

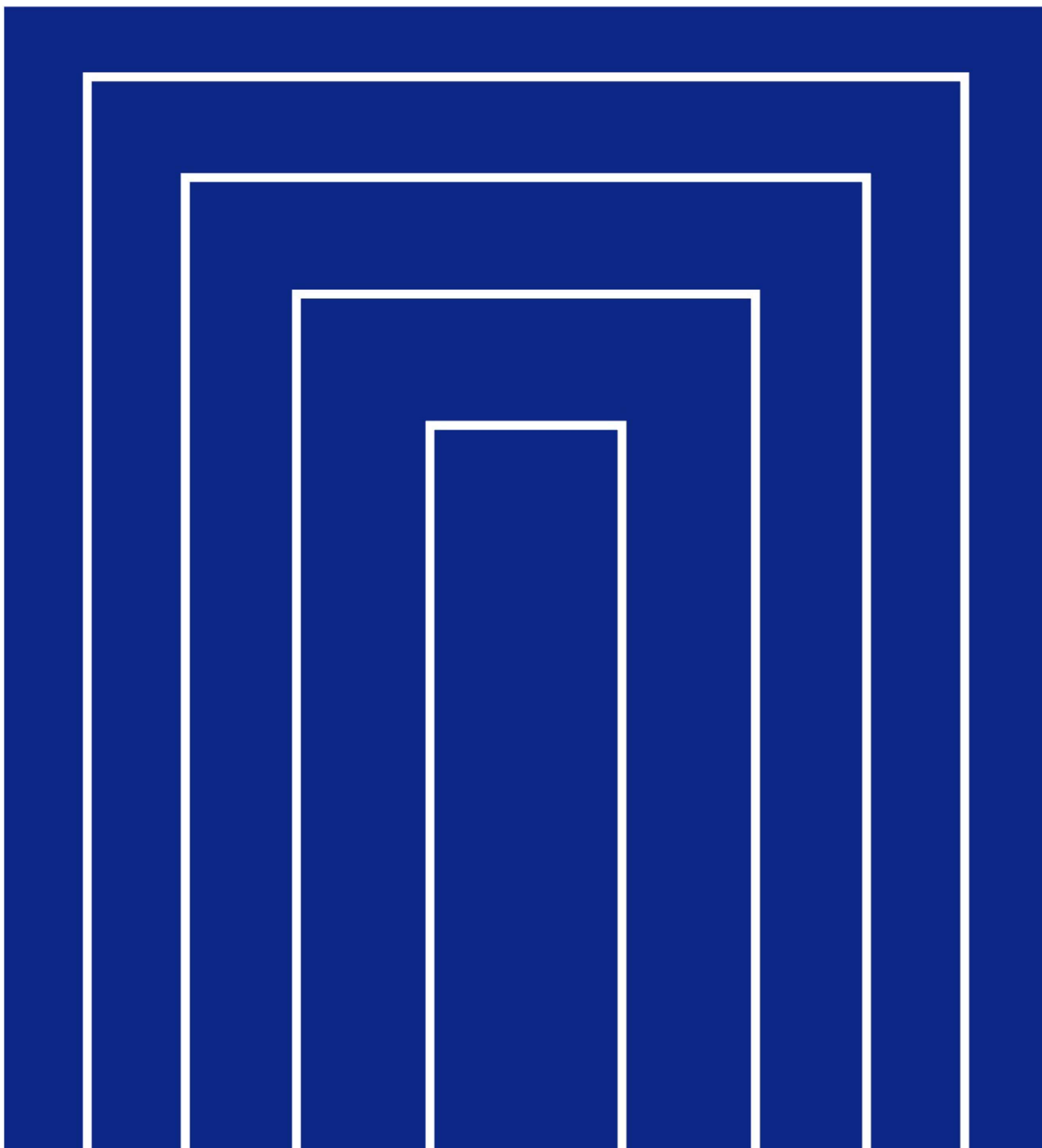
# TOYOTA

## A441L, A440F, A442F

### AUTOMATIC TRANSMISSION

## REPAIR MANUAL

Mar., 1990



# FOREWORD

This repair manual has been prepared to provide information covering general service repairs for the Automatic Transmission A440F, A442F, A441L.

Applicable models:

|       |                                            |
|-------|--------------------------------------------|
| A440F | FJ 70, 73, 80 Series<br>HZJ 73, 80, Series |
| A442F | HDJ 80 Series                              |
| A441L | BB 32 Series<br>HZB 30 Series              |

For the service specifications and repair procedure of the above model other than those listed in this manual, refer to the following manuals.

| Manual Name                                                       | Pub. No.           |
|-------------------------------------------------------------------|--------------------|
| • Land Cruiser Repair Manual                                      | RM180U             |
| • Land Cruiser Chassis and Body Repair Manual (Station Wagon)     | RM184E             |
| • Land Cruiser Chassis and Body Repair Manual (Hard Top)          | RM183E             |
| • Coaster Chassis and Body Repair Manual Supplement               | RM186E             |
| • Land Cruiser Electrical Wiring Diagram (for USA)                | EWD085U            |
| • Land Cruiser Electrical Wiring Diagram (for Europe and General) | EWD090F            |
| • Land Cruiser New Car Features                                   | NCF067U<br>NCF064E |

All information contained in this manual is the most up-to-date at the time of publication. However, specifications and procedures are subject to change without notice.

**TOYOTA MOTOR CORPORATION**

# **TOYOTA A440F, A442F, A441L AUTOMATIC TRANSMISSION REPAIR MANUAL**

## **INTRODUCTION AUTOMATIC TRANSMISSION**

**SERVICE SPECIFICATIONS**

**STANDARD BOLT TORQUE SPECIFICATIONS**

**SST AND SSM**

**IN**

**AT**

**A**

**B**

**C**

# INTRODUCTION

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| GENERAL REPAIR INSTRUCTIONS .....       | IN-4 |
| ABBREVIATIONS USED IN THIS MANUAL ..... | IN-6 |

IN

## HOW TO USE THIS MANUAL

To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

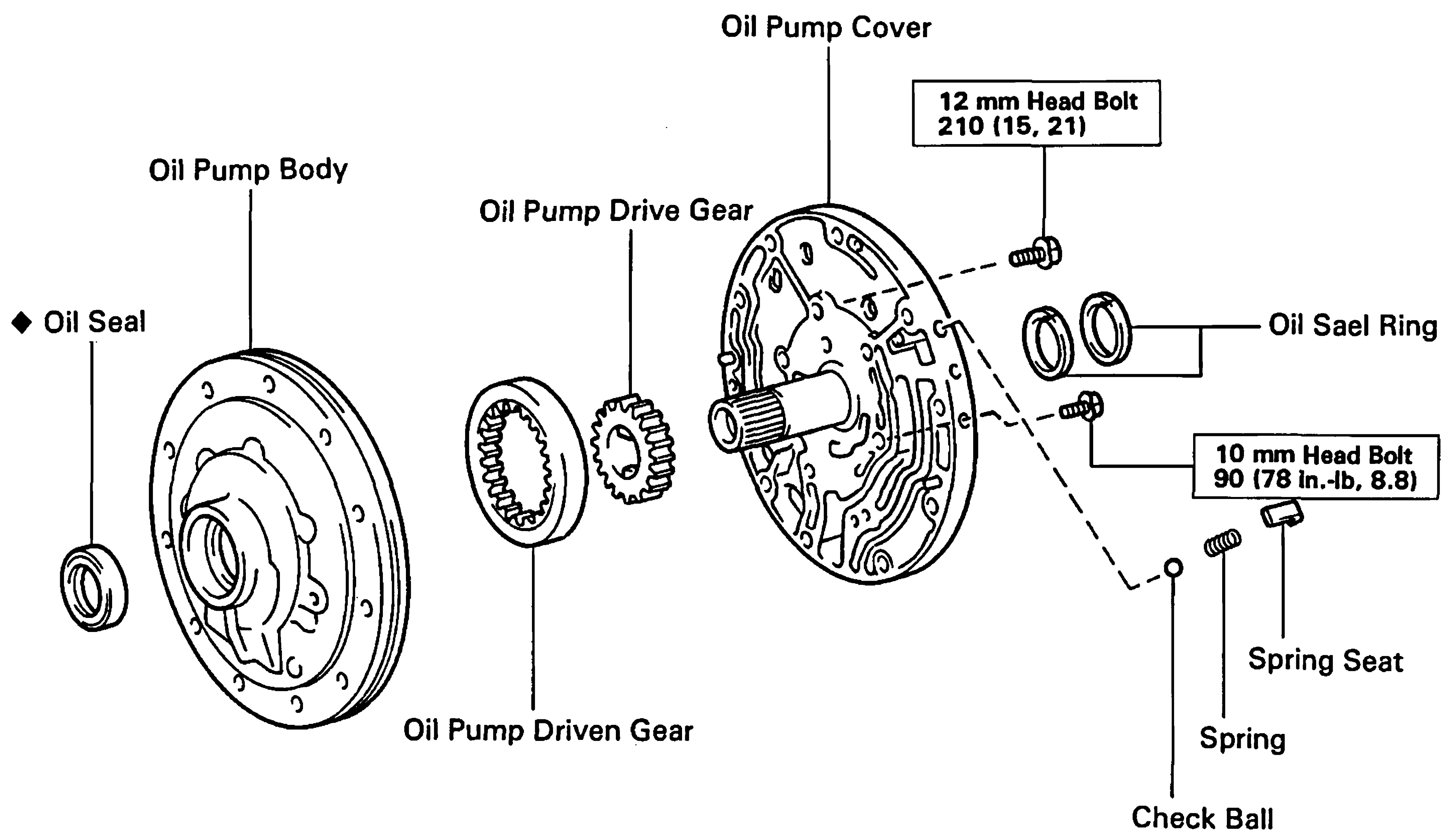
An **INDEX** is provided on the 1st page of each section to guide you to the item to be repaired.

At the beginning of each section, **PRECAUTIONS** are given that pertain to *all* repair operations contained in that section. *Read these precautions before starting any repair task.*

## REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



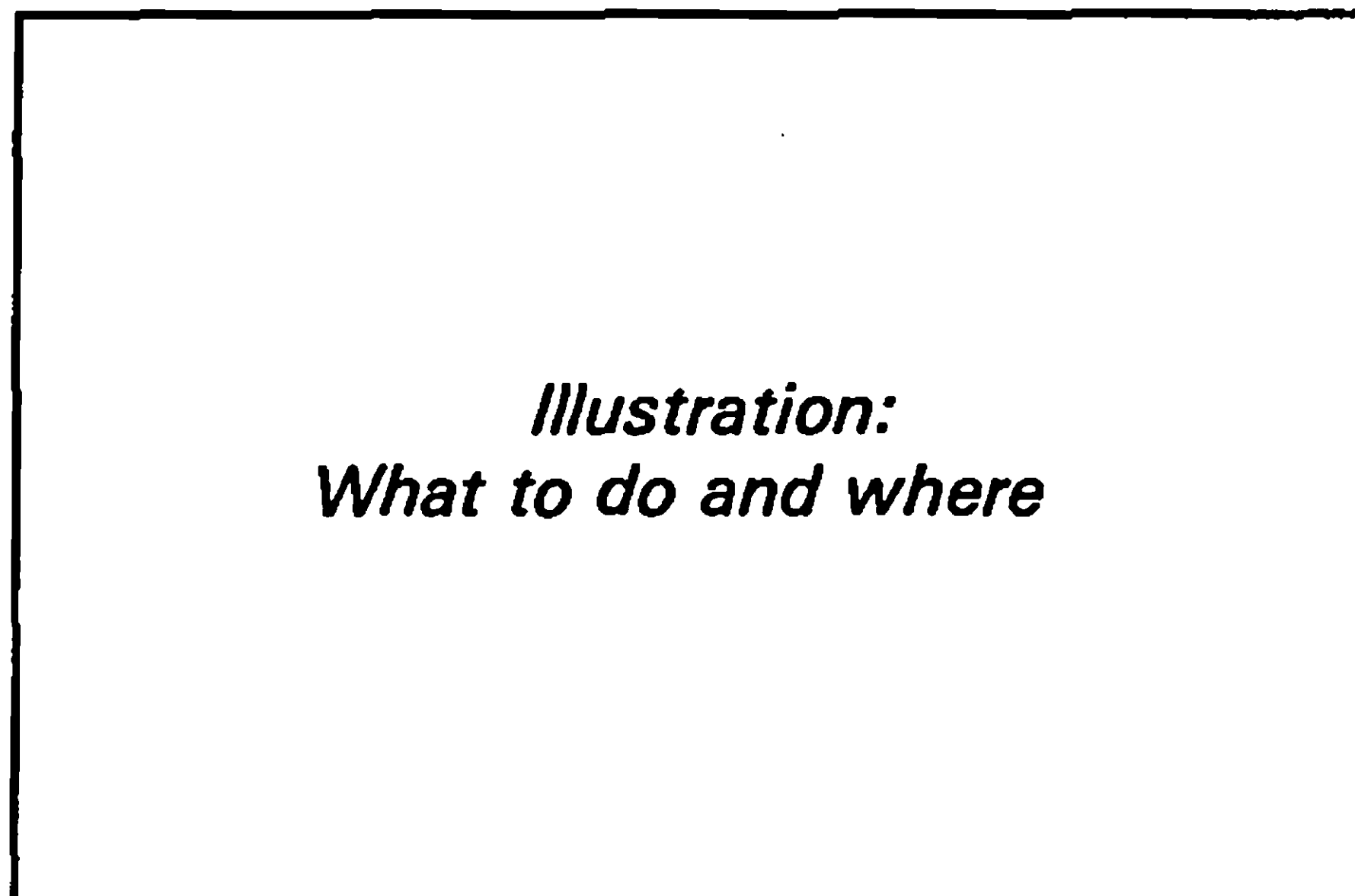
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

The procedures are presented in a step-by-step format:

- Illustration shows *what* to do and *where* to do it.
- The task heading tells *what* to do.
- The detailed text tells *how* to perform the task and gives other information such as specifications and warnings.

Example:



## 7. CHECK PISTON STROKE OF FORWARD CLUTCH

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

*Task heading : what to do*

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)

*Set part No.*

*Component part No.*

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

*Specification*

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance and only when necessary, the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

## REFERENCES

References have been kept to a minimum. However, when they are required you are given the *page* to go to.

## SPECIFICATIONS

Specifications are presented in bold type throughout the text in the applicable step. You never have to leave the procedure to look up your specs. All specifications are also found in Appendix A, specifications for quick reference.

## CAUTIONS, NOTICES, HINTS:

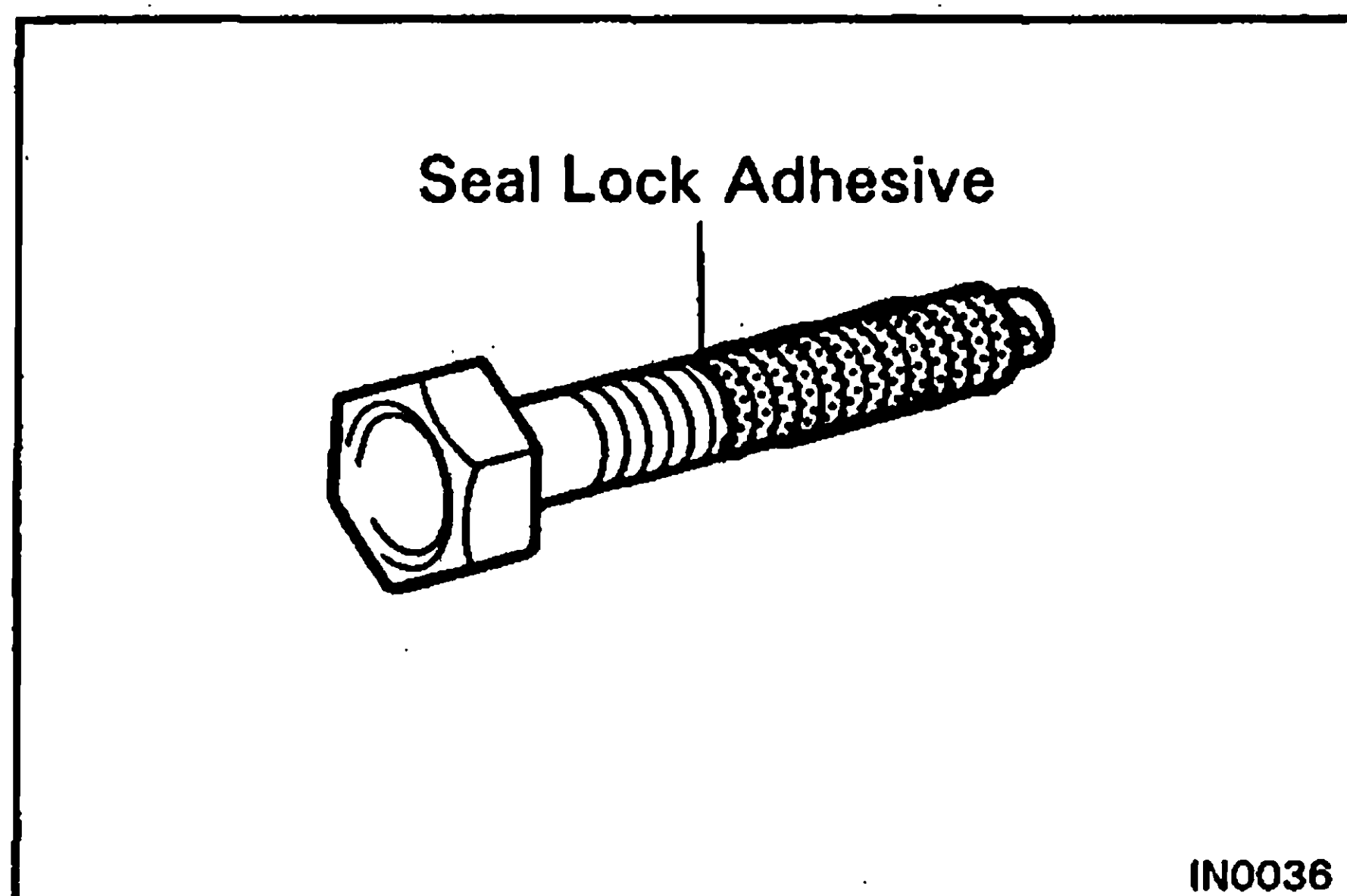
- **CAUTIONS** are presented in bold type, and indicate there is a possibility of injury to you or other people.
- **NOTICES** are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- **HINTS** are separated from the text but do not appear in bold. They provide additional information to help you efficiently perform the repair.

## GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in order to facilitate reassembly.
3. Observe the following:
  - (a) Before performing electrical work, disconnect the negative cable from the battery terminal.
  - (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (—) terminal which is grounded to the vehicle body.
  - (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable straight up without twisting it or prying it.
  - (d) Clean the battery terminal posts and cable terminals with a shop rag. Do not scrape them with a file or other abrasive object.
  - (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installation. Do not use a hammer or such to tap the terminal onto the post.
  - (f) Be sure the cover for the positive (+) terminals are properly in place.
4. Check hoses and wiring connectors to make sure that they are secure and correct.
5. Non-reusable parts
  - (a) Always replace cotter pins, gaskets, O-rings and oil seals etc. with new ones.
  - (b) Non-reusable parts are indicated in the component illustrations by the "♦" symbol.
6. Precoated parts

Precoated parts are the bolts and nuts, which have been coated with a seal lock adhesive at the factory.

  - (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.
  - (b) Recoating of precoated parts
    - (1) Clean off the old adhesive from the bolt, nut or installation part threads.
    - (2) Dry with compressed air.
    - (3) Apply the specified seal lock adhesive to the bolt or nut threads.
  - (c) Precoated parts are indicated in the component illustrations by the "★" symbol.



7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found at the back of this manual.
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the fuse amp rating or use one of a lower rating.
11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.
  - (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels in order to ensure safety.
  - (b) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone, even for a small job that can be finished quickly.

## ABBREVIATIONS USED IN THIS MANUAL

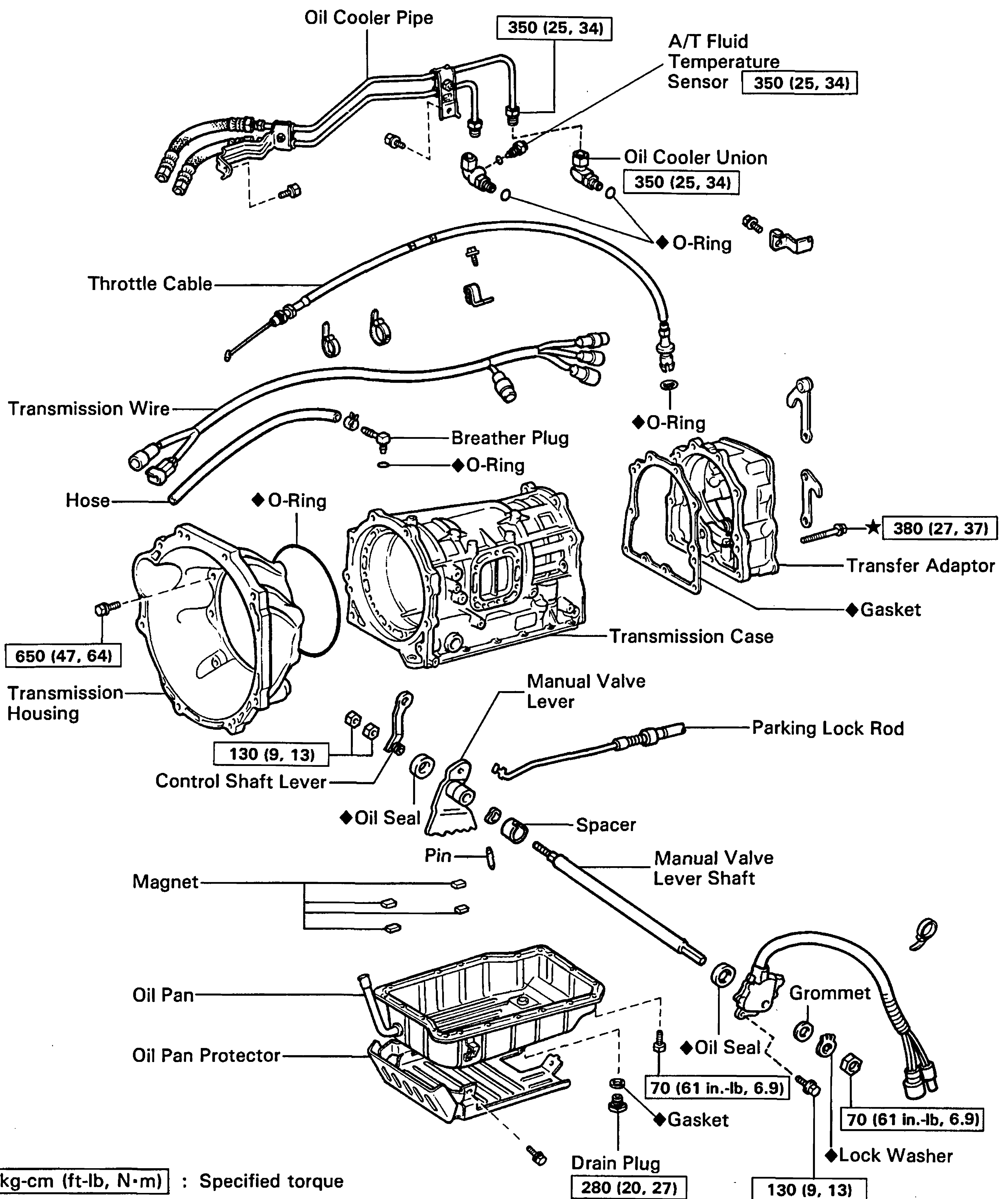
|                |                              |
|----------------|------------------------------|
| A/T ATM        | Automatic Transmission       |
| ATF            | Automatic Transmission Fluid |
| B <sub>0</sub> | Overdrive Brake              |
| B <sub>1</sub> | Second Coast Brake           |
| B <sub>2</sub> | Second Brake                 |
| B <sub>3</sub> | First and Reverse Brake      |
| C <sub>0</sub> | Overdrive Clutch             |
| C <sub>1</sub> | Forward Clutch               |
| C <sub>2</sub> | Direct Clutch                |
| D              | Disc                         |
| MP             | Multipurpose                 |
| O/D            | Overdrive                    |
| P              | Plate                        |
| SSM            | Special Service Materials    |
| SST            | Special Service Tools        |
| w/             | With                         |

# AUTOMATIC TRANSMISSION

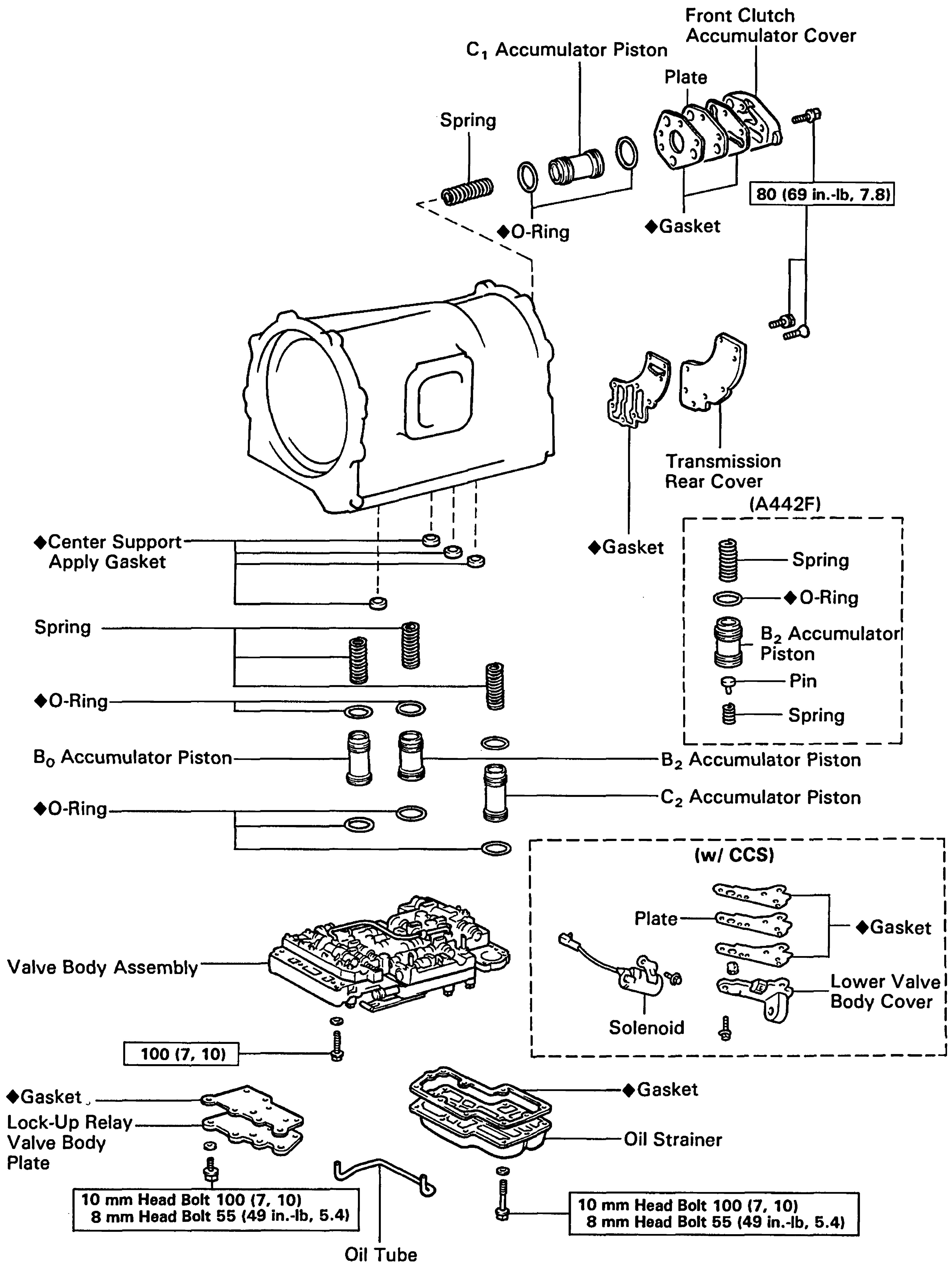
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**AT**

# REMOVAL OF COMPONENT PARTS (A440F, A442F) COMPONENTS



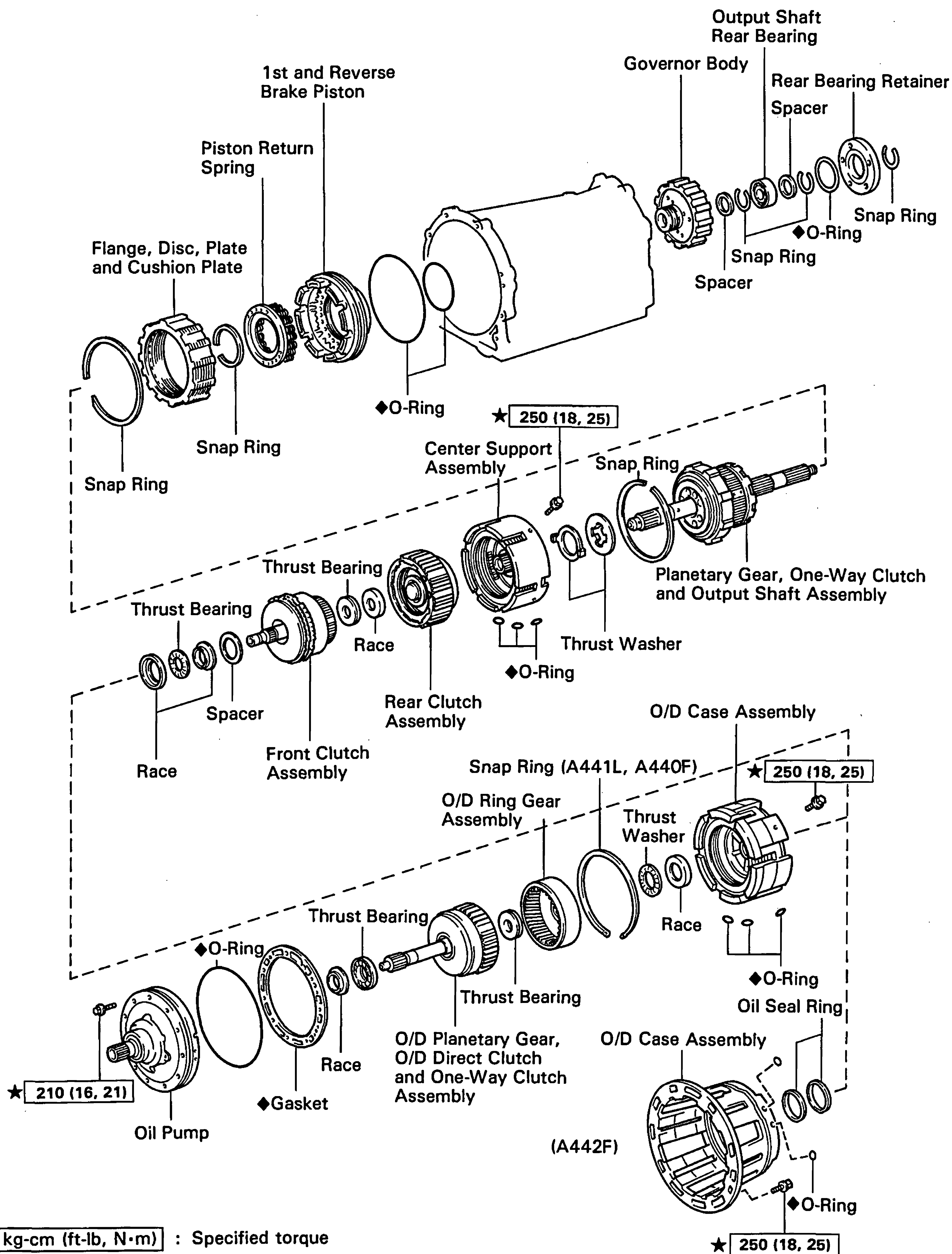
## COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

## COMPONENTS (Cont'd)



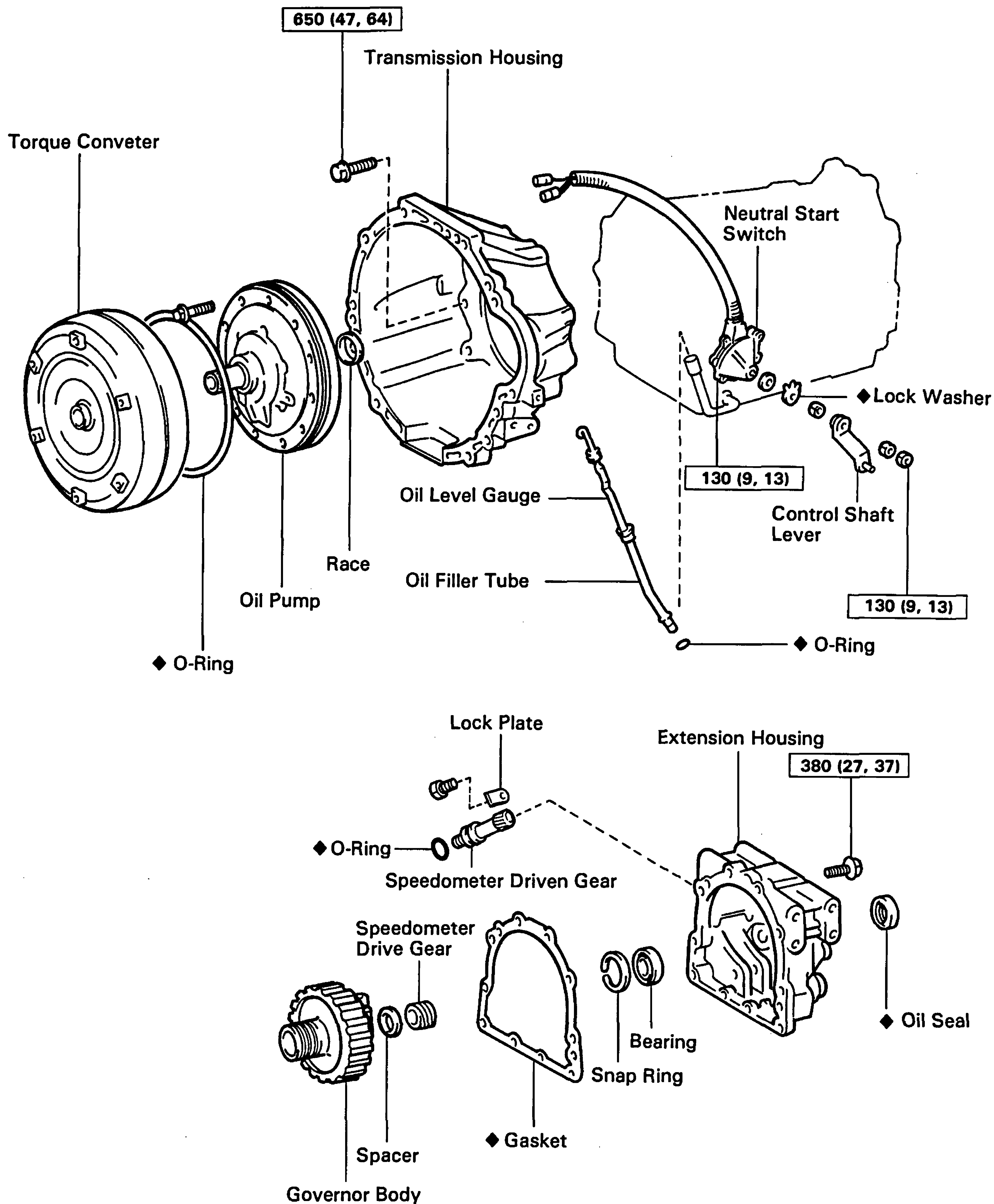
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

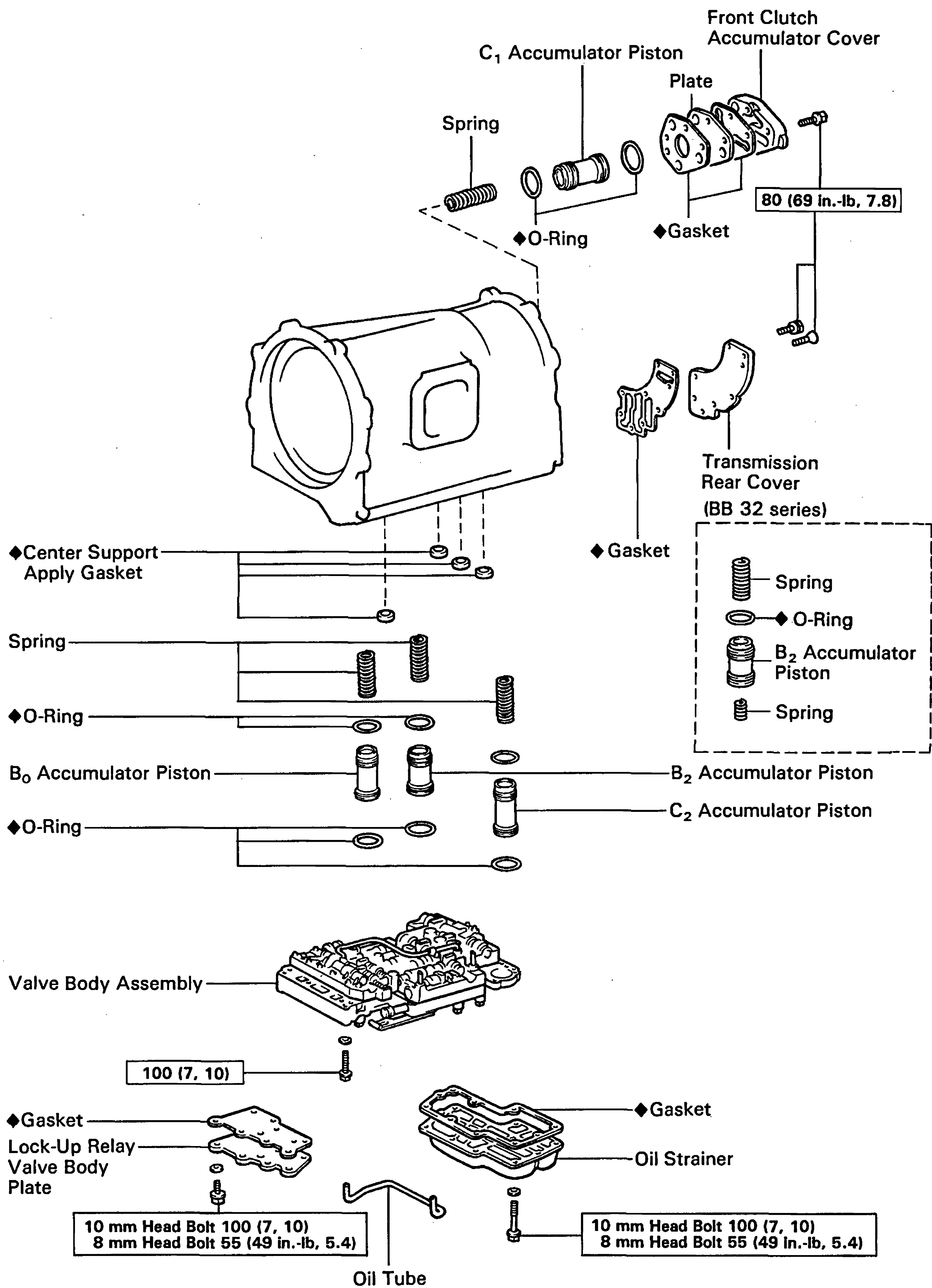
★ Precoated part

# REMOVAL OF COMPONENT PARTS (A441L)

## COMPONENTS



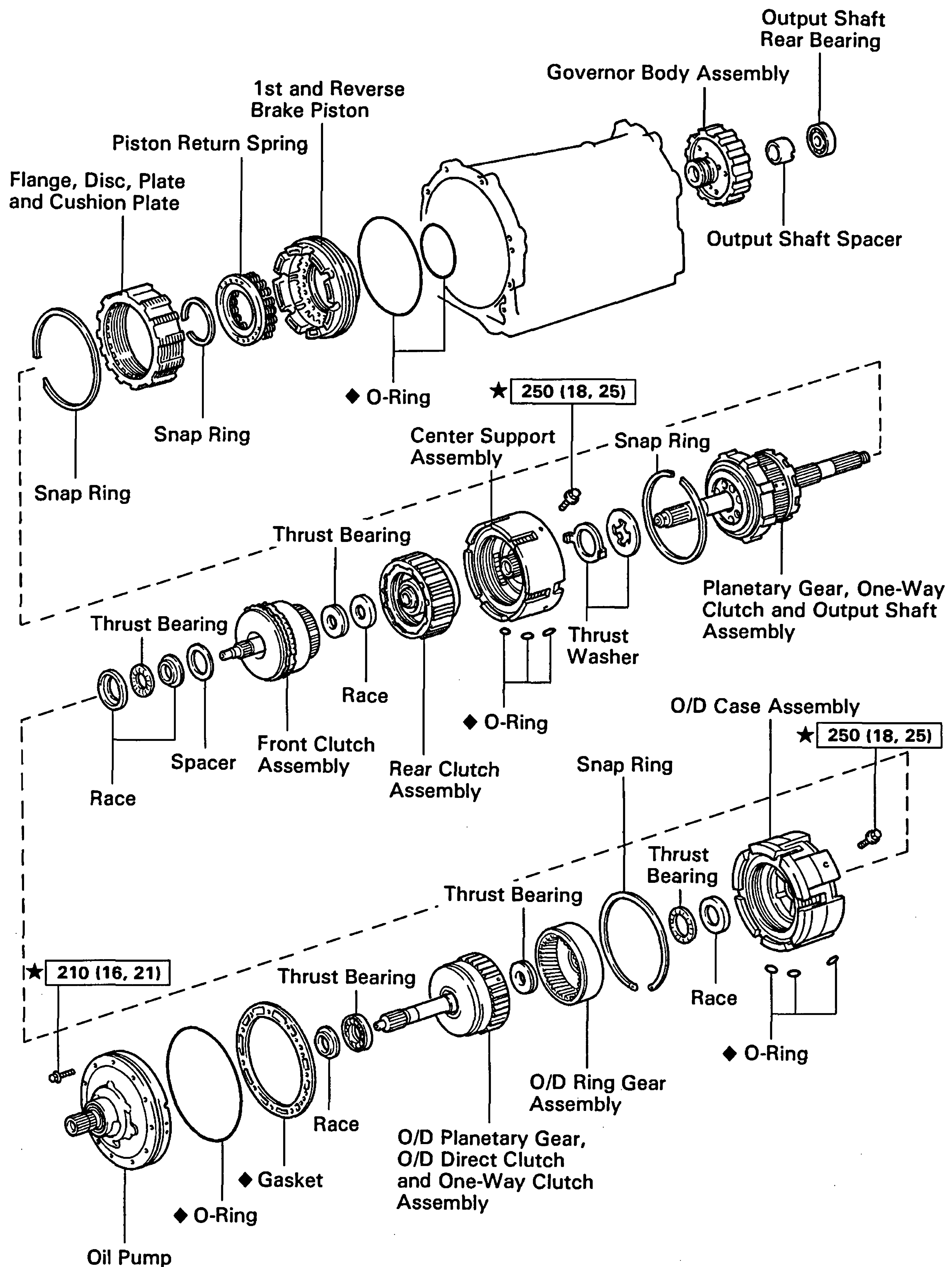
## COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

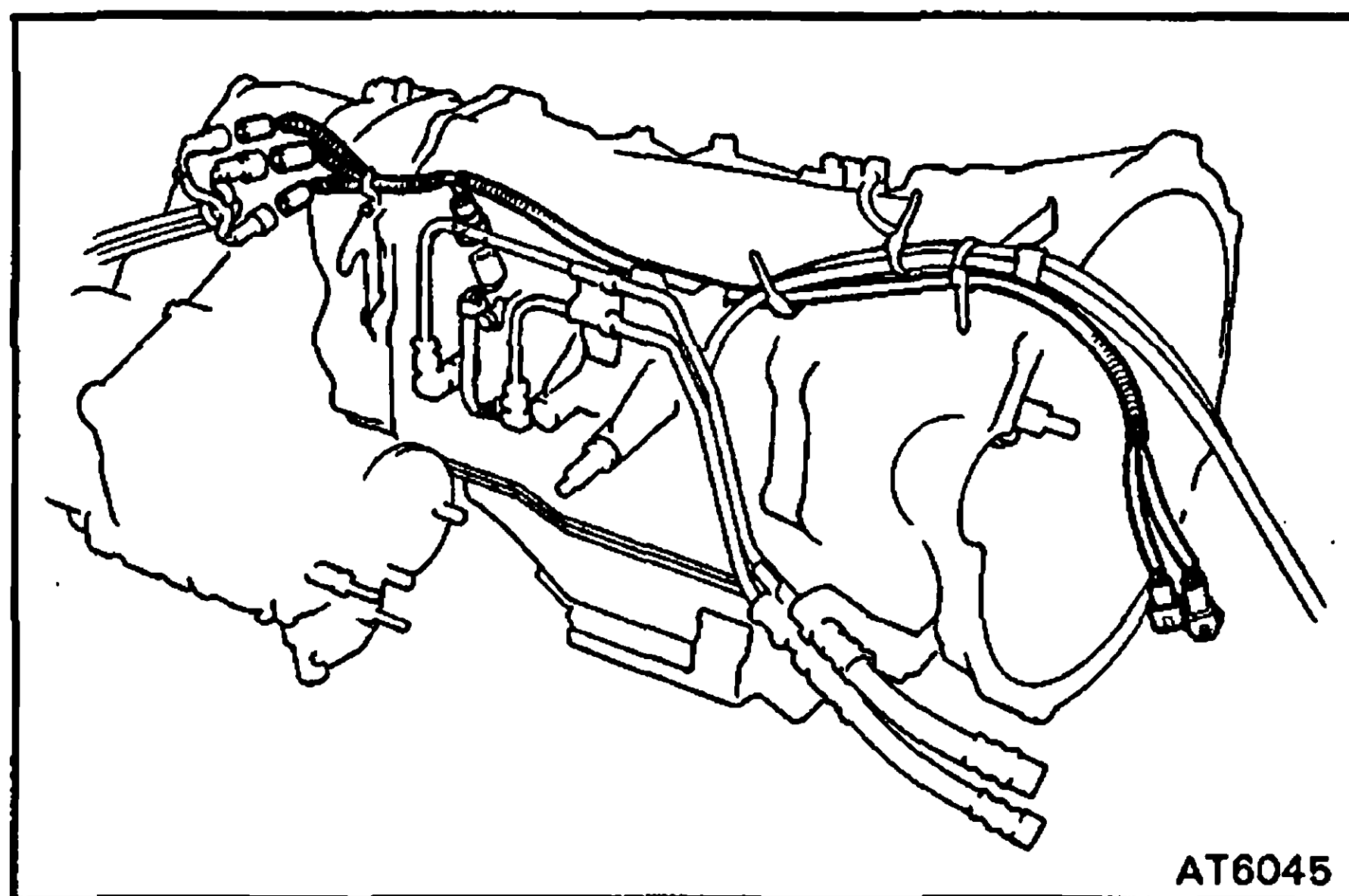
## COMPONENTS (Cont'd)



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

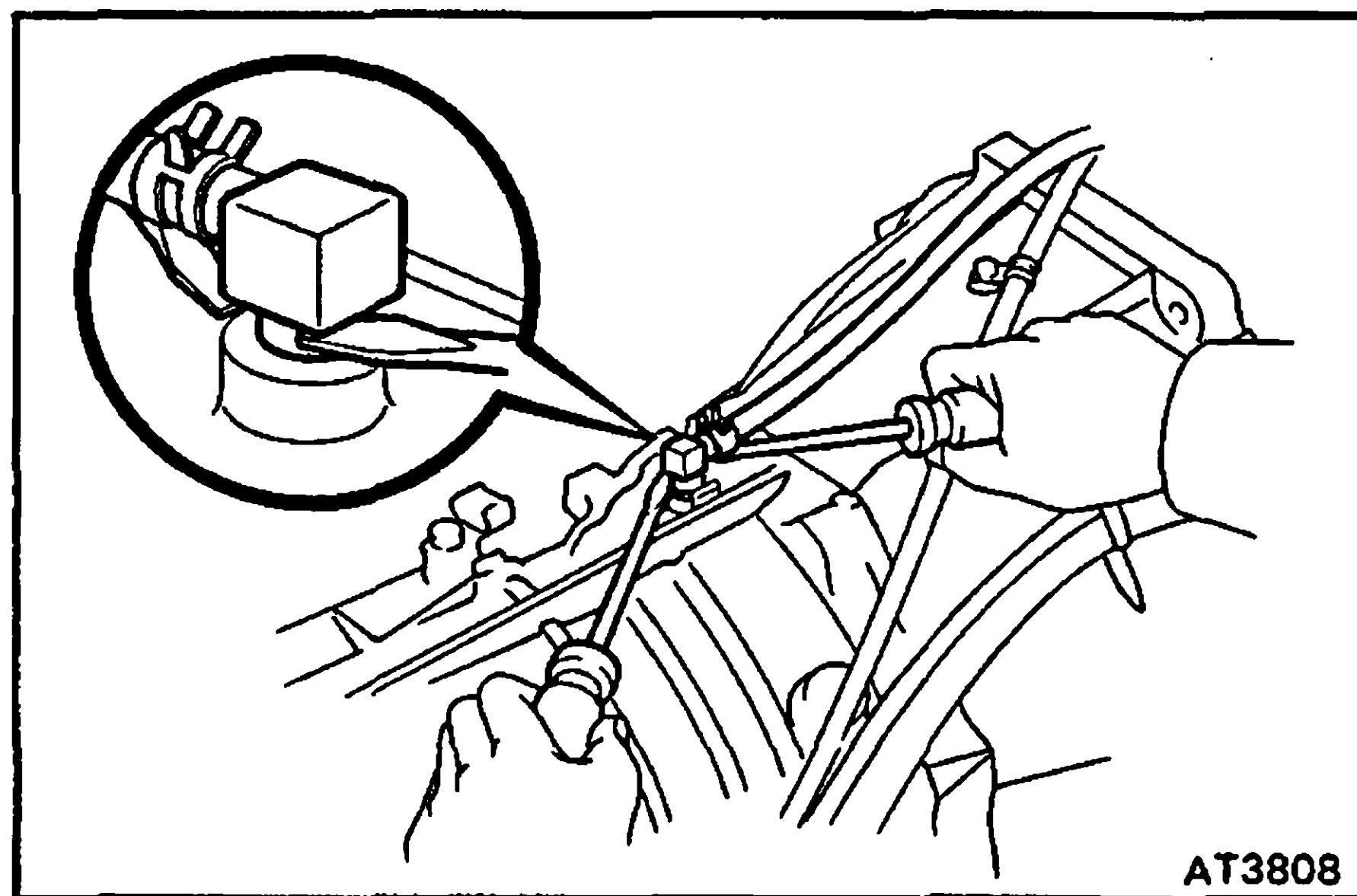
★ Precoated part



## SEPARATE BASIC SUBASSEMBLY

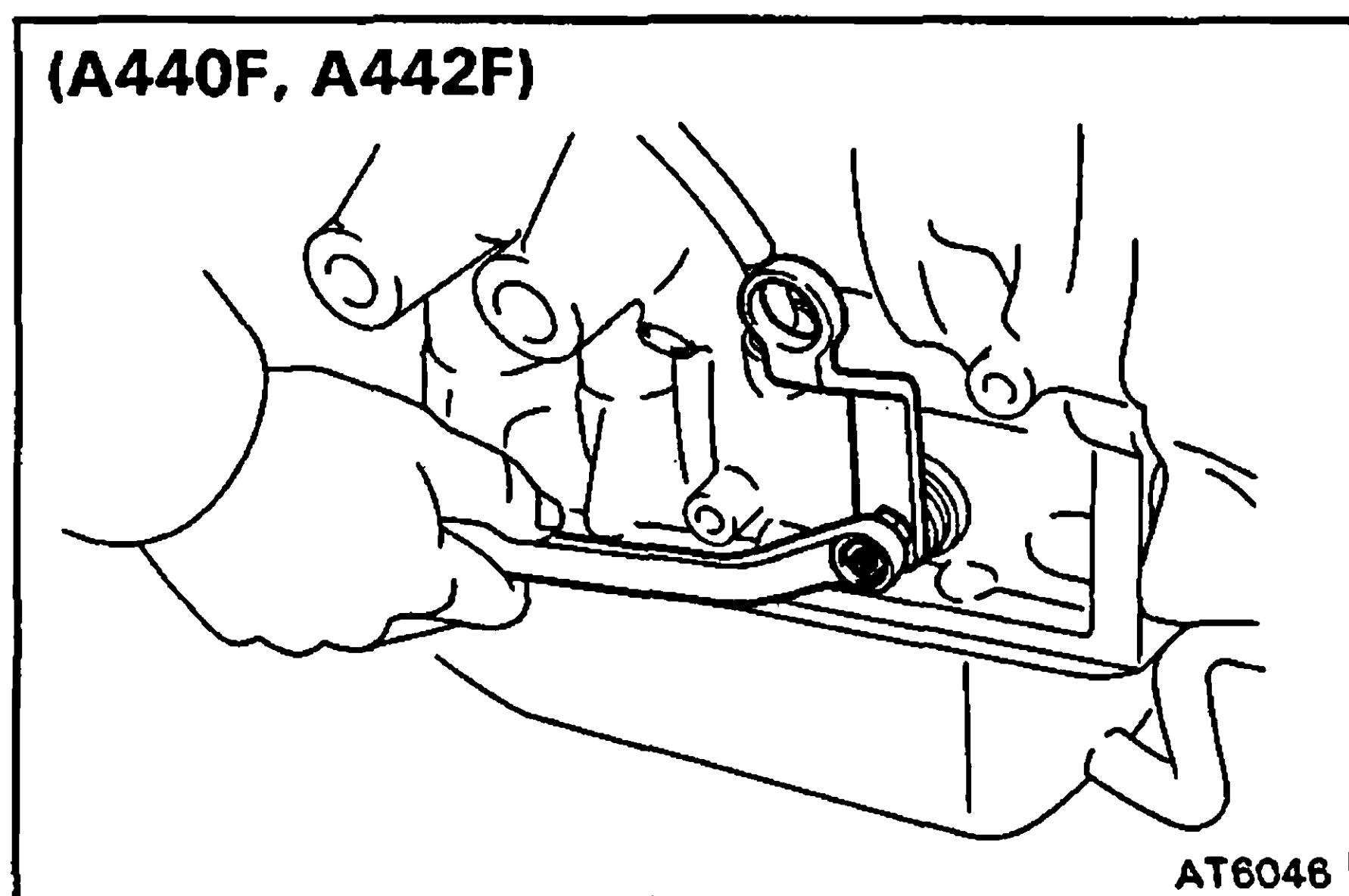
### 1. REMOVE TRANSMISSION WIRING

Disconnect the connectors, and remove the transmission wiring.



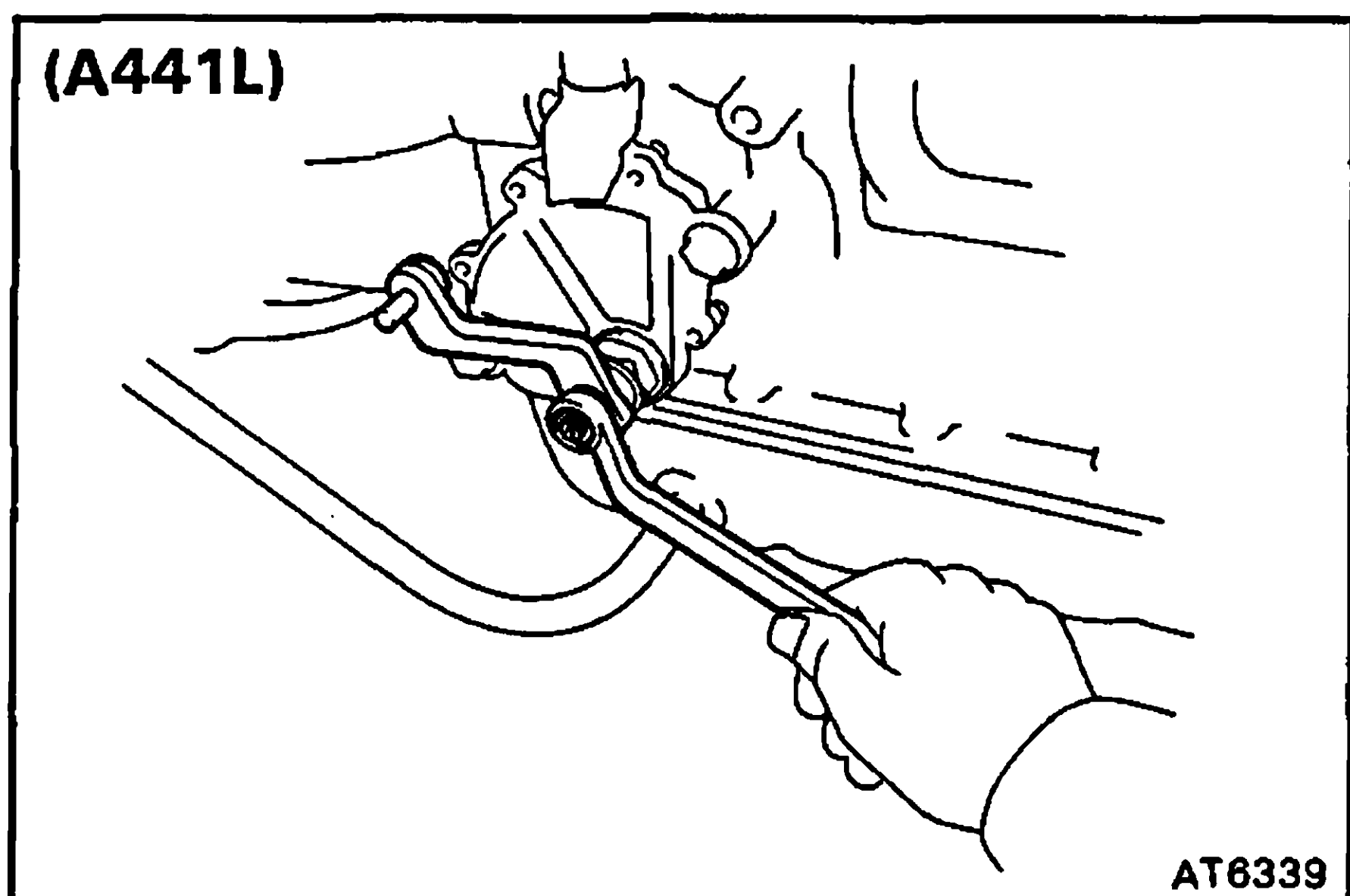
### 2. REMOVE BREATHER PLUG AND HOSE

- (a) Using two screwdrivers, pry out the breather plug.
- (b) Remove the O-ring from the breather plug.



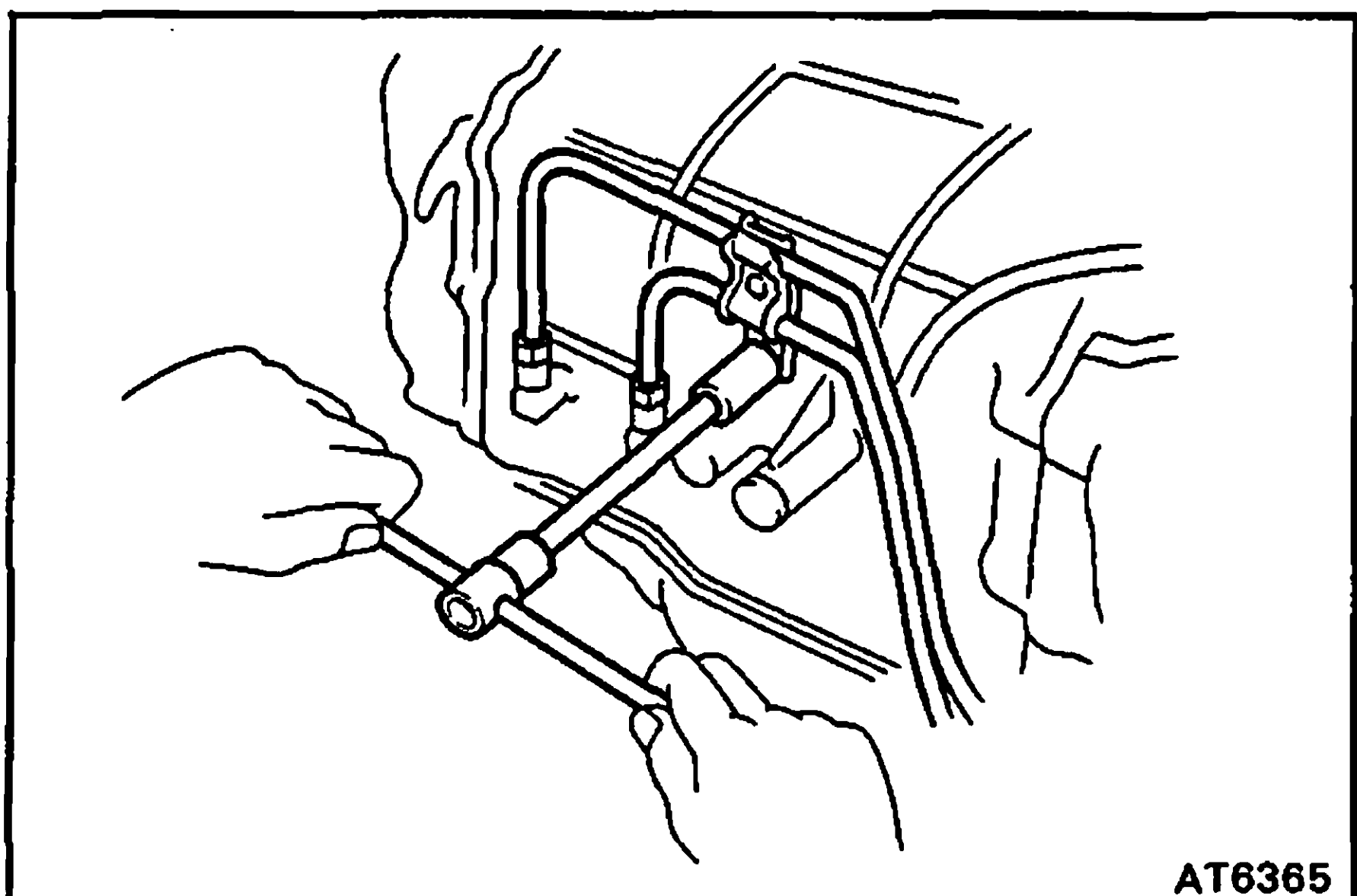
### 3. REMOVE CONTROL SHAFT LEVER

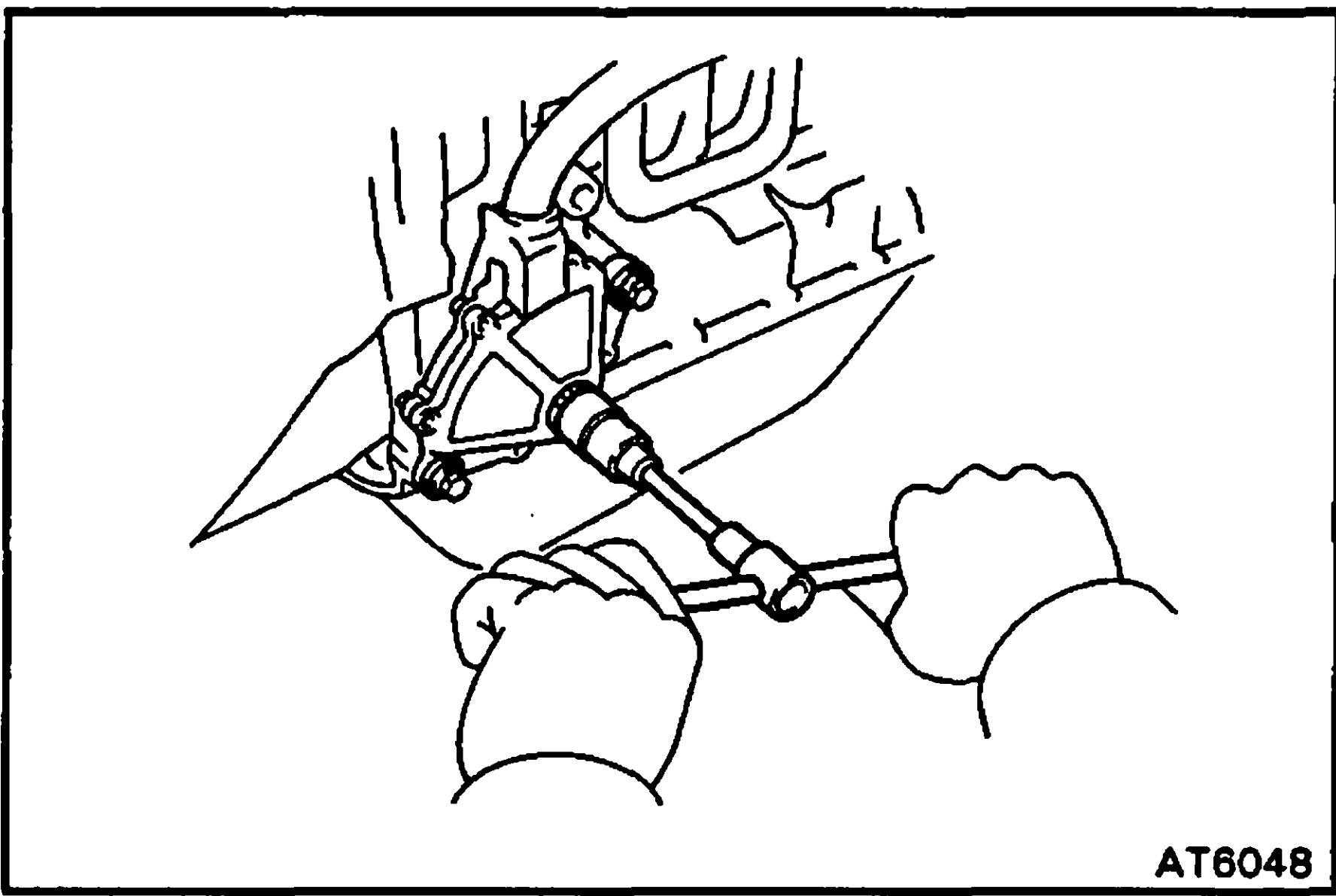
Remove the two nuts and lever.



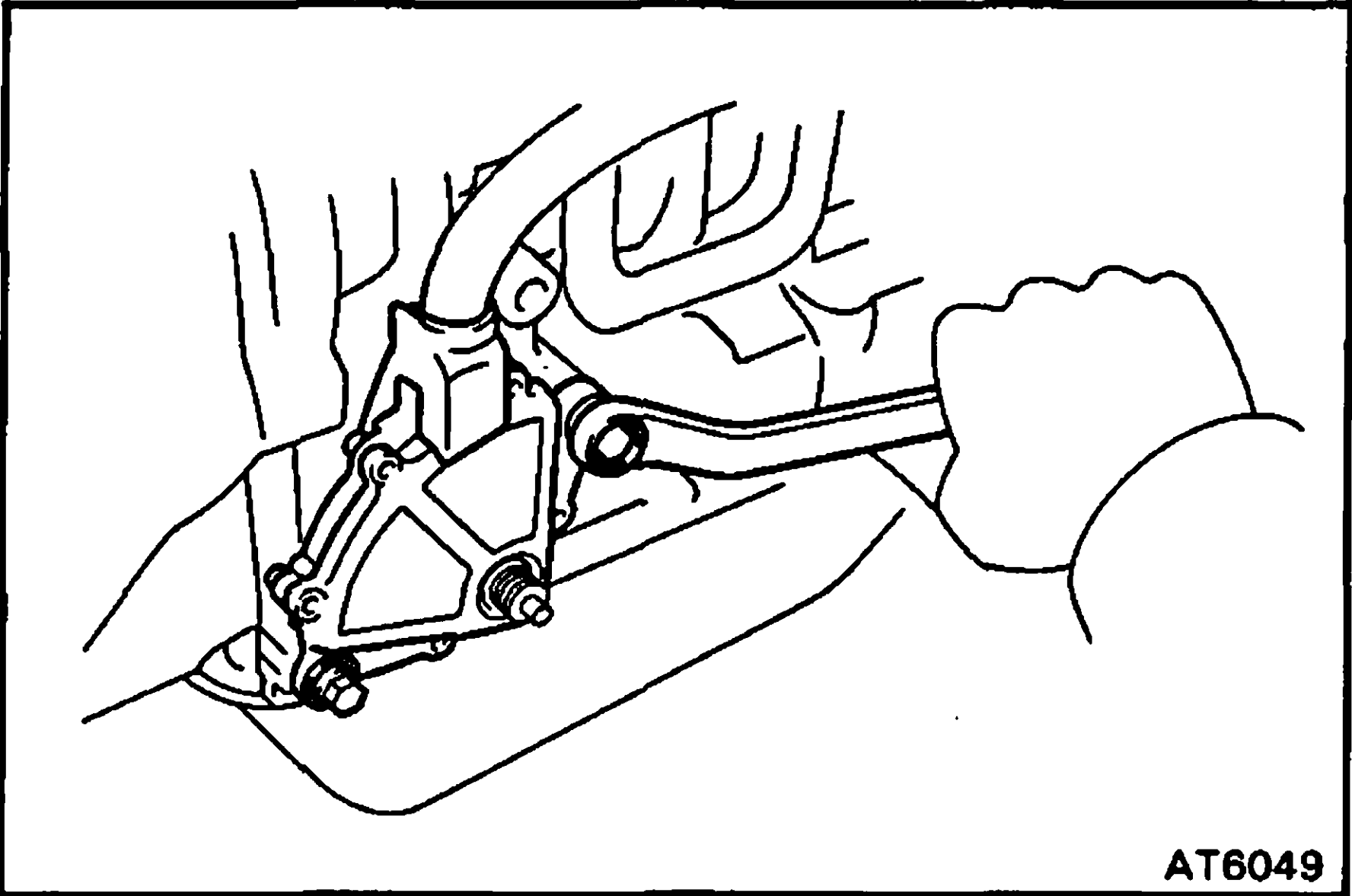
### 4. REMOVE OIL COOLER PIPES

- (a) Remove the mount stay bolt.
- (b) Loosen the two union bolts, and remove two cooler pipe assembly.

