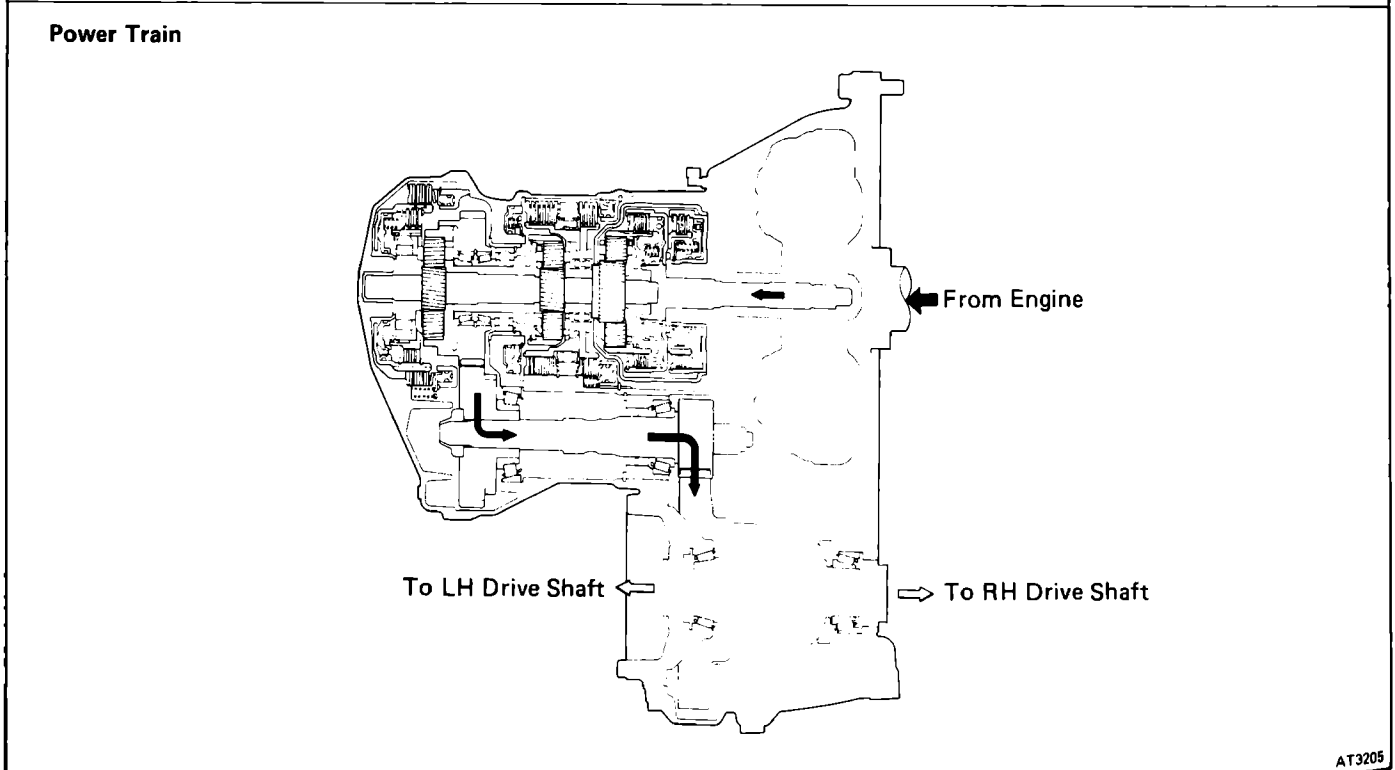
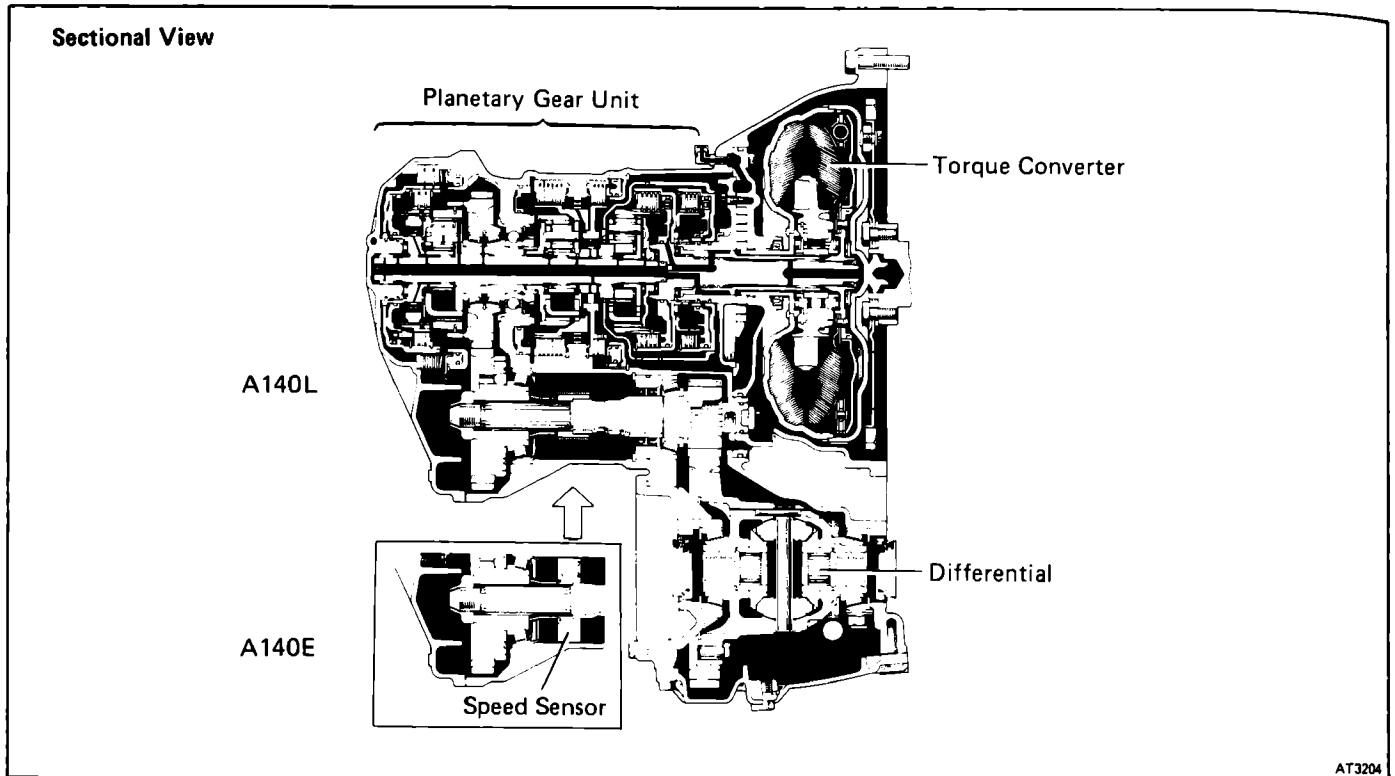




# DESCRIPTION

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.



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

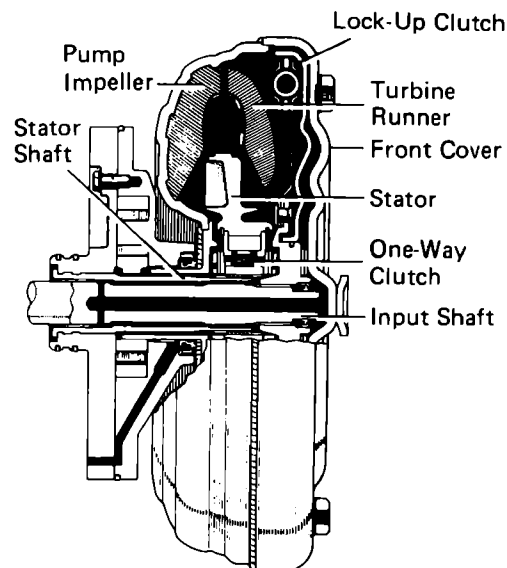
The A140L automatic transaxle can be roughly divided into the automatic transmission section and the differential section. The automatic transmission section is composed of the torque converter, planetary gear unit and the hydraulic control system.

### 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.



AT2838

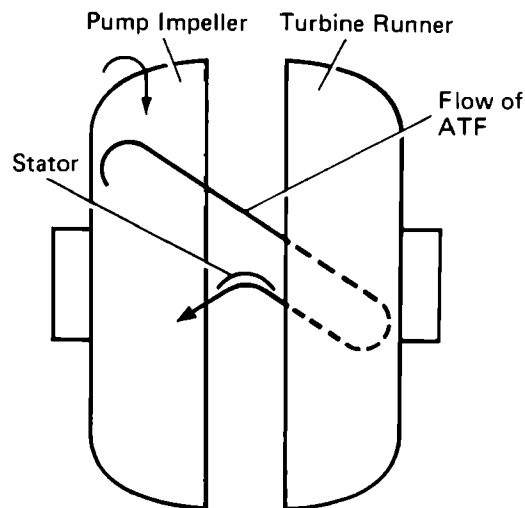
#### OPERATION

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.

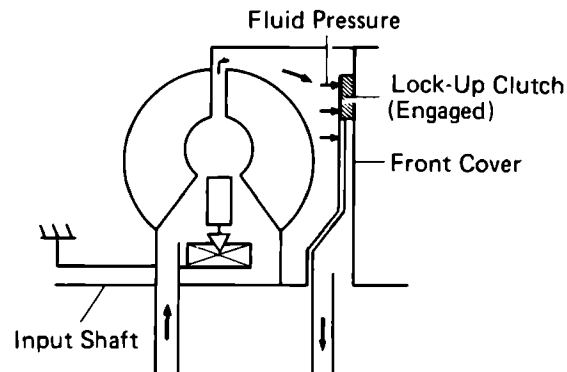
The flow of ATF which has hit the turbine runner rebounds and tries to flow in the direction opposite to the direction of rotation of the pump impeller, but the stator returns the flow the original direction of rotation. So the ATF becomes a force which supports the pump impeller and increases torque.

NOTE: 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.



AT2829

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.

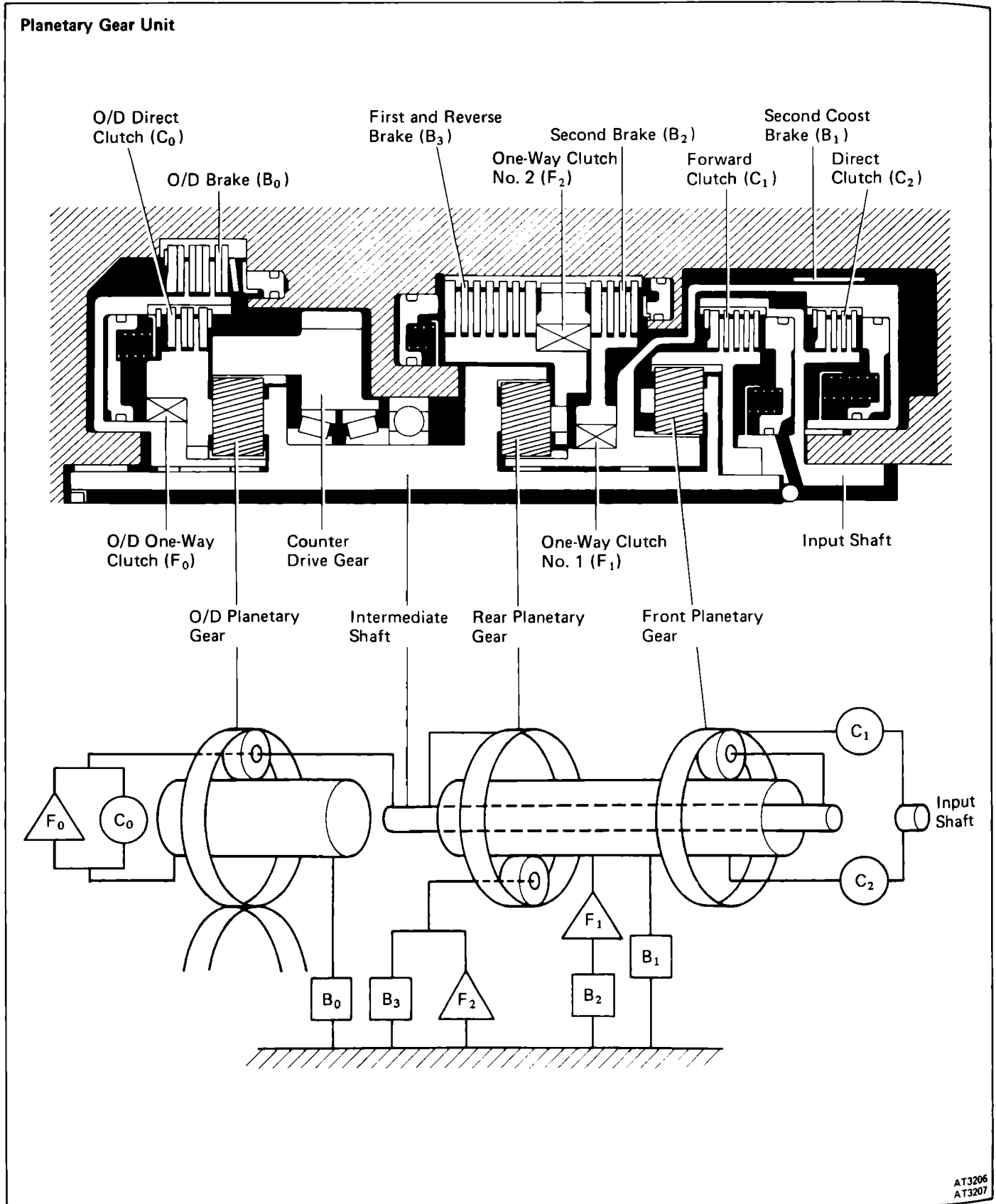


AT2839

## 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.

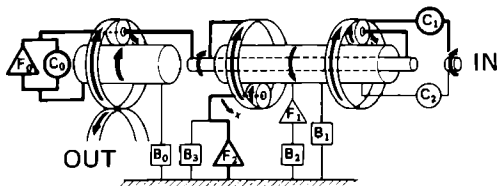
By operation of the brake and one-way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the planetary gear unit.

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.

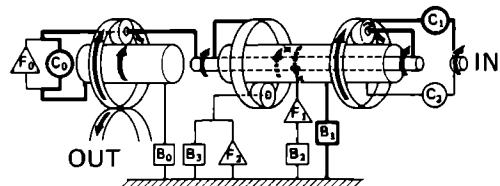
The conditions of operation for each gear position are shown on the following illustrations:

**D or 2 Range 1st Gear**



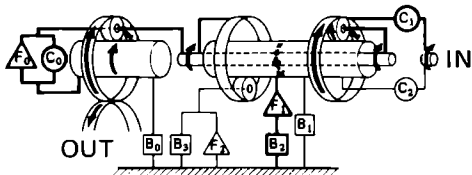
AT1097

**2 Range 2nd Gear**



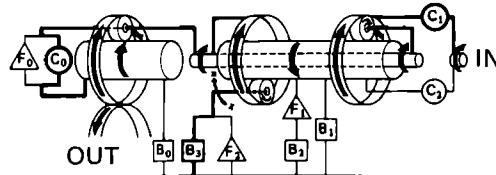
AT1102

**D Range 2nd Gear**



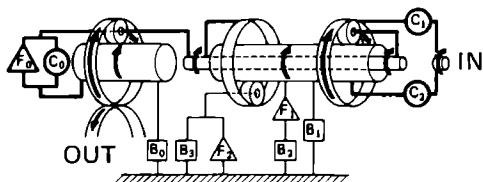
AT1098

**L Range 1st Gear**



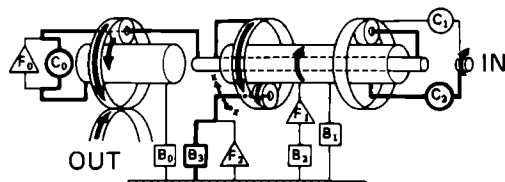
AT1103

**D Range 3rd Gear**



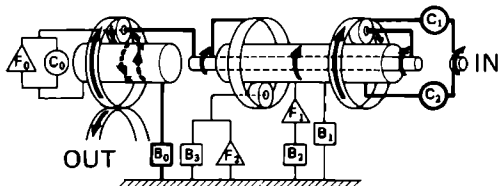
AT1099

**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 passages; 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.

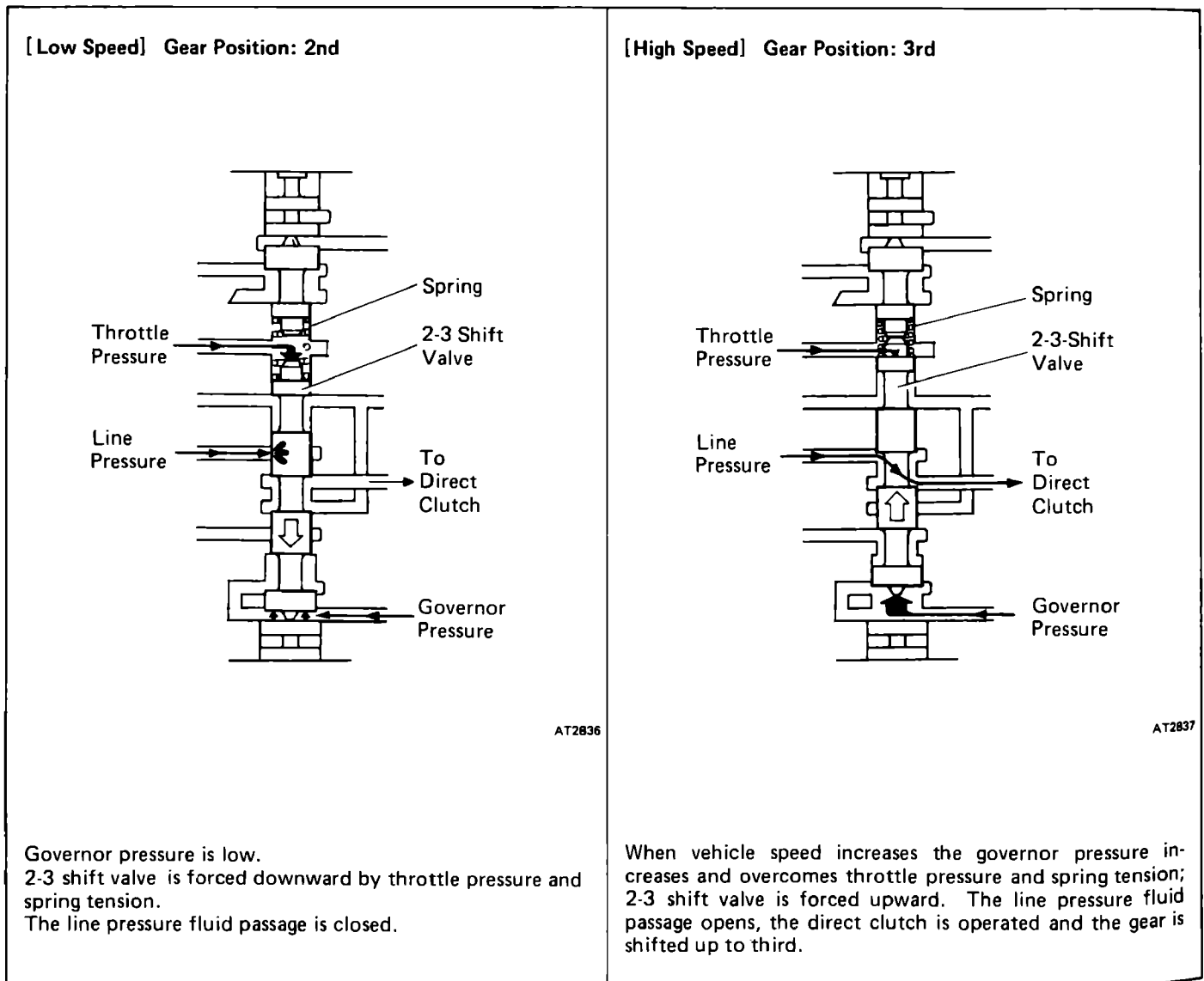
Line pressure produces the hydraulic pressure for throttle pressure and governor pressure. Also, line pressure produces hydraulic pressure for the operation of each brake and clutch in the planetary gear unit.

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 and 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:



# A140-E 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.
- (c) 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

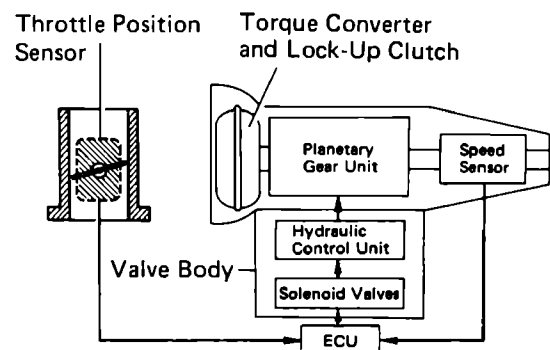
In the A140E there are three solenoid valves, the No. 1, the No. 2 and the lock-up solenoid valves. Shifting occurs according to whether the No. 1 and No. 2 solenoid valves are ON or OFF, and the lock-up solenoid valve controls the lock-up clutch.

#### 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.

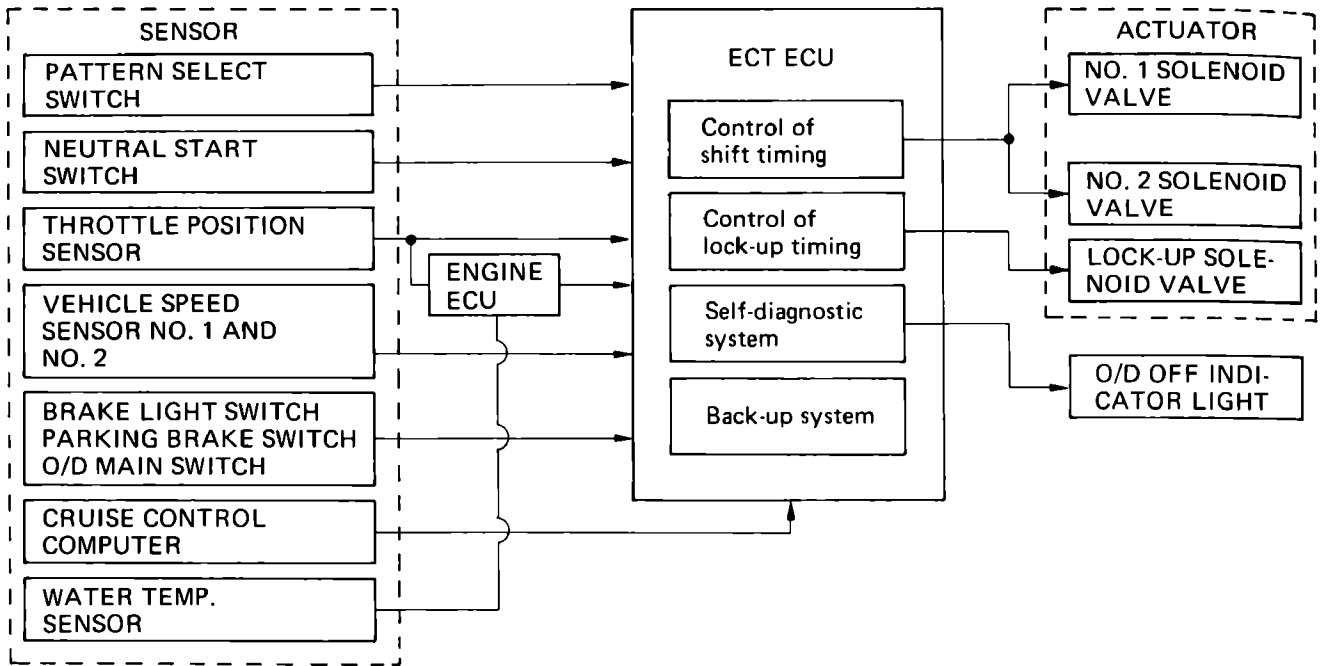


## 2. Electronic Control System

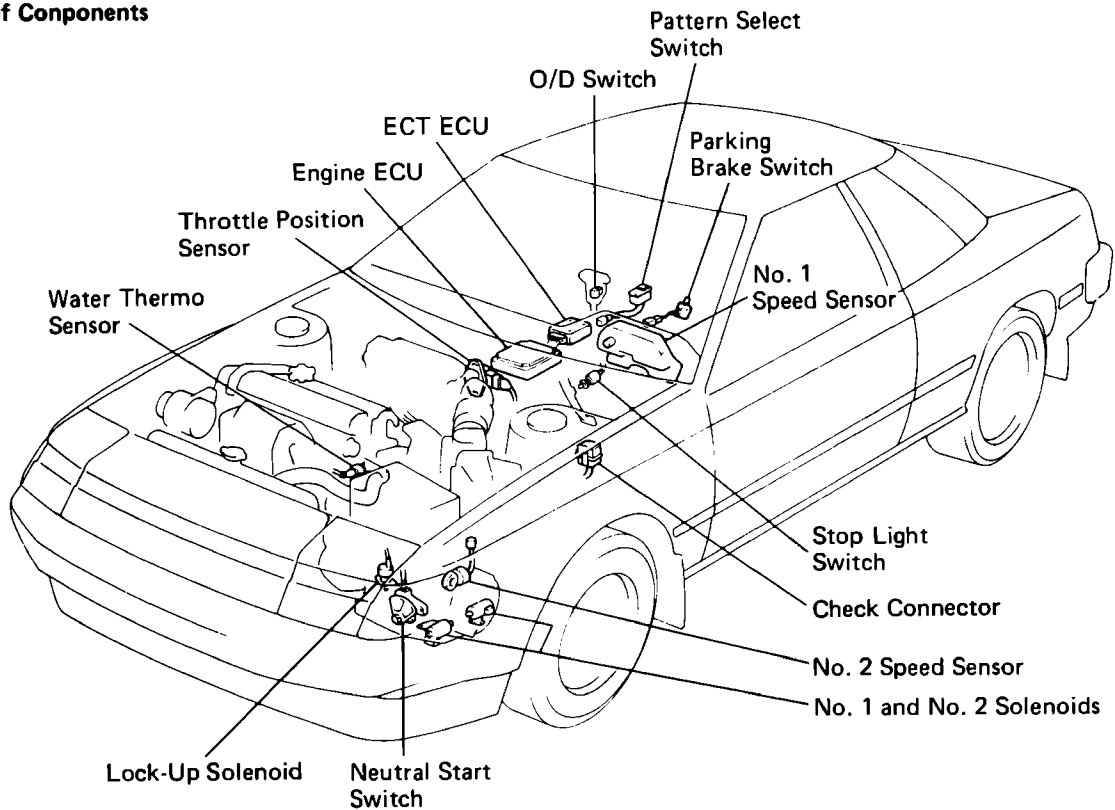
### COMPONENTS

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



Location of Components





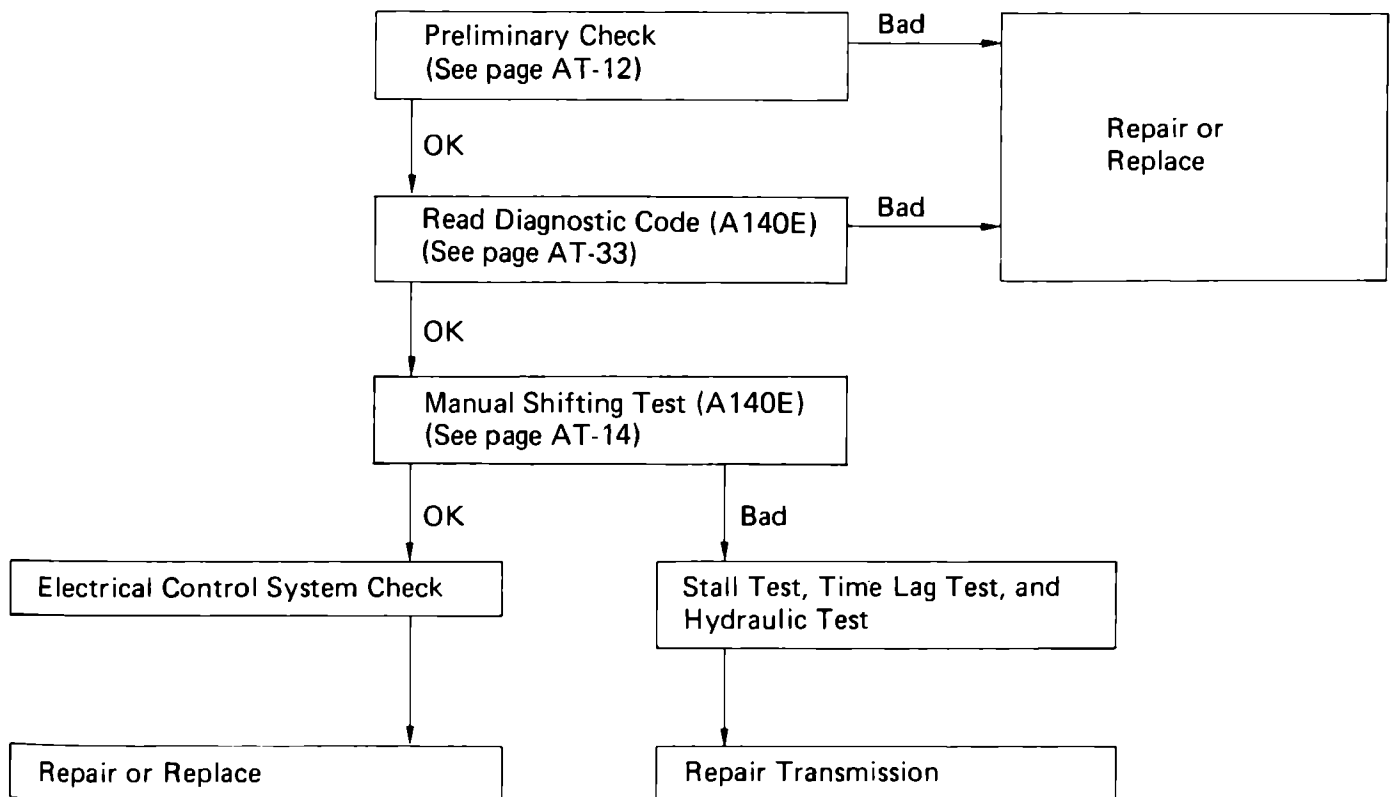
## TROUBLESHOOTING

Trouble occurring in the ECT can stem from one of three sources: the engine, the ECT electronic control unit or the transaxle itself. Before troubleshooting, determine in which these three sources the problem lies, and begin troubleshooting with the simplest operation, gradually working up in order of difficulty.

### 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 page should speed the procedure.



## General Troubleshooting

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter faulty Transmission faulty	Replace fluid Replace torque converter Disassemble and inspect transmission	AT-12 AT-58 AT-63
Vehicle does not move in any forward range or reverse	Control cable out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust control cable Inspect valve body Inspect parking lock pawl Replace torque converter Replace drive plate Clean screen Disassemble and inspect transmission	AT-13 AT-107, 119 AT-132 AT-58 AT-58 AT-63
Shift lever position incorrect	Control cable out of adjustment Manual valve and lever faulty Transmission faulty	Adjust control cable Inspect valve body Disassemble and inspect transmission	AT-13 AT-107, 119 AT-63
Harsh engagement into any drive range	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT-13 AT-107, 119 AT-141 AT-63
Delayed 1-2, 2-3 or 3-O/D up-shift, or down-shifts from 4-3 or 3-2 and shifts back to 4 or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect valve body	AT-25, 39 AT-107, 119 AT-107
Slips on 1-2, 2-3 or 3-O/D up-shift, or slips or shudders on acceleration	Control cable out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust control cable Adjust throttle cable Inspect valve body Inspect valve body Disassemble and inspect transmission	AT-13 AT-13 AT-107, 119 AT-107 AT-63
Drag, binding or tie-up on 1-2, 2-3 or 3-O/D up-shift	Control cable out of adjustment Valve body faulty Transmission faulty	Adjust control cable Inspect valve body Disassemble and inspect transmission	AT-13 AT-107, 119 AT-63

## General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
No lock-up in 2nd, 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT-25, 39 AT-107, 119 AT-107 AT-63
Harsh down-shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator piston Inspect valve body Disassemble and inspect transmission	AT-13 AT-13 AT-141 AT-107, 119 AT-63
No down-shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	AT-107, 119 AT-107 AT-25, 39
Down-shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT-13 AT-107, 119 AT-63 AT-107 AT-25, 39
No O/D-3, 3-2 or 2-1 kick-down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT-107 AT-25, 39 AT-107, 119
No engine braking in "2" or "L" range	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT-107 AT-25, 39 AT-107, 119 AT-63
Vehicle does not hold in "P"	Control cable out of adjustment Parking lock pawl cam and spring faulty	Adjust control cable Inspect cam and spring	AT-13 AT-132

## Preliminary Check

### 1. CHECK FLUID LEVEL

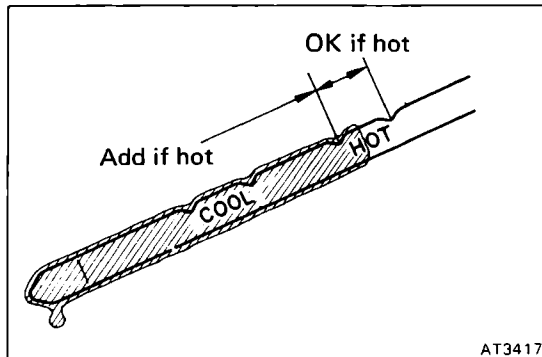
**NOTE:** The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (fluid temperature: 70 – 80°C or 158 – 176°F)

- Park the vehicle on a level surface, set the parking brake.
- With the engine idling, shift the selector into each gear from P range to L range and return to P range.
- Pull out the transmission dipstick and wipe it clean.
- Push it back fully into the tube.
- Pull it out and check that the fluid level is in the HOT range. If the level is at the low side of either range.

If low, add fluid.

**Fluid type:** ATF DEXRON® II

**CAUTION:** Do not overfill.



### 2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it.

### 3. REPLACE ATF

**CAUTION:** Do not overfill.

- Remove the drain plug and drain the fluid.
- Reinstall the drain plug securely.
- With the engine OFF, and new fluid through the dipstick tube.

SST 09043-38100

**Fluid:** ATF DEXRON® II

**Capacity:**

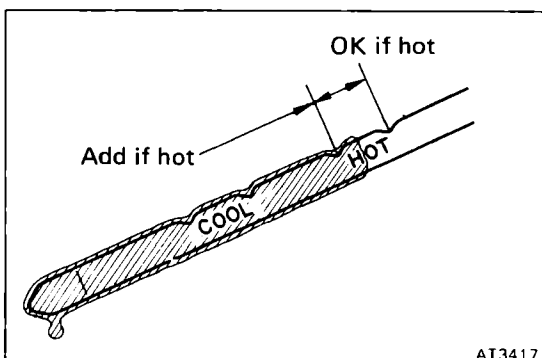
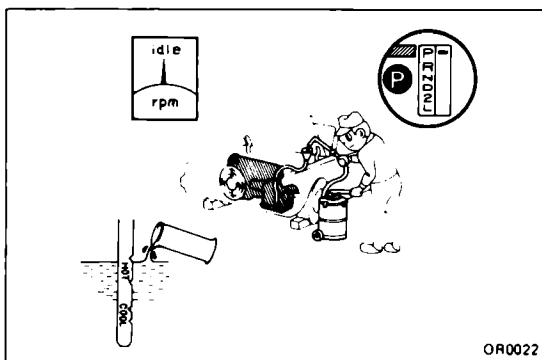
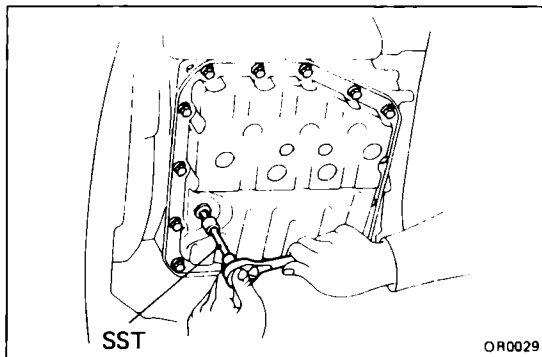
A140E 5.3 liters (5.6 US qts, 4.7 Imp. qts)

A140L 5.7 liters (6.0 US qts, 5.0 Imp. qts)

**Drain and refill (Reference):**

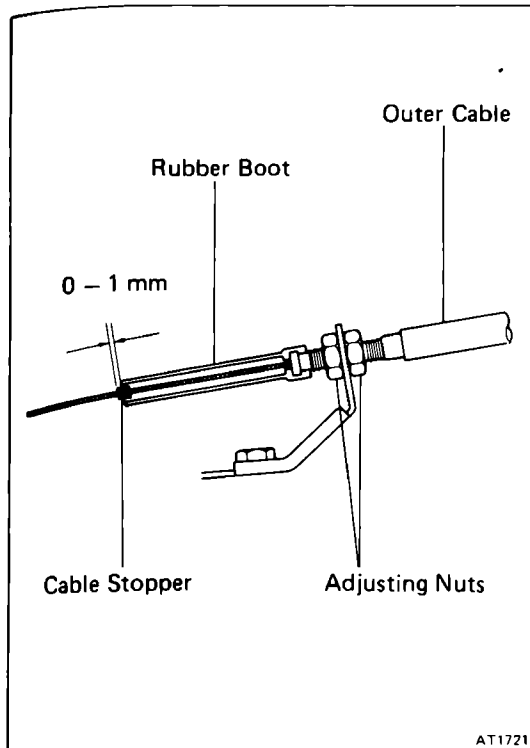
A140E, A140L 2.5 liters (2.6 US qts, 2.2 Imp. qts)

- Start the engine and shift the selector into all positions from P through L and then shift into P.
- With the engine idling, check the fluid level. Add fluid up to the "COOL" level on the dipstick.



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

**CAUTION:** Do not overfill.



#### 4. INSPECT AND ADJUST THROTTLE CABLE

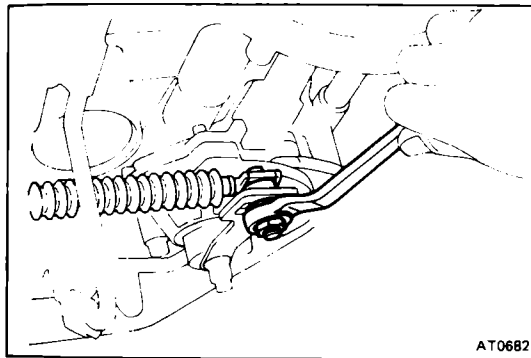
- (a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

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

- (b) Fully depress the accelerator.  
 (c) Loosen the adjustment nuts.  
 (d) Adjust the cable housing so that the distance between the end of the boot and stopper on the cable is the standard.

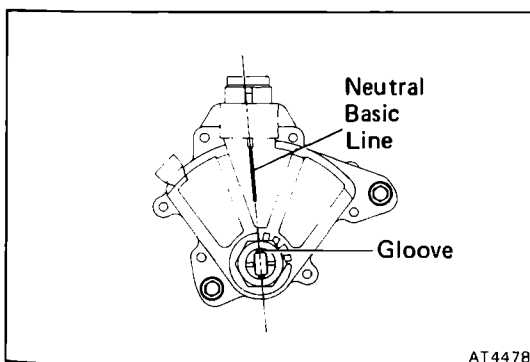
**Standard boot and cable stopper distance:**  
**0 – 1 mm (0 – 0.04 in.)**

- (e) Tighten the adjusting nuts.  
 (f) Recheck the adjustments.



#### 5. ADJUST CONTROL CABLE

- (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

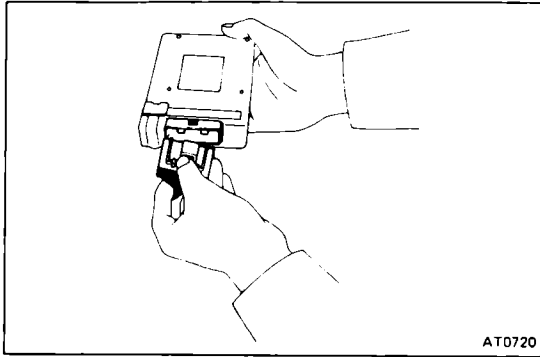
If the engine will start with the shift selector in any range other than N or P range, adjustment is required.

- (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: 3S-GE 750 rpm  
 3S-FE 700 rpm



## Manual Shifting Test (A140E/3S-GE)

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

### 1. DISCONNECT ECT ECU CONNECTOR

- (a) Remove the center cluster.
- (b) With the engine OFF, disconnect the ECU connector.

### 2. INSPECT MANUAL DRIVING OPERATION

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

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

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

- (a) While driving, shift through the L, 2 and D ranges and back up again. Check that the gear change corresponds to the gear position.
- (b) While driving shift through the D, 2 and L ranges and back down again. Check that the gear change corresponds to the gear position.

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

### 3. CONNECT ECT COMPUTER CONNECTOR

- (a) Connect the ECT ECU connector.
- (b) Install the center cluster.

## Stall Test

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

### CAUTION:

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

### MEASURE STALL SPEED

- (a) Chock the front and rear wheels.
- (b) Mount an engine tachometer.
- (c) Fully apply the parking brake.
- (d) Keep your left foot pressed firmly on the brake pedal.
- (e) Start the engine.
- (f) Shift into D range. Step all the way down on the accelerator pedal with your right foot. Quickly read the highest engine rpm at this time.

Stall speed: 3S-GE 2,500 ± 150 rpm  
3S-FE 2,200 ± 150 rpm

- (g) Perform the same test in "R" range.

### EVALUATION

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

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

- (b) If the stall speed at D range is higher than specified:

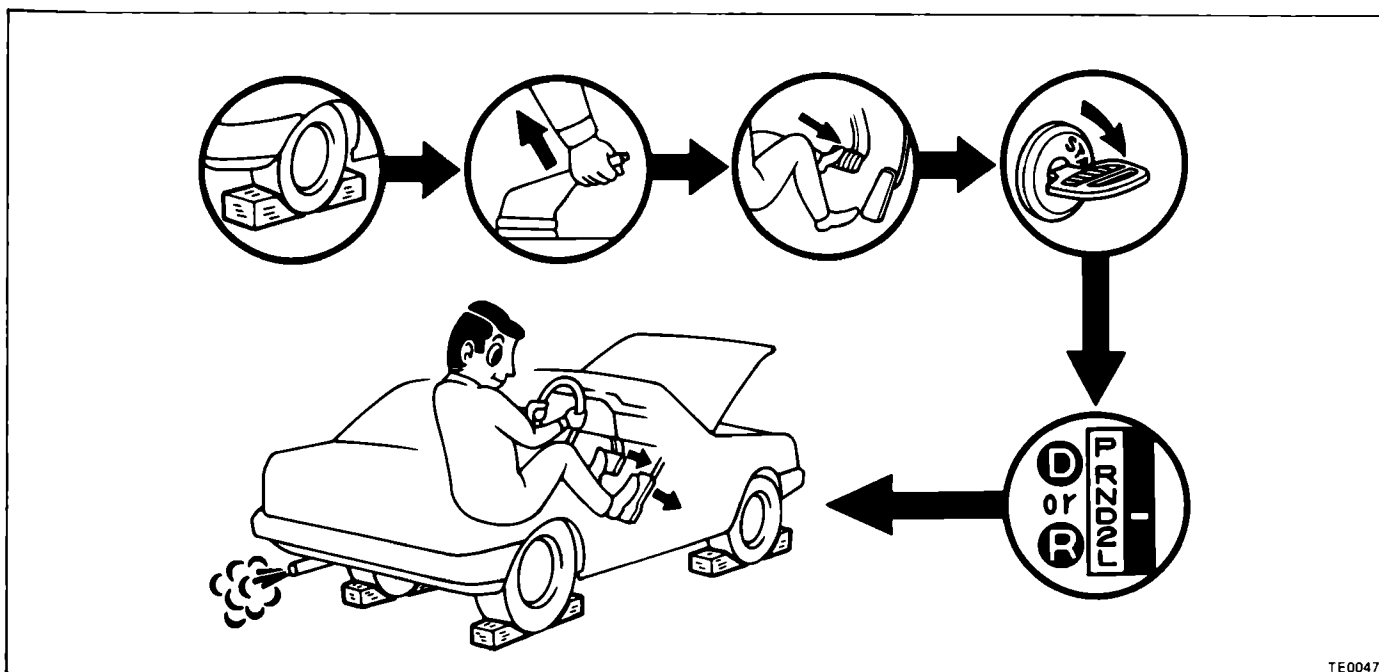
- Line pressure too low
- Forward clutch slipping
- No. 2 one-way clutch not operating properly.
- O/D one-way clutch not operating properly

- (c) If the stall speed at 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 R and D ranges is 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 lapse or lag before the shock can be felt. This is used for checking the condition of the OD clutch, forward clutch, direct clutch and first and reverse brake.

### CAUTION:

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

### MEASURE TIME LAG

- Fully apply the parking brake.
- Start the engine and check the idle speed.

#### Idling speed:

3S-GE N range 750 rpm

3S-FE N range 700 rpm

- Shift the shift lever from N to D range.

Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

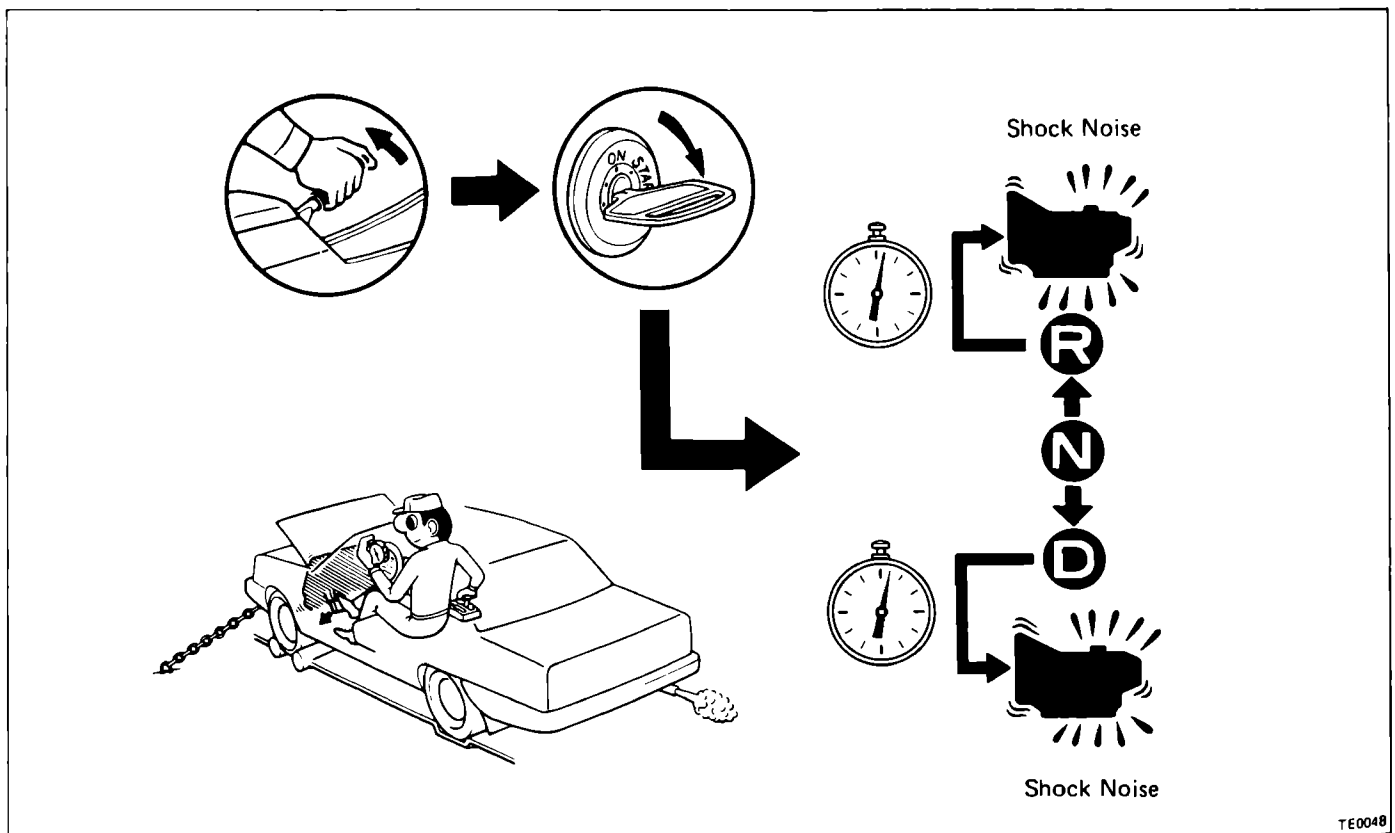
**Time lag: Less than 1.2 seconds**

- In same manner, measure the time lag for N → R.

**Time lag: Less than 1.5 seconds**

### EVALUATION

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

## 1. PREPARATION

- (a) Warm up the transmission fluid.
- (b) Remove the transmission case test plug and mount the hydraulic pressure gauge.

SST 09992-00094 Oil pressure gauge

### CAUTION:

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

## 2. MEASURE LINE PRESSURE

- (a) Fully apply the parking brake and chock the four wheels.
- (b) Start the engine and check the idling rpm.
- (c) Shift into D range, step down strongly on the brake pedal with your left foot and while manipulating the accelerator pedal with the right foot, measure the line pressure at the engine speeds specified in table.
- (d) In the same manner, perform the test in R range.

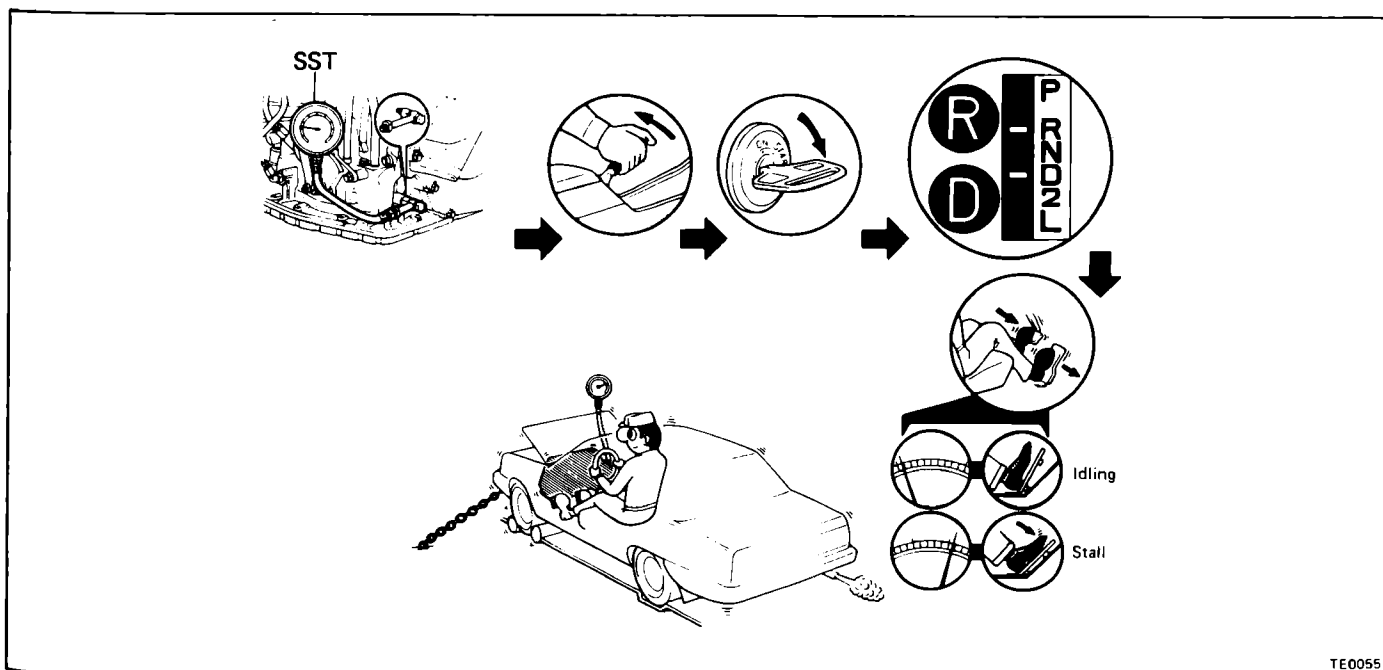
(A140E/3S-GE, A140L/3S-FE)

Engine speed	Line pressure kg/cm <sup>2</sup> (psi, kPa)	
	D range	R range
Idling	3.7 – 4.3 (53 – 61) (363 – 422)	5.4 – 7.2 (77 – 102) (530 – 706)
Stall	9.2 – 10.7 (131 – 152) (902 – 1,049)	14.4 – 16.8 (205 – 239) (1,412 – 1,648)

- (e) If the measured pressures are not up to specified values, recheck the throttle cable adjustment and 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 clutch defective
- (c) If pressure is low in D range only:
  - D range circuit fluid leakage
  - Forward clutch defective
- (d) If pressure is low in R range only:
  - R range circuit fluid leakage
  - First and reverse brake defective
  - Direct clutch defective



**3. MEASURE GOVERNOR PRESSURE (140L/3S-FE)**

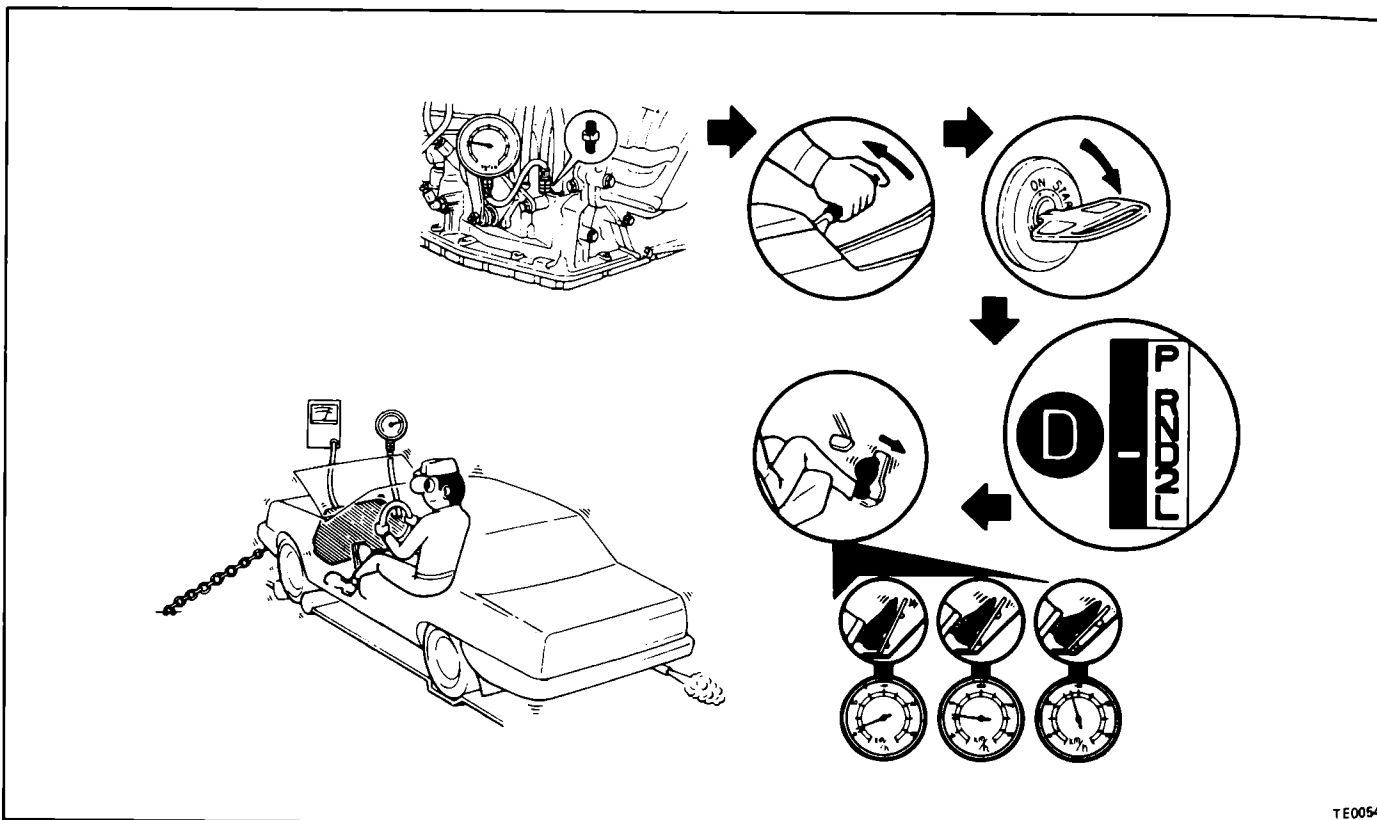
- (a) Check the parking brake to see that it is not applied.
- (b) Start the engine.
- (c) Shift into D range and measure the governor pressures at the speeds specified in the table.

**EVALUATION**

If governor pressure is defective:

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

Counter drive gear	Vehicle speed (Reference only)	Governor pressure
1,000 rpm	30 km/h (19 mph)	0.9 – 1.8 kg/cm <sup>2</sup> (13 – 26 psi, 88 – 177 kPa)
1,800 rpm	55 km/h (34 mph)	1.6 – 2.5 kg/cm <sup>2</sup> (23 – 36 psi, 157 – 245 kPa)
3,500 rpm	107 km/h (66 mph)	4.5 – 5.4 kg/cm <sup>2</sup> (64 – 77 psi, 441 – 530 kPa)



## Road Test (A140E/3S-GE)

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

### 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-44)

Conduct a test under both Normal and Power patterns.

**NOTE:**

- There is no O/D up-shift and lock-up when the coolant temp. is below 70°C (158°F).
- When the coolant temp. is below 60°C (140°F), 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.

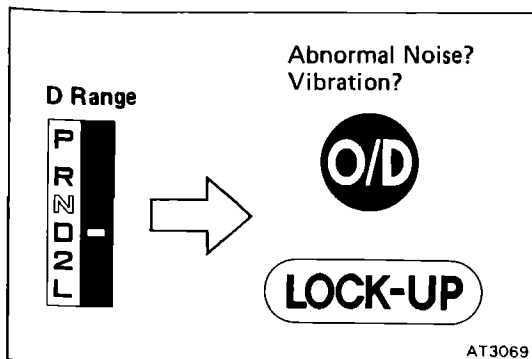
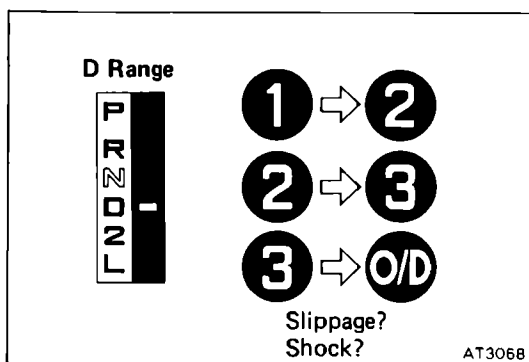
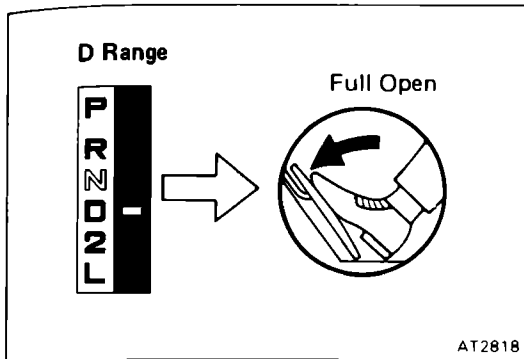
### EVALUATION

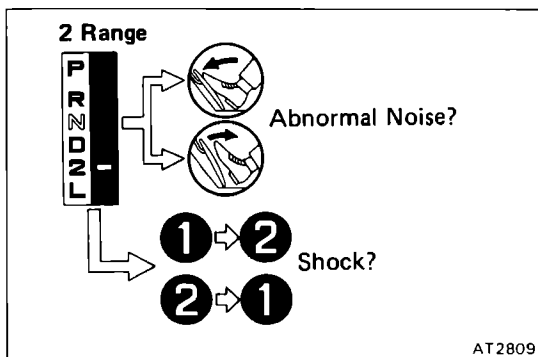
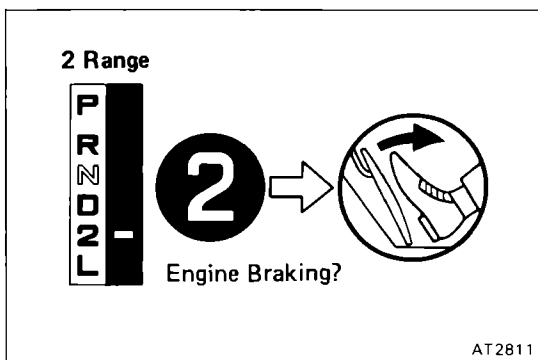
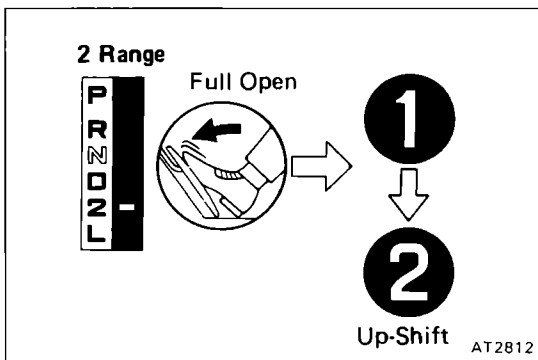
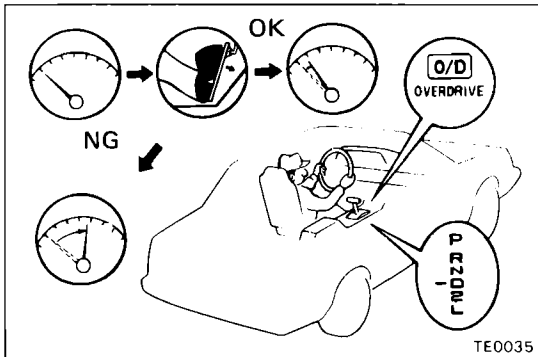
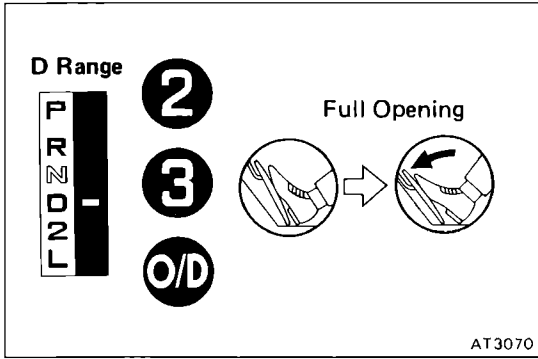
If the shock is excessive:

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

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

**NOTE:** The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the 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 kick-downs conform to those indicated on the automatic shift schedule.
- (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 60 – 70 km/h (37 – 44 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

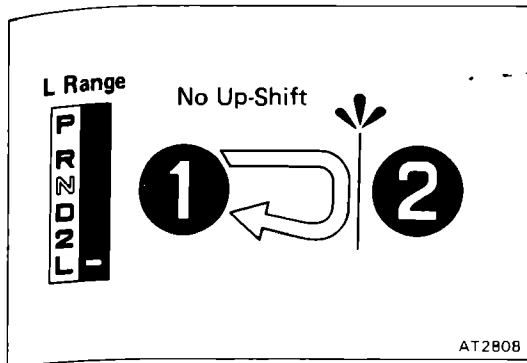
Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

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

EVALUATION

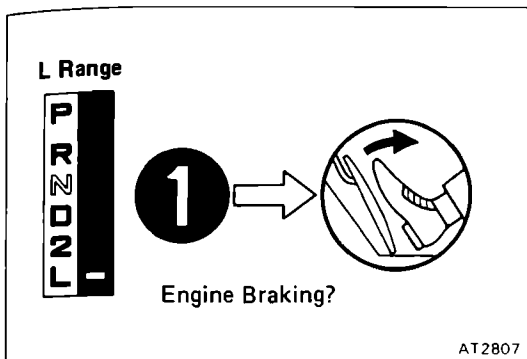
- If there is no engine braking effect:
- Second coast brake is defective

- (c) Check for abnormal noise at acceleration 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.

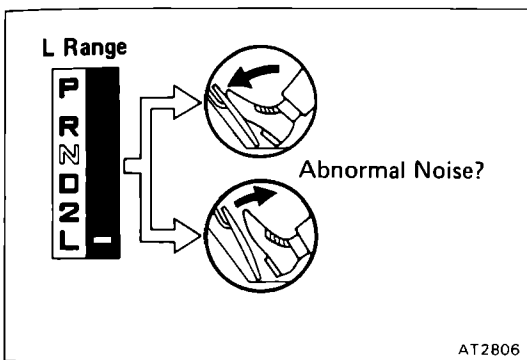


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

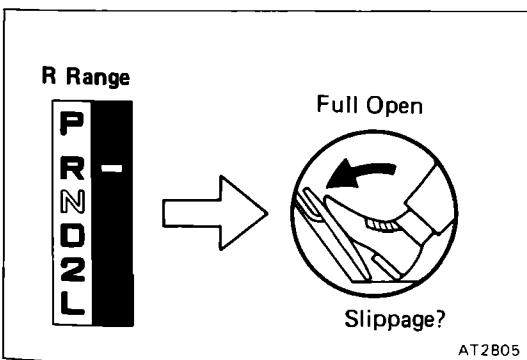
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

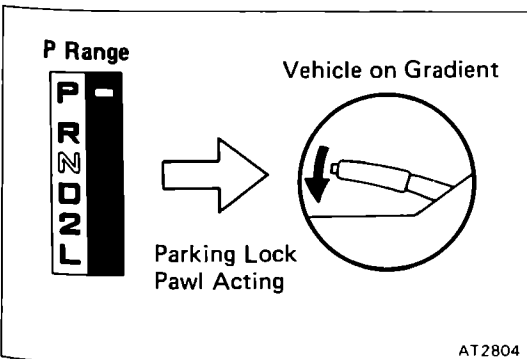


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

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



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/3S-FE)

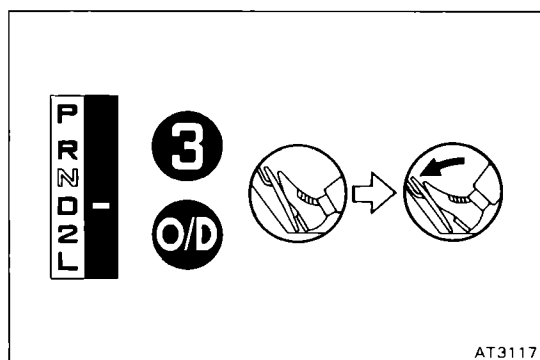
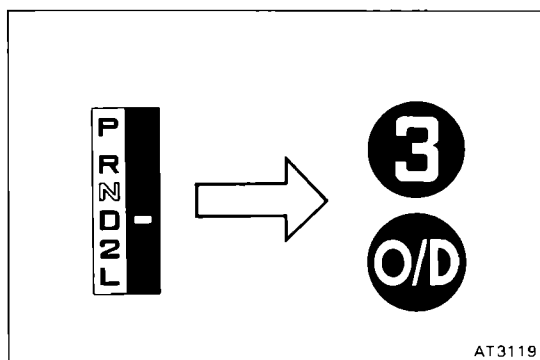
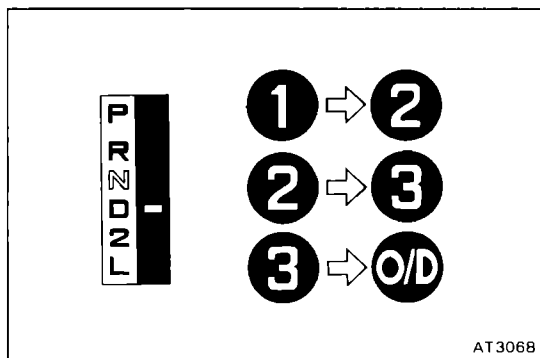
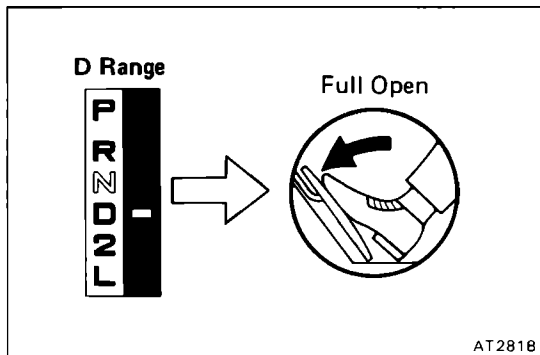
**CAUTION:** Perform this test at normal fluid temperature (50 – 80°C or 122 – 176°F).

### INSPECTION OF AUTOMATIC SHIFT POINT

#### 1. D RANGE TEST

Shift into D range and while driving with the accelerator pedal held constant at the throttle valve full open, check on the following points:

- (a) Check to see that the 1-2, 2-3 and 3-O/D up-shifts take place and also that the shift points conform to those shown in the automatic shift schedule (See page AT-44).



#### EVALUATION

- (1) If there is no 1-2 up-shift:
  - Governor valve is defective.
  - 1-2 shift valve stuck.
- (2) If there is no 2-3 up-shift:
  - 2-3 shift valve stuck.
- (3) If there is no 3-O/D up-shift (throttle valve opening less than 86%):
  - 3-4 shift valve is stuck.
  - Solenoid valve or circuit defective.
- (4) If the shift point is defective:
  - Throttle cable out-of adjustment.
  - Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-4 shift valve, etc. defective.
- (b) In the same manner, check the shock and the slip at 1-2, 2-3 and 3-O/D up-shifts.

#### EVALUATION:

If the shock is severe:

- Line pressure is too high.
  - Accumulator is defective.
  - Check ball is defective.
- (c) Run in the 3rd gear or O/D of D range and check the abnormal noise and vibration.

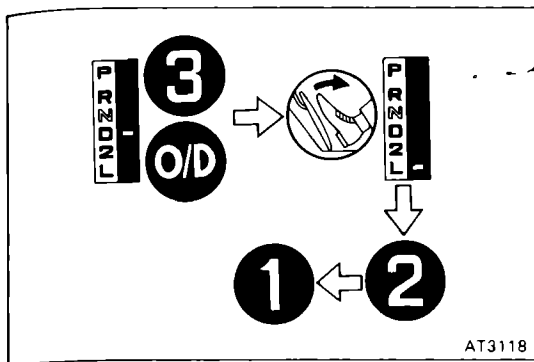
**NOTE:** Check for cause of abnormal noise and vibration must be made with extreme care as they could also be due to unbalance in the drive shaft, differential, tires, torque converter, etc..

- (d) While running in the 3rd gear or O/D of D range, check to see that the possible kick-down vehicle speed limits for the 3-1, 3-2, O/D-3 and O/D-2 kick-downs conform to those indicated in the automatic shift schedule.

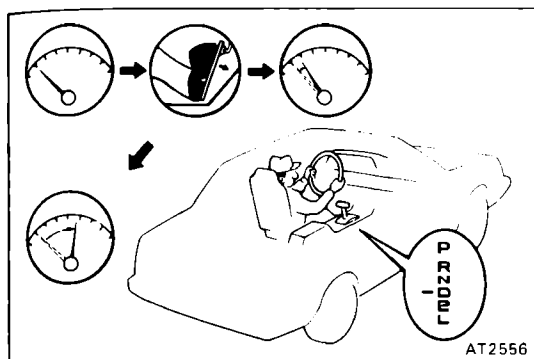
#### EVALUATION:

If the possible kick-down vehicle speed limit is defective:

- Throttle cable out-of adjustment.
  - Throttle valve, 1-2 shift valve, 2-3 shift valve, 3-4 shift valve, etc. defective.
- (e) Check for abnormal shock and slip at kick-down.

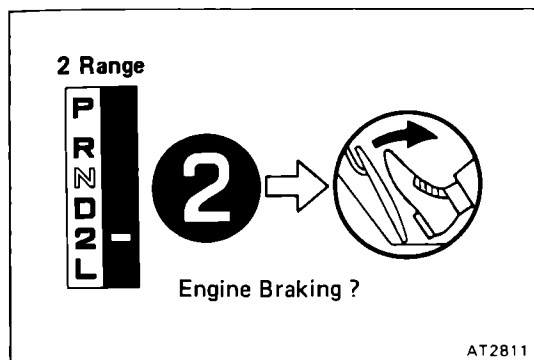


(f) While running more than 60 km/h (37 mph) in the O/D of D range, release your foot from the accelerator pedal and shift into L range. Then check to see if the 2-1 down-shift point conform to those indicated in the automatic shift schedule.



**2. INSPECT LOCK-UP MECHANISM**

- (a) Drive in D range, at a steady speed (Lock-up ON) of about 65 km/h (40 mph).
  - (b) Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
- If there is a big jump in engine rpm, there is no lock-up.

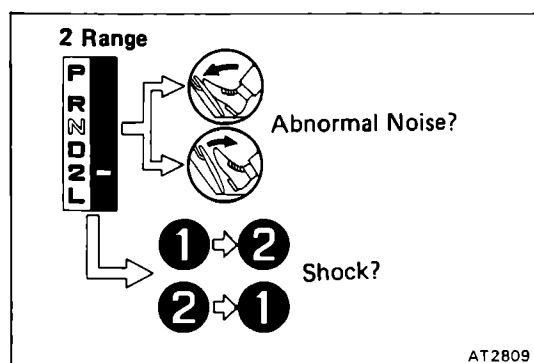


**3. 2 RANGE TEST**

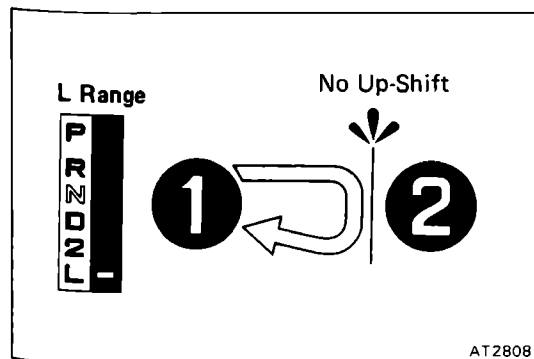
- (a) While running in 2 range, 2nd gear, release the accelerator pedal and check the engine braking effect.

**EVALUATION**

- If there is no engine braking effect:
- Second coast brake is defective.

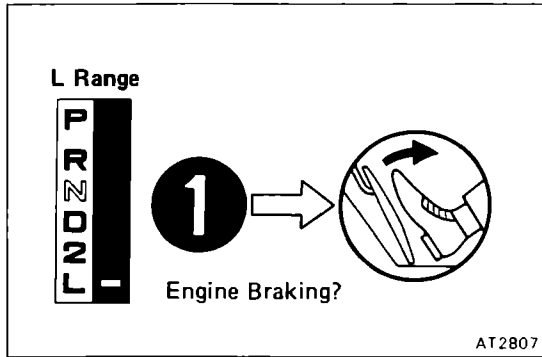


- (b) Check the abnormal noise during acceleration and deceleration.
- (c) Check the shock at up-shift and down-shift.



