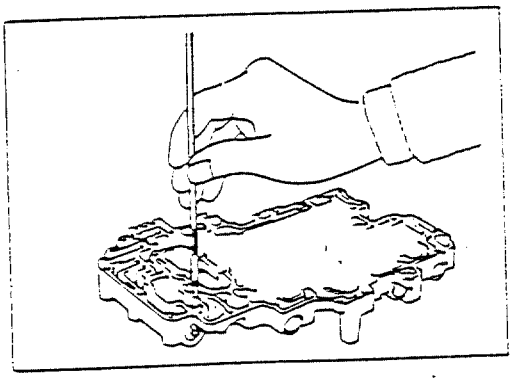
14. Retainer

    Remove the retainer.



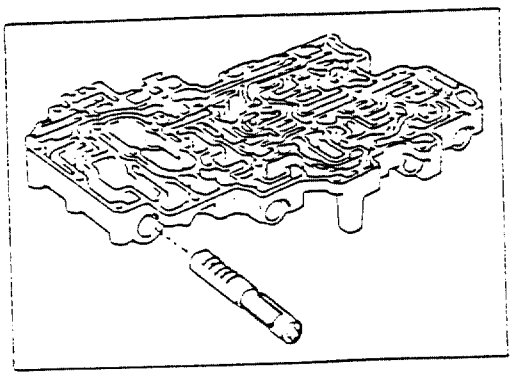
15. Plug
16. 2nd coast modulator valve
17. Spring

    Remove the plug, second-coast modulator valve and spring.



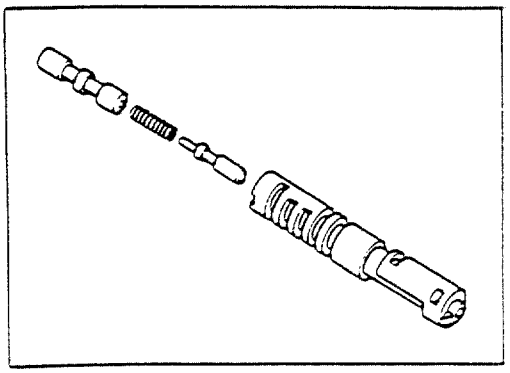
18. Retainer

    Remove the retainer with the magnetic finger.

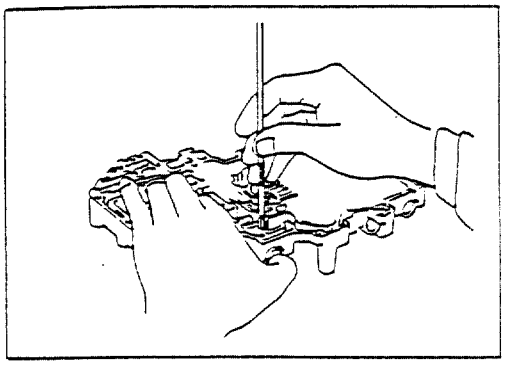


19. Sleeve with plunger, spring and lock up relay valve

    Remove the sleeve with the plunger, spring and lock-up relay valve.

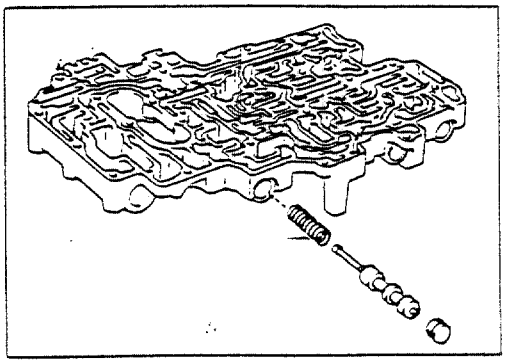


Remove the lock-up relay valve, spring and plunger from the sleeve.



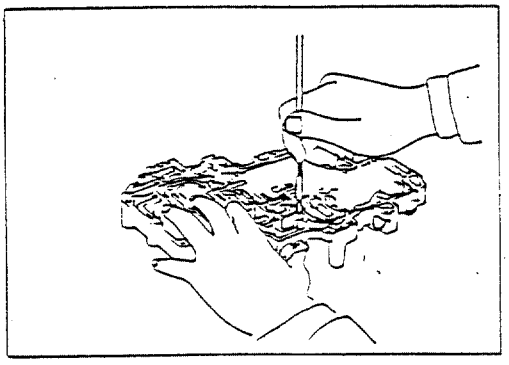
20. Retainer

Remove the retainer with a magnetic finger by pushing in the plug.



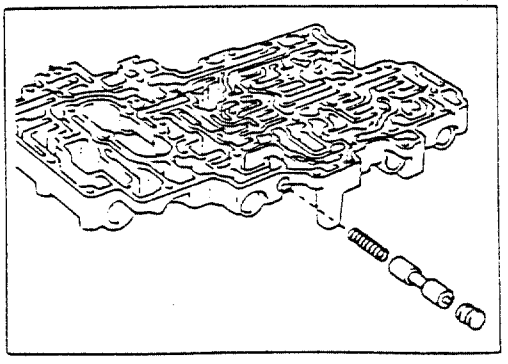
21. Plug
22. Secondary regulator valve
23. Spring

Remove the plug, secondary regulator valve and spring.



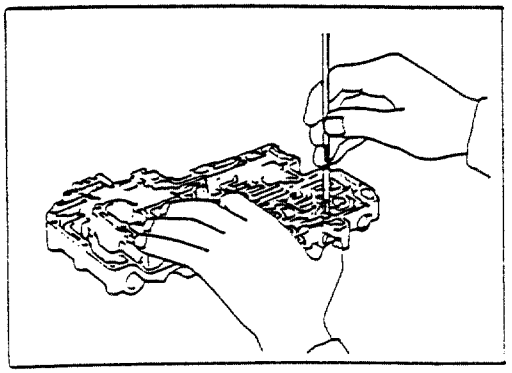
24. Retainer

Remove the retainer with a magnetic finger by pushing in the plug.



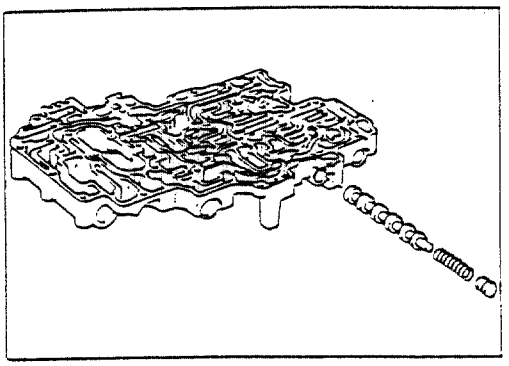
25. Plug
26. Cut-back valve
27. Spring

Remove the plug, cut-back valve and spring.



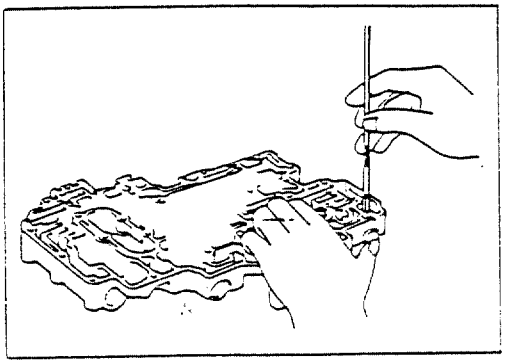
28. Retainer

Remove the retainer with a magnetic finger by pushing in the plug.



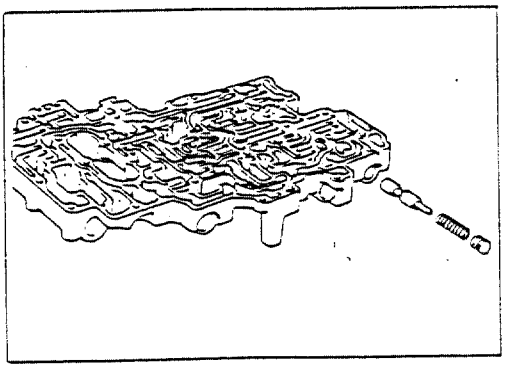
29. Plug
30. Spring
31. 2 - 3 shift valve

Remove the plug, spring and 2 - 3 shift valve.



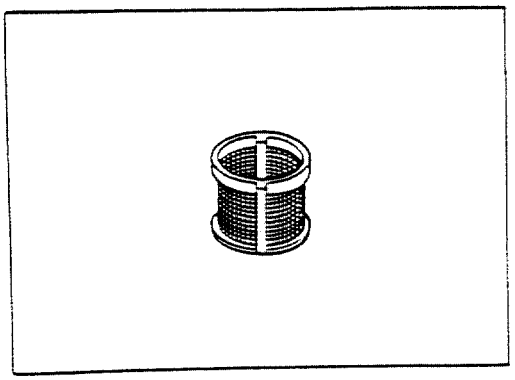
32. Retainer

Remove the retainer with a magnetic finger by pushing in the plug.



33. Plug
34. Spring
35. Low coast modulator valve

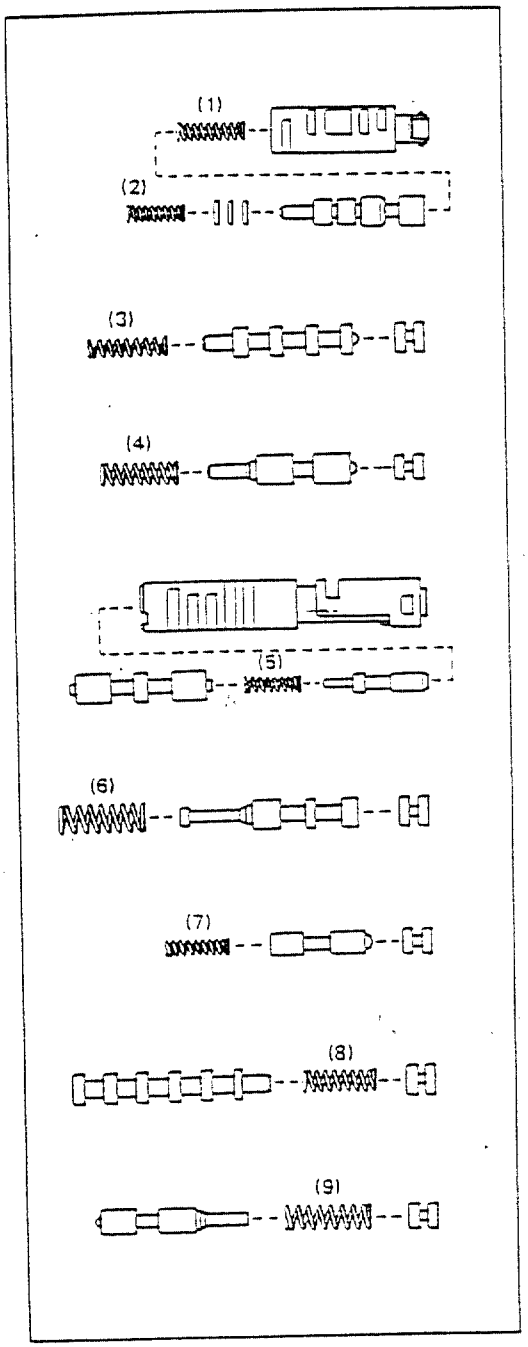
Remove the plug, spring and low coast modulator valve.



INSPECTION AND REPAIR

Inspect strainer

Inspect strainer for residual adhesive and damage, and clean and replace as necessary.



Inspect valve springs

Check for damage, squareness, rust and distorted coils.

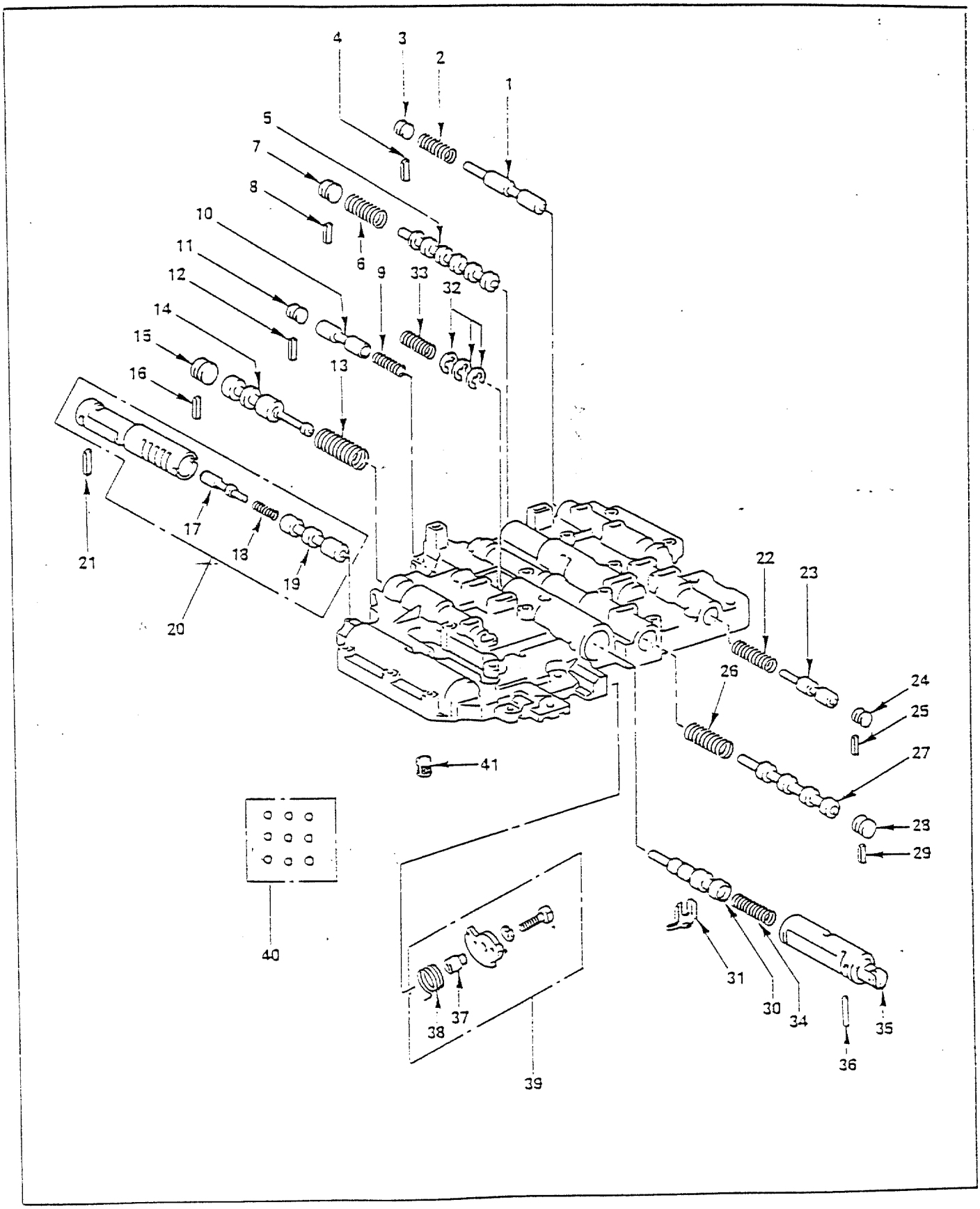
Measure the spring free height and replace if less than that shown below.

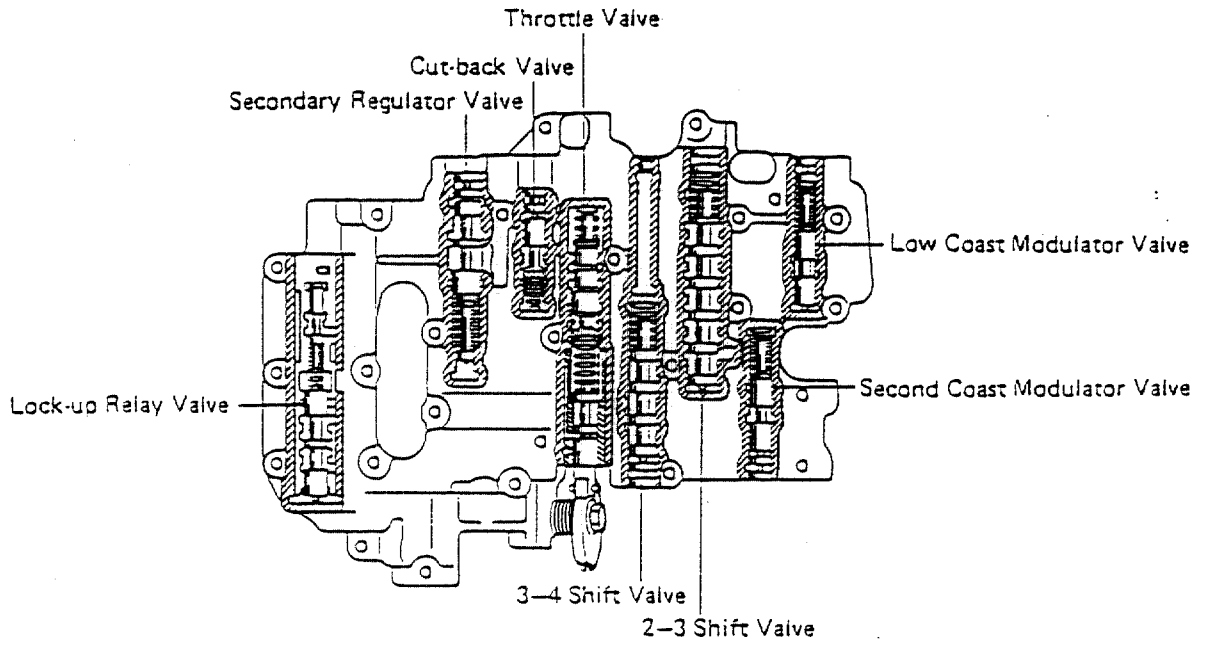
mm (in.)