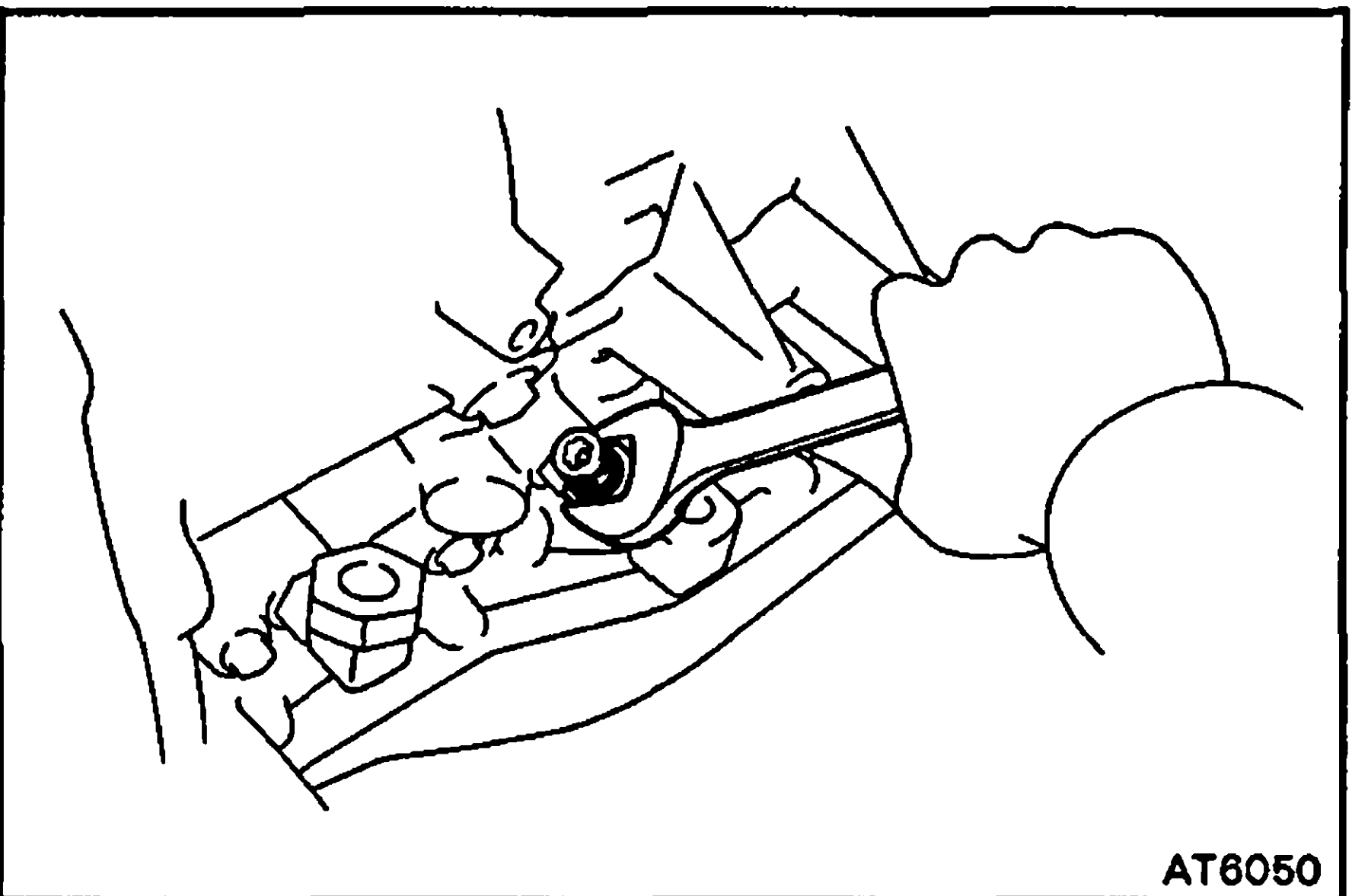


**5. REMOVE NEUTRAL START SWITCH**

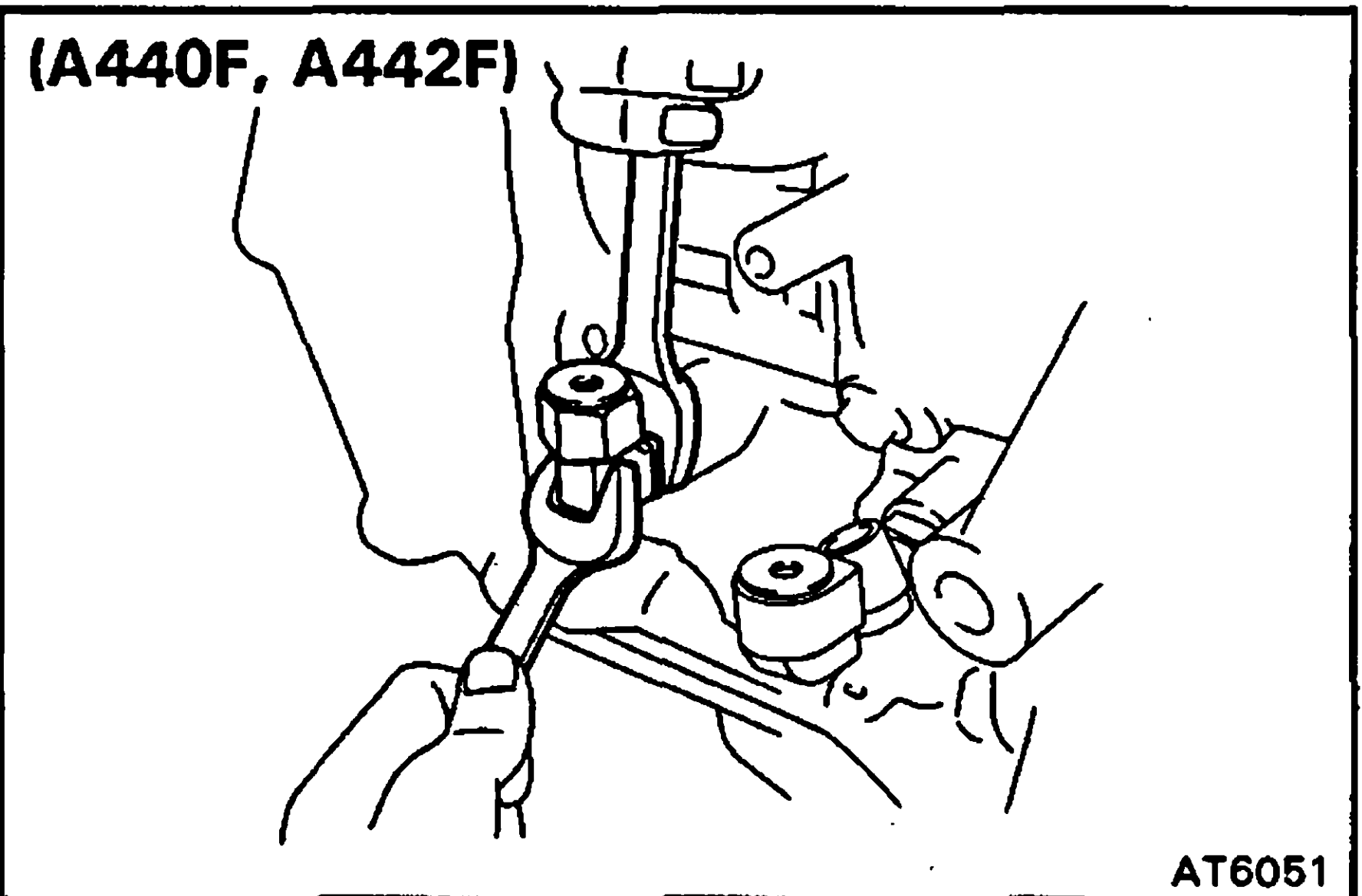
- (a) Unstake the lock washer.
- (b) Remove the nut, lock washer and grommet.



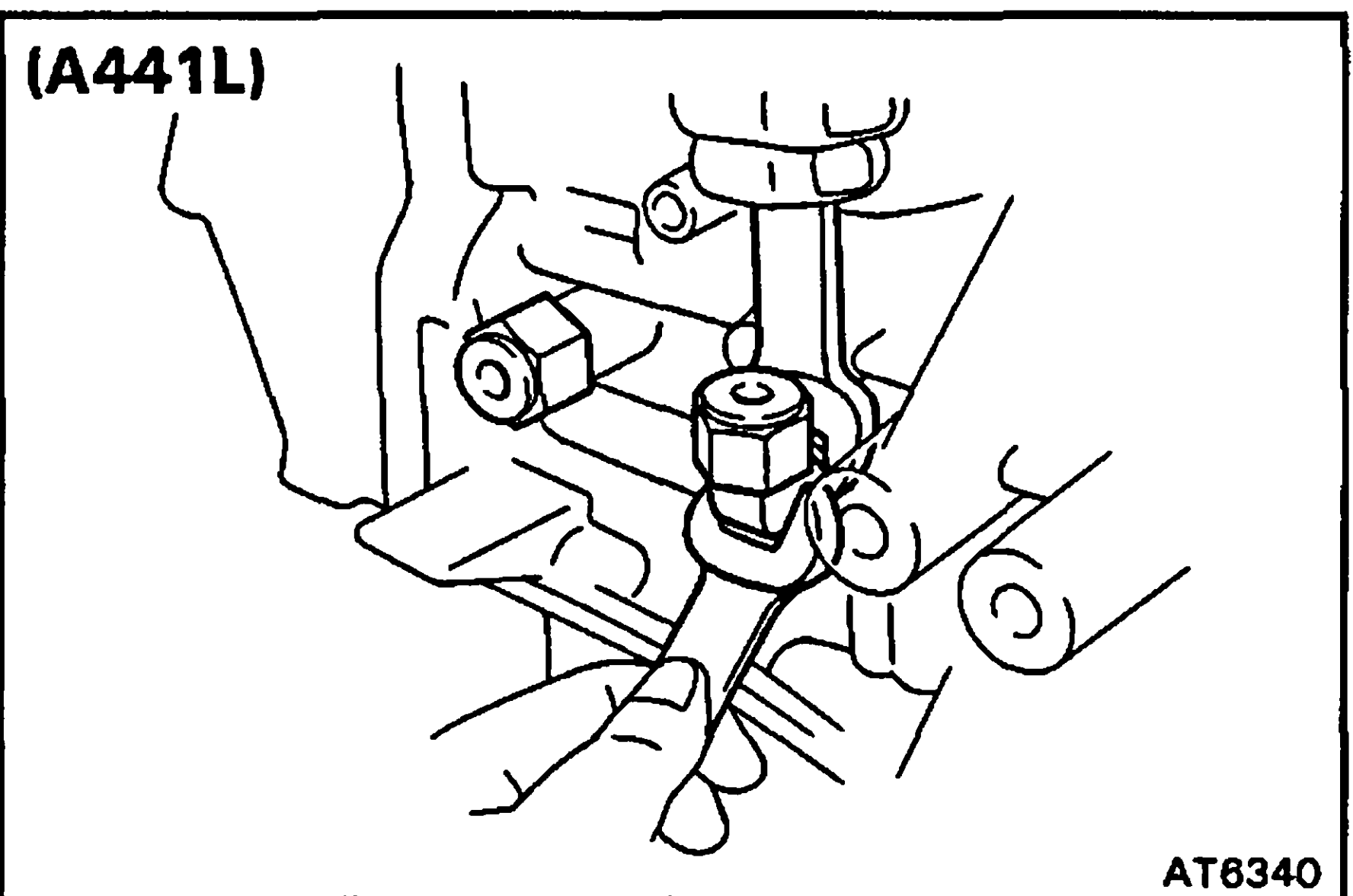
- (c) Remove the two bolts and neutral start switch.

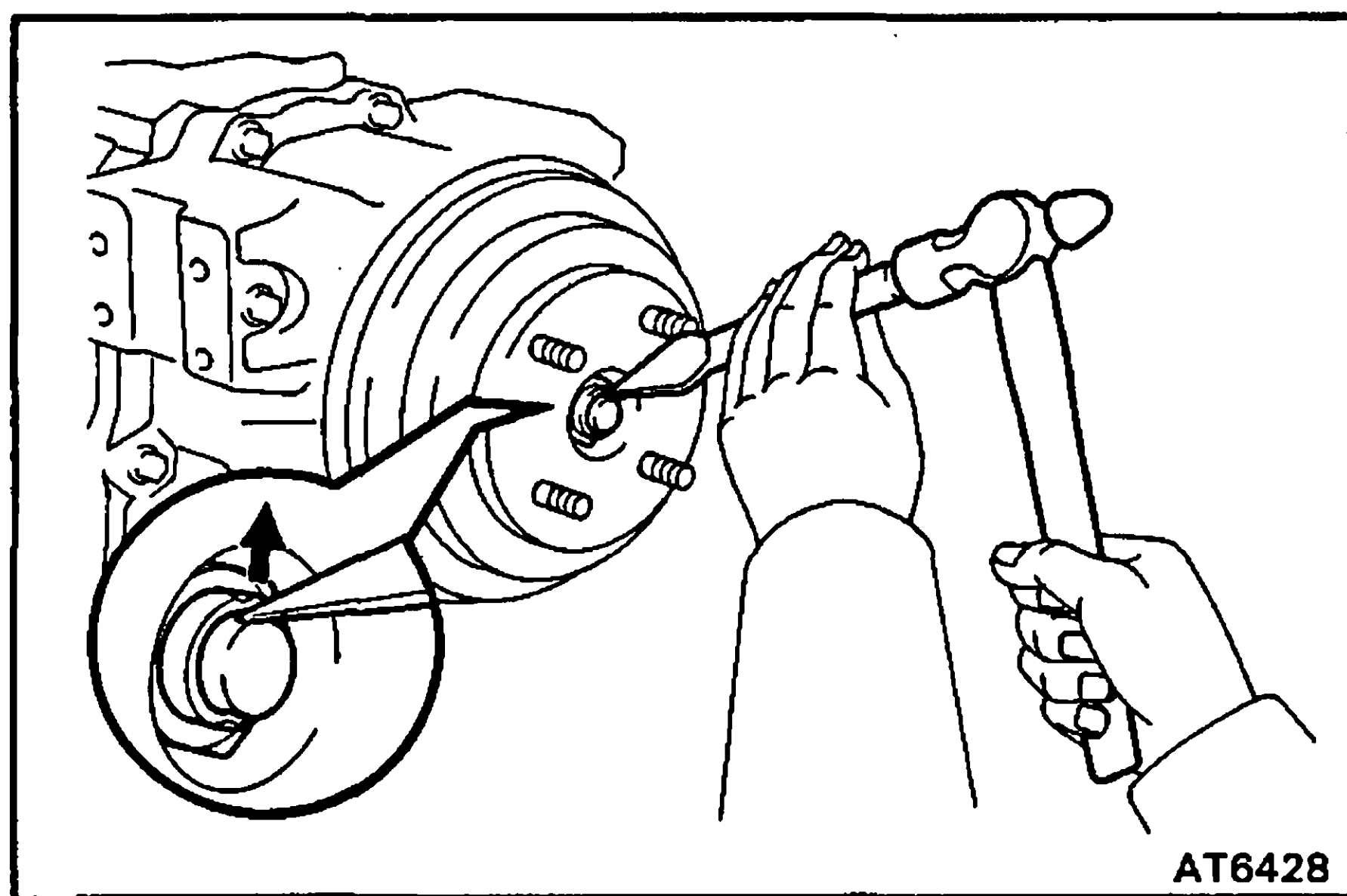
**6. (A440F, A442F)****REMOVE A/T FLUID TEMPERATURE SENSOR**

- (a) Remove the sensor from front union.
- (b) Remove the O-ring from the sensor.

**7. REMOVE OIL COOLER UNIONS**

- (a) Remove the two unions.
- (b) Remove the O-ring from both unions.

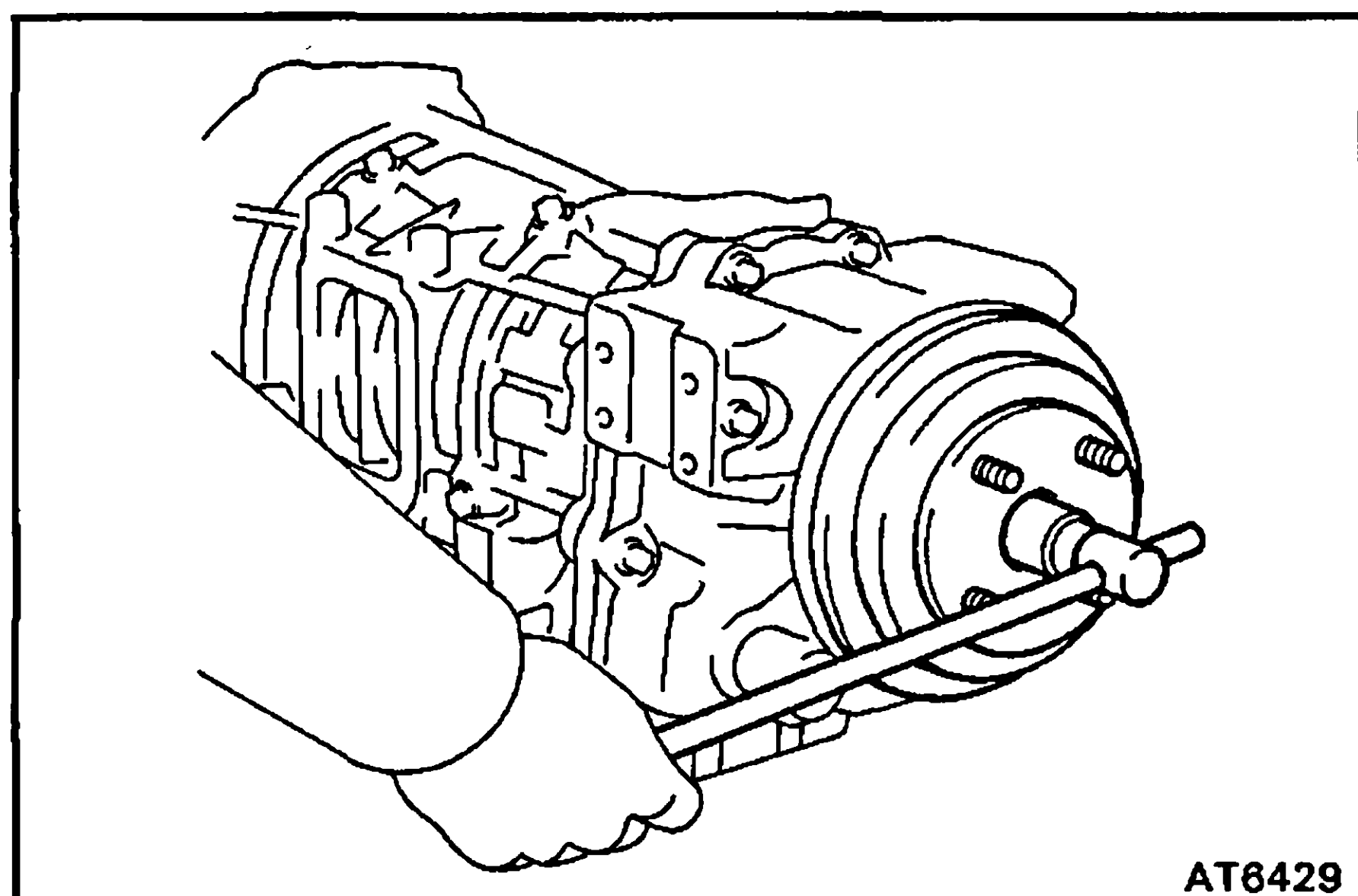




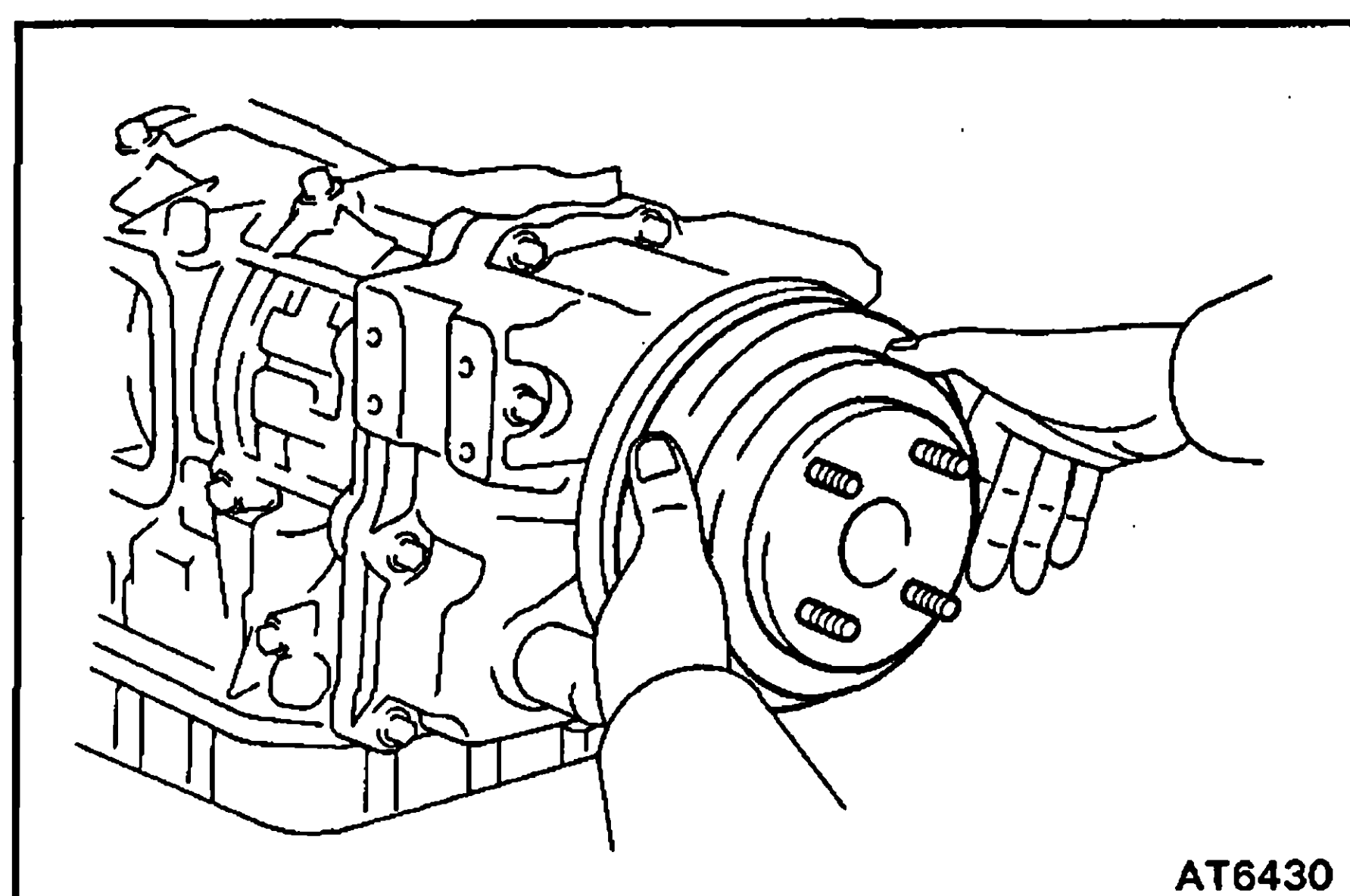
**8. (A441L)  
REMOVE PARKING BRAKE ASSEMBLY**

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

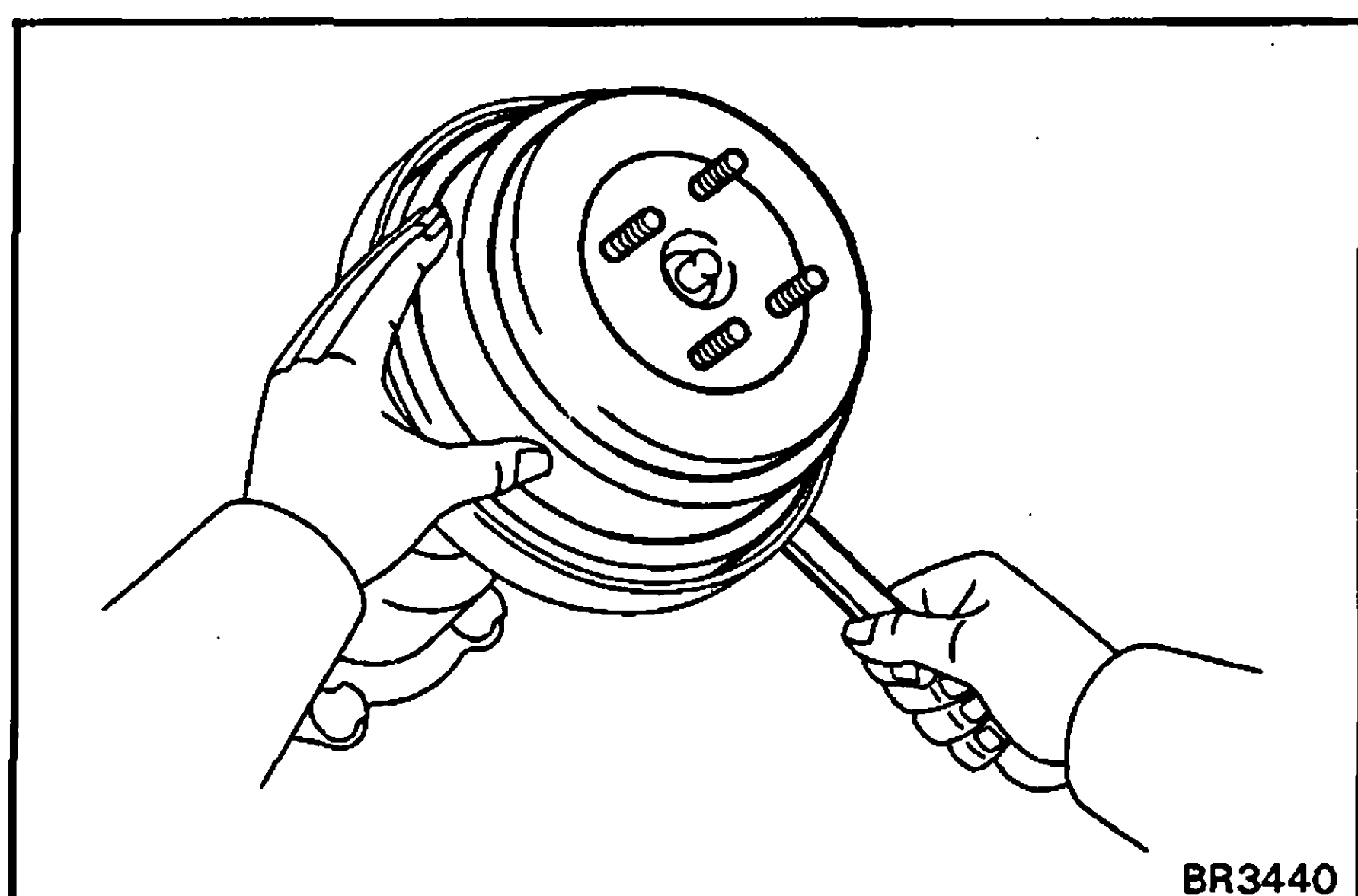
HINT: Shift the manual valve lever to the P position.



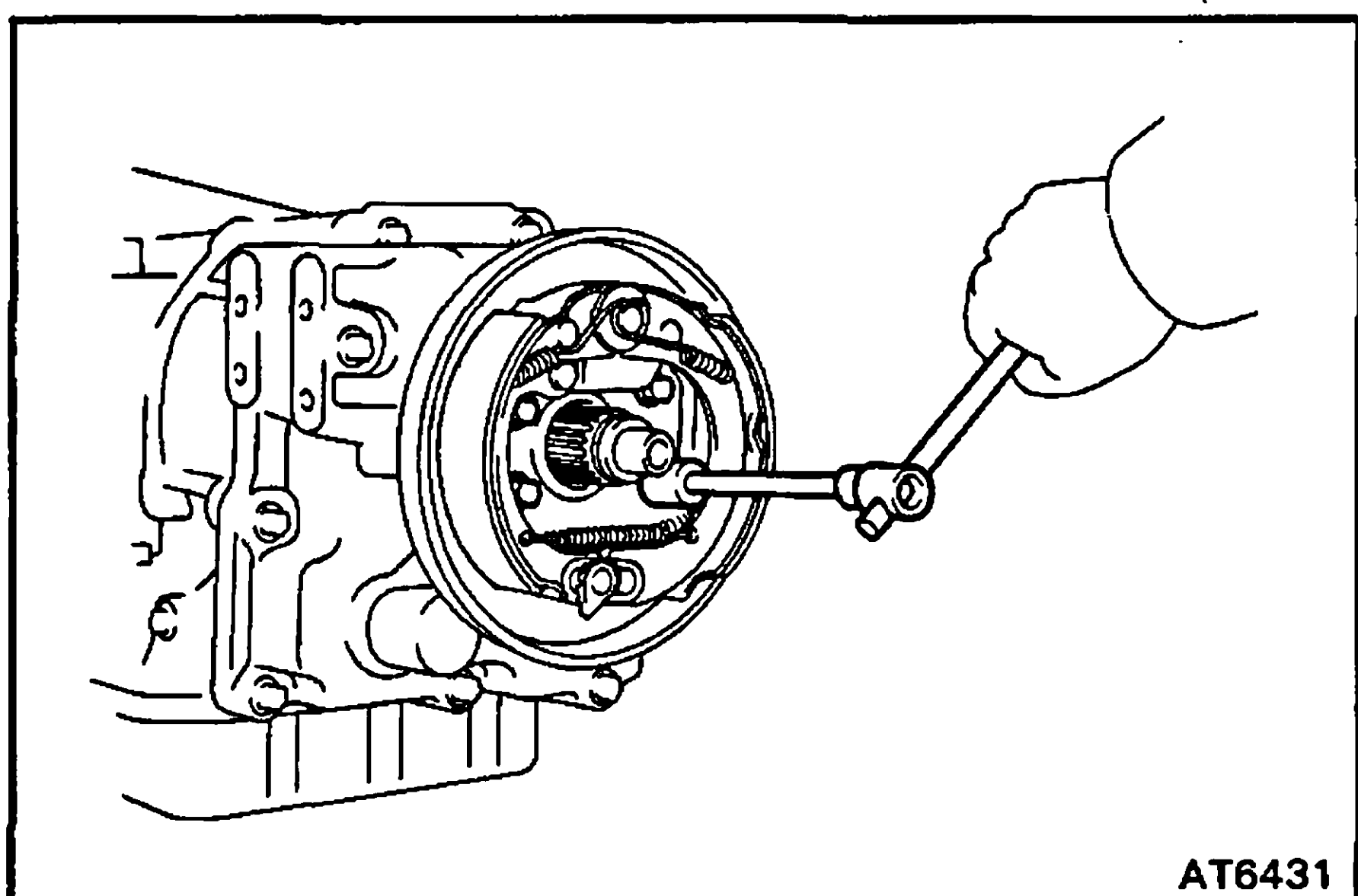
- (b) Remove the lock nut and O-ring.



- (c) Remove the parking brake drum.

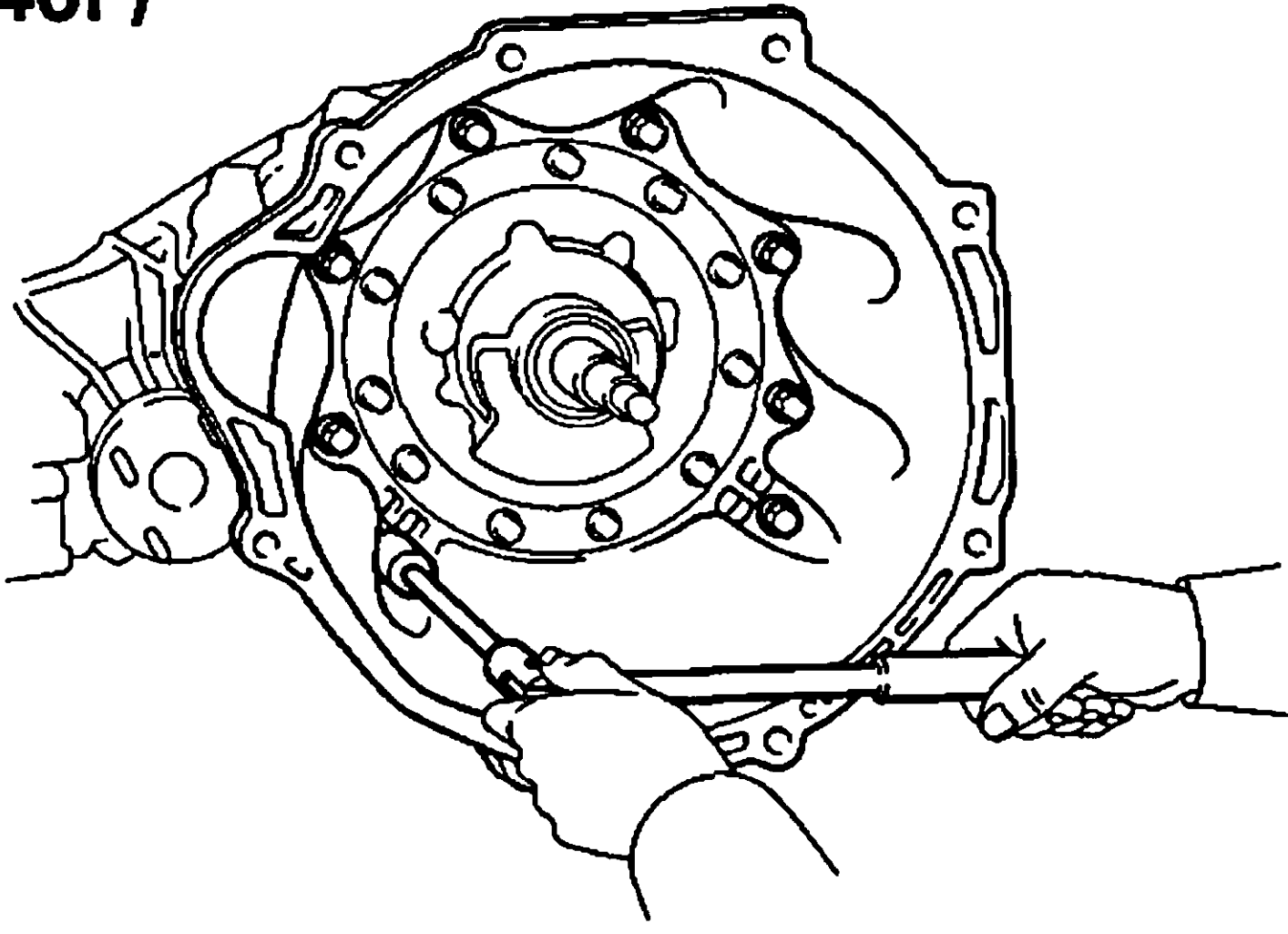


HINT: If the brake drum cannot be removed easily, turn the shoe adjuster clockwise until the drum turns freely.



- (d) Remove the four bolts and the parking brake assembly.

(A440F)

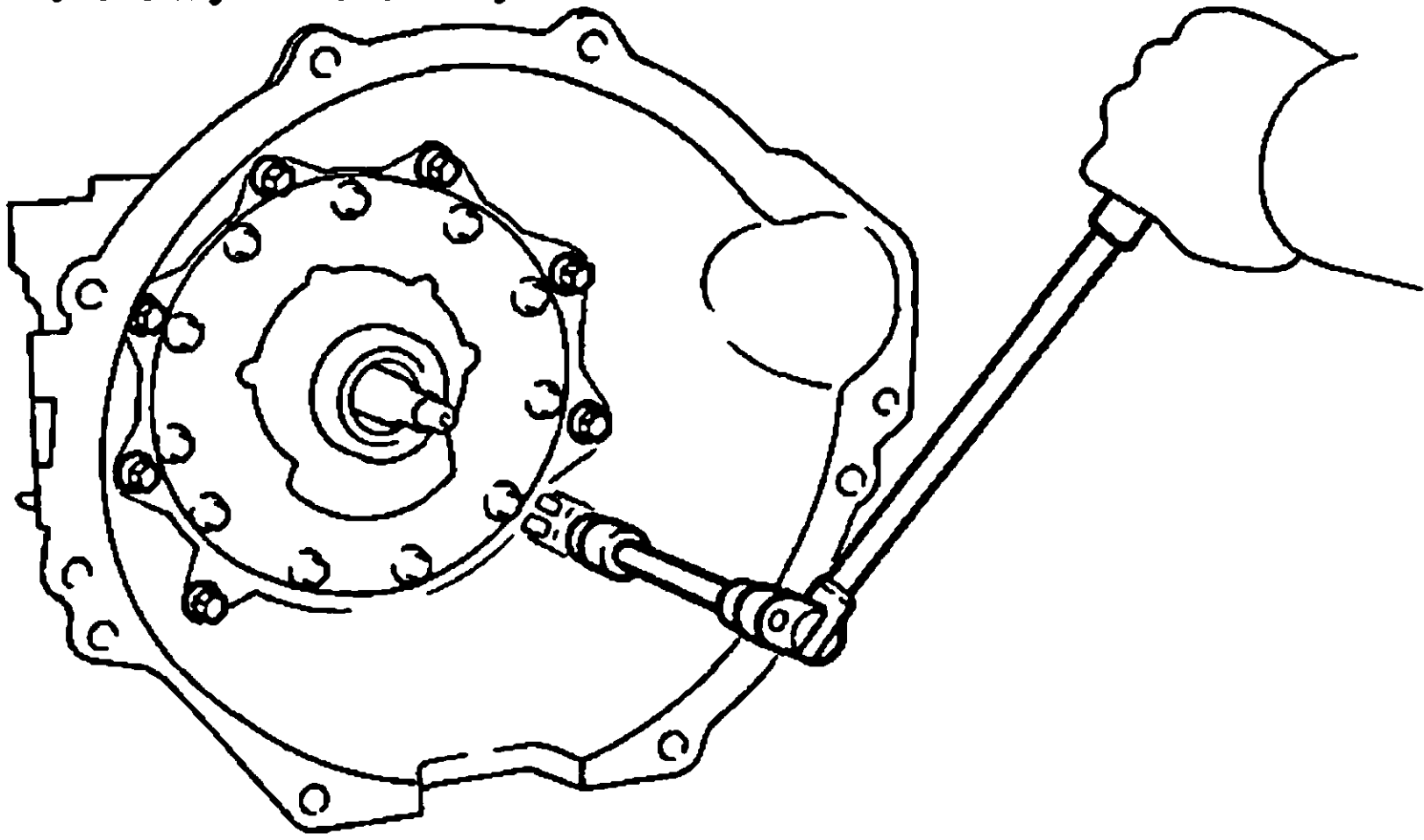


AT1585

**9. REMOVE TRANSMISSION HOUSING**

- (a) Remove the throttle cable clamp bolt.
- (b) Remove the eight bolts and transmission housing.

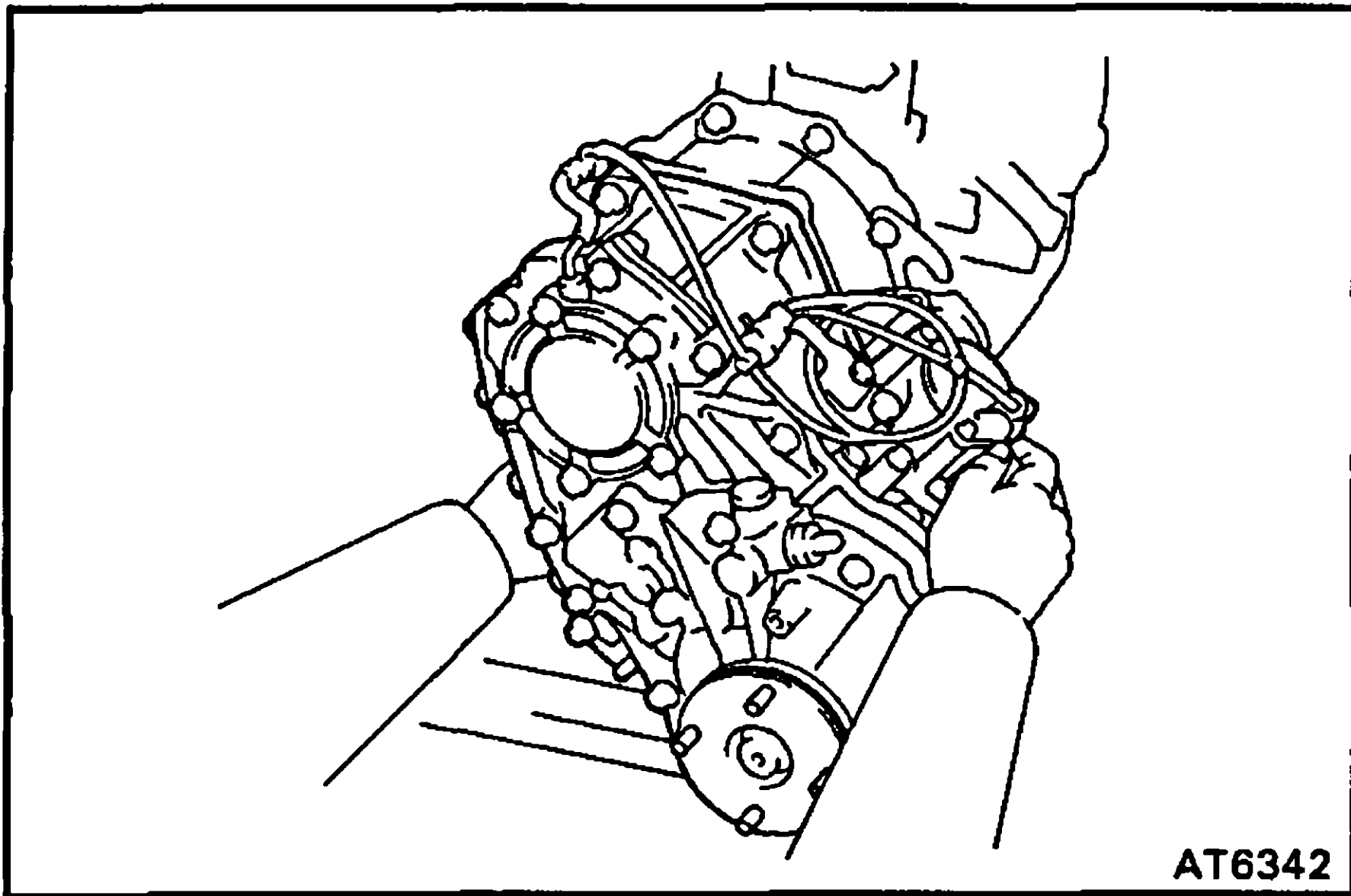
(A441L, A442F)



AT6341

**10. (A440F, A442F)  
REMOVE TRANSFER ASSEMBLY**

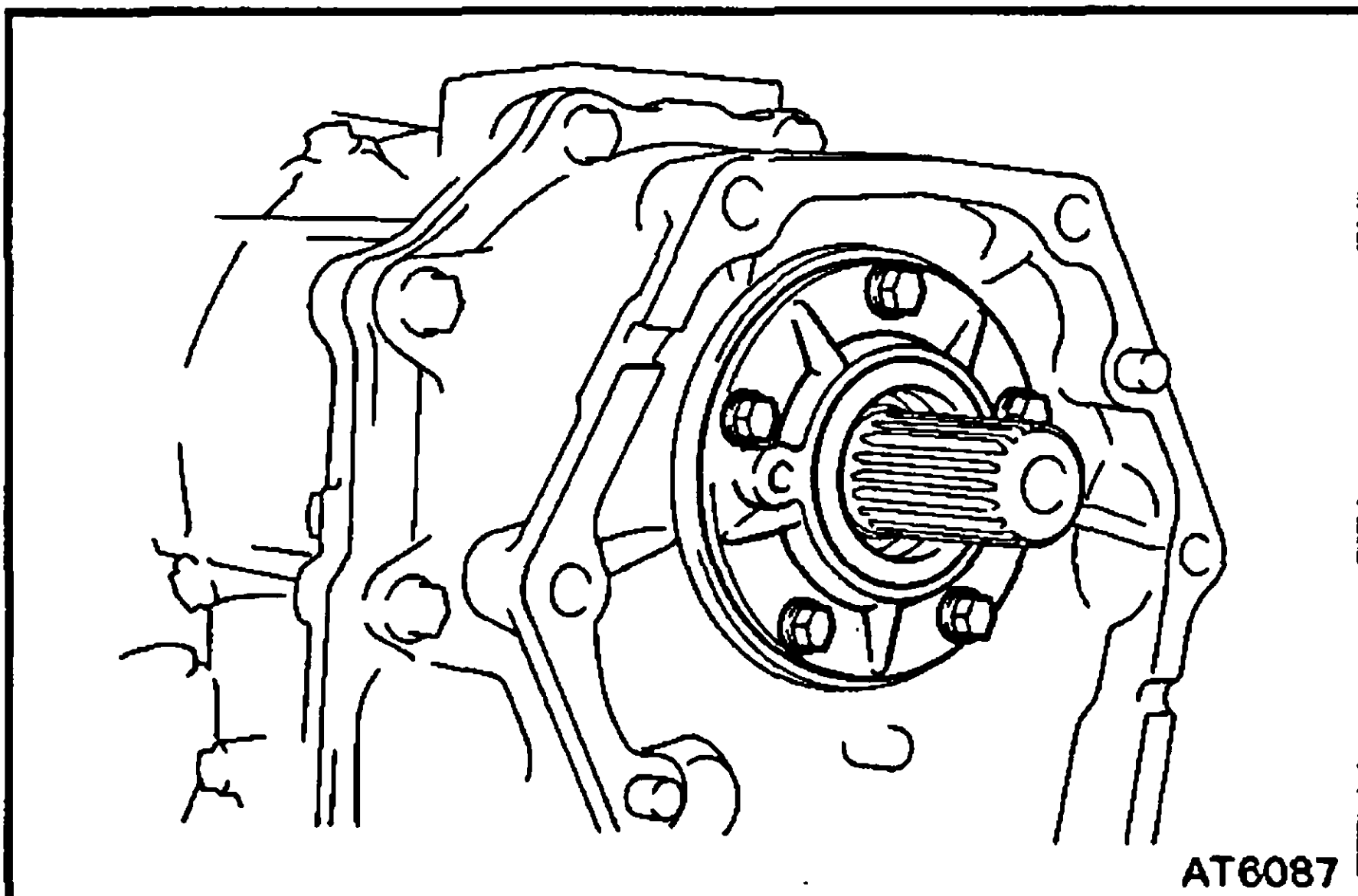
Remove the six bolts and the transfer.



AT6342

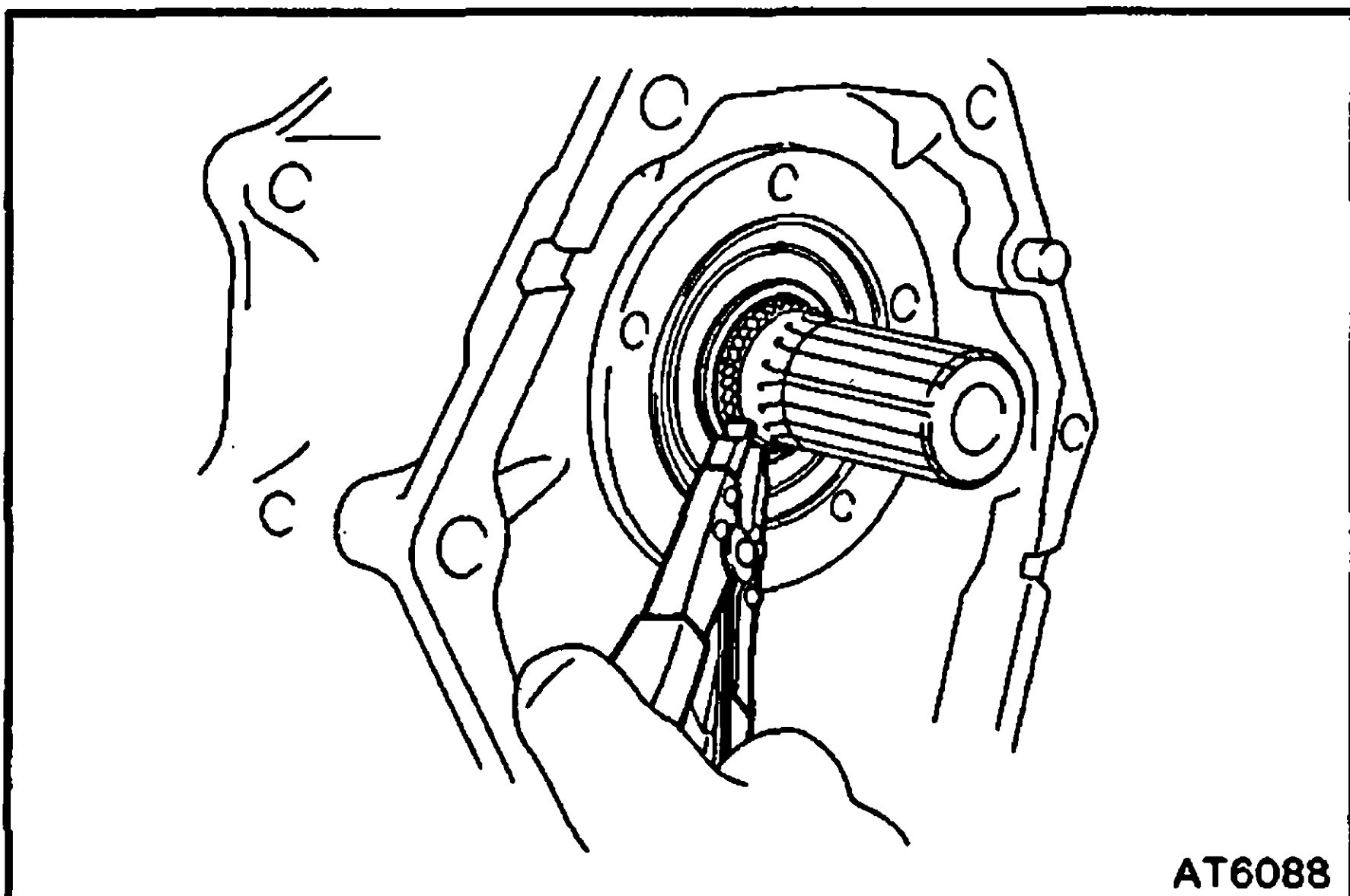
**11. (A440F, A442F)  
REMOVE TRANSFER ADAPTOR AND OUTPUT SHAFT  
REAR BEARING**

- (a) Remove the five bolts and the rear bearing retainer.

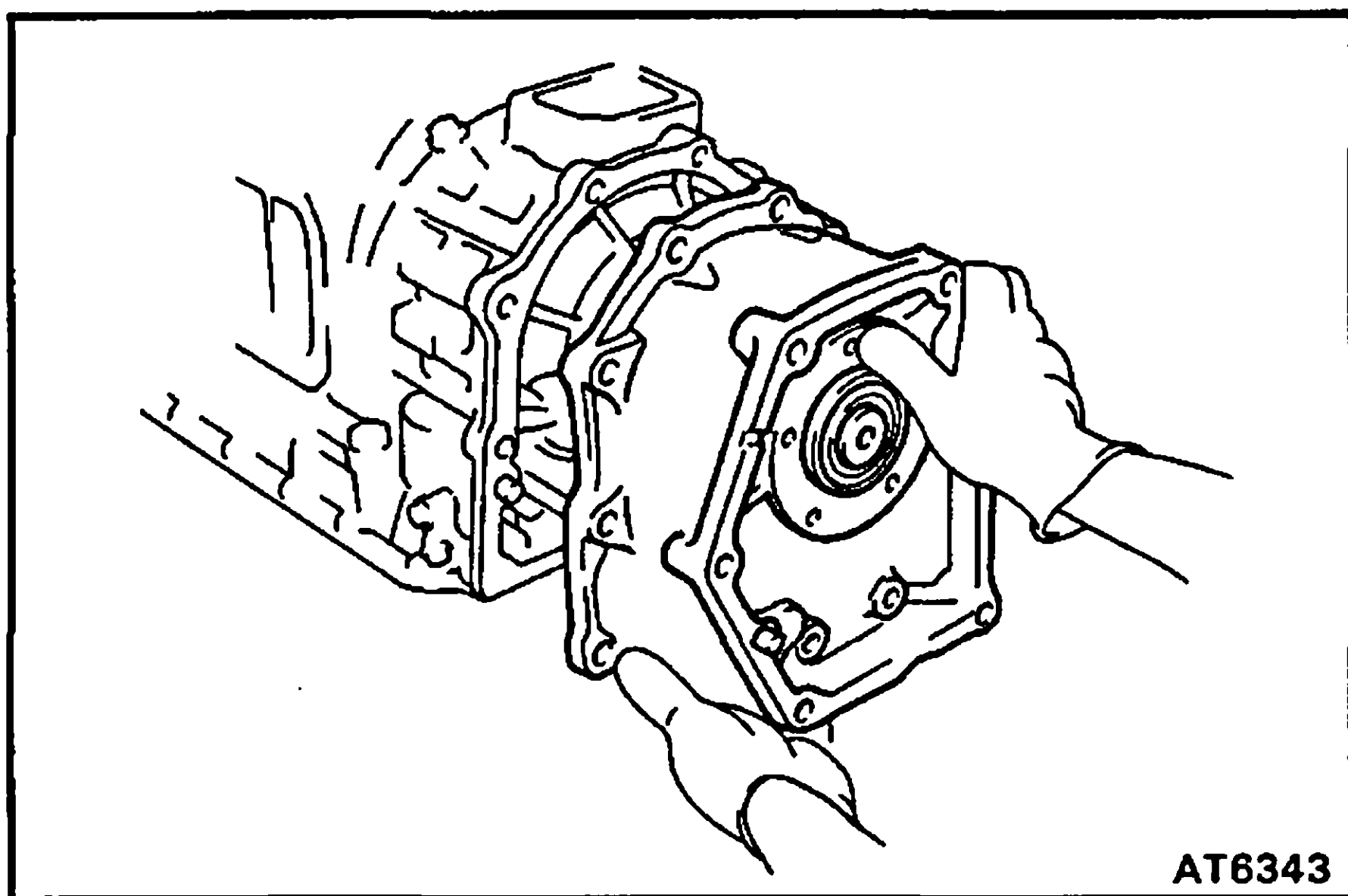


AT6087

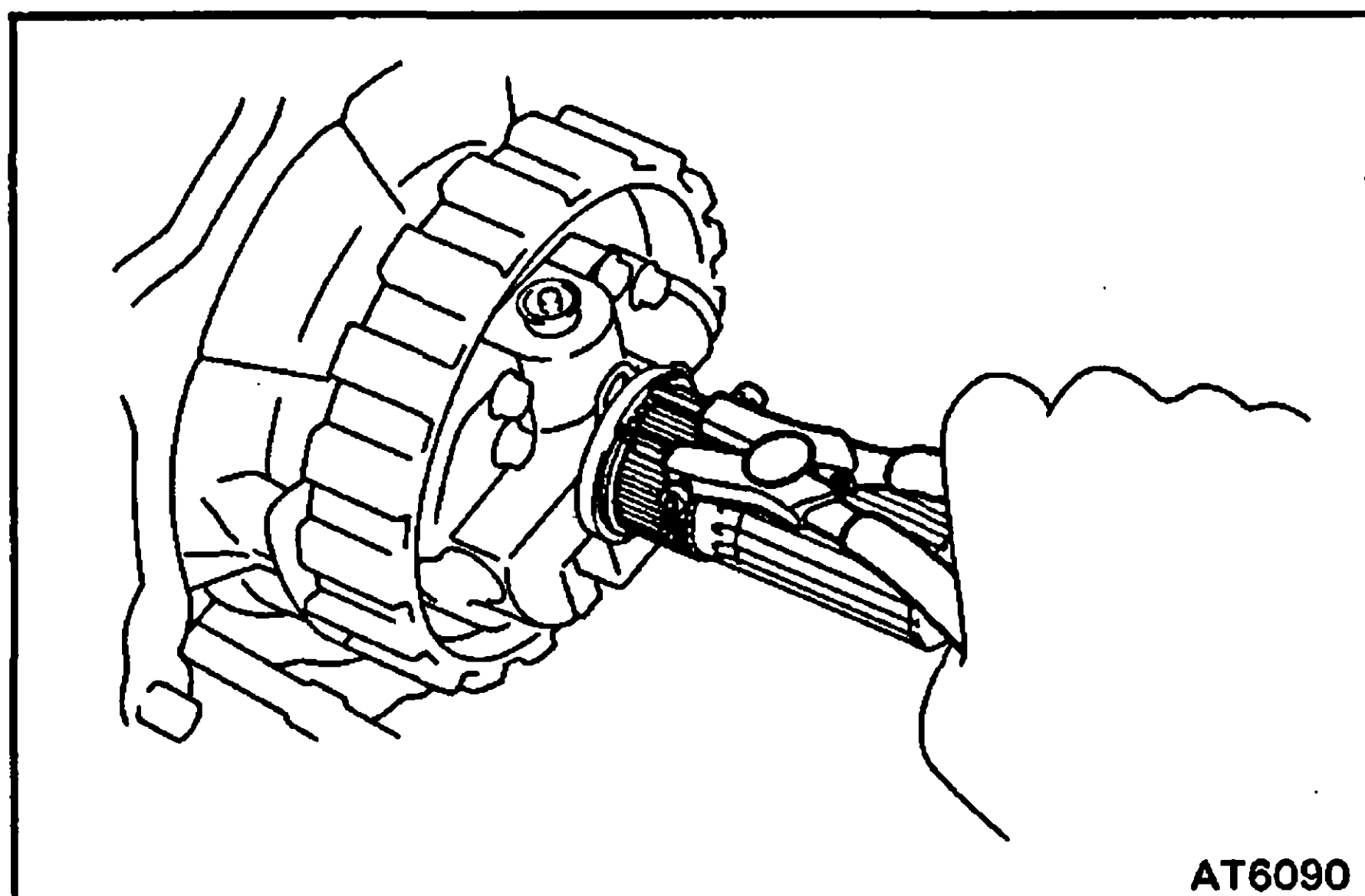
- (b) Using snap ring pliers, remove the snap ring.



AT6088

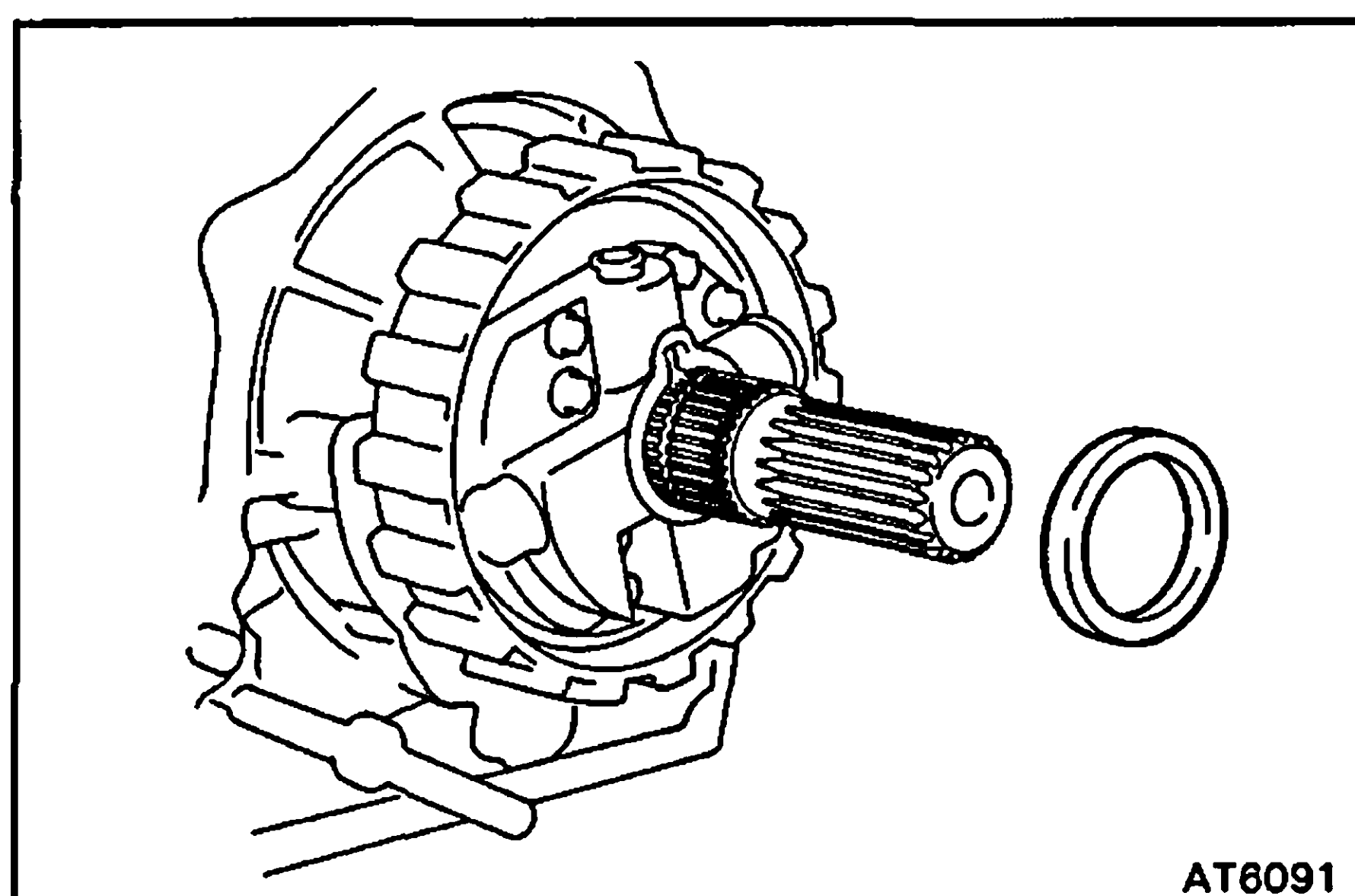


- (c) Remove the ten bolts and the adaptor.
- (d) Remove the gasket.

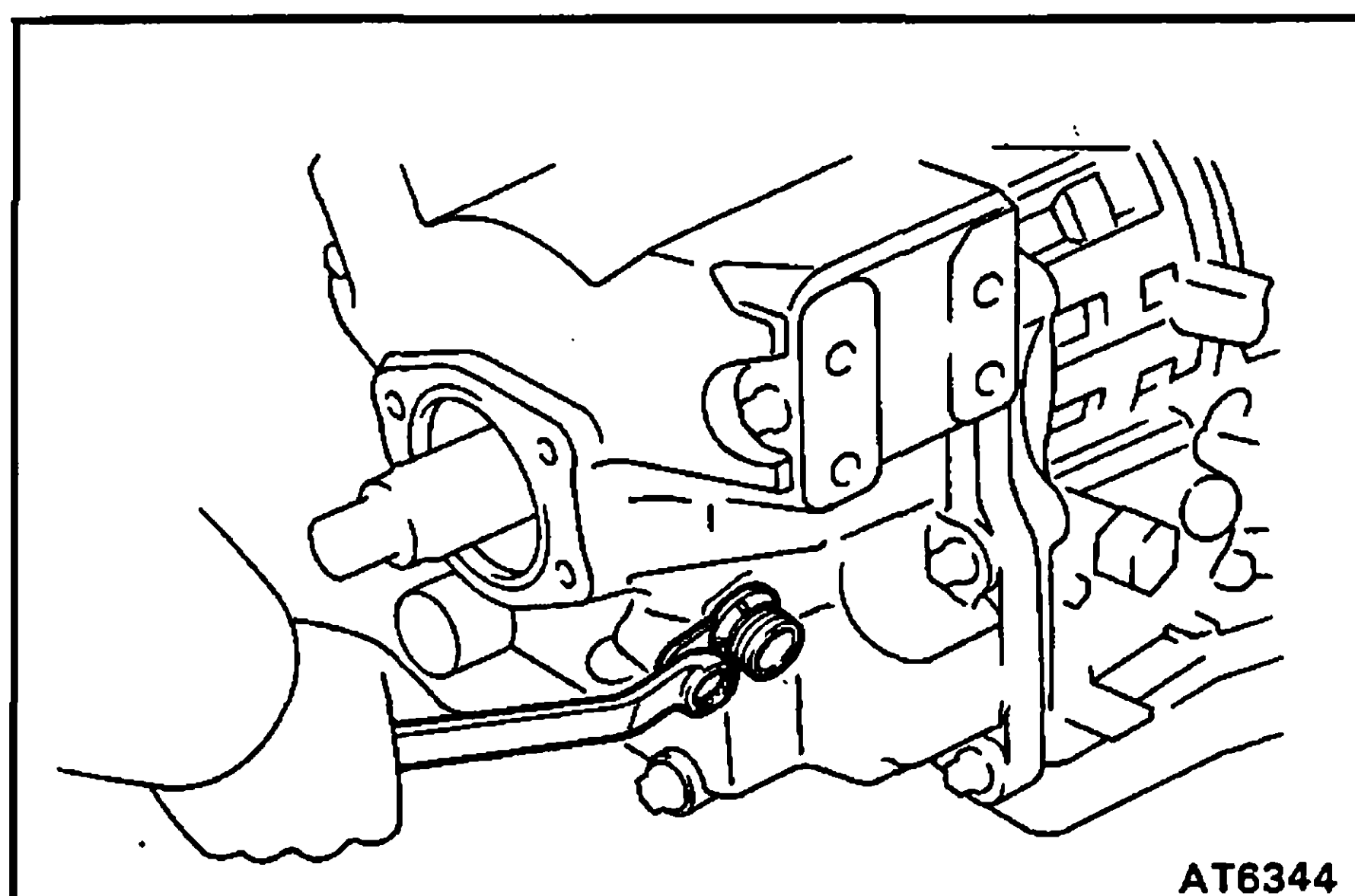


**12. (A440F, A442F)**  
**REMOVE OUTPUT SHAFT SPACER**

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

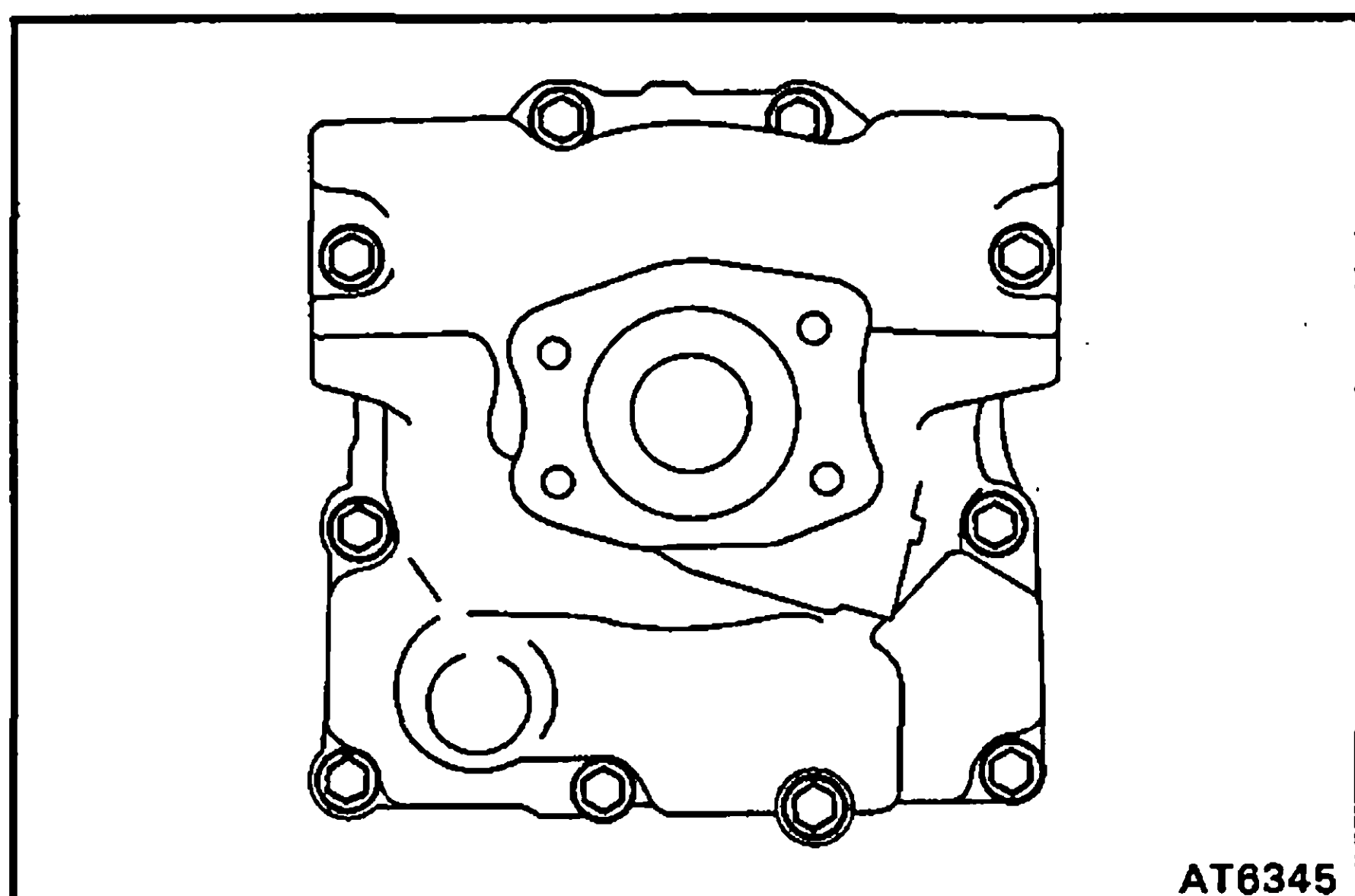


- (b) Remove the output shaft spacer.



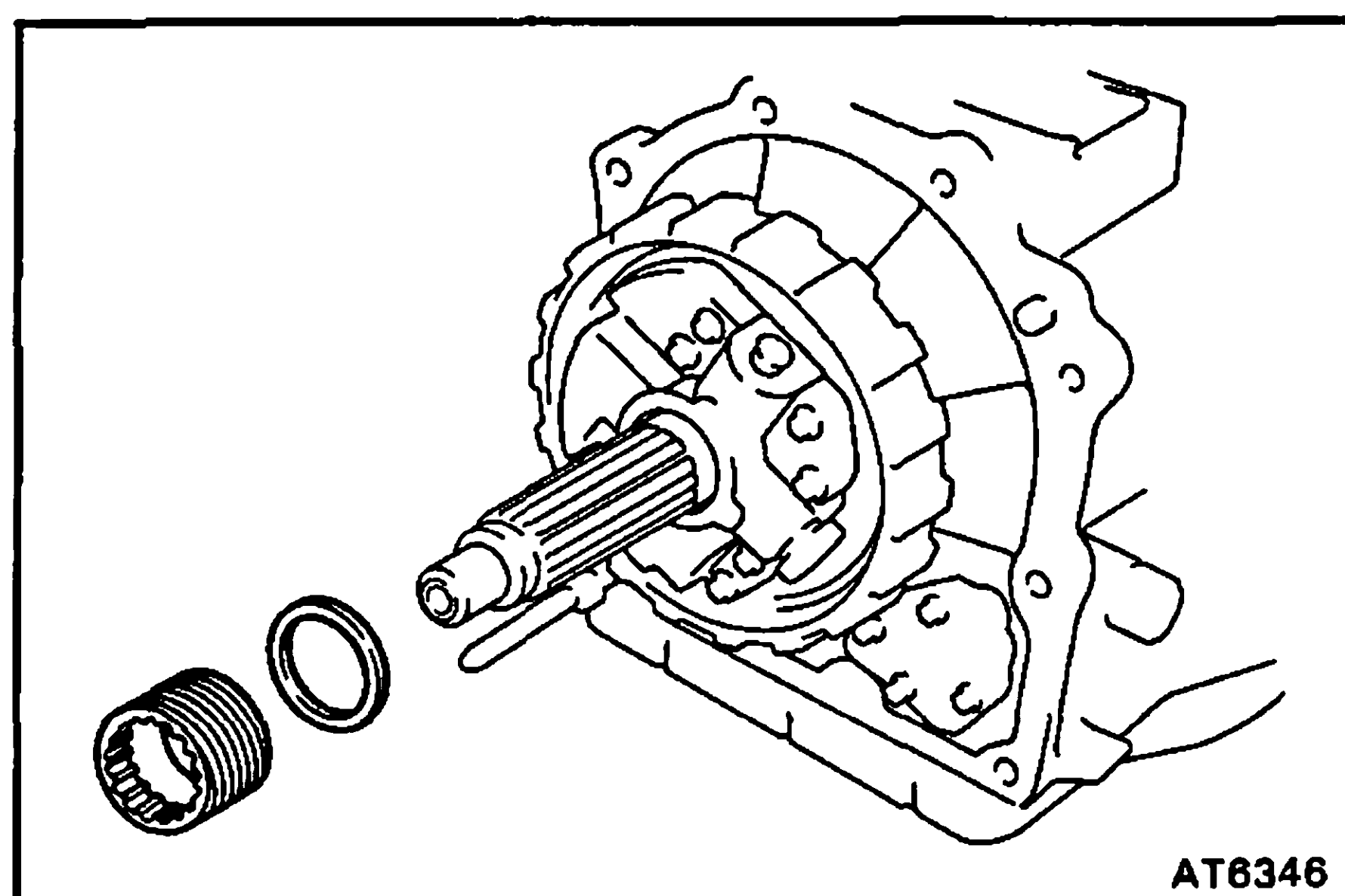
**13. (A441L)**  
**REMOVE SPEEDOMETER DRIVEN GEAR**

- (a) Remove the lock plate.
- (b) Remove the speedometer driven gear.
- (c) Remove the O-ring from it.