**4. L RANGE TEST**

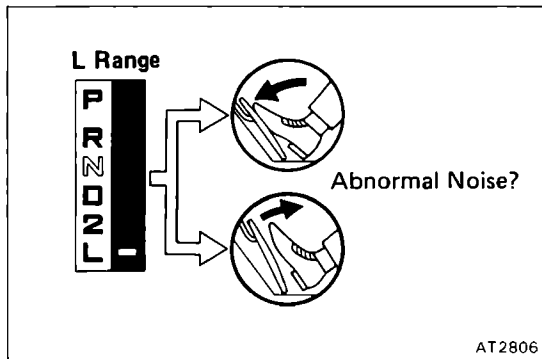
- (a) While running in L range, check to see that there is no up-shift to 2nd gear.



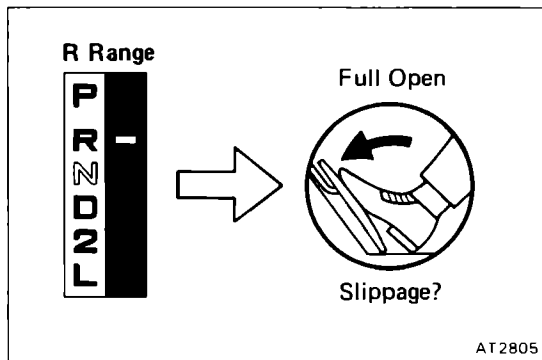
- (b) While running in L range, release the accelerator pedal and check the engine braking effect.

**EVALUATION**

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

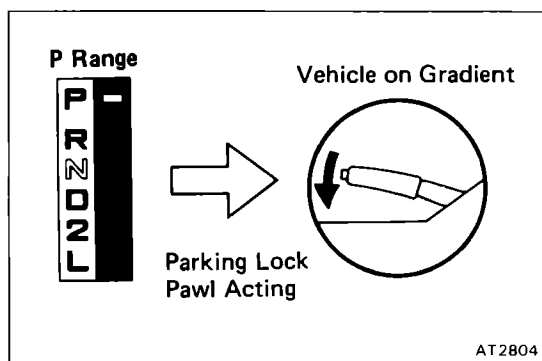


- (c) Check the abnormal noise during acceleration and deceleration.



**5. R RANGE TEST**

Shift into R range and, while running at full throttle, check the slippage.



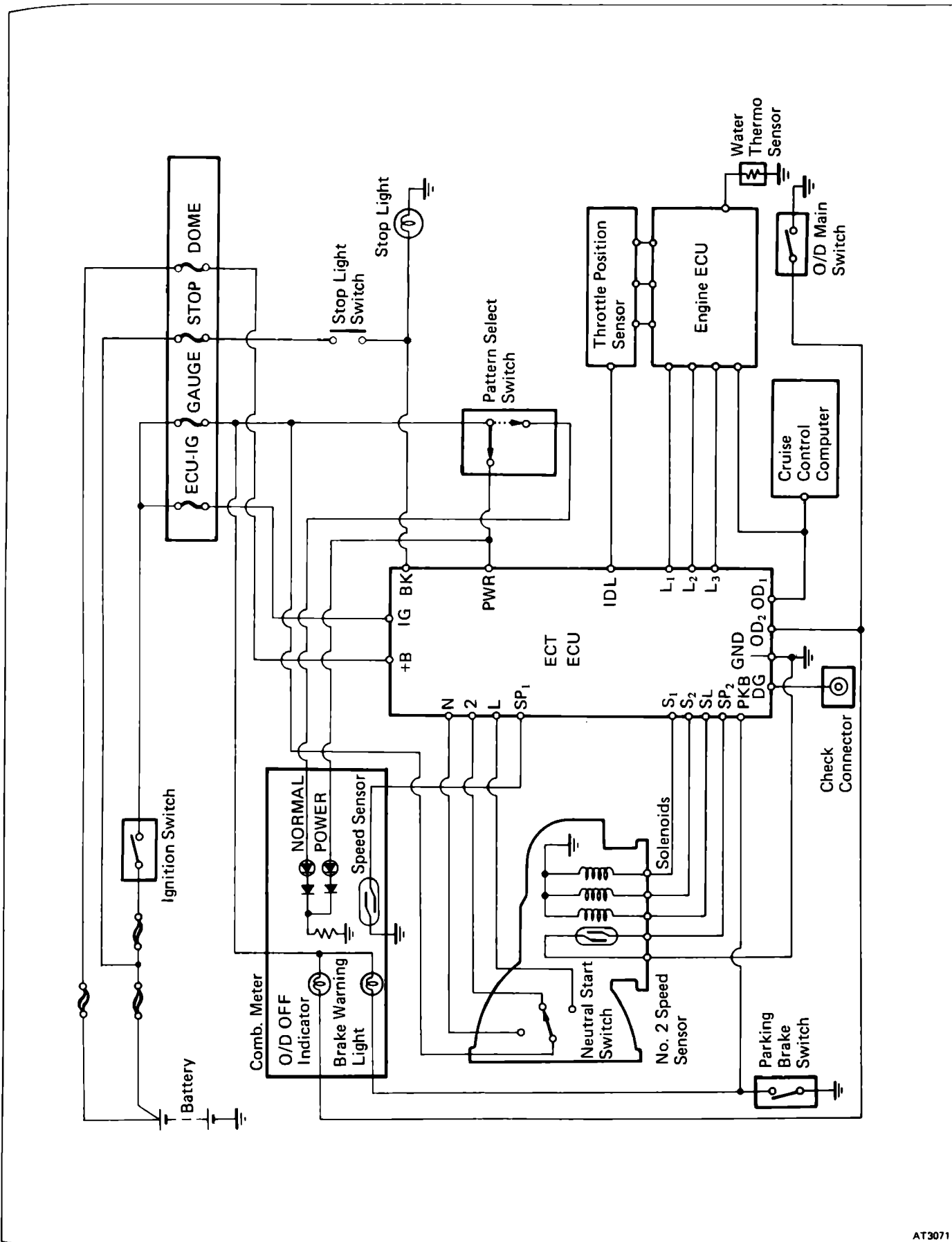
**6. P RANGE TEST**

Stop the vehicle on a gradient (more than 9%) and, after shifting into P range, release the parking brake. Then check to see that the parking lock pawl prevents the vehicle from moving.

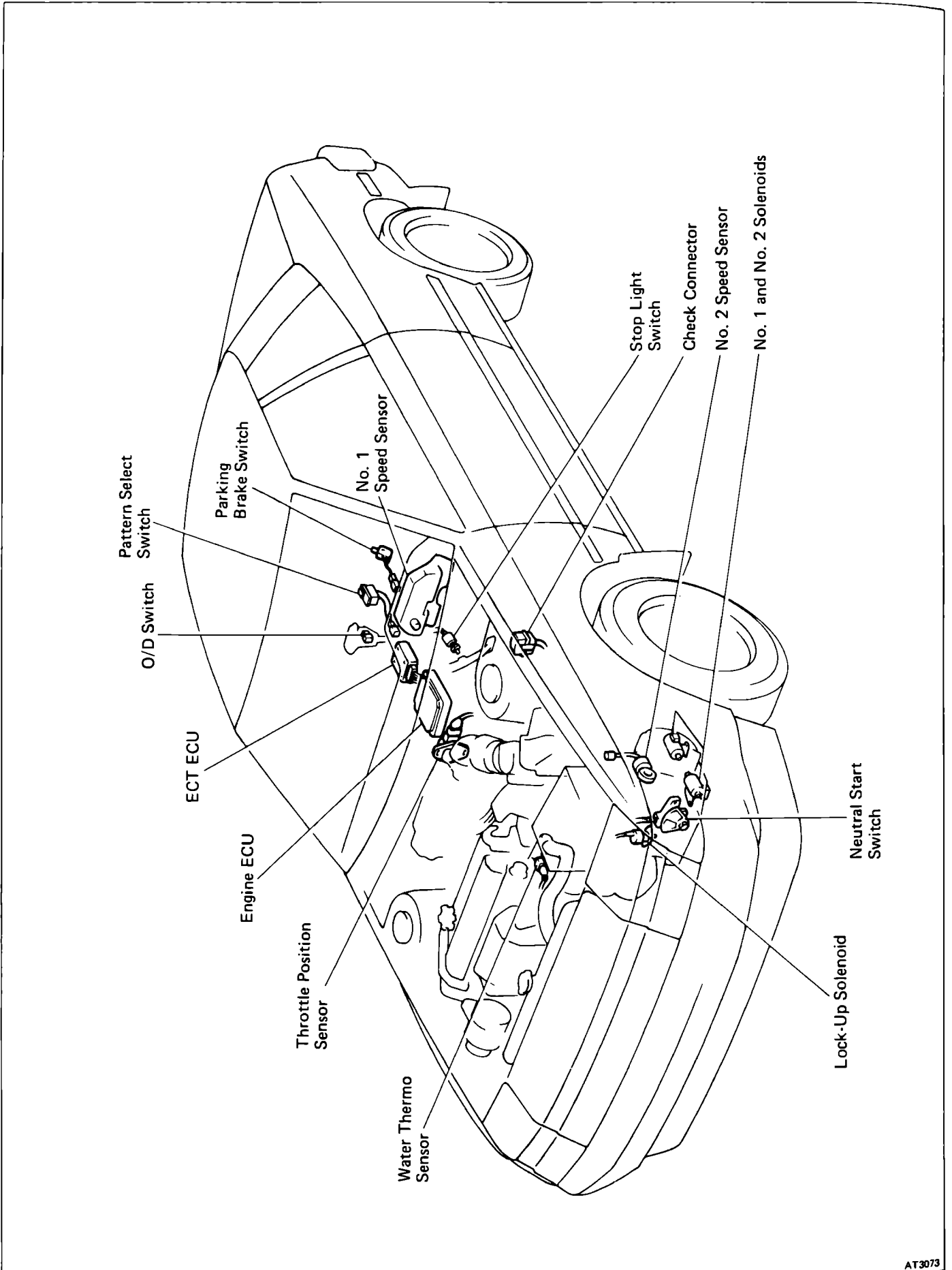


# Electronic Control System (A140E/3S-GE)

## ELECTRONIC CONTROL CIRCUIT



# ELECTRONIC CONTROL COMPONENTS

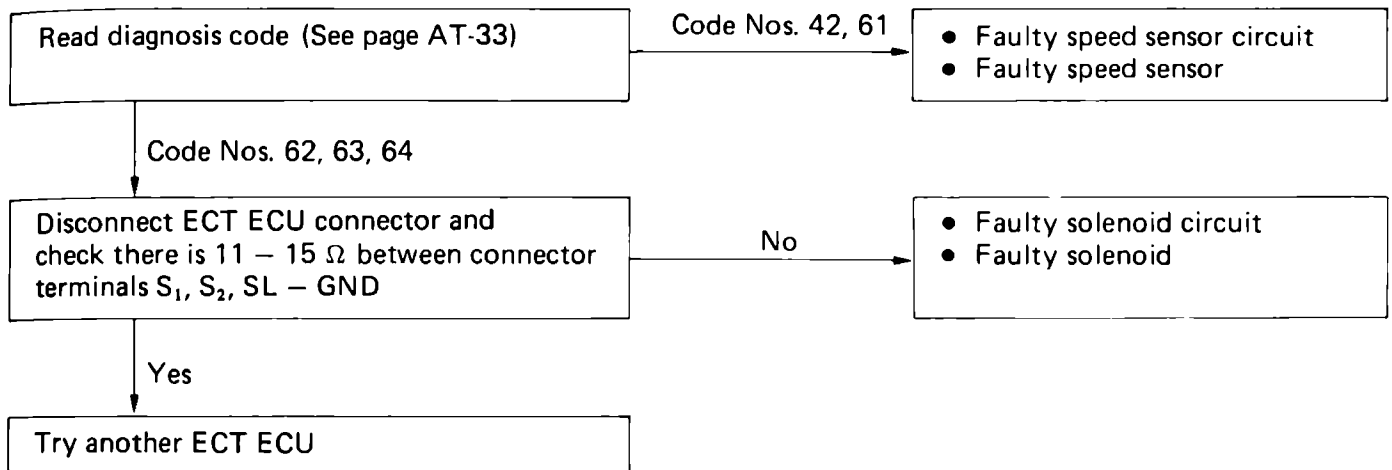


## TROUBLESHOOTING OF ELECTRONIC CONTROL SYSTEM

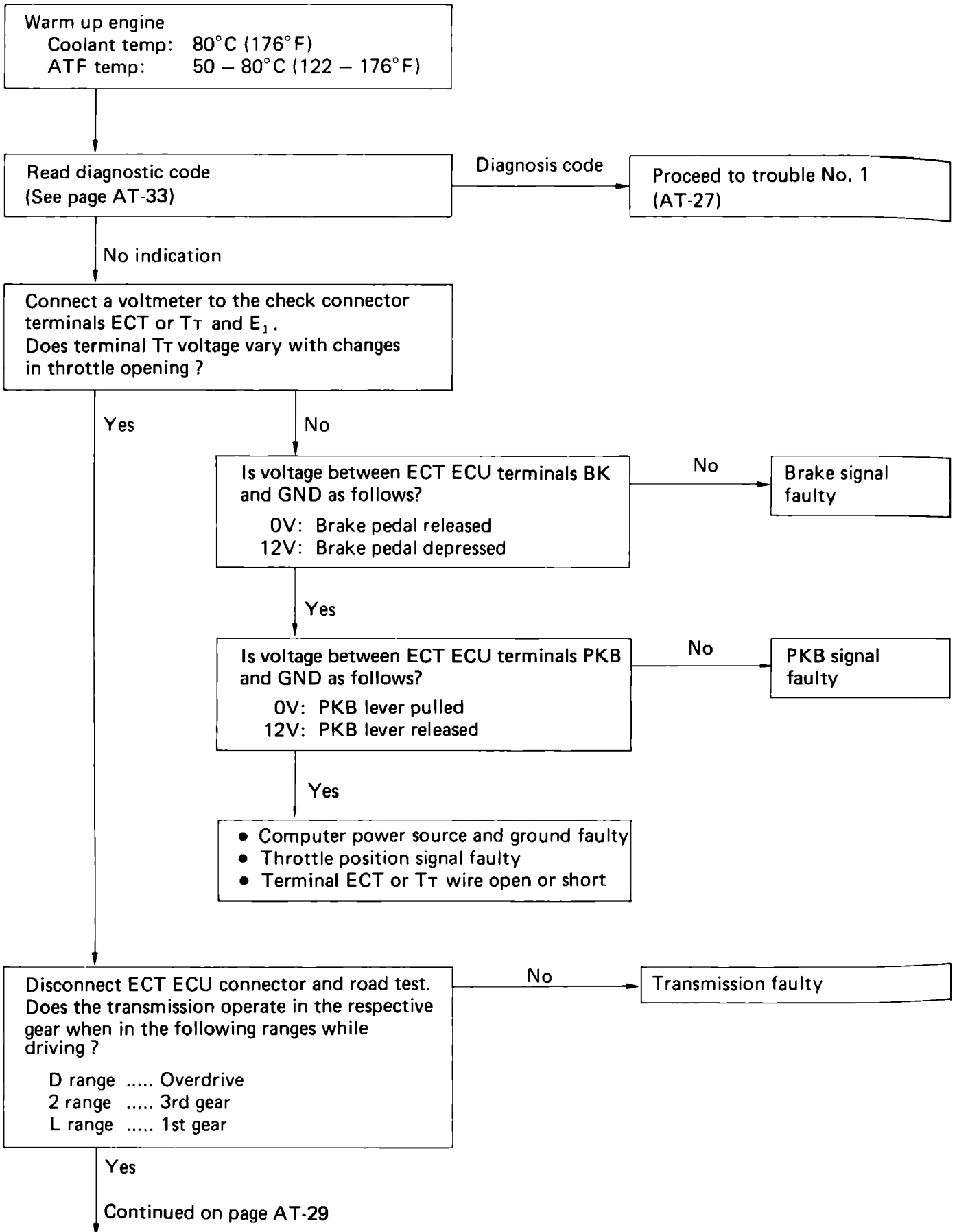
### NOTE:

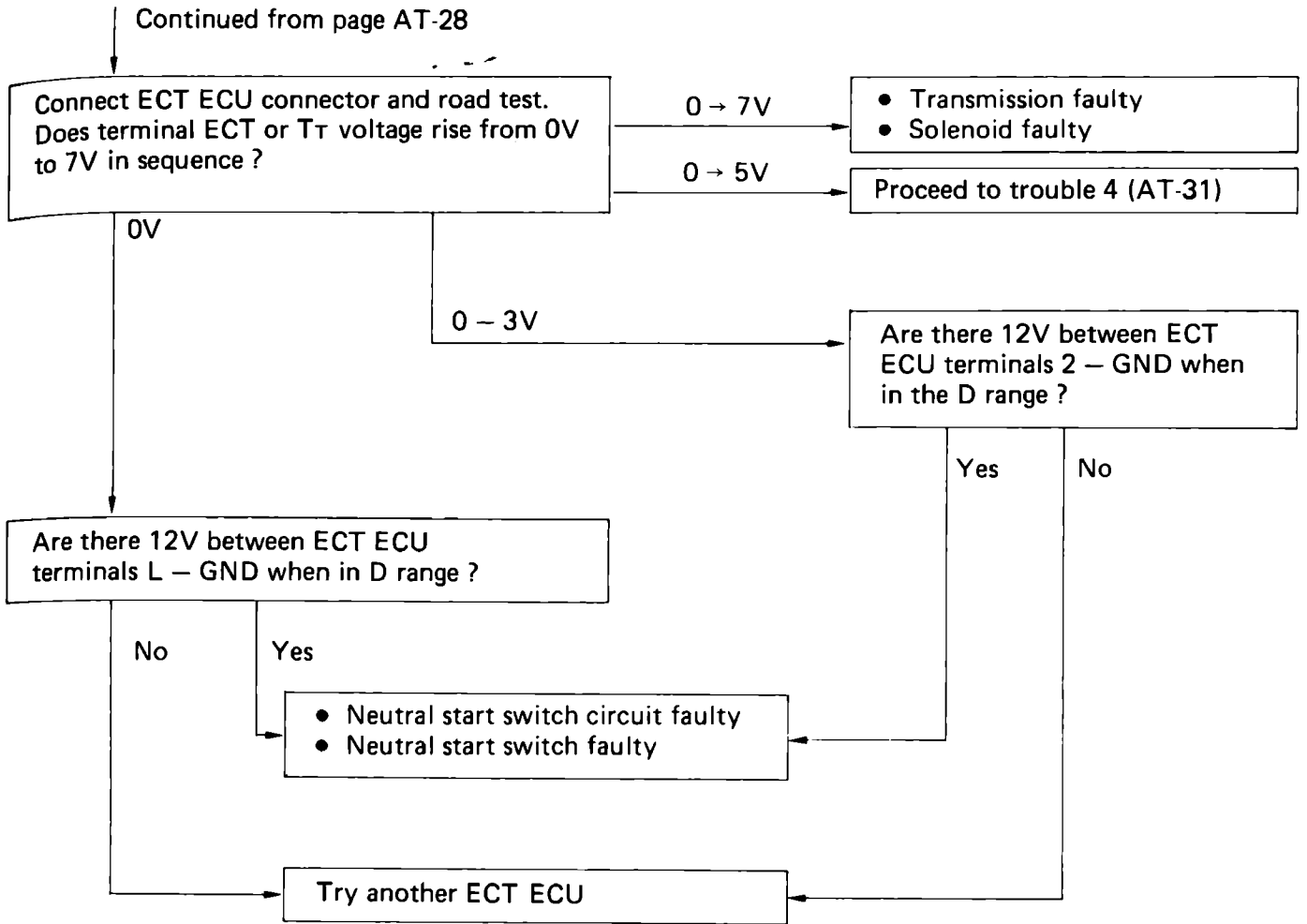
- If diagnostic code Nos. 42, 61, 62 or 63 occur, the overdrive indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but, the code will still be retained in the ECT ECU memory until canceled out.
- There is no warning for diagnostic 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 transmission will not up-shift from first gear, regardless of the vehicle speed.

### Trouble No. 1      Blinking overdrive indicator light (while driving)



Trouble No. 2 No shifting

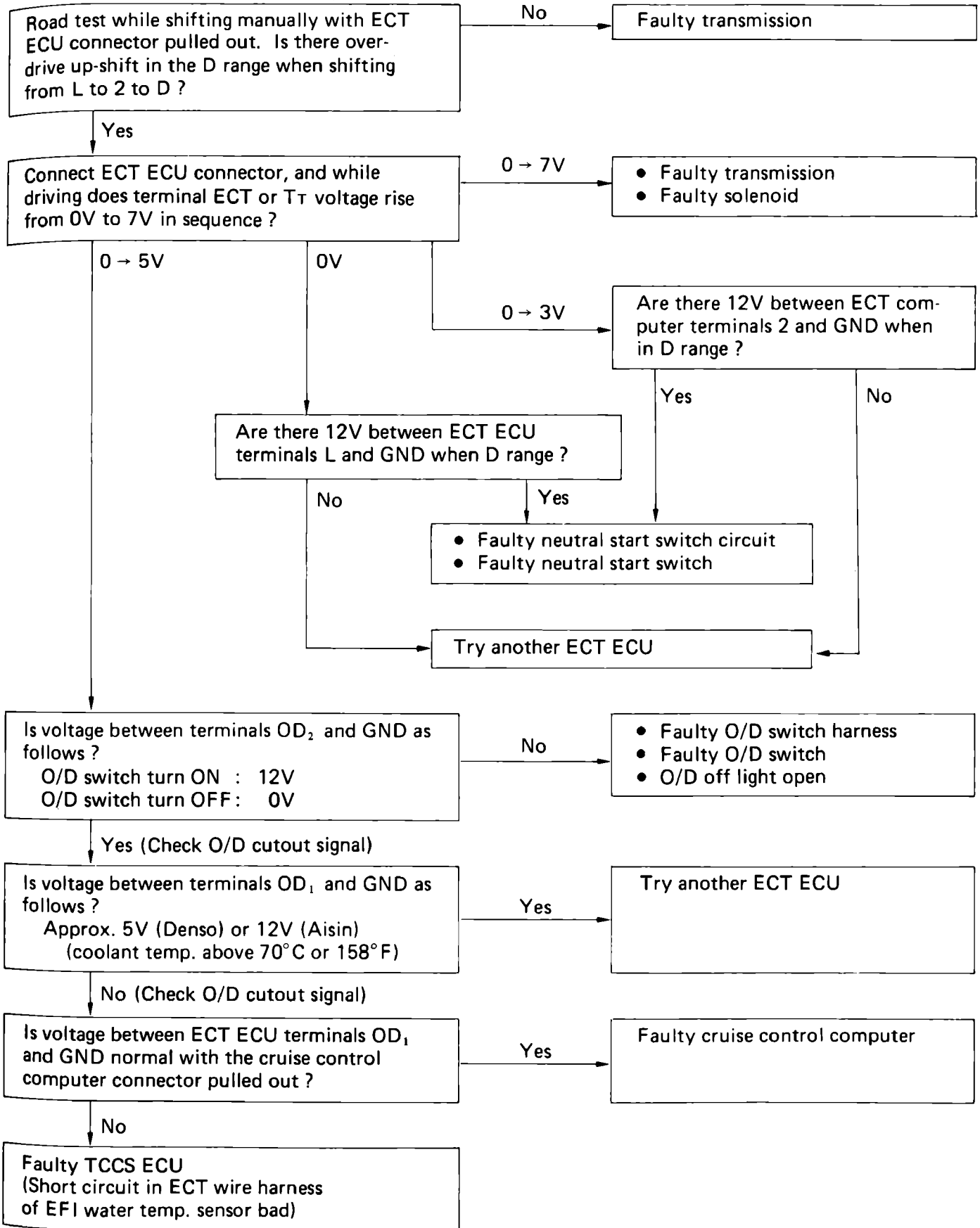




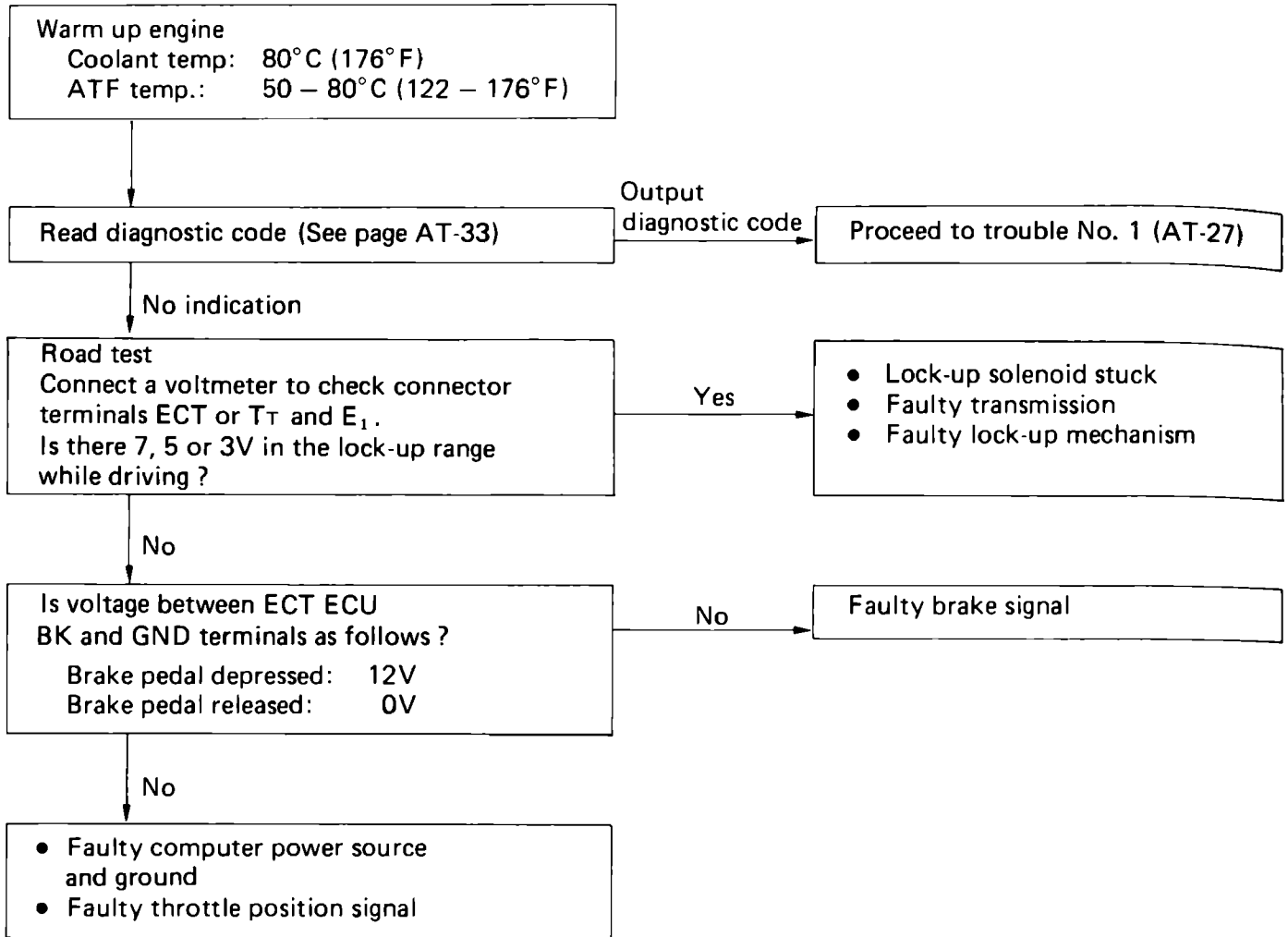
**Trouble No. 3 Shift point too high or too low**



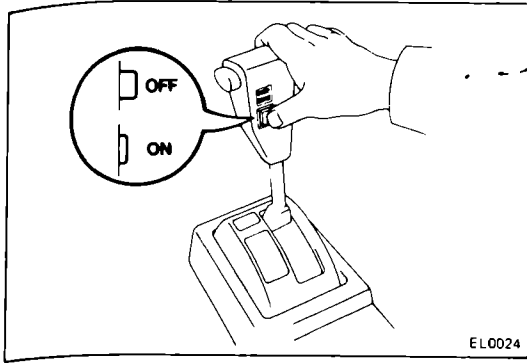
**Trouble No. 4 No up-shift to overdrive (After warm-up)**



**Trouble No. 5 No lock-up (After warm-up)**





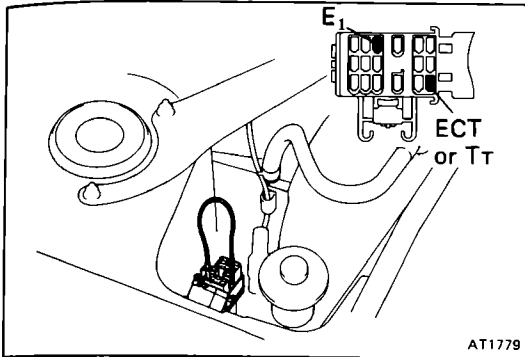


## READ OF DIAGNOSTIC CODE

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

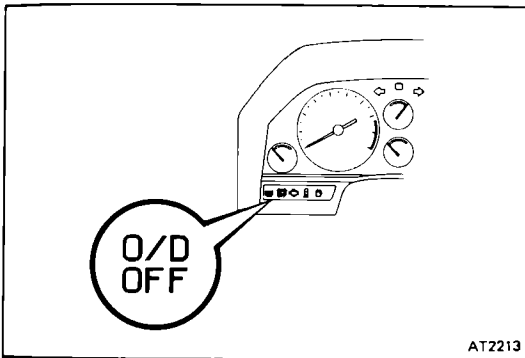
Do not start the engine.

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



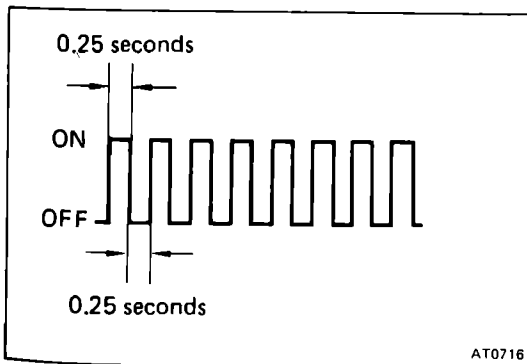
### 2. OUTPUT DIAGNOSTIC CODE

Using a service wire, connect the check connector terminals ECT or T<sub>1</sub> and E<sub>1</sub>.

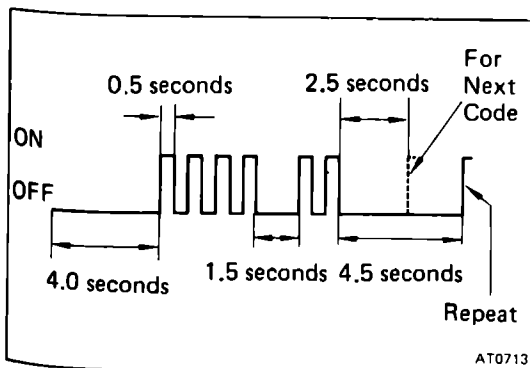


### 3. READ DIAGNOSTIC CODE

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



- (a) If the system is operating normally, the light will blink 2 times per second.








- (b) In the event of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after a 1.5 second pause, the second number of the two digit diagnostic code. If there are two or more codes, there will be a 2.5 second pause between each.

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

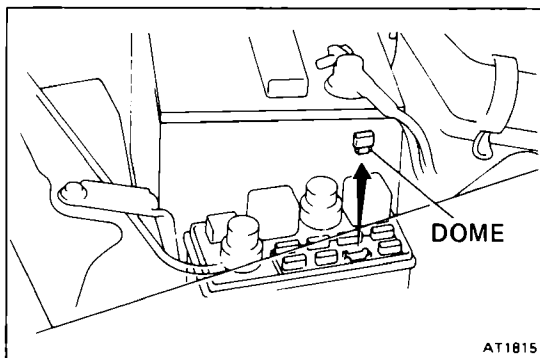
- (c) Remove the service wire from the check connector terminals T<sub>T</sub> and E<sub>1</sub>.

### Diagnostic Code

Code No.	Light Pattern	Diagnosis System
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

NOTE: If codes 62, 63, 64 appear, there is an electrical malfunction in the solenoid.

Causes due to mechanical failure, such as a stuck switch, will not appear.



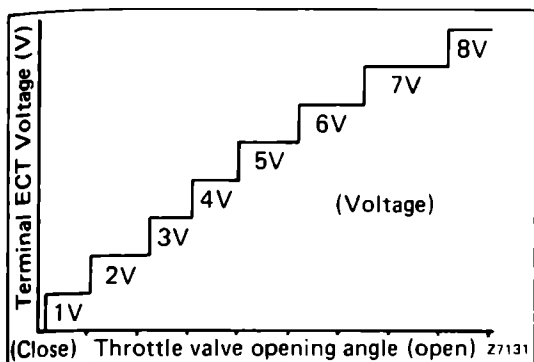
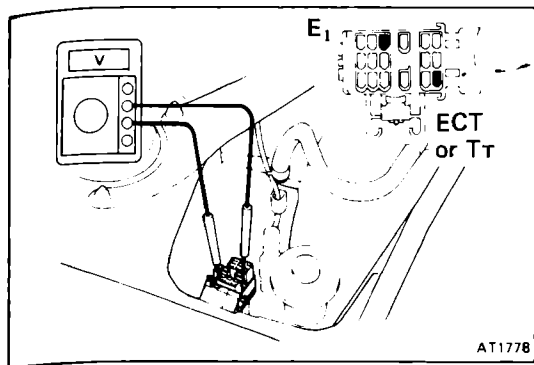
### CANCEL OUT DIAGNOSTIC CODE

- After repair of the trouble area, the diagnostic code retained in memory by the ECT ECU must be canceled by removing the fuse DOME (20A) 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.

NOTE:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case, other memory systems (clock, radio ETR, etc.) will also be canceled out.
- The diagnostic code can also be 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.

- After cancellation, perform a road test to confirm that a “normal code” is now read on the O/D “OFF” light.



## INSPECTION OF TERMINAL T<sub>τ</sub> VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL
  - (a) Turn the ignition switch to ON. Do not start the engine.
  - (b) Connect a voltmeter to the terminals ECT or T<sub>τ</sub> and E<sub>1</sub> of the check connector.

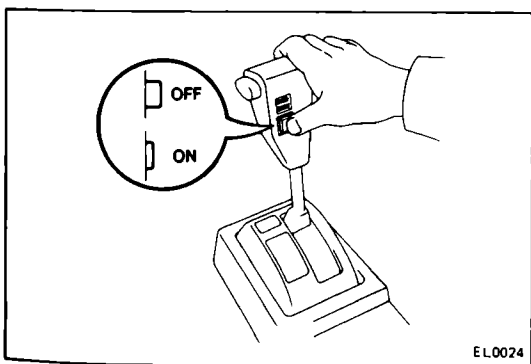
- (c) While slowly depressing the accelerator pedal, check that terminal ECT or T<sub>τ</sub> voltage rises in sequentially.

If the voltage is in proportion to the throttle opening angle and does not change, there is a malfunction with the throttle position sensor or circuit.

## 2. INSPECT BRAKE SIGNAL AND PKB SIGNAL

- (a) Depress the accelerator pedal until the terminal ECT or T<sub>τ</sub> indicates 8V.
- (b) Depress the brake pedal and check the voltage reading from the terminal ECT or T<sub>τ</sub>.
  - Brake pedal depressed . . . . . 0V
  - Brake pedal released . . . . . 8V
- (c) Pull the parking brake lever and check the voltage reading from the terminal ECT or T<sub>τ</sub>.
  - Pull PKB lever . . . . . 0V
  - Released PKB lever . . . . . 8V

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



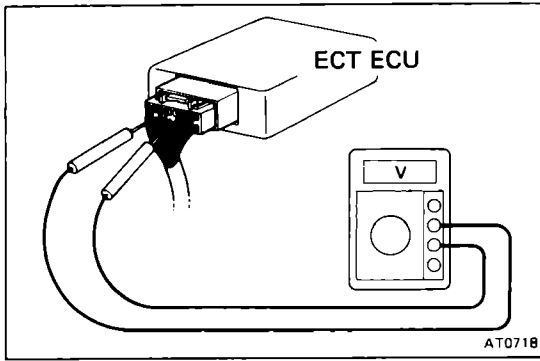
## 3. INSPECT EACH UP SHIFT POSITION

- (a) Warm up the engine.
 

**Coolant temperature: 80°C (176°F)**
- (b) Turn the O/D switch to "ON".
- (c) Place the pattern select switch in "Normal" and the shift selector into the D range.
- (d) During a road test (above 10 km/h or 6 mph) check that voltage at the terminal ECT or T<sub>τ</sub> is as indicated below for each up-shift position.
- (e) If the voltage rises from 0V to 7V in the sequence shown, the control system is okay.
- (f) The voltage could rise anywhere between 0V – 8V before the vehicle reaches 10 km/h (6 mph), the voltmeter indicates the current gear.

NOTE: Determine the gear position by a light shock or change in engine rpm when shifting.

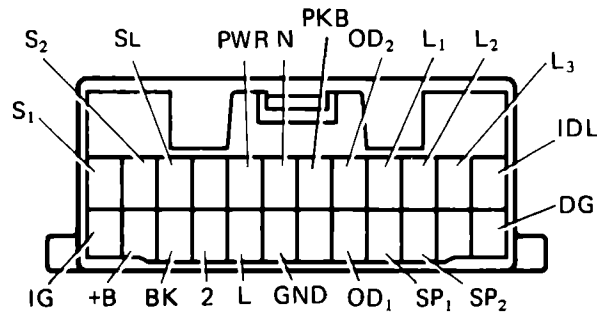
Terminal ECT (V)	Gear position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	OD
7	OD Lock-up



## INSPECTION OF ELECTRONIC CONTROL COMPONENTS

### 1. INSPECT VOLTAGE OF ECT ECU CONNECTOR

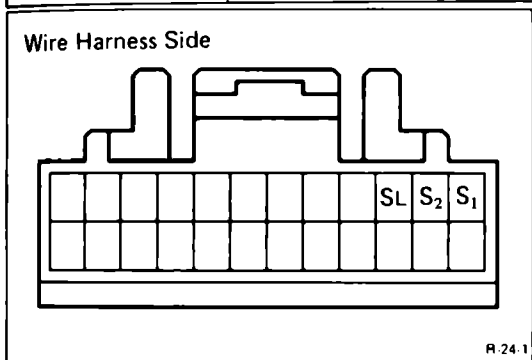
- (a) Remove the center cluster.
- (b) Turn on the ignition switch.
- (c) Measure the voltage at each terminal.



R-24-2

Terminal	Measuring condition	Voltage (V)	
		DENSO type computer	AISIN type computer
L <sub>1</sub> - GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0	12 to 0
	Throttle valve fully open	0	←
L <sub>2</sub> - GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0 to 5	12 to 0 to 12
	Throttle valve fully open	5	12
L <sub>3</sub> - GND	Throttle valve fully closed	5	12
	Throttle valve fully closed to fully open	5 to 0 to 5 to 0 to 5	12 to 0 to 12 to 0 to 12
	Throttle valve fully open	5	12
IDL - GND	Throttle valve fully closed	0	←
	Throttle valve opening above 1.5°	12	←
SP <sub>1</sub> - GND	Standing still	5 or 0	12 or 0
	Vehicle moving	2.5	6
BK - GND	When brake pedal is depressed	12	←
	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	←

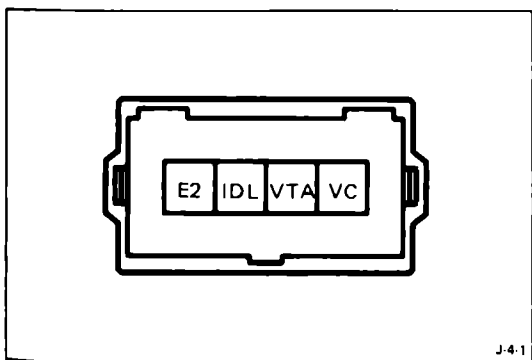
Terminal	Measuring condition	Voltage (V)	
		DENSO type computer	AISIN type computer
S <sub>1</sub> – GND	–	12	←
S <sub>2</sub> , SL – GND	–	0	←
OD <sub>1</sub> – GND	Coolant temp. below 70°C (158°F)	0	←
	Coolant temp. above 70°C (158°F)	5	12
OD <sub>2</sub> – GND	OD main switch turned ON	12	←
	OD main switch turned OFF	0	←
IG – GND	Standing still	12	←
SP <sub>2</sub> – GND	Standing still	5 or 0	←
	Vehicle moving	4	←
PWR – GND	PWR pattern	12	←
	NORM pattern	0 to 2	←
+B – GND	–	12	←
PKB – GND	Engine running, PKB lever pulled	0	←
	Engine running, PKB lever released	12	←



**2. INSPECT SOLENOID**

- (a) Disconnect the connector from the ECT ECU.
- (b) Measure the resistance between S<sub>1</sub>, S<sub>2</sub>, SL and ground.  
**STD: 11 – 15Ω**
- (c) Apply battery voltage to the solenoid.  
Check that an operation noise can be heard from the solenoid.

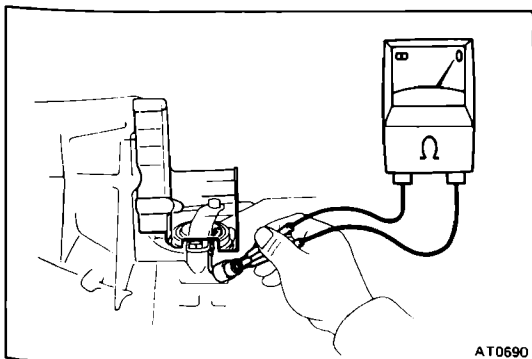
NOTE: If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.



**3. INSPECT THROTTLE POSITION SENSOR**

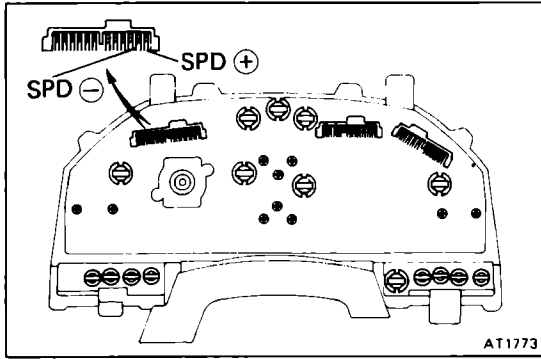
Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	Resistance (kΩ)
IDL – E <sub>2</sub>	Fully closed	0 – 0.1
	Open	Infinity
Vc – E <sub>2</sub>	–	3 – 7
VTA – E <sub>2</sub>	Fully closed	0.2 – 0.8
	Fully open	3.3 – 10

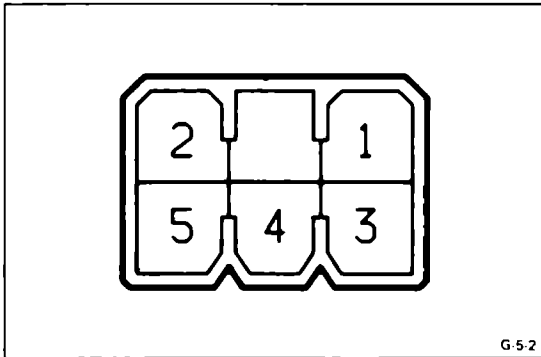


**4. INSPECT NO. 2 SPEED SENSOR**

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



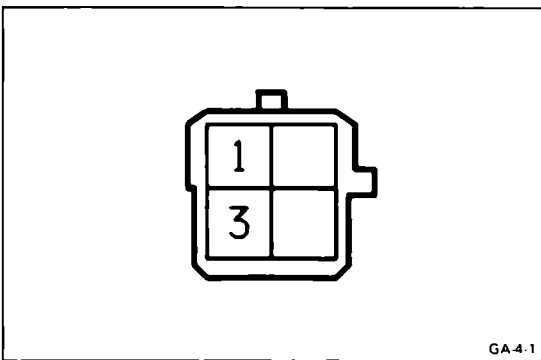
5. **INSPECT NO. 1 SPEED SENSOR IN COMBINATION METER (ANALOG METER)**
  - (a) Remove the combination meter.
  - (b) Connect an ohmmeter between terminals SPD + and SPD -.
  - (c) Revolve the meter shaft and check that the meter needle repeatedly deflects from 0  $\Omega$  to  $\infty \Omega$ .



6. **INSPECT PATTERN SELECTION SWITCH**  
 Inspect that there is continuity between 2 and each terminal.  
 NOTE: As there are diodes inside, be careful of the tester probe polarity.

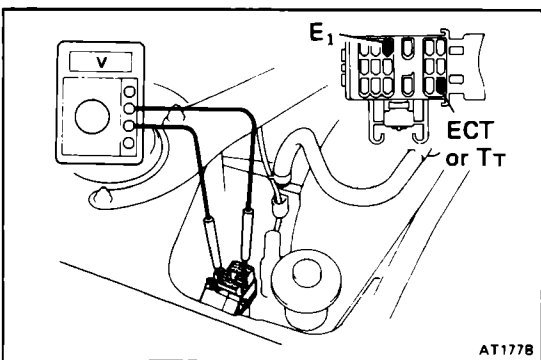
Terminal \ Pattern	5	4	3
NORM	○	○	
PWR	○	○	○

7. **INSPECT BRAKE SIGNAL**  
 Check that the brake light comes on when the brake pedal is depressed.
8. **INSPECT NEUTRAL START SWITCH**  
 (See page AT-41)



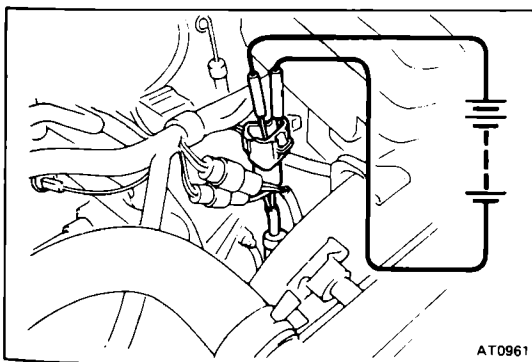
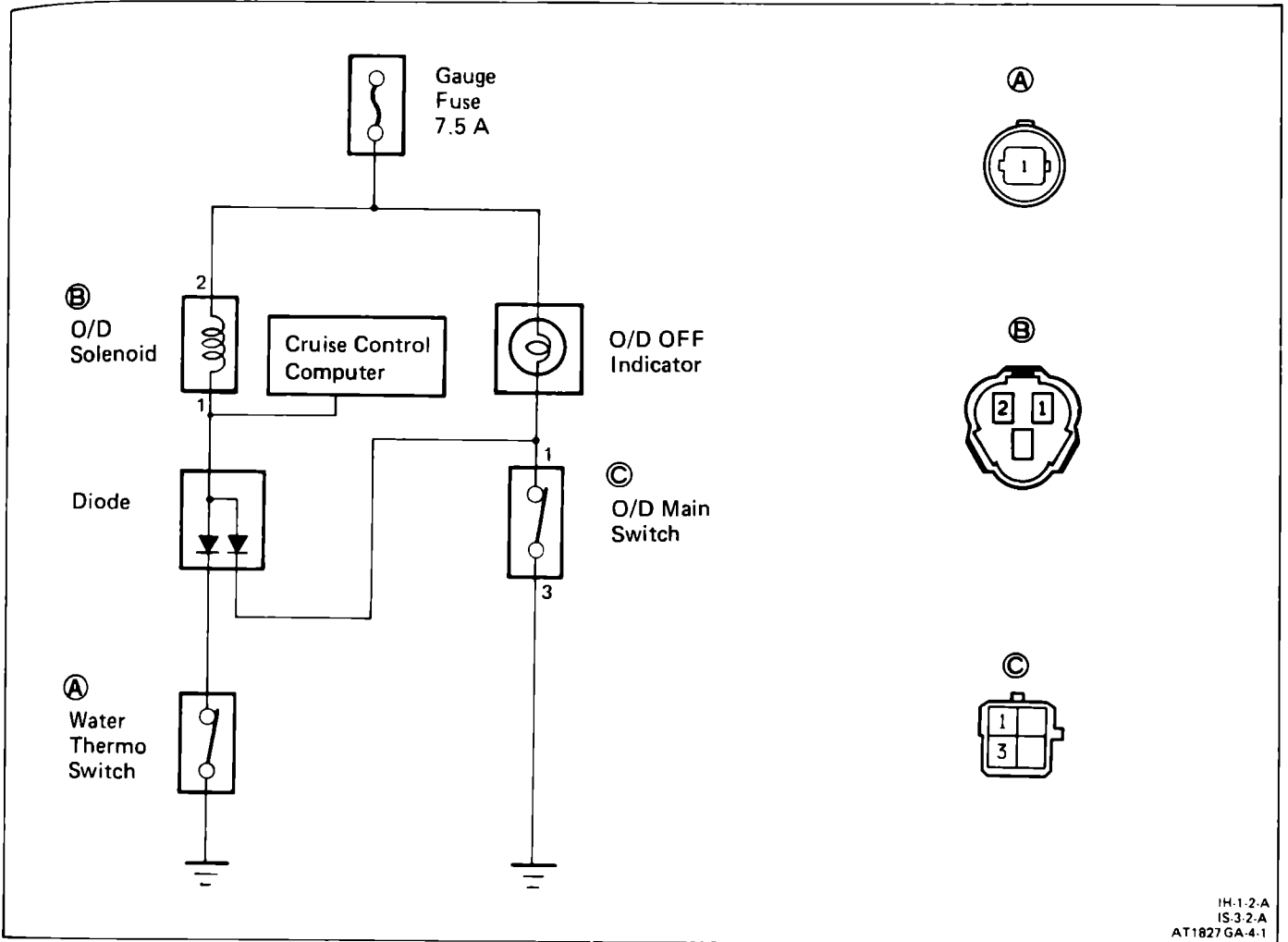
9. **INSPECT O/D SWITCH**  
 Inspect that there is continuity between terminals 1 and 3.

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



10. **INSPECT LOCK-UP MECHANISM**
  - (a) Warm up the coolant and ATF.
  - (b) Connect a voltmeter to the terminal ECT or T<sub>t</sub> and E<sub>1</sub>.
  - (c) Select the normal pattern.
  - (d) Drive at around 70 km/h (43 mph) until 7, 5 or 3V appears on the voltmeter (this is the lock-up range).
  - (e) Depress the accelerator pedal and read the tachometer. If there is a big jump in engine rpm there is no lock-up.

# Overdrive Control (A140L/3S-FE) CIRCUIT

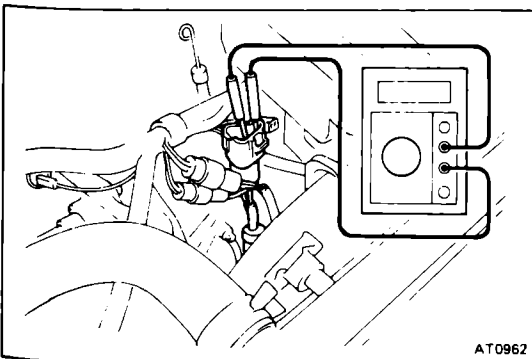


## INSPECTION OF ELECTRIC CONTROL COMPONENTS

### 1. INSPECT O/D SOLENOID

- (a) Disconnect the solenoid connector.
- (b) Apply voltage between terminals 1 and 2.

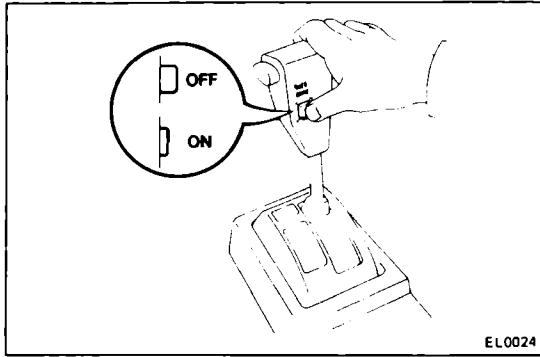
At this time, confirm that a solenoid operation sound is heard.



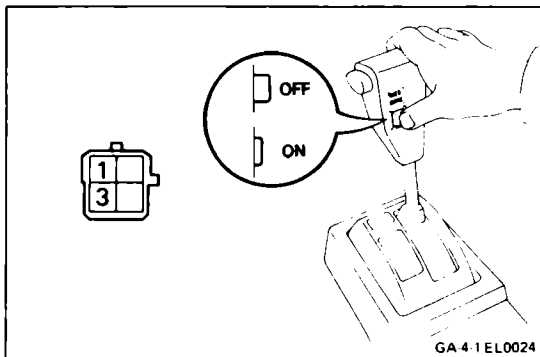
- (c) Using an ohmmeter, measure the solenoid coil resistance between terminals 1 and 2.

**Resistance:  $13 \pm 2 \Omega$**

- (d) Connect the solenoid connector.

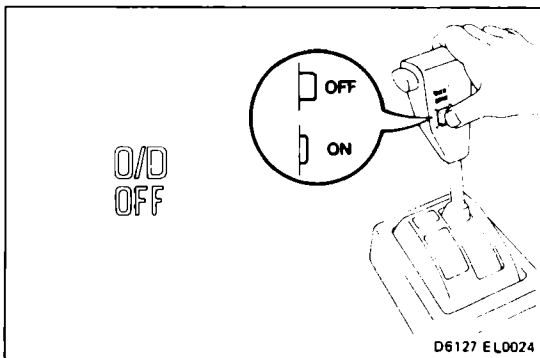


- (e) Turn on the ignition switch and disconnect the thermo switch wire.
- (f) Confirm that the operation sounds of the solenoid can be heard if the O/D main switch is repeatedly turn on and off.
- (g) Turn off the ignition switch and connect the thermo switch wire.



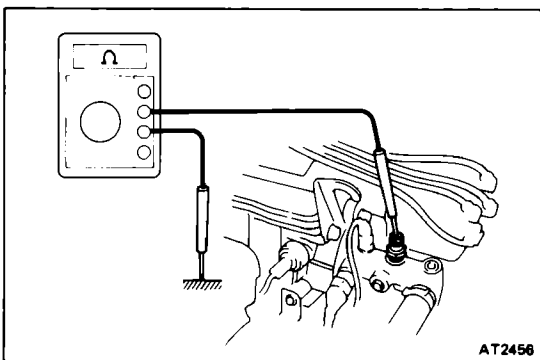
## 2. INSPECT O/D MAIN SWITCH

- (a) Remove the console box.
- (b) Using an ohmmeter, measure the resistance between terminals 1 and 3.
  - Switch ON – Resistance:  $\infty \Omega$
  - Switch OFF – Resistance:  $0 \Omega$



## 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 THERMO SWITCH

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

### Coolant temperature:

- Below 43° C (109° F)  $0 \Omega$
- Above 55° C (131° F)  $\infty \Omega$

- (c) Connect the thermo switch connector.





# OPERATING MECHANISM FOR EACH GEAR (A140E/3S-GE)

## 1. TRANSMISSION SYSTEM

○ ..... Operating

Shift Lever position	Gear position	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	B <sub>0</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	F <sub>0</sub>	F <sub>1</sub>	F <sub>2</sub>
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	2nd	○	○			○	○		○	○	

## 2. SOLENOID SYSTEM

Possible gear positions in accordance with solenoid operating conditions.

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

**OPERATING MECHANISM FOR EACH GEAR (A140L/3S-FE)**

○ ..... Operating

Shift Lever position	Gear position	C <sub>0</sub>	C <sub>1</sub>	C <sub>2</sub>	B <sub>0</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	F <sub>0</sub>	F <sub>1</sub>	F <sub>2</sub>
P	Parking	○									
R	Reverse	○		○				○			
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
L	1st	○	○					○	○		○
	*2nd	○	○			○	○		○	○	

\* Down shift only in L range, 2nd gear – no up-shift.

## AUTOMATIC SHIFT SCHEDULE (A140E/3S-GE)

		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	49–55 (30–34)	96–106 (60–66)	150–160 (93–99)	33–38 (21–24)	20–24 (12–15)	142–152 (88–94)	91–100 (57–62)	41–46 (25–29)
	PWR	60–66 (37–41)	110–120 (68–75)	177–188 (110–117)	41–46 (25–29)	20–24 (12–15)	169–180 (105–112)	104–114 (65–71)	41–46 (25–29)
2 range	NORM PWR	60–66 (37–41)	–	–	–	–	–	–	41–46 (25–29)
L range	NORM PWR	–	–	–	–	–	–	–	49–54 (30–34)

		Throttle valve opening 5% km/h (mph)					
		Lock-up ON			Lock-up OFF		
		2nd	3rd	O/D	2nd	3rd	O/D
D range	NORM	–	*57–63 (35–39)	54–60 (34–37)	–	*52–57 (32–35)	52–57 (32–35)
	PWR	–	*68–74 (42–46)	68–74 (42–46)	–	*63–68 (39–42)	63–68 (39–42)

\* O/D main switch OFF

### NOTE:

- (1) In the 2 and L ranges, all 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/3S-FE)

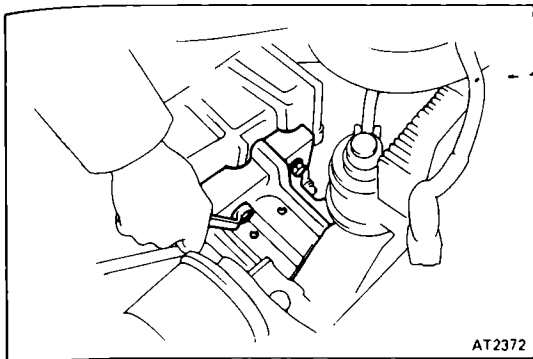
Differential gear ratio	D range (throttle valve fully open)								L range
	1 → 2	2 → 3	3 → O/D *1	Lock-up ON *2	Lock-up OFF *3	O/D → 3 *4	3 → 2	2 → 1	2 → 1
3.736	48–64 (30–40)	93–110 (58–68)	–	–	–	–	89–108 (55–67)	37–48 (23–30)	38–51 (24–32)

\*1 3 → O/D up-shift point with closed accelerator pedal is at 25 – 36 km/h (16 – 22 mph).

\*2 Lock-up "ON" point with closed accelerator pedal is at 60 – 69 km/h (37 – 43 mph).

\*3 Lock-up "OFF" point with closed accelerator pedal is at 56 – 65 km/h (35 – 40 mph).

\*4 O/D → 3 down-shift is possible up to maximum speed.

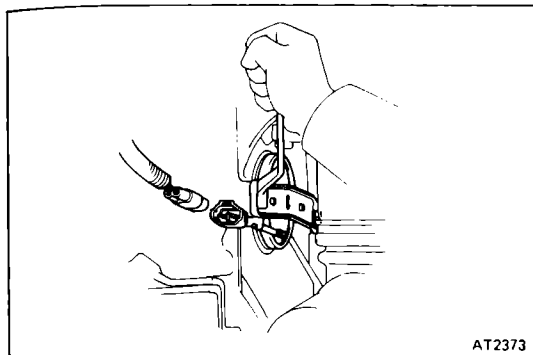


AT2372

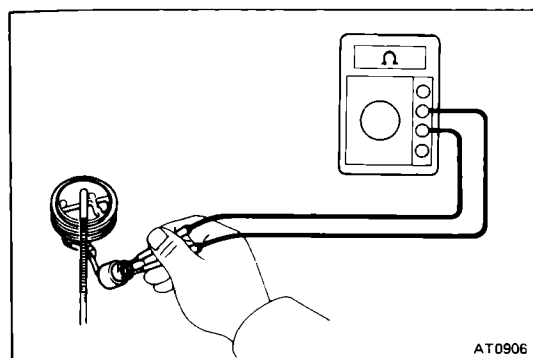
## ON-VEHICLE REPAIR

### REMOVAL OF SPEED SENSOR (A140E/3S-GE)

1. REMOVE TRANSMISSION CASE PROTECTOR
2. DISCONNECT SPEED SENSOR CONNECTOR
3. REMOVE BRACKET
4. REMOVE SPEED SENSOR AND O-RING



AT2373

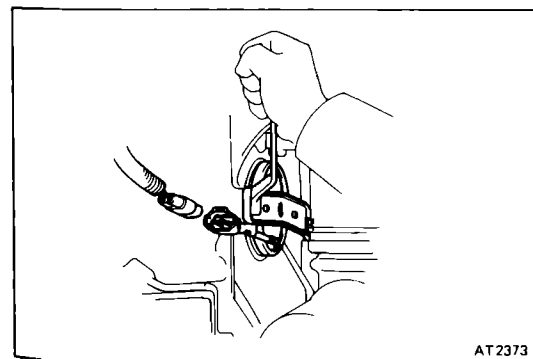


AT0906

### INSPECTION OF SPEED SENSOR

#### INSPECT SPEED SENSOR

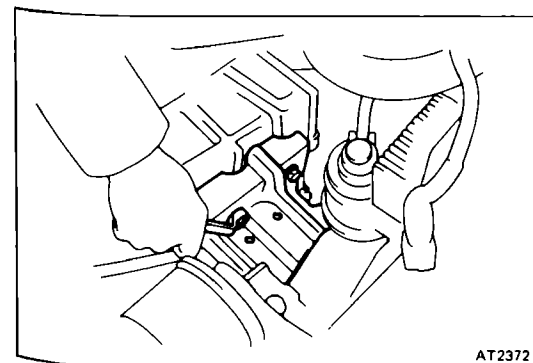
Connect an ohmmeter to the speed sensor and check that the meter deflects when the sensor is repeatedly brought close to a magnet and removed from it.



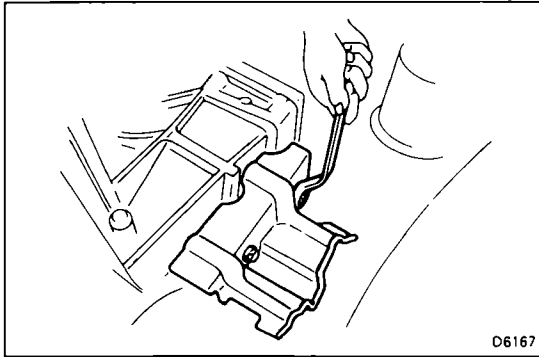
AT2373

### INSTALLATION OF SPEED SENSOR

1. 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 TRANSMISSION CASE PROTECTOR

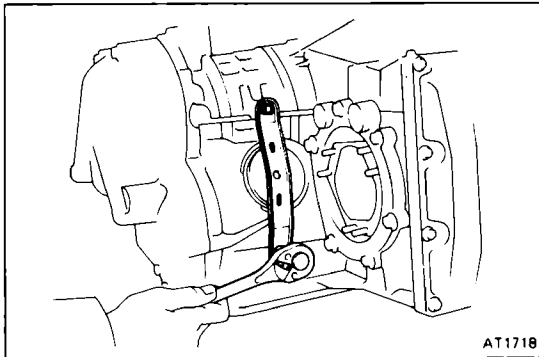


AT2372

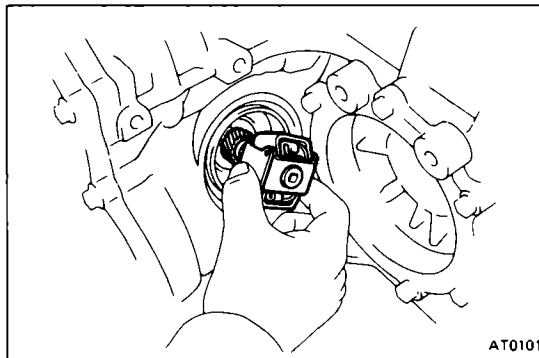


## REMOVAL OF GOVERNOR VALVE (A140L/3S-FE)

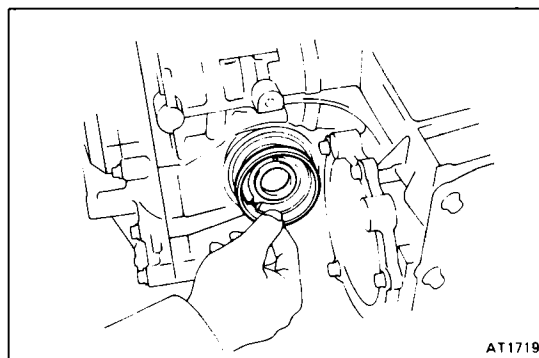
1. REMOVE TRANSAXLE PROTECTOR
2. REMOVE LH DRIVE SHAFT (See page FA-15)



3. REMOVE BOLTS AND BRACKET
4. REMOVE GOVERNOR COVER AND O-RING



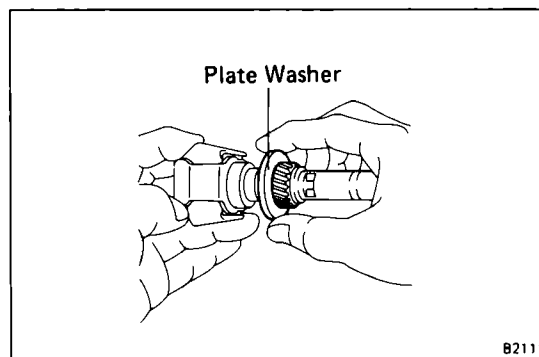
5. REMOVE GOVERNOR BODY, THRUST WASHER AND PLATE WASHER



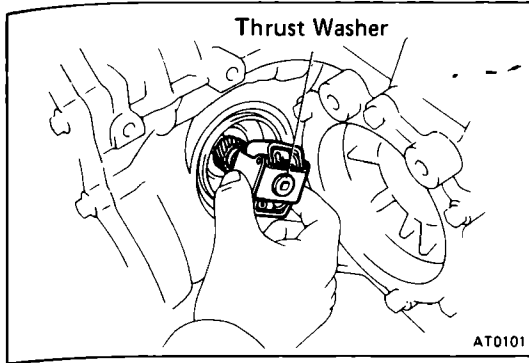
6. REMOVE GOVERNOR BODY ADAPTOR

## INSTALLATION OF GOVERNOR VALVE (A140L/3S-FE)

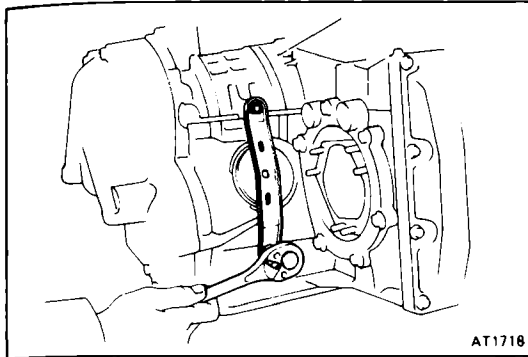
1. INSTALL GOVERNOR BODY ADAPTOR



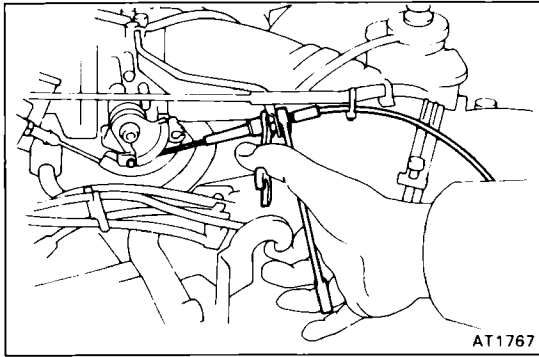
2. INSTALL GOVERNOR BODY, PLATE WASHER AND THRUST WASHER
  - (a) Install the thrust washer onto the governor body.
  - (b) Install the washer into the governor body.



(c) Install the governor body to the automatic transaxle.



3. **INSTALL GOVERNOR COVER AND NEW O-RING**
4. **INSTALL BRACKET AND BOLTS**
5. **INSTALL TRANSAXLE PROTECTOR**
6. **INSTALL LH DRIVE SHAFT (See page FA-29)**

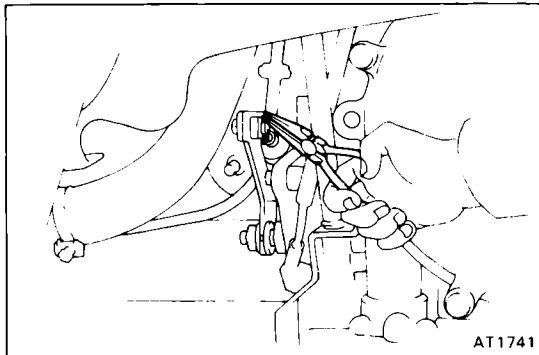


AT1767

## REMOVAL OF THROTTLE CABLE

### 1. DISCONNECT THROTTLE CABLE

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

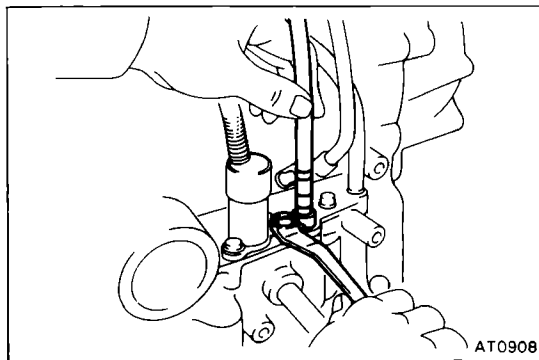


AT1741

### 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.

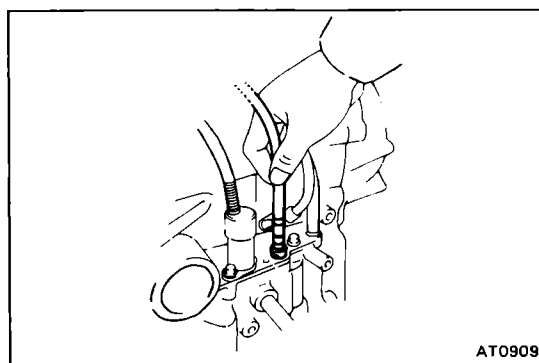
### 3. REMOVE VALVE BODY (See page AT-52)



AT0908

### 4. PULL THROTTLE CABLE OUT OF TRANSMISSION CASE

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



AT0909

## INSTALLATION OF THROTTLE CABLE

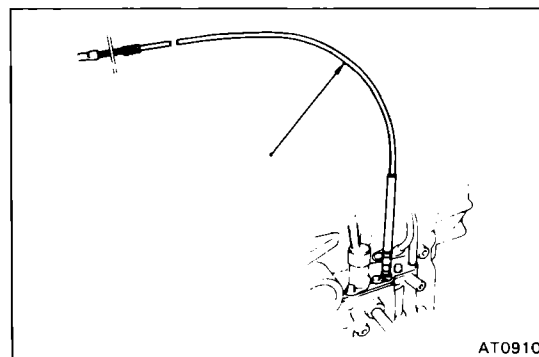
### 1. INSTALL CABLE IN TRANSMISSION CASE

- (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-53)

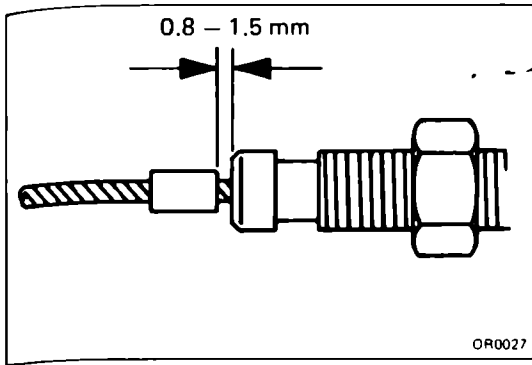
### 3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

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

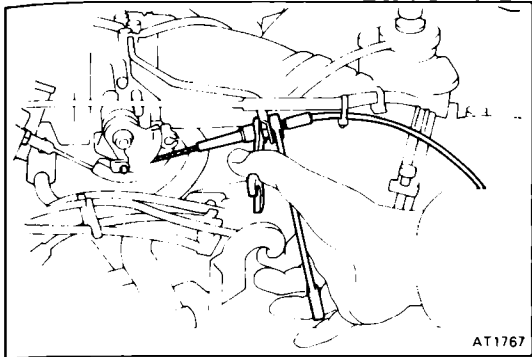


AT0910





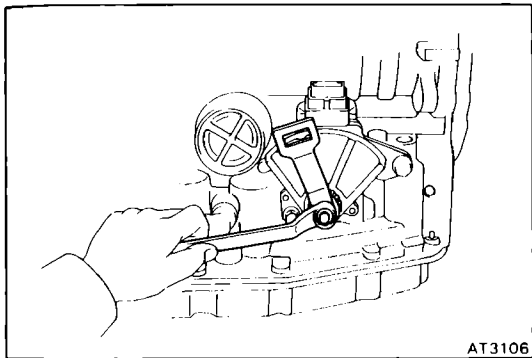
- (b) Pull the inner cable lightly until a slight resistance is felt, and hold it.
- (c) Stake the stopper 0.8 – 1.5 mm (0.031 – 0.059 in.) from the surface of outer cable as shown.



#### 4. CONNECT THROTTLE CABLE

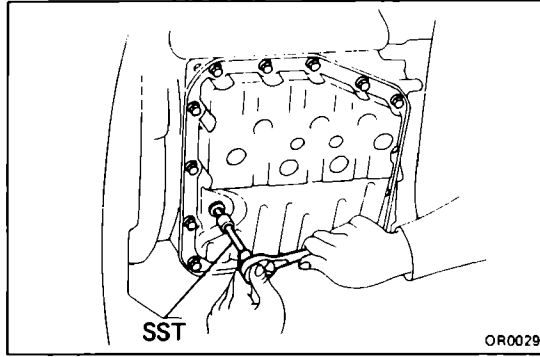
- (a) Connect the cable to the throttle linkage.
- (b) Connect the cable housing to the bracket.

#### 5. ADJUST THROTTLE CABLE (See page AT-13)



#### 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-13)
- (d) Connect the transmission control cable.



## REMOVAL OF VALVE BODY

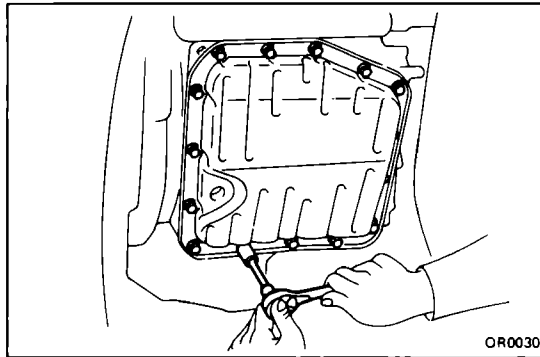
### 1. CLEAN TRANSMISSION EXTERIOR

To help prevent contamination, clean the exterior of the transmission.

### 2. DRAIN TRANSMISSION FLUID

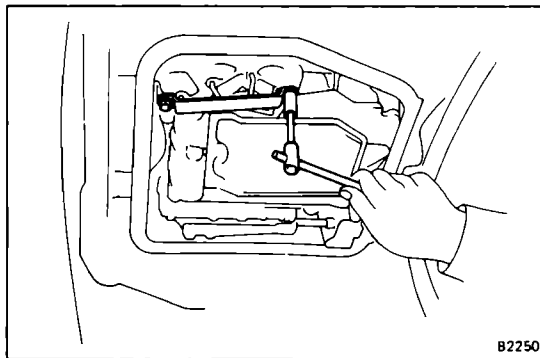
Remove the drain plug with SST and drain the fluid into a suitable container.