Spring		Free length
(1)	Down-shift plug	27.3 (1.075)
(2)	Throttle valve	20.6 (0.811)
(3)	3 - 4 shift valve	30.8 (1.212)
(4)	Second coast modulator valve	30.9 (1.217)
(5)	Lock-up relay valve	21.4 (0.843)
(6)	Secondary regulator valve	30.9 (1.217)
(7)	Cut-back valve	21.8 (0.858)
(8)	2 - 3 shift valve	30.8 (1.212)
(9)	Low coast modulator valve	30.4 (1.197)

UPPER VALVE BODY

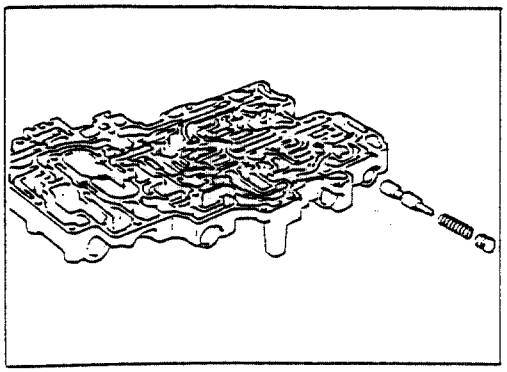
REASSEMBLY





Reassembly steps

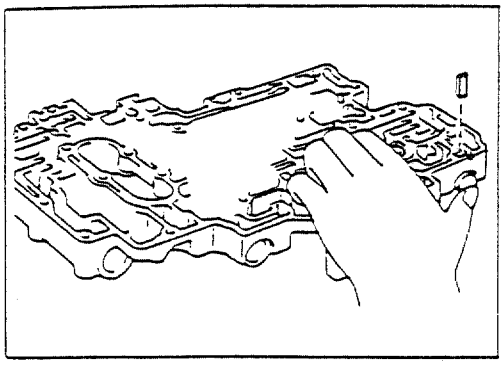
▲ 1. Low-coast modulator valve
▲ 2. Spring
▲ 3. Plug
▲ 4. Retainer
▲ 5. 2 - 3 shift valve
▲ 6. Spring
▲ 7. Plug
▲ 8. Retainer
▲ 9. Spring
▲ 10. Cut-back valve
▲ 11. Plug
▲ 12. Retainer
▲ 13. Spring
▲ 14. Secondary regulator valve
▲ 15. Plug
▲ 16. Retainer
▲ 17. Plunger
▲ 18. Spring
▲ 19. Lock-up relay valve
▲ 20. Sleeve with plunger, spring and lock-up relay valve
▲ 21. Retainer
▲ 22. Spring
▲ 23. Second coast modulator valve
▲ 24. Plug
▲ 25. Retainer
▲ 26. Spring
▲ 27. 3 - 4 shift valve
▲ 28. Plug
▲ 29. Retainer
▲ 30. Throttle valve
▲ 31. Valve stopper
▲ 32. Adjusting ring
▲ 33. Spring
▲ 34. Spring
▲ 35. Down-shift plug
▲ 36. Pin
▲ 37. Sleeve
▲ 38. Spring
▲ 39. Throttle cam assembly
▲ 40. Check ball
▲ 41. Strainer



Important operations

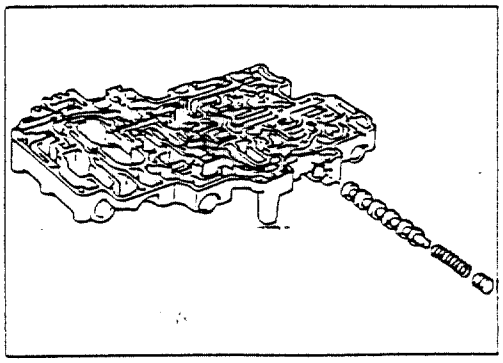
1. Low coast modulator valve
2. Spring
3. Plug

Install the low coast modulator valve, spring and plug into the bore.



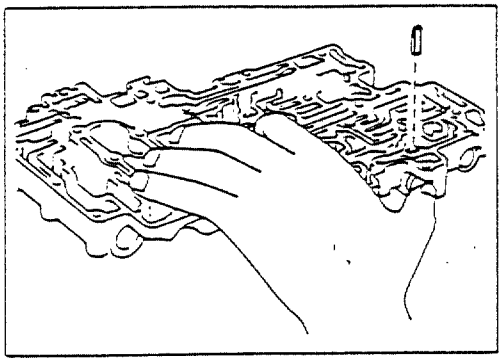
4. Retainer

Install the retainer by pushing in the plug.



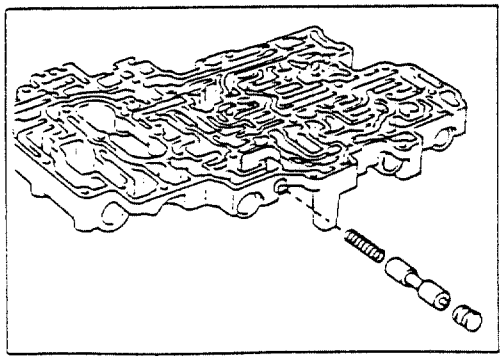
5. 2 - 3 shift valve
6. Spring
7. Plug

Install the 2 - 3 valve, spring and plug into the bore.



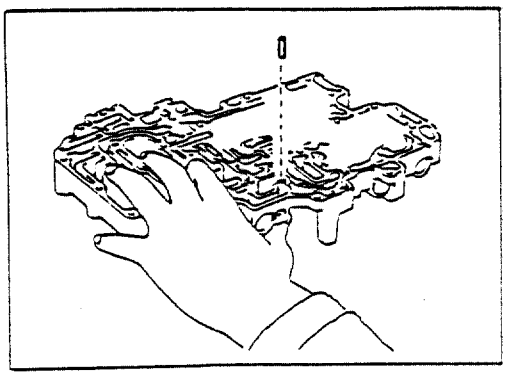
8. Retainer

Install the retainer by pushing in the plug.

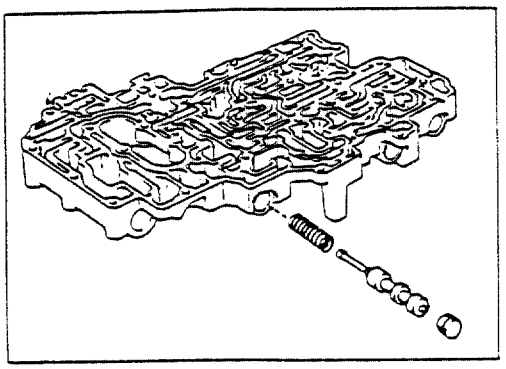


9. Spring
10. Cut-back valve
11. Plug

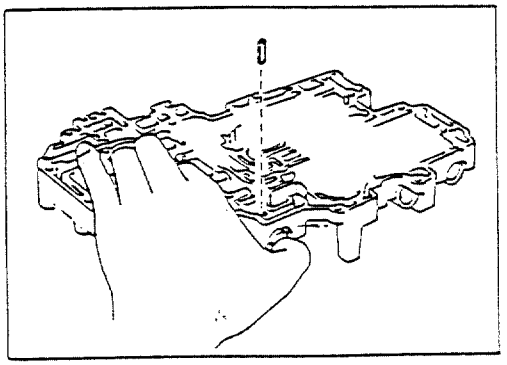
Install the spring, cut-back valve and plug into the bore.



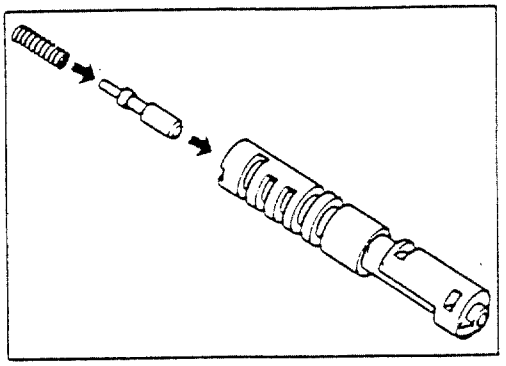
12. **Retainer**
    Install the retainer by pushing in the plug.



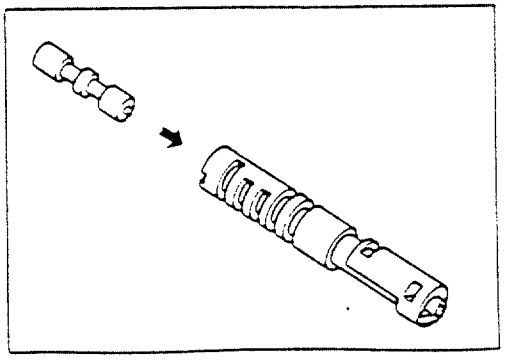
13. **Spring**
14. **Secondary regulator valve**
15. **Plug**
    Install the spring, secondary regulator valve and plug into the bore.



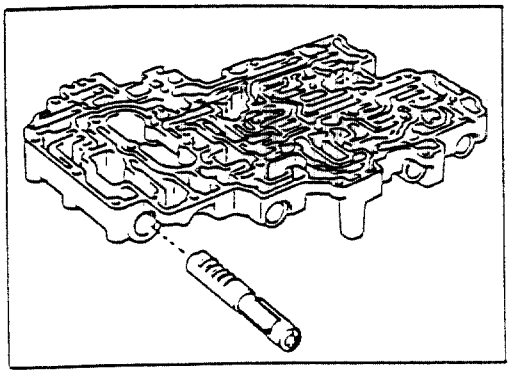
16. **Retainer**
    Install the retainer by pushing in the plug.



17. **Plunger**
18. **Spring**
    Install the plunger and spring into the sleeve.

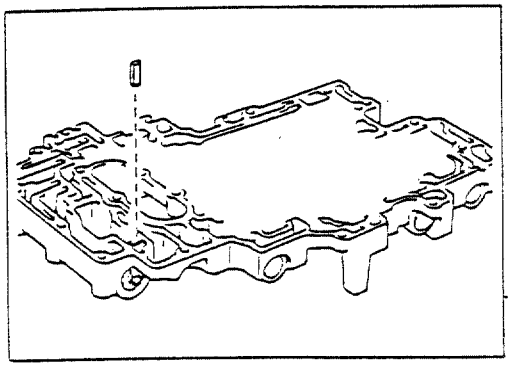


19. **Lock-up relay valve**
    Install the lock-up relay valve into the sleeve.



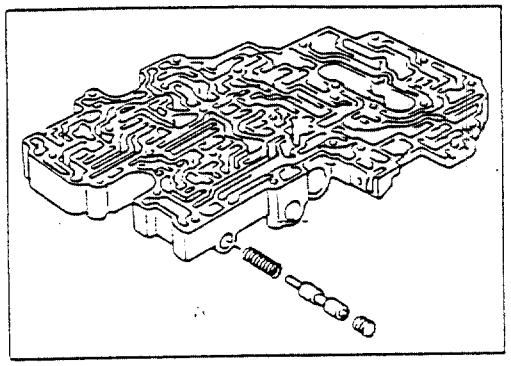
20. **Sleeve with plunger, spring and lock-up relay valve**

    Install the sleeve with the plunger, spring and lock-up relay valve into the bore.



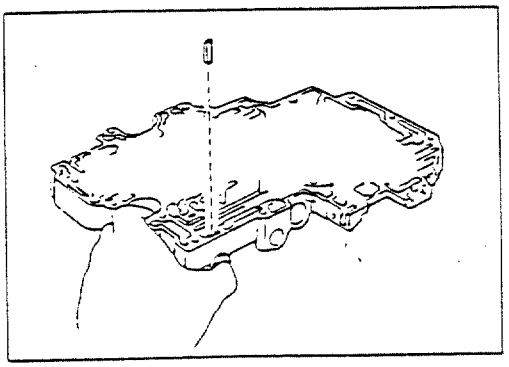
21. **Retainer**

    Install the retainer.



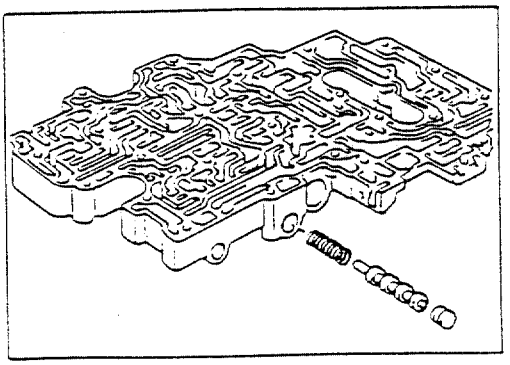
22. **Spring**
23. **Second coast modulator valve**
24. **Plug**

    Install the spring, second coast modulator valve and plug into the bore.



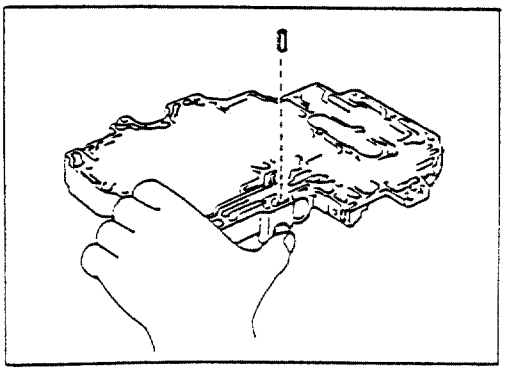
25. **Retainer**

    Install the retainer by pushing in the plug.



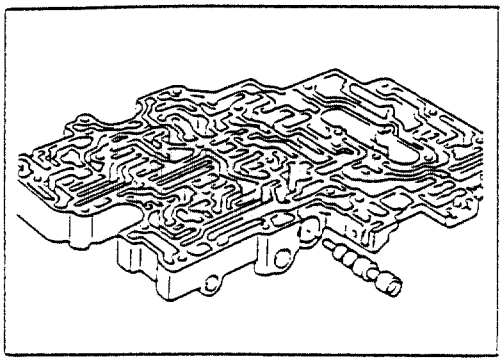
26. **Spring**
27. **3 - 4 shift valve**
28. **Plug**

    Install the spring, 3 - 4 shift valve and plug into the bore.



29. **Retainer**

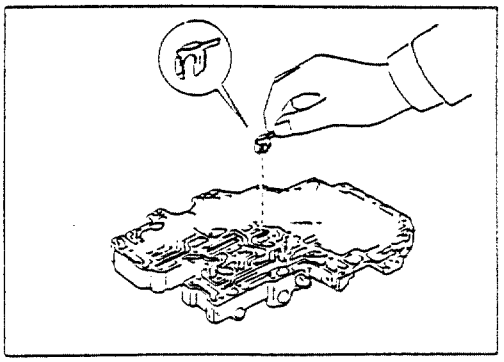
Install the retainer by pushing in the plug.



30. **Throttle valve**

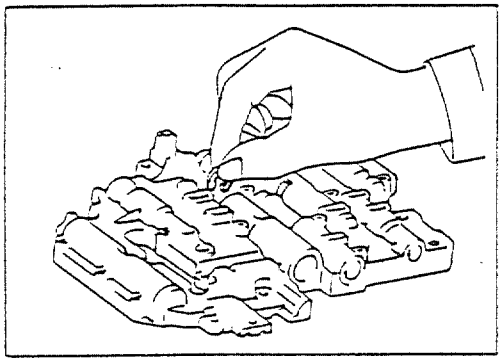
Insert the throttle valve into the bore.

Note: Check that the valve is fully inserted into the bore.



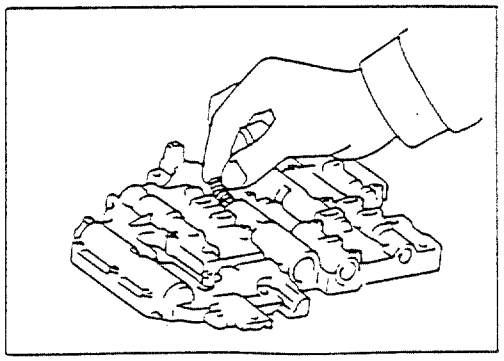
31. **Valve stopper**

Install the valve stopper as shown.



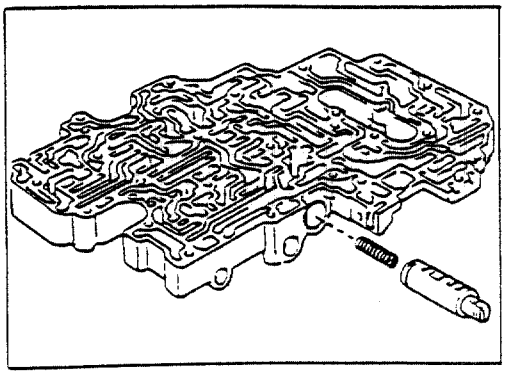
32. **Adjusting ring**

Turn over valve body, and install the same number of adjusting rings as were removed during disassembly.



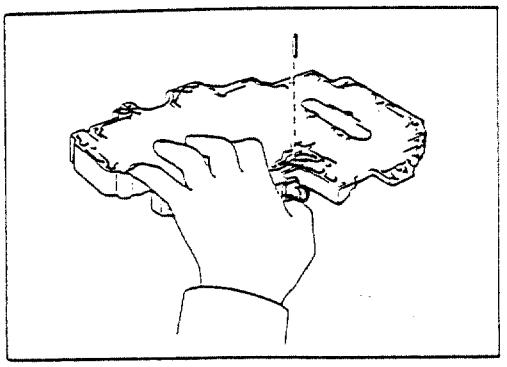
33. **Spring**

Install the spring onto the end of the valve shaft.



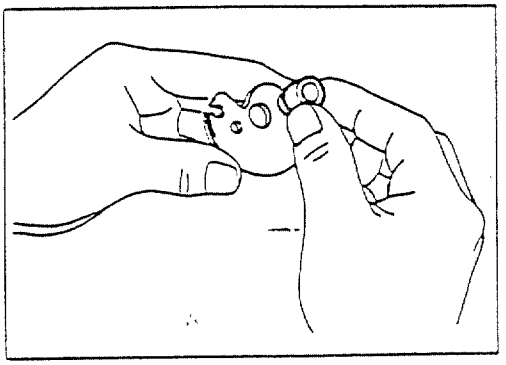
34. Spring
35. Down-shift plug

Install the spring and down-shift plug into the bore.



