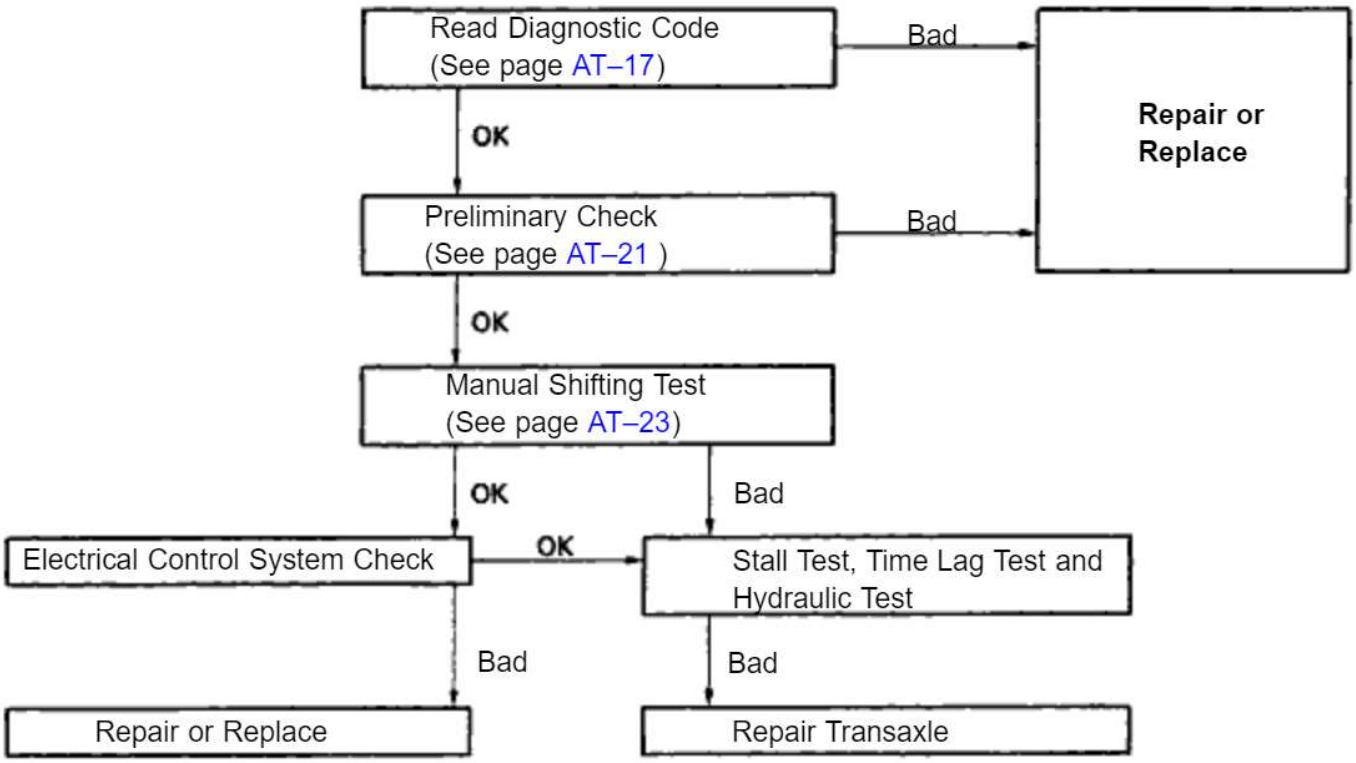
TROUBLESHOOTING
Basic Troubleshooting

Before troubleshooting an ECT, first determine whether the problem is electrical or mechanical.
To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



AUTOMATIC TRANSAXLE

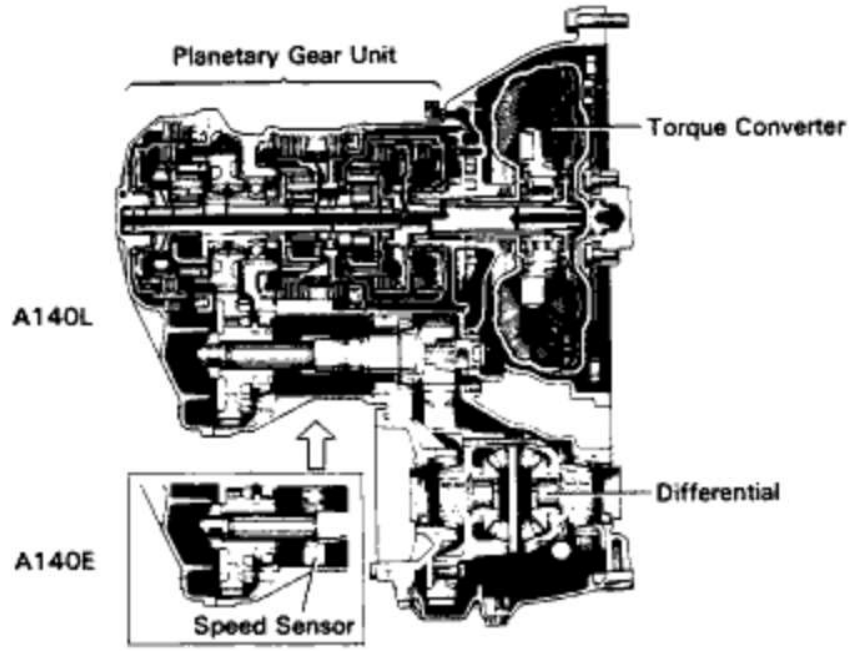
MEMO

A140L AND A140E AUTOMATIC TRANSAXLE

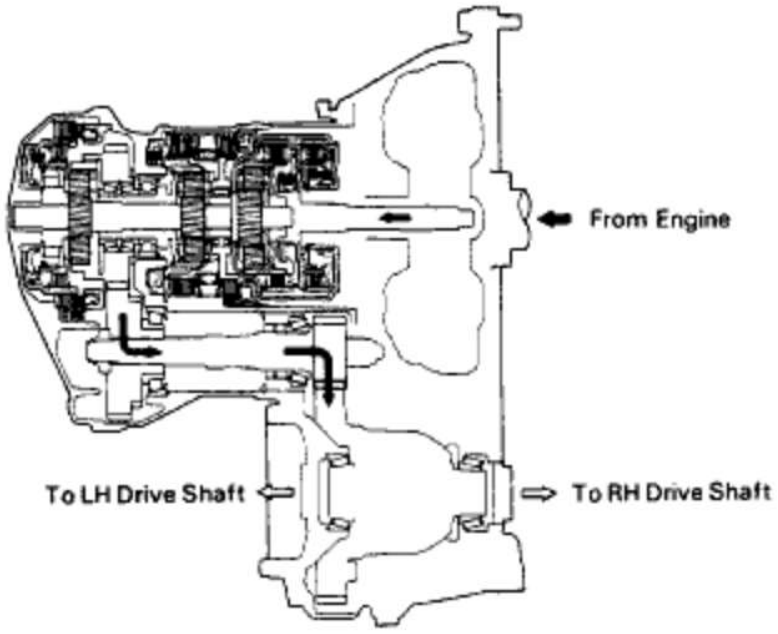
DESCRIPTION

The A140L and. A140E automatic transaxle described in this AT section is a lock–up four–speed automatic transaxle developed exclusively for use– with a transversely–mounted engine.
The A140E is called an ECT (Electronic Controlled Transaxle). Based on the A140L, the hydraulic control system has been changed, and the shift and lock–up timing are controlled by micro computer.

Sectional View



Power Train



The construction and operation of the A140L, will first be explained. Then the difference between the A140E
and the A140L, and the features of the ECT, will also be explained.

A140L Automatic Transaxle

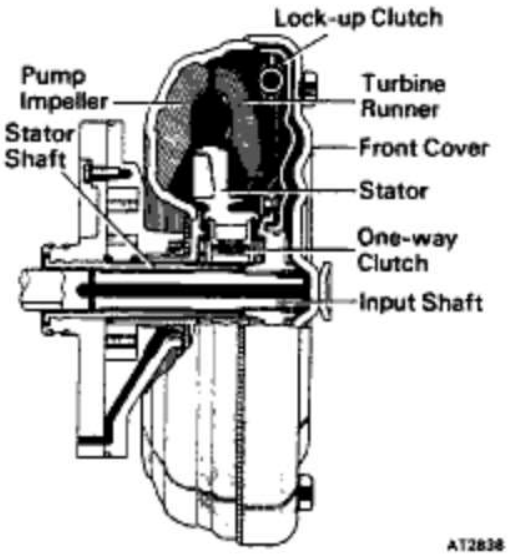
CONSTRUCTION AND OPERATION

The A140L automatic transaxle can be roughly divided into the automatic transmission section and the differential section. The automatic transmission section is composed of the torque converter, planetary gear unit and the hydraulic control system.

1. Torque Converter

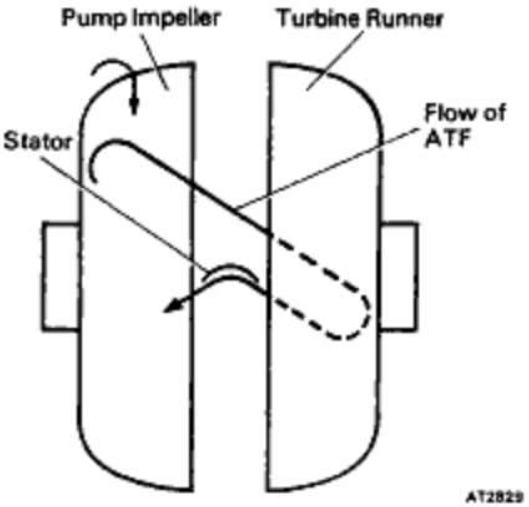
CONSTRUCTION

The torque converter is composed of the pump impeller which is rotated by the engine, the turbine runner and lock–up clutch which are fixed to the transmission input shaft, and the stator which is attached to the stator shaft via the one–way clutch.
The torque converter is filled with ATF.

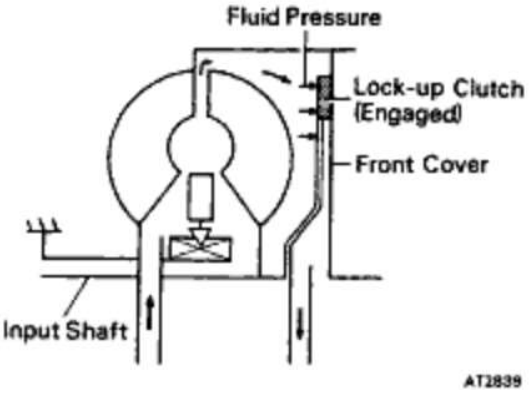


OPERATION

The pump impeller is rotated by the engine, which causes a flow in the ATF inside the torque converter. The flow of ATF caused by the pump impeller strikes the turbine runner, providing a force to rotate the turbine runner, and transmits torque to the input shaft. The flow of ATF which has hit the turbine runner rebounds and tries to flow in the direction opposite to the direction of rotation of the pump impeller, but the stator returns the flow the original direction of rotation. So the ATF
becomes a force which supports the pump impeller and increases torque.
HINT: Although the stator is immobilized by the one-way clutch, should the one–way clutch become defective the stator will be rotated by the flow of ATF, the flow of
ATF will not be reversed, torque will not be increased and the problem of inadequate acceleration will occur.



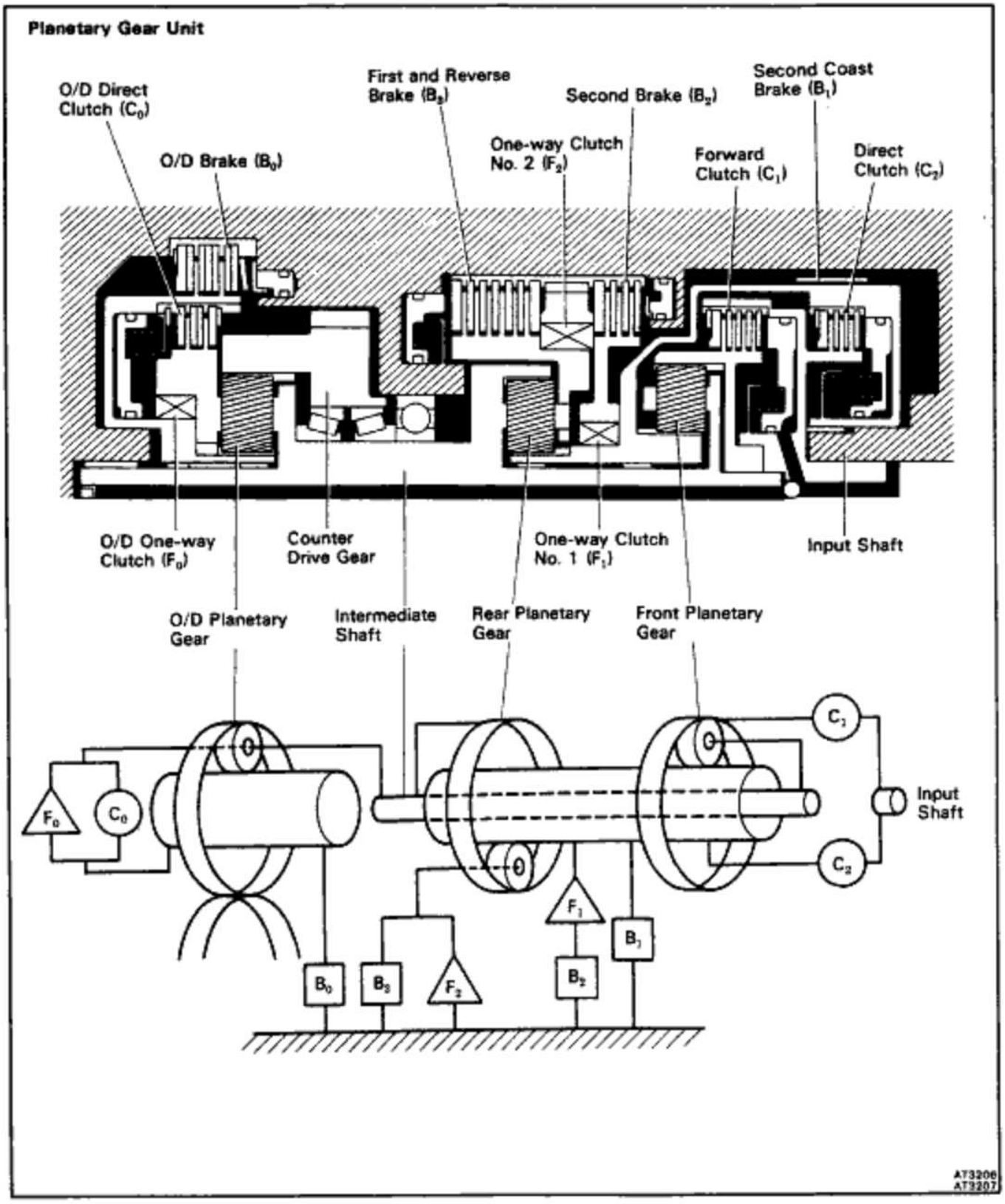
The lock–up clutch is pushed against the front cover by fluid pressure so that the engine revolutions are directly transmitted to the input shaft without the medium of the
ATF.



2. Planetary Gear Unit

CONSTRUCTION

The planetary gear unit is composed of three sets of planetary gears, three clutches which transmit power to the planetary gears, and four brakes and three one–way clutches which immobilize the planetary carrier and planetary sun gear.



OPERATION

Power from the engine transmitted to the input shaft via the torque converter is then transmitted to the planetary gears by the operation of the clutch.

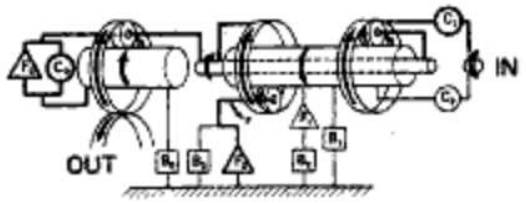
By operation of the brake and one–way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the. planetary gear unit.

Shift change is carried out by altering the combination of clutch and brake operation.

Each clutch and brake operates by hydraulic pressure; gear position is decided according to the throttle opening angle and vehicle speed, and shift change automatically occurs.

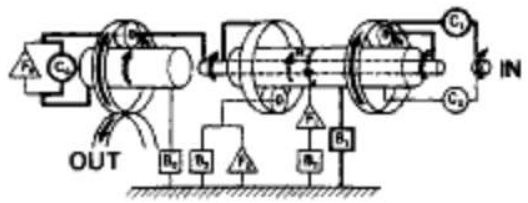
The conditions of operation for each gear position are shown on the following illustrations:

D or 2 Range 1st Gear



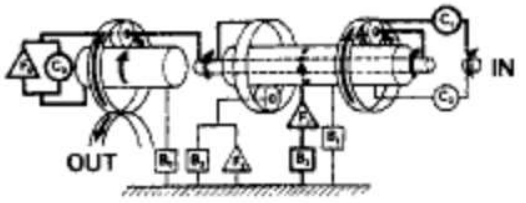
AT1097

2 Range 2nd Gear



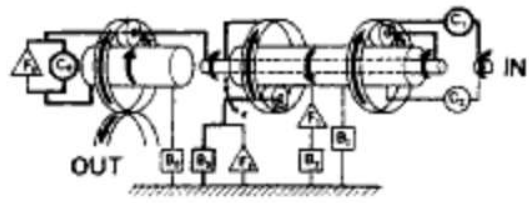
AT1102

D Range 2nd Gear



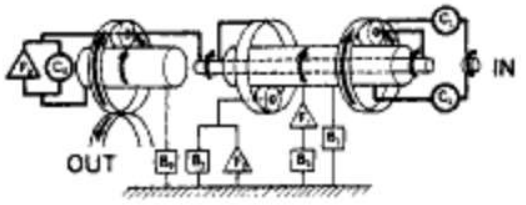
AT1098

L Range 1st Gear



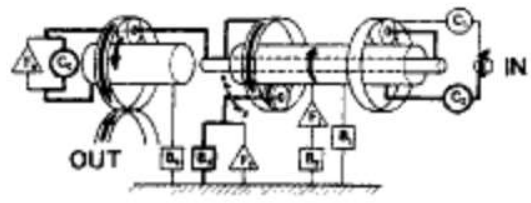
AT1103

D Range 3rd Gear



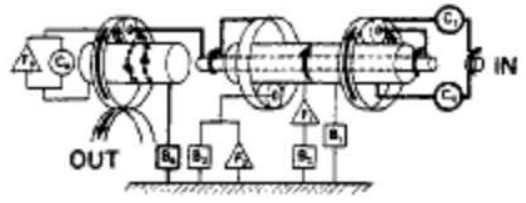
AT1099

R Range Reverse Gear



AT1101

D Range O/D Gear



AT1100

3. Hydraulic Control System

CONSTRUCTION

The hydraulic control is composed of an oil pump, rotated by the engine, which supplies hydraulic pressure; a valve body which controls the hydraulic pressure and the opening and closing of the fluid passaged; and a governor valve which supplies hydraulic pressure in accordance with vehicle speed.

OPERATION

Hydraulic pressure supplied by the oil pump is controlled– by the regulator valve; the resulting oil pressure controlled by the regulator valve is called the line pressure.

Line pressure produces the hydraulic pressure for throttle pressure and governor pressure. Also, line pressure produces hydraulic pressure for the operation of each brake and clutch in the planetary gear unit.

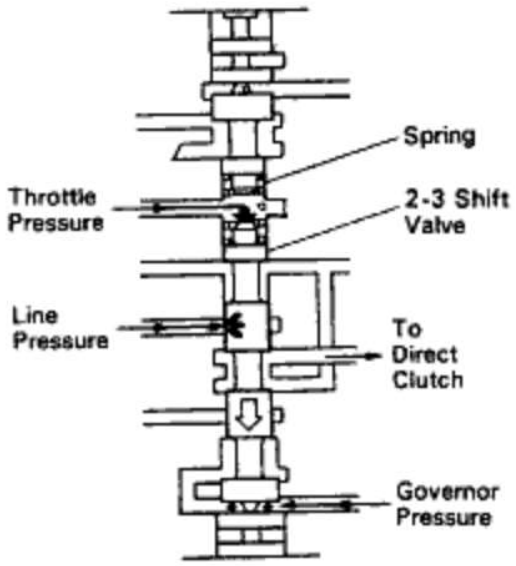
The throttle valve acts to produce hydraulic pressure, called the throttle pressure, which responds to accelerator pedal modulation. Throttle pressure increases as the accelerator pedal is depressed.

The governor valve produces hydraulic pressure, called the governor pressure, in response to vehicle speed. Governor pressure increases as vehicle speed increases.

In accordance with the difference between throttle pressure and governor pressure, each shift valve shifts, the fluid passages to the clutches are brakes in the planetary gear unit are opened and the clutches and brakes operate, and shift change occurs.

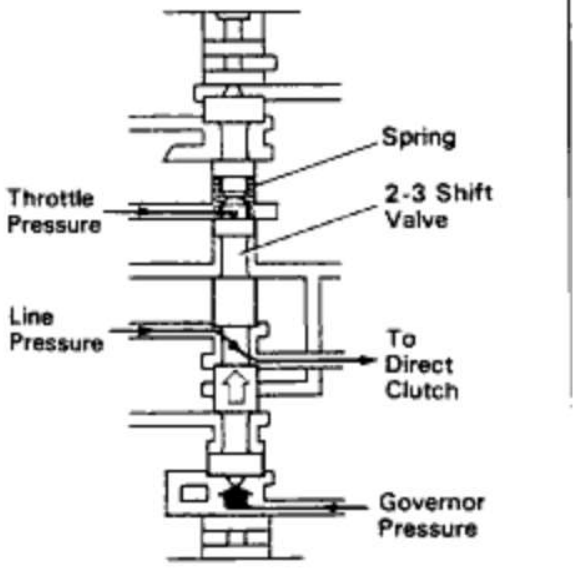
The operation of the hydraulic control system, using the 2–3 shift valve as an example, is shown below;

[Low Speed] Gear Position: 2nd



Governor pressure is low.
2-3 shift valve is forced downward by throttle pressure and spring tension.
The line pressure fluid passage is closed.

[High Speed] Gear Position: 3rd



When vehicle speed increases the governor pressure increases and overcomes throttle pressure and spring tension; 2-3 shift valve is forced upward. The line pressure fluid passage opens, the direct clutch is operated and the gear is shifted up to third.

A140E Automatic Transaxle (ECT)

WHAT IS THE ECT?

ECT means Electronic Controlled Transaxle. The hydraulic control system of the previous automatic transaxle has been changed, the throttle and governor pressure have been replaced by electronic signals and a micro computer has been used to give precise control of shift timing and lock–up timing.

FEATURES OF THE ECT

(a) The shift pattern can be chosen.
In the ECT ECU micro computer used in the A140E, two types of shift pattern, Power and Normal, are recorded in the memory. By operating the pattern select switch, the driver can select the preferred shift pattern.

(b) Reduced fuel consumption and reduced shock during shifting is made possible.
Precise control of the shift timing by the ECT ECU, operation of the lock–up clutch from low speeds, and decreased fuel consumption are made possible. Also, shock during Shifting is reduced.

(e) Self–Diagnostic System
When a malfunction occurs in the electronic control system, the driver is informed of this fact. Also, there is a Self–Diagnostic System which displays the location of the malfunction when the service connector is shorted.

(d) Fail–Safe System
A fail–Safe System is included so that, even if a malfunction occurs in the electronic control system, the vehicle will be able to operate.

CONSTRUCTION AND OPERATION

When the A140E (ECT) is compared with the A140L, the automatic transaxle body has the same construction and operation, with the exception of the hydraulic control system, as the A140L.
The electronic control system, which controls the shift timing and lock–up timing, has been added.

1. Hydraulic Control System (Comparison with the A140L)

VALVE BODY – Additions or changes to solenoid valve

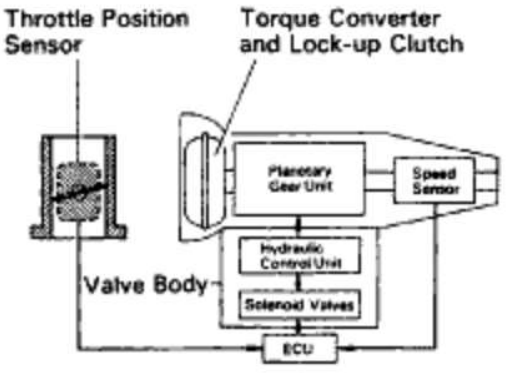
In the A140E there are three solenoid valves, the No. 1, the No. 2 and the lock–up solenoid valves. Shifting occurs according to whether the No. 1 and No. 2 solenoid valves are ON or OFF, and the lock–up solenoid valve controls the lock–up clutch.

GOVERNOR VALVE – Removed

With the A140E, the governor valve has been replaced with a speed sensor, so that instead of the governor pressure, a speed sensor signal is sent to the ECT ECU.

SHIFT CONTROL IN ECT

1. The vehicle speed is sensed by the vehicle speed sensor, which sends this data to the ECU in the form of electrical signals.
2. The angle to which the throttle is open is sensed by the throttle position sensor, which sends this data to the ECU in the form of electrical signals.
3. The ECT computer determines the shift point on the basis of these two signals and operates the solenoid valves in the hydraulic control unit, thus shifting the transmission.



AT1079

2. Electronic Control System

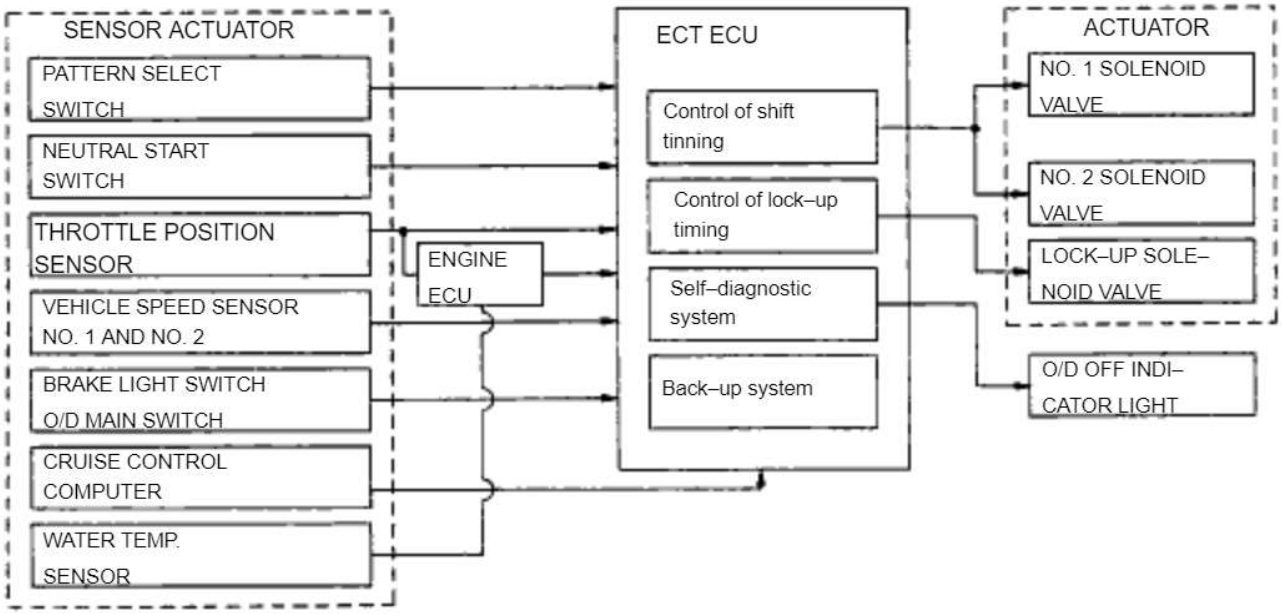
COMPONENTS

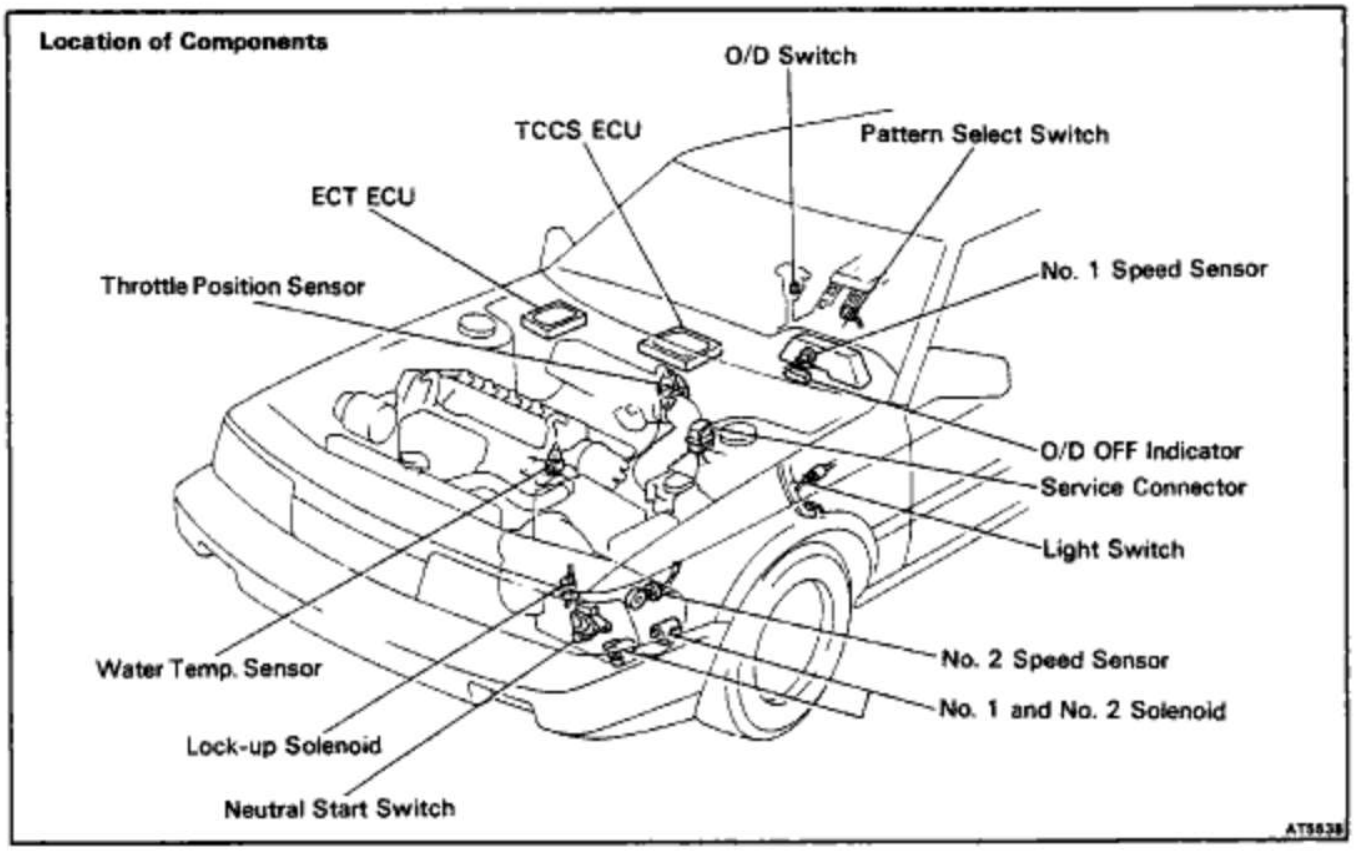
The electronic control system for controlling the shift timing and the operation of the lock–up clutch is composed of the following three parts:

(a) Sensors: These sense the vehicle speed and throttle position and send this data to the ECT ECU in the form of electronic signals.

(b) ECT ECU: This determines the shift and lock–up timing based upon the signals from the. sensors.

(e) Actuators: Solenoid valves divert hydraulic pressure from one circuit of the hydraulic control unit to another, thus controlling shifting and lock–up timing.





General Troubleshooting

Problem	Possible cause	Remedy	Page	
			A140L	A140E
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	AT–21	←
	Torque converter faulty	Replace torque converter	AT–156	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	←
Vehicle does not move in any forward range or reverse	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Valve body or primary regulator faulty	Inspect valve body	AT–133	
	Parking lock pawl faulty	Inspect parking lock pawl	AT–72	←
	Torque converter faulty	Replace torque converter	AT–156	←
	Converter drive plate broken	Replace drive plate		
	Oil pump intake screen blocked	Clean screen		
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	←
Shift lever position incorrect	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Manual valve and lever faulty	Inspect valve body	AT–133	
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	AT–22	AT–121
	Valve body or primary regulator faulty	Inspect valve body	AT–133	
	Accumulator pistons faulty	Inspect accumulator pistons	AT–177	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	←
Delayed 1–2, 2–3 or 3–O/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty	Inspect electronic control	AT–36	AT–24
	Valve body faulty	Inspect valve body	AT–133	AT–121
	Solenoid valve faulty	Inspect solenoid valve		AT–33
Slips on 1–2, 2–3 or 3–O/D up–shift, or slips or shudders on acceleration	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Throttle cable out of adjustment	Adjust throttle cable	AT–22	AT–33
	Valve body faulty	Inspect valve body	AT–133	
	Solenoid valve faulty	Inspect solenoid valve	AT–56	
	Transaxle faulty	Disassemble and inspect transaxle		
Drag, binding or tieup on 1–2, 2–3 or 3–4/D up–shift	Shift cable out of adjustment	Adjust shift cable	AT–22	AT–121
	Valve body faulty	Inspect valve body	AT–133	
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page	
			A140L	A140E
No lock–up in 2nd, 3rd or O/D	Electronic control faulty	Inspect electronic control	AT–36	AT–24
	Valve body faulty	Inspect valve body	AT–133	AT–121
	Solenoid valve faulty	Inspect solenoid valve	AT–56	AT–33
	Transaxle faulty	Disassemble and inspect transaxle		
Harsh down–shift	Throttle cable out of adjustment	Adjust throttle cable	AT–22	←
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT–22	←
		Inspect accumulator pistons	AT–177	
	Accumulator pistons faulty	Inspect valve body	AT–133	
	Valve body faulty	Disassemble and inspect transaxle	AT–56	AT–121
	Transaxle faulty			
No down–shift when coasting	Valve body faulty	Inspect valve body	AT–133	AT–121
	Solenoid valve faulty	Inspect solenoid valve	AT–36	AT–33
	Electronic control faulty	Inspect electronic control		AT–24
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty	Inspect throttle cable	AT–22	AT–121
	Valve body faulty	Inspect valve body	AT–133	
	Transaxle faulty	Disassemble and inspect transaxle	AT–56	
	Solenoid valve faulty	Inspect solenoid valve		AT–33
	Electronic control faulty	Inspect electronic control	AT–36	AT–24
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty	Inspect solenoid valve	AT–36	AT–33
	Electronic control faulty	Inspect electronic control	AT–133	AT–24
	Valve body faulty	Inspect valve body		AT–121
No engine braking in 2 or L range	Solenoid valve faulty	Inspect solenoid valve	AT–36	AT–33
	Electronic control faulty	Inspect electronic control	AT–133	AT–24
	Valve body faulty	Inspect valve body	AT–56	AT–121
	Transaxle faulty	Disassemble and inspect transaxle		
Vehicle does not hold in P	Shift cable out of adjustment	Adjust shift cable	AT–22	←
	Parking lock pawl cam and spring faulty	Inspect cam and spring	AT–72	←

Operating Mechanism for Each Gear (A140L A140E)

1. CLUTCH BRAKE AND ONE–WAY CLUTCH

A140L

○ . . . . . Operating

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
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
L	1 st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

'Down–shift only – no up–shift

A140E

○ . . . . . Operating

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
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

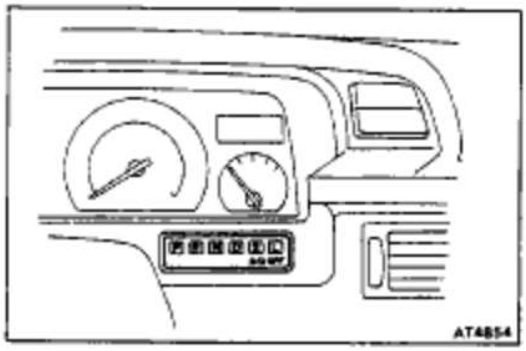
'Down–shift only – no up–shift

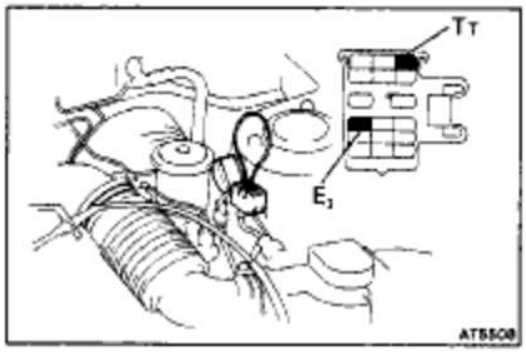
2. SOLENOID SYSTEM (A140E)

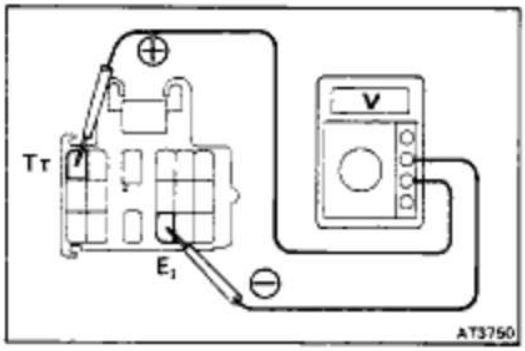
Possible gear positions in accordance with solenoid operating conditions.
A140E

Range	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO. 2 SOLENOID MALFUNCTIONING			BOTH SOLENOID MALFUNCTIONING		
	Solenoid valve		Gear Position	Solenoid valve		Gear Position	Solenoid valve		Gear Position	Solenoid valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D range	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	O/D
	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	O/D (1st)	x	x	O/D
	OFF	ON	3rd	x	ON	3rd	OFF	x	O/D	x	x	O/D
	OFF	OFF	O/D	x	OFF	O/D	OFF	x	O/D	x	x	O/D
2 range	ON	OFF	1st	x	ON (OFF)	3rd (O/D)	ON	x	1st	x	x	3rd
	ON	ON	2nd	x	ON	3rd	OFF (ON)	x	3rd (1st)	x	x	3rd
	OFF	ON	3rd	x	ON	3rd	OFF	x	3rd	x	x	3rd
L. range	ON	OFF	1st	x	OFF	1st	ON	x	1st	x	x	1st
	ON	ON	2nd	x	ON	2nd	ON	x	1st	x	x	1st

( ) : No fail safe function x: Malfunctions



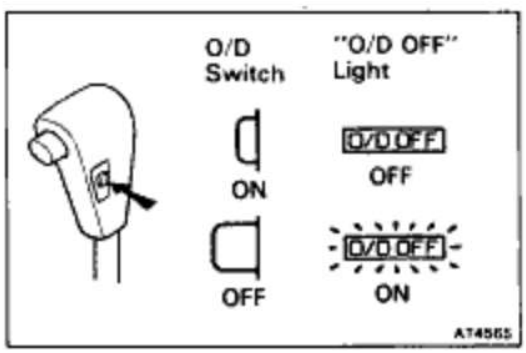




Diagnosis System (A140E)

DESCRIPTION

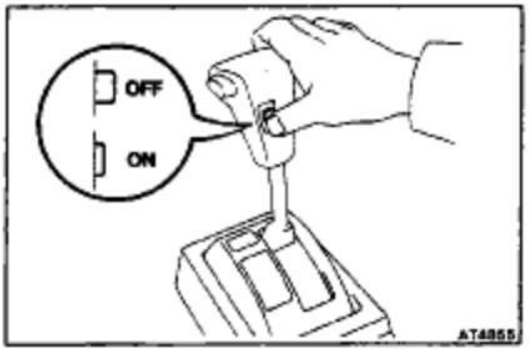
1. A self–diagnosis function is built into the electrical control system.
   Warning is indicated by the overdrive OFF indicator.
   HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF indicator is lit continuously and will not blink.
   (a) If a malfunction occurs within the speed sensors (No. 1 or 2) or solenoids (No. 1 or 2), the overdrive OFF light will blink to. warn the driver. .
   However, there will be no warning of a malfunction with lock–up solenoid.
   (b) The diagnostic code can be read by the number of blinks of the overdrive OFF indicator when terminals Tt and E1 are short–circuited. (See page AT–17)
   tc) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal Tt of the check connector (diagnosis).
   (d) The signals to each gear can be checked by measuring the voltage at terminal Tt of the check connector while driving.
2. The diagnostic (malfunction) code is retained in memory by the CPU and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the fuse EFI (15A) or disconnect the ECT computer connector to cancel out the diagnostic (malfunction)
   code. (See page AT–18)
   HINT:
   - Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
   - Use a voltmeter and ohmmeter that have an impedance of at least 10 k 11 IV.



CHECK O/D OFF INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The O/D OFF light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the O/D OFF light should go out.
   If the O/D OFF light flashes when the O/D switch is set to ON, the electronic control system is faulty.

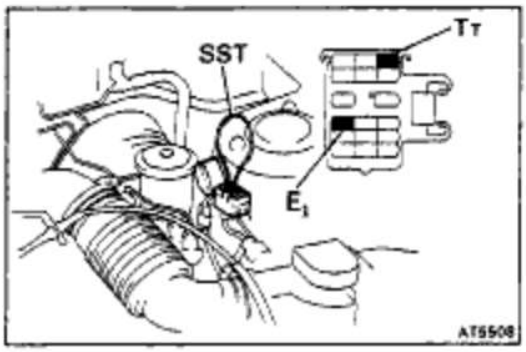
READ DIAGNOSTIC CODE



1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

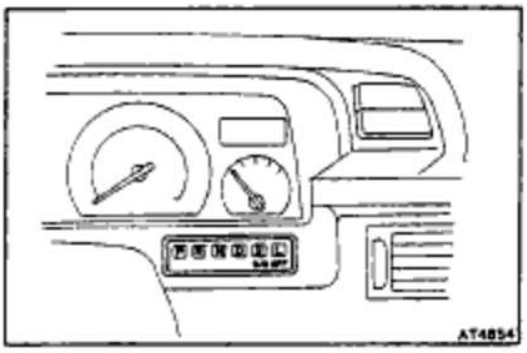
HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. SHORT ECT TERMINAL CIRCUIT OF CHECK CONNECTOR

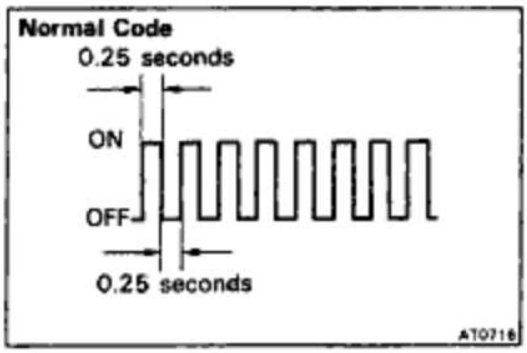
Using a SST, short terminals Tt and E1 of the check connector.

SST 09843–18020



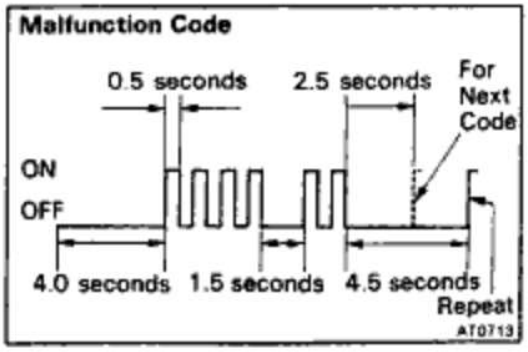
3. READ DIAGNOSTIC CODE

Read the diagnostic code as indicated by the number of times the O/D OFF indicator flashes.



(Diagnostic Code Indication)

- If the system is operating normally, the light will blink once every 0.25 seconds.



- In the event of a malfunction, the fight will blink once every 0.5 seconds. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

HINT: In the event of several trouble codes occurring simultaneously, indication will begin from the smaller value and continue to the larger.

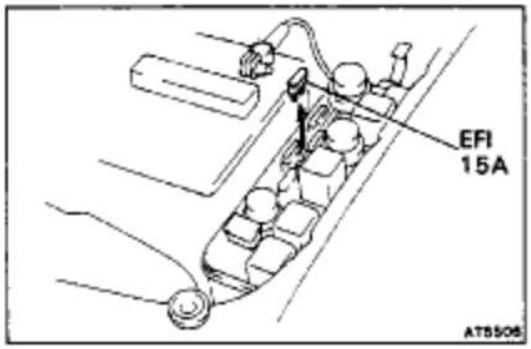
4. REMOVE SST

SST 09843–18020

DIAGNOSTIC CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 speed sensor (in combination meter) – severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM) – severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit – severed wire harness or short circuit

HINT: If codes 62, 63 or 64 appear, there is an electrical malfunction in the solenoid.
Causes due to –mechanical failure, such as a stuck valve, will not appear.



CANCEL OUT DIAGNOSTIC CODE

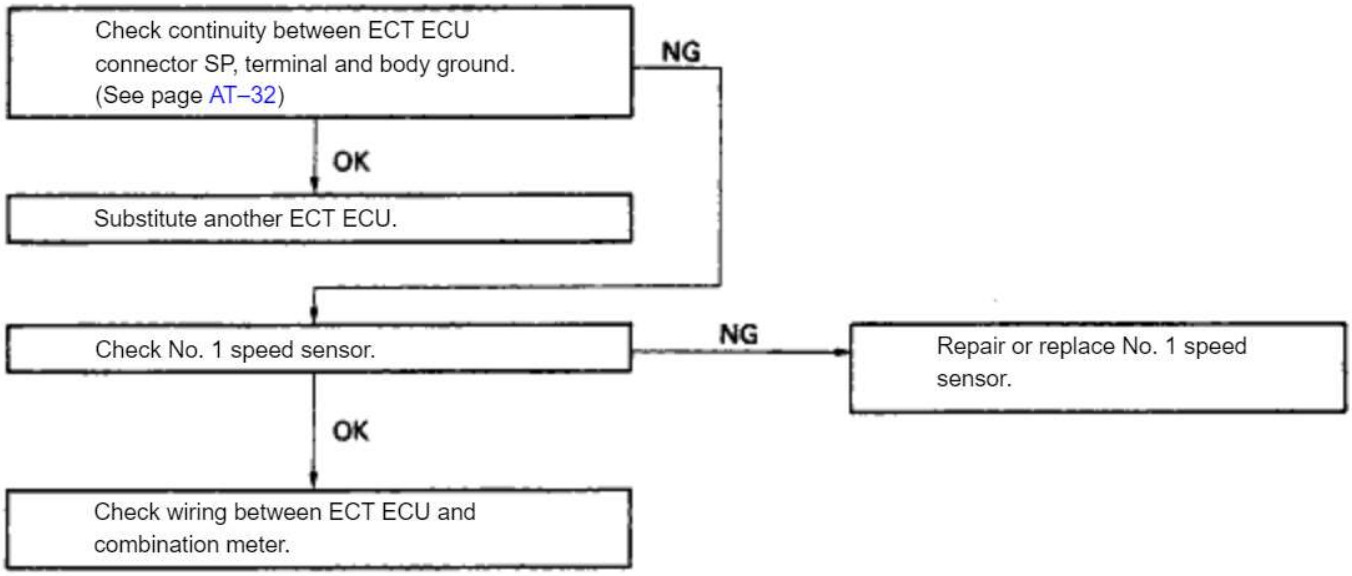
1. After repair of the trouble area, the diagnostic code retained in memory by the ECT ECU must be canceled by removing the fuse EFI (15A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.
   HINT:
   - Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems (TCCS diagnosis memory, etc.) will be also canceled out.
   - The diagnostic code can be also canceled out by disconnecting the ECT ECU connector.
   - If the diagnostic code is not canceled out, it will be retained by the ECT ECU and appear along with a new code in event of future trouble.
2. After cancellation, perform a road test to confirm that a "normal code" is now read on the O/D OFF indicator.

TROUBLESHOOTING FLOW–CHART

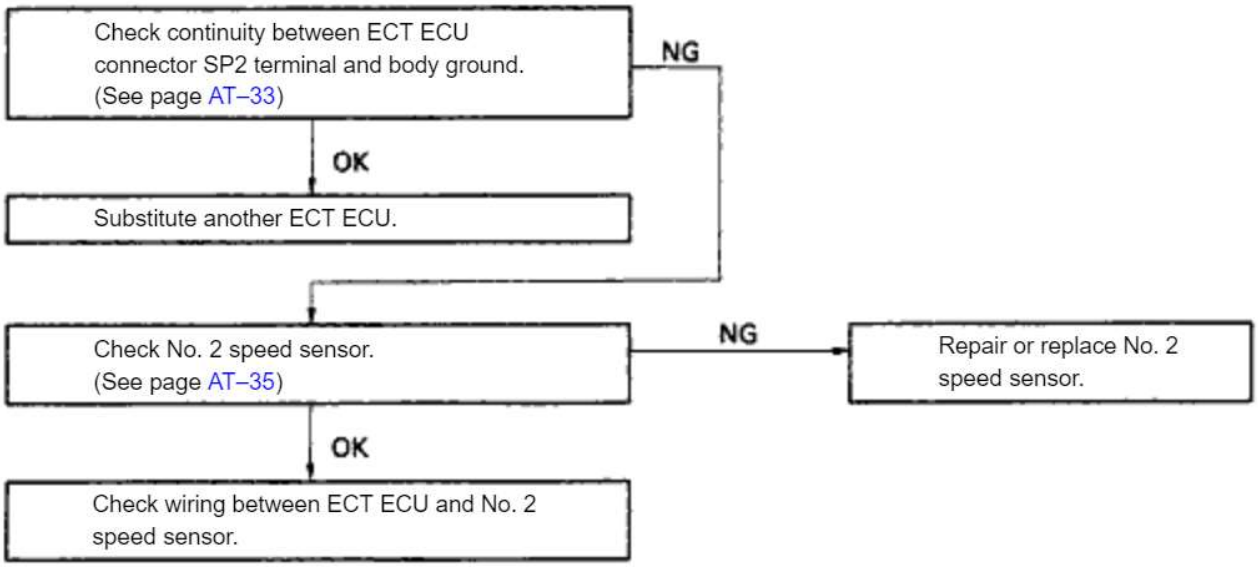
HINT:

- If diagnostic code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transaxle will not up–shift from first gear, regardless of the vehicle speed.

1. Diagnostic code 42 (No. 1 speed sensor circuitry)



2. Diagnostic code 61 (No. 2 speed sensor circuitry



3. Diagnostic code 62 (No. 1 solenoid valve circuitry)

Check resistance of No. 1 solenoid valve at NG

Check resistance of No. 1 solenoid valve at ECT ECU connector. (See page AT–33)

OK

Substitute another ECT ECU.

Remove the oil pan and check resistance of No. 1 solenoid valve connector and body ground.
Resistance: 11 – 15Ω

NG → Replace No. 1 and No. 2 solenoid valves.

OK

Check wiring between No. 1 solenoid valve and ECT ECU.

4. Diagnostic code 63 (No. 2 solenoid valve circuitry)

Check resistance of No. 2 solenoid valve at NG

Check resistance of No. 2 solenoid valve at ECT ECU connector. (See page AT–33)

OK

Substitute another ECT ECU.

Remove the oil pan and check resistance of No. 2 solenoid valve connector and body ground.
Resistance: 11 – 15Ω

NG → Replace No. 1 and No. 2 solenoid valve.

OK

Check wiring between No. 2 solenoid valve and. ECT ECU.

5. Diagnostic code 64 (Lock–up solenoid valve circuitry)

Check resistance of lock–up solenoid valve at NG

Check resistance of lock–up solenoid valve at ECT ECU connector. (See page AT–33)

OK

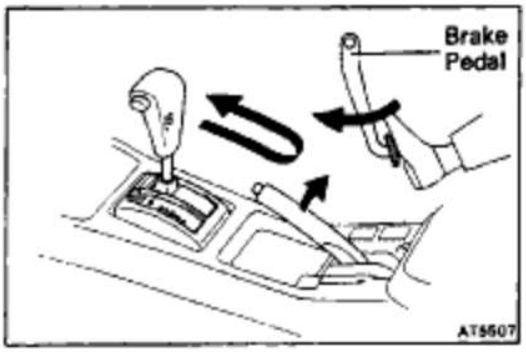
Substitute another ECT computer.

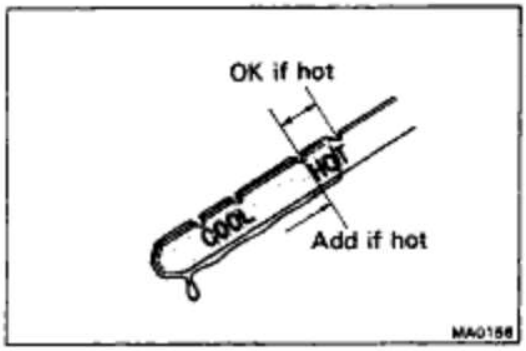
Remove the oil pan and check resistance of lock–up solenoid valve connector and body ground.
Resistance: 11 – 15Ω

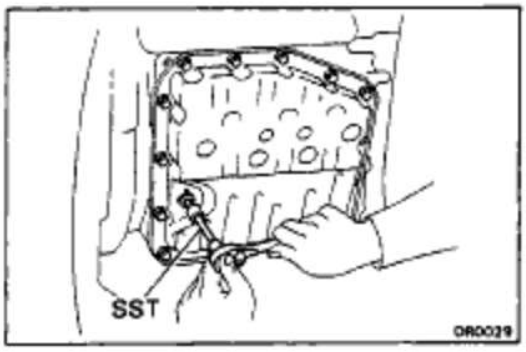
NG → Replace lock–up solenoid valve.

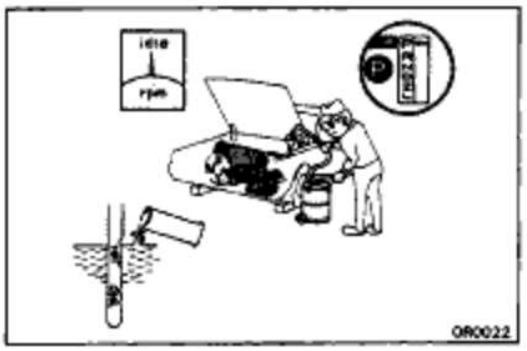
OK

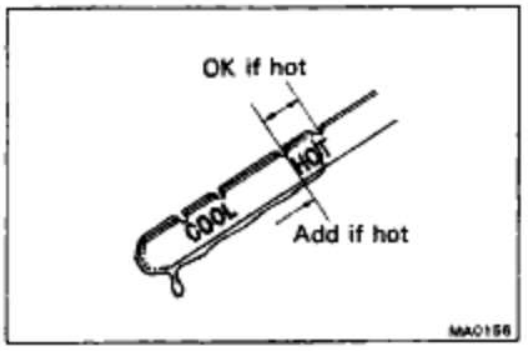
Check wiring between lock–up solenoid valve and ECT ECU.











Preliminary Check

11. CHECK FLUID LEVEL

HINT: The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (fluid temperature: 158 – 176˚F or 70 –80˚C)

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress the brake pedal.

(a) Pull out the transaxle dipstick and wipe it clean.

(b) Push it back fully into the tube.

(c) Pull it out and check that the fluid level is in the HOT range. If the level is at the low side of the hot range, add fluid.

Fluid type: ATF DEXRON→ II

NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it

3. REPLACE ATF

NOTICE: Do not overfill.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

(c) With the engine OFF, and new fluid through the dip stick tube.

SST 09043–38100

Fluid: ATF DEXRON→ II

Capacity:

Dry fill:

A140E 5.3 liters (5.6 US qts, 4.7 Imp. qts)

A140L 5.7 liters (6.0 U S qts, 5.0 Imp. qts)

Drain and refill (Reference):

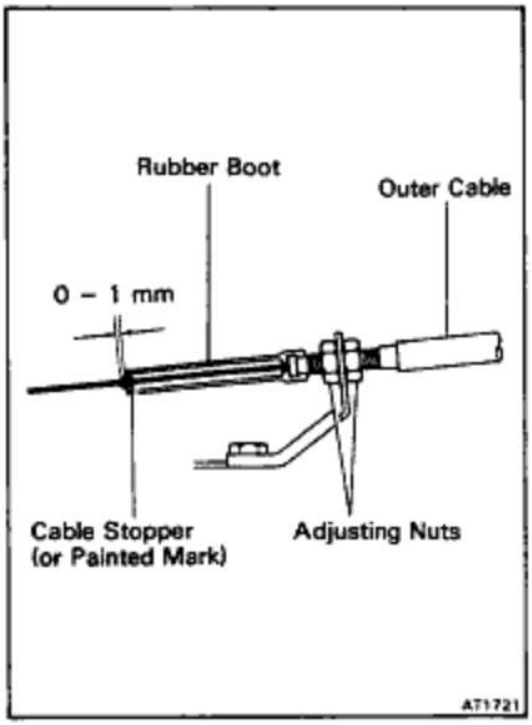
140E, A140L 2.5 liters (2.6 US qts, 2.2 Imp. qts)

(d) Start the engine and shift the selector into all positions from P through L and then shift into P.

(e) With the engine idling, check the fluid level. Add fluid up to the ”COOL” level on the dipstick.

(f) Check the fluid level with the normal fluid temperature (158 – 176˚F or 70 – 80˚C) and add as necessary.

NOTICE: Do not overfill.



4. INSPECT AND ADJUST THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

HINT: If the valve does not open fully, adjust the accelerator link.

(b) Fully depress the accelerator pedal.

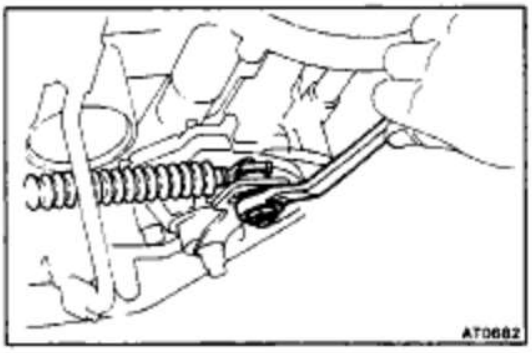
(c) Loosen the adjustment nuts.

(d) Adjust the outer cable so that the distance between the end of the boot and stopper on the cable is the standard.

Standard boot and cable stopper distance:
0– 1 mm 10–0.04 in.)

(e) Tighten the adjusting nuts.

(f) Recheck the adjustments.



5. INSPECT AND ADJUST SHIFT CABLE

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

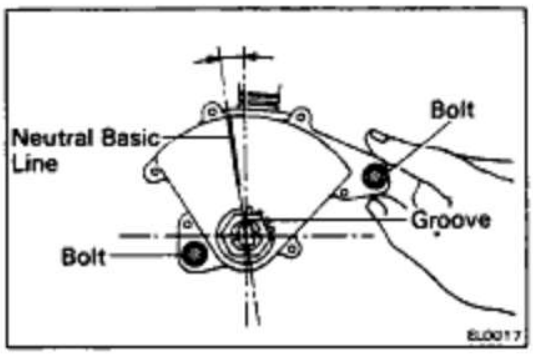
(a) Loosen the swivel nut on manual shift lever.

(b) Push the manual lever fully toward the right side of the vehicle.

(c) Return the lever two notches to NEUTRAL position.

(d) Set the shift lever to N.

(e) While holding the lever lightly toward the R range side, tighten the swivel nut.



6. ADJUST NEUTRAL START SWITCH

If the engine will start with the shift selector in any range other than N or P range, adjustment is required.

(a) Loosen the neutral start switch bolts and set the shift selector to the N range.

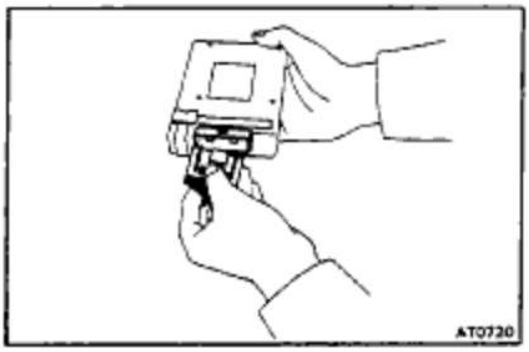
(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

7. INSPECT IDLE SPEED (N RANGE)

Idle speed: 700 rpm



Manual Shifting Test (A140E)

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

1. DISCONNECT ECT ECU CONNECTOR

(a) Remove the glove box.

(b) With the engine OFF, disconnect the ECT connector.

2. INSPECT MANUAL DRIVING OPERATION

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

Shift position	V range	2 range	L range	R range	P ' range
Gear position	O/D	3rd	1st	Reverse	Pawl Lock

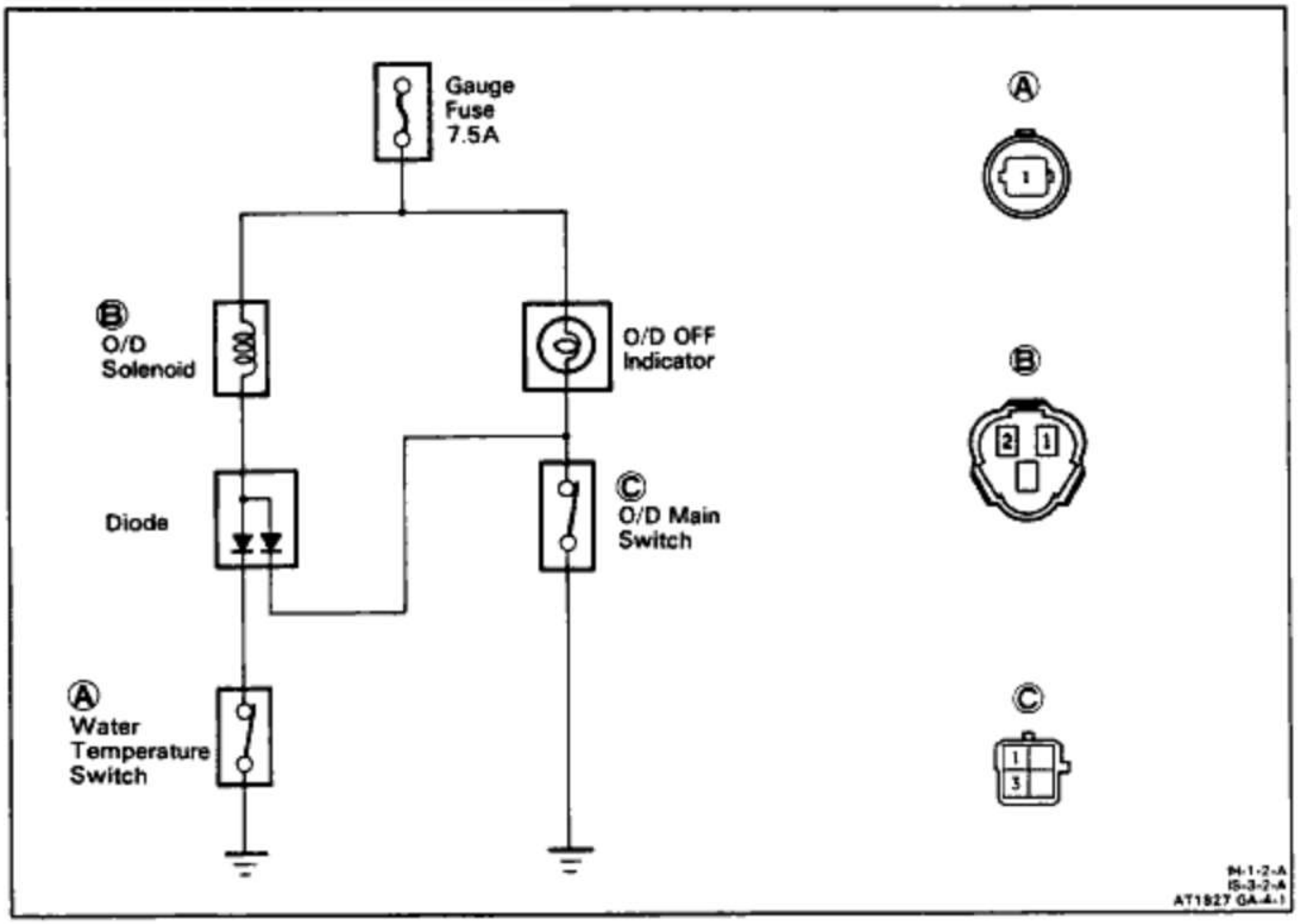
HINT: If the L, 2 and D range gear positions are difficult to distinguish, perform the following road test.

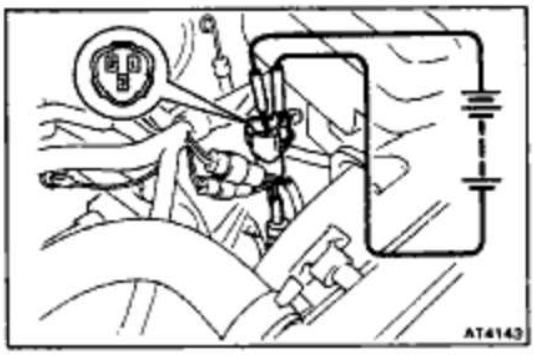
- White driving, shift through the L, 2 and D ranges. Check that the gear change corresponds to the shift position.

3. CONNECT ECT ECU CONNECTOR

Electronic Control System (A140L)

ELECTRONIC CONTROL CIRCUIT



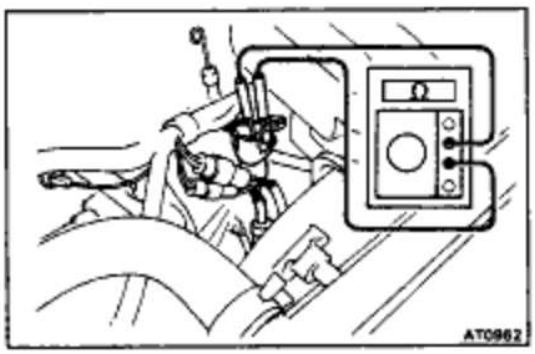


INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT O/D SOLENOID

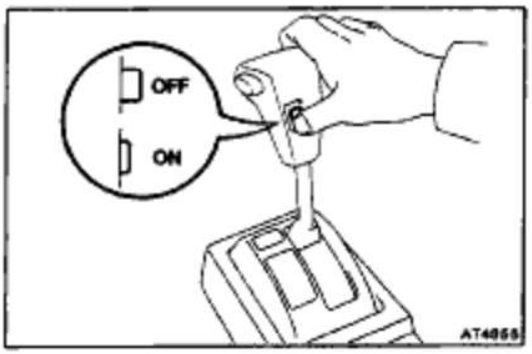
(a) Disconnect the solenoid connector.

(b) Apply voltage between terminals 1 and 2.
At this time, confirm that a solenoid operation sound in heard.

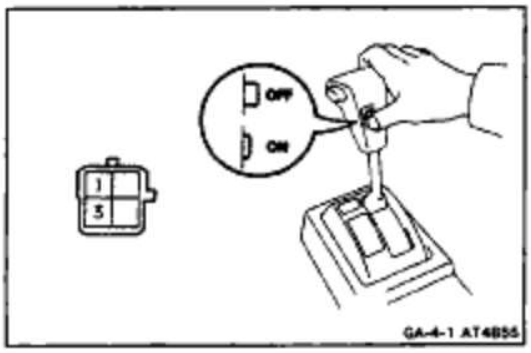


(e) Using an ohmmeter, measure the solenoid coil resistance between terminals 1 and 2.
Resistance: 13 × 2

(d) Connect the solenoid connector.



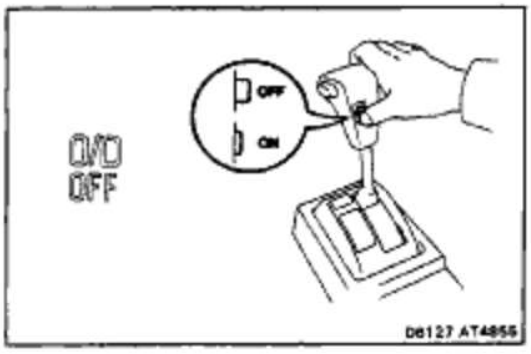
(e) Turn on the ignition switch and disconnect the water temperature switch wire.
(f) Confirm that operation sounds of the solenoid can be heard if the O/D main switch is repeatedly turn on and off.
(g) Turn off the ignition switch and connect the water temperature switch wire.



2. INSPECT O/D MAIN SWITCH

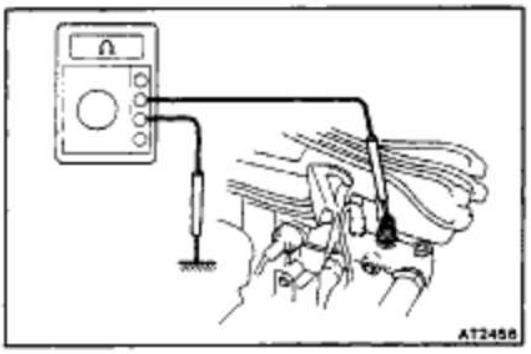
(a) Remove the console box.
(b) Using an ohmmeter, measure the resistance between terminals 1 and 3.

- Switch ON – Resistance: ∞
- Switch OFF– Resistance: 0



3. INSPECT O/D OFF INDICATOR

(a) Turn on the ignition switch.
(b) Turn off the O/D main switch.
(c) Check that the O/D OFF indicator lights.



4. INSPECT WATER TEMPERATURE SWITCH

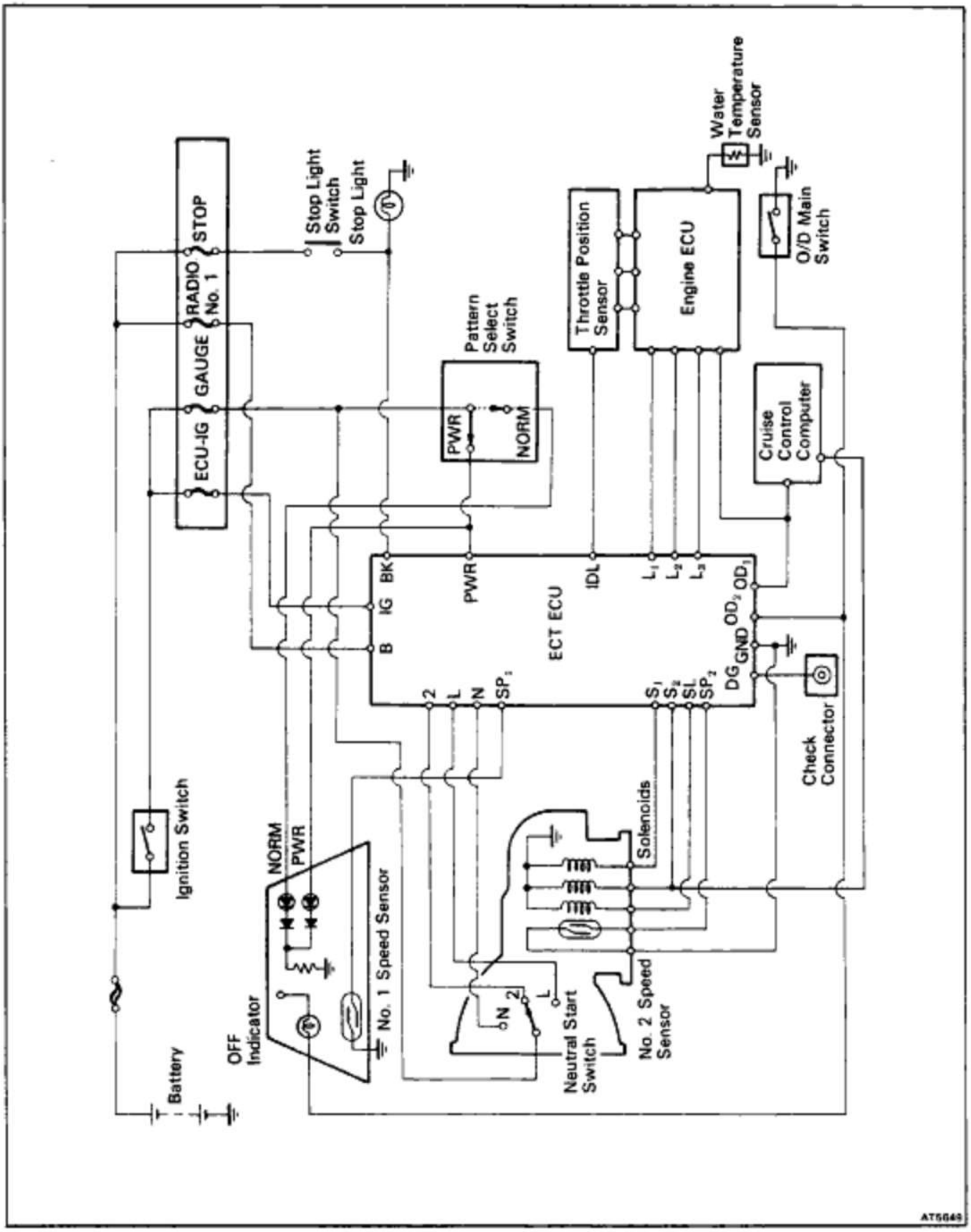
(a) Disconnect the switch connector.
(b) Using an ohmmeter, measure the resistance between terminal 1 and body ground.

Coolant temperature:
Below 109°F (43°C) 0
Above 131°F (55°C) ∞

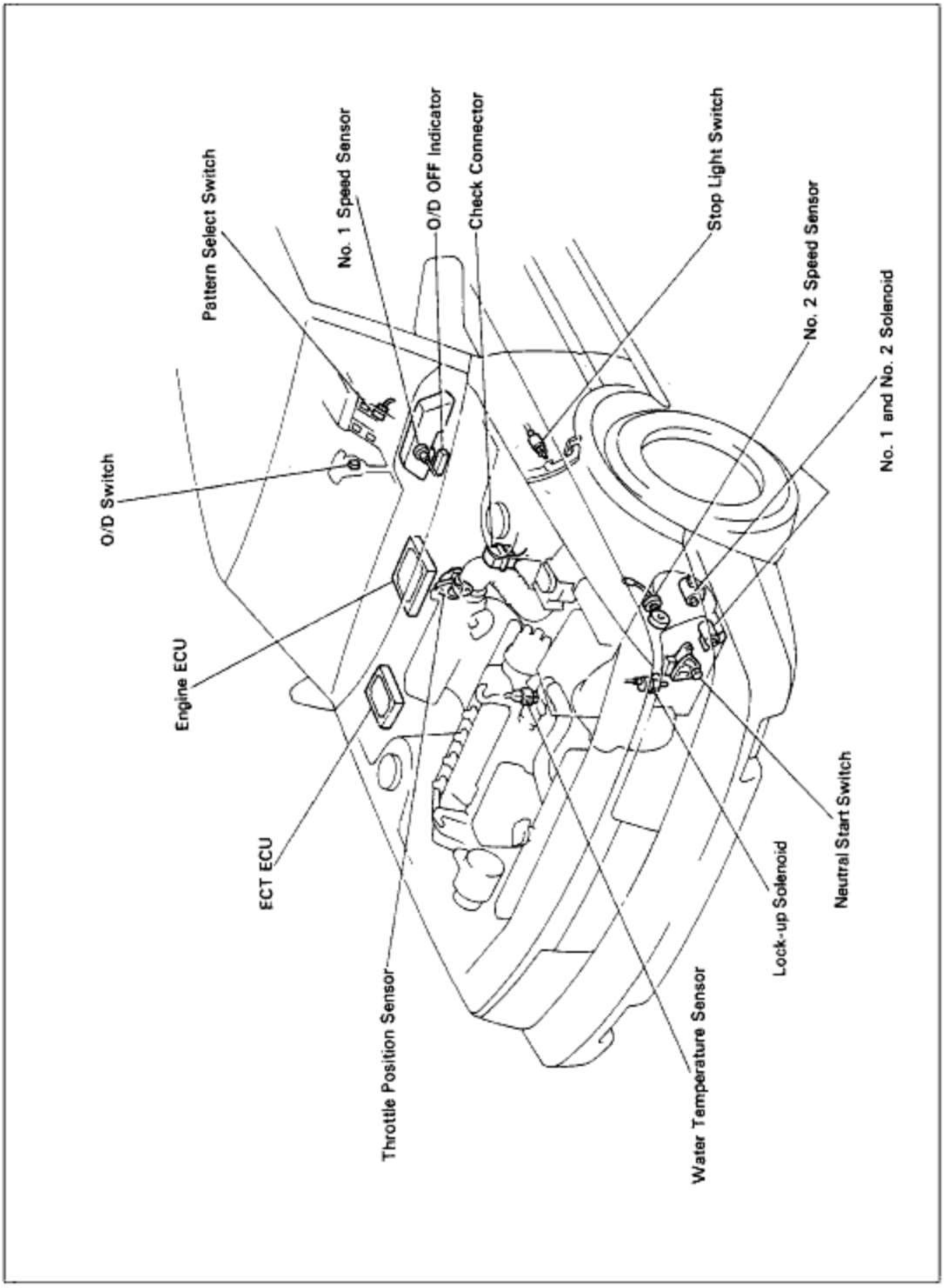
(c) Connect the switch connector.

Electronic Control System (A140E)

ELECTRONIC CONTROL CIRCUIT

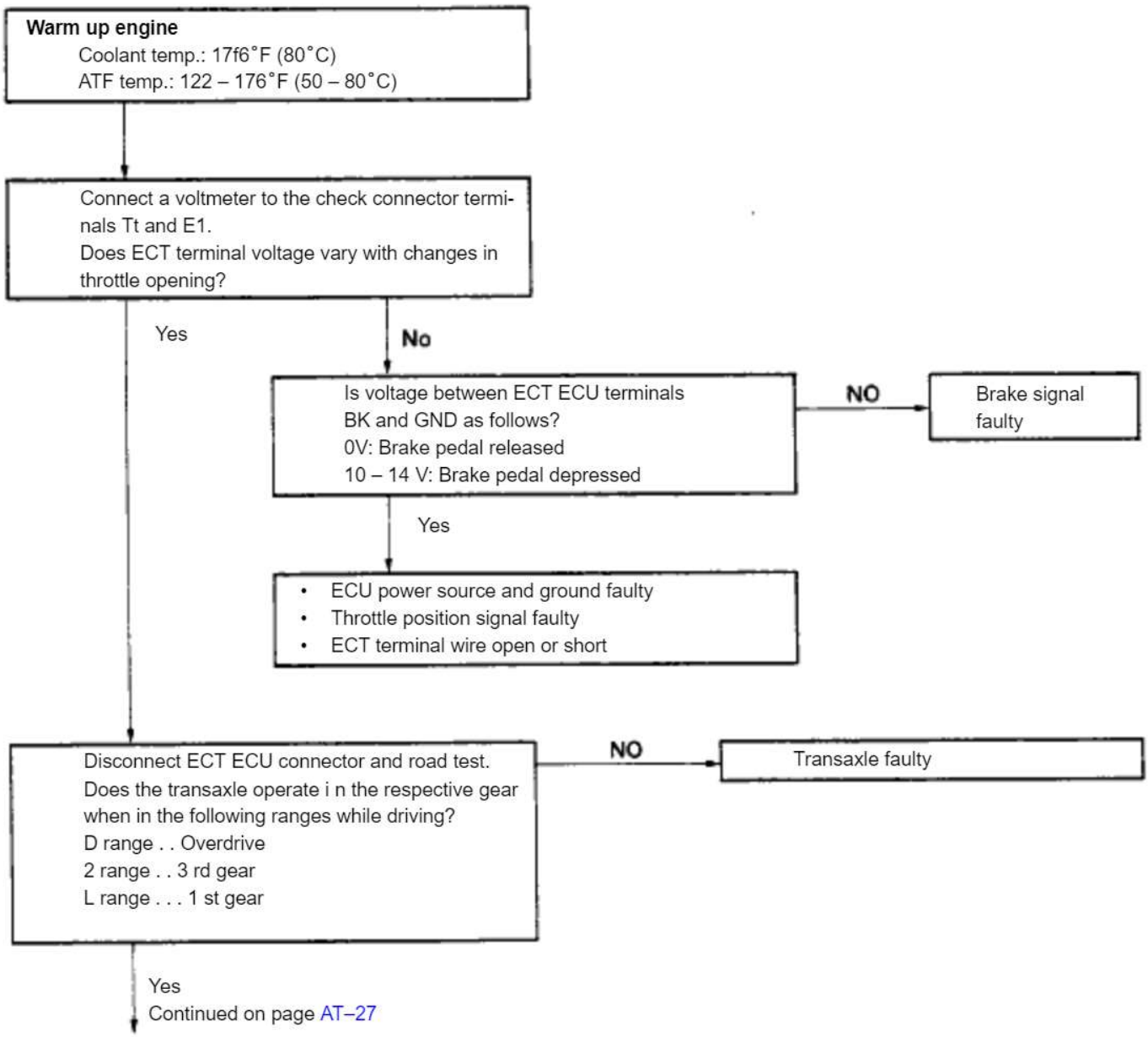


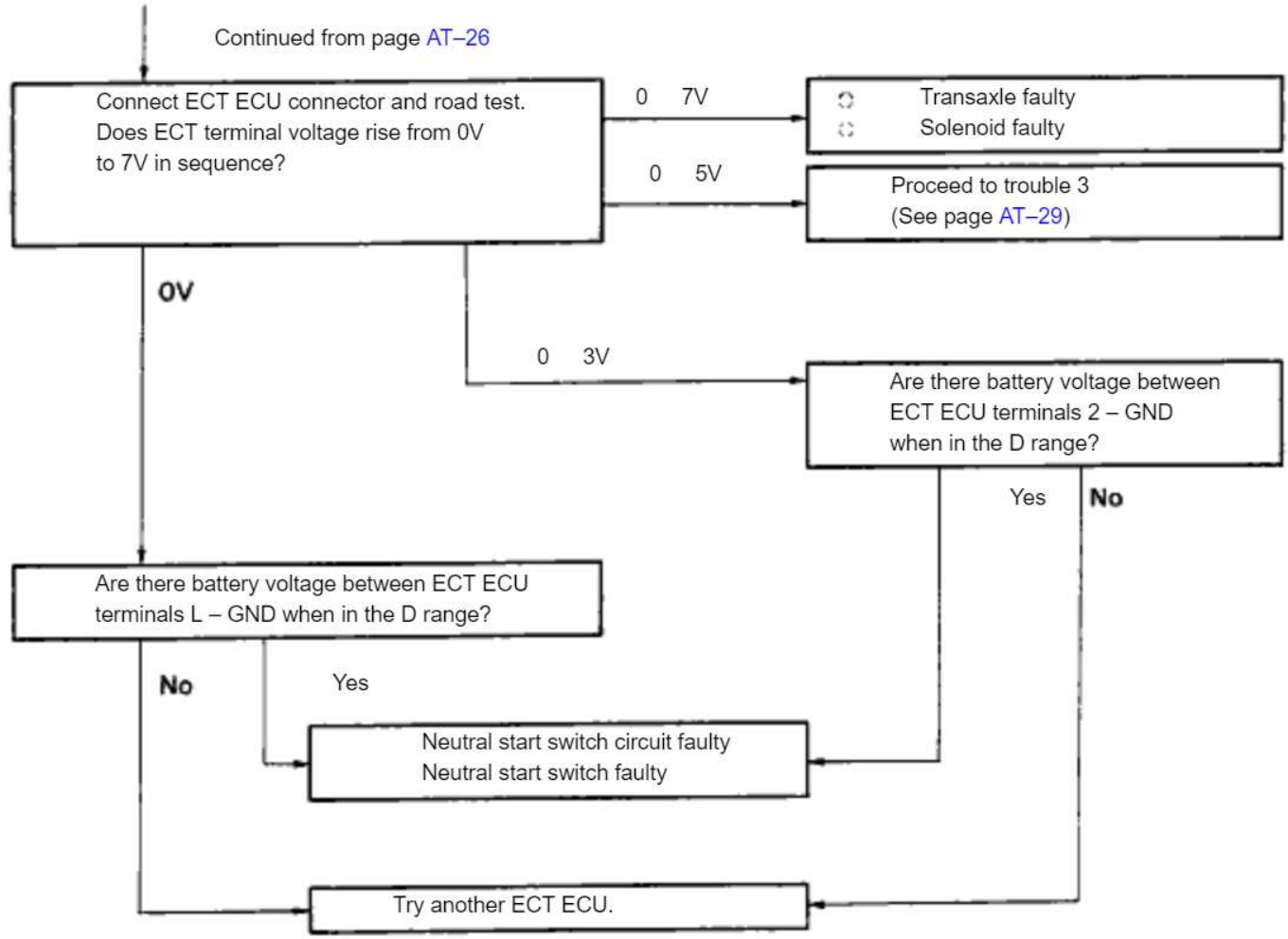
ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW–CHART

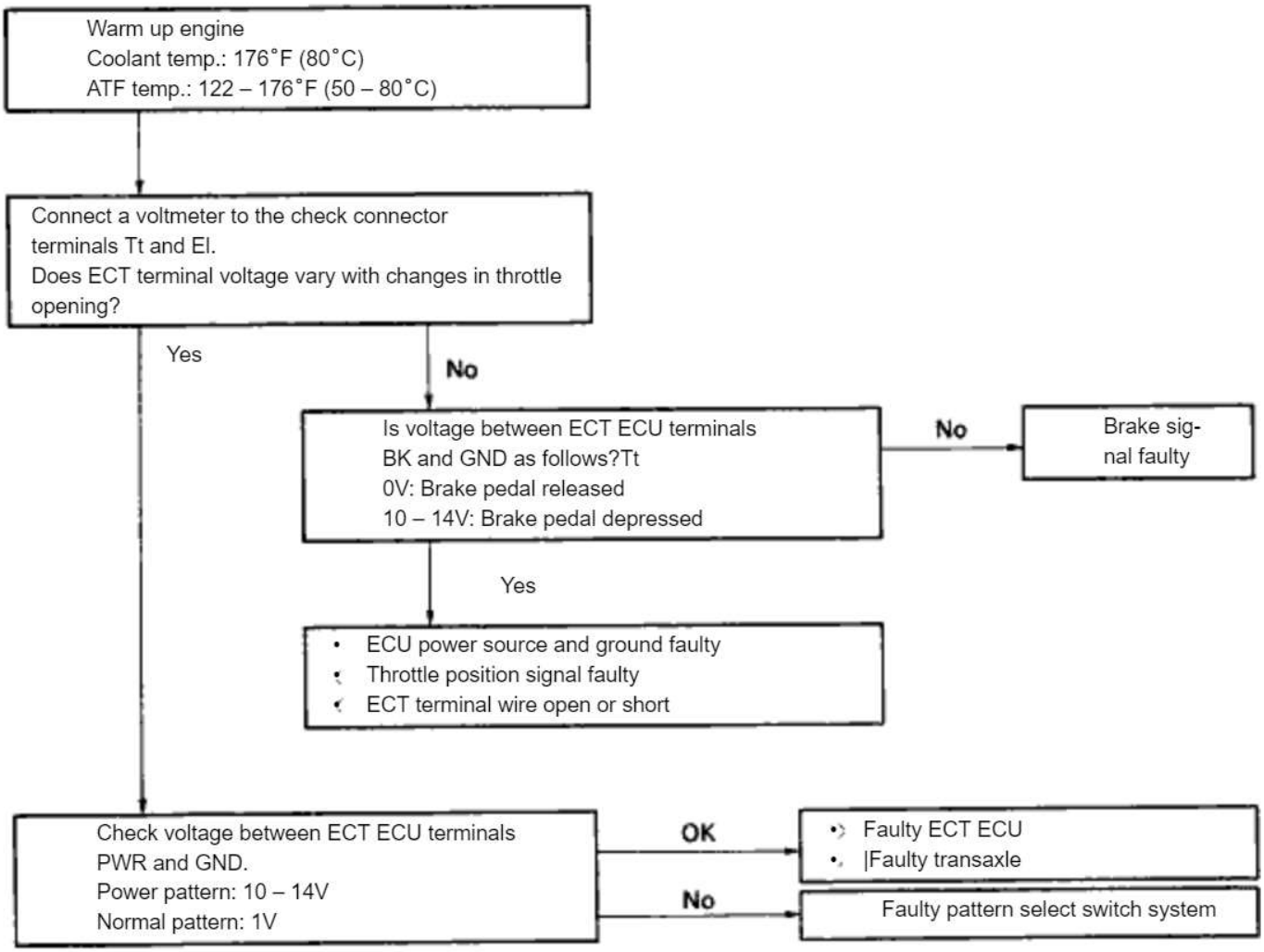
Trouble No.1 No Shifting



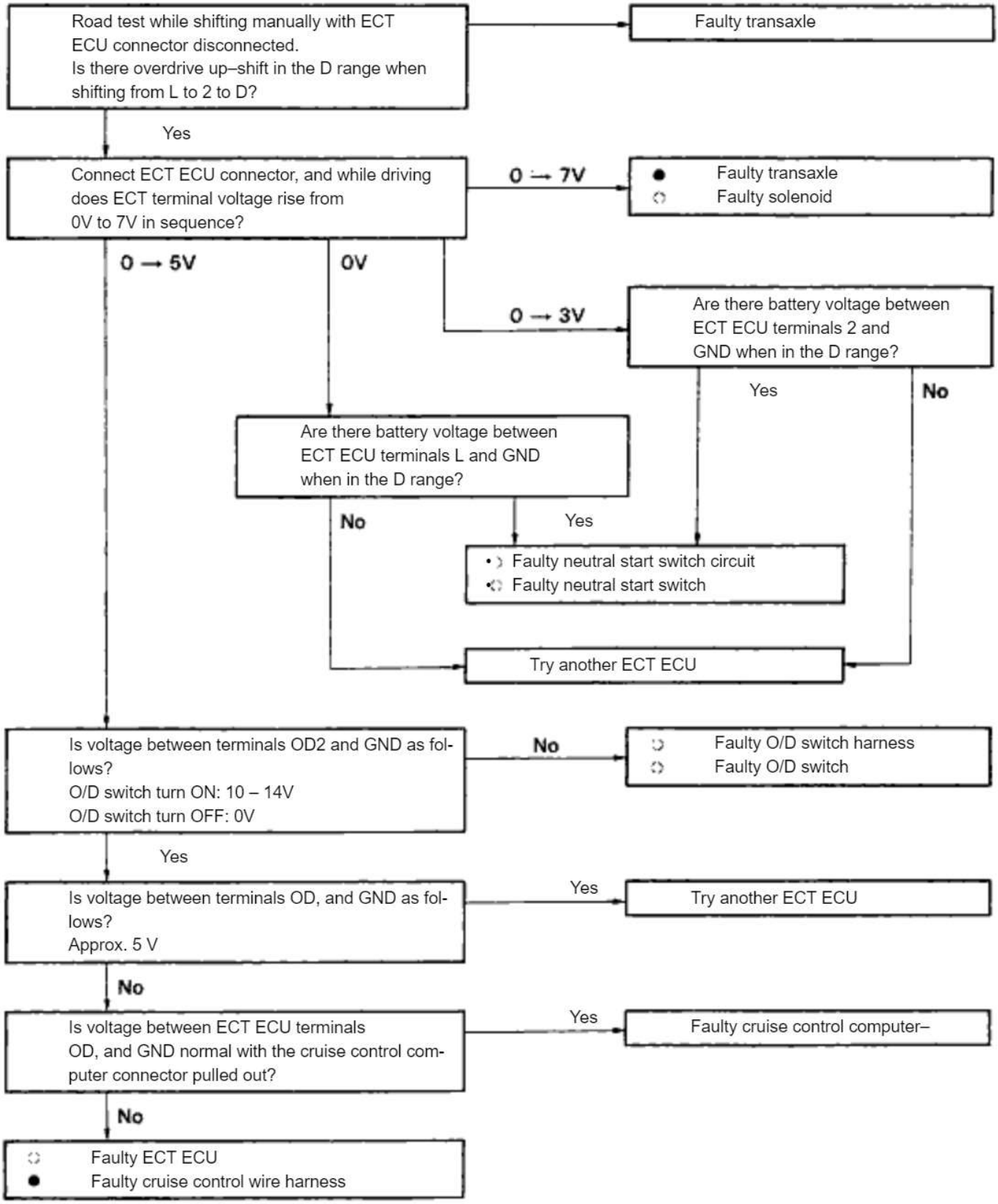

Continued from page AT–26
Connect ECT ECU connector and road test.
Does ECT terminal voltage rise from 0V
to 7V in sequence?
0 7V
Transaxle faulty
Solenoid faulty
0 5V
Proceed to trouble 3
(See page AT–29)
0V
0 3V
Are there battery voltage between
ECT ECU terminals 2 – GND
when in the D range?
Yes
No
Are there battery voltage between ECT ECU
terminals L – GND when in the D range?
No
Yes
Neutral start switch circuit faulty
Neutral start switch faulty
Try another ECT ECU.

Trouble No. 2

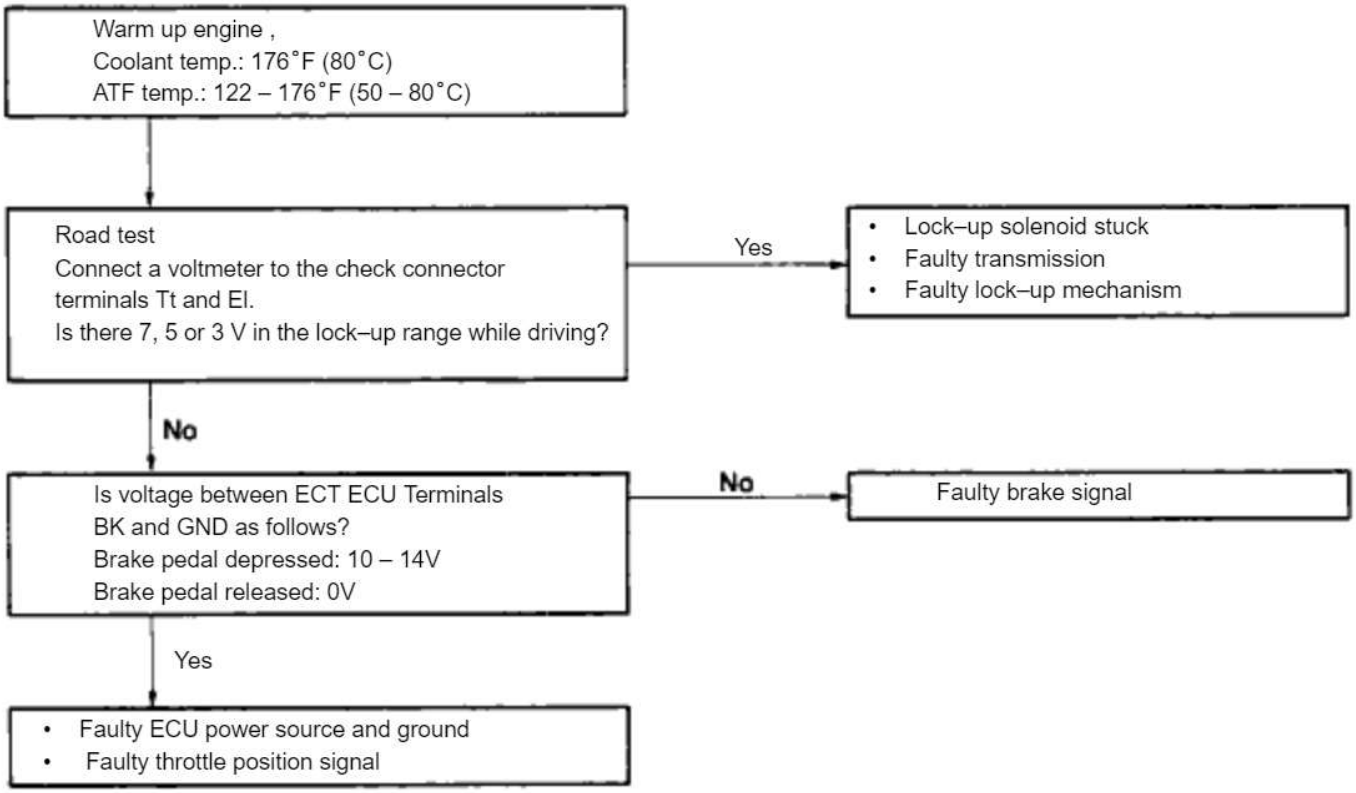
Shift point too high or too low



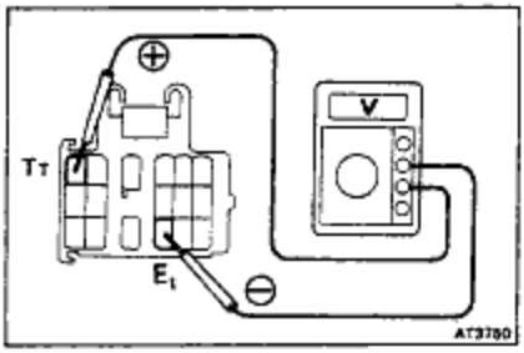
Trouble No. 3 No up–shift to overdrive (After warm–up)



Trouble No. 4 **No lock–up (After warm–up)**



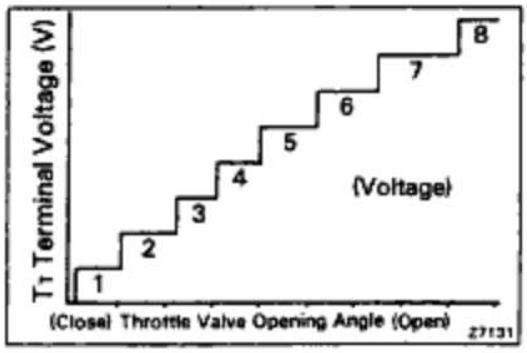
INSPECTION OF Tt TERMINAL VOLTAGE



1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to terminals Tt and E1.



(c) While slowly depressing the accelerator pedal, check that ECT terminal voltage rises in sequence. if the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

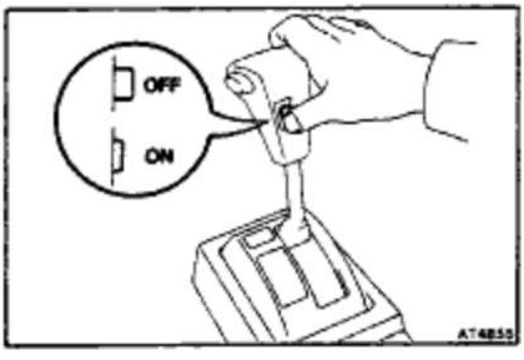
(a) Depress the accelerator pedal until the ECT terminal indicates 8V.

(b) Depress the brake pedal and check the voltage reading from the ECT terminal.

(c) Brake pedal depressed 0V

Brake pedal released 8V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



ECT Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Coolant temperature: 176°F (80°C)

(b) Turn the O/D switch to "ON".

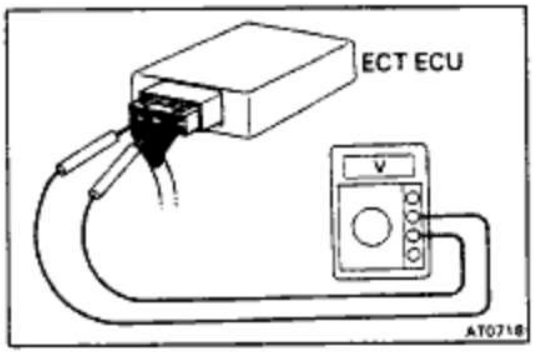
(c) Place the pattern select switch in "Normal" and the shift lever into the D range.

(d) During a road test (above 10 km/h or 6 mph) check that voltage at the ECT terminal is as indicated below for each up–shift position.

If the voltage rises from 0V to 7V in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears. .

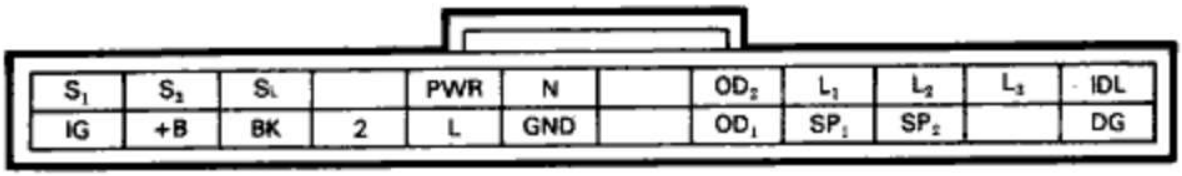
HINT: Determine the gear position by a light shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2V – 4V – 6V – 7V.



INSPECTION ELECTRONIC CONTROL COMPONENTS

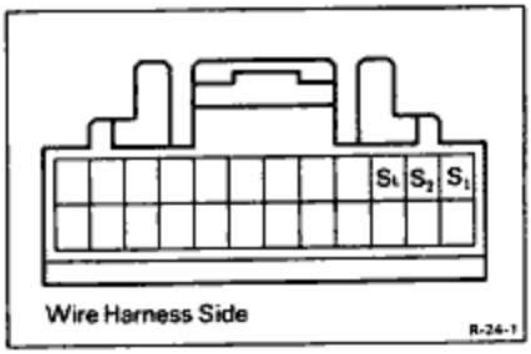
1. INSPECT VOLTAGE OF ECT ECU CONNECTOR

(a) Remove the glove box and instrument panel.
(b) Turn on the ignition switch.
(e) Measure the voltage at each terminal.



Terminal	Measuring condition	Voltage (V)
L_1 – GND	Throttle valve fully closed	5
	Throttle valve fully closed to fully open	5 to 0
	Throttle valve fully open	0
L_2 – GND	Throttle valve fully closed	5
	Throttle valve fully closed to fully open	5 to 0 to 5
	Throttle valve fully open	5
L_3 – GND	Throttle valve fully closed	5
	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5
	Throttle valve fully open	5
IDL – GND	Throttle valve fully closed	0
	Throttle valve opening above 1 .5°	10 – 14
SP_1 – GND	Standing still (Cruise control OFF)	5 or 0
	Vehicle moving (Cruise control OFF)	2.5
BK – GND	When brake pedal is depressed	10 – 14
	When brake pedal is not depressed	0
2 – GND	2 range	10 – 16
	Except 2 range	0 – 2
L – GND	L range	10 – 16
	Except L range	0 – 2
N – GND	N range	10 – 16
	Except N range	0 – 2

Terminal	Measuring condition	Voltage (V)
S_1 – GND	–	10 – 14
S_2, SL – GND	–	0
OD_1 – GND	Coolant temp. below 122°F (50°C)	0
	Coolant temp. above 122°F (50°C)	5
OD_2 – GND	O/D main switch turned ON	10 – 14
	O/D main switch turned OFF	0
IG – GND	Ignition switch ON	10 – 14
SP_2 – GND	Standing still	5 or 0
	Vehicle moving	4
PWR – GND	PWR pattern	10 – 14
	NORM pattern	0 – 2
+B – GND	–	10 – 14



2. INSPECT SOLENOID

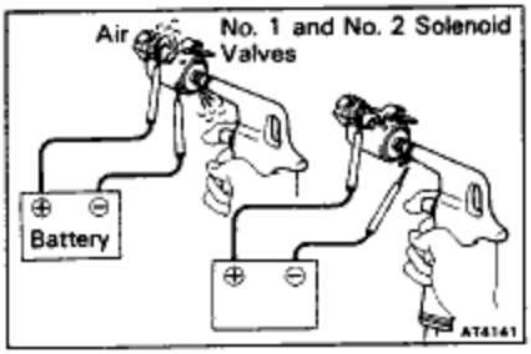
(a) Disconnect the connector from the ECT computer.

(b) Measure the resistance between S1, S2, SL and ground.

Resistance: 11 – 15Ω

(c) Apply battery voltage to the solenoid. Check that an operation noise can be heard from the solenoid.

HINT: If there is foreign matter in the solenoid valve, there will be no fluid control even with solenoid operation.

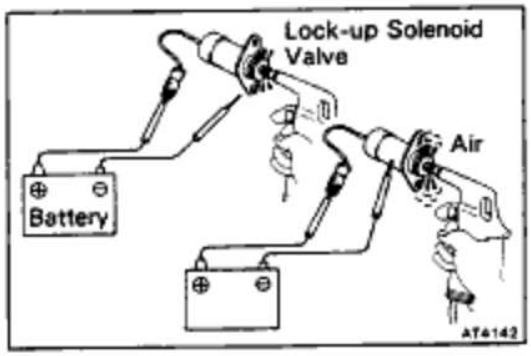


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

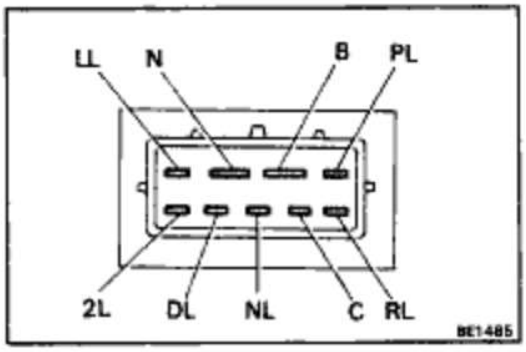
(a) Check No. 1 and No. 2 solenoid valves.

- Applying 5 kg/cm2 (71 psi, 490 kPa) or compressed air, check that the solenoid valves do not leak the air.
- When supply battery voltage to the solenoids, check that the solenoid valves open.



(b) Check the lock–up solenoid valve.

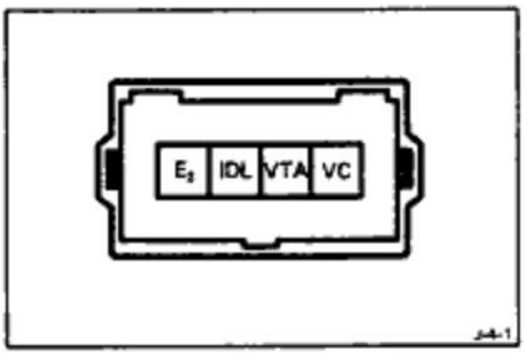
- Applying 5 kglcm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valve opens.
- When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.



4. INSPECT NEUTRAL START SWITCH

Inspect that there is continuity between terminal LL–C, 2L–C and NL–C.

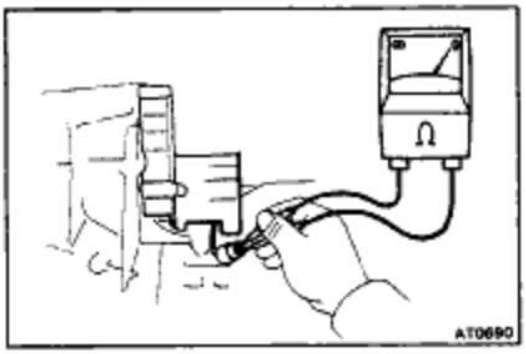
Shift Position \ Terminal	LL	2L	NL	C
N range			○	○
2 range		○		○
L range	○			○



5. INSPECT THROTTLE POSITION SENSOR

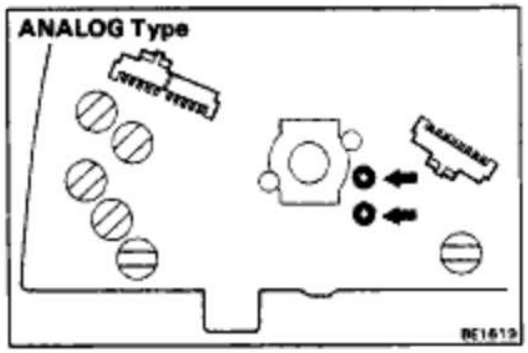
Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	resistance (W)
IDL – E_2	Fully closed	0 – 0.1
	Open	Infinity
V_C – E_2	–	3 – 7
V_{TA} – E_2	Fully closed	0.2 – 0.8
	Fully open	3.3 – 10



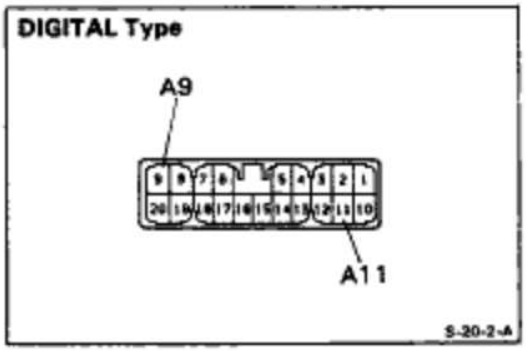
6. INSPECT NO. 2 SPEED SENSOR IN ATM

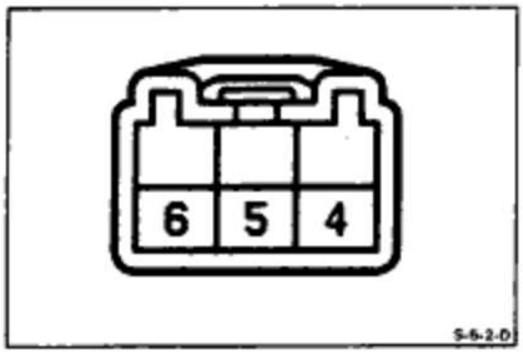
(a) Jack up a front wheel on one side.
(b) Connect an ohmmeter between the terminals.
(c) Spin the wheel and check that the meter needle deflects from 0 to ∞ Ω.

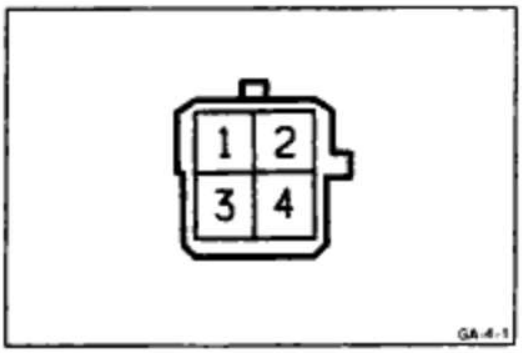


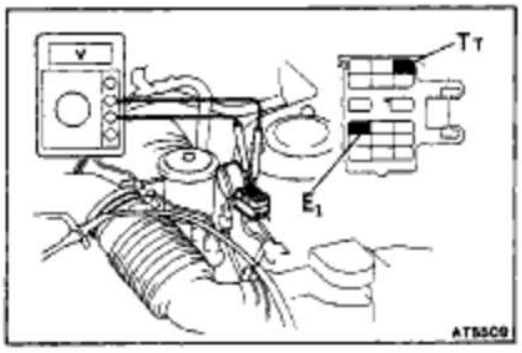
7. INSPECT NO. 1 SPEED SENSOR IN COMBINATION METER

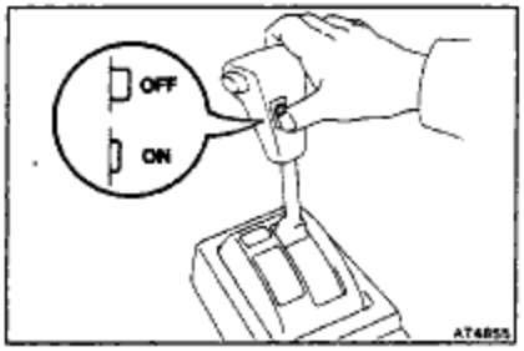
(a) Remove the combination meter.
(b) Connect an ohmmeter between the terminals.
(c) Revolve the meter shaft and check that the meter needle repeatedly deflects from 0 to ∞ .











8. INSPECT PATTERN SELECTION SWITCH

Inspect that there is continuity between 5 and each terminal. .

HINT: As there are diodes inside, be careful of the tester probe polarity.

Terminal / Pattern	6	5	4
NORM	○——	——○	
PWR	○——	——	——○

9. INSPECT O/D SWITCH

Inspect that there is continuity between terminals 1 and 3.

Terminal / S/W position	1	3
ON		
OFF	○——	——○

10. INSPECT LOCK–UP MECHANISM

(a) Warm up the coolant and ATF.

(b) Connect a voltmeter to the check connector terminals Tt and E1.

(e) Turn the O/D switch ON.

(d) Select the normal pattern.

(e) Drive .at around 50 km/h (31 mph) to where 7, 5 or 3 volts appears on the voltmeter (this is the lock–up range) .

(f) Depress the accelerator pedal and read the tachometer. If there is a big jump in engine rpm there is not lock–up.

11. INSPECT BRAKE SIGNAL

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

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

CAUTION:

- **Perform the test at normal operation fluid temperature (122 – 176˚F or 50 – 80˚C).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Step down strongly on the brake pedal with your left foot.
(e) Start the engine.
(f) Shift into the D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.
Stall speed: 2,200 ±150 rpm
(g) Perform the same test in R range.

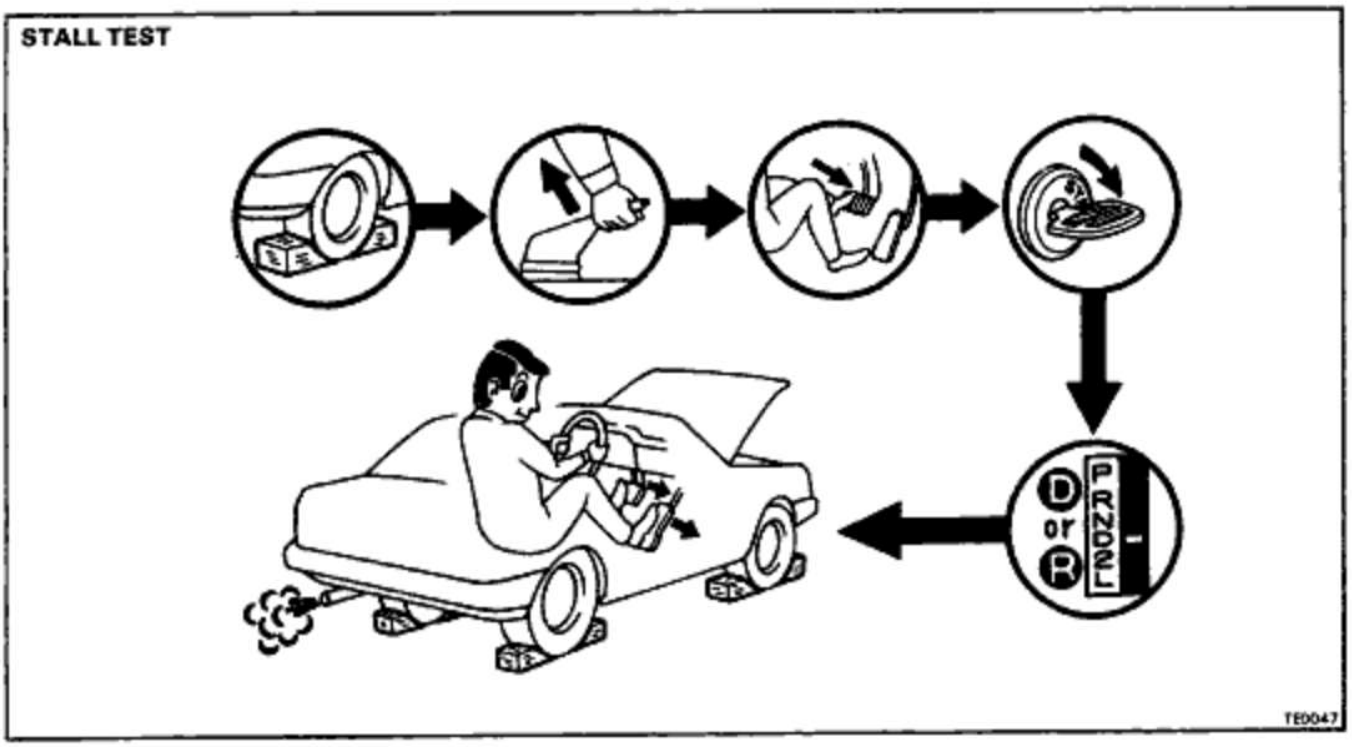
EVALUATION

(a) If the stall speed is the same for both ranges without the rear wheels rotating but lower than specified value:
- Engine output may be insufficient
- Stator one–way clutch is not operating properly

(b) If the stall speed in D range is higher than specified:
- Line pressure too low
- Forward clutch slipping
- No. 2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R range is higher than specified:
- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D ranges are higher than specified:
- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly



TIME LAG TEST

When 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 O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

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

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed (N range) : 700 rpm

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

Time lag: Less than 1.2 seconds

(d) In the same manner, measure the time lag for N – R.

Time lag: Less than 1.5 seconds

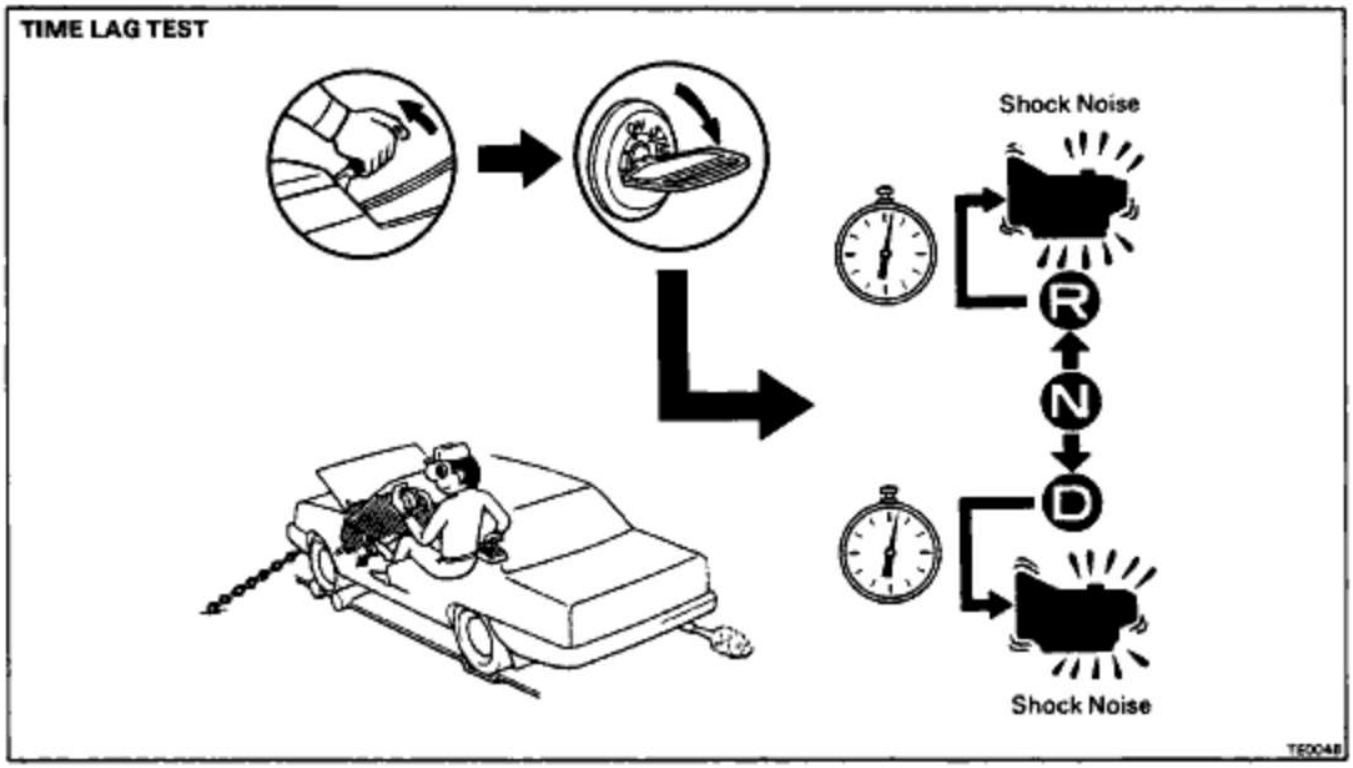
EVALUATION

(a) If N – D time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- O/D one–way clutch not operating properly

(b) If N – R time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transaxle fluid.

(b) Remove the transaxle case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (122 –176˚F or 50 – 80˚C).**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check idling rpm.

(e) Step down strongly on the brake pedal with your left foot and shift into D range.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(f) In the same manner, perform the test in R range.

Line pressure kg/cm (psi, kPa)			
D range		R range	
Idling	Stall	Idling	Stall
3.7 – 4.3 (53 – 61, 363 – 422)	9.2 – 10.7 (131 – 152, 902 – 1,049)	5.4 – 7.2 (77 – 102, 530 – 706)	14.4 – 16.8 (205 – 239, 1,412 – 1,648)

If the measured pressure are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

(a) If the measured values at all ranges are higher than specified:

- Throttle cable out of adjustment
- 4 Throttle valve defective
  Regulator valve defective

(b) If the measured values at all ranges are lower than specified:

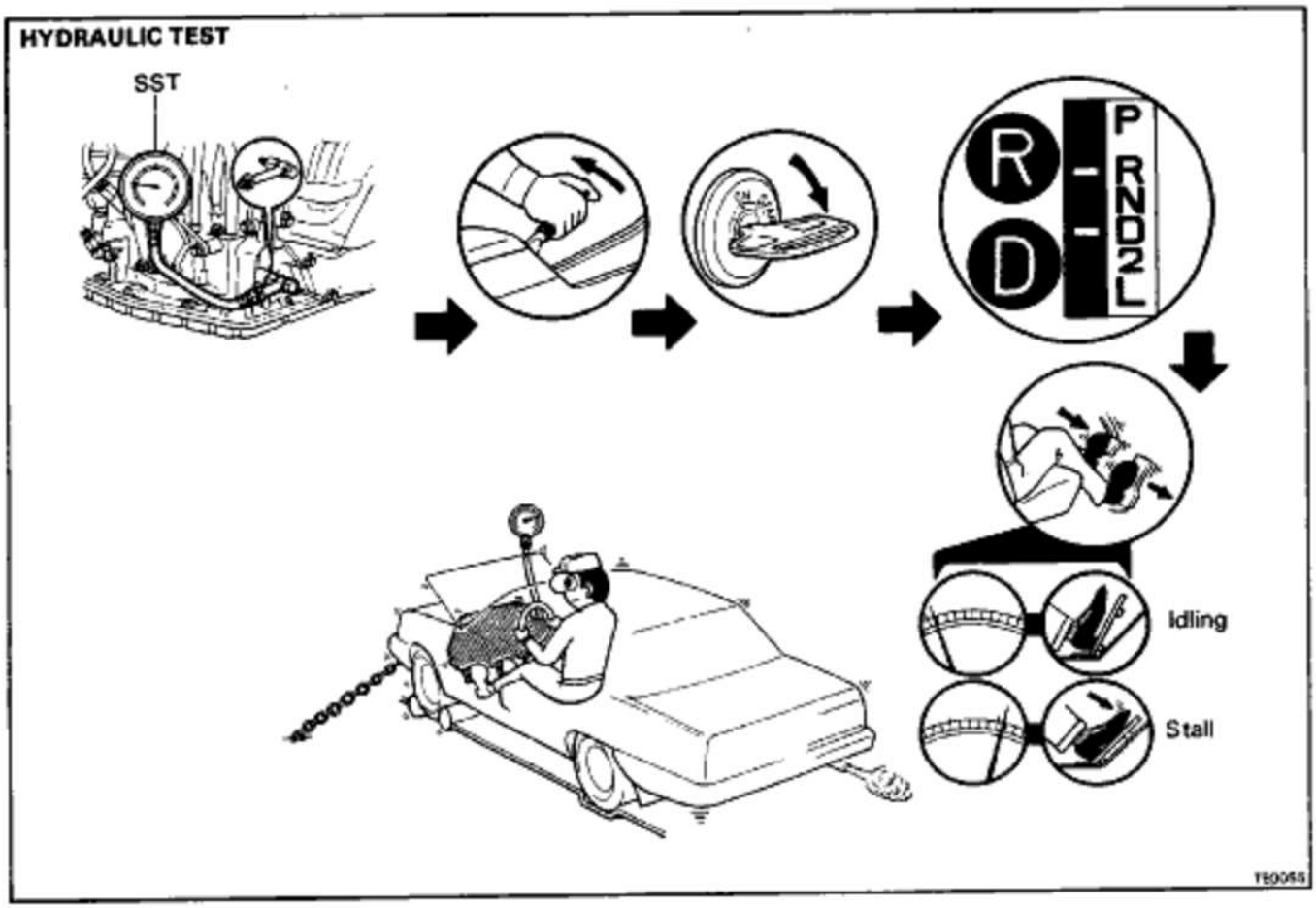
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D range only:

- D range circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R range only:

- R range circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective



MEASURE GOVERNOR PRESSURE (A1401)

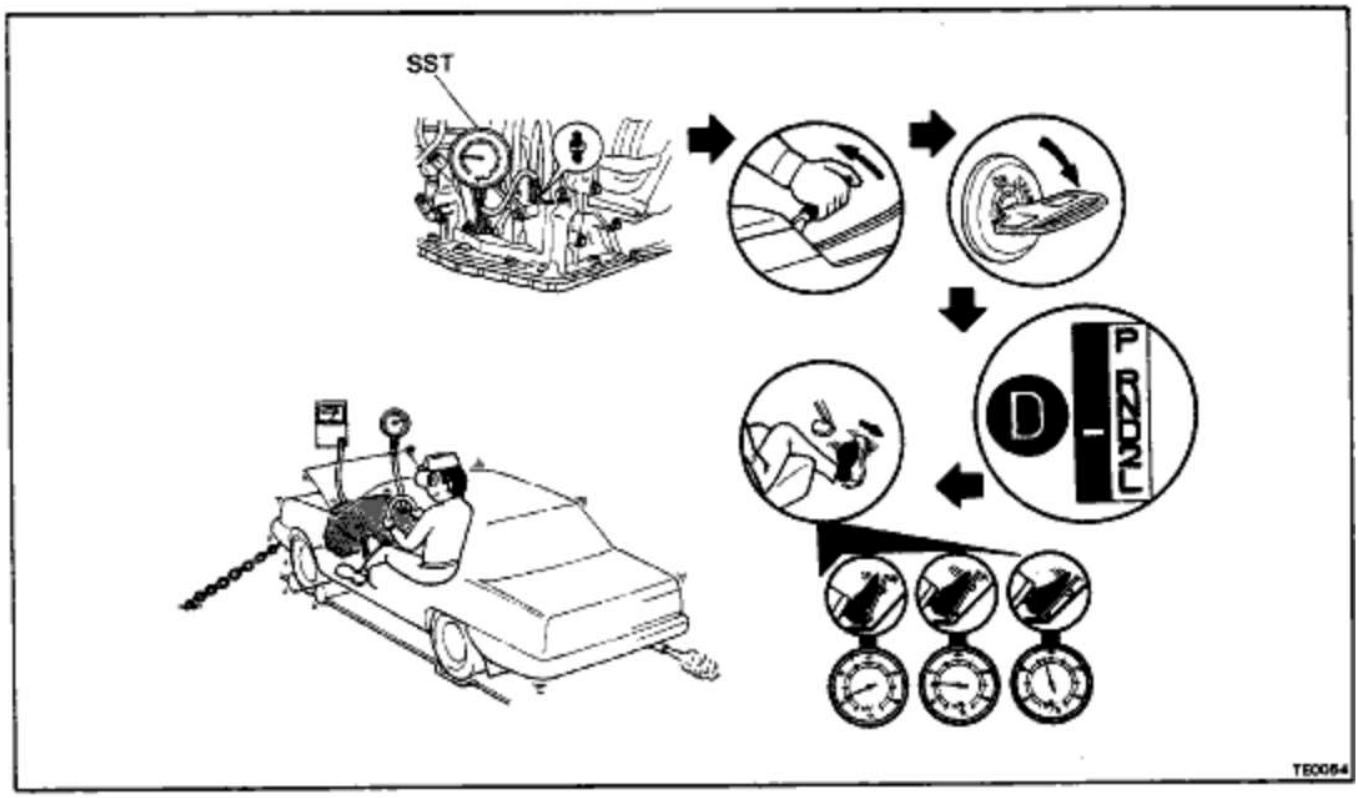
(a) Check the parking brake to see that it is not applied.
(b) Start the engine.
(c) Shift into D range and measure the governor pressures at the speeds specified in the table.

EVALUATION

If governor pressure is defective:

- Line pressure defective
- Fluid leakage in governor pressure circuit
- Governor valve operation defective .

Drive pinion shaft	Vehicle speed (Reference only)	Governor pressure
1,000 rpm	30 km/h (19 mph)	0.6 – 1.4 kg/cm² (9 – 20 psi, 59 – 137 kPa)
1,800 rpm	55 km/h (34 mph)	1.5 – 2.3 kg/cm² (21 – 33 psi, 147 – 226 kPa)
3,500 rpm	106 km/h (66 mph)	4.2 – 5.0 kg/cm² (60 – 71 psi, 412 – 490 kPa)



ROAD TEST (A140E)

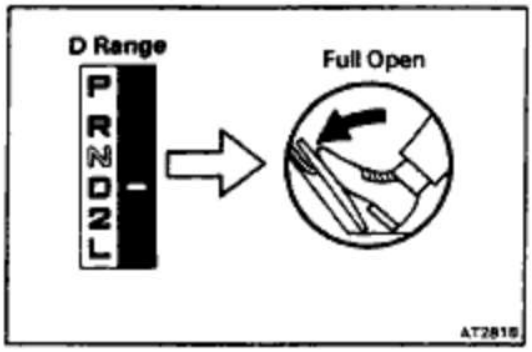
NOTICE: Perform the test at normal operating fluid temperature (122 – 176˚F or 50 – 84˚C). .

1. D RANGE TEST IN NORM AND PWR PATTERN RANGES

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–49)



Conduct a test under both Normal and Power patterns.

HINT:

There is no O/D up–shift when coolant temperature is below 122˚F (50˚C).

There is no lock–up when the vehicle speed is 10 km/h (6 mph) less than the set cruise control 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 – O/D up–shift:

- 3–O/D shift valve is stuck

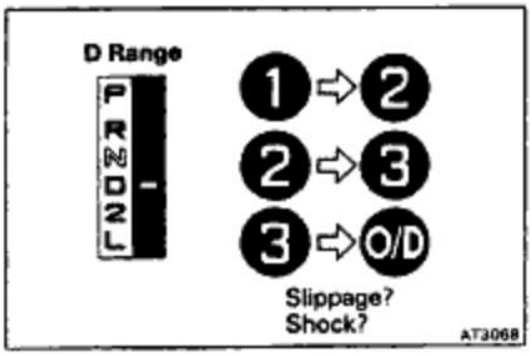
(4) If the shift point is defective:

- Throttle valve, 1–2 shift valve, 2–3 .shift valve, 3–
- O/D shift valve etc., are defective

(5) If the lock–up is defective:

- Lock–up solenoid is stuck
- Lock–up relay valve is stuck

(b) In the same manner, check the shock and slip at the 1 –2, 2 – 3 and 3 – O/D up–shifts.

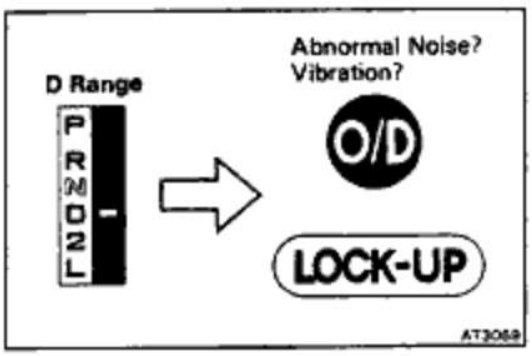


EVALUATION

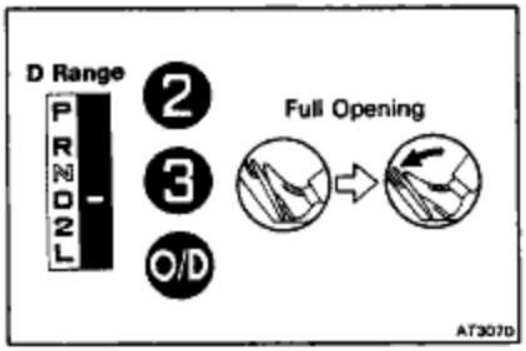
If the shock is excessive:

- Line pressure is too high
- Accumulator is defective
- Check ball is defective

(c) Run at the D range lock–up or O/D gear and check for abnormal noise and vibration.

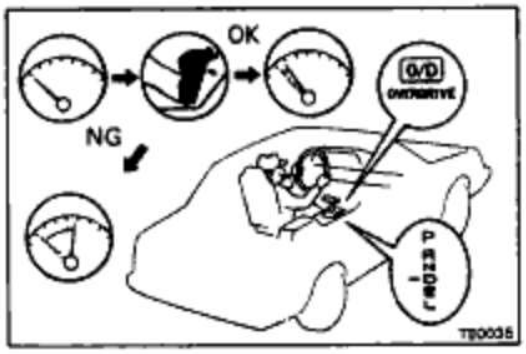


HINT: The check for the cause of abnormal noise and vibration must be make with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter, etc.



(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 –1, 3 –2 and O/D –3 kickdowns conform to those indicated on the automatic shift schedule. (See page **AT–49**)

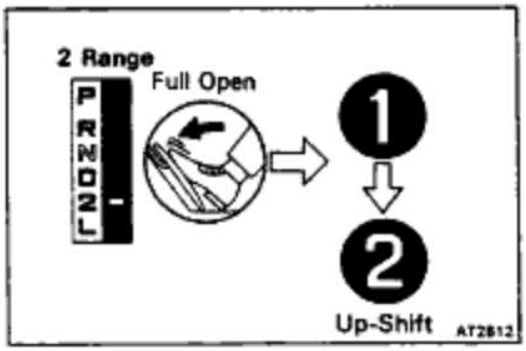
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism:

(1) Drive in D range – O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

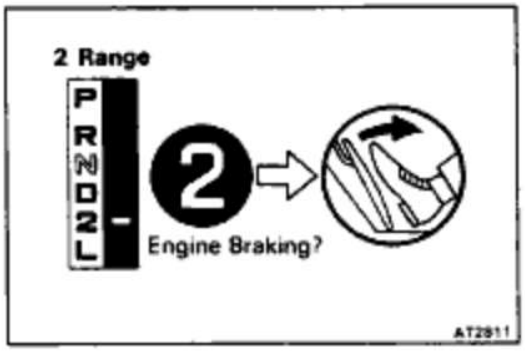
(2) Lightly depress the. accelerator pedal and check that the engine rpm does not change abruptly. If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1 –2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule. (See page AT–49)

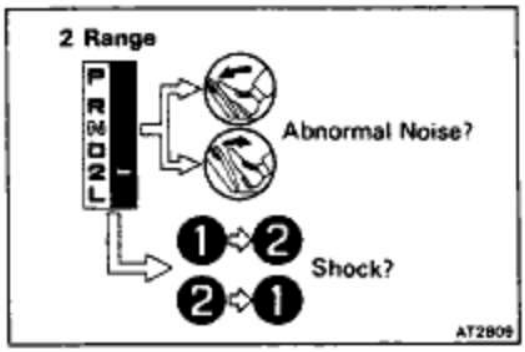


(b) White running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effect.

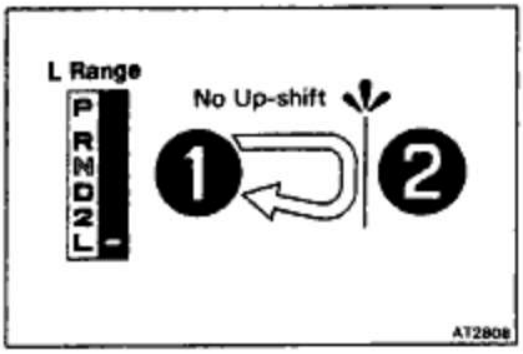
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective

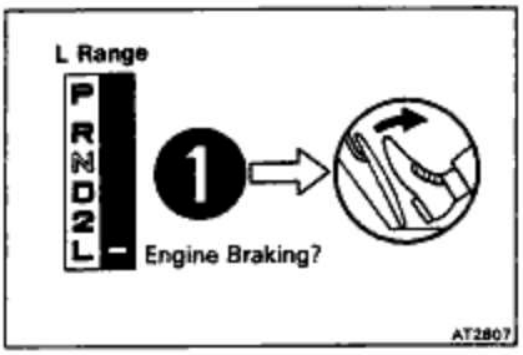


(e) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and downshift.



3. L RANGE TEST

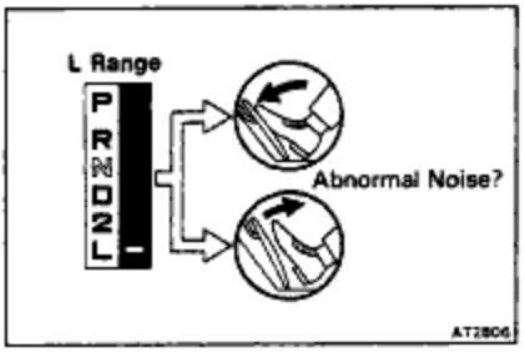
(a) White running in the L range, check to see that there is no up–shift to 2nd gear.



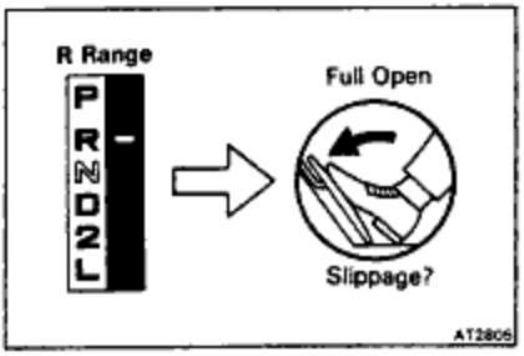
(b) White running in the L range, release the accelerator pedal and check the engine braking effect.

EVALUATION

If there is no engine braking effect:
First and reverse brake is defective

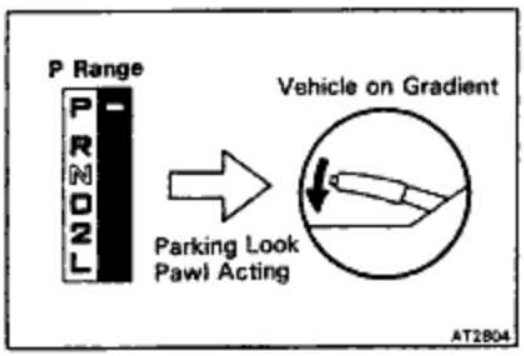


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

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



5. P RANGE TEST

Stop the vehicle on a gradient (more than 5°) 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.

ROAD TEST (A140L)

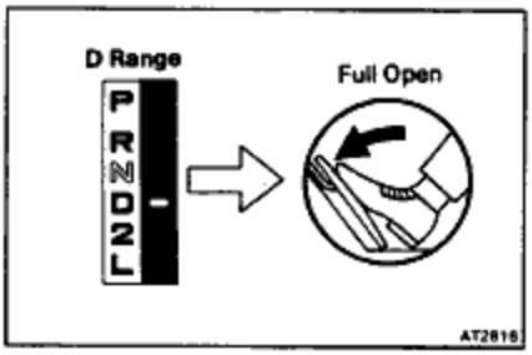
NOTICE: Perform the test at norrnal operating fluid temperature (122 – 176˚F or 50 – 80˚C).

1. D RANGE TEST

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–0ID up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–49)



EVALUATION

(1) If there is no 1 –2 up–shift:

- Governor valve is defective
- 1–2 shift valve is stuck

(2) if there is no 2 –3 up–shift:

- 2–3 shift valve is stuck .

(3) If there is no 3 – O/D up–shift:

- 3–O/D shift valve is stuck
- O/D solenoid is defective

(4) If the shift point is defective:

- Throttle cable is out–of–adjustment
- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–O/D shift valve etc., are defective

(b) In the same manner, check the shock and slip at the 1– 2, 2 – 3 and 3 – O/D up–shifts.

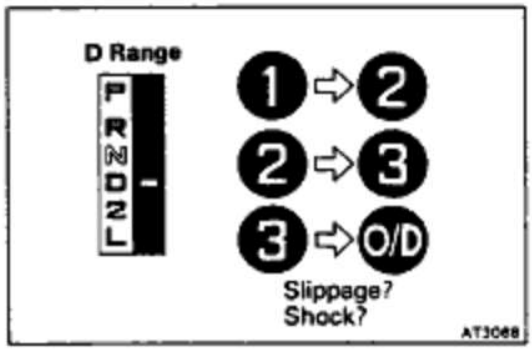
EVALUATION

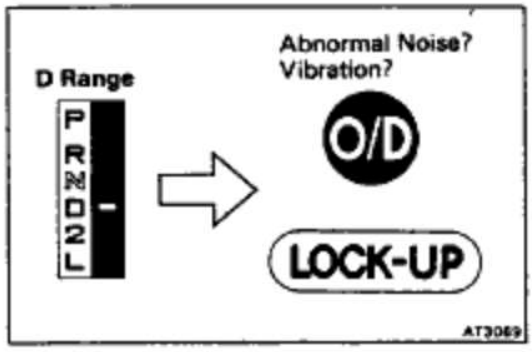
If the shock is excessive:

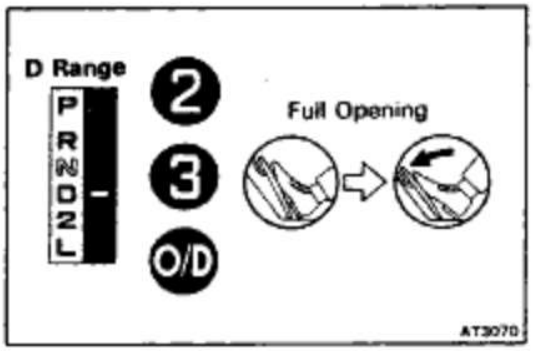
- Line pressure is too high
  Accumulator is defective
- Check ball is defective

(c) Run at the D range lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be make with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter, etc.

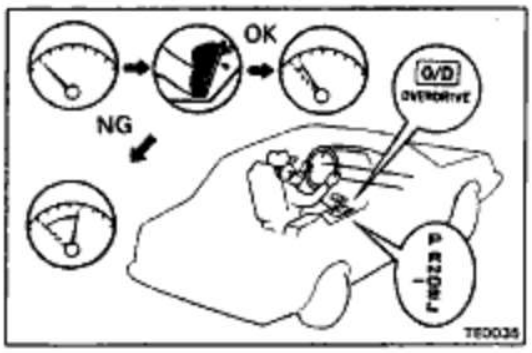






(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 –1, 3 –2 and O/D – 3 kickdowns conform to those indicated on the automatic shift schedule. (See page AT–49)

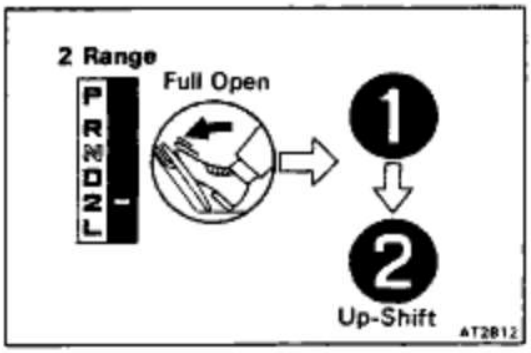
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.

(1) Drive in D range, O/D gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).

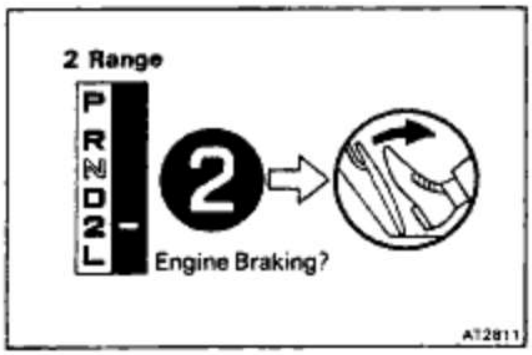
(2) Lightly depress the accelerator pedal and check that the engine rpm does. not change abruptly. If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

Shift into the .2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, check on the following points.

(a) Check to see that the 1 – 2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule. (See page AT–49)

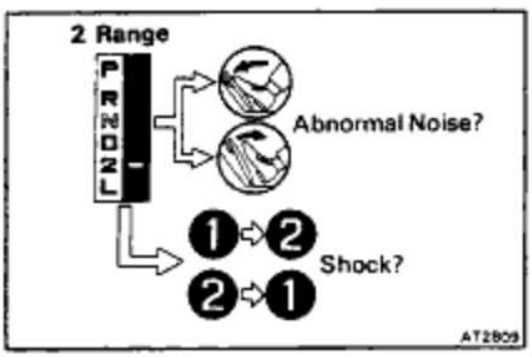


(b) While running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effe**ct.**

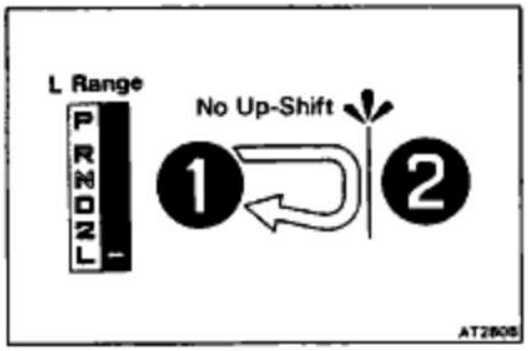
EVALUATION

If there is no engine braking effect:

Second coast brake is defective

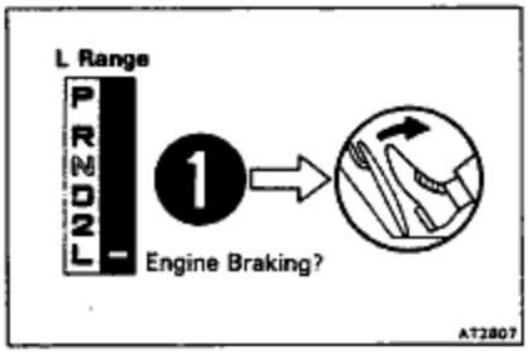


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down-shift.



3. L RANGE TEST

(a) While running in the L range, check to see that there is no up–shift to 2nd gear.

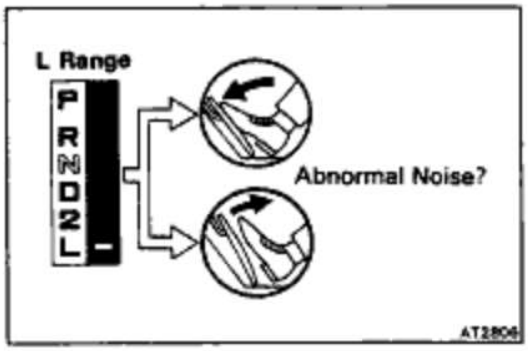


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

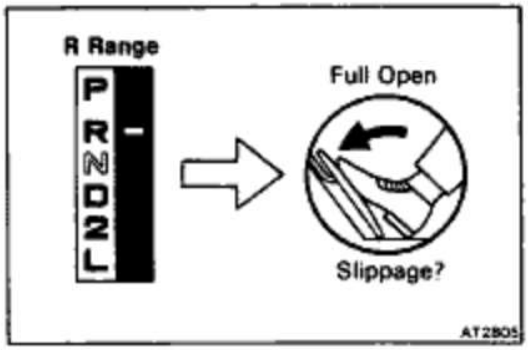
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

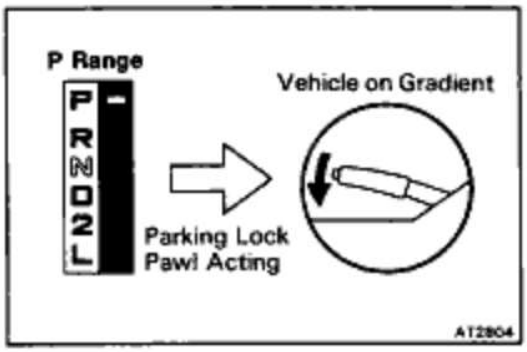


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

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



5. P RANGE TEST

Stop the vehicle on a gradient (more than 5°) 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.

Automatic Shift Schedule (A140E)

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	51 - 56 (32 - 35)	97 - 107 (60 - 66)	145 - 155 (90 - 96)	31 - 36 (19 - 22)	22 - 26 (14 - 16)	135 - 145 (84 - 90)	90 - 100 (56 - 62)	41 - 46 (25 - 29)
	PWR	60 - 65 (37 - 40)	112 - 122 (70 - 76)	148 - 158 (92 - 98)	34 - 39 (21 - 24)	22 - 26 (14 - 16)	138 - 148 (86 - 92)	105 - 115 (65 - 71)	41 - 46 (25 - 29)
2 range	NORM PWR	51 - 56 (32 - 35)	–	–	–	–	–	–	41 - 46 (25 - 29)
L range	NORM PWR	–	–	–	–	–	–	–	46 - 51 (29 - 32)

		Throttle valve opening 5% km/h (mph)			
		Lock–up ON		Lock–up OFF	
		3rd	O/D	3rd	O/D
D range	NORM	*61 - 66 (38 - 41)	67 - 72 (42 - 45)	*46 - 51 (29 - 32)	64 - 69 (40 - 43)
	PWR	*64 - 69 (40 - 43)	73 - 78 (45 - 48)	*58 - 63 (36 - 39)	70 - 75 (43 - 47)

***O/D main switch OFF**

HINT:

(1) In the 2 and L ranges, ail stages lock–up is OFF.

(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.

(A140L)

km/h (mph)

Differential gear ratio	D range (Throttle valve fully open)								L range
	1 → 2	2 → 3	3 → O/D	Lock-up ON	Lock-up OFF	O/D → 3	3 → 2	2 → 1	2 → 1
3.736	51 - 67 (32 - 42)	99 - 114 (62 - 71)	–*1	–*2	–*3	–*4	94 - 113 (58 - 70)	39 - 49 (24 - 30)	38 - 50 (24 - 31)

*1 3 – O/D up–shift point with closed throttle valve is at 32 – 45 km/h (20 – 28 mph).

*2 Lock–up "ON"' point with closed throttle valve is at 64 – 73 km/h (40 – 45 mph).

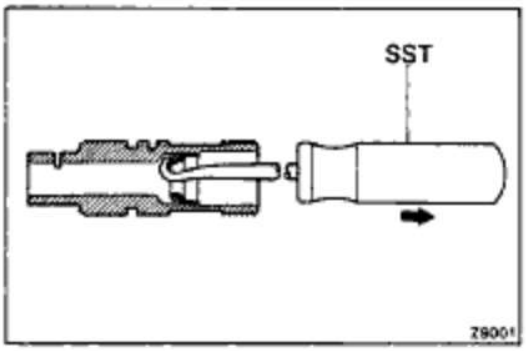
*3 Lock–up "OFF" point with closed throttle valve is at 60 – 68 km/h (37 – 42 mph).

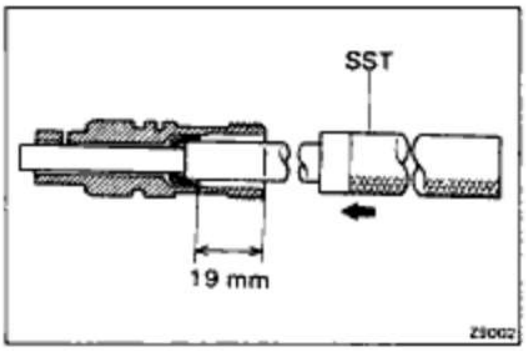
*4 O/D –3 down–shift is possible up to maximum speed.

ON–VEHICLE REPAIR

HINT: The components mentioned below can be replaced on the vehicle as they are without any necessity removal of the transmission. For the respective operating procedures refer to the following pages:

Components	Removal		Installation	
	See page	Remarks	See page	Remarks
Valve Body	AT–61 to AT–63	Using SST, remove the drain plug and drain the fluid before removing oil pan.	AT–1 7 7 to AT–180	After installing oil pan, fill transmission with ATF. (See page AT–21)
Throttle Cable	AT–51		AT–51 and AT–52	
Speed Sensor (A140E)	AT–52		AT–53	
Governor Valve (A140L)	AT–61	Before removing governor bracket, remove transaxle protector and– LH drive shaft.	AT–1 80 and AT–181	After installing governor bracket, install transaxle protector an d LH drive shaft.
Speedometer Driven Gear	AT–50		AT–50	





Speedometer Driven Gear

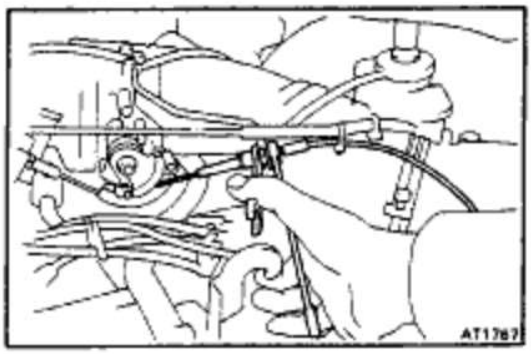
REPLACEMENT OF SPEEDOMETER DRIVEN GEAR OIL SEAL

1. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, pull out the oil seal.
SST 09921–00010

2. INSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL

SST 09201–60011
Drive in depth: 19 mm (0.75 in.)

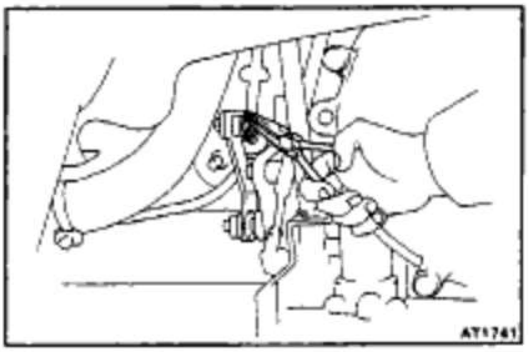


Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE

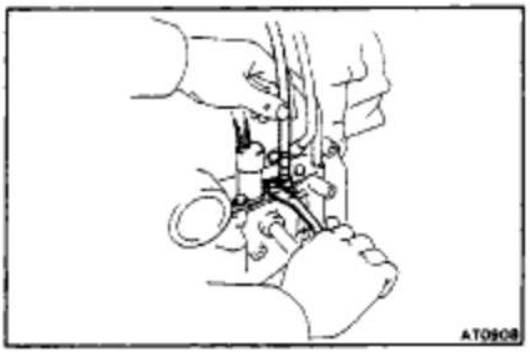
(a) Disconnect the cable housing from the bracket.
(b) Disconnect the cable from the throttle linkage.



2. REMOVE NEUTRAL START SWITCH

(a) Remove the clips and, disconnect the transmission control cable from manual shift lever.
(b) Remove the manual shift lever.
(c) Remove the neutral start switch.

3. REMOVE VALVE BODY (See page AT–61, AT–62)



4. PULL THROTTLE CABLE OUT OF TRANSMISSION CASE

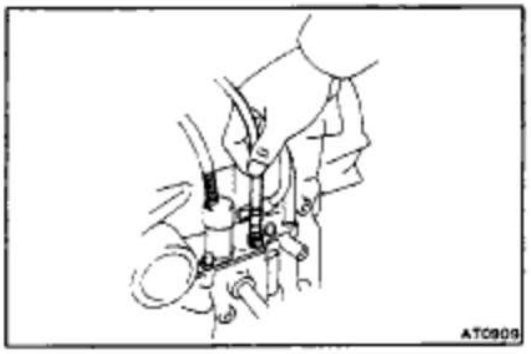
(a) Remove the bolt and retaining plate.
(b) Pull the cable out of the transmission case.

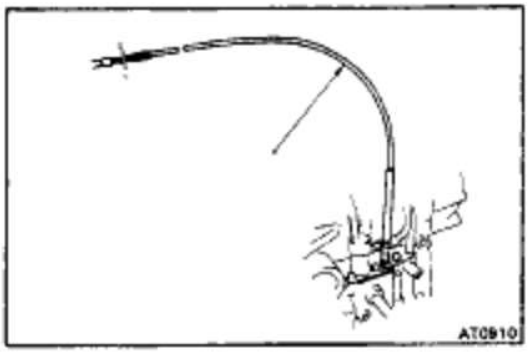
INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

(a) Be sure to push it in all the way.
(b) Install the retaining plate and one bolt.

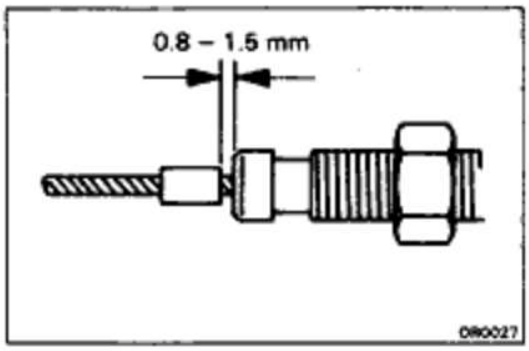
2. INSTALL VALVE BODY (See page AT–177, AT–178)



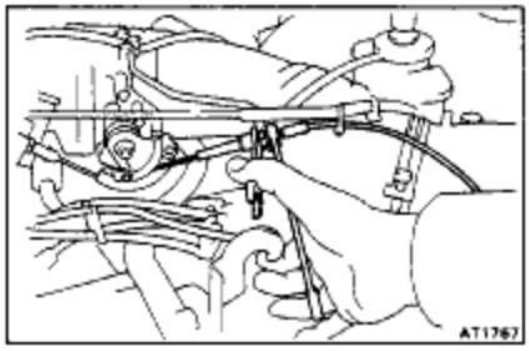


3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

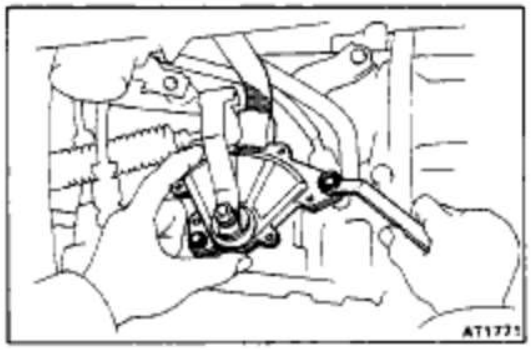
(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).



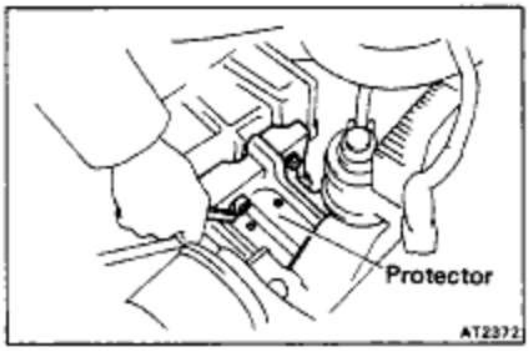
(b) Pull the inner cable lightly until a slight resistance is felt, and hold it.
(c) Stake the stopper 0.8 – 1.5 mm (0.031 – 0.059 in.) from the surface of outer cable as shown.



4. CONNECT THROTTLE CABLE
(a)Connect the cable to the throttle linkage.
(b) Connect the cable housing to the bracket.
5. ADJUST THROTTLE CABLE (See page AT–22)



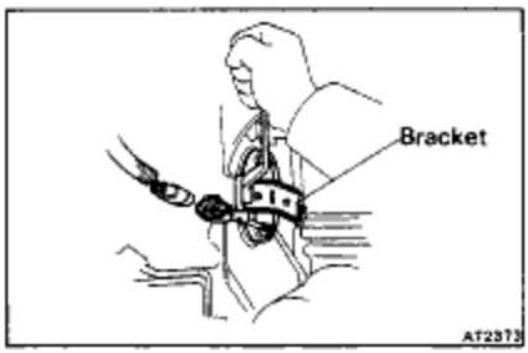
6. INSTALL NEUTRAL START SWITCH
(a) Install the neutral start switch.
(b) Install the manual shift lever.
(c) Adjust the neutral start switch.
(See page AT–22)
(d) Connect the transmission control cable.



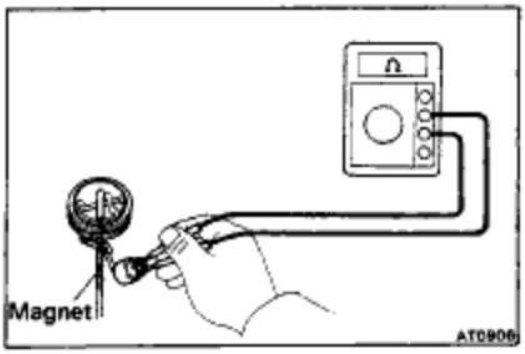
No. 2 Speed Sensor (A140E)

REMOVAL OF SPEED SENSOR

1. REMOVE TRANSAXLE CASE PROTECTOR



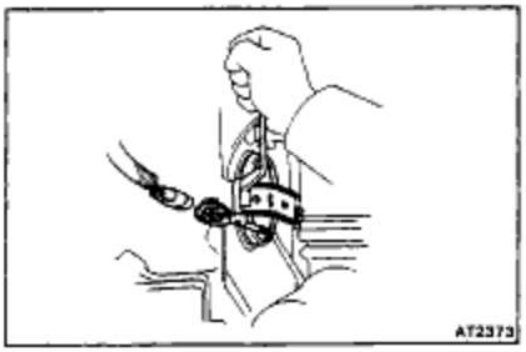
2. DISCONNECT SPEED SENSOR CONNECTOR
3. REMOVE BRACKET
4. REMOVE SPEED SENSOR AND O–RING



INSPECTION OF SPEED SENSOR

INSPECT SPEED SENSOR

Connect an ohmmeter to the speed sensor and check that the meter deflects when the sensor is repeatedly brought close to a magnet and removed from it.



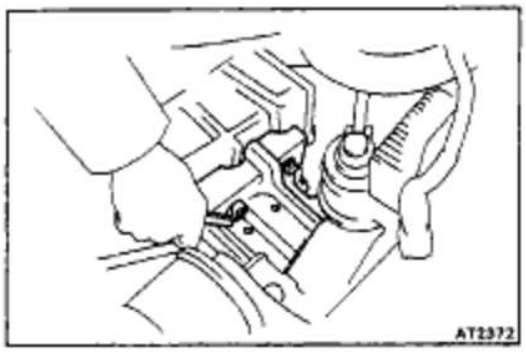
INSTALLATION OF SPEED SENSOR

7. INSTALL SPEED SENSOR AND O–RING

2. INSTALL BRACKET

Torque: 130 kg–cm (9 ft–lb. 13 N–m)

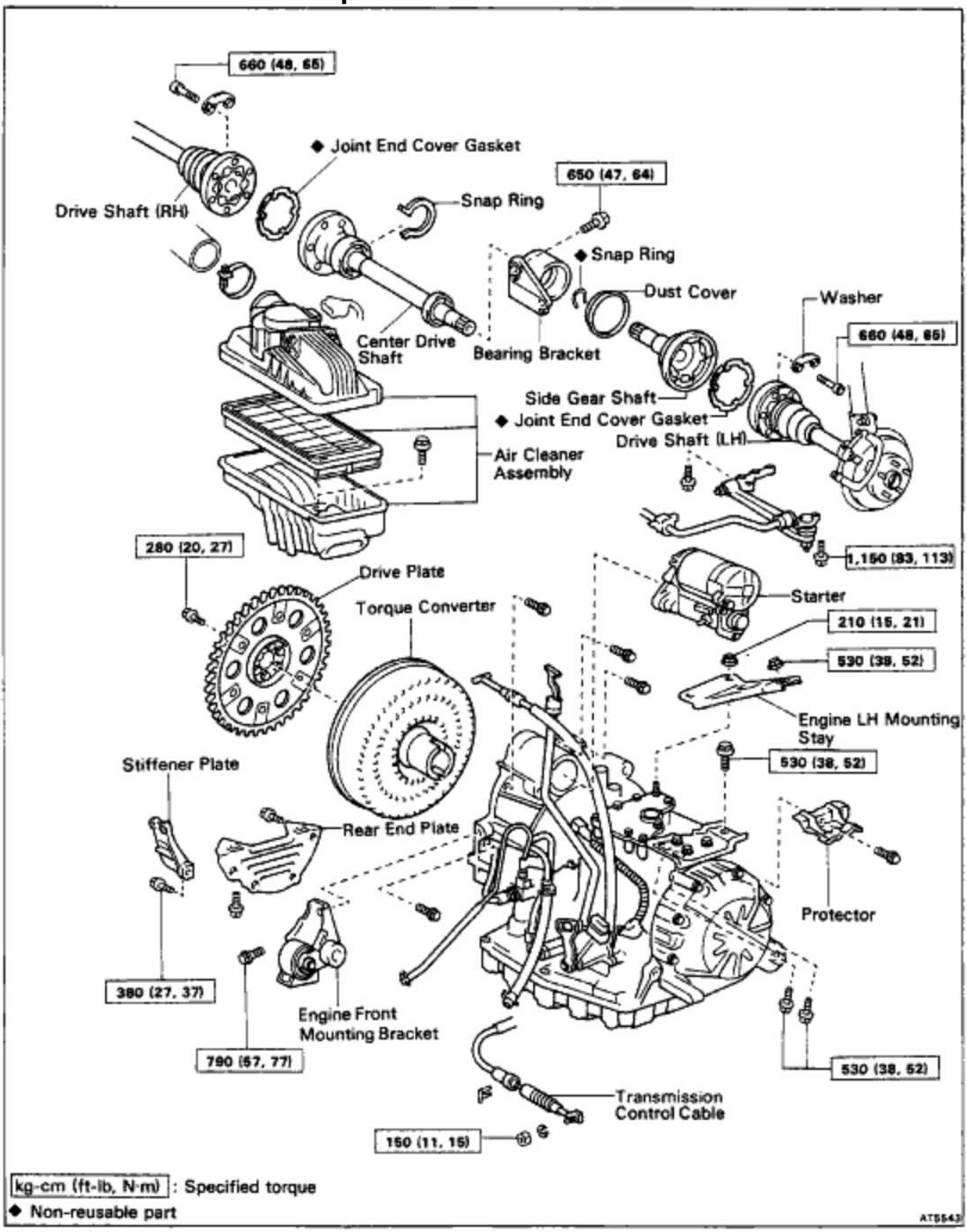
3. CONNECT SPEED SENSOR CONNECTOR



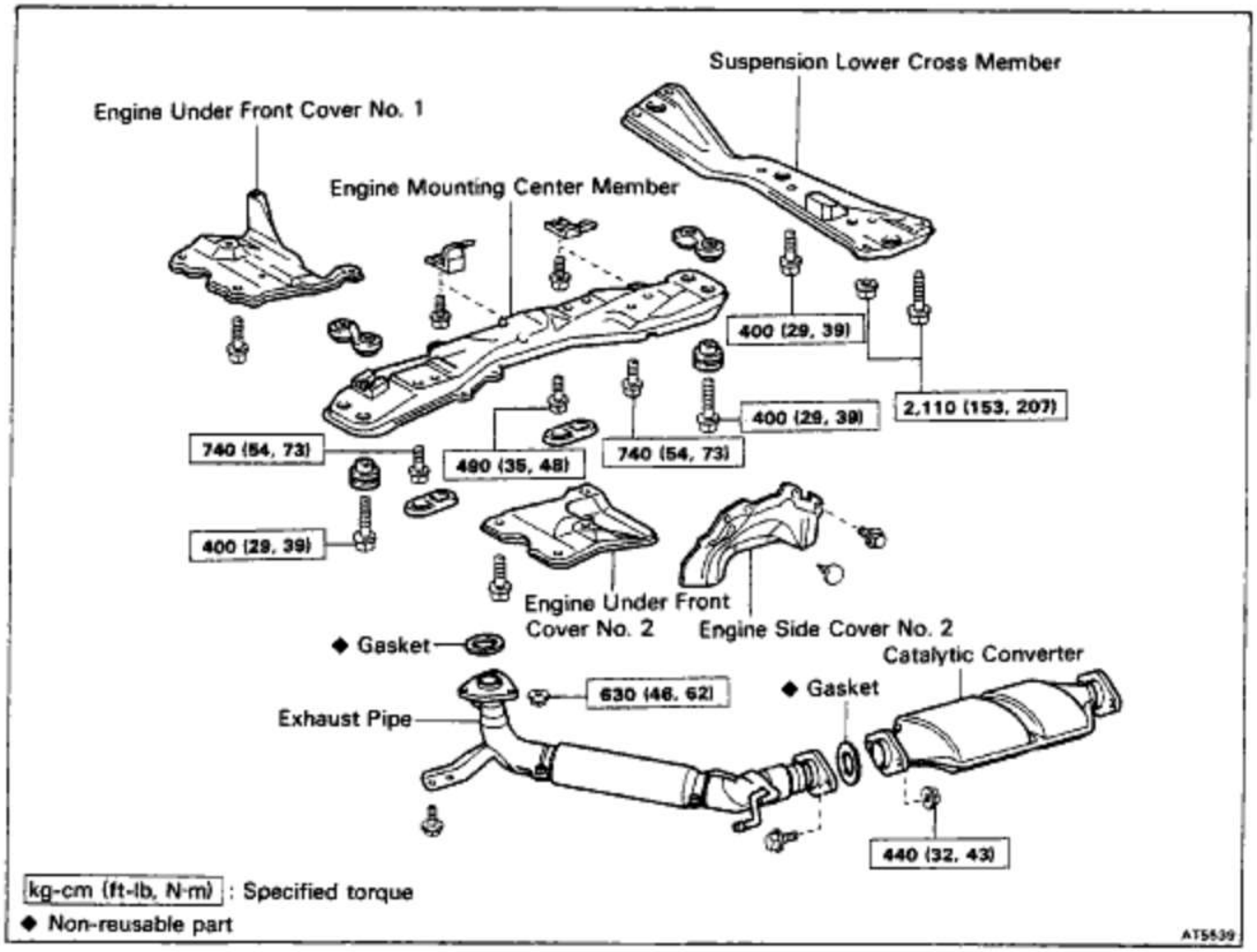
4. INSTALL TRANSAXLE CASE PROTECTOR

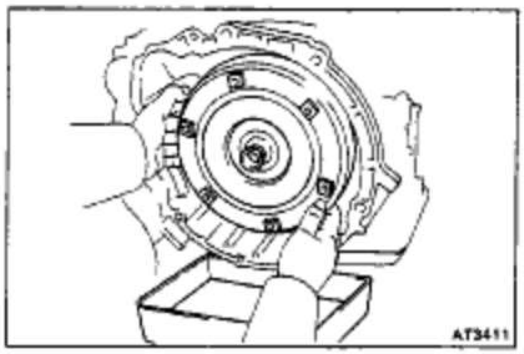
REMOVAL AND INSTALLATION OF TRANSAXLE

Remove and install the parts as shown.



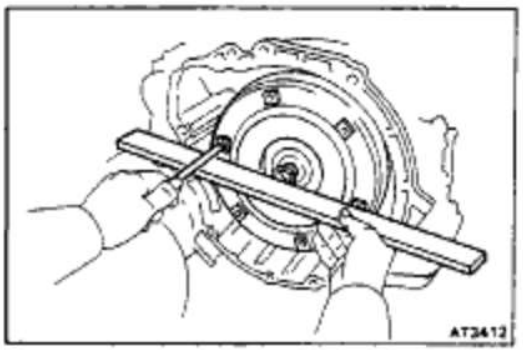
REMOVAL AND INSTALLATION OF TRANSAXLE (Cont'd)





(MAIN POINT OF INSTALLATION)

1. INSTALL TORQUE CONVERTER IN TRANSAXLE



2. CHECK TORQUE CONVERTER INSTALLATION

Using calipers and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance: 13 mm (0.51 in.)

COMPONENT PARTS
General Notes

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 work bench 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 assembly before proceeding to the next component group. If a component group can not be assembled because parts are being ordered, be sure tc keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.
Recommended fluid for the automatic transaxle is ATF type DEXRON→ II.

GENERAL CLEANING NOTES:

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

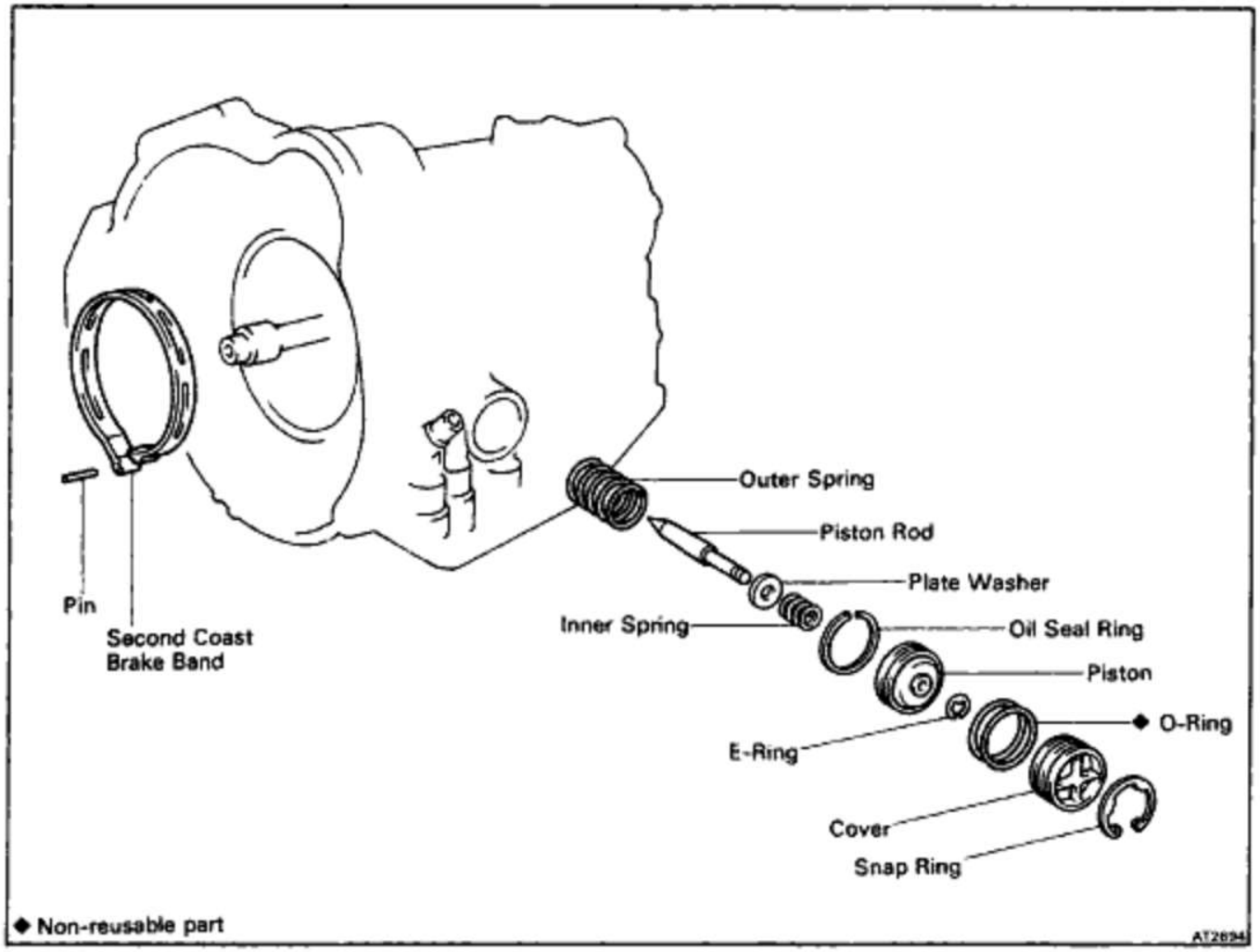
PARTS ARRANGEMENT:

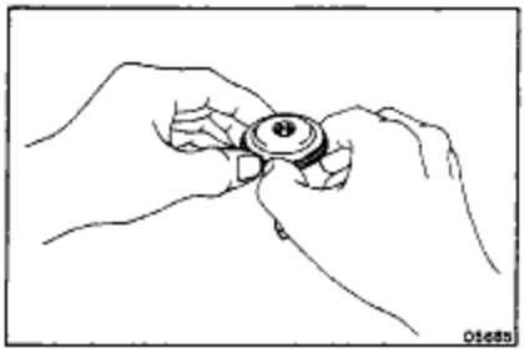
1. After cleaning, the parts should be arranged in proper order to allow efficient inspection, repairs, an(reassembly.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring
3. New brakes and clutches that are to be used for replacement must be soaked in transaxle fluid for a least fifteen 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 to keep parts in place.

Second Coast Brake

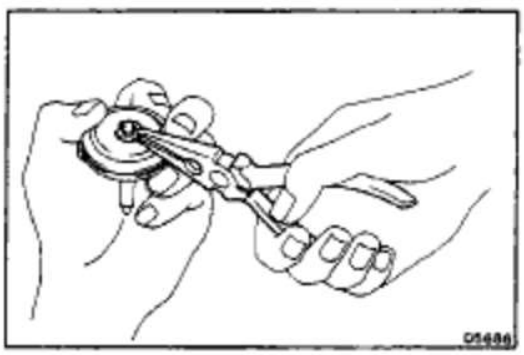




DISASSEMBLY OF SECOND COAST BRAKE PISTON

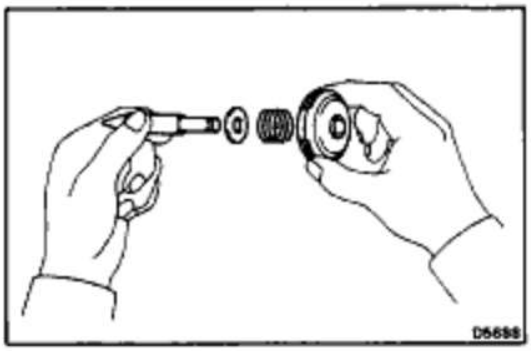
1. REMOVE OIL SEAL RING

Remove the oil seal ring from the piston.

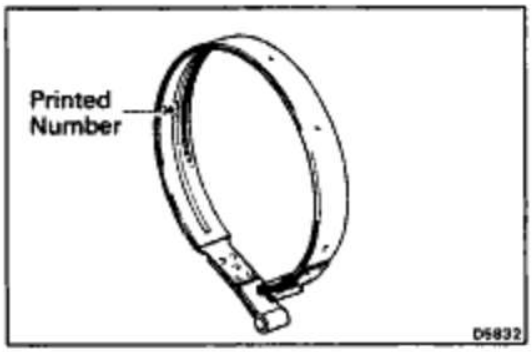


Z. REMOVE PISTON ROD

(a) Remove the E–ring white pushing the piston with needle–nose pliers.



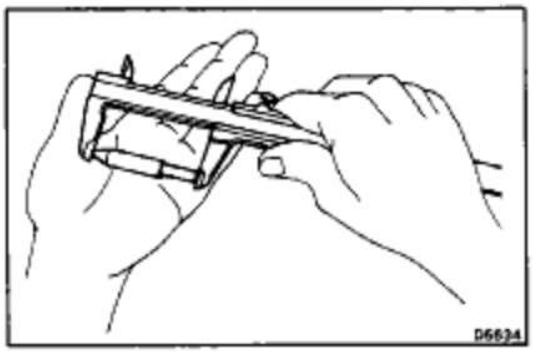
(b) Remove the spring, washer and piston rod.



INSPECTION OF SECOND COAST BRAKE COMPONENT

INSPECT BRAKE BAND

If the lining of the brake band is exfoliated or discolored, or even part of the printed numbers are defaced, replace the brake band.



ASSEMBLY OF SECOND COAST BRAKE PISTON

1. SELECT PISTON ROD

If the band is OK with piston stroke not within the standard value, select the piston rod.

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

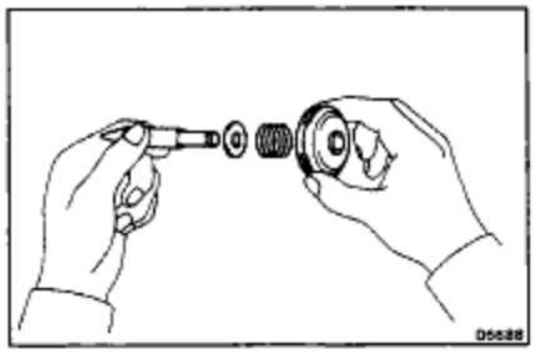
There are two lengths of piston rod.

Piston rod length: 72.9 mm (2.870 in.)

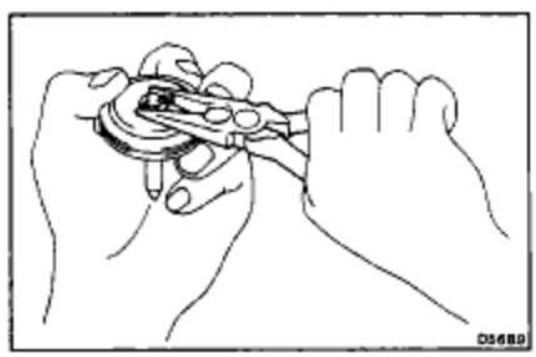
71.4 mm (2.811 in.)

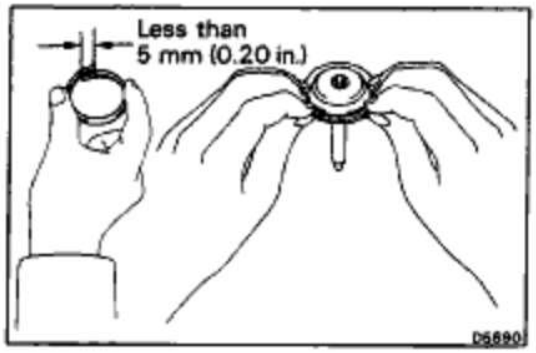
2. INSTALL PISTON ROD

(a) Install the washer and spring to the piston rod.



(b) Install an E–ring while pushing the piston.