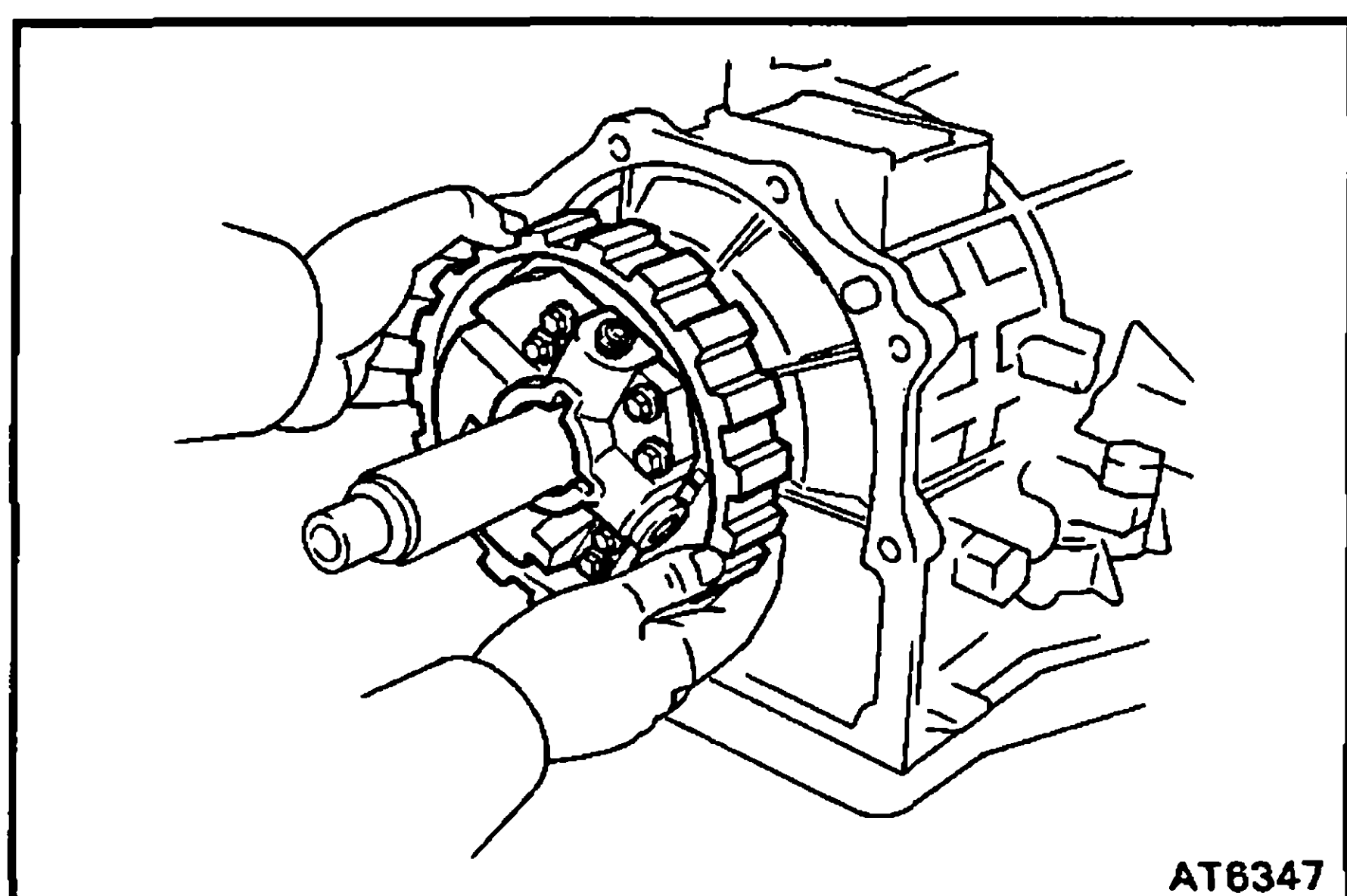


**14. (A441L)**  
**REMOVE EXTENSION HOUSING**

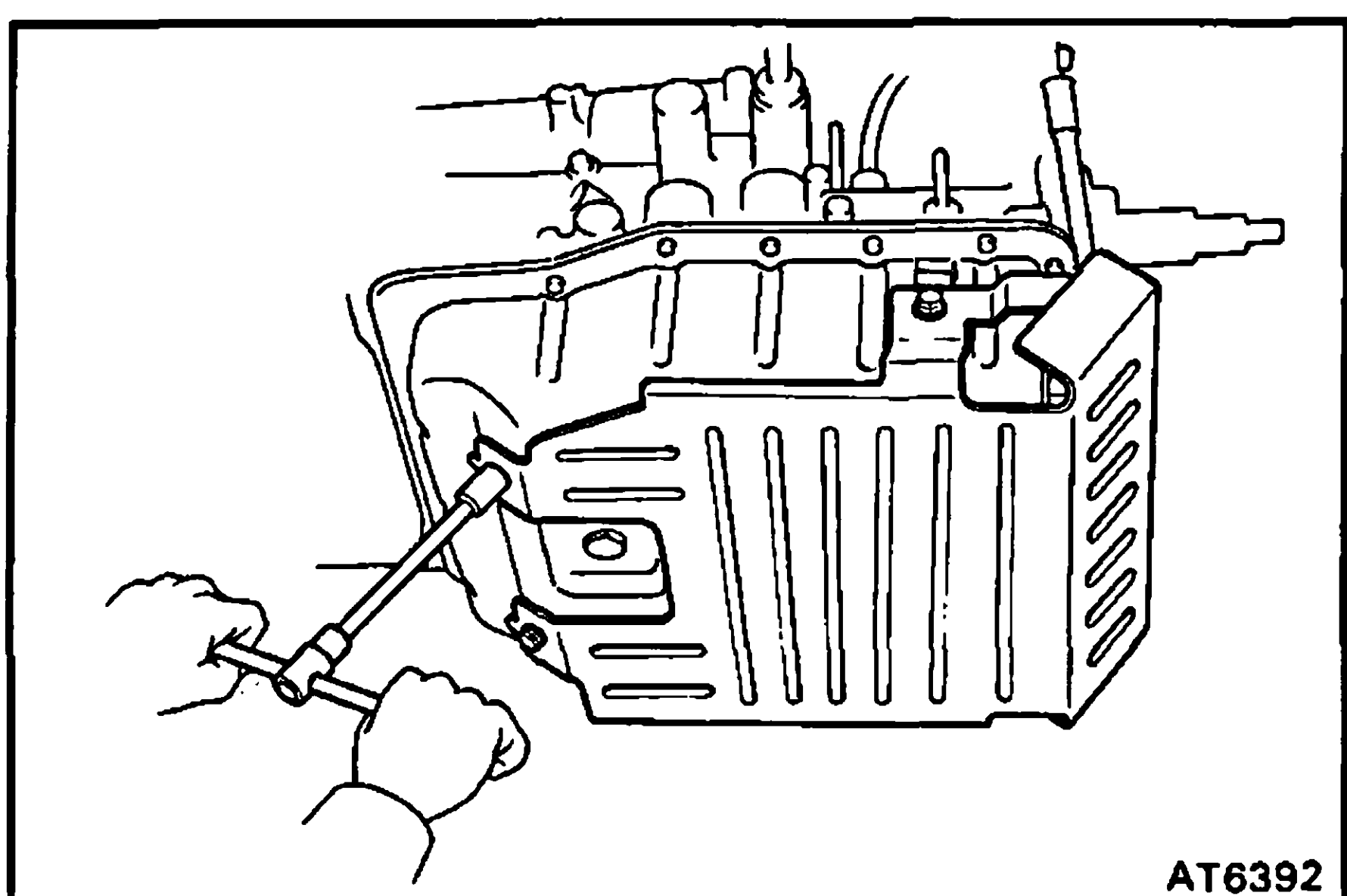
- (a) Remove the ten bolts and extension housing.
- (b) Remove the gasket.



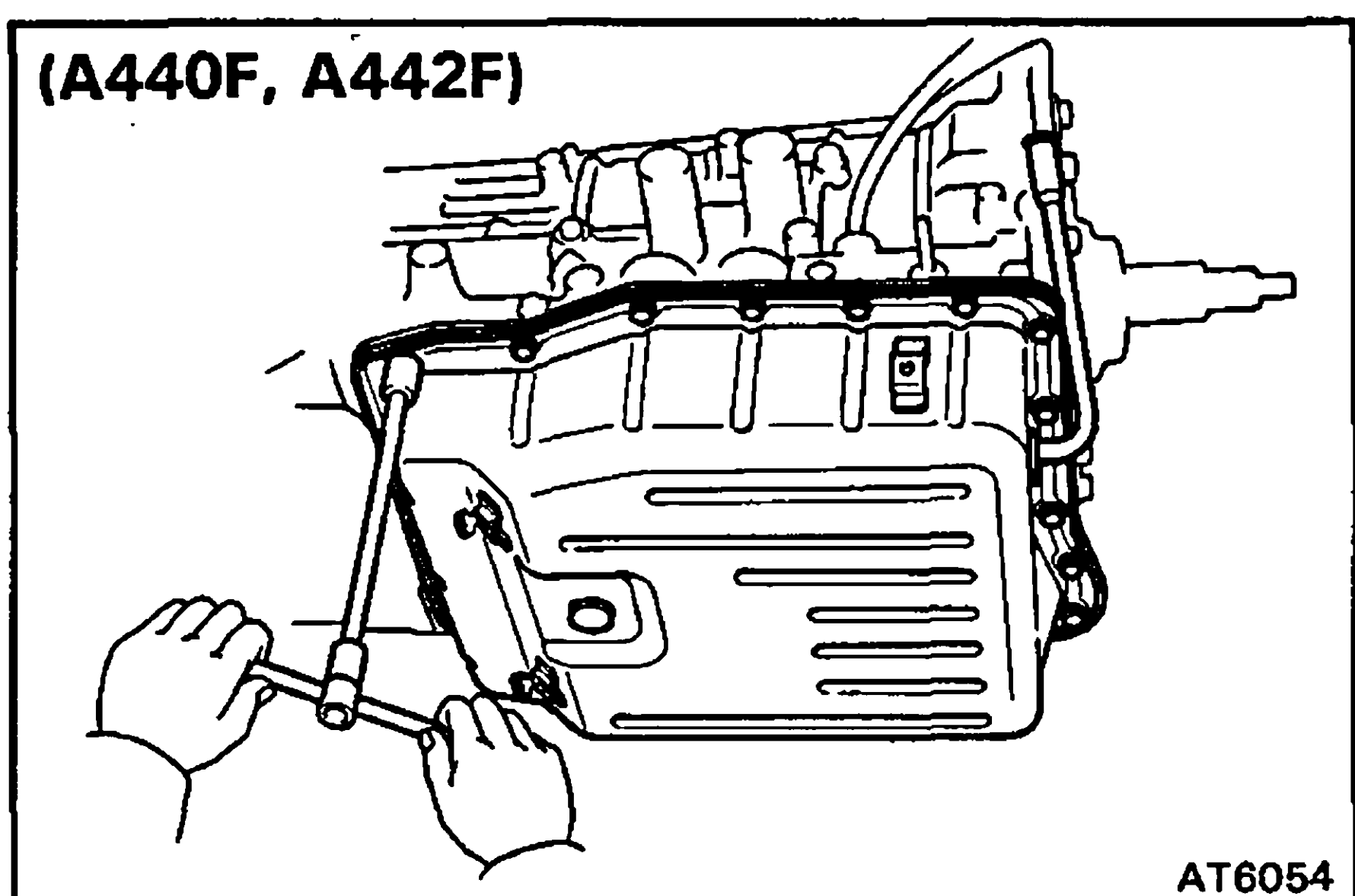
- 15. (A441L)  
REMOVE SPEEDOMETER DRIVE GEAR AND SPACER**



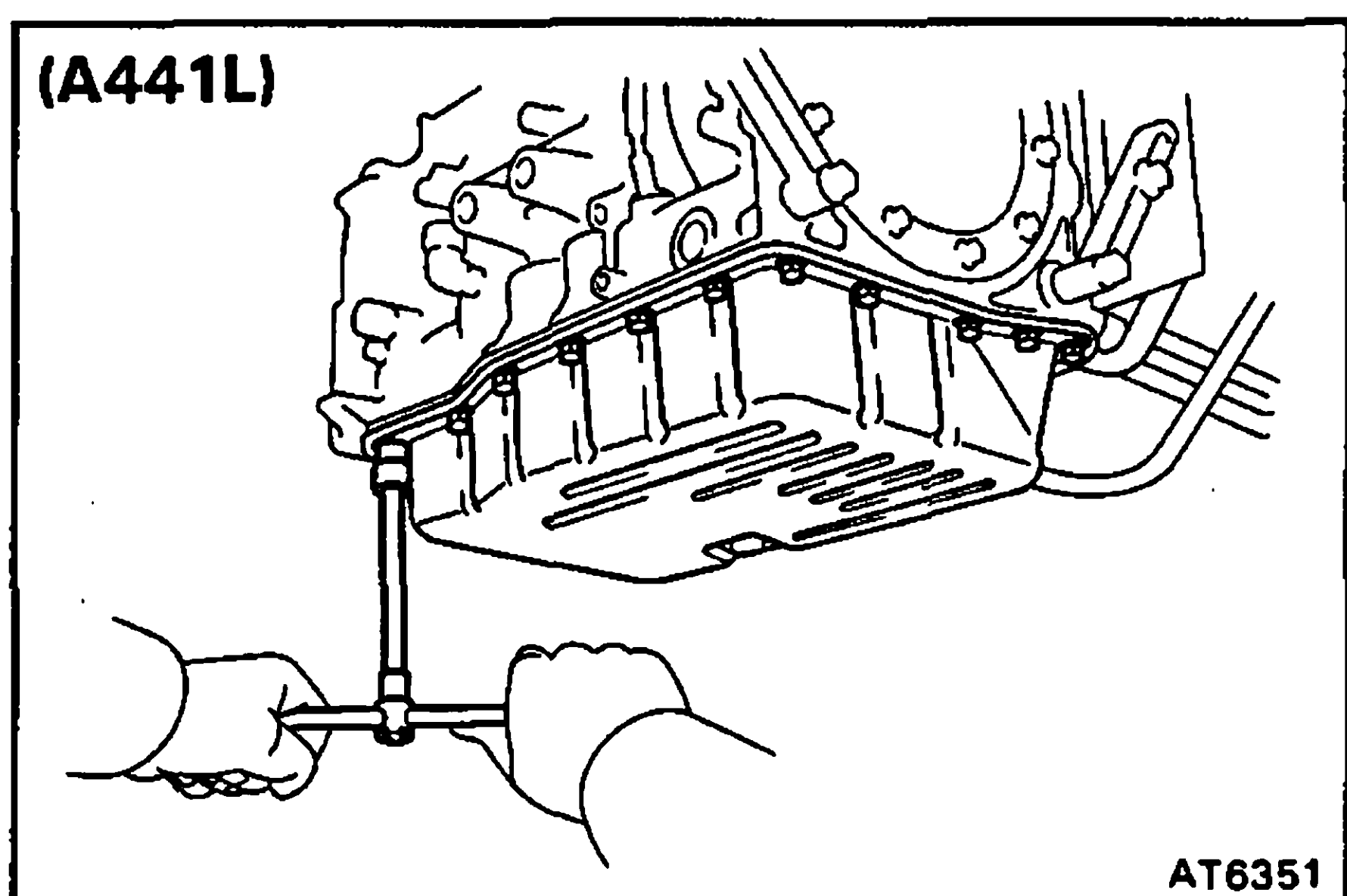
- 16. REMOVE GOVERNOR BODY**

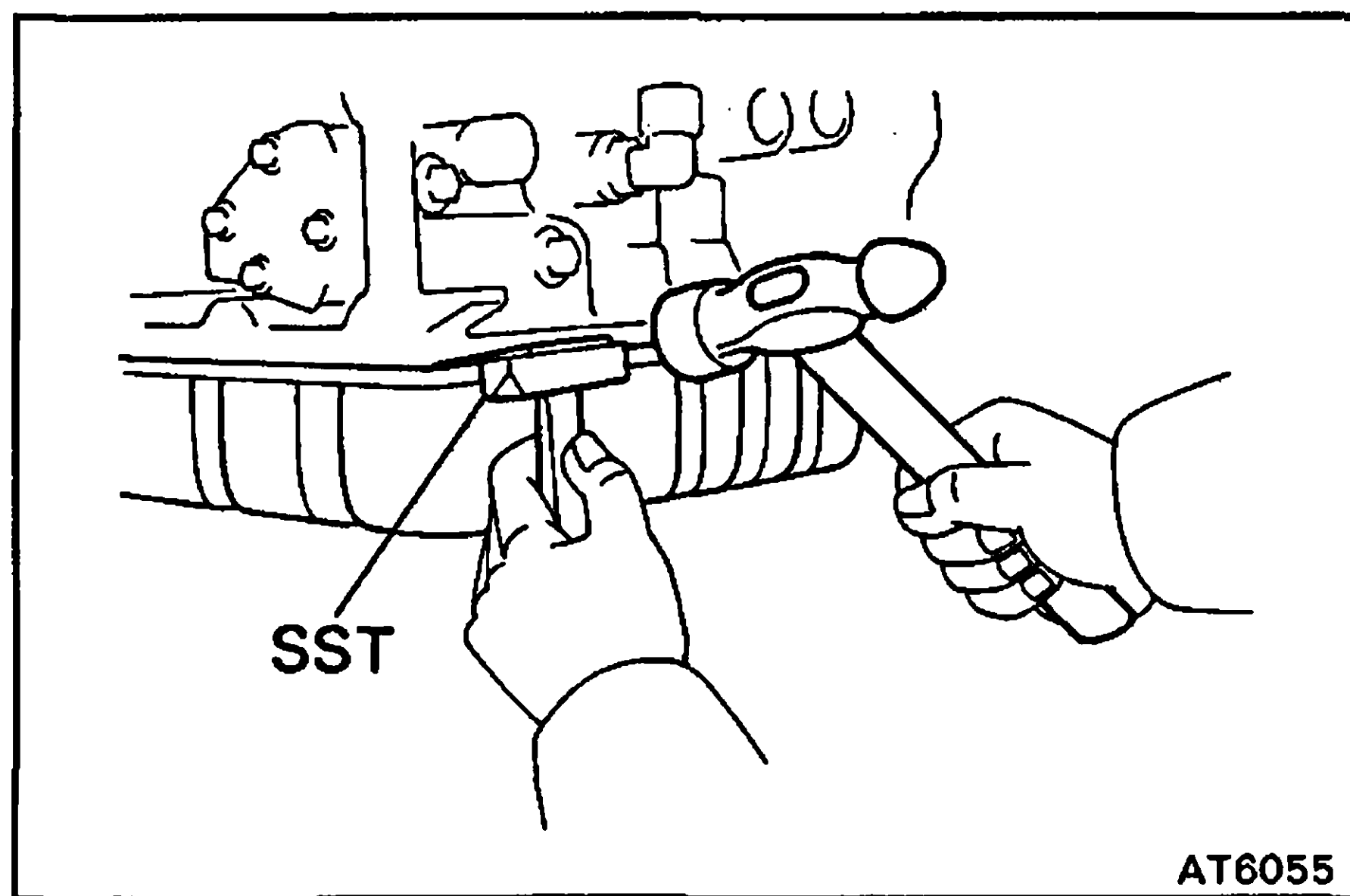


- 17. (A440F, A442F)  
REMOVE OIL PAN PROTECTOR**  
Remove the four bolts and protector.



- 18. REMOVE OIL PAN**  
**NOTICE:** Do not turn the transmission over as this will contaminate the valve body with any foreign matter at the bottom of the pan.  
(a) Remove the twenty bolts.

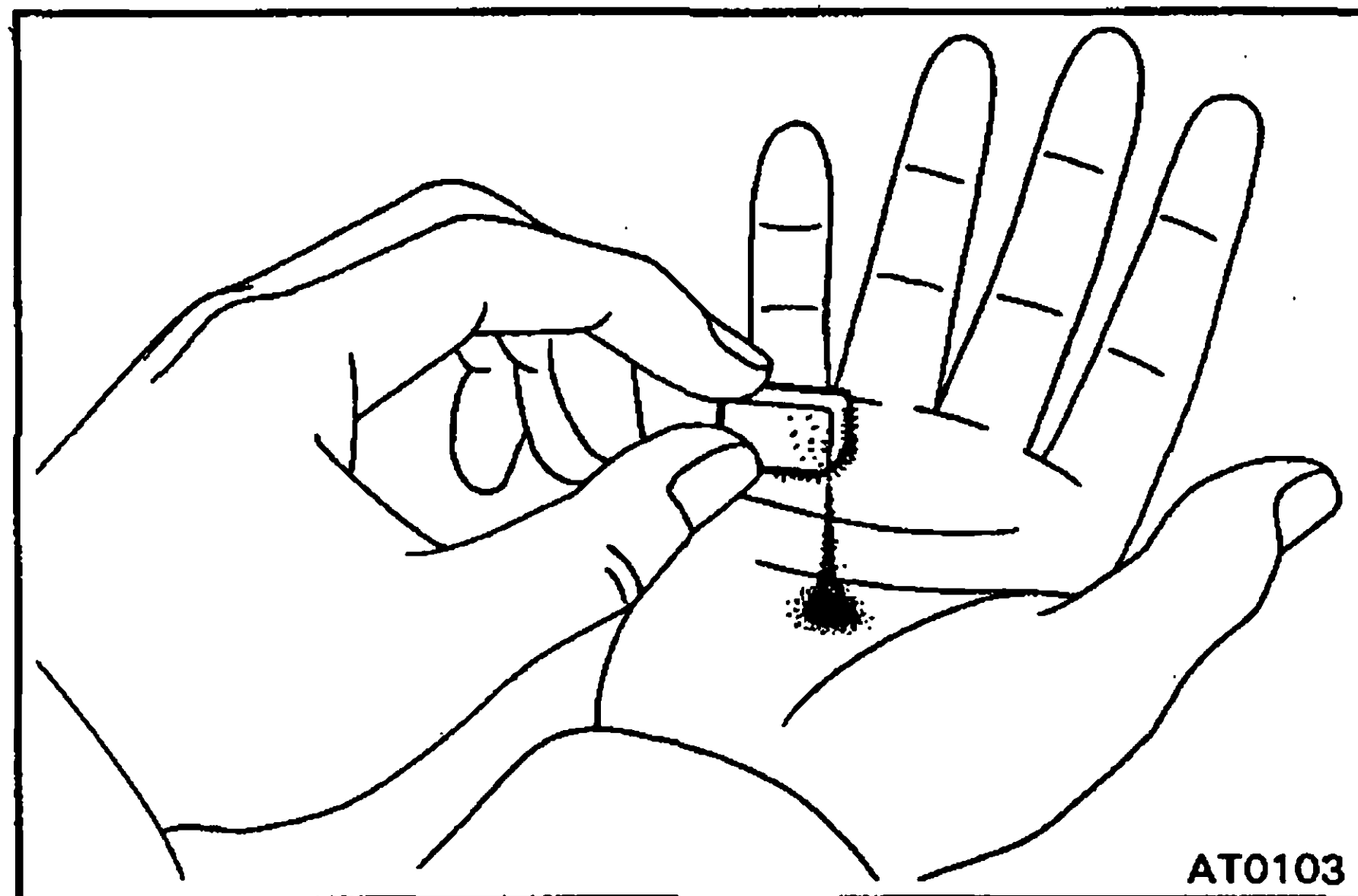




- (b) Insert the blade of SST between the transmission case and oil pan, cut off applied sealer.

SST 09032-00100

**NOTICE:** Be careful not to damage the oil pan flange.



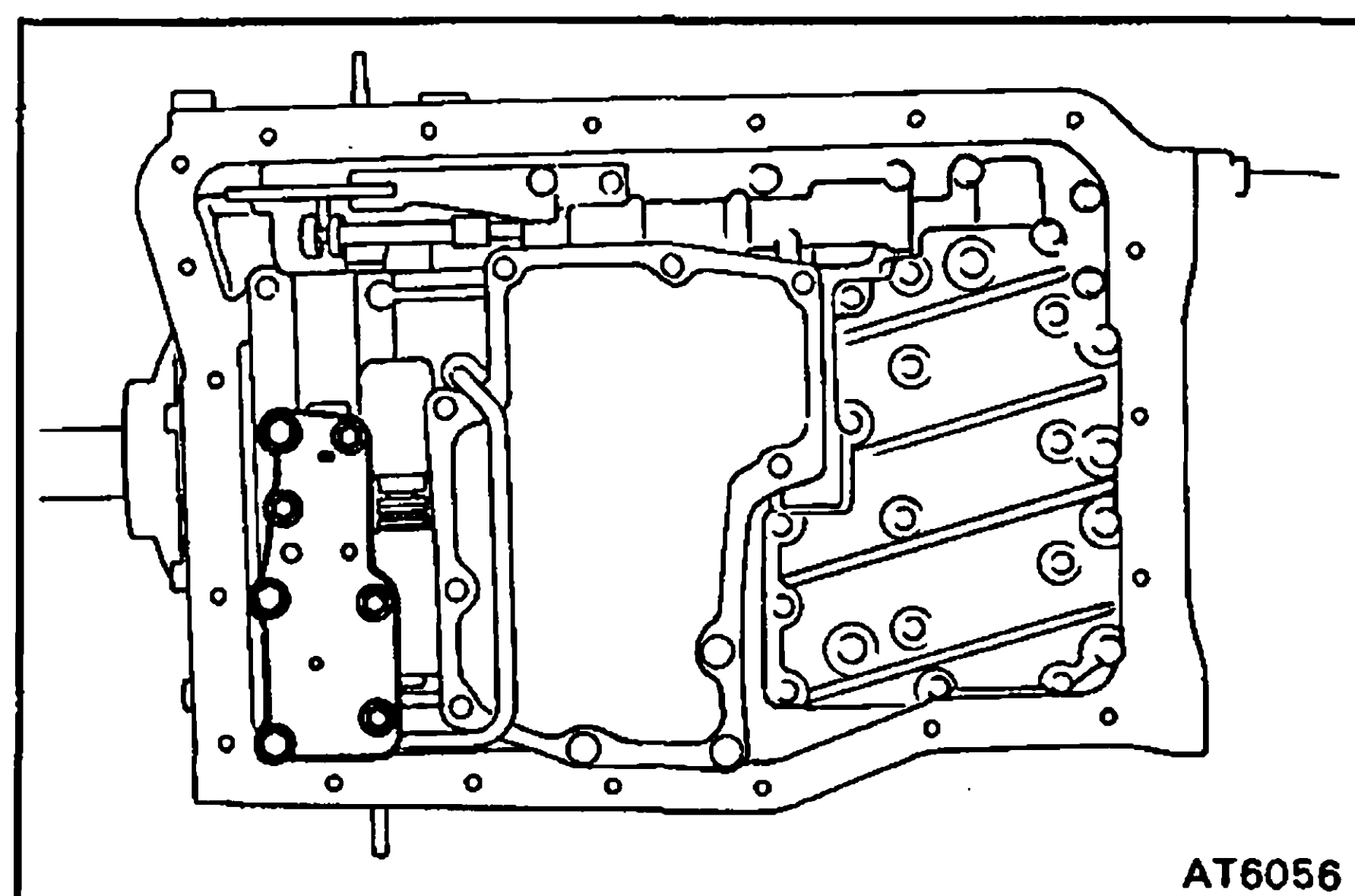
## 19. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel particles.

Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission:

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

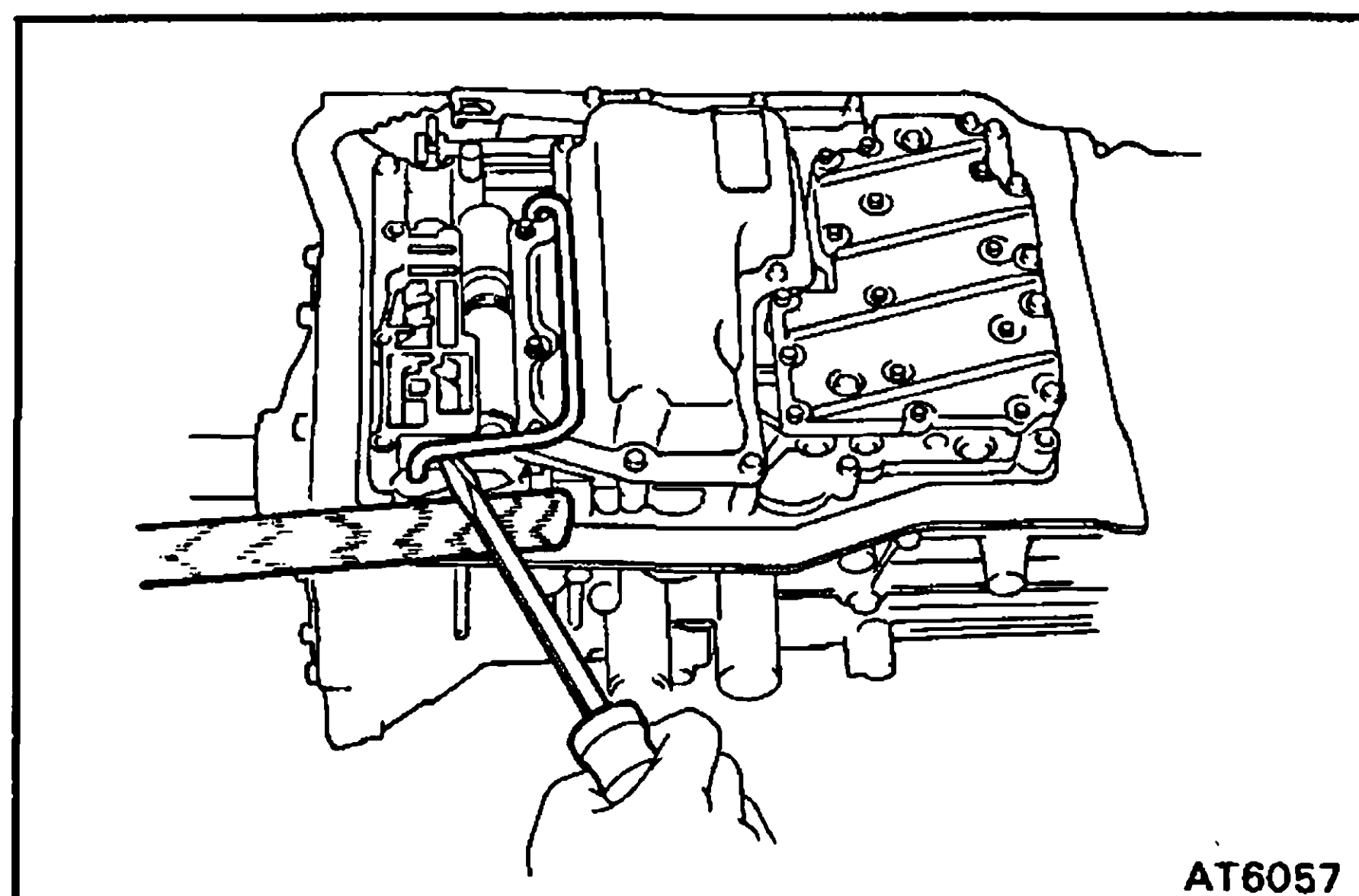
Brass (non-magnetic) ..... Bushing wear



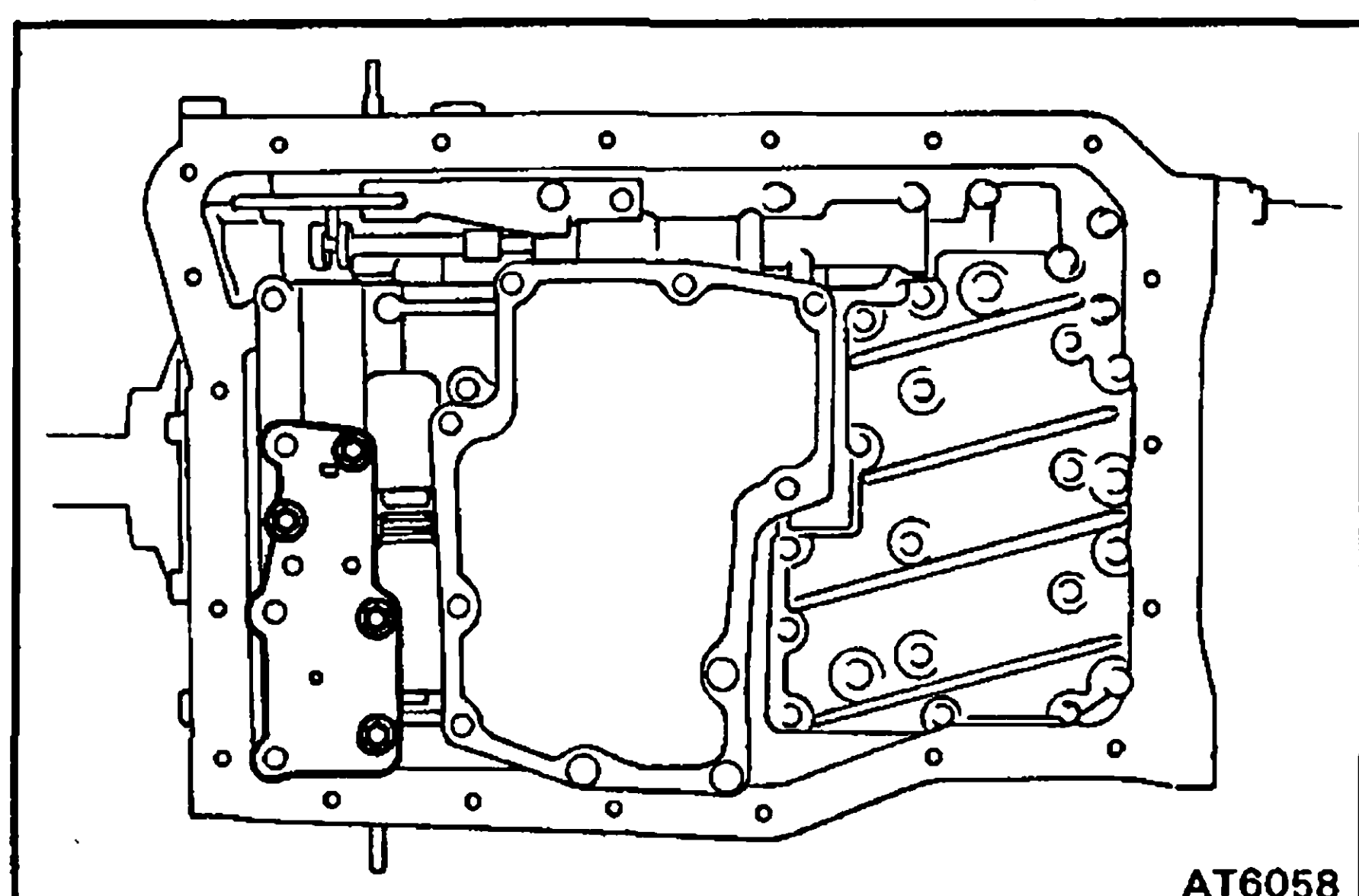
## 20. REMOVE OIL TUBE

- (a) Remove the seven bolts, four wave washers, lock-up relay valve body plate and gasket.

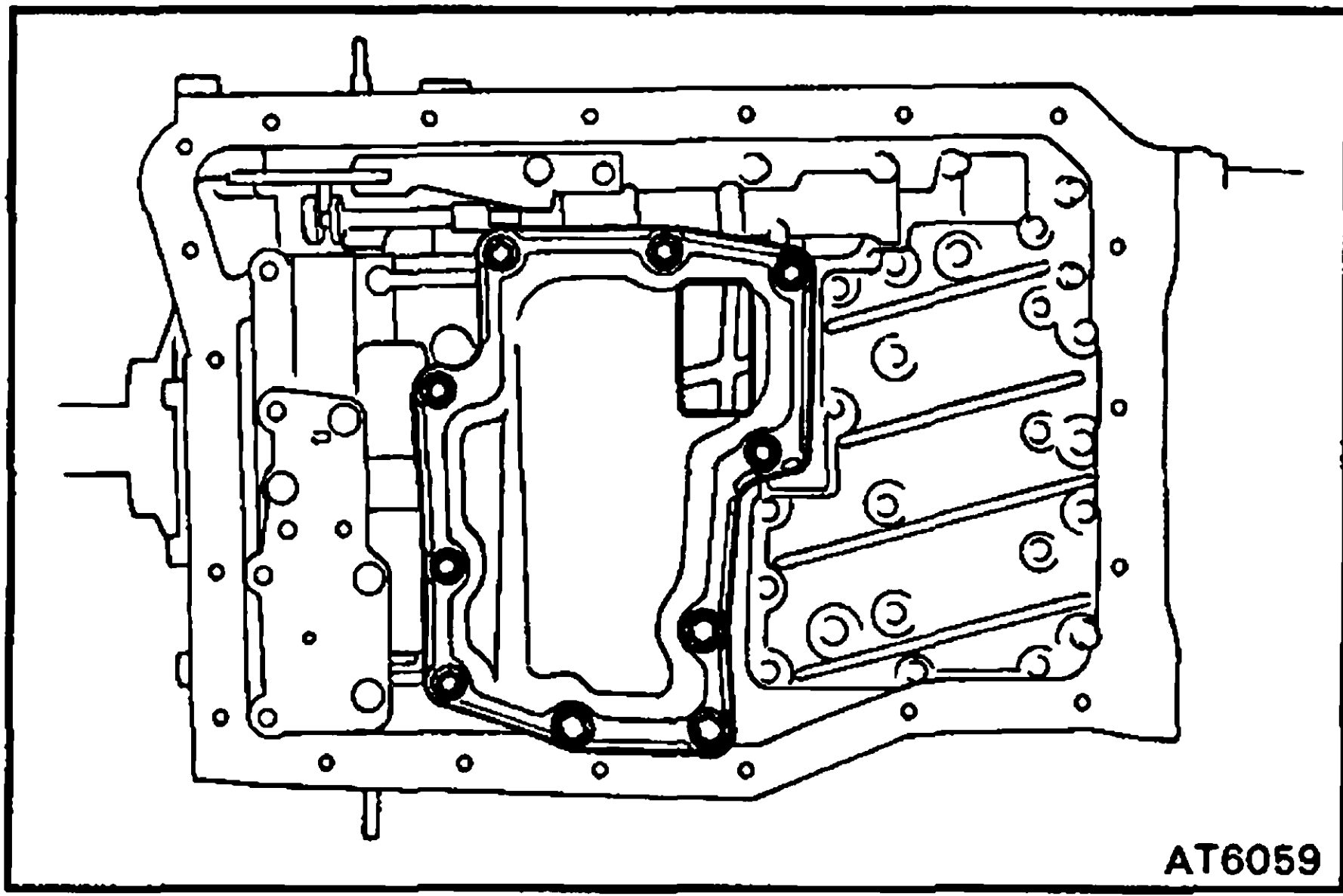
**HINT:** Do not drop the lock-up relay valve pins.



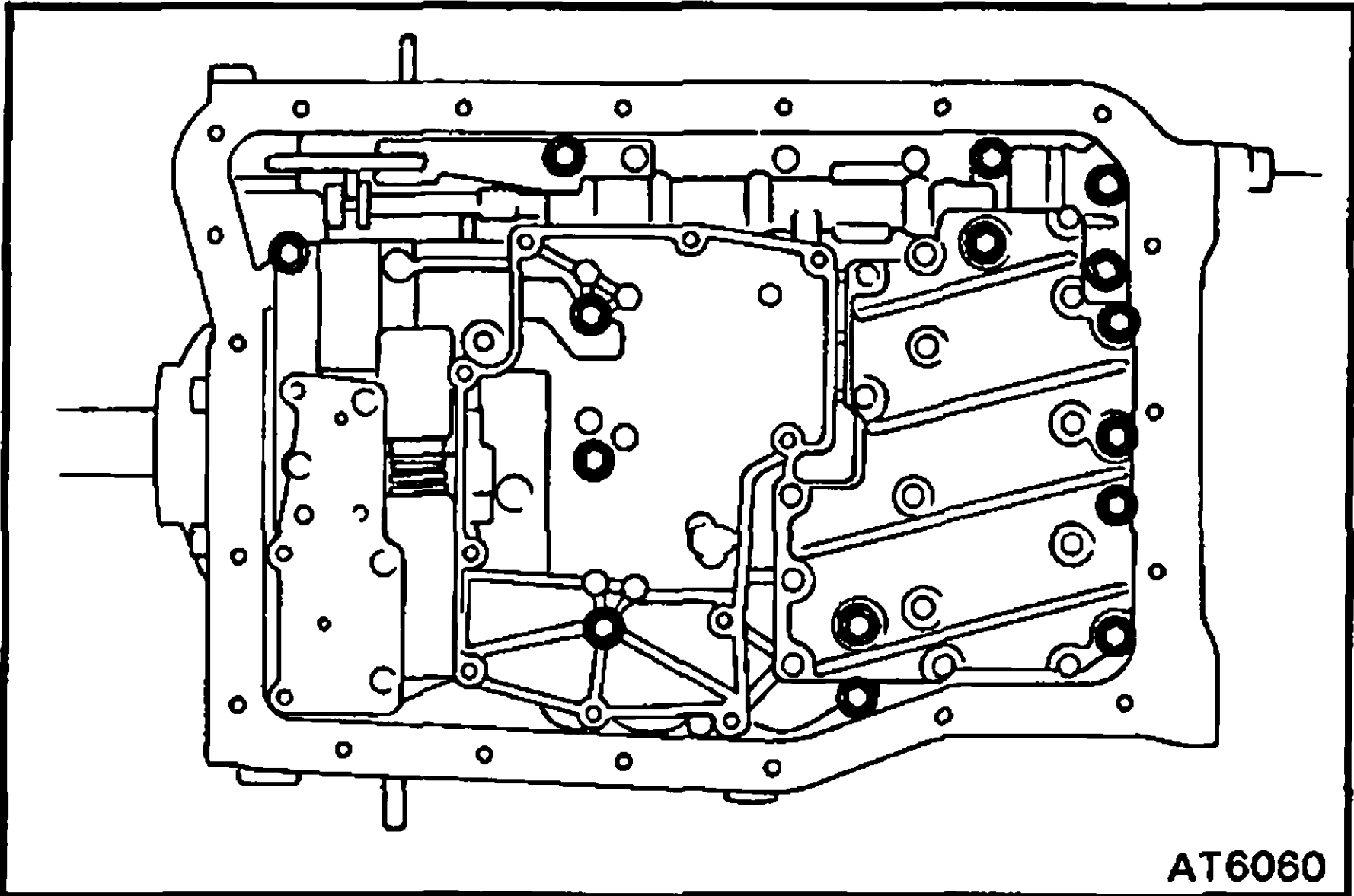
- (b) Using a large screwdriver, remove the oil tube by prying both tube ends.



- (c) Temporarily install the lock-up relay valve body plate with the four bolts.

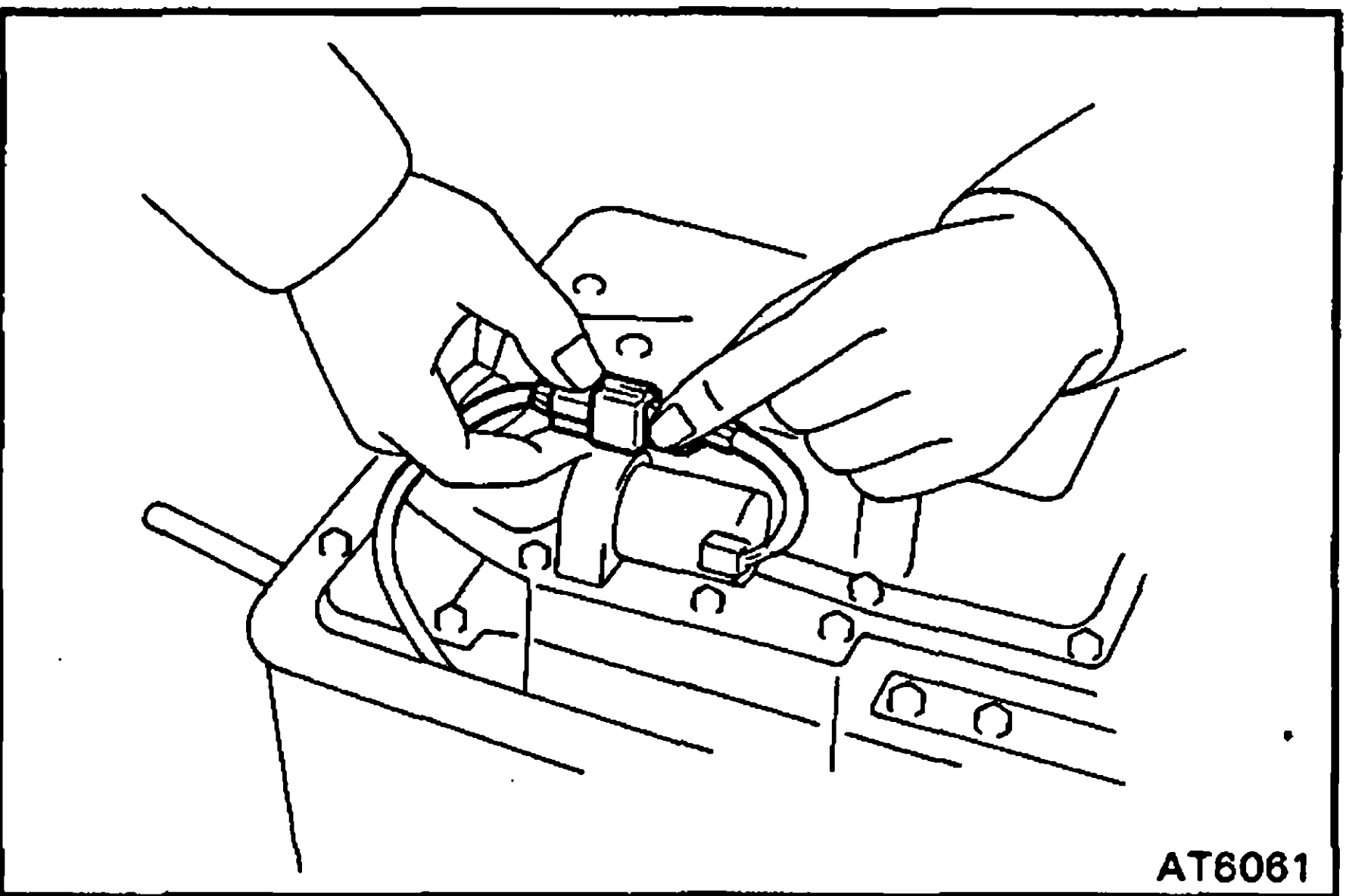
**21. REMOVE OIL STRAINER**

Remove the ten bolts, seven wave washers, oil strainer and gasket.

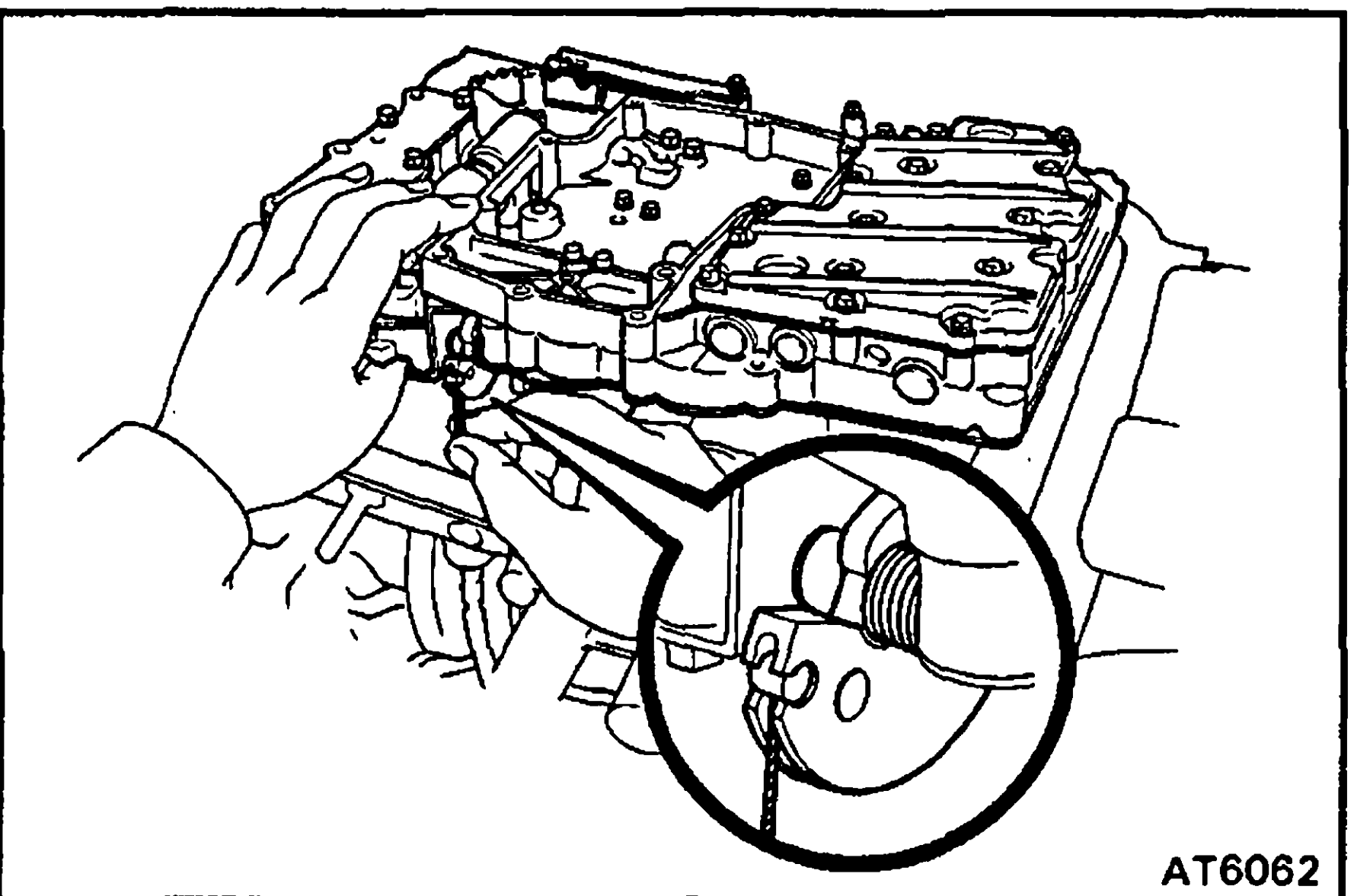
**22. REMOVE VALVE BODY**

(a) Remove the fifteen bolts.

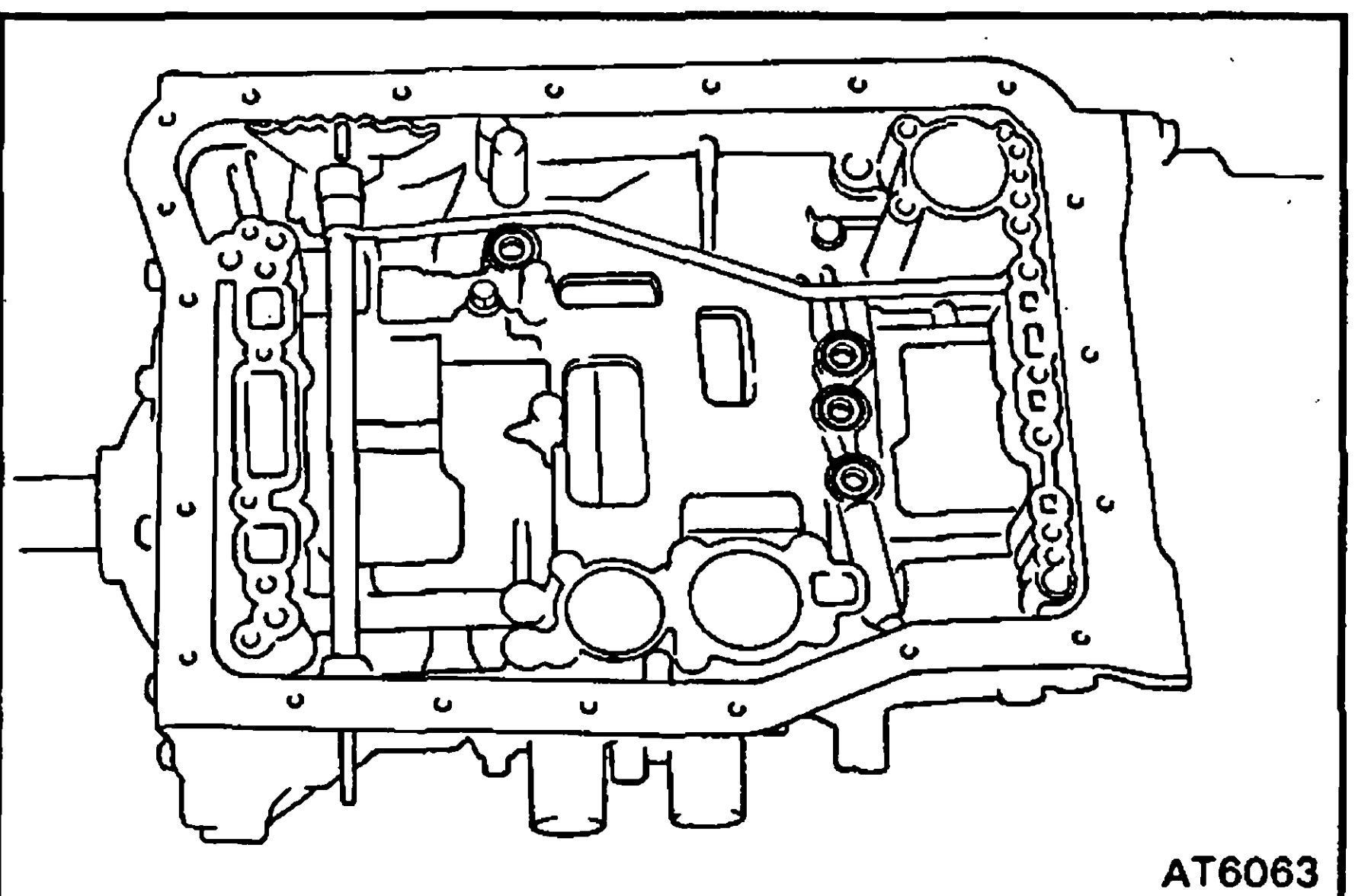
(b) (w/ Cruise Control System)  
Disconnect the connector from the solenoid.

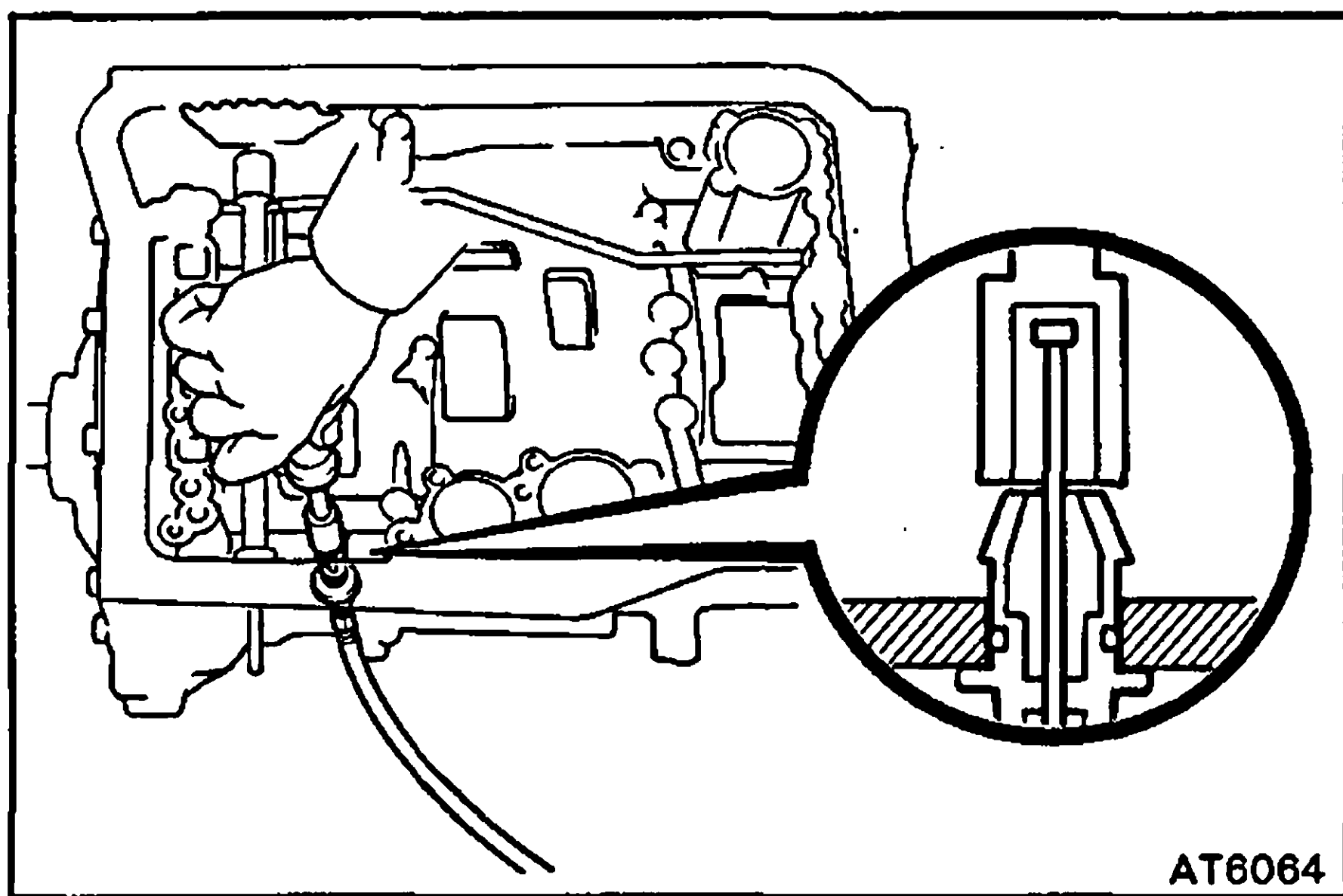


(c) Disconnect the throttle cable from the cam and remove the valve body.

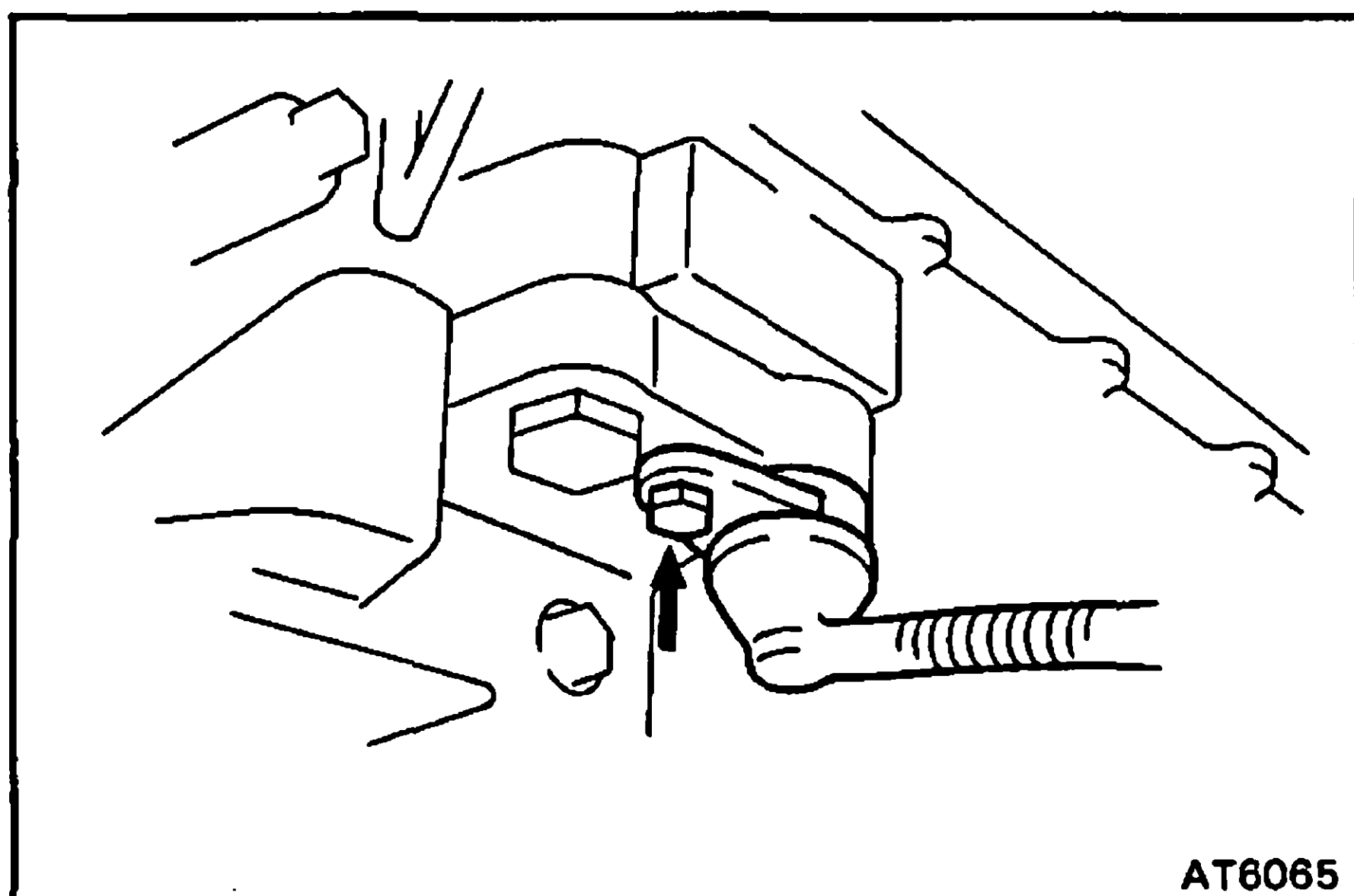
**23. REMOVE CENTER SUPPORT APPLY GASKETS**

Remove the four apply gaskets.

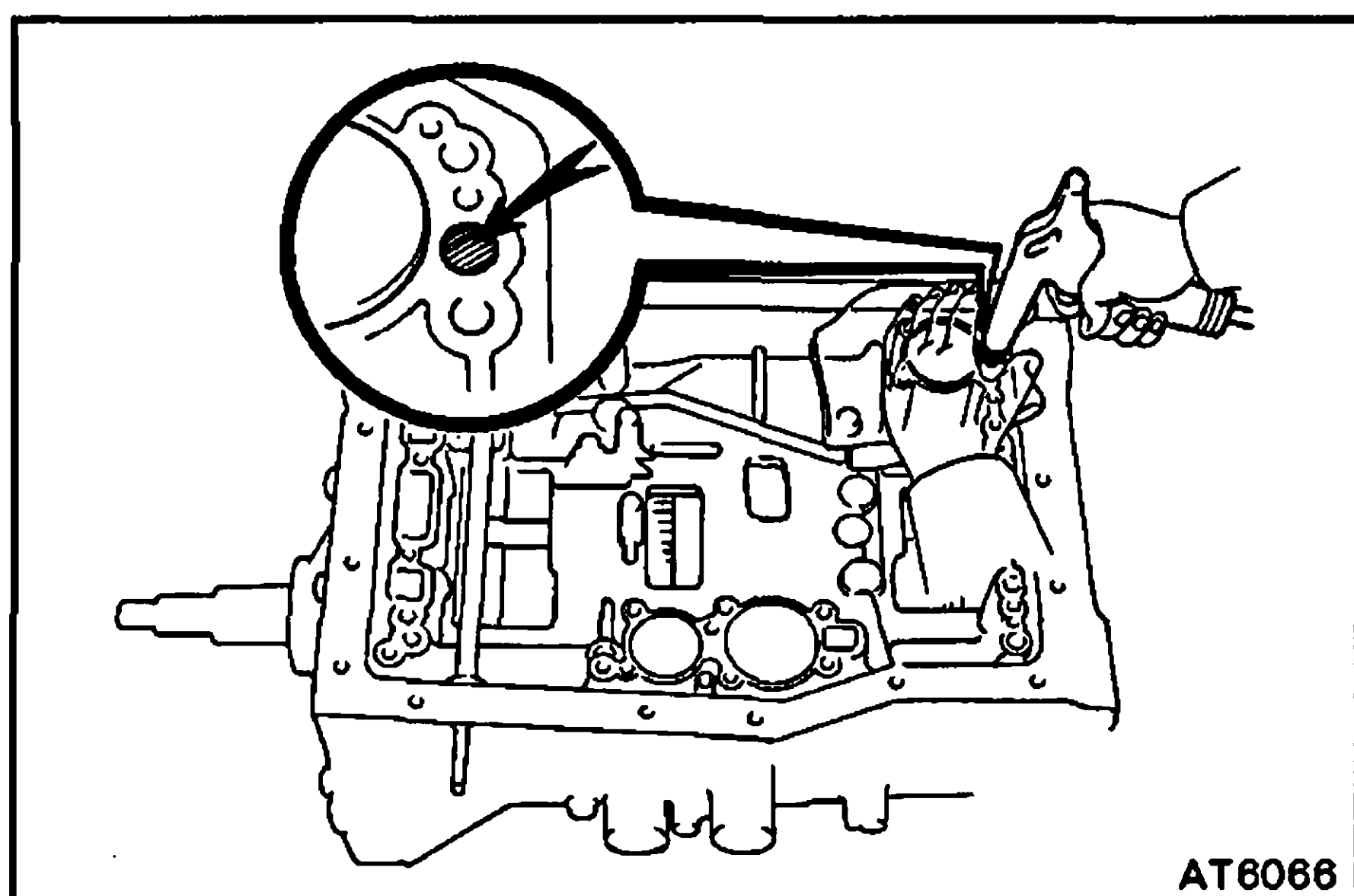


**24. REMOVE THROTTLE CABLE**

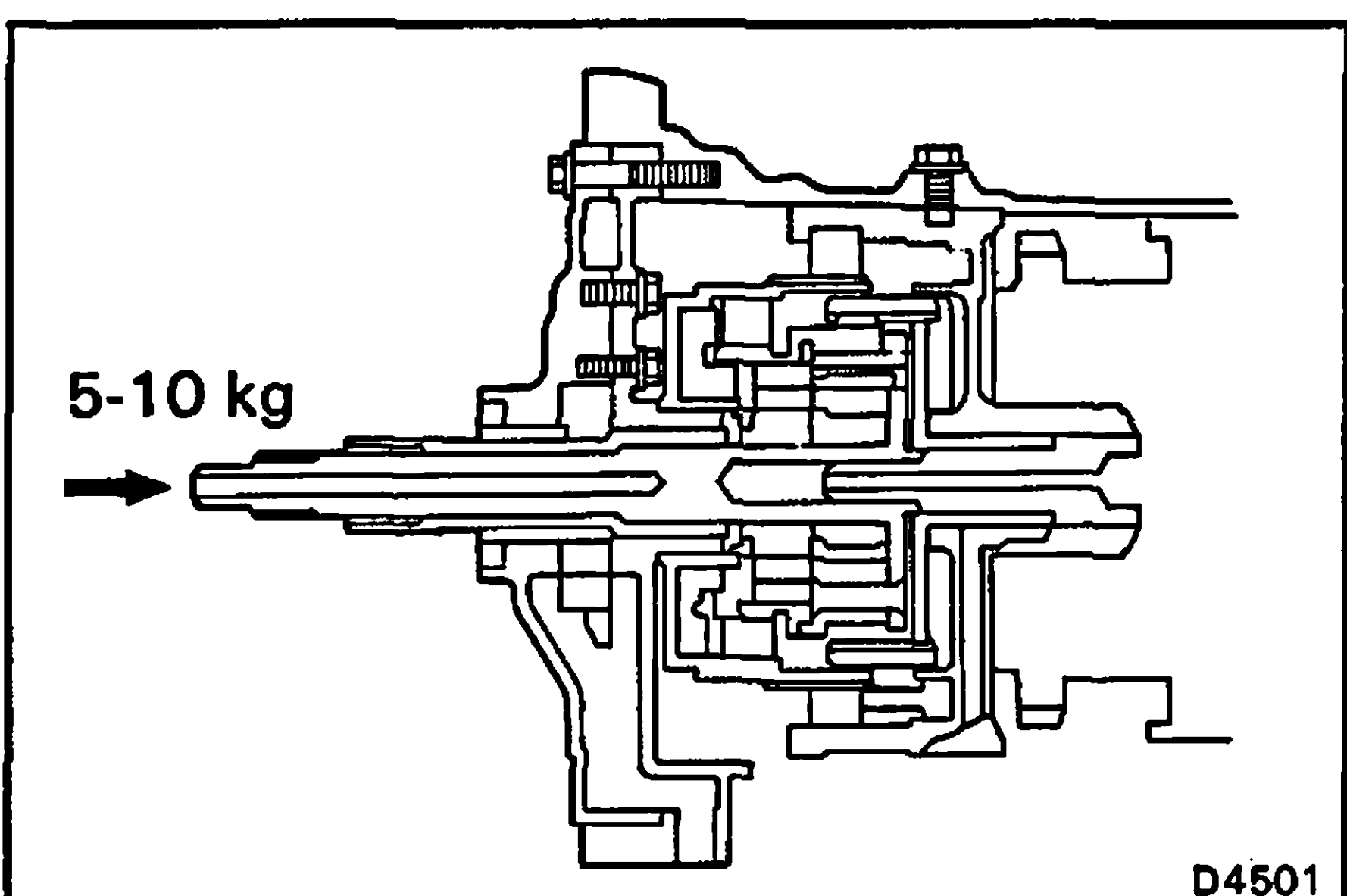
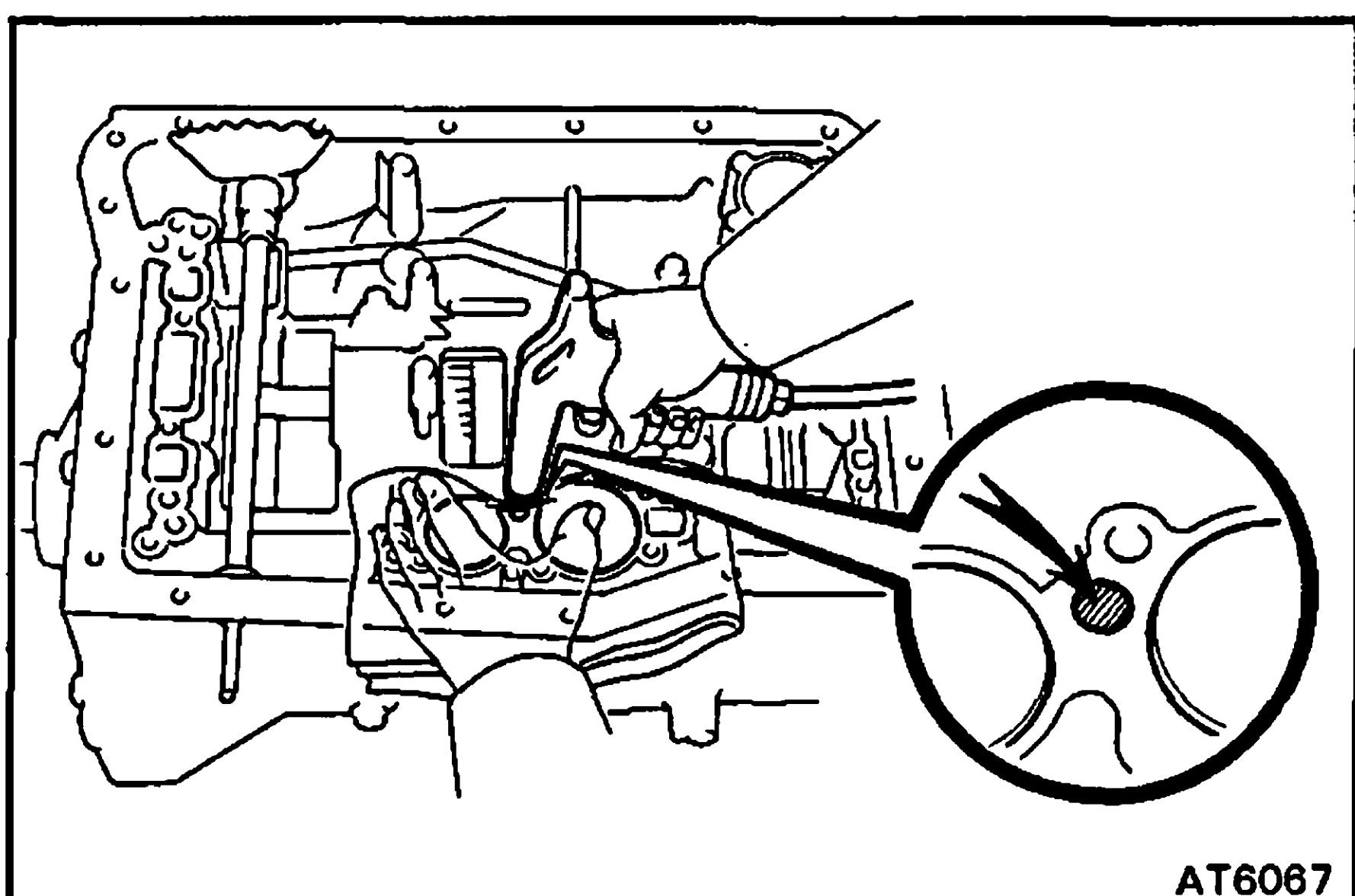
Using a 10 mm socket driver, remove the throttle cable by pushing the retainer portion of the throttle cable.