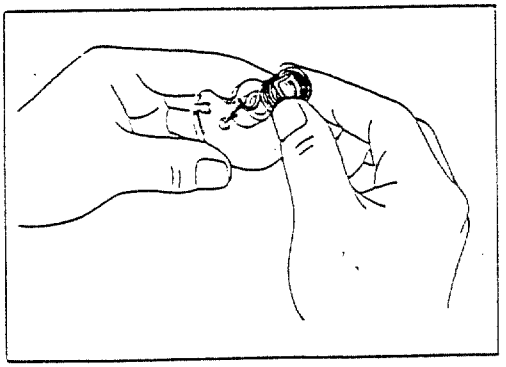
36. Pin

Install the retainer by pushing in the plug.



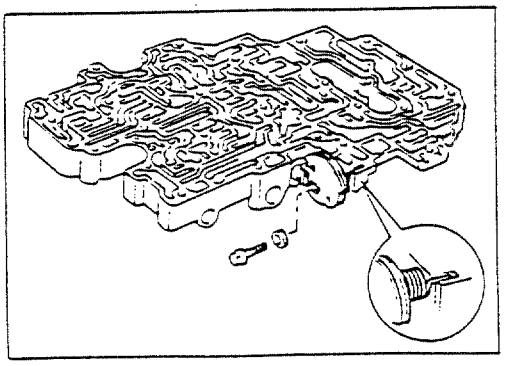
37. Sleeve

Insert the sleeve through one side of the cam.



38. Spring

Install the spring with the hook through the hole in the cam.



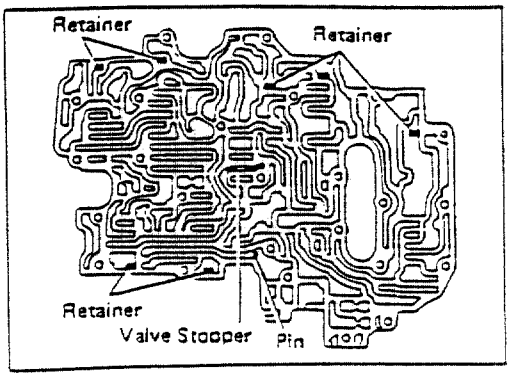
39. Throttle cam assembly

Check that position of the spring end is positioned as shown in the figure.

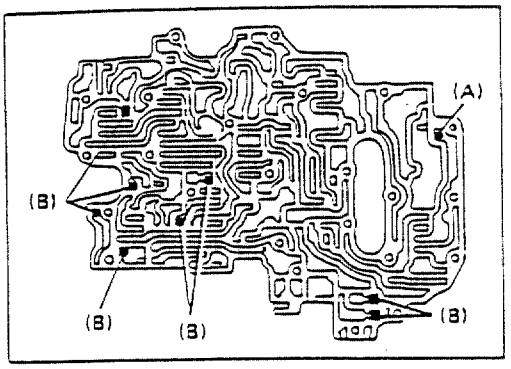
Tighten bolt.

N.m (kgf.m/lb.ft)

Torque	8.8 (0.897 / 77.89)



Make sure pin, seven retainers and valve stopper are installed correctly

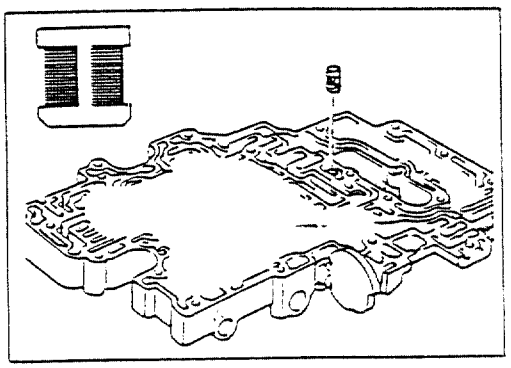


40. **Check ball**

Install the two types of check balls (total 9 pcs.) to the valve body.

mm (in.)

Check ball	Diameter
(A) Rubber ball	6.35 (0.2500)
(B) Rubber ball	5.54 (0.2181)

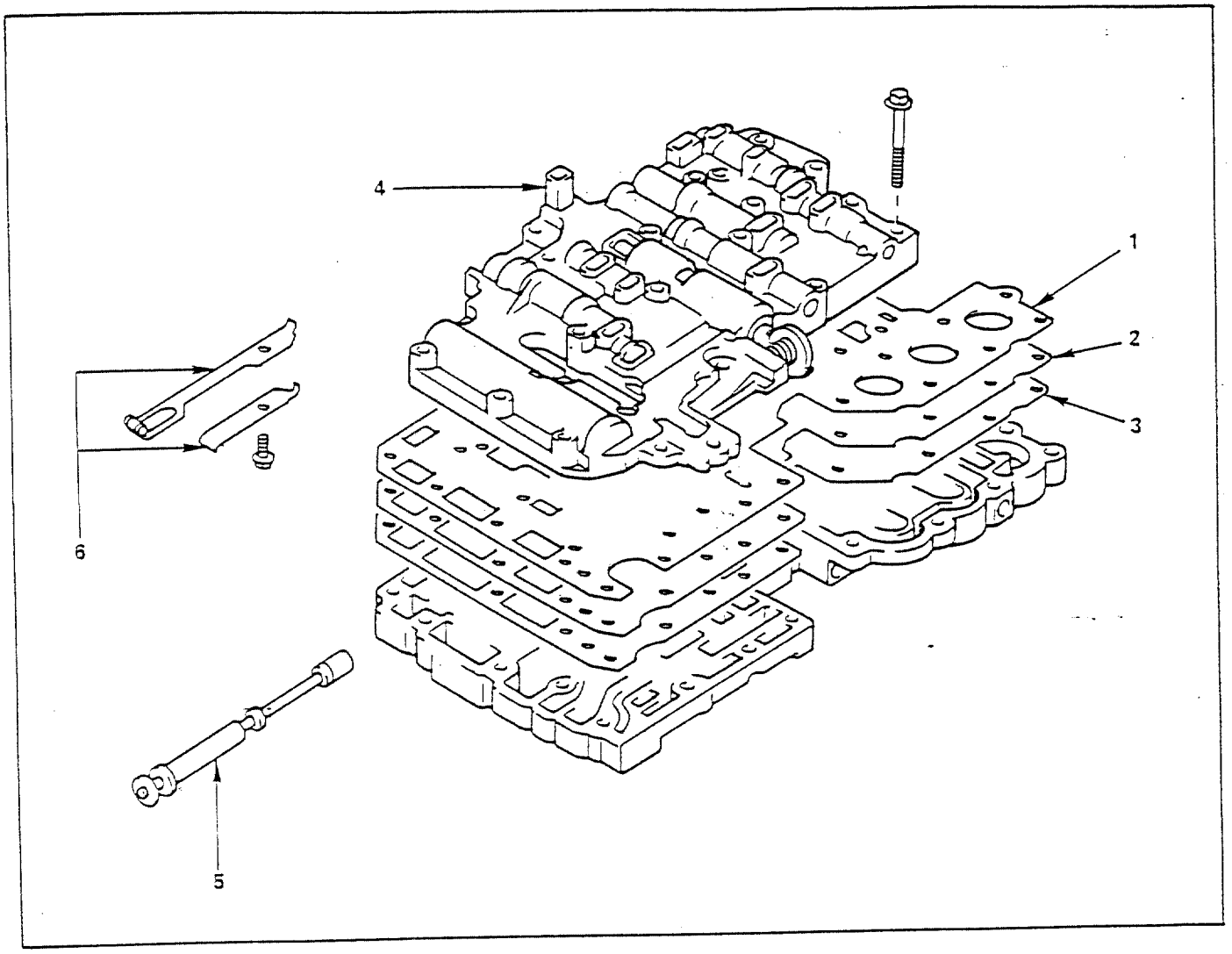


41. **Strainer**

Install strainer.

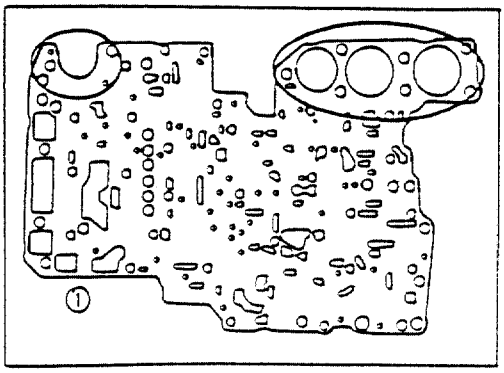
TRANSMISSION VALVE BODY ASSEMBLY

REASSEMBLY



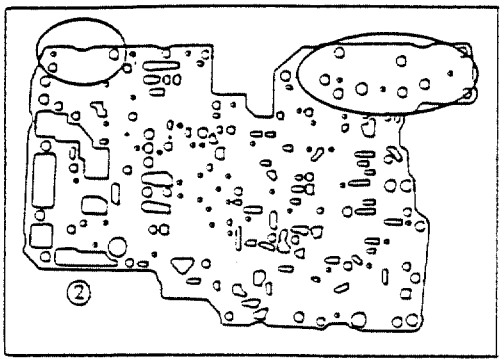
Reassembly steps

- ▲ 1. No. 1 gasket (Upper valve body side)
- ▲ 2. Valve body plate
- ▲ 3. No. 2 gasket (Lower valve body side)
- ▲ 4. Upper valve body
- ▲ 5. Manual shift valve
- ▲ 6. Detent spring

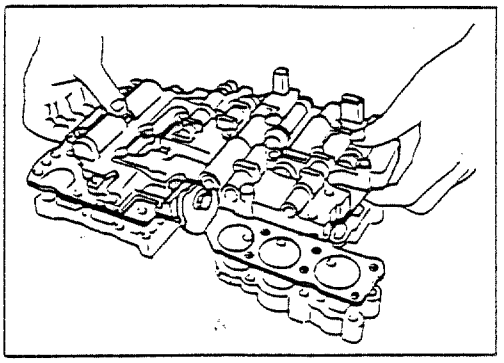


Important operations

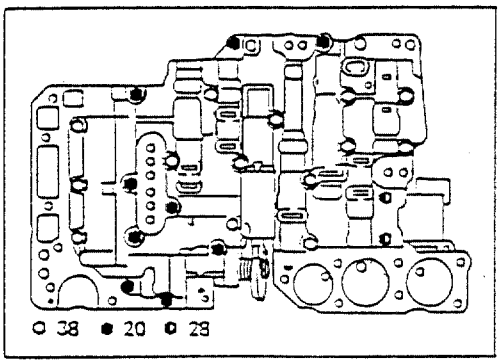
1. **No. 1 gasket (Upper valve body side)**
   Position new No. 1 gasket ① on upper valve body.
   Align a new No. 1 gasket at each bolt hole.



2. **Valve body plate**
   Position valve body plate ② on No. 1 gasket.
   Align the plate at each bolt hole.
3. **No. 2 gasket (Lower valve body side)**
   Position new No. 2 gasket 2 on plate.
   Align a new No. 2 gasket at each bolt hole.



4. **Upper valve body**
   Place upper valve body with plate and gaskets on top lower valve body.
   Align each bolt hole and gasket in the valve body.

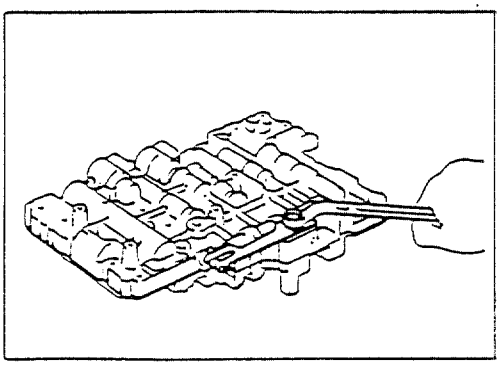


Install twenty-five bolts to upper valve body.

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

N.m (kgf.m/lb.ft)

Torque	6.4 (0.65 / 56.64)



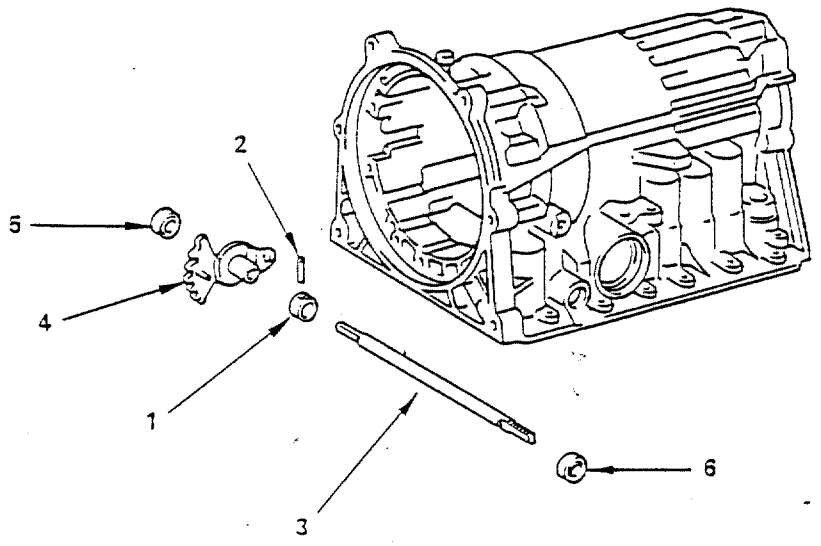
5. **Manual shift valve**
   Install manual shift valve.
6. **Detent spring**
   Install detent spring.

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)

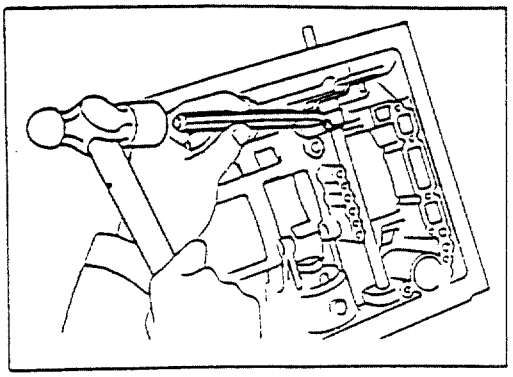
TRANSMISSION CASE

DISASSEMBLY



Disassembly steps

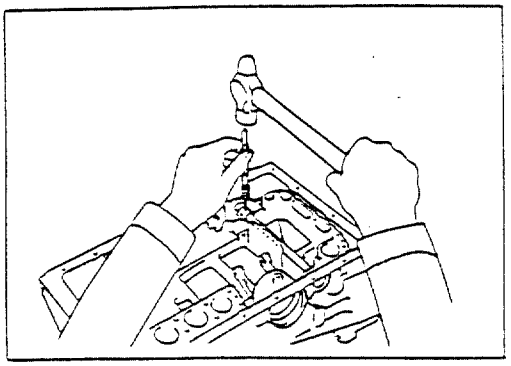
- ▲ 1. Spacer
- ▲ 2. Pin
- ▲ 3. Manual valve lever shaft
- ▲ 4. Manual valve lever
- ▲ 5. Oil seal
- ▲ 6. Oil seal



Important operations

1. Spacer

   Using a chisel, cut off the spacer and remove it from the shaft.

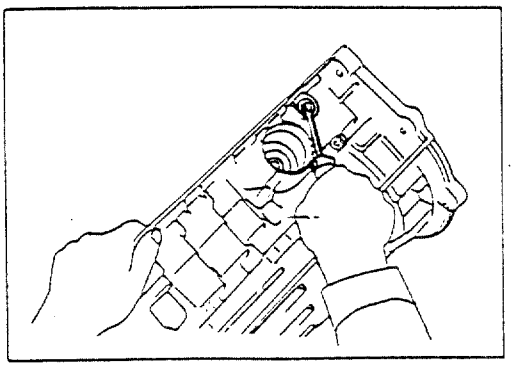


2. Pin

   Using a punch, drive out the pin.

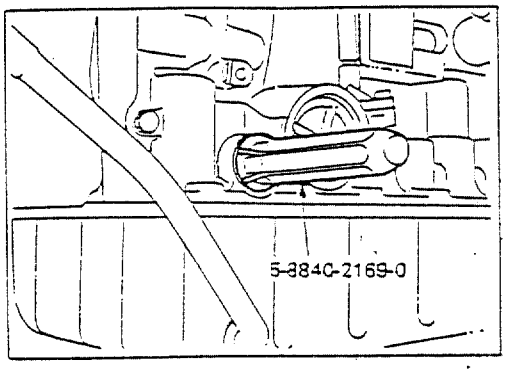
3. Manual valve lever shaft
4. Manual valve lever

   Pull the manual valve lever shaft out through the case by the threads.



5. Oil seal
6. Oil seal

   Using a screwdriver, remove the oil seal.

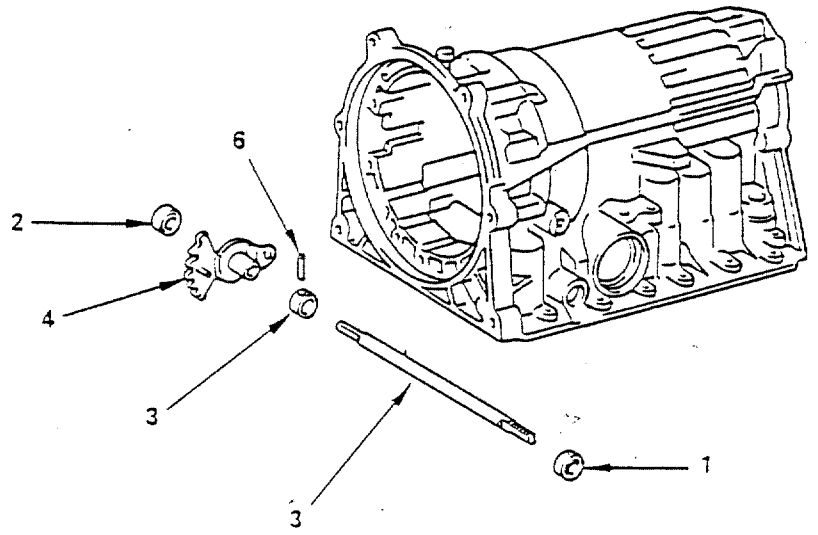


On-vehicle replacement of oil seal

Using special tool, install the oil seal.