SST 09043-38100

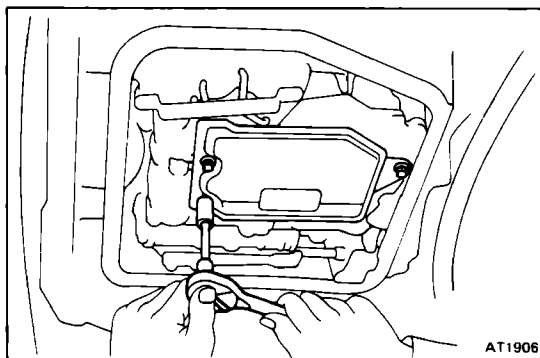


### 3. REMOVE OIL PAN, AND GASKET

**CAUTION:** Some fluid will remain in the oil pan. Remove all pan bolts, and carefully remove the pan assembly. Discard the gasket.



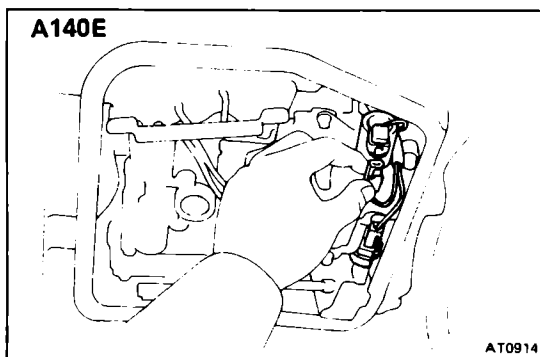
### 4. REMOVE BOLTS AND APPLY TUBE BRACKET



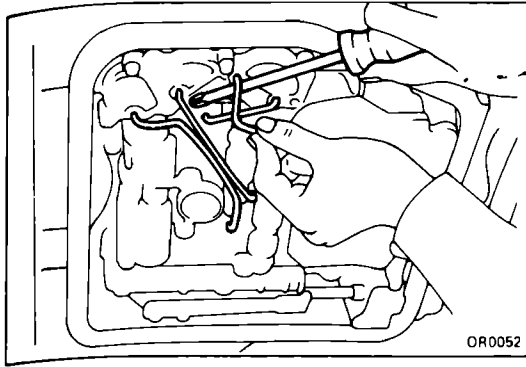
### 5. REMOVE OIL STRAINER

Remove the three bolts, and the oil strainer.

**CAUTION:** Be careful as some oil will come out with the filter.

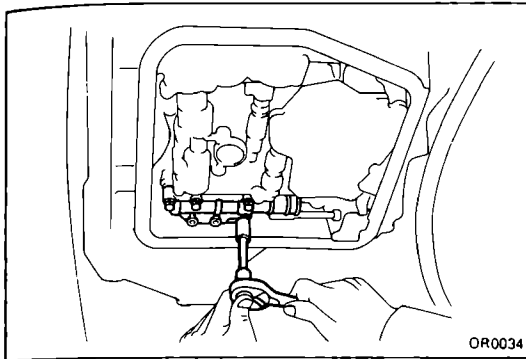


### 6. DISCONNECT SOLENOID CONNECTORS (A140E)



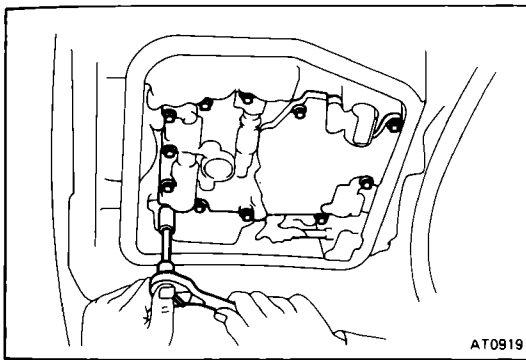
**7. REMOVE OIL TUBES**

Pry up both tube ends with a large screwdriver and remove the tubes.



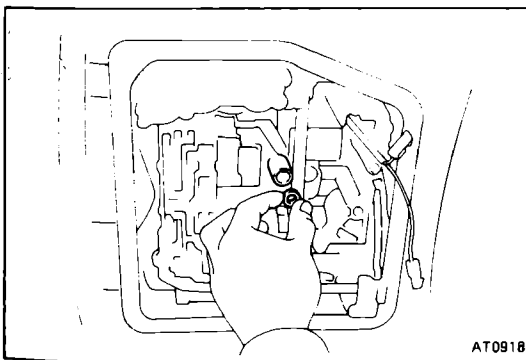
**8. REMOVE MANUAL DETENT SPRING**

**9. REMOVE MANUAL VALVE AND VALVE BODY**



**10. REMOVE VALVE BODY**

- (a) (A140E)  
Remove the twelve bolts.
- (b) (A140L)  
Remove the fourteen bolts.
- (c) Disconnect the throttle cable from the cam and remove the valve body.



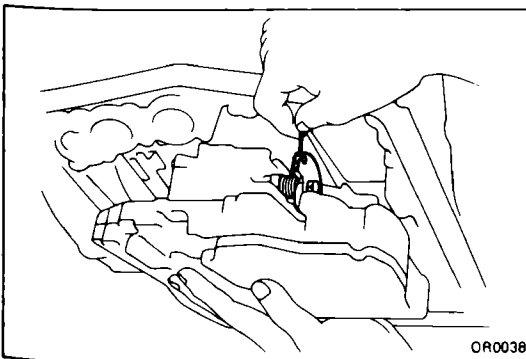
**11. REMOVE SECOND BRAKE APPLY GASKET**

**12. (A140L)  
REMOVE GOVERNOR OIL STRAINER**

**INSTALLATION OF VALVE BODY**

**1. INSTALL NEW SECOND BRAKE APPLY GASKET**

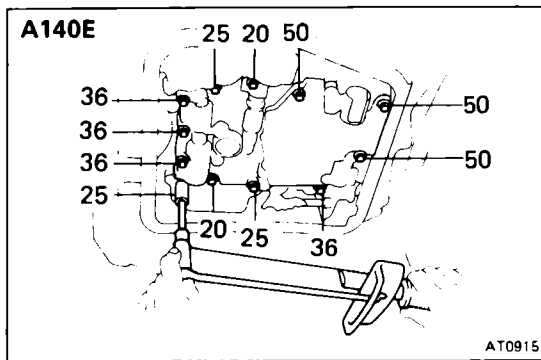
**2. (A140L)  
INSTALL GOVERNOR OIL STRAINER**



**3. PLACE VALVE BODY ON TRANSMISSION**

- (a) While holding the cam down with your hand, slip the cable end into the slot.
- (b) Bring valve body into place.

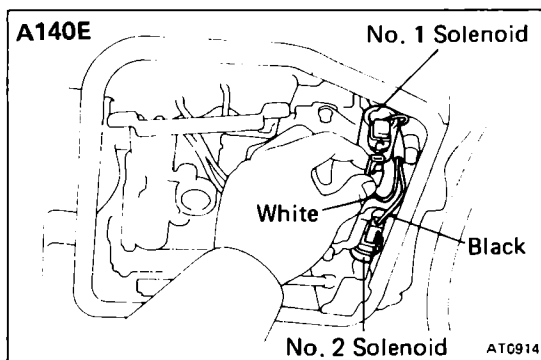
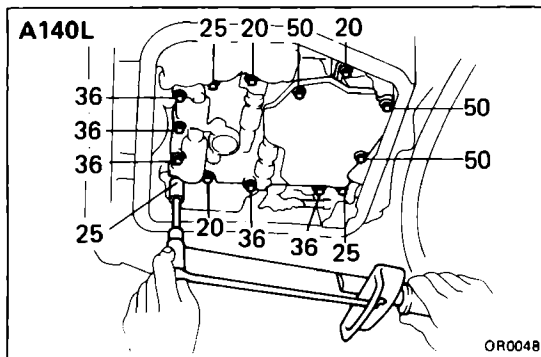
**CAUTION:** Be careful not to entangle the solenoid wire.



#### 4. INSTALL BOLTS IN VALVE BODY

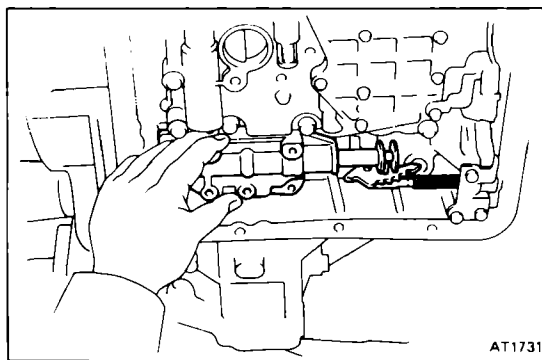
NOTE: Each bolt length (mm) is indicated in the figure. Finger tighten the all bolts first. Then tighten them with a torque wrench.

Torque: 100 kg-cm (7 ft-lb, 10 N-m)



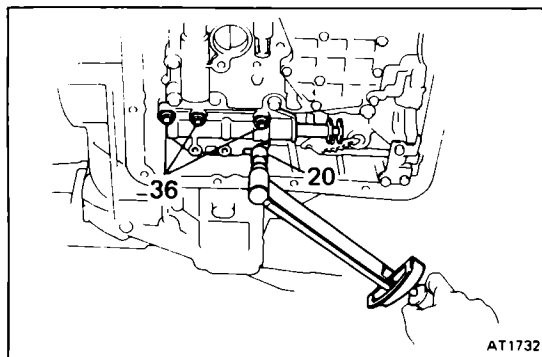
#### 5. (A140E) CONNECT SOLENOID WIRING

- Connect the No. 1 solenoid connector. (white and shorter wire)
- Connect the No. 2 solenoid connector. (black and longer wire)



#### 6. PLACE MANUAL VALVE AND BODY ON TRANSMISSION

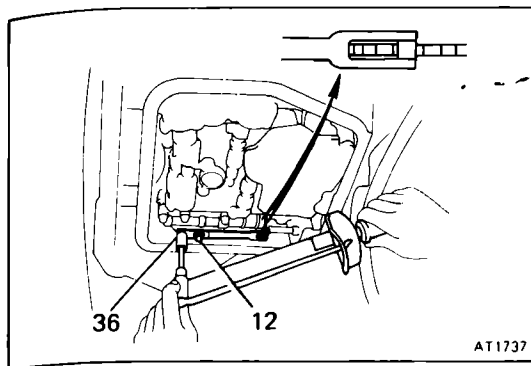
- Align the manual valve with the pin on the manual shift lever.
- Install the manual valve body into place.



- Finger tighten the four bolts first. Tighten them with a torque wrench.

Torque: 100 kg-cm (7 ft-lb, 10 N-m)

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

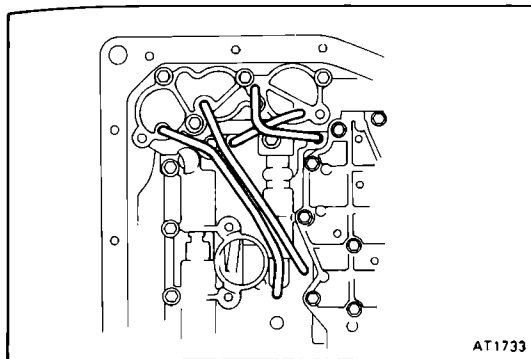


**7. INSTALL DETENT SPRING**

NOTE: Each bolt length (mm) is indicated in the figure.  
 (a) Finger tighten all the bolts first. Then tighten them with a torque wrench.

**Torque: 100 kg-cm (7 ft-lb, 10 N-m)**

(b) Check that the manual valve lever is in contact with the center of the roller at the tip of the detent spring.

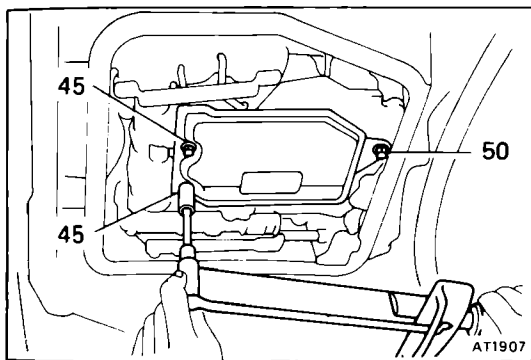


**8. INSTALL OIL TUBES**

Tap the tubes into the positions indicated in the figure with a plastic hammer.

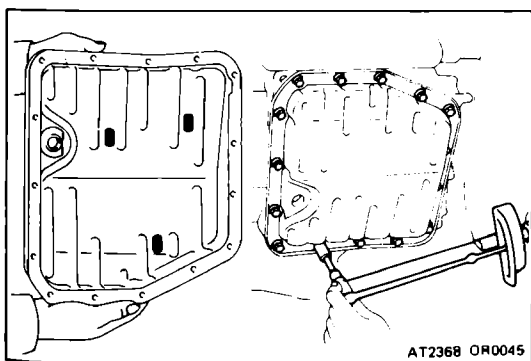
**CAUTION: Be careful not to bend or damage the tubes.**

**9. INSTALL APPLY TUBE BRACKET**



**10. INSTALL OIL STRAINER**

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



**11. INSTALL MAGNETS IN PAN AND INSTALL OIL PAN WITH NEW GASKET**

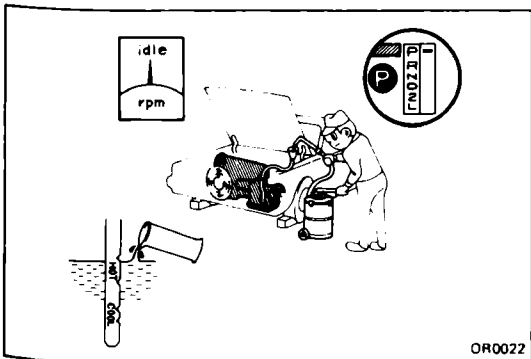
**CAUTION: Make sure that the magnets does not interfere with the oil tubes.**

**Torque: 50 kg-cm (43 in.-lb, 4.9 N·m)**

**12. INSTALL DRAIN PLUG WITH NEW GASKET**

SST 09043-38100

**Torque: 500 kg-cm (36 ft-lb, 49 N-m)**

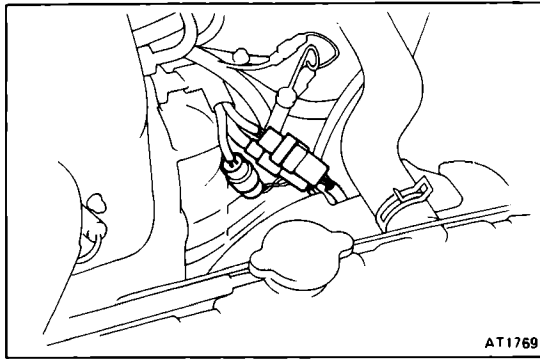


**13. FILL TRANSMISSION WITH ATF**

**CAUTION: Do not overfill.**

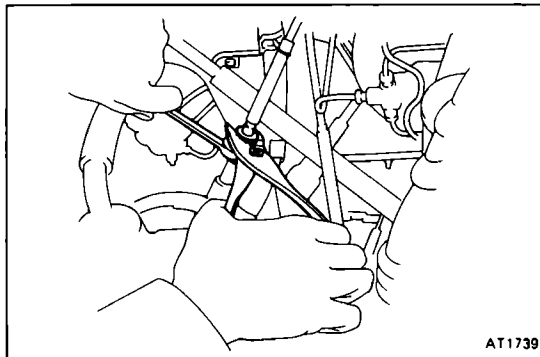
Fluid type: ATF DEXRON® II

**14. CHECK FLUID LEVEL (See page AT-12)**

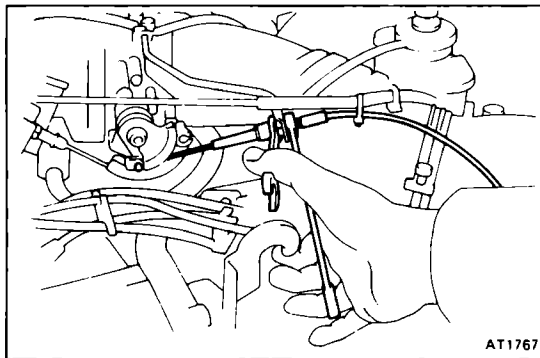


## REMOVAL OF TRANSAXLE

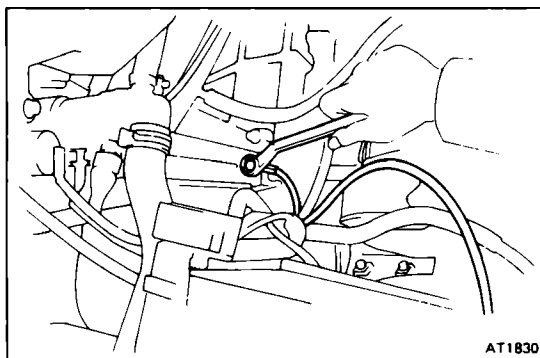
1. DISCONNECT NEGATIVE BATTERY TERMINAL
2. REMOVE AIR FLOW METER
3. DISCONNECT THREE CONNECTORS



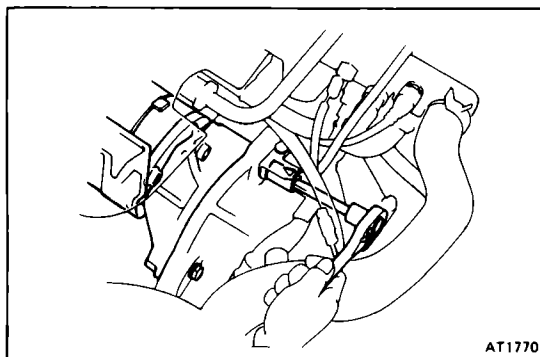
4. DISCONNECT SPEEDOMETER CABLE



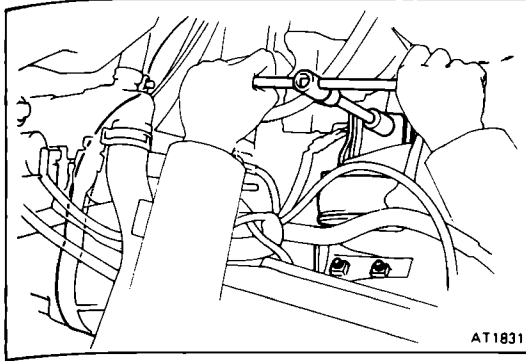
5. DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE AND BRACKET



6. DISCONNECT GROUND STRAP



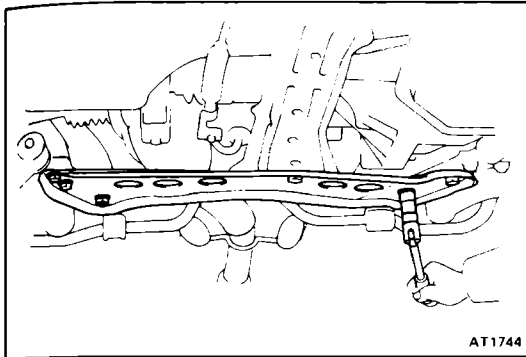
7. REMOVE STARTER MOTOR SET BOLTS
8. REMOVE TWO TRANSMISSION HOUSING SET BOLTS



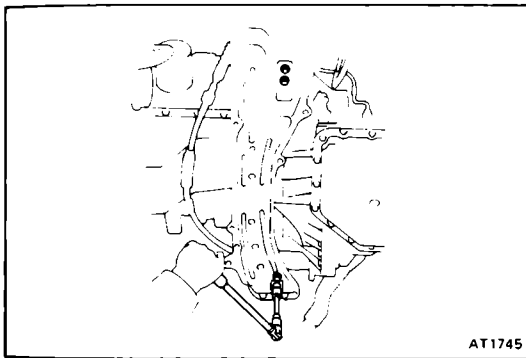
9. REMOVE ENGINE REAR MOUNT INSULATOR BRACKET SET BOLT

10. RAISE VEHICLE AND DRAIN TRANSAXLE

11. REMOVE ENGINE UNDER COVERS

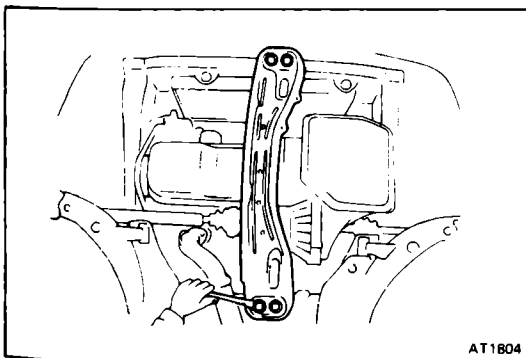


12. REMOVE SUSPENSION LOWER CROSSMEMBER



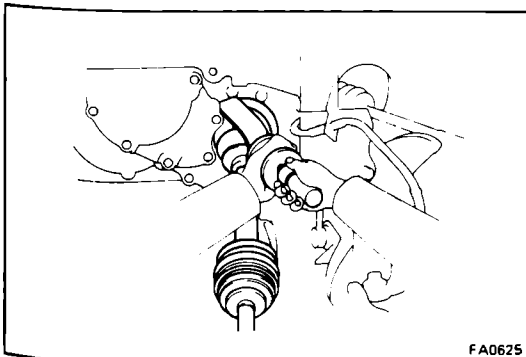
13. DISCONNECT FRONT AND REAR MOUNTING

- (a) Remove the two dust covers from the center member.
- (b) Remove the four bolts.



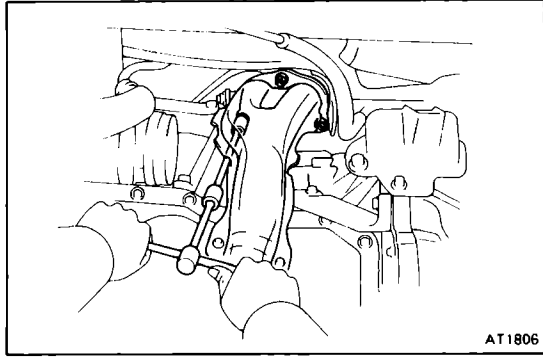
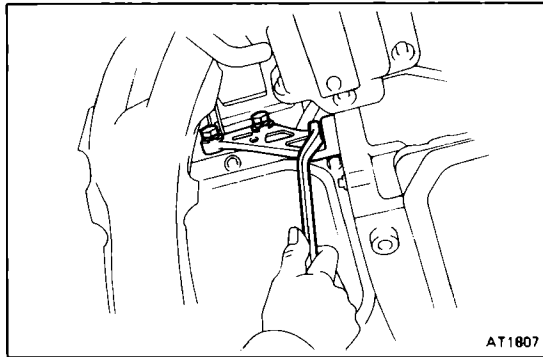
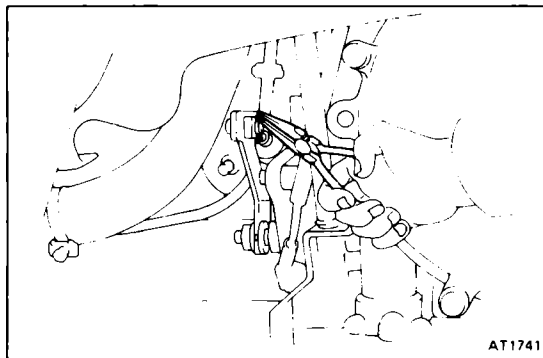
14. REMOVE ENGINE MOUNTING CENTER MEMBER

- (a) Disconnect the two clamps.
- (b) Remove the four bolts and engine mounting center member.

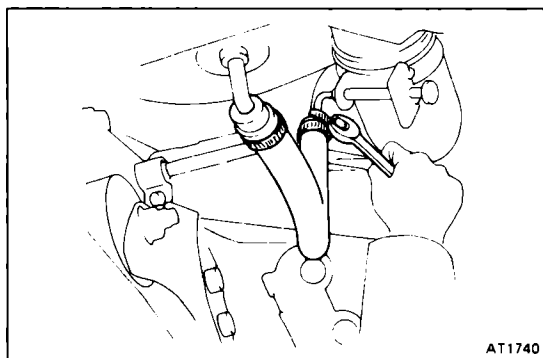
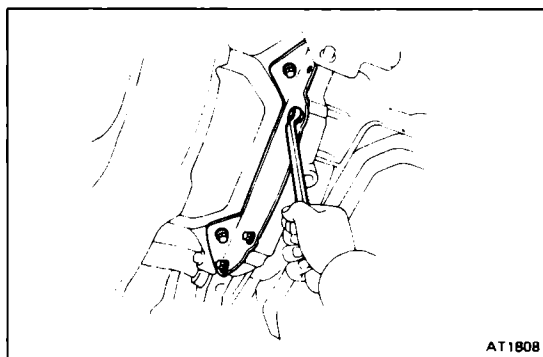


15. REMOVE LH DRIVE SHAFT (See page FA-17)

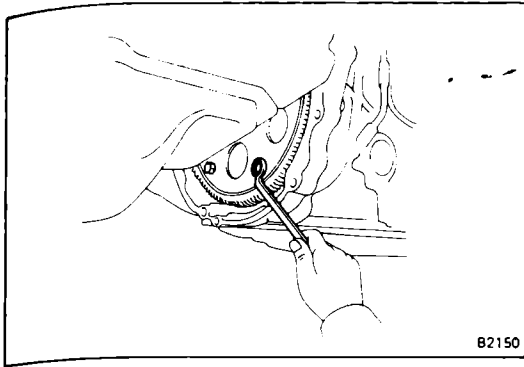
16. DISCONNECT RH DRIVE SHAFT (See page FA-17)

**17. DISCONNECT EXHAUST PIPE FROM MANIFOLD****18. REMOVE STIFFENER PLATE****19. DISCONNECT CONTROL CABLE**

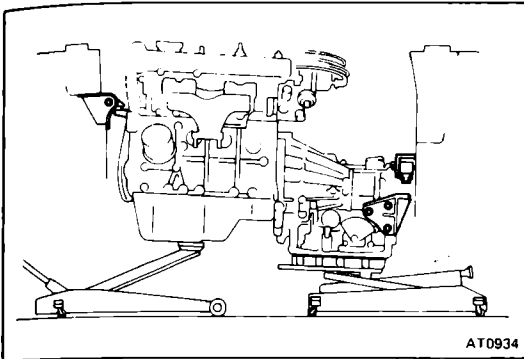
- (a) Remove the clip.
- (b) Remove the retainer.
- (c) Disconnect the control cable from the bracket and remove the control cable bracket.

**20. DISCONNECT OIL COOLER HOSES****21. REMOVE ENGINE REAR END PLATE**

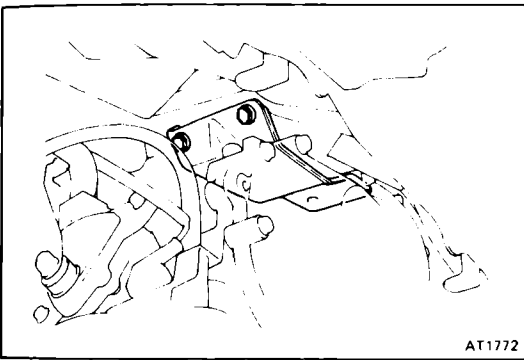


**22. REMOVE TORQUE CONVERTER MOUNTING BOLTS**

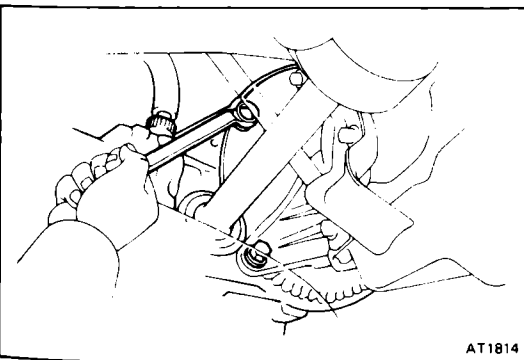
- (a) Turn the crankshaft to gain access to each bolt.
- (b) Hold the crankshaft pulley nut with a wrench, remove the six bolts.

**23. REMOVE ENGINE REAR MOUNTING SET BOLTS**

- (a) Hold the engine and transaxle with two jacks, or a chain block and jack.



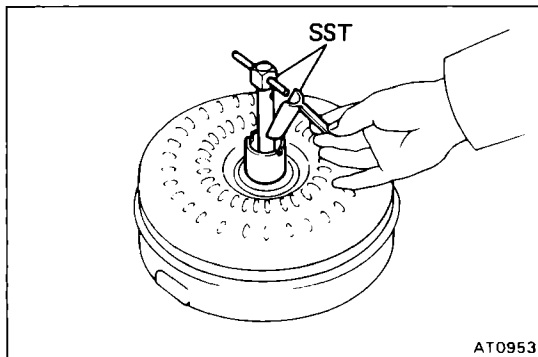
- (b) Remove the two engine rear mounting set bolts.

**24. REMOVE TRANSAXLE MOUNTING BOLTS****25. REMOVE TORQUE CONVERTER FROM TRANSAXLE**

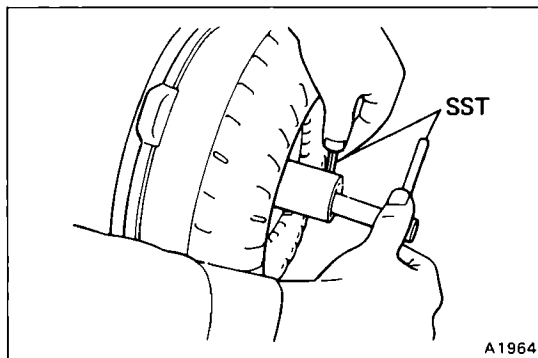
# TORQUE CONVERTER

## CLEAN TORQUE CONVERTER

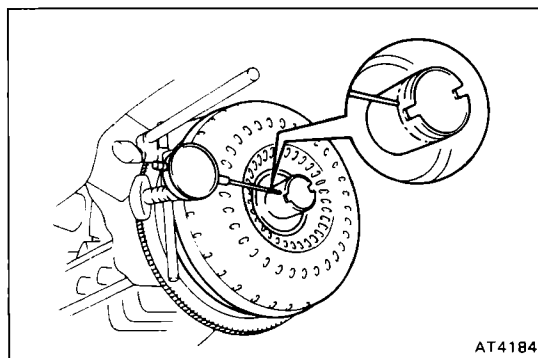
If the transmission is contaminated, the torque converter and transmission cooler should be thoroughly flushed using Toyota Transmission Cleaner.



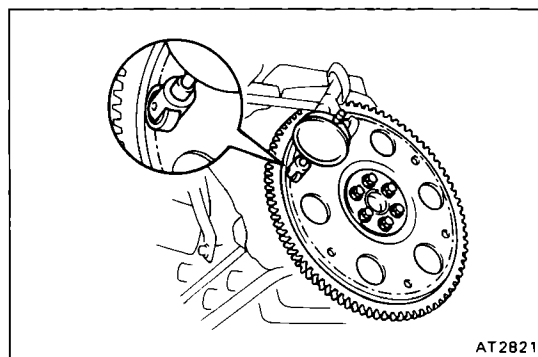
AT0953



A1964



AT4184



AT2821

## INSPECTION OF TORQUE CONVERTER

### 1. INSERT SST IN END OF TORQUE CONVERTER

- Insert a turning tool in the inner race of the one-way clutch.
- Install the stopper so that it fits in the notch of the converter hub and outer race of the one-way clutch.  
SST 09350-32014 (09351-32010, 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. Less than 25 kg-cm (22 ft-lb, 2.5 N·m) of torque should be required to rotate the clutch clockwise.

If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.

### 3. MEASURE TORQUE CONVERTER SLEEVE RUNOUT

- Temporarily mount the torque converter to the drive plate. Set up a dial indicator.

**Torque:** 280 kg-cm (20 ft-lb, 27 N·m)

**Runout:** 0.30 mm (0.0118 in.)

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter.

**NOTE:** Mark the position of the converter to ensure correct installation.

- Remove the torque converter.

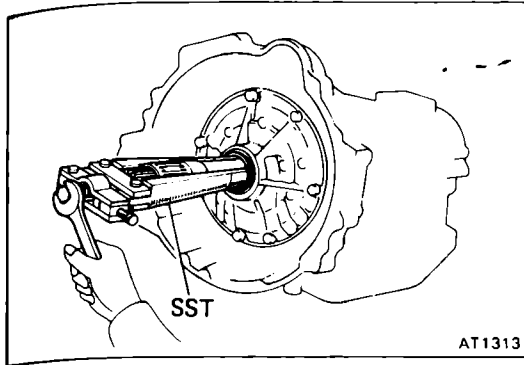
### 4. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of the spacers and tighten the bolts.

**Torque:** 850 kg-cm (61 ft-lb, 83 N·m)

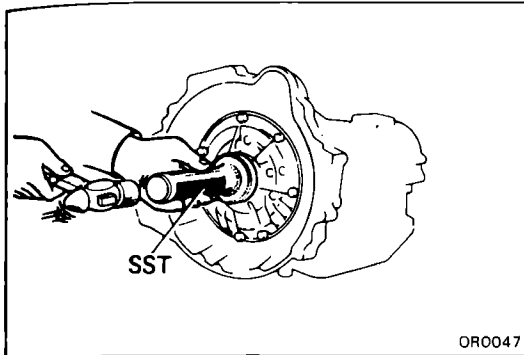
**Runout:** 0.20 mm (0.0079 in.)



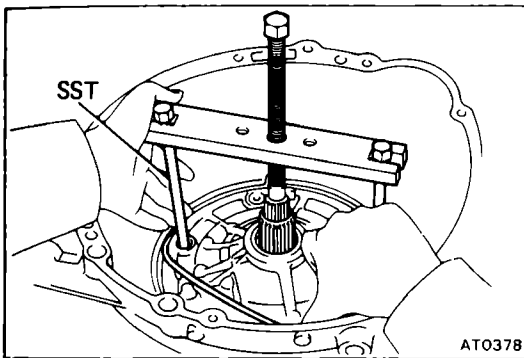
## OIL PUMP

### REPLACEMENT OF OIL SEAL

1. REMOVE OIL SEAL WITH SST  
SST 09350-32014 (09308-10010)



2. INSTALL NEW OIL SEAL
  - (a) Apply MP grease to a new oil seal lip.
  - (b) Drive in the oil seal with SST.  
SST 09350-32014 (09351-32140)

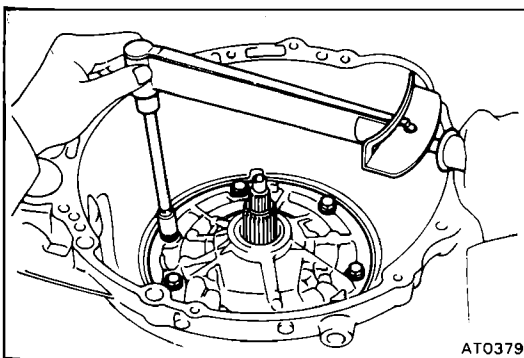


### REPLACEMENT OF O-RING

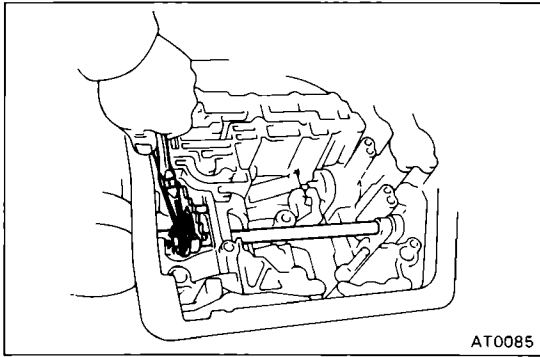
1. REMOVE OIL PUMP
  - (a) Position the transmission with the oil pump facing upward.
  - (b) Remove the seven bolts.
  - (c) Remove the oil pump until the O-ring can be removed with SST.

SST 09350-32014 (09351-32061)

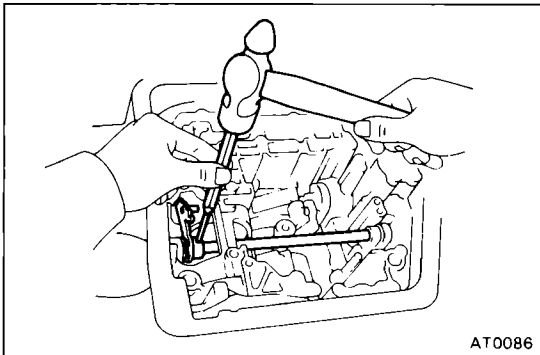
- (d) Temporarily install the bolt.



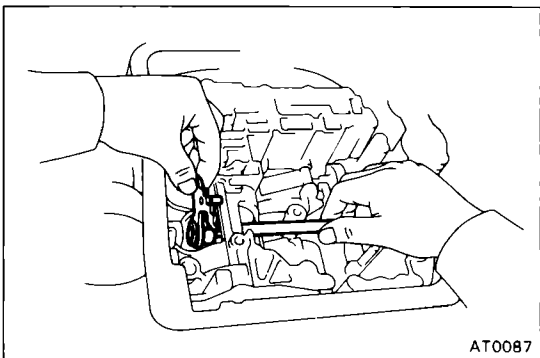
2. REMOVE O-RING
3. INSTALL NEW O-RING
4. INSTALL OIL PUMP MOUNTING BOLT  
Tighten the seven bolts gradually and uniformly.  
Torque: 225 kg-cm (16 ft-lb, 22 N·m)



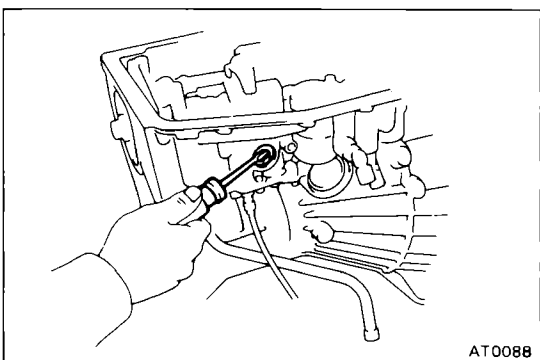
AT0085



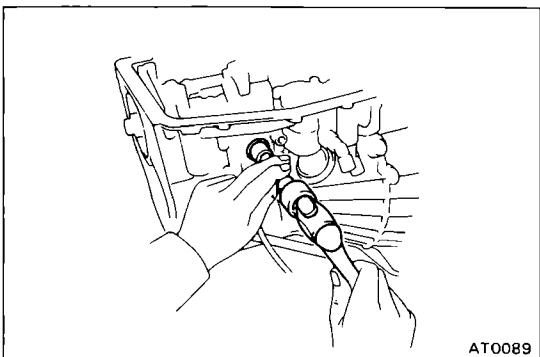
AT0086



AT0087



AT0088



AT0089

## MANUAL VALVE LEVER AND SHAFT

### REMOVAL OF MANUAL VALVE LEVER AND SHAFT

1. REMOVE VALVE BODY (See page AT-52)
2. REMOVE PARKING LOCK PAWL BRACKET
3. REMOVE PARKING LOCK ROD
4. REMOVE RETAINING SPRING
5. REMOVE MANUAL VALVE SHAFT
  - (a) Using a hammer and chisel, pry and turn the collar.
  - (b) Using a hammer and a punch, drive out the pin.

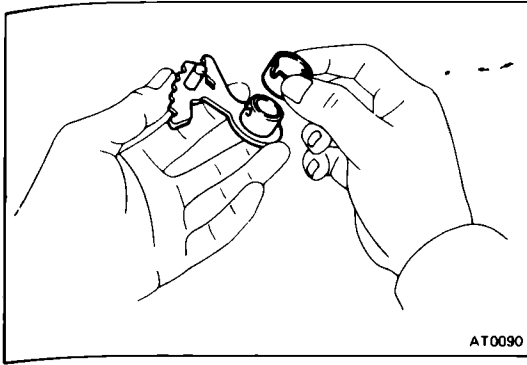
(c) Slide out the shaft and remove the detent plate.

### 6. IF NECESSARY, REPLACE OIL SEAL OF MANUAL SHAFT

(a) Remove the oil seal with a screwdriver.

(b) Drive in a new oil seal.

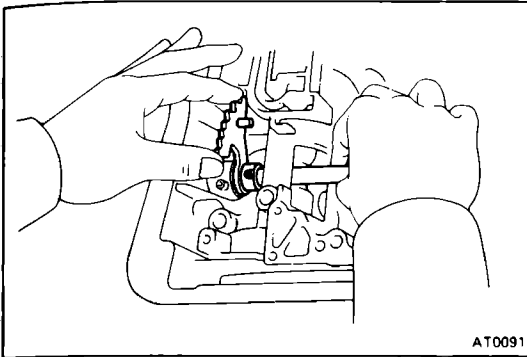
(c) Apply MP grease to the oil seal lip.



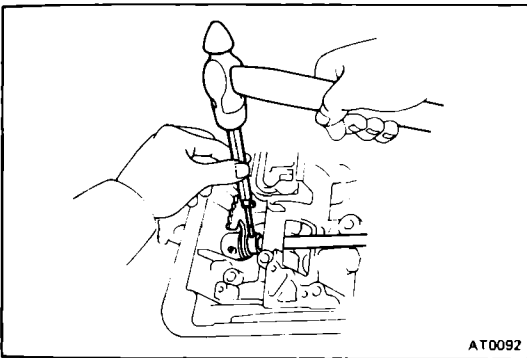
## INSTALLATION OF MANUAL VALVE LEVER AND SHAFT

### 1. INSTALL MANUAL VALVE SHAFT INTO CASE

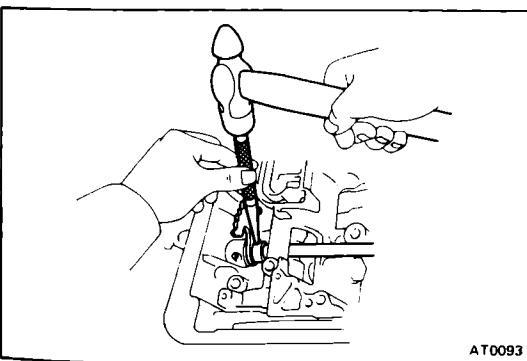
(a) Assemble a new collar to the manual valve lever.



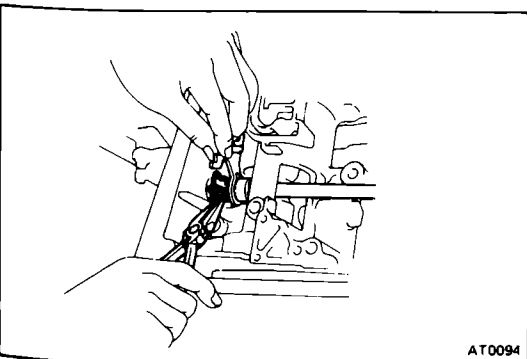
(b) Install the manual valve shaft to the transmission case through the manual valve lever.



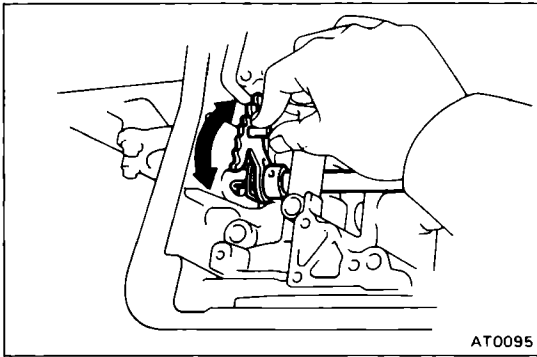
(c) Drive in the roll pin with the slot at a right angle to the shaft.



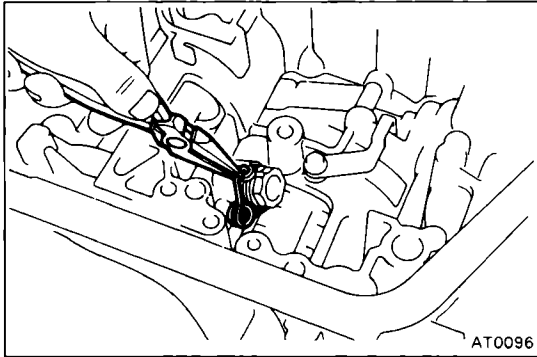
(d) Match the collar hole to the lever calking hollow and calk the collar to the lever.



### 2. INSTALL RETAINING SPRING



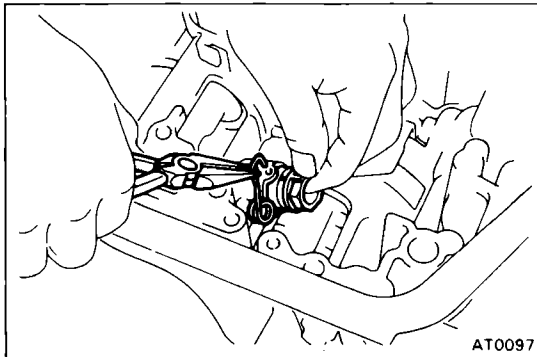
3. MAKE SURE THAT LEVER MOVES SMOOTHLY
4. INSTALL PARKING LOCK ROD
5. INSTALL PARKING LOCK PAWL BRACKET
6. INSTALL VALVE BODY (See page AT-53)



## GOVERNOR PRESSURE ADAPTOR (A140L/3S-FE)

### REMOVAL OF GOVERNOR PRESSURE ADAPTOR

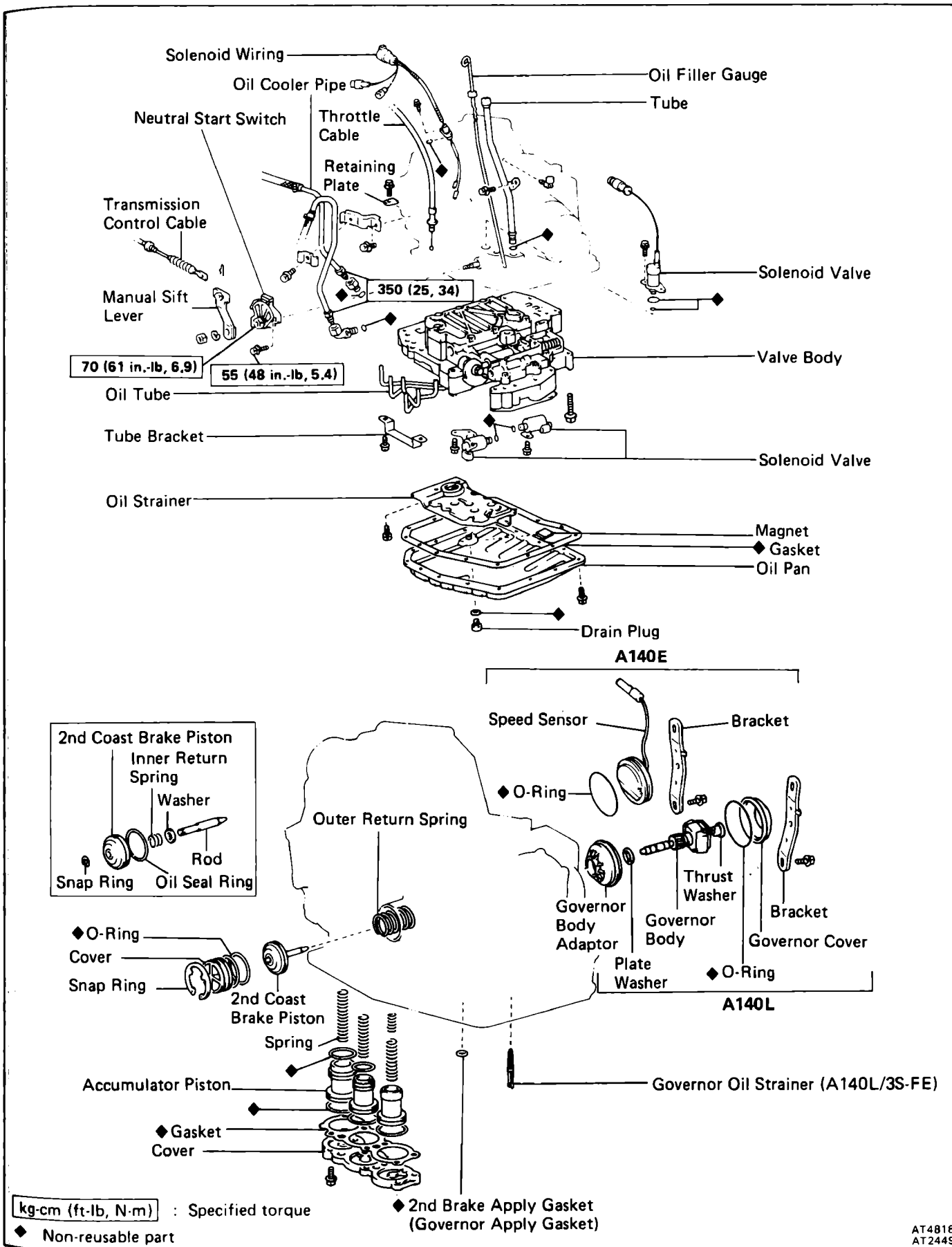
1. REMOVE MANUAL VALVE LEVER AND SHAFT (See page AT-64)
2. REMOVE TORSION SPRING
3. REMOVE GOVERNOR PRESSURE ADAPTOR



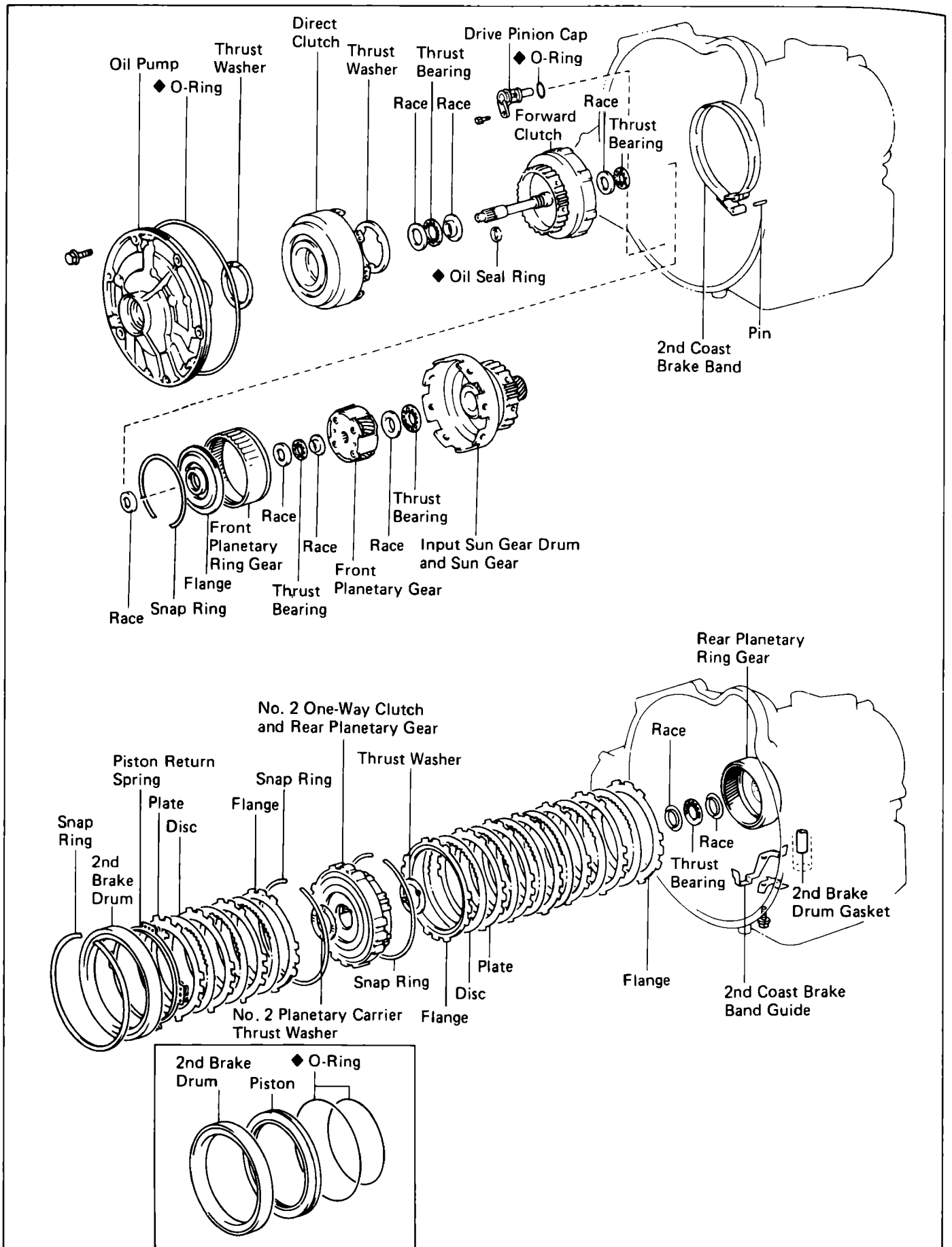
### INSTALLATION OF GOVERNOR PRESSURE ADAPTOR

1. INSTALL GOVERNOR PRESSURE ADAPTOR INTO CASE
2. INSTALL TORSION SPRING
  - (a) Align the hole of adaptor with the hole of case and install the torsion spring.
  - (b) Check that the adaptor does not slide or the spring fall out when pulled by hand.
3. INSTALL MANUAL VALVE LEVER AND SHAFT (See page AT-63)

# DISASSEMBLY OF TRANSMISSION COMPONENTS



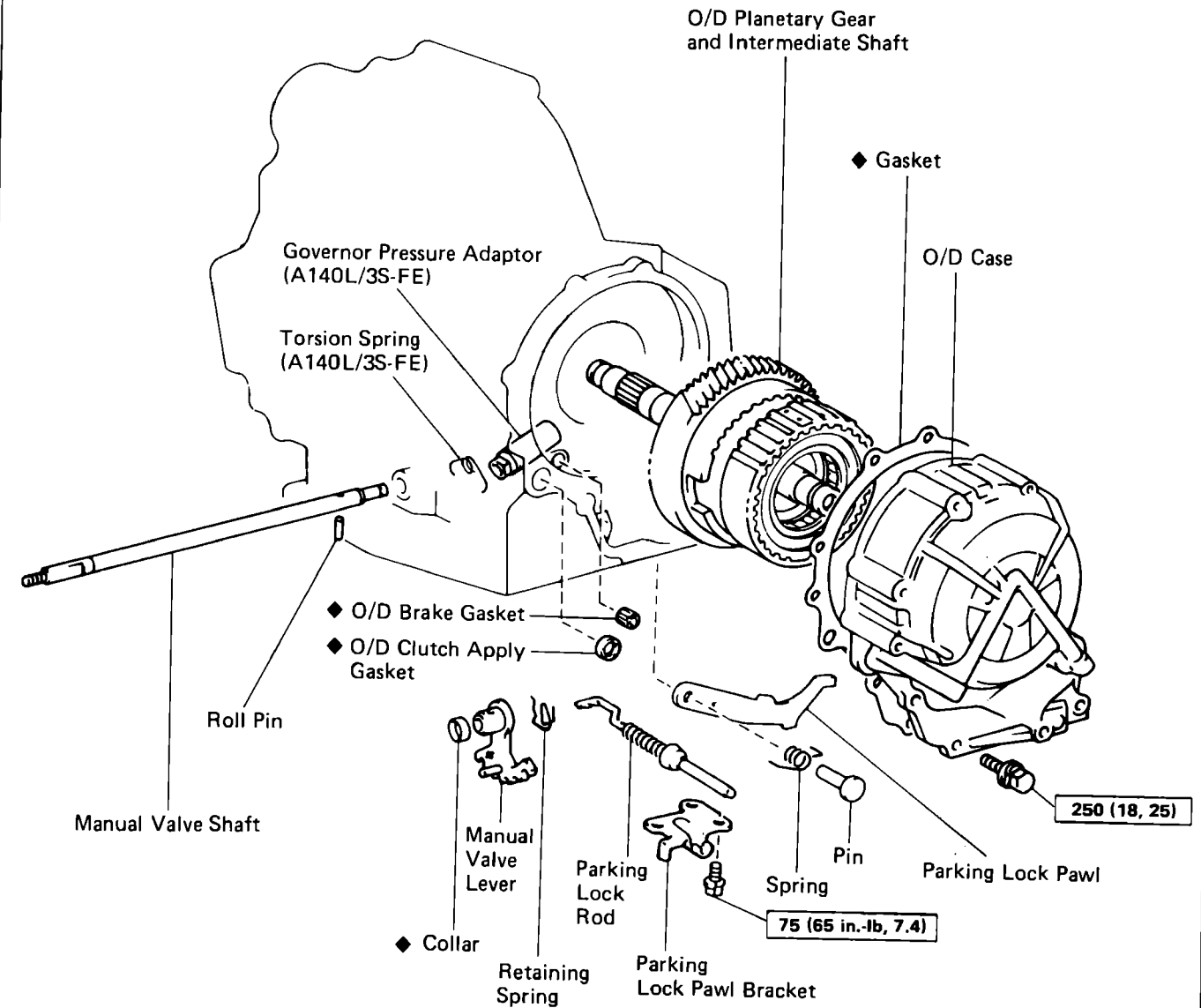
COMPONENTS (Cont'd)



◆ Non-reusable part

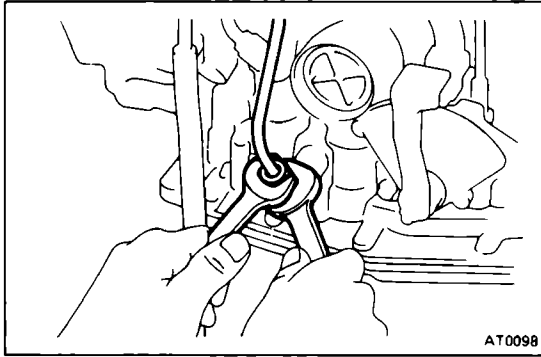


COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque

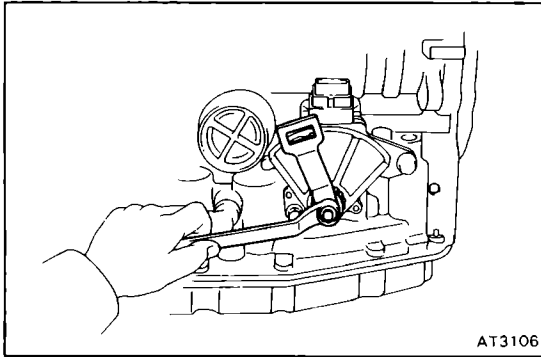
◆ Non-reusable part



AT0098

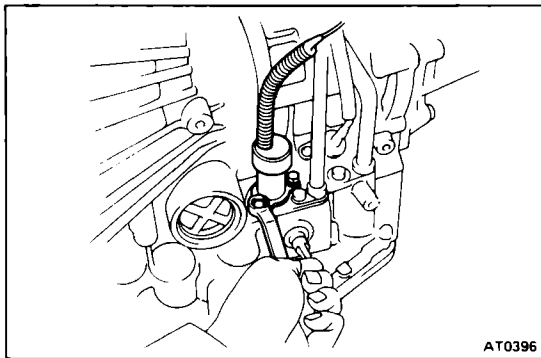
**SEPARATE BASIC SUBASSEMBLY**

1. REMOVE TWO OIL COOLER PIPES
2. REMOVE SHIFT LEVER



AT3106

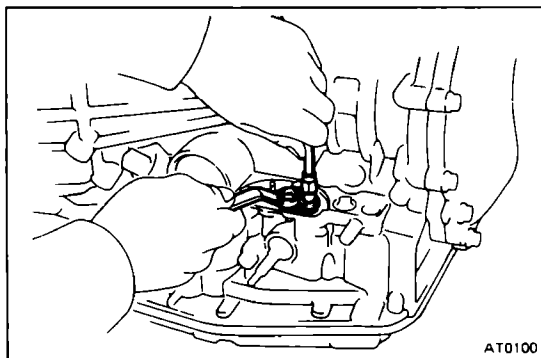
3. REMOVE NEUTRAL START SWITCH



AT0396

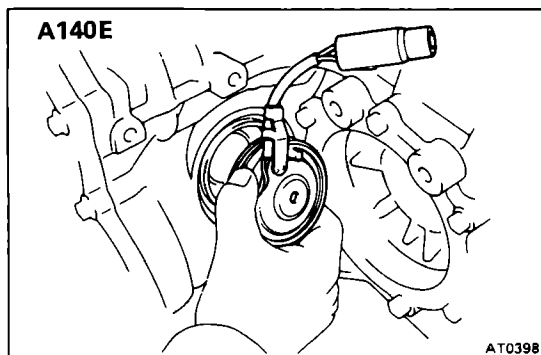
4. REMOVE SOLENOID
  - (a) Disconnect connector.
  - (b) Remove the two bolts and solenoid.

5. REMOVE OIL FILLER GAUGE AND TUBE



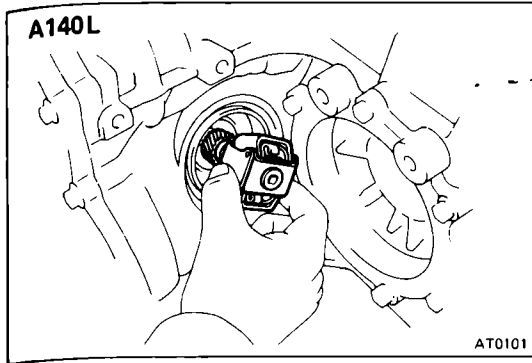
AT0100

6. REMOVE FOLLOWING PARTS:
  - (a) Throttle cable retaining plate
  - (b) (A140E)  
Solenoid wiring retaining bolt



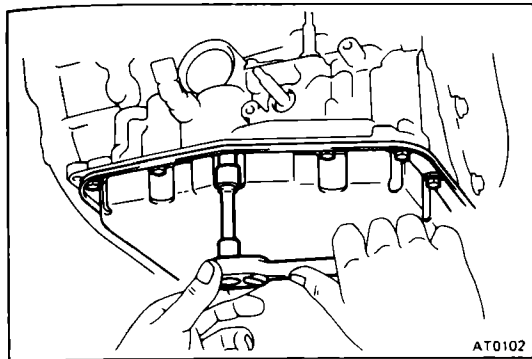
AT0398

7. (A140E)  
REMOVE SPEED SENSOR
  - (a) Disconnect the connector.
  - (b) Remove the two bolts and cover bracket.
  - (c) Remove the speed sensor and O-ring.



**8. (A140L)  
REMOVE GOVERNOR BODY**

- (a) Remove the two bolts and cover bracket.
- (b) Remove the governor cover and O-ring.
- (c) Remove the governor body with thrust washer.
- (d) Remove the plate washer and governor body adaptor.

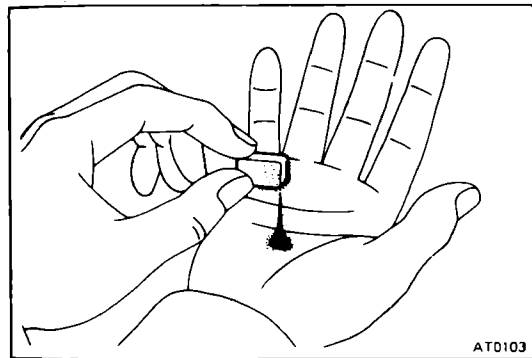


**9. REMOVE OIL PAN AND GASKET**

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

**CAUTION:** Do not turn the transmission over as this will contaminate the valve body with foreign material in the bottom of the pan.

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

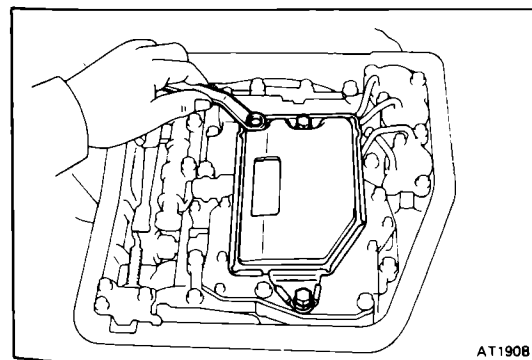


**10. EXAMINE PARTICLES IN PAN**

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

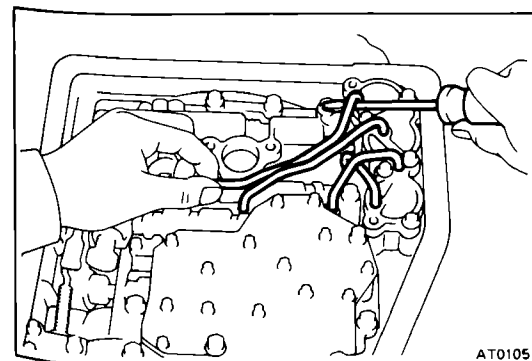
Steel (magnetic)...bearing, gear and clutch plate wear

Brass (non-magnetic)...bushing wear



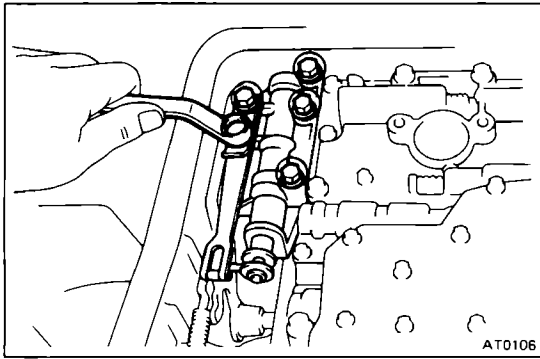
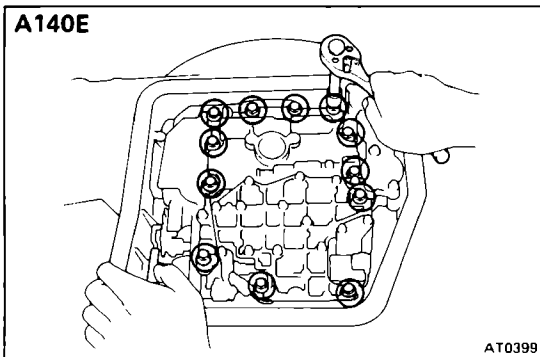
**11. TURN TRANSMISSION OVER AND REMOVE FOLLOWING:**

- (a) Tube bracket
- (b) Oil strainer
- (c) (A140E)  
Solenoid connectors

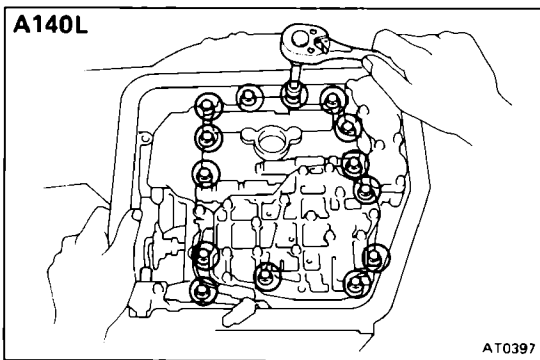


**12. REMOVE FOUR OIL TUBES**

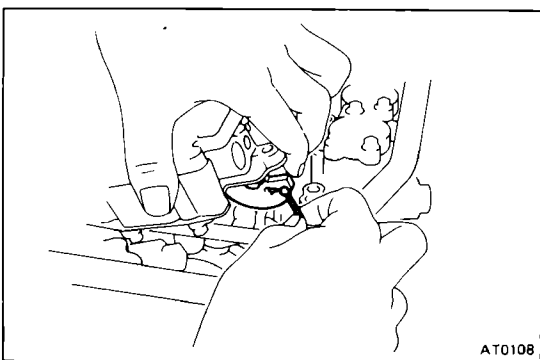
Pry up both tube ends with a large screwdriver and remove the four tubes.

**13. REMOVE MANUAL DETENT SPRING****14. REMOVE MANUAL VALVE AND MANUAL VALVE BODY****15. REMOVE VALVE BODY**

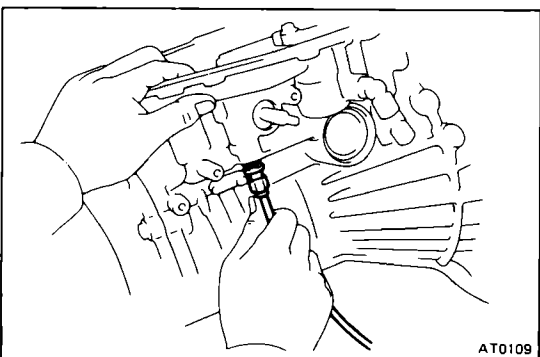
- (a) (A140E)  
Remove the twelve bolts.

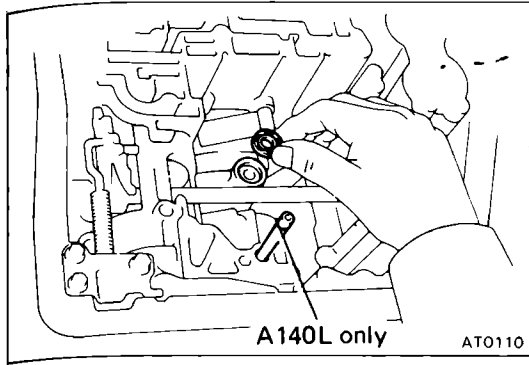


- (b) (A140L)  
Remove the fourteen bolts.



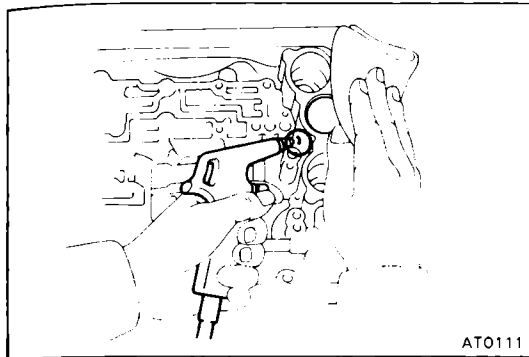
- (c) Disconnect the throttle cable from the cam and remove the valve body.

**16. REMOVE THROTTLE CABLE AND SOLENOID WIRING FROM CASE**



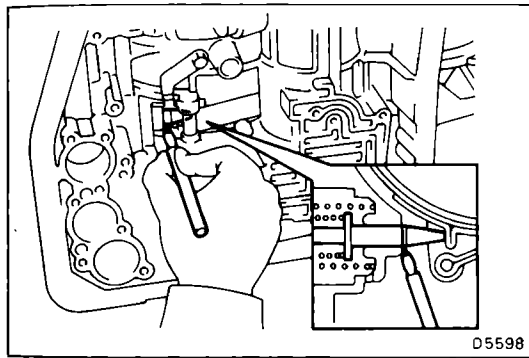
**17. REMOVE SECOND BRAKE APPLY GASKET AND GOVERNOR OIL STRAINER**

NOTE: Governor oil strainer...A140L only



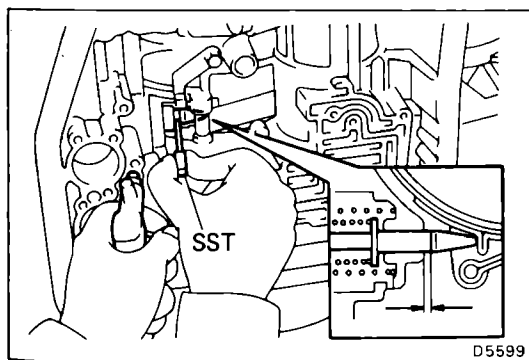
**18. REMOVE ACCUMULATOR PISTON AND SPRINGS**

- (a) Loosen the five bolts one turn at a time until spring tension is released.
- (b) Remove the cover and the gasket.
- (c) Remove the piston and spring for C<sub>1</sub> and C<sub>2</sub>.
- (d) Pop out piston B<sub>2</sub> into a rag, using low-pressure compressed air (1kg/cm<sup>2</sup>, 14 psi or 98 kPa). Force air into the hole shown and remove the piston and spring.



**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.

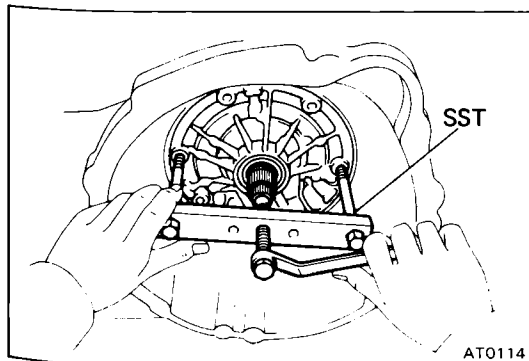


- (b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm<sup>2</sup>, 57 – 114 psi or 392 – 785 kPa) as shown.

SST 09240-00020

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

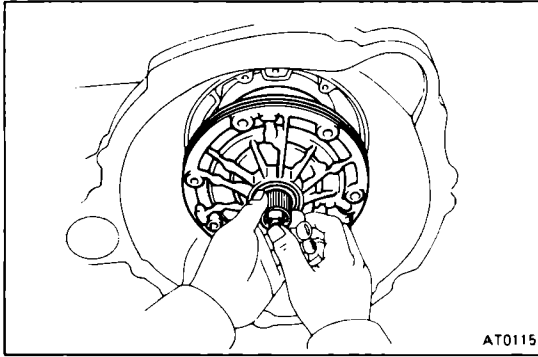
If the piston stroke exceeds the limit, replace the piston rod or brake band.



**20. REMOVE SEVEN BOLTS HOLDING OIL PUMP TO TRANSMISSION CASE**

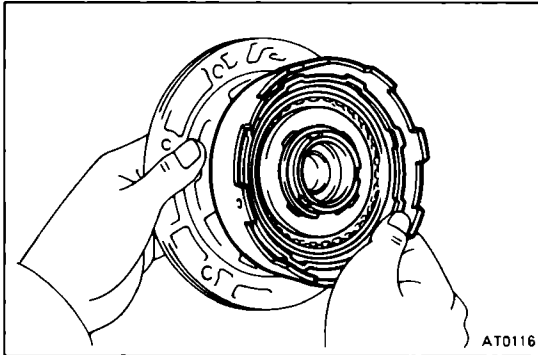
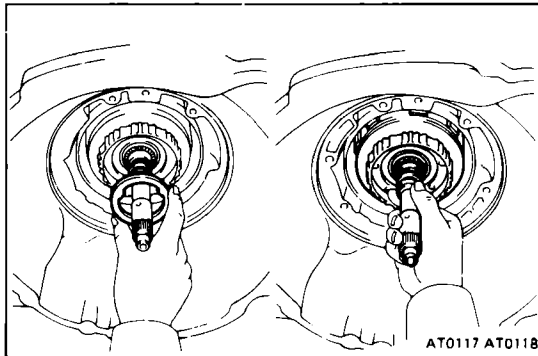
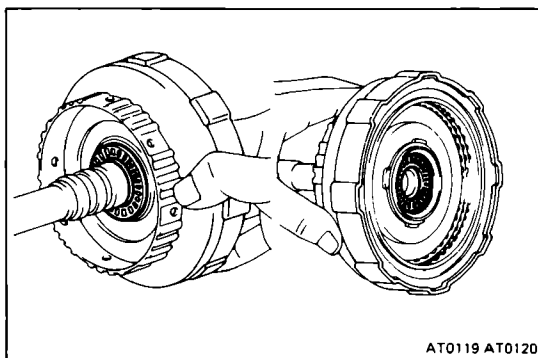
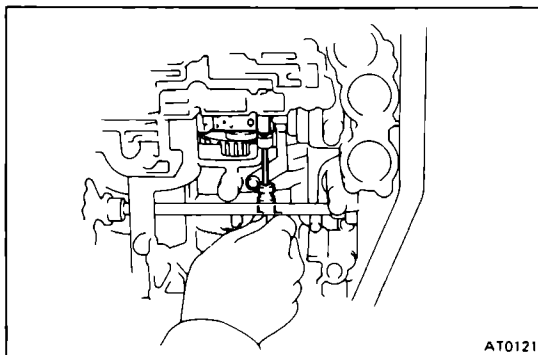
**21. PULL OIL PUMP FREE WITH SST FROM TRANSMISSION CASE**

SST 09350-32014 (09351-32061)

**22. REMOVE OIL PUMP AND DIRECT CLUTCH**

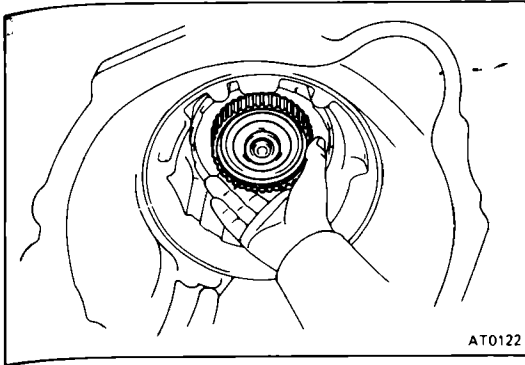
While holding the input shaft, grasp the pump stator shaft and pull the oil pump and direct clutch together out the transmission case.