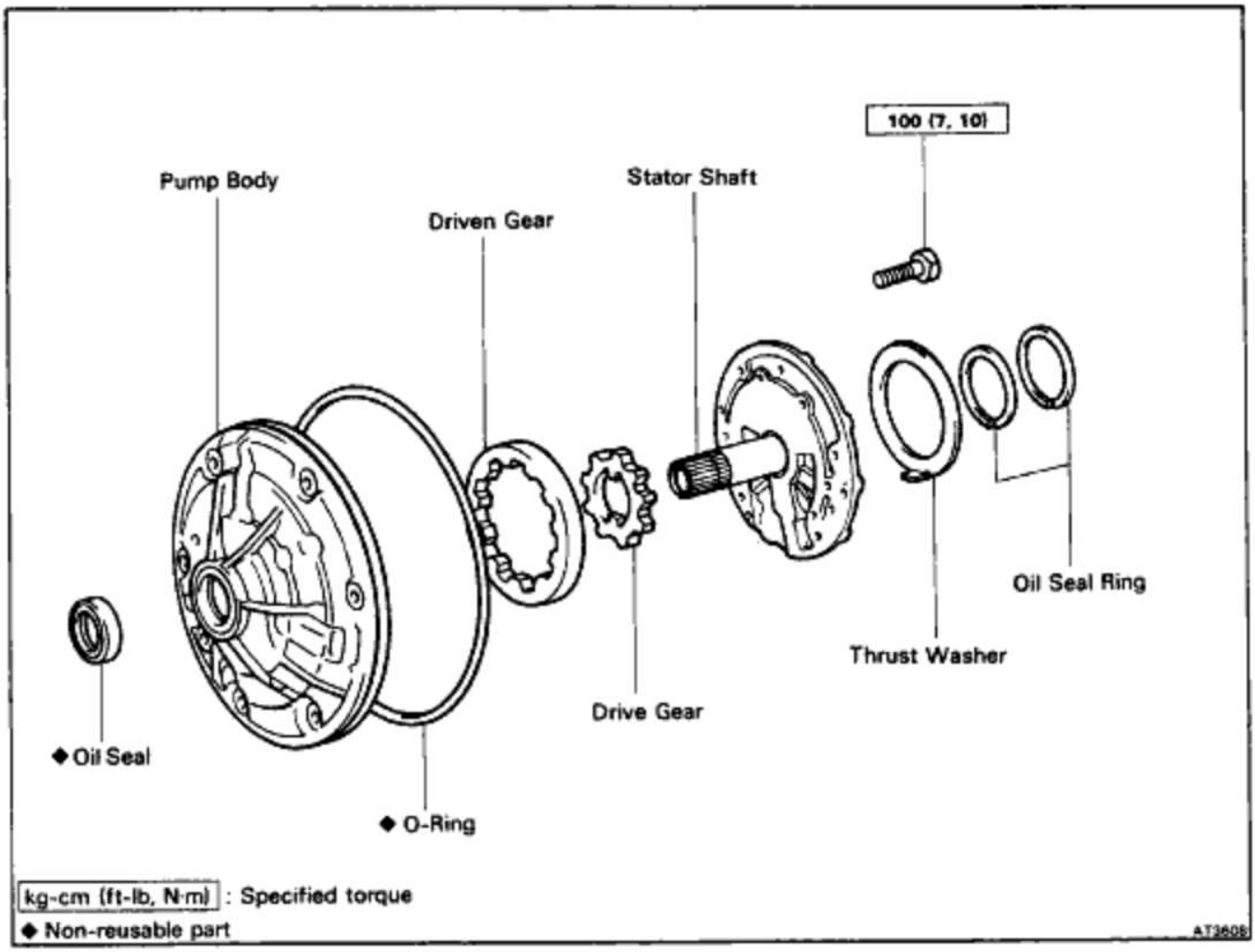
3. INSTALL OIL SEAL RING

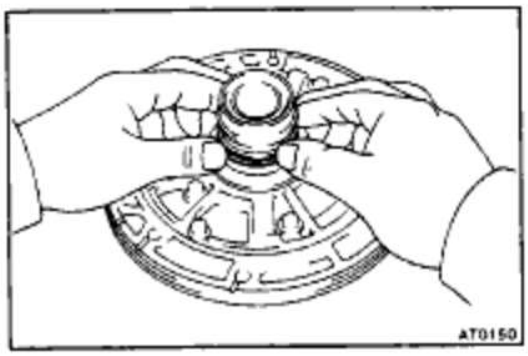
(a) Apply ATF to the oil seal ring.

(b) Install the oil seal ring to the piston.

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

Oil Pump

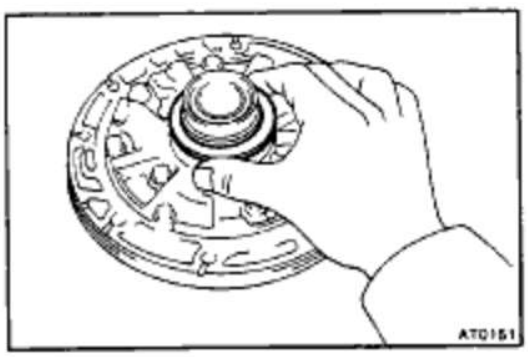




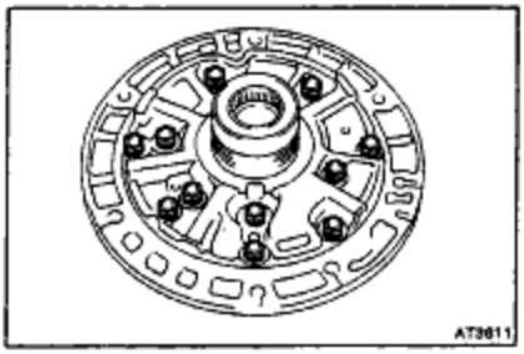
DISASSEMBLY OF OIL PUMP

1. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the stator shaft back, side.

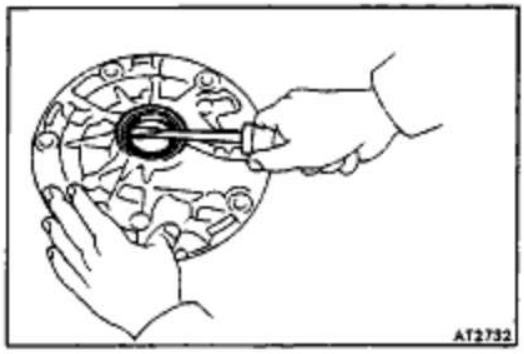


2. REMOVE THRUST WASHER FROM STATOR SHAFT BACK SIDE



3. REMOVE STATOR SHAFT

Remove the eleven bolts and stator shaft.
Keep the gears in assembly order.



4. REMOVE FRONT OIL SEAL

Pry off the oil seal with a screwdriver.

INSPECTION OF OIL PUMP



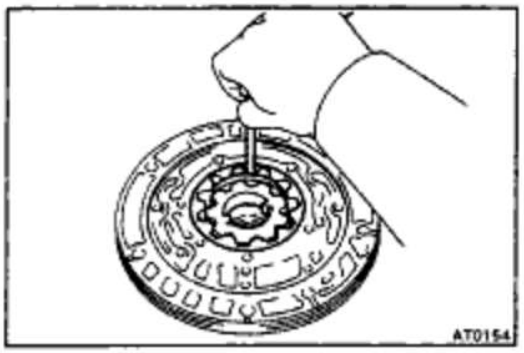
1. CHECK BODY CLEARANCE OF DRIVEN GEAR

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

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

Maximum body clearance: 0.3 mm (0.012 in.)

If the body clearance is greater than the maximum, r place the oil pump body subassembly.



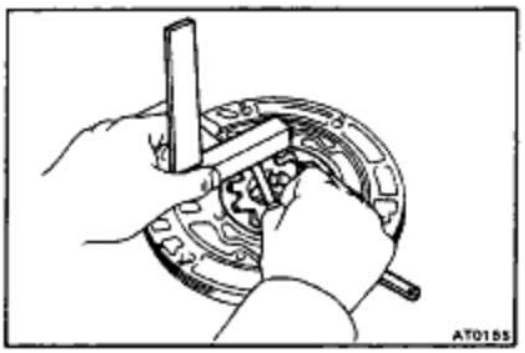
2. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent shaped part of the pump body.

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

Maximum tip clearance: 0.3 mm (0.012 in.)

If the tip clearance is greater than the maximum, replace the oil pump body subassembly.



3. CHECK SIDE CLEARANCE OF BOTH GEARS

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

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

Maximum side clearance: 0.1 mm (0.004 in.)

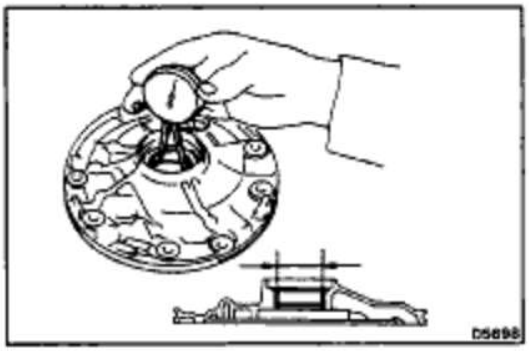
There are three different thicknesses for drive and driven gears.

Drive and driven gear thickness

Mark	Thickness
A	9.440 – 9.455 mm (0.3717 – 0.3723 in.)
g	9.456 – 9.474 mm (0.3723 – 0.3730 in.)
C	9.474 – 9.490 mm (0.3730 – 0.3736 in.)

If the thickest gear can not make the side clearance within standard specification, replace the oil pump body **subassembly.**

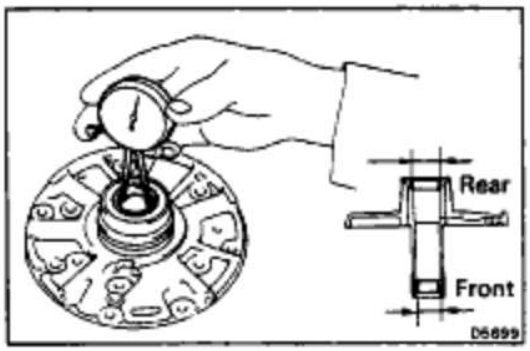
4. CHECK OIL PUMP BODY BUSHING



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

Maximum inside diameter: 38.18 mm (1.5031 in.)

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



5. CHECK STATOR SHAFT BUSHINGS

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

Maximum inside diameter:

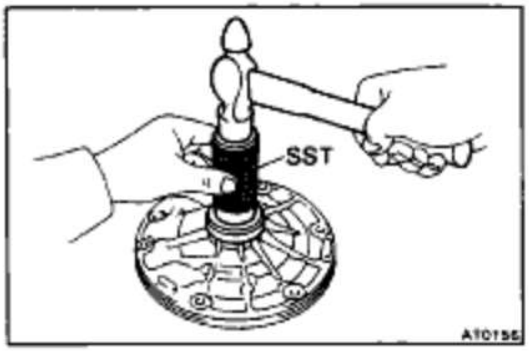
Front side 21.57 mm (0.8492 in.)

Rear side 27.07 mm (1.0657 in.)

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

ASSEMBLY OF OIL PUMP

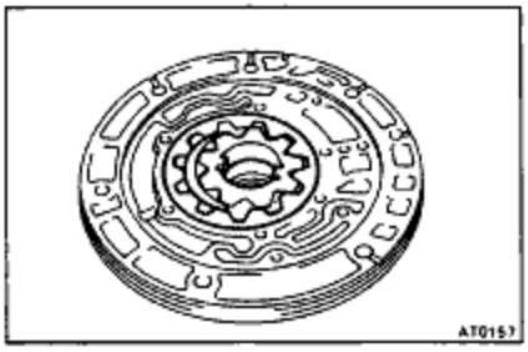
1. INSTALL FRONT OIL SEAL



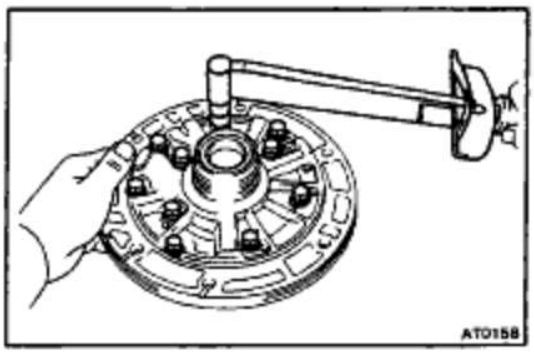
Using SST and a hammer, install a new oil seal. The seal end should be flush with the outer edge of the pump body.

SST 09350–32014 (09351–32140)

2. INSTALL DRIVEN GEAR AND DRIVE GEAR



Make sure the top of the gears are facing upward.

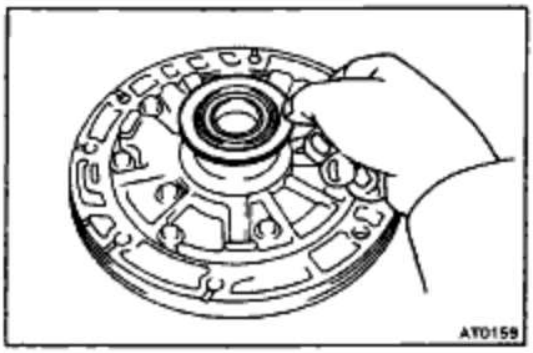


3. INSTALL STATOR SHAFT ONTO PUMP BODY

Align the stator shaft with each bolt hole.

4. TIGHTEN ELEVEN BOLTS

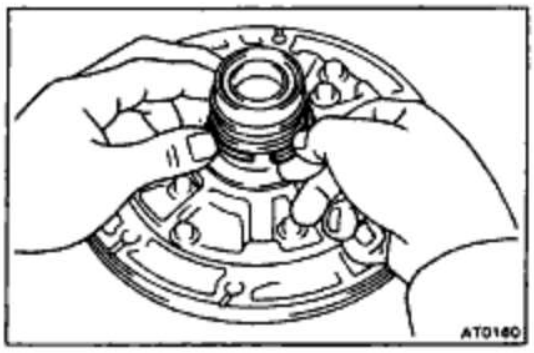
Torque: 100 kg–cm (7 ft–lb, 10 N–m)



5. INSTALL THRUST WASHER

(a) Coat the thrust washer with petroleum jelly.

(b) Align the tab of the washer with the hollow of the pump body.

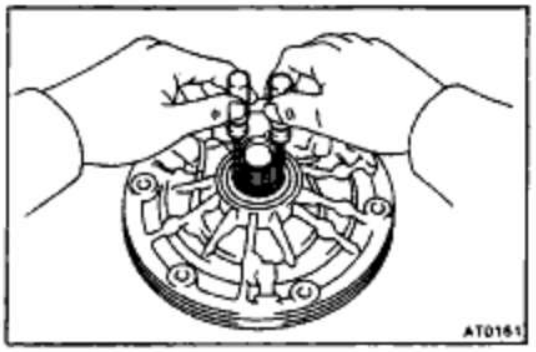


6. INSTALL TWO OIL SEAL RINGS ON OIL PUMP

Spread the rings apart and install them into the groove.

NOTICE: Do not spread the ring ends too much.

HINT: After installing the oil seal rings, check that they move smoothly.



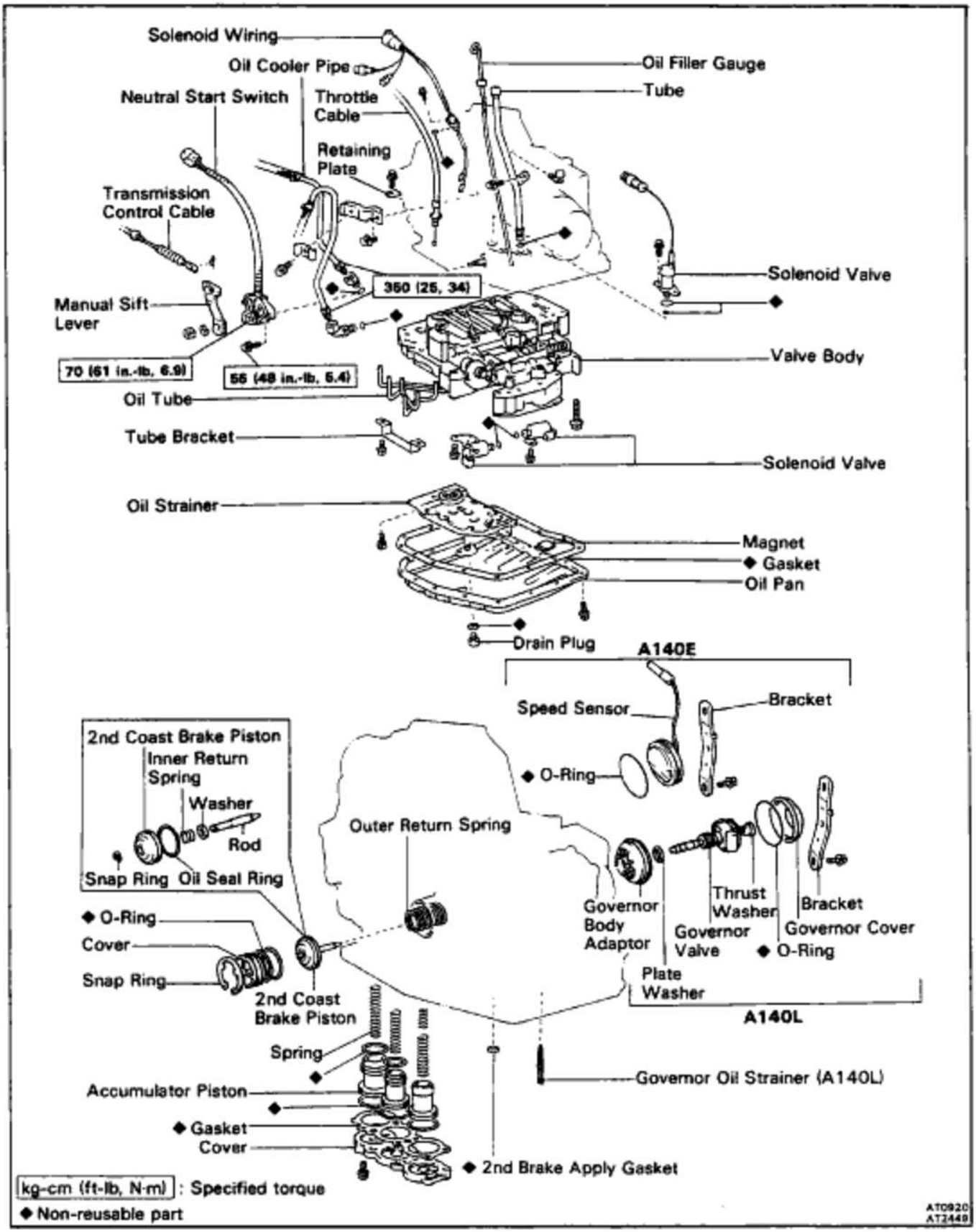
7. CHECK PUMP DRIVE GEAR ROTATION

Turn the drive gear with screwdrivers and make sure that it rotates smoothly.

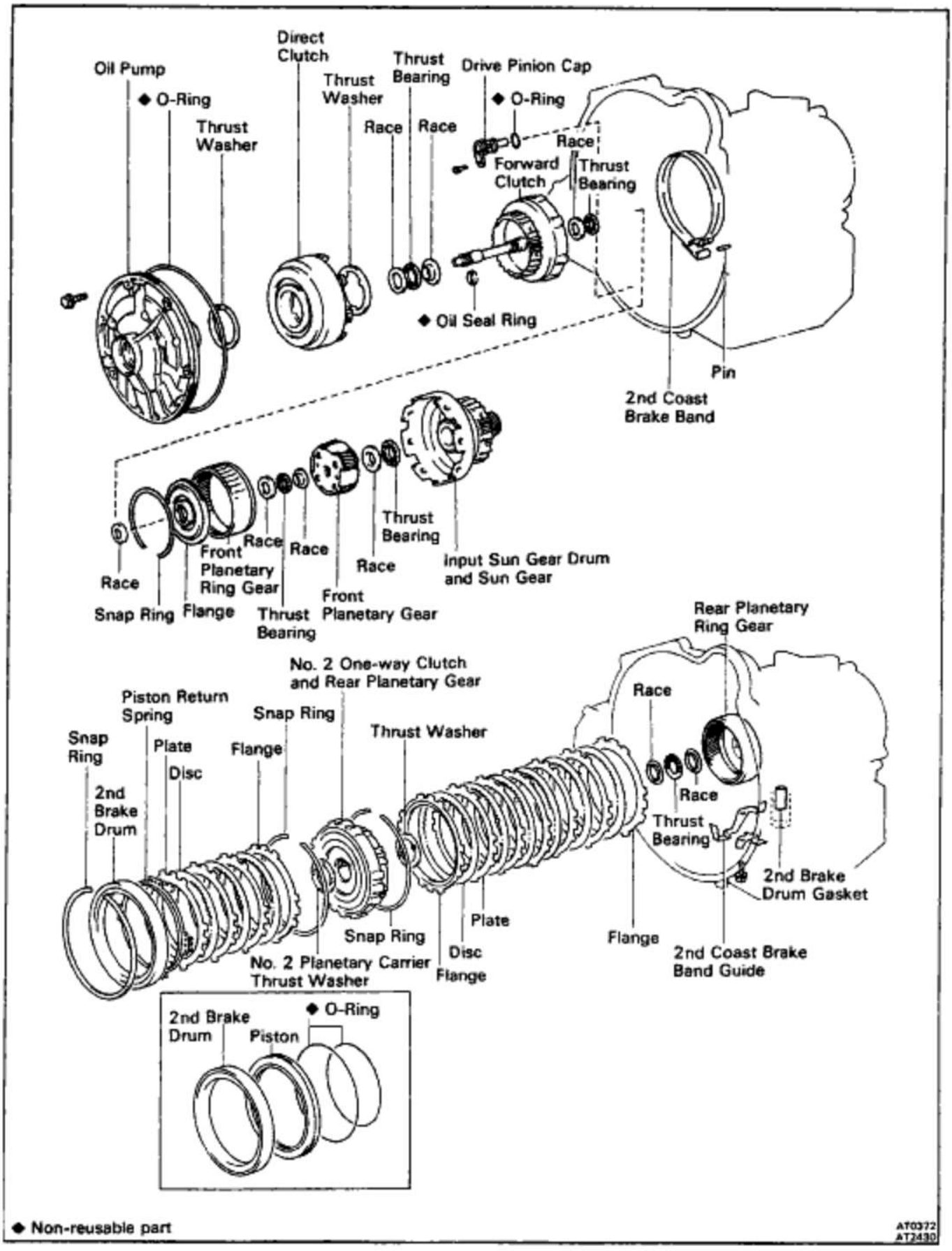
NOTICE: Be careful not to damage the oil seal lip.

REMOVAL OF COMPONENT PARTS

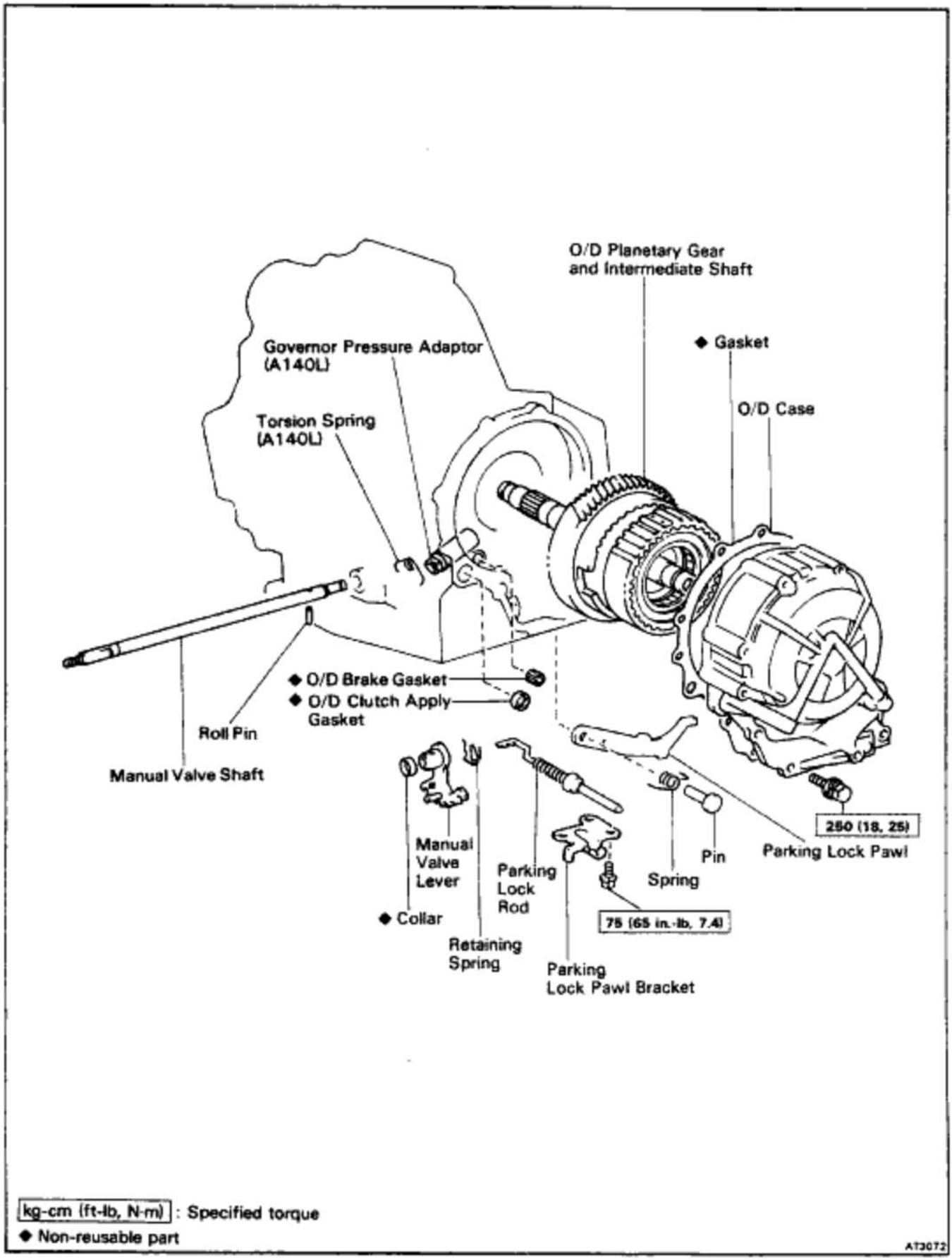
COMPONENTS



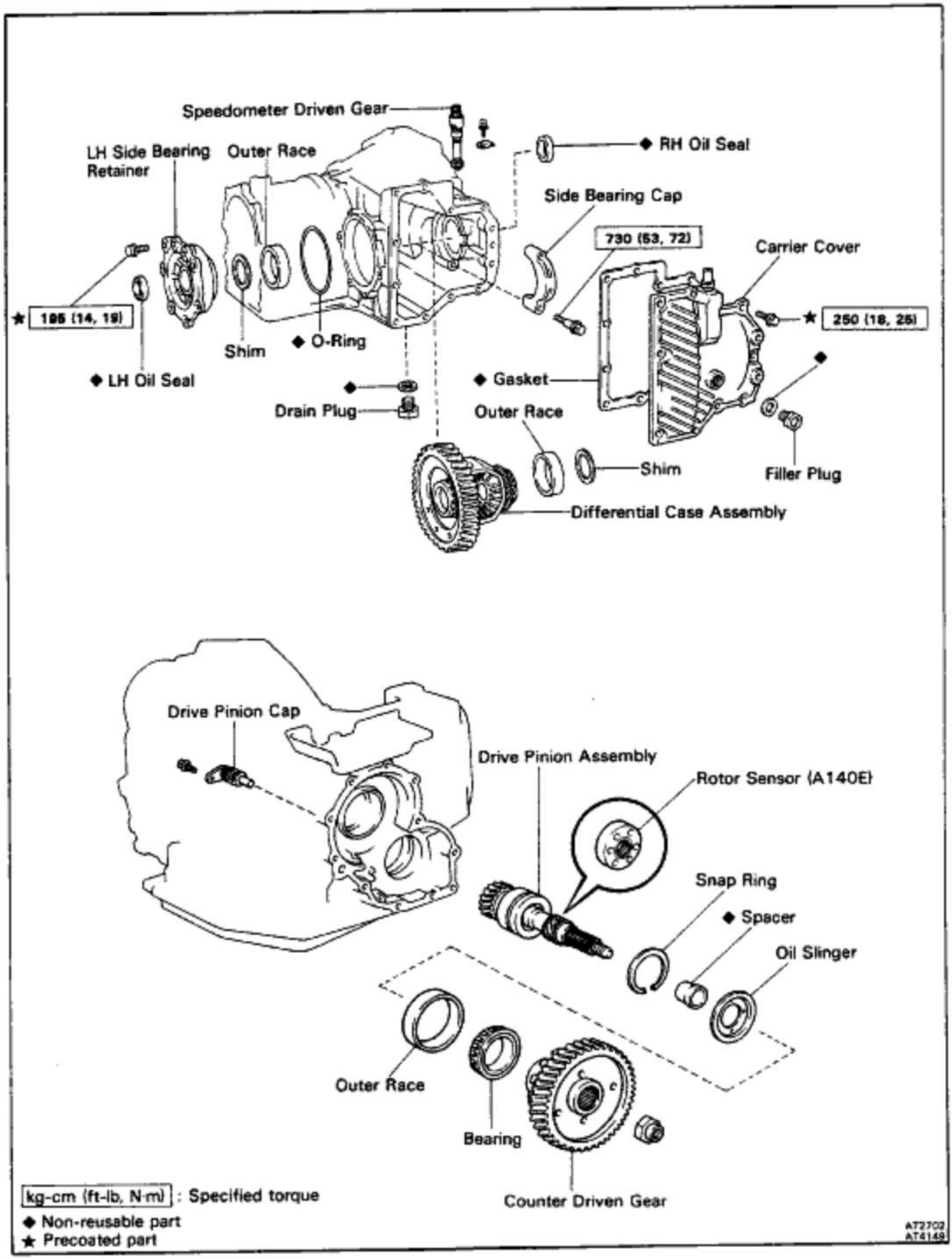
COMPONENTS (Cont'd)

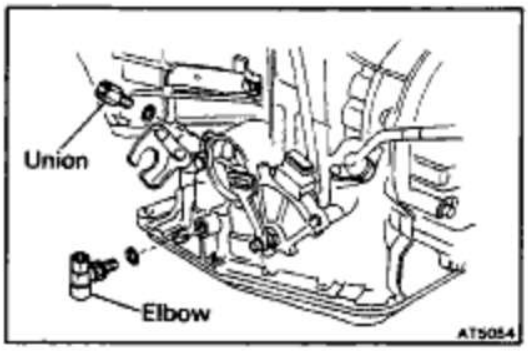


COMPONENTS (Cont'd)



COMPONENTS (Cont'd)

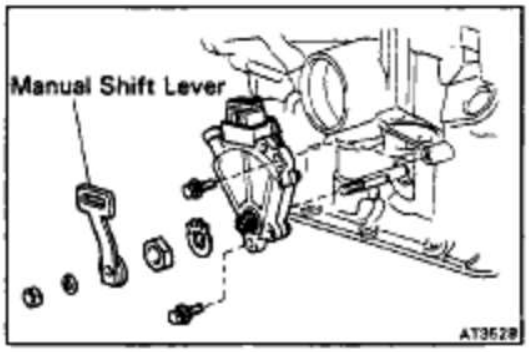




SEPARATE BASIC SUBASSEMBLY

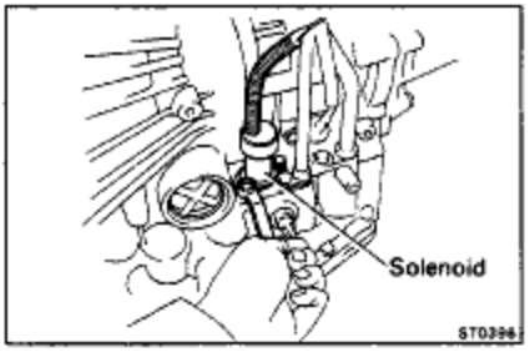
1. REMOVE UNION AND ELBOW

(a) Using the open end wrench, remove the union and elbow.
(b) Remove the O–rings from the union and elbow.



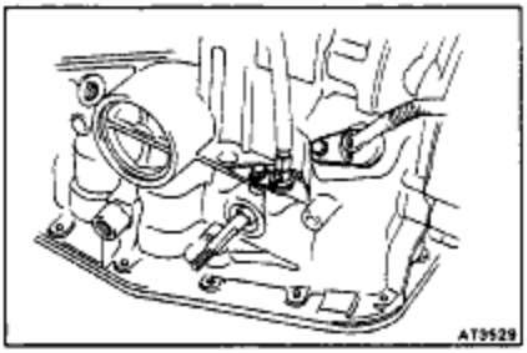
2. REMOVE NEUTRAL START SWITCH

(a) Remove the manual shift lever.
(b) Pry off the lock washer and remove the manual valve shaft nut.
(c) Remove the two bolts and pull out the neutral start switch.



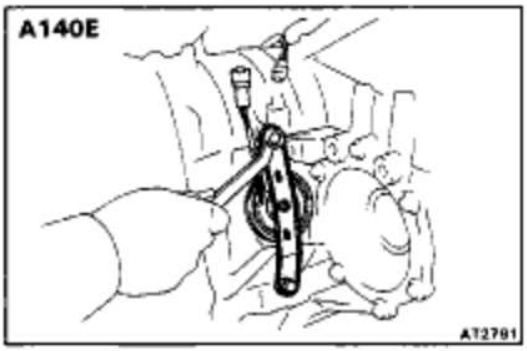
3. REMOVE SOLENOID

(a) Disconnect connector.
(b) Remove the two bolts and solenoid.



4. REMOVE THROTTLE CABLE RETAINING PLATE

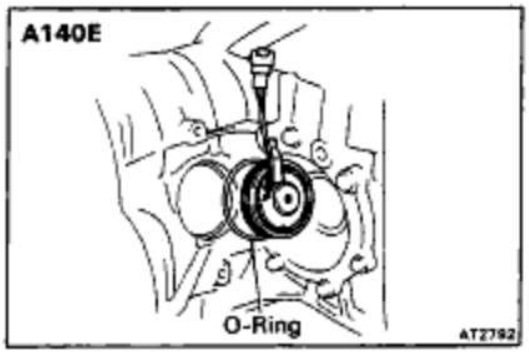
5. REMOVE SOLENOID WIRE RETAINING BOLT



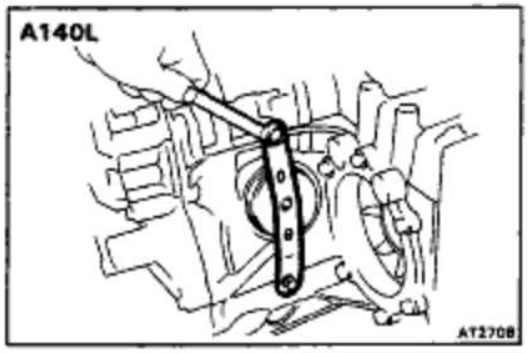
6. (A140E)

REMOVE NO. 2 SPEED SENSOR

(a) Disconnect the speed sensor connector.
(b) Remove the two bolts and cover bracket.



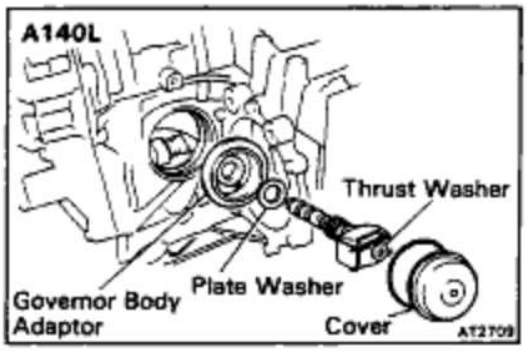
(c) Remove the speed sensor.



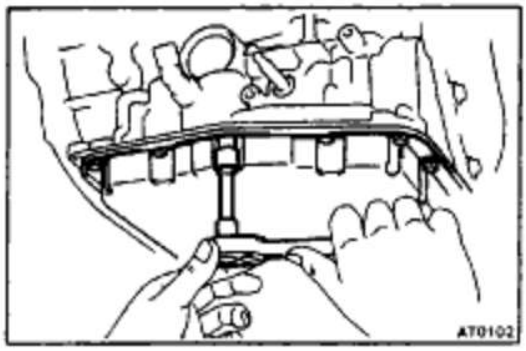
7. (A 140 L)

REMOVE GOVERNOR BODY

(a) Remove the two bolts and cover bracket.



(b) Remove the governor cover.
(c) Remove the governor body and thrust washer.
(d) Remove the plate washer and governor body adaptor.

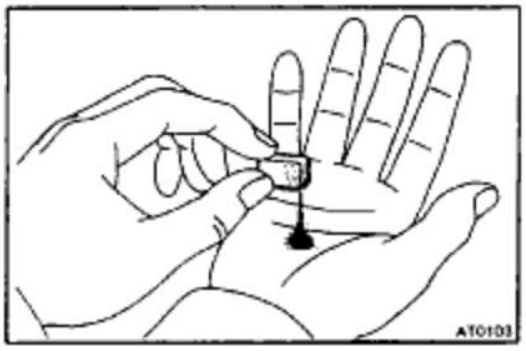


8. REMOVE OIL PAN AND GASKET

(a) Remove the fifteen bolts.
(b) Remove the oil pan by lifting transmission case.

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

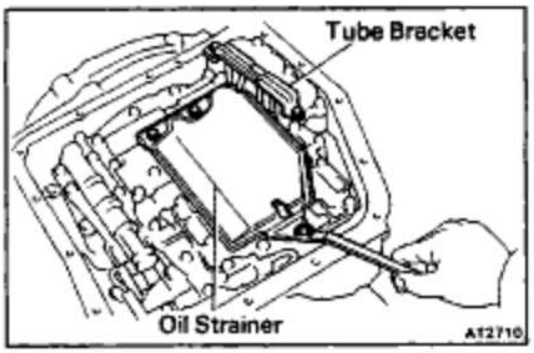
(c) Place the transmission on wooden blocks to prevent damage to the tube bracket.



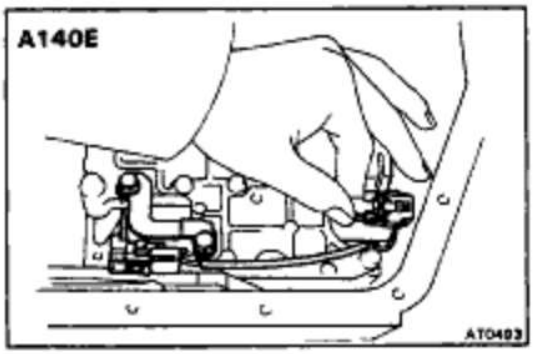
9. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the oil pan and on the magnets to anticipate what type of wear you will find in the transmission:

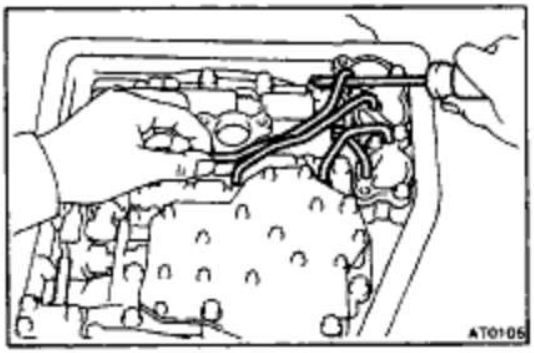
Steel (magnetic) ...bearing, gear and plate wear
Brass (non–magnetic) ...bushing wear



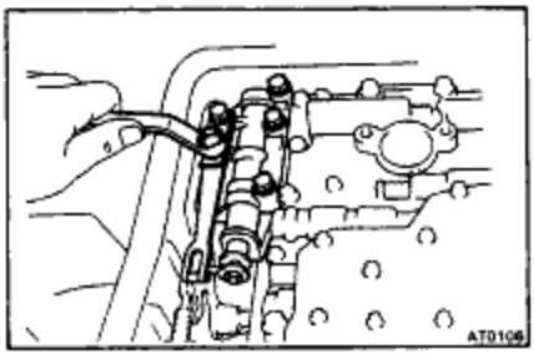
14. REMOVE TUBE BRACKET AND OIL STRAINER



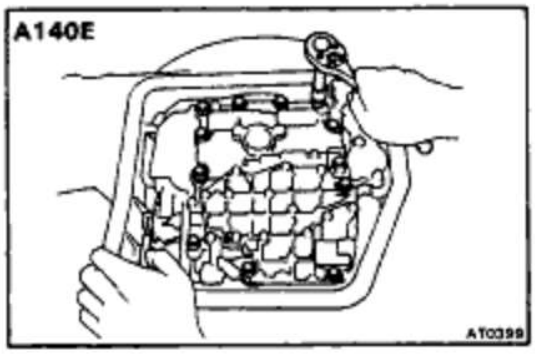
11. (A140E)
DISCONNECT SOLENOID CONNECTORS



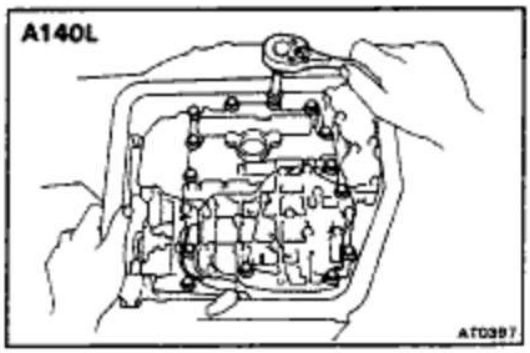
12. REMOVE OIL TUBES
Pry up both tube ends with a large screwdriver and remove the four tubes.



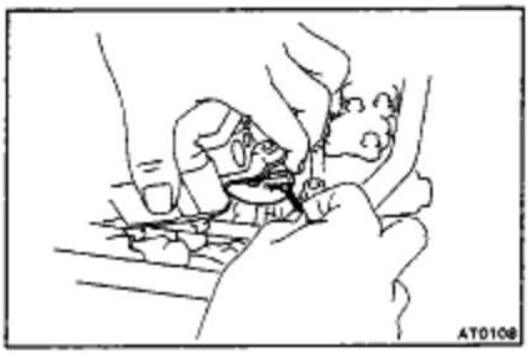
13. REMOVE MANUAL DETENT SPRING
14. REMOVE MANUAL VALVE AND MANUAL VALVE BODY



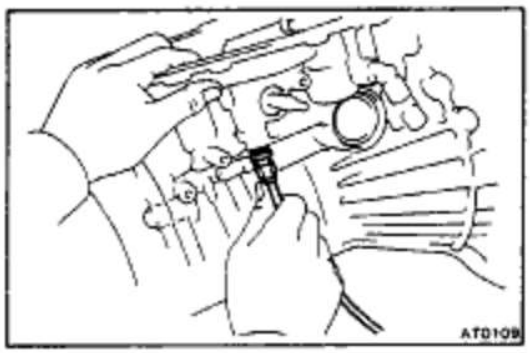
15. REMOVE VALVE BODY
(a) (A140E)
Remove the twelve bolts.



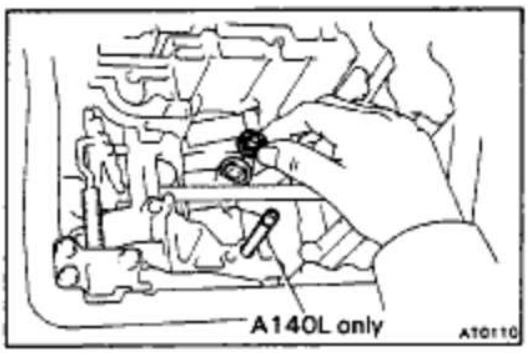
(b) (A140L)
Remove the fourteen bolts.



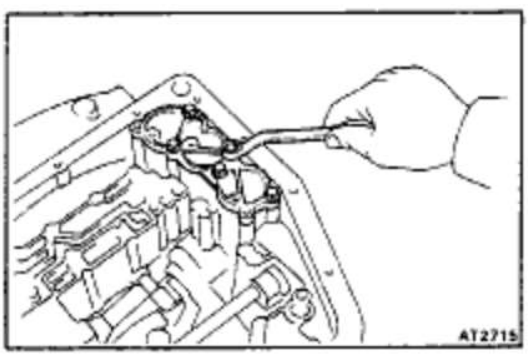
(e) Disconnect the throttle cable from the cam and remove the valve body.



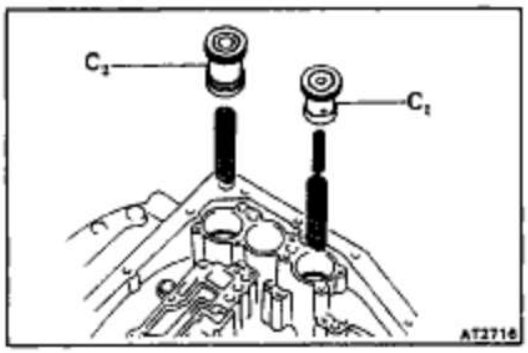
16. REMOVE THROTTLE CABLE AND SOLENOID WIRING FROM CASE



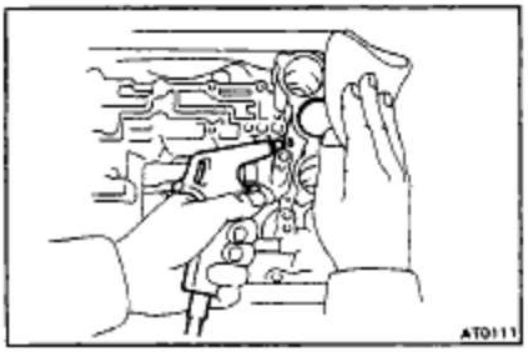
17. REMOVE SECOND BRAKE APPLY GASKET AND GOVERNOR OIL STRAINER
HINT: Governor oil strainer...A140L only



18. REMOVE ACCUMULATOR PISTON AND SPRINGS
(a) Loosen the five bolts one turn at a time until the spring tension is released.
(b) Remove the cover and gasket.



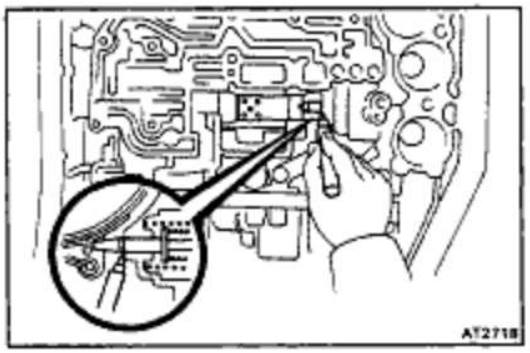
(c) Remove the piston and spring for C1 and C2.
(d) Remove the O–rings.



(e) Pop out piston B2 into a rag, using low–pressure compressed air 0 kg/cm2, 14 psi or 98 kPa1. Force air into the hole shown and remove the piston and spring.
(f) Remove the two O–rings from the B2 piston.

19. MEASURE PISTON STROKE OF SECOND COAST BRAKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.

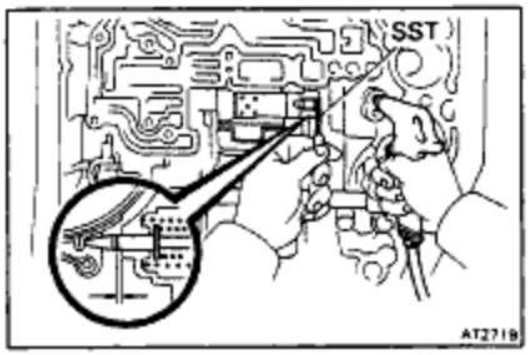


(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

SST 09240–00020

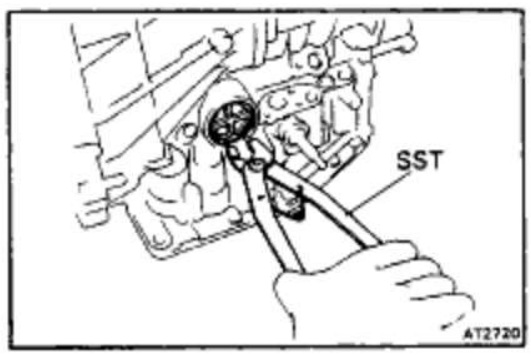
Piston stroke: 1.5 – 3.0 mm (0.059 – 0.118 in.)

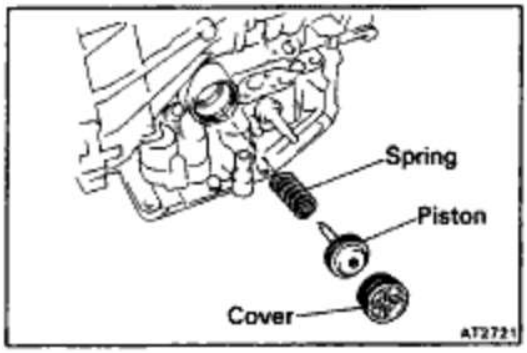
If the piston stroke exceeds the limit, replace the piston rod or brake band.



20. REMOVE SECOND COAST BRAKE PISTON

(a) Using SST, remove the snap ring.
SST 09350–32014 (09351–32050)



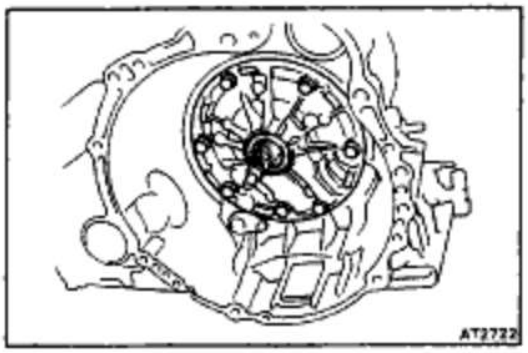


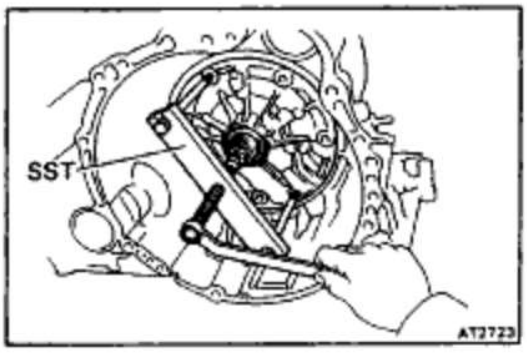
(b) Remove the cover.
(c) Remove the piston and outer return spring.
(d) Remove the O–ring from the cover.

21. REMOVE OIL PUMP AND DIRECT CLUTCH

NOTICE: Before removing the oil pump, remove the second coast brake piston.

(a) Remove the seven bolts. .



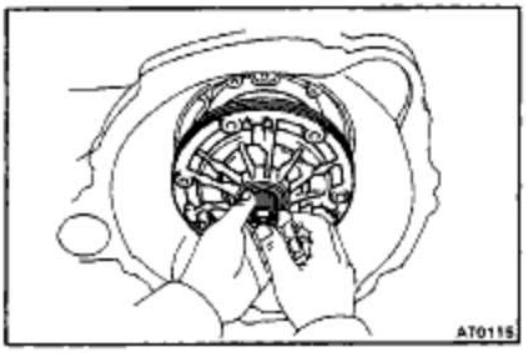


(b) Using SST, pull out the oil pump from the transmission case.
SST 09350–32014 (09351–32061)

22. REMOVE OIL PUMP AND DIRECT CLUTCH

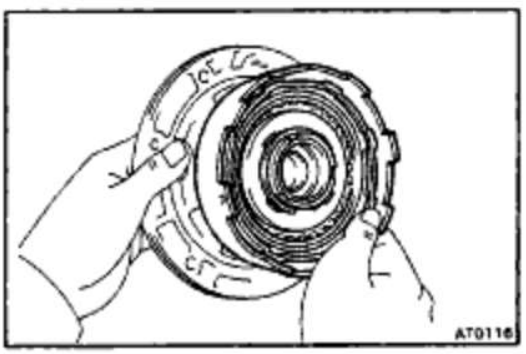
While holding the input shaft, grasp the pump stator shaft and pull the oil pump and direct clutch together out the transmission case.

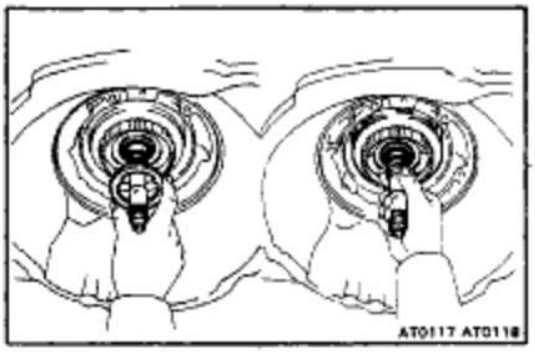
NOTICE: Push the 2nd coast brake band into the case, being careful not to catch it on the direct clutch
drum.



23. REMOVE DIRECT CLUTCH FROM OIL PUMP

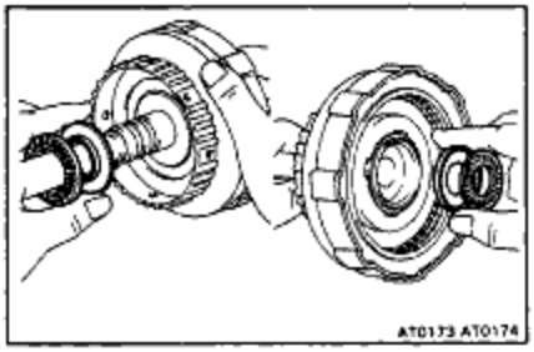
24. BE CAREFUL WHEN REMOVING RACE BEHIND OIL PUMP



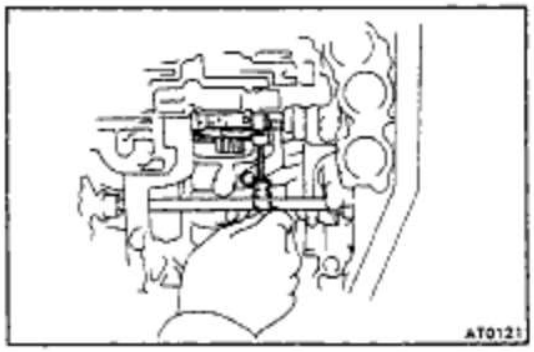


25. REMOVE CLUTCH DRUM THRUST WASHER

26. REMOVE FORWARD CLUTCH



27. REMOVE BEARINGS AND RACES FROM FORWARD CLUTCH

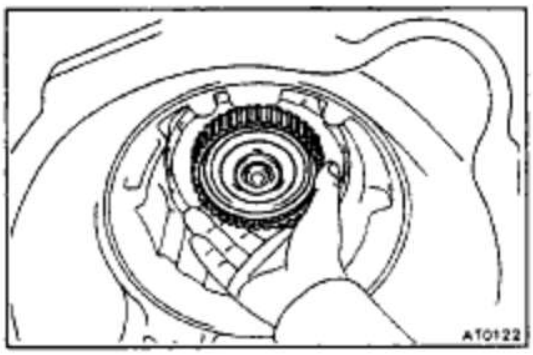


28. REMOVE SECOND COAST BRAKE BAND

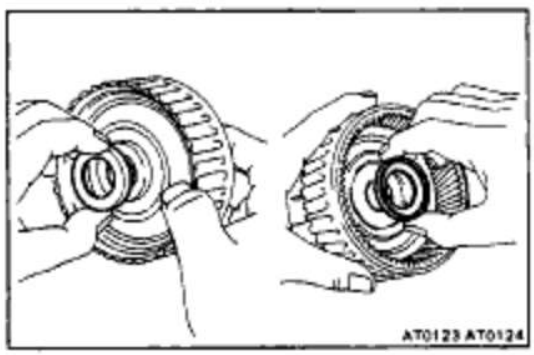
(a) Push the pin with a small screwdriver and remove it from the bolt hole of the oil pump mounting.

(b) Remove the brake band.

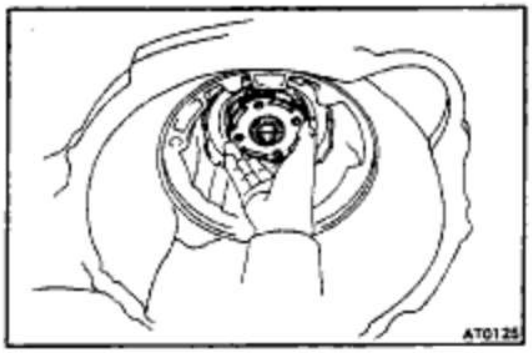
HINT: The method of inspection, refer to page AT–80.



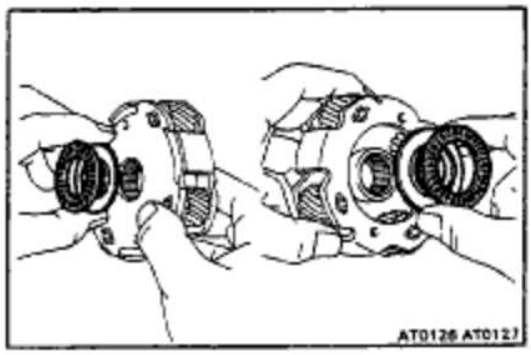
29. REMOVE FRONT PLANETARY RING GEAR



30. REMOVE BEARING RACES FROM FRONT PLANETARY RING GEAR



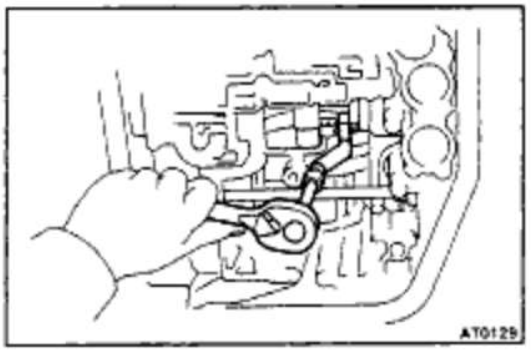
31. REMOVE PLANETARY GEAR



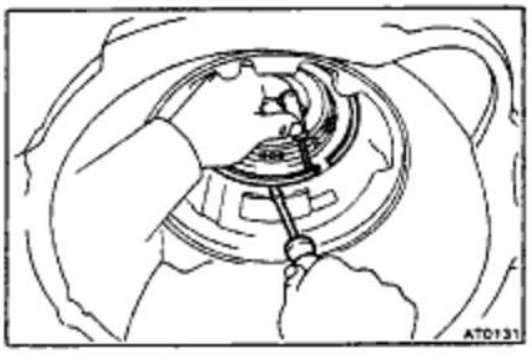
32. REMOVE RACES AND BEARINGS FROM PLANETARY GEAR



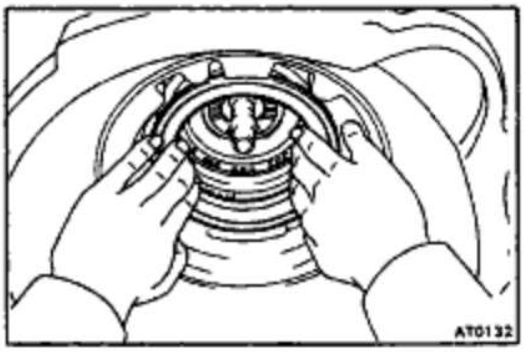
33. REMOVE SUN GEAR, SUN GEAR INPUT DRUM, SECOND BRAKE HUB AND NO. 1 ONE–WAY CLUTCH



34. STAND TRANSMISSION CASE UP AND REMOVE SECOND COAST BRAKE BAND GUIDE

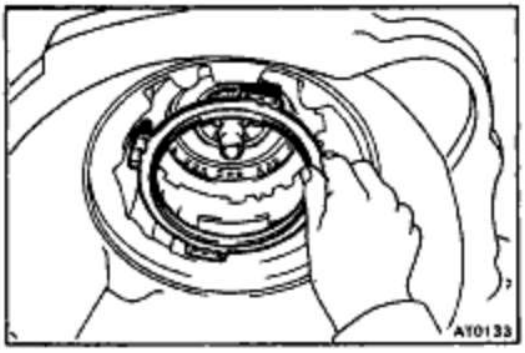


35. REMOVE SNAP RING HOLDING SECOND BRAKE DRUM TO CASE

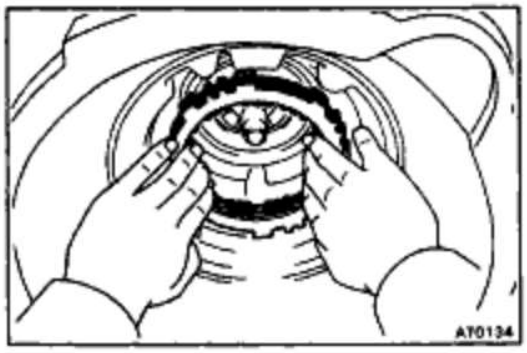


36. REMOVE SECOND BRAKE DRUM

If the brake drum is difficult to remove, lightly tap it with a wooden block.

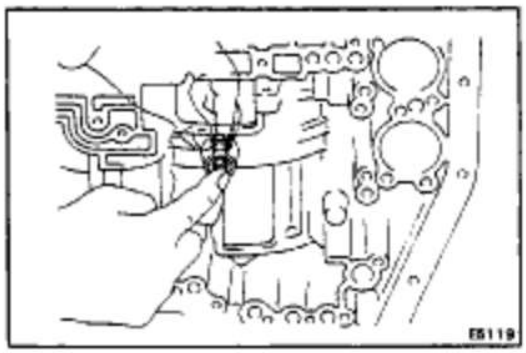


37. REMOVE SECOND BRAKE PISTON RETURN SPRING

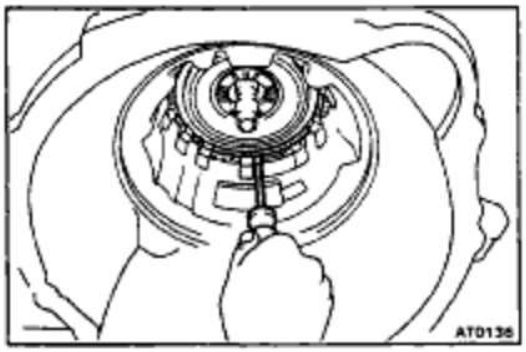


38. REMOVE PLATES, DISCS AND FLANGE

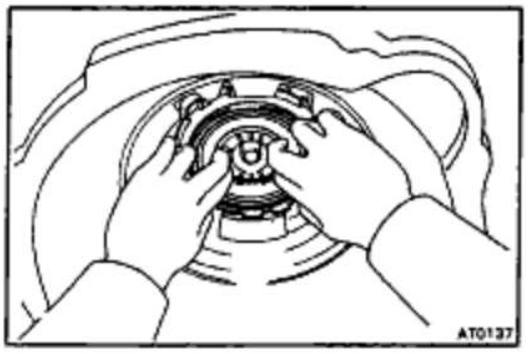
HINT: For the method of inspection, refer to AT–100.



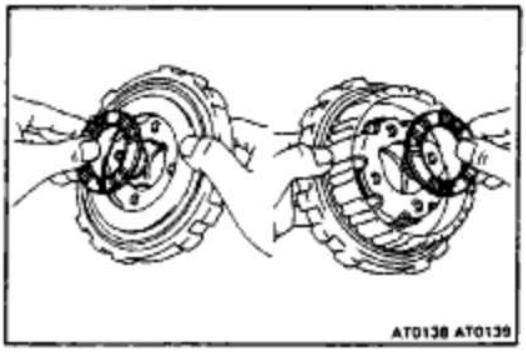
39. REMOVE SECOND BRAKE DRUM GASKET



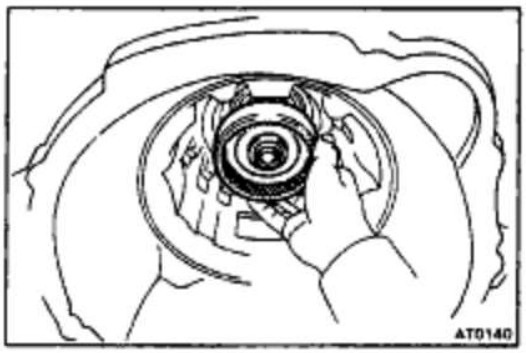
40. REMOVE SNAP RING HOLDING NO. 2 ONE–WAN CLUTCH OUTER RACE TO CASE



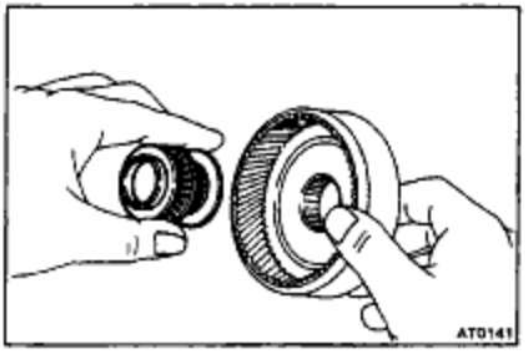
41. REMOVE NO. 2 ONE–WAY CLUTCH AND REAR PLANETARY GEAR



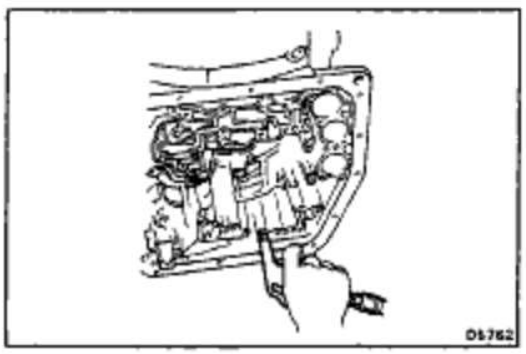
42. BE CAREFUL WHEN REMOVING THRUST WASHERS FROM BOTH SIDES OF PLANETARY CARRIER



43. REMOVE REAR PLANETARY RING GEAR



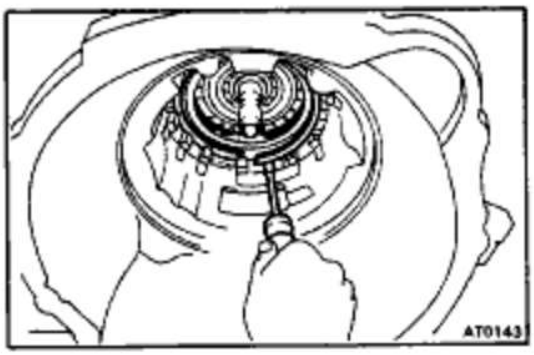
44. REMOVE BEARINGS AND RACES



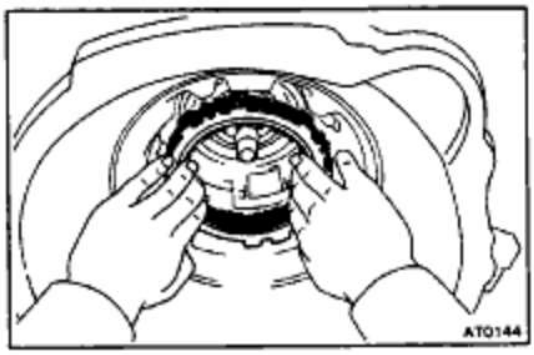
45. CHECK OPERATION OF FIRST AND REVERSE BRAKE PISTON

Apply compressed air into the case passage and confirm that the piston moves.

If the piston does not move, disassemble and inspect.



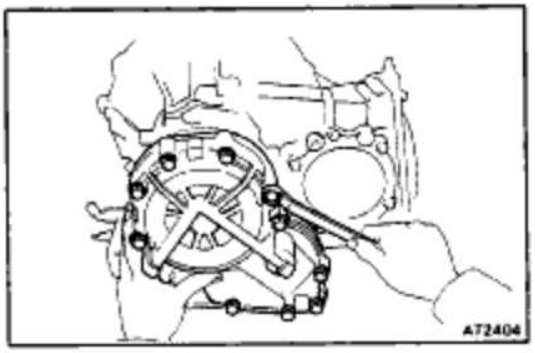
46. REMOVE SNAP RING HOLDING FLANGE TO CASE



47. REMOVE FLANGES. PLATES AND DISCS

48. TURN TRANSMISSION CASE AROUND

49. REMOVE ELEVEN BOLTS HOLDING OVERDRIVE UNIT TO TRANSMISSION CASE

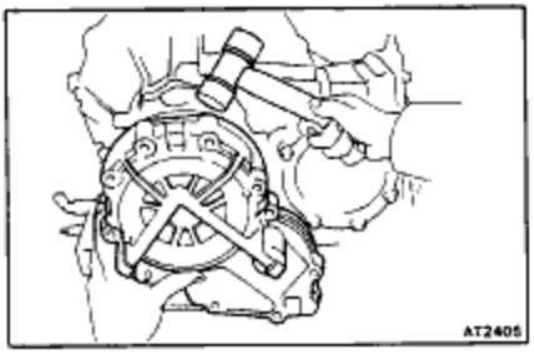


50. REMOVE OVERDRIVE UNIT WITH ALL PARTS

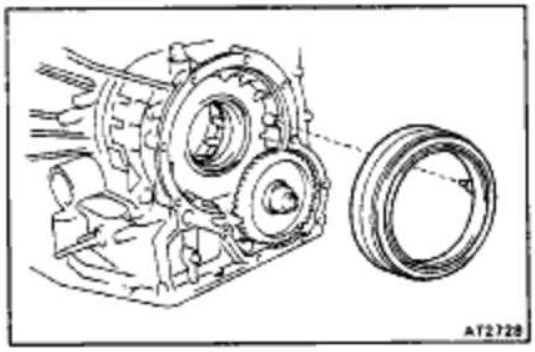
(a) Tap on the overdrive case circumference with¿plastic hammer to remove the unit from the transmis. sion case.

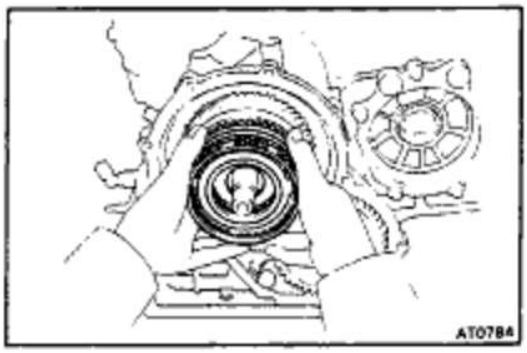
(b) Remove the overdrive planetary gear and counter gear if they remained in the transmission.

HINT: The overdrive unit is heavy, so be careful not tc drop it.

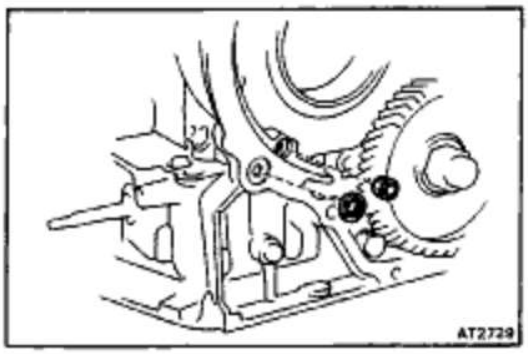


(c) Remove the overdrive brake drum from the transmission case.

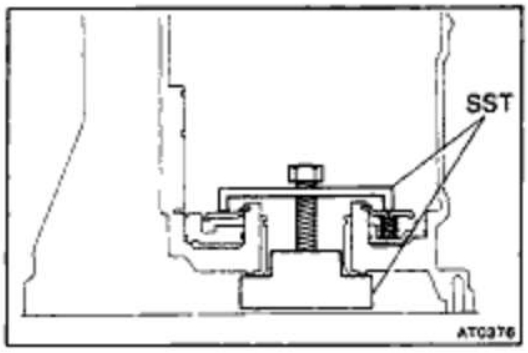




(d) Remove the overdrive planetary gear and counter gear if they remain in the transmission.

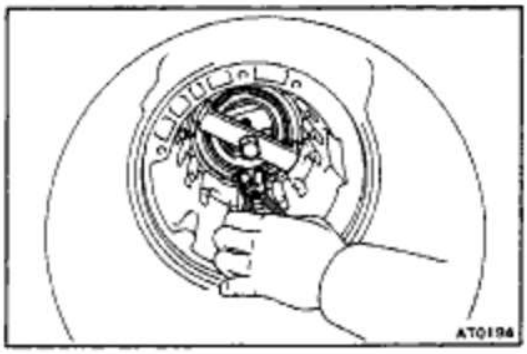


51. REMOVE– OVERDRIVE CLUTCH APPLY GASKET AND OVERDRIVE BRAKE APPLY GASKET

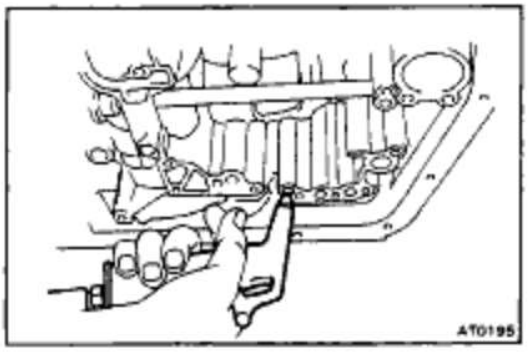


52. REMOVE PISTON RETURN SPRING

(a) Place SST, and compress the return springs evenly by tightening the bolt gradually.
SST 09350–32014 (09351–32040)



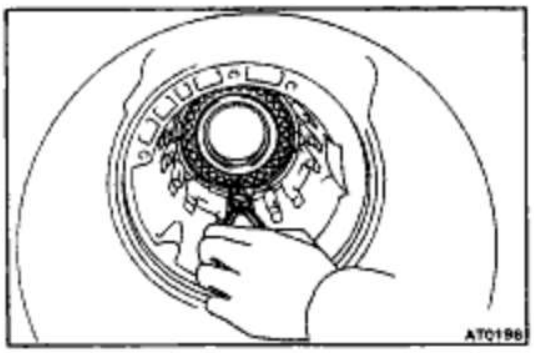
(b) Using snap ring pliers, remove the snap ring.
(c) Remove SST.
(d) Remove the return spring from the case.



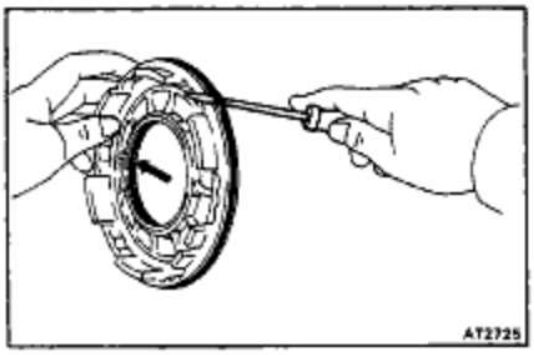
53. REMOVE FIRST AND REVERSE BRAKE PISTON

(a) Apply compressed air into the passage of the case to remove the piston.

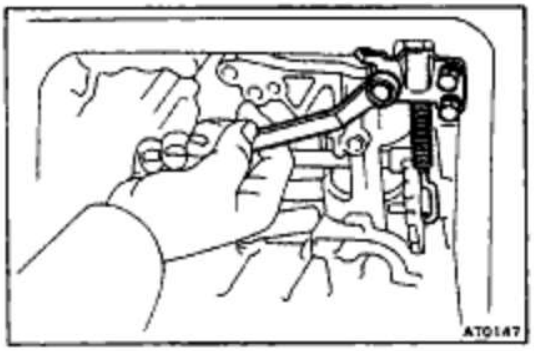
HINT: Hold the piston so it is not slanted and blow with the gun 'slightly away from the oil hole.



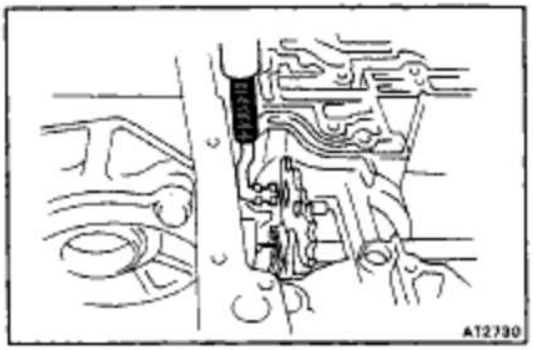
(b) If the piston does not pop out with compressed air, use needle–nose pliers to remove it.



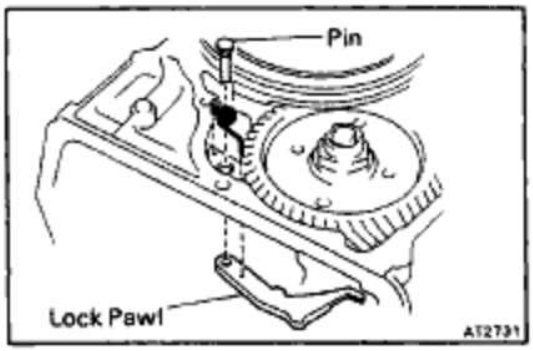
(c) Remove the two O–rings from the piston.



54. REMOVE PARKING LOCK PAWL BRACKET



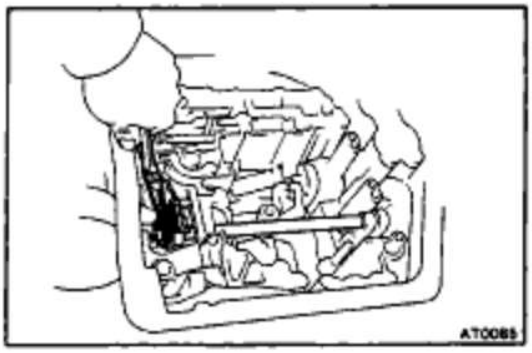
55. REMOVE PARKING LOCK ROD

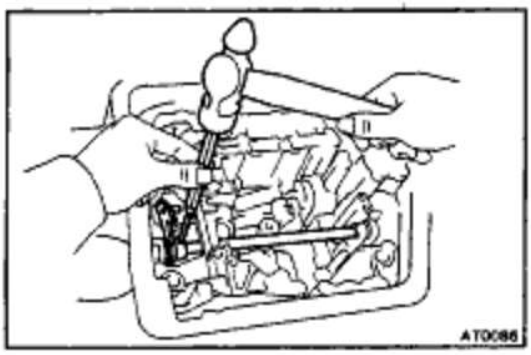


56. REMOVE PIN, SPRING AND PARKING LOCK PAWL

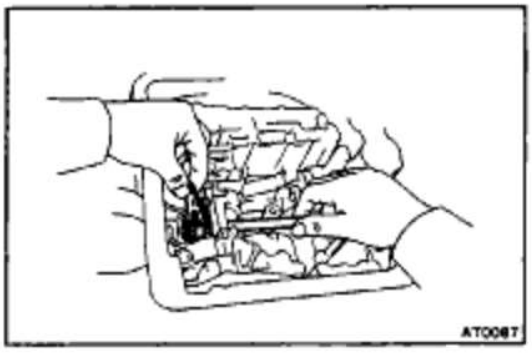
57. REMOVE MANUAL VALVE SHAFT

(a) Remove the retaining spring.





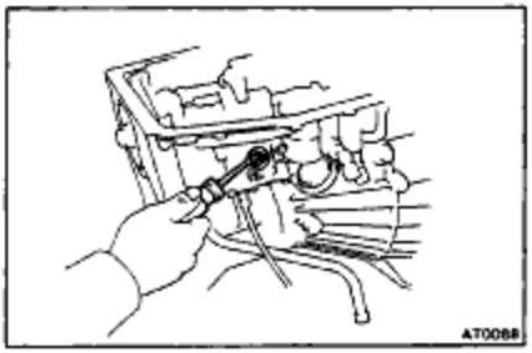
(b) Using a hammer and chisel, pry and turn the collar.
(c) Using a hammer and punch, drive out the pin.



(d) Slide out the shaft and remove the manual valve lever from the case.

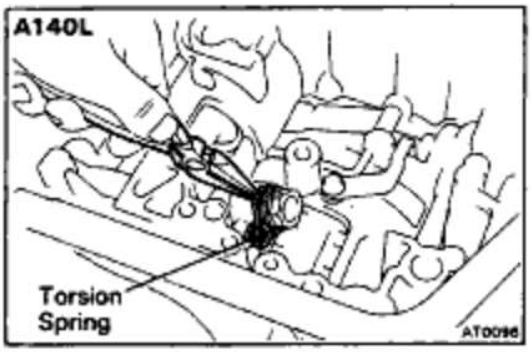
58. REMOVE MANUAL SHAFT OIL SEAL

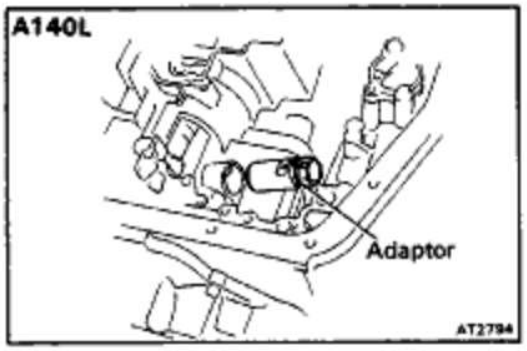
Remove the oil seal with a screwdriver.



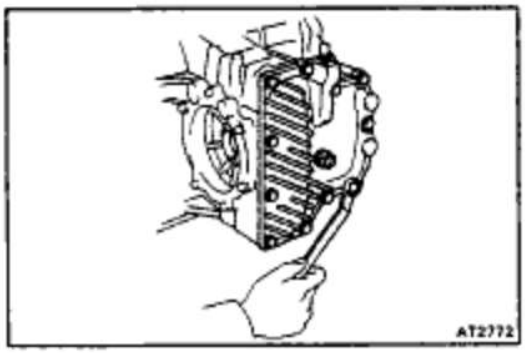
59. (A140L)
REMOVE GOVERNOR PRESSURE ADAPTOR

(a) Remove the torsion spring with long nose pliers.



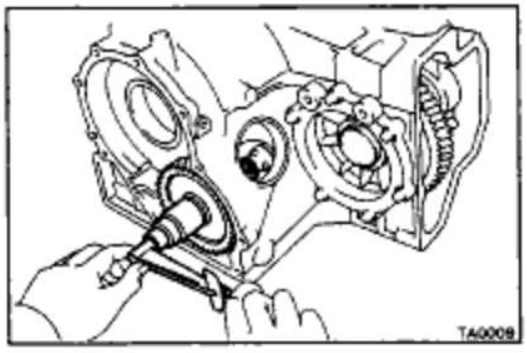


(b) Remove the governor pressure adaptor from the case.



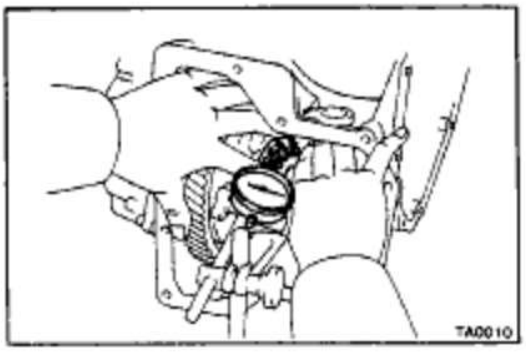
DISASSEMBLY OF DIFFERENTIAL

1. REMOVE CARRIER COVER



2. MEASURE TOTAL PRELOAD

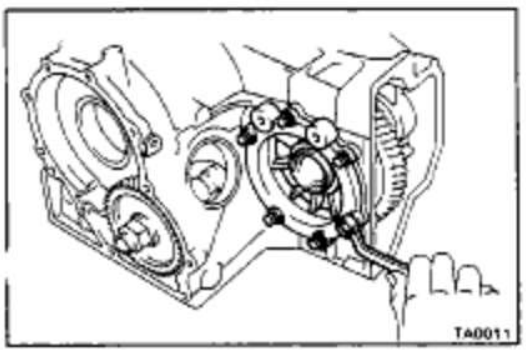
Using a torque meter, measure the total preload, and note the measurement value.



3. MEASURE BACKLASH OF SIDE GEAR

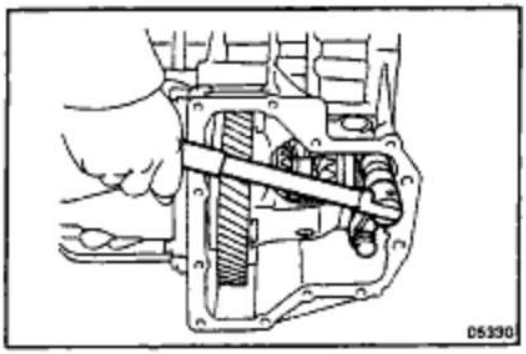
Measure each side gear backlash while holding one pinion toward the case.

Standard backlash:
0.05 – 0.20 mm (0.0020 – 0.0079 in.)



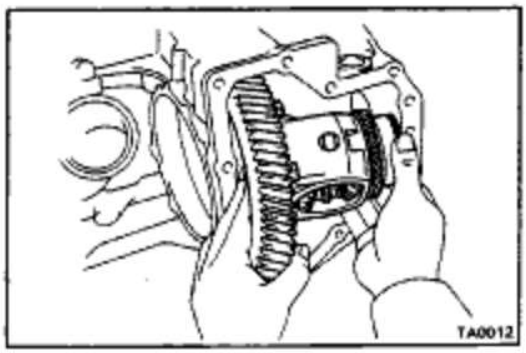
4. REMOVE LH BEARING RETAINER

(a) Remove the six bolts.
(b) Tap the retainer with a plastic hammer to remove it
(c) Remove the O–ring from the retainer.



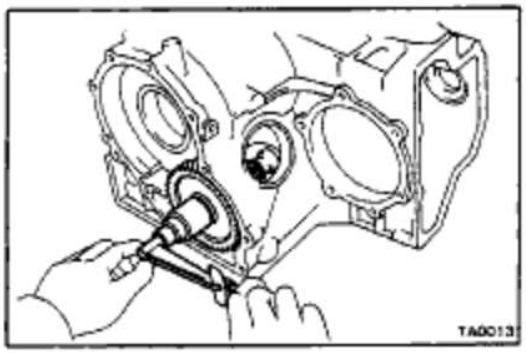
5. REMOVE RH SIDE BEARING CAP

Remove the two bolts and the side bearing cap.



6. REMOVE DIFFERENTIAL CASE, OUTER RACE AND ADJUSTING SHIM

Remove the differential case, the outer race and the adjusting shim from the case.



7. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the drive pinion preload.

Preload (at starting):

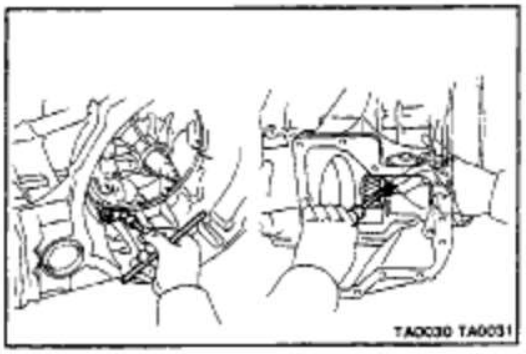
Reused bearing 5 – 8 kg–cm

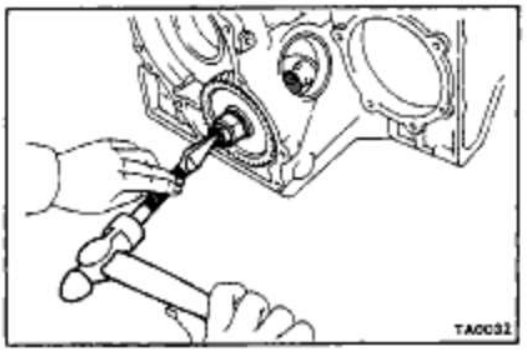
(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

The total preload measured in step 2 minus the drive pinion preload equals 1.5 – 2.0 kg–cm 0.3 – 1.7 in.–lb, 0.1 –0.2N–m).

If the result is not within this specification, the side bearing preload is bad.

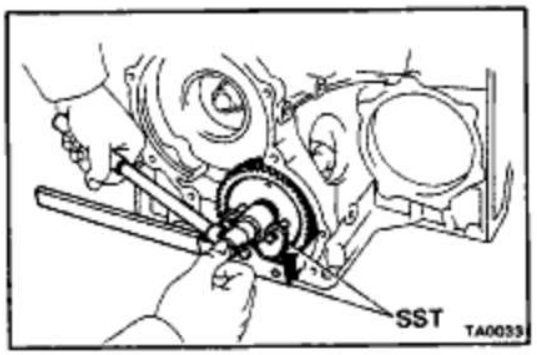
8. REMOVE DRIVE PINION CAP



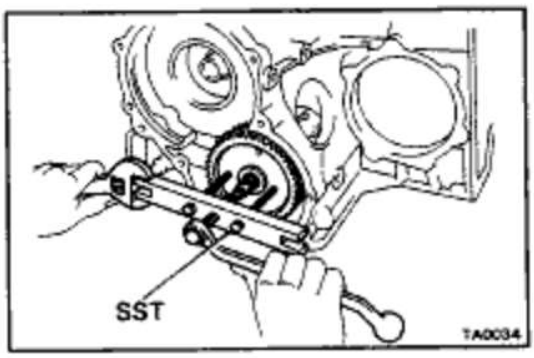


9. REMOVE COUNTER DRIVEN GEAR

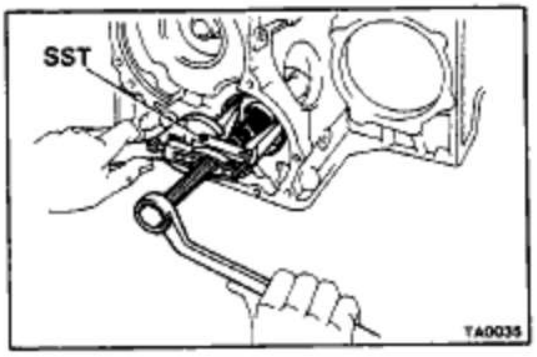
(a) Using a chisel, loosen the staked part of the nut.



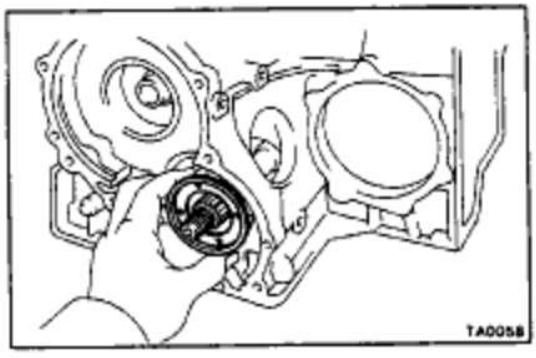
(b) Install SST onto the gear.
SST 09350–32014 (09351–32031)
(c) Using SST to hold the gear, remove the nut.
SST 09330–00021



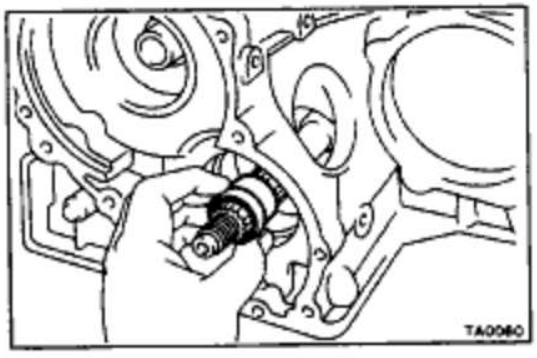
(d) Using SST, remove the gear and bearing.
SST 09350–32014 (09351–32061)



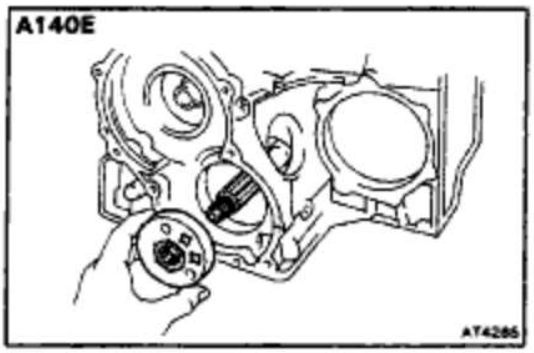
10. REMOVE OUTER RACE FROM CASE
Using SST, remove the outer race.
SST 09350–32014 (09308–10010)



11. REMOVE OIL SLINGER



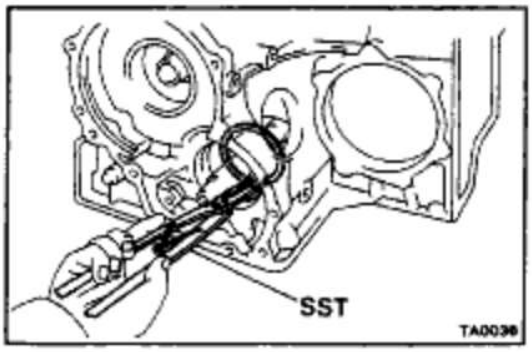
12. REMOVE SPACER

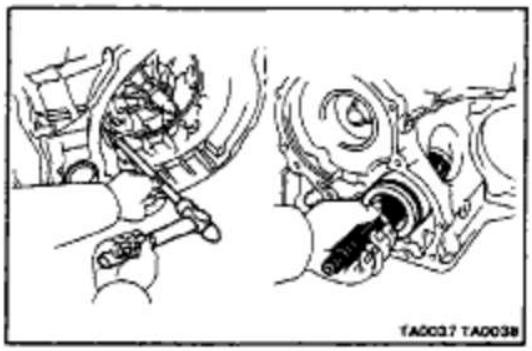


13. (A140E)
REMOVE ROTOR SENSOR

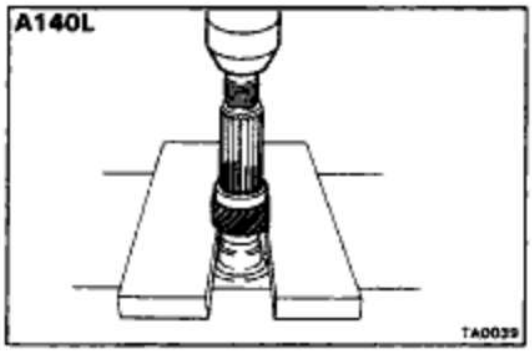
14. REMOVE DRIVE PINION

(a) Using SST, remove the snap ring.'
SST 09350–32014 (09351–32050)

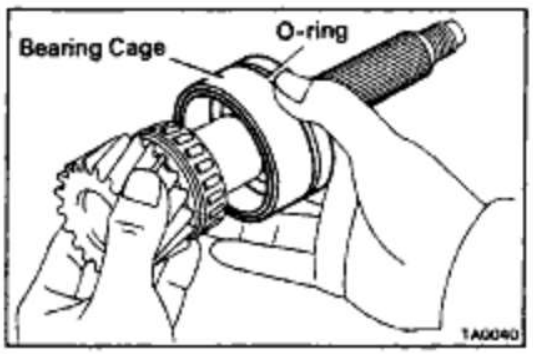




(b) Insert a brass bar into case hole to tap out the drive pinion.
(c) Tap the drive pinion and remove the bearing cage from the bore.

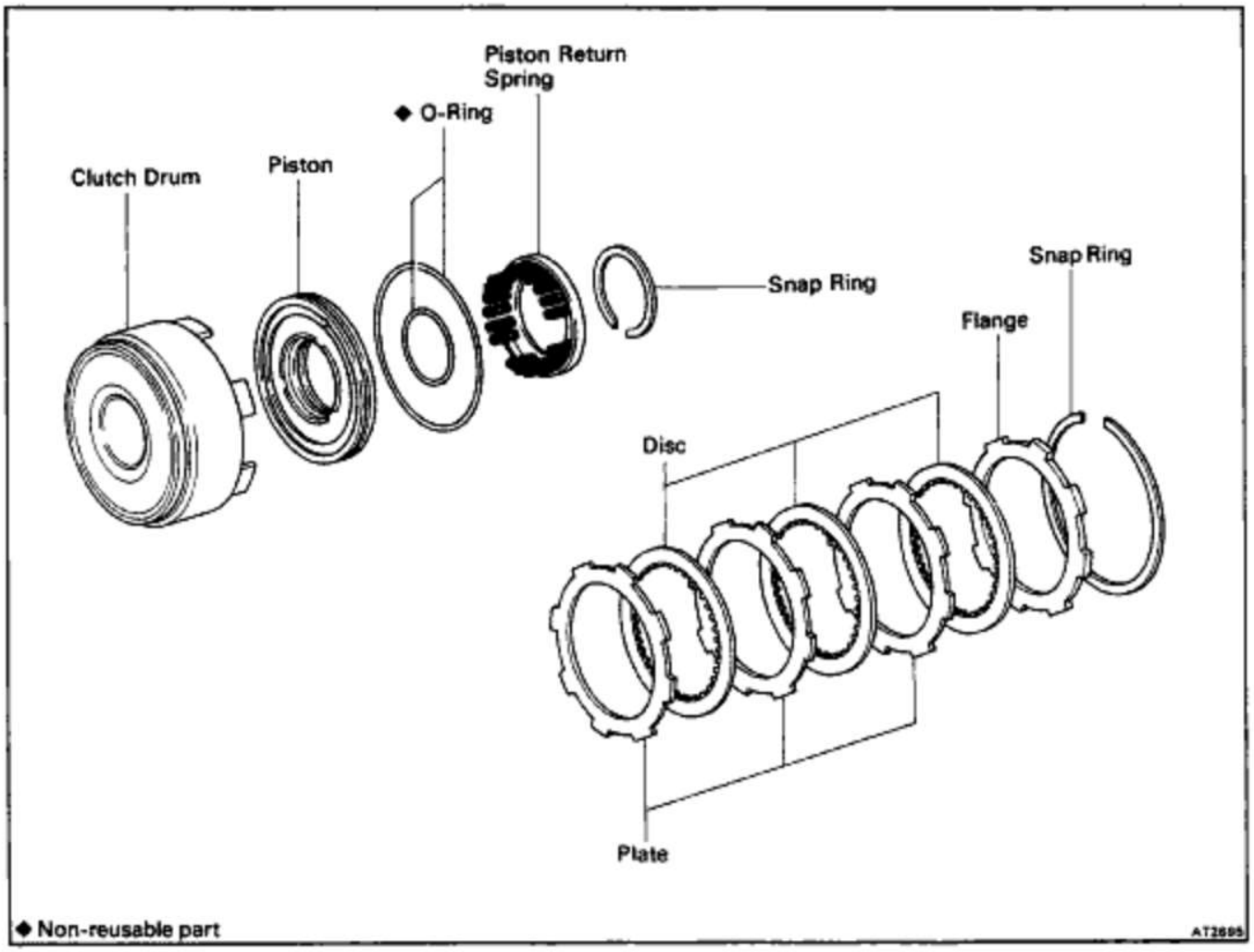


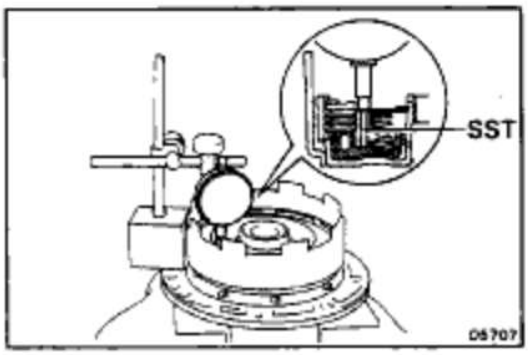
15. (A140L)
REMOVE GOVERNOR BODY DRIVE GEAR
Using a press, press out the governor body drive gear.

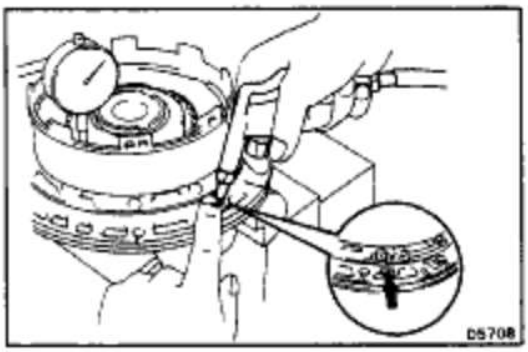


16. REMOVE BEARING CAGE FROM DRIVE PINION
17. REMOVE O–RING FROM BEARING CAGE

Direct Clutch







DISASSEMBLY OF DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

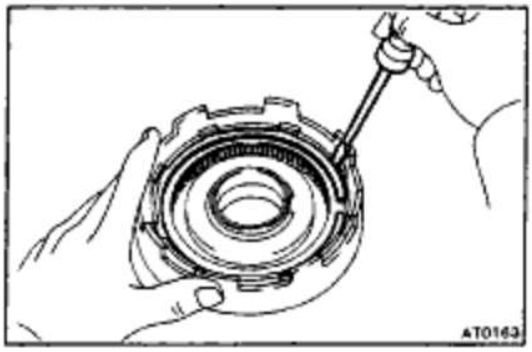
(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

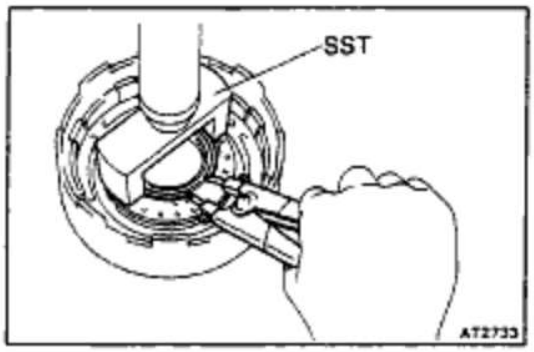
SST 09350–32014 (09351–32190)

Piston stroke: 1.11 – 1.44 mm (0.0437 – 0.0567 in.)

If the piston stroke is greater than the maximum inspect the each component.

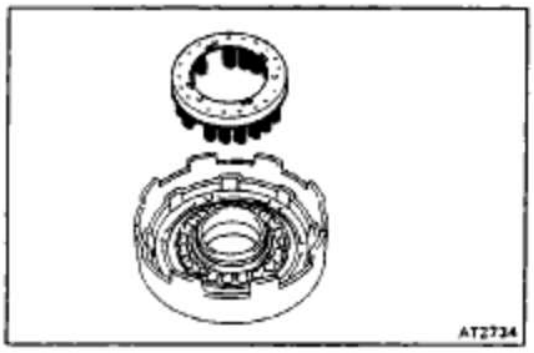


2. REMOVE SNAP RING FROM CLUTCH DRUM
3. REMOVE FLANGE. DISCS AND PLATES

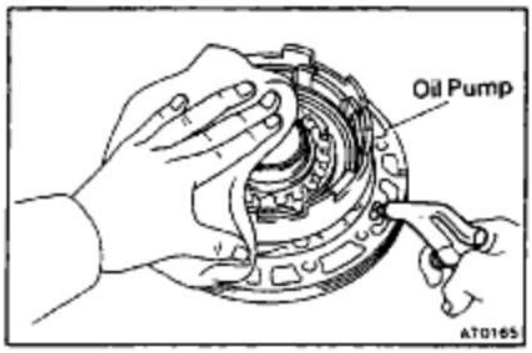


4. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)
(b) Remove the snap ring with the snap ring pliers.

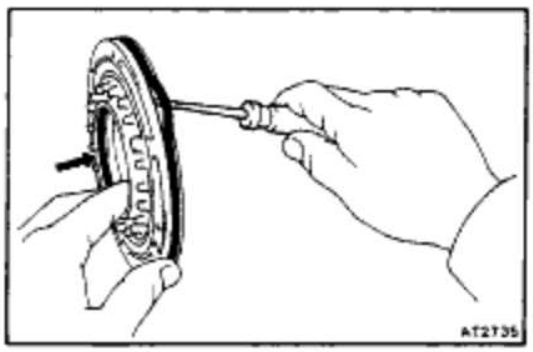


(c) Remove the piston return spring.

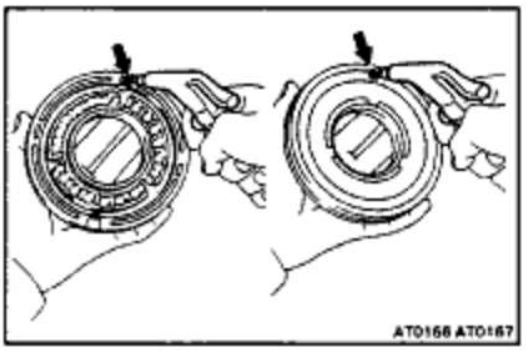


5. REMOVE CLUTCH PISTON

(a) Install the direct clutch onto the oil pump.
(b) Apply compressed air to the oil pump to remove the piston. (if the piston does not come out completely, use needle–nose pliers to remove it.)
(c) Remove the direct clutch from the oil pump.



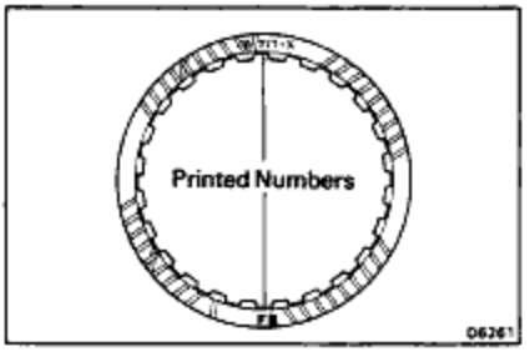
(d) Remove the two O–rings from the piston.



INSPECTION OF DIRECT CLUTCH

1. INSPECT CLUTCH PISTON

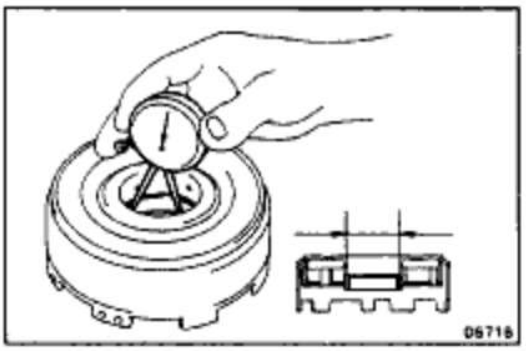
(a) Check that the check ball is free by shaking the piston.
(b) Check that the valve does not leak by applying low pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



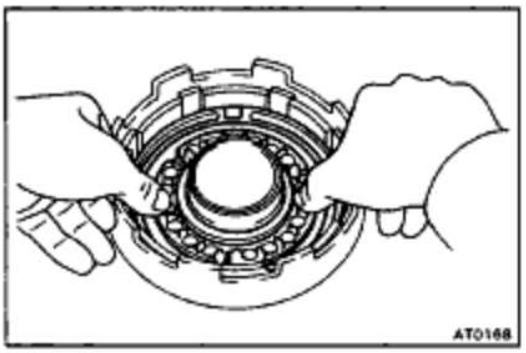
3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the direct clutch bushing.
Maximum inside diameter: 47.07 mm (1.8531 in.)
If the inside diameter is greater than the maximum, replace the direct clutch.

ASSEMBLY OF DIRECT CLUTCH

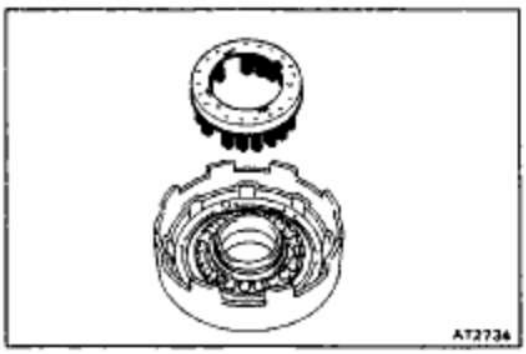
1. INSTALL CLUTCH PISTON IN DIRECT CLUTCH DRUM

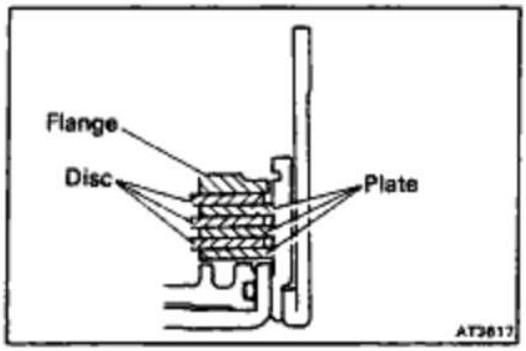
(a) Install new O–rings to the piston. Coat the O–ring¿¿c with ATF.
(b) Being careful not to damage the O–rings, press the piston into the drum with the cup side up.



2. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring onto the piston
(b) Place SST on the spring retainer, and compress the return spring with a shop press.
SST 09350–32014 (09351–32070)
(c) Install the snap ring with the snap ring pliers. Be surf the end gap of snap ring is not aligned with the spring retainer claw.

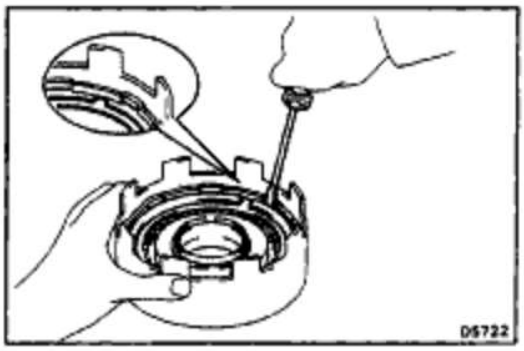




3. INSTALL PLATES, DISCS AND FLANGE

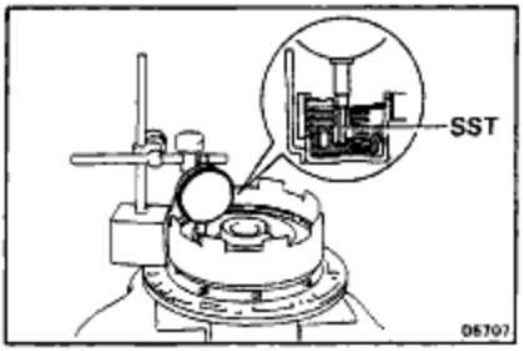
(a) Install plates and discs.
Install in order: P=Plate D=Disc
P–D–P–D–P–D

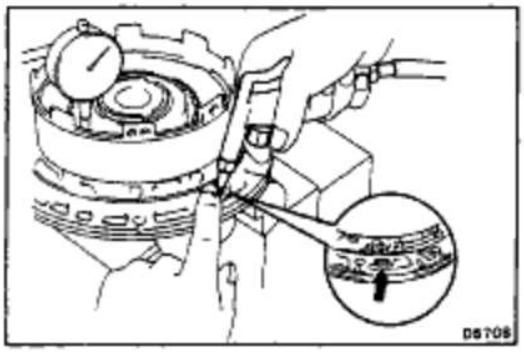
(b) Install the flange with the flat end facing downward.



4. INSTALL SNAP RING

Check that the end gap of the snap ring is not aligned with one of the cutouts.





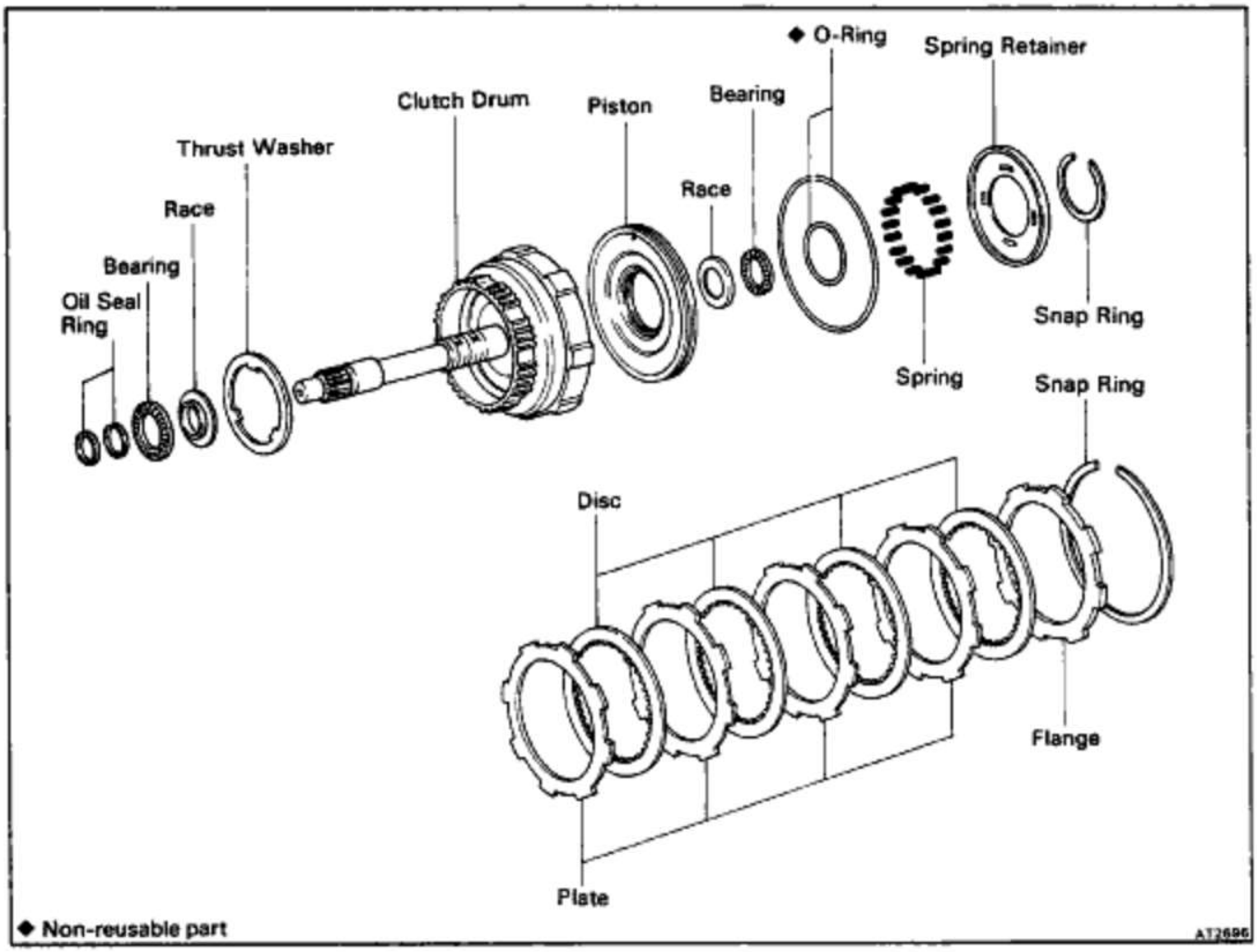
5. RECHECK PISTON STROKE OF DIRECT CLUTCH

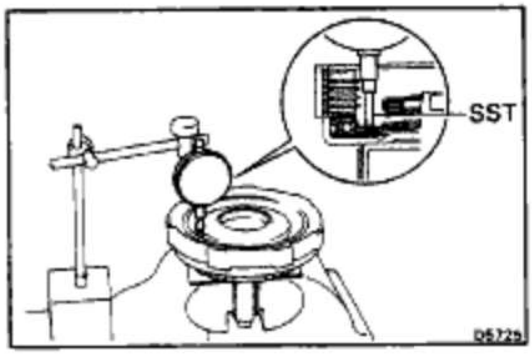
(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.
SST 09350–32014 (09351–32190)
Piston stroke: 1.11 – 1.44 mm 10.0437 – 0.0567 in.)
If the piston stroke nonstandard, select another flange.

HINT: There are two different flange thickness.
Flange thickness: 2.60 mm (0.1024 in.)
3.00 mm (0.1181 in.)

Forward Clutch





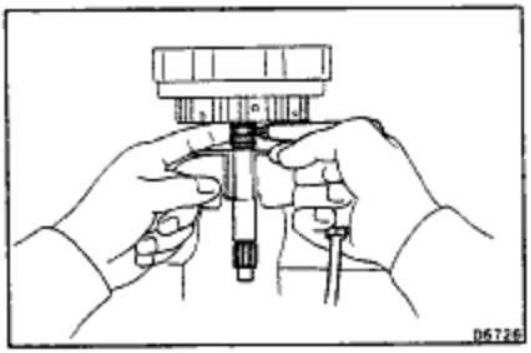
DISASSEMBLY OF FORWARD CLUTCH

1. CHECK PISTON STROKE OF FORWARD CLUTCH

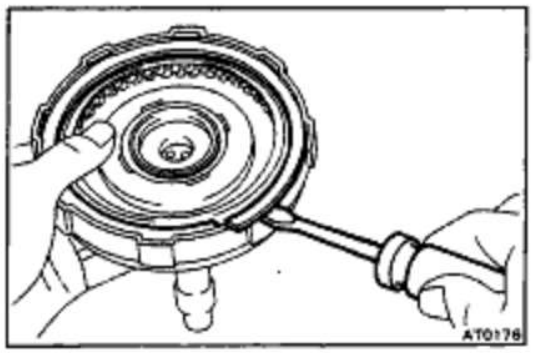
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

SST 09350–32014 (09351–32190)

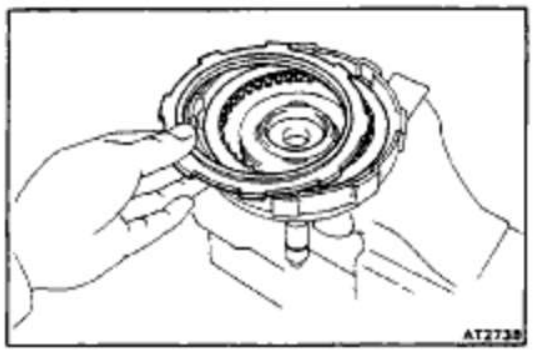
Piston stroke: 1.41 – 1.82 mm (0.0555 – 0.0717 in.)



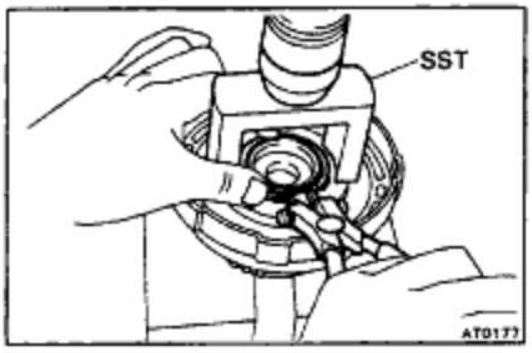
If the piston stroke is greater than the maximum inspect the each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM



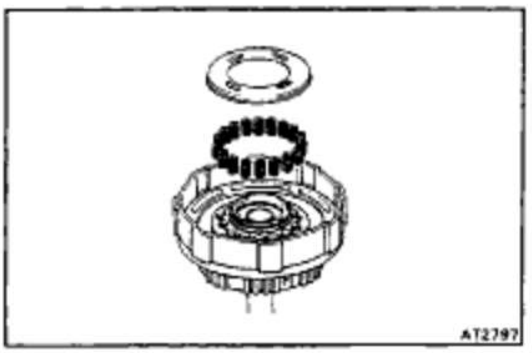
3. REMOVE FLANGE, DISCS AND PLATES



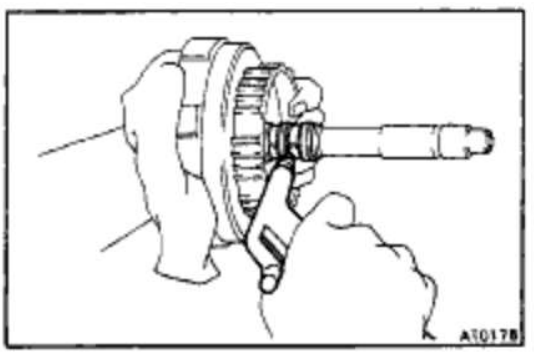
4. REMOVE RETURN SPRINGS

(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring with the snap ring pliers.

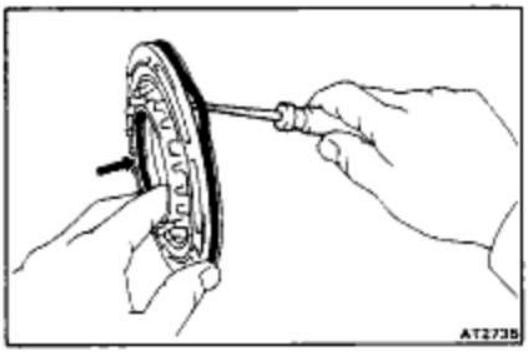


(c) Remove the spring retainer and eighteen return springs.

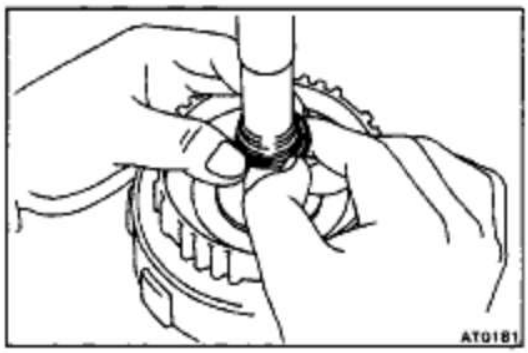


5. REMOVE CLUTCH PISTON

(a) Apply compressed air into the oil passage to remove the piston.
if the piston does not come out, use needle–nose pliers to remove it.

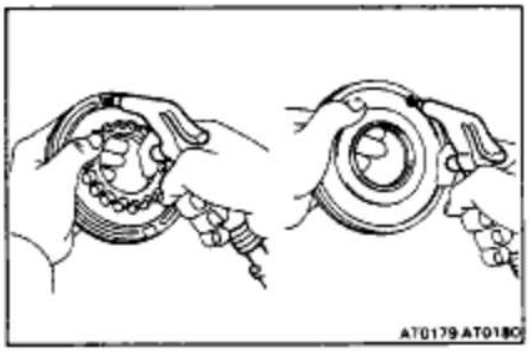


(b) Remove the two O–rings from the piston.



6. IF NECESSARY, REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the shaft.

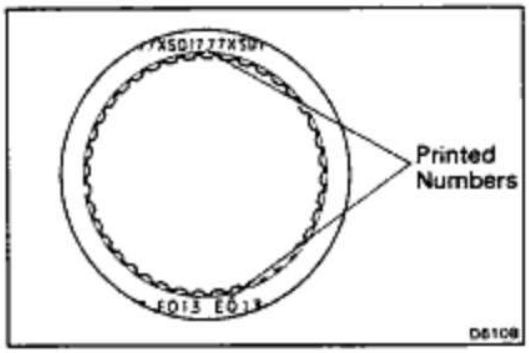


INSPECTION OF FORWARD CLUTCH

1. INSPECT CLUTCH PISTON

(a) Check that the check ball is free by shaking the piston.

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

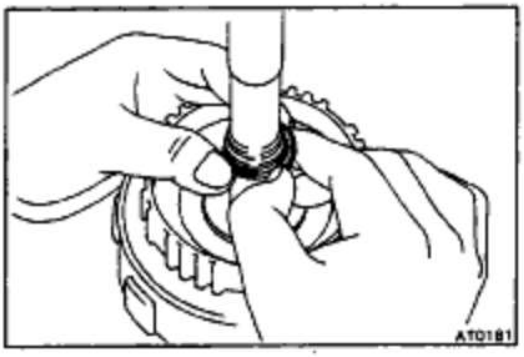


2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates are flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, o even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.



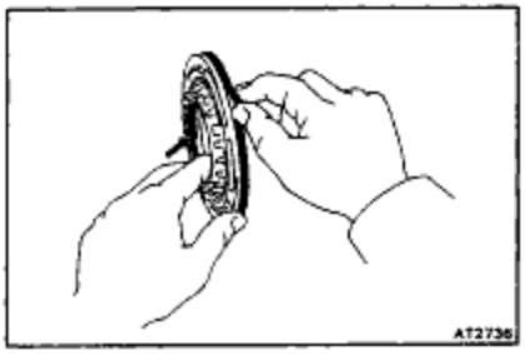
ASSEMBLY OF FORWARD CLUTCH

1. INSTALL OIL SEAL RINGS

Instal! the two oil seal rings to the shaft.

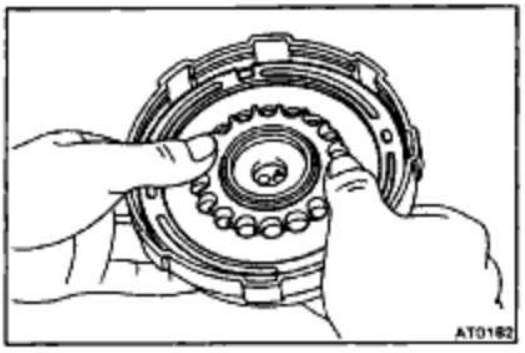
NOTICE: Do not spread the ring ends more than necessary.

HINT: After installing the oil seal rings, check that they move smoothly.



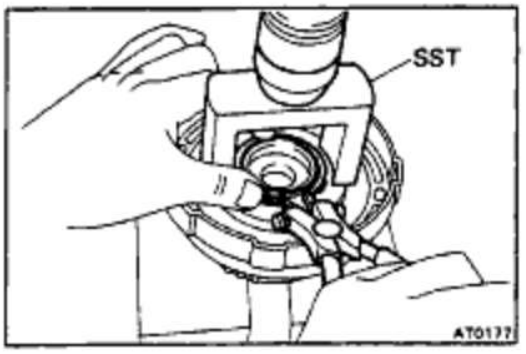
2. INSTALL CLUTCH PISTON TO CLUTCH DRUM

(a) Install the two new O–rings to the piston.



(b) Coat the O–rings with ATF.

(c) Press the piston into the drum with the cup side up, being careful not to damage the O–rings.

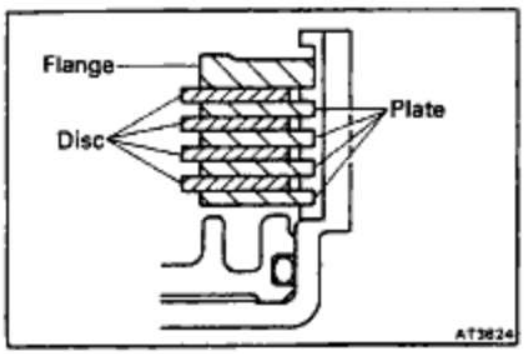


3. INSTALL PISTON RETURN SPRINGS

(a) Place the eighteen springs, spring retainer and snap ring onto the piston.

(b) Place SST on the spring retainer, and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

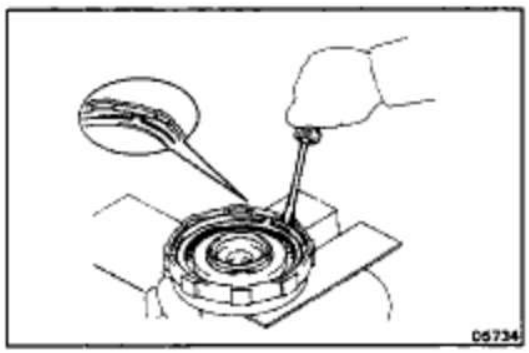
(c) Install the snap ring with snap ring pliers.
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



4. INSTALL PLATES, DISCS AND FLANGE

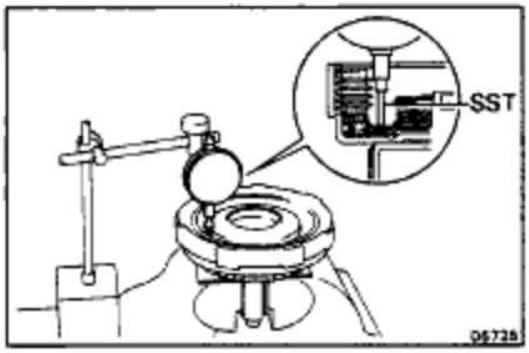
(a) Install the plates and discs.
Install in order: P=Plate D= Disc
P–D–P–D–P–D–P–D

(b) Install the flange with the flat end facing downward.



5. INSTALL SNAP RING

Check that the end gap of snap ring is not aligned with one of the cutouts.



6. RECHECK PISTON STROKE OF FORWARD CLUTCH

Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

SST 09350–32014 (09351–32190)

Piston stroke: 1.41 – 1.82 mm (0.0555 – 0.0717 in.)

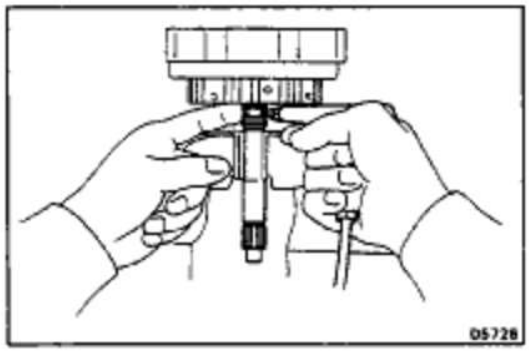
If the piston stroke is less than the limit, parts may be misassembled and reinstall them.

If the piston stroke nonstandard, select another flange.

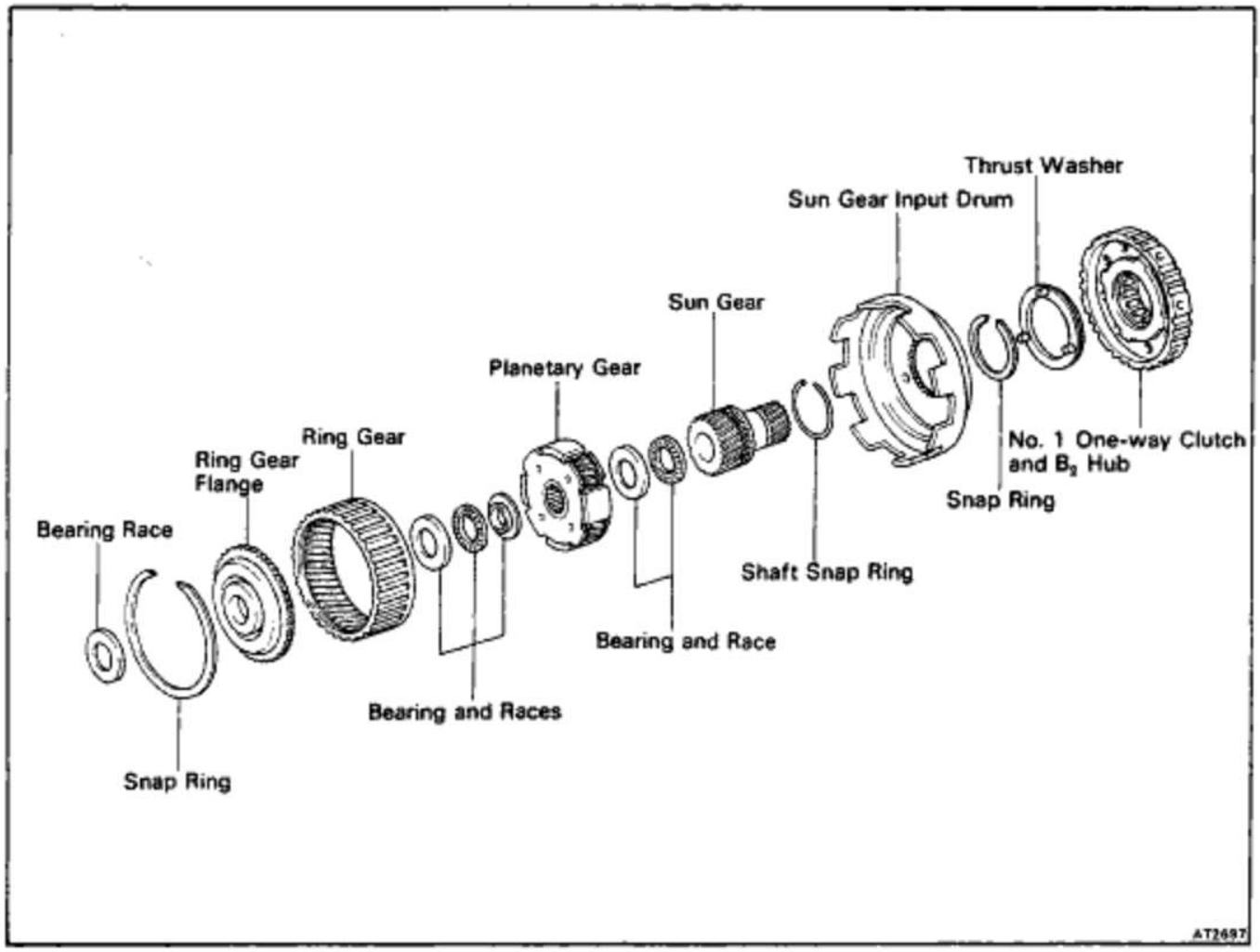
HINT: There are two different flange thickness.

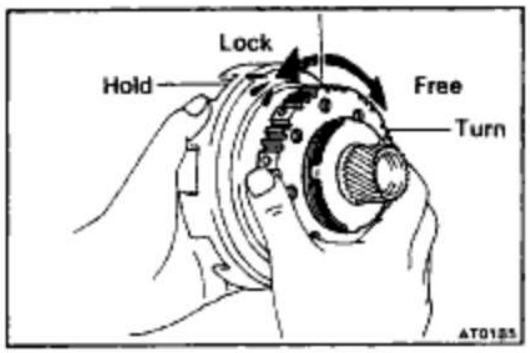
Flange thickness: 3.00 mm (0.1181 in.)

3.37 mm 10.1327 in.)



Front Planetary Gear

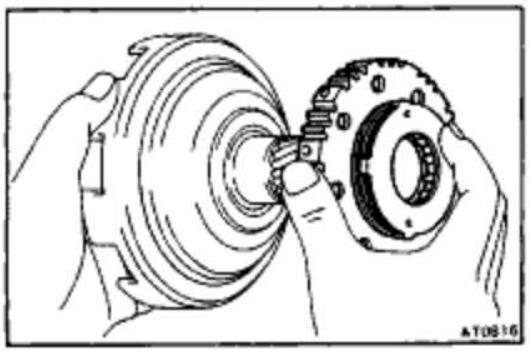




DISASSEMBLY OF ONE–WAY CLUTCH AND SUN GEAR

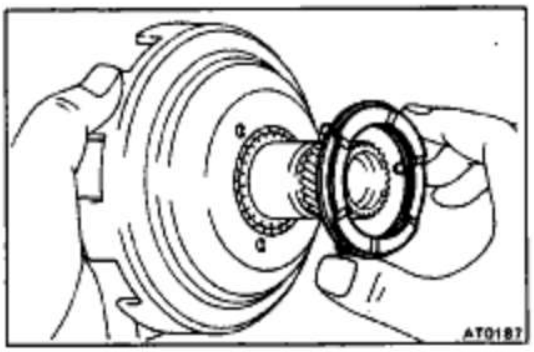
7. CHECK OPERATION OF ONE–WAY CLUTCH

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

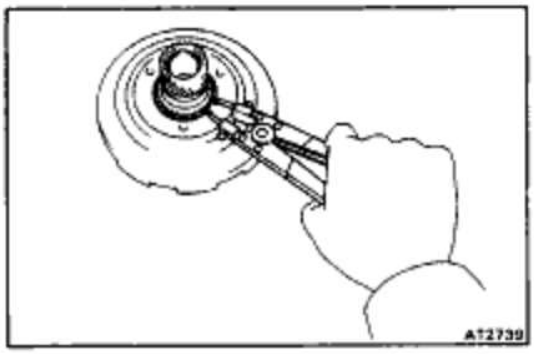


2. REMOVE SECOND BRAKE HUB AND ONE–WAY CLUTCH FRONT SUN GEAR .

While turning the hub clockwise, remove the one–way clutch from the sun gear.



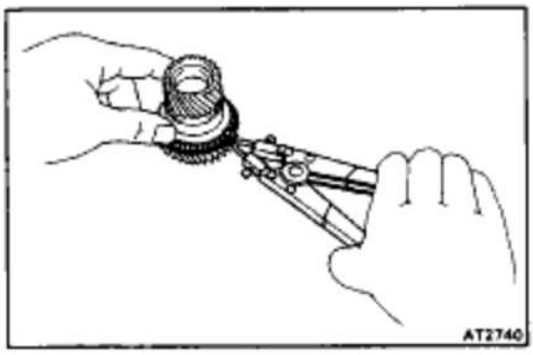
3. REMOVE THRUST WASHER FROM SUN GEAR INPUT DRUM



4. REMOVE SUN GEAR FROM DRUM

(a) Using the snap ring pliers, remove the snap ring from the drum.

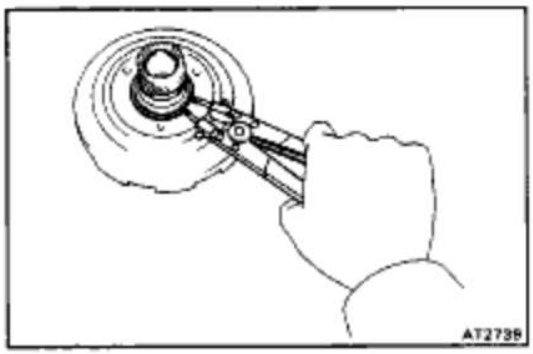
(b) Remove the sun gear from the drum.



5. REMOVE SHAFT SNAP RING

Using the snap ring pliers, remove the shaft snap ring from the sun gear.

ASSEMBLY OF ONE–WAY CLUTCH AND SUN GEAR

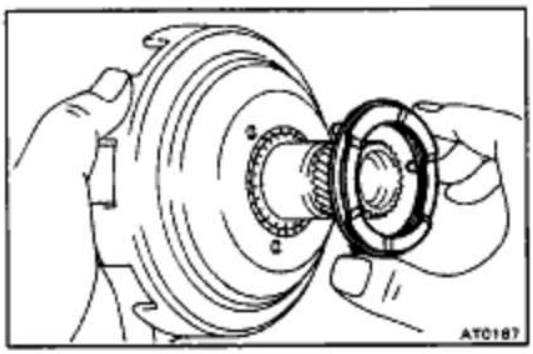


1. INSTALL SHAFT SNAP RING TO SUN GEAR

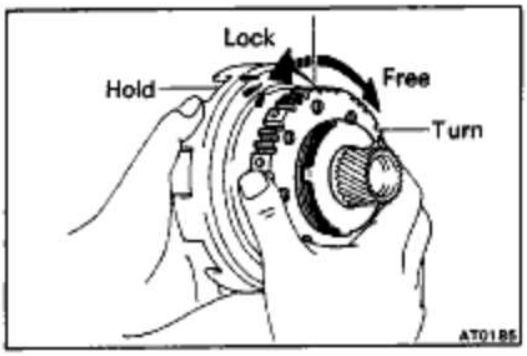
2. INSTALL SUN GEAR TO DRUM

(a) Install the sun gear to the drum.

(b) Using the snap ring plies, install the snap ring to the drum.



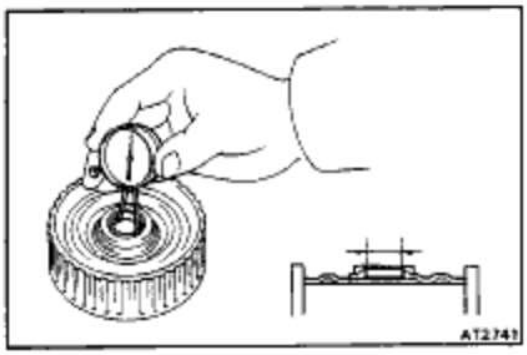
3. INSTALL THRUST WASHER TO SUN GEAR INPUT DRUM



4. INSTALL ONE–WAY CLUTCH AND SECOND BRAKE HUB ON SUN GEAR

While turning the hub clockwise, slide the one–way clutch onto the sun gear.

5. RECHECK OPERATION OF ONE–WAY CLUTCH



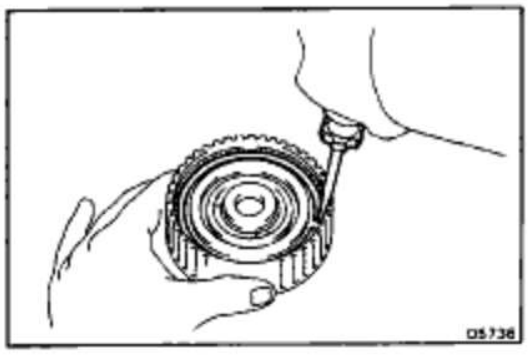
INSPECTION OF PLANETARY RING GEAR

1. INSPECT RING GEAR FLANGE BUSHING

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

Standard inside diameter: 19.025 – 19.050 mm (0.7490 – 0.7500 in.)

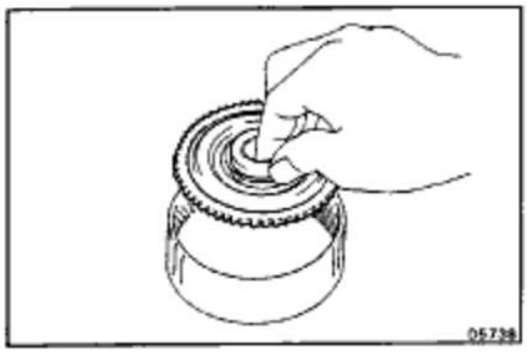
If the inside diameter is greater than the maximum, replace the flange.



2. REMOVE RING GEAR FLANGE

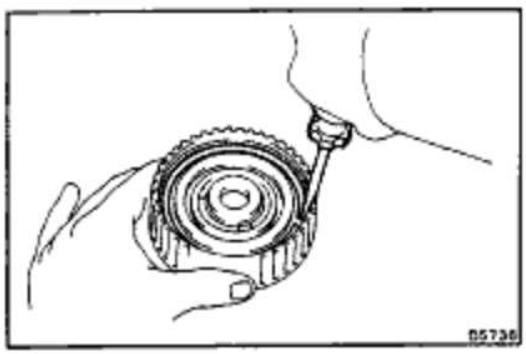
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

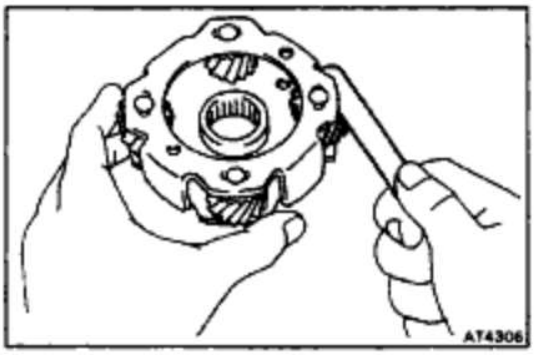


3. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.



(b) Using a screwdriver, install the snap ring.



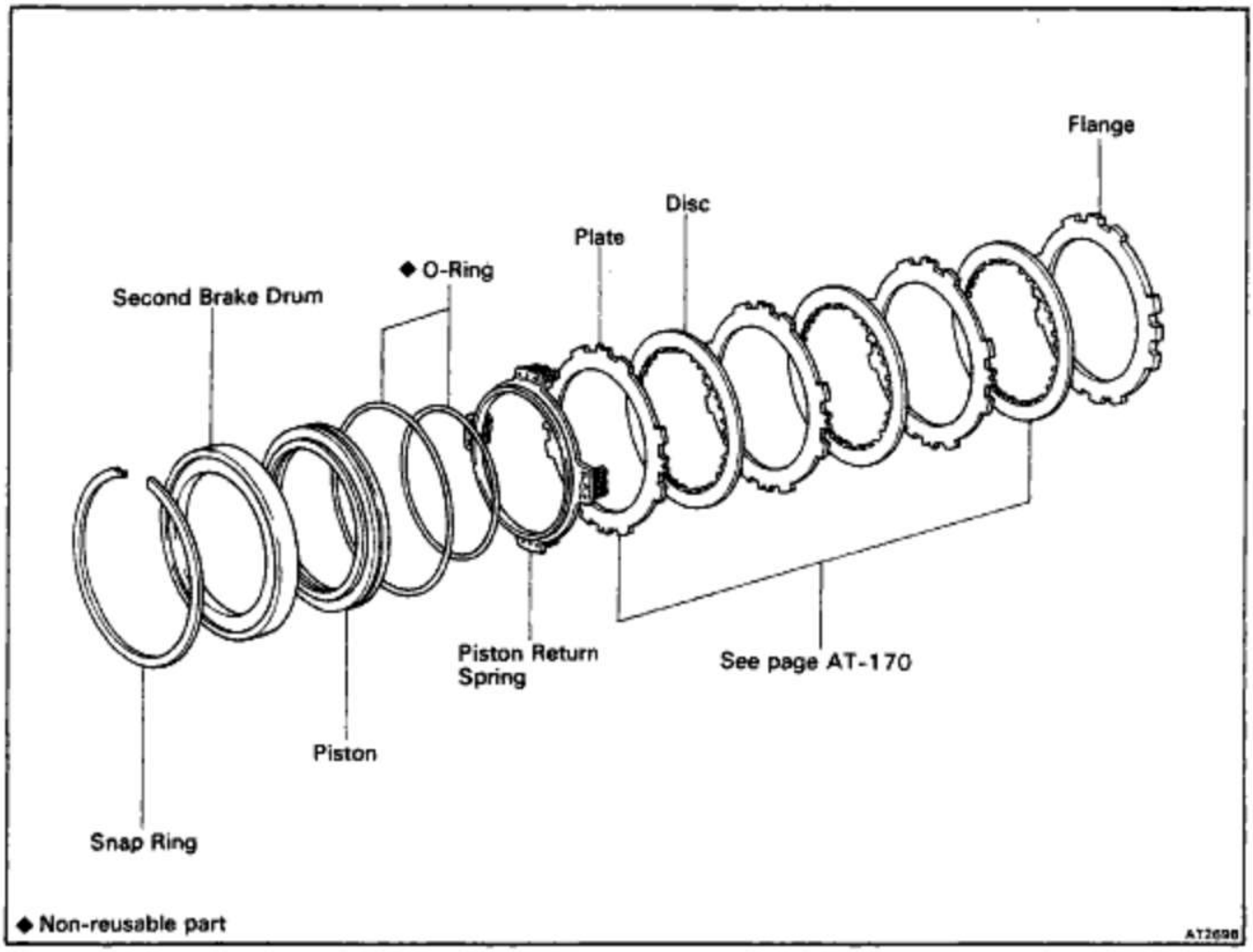
INSPECTION OF FRONT PLANETARY GEAR

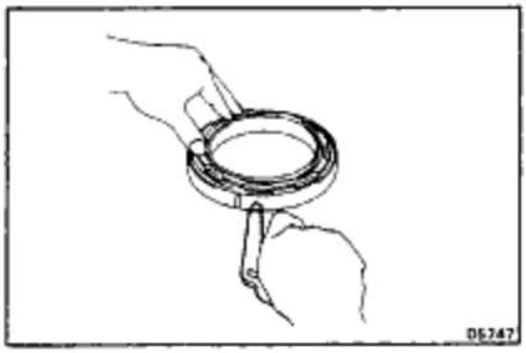
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.20 – 0.50 mm (0.0079 – 0.0197 in.)

Second Brake

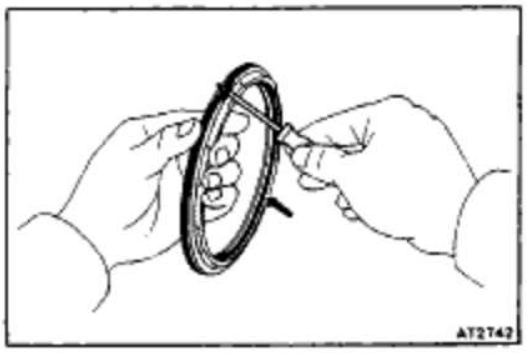




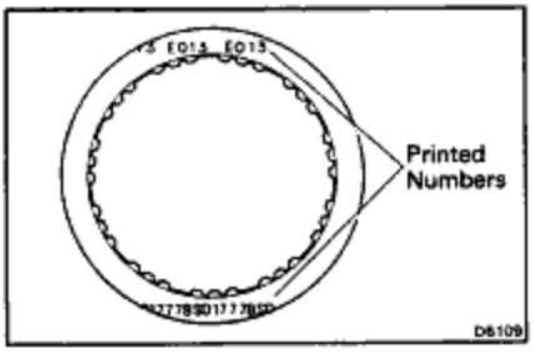
DISASSEMBLY OF SECOND BRAKE PISTON

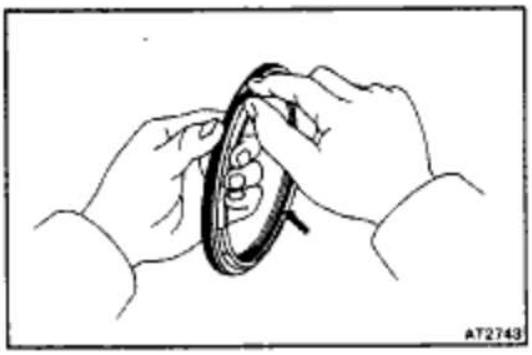
REMOVE SECOND BRAKE PISTON

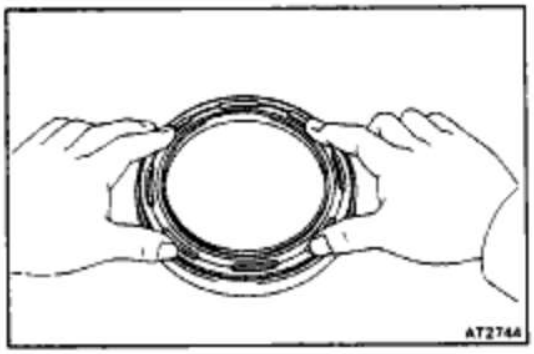
(a) Apply compressed air to the oil hole to remove the piston.



(b) Remove the two O–rings from the piston.







INSPECTION OF SECOND BRAKE COMPONENT

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surface of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least two hours.

ASSEMBLY OF SECOND BRAKE PISTON

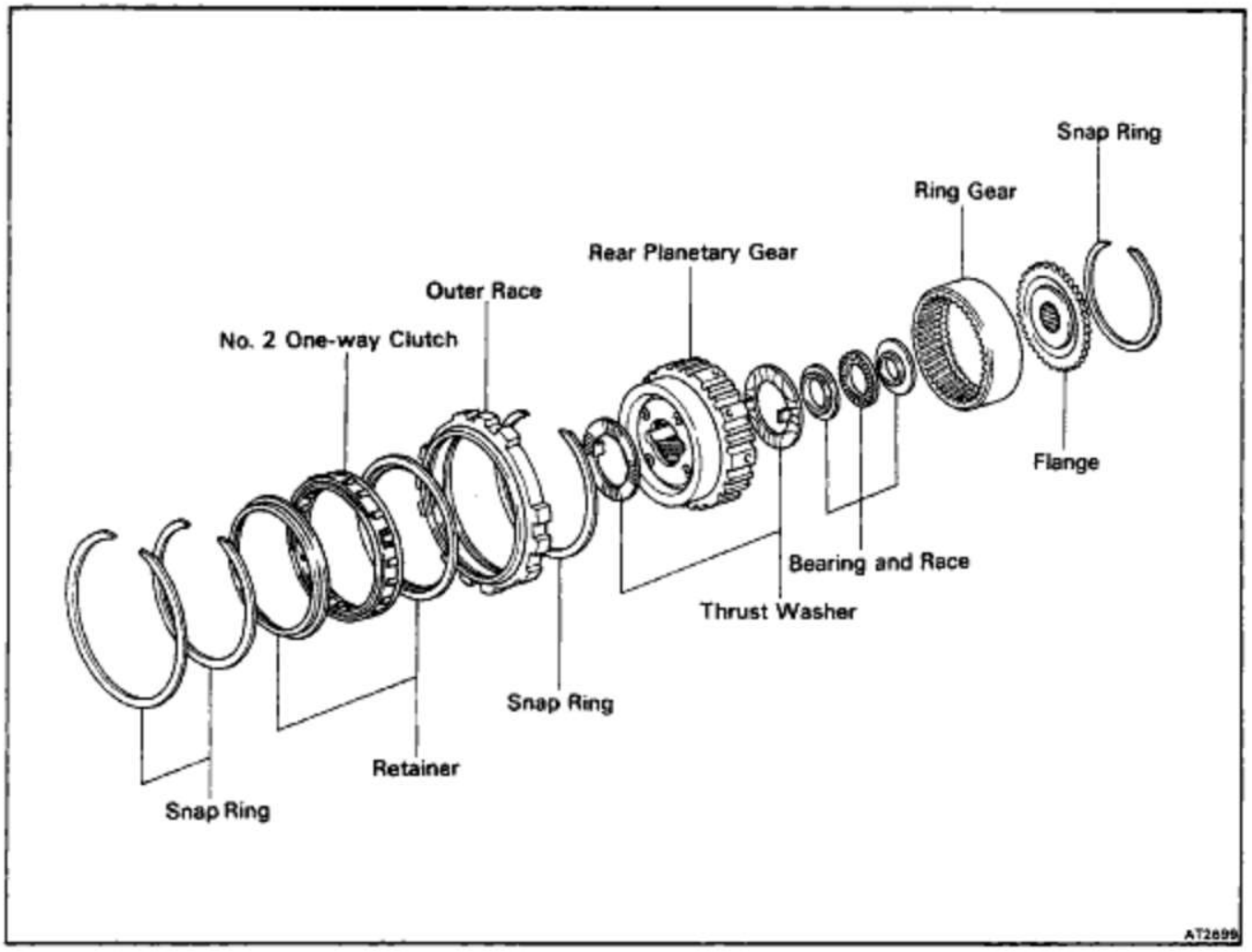
INSTALL PISTON

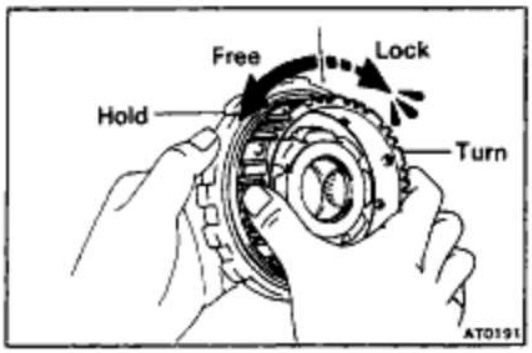
(a) Coat a new O–ring with ATF.

(b) Install the two O–rings on the piston.

(c) Press the piston into the drum, being careful not to damage the O–rings.

Rear Planetary Gear

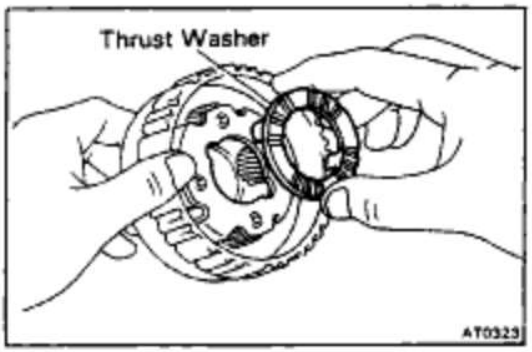




DISASSEMBLY OF ONE–WAY CLUTCH

1. CHECK OPERATION OF ONE–WAY CLUTCH

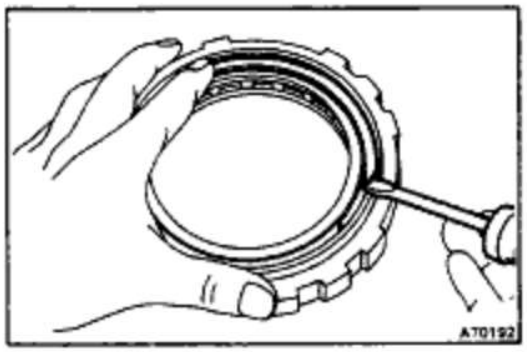
Hold the outer race and turn the hub. The hub should turn freely counterclockwise and should lock clockwise.



2. SEPARATE ONE–WAY CLUTCH AND PLANETARY GEAR

3. REMOVE THRUST WASHERS

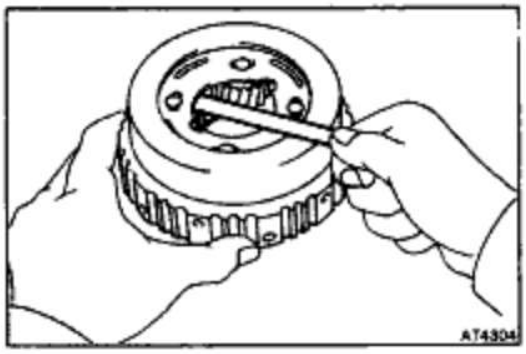
Remove the two thrust washers from the both sides of planetary gear.



4. REMOVE ONE–WAY CLUTCH FROM OUTER RACE

(a) Remove the two snap rings and retainers from the both sides.

(b) Remove the one–way clutch from the outer race.

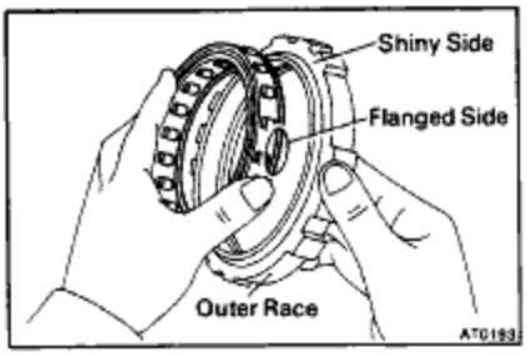


INSPECTION OF REAR PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

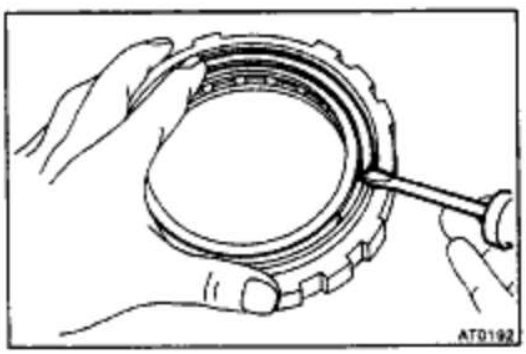
Standard clearance: 0.20 – 0.50 mm (0.0079 – 0.0197 in.)



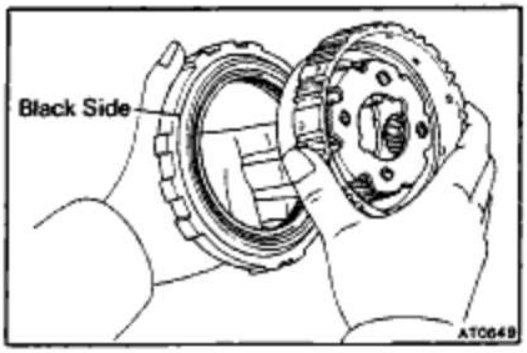
ASSEMBLY OF ONE–WAY CLUTCH

1. INSTALL ONE–WAY CLUTCH

(a) Install the one–way clutch into the outer race, facing the flanged side of the one–way clutch toward the shiny side of the outer race.

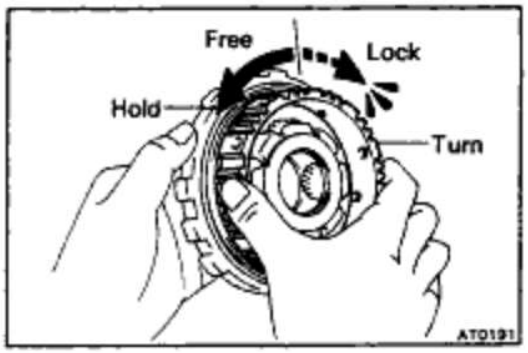


(b) Install the two retainers and snap rings to the bott sides.

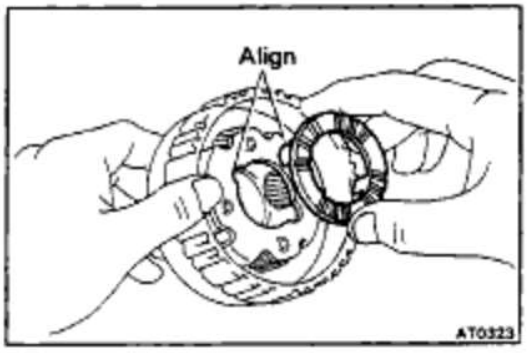


2. INSTALL PLANETARY GEAR INTO ONE–WAY CLUTCH

Install the planetary gear into the one–way clutch, facing the inner race of the planetary gear toward the black side of the one–way clutch outer race.



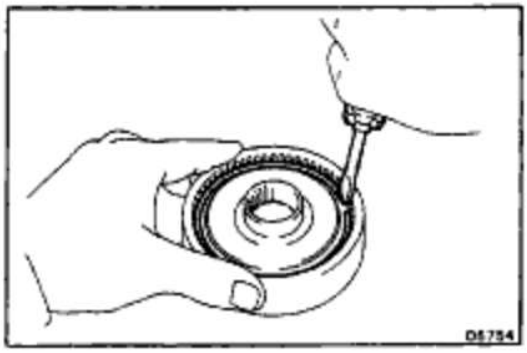
3. CHECK OPERATION OF ONE–WAY CLUTCH



4. INSTALL THRUST WASHERS

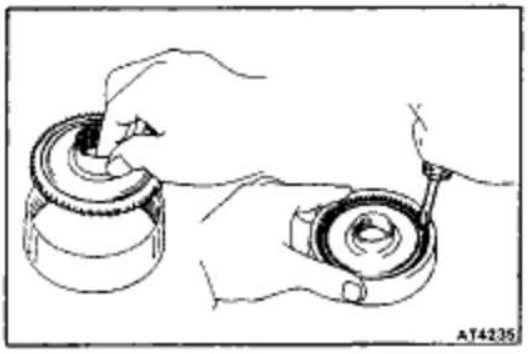
(a) Coat the two thrust washers with petroleum jelly.
(b) Align the tab of the washers with the hollow of the carrier.

REPLACEMENT OF RING GEAR FLANGE



1. REMOVE RING GEAR FLANGE

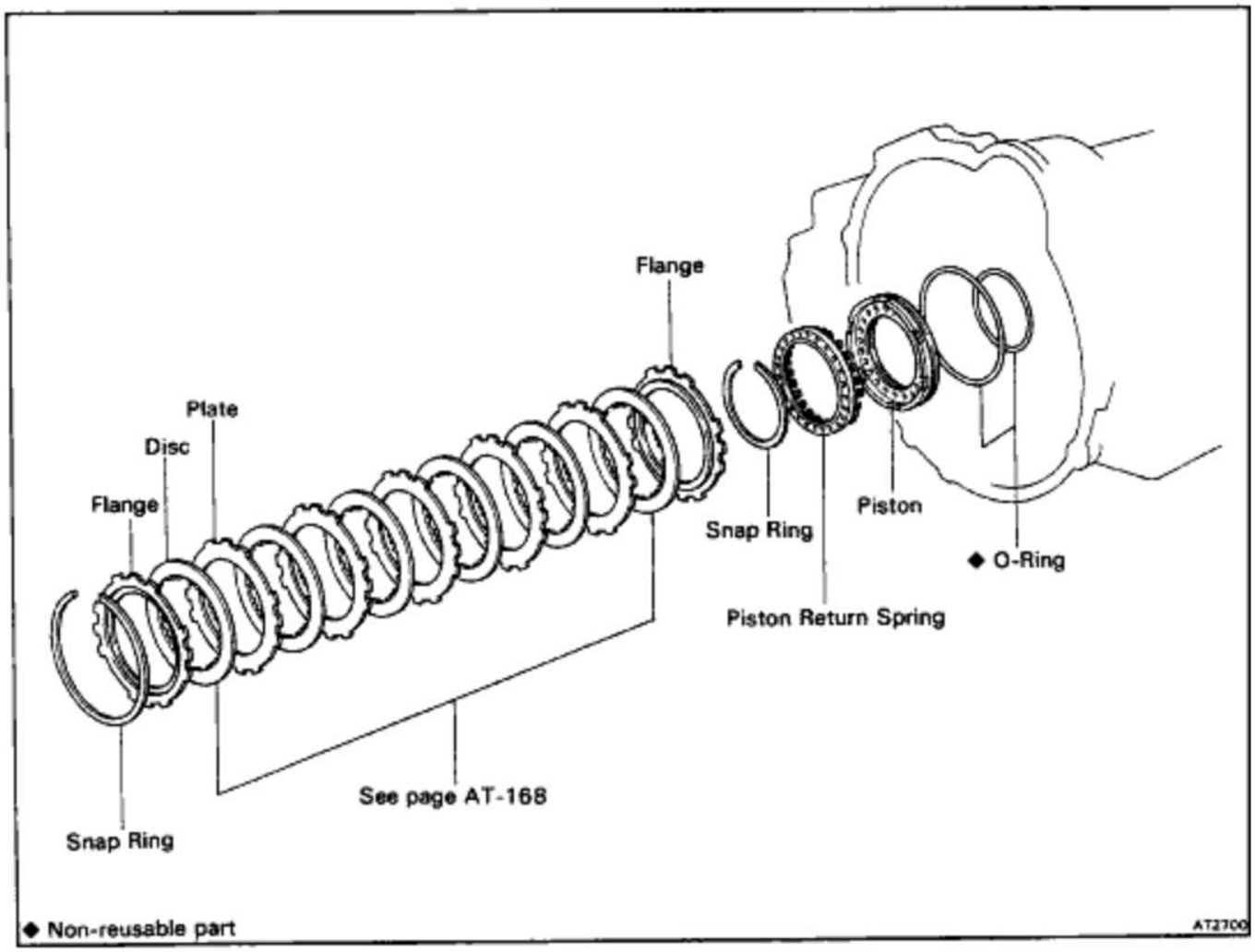
(a) Using a screwdriver, remove the snap ring.
(b) Remove the flange from the ring gear.

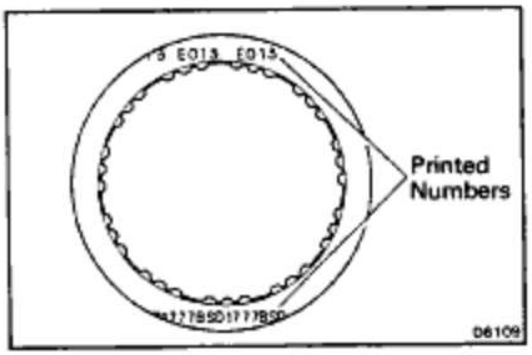


2. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.
(b) Using a screwdriver, install the snap ring.

First and Reverse Brake





INSPECTION OF FIRST AND REVERSE BRAKE COMPONENT

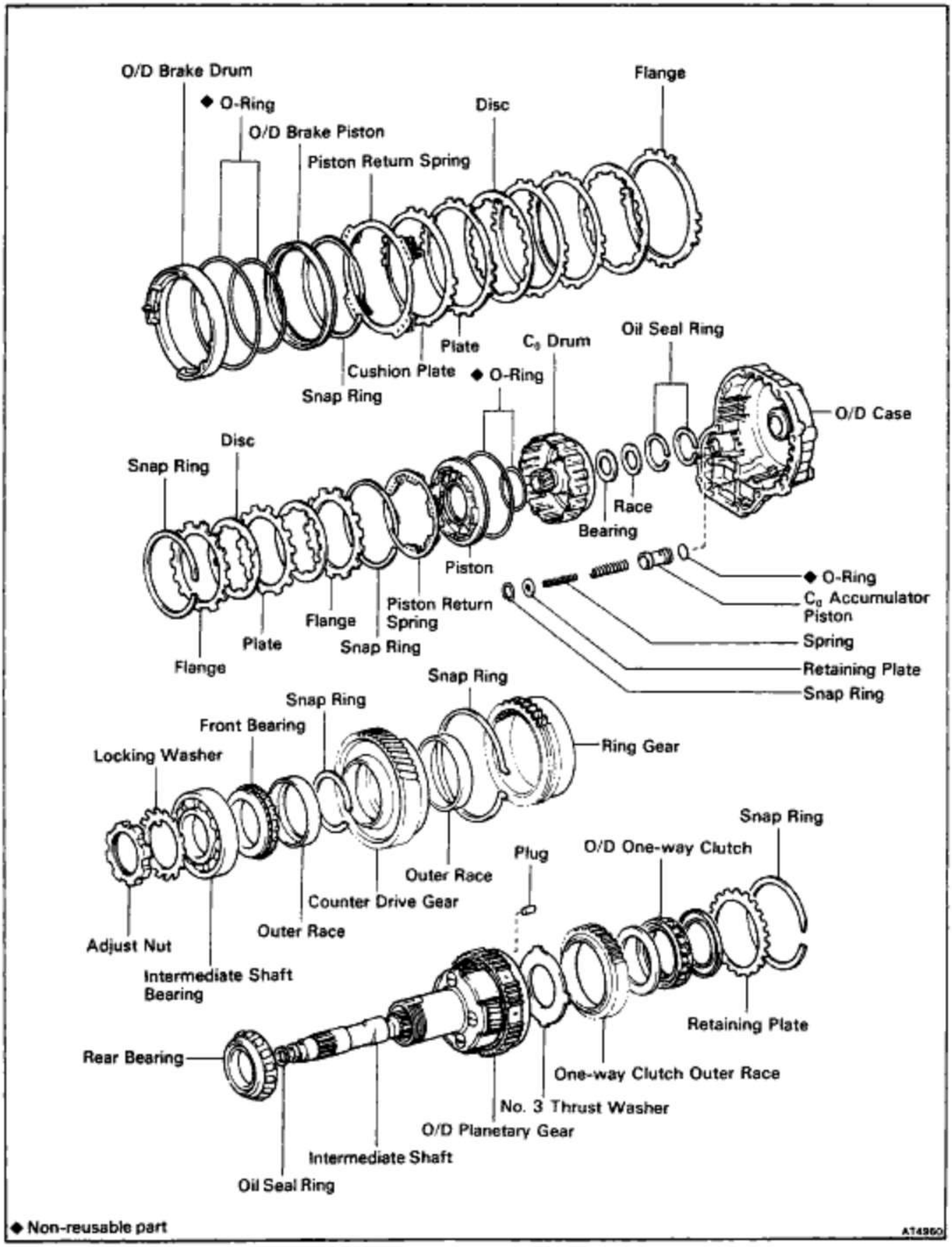
INSPECT DISCS, PLATES AND FLANGES

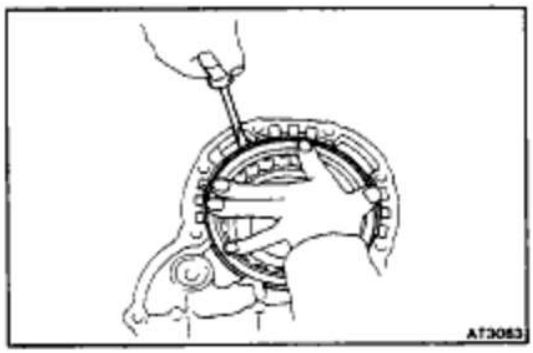
Check if the sliding surfaces of the discs, plates an flanges are worn or burnt. If necessary, replace them.

HINT:

- If the lining of the disc is exfoliated or discolored, c even a part of the printed numbers are defaced, replace all discs.
- Before assembly new discs, soak them in ATF for at least fifteen minutes.

Overdrive Unit

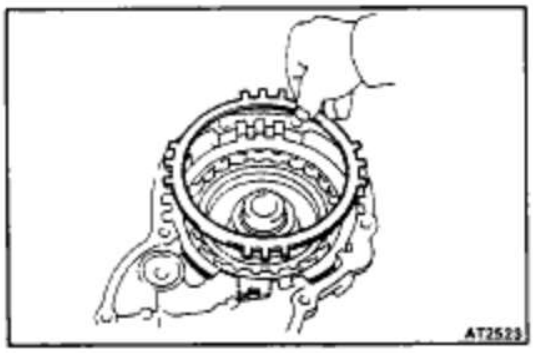




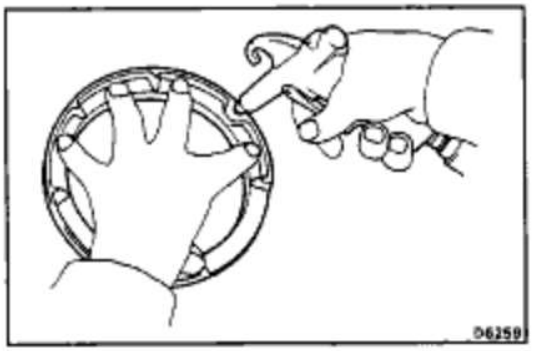
DISASSEMBLY OF OVERDRIVE BRAKE

1. REMOVE PISTON RETURN SPRING

(a) While pushing the return spring, remove the snap ring with a screwdriver.
(b) Remove the piston return spring.

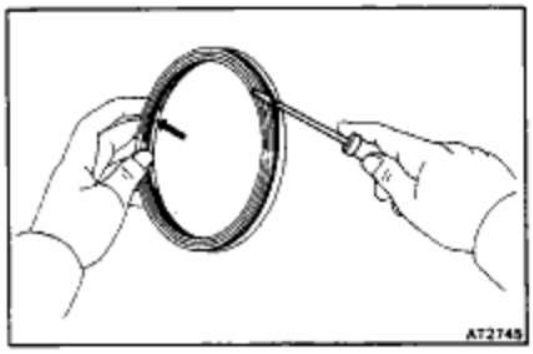


2. REMOVE CUSHION PLATE, PLATES, DISCS AND FLANGE



3. REMOVE PISTON FROM DRUM

Apply compressed air to oil hole to remove the piston.
HINT: Blow with the gun slightly away from the oil hole, and be careful that the piston does not tilt.



4. REMOVE O–RINGS

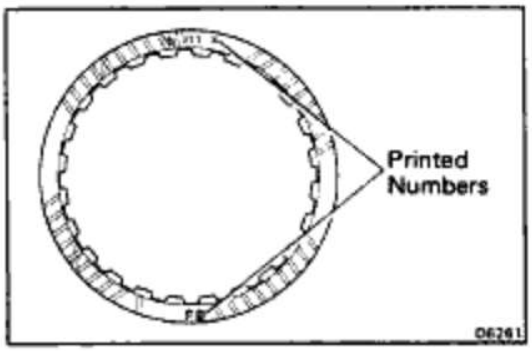
Remove the inner and outer O–rings from the piston.

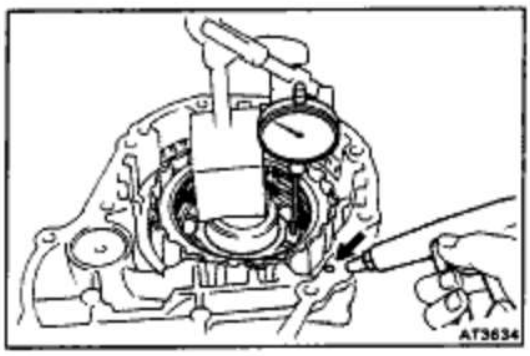
INSPECTION OF OVERDRIVE BRAKE

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates an, flange are worn or burnt. If necessary, replace them.
HINT:

- If the fining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.





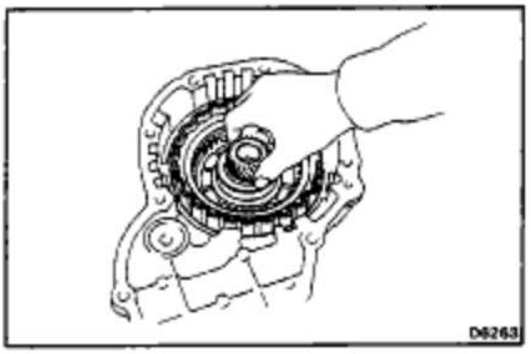
DISASSEMBLY OF OVERDRIVE DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

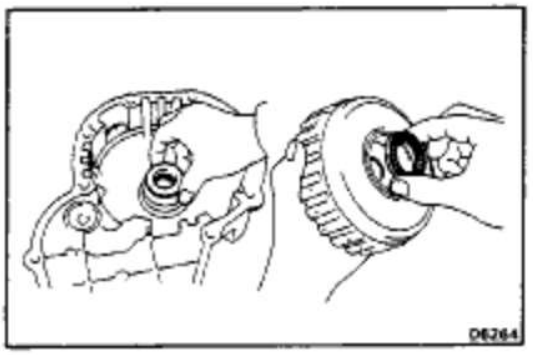
Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

Piston stroke: 1.21 – 1.81 mm
(0.0476 – 0.0752 in.)

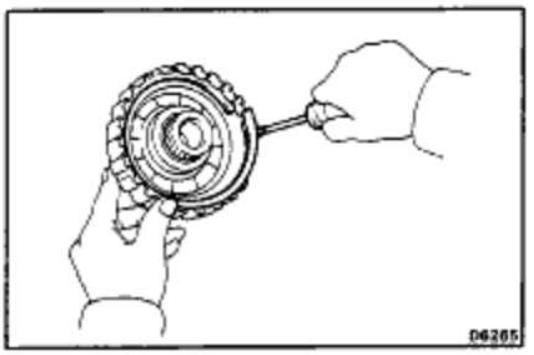
If the piston stroke is greater than the maximum, inspect the each component.



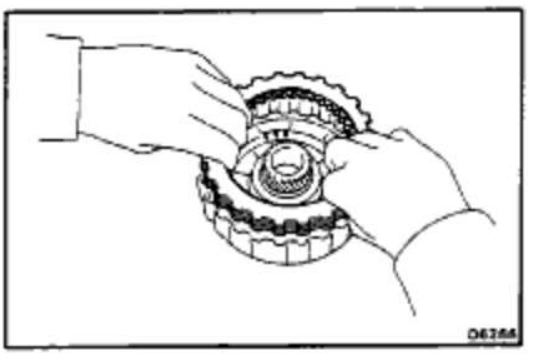
2. REMOVE OVERDRIVE DIRECT CLUTCH FROM CASE



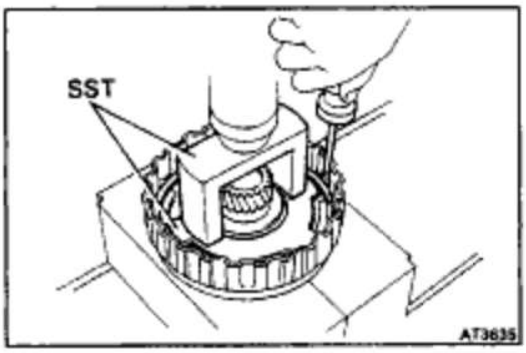
3. REMOVE BEARING AND RACE FROM CLUTCH DRUM AND CASE



4. REMOVE SNAP RING WITH SCREWDRIVER



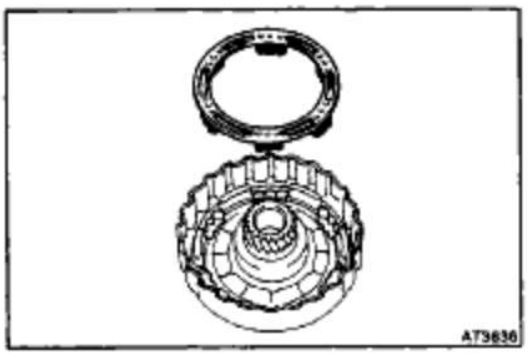
5. REMOVE FLANGES, DISCS AND PLATES



6. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(b) Remove the snap ring.



(c) Remove the piston return spring.

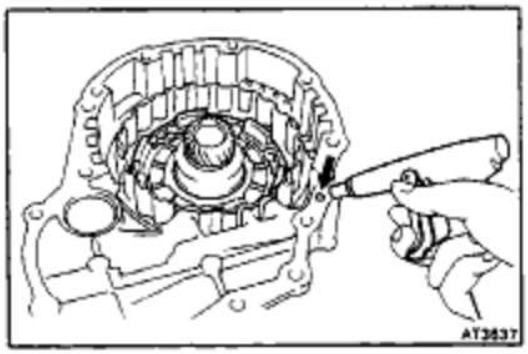
7. REMOVE PISTON FROM CLUTCH DRUM

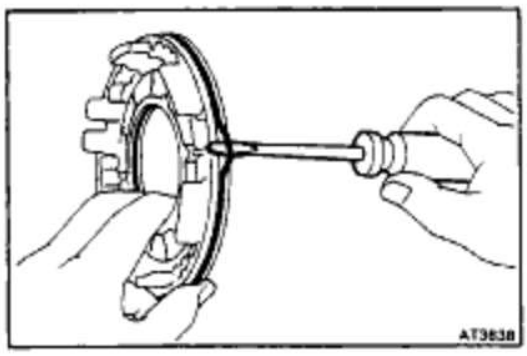
(a) Install the clutch drum of the case.

(b) Apply compressed air to the pressure apply hole of the case.

(c) Remove the piston from the clutch drum.
If the piston does not come out completely, use needle–nose pliers to remove it.

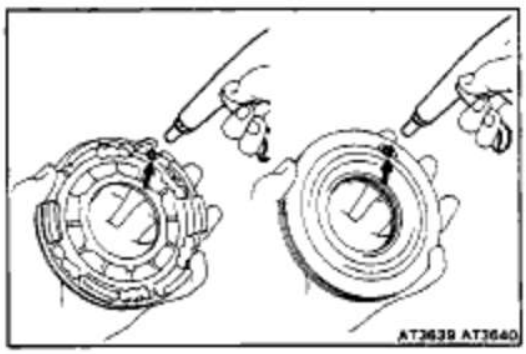
(d) Remove the clutch drum from the case.





8. REMOVE O–RINGS

Remove the two 4–rings from the piston.

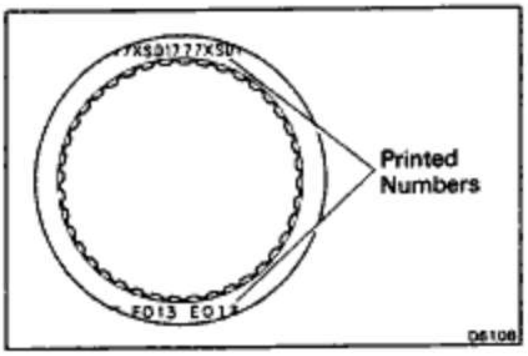


INSPECTION OF OVERDRIVE DIRECT CLUTCH

1. INSPECT OVERDRIVE DIRECT CLUTCH

(a) Check that the check ball is free by shaking the piston.