**25. (w/ Cruise Control System)  
REMOVE SOLENOID WIRING**

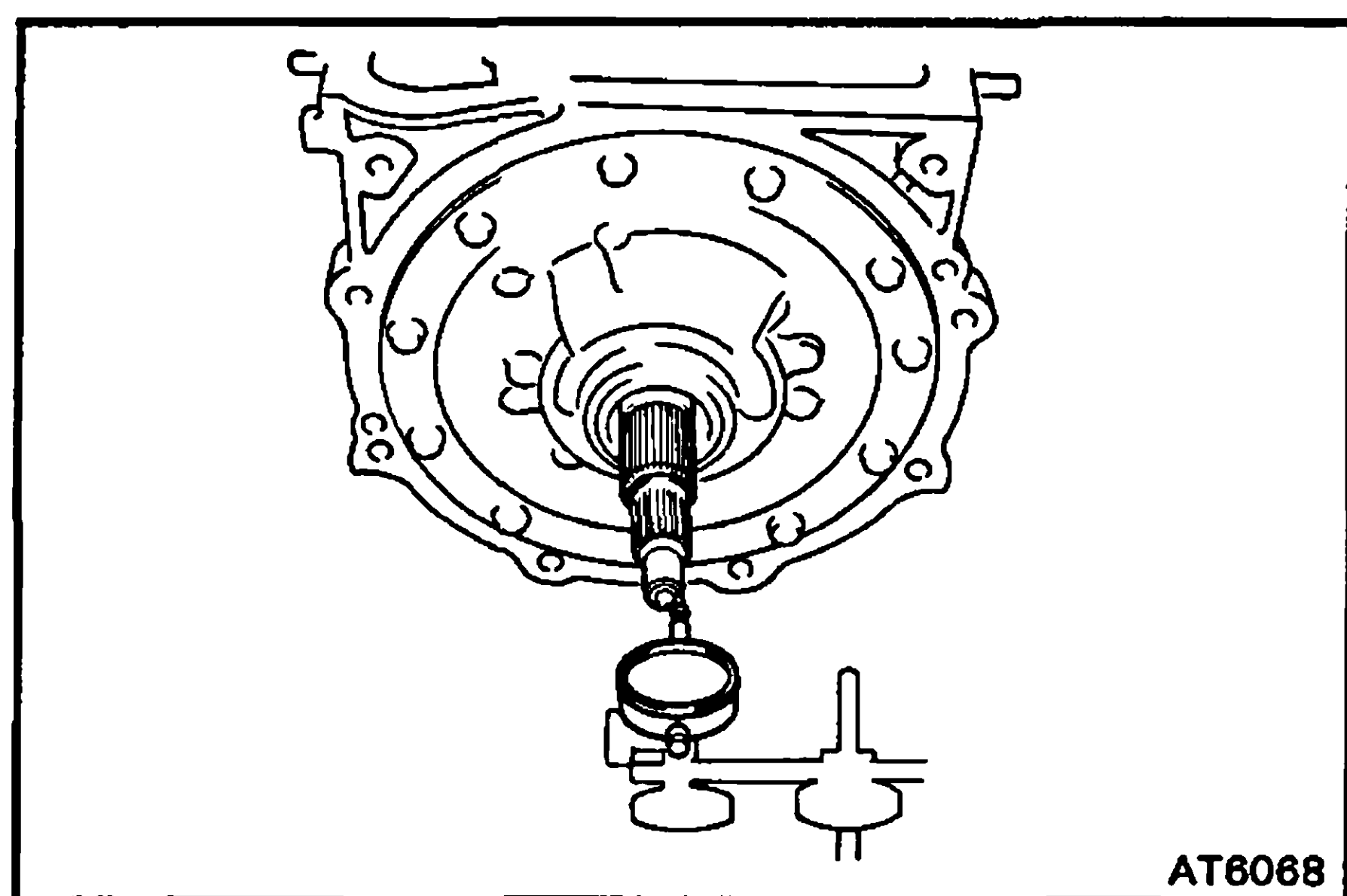
- (a) Remove the bolt and the solenoid wiring.
- (b) Remove the O-ring from it.

**26. REMOVE C<sub>2</sub>, B<sub>0</sub>, B<sub>2</sub> ACCUMULATOR PISTONS AND SPRINGS**

- (a) Remove the C<sub>2</sub> accumulator piston and spring by applying compressed air to the oil hole.
- (b) Remove the B<sub>0</sub> accumulator piston together with the B<sub>2</sub> accumulator piston by applying compressed air to the oil hole.
- (c) Remove the B<sub>0</sub> and B<sub>2</sub> accumulator pistons.
- (d) Remove the O-ring from the accumulator pistons.

**27. CHECK THRUST CLEARANCE OF OVERDRIVE INPUT SHAFT (OVERDRIVE PLANETARY GEAR)**

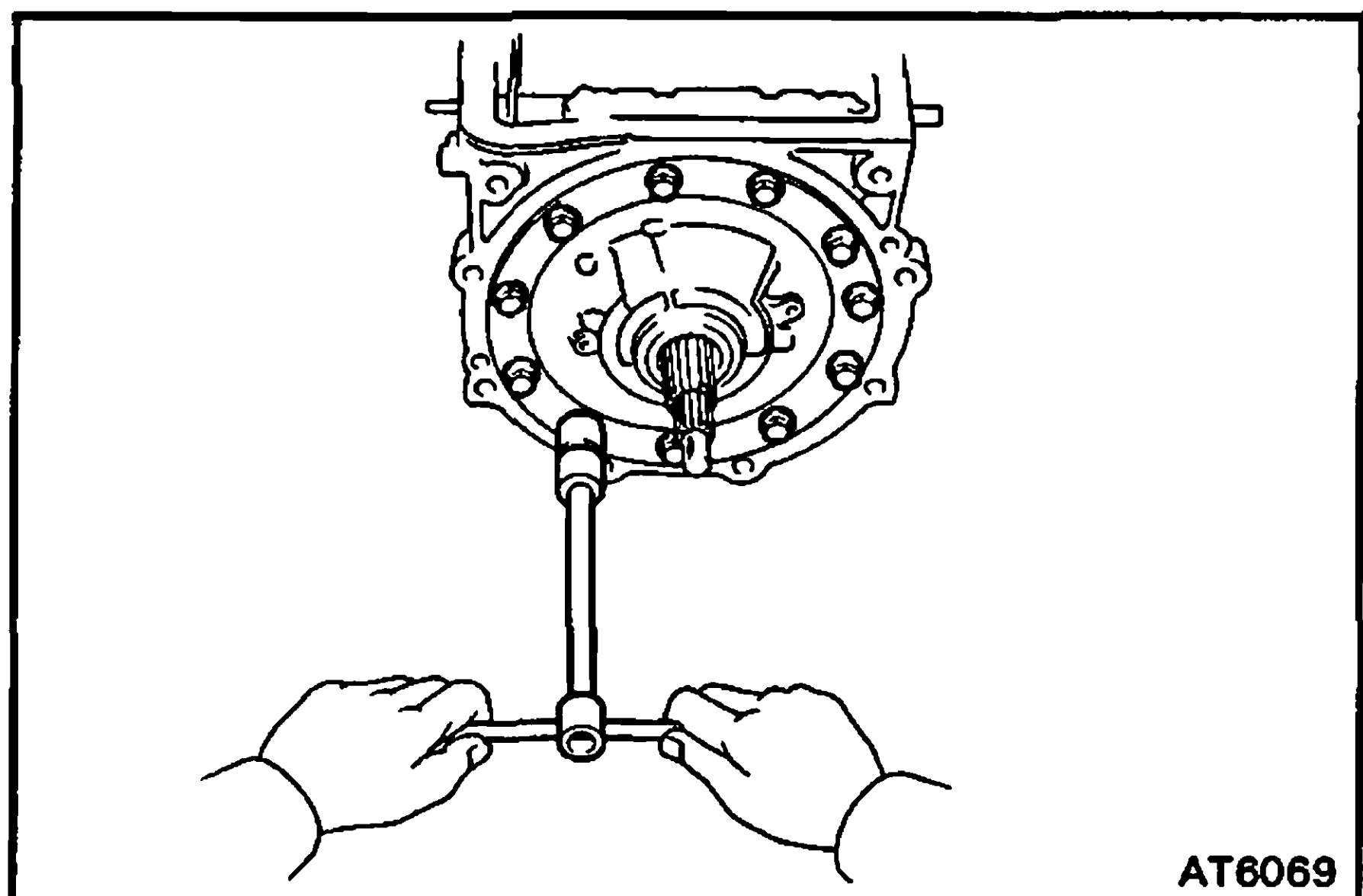
- (a) Push the O/D input shaft toward the rear of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).



- (b) Using dial indicator, measure the thrust clearance of the input shaft.

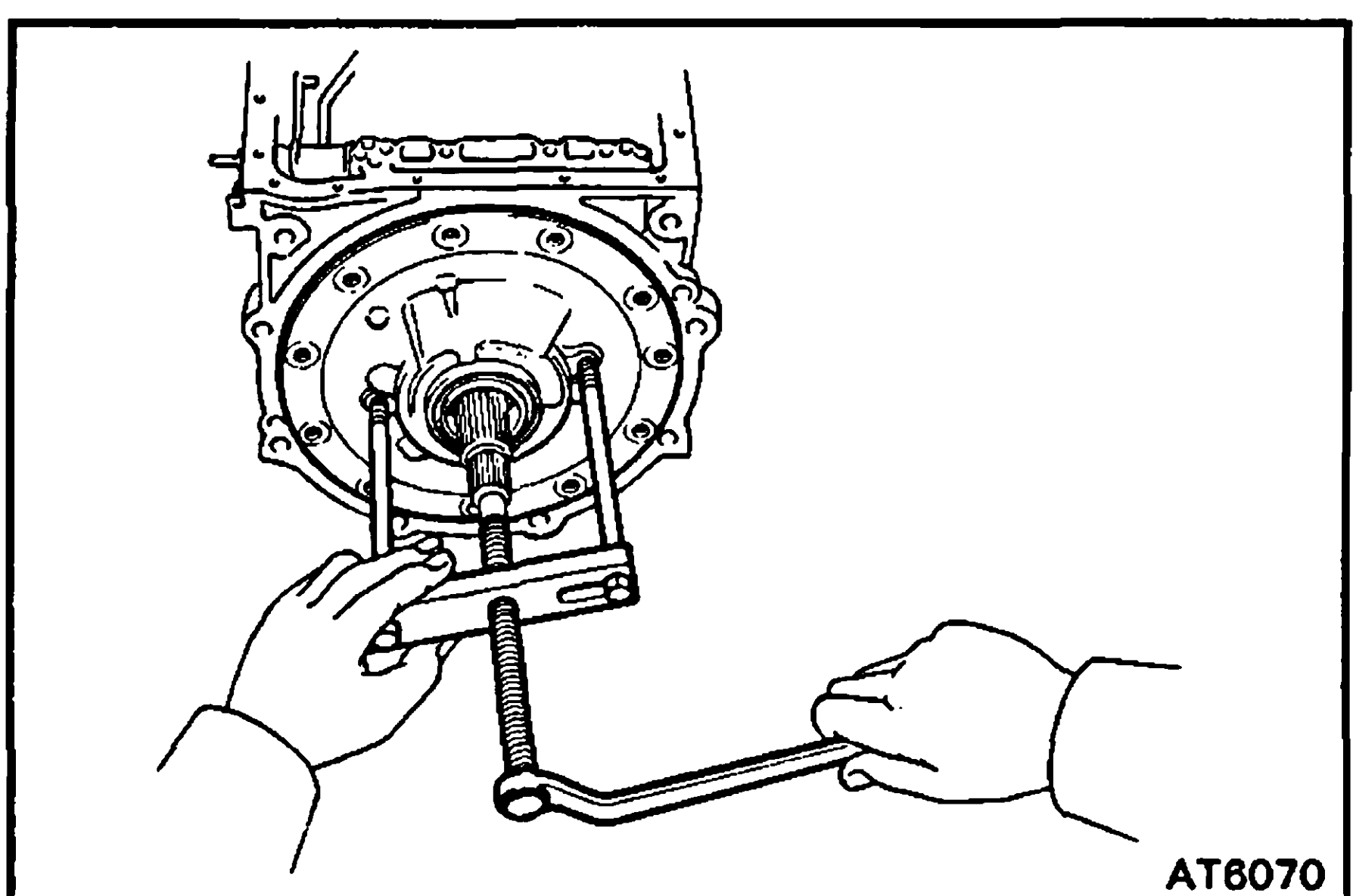
**Standard thrust clearance:** 0.40 – 0.90 mm  
(0.0157 – 0.0354 in.)

**Maximum thrust clearance:** 0.90 mm (0.0354 in.)



## 28. REMOVE OIL PUMP

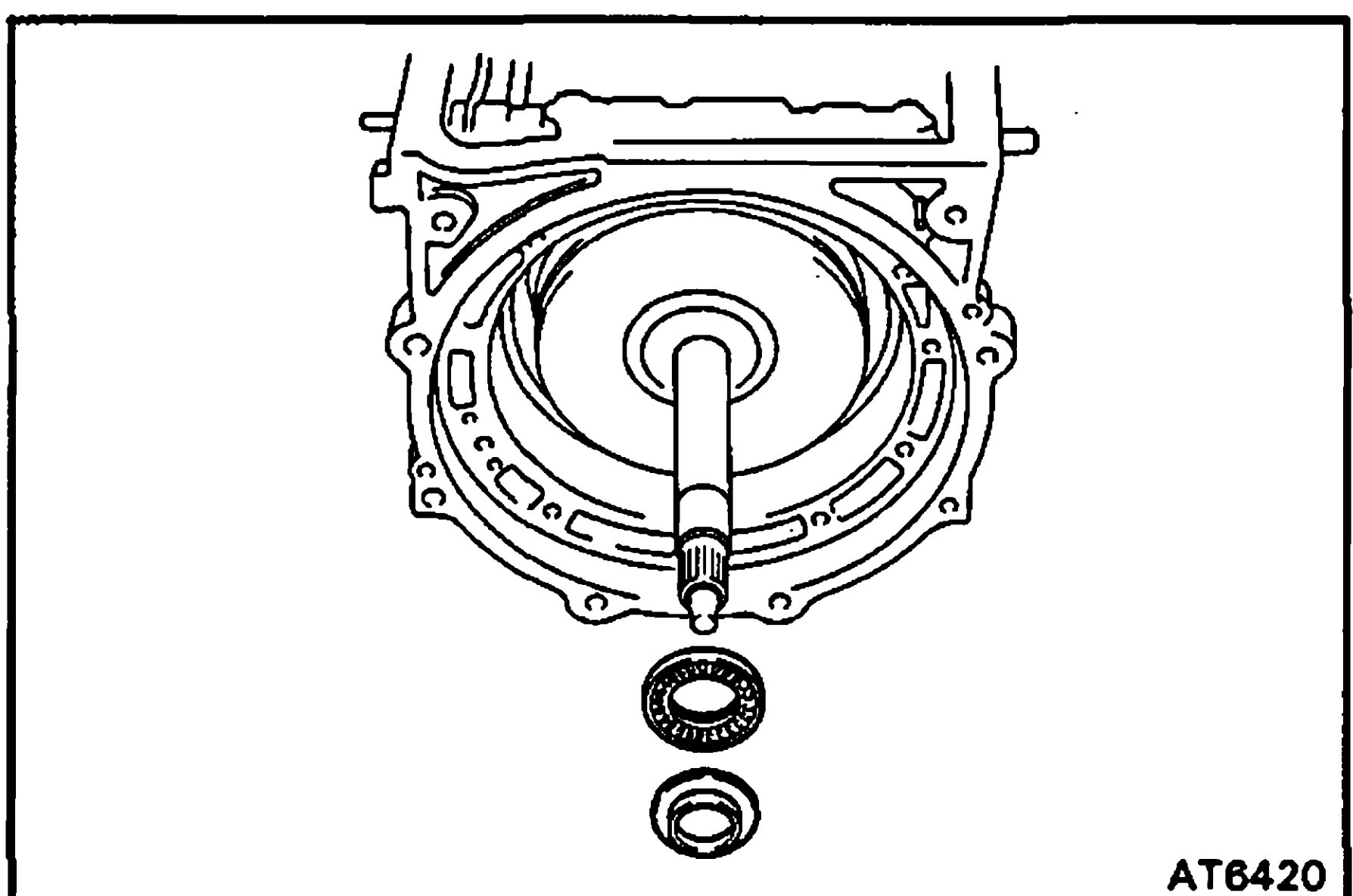
- (a) Remove the eleven bolts holding the oil pump to the transmission case.



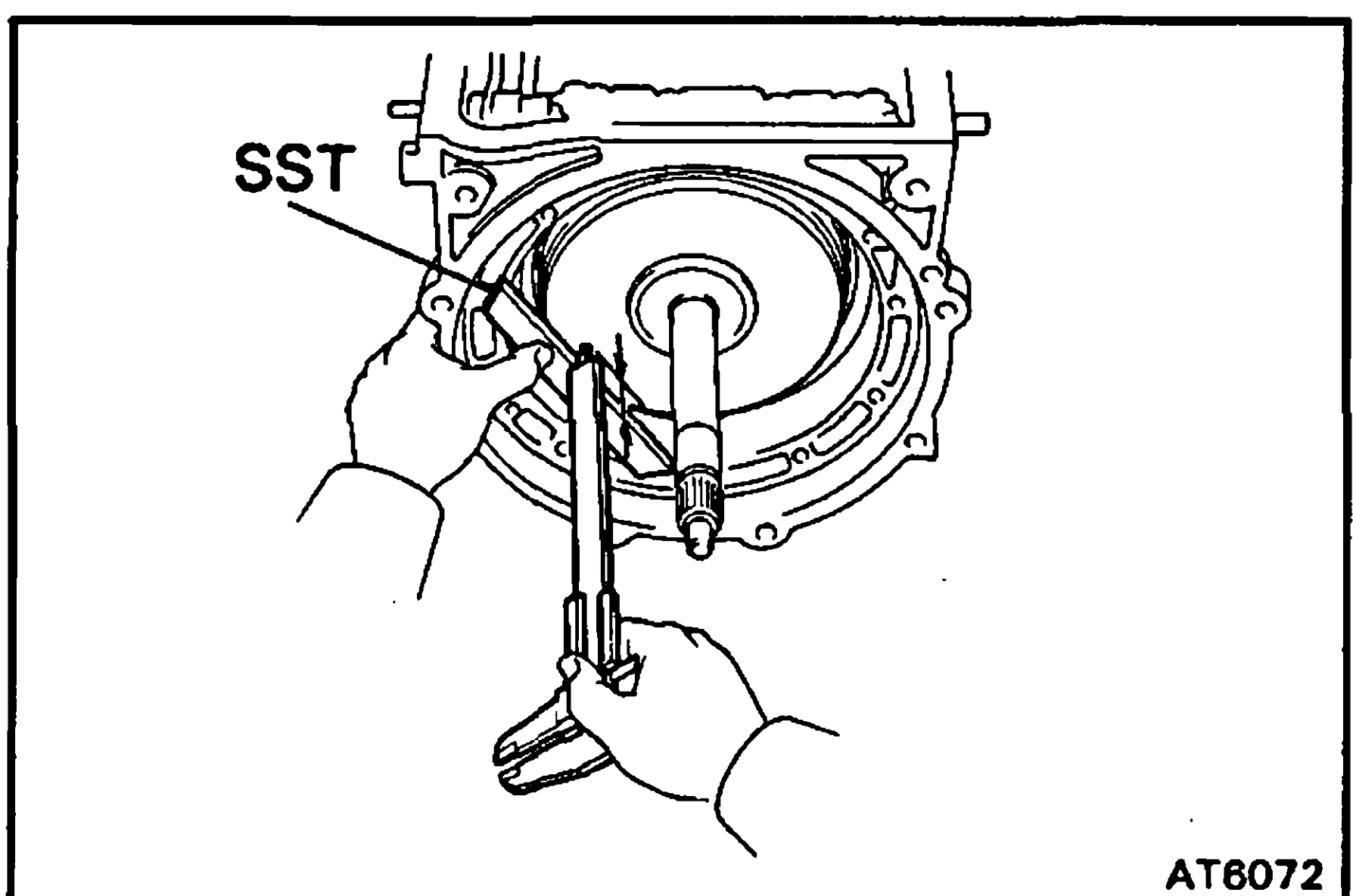
- (b) Using SST, remove the oil pump and gasket.

SST 09350-36010 (09350-06140)

- (c) Remove the O-ring from the oil pump.



- (d) Remove the assembled bearing and race from the O/D direct clutch drum or oil pump.

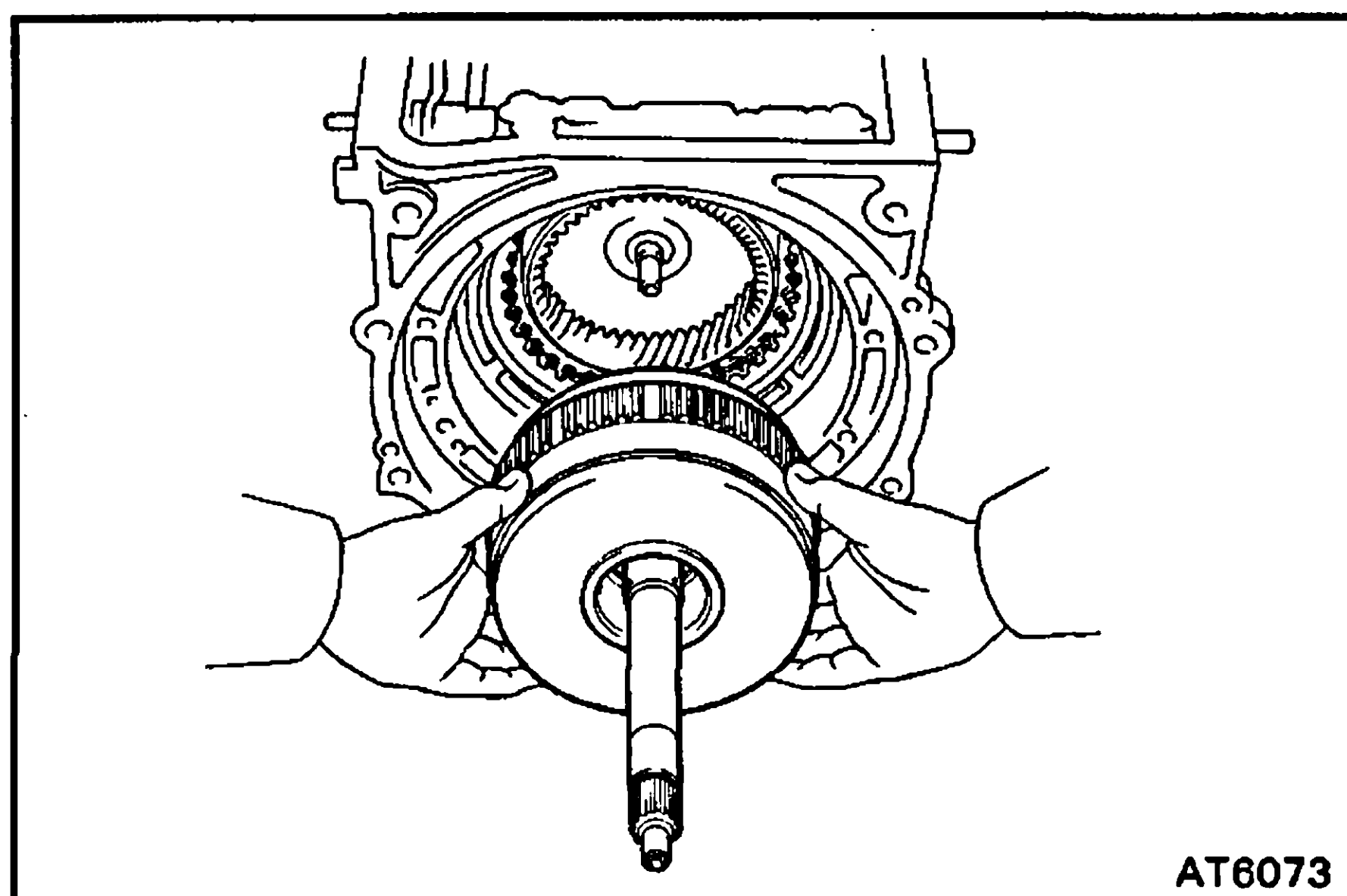


## 29. REMOVE OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH ASSEMBLY

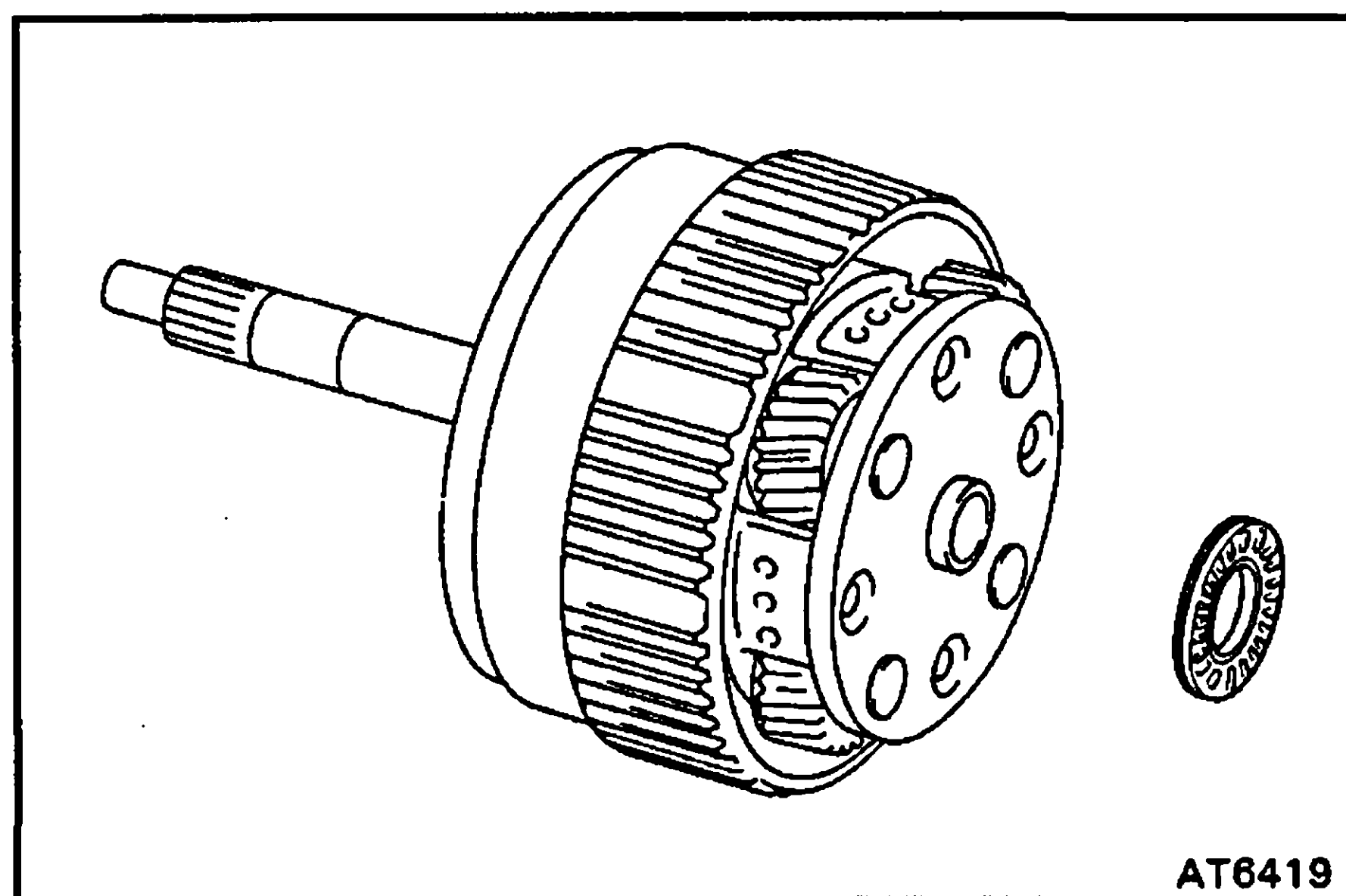
- (a) Place SST on the installation surface of the oil pump.

SST 09350-36010 (09350-06090)

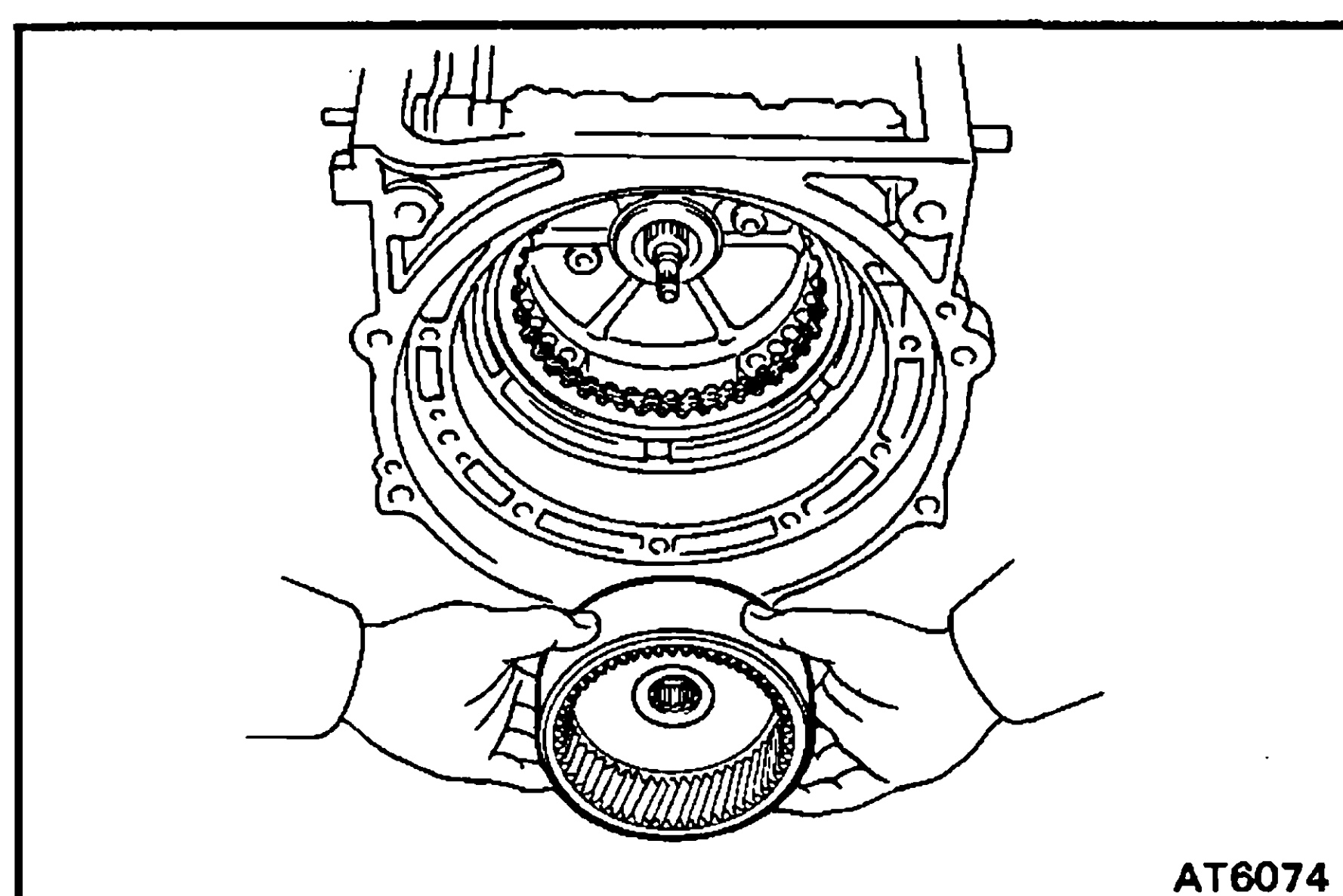
- (b) Using calipers, measure the distance between the tops of SST and the clutch drum for assembly.



- (c) Remove the O/D planetary gear, direct clutch and one-way clutch assembly.

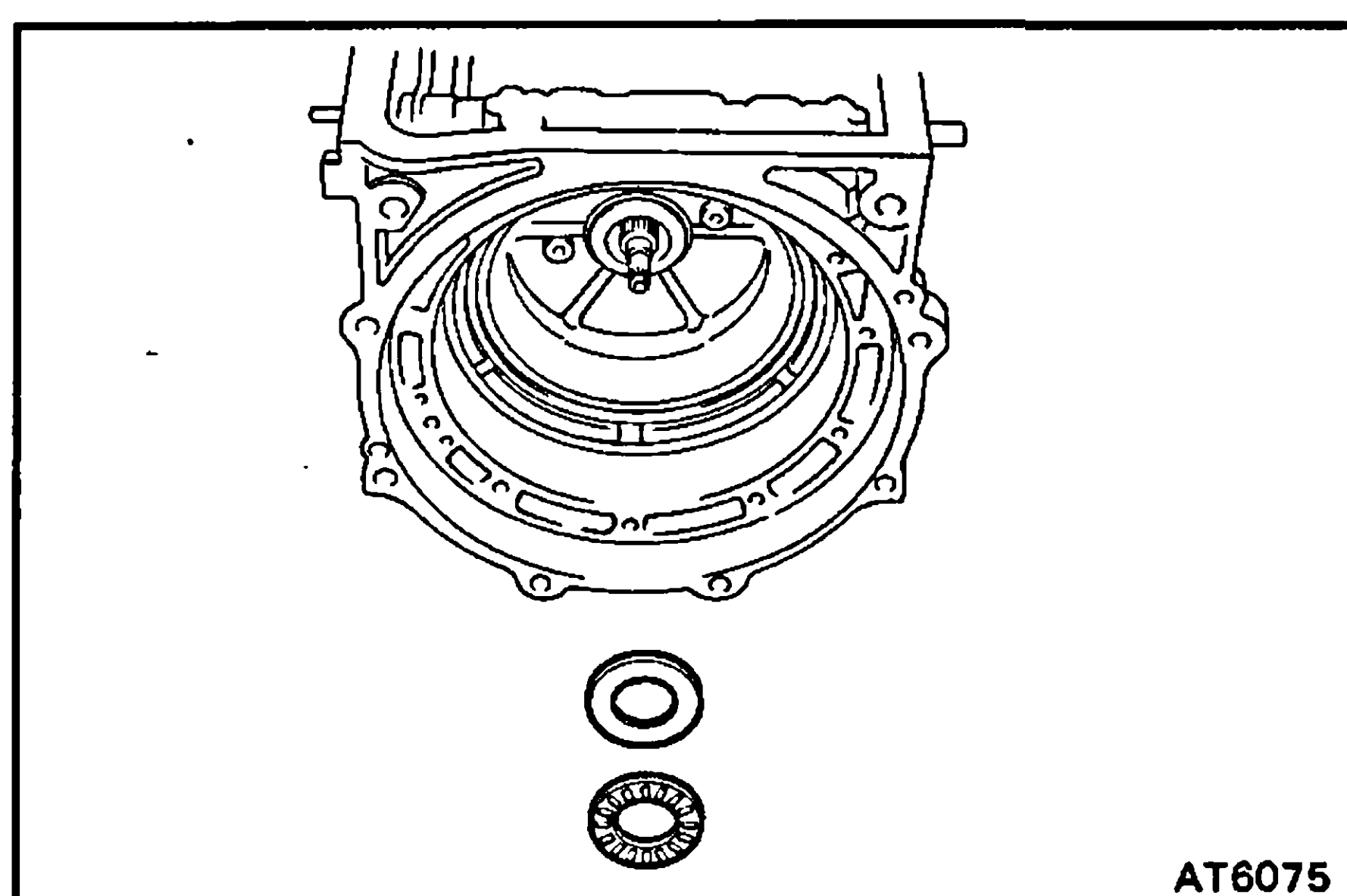


- (d) Remove the assembled bearing and race from the O/D planetary gear or ring gear.

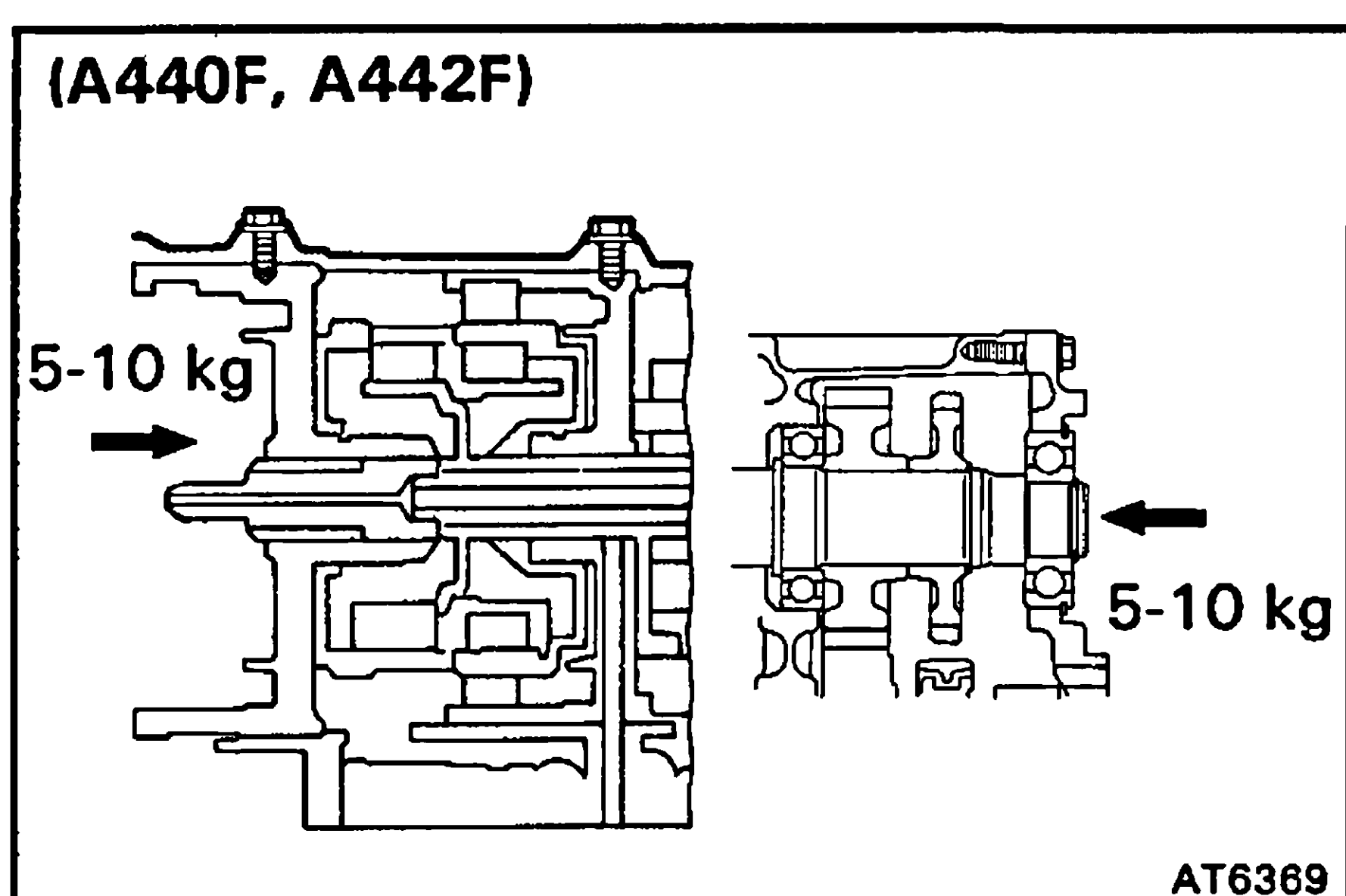


### 30. REMOVE OVERDRIVE PLANETARY RING GEAR ASSEMBLY

- (a) Remove the ring gear assembly from the O/D case.



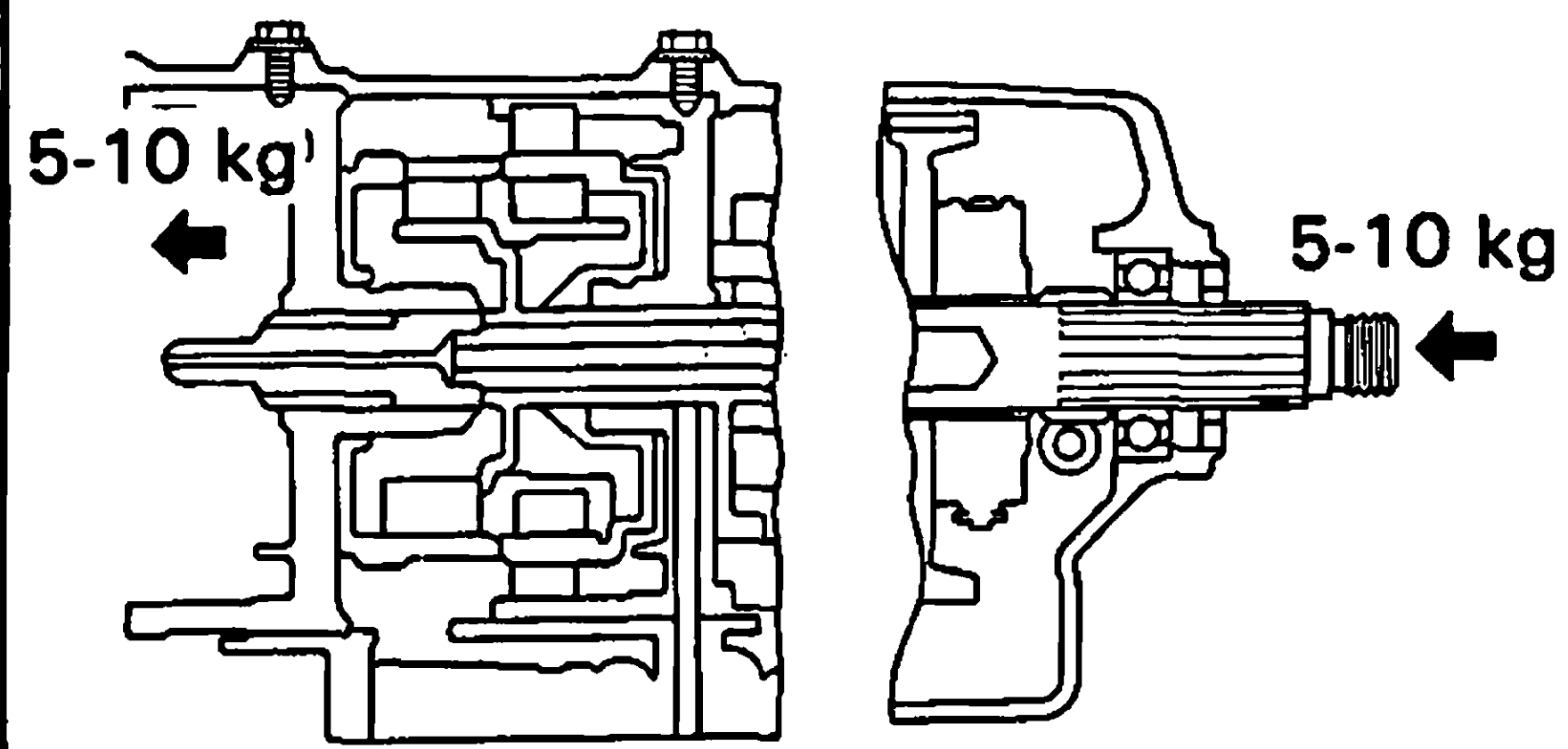
- (b) Remove the thrust bearing and race from the O/D case or ring gear flange.



### 31. CHECK THRUST CLEARANCE OF INPUT SHAFT (FRONT CLUTCH DRUM)

- (a) Push the transmission output shaft toward the front of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).
- (b) Push the O/D case toward the rear of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).

(A441L)



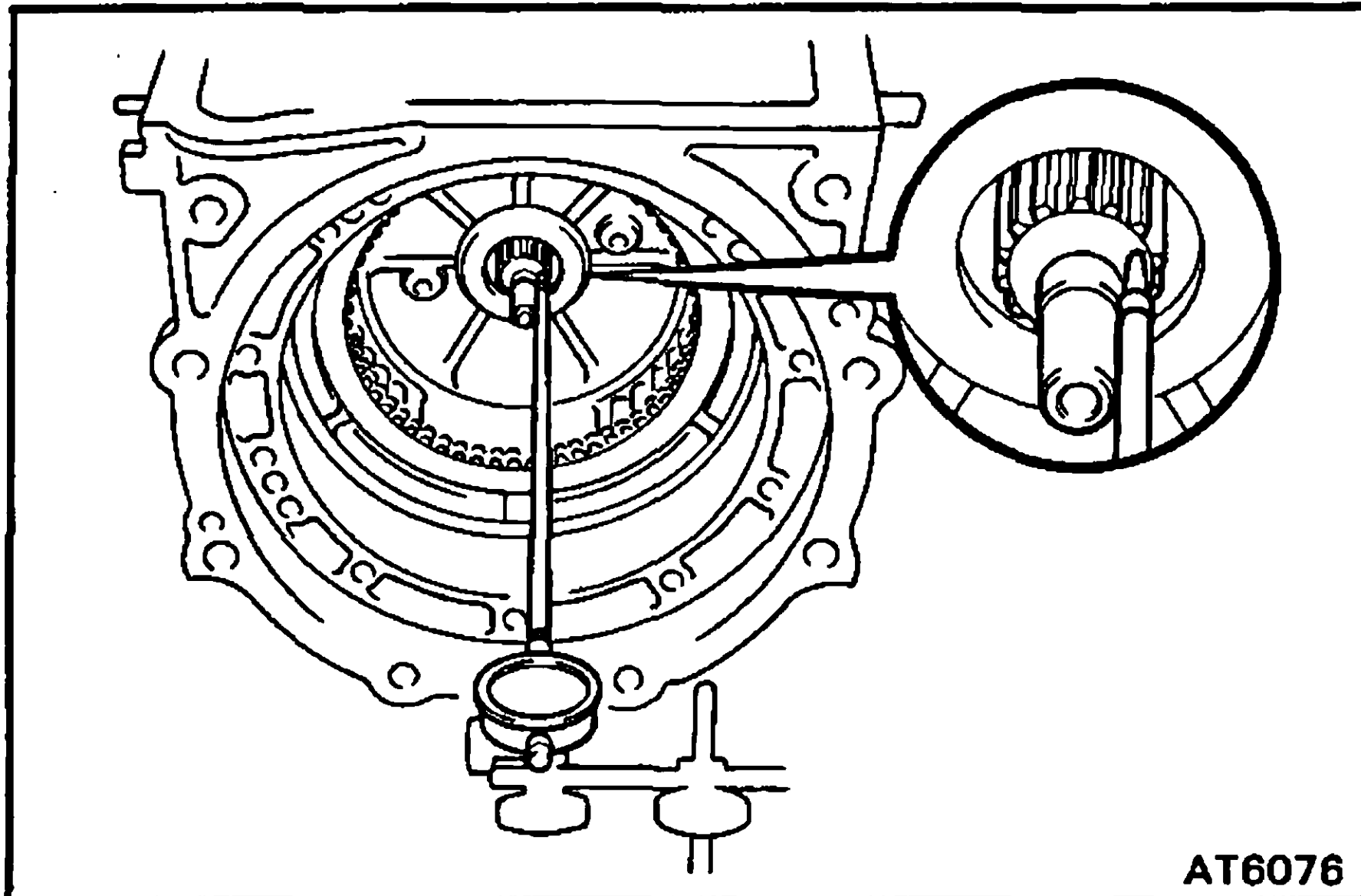
AT6373

- (c) Using SST and dial indicator, measure the thrust clearance of the input shaft.

SST 09350-36010 (09350-06130)

Standard thrust clearance: 0.30 — 0.70 mm  
(0.0118 — 0.0276 in.)

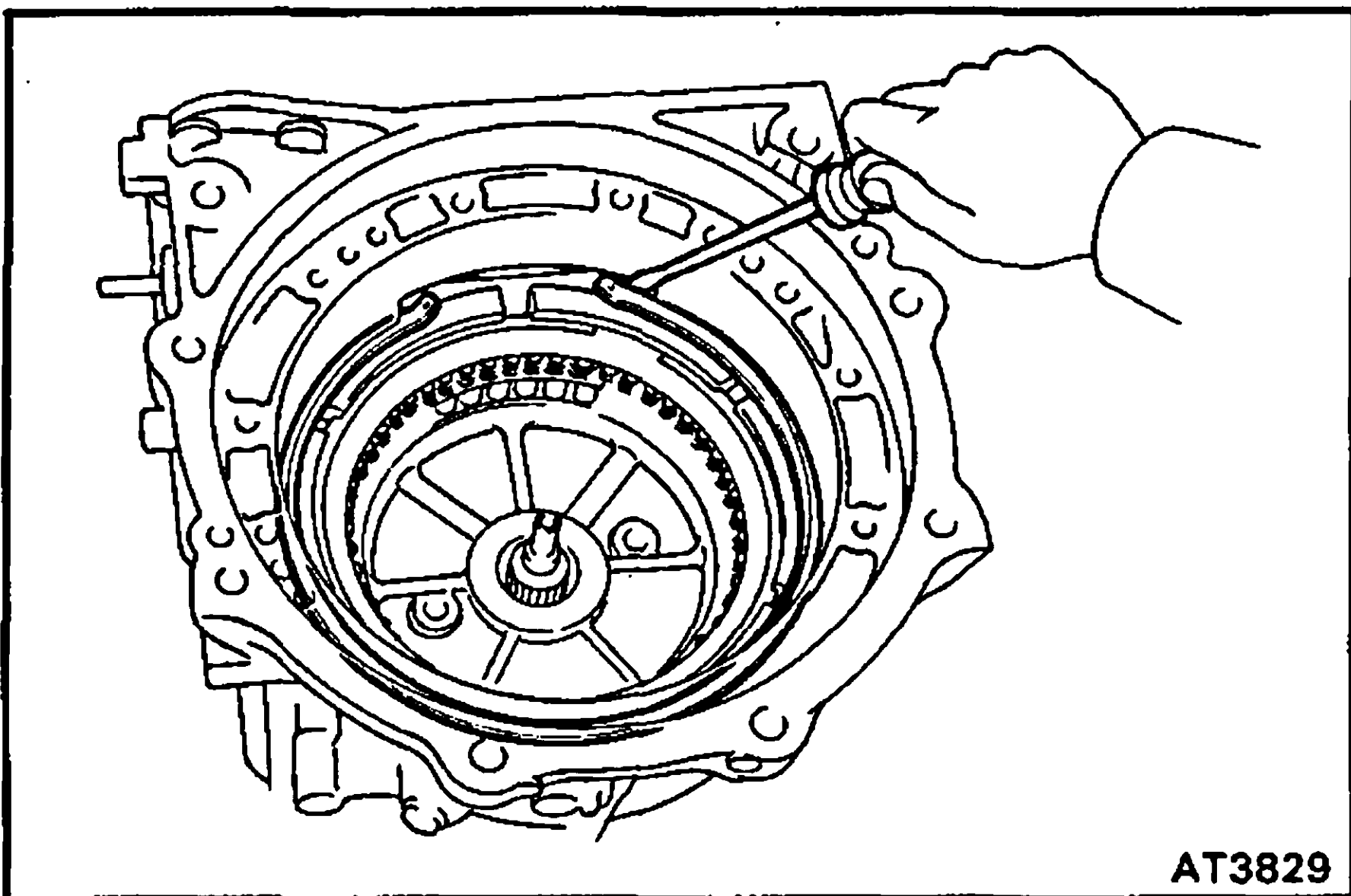
Maximum thrust clearance: 0.70 mm (0.0276 in.)



AT6076

## 32. REMOVE OVERDRIVE CASE ASSEMBLY

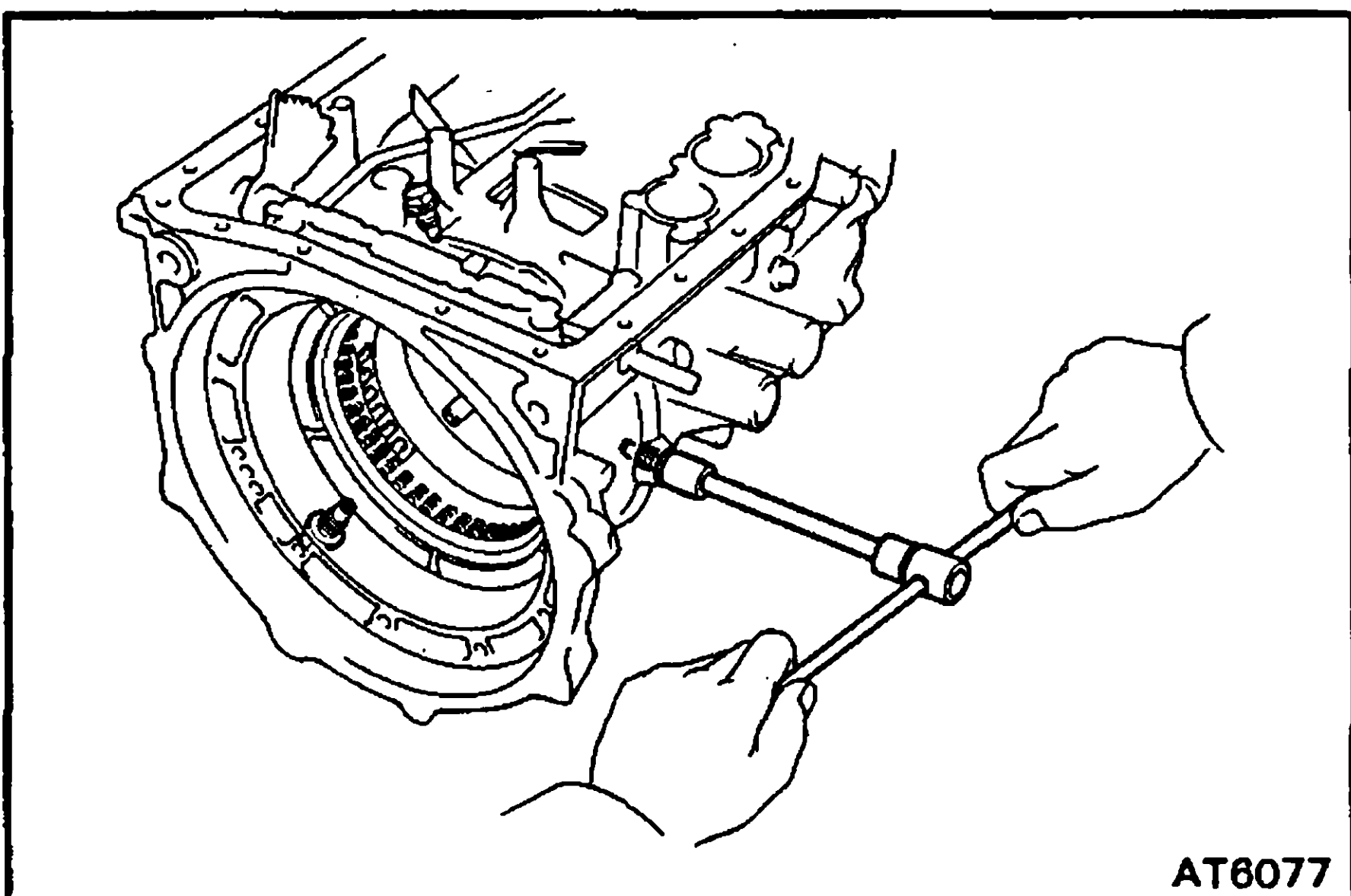
- (a) Using a screwdriver, remove the snap ring.



AT3829

(A441L, A440F)

- (b) Remove the three O/D case set bolts.

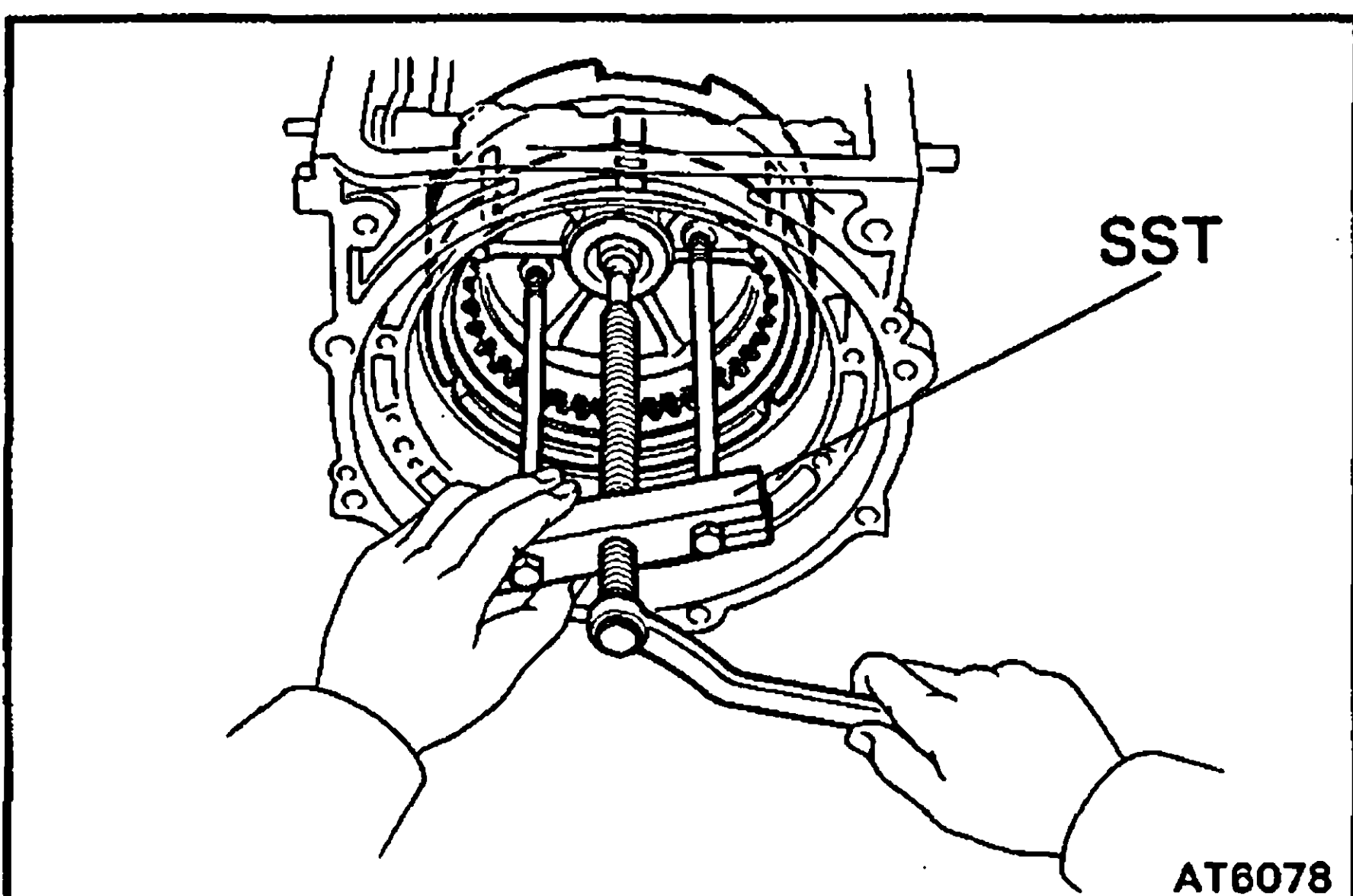


AT6077

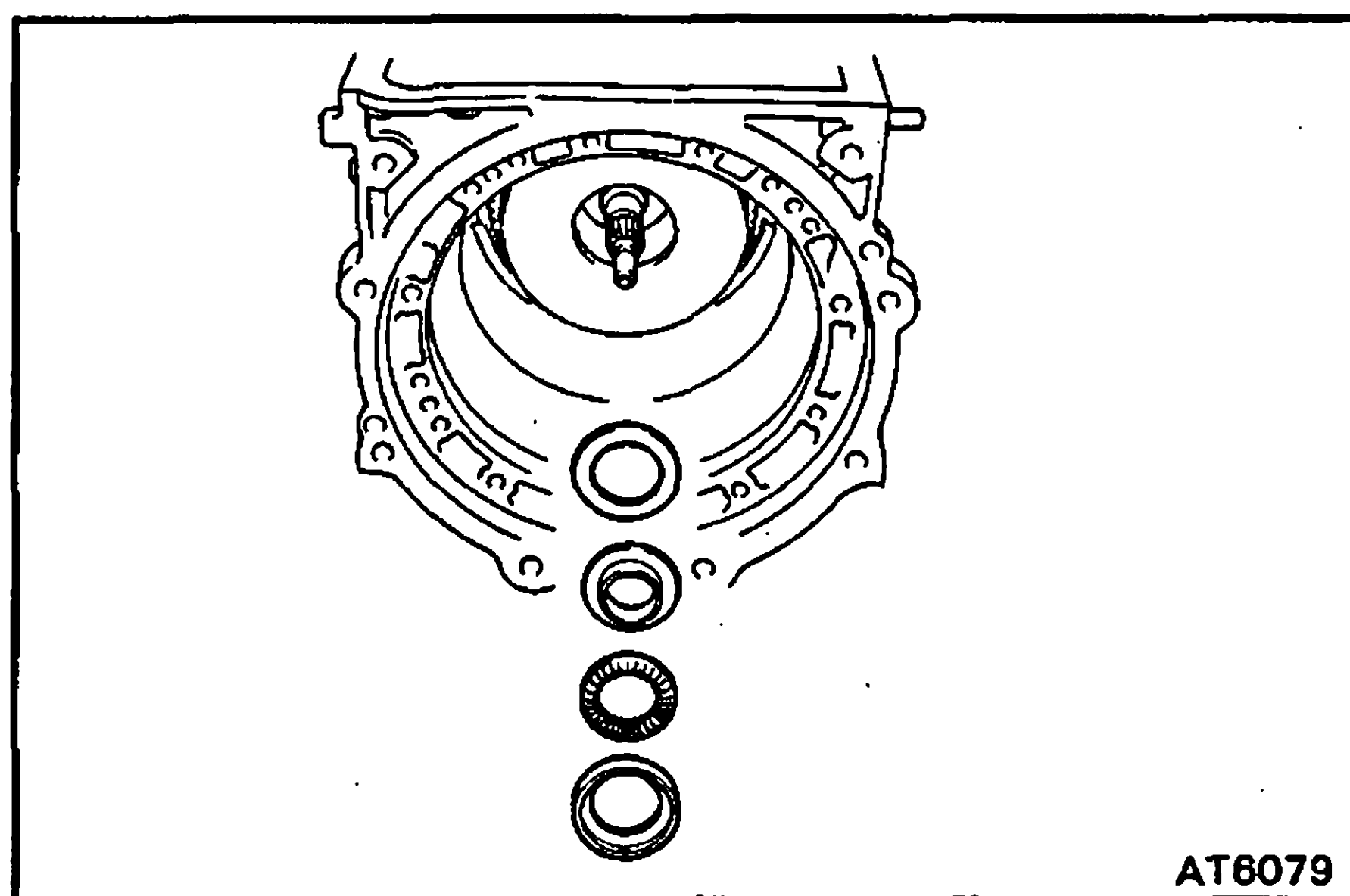
- (c) Using SST, remove the O/D case assembly.

SST 09350-36010 (09350-06140)

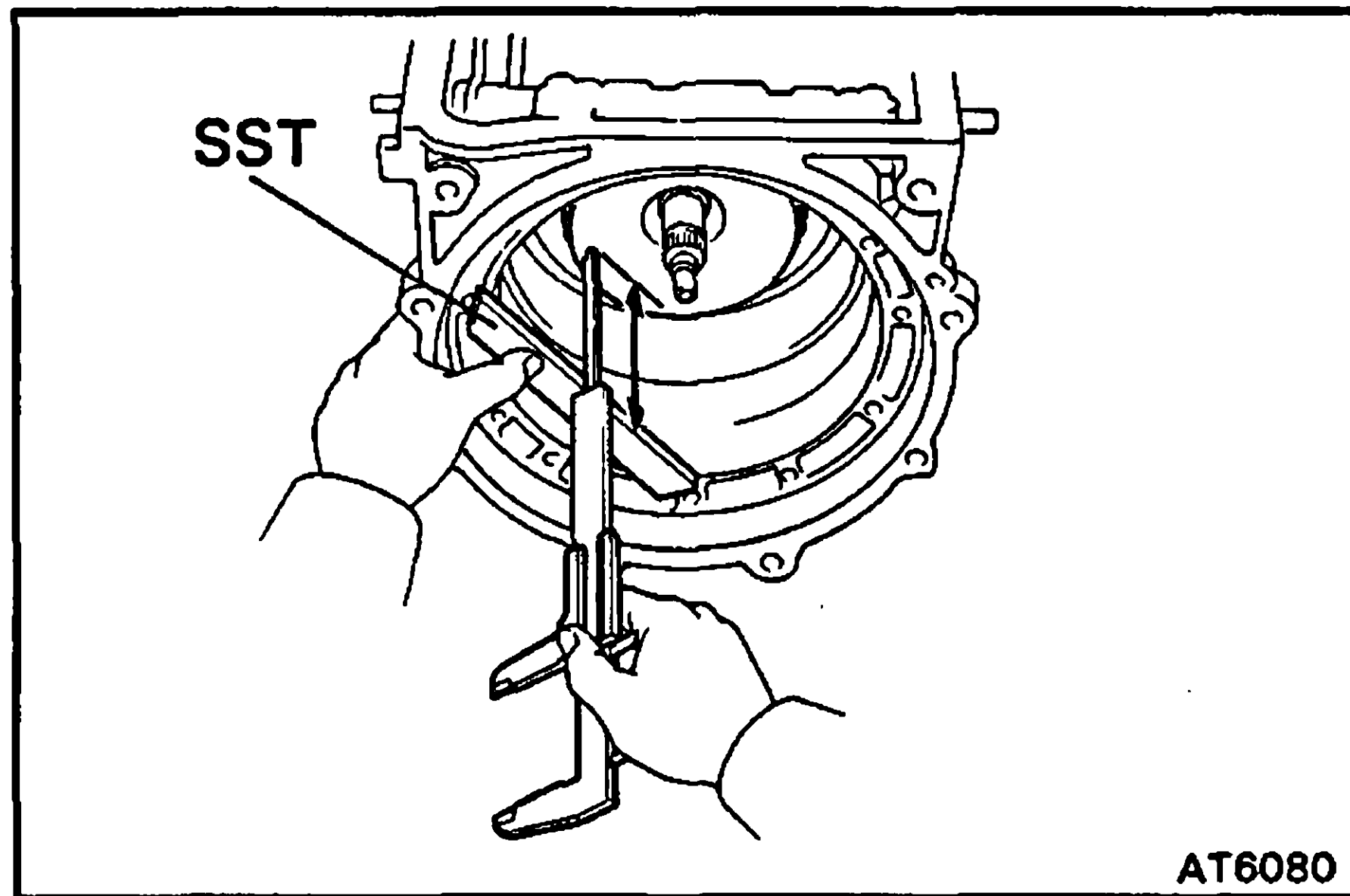
- (d) Remove the three O-rings from the oil holes of the O/D case.



AT6078



- (e) Remove the oil seal ring from the input shaft.
- (f) Remove the two races, thrust bearing and spacer from the front clutch drum or O/D case.
- (g) Reinstall the oil seal ring to the input shaft.

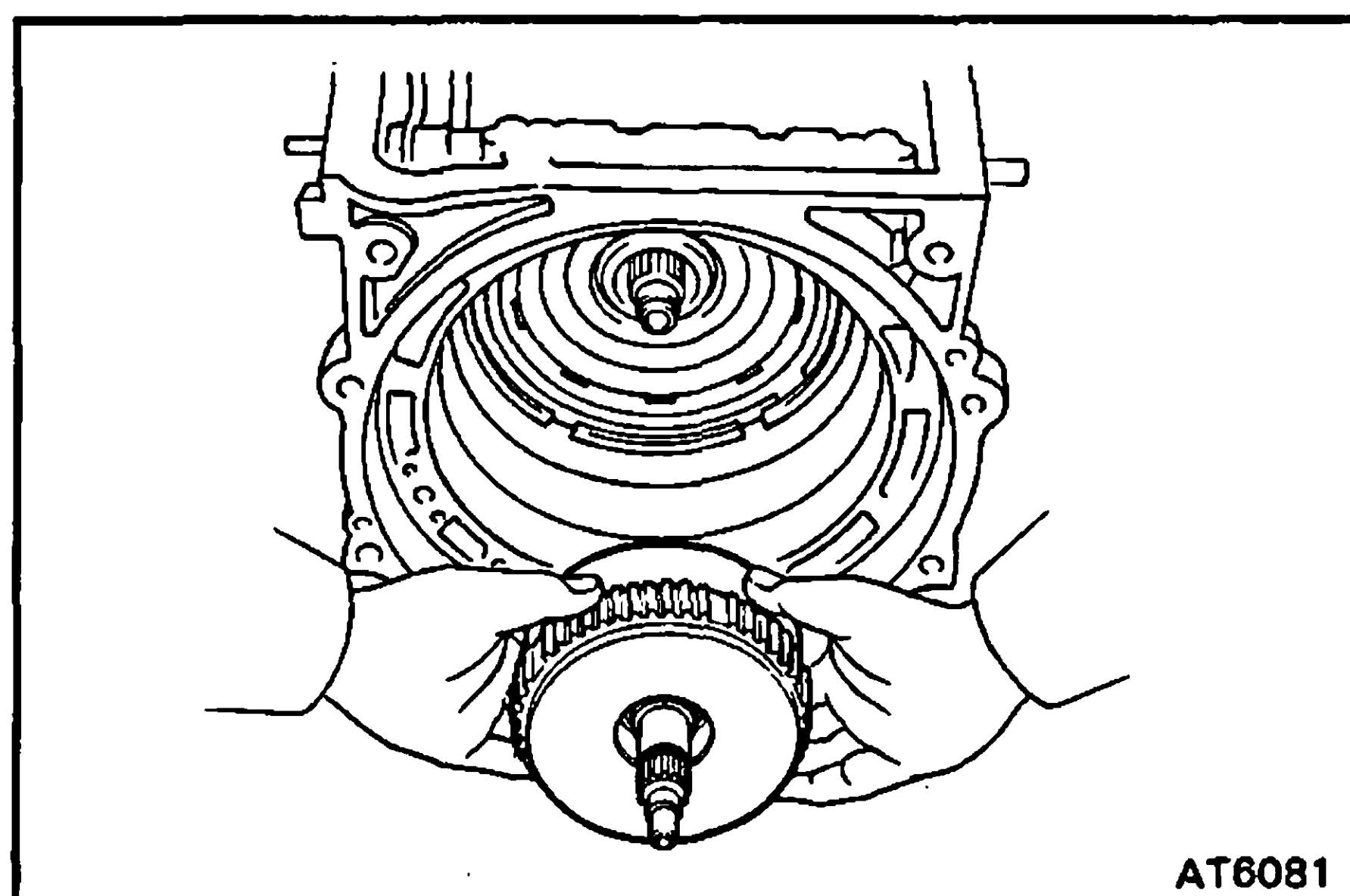


### 33. REMOVE FRONT CLUTCH ASSEMBLY

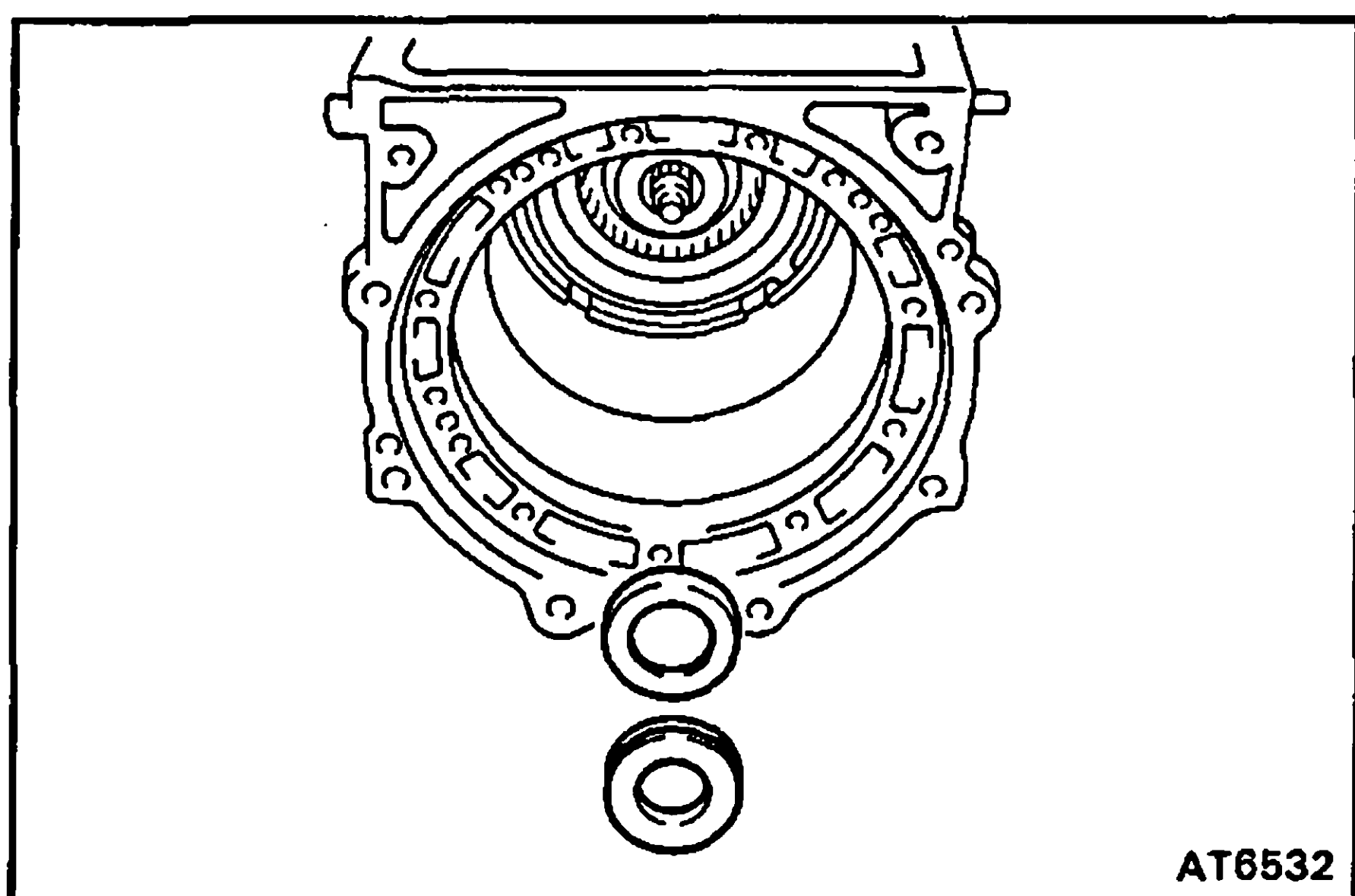
- (a) Place SST on the installation surface of the oil pump.