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

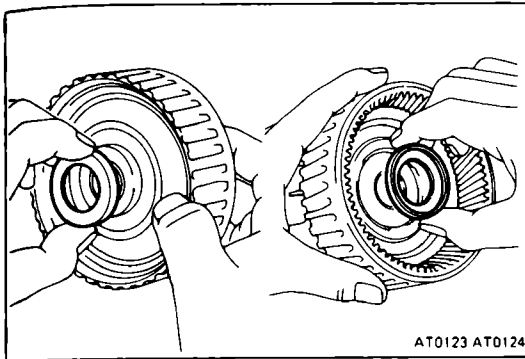
**23. REMOVE DIRECT CLUTCH FROM OIL PUMP****24. BE CAREFUL WHEN REMOVING RACE BEHIND OIL PUMP****25. REMOVE CLUTCH DRUM THRUST WASHER****26. REMOVE FORWARD CLUTCH****27. BE CAREFUL WHEN REMOVING BEARINGS AND RACES****28. REMOVE SECOND COAST BRAKE BAND**

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

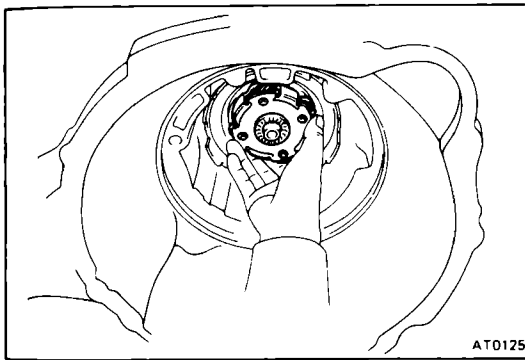
(b) Remove the brake band.



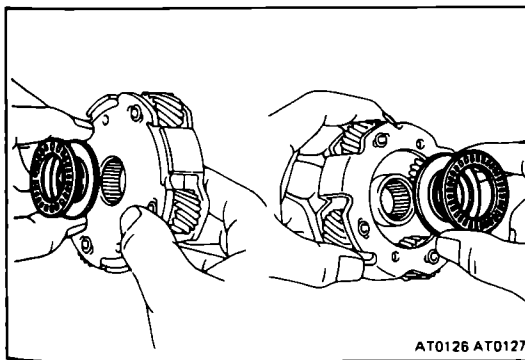
29. REMOVE FRONT PLANETARY RING GEAR



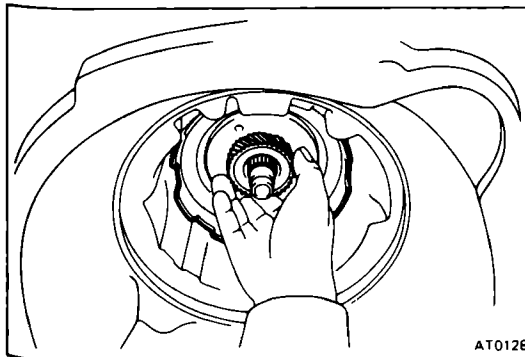
30. BE CAREFUL WHEN REMOVING RACES ON RING GEAR



31. REMOVE PLANETARY GEAR

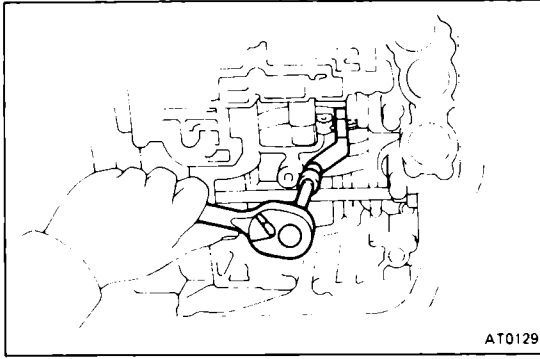


32. BE CAREFUL WHEN REMOVING RACES AND BEARINGS ON PLANETARY GEAR

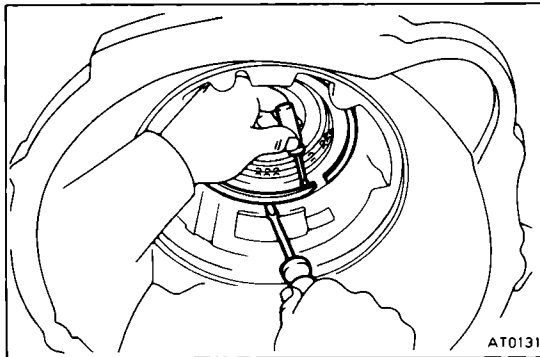


33. REMOVE BEARING FROM PLANETARY SUN GEAR

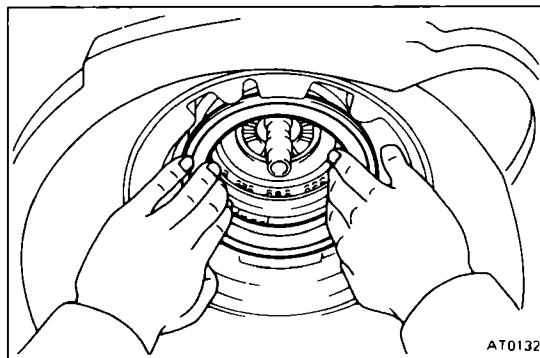
34. REMOVE SUN GEAR, SUN GEAR INPUT DRUM, SECOND BRAKE HUB AND NO. 1 ONE-WAY CLUTCH



- 35. STAND TRANSMISSION CASE UP AND REMOVE SECOND COAST BRAKE BAND GUIDE**



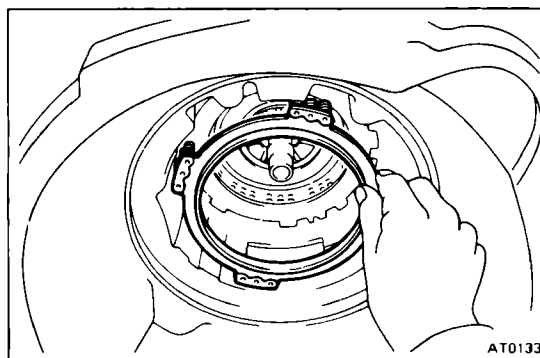
- 36. REMOVE SNAP RING HOLDING SECOND BRAKE DRUM TO CASE**



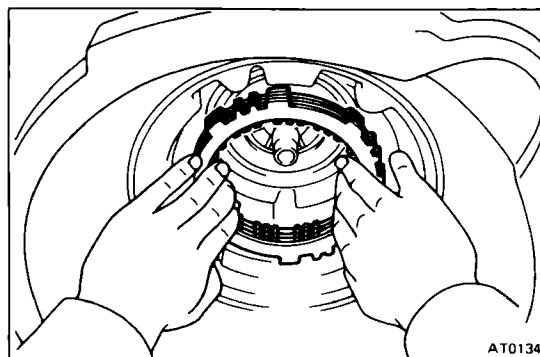
- 37. REMOVE SECOND BRAKE DRUM**

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

- 38. REMOVE SECOND BRAKE DRUM GASKET**

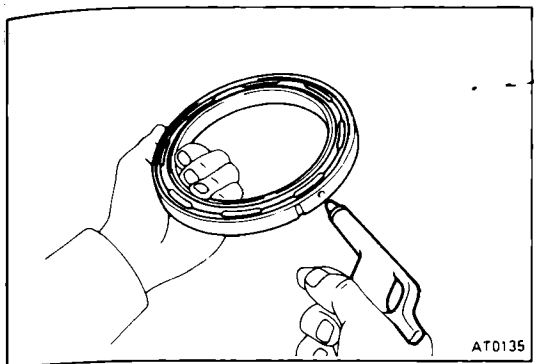


- 39. REMOVE SECOND BRAKE PISTON RETURN SPRING**



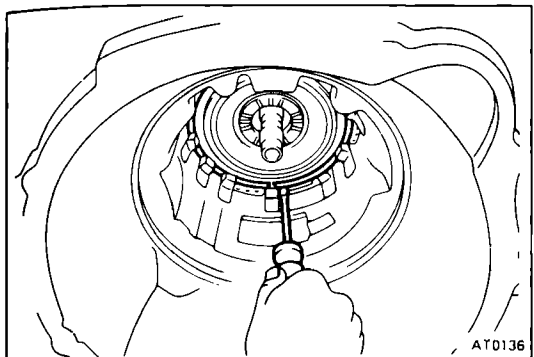
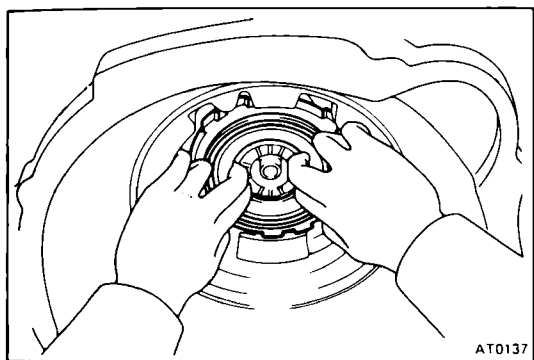
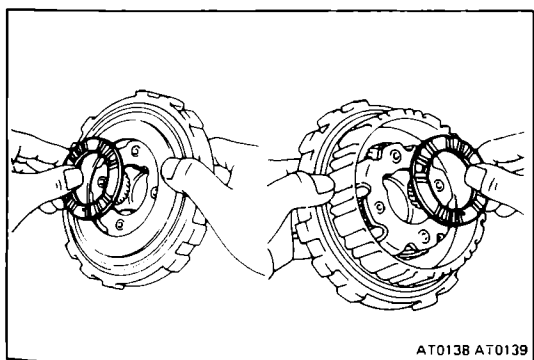
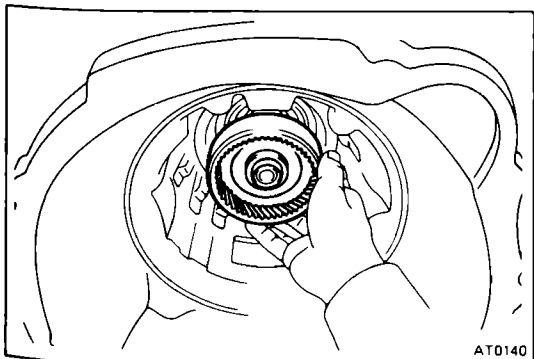
- 40. REMOVE PLATES, DISCS AND FLANGE**

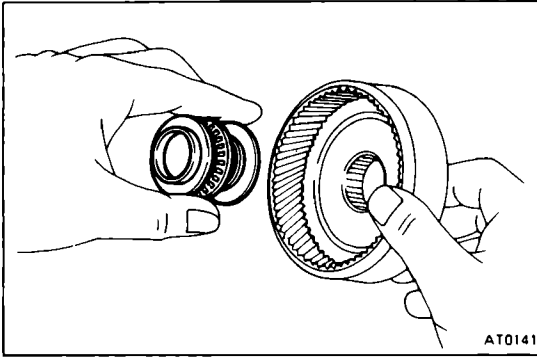


**41. BLOW OUT PISTON WITH COMPRESSED AIR**

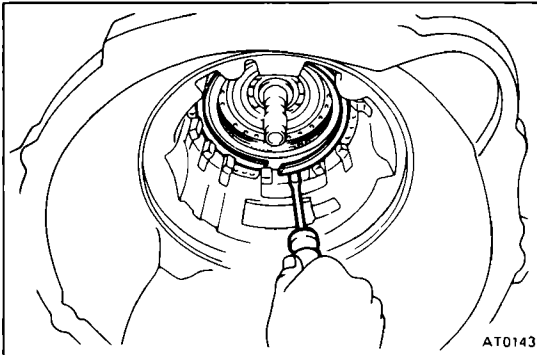
Use compressed air to remove the piston.

NOTE: Hold the piston so it does not slant and then blow with the gun slightly away from the oil hole.

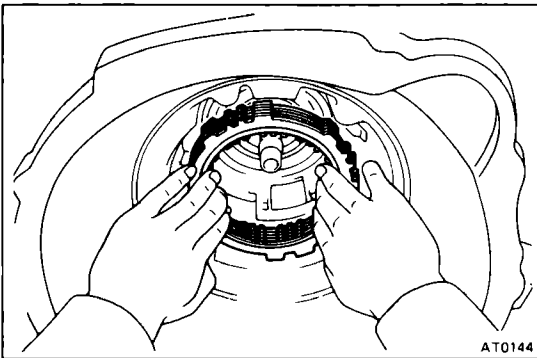
**42. REMOVE SNAP RING HOLDING NO. 2 ONE-WAY CLUTCH OUTER RACE TO CASE****43. REMOVE NO. 2 ONE-WAY CLUTCH AND REAR PLANETARY GEAR****44. BE CAREFUL WHEN REMOVING THRUST WASHERS FROM BOTH SIDES OF PLANETARY CARRIER****45. REMOVE REAR PLANETARY RING GEAR, BEARING AND RACE**



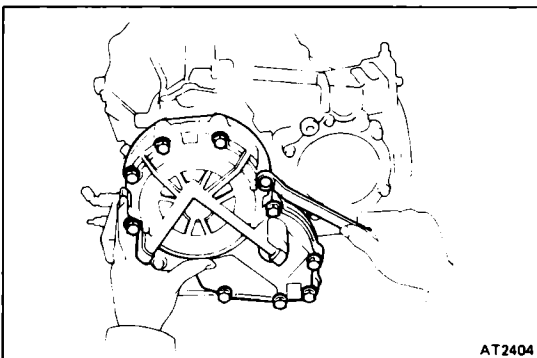
- 46. BE CAREFUL WHEN REMOVING RACES AND BEARING ON RING GEAR**



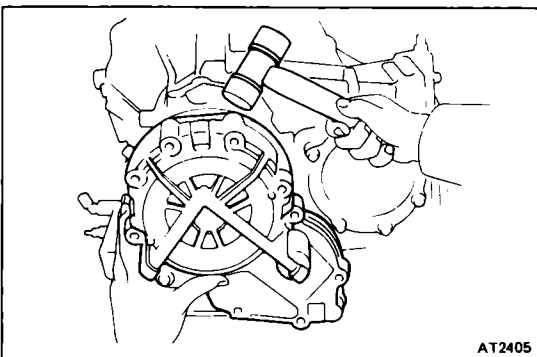
- 47. REMOVE SNAP RING HOLDING FLANGE TO CASE**



- 48. REMOVE FLANGES, PLATES AND DISCS**

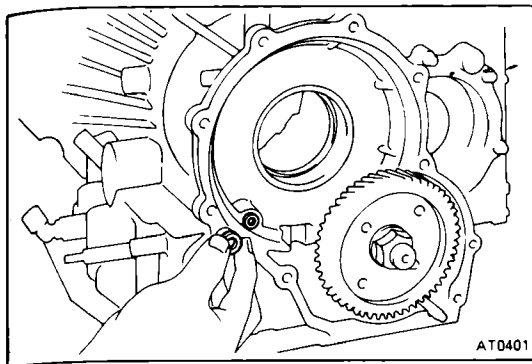


- 49. TURN TRANSMISSION CASE AROUND**
- 50. REMOVE ELEVEN BOLTS HOLDING OVERDRIVE UNIT TO TRANSMISSION CASE**



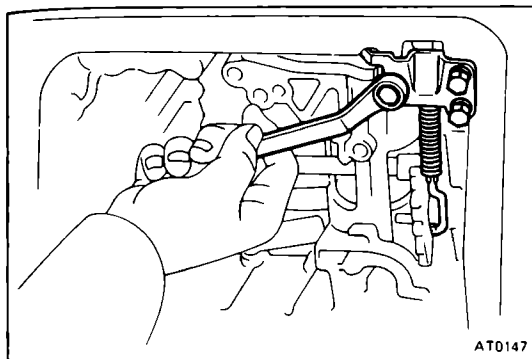
- 51. REMOVE OVERDRIVE UNIT WITH ALL PARTS**
- (a) Tap on the overdrive case circumference with a plastic hammer to remove the unit from the transmission case.
  - (b) Remove the overdrive planetary gear and counter gear if they remained in the transmission.

**NOTE:** The overdrive unit is heavy, so be careful not to drop it.



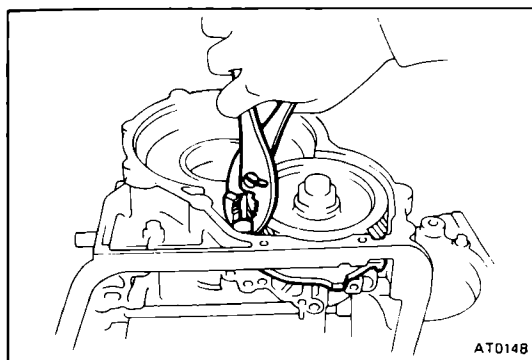
**52. REMOVE CASE GASKET**

**53. REMOVE OVERDRIVE CLUTCH APPLY GASKET AND OVERDRIVE BRAKE APPLY GASKET**



**54. REMOVE PARKING LOCK PAWL BRACKET**

**55. REMOVE PARKING LOCK ROD**



**56. REMOVE PIN**

**57. REMOVE SPRING AND PARKING LOCK PAWL**

# COMPONENT GROUP DISASSEMBLY, INSPECTION AND ASSEMBLY NOTE

The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion of similar-looking parts from 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 cannot 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 ATF: type DEXRON® II

## GENERAL CLEANING NOTES:

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

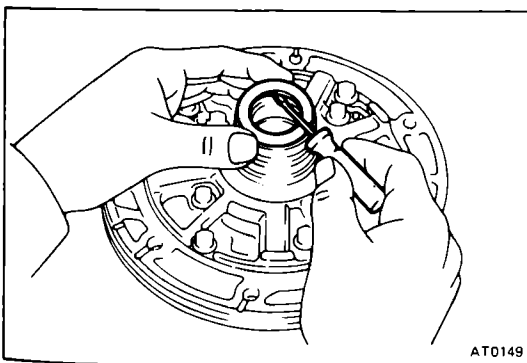
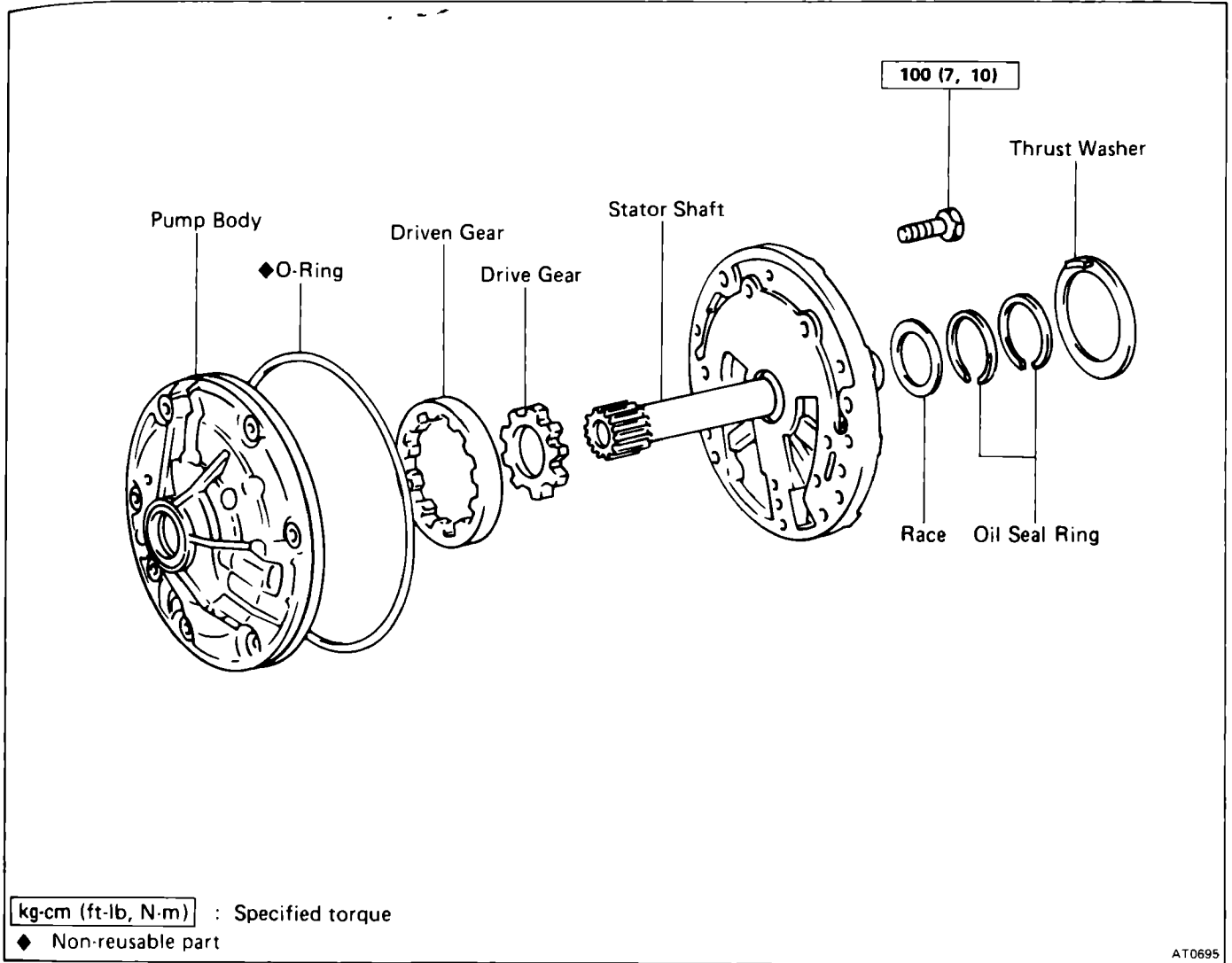
## PARTS ARRANGEMENT:

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

## GENERAL ASSEMBLY:

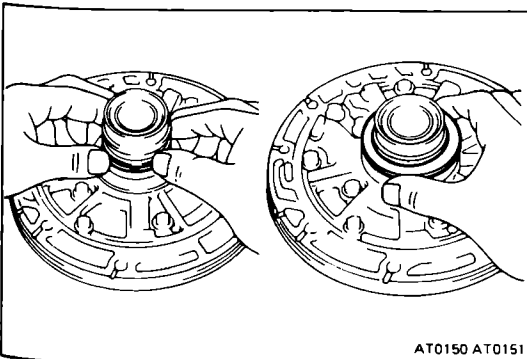
1. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with transmission fluid prior to reassembly.
2. All gaskets and rubber O-rings should be replaced.
3. Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed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

# OIL PUMP

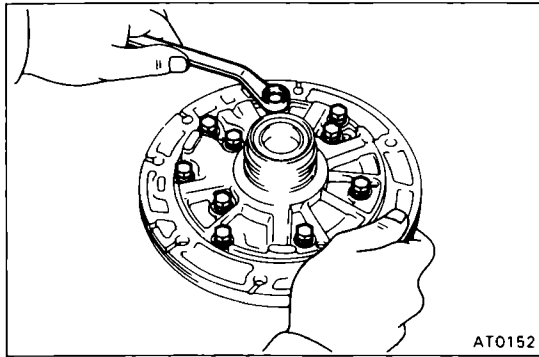


## DISASSEMBLY OF OIL PUMP

1. REMOVE RACE FROM STATOR SHAFT



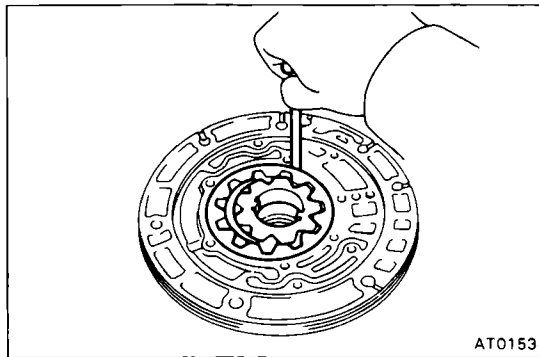
2. REMOVE O-RING FROM PUMP BODY
3. REMOVE TWO OIL SEAL RINGS FROM BACK OF STATOR SHAFT
4. REMOVE THRUST WASHER OF CLUTCH DRUM FROM STATOR SHAFT



AT0152

## 5. REMOVE STATOR SHAFT

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



AT0153

## INSPECTION OF OIL PUMP

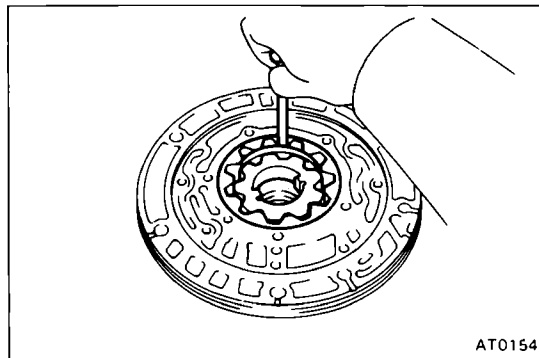
### 1. CHECK BODY CLEARANCE OF DRIVEN GEAR

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.



AT0154

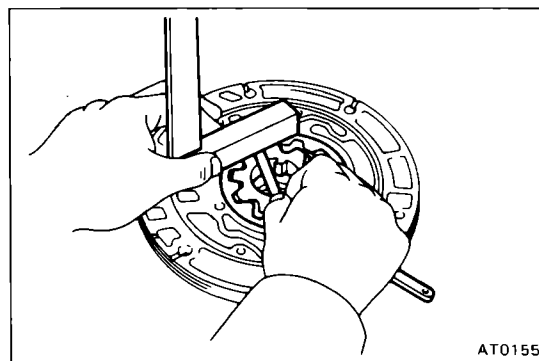
### 2. CHECK TIP CLEARANCE OF BOTH GEARS

Measure between the 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.



AT0155

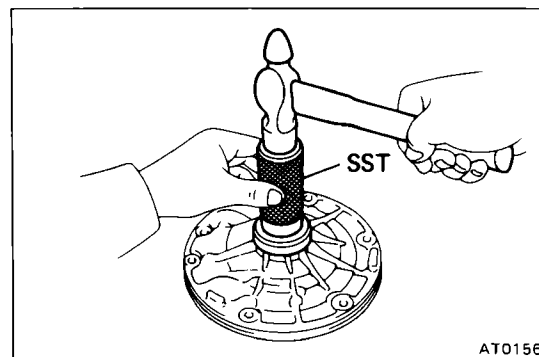
### 3. CHECK SIDE CLEARANCE OF BOTH GEARS

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.)

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



AT0156

### 4. INSPECT FRONT OIL SEAL

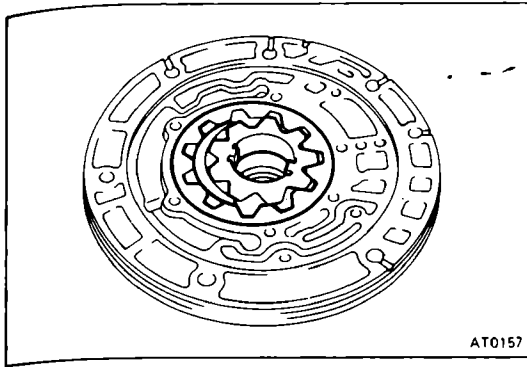
Check for wear, damage or cracks.

### 5. IF NECESSARY, REPLACE FRONT OIL SEAL

(a) Pry off the oil seal with a screwdriver.

(b) 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)

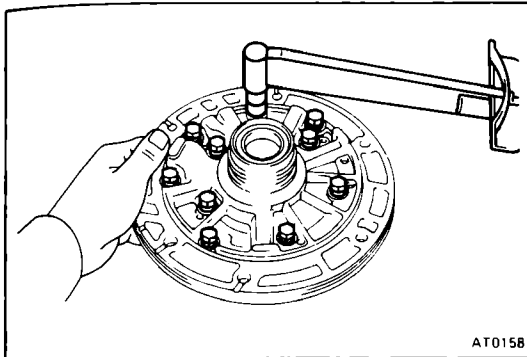


## ASSEMBLY OF OIL PUMP

(See page AT-77)

### 1. INSTALL DRIVEN GEAR AND DRIVE GEAR

Make sure the top of the gears are facing upward.

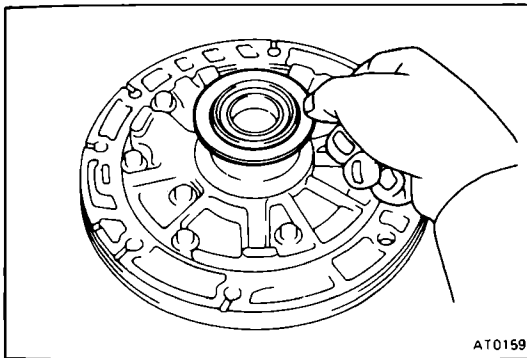


### 2. INSTALL STATOR SHAFT ONTO PUMP BODY

Align the stator shaft with each bolt hole.

### 3. TIGHTEN ELEVEN BOLTS

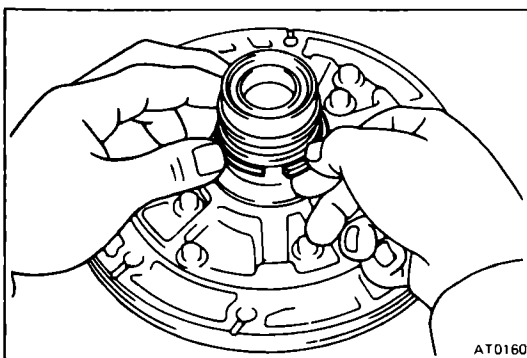
Torque: 100 kg-cm (7 ft-lb, 10 N·m)



### 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.

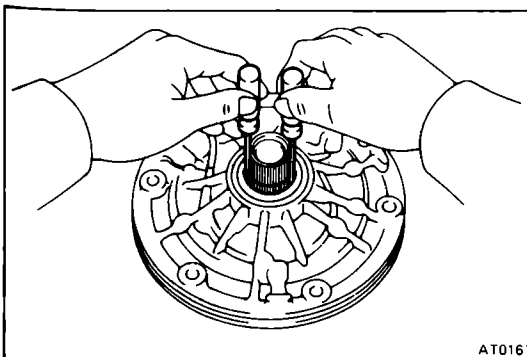


### 5. INSTALL TWO OIL SEAL RINGS ON OIL PUMP

Spread the rings apart and install them into the groove.

**CAUTION:** Do not spread the ring ends too much.

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



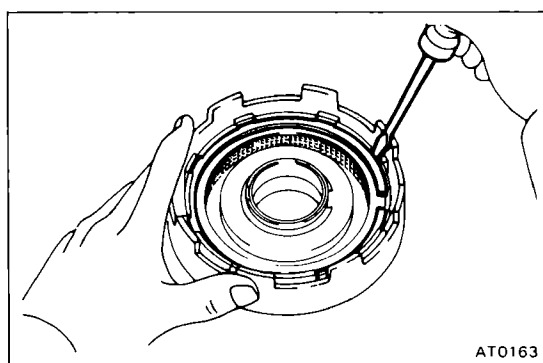
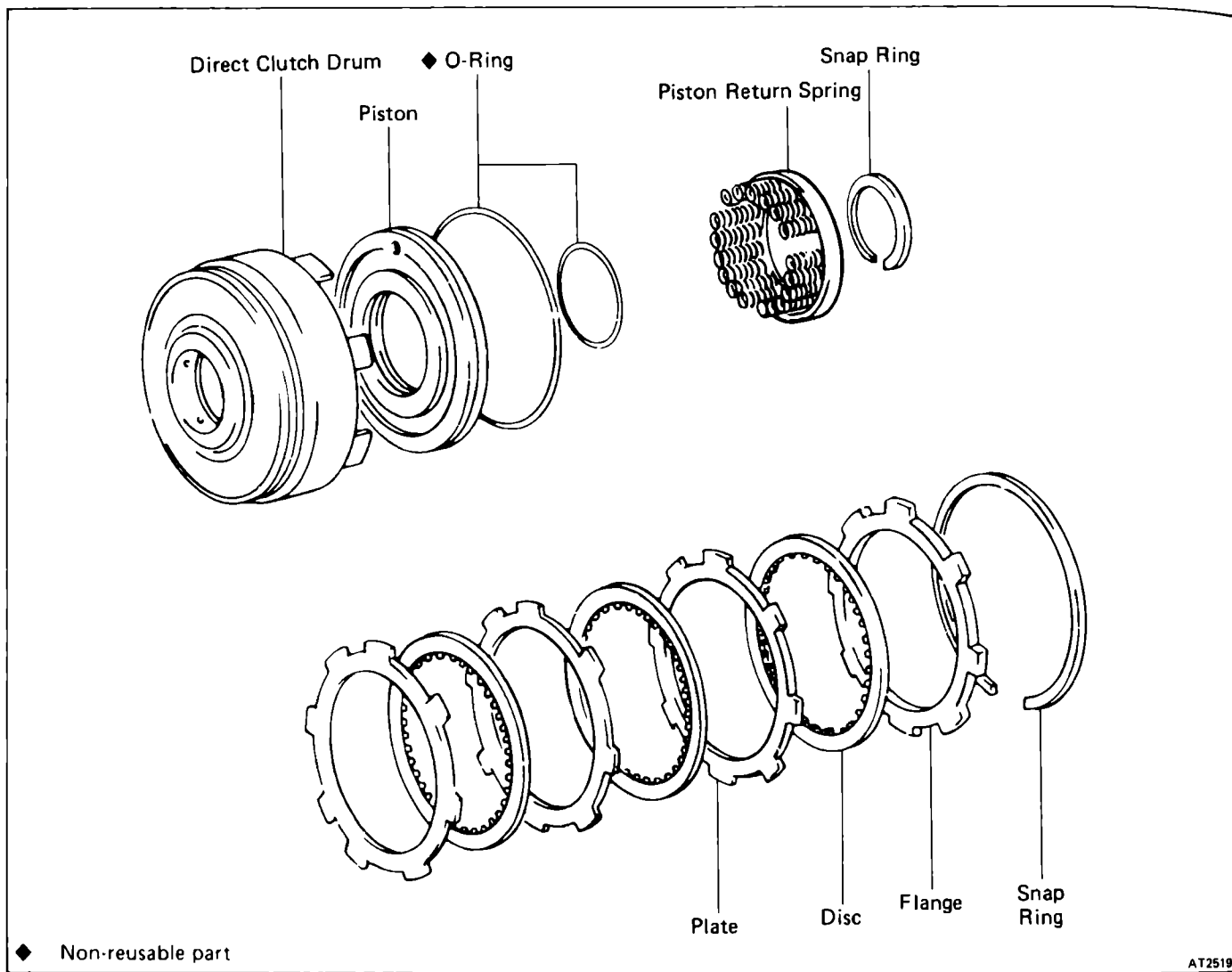
### 6. CHECK PUMP DRIVE GEAR ROTATION

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

**CAUTION:** Be careful not to damage the oil seal lip.

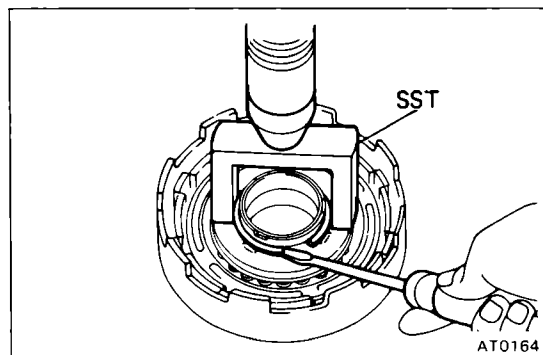
### 7. INSTALL RACE ONTO STATOR SHAFT

# DIRECT CLUTCH



## DISASSEMBLY OF DIRECT CLUTCH

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



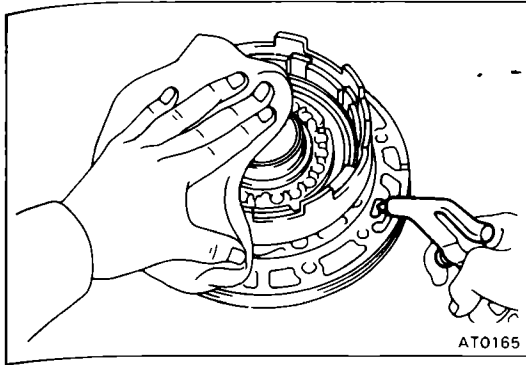
3. COMPRESS PISTON RETURN SPRING AND REMOVE SNAP RING

Place SST on the spring retainer and compress the springs with a shop press. Using a screwdriver, remove the snap ring.

SST 09350-32014 (09351-32070)

4. REMOVE PISTON RETURN SPRING

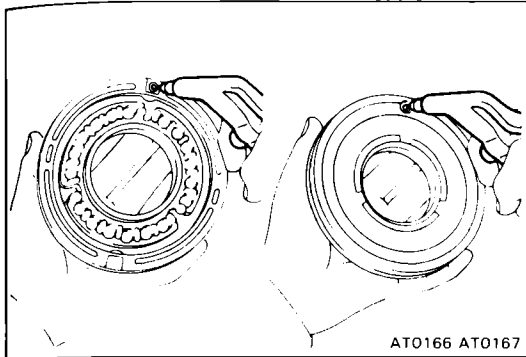




## 5. ASSEMBLE DIRECT CLUTCH ON OIL PUMP AND BLOW OUT PISTON

- (a) Slide 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.

## 6. REMOVE CLUTCH PISTON O-RING



## INSPECTION OF DIRECT CLUTCH

### 1. INSPECT CLUTCH PISTON

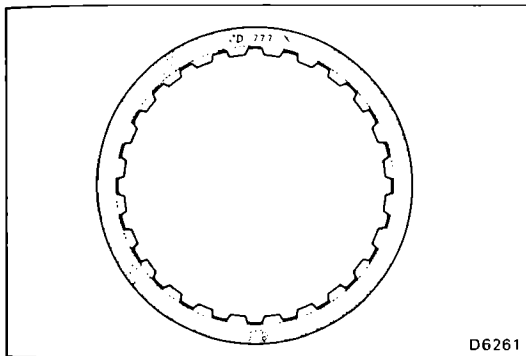
- (a) Check that check ball is free by shaking the piston.
- (b) Check that the valve does not leak by applying low-pressure compressed air.

### 2. INSPECT DISC, PLATE AND FLANGE

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

#### NOTE:

- 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.

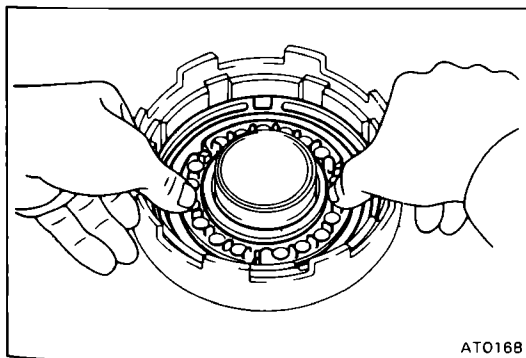


## ASSEMBLY OF DIRECT CLUTCH

(See page AT-80)

### 1. INSTALL CLUTCH PISTON IN DIRECT CLUTCH DRUM

- (a) Install new O-rings on 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.



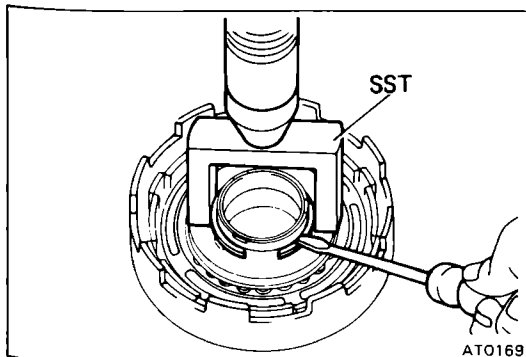
### 2. SET PISTON RETURN SPRING AND SNAP RING IN PLACE

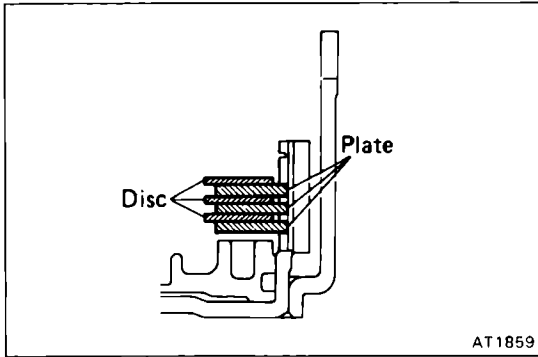
### 3. COMPRESS RETURN SPRING AND INSTALL SNAP RING IN GROOVE

- (a) Place SST on the spring retainer, and compress the spring with a shop press.

SST 09350-32014 (09351-32070)

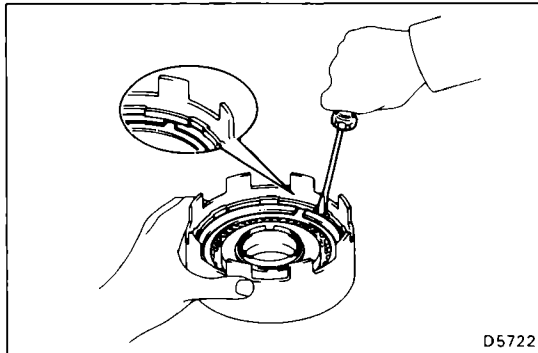
- (b) Install the snap ring with a screwdriver. Be sure the end gap of snap ring is not aligned with the spring retainer claw.





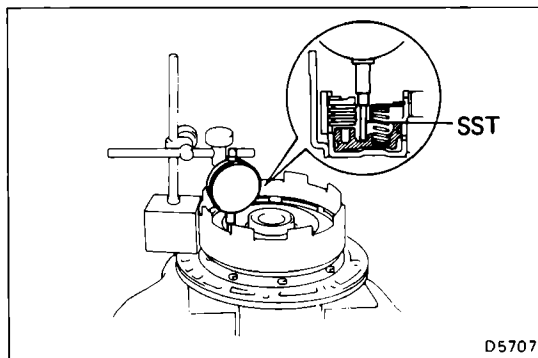
#### 4. INSTALL PLATES, DISCS AND FLANGE

Install in order: Plate-disc-plate-disc-plate-disc  
Install the flange with the flat end facing downward.



#### 5. INSTALL OUTER SNAP RING

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



#### 6. CHECK PISTON STROKE OF DIRECT CLUTCH

If replacing the disc, plate or flange, check the piston stroke.

- Install the direct clutch on the oil pump.
- Using a dial indicator (long type pick or SST), measure the direct clutch piston stroke applying and releasing the compressed air (4 — 8 kg/cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-32014 (09351-32190)

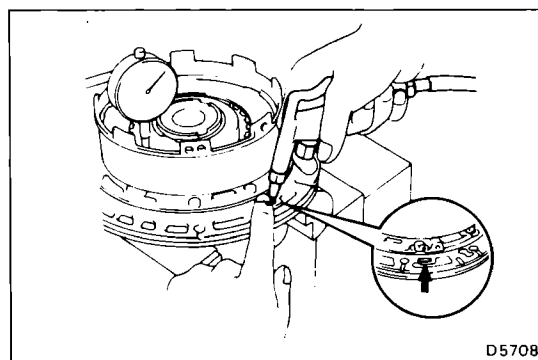
**Piston stroke: 1.11 — 1.44 mm  
(0.0437 — 0.0567 in.)**

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

If the piston stroke nonstandard, select another flange.

NOTE: There are two different thickness for the flange.

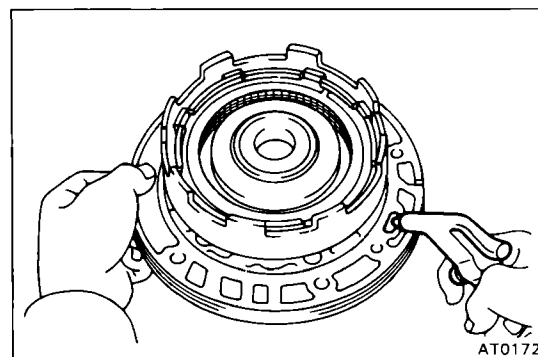
**Flange thickness: 2.60 mm (0.1024 in.)  
3.00 mm (0.1181 in.)**



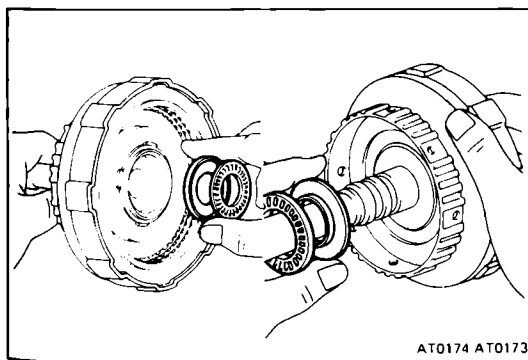
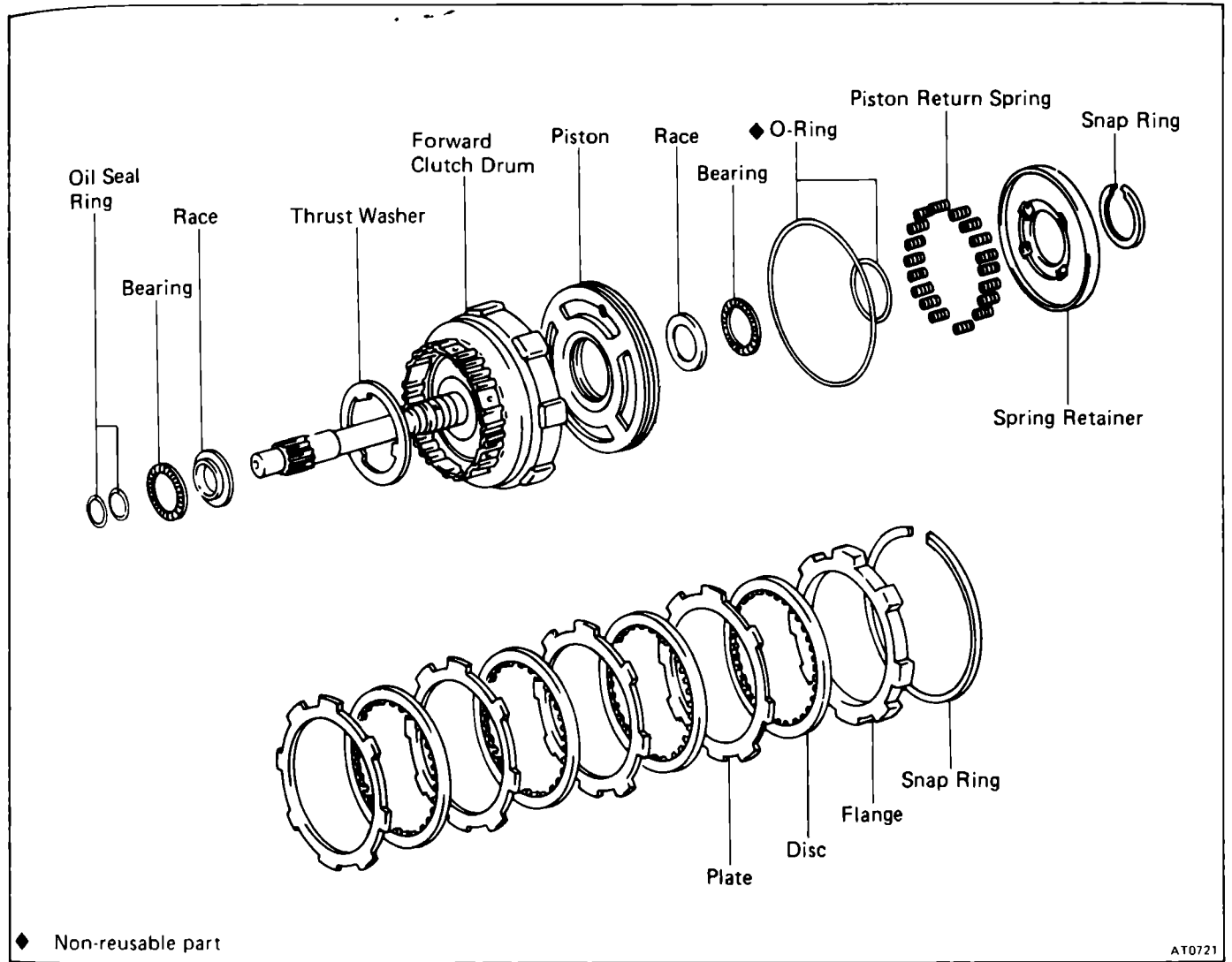
#### 7. CHECK OPERATION OF DIRECT CLUTCH

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

If the piston does not move, disassemble and inspect.



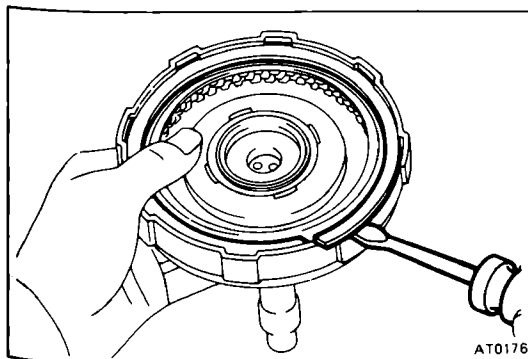
# FORWARD CLUTCH



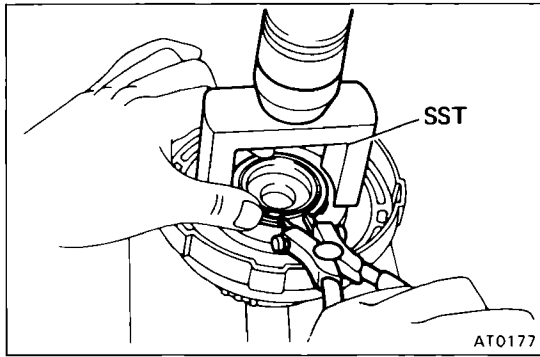
## DISASSEMBLY OF FORWARD CLUTCH

1. REMOVE THRUST BEARINGS AND RACES FROM BOTH SIDES OF CLUTCH

Note the position of the races.



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



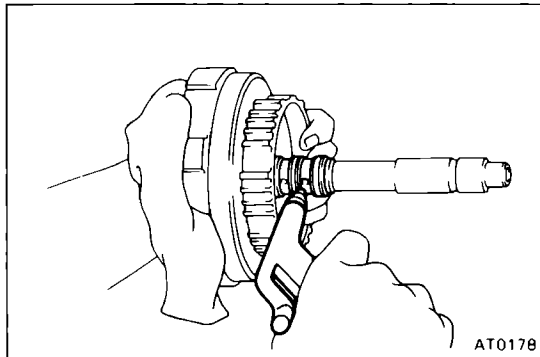
#### 4. COMPRESS PISTON RETURN SPRINGS AND REMOVE SNAP RING

(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.

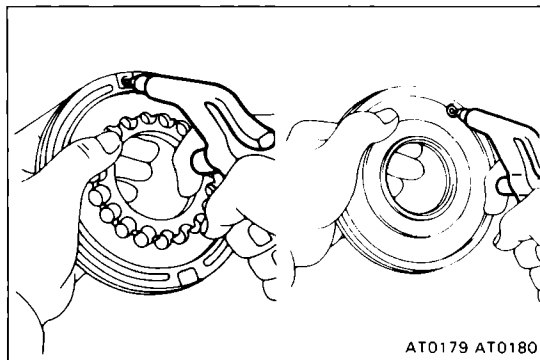
#### 5. REMOVE SPRING RETAINER AND EIGHTEEN SPRINGS



#### 6. BLOW OUT PISTON

Apply compressed air into oil passage to remove the piston.

If the piston does not come out, use needle-nose pliers to remove it.

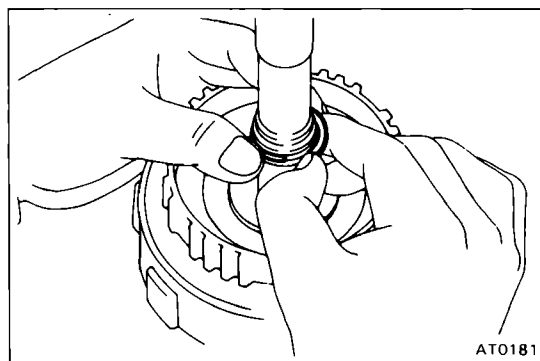


### INSPECTION OF FORWARD CLUTCH

#### 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.



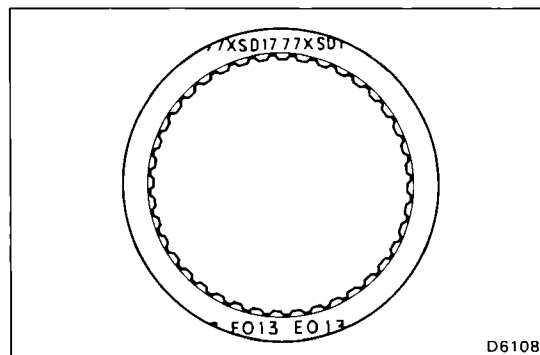
#### 2. REPLACE OIL SEAL RINGS

(a) Remove the oil seal rings.

(b) Spread the rings apart and install them into the groove.

**CAUTION:** Do not spread the ring ends too much.

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

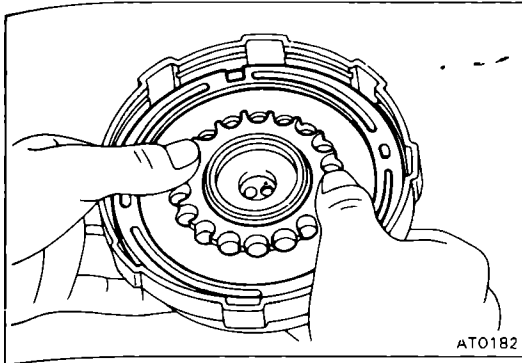


#### 3. INSPECT DISC, PLATE AND FLANGE

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

**NOTE:**

- 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 FORWARD CLUTCH**

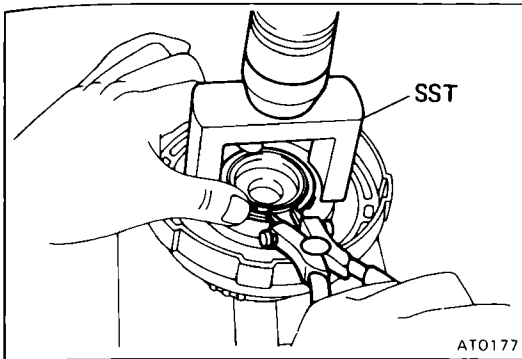
(See page AT-83)

**1. INSTALL NEW O-RINGS ON PISTON**

Coat the O-ring with ATF.

**2. INSTALL PISTON IN FORWARD CLUTCH DRUM**

Press the piston into the drum with the cup side up, being careful not to damage the O-ring.

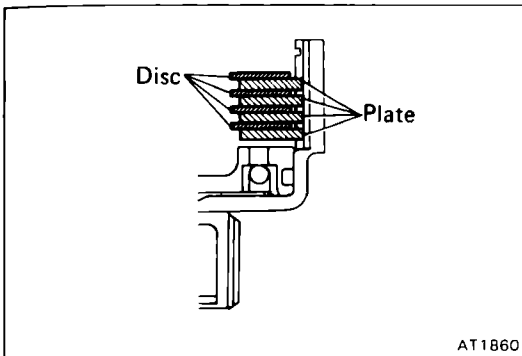
**3. INSTALL EIGHTEEN PISTON RETURN SPRINGS, SPRING RETAINER AND SNAP RING IN PLACE****4. COMPRESS RETURN SPRINGS AND INSTALL SNAP RING IN GROOVE**

(a) Place SST on the spring retainer, and compress the springs with a shop press.

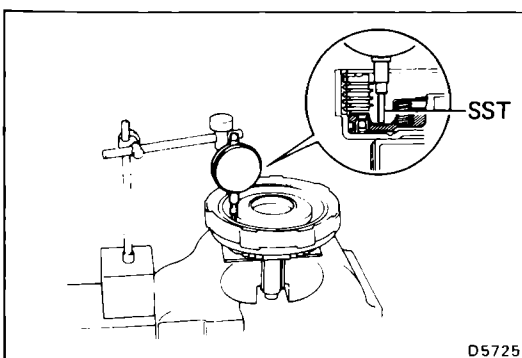
SST 09350-32014 (09351-32070)

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

The end gap of the snap ring is not aligned with the spring retainer claw.

**5. INSTALL PLATES, DISCS AND FLANGE**Install in order: Plate-disc-plate-disc-plate-disc-plate-disc-plate-disc  
Install the flange with the flat end facing downward.**6. INSTALL OUTER SNAP RING**

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

**7. CHECK PISTON STROKE OF FORWARD CLUTCH**

If replacing the disc, plate or flange, check the piston stroke.

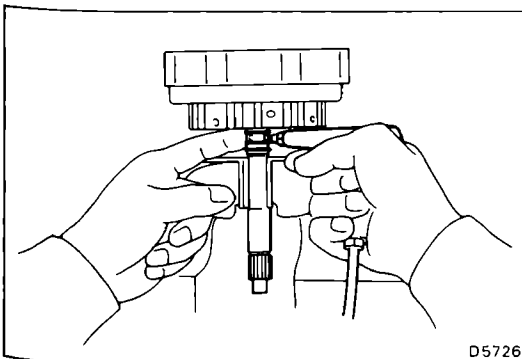
Using a dial indicator (long type pick or SST), measure the forward clutch piston stroke applying and releasing the compressed air (4 – 8 kg/cm<sup>2</sup>, 57 – 114 psi or 392 – 785 kPa) as shown.

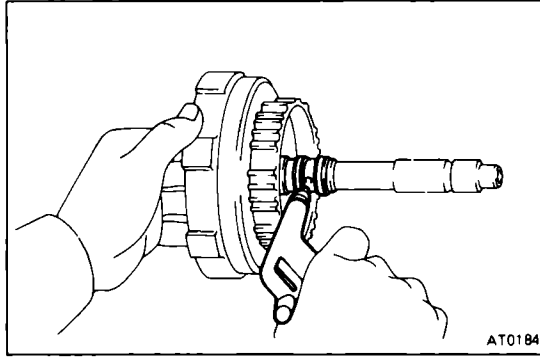
SST 09350-32014 (09351-32190)

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

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

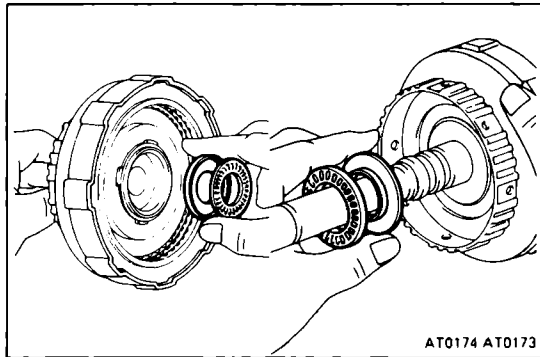
If the piston stroke nonstandard, select another flange.

**NOTE:** There are two different thicknesses for the flange.**Flange thickness: 3.00 mm (0.1181 in.)****3.37 mm (0.1327 in.)**

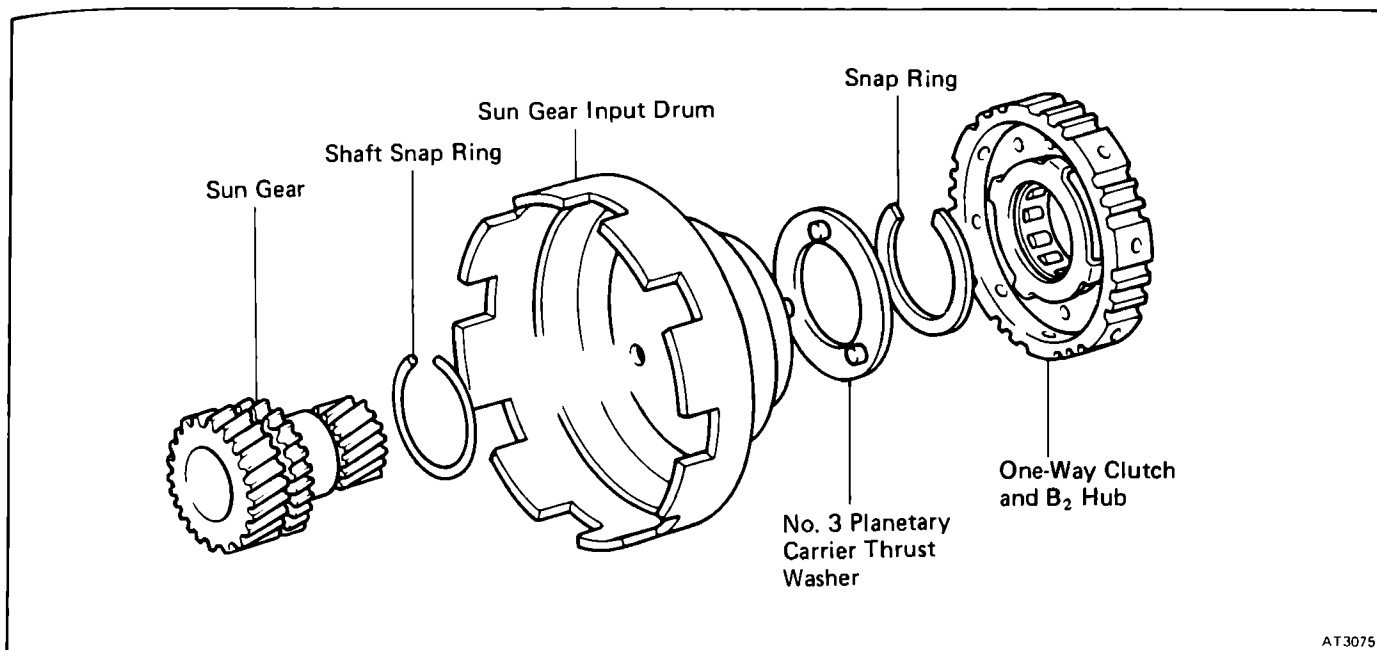
**8. CHECK OPERATION OF FORWARD CLUTCH**

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

If the piston does not move, disassemble and inspect.

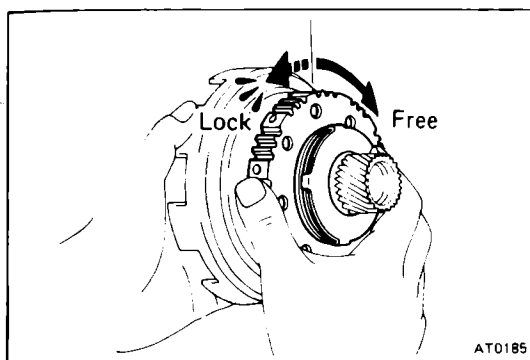
**9. INSTALL BEARING AND RACES**

## NO. 1 ONE-WAY CLUTCH AND SUN GEAR



AT3075

### DISASSEMBLY OF NO. 1 ONE-WAY CLUTCH AND SUN GEAR

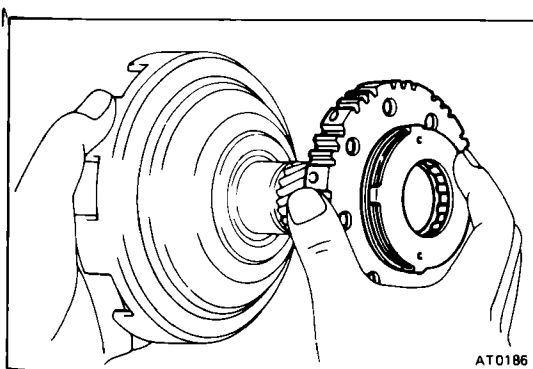


AT0185

#### 1. CHECK OPERATION OF ONE-WAY CLUTCH

Hold the sun gear input drum and turn the hub.

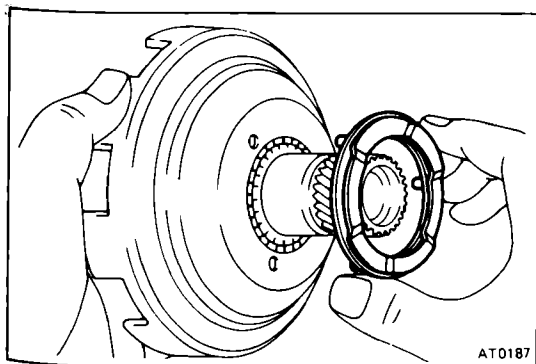
The hub should turn freely clockwise and should lock counterclockwise.



AT0186

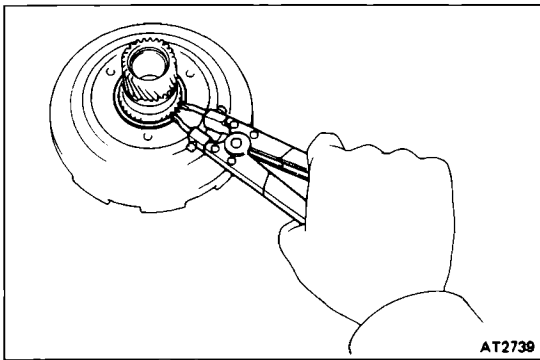
#### 2. REMOVE SECOND BRAKE HUB AND ONE-WAY CLUTCH FROM SUN GEAR

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



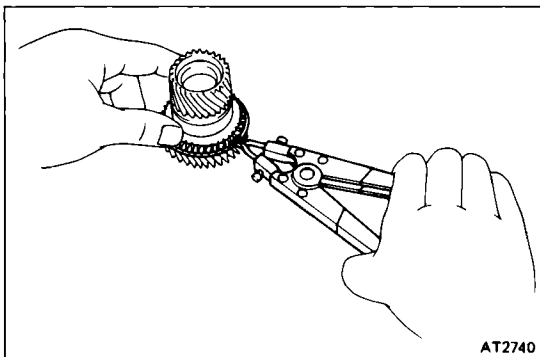
AT0187

#### 3. REMOVE NO. 3 PLANETARY CARRIER 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

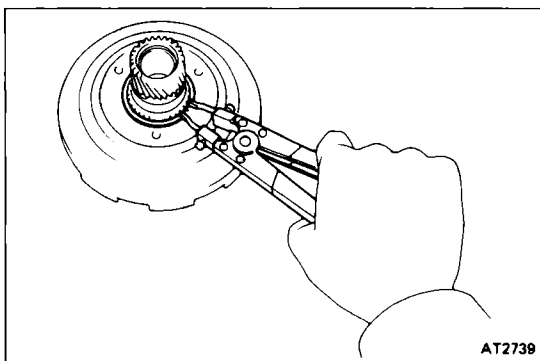
- Using the snap ring pliers, remove the shaft snap ring from the sun gear.

### ASSEMBLY OF NO. 1 ONE-WAY CLUTCH AND SUN GEAR

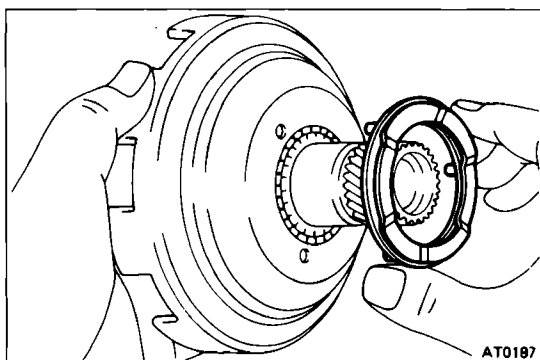
#### 1. INSTALL SHAFT SNAP RING TO SUN GEAR

#### 2. INSTALL SUN GEAR TO DRUM

- (a) Install the sun gear to the drum.
- (b) Using the snap ring pliers, install the snap ring to the drum.



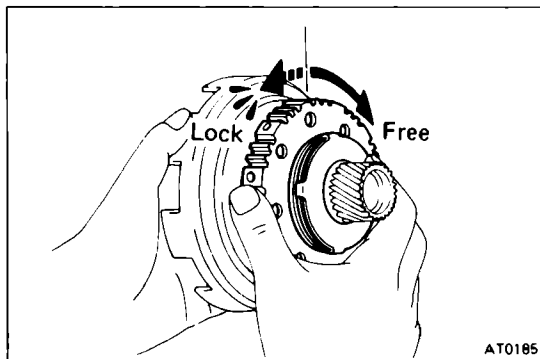
#### 3. INSTALL THRUST WASHER TO SUN GEAR INPUT DRUM



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

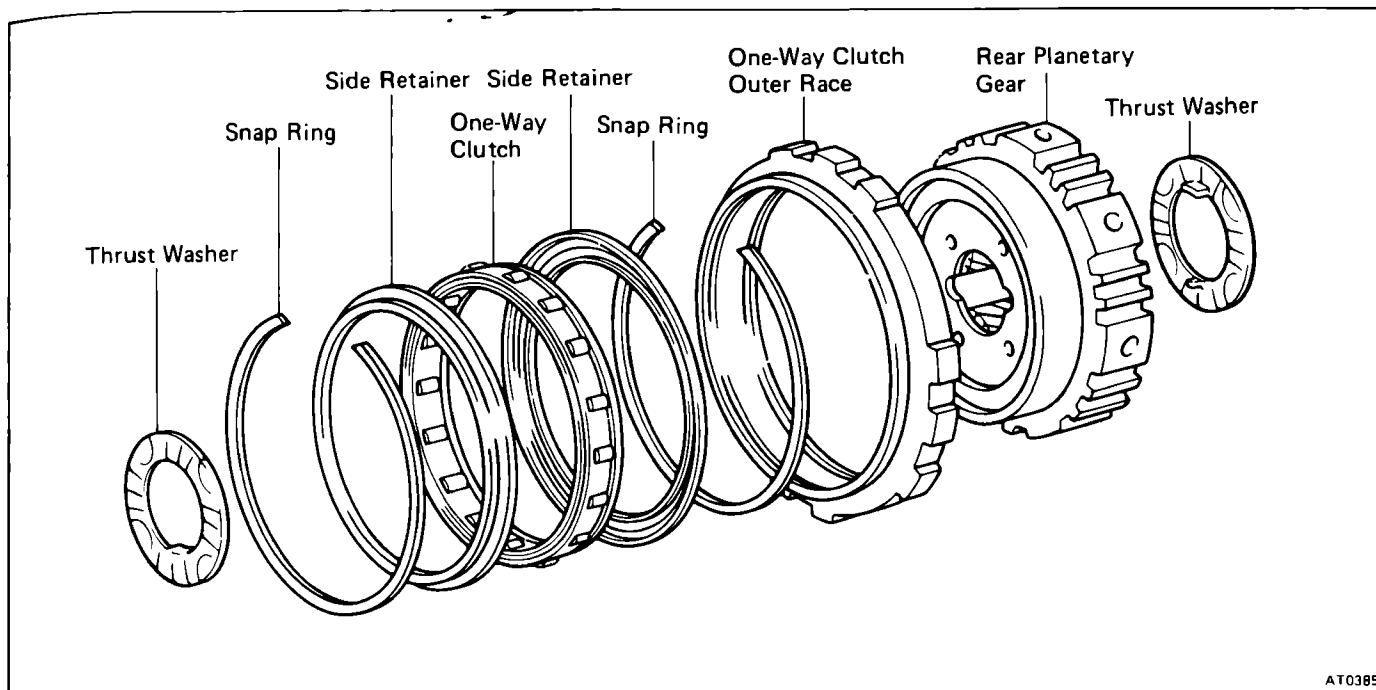
- While turning the hub clockwise, slide the one-way clutch onto the sun gear.

#### 5. RECHECK OPERATION OF NO. 1 ONE-WAY CLUTCH

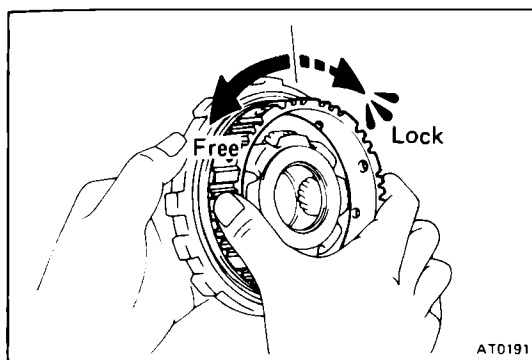




# NO. 2 ONE-WAY CLUTCH AND REAR PLANETARY GEAR



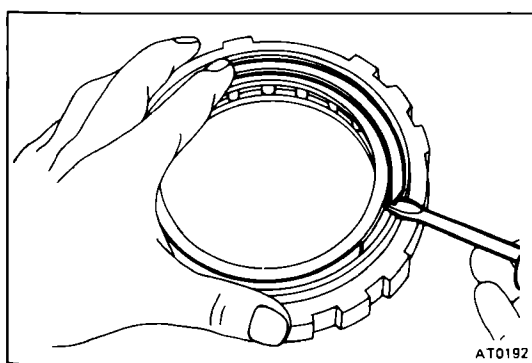
AT0385



AT0191

## DISASSEMBLY OF ONE-WAY CLUTCH

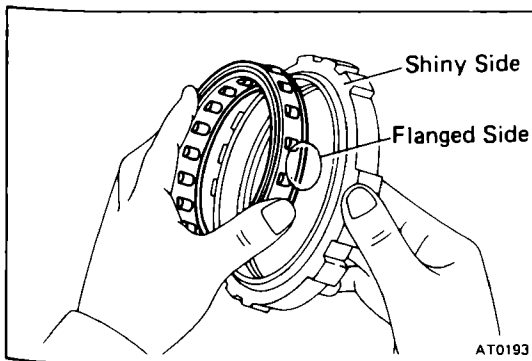
1. **CHECK OPERATION OF ONE-WAY CLUTCH**  
Hold the outer race and turn the hub.  
The hub should turn freely counterclockwise and should lock clockwise.
2. **REMOVE NO. 2 PLANETARY CARRIER THRUST WASHERS FROM BOTH SIDES OF CARRIER**
3. **DISASSEMBLE ONE-WAY CLUTCH**  
Remove the hub and the planetary gear from the one-way clutch.
4. **REMOVE BOTH SIDE SNAP RINGS AND TWO SIDE RETAINERS**
5. **REMOVE ONE-WAY CLUTCH FROM OUTER RACE**



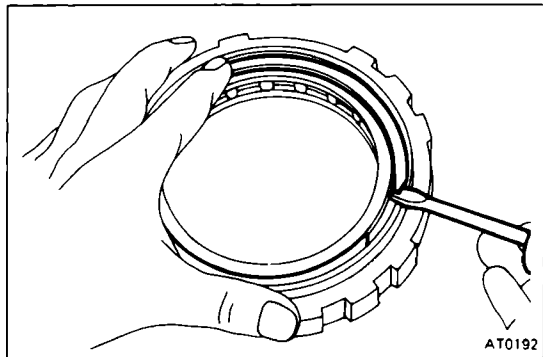
AT0192

## ASSEMBLY OF ONE-WAY CLUTCH

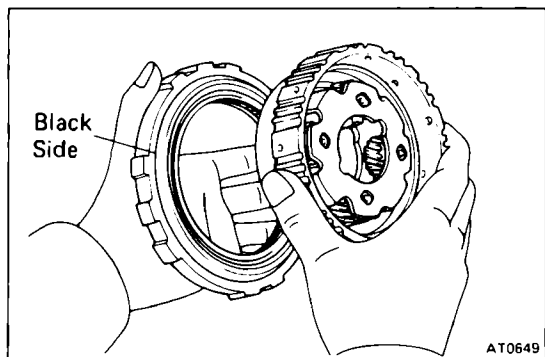
1. **INSTALL ONE-WAY CLUTCH**  
Install the one-way clutch into the outer race, facing the flanged side of the one-way clutch inward from the shiny side of the outer race.