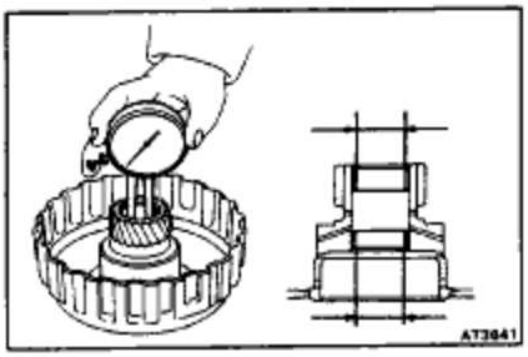
(b) Check that the valve does not leak by applying low pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGES

Check that the sliding surfaces of discs, plates and flanges are worn or burnt. If necessary, replace them.
HINT:

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



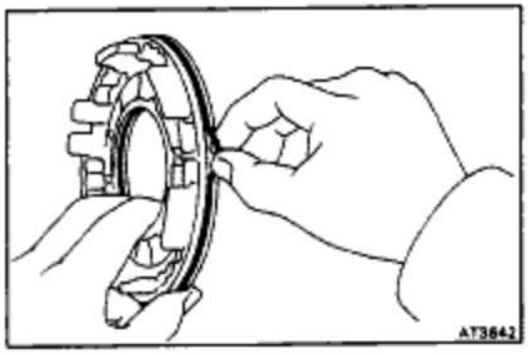
3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the two direct clutch bushings.
Maximum inside diameter: 22.09 mm (0.8697 in.)
If the inside diameter is greater than the maximum, replace the direct clutch drum.

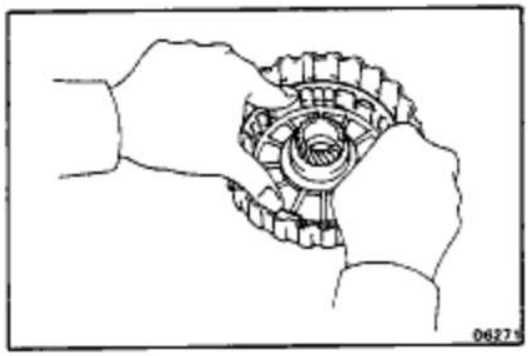
ASSEMBLY OF OVERDRIVE DIRECT CLUTCH

1. INSTALL CLUTCH PISTON

(a) Install new O–rings to the piston. Coat the O–rings with ATF.

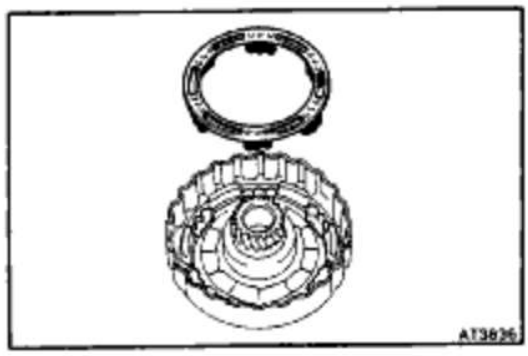


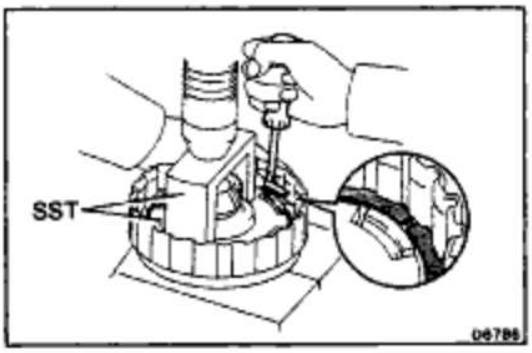
(b) Press the piston into the drum with the cup side up, being careful not to damage the O–ring.



2. INSTALL PISTON RETURN SPRING

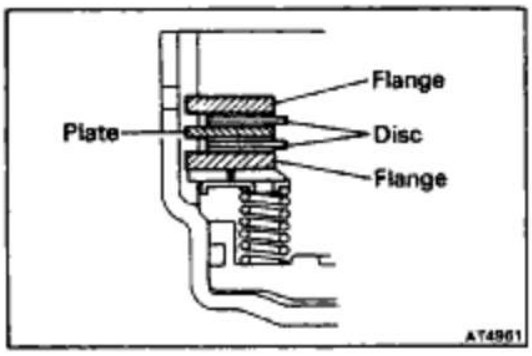
(a) Install the return spring and set snap ring in place.





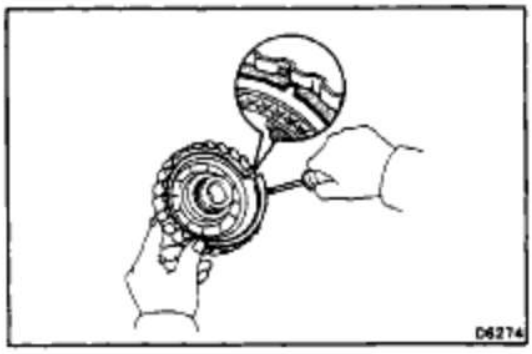
(b) Place SST on the spring retainer, and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(c) Install the snap ring with a screwdriver. Be sure end gap of snap ring is aligned with the groove of the clutch drum.



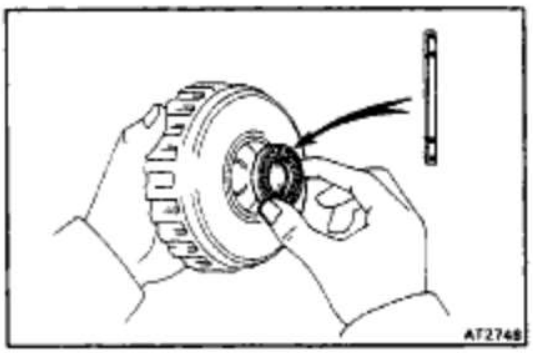
3. INSTALL PLATES. DISCS AND FLANGE

Install in order: P=Plate D=Disc
Flange – D – P – D – Flange



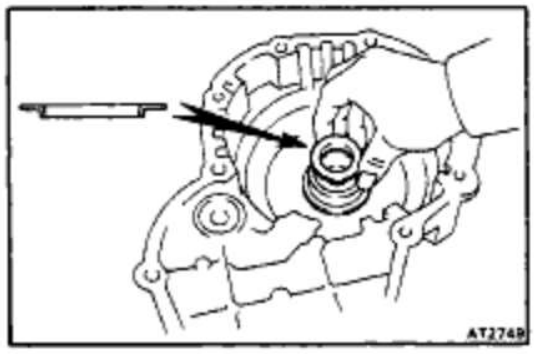
4. INSTALL SNAP RING

Be sure end gap of the snap ring is not aligned with the groove of the clutch drum.

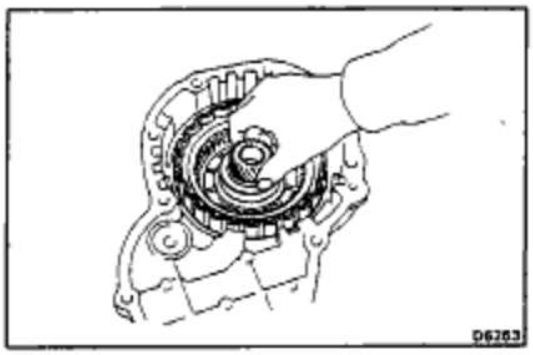


5. INSTALL BEARING AND RACE

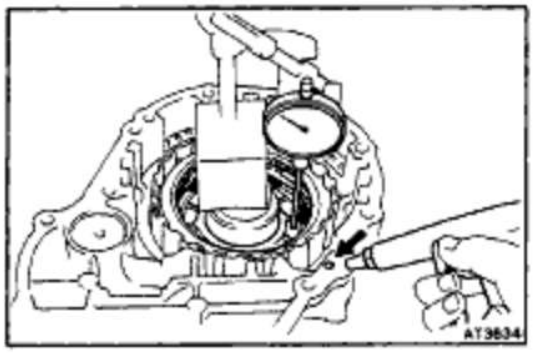
(a) Coat the bearing with petroleum jelly and install it facing the race side downward to the clutch drum.
Bearing: Outer diameter 46.3 mm (1 .823 in.)
Inner diameter 26.2 mm (1.031 in.)



(b) Coat the race with petroleum jelly and install it to the case.
Race: Outer diameter 43.0 mm (11 .693 in.)
Inner diameter 24.6 mm (0.965 in.)



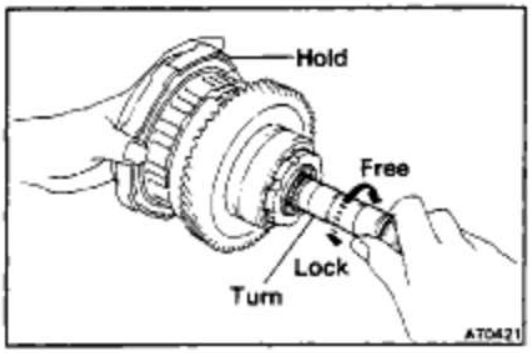
6. INSTALL DIRECT CLUTCH ON CASE



7. RECHECK PISTON STROKE OF' DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

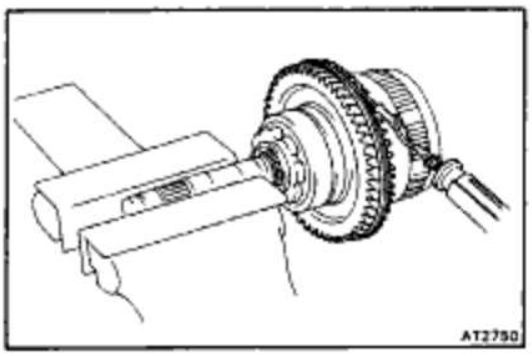
Piston stroke: 1.21 – 1.91 mm
(0.0476 – 0.0752 in.)



DISASSEMBLY OF COUNTER DRIVE GEAR

1. CHECK OPERATION OF ONE–WAY CLUTCH

(a) While turning the overdrive gear clockwise, install the overdrive direct clutch into the one–way clutch.
(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.
(c) Remove the overdrive direct clutch.

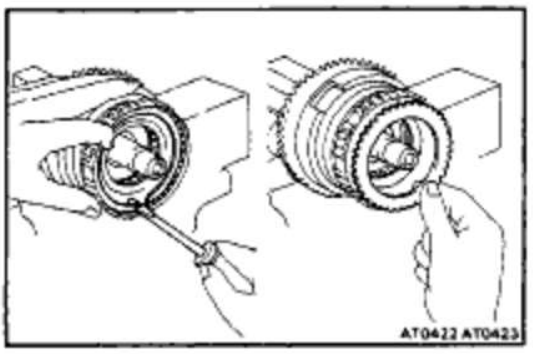


2. CHECK COUNTER DRIVE GEAR PRELOAD

(a) Hold the intermediate shaft in a vise with soft jaws.
(b) Using a tension gauge, measure the preload.

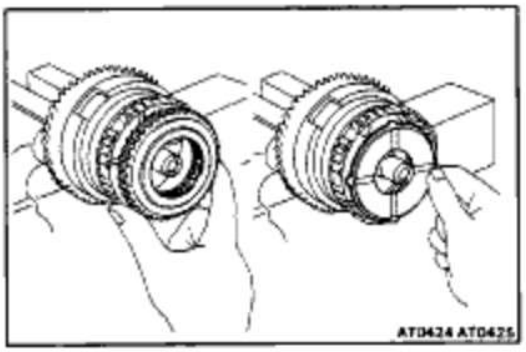
Preload (at starting) : 920 – 1,530 g
(2.0 – 3.4 lb, 9 – 15 N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.



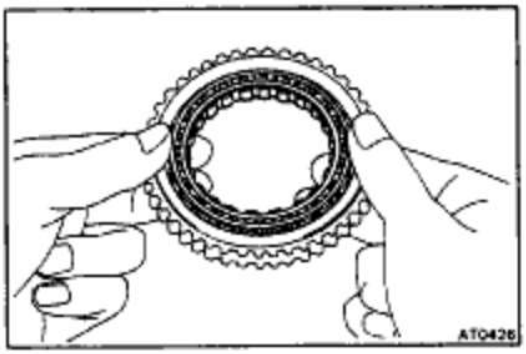
3. REMOVE RETAINING PLATE

(a) Remove the snap ring with a screwdriver.
(b) Remove the retaining plate.



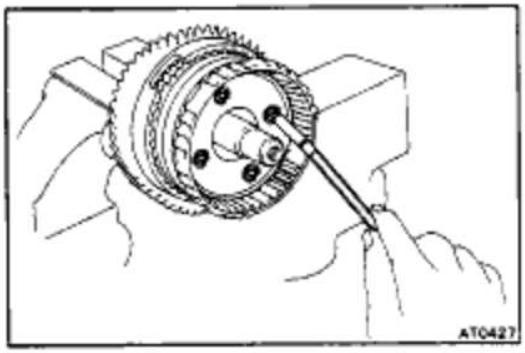
4. REMOVE ONE–WAY CLUTCH AND OUTER RACE

5. REMOVE NO. 3 OVERDRIVE PLANETARY THRUST WASHER



6. REMOVE ONE–WAY CLUTCH FROM OUTER RACE

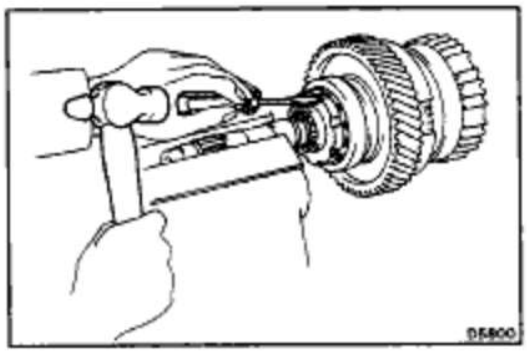
Note the direction of the one–way clutch.



7. REMOVE PLUGS FROM PLANETARY GEAR

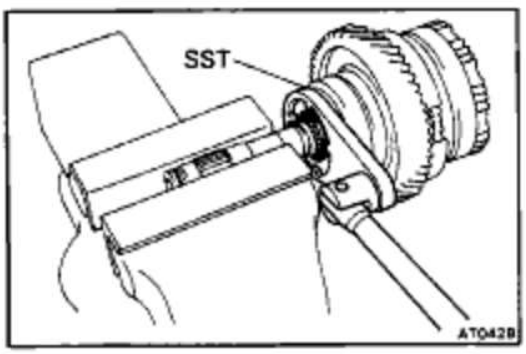
Remove the four plugs with a magnetic finger.

HINT: Be careful not to lose them.



8. REMOVE ADJUSTING NUT AND WASHER

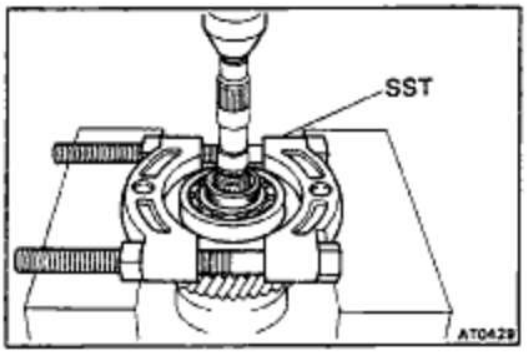
(a) Pry off the locking washer with chisel.



(b) Using SST, loosen the adjusting nut.

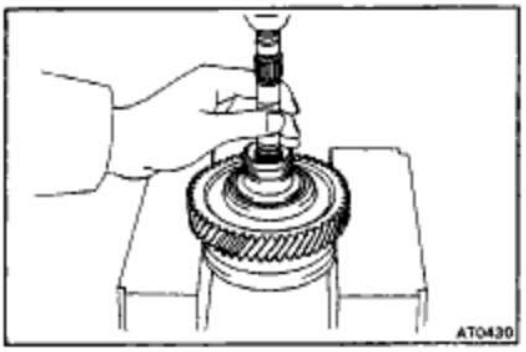
SST 09350–32014 (09351–32080)

(c) Remove the adjusting nut and washer.



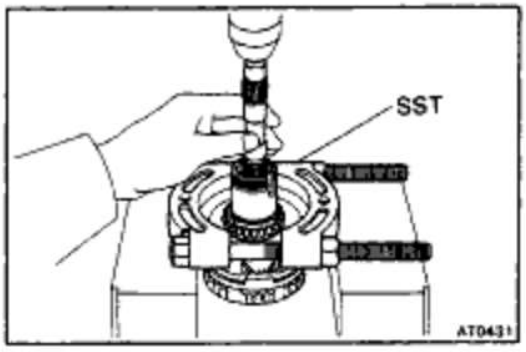
9. REMOVE INTERMEDIATE SHAFT BEARING

Using SST, press out the bearing from the shaft.
SST 09950–00020



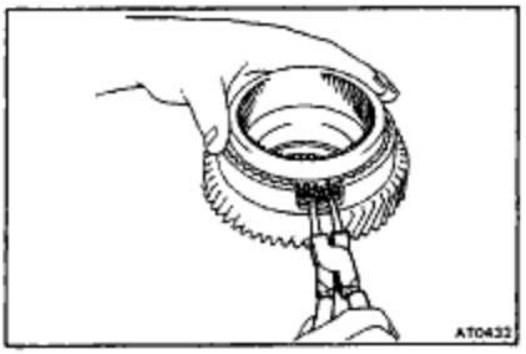
10. REMOVE COUNTER DRIVE GEAR AND FRONT BEARING

Press out the gear and bearing together.



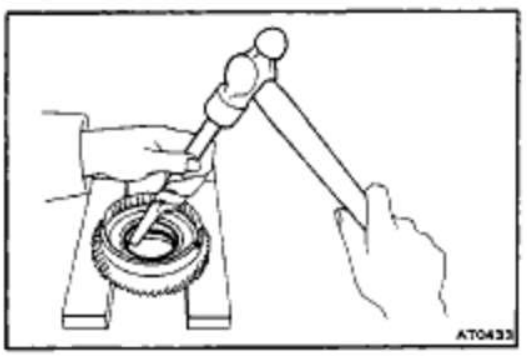
11. REMOVE REAR BEARING

Using SST, press out the bearing.
SST 09950–00020



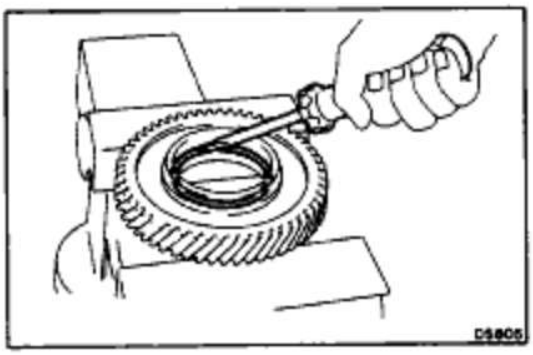
12. REMOVE OVERDRIVE PLANETARY RING GEAR FROM COUNTER DRIVE GEAR

(a) While pulling up the ring gear, compress the snap ring with needle–nose pliers and remove it from the groove.
(b) Remove the ring gear from the counter drive gear.



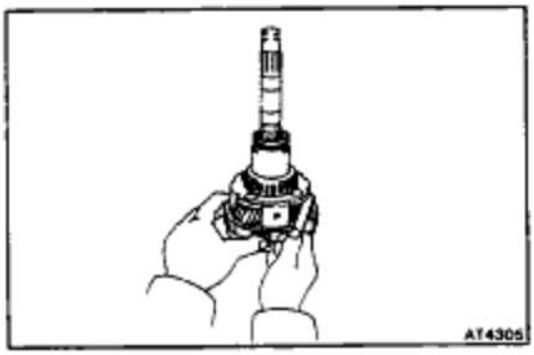
13. REMOVE OUTER RACES FROM COUNTER DRIVE GEAR

Drive out the two races with a brass bar and hammer.



14. REMOVE SNAP RING FROM COUNTER DRIVE GEAR

Using a screwdriver, remove the snap ring.

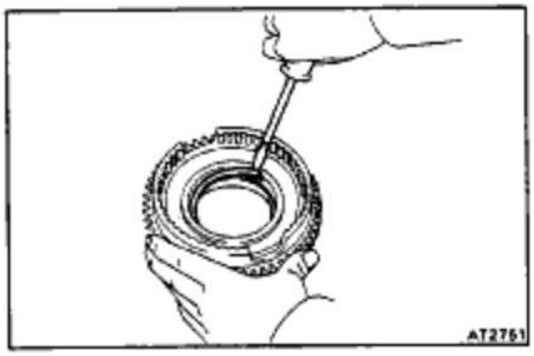


INSPECTION OF OVERDRIVE PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

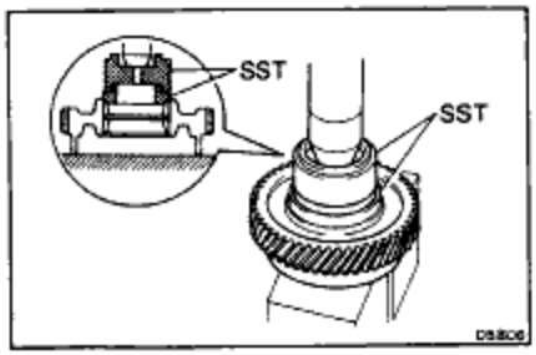
Standard clearance: 0.20 – 0.50 mm (0.0079 – 0.0197 in.)



ASSEMBLY OF COUNTER DRIVE GEAR

1. INSTALL SNAP RING INTO COUNTER GEAR

Install the snap ring with a screwdriver.

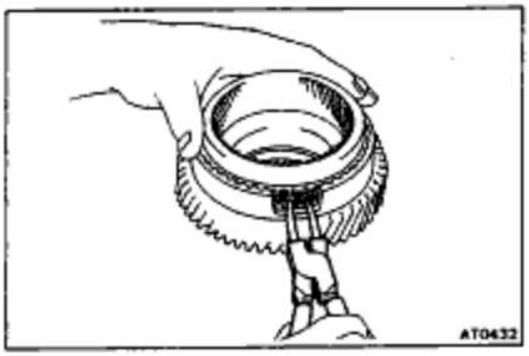


2. INSTALL OUTER RACES INTO COUNTER DRIVE GEAR

Using SST, press in the two outer races to the gear both side.

SST 09350–32014 (09351–32120, 09351–32150)

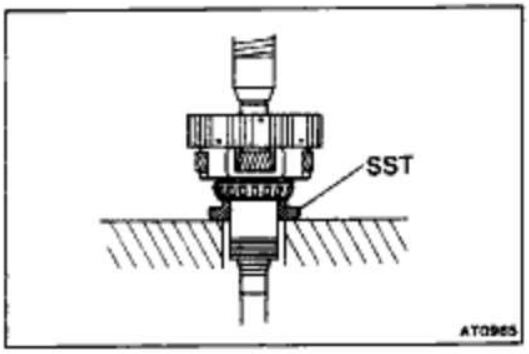
HINT: Press in the two outer races until they touch the snap ring. Tap the races in straight, so that they do not tilt



3. INSTALL OVERDRIVE PLANETARY RING GEAR INTO COUNTER DRIVE GEAR

While pushing down the ring gear, squeeze the snap ring end with a needle–nose pliers, and install it into the groove.

HINT: When the snap ring is fully seated, the end will be free.

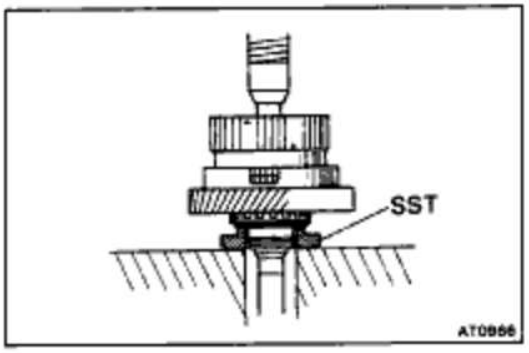


4. INSTALL REAR BEARING

Using SST, press in the bearing onto the shaft.

SST 09350–32014 (09351–32120)

HINT: Press in the bearing until the side surface of the inner race touches the shaft.

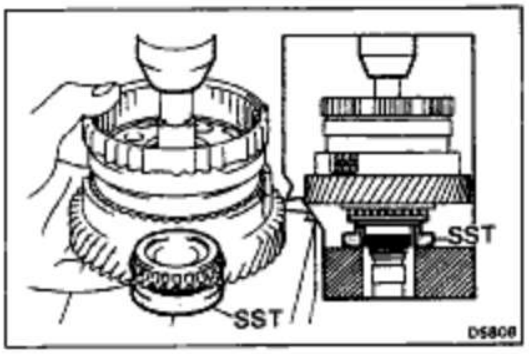


5. INSTALL COUNTER DRIVE GEAR AND FRONT BEARING

(a) Install the gear onto the shaft, and mesh the ring gear with the planetary pinions.

(b) Place the front bearing onto the shaft.

HINT: Hold the ring gear to prevent it from failing.



(c) Using SST, press in the bearing until slightly play between the bearings.

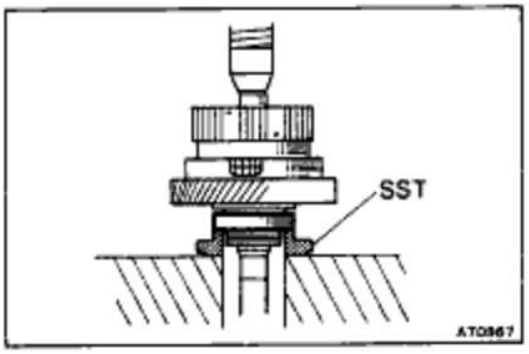
SST 09350–32014 (09351–32120)

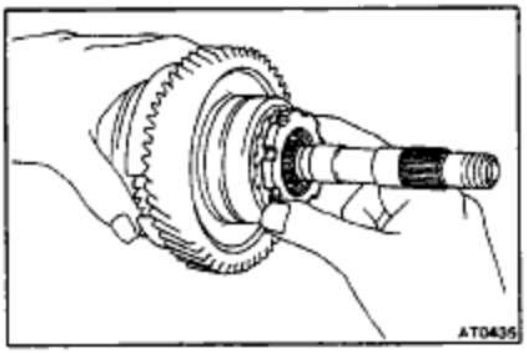
6. INSTALL INTERMEDIATE SHAFT BEARING

Using SST, press in the bearing until it slightly touches the front bearing of the counter drive gear.

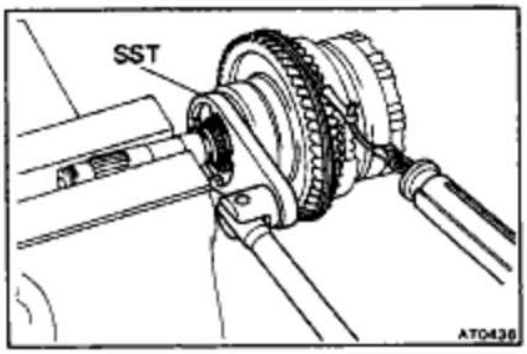
SST 09350–32014 (09351–32120)

HINT: The counter drive gear can be turned lightly.





7. PLACE NEW LOCKING WASHER AND ADJUSTING NUT ONTO INTERMEDIATE SHAFT



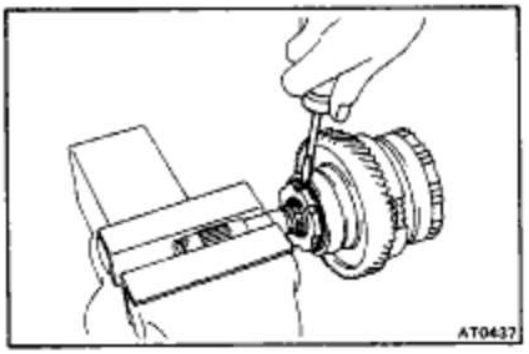
8. ADJUST PRELOAD OF COUNTER DRIVE GEAR

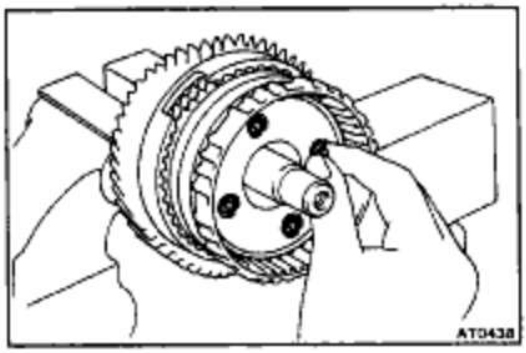
(a) Place SST onto the adjusting nut and hold the shaft in a vise with soft jaws.
SST 09350–32014 (09351–32080)

(b) Tighten the adjusting nut until the following gear starting load occurs with a tension gauge.
(Preload at starting): 920 – 1,530 g (2.0–3.41b,9–15N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.

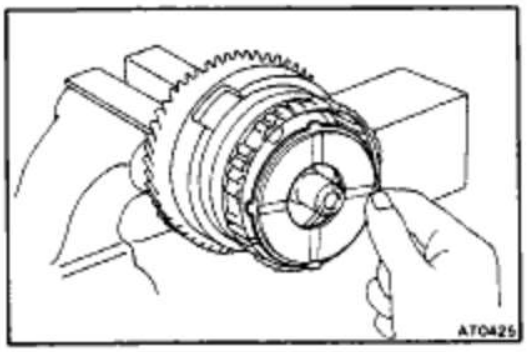
(c) Lock the adjusting nut with one tab on locking washer. Bend the locking washer tab until it is even with the adjusting nut groove.





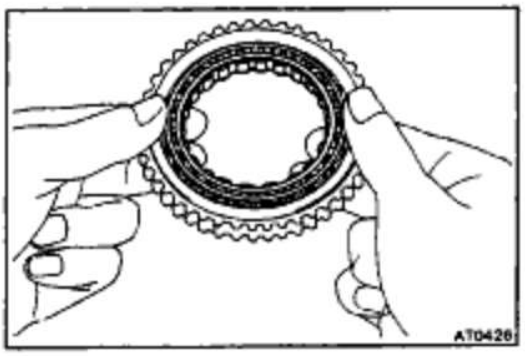
9. INSTALL PINION SHAFT PLUGS

Install the four plugs into the pinion shaft.



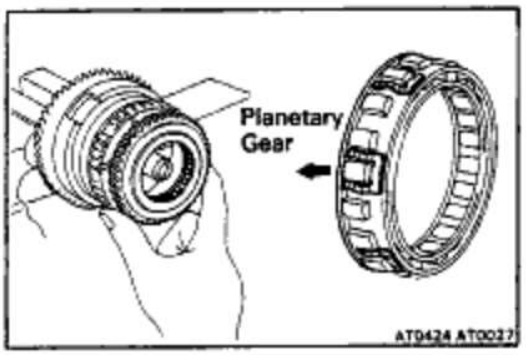
10. INSTALL NO. 3 OVERDRIVE PLANETARY THRUST WASHER

Install the thrust washer, facing the groove toward the overdrive case.



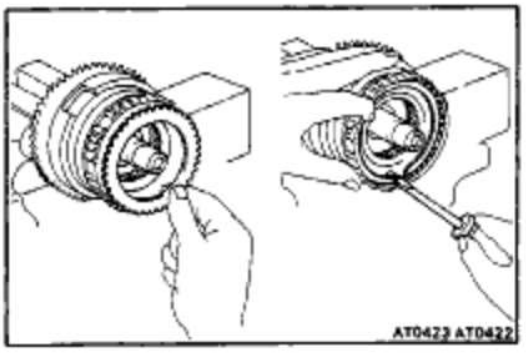
11. ASSEMBLE OVERDRIVE ONE–WAY CLUTCH

(a) Install the one–way clutch into the outer race.
(b)Install a retainer on both sides of the one–way clutch.



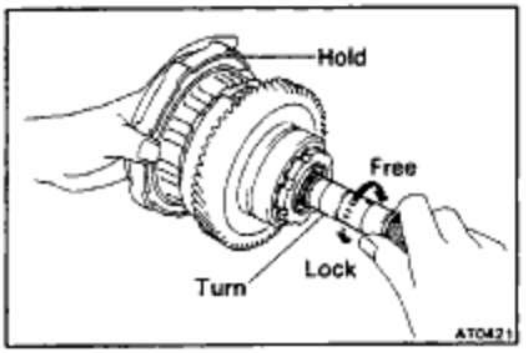
12. INSTALL OVERDRIVE ONE–WAY CLUTCH INTO HUB

Be sure that the one–way clutch is installed in the correct direction.



13. INSTALL RETAINING PLATE

(a) Place the retaining plate into the hub.
(b) Install the snap ring with a screwdriver.



14. CHECK OPERATION OF ONE–WAY CLUTCH

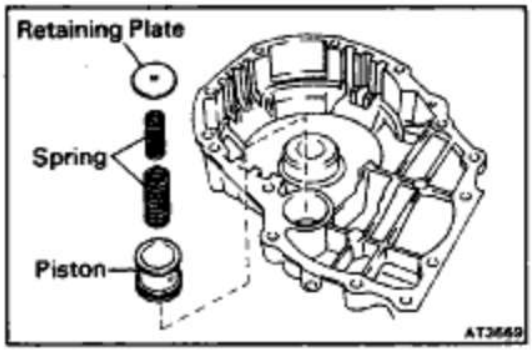
(a) While turning the overdrive gear clockwise, install the overdrive direct clutch into the one–way clutch.
(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.
(e) Remove the overdrive direct clutch.



DISASSEMBLY OF OVERDRIVE CASE

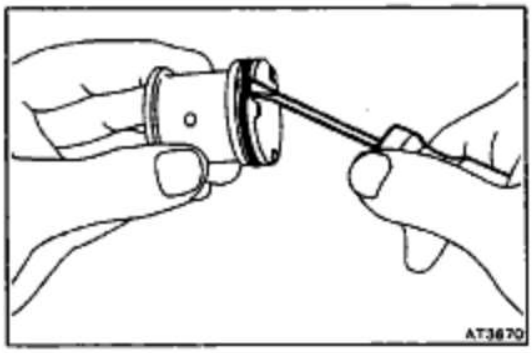
1. REMOVE Co ACCUMULATOR PISTON FROM OVERDRIVE CASE

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the retaining plate and two springs.

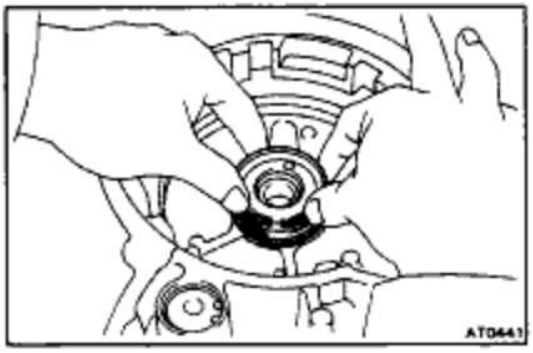
(e) Remove the accumulator piston.



(d) Remove the O–ring from the piston.

2. REMOVE OIL SEAL RINGS

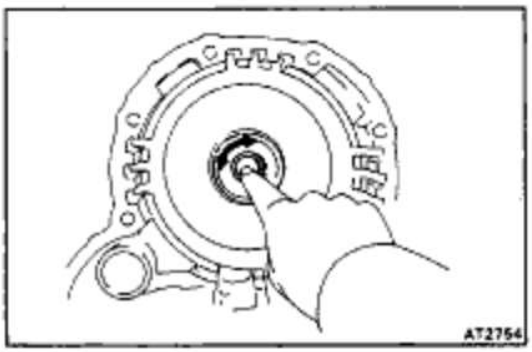
Spread the two rings apart and remove them.

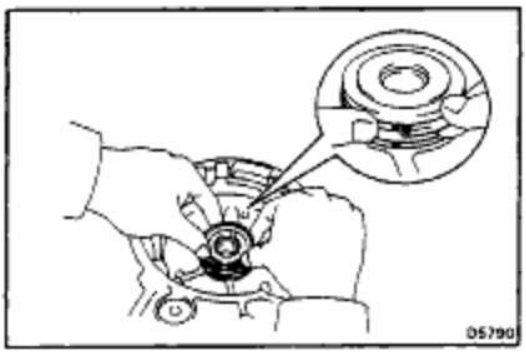


INSPECTION OF OVERDRIVE CASE

INSPECT OVERDRIVE CASE BEARING

Check that the bearing turn smoothly with finger.



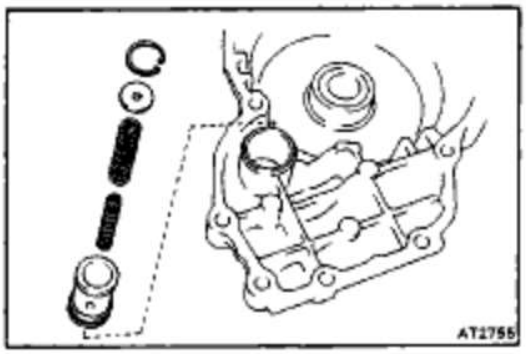


ASSEMBLY OF OVERDRIVE CASE

1. INSTALL OIL SEAL RINGS ON OVERDRIVE CASE

Spread the two rings apart and install them into the groove.

HINT: After installing the oil seal rings, check that they move smoothly.

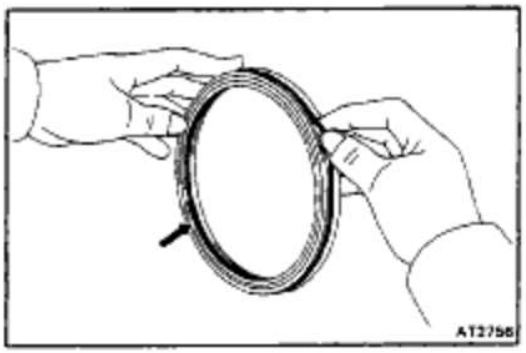


2. INSTALL Co ACCUMULATOR PISTON OF OVERDRIVE CLUTCH

(a) Install a new O–ring to the accumulator piston.
Coat the O–ring with ATF.

(b) Install the accumulator piston, two springs and plate.

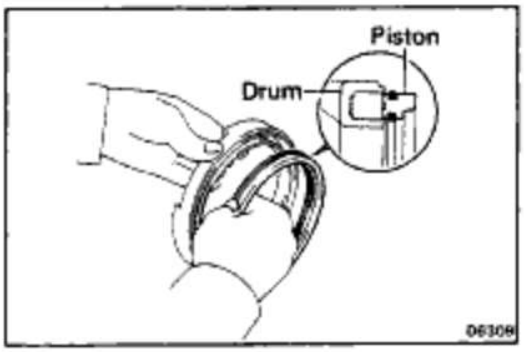
(c) Install the snap ring with snap ring pliers.



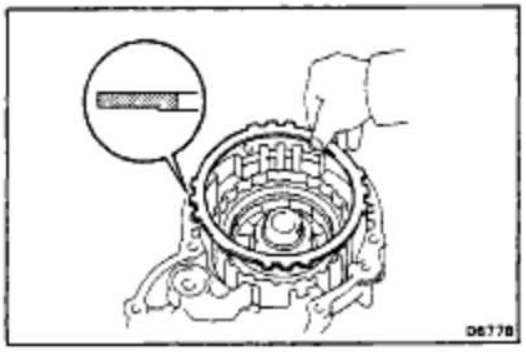
ASSEMBLY OF OVERDRIVE BRAKE

1. INSTALL PISTON INTO DRUM

(a) Install the new O–rings to the piston.
Coat the O–rings with ATF.

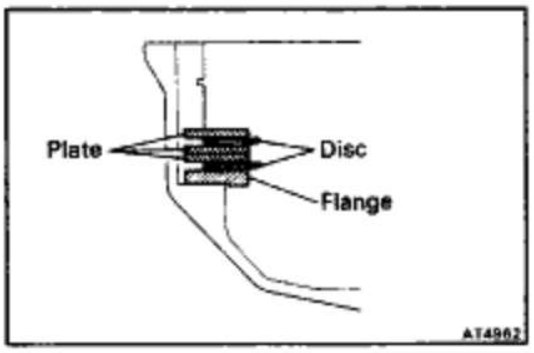


(b) Press the piston into the drum, being careful not to damage the O–rings.

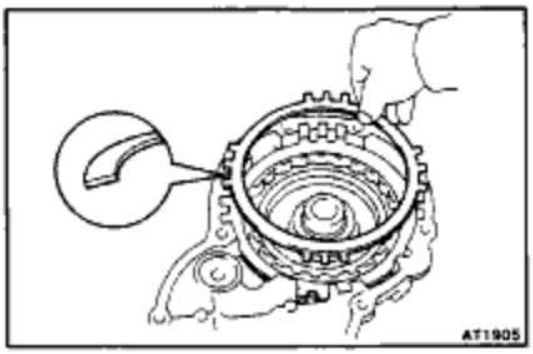


2. INSTALL FLANGE, DISCS AND PLATES

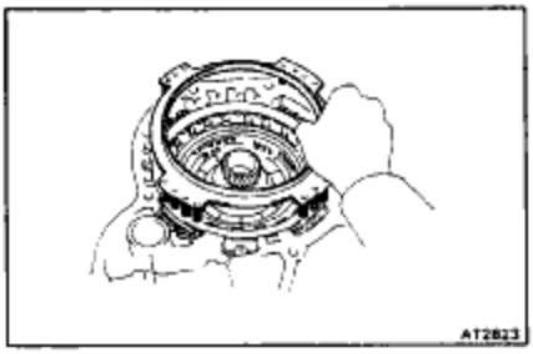
(a) Install the flange, facing the flat end upward.



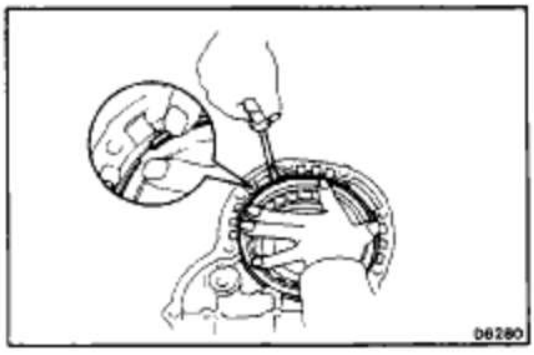
(b) Install the discs and plates.
Install in order: P=Plate D=Disc
Flange –D–P–P–D–P



(c) Install the cushion plate facing the rounded end upward.

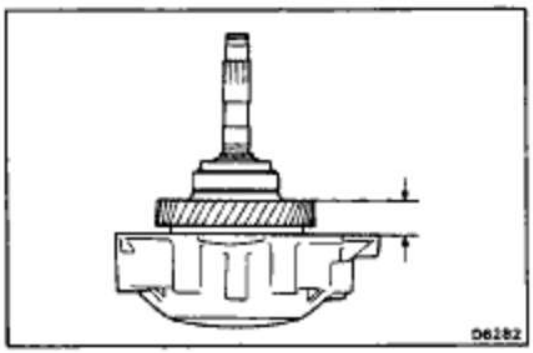


3. INSTALL PISTON RETURN SPRING



4. INSTALL SNAP RING INTO CASE

Be sure the end gap of the snap ring is not aligned with one of cutouts.

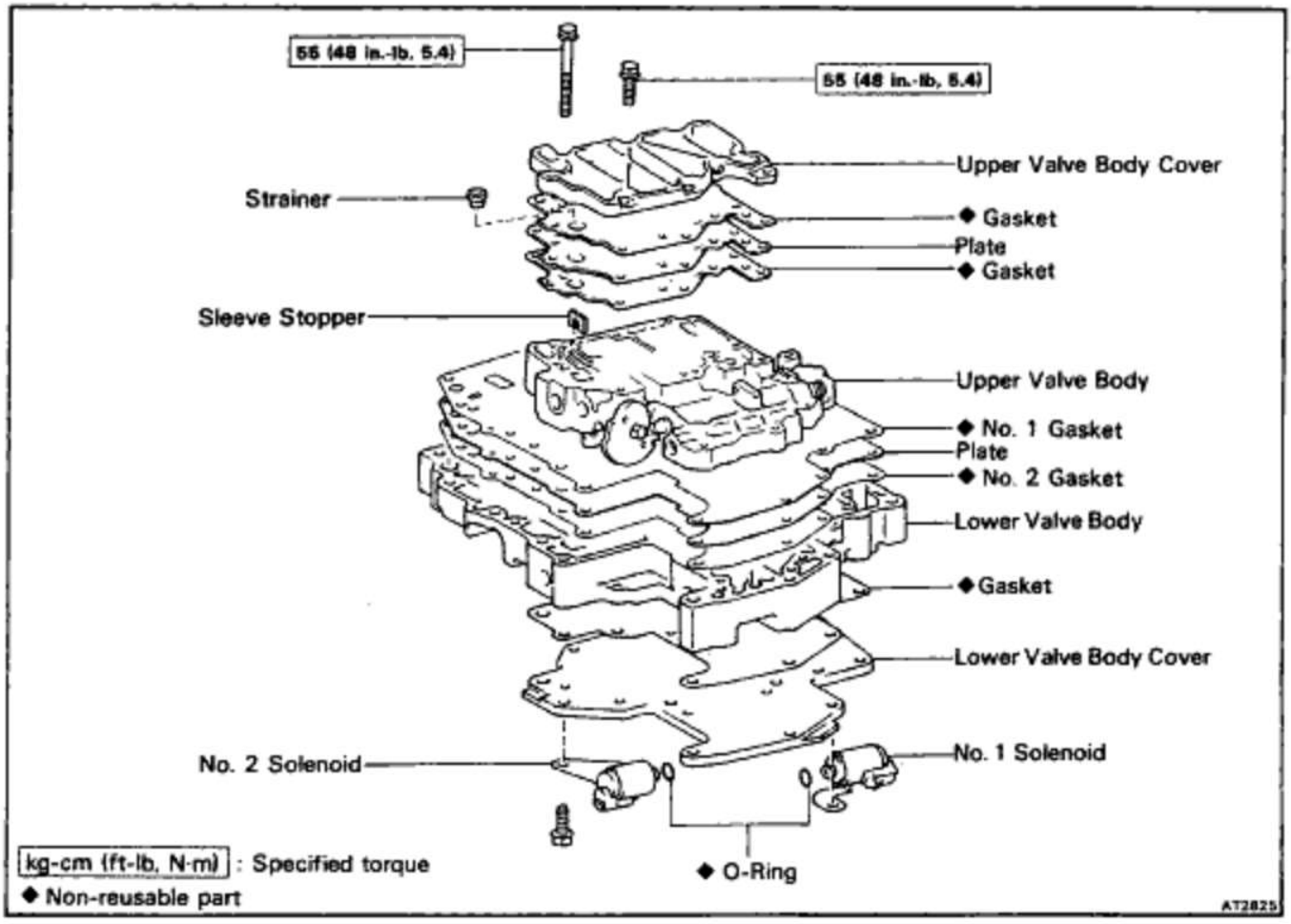


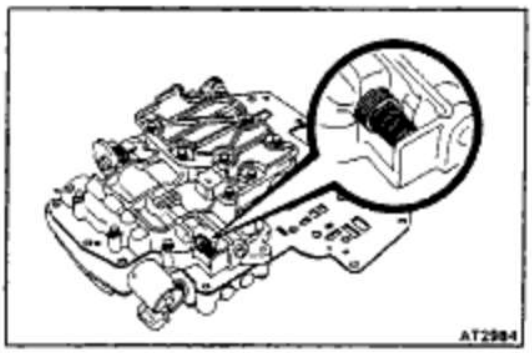
5. INSTALL OVERDRIVE GEAR ASSEMBLY ONTO CASE

While turning the overdrive gear clockwise, install the overdrive gear assembly to the case.
If the overdrive gear assembly is properly installed to the overdrive case, the clearance between them will be about 24 mm (0.94 in.).

Valve Body (A140E)

COMPONENTS

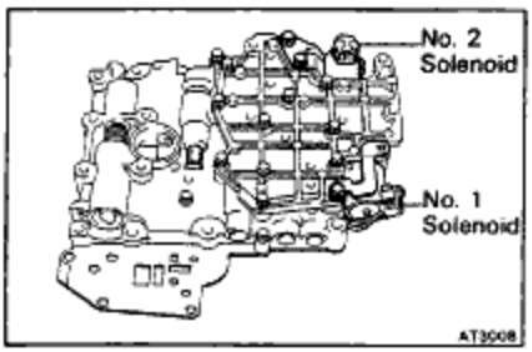




(Disassembly of Valve Body)

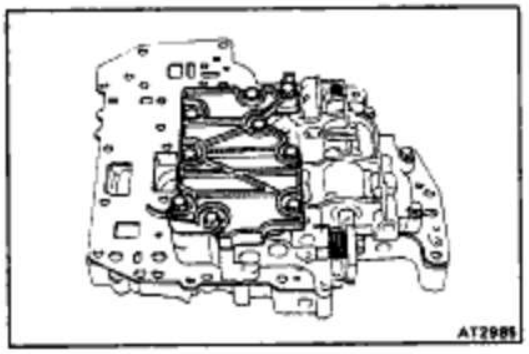
1. NOTE THE NUMBERS OF ADJUSTING RINGS

HINT: Count the number of adjusting rings before disassembly of the valve body because the throttle pressure is changed according to the number. (Some of the valve bodies do not have any adjusting rings.)



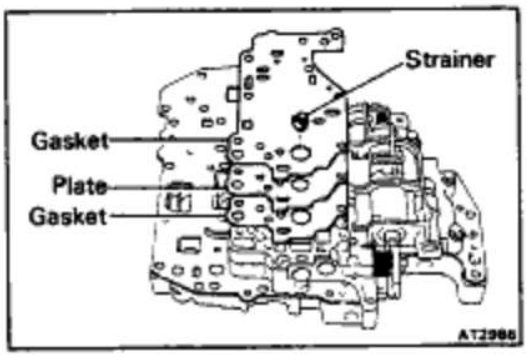
2. REMOVE SOLENOIDS

(a) Remove the No. 1 and No. 2 solenoids.
(b) Remove the 4–rings from the solenoids.



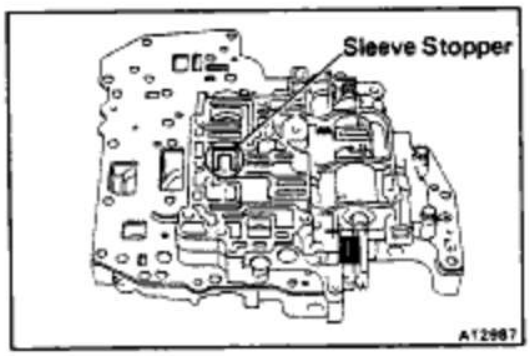
3. REMOVE UPPER VALVE BODY COVER

Remove the nine bolts and upper valve body cover.

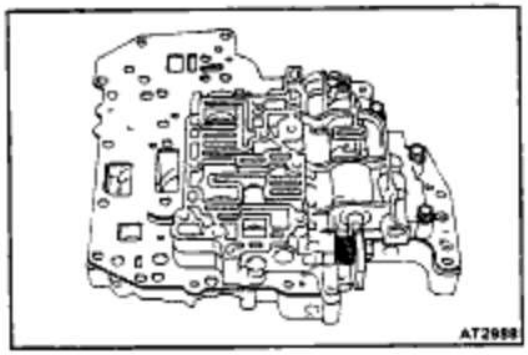


4. REMOVE STRAINER GASKETS, PLATE AND SLEEVE STOPPER FROM UPPER VALVE BODY

(a) Remove the strainer, two gaskets and plate.

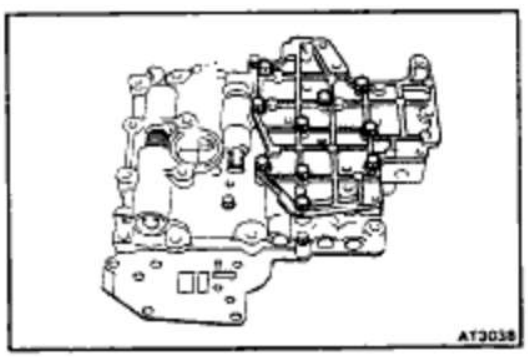


(b) Remove the sleeve stopper.



5. REMOVE BOLTS FROM UPPER VALVE BODY

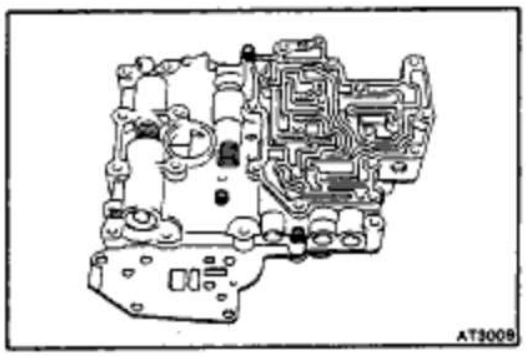
Remove the three bolts from the upper valve body.



6. REMOVE LOWER VALVE BODY COVER

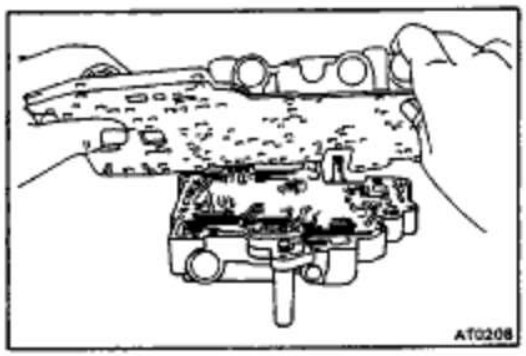
(a) Remove the ten bolts.

(b) Remove the lower valve body cover and gasket.



7. REMOVE BOLTS FROM LOWER VALVE BODY

Remove the three bolts from lower valve body.



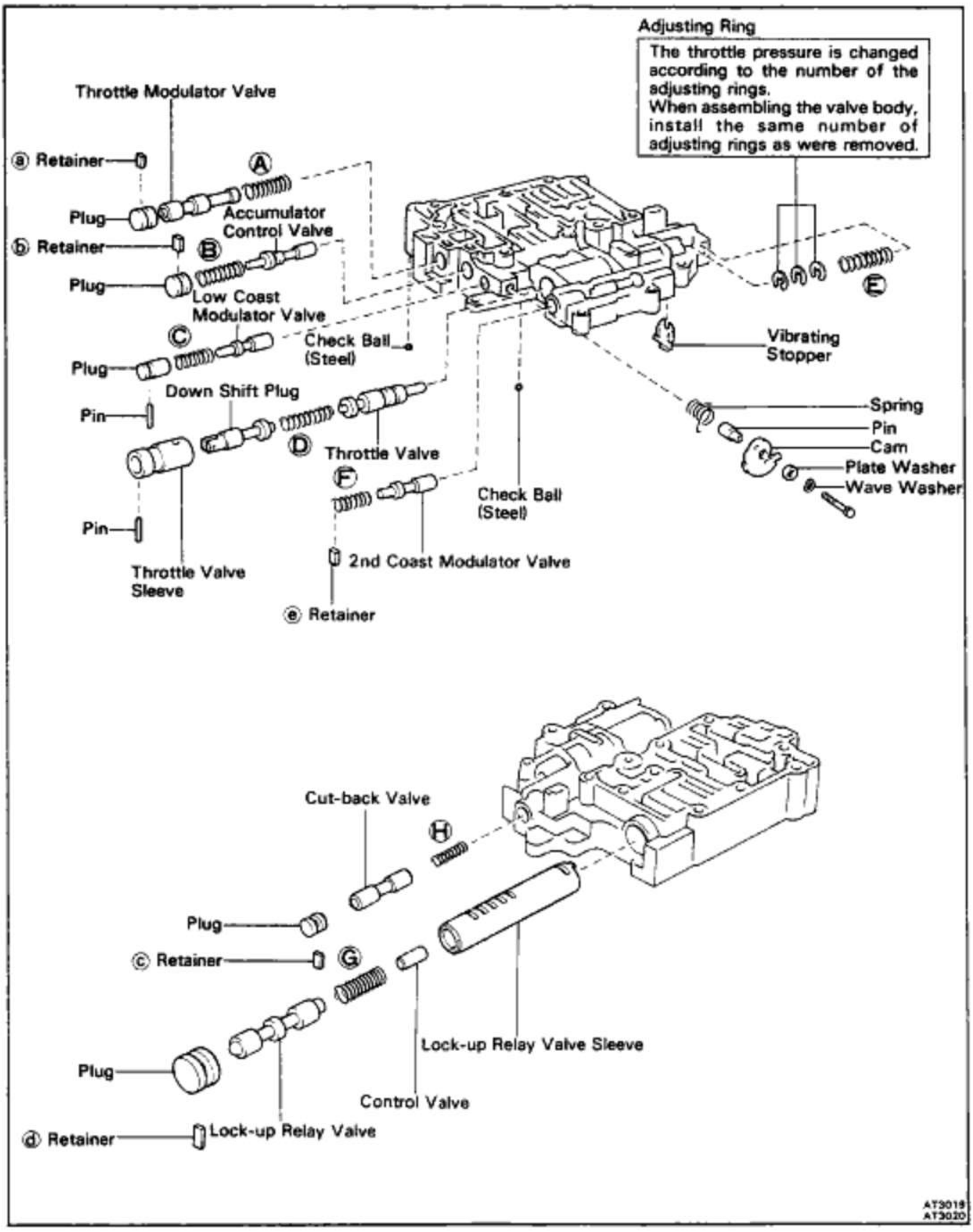
8. LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT

Hold the plate to the lower valve body and lift off the lower valve body.

HINT: Be careful that the check balls do not fail out.

9. REMOVE PLATE AND GASKETS

(Upper Valve Body)
COMPONENTS

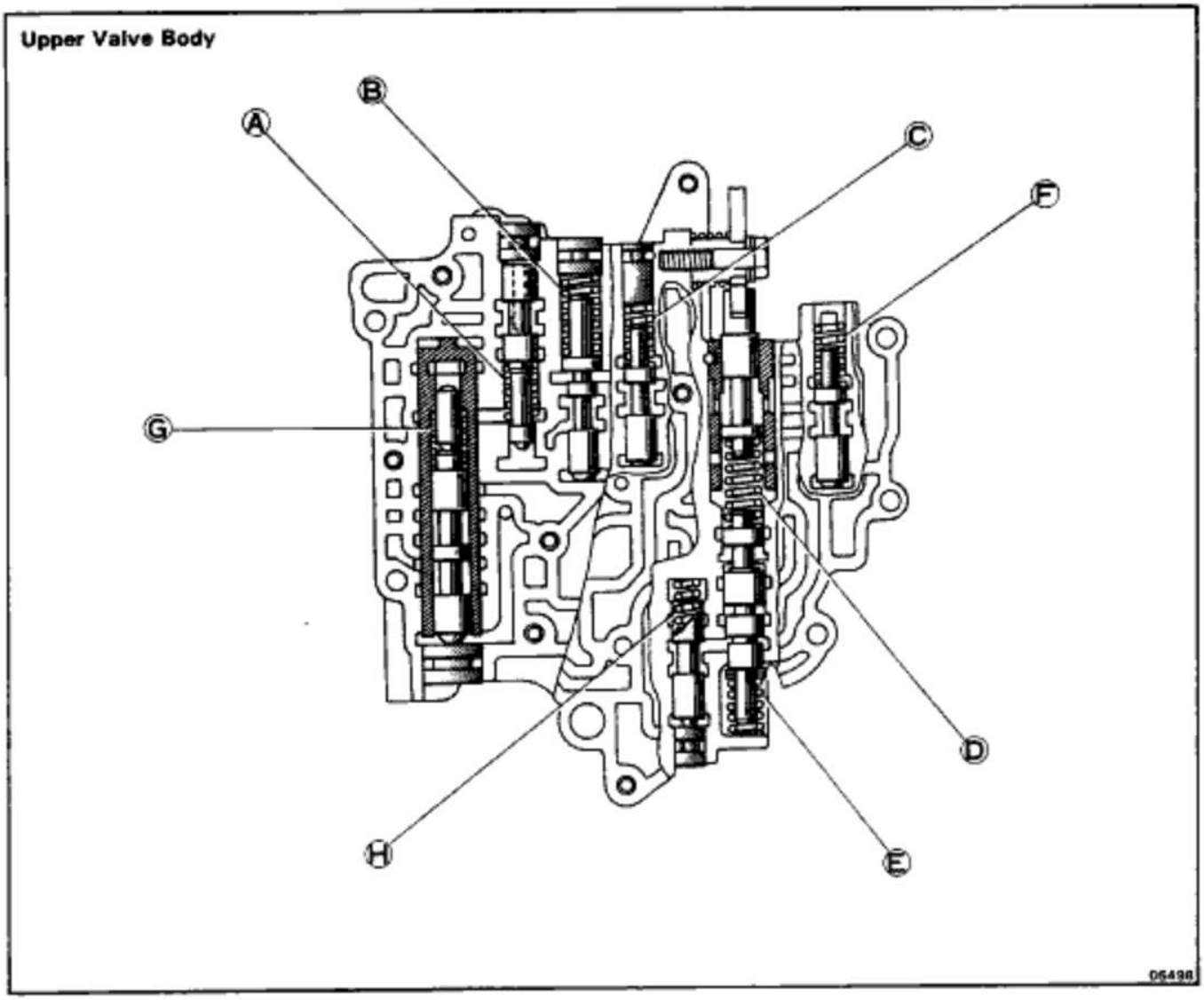


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
A	Throttle Modulator Valve Spring	21.70 (0.8543)	9.50 (0.3740)	9.5	None
B	Accumulator Control Valve Spring	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
C	Low Coast Modulator Valve Spring	21.60 (0.8504)	7.90 (0.3110)	11.5	None
D	Down Shift Plug Spring	29.76 (1.1717)	8.73 (0.3437)	13.5	Yellow
E	Throttle Valve Spring	30.70 (1.2087)	9.20 (0.3622)	9.5	None
F	2nd Coast Modulator Valve Spring	20.93 (0.8240)	8.50 (0.3346)	10.0	Light Green
G	Lock–up Relay Valve Spring	26.56 (1.0457)	10.20 (0.4016)	11.5	Green
H	Cut–back Valve Spring	21.80 (0.8583)	6.00 (0.2362)	13.5	None

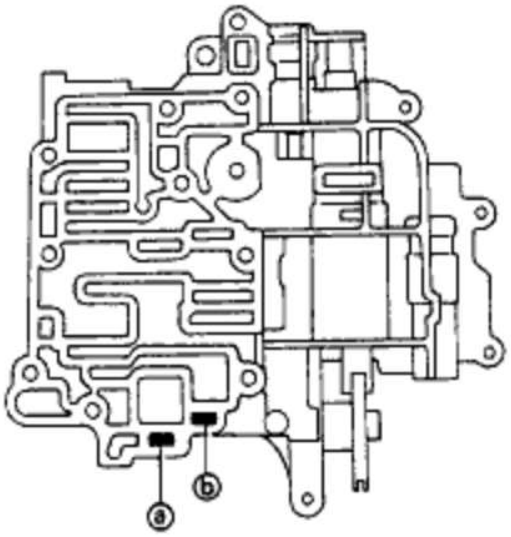
HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY

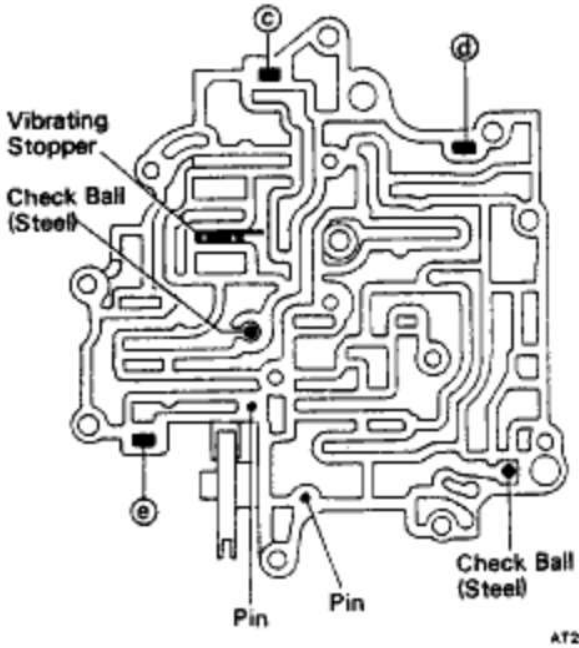


LOCATION OF RETAINERS PINS VIBRATING STOPPER AND CHECK BALLS

[Upper Side]



[Low Side]

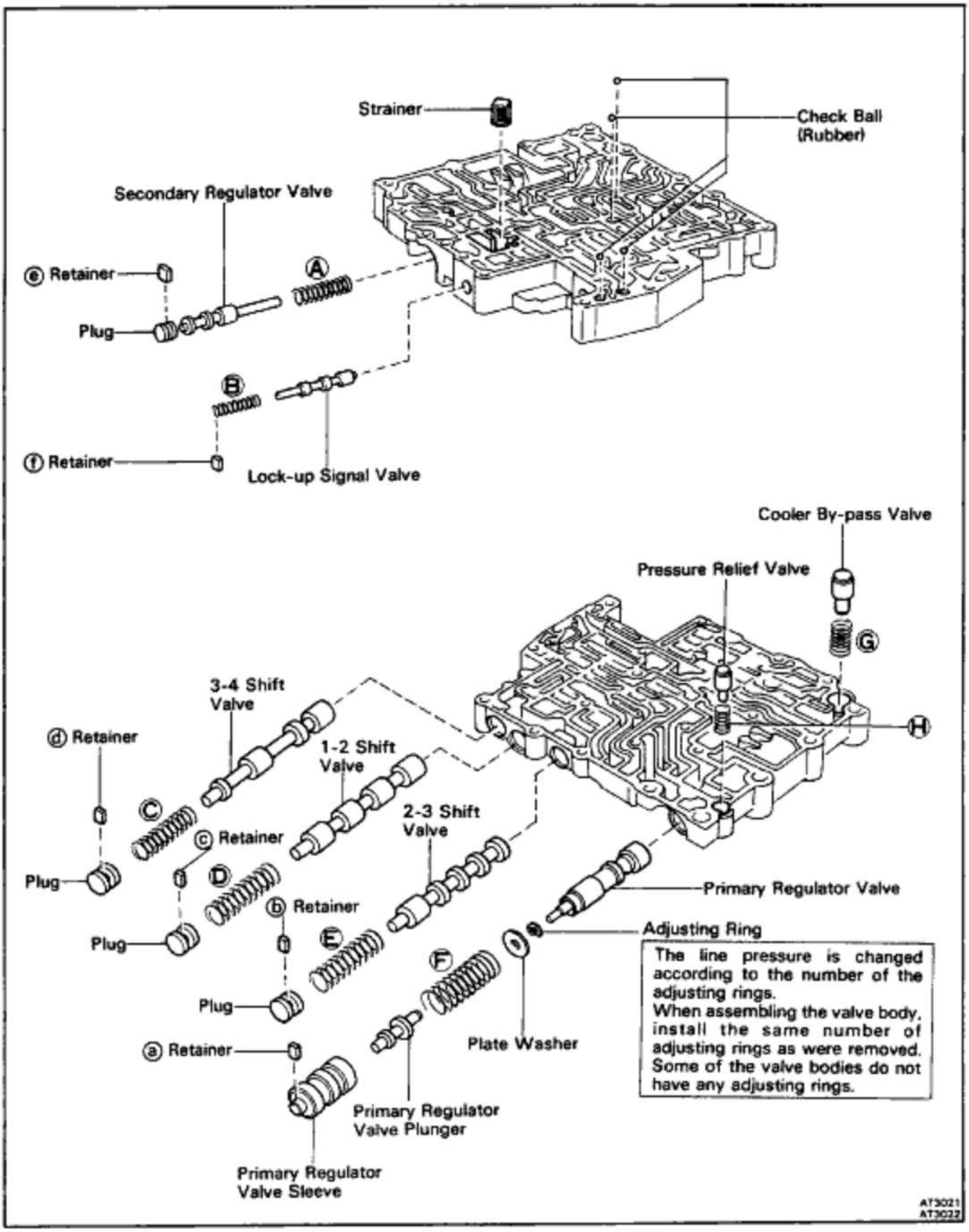


AT2989 AT2990

mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Throttle modulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Accumulator control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓒ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Lock-up relay valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓔ	2nd coast modulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)

(Lower. Valve Body)
COMPONENTS

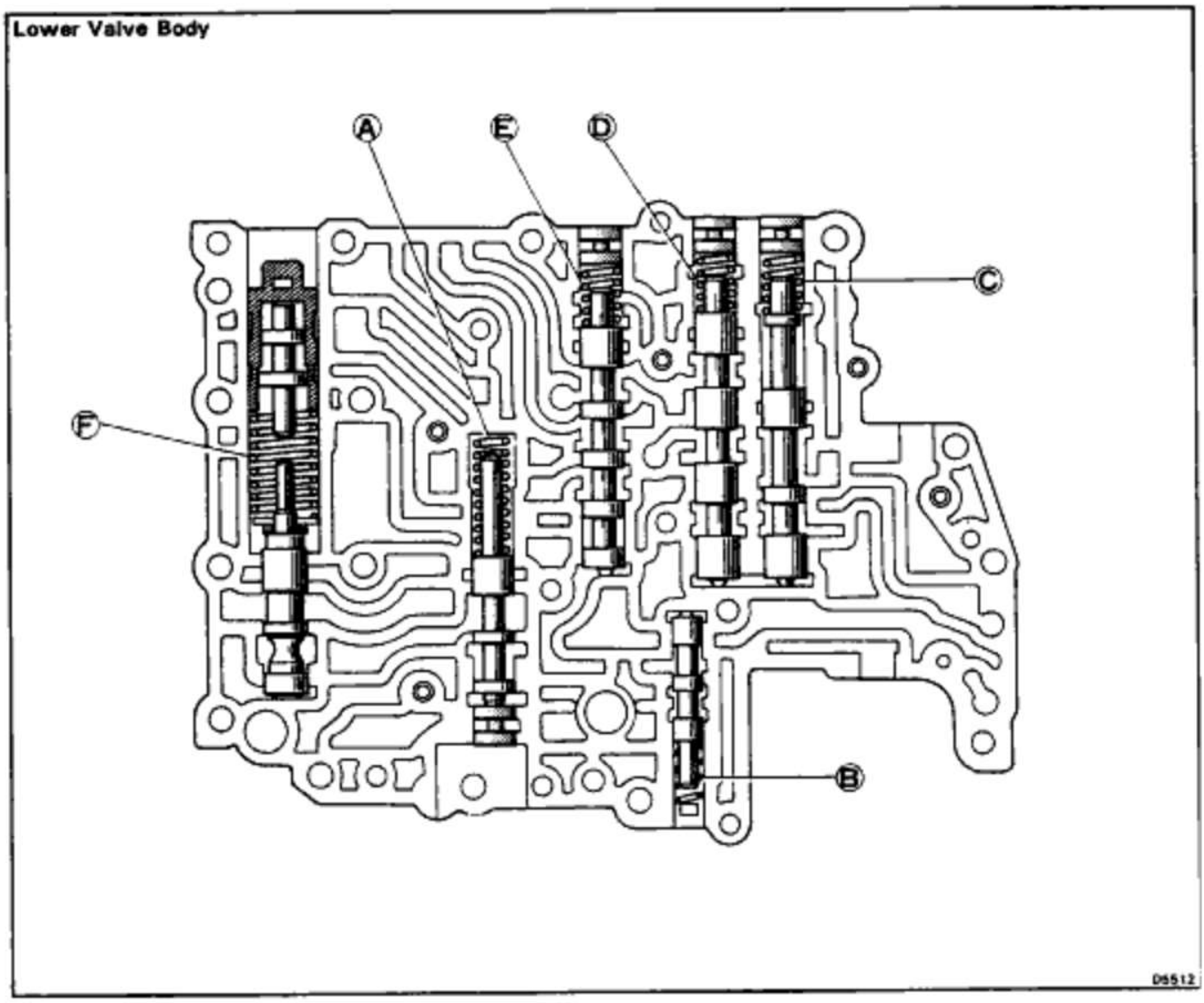


SPECIFICATIONS OF VALVE BODY SPRINGS

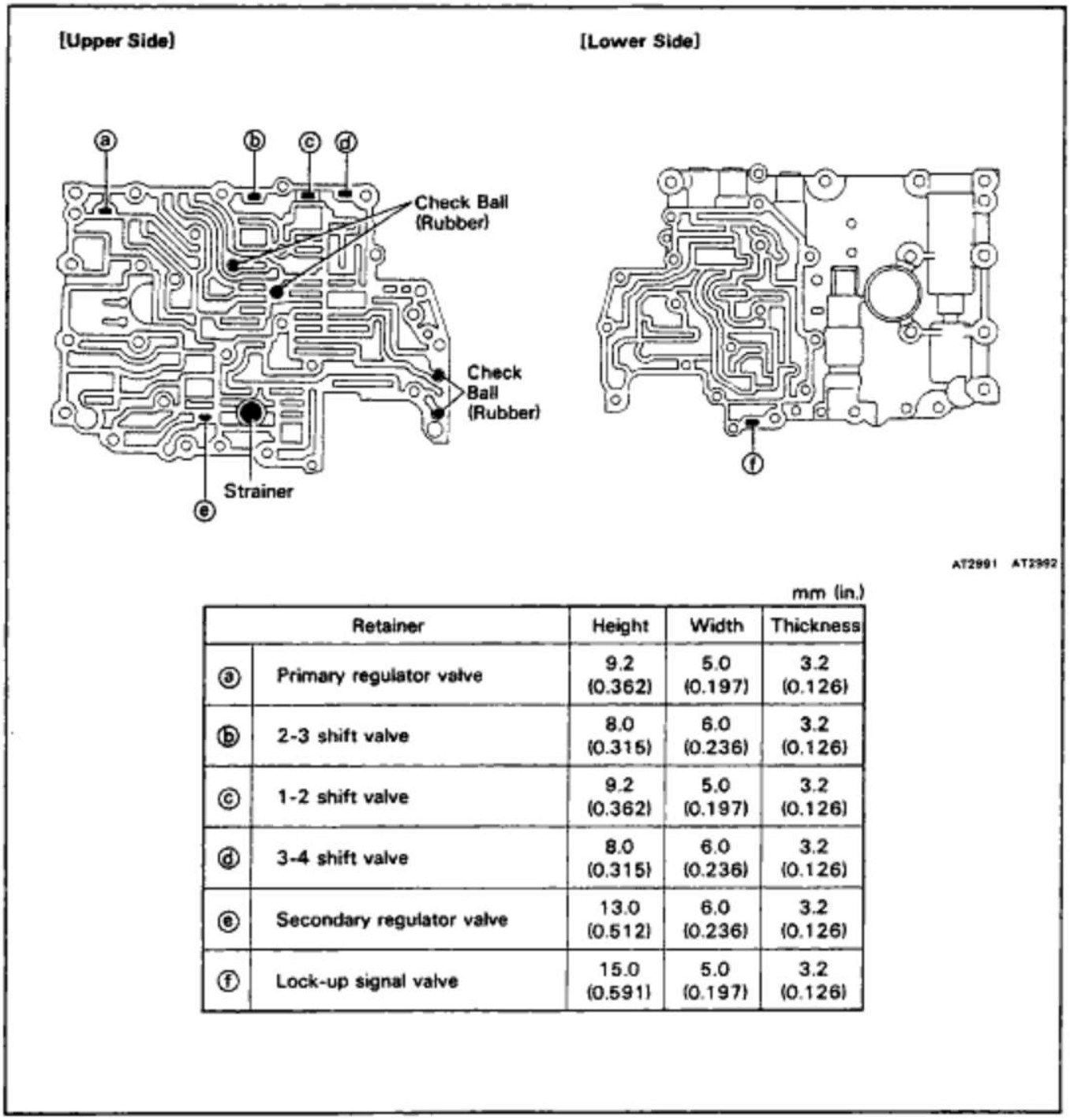
Spring		Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
A	Secondary Regulator Valve Spring	43.60 (1.7165)	10.90 (0.4291)	11.5	None
B	Lock–up Signal Valve Spring	30.00 (1.1811)	8.20 (0.3228)	11.5	None
C	3–4 Shift Valve Spring	29.27 (1.1524)	9.70 (0.3819)	10.5	None
D	1–2 Shift Valve Spring	29.27 (1.1524)	9.70 (0.3819)	10.5	None
E	2–3 Shift Valve Spring	29.27 (1.1524)	9.70 (0.3819)	10.5	None
F	Primary Regulator Valve Spring	66.65 (2.6240)	18.60 (0.7323)	12.5	None
G	Cooler By–pass Valve Spring	19.90 (0.7835)	11.00 (0.4331)	8.5	None
H	Pressure Relief Valve Spring	11.20 (0.4409)	6.40 (0.2520)	7.5	None

HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY

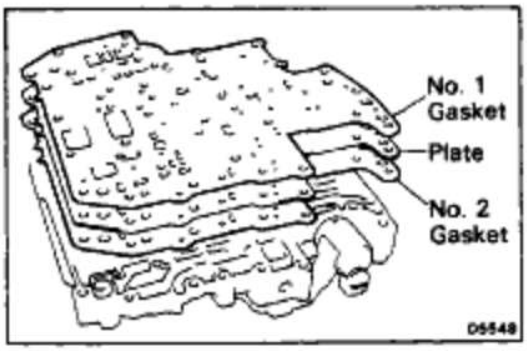


LOCATION OF RETAINER STRAINER AND CHECK BALLS



mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	2-3 shift valve	8.0 (0.315)	6.0 (0.236)	3.2 (0.126)
ⓒ	1-2 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	3-4 shift valve	8.0 (0.315)	6.0 (0.236)	3.2 (0.126)
ⓔ	Secondary regulator valve	13.0 (0.512)	6.0 (0.236)	3.2 (0.126)
ⓕ	Lock-up signal valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)



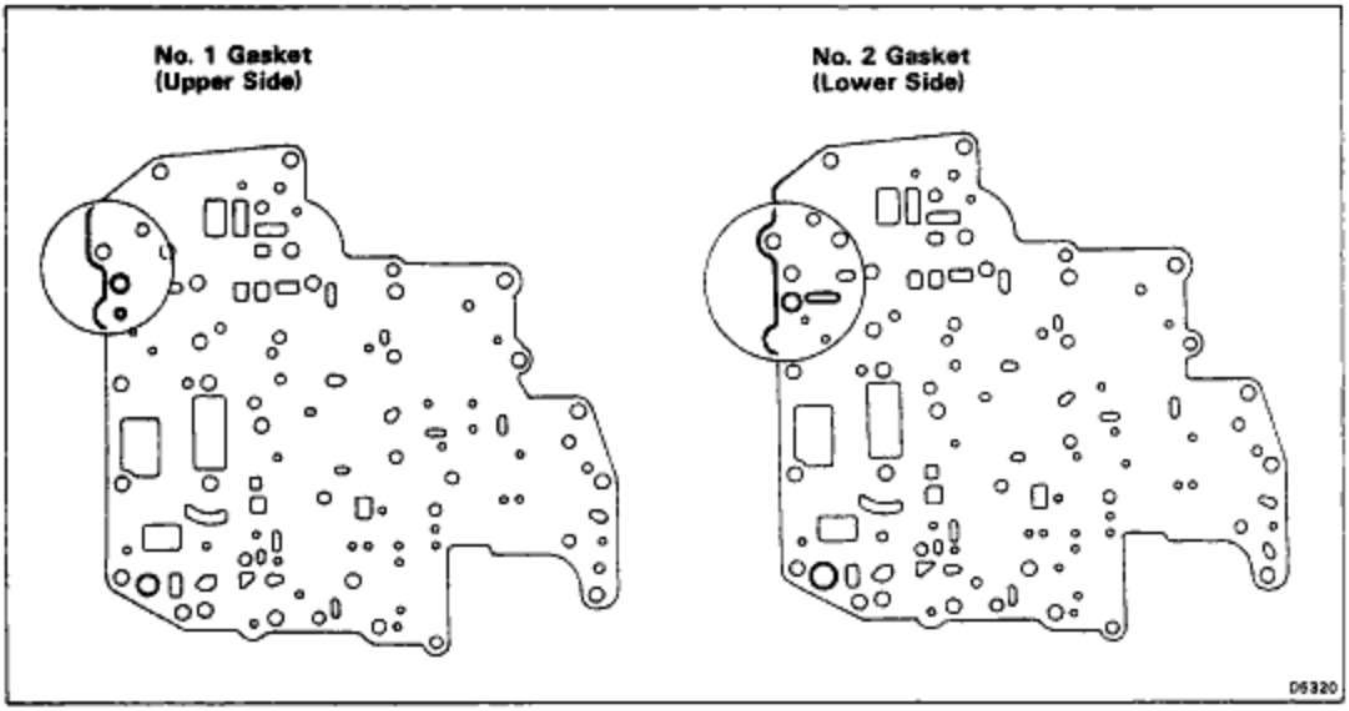
(Assembly of Valve Body)

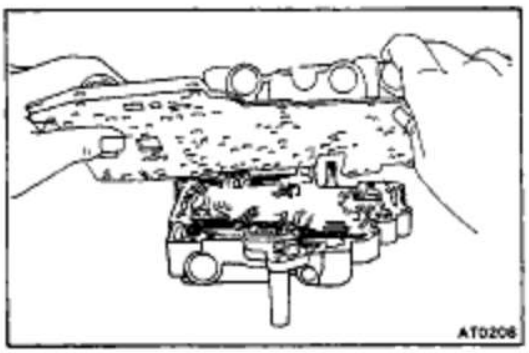
(See page AT–121)

1. POSITION PLATE AND NEW GASKETS ON LOWER VALVE BODY

Position the new No. 2 gasket, the plate and then the new No. 1 gasket on the lower valve body.

HINT: Since No. 1 gasket and No. 2 gasket are similar use the illustration below to discriminate between them.

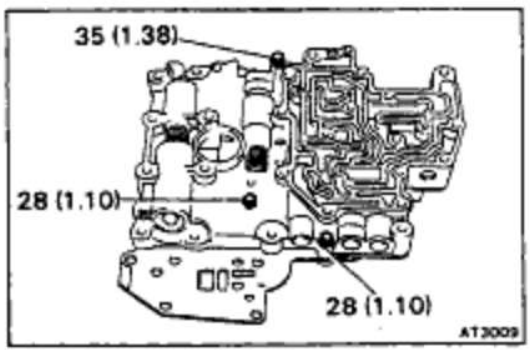




2. PLACE LOWER VALVE BODY WITH PLATE AND GASKETS ON UPPER VALVE BODY

HINT: Hold the lower valve body, gaskets and plate securely so they do not separate.

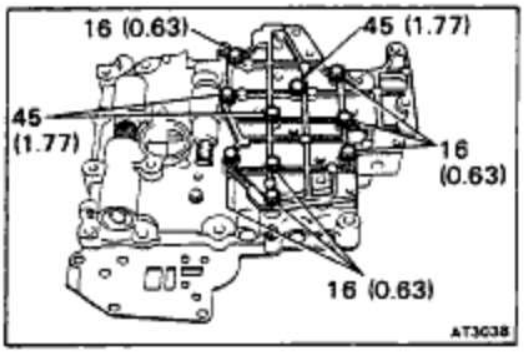
Align each bolt hole in the valve bodies with the gaskets and plate.



3. INSTALL AND FINGER TIGHTEN BOLTS IN LOWER VALVE BODY TO SECURE UPPER VALVE BODY

Install and finger tighten the three bolts.

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

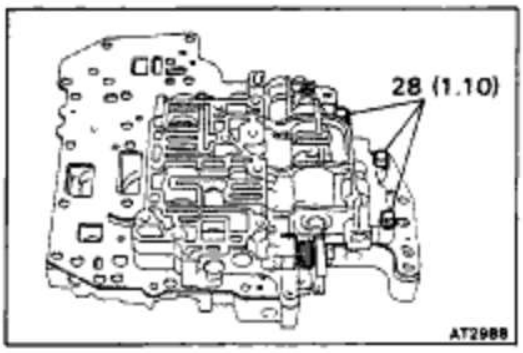


4. INSTALL LOWER VALVE BODY COVER

(a) Install the lower valve body cover over the new gasket.

(b) Install and finger tighten the ten bolts.

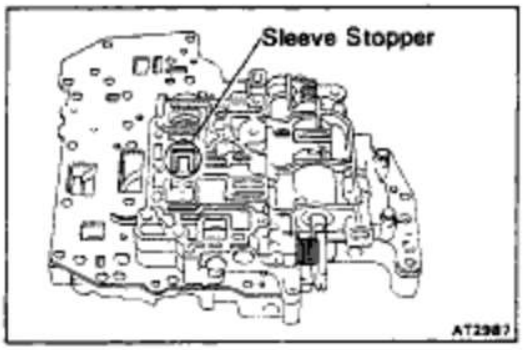
HINT: Each bolt length (mm (in.)) is indicated in the figure.



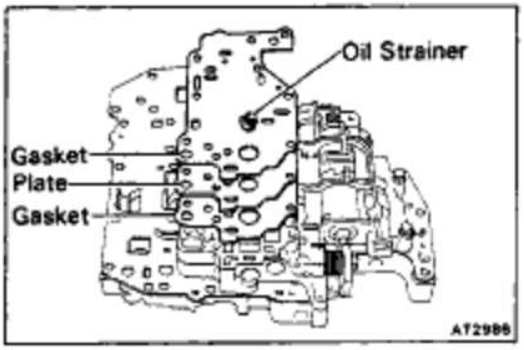
5. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY

Install and finger tighten the three bolts.

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



6. INSTALL SLEEVE STOPPER

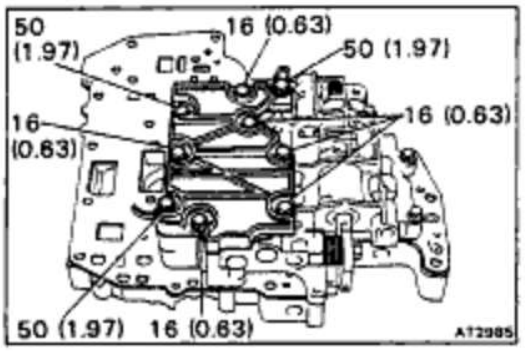


7. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

(b) Install the oil strainer onto the gasket.

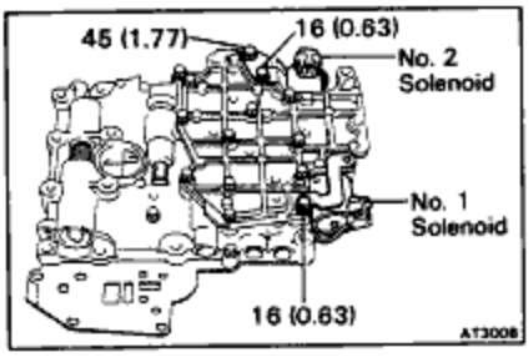


8. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

(b) Install and finger tighten the nine bolts.

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



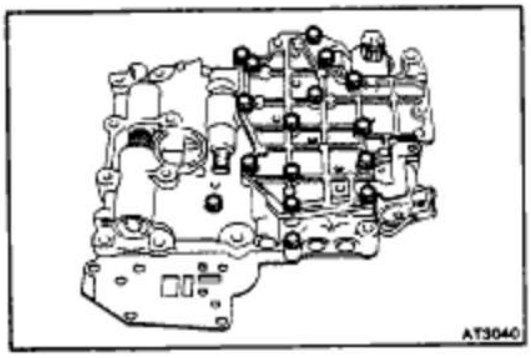
9. INSTALL SOLENOIDS

(a) Install the new O–rings on the solenoids.

W Install the No. 1 and No. 2 solenoids.

(e) Install and finger tighten the three bolts.

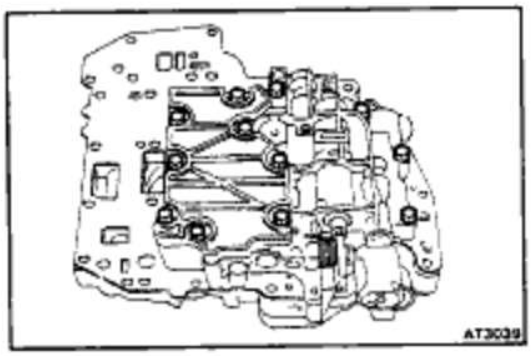
HINT: Each bolt length (mm (in.)) is indicated in the figure.



10. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

(a) Tighten the sixteen bolts in the lower valve body.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

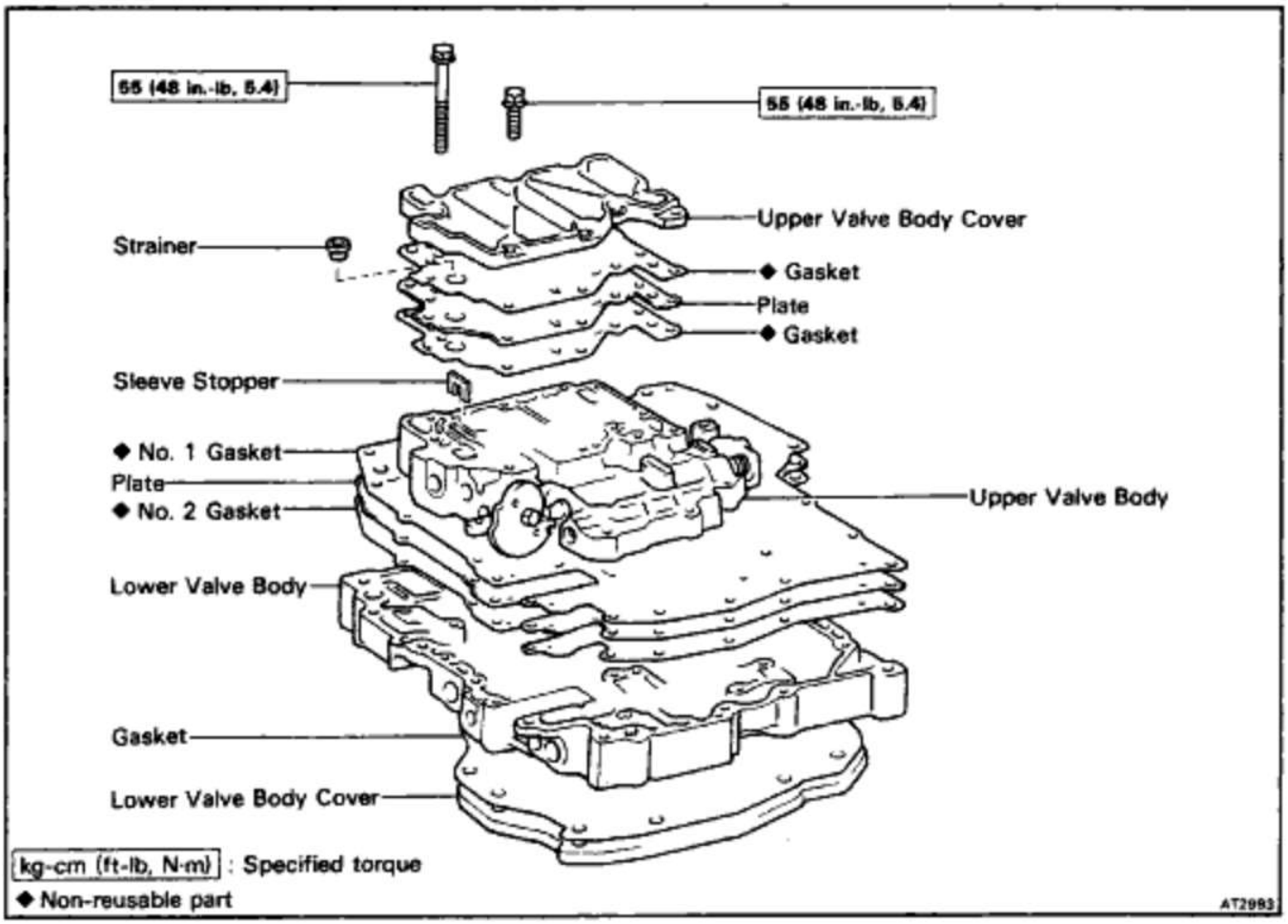


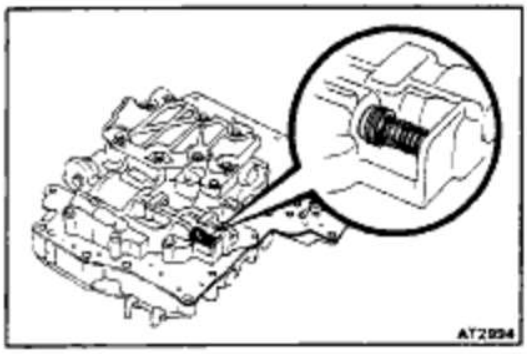
(b) Tighten the twelve bolts in the upper valve body.

Torque: 55 k9–cm (48 in.–lb, 5.4 N–m))

Valve Body (A140L)

COMPONENTS

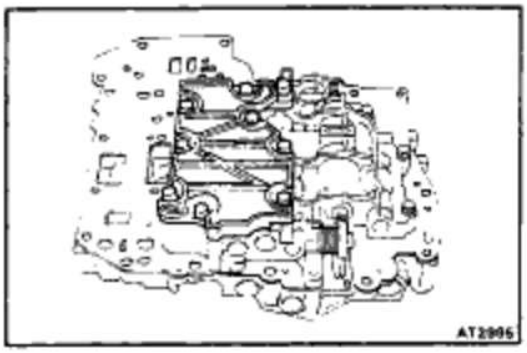




(Disassembly of Valve Body)

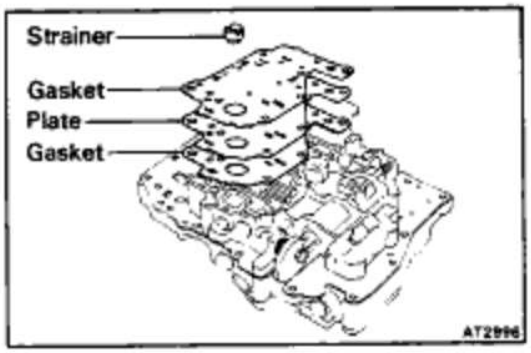
1. NOTE THE NUMBER OF ADJUSTING RINGS

HINT: Count the number of adjusting rings before disassembly of the valve body because the throttle pressure
is changed according to the number. (Some of the valve bodies do not have any adjusting rings.)



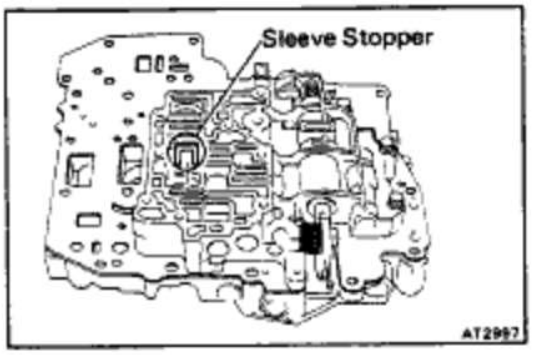
2. REMOVE UPPER VALVE BODY COVER

Remove the nine bolts and upper valve body cover.



3. REMOVE STRAINER, GASKETS, PLATE AND SLEEVE STOPPER FROM UPPER VALVE BODY

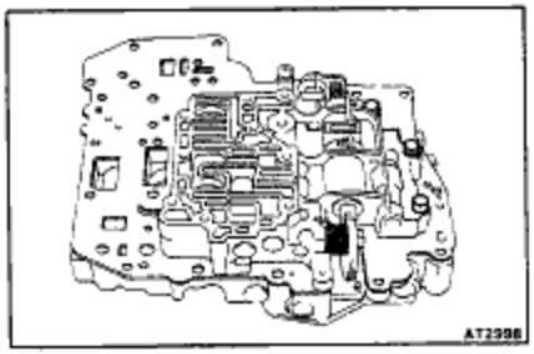
(a) Remove the strainer, two gaskets and plate.



(b) Remove the sleeve stopper.

4. REMOVE BOLTS FROM UPPER VALVE BODY

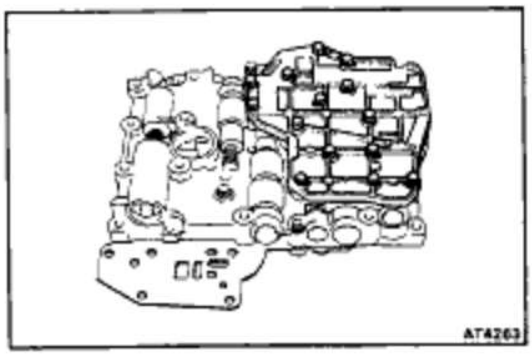
Remove the three bolts from upper valve body.



5. REMOVE LOWER VALVE BODY COVER

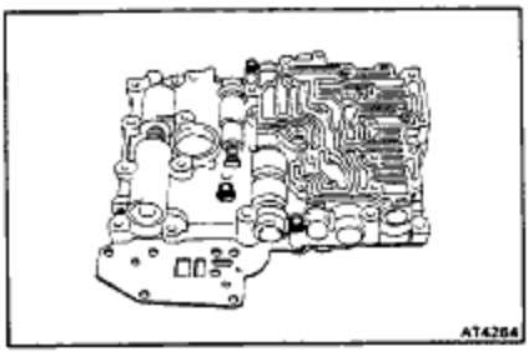
(a) Remove the fourteen bolts.

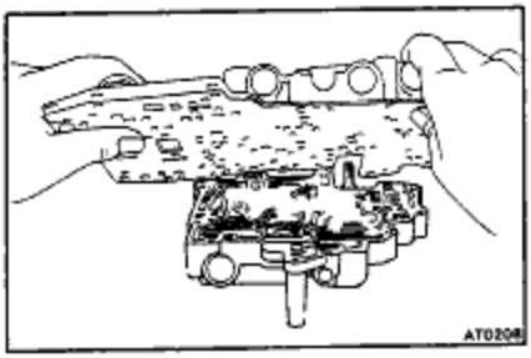
(b) Remove the lower valve body cover and gasket.



6. REMOVE BOLTS FROM LOWER VALVE BODY

Remove the three bolts from lower valve body.

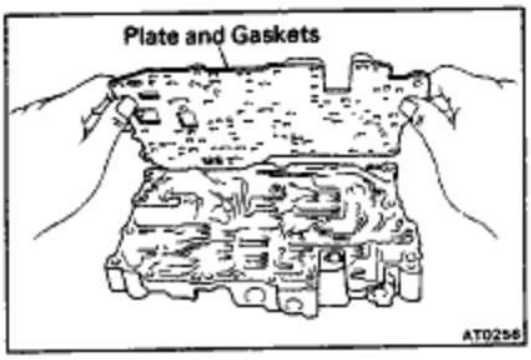




7. LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT

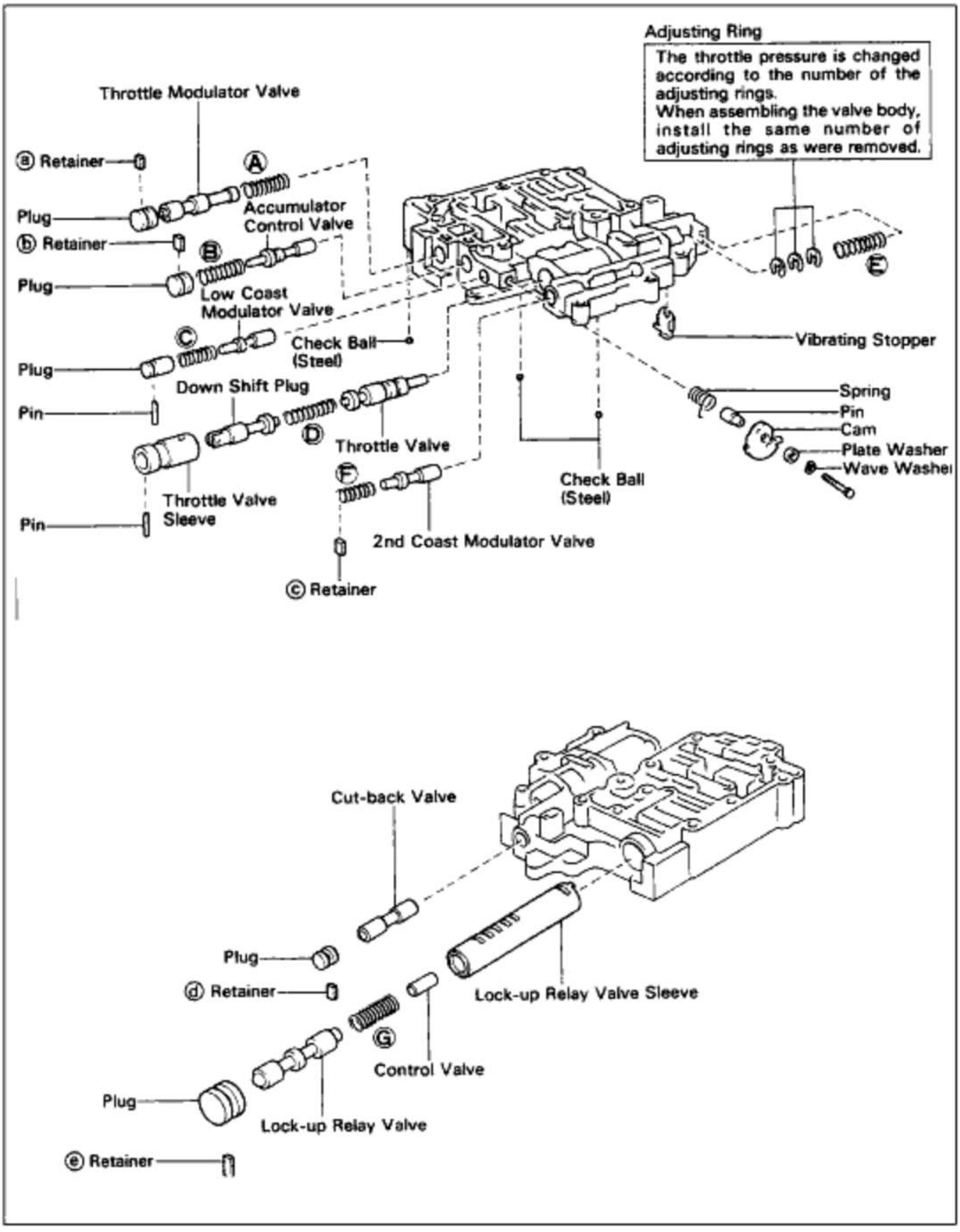
Hold the plate to the lower valve body and lift off the tower valve body.

HINT: Be careful that the check balls do not fall out.



8. REMOVE PLATE AND GASKETS

(Upper Valve Body)
COMPONENTS

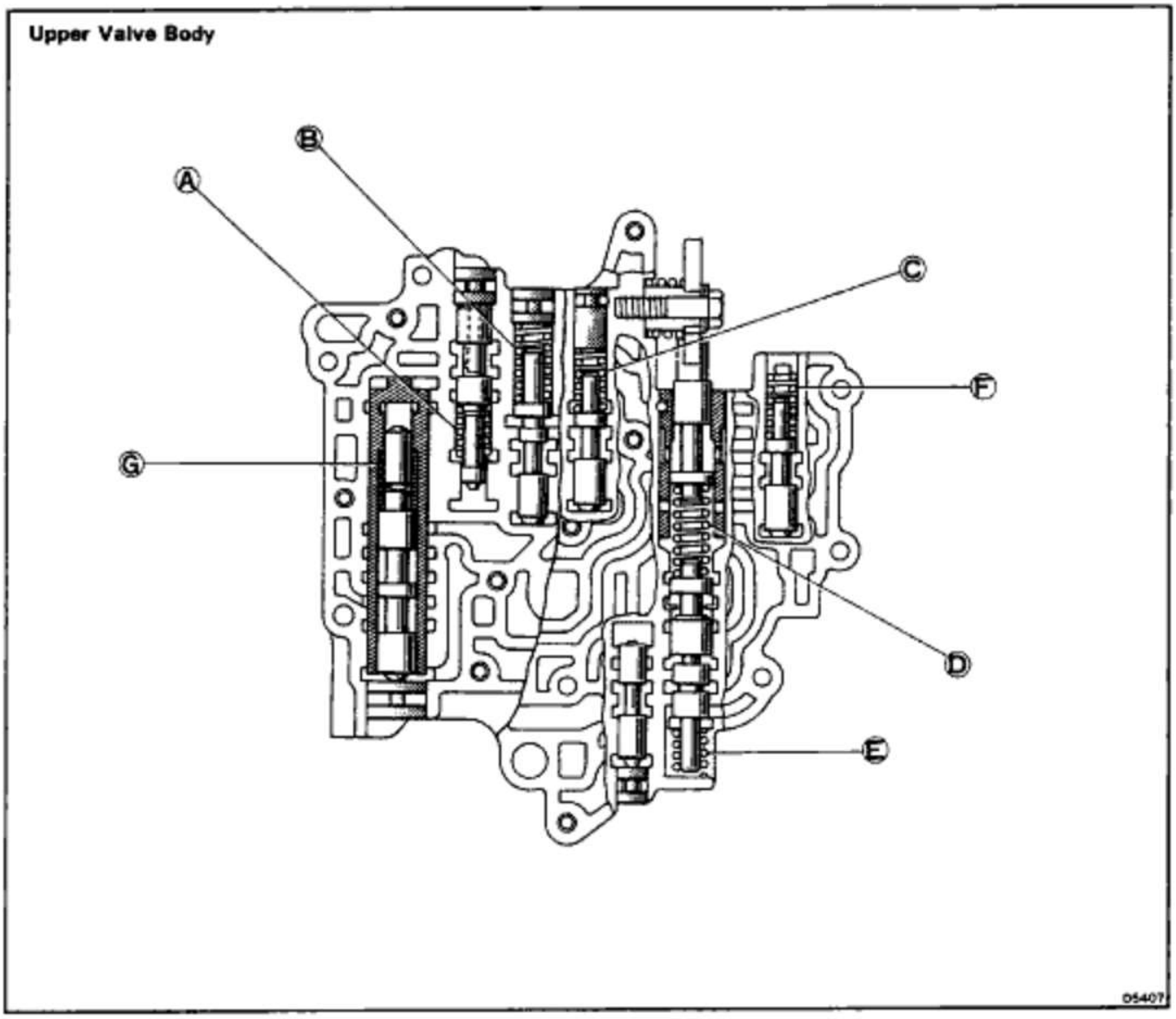


SPECIFICATIONS OF VALVE BODY SPRINGS

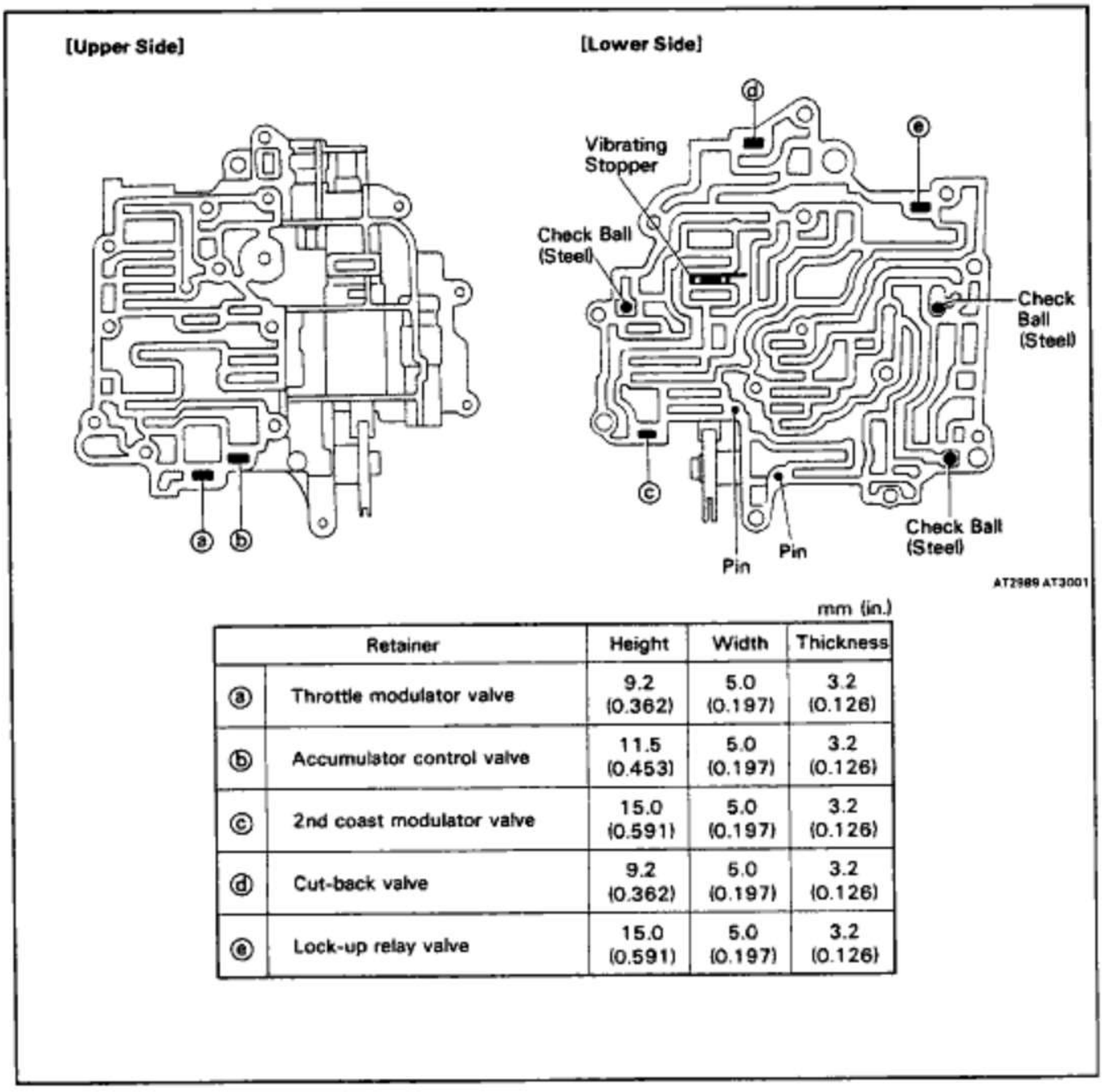
Spring		Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
A	Throttle Modulator Valve Spring	21.70 (0.8543)	9.50 (0.3740)	9.5	None
B	Accumulator Control Valve Spring	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
C	Low Coast Modulator Valve Spring	23.40 (0.9213)	7.90 (0.3110)	11.5	Red
D	Down Shift Plug Spring	29.76 (1.1717)	8.73 (0.3437)	13.5	Yellow
E	Throttle Valve Spring	30.70 (1.2087)	9.20 (0.3622)	9.5	None
F	2nd Coast Modulator Valve Spring	20.93 (0.8240)	8.50 (0.3346)	10.0	Light Green
G	Lock–up Relay Valve Spring	26.56 (1.0457)	10.20 (0.4016)	11.5	Green

HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY



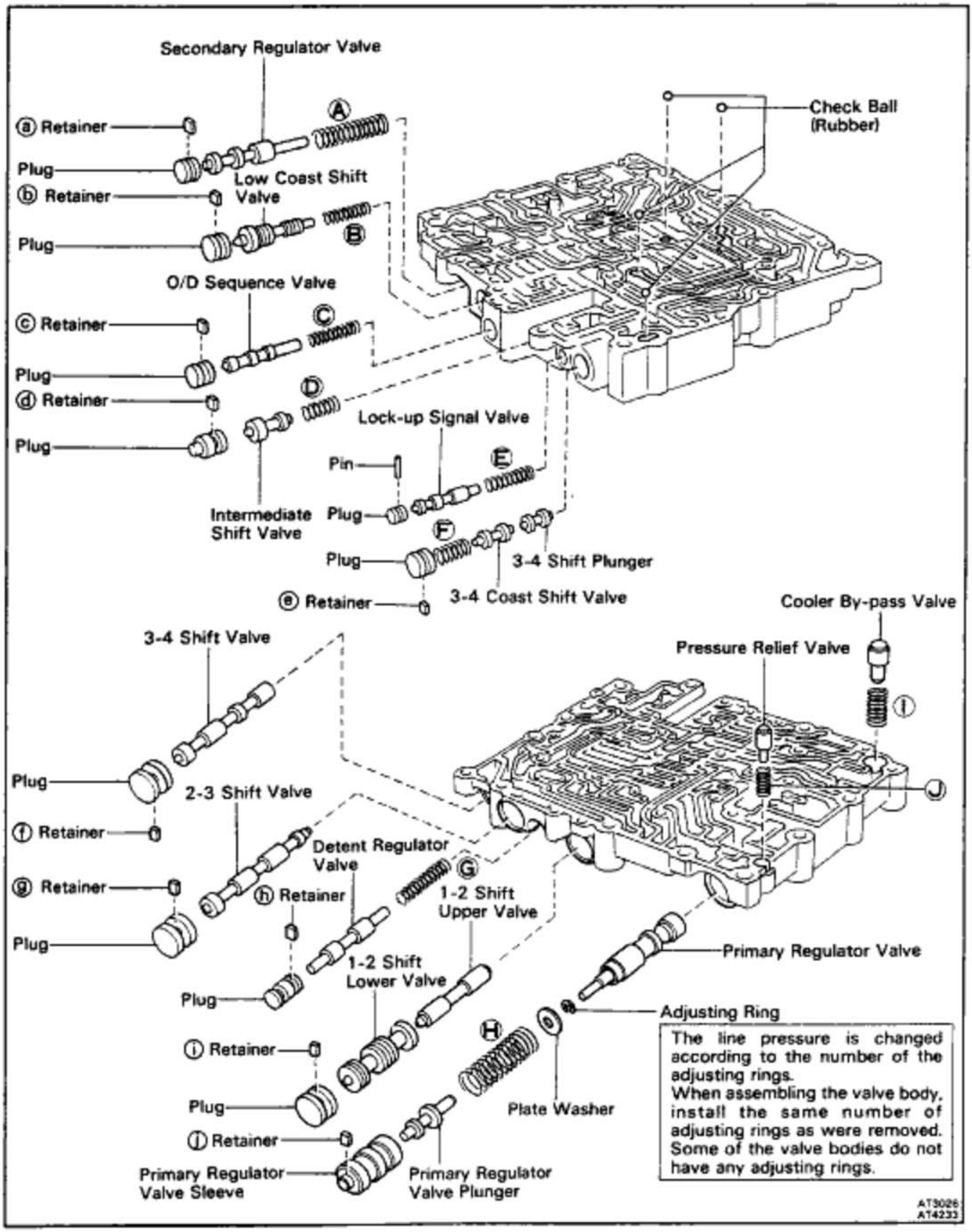
LOCATION OF RETAINERS, PINS, VIBRATING STOPPER AND CHECK BALLS



mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Throttle modulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Accumulator control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓒ	2nd coast modulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓓ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓔ	Lock-up relay valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)

(Lower Valve Body)
COMPONENTS

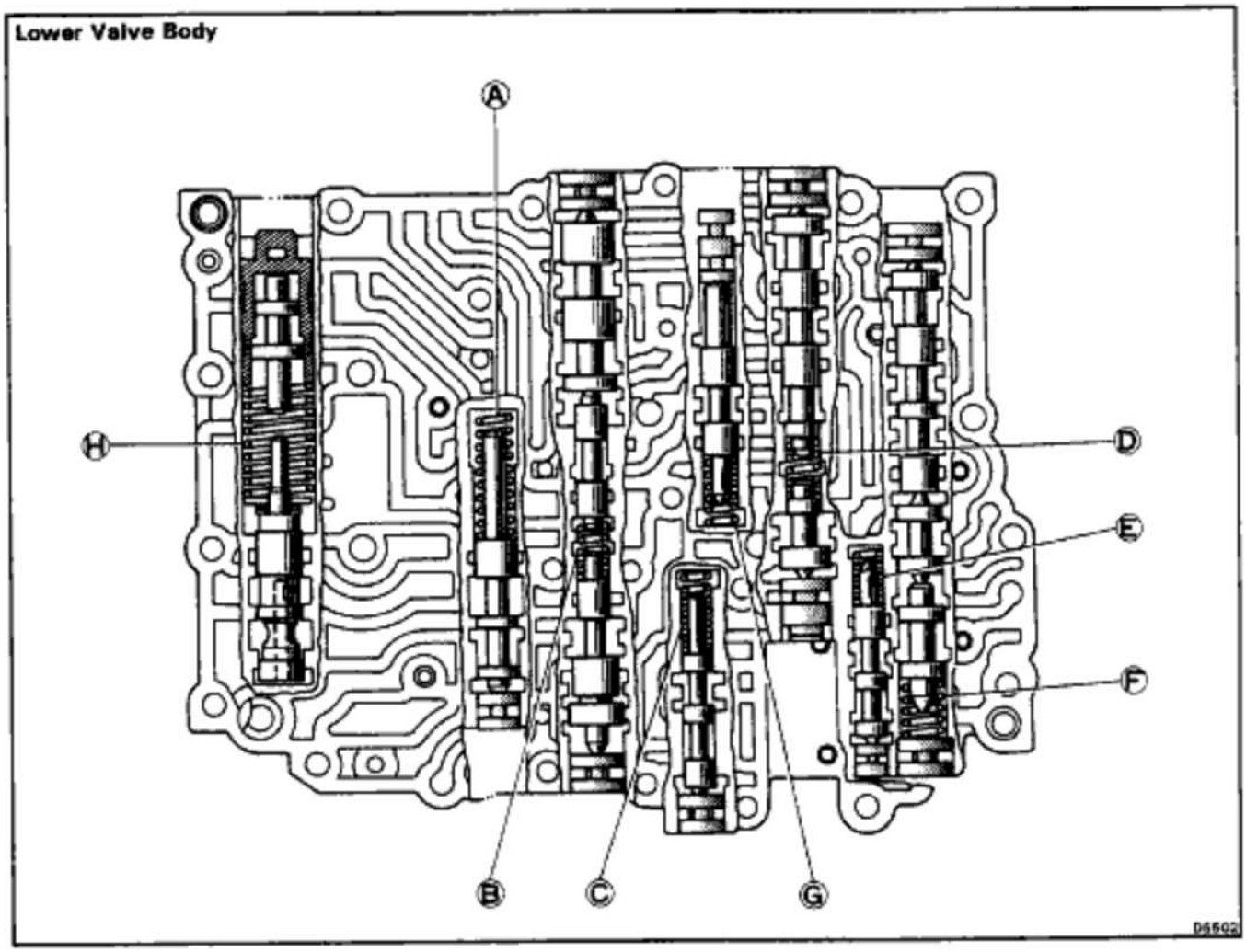


SPECIFICATIONS OF VALVE BODY SPRINGS

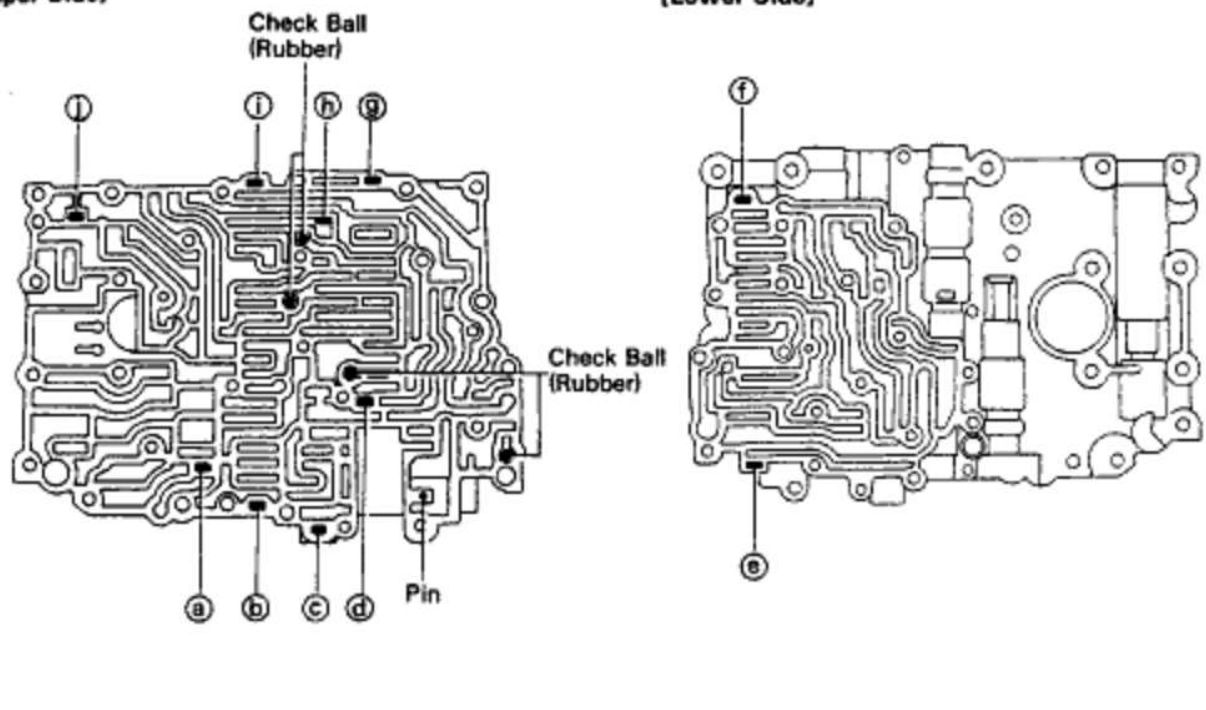
Spring		Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
Ⓐ	Secondary Regulator Valve Spring	43.60 (1.7165)	10.90 (0.4291)	11.5	None
Ⓑ	1–2 Shift Valve Spring	27.17 (1.0697)	6.39 (0.2516)	15.5	Yellow
Ⓒ	O/D Sequence Valve Spring	30.90 (1.2165)	7.00 (0.2756)	18.5	None
Ⓓ	2–3 Shift Valve Spring	27.74 (1.0921)	8.30 (0.3268)	11.0	None
Ⓔ	Lock–up Signal Valve Spring	38.65 (1.5217)	8.15 (0.3209)	15.25	Pink
Ⓕ	3–4 Coast Shift Valve Spring	21.10 (0.8307)	10.90 (0.4291)	8.5	White
Ⓖ	Detent Regulator Valve Spring	30.64 (1.2063)	7.90 (0.3110)	12.5	Blue
Ⓗ	Primary Regulator Valve Spring	66.65 (2.6240)	18.60 (0.7323)	12.5	None
Ⓘ	Cooler By–pass Valve Spring	19.90 (0.7835)	11.00 (0.4331)	8.5	None
Ⓙ	Pressure Relief Valve Spring	11.20 (0.4409)	6.40 (0.2520)	7.5	None

HINT: During re–assembly please refer to the spring specifications above to help discriminate between the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINER PIN AND CHECK BALLS

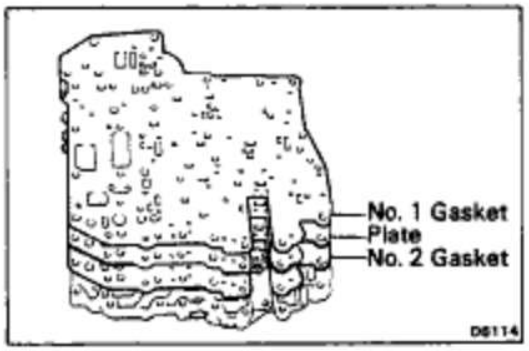


mm (in.)

Retainer		Height	Width	Thickness
ⓐ	Secondary regulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓑ	Low coast shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓒ	O/D sequence valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Intermediate shift valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓔ	3-4 coast shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
ⓕ	3-4 shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
ⓖ	2-3 shift valve	6.0 (0.236)	8.0 (0.315)	3.2 (0.126)
ⓗ	Detent regulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓘ	1-2 shift lower valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓙ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)

(Assembly of Valve Body)

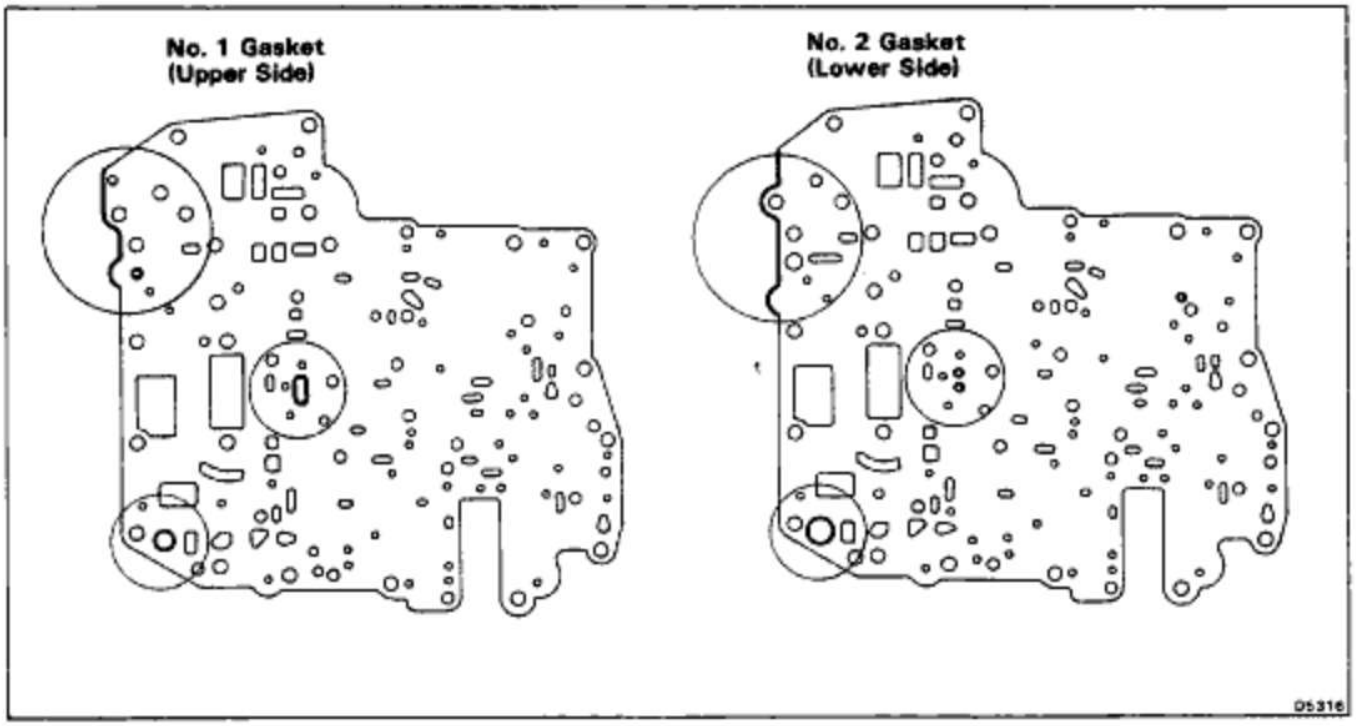
(See page AT–133)

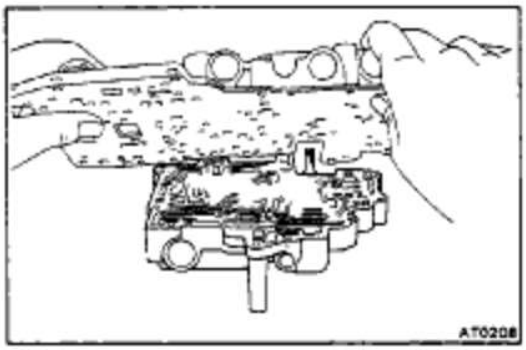


1. POSITION PLATE AND NEW GASKETS ON LOWER VALVE BODY

Position the new No. 2 gasket, the plate and then the new No. 1 gasket on the lower valve body.

HINT: Since No. 1 gasket and No. 2 gasket are similar use the illustration below to discriminate between them.

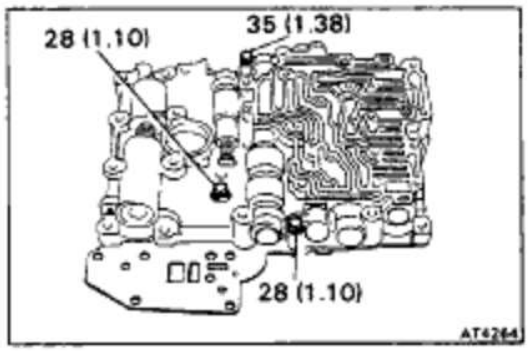




2. PLACE LOWER VALVE BODY WITH PLATE AND GASKETS ON UPPER VALVE BODY

HINT: Hold the tower valve body, gaskets and plate securely so they do not separate.

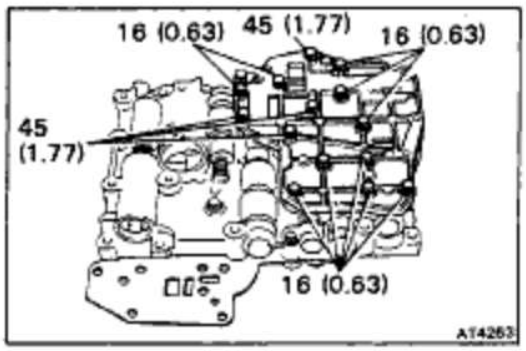
Align each bolt hole in the valve bodies with the gaskets and plate.



3. INSTALL AND FINGER TIGHTEN BOLTS IN LOWER VALVE BODY

Install and finger tighten the three bolts.

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

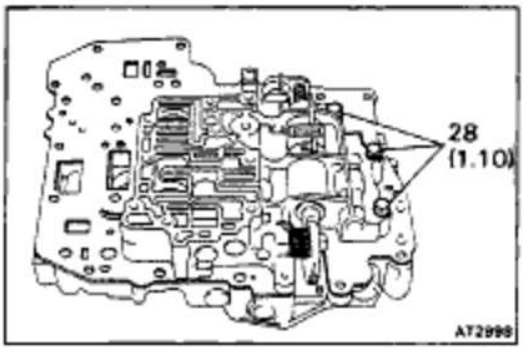


4. INSTALL LOWER VALVE BODY COVER

(a) Install the lower valve body cover over the new gasket.

(b) Install and finger tighten the fourteen bolts.

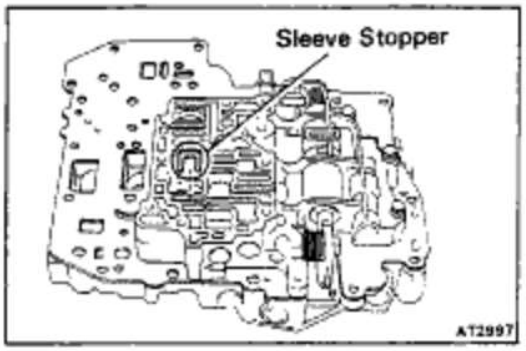
HINT: Each bolt length (mm (in.)) is indicated in the figure.



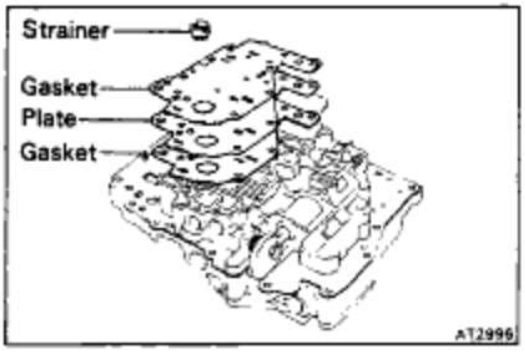
5. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY

Install and finger tighten the three bolts.

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



6. INSTALL SLEEVE STOPPER

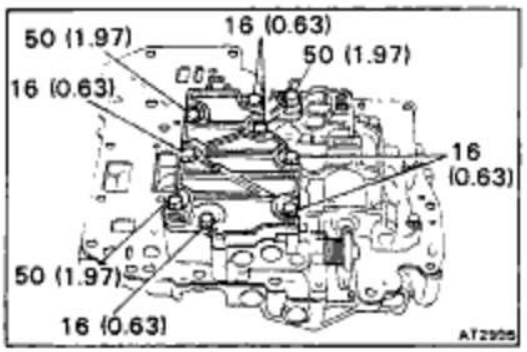


7. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

(b) install the oil strainer onto the gasket.

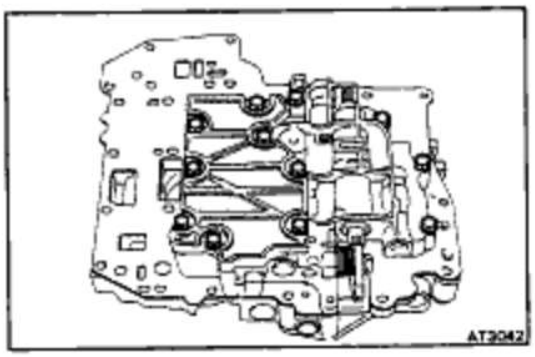


8. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

(b) Install and finger tighten the nine bolts.

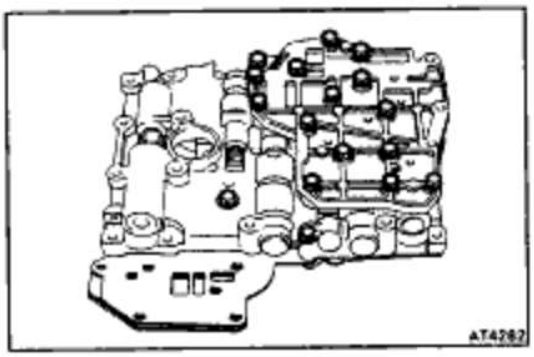
HINT: Each bolt length (mm (in.)) is indicated in the figure.



9. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

(a) Tighten the twelve bolts in the upper valve body.

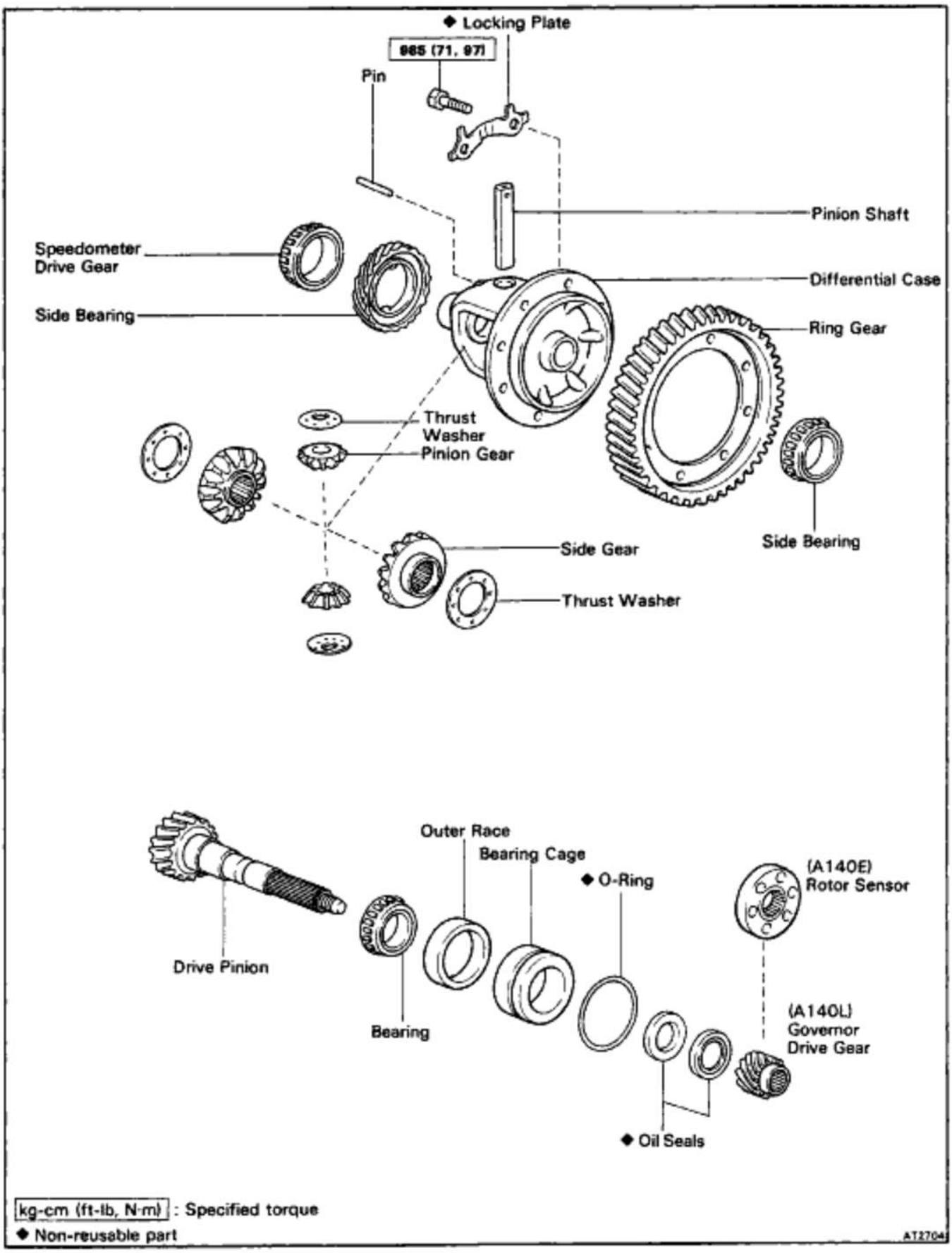
Torque: 55 kg–cm (48 in.–lb, 54 N–m)

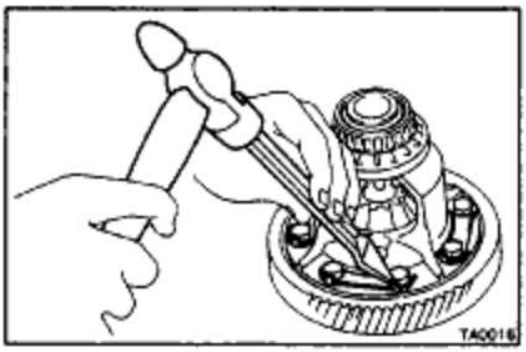


(b) Tighten the seventeen bolts in the lower valve body.

Torque: 55 kg–cm (48 in.–lb, 54 N–m)

Differential and Drive Pinion

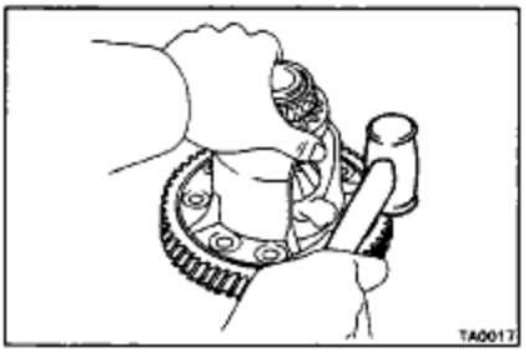




DISASSEMBLY OF DIFFERENTIAL CASE

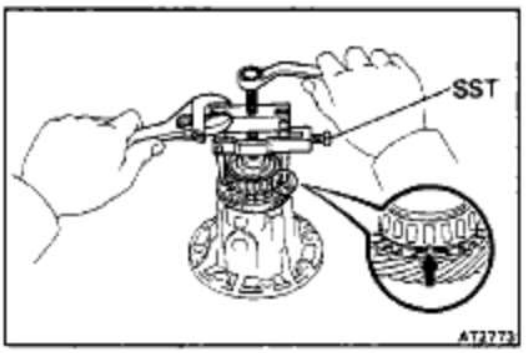
1. REMOVE RING GEAR

(a) Loosen the staked part of the lock plate.



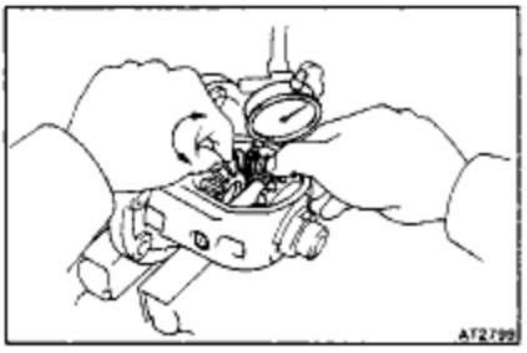
(b) Remove the eight bolts and locking plates.

(c) Using a copper hammer, tap on the ring gear to remove it from the case.



2. REMOVE SIDE BEARINGS

Fasten SST under the bearing above the cutouts on the speedometer drive gear. Remove the bearing from the case.
SST 09502–10012

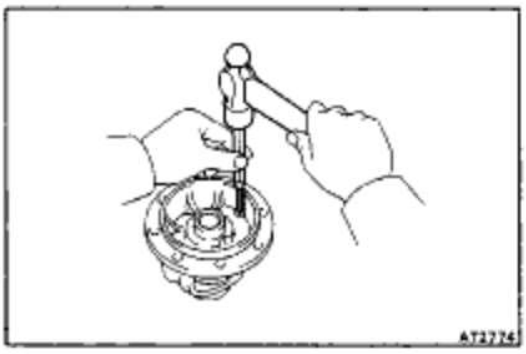


3. CHECK SIDE GEAR BACKLASH

Using a dial gauge, measure the backlash of each side gear while holding one pinion toward the case.

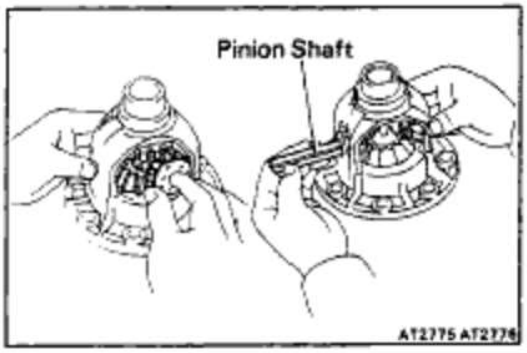
Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

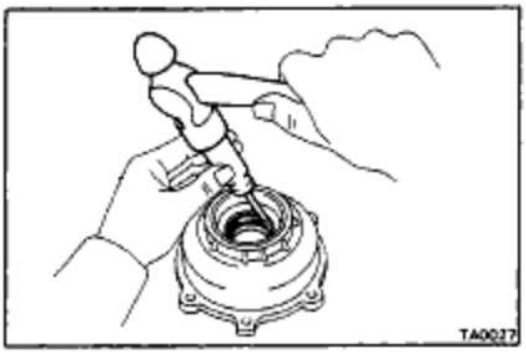


4. DISASSEMBLE DIFFERENTIAL CASE

(a) Drive out the pinion shaft lock pin from the side on which the ring gear is installed.

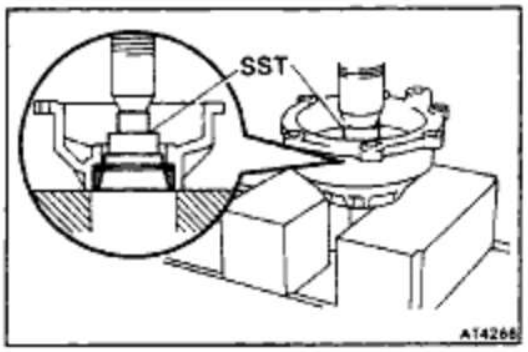


(b) Remove the pinion shaft from the case.
(c) Remove the two pinions and two side gears with the four thrust washers.



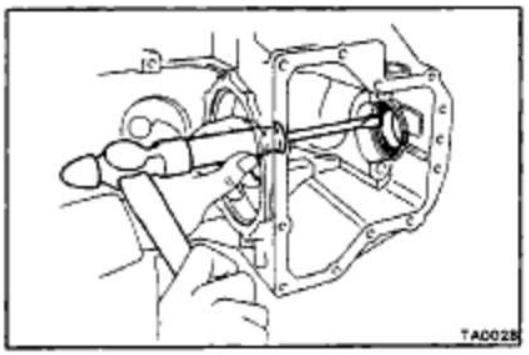
5. REMOVE LH OIL SEAL

Using a hammer and screwdriver, remove the oil seal.



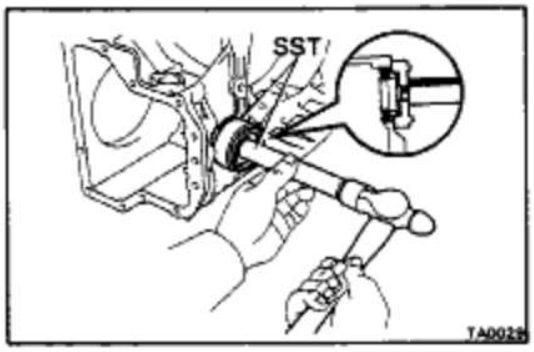
6. REMOVE BEARING OUTER RACE FROM LH SIDE BEARING RETAINER

Using SST, press out the outer race and shim.
SST 09350–32014 (09351–32090)



7. REMOVE RH OIL SEAL

Using a hammer and screwdriver, remove the oil seal.

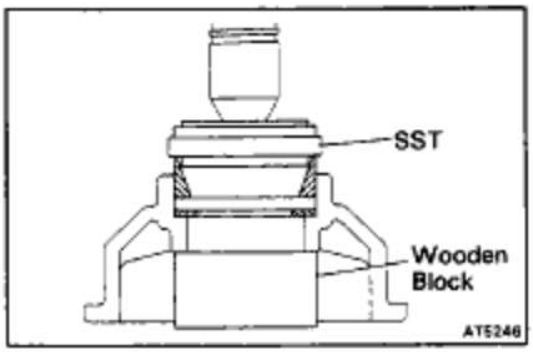


ASSEMBLY OF DIFFERENTIAL CASE

1. INSTALL RH OIL SEAL

(a) Using SST, drive in a new oil seal until its surface is flush with the surface of the case.
SST 09350–32014 (09351–32130, 09351–32150)

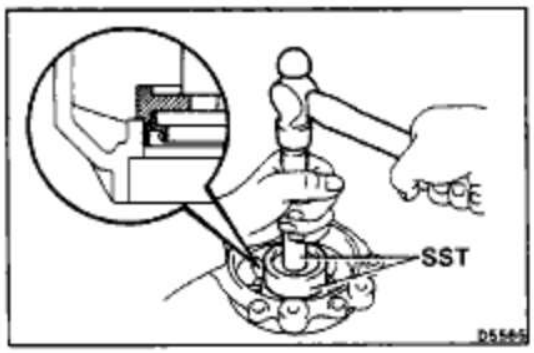
(b) Coat the oil seal lip with MP grease.



2. INSTALL BEARING OUTER RACE TO LH SIDE BEARING RETAINER

(a) Place the shim onto the retainer.

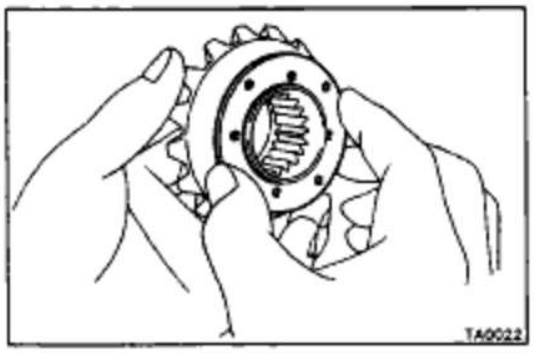
(b) Using SST, press a new outer race into the retainer.
SST 09350–32014 (09351–32111, 09351–32130)
HINT: Use the shim 2.60 mm (0.1024 in.) thick.



3. INSTALL LH OIL SEAL

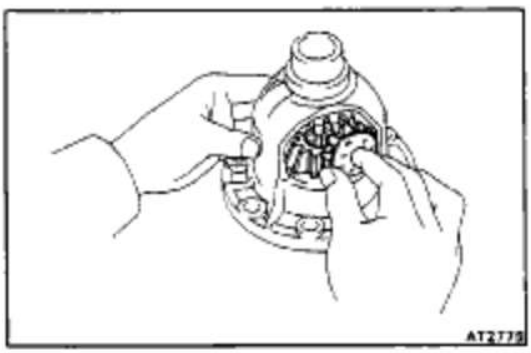
(a) Using SST, drive in a new oil seal.
SST 09350–32014 (09351–32130, 09351–32150)
Oil seal drive in depth: 2.7 mm (0.106 in.)

(b) Coat the oil seal lip with MP grease.

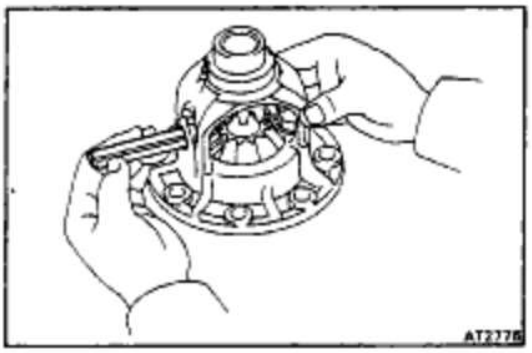


4. ASSEMBLE DIFFERENTIAL CASE

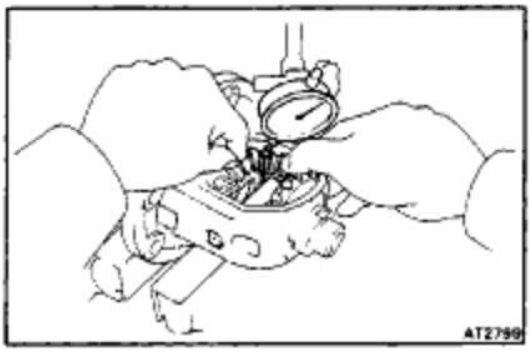
(a) Install the removed thrust washers to the side gears.



(b) Install the side gears with thrust washers, pinion thrust washers and pinion gears.



(c) Install the pinion shaft.



(d) Check the side gear backlash.
Measure the side gear backlash while holding one pinion gear toward the case.

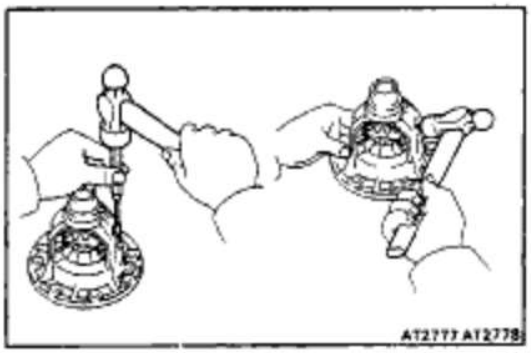
Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

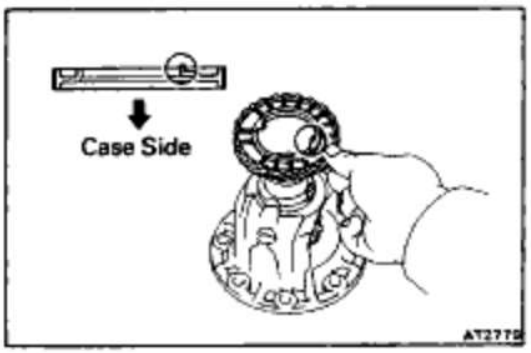
Referring to the table below, select thrust washers which will ensure that the backlash is within specification. Try to select washers of the same size for both sides.

Thrust washer thickness mm (in.)

0.95 (0.0374) 1.00 (0.0394) 1.05 (0.0413)	1.10 (0.0433) 1.15 (0.0453) 1.20 (0.0472)

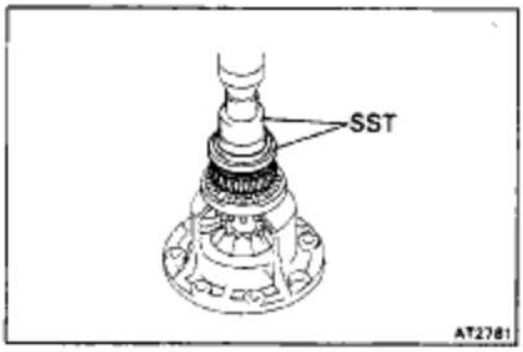
If the backlash is not within specification, install a thrust washer of a different thickness.
Using a hammer and punch, drive the lock pin through the case and hole in the pinion shaft.
(f) Stake the differential case.



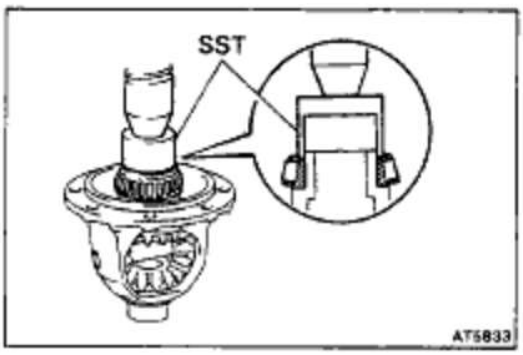


5. INSTALL SIDE BEARINGS

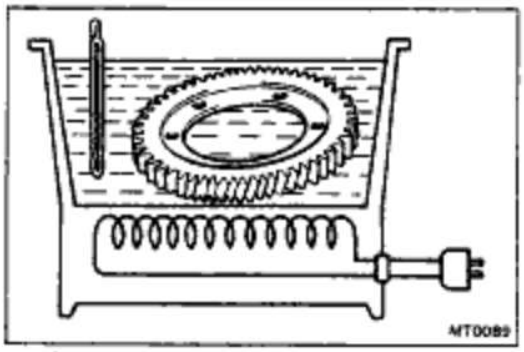
(a) Install the speedometer drive gear onto the differential case.



(b) Using SST and a press, press in the RH side bearing onto the differential case.
SST 09350–32014 (09351–32090, 09351–32120)

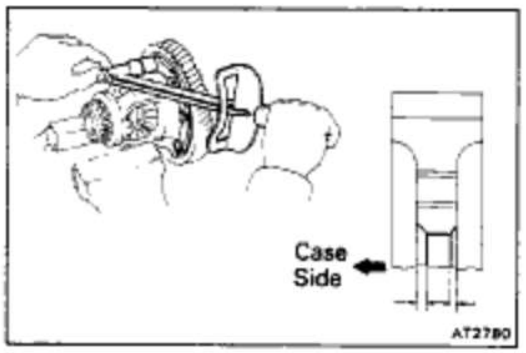


(c) Using SST and a press, press in the LH side bearing onto the differential case.
SST 09710–28020 (09710–08040)

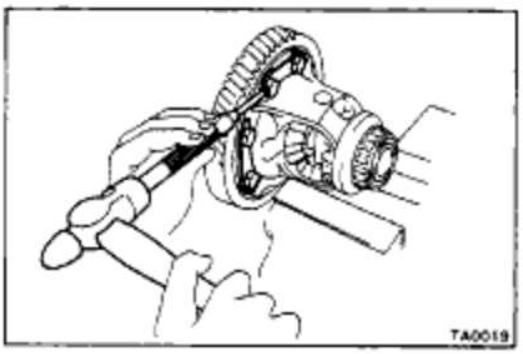


6. INSTALL RING GEAR

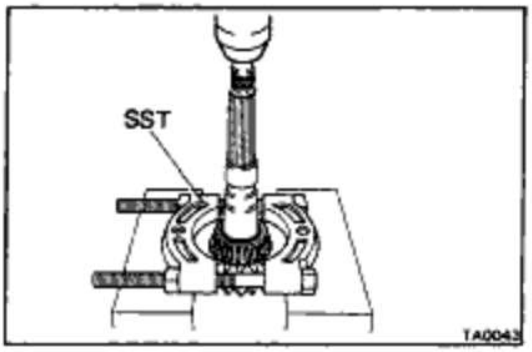
(a) Clean the contact surface of the differential case.
(b) Heat the ring gear to about 212°F (100°C) in an oil bath.
NOTICE: Do not heat the ring gear above 230°F (110°C).
(c) Clean the contact surface of the ring gear with cleaning solvent.



(d) Quickly install the ring gear on the differential case.
(e) install new locking plates and set bolts. Tighten the set bolts uniformly and a little at a time. Torque the bolts.
Torque: 985 kg–cm (71 ft–lb, 97 N–m)



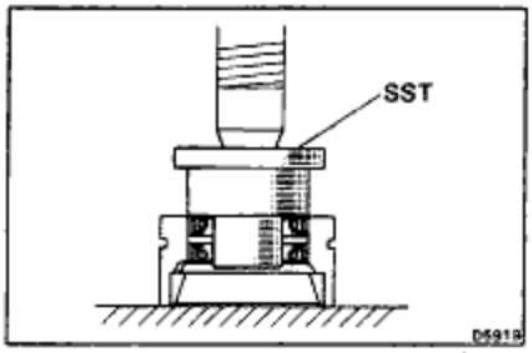
(f) Using a hammer and drift punch, stake the locking plates.
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



DISASSEMBLY OF DRIVE PINION ASSEMBLY

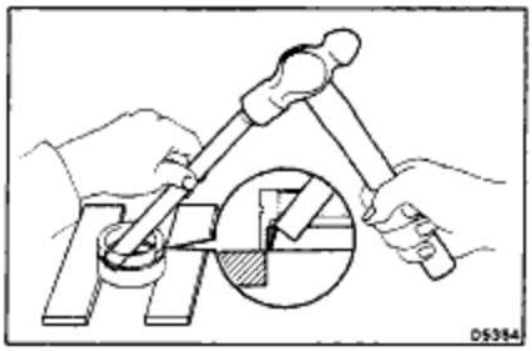
1. REMOVE DRIVE PINION SHAFT BEARING

Using SST, press out the bearing.
SST 09950–00020



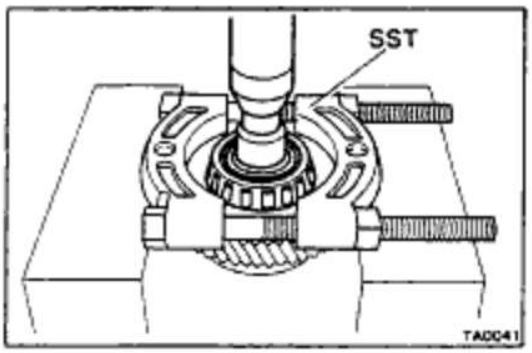
2. REMOVE OIL SEALS FROM CAGE

Using SST, press out the two oil seals together.
SST 09350–32014 (09351–32090)



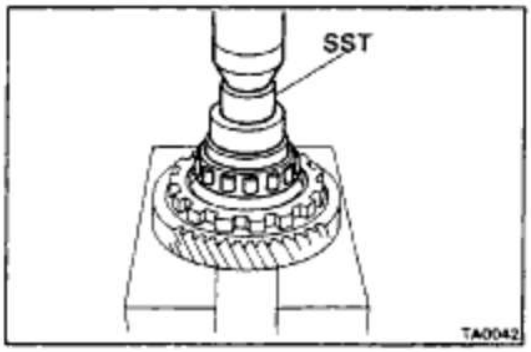
3. REMOVE SHAFT BEARING OUTER RACE FROM CAGE

Using a hammer and, brass bar, drive out the outer race from the cage.



4. REMOVE COUNTER DRIVEN GEAR BEARING

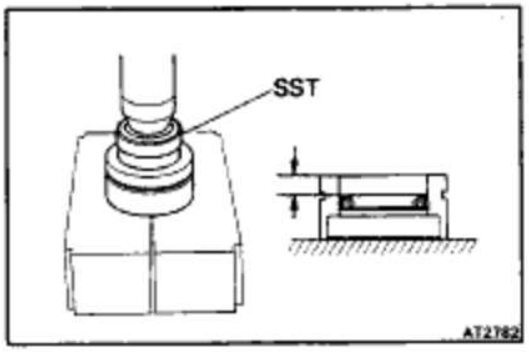
Using SST, press out the bearing.
SST 09950–00020



ASSEMBLY OF DRIVE PINION SHAFT COMPONENTS

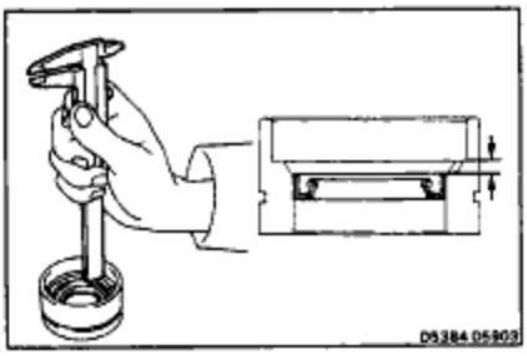
1. INSTALL COUNTER DRIVEN GEAR BEARING

Using SST, press in a new bearing.
SST 09350–32014 (09351–32090)

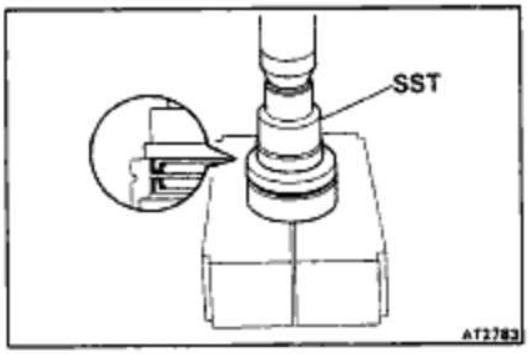


2. INSTALL OIL SEALS TO CAGE

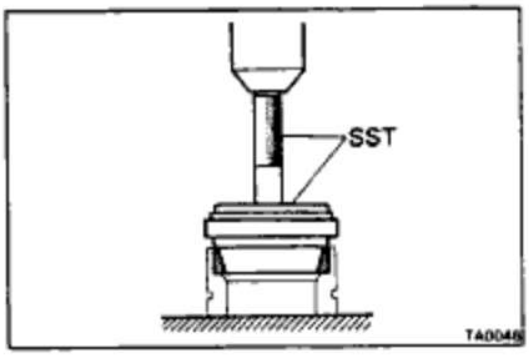
(a) Using SST, press in a new oil seal with the lip facing downward.
SST 09350–32014 (09351–32090)
Oil seal press in depth (from flat end): 9.5 mm (0.374 in.)



(b) Measure the oil seal press in depth.
Oil seal press in depth: 4 mm (0.16 in.)

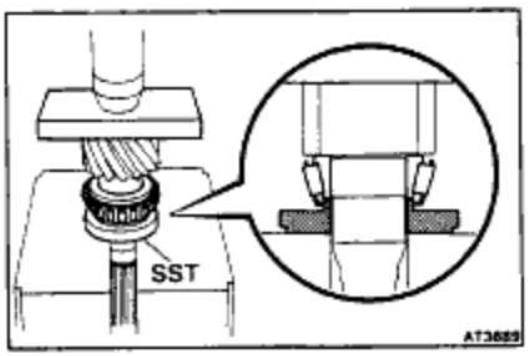


(c) With the oil seal lip facing upward, use SST to press in a new oil seal until its end is flush with the surface of the cage.
SST 09350–32014 (09351–32090)
(d) Coat the oil seal lip with MP grease.



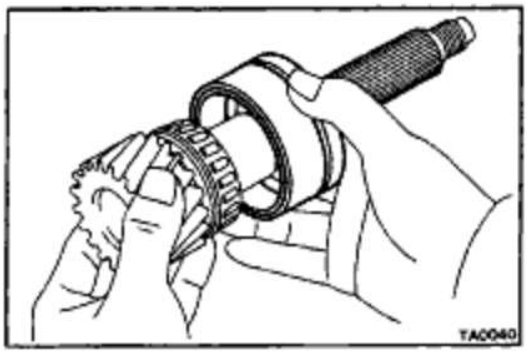
3. INSTALL SHAFT BEARING OUTER RACE TO CAGE

Using SST, press a new outer race into the cage.
SST 09350–32014 (09351–32111, 09351–32130)



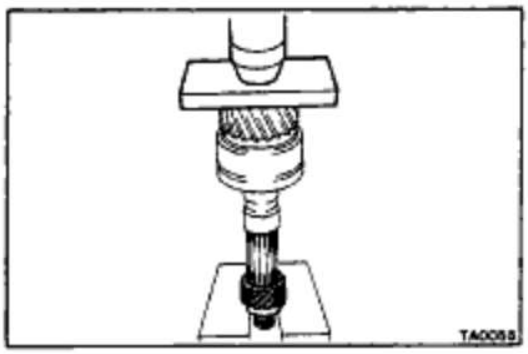
4. INSTALL DRIVE PINION SHAFT BEARING

Using SST, press in the bearing.
SST 09350–32014 (09351–32100)



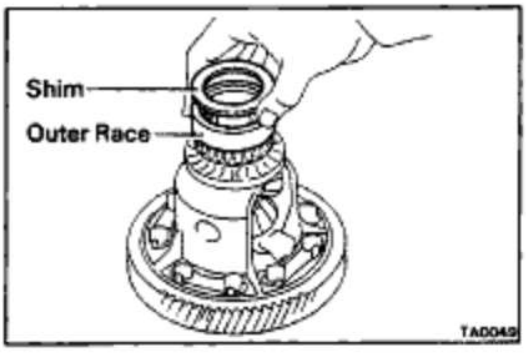
5. PLACE BEARING CAGE ONTO DRIVE PINION SHAFT

Be careful not to damage the oil seal with the splines.



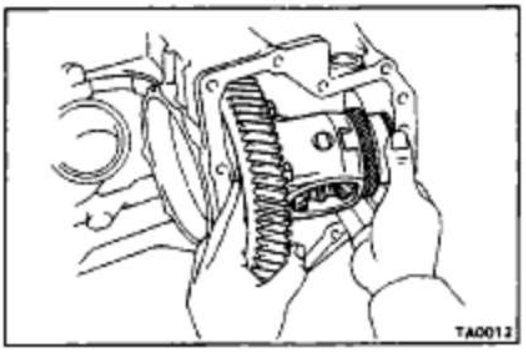
6. INSTALL ROTOR SENSOR (A140E) OR GOVERNOR DRIVE GEAR (A140L)

ADJUSTMENT OF DIFFERENTIAL SIDE BEARING PRELOAD



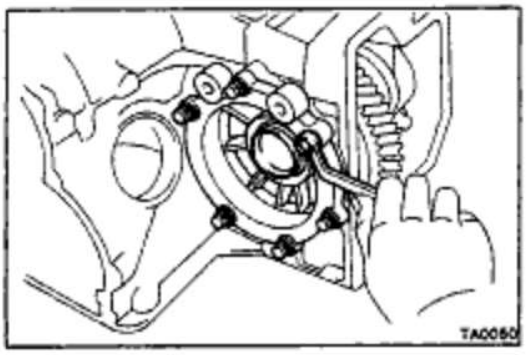
1. PLACE OUTER RACE AND ADJUSTING SHIM ONTO RH SIDE BEARING

Use the adjusting shim which was removed or one 2.40 mm (0.0945 in.) thick.



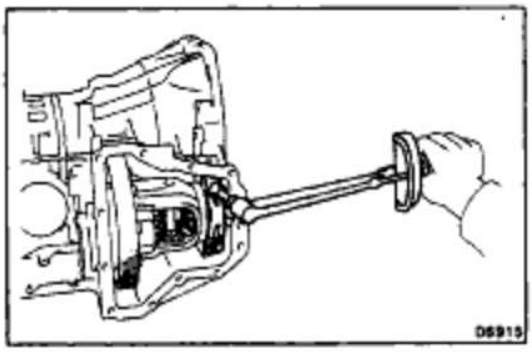
2. PLACE DIFFERENTIAL CASE INTO TRANSAXLE CASE

Be sure to install the adjusting shim.



3. INSTALL LH BEARING RETAINER

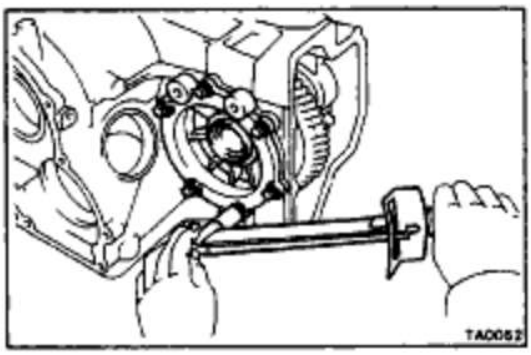
(a) Do not install the O–ring yet.
(b) Do not coat the bolt threads with sealant yet.
(e) Temporarily tighten the bolts evenly and gradually while turning the ring gear.



4. INSTALL RH SIDE BEARING CAP

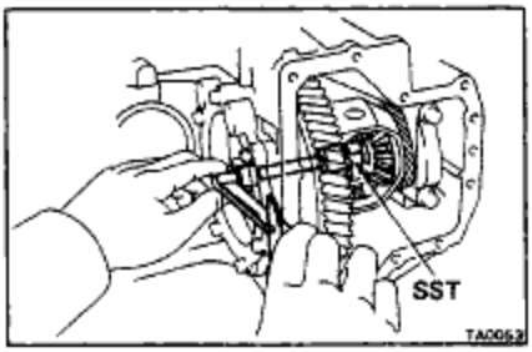
Tighten the bolts evenly. and gradually while turning the ring gear.

Torque: 730 kg–cm l53 ft–lb, 72 N–m)



5. TIGHTEN LH BEARING RETAINER

Torque: 195 kg–cm (14 ft–ft. 19 N–m)



6. ADJUST SIDE BEARING PRELOAD

Using SST and a torque meter, measure the preload of the ring gear.

SST 09564–32011

Preload (at starting):

New bearing 10 – 16 kg–cm

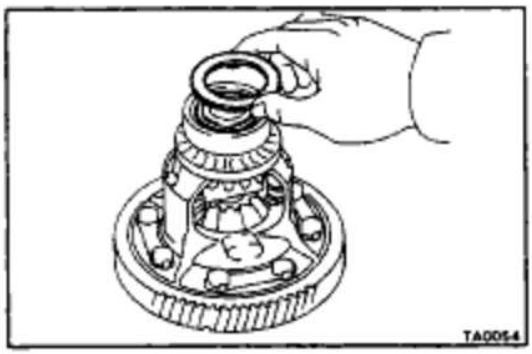
(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing 5 – 8 kg–cm

(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

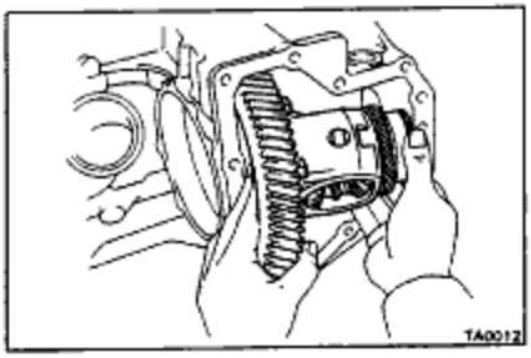
If the preload is not within specification, remove the differential case assembly.

B



Thickness mm (in.)	Thickness mm (in.)
1.90 (0.0748)	2.40 (0.0945)
1.95 (0.0768)	2.45 (0.0965)
2.00 (0.0787)	2.50 (0.0984)
2.05 (0.0807)	2.55 (0.1004)
2.10 (0.0827)	2.60 (0.1024)
2.15 (0.0846)	2.65 (0.1043)
2.20 (0.0866)	2.70 (0.1063)
2.25 (0.0886)	2.75 (0.1083)
2.30 (0.0906)	2.80 (0.1103)

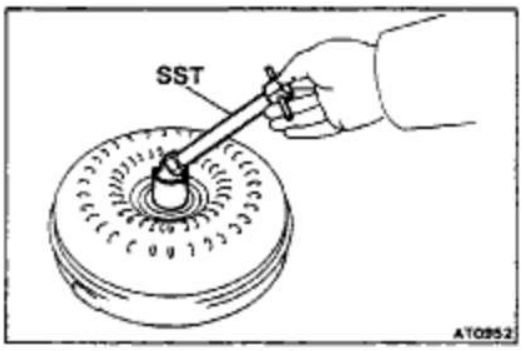
HINT: The preload will change about 3 – 4 kg–cm (2.6 – 3.5 in.–lb, 0.3 – 0.4 N–m) with each shim thickness.



7. REMOVE DIFFERENTIAL CASE AND COMPONENT PARTS

If the preload is adjusted within specification, remove the bearing retainer, differential case, RH side bearing and shim.

Be careful not to lose the adjusted shim.

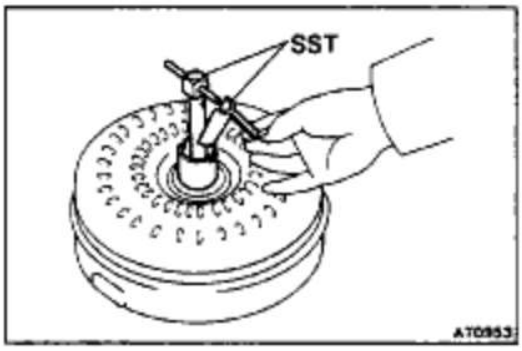


Torque Converter

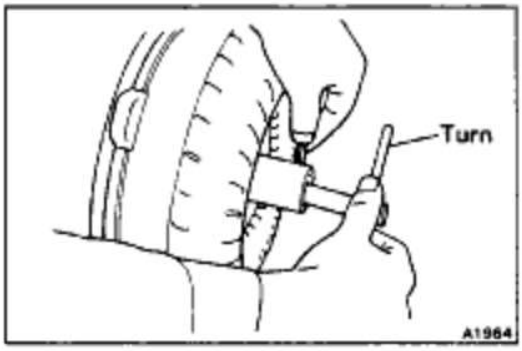
INSPECTION OF TORQUE CONVERTER

1. INSERT SST IN END OF TORQUE CONVERTER

(a) Insert a turning tool into the inner race of the one–way clutch.
SST 09350–32014 f09351–320101



(b) Insert the stopper so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



2. TEST ONE–WAY CLUTCH

With the torque converter standing on its side, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

CLEAN TORQUE CONVERTER

If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed with ATF.

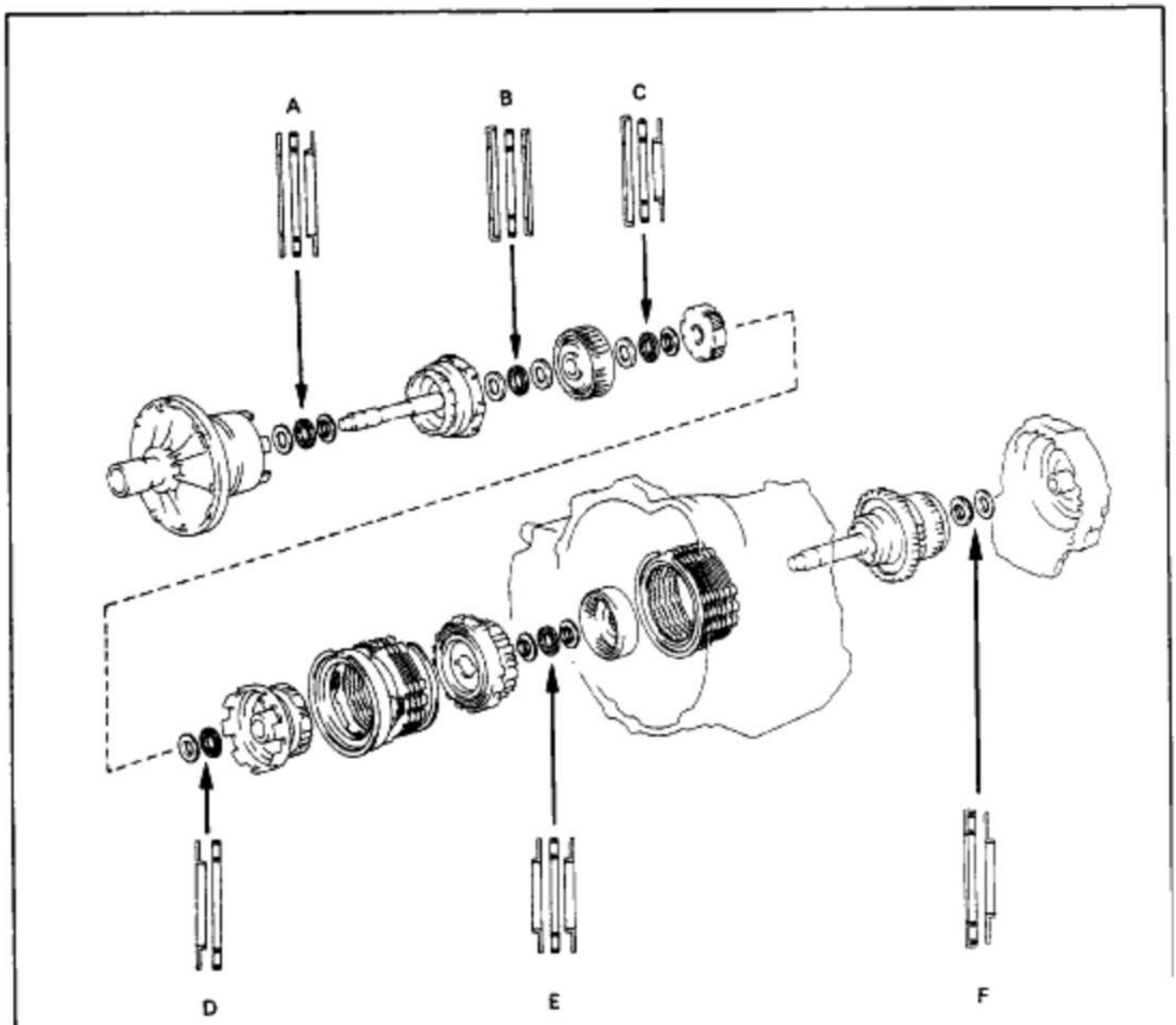
INSTALLATION OF COMPONENT PARTS

Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. Before assembly, 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.
Recommended ATF: DEXRON→ II

GENERAL INSTALLATION NOTES:

1. The automatic transaxle is composed of highly precision–finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in automatic transaxle fluid for at least two hours.
3. Apply automatic transaxle 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 transaxle, be sure to use new gaskets and O–rings.
7. Dry all parts with compressed air–never use shop rags.

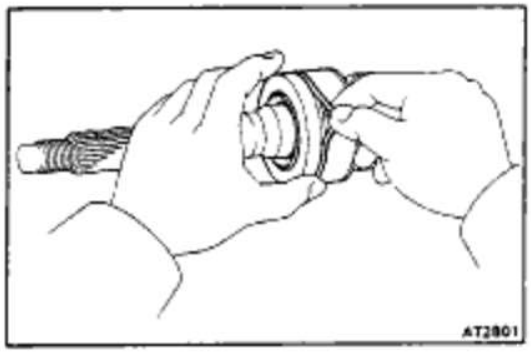
8. Be sure to install the thrust bearings and races in the correct direction and position.



AT2701

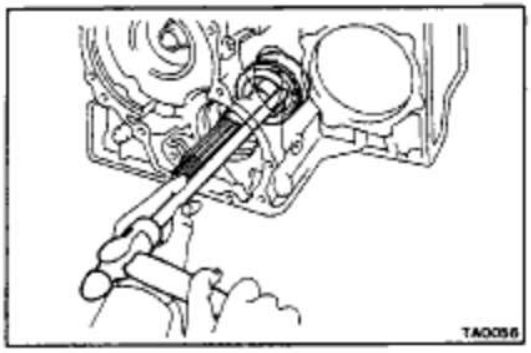
mm (in.)

		A	B	C	D	E	F
Front Bearing Race	Outer Diameter	43.0 (1.693)	37.9 (1.492)	←	45.0 (1.772)	37.3 (1.469)	–
	Inner Diameter	30.5 (1.201)	22.0 (0.866)	←	28.0 (1.102)	24.1 (0.949)	–
Thrust Bearing	Outer Diameter	42.0 (1.654)	36.1 (1.421)	←	45.0 (1.772)	37.6 (1.480)	46.3 (1.823)
	Inner Diameter	28.9 (1.138)	22.2 (0.874)	←	30.0 (1.181)	24.0 (0.945)	26.2 (1.031)
Rear Bearing Race	Outer Diameter	42.0 (1.654)	35.7 (1.406)	35.0 (1.378)	–	37.6 (1.480)	43.0 (1.693)
	Inner Diameter	27.1 (1.067)	23.0 (0.906)	19.0 (0.748)	–	22.2 (0.874)	24.5 (0.965)



INSTALL AND ADJUSTMENT OF DRIVE PINION ASSEMBLY

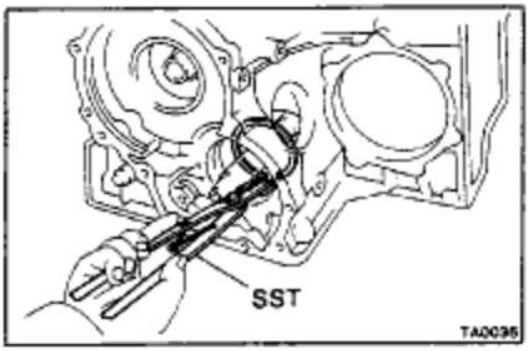
1. INSTALL NEW O–RING ONTO BEARING CAGE



2. INSTALL DRIVE PINION SHAFT INTO CASE

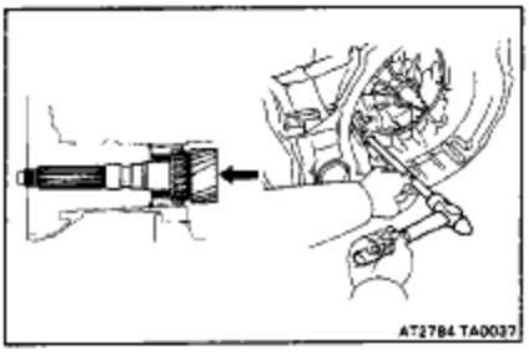
Slightly tap the cage into the case until the groove with the bore can be seen.

HINT: Drive in the bearing cage until the surface of the bearing cage passes through the groove with the bore.

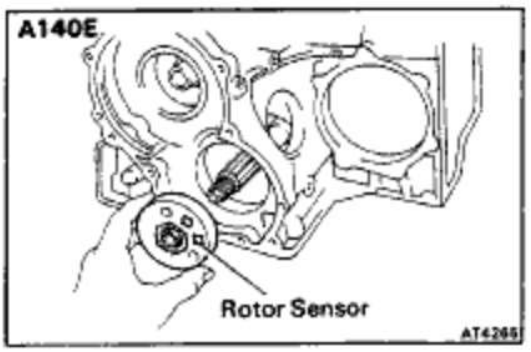


3. INSTALL SNAP RING INTO CASE

(a) Using SST, install the snap ring into the groove.
SST 09350–32014 (09351–32050)



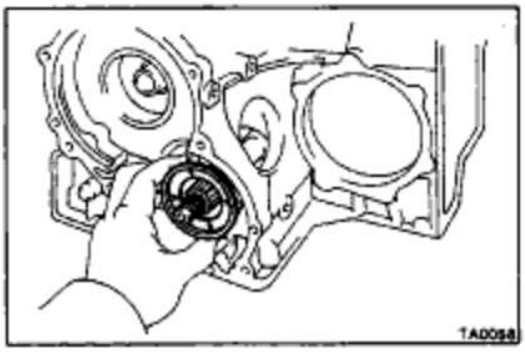
(b) Slightly tap the drive pinion to fit the snap ring into the groove.