SST 09350-36010 (09350-06090)

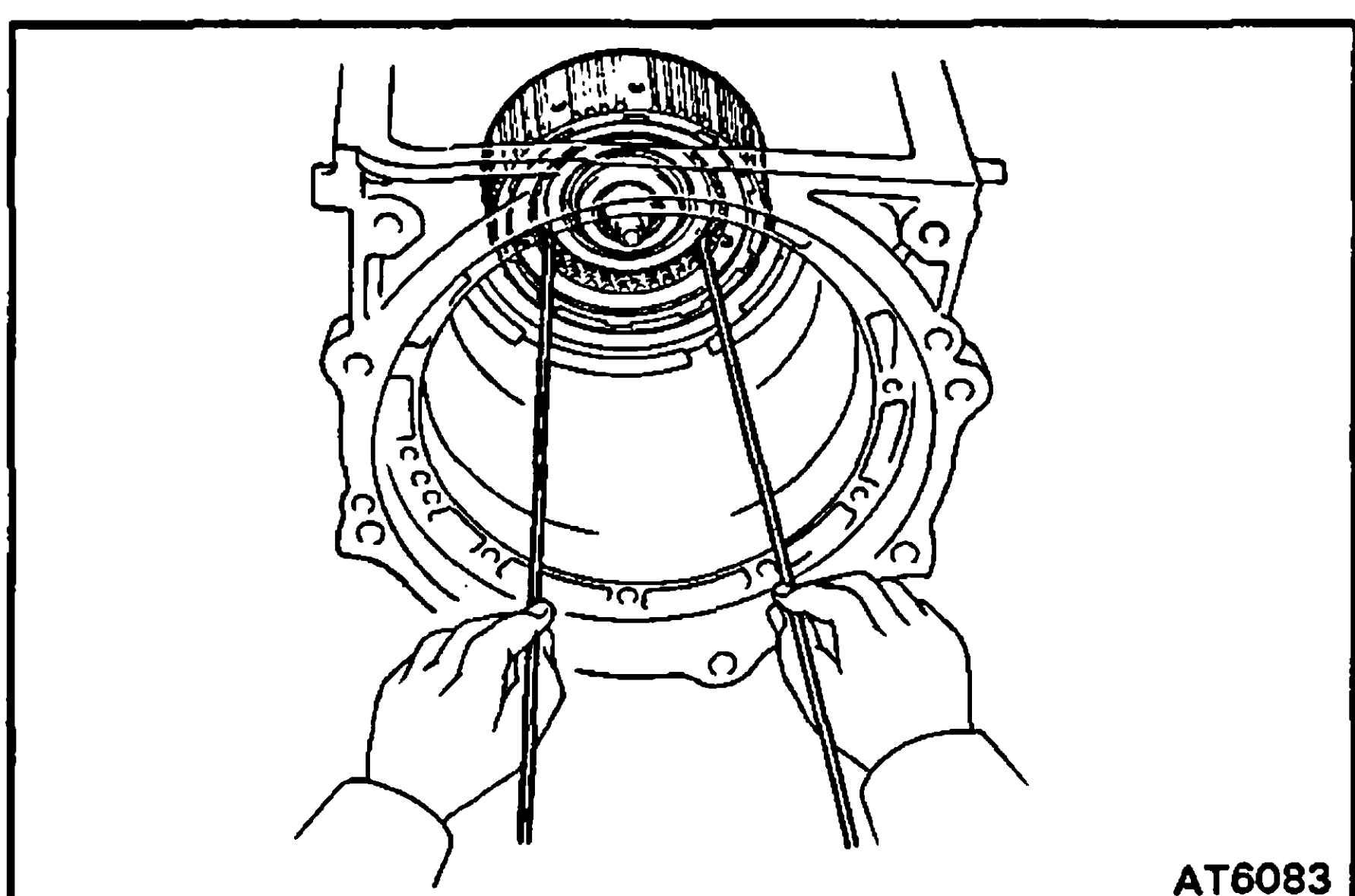
- (b) Using calipers, measure the distance between the tops of SST and the clutch drum for assembly.



- (c) Remove the front clutch assembly.



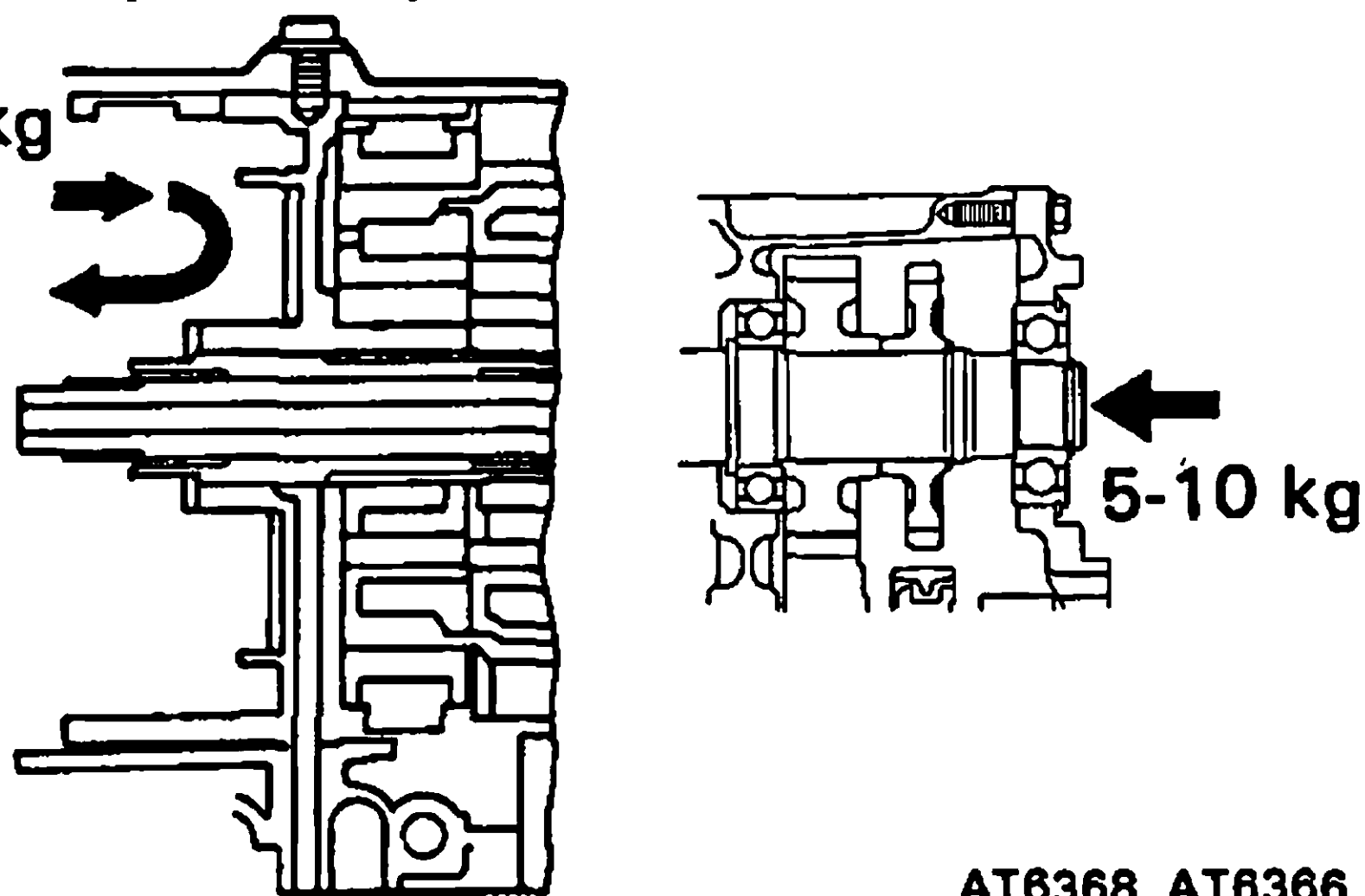
- (d) Remove the assembled bearing and race from the rear clutch drum or front clutch hub.



### 34. REMOVE REAR CLUTCH ASSEMBLY

Insert two wires into flukes of the clutch discs, and remove the rear clutch assembly.

(A440F, A442F)

5-  
10 kg

AT6368 AT6366

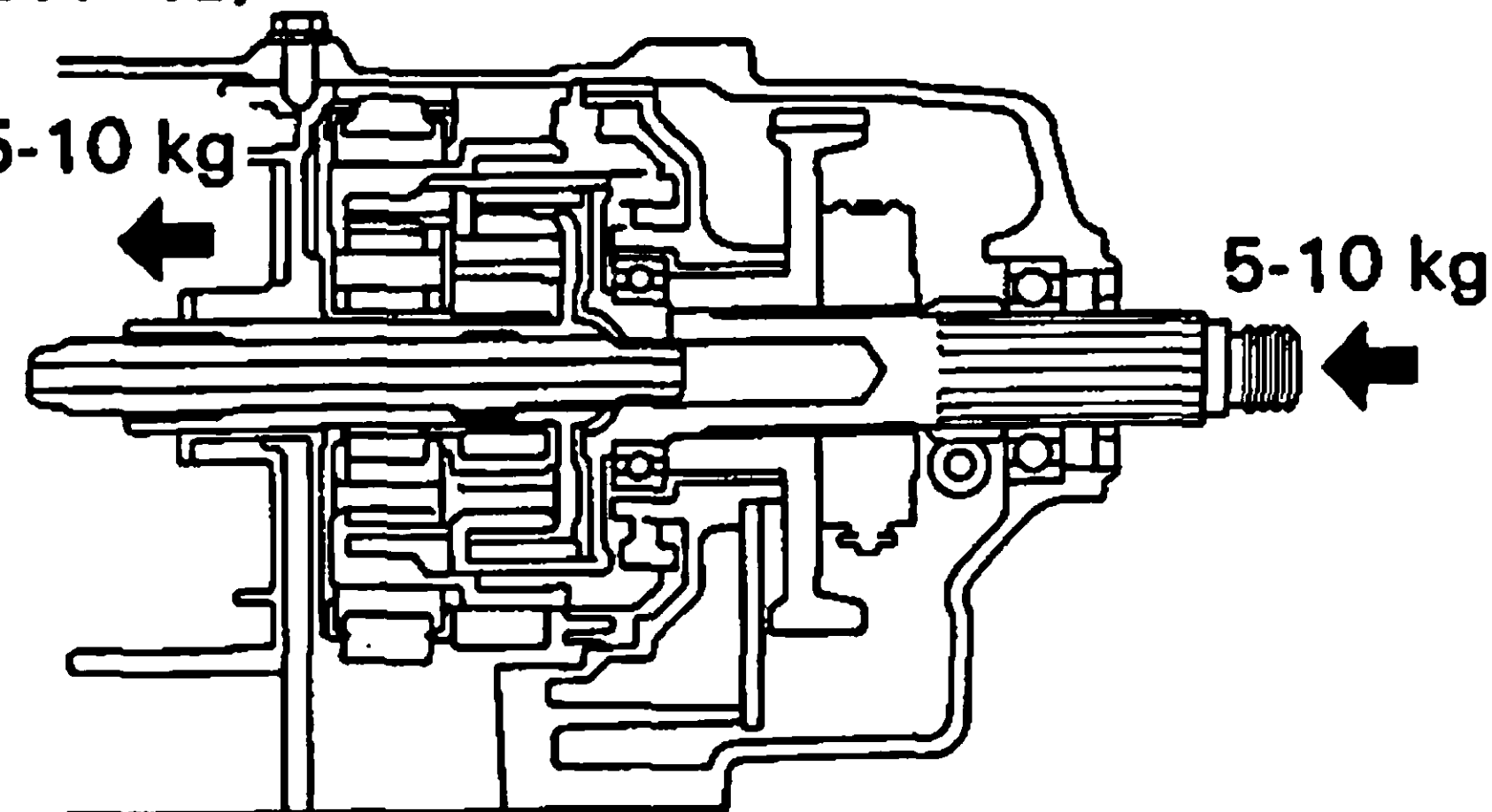
**35. CHECK THRUST CLEARANCE OF CENTER SUPPORT, AND REMOVE CENTER SUPPORT ASSEMBLY**

- (a) Push the transmission output shaft toward the front of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).
- (b) Push the center support toward the rear of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N), then pull with the same amount of force.

(A441L)

5-10 kg

5-10 kg



AT6374

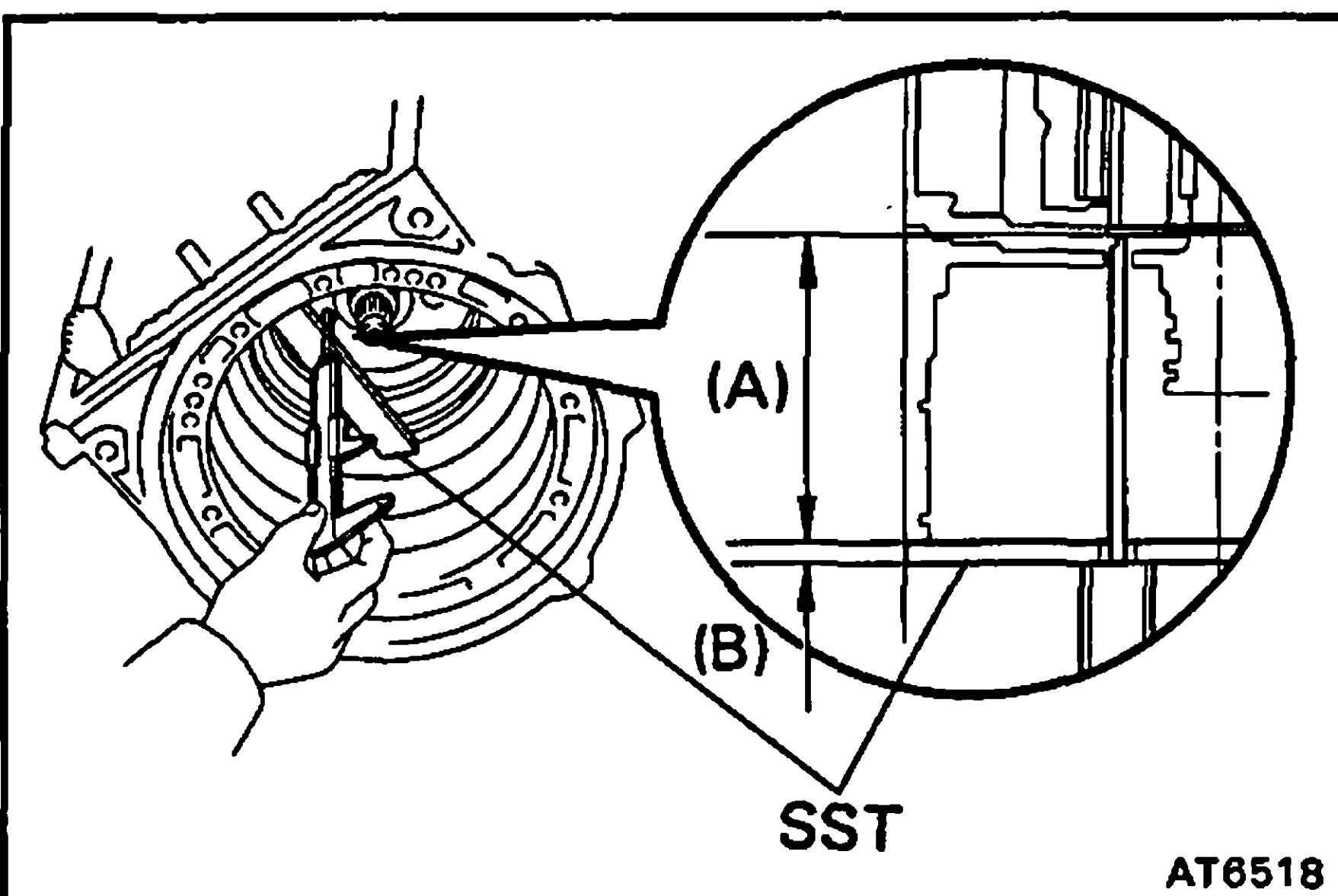
- (c) Place SST on the center support.

SST 09350-36010 (09350-06090)

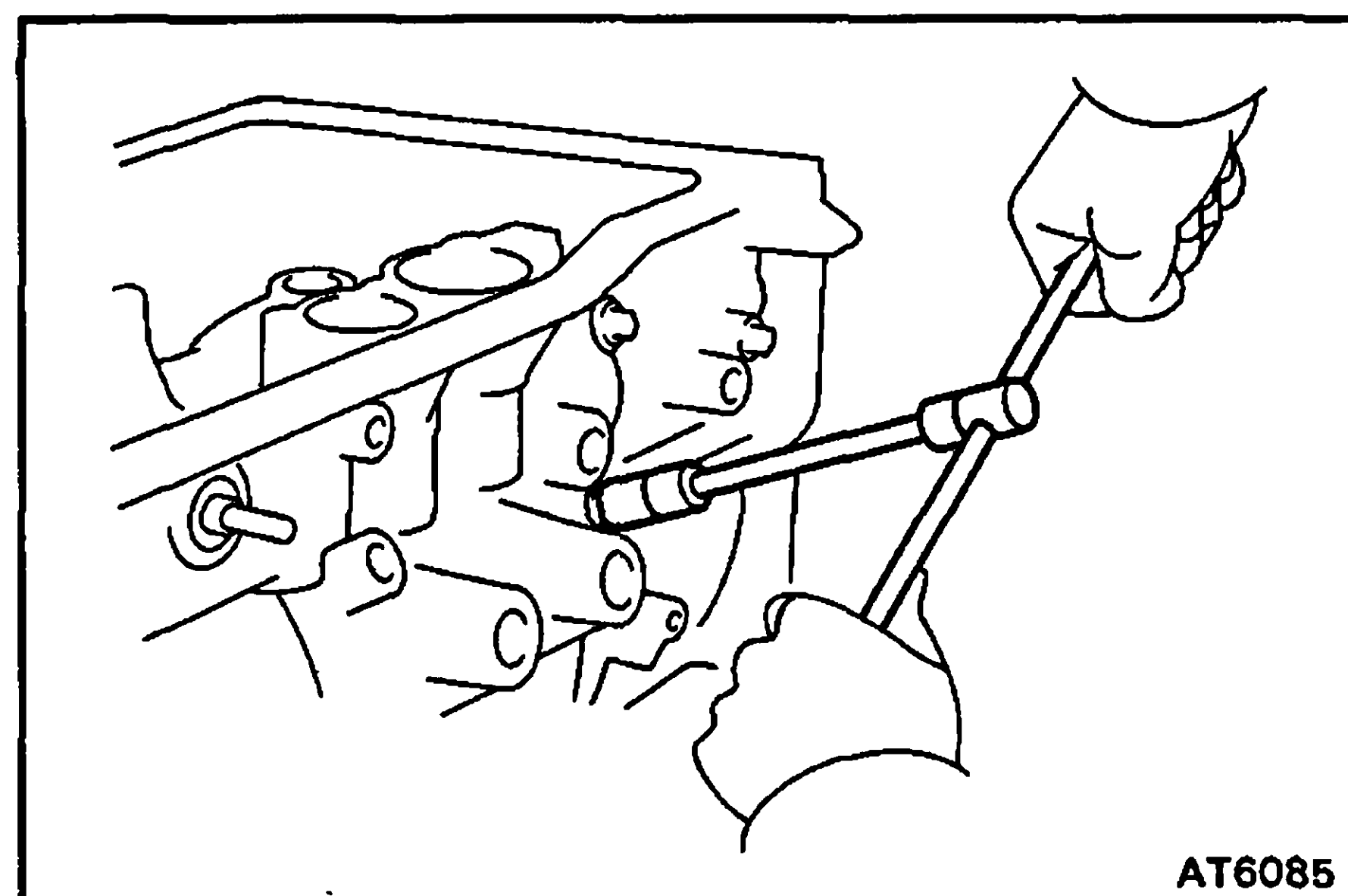
- (d) Using calipers, measure distance (A) between the tops of SST and the thrust washer on the front planetary gear.
- (e) Using calipers, measure thickness (B) of SST.

- (f) Remove the three center support set bolts.

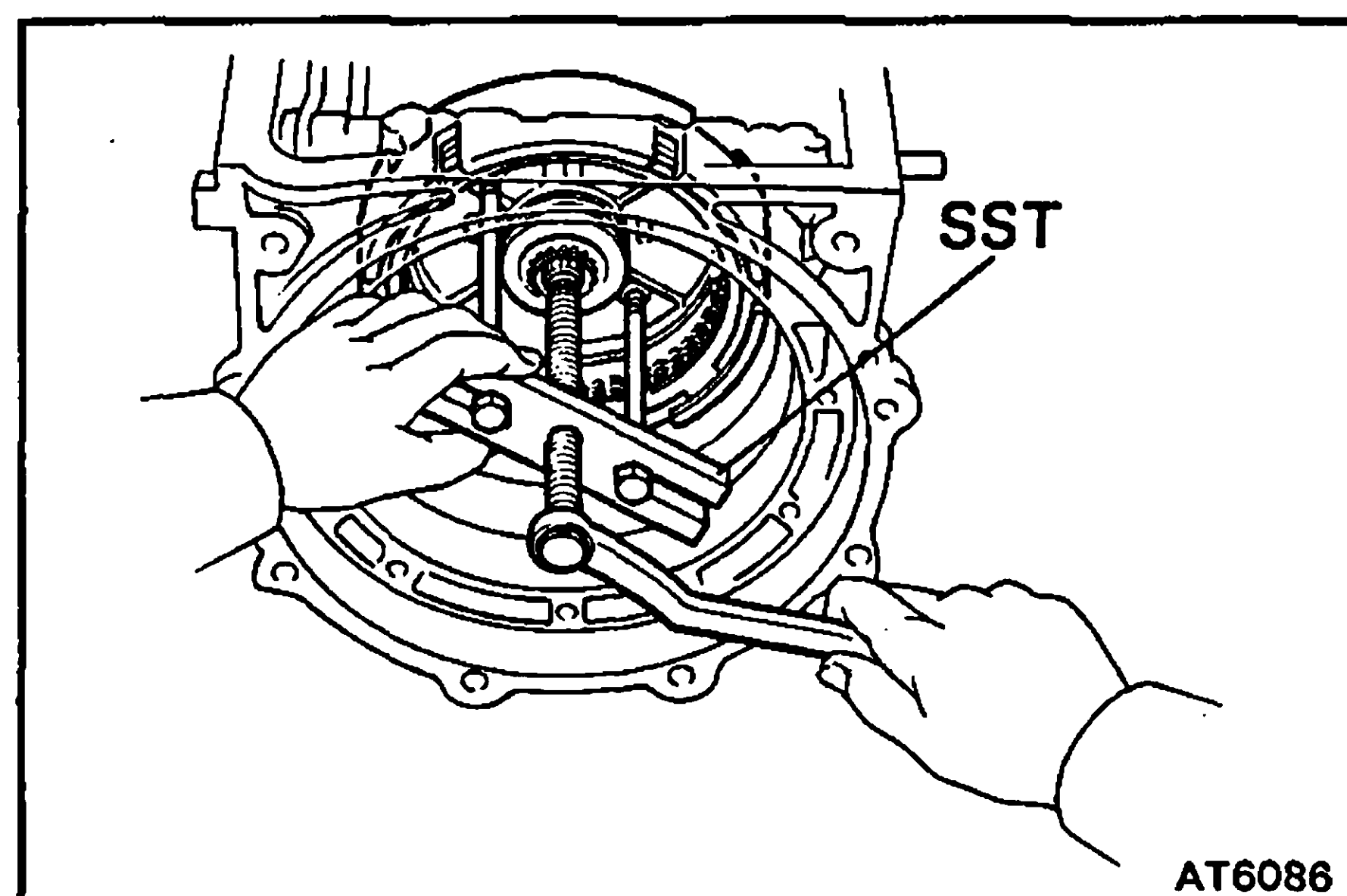
- (g) Using SST, remove the center support assembly.  
SST 09350-36010 (09350-06140)



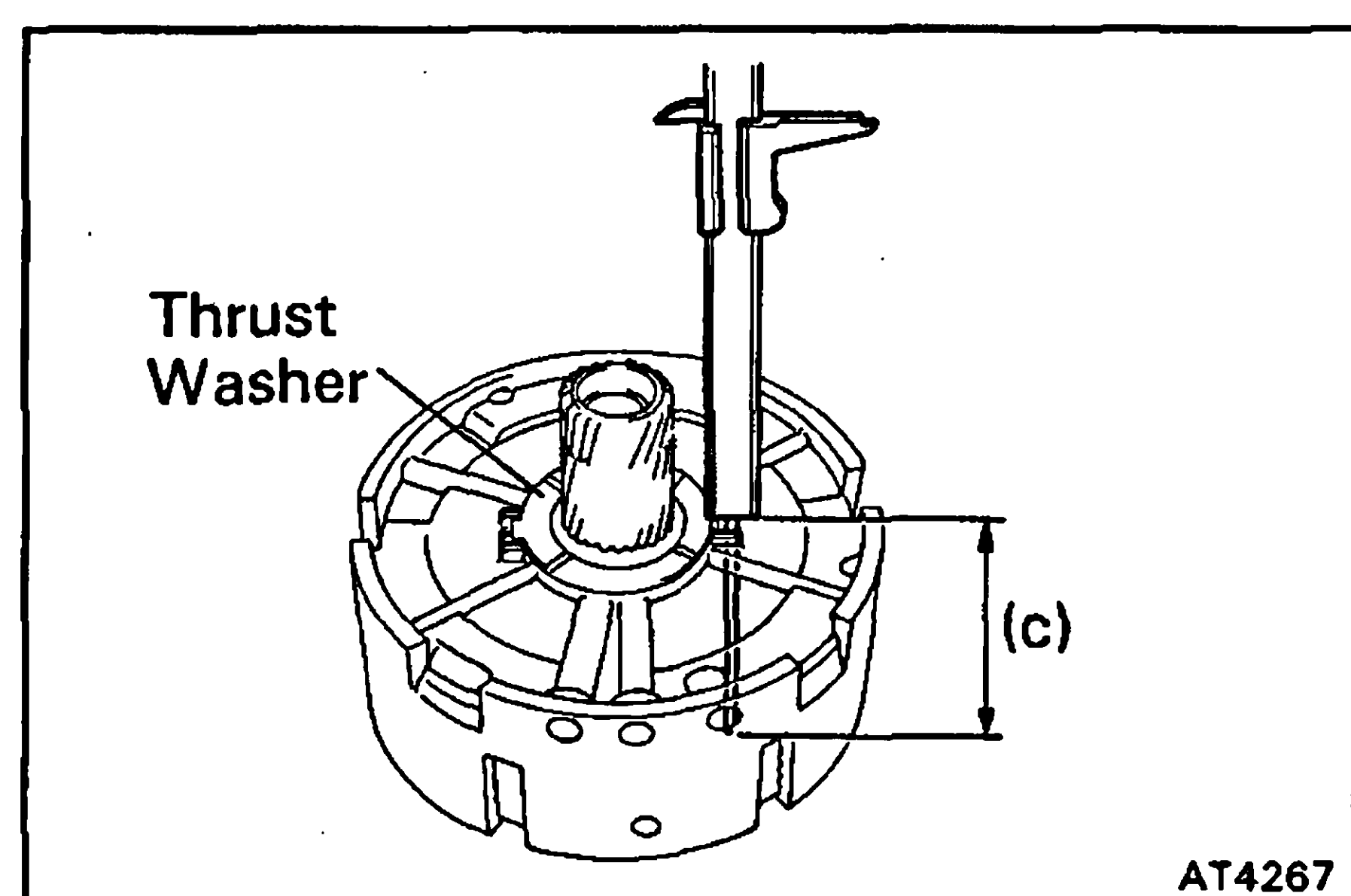
AT6518



AT6085



AT6086



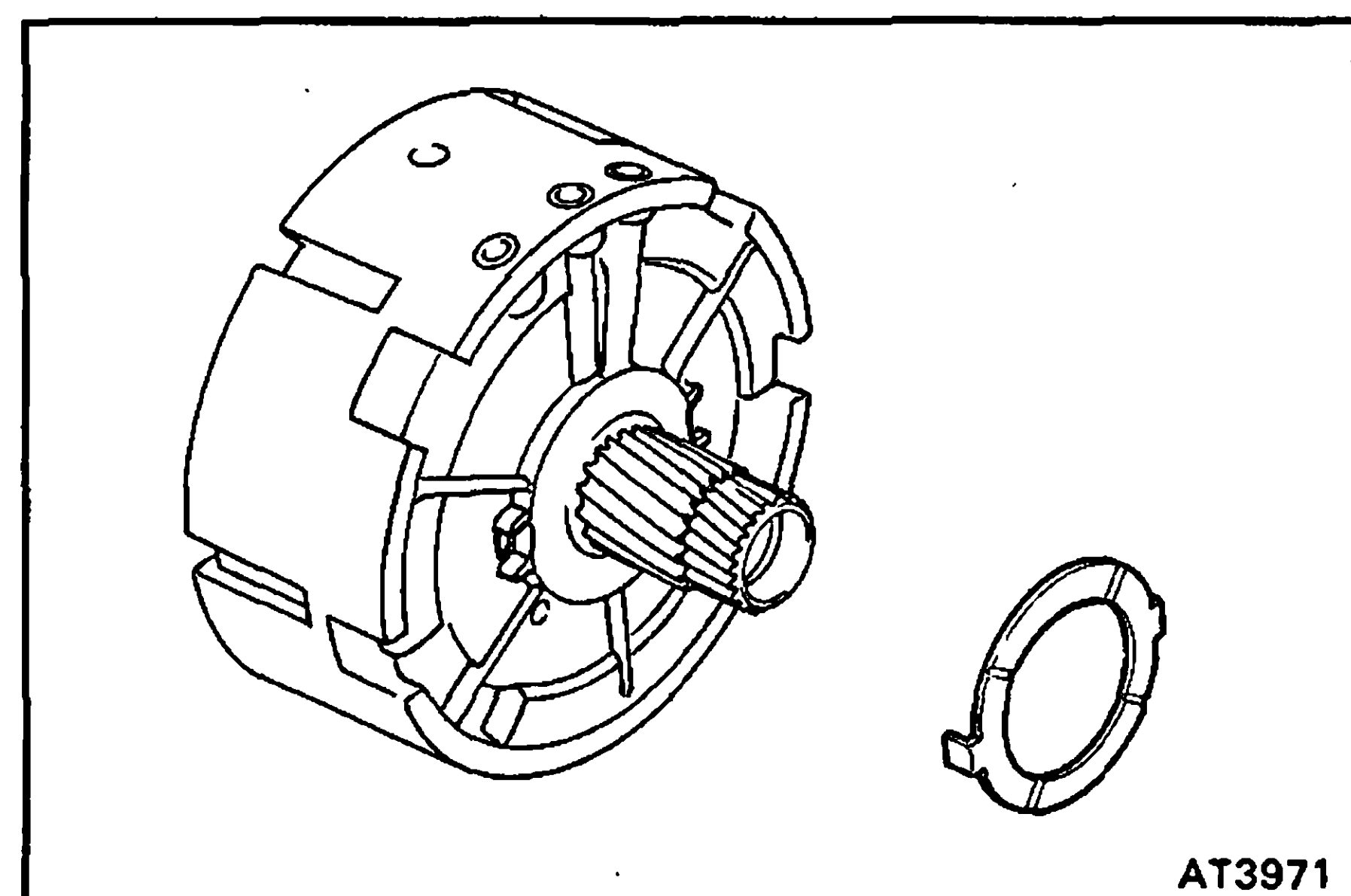
(h) Turn over the center support together with the thrust washer, and place it on a flat surface.

(i) Inserting calipers into the thrust washer hole, measure the distance (C) between it and the flat surface.

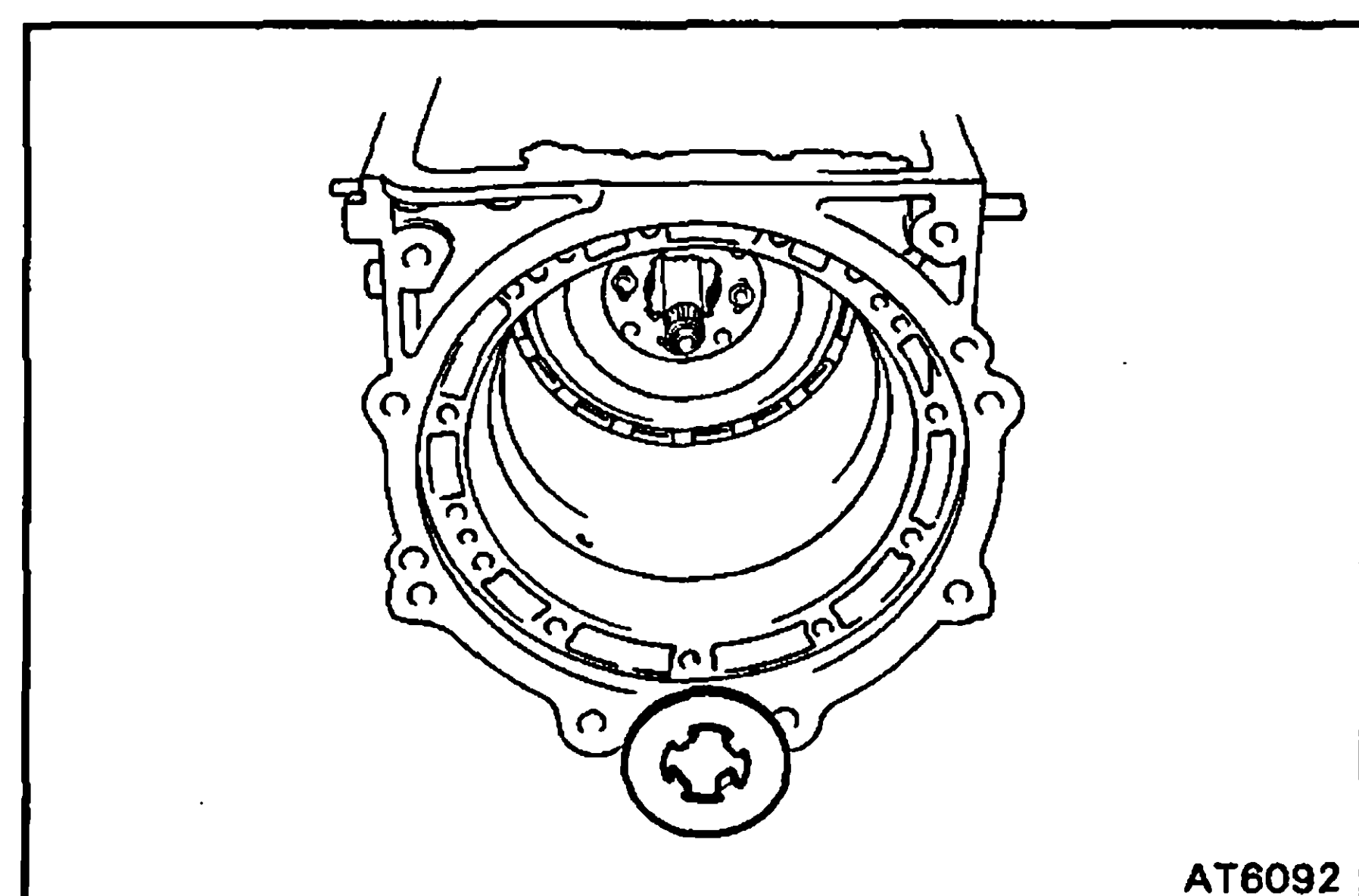
**Center support thrust clearance:  $A - (B + C)$**

**Standard thrust clearance: 0.30 — 0.70 mm  
(0.0118 — 0.0276 in.)**

**Maximum thrust clearance: 0.90 mm (0.0354 in.)**

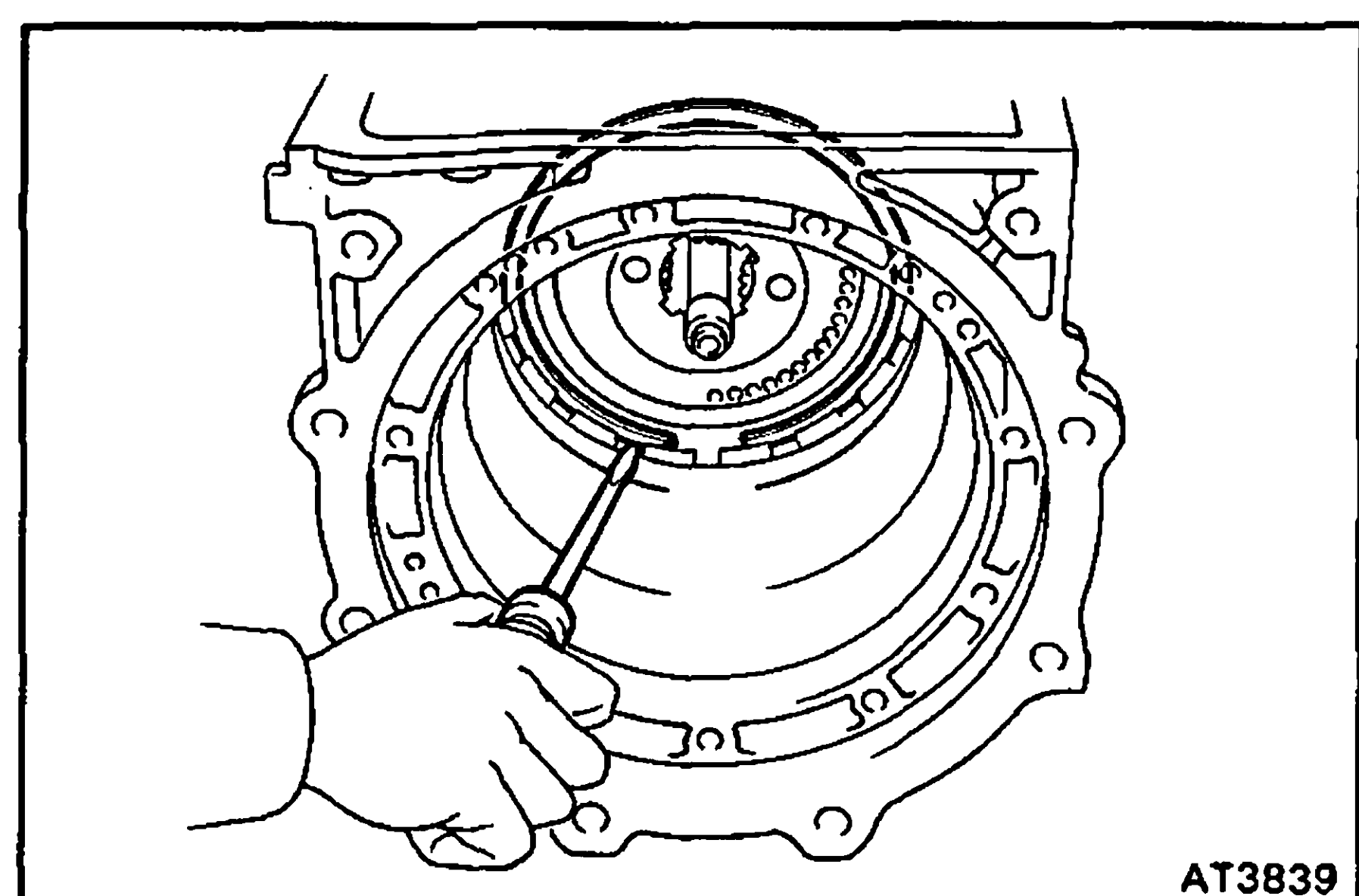


(j) Remove the thrust washer from the center support.

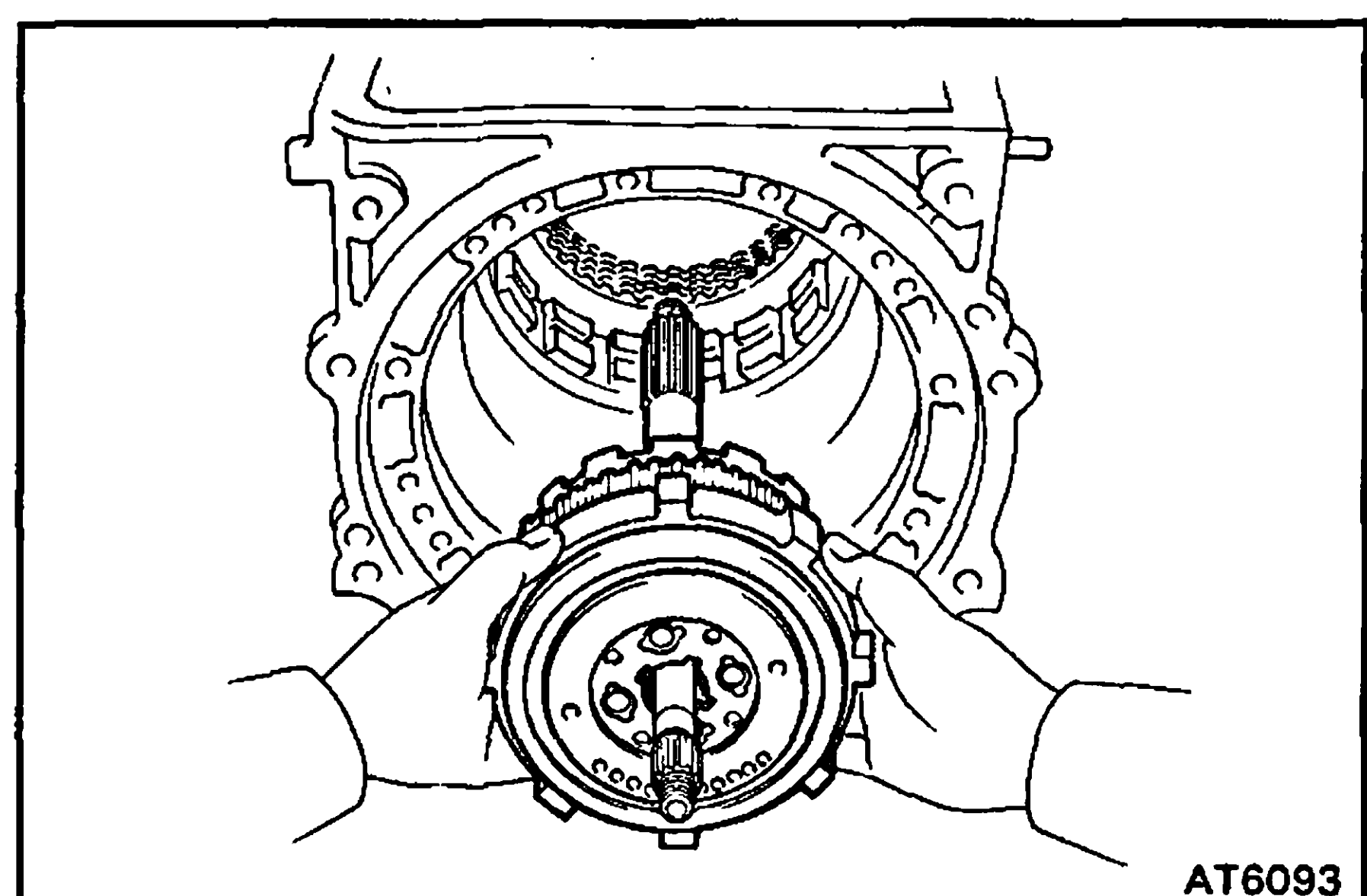


### 36. REMOVE PLANETARY GEARS, ONE-WAY CLUTCH AND OUTPUT SHAFT ASSEMBLY

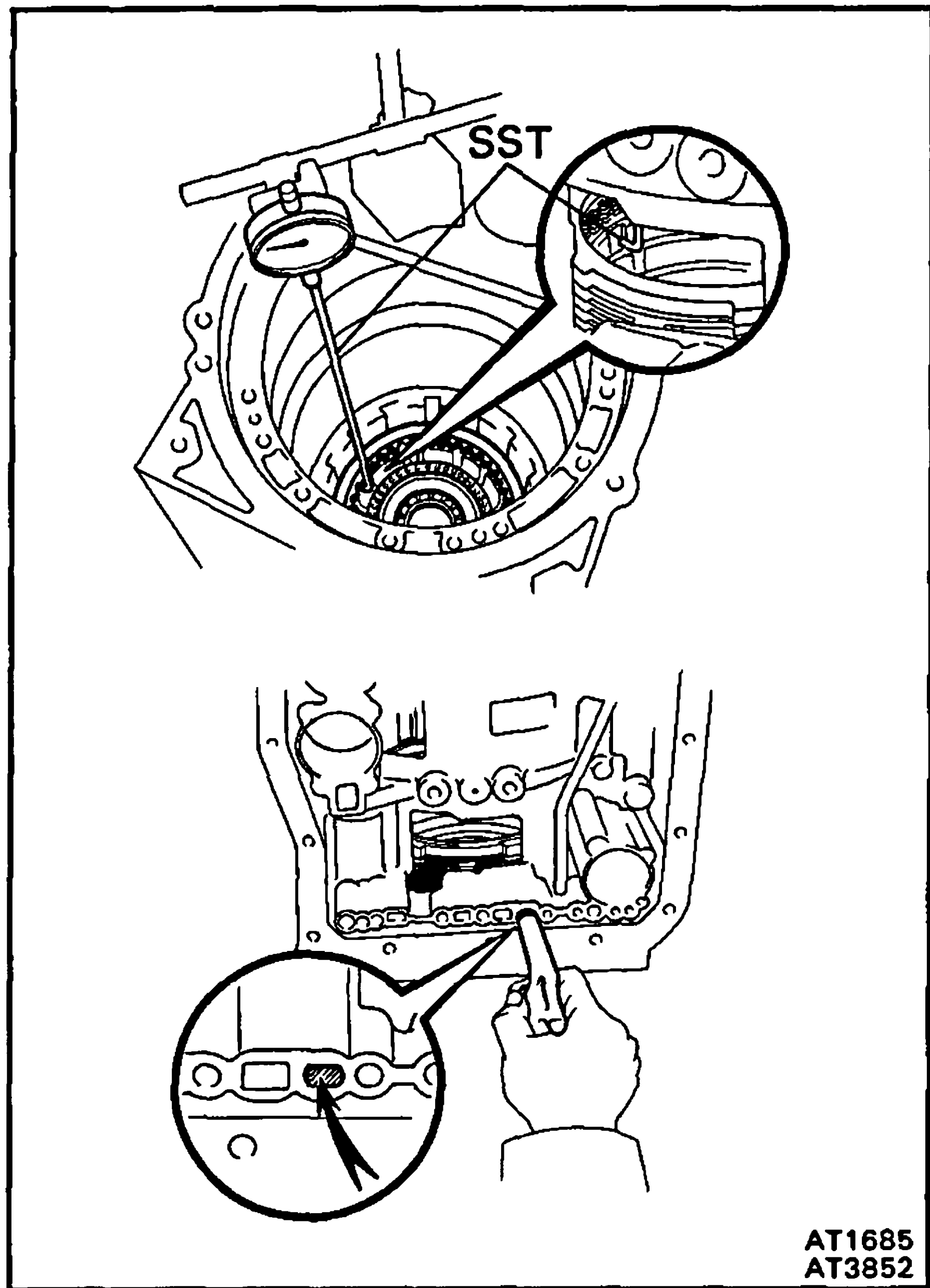
(a) Remove the thrust washer from the planetary gear.



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



(c) Remove the planetary gears, one-way clutch and output shaft assembly.



### 37. CHECK PISTON STROKE OF FIRST AND REVERSE BRAKE PISTON

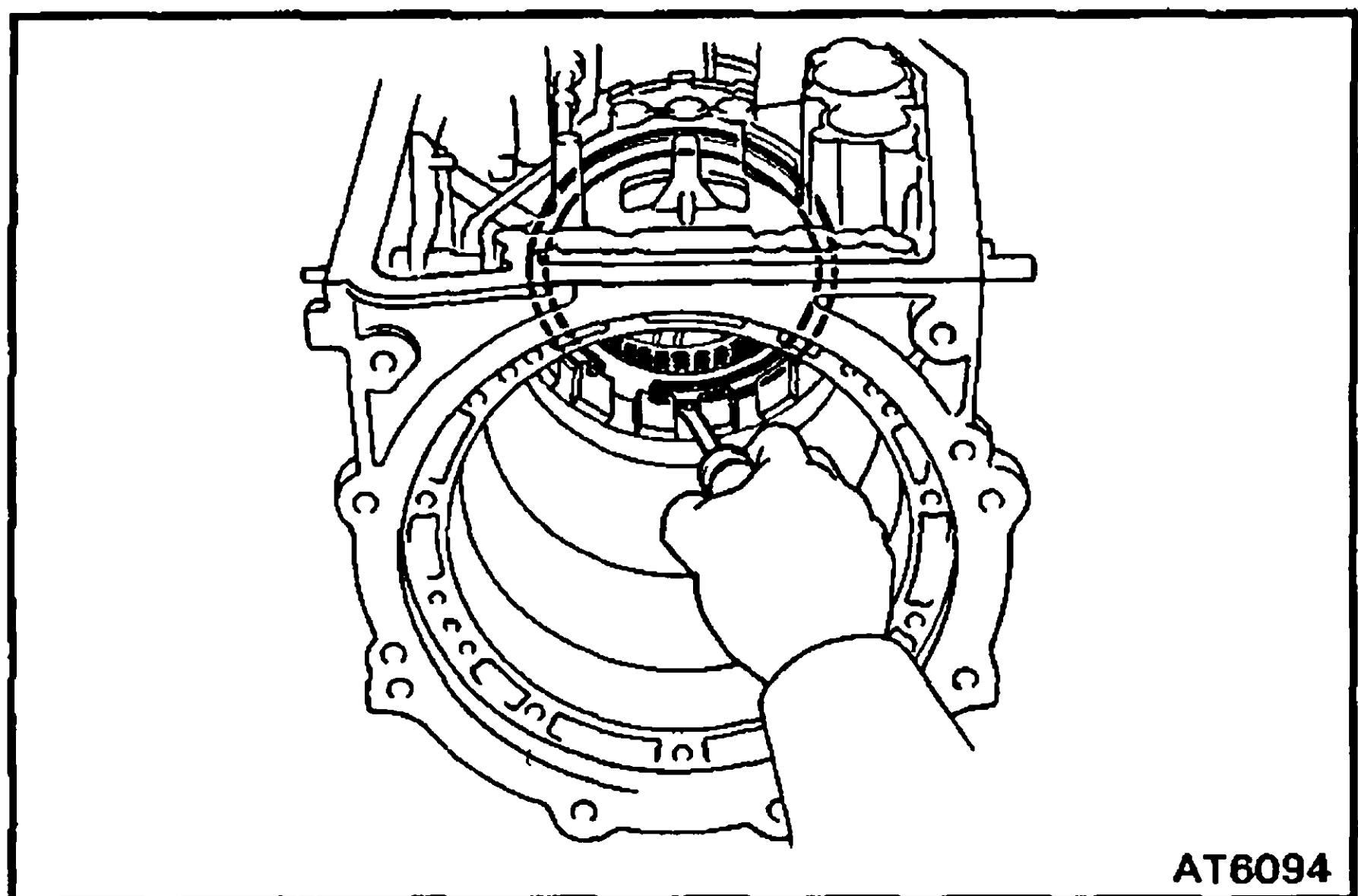
Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air (4 — 8 kg/cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-36010 (09350-06130)

Piston stroke: 3.30 — 3.80 mm (0.1299 — 0.1496 in.)

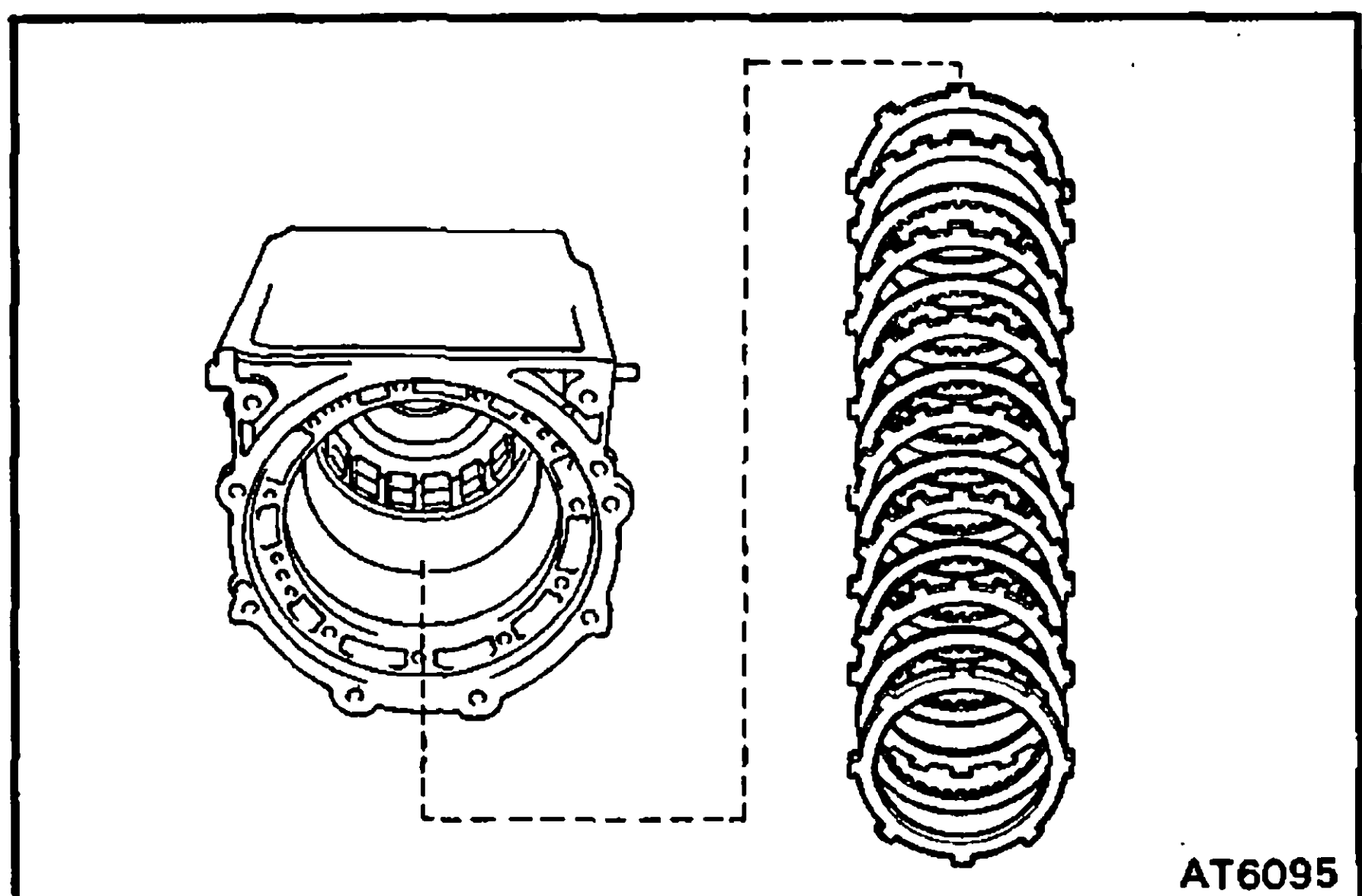
If the piston stroke is not as specified, inspect the discs.

(See page AT-76)

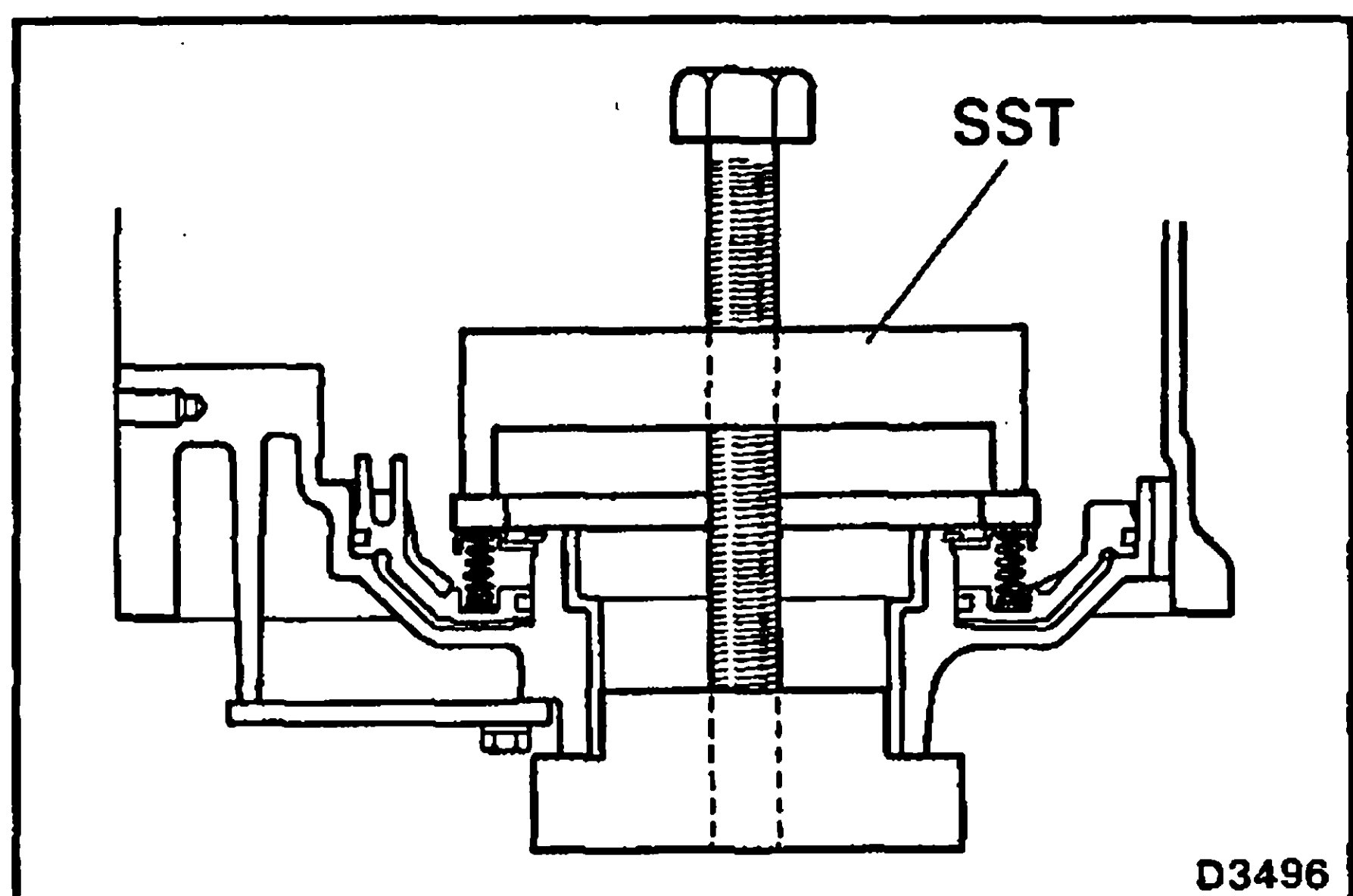


### 38. REMOVE FIRST AND REVERSE BRAKE PISTON

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

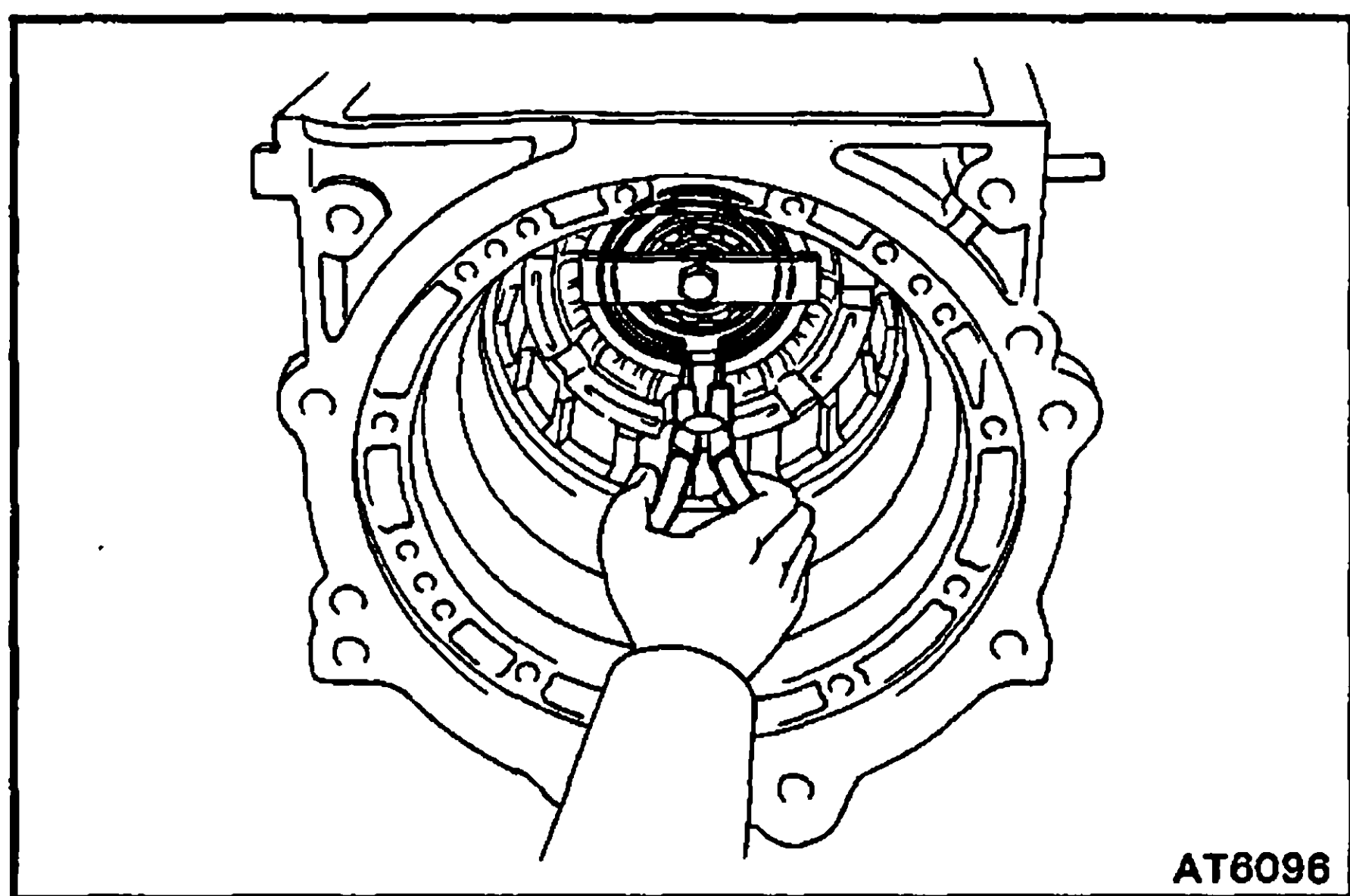


(b) Remove the flange, six discs, six plates and cushion plate.

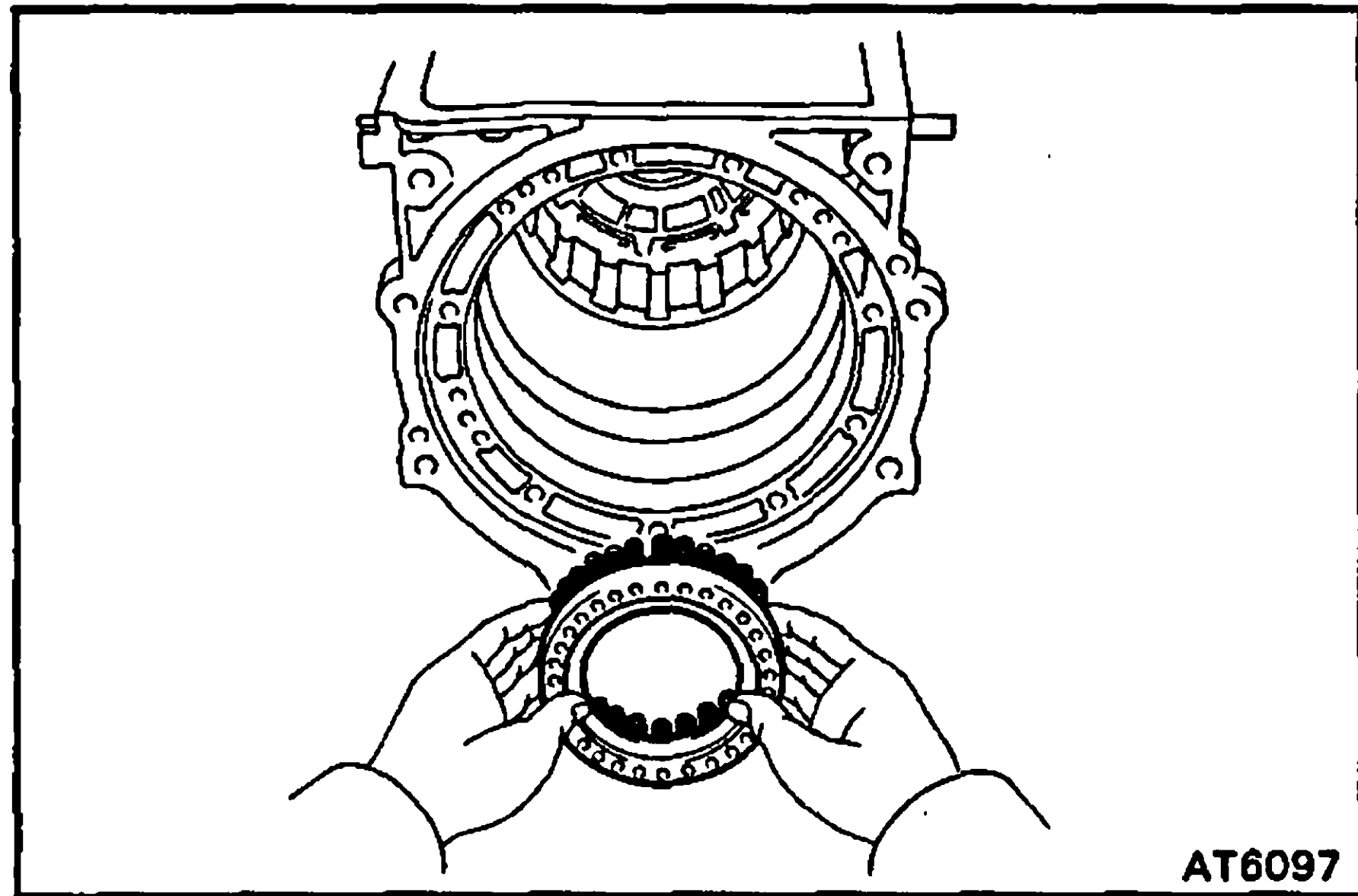


(c) Set SST on the spring retainer, and compress the return spring.

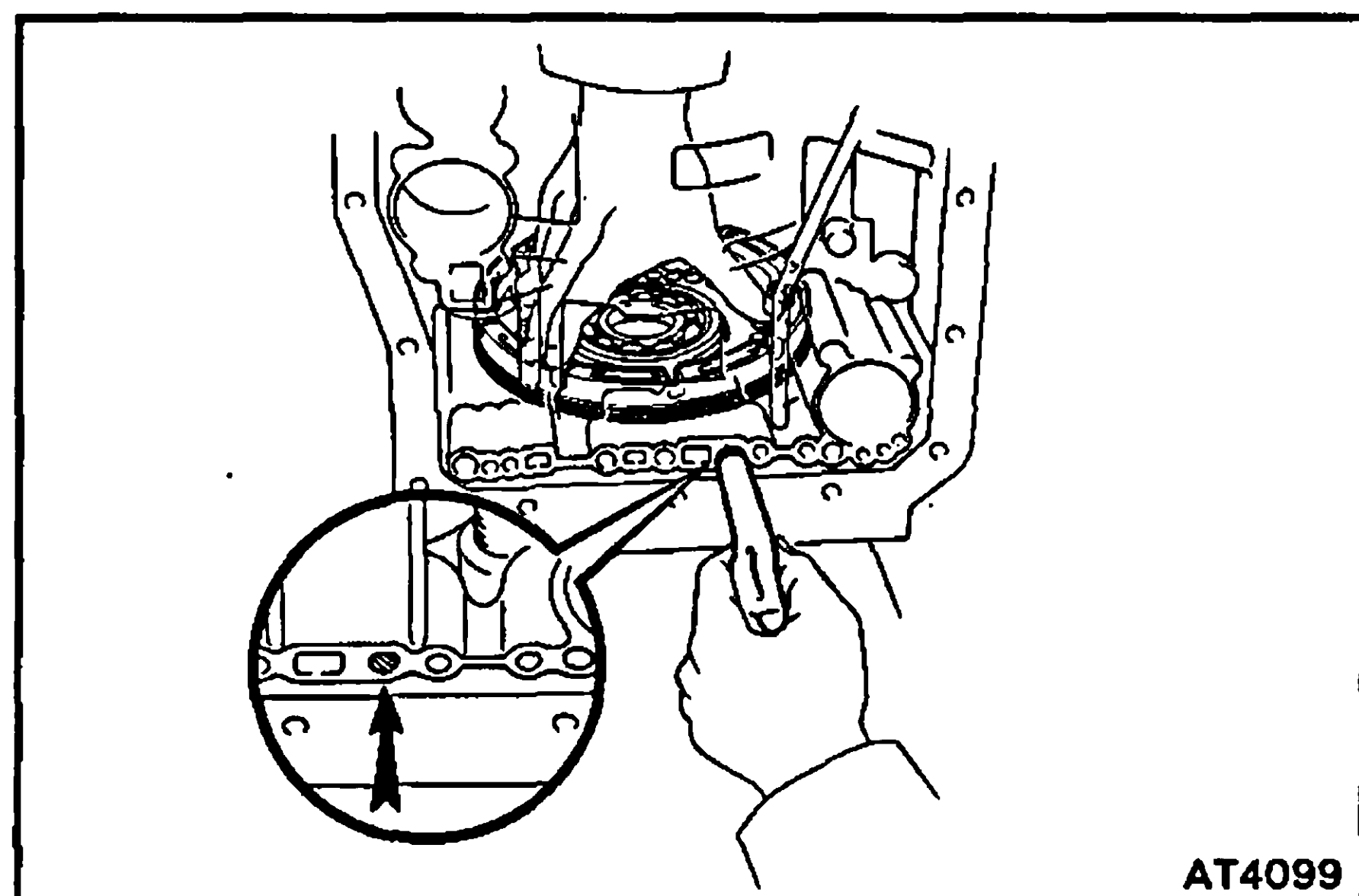
SST 09350-36010 (09350-06030)



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

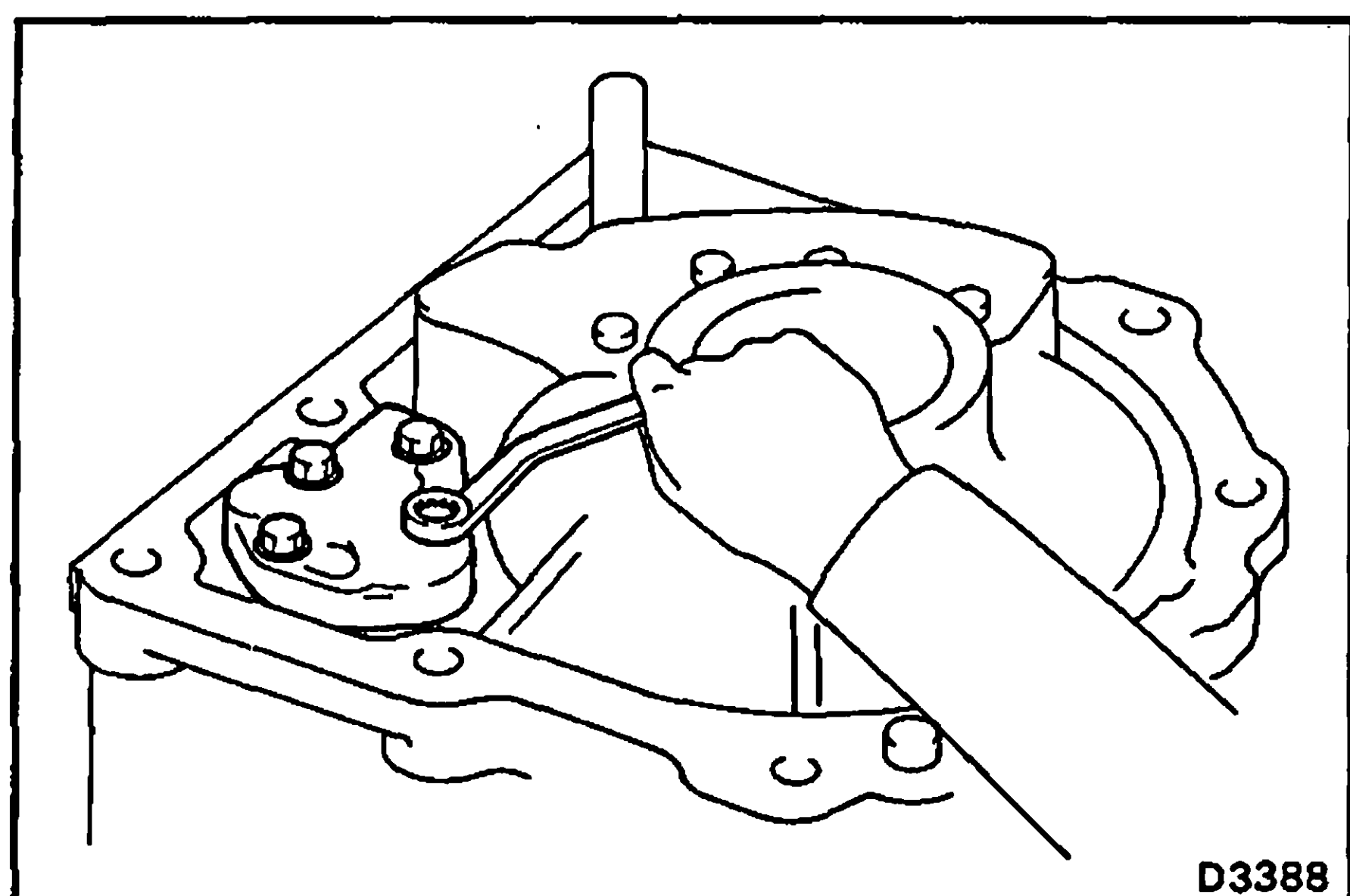


(e) Remove the piston return spring.