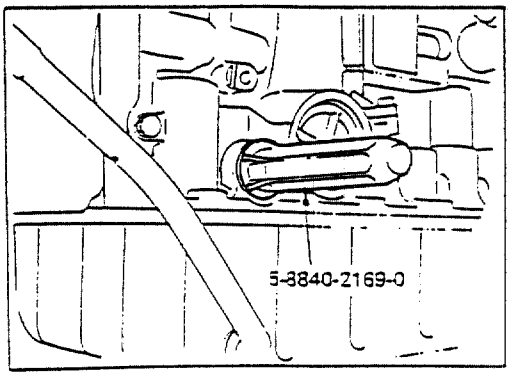
Installer : 5-8840-2169-0 (J-37232-2)

REASSEMBLY



Reassembly steps

- ▲ 1. Oil seal
- ▲ 2. Oil seal
- ▲ 3. Spacer
- ▲ 4. Manual valve lever
- ▲ 5. Manual valve lever shaft
- ▲ 6. Pin

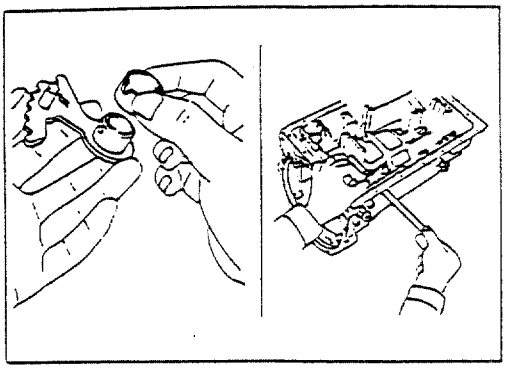


Important operations

1. **Oil seal**
2. **Oil seal**

Coat a new oil seal lip with multi purpose grease.
Using special tool, drive in the oil seal.

Oil seal installer : 5-8840-2169-0 (J-37232-2)

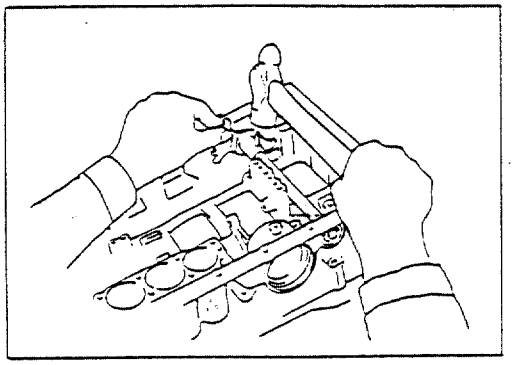


3. **Spacer**
4. **Manual valve lever**

Assemble a new spacer to the manual valve lever.

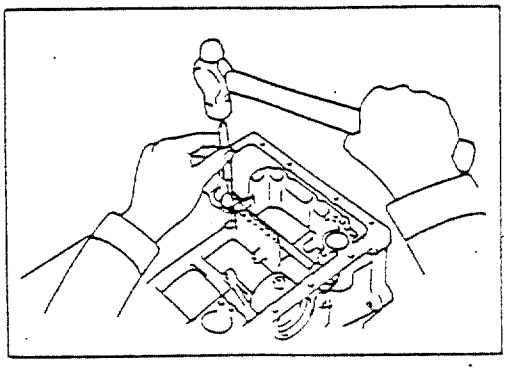
5. **Manual valve lever shaft**

Install the manual valve lever shaft to the transmission case through the manual valve lever by the threads.

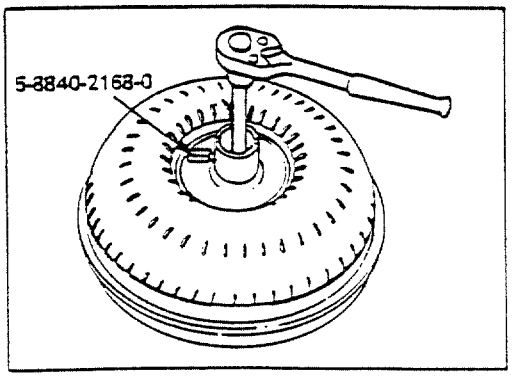


6. **Pin**

Drive in the pin with the slot at a right angle to the shaft.



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.



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 : 5-8840-2168-0 (J-35467)

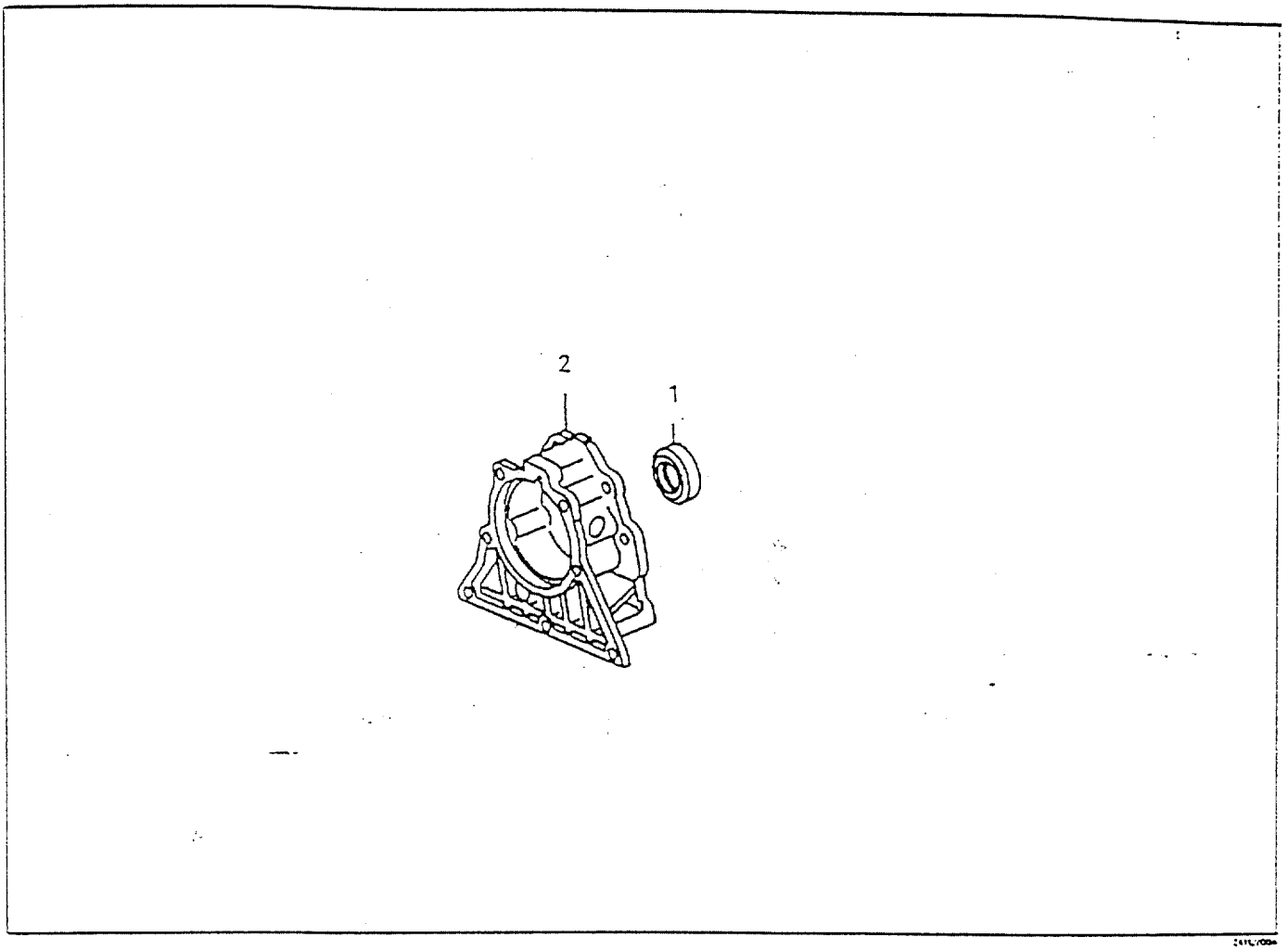
Insert the stopper so that it fits in the notch of the converter hub and outer race of the one-way clutch.

Test one-way clutch

The clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise. Less than 25 kg·cm (22 in.-lbs.) 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.

ADAPTOR HOUSING

DISASSEMBLY



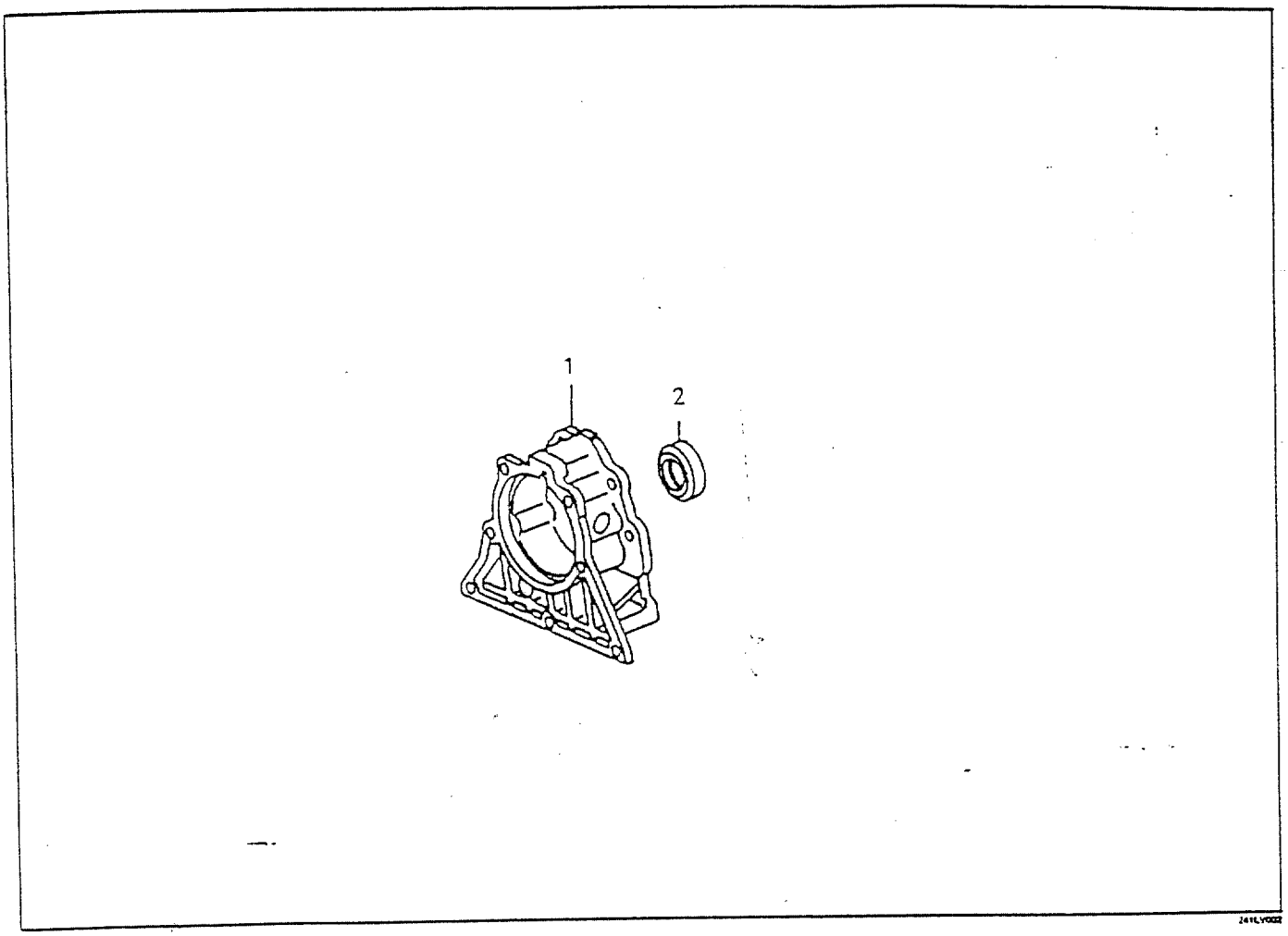
Disassembly steps

1. Adaptor Housing
▲ 2. Oil seal

Important operations

2. Oil seal
Using a screwdriver, remove the oil seal.

REASSEMBLY



Reassembly steps

▲ 1. Oil seal
2. Adaptor Housing

Important operations

1. Oil seal
   Using 5-8840-2150-0 installer, install the new oil seal to the housing on proper position.

REASSEMBLY OF MAJOR COMPONENTS

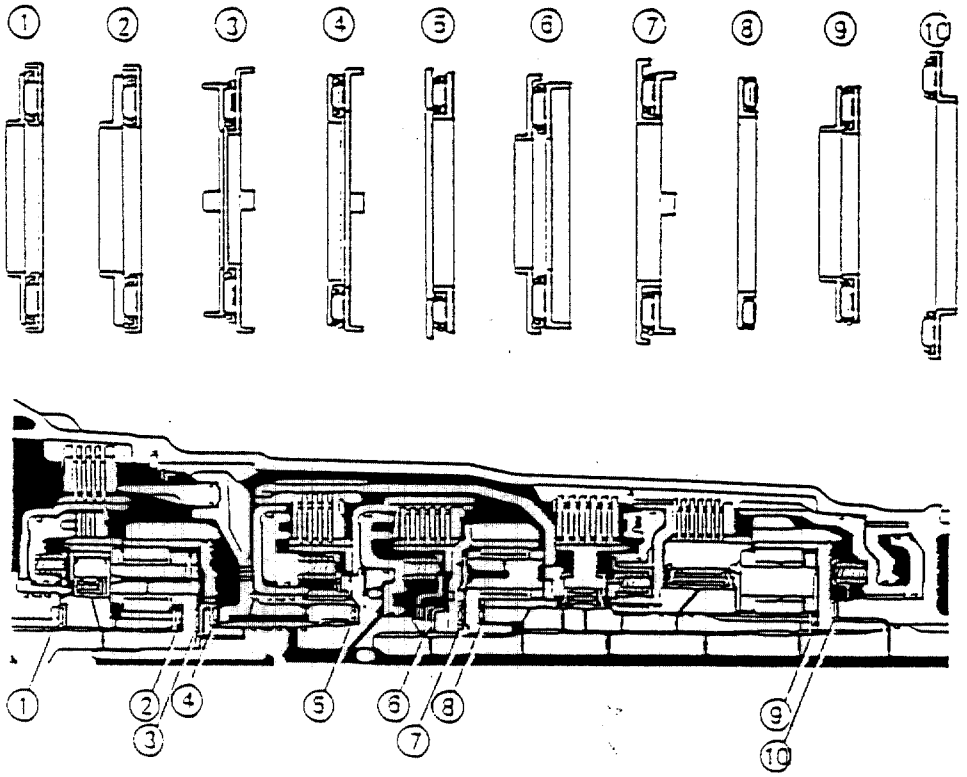
Disassembly, inspection and reassembly of each component group have been indicated in the preceding chapter. Before reassembly, make sure, again, that all component groups are assembled correctly.

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

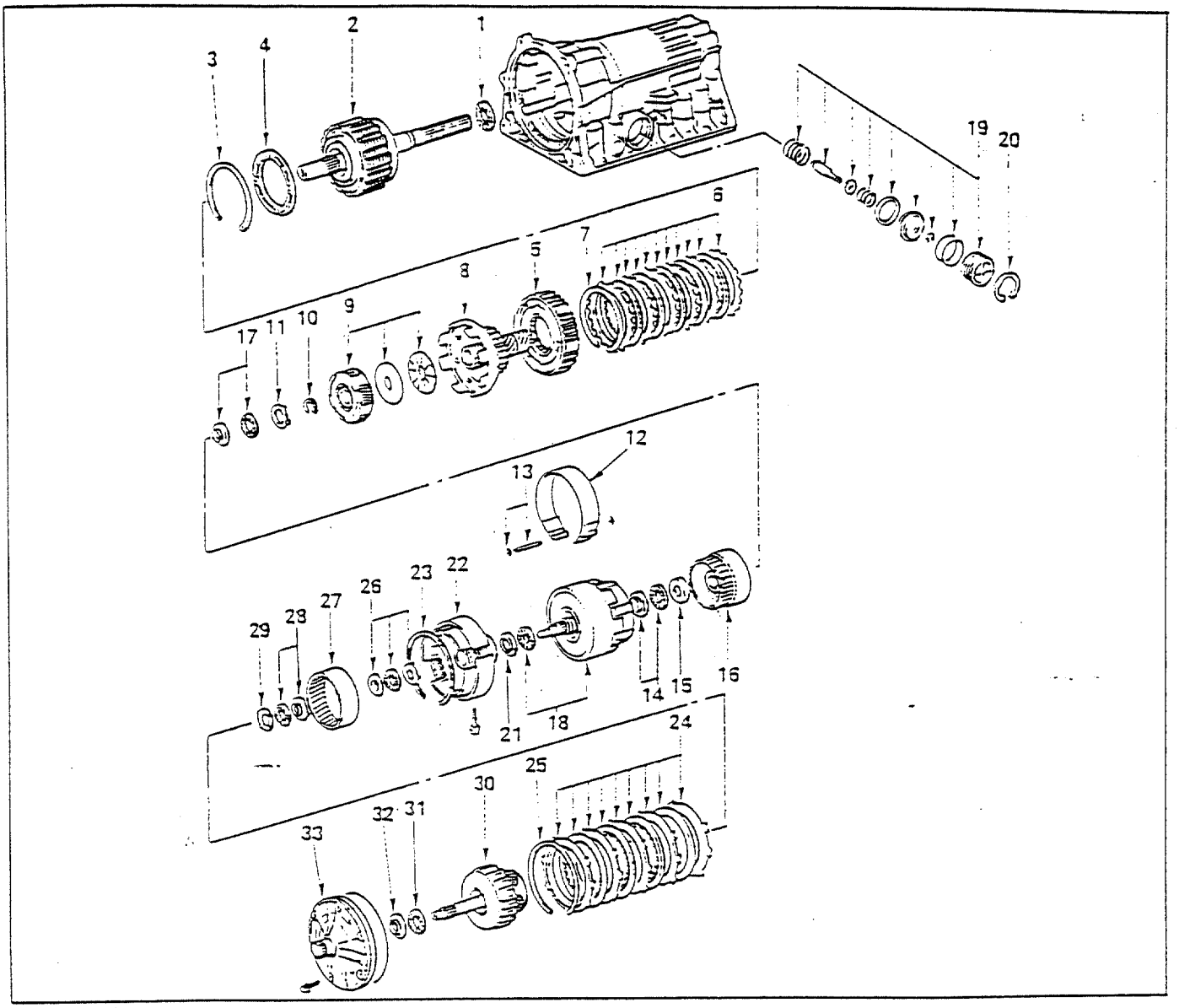
GENERAL ASSEMBLY NOTES:

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 places.
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.