4. (A140E)

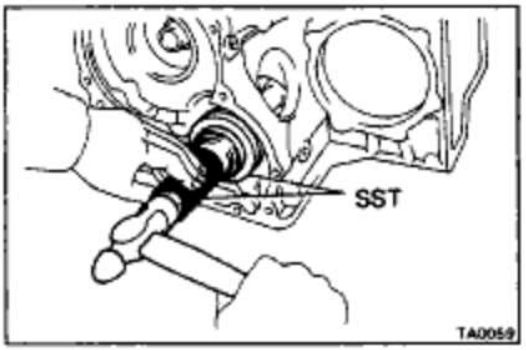
INSTALL ROTOR SENSOR

Install the rotor sensor, facing the magnet outward.



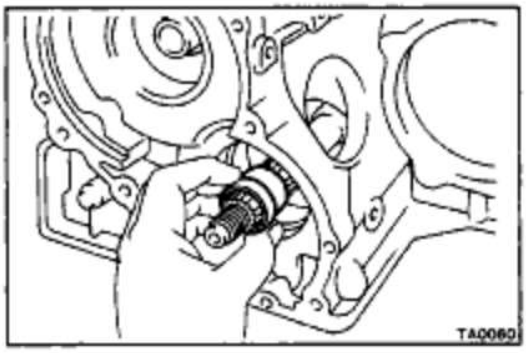
5. INSTALL OIL SLINGER

Install the oil slinger, facing the lip outward.



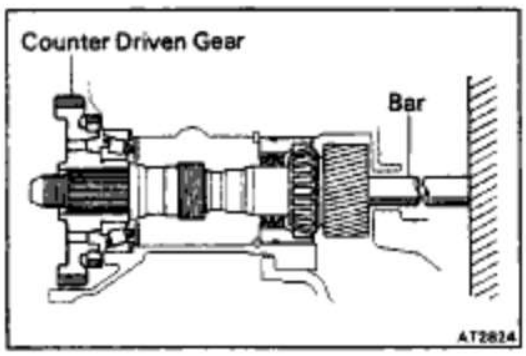
6. INSTALL OUTER RACE

Using SST, drive the outer race into the case.
SST 09350–32014 (09351–32100, 09351–32140)



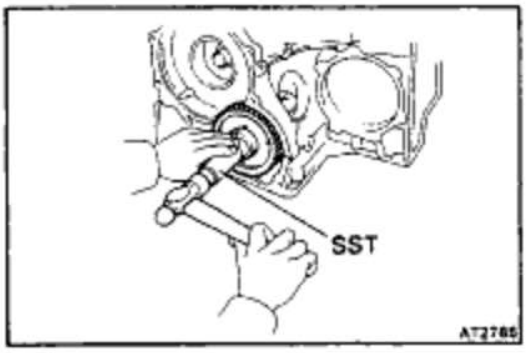
7. INSTALL NEW SPACER

Always use new spacer.
Install the spacer with the small end first.



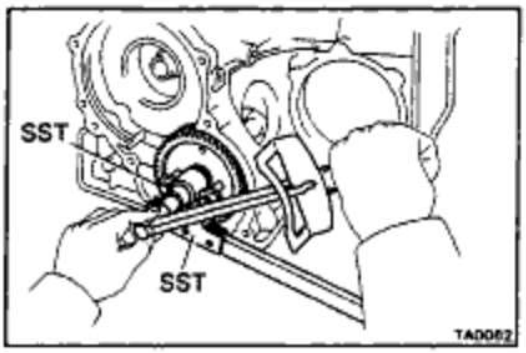
8. INSTALL COUNTER DRIVEN GEAR ONTO SHAFT

(a) Place a bar at the drive pinion side ’and position the outer end of the bar against a vise or such.



(b) Using SST, driven in gear onto the shaft until the nut can be installed on the threads of the shaft.
NOTICE: Be careful not to cause an impact to the transmission case.
SST 09350–32014 (09351–32140)

9. ADJUST DRIVE PINION PRELOAD

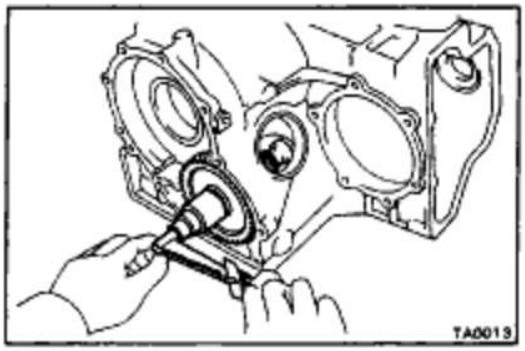


(a) Coat the threads and surface of the nut with MP grease.

(b) Using SST to hold the gear, tighten the nut.

Torque: 1,750 kg–cm (127 ft–lb, 172 N–m)

SST 09330–00021, 09350–32014 (09351–32031)



(e) Turn the gear counterclockwise and clockwise several times.

(d) Using a torque meter, measure the preload of the drive pinion.

Preload (at starting) :

New bearing 10 – 16 kg–cm
(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing 5 – 8 kg–cm
(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

- If the preload is greater than specified, replace the bearing spacer.
- If the preload is less than specified, retighten the nut 130 kg–cm (9 ft–lb, 13 N–m) at a time until the specified preload is reached.

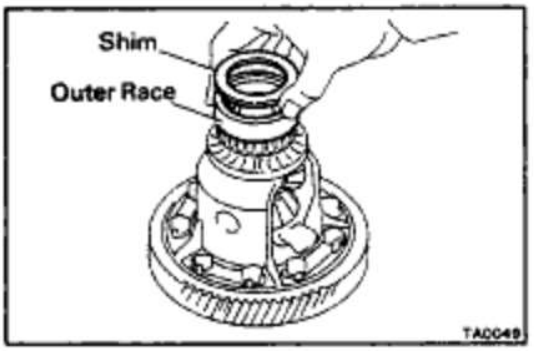
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

Do not back off the nut to reduce the preload.

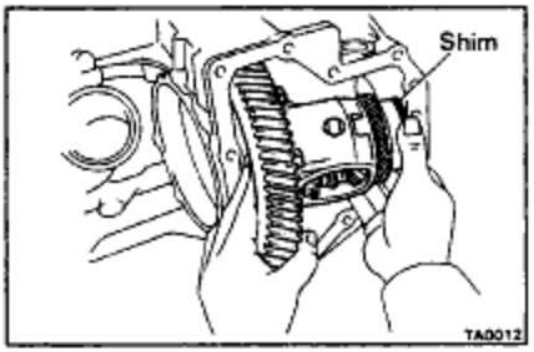
Maximum torque: 2,950 kg–cm (213 ft–lb, 289 N–m)

(e) If the preload is adjusted within specification, make a note of it.

INSTALLATION OF DIFFERENTIAL

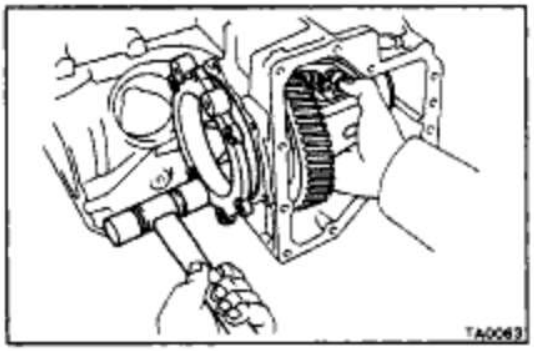


1. PLACE OUTER RACE AND SELECTED ADJUSTING SHIM ONTO RH SIDE BEARING



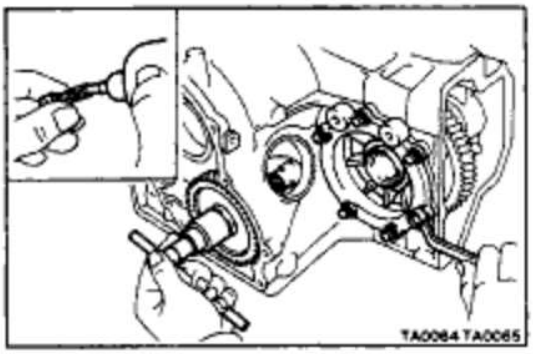
2. PLACE DIFFERENTIAL CASE INTO CASE

Be sure to install the adjusting shim into place.



3. INSTALL LH BEARING RETAINER

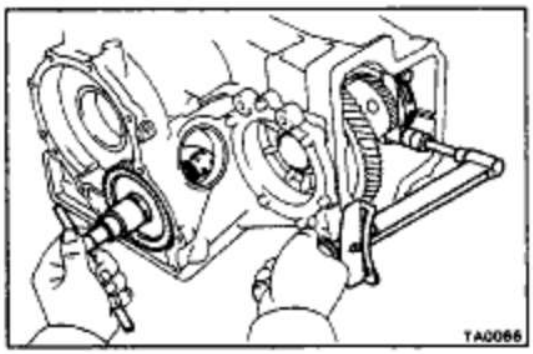
(a) Install a new O–ring.
(b) Position the retainer by tapping it while holding the differential case center with the retainer.
(c) Clean the threads of the bolts and case with white gasoline.

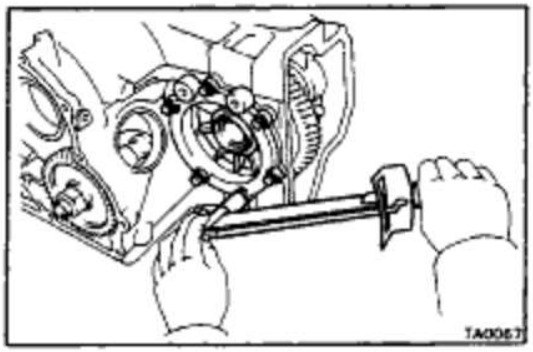


(d) Coat the threads of the bolts with sealer.
Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent
(e) Temporarily tighten the bolts evenly and gradually while turning the ring gear.

4. INSTALL RN SIDE BEARING CAP

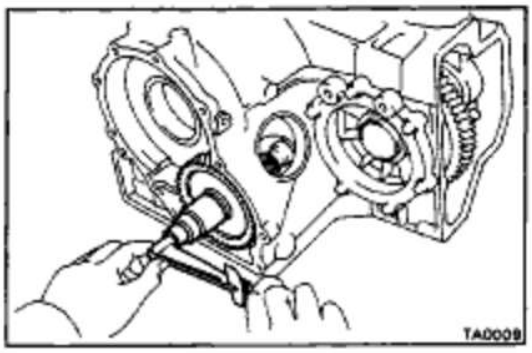
Tighten the bolts evenly and gradually while turning the ring gear.
Torque: 730 kg–cm (53 ft–lb, 72 N–m)





5. TIGHTEN LH BEARING RETAINER

Torque: 195 kg–cm (14 ft–lb, 19 N–m)



6. MEASURE TOTAL PRELOAD

Using a torque meter, measure. the total preload of the drive pinion shaft.

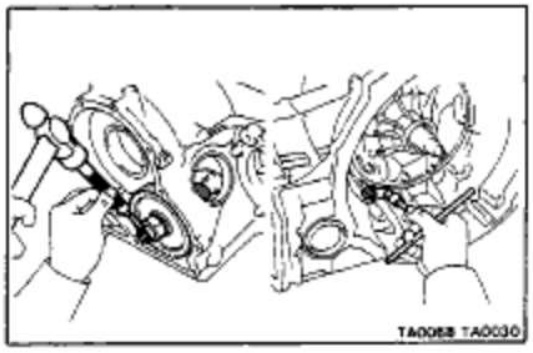
Total preload (at starting) :

Add drive pinion preload (See page AT–164)

New bearing 2.9 – 4.0 kg–cm
(2.5 – 3.5 in.–lb, 0.3 – 0.4 N–m)

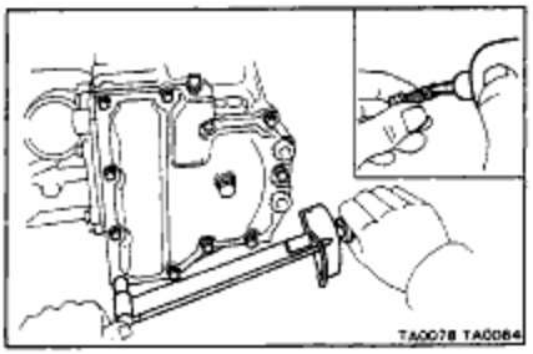
Reused bearing 1.5 – 2.0 kg–cm
(1.3 – 1.7 in.–lb, 0.1 – 0.2 N–m)

If the preload is not within specification, redisassemble and readjust.



7. STAKE COUNTER DRIVEN GEAR NUT

8. INSTALL DRIVE PINION CAP



9. INSTALL CARRIER COVER

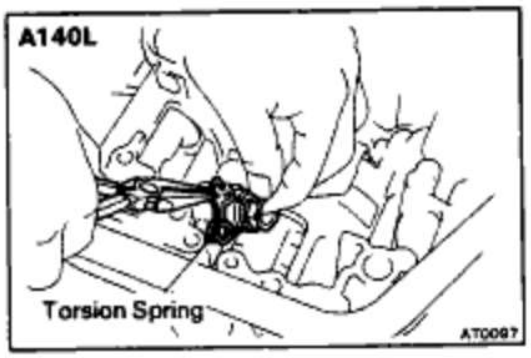
(a) Clean the threads of the bolts and case with white gasoline.

(b) Coat the threads of the bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

(c) Install the carrier cover over the gasket.

Torque: 250 kg–cm (18 ft–lb, 25 N–m)



INSTALLATION OF 4–SPEED GEAR UNIT

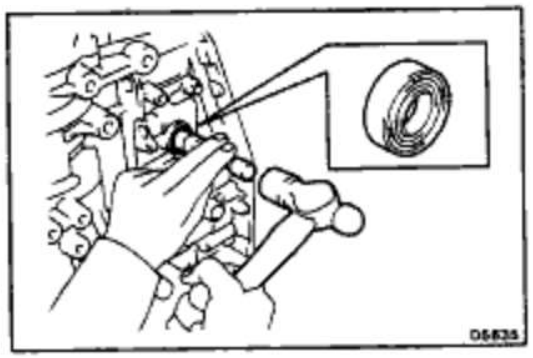
1. (A140L)

INSTALL GOVERNOR PRESSURE ADAPTOR

(a) Install the governor pressure adaptor into the case.

(b) Align the hole of adaptor with the hole of the case and install the torsion spring.

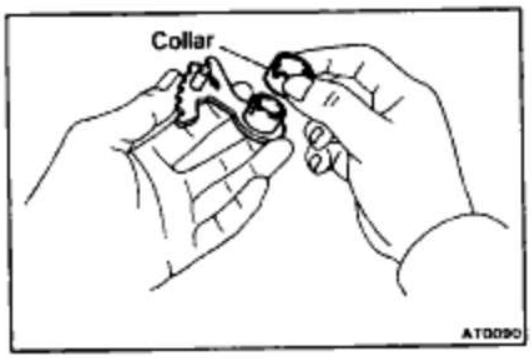
(e) Check that the adaptor dose not slide or the spring fall out when puller by hand.



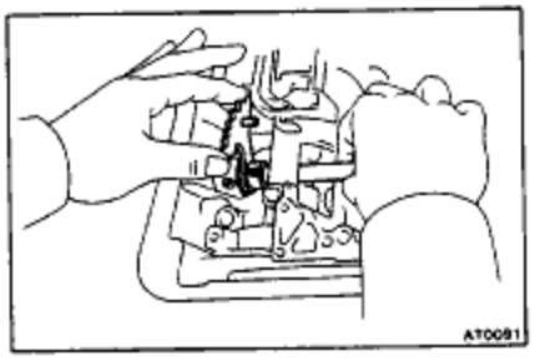
2. INSTALL MANUAL VALVE SHAFT

(a) Coat the oil seal lip with MP grease.

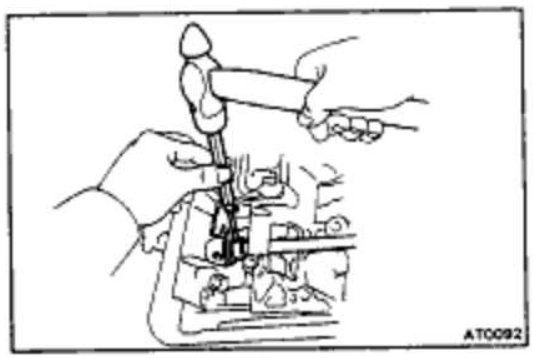
(b) Install the manual valve shaft oil seal to the case.



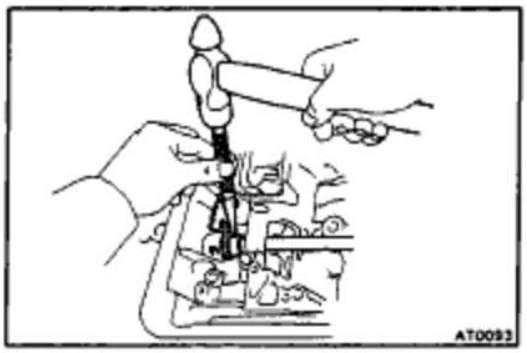
(c) Assemble a new collar to the manual valve lever.



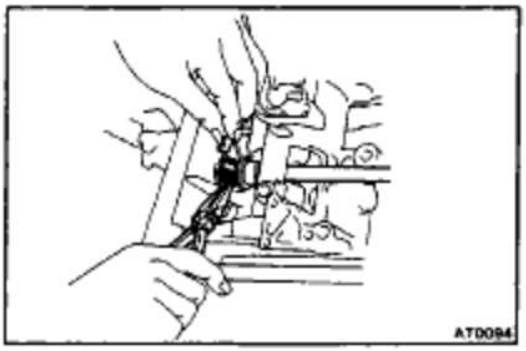
Install the manual valve lever shaft to the transmission case through the manual valve lever.



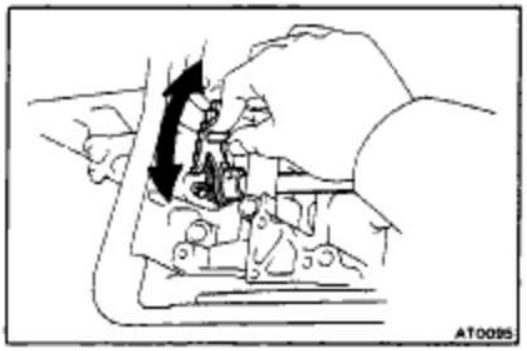
(e) Using a pin punch, drive in the roll pin until its surface is flush with the manual valve lever surface.



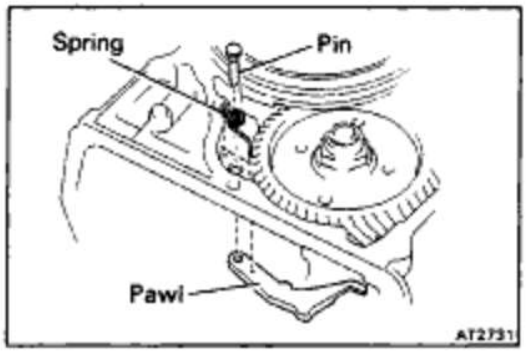
(f) Match the collar hole to the lever calking hollow and calk the collar to the lever.



(g) Install the retaining spring.



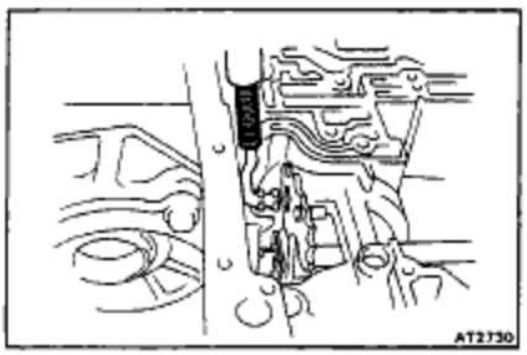
(h) Make sure that the lever moves smoothly.



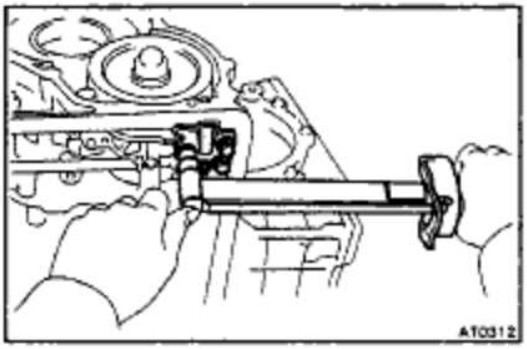
3. INSTALL PARKING LOCK PAWL

(a) Place the parking lock pawl onto the case. Hook the spring ends to the case and pawl.

(b) Install the pin into the hole of the case through the spring and pawl.

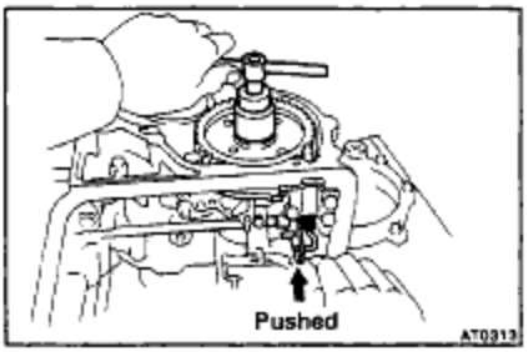


4. INSTALL PARKING LOCK ROD



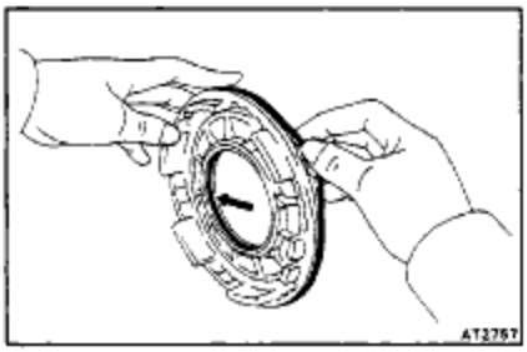
5. INSTALL PARKING LOCK PAWL BRACKET

Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



6. CHECK OPERATION OF PARKING LOCK PAWL

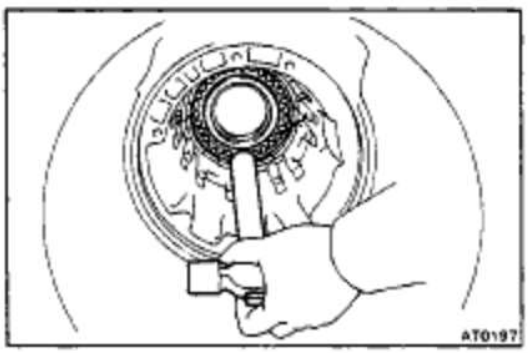
Make sure the counter driven gear is locked when the manual valve lever is in the P range.



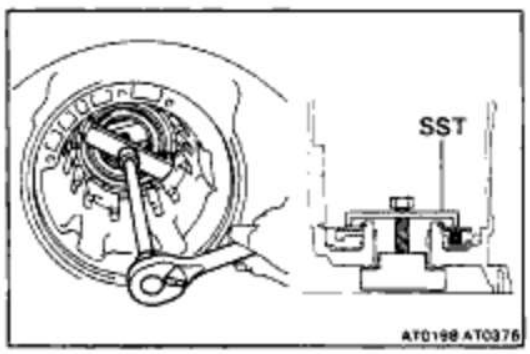
7. INSTALL FIRST AND REVERSE BRAKE PISTON TO TRANSMISSION CASE

(a) Coat the new O–rings with ATF.

(b) Install the two O–rings on the piston.



(e) Push the piston into the bore of the case, facing the spring seat upward.

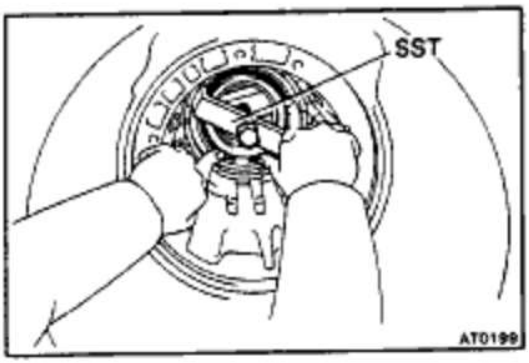


8. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring on the piston.

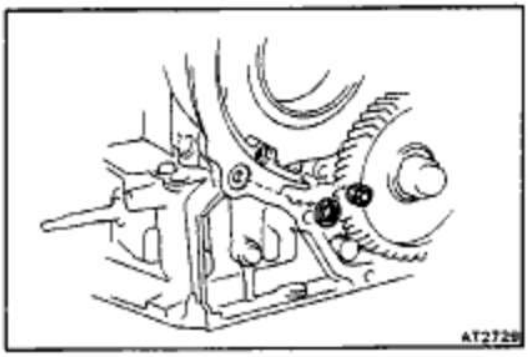
(b) Place SST, and compress the return spring evenly by tightening the bolt gradually.

SST 09s50–32014 (09351–32040)

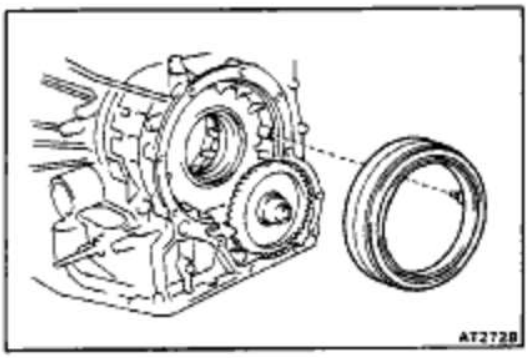


(c) Install snap ring. Visually check to make sure it is fully seated and centered by the three lugs on the spring retainer.
Be sure the end gap of snap ring is not aligned with the spring retainer claw.
(d) Remove SST.

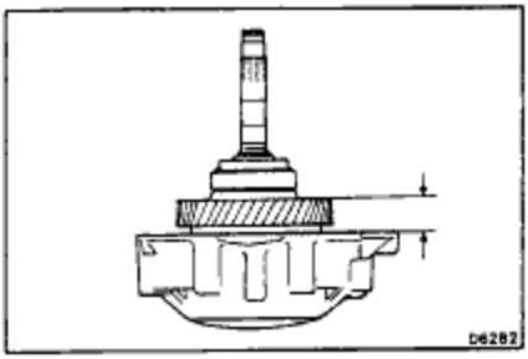
9. INSTALL OVERDRIVE UNIT



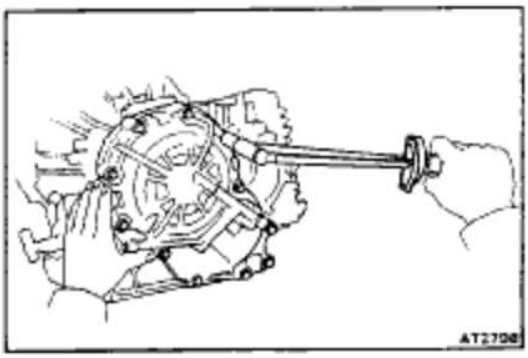
(a) Install the overdrive brake apply gasket and overdrive clutch apply gasket.



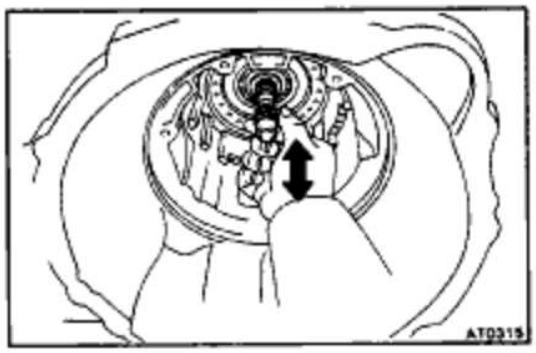
(b) Install the overdrive brake drum to the case.
(c) Install the new case gasket to the case.



(d) Make sure that the length from the top surface of the case to the counter driven gear top surface should be about 24 mm (0.94 in.).



(e) Install the overdrive unit with overdrive case to the transaxle case.
(f) Install and tighten the bolts.
Torque: 250 kg–cm (18 ft–lb, 25 N–m)



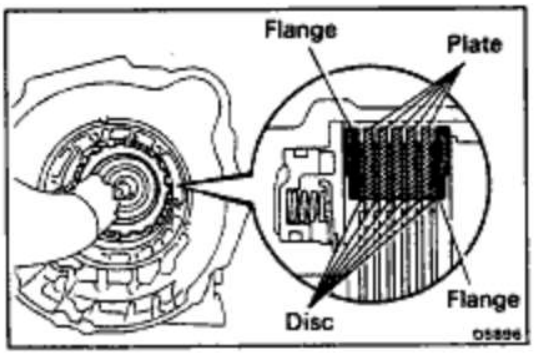
10. CHECK INTERMEDIATE SHAFT END PLAY

(a) Make sure that the intermediate shaft has thrust play.

Thrust play: 0.49 – 1.51 mm (0.0193 – 0.0594 in.)

If the thrust play is not within specification, check the installation of intermediate shaft.

(b) Make sure that the intermediate shaft turns smoothly.



11. INSTALL FIRST AND REVERSE BRAKE IN CASE

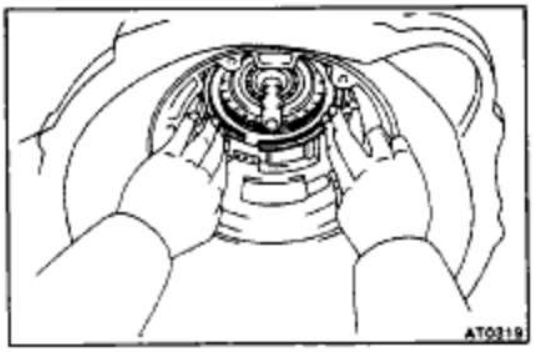
(a) Install the inner flange facing the flat end toward the oil pump side.

(b) Install the discs and plates.

Install in order: P=Plate D=Disc

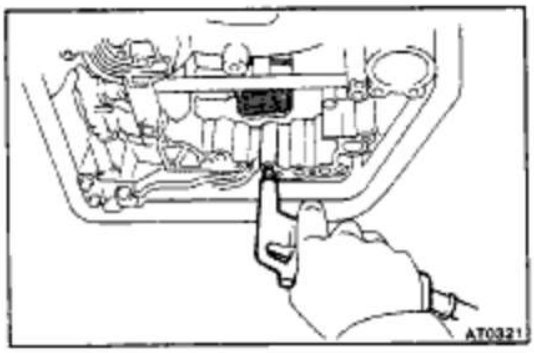
D–P–D–P–D–P–D–P–D–P–C

(c) Install the outer flange, facing the flat end toward the piston side.



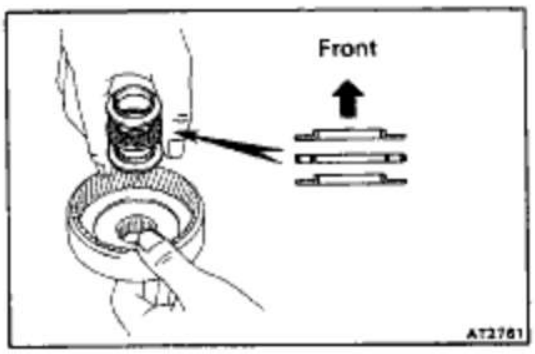
12. INSTALL SNAP RING

Be sure the end gap of the snap ring is not aligned with one of the cutouts.



13. CHECK OPERATION OF FIRST AND REVERSE BRAKE

Apply compressed air into the oil passage with the case and be sure that the piston moves.

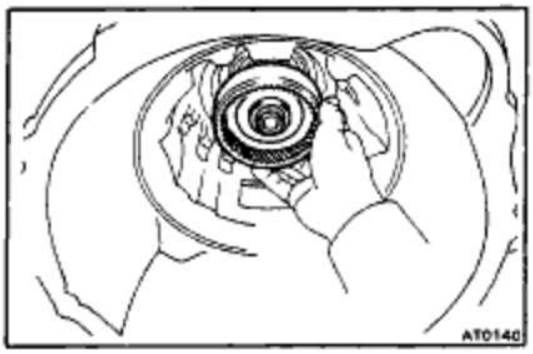


14. INSTALL RING GEAR INTO CASE

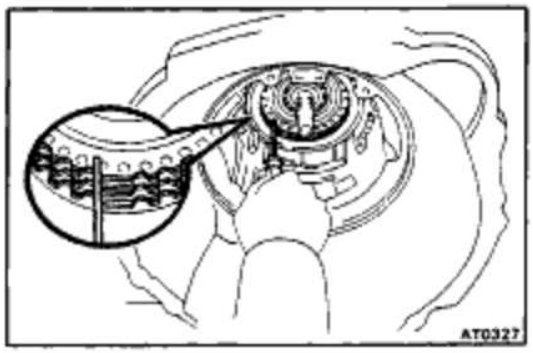
(a) Coat the races and bearing with petroleum jelly an install them onto the ring gear.

Bearing and races: mm(in)

	Outer Diameter	Inner Diameter
Front Race	37.3 (1.469)	24.1 (0.949)
Bearing	37.6 (1.480)	24.0 (0.945)
Rear Race	37.6 (1.480)	22.2 (0.874)

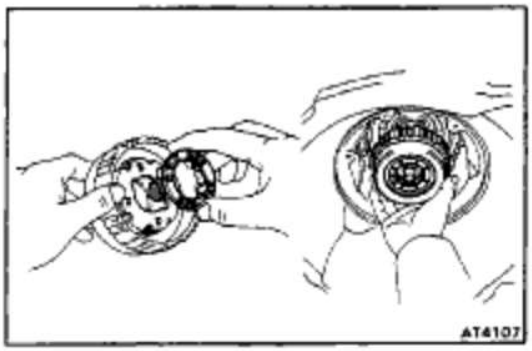


(b) Install the ring gear into the case.



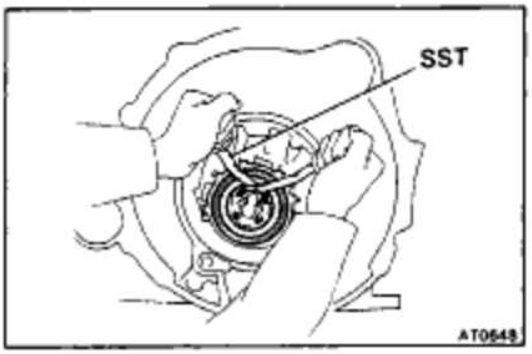
15. INSTALL REAR PLANETARY GEAR INTO CASE

(a) Align the flukes of the discs in the first and reverse brake.



(b) Coat the thrust washer with petroleum jelly. Align the tab of the washer with the hollow of the carrier.

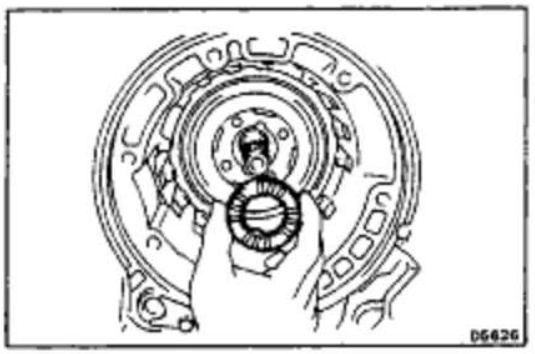
(c) Align the spline of the planetary carrier with either of the flukes of the discs, and install the planetary gear into the first and reverse brake discs.



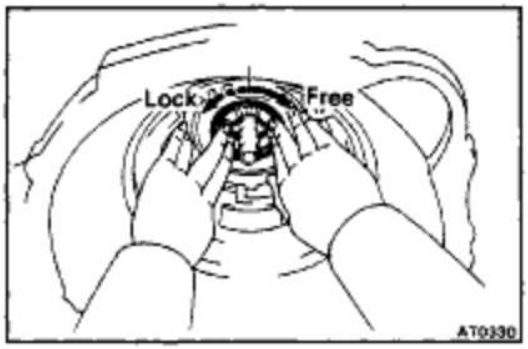
16. INSTALL NO. 2 ONE–WAY CLUTCH INTO CASE WITH SHINY SIDE UPWARD

(a) Place the one–way clutch with the shiny side upward.

(b) Install the one–way clutch onto the inner race while turning the planetary gear clockwise with SST.
SST 09350–32014 (09351–32050)

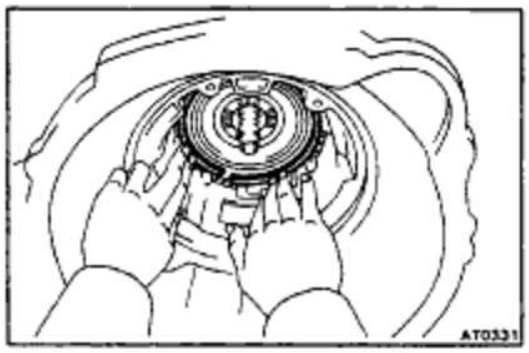


(e) Coat the thrust washer with petroleum jelly and install it onto the planetary gear.



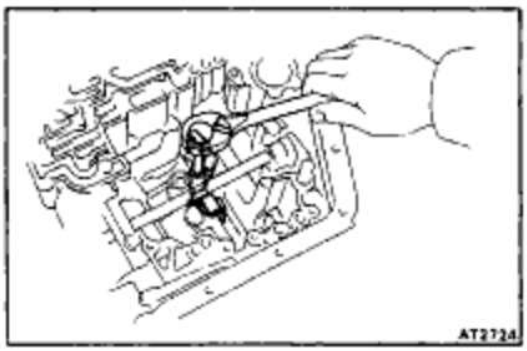
17. CHECK OPERATION OF NO. 2 ONE–WAY CLUTCH

Turn the planetary carrier. The carrier should turn freely clockwise and lock counterclockwise.



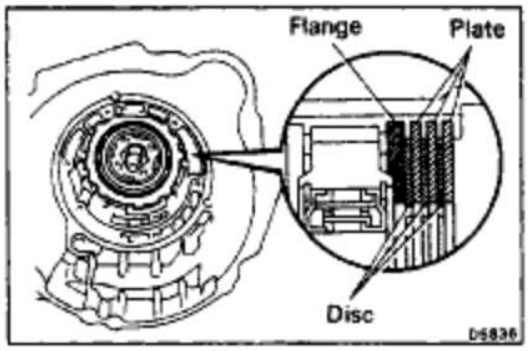
18. INSTALL SNAP RING

Be sure the end gap of the snap ring is not aligned with one of cutouts.



19. INSTALL SECOND COAST BRAKE BAND GUIDE

Install the two band guides so that its tip touches the case.



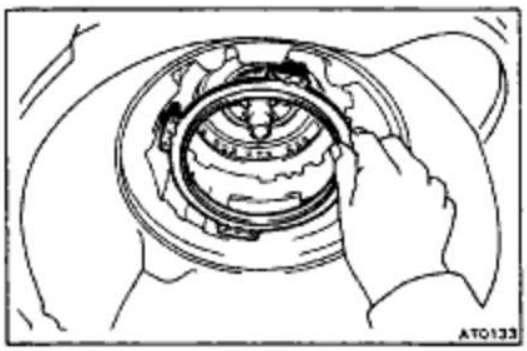
20. INSTALL SECOND BRAKE INTO CASE

(a) Install the flange, facing the flat end toward the oil pump side.

(b) Install the discs and plates.

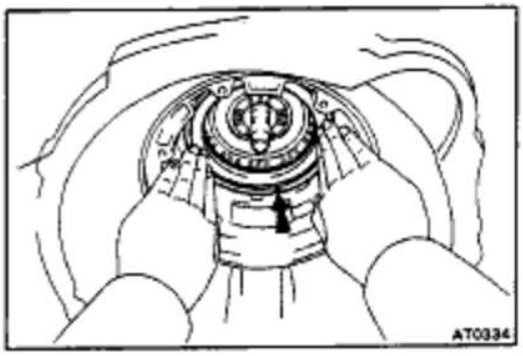
Install in order: P=Plate D=Disc

Flange– D–P–D–P–D–P



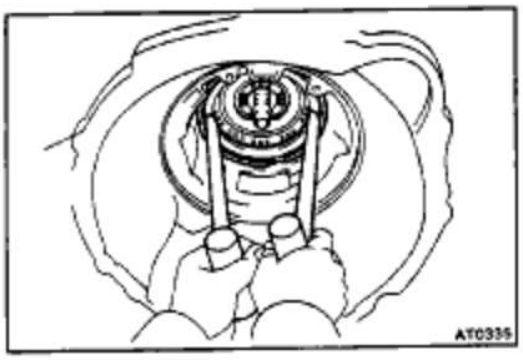
21. INSTALL PISTON RETURN SPRING

Each spring end is installed onto the protrusion with the case.



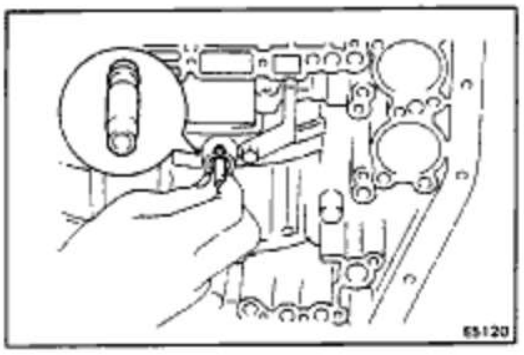
22. INSTALL SECOND BRAKE DRUM INTO CASE

Align the groove of the drum with the bolt and place it into the case.



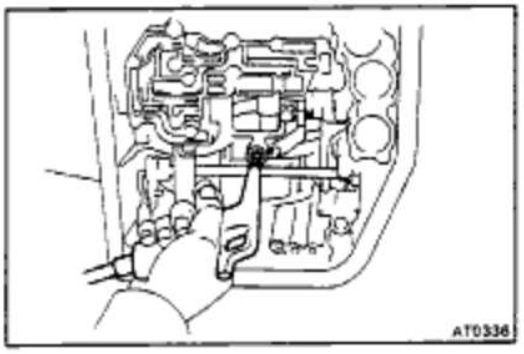
23. INSTALL SNAP RING

(a) Place the snap ring into the case so that the end gap is installed into the groove.
(b) While compressing the piston return springs over the drum with hammer handles, install the snap ring into the groove.
(c) Be sure the end gap of the snap ring is not aligned with one of the cutouts.



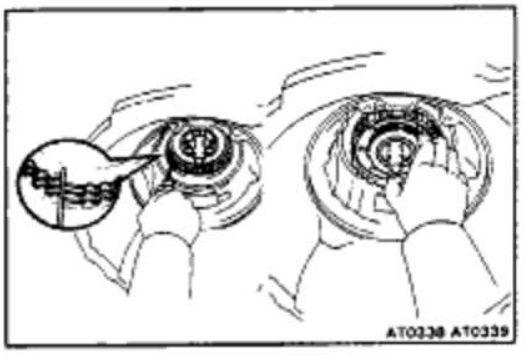
24. INSTALL SECOND BRAKE DRUM GASKET

Install a new gasket until it makes contact with the second brake drum.



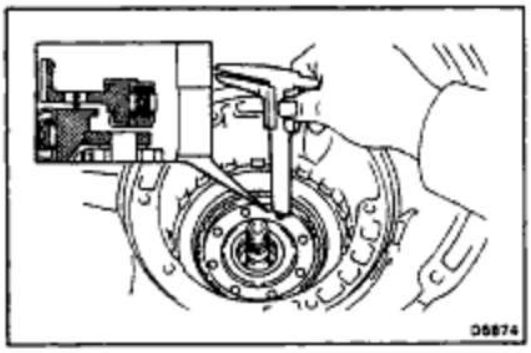
25. CHECK OPERATION OF SECOND BRAKE

Blow compressed air into the oil passage with the case, and be sure that the piston moves.

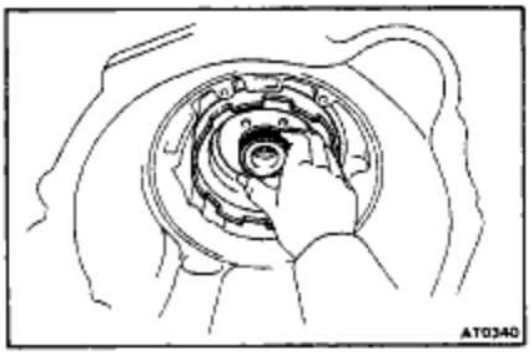


26. INSTALL NO–1 ONE–WAY CLUTCH AND SECOND BRAKE HUB

(a) Align the flukes of the discs in the 2nd brake.
(b) Align the spline of the hub with the flukes of the discs and install the hub to the 2nd brake discs.

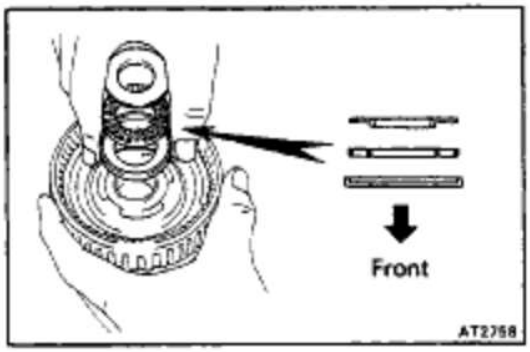


(c) Check the distance between the surfaces of the 2nd brake hub and rear planetary gear.
Distance: Approx. 5 mm (0.20 in.)



27. INSTALL SUN GEAR AND SUN GEAR INPUT DRUM

While turning the sun gear clockwise, install it into the one–way clutch.

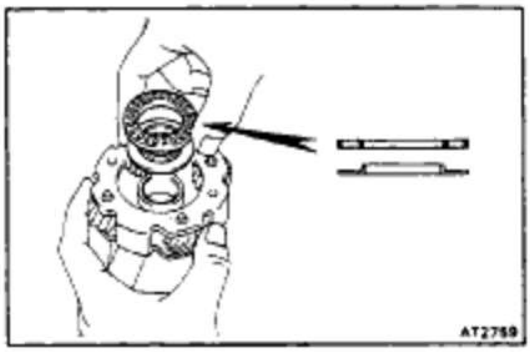


28. INSTALL FRONT PLANETARY GEAR ONTO RING GEAR

(a) Coat the races and bearing with petroleum jelly, and install them onto the ring gear.

Bearing and race: mm (in.)

	Outer Diameter	Inner Diameter
Front Race	37.9 (1.492)	22.0 (0.866)
Bearing	36.1 (1.421)	22.2 (0.874)
Rear Race	35.0 (1.378)	19.0 (0.748)

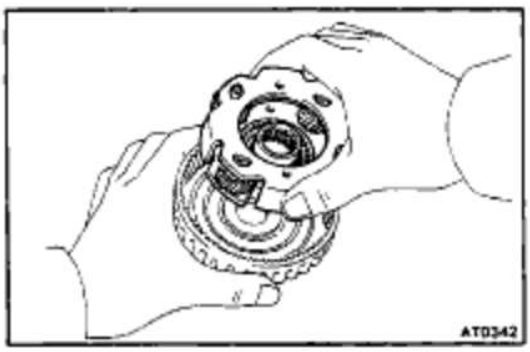


(b) Coat the race and bearing with petroleum jelly, and install them onto the planetary gear.

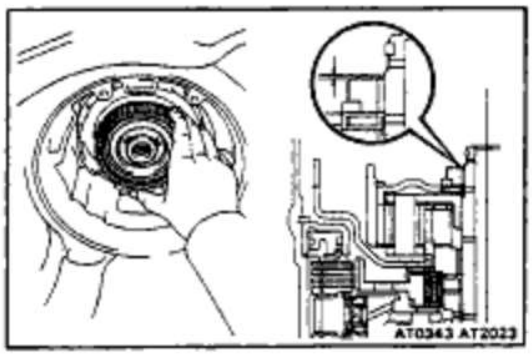
Bearing and race:

mm (in.)

	Outer Diameter	Inner Diameter
Bearing	45.0 (1.772)	30.0 (1.181)
Race	45.0 (1.772)	28.0 (1.102)

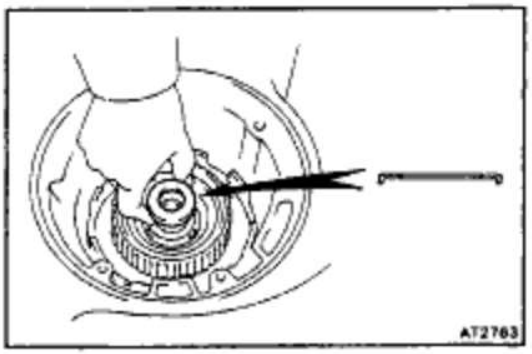


(c) Install the planetary gear onto the ring gear.



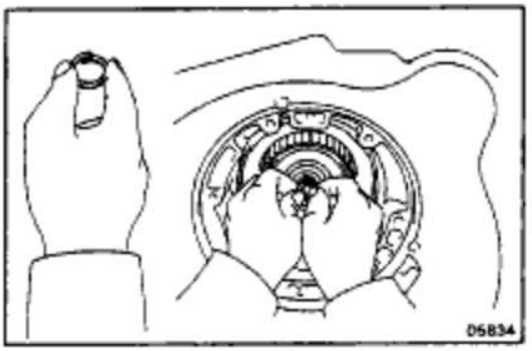
29. INSTALL FRONT PLANETARY GEAR ASSEMBLY ONTO SUN GEAR

(a) If the planetary gear and other parts are installed correctly into the case, the end of the bushing with the ring gear flange will be flush with a shoulder of the intermediate shaft or under.

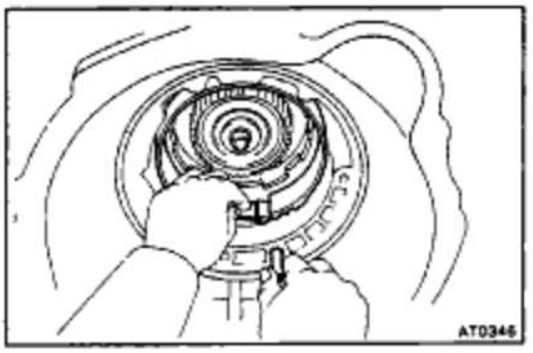


(b) Coat the race with petroleum jelly and install it onto the tip of ring gear flange.

Race: Outer diameter 35.7 mm (1.406 in.)
Inner diameter 23.0 mm (0.906 in.)



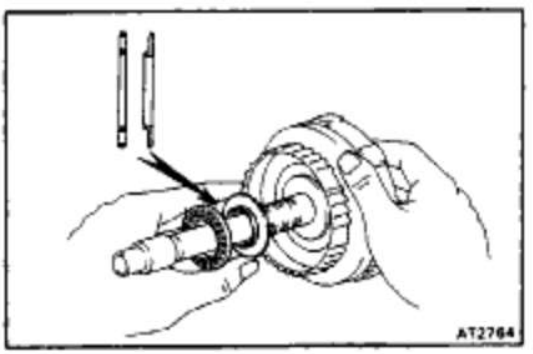
30. INSTALL INTERMEDIATE SHAFT OIL SEAL RING



31. INSTALL SECOND COAST BRAKE BAND

(a) Place the band into the case.

(b) Install the pin. through the oil pump mounting bolt hole.

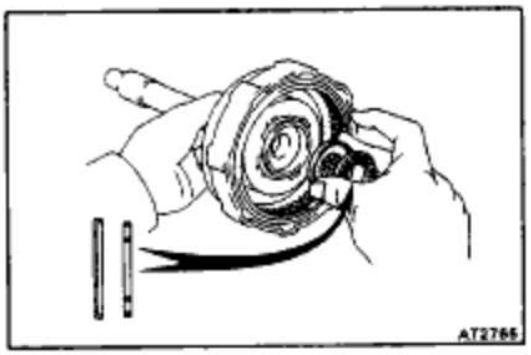


32. INSTALL FORWARD CLUTCH AND DIRECT CLUTCH

(a) Coat the races and bearing with petroleum jelly, and install them onto both sides of the clutch drum.

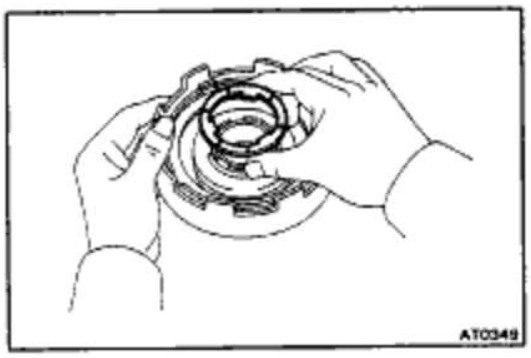
Bearing and race: mm (in.)

	Outer Diameter	Inner Diameter
Bearing	42.0 (1.654)	28.9 (1.138)
Race	42.0 (1.654)	27.1 (1.067)

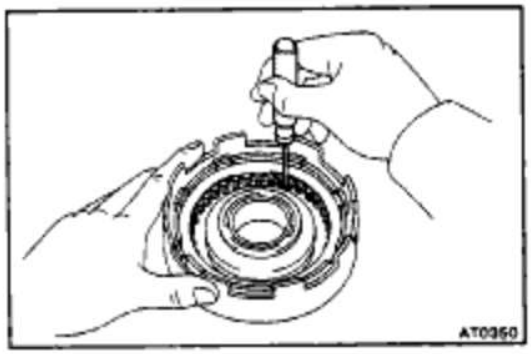


Bearing and race: mm (in.)

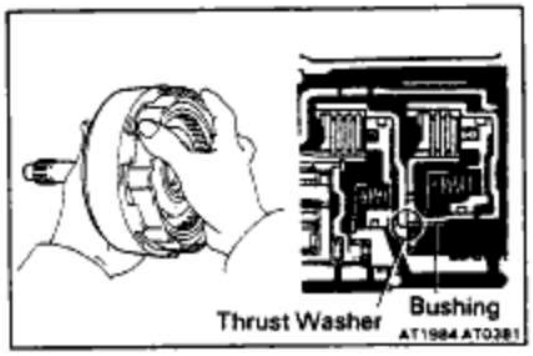
	Outer Diameter	Inner Diameter
Bearing	36.1 (1.421)	22.2 (0.874)
Race	37.9 (1.492)	22.0 (0.866)



(b) Coat the clutch drum thrust washer with petroleum jelly and install it with the oil groove facing upward onto the direct clutch drum.

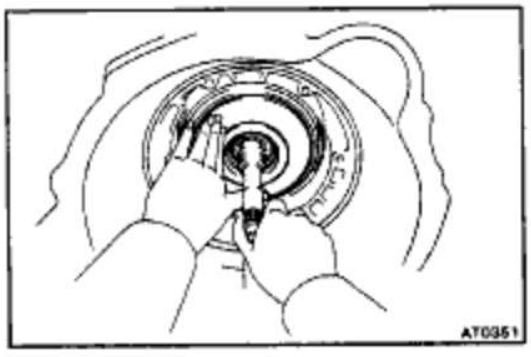


(c) Align the flukes of discs in the direct clutch.



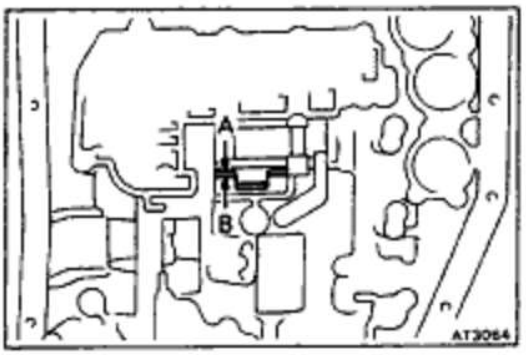
(d) Mesh the hub with the flukes of the direct clutch while turning the clutch drum or forward clutch.

(e) If the flukes of the discs are meshed with the hut correctly, the end of the bushing with the direct clutch drum will be flush with the surface of the for ward clutch.

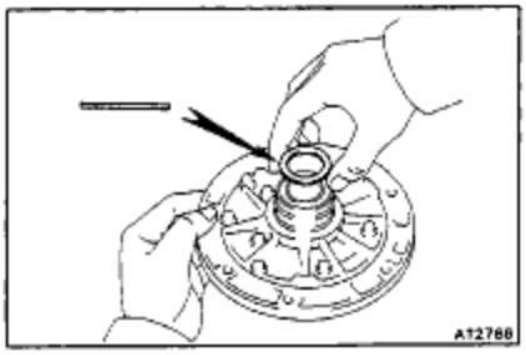


(f) Place the direct clutch and forward clutch into the case.

(g) Rotate the forward clutch to mesh the front planetar ring gear and discs.

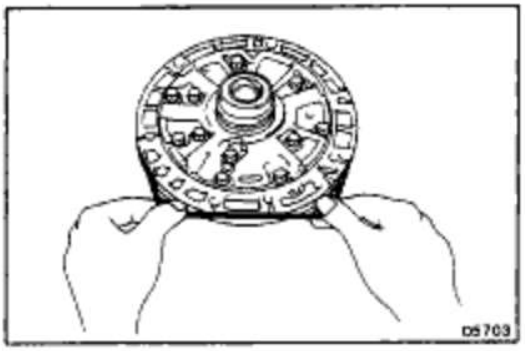


(h) Check the distance between the A and6 as shown in the illustration.
Distance: Approx. 3 mm (0.118 in.)

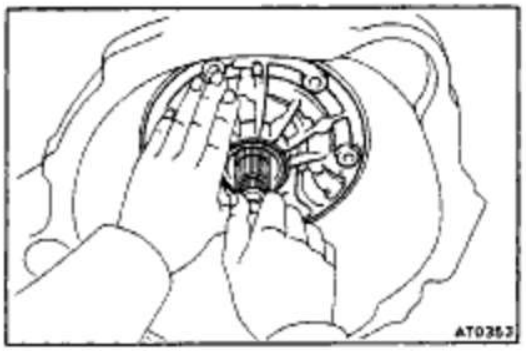


33. INSTALL OIL PUMP INTO CASE

(a) Coat the race with petroleum jelly and install it onto stator shaft.



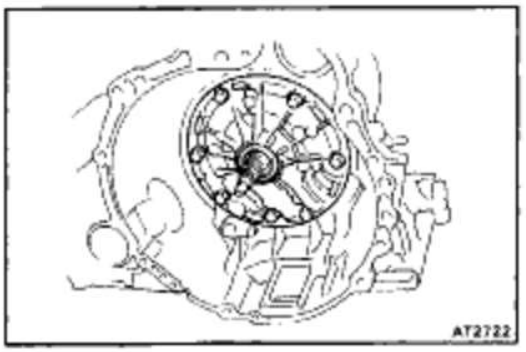
(b) Coat a new O–ring with ATF and install it to oil pump.



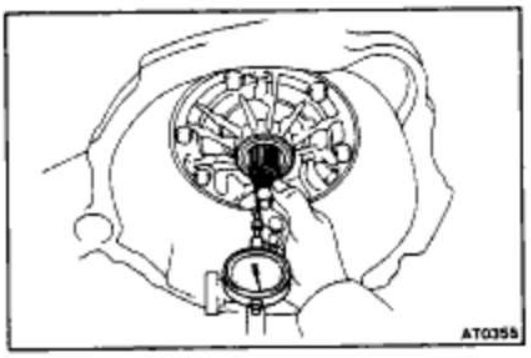
(c) Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.

(d) 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.

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



(e) Install and tighten the seven bolts.
Torque: 225 kg–cm (16 ft–lb, 22 N–m)



34. MEASURE THRUST PLAY OF INPUT SHAFT

Measure the thrust play with a dial gauge.

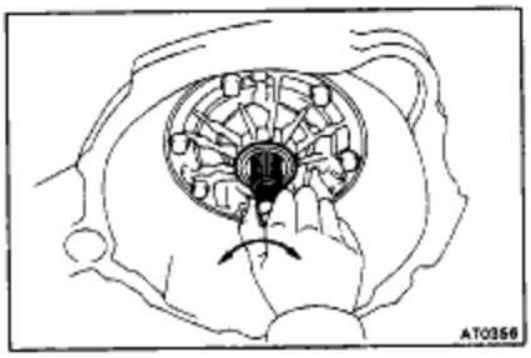
Thrust play: 0.3 – 0.9 mm (0.012 – 0.035 in.)

HINT: There are two thickness of races for the end of stator shaft.

If the thrust play is in excess of standard, select one of them.

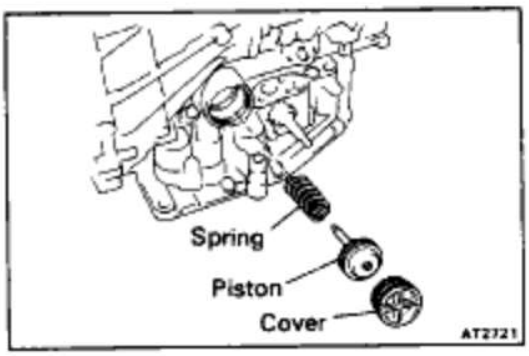
Race thicknesses: 0.8 mm (0.031 in.)

1.4 mm (0.055 in.)



35. CHECK INPUT SHAFT ROTATION

Make sure that the input shaft rotates smoothly.

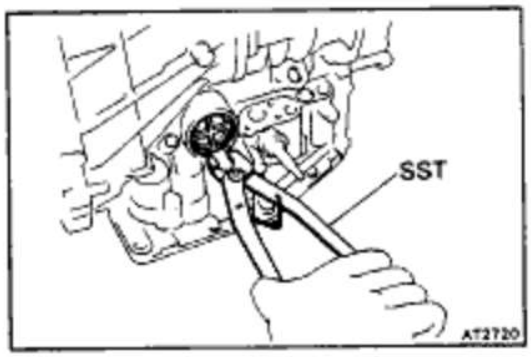


36. INSTALL SECOND COAST BRAKE PISTON

(a) Coat the new O–rings. with ATF and install them on the cover.

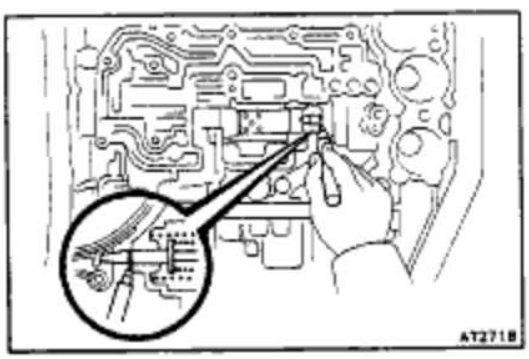
(b) Install the outer spring with the piston.

(c) Place the cover into the bore.



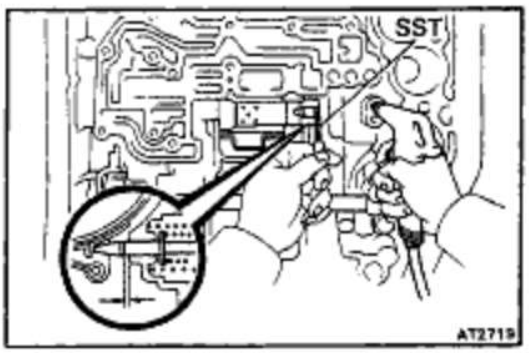
(d) Using SST, install the snap ring while pressing the cover.
SST 09350–32014 109351–32050

(e) Check that the front end of the piston rod contact: the center of the second brake band depression.



37. CHECK SECOND COAST BRAKE PISTON STROKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.

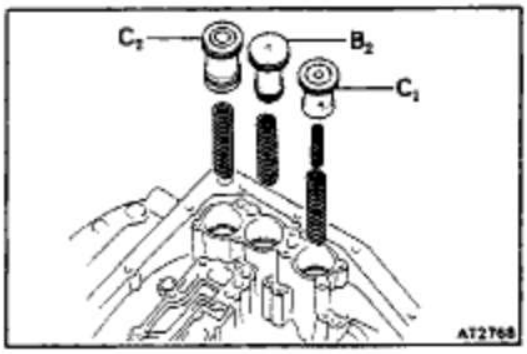


(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 5 7 – 114 psi or 392 – 785 kPa) as shown.
SST 09240–00020

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

If the stroke is more than standard value, replace the piston rod with a longer one.

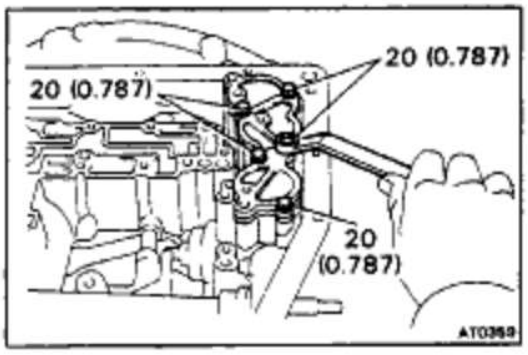
Piston rod length: 72.9 mm (2.870 in)
71.4 mm (2.811 in)



38. INSTALL ACCUMULATOR PISTONS AND SPRINGS

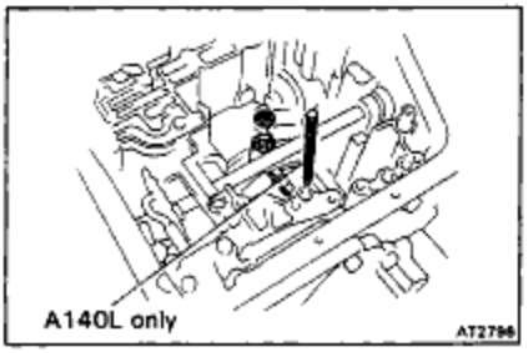
(a) Install the springs and pistons into the bore.

Spring		Free length mm (in)	Color
C_1	Inner	48.00 (1.8898)	None
	Outer	81.09 (3.1925)	Yellow Green
C_2		72.18 (2.8417)	Yellow
B_2		66.68 (2.6252)	Orange



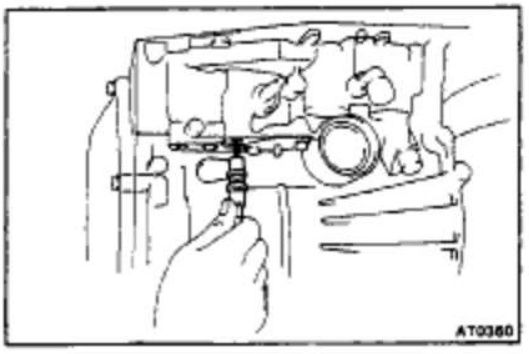
(b) Place the cover with the gasket and tighten the bolts gradually in sequence.

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



39. INSTALL NEW SECOND BRAKE APPLY GASKET

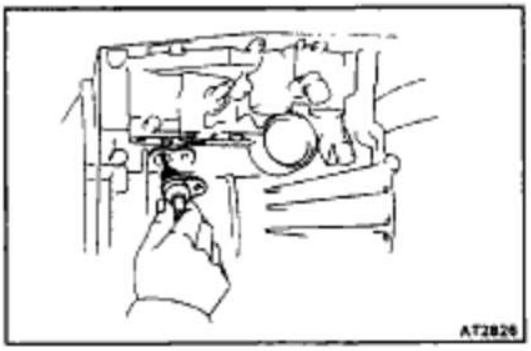
40. (A 1401.)
INSTALL NEW GOVERNOR OIL STRAINER



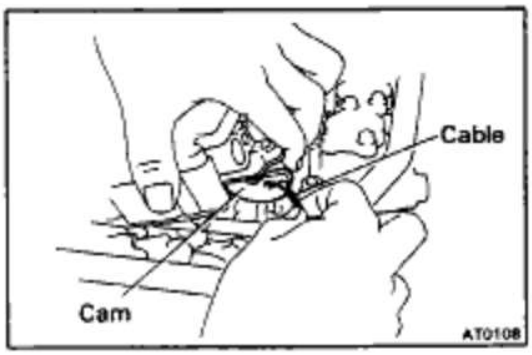
41. INSTALL THROTTLE CABLE IN CASE

Push the cable through the case, being careful not to damage the O–ring. Check for full seating.

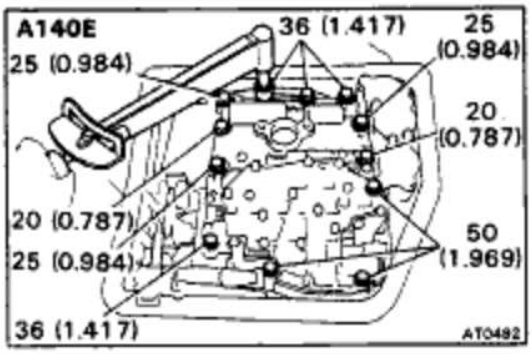
NOTICE: In subsequent work, to avoid breaking the cable fitting do not roll the case over the cable.



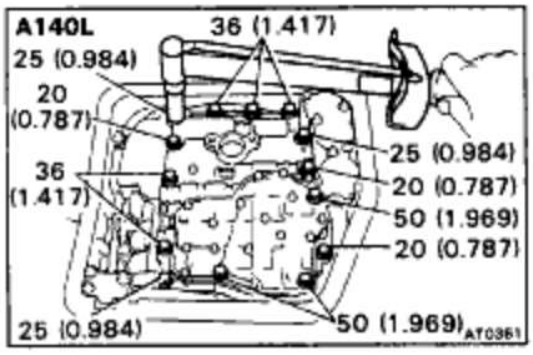
42. (A140E)
INSTALL SOLENOID WIRING
(A 140 L)
INSTALL KICK–DOWN SWITCH WIRING
Push the solenoid wiring through the case, being careful not to damage the O–ring. Check for full seating.

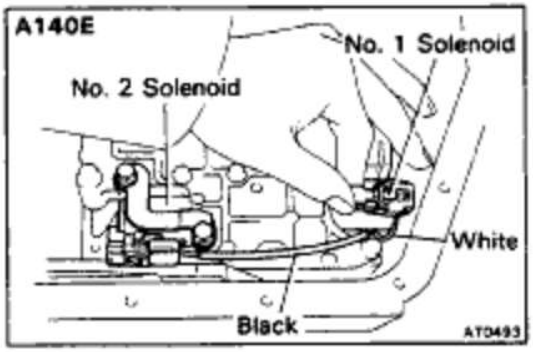


43. PLACE VALVE BODY ON TRANSMISSION
(a) While holding the cam down with your hand, slip the cable end into the slot.
(b) Lower the valve body into place.
NOTICE: Do not entangle the kick–down switch wire or solenoid wire.

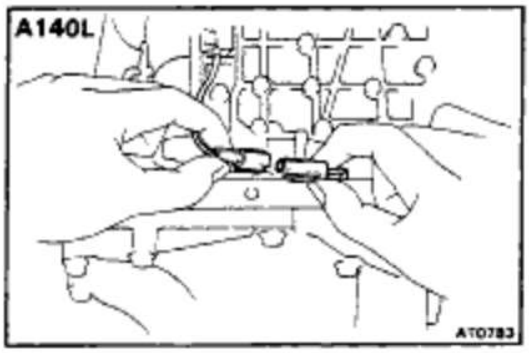


44. INSTALL BOLTS IN VALVE BODY
HINT: Each bolt length (mm (in.)) is indicated in the figure.
Hand tighten the twelve bolts A140E) of fourteen bolts (A140L) first, then torque with a torque wrench.
Torque: 100 kg–cm (7 ft–lb, 10 N–m)





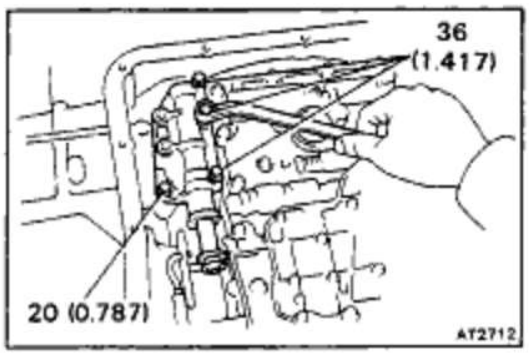
5. (A140E)
CONNECT SOLENOID WIRING
(a) Connect the No. 1 solenoid connector. (white and shorter wire)
(b) Connect the No. 2 solenoid connector. (black and longer wire)



46. (A140L)

CONNECT KICK–DOWN SWITCH WIRING

Connect the kick–down switch connector and clamp it onto the bracket.



47. INSTALL MANUAL VALVE BODY AND DETENT SPRING

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

(a) Align the manual valve with the pin on the manual shaft lever.

(b) Lower the manual valve body into place.

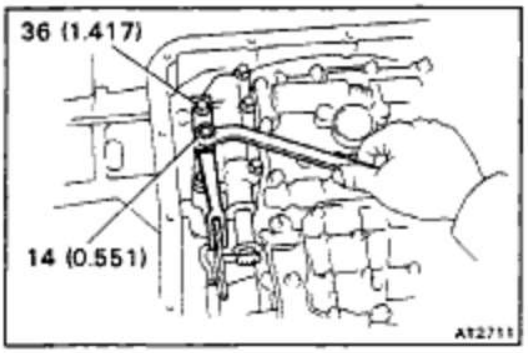
(c) Hand tighten the four bolts first. Then, tighten them with a torque wrench.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

(d) Place the detent spring on the manual valve body and hand tighten the two bolts first.
Then, tighten them with a torque wrench.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

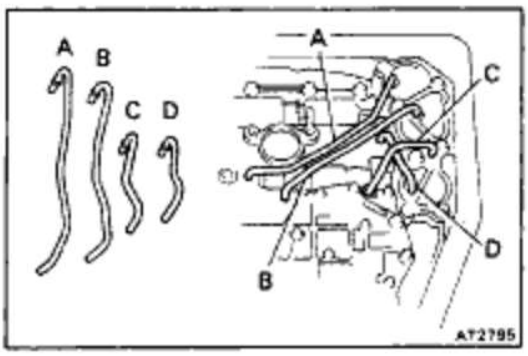
(e) Check that the manual valve lever is touching the center of the detent spring tip roller.



48. INSTALL OIL TUBES

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

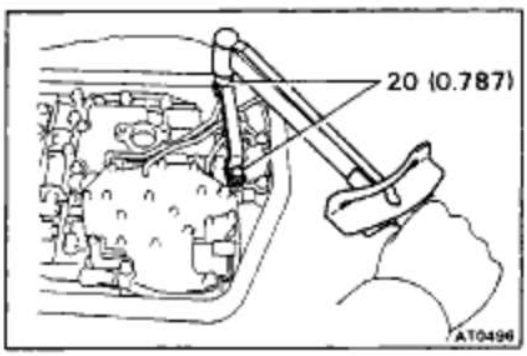
NOTICE: Be careful not to bend or damage the tubes.

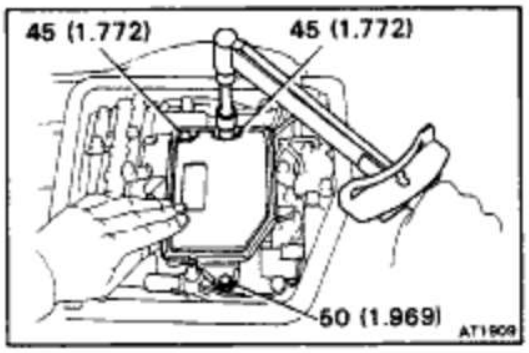


49. INSTALL TUBE BRACKET

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

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

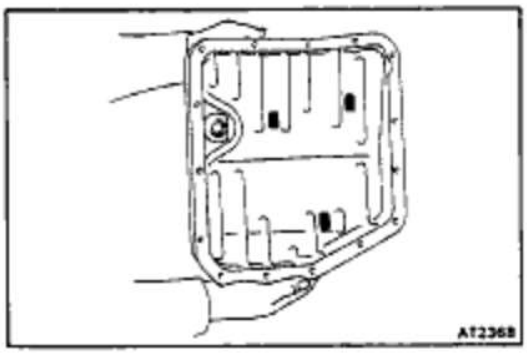




50. INSTALL OIL STRAINER

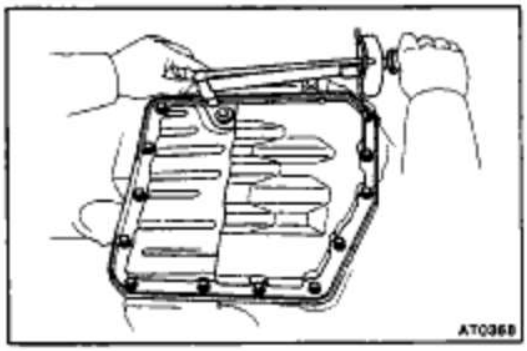
Each bolt length (mm (in.)) is indicated in the figure.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)



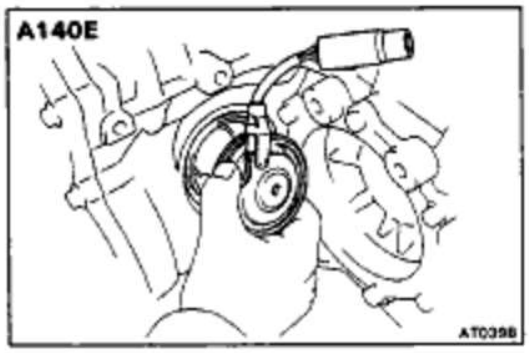
51. INSTALL MAGNETS IN PLACE AS SHOWN

NOTICE: Make sure that the magnets do not interfere with the oil tubes.



52. INSTALL OIL PAN WITH NEW GASKET

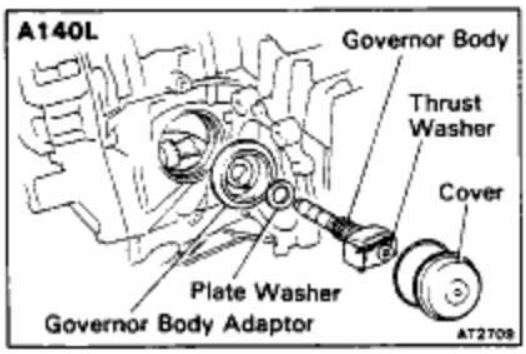
Torque: 50 kg–cm (43 in.–lb, 4.9 N–m)



53. (A140E)

INSTALL NO. 2 SPEED SENSOR

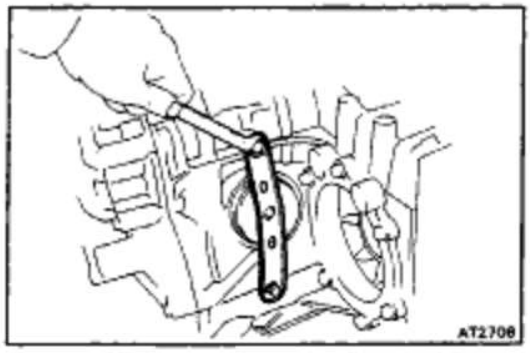
(a) Install the speed sensor with a new O–ring.
(b) Install the cover bracket with the two bolts.



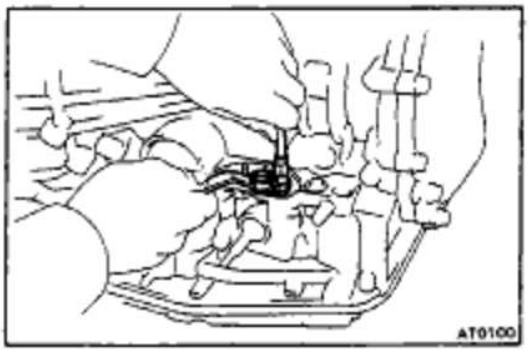
54. (140L)

INSTALL GOVERNOR BODY

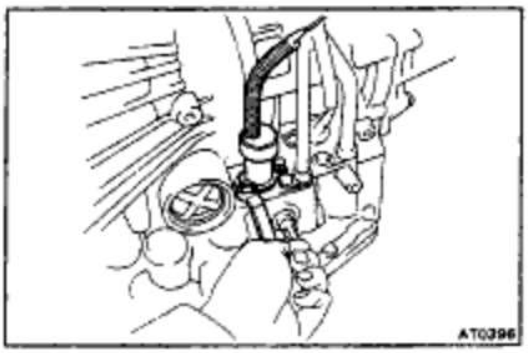
(a) Install the governor body adaptor.
(b) Install the governor body with the plate washer.
(c) Install the thrust washer onto the governor body.
(d) Install the new O–ring to the cover.
(e) Install the cover to the case.



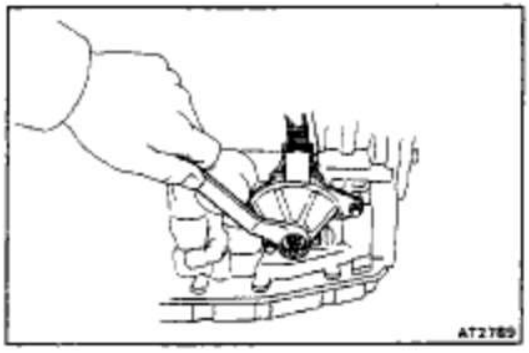
55. INSTALL COVER BRACKET



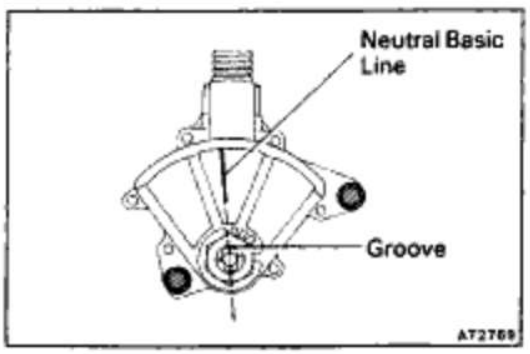
56. (A140E)
INSTALL SOLENOID WIRING RETAINING PLATE
57. INSTALL THROTTLE CABLE RETAINING PLATE
58. INSTALL FILLER TUBE AND DIPSTICK



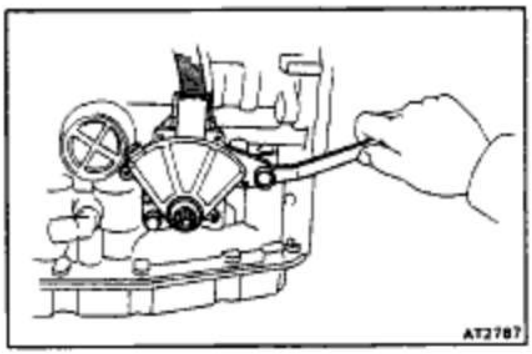
59. INSTALL SOLENOID
(a) Coat the O–rings with ATF and push the tip of solenoid into the hole.
(b) Tighten the two bolts evenly and gradually.



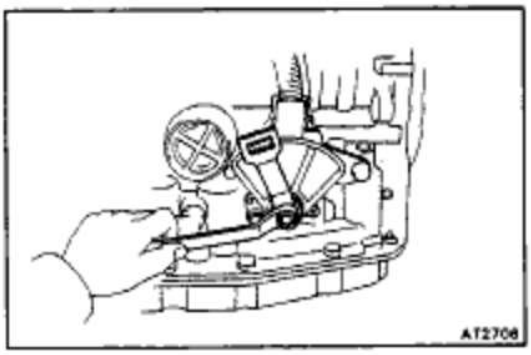
60. INSTALL NEUTRAL START SWITCH
(a) Install the neutral start switch to the manual valve shaft.
(b) Install the seal gasket and locking plate.
(c) Tighten the nut and stake it with the locking plate.
Torque: 70 kg–cm (61 in.–lb. 6.9 N–m)



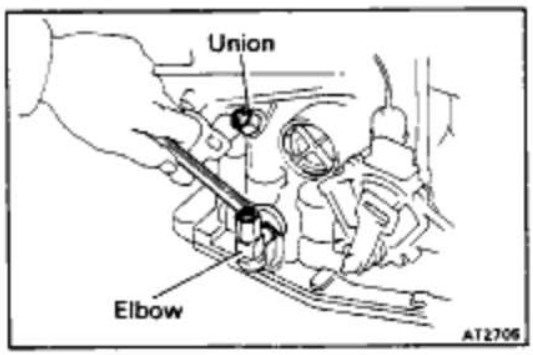
61. ADJUST NEUTRAL START SWITCH
(a) Align the groove and return neutral basic line.



(b) Lock the switch with two bolts.
Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)



62. INSTALL MANUAL SHIFT LEVER



63. INSTALL UNION AND ELBOW

(a) Coat a new O–rings with ATF.
(b) Install the O–rings to the union and elbow.
(e) Install the union and elbow to the transaxle case.
Torque: 275 kg–cm (20 ft–lb, 27 N–m)

A540E AND A540H AUTOMATIC TRANSAXLE

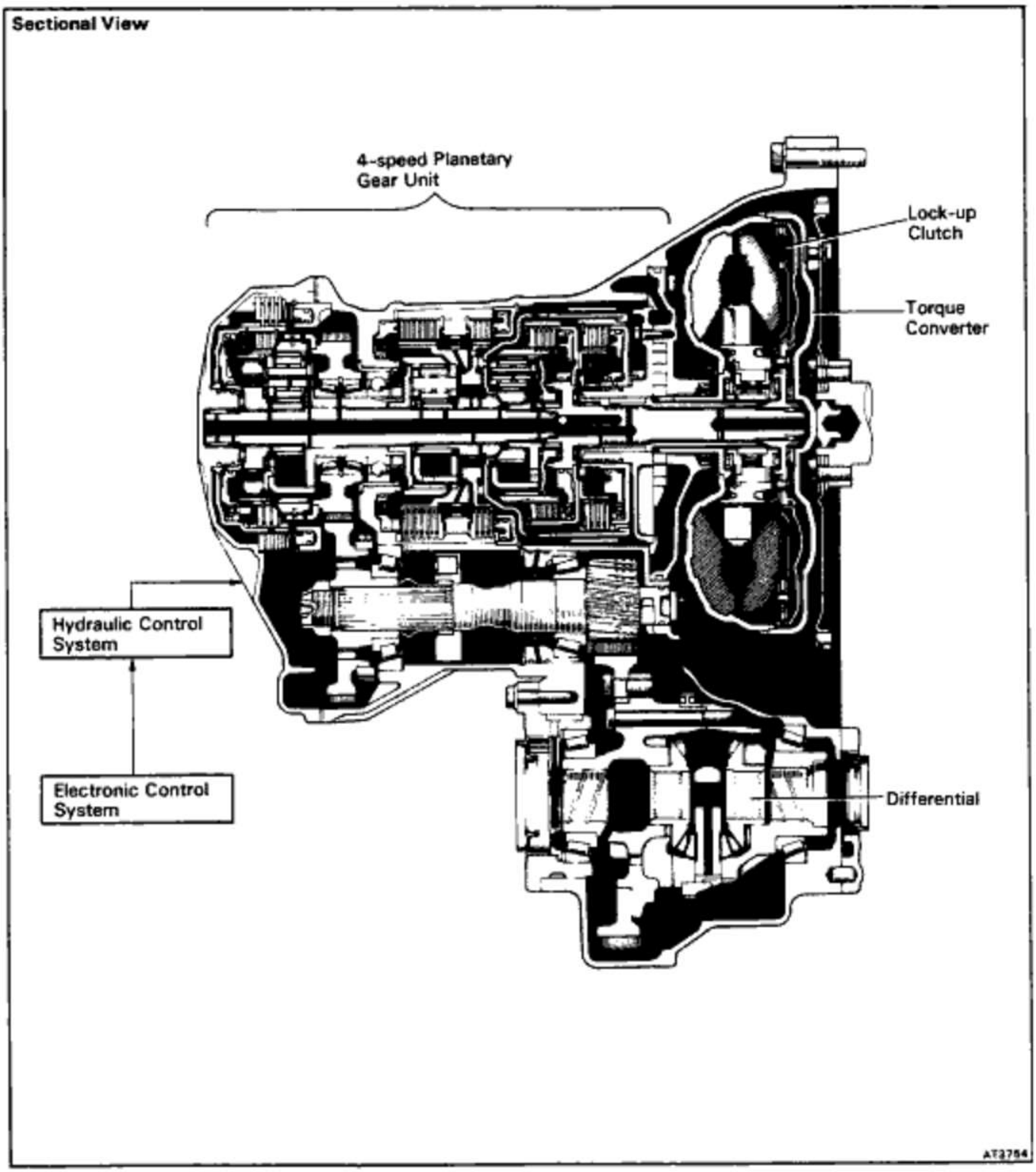
DESCRIPTION

GENERAL

(A540E)

The A540E is a 4–speed, Electronic Controlled Transaxle (hereafter called ECT) developed exclusively for use with a transversely–mounted engine. A lock–up is built into the torque converter.

The A540E transaxle is mainly composed of the torque converter, the 4–speed planetary gear unit, the differential, the hydraulic control system and the electronic control system.

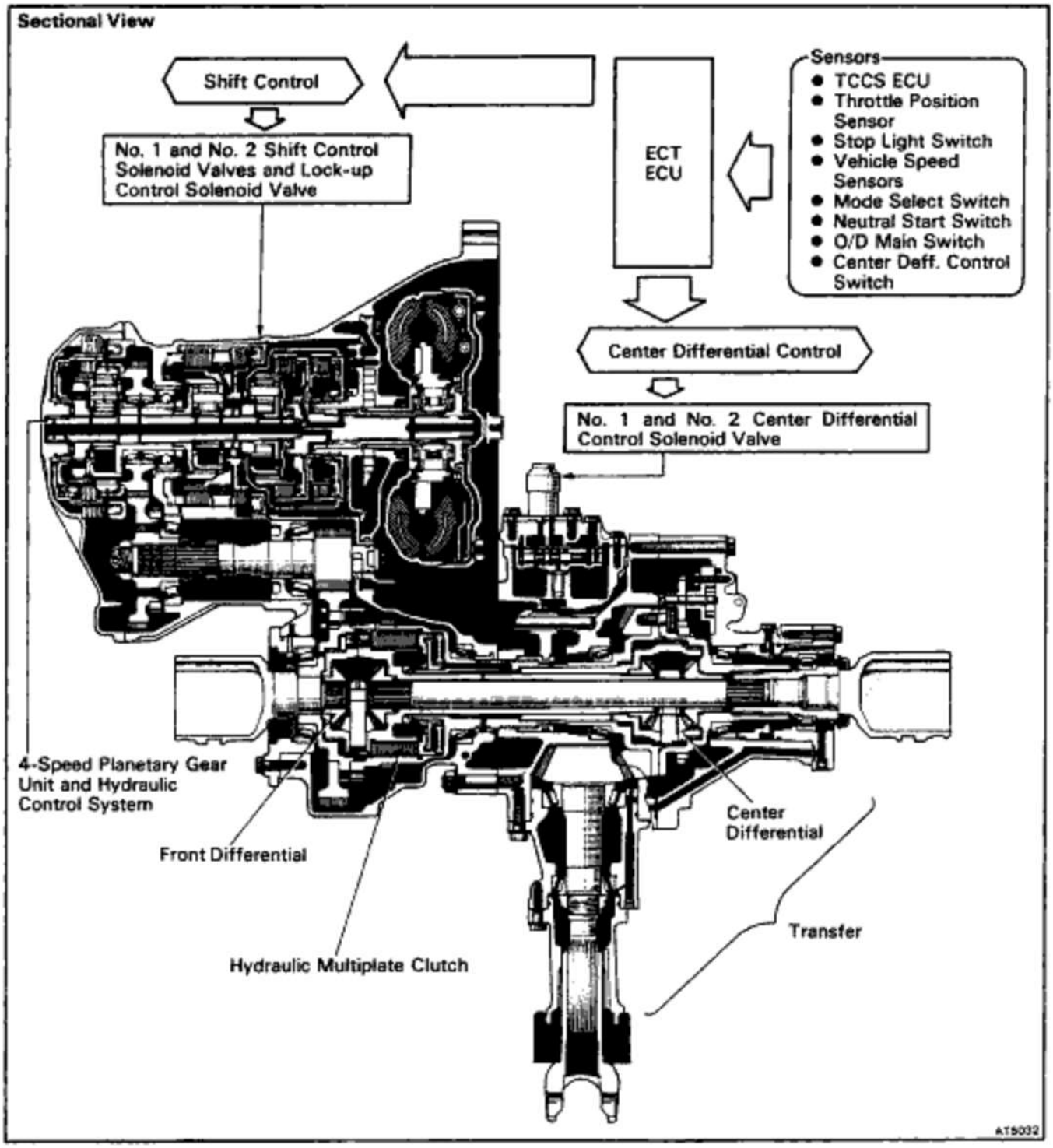


(A540H)

The A540H automatic transaxle design is based on the A540E automatic transaxle and equipped with a center differential and transfer.

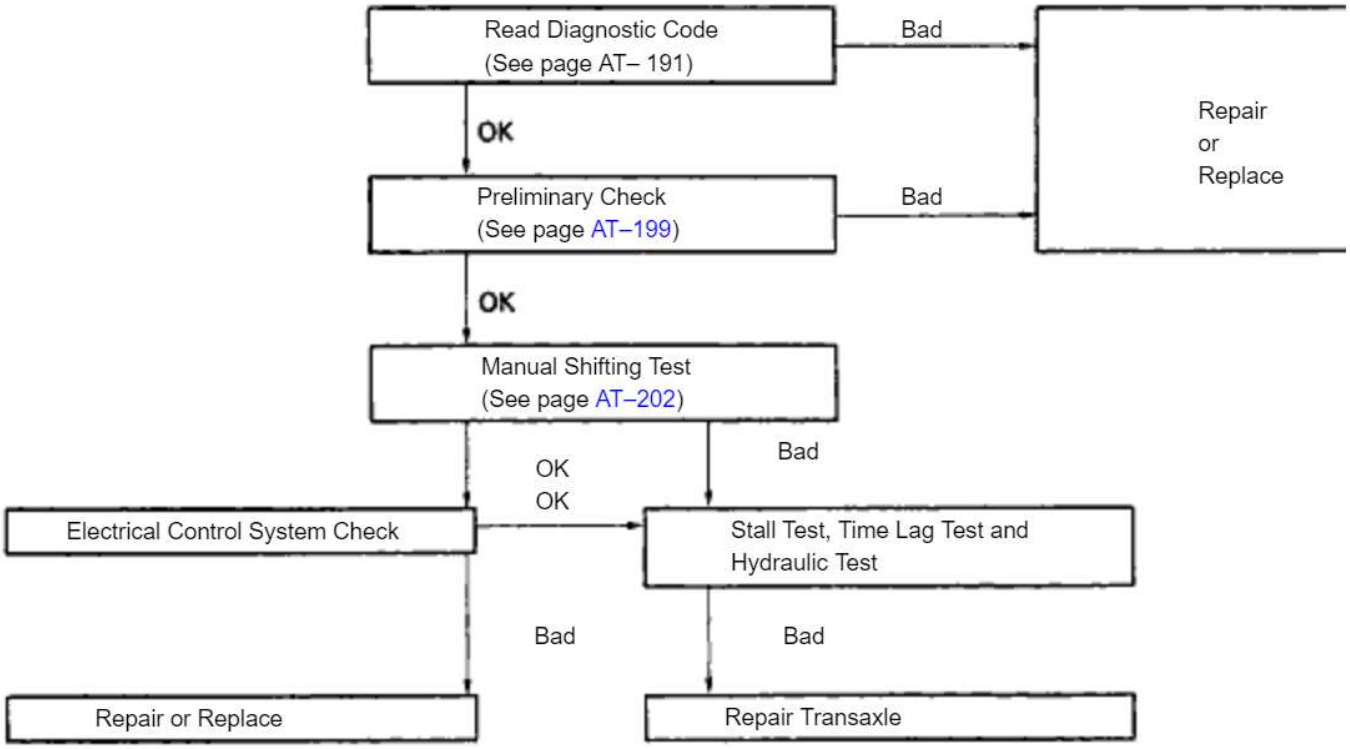
This transaxle has the same hydraulic multiplate clutch in the center differential limiting control mechanism as the A241 H automatic transaxle on the Corolla All–TRAC/4WD Station Wagon. The fluid pressure acting on the hydraulic multiplate clutch of the A540H is controlled by the ECT ECU (Electronic Control Unit according to the vehicle driving conditions. As a result, torque is distributed to the front and rear wheels appropriately at all times to maximize the overall performance of the 4WD vehicle.

NOTICE: Special handling methods are necessary for full–time 4WD vehicles during inspection and maintenance. Instructions concerning these handling methods are given on page IN–8.



TROUBLESHOOTING (A540E, A540H)
Basic Troubleshooting

Before troubleshooting an ECT, first determine whether the problem is electrical or mechanical.
To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



General Troubleshooting

Problem	Possible cause	Remedy	Page	
			A540E	A540 H
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	AT–200	–
	Torque converter faulty	Replace torque converter	AT–381	–
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	–
Vehicle does not move in any forward range or reverse	Shift cable out of adjustment	Adjust shift cable	AT–201	–
	Valve body or primary regulator faulty	Inspect valve body	AT–308	–
	Parking lock pawl faulty	Inspect parking lock pawl	AT–392	–
	Torque converter faulty	Replace torque converter	AT–381	–
	Converter drive plate broken	Replace drive plate		
	Oil pump intake screen blocked	Clean screen		
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	–
Shift lever position incorrect	Shift cable out of adjustment	Adjust shift cable	AT–201	1–
	Manual valve and lever faulty	Inspect valve body	AT–308	
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	
Harsh engagement into any drive range	Throttle cable out of adjustment	Adjust throttle cable	AT–201	–
	Valve body or primary regulator faulty	Inspect valve body	AT–308	–
	Accumulator pistons faulty	Inspect accumulator pistons	AT–403	–
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	–
Delayed 1–2, 2–3 or 3–O/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty	Inspect electronic control	AT–203	AT–219
	Valve body faulty	Inspect valve body	AT–308	
	Solenoid valve faulty	Inspect solenoid valve	AT–218	
Slips on 1–2, 2–3 or 3–O/D up–shift, or slips or shudders on acceleration	Shift cable out of adjustment	Adjust shift cable	AT–201	AT–219
	Throttle cable out of adjustment	Adjust throttle cable	AT–201	
	Valve body faulty	Inspect valve body	AT–308	
	Solenoid valve faulty	Inspect solenoid valve	AT–218	
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	
Drag, binding or tieup on 1–2, 2–3 or 3–O/D up–shift	Shift cable out of adjustment	Adjust shift cable	AT–201	–
	Valve body faulty	Inspect valve body	AT–308	–
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	–

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page	
			A540E	A540H
No lock–up in 2nd, 3rd or O/D	Electronic control faulty	Inspect electronic control	AT–203	←
	Valve body faulty	Inspect valve body	AT–308	←
	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Harsh down–shift	Throttle cable out of adjustment	Adjust throttle cable	AT–201	←
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT–201	←
	Accumulator pistons faulty	Inspect accumulator pistons		
	Valve body faulty	Inspect valve body	AT–403	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–308	←
			AT–236	←
No down–shift when coasting	Valve body faulty	Inspect valve body	AT–308	←
	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty	Inspect throttle cable	AT–201	←
	Valve body faulty	Inspect valve body	AT–308	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
	Valve body faulty	Inspect valve body	AT–308	←
No engine braking in 2 or L range	Solenoid valve faulty	Inspect solenoid valve	AT–218	AT–219
	Electronic control faulty	Inspect electronic control	AT–203	←
	Valve body faulty	Inspect valve body	AT–308	←
	Transaxle faulty	Disassemble and inspect transaxle	AT–236	←
Vehicle does not hold in P range	Shift cable out of adjustment	Adjust shift cable	AT–201	←
	Parking lock pawl and spring faulty	Inspect cam and spring	AT–392	←
No center differential Control	Electronic control faulty	Inspect electronic control	–	AT–203
	Valve body faulty	Inspect valve body	–	AT–368
	Transfer faulty	disassemble and inspect transfer	–	AT–343
	Hydraulic multiplate clutch faulty	Disassemble and inspect center differential clutch	–	AT–335

Operating Mechanism for Each Gear (A540E A540H)

1. CLUTCH BRAKE AND ONE–WAY CLUTCH

A540E, A540H

○ ..... Operating

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
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3 rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

Down–shift only – no up–shift

2. SOLENOID SYSTEM

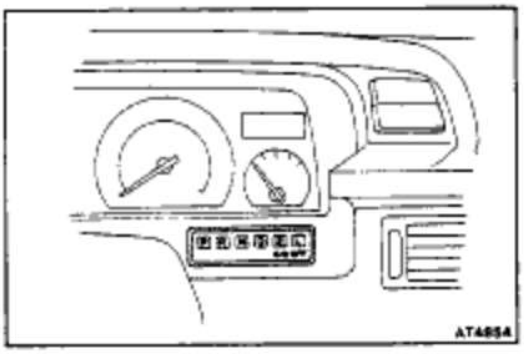
Possible gear positions in accordance with solenoid operating conditions.

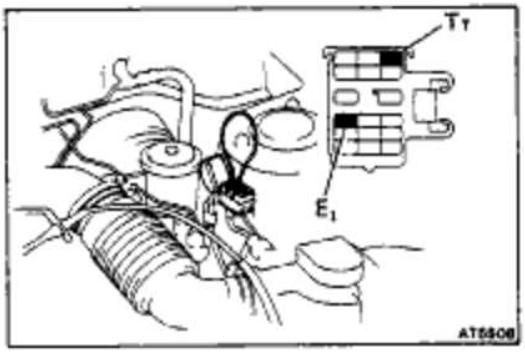
A540E, A540H

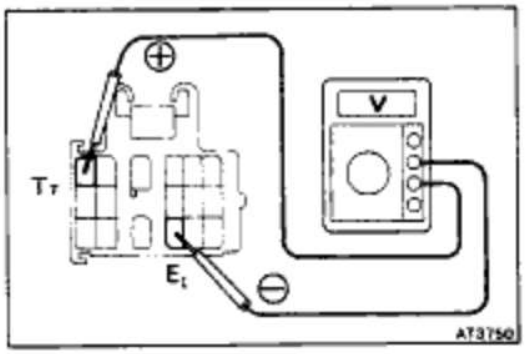
Range	NORMAL			NO. I SOLENOID MALFUNCTIONING			NO. 2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D range	ON	OFF	1st	X	ON (OFF)	3rd (O/D)	ON	X	1st	X	X	O/D
	ON	ON	2nd	X	ON	3rd	OFF (ON)	X	O/D (1st)	X	X	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	X	X	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	X	X	O/D
2 range	ON	OFF	1st	X	ON (OFF)	3rd (O/D)	ON	X	1st	X	X	O/D
	ON	ON	2nd	X	ON	3rd	OFF (ON)	X	O/D (1st)	X	X	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	X	X	O/D
L range	ON	OFF	1st	X	OFF	1st	ON	X	1st	X	X	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	X	X	1st

( ) 1: No fail–safe function X: Malfunctions

HINT: (A540H) When any one of the speed sensors (front or rear) or center differential control solenoid valves (No. 1 or No. 2) malfunction, the ECT ECU stops center differential control and maintains the center differential in a free condition.



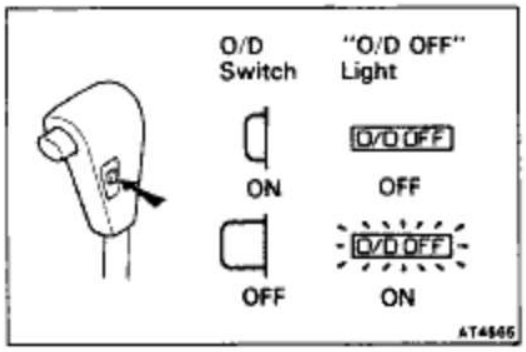




Diagnosis System

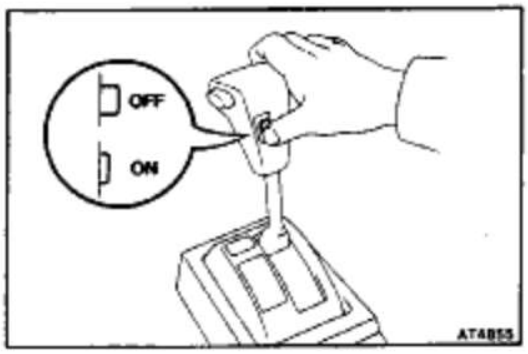
DESCRIPTION

1. A self–diagnosis function is. built into the electrical control system. Warning is indicated by the overdrive OFF indicator.
   HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF indicator is lit continuously and will not blink.
   (a) If a malfunction occurs within the speed sensors or solenoids, the overdrive OFF light will blink to warn the driver. However, there will be no warning of a malfunction with lock–up solenoid.
   W The diagnostic code can be read by the number of blinks of the overdrive OFF indicator when terminals Tt and E1 are short–circuited. (See page AT– 191)
   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal Tt of the check connector.
   (d) The signals to each gear can be checked by measuring the voltage at terminal Tt of the check connector while driving.
2. The diagnostic (malfunction) code is retained in memory by the ECU and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the fuse EFI (15A) (A540E) or DOME (20A)
   (A540H) or disconnect the Engine and ECT ECU (A540E) or ECT ECU (A540H) connector to cancel out the diagnostic (malfunction) code. (See page AT–192)
   HINT:
   - Low battery voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
   - Use a voltmeter and ohmmeter that have an impedance of at least 10 k /V.



CHECK O/D OFF INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The O/D OFF light will come on when the O/D switch placed at OFF.
3. When the O/D switch is set to ON, the O/D OFF light should go out.
   If the O/D OFF light flashes when the O/D switch is set to ON, the electronic control system is faulty.

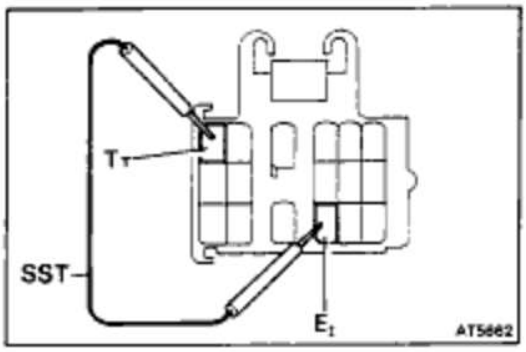


READ DIAGNOSTIC CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

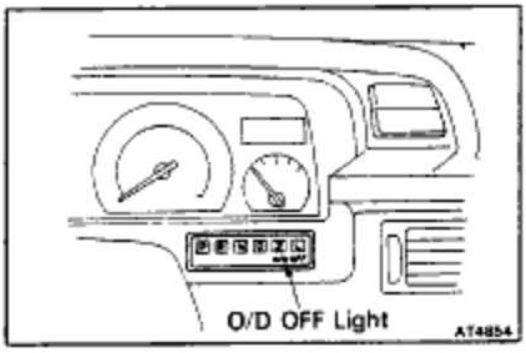
HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. SHORT Tt TERMINAL CIRCUIT OF CHECK CONNECTOR

Using SST, short terminals Tt and E1 of the check connector.

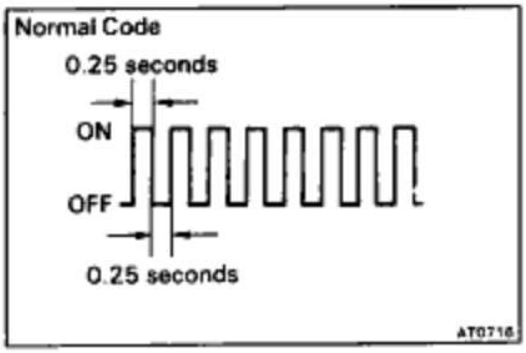
SST 09843–18020



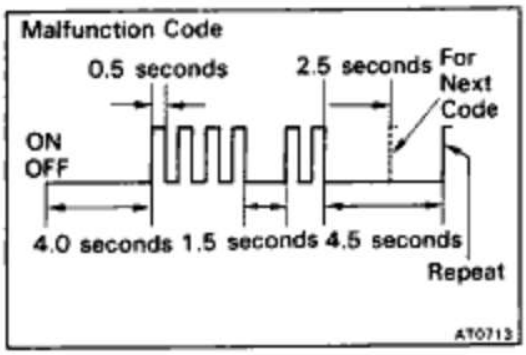
3. READ DIAGNOSTIC CODE

Read the diagnostic code as indicated by the number of times the O/D OFF light flashes.

(Diagnostic Code Indication)



- If the system is operating normally, the light will blink once every 0.25 seconds.



- In the event of a malfunction, the light will blink once every 0.5 seconds. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 seconds pause between each.

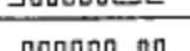
HINT: In the event of several trouble codes occurring simultaneously, indication will begin from the smaller value and continue to the larger.

4. REMOVE SST

SST 09843–18020

DIAGNOSTIC CODES.

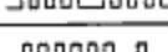
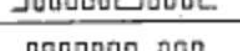
(A540E)

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 speed sensor (in combination meter) – severed wire harness or short circuit
61		Defective No. 2 speed sensor (in ATM) – severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit – severed wire harness or short circuit

AT2020

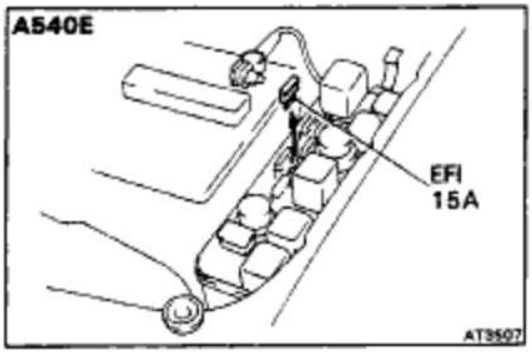
HINT: If codes 62, 63 or 64 appear, there is an electrical malfunction in the solenoid. Causes due to mechanical failure, such as a stuck valve, will not appear.

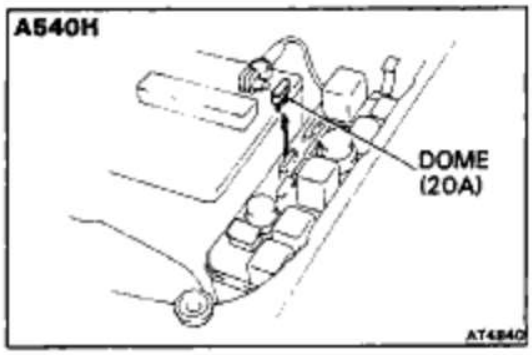
(A540H)

Code No.	Light Pattern	Diagnosis System
–		Normal
44		Defective rear wheel speed sensor (in transfer left case) – severed wire harness or short circuit
61		Defective vehicle speed sensor (in differential carrier cover) severed wire harness or short circuit
62		Severed No. t solenoid or short circuit – severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit – severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit – severed wire harness or short circuit
73		Severed No. 1 center differential control solenoid valve or short circuit – severed wire harness or short circuit.
74		Severed No. 2 center differential control solenoid valve or short circuit – severed wire harness or short circuit.

AT4B

HINT: If codes 62, 63, 64, 73 or 74 appear, there is an electrical malfunction in the solenoid. Causes due t mechanical failure, such as a stuck valve, will not appear.
If codes 44 and 61 appear, check the both (vehicle and rear wheel) speed sensors.





CANCEL OUT DIAGNOSTIC CODE

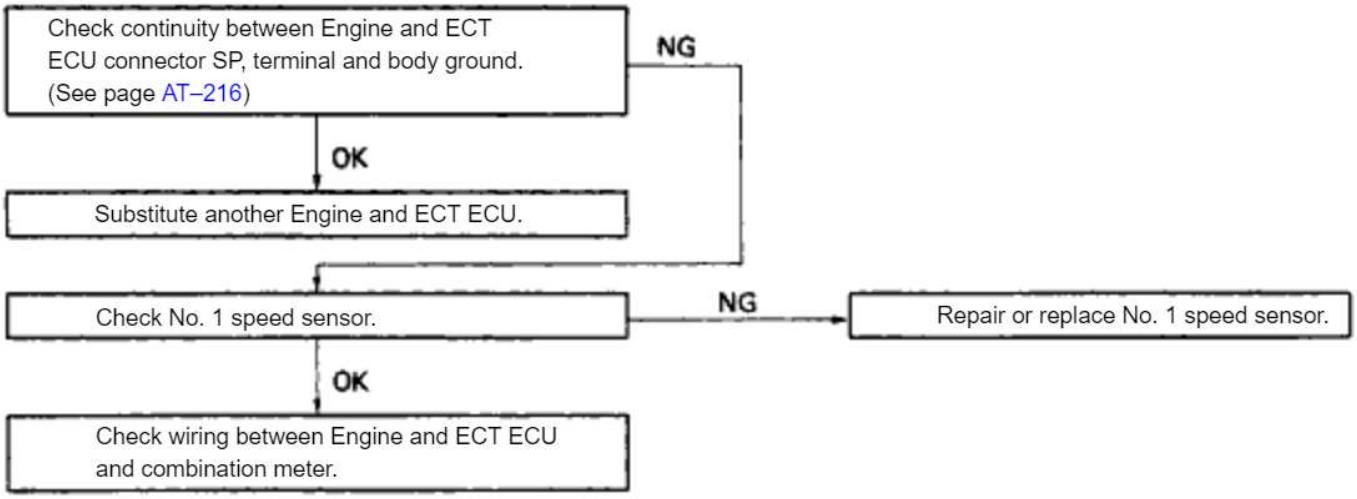
1. After repair of the trouble area, the diagnostic code retained in memory by the Engine and ECT ECU (A540E) or ECT ECU (A540H) must be canceled by removing the fuse EFI (15A) (A540E) or DOME (20A) (A540H) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out with the ignition switch OFF.
   - HINT:Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems (engine control system diagnosis memory, clock. ETR, etc.) will also be canceled out
   - The diagnostic code can be also canceled out by disconnecting the Engine and ECT ECU (A540E) or ECT ECU (A540H) connector.
   - If the diagnostic code is not canceled out, it will be retained by the Engine and ECT ECU (A540E) or ECT ECU (A540H) and appear along with a new code in event of future trouble.
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF indicator.

TROUBLESHOOTING FLOW–CHART (A540E)

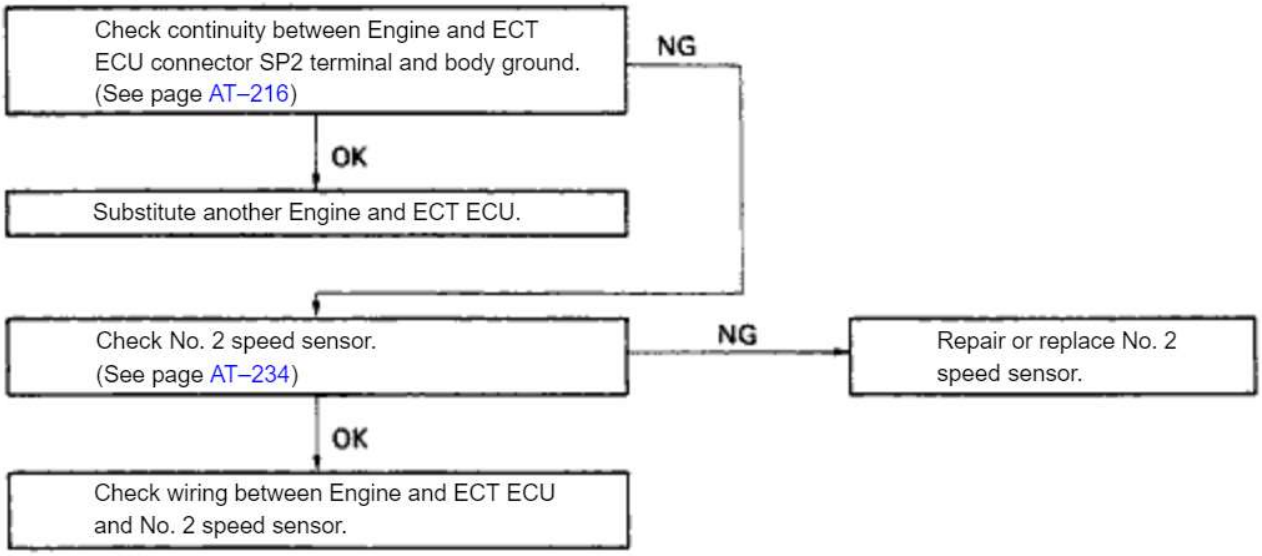
HINT:

- If diagnostic code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the Engine and ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transaxle will not up–shift from first gear, regardless of the vehicle speed.

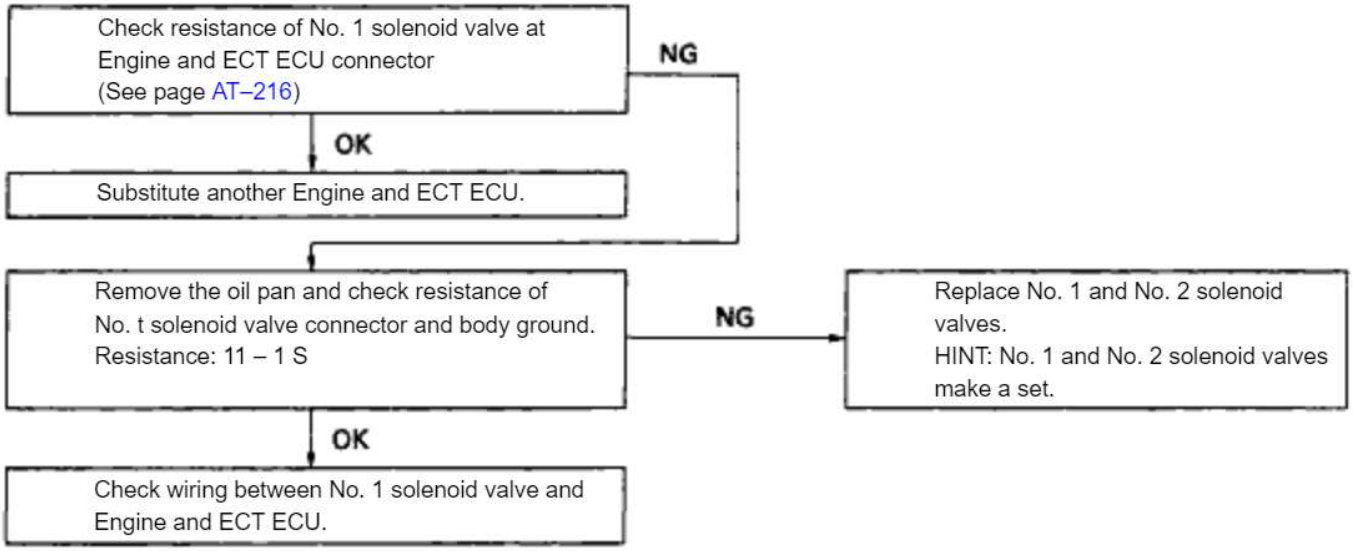
1. Diagnostic code 42 (No. 1 speed sensor circuitry)



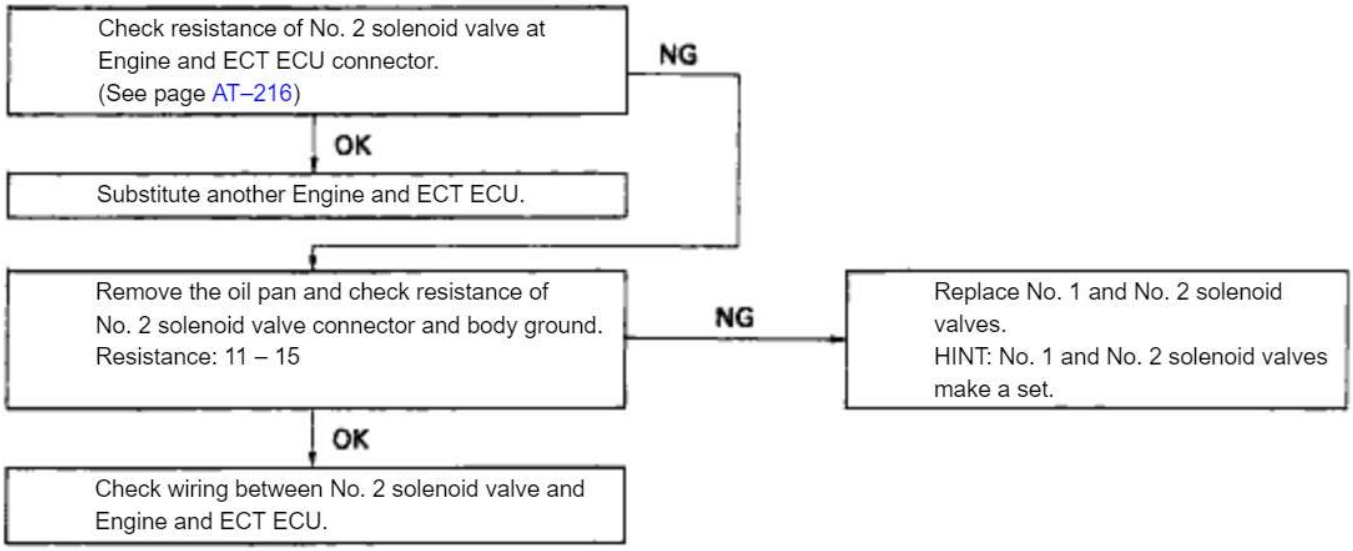
2. Diagnostic code 61 (No. 2 speed sensor circuitry)



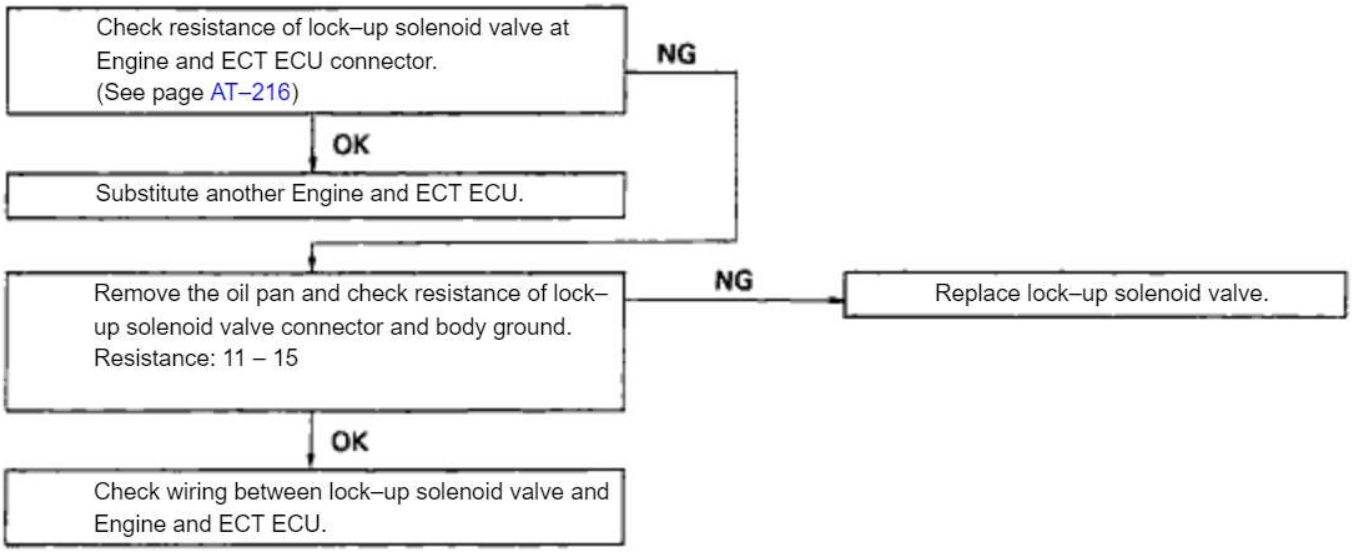
3. Diagnostic code 62 (No. 1 solenoid valve circuitry)



4. Diagnostic code 63 (No. 2 solenoid valve circuitry)



5. Diagnostic code 64 (Lock–up solenoid valve circuitry)

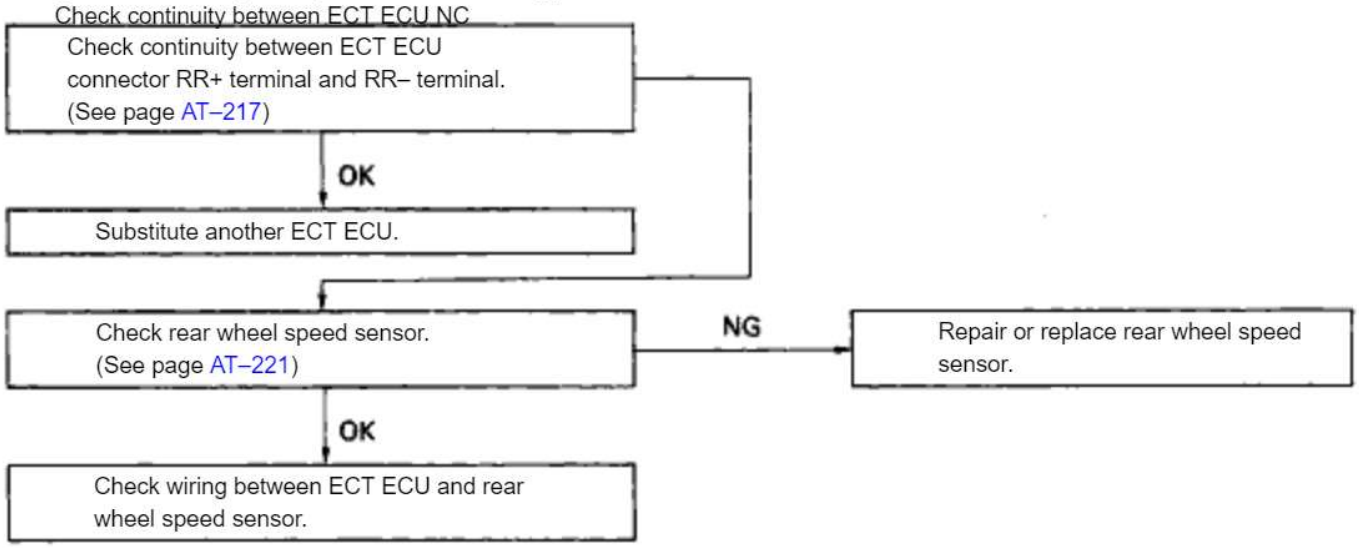


TROUBLESHOOTING FLOW–CHART (A540H)

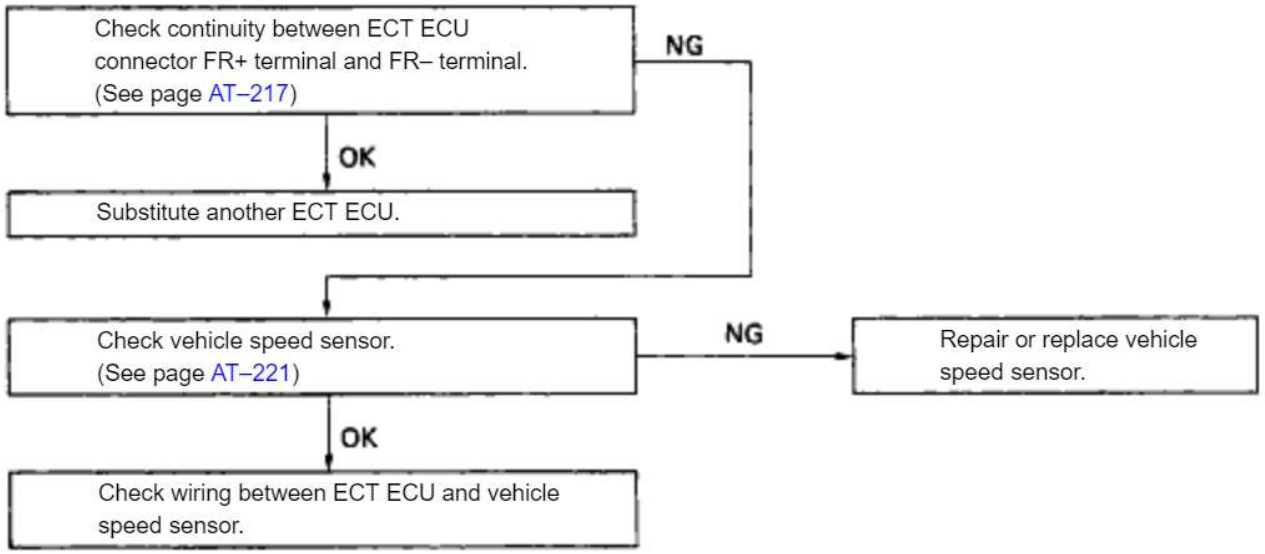
HINT:

- If diagnostic code Nos. 44, 61, 62, 63, 73 or 74 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver.
  However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic code No. 64.
- In the event of a simultaneous malfunction of both vehicle and rear speed sensors, no diagnostic code will appear and the fail–safe system will not function. However, when driving in the D range, the transaxle will not up–shift from first gear, regardless of the vehicle speed.

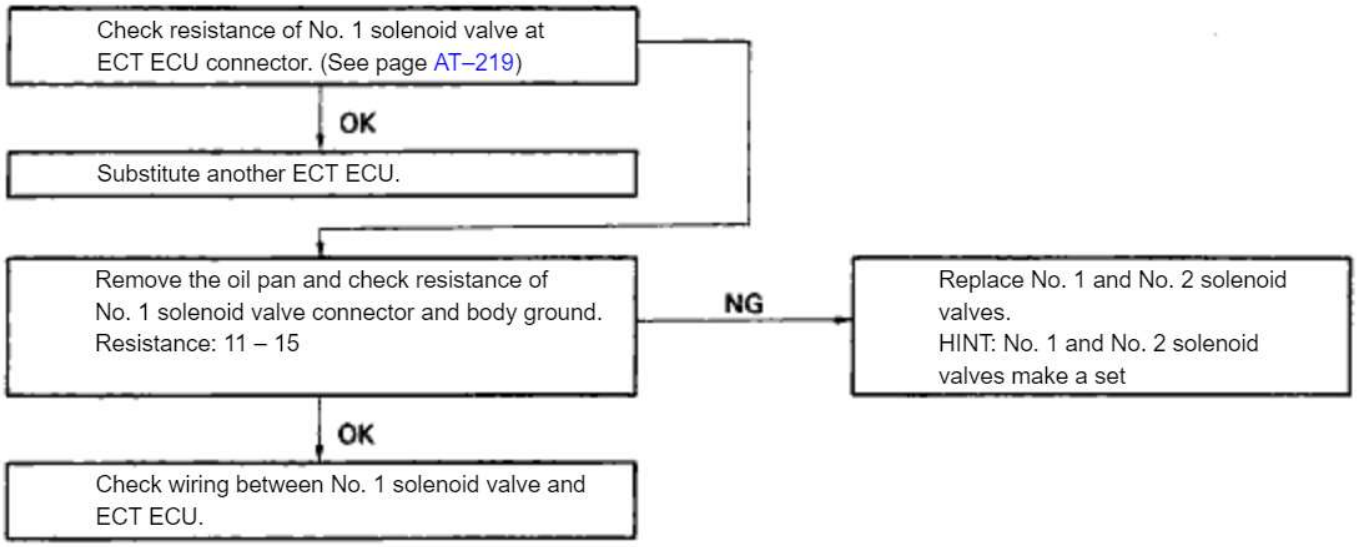
1. Diagnostic code 44 (Rear speed sensor circuitry)



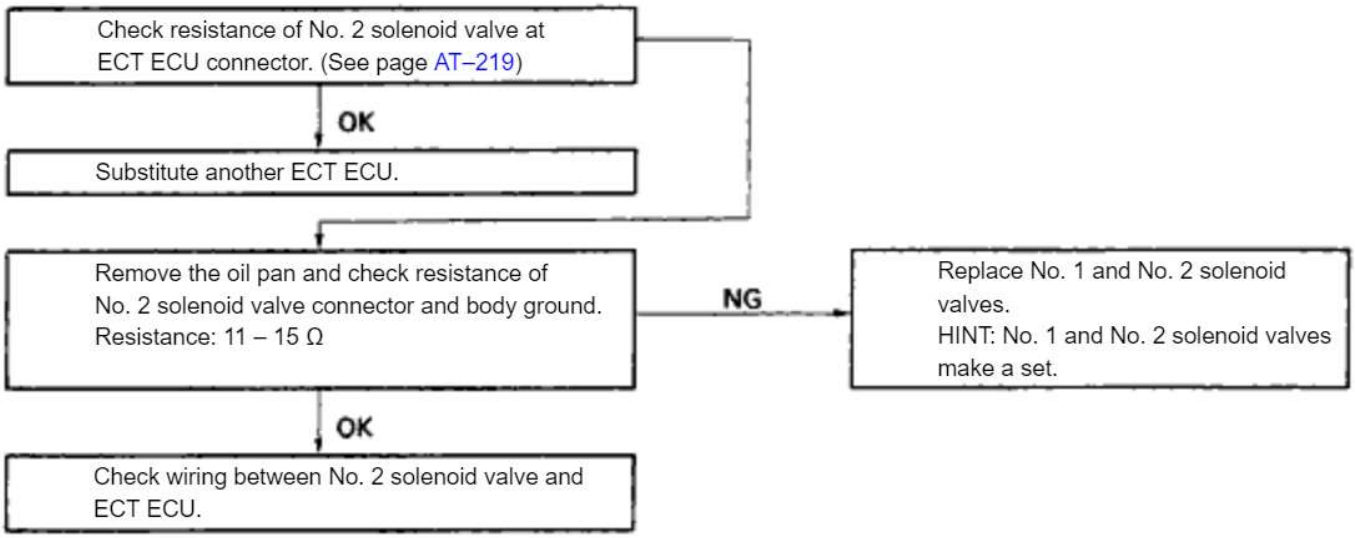
2. Diagnostic code 61 (Vehicle speed sensor circuitry)



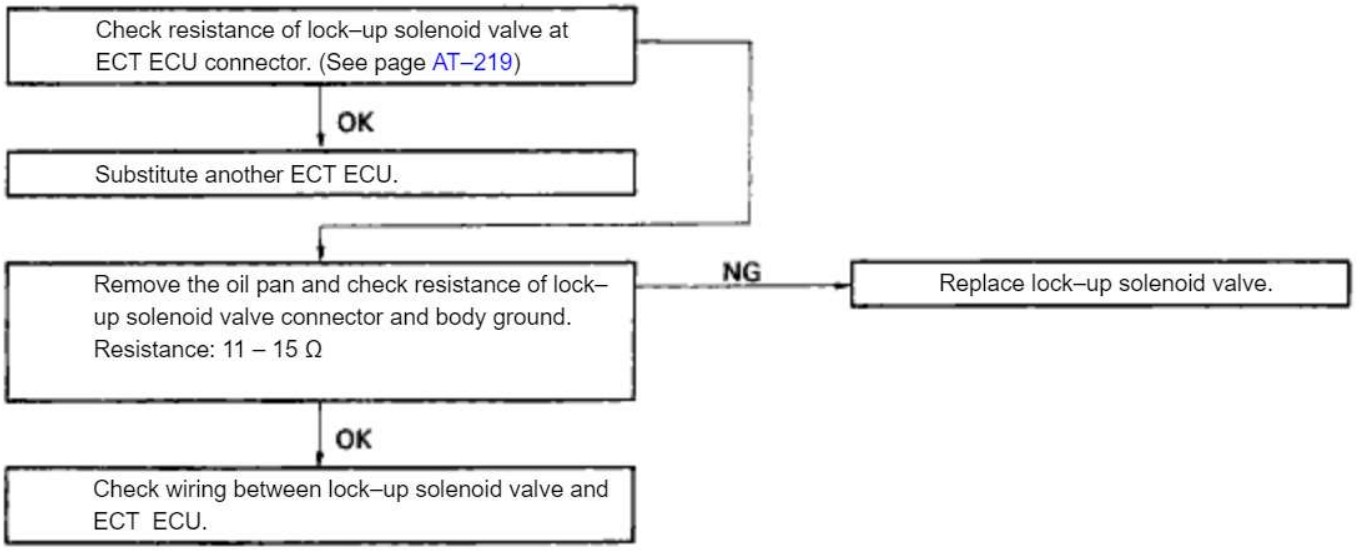
3. Diagnostic code 62 (No. 1 solenoid valve circuitry)



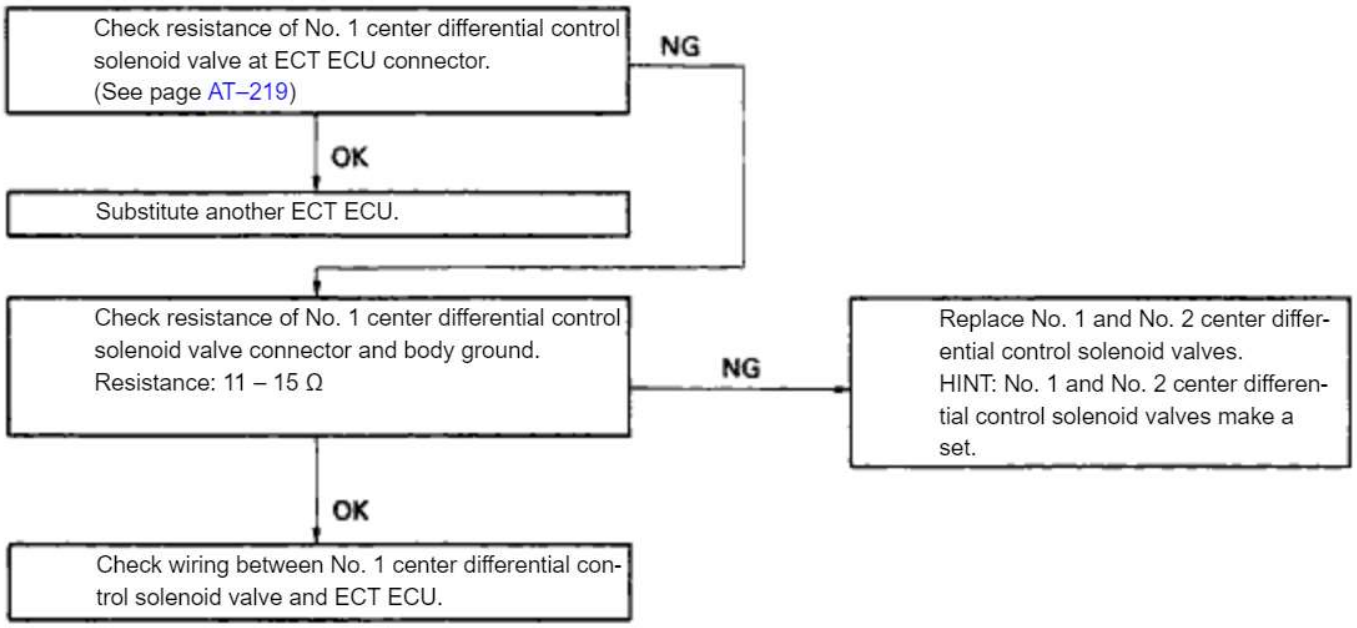
4. Diagnostic code 63 (No. 2 solenoid valve circuitry)



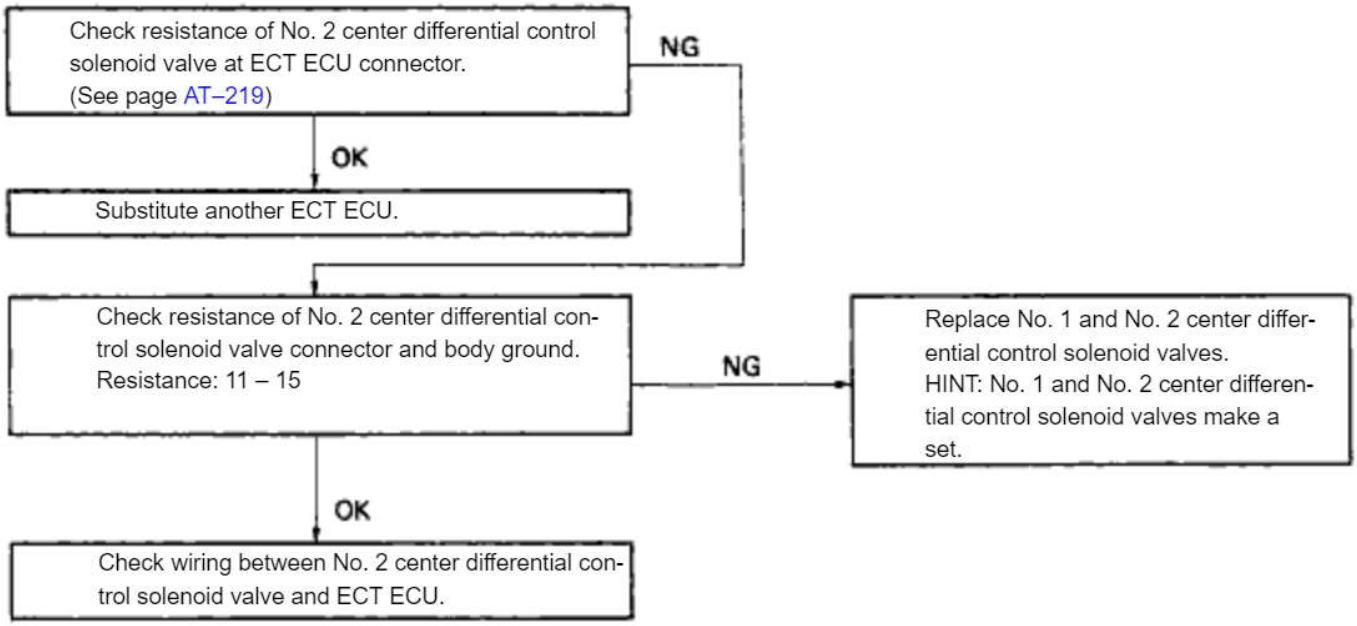
5. Diagnostic code 64 (Lock–up solenoid valve circuitry)

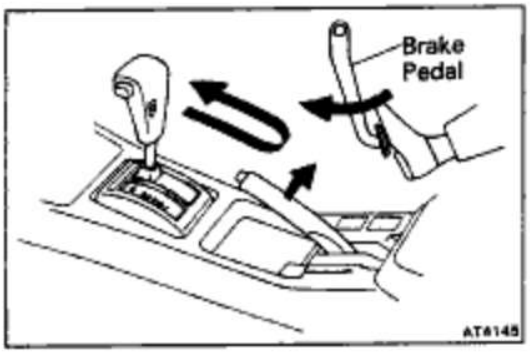


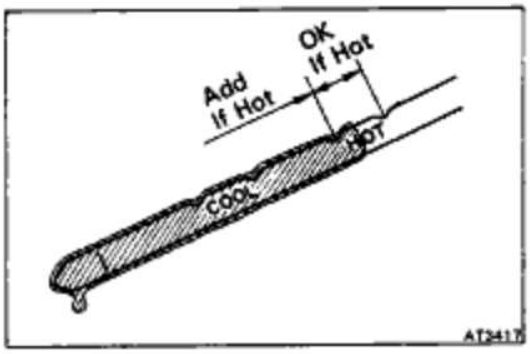
6. Diagnostic code 73 (No. 1 center differential control solenoid valve circuitly)

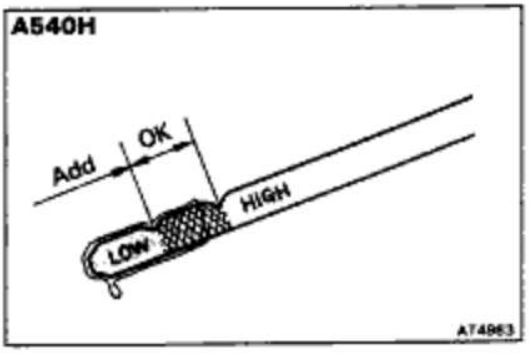


7. Diagnostic code 74 (No. 2 center differential control solenoid valve circuitly)









Preliminary Check

1. CHECK TRANSAXLE FLUID LEVEL

HINT:

The vehicle must have been driven so that the engine and transaxle are at normal operating temperature.

(Fluid temperature: 158 – 176°F or 70 – 80°C)

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress the brake pedal.

(e) Pull out the transaxle dipstick and wipe it clean.

(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: A540E ATF DEXRON© II
A540H ATF Type T (08886–00405) or equivalent

NOTICE: Do not overfill.

2. (A540H)

CHECK TRANSFER OIL LEVEL

(a) Park the vehicle on a level surface, set the parking brake.

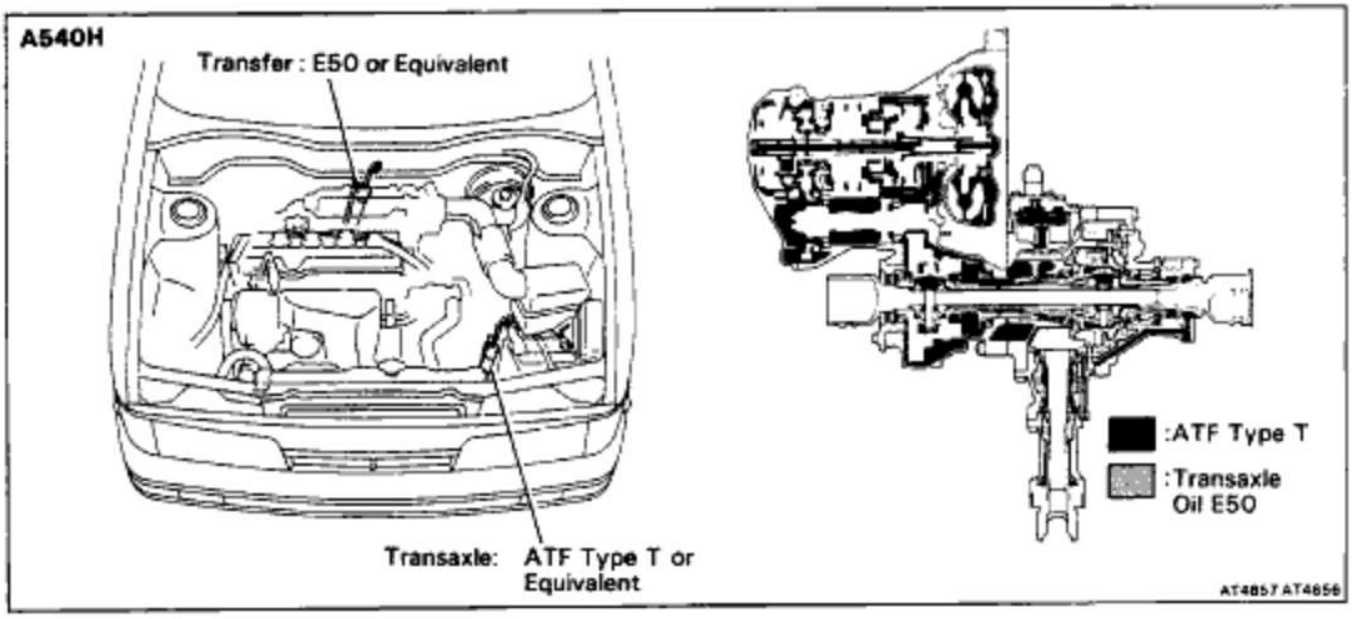
(b) Pull out the transfer dipstick and wipe it clean.

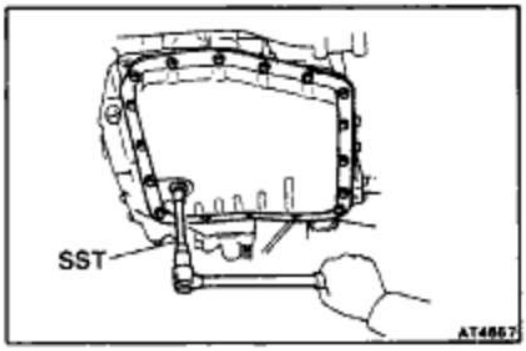
(e) Push it back fully into the tube.

(d) Pull it out and check the oil level as shown in the illustration.

Oil type: Transaxle oil E50 (08885–80206), AP GL5, SAE 75W – 90 or equivalent

NOTICE: Do not overfill.







3. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it.

4. REPLACE TRANSAXLE FLUID

NOTICE: Do not overfill.

(a) Remove the drain plug and drain the fluid.

(b) Install the drain plug.

(c) Add new fluid through the filler tube.

SST 09043–38100

(A540E)

Fluid type: ATF DEXRON© II

Capacity:

Dry fill: 5.9 liters (6.2 US qts, 5.2 Imp. qts)

Drain and refill:

2.5 liters (2.6 US qts, 2.2 Imp. qts)

(A540H)

Fluid type: ATF Type T (08886–00405) or equivalent

Capacity:

Dry fill: 7.0 liter (7.4 US qts, 6.2 Imp. qts)

Drain and refill:

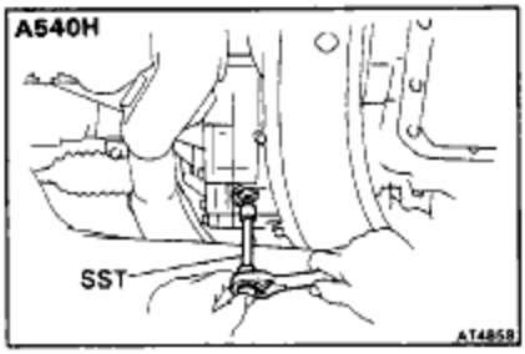
3.3 liter (3.5 US qts, 2.9 Imp. qts)

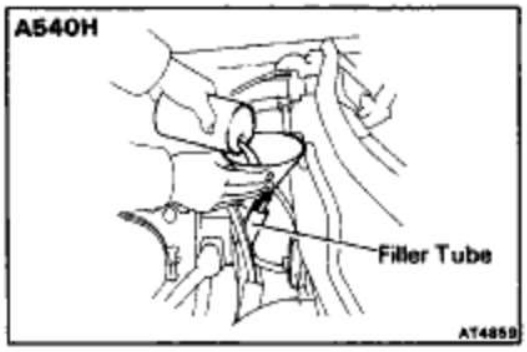
(d) Start the engine and shift the selector into all positions from P through L and then shift into P.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(f) Check the fluid level with the normal fluid temperature (158 – 176° F or 70 – 80°C) –and add as necessary.

NOTICE: Do not overfill.





5. (A540H)

REPLACE TRANSFER OIL

(a) Remove the drain plug and drain the oil.

(b) Install the drain plug.

(e) Add new oil through the filler tube.

SST 09043–38100

Oil type: Transaxle oil E50 (08885–80206) or equivalent

Recommended oil:

Oil grade API GL–5

Viscosity SAE 75W – 90 or 80W – 90

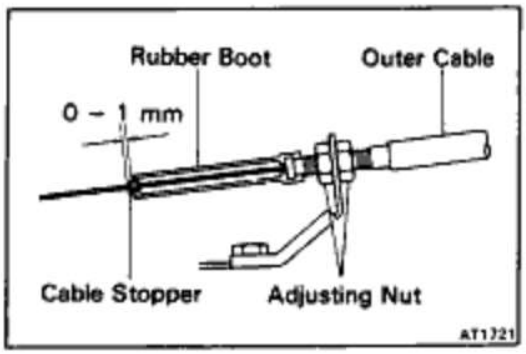
Above –18˚C (0˚F) SAE 90W

below –18˚C (0˚F) SAE 80W

NOTICE: 0.7 liter (0.74 US qts, 0.62 Imp. qts)

(d) Check the oil level and add as necessary.

NOTICE: Do not overfill.



S. INSPECT AND ADJUST THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

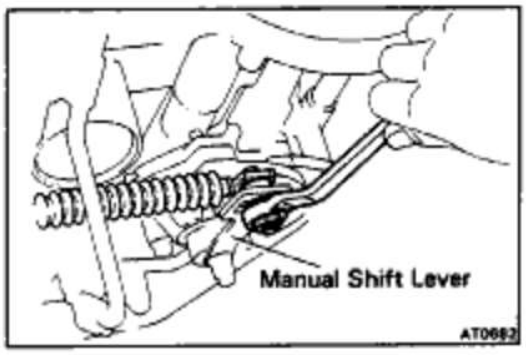
HINT: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.



7. INSPECT AND ADJUST SHIFT CABLE

When shifting the shift lever from the –N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

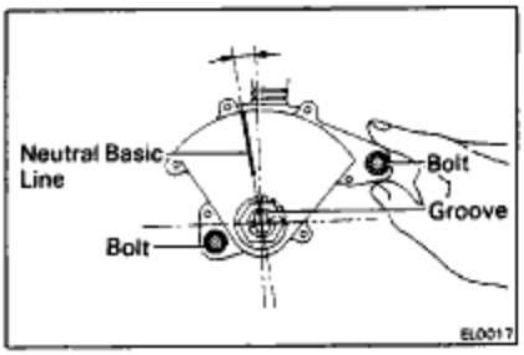
(a) Loosen the swivel nut on manual shift lever.

(b) Push the manual lever fully toward the right side of the vehicle.

(c) Return the lever two notches to NEUTRAL position.

(d) Set the shift lever to N.

(e) While holding the lever lightly toward the R range side, tighten the swivel nut.



8. ADJUST NEUTRAL START SWITCH

If the engine will start with the shift selector in any range other than N or P range, adjustment is required.

(a) Loosen the neutral start switch bolts and set the shift selector to the N range.

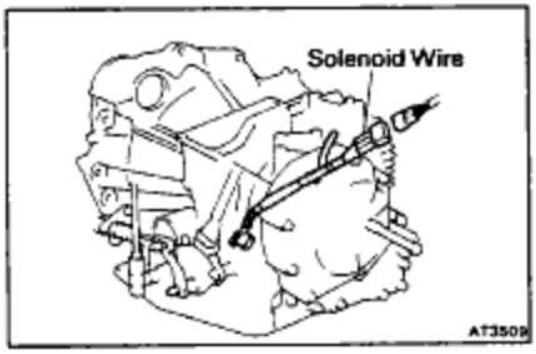
(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolts.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

9. INSPECT IDLE SPEED IN RANGE)

Idle speed: 700 rpm



Manual Shifting Test

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

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

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

Shift position	D range	2 range	range	R range	P range
Gear position	O/D	O/D	1 st	Reverse	Pawl Lock

HINT: If the L, 2 and D range gear positions are difficult to distinguish, perform the following road test.

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

If any abnormality is found in the above test, the problem lies in transaxle itself.

3. CONNECT SOLENOID WIRE

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R ranges.

CAUTION:

- Perform the test at normal operation fluid temperature (122 – 176°F or 50 – 80°C).
- Do not continuously run this test longer than 5 seconds.
- To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.
- The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Step down strongly on the brake pedal with your left foot.
(e) Start the engine.
(f) Shift into the D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: A540E (2VZ–FE) 2,450 ±150 rpm
A540H (3S–FE) 2,320 ±150 rpm

(g) Perform the same test in R range.

EVALUATION

(a) If the stall speed is the same for both ranges without the rear wheels rotating but lower than specified value:

- Engine output may be insufficient
- Startor one–way clutch is not operating properly

(b) If the stall speed in D range is higher than specified:

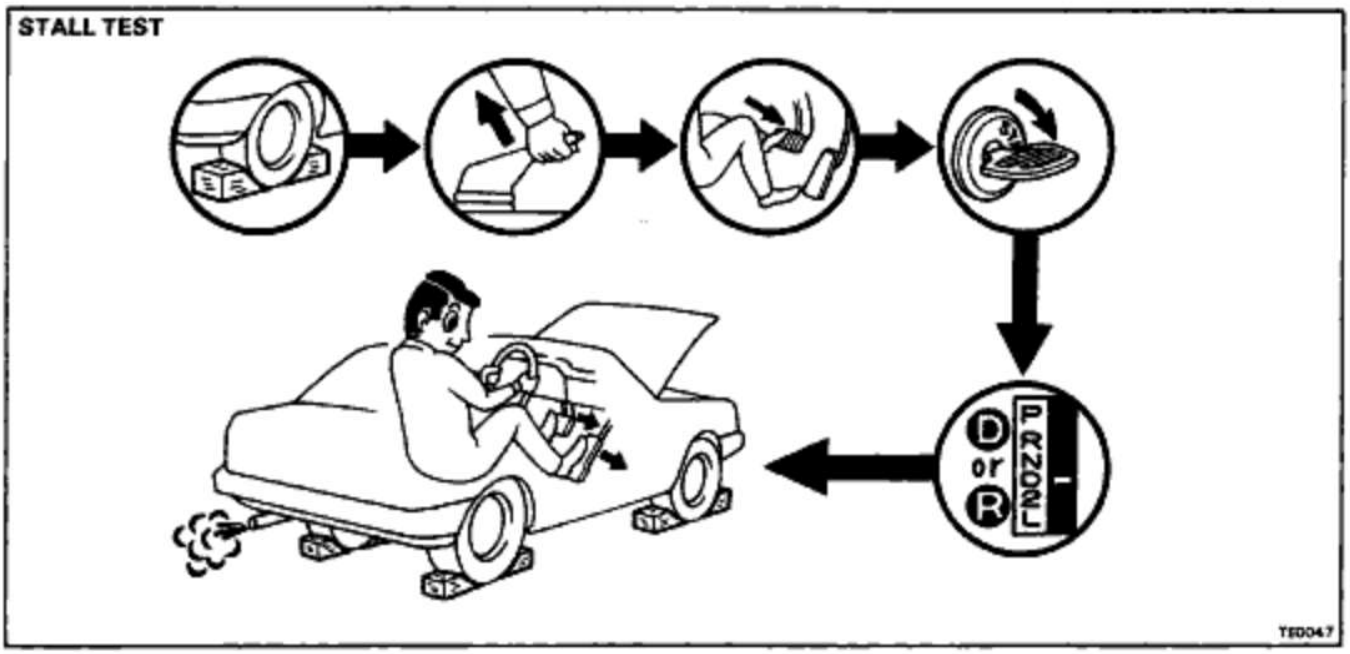
- Line pressure too low
- Forward clutch slipping
- No. 2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(e) If the stall speed in R range is higher than specified:

- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D ranges are higher than specified:

- Line pressure too low
- Improper fluid level
- O/D 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 O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE: .

- **Perform the test at normal operating fluid temperature (122 – 176˚F or 50 – 80˚C).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed (N range): 700 rpm (A540E and A540H)

(c) Shift the shift lever from N to D position. Using a stopwatch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds.

(d) In the same manner, measure the time lag for N – R.

Time lag: Less than 1.5 seconds.

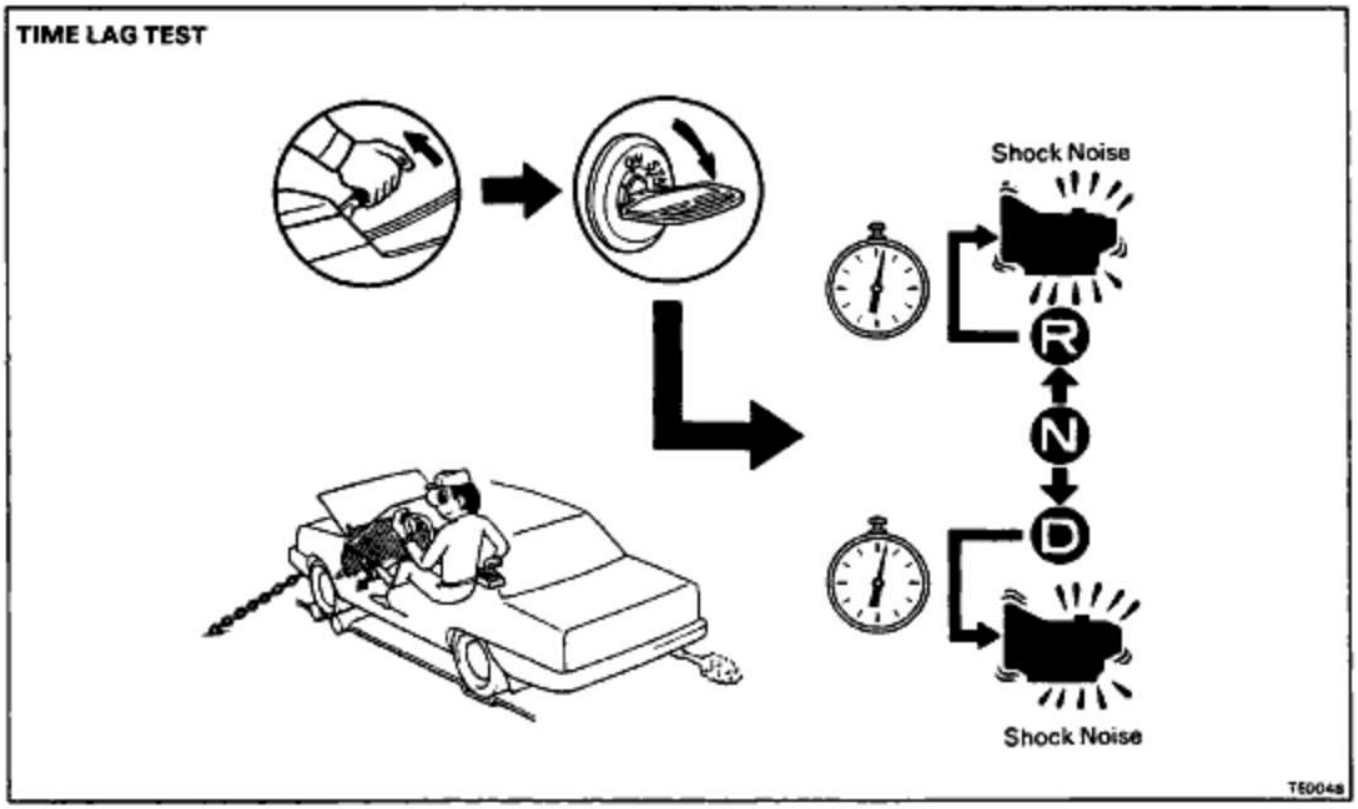
EVALUATION

(a) If N – D time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- O/D one–way clutch not operating properly

(b) If N – R time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transaxle fluid.

(b) Remove the transaxle case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (122 – 176°F or 50 – 80°C)**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check idling rpm.

(c) Step down strongly on the brake pedal with your left foot and shift into D range.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

(f) In the same manner, perform the test in R range.

(A540E)

Line pressure			kg/cm2 (psi, kPa)
D range		R range	
Idling	Stall	Idling	Stall
3.6 – 4.2 (53 – 60, 363 – 412)	7.5 – 8.7 (107 – 124, 735 – 853)	5.7 – 6.6 (81 – 94, 559 – 647)	11.8 – 13.8 (168 – 196, 1,157 – 1,353)

(A540H)

Line pressure				kg/cm2 (psi, kPa)
D			R range	Stall
Id-	rang	S	Idling	
3.6 – 4.2 (53 – 60, 369 – 412)	e	7.5 – 8.7 (107 – 124, 735 – 853)	6.6 – 7.7 (94 – 102, 647 – 706)	13.5 – 15.8 (192 – 225, 1,324 – 1,549)

If the measured pressure are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

(a) If the measured values at all ranges are higher than specified:

- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all ranges are lower than specified:

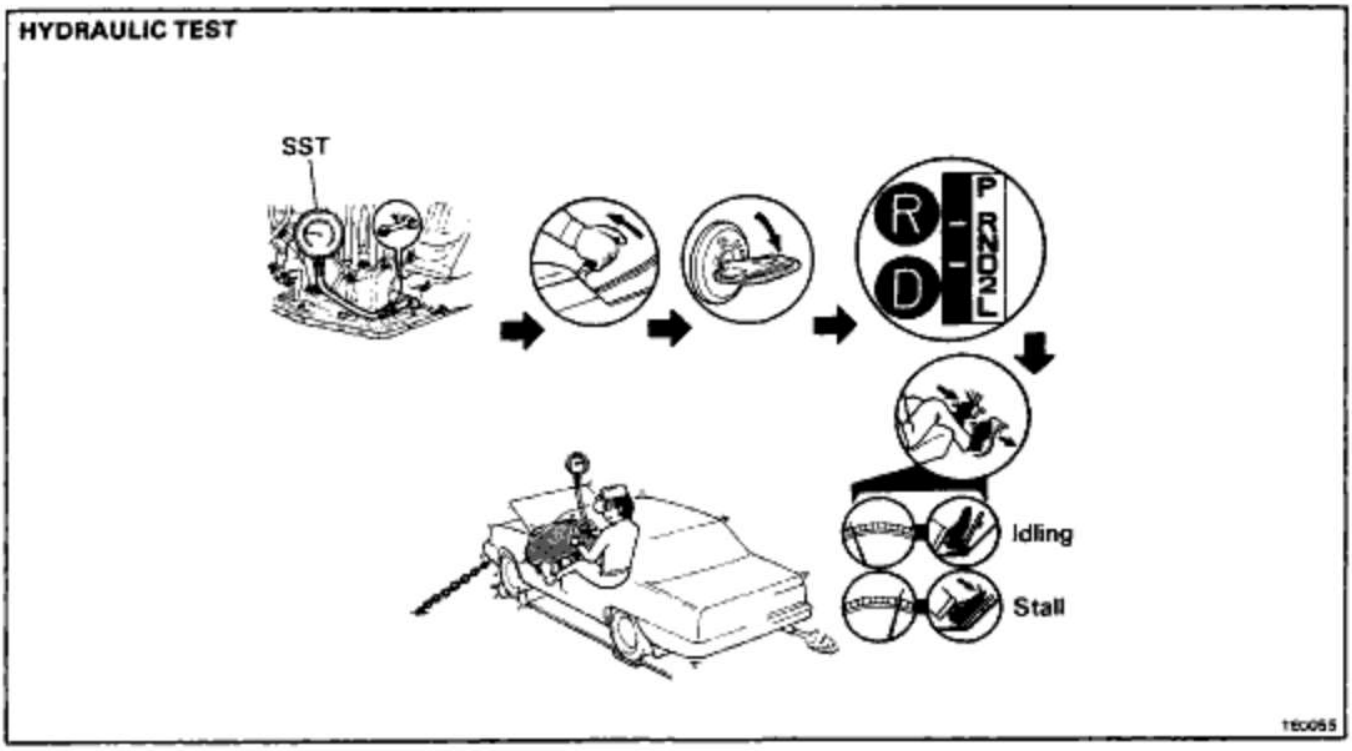
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(e) If pressure is low in the D range only:

- D range circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R range only:

- R range circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

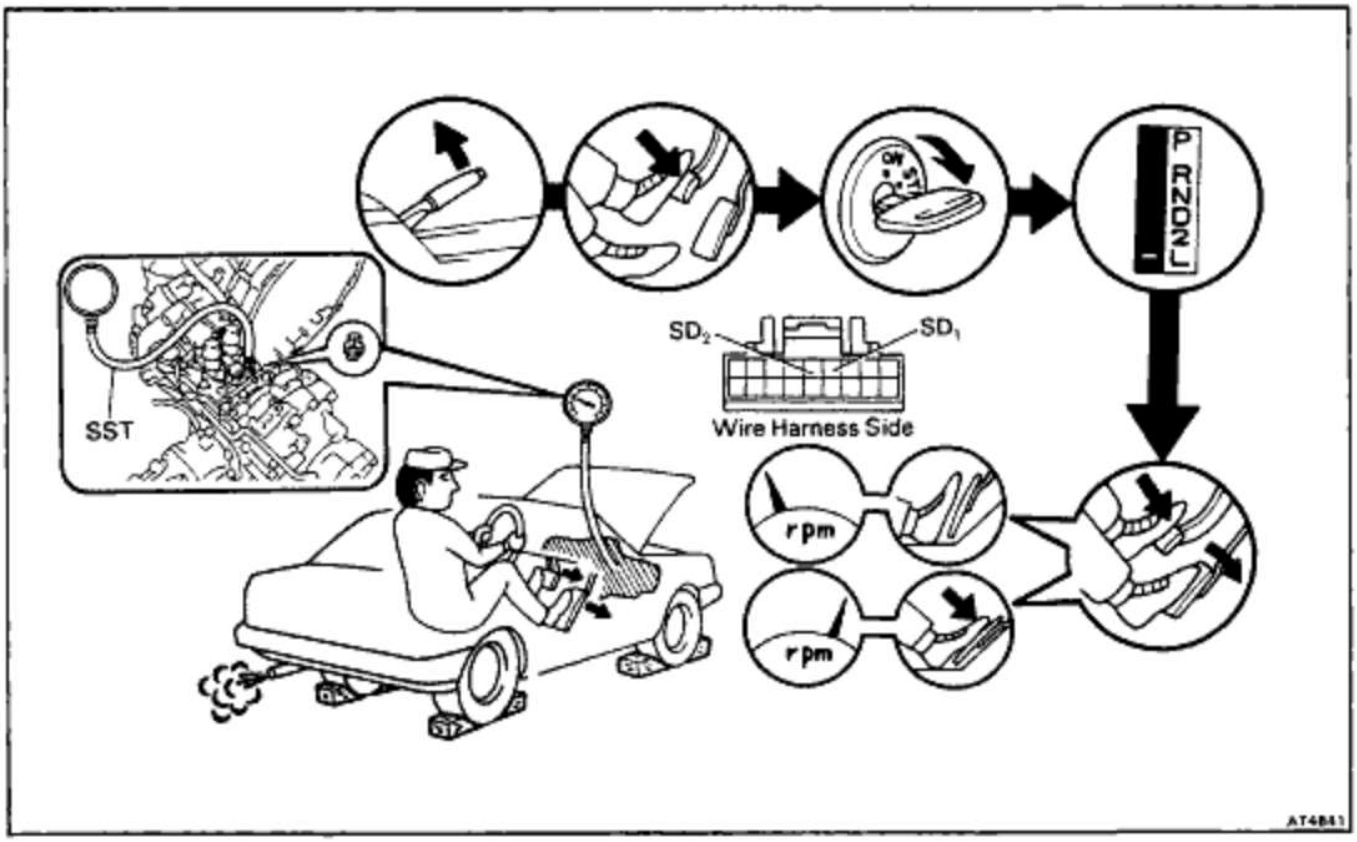


MEASURE CENTER DIFFERENTIAL CONTROL PRESSURE (A540H Only)

(a) Warm up the transaxle fluid (122 – 176˚F or 50 – 80˚C)
(b) Measure the line pressure. (See page AT–224)
(e) Remove the transfer case test plug and mount the oil pressure gauge (SST).
SST 09992–00094
(d) Check the parking brake to see that it is fully applied chock the four wheels.
(e) Disconnect the connector from ECT ECU.
(f) Start the engine.
(g) Apply battery voltage to terminal SD1, or SD2 of the wire harness side connector and turn the No. .1 and No. 2 center differential control solenoid valves to either ON or OFF.
(h) Shift into the L range, step down strongly on the brake pedal with your left foot and while manipulating the accelerator pedal with the right foot, measure the pressure at the engine speeds specified in the table.
kg/cm2 (psi, kPa)

Range		L range			
Condition of Solenoid Valves	No. 1 Solenoid Valve	ON	OFF	ON	OFF
	No. 2 Solenoid Valve	ON	ON	OFF	OFF
Engine RPM	Idling	3.6–4.2 (51–60, 353–412)	1.7–2.4 (24–34, 167–235)	0.7–1.4 (10–20, 69–137)	Under 0.1 (1 , 10)
	Stall	7.4–8.8 (107–125, 726–863)	4.3–5.2 (61–74, 422–510)	2.5–3.2 (36–46, 245–314)	Under 0.1 (1 , 10)

HINT: After inspecting the center differential control pressure, erase the diagnosis codes (No. 73 and 74) from the memory.



ROAD TEST (A540E and A540H)

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

1. D RANGE TEST IN NORM AND PWR PATTERN RANGES

Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

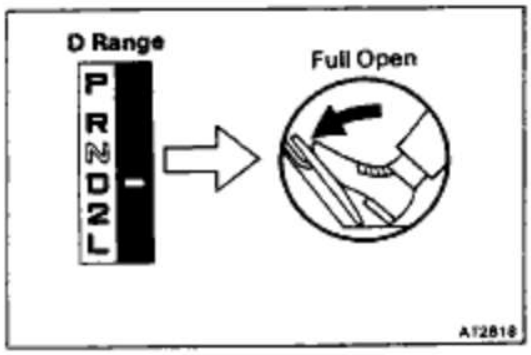
Check the following:

(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule. (See page AT–230)

Conduct a test under both Normal and Power. patterns.

HINT:

- There is no O/D up–shift and lock–up when the coolant temp. is below 140˚F (60˚C) (A540E) or 122˚I= (50˚C) (A540H).
- When the coolant temp. is below 140˚F (600C) or 122˚F (50˚C) (A540H), the shift point is lower than specified in the automatic shift schedule.



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 – O/D up–shift:

- 3–4 shift valve is stuck

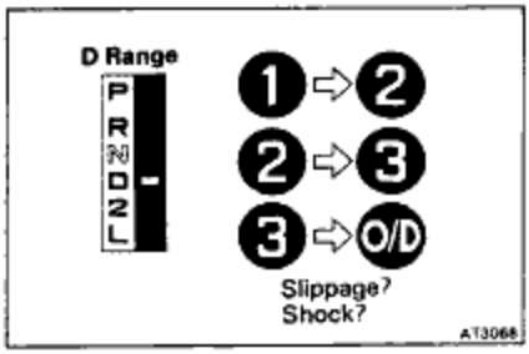
(4) If the shift point is defective:

- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:

- Lock–up solenoid is stuck .
- Lock–up relay valve is stuck

(b) In the same manner, check the shock and slip at the 1 –2, 2 – 3 and 3 – O/D up–shifts.



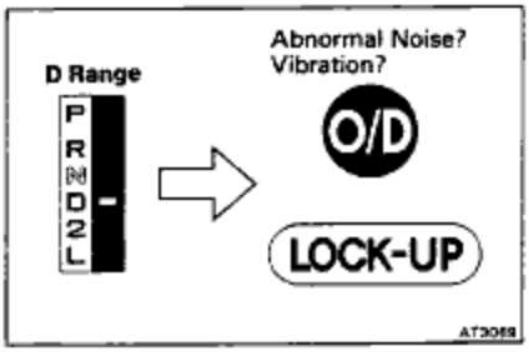
EVALUATION

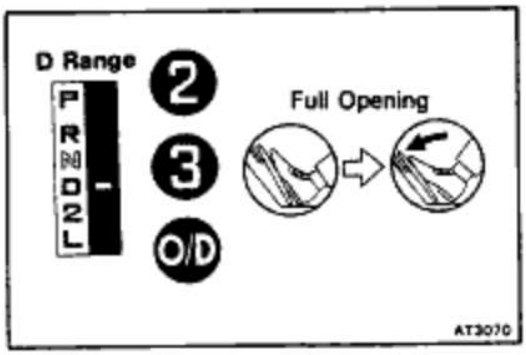
If the shock is excessive:

- Line pressure is too high
- Accumulator is defective
- Check ball is defective

(c) Run at the D range lock–up or 0/C) gear and check for abnormal noise and vibration.

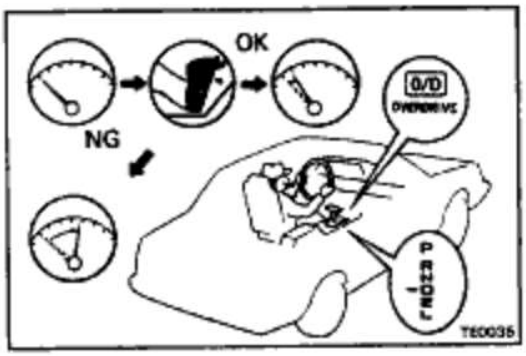
HINT: The check for the cause of abnormal noise and vibration must be make with extreme care as it could also be due to loss of balance in the drive shaft, tire, torque converter, etc.





(d) While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 – 1, 3 – 2 and O/D – 3 kickdowns conform to those indicated on the automatic shift schedule. (See page AT–230)

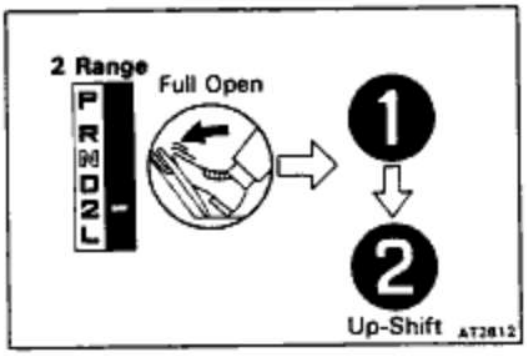
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.

(1) Drive in D range, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

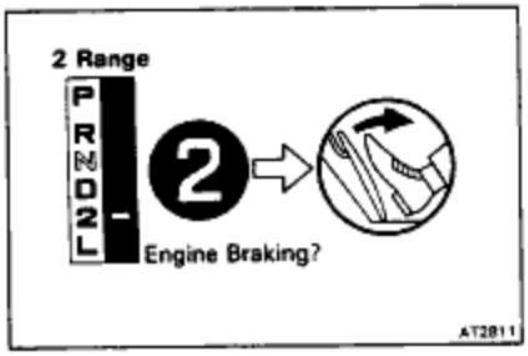
(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly. If there is a big jump in engine rpm, there is no lock–up.



2. 2 RANGE TEST

Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check or the following points.

(a) Check to see that the 1 – 2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule. (See page AT–230)

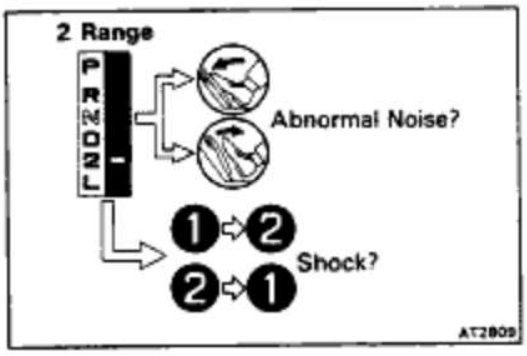


(b) While running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effect.

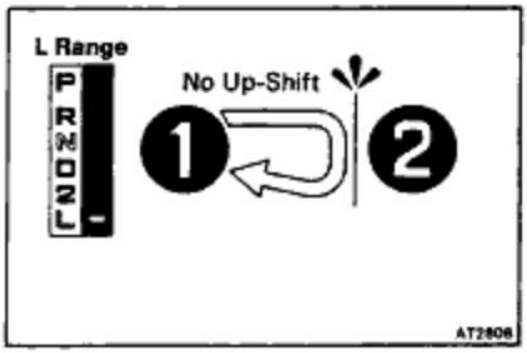
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective

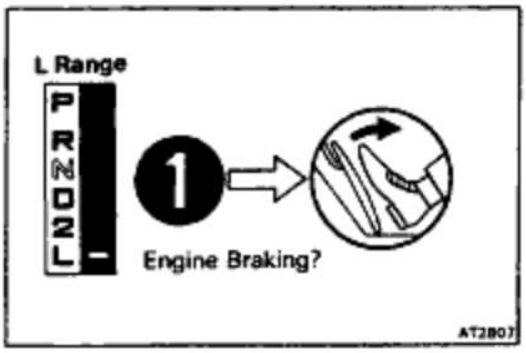


(c) Check for abnormal noise at acceleration an4 deceleration, and for shock at up–shift and down shift.



3. L RANGE. TEST

(a) While running in the L range, check to see that there is no up–shift to 2nd gear.

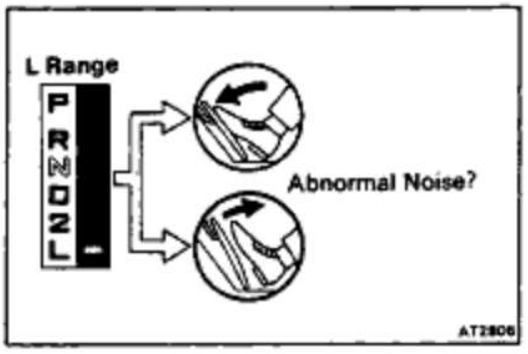


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

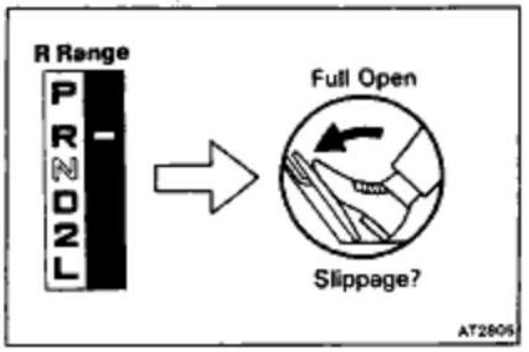
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

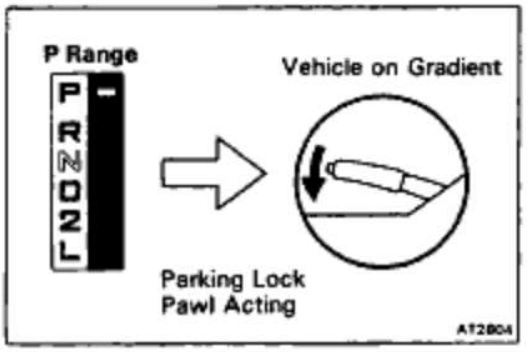


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

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



5. P RANGE TEST

Stop the vehicle on a gradient (more than 51 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.

Automatic Shift Schedule (A540E)

		Throttle valve fully open			[fully closed]		km/h (mph)		
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	55 – 60 (34 – 37)	100 – 109 (62 – 68)	154 – 164 (96 – 102)	[35 – 39 (22 – 24)]	[19 – 24 (12 – 15)]	148 – 157 (92 – 98)	88 – 97 (55 – 60)	48 – 53 (30 – 33)
	PWR	61 – 66 (38 – 41)	116 – 125 (72 – 78)	181 – 191 (112 – 119)	[35 – 39 (22 – 24)]	[19 – 24 (12 – 15)]	172 – 182 (107 – 113)	107 – 115 (66 – 71)	48 – 53 (30 – 33)
2 range	NORM PWR	61 – 66 (38 – 41)	–	–	–	–	–	–	48 – 53 (30 – 33)
L range	NORM PWR	–	–	–	–	–	–	–	51 – 56 (32 – 35)

		Throttle valve opening 5%			km/h (mph)		
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	77 – 82 (48 – 51)	64 – 69 (40 – 43)	–	68 – 73 (42 – 45)	61 – 66 (38 – 41)
	PWR	–	77 – 82 (48 – 51)	64 – 69 (40 – 43)	–	68 – 73 (42 – 45)	61 – 66 (38 – 41)

*: O/D switch OFF

(A540H)

		Throttle valve fully open			[fully closed]		km/h (mph)		
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	41 – 45 (25 – 28)	79 – 85 (49 – 53)	117 – 123 (73 – 76)	[25 – 29 (16 – 18)]	[15 – 19 (9 – 12)]	109 – 116 (68 – 72)	75 – 79 (47 – 49)	35 – 39 (22 – 24)
	PWR	48 – 52 (30 – 32)	90 – 97 (56 – 60)	126 – 133 (78 – 83)	[27 – 31 (17 – 19)]	[15 – 19 (9 – 12)]	112 – 118 (70 – 73)	85 – 91 (53 – 57)	41 – 44 (25 – 27)
2 range	NORM PWR	41 – 45 (25 – 28)	–	–	–	–	–	–	35 – 39 (22 – 24)
L range	NORM PWR	–	–	–	–	–	–	–	37 – 41 (23 – 25)

		Throttle valve opening 5%			km/h (mph)		
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	49 – 53 (30 – 33)	57 – 61 (35 – 38)	–	37 – 41 (23 – 25)	47 – 51 (29 – 32)
	PWR	–	59 – 63 (37 – 39)	66 – 70 (41 – 43)	–	47 – 51 (29 – 32)	57 – 61 (35 – 38)

*: O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.