AT0193

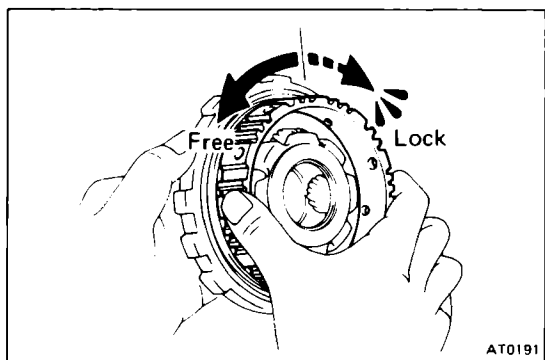


**2. INSTALL BOTH RETAINERS AND TWO SNAP RINGS**



**3. INSTALL REAR PLANETARY GEAR INTO ONE-WAY CLUTCH**

Install the planetary gear into the one-way clutch, facing the inner race of planetary gear inward from the black side of the outer race.

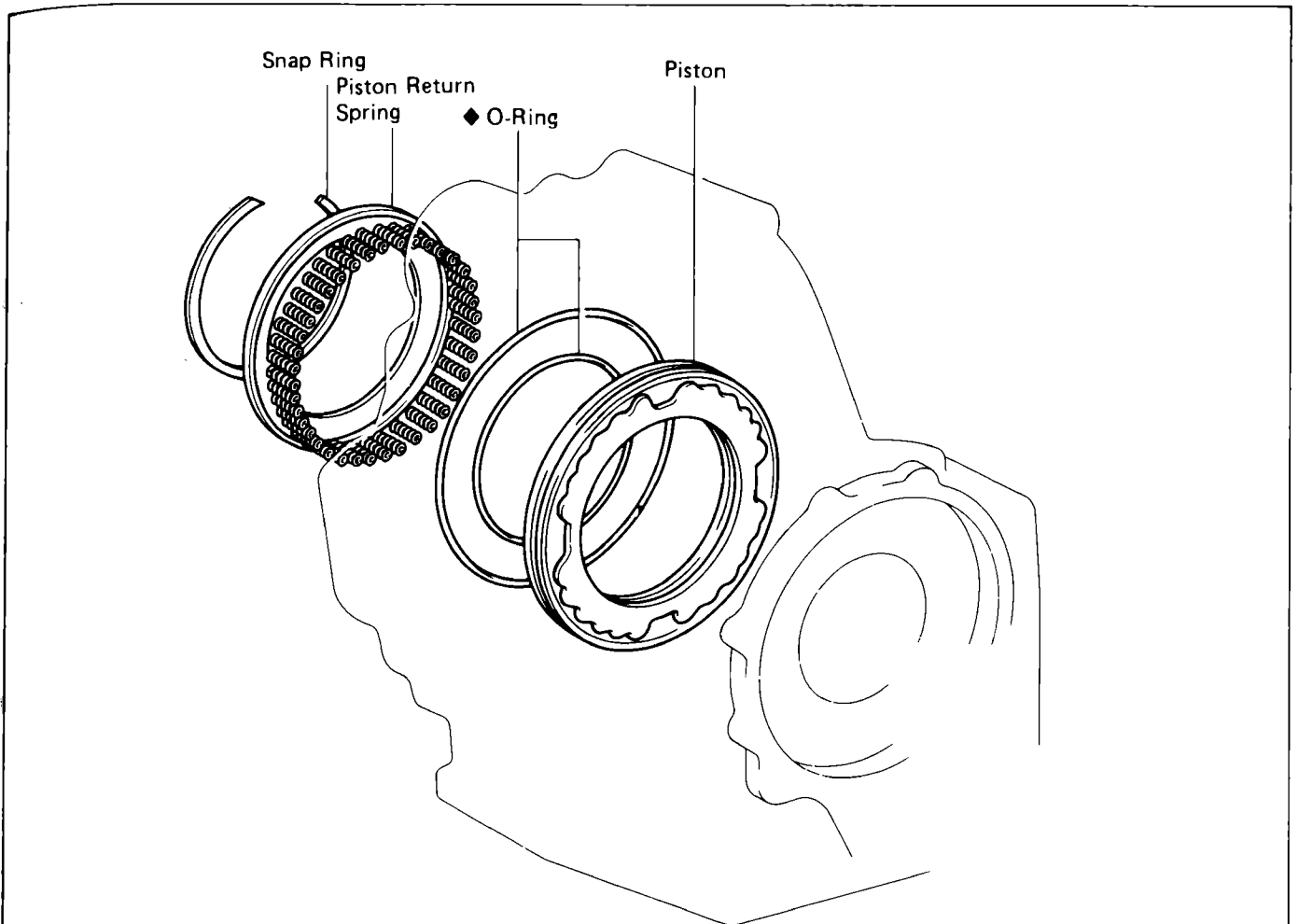


**4. CHECK OPERATION OF ONE-WAY CLUTCH**

**5. INSTALL NO. 2 PLANETARY CARRIER THRUST WASHERS ONTO BOTH SIDES OF CARRIER**

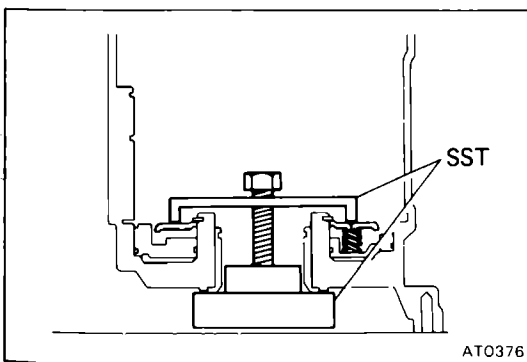
- (a) Coat the thrust washers with petroleum jelly.
- (b) Align the tab of the washers with the hollow of the carrier.

# FIRST AND REVERSE BRAKE PISTON



◆ Non-reusable part

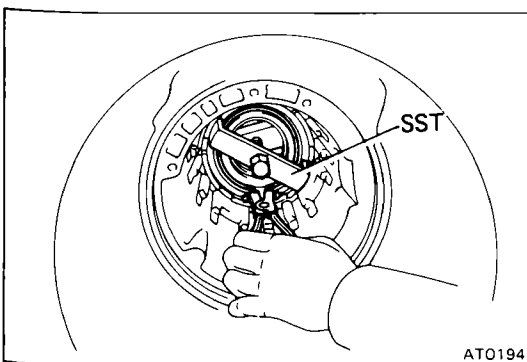
AT0386



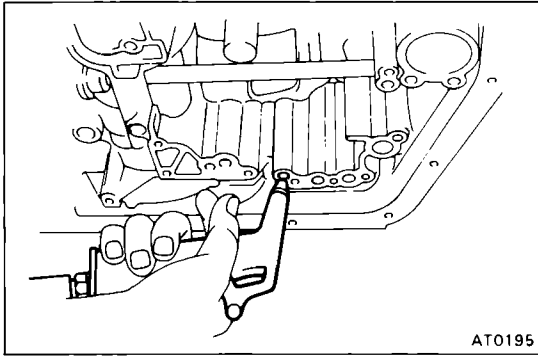
AT0376

## DISASSEMBLY OF FIRST AND REVERSE BRAKE PISTON

1. **COMPRESS RETURN SPRINGS AND REMOVE SPRING RETAINER SNAP RING**
  - (a) Install SST. Compress the springs evenly by tightening the bolt gradually.  
SST 09350-32014 (09351-32040)
  - (b) Using snap ring pliers, remove the snap ring.
  - (c) Remove SST.  
SST 09350-32014 (09351-32040)
2. **REMOVE SNAP RING AND RETURN SPRING ASSEMBLY**



AT0194

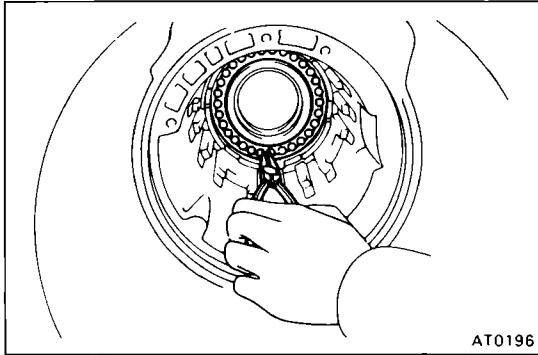


AT0195

### 3. REMOVE PISTON FROM TRANSMISSION CASE WITH COMPRESSED AIR

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

NOTE: Hold the piston so it does not slant and then blow with the gun slightly away from the oil hole.



AT0196

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

### 4. REMOVE O-RINGS FROM PISTON

## ASSEMBLY OF FIRST AND REVERSE BRAKE PISTON

(See page AT-91)

### 1. INSTALL NEW O-RINGS ON PISTON

Coat the O-rings with ATF.

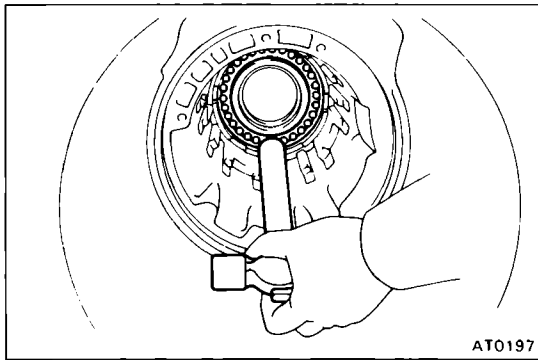
### 2. INSTALL PISTON IN TRANSMISSION CASE

Push the piston into the bore of the case facing the spring seats upward.

### 3. PLACE SST BASE UNDER CASE

SST 09350-32014 (09351-32040)

### 4. INSTALL PISTON RETURN SPRING ASSEMBLY AND SET SNAP RING IN PLACE



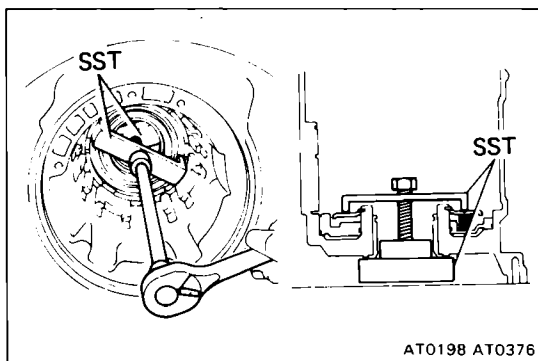
AT0197

### 5. COMPRESS PISTON RETURN SPRINGS TO ALLOW INSTALLATION OF SNAP RING

**CAUTION:** Do not overtighten the bolt.

Gradually and evenly tighten the bolt to compress the springs, being careful not to damage the transmission case with SST.

SST 09350-32014 (09351-32040)



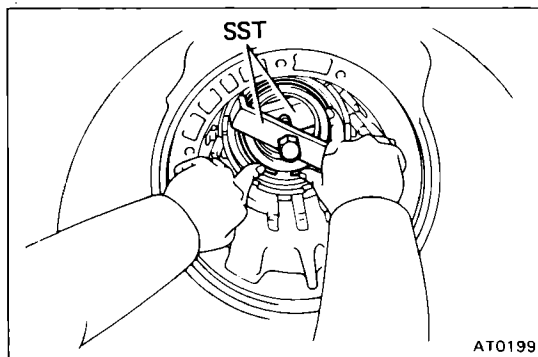
AT0198 AT0376

### 6. INSTALL SNAP RING

- (a) Push the snap ring into place with your fingers. 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.

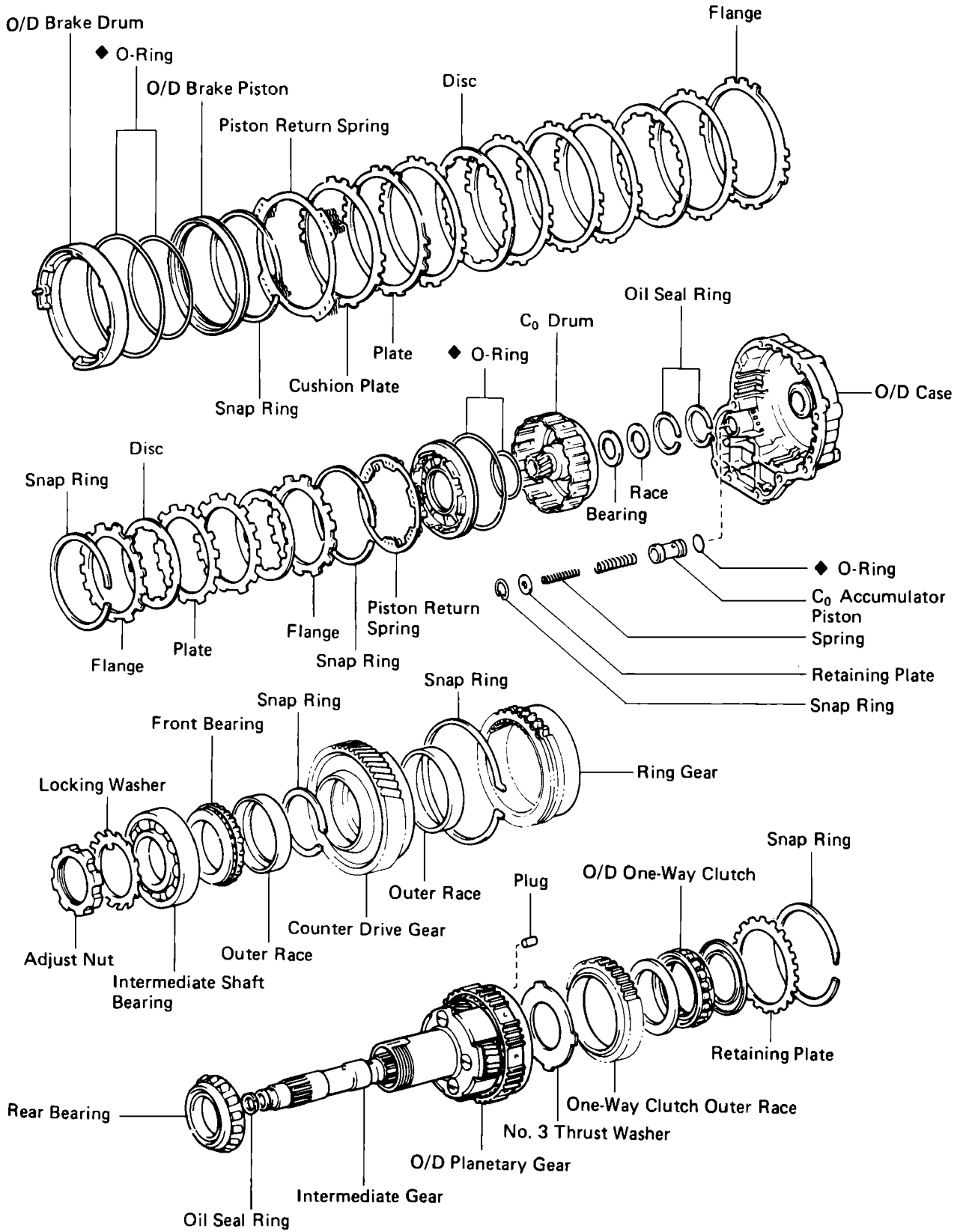
- (b) Remove the SST.

SST 09350-32014 (09351-32040)

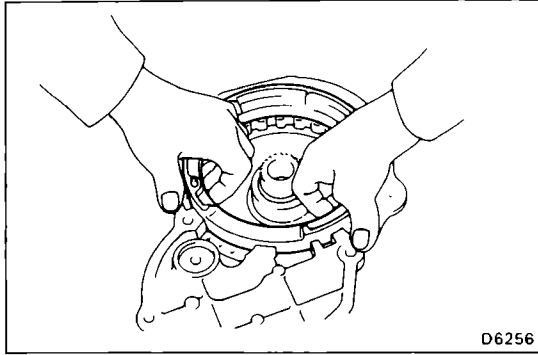


AT0199

# OVERDRIVE UNIT



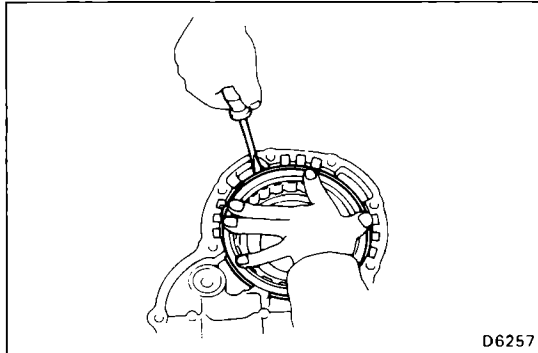
♦ Non-reusable part



D6256

## DISASSEMBLY OF OVERDRIVE BRAKE

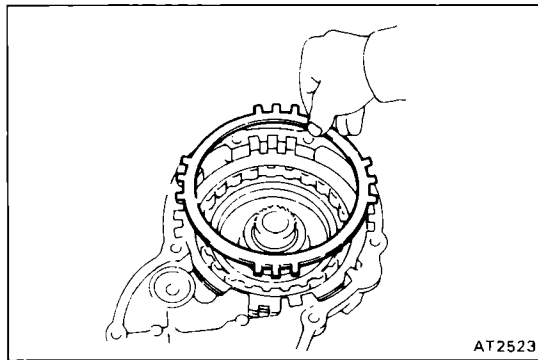
### 1. REMOVE OVERDRIVE BRAKE DRUM



D6257

### 2. REMOVE PISTON RETURN SPRING ASSEMBLY

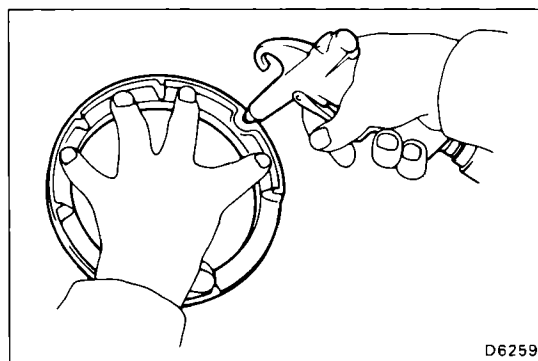
- (a) While pushing the return spring, remove the snap ring with a screwdriver.
- (b) Remove the return spring.



AT2523

### 3. REMOVE CUSHION PLATE

### 4. REMOVE PLATES, DISCS AND FLANGE



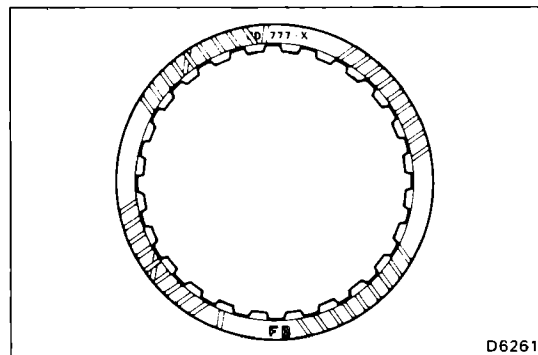
D6259

### 5. BLOW OUT PISTON FROM DRUM

Apply compressed air to oil hole to remove the piston.

NOTE: Blow with the gun slightly away from the oil hole, and be careful that the piston doesn't tilt.

### 6. REMOVE O-RING FROM PISTON



D6261

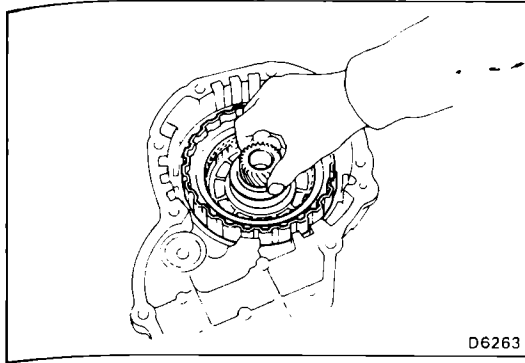
## INSPECTION OF OVERDRIVE BRAKE

### INSPECT DISC, PLATE AND FLANGE

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

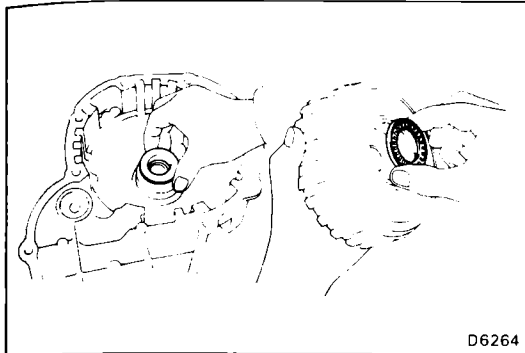
#### NOTE:

- 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.

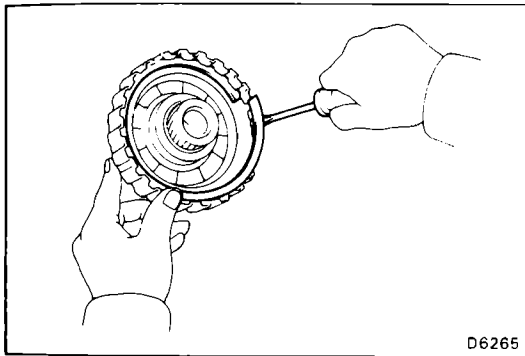


## DISASSEMBLY OF OVERDRIVE DIRECT CLUTCH (See page AT-93)

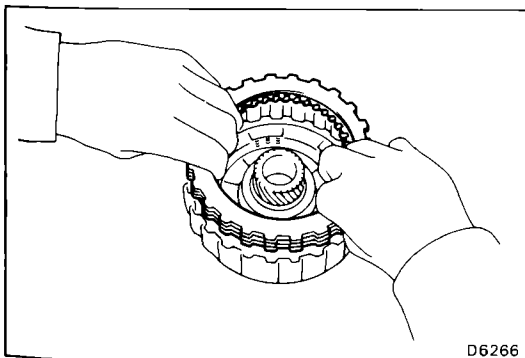
1. REMOVE OVERDRIVE DIRECT CLUTCH FROM CASE



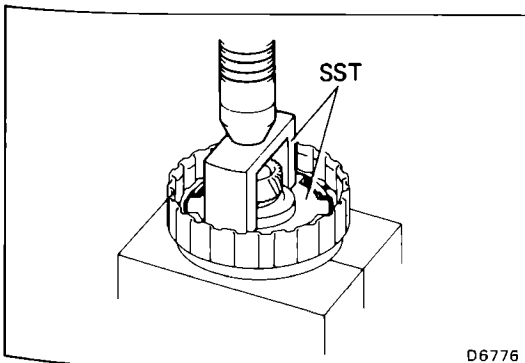
2. REMOVE BEARING AND RACE FROM CLUTCH DRUM AND CASE



3. REMOVE SNAP RING WITH SCREWDRIVER



4. REMOVE FLANGES, DISCS AND PLATES

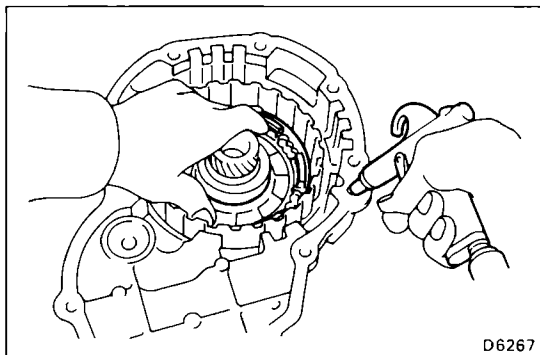


5. COMPRESS PISTON RETURN SPRING AND REMOVE SNAP RING

(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 with a screwdriver.

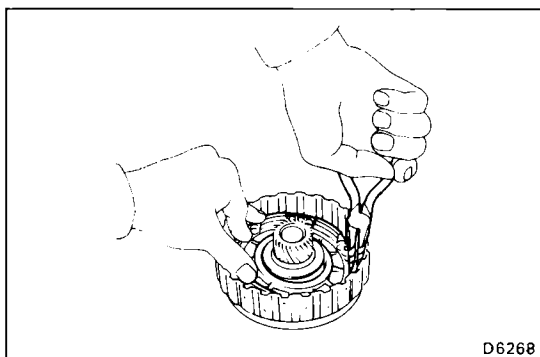


D6267

## 6. ASSEMBLE OVERDRIVE DIRECT CLUTCH DRUM ON CASE AND BLOW OUT PISTON

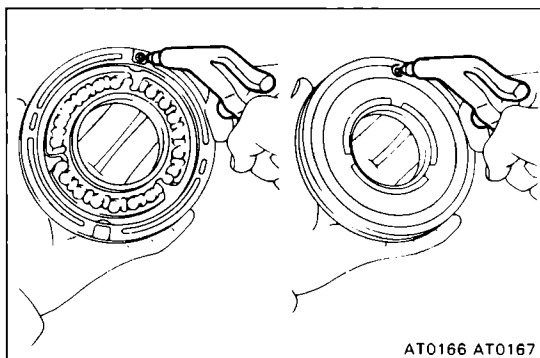
- (a) Install the clutch drum on the case.
- (b) Apply compressed air to the pressure apply hole with the case.
- (c) Remove the overdrive direct clutch drum from the case.

If the piston does not come out completely, use needle-nose pliers to remove it.



D6268

## 7. REMOVE O-RINGS FROM PISTON



AT0166 AT0167

## INSPECTION OF OVERDRIVE DIRECT CLUTCH

### 1. INSPECT OVERDRIVE DIRECT CLUTCH PISTON

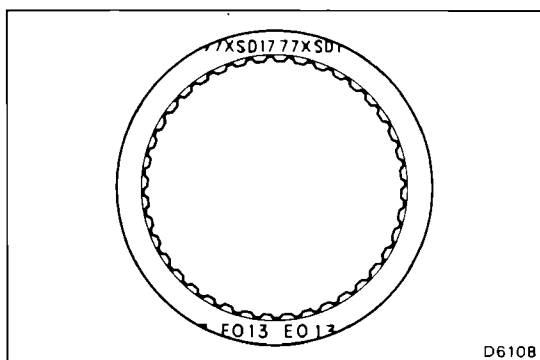
- (a) Check that check ball is free by shaking the piston.
- (b) Check that the valve does not leak by applying low-pressure compressed air.

### 2. INSPECT DISC, PLATE AND FLANGE

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

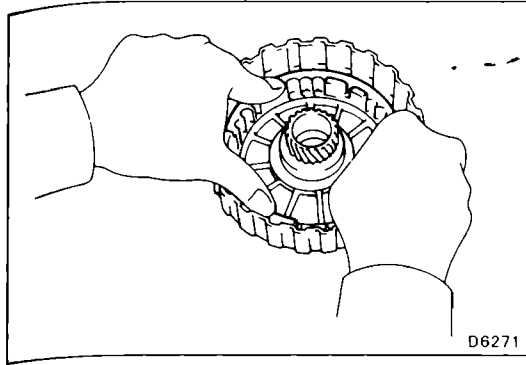
#### NOTE:

- 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.



D6108



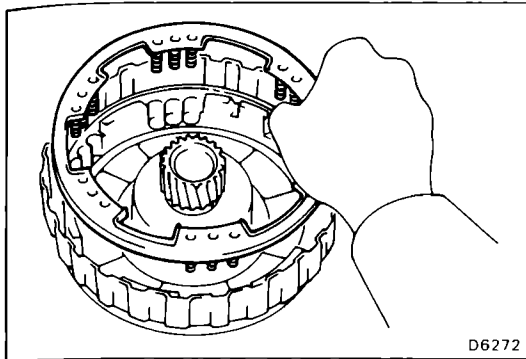


**ASSEMBLY OF OVERDRIVE DIRECT CLUTCH**

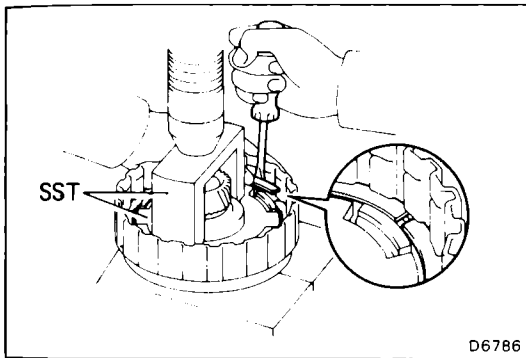
(See page AT-93)

**1. INSTALL CLUTCH PISTON IN OVERDRIVE DIRECT CLUTCH DRUM**

- (a) Install new O-rings on the piston. Coat the O-ring with ATF.
- (b) Press the piston into the drum with the cup side up, being careful not to damage the O-ring.

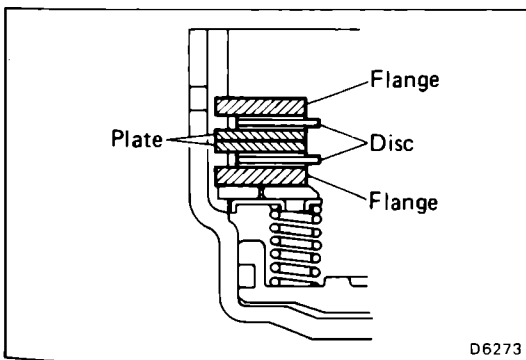


**2. INSTALL PISTON RETURN SPRING AND SET SNAP RING IN PLACE**



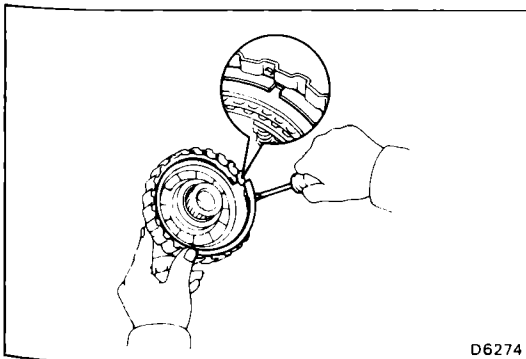
**3. COMPRESS RETURN SPRING AND INSTALL SNAP RING IN GROOVE**

- (a) Place SST on the spring retainer, and compress the spring with a shop press.  
SST 09350-32014 (09351-32070, 09351-32200)
- (b) Install the snap ring with your hands. Be sure end gap of snap ring is aligned with the groove of the clutch drum.



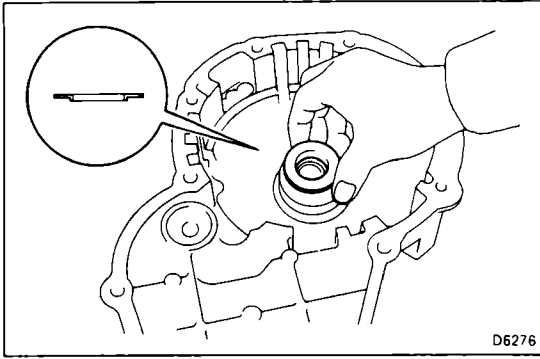
**4. INSTALL FLANGE, DISCS AND PLATE**

Install in order: Flange-disc-plate-plate-disc-flange



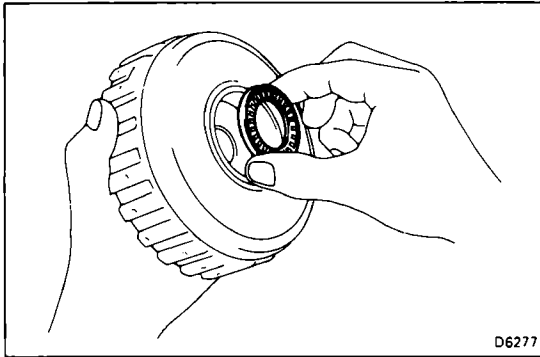
**5. INSTALL SNAP RING WITH SCREWDRIVER**

Be sure end gap of snap ring is aligned with the groove of the clutch drum.

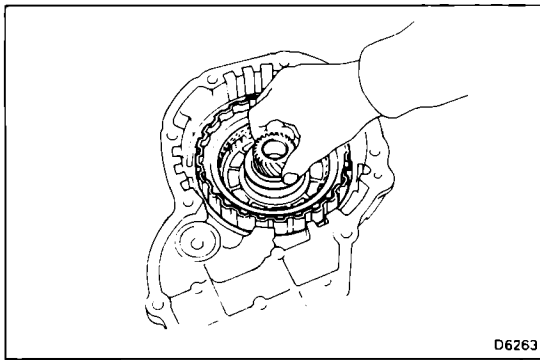


## 6. INSTALL OVERDRIVE DIRECT CLUTCH TO OVERDRIVE CASE

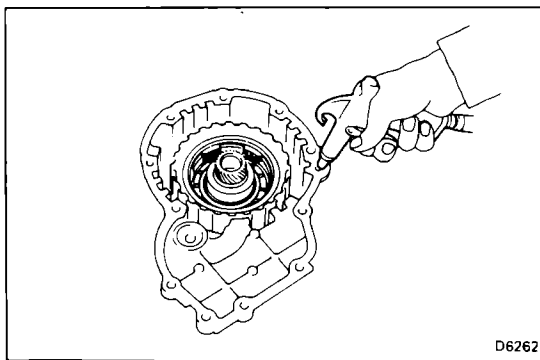
- (a) Coat the race with petroleum jelly and install it to the O/D case.



- (b) Coat the assembled bearing and race with petroleum jelly and install it facing the race side downward to the clutch drum.



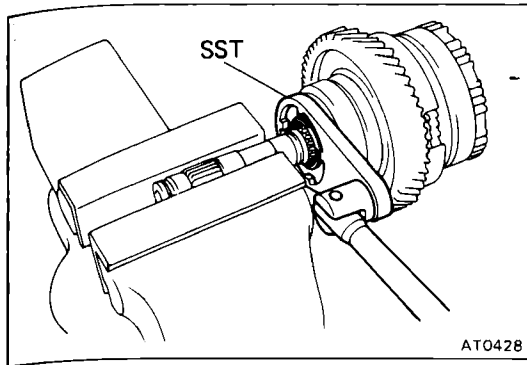
- (c) Install the O/D clutch drum to the O/D case.



## 7. CHECK OPERATION OF OVERDRIVE DIRECT CLUTCH PISTON

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

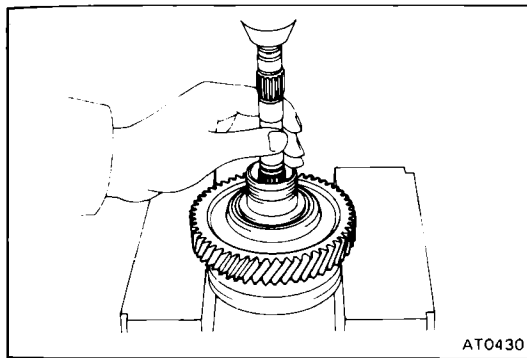
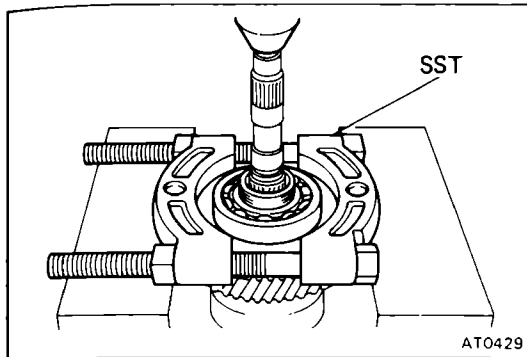
If the piston does not move, disassemble and inspect.



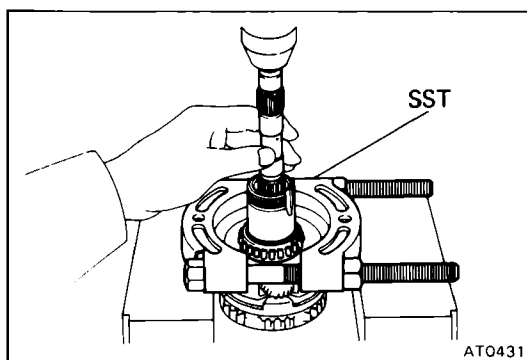
## REPLACEMENT OF COUNTER DRIVE GEAR AND BEARING

(See page AT-93)

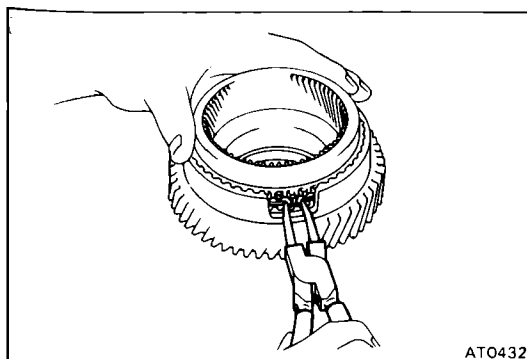
1. PRY OFF LOCKING WASHER WITH SCREWDRIVER
2. HOLD SHAFT IN VISE WITH SOFT JAWS, AND LOOSEN ADJUSTING NUT WITH SST  
SST 09350-32014 (09351-32080)
3. REMOVE ADJUSTING NUT AND WASHER
4. REMOVE INTERMEDIATE SHAFT BEARING  
Using SST, press out the bearing from the shaft.  
SST 09950-00020



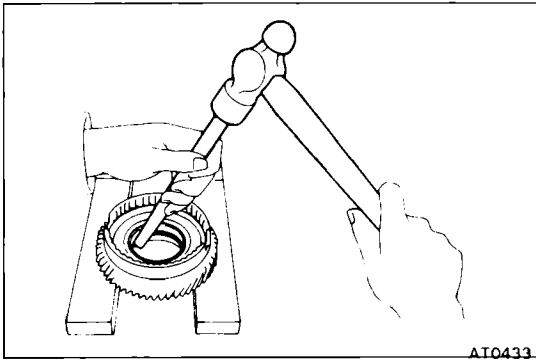
5. REMOVE COUNTER DRIVE GEAR AND FRONT BEARING  
Using a press, press out the gear and bearing together.



6. REMOVE REAR BEARING  
Using SST, press out the bearing.  
SST 09950-00020



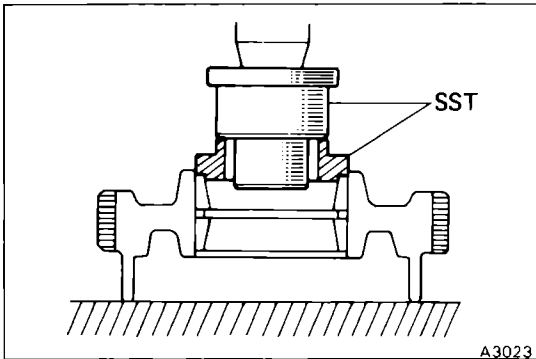
7. REMOVE OVERDRIVE PLANETARY RING GEAR FROM COUNTER DRIVE GEAR
  - (a) While pulling up the ring gear, compress the snap ring with needle-nose pliers and remove it from the groove.
  - (b) Remove the ring gear from the counter drive gear.



**8. REMOVE TWO OUTER RACES FROM COUNTER DRIVE GEAR**

Drive out the races with a brass bar and hammer.

**9. REMOVE SNAP RING FROM COUNTER DRIVE GEAR**



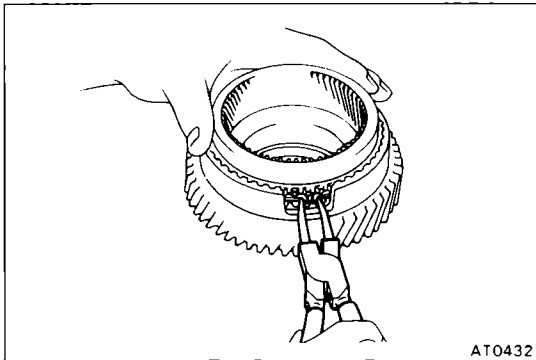
**10. INSTALL SNAP RING INTO COUNTER DRIVE GEAR**

**11. INSTALL TWO OUTER RACES INTO COUNTER DRIVE GEAR**

Using SST, press the outer races into the gear.

SST 09350-32014 (09351-32090, 09351-32120)

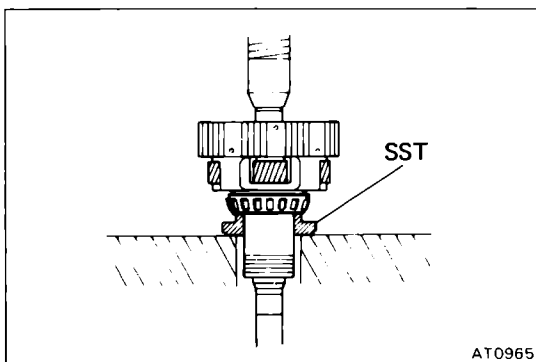
NOTE: Press in the outer races until they touch the snap ring. Tap the races in straight, so that they do not tilt.



**12. 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.

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

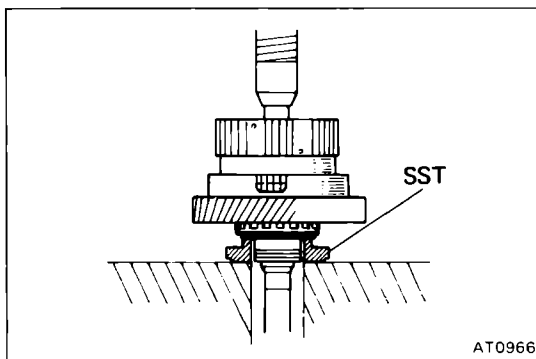


**13. INSTALL REAR BEARING**

Using SST, press in the bearing into the shaft.

SST 09350-32014 (09351-32120)

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

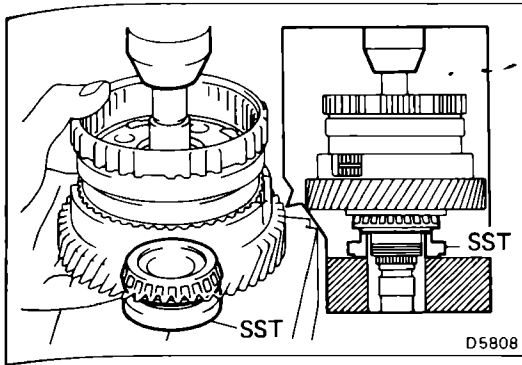


**14. INSTALL COUNTER DRIVE GEAR AND FRONT BEARING**

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

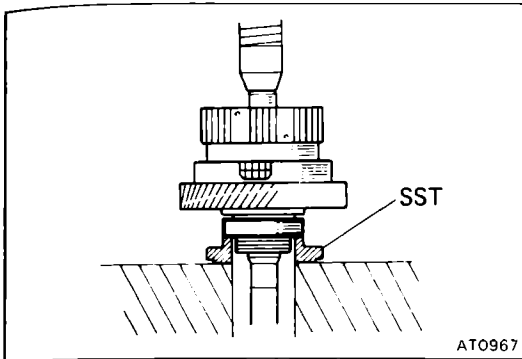
(b) Place the front bearing onto the shaft.

NOTE: Hold the ring gear to prevent it from falling.



(c) Using SST, press in the bearing until axial play between the bearings is 0.5 mm (0.020 in.).

SST 09350-32014 (09351-32120)

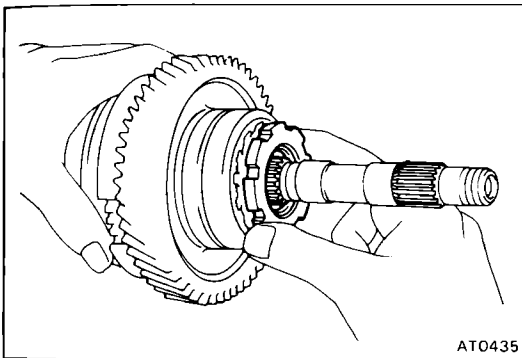


**15. INSTALL INTERMEDIATE SHAFT BEARING**

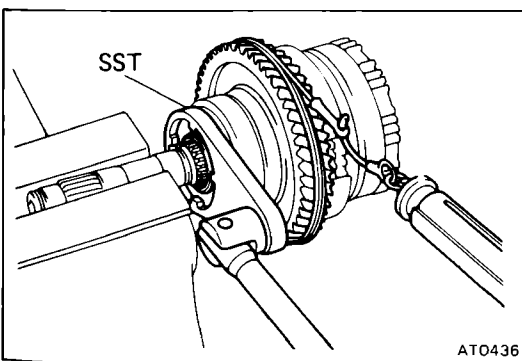
Using SST, press in the bearing until it slightly touches the front bearing of the counter drive gear.

SST 09350-32014 (09351-32120)

NOTE: The counter drive gear can be turned lightly.



**16. PLACE LOCKING WASHER AND ADJUSTING NUT ONTO INTERMEDIATE SHAFT**



**17. ADJUST PRELOAD OF COUNTER DRIVE GEAR**

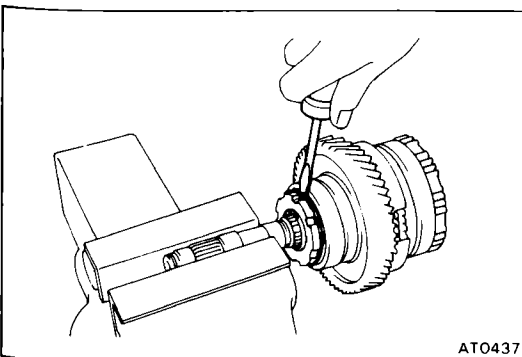
(a) Place SST onto the adjusting nut and hold the shaft in a vise with soft jaws.

SST 09350-32014 (09351-32080)

(b) Tighten the adjusting nut to the point where the following gear starting load occurs with SST.

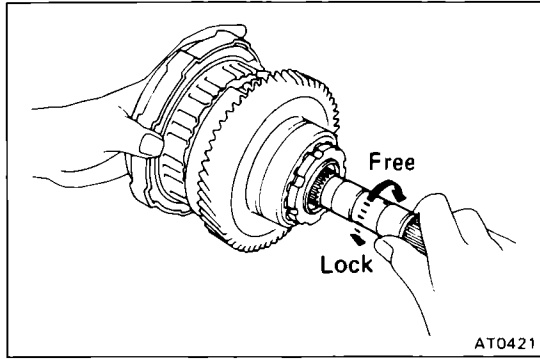
**Preload (at starting): 920 — 1,530 g  
(2.0 — 3.4 lb, 9 — 15 N)**

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



**18. LOCK ADJUSTING NUT WITH ONE TAB ON LOCKING WASHER**

Bend the locking washer tab until it is even with the adjusting nut groove.

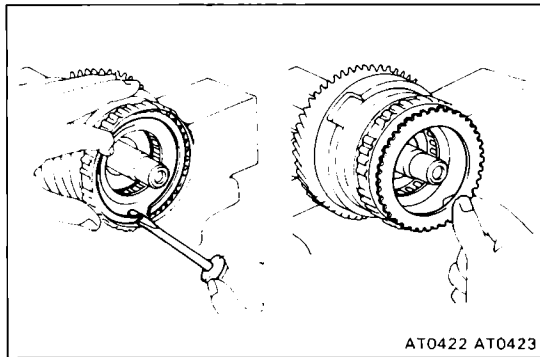


## DISASSEMBLY OF OVERDRIVE ONE-WAY CLUTCH

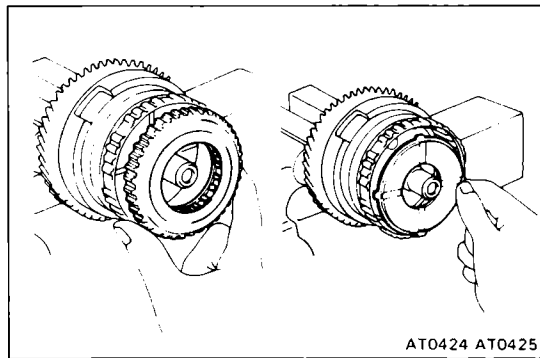
(See page AT-93)

### 1. CHECK OPERATION OF ONE-WAY CLUTCH

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

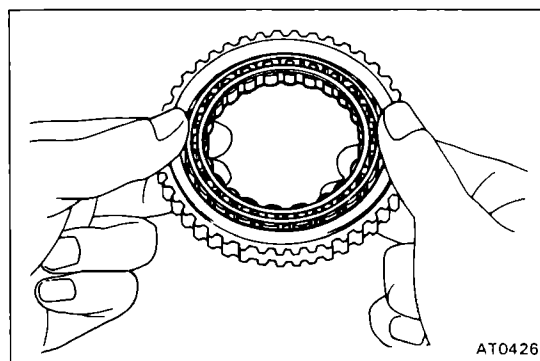


### 2. REMOVE SNAP RING AND RETAINING PLATE



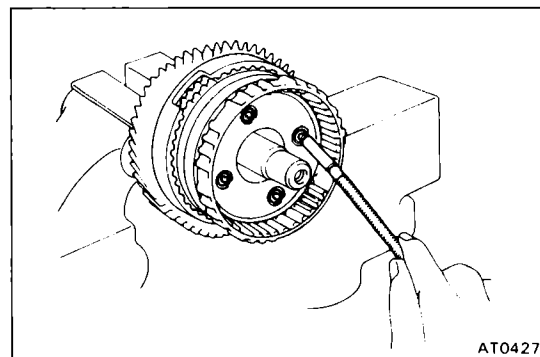
### 3. REMOVE ONE-WAY CLUTCH AND OUTER RACE TOGETHER

### 4. REMOVE NO. 3 OVERDRIVE PLANETARY THRUST WASHER



### 5. REMOVE ONE-WAY CLUTCH FROM OUTER RACE

Note the direction of the one-way clutch.



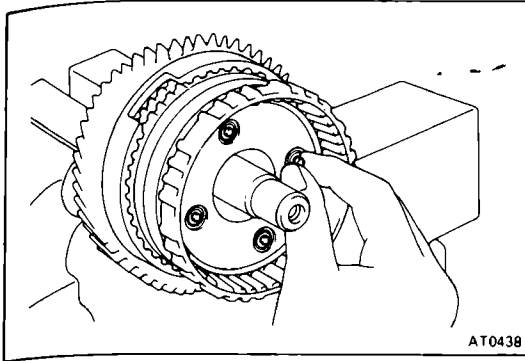
### 6. REMOVE FOUR PLUGS WITH MAGNETIC FINGER

NOTE: Be careful not to lose them.

**ASSEMBLY OF OVERDRIVE ONE-WAY CLUTCH**

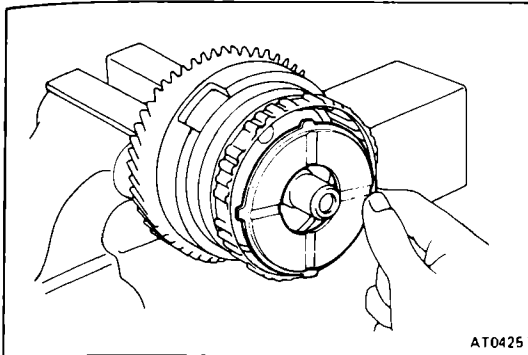
(See page AT-93)

1. INSTALL FOUR PLUGS INTO HOLE OF PINION SHAFT



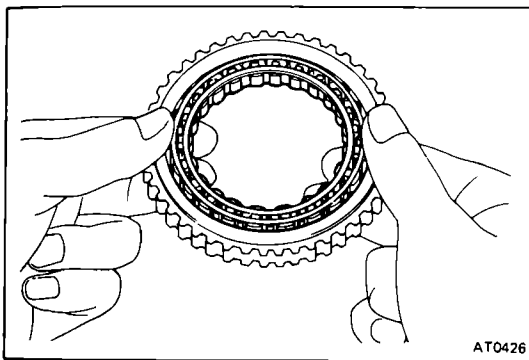
2. INSTALL NO. 3 OVERDRIVE PLANETARY THRUST WASHER

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



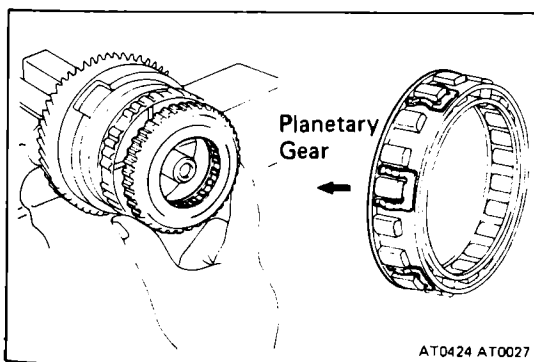
3. ASSEMBLE OVERDRIVE ONE-WAY CLUTCH

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

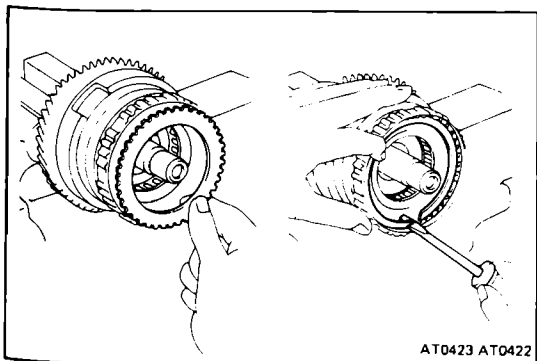


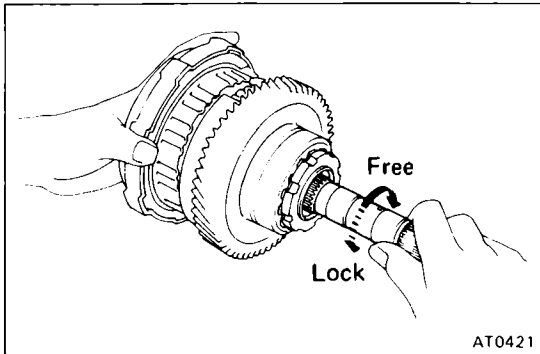
4. INSTALL OVERDRIVE ONE-WAY CLUTCH INTO HUB

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



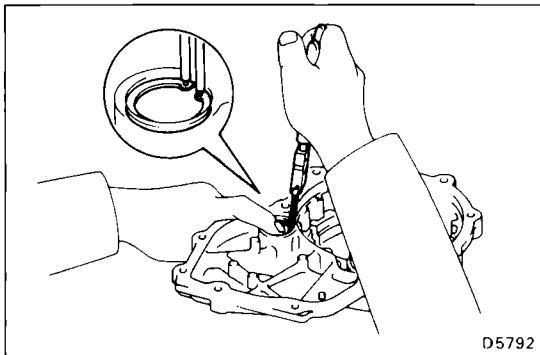
5. INSTALL RETAINING PLATE AND SNAP RING





## 6. CHECK OPERATION OF ONE-WAY CLUTCH

- (a) Install the overdrive clutch into the one-way clutch.
- (b) Hold the overdrive clutch and turn the intermediate shaft. The shaft should turn freely clockwise and should lock counterclockwise.
- (c) Remove overdrive clutch from the one-way clutch.

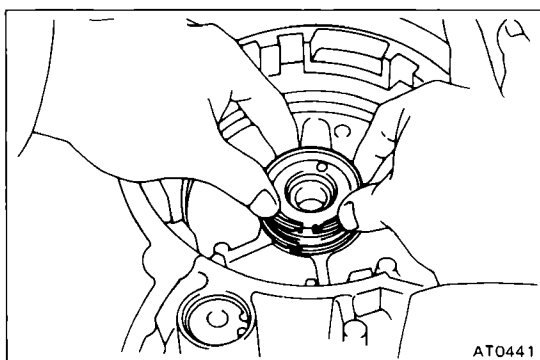
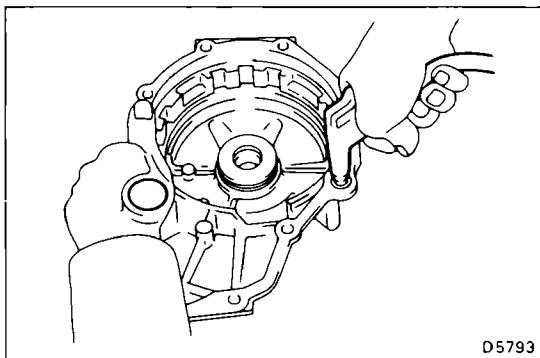


## DISASSEMBLY OF OVERDRIVE CASE

(See page AT-93)

### 1. REMOVE ACCUMULATOR PISTON OF OVERDRIVE CLUTCH

- (a) Remove the snap ring, retaining plate and springs.
- (b) Remove the accumulator piston, using low-pressure compressed air (1 kg/cm<sup>2</sup>, 14 psi or 98 kPa). Force air into the hole shown and remove the piston.



### 2. REMOVE TWO OIL SEAL RINGS FROM CASE

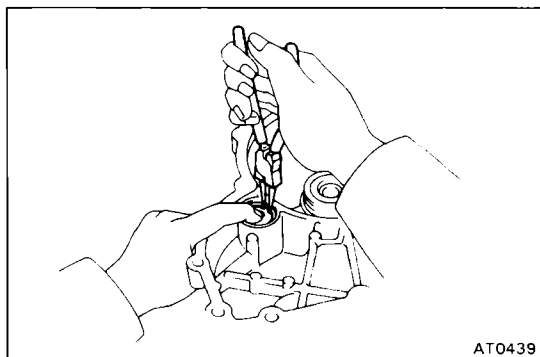
Spread the rings apart and remove them.

## ASSEMBLY OF OVERDRIVE CASE

(See page AT-93)

### 1. INSTALL TWO OIL SEAL RINGS ON OVERDRIVE CASE

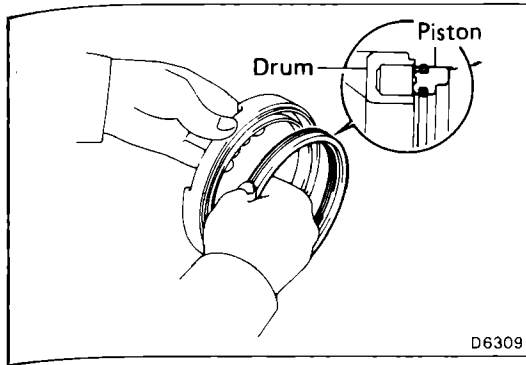
Spread the rings apart and install them into the groove.



### 2. INSTALL ACCUMULATOR PISTON OF OVERDRIVE CLUTCH

- (a) Install the accumulator piston.
- (b) Install the piston springs, retaining plate and snap ring.





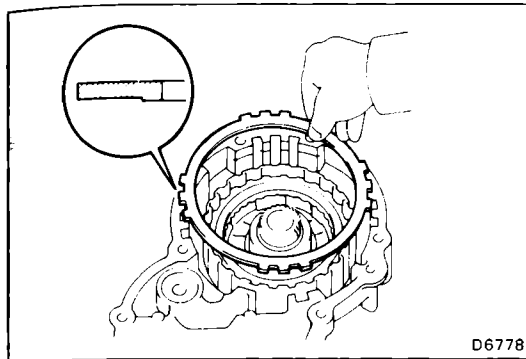
**ASSEMBLY OF OVERDRIVE BRAKE**

(See page AT-93)

**1. INSTALL NEW O-RINGS ONTO PISTON**

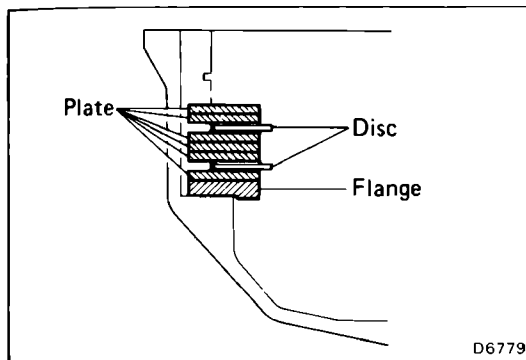
**2. INSTALL PISTON INTO DRUM**

- (a) Coat the O-rings with ATF.
- (b) Press the piston into the drum, being careful not to damage the O-rings.

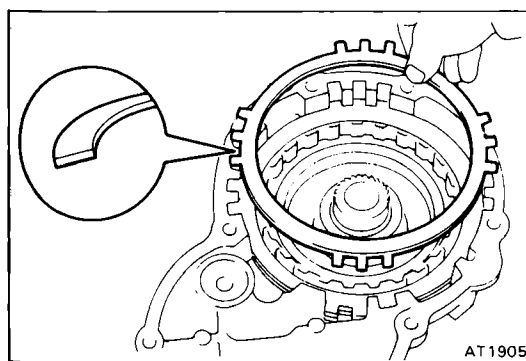


**3. INSTALL FLANGE, DISCS AND PLATES**

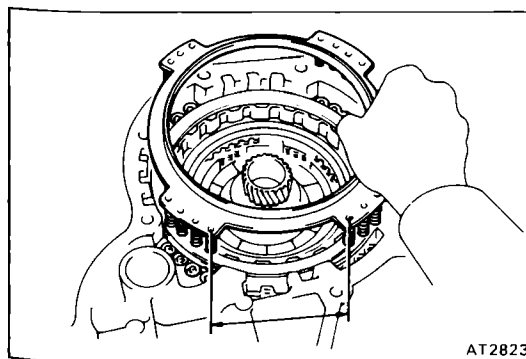
- (a) Install the flange, facing the flat end upward.



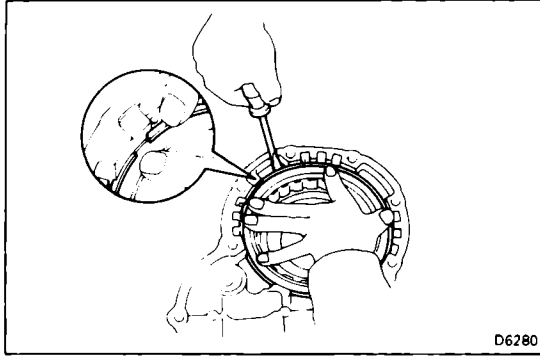
- (b) Install in order: Plate-disc-plate-plate-disc-plate-plate



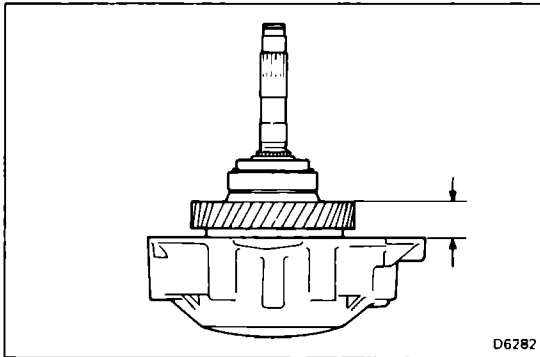
- (c) Install the cushion plate facing the rounded end upward.



**4. INSTALL PISTON RETURN SPRING**

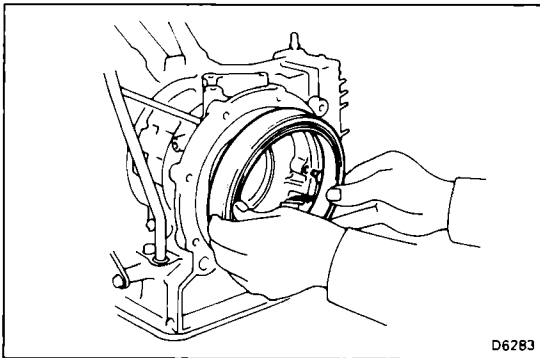
**5. INSTALL SNAP RING INTO CASE**

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

**6. INSTALL OVERDRIVE GEAR ASSEMBLY ONTO CASE**

While turning the overdrive gear clockwise, install the overdrive gear assembly to the case.

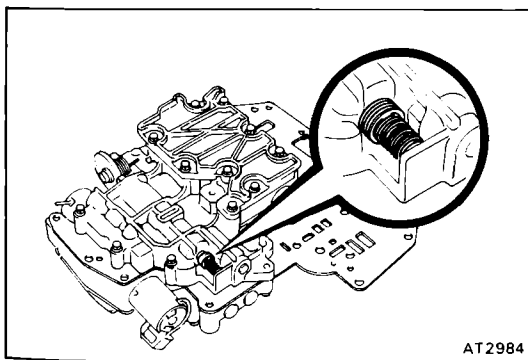
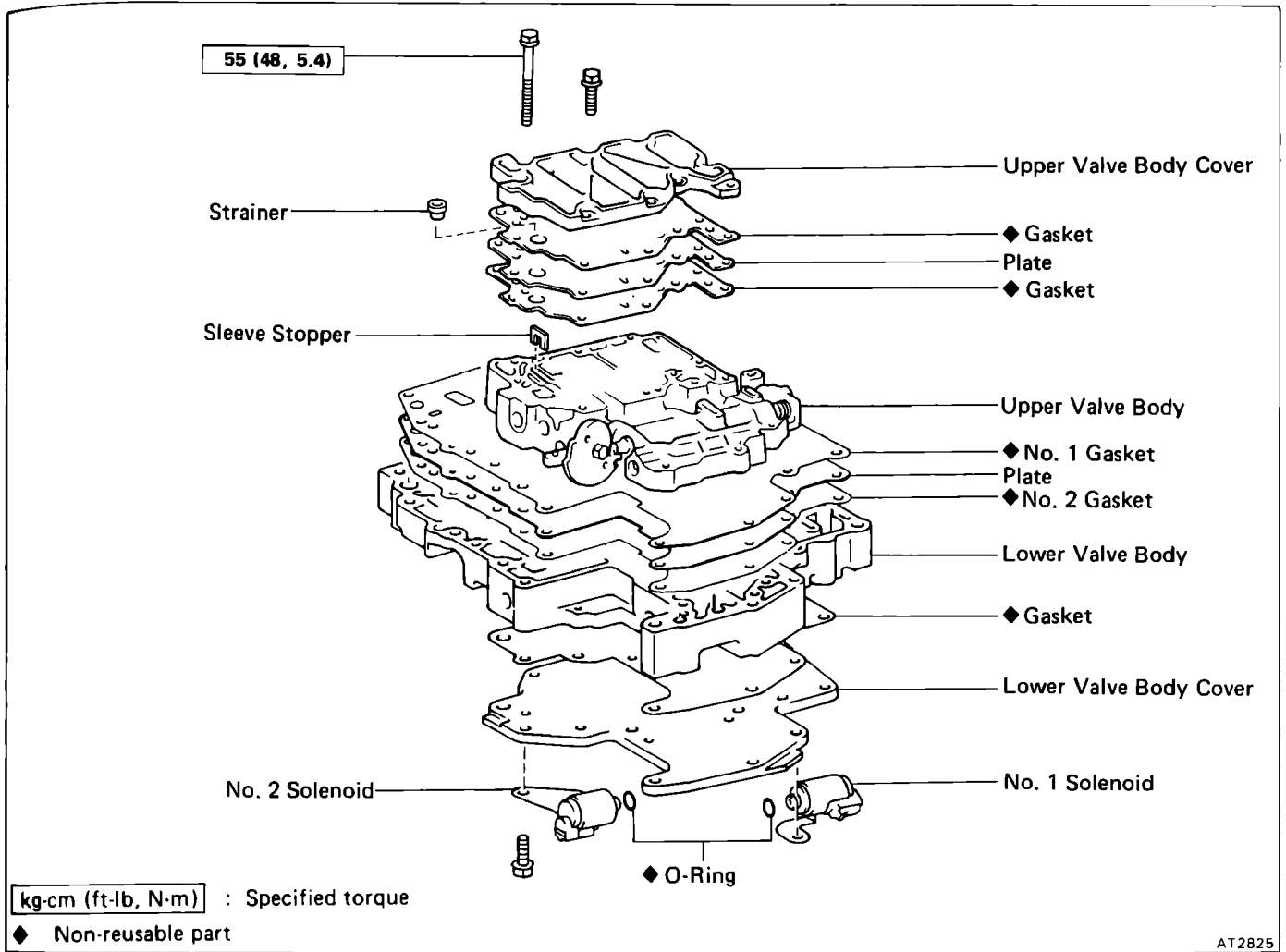
If the overdrive gear assembly is properly installed to the overdrive case, the clearance between them will be about 24 mm (0.94 in.).

**7. INSTALL OVERDRIVE BRAKE DRUM**

Align the pin of overdrive brake drum to the hole of transaxle case, and install it.

# VALVE BODY (A140E)

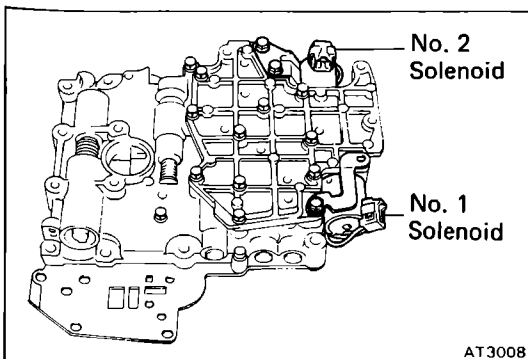
## COMPONENTS



### (Disassembly of Valve Body)

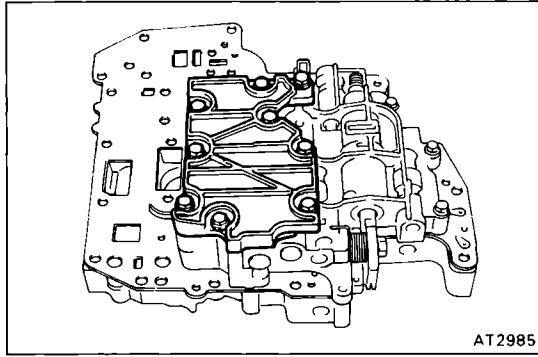
#### 1. NOTE THE NUMBERS OF ADJUSTING RINGS

NOTE: 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.)



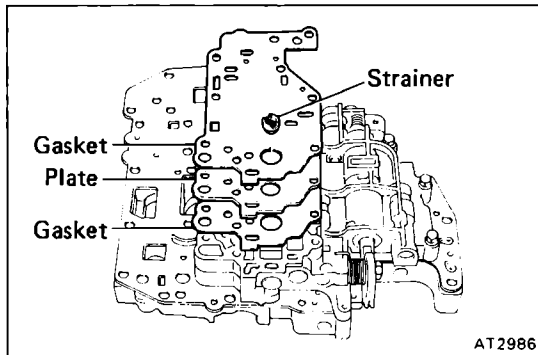
#### 2. REMOVE SOLENOIDS

- (a) Remove the No. 1 and No. 2 solenoids.
- (b) Remove the O-rings from the solenoids.



### 3. REMOVE UPPER VALVE BODY COVER

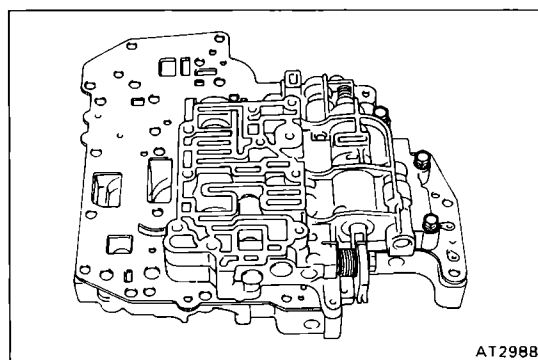
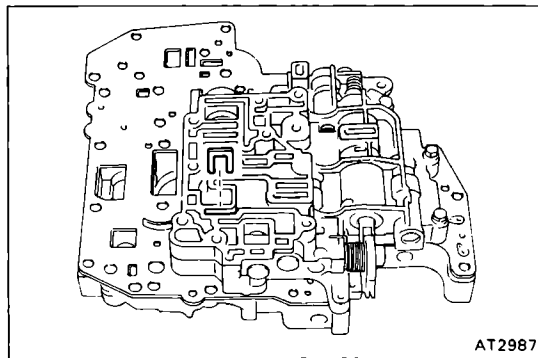
Remove the nine bolts and upper valve body cover.



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

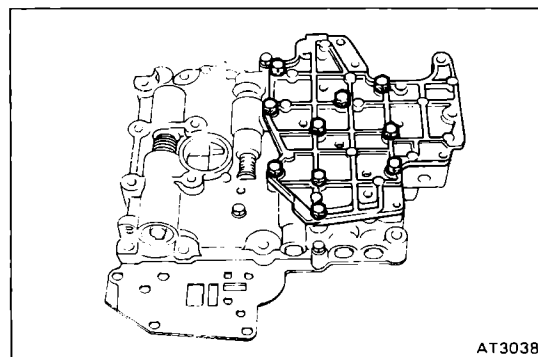
(a) Remove the strainer, two gaskets and plate.

(b) Remove the sleeve stopper.



### 5. REMOVE BOLTS FROM UPPER VALVE BODY

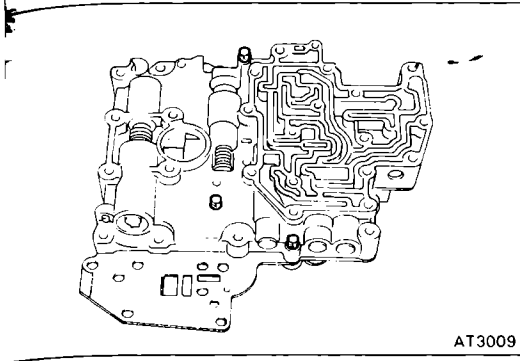
Remove the three bolts from the upper valve body.



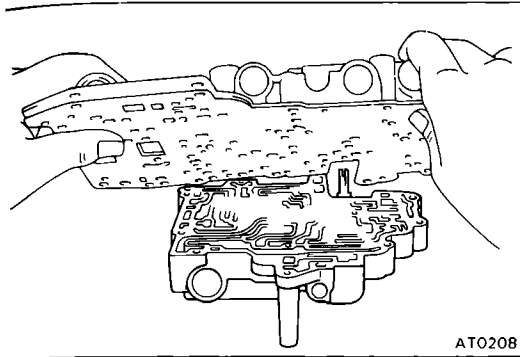
### 6. REMOVE LOWER VALVE BODY COVER

(a) Remove the ten bolts.