TRANSMISSION

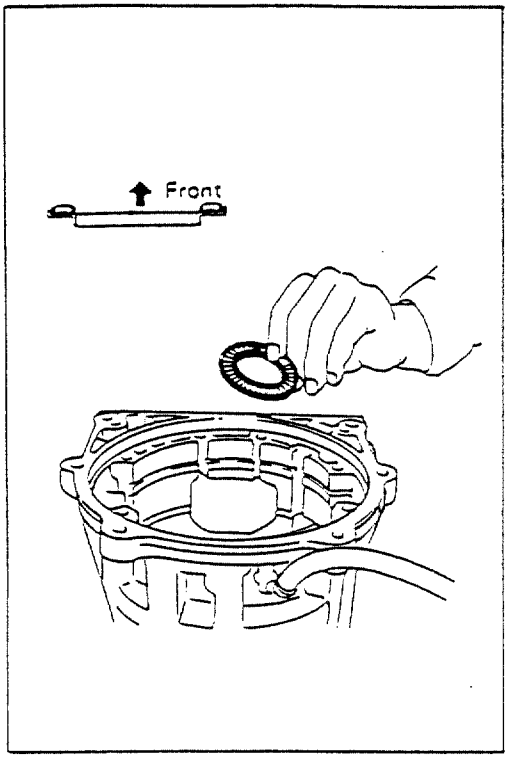


REASSEMBLY OF MAJOR COMPONENTS (1)



Reassembly steps

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



Important operations

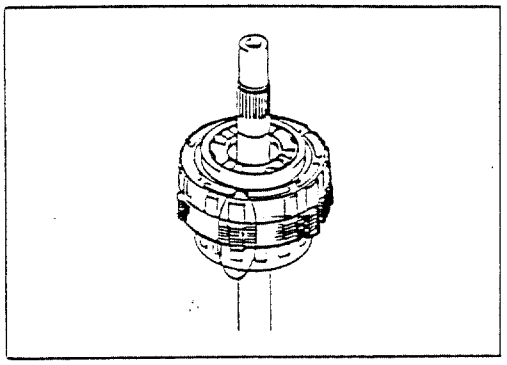
1. **Bearing**

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

   Assembled bearing and race (Reference)

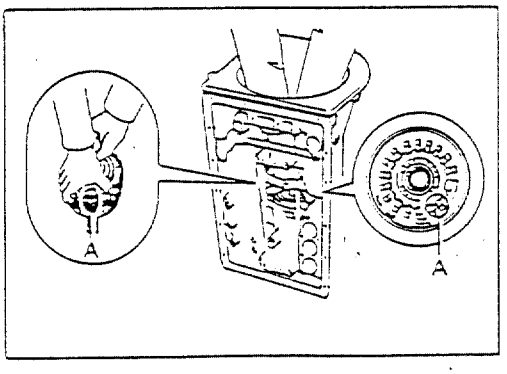
   mm(in.)

Bearing and race	Diameter
Inside	39.2 (1.543)
Outside	57.7 (2.272)

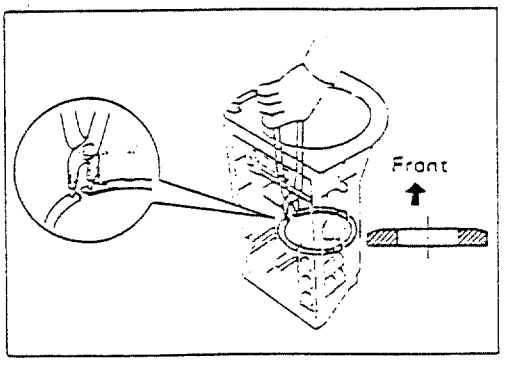


2. **Rear planetary gear, second brake drum and output shaft**

   Align the teeth of the second brake drum, flanges, discs and plates as shown in the figure.

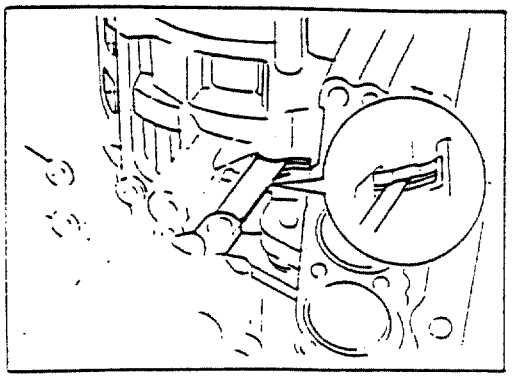


Align the splines of the transmission case and the assembled rear planetary gear, second brake drum and output shaft, indicated by A in the figure at left.



3. **Snap ring**

   Using snap ring pliers, install the snap ring.

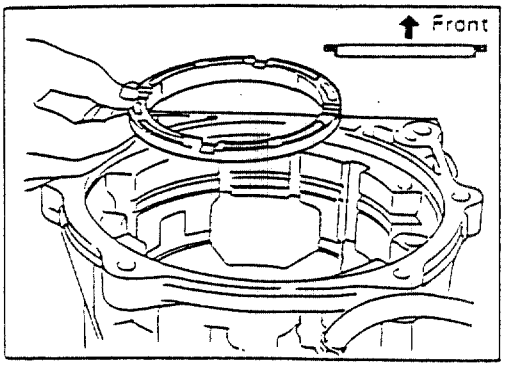


Check pack clearance of first and reverse brake

Using a thickness gauge, measure the clearance between the plate and second brake drum as shown in the figure.

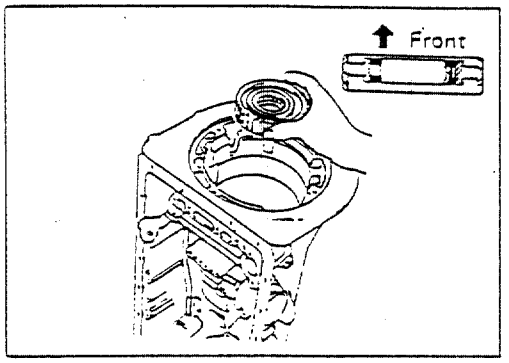
Clearance	mm(in.)	0.50 — 1.78 (0.0197 — 0.0701)

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



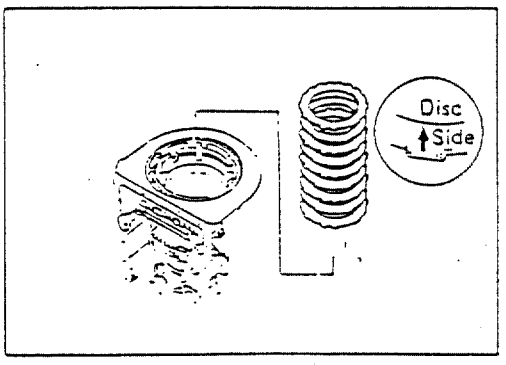
4. **Second brake piston sleeve**

Install second brake piston sleeve.



5. **One-way clutch**

Install one-way clutch



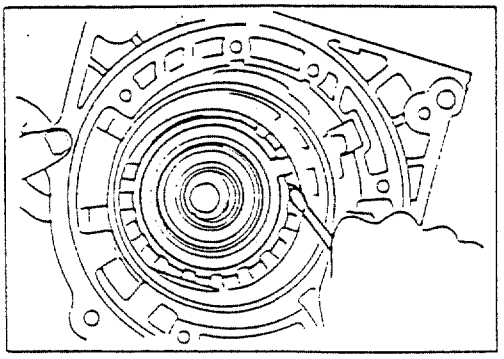
6. **Flange plate and disc**

Install flange, discs and plates.

Install the 2.5 mm (0.098 in.) thick plate with the rounded edge side of the plate facing the disc.

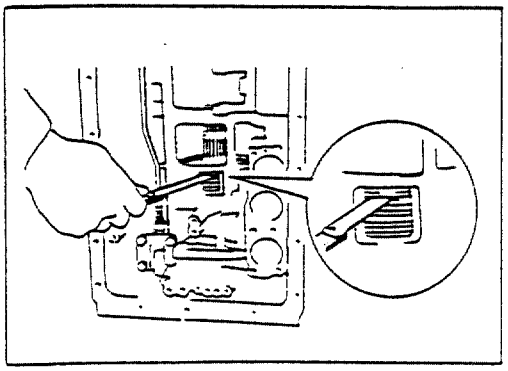
Alternately install four discs and three plates (Disc first)

Install the flange with the rounded edge of the flange facing the disc.



7. **Snap ring**

Install the snap ring.

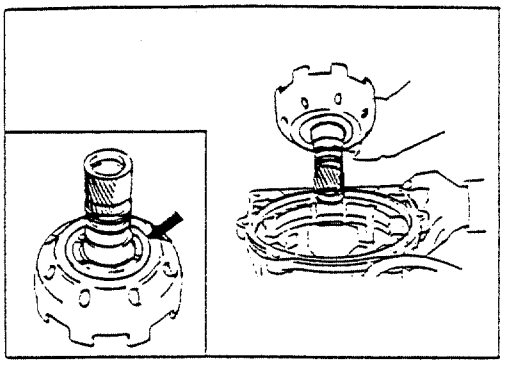


Check pack clearance of second brake

Using a thickness gauge, measure the clearance between the snap ring and flange as shown in the figure.

Clearance	mm (in.)	0.62 – 1.98 (0.0244 – 0.0780)

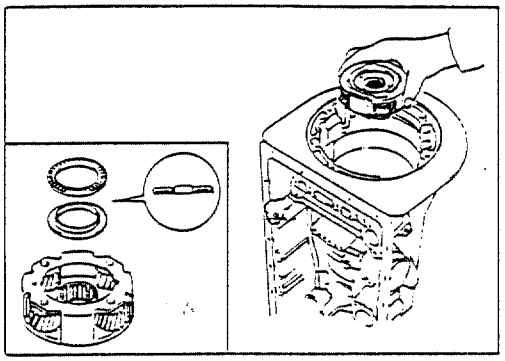
If the values are nonstandard, check for an improper installation.



8. Drum

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

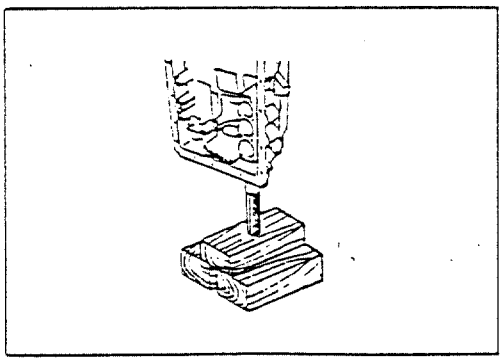
Note: Confirm the thrust washers are installed correctly.



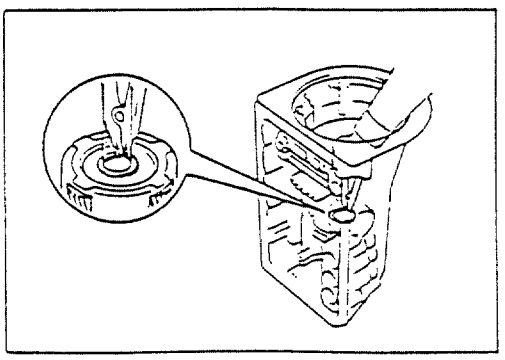
9. Front planetary gear and bearing

Install the front planetary gear to the sun gear.

Note: Confirm the bearing and race is installed correctly.

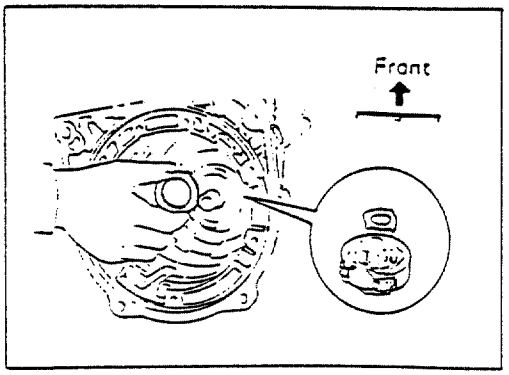


With wooden blocks under the output shaft, stand the transmission on the output shaft.



10. Snap ring

Using snap ring pliers, install the snap ring.

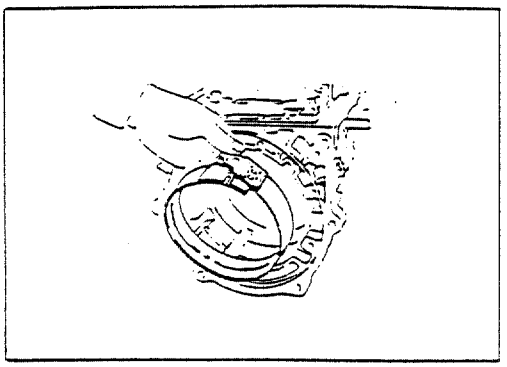


11. **Race**

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

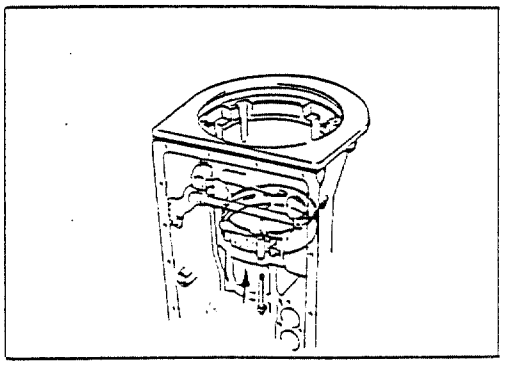
Bearing race diameter (Reference) mm(in.)

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



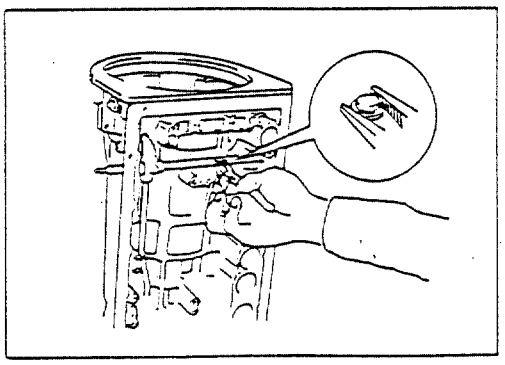
12. **Second coast brake band**

Insert the second coast brake band to the case.

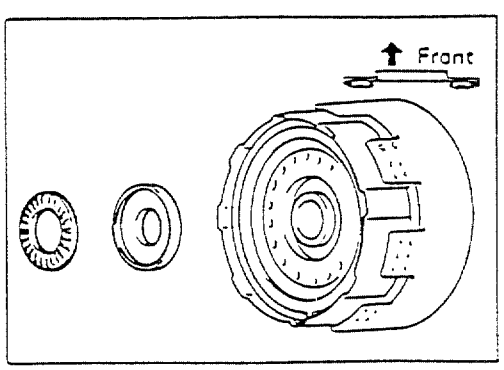


13. **E-ring and pin**

Install the pin through the brake band.



Install the E-ring to the pin.

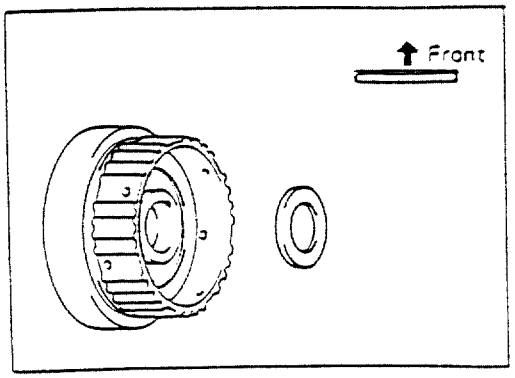


14. **Bearing and race**

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

Bearing and race diameter (Reference) mm(in.)

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

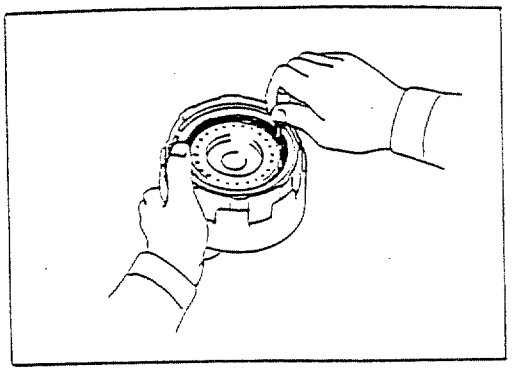


15. **Race**

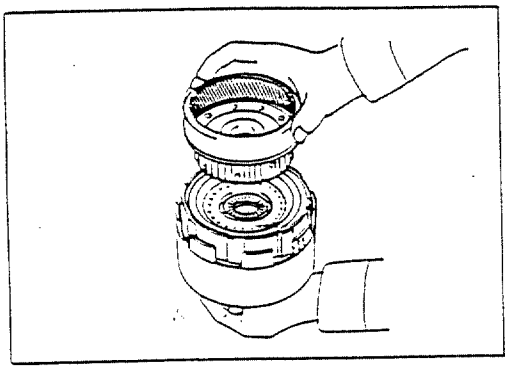
Coat the race with petroleum jelly and install it onto the front planetary ring gear.