(2) There is no lock–up in the 2 and L ranges.

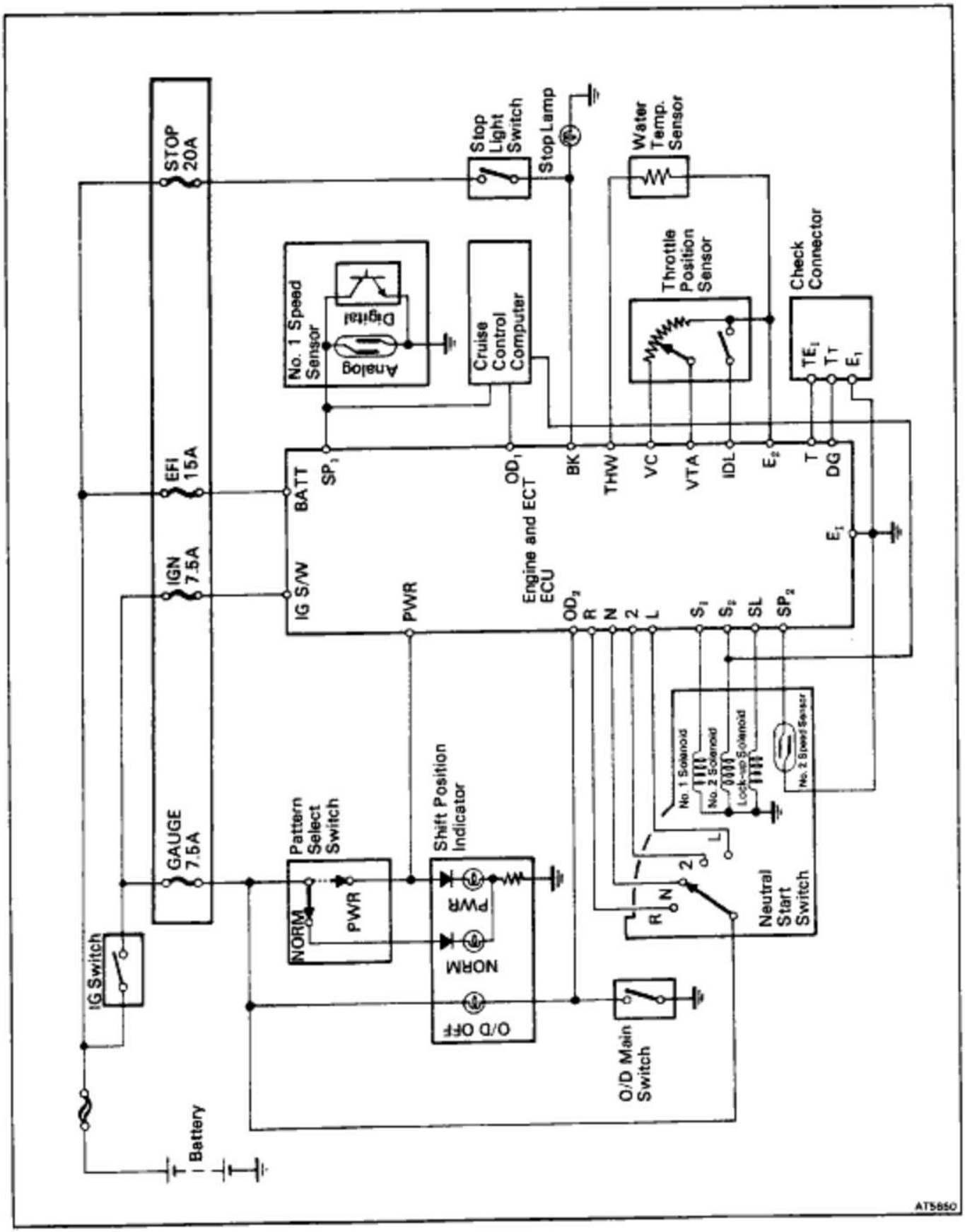
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.

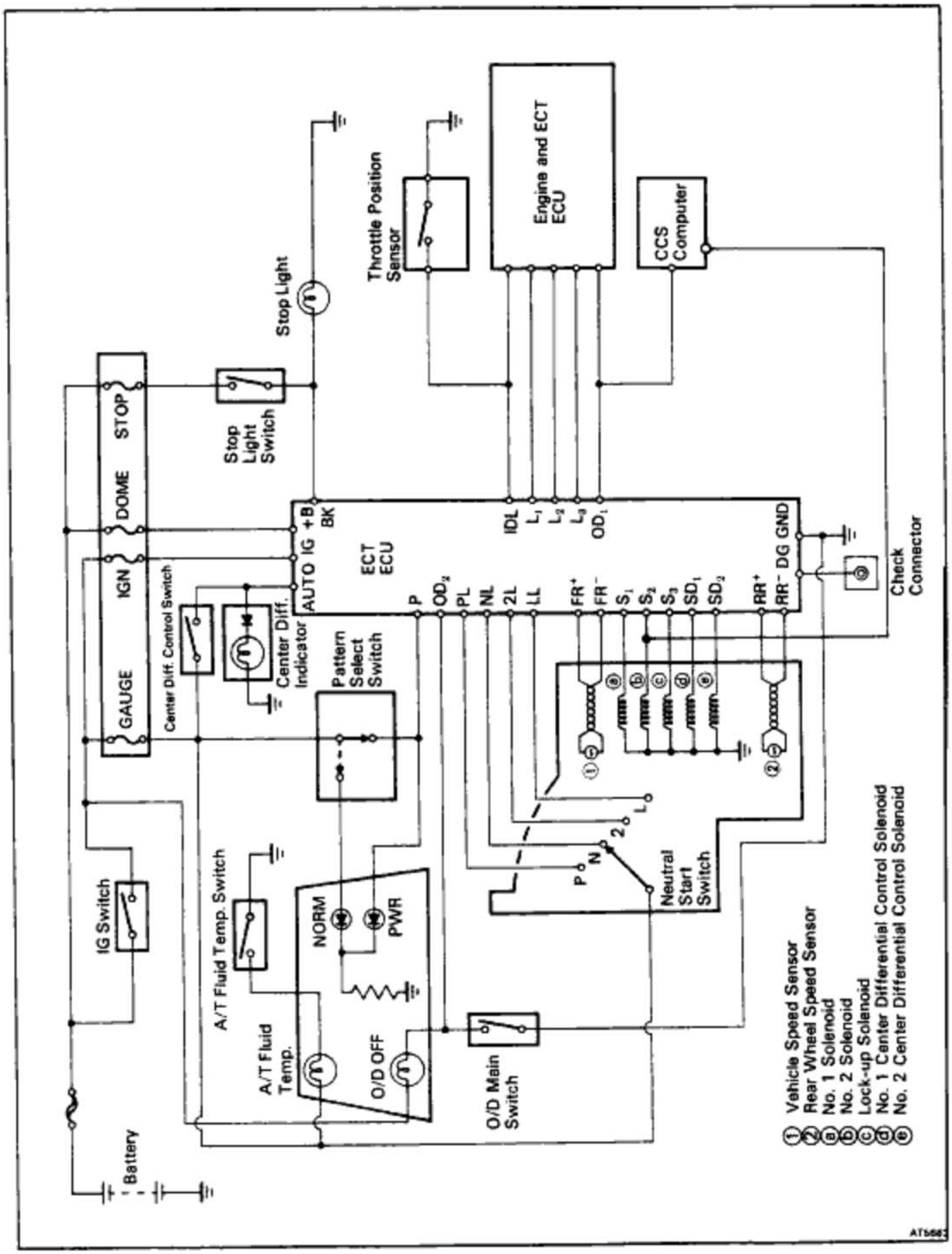
(4) When the coolant. temp. is below 140°F (60°C) (A540E) or 122°F (50°C) (A540H), the shift point is lower than specified vehicle speed.

Electronic Control System

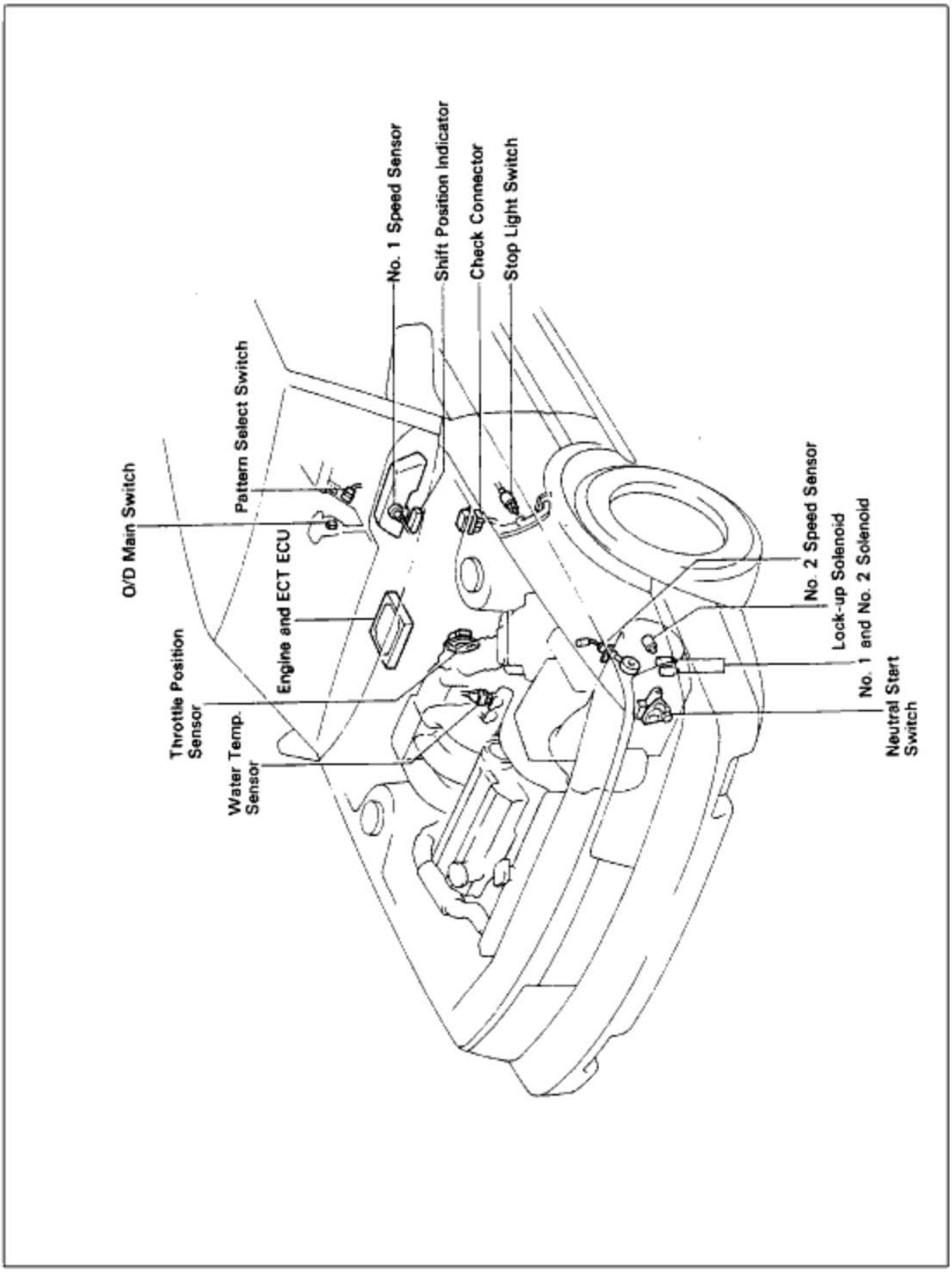
ELECTRONIC CONTROL CIRCUIT (A540E)



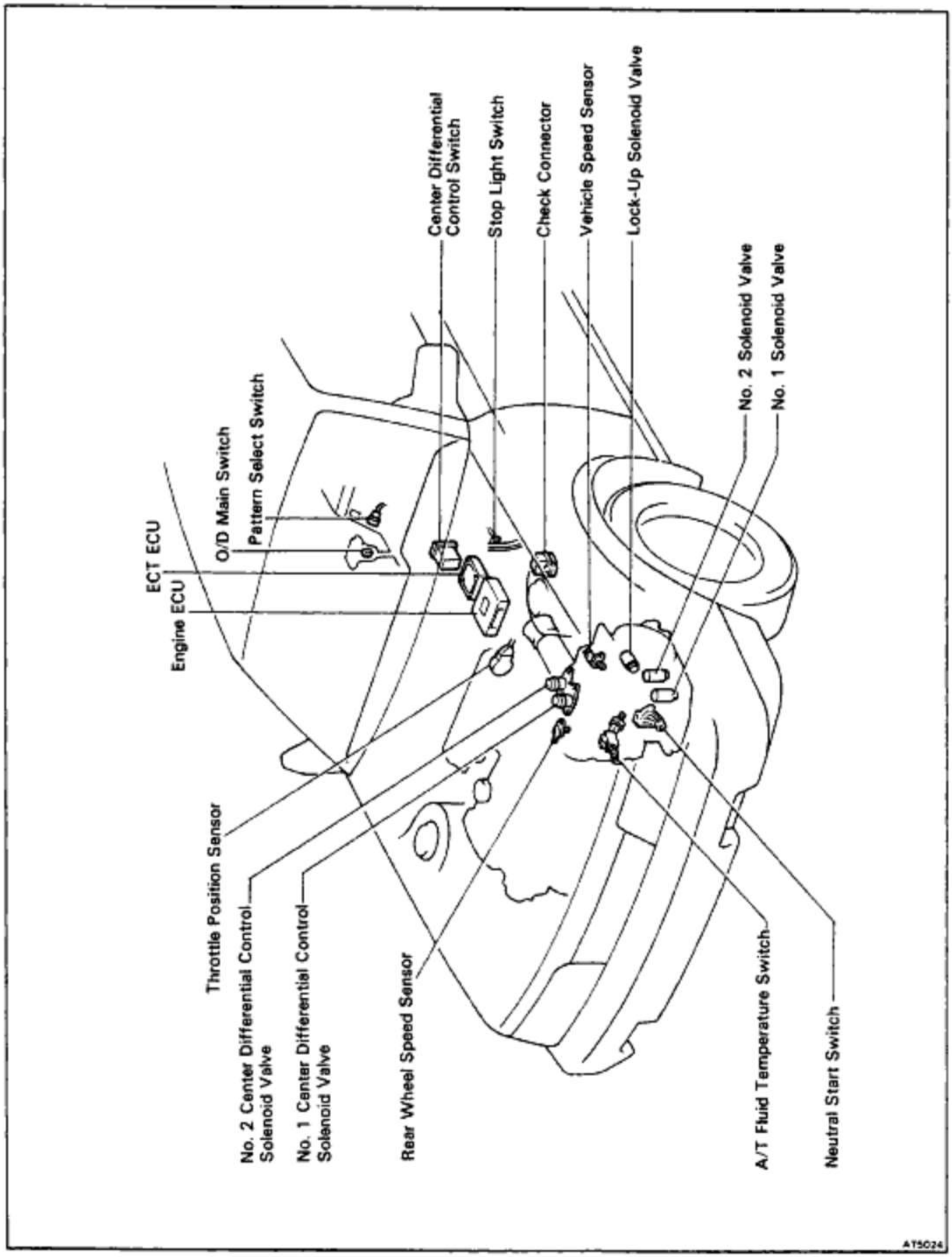
ELECTRONIC CONTROL CIRCUIT (A540H)



ELECTRONIC CONTROL COMPONENTS (A540E)

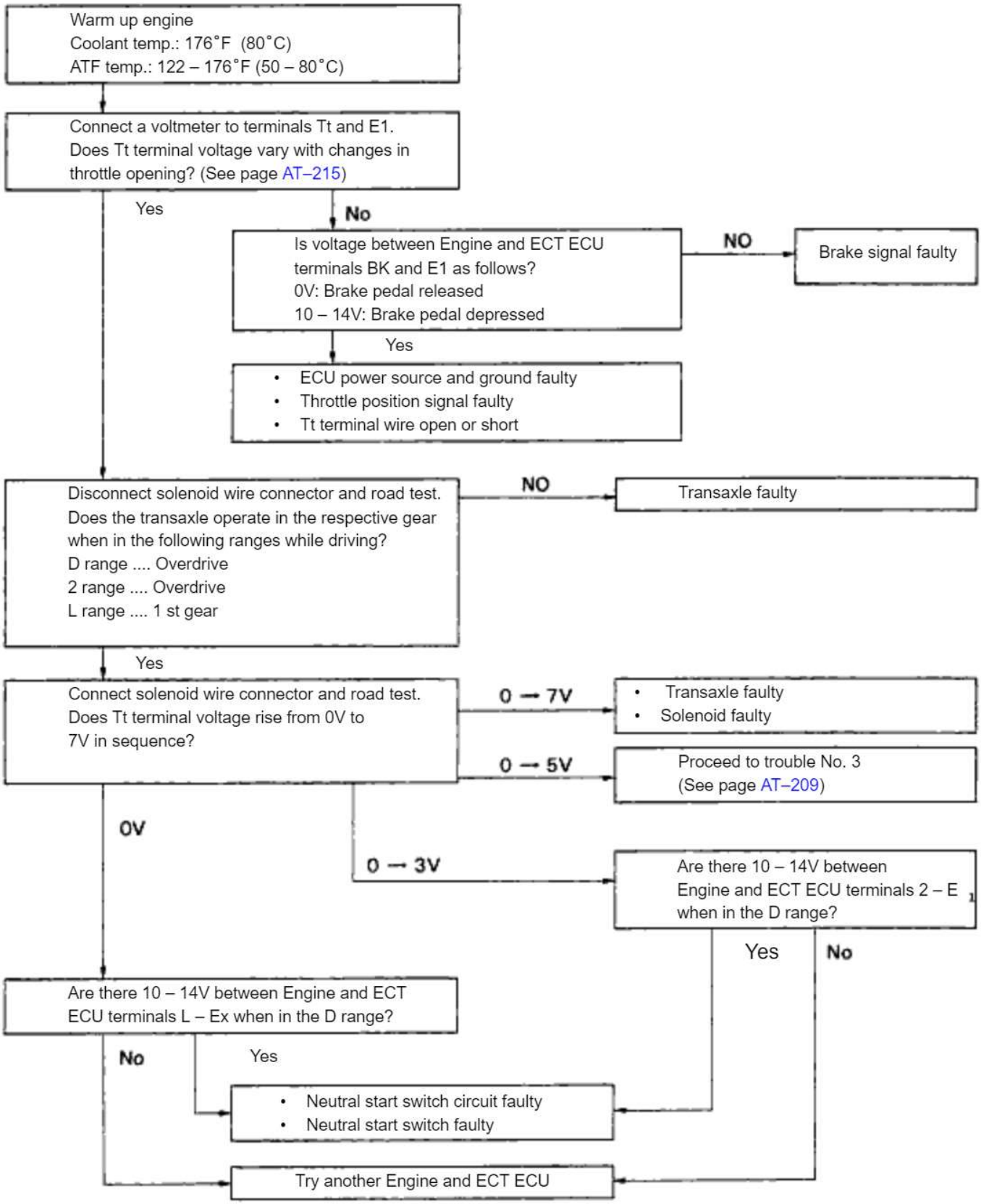


ELECTRONIC CONTROL COMPONENTS (A540H)

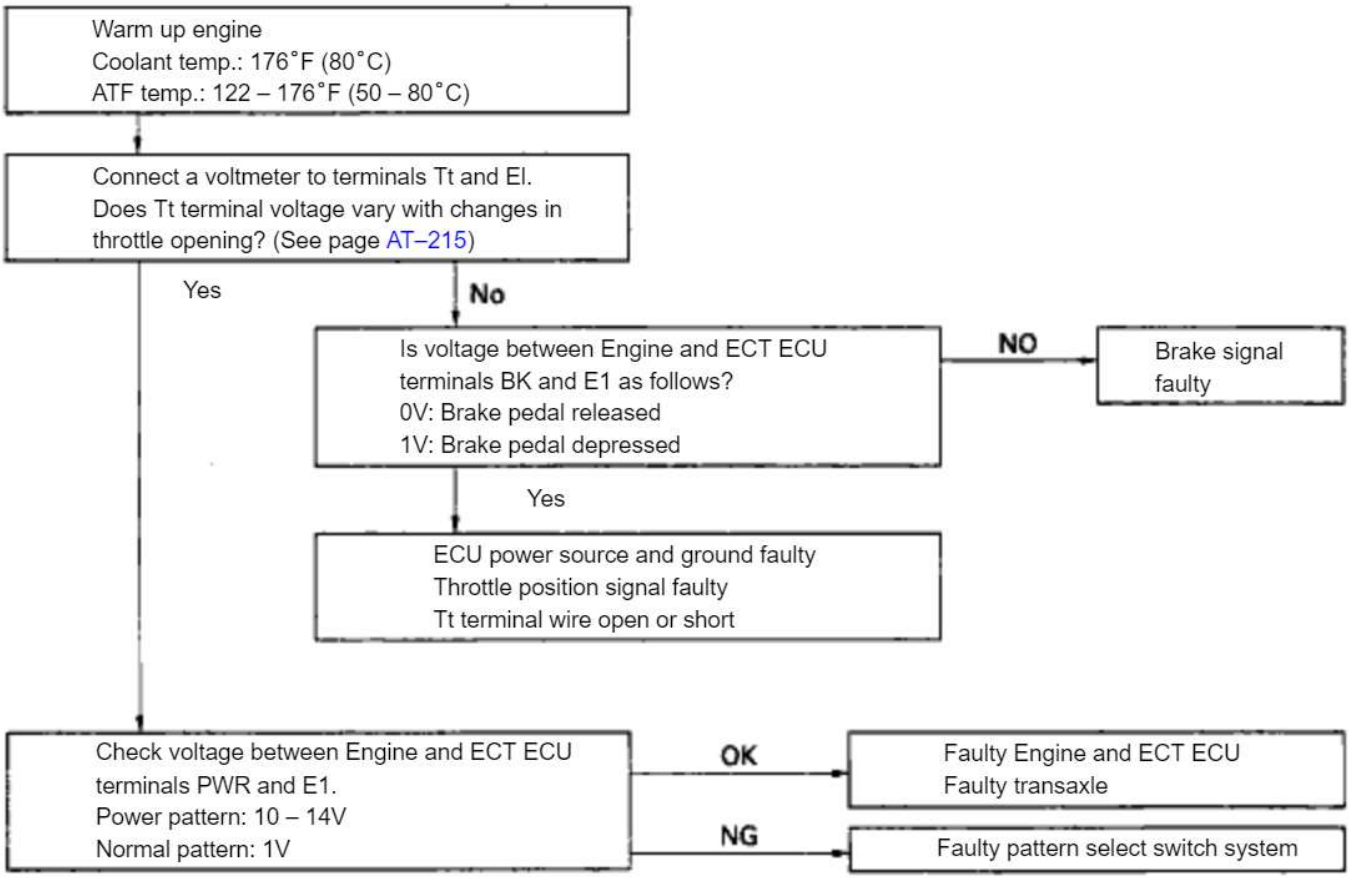


TROUBLESHOOTING FLOW–CHART (A540E)

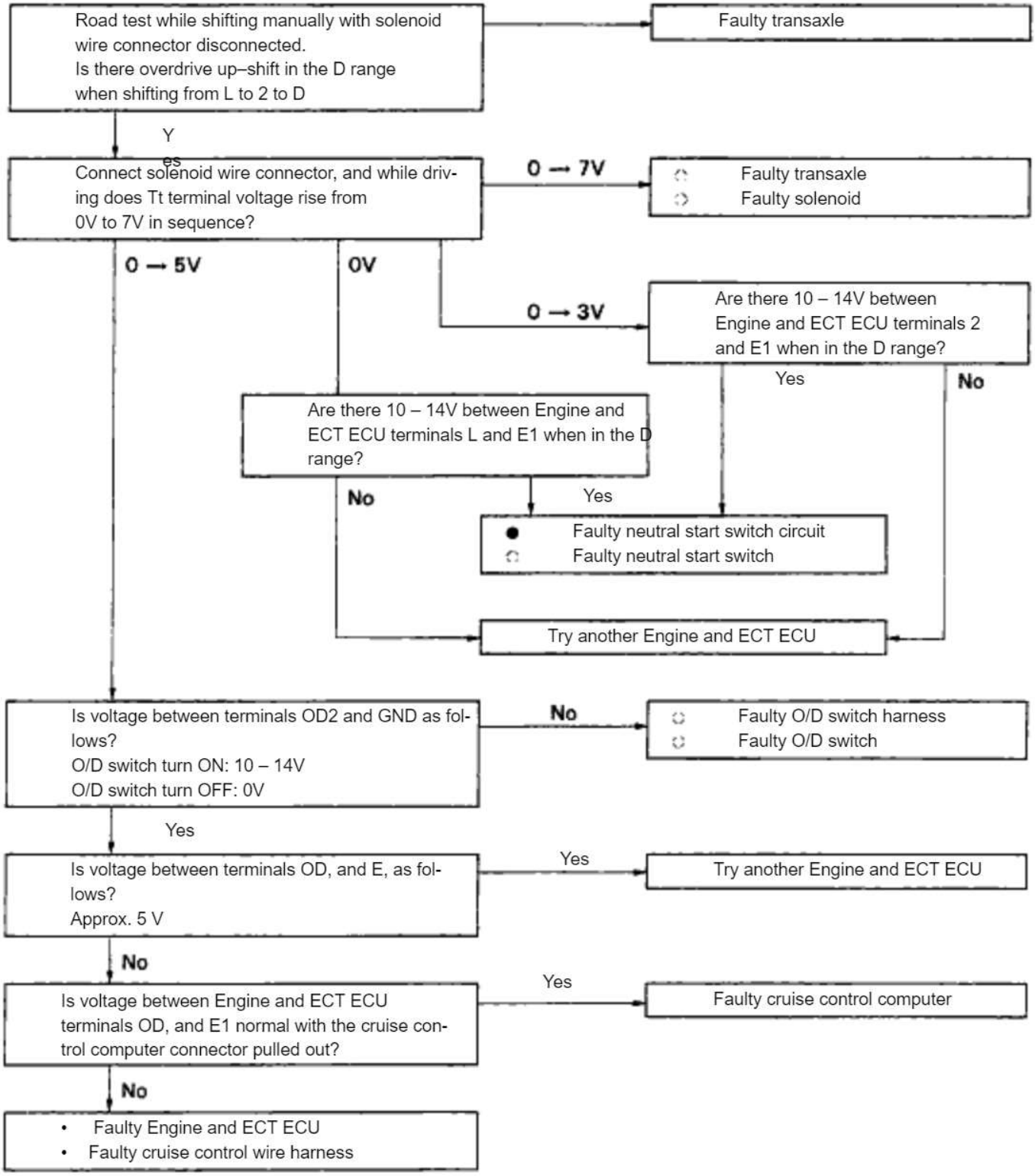
Trouble No. 1 No Shifting



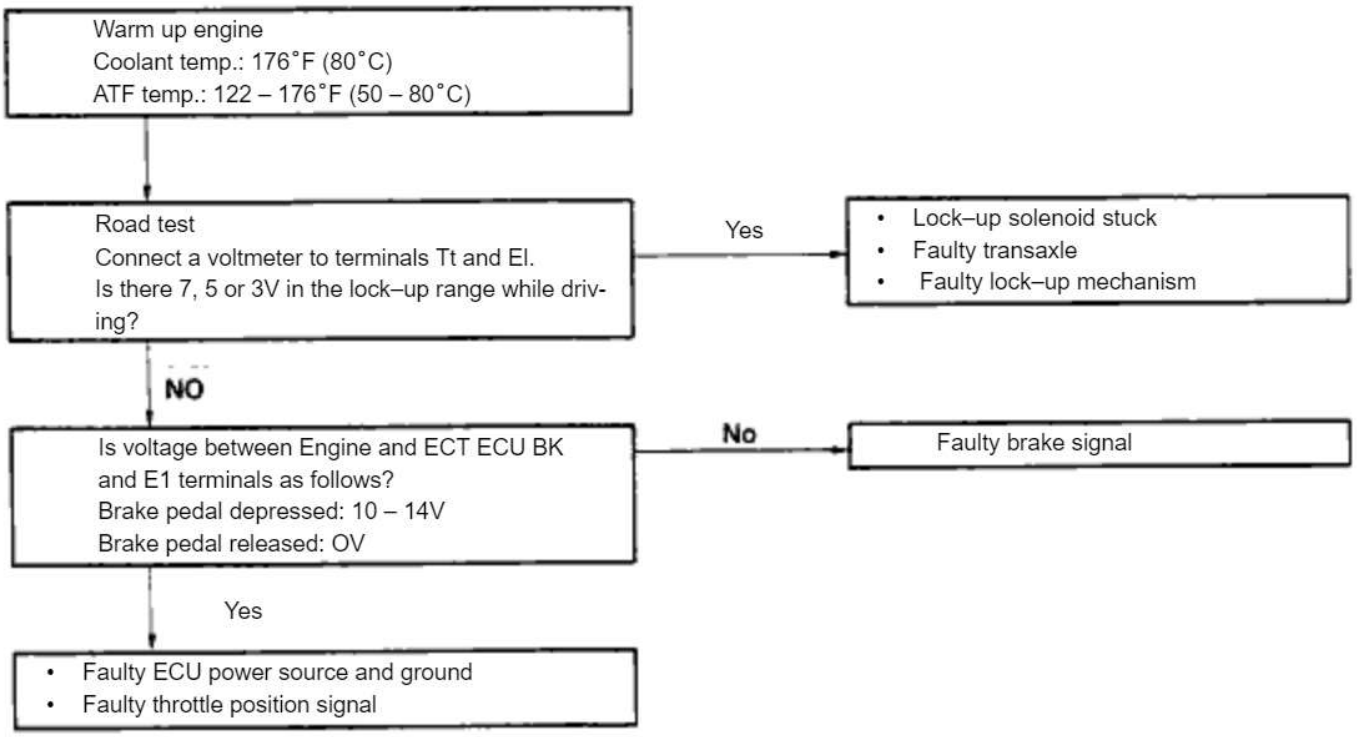
Trouble No. 2 Shift point too high or too Low



Trouble No. 3 No up–shift to overdrive (After warm–up)

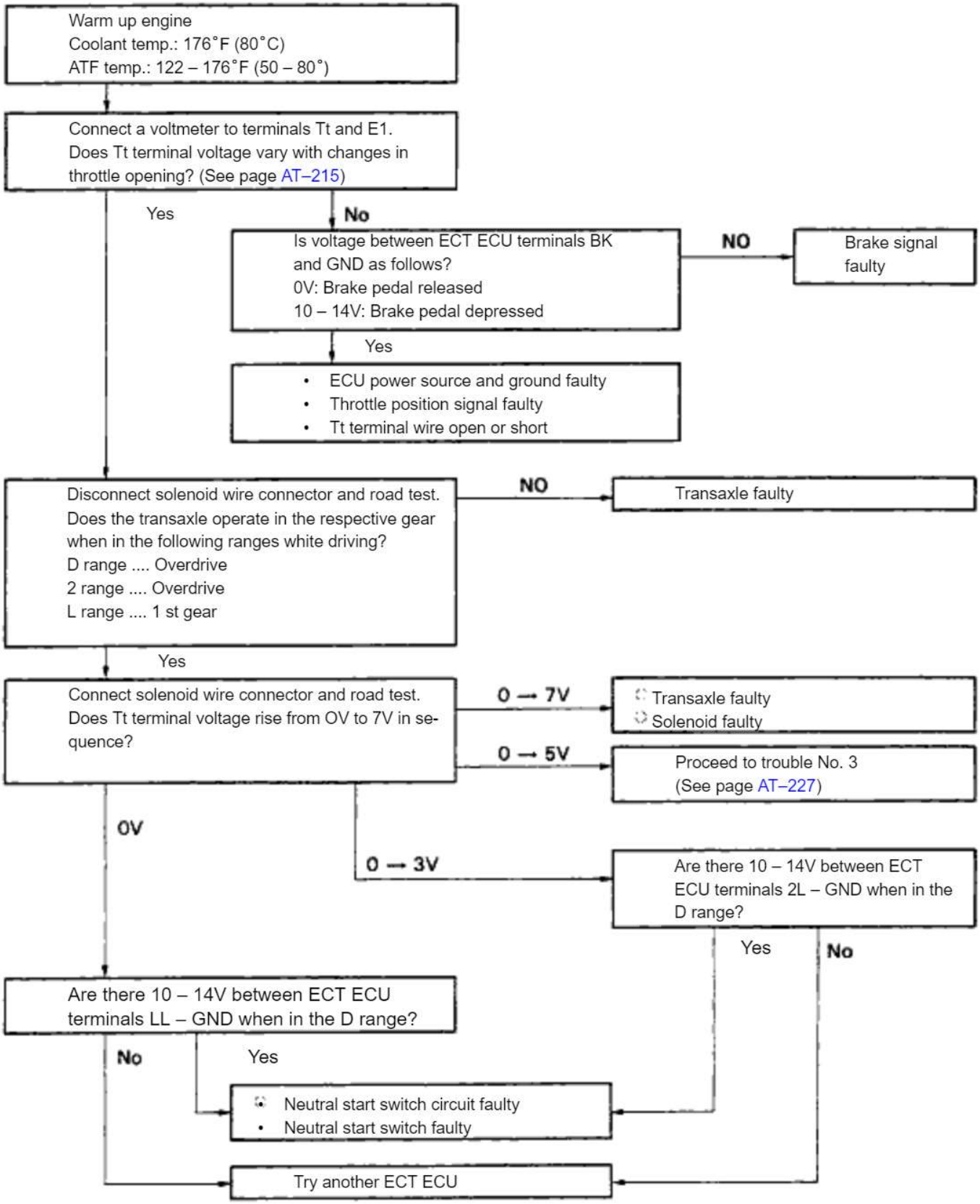


Trouble No. 4 **No lock–up (After warm–up)**

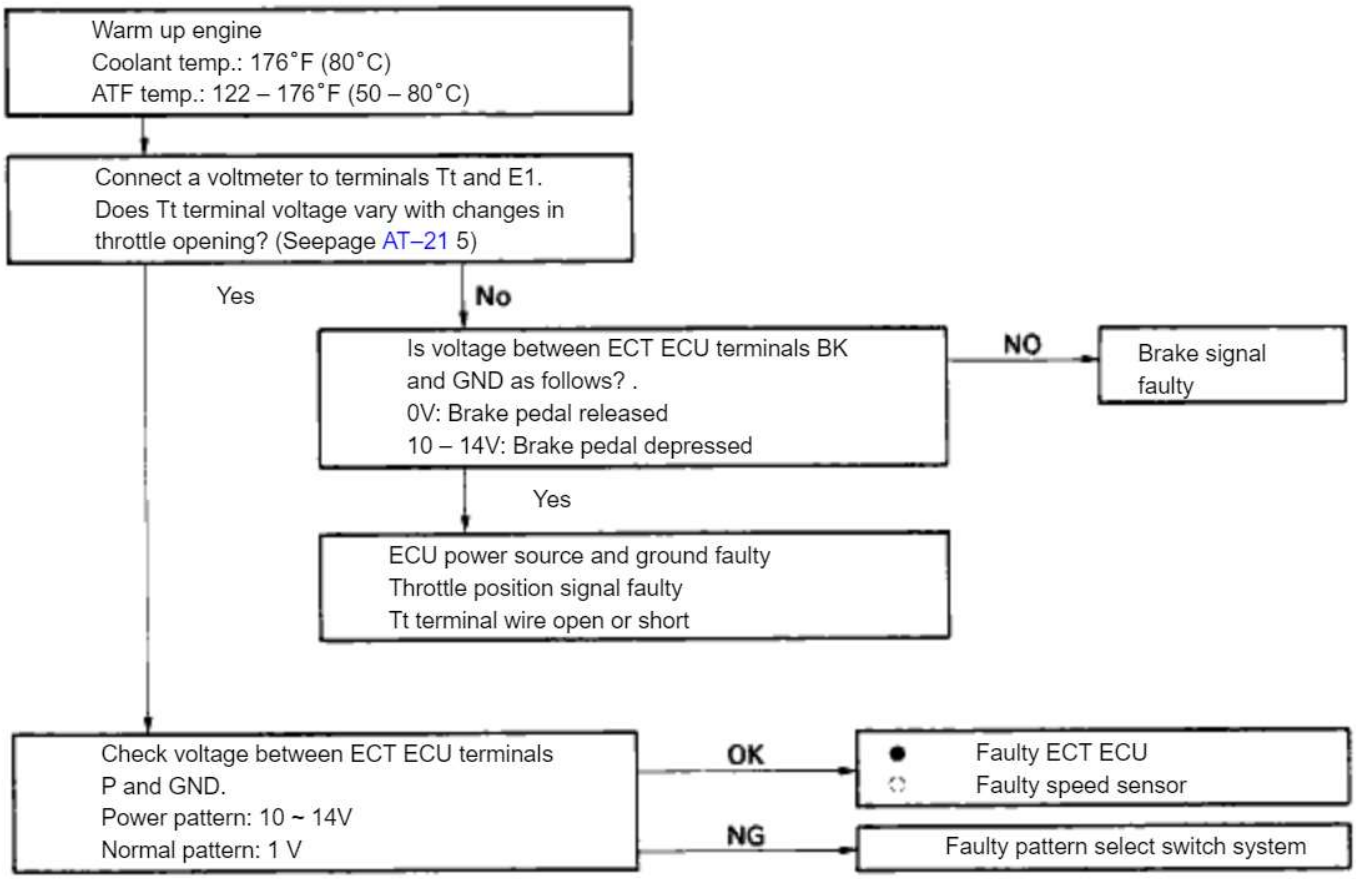


TROUBLESHOOTING FLOW–CHART (A540H)

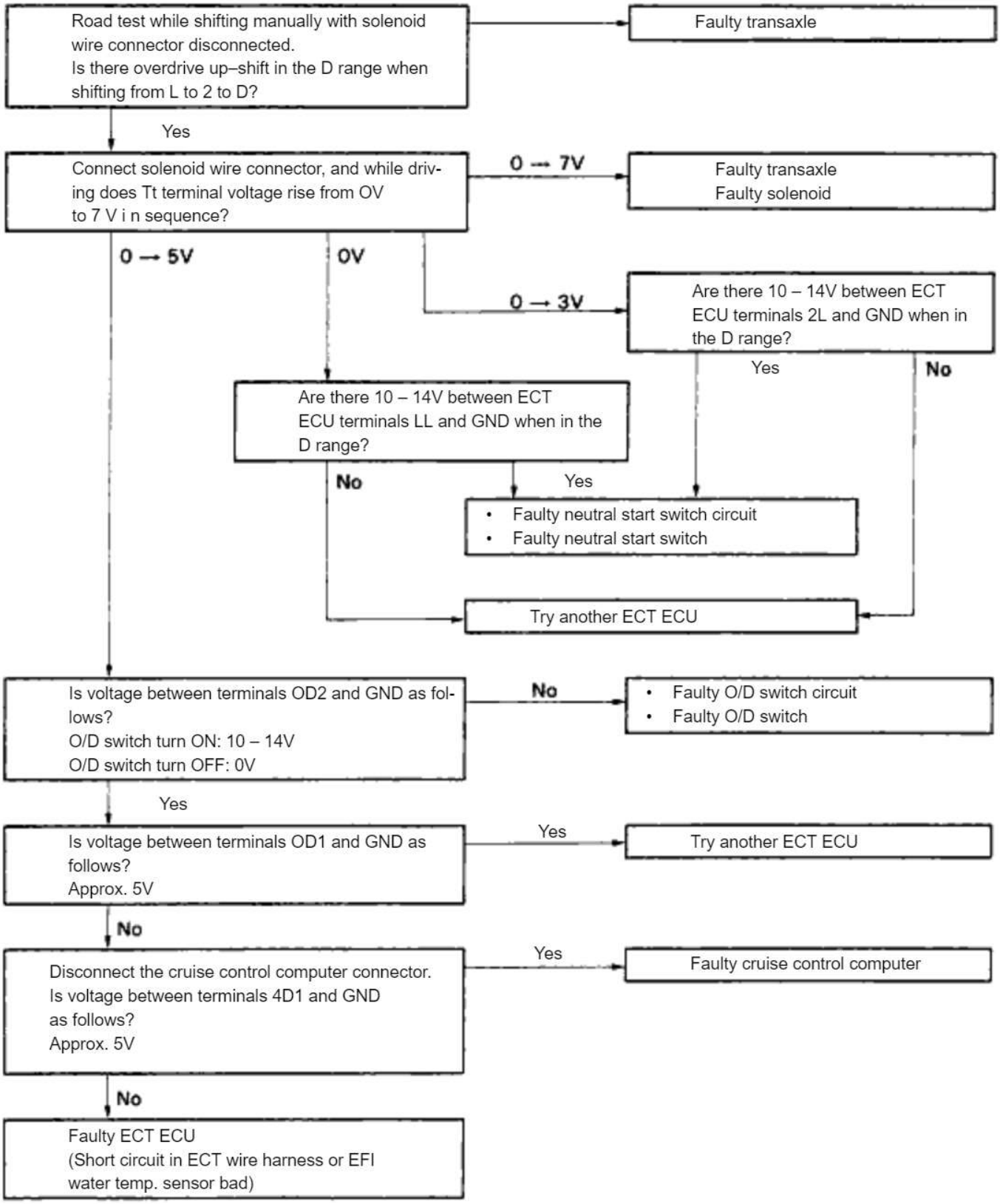
Trouble No. 1 No Shifting



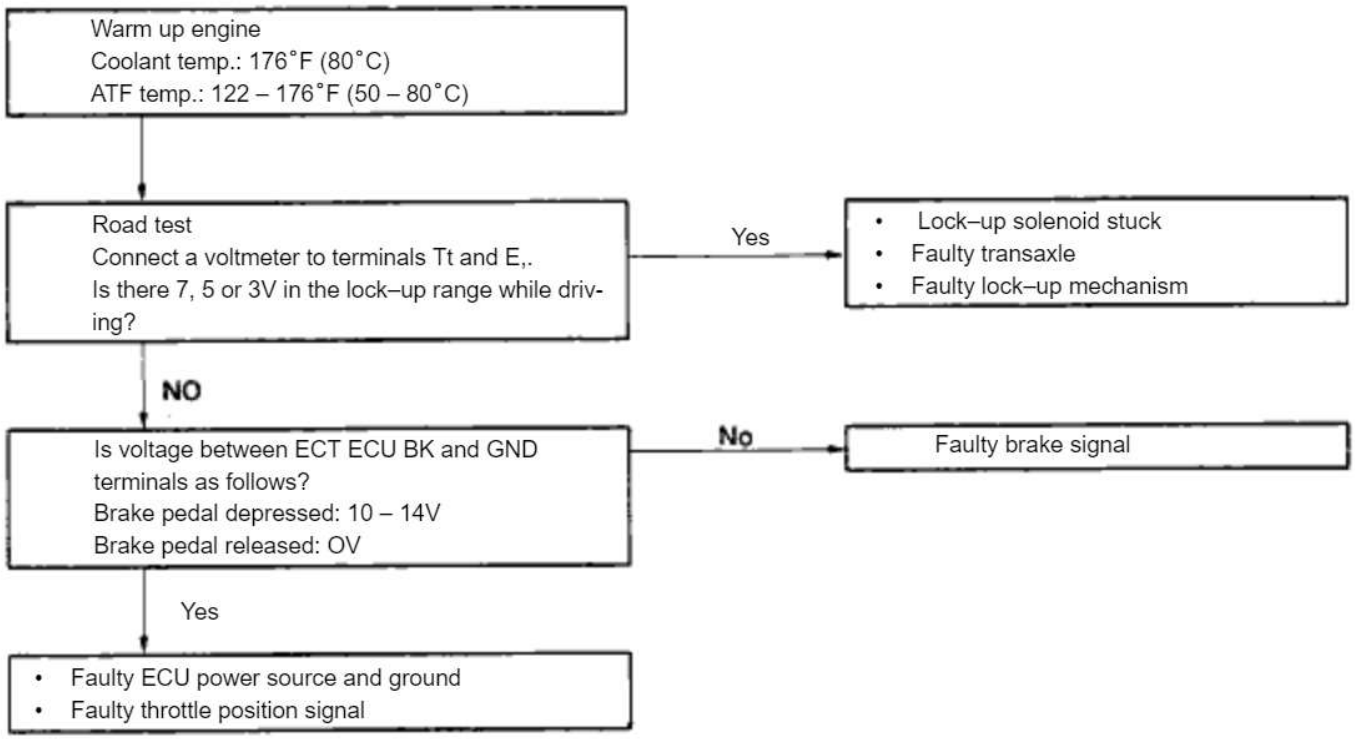
Trouble No. 2 Shift point too high or too low

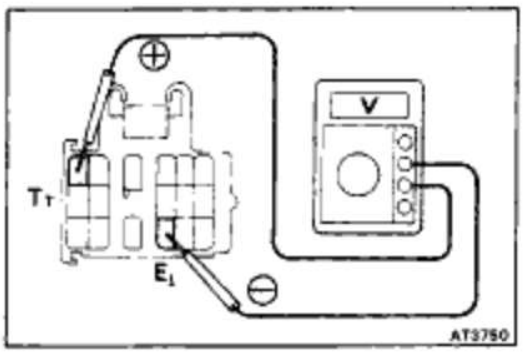


Trouble No. 3 No up–shift to overdrive (After warm–up)



Trouble No. 4 No lock–up (After warm–up)



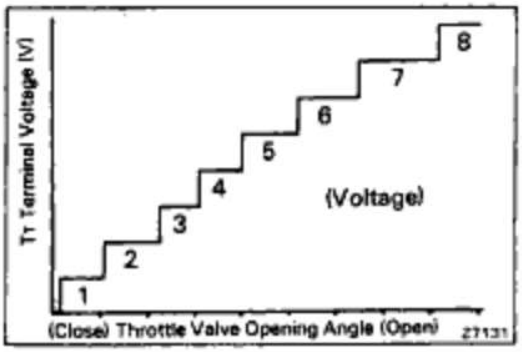


INSPECTION OF ECT OR Tt TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to terminals Tt and E1.



(c)while slowly depressing the accelerator pedal, check that Tt terminal voltage rises in sequence.

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

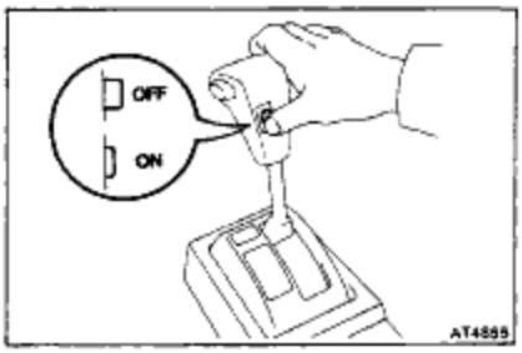
(a) Depress the accelerator pedal until the Tt terminal indicates 8V.

(b) Depress the brake pedal and check the voltage reading from the Tt terminal.

Brake pedal depressed 0V

Brake pedal released 8V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Coolant temperature: 176˚F (80˚)

(b) Turn the O/D switch to "ON".

(c) Place the pattern select switch in "Normal" and the shift lever into the D range.

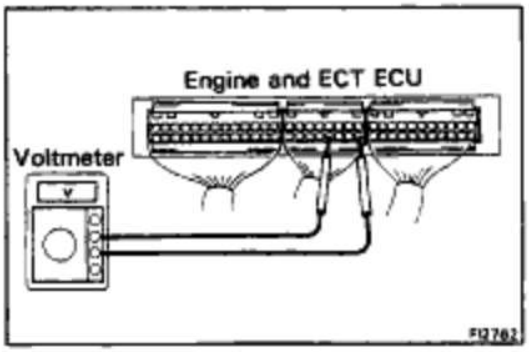
(d) During a road test (above 10 km/h or 6 mph) check that voltage at the Tt terminal is as indicated below for each up–shift position.

If the voltage rises from 0V to 7V in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears.

ECT terminal (V)	Gear position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

HINT: Determine the gear position by a fight shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2v – 4V – 6V – 7V.



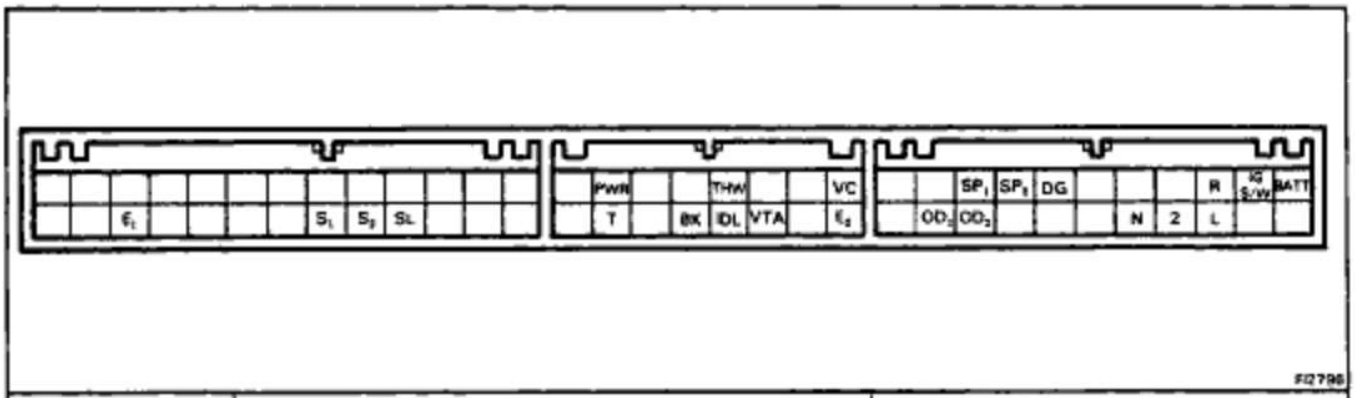
INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. (A540E)

INSPECT VOLTAGE OF TCCS ECU CONNECTOR

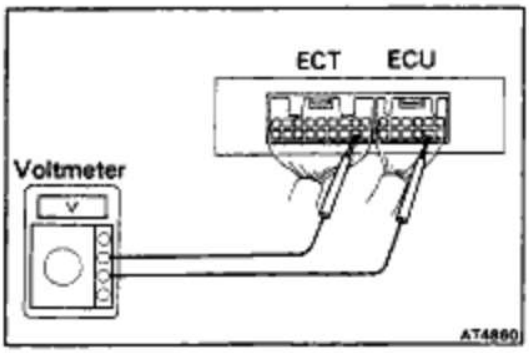
(a) Turn on the ignition switch.

(b) Measure the voltage at each terminal.



Terminal	Measuring condition		Voltage (V)
S_1 – E_1	D, 2 or L range		10 – 14
	P, R or N range		0
S_2, S_L – E_1	——		0
PWR – E_1	PWR pattern		10 – 14
	NORM pattern		0 – 2
BK – E_1	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
THW – E_2	Coolant temp. 176°F (84°C)		0.1 – 1.0
IDL – E_2	Throttle valve fully closed		0
	Throttle valve open		4 – 6
VTA – E_2	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
VC – E_2	——		4 – 6
OD_1 – E_1	——		5
OD_2 – E_1	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
SP_1 – E_1	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
SP_2 – E_1	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage IV1
R – E_1	R range	10 – 14
	Except R range	0 – 2
N – E_1	N range	10 – 14
	Except N range	0 – 2
2 – E_1	2 range	10 – 14
	Except 2 range	0 – 2
L – E_1	L range	10 – 14
	Except L range	0 – 2
IG S/W – E_1	———	10 – 14
BATT – E_1	———	10 – 14

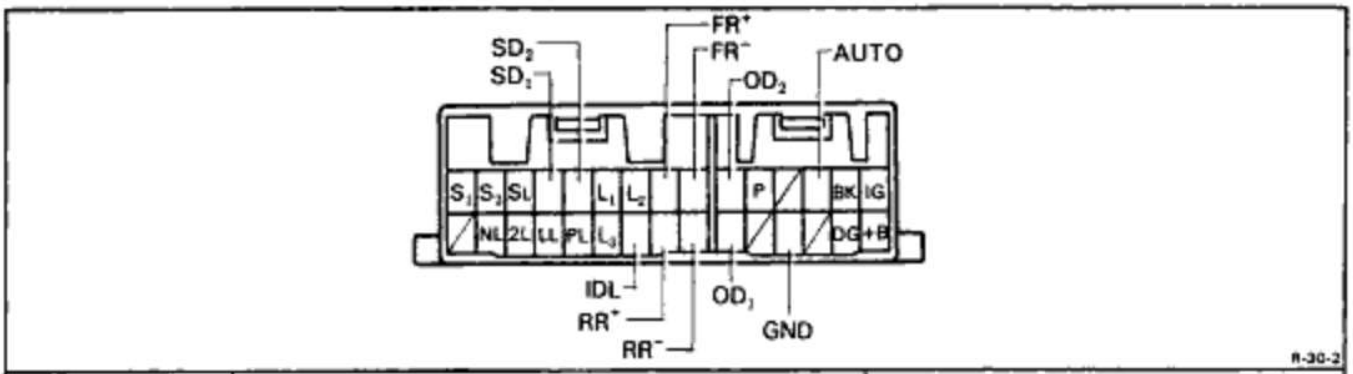


2. (A540H)

INSPECT VOLTAGE OF ECT ECU CONNECTOR

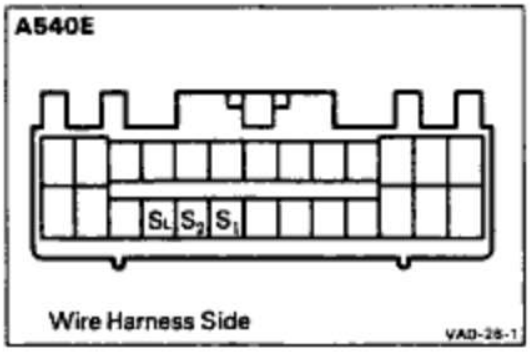
(a) Turn on the ignition switch.

(b) Measure the voltage at each terminal.



Terminal	Measuring condition	Voltage (V)
IG – GND	———	10 – 14
+B – GND	———	10 – 14
IDL – GND	Throttle valve fully closed	0
	Throttle valve open	10 – 14
L_3 – GND	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5
L_2 – GND	Throttle valve fully closed to fully open	5 to 0 to 5

Terminal	Measuring condition	Voltage (V)
L_1 – GND	Throttle valve fully closed to fully open	5 to 0
OD_2 – GND	O/D main switch turned ON	10 – 14
	O/D main switch turned OFF	0
OD_1 – GND	Coolant temp. below 122°F950°0	0
	Coolant temp. above 122°F (50°C0	5
AUTO – GND	Center differential control switch AUTO position	10 – 14
	Center differential control switch turned OFF	0
PL – GND	P range	10 – 14
	Except P range	0
LL – GND	L range	10 – 14
	Except L range	0
2L – GND	2 range	10 – 14
	Except 2 range	0
NL – GND	N range	10 – 14
	Except N range	0
P – GND	PWR pattern	10 – 14
	NORM pattern	0
BK – GND	Brake pedal is depressed	10 – 14
	Brake pedal is released	0
SD_2,S_L,S_2 – GND	———	0
S_1 – GND	———	10 – 14
FR^-,FR^+ RR^-,RR^+ – GND	———	0.5 – 1
SD_1 – GND	Center differential control switch AUTO position	10 – 14
	Center differential control switch turned OFF	0



3. (A540E)

INSPECT SOLENOID VALVES

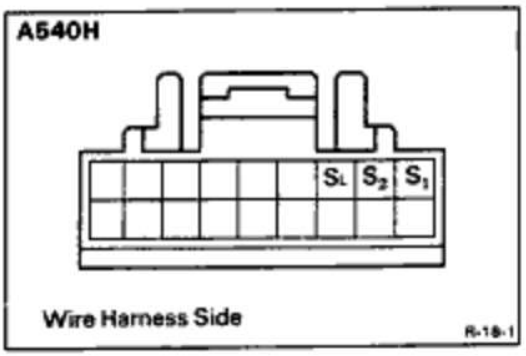
(a) Disconnect the connector from Engine and ECT ECU

(b) Measure the resistance between S1, S2, SL and body ground.

Resistance: 11 – 15Ω

(e) Apply battery voltage to each terminal.

Check that an operation noise can be heard from the solenoid.



4. (A540H)

INSPECT SOLENOID VALVES

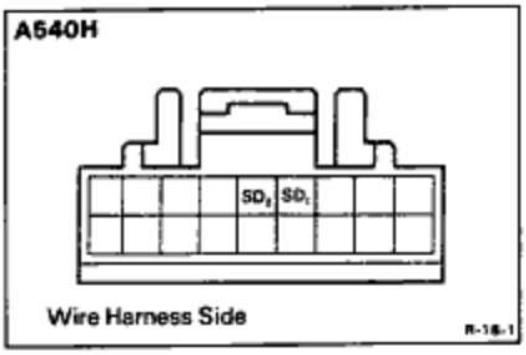
(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between S1, S2, SL and body ground.

Resistance: 11 – 15Ω

(c) Apply battery voltage to each terminal.

Check that an operation noise can be heard from the solenoid.



5. (A540H)

INSPECT CENTER DIFFERENTIAL CONTROL SOLENOID VALVES

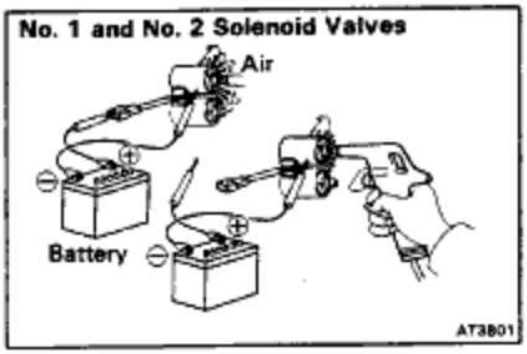
(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between SD1, SD2 and body ground.

Resistance: 11 – 15Ω

(c) Apply battery voltage to each terminal.

Check that an operation noise can be heard from– the solenoid.



6. CHECK SOLENOID SEALS

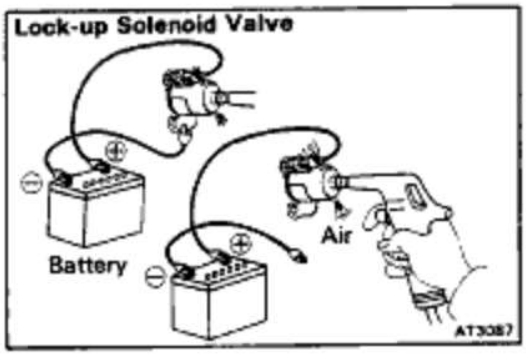
If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

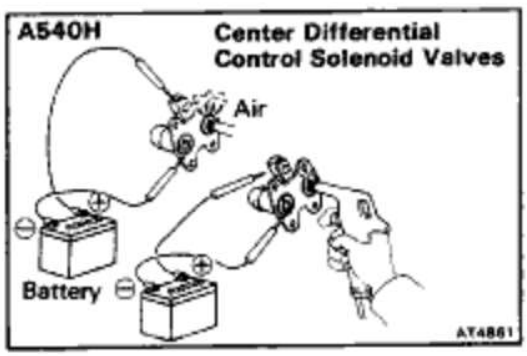
(a) Check No. 1 and No. 2 solenoid valves. (A540E, A540H)

- Applying 5 kg/cm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valves open do not leak the air.
- When supply battery voltage to the solenoids, check that the solenoid valves open.

(b) Check the lock–up solenoid valve. (A540E, A540H)

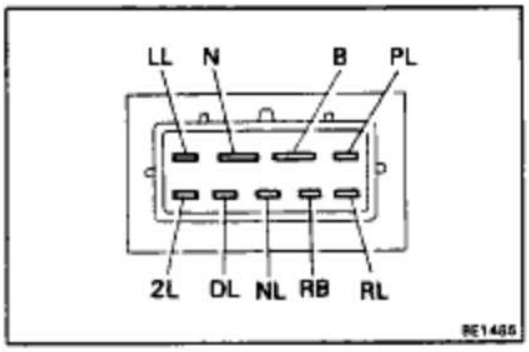
- Applying 5 kglcm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valve opens.
- When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.





(c) Check No. 1 and No. 2 center differential control solenoid valves. (A540H)

- Applying 5 kg/cm2 (71 psi, 490 kPa) of compressed air, check that the solenoid valves open do not leak the air.
- When supply battery voltage to the solenoids, check that the solenoid valves open.



7. (A540E, A540H)

INSPECT NEUTRAL START SWITCH

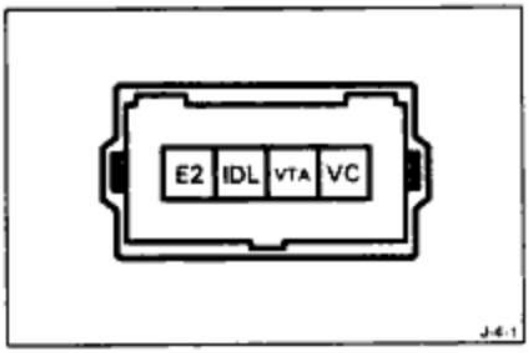
Using an ohmmeter, check the continuity of the terminals for each switch position shown in the table below. (A540H)

Range \ Terminal	B	N	RB	PL	RL	NL	DL	2L	LL
P	○—○		○—○						
R			○—	—○					
N	○—○		○—	—	—	—○			
D			○—	—	—	—	—○		
2			○—	—	—	—	—	—○	
L			○—	—	—	—	—	—	—○

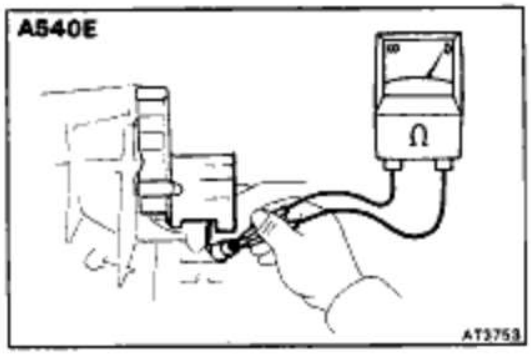
8. (A540E, A540H)

INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.



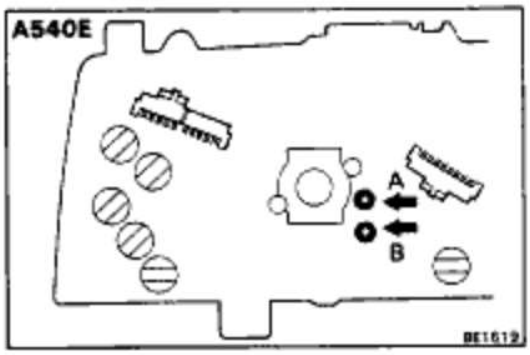
Terminal	Throttle valve condition	Resistance (kΩ)
IDL – E_2	Fully closed	0 – 0.1
	Open	Infinity
V_C – E_2	–	3 – 7
V_{TA} – E_2	Fully closed	0.2 – 0.8
	Fully open	3.3 – 10



(A540E)

INSPECT NO. 2 SPEED SENSOR

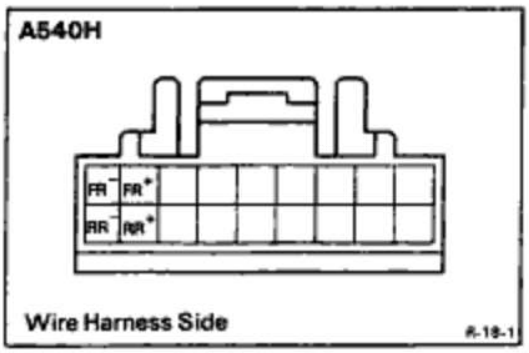
(a) Jack up a front wheel on one side.
(b) Connect an ohmmeter between the terminals.
(c) Spin the wheel and check that the meter needle deflects from 4 to ∞ Ω



10. (A540E)

INSPECT NO. 1 SPEED SENSOR IN COMBINATION METER

(a) Remove the combination meter.
(b) Connect an ohmmeter between terminals A and B.
(c) Revolve the meter shaft and check that the mete needle repeatedly deflects from 0 Ω to ∞ Ω



11. (A540H) . . . .

INSPECT VEHICLE SPEED SENSOR AND REAR WHEEL SPEED SENSOR

(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between FR– and FR* (vehicle speed sensor, and between RR– and RR* (rear wheel speed sensor). .

Resistance: 620 × 60Ω



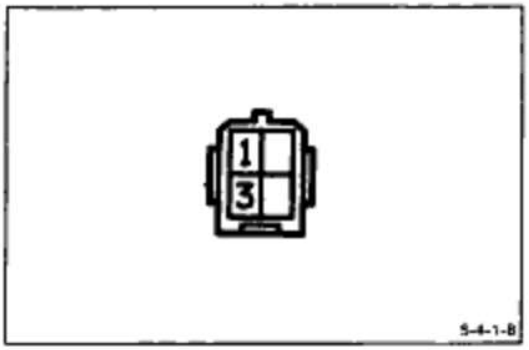
12. (A540E, A540H)

INSPECT PATTERN SELECTION SWITCH

Inspect that there is continuity between 5 and each terminal.

HINT: As there are diodes inside, be careful of the tester probe polarity.

Pattern \ Terminal	6	5	4
NORM	○——	——○	
PWR	○——		——○

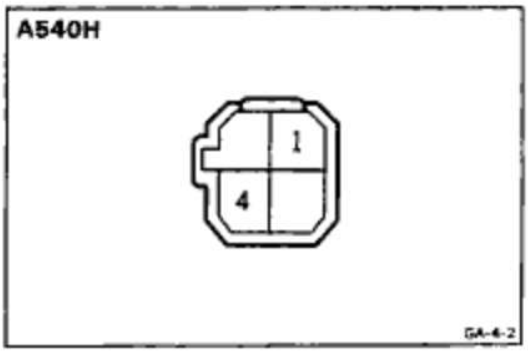


13. (A540E, A540H)

INSPECT O/D MAIN SWITCH

Inspect that there is continuity between terminals 1 and 3.

S/W position \ Terminal	1	3
ON		
OFF	○——	——○



14. (A540H)

INSPECT CENTER DIFFERENTIAL CONTROL SWITCH

(a) Disconnect the connector from center differential control switch.

(b) Inspect that there is continuity between terminals 1 and 4.

S/W position . \ Terminal	1	4
AUTO	○——	——○
OFF		

ON–VEHICLE REPAIR

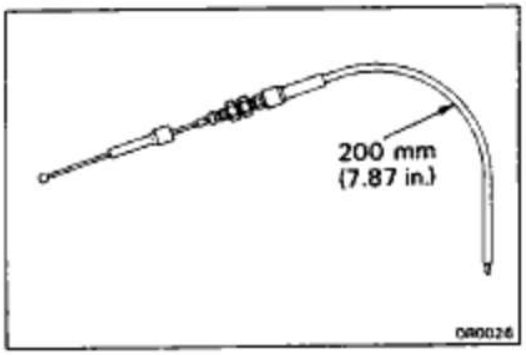
HINT: The components mentioned below can be replaced on the vehicle without any necessity for removal of the transaxle. For the respective operating procedures refer to the following pages:

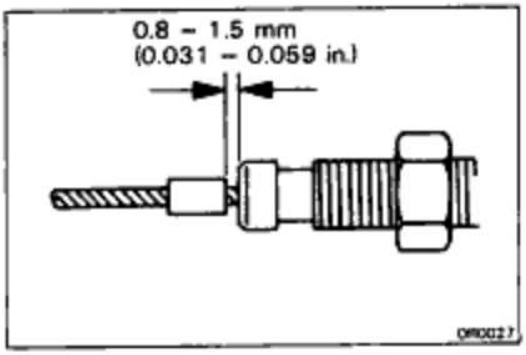
Components	Removal	Installation	Remarks
Valve body	AT–242 to AT–244	AT-403 to AT-405	
Throttle cable	AT–231	AT–231	
Speedometer driven gear oil seal	AT–232	AT–232	
Side gear shaft oil seal	AT–232	AT–232 and AT–233	
Extension housing oil seal	AT–233	AT–233	Only A540H

Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE FROM ENGINE
2. REMOVE NEUTRAL START SWITCH
3. REMOVE VALVE BODY
4. REMOVE THROTTLE CABLE





INSTALLATION OF THROTTLE CABLE

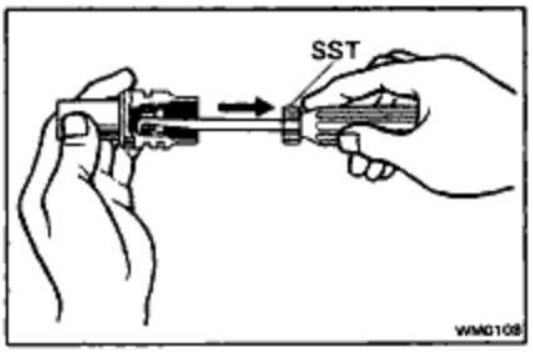
1. INSTALL CABLE INTO TRANSMISSION CASE
2. INSTALL VALVE BODY
3. IF THROTTLE CABLE IS NEW, STAKE STOPPER OR PAINT MARK ON INNER CABLE

   HINT: New cable do not have a cable stopper staked.

   (a) Bend the cable so there is a radius of about 200 mm(7.87 in.).

   (b) Pull the inner cable lightly until a slight resistance is felt, and hold it.

   (e) Stake the stopper, 0.8 – 1.5 mm (0.031 – 0.059 in.) from the end of outer cable.
4. CONNECT THROTTLE CABLE TO ENGINE
5. ADJUST THROTTLE CABLE (See page AT–201)
6. INSTALL AND ADJUST NEUTRAL START SWITCH
7. TEST DRIVE VEHICLE

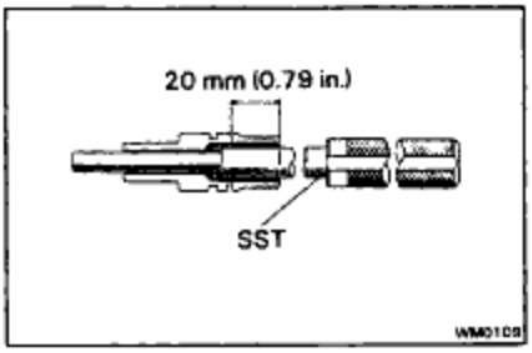


Speedometer Driven Gear Oil Seal

REPLACEMENT OF SPEEDOMETER DRIVEN GEAR OIL SEAL

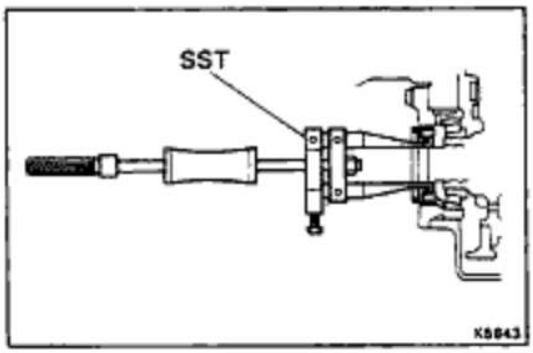
1. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, pull out the oil seal.
SST 09921–00010



2. INSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, drive in the oil seal.
SST 09201–60011
Drive in depth: 20 mm (0.79 in.)



Side Gear Shaft Oil Seal

REPLACEMENT OF SIDE GEAR SHAFT OIL SEAL

1. REMOVE BOTH DRIVE SHAFTS

(See page FA–30 or FA–43)

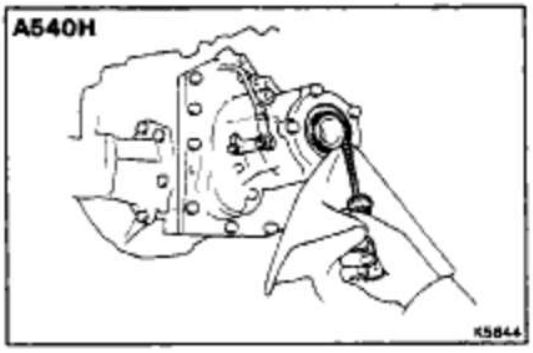
2. REMOVE LEFT SIDE GEAR SHAFT OIL SEAL

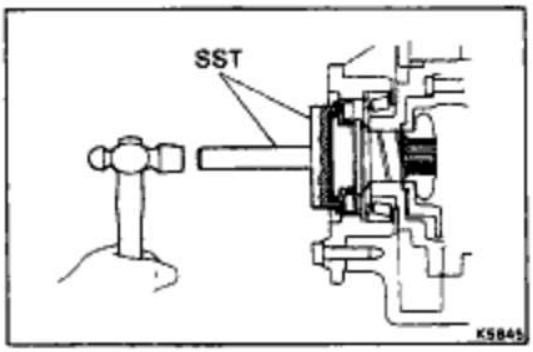
Using SST, pull out the oil seal.
SST 09308–00010

3. (A540H)

REMOVE RIGHT SIDE GEAR SHAFT OIL SEAL

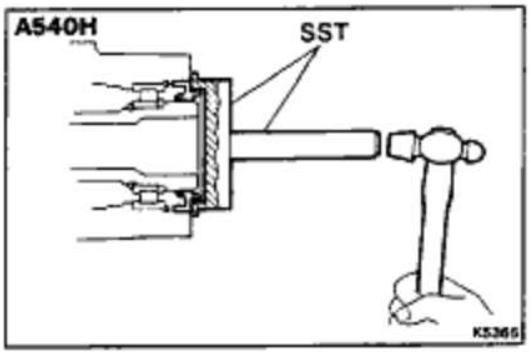
Using a screwdriver, remove the oil seal.





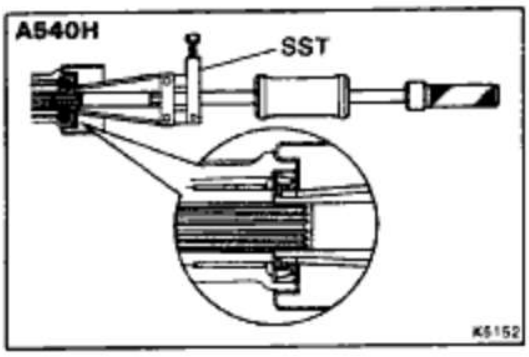
4. INSTALL LEFT SIDE GEAR SHAFT OIL SEAL

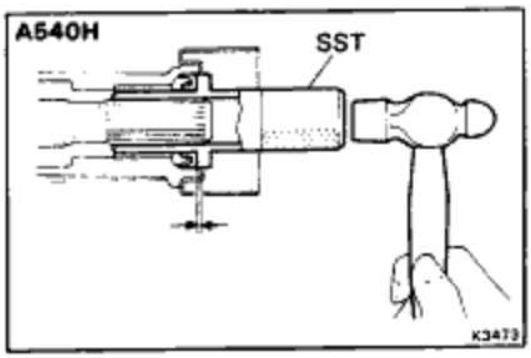
(1) Using SST, drive in a new oil seal.
SST 09608–30022 (09608–05010, 09608–32010)
Oil seal depth: 0 0.5 mm (0 0.02 in.)
(2) Coat the lip of oil seal with MP grease.



5. (A540H)
INSTALL RIGHT SIDE GEAR SHAFT OIL SEAL
(1) Coat the lip of oil seal with MP grease.
(2) Using SST, drive in a new oil seal.
SST 09608–30022 (09608–05010, 09608–32010)
Oil seal depth: 0 0.3 mm (0.012 in.)

6. INSTALL BOTH DRIVE SHAFTS
(See page FA–39 **or** FA–50**) .**
7. CHECK TRANSAXLE FLUID LEVEL (See page AT–199**)**





Extension Housing Oil Seal (A540H)

REPLACEMENT OF EXTENSION HOUSING OIL SEAL

1. DRAIN TRANSFER OIL
2. REMOVE PROPELLER SHAFT (See page PR–4**)**
3. REMOVE EXTENSION HOUSING OIL SEAL
Using SST, remove the oil seal.
SST 09308–00010
4. INSTALL EXTENSION HOUSING OIL SEAL
(a) Coat the lip of oil seal with MP grease.
(b) Using SST, drive in a new oil seal.
SST 09325–20010
5. INSTALL PROPELLER SHAFT (See page PR–10**)**
6. FILL TRANSFER OIL (See page AT–200**)**

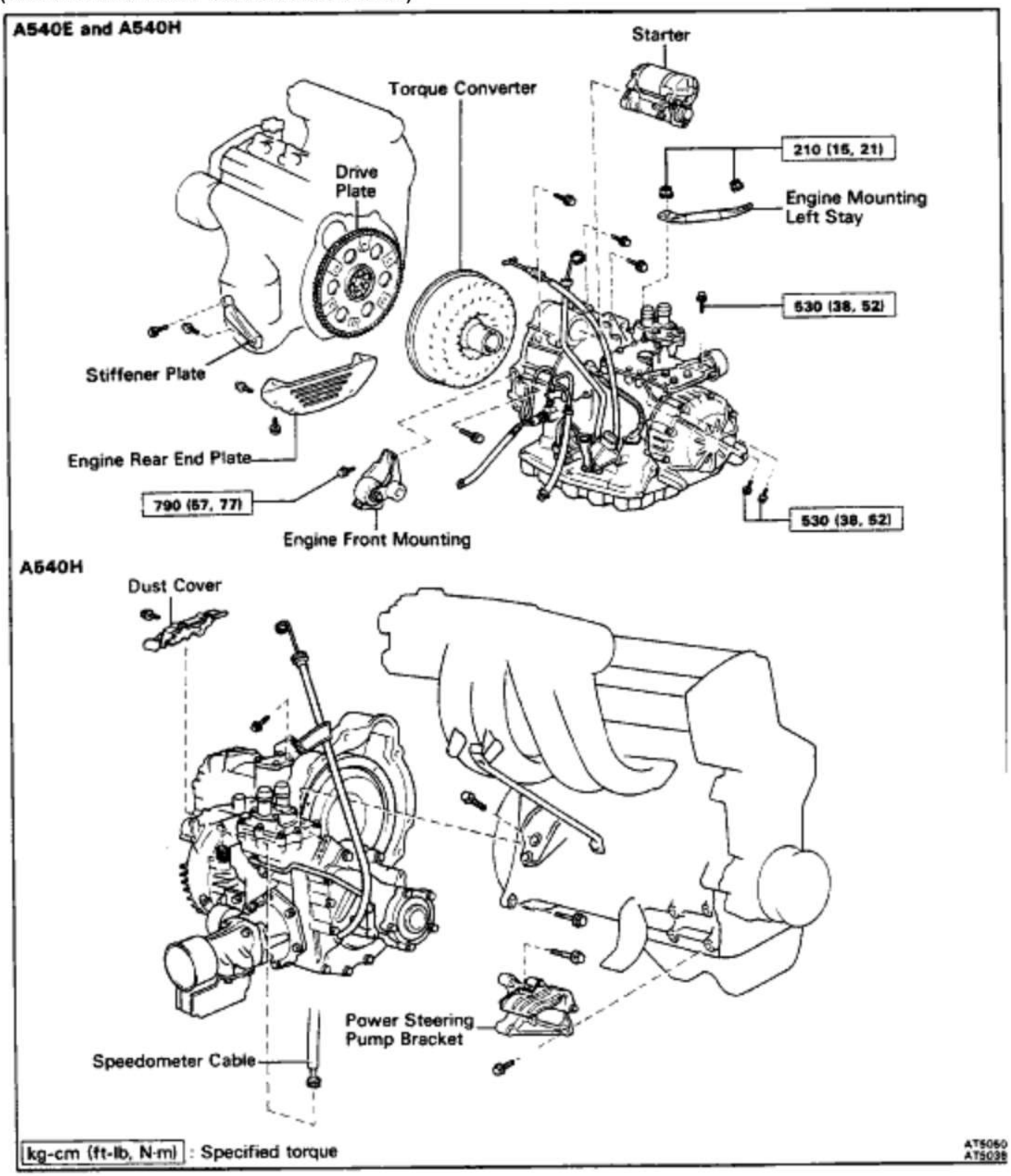
REMOVAL AND INSTALLATION OF TRANSAXLE (A540E and A540H)

REMOVAL AND INSTALLATION OF ENGINE

(3S–FE: See pages EM–106 and EM–t30, 2VZ–FE: EM–138 and EM–165)

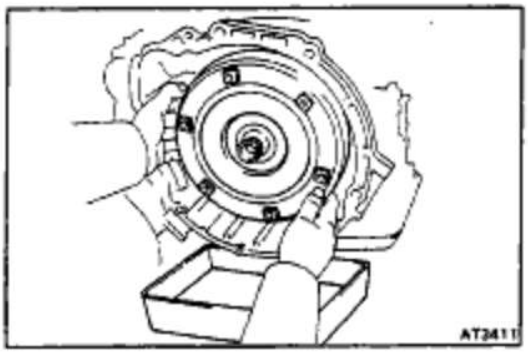
REMOVAL AND INSTALLATION OF TRANSAXLE

(Remove and install transaxle as shown)



(MAIN POINT OF INSTALLATION)

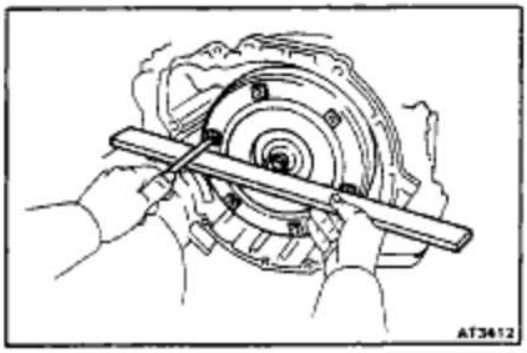
1. INSTALL TORQUE CONVERTER IN TRANSAXLE



2. CHECK TORQUE CONVERTER INSTALLATION

Using a scale and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance: 23.0 mm I0.906 in.) or more



3. INSTALL TORQUE CONVERTER MOUNTING BOLTS

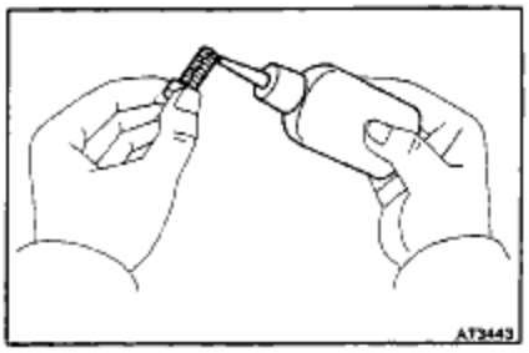
(a) Clean the threads of the bolts with the gasoline.

(b) Coat the threads of the bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent.

(c) Tighten the bolts evenly.

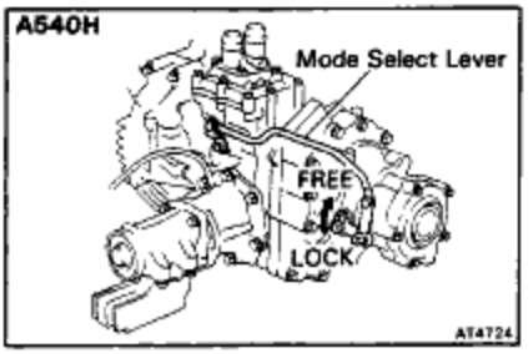
Torque: 280 kg–cm (20 ft–lb, 27 N–m)



4. (A540H, Transfer)

INSPECT MODE SELECT LEVER POSITION

After finishing inspection or repair the transaxle, be sure the mode select lever position to FREE mode and attach the lock bolt.



COMPONENT PARTS
General Notes

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 assembly before proceeding to the next component group. If a component group can not be assembled 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 assembly of other component groups.
Recommended fluid for the automatic transaxle: A540E ATF DEXRON©II
A540H ATF Type T or equivalent
Recommended oil for the transfer: Transaxle oil E50, API GL5, SAE 75W–90 or equivalent

GENERAL CLEANING NOTES:

1. All disassembled parts should be washed clean, with 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 transaxle fluid or kerosene in your face.
3. The recommended automatic transaxle fluid or kerosene should be used for cleaning.

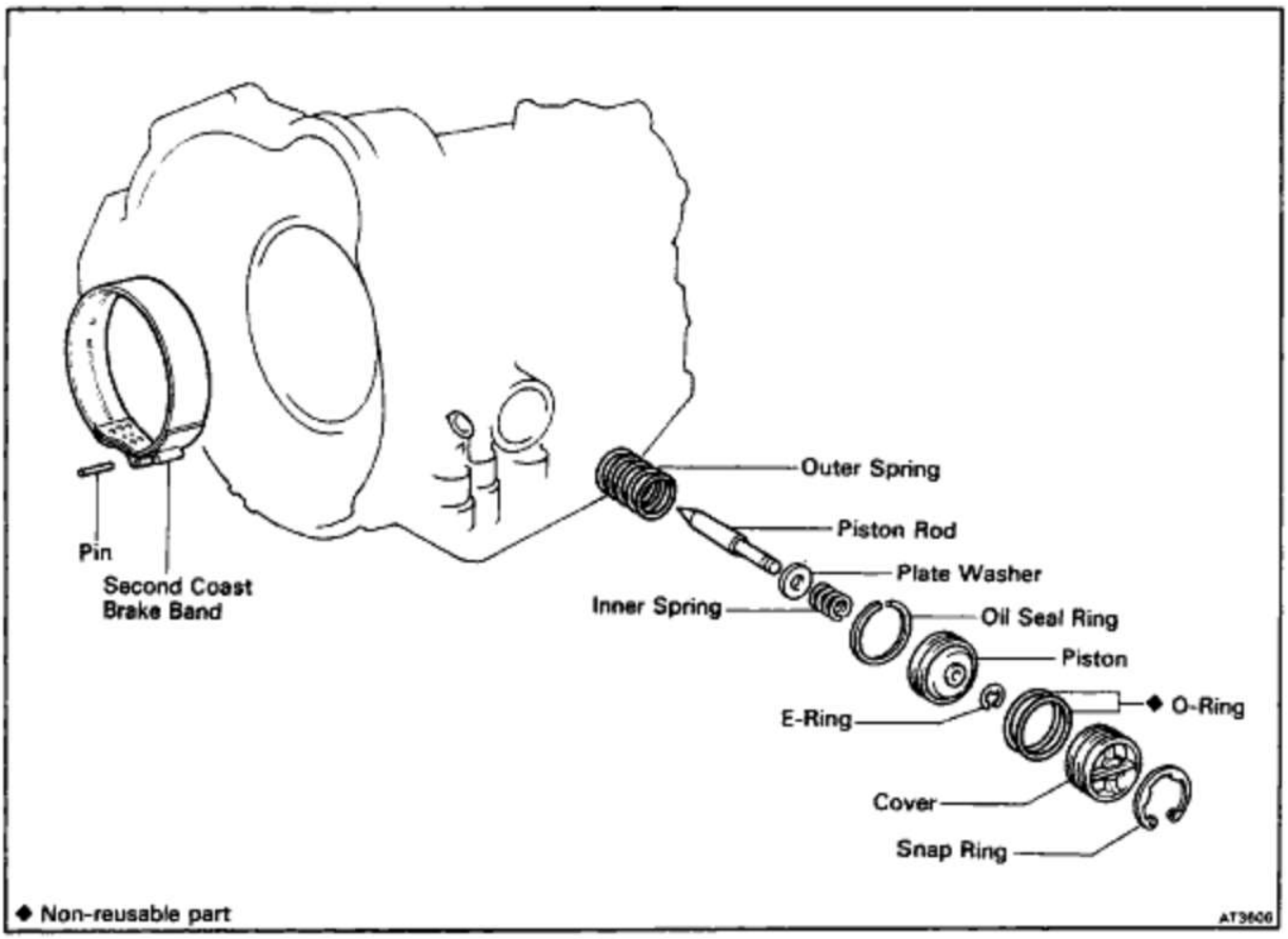
PARTS ARRANGEMENT:

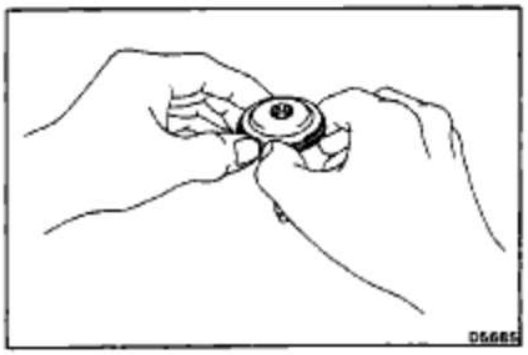
1. After cleaning, the parts should be arranged in proper order to allow efficient inspection, repairs, and reassembly.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New brakes and clutches that are to be used for replacement must be soaked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

COMPONENT PARTS
Second Coast Brake

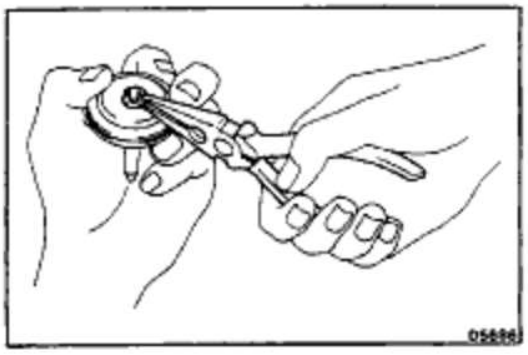




DISASSEMBLY OF SECOND COAST BRAKE PISTON

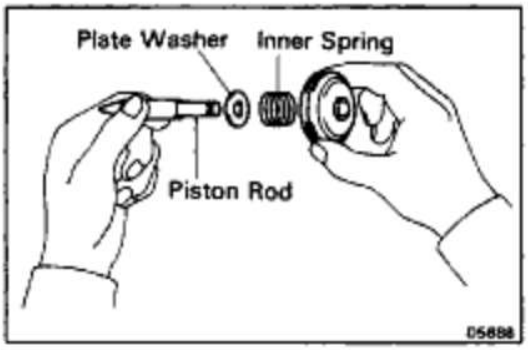
1. REMOVE OIL SEAL RING

Remove the oil seal ring from the piston.

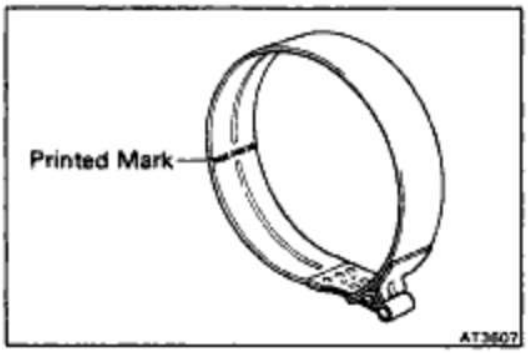


2. REMOVE PISTON ROD

(a) Remove the E–ring while pushing the piston with needle–nose pliers.



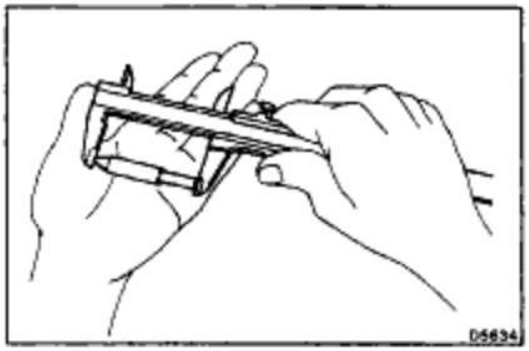
(b) Remove the inner spring, plate washer and piston rod.



INSPECTION OF SECOND COAST BRAKE COMPONENT

If the lining of the brake band is exfoliated or discolored,

or even part of the printed marks is defaced, replace the brake band.



ASSEMBLY OF SECOND COAST BRAKE PISTON

1. SELECT PISTON ROD

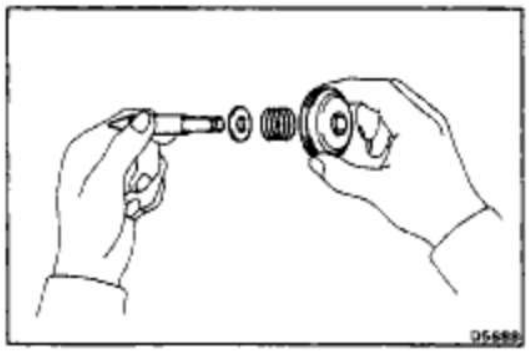
If the band is OK but piston stroke not within the standard value, select the piston rod.

Piston stroke: 2.0 – 3.5 mm (0.079 – 0.138 in.)

There are two lengths of piston rod.

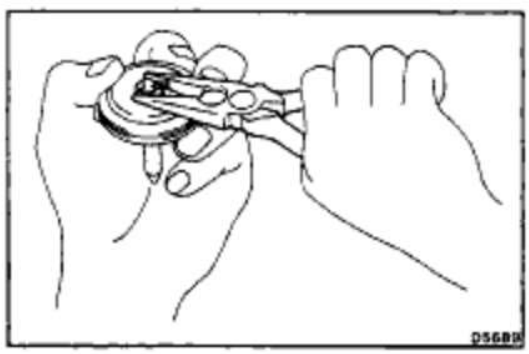
Piston rod length: 95.2 mm l3.748 in.)

96.3 mm (3.791 in.)

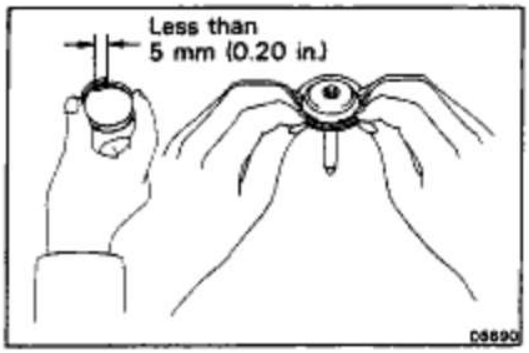


2. INSTALL PISTON ROD

(a) Install the plate washer and inner spring to the piston rod.



(b) Install the E–ring while pushing the piston.



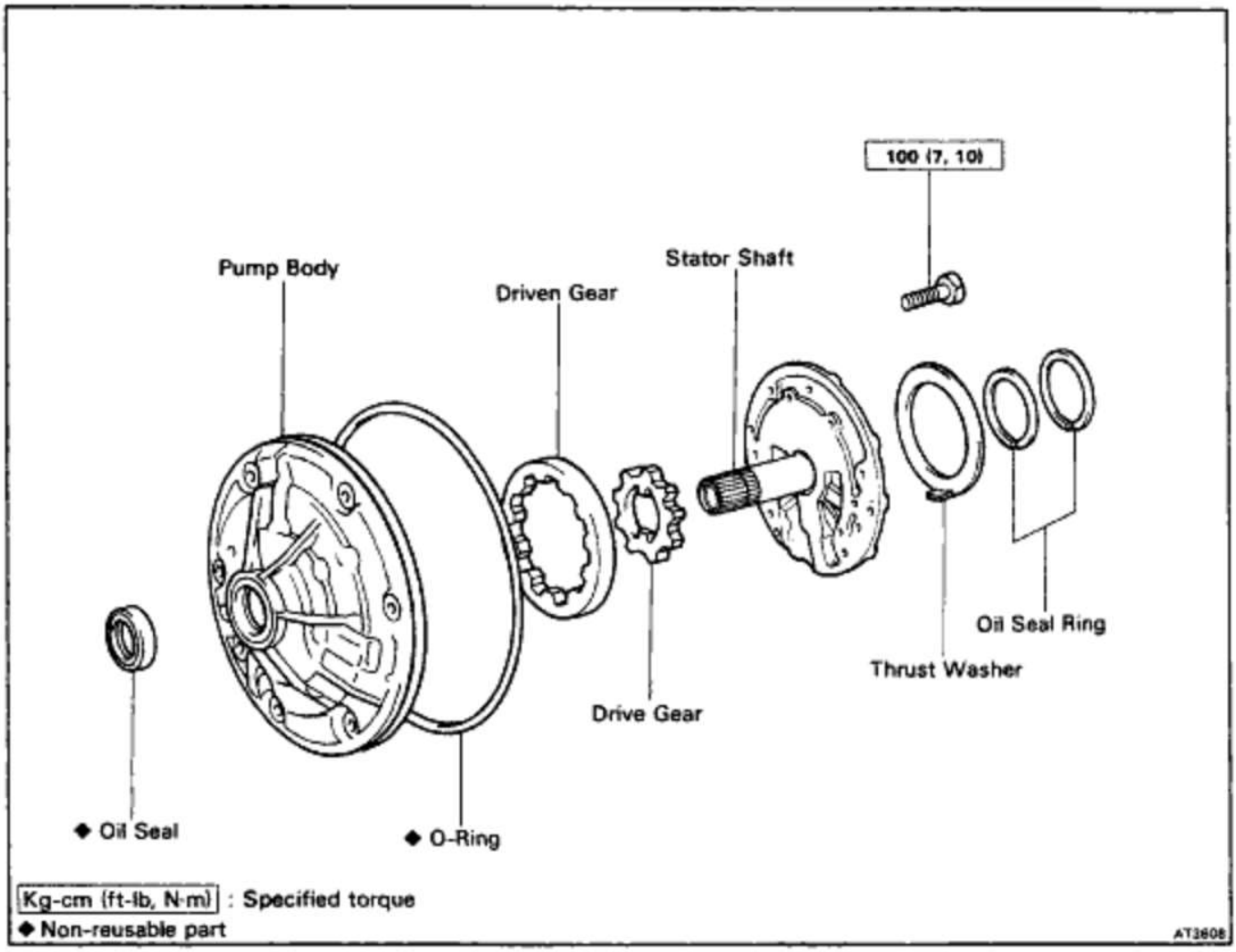
3. INSTALL OIL SEAL RING

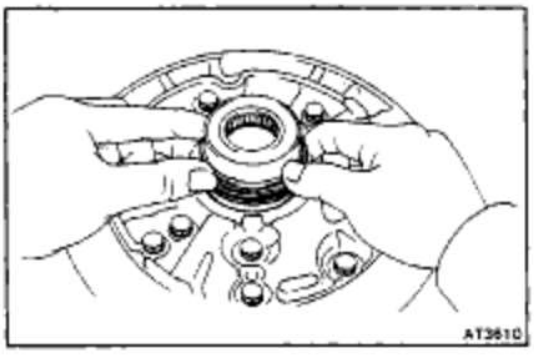
(a) Apply ATF to the oil seal ring.

(b) Install the oil seal ring to the piston.

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

Oil Pump

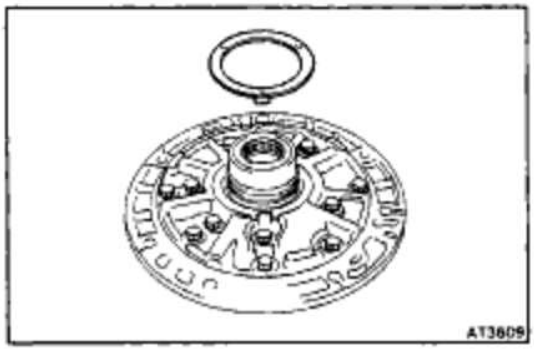




DISASSEMBLY OF OIL PUMP

1. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the stator shaft back side.



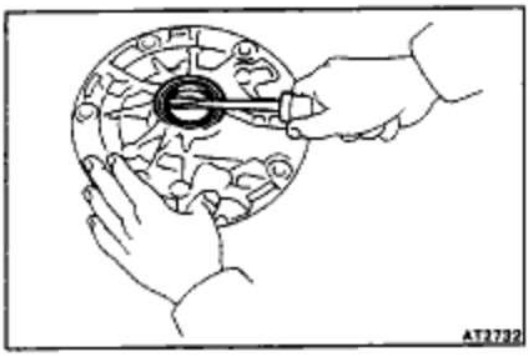
2. REMOVE THRUST WASHER FROM STATOR SHAFT BACK SIDE



3. REMOVE STATOR SHAFT

Remove the eleven bolts and stator shaft.

HINT: Keep the gears in assembly order.



4. REMOVE FRONT OIL SEAL

Pry off the oil seal with a screwdriver.

INSPECTION OF OIL PUMP



1. CHECK BODY CLEARANCE OF DRIVEN GEAR

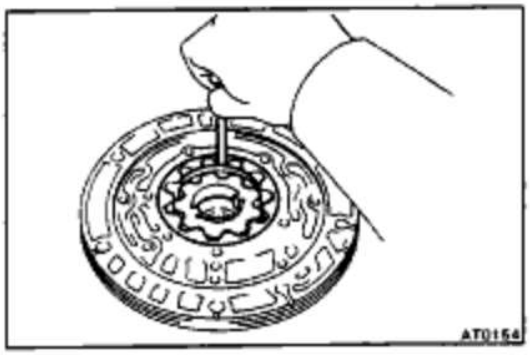
Push the driven gear to one side of the body.

Using a feeler gauge, measure the clearance.

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

Maximum body clearance: 0.3 mm (0.012 in.)

If the body clearance is greater than the maximum, replace the oil pump body subassembly.



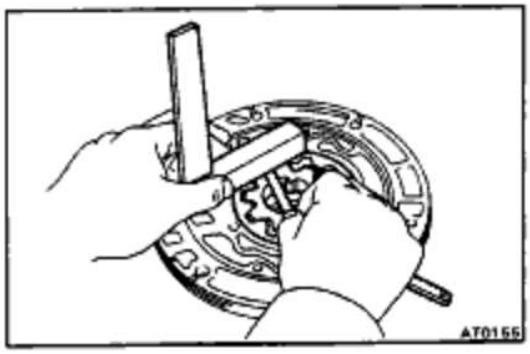
2. CHECK TIP CLEARANCE OF DRIVEN GEAR

Measure between the driven gear teeth and the crescent shaped part of the pump body.

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

Maximum tip clearance: 0.3 mm (0.012 in.)

If the tip clearance is greater than the maximum, replace the oil pump body subassembly.



3. CHECK SIDE CLEARANCE OF BOTH GEARS

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

Standard side clearance: 0.002 – 0.005 mm (0.0008 – 0.0020 in.)

Maximum side clearance: 0.1 mm (0.004 in.)

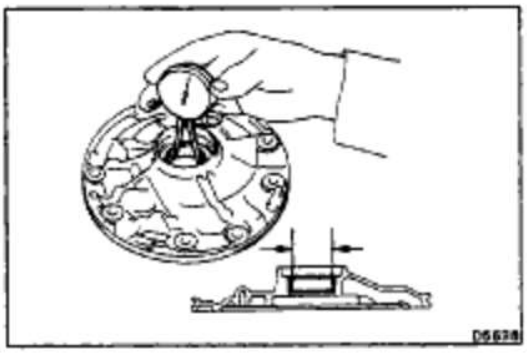
There are three different thicknesses for drive and driven gears.
Drive and driven gear thickness

Mark Thickness

A 9.440 – 9.456 mm (0.3717 – 0.3723 in.)
B 9.456 – 9.474 mm (0.3723 – 0.3730 in.)
C 9.474 – 9.490 mm (0.3730 – 0.3736 in.)

If the thickest gear can not make the side clearance within standard specification, replace the oil pump body subassembly.

4. CHECK OIL PUMP BODY BUSHING

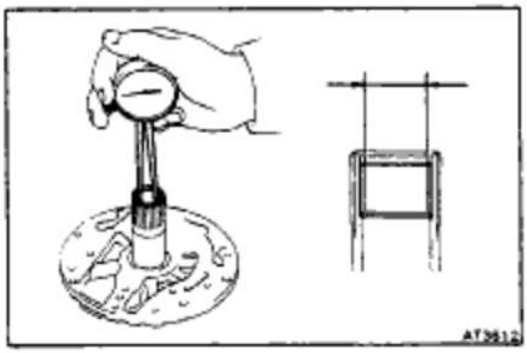


Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Maximum inside diameter: 38.18 mm (1.5031 in.)

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

5. CHECK STATOR SHAFT BUSHING



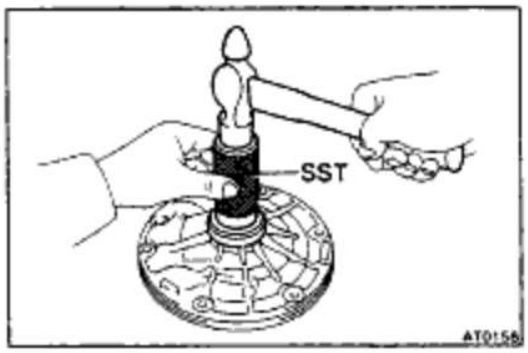
Using a dial indicator, measure the inside diameter stator shaft bushing.

Maximum inside diameter: 21.57 mm (0.8492 in.)

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

ASSEMBLY OF OIL PUMP

1. INSTALL FRONT OIL SEAL

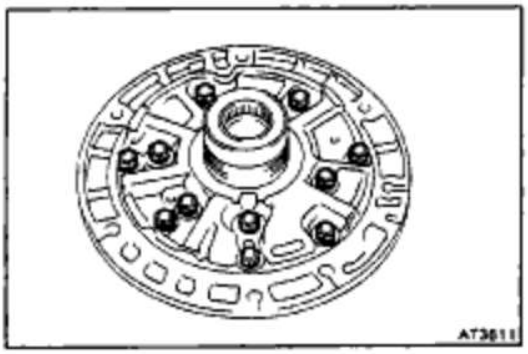


Using SST and a hammer, install a new oil seal. The sea end should be flush with the outer edge of the pump body
SST 09350–32014 (09351–32140)

Z. INSTALL DRIVEN GEAR AND DRIVE GEAR



Make sure the top of the gears are facing upward.

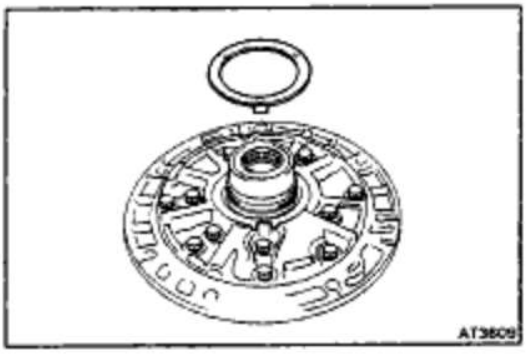


3. INSTALL STATOR SHAFT TO PUMP BODY

(a) Align the stator shaft with each bolt hole.

(b) Torque the eleven bolts.

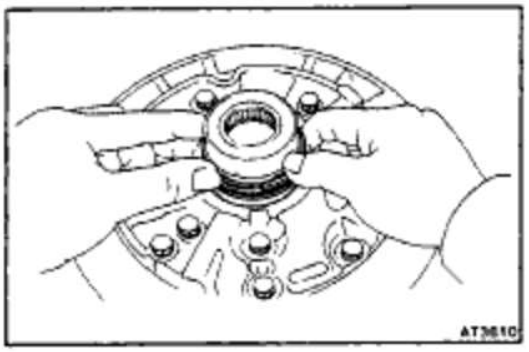
Torque: 100 kg–cm (7 ft–lb, 10 N–m)



4. INSTALL THRUST WASHER

(a) Coat the thrust washer with petroleum jelly.

(b) Align the tab of the washer with the hollow of the pump body.

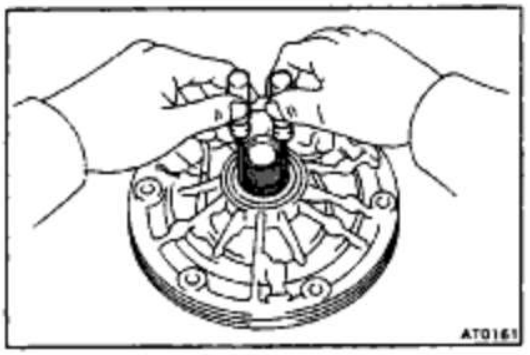


5. INSTALL OIL SEAL RINGS

Install the two oil seal rings to the stator shaft back side.

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

HINT: After installing the oil seal rings, check that they move smoothly.

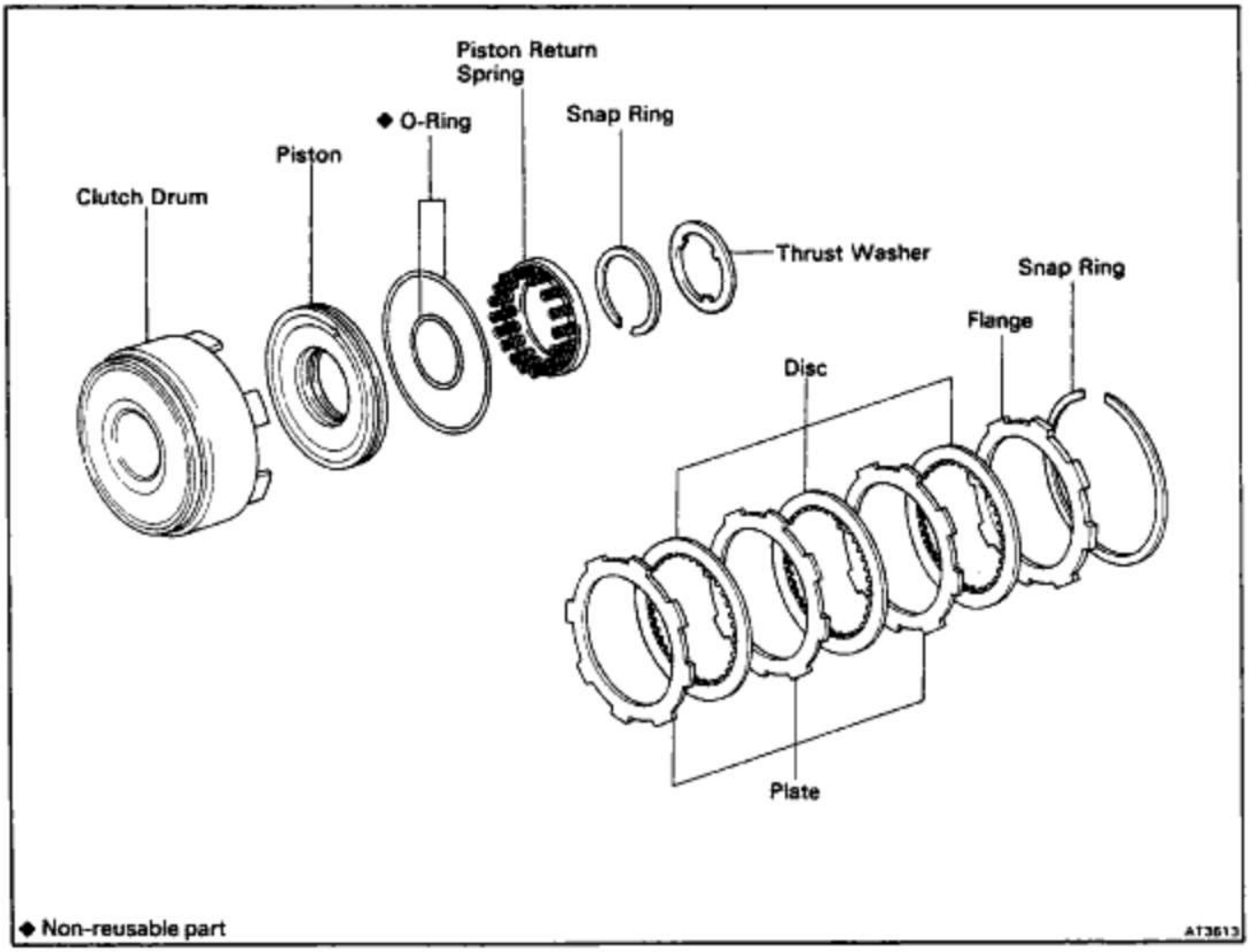


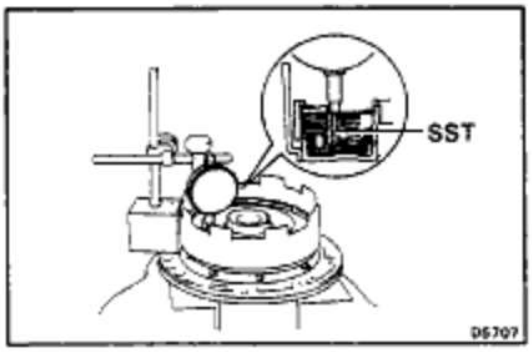
6. CHECK PUMP DRIVE GEAR ROTATION

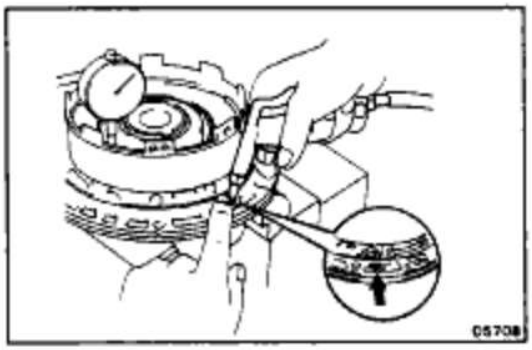
Turn the drive gear with two screwdrivers and make sure it rotates smoothly.

NOTICE: Be careful not to damage the oil seal lip.

Direct Clutch







DISASSEMBLY OF DIRECT CLUTCH

1. CHECK PISTON STROKE OF DIRECT CLUTCH

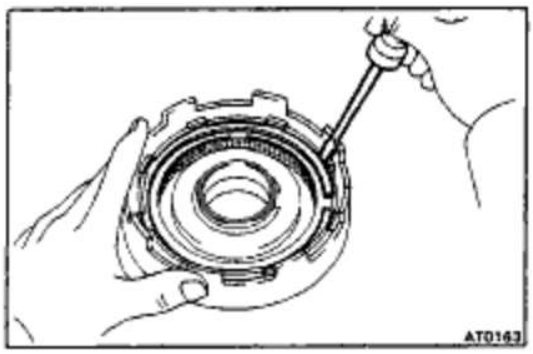
(a) Install the direct clutch on the oil pump.

(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown.

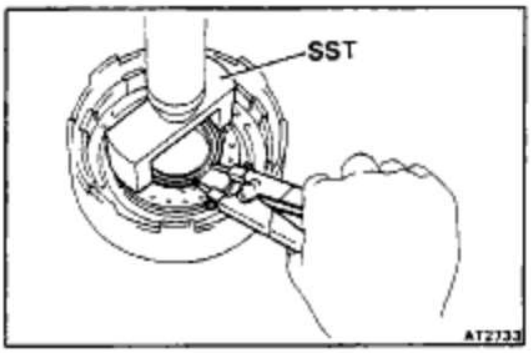
SST 09350–32014 (09351–32190)

Piston stroke: A540E 0.91 – 1.35 mm
(0.0358 – 0.0531 in.)
A540H 1.11 – 1.47 mm
(0.0437 – 0.0579 in.)

If the piston stroke is greater than the maximum, inspect each component.



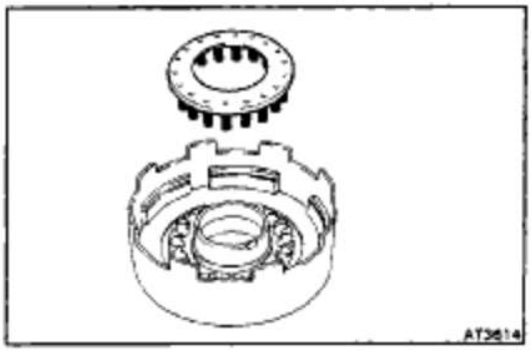
2. REMOVE SNAP RING FROM CLUTCH DRUM
3. REMOVE FLANGE, DISCS AND PLATES



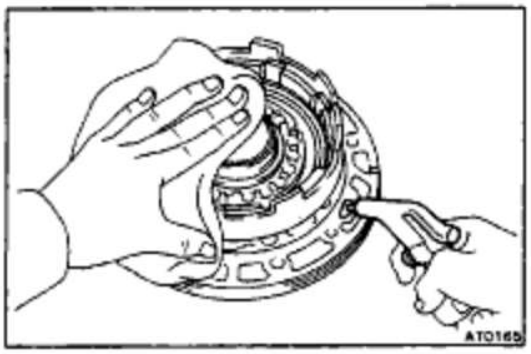
4. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring with snap ring pliers.



(e) Remove the piston return spring.

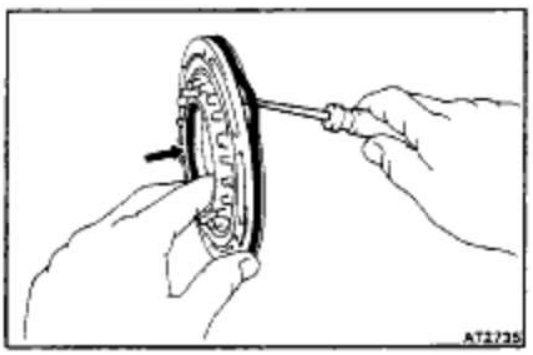


5.REMOVE CLUTCH PISTON

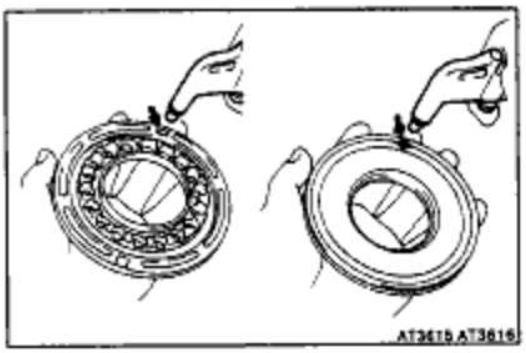
(a) Install the direct clutch onto the oil pump.

(b) Apply compressed air to the oil pump to remove the piston. (If the piston does not come out completely, use needle–nose pliers to remove it.)

(c) Remove the direct clutch from the oil pump.



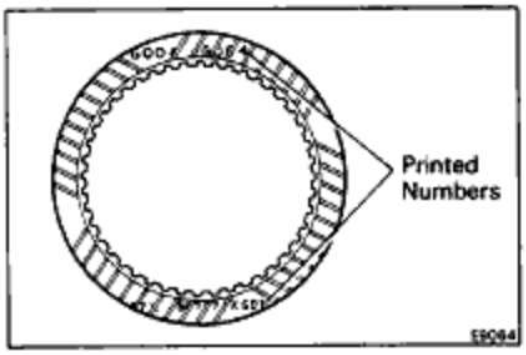
(d) Remove the two O–rings from the piston.



INSPECTION OF DIRECT CLUTCH

1. INSPECT CLUTCH PISTON

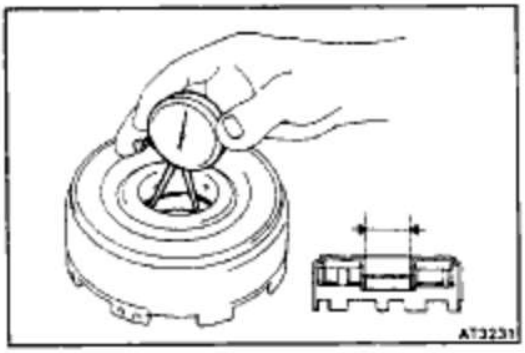
(a) Check that the check ball is free by shaking the piston.
(b) Check that the valve does not leak by applying low pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGE

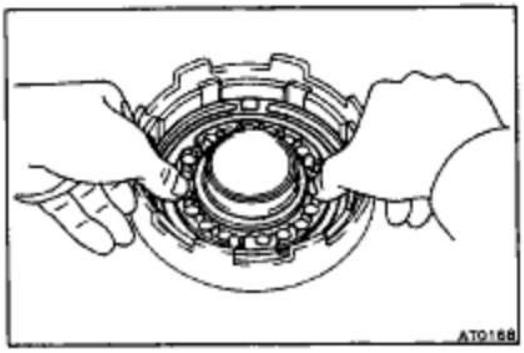
Check if the sliding surfaces of the discs, plates and flange are worn or burnt If necessary, replace them.
HINT:

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



3. CHECK DIRECT CLUTCH BUSHING

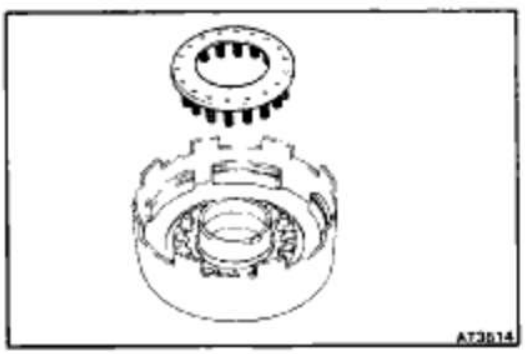
Using a dial indicator, measure the inside diameter of the direct clutch bushing.
Maximum inside diameter: 48.27 mm (1.9004 in.)
If the inside diameter is greater than the maximum, replace the direct clutch.



ASSEMBLY OF DIRECT CLUTCH

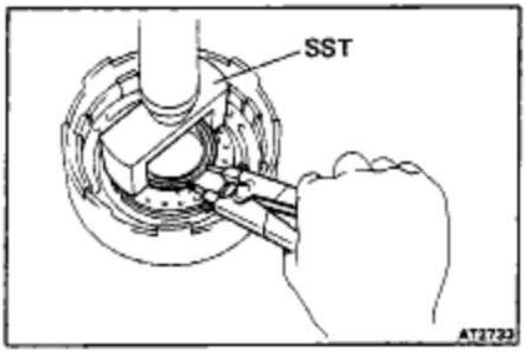
1. INSTALL CLUTCH PISTON IN DIRECT CLUTCH DRUM

(a) Install new O–rings to the piston. Coat the O–ring: with ATF.
(b) Being careful not to damage the O–rings, press the piston into the drum with the cup side up.

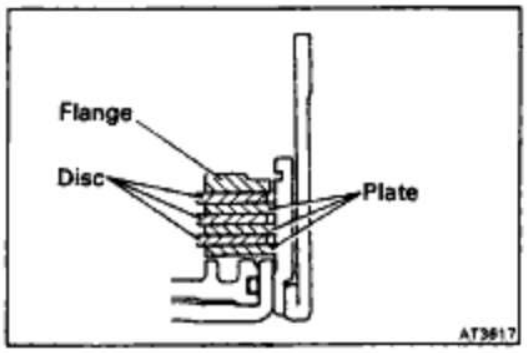


2. INSTALL PISTON RETURN SPRING

(a) Place the return spring and snap ring onto the piston

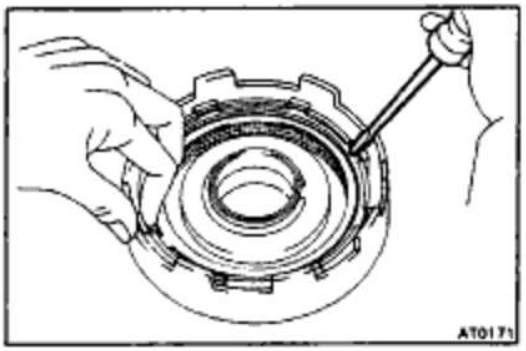


(b) Place SST on the spring retainer, and compress the return spring with a shop press.
SST 09350–32014 (09351–32070)
(c) Install the snap ring using snap ring pliers. Be sure the end gap of snap ring is not aligned with the spring retainer claw.



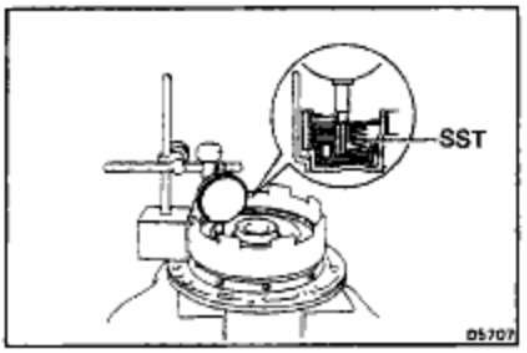
3. INSTALL PLATES, DISCS AND FLANGE

(a) Install plates and discs.
Install in order: P=Plate D=Disc
P–D–P–D–P–D
(b) Install the flange with the flat end facing downward.



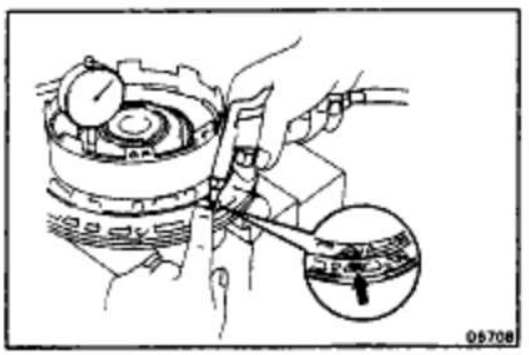
4. INSTALL SNAP RING

Check that the end gap of the snap ring is not aligned with one of the cutouts.



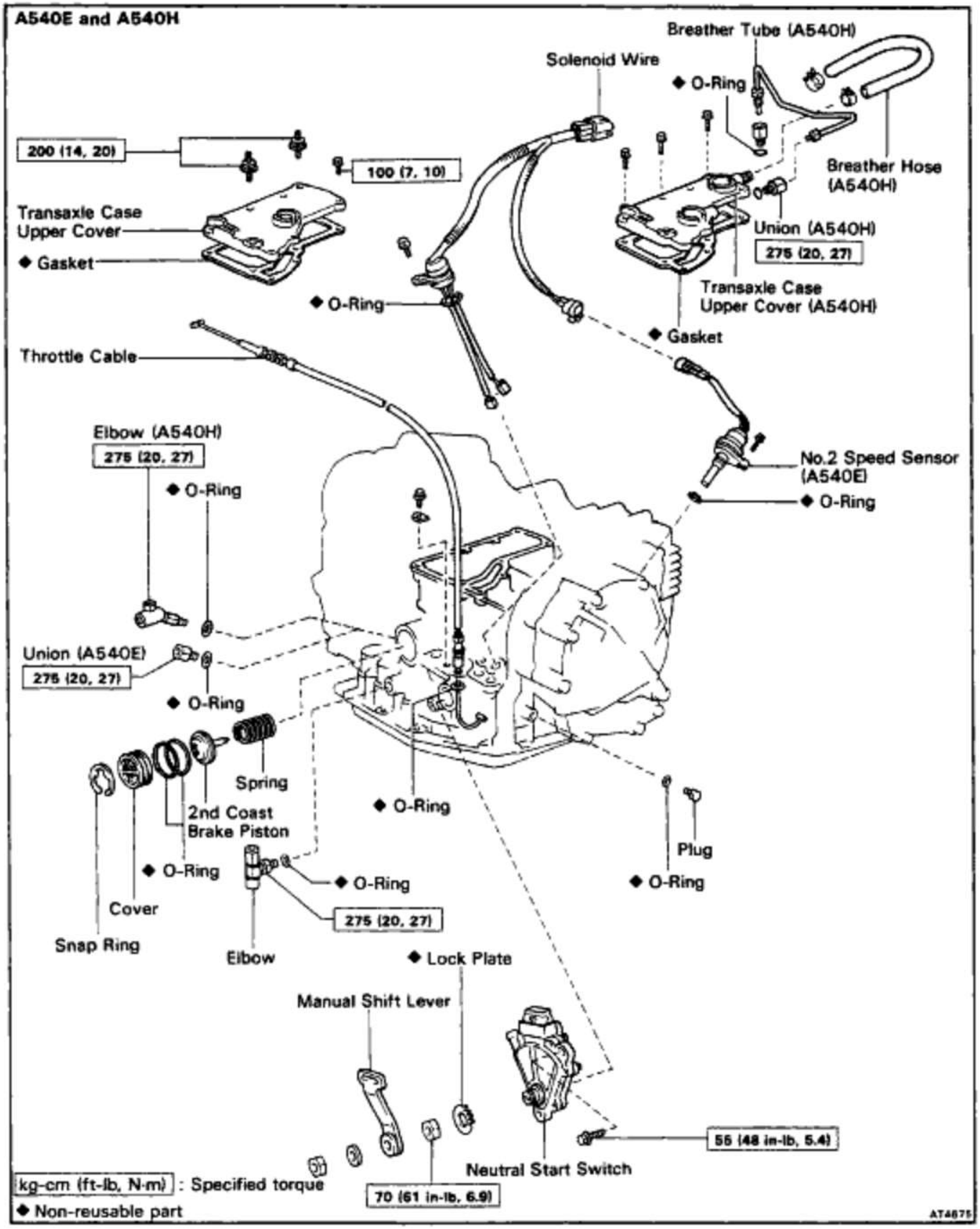
5. RECHECK PISTON STROKE OF DIRECT CLUTCH

(a) Install the direct clutch on the oil pump.
(b) Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 – 8 kg/Cm2, 57 – 114 psi, 392 – 785 kPa) as shown.
SST 09350–32014 (09351–32190)
Piston stroke: A540E 0.91 – 1.35 mm
(0.0358 – 0.0531 in.)
A540H 1.11 – 1.47 mm
(0.0437 – 0.0579 in.)
If the piston stroke is nonstandard, select another flange.
HINT: There are two different thicknesses for the flange.
Flange thickness: 2.70 mm (0.1063 in.)
3.00 mm (0.1181 in.)

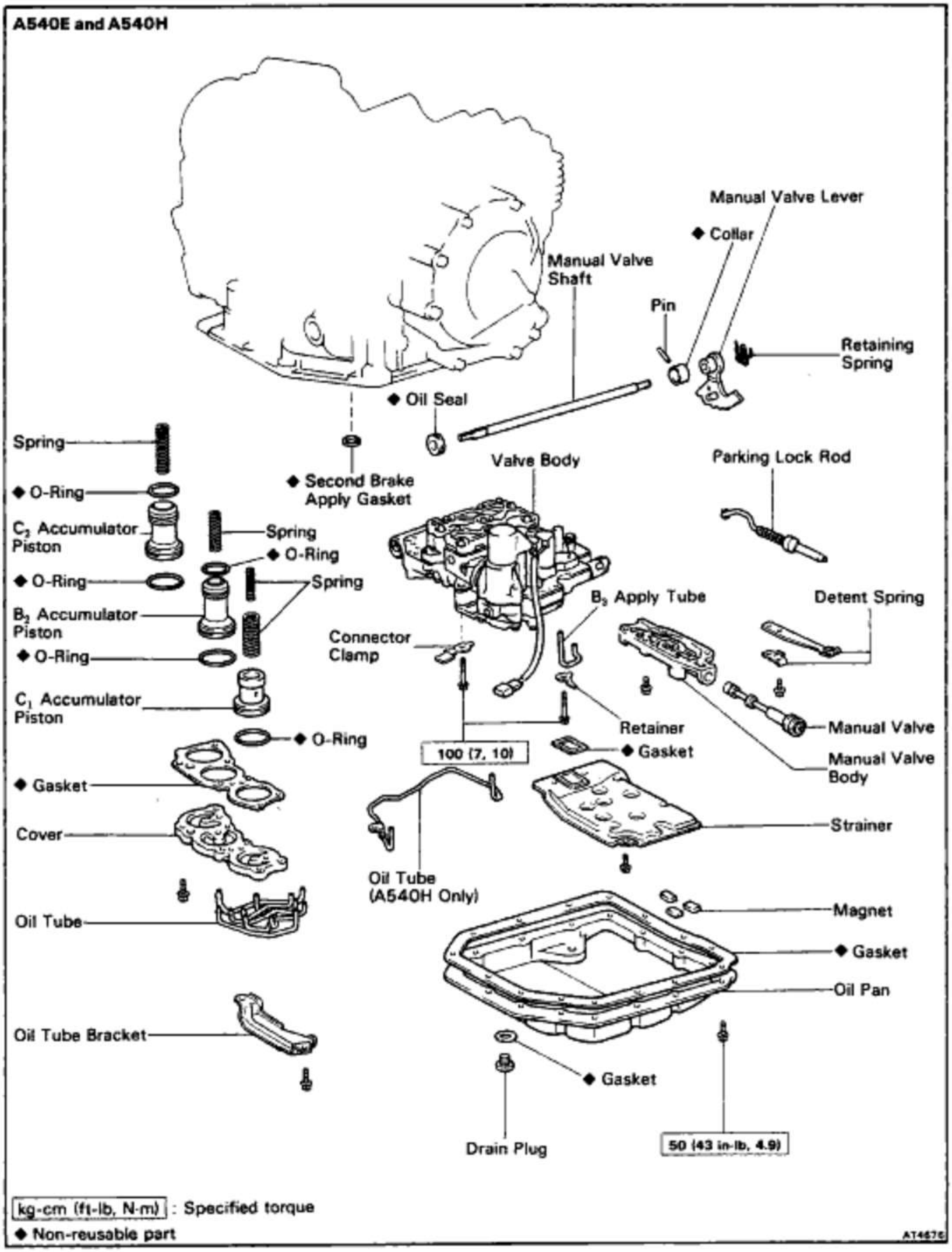


REMOVAL OF COMPONENT PARTS (A540E and A540H)

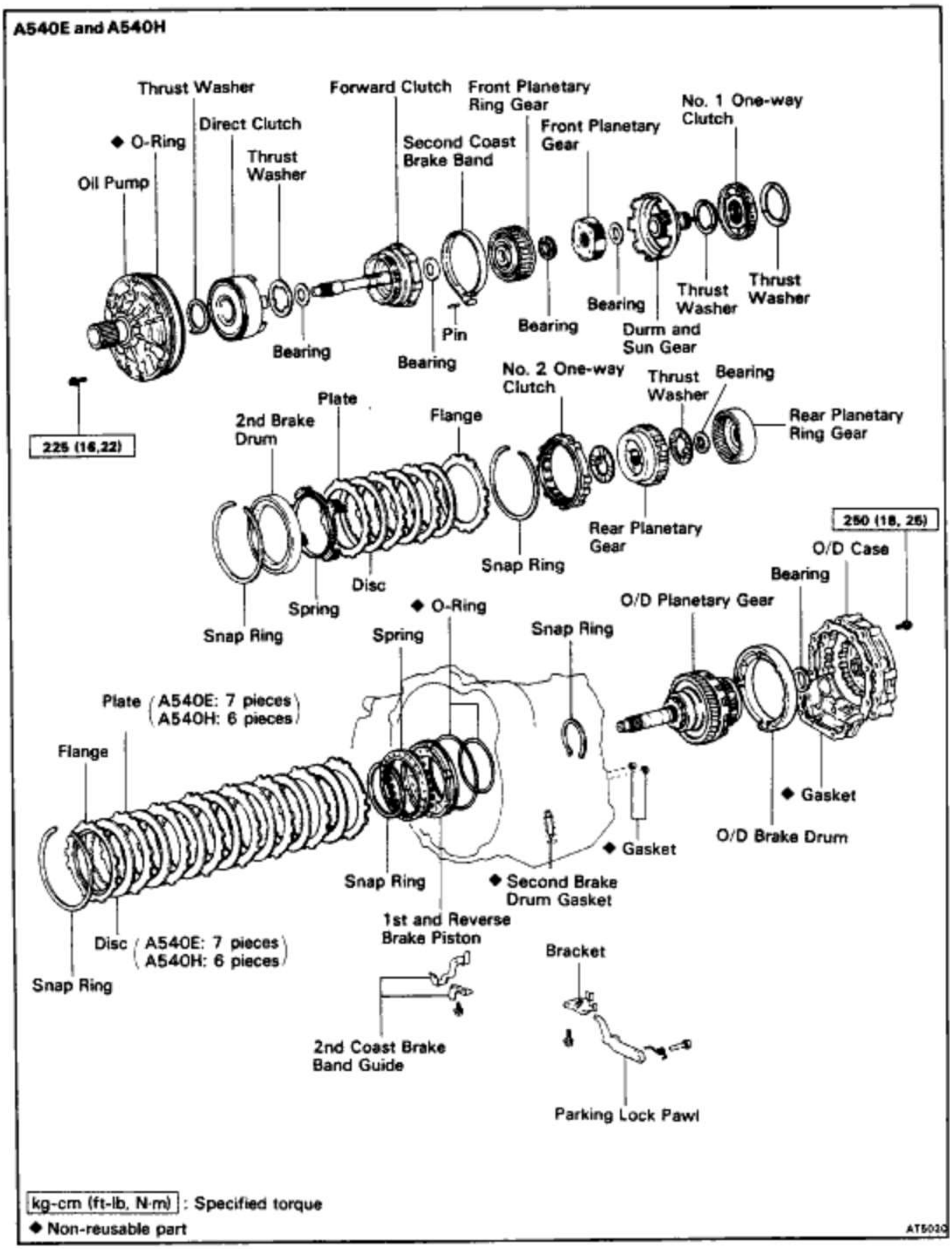
COMPONENTS



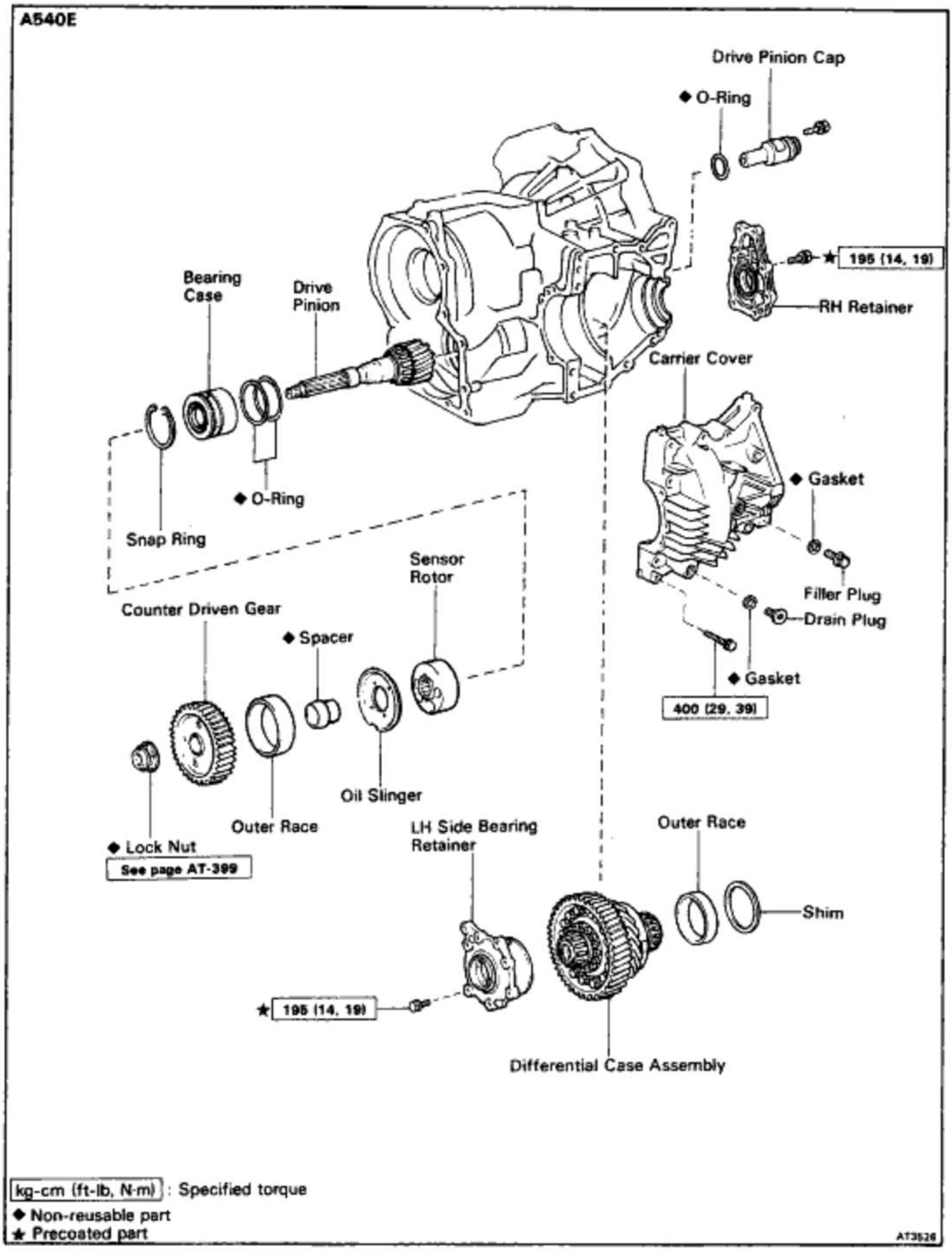
COMPONENTS (Cont'd)



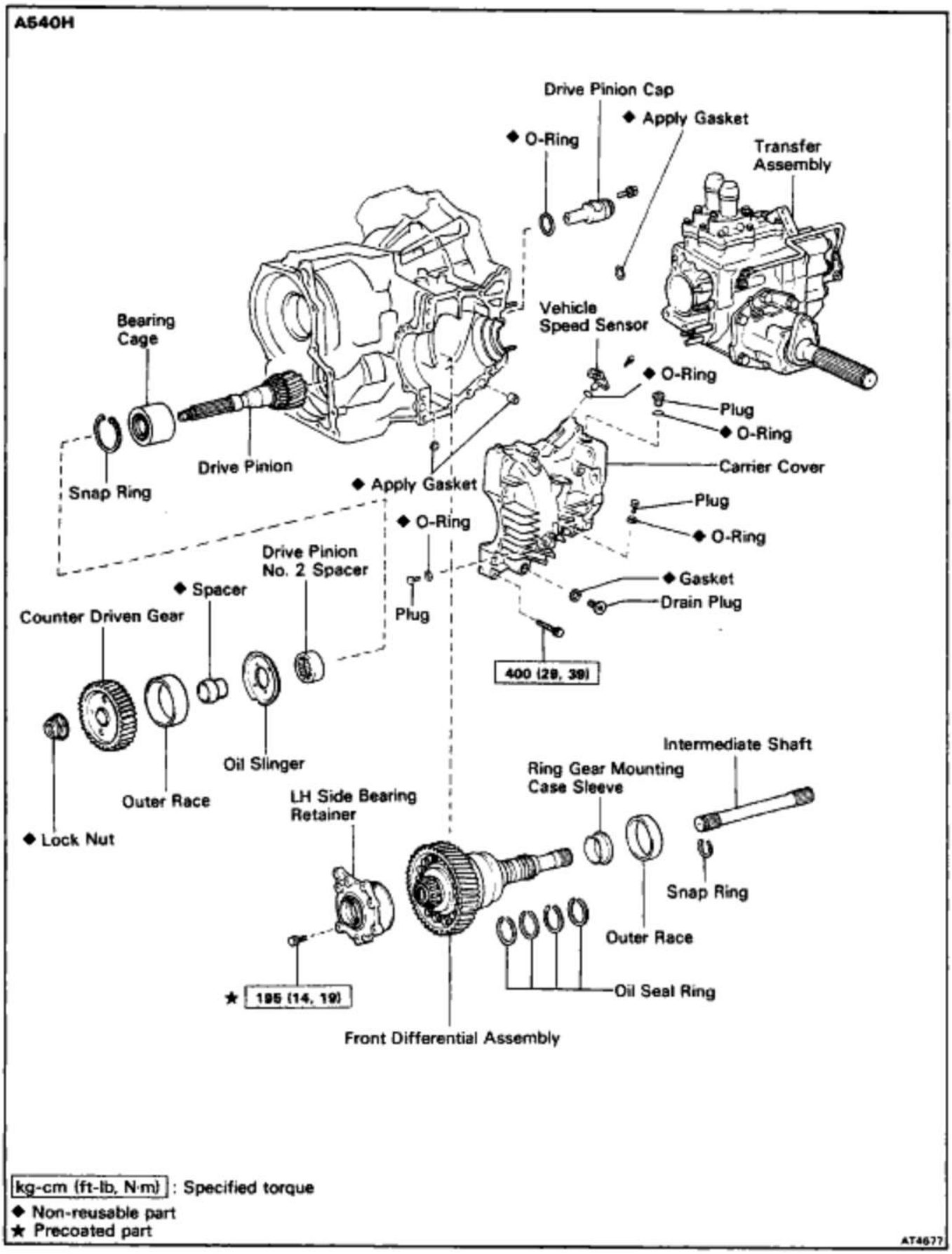
COMPONENTS (Cont'd)

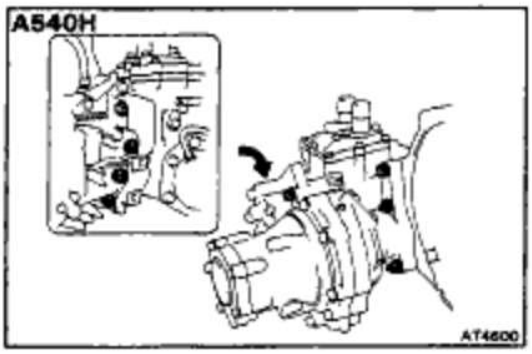


COMPONENTS (Cont'd)



COMPONENTS (Cont'd)





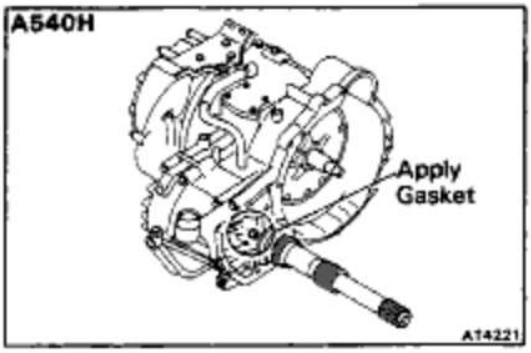
SEPARATE BASIC SUBASSEMBLY

1. (A540H)

REMOVE TRANSFER ASSEMBLY

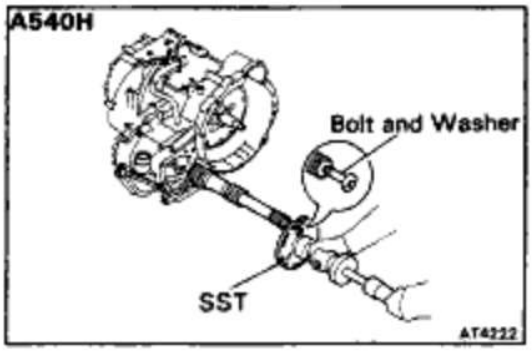
(a) Remove the five nuts and three bolts.

(b) Using a plastic hammer, remove the transfer assembly form the transaxle.



2. (A540H)

REMOVE APPLY GASKET

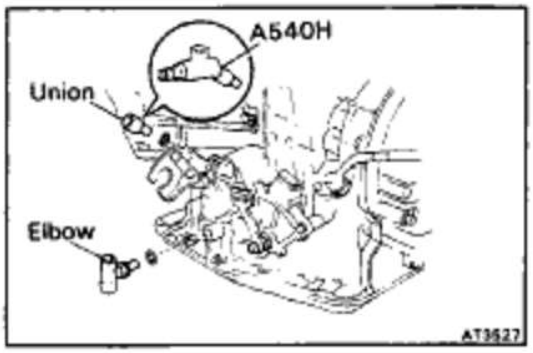


3. (A540H)

REMOVE DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Screw in suitable bolt with washer into the side gear intermediate shaft.

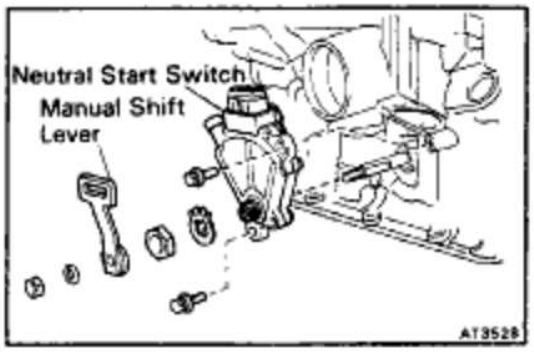
(b) Using SST, remove the side gear intermediate shaft.
SST 09520–32012



4. REMOVE UNION AND ELBOW

(a) Using an open end wrench, remove the union and elbow.

(b) Remove the O–rings from the union and elbow.

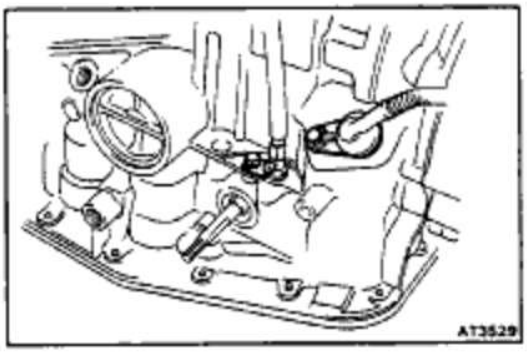


5. REMOVE NEUTRAL START SWITCH

(a) Remove the manual shift lever.

(b) Pry off the lock washer and remove the manual valve shaft nut.

(c) Remove the two bolts and pull out the neutral start switch.



6. REMOVE THROTTLE CABLE RETAINING BOLT AND PLATE

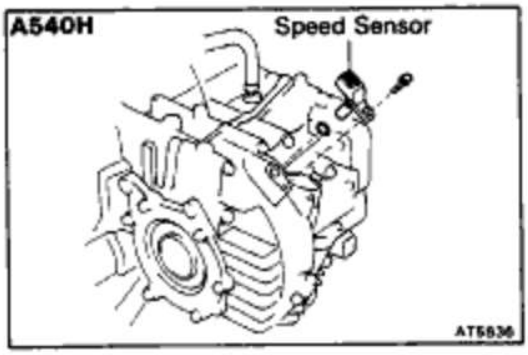
7. . REMOVE SOLENOID WIRE RETAINING BOLT



8. (A540E)

REMOVE NO. 2 SPEED SENSOR

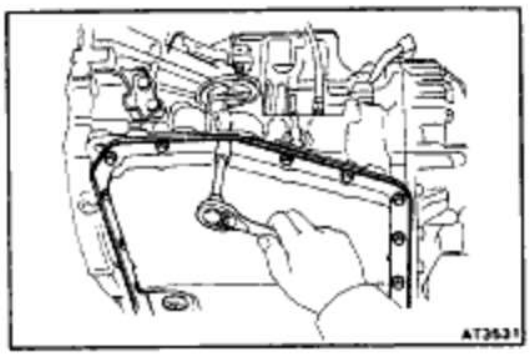
(a) Disconnect the connector.
(b) Remove the bolt and pull out the speed sensor.
(c) Remove the O–ring from speed sensor.



9. (A540H)

REMOVE VEHICLE SPEED SENSOR

(a) Remove the bolt and pull out the speed sensor.
(b) Remove the O–ring from speed sensor.

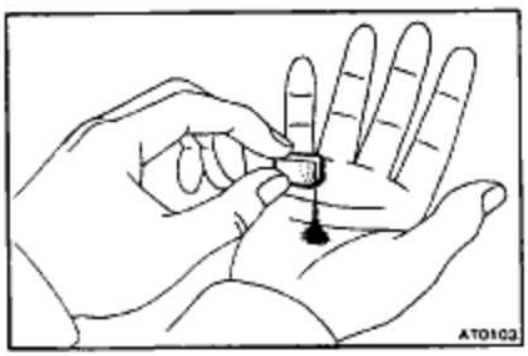


10. REMOVE OIL PAN AND GASKET

(a) Remove the seventeen bolts.
(b) Remove the oil pan by lifting transaxle case.

NOTICE: Do not turn the transaxle over as this will contaminate the valve body with the foreign material; in the bottom of the oil pan.

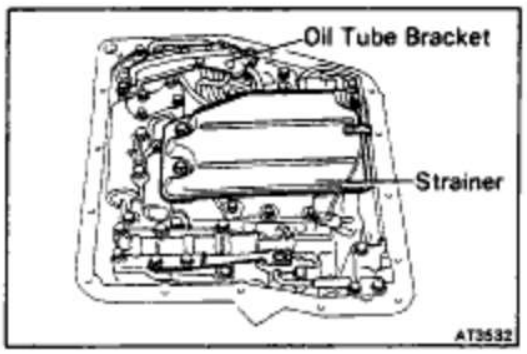
(c) Place the transaxle on wooden blocks to prevent damage to the oil tube bracket.



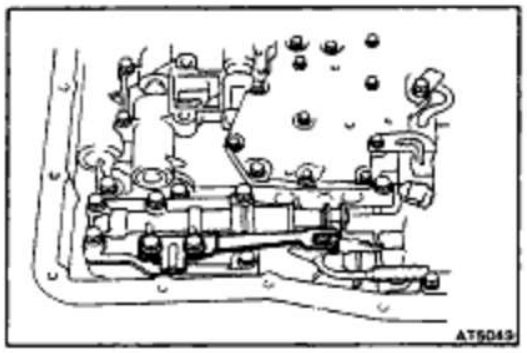
11. EXAMINE PARTICLES IN PAN

Remove the magnet and use it to collect any steel chips
Look carefully at the chips and particles in the oil pan an(on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic) ... bearing, gear and plate wear
Brass (non–magnetic) ... bushing wear

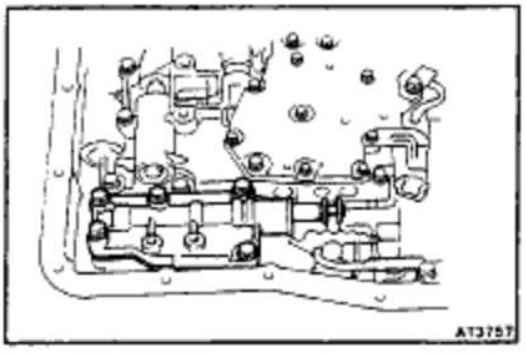


12. REMOVE OIL TUBE BRACKET AND STRAINER



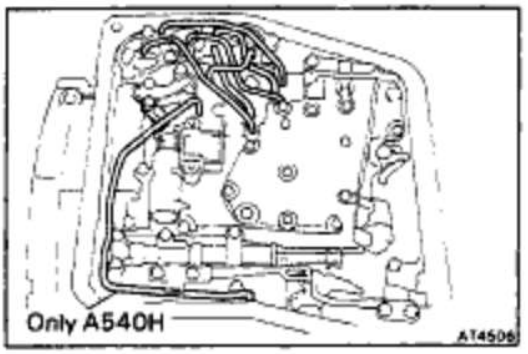
13. REMOVE MANUAL VALVE BODY

(a) Remove the two bolts and detent spring.



(b) Remove the five bolts and manual valve body with the manual valve.

(c) Remove the manual valve from the manual valve body.



14. REMOVE OIL TUBES

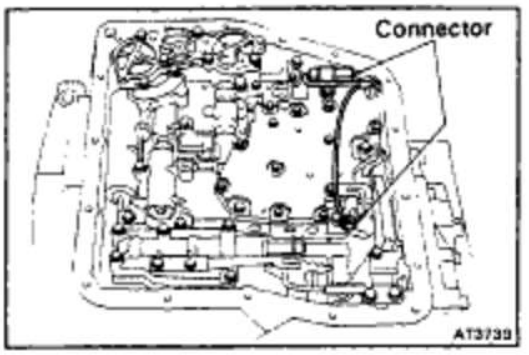
(A540E)

Pry up both tube ends with a large screwdriver and remove the six tubes.

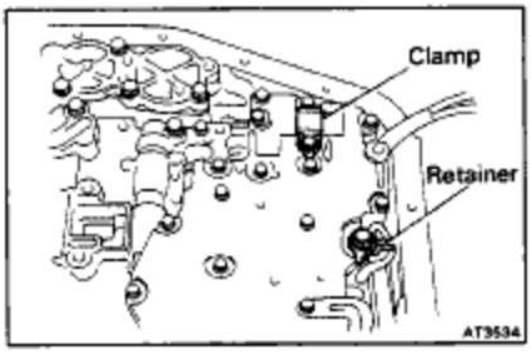
(A540H)

(a) Remove the bolt.

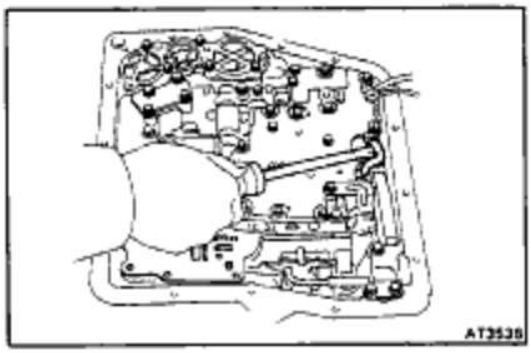
(b) Pry up both tube ends with a large screwdriver and remove the seven tubes.



15. DISCONNECT SOLENOID CONNECTORS

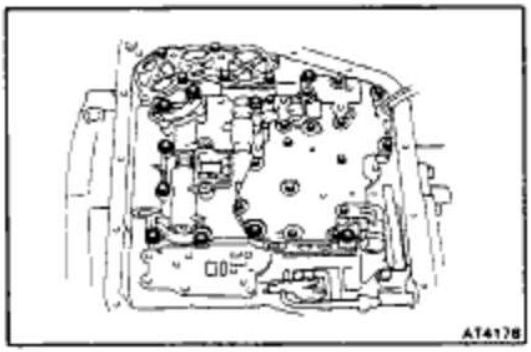


16. REMOVE CONNECTOR CLAMP AND TUBE RETAINER



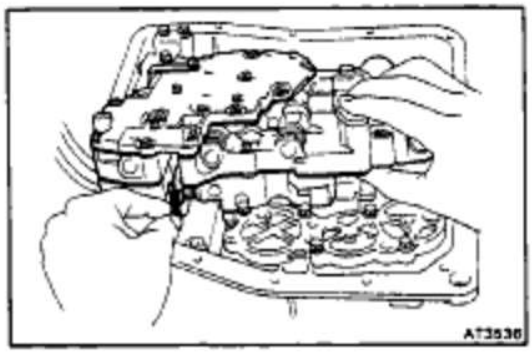
17. REMOVE B3 APPLY TUBE

Pry up the tube with a screwdriver and remove the tube.

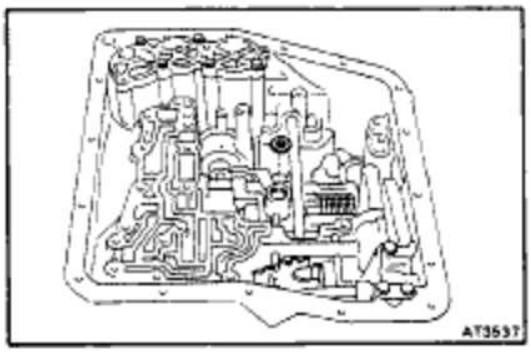


18. REMOVE VALVE BODY

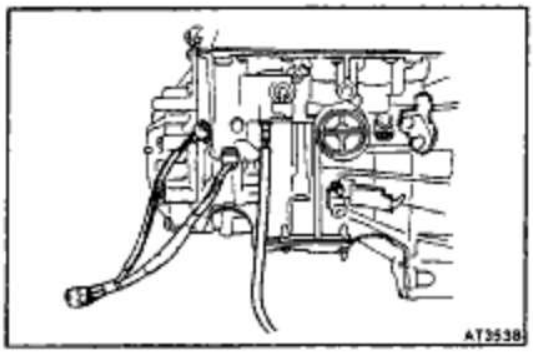
(a) Remove the ten bolts.



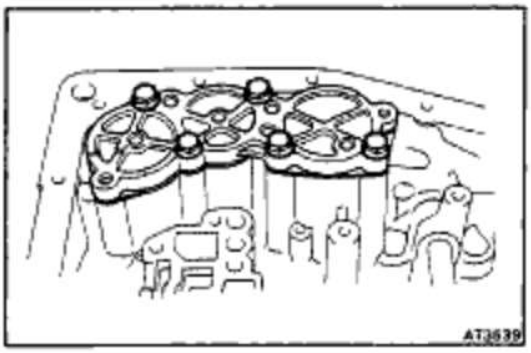
(b) Disconnect the throttle cable from the cam and remove the valve body.



19. REMOVE SECOND BRAKE APPLY GASKET

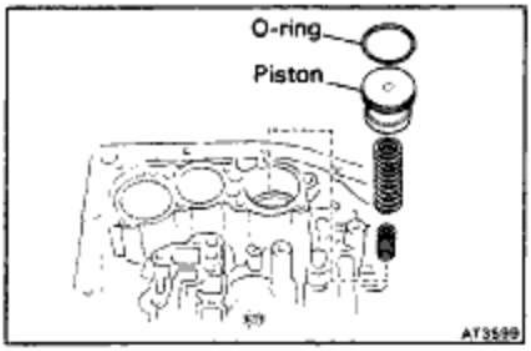


20. REMOVE THROTTLE CABLE AND SOLENOID WIRE

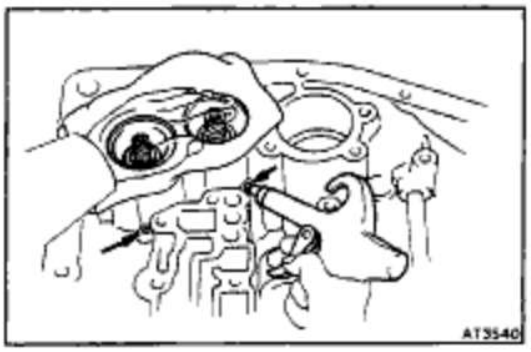


21. REMOVE ACCUMULATOR PISTONS AND SPRINGS

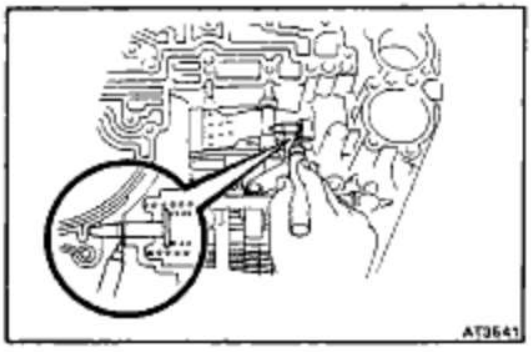
(a) Loosen the five bolts one turn at a time until the spring tension is released.
(b) Remove the cover and gasket.



(e) Remove the C1 accumulator piston.
(d) Remove the O–ring.

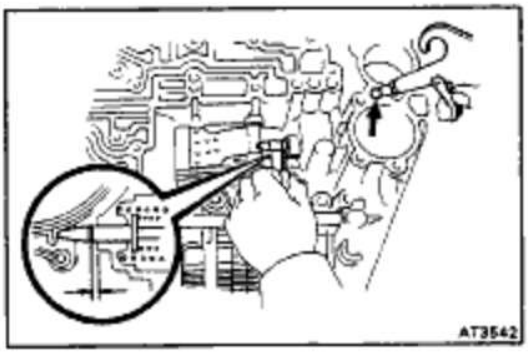


(e) Pop out pistons for C2 and B2 into a rag, using low pressure compressed air (1 kg/cm2, 14 psi or 98 kPa). Force air into the holes shown and remove the pistons and springs.
(f) Remove the 4–rings from the pistons.



22. MEASURE PISTON STROKE OF SECOND COAST BRAKE

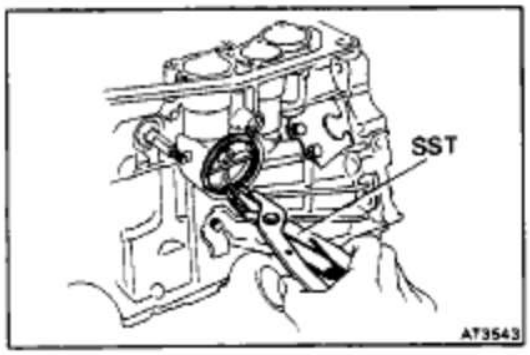
(a) Apply a small amount of paint to the piston rod at the point it meets the case as shown in the illustration.



(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm2 57 – 114 psi or 392 – 785 kPa) as shown.
SST 09240–00020

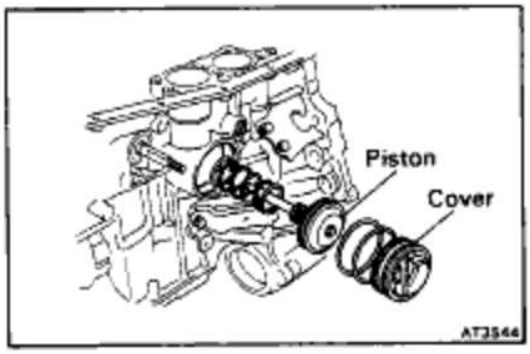
Piston stroke: 2.0 – 3.5 mm (0.079 – 0.138 in.)

if the piston stroke exceeds the limit, inspect the second coast brake band (See page AT–264).

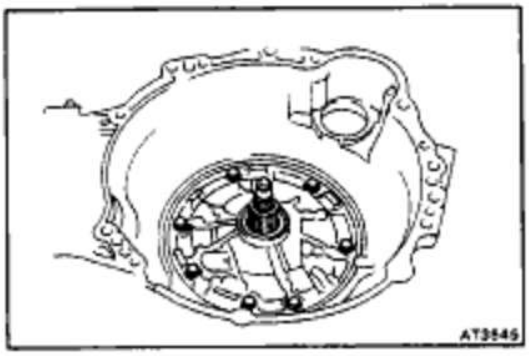


23. REMOVE SECOND COAST BRAKE PISTON

(a) Using SST, remove the snap ring.
SST 09350–32014 (09351–32050)



(b) Remove the cover.
(c) Remove the piston and outer return spring.
(d) Remove the two O–rings from the cover.

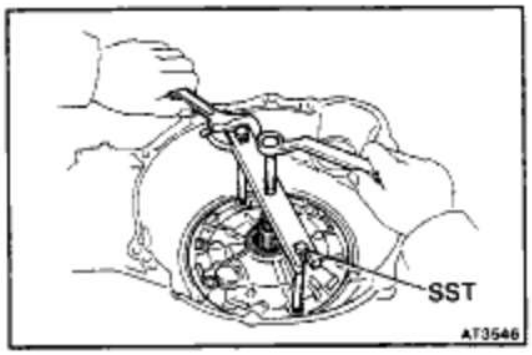


24. STAND TRANSAXLE ENGINE SIDE UPWARD

25. REMOVE OIL PUMP

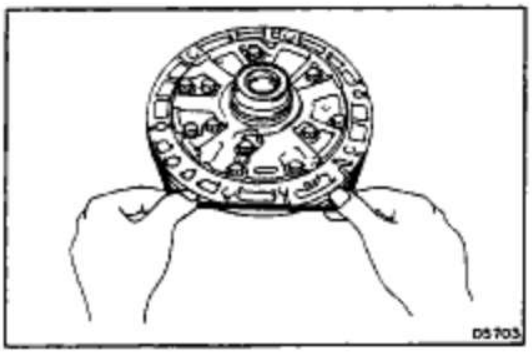
NOTICE: Before removing the oil pump, remove the second coast brake piston.

(a) Remove the seven bolts.

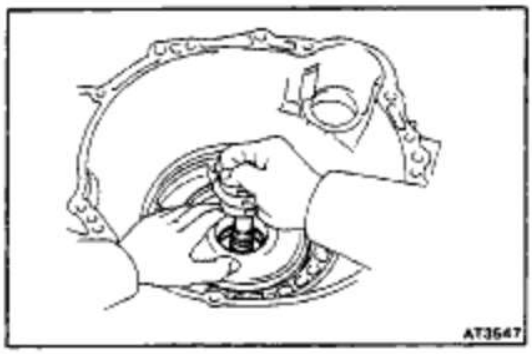


(b) Using SST, pull out the oil pump from the transaxle case.
SST 09350–32014 (09351–32061

26. REMOVE O–RING FROM OIL PUMP

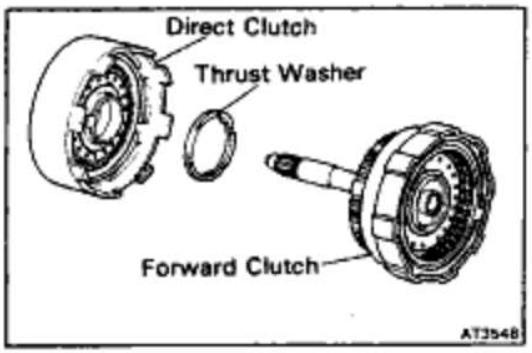


27. REMOVE DIRECT CLUTCH AND FORWARD CLUTCH

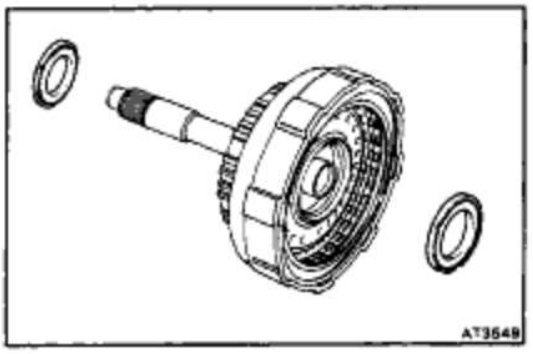


28. SEPARATE DIRECT CLUTCH AND FORWARD CLUTCH

(a) Separate the direct clutch and forward clutch.
(b) Remove the thrust washer from direct clutch.



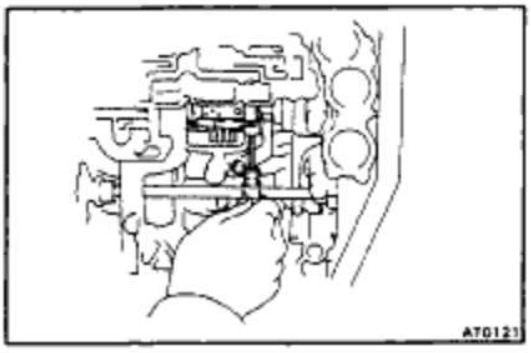
29. REMOVE BEARINGS FROM FORWARD CLUTCH

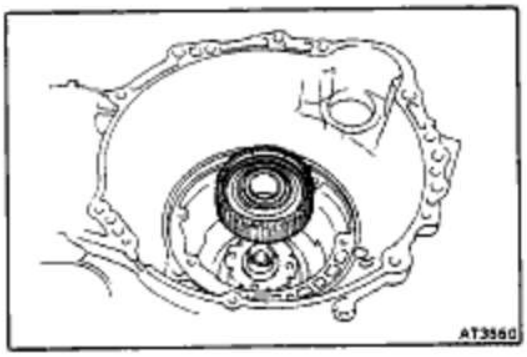


30. REMOVE SECOND COAST BRAKE BAND

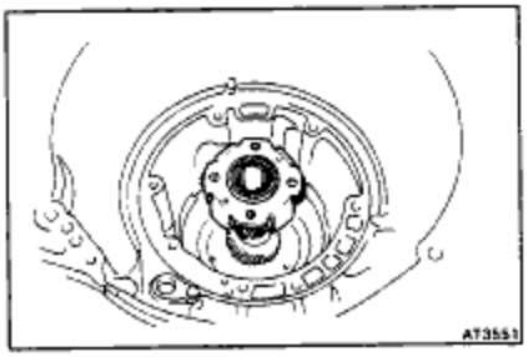
(a) Push the pin with a small screwdriver and remove it from the bolt hole of the oil pump mounting.
(b) Remove the brake band.

HINT: For the method of inspection, refer to page AT–264.



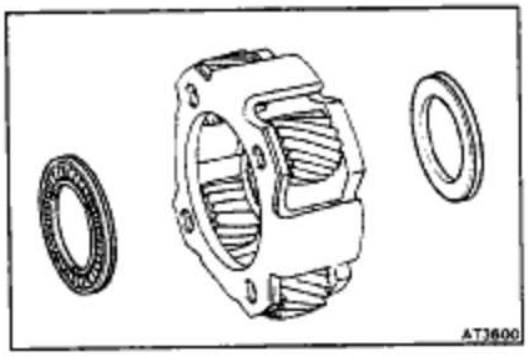


31. REMOVE FRONT PLANETARY RING GEAR

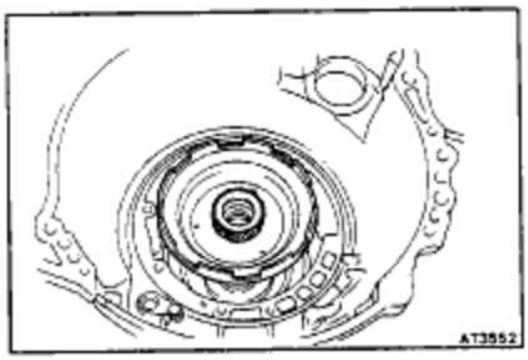


32. REMOVE FRONT PLANETARY GEAR

(a) Remove the front planetary gear.

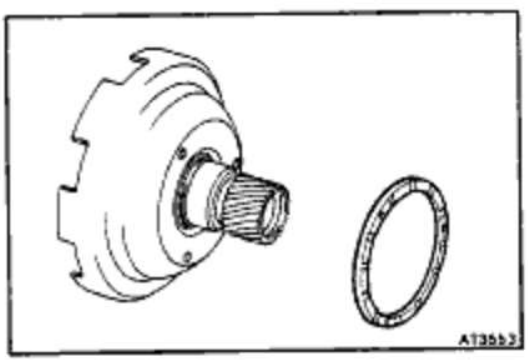


(b) Remove the two bearings from the planetary gear.

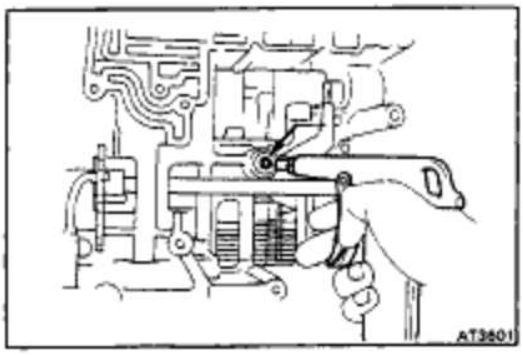


33. REMOVE SUN GEAR AND SUN GEAR INPUT DRUM

(a) Remove the sun gear and sun gear input drum.



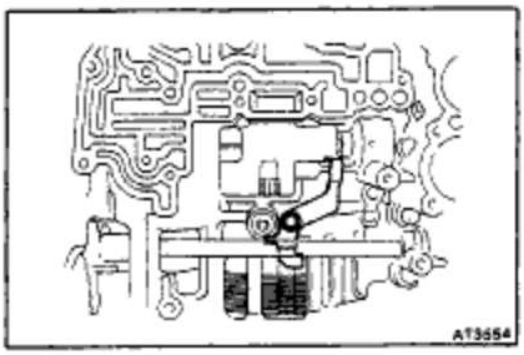
(b) Remove the thrust washer from sun gear input drum



34. CHECK OPERATION OF SECOND BRAKE PISTON

Apply compressed air into the case passage and confirm that the piston moves.

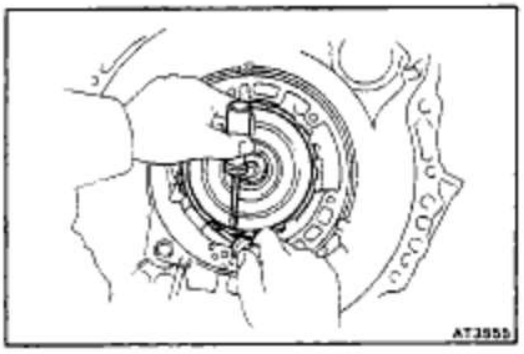
If the piston does not move, disassemble and inspect.



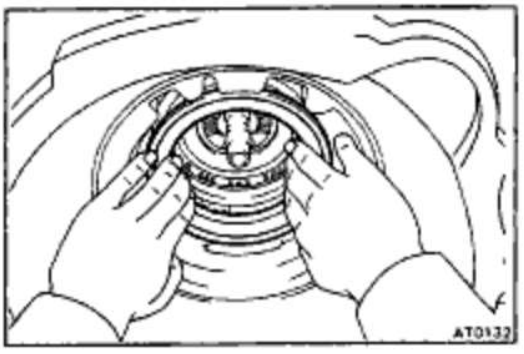
35. REMOVE SECOND COAST BRAKE BAND GUIDE

36. REMOVE SECOND BRAKE DRUM

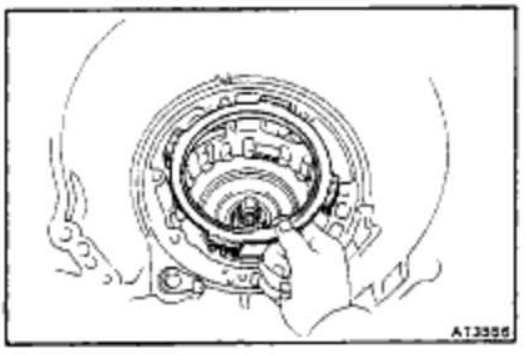
(a) Remove the snap ring.

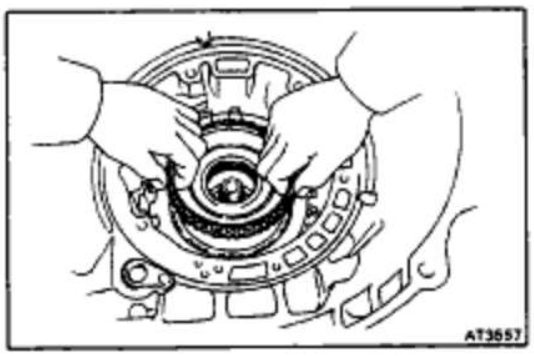


(b) Remove the second brake drum.

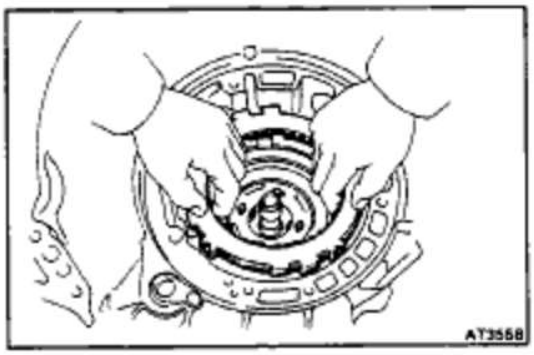


37. REMOVE SECOND BRAKE PISTON RETURN SPRING.



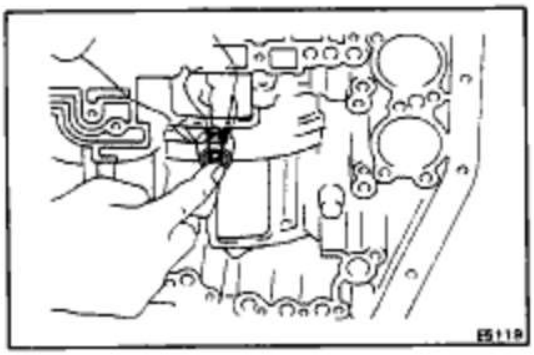


38. REMOVE NO. 1 ONE–WAY CLUTCH



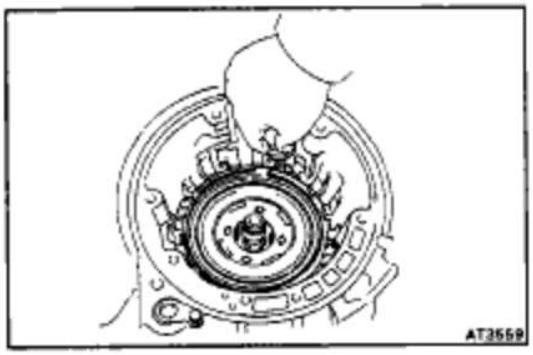
39. REMOVE PLATES, DISCS AND FLANGE

HINT: For the method of inspection, refer to page AT–285.



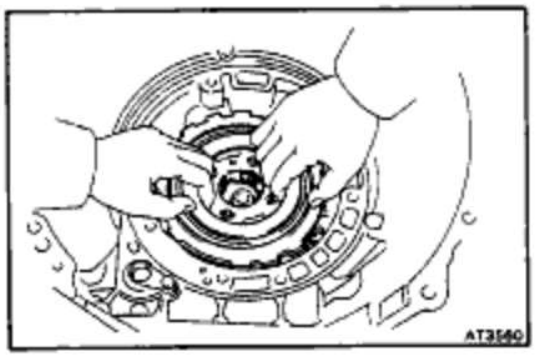
40. REMOVE SECOND BRAKE DRUM GASKET

Remove the gasket.

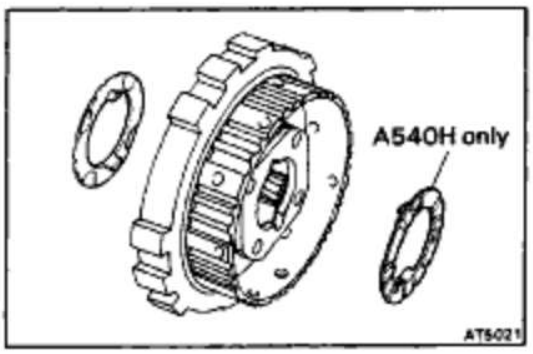


41. REMOVE NO.2 ONE–WAY CLUTCH AND REAR PLANETARY GEAR

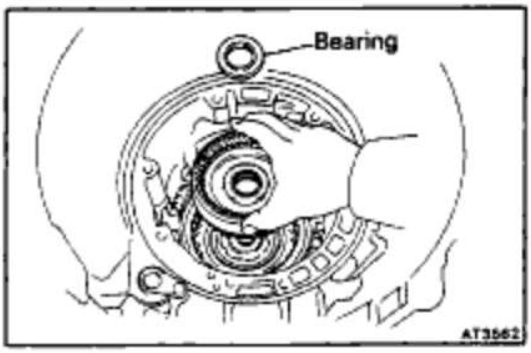
(a) Remove the snap ring.