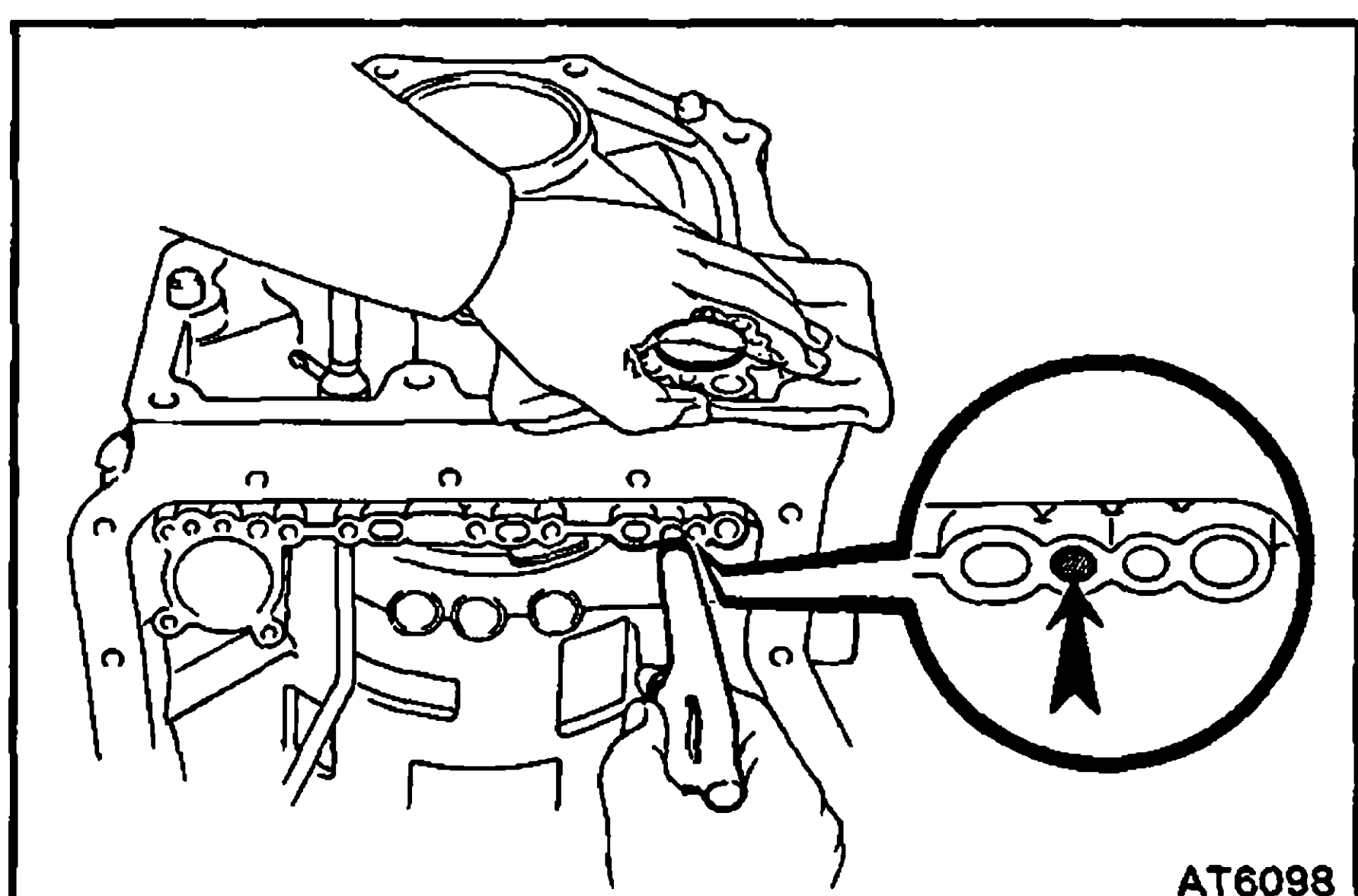
(f) Hold first and reverse brake piston with hand, remove first and reverse brake piston by applying compressed air into the oil hole of the transmission case.

(g) Remove the two O-rings from brake piston.



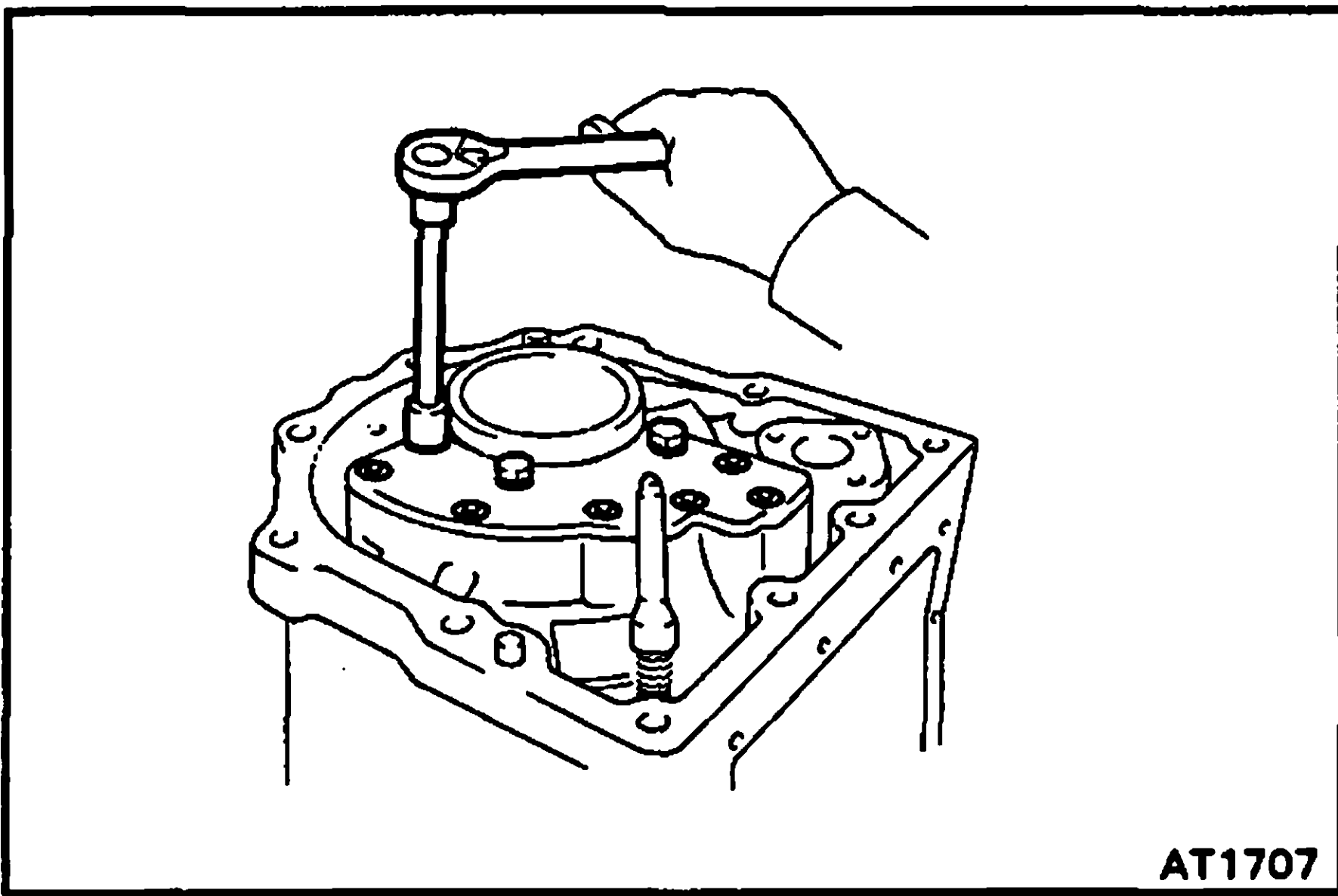
### 39. REMOVE C<sub>1</sub> ACCUMULATOR PISTON AND SPRING

(a) Remove the four bolts, front clutch accumulator cover, two gaskets and plate.

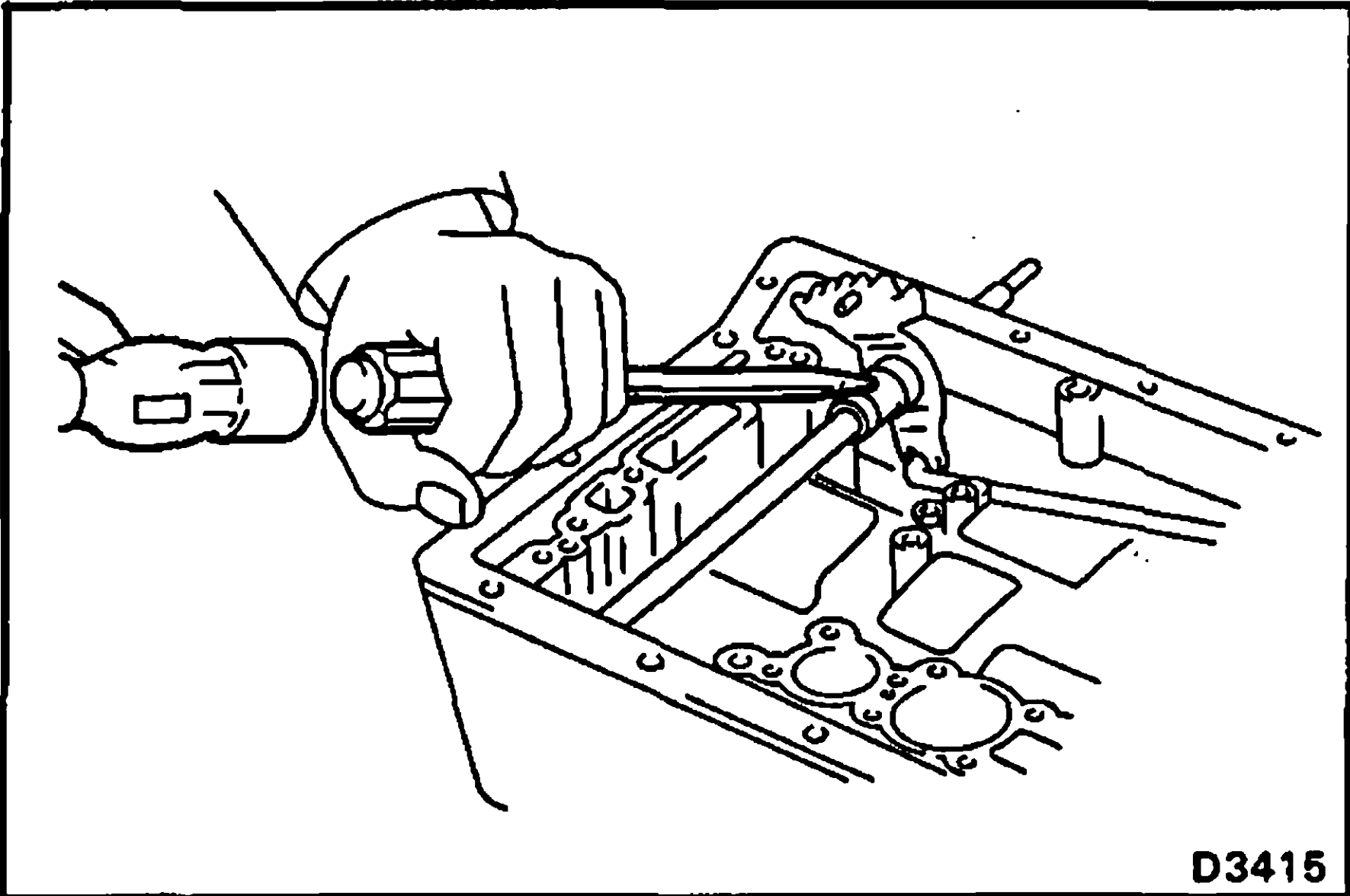


(b) Remove the accumulator piston and spring by applying compressed air to the oil hole.

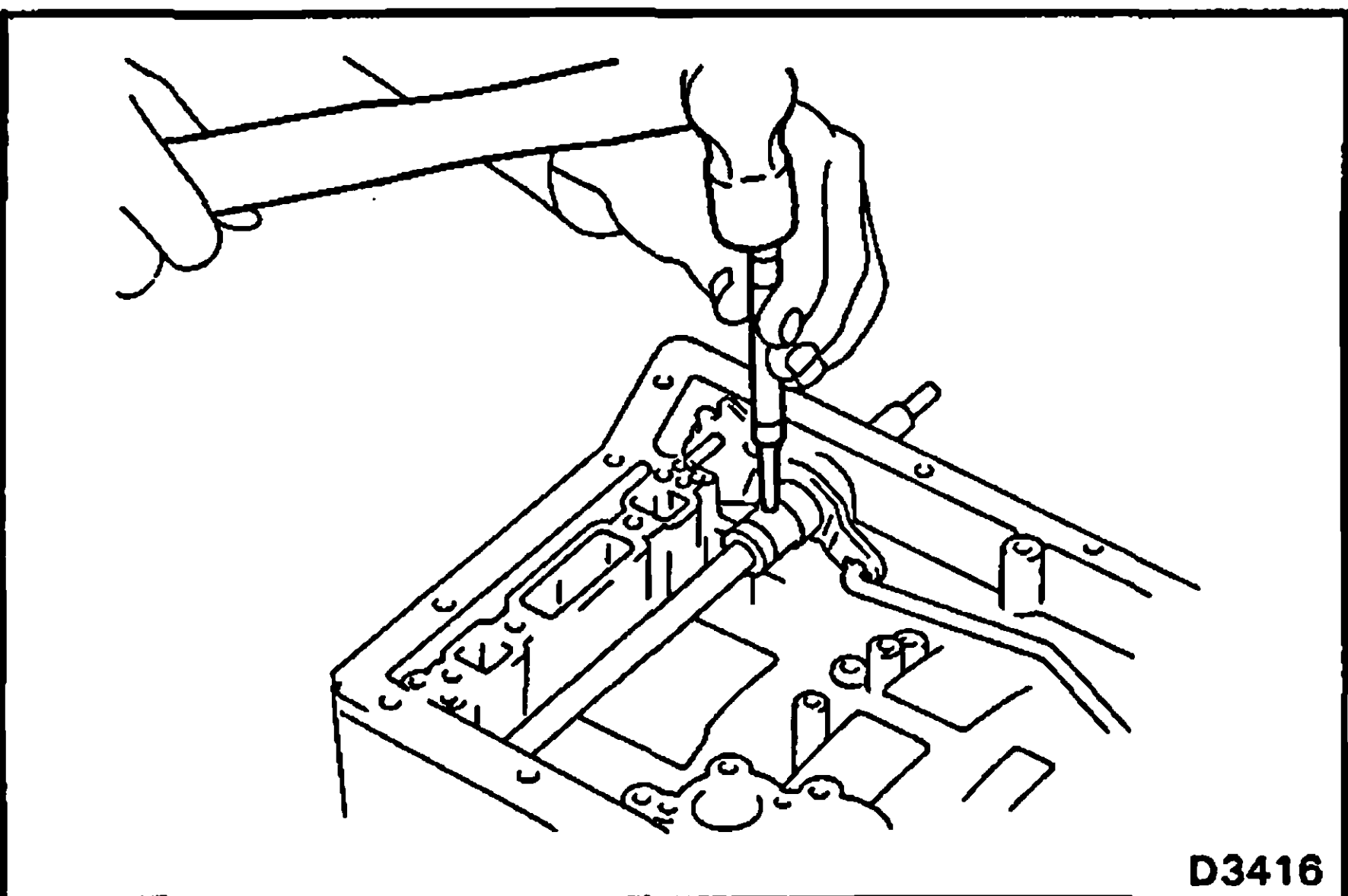
(c) Remove the O-rings from accumulator piston.

**40. REMOVE TRANSMISSION REAR COVER**

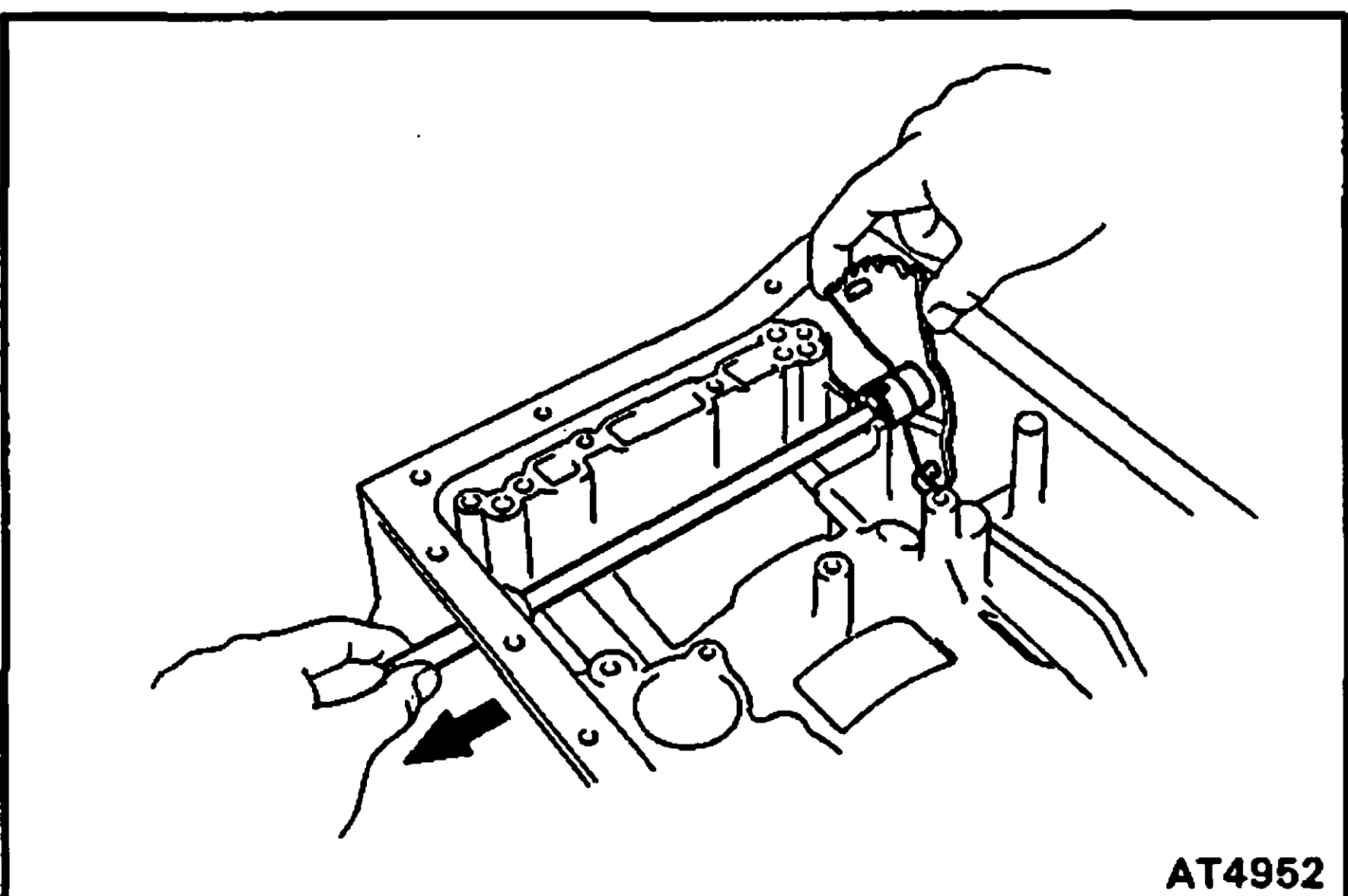
Remove the three bolts, six screws, rear cover and gasket.

**41. REMOVE MANUAL VALVE LEVER, SHAFT AND OIL SEALS**

(a) Using a screwdriver or chisel, cut off the spacer and remove it from the shaft.

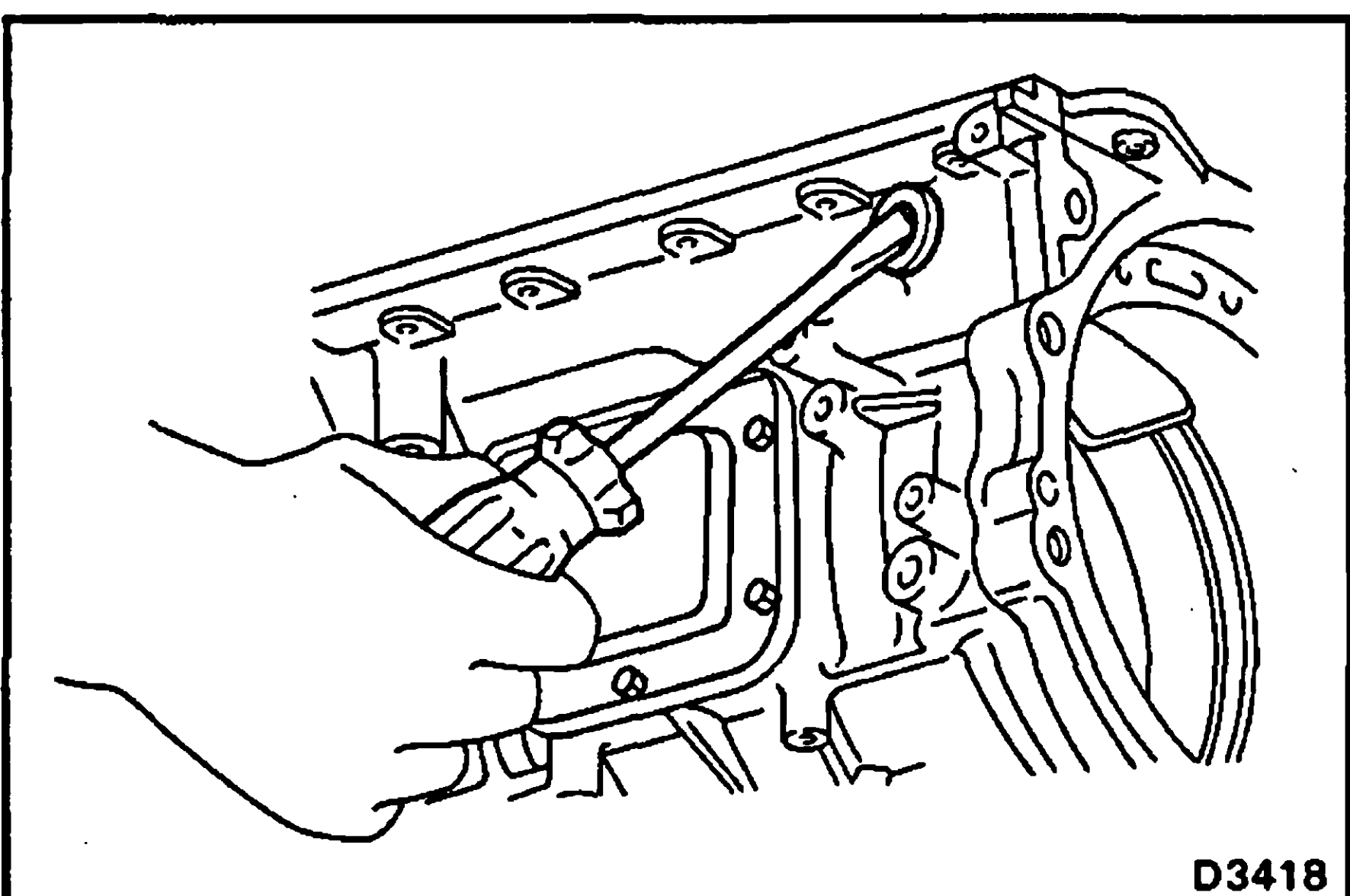


(b) Using a pin punch, tap out the pin.



(c) Pull the manual valve lever shaft out through the case, remove the manual valve lever, parking lock rod assembly, the two plate washers and wave washer.

(d) Disconnect the parking lock rod from the manual valve lever.



(e) Using a screwdriver, pry out the two oil seals.

# COMPONENT PARTS

## General Notes

The instructions here are organized so that you work on only one component group at a time.

This will help avoid confusion from similar-looking parts of different subassemblies being on your workbench at the same time.

The component groups are inspected and repaired from the converter housing side.

As much as possible, complete the inspection, repair and assembly before proceeding to the next component group. If a component group can not be assembled because parts are being ordered, be sure to keep all parts of that group in a separate container while proceeding with disassembly, inspection, repair and assembly of other component groups.

Recommended fluid of the automatic transmission is ATF type DEXRON® II.

### GENERAL CLEANING NOTES:

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

### PARTS ARRANGEMENT:

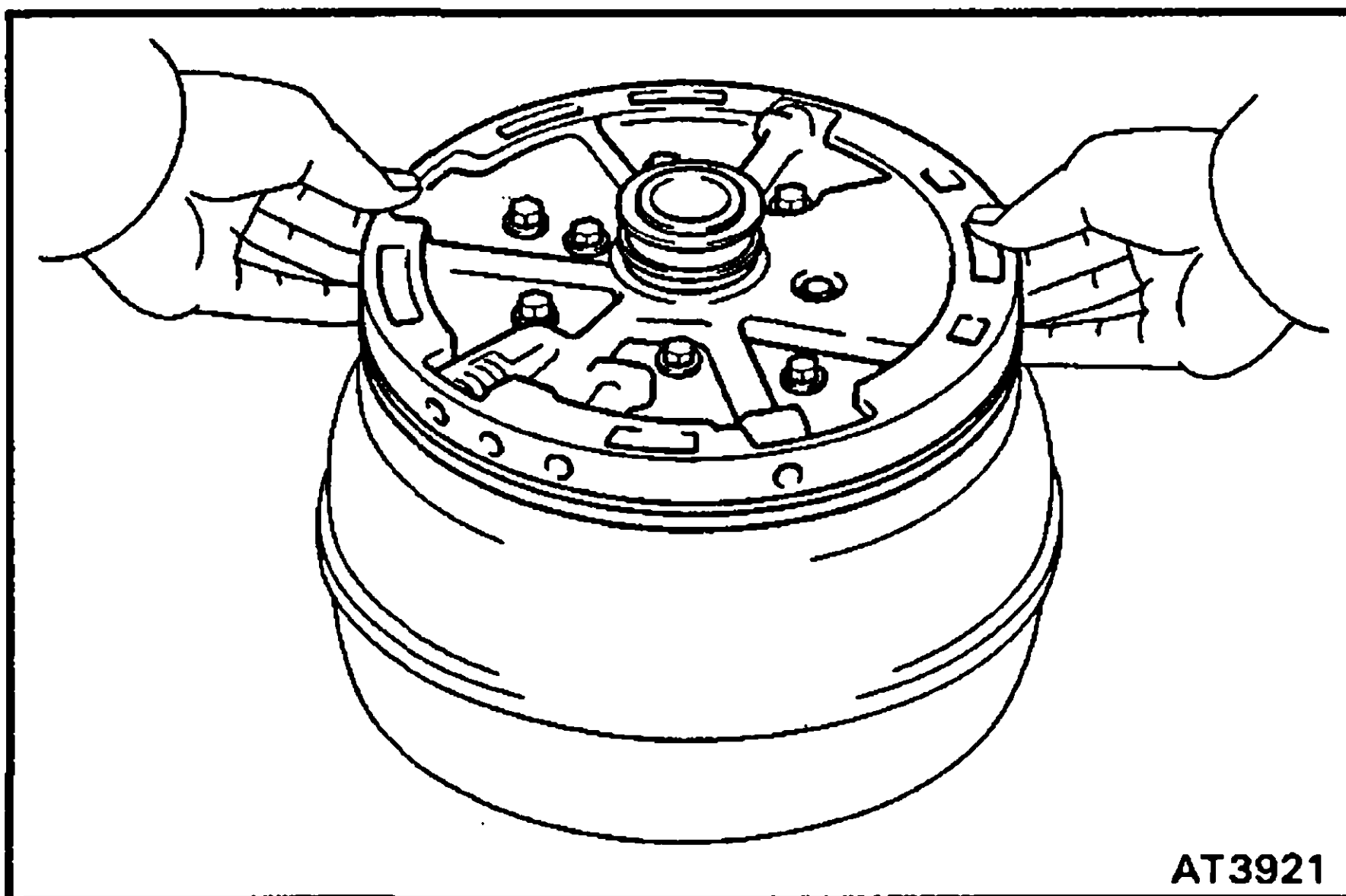
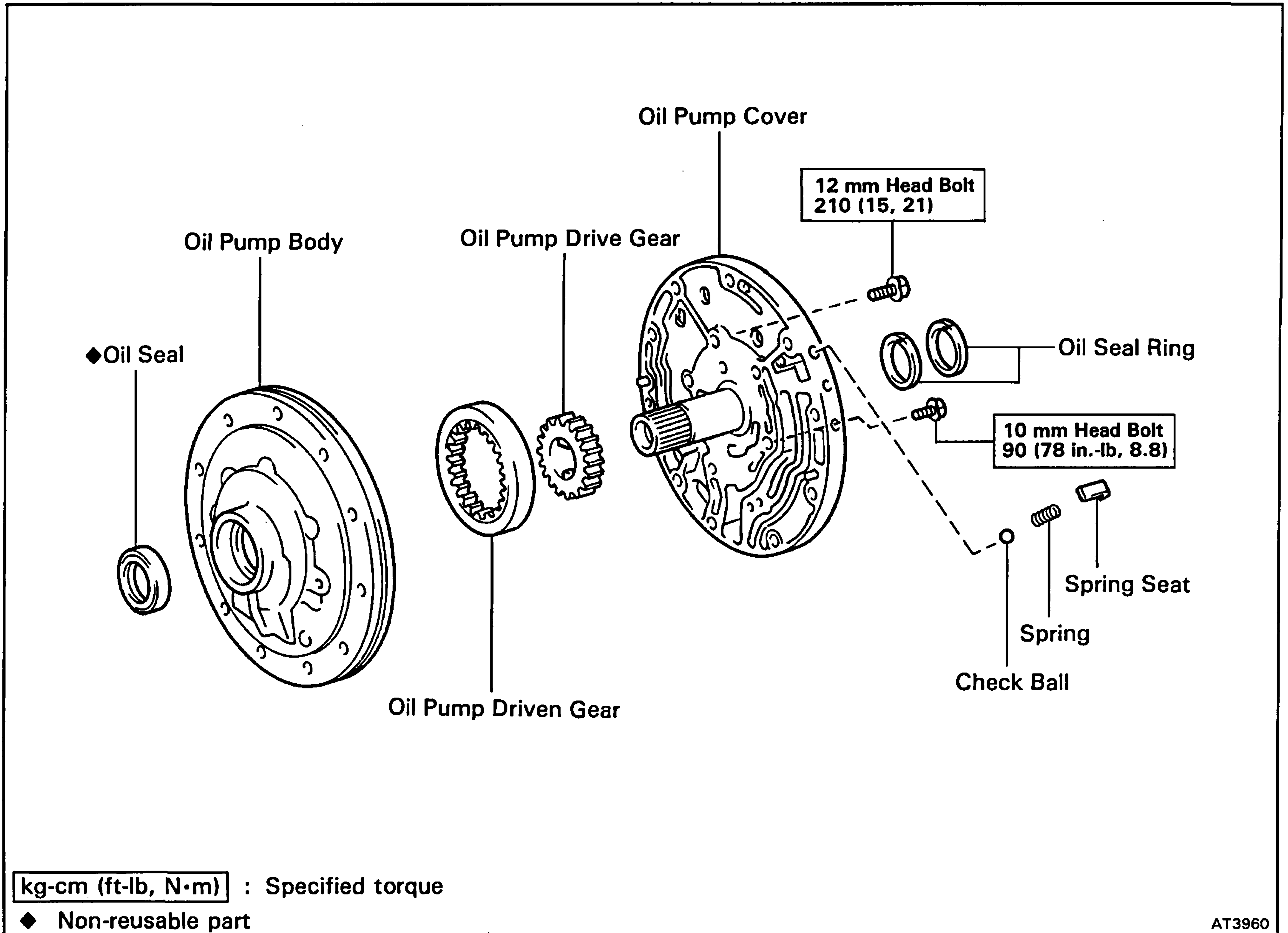
1. After cleaning, the parts should be arranged in proper order to allow performing inspection, repairs, and reassembly with efficiency.
2. When disassembling a valve body, be sure to keep each valve together with the corresponding spring.
3. New disc for the brakes and clutches that are to be used for 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 subassembly containing that bushing must also be replaced.
5. Check thrust bearings and races for wear or damage. Replace if necessary.
6. Use petroleum jelly to keep parts in place.

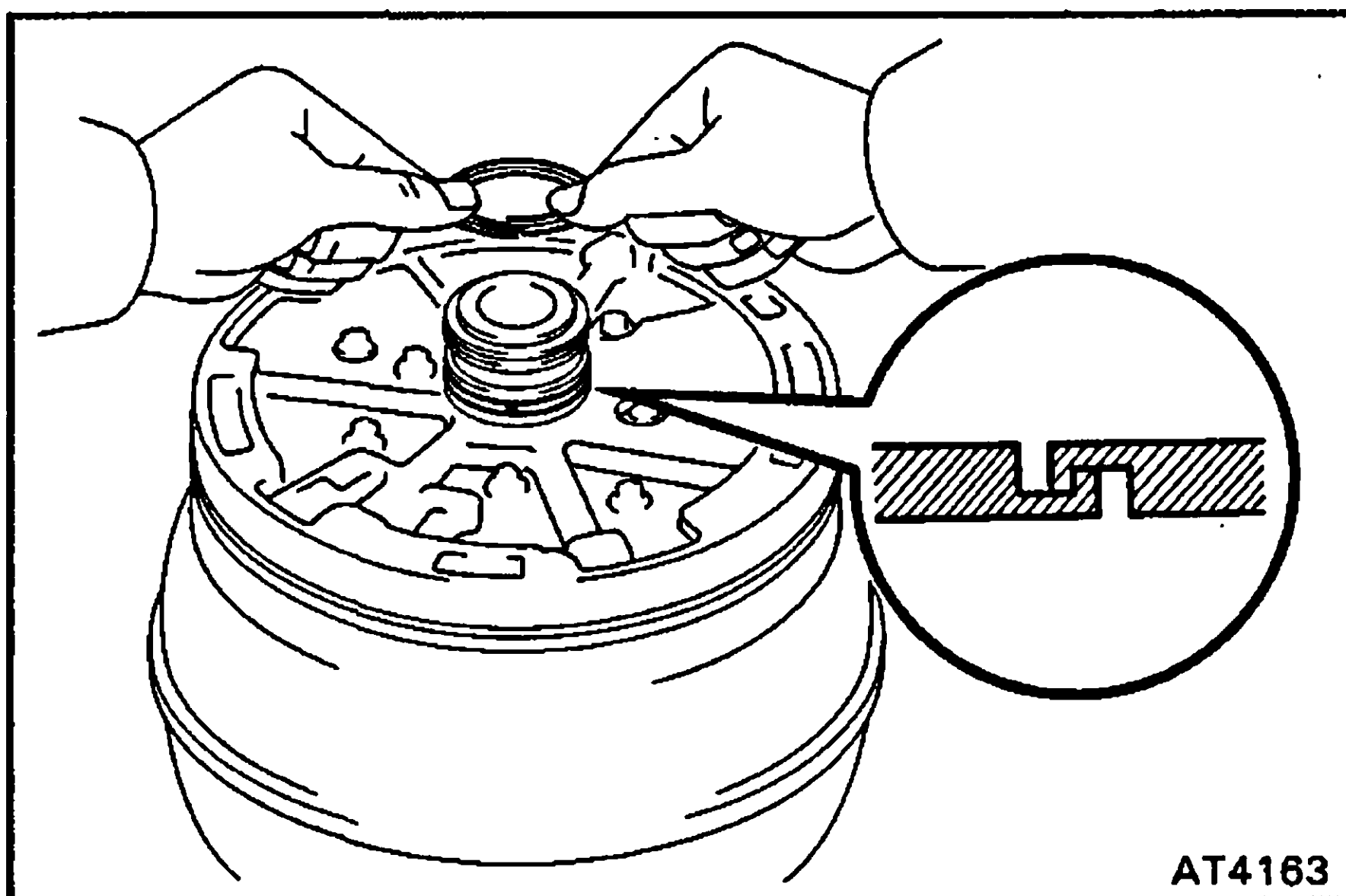
# Oil Pump

## COMPONENTS



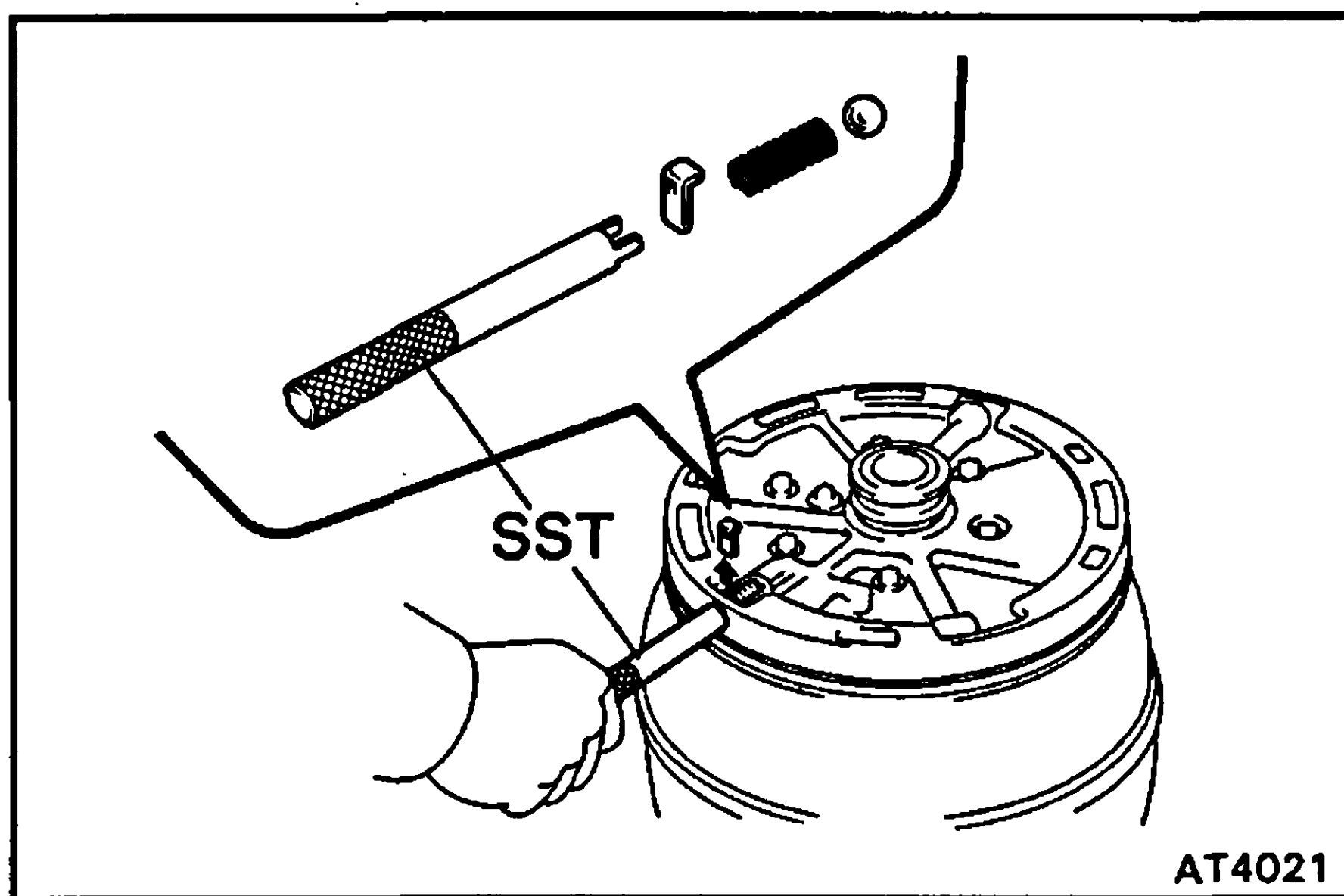
### DISASSEMBLY OF OIL PUMP

#### 1. USE TORQUE CONVERTER AS WORK STAND



#### 2. REMOVE OIL SEAL RINGS

Remove the two oil seal rings.

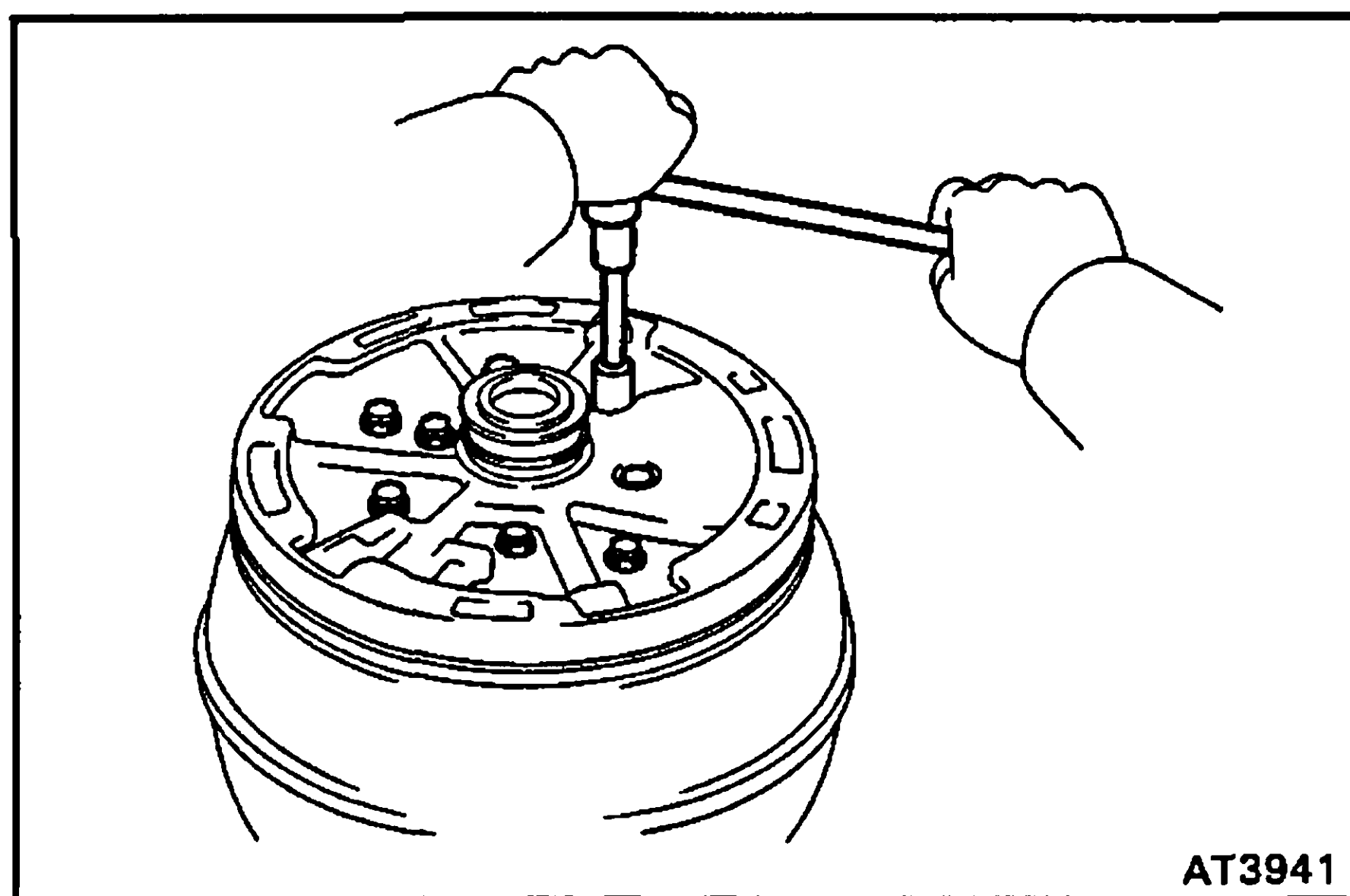


### 3. REMOVE CHECK BALL

- (a) Using SST, compress the spring and remove the spring seat.

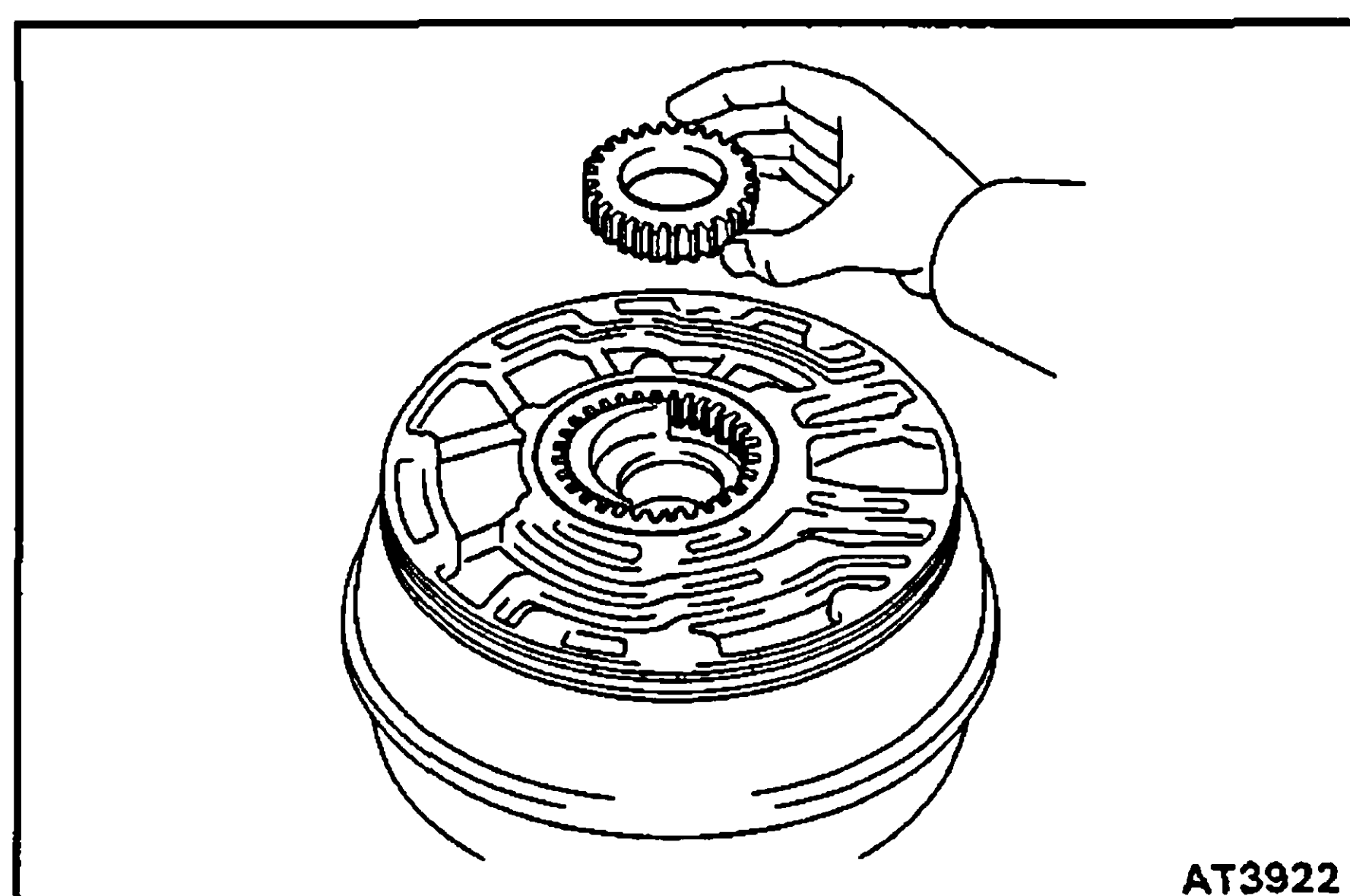
SST 09350-36010 (09350-06100)

- (b) Remove the spring and check ball.



### 4. REMOVE OIL PUMP COVER

Remove the eight bolts and pump cover.



### 5. REMOVE OIL PUMP DRIVE AND DRIVEN GEARS

## INSPECTION OF OIL PUMP

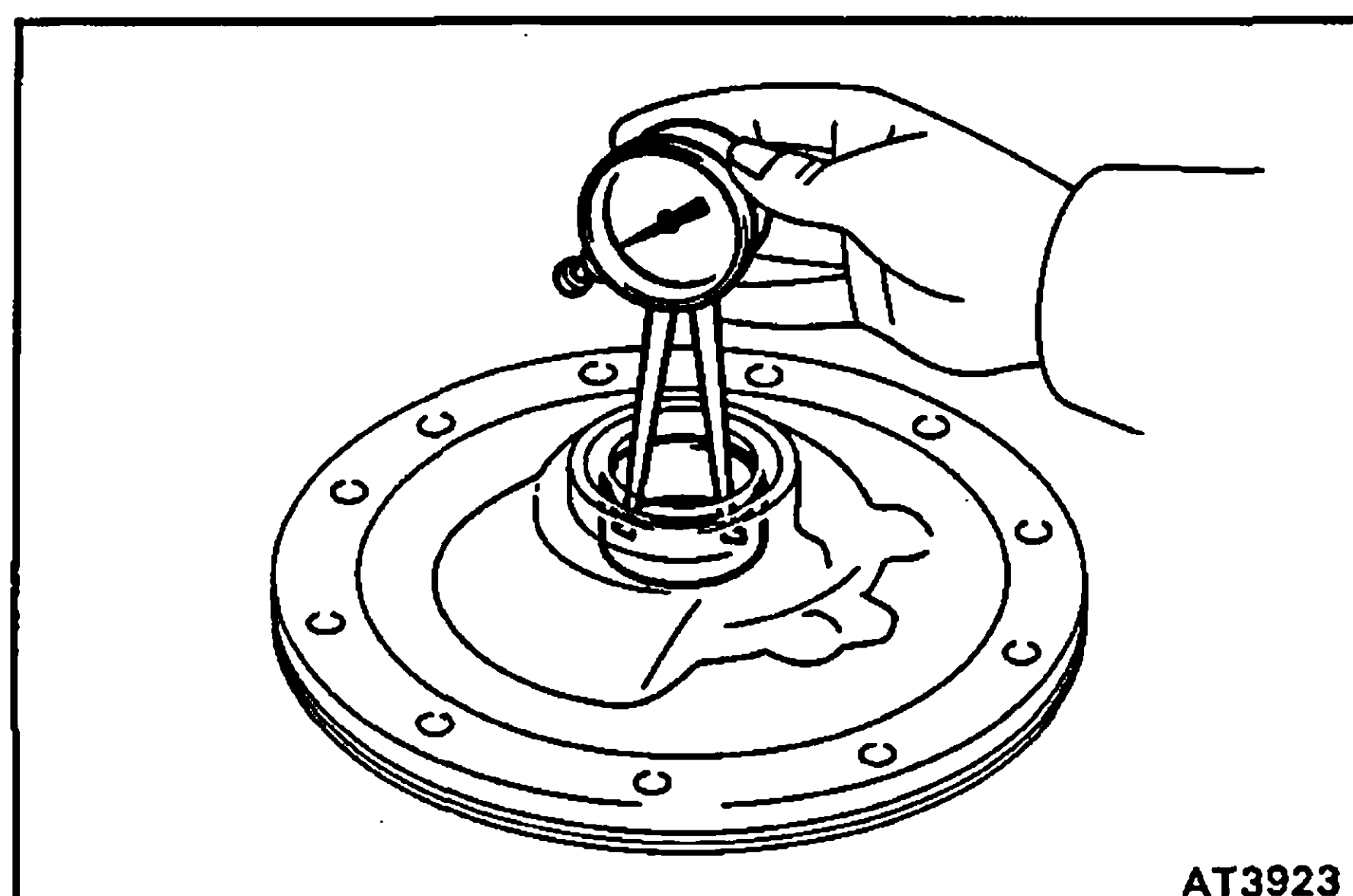
#### 1. INSPECT BUSHING OF OIL PUMP BODY

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:** 42.050 — 42.075 mm  
(1.6555 — 1.6565 in.)

**Maximum inside diameter:** 42.13 mm (1.6587 in.)

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



#### 2. INSPECT BUSHINGS OF OIL PUMP COVER

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:**

**Front** 24.000 — 24.021 mm  
(0.9449 — 0.9457 in.)

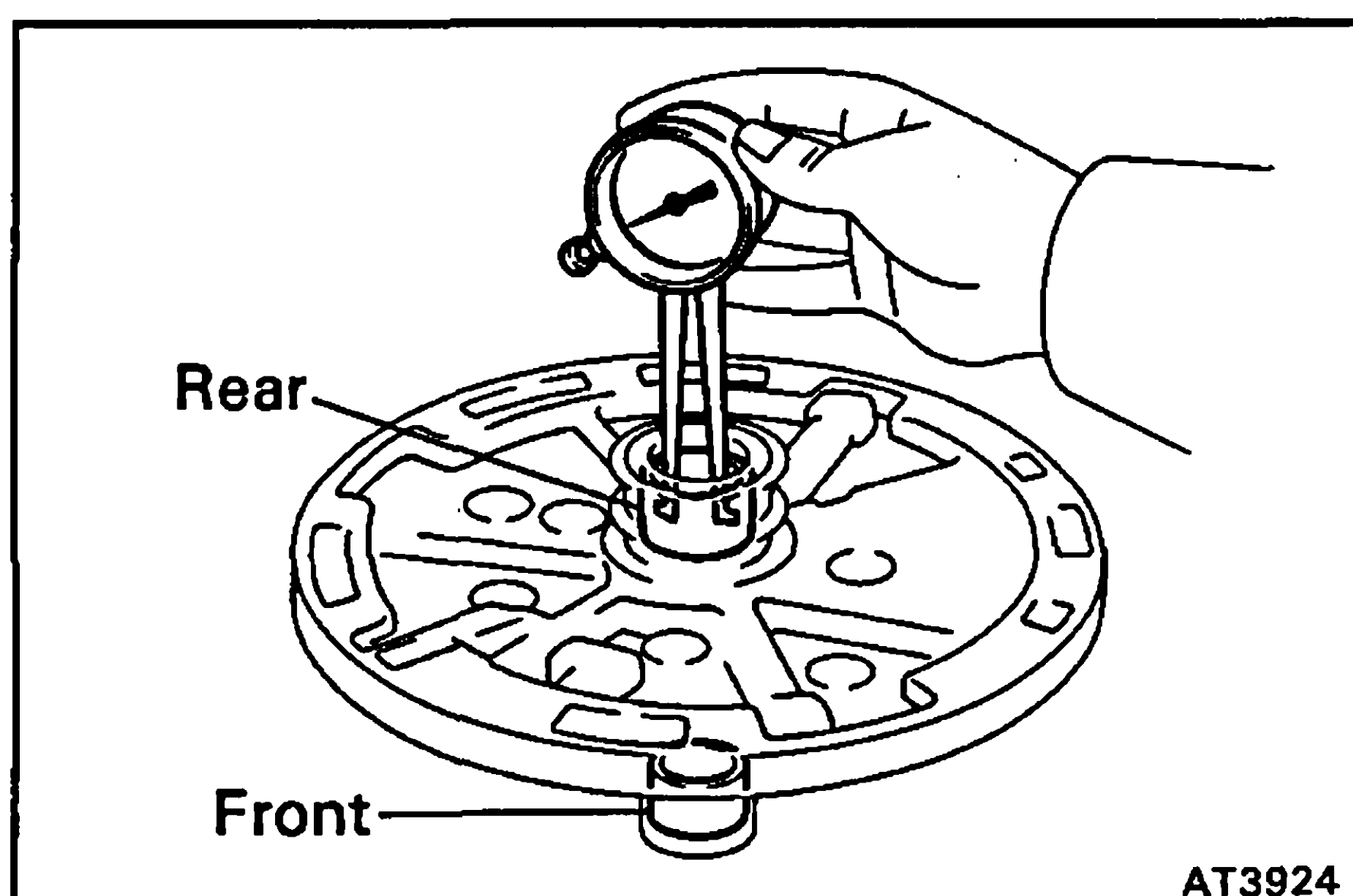
**Rear** 26.500 — 26.521 mm  
(1.0433 — 1.0441 in.)

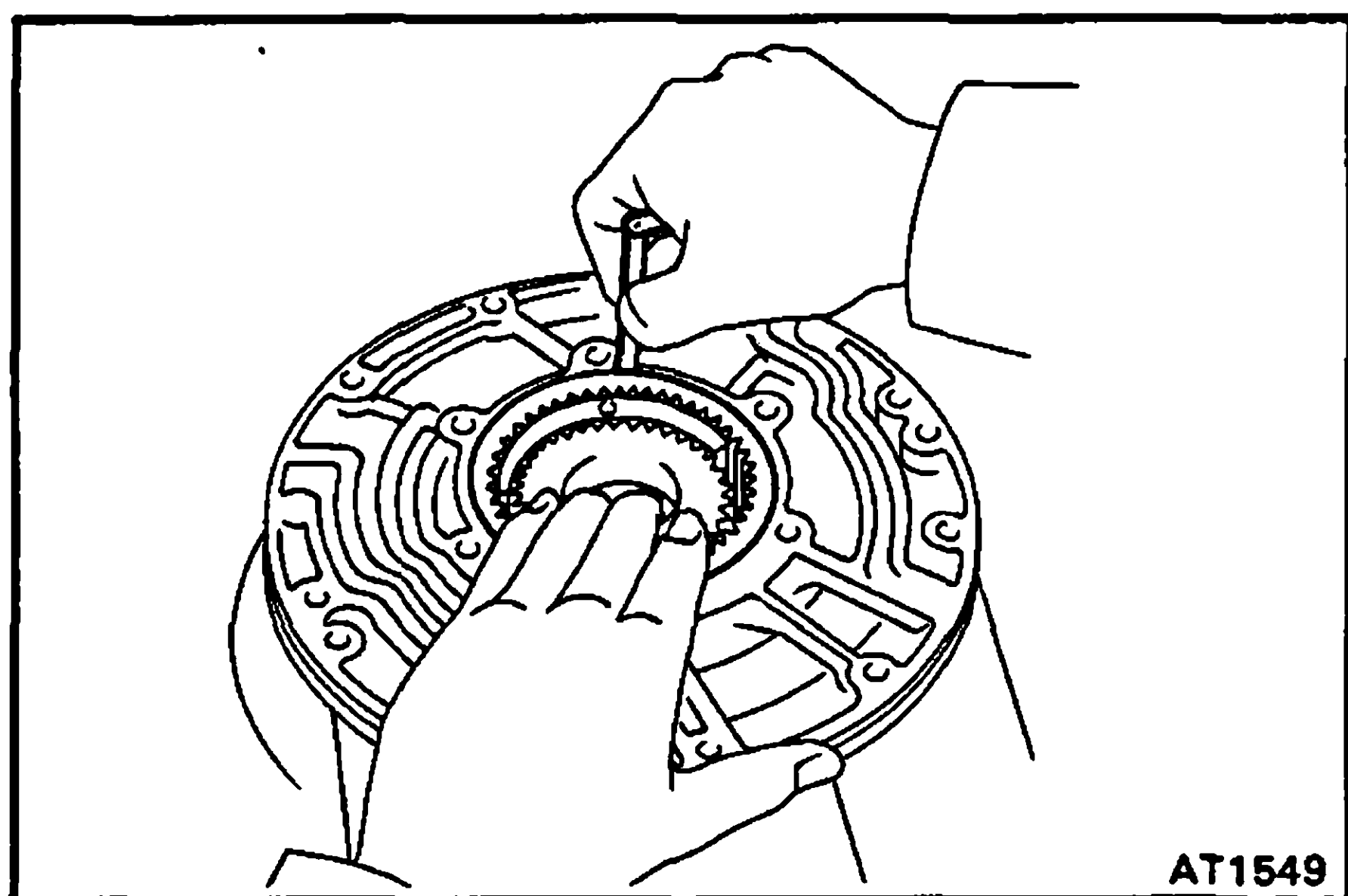
**Maximum inside diameter:**

**Front** 24.07 mm (0.9476 in.)

**Rear** 26.57 mm (1.0461 in.)

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





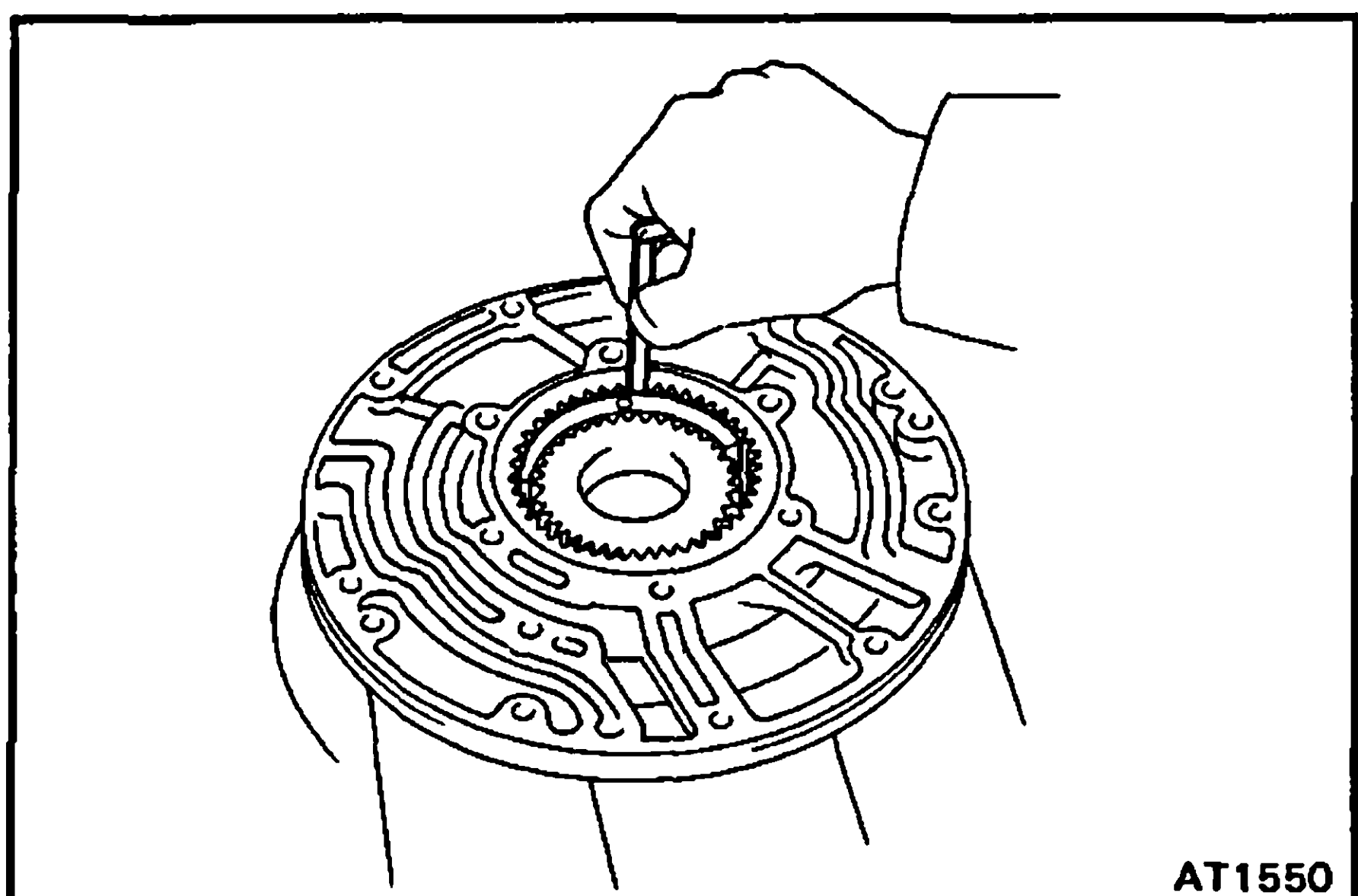
### 3. INSPECT BODY CLEARANCE OF DRIVEN GEAR

- (a) Push the driven gear to one side of the body.
- (b) Using a feeler gauge, measure the clearance between the driven gear and body.

**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 maximum, replace the gears and pump body as a set.



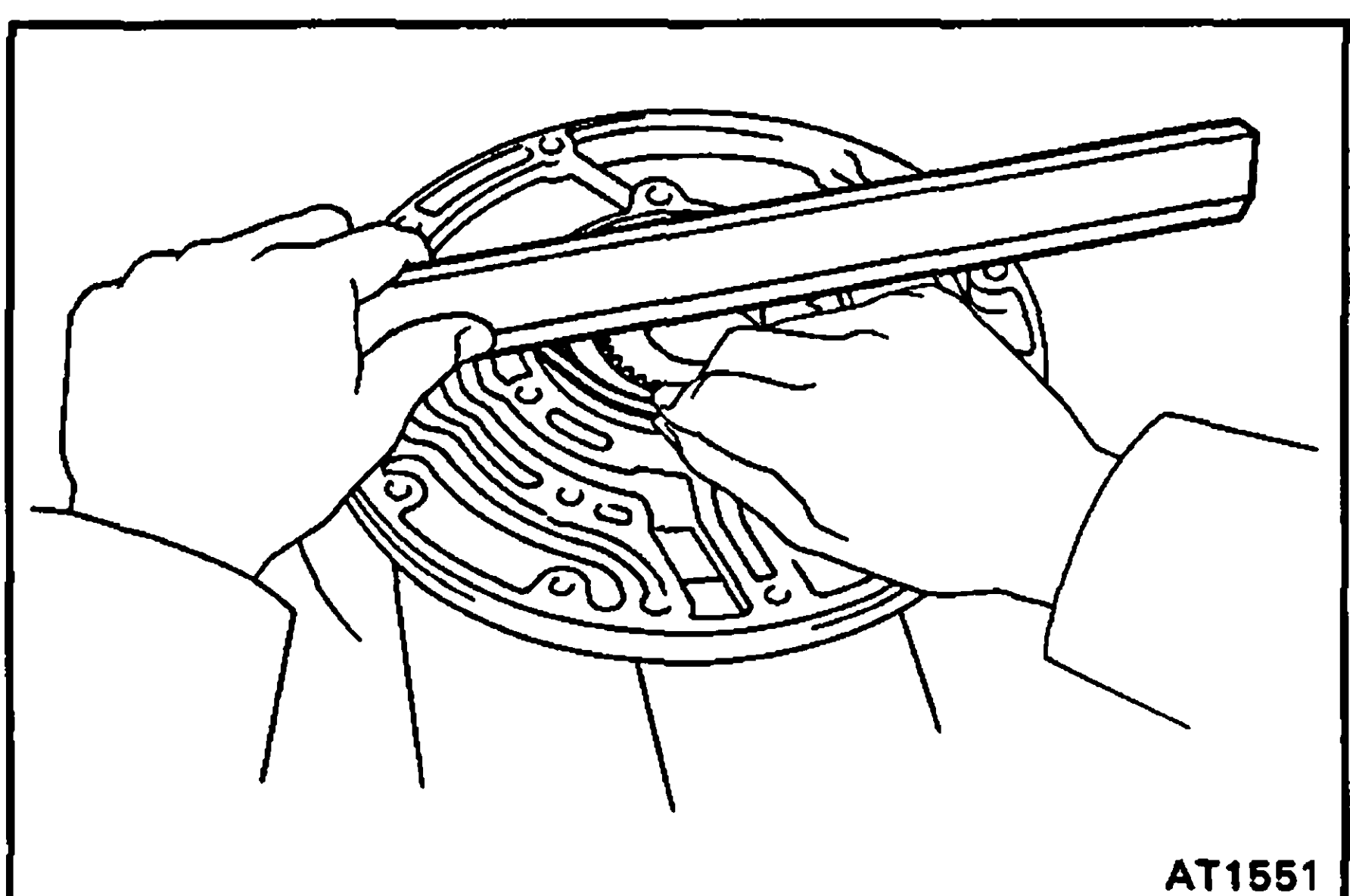
### 4. INSPECT TIP CLEARANCE OF DRIVEN GEAR

Using a feeler gauge, measure the clearance between the gear teeth and the crescent - shaped pad of the pump body.

**Standard tip clearance:** 0.14 — 0.24 mm  
(0.0055 — 0.0094 in.)

**Maximum tip clearance:** 0.3 mm (0.012 in.)

If the tip clearance is greater than maximum, replace the gears and pump body as a set.



### 5. INSPECT SIDE CLEARANCE OF DRIVE AND DRIVEN GEARS

Using a steel straight edge and a feeler gauge, measure the clearance between the gears and steel straight edge.

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

**Maximum side clearance:** 0.1 mm (0.004 in.)

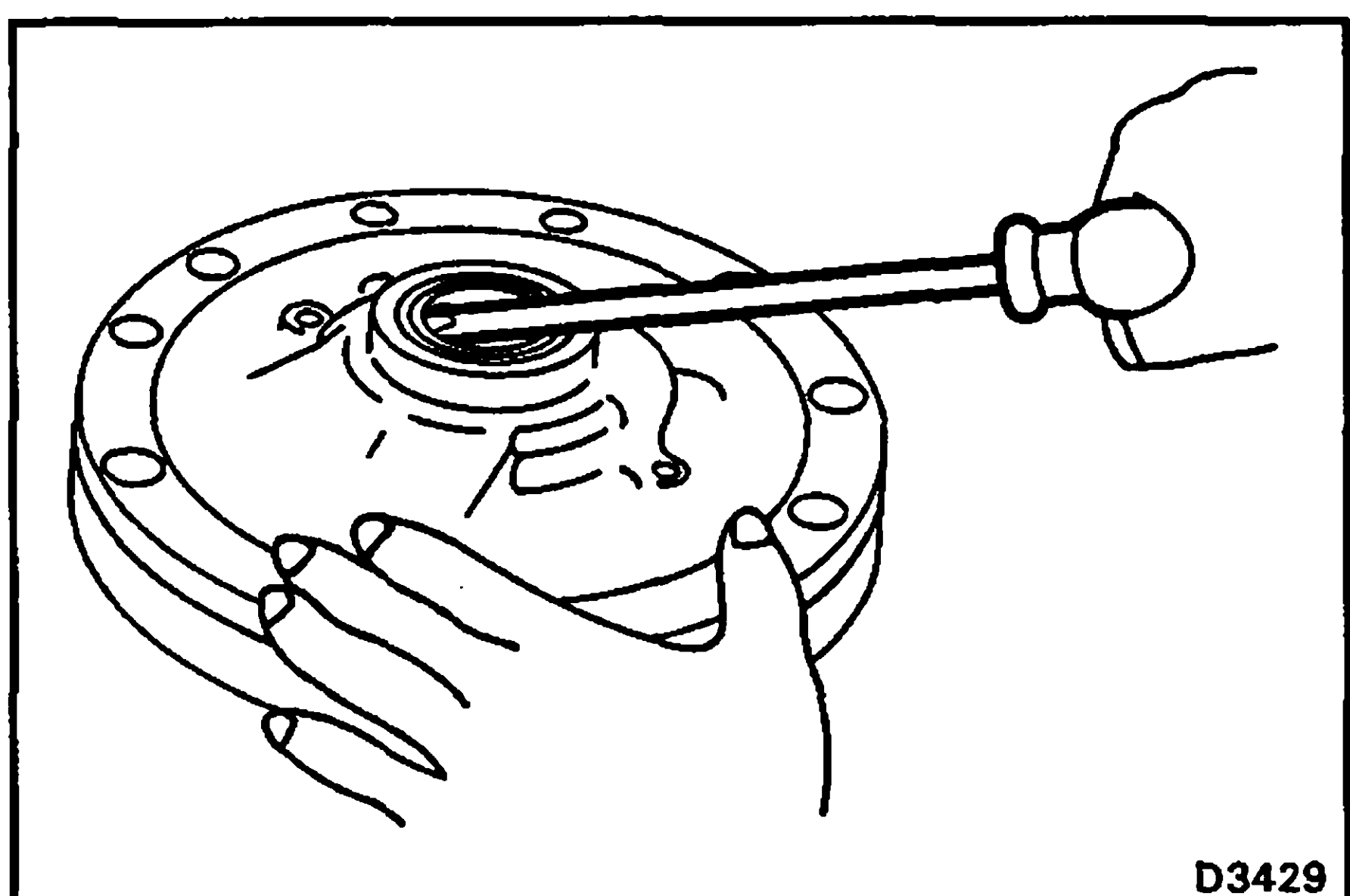
If the side clearance is greater than maximum, select and replace the gears as a set.