Race diameter (Reference) mm(in.)

	Inside	Outside
Race	26.8 (1.055)	47.0 (1.850)

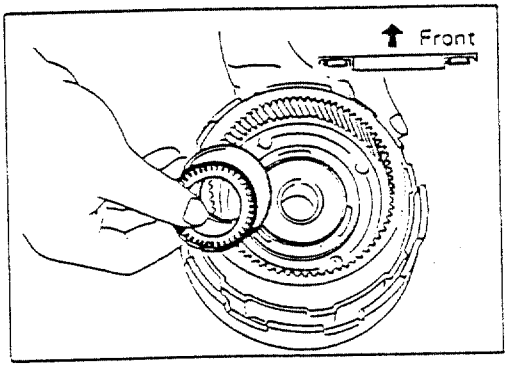


Align the flukes of the discs in the forward clutch.



16. **Front planetary ring gear**

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

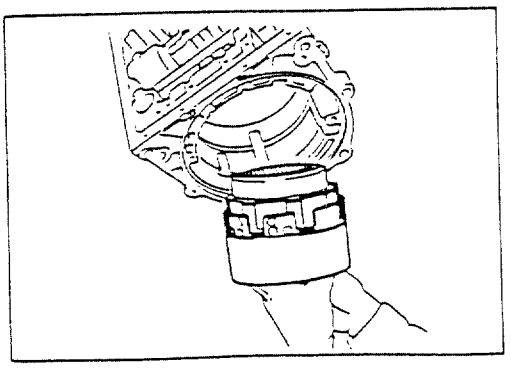


17. **Bearing and race**

Coat the bearing and race with petroleum jelly and install them onto the ring gear.

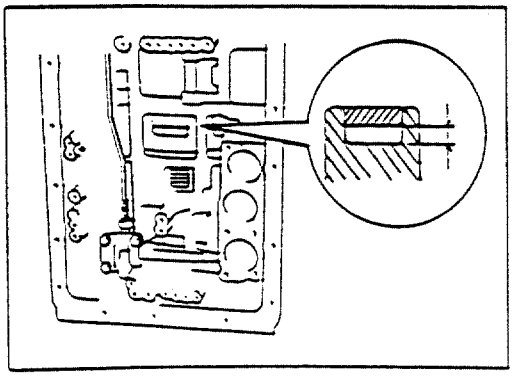
Bearing and race diameter (Reference) mm(in.)

	Inside	Outside
Bearing	32.6 (1.283)	47.7 (1.878)
Race	30.6 (1.205)	53.6 (2.110)



18. **Direct clutch and forward clutch**

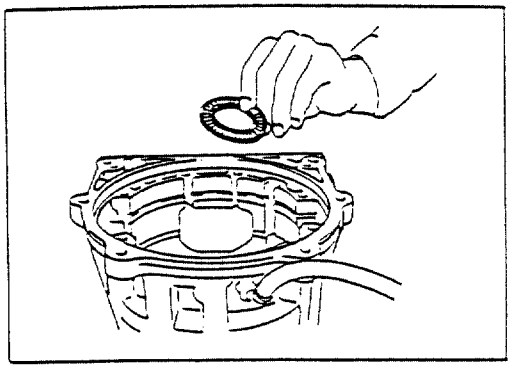
Install the assembled direct clutch, forward clutch and front planetary ring gear into the transmission case.



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

Height	mm(in.)	9.8 — 11.8 (0.386 — 0.465)

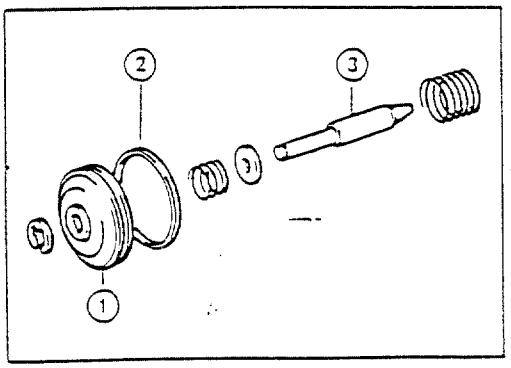
If the values are nonstandard, check for an improper installation.



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

Assembled bearing and race diameter (Reference) mm (in.)

	Inside	Outside
Bearing and race	33.7 (1.327)	47.8 (1.882)

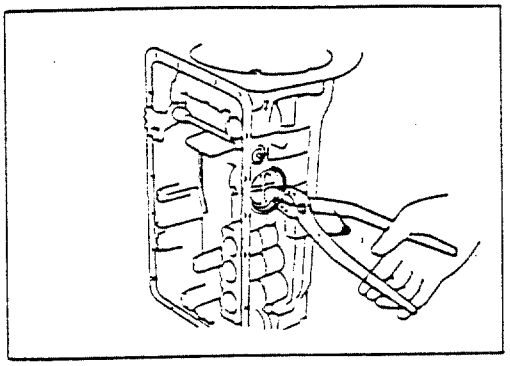


19. **Second coast brake piston assembly**

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.

①: Second coast brake piston
②: Oil seal
③: Piston rod

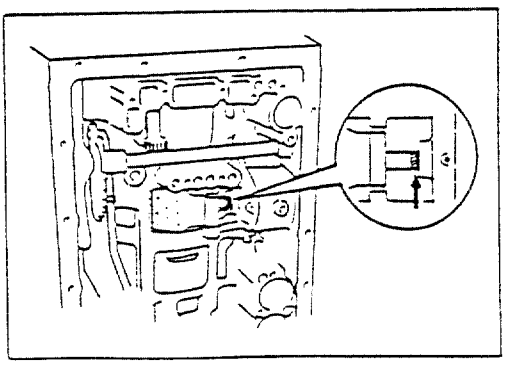


20. **Snap ring**

Coat two new oil seals with ATF and install them to the piston cover.

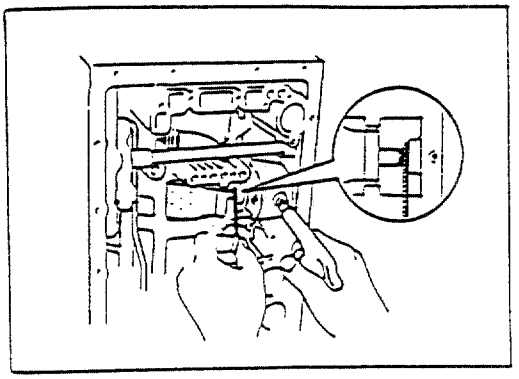
Install the spring, second coast brake piston assembly and piston cover to the case.

Using snap ring pliers, install the snap ring.



Check piston stroke of second coast brake

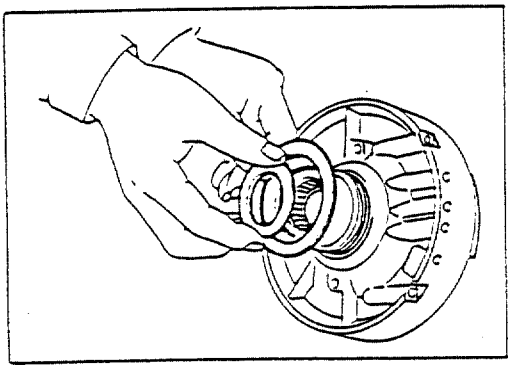
Place a mark on the second coast brake piston rod as shown in the figure.



Using wire gage, measure the stroke by applying the compressed air (4 — 8 kgf/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

Piston stroke	mm(in.)	1.5 — 3.0 (0.059 — 0.118)

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

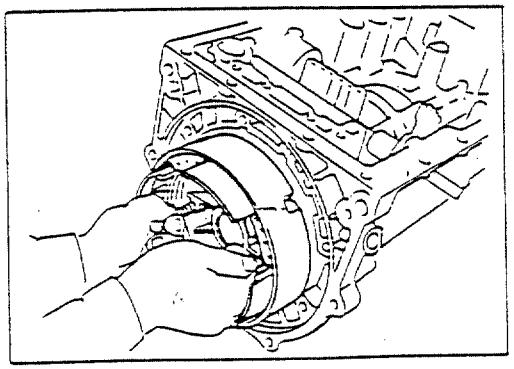


21. Race

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

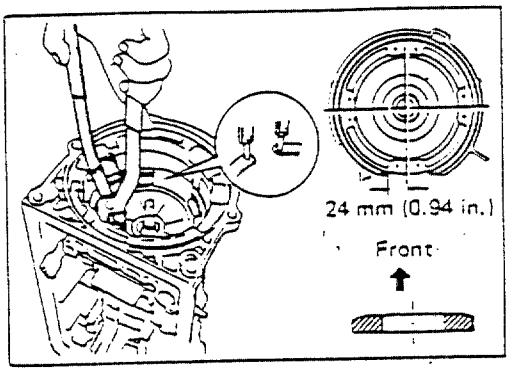
Race diameter (Reference) mm (in.)

	Inside	Outside
Race	36.8 (1.450)	50.9 (2.004)



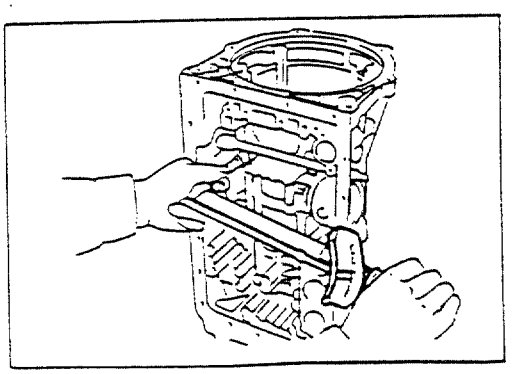
22. OD support

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.



23. Snap ring

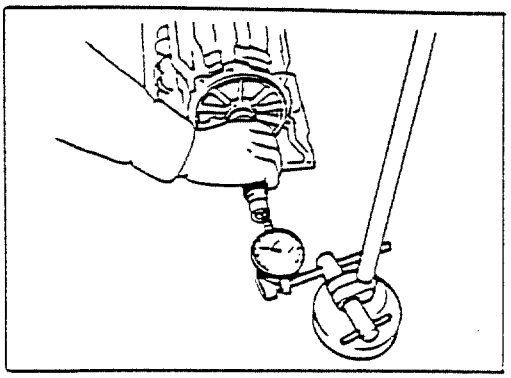
Using snap ring pliers, install the snap ring as shown in the figure.



Install and tighten the two bolts.

N.m (kgf.m/lb.ft)

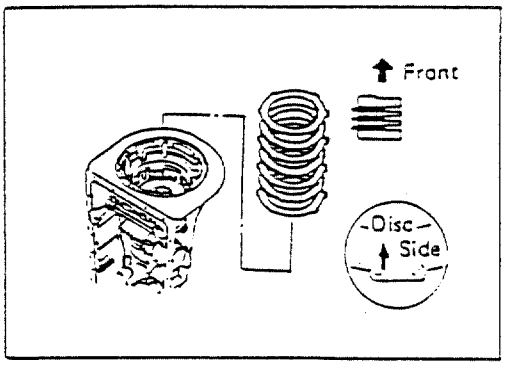
Torque	25 (2.6/19)



Check end of output shaft

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

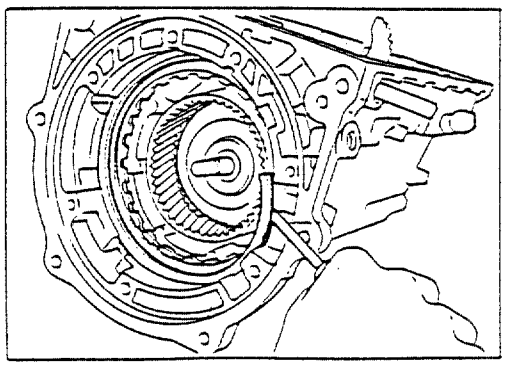
End play	mm(in.)	0.27 — 0.86 (0.0106 — 0.0339)



24. **Flange, plate and disc**

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 three discs and two plates. (Disc first)

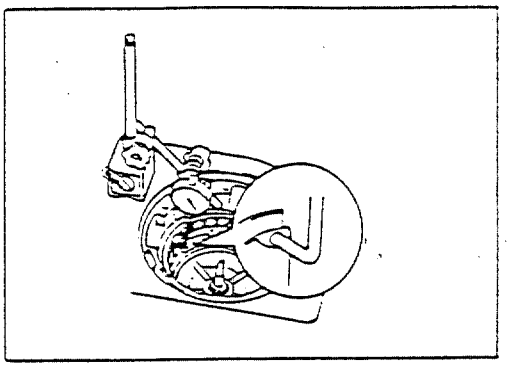


25. **Snap ring**

Install the (stepped ring) flange with the flat side of the flange facing the disc.

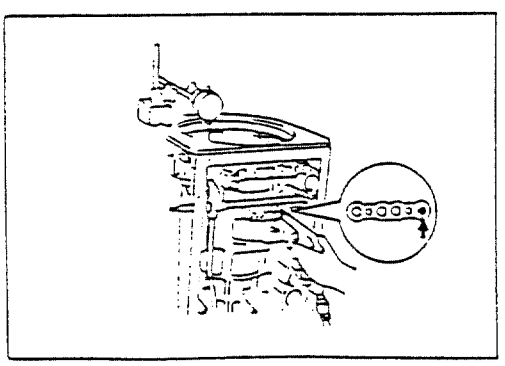
Install the snap ring.

Snap ring (Reference)	mm(in.)
Inside diameter	167.9 (6.61)



Check piston stroke of overdrive brake

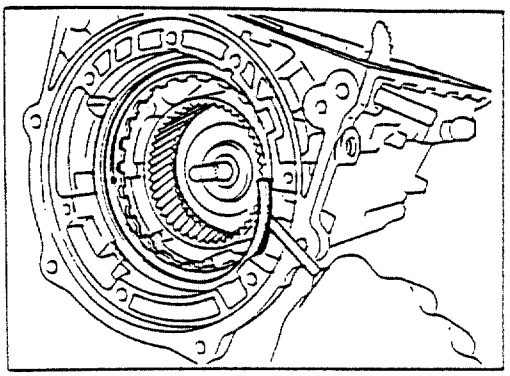
Place a dial indicator onto the overdrive brake piston as shown in the figure.



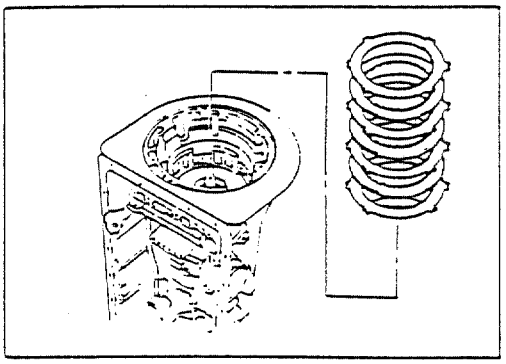
Measure the stroke by applying and releasing the compressed air (4 — 8 kgf/cm², 57 — 114 psi or 392 — 785 kPa) as shown in the figure.

Piston stroke	mm (in.)	1.40 – 1.70 (0.0552 – 0.0670)

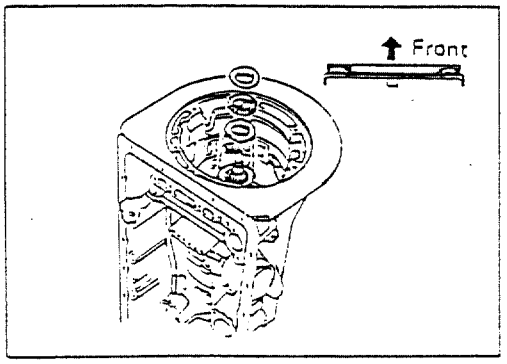
If the values are nonstandard, check for an improper installation.

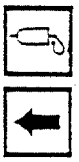


Remove the snap ring.



Remove two flanges, three plates and four discs.



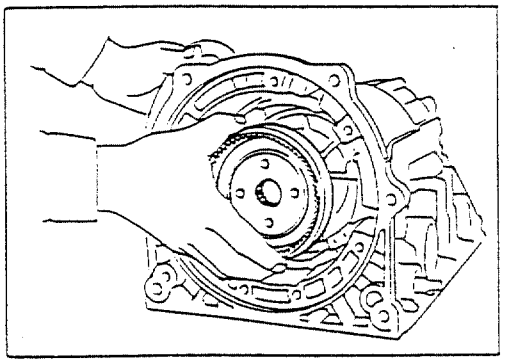


26. **Bearing and race**

Coat the bearing and races with petroleum jelly and install them onto the overdrive support.

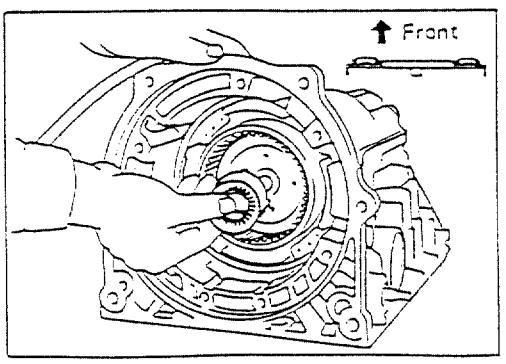
Bearing and races diameter (Reference) mm (in.)

	Inside	Outside
Bearing	36.5 (1.437)	48.5 (1.910)
Race (Front)	37.2 (1.465)	58.8 (2.315)
Race (Rear)	33.7 (1.327)	50.1 (1.973)



27. **OD planetary ring gear**

Install the overdrive planetary ring gear.