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



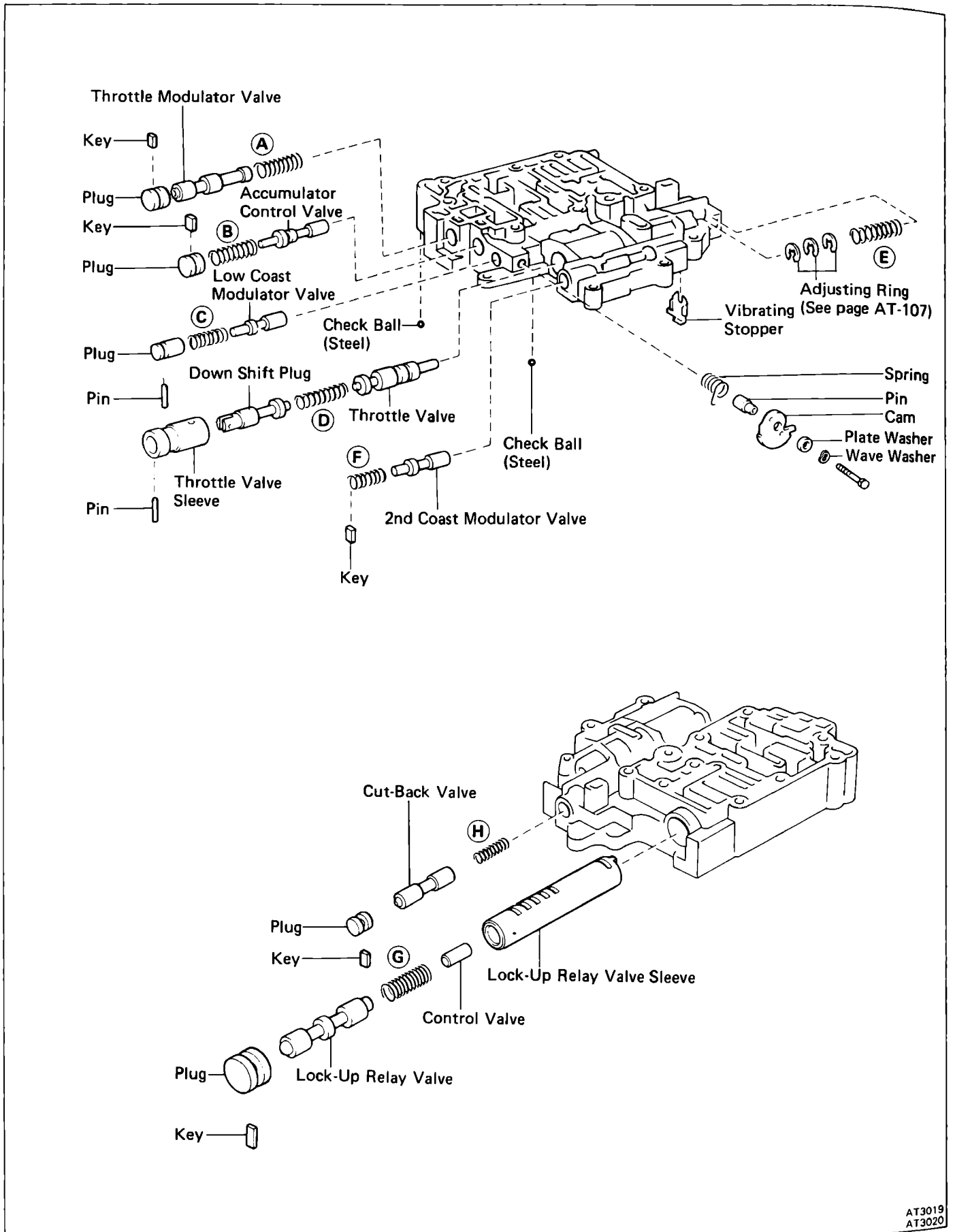
- 7. REMOVE BOLTS FROM LOWER VALVE BODY**  
Remove the three bolts from lower valve body.



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

- 9. REMOVE PLATE AND GASKETS**

# (Upper Valve Body) COMPONENTS

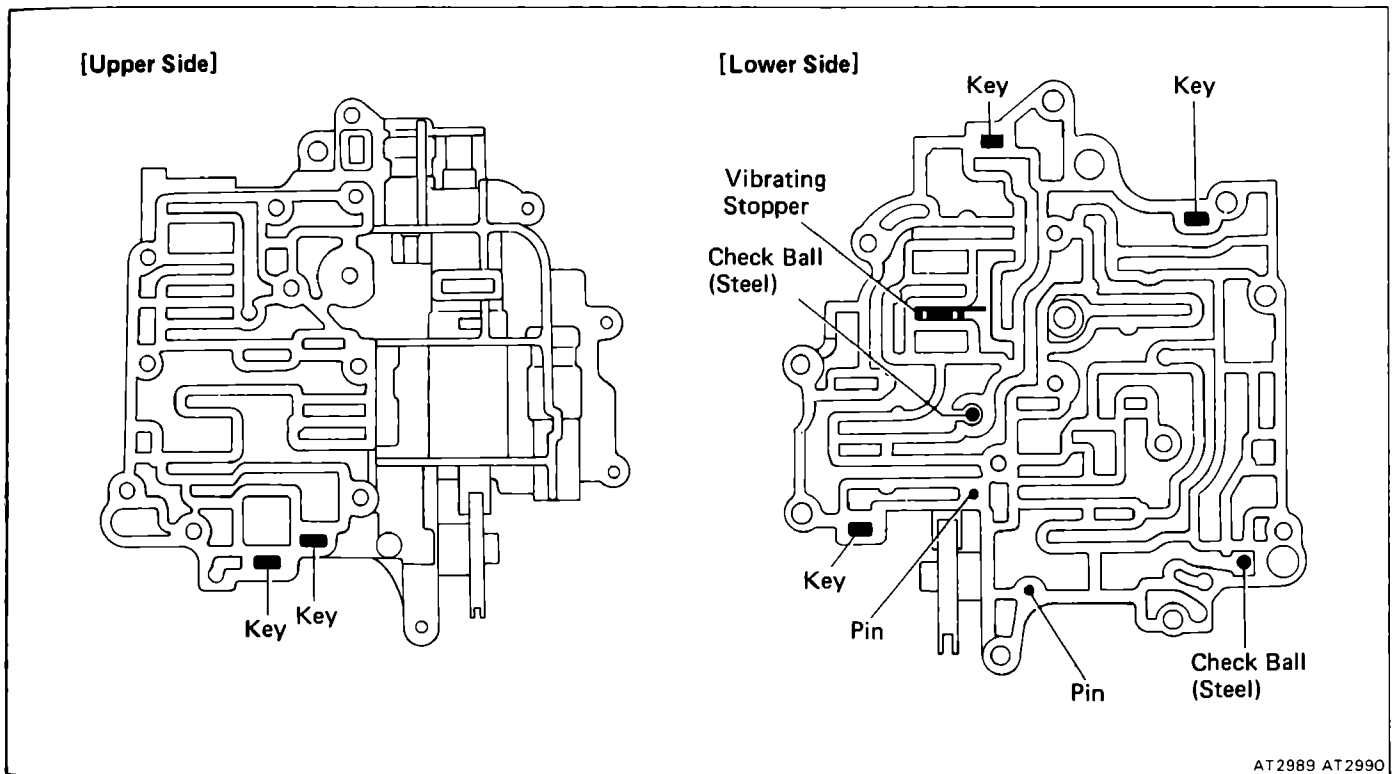


**SPECIFICATIONS OF VALVE BODY SPRINGS**

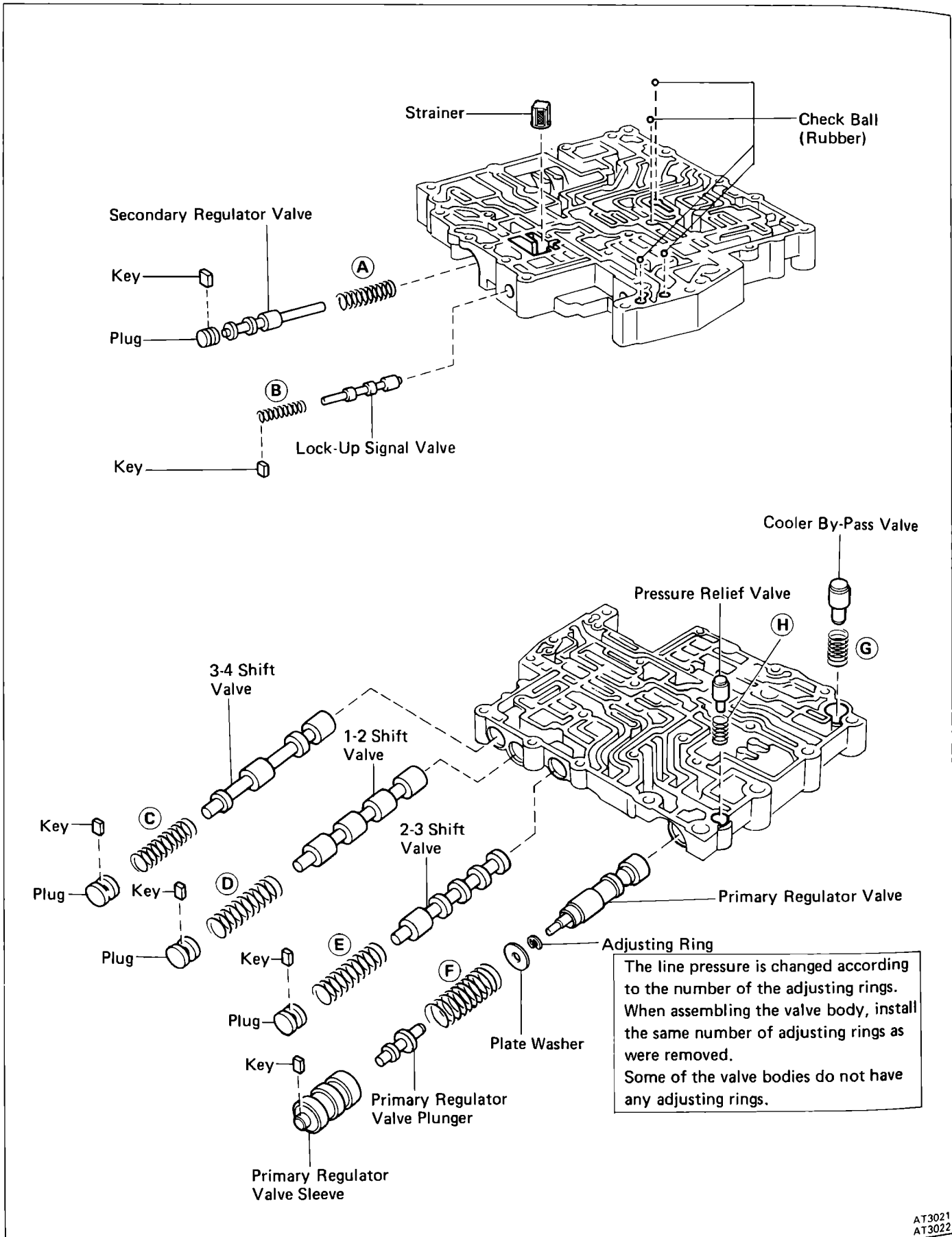
Spring	Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
(A) Throttle Modulator Valve Spring	21.70 (0.8543)	9.50 (0.3740)	9.5	Orange
(B) Accumulator Control Valve Spring	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
(C) Low Coast Modulator Valve Spring	21.60 (0.8504)	7.90 (0.3110)	11.5	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	Purple
(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

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

**LOCATION OF KEYS, PINS, VIBRATING STOPPER AND CHECK BALLS**



# (Lower Valve Body) COMPONENTS



The line pressure is changed according to the number of the adjusting rings. When assembling the valve body, install the same number of adjusting rings as were removed. Some of the valve bodies do not have any adjusting rings.

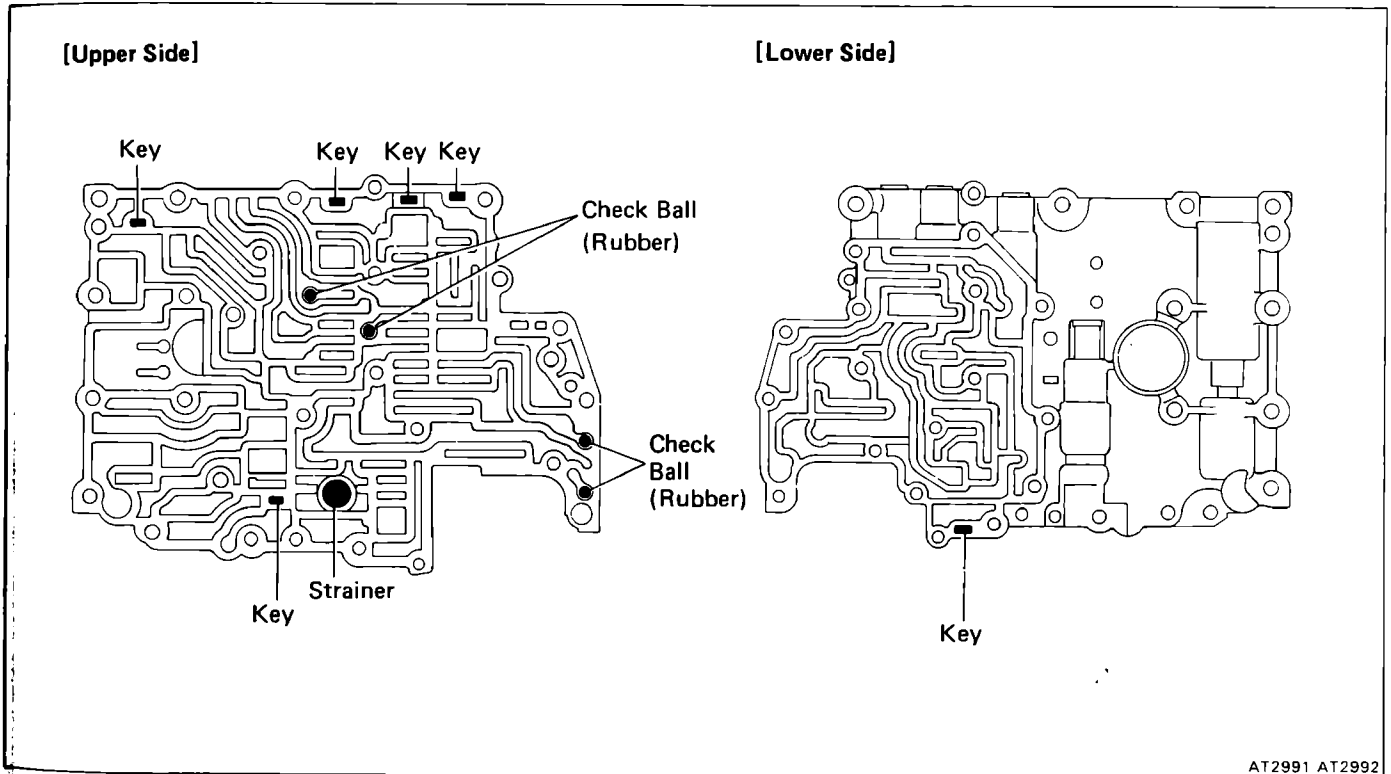


**SPECIFICATIONS OF VALVE BODY SPRINGS**

Spring	Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
(A) Secondary Regulator Valve Spring	27.30 (1.0748)	8.30 (0.3268)	13.0	Green
(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

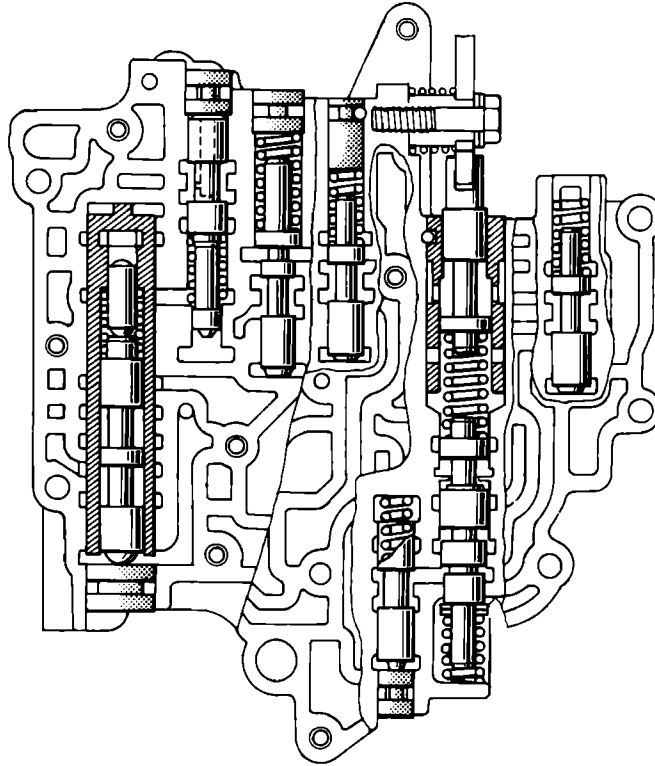
NOTE: During re-assembly please refer to the spring specifications above to help discriminate between the different springs.

**LOCATION OF KEYS, STRAINER AND CHECK BALLS**



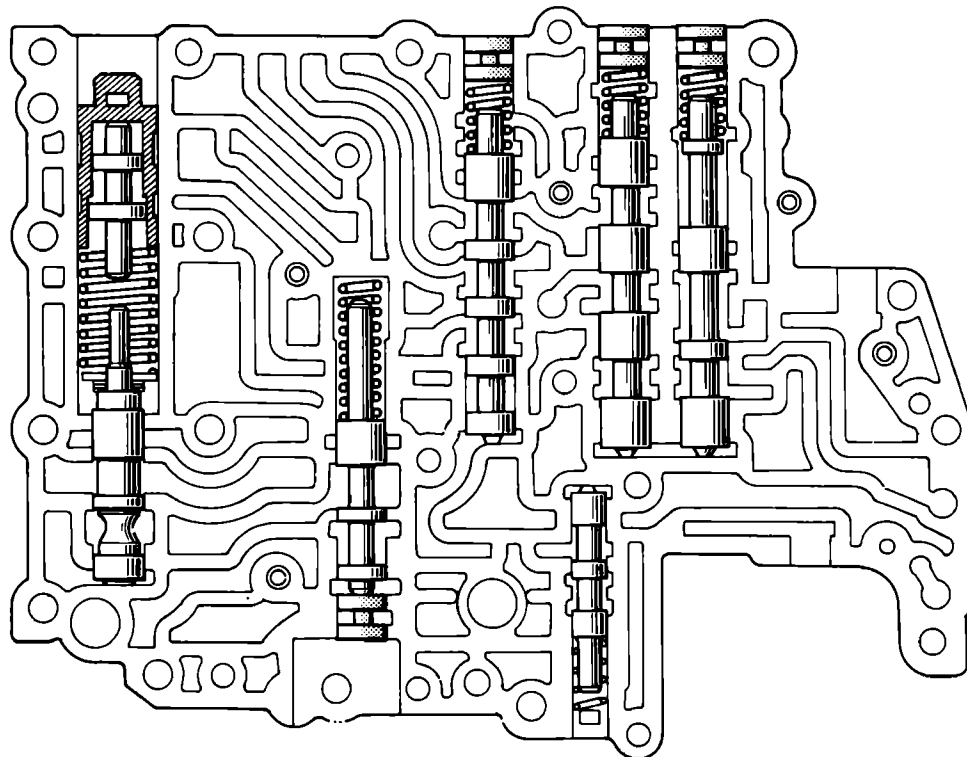
SECTIONAL VIEW OF VALVE BODY

Upper Valve Body



D5498

Lower Valve Body



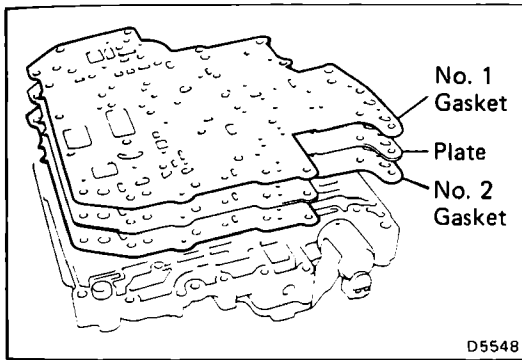
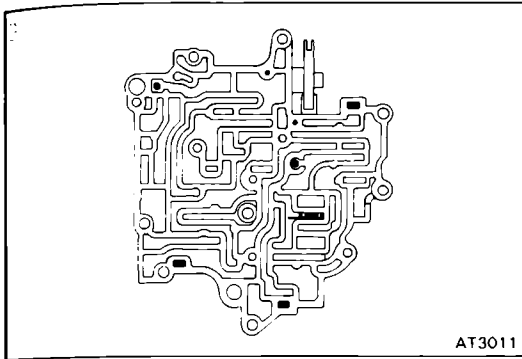
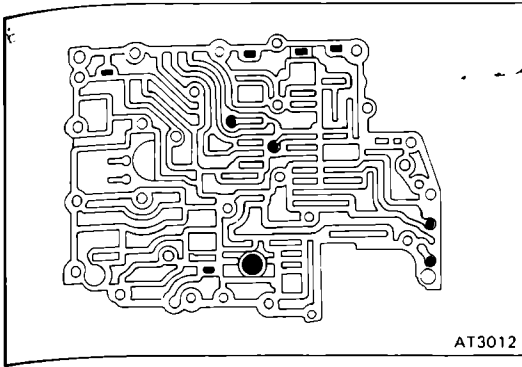
D5512

## (Assembly of Valve Body)

(See page AT-107)

### 1. CHECK INSTALLATION OF KEYS, PINS, CHECK BALLS, STOPPER AND STRAINER

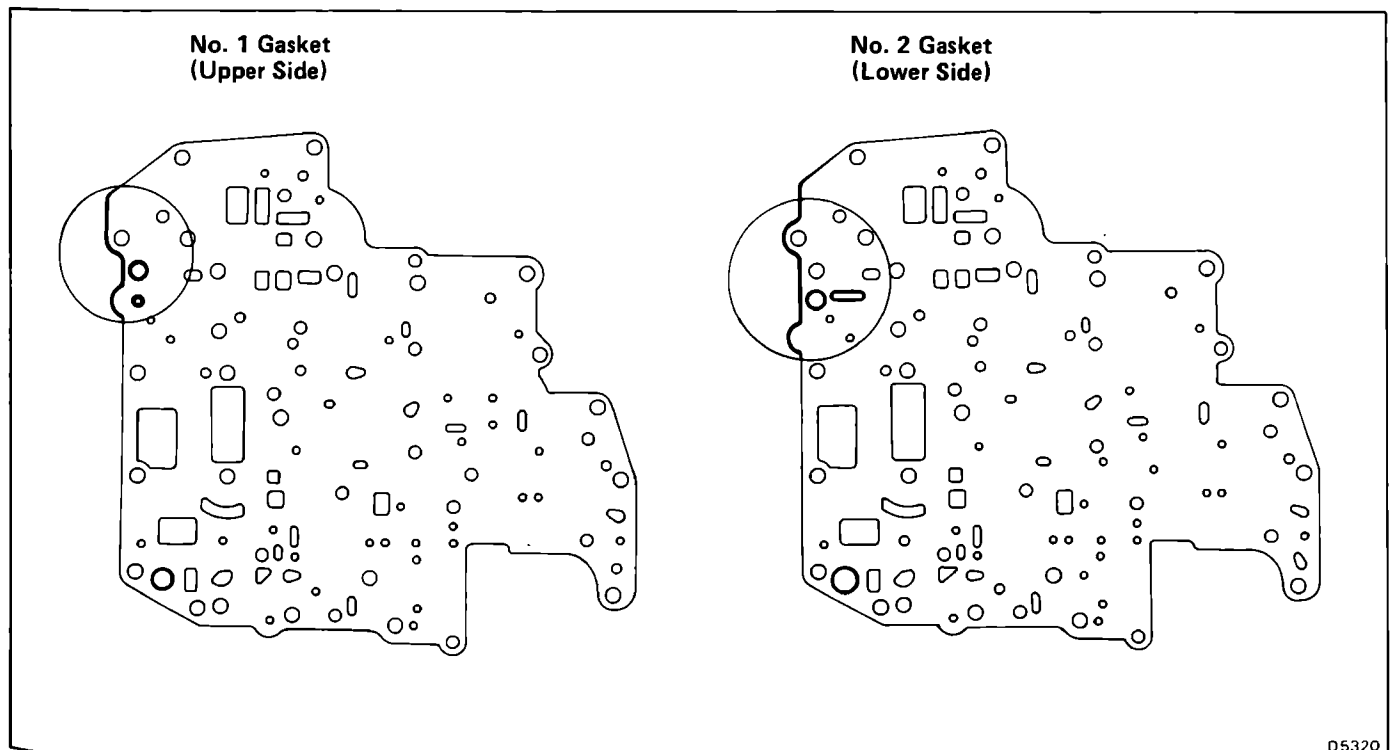
- (a) Make sure that the keys, check balls and strainer on the upper side of the lower valve body are installed correctly. (See page AT-113)
- (b) Make sure that the keys, pins, vibrating stopper and check balls on the lower side of the upper valve body are installed correctly. (See page AT-111)

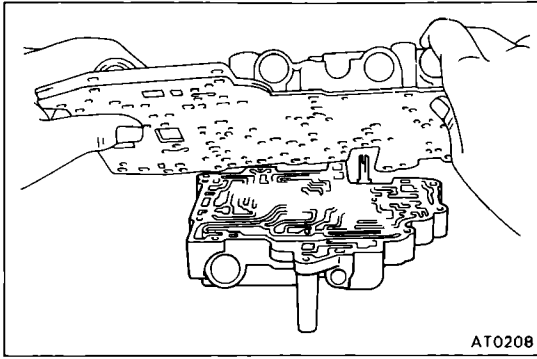


### 2. POSITION PLATE AND NEW GASKETS ON LOWER VALVE BODY

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

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

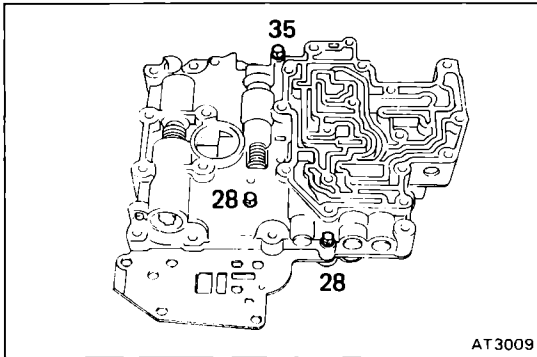




**3. PLACE LOWER VALVE BODY WITH PLATE AND GASKETS ON UPPER VALVE BODY**

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

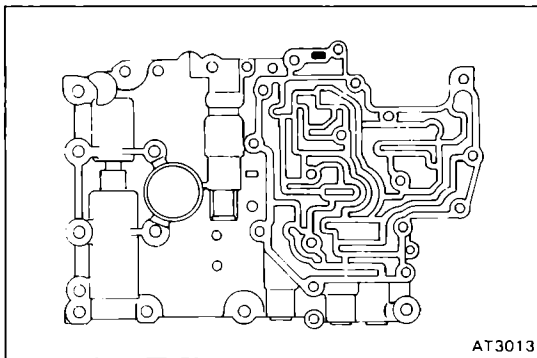
Align each bolt hole in the valve bodies with the gaskets and plate.



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

Install and finger tighten the three bolts.

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



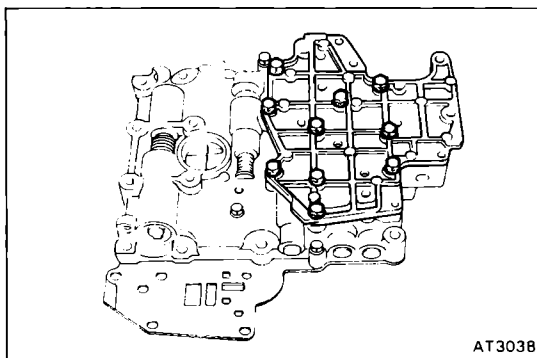
**5. INSTALL LOWER VALVE BODY COVER**

(a) Make sure that the key is installed correctly. (See page AT-113)

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

(c) Install and finger tighten the ten bolts.

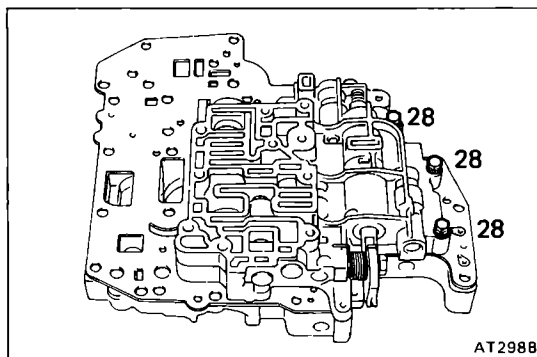
NOTE: Each bolt length (mm) is indicated in the figure.

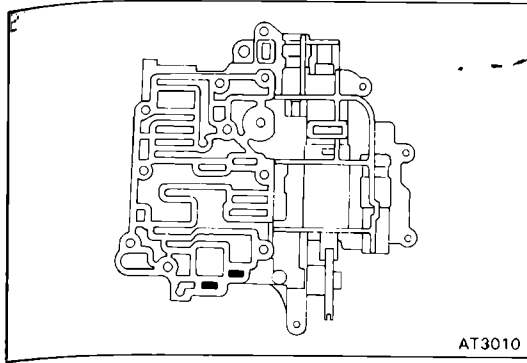


**6. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY**

Install and finger tighten the three bolts.

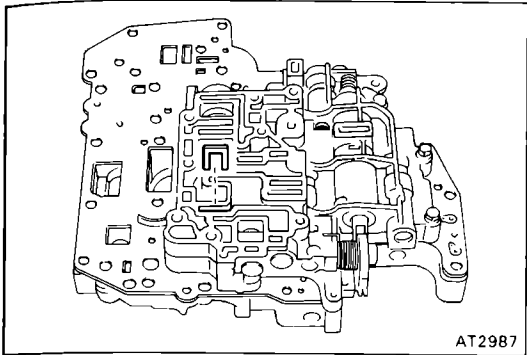
NOTE: Each bolt length (mm) is indicated in the figure.



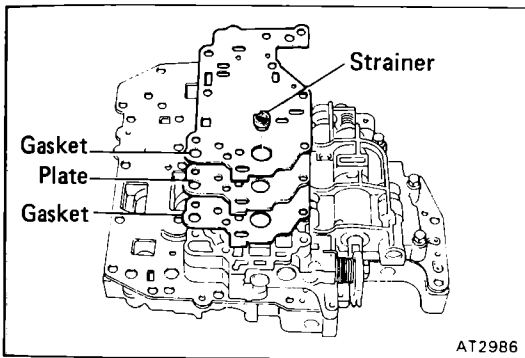


**7. INSTALL UPPER VALVE BODY COVER**

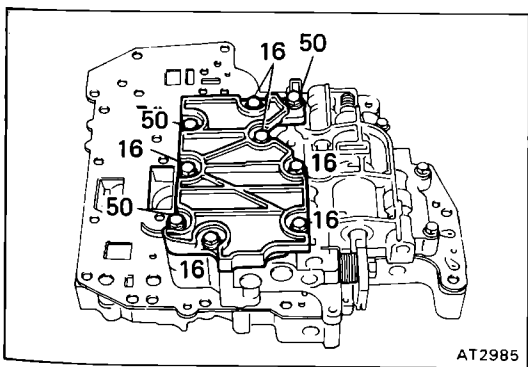
- (a) Make sure that the keys are installed correctly. (See page AT-111)



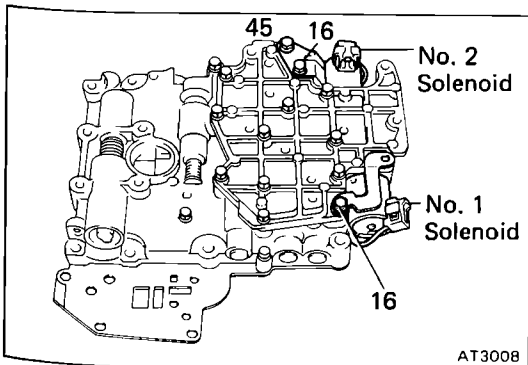
- (b) Install the sleeve stopper.



- (c) Position a new gasket and plate and then another new gasket.
- (d) Install the strainer onto the plate.



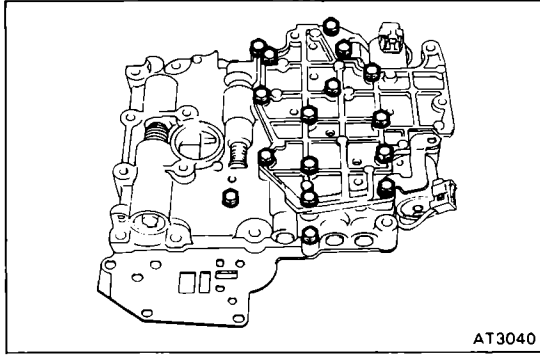
- (e) Position the upper valve body cover.
  - (f) Install and finger tighten the nine bolts.
- NOTE: Each bolt length (mm) is indicated in the figure.



**8. INSTALL SOLENOIDS**

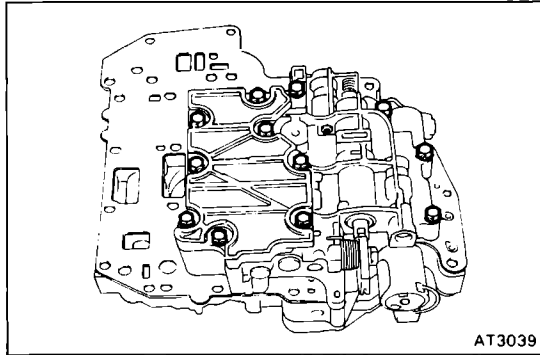
- (a) Install the new O-rings on the solenoids.
- (b) Install the No. 1 and No. 2 solenoids.
- (c) Install and finger tighten the three bolts.

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

**9. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES**

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

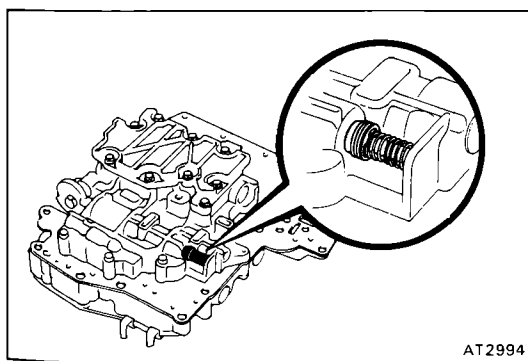
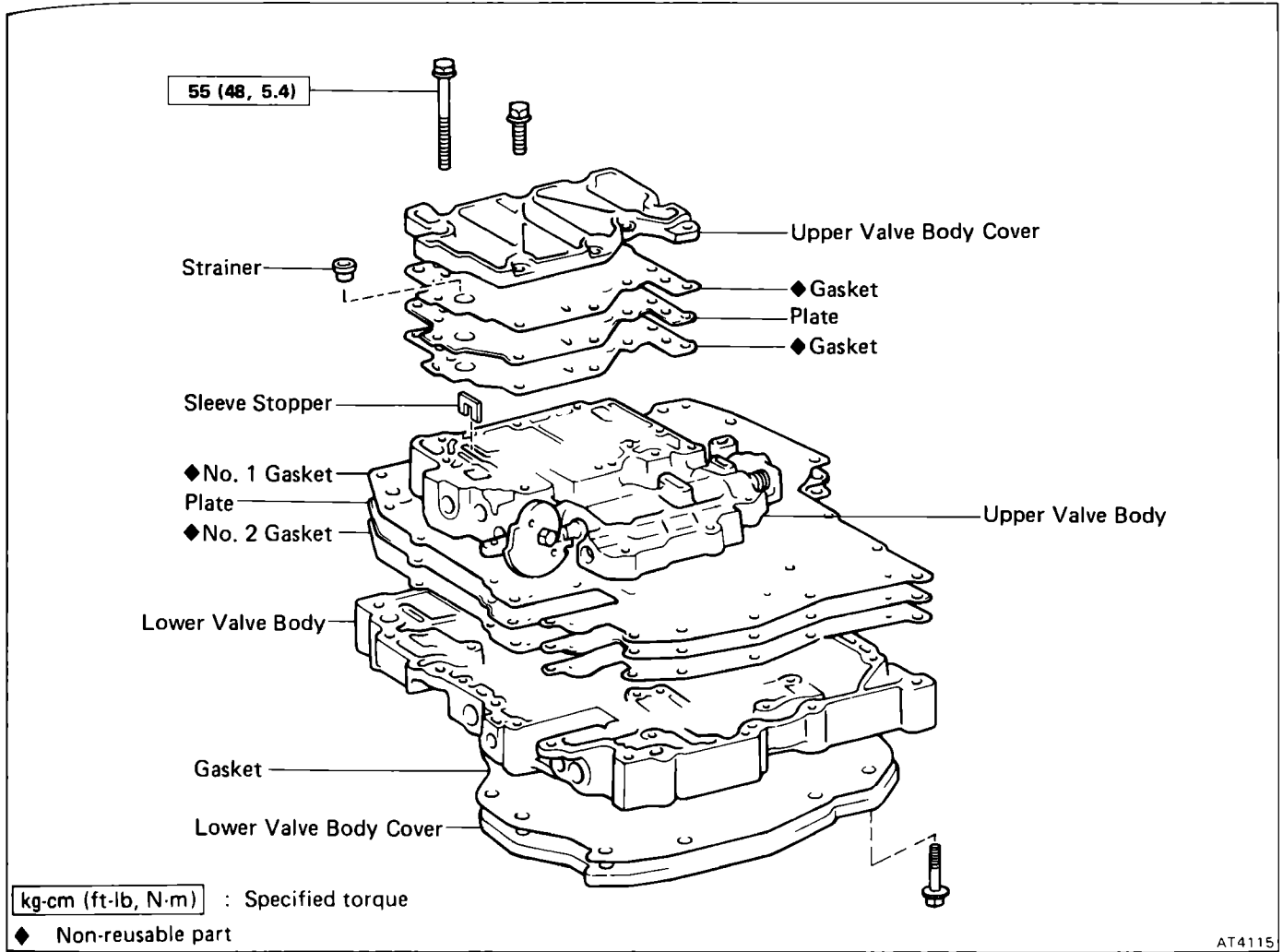
**Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)**



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

**Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)**

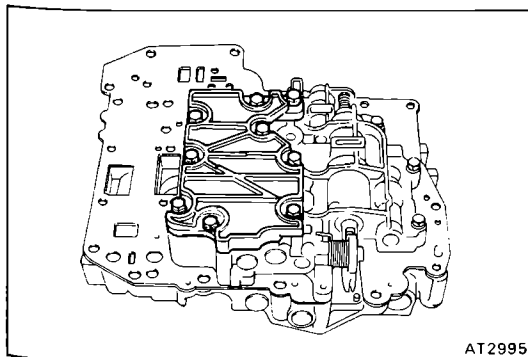
# VALVE BODY (A140L) COMPONENTS



## (Disassembly of Valve Body)

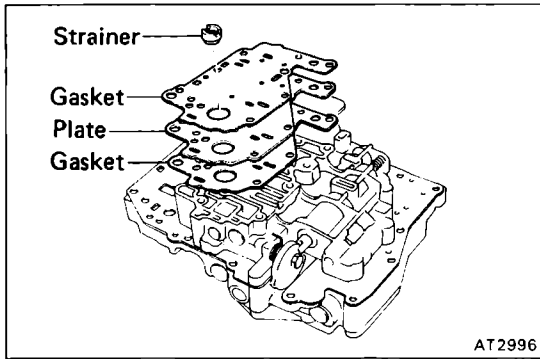
### 1. NOTE THE NUMBER OF ADJUSTING RINGS

NOTE: 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.)



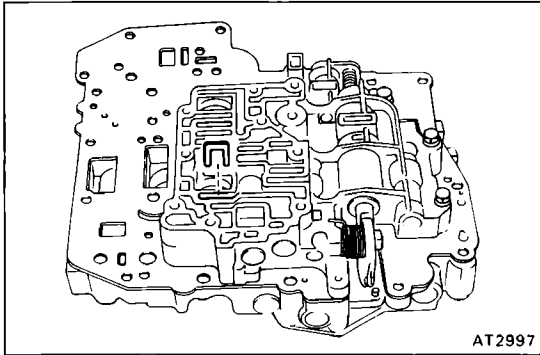
### 2. REMOVE UPPER VALVE BODY COVER

Remove the nine bolts and upper valve body cover.

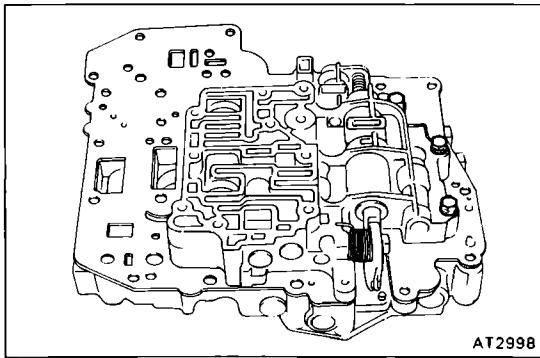


### 3. REMOVE STRAINER, GASKETS, PLATE AND SLEEVE STOPPER FROM UPPER VALVE BODY

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

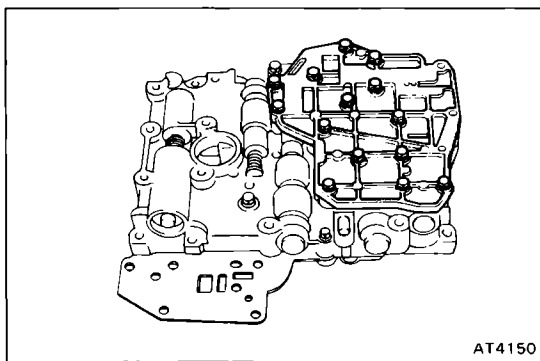


(b) Remove the sleeve stopper.



### 4. REMOVE BOLTS FROM UPPER VALVE BODY

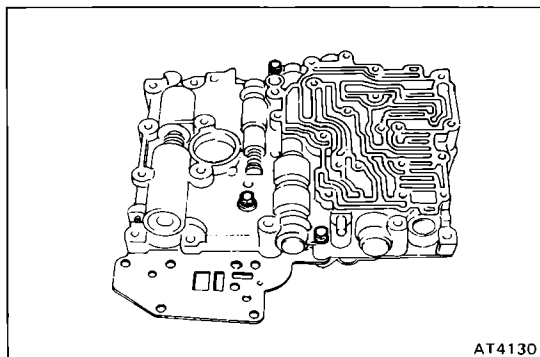
Remove the three bolts from upper valve body.



### 5. REMOVE LOWER VALVE BODY COVER

(a) Remove the fourteen bolts.

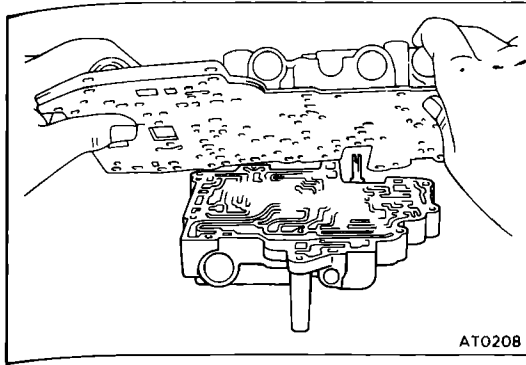
(b) Remove the lower valve body cover and gasket.



### 6. REMOVE BOLTS FROM LOWER VALVE BODY

Remove the three bolts from lower valve body.

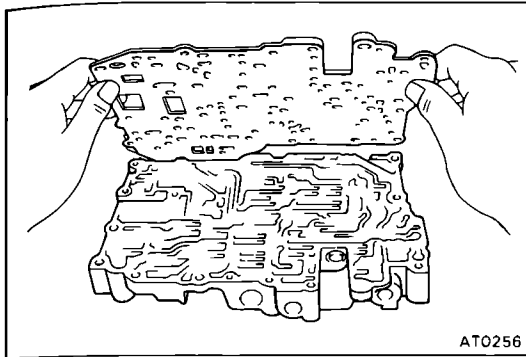




**7. LIFT OFF LOWER VALVE BODY AND PLATE AS SINGLE UNIT**

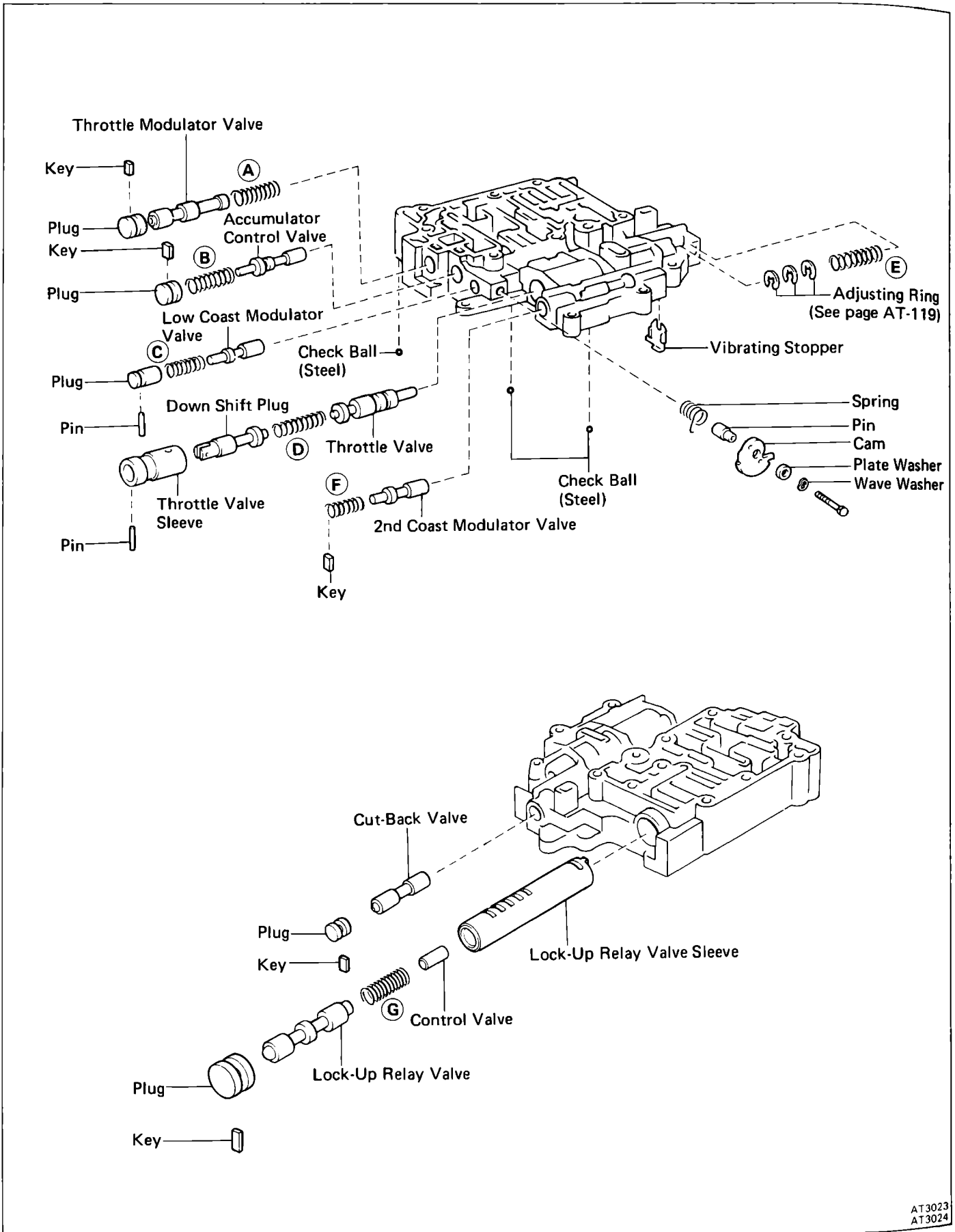
Hold the plate to the lower valve body and lift off the lower valve body.

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



**8. REMOVE PLATE AND GASKETS**

# (Upper Valve Body) COMPONENTS

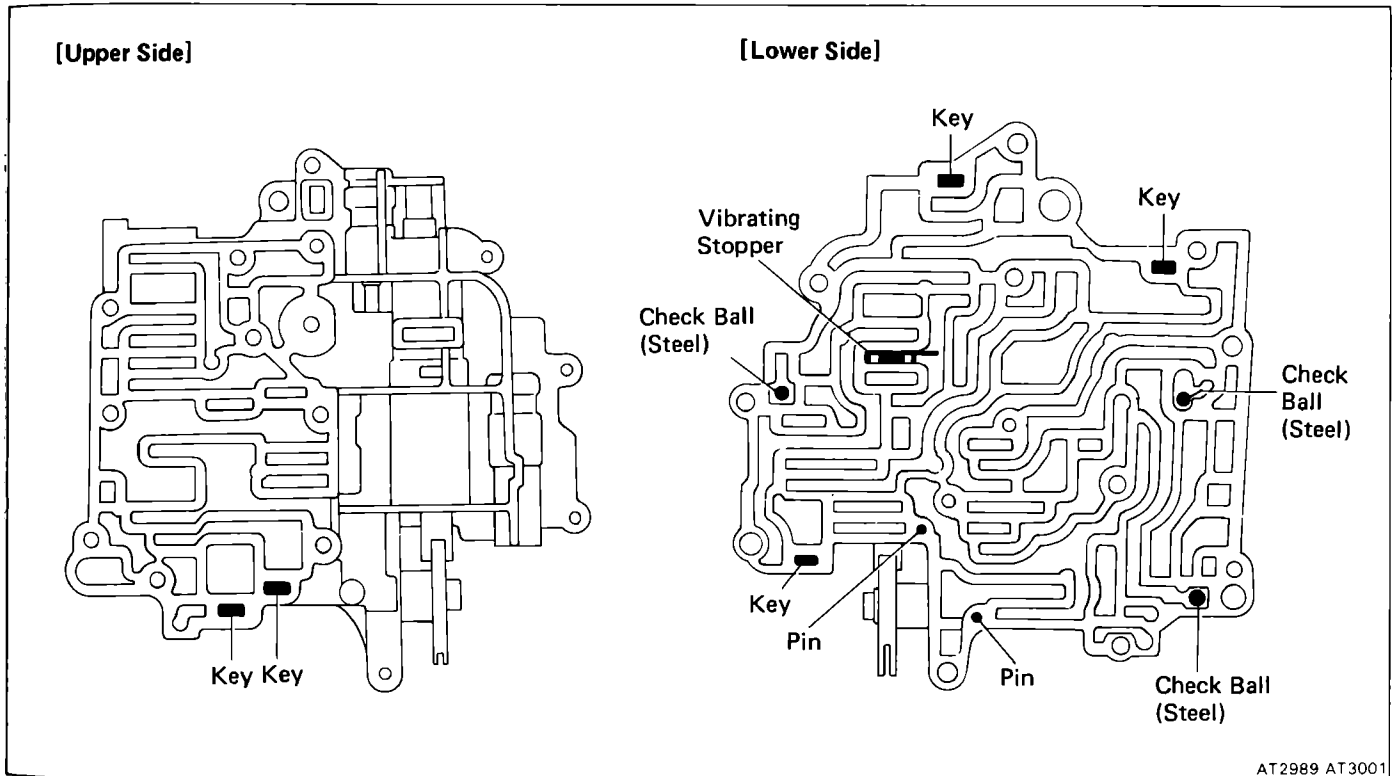


### SPECIFICATIONS OF VALVE BODY SPRINGS

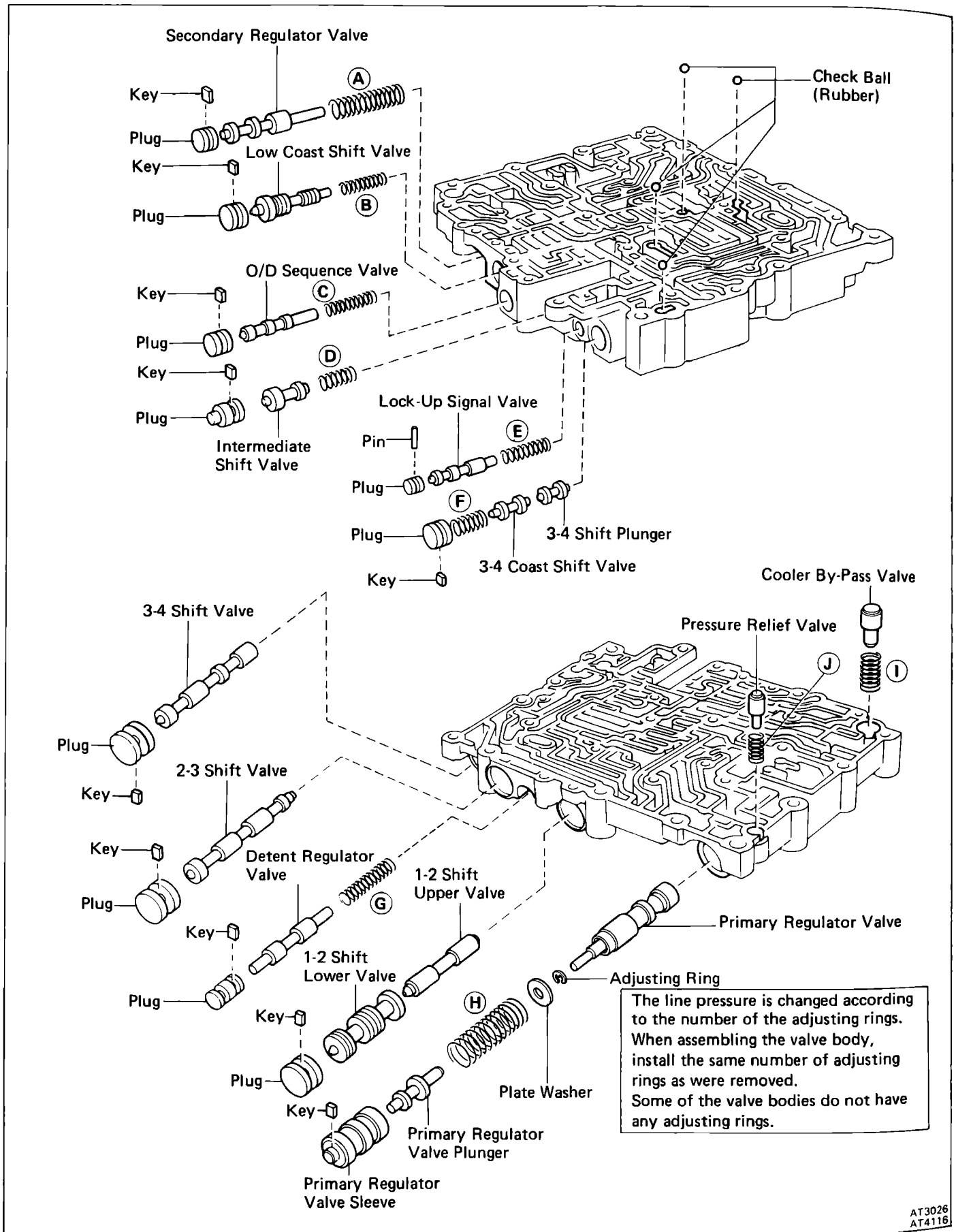
Spring	Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
(A) Throttle Modulator Valve Spring	21.70 (0.8543)	9.50 (0.3740)	9.5	Orange
(B) Accumulator Control Valve Spring	28.06 (1.1047)	10.60 (0.4173)	13.0	Yellow
(C) Low Coast Modulator Valve Spring	23.40 (0.9213)	7.90 (0.3110)	11.5	Blue
(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	Purple
(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

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

### LOCATION OF KEYS, PINS, VIBRATING STOPPER AND CHECK BALLS



# (Lower Valve Body) COMPONENTS

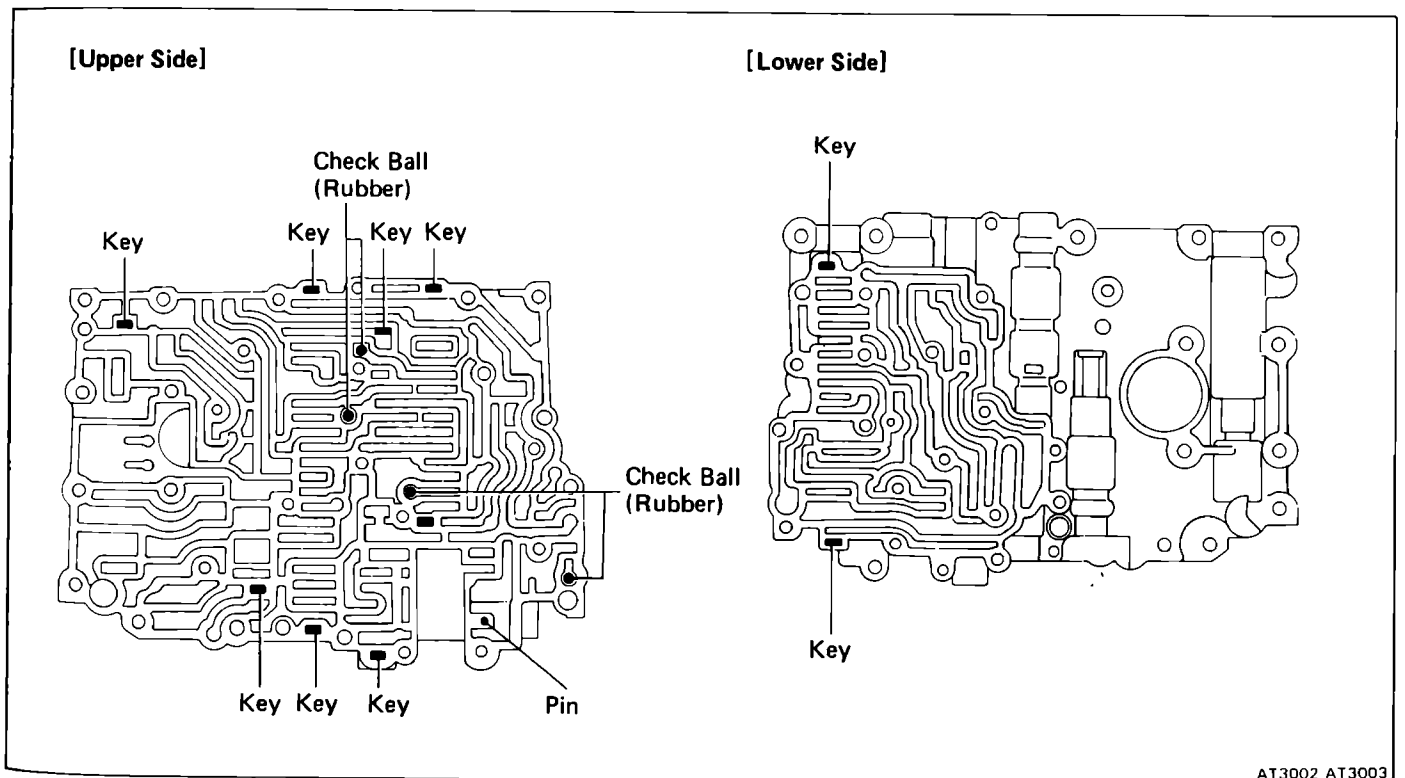


**SPECIFICATIONS OF VALVE BODY SPRINGS**

Spring	Free Length mm (in.)	Coil Outer Diameter mm (in.)	Number of Coils	Color
(A) Secondary Regulator Valve Spring	32.80 (1.2913)	8.30 (0.3268)	15.0	Orange
(B) 1-2 Shift Valve Spring	27.17 (1.0697)	6.39 (0.2516)	15.5	Yellow
(C) O/D Sequence Valve Spring	30.90 (1.2165)	7.00 (0.2756)	18.5	None
(D) 2-3 Shift Valve Spring	27.74 (1.0921)	8.30 (0.3268)	11.0	Pink
(E) Lock-up Signal Valve Spring	38.65 (1.5217)	8.15 (0.3209)	15.25	None
(F) 3-4 Coast Shift Valve Spring	21.10 (0.8307)	10.90 (0.4291)	8.5	White
(G) Detent Regulator Valve Spring	29.72 (1.1701)	7.90 (0.3110)	12.5	Gray
(H) Primary Regulator Valve Spring	66.65 (2.6240)	18.60 (0.7323)	12.5	None
(I) Cooler By-pass Valve Spring	19.90 (0.7835)	11.00 (0.4331)	8.5	None
(J) Pressure Relief Valve Spring	11.20 (0.4409)	6.40 (0.2520)	7.5	None

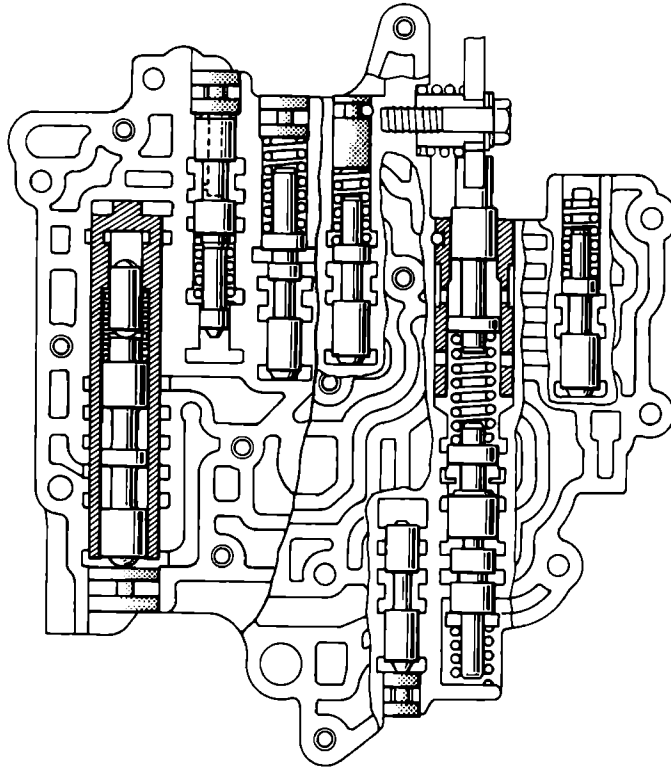
NOTE: During re-assembly please refer to the spring specifications above to help discriminate between the different springs.

**LOCATION OF KEYS, PIN AND CHECK BALLS**



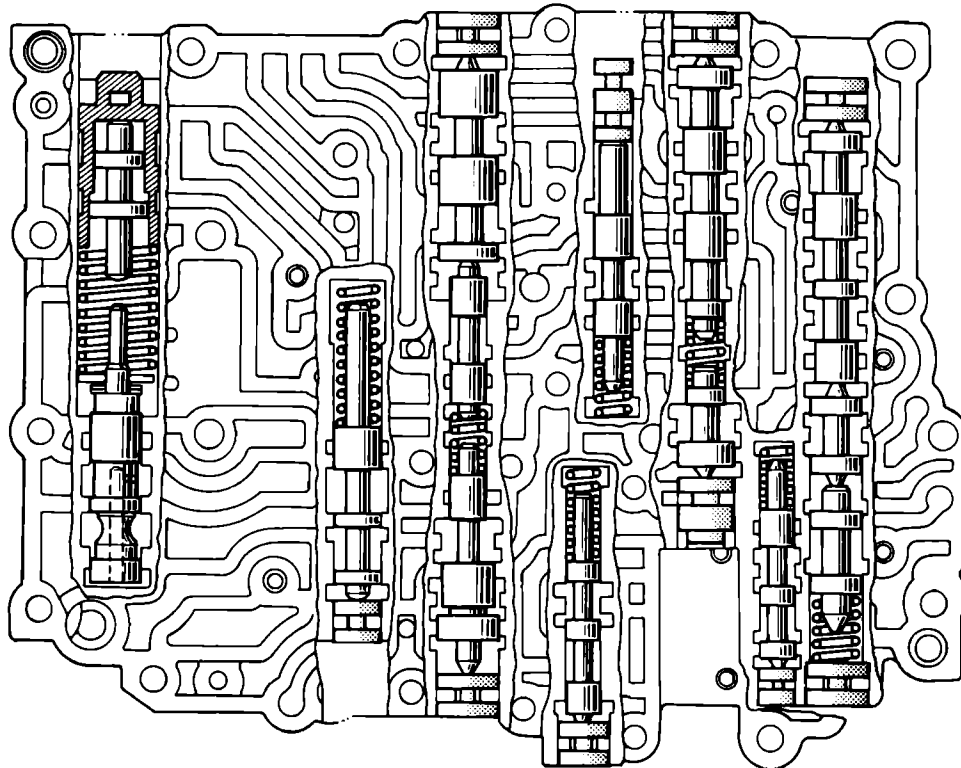
SECTIONAL VIEW OF VALVE BODY

Upper Valve Body



05407

Lower Valve Body



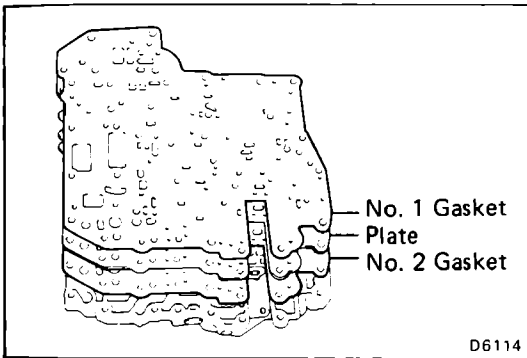
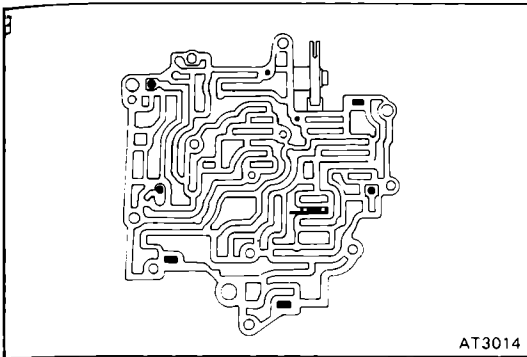
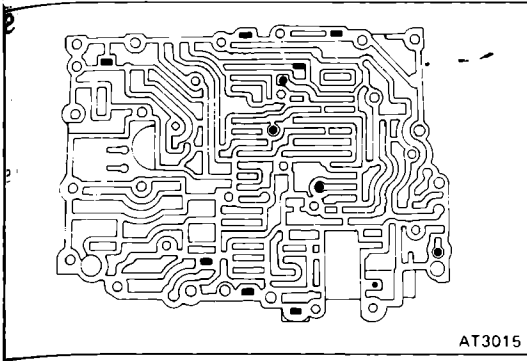
D5502

## (Assembly of Valve Body)

(See page AT-119)

### 1. CHECK INSTALLATION OF KEYS, PINS, CHECK BALLS AND STOPPER

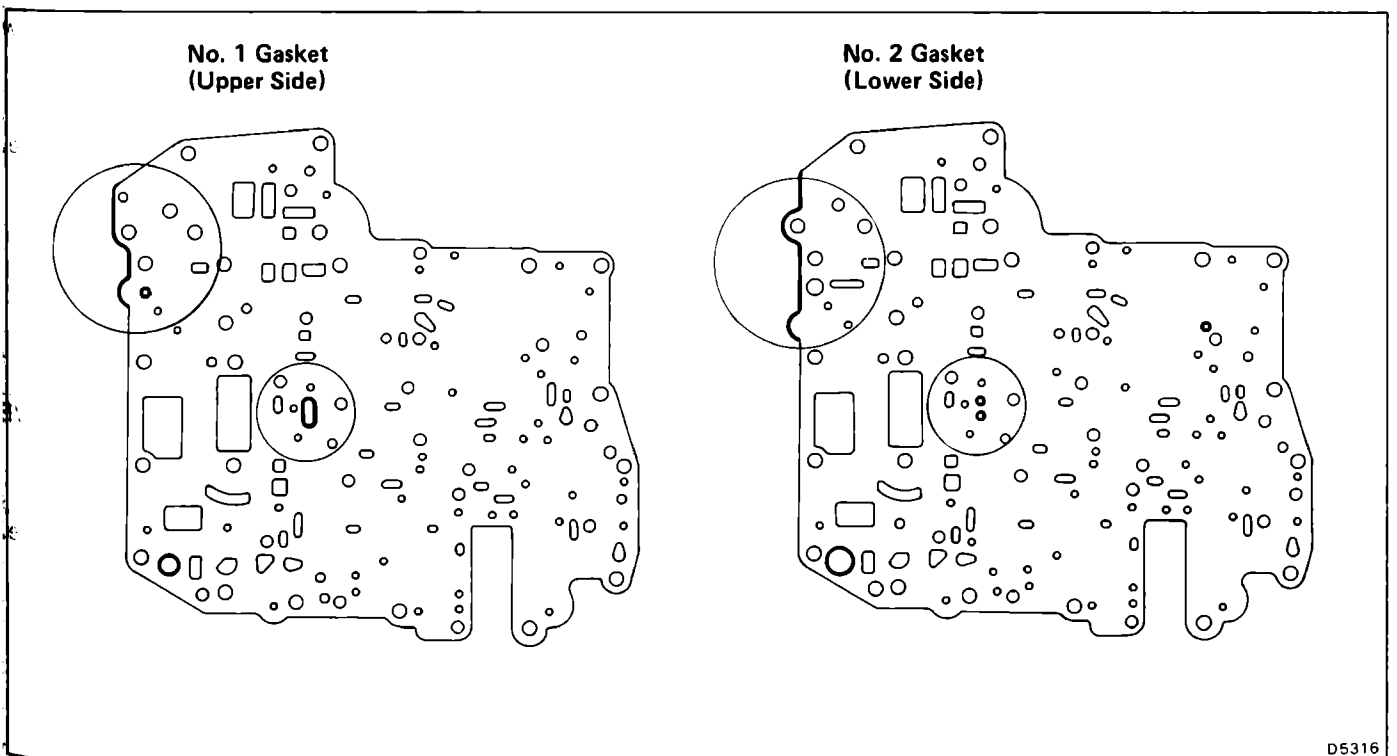
- (a) Make sure that the keys, pin and check balls on the upper side of the lower valve body are installed correctly. (See page AT-125)
- (b) Make sure that the keys, pins, vibrating stopper and check balls on the lower side of the upper valve body are installed correctly. (See page AT-123)

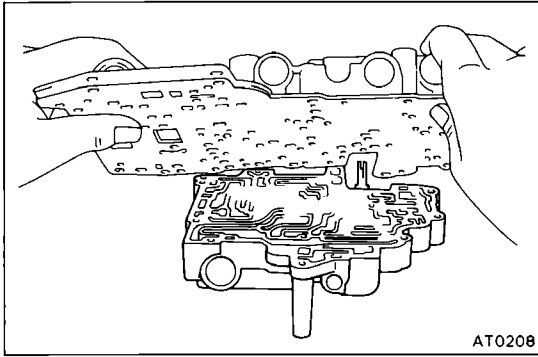


### 2. POSITION PLATE AND NEW GASKETS ON LOWER VALVE BODY

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

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

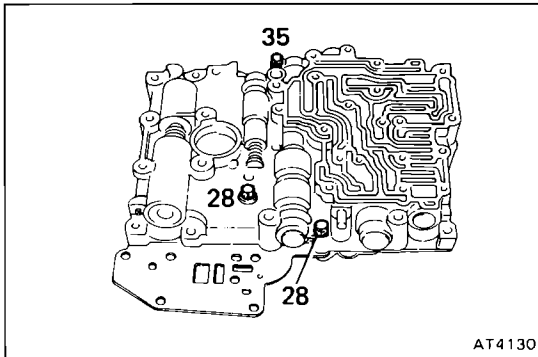




**3. PLACE LOWER VALVE BODY WITH PLATE AND GASKETS ON UPPER VALVE BODY**

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

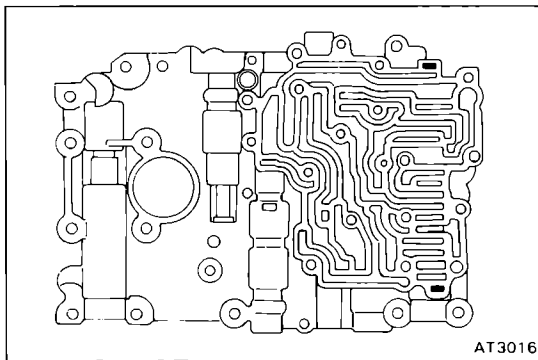
Align each bolt hole in the valve bodies with the gaskets and plate.



**4. INSTALL AND FINGER TIGHTEN BOLTS IN LOWER VALVE BODY**

Install and finger tighten the three bolts.

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



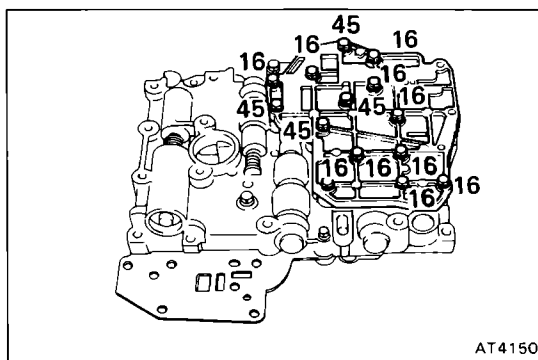
**5. INSTALL LOWER VALVE BODY COVER**

(a) Make sure that the keys are installed correctly. (See page AT-125)

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

(c) Install and finger tighten the fourteen bolts.

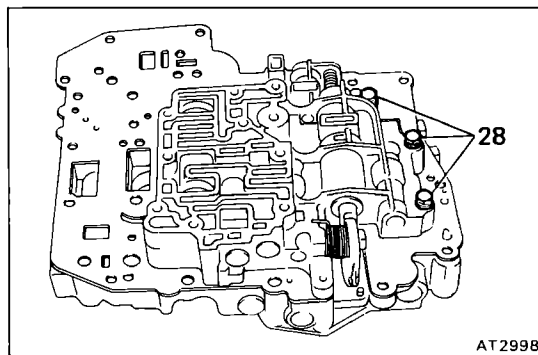
NOTE: Each bolt length (mm) is indicated in the figure.



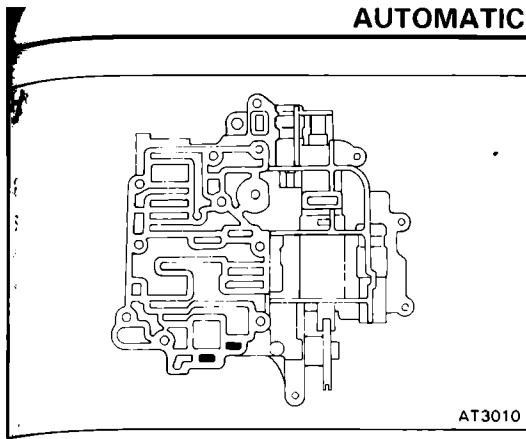
**6. INSTALL AND FINGER TIGHTEN BOLTS IN UPPER VALVE BODY**

Install and finger tighten the three bolts.