**HINT:** There are two difference thicknesses for drive and driven gears.

**Gear thickness:**

18.435 — 18.450 mm (0.7258 — 0.7264 in.)  
18.451 — 18.486 mm (0.7264 — 0.7278 in.)

If necessary, replace the pump body.



### 6. IF NECESSARY, REPLACE OIL SEAL

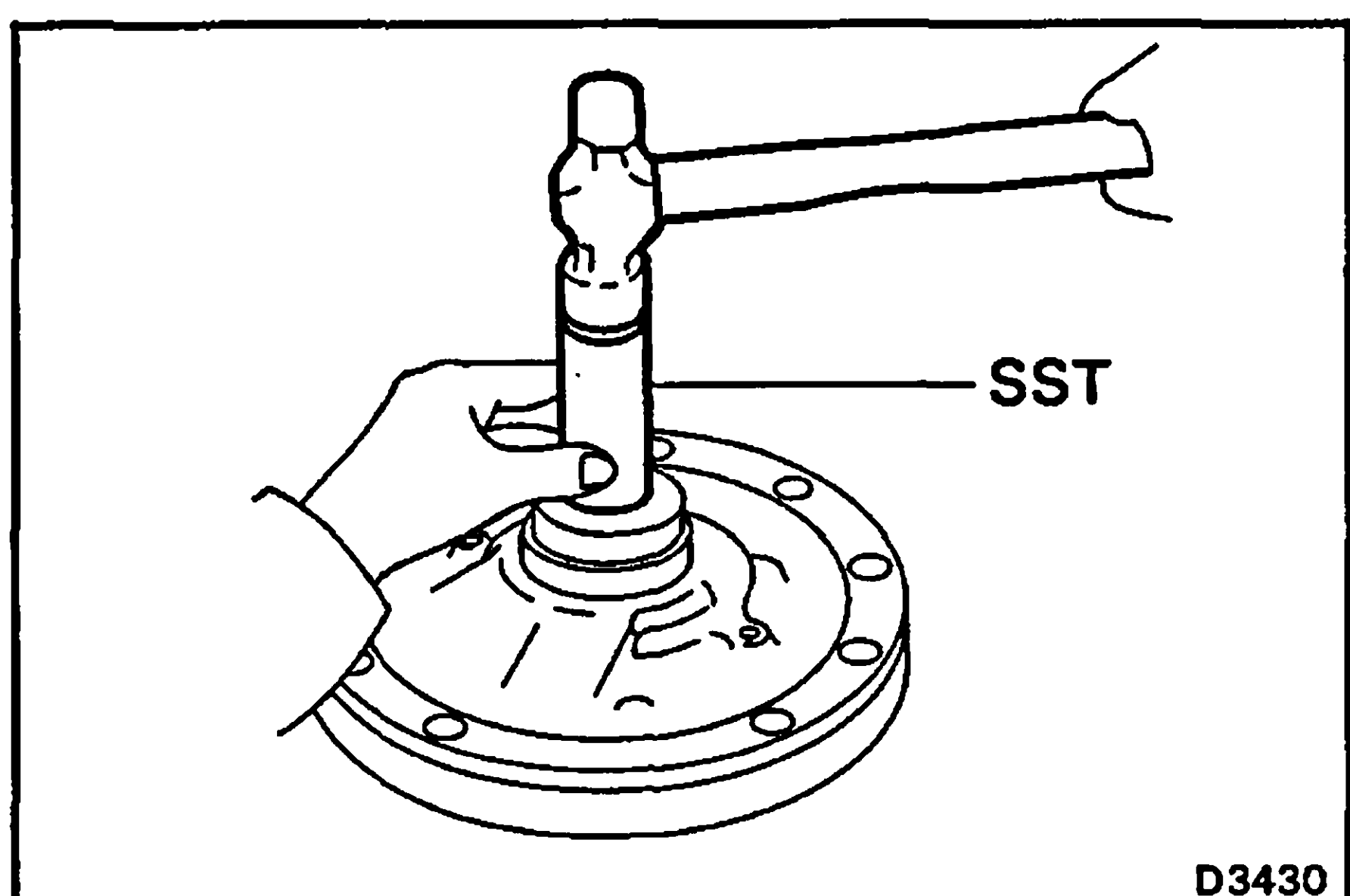
- (a) Using a screwdriver, pry off the oil seal.

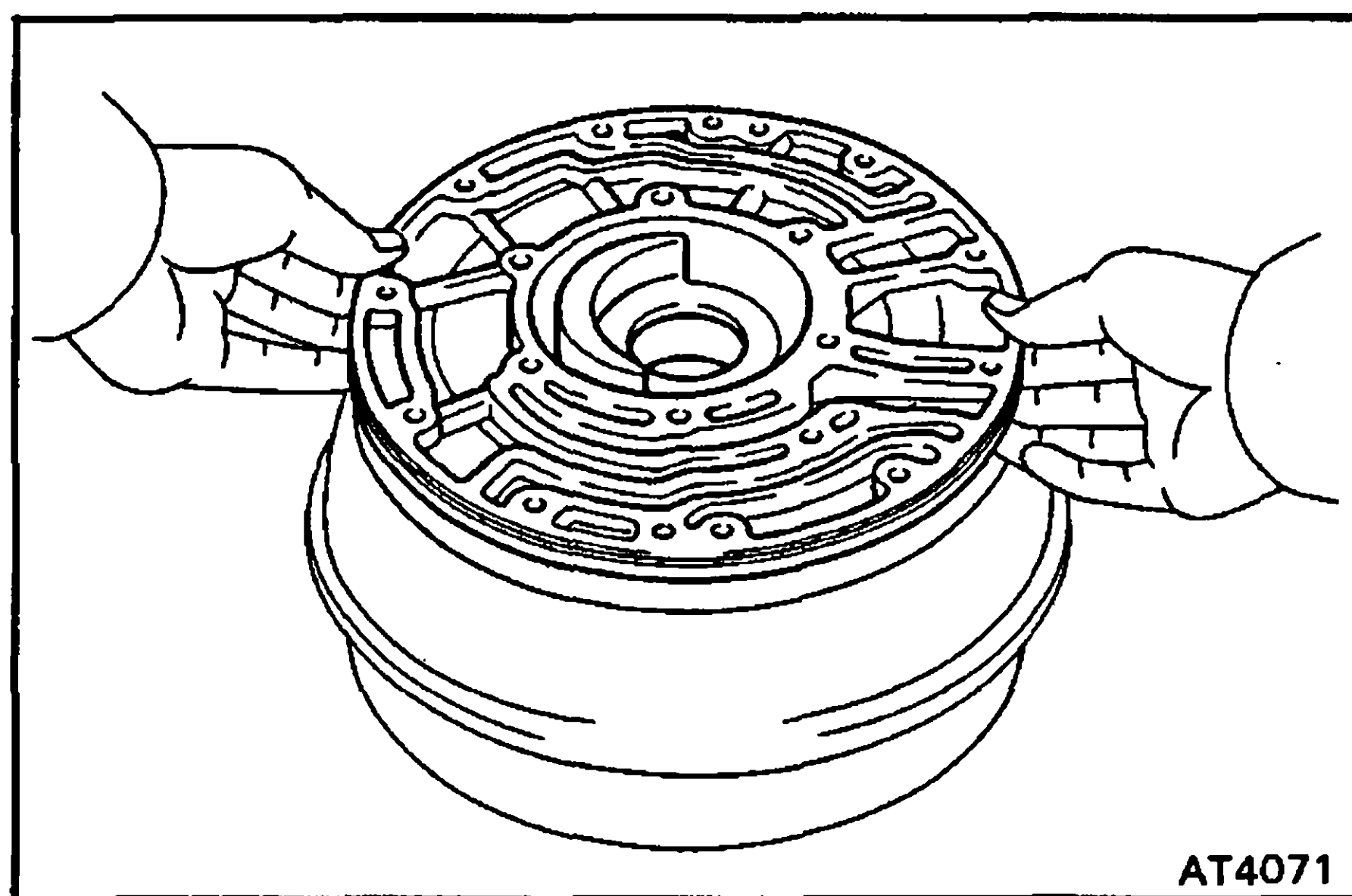
- (b) Using SST, tap in a new oil seal

The oil seal end should be flushed with the outer edge of the pump body.

SST 09350-36010 (09350-06040)

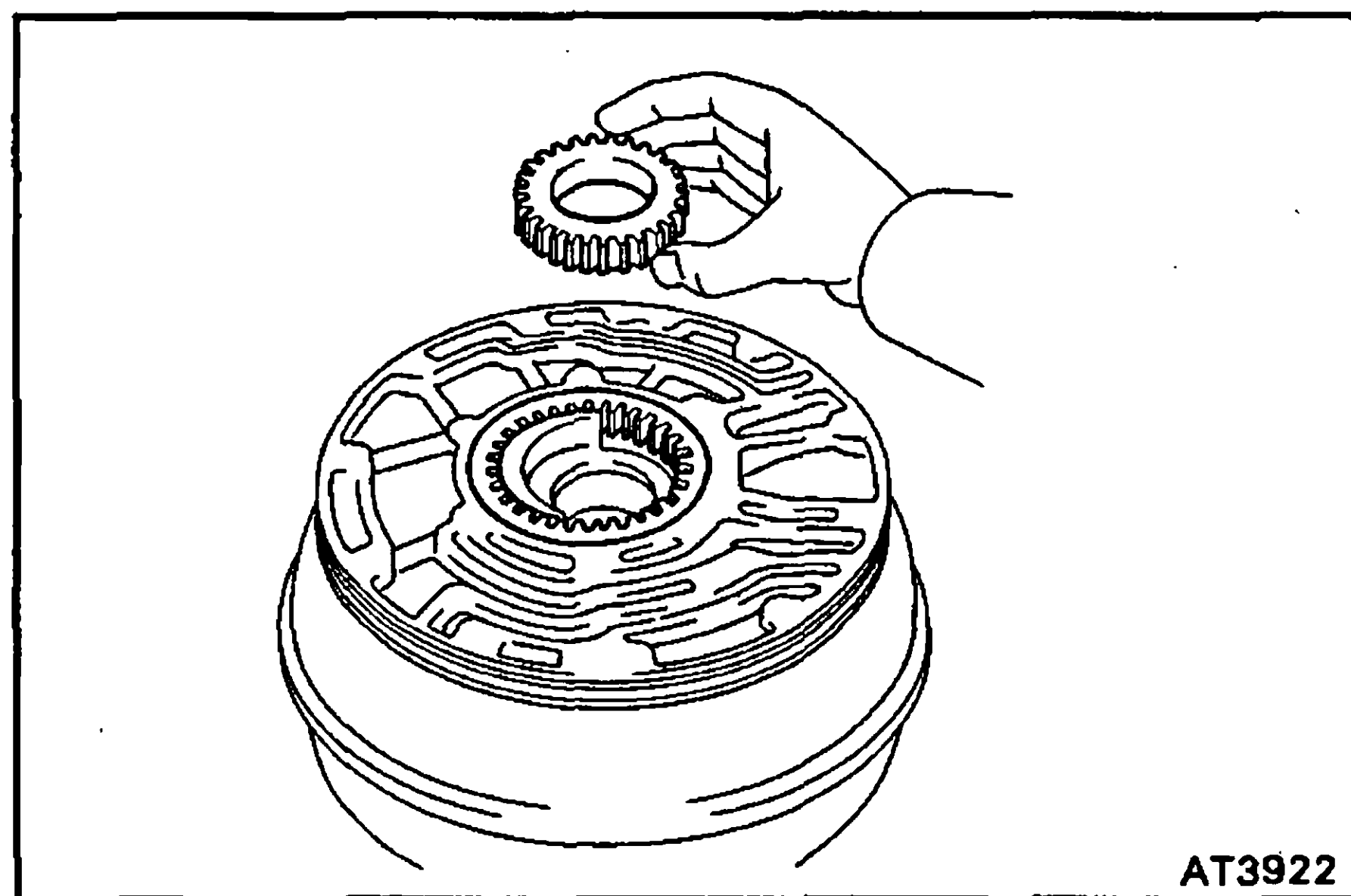
- (c) Apply MP grease to the oil seal lip.





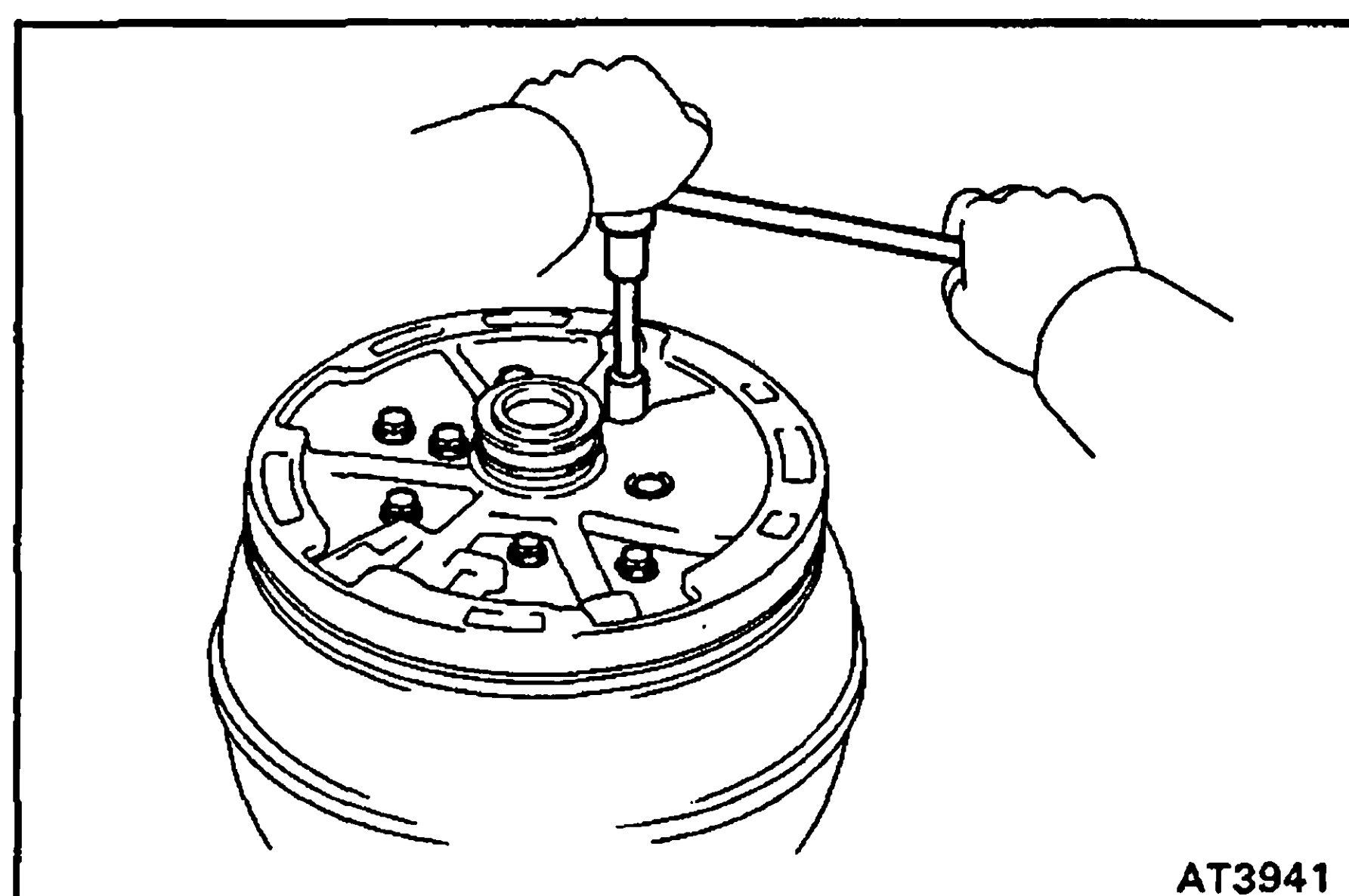
## ASSEMBLY OF OIL PUMP

### 1. PLACE OIL PUMP BODY ONTO TORQUE CONVERTER



### 2. INSTALL DRIVEN AND DRIVE GEARS TO OIL PUMP BODY

- (a) Coat the driven and drive gears with ATF.
- (b) Install the driven and drive gears.



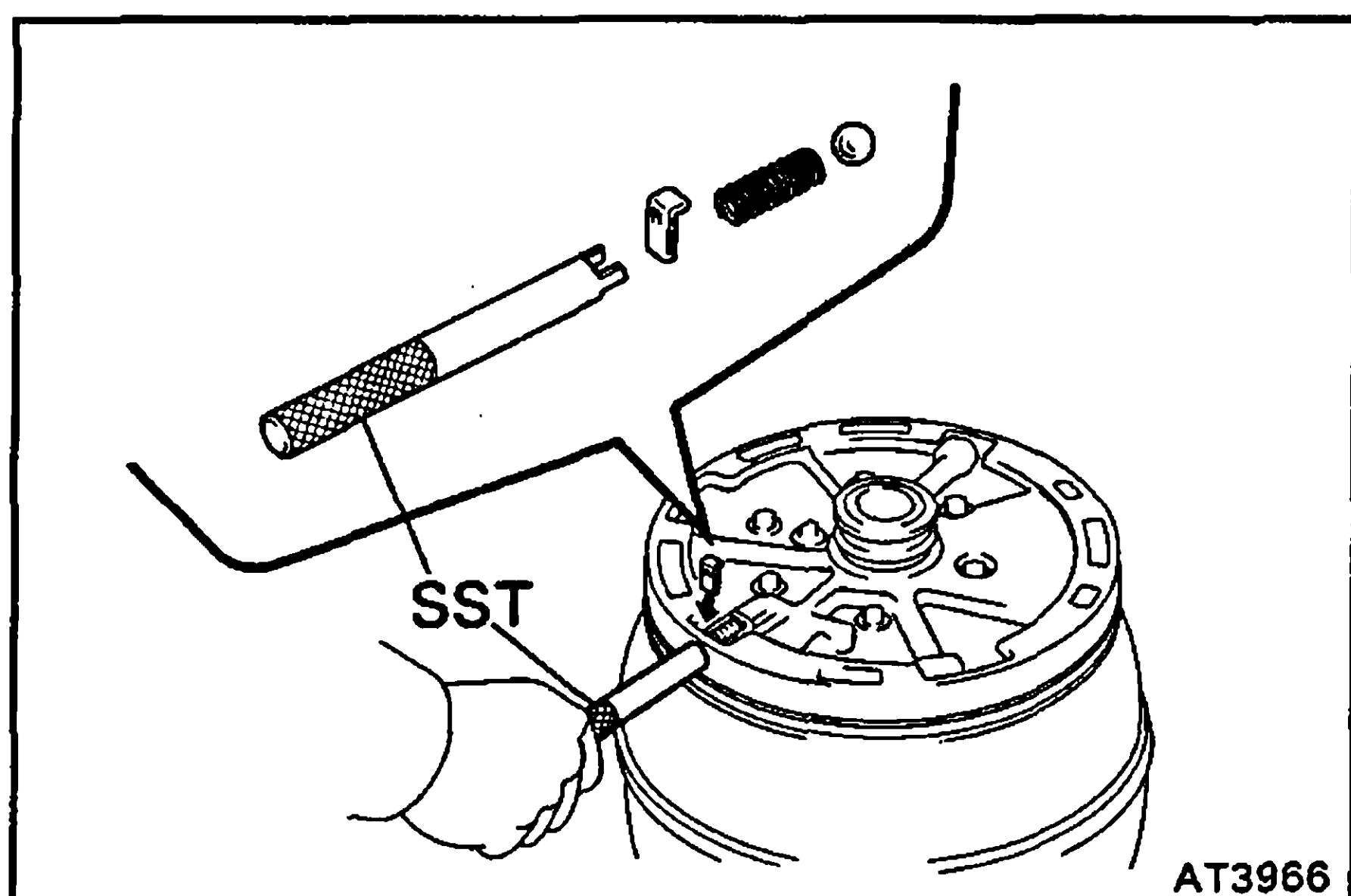
### 3. INSTALL OIL PUMP COVER TO OIL PUMP BODY

- (a) Align the bolt holes of the pump body and cover.
- (b) Install the pump cover with the eight bolts.

**Torque:**

10 mm head bolt 90 kg-cm (78 in.-lb, 8.8 N·m)

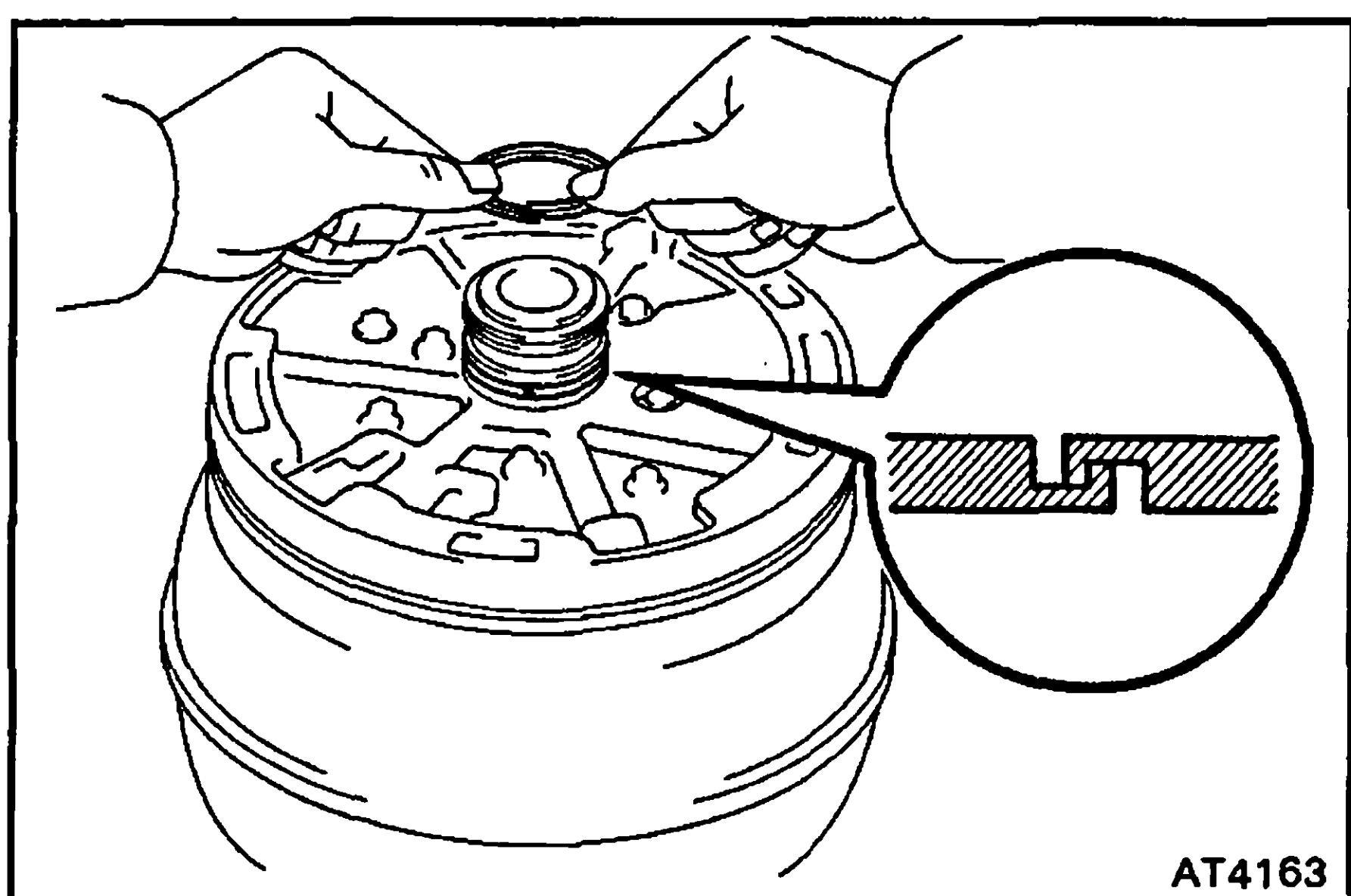
12 mm head bolt 210 kg-cm (15 ft-lb, 21 N·m)



### 4. INSTALL CHECK BALL

- (a) Install the check ball and spring.
- (b) Using SST, compress the spring and install the spring seat.

SST 09350-36010 (09350-06100)

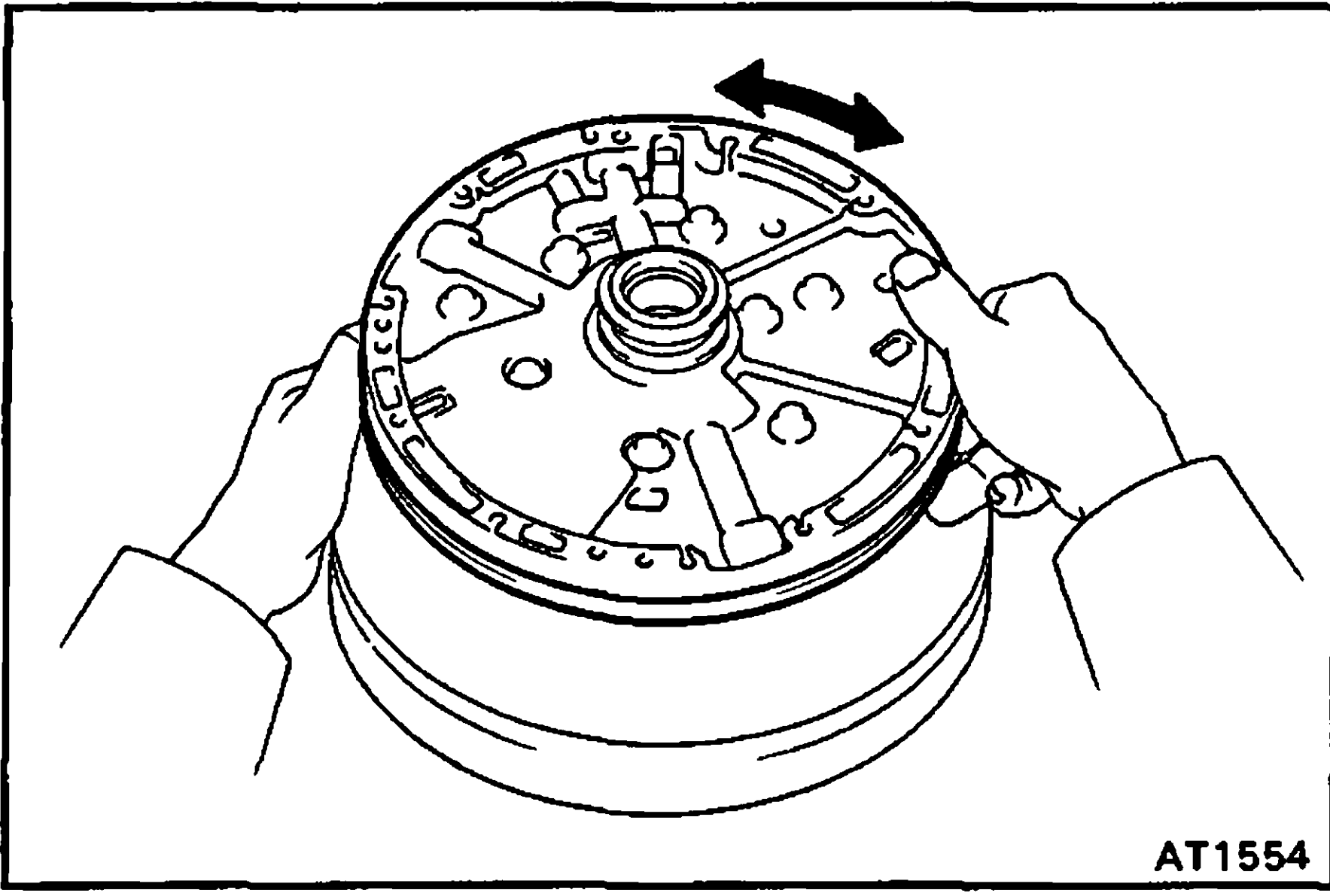


### 5. INSTALL OIL SEAL RINGS

- (a) Coat the two oil seal rings with ATF.
- (b) Contract the oil seal rings, and install them onto the stator shaft.

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

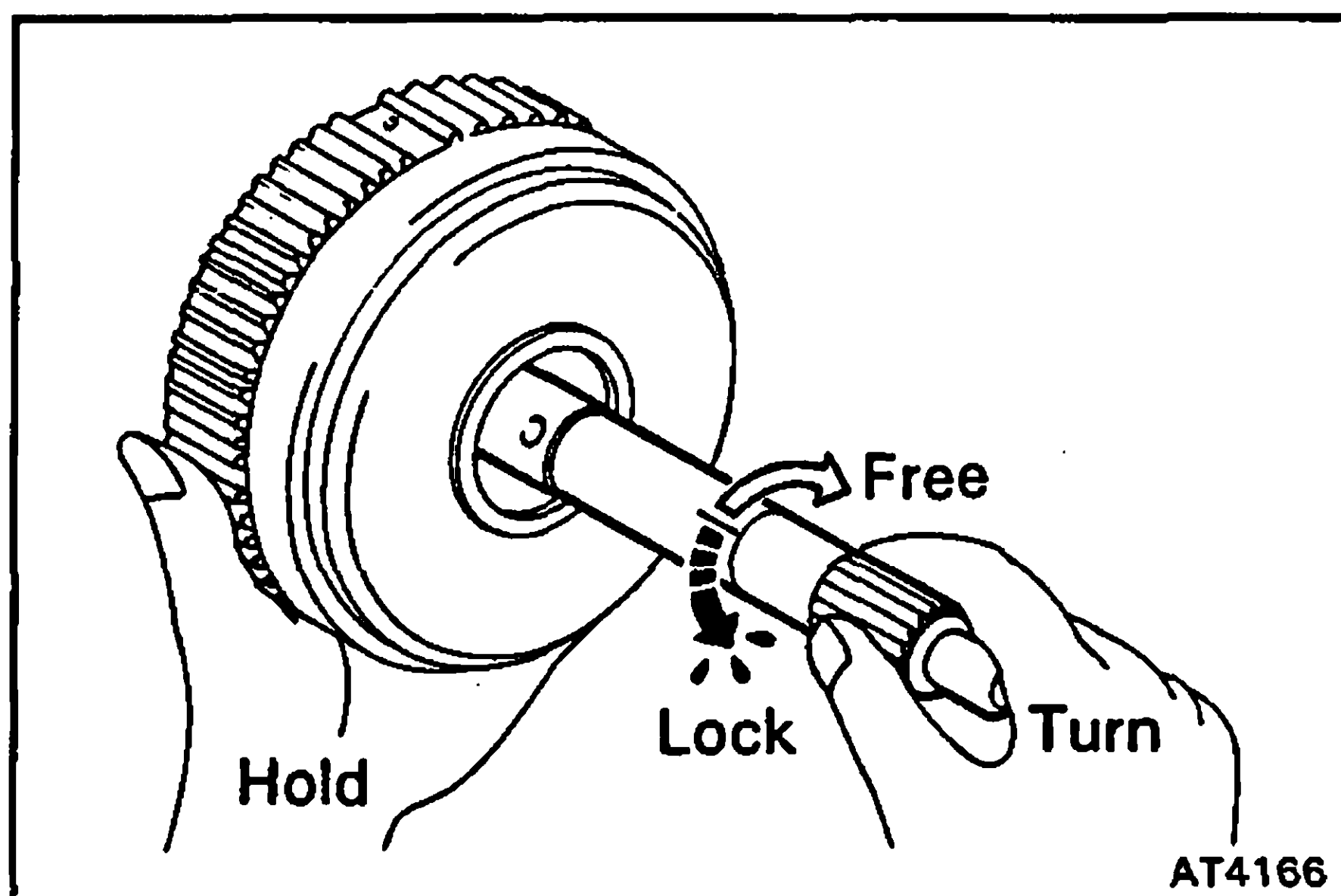
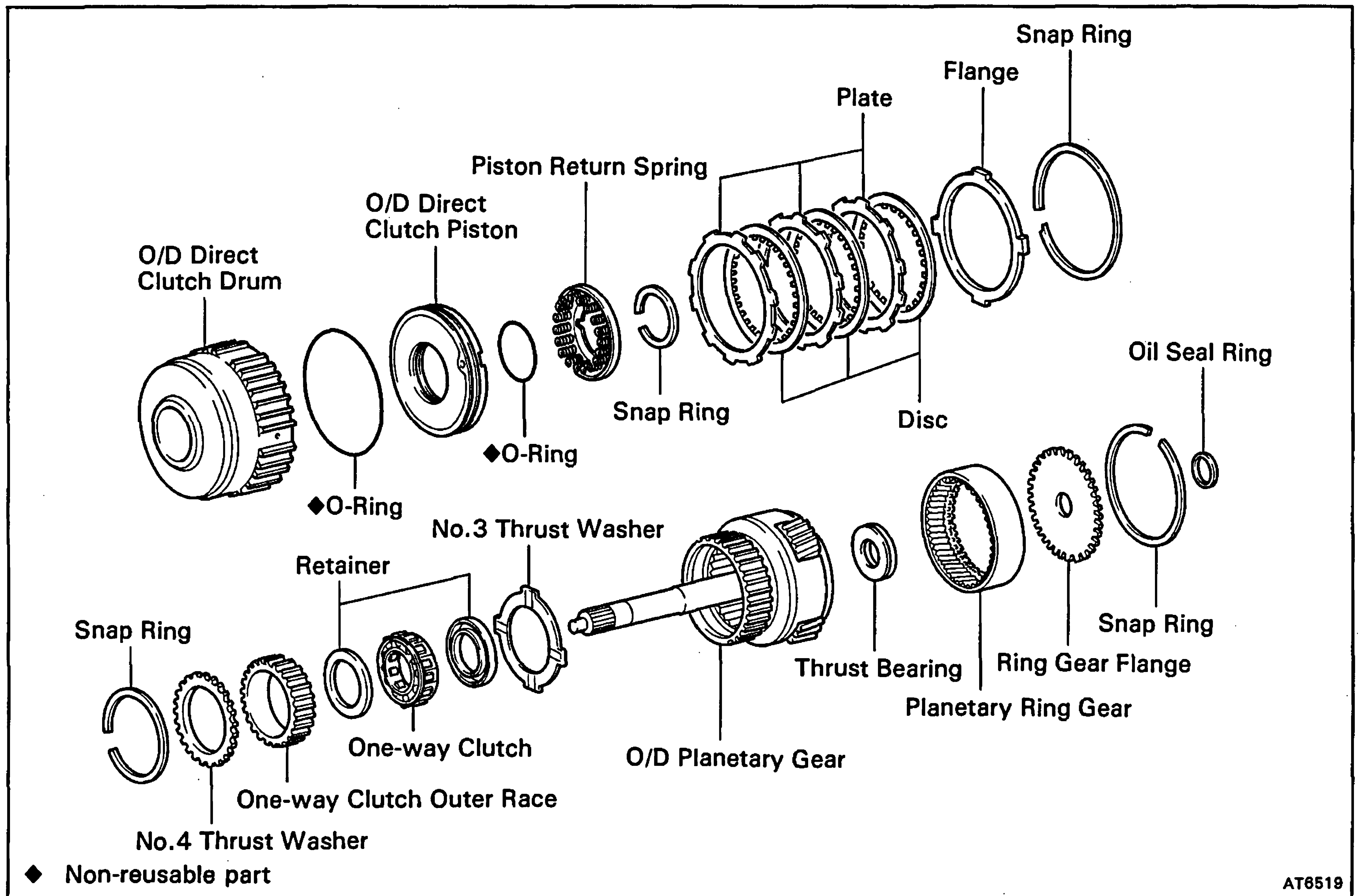
**HINT:** After installing the oil seal rings, check that they rotate smoothly.

**6. CHECK OIL PUMP DRIVE GEAR ROTATION**

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

# Overdrive Planetary Gear, Overdrive Direct Clutch and Overdrive One-Way Clutch

## COMPONENTS

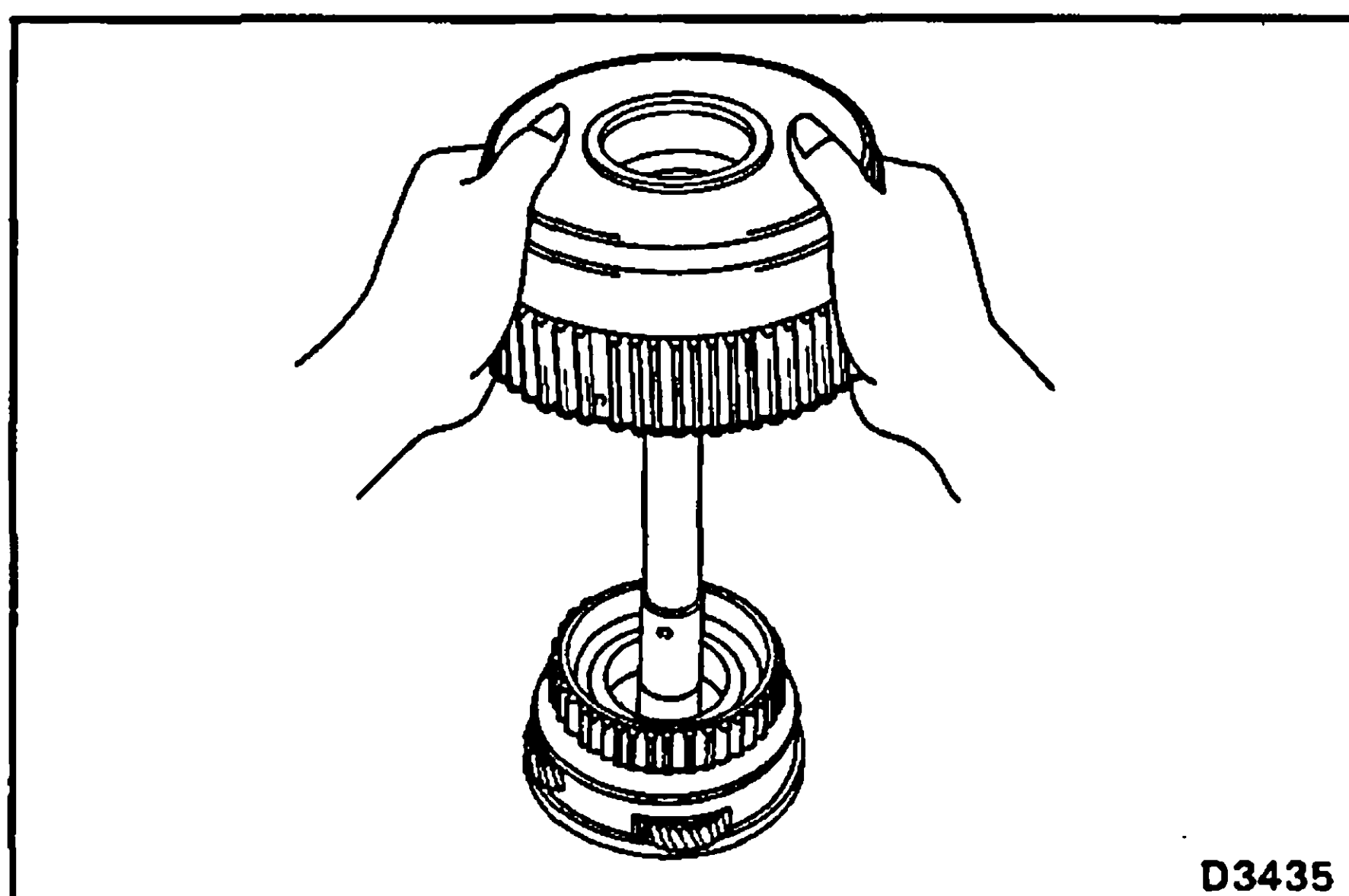


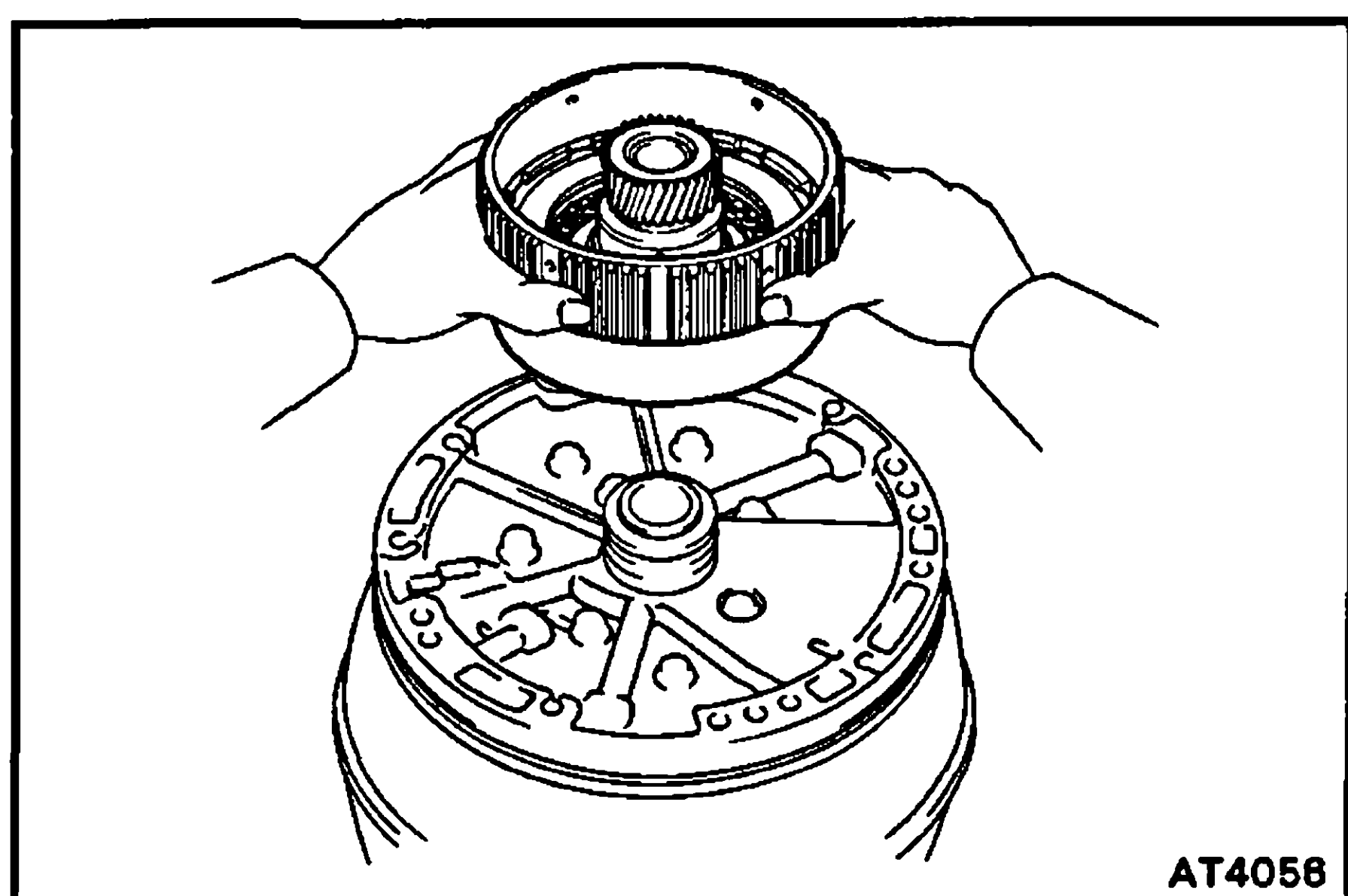
## DISASSEMBLY OF OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND OVERDRIVE ONE-WAY CLUTCH

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

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

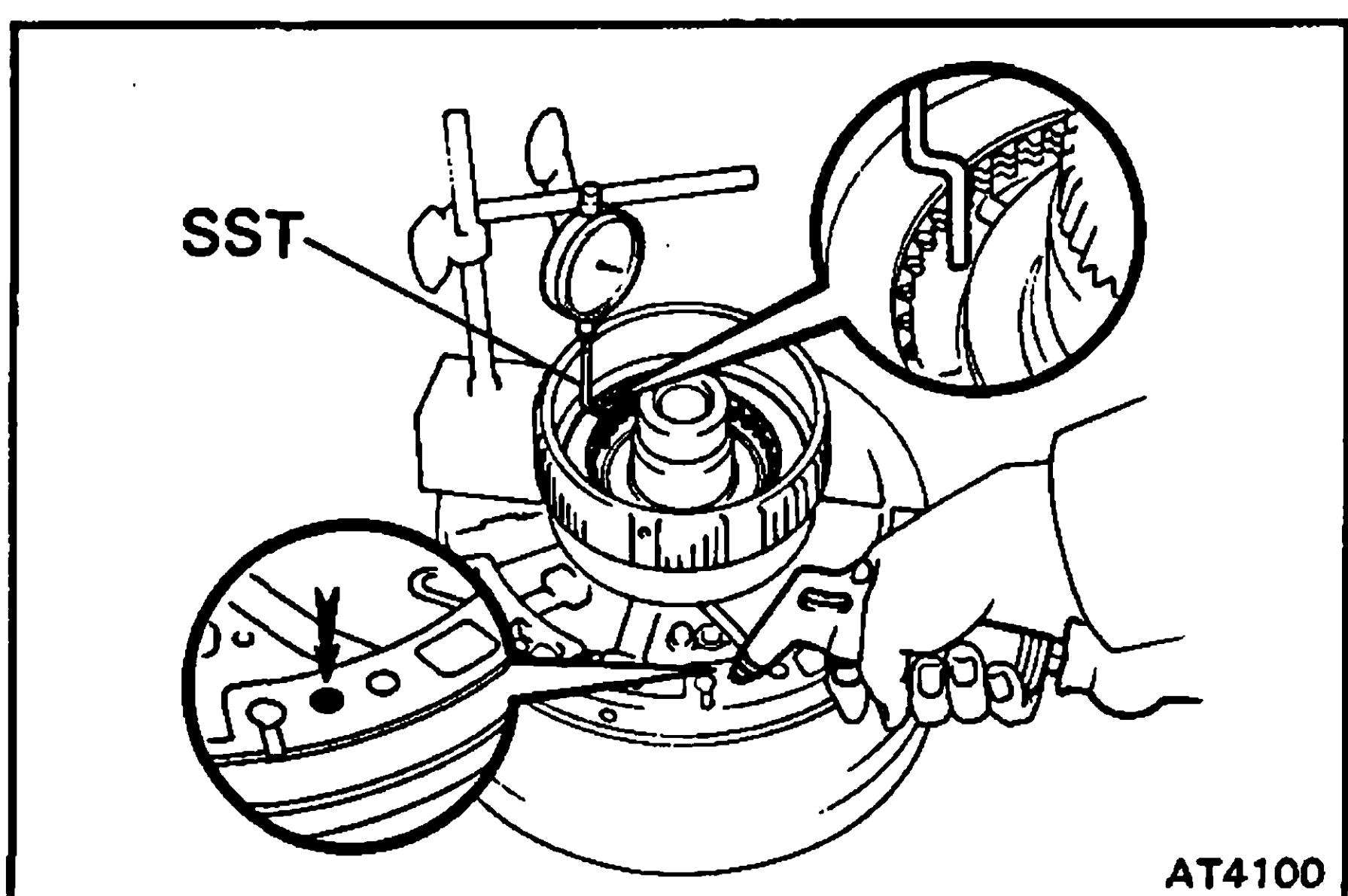
### 2. REMOVE OVERDRIVE DIRECT CLUTCH ASSEMBLY FROM OVERDRIVE PLANETARY GEAR





### 3. CHECK PISTON STROKE OF OVERDRIVE DIRECT CLUTCH

- (a) Place the oil pump onto the torque converter, and then place the O/D direct clutch assembly onto the oil pump.

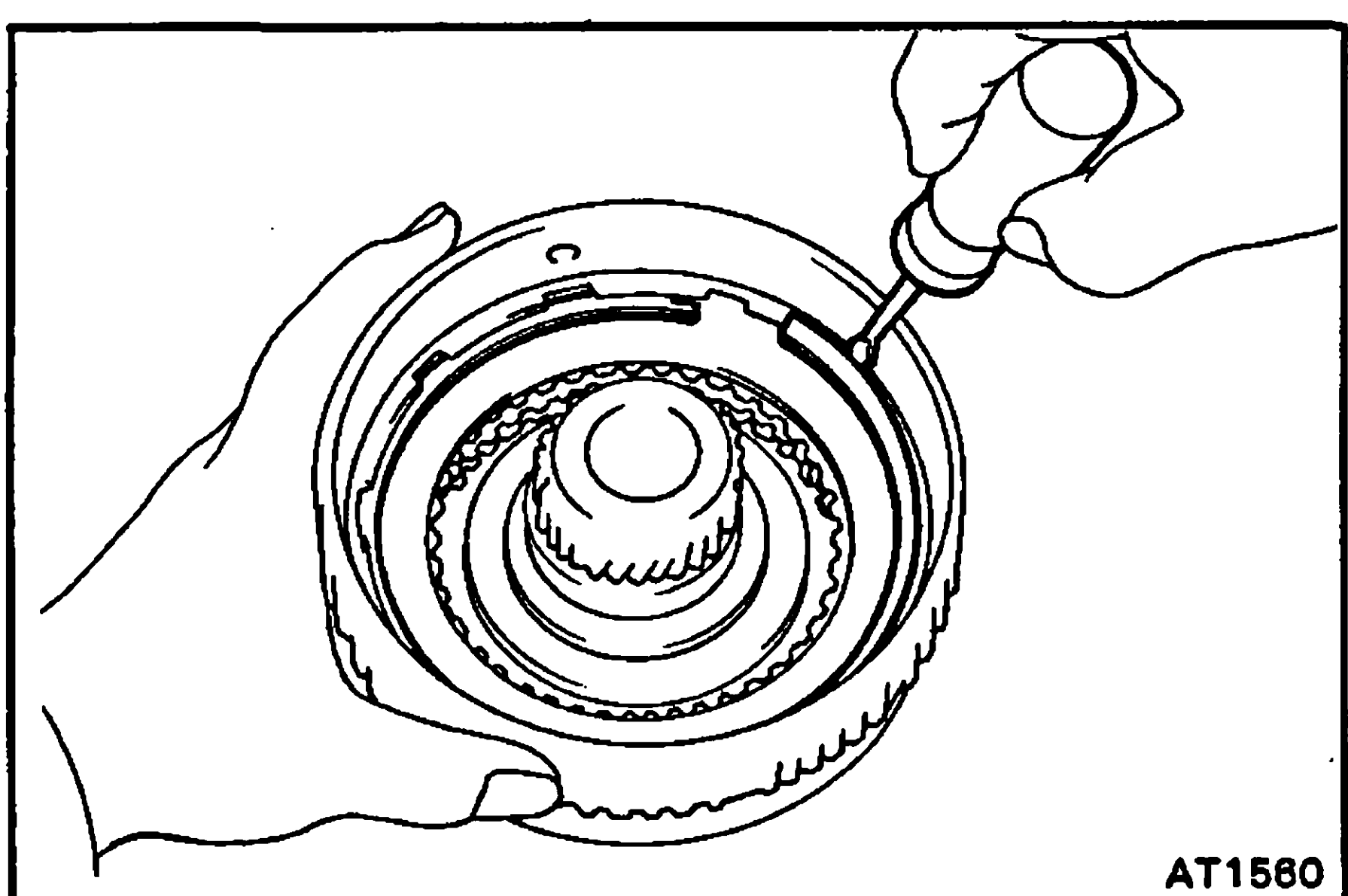


- (b) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air ( $4 - 8 \text{ kg/cm}^2$ , 57 — 114 psi or 392 — 785 kPa) as shown.

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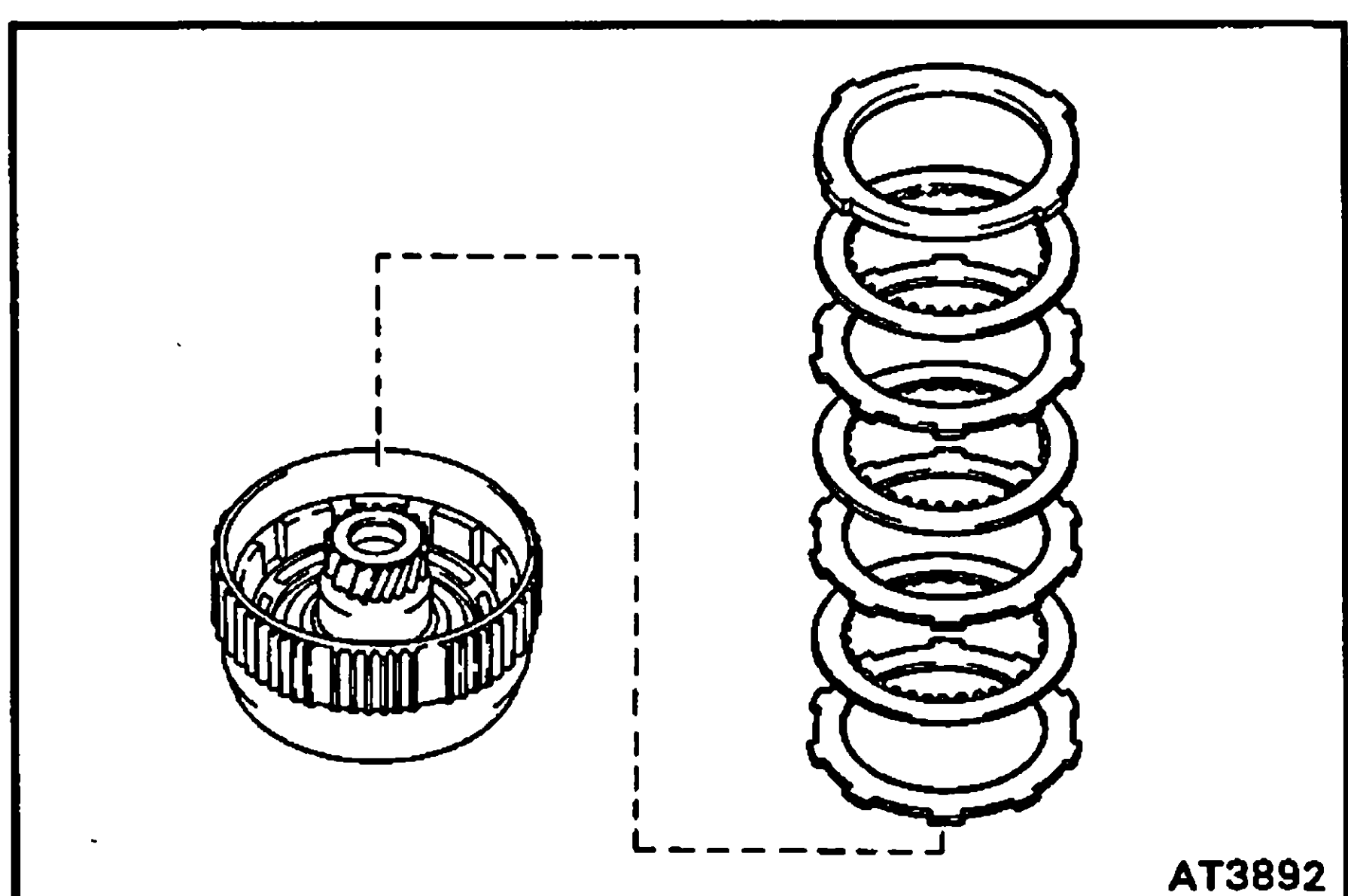
Piston stroke: 1.10 — 1.70 mm (0.0433 — 0.0669 in.)

If the piston stroke is not as specified, inspect the discs.

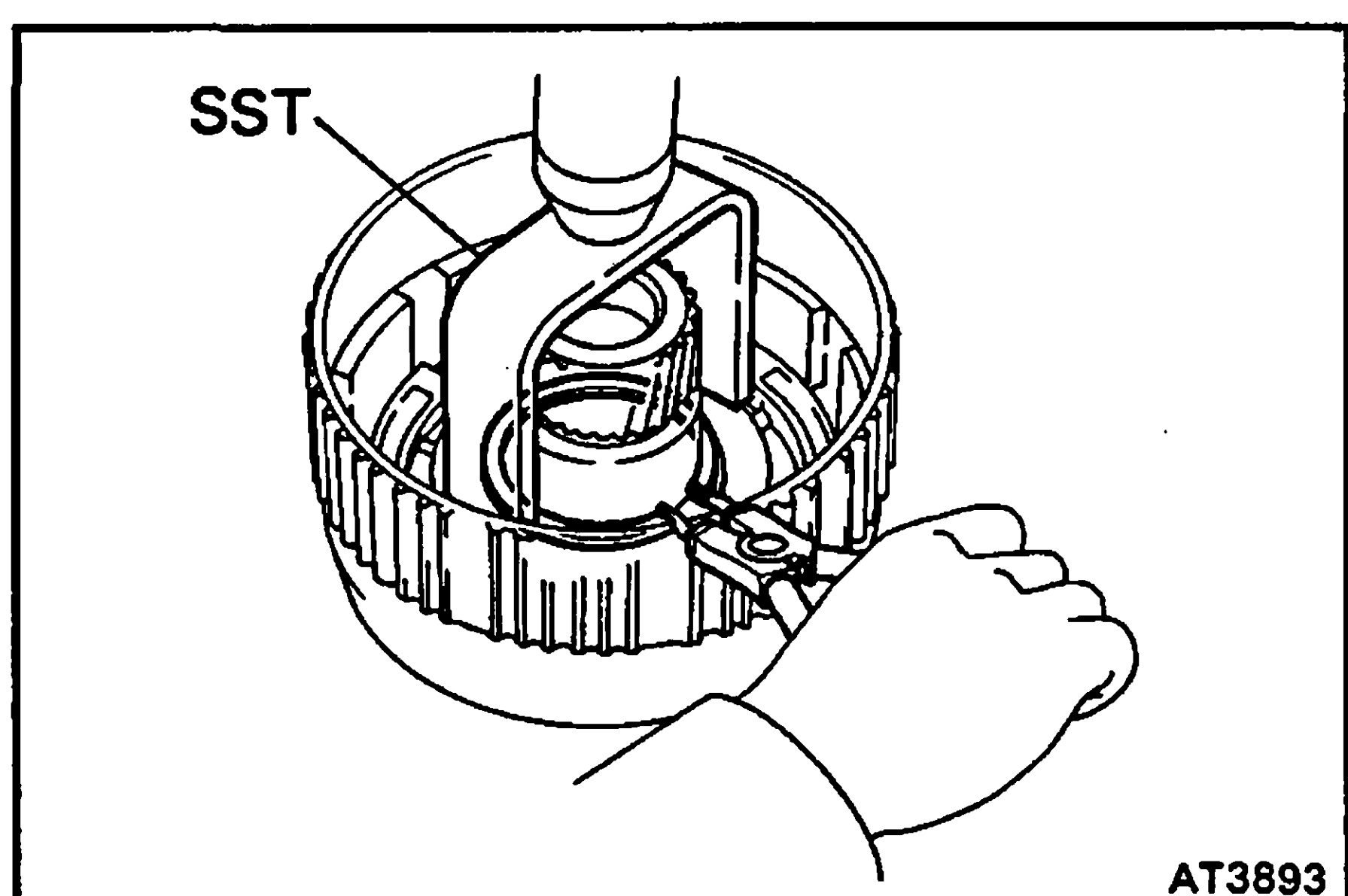


### 4. REMOVE FLANGE, PLATES AND DISCS

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



- (b) Remove the flange, three discs and three plates.

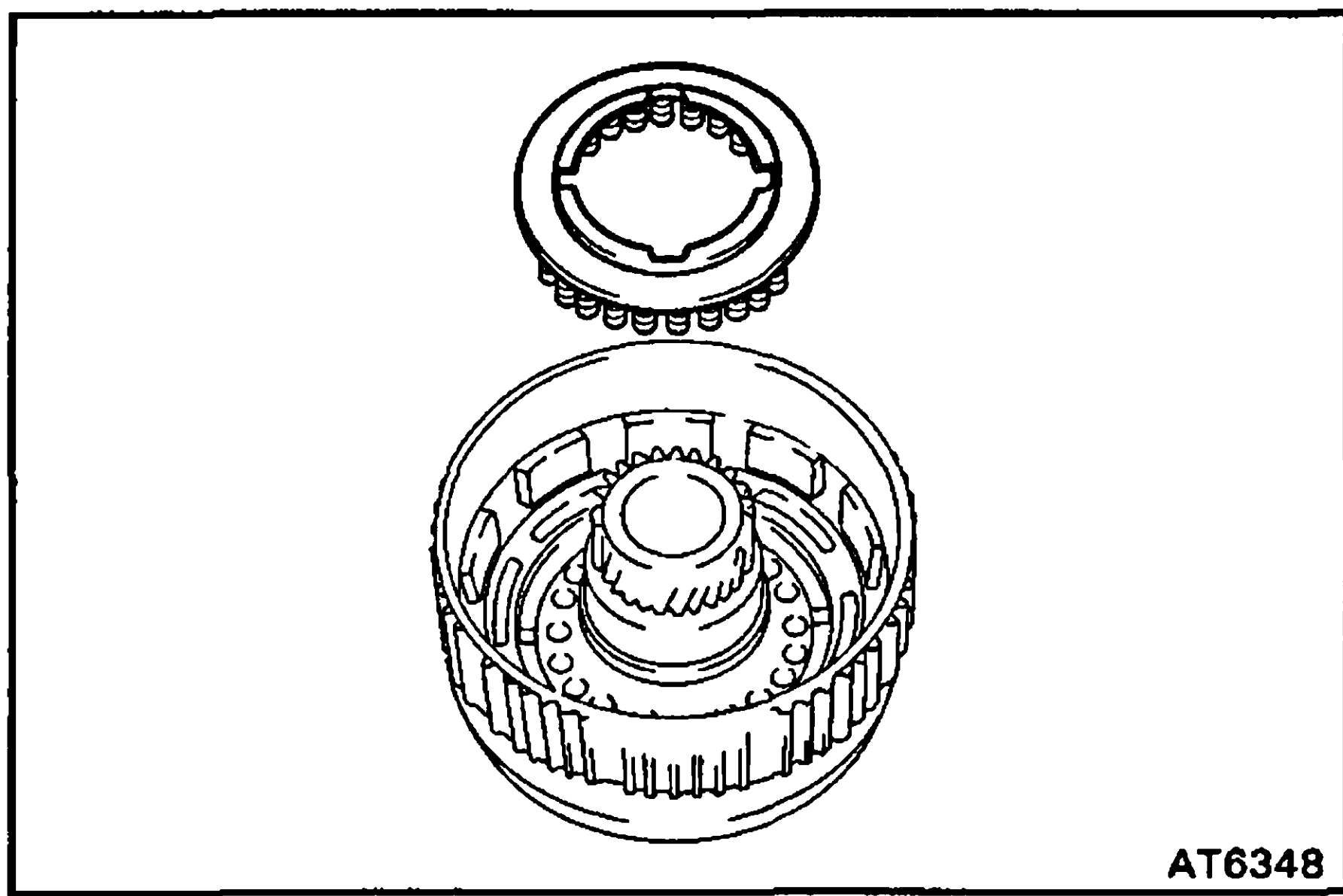


### 5. REMOVE PISTON RETURN SPRING

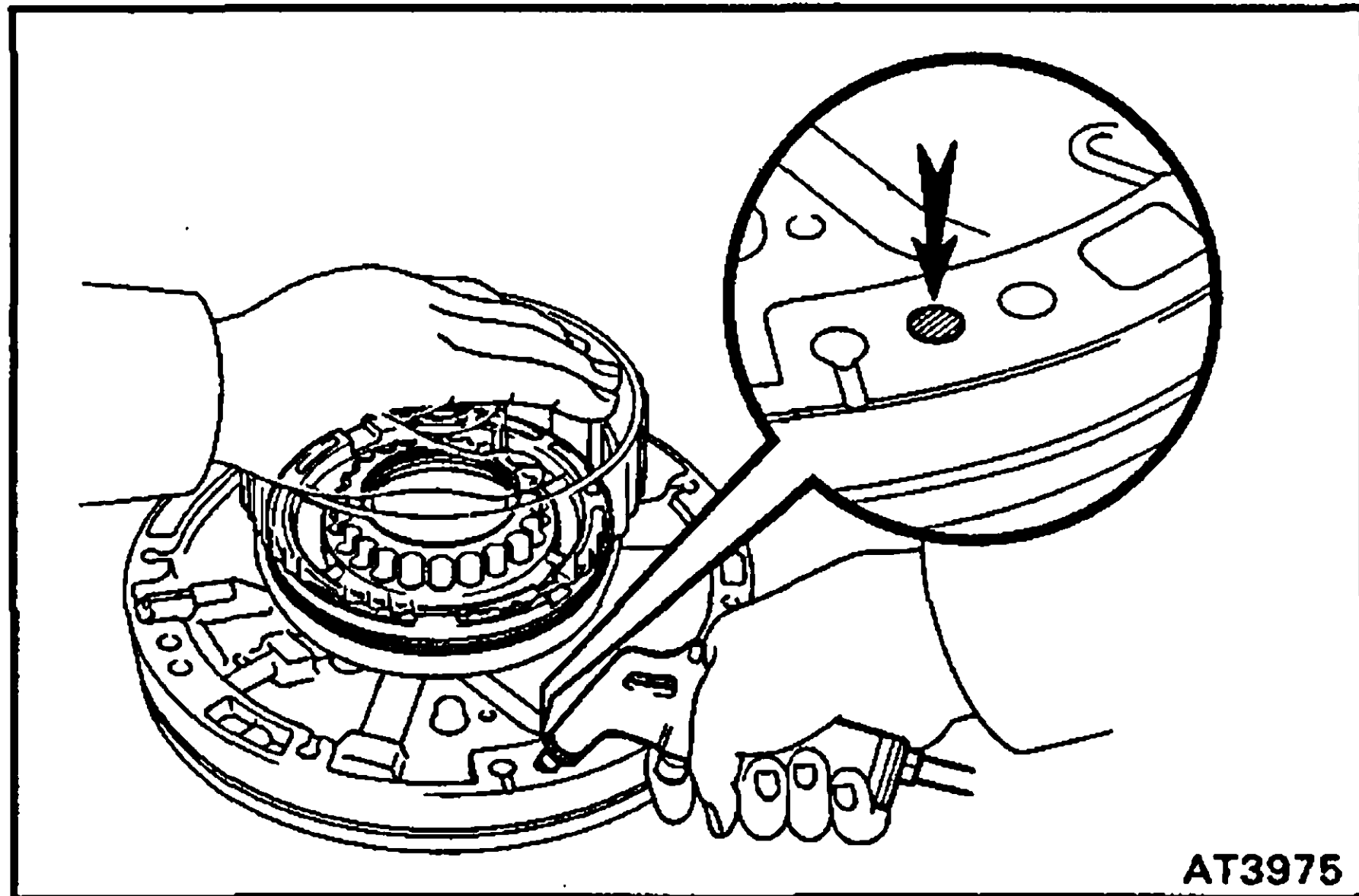
- (a) Place SST on the spring seat, and compress the return spring with a shop press.

SST 09350-36010 (09350-06010)

- (b) Using snap ring pliers, remove the snap ring.

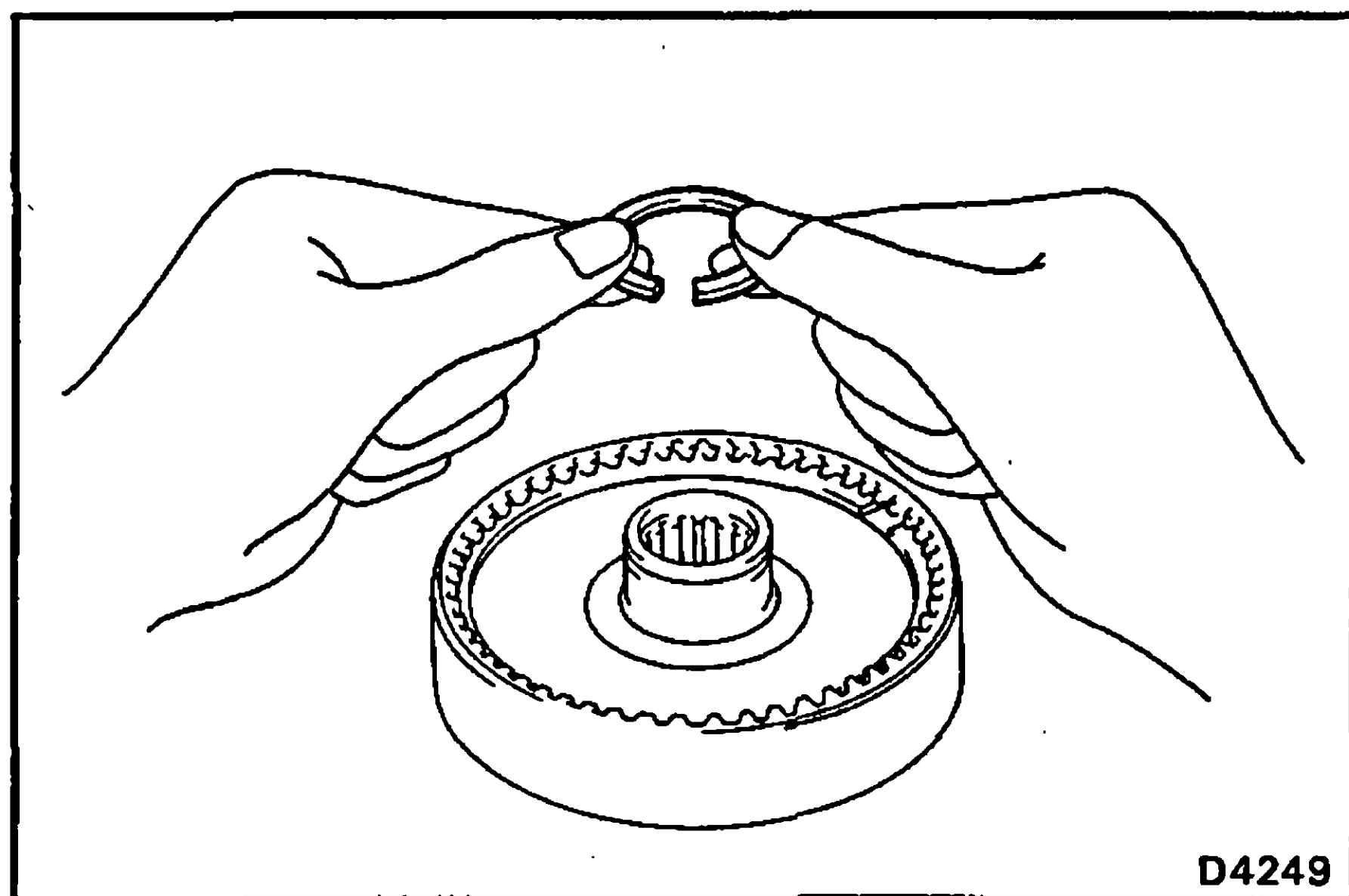


(c) Remove the piston return spring.

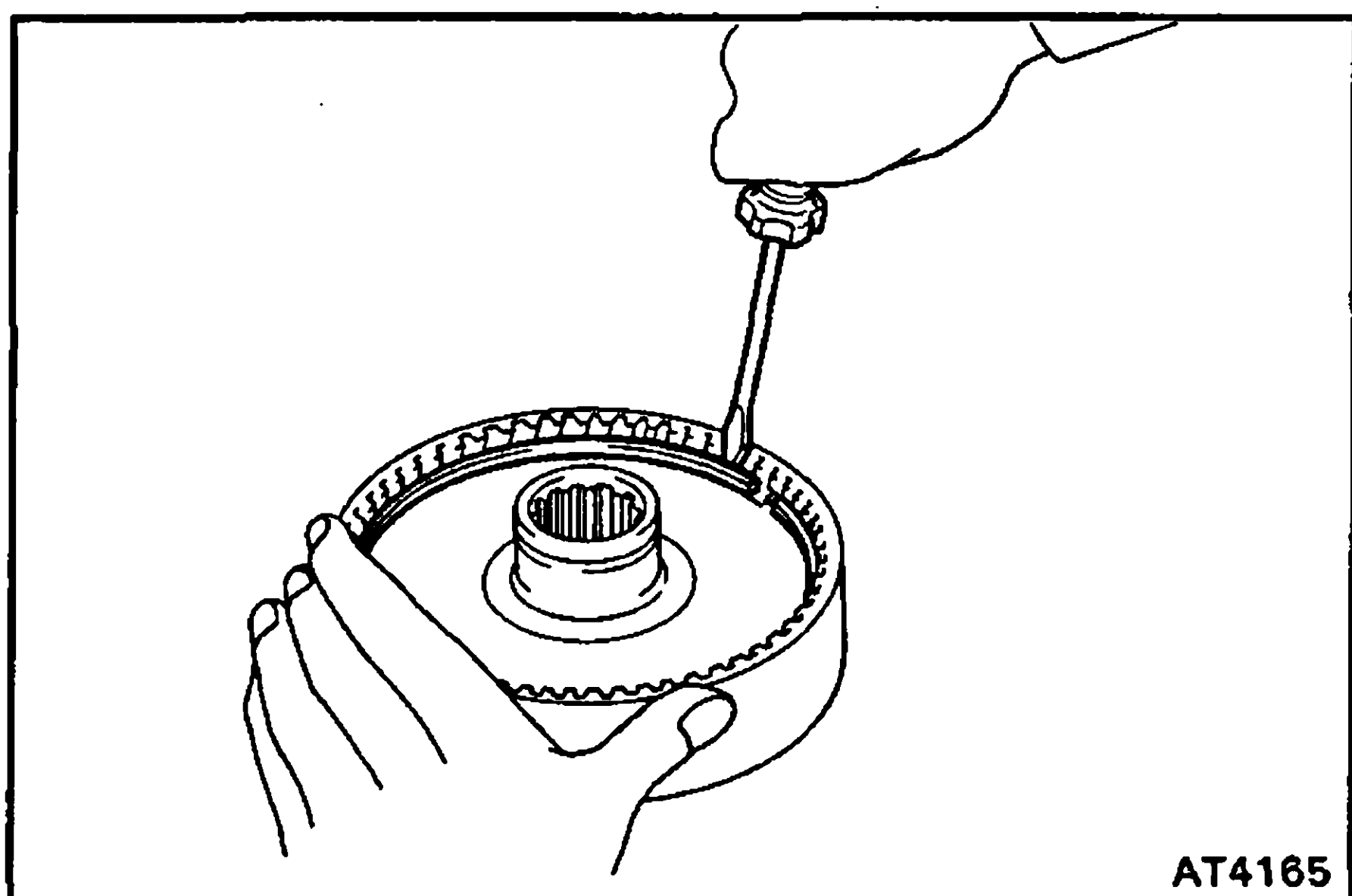


## 6. REMOVE OVERDRIVE DIRECT CLUTCH PISTON

- Place the oil pump onto the torque converter, and then place the O/D direct clutch onto the oil pump.
- Hold the clutch piston with hand, apply compressed air into the oil hole of the oil pump to remove the clutch piston.
- Remove the two O-rings from the clutch piston.

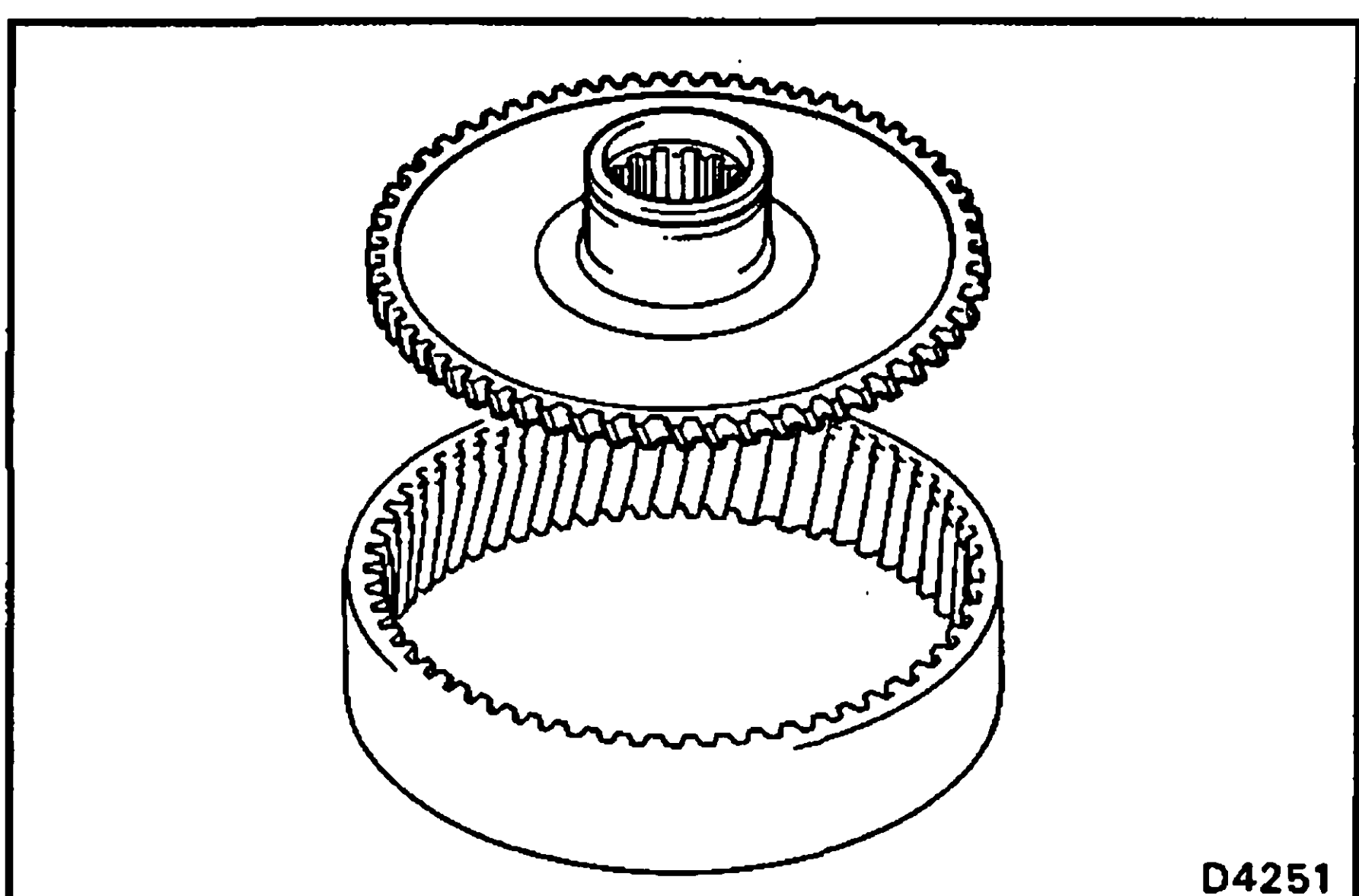


## 7. REMOVE OIL SEAL RING FROM RING GEAR FLANGE

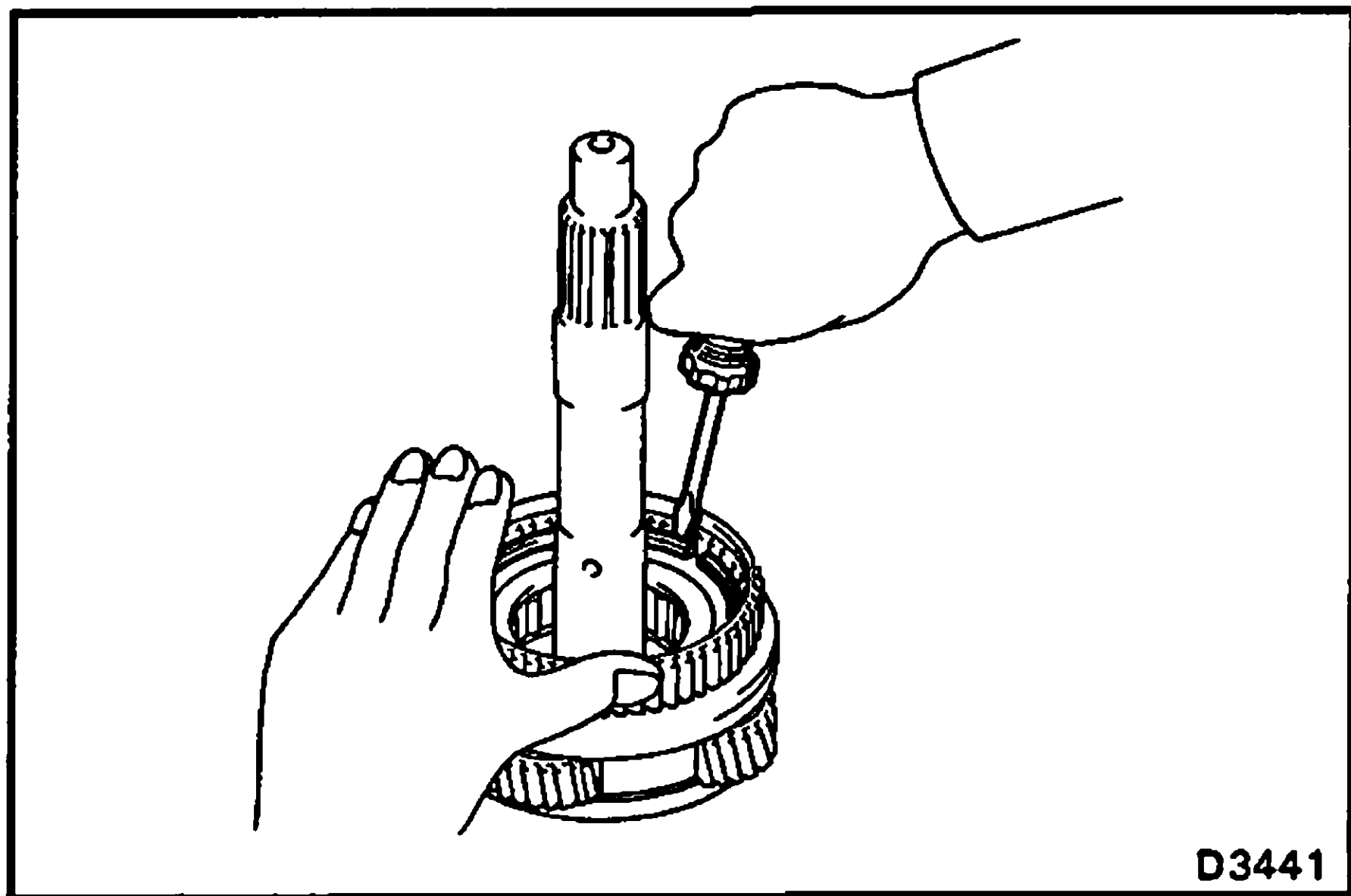


## 8. REMOVE RING GEAR FLANGE

- Using a small screwdriver, remove the snap ring.

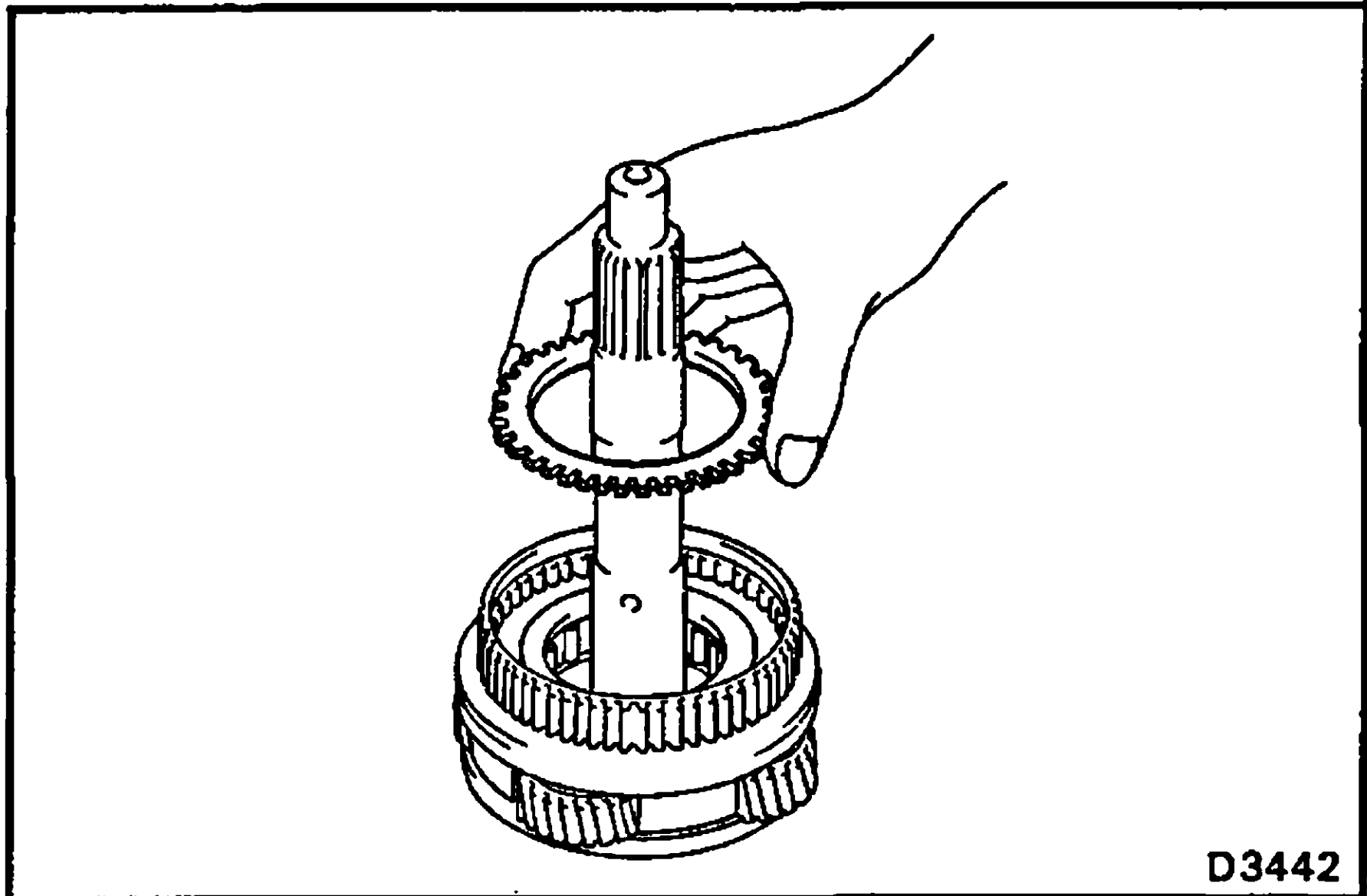


- Remove the ring gear flange.

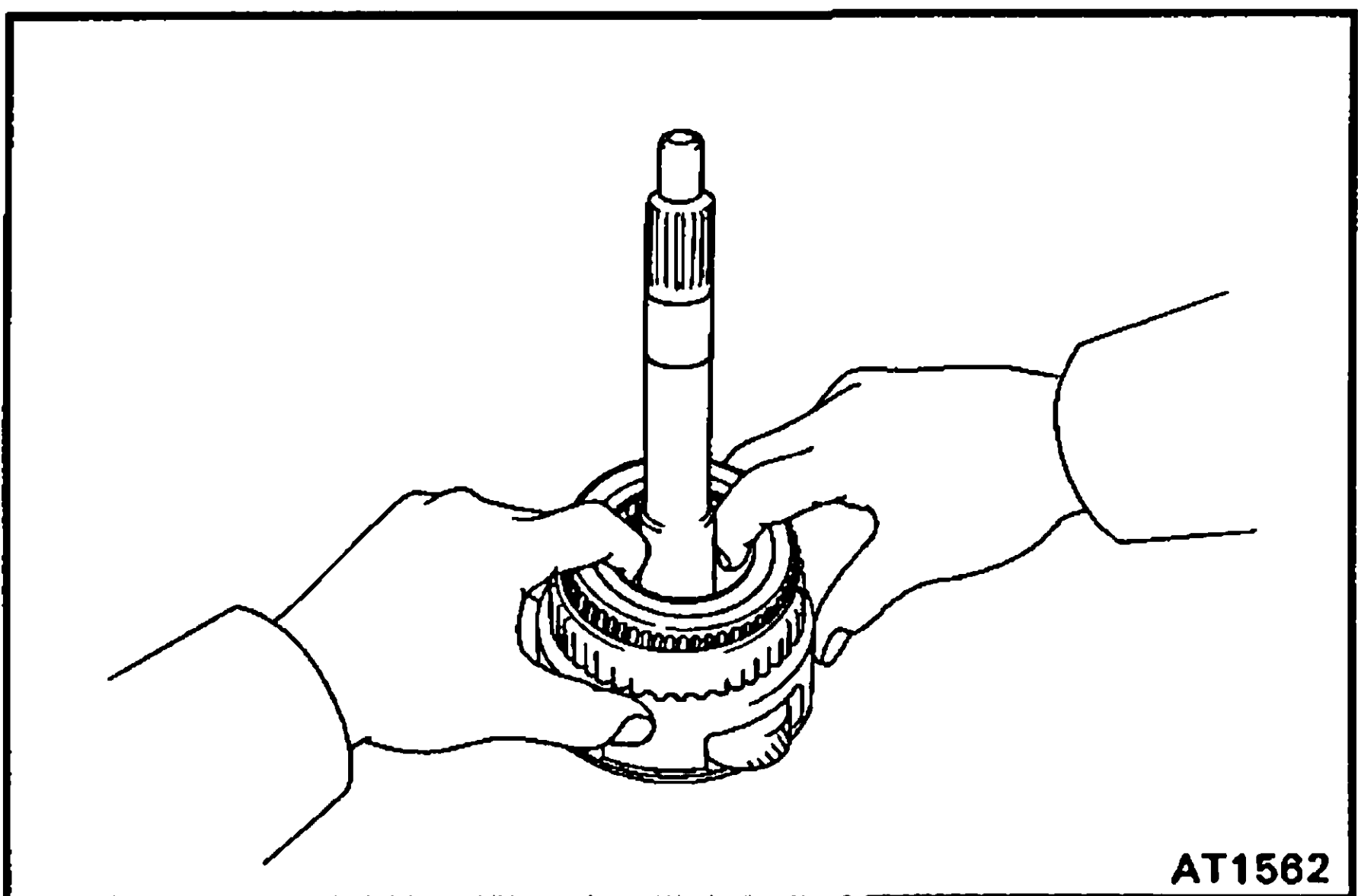


**9. REMOVE ONE-WAY CLUTCH FROM OVERDRIVE PLANETARY GEAR**

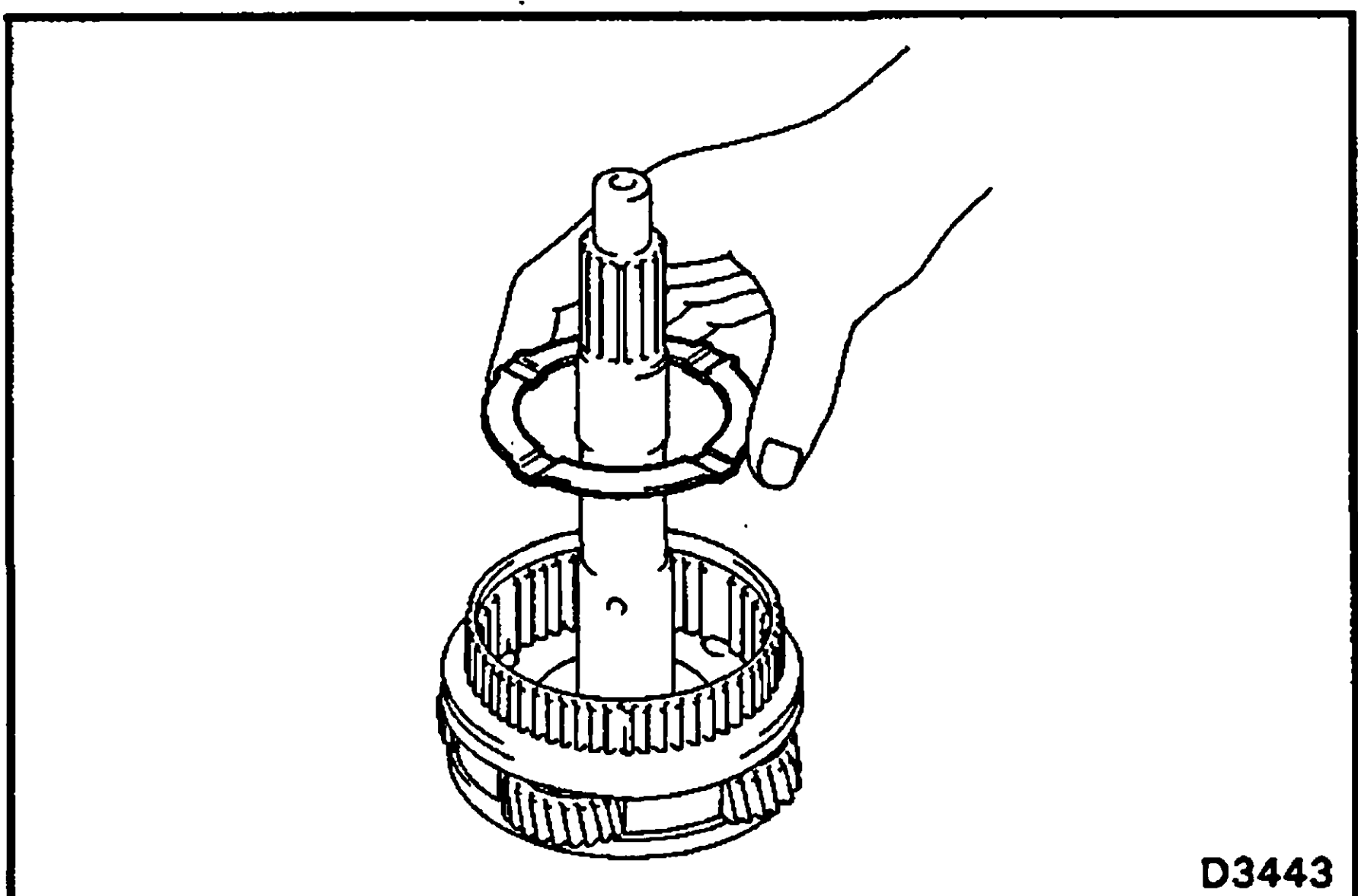
(a) Using a small screwdriver, remove the snap ring.



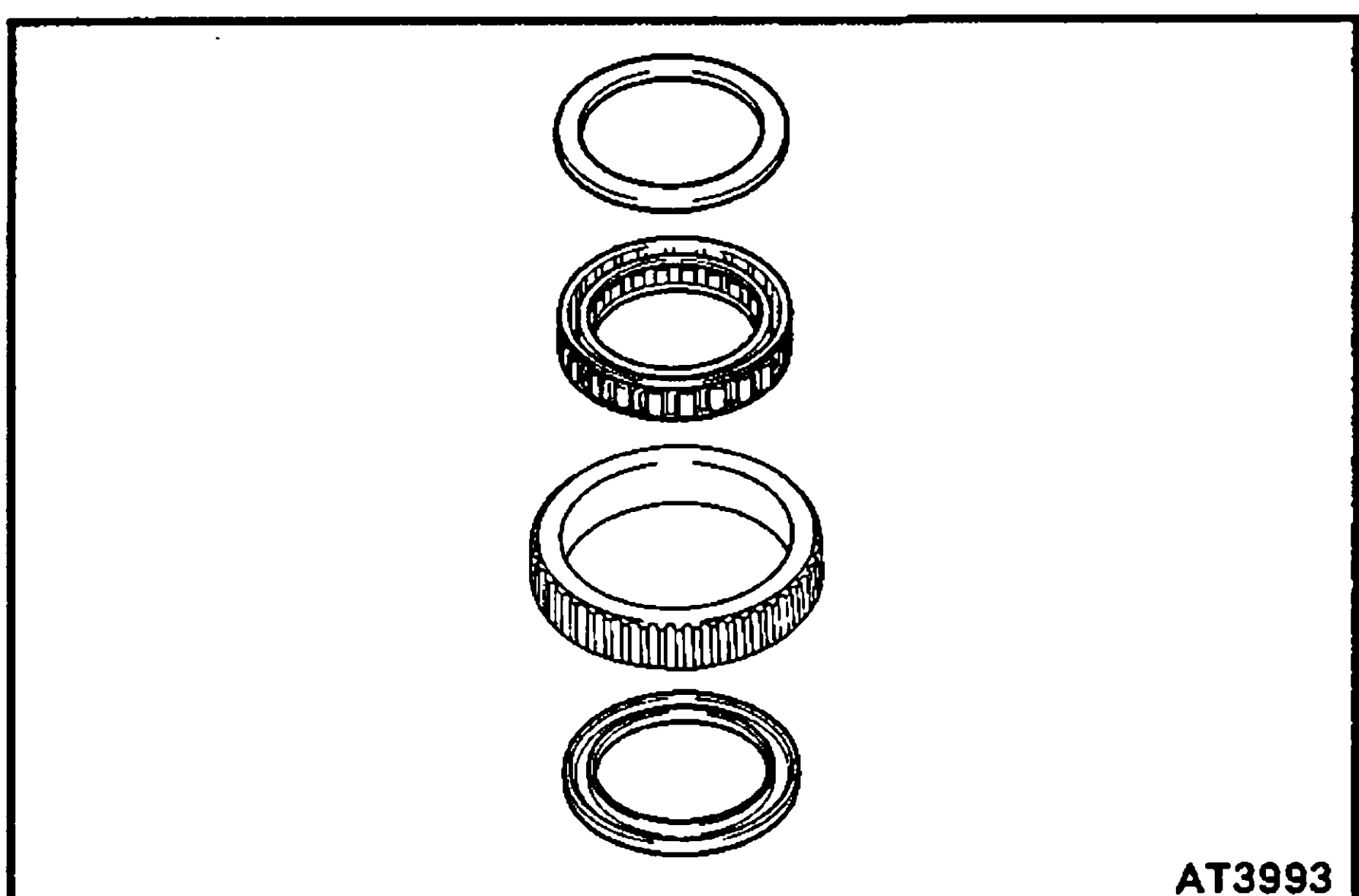
(b) Remove the No.4 thrust washer.



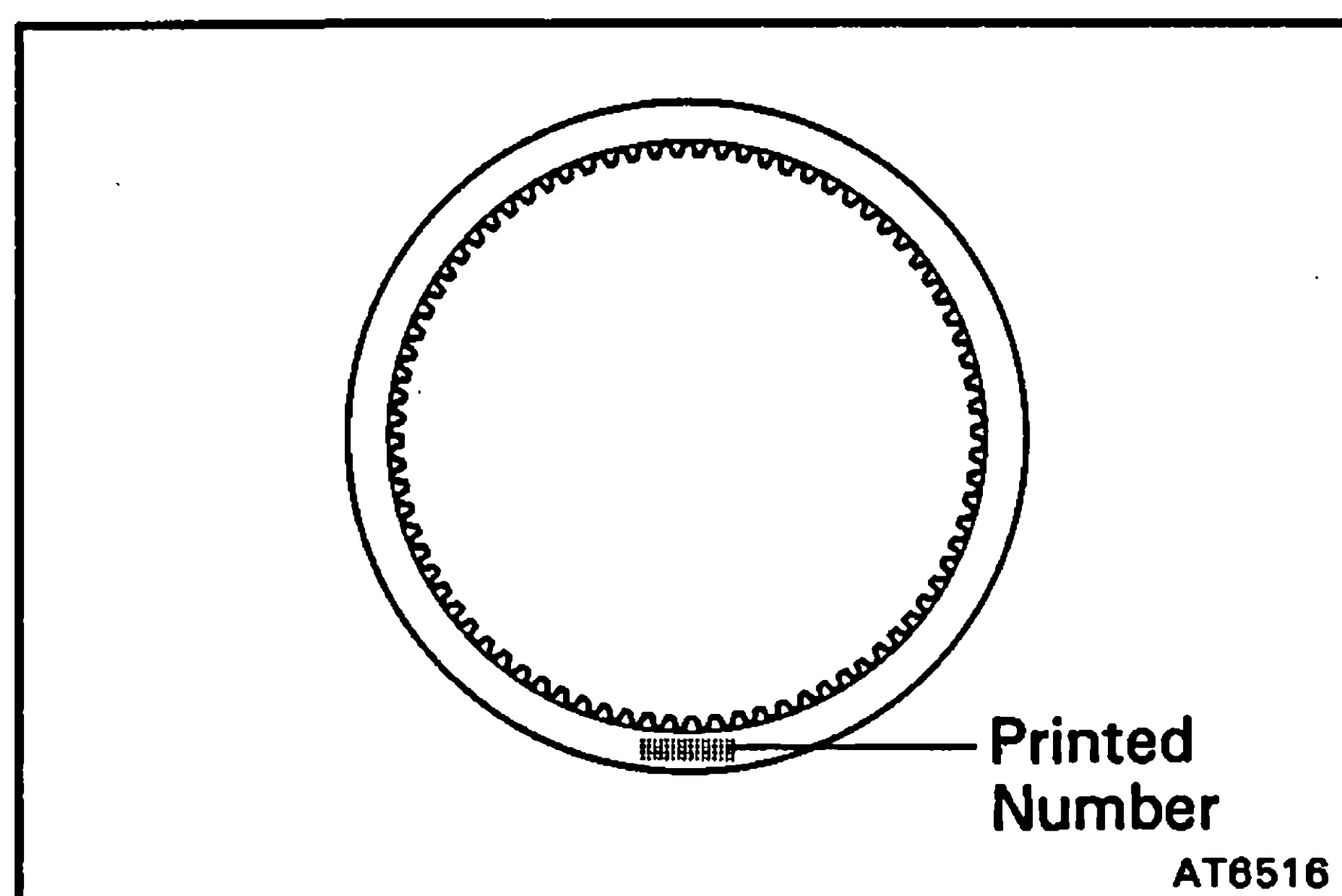
(c) Remove the one-way clutch together with the outer race.



(d) Remove the No.3 thrust washer.



(e) Remove the two retainers and one-way clutch from the outer race.



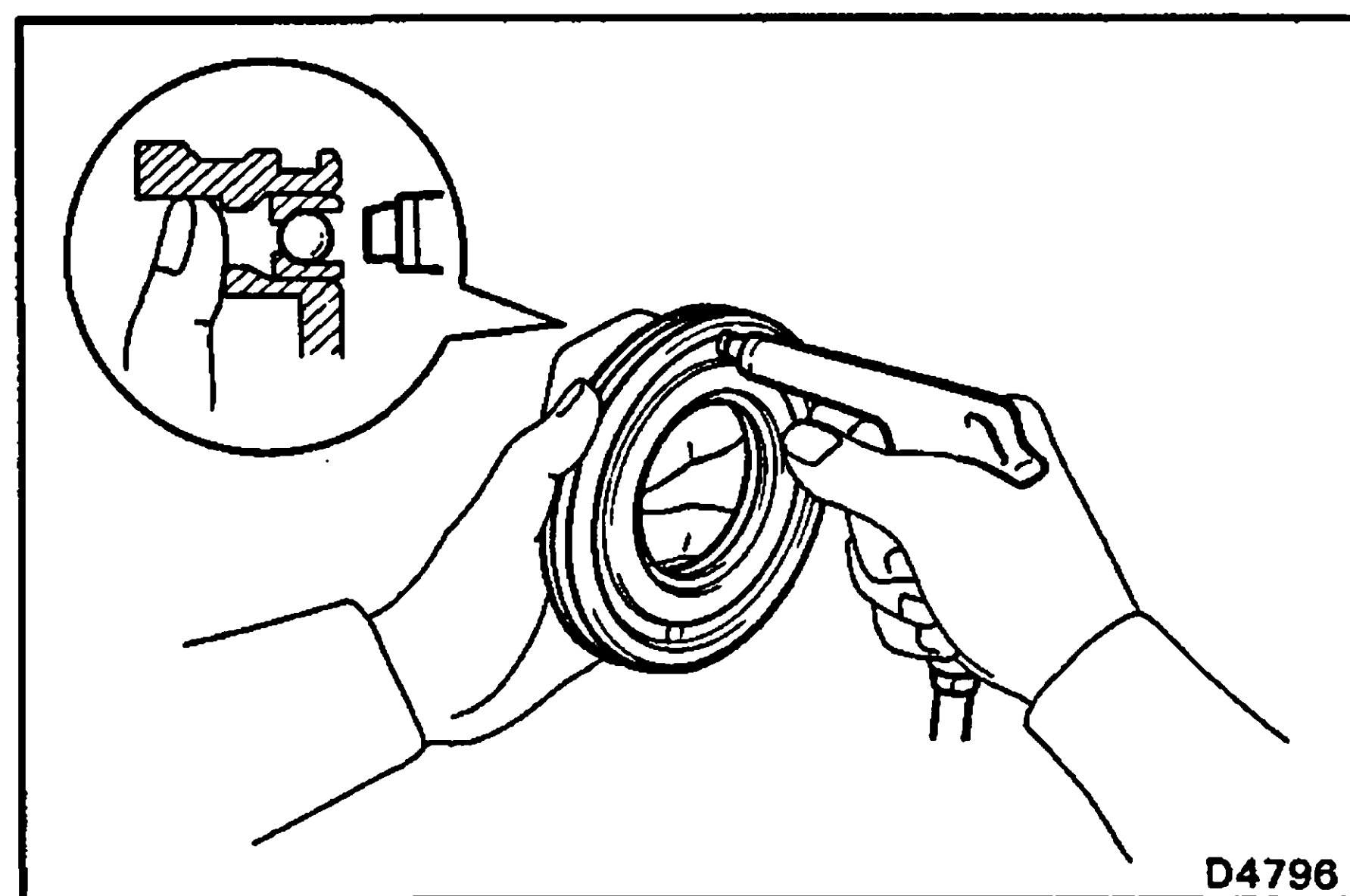
## INSPECTION OF OVERDRIVE PLANETARY GEAR AND OVERDRIVE DIRECT CLUTCH

### 1. INSPECT DISCS, PLATES AND FLANGE

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

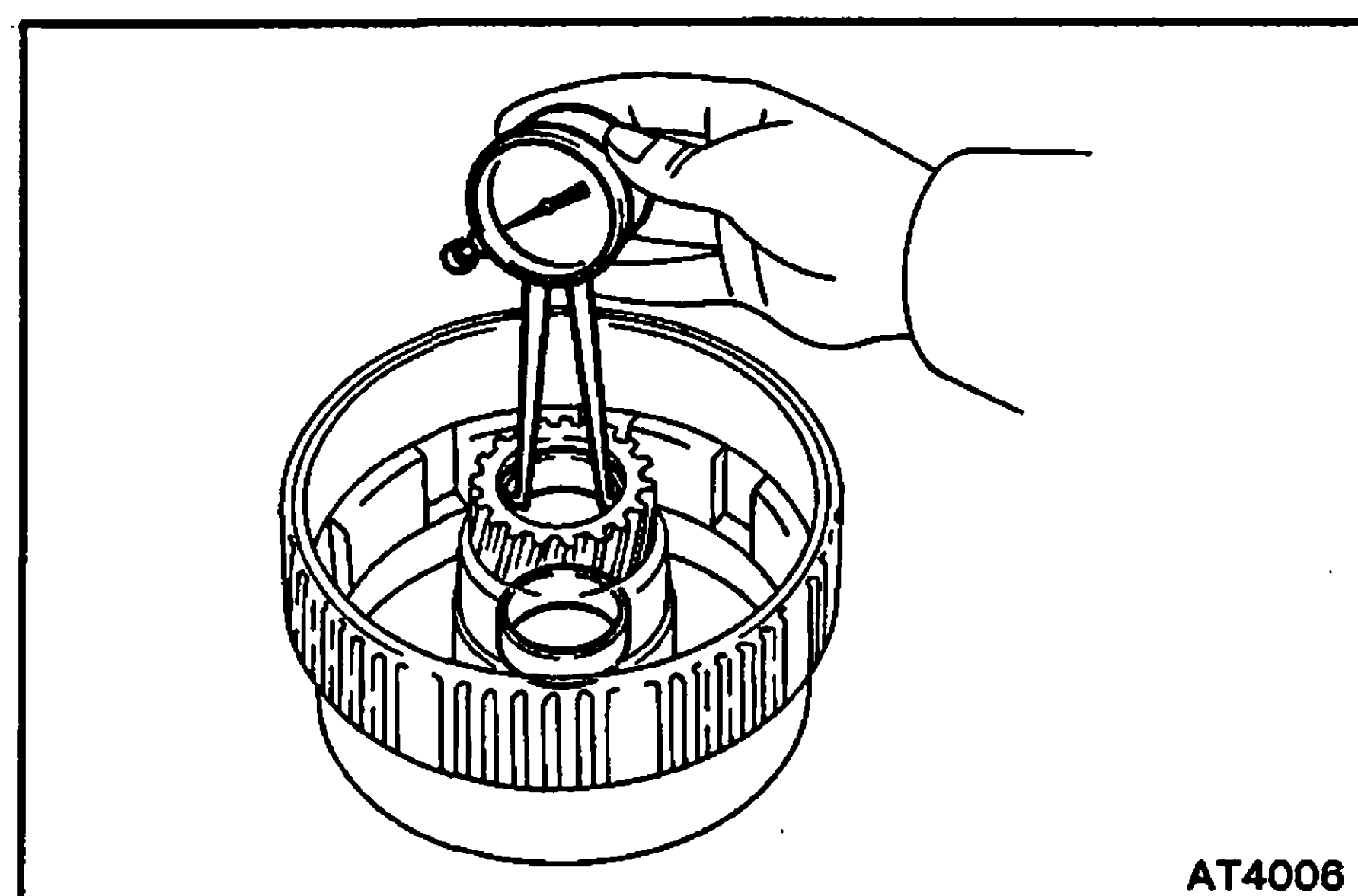
#### HINT:

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



### 2. INSPECT OVERDRIVE DIRECT CLUTCH PISTON

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



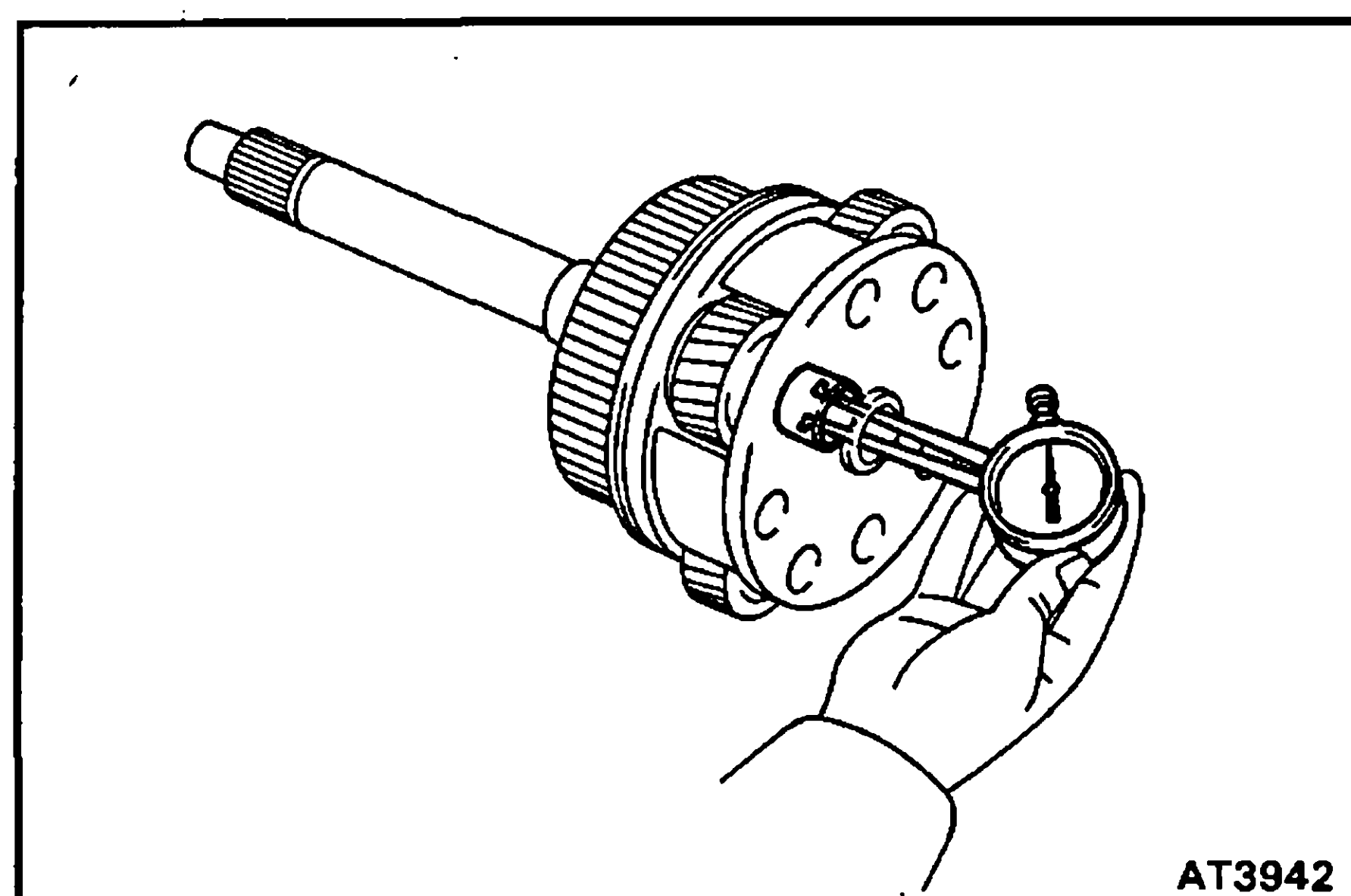
### 3. INSPECT BUSHINGS OF OVERDRIVE DIRECT CLUTCH DRUM

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:** 26.500 – 26.521 mm  
(1.0433 – 1.0441 in.)

**Maximum inside diameter:** 26.57 mm (1.0461 in.)

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



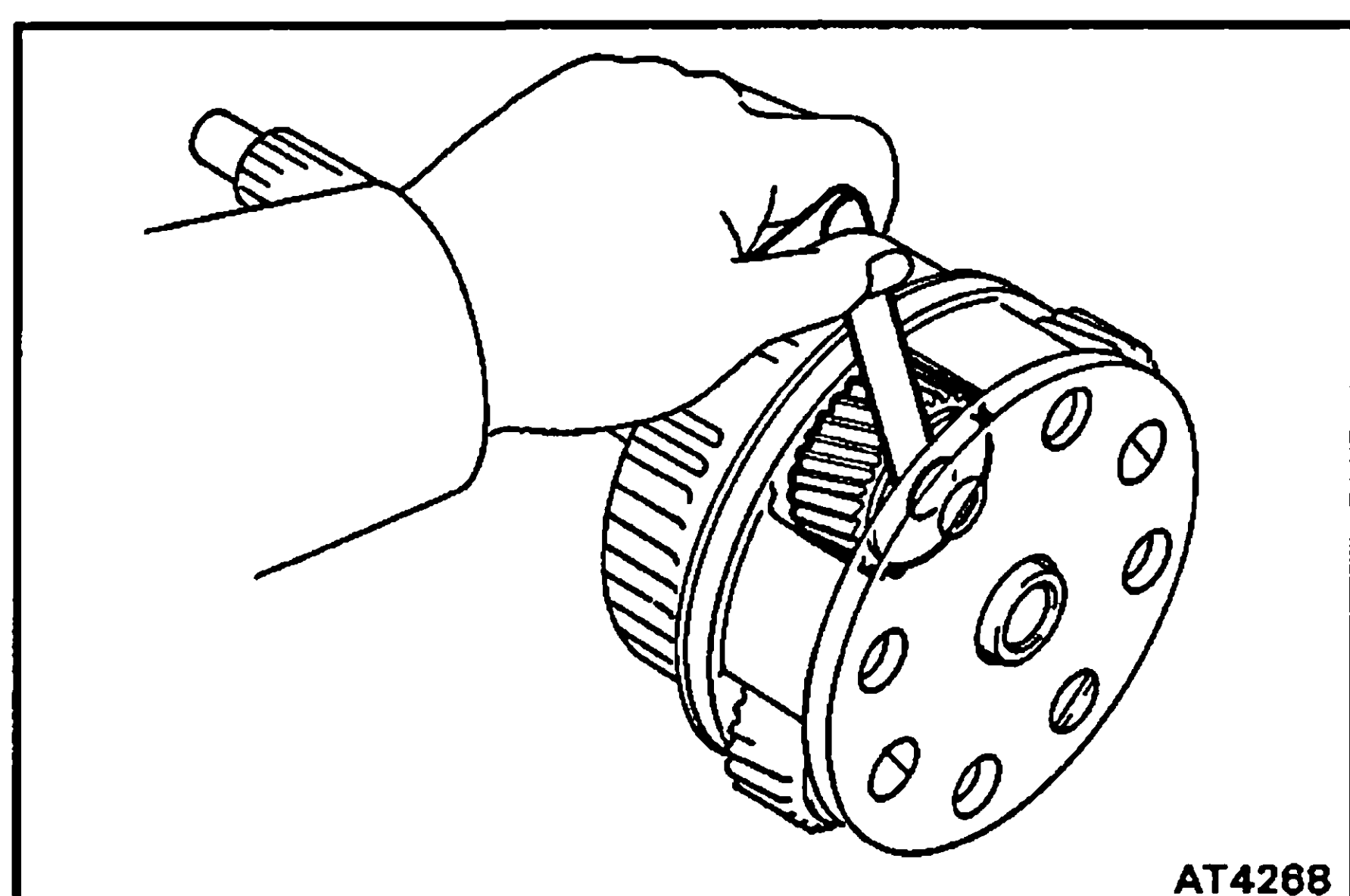
### 4. INSPECT BUSHINGS OF OVERDRIVE PLANETARY GEAR

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:** 12.000 – 12.018 mm  
(0.4724 – 0.4731 in.)

**Maximum inside diameter:** 12.07 mm (0.4752 in.)

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



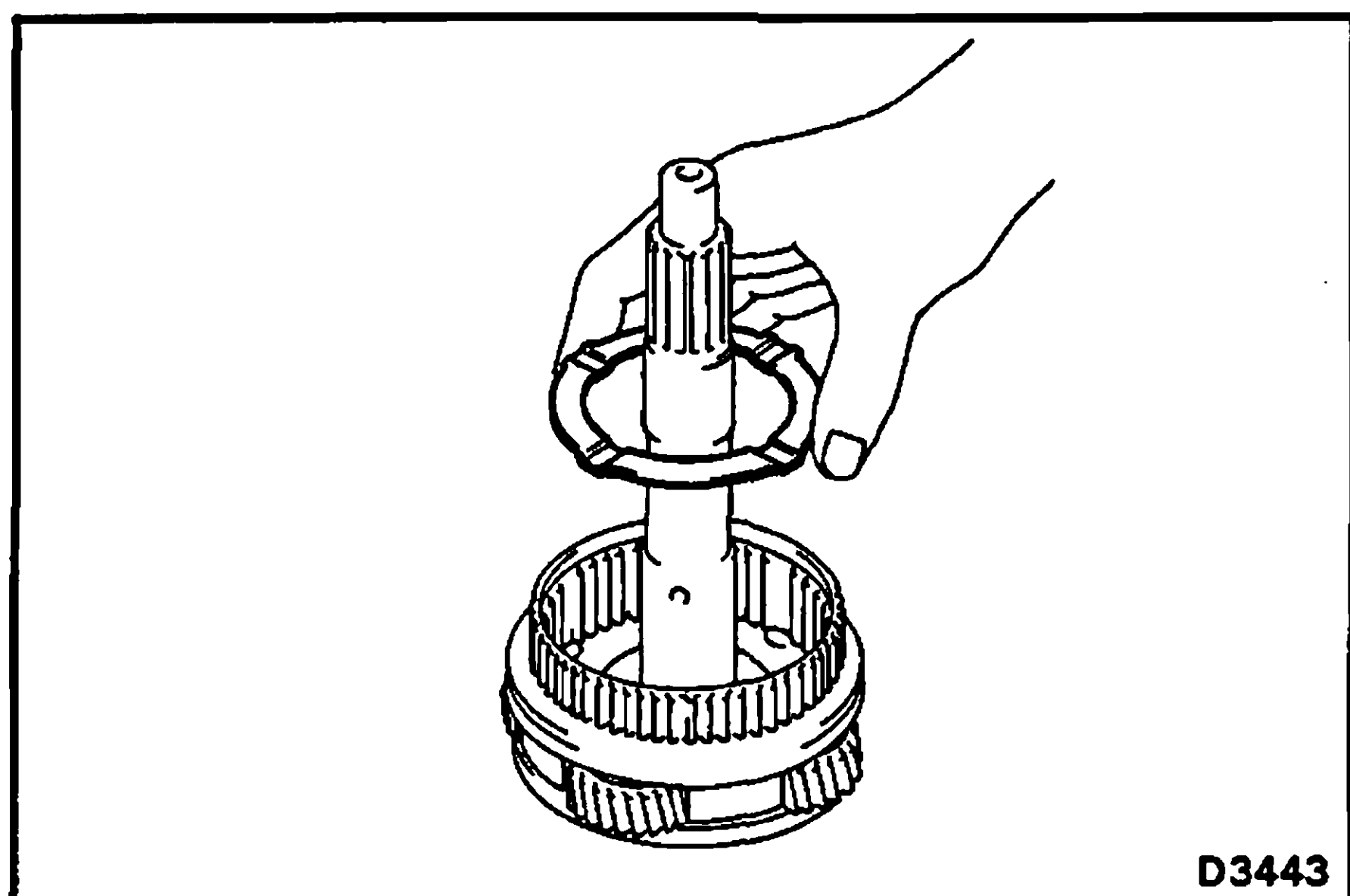
### 5. INSPECT PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the clearance between the pinions and carrier.

**Standard inside diameter:** 0.20 – 0.59 mm  
(0.0079 – 0.0232 in.)

**Maximum inside diameter:** 0.80 mm (0.0315 in.)

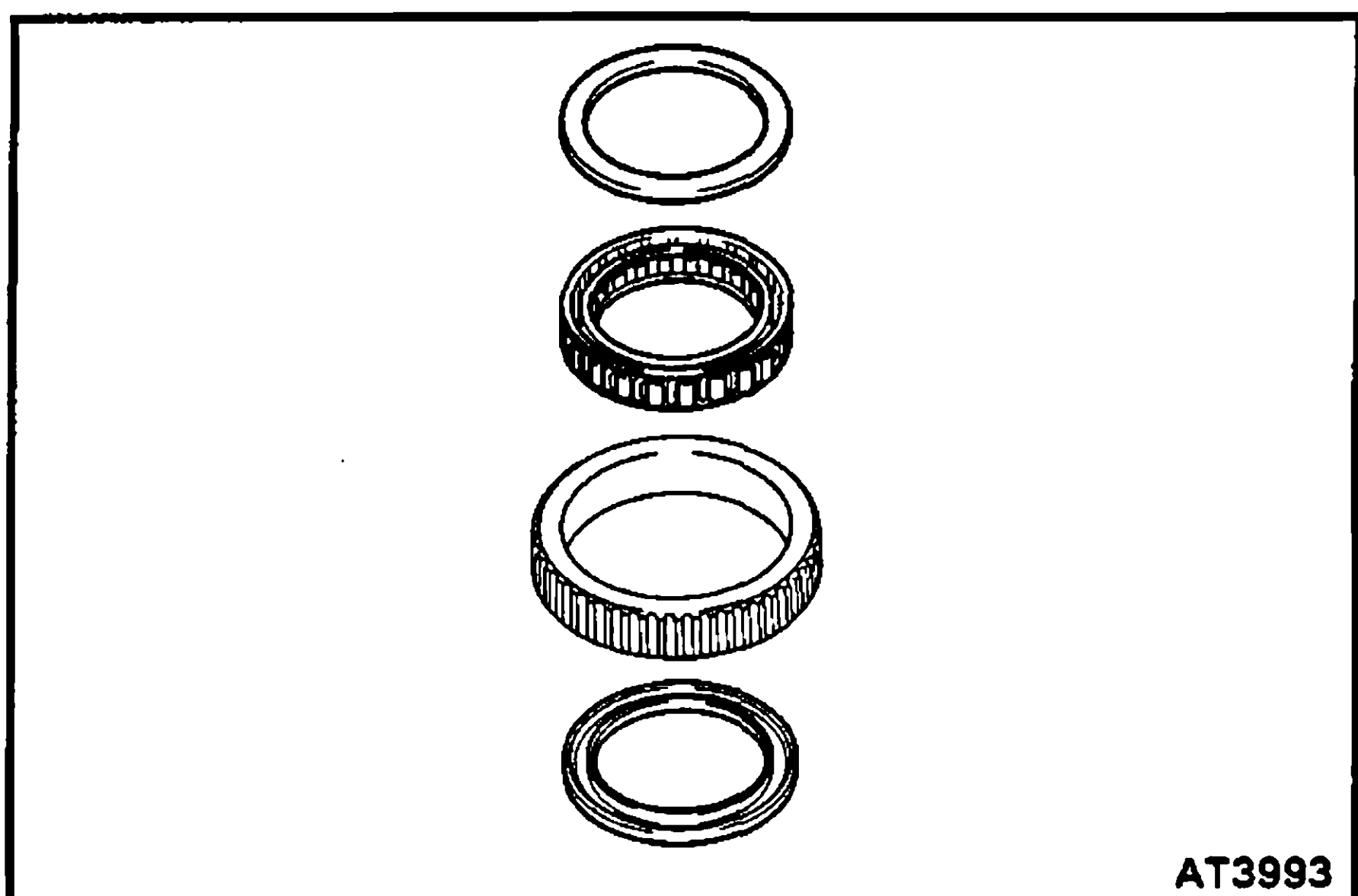
If the thrust clearance is greater than maximum, replace the planetary gear.



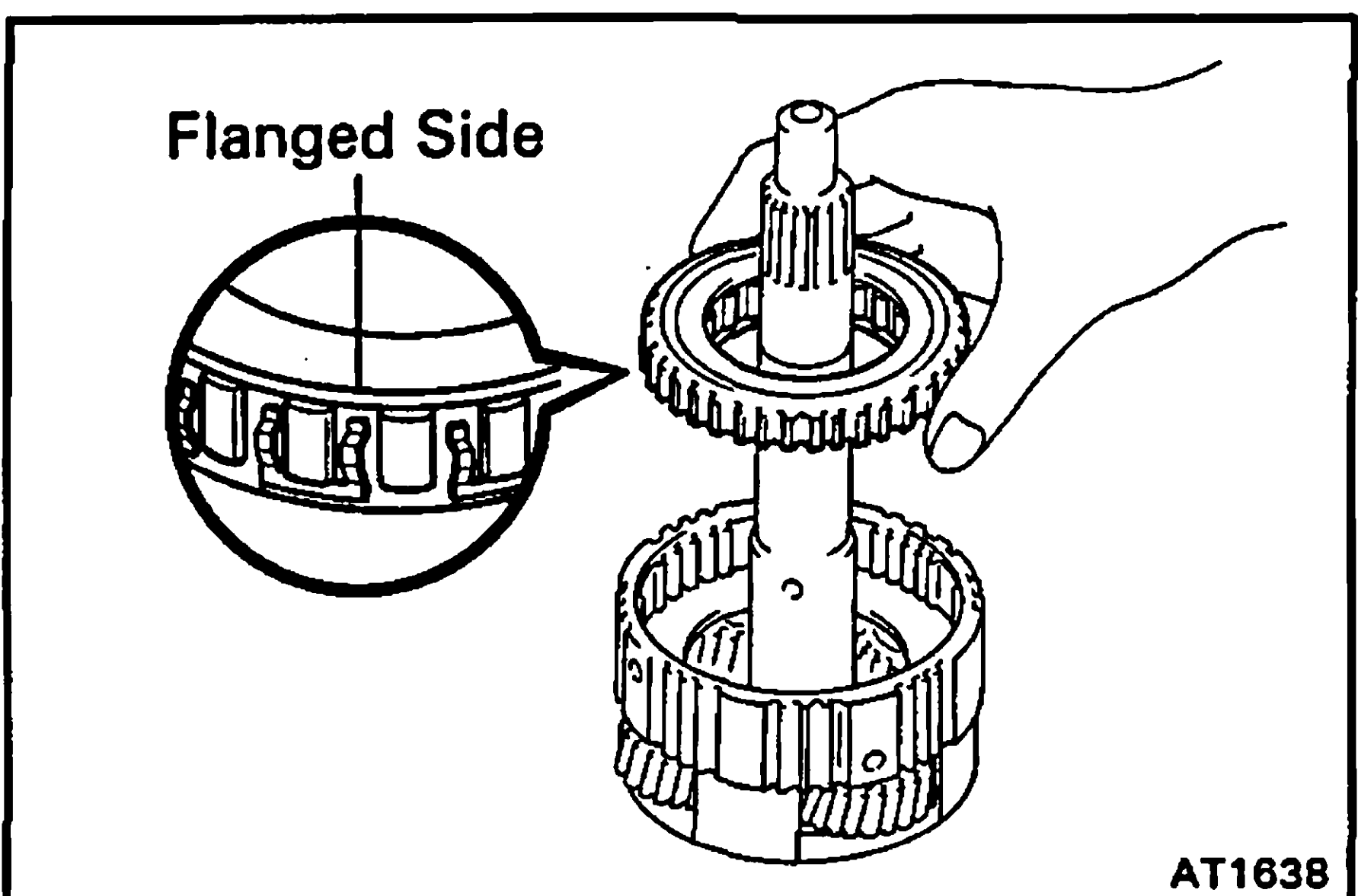
## ASSEMBLY OF OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND OVERDRIVE ONE-WAY CLUTCH

### 1. INSTALL ONE-WAY CLUTCH TO OVERDRIVE PLANETARY GEAR

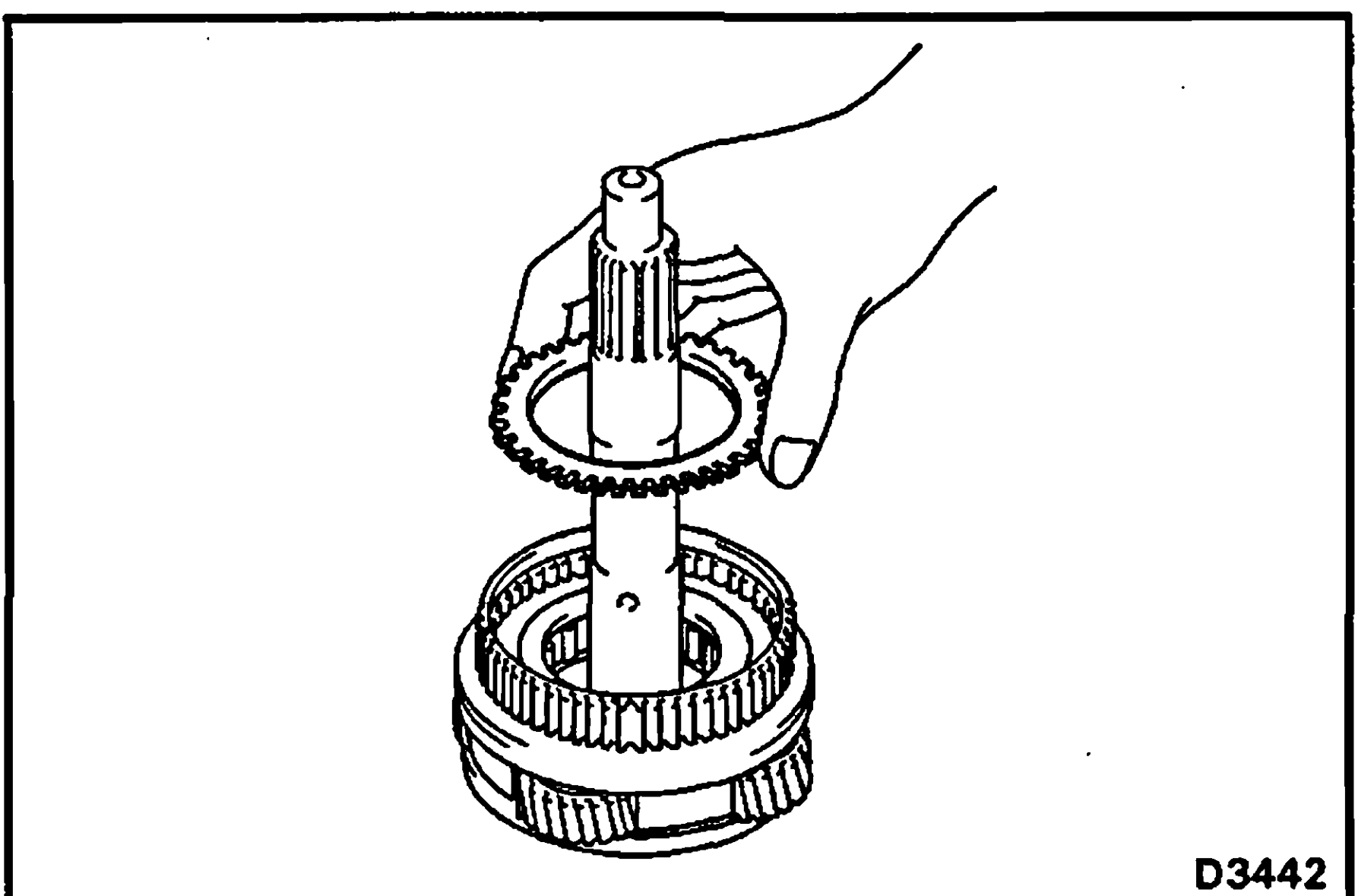
(a) Install the No.3 thrust washer, facing the grooved side upward.



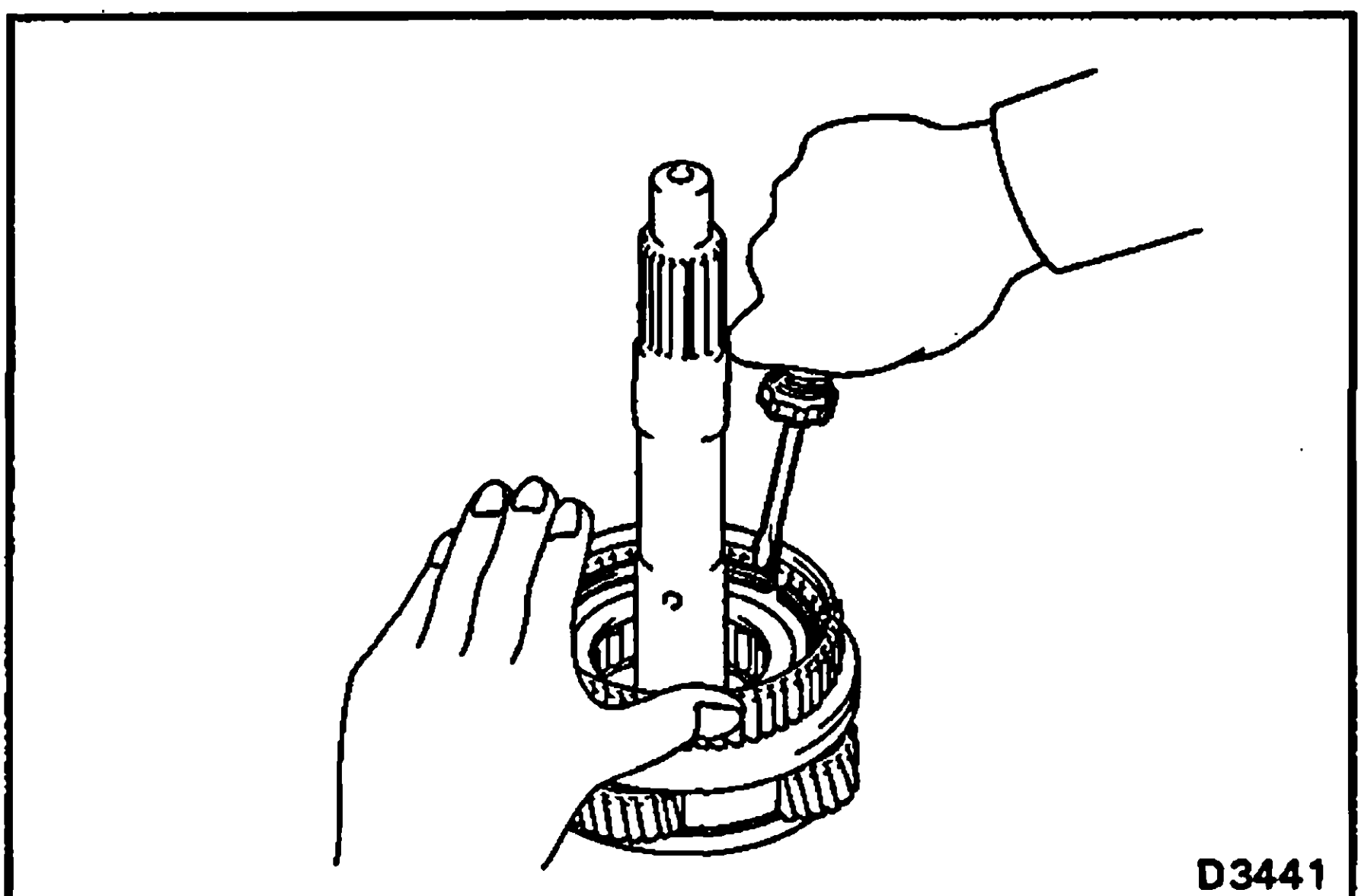
(b) Install the one-way clutch and two retainers into the outer race.



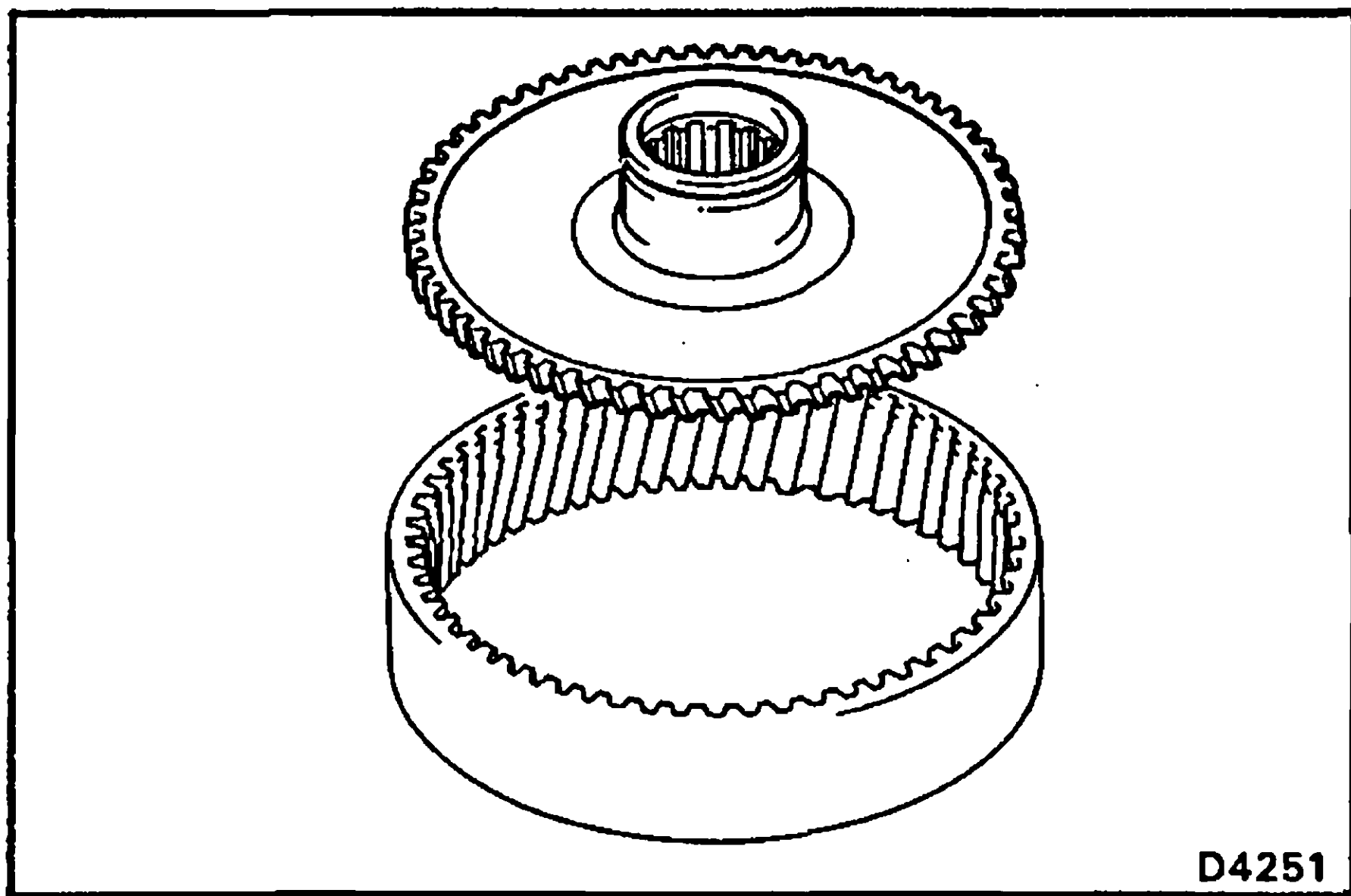
(c) Install the one-way clutch and outer race assembly, facing the flanged side of the one-way clutch upward.



(d) Install the No.4 thrust washer.

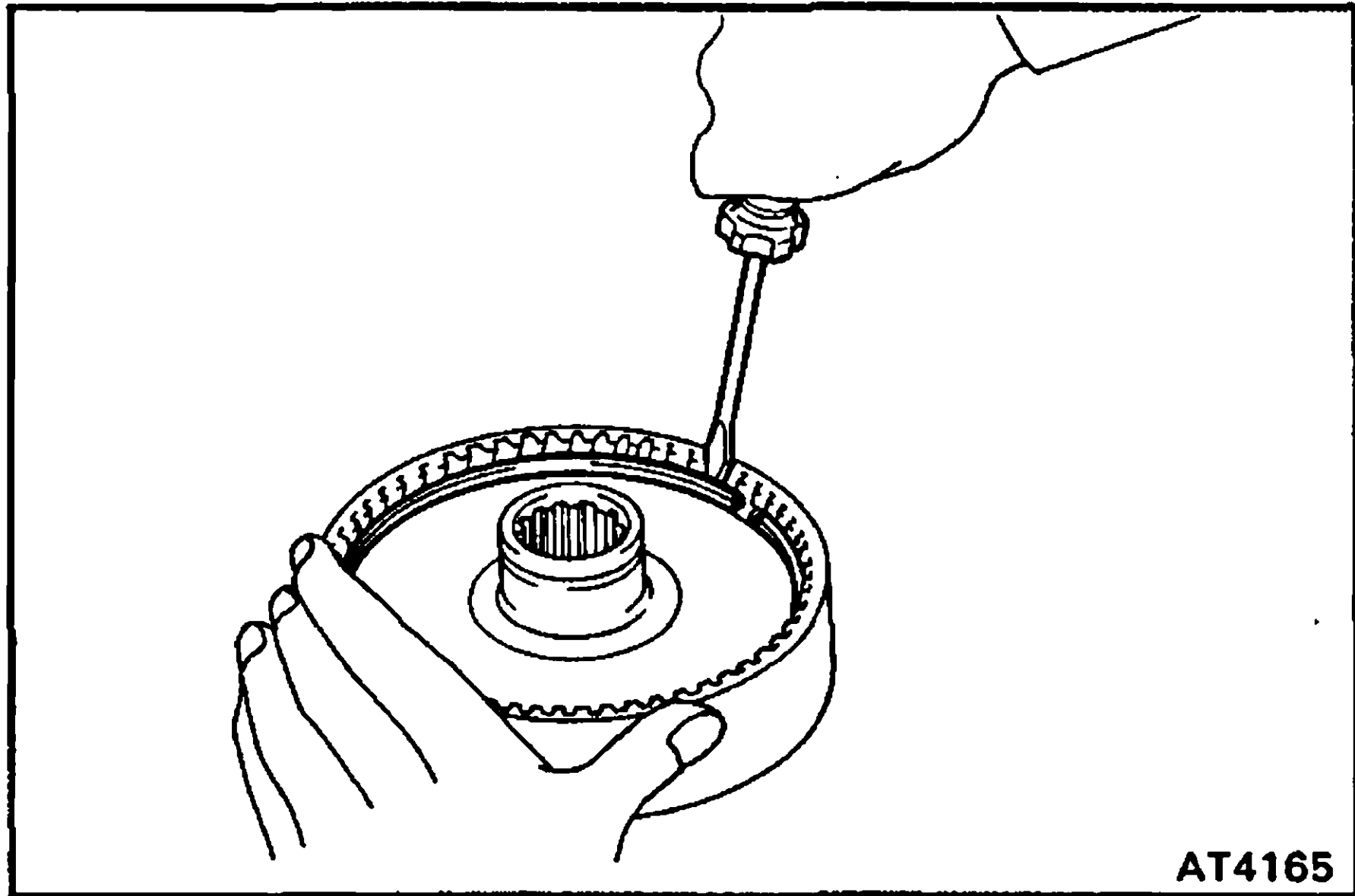


(e) Using a screwdriver, install the snap ring.