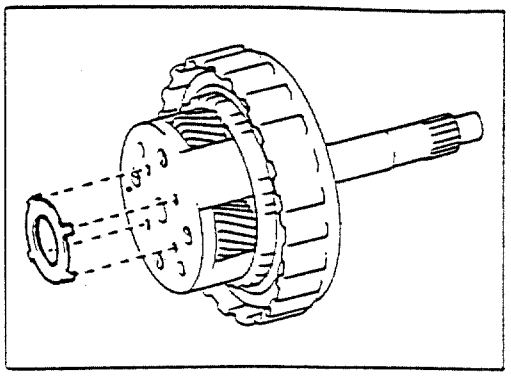


28. **Bearing and race**

Coat the bearing and race with petroleum jelly and install them onto the planetary ring gear.

Bearing and race diameter (Reference) mm (in.)

	Inside	Outside
Bearing	26.0 (1.024)	46.8 (1.843)
Race	24.2 (0.953)	47.8 (1.882)

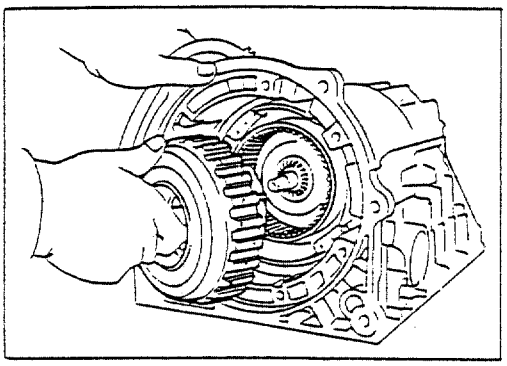


29. **Race**

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

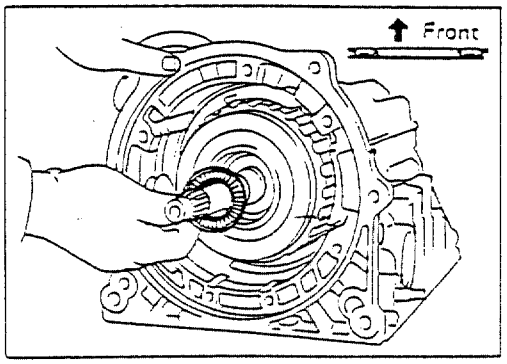
Race diameter (Reference) mm (in.)

	Inside	Outside
Race	27.3 (1.075)	41.8 (1.646)



30. **OD planetary gear and OD direct clutch**

Install the overdrive planetary gear and direct clutch.

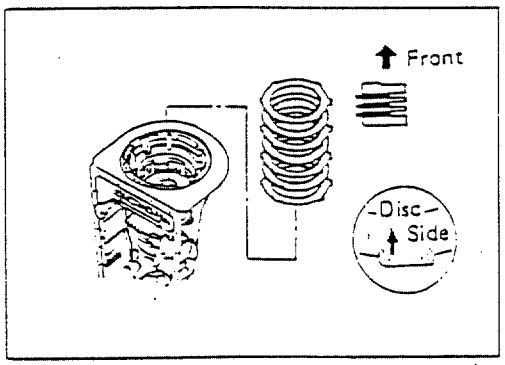


31. **Bearing**

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

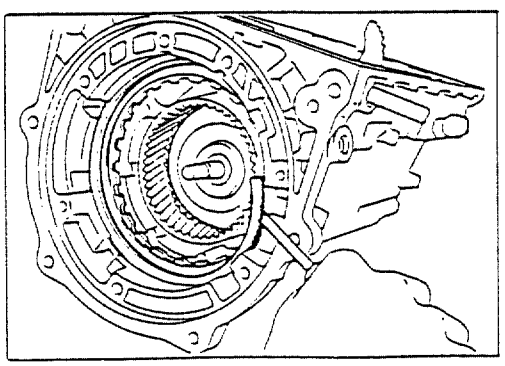
Bearing and race diameter (Reference) mm(in.)

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



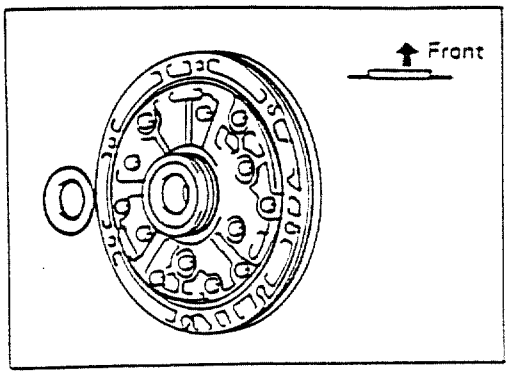
Install the (flat ring) 4.0 mm (0.157 in.) thick flange with the rounded edge side of the flange facing the disc.

Alternately install three discs and two plates. (Disc first)



Install the (stepped ring) flange with the flat side of the flange facing the disc.

Install the snap ring.

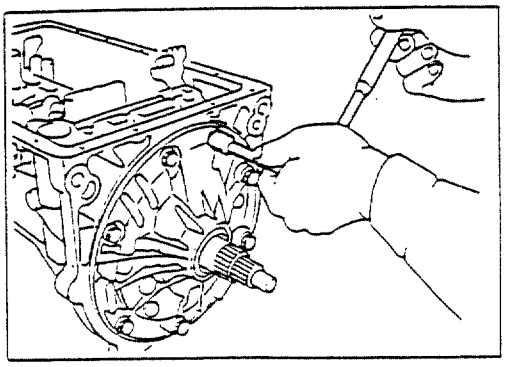


32. **Race**

Coat the race with petroleum jelly and install it onto the oil pump.

Race diameter (Reference) mm (in.)

	Inside	Outside
Race	28.1 (1.106)	47.3 (1.862)



33. **Oil pump**

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.

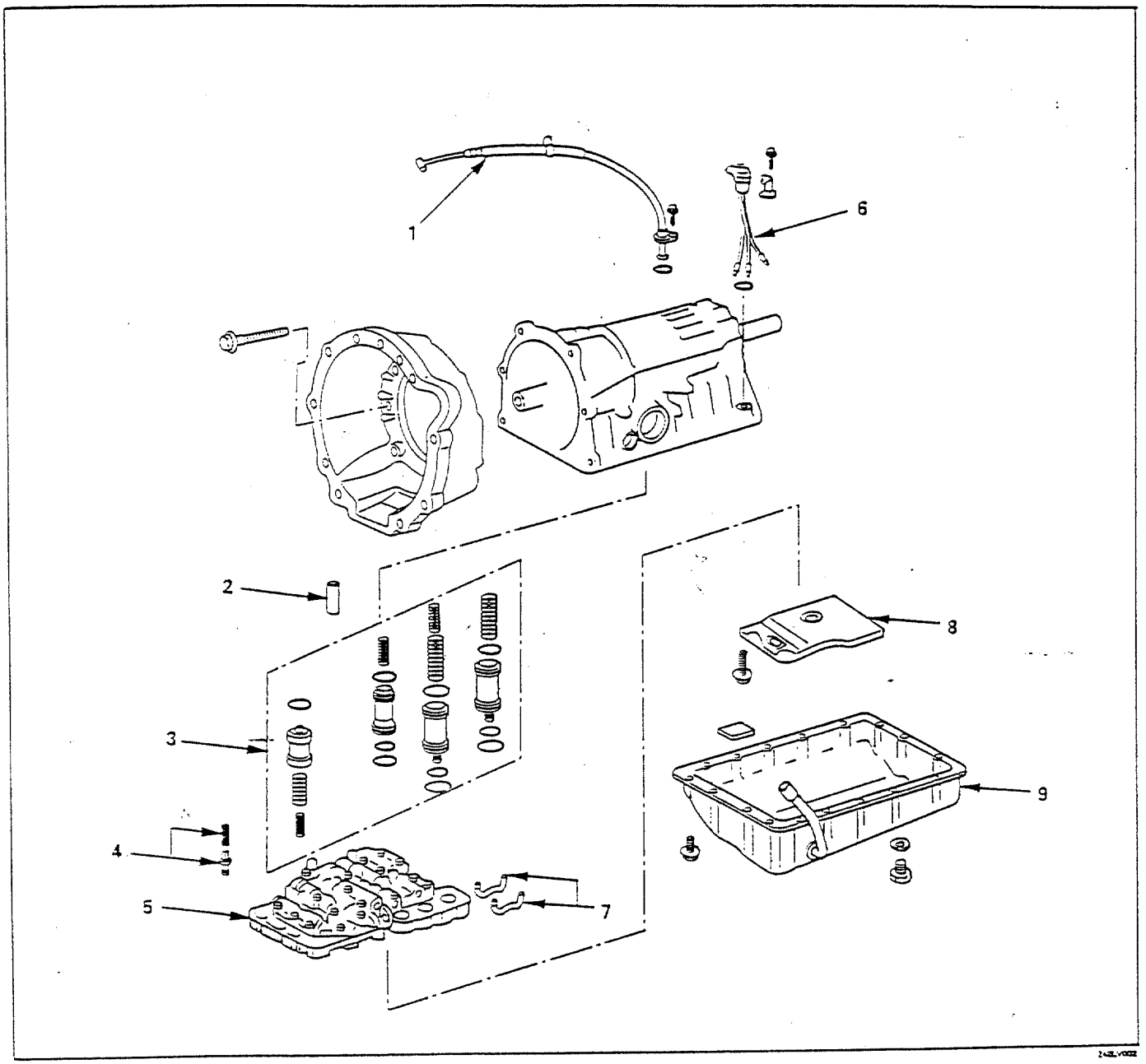
N.m (kgf.m/lb.ft)

Torque	22 (2.2/16)

Check input shaft rotation

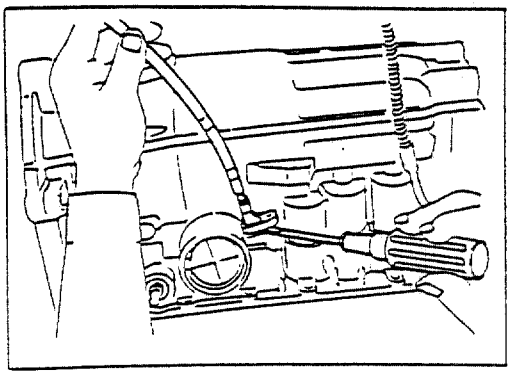
Make sure the input shaft rotates smoothly.

REASSEMBLY OF MAJOR COMPONENTS (2)



Reassembly steps

- ▲ 1. Throttle cable
- ▲ 2. Second brake drum gasket
- ▲ 3. Accumulator piston
- ▲ 4. Check ball body, spring
- ▲ 5. Valve body
- ▲ 6.. Solenoid wiring
- ▲ 7. Oil tube
- ▲ 8. Oil strainer assembly
- ▲ 9. Oil pan

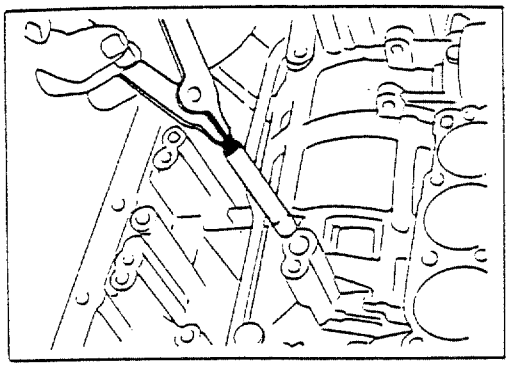


Important operations

1. Throttle cable

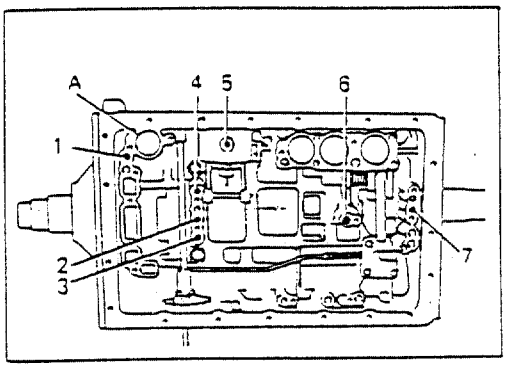
Coat a new O-ring with the ATF and install it to the cable.

Install the cable to the case.



2. Second brake drum gasket

Install a new brake drum gasket to the transmission case.



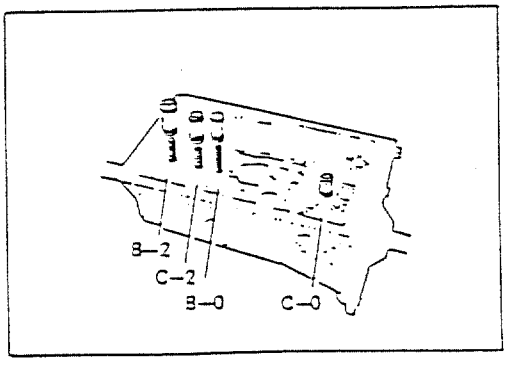
Individual piston operation inspection

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

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

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.

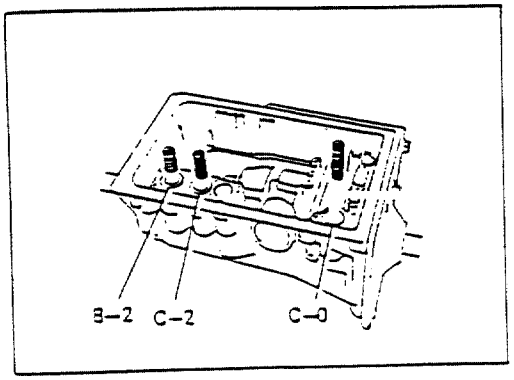
A : C-0 Accumulator piston hole

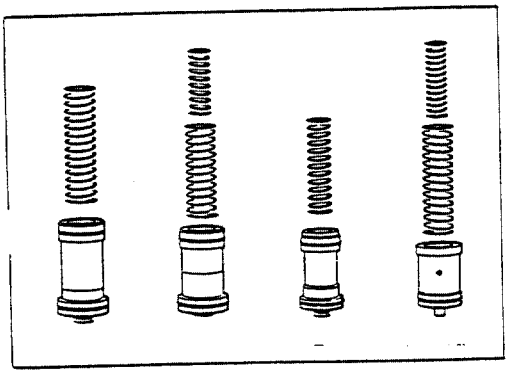


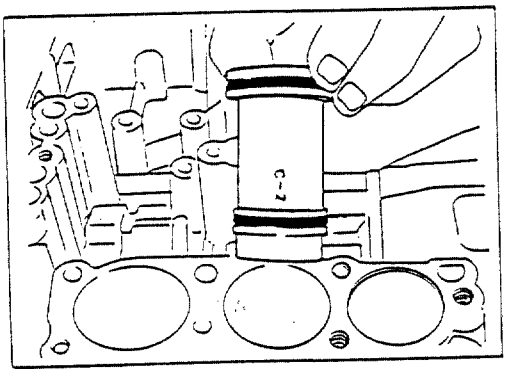
3. Accumulator piston

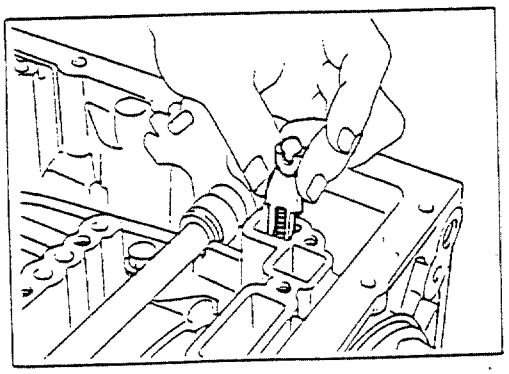
Coat the O-ring with ATF and install it to the piston.

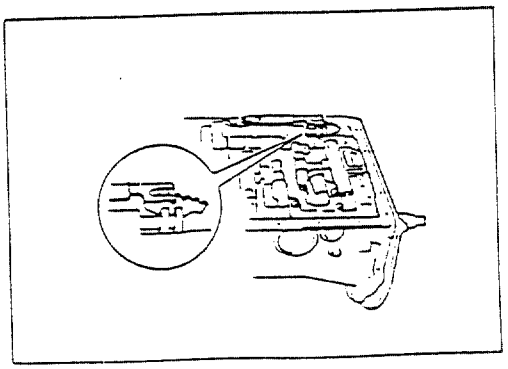
Install the three springs and four accumulator pistons to the bore as shown in the figure.











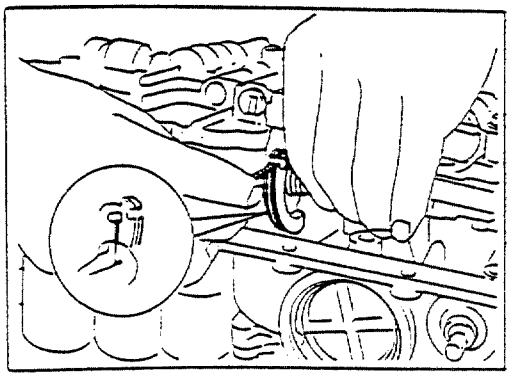
mm (in.)