(b) Remove the No. 2 one–way clutch and rear planetary gear.



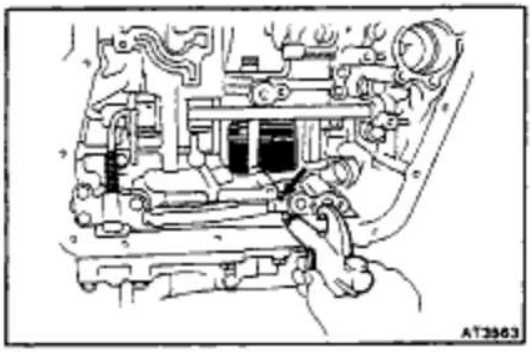
(c) Remove the thrust washer from the rear planetary gear.



42. REMOVE REAR PLANETARY RING GEAR

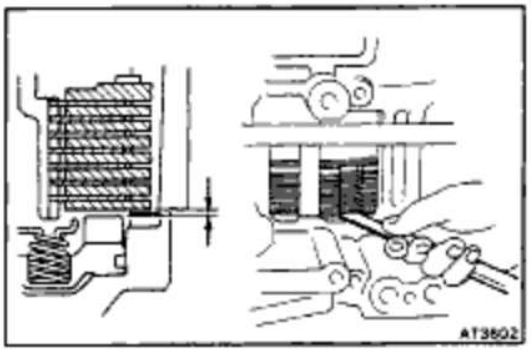
(a) Remove the rear planetary ring gear.

(b) Remove the bearing from the ring gear.



43. CHECK FIRST AND REVERSE BRAKE

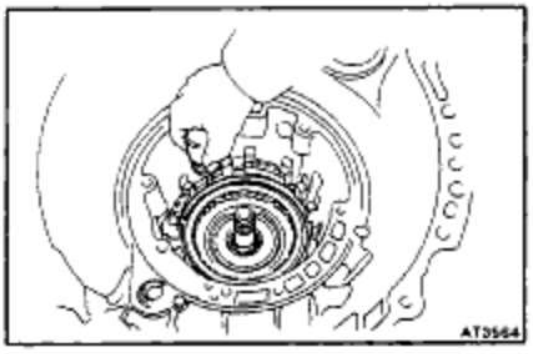
(a) Check the operation of the first and reverse brake piston
Apply compressed air into the case passage and confirm that the piston moves.
If the piston does not move, disassemble and inspect.



(b) Using a filter gauge, check the pack clearance of the first and reverse brake.

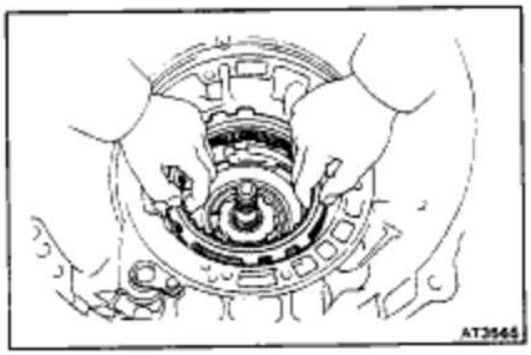
Clearance: A540E
0.85 – 2.05 mm (0.033 – 0.081 in.)
A540H
1.04 – 2.16 mm (0.041 – 0.085 in.)

If the pack clearance is not within specification, disassemble and inspect.

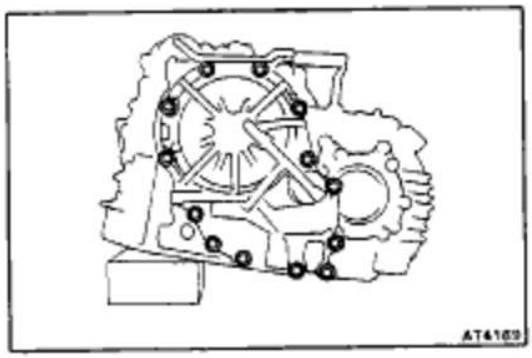


44. REMOVE FLANGE, DISCS AND PLATES OF FIRST AND REVERSE BRAKE

(a) Remove the snap ring.



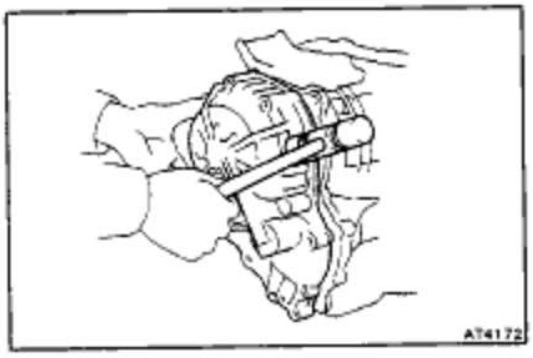
(b) Remove the flange, seven discs and seven plates.
HINT: For the method of inspection, refer to AT–289.



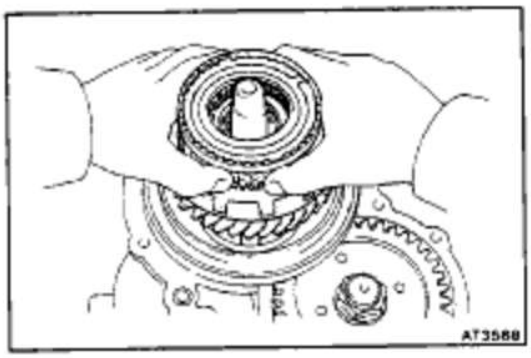
45. TURN TRANSAXLE CASE AROUND

46. REMOVE OVERDRIVE UNIT

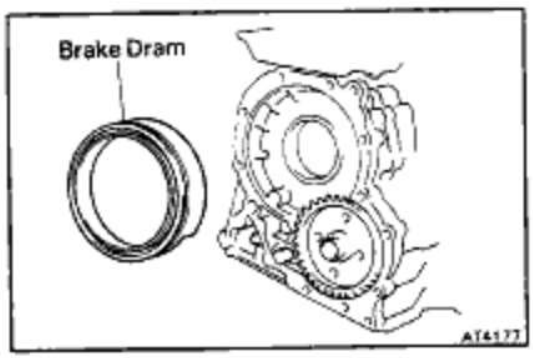
(a) Remove the thirteen bolts.



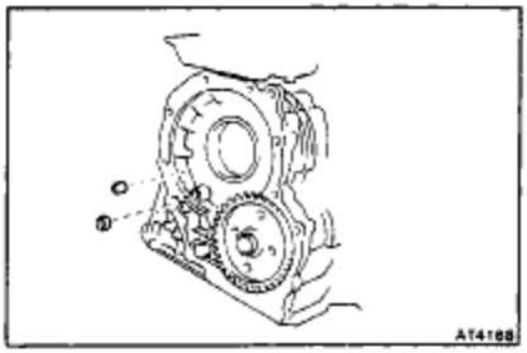
(b) Tap on the circumference of the overdrive case with a plastic hammer to remove the overdrive case and gasket.



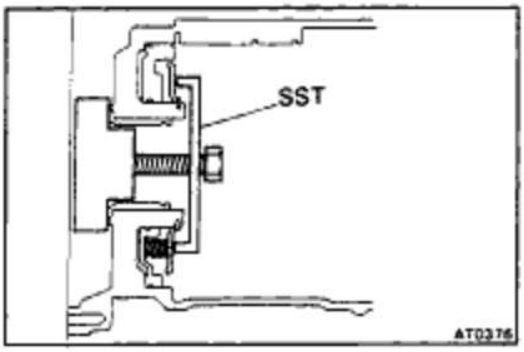
(c) Remove the overdrive planetary gear from transaxle case.



(d) Remove the overdrive brake drum from the transaxle case.



(e) Remove the overdrive clutch apply gasket and overdrive brake apply gasket.

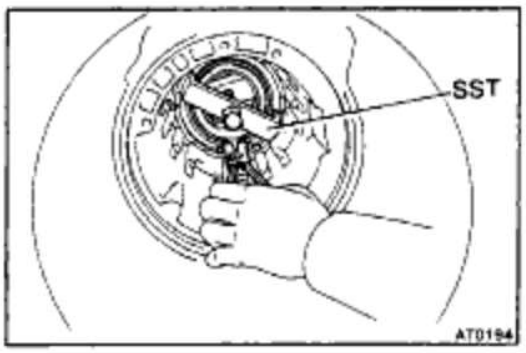


47. REMOVE FIRST AND REVERSE BRAKE PISTON

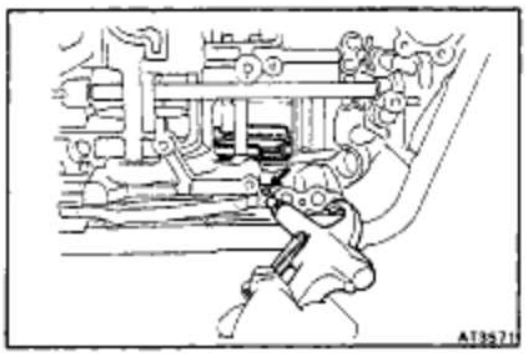
(a) Remove the piston return spring.

Place SST, and compress the return spring evenly by tightening the bolt gradually.

SST 09350–32014 (09351–32040)

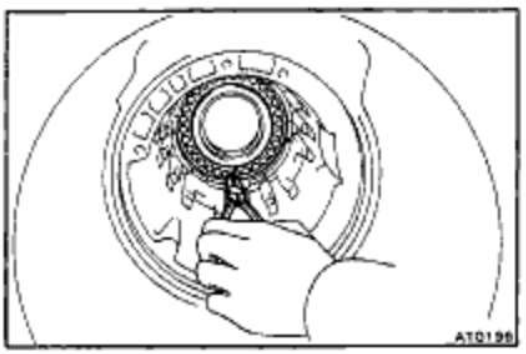


- Using snap ring pliers, remove the snap ring.
- Remove SST.
- Remove the return spring from the case.

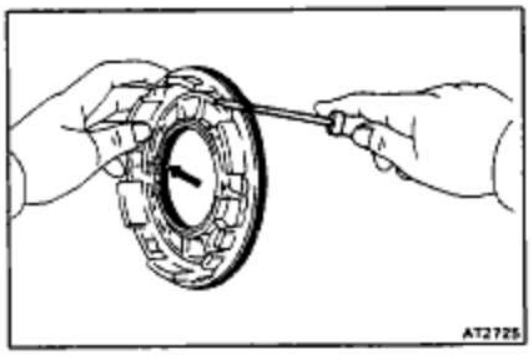


(b) Apply compressed air into the passage of the case to remove the piston.

HINT: Hold the piston so it is not slanted and blow with the gun slightly away from the oil hole.

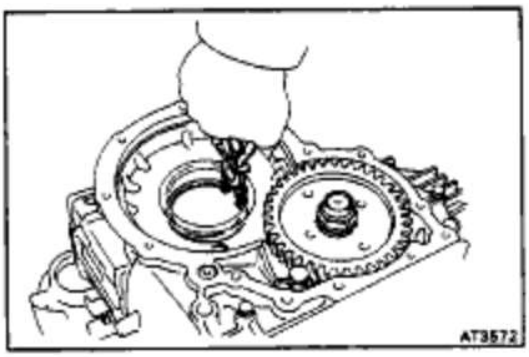


(c) If the piston does not pop out with compressed air, use needle–nose pliers to remove it.

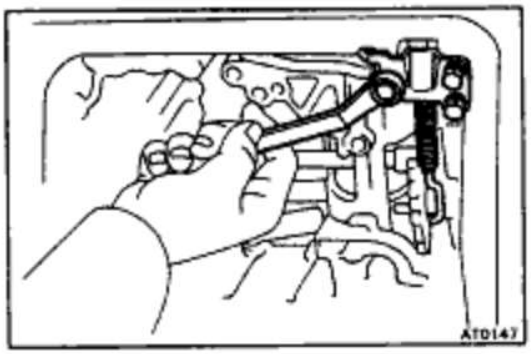


(d) Remove the two O–rings from the piston.

48. REMOVE SNAP RING FROM TRANSAXLE CASE

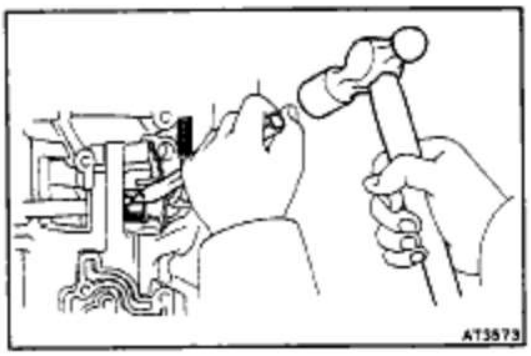


49. REMOVE PARKING LOCK PAWL BRACKET

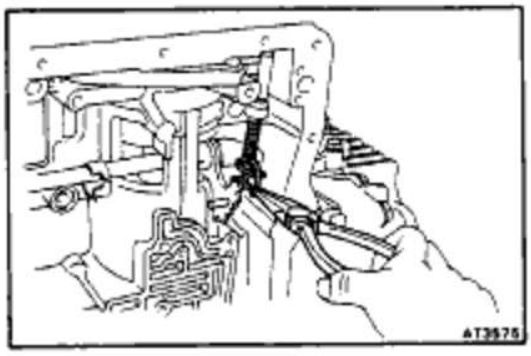


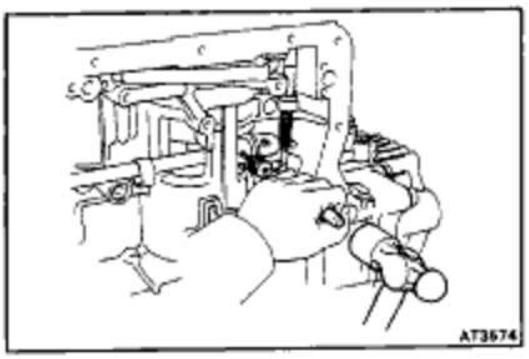
50. REMOVE MANUAL VALVE SHAFT

(a) Using a cold chisel and hammer, cut the collar.

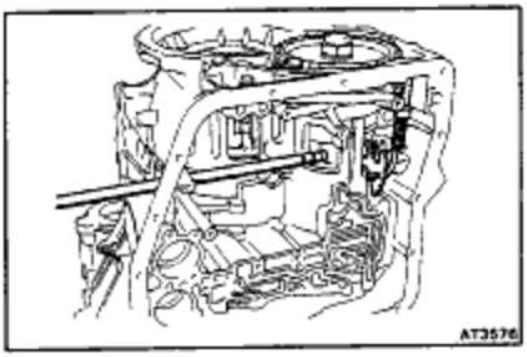


(b) Remove the retaining spring.

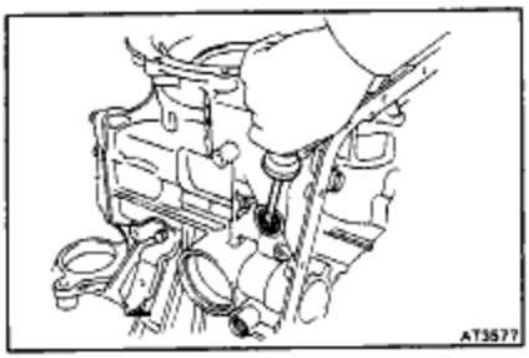




(c) Using a hammer and punch, drive out the pin.

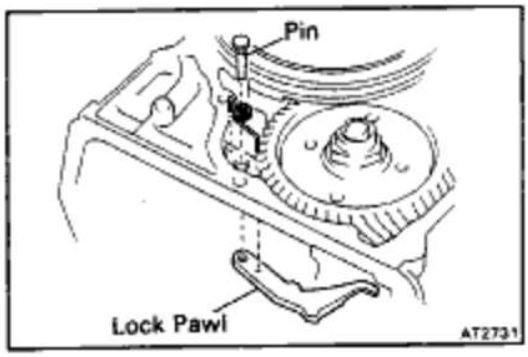


(d) Slide out the shaft from the transaxle case and remove the manual valve lever and parking lock rod.

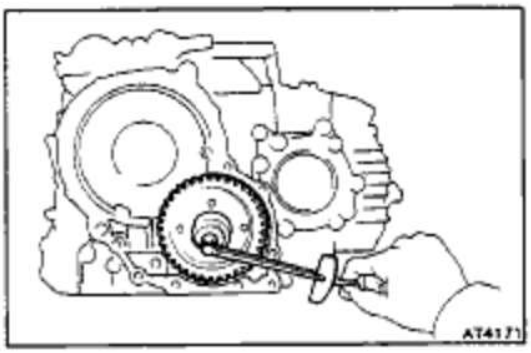


51. REMOVE MANUAL VALVE SHAFT OIL SEAL

Using a screwdriver, remove the oil seal.



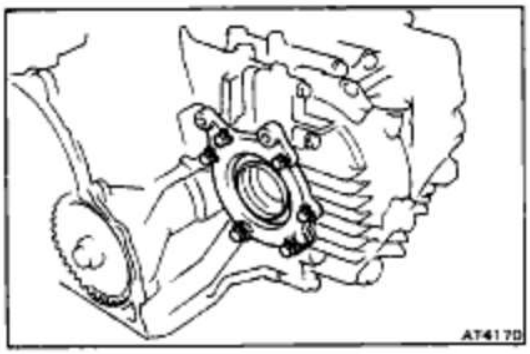
52. REMOVE PIN, SPRING AND PARKING LOCK PAWL



REMOVAL OF DIFFERENTIAL COMPONENT PARTS

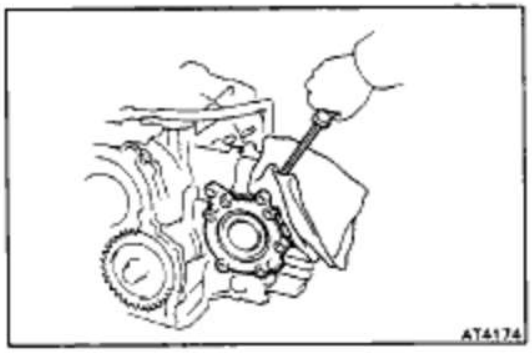
1. MEASURE DIFFERENTIAL TOTAL PRELOAD

Using a torque meter measure the total preload, and make a note of it.



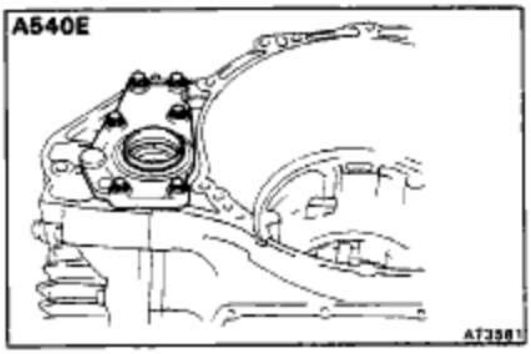
2. REMOVE LH BEARING RETAINER

(a) Remove the six bolts.



(b) Using a large screwdriver, remove the LH bearing retainer.

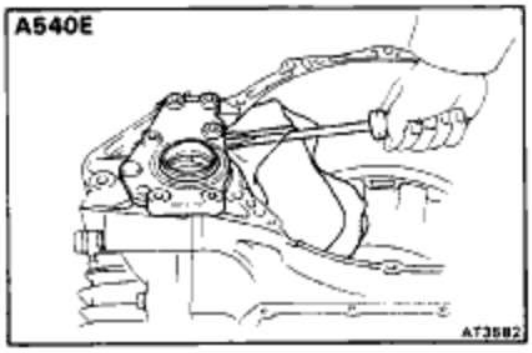
NOTICE: Wrap the screwdriver in a rag, etc. to avoid damage to the case and retainer.



3. (A540E)

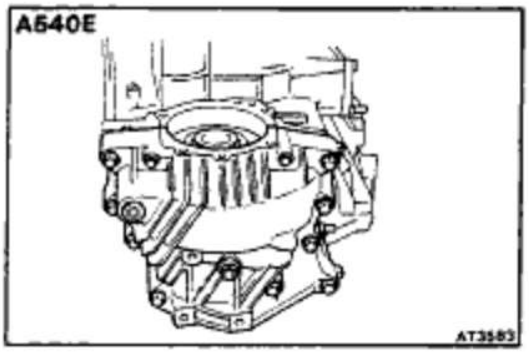
REMOVE RH RETAINER

(a) Remove the six bolts.



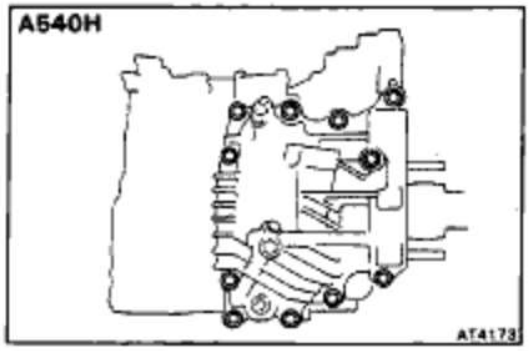
(b) Using a large screwdriver, remove the RH retainer.

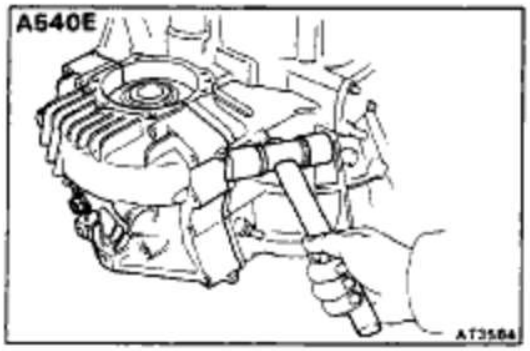
NOTICE: Wrap the screwdriver in a rag, etc. to avoid damage to the case and retainer.



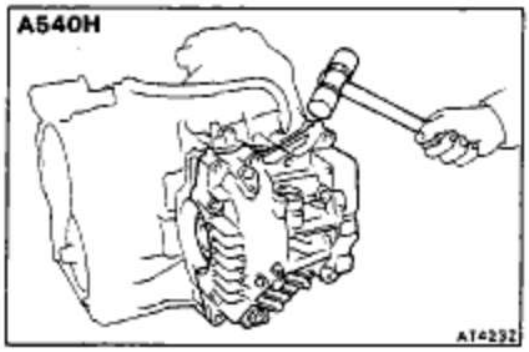
4. REMOVE CARRIER COVER

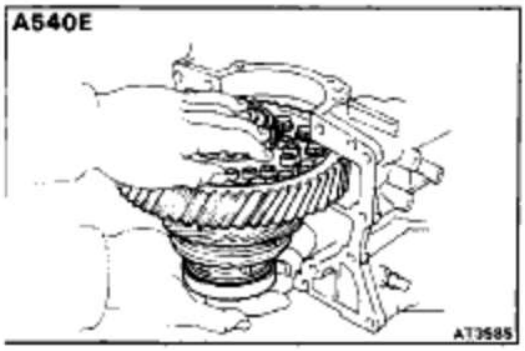
(a) Remove the eleven bolts.





(b) Tap the carrier cover with a plastic hammer to remove it.

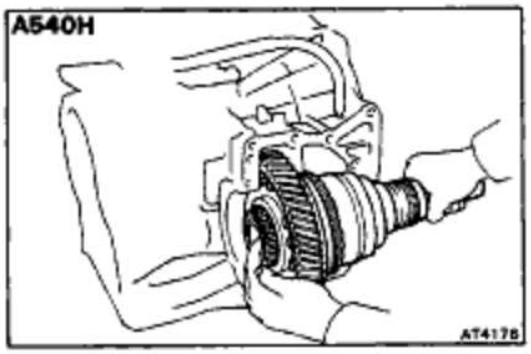




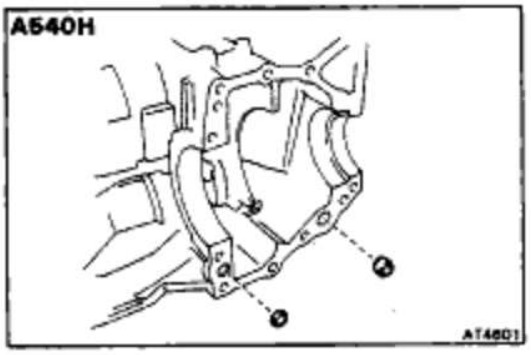
5. REMOVE DIFFERENTIAL CASE

(a) (A540E)

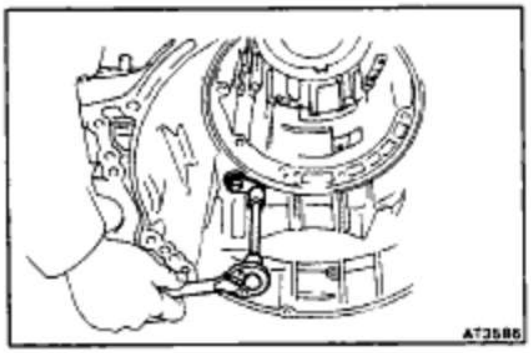
Remove the differential case, outer race and shim from the transaxle case.



(a) (540H)
Remove the differential assembly.

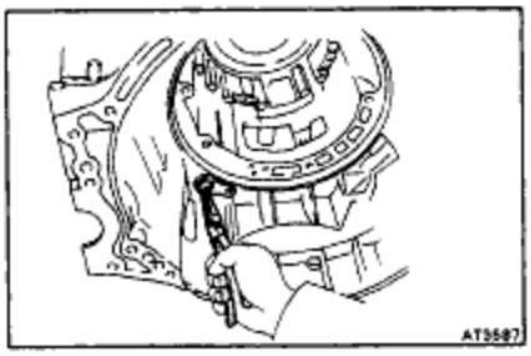


(b) Remove the two apply gaskets.

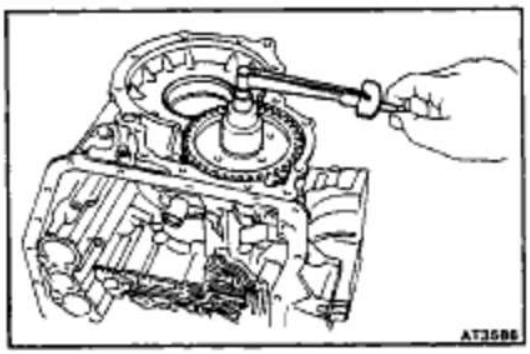


6. REMOVE DRIVE PINION CAP

(a) Remove the bolt.



(b) Using pliers, pull out the drive pinion cap.
(c) Remove the O–rings from the cap.



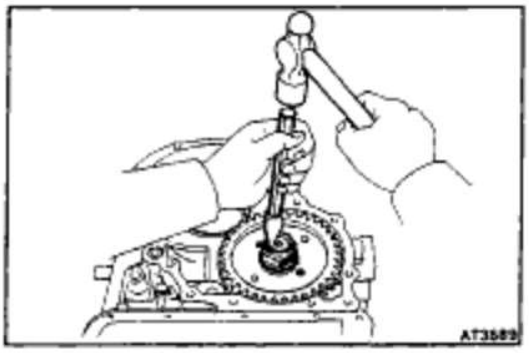
7. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the drive pinion preload.

Preload (at starting) : Reused bearing

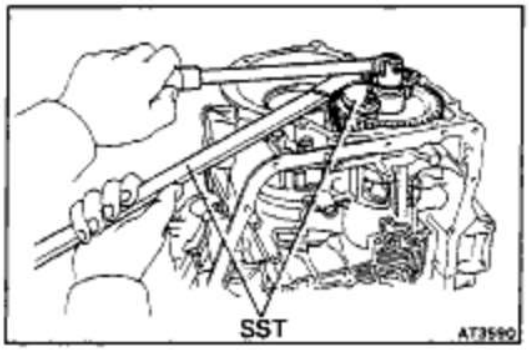
5 – 8 kg–cm (4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

The total preload measured in step 1 minus the drivE pinion preload equals 1.3 – 2.0 kg–cm (1.1 – 1.7 in.–lb 0.1 – 0.2 N–m). If the result is not within this specification the side bearing preload is bad.

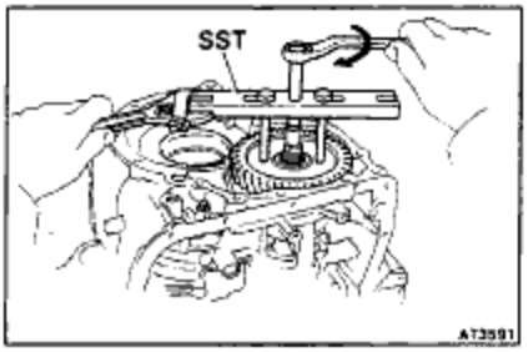


8. REMOVE COUNTER DRIVEN GEAR

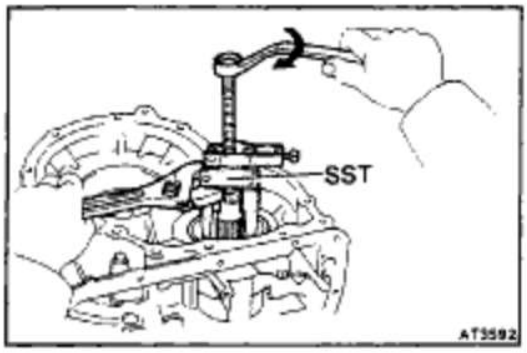
(a) Using a chisel, loosen the staked part of the nut.



(b) Using SST to hold the gear, remove the nut.
SST 09330–00021, 09350–32014 (09351–32032)

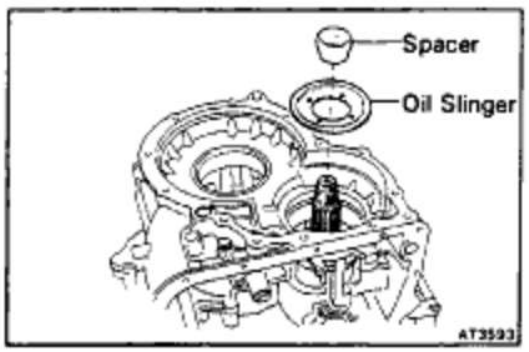


(e) Using SST, remove the gear and bearing.
SST 09350–32014 (09351–32061)

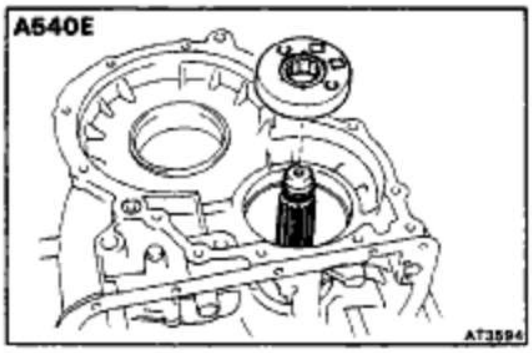


9. REMOVE OUTER RACE, SPACER AND OIL SLINGER

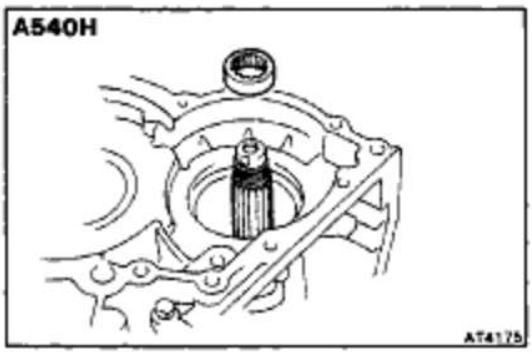
(a) Using SST, remove the outer race.
SST 09350–32014 (09308–10010)



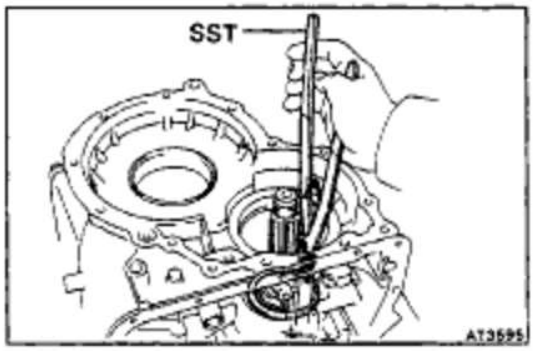
(b) Remove the spacer and oil slinger.



10. (A540E)
REMOVE SENSOR ROTOR

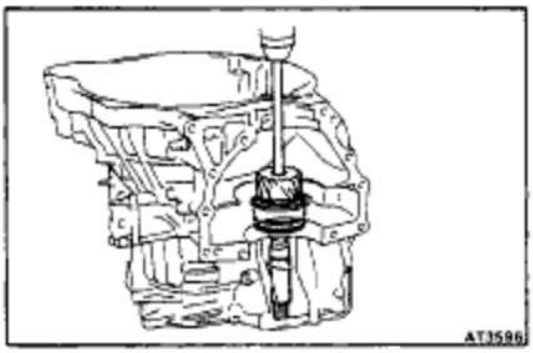


11. (A540H)
REMOVE DRIVE PINION BEARING NO. 2 SPACER



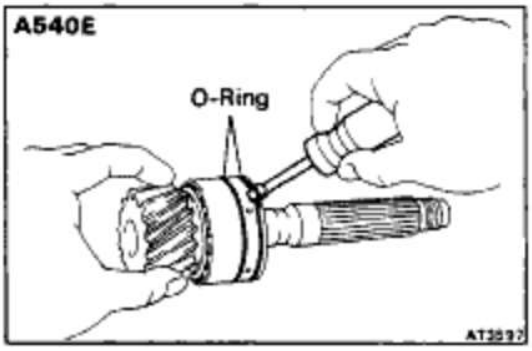
12. REMOVE DRIVE PINION

(a) Using SST, remove the snap ring.
SST 09350–32014 (09351–32050)

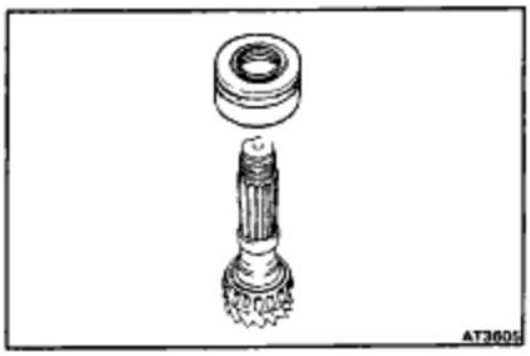


(b) Insert the bar into the case hole to drive out the drive pinion.

(c) Using a press, drive out the drive pinion from transaxle case.

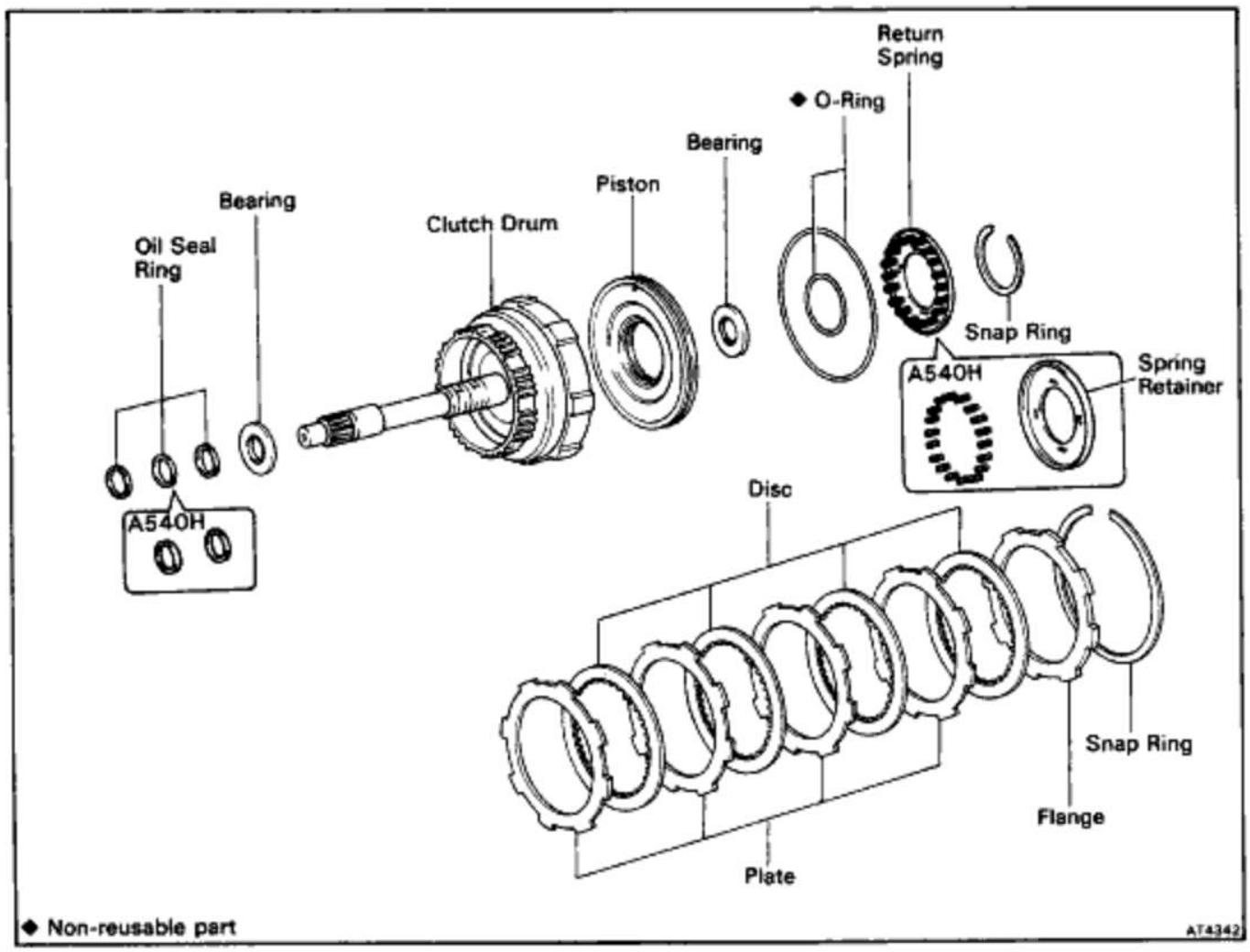


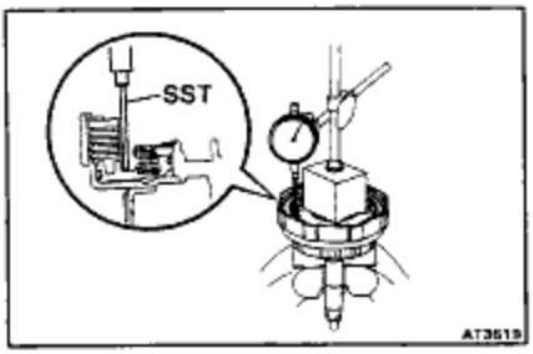
(d) (A540E)
Remove the two O–rings from the bearing cage.

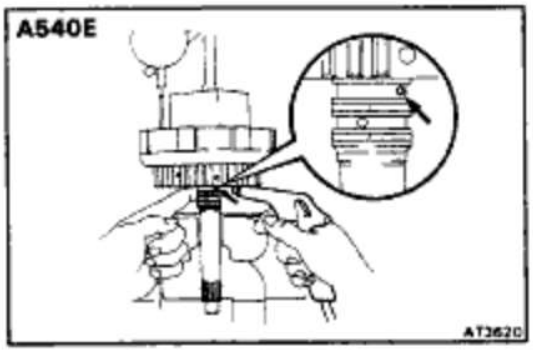


(e) Remove the bearing cage from drive pinion.

Forward Clutch







DISASSEMBLY OF FORWARD CLUTCH

1. CHECK PISTON STROKE OF FORWARD CLUTCH

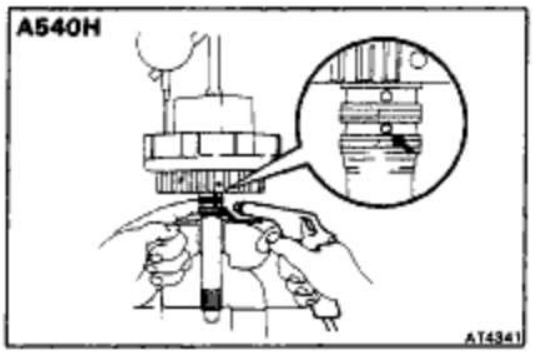
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 78E kPa) as shown.

SST 09350–32014 (09351–32190)

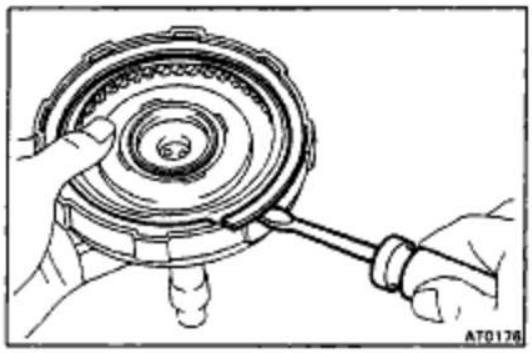
Piston stroke: 1.41 – 1.82 mm

(0.0555 – 0.0717 in.)

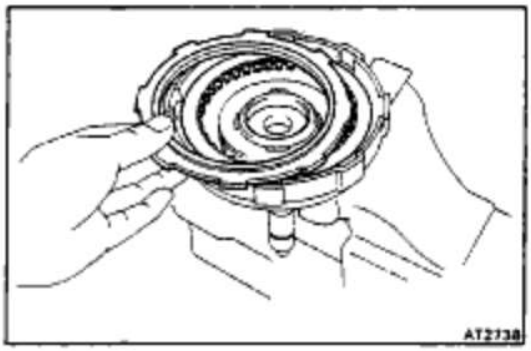
If the piston stroke is greater than the maximum, inspect each component.



2. REMOVE SNAP RING FROM CLUTCH DRUM



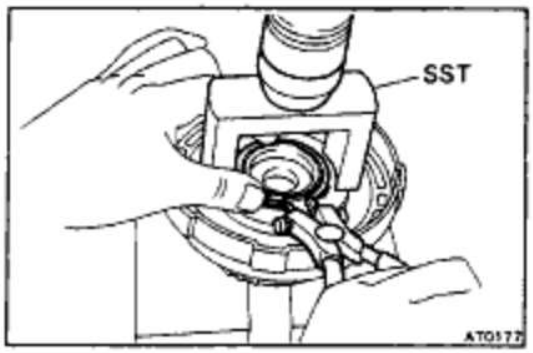
3. REMOVE FLANGE, DISCS AND PLATES

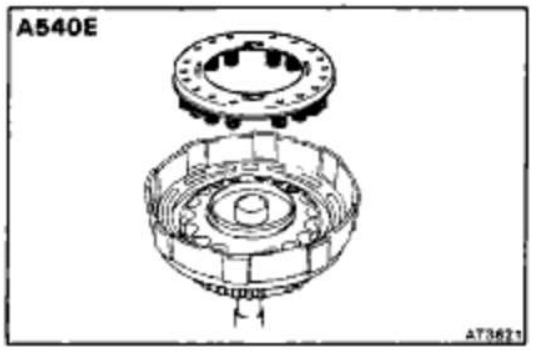


4. REMOVE RETURN SPRING

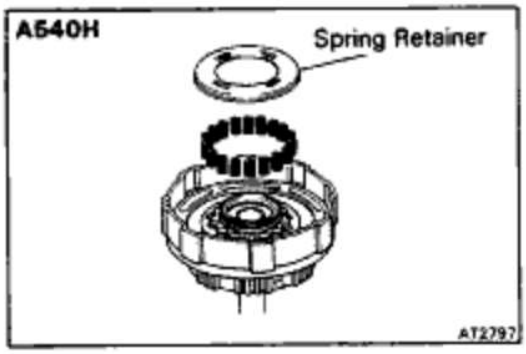
(a) Place SST on the spring retainer and compress the springs with a shop press.
SST 09350–32014 (09351–32070)

(b) Remove the snap ring using snap ring pliers.

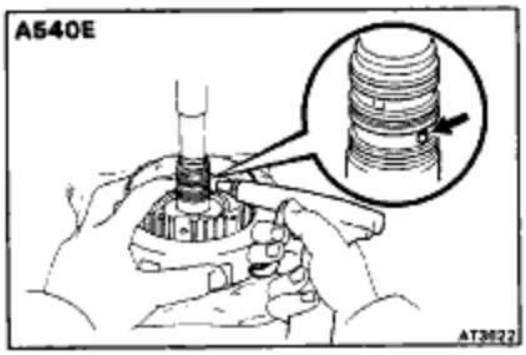




(c) (A540E)
Remove the return spring.

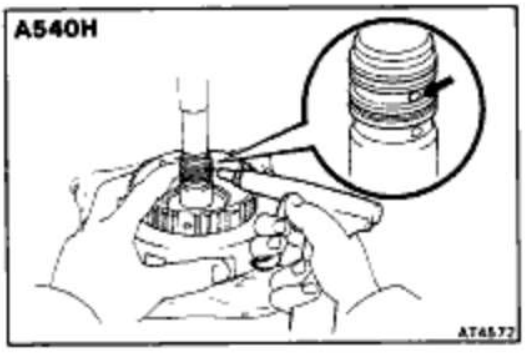


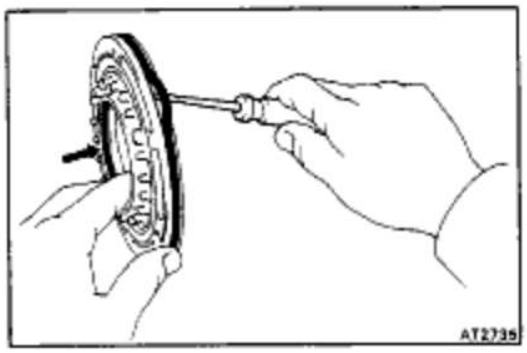
(A540H)
Remove the spring retainer and eighteen return springs.



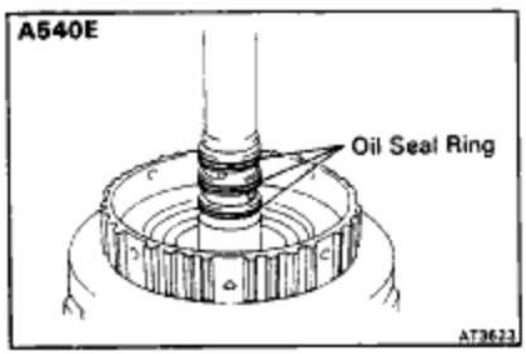
5. REMOVE CLUTCH PISTON

(a) Apply compressed air into the oil passage to remove the piston.
If the piston does not come out, use needle–nose pliers to remove it.

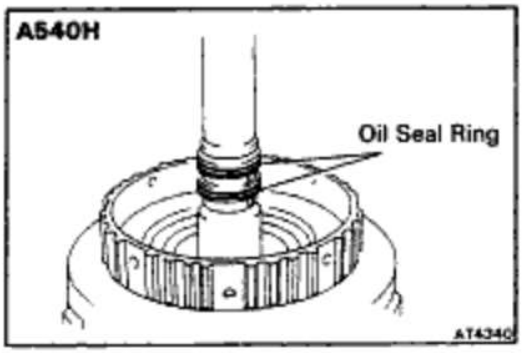




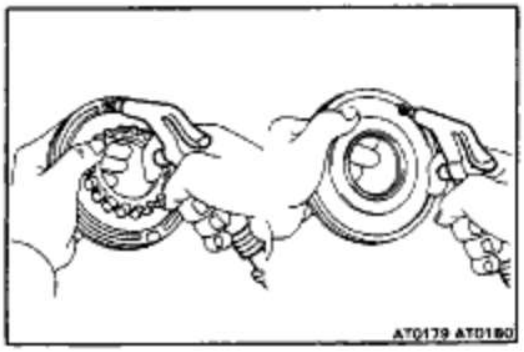
(b) Remove the two 4–rings from the piston.



S. IF NECESSARY, REMOVE OIL SEAL RINGS (A540E)
Remove the three oil seal rings from the shaft.



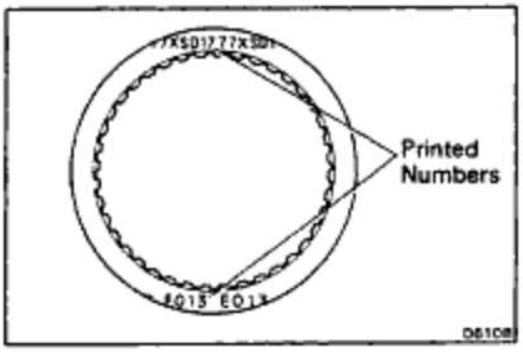
(A540H)
Remove the two oil seal rings from the shaft.



INSPECTION OF FORWARD CLUTCH

1. INSPECT CLUTCH PISTON

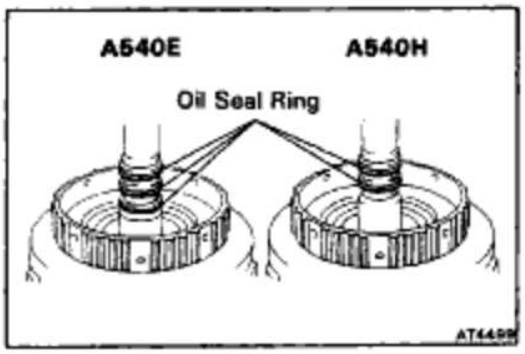
(a) Check that the check ball is free by shaking the piston.
(b) Check that the valve does not leak by applying low pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

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



ASSEMBLY OF FORWARD CLUTCH

1. (A540E, A540H)

INSTALL OIL SEAL RINGS

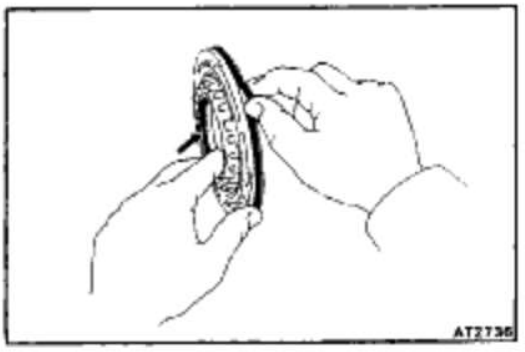
Install the three oil seal rings (A540E) or two oil seal rings (A540H) to the shaft.

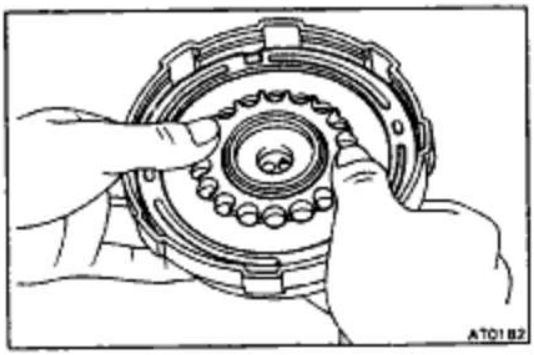
NOTICE: Do not spread the ring ends more than necessary.

HINT: After installing the oil seal rings, check that they move smoothly.

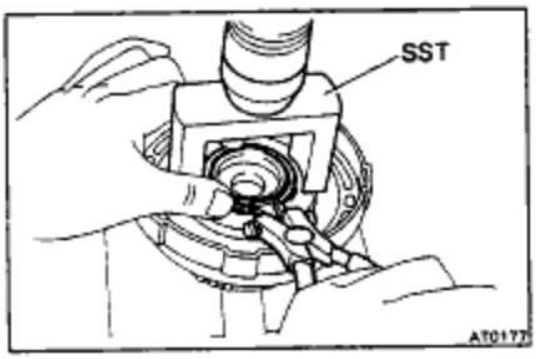
2. INSTALL CLUTCH PISTON TO CLUTCH DRUM

(a) Install the two new O–rings, to the piston.



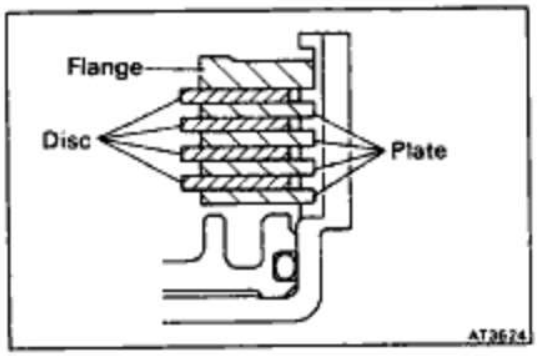


(b) Coat the O–rings with ATF.
(c) Press the piston into the drum with the cup side up, being careful not to damage the O–rings.



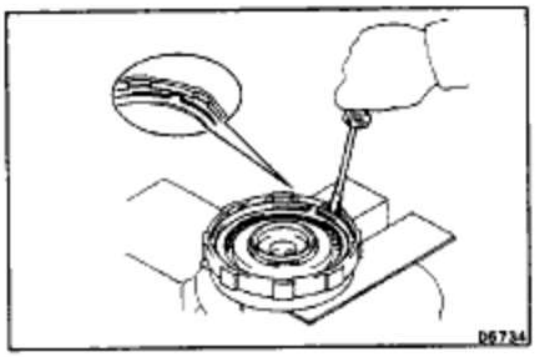
3. INSTALL PISTON RETURN SPRINGS

(a) Place the return spring and snap ring onto the piston.
(b) Place SST on the spring retainer, and compress the springs with a shop press.
SST 09350–32014 (09351–32070)
(e) 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.



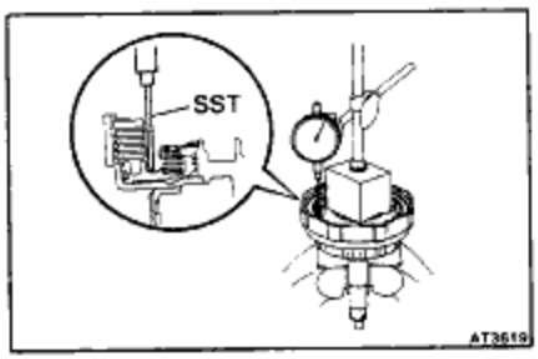
4. INSTALL PLATES, DISCS AND FLANGE

(a) Install the plates and discs.
Install in order: P=Plate D=Disc
P–D–P–D–P–D–P–D
(b) Install the flange with the flat end facing downward.



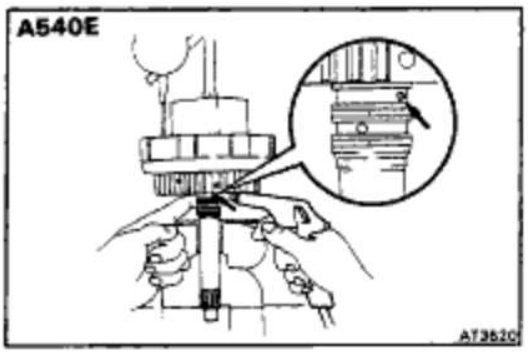
5. INSTALL SNAP RING

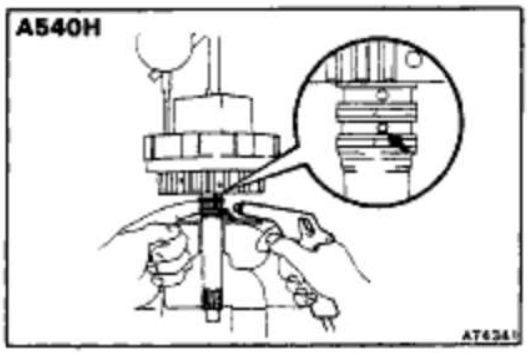
Check that the end gap of snap ring is not aligned with one of the cutouts.



6. RECHECK PISTON STROKE OF FORWARD CLUTCH

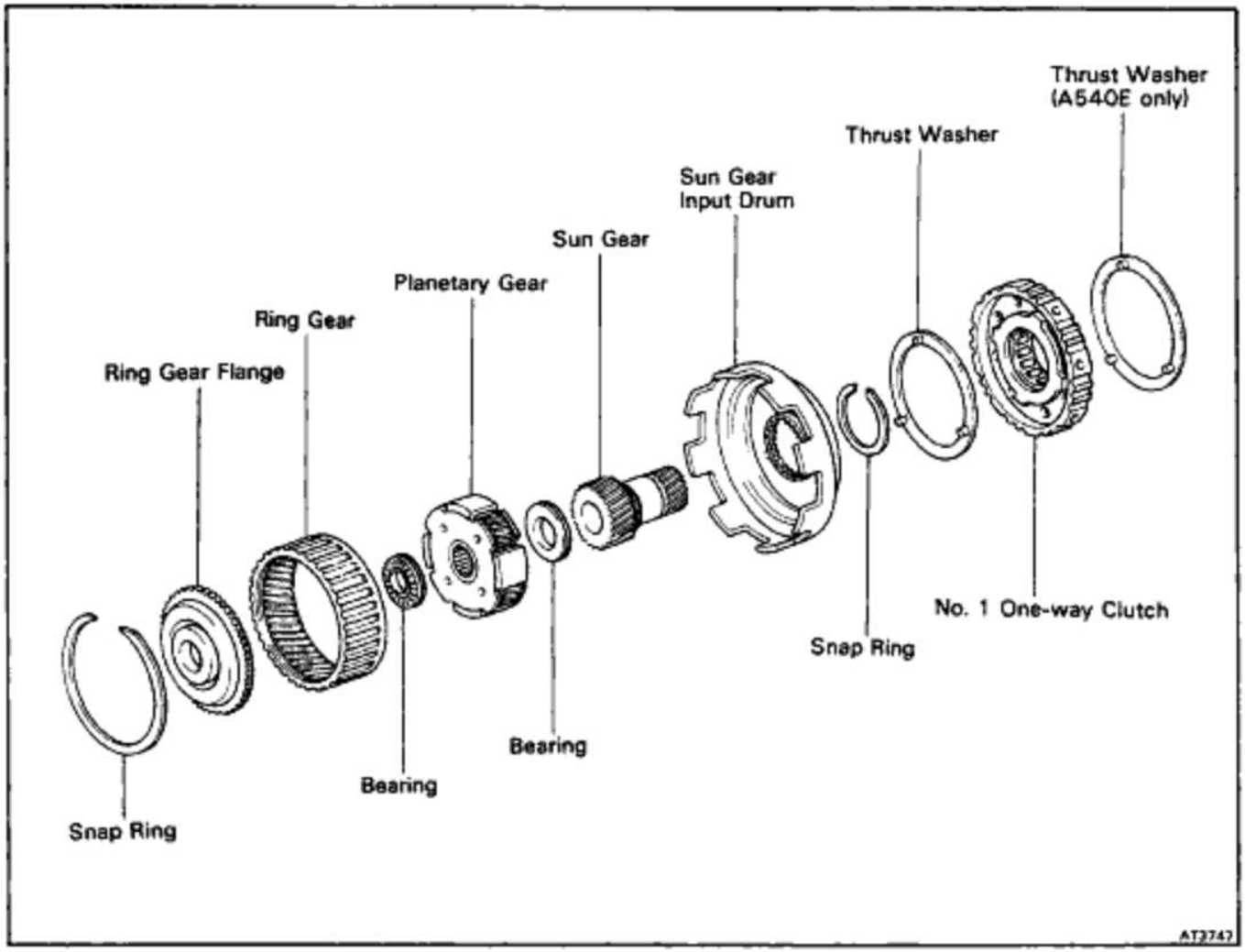
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi, 392 – 785 kPa) as shown next page.
SST 09350–32014 (09351–32190)
Piston stroke: 1.41 – 1.82 mm
(0.0555 – 0.0717 in.)

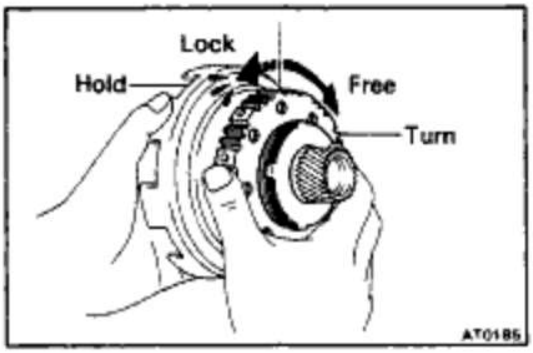




If the piston stroke is nonstandard, select another flange.
HINT: There are two different thicknesses for the flange.
Flange thickness: 3.00 mm (0.1181 in.)
3.37 mm (0.1327 in.)

Front Planetary Gear

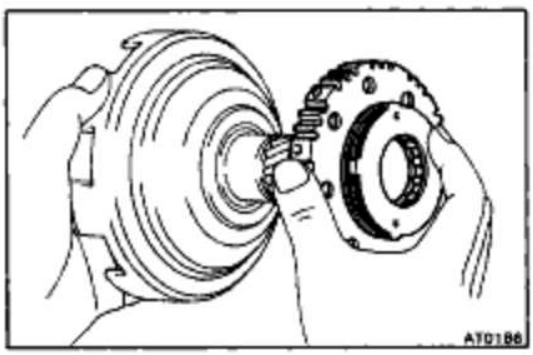




DISASSEMBLY OF NO. 1 ONE–WAY CLUTCH AND SUN GEAR

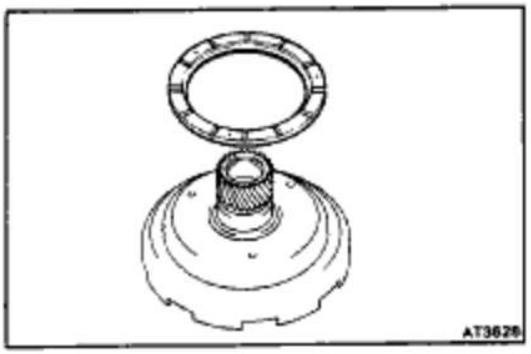
1. CHECK OPERATION OF NO. 1 ONE–WAY CLUTCH

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

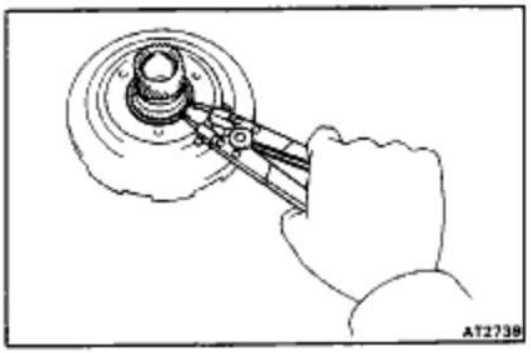


2. REMOVE NO. 1 ONE–WAY CLUTCH FROM SUN GEAR .

While turning the hub clockwise, remove the No. 1 one–way clutch from the sun gear.



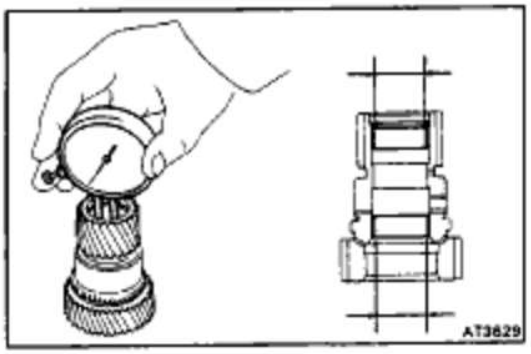
3. REMOVE THRUST WASHER FROM SUN GEAR INPUT DRUM



4. REMOVE SUN GEAR FROM DRUM

(a) Using snap ring pliers, remove the snap ring from the drum.

(b) Remove the sun gear from the drum.

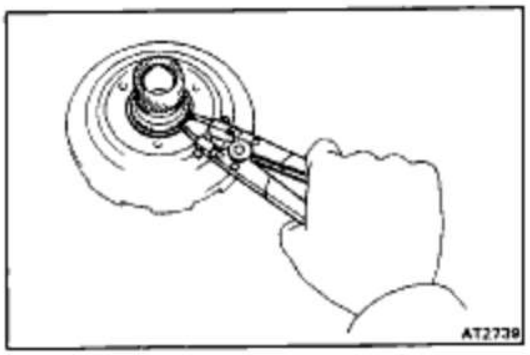


5. CHECK SUN GEAR BUSHINGS

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

Maximum inside diameter: 22.59 mm(0.8894 in.)

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

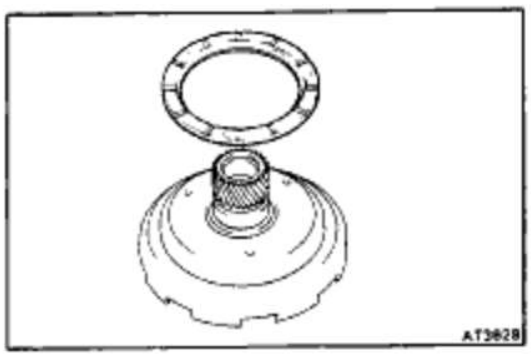


ASSEMBLY OF NO. 1 ONE–WAY CLUTCH AND SUN GEAR

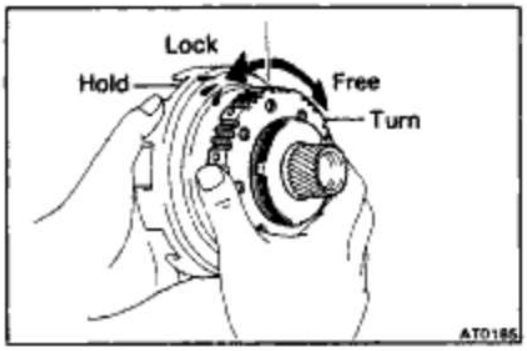
1. INSTALL SUN GEAR TO DRUM

(a) Install the sun gear to the drum.

(b) Using snap ring pliers, install the snap ring to drum.



2. INSTALL THRUST WASHER TO SUN GEAR INPUT DRUM

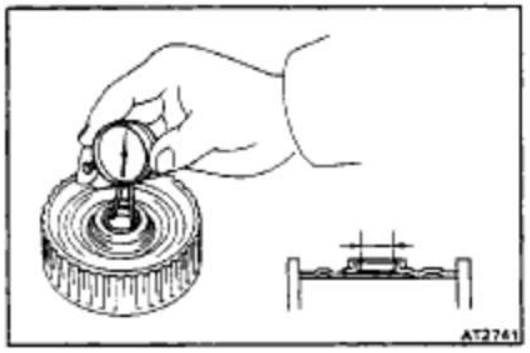


3. INSTALL NO. 1 ONE–WAY CLUTCH ON SUN GEAR

While turning the hub clockwise, slide the No. 1 one–way clutch onto the sun gear.

4. RECHECK OPERATION OF NO. 1 ONE–WAY CLUTCH

INSPECTION OF PLANETARY RING GEAR

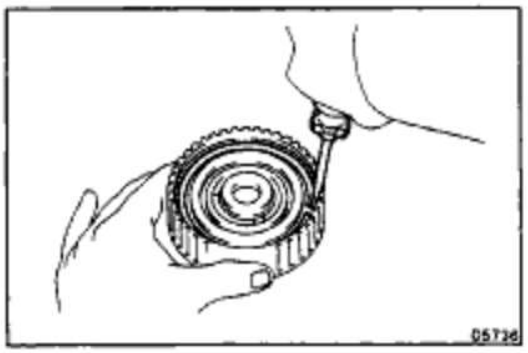


1. INSPECT RING GEAR FLANGE BUSHING

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

Maximum inside diameter: 30.08 mm (1.1842 in.)

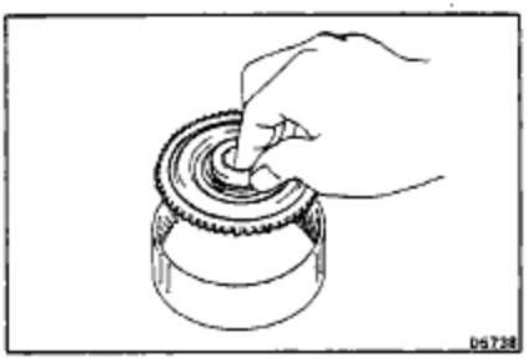
If the inside diameter is greater than the maximum, replace the flange.



2. REMOVE RING GEAR FLANGE

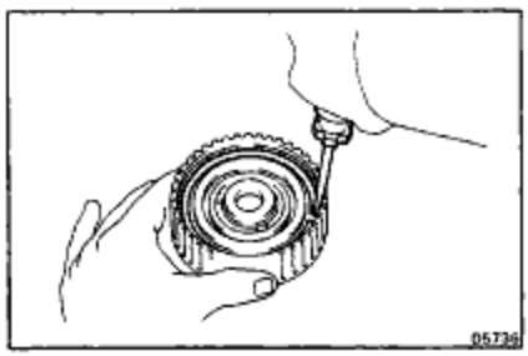
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

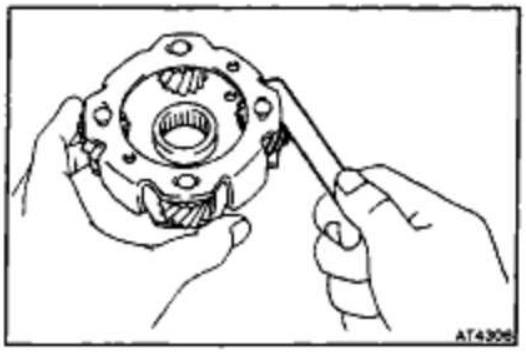


3. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.



(b) Using a screwdriver, install the snap ring.



INSPECTION OF FRONT PLANETARY GEAR

MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

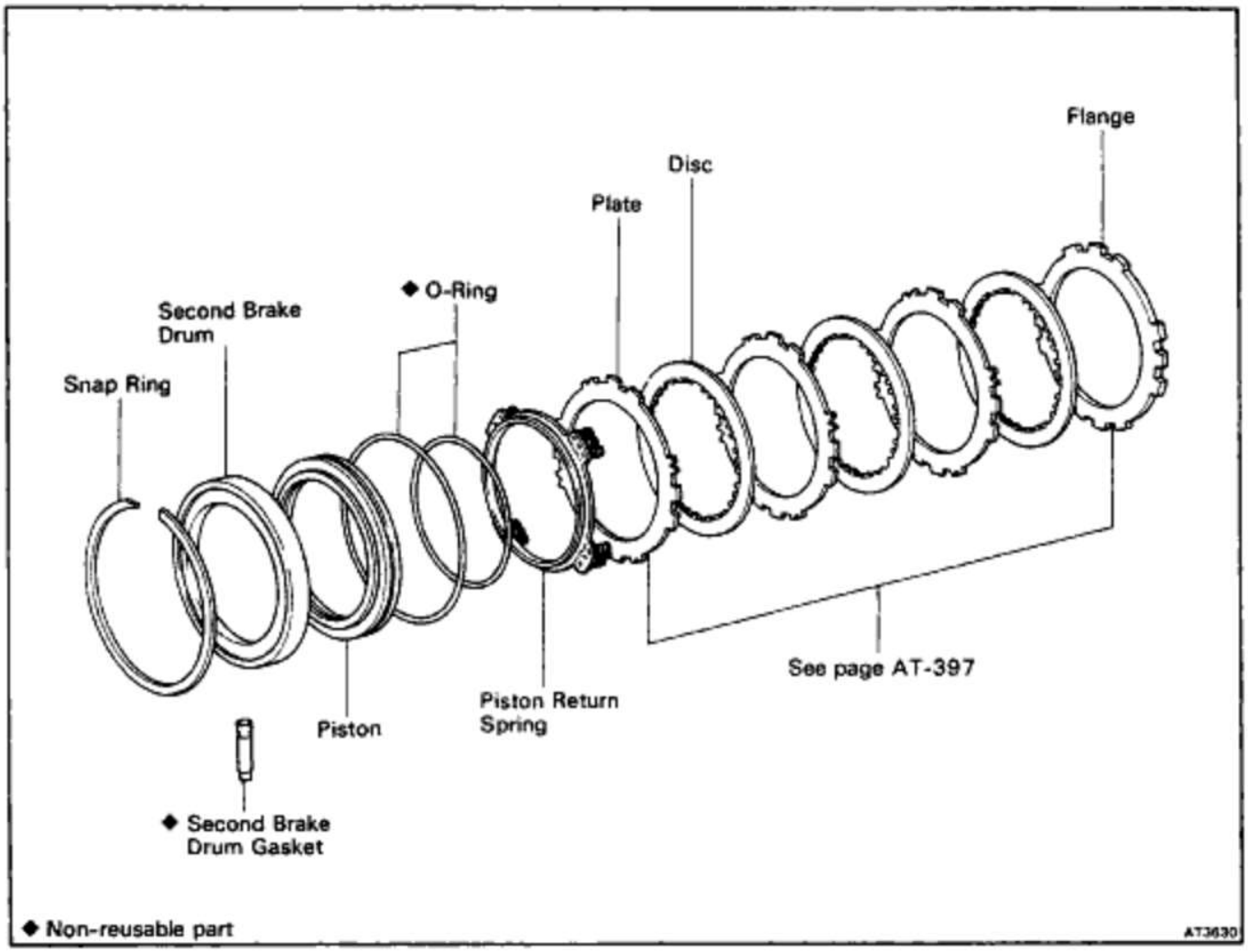
Using a feeler gauge, measure the planetary pinion gear thrust clearance.

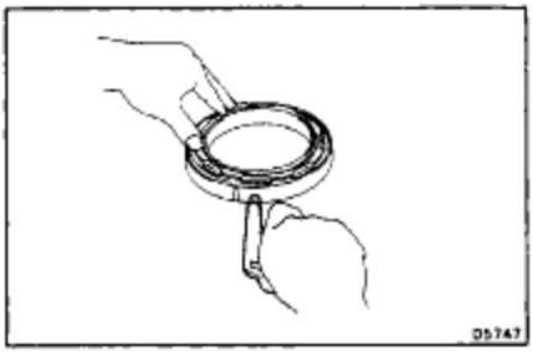
Standard clearance: 0.16 – 0.56 mm
(0.0063 – 0.0220 in.)

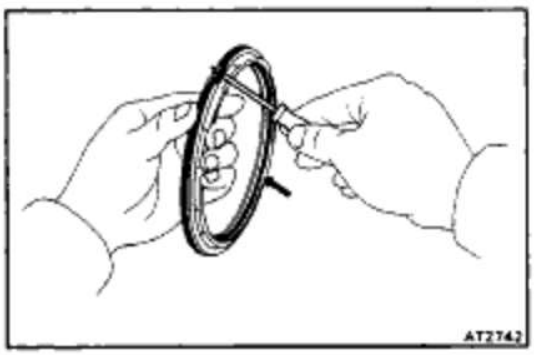
Maximum clearance: 0.61 mm
(0.0240 in.)

If the clearance is greater than the maximum, replace the planetary gear assembly.

Second Brake





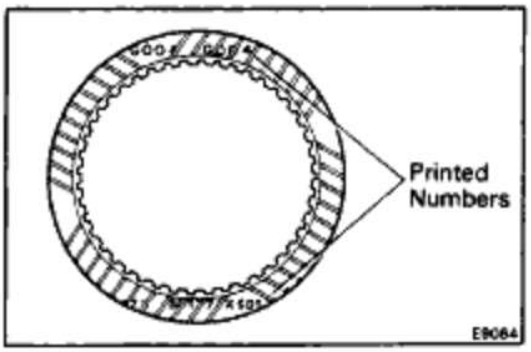


DISASSEMBLY OF SECOND BRAKE PISTON

REMOVE SECOND BRAKE PISTON

(a) Apply compressed air to the oil hole to remove the piston.

(b) Remove the two O–rings from the piston.



INSPECTION OF SECOND BRAKE COMPONENT

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.

HINT:

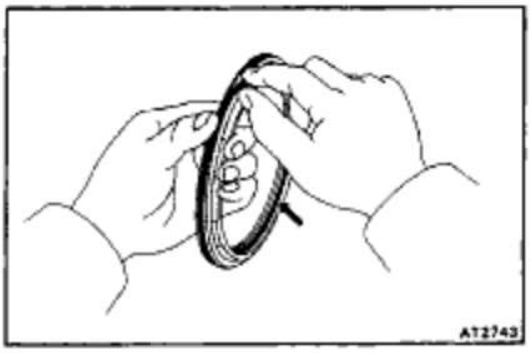
- If the lining of the disc is exfoliated or discolored, or even a part of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

ASSEMBLY OF SECOND BRAKE PISTON

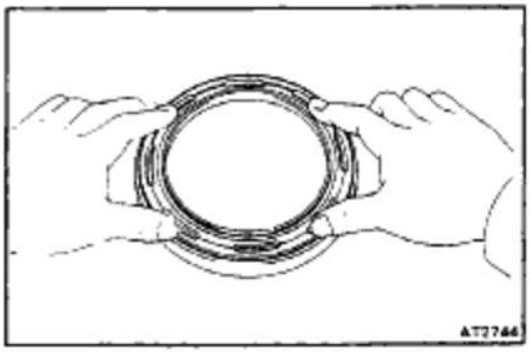
INSTALL PISTON

(a) Coat a new O–ring with ATF.

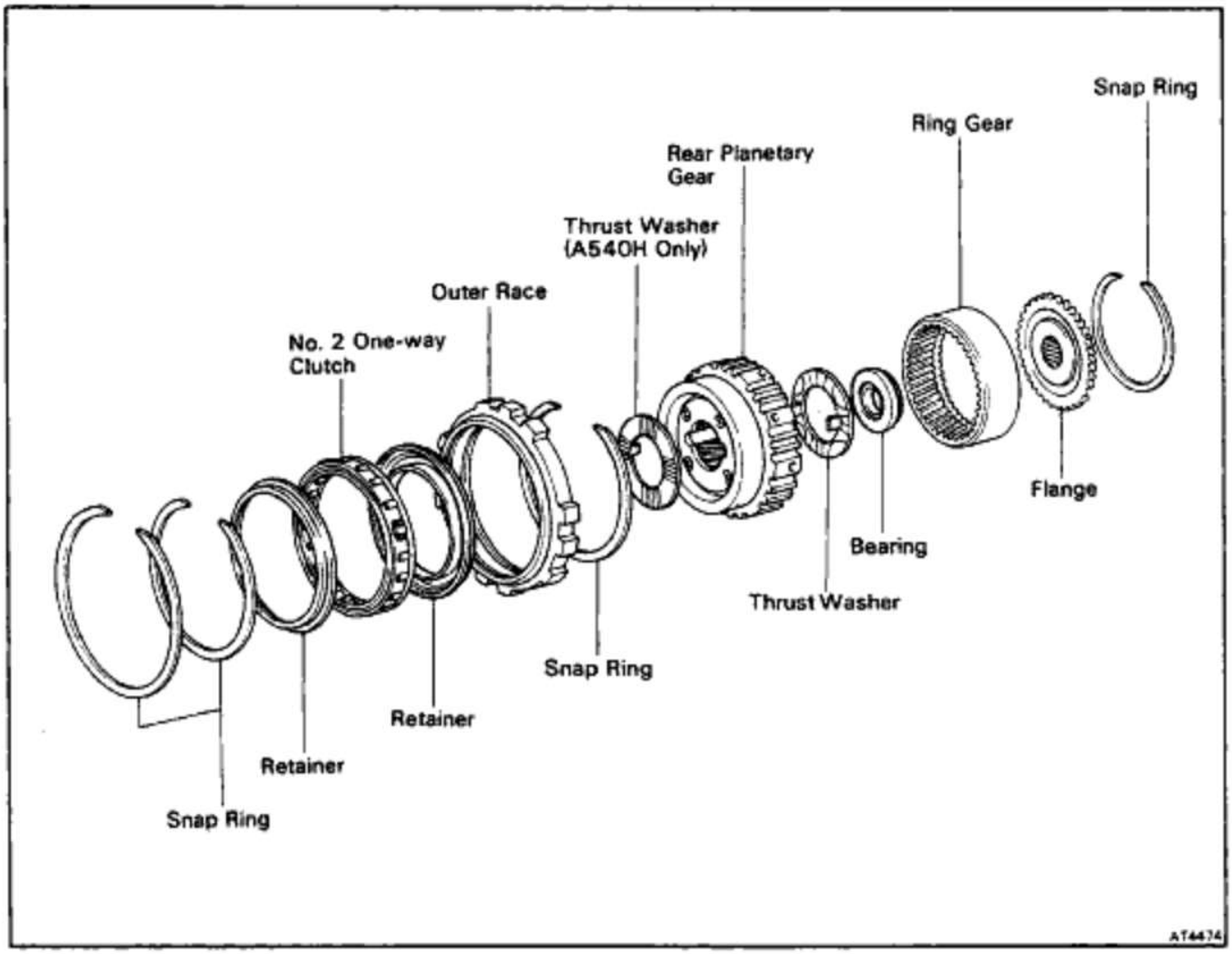
(b) Install the two O–rings on the piston.

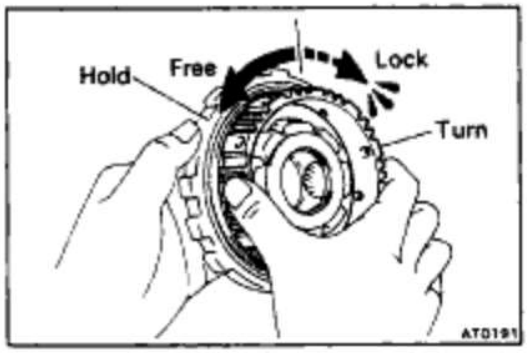


(c) Press the piston into the drum, being careful not to damage the O–rings.



Rear Planetary Gear



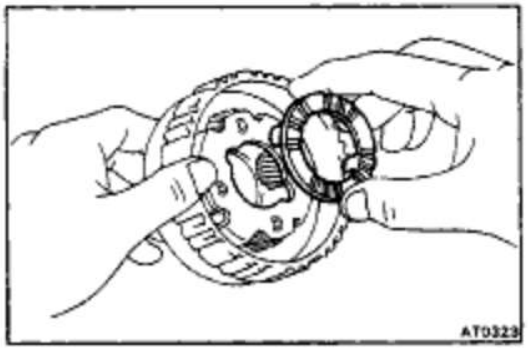


DISASSEMBLY OF NO. 2 ONE–WAY CLUTCH

1. CHECK OPERATION OF NO. 2 ONE–WAY CLUTCH

Hold the outer race and turn the rear planetary gear. The rear planetary gear should turn freely counter-clockwise and should lock clockwise.

2. SEPARATE NO. 2 ONE–WAY CLUTCH AND REAR PLANETARY GEAR



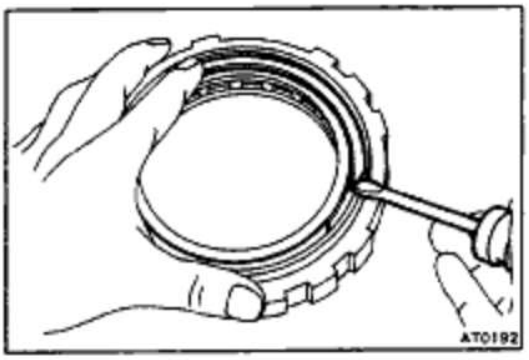
3. REMOVE THRUST WASHERS

(A540E)

Remove the thrust washer from the rear side of planetary gear.

(A540H)

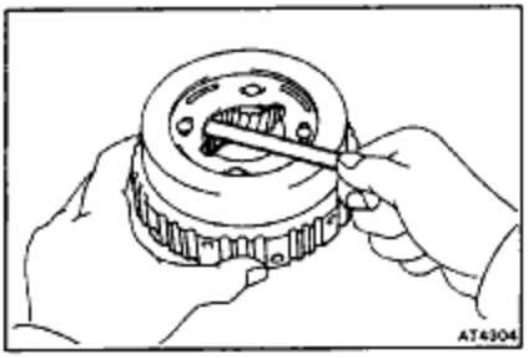
Remove the two thrust washers from both sides of planetary gear.



4. REMOVE NO. 2 ONE–WAY CLUTCH FROM OUTER RACE .

(a) Remove the two snap rings and retainers from both sides.

(b) Remove the No. 2 one–way clutch from the outer race.



INSPECTION OF REAR PLANETARY GEAR

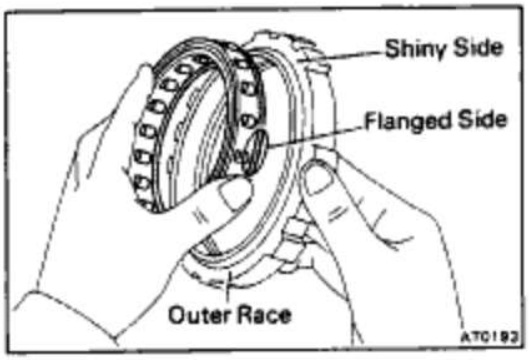
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.16 – 0.56 mm (0.0063 – 0.0220 in)

Maximum clearance: 0.61 mm (0.0240 in.)

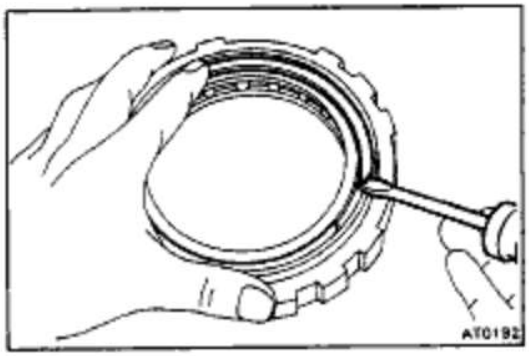
If the clearance is greater than the maximum, replace the planetary gear assembly.



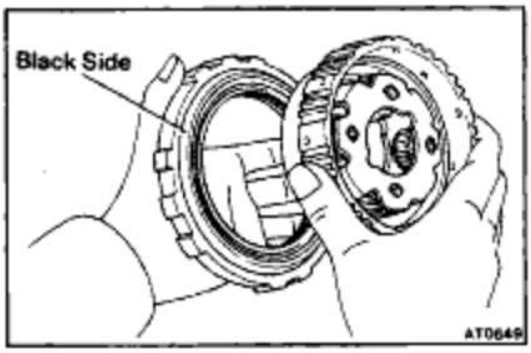
ASSEMBLY OF NO. 2 ONE–WAY CLUTCH

1. INSTALL ONE–WAY CLUTCH

(a) Install the No. 2 one–way clutch into the outer race, facing the flanged side of the No. 2 one–way clutch toward the shiny side of the outer race.

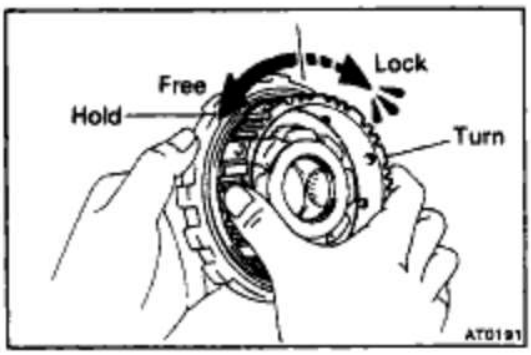


(b) Install the two retainers and snap rings to both sides.

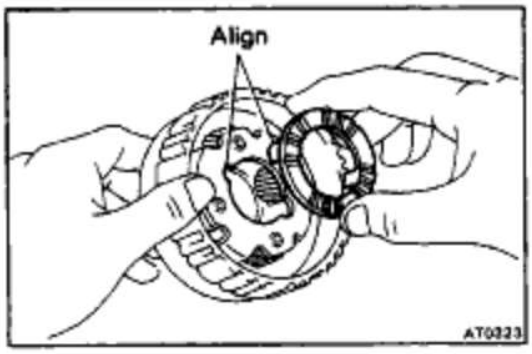


2. INSTALL PLANETARY GEAR INTO NO. 2 ONE–WAY CLUTCH

Install the planetary gear into the No. 2 one–way clutch, facing the inner race of the rear planetary gear toward the black side of the No. 2 one–way clutch outer race.



3. CHECK OPERATION OF NO. 2 ONE–WAY CLUTCH



4. INSTALL THRUST WASHERS

(A540E)

(a) Coat the thrust washer with petroleum jelly.

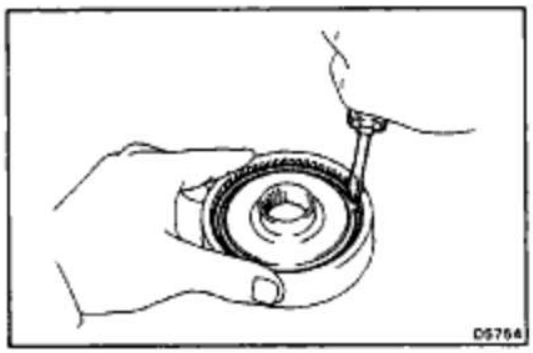
(b) Align the tab of the washer with the hollows of the carrier.

(A540H)

(a) Coat the two thrust washers with petroleum jelly.

(b) Align the tab of the washer with the hollows of the carrier.

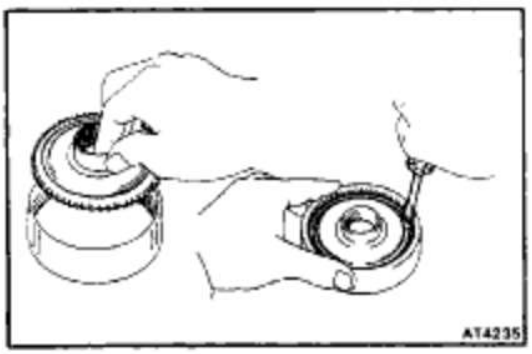
REPLACEMENT OF RING GEAR FLANGE



1. REMOVE RING GEAR FLANGE

(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange from the ring gear.

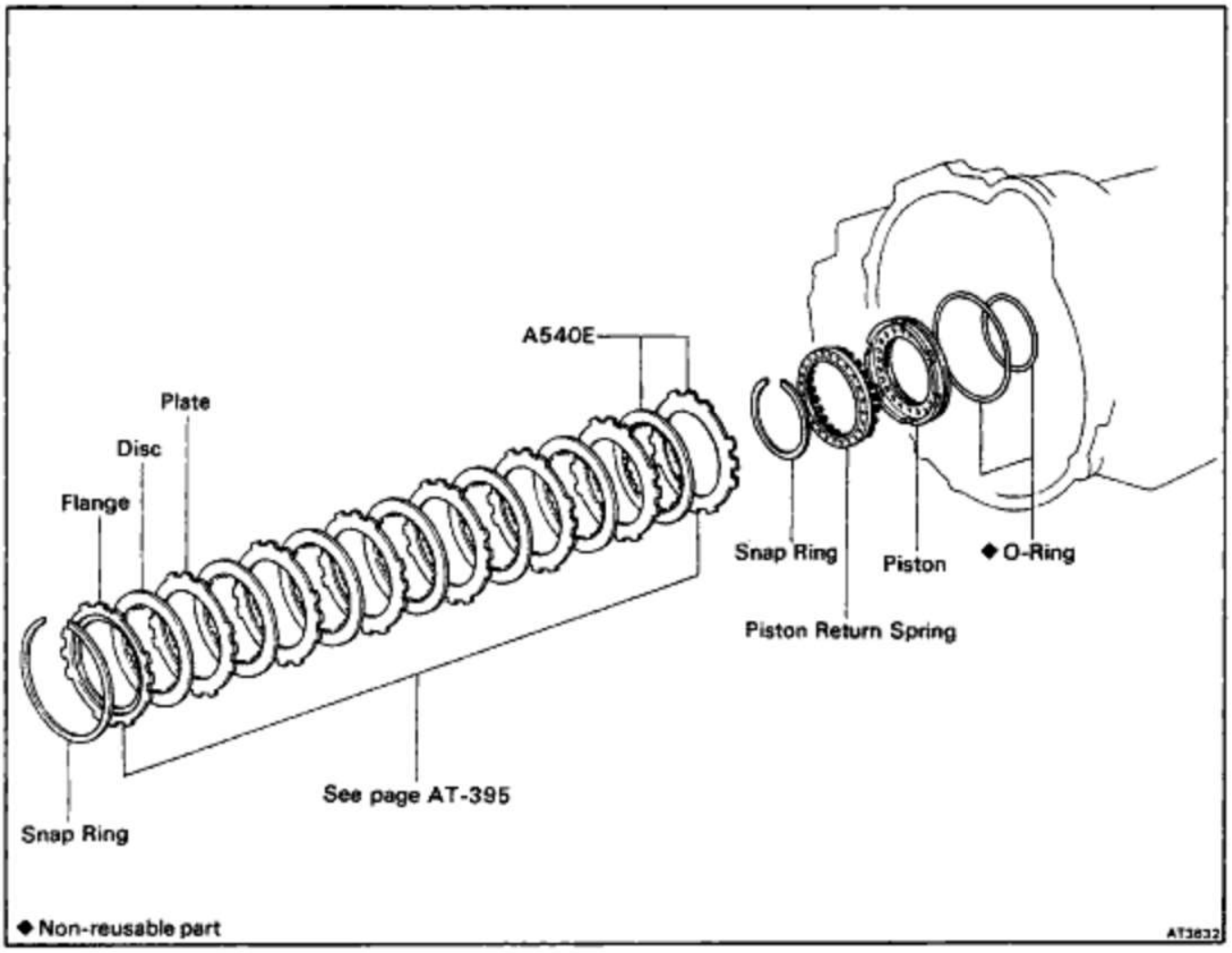


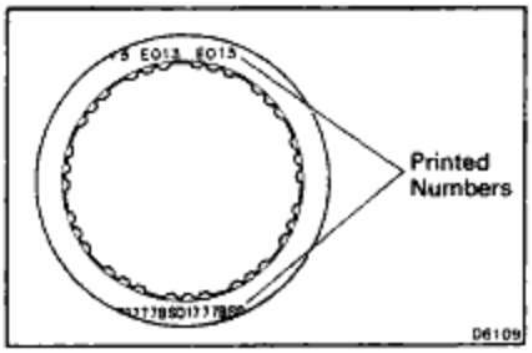
2. INSTALL RING GEAR FLANGE

(a) Position the flange into the ring gear.

(b) Using a screwdriver, install the snap ring.

First and Reverse Brake





INSPECTION OF FIRST AND REVERSE BRAKE COMPONENTS

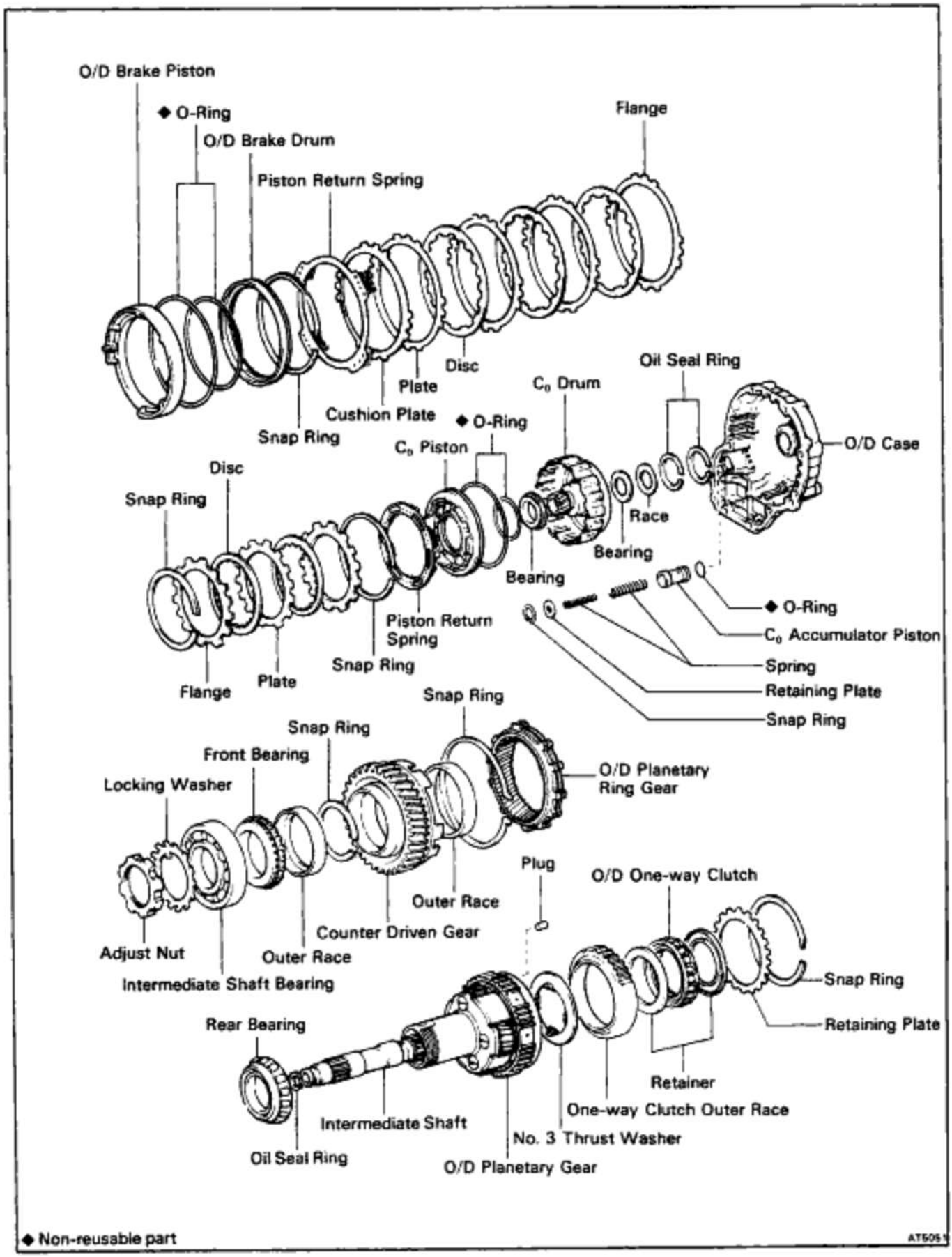
INSPECT DISCS, PLATES AND FLANGES

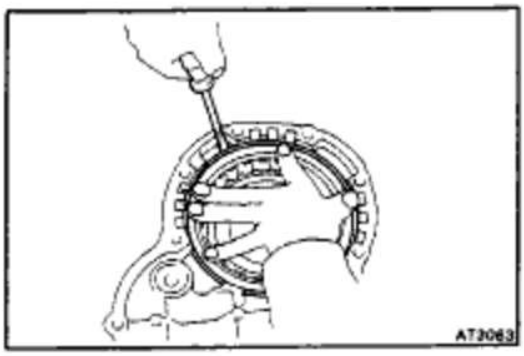
Check if the sliding surfaces of the discs, plates and flanges are worn or burnt If necessary, replace them.

HINT:

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

Overdrive Unit

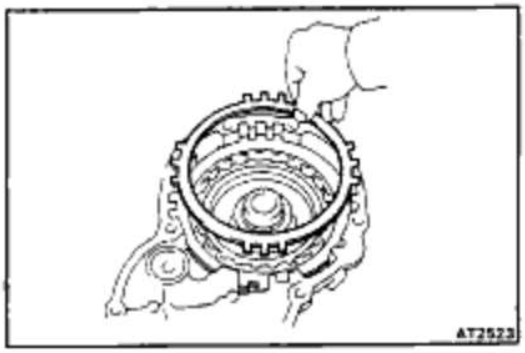




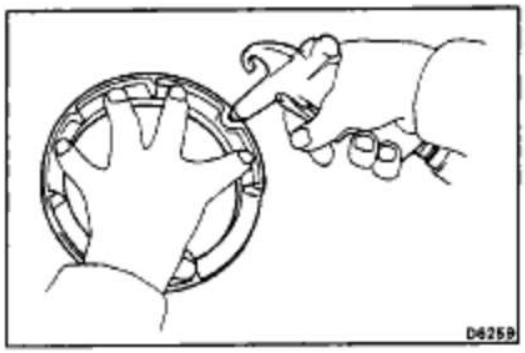
DISASSEMBLY OF OVERDRIVE BRAKE

1. REMOVE PISTON RETURN SPRING

(a) While pushing the return spring, remove the snap ring with a screwdriver.
(b) Remove the piston return spring.

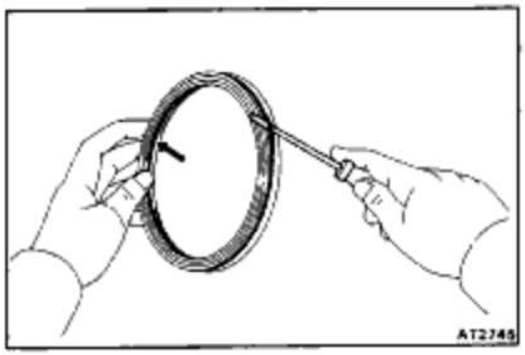


2. REMOVE PLATES, DISCS AND, FLANGE



3. REMOVE PISTON FROM DRUM

Apply compressed air to oil hole to remove the piston.
HINT: Blow with the gun slightly away from the oil hole, and be careful that the piston dose not tilt.



4. REMOVE 4–RINGS

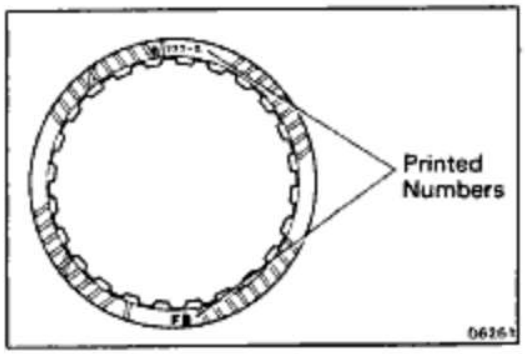
Remove the inner and outer O–rings from the piston.

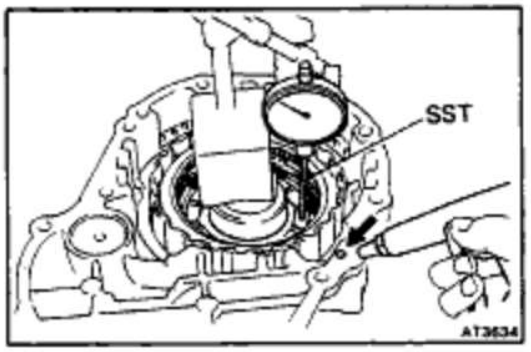
INSPECTION OF OVERDRIVE BRAKE

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of the discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

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





DISASSEMBLY OF OVERDRIVE DIRECT CLUTCH

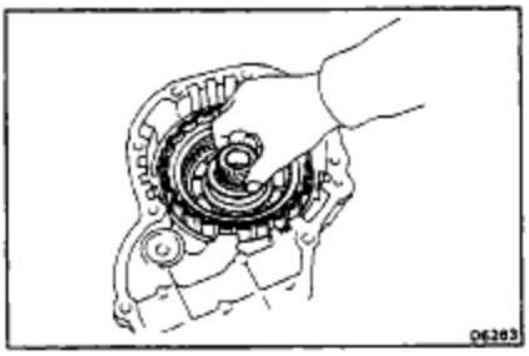
1. CHECK PISTON STROKE OF DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

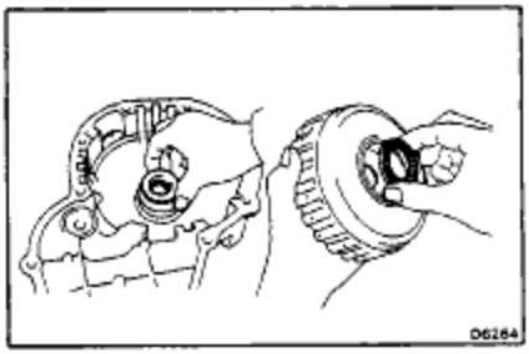
Piston stroke: 1.75 – 2.49 mm
(0.0688 – 0.0980 in.)

SST 09350–32014 (09351–32190)

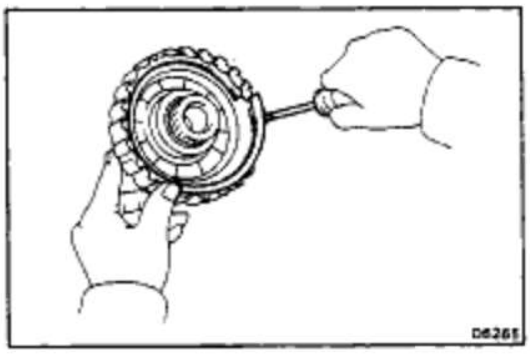
If the piston stroke is greater than the maximum, inspect each component.



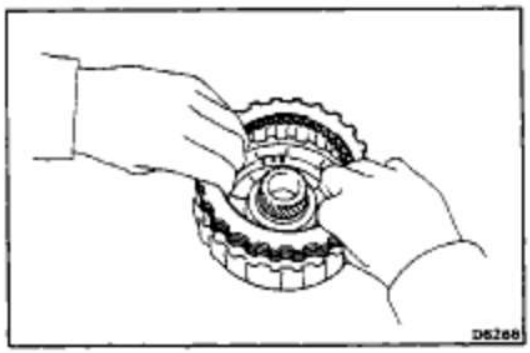
2. REMOVE OVERDRIVE DIRECT CLUTCH PROM CASE



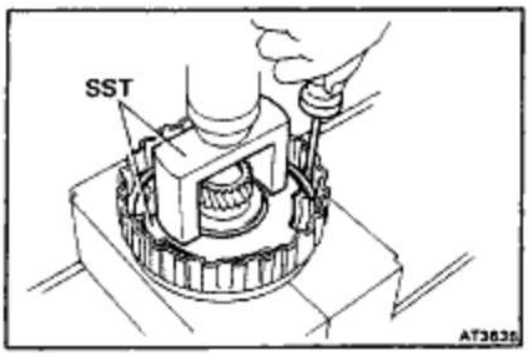
3. REMOVE BEARING AND RACE FROM CLUTCH DRUM AND CASE



4. REMOVE SNAP RING WITH SCREWDRIVER



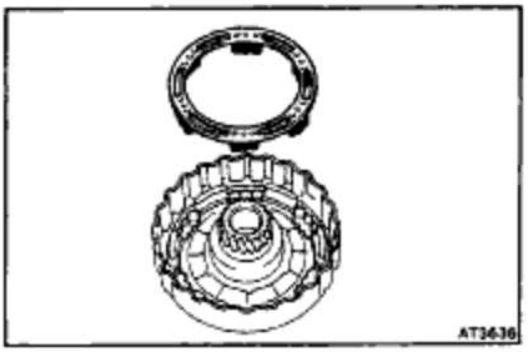
5. REMOVE FLANGES, DISCS AND PLATES



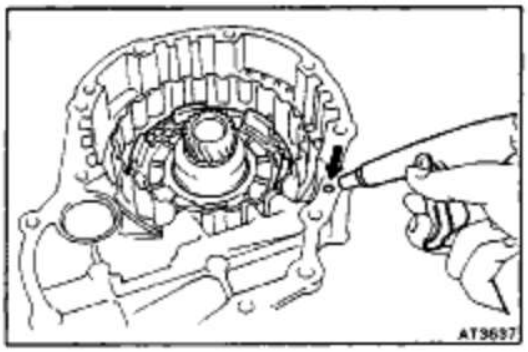
6. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring retainer and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)

(b) Remove the snap ring.



(c) Remove the piston return spring.



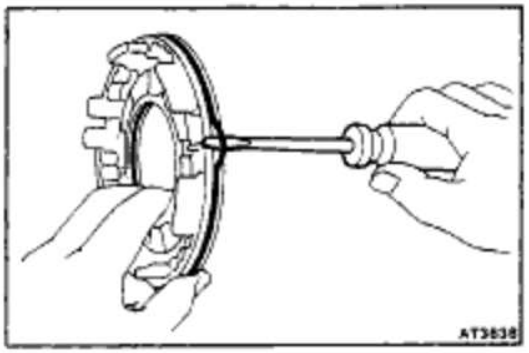
7. REMOVE PISTON FROM CLUTCH DRUM

(a) Install the clutch drum on the case.

(b) Apply compressed air to the pressure apply hole of the case.

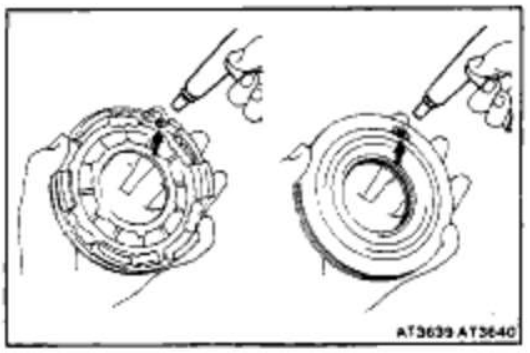
(c) Remove the piston from the clutch drum.
If the piston does not come out completely, use needle–nose pliers to remove it.

(d) Remove the clutch drum from the case.



8. REMOVE O–RINGS

Remove the two O–rings from the piston.

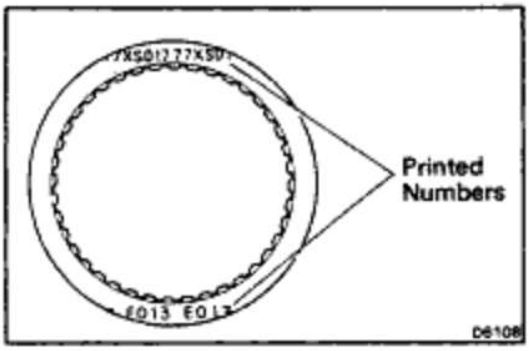


INSPECTION OF OVERDRIVE DIRECT CLUTCH

1. INSPECT OVERDRIVE DIRECT CLUTCH

(a) Check that the check ball is free by shaking the piston.

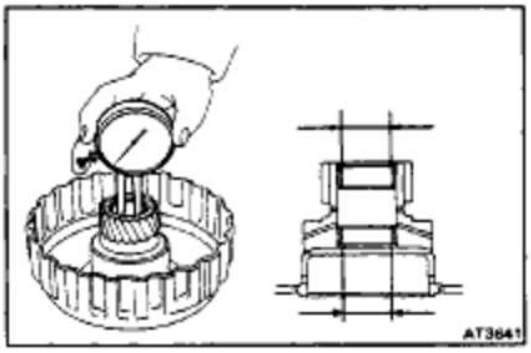
(b) Check that the valve does not leak by applying low–pressure compressed air.



2. INSPECT DISCS, PLATES AND FLANGES

Check if the sliding surfaces of the discs, plates and flanges are worn or burnt. If necessary, replace them.
HINT:

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



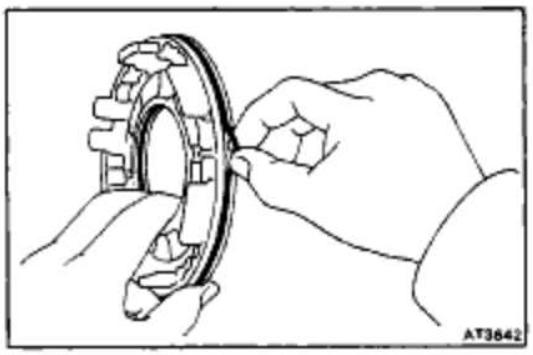
3. CHECK DIRECT CLUTCH BUSHING

Using a dial indicator, measure the inside diameter of the two direct clutch bushings.
Maximum inside diameter: 22.13 mm (0.8713 in.)
If the inside diameter is greater than the maximum, replace the direct clutch drum.

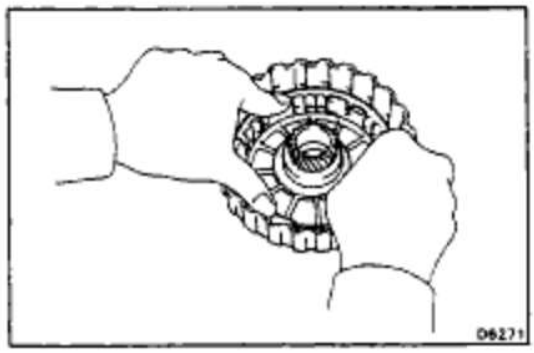
ASSEMBLY OF OVERDRIVE DIRECT CLUTCH

1. INSTALL CLUTCH PISTON

(a) Install new O–rings to the piston. Coat the O–rings with ATF.

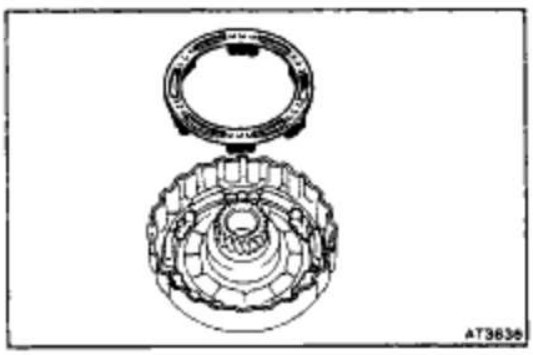


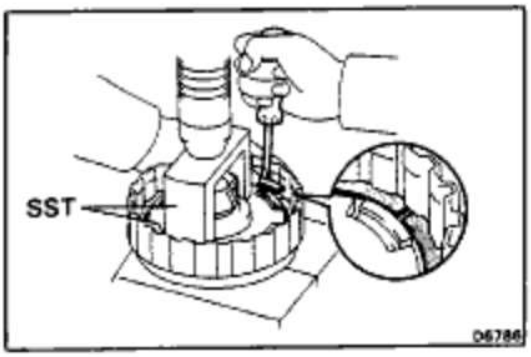
(b) Press the piston into the drum with the cup side up, being careful not to damage the O–ring.



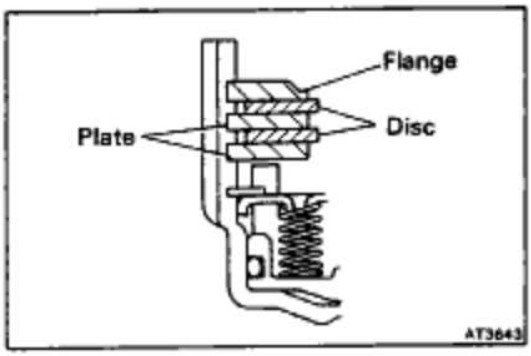
2. INSTALL PISTON RETURN SPRING

(a) Install the return spring and set snap ring in place.



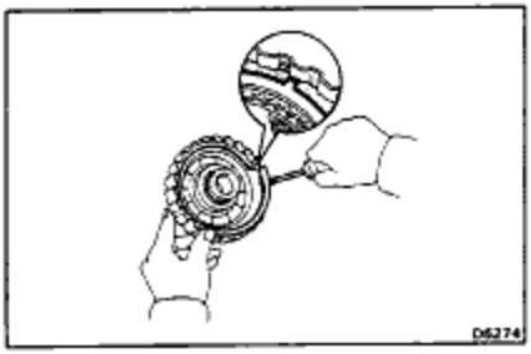


(b) Place SST on the spring retainer, and compress the spring with a shop press.
SST 09350–32014 (09351–32070, 09351–32200)
(c) Install the snap ring with a screwdriver. Be sure end gap of snap ring is aligned with the groove of the clutch drum.



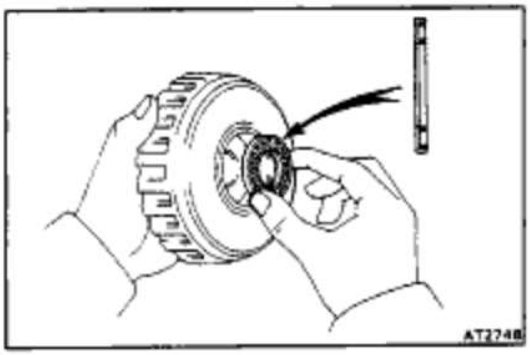
3. INSTALL PLATES, DISCS AND FLANGE

Install in order: P=Plate D=Disc
P–D–P–D–Flange



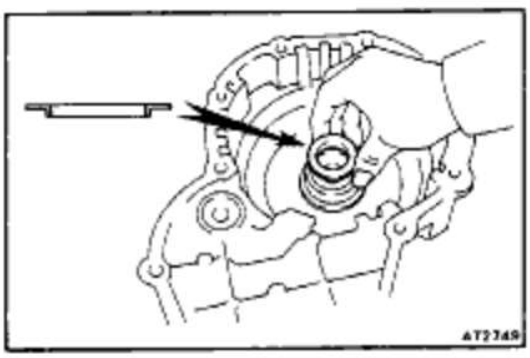
4. INSTALL SNAP RING

Be sure end gap of the snap ring is not aligned with the groove of the clutch drum.

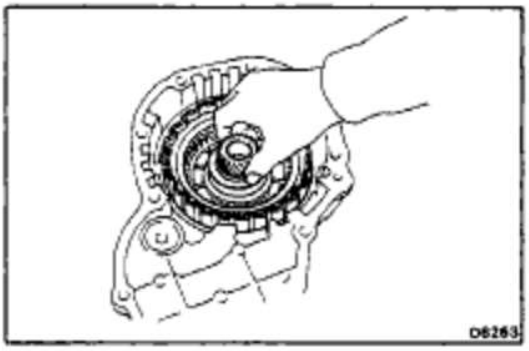


5. INSTALL BEARING AND RACE

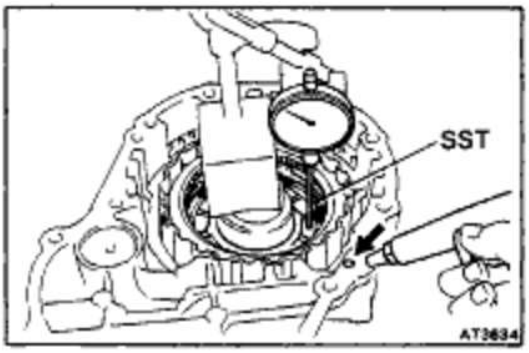
(a) Coat the bearing with petroleum jelly and install it facing the race side downward to the clutch drum.
Bearing: outer diameter 46.3mm (1.823 in.)
Inner diameter 26.2mm (1.031 in.)



(b) Coat the race with petroleum jelly and install it to the case.
Race: Outer diameter 43.0mm (1.693 in.)
Inner diameter 24.5mm (0.965 in.)



6. INSTALL DIRECT CLUTCH ON CASE



7. RECHECK PISTON STROKE OF DIRECT CLUTCH

Using a dial indicator, measure the piston stroke while applying and releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.

Piston stroke: 1.75 – 2.49mm
(0.0689 – 0.0980 in.)

SST 09350–32014 (09351–32190)

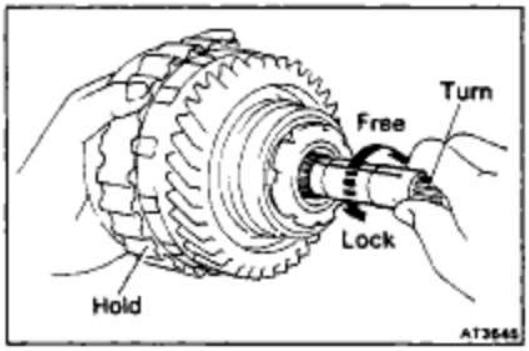
DISASSEMBLY OF COUNTER DRIVE GEAR

1. CHECK OPERATION OF ONE–WAY CLUTCH

(a) Install the overdrive direct clutch into the one–way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft.
The shaft should turn freely clockwise and should lock counterclockwise.

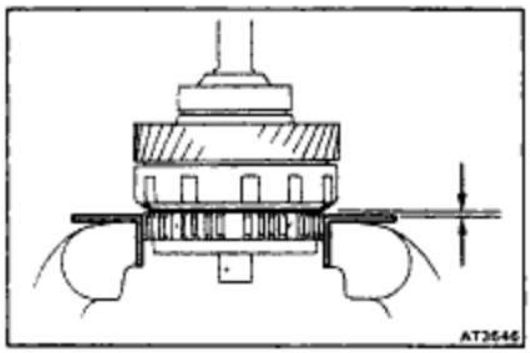
(e) Remove the overdrive direct clutch.



2. CHECK COUNTER DRIVE GEAR PRELOAD

(a) Hold the overdrive planetary gear in a vise with soft jaws.

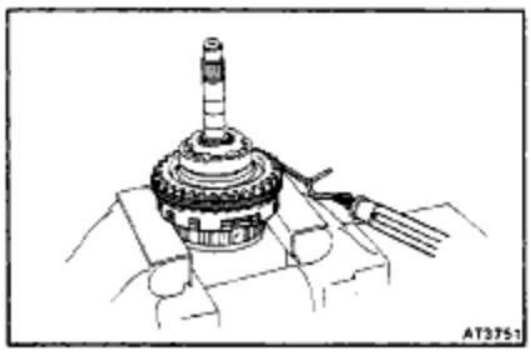
HINT: Do not let the counter drive gear touch the vise.



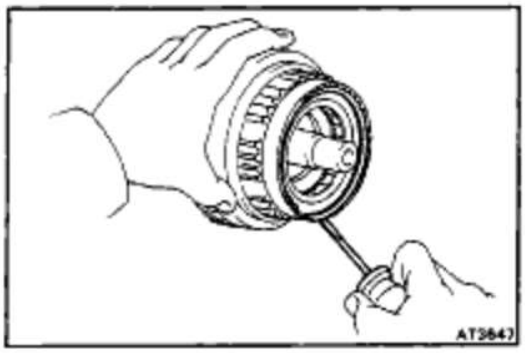
(b) Using a tension gauge, measure the preload.

Preload (at starting) : 940 – 1,560 g
(2.1 – 3.4 lb, 9.2 – 15.3 N)

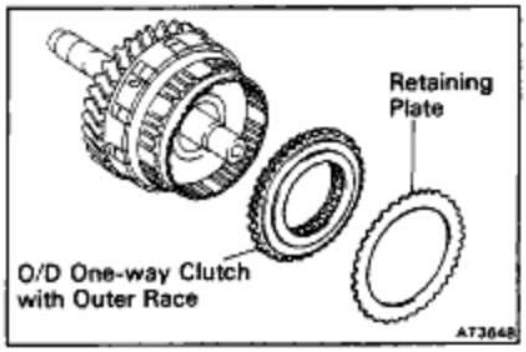
HINT: Turn the counter drive gear right and left several times before measuring the preload.



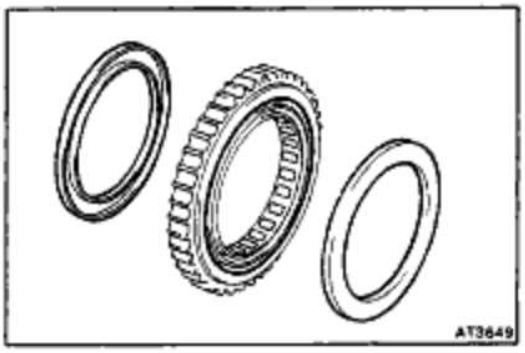
3. REMOVE O/D ONE–WAY CLUTCH AND OUTER RACE



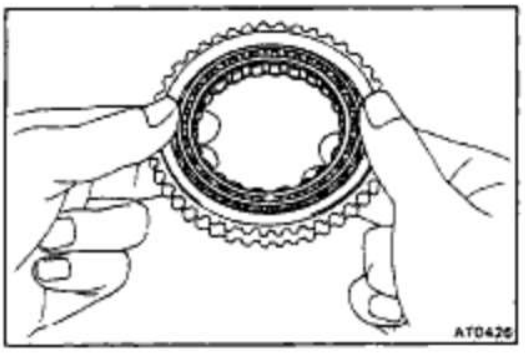
(a) Remove the snap ring.



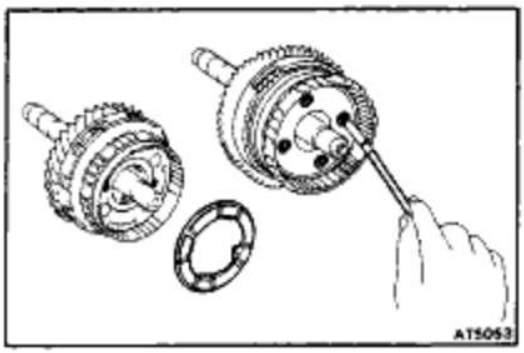
(b) Remove the retaining plate.
(c) Remove the O/D one–way clutch with outer race.



(d) Remove the two retainers from both sides of the O/D one–way clutch.



(e) Remove the O/D one–way clutch from the outer race.
HINT: Note the direction of the one–way clutch.

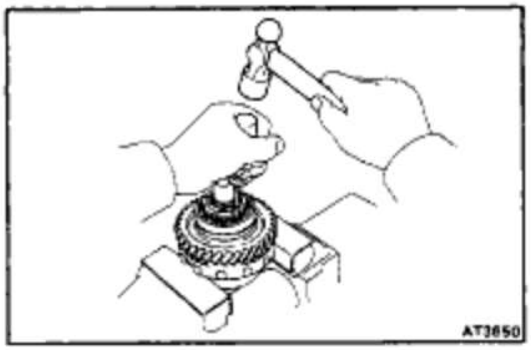


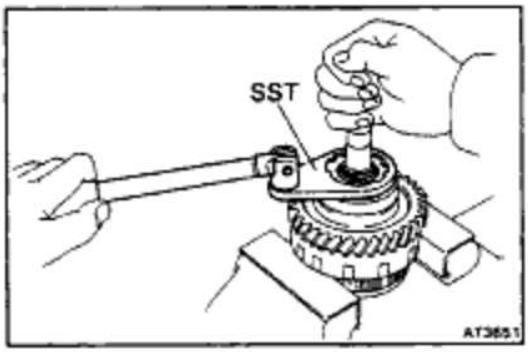
4. REMOVE NO. 3 PLANETARY THRUST WASHER
5. REMOVE PLUGS FROM PLANETARY GEAR

Remove the four plugs with a magnetic finger.
HINT: Be careful not to lose them.

6. REMOVE ADJUSTING NUT AND LOCKING WASHER

(a) Pry off the locking washer.



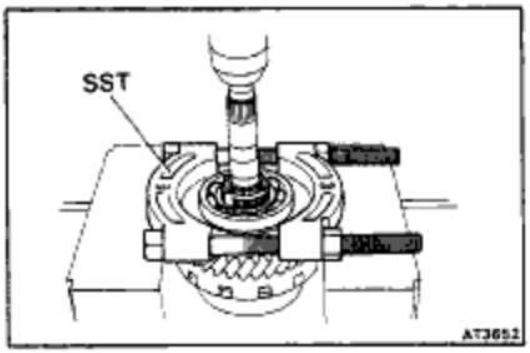


(b) Using SST, loosen the adjusting nut.
SST 09350–32014 (09351–32080)

(c) Remove the adjusting nut and locking washer.

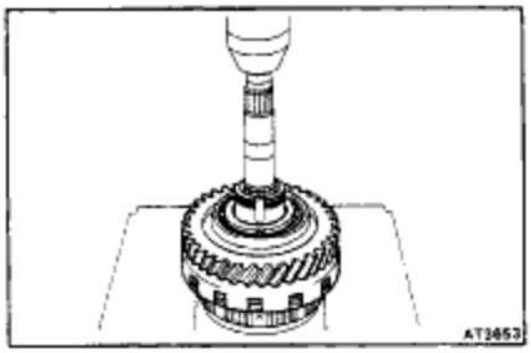
7. REMOVE INTERMEDIATE SHAFT REARING

Using SST, press out the bearing from the shaft.
SST 09950–00020



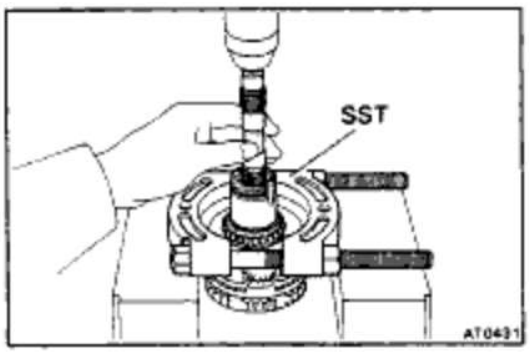
8. REMOVE COUNTER DRIVE GEAR AND FRONT BEARING

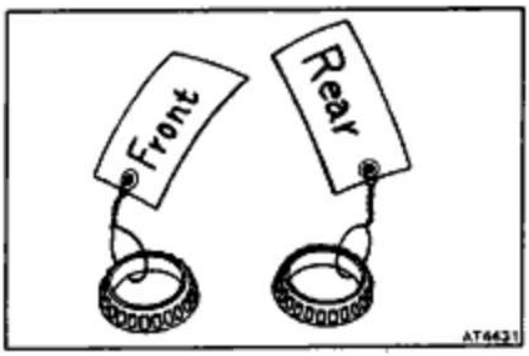
Press out the gear and bearing together.



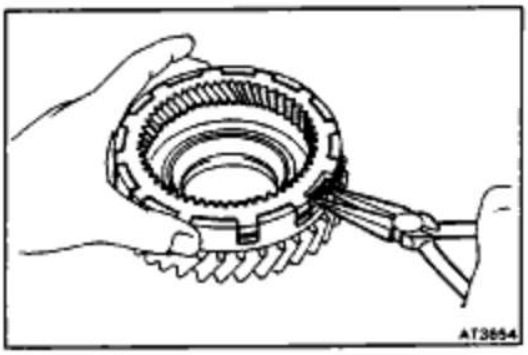
9. REMOVE REAR BEARING

(a) Using SST, press out the bearing.
SST 09950–00020





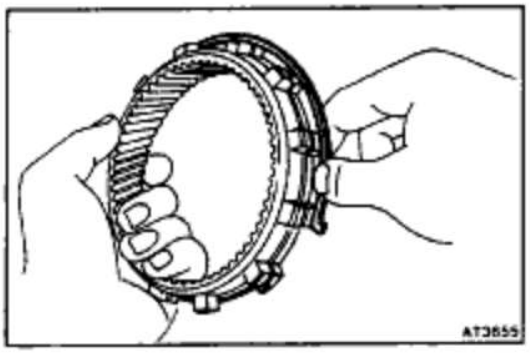
(b) Tag the bearings to show the location for reassembly.



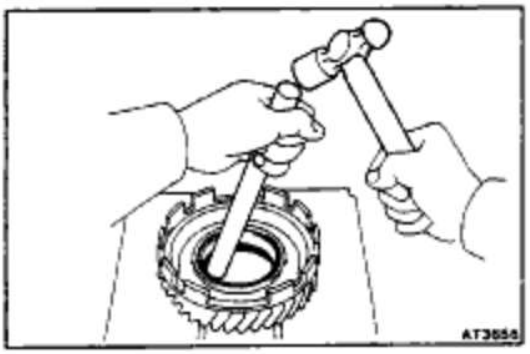
10. REMOVE OVERDRIVE PLANETARY RING GEAR FROM COUNTER DRIVE GEAR

(a) While pulling up the ring gear, compress the snap ring with needle–nose pliers and remove it from the groove.

(b) Remove the ring gear from the counter drive gear.

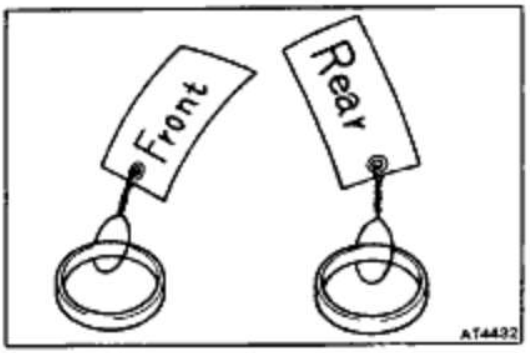


(c) Remove the snap ring from the ring gear.

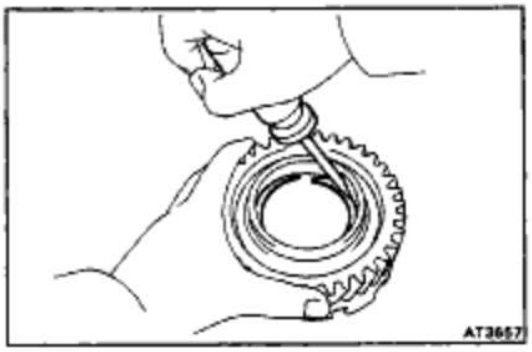


11. REMOVE OUTER RACES FROM COUNTER DRIVE GEAR

(a) Drive out the two races with a brass bar and hammer.

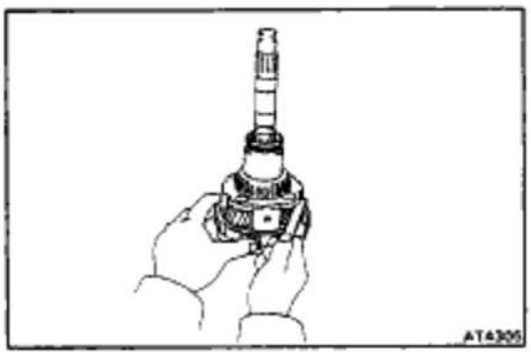


(b) Tag the races to show the location for reassembly.



12. REMOVE SNAP RING FROM COUNTER DRIVE GEAR

Using a screwdriver, remove the snap ring.



INSPECTION OF OVERDRIVE PLANETARY GEAR

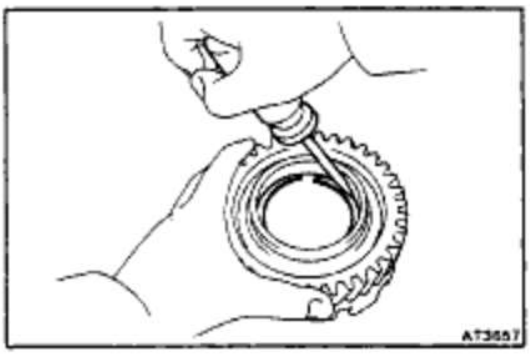
MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.16 – 0.56 mm
(0.0063 – 0.0220 in.)

Maximum clearance: 0.61 mm
(0.0240 in.)

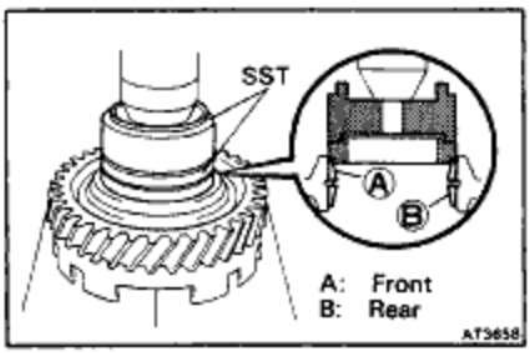
If the clearance is greater than the maximum, replace the planetary gear assembly.



ASSEMBLY OF COUNTER DRIVE GEAR

1. INSTALL SNAP RING INTO COUNTER GEAR

Install the snap ring with a screwdriver.

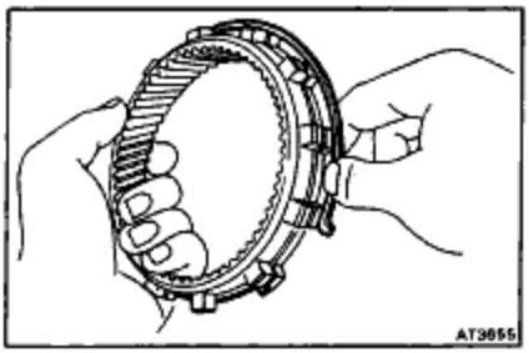


2. INSTALL OUTER RACES INTO COUNTER DRIVE GEAR

Using SST, press in the two outer races to both sides o1 the gear.

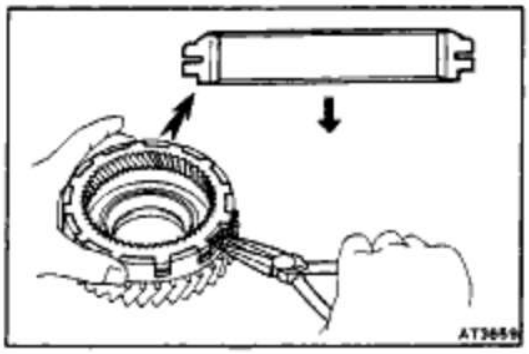
SST 09350–32014 (09351–32120, 09351–32150)

HINT: Press in the two outer races until they touch the snap ring. Tap the races in straight, so that they do not tilt

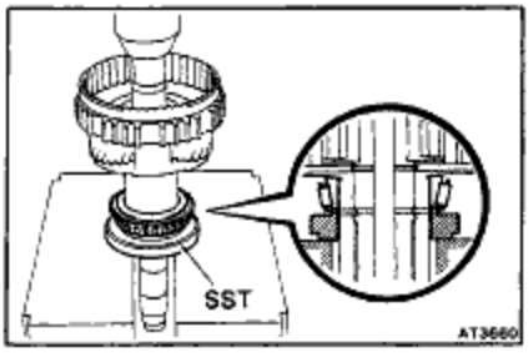


3: INSTALL OVERDRIVE PLANETARY RING GEAR INTO COUNTER DRIVE GEAR

(a) Install the snap ring to the ring gear.

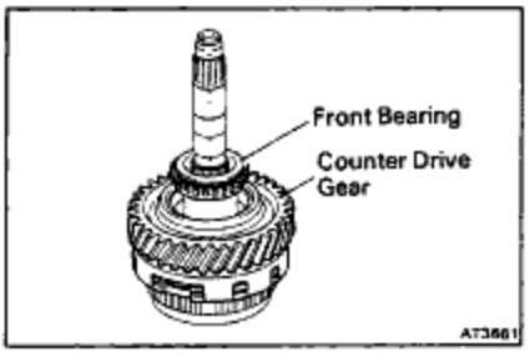


(b) While pushing down the ring gear, squeeze the snap ring end with needle–nose pliers, and install it into the groove.



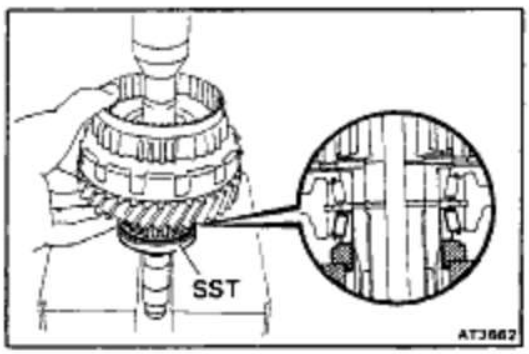
4. INSTALL REAR BEARING

Using SST, press in the bearing onto the shaft.
SST 09350–32014 (09351–32120)
HINT: Press in the bearing until the side surface of the inner race touches the planetary carrier.

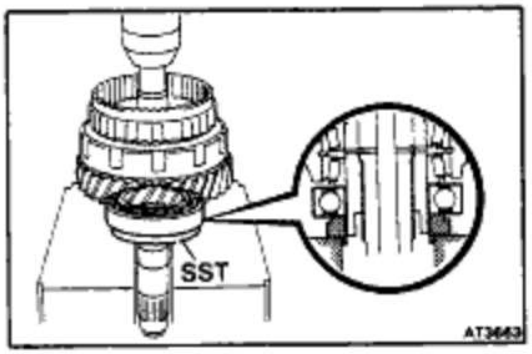


5. INSTALL COUNTER DRIVE GEAR AND FRONT BEARING

(a) Install the gear onto the shaft, and mesh the ring gear with the planetary pinions.
(b) Place the front bearing onto the shaft.



(c) Using SST, press in the bearing until slightly play between the bearings.
SST 09350–32014 (09351–32120)
HINT: Hold the ring gear to prevent it from falling.

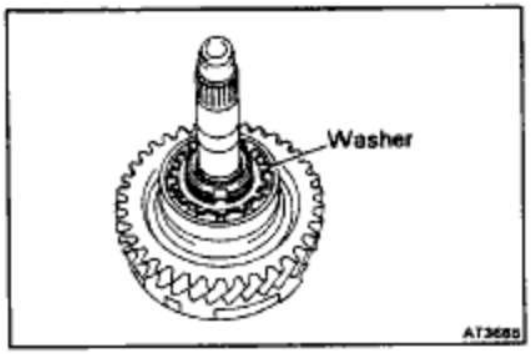


6. INSTALL INTERMEDIATE SHAFT BEARING

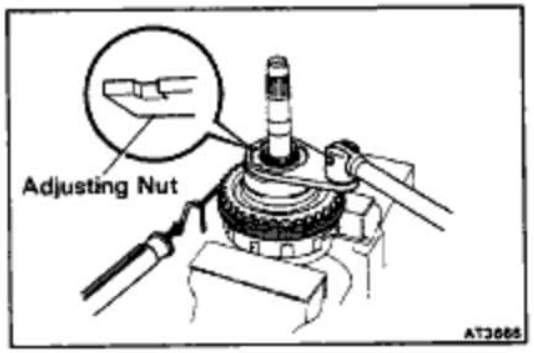
Using SST, press in the bearing until it slightly touches the front bearing of the counter drive gear.

SST 09350–32014 109351–32120i

HINT: The counter drive gear can be turned tightly.



7. PLACE NEW LOCKING WASHER



8. INSTALL ADJUSTING NUT AND ADJUST PRELOAD OF COUNTER DRIVE GEAR

(a) Hold the overdrive planetary gear in a vise with soft jaws.

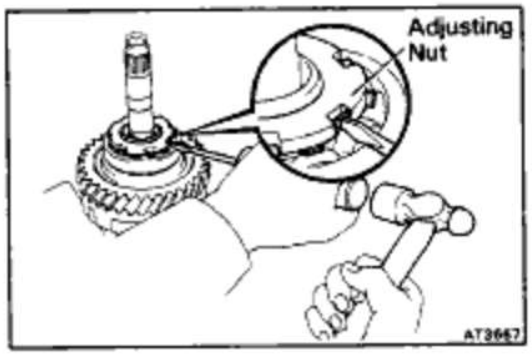
(b) Using SST, tighten the adjusting nut until the following gear starting load is reached on the tension gauge.

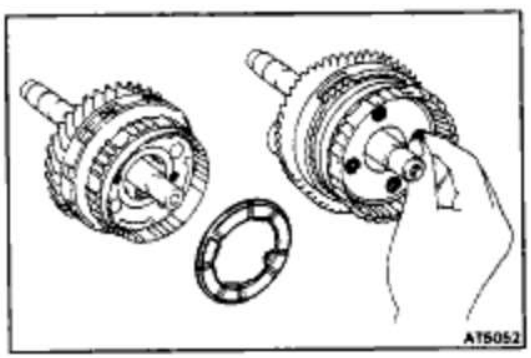
SST 09350–32014 I09351–32080

Preload (at starting) : 940 – 1,560 g (2.1 – 3.4 lb, 9.2 – 15.3 N)

HINT: Turn the counter drive gear right and left several times before measuring the preload.

(c)Lock the adjusting nut with one tab on locking washer. Bend the locking washer tab until it is ever with the adjusting nut groove.

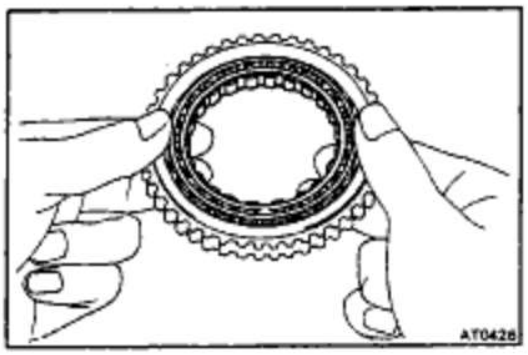




9. INSTALL NO. 3 OVERDRIVE PLANETARY THRUST WASHER

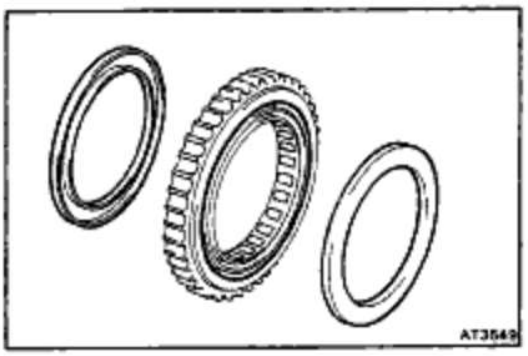
10. INSTALL PINION SHAFT PLUGS

Install the four plugs into the pinion shaft.

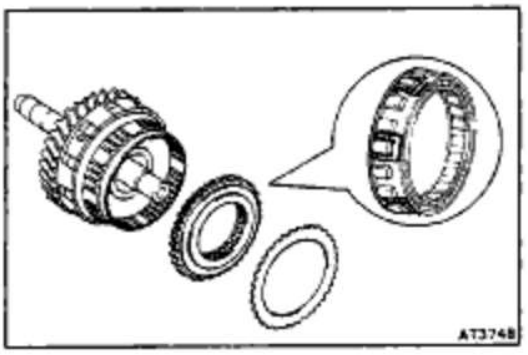


11. INSTALL OVERDRIVE ONE–WAY CLUTCH AND RETAINING PLATE

(a) Install the one–way clutch into the outer race.



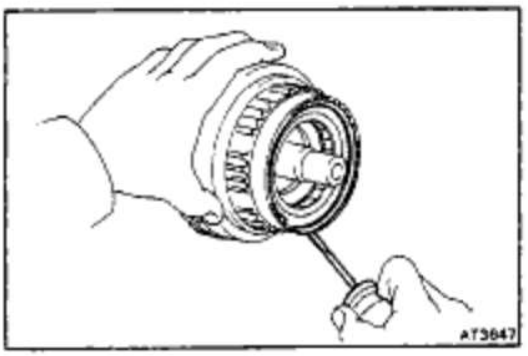
(b) Install the two retainer on both sides of the one–way clutch.



(c) Install the one–way clutch into the overdrive planetary gear.

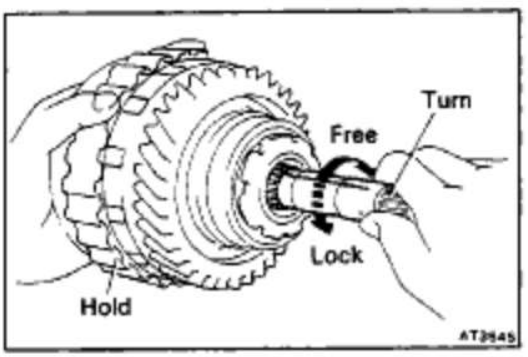
HINT: Be sure that the one–way clutch is installed in the correct direction.

(d) Install the retaining plate.



(e) Install the snap ring.

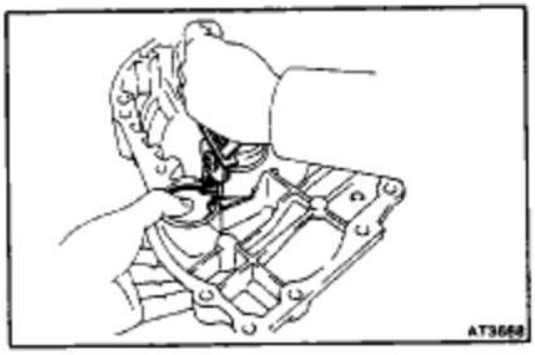
12. CHECK OPERATION OF O/D ONE–WAY CLUTCH



(a) Install the overdrive direct clutch into the one–way clutch.

(b) Hold the overdrive direct clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.

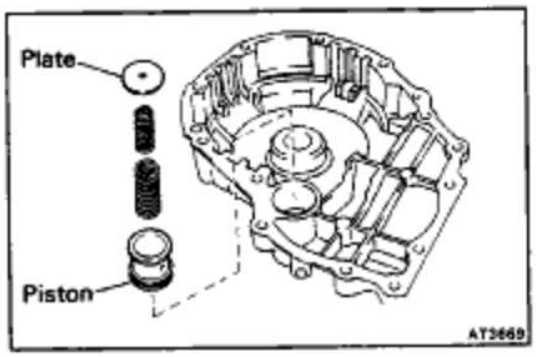
(c) Remove the overdrive direct clutch.



DISASSEMBLY OF OVERDRIVE CASE

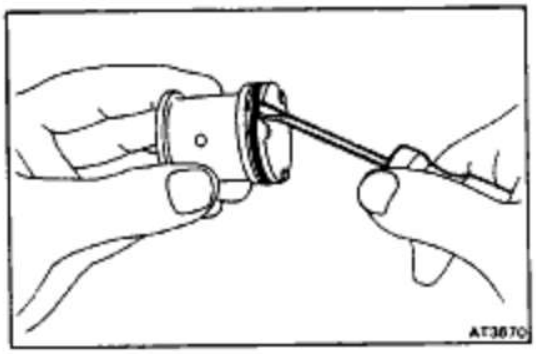
1. REMOVE C0 ACCUMULATOR PISTON FROM OVERDRIVE CASE

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the retaining plate and two springs.

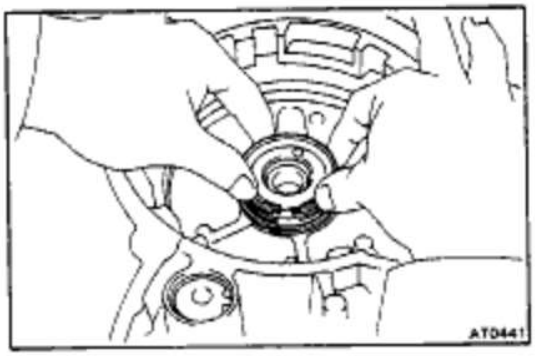
(c) Remove the accumulator piston.



(d) Remove the O–ring from the piston.

2. REMOVE OIL SEAL RINGS

Spread the two rings apart and remove them.

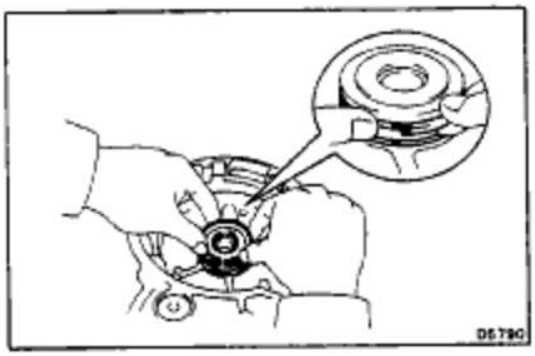


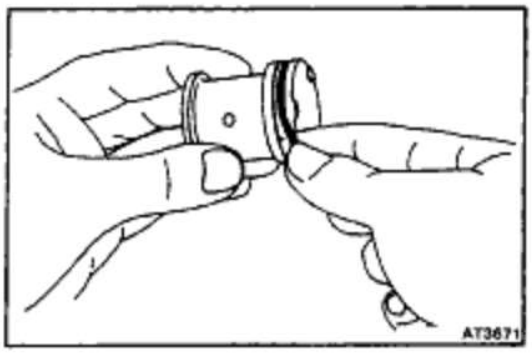
ASSEMBLY OF OVERDRIVE CASE

1. INSTALL OIL SEAL RINGS ON OVERDRIVE CASE

Spread the two rings apart and install them into the groove.

HINT: After installing the oil seal rings, check that the move smoothly.

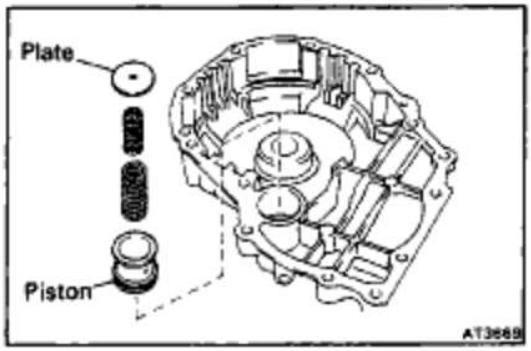




2. INSTALL Co ACCUMULATOR PISTON TO OVERDRIVE CASE

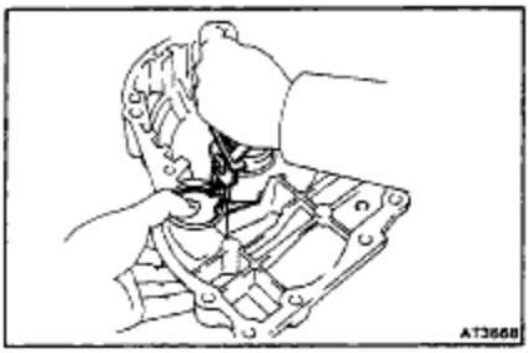
(a) Install a new O–ring to the accumulator piston.

(b) Coat the O–ring with ATF.



(c) Install the accumulator piston, two springs and retaining plate.

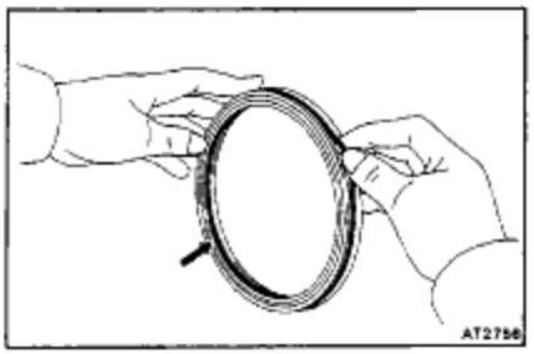
(d) Using snap ring pliers, install the snap ring.



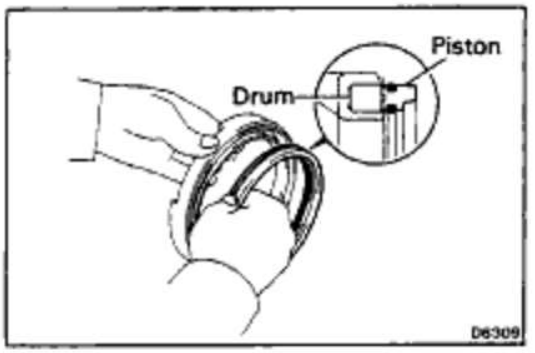
ASSEMBLY OF OVERDRIVE BRAKE

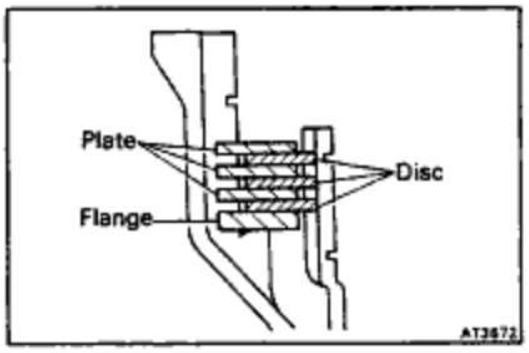
1. INSTALL PISTON INTO DRUM

(a) Install the new O–rings to the piston.
Coat the O–rings with ATF.



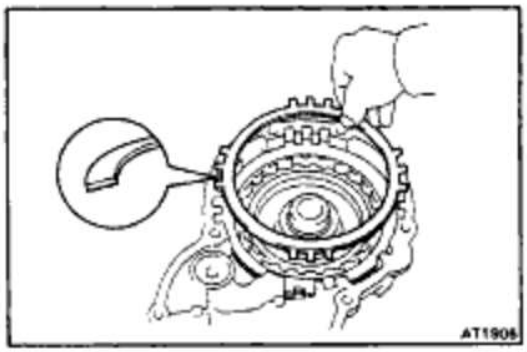
(b) Press the piston into the drum, being careful not to damage the O–rings.



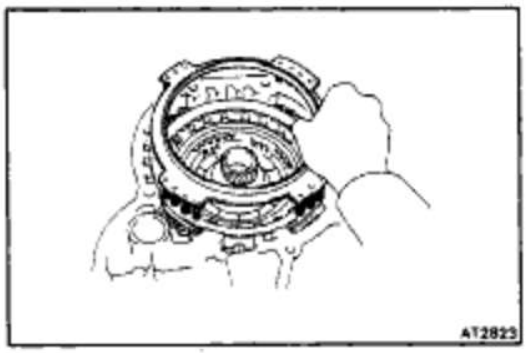


2. INSTALL FLANGE, DISCS AND PLATES

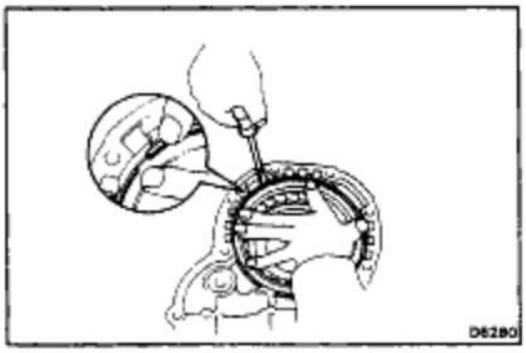
(a) Install the flange, discs and plates.
Install in order: P=Plate D=Disc
Flange– D=P–D–P–D–P



(b) Install the cushion plate with the rounded end facing upward.

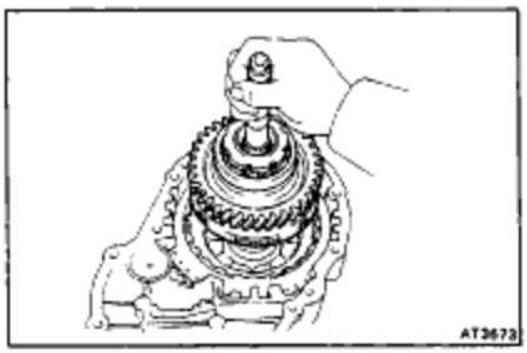


3. POSITION PISTON RETURN SPRING



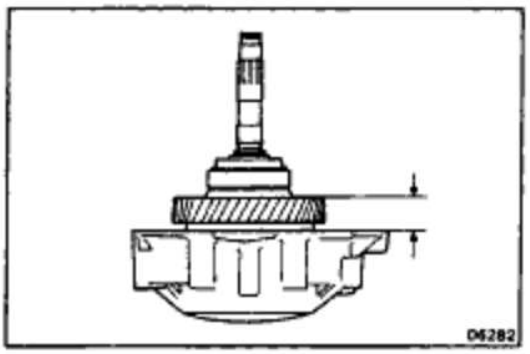
4. INSTALL SNAP RING INTO CASE

Be sure the end gap of the snap ring is not aligned with one of cutouts.



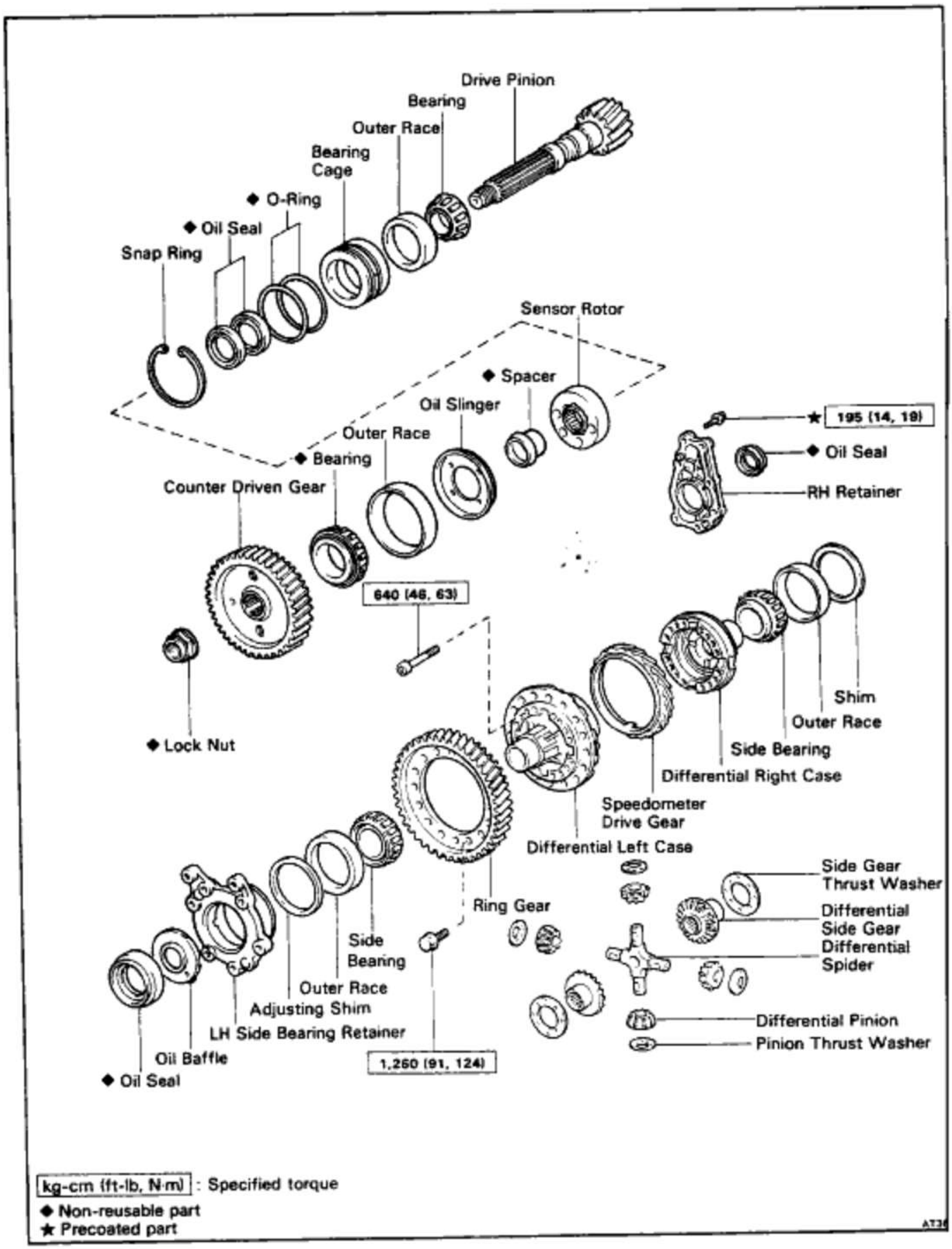
5. INSTALL OVERDRIVE PLANETARY GEAR ONTO OVERDRIVE DIRECT CLUTCH

While turning the overdrive planetary gear clockwise install it onto the overdrive direct clutch.

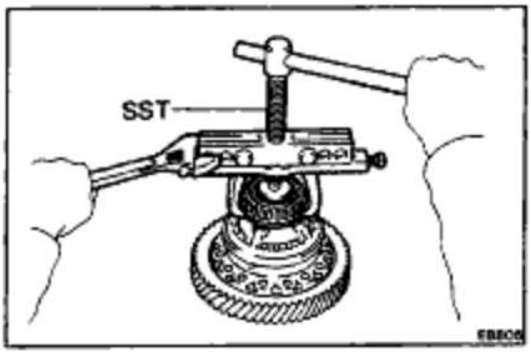


HINT: If the overdrive planetary gear is properly installed onto the direct clutch, the counter drive gear height from the overdrive case will be about 24mm (0.94 in.).

Differential Assembly (A540E)

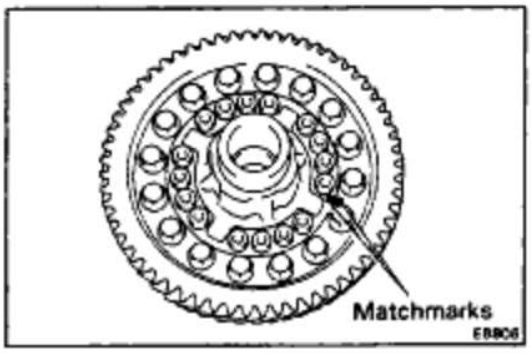


DISASSEMBLY OF DIFFERENTIAL CASE



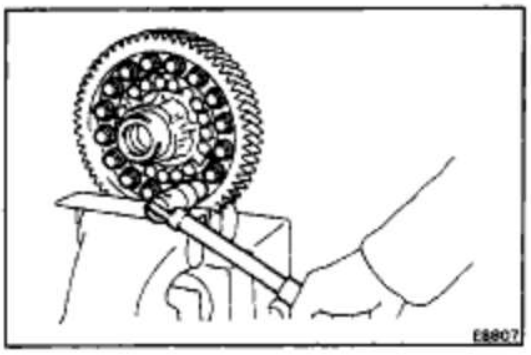
1. REMOVE SIDE BEARING

Using SST, remove the two side bearings.
SST 09950–20017

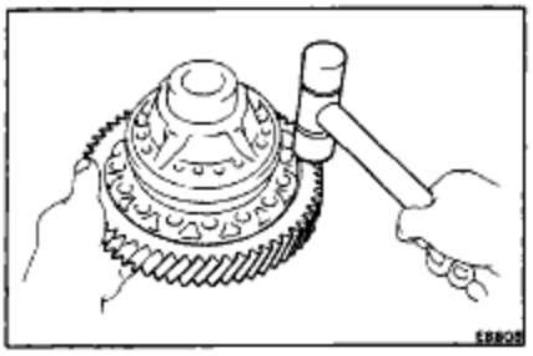


2. REMOVE RING GEAR

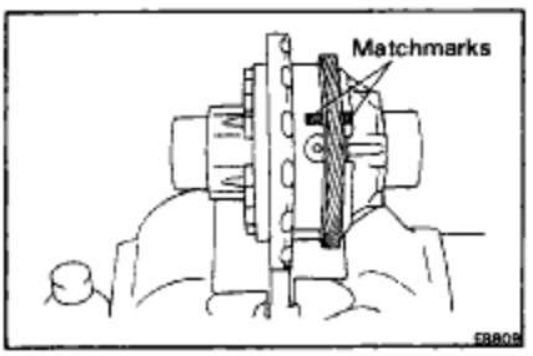
(a) Place the matchmarks on both the differential case and ring gear.



(b) Remove the sixteen bolts.

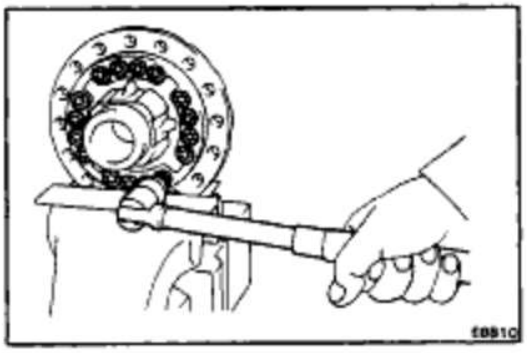


(c) Using a plastic hammer, tap out the ring gear.

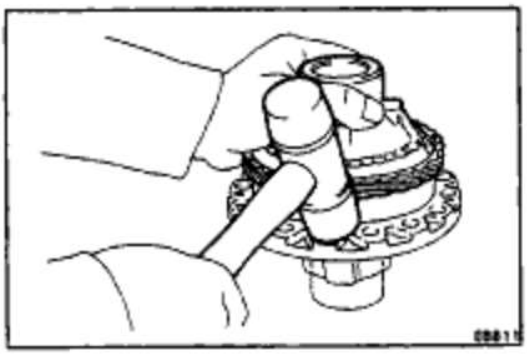


3. DISASSEMBLE OF DIFFERENTIAL CASE

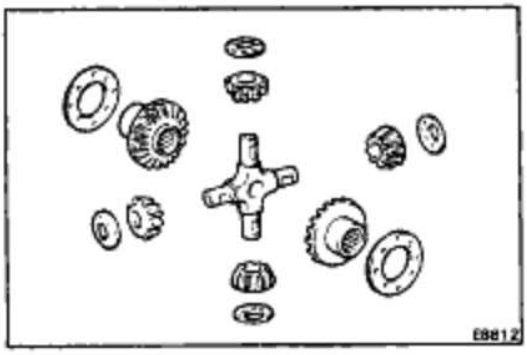
(a) Place the matchmarks on the differential right and left case.



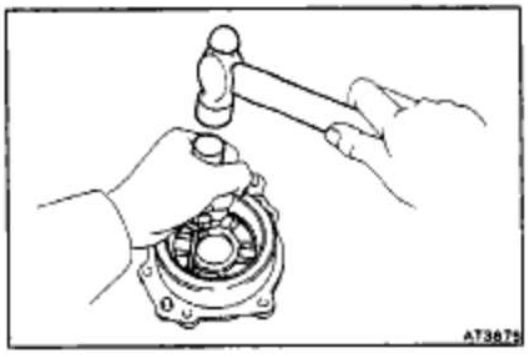
(b) Using a torx wrench, remove the sixteen torx screws.



(c) Using a plastic hammer, tap out the differential left case.
(d) Remove the speedometer drive gear from the differential right case.

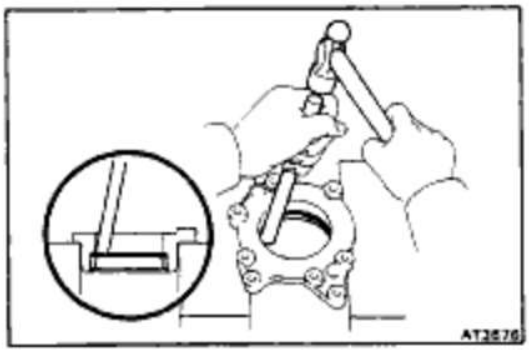


(e) Remove the two differential side gears, two side thrust washers, differential spider, four differential pinions and four pinion washers from the differential left case.

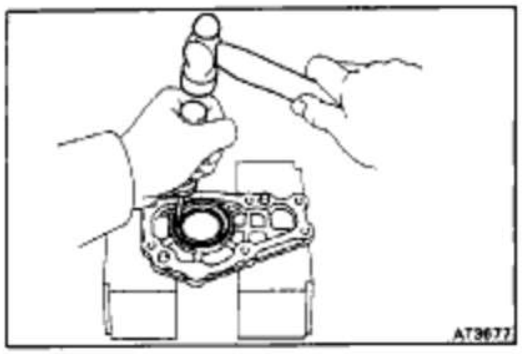


4. DISASSEMBLE LH BEARING RETAINER

(a) Using a hammer and screwdriver, remove the oil seal.
(b) Remove the oil baffle from the LH bearing retainer.

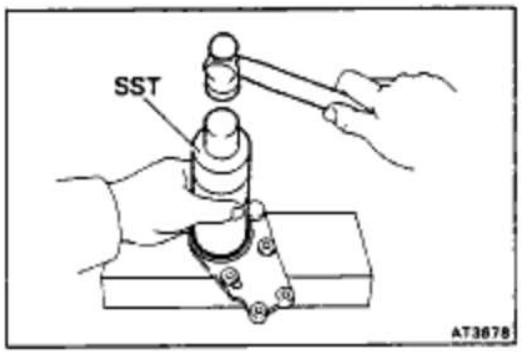


(e) Using a hammer and brass bar, drive out the outer race and adjusting shim from LH bearing retainer.



5. REMOVE RH OIL SEAL FROM RH RETAINER

Using a hammer and screwdriver, drive out the oil seal.

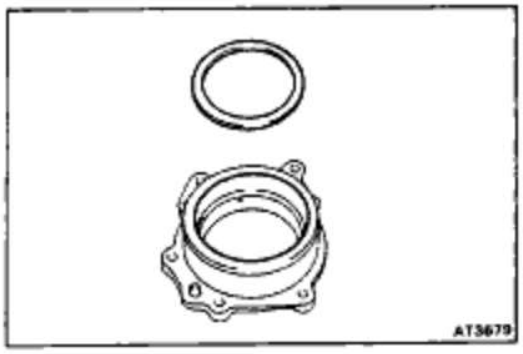


ASSEMBLY OF DIFFERENTIAL CASE

1. INSTALL RH OIL SEAL TO RH RETAINER

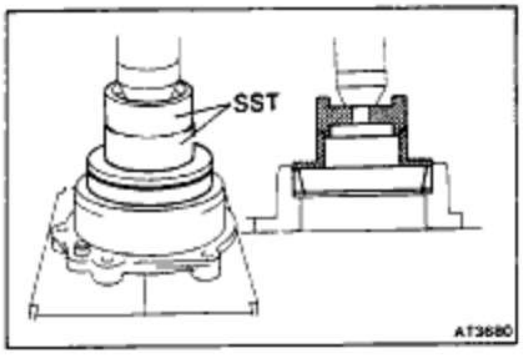
(a) Using SST, drive in a new oil seal until its surface is flush with the surface of RH retainer.
SST 09316–60010 (09316–00010)

(b) Coat the oil seal lip with MP grease.

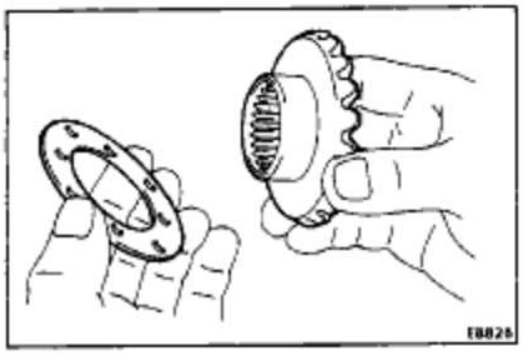


2. INSTALL ADJUSTING SHIM AND BEARING OUTER RACE TO LH BEARING RETAINER

(a) Place the adjusting shim into the LH bearing retainer.
HINT: Use either the shim which was removed or one 2.40 mm (0.0945 in.).



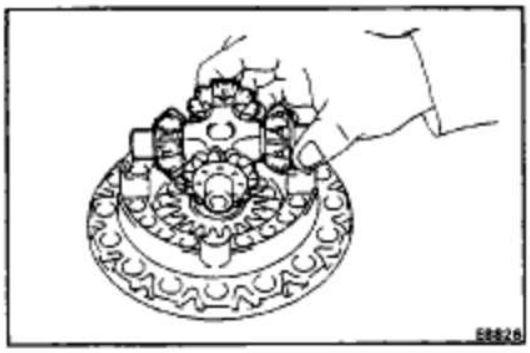
(b) Using SST, press the outer race into the LH retainer.
SST 09316–20011, 09350–32014 109351–32150y
HINT: Install the oil baffle and oil seal after adjusting the differential side bearing preload.
(See page AT–388)



3. ASSEMBLE DIFFERENTIAL CASE

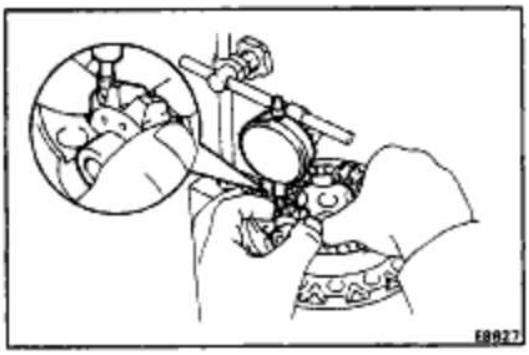
HINT: Coat all of the sliding and rotating surface with ATF before assembly.

(a) Install the thrust washer to the side gear.



(b) Install the four pinions –and thrust washers to the spider.

(c) Install the side gear and spider with four pinions to the differential left case.



(d) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear.

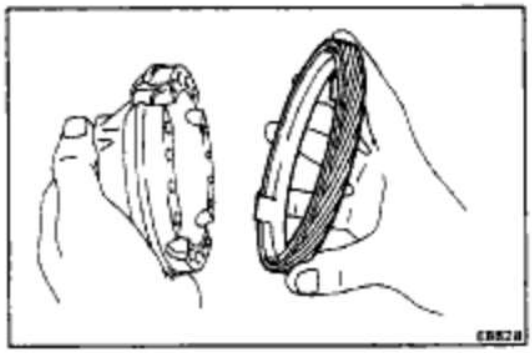
Standard backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

(e) Install the side gear and spider with four pinions to the right side of the differential case. And check the pinion gear backlash.

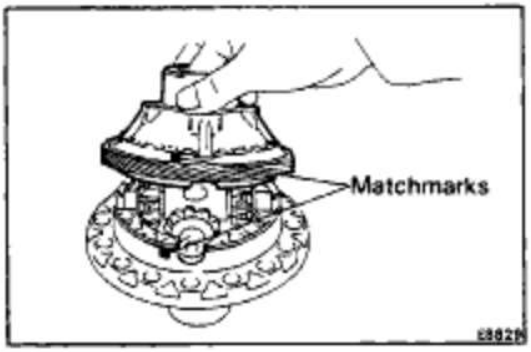
(f) Referring to the table below, select the side gear thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

mm (in.)

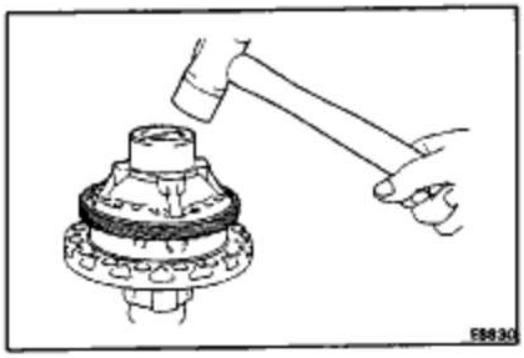
Thickness	
0.80 (0.0315)	1.20 (0.0472)
0.90 (0.0354)	1.30 (0.0512)
1.00 (0.0394)	1.40 (0.0551)
1.10 (0.0433)	



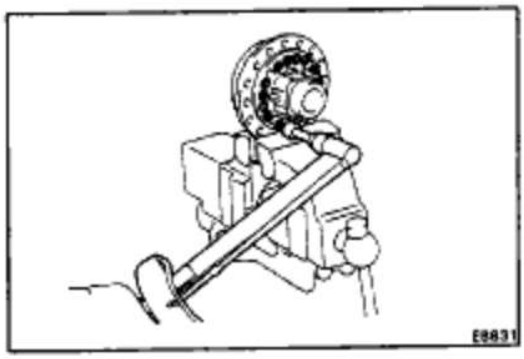
(g) Install the speedometer driven gear.



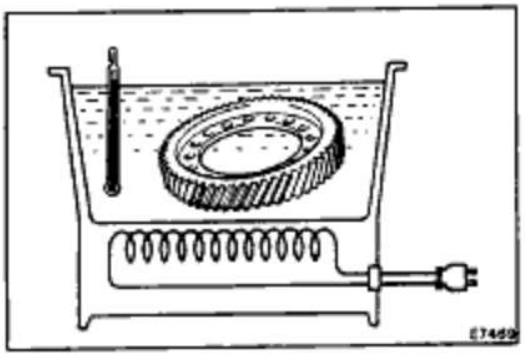
(h) Align the matchmarks on the differential cases.



(i) Using plastic hammer, carefully tap the differential right case.

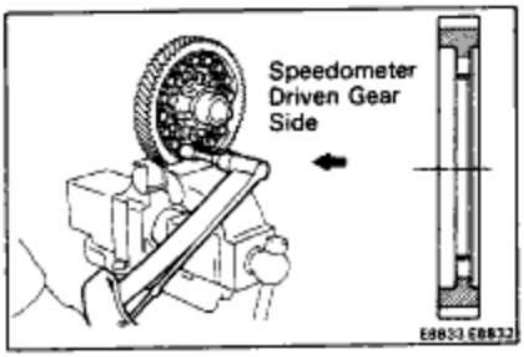


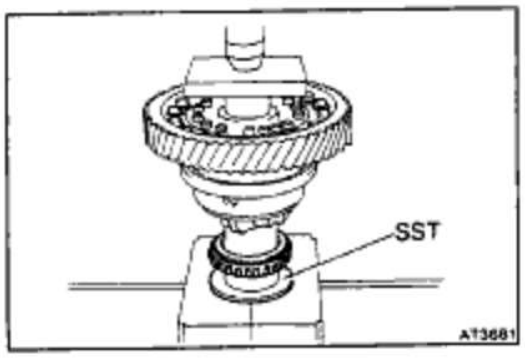
Q) Using a torx wrench, install and torque the sixteen torx screws.
Torque: 640 kg–cm (46 ft–lb, 63 N–m)



4. INSTALL RING GEAR

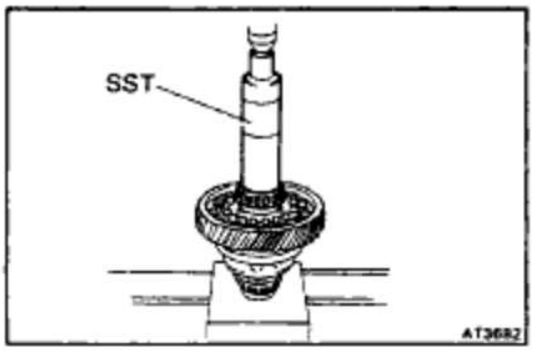
(a) Clean the contact surface of the differential case.
(b) Heat the ring gear to about 212°F (100°C) in an oil bath.
NOTICE: Do not heat the ring gear above 230°F (110°C).
(c) Clean the contact surface of the ring gear with cleaning solvent.
(d) Quickly install the ring gear on the differential case. Install the sixteen bolts.
HINT: Align the matchmarks on the differential left case and contact the ring gear.
(e) Tighten the set bolts uniformly and a little at a time. Torque the bolts.
Torque: 1,260 kg–cm (91 ft–lb, 124 N–m)





5. INSTALL SIDE BEARINGS

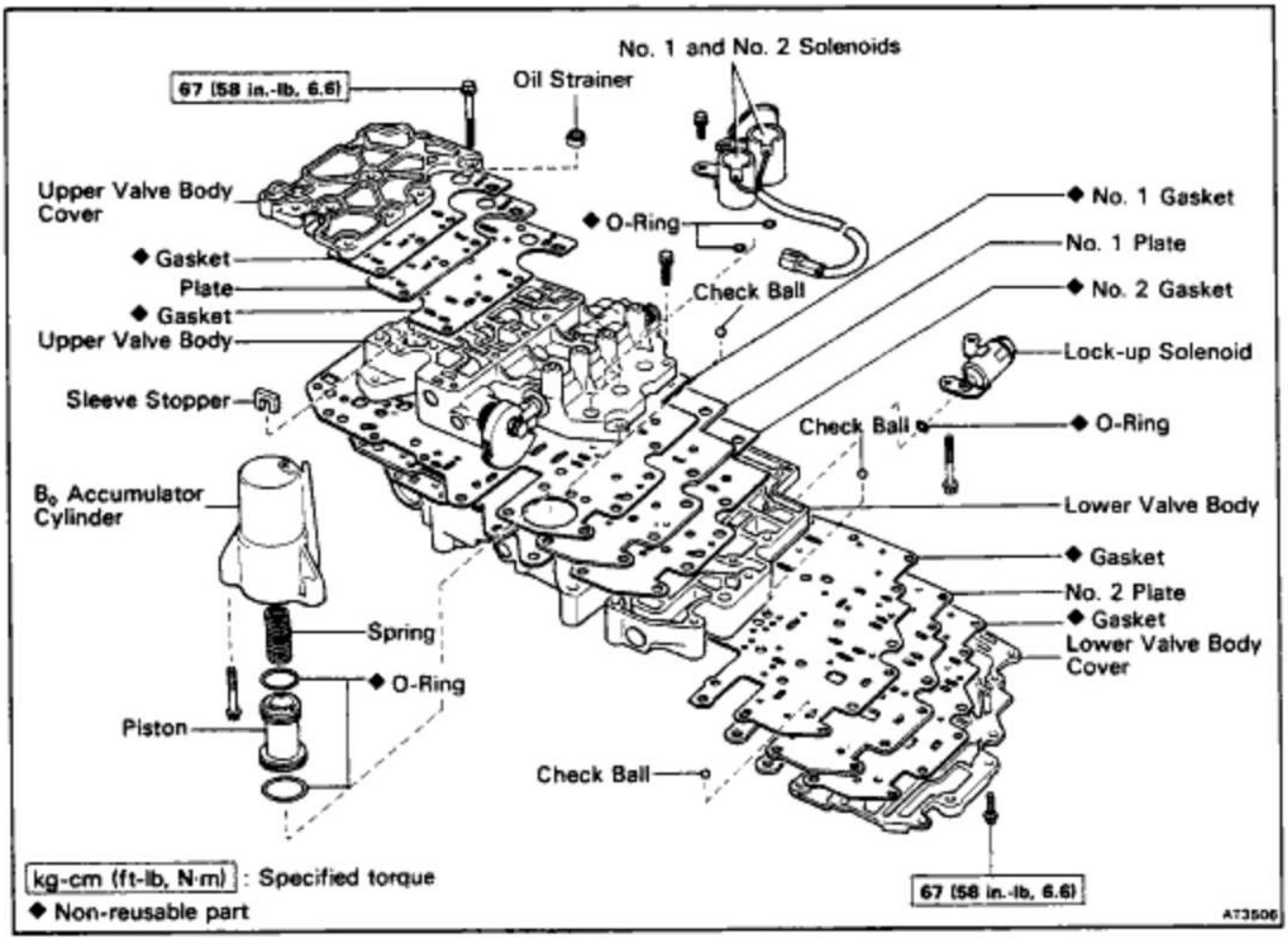
(a) Using SST and a press, install the RH side bearing to the differential case.
SST 09361–20011

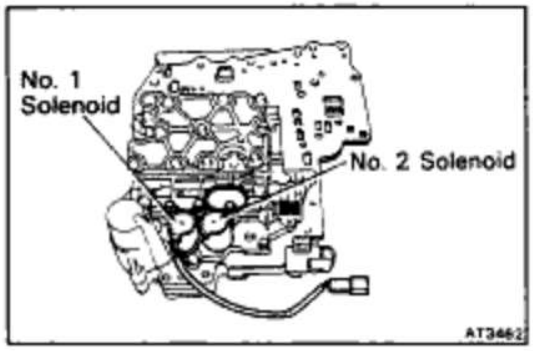


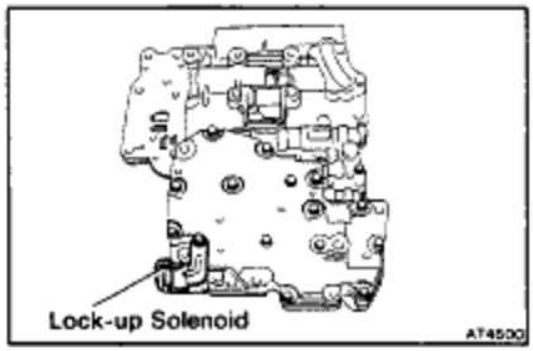
(b) Using SST and a press, install the LH side bearing.
SST 09316–60010 (09316–00010)

Valve Body (A540E and A540H)

COMPONENTS







(Disassembly of Valve Body)

NOTICE: When disassembling the valve body, be careful not to damage or deform the plate which over. hangs the valve body.

1. REMOVE SOLENOIDS

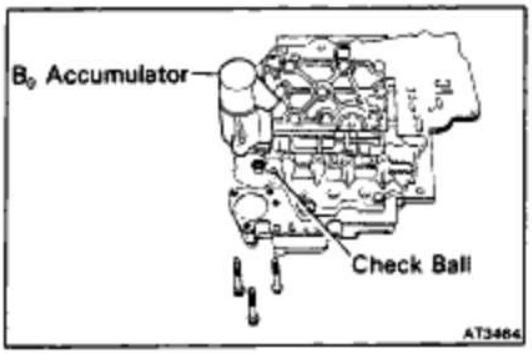
(a) Remove No. 1 and No. 2 solenoids.

NOTICE: When removing the solenoid, do not use g screwdriver, etc. to pry up. the solenoid.

(b1 Remove the O–ring from each solenoid.

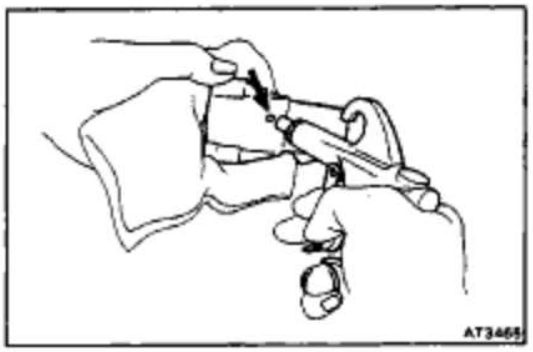
(e1 Remove the lock–up solenoid.

(d) Remove the O–ring from the solenoid.



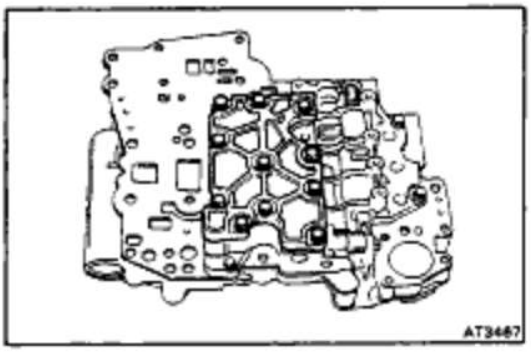
2. REMOVE So ACCUMULATOR ASSEMBLY

(a) Remove the three bolts.
(b) Remove the B0 accumulator assembly.
(c) Remove the check ball on No. 1 plate.



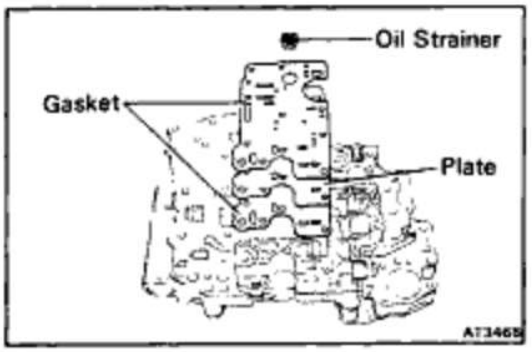
3. DISASSEMBLE So ACCUMULATOR ASSEMBLY

(a) Applying compressed air to the cylinder hole, remove the piston and spring.
(b) Remove the two O–ring from the piston.



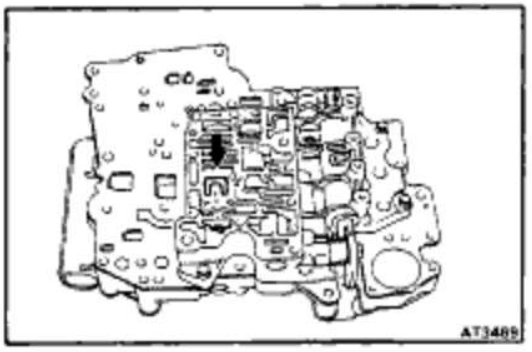
4. REMOVE UPPER VALVE BODY COVER

Remove the eleven bolts and upper valve body cover.

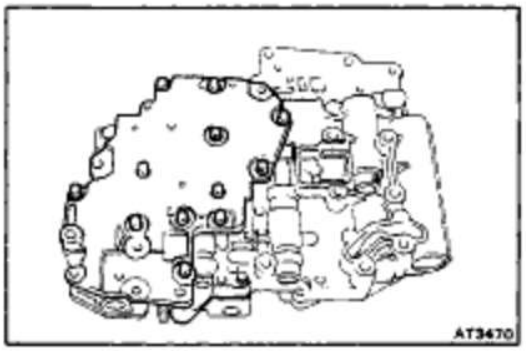


5. REMOVE OIL STRAINER, UPPER VALVE BODY COVER GASKETS AND PLATE

(a) Remove the oil strainer on the gasket.
(b) Remove the two gaskets and plate from the upper valve body.

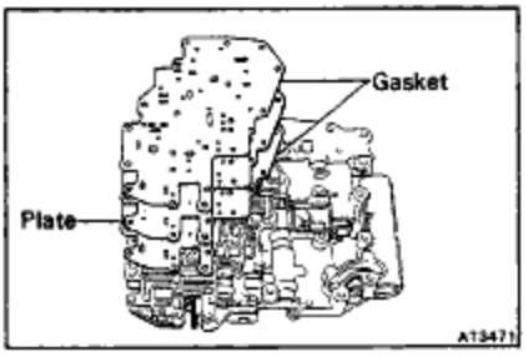


6. REMOVE LOCK–UP RELAY VALVE SLEEVE STOPPER

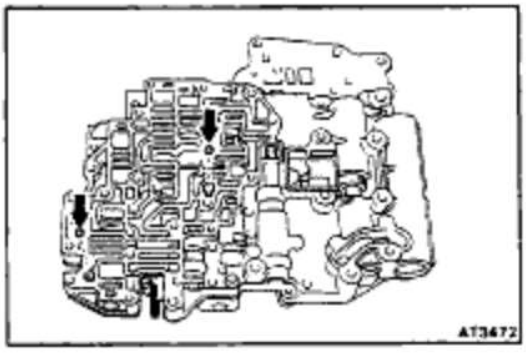


7.. REMOVE LOWER VALVE BODY COVER

Remove the twelve bolts and lower valve body cover.

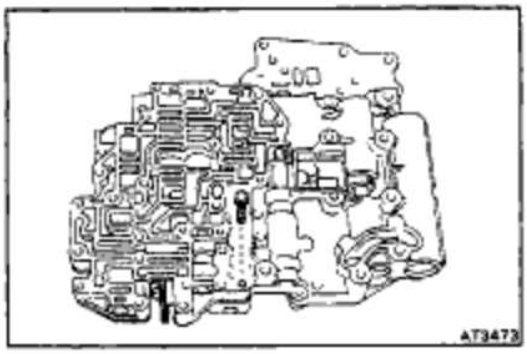


8. REMOVE LOWER VALVE BODY COVER GASKETS AND NO. 2 PLATE

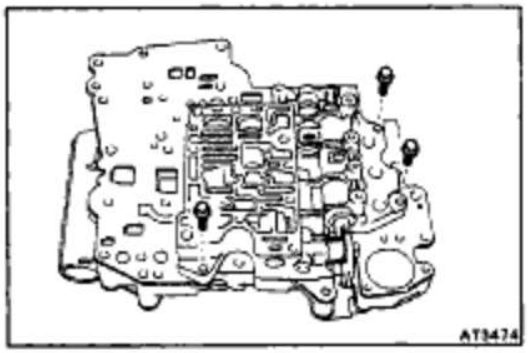


9. REMOVE CHECK BALLS

Remove the two check balls from the lower valve body.

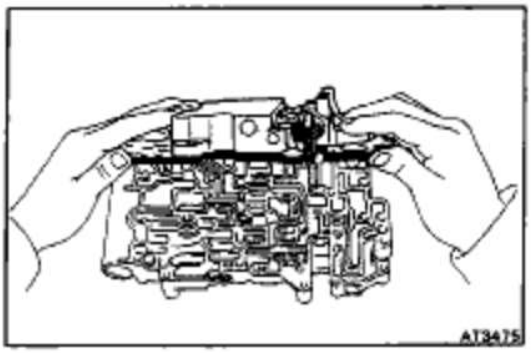


10. REMOVE BOLT FROM LOWER VALVE BODY



11. REMOVE BOLTS FORM UPPER VALVE BODY

Remove the three bolts.

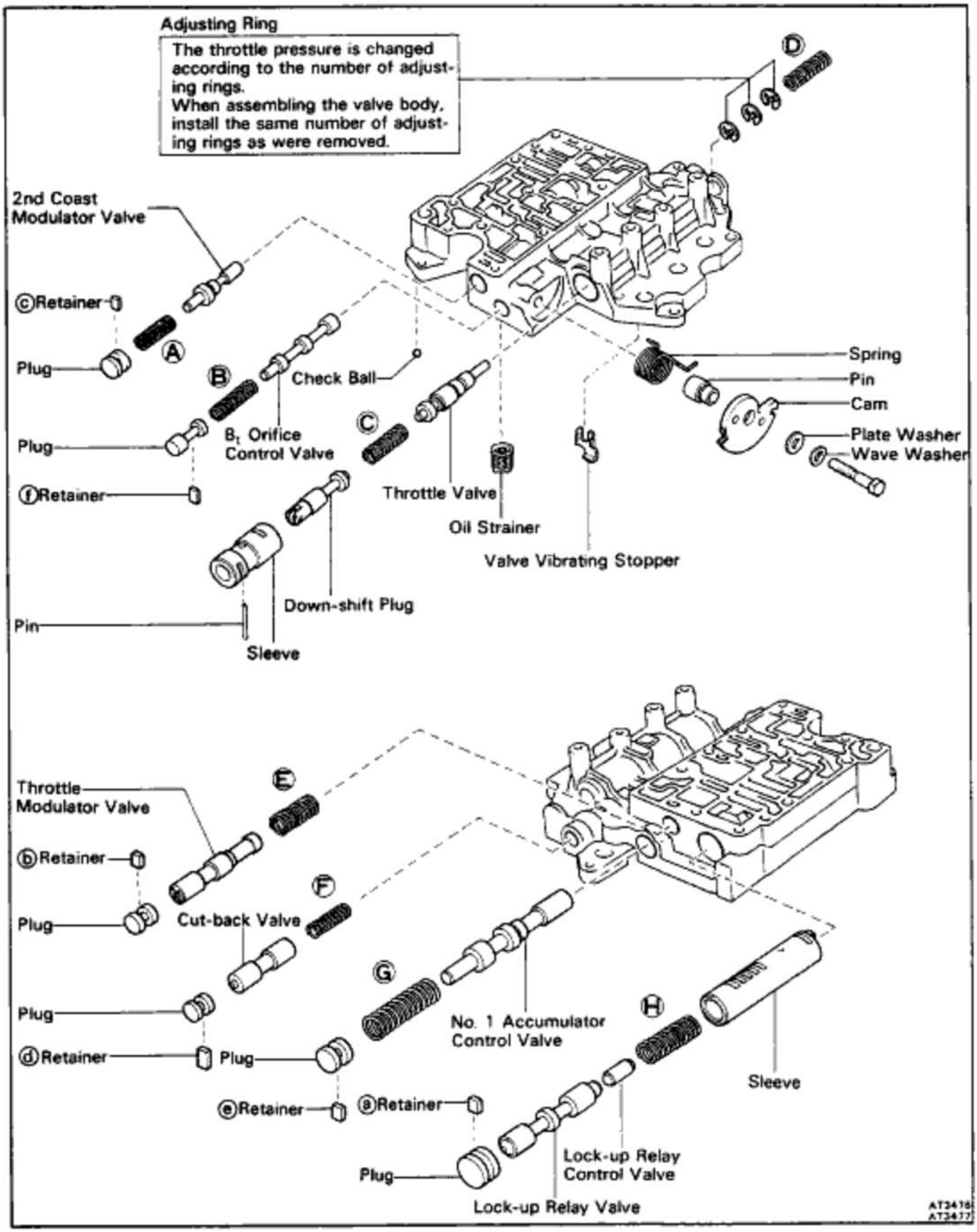


12. LIFT OFF UPPER VALVE BODY AND NO. 1 PLATE AS A SINGLE UNIT

Hold No. 1 plate to the upper valve body and lift off the upper valve body.

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

(Upper Valve Body)
COMPONENTS

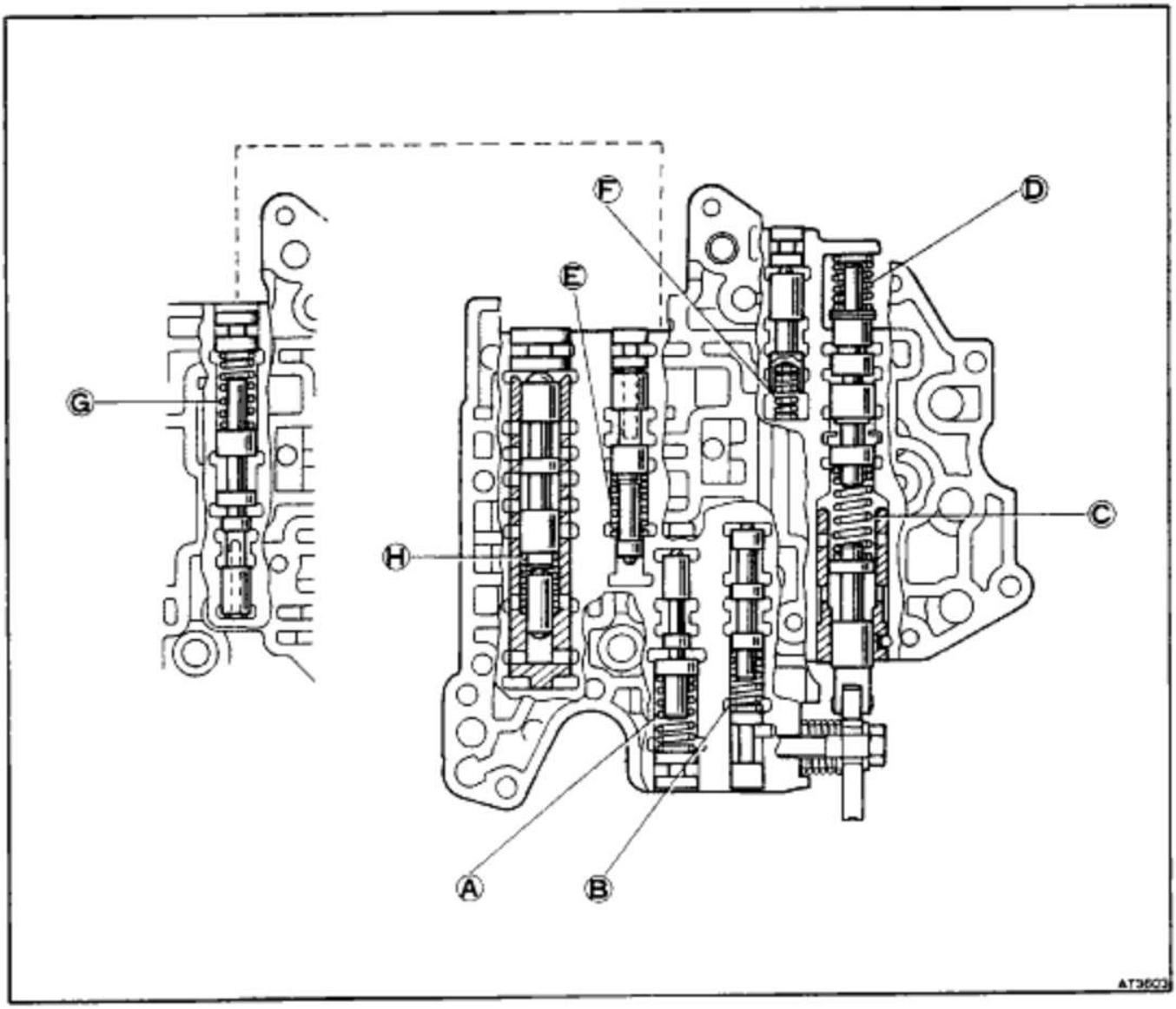


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Ⓐ	Second coast modulator valve	27.5 (1.083)	8.9 (0.350)	14.6	Brown
Ⓑ	B1 orifice control valve	24.8 (0.976)	8.0 (0.315)	12.0	White
Ⓒ	Down–shift plug	29.8 (1.173)	8.7 (0.343)	13.5	Yellow
Ⓓ	Throttle valve	30.7 (1.209)	9.2 (0.362)	9.5	Purple
Ⓔ	Throttle modulator valve	21.7 (0.854)	9.5 (0.374)	9.5	Orange
Ⓕ	Cut–back valve	21.8 (0.858)	6.0 (0.236)	13.5	Red
Ⓖ	No. 1 accumulator control valve	28.1 (1.106)	10.6 (0.417)	13.0	Yellow
Ⓗ	Lock–up relay valve	26.6 (1.047)	10.2 (0.402)	11.5	Green

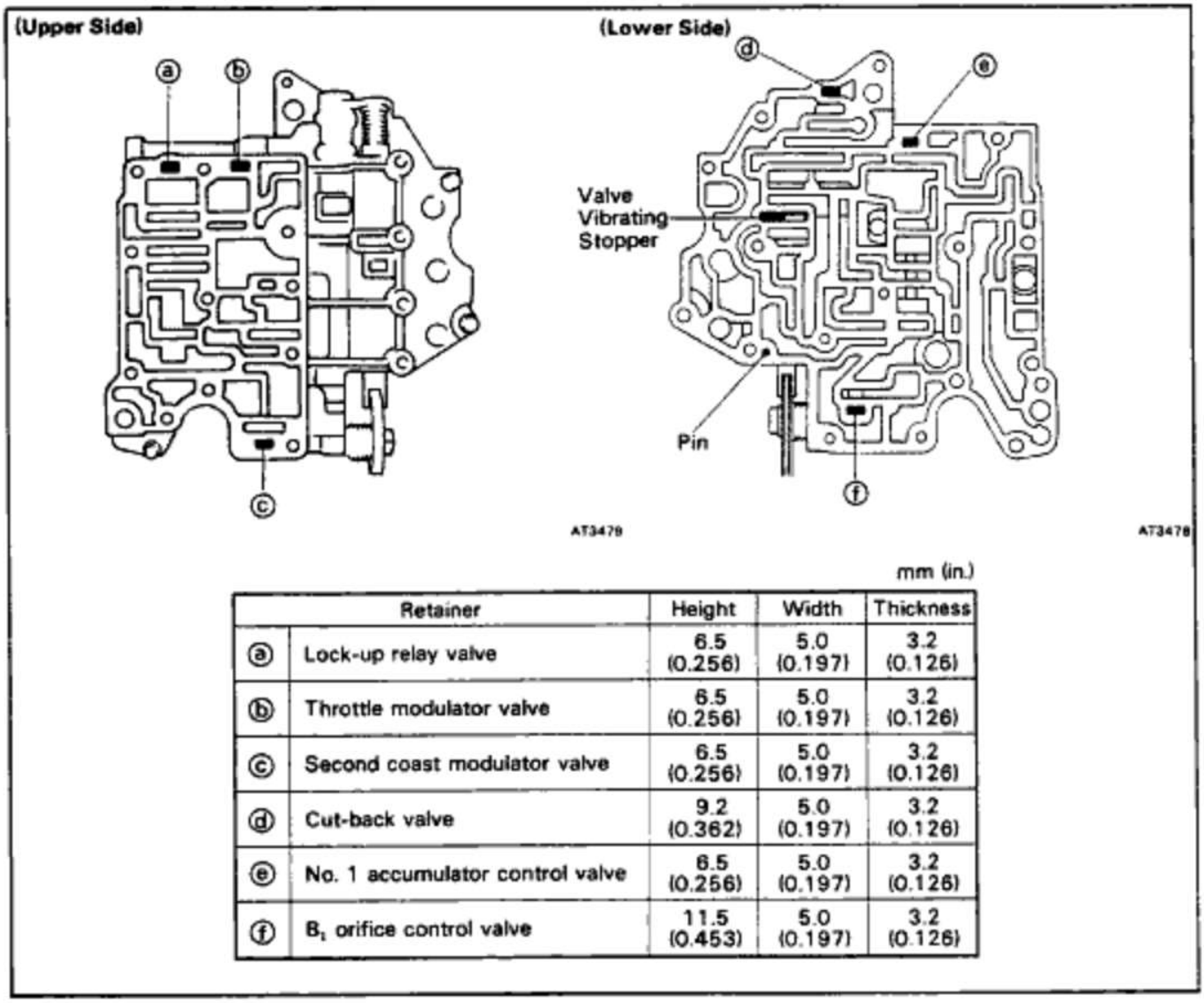
HINT: During reassembly please refer to the spring specifications above to help discriminate the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS PIN STOPPER CHECK BALL AND STRAINER

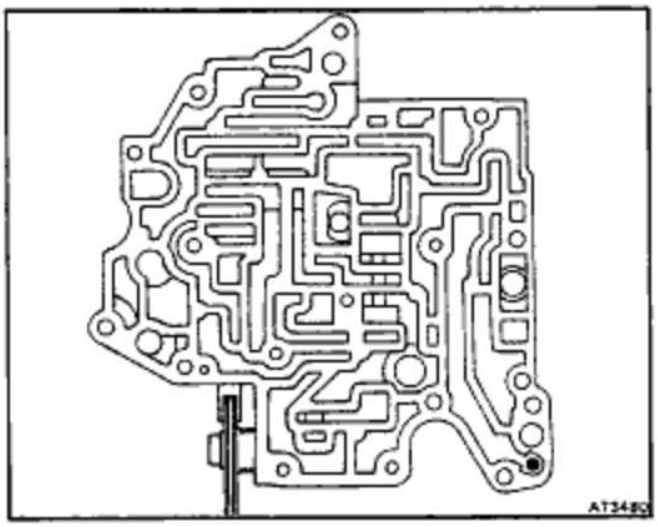
7. RETAINER, STOPPER AND PIN



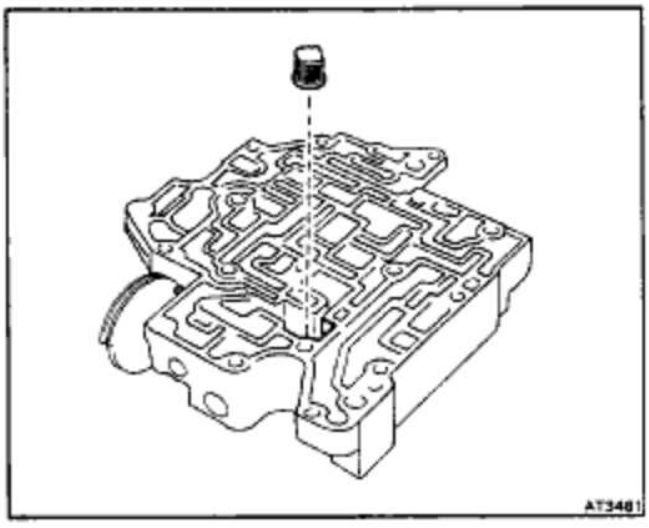
mm (in.)

	Retainer	Height	Width	Thickness
ⓐ	Lock-up relay valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓑ	Throttle modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓒ	Second coast modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓓ	Cut-back valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓔ	No. 1 accumulator control valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓕ	B_1 orifice control valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)

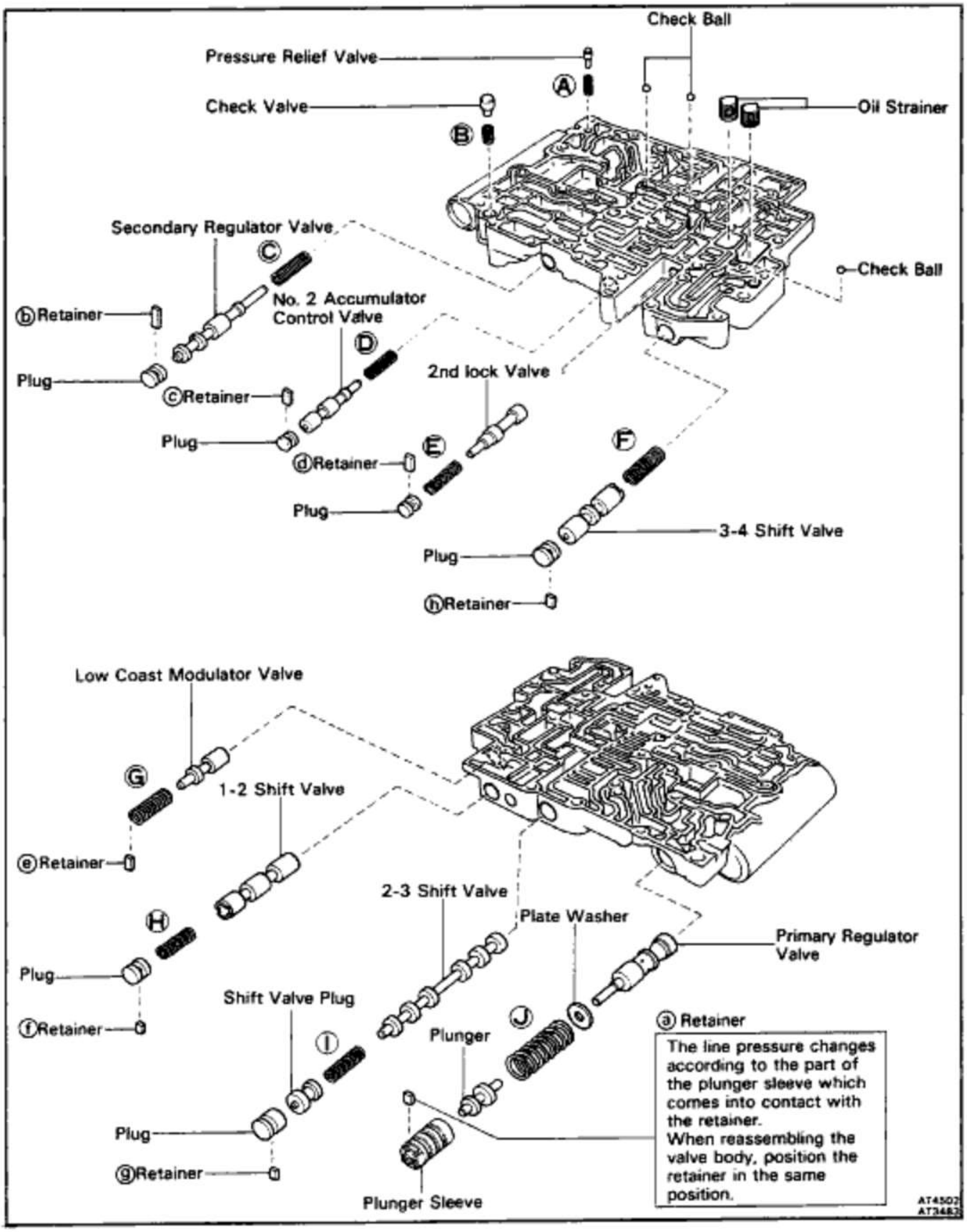
2. CHECKBALL



3. STRAINER



(Lower Valve Body)
COMPONENTS

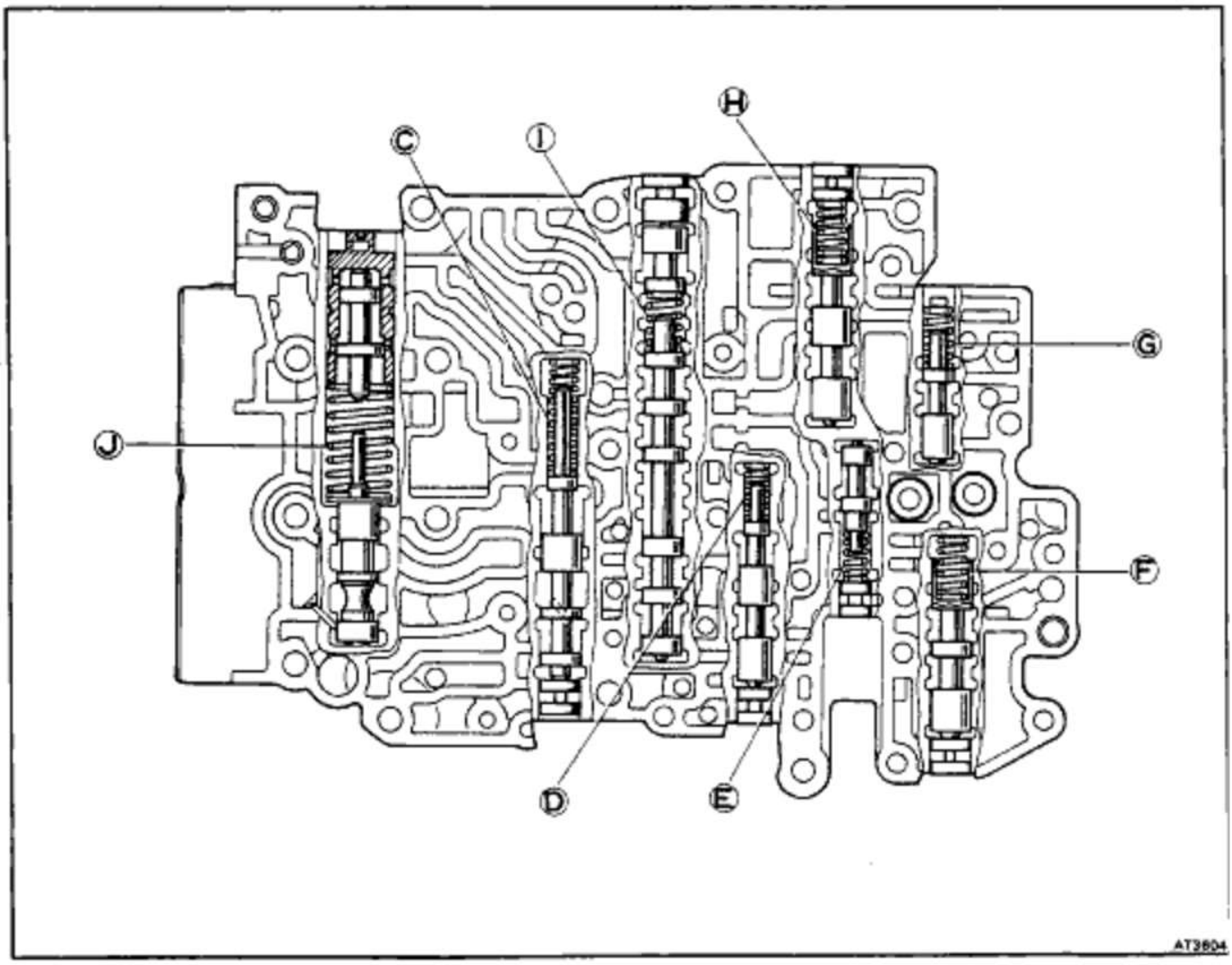


SPECIFICATIONS OF VALVE BODY SPRINGS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of coils	Color
Ⓐ	Pressure relief valve	11.2 (0.441)	6.4 (0.252)	7.5	None
Ⓑ	Check valve	19.9 (0.783)	11.0 (0.433)	8.5	None
Ⓒ	Secondary regulator valve	38.5 (1.516)	8.4 (0.331)	17.0	Purple
Ⓓ	No. 2 accumulator control valve	23.0 (0.906)	6.3 (0.248)	12.0	Gray
Ⓔ	Second lock valve	20.7 (0.815)	6.1 (0.240)	12.0	Orange
Ⓕ	3–4 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light Green
Ⓖ	Low coast modulator valve	20.2 (0.795)	7.9 (0.311)	11.9	Purple
Ⓗ	1–2 shift valve	29.2 (1.150)	8.9 (0.350)	12.0	Light Green
Ⓘ	2–3 shift valve	28.0 (1.102)	9.4 (0.370)	10.3	None
Ⓙ	Primary regulator valve	64.2 (2.528)	18.6 (0.732)	12.5	None

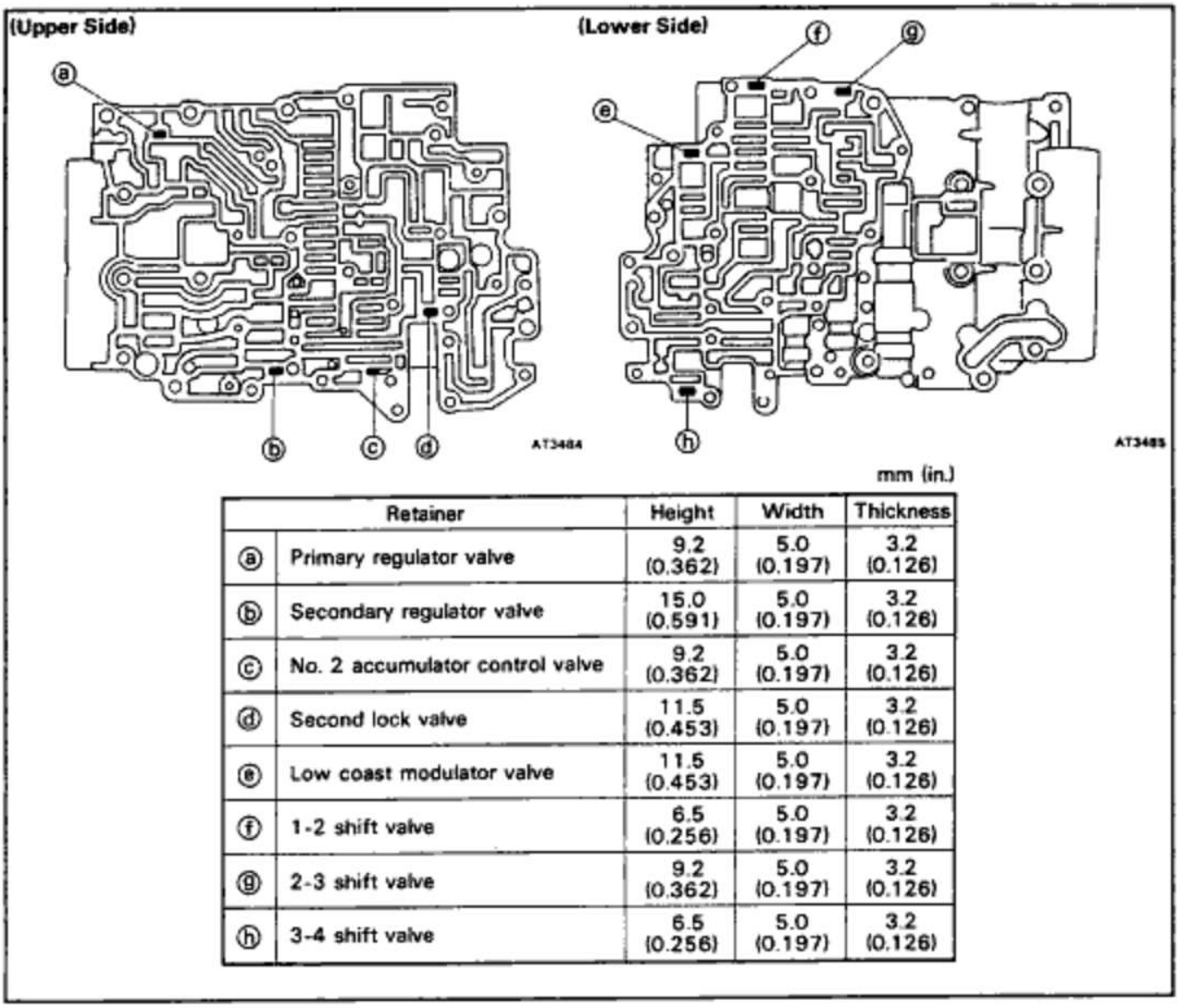
HINT: During reassembly please refer to the spring specifications above to help discriminate the different springs.

SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS CHECK BALLS AND STRAINERS

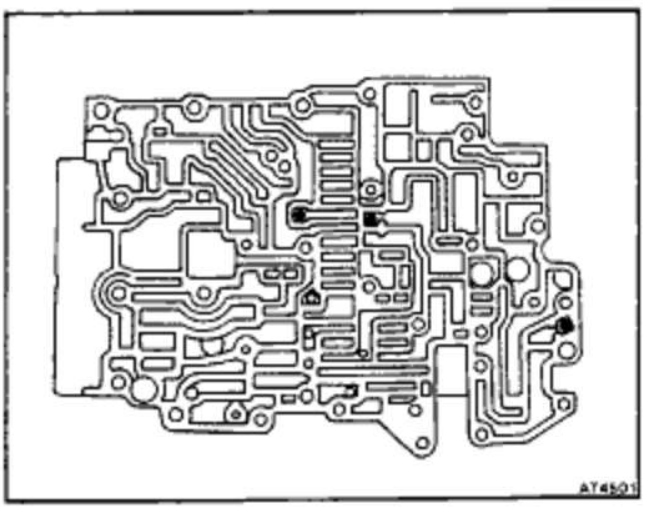
1. RETAINER



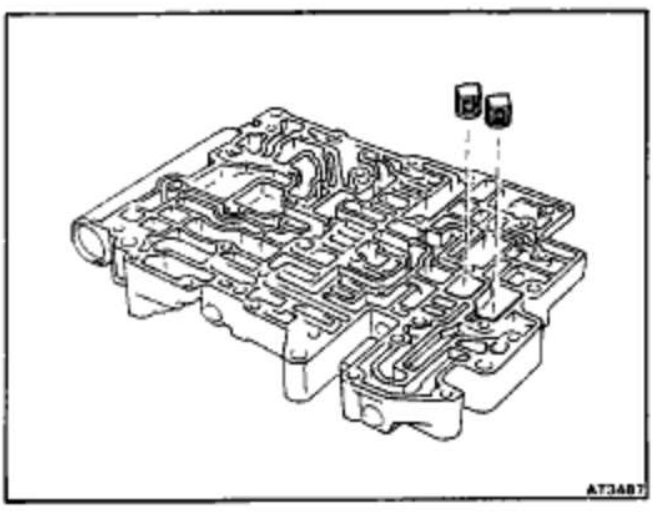
mm (in.)

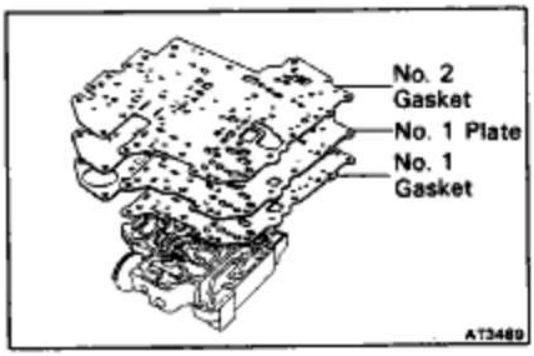
	Retainer	Height	Width	Thickness
ⓐ	Primary regulator valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓑ	Secondary regulator valve	15.0 (0.591)	5.0 (0.197)	3.2 (0.126)
ⓒ	No. 2 accumulator control valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓓ	Second lock valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓔ	Low coast modulator valve	11.5 (0.453)	5.0 (0.197)	3.2 (0.126)
ⓕ	1-2 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓖ	2-3 shift valve	9.2 (0.362)	5.0 (0.197)	3.2 (0.126)
ⓗ	3-4 shift valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)

2. CHECK BALL



3. STRAINER





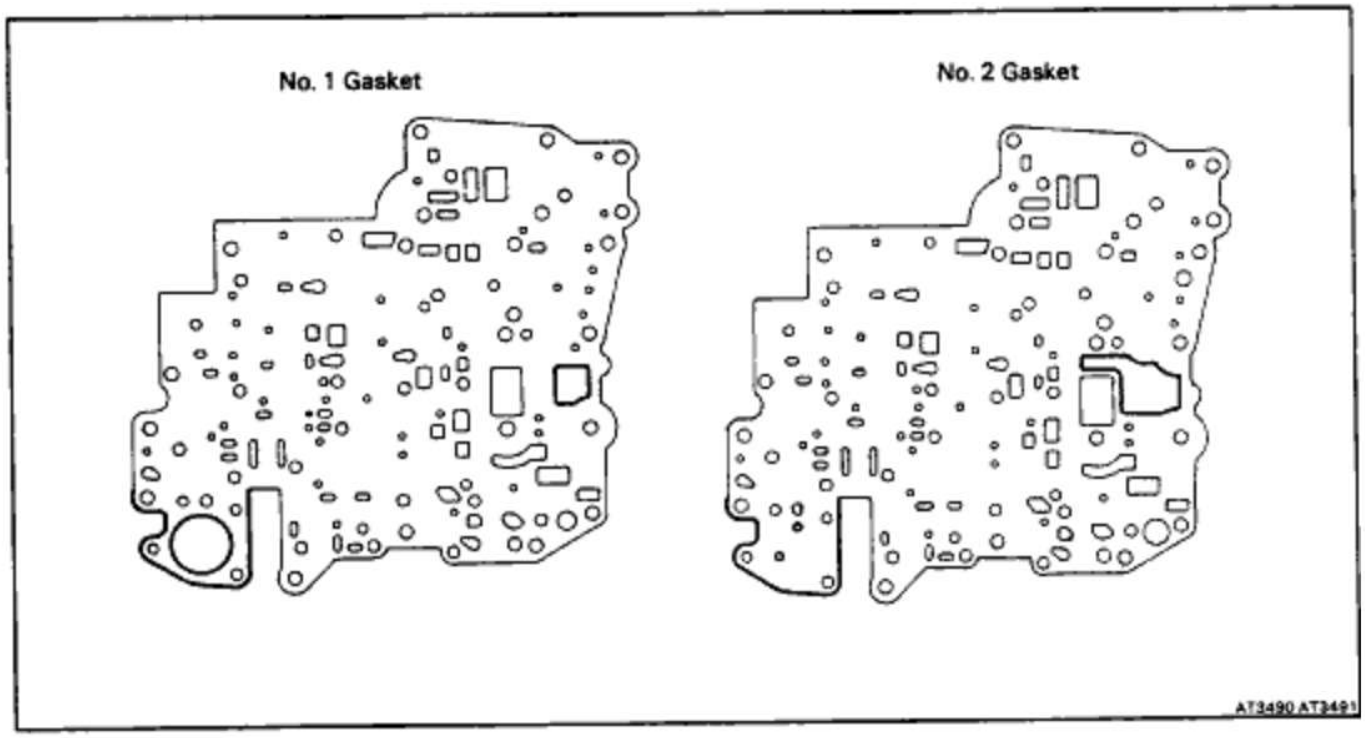
(Assembly of Valve Body)

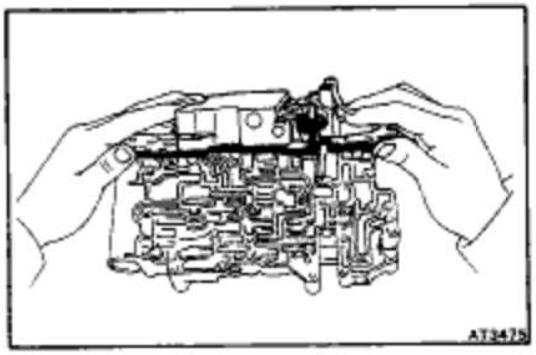
(See page AT–308)

1. POSITION NO. 1 PLATE AND NEW GASKETS ON UPPER VALVE BODY

Position new No. 1 gasket, No. 1 plate and then new No. 2 gasket on the upper valve body.

HINT: Since No. 1 gasket and No. 2 gasket are similar, use the illustration below to discriminate between them.

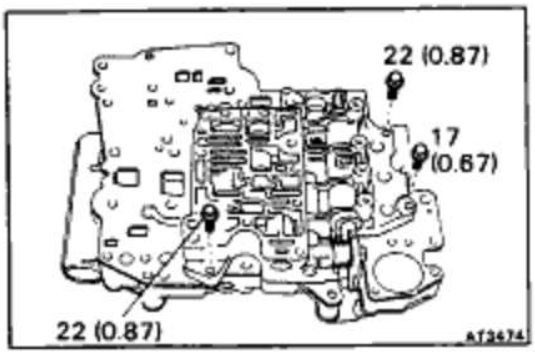




2. PLACE UPPER VALVE BODY WITH NO. 1 PLATE AND GASKETS ON LOWER VALVE BODY

Hold the upper valve body, No. 1 plate and gasket; securely so they do not separate.

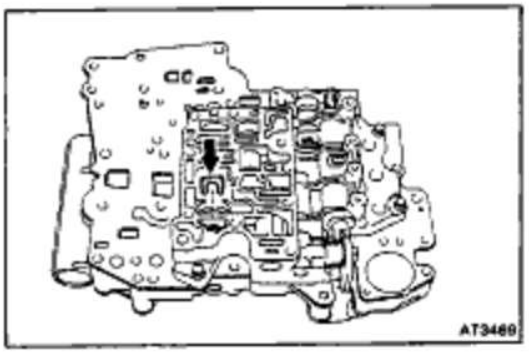
Align each bolt hole in the valve bodies with the gasket; and plate.



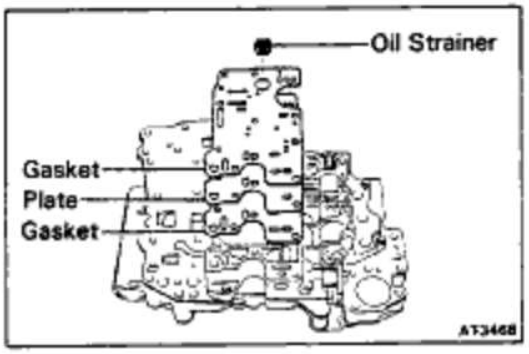
3. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY TO SECURE LOWER VALVE BODY

Install and finger tighten the three bolts.

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



4. INSTALL LOCK–UP RELAY VALVE SLEEVE STOPPER

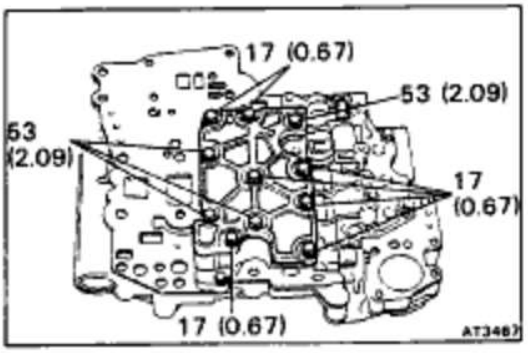


5. INSTALL UPPER VALVE BODY COVER GASKETS, PLATE AND THROTTLE MODULATOR OIL STRAINER

(a) Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

(b) Install the oil strainer onto the gasket.

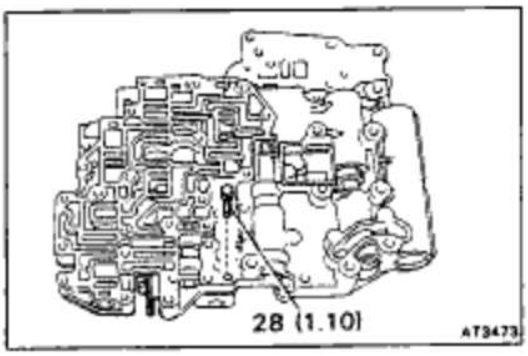


6. INSTALL UPPER VALVE BODY COVER

(a) Position the upper valve body cover.

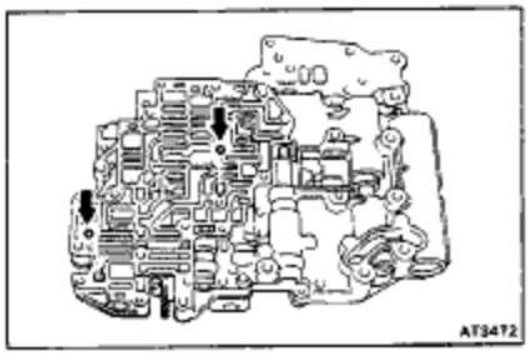
(b)) Install and finger tighten the eleven bolts.

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



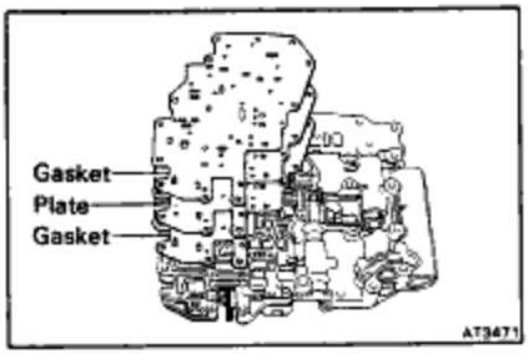
7. INSTALL AND FINGER TIGHTEN BOLT IN LOWER VALVE BODY

HINT: Bolt length (mm (in)) is indicated in the figure.



8. INSTALL CHECK BALLS

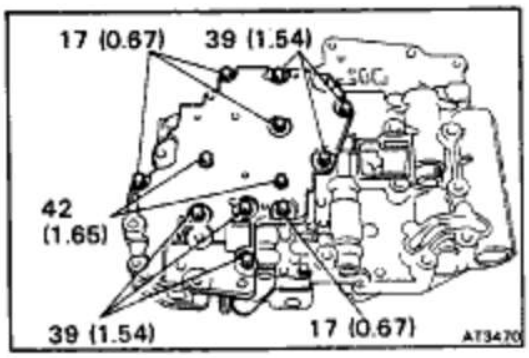
Install the two check balls into the lower valve body.



9. INSTALL LOWER VALVE BODY COVER GASKETS AND NO. 2 PLATE

Position a new gasket and plate and then another new gasket.

HINT: Both gaskets are same one.

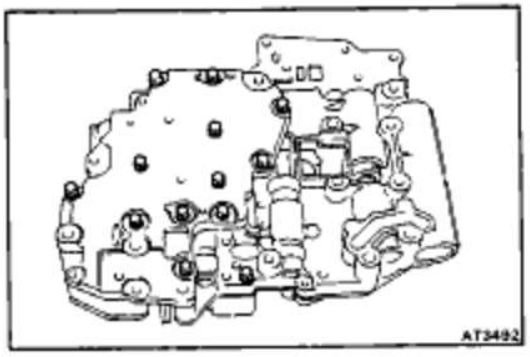


14. INSTALL LOWER VALVE BODY COVER

(a) Position the lower valve body cover.

(b) Install and finger tighten the twelve bolts.

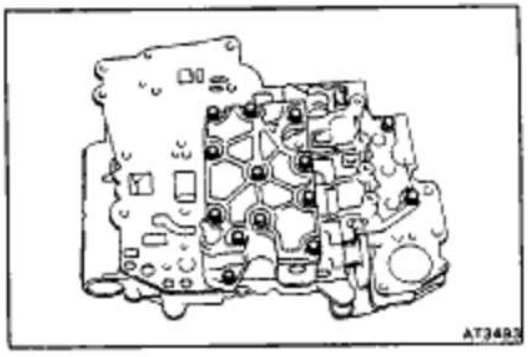
HINT: Each bolt length (mm (in.)) is indicated in the figure.



11. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

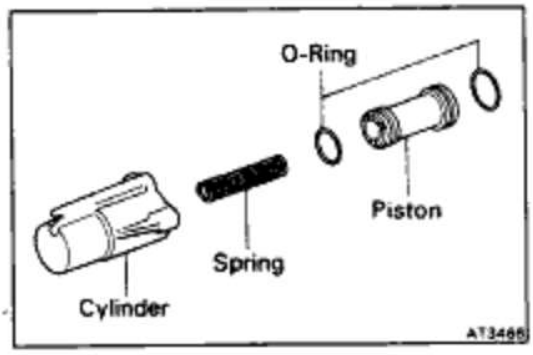
(a) Tighten the thirteen bolts in the lower valve body.

Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



(b) Tighten the fourteen bolts in the upper valve body.

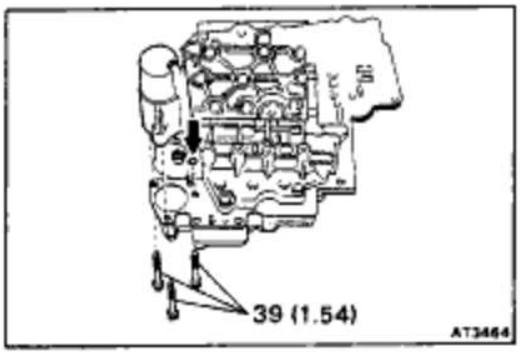
Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



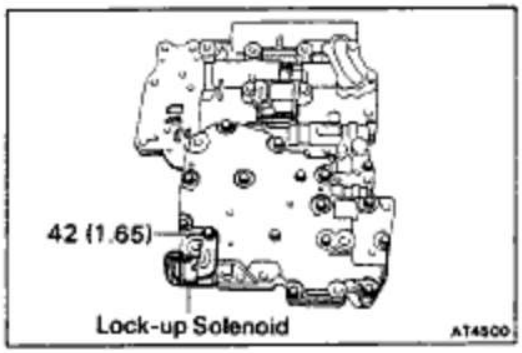
12. INSTALL B0 ACCUMULATOR ASSEMBLY

(a) Coat new O–rings with ATF and install them to the piston.

(b) Insert the spring and piston into the cylinder.

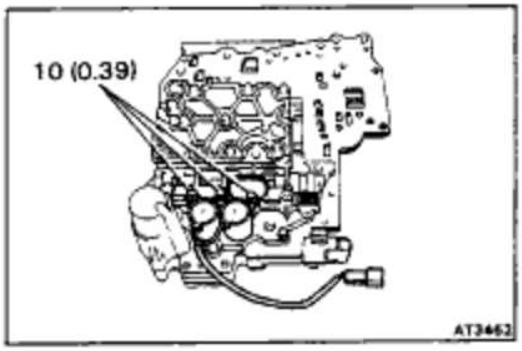


(c) Plate the check ball on No. 1 gasket.
(d) Install the B0 accumulator assembly.
(e) Install and torque the three bolts.
HINT: Each bolt length (mm 60) is indicated in the figure.
Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



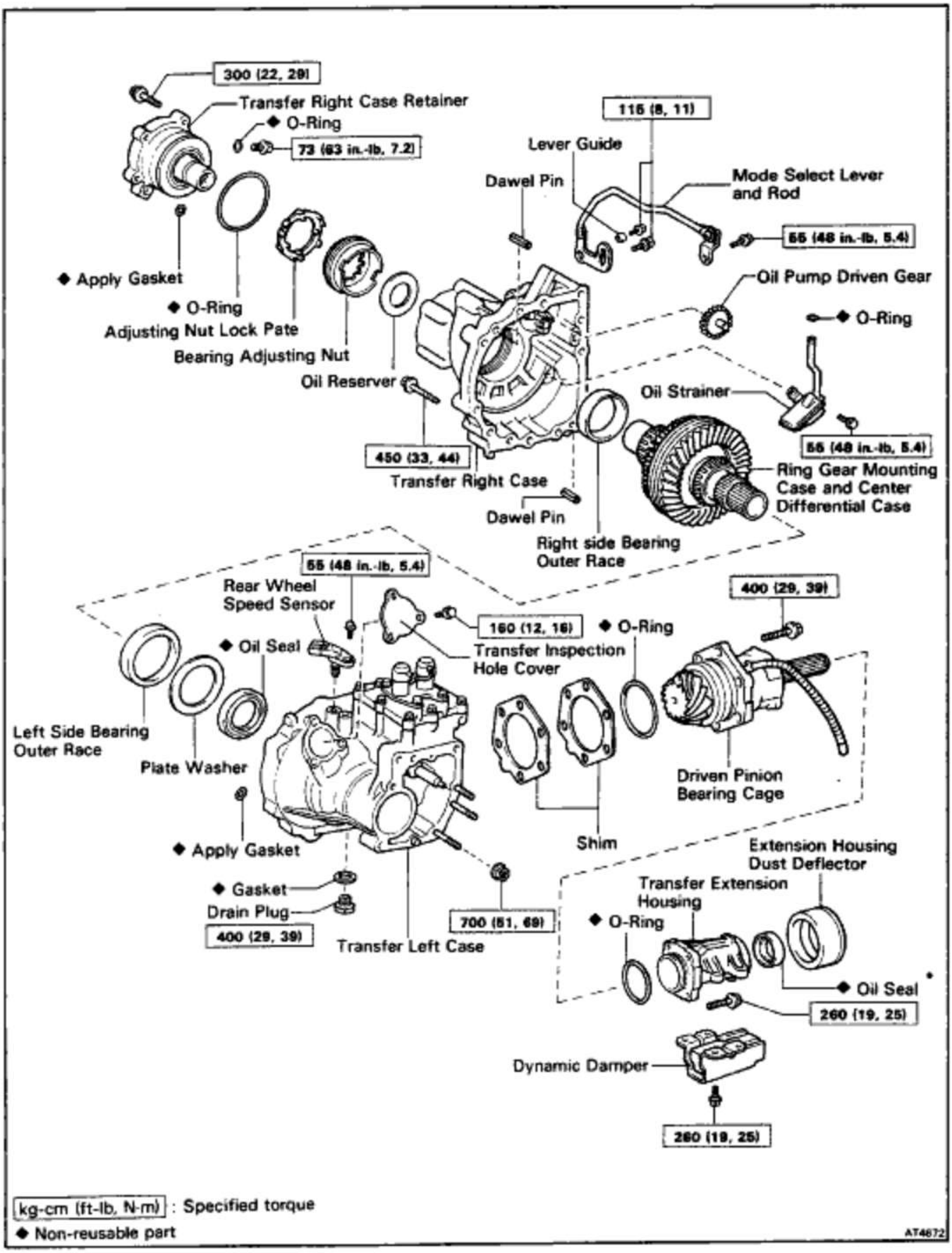
13. INSTALL SOLENOIDS

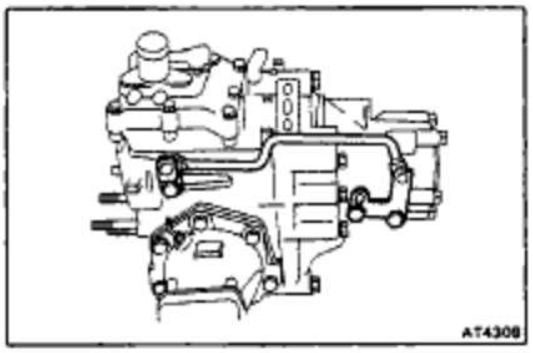
(a) Coat new O–rings with ATF and install them to the solenoids.
(b) Install the lock–up. solenoid.
(e) Install and torque the bolt:
HINT: Bolt length (mm (in.)) is indicated in the figure.
Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



(d) Install No. 1 and No. 2 solenoids.
(e) Install and torque the three bolts.
HINT: Each bolt length (mm (in.)) is indicated in the figure.
Torque: 67 kg–cm (58 in.–lb. 6.6 N–m)

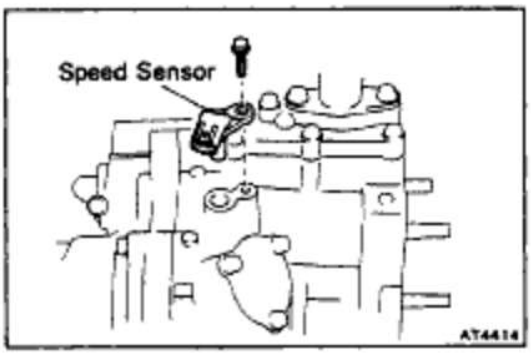
Transfer (A540H)





REMOVAL OF COMPONENT PARTS

7. REMOVE TRANSFER MODE SELECT LEVER AND ROD

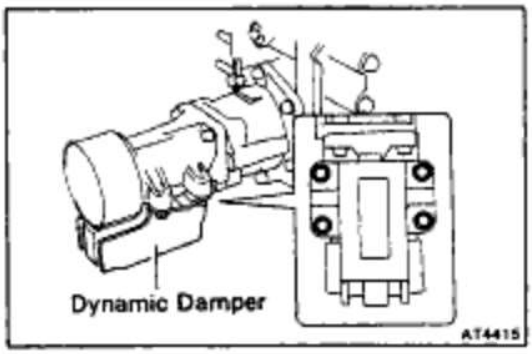


2: REMOVE REAR WHEEL SPEED SENSOR

(a) Remove the bolt and pull out the speed sensor.
(b) Remove the O–ring from speed sensor.

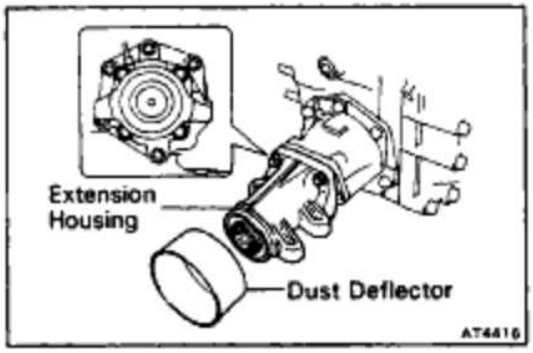
3. REMOVE DYNAMIC DAMPER

Remove the four bolts and dynamic damper.

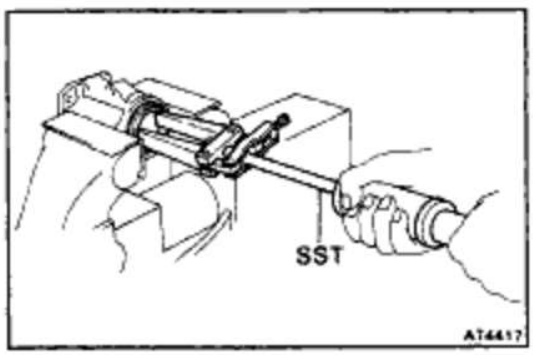


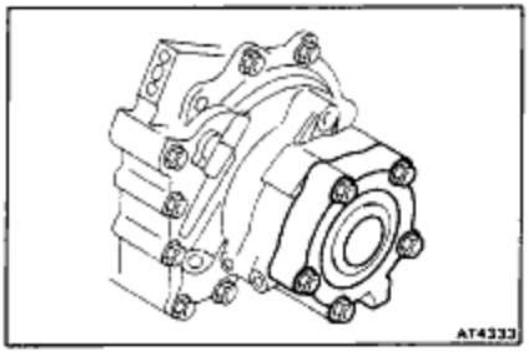
4. REMOVE EXTENSION HOUSING

(a) Remove the dust deflector from the extension housing.
(b) Remove the four bolts and extension housing.
(c) Remove the O–ring from the extension housing.



(d) Using SST, remove the oil seal.
SST 09308–00010

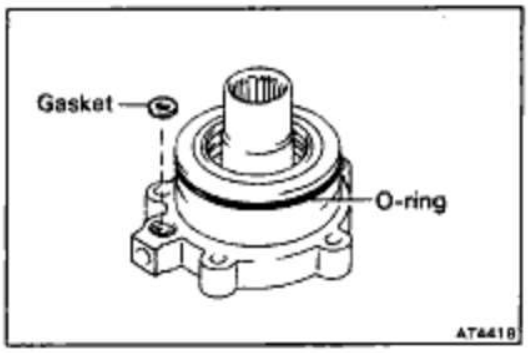




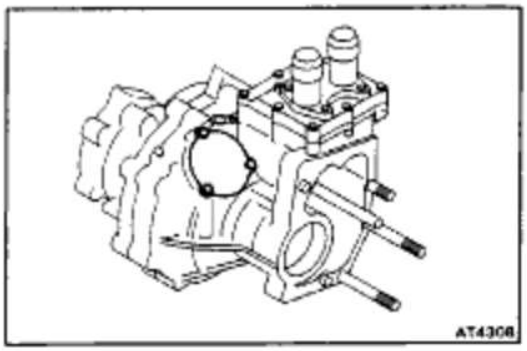
5. REMOVE TRANSFER RIGHT CASE RETAINER

(a) Remove the five bolts.

(b) Using a plastic hammer, remove the right case retainer.

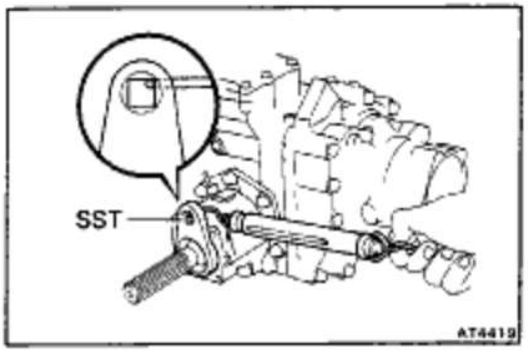


(e) Remove the O–ring and apply gasket from the right case retainer.



6. REMOVE TRANSFER INSPECTION HOLE COVER

Remove the three bolts and inspection hole cover.



7. CHECK PRELOAD

(a) Using SST and a spring tension gauge, measure the driven pinion preload of the backlash between the driven pinion and ring gear.

SST 09326–20011

Driven pinion preload (at starting) :

0.9– 1.4 kg (2.0–3.1 lb,8.8– 13.7 N)

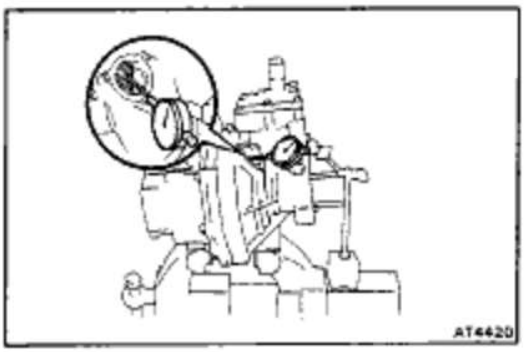
(b) Using SST and a spring tension gauge, measure the total preload.

SST 09326–20011

Total pre load (at starting):

Add driven pinion preload

0.5–0.9kg(1.1 –2.0 lb,4.9–8.8N)



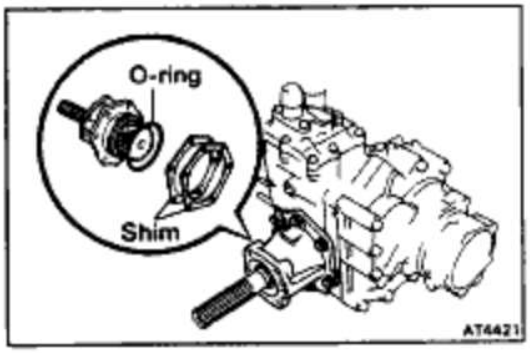
8. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the –ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

CHECK TOOTH CONTACT

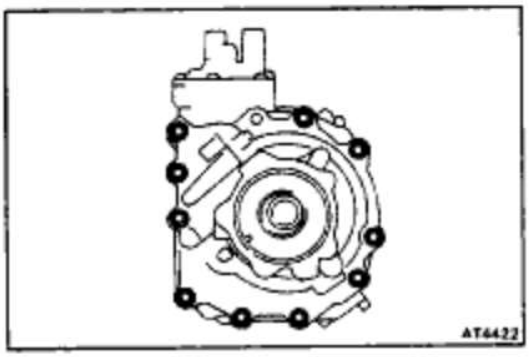
(See page AT–374)



9. REMOVE DRIVEN PINION BEARING CAGE

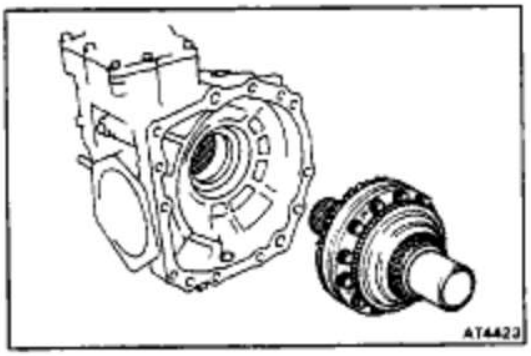
(a) the six bolts and bearing cage.

(b) Remove the O–ring and the shims from the bearing cage.

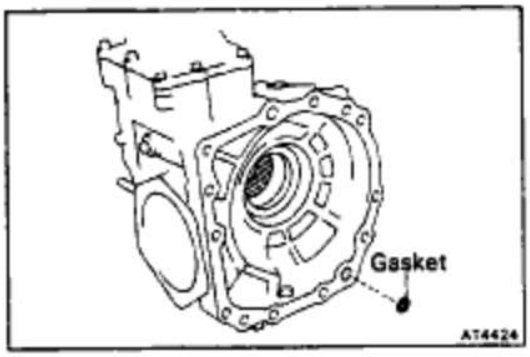


10. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and right case.

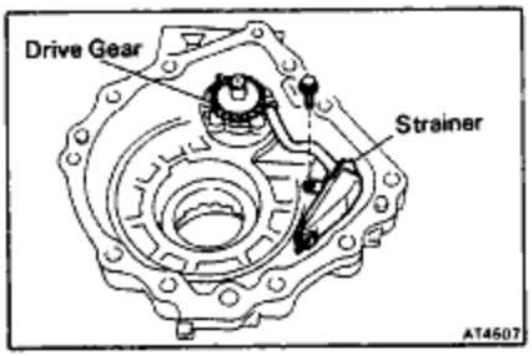


11. REMOVE CENTER DIFFERENTIAL ASSEMBLY



12. REMOVE APPLY GASKET

Remove the apply gasket from the left case.

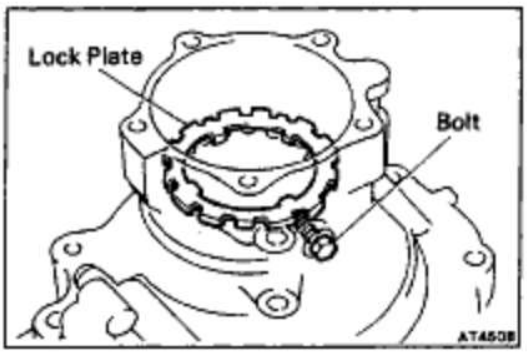


13. REMOVE OIL PUMP DRIVEN GEAR AND OIL PUMP STRAINER

(a) Remove oil pump driven gear.

(b) Remove the bolt and oil pump strainer.

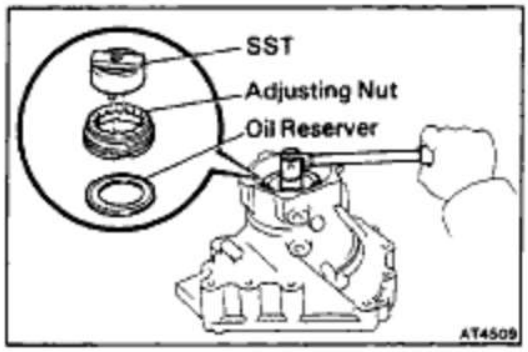
(c) Remove the O–ring from the oil pump strainer.



14. REMOVE ADJUSTING NUT LOCK PLATE

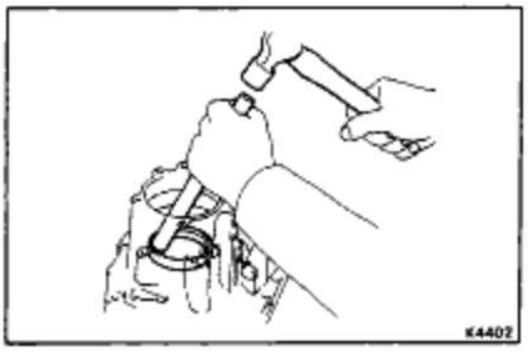
(a) Remove the bolt and nut lock plate from the right case.

(b) Remove the O–ring from the bolt.

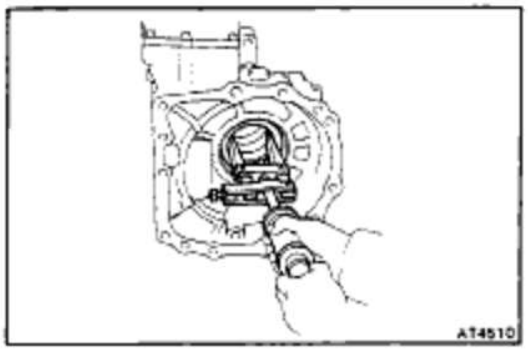


15. REMOVE DIFFERENTIAL RIGHT SIDE BEARING OUTER RACE

(a) Using SST, remove the adjusting nut and oil reservoir from the right case.
SST 09318–12010

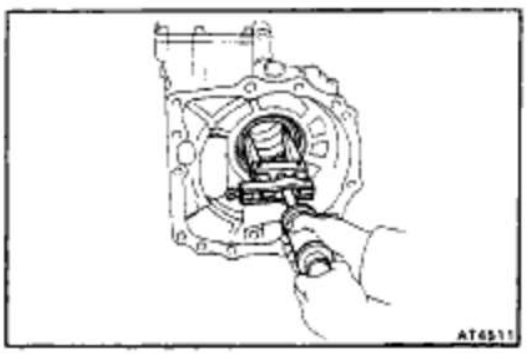


(b) Using a brass bar, remove the outer race.



16. REMOVE DIFFERENTIAL LEFT SIDE BEARING OUTER RACE

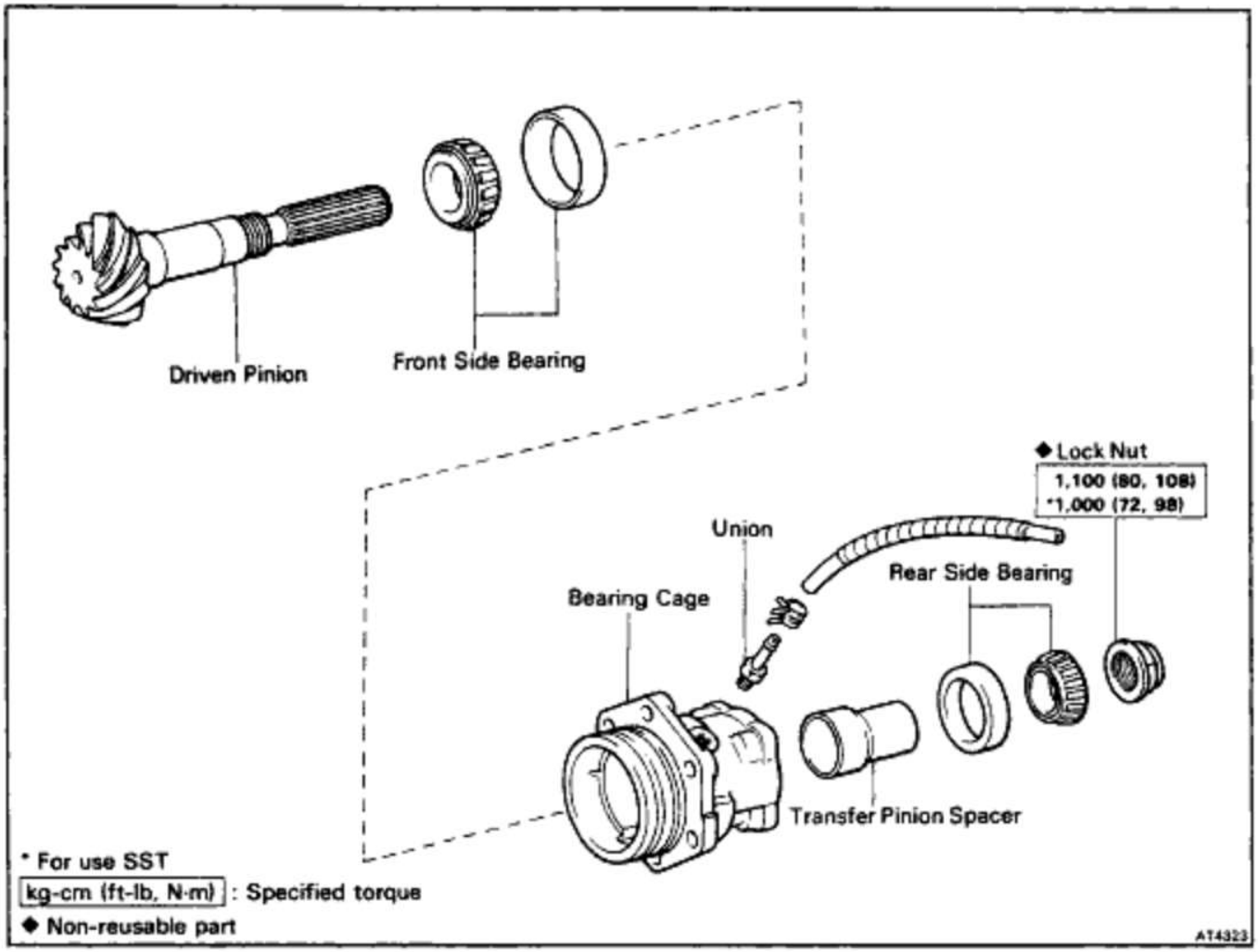
Using SST, remove the outer race and plate washer.
SST 09308–00010

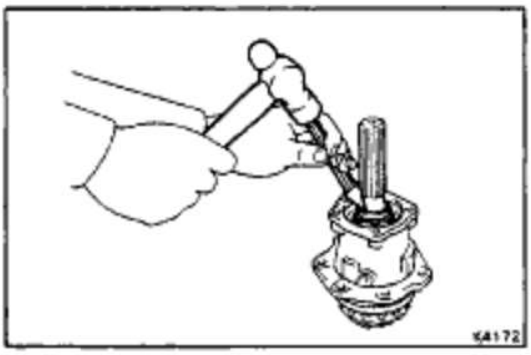


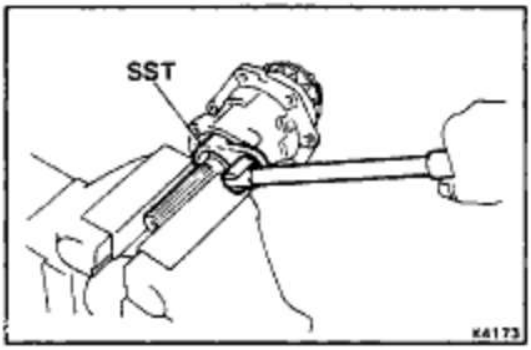
17. REMOVE LEFT CASE OIL SEAL

Using SST, remove the oil seal.
SST 09308–00010

(Driven Pinion Bearing Cage)







DISASSEMBLY OF DRIVEN PINION BEARING CAGE

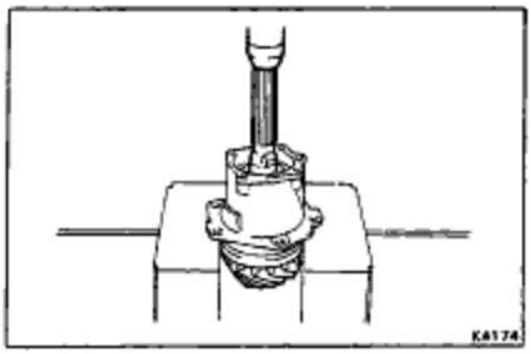
1. REMOVE LOCK NUT

(a) Using a chisel and hammer, unstake the lock nut.

(b) Using SST, remove the lock nut.

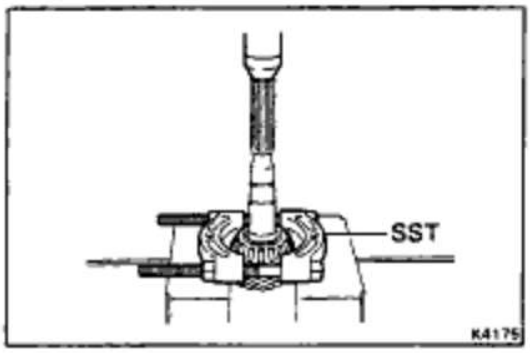
SST 09326–20011

NOTICE: Using soft jaws, hold the driven pinion in a vise.



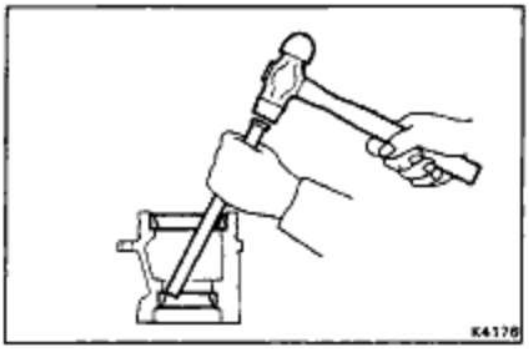
2. REMOVE DRIVEN PINION

Using a press, remove the driven pinion, rear side bearing and spacer.



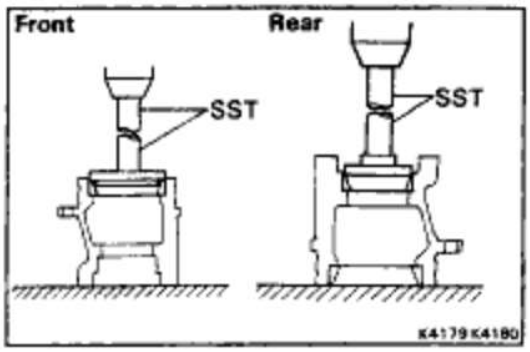
3. REMOVE FRONT SIDE BEARING

Using a press and SST, remove the front side bearing.
SST 09950–00020



4. REMOVE BEARING OUTER RACES

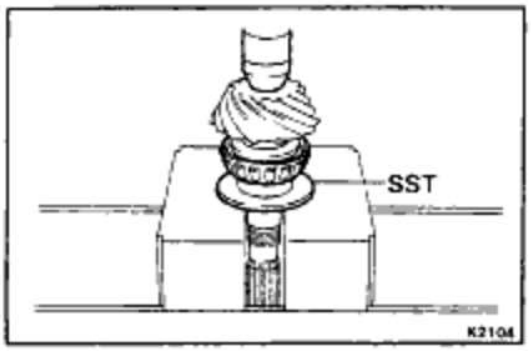
Using a brass bar and hammer, remove the two bearing outer races.



ASSEMBLY OF DRIVEN PINION BEARING CAGE

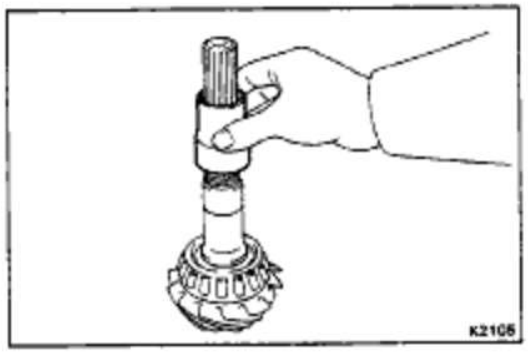
1. INSTALL BEARING OUTER RACES

Using a press and SST, install the two bearing outer races to the bearing cage.
SST
Front side:
09608–35014 (09608–06020, 09608–06120)
Rear side:
09608–30022 (09608–05010. 09608–00050)



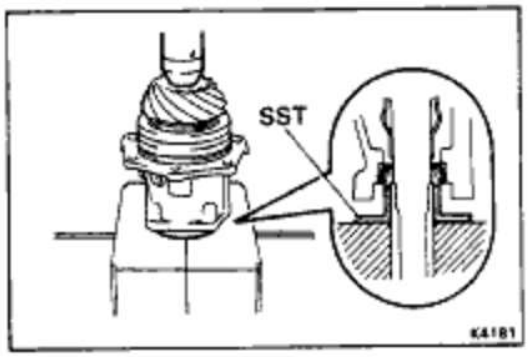
2. INSTALL DRIVEN PINION FRONT SIDE BEARING

Using a press and SST, install the front side bearing.
SST 09506–35010



3. INSTALL SPACER

Install a new spacer to the driven pinion.

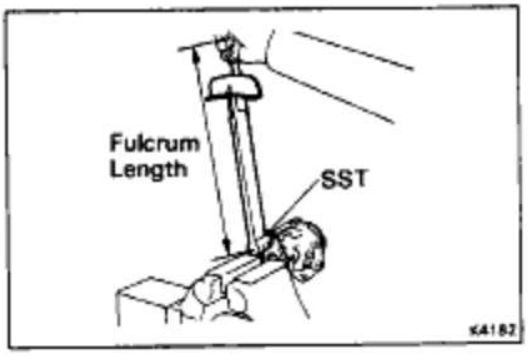


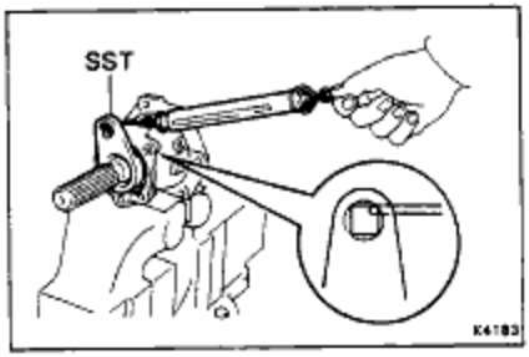
4. INSTALL DRIVEN PINION REAR SIDE BEARING

(a) Install the bearing cage to the driven pinion.

(b) Using a press and SST, install the rear side bearing to the driven pinion.

SST 09506–35010





5. ADJUST DRIVEN PINION PRELOAD

(a) Using SST, torque a new nut.

SST 09326–20011

Torque: 1,000 kg–cm (72 ft–lb, 98 N–m)

HINT: Use a torque wrench with a fulcrum length of 42.5 cm (16.732 in.).

(b) Using a spring tension gauge and SST, measure the preload.

SST 09326–20011

HINT: Turn the driven pinion right and left two or three times to allow the bearings to settle.

Preload (at starting) :

New bearing

1.8–2.9kg (4.0–6.41b, 18–28N)

Reused bearing

0.9– 1.4 kg (2.0–3.1 lb,9– 14 N)

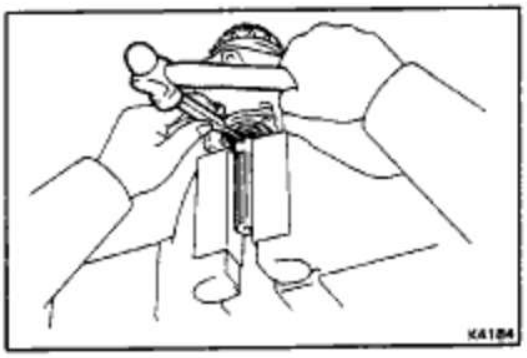
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 5 – 10° at a time until the specified preload is rechecked

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

Do not back off the pinion nut to reduce the preload.

Maximum torque: 2,400 kg–cm (174 ft–lb, 235 N–m)

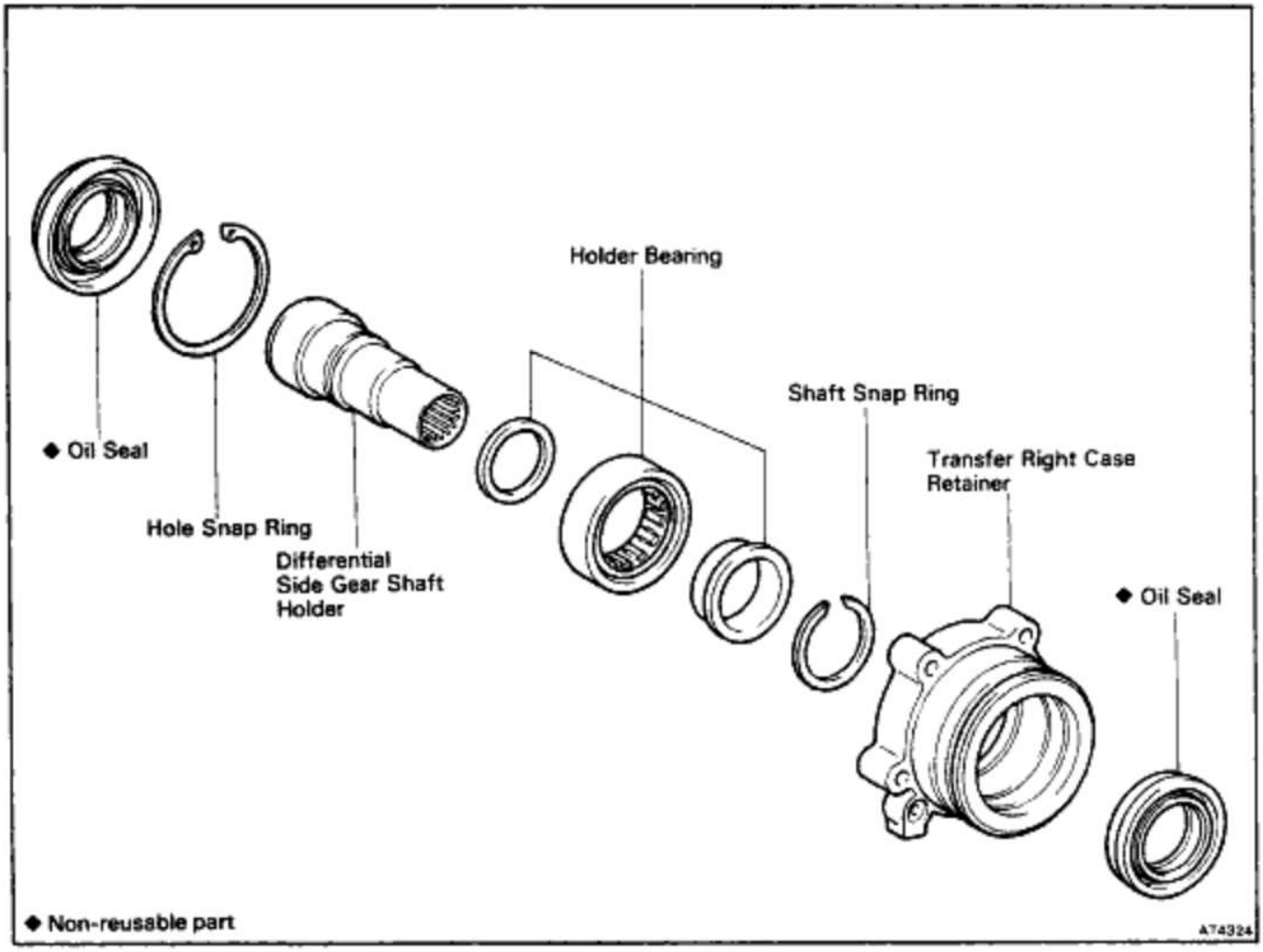
NOTICE: Using the soft jaws, hold the bearing cage in a vise.

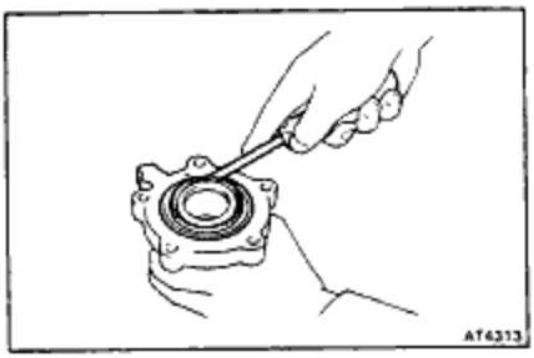


6. STAKE LOCK NUT

Using a punch and hammer, stake the nut.

(Transfer Right Case Retainer)

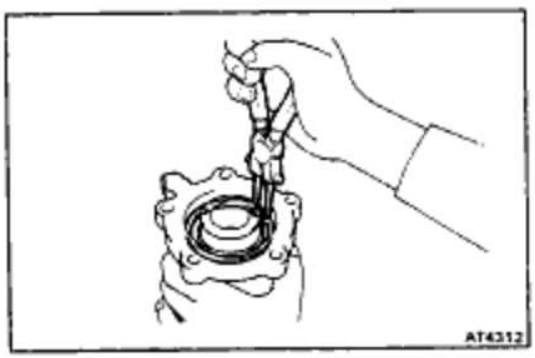




DISASSEMBLY OF TRANSFER RIGHT CASE RETAINER

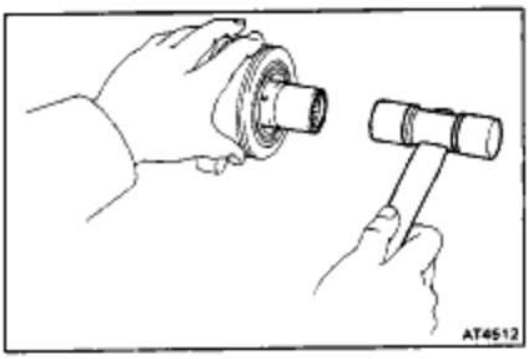
1. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.

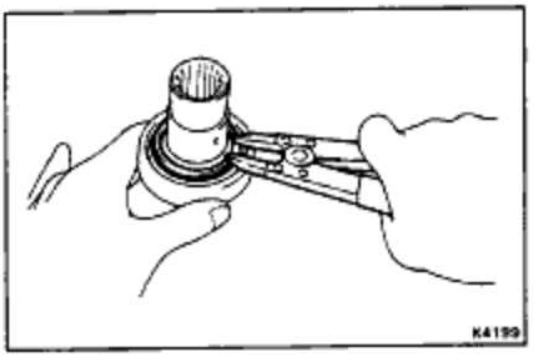


2. REMOVE SIDE GEAR SHAFT HOLDER

(a) Using a snap ring pliers, remove the snap ring.

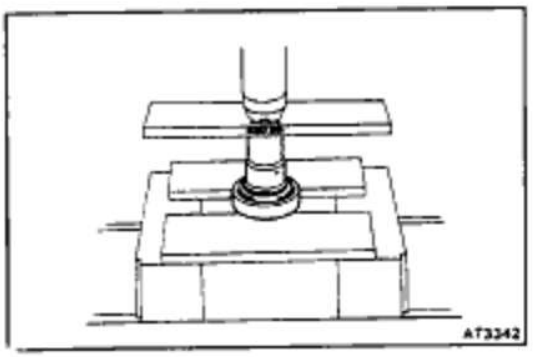


(b) Using a plastic hammer, remove the side gear shaft holder.

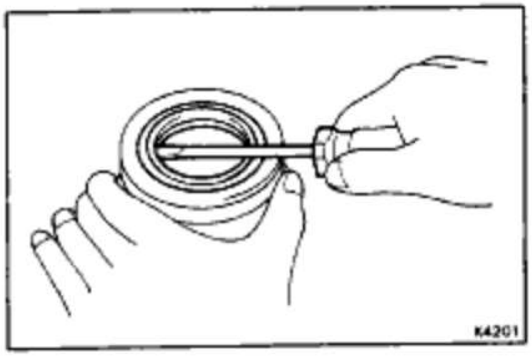


3. REMOVE HOLDER BEARING

(a) Using snap ring pliers, remove the snap ring.



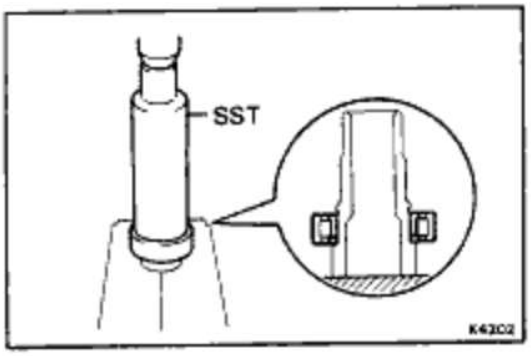
(b) Using a press, press out the bearing.



4. REMOVE OIL SEAL

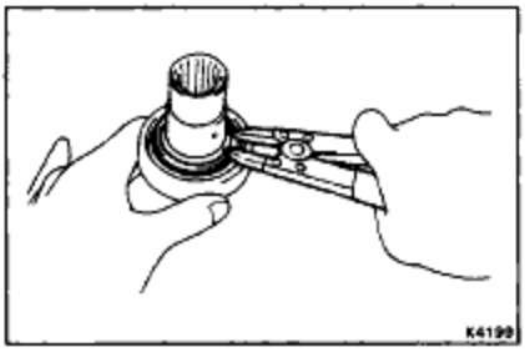
Using a screwdriver, remove the oil seal.

ASSEMBLY OF TRANSFER RIGHT CASE RETAINER

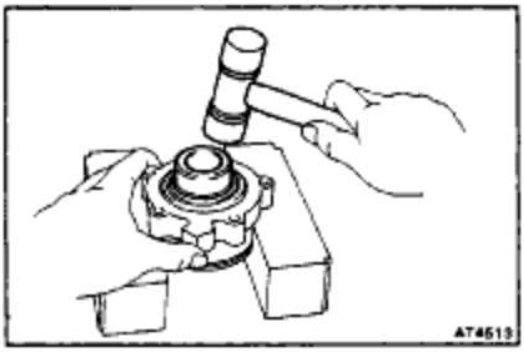


1. INSTALL HOLDER BEARING

(a) Using SST and a press, press in the holder bearing.
SST 09226–10010

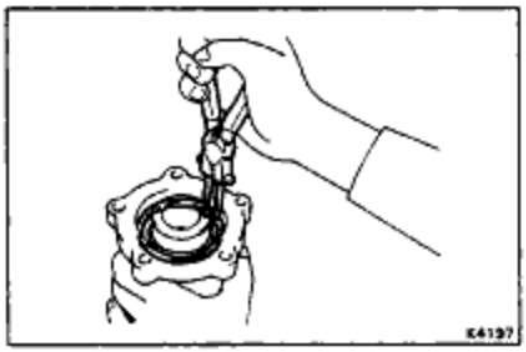


(b) Using snap ring pliers, instal! the snap ring.

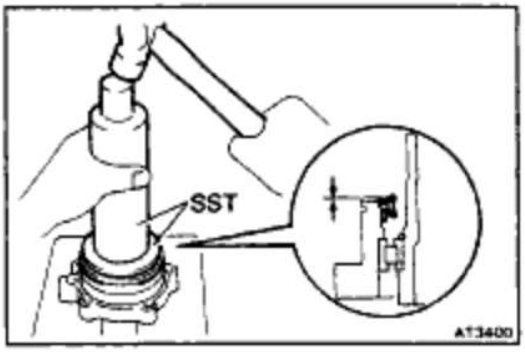


2. INSTALL SIDE GEAR SHAFT HOLDER

(a) Install the side gear shaft holder.



(b) Using snap ring pliers, install the snap ring.



3. INSTALL OIL SEAL

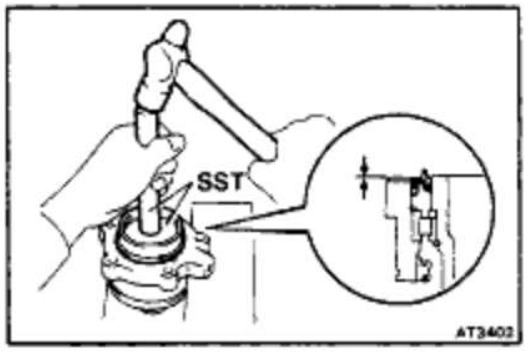
(Left side oil seal)

(a) Coat a new oil seal lip with MP grease.

(b) Using a hammer and SST, drive in the oil seal.

SST 09316–60010 (09316–00010, 09316–00040)

Oil seal depth: 0 mm (0 in.)



(Right side oil seal)

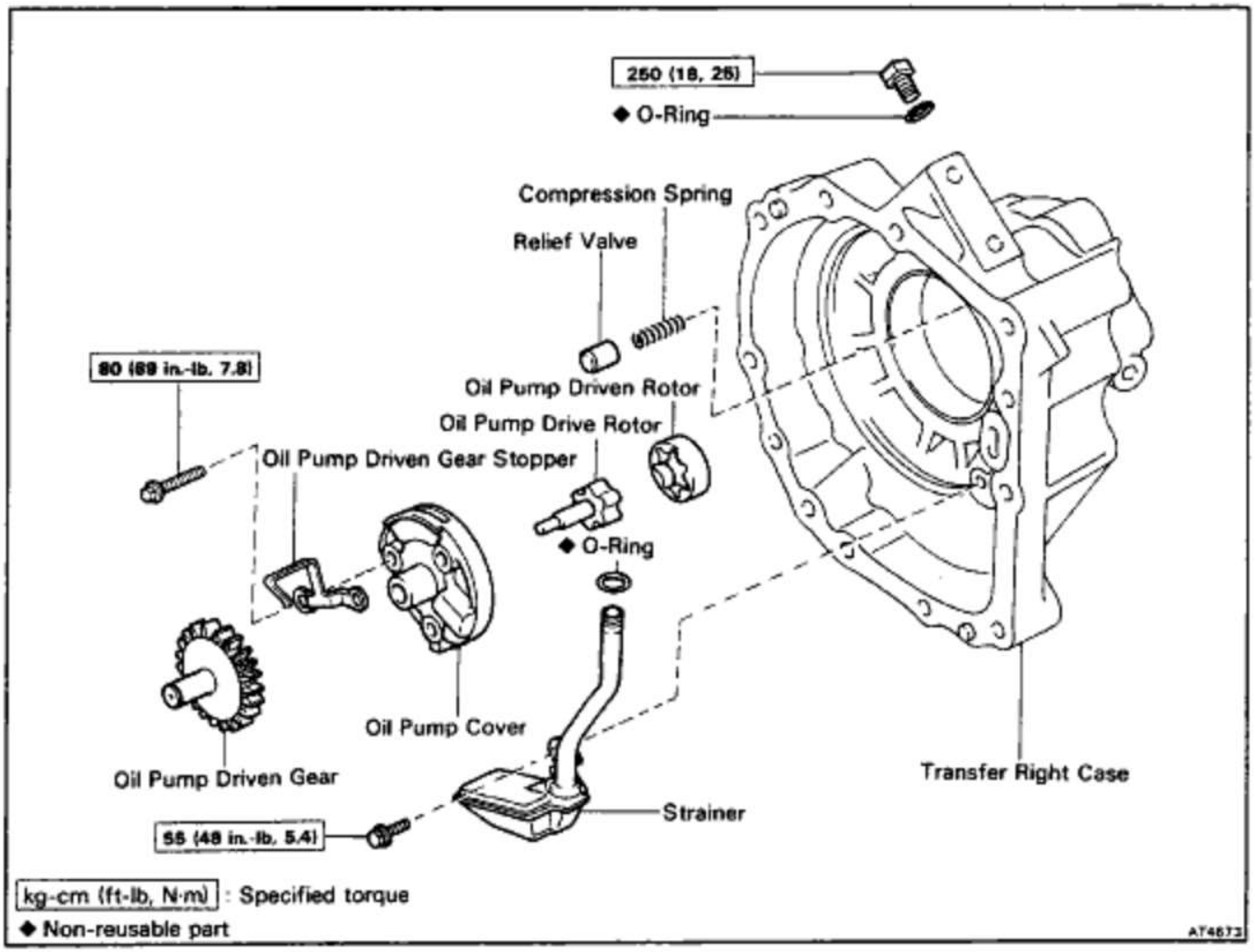
(a) Coat a new oil seal lip with MP grease.

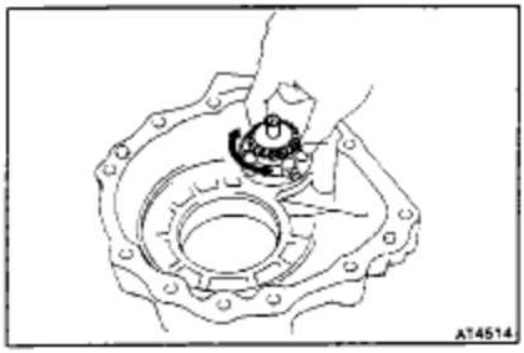
(b) Using a hammer and SST, drive in the oil seal.

SST 09608–32010, 09608–35014 (09608–06020)

Oil seal depth: 0 mm (0 in.)

(Transfer Right Case)

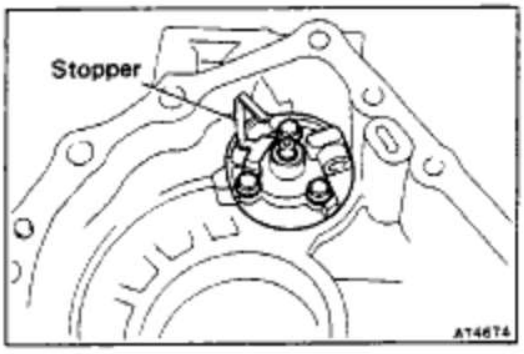




DISASSEMBLY OF TRANSFER RIGHT CASE

1. INSPECT OIL PUMP OPERATION

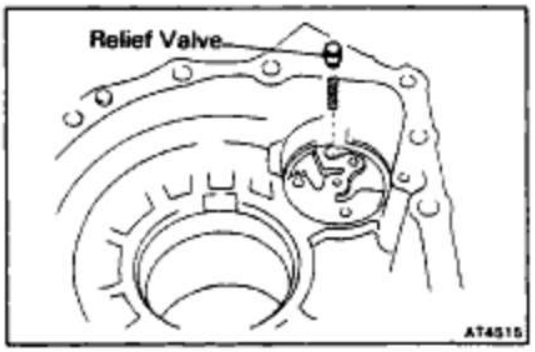
Check that the oil pump turns smoothly with oil pump driven gear.



2. REMOVE OIL PUMP DRIVEN GEAR STOPPER, OIL PUMP COVER, DRIVE ROTOR AND DRIVEN ROTOR

(a) Remove the three bolts and oil pump driven gear stopper.

(b) Pull out the oil pump cover, drive rotor and driven rotor.



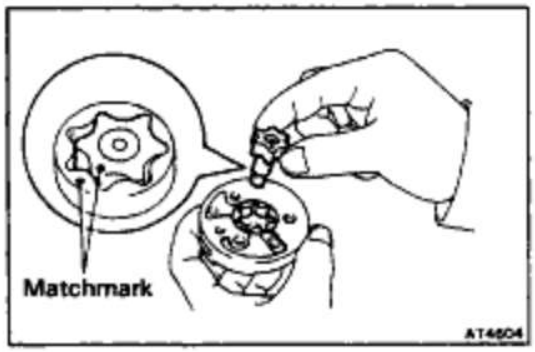
3. REMOVE RELIEF VALVE

Remove the relief valve and spring.

ASSEMBLY OF TRANSFER RIGHT CASE

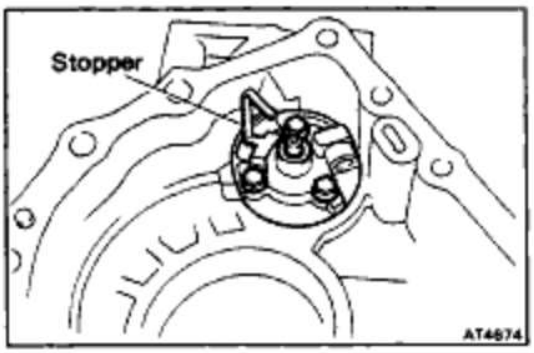
1. INSTALL RELIEF VALVE

Install the relief valve and spring.



2. INSTALL OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR

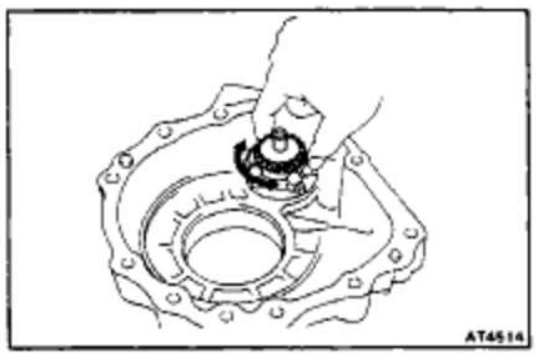
Align the matchmarks on the drive rotor and the driven rotor.



3. INSTALL OIL PUMP COVER AND DRIVEN GEAR STOPPER

Torque the three bolts evenly.

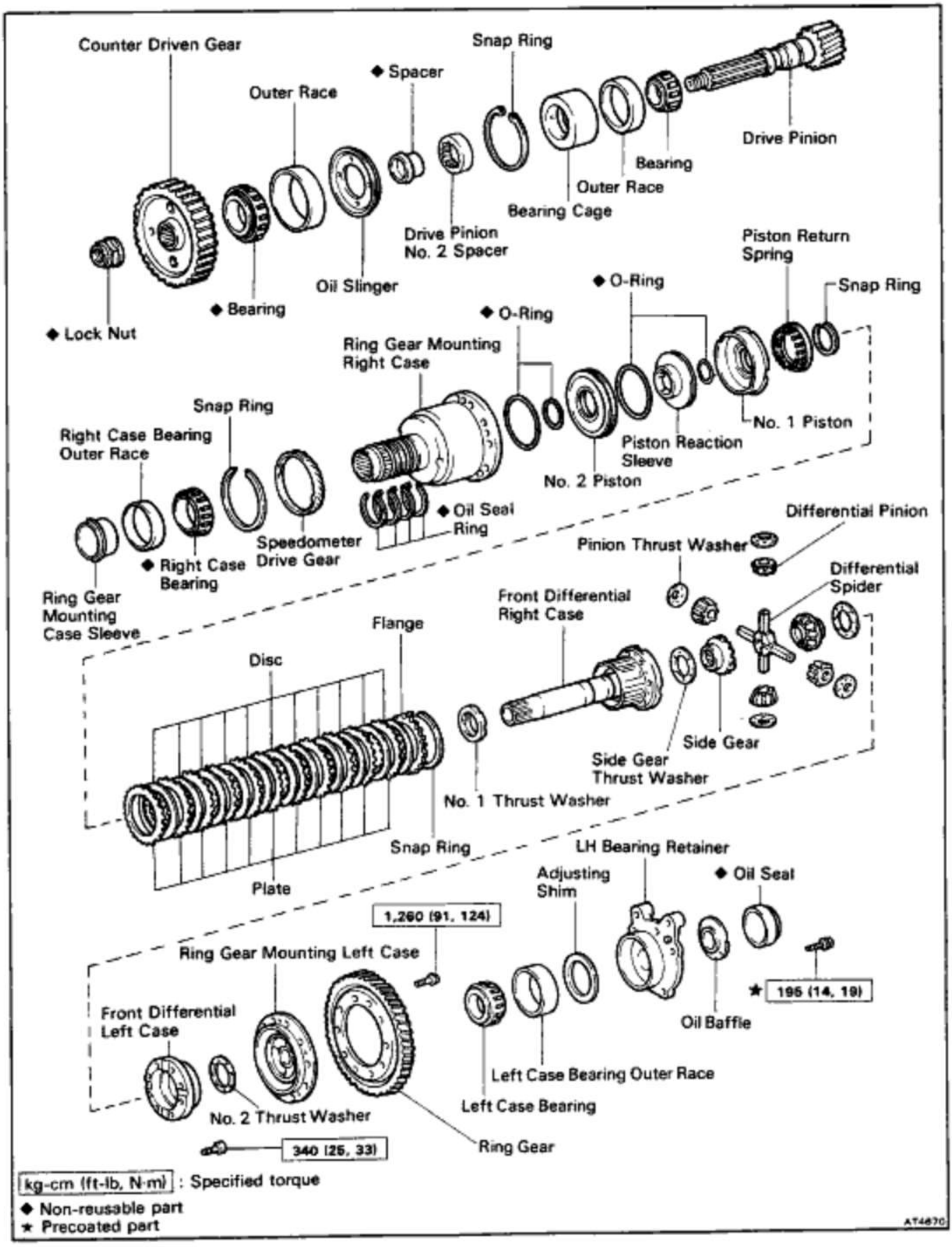
Torque: 80 kg–cm (69 in.–lb, 7.8 N–m)

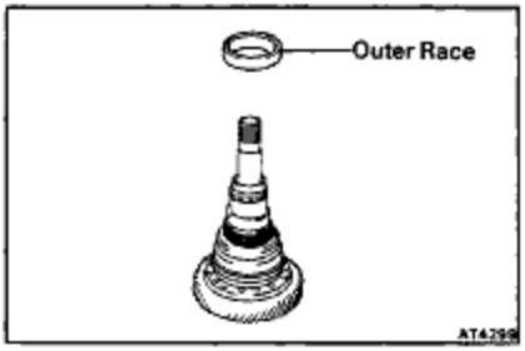


4. CHECK OPERATION OF OIL PUMP

Insert the oil pump driven gear to the drive rotor, check that the drive rotor turns smoothly.

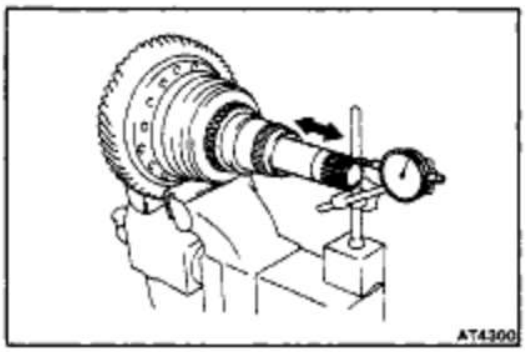
Differential Assembly (A540H)





DISASSEMBLY OF DIFFERENTIAL ASSEMBLY

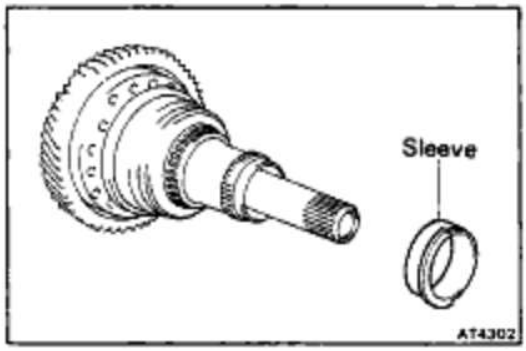
1. REMOVE RIGHT SIDE BEARING OUTER RACE



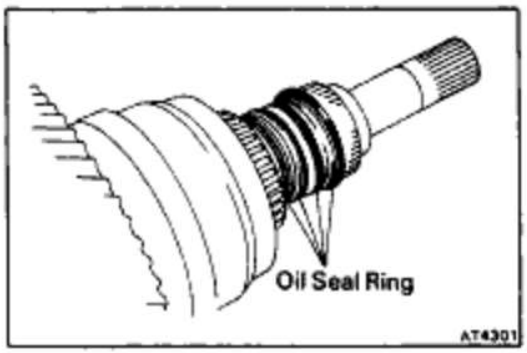
2. CHECK DIFFERENTIAL END PLAY

Using a dial indicator, measure the differential end play.

End play: 0.18 – 0.82 mm (0.o071 – 0.0323 in.)

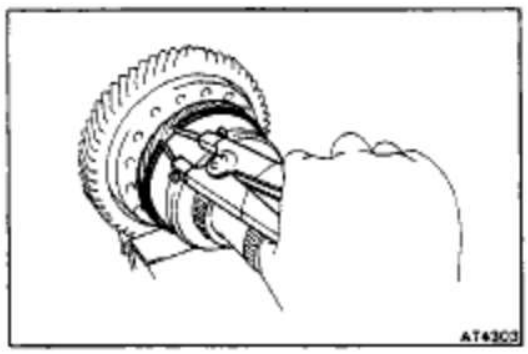


3. REMOVE RING GEAR MOUNTING CASE SLEEVE



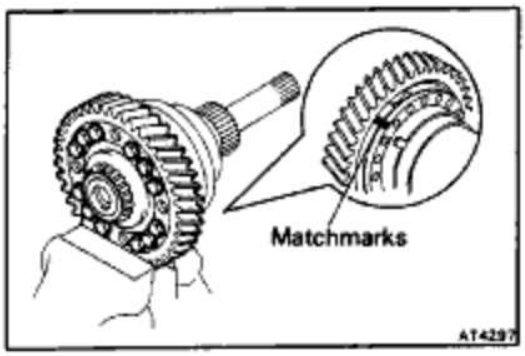
4. REMOVE OIL SEAL RINGS

Remove four oil sea! rings from the ring gear mounting right case.



5. REMOVE SPEEDOMETER DRIVE GEAR

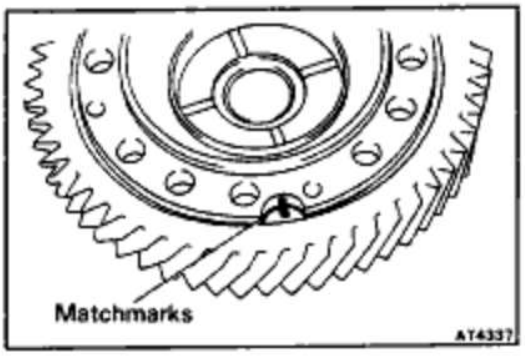
Using snap ring pliers, remove the snap ring and the speedometer drive gear.



6. REMOVE RING GEAR MOUNTING LEFT CASE

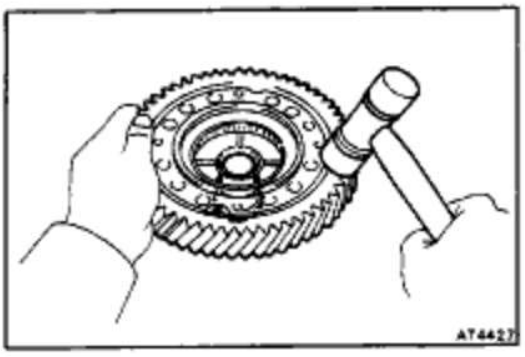
(a) Place matchmarks on the ring gear mounting left case and right case.

(b) Remove the twelve bolts and left case.



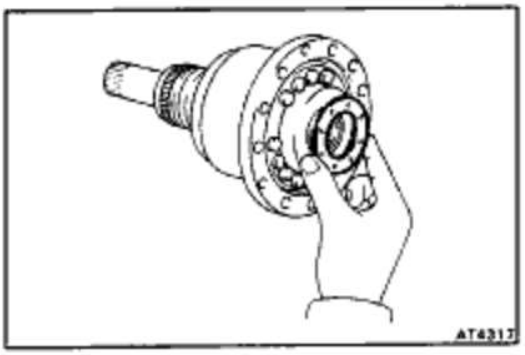
7. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and left case.



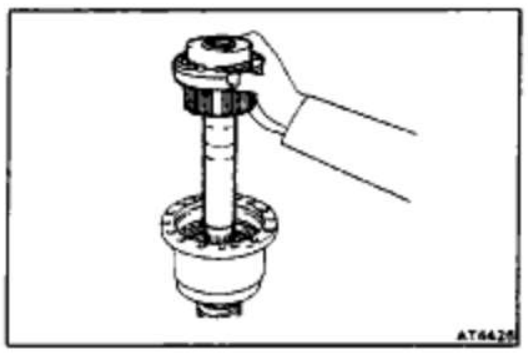
(b) Place the left case on SST.
SST 09350–32014 (09351–32090)

(c) Using a plastic hammer, remove the ring gear from the left case.

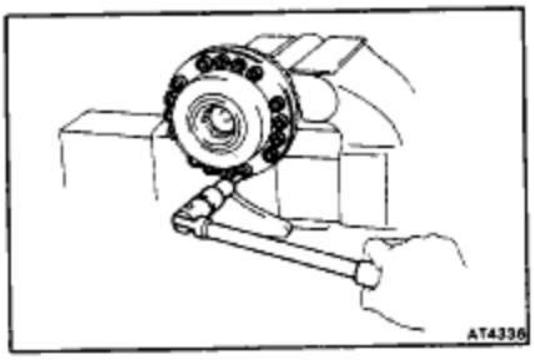


8. REMOVE FRONT DIFFERENTIAL CASE

(a) Remove the No. 2 thrust washer.



(b) Remove the front differential case from the ring gear mounting right case.

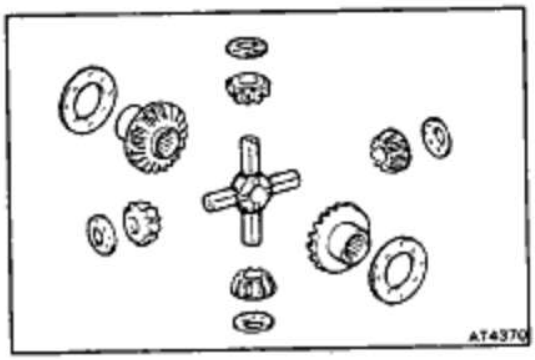


9. REMOVE FRONT DIFFERENTIAL LEFT CASE

(a) Using a torx wrench, remove the sixteen screws from the left case.

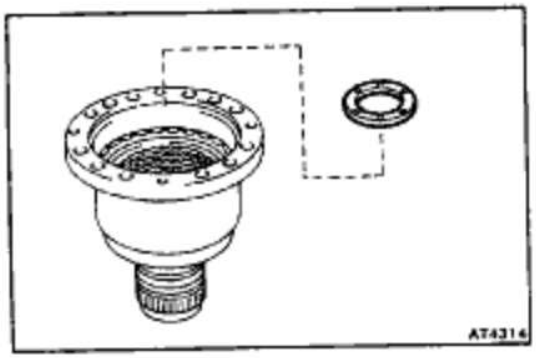
(b) Separate the left case and right case..

NOTICE: Do not scratch the contact surface of the needle bearing.

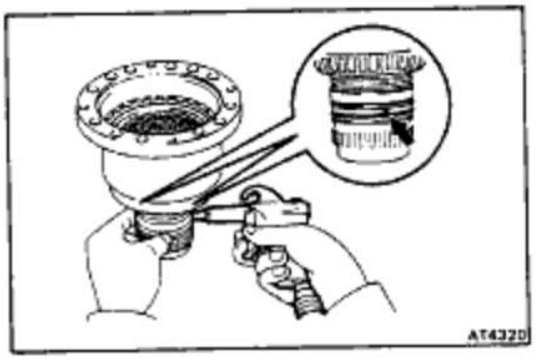


10. REMOVE DIFFERENTIAL PINIONS AND SIDE GEARS

Remove the two differential side gears, two side thrust washers, differential spider, four differential pinions and four pinion washers from the front differential cases.



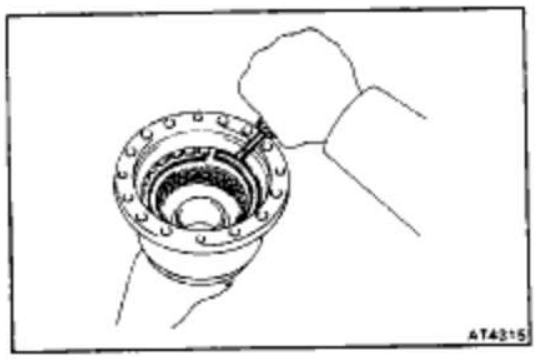
11. REMOVE NO. 1 THRUST WASHER



12. CHECK OPERATION OF CLUTCH PISTONS

(a) Plug one hole of the right case with your hand.

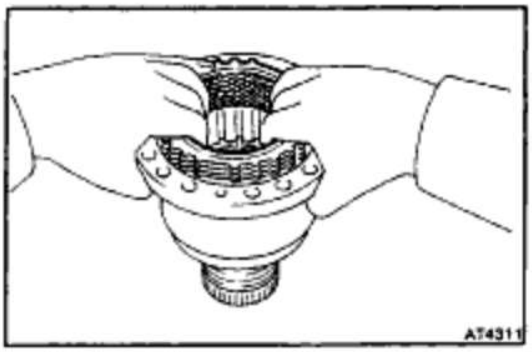
(b) Apply compressed air into the other hole and confirm that the pistons move.

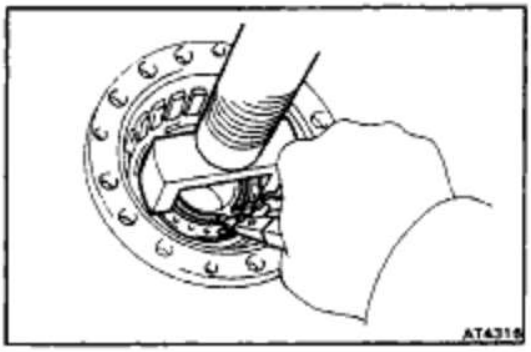


13. REMOVE HYDRAULIC MULTIPLATE CLUTCH DISCS AND PLATES

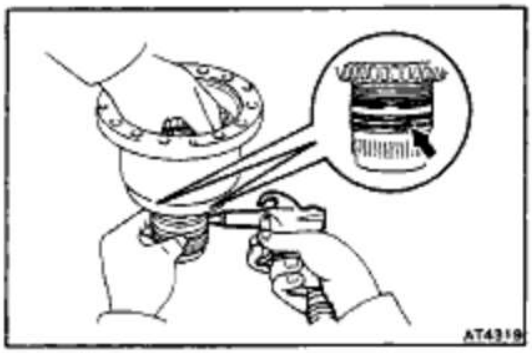
(a) Using a screwdriver, remove the snap ring.

(b) Remove the flange, eleven discs and eleven plates.

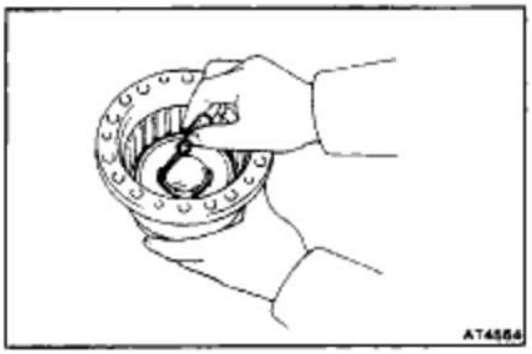




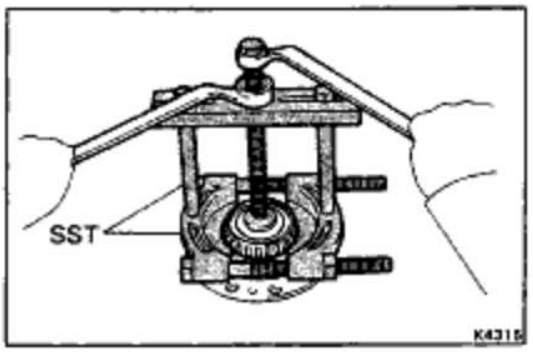
(c) Place SST, and compress the return spring.
SST 09350–32014¿09351–320701
(d) Using snap ring pliers, remove the snap ring.



(e) Apply compressed air to the right case hole to remove the No. 1 piston.
(f) Remove the O–ring from the No. 1 piston.



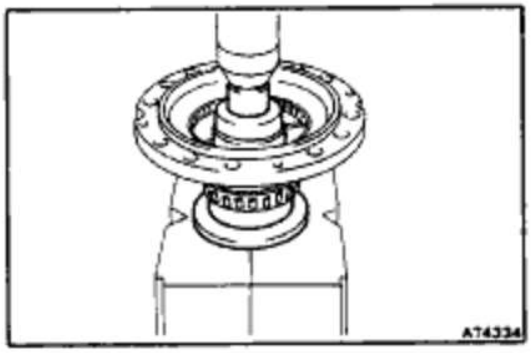
(g) Using a small screwdriver, remove the reaction sleeve and No. 2 piston.
(h) Remove the three O–rings from the reaction sleeve and No. 2 piston.



REPLACEMENT OF RING GEAR MOUNTING CASE BEARINGS

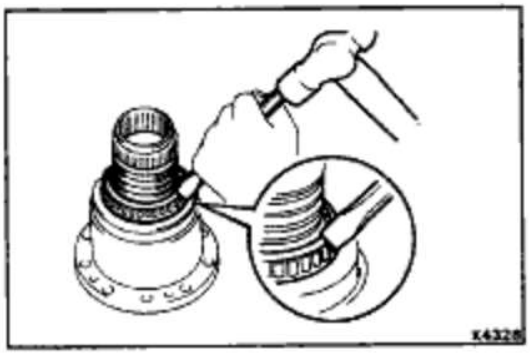
1. REMOVE RING GEAR MOUNTING LEFT CASE BEARING

Using SST, remove the bearing.
SST 09950–00020, 09950–00030



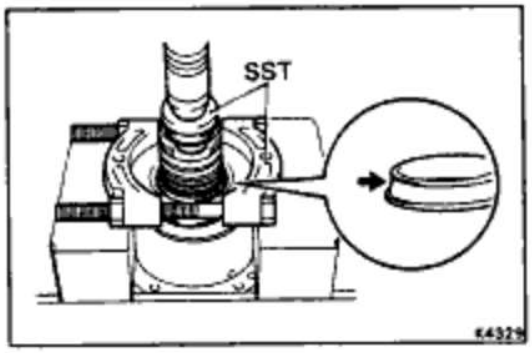
2. INSTALL RING GEAR MOUNTING LEFT CASE BEARING

Using a press and SST, press in the bearing.
SST 09316–20011, 09350–32014 (09351–32090)

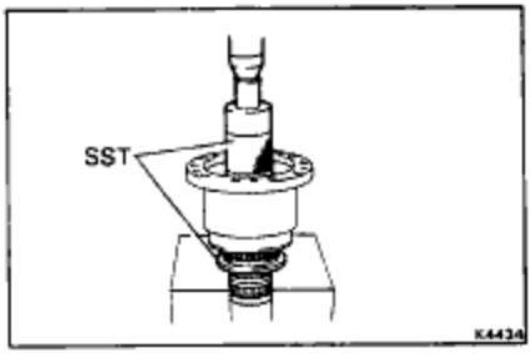


3. REMOVE RING GEAR MOUNTING RIGHT CASE BEARING

(a) Using a chisel and hammer, cut out the bearing cage.
NOTICE: Do not damage the right case.

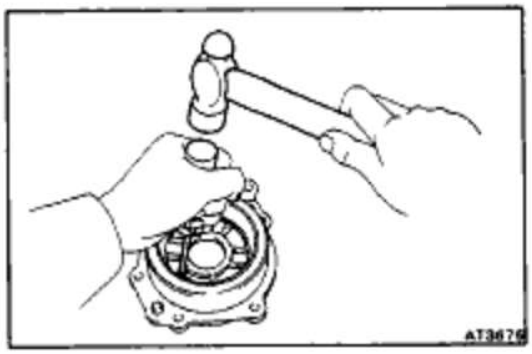


(b) Using a press and SST, press out the bearing inner race.
SST 09350–32014 (09351–32090), 09950–00020



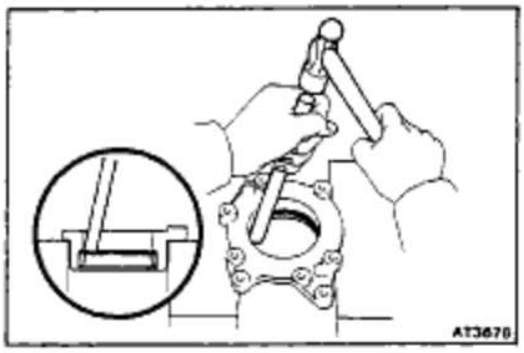
4. INSTALL RING GEAR MOUNTING RIGHT CASE BEARING

Using a press and SST, press in the new bearing.
SST 09316–60010 (09316–00010), 09502–12010



5. REMOVE RING GEAR MOUNTING LEFT CASE BEARING OUTER RACE FROM LH BEARING RETAINER

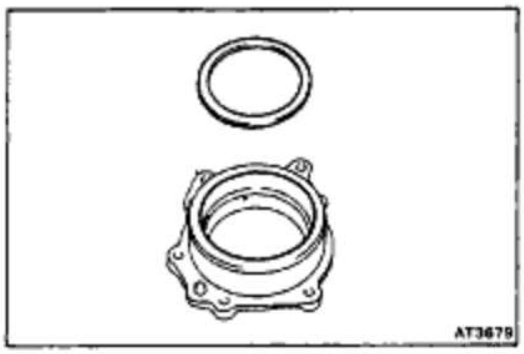
(a) Using a hammer and screwdriver, remove the oil seal.
(b) Remove the oil baffle from the LH bearing retainer.

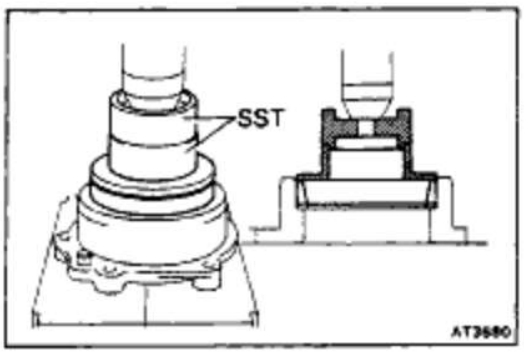


(c) Using a hammer and brass bar, drive out the outer race and adjusting shim from LH bearing retainer.

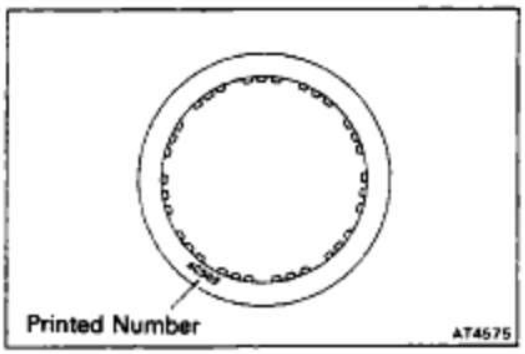
6. INSTALL ADJUSTING SHIM AND BEARING OUTER RACE TO LH BEARING RETAINER

(a) Place the adjusting shim into the LH bearing retainer.
HINT: Use either the shim which was removed or one 2.40 mm (4.0945 in.).





(b) Using SST, press the outer race into the LH retainer.
SST 09316–20011, 09350–32014 (09351–32150)
HINT: Install the oil baffle and oil seal after adjusting the differential side bearing preload.
(See page AT–388)

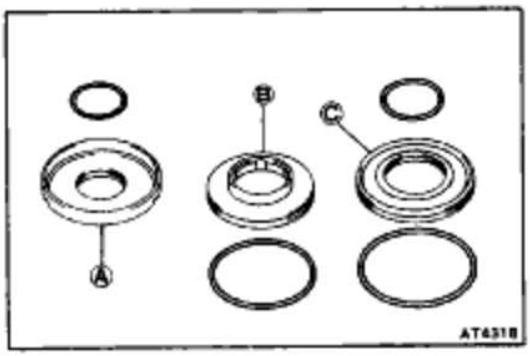


INSPECTION OF HYDRAULIC MULTIPLATE CLUTCH

INSPECT DISCS, PLATES AND FLANGE

Check if the sliding surfaces of discs, plates and flange are worn or burnt. If necessary, replace them.
HINT:

- If the lining of the disc is exfoliated or discolored, or even a part of the printed number is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.

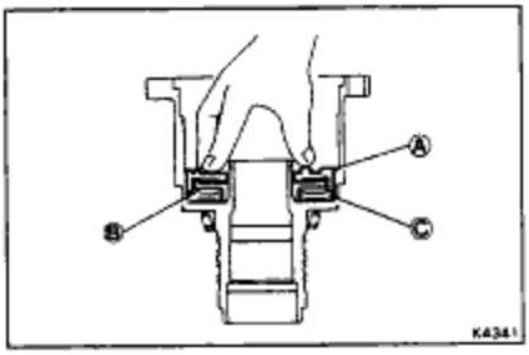


ASSEMBLY OF DIFFERENTIAL ASSEMBLY

1. INSTALL PISTONS AND SLEEVE

(a) Coat the four O–rings with ATF.

(b) Install the four O–rings to the reaction sleeve and pistons.



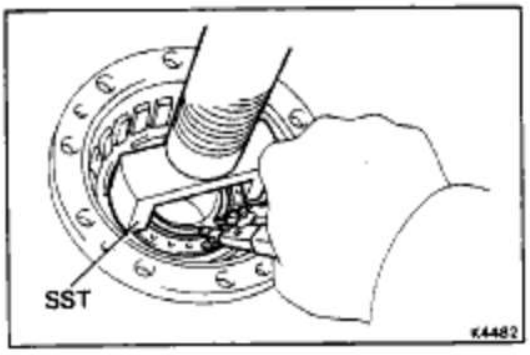
(c) Install the No. 1 ((A)), No. 2 ((B)) pistons and reaction sleeve ((C)) to the ring gear mounting right case.

2. INSTALL PISTON RETURN SPRING

(a) Place the spring on the piston.

(b) Place SST on the spring retainer, and compress the spring with a press.
SST 09350–32014 (09351–32070)

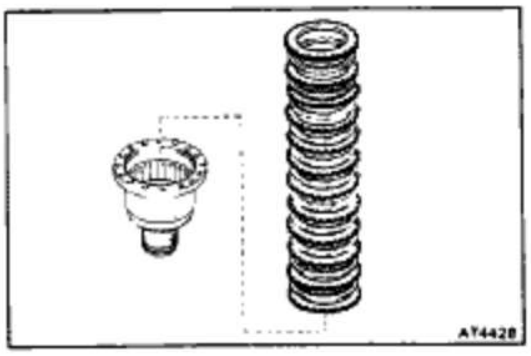
(c) Using snap ring pliers, install the snap ring.



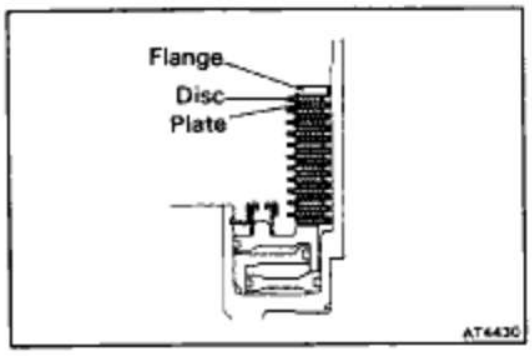
3. INSTALL PLATE, DISCS AND FLANGE

(a) Install the plate and discs.
Install in order: P = Plate D = Disc
P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D–P–D

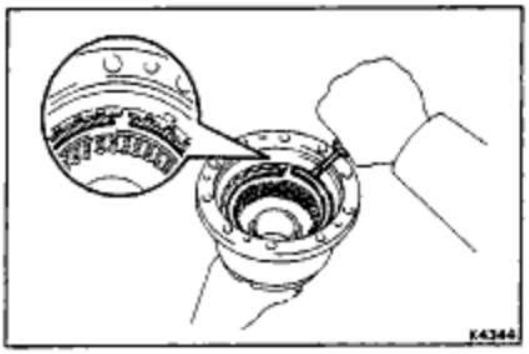
HINT: Before assembling new discs, soak them in ATF for at least fifteen minutes.

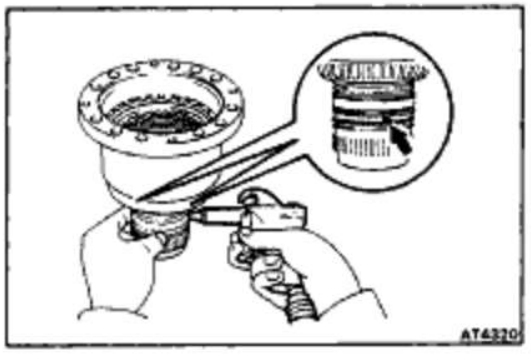


(b) Install the flange with the flat end facing downward



(e) Using a screwdriver, install the snap ring.



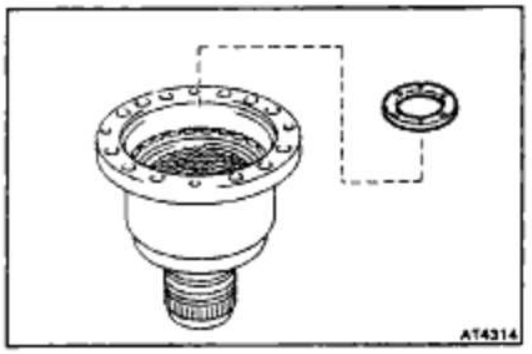


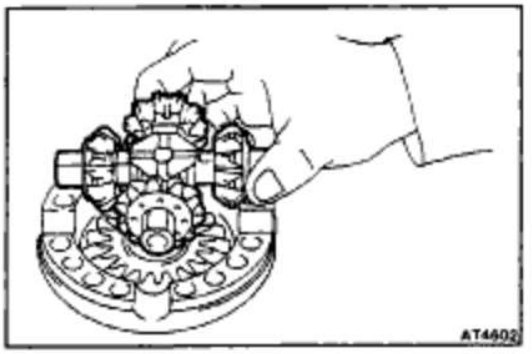
4. CHECK OPERATION OF CLUTCH PISTONS

(a) Plug one hole with your hand.

(b) Apply compressed air into the other hole and make sure that the pistons move.

5. INSTALL NO. 1 THRUST WASHER





6. CHECK AND ADJUST FRONT DIFFERENTIAL SIDE GEAR BACKLASH

(Front Differential Left Case)

(a) Install the following parts:

- Side gear thrust washer
- Side gear
- Four differential pinion gears
- Four pinion gear thrust washers
- Differential spider

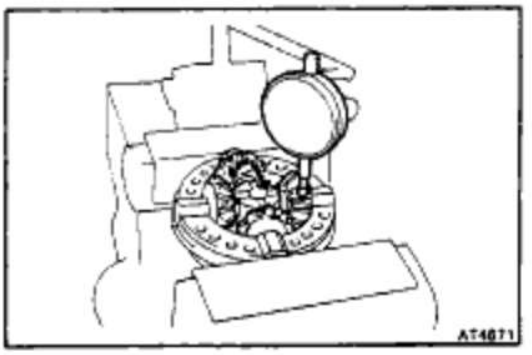
(a)Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

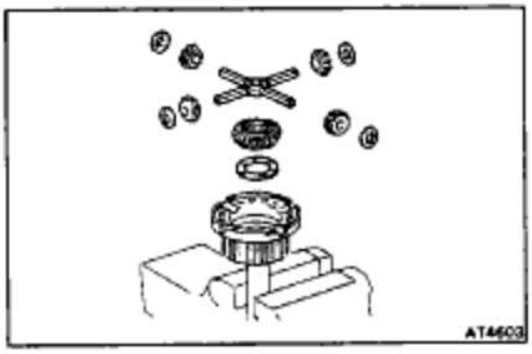
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If not within specification select the side gear thrust washer.

NOTICE: Do not tighten the vise too tight.

(c) Remove four pinion gears, four thrust washers and spider.

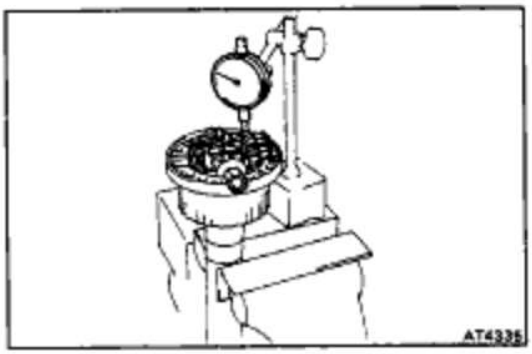




(Front Differential Right Case)

(a) Install the following parts:

- Side gear thrust washer
- Side gear
- Four differential pinion gears
- Four pinion gear thrust washer
- Differential spider

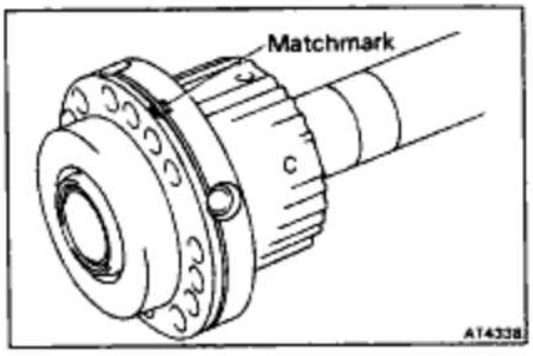


(b) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

Referring to the table below, select the side gear thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

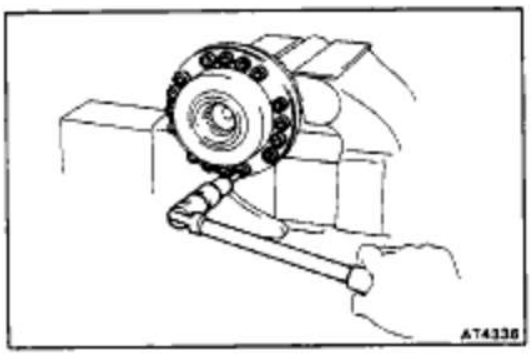
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	E	1.20 (0.0472)
B	1.05 (0.0413)	F	1.25 (0.0492)
C	1.10 (0.0433)	G	1.30 (0.0512)
D	1.15 (0.0453)		



7. INSTALL FRONT DIFFERENTIAL LEFT CASE

(a) Install the left case to the right case.

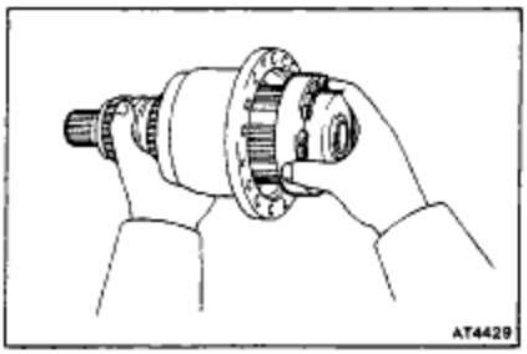
HINT: Align the matchmarks on the left case and right case.



(b) Using a torx wrench, torque the sixteen torx screw:

Torque: 340 kg–cm (25 ft–lb, 33 N–m)

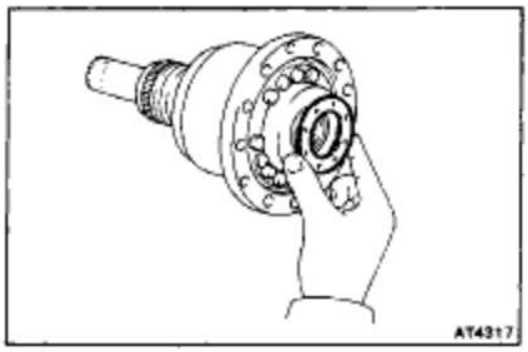
NOTICE: Do not scratch the contact surface of the needle bearing.



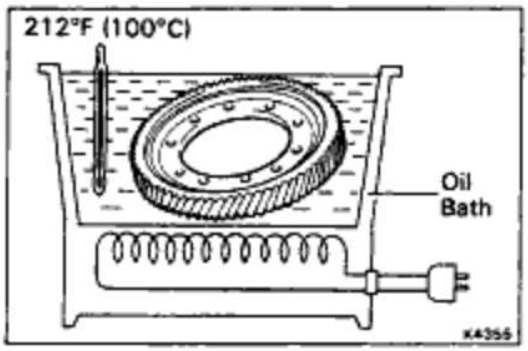
8. INSTALL FRONT DIFFERENTIAL CASE

(a) Install the front differential case to the ring gear mounting right case.

HINT: Align the flukes of the discs in the hydraulic mut-tiplate clutch.



(b) Install the No. 2 thrust washer.



9. INSTALL RING GEAR

(a) Clean the contact surface of the ring gear mounting left case.

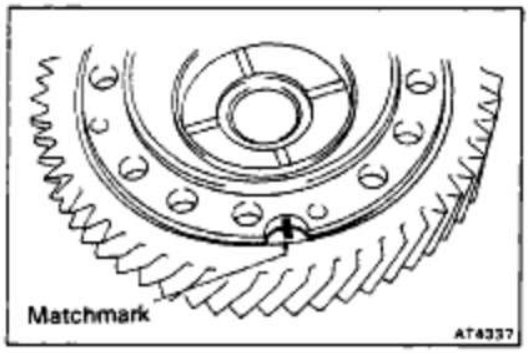
(b) Heat the ring gear to about 212* F (1000C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (11 0˚C).

(c) Clean the contact surface of the ring gear with cleaning solvent.

(d) Quickly install the ring gear on the ring gear mounting left case.

HINT: Align the matchmarks on the ring gear mounting left case and the ring gear.

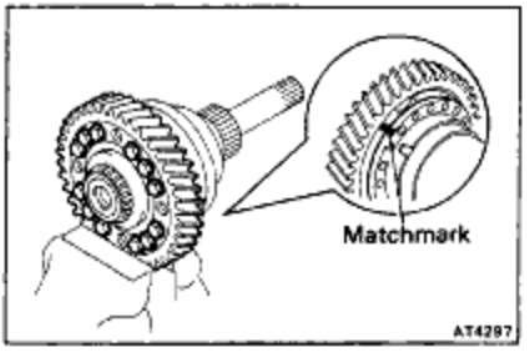


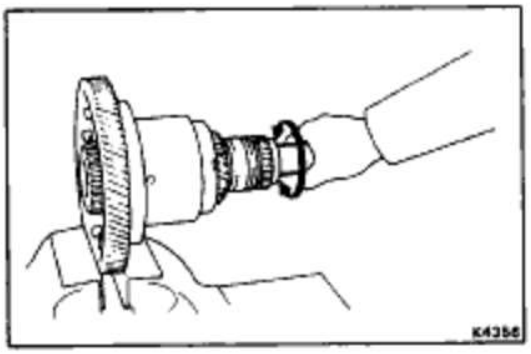
(e) Install the ring gear and ring gear mounting left case on the ring gear mounting right case. Install the twelve bolts.

HINT: Align the matchmarks on the ring gear mounting left case and contact the right case.

(f) Tighten the set bolts uniformly and a little at a time. Torque the bolts.

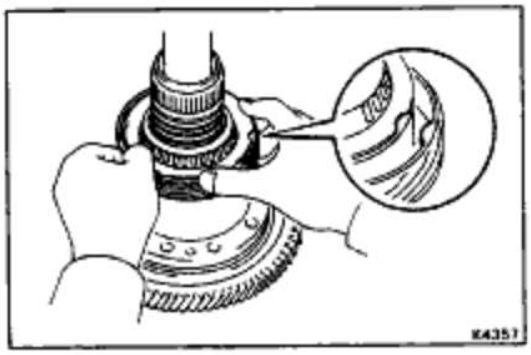
Torque: 1,260 kg–cm l91 ft–lb, 124 N–m)





10. CHECK OPERATION OF FRONT DIFFERENTIAL

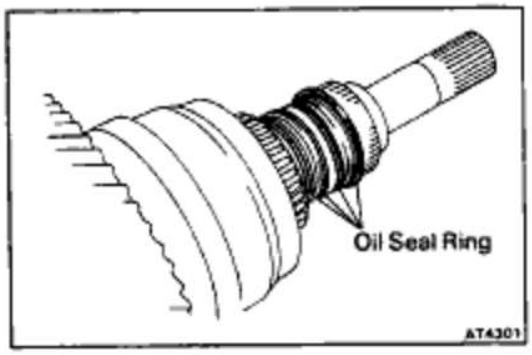
Check that the front differential turns smoothly.



11. INSTALL SPEEDOMETER DRIVE GEAR

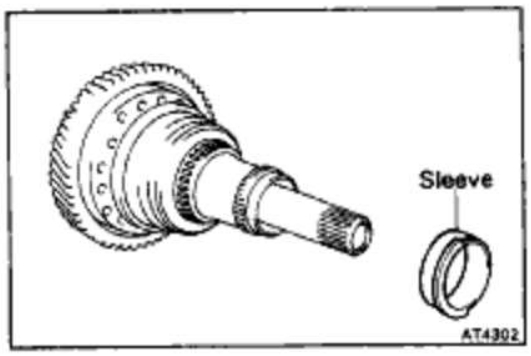
(a) Place the speedometer drive gear on the ring gear mounting case.

(b) Install the snap ring.

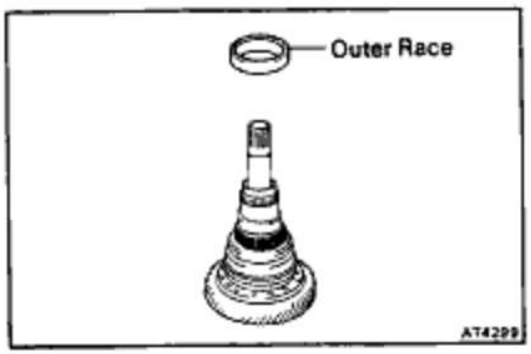


12. INSTALL OIL SEAL RINGS

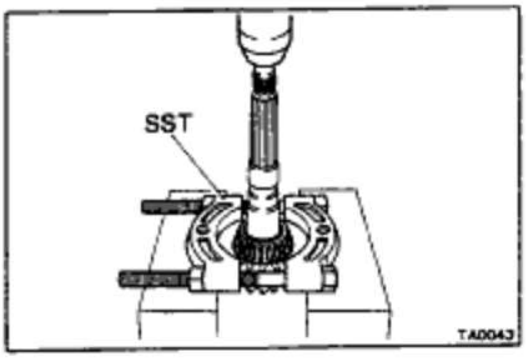
Install the four oil seal rings to the ring gear mounting right case.



13. INSTALL RING GEAR MOUNTING CASE SLEEVE



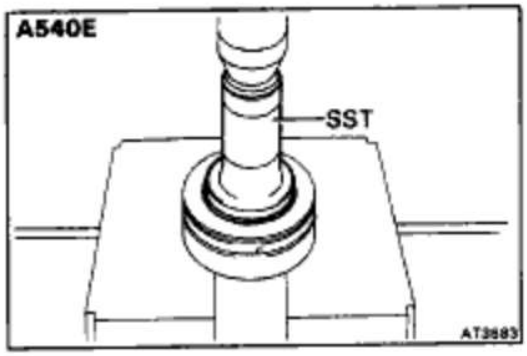
14. INSTALL RIGHT SIDE BEARING OUTER RACE



DISASSEMBLY OF DRIVE PINION

1. REMOVE DRIVE PINION SHAFT BEARING

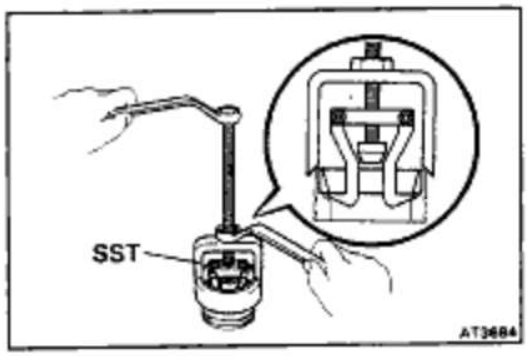
Using SST and a press, remove the bearing.
SST 09950–00020



2. (A540E)

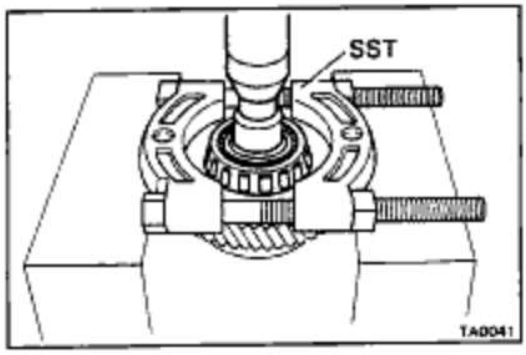
REMOVE OIL SEALS FROM CAGE

Using SST, press out the two oil seals.
SST 09325–12010



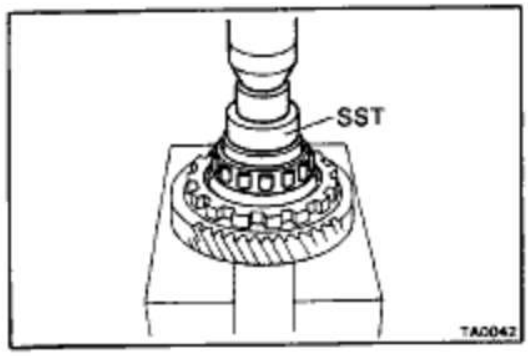
3. REMOVE PINION SHAFT BEARING OUTER RACE FROM CAGE

Using SST, remove the outer race.
SST 09612–65014



4. REMOVE COUNTER DRIVEN GEAR BEARING

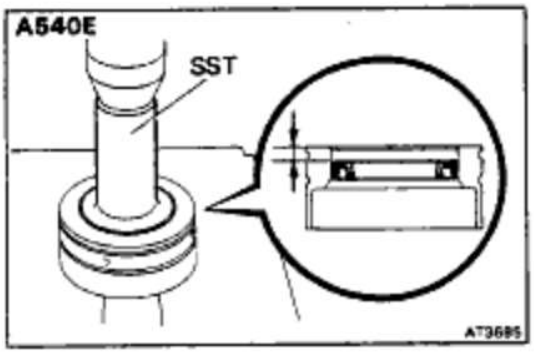
Using SST and a press, remove the bearing.
SST 09950–00020



ASSEMBLY OF DRIVE PINION SHAFT COMPONENTS

1. INSTALL COUNTER DRIVEN GEAR BEARING

Using SST, press in a new bearing.
SST 09350–32014 (09351–32090)

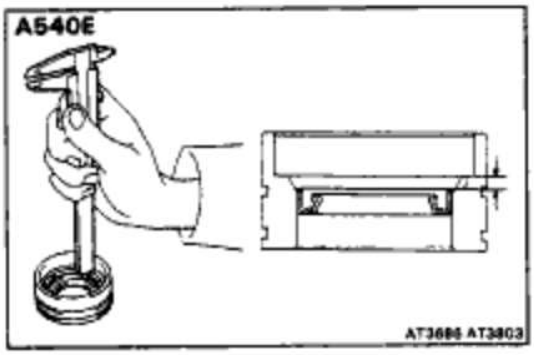


2. (A540E)

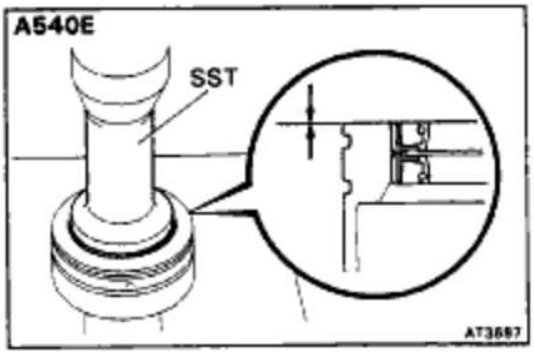
INSTALL OIL SEALS TO CAGE

(a) Using SST, press in a new oil seal with the lip facing downward.
SST 09325–12010

Oil seal press in depth (from flat end):
8 mm (0.31 in.)

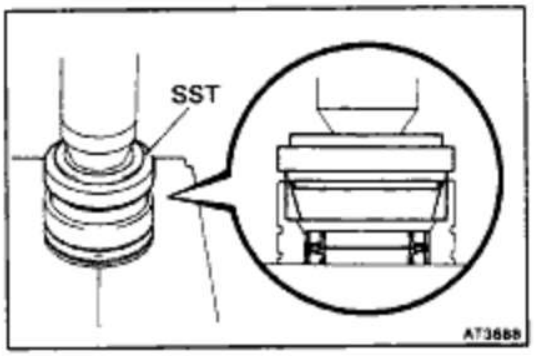


(b) Check the oil seal press in depth.
Oil seat press in depth: 4.3 mm (0–169 in.)



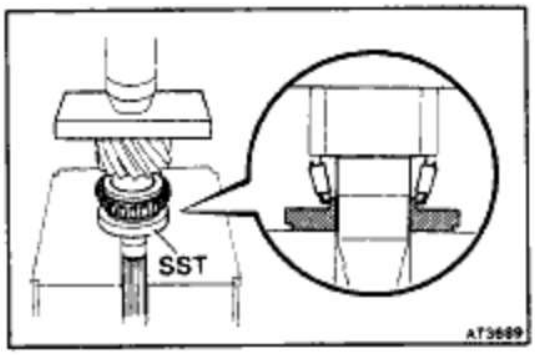
(c) With the oil seal lip facing upward, use SST to press in a new oil seal until its end is flush with the surface of the cage.
SST 09325–12010

(d) Coat the oil seal lips with MP grease.



3. INSTALL SHAFT BEARING OUTER RACE TO CAGE

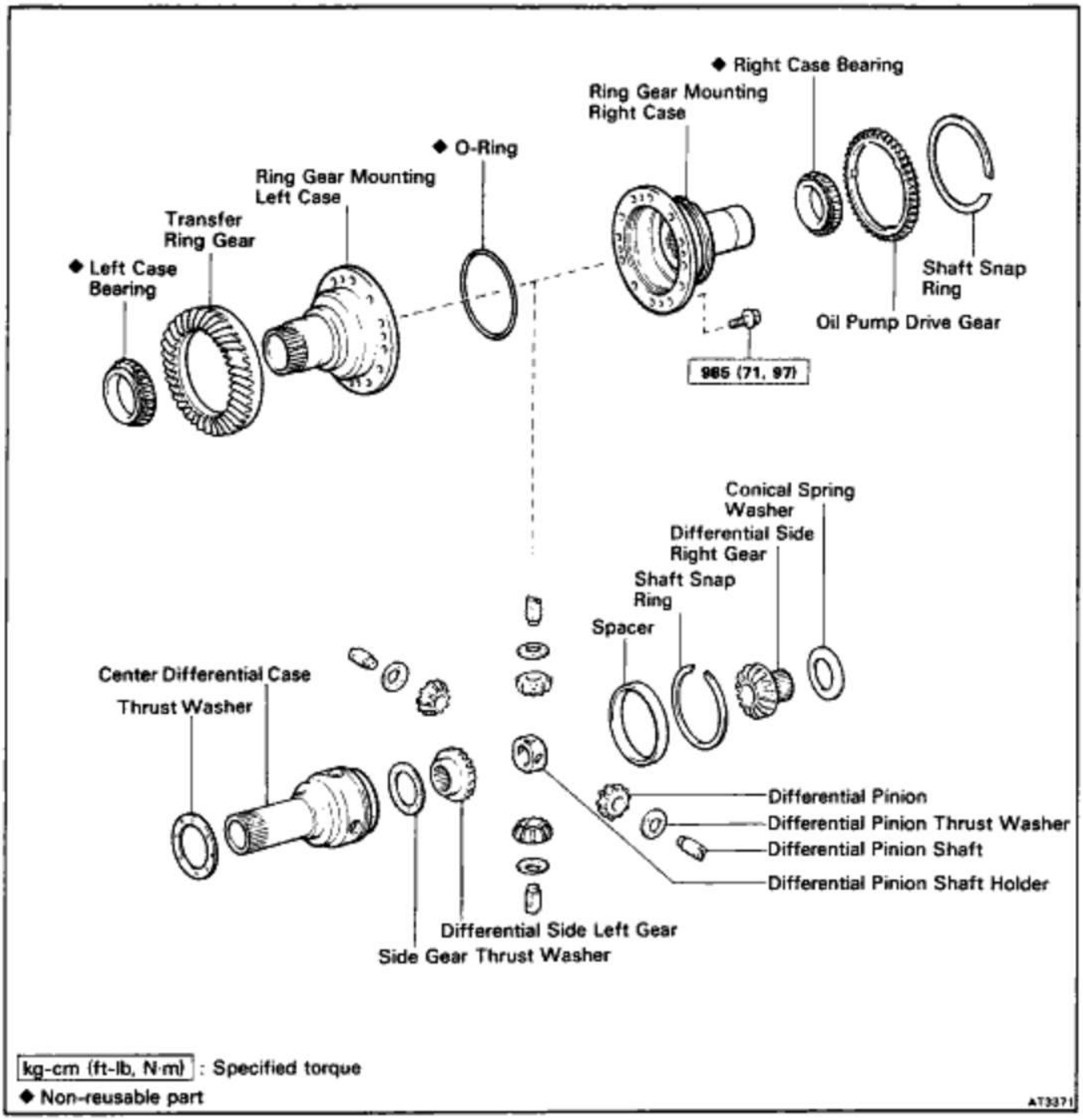
Using SST, press the outer race into the cage.
SST 09350–32014 (09351–32111)

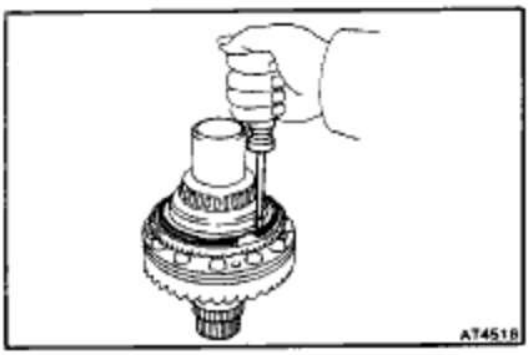


4. INSTALL DRIVE PINION SHAFT BEARING

Using SST, press in the bearing.
SST 09350–32014 (09351–32100)

(Ring Gear Mounting Case and Center Differential Case)

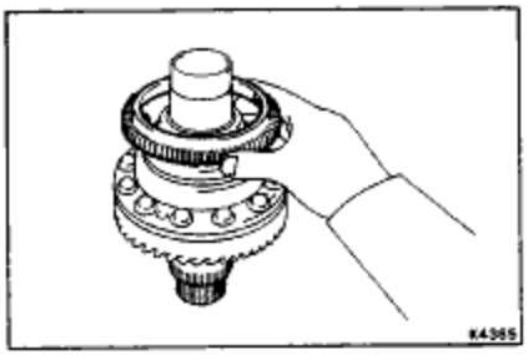




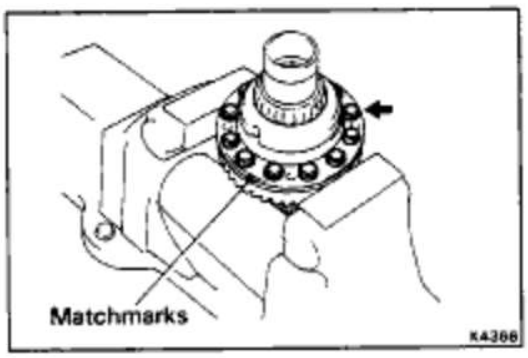
DISASSEMBLY OF RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE

1. REMOVE OIL PUMP DRIVE GEAR

(a) Using a screwdriver, remove the shaft snap ring.



(b) Remove oil pump drive gear.

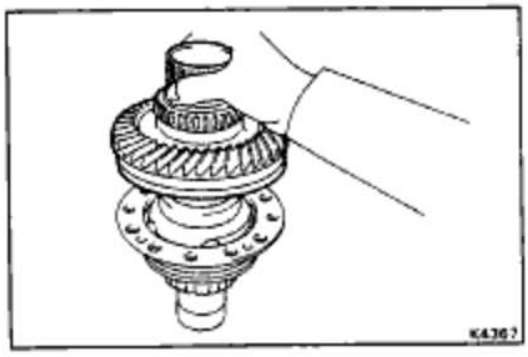


2. REMOVE RING GEAR MOUNTING LEFT CASE

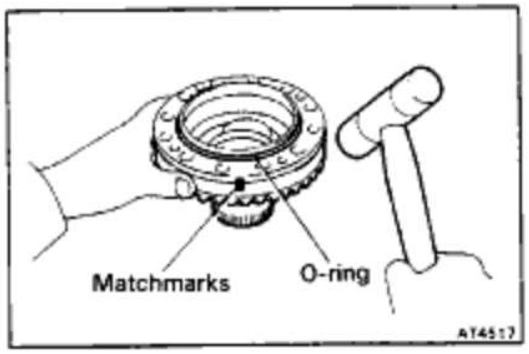
(a) Place matchmarks on the differential left case and the differential right case.

(b) Remove the twelve bolts.

NOTICE: Using the soft jaws, hold the left case in a vise.



(c) Remove the differential left case upward.

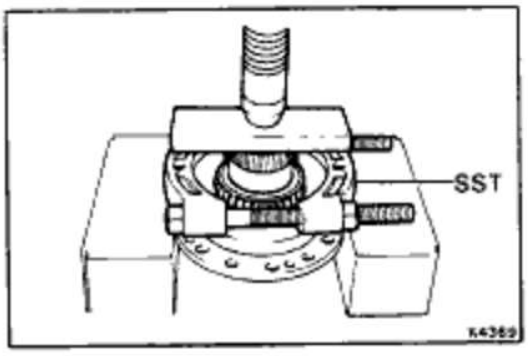


3. REMOVE RING GEAR

(a) Place matchmarks on the differential left case an(ring gear.

(b) Using a plastic hammer, tap out the ring gear.

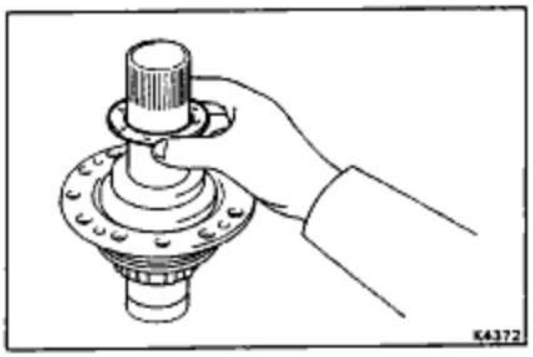
(c) Remove the O–ring from the left case.



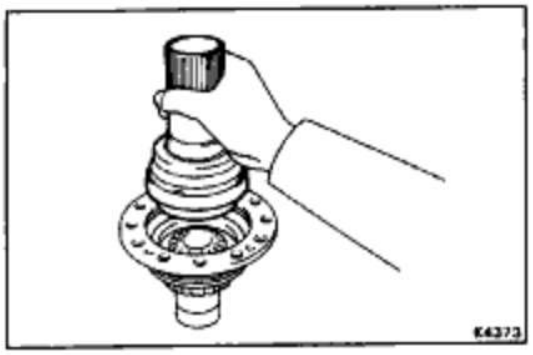
4. REMOVE LEFT CASE BEARING

Using SST and a press, press out the bearing.

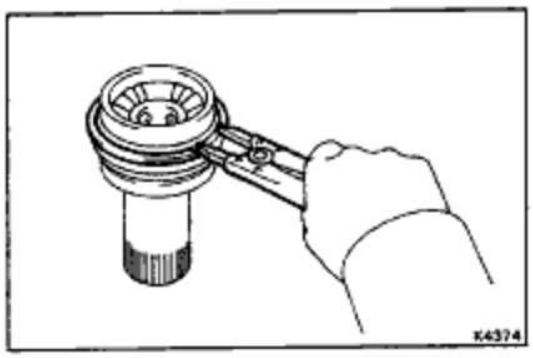
SST 09950–00020



5. REMOVE THRUST WASHER

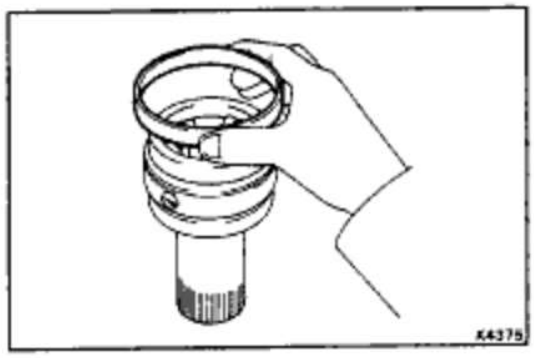


6. REMOVE CENTER DIFFERENTIAL CASE ASSEMBLY

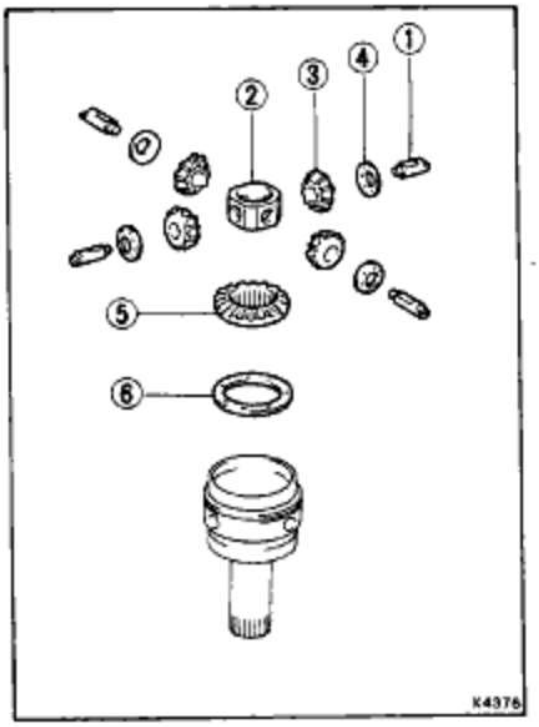


7. DISASSEMBLE CENTER DIFFERENTIAL CASE

(a) Using snap ring pliers, remove the shaft snap ring.

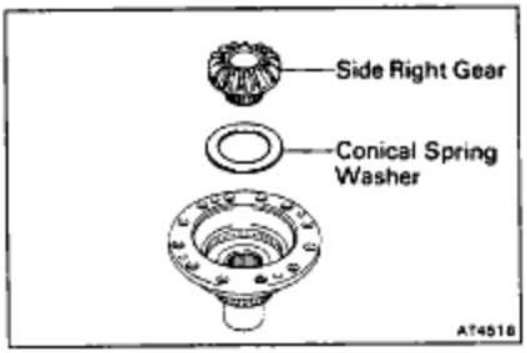


(b) Remove the spacer.

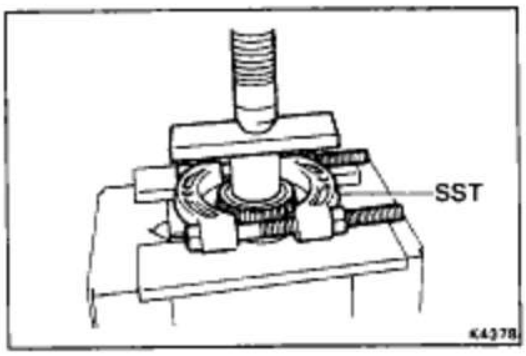


(e) Remove the following parts from the center differential case:

- Four pinion shafts
- Pinion shaft holder
- Four differential pinions
- Four pinion thrust washers
- Differential side left gear
- Side gear thrust washer

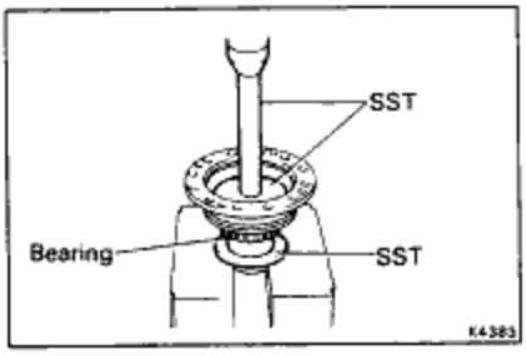


8. REMOVE DIFFERENTIAL SIDE RIGHT GEAR AND CONICAL SPRING WASHER



9. REMOVE RIGHT CASE BEARING

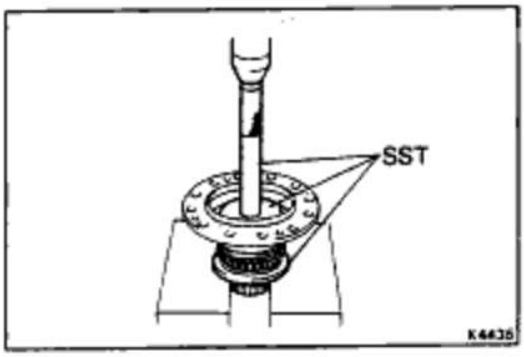
Using SST and a press, press out the bearing.
SST 09950–00020



ASSEMBLY OF RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE

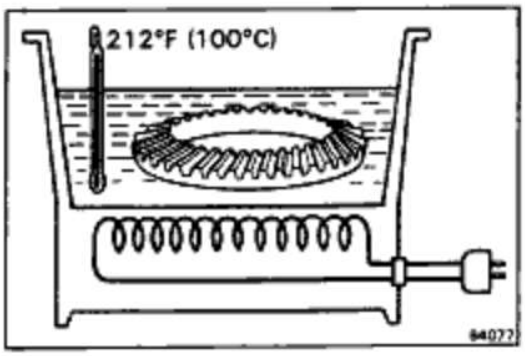
1. INSTALL RIGHT CASE BEARING

Using SST and a press, press in the bearing.
SST 09316–20011, 09608–35014
(09608–06020, 09608–06120)



2. INSTALL LEFT CASE¿ BEARING

Using SST and a press, press in the left case.
SST 09316–12010, 09608–35014
(09608–06020, 09608–06120)

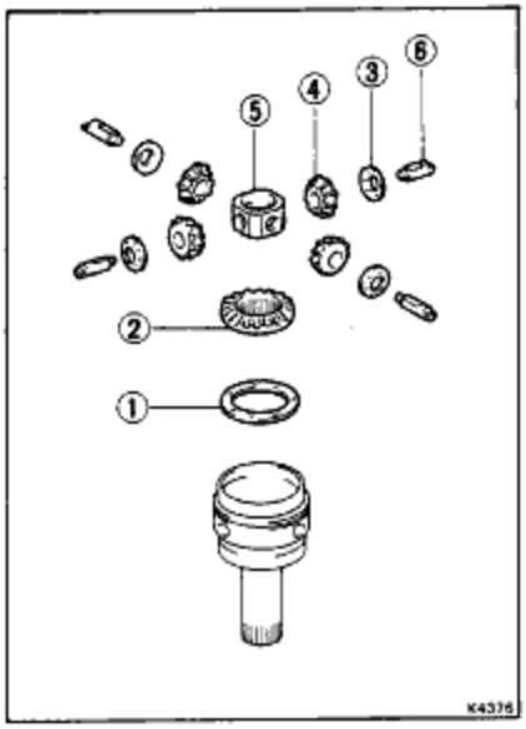


3. INSTALL RING GEAR

(a) Clean the contact surface of the ring gear mounting left case.
(b) Heat the ring gear to about 212˚F (100˚C) in an oil bath.

NOTICE: Do not heat the ring gear above 230˚F (110˚C).

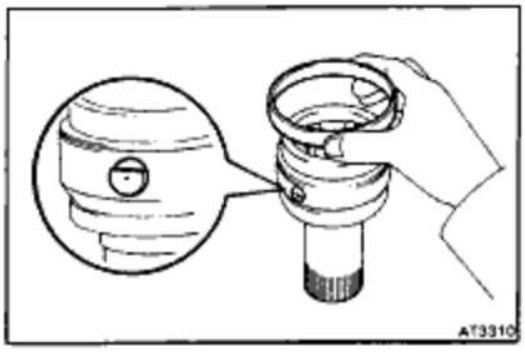
(e) Clean the contact surface of the ring gear with cleaning solvent.
(d) Align the matchmarks and quickly install the ring gear on the ring gear mounting left case.



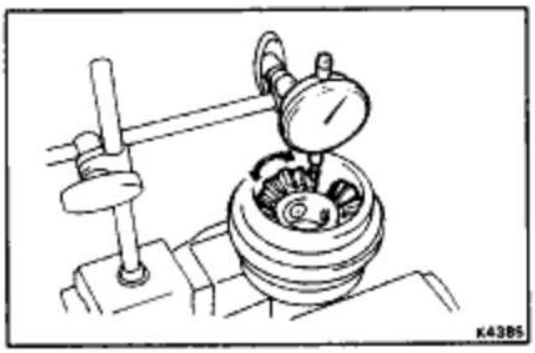
4. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR BACKLASH

(a) Install the following parts to the center differential case:

- Side gear thrust washer|
- Differential side left gear
- Four pinion thrust washers
- Four differential pinions
- Pinion shaft holder
- Four pinion shafts



(b) Install the spacer to the case as shown.



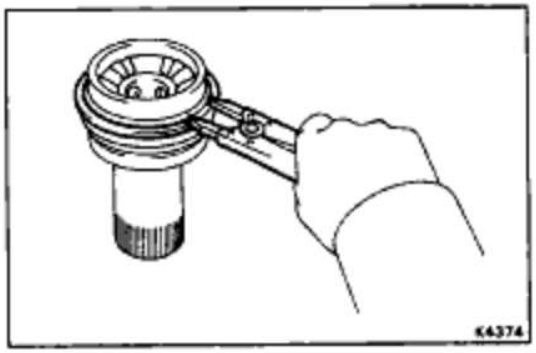
(c) Using a dial indicator, measure the backlash of one pinion gear while holding the side gear toward the case.

Standard backlash: 0.05 – 0.20 mm (0.002 – 0.0079 in.)

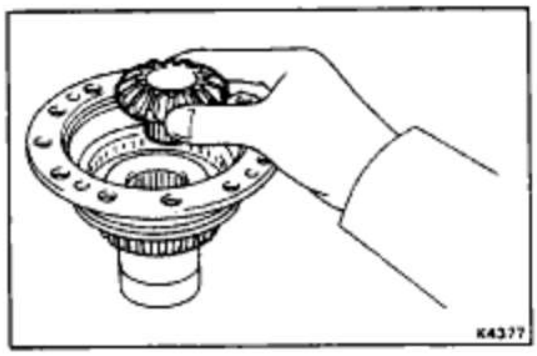
HINT: Do not place in a vise the surface of the center differential case which comes in contact with the bushing.

Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	F	1.25 (0.0492)
B	1.05 (0.0413)	G	1.30 (0.0512)
C	1.10 (0.0433)	H	1.35 (0.0531)
D	1.15 (0.0453)	J	1.40 (0.0551)
E	1.20 (0.0472)		



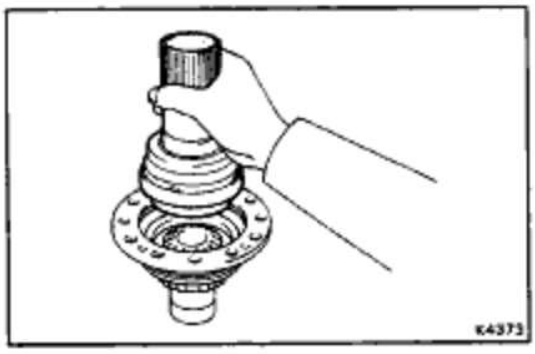
(d) Using snap ring pliers, install the shaft snap ring.



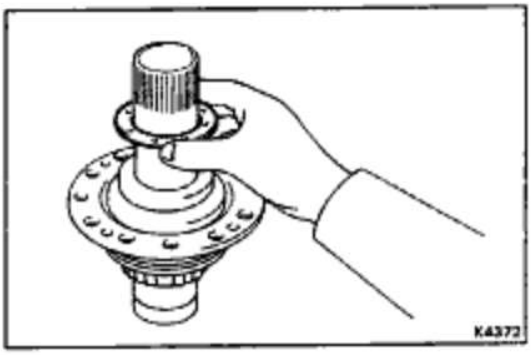
5. CHECK AND ADJUST CENTER DIFFERENTIAL SIDE GEAR THRUST CLEARANCE

(a) Install the differential side right gear.

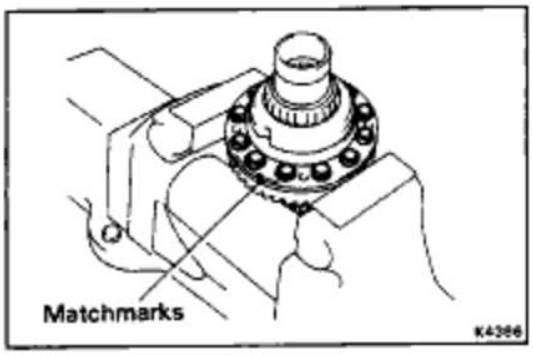
HINT: Do not install the conical spring washer.



(b) Install the center differential case.



(c) Install the thrust washer.



(d) Align the matchmarks on the ring gear mounting left and right case.

(e) Install and torque the twelve bolts.

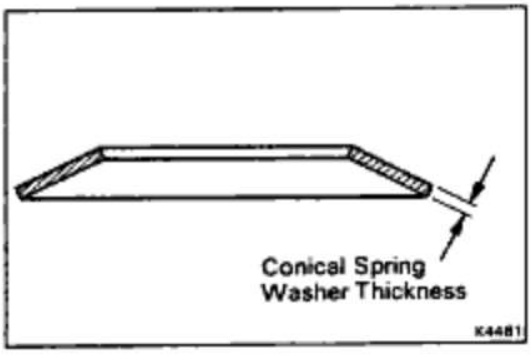
Torque: 985 kg–cm (71 ft–lb, 97 N–m)

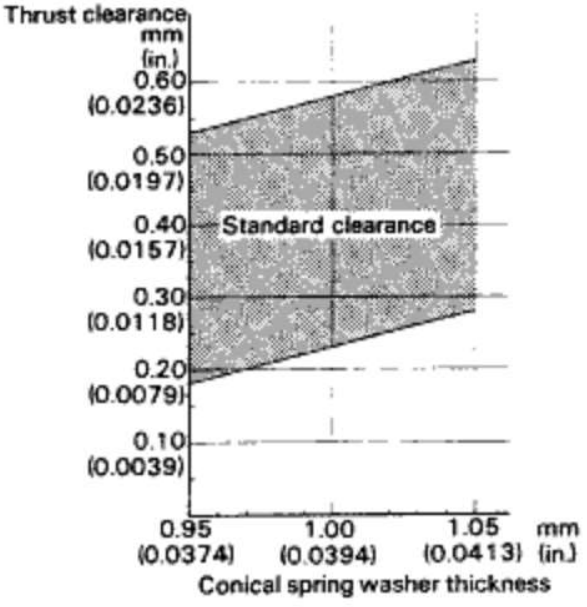
HINT: Do not install the O–ring.

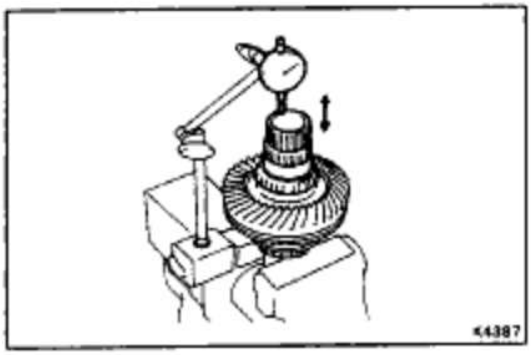
(f) Using a caliper, measure the conical spring washer thickness.

Using a dial indicator, measure the thrust clearance of center differential case while holding the ring gear mounting case.

Standard clearance:



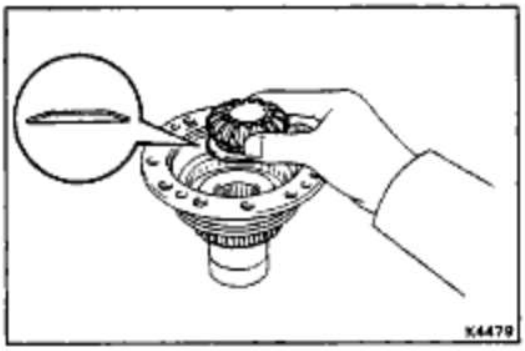




(h) Referring to the table below, select the thrust washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

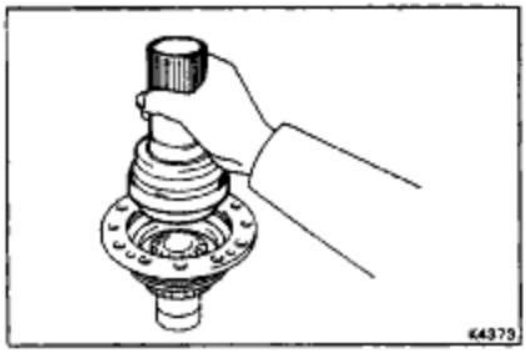
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.00 (0.0394)	G	1.30 (0.0512)
B	1.05 (0.0413)	H	1.35 (0.0531)
C	1.10 (0.0433)	J	1.40 (0.0551)
D	1.15 (0.0453)	K	1.45 (0.0571)
E	1.20 (0.0472)	L	1.50 (0.0591)
F	1.25 (0.0492)		

(i) **Remove ring gear mounting right case.**

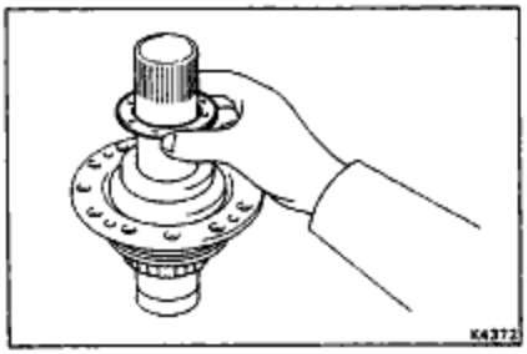


6. INSTALL DIFFERENTIAL SIDE GEAR AND CONICAL SPRING WASHER

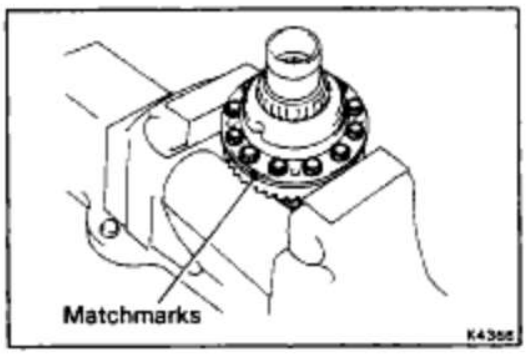
HINT: Be careful not to make a mistake in the direction of the conical spring washer.



7. INSTALL CENTER DIFFERENTIAL CASE



8. INSTALL THRUST WASHER (Previously selected)



9. INSTALL RING GEAR MOUNTING LEFT CASE

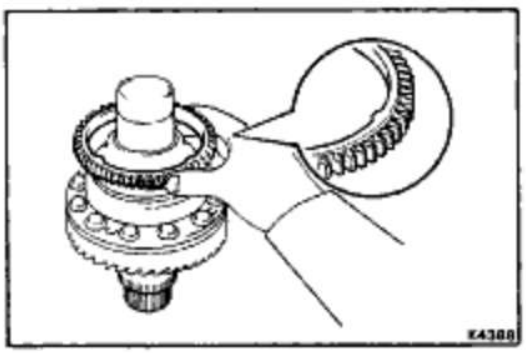
(a) Coat the new O–ring with ATF, and install it onto the left case.

(b) Align the matchmarks on the right and left case.

(c) Install and torque the twelve bolts.

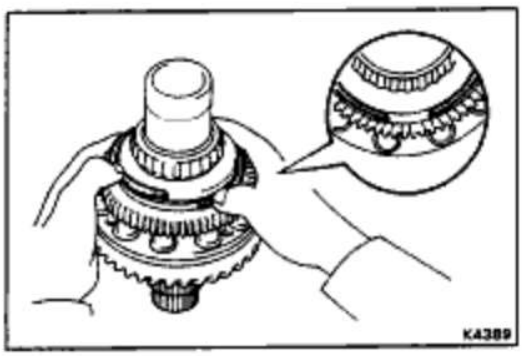
Torque: 985 kg–cm (71 ft–lb, 97 N–m)

NOTICE: Using the soft jaws, hold the left case in a vise.

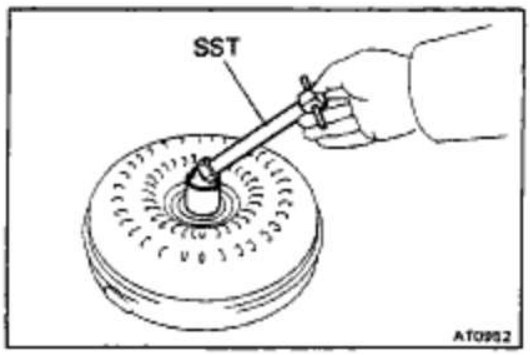


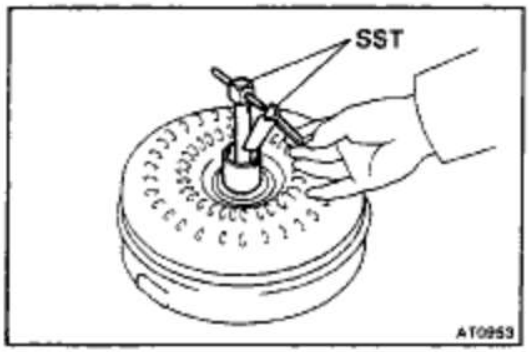
10. INSTALL OIL PUMP DRIVE GEAR

(a) Install the oil pump drive gear.



(b) Install the shaft snap ring.





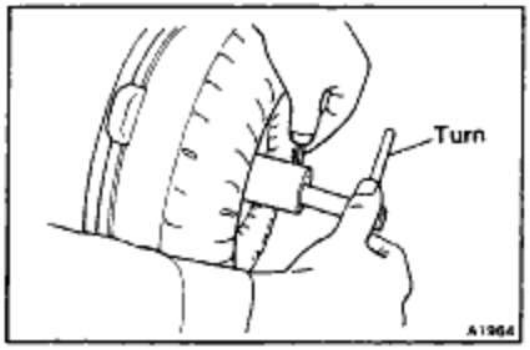
Torque Converter

INSPECTION OF TORQUE CONVERTER

1. INSERT SST IN END OF TORQUE CONVERTER

(a) Insert a turning tool into the inner race of the one–way clutch.
SST 09350–32014 (09351–32010)

(b) Insert the stopper so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351–32020)



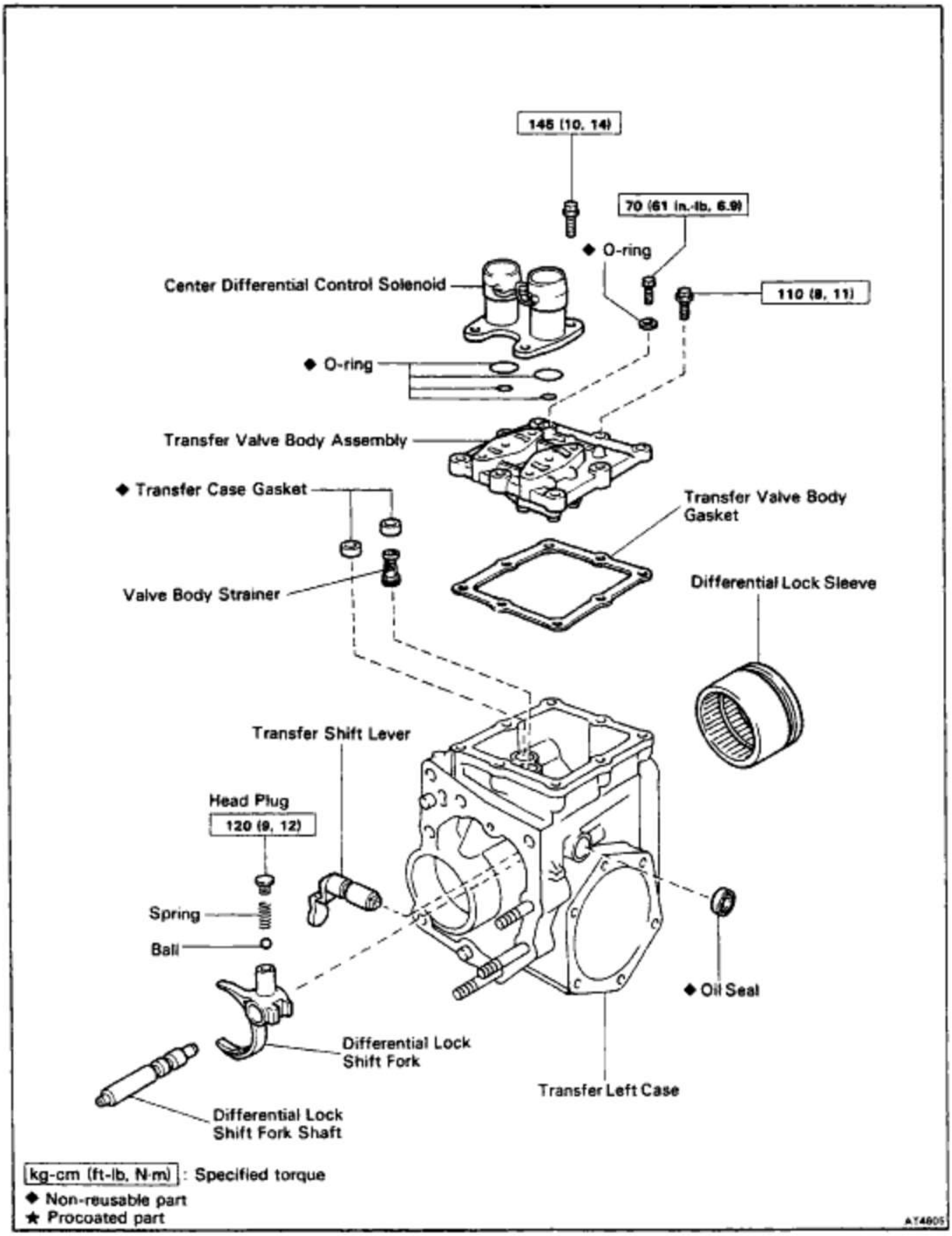
2. TEST ONE–WAY CLUTCH

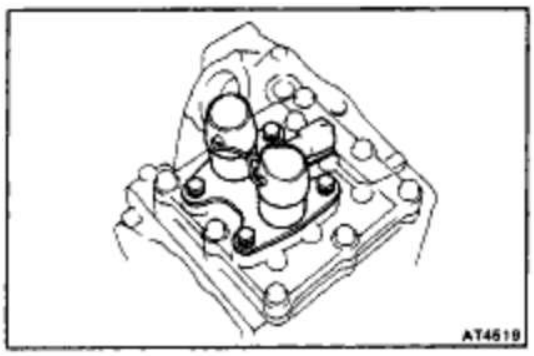
With the torque converter made stand, the clutch should lock when turned counterclockwise, and rotate freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

CLEAN TORQUE CONVERTER

if the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed with ATF.

(Transfer Left Case)

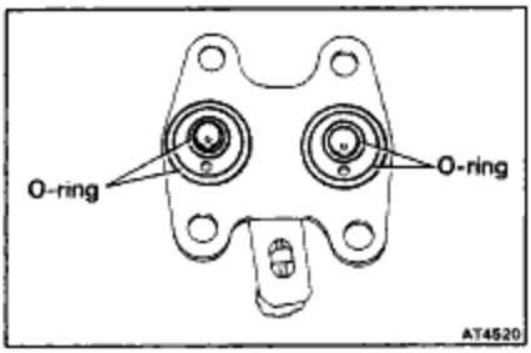




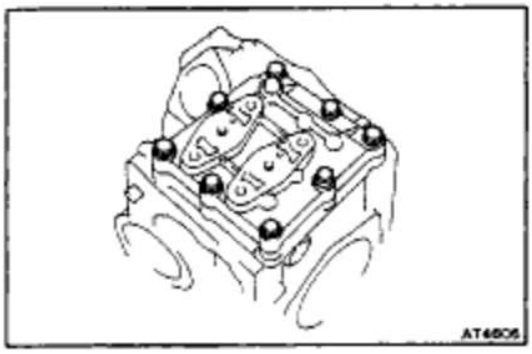
DISASSEMBLY OF TRANSFER LEFT CASE

1. REMOVE CENTER DIFFERENTIAL CONTROL SOLENOIDS

(a) Remove the four bolts and solenoids.



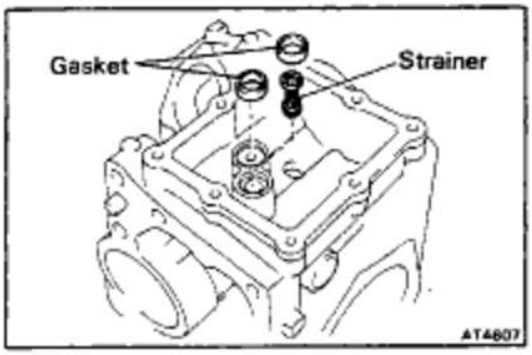
(b) Remove the four O–rings from the solenoids.



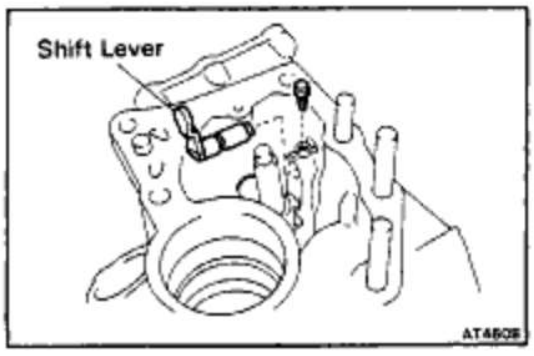
2. REMOVE TRANSFER VALVE BODY ASSEMBLY

(a) Remove the eight bolts and transfer valve body assembly.

(b) Remove the transfer valve body gasket.

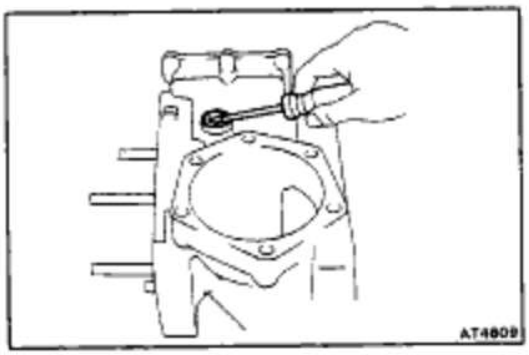


(c) Remove transfer case gaskets and valve body strainer.

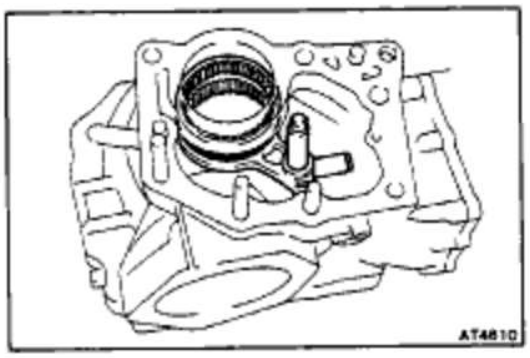


3. REMOVE TRANSFER SHIFT LEVER

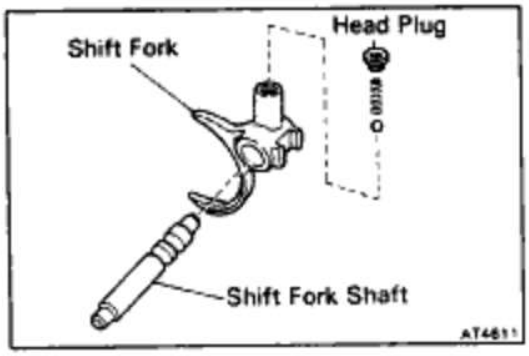
(a) Remove the lock bolt and transfer shift lever.



(b) Using a screwdriver, remove the oil seal.



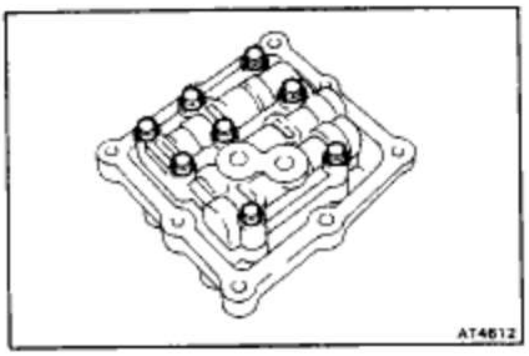
4. REMOVE SHIFT FORK SHAFT, SHIFT FORK AND SLEEVE



5. REMOVE SHIFT FORK SHAFT FROM SHIFT FORK

(a) Remove the head plug, spring and bail.

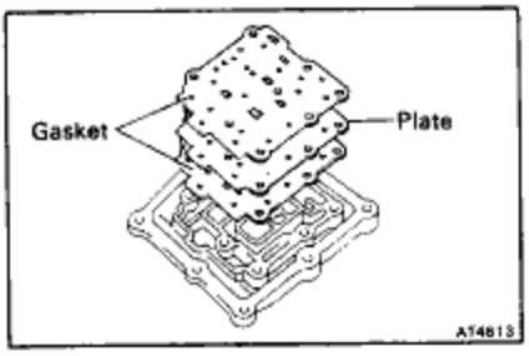
(b) Pull out the shift fork shaft from shift fork.



DISASSEMBLY OF TRANSFER VALVE BODY

REMOVE TRANSFER LOWER VALVE BODY

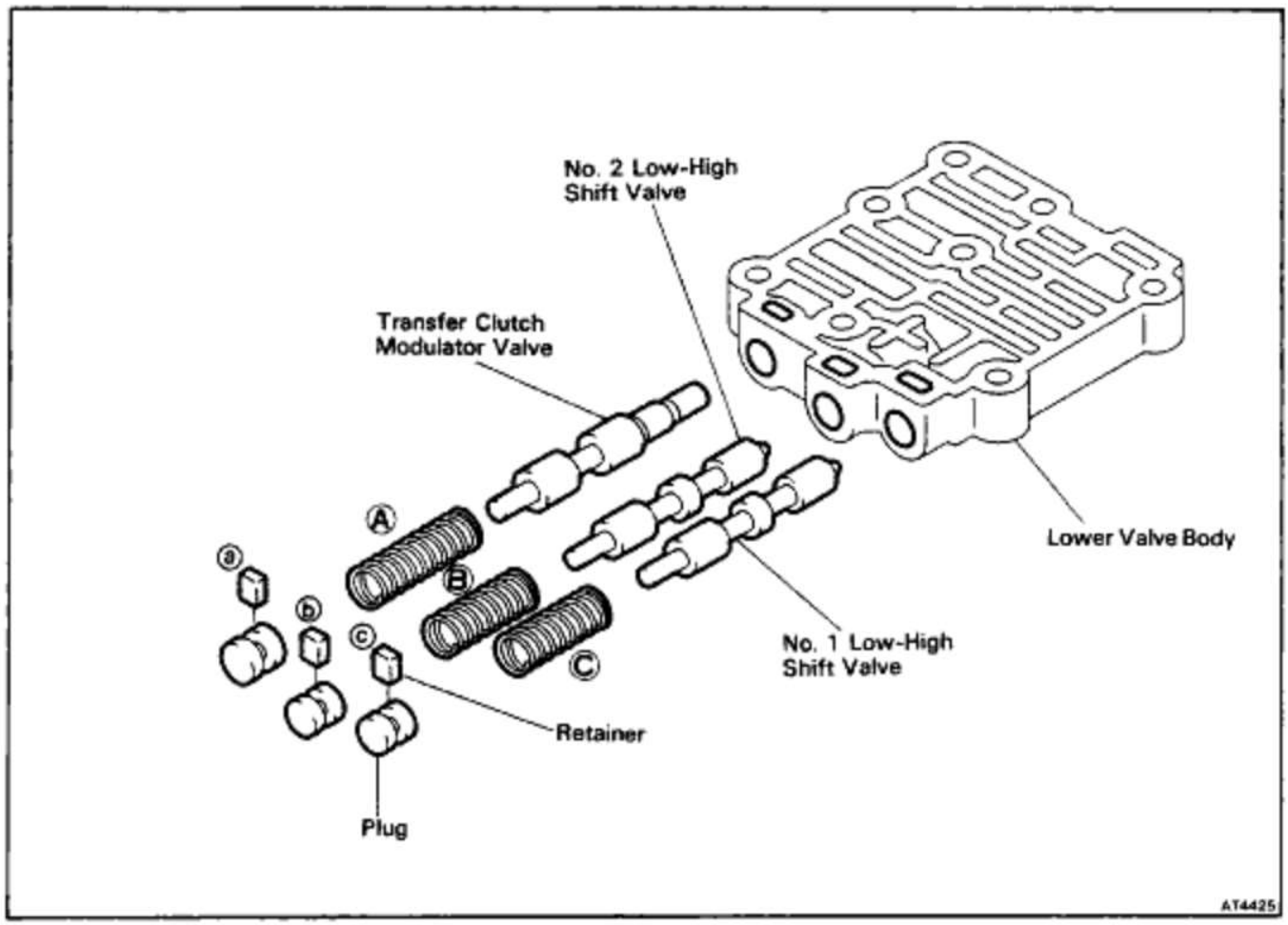
(a) Remove the eight bolts and transfer lower valve(body.



(b) Remove the two gaskets and plate from the transfer upper valve body.

(Transfer Lower Valve Body)

COMPONENTS

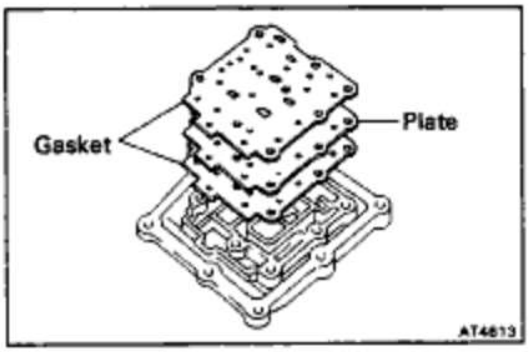


SPECIFICATIONS OF TRANSFER LOWER VALVE BODY SPRINGS AND RETAINERS

Spring		Free length mm (in.)	Coil outer diameter mm (in.)	Total No. of Coils	Color
Ⓐ	Transfer clutch modulator valve	32.3 (1.272)	7.6 (0.299)	16	None
Ⓑ	No. 2 Low–high shift valve	28.9 (1.138)	7.0 (0.276)	14	None
Ⓒ	No. 1 Low–high shift valve				

HINT: During reassembly please refer to the spring specifications above to help discriminate between the different springs.

Retainer		Height mm (in.)	Width mm (in.)	Thickness mm (in.)
ⓐ	Transfer clutch modulator valve	6.5 (0.256)	5.0 (0.197)	3.2 (0.126)
ⓑ	No. 2 Low–high shift valve			
ⓒ	No. 1 Low–high shift valve			

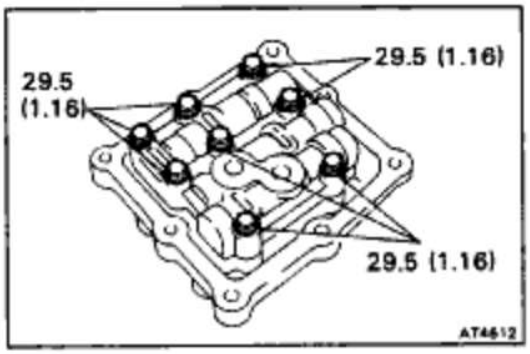


ASSEMBLY OF TRANSFER VALVE BODY

1. INSTALL PLATE AND NEW GASKETS ON TRANSFER LOWER VALVE BODY

Install a new gasket and plate and then the other new gasket.

HINT: Both gaskets are the same.



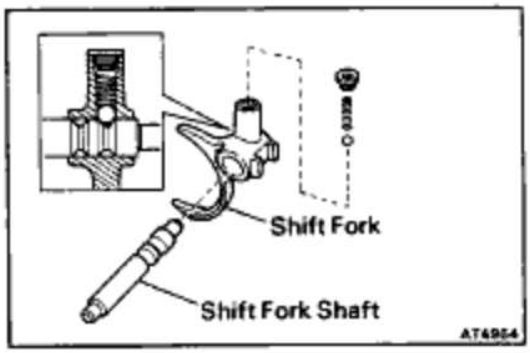
2. INSTALL TRANSFER LOWER VALVE BODY

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

(a) Lower the transfer tower valve body into place.

(b1 Hand tighten the eight bolts first. Then, tighten them with a torque wrench.

Torque: 67 kg–cm (58 in.–lb, 6.6 N–m)



ASSEMBLY OF TRANSFER LEFT CASE

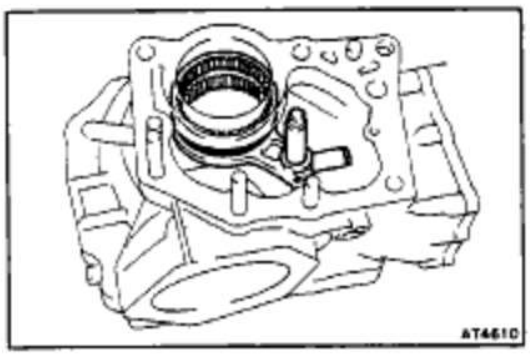
1. INSTALL SHIFT FORK SHAFT TO SHIFT FORK

(a) Insert the shift fork shaft into the shift fork.

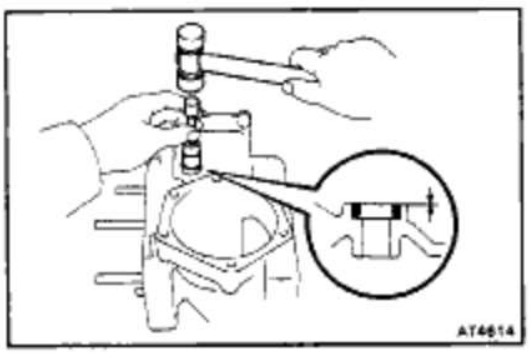
(b) Install the ball, spring and head plug.

(c) Tighten the plug.

Torque: 250 kg–cm (18 ft–lb, 25 N–m)



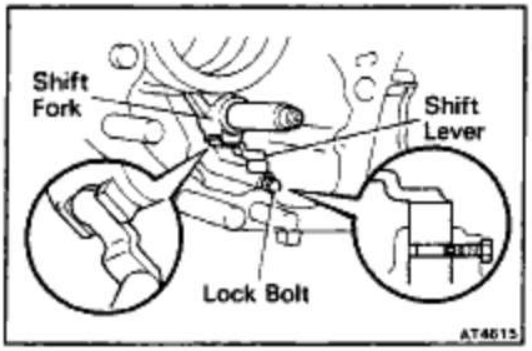
2. INSTALL SHIFT FORK SHAFT, SHIFT FORK AND SLEEVE



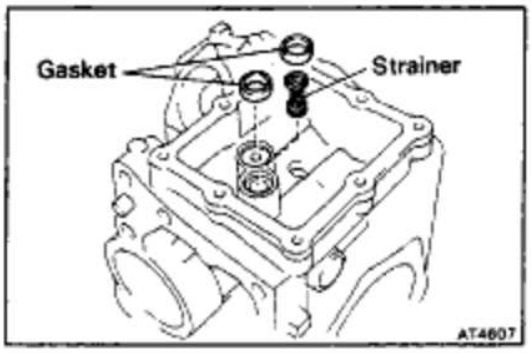
3. INSTALL TRANSFER SHIFT LEVER

(a) Coat the lip of new oil seal with MP grease.

(b) Using a 17 mm (0.67 in.) socket wrench and hammer, drive in the oil seal as shown.

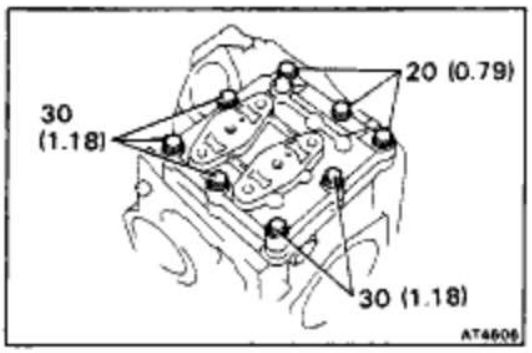


(c)Install transfer shift lever.
HINT: Engage shift fork and transfer shift lever.
(d) Install and tighten the lock bolts.
Torque: 40 kg–cm (35 in.–lb, 3.9 N–m)

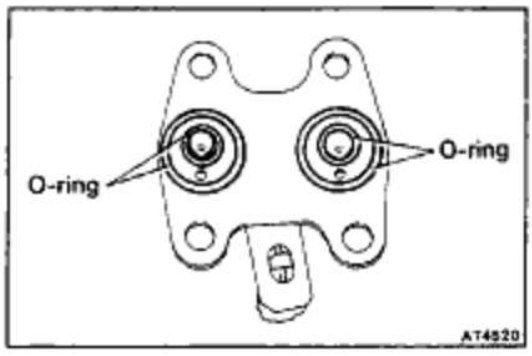


4. INSTALL TRANSFER VALVE BODY ASSEMBLY

(a) Install the new transfer case gaskets and valve body strainer.

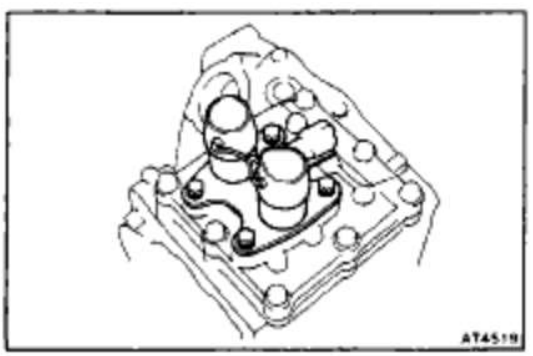


(b) Install the new transfer valve body gasket.
(e) Install the transfer valve body assembly.
(d) Tighten the bolts.
Torque: 110 kg–cm (8 ft–lb, 11 N–m)



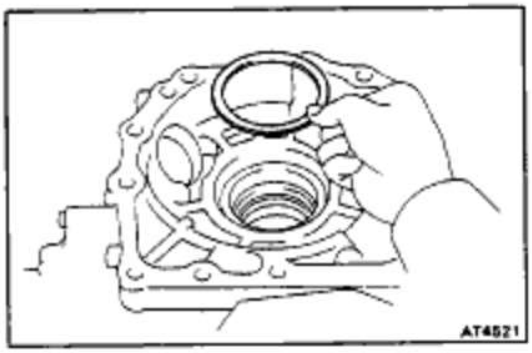
5. INSTALL CENTER DIFFERENTIAL CONTROL SOLENOIDS

(a) Install the four new O–rings to the solenoids.
(b) Coat the O–rings with ATF.



(c) Install the solenoids.

Torque: 145 kg–cm (10 ft–lb, 14 N–m)

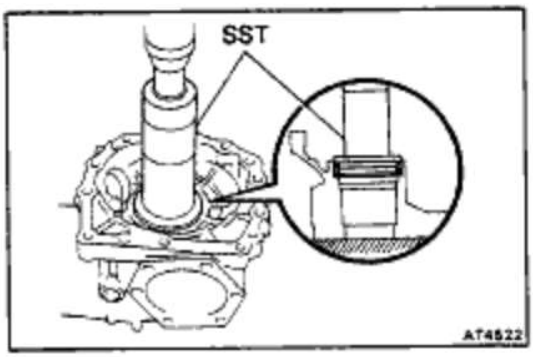


ASSEMBLY OF COMPONENT PARTS

1. INSTALL CASE SIDE

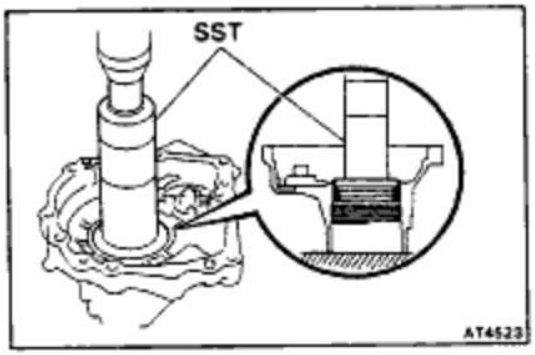
(a) Install the plate washer.

HINT: First install a washer of the same thickness as before.

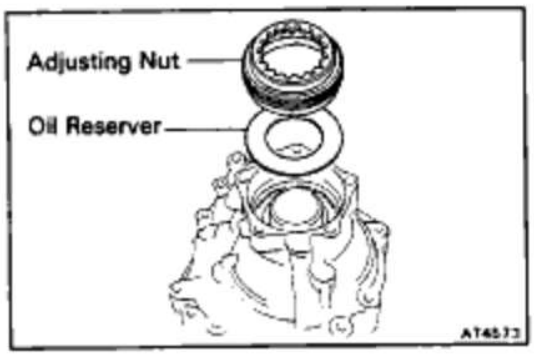


(b) Using SST and a press, press in the outer race.
SST 09316–60010 (09316–00010, 09316–00060)

2. INSTALL RIGHT CASE SIDE

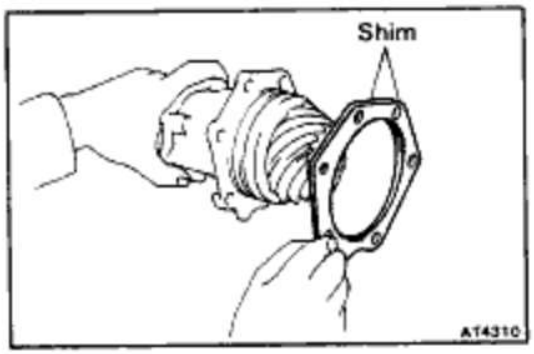


(a) Using SST and a press, press in outer race as shown
SST 09316–60010 (09316–00010, 09316–00060)



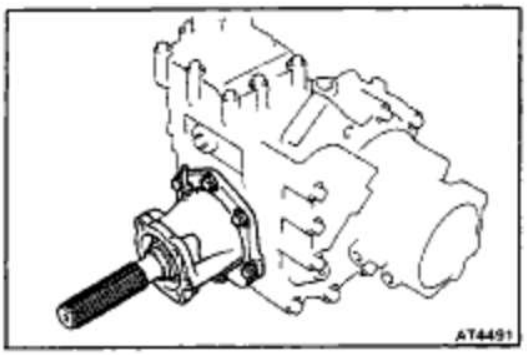
(b) Install the bearing adjusting nut and oil reservoir, until it touches the outer race.

3. ADJUST RING GEAR BACKLASH

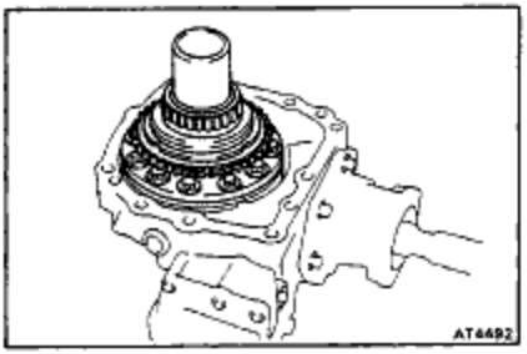


(a) Install the two shims to the driven pinion bearing cage assembly.

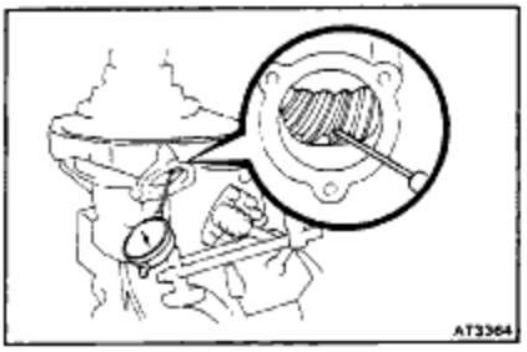
HINT: First install shims of the same thickness as before



(b) Install the driven pinion bearing cage.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)
HINT: Do not install the O–ring.



(c) Install the ring gear mounting case and center differential case.
(d) Using a dial indicator, measure the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)



(e) Referring to the table below, select the plate washer which will ensure that the backlash is within specification. Try to select a washer of the same size.

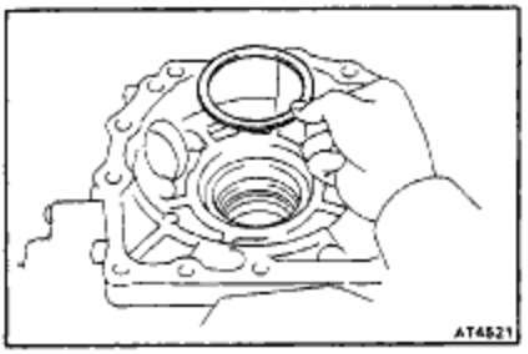
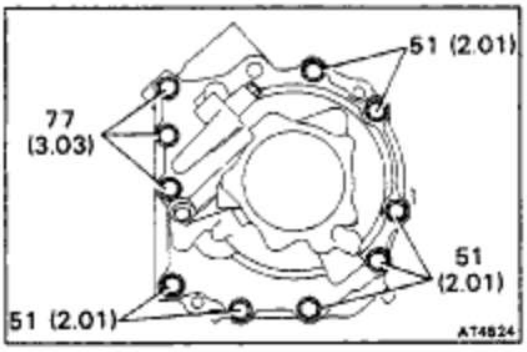


Plate washer thickness mm (in)

Mark	Thickness	Mark	Thickness
71	2.13 (0.0839)	83	2.49 (0.0980)
72	2.16 (0.0850)	84	2.52 (0.0992)
73	2.19 (0.0862)	85	2.55 (0.1004)
74	2.22 (0.0874)	86	2.58 (0.1016)
75	2.25 (0.0886)	87	2.61 (0.1028)
76	2.28 (0.0898)	88	2.64 (0.1039)
77	2.31 (0.0909)	89	2.67 (0.1051)
78	2.34 (0.0921)	90	2.70 (0.1063)
79	2.37 (0.0933)	91	2.73 (0.1075)
80	2.40 (0.0945)	92	2.76 (0.1087)
81	2.43 (0.0957)	93	2.79 (0.1098)
82	2.46 (0.0969)	94	2.82 (0.1110)



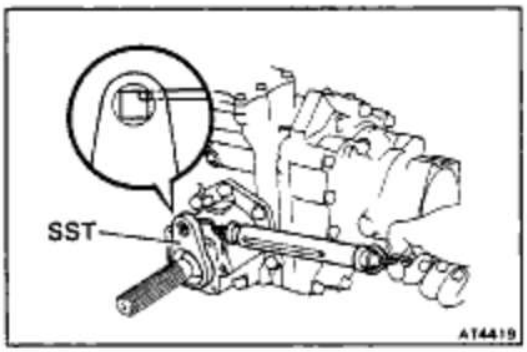
4. ADJUST TOTAL PRELOAD

(a) Install the transfer right case.

(b) Install and torque the ten bolts.

Torque: 450 kg–cm (33 ft–lb, 44 N–m)

HINT: Do not apply seal packing and do not install gasket. Each bolt length (mm (in.) is indicated in the figure.



(c) Using SST and a spring tension gauge, measure the total preload.

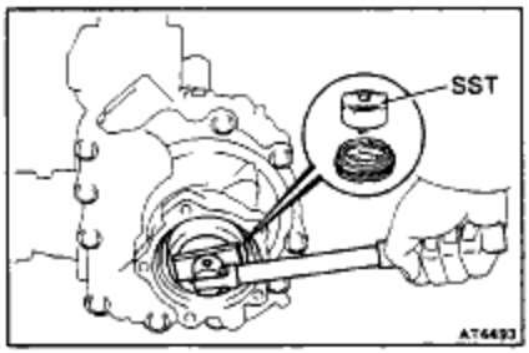
SST 09326–20011

Preload (at starting):

Add driven pinion preload

0.5–0.9kg (1.1 –2.0lb,4.9–8.8N)

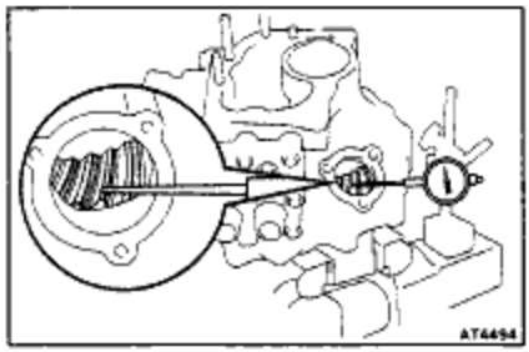
HINT: Turn the drive pinion counterclockwise and clockwise several times.



(d) Adjust the total preload by tightening the adjusting nut with SST.

SST 09318–12010

HINT: Measure the preload while tightening the bearing adjusting nut a little at a time.

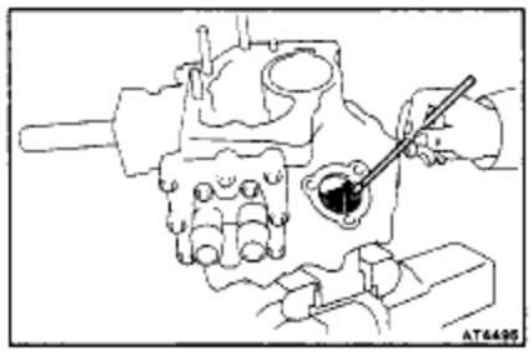


5. CHECK RING GEAR BACKLASH

(a) Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

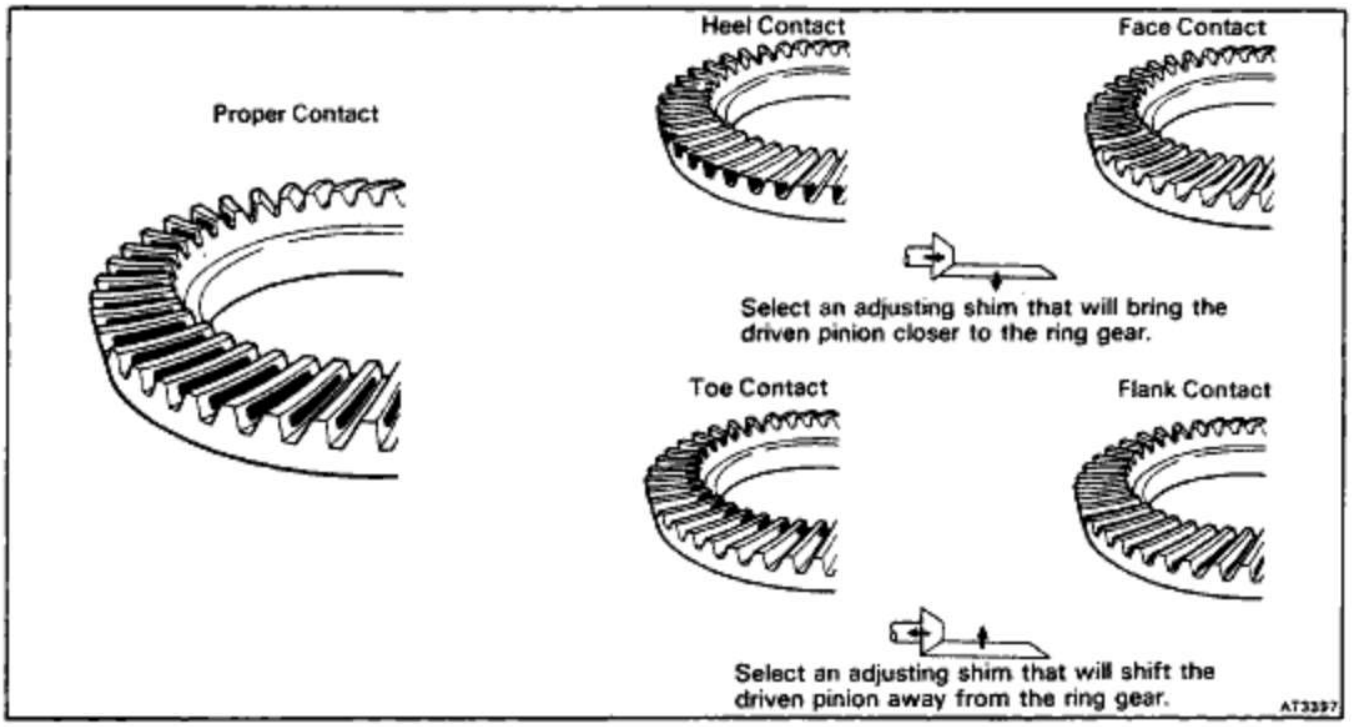
(b) When the backlash is outside the standard value, select a different plate washer to the one selected in step 3. Again adjust the backlash and total preload.

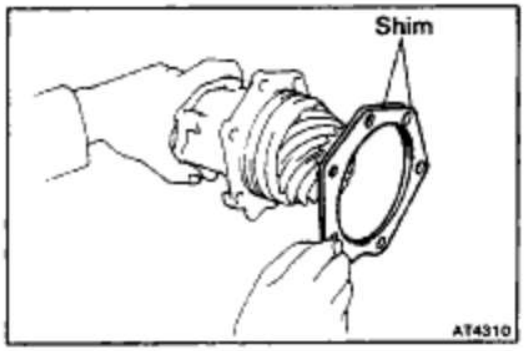


6. CHECK TOOTH CONTACT

(a) Coat 3 or 4 teeth at four different positions on the ring gear with red lead.

(b) Rotate the ring gear, inspect the teeth pattern.

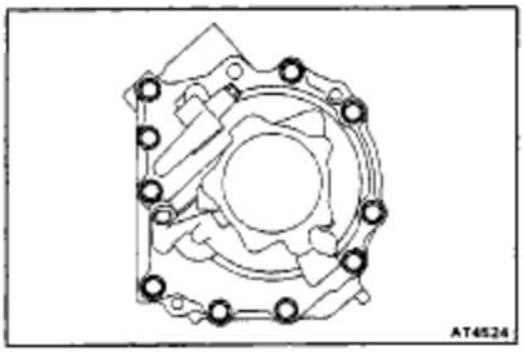




(e) If the teeth are not connecting properly, again the proper shim and plate washer.

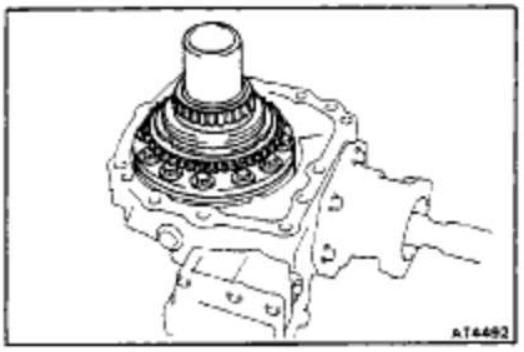
Shim thickness mm (in.)

Mark	Thickness	Mark	Thickness
A	0.30 (0.0118)	F	0.45 (0.0177)
B	0.33 (0.0130)	G	0.48 (0.0189)
C	0.36 (0.0142)	H	0.51 (0.0201)
D	0.39 (0.0154)	J	0.54 (0.0213)
E	0.42 (0.0165)	K	0.57 (0.0224)

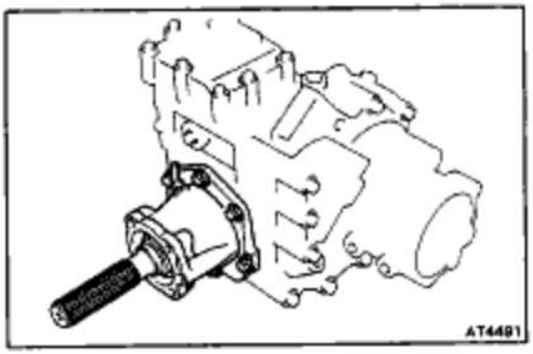


7. REMOVE TRANSFER RIGHT CASE

Remove the ten bolts and transfer right case.

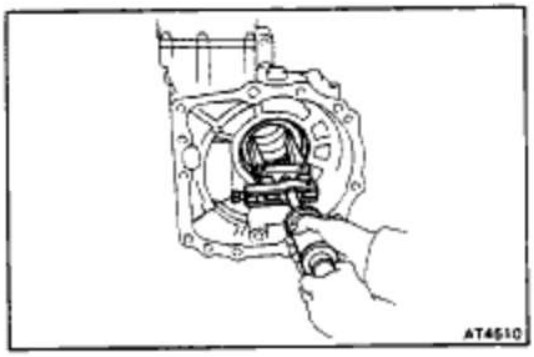


8. REMOVE RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE



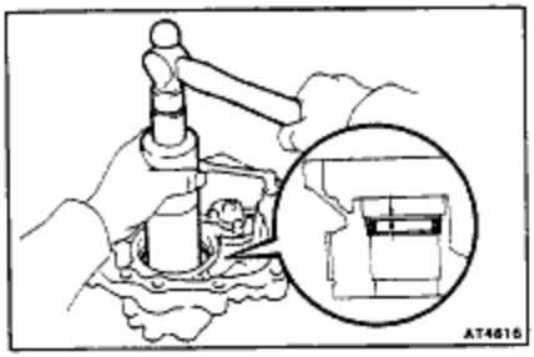
9. REMOVE DRIVEN PINION BEARING CAGE ASSEMBLY

Remove the six bolts and driven pinion bearing cage assembly.



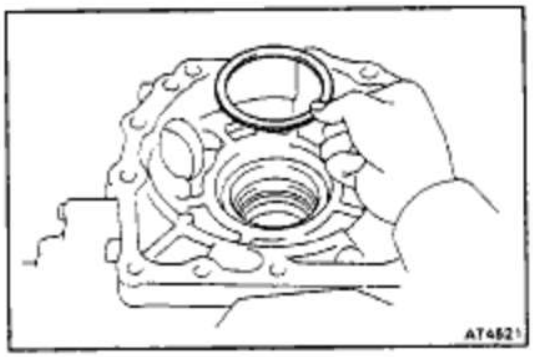
10. REMOVE DIFFERENTIAL LEFT SIDE BEARING OUTER RACE AND PLATE WASHER

Using SST, remove the outer race and plate washer.
SST 09308–00010



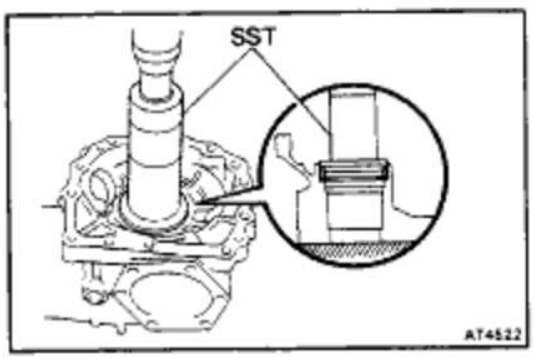
11. INSTALL OIL SEAL

(a) Using SST, install a new oil seal as shown.
SST 09316–60010 (09316–00010, 09316–00030)
Oil seal depth: 3 mm (0.12 in.)
(b) Coat the lip of oil seal with MP grease.

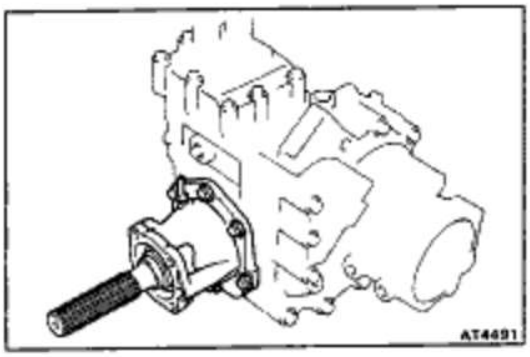


12. INSTALL LEFT CASE BEARING OUTER RACE

(a) Install the plate washer. (previously selected)



(b) Using SST and a press, press in the outer race.
SST 09316–60010 (09316–00010, 09316–00060)



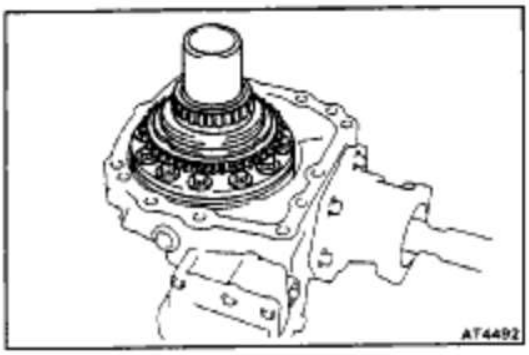
13. INSTALL DRIVEN PINION BEARING CAGE ASSEMBLY

(a) Coat the O–ring with gear oil, and install it to the bearing cage assembly.

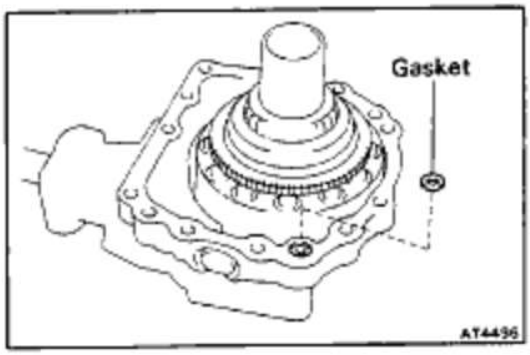
W Install the bearing cage with adjust shim (Previously selected) to the transfer left case.

W Install and torque the six bolts.

Torque: 400 kg–cm (29 ft–lb, 39 N–m)

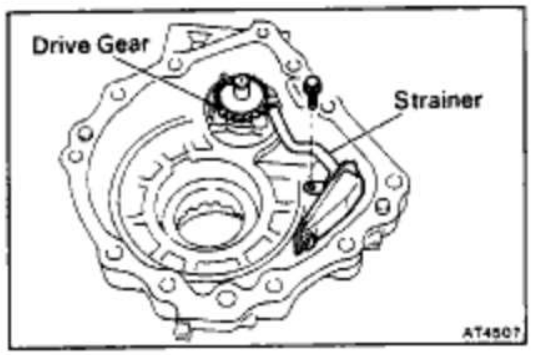


14. INSTALL RING GEAR MOUNTING CASE AND CENTER DIFFERENTIAL CASE



15. INSTALL TRANSFER RIGHT CASE

(a) Install a new apply gasket to the left case.



(b) Coat the O–ring with gear oil.

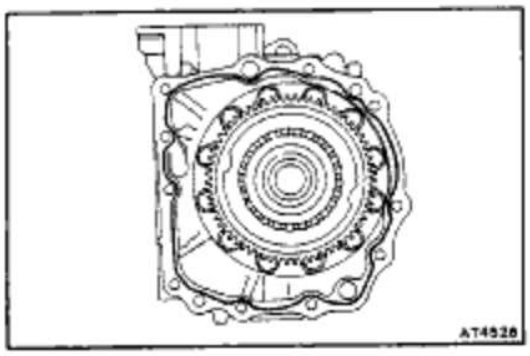
(c) Install the O–ring to the oil pump strainer.

(d) Install the oil pump strainer to the transfer right case.

(e) Install and torque the bolt.

Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

(f) Install the oil pump driven gear.

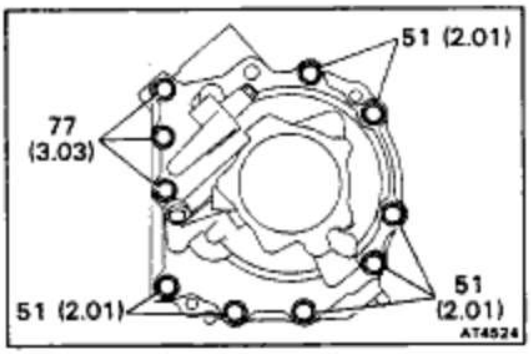


(g) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer left case or right case.

(h) Apply–seal packing to the left case as shown in the figure.

Seal packing: Part No. 08826–00090 THREE BOND 1281 or equivalent

HINT: Install the right case as soon as the seal packing is applied.



Install the right case to the left case.

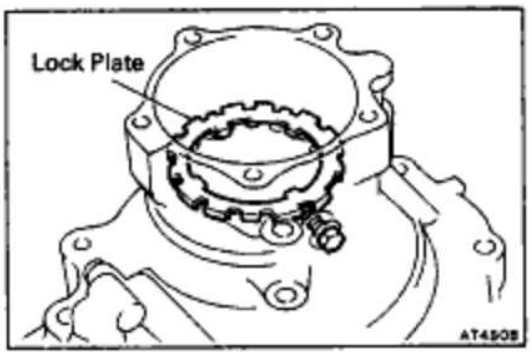
Q) Install and torque the ten bolts.

Torque: 450 kg–cm (33 ft–b. 44 N–m)

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

16. CHECK TOTAL PRELOAD

(See page AT–388)

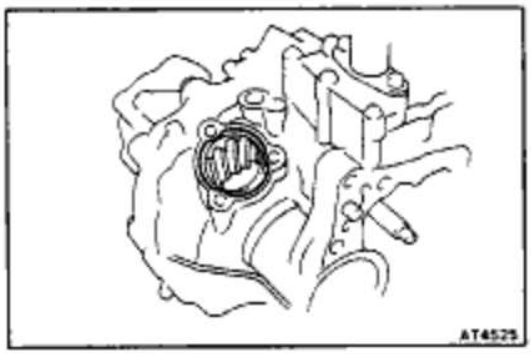


17. INSTALL ADJUSTING NUT LOCK PLATE

(a) Install the lock plate so that the projection from the lock plate fits properly into the groove of the adjusting nut.

HINT: When the lock plate cannot be installed, tighten the adjusting nut the smallest amount possible.

(b) Coat a new O–ring with gear oil and install it to the lock bolt.



(c) Install and torque the lock bolt.

Torque: 73 kg–cm (63 in.–lb, 7 N–m)

18. INSTALL TRANSFER INSPECTION HOLE COVER

(a) Apply seal packing to the left case as shown in the figure.

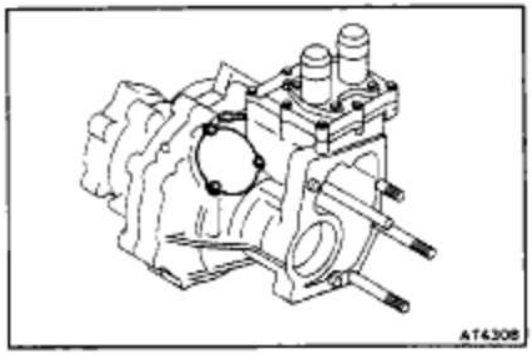
Seal packing: Part No. 08826–00090 THREE BOND 1281 or equivalent

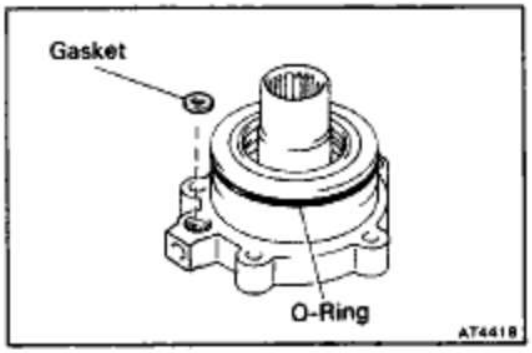
HINT: Install the cover as soon as the seal packing is applied.

(b) Install the hole cover to the transfer left case.

(c) Install and torque the three bolts.

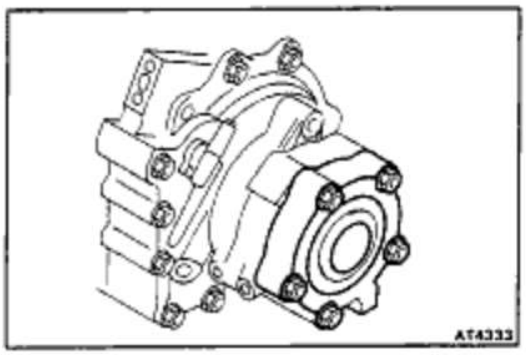
Torque: 160 kg–cm (12 ft–lb, 16 N–m)



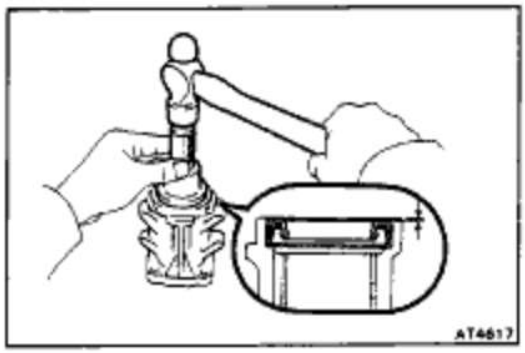


19. INSTALL TRANSFER RIGHT CASE RETAINER

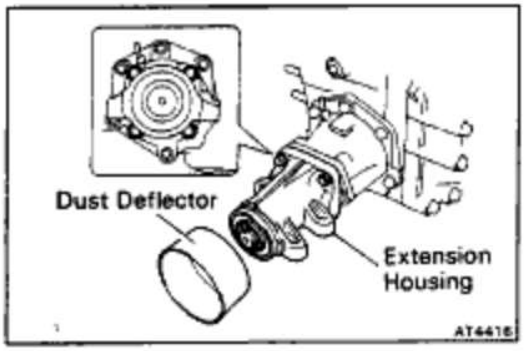
(a) Coat a new O–ring with gear oil, and install it and new apply gasket.



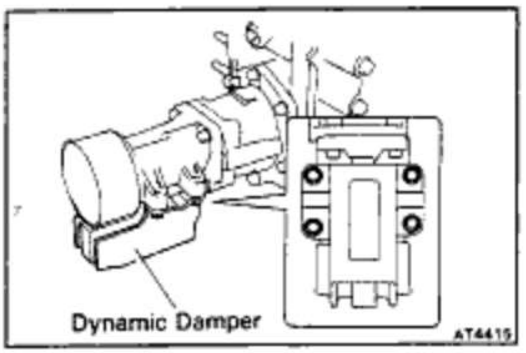
(b) Install the right case retainer to the transfer right case.
(c) Install and torque the five bolts.
Torque: 300 kg–cm (22 ft–lb, 29 N–m)



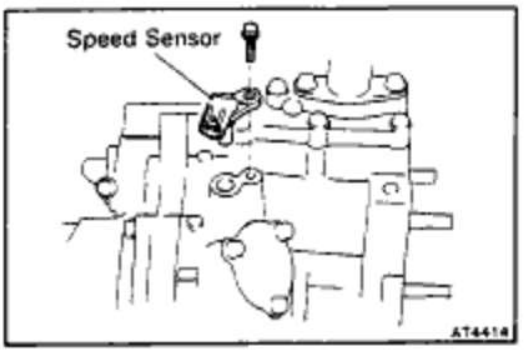
20. INSTALL EXTENSION HOUSING
(a) Using SST and a hammer, drive in a new oil seal as shown.
SST 09325–20010
(b) Coat the lip of the oil seal with MP grease.



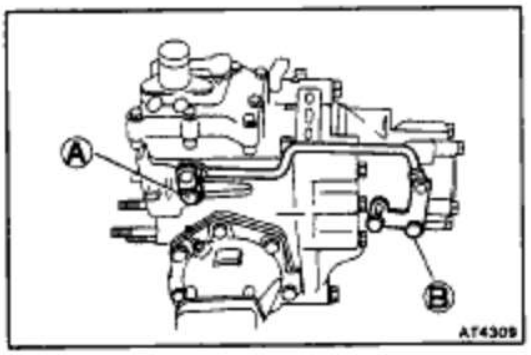
(c) Coat a new O–ring with gear oil and install it to the extension housing.
(d) Install the extension housing to the driven pinion bearing cage.
(e) Install and torque the four bolts.
Torque: 260 kg–cm (19 ft–lb, 25 N–m)
(f) Using a plastic hammer, install the dust deflector.



21. INSTALL DYNAMIC DAMPER
Install and torque the four bolts.
Torque: 260 kg–cm (19 ft–lb, 25 N–m)



22. INSTALL REAR WHEEL SPEED SENSOR
(a) Install a new O–ring to the speed sensor.
(b) Install the speed sensor to the transfer left case.
(c) Install and torque a bolt.
Torque: 55 kg–cm (48 in.–lb, 5.4 N–m)

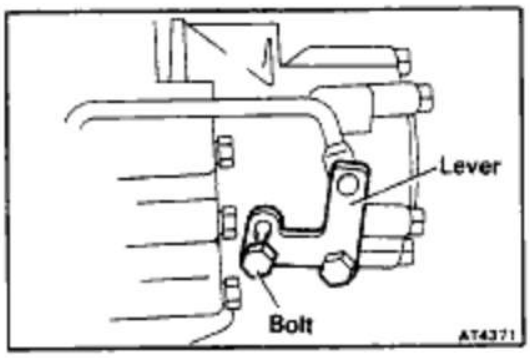


23. INSTALL TRANSFER MODE SELECT LEVER AND ROD

(a) Install the lever, rod and lever guide.

1bl Install and torque the two bolts.

Torque: (A) 55 kg–cm (48 in.–lb, 5.4 N–m)
115 kg–cm (8 ft–lb, 11 N–m)

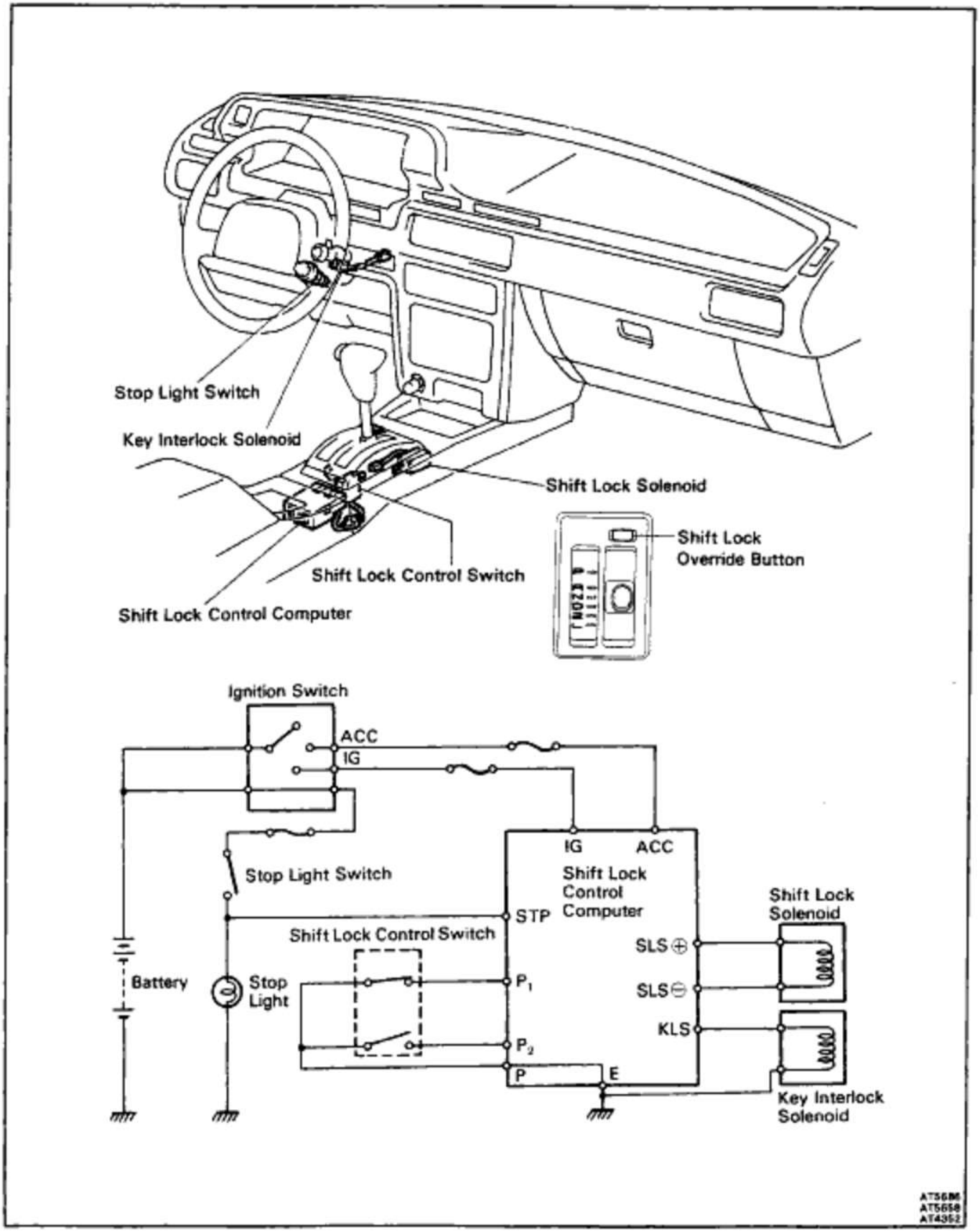


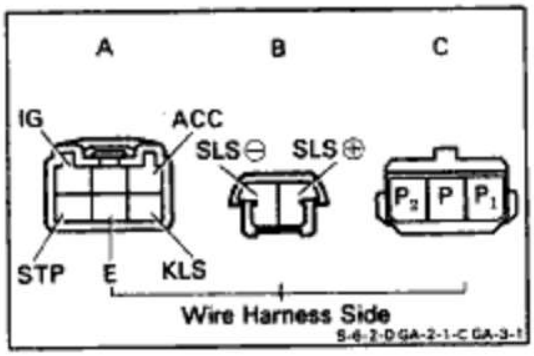
(c) Install the bolt while setting the lever as shown.

Torque: 115 kg–cm (8 ft–lb, 11 N–m)

SHIFT LOCK SYSTEM

COMPONENT AND CIRCUIT





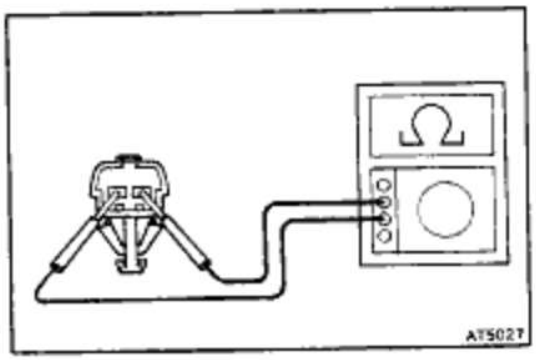
INSPECTION OF ELECTRIC CONTROL COMPONENTS

1. INSPECT SHIFT LOCK CONTROL COMPUTER

Using a voltmeter, measure the voltage at each terminals.

HINT: Do not disconnect the computer connector.

Connector	Terminal	Measuring condition	Voltage (V)
A	ACC – E	Ignition switch ACC position	10 – 14
	IG – E	Ignition switch ON position	10 – 14
	STP – E	Depress brake pedal	10 – 14
	KLS – E	① Ignition switch ACC position and P range	0
		② Ignition switch ACC position and except P range	10 – 14
		③ (Approx.–after one second)	6 – 9
B	SLS + – SLS -	① Ignition switch ON position and P range	0
		② Depress brake pedal	8.5 – 13.5
		③ (Approx.–after 20 seconds)	5.5 – 9.5
		④ Except P range	0
C	P_1 – P	① Ignition switch 4N, P range and depress brake pedal	0
		② Shift except P range under conditions above	9 – 13.5
	P_2 – P	① Ignition switch ACC position and P range	9 – 13.5
		② Shift except P range under condition above	0

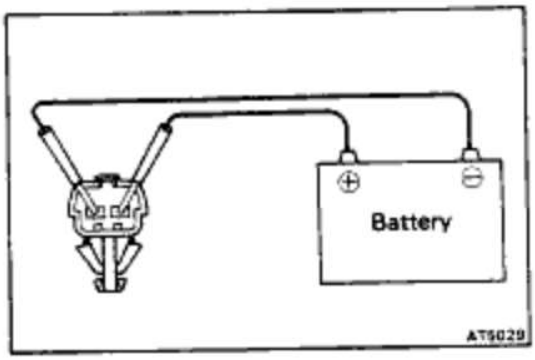


2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.

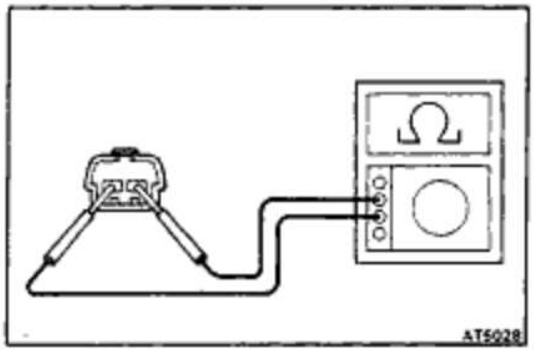
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance: 21 – 27 Ω



(c) Apply the battery voltage between terminals. Check that an operation noise can be heard from the solenoid.

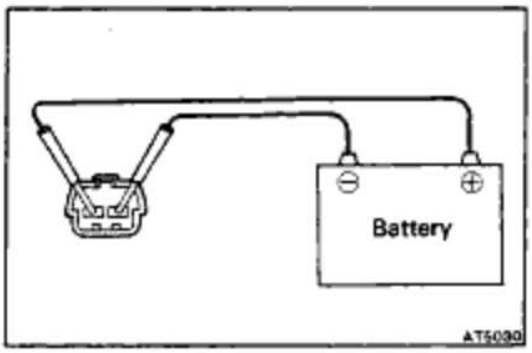
3. INSPECT KEY INTERLOCK SOLENOID



(a) Disconnect the solenoid connector.

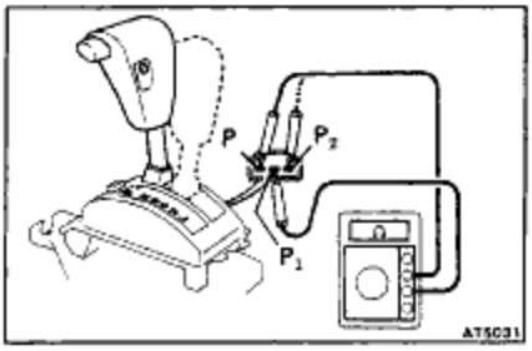
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance: 12.5 – 16.5Ω



(e) Apply the battery voltage between terminals. Check that an operation noise can be heard from the solenoid.

4. INSPECT SHIFT LOCK CONTROL SWITCH



Inspect that there is continuity between each terminals.

O—O : Continuity

Shift Position \ Terminal	P	P_1	P_2
P range (Release button is not pushed)	O—O		
R,N,D,2,L range	O—		—O

INSTALLATION OF COMPONENT PARTS

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

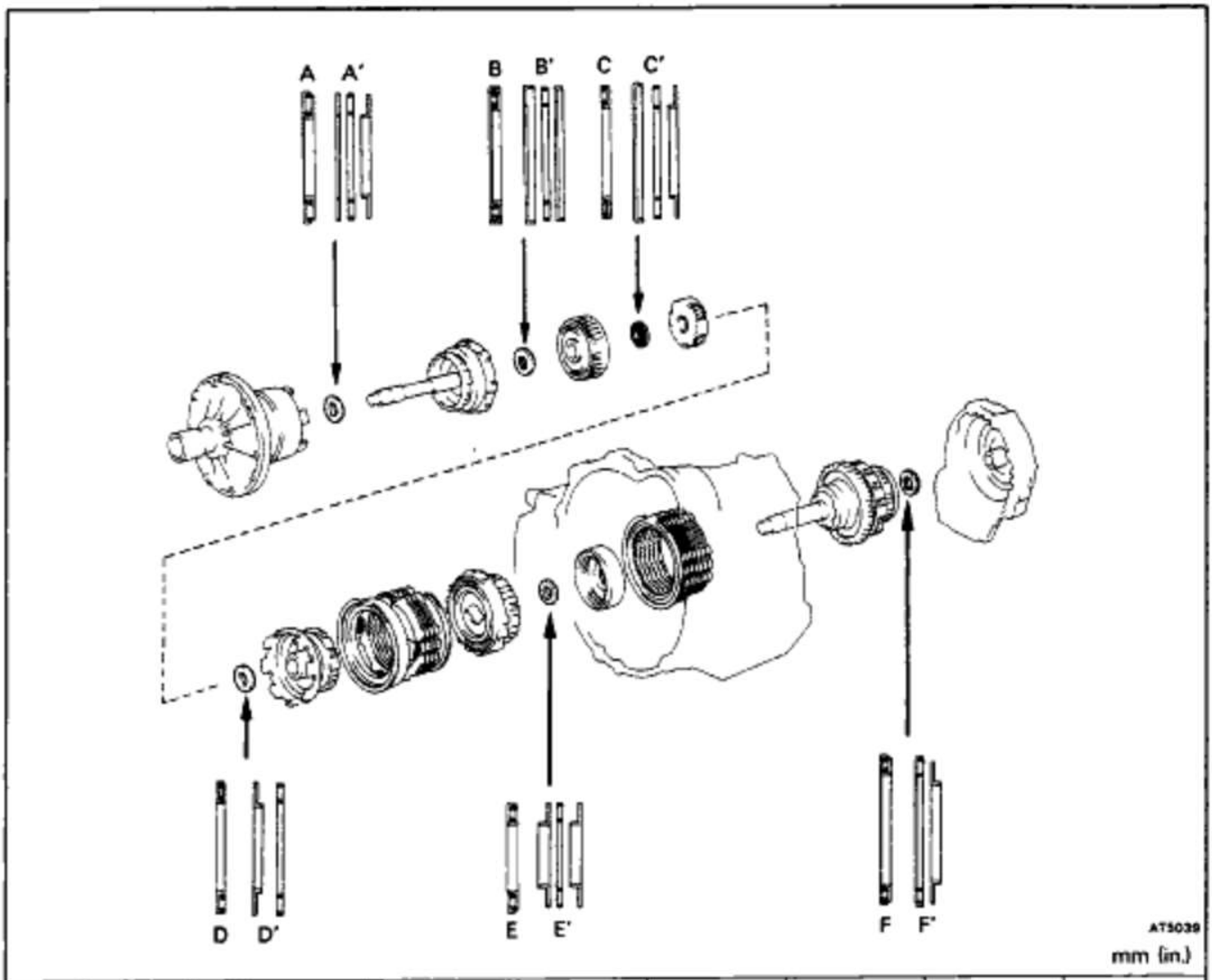
If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

Recommended ATF: DEXRON© II (A540E)
Type T (08886–00405) or equivalent (A540H)

GENERAL INSTALLATION NOTES:

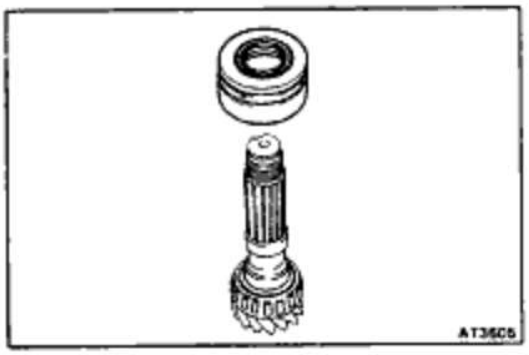
1. The automatic transaxle is composed of highly precision–finished parts, necessitating careful inspection before assembly because even a small nick could cause fluid leakage or affect performance.
2. Before assembling new clutch discs, soak them in automatic transaxle fluid for at least two hours.
3. Apply automatic transaxle 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 transaxle, 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.



mm (in.)

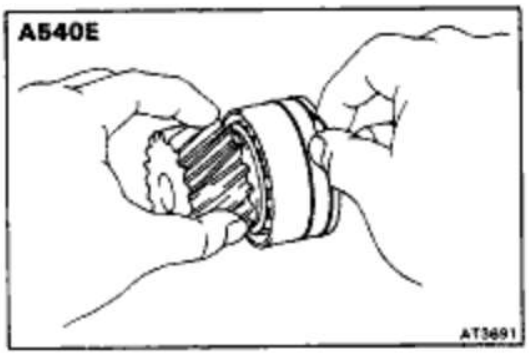
A540E		A	B	C	D	E	F
Bearing (with race)	Outer Diameter	See page AT-354	47.6 (1.874)	45.5 (1.791)	←	38.7 (1.524)	54.0 (2.126)
	Inner Diameter	27.7 (1.091)	31.4 (1.236)	30.1 (1.185)	←	22.6 (0.890)	39.4 (1.551)
A540H		A'	B'	C'	D'	E'	F'
Front Bearing Race	Outer Diameter	43.0 (1.693)	37.9 (1.492)	←	45.0 (1.772)	37.3 (1.469)	–
	Inner Diameter	30.5 (1.201)	22.0 (0.866)	←	28.0 (1.102)	24.1 (0.949)	–
Thrust Bearing	Outer Diameter	42.0 (1.654)	36.1 (1.421)	←	45.0 (1.772)	37.6 (1.480)	46.3 (1.823)
	Inner Diameter	28.9 (1.138)	22.2 (0.874)	←	30.0 (1.181)	24.0 (0.974)	26.2 (1.031)
Rear Bearing Race	Outer Diameter	42.0 (1.654)	35.7 (1.406)	35.0 (1.378)	–	37.6 (1.480)	43.0 (1.693)
	Inner Diameter	27.1 (1.067)	23.0 (0.906)	19.0 (0.748)	–	22.2 (0.874)	24.5 (0.965)



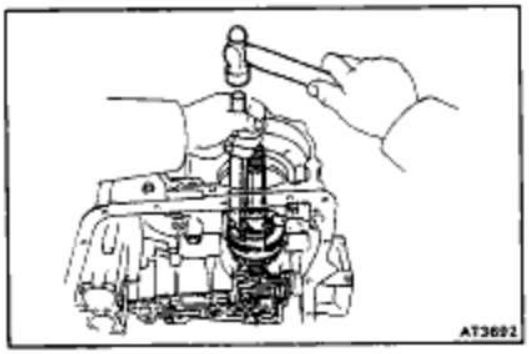
INSTALLATION OF DIFFERENTIAL AND DRIVE. PINION

1. INSTALL DRIVE PINION INTO TRANSAXLE CASE

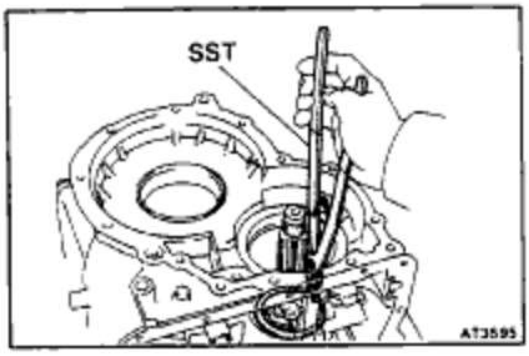
(a) Place the bearing cage onto the drive pinion shaft.
NOTICE: Be careful not to damage the oil seals with the pinion shaft. (A540E)



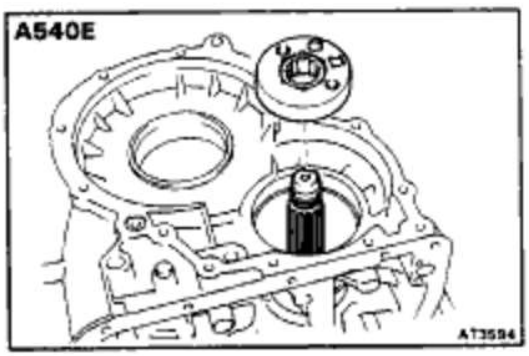
(b) Install the two new O–rings to the bearing cage. (A540E)
(c) Coat the O–rings with ATF. (A540E)



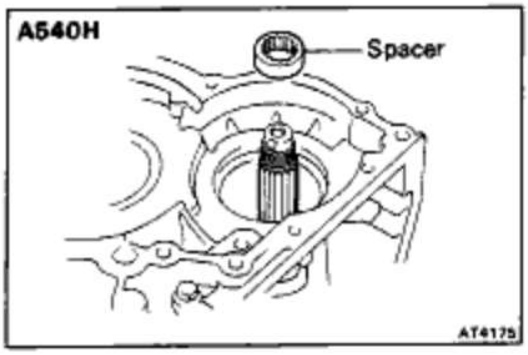
(d) Using a hammer and brass bar, slightly tap the bearing cage into the transaxle case until the snap ring groove in the bore can be seen.



(e) Using SST, install snap ring into the bore.
SST 09350–32014 (09351–32050‘



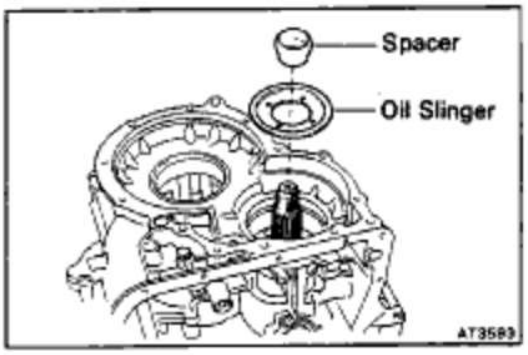
2. (A540E) PLACE SENSOR ROTOR ONTO DRIVE PINION SHAFT



3.(A540H)
INSTALL DRIVE PINION BEARING NO. 2 SPACER

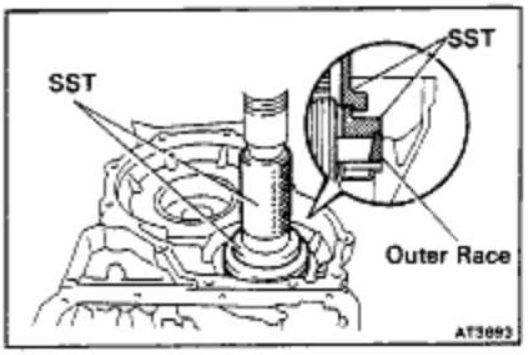
4. PLACE OIL SLINGER AND NEW SPACER

HINT: Install the spacer with the small end downward.



5. INSTALL OUTER RACE TO TRANSAXLE CASE

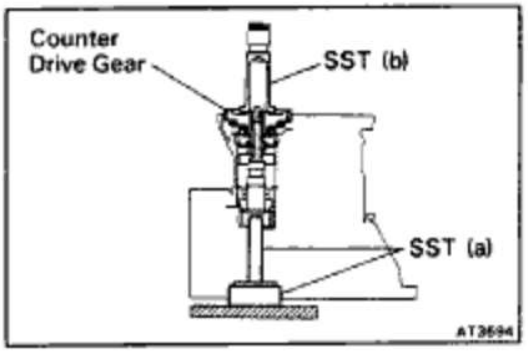
Using SST, press in the outer race.
SST 09350–32014 (09351–32100, 09351–32140)



6. INSTALL COUNTER DRIVEN GEAR

(a) Place SST into the transaxle hole to hold the drive pinion shaft.
SST (a) 09350–32014 (09351–32130, 09351–32150)

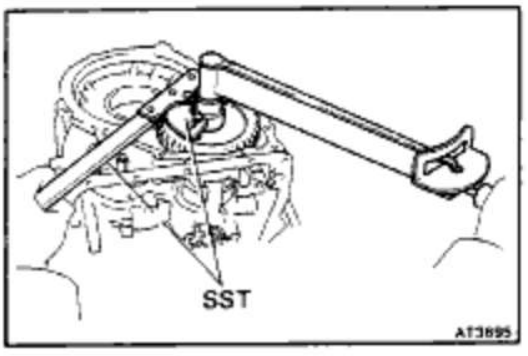
(b) Using SST, press in the counter driven gear until slightly thickness between the counter driven gear bearing and outer race.
SST (b) 09350–32014 (09351–32140)

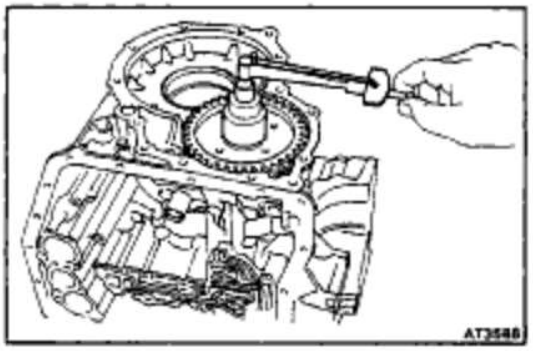


7. INSTALL NEW LOCK NUT AND ADJUST DRIVE PINION PRELOAD

(a) Install the new lock nut.

(b) Using SST to hold the gear, tighten the nut.
Torque: 2,100 kg–cm (152 ft–lb, 206 N–m)
SST 09330–00021, 09350–32014 (09351–32032)





Turn the gear counterclockwise and clockwise several times.

(d) Using a torque meter, measure the preload of the drive pinion.

Drive pinion preload (at starting):

New bearing

10 – 16 kg–cm

(8.7 – 13.9 in.–lb, 1.0 – 1.6 N–m)

Reused bearing

5 – 8 kg–cm

(4.3 – 6.9 in.–lb, 0.5 – 0.8 N–m)

- If the preload is greater than specified, replace the bearing spacer.
- If the preload is less than specified, retighten the nut 130 kg–cm (9 ft–lb, 13 N–m) at a time until the specified preload is reached.

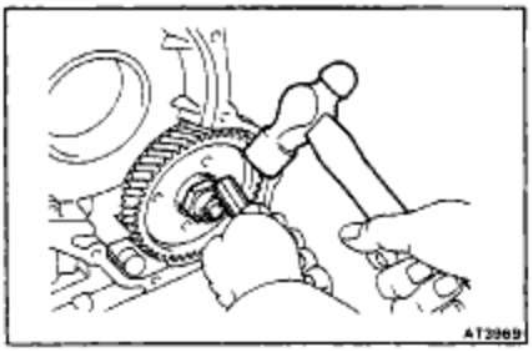
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure.

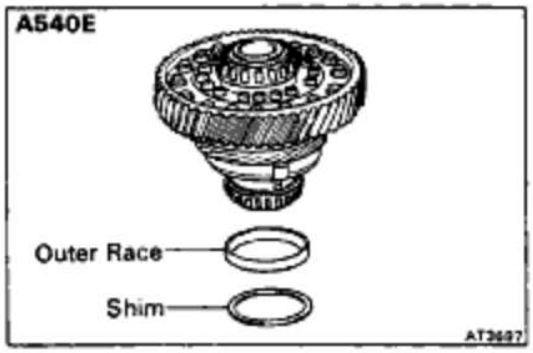
Do not back off the nut to reduce the preload.

Maximum torque: 3,640 kg–cm (260ft–lb, 353 N–m)

(e) If the preload is adjusted within specification, make a note of it.

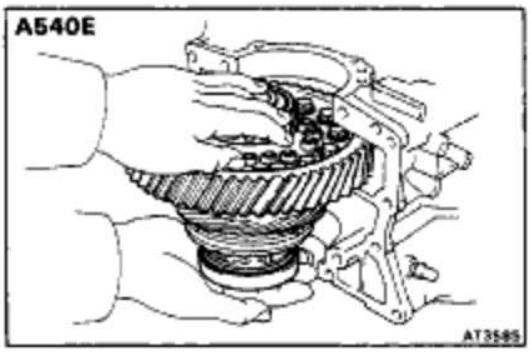
M Stake the lock nut.





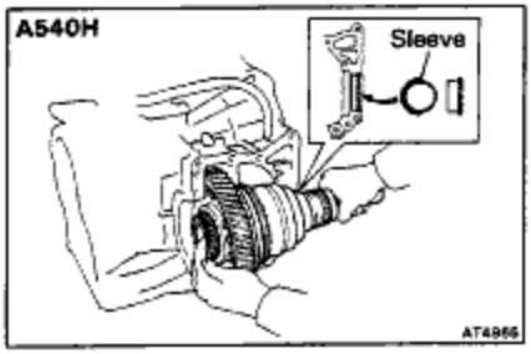
8. (AS40E)

PLACE OUTER RACE AND SHIM ONTO RH SIDE BEARING

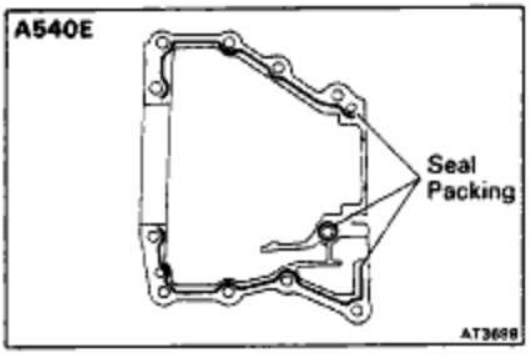


9. PLACE DIFFERENTIAL CASE INTO TRANSAXLE CASE

(A540E) Be sure to install the shim and outer rece into place.



(A540H)
Be sure to install the ring gear mount case sleeve and outer race into place.

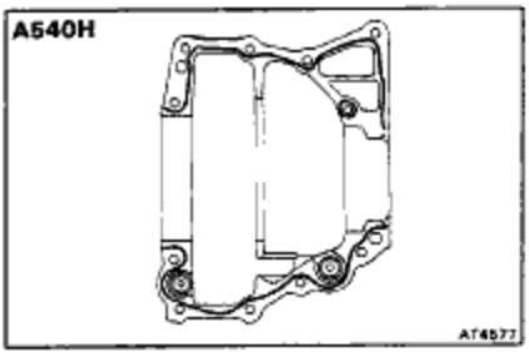


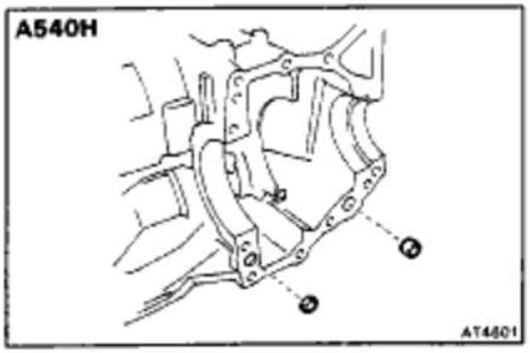
10. INSTALL CARRIER COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the carrier cover and transaxle case.

(b) Apply seat packing to the carrier cover as shown.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

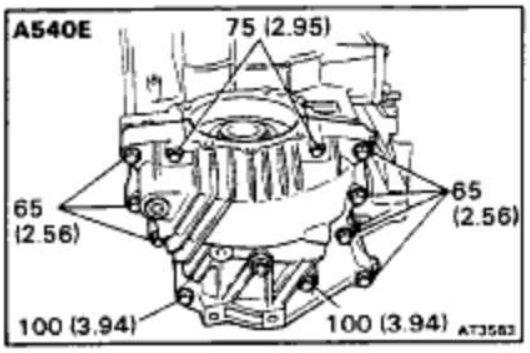
HINT: Install the carrier cover within ten minutes after applying seal packing.

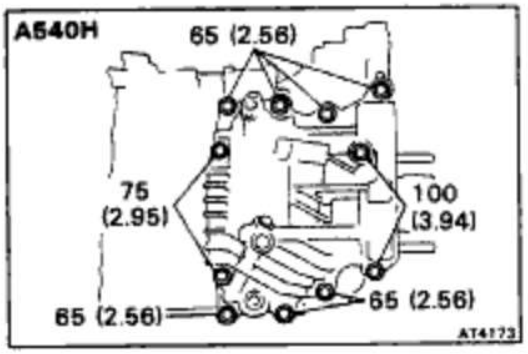


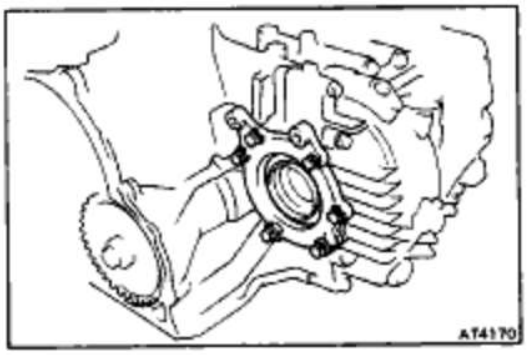


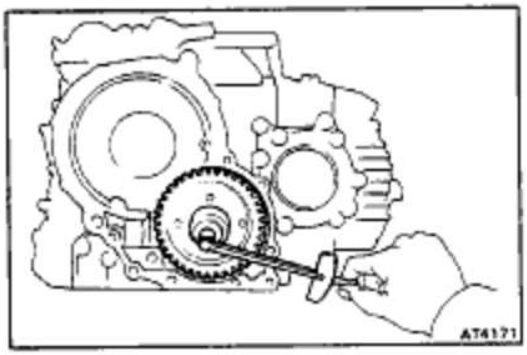
(e) Install the two apply gaskets.

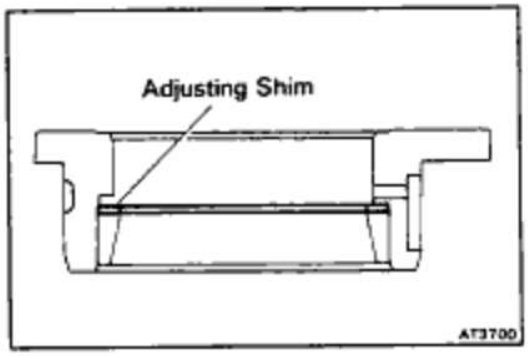
(d) Install and torque the eleven bolts.
Torque: 400 kg–cm (29 ft–lb, 39 N–m)
HINT: Each bolt length (mm (in)) is indicated in the figure.











11. ADJUST SIDE BEARING PRELOAD

1ay Remove any packing material on the contacting surfaces of the LH bearing retainer and transaxle case.

HINT: Do not apply seal packing yet.

W Install the LH bearing retainer and torque the six bolts.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

Snap down the bearings by turning the differential case several times.

(d) Using a torque meter, measure the differential total preload.

Total preload (at starting):

Add drive pinion preload

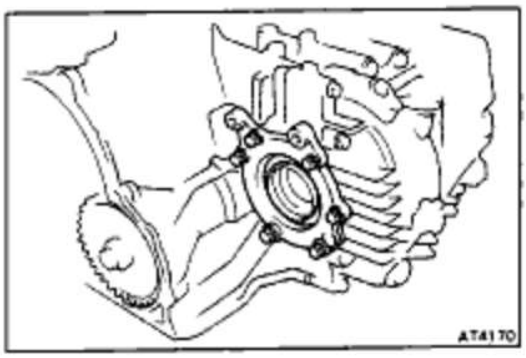
kg–cm (in–lb, N–m)

	New Bearing	Reused Bearing
A540E	2.8 – 4.4 (2.4 – 3.8, 0.3 – 0.4)	1.4 – 2.2 (1.2 – 1.9, 0.1 – 0.2)
A540H	2.3 – 3.7 (2.0 – 3.2, 0.2 – 0.4)	1.2 – 1.9 (1.0 – 1.6, 0.1 – 0.2)

If the preload is not within specification, replace tho adjusting shim in the LH bearing retainer with another thickness one.

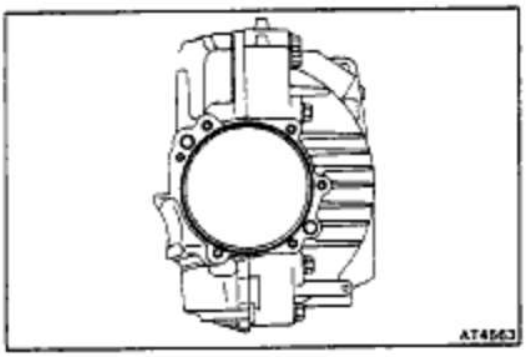
mm (in)

Mark	Thickness	Mark	Thickness
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0846)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.85 (0.1122)



12. INSTALL LH BEARING RETAINER

(a) Remove the six bolts and LH bearing retainer.

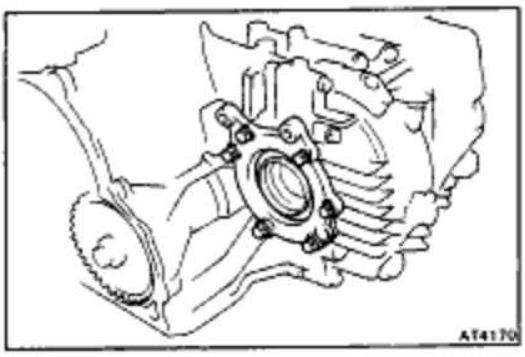


(b) Remove any packing material on the contacting surfaces of LH bearing retainer, transaxle case and carrier cover.

(c) Apply the seal packing to the transaxle case and carrier cover as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the LH bearing retainer with ten minutes after applying seal packing.



(d) Install the LH bearing retainer.

(e) Coat the threads of bolts with sealer.

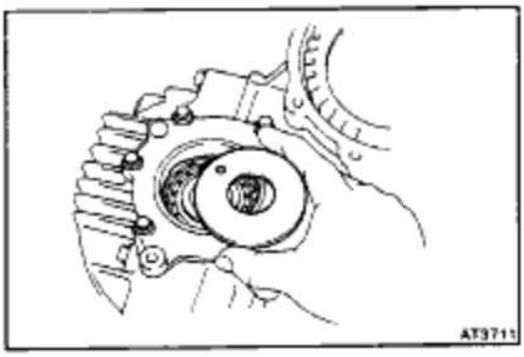
Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

(f) Tighten the bolts.

Torque: 195 kg–cm (14 ft–lb, 19 N–m)

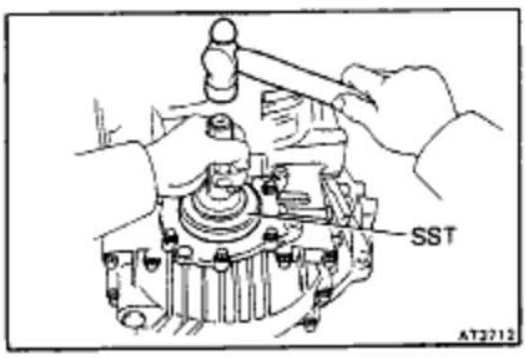
(g) Snap down the bearings.

(h) Recheck the differential total preload.



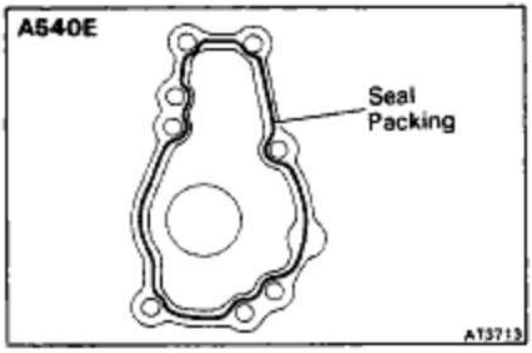
13. INSTALL NEW OIL SEAL

(a) Place the oil baffle onto the LH bearing retainer.



(b) Using SST, driven in a new oil seal until its end is flush with the surface of the LH bearing retainer.

SST 09223–15010



14. (A540E)

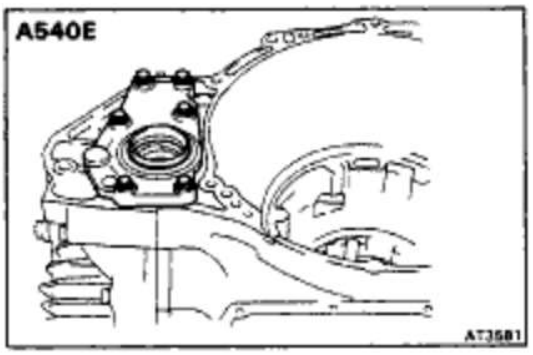
INSTALL RH RETAINER

(a) Remove any packing material on the contacting surfaces of RH retainer and transaxle case.

(b) Apply the seal packing to the RH retainer as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the RH retainer within ten minutes after applying seal packing.

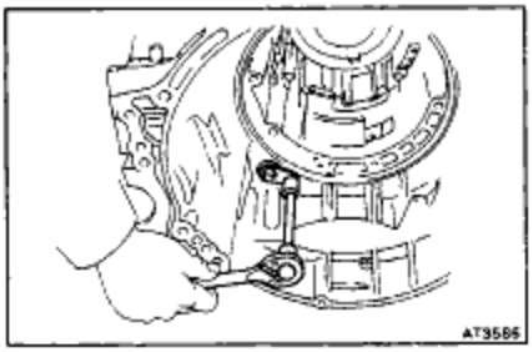


(e) Coat the threads of bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent

(d) Tighten the bolts.

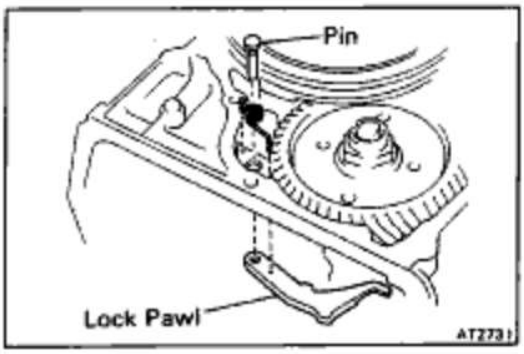
Torque: 196 kg–cm 114 ft–lb, 19 N–m)



15. INSTALL DRIVE PINION CAP

(a) Install a new O–ring to the cap.

(b) Install the drive pinion cap to the transaxle case.

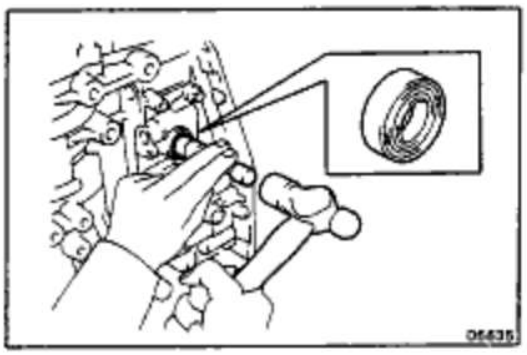


INSTALLATION OF 4–SPEED GEAR UNIT

1. INSTALL PARKING LOCK PAWL

(a) Place the parking lock pawl onto the case.
Hook the spring ends to the case and pawl.

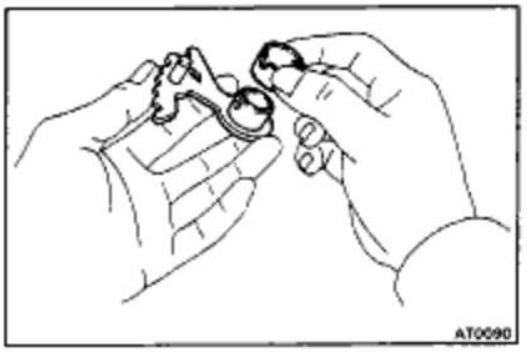
(b) Install the pin into the hole of the case through the spring and pawl.



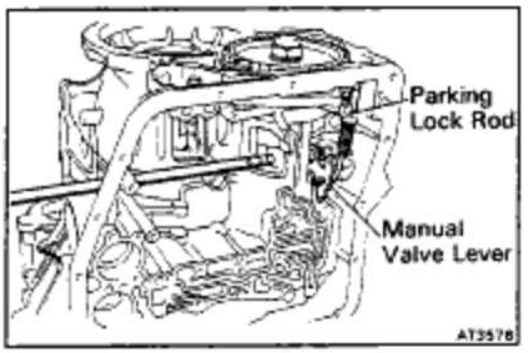
2. INSTALL MANUAL VALVE SHAFT

(a) Coat the oil seal lip with the MP grease.

(b) Install the manual valve shaft oil seal to the case.

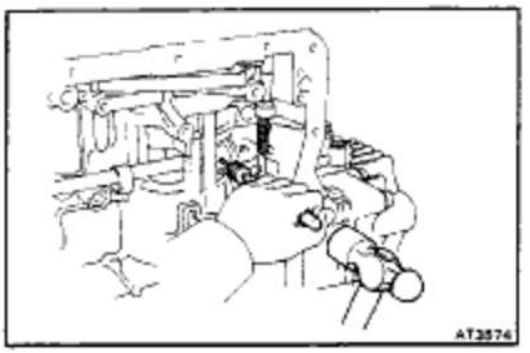


(c) Assemble a new collar to the manual valve lever.

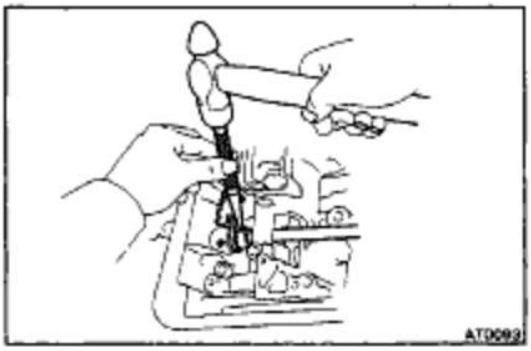


(d) Install the manual valve shaft to the transmission case through the manual valve lever.

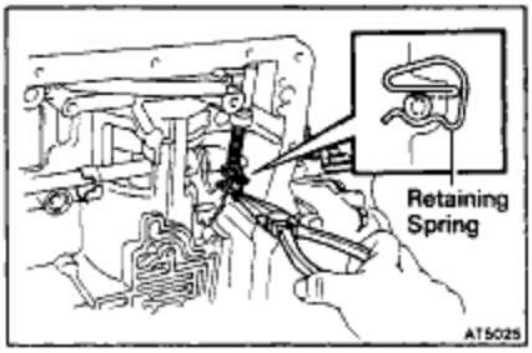
(e) Install the parking lock rod.



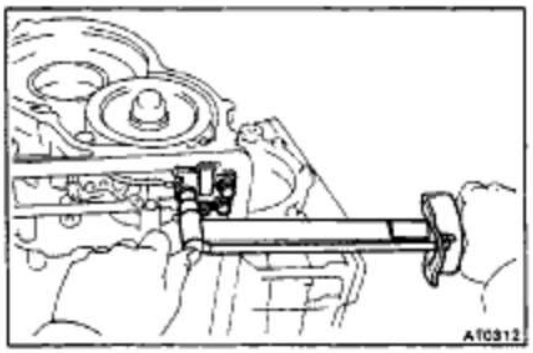
(f) Using a pin punch, drive in the roll pin until its surface is flush with the manual valve lever surface.



(g) Match the collar hole to the lever calking hollow and calk the collar to the lever.

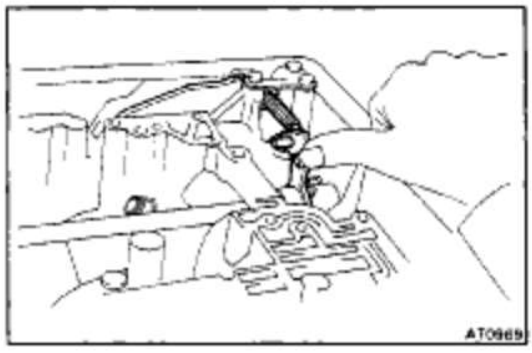


(h) Install the retaining spring.



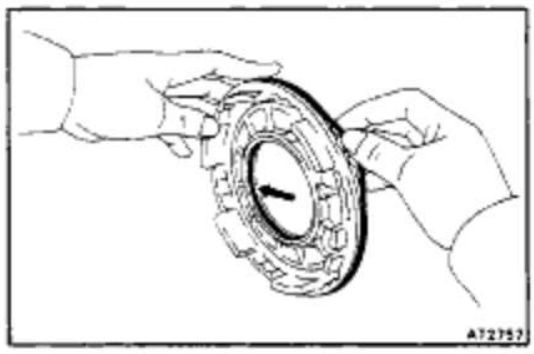
3. INSTALL PARKING LOCK PAWL BRACKET

Torque: 75 kg–cm (65 in.–lb, 7.4 N–m)



4. CHECK OPERATION OF PARKING LOCK PAWL

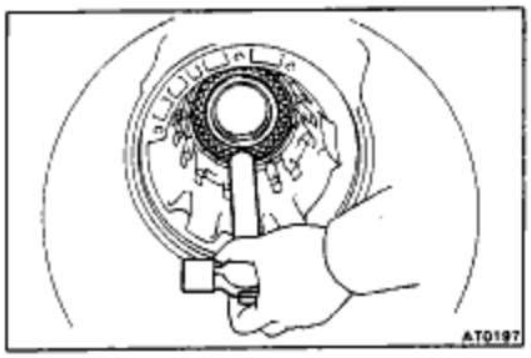
Make sure the counter driven gear is locked when the manual valve fever is in the P range.



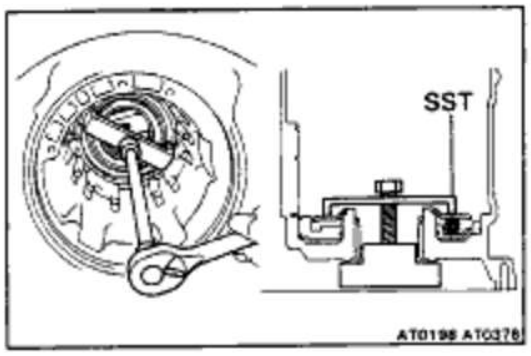
5. INSTALL FIRST AND REVERSE BRAKE PISTON TO TRANSMISSION CASE

(a) Coat the new 4–rings with ATF.

(b) Install the two O–rings on the piston.



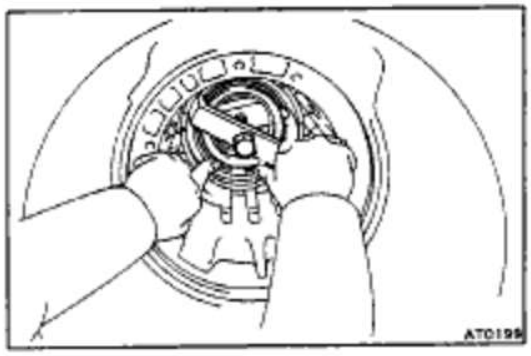
(c) Push the piston into the bore of the case, facing the spring seat upward.



6. INSTALL PISTON RETURN SPRING

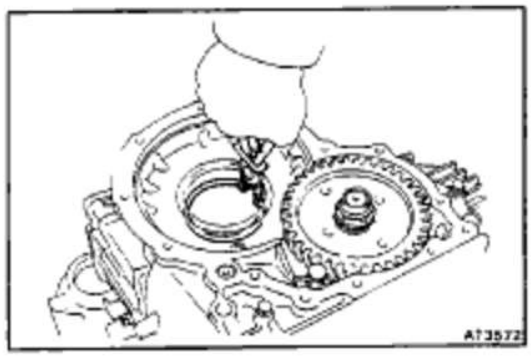
(a) Place the return spring and snap ring on the piston.

(b) Place SST, and compress the return spring evenly by tightening the bolt gradually.
SST 09350–32014 (09351–32040)

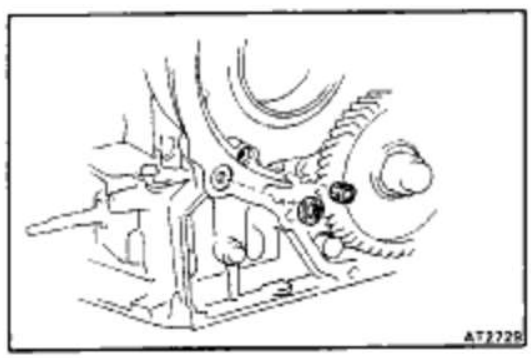


(c)Install snap ring. Visually check– to make sure it is fully seated and centered by the three lugs on the spring retainer.
Be sure, the end gap of snap ring is not aligned with the spring retainer claw.

(d) Remove SST.

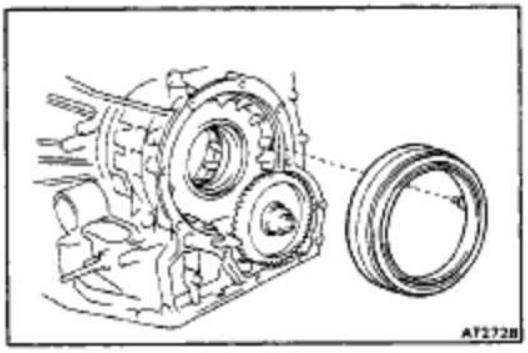


7. INSTALL SNAP RING TO TRANSAXLE CASE

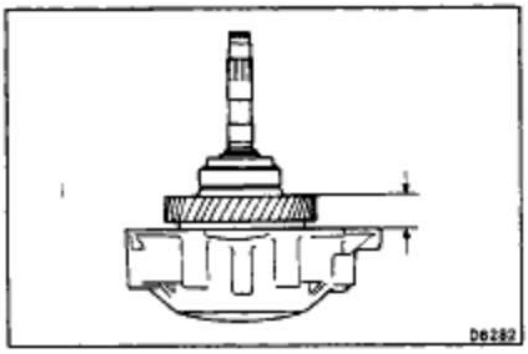


8. INSTALL OVERDRIVE UNIT

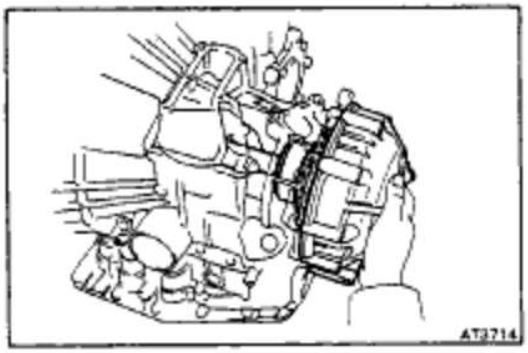
(a) Install the overdrive brake apply gasket and overdrive clutch apply gasket.



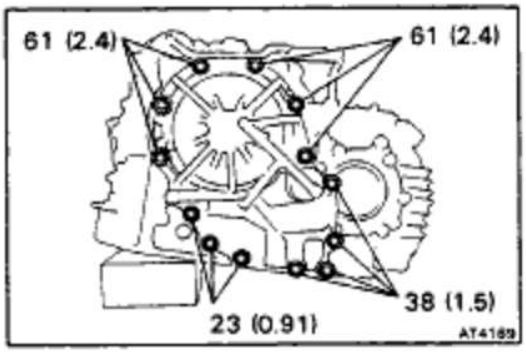
(b) Install the overdrive brake drum to the case.
(c) Install the new case gasket to the case.



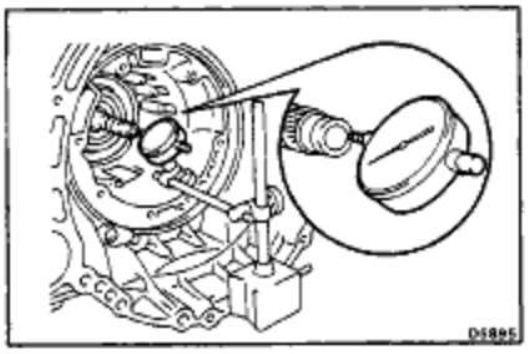
(d) Make sure that the length from the top surface of the case to the counter driven gear top surface should be about 24 mm (0.94 in.)



(e) Place the new gasket onto the transaxle case.
M Install the overdrive assembly with overdrive case to the transaxle case.

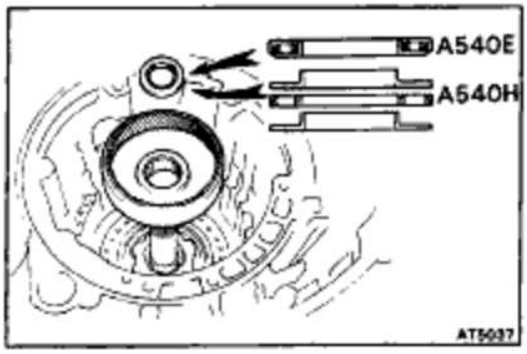


(g) Coat the threads of 23 mm (0.91 in.) bolts with sealer.
Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent.
(h) Install and tighten the thirteen bolts.
Torque: 250 kg–cm (18 ft–lb, 25 N–m)
HINT: Each bolt length (mm (in.)) is indicated in the figure.



9. CHECK INTERMEDIATE SHAFT END PLAY

(a) Make sure that the intermediate shaft has thrust plate) in axial direction.
Thrust play: 0.47 – 1.50 mm (0.0185 – 0.0591 in.)
If the thrust play is not within specification, check the installation of intermediate shaft.
(See page AT–306)
(b) Make sure that the intermediate shaft turns smoothly.



10. INSTALL REAR PLANETARY GEAR

(a) Install the rear planetary ring gear.

(b) (A540E)

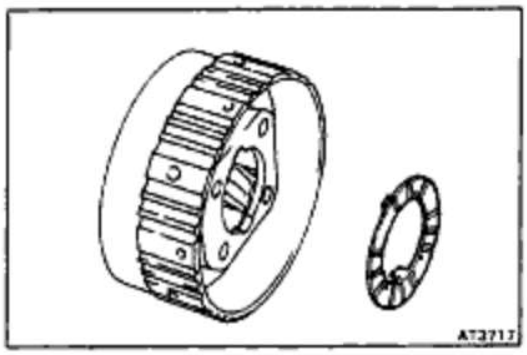
Place the bearing onto the ring gear.

(e) (A540H)

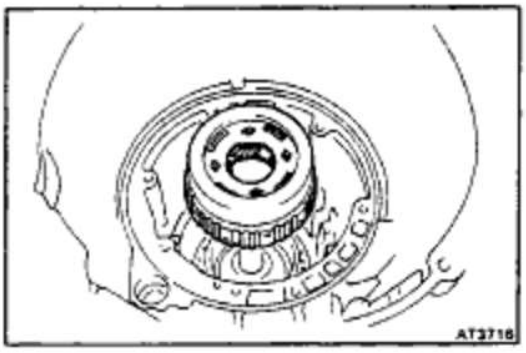
Coat the races and bearing with petroleum jelly and install them onto the ring gear.

Bearing and race: mm (in.) mm (in.)

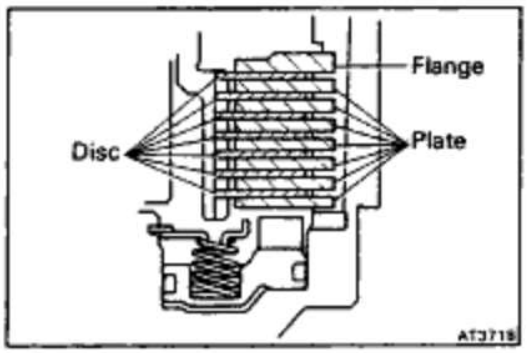
		Outer Diameter	Inner Diameter
A540E	Bearing	38.7 (1.524)	22.6 (0.890)
A540H	Front Race	37.3 (1.469)	24.1 (0.949)
	Bearing	37.6 (1.480)	24.0 (0.945)
	Rear Race	37.6 (1.480)	22.2 (0.874)



(d) Coat the thrust washer with petroleum jelly and place it onto the rear planetary gear.



(3) Install the rear planetary gear.



11. INSTALL DISCS, PLATES AND FLANGE OF FIRST AND REVERSE BRAKE

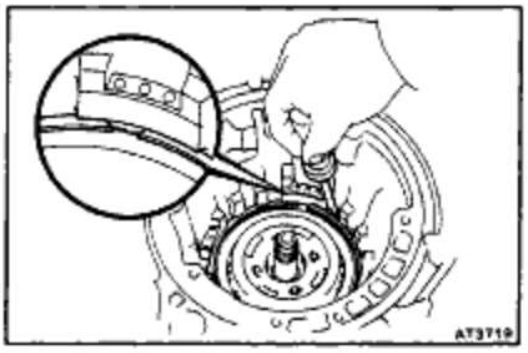
(a) Install the seven plates and seven discs.

Install in order: P = Plate D = Disc

A540E: P–D–P–D–P–D–P–D–P–D–P–D–P–D

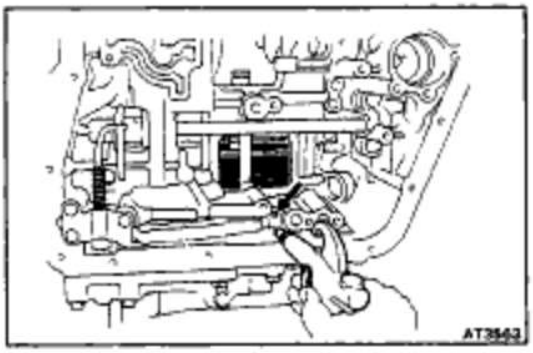
A540H: P–D–P–D–P–D–P–D–P–D–P–D

(b) Install the flange, facing the flat end downward.



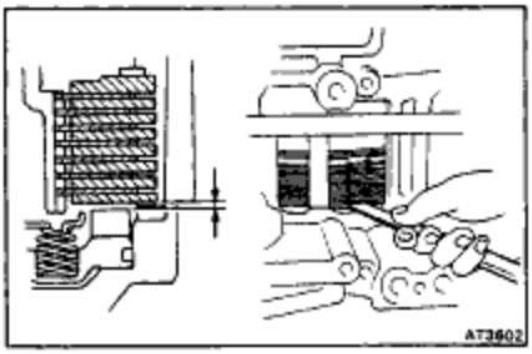
(c) Install the snap ring.

HINT: Be sure that the end gap of the snap ring is not aligned with one of cutouts.

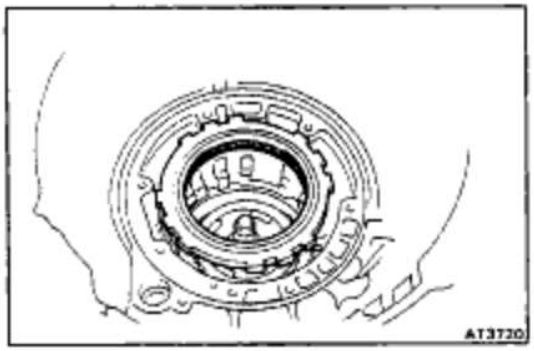


12. CHECK FIRST AND REVERSE BRAKE

(a) Check the operation of the first and reverse brake piston. – Apply compressed air into the case passage and confirm that the piston moves.

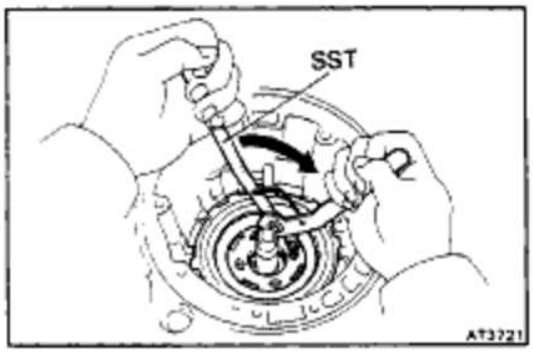


(b) Using a filler gauge, check the pack clearance of the first and reverse brake.
Clearance: A540E
0.85 – 2.05 mm (0.033 – 0.081 in.)
A540H
1.04 – 2.16 mm (0.041 – 0.085 in.)

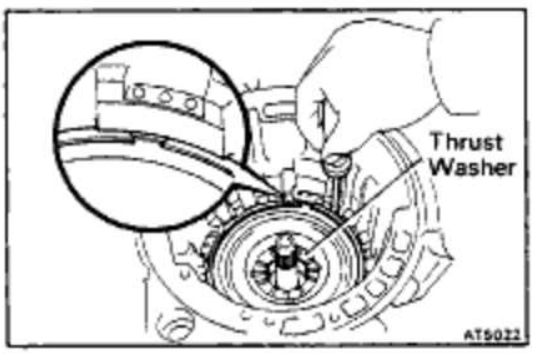


13. INSTALL NO. 2 ONE–WAY CLUTCH INTO CASE

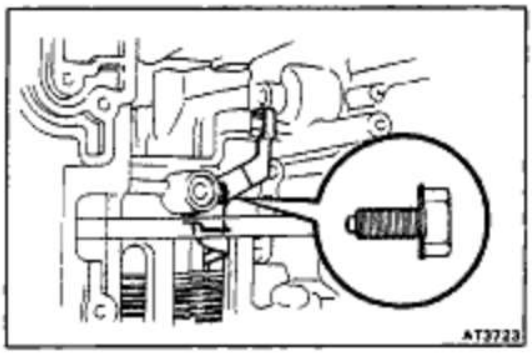
(a) Place the No. 2 one–way clutch with the shiny side of flange upward.



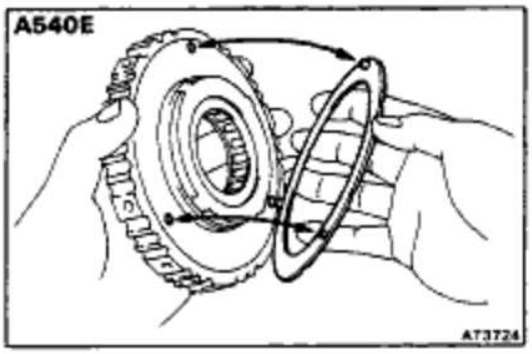
(b) Install the one–way clutch while turning the planetary gear clockwise with SST.
SST 09350–32014 (09351–32050)
If can not turn the planetary gear clockwise, check the installation of the one–way clutch.



(c) Install the snap ring.
HINT: Be sure that the end gap of the snap ring is not aligned with one of cutouts.
(d) (A540H only)
Coat the thrust washer with petroleum jelly and install it onto the rear planetary gear.

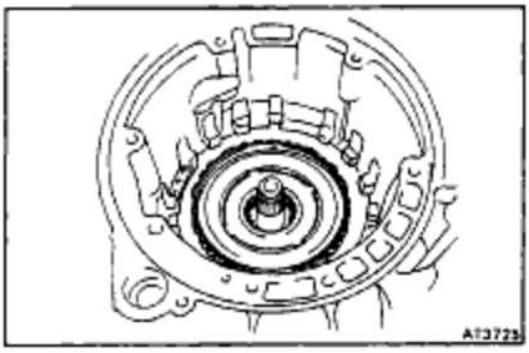


14. INSTALL SECOND COAST BRAKE BAND GUIDE

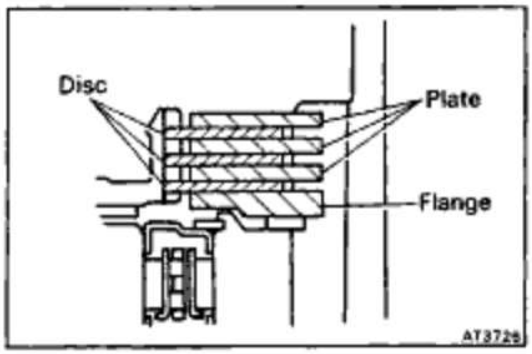


15. PLACE NO. 1 ONE–WAY CLUTCH

(a) Coat the thrust washer with petroleum jelly and install it on the No. 1 one–way clutch. (A540E)



(b) Place the No. 1 one–way clutch onto the rear planetary gear.



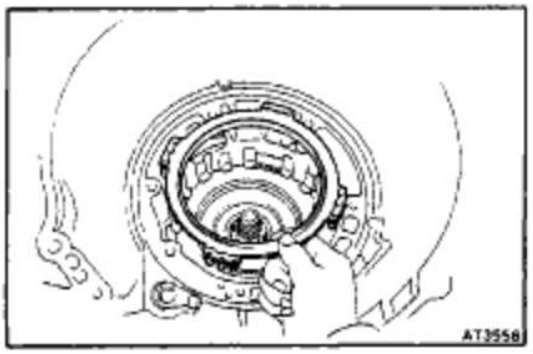
16. INSTALL SECOND BRAKE

(a) Install the flange, facing the flat end upward.

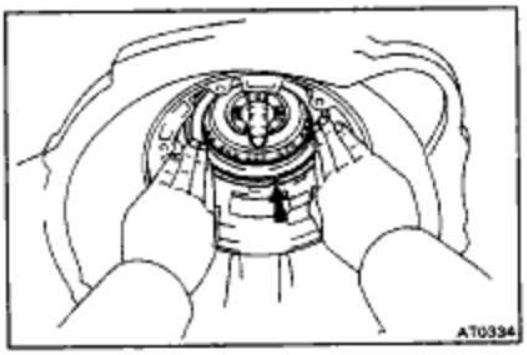
(b) Install the three discs and plates.

Install in order: P = Plate D = Disc

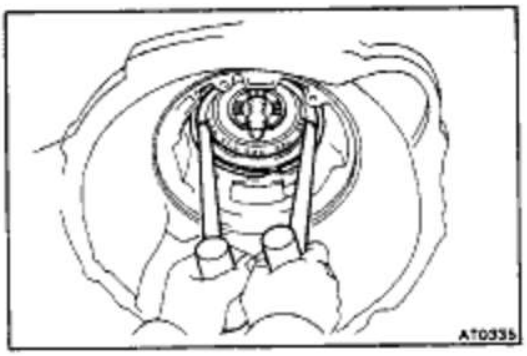
D–P–D–P–D–P



(c) Place the piston return spring into the case.

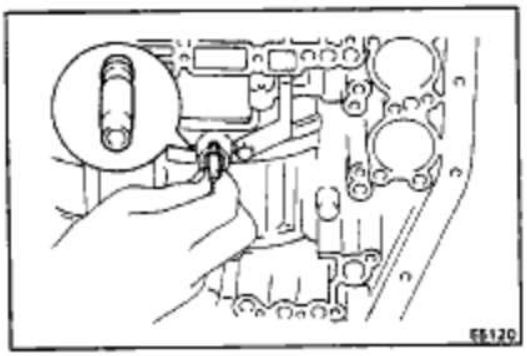


(d) Place the second brake drum into the case.
HINT: Align the groove of the drum with the bolt.



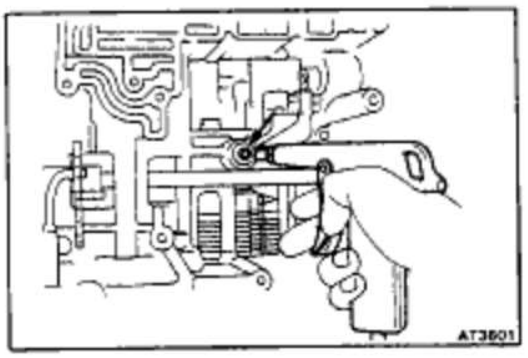
(e) Place the snap ring into the case so that end gap is installed into the groove.
(f) While compressing the piston return springs over the drum with hammer handles, install the snap ring into the groove.

(g) Be sure that the end gap of the snap ring is not aligned with one of cutouts.



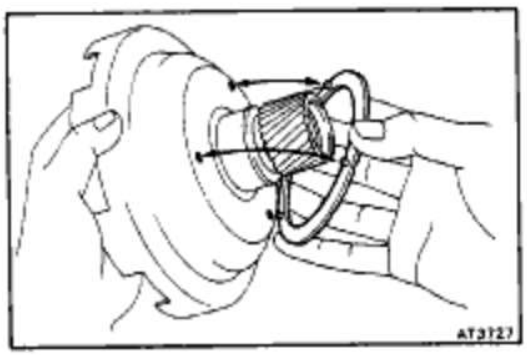
17. INSTALL NEW SECOND BRAKE GASKET

Install a new gasket until it makes contact with the second brake drum.



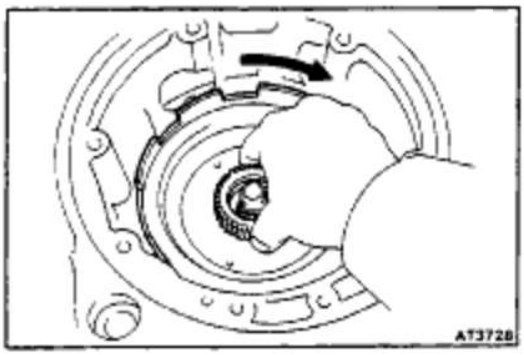
18. CHECK OPERATION OF SECOND BRAKE

Apply compressed air into the second brake gasket and confirm that the piston moves.

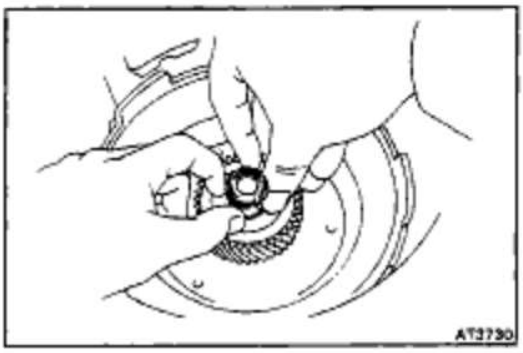


19. INSTALL SUN GEAR AND SUN GEAR INPUT DRUM

(a) Coat the thrust washer with petroleum jelly an install it on the sun gear input drum.

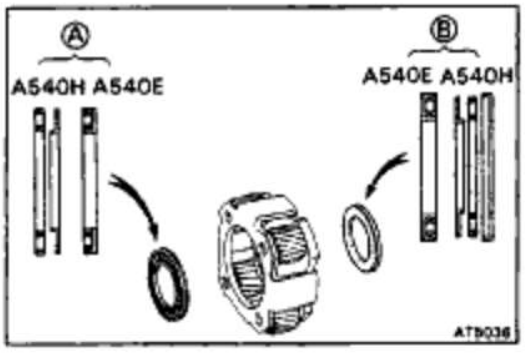


(b) While turning the sun gear clockwise, install it into the No. 1 one–way clutch.



20. INSTALL OIL SEAL RING TO INTERMEDIATE SHAFT

HINT: After installing the oil seal ring, check that it moves smoothly.



21. INSTALL FRONT PLANETARY GEAR

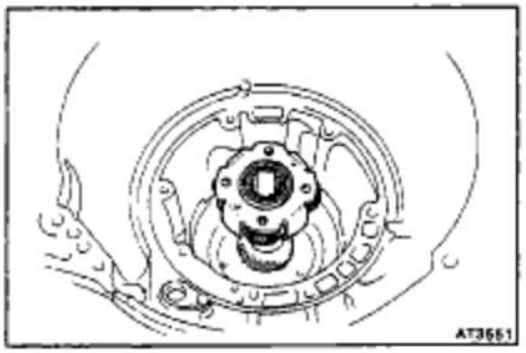
(a) Coat the races and bearings with petroleum jelly, and install them onto the both sides of planetary gear.

Bearing and race: Ⓐ mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	45.5 (1.791)	30.1 (1.185)
A540H	Bearing	45.0 (1.772)	30.0 (1.181)
	Race	45.0 (1.772)	28.0 (1.102)

Bearing and race: Ⓑ mm (in.)

		Outer Diameter	Inner Diameter
A540E	Beating	45.5 (1.791)	30.1 (1.185)
A540H	Front Race	37.9 (1.492)	22.0 (0.866)
	Bearing	36.1 (1.421)	22.2 (0.874)
	Rear Race	35.0 (1.378)	19.0 (0.748)



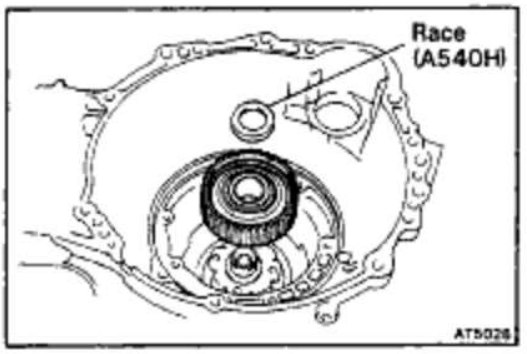
HINT: The bearings are the same on the (A) and (B) side (A540E).

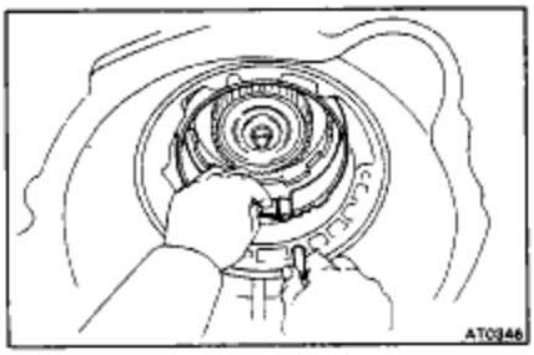
(b) Install the planetary gear onto the sun gear.

22. INSTALL FRONT PLANETARY RING GEAR (A540H)

Coat the race with petroleum jelly and install it onto the tip of ring gear.

Race: Outer diameter 35.7 mm (1.406 in.)
Inner diameter 23.0 mm (0.906 in.)

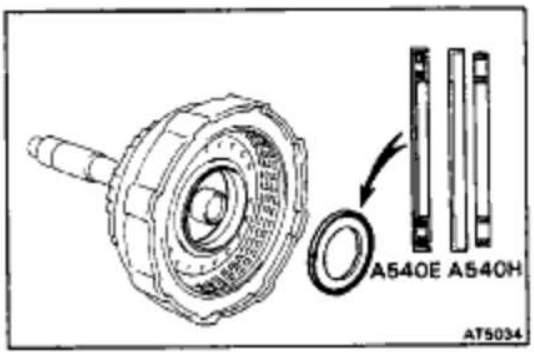




23. INSTALL SECOND COAST BRAKE BAND

(a) Place the band into the case.

(b) Install the pin through the oil pump mounting bolt hole.

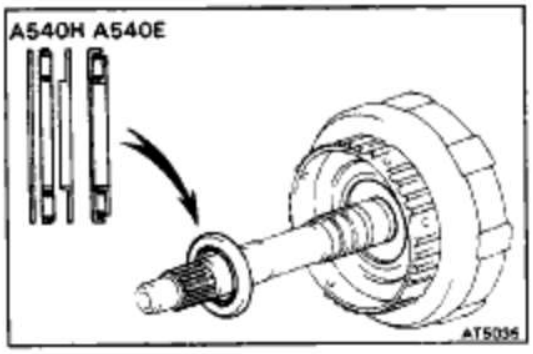


24. INSTALL FORWARD CLUTCH AND DIRECT CLUTCH

(a) Coat the race and bearing with petroleum jelly and install it onto rear side of the forward clutch.

Bearing and race mm (in.)

		Outer Diameter	Inner Diameter
A540E	Bearing	47.6 (1.874)	31.4 (1.236)
A540H	Bearing	36.1 (1.421)	22.2 (0.874)
	Race	37.9 (1.492)	22.0 (0.866)



(b) Coat the race and bearing with petroleum jelly and install it onto front side of the forward clutch.

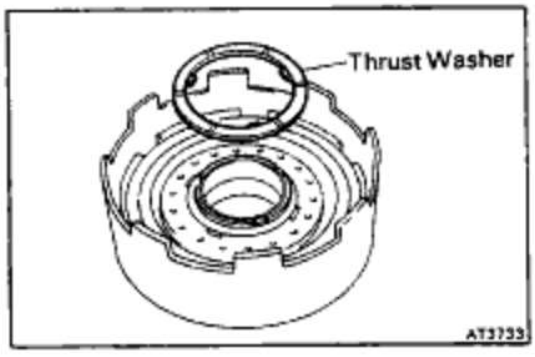
HINT: There are two different–thick races (A540H) and bearings (A540E) for adjustment of the input shaft thrust play.

Bearing: A540E mm (in.)

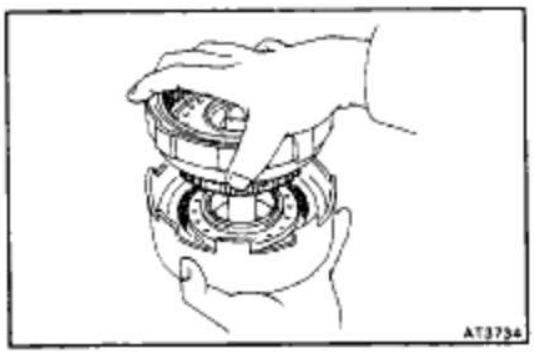
	Thickness	Outer Diameter	Inner Diameter
Bearing	3.60 (0.1417)	45.9 (1.807)	27.7 (1.091)
	4.19 (0.1650)	47.1 (1.854)	27.7 (1.091)

Bearing and race: A540H mm (in.)

	Thickness	Outer Diameter	Inner Diameter
Front Race	0.8 (0.0315)	43.0 (1.693)	30.5 (1.201)
	1.4 (0.0551)		
Bearing	–	42.0 (1.654)	28.9 (1.138)
Rear Race	–	42.0 (1.654)	27.1 (1.067)

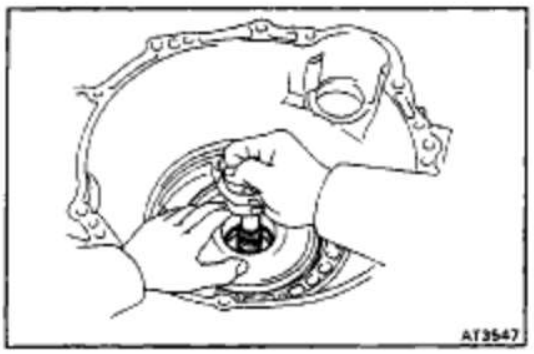


(c) Coat the thrust washer with petroleum jelly an(install it with the oil groove facing upward onto the direct clutch drum.



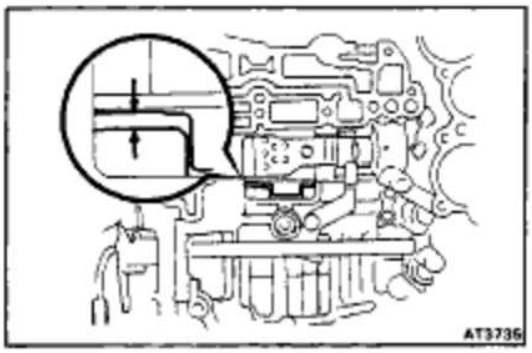
(d) Mesh the hub of the forward clutch with flukes of the direct clutch discs.

HINT: Be careful that the bearing and thrust washer do not get out of place.



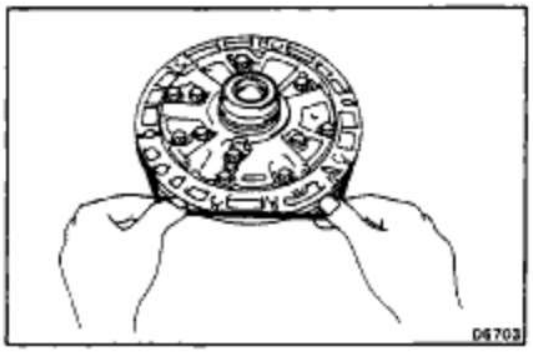
(e) Install the direct clutch and forward clutch into the case.

HINT: Hold the direct clutch toward the forward clutch to prevent the thrust washer from getting out of place.



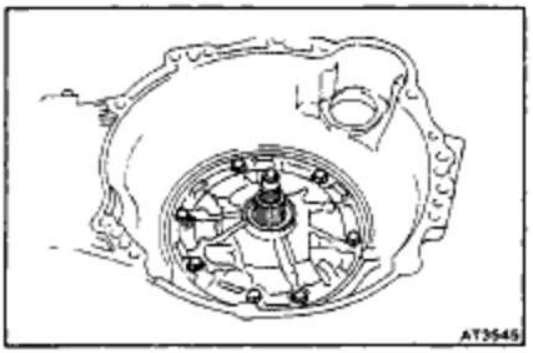
(f) Check the distance between the direct clutch drum and the sun gear input drum.

Distance: Approx. 3mm (0.12 in.)



25. INSTALL OIL PUMP INTO CASE

(a) Coat a new O–ring with ATF and install it to the oil purnp.

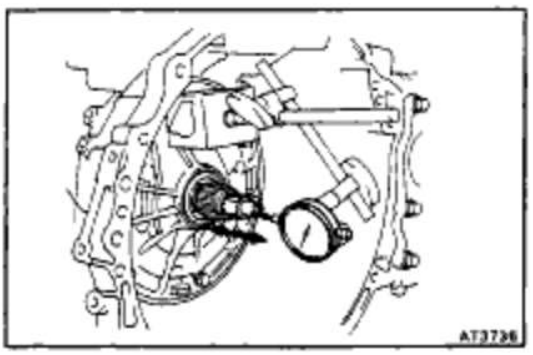


(b) Place the oil pump through the input shaft, and align the bolt holes of the pump body with the transmission case.

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

(c) Install and tighten the seven bolts.

Torque:. 225 kg–cm (16 ft–lb, 22 N–m)



26. MEASURE THRUST PLAY OF INPUT SHAFT

Measure the thrust play with a dial gauge.

Thrust play: 0.13 – 0.90 mm (0.0051 – 0.0354 in.)

HINT: There are two different–thick bearings (A540E) or races (A540H) for the end of stator shaft. If the thrust play is in excess of standard, select one of them.

(A540E)

Bearing thickness: 3.60 mm (0.1417 in.)

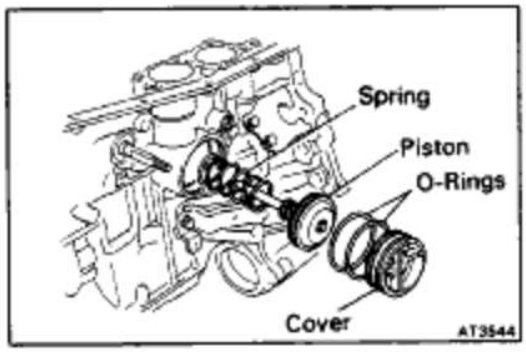
4.19 mm (0.1650 in.)

(A540H)

Race thickness: 0.8 mm (0.031 in.)

0.8 mm (0.031 in.)

1.4 mm (0.055 in.)



27. CHECK INPUT SHAFT ROTATION

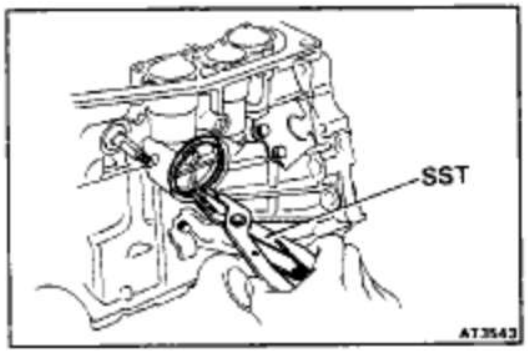
Make sure that the input shaft rotates smoothly.

28. INSTALL SECOND COAST BRAKE PISTON

(a) Coat the new O–rings with ATF and install it to the cover.

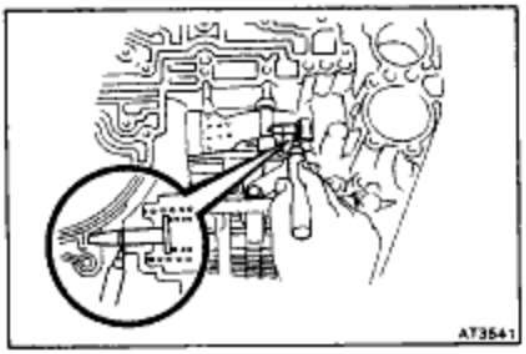
(b) Install the outer spring with the piston.

(c) Place the cover into the bore.



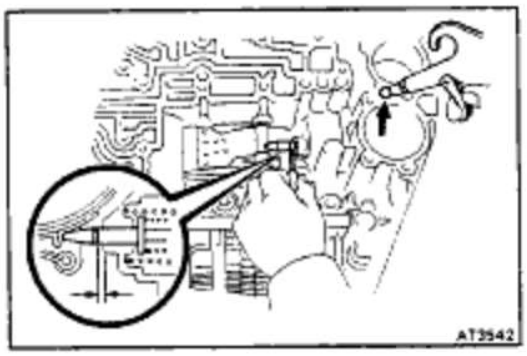
(d) Using SST, install the snap ring while pressing the cover.
SST 09350–32014 (09351–32050)

(e) Check that the front end of the piston rod contacts the center of the second brake band depression.

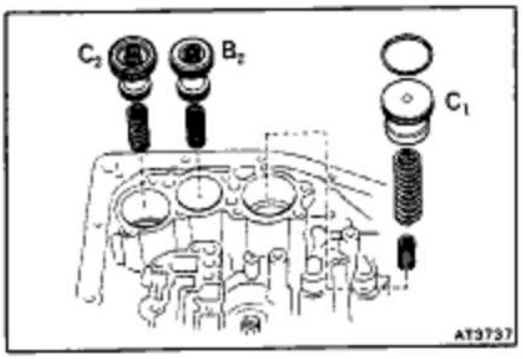


29. CHECK SECOND COAST BRAKE PISTON STROKE

(a) Apply a small amount of paint to the piston rod at the point it meets the case shown in the illustration.



(b) Using SST, measure the piston stroke applying an(releasing the compressed air (4 – 8 kg/cm2, 57 – 114 psi or 392 – 785 kPa) as shown.
SST 09240–00020
Piston stroke: 2.0 – 3.5 mm (o.079 – 0.138 in.)
If the stroke is more than specified, replace the piston rod with a longer one.
Piston rod length: 95.2 mm (3.748 in.)
96.3 mm (3.791 in.)
It is still more than standard value, replace the brake ban(with a new one.



34. INSTALL ACCUMULATOR PISTONS AND SPRINGS

(a) Install the new O–rings to the pistons.

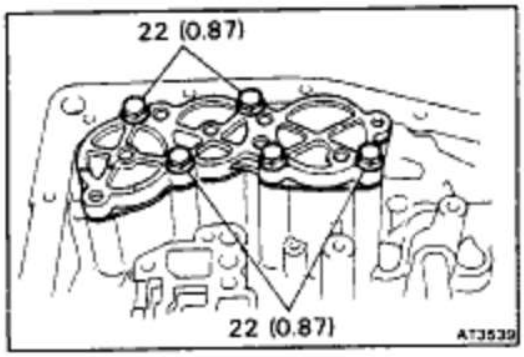
(b) Install the springs and pistons into the bores.

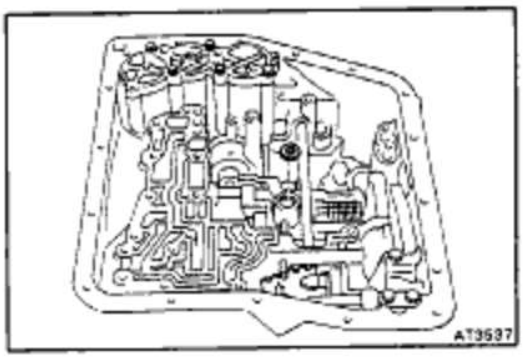
Spring		Free length mm (in.)	Outer diameter mm (in.)	Color
C_2		51.0 (2.008)	18.0 (0.709)	Red
B_2		58.5 (2.303)	15.2 (0.598)	Orange
C_1	Outer	71.2 (2.803)	24.4 (0.961)	Blue
	Inner	43.4 (1.709)	17.8 (0.701)	Light green

(c) Place the cover with a new gasket and gradually tighten the bolts a little a time in sequence.

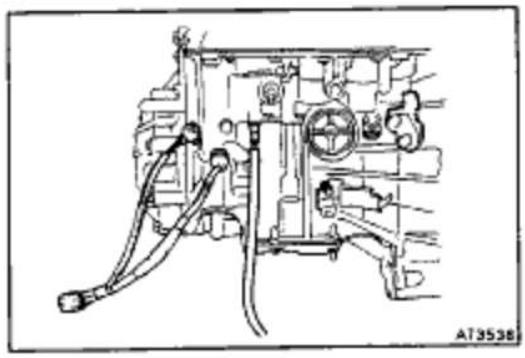
HINT: Each bolt length (mm (in.)) is indicated in the figure.

Torque: 100 kg–cm (7 ft–lb, 10 N–m)

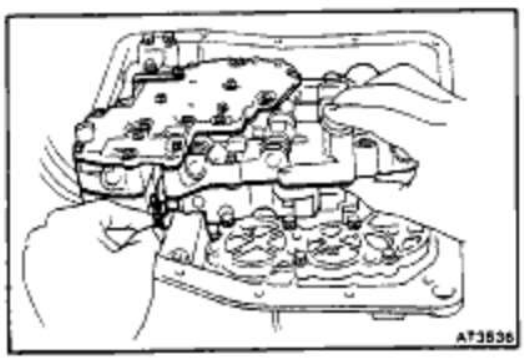




31. PLACE NEW SECOND BRAKE APPLY GASKET



32. INSTALL THROTTLE CABLE AND SOLENOID WIRE

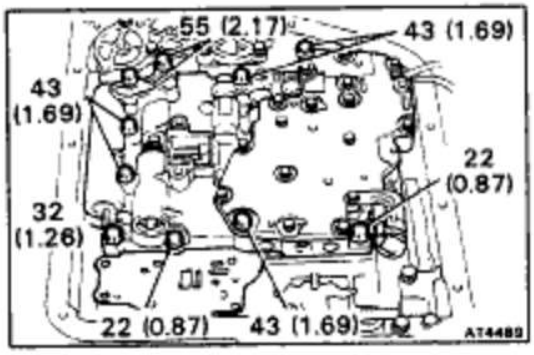


33. INSTALL VALVE BODY TO TRANSAXLE CASE

(a) While holding the cam down with your hand, slip the cable end into the slot.

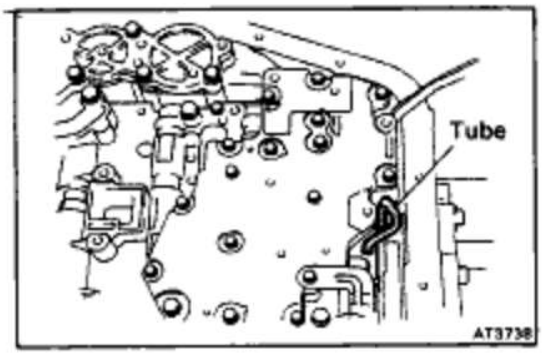
(b) Lower the valve body into place.

NOTICE: Do not entangle the solenoid wire.



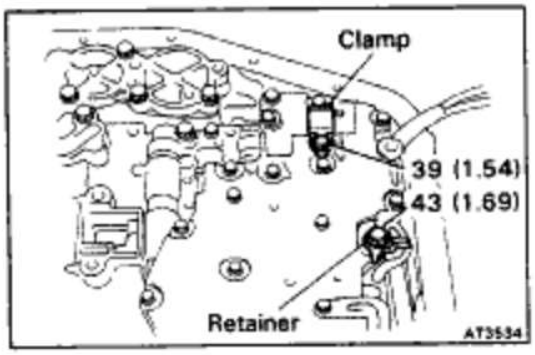
(c)Install and tighten the ten bolts.
HINT:
- Each bolt length (mm (in.)) is indicated in the figure.
- Hand tighten the ten bolts first, then torque with a torque wrench.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)



34. INSTALL B3 APPLY TUBE

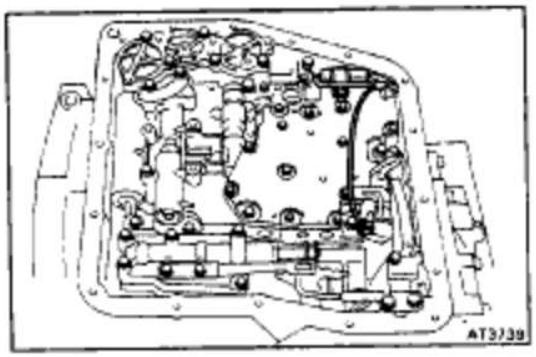
NOTICE: Be careful not to bend or damage the tube.



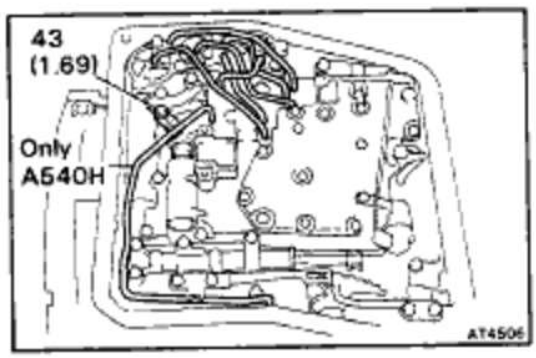
35. INSTALL CONNECTOR CLAMP AND TUBE RETAINER

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

Torque: 110 kg–cm (8 ft–lb, 11 N–m)



36. CONNECT SOLENOID CONNECTORS



37. INSTALL OIL TUBES

(A540E)

Using a plastic hammer, install the tubes into the position: indicated in the figure.

(A540H)

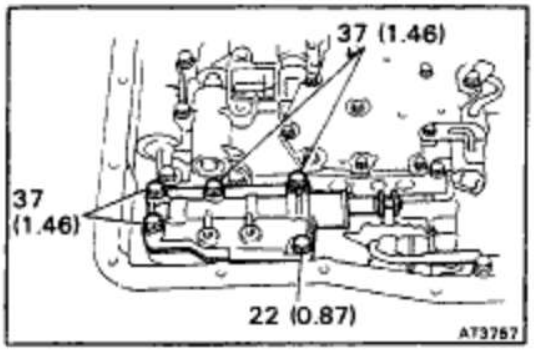
(a) Using a plastic hammer, install the tubes into the positions indicated in the figure.

(b) Install the bolt.

Torque: 55 kg–cm (48 in–lb, 5.4 N–m)

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

NOTICE: Be careful not no bend or damage the tubes



38. INSTALL MANUAL VALVE BODY AND DETENT SPRING

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

(a) Align the manual valve with the pin on the manual shaft lever.

(b) Lower the manual valve body into place.

(e¿ Hand tighten the five bolts first. Then, tighten them with a torque wrench.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)

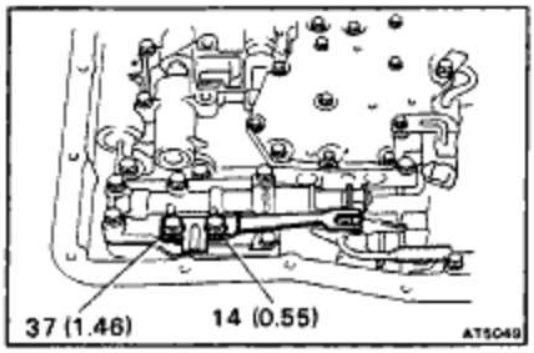
(d) Place the detent springs on the manual valve body and hand tighten the two bolts first.

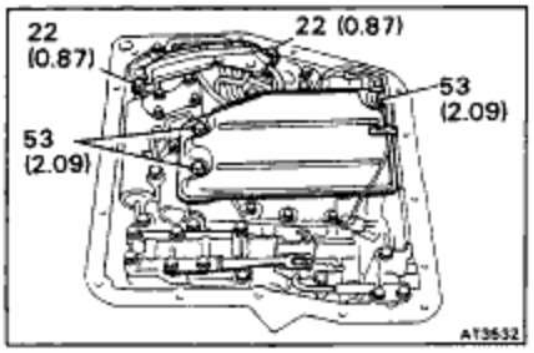
Then, tighten them with a torque–wrench.

Torque: 110 kg–cm (8 ft–lb, 11 N–m)

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

(e) Check that the manual valve lever is touching the center of the detent spring tip roller.





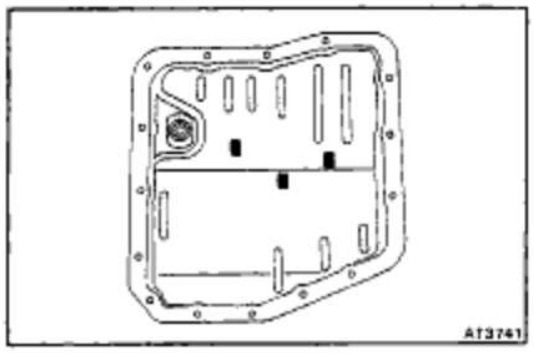
39. INSTALL TUBE BRACKET AND OIL STRAINER

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

Torque:

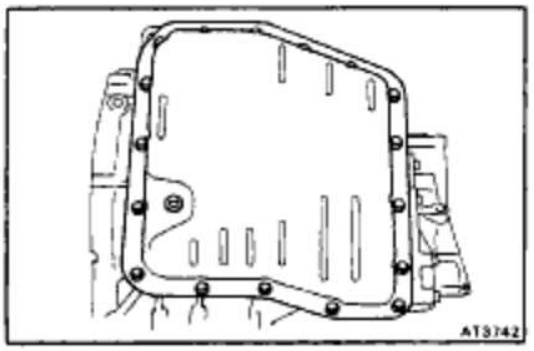
Tube bracket 100 kg–cm (7 ft–lb, 10 N–m)

Oil strainer 110 kg–cm (8 ft–lb, 11 N–m))



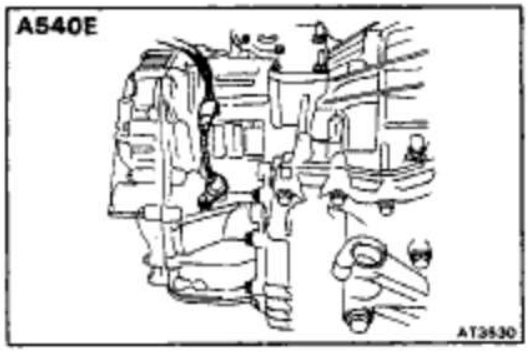
40. INSTALL MAGNETS IN PLACE AS SHOWN

NOTICE: Make sure that the magnets do not interfere with the oil tubes.



41. INSTALL OIL PAN WITH NEW GASKET

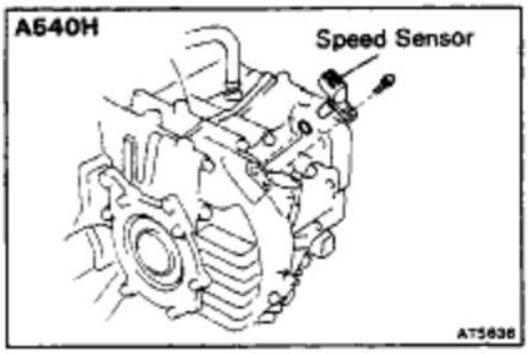
Torque: 50 kg–cm (43 in–lb, 4.9 N–m)



42. (A540E)

INSTALL SPEED SENSOR

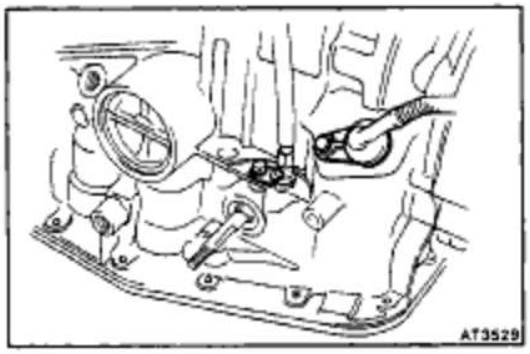
(a) Install a new O–ring to the speed sensor.
(b) Install the speed sensor to the transaxle case.
(c) Tighten the bolt.
(d) Connect the sensor connector.



43. (A540H)

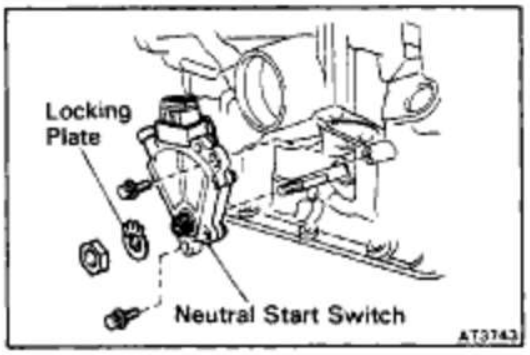
INSTALL VEHICLE SPEED SENSOR

(a) Install a new O–ring to the vehicle speed sensor.
(b) Install the vehicle speed sensor to the transaxle case.
(e) Install and tighten the bolt.



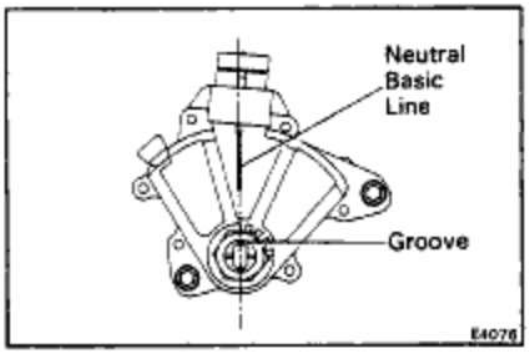
44. INSTALL THROTTLE CABLE RETAINING PLATE

45. INSTALL SOLENOID WIRE .

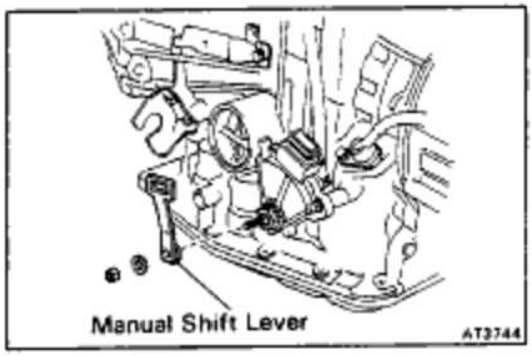


46. INSTALL NEUTRAL START SWITCH

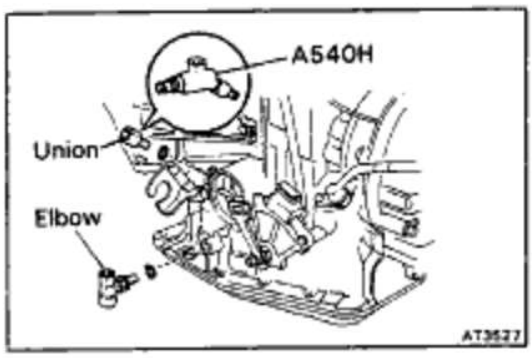
(a) Install the neutral start switch to the manual valve shaft.
(b) Place the new locking plate and tighten the nut.
(c) Stake the nut with locking plate.
(d) Install the two bolts.



(e) Adjust the neutral start switch.
HINT: Align the groove and neutral basic line.
(f) Tighten the two bolts.

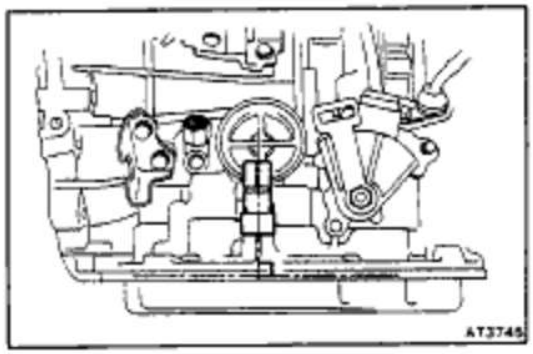


47. INSTALL MANUAL SHIT LEVER

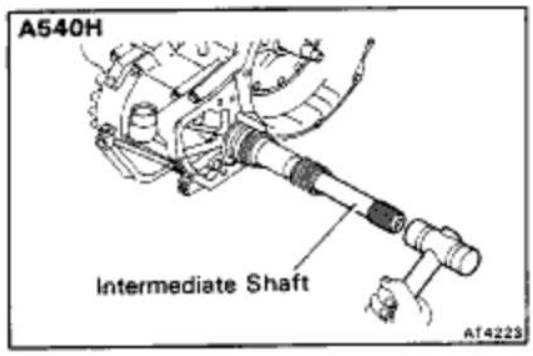


48. INSTALL UNION AND ELBOW

(a) Install the new O–rings to the union and elbow.
(b) Install the union and elbow to the transaxle case.
Torque: 275 kg–cm (20 ft–lb, 27 N–m)

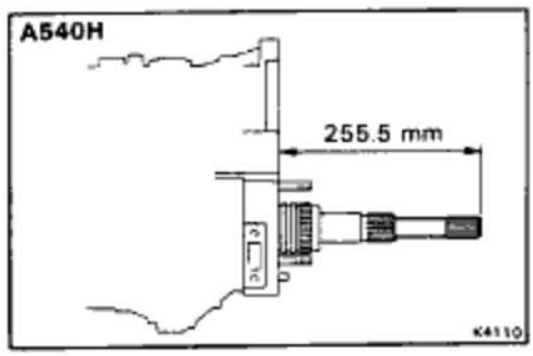


HINT: Install the elbow at right angles to the bottom of the transaxle case.

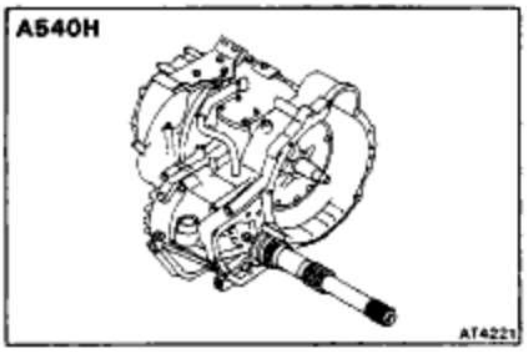


49. (A540H)
INSTALL DIFFERENTIAL SIDE GEAR INTERMEDIATE SHAFT

(a) Install a new snap ring to the shaft groove.
(b) Using a plastic hammer, install the shaft.



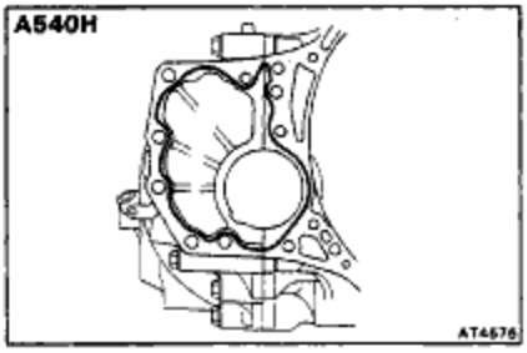
HINT: Keeping the intermediate shaft on the pinion shaft of differential, measure the point in the illustration.
Protrusion length (Reference): 255.5 mm 110.059 in.)



50. (A540 H)

INSTALL APPLY GASKET

Install a new apply gasket to the differential carrier cover.



51. (A540H)

INSTALL TRANSFER ASSEMBLY

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transfer and transaxle.

(b) Apply seal packing to the transaxle as shown in the illustration.

Seal packing: Part No. 08883–00090, Adhesive 1131, THREE BOND 1131, Loctite 518, or equivalent

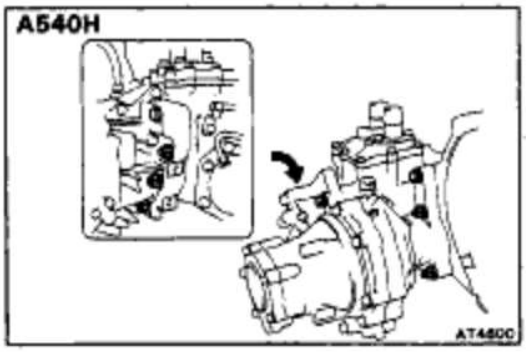
HINT: Install the transfer assembly as soon as the seal packing is applied.

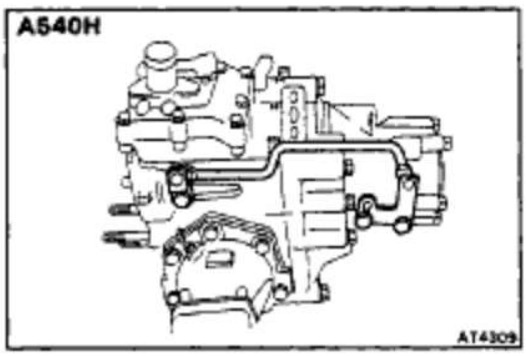
(e) Coat the threads of bolts with sealer.

Sealer: Part No. 08833–00070, THREE BOND 1324 or equivalent.

(d) Install and torque the five nuts and three bolts.

Torque: 700 kg–cm (51 ft–lb, 69 N–m)





52. (A540H)

INSPECT MODE SELECT LEVER POSITION

After finishing inspection or repair the transaxle, be sure the select lever position to FREE mode and attach the lock bolt.