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

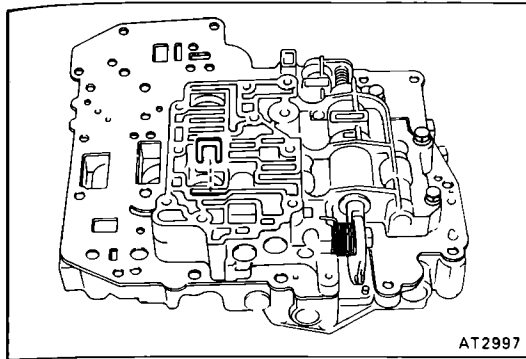




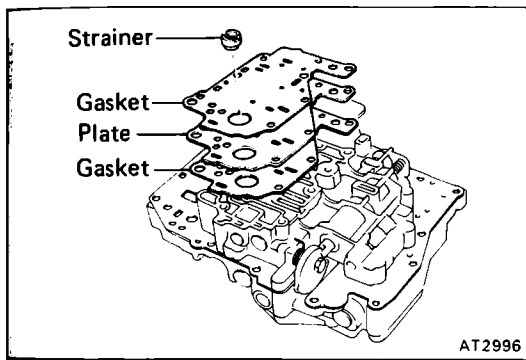


**7. INSTALL UPPER VALVE BODY COVER**

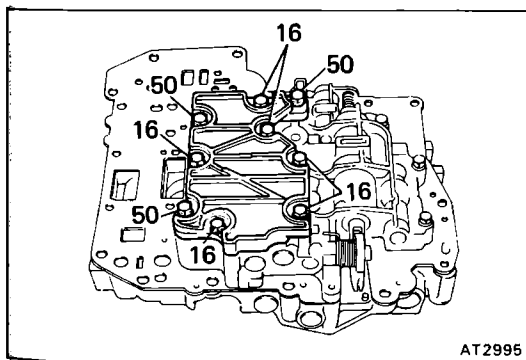
- (a) Make sure that the keys are installed correctly. (See page AT-123)



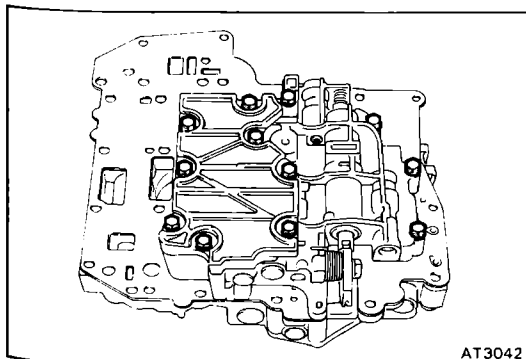
- (b) Install the sleeve stopper.



- (c) Position a new gasket and plate and then another new gasket.
- (d) Install the strainer onto the plate.

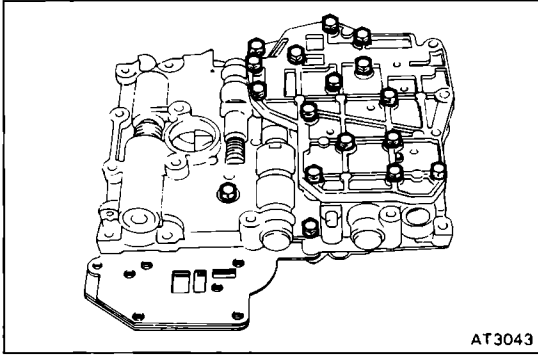


- (e) Position the upper valve body cover.
  - (f) Install and finger tighten the nine bolts.
- NOTE: Each bolt length (mm) is indicated in the figure.



**8. 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)**

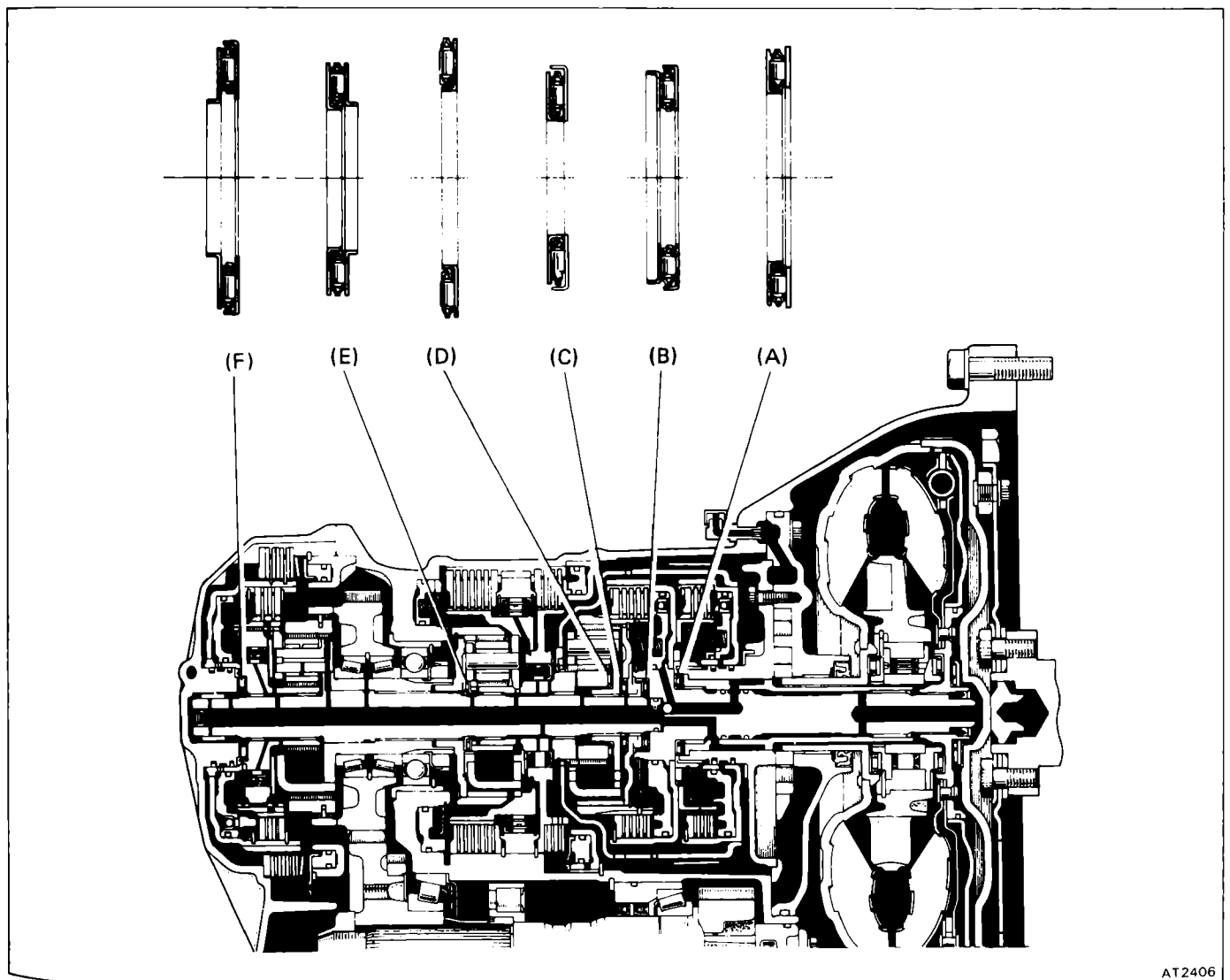
## ASSEMBLY OF TRANSMISSION

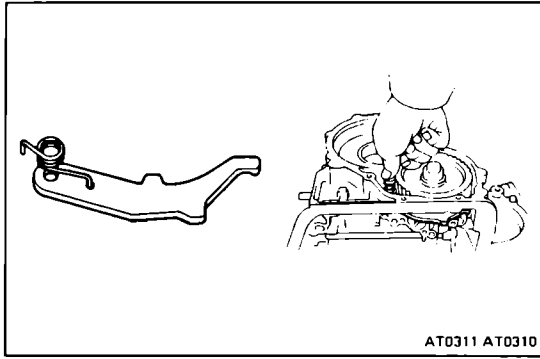
Disassembly, inspection and assembly of each component group have been indicated in the preceding chapter. This chapter deals with assembly of A140E transmission.

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 type DEXRON® II.

### GENERAL ASSEMBLY NOTE:

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



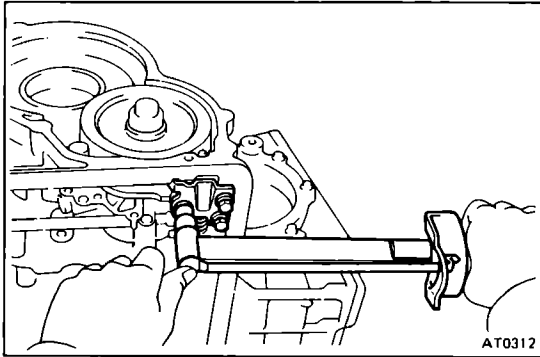


AT0311 AT0310

### 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 the pawl.

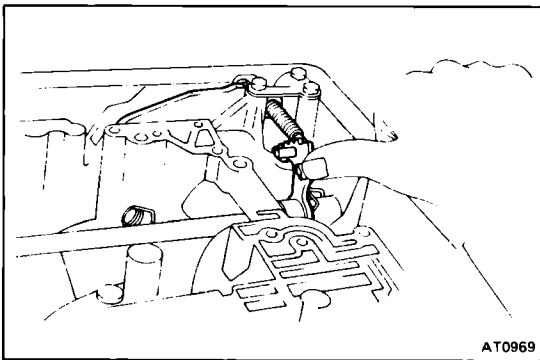
### 2. INSTALL PARKING LOCK ROD



AT0312

### 3. INSTALL PARKING LOCK PAWL BRACKET

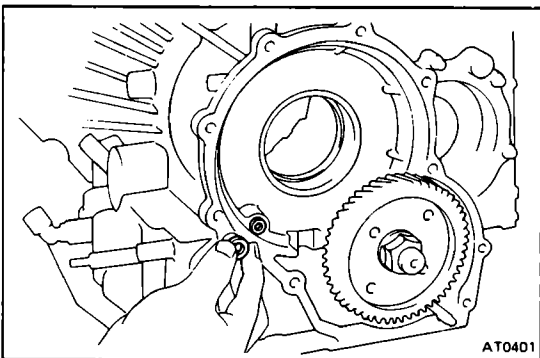
Torque: 75 kg-cm (65 in.-lb, 7.4 N·m)



AT0969

### 4. CHECK OPERATION OF PARKING LOCK PAWL

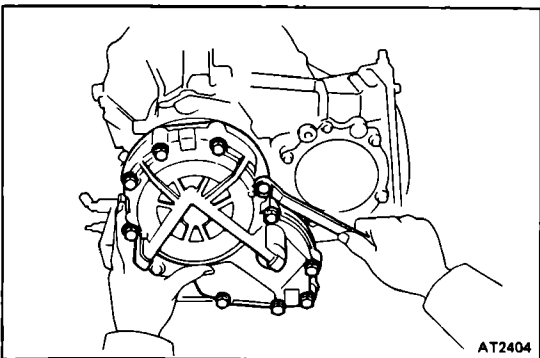
Make sure the counter driven gear is locked when the manual valve lever is in the P range.



AT0401

### 5. INSTALL NEW GASKETS ON TRANSMISSION CASE

- (a) Coat new gaskets with petroleum jelly to hold them in place.
- (b) Install the overdrive brake gasket into the hole of the case.
- (c) Install the overdrive clutch apply gasket into the hole of the case.

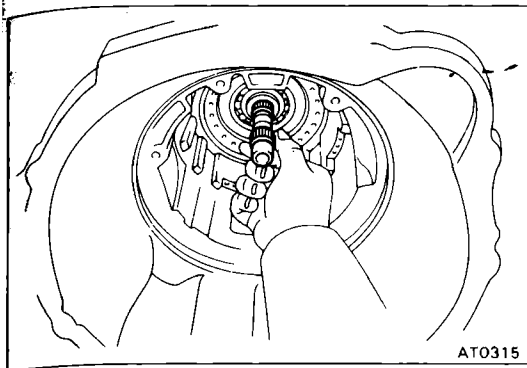


AT2404

### 6. INSTALL OVERDRIVE UNIT OVER GASKET

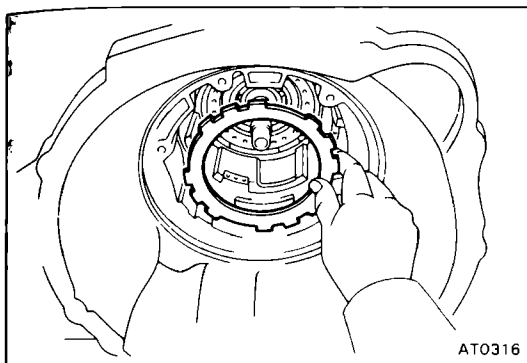
Align each bolt hole in the gasket and the case. Tighten the bolts.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)



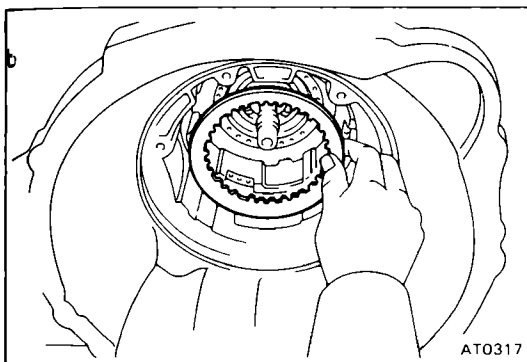
### 7. CHECK INTERMEDIATE SHAFT END PLAY

- (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.  
 (See page AT-106)
- (b) Make sure that the intermediate shaft turns smoothly.

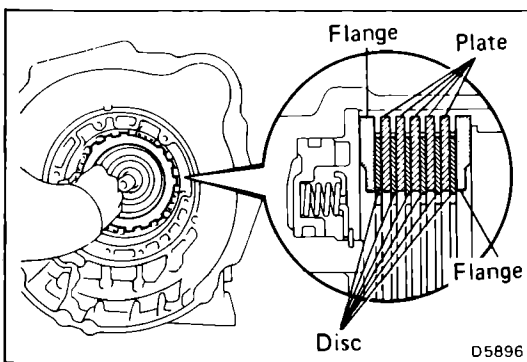


### 8. INSTALL FIRST AND REVERSE BRAKE IN CASE

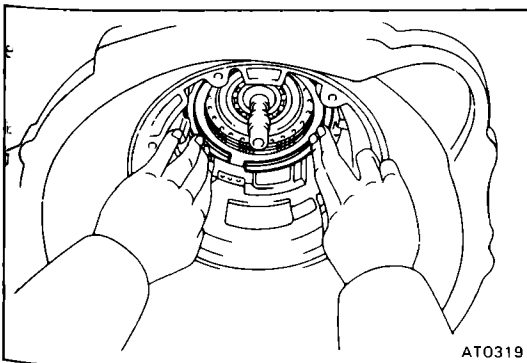
- (a) Install the inner flange facing the flat end toward you.



- (b) Install in order: Disc-plate-disc-plate- disc-plate-disc-plate-disc-plate-disc

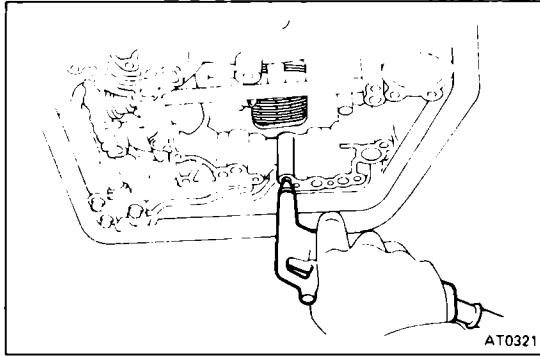


- (c) Install the outer flange, facing the flat end toward the piston side.

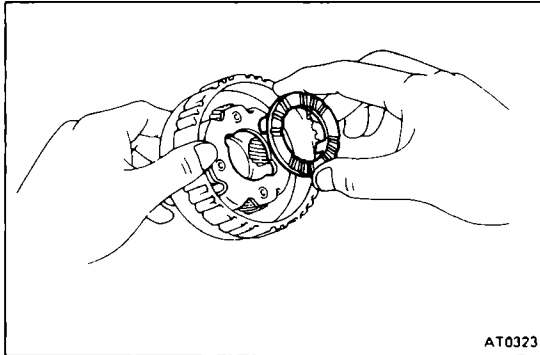


### 9. INSTALL SNAP RING

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

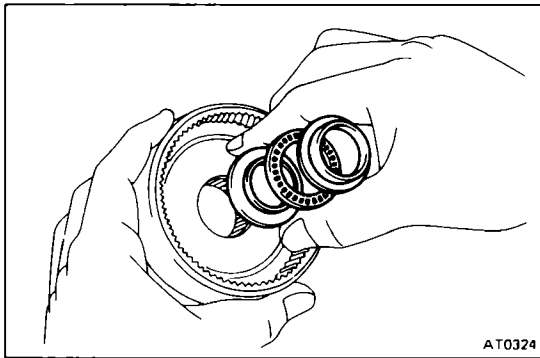
**10. CHECK OPERATION OF FIRST AND REVERSE BRAKE**

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

**11. INSTALL NO. 2 PLANETARY CARRIER THRUST WASHER**

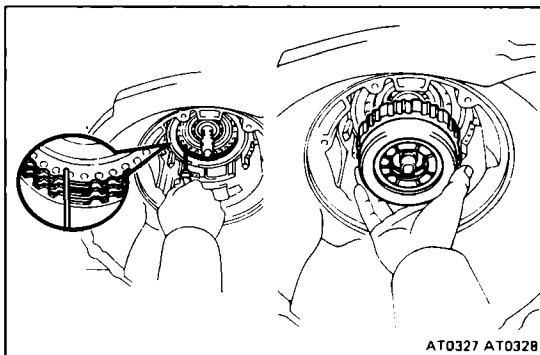
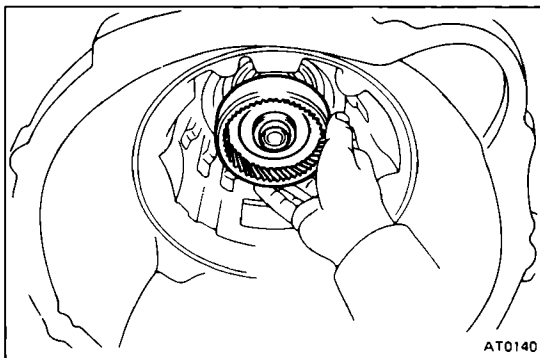
Coat the thrust washer with petroleum jelly and install it onto the planetary carrier.

**NOTE:** Make sure that the different lug shapes match the openings on the carrier.

**12. INSTALL RING GEAR INTO CASE**

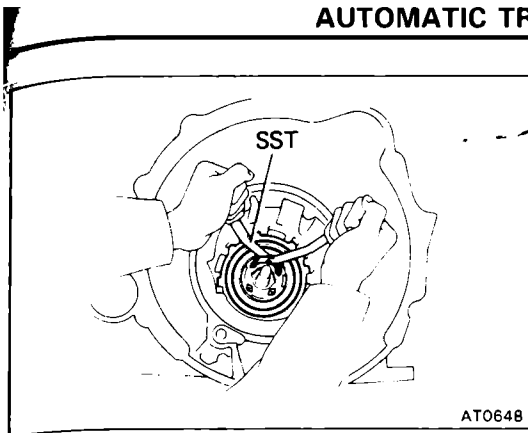
(a) Coat the races and bearing with petroleum jelly and install them onto the ring gear.

(b) Install the ring gear into the case.

**13. INSTALL REAR PLANETARY GEAR INTO CASE**

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

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

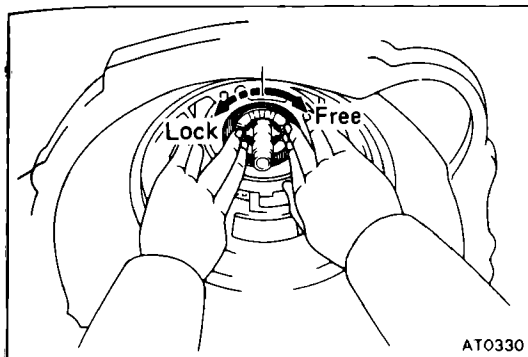


**14. INSTALL NO. 2 ONE-WAY CLUTCH INTO CASE WITH SHINY SIDE UPWARD**

- (a) Place the one-way clutch into the case, facing the shiny side upward.
- (b) Install the one-way clutch onto the inner race while turning the planetary gear clockwise with SST.

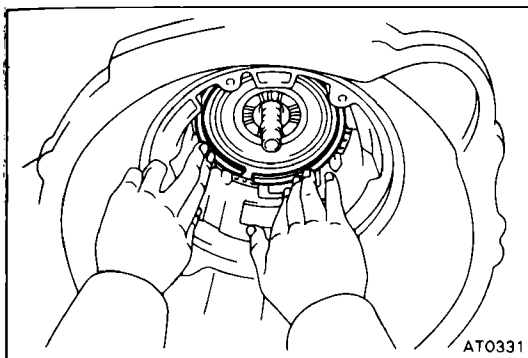
SST 09350-32013 (09351-32050)

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



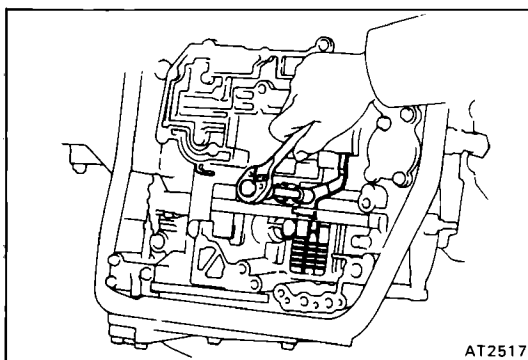
**15. CHECK OPERATION OF NO. 2 ONE-WAY CLUTCH**

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



**16. INSTALL SNAP RING**

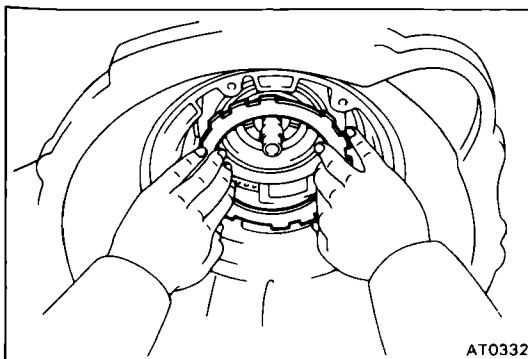
Be sure the end gap of the snap ring is not aligned with one of the cutouts.



**17. INSTALL SECOND COAST BRAKE BAND GUIDE**

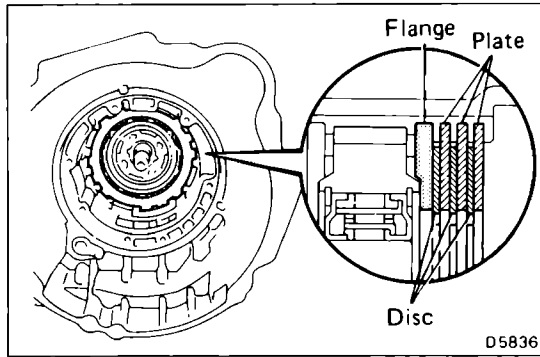
Install the band guide so that its tip touches the case.

**18. INSPECTION DISCS**

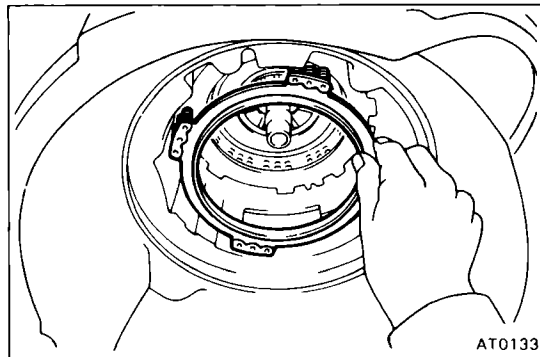


**19. INSTALL SECOND BRAKE INTO CASE**

- (a) Install the flange, facing the flat end toward you.

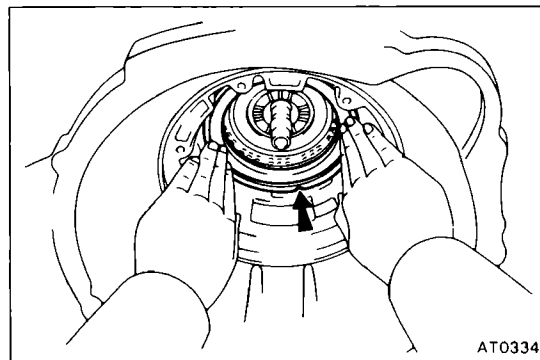


(b) Install in order: Disc-plate-disc-plate-disc-plate



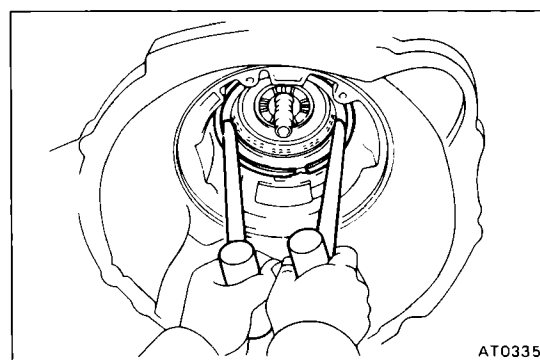
## 20. INSTALL PISTON RETURN SPRING ASSEMBLY

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



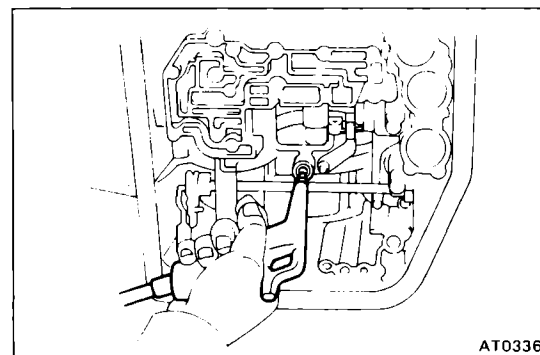
## 21. INSTALL SECOND BRAKE DRUM INTO CASE

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



## 22. INSTALL SNAP RING

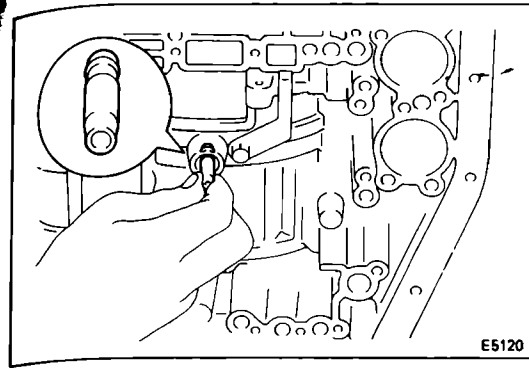
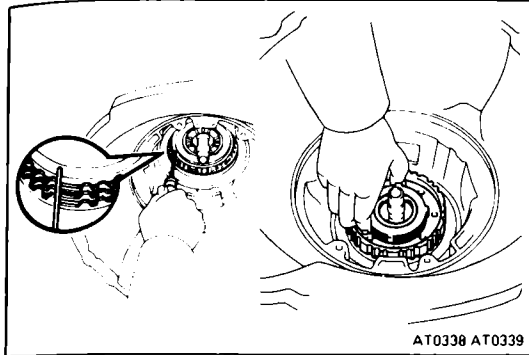
- Place the snap ring into the case so that the end gap is installed into the groove.
- While compressing the piston return springs over the drum with hammer handles, install the snap ring into the groove.
- Be sure the end gap of the snap ring is not aligned with one of the cutouts.



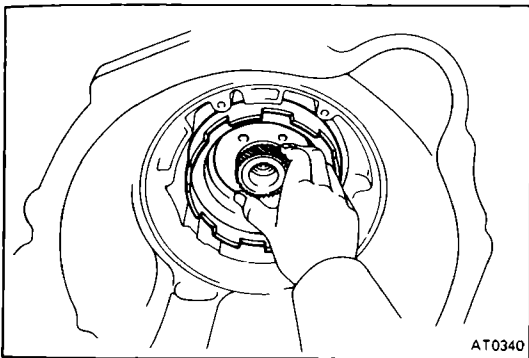
## 23. CHECK OPERATION OF SECOND BRAKE

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

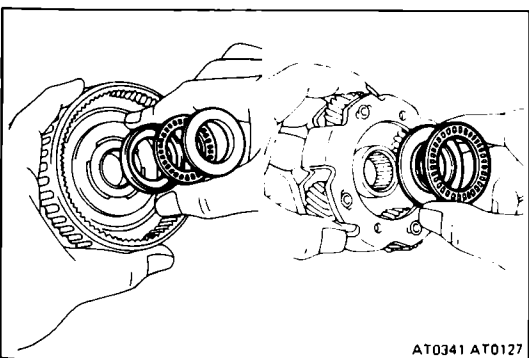


**24. INSTALL NEW SECOND BRAKE DRUM GASKET****25. INSTALL NO. 1 ONE-WAY CLUTCH AND SECOND BRAKE HUB**

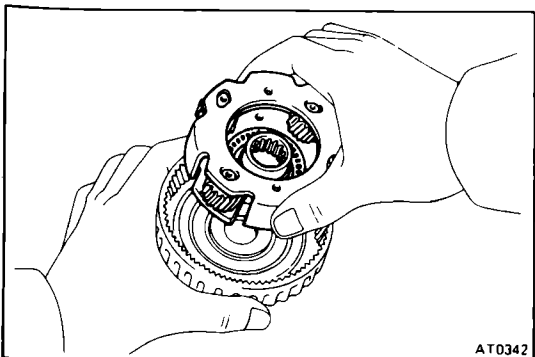
- (a) Align the flukes of the discs in the 2nd brake.
- (b) Align the spline of the hub with the flukes of the discs and install the hub into the 2nd brake discs.

**26. INSTALL SUN GEAR AND SUN GEAR INPUT DRUM**

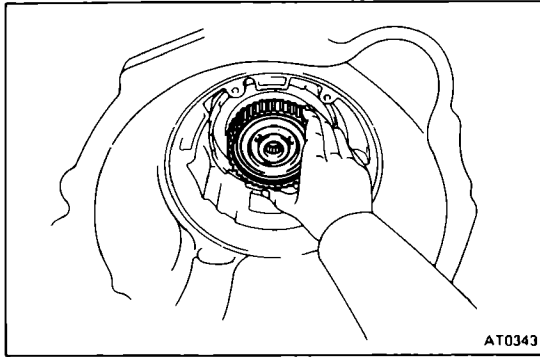
While turning the sun gear clockwise, install it into the one-way clutch.

**27. INSTALL FRONT PLANETARY GEAR ONTO RING GEAR**

- (a) Coat the races and the bearing with petroleum jelly and install them onto the ring gear.
- (b) Coat the race and the bearing with petroleum jelly and install them onto the carrier.

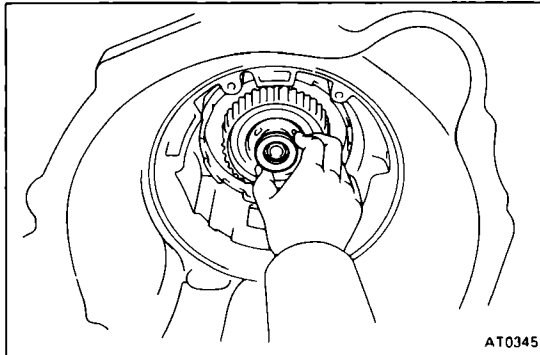


- (c) Install the planetary gear onto the ring gear.



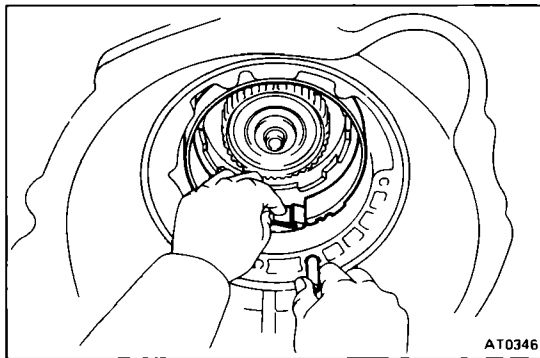
## 28. INSTALL FRONT PLANETARY GEAR ASSEMBLY ONTO SUN GEAR

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



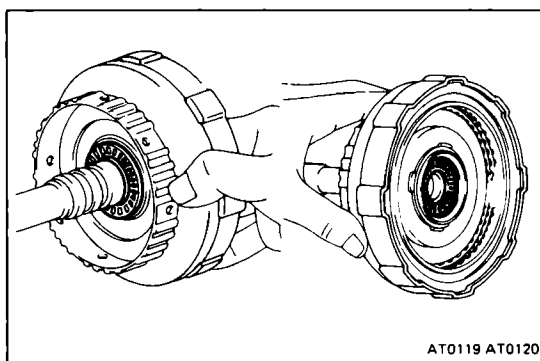
- (b) Coat the race with petroleum jelly and install it onto the tip of ring gear flange.

## 29. INSTALL INTERMEDIATE SHAFT OIL SEAL RING



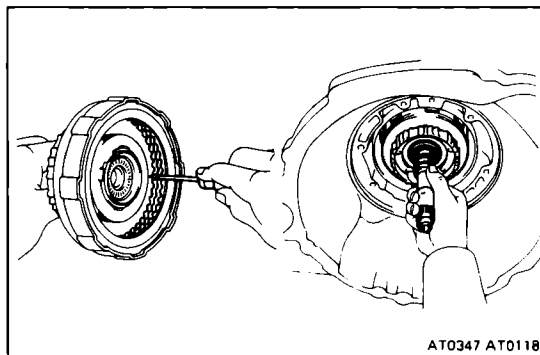
## 30. INSTALL SECOND COAST BRAKE BAND

- (a) Place the band into the case.  
 (b) Install the pin through the oil pump mounting bolt hole.



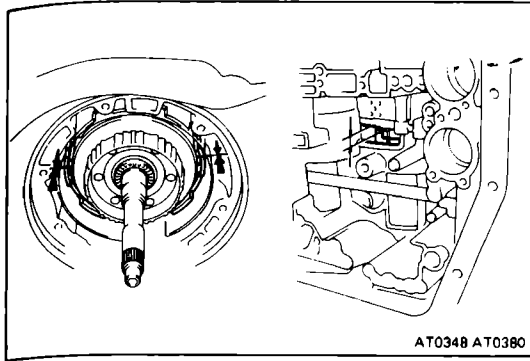
## 31. INSTALL FORWARD CLUTCH INTO CASE

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

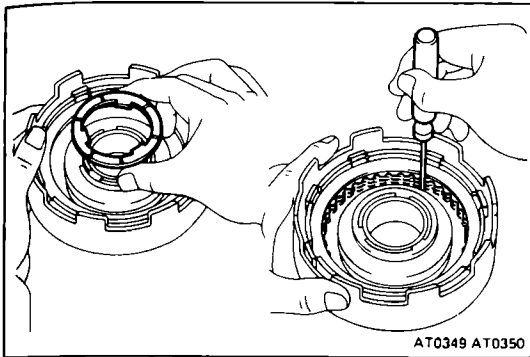


- (b) Align the flukes of the discs in the forward clutch.  
 (c) Hold the sun gear input drum and rotate the input shaft to mesh the hub with the clutch discs of the forward clutch.

**NOTE:** Align the center of the input shaft and intermediate shaft, and while pushing on the input shaft, rotate it to mesh the hub and discs.

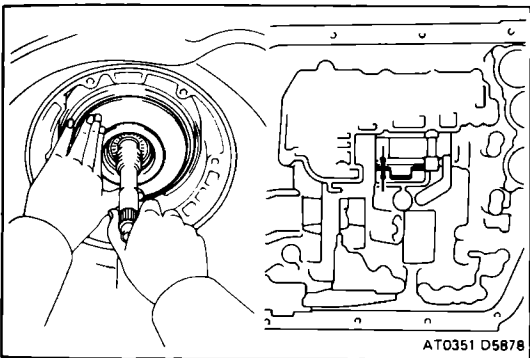


- (d) If the flukes of the discs are meshed with the hub correctly, the protrusion of the forward clutch drum will have entered deeper than the tip of the sun gear input drum.



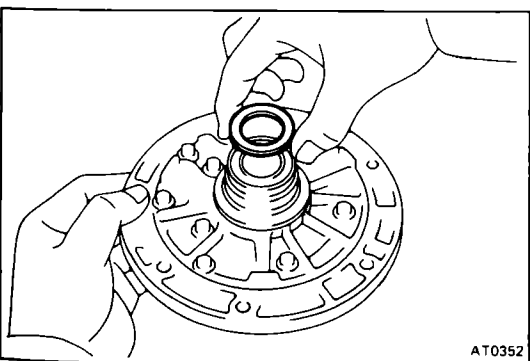
**32. INSTALL DIRECT CLUTCH INTO CASE**

- (a) Coat the clutch drum thrust washer with petroleum jelly and install it facing the oil groove upward onto the drum.
- (b) Align the flukes of discs in the direct clutch.



- (c) Hold the input shaft, and put the direct clutch drum through the 2nd coast brake band.
- (d) Mesh the hub with the flukes of the direct clutch while turning the clutch drum or forward clutch.
- (e) Check the distance between the direct clutch and forward clutch.

**Distance: Approx. 3 mm (0.12 in.)**

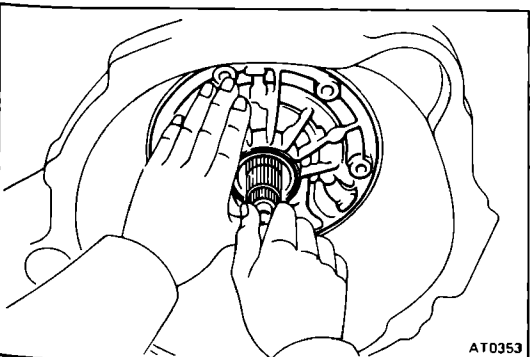


**33. INSTALL OIL PUMP INTO CASE**

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

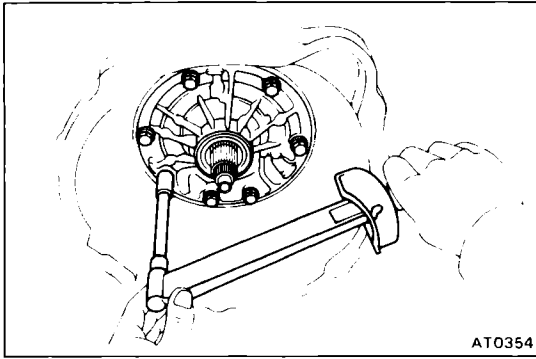
**NOTE:** After installing the oil pump, measure the input shaft thrust play.

If the thrust play is greater than standard, select and insert one of the two different size races.



- (b) Place the oil pump through the input shaft, and align the bolt holes of the pump body at the transmission case.
- (c) Hold the input shaft, and lightly press the oil pump body to slide the oil seal rings on the stator shaft through the direct clutch drum.

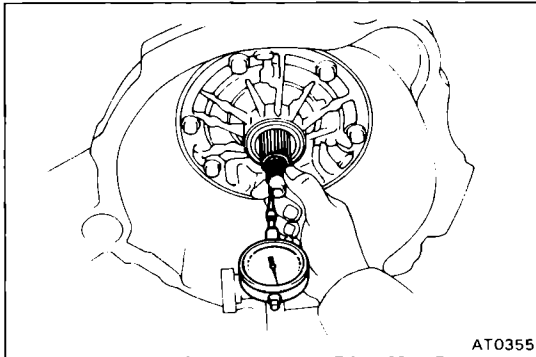
**CAUTION:** Do not push on the oil pump strongly or the oil seal ring will stick to the direct clutch drum.



AT0354

(d) Install the seven bolts.

**Torque: 225 kg-cm (16 ft-lb, 22 N·m)**



AT0355

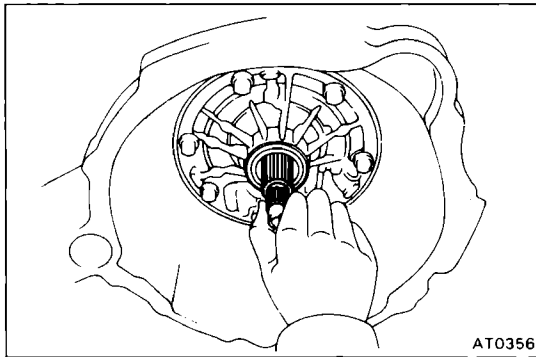
### 34. MEASURE THRUST PLAY OF INPUT SHAFT

Measure the thrust play.

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

**NOTE:** There are two different thickness of races for the end of stator shaft. If necessary, select one of them.

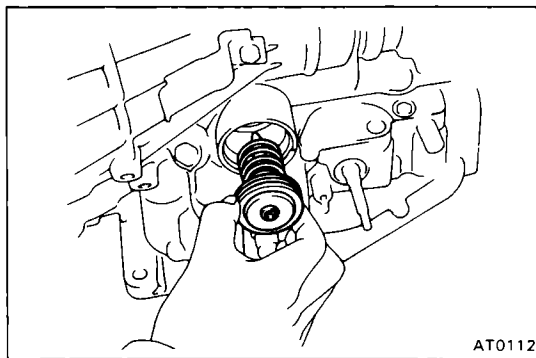
**Race thickness: 0.8 mm (0.031 in.)**  
**1.4 mm (0.055 in.)**



AT0356

### 35. CHECK INPUT SHAFT ROTATION

Make sure that the input shaft rotates smoothly.



AT0112

### 36. INSTALL SECOND COAST BRAKE PISTON

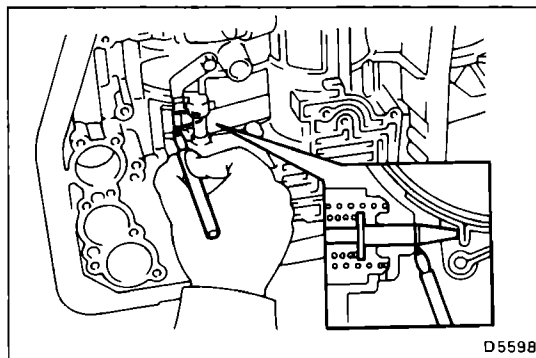
(a) Install the outer spring with the piston.

(b) Place the cover into the bore.

(c) Using SST, install the snap ring while pressing the cover.

**SST 09350-32014 (09351-32050)**

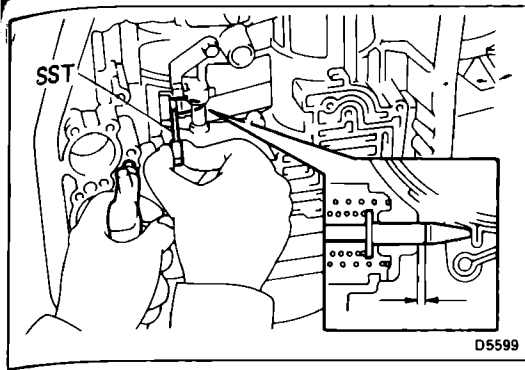
(d) Check that the front end of the piston rod contacts the center of the second brake band depression.



D5598

### 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 show in the illustration.



(b) Using SST, measure the piston stroke applying and releasing the compressed air (4 – 8 kg/cm<sup>2</sup>, 57 – 114 psi or 392 – 785 kPa) as shown.

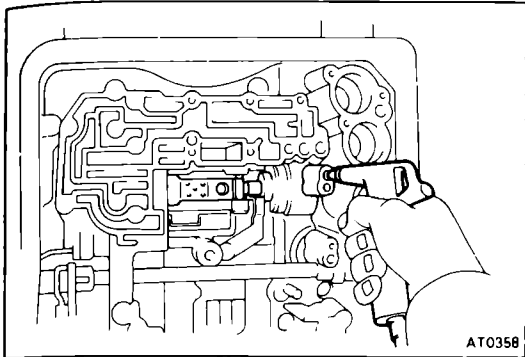
SST 09240-00020

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

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

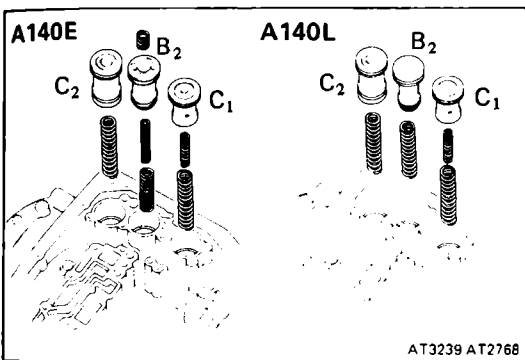
**Piston rod length: 72.9 mm (2.870 in)  
71.4 mm (2.811 in)**

Re-measure the stroke. If it is still more than standard value, replace the brake band with a new one.



**38. CHECK OPERATION OF SECOND COAST BRAKE**

Apply the compressed air into the hole with the case and make sure that the piston rod moves.



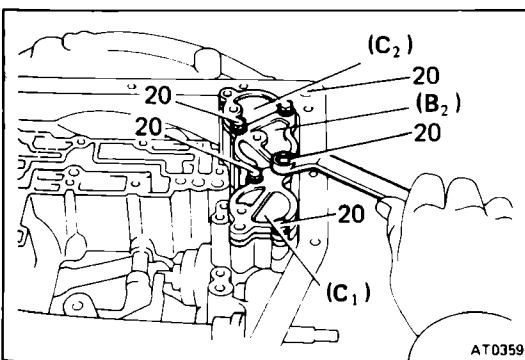
**39. INSTALL ACCUMULATOR PISTONS AND SPRINGS**

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

ATM	Spring		Free length mm (in.)	Color	
A140L	C <sub>1</sub>	Inner	48.00 (1.8898)	Red	
		Outer	81.09 (3.1925)	Light Green	
	C <sub>2</sub>		72.18 (2.8417)	Yellow	
	B <sub>2</sub>		66.68 (2.6252)	Orange	
A140E	C <sub>1</sub>	Inner	48.00 (1.8898)	Red	
		Outer	81.09 (3.1925)	Light Green	
	C <sub>2</sub>		89.25 (3.5138)	White	
	B <sub>2</sub>	Upper	Inner	54.10 (2.1299)	Green
		Outer	54.00 (2.1260)	White	
	Lower	22.00 (0.8661)		Yellow	

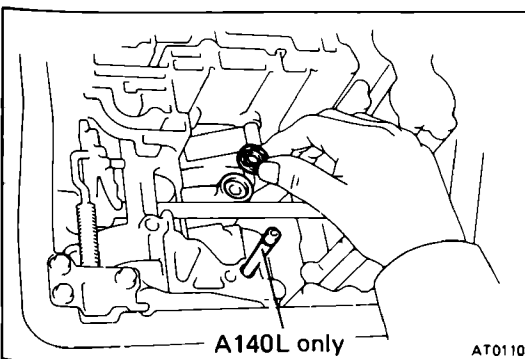
(b) Place the cover with the gasket and tighten the bolts gradually in sequence.

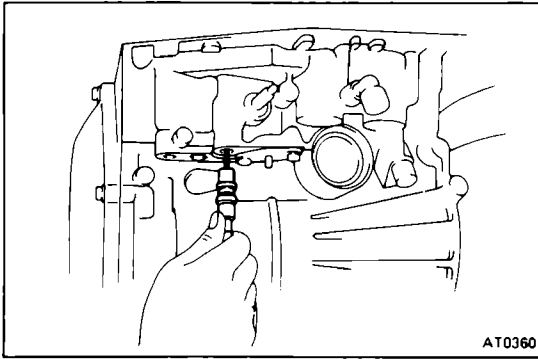
NOTE: Each bolt length (mm) is indicated in the figure.



**40. INSTALL NEW SECOND BRAKE APPLY GASKET (GOVERNOR APPLY GASKET) AND GOVERNOR OIL STRAINER**

NOTE: Governor oil strainer.....A140L only

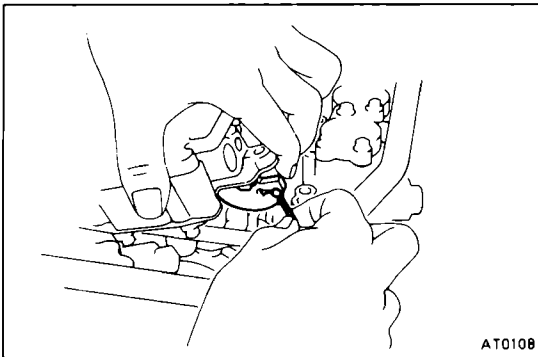




**41. INSTALL THROTTLE CABLE AND SOLENOID WIRING IN CASE**

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

**CAUTION:** In subsequent work, do not roll the case over the cable and break the cable fitting.

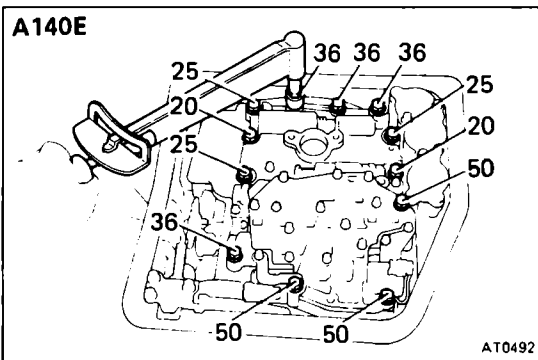


**42. PLACE VALVE BODY ON TRANSMISSION**

(a) While holding the cam down with your hand, slip the cable end into the slot.

(b) Lower valve body into place.

**CAUTION:** Do not entangle the throttle cable.



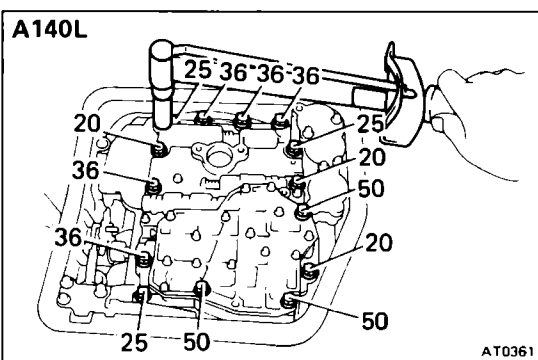
**43. INSTALL BOLTS IN VALVE BODY**

[A140E]

(a) Finger tighten the twelve bolts first, then tighten them with torque wrench.

**Torque:** 100 kg-cm (7 ft-lb, 10 N·m)

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

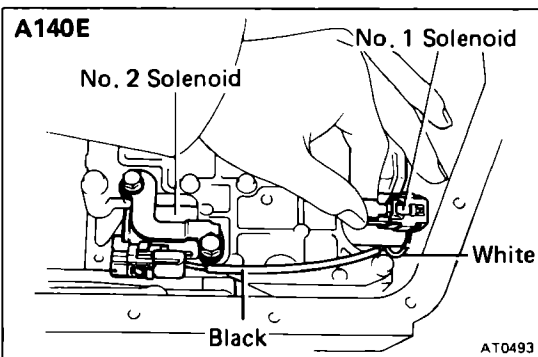


[A140L]

(b) Finger tighten the fourteen bolts first, then tighten them with torque wrench.

**Torque:** 100 kg-cm (7 ft-lb, 10 N·m)

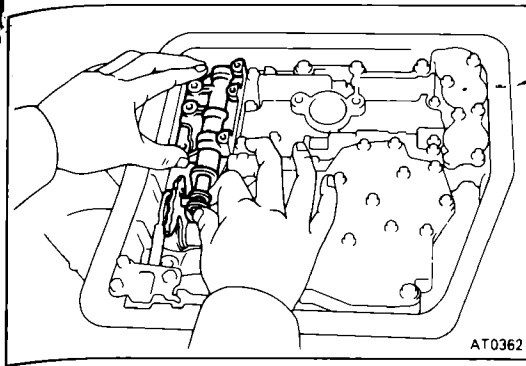
**NOTE:** Each bolt length (mm) is indicated in the figure.



**44. (A140E) CONNECT SOLENOIDS WIRING**

(a) Connect the No.1 solenoid connector. (white and shorter wire)

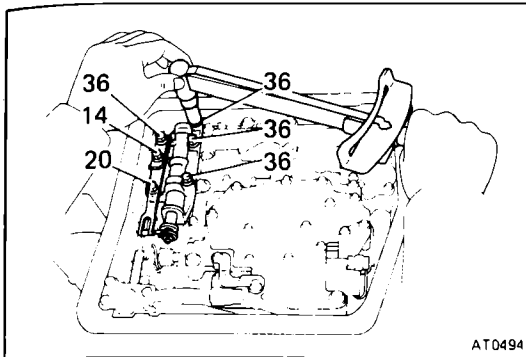
(b) Connect the No.2 solenoid connector. (black and longer wire)

**45. PLACE MANUAL VALVE AND BODY ON TRANSMISSION**

- (a) Align the manual valve with the pin on the manual valve lever.
- (b) Lower the manual valve body into place.
- (c) Finger tighten the four bolts first. Then tighten them with a torque wrench.

**Torque: 100 kg-cm (7 ft-lb, 10 N·m)**

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

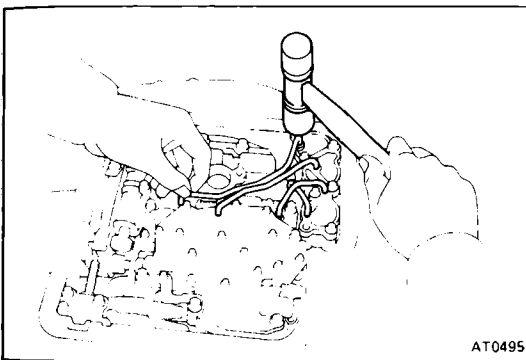
**46. INSTALL DETENT SPRING**

- (a) Finger tighten the two bolts first. Then tighten them with a torque wrench.

**Torque: 100 kg-cm (7 ft-lb, 10 N·m)**

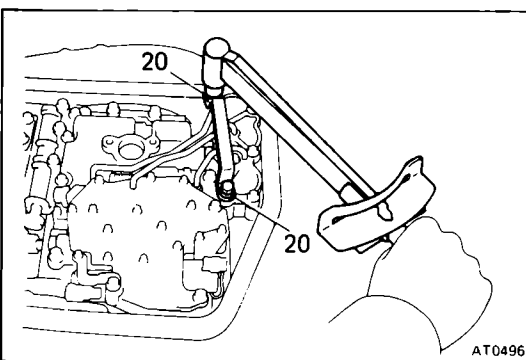
**NOTE:** Each bolt length (mm) is indicated in the figure.

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

**47. INSTALL OIL TUBES**

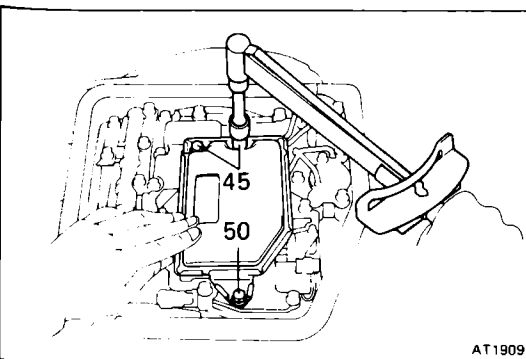
Using a plastic hammer, install the tubes into the positions indicated in the figure.

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

**48. INSTALL TUBE BRACKET**

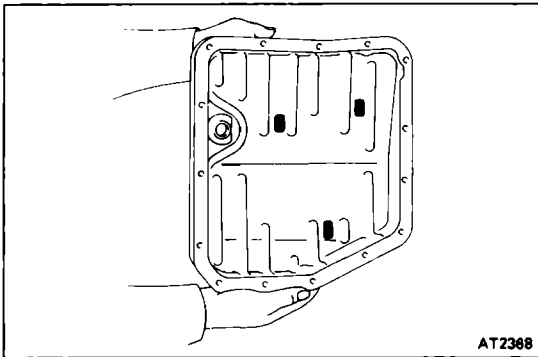
Each bolt length (mm) is indicated in the figure.

**Torque: 100 kg-cm (7 ft-lb, 10 N·m)**

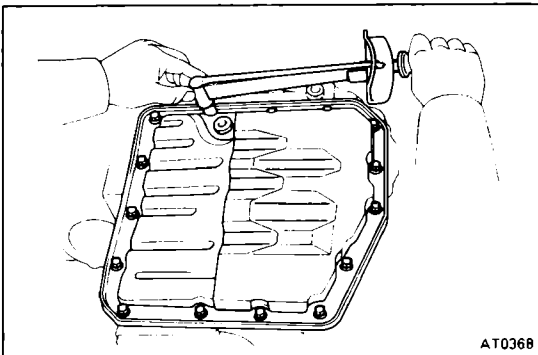
**49. INSTALL OIL STRAINER**

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

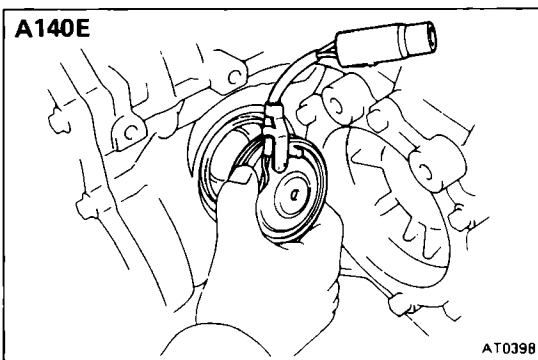
**Torque: 100 kg-cm (7 ft-lb, 10 N·m)**

**50. INSTALL MAGNETS IN PLACE AS SHOWN**

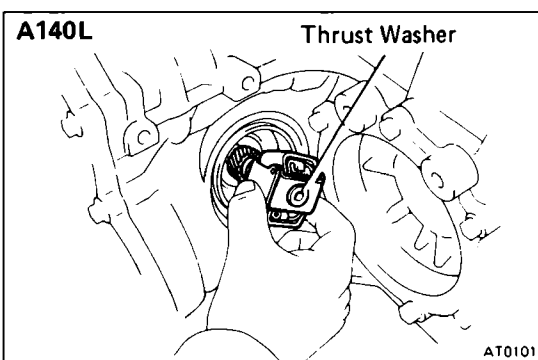
**CAUTION:** Make sure that the magnets do not interfere with the oil tubes.

**51. INSTALL OIL PAN WITH GASKET**

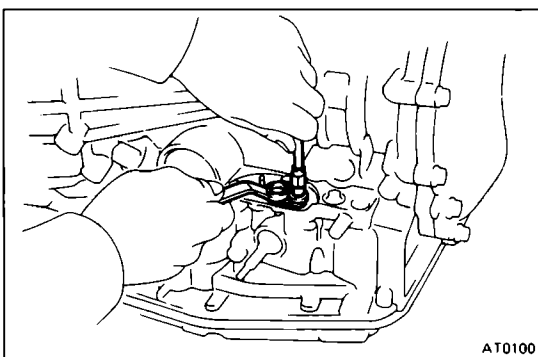
**Torque:** 50 kg-cm (43 in.-lb, 4.9 N·m)

**52. (A140E)****INSTALL SPEED SENSOR**

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

**53. (A140L)****INSTALL GOVERNOR BODY**

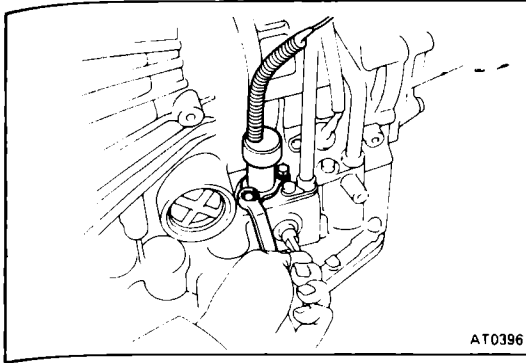
- (a) Install the governor body adaptor.
- (b) Install the thrust washer onto the governor body.
- (c) Install the governor body with the plate washer.
- (d) Install the cover over a new O-ring.
- (e) Install the cover bracket with the two bolts.

**54. INSTALL RETAINING PLATES**

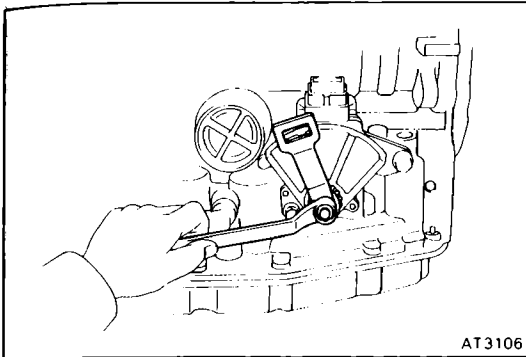
- (a) Install the solenoid wiring retaining plate.
- (b) Install the throttle cable retaining plate.

**55. INSTALL FILLER TUBE AND FILLER GAUGE**



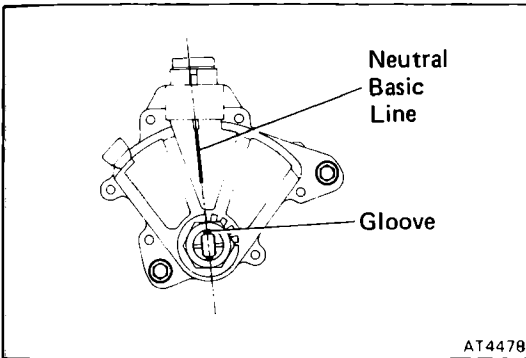
**56. INSTALL SOLENOID**

- (a) Coat a new O-ring with ATF and push the tip of solenoid into the hole.
- (b) Tighten the two bolts evenly and gradually.

**57. INSTALL NEUTRAL START SWITCH**

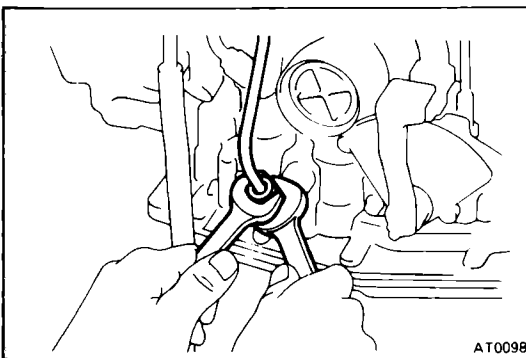
- (a) Install the seal gasket, facing the lip inward.
- (b) Tighten the nut and stake it with the lock washer.

**Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)**

**58. INSTALL MANUAL SHIFT LEVER****59. ADJUST NEUTRAL START SWITCH**

- (a) Align the groove and neutral basic line.
- (b) Lock the switch with two bolts.

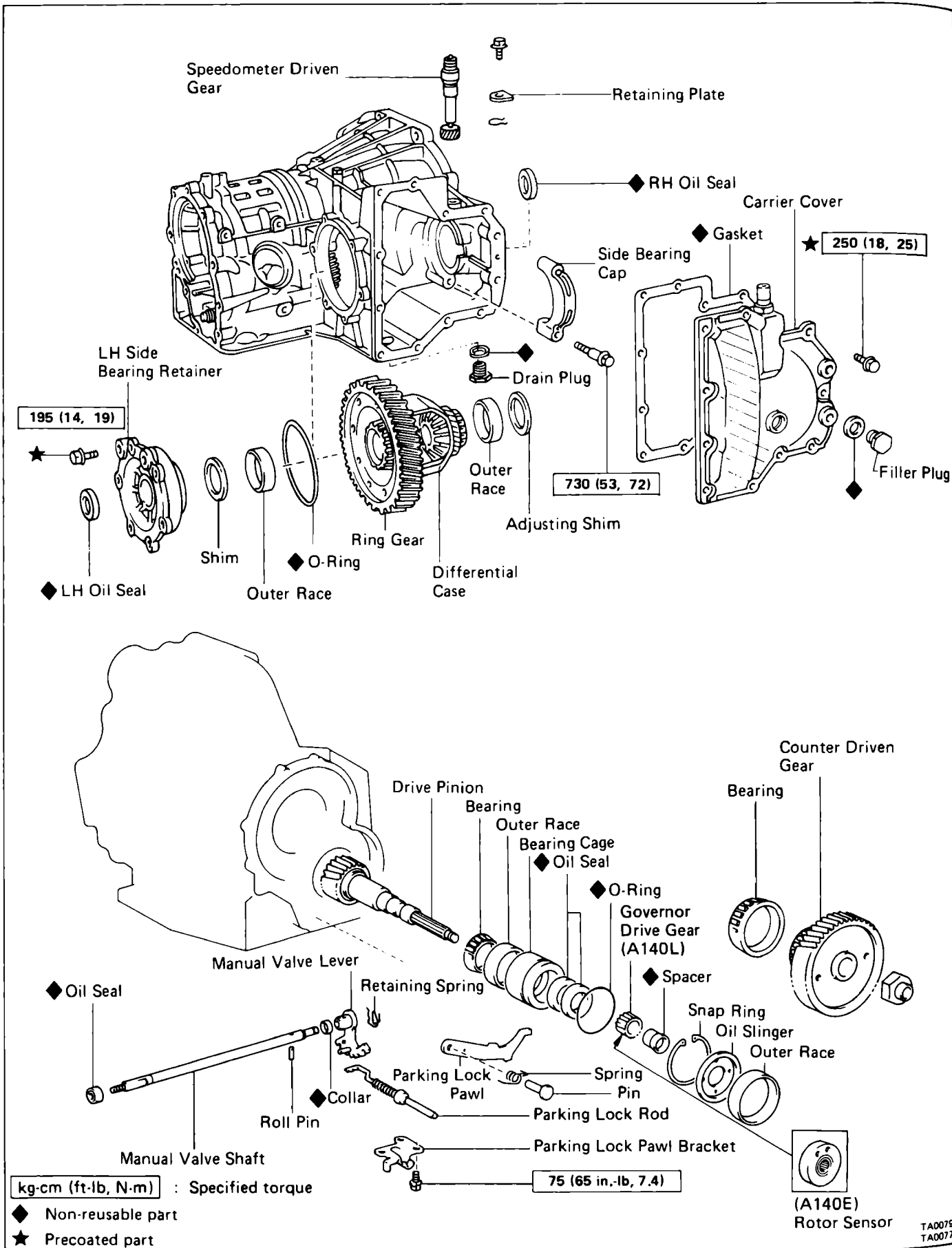
**Torque: 55 kg-cm (48 in.-lb, 5.4 N·m)**

**60. INSTALL TWO OIL COOLER PIPES**

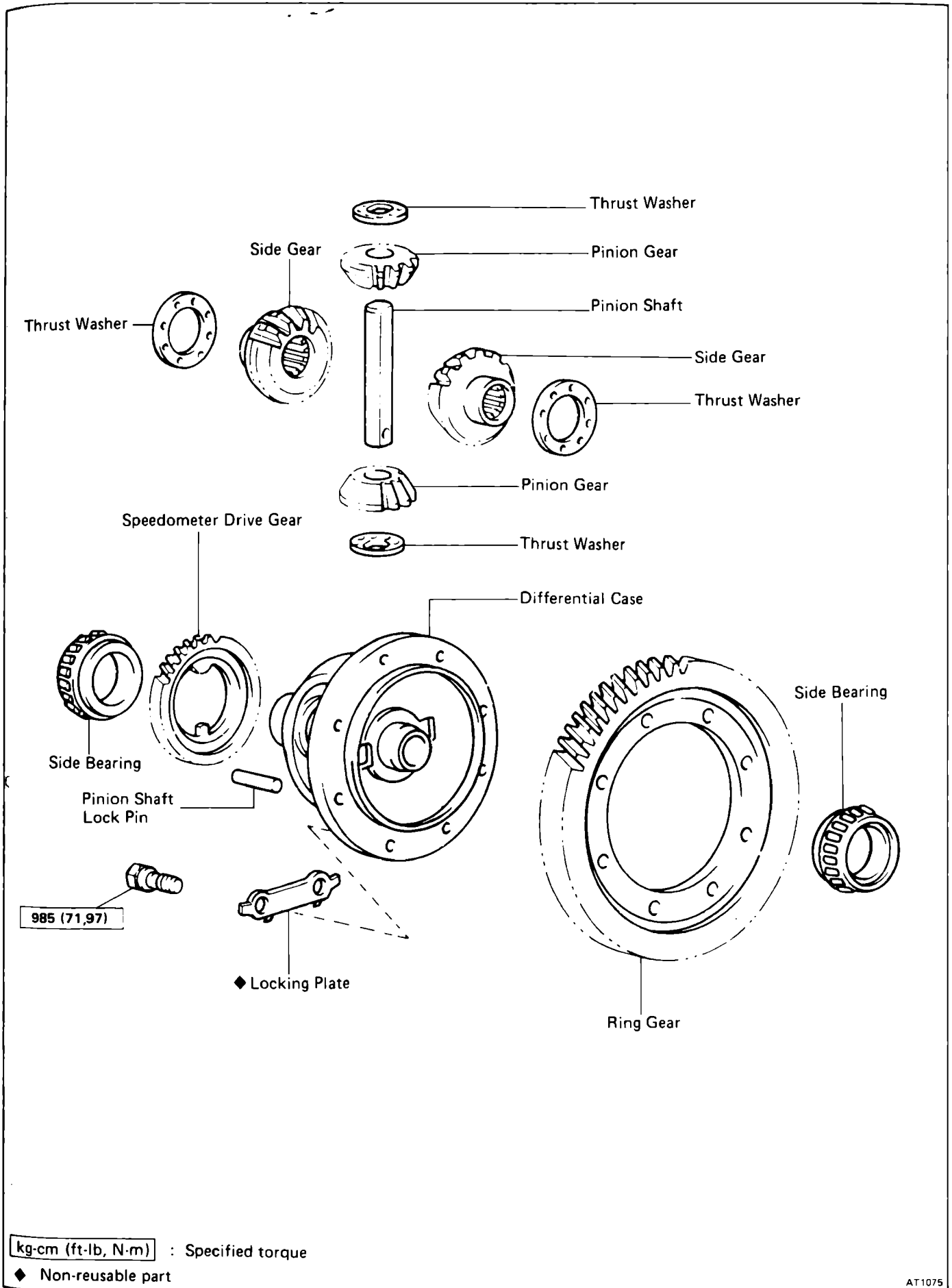
- (a) Install the bracket onto the case.
- (b) Connect the pipes to the union.
- (c) Clamp the two pipes onto bracket.
- (d) Tighten the union nuts.

**Torque: 350 kg-cm (25 ft-lb, 34 N·m)**

# DIFFERENTIAL AND DRIVE PINION COMPONENTS



COMPONENTS (Cont'd)

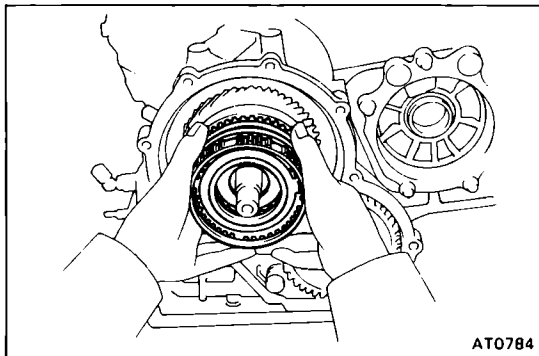
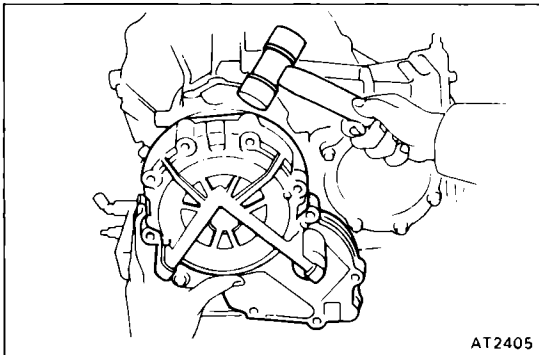


**REMOVAL OF TRANSAXLE**

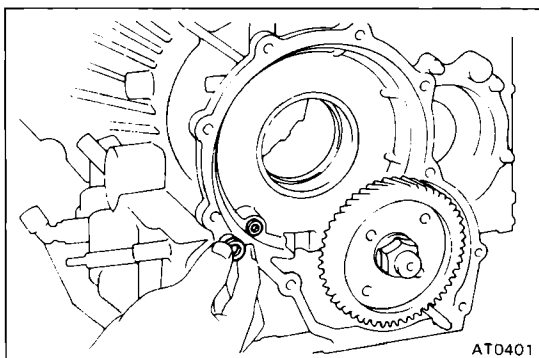
(See page AT-54)

**PREPARATION FOR DISASSEMBLY**

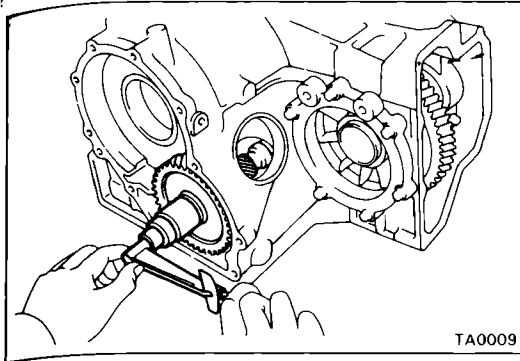
1. REMOVE NEUTRAL START SWITCH (See page AT-66)
2. REMOVE SPEEDOMETER DRIVEN GEAR
3. REMOVE SPEED SENSOR (See page AT-66)
4. REMOVE OIL PAN (See page AT-67)
5. REMOVE VALVE BODY (See pages AT-67,68)
6. REMOVE OVERDRIVE UNIT
  - (a) Remove the eleven bolts and tap the overdrive case with a plastic hammer to remove it.



- (b) If the intermediate shaft did not come out with the overdrive case, remove it from the transmission case.



7. REMOVE OVERDRIVE CLUTCH APPLY GASKET AND OVERDRIVE BRAKE GASKET
8. REMOVE PARKING LOCK PAWL BRACKET AND ROD (See page AT-75)
9. REMOVE PARKING LOCK PAWL (See page AT-75)
10. REMOVE MANUAL SHAFT AND LEVER (See page AT-60)

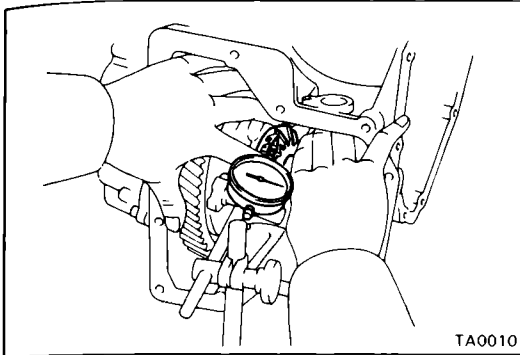


TA0009

## DISASSEMBLY OF DIFFERENTIAL

1. REMOVE CARRIER COVER
2. MEASURE TOTAL PRELOAD

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



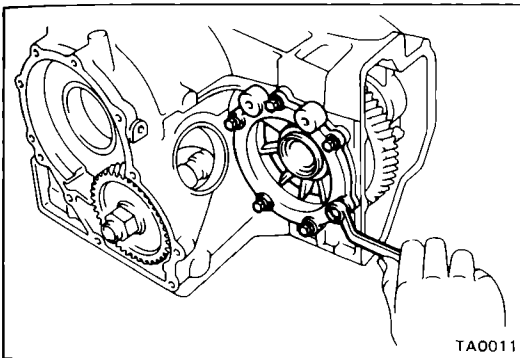
TA0010

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.)**



TA0011

4. REMOVE LH BEARING RETAINER

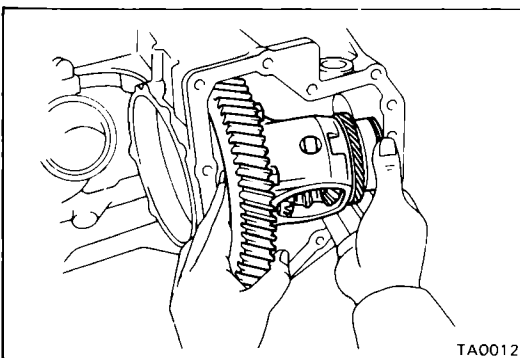
(a) Remove the six bolts.