Piston	Outer diameter	Height
B-2	36.8 (1.449)	62.5 (2.461)
C-2	36.8 (1.449)	56.6 (2.228)
B-0	31.8 (1.252)	52.0 (2.047)
C-0	29.8 (1.173)	49.0 (1.929)

Spring	Free length	Outer diameter
(1) B-2 (Inner)	70.5 (2.776)	19.7 (0.776)
(2) B-2 (Outer)	22.0 (0.866)	14.0 (0.551)
(3) C-2 (Inner)	68.5 (2.697)	20.2 (0.795)
(4) C-2 (Outer)	20.0 (0.787)	12.1 (0.476)
(5) B-0	66.0 (2.598)	16.5 (0.650)
(6) C-0	74.6 (2.937)	20.3 (0.799)
(7) C-0	46.0 (1.811)	14.0 (0.551)

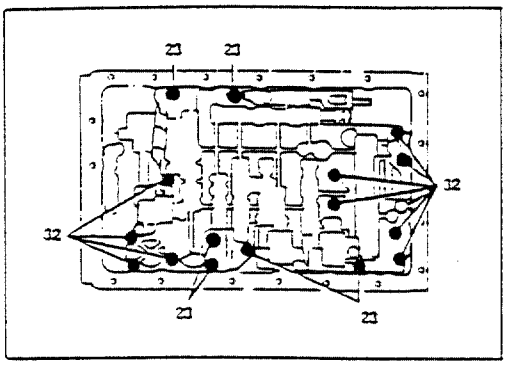
4. **Check ball body, spring**
   Install new check ball body and spring

5. **Valve body**
   Align the groove of the manual valve to the pin of the lever.



Connect the throttle cable to the cam.

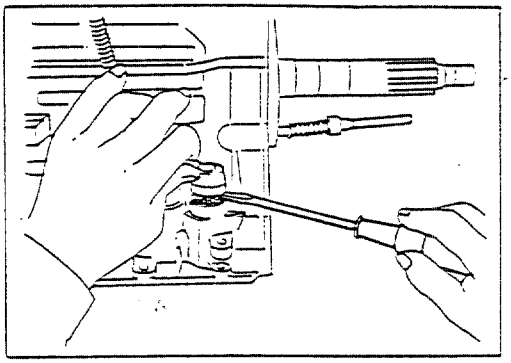
Confirm the springs into the accumulator piston are installed correctly.



Install the seventeen bolts.

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

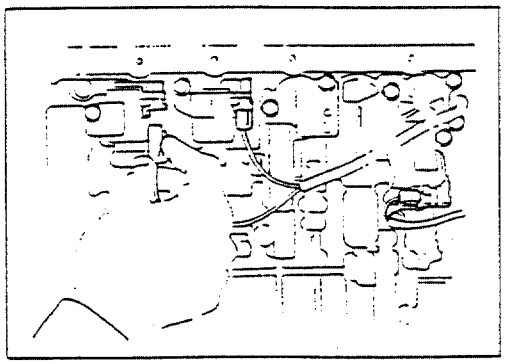
	N.m (kgf.m/lb.ft
Torque	9 (0.92 / 79.66)



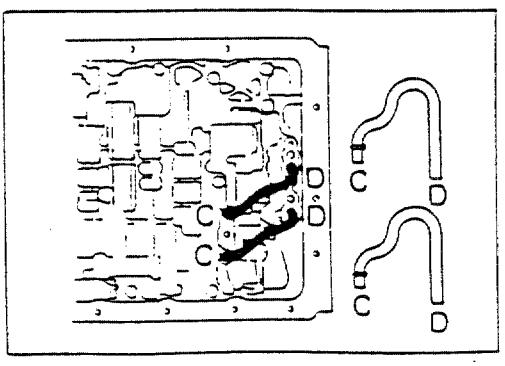
6. Solenoid wiring

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.



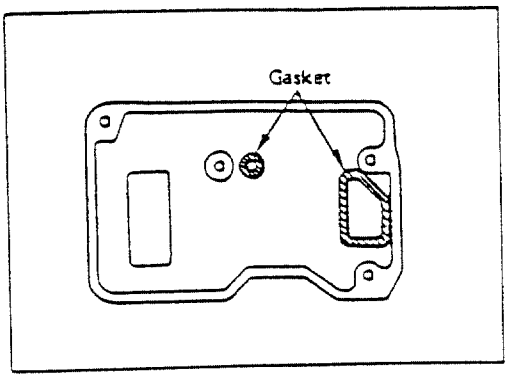
Connect the connectors to the No. 1, No. 2 and No. 3 solenoids.



7. Oil tube

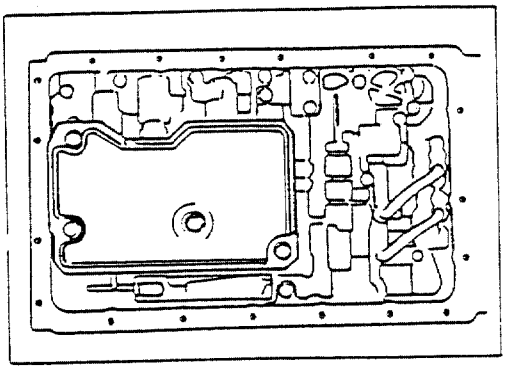
Using a plastic hammer, install the two tubes into the positions shown in the figure.

CAUTION: Be careful not to bend or damage the tubes.



8. **Oil strainer assembly**

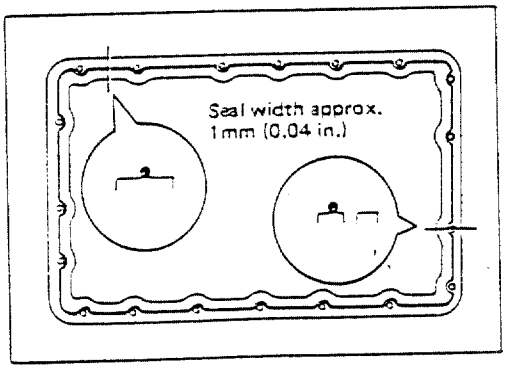
Install two new gaskets to the oil strainer.



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

N.m (kgf.m/lb.ft)

Torque	10 (1.0 / 86.74)



9. **Oil pan**

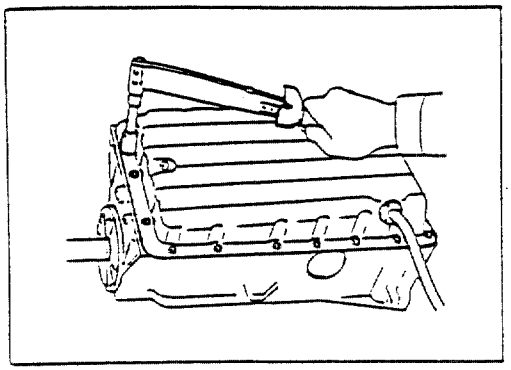
Install magnet in pan.

Note: Make sure that the magnet does not interfere with the oil tubes.

Remove any packing 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 packing is applied.

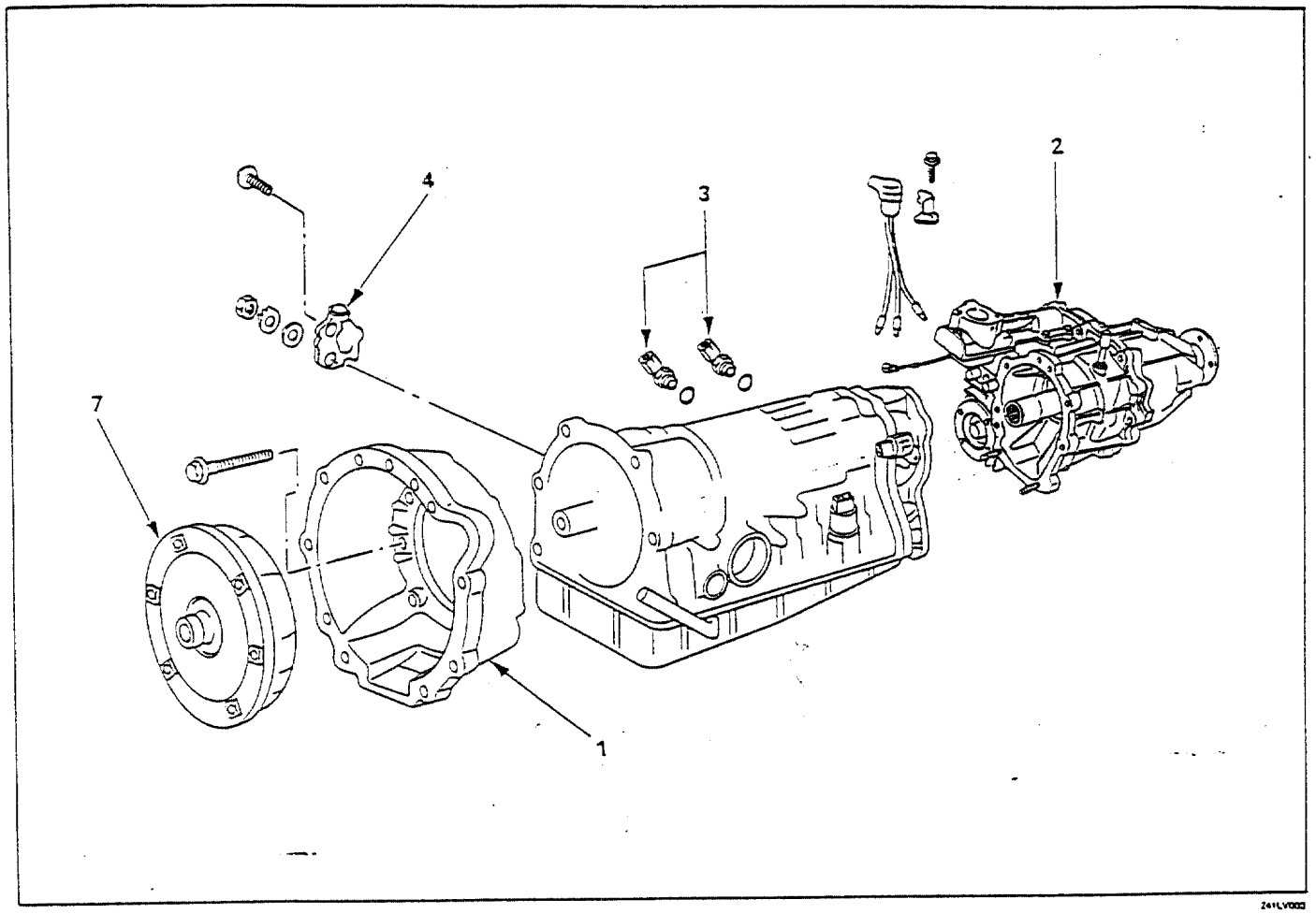


Install and tighten the nineteen bolts.

N.m (kgf.m/lb.ft)

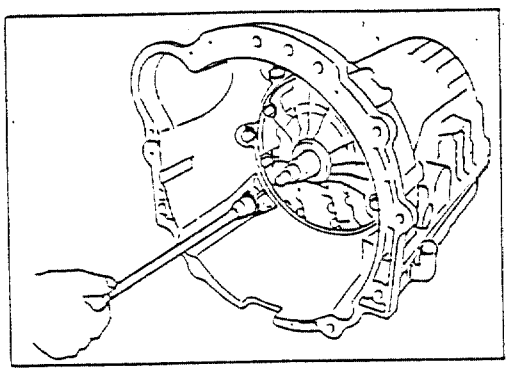
Torque	8 (0.82 / 70.81)

REASSEMBLY OF MAJOR COMPONENTS (3)



Reassembly steps

- ▲ 1. Converter housing
- 2. Extension housing
- ▲ 3. Union
- ▲ 4. Neutral start switch
- ▲ 5. Transmission control shaft lever
- 6. Wire harness
- ▲ 7. Torque converter



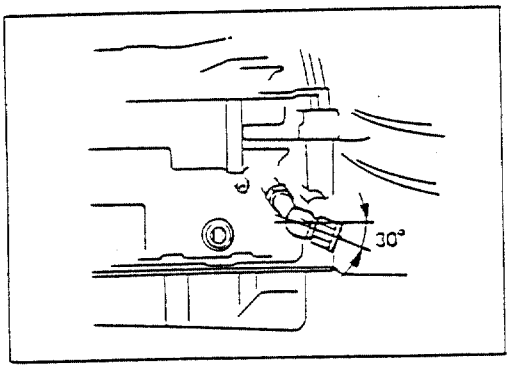
Important operations

1. **Converter housing**

   Install the converter housing and tighten the bolts.

N.m (kgf.m/lb.ft)

Torque	M10	34 (3.5/25)
	M12	57 (5.8/42)



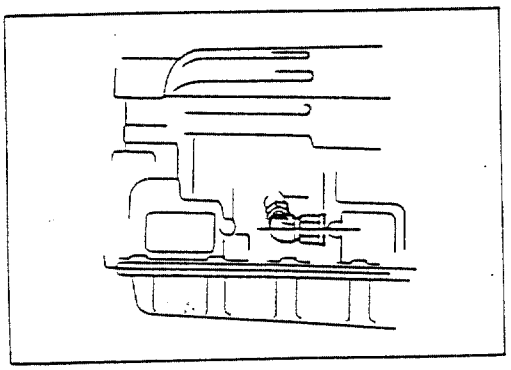
3. Union

Coat new O-rings with ATF, install them to the two unions.

Install the front union as shown in the figure.

N.m (kgf.m/lb.ft)

Torque	30 (3.06 / 265.52)



Install the rear union as shown in the figure.

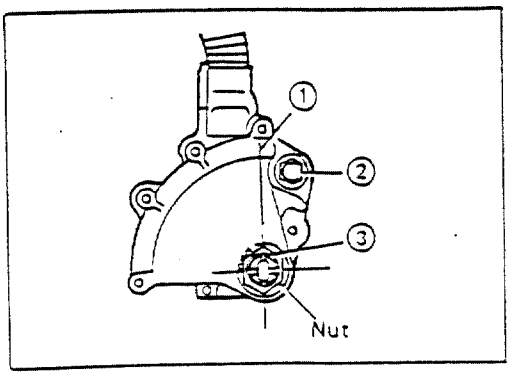
N.m (kgf.m/lb.ft)

Torque	30 (3.06 / 265.52)

4. Neutral start switch

Using the control shaft lever, fully turn the manual lever shaft back and return two notches. It is now in neutral.

Insert the neutral start switch onto the manual valve shaft and temporarily tighten the adjusting bolt.



Install the lock washer and install and torque the nut.

	N.m (kgf.m/lb.ft)
Torque	6.9 (0.7 / 61.07)

Align the neutral standard line ① and the switch groove ③ and tighten the adjusting bolt ②.

	N.m (kgf.m/lb.ft)
Torque	13 (1.33 / 115.06)

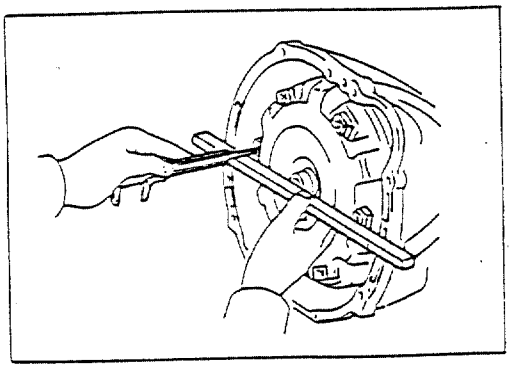
Bend the tabs of the lock washer.

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

5. Control shaft lever

Install control shaft lever.

	N.m (kgf.m/lb.ft)
Torque	1.6 (0.16 / 14.16)

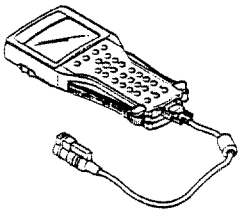
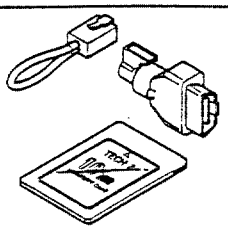
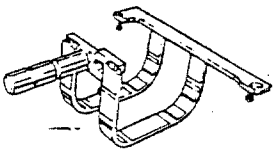
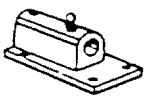
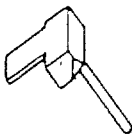
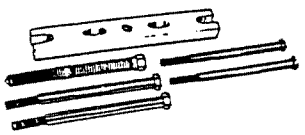


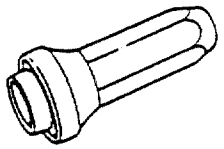
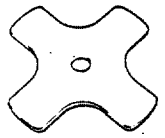
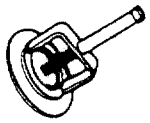
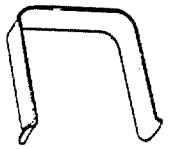
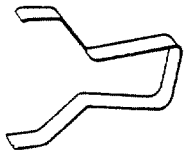
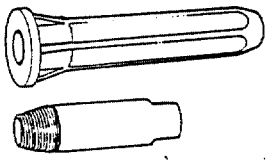
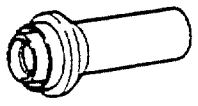
7. Torque converter

Using calipers and a straight edge, measure from the installed surface of the transmission housing.

Correct distance	mm(in.)	67 (2.64) or more

SPECIAL TOOLS (A/T AW30-40LE)

ITEM NO.	ILLUSTRATION	PART NO.	PART NAME
ATL-62		5-8840-0608-0 (TK00200-1)	TECH 1A KIT
ATL-59		5-8840-0610-0 (TA02279B)	Adapter
ATL-1		5-8840-0093-0	Oil pressure gauge
		5-8840-2152-0 (J-37227)	Holding fixture
ATL-3		5-8840-0003-0 (J-3289-20)	Holding fixture base
ENL-89		5-8840-2153-0 (J-37228)	Oil pan seal cutter
		5-8840-2154-0 (J-37230)	Puller

ITEM NO.	ILLUSTRATION	PART NO.	PART NAME
		5-8840-2256-0 (J-9617)	Oil seal installer
		5-8840-2170-0 (J-37233)	OD Brake Piston Spring Compressor
		5-8840-0254-0 (J-25048)	Spring compressor (snap ring)
ATL-10		5-8840-2173-0 (J-37236)	1st/Reverse Brake Puller
		5-8840-2174-0 (J-37237)	1st/Reverse Brake Puller
		5-8840-2169-0 (J-37232-2)	Manual Valve Shaft Seal Installer & Remover
		5-8840-2168-0 (J-35467)	One-way clutch testing tool torque converter
ATL-32		5-8840-2150-0	Oil seal installer

No.TF40L-WE-989IR

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