(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

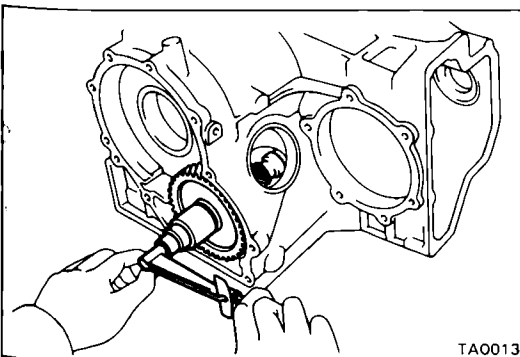
Remove the two bolts and the side bearing cap.



TA0012

6. REMOVE DIFFERENTIAL CASE, OUTER RACE AND ADJUSTING SHIM

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



TA0013

7. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the drive pinion preload.

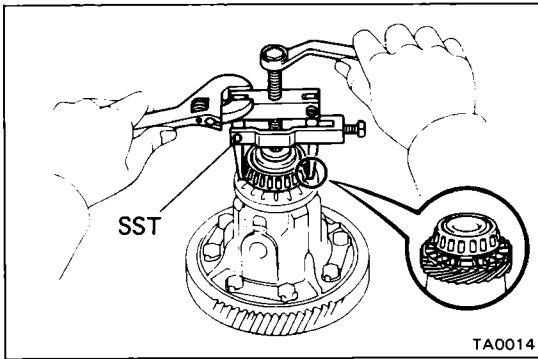
**Preload (at starting):**

**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 (1.3 — 1.7 in.-lb, 0.1 — 0.2 N·m).

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



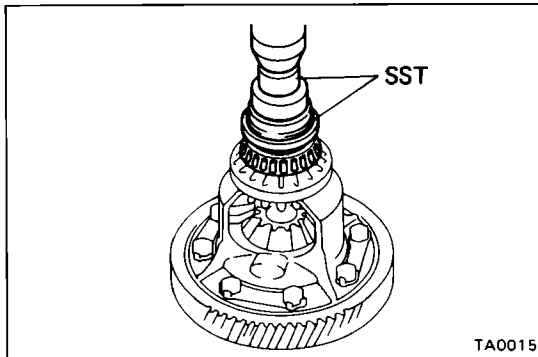
## REPLACEMENT OF DIFFERENTIAL

### 1. REPLACE SIDE BEARING

- (a) Fasten SST under the bearing above the cutouts on the speedometer drive gear.

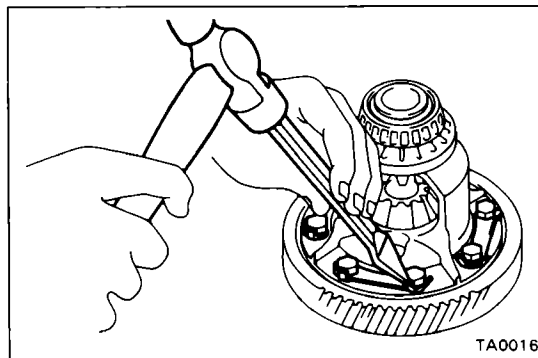
Remove the bearing from the case.

SST 09502-10012



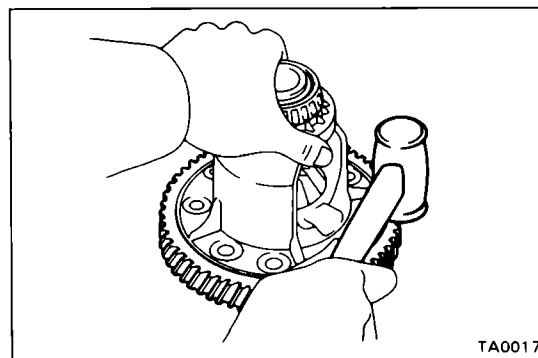
- (b) Using SST and a press, press each side bearing onto the differential case.

SST 09350-32014 (09351-32090, 09351-32120)

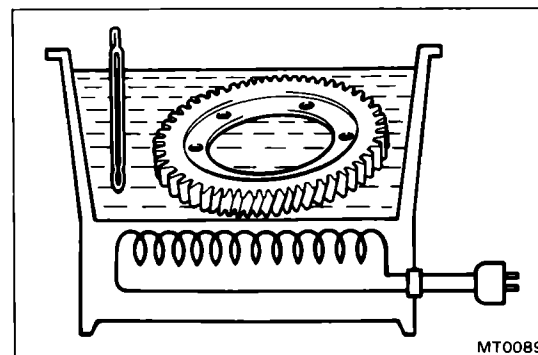


### 2. REPLACE RING GEAR

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



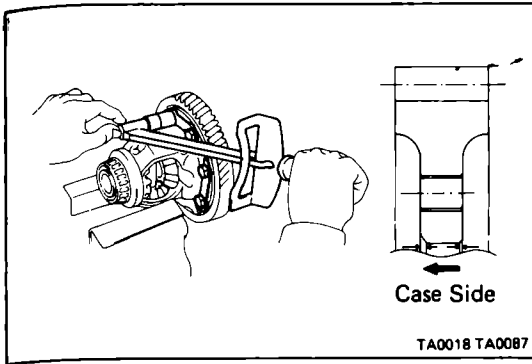
- (b) Remove the eight bolts and locking plates.  
 (c) Using a copper hammer, tap on the ring gear to remove it from the case.



- (d) Clean the contact surface of the differential case.  
 (e) Heat the ring gear to about 100°C (212°F) in an oil bath.

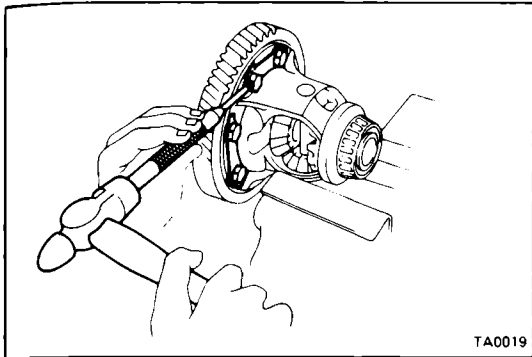
**CAUTION:** Do not heat the ring gear above 110°C (230°F).

- (f) Clean the contact surface of the ring gear with cleaning solvent.



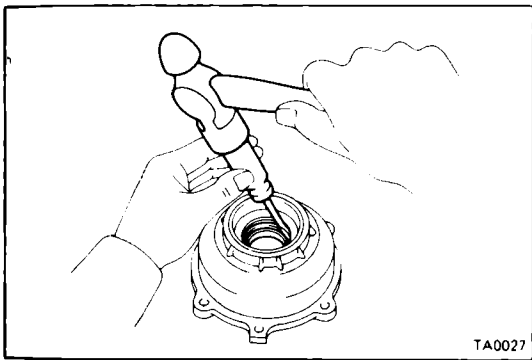
- (g) Then quickly install the ring gear on the differential case.
- (h) Install a new locking plates and set bolts. Tighten the set bolts uniformly and a little at a time. Torque the bolts.

**Torque: 985 kg-cm (71 ft-lb, 97 N·m)**



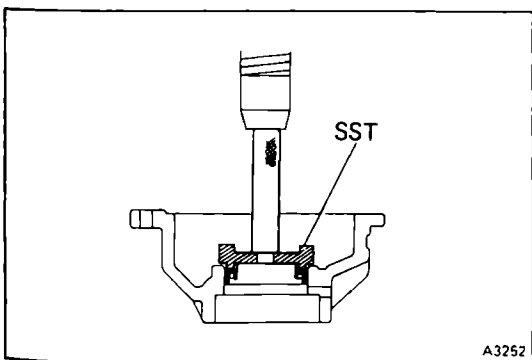
- (i) Using a hammer and drift punch, stake the locking plates.

**NOTE:** 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.



**3. REPLACE LH OIL SEAL**

- (a) Using a hammer and screwdriver, remove the oil seal.

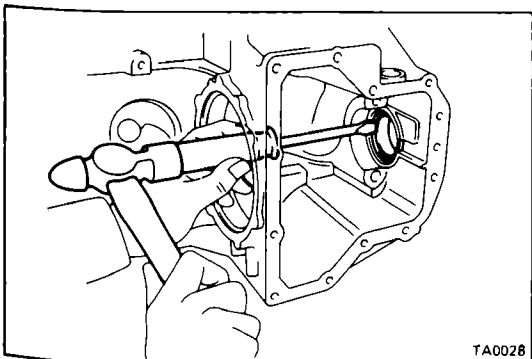


- (b) Using SST, press in a new oil seal.

SST 09350-32013 (09351-32150)

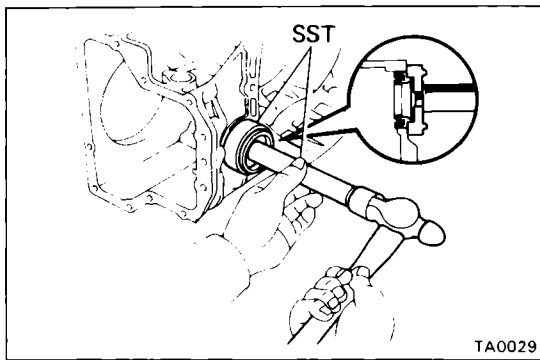
**Oil seal drive in depth: 2.7 mm (0.106 in.)**

- (c) Coat the lip of oil seal with MP grease.



**4. REPLACE RH OIL SEAL**

- (a) Using a hammer and screwdriver, remove the oil seal.

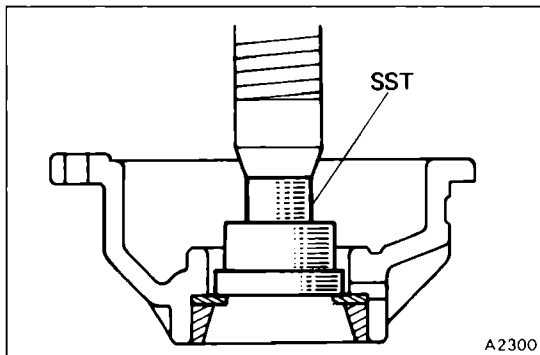


TA0029

(b) Using SST, drive in a new oil seal until its surface is flush with the surface of the case.

SST 09350-32013 (09351-32130, 09351-32150)

(c) Coat the lip of oil seal with MP grease.



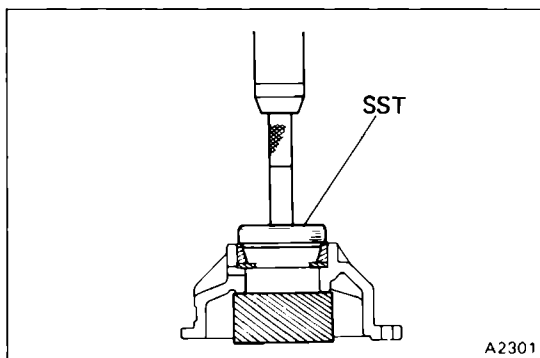
A2300

#### 5. REPLACE LH SIDE BEARING OUTER RACE

(a) Remove oil seal.

(b) Using SST, press out outer race and shim.

SST 09350-32014 (09351-32130, 09351-32090)



A2301

(c) Place the shim onto the retainer.

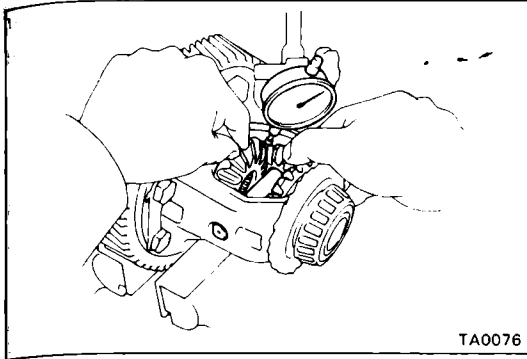
(d) Using SST, press a new outer race into the retainer.

SST 09350-32014 (09351-32111, 09351-32130)

NOTE: Use the shim 2.60 mm (0.1024 in.) thick.

(e) Install a new oil seal.





TA0076

## ADJUSTMENT OF DIFFERENTIAL CASE

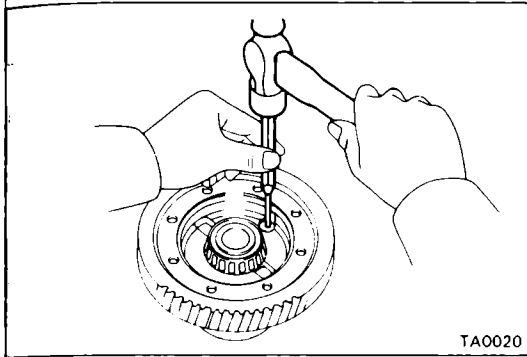
### 1. CHECK SIDE GEAR BACKLASH

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

**Standard backlash:**

**0.05 — 0.20 mm (0.0020 — 0.0079 in.)**

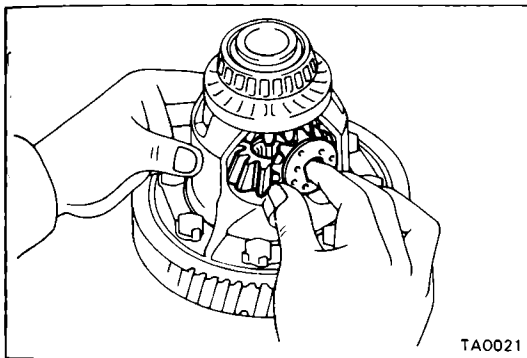
If the backlash is out of specification, install the correct thrust washer to the side gears.



TA0020

### 2. DISASSEMBLY DIFFERENTIAL CASE

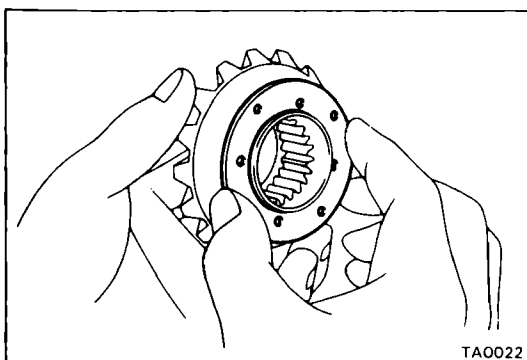
(a) Drive out the pinion shaft lock pin from the side on which the ring gear is installed.



TA0021

(b) Remove the pinion shaft from the case.

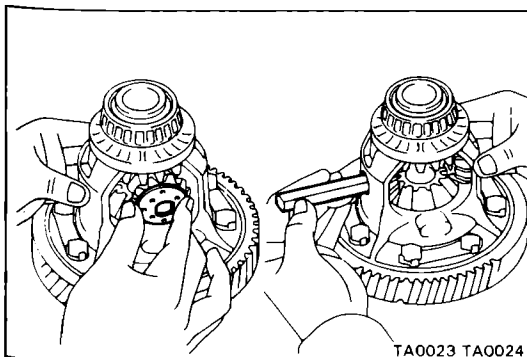
(c) Remove the two pinion gears and two side gears with the four thrust washers from the case.



TA0022

### 3. ASSEMBLE DIFFERENTIAL CASE

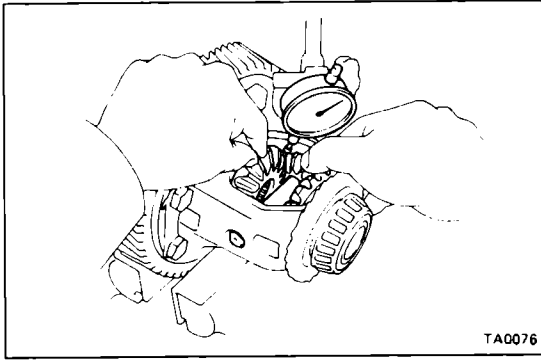
(a) Install the removed thrust washers to the side gears.



TA0023 TA0024

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

(c) Install the pinion shaft.



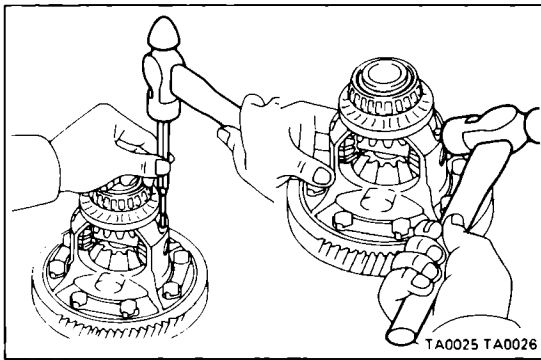
- (d) Check the side gear backlash. Measure the side gear backlash while holding one pinion gear toward the case.

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

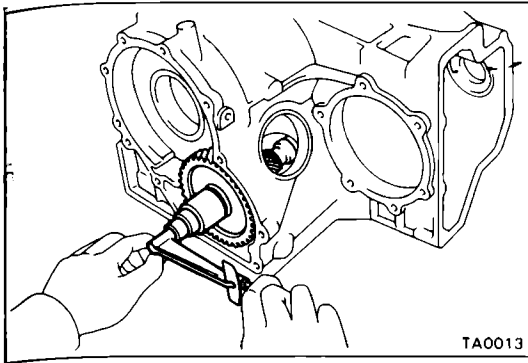
Referring to the table below, select the thrust washers which will ensure that the backlash is within specification. Try to select washers of the same size for both sides.

Thrust washer thickness		mm (in.)
0.95 (0.0374)	1.10 (0.0433)	
1.00 (0.0394)	1.15 (0.0453)	
1.05 (0.0413)	1.20 (0.0472)	

If the backlash is not within specification, install a thrust washer of different thickness.



- (e) Install the lock pin.
  - (1) Using a hammer and punch, drive the lock pin through the case and hole in the pinion shaft.
  - (2) Stake the differential case.



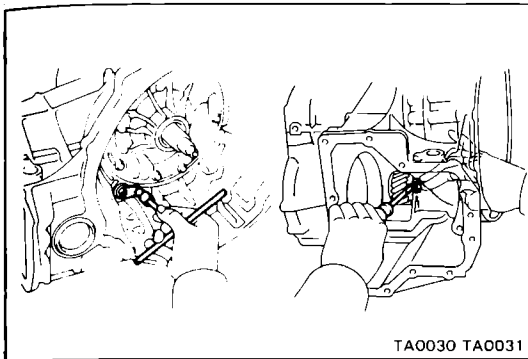
## DISASSEMBLY OF DRIVE PINION SHAFT

### 1. MEASURE DRIVE PINION PRELOAD

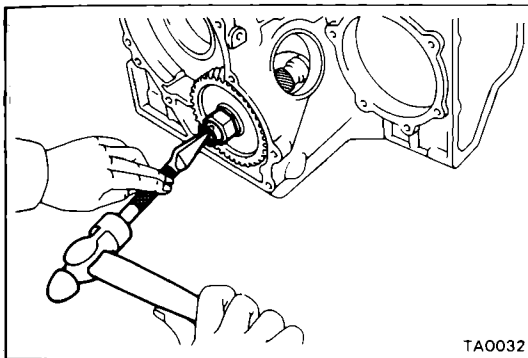
Using a torque meter, measure the preload of the drive pinion.

**Preload:**

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

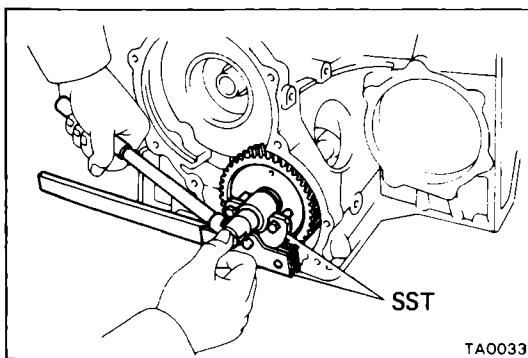


### 2. REMOVE DRIVE PINION CAP



### 3. REMOVE COUNTER DRIVEN GEAR

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

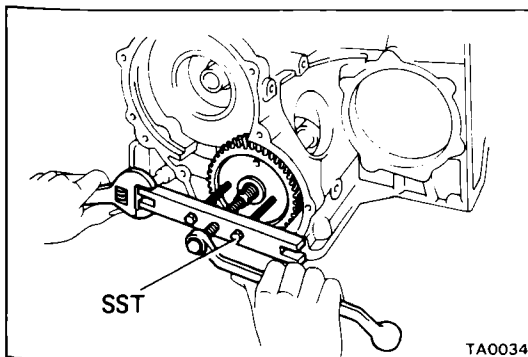


(b) Install SST onto the gear.

SST 09350-32014 (09351-32032)

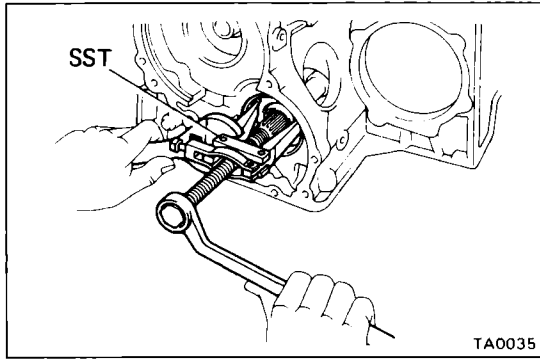
(c) Using SST to hold the gear, remove the nut.

SST 09330-00021

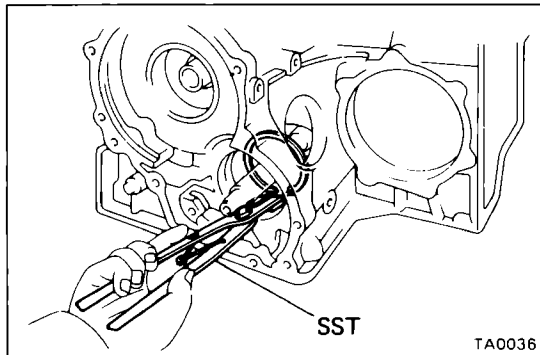


(d) Using SST, remove the gear and bearing.

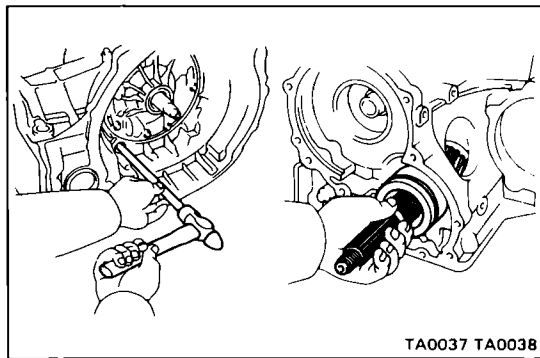
SST 09350-32014 (09351-32061)

**4. REMOVE OUTER RACE FROM CASE**

Using SST, remove the outer race.  
SST 09350-32014 (09308-10010)

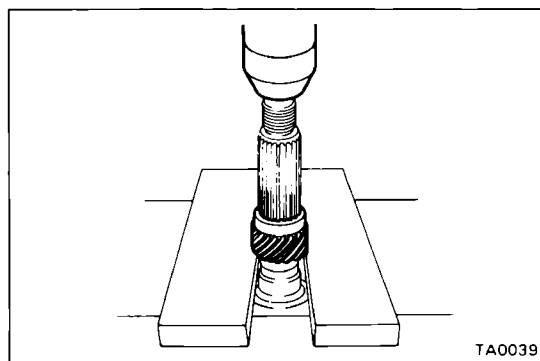
**5. REMOVE OIL SLINGER, SPACER AND ROTOR SENSOR OR GOVERNOR BODY DRIVE GEAR****6. REMOVE DRIVE PINION**

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

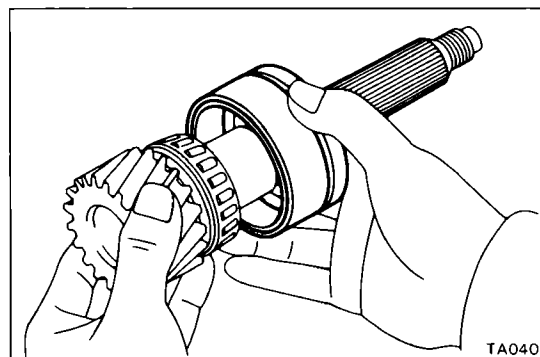


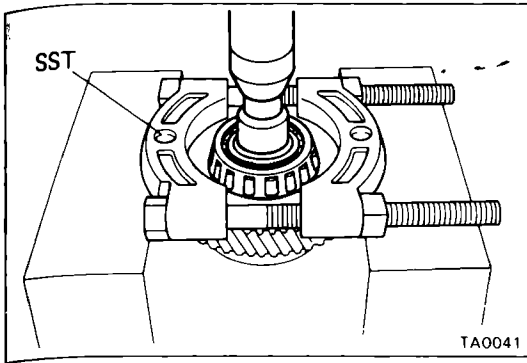
(b) Insert a brass bar into case hole to tap out the drive pinion.

(c) Tap the drive pinion and remove the bearing cage from the bore.

**7. REMOVE GOVERNOR BODY DRIVE GEAR (A140L)**

Using a press, press out the governor body drive gear.

**8. REMOVE BEARING CAGE FROM DRIVE PINION****9. REMOVE O-RING FROM BEARING CAGE**

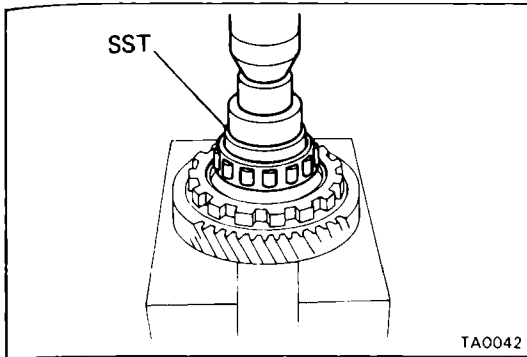


## REPLACEMENT OF DRIVE PINION SHAFT COMPONENTS

### 1. REPLACE BEARING OF COUNTER DRIVEN GEAR

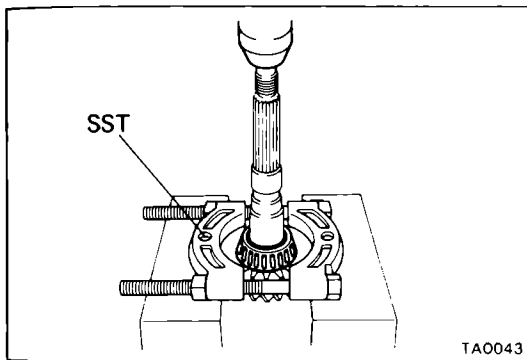
(a) Using SST, press out the bearing.

SST 09950-00020



(b) Using SST, press in a new bearing.

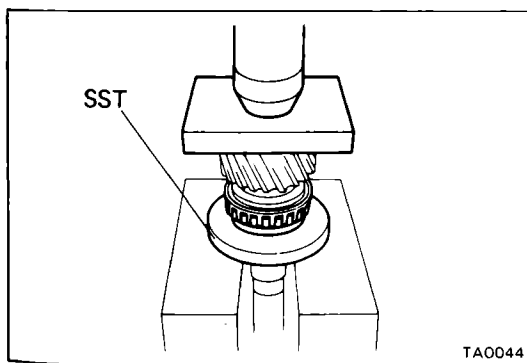
SST 09350-32014 (09351-32090)



### 2. REPLACE BEARING AND OUTER RACE OF DRIVE PINION SHAFT

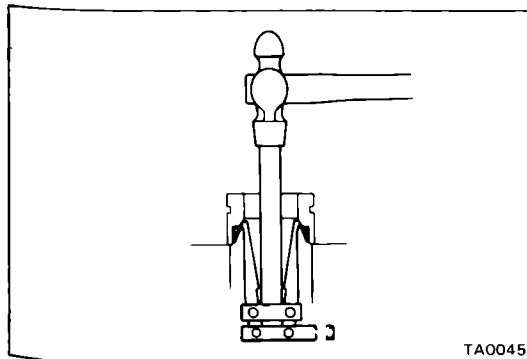
(a) Using SST, press out the bearing.

SST 09950-00020



(b) Using SST, press in a new bearing.

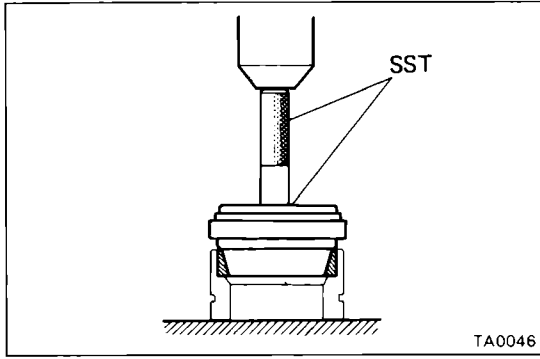
SST 09350-32014 (09351-32100)



(c) Using SST, drive out the outer race from the bearing cage.

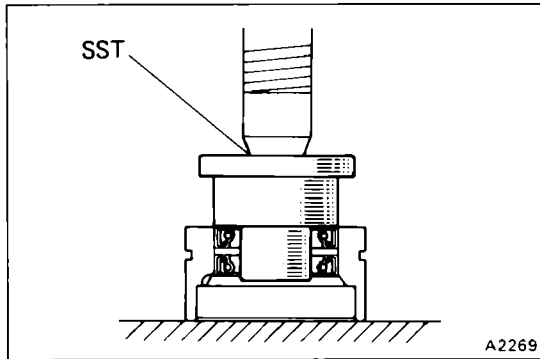
SST 09350-32014 (09308-10010)

NOTE: Use SST without the bolt.



(d) Using SST, press a new outer race into the bearing cage.

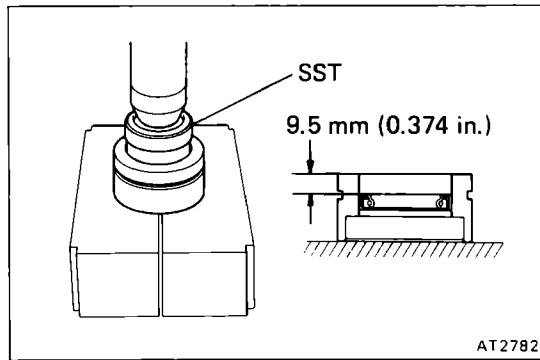
SST 09350-32014 (09351-32111, 09351-32130)



**3. REPLACE OIL SEAL OF CAGE**

(a) Using SST, press out the two oil seals together.

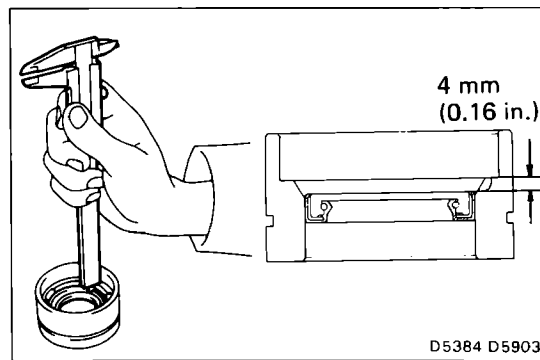
SST 09350-32014 (09351-32090)



(b) Using SST, press in a new oil seal with the lip facing downward.

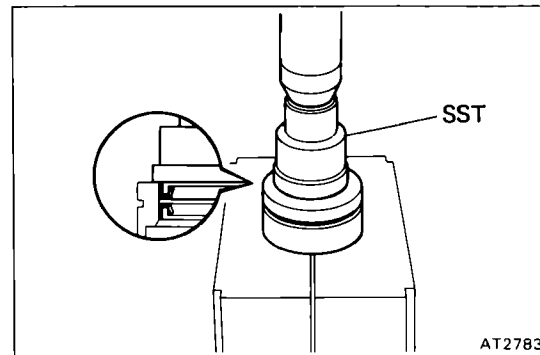
SST 09350-32014 (09351-32090)

**Oil seal press in depth (from flat end): 9.5 mm (0.374 in.)**



(c) Measure the oil seal press in depth.

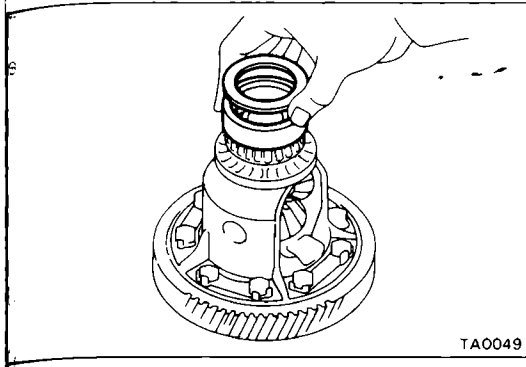
**Oil seal press in depth: 4 mm (0.16 in.)**



(d) 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)

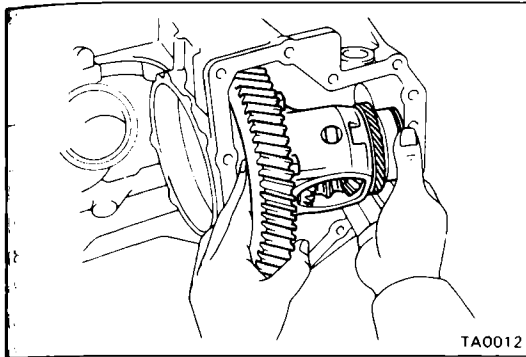
(e) Coat the oil seal lip with MP grease.



## ADJUSTMENT OF DIFFERENTIAL SIDE BEARING PRELOAD

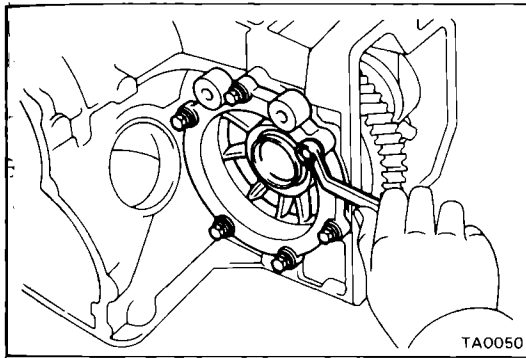
### 1. PLACE OUTER RACE AND ADJUSTING SHIM ONTO RH SIDE BEARING

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



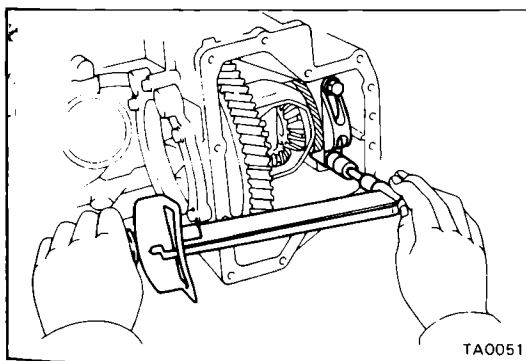
### 2. PLACE DIFFERENTIAL CASE INTO CASE

Be sure to install the adjusting shim into place.



### 3. INSTALL LH BEARING RETAINER

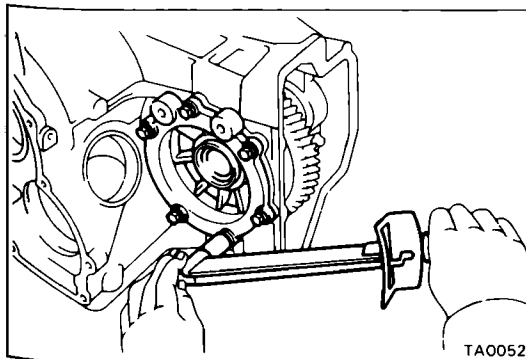
- Do not install the O-ring yet.
- Do not coat the bolt threads with sealant yet.
- Temporarily tighten the bolts evenly and gradually while turning the ring gear.



### 4. INSTALL RH SIDE BEARING CAP

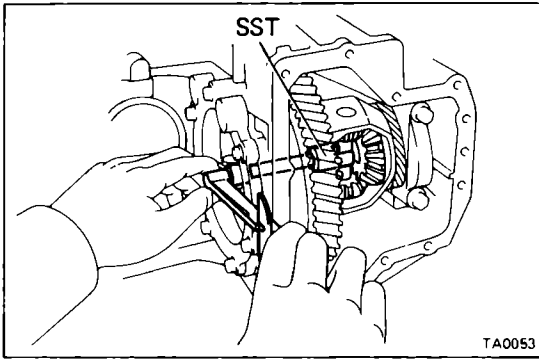
Tighten the bolts evenly and gradually while turning the ring gear.

**Torque:** 730 kg-cm (53 ft-lb, 72 N·m)



### 5. TIGHTEN LH BEARING RETAINER

**Torque:** 195 kg-cm (14 ft-lb, 19 N·m)



**6. ADJUST SIDE BEARING PRELOAD**

Using SST and torque meter, measure the preload of the side bearing.

SST 09564-32011

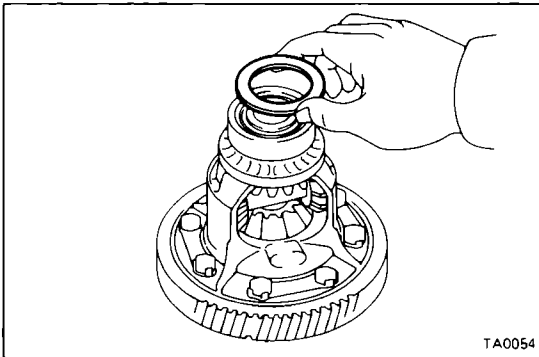
NOTE: Install SST on the pinion shaft.

**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)

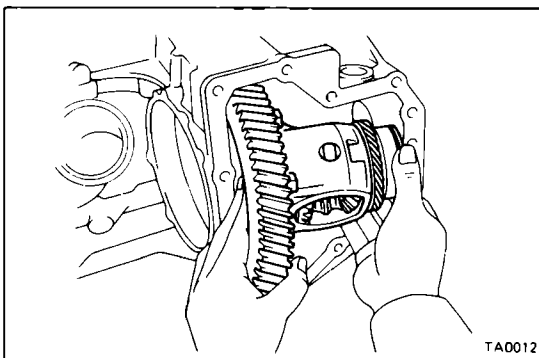
If the preload is not within specification, remove the ring gear from the case.

Reselect the RH adjusting shim.



Thickness	mm (in.)	Thickness	mm (in.)
1.89 – 1.91	(0.0744 – 0.0752)	2.39 – 2.41	(0.0941 – 0.0949)
1.94 – 1.96	(0.0764 – 0.0772)	2.44 – 2.46	(0.0961 – 0.0969)
1.99 – 2.01	(0.0783 – 0.0791)	2.49 – 2.51	(0.0980 – 0.0988)
2.04 – 2.06	(0.0803 – 0.0811)	2.54 – 2.56	(0.1000 – 0.1008)
2.09 – 2.11	(0.0823 – 0.0831)	2.59 – 2.61	(0.1020 – 0.1028)
2.14 – 2.16	(0.0843 – 0.0850)	2.64 – 2.66	(0.1039 – 0.1047)
2.19 – 2.21	(0.0862 – 0.0870)	2.69 – 2.71	(0.1059 – 0.1067)
2.24 – 2.26	(0.0882 – 0.0890)	2.74 – 2.76	(0.1079 – 0.1087)
2.29 – 2.31	(0.0902 – 0.0909)	2.79 – 2.81	(0.1098 – 0.1106)
2.34 – 2.36	(0.0921 – 0.0929)		

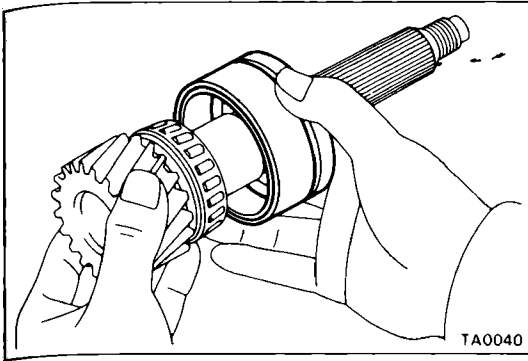
NOTE: The preload will change about 3 – 4 kg-cm (2.6 – 3.5 in.-lb, 0.3 – 0.4 N·m) with each shim thickness.



**7. REMOVE DIFFERENTIAL CASE AND COMPONENT PARTS**

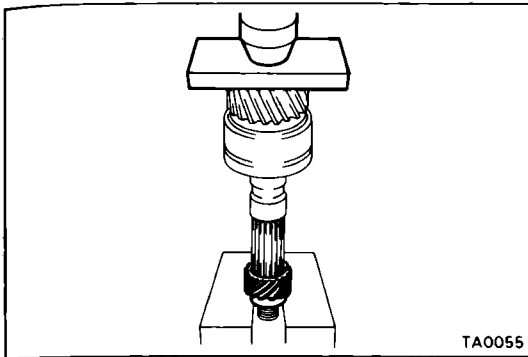
If the preload is adjusted within specification, remove the bearing retainer, differential case, RH side bearing and shim.



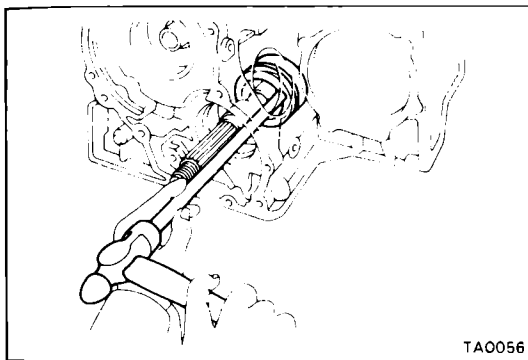


## ASSEMBLY AND ADJUSTMENT OF DRIVE PINION SHAFT

1. **INSTALL NEW O-RING ONTO BEARING CAGE**
2. **PLACE BEARING CAGE ONTO DRIVE PINION SHAFT**  
Be careful not to damage the oil seal with the splines.



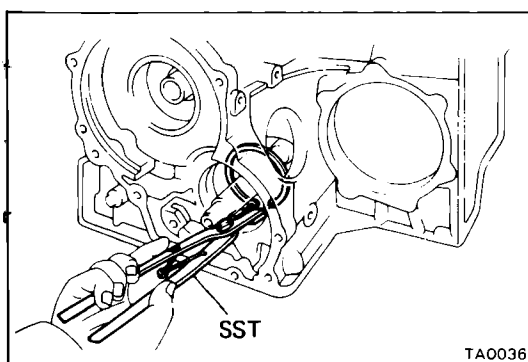
3. **INSTALL GOVERNOR DRIVE GEAR (A140L)**



4. **INSTALL DRIVE PINION SHAFT INTO CASE**

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

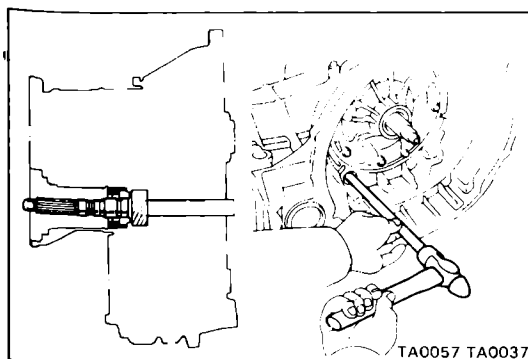
**NOTE:** Drive in the bearing cage until the surface of the bearing cage passes through the groove with the bore.



5. **INSTALL SNAP RING INTO CASE**

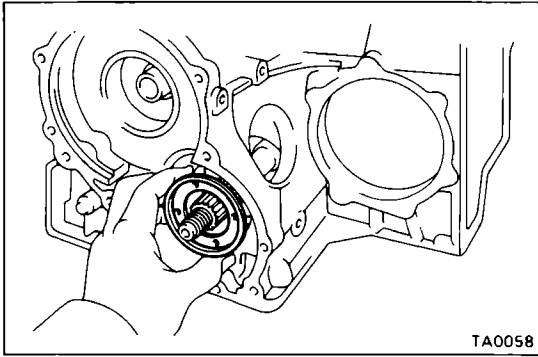
(a) Using SST, install the snap ring into the groove.  
SST 09350-32014 (09351-32050)

(b) Slightly tap the bearing cage to fit the snap ring into the groove.



6. **INSTALL ROTOR SENSOR (A140E)**

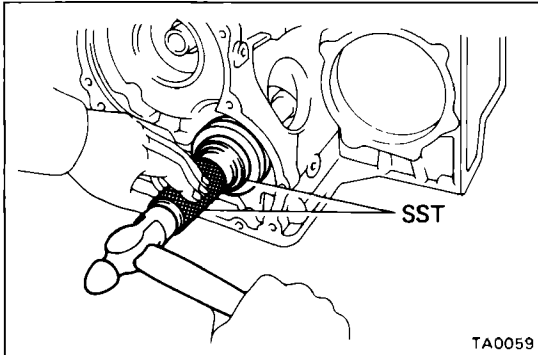
Install the rotor sensor, facing the magnet outward.



TA0058

**7. INSTALL OIL SLINGER**

Install the oil slinger, facing the lip outward.

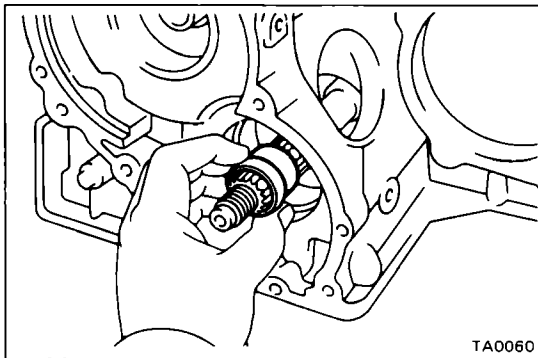


TA0059

**8. INSTALL OUTER RACE**

Using SST, drive the outer race into the case.

SST 09350-32014 (09351-32100, 09351-32140)

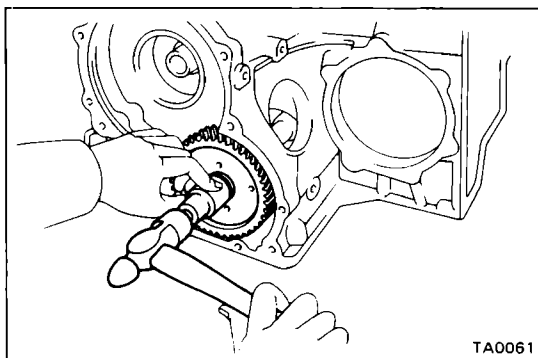


TA0060

**9. INSTALL NEW SPACER**

Always use new spacer.

Install the spacer with the small end first.



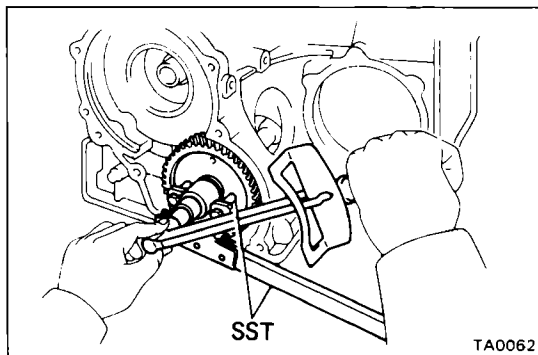
TA0061

**10. INSTALL COUNTER DRIVEN GEAR ONTO SHAFT**

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

(b) Drive the gear onto the shaft until the nut can be installed on the threads of the shaft.

**CAUTION:** Be careful not to damage to the transmission case.



TA0062

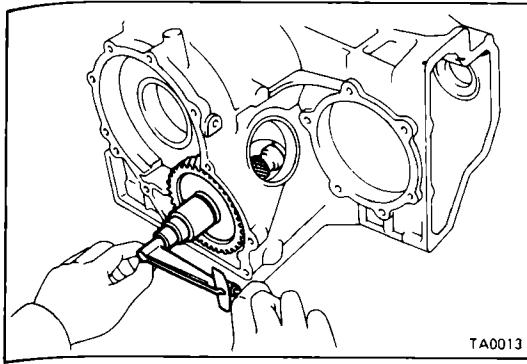
**11. ADJUST DRIVE PINION PRELOAD**

(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 09350-32014 (09351-32032) and 09330-00021



- (c) Turn the gear counterclockwise and clockwise several times.
- (d) Using a torque meter, measure the preload of the drive pinion.

**Preload (at starting):**

<b>New bearing</b>	<b>10 — 16 kg-cm</b> <b>(8.7 — 13.9 in.-lb, 1.0 — 1.6 N·m)</b>
<b>Reused bearing</b>	<b>5 — 8 kg-cm</b> <b>(4.3 — 6.9 in.-lb, 0.5 — 0.8 N·m)</b>

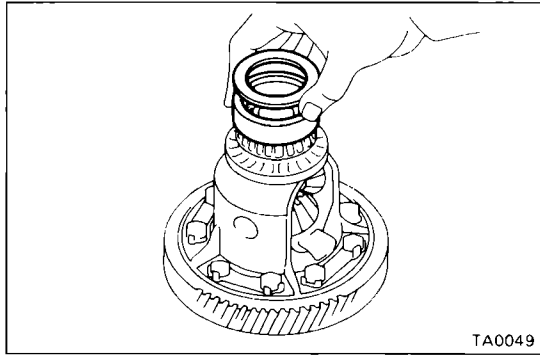
- If preload is greater than specification, replace the bearing spacer.
- If preload is less than specification, retighten the nut 130 kg-cm (9 ft-lb, 13 N·m) at a time until the specified preload is reached.

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)**

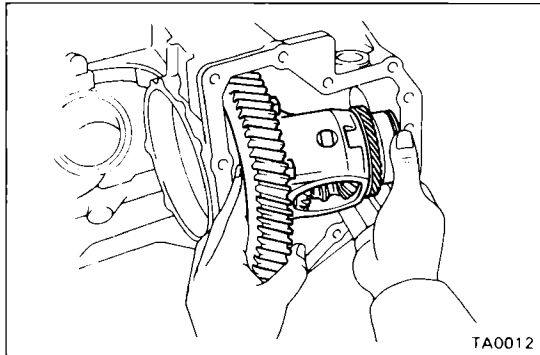
- (e) If the preload is adjusted within specification, note the preload.



TA0049

## INSTALLATION OF DIFFERENTIAL

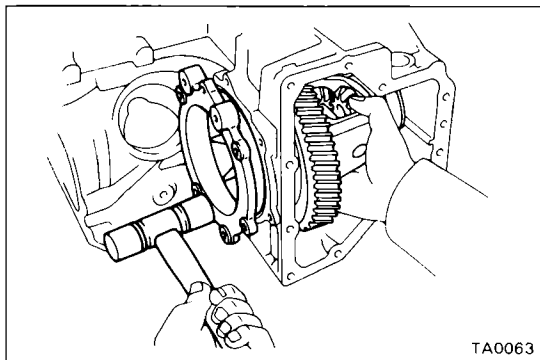
1. PLACE OUTER RACE AND SELECTED ADJUSTING SHIM ONTO RH SIDE BEARING



TA0012

2. PLACE DIFFERENTIAL CASE INTO CASE

Be sure to install the adjusting shim into place.



TA0063

3. INSTALL LH BEARING RETAINER

(a) Install a new O-ring.

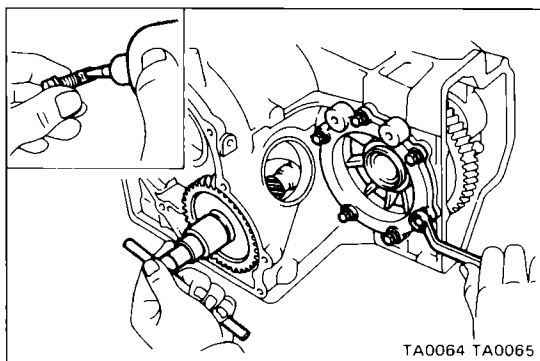
(b) Position the retainer by tapping it while holding the differential case center with the retainer.

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

(d) Coat the threads of the bolts with sealant.

**Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent**

(e) Temporarily tighten the bolts evenly and gradually while turning the ring gear.

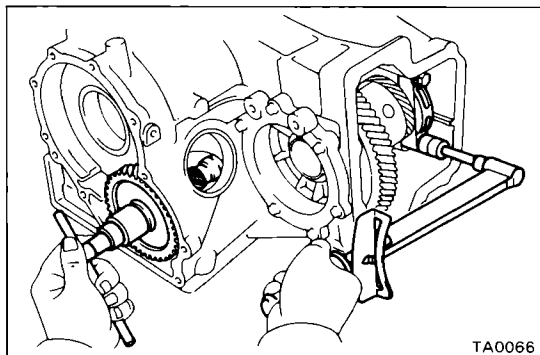


TA0064 TA0065

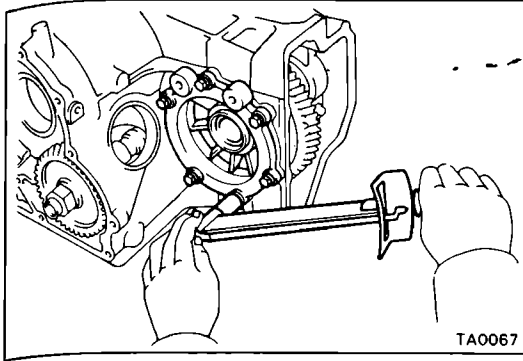
4. INSTALL RH SIDE BEARING CAP

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

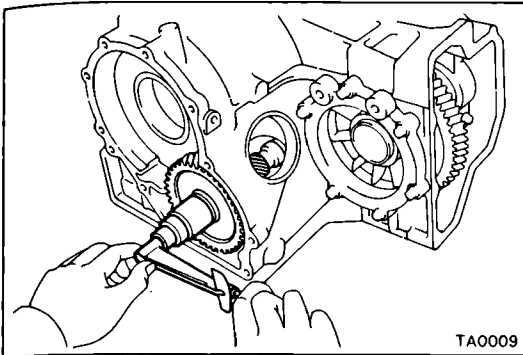
**Torque: 730 kg-cm (53 ft-lb, 72 N·m)**



TA0066

**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.

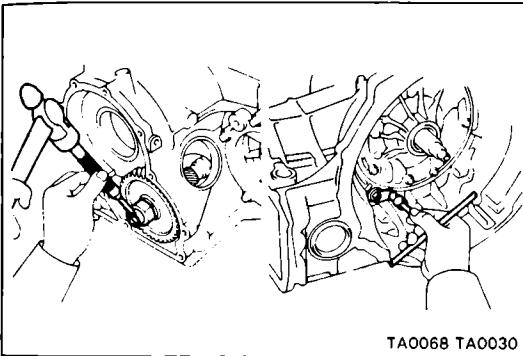
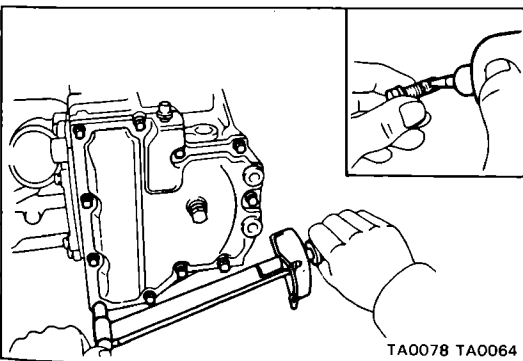
**Total preload (at starting):**

**Add drive pinion preload (See page AT-151)**

**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, reassemble 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 sealant.

**Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent**

(c) Install the carrier cover over the gasket.

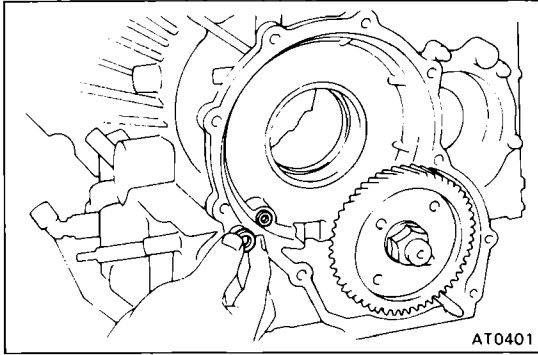
**Torque: 250 kg-cm (18 ft-lb, 25 N·m)**

**POST ASSEMBLY**

**1. INSTALL MANUAL SHAFT AND LEVER  
(See page AT-60)**

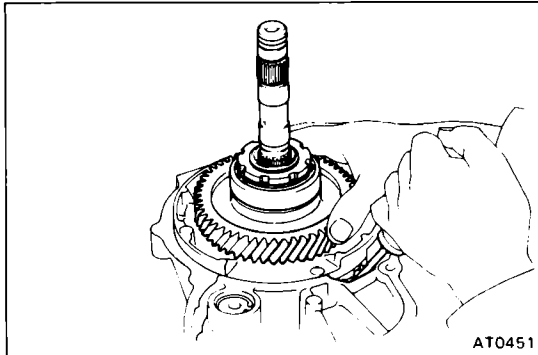
**2. INSTALL PARKING LOCK PAWL  
(See page AT-132)**

**3. INSTALL PARKING LOCK ROD AND BRACKET  
(See page AT-132)**



**4. INSTALL NEW OVERDRIVE CLUTCH APPLY GASKET AND NEW OVERDRIVE BRAKE GASKET**

Coat the new gaskets with petroleum jelly, and install them onto the case.



**5. INSTALL OVERDRIVE UNIT**

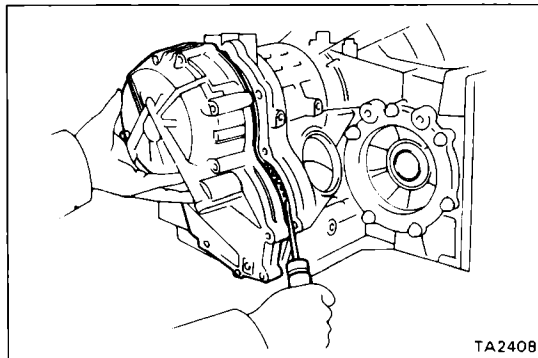
(a) Install the intermediate shaft into the overdrive case.

(b) Place the overdrive unit over a new gasket. Be sure to install the intermediate shaft into the case.

**NOTE:** Do not damage the bushing and oil seal ring.

(c) Turn the counter driven gear with a screw driver to install the overdrive unit. Tighten the bolts.

**Torque:** 250 kg-cm (18 ft-lb, 25 N·m)



**6. INSTALL VALVE BODY (See page AT-142)**

**7. INSTALL SPEED SENSOR OR GOVERNOR BODY (See page AT-144)**

**8. INSTALL OIL PAN**

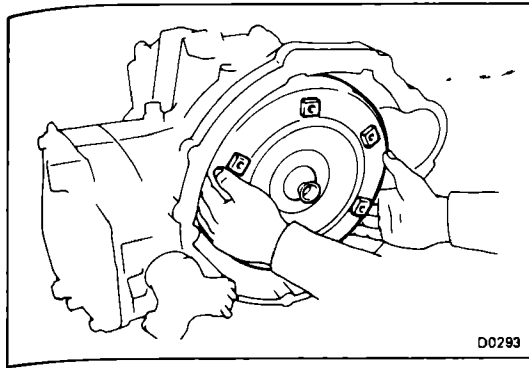
**9. INSTALL SPEEDOMETER DRIVEN GEAR**

**10. INSTALL NEUTRAL START SWITCH (See page AT-145)**

**INSTALLATION OF TRANSAXLE (See page AT-167)**

## INSTALLATION OF TRANSAXLE

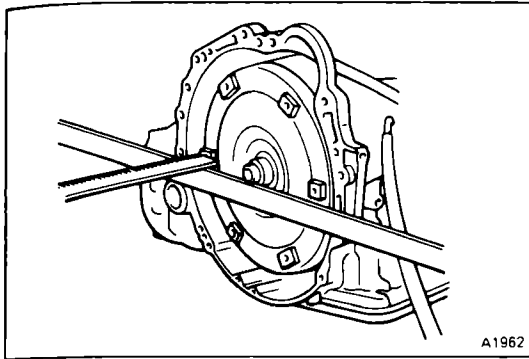
### 1. INSTALL TORQUE CONVERTER IN TRANSMISSION



### 2. CHECK TORQUE CONVERTER INSTALLATION

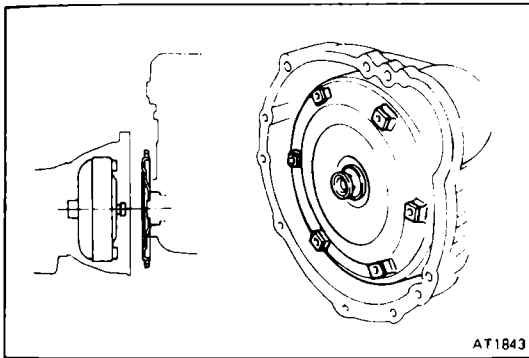
Using calipers and a straight edge, measure from the installed surface to the front surface of the transmission housing.

**Correct distance: 13 mm (0.51 in.)**



### 3. ALIGN TRANSMISSION AT INSTALLATION POSITION

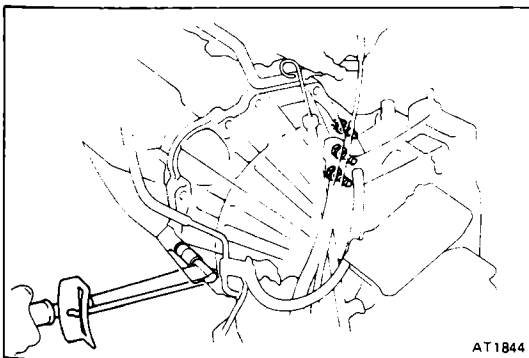
- (a) Align the two knock pins on the block with the converter housing.
- (b) Temporarily install one bolt.



### 4. INSTALL TRANSMISSION HOUSING MOUNTING BOLTS

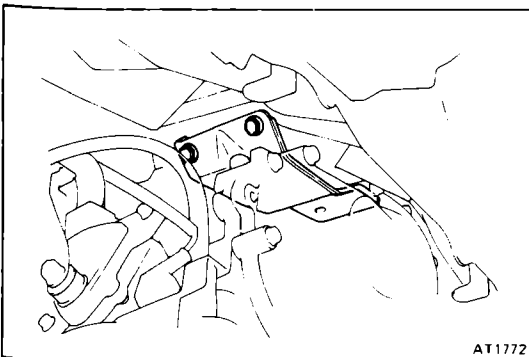
Install the transmission housing mounting bolts.

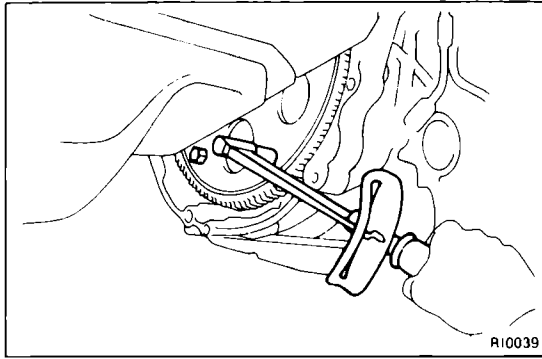
**Torque: 12 mm 650 kg-cm (47 ft-lb, 64 N·m)**  
**10 mm 470 kg-cm (34 ft-lb, 46 N·m)**



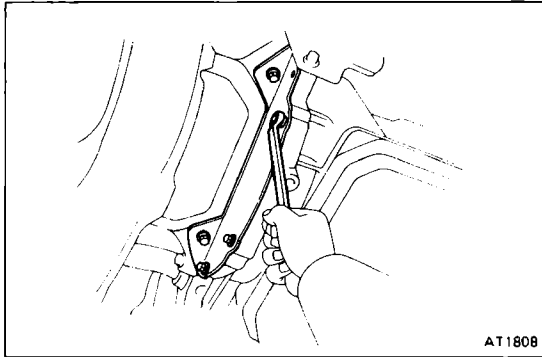
### 5. INSTALL ENGINE REAR MOUNTING SET BOLTS

**Torque: 530 kg-cm (38 ft-lb, 52 N·m)**

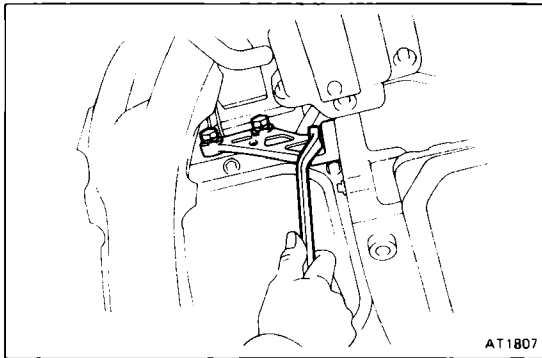




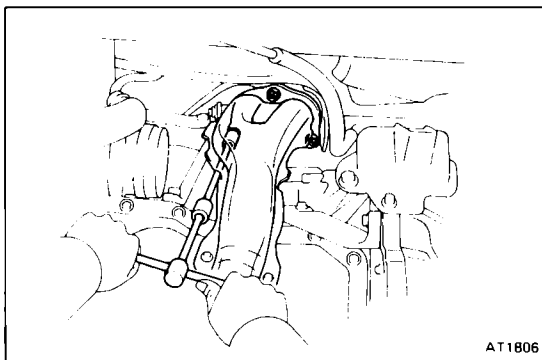
- 6. INSTALL TORQUE CONVERTER MOUNTING BOLTS**  
 (a) First, install the gray bolt and then the five black bolts.  
 (b) Tighten the bolts evenly.  
**Torque: 280 kg-cm (20 ft-lb, 27 N·m)**



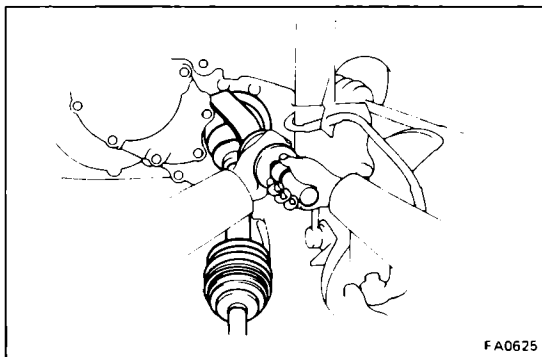
- 7. INSTALL ENGINE REAR END PLATE**



- 8. INSTALL STIFFENER PLATE**  
**Torque: 380 kg-cm (27 ft-lb, 37 N·m)**

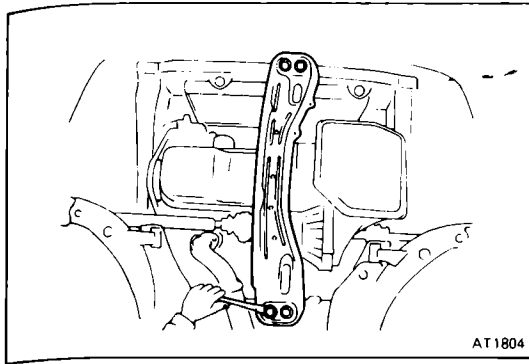


- 9. CONNECT EXHAUST PIPE TO MANIFOLD**  
**Torque: 630 kg-cm (46 ft-lb, 62 N·m)**



- 10. CONNECT RH DRIVE SHAFT (See page FA-29)**  
**11. INSTALL LH DRIVE SHAFT (See page FA-29)**



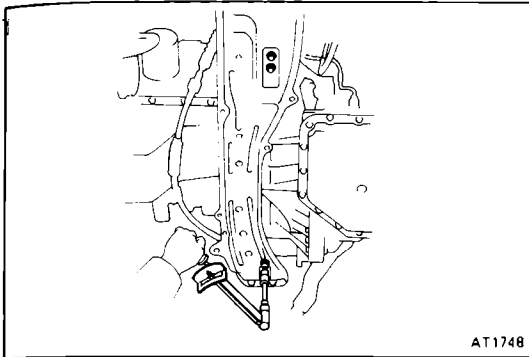


**12. INSTALL ENGINE MOUNTING CENTER MEMBER**

- (a) Install the cushions.
- (b) Tighten the four bolts.

**Torque: 400 kg-cm (29 ft-lb, 39 N·m)**

- (c) Connect the two clamps.



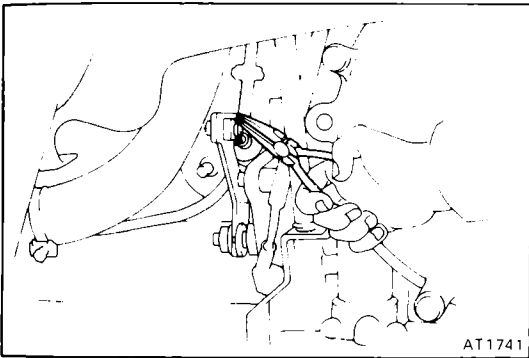
**13. CONNECT FRONT AND REAR MOUNTING**

- (a) Tighten the four bolts.

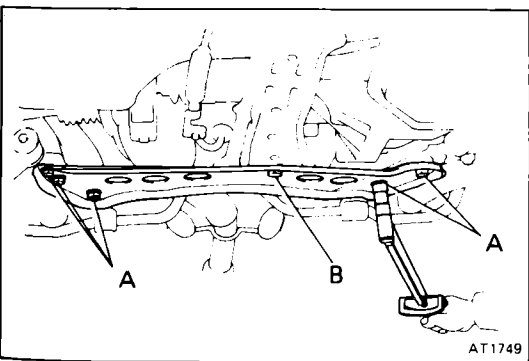
**Torque: 400 kg-cm (29 ft-lb, 39 N·m)**

- (b) Install the two covers.

**14. INSTALL CONTROL CABLE BRACKET**



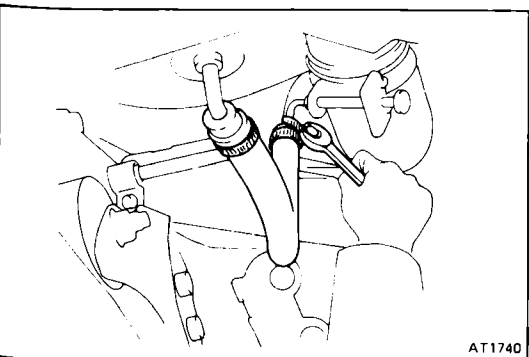
**15. CONNECT CONTROL CABLE**



**16. INSTALL SUSPENSION LOWER CROSSMEMBER**

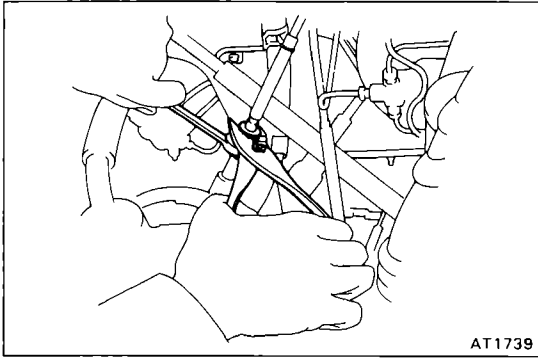
**Torque: A 2,125 kg-cm (154 ft-lb, 208 N·m)**

**B 400 kg-cm (29 ft-lb, 39 N·m)**

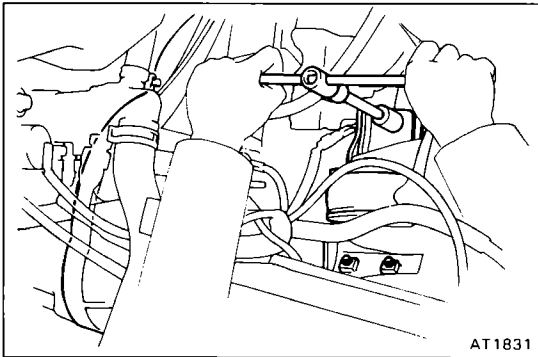


**17. CONNECT OIL COOLER HOSES**

**18. INSTALL ENGINE UNDER COVERS**

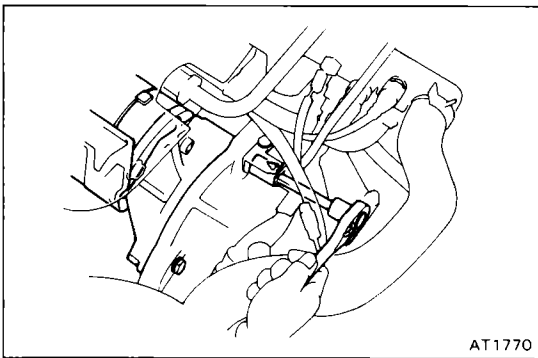


## 19. CONNECT SPEEDOMETER CABLE



## 20. INSTALL ENGINE REAR MOUNT INSULATOR BRACKET SET BOLT

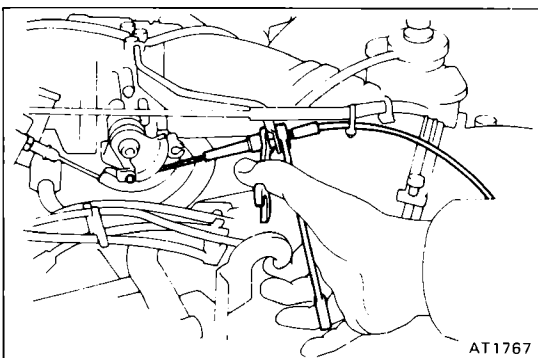
Torque: 530 kg-cm (38 ft-lb, 52 N·m)



## 21. INSTALL STARTER MOTOR SET BOLTS

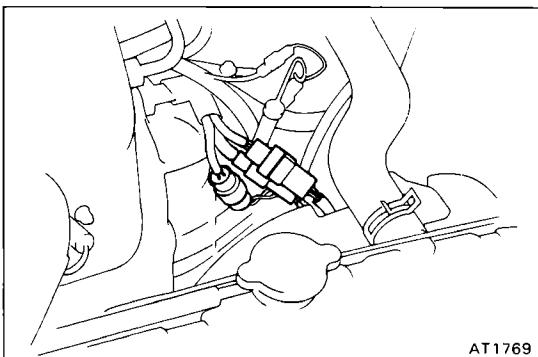
## 22. INSTALL TWO TRANSMISSION HOUSING SET BOLTS

## 23. CONNECT GROUND STRAP



## 24. CONNECT THROTTLE CABLE TO THROTTLE LINKAGE AND BRACKET

## 25. ADJUST THROTTLE CABLE (See page AT-13)



## 26. CONNECT THREE CONNECTORS

## 27. INSTALL AIR FLOW METER

## 28. CONNECT NEGATIVE BATTERY TERMINAL

## 29. FILL TRANSAXLE WITH ATF

Fluid type: ATF DEXRON® II

CAUTION: Do not overfill.

## 30. CHECK FLUID LEVEL (See page AT-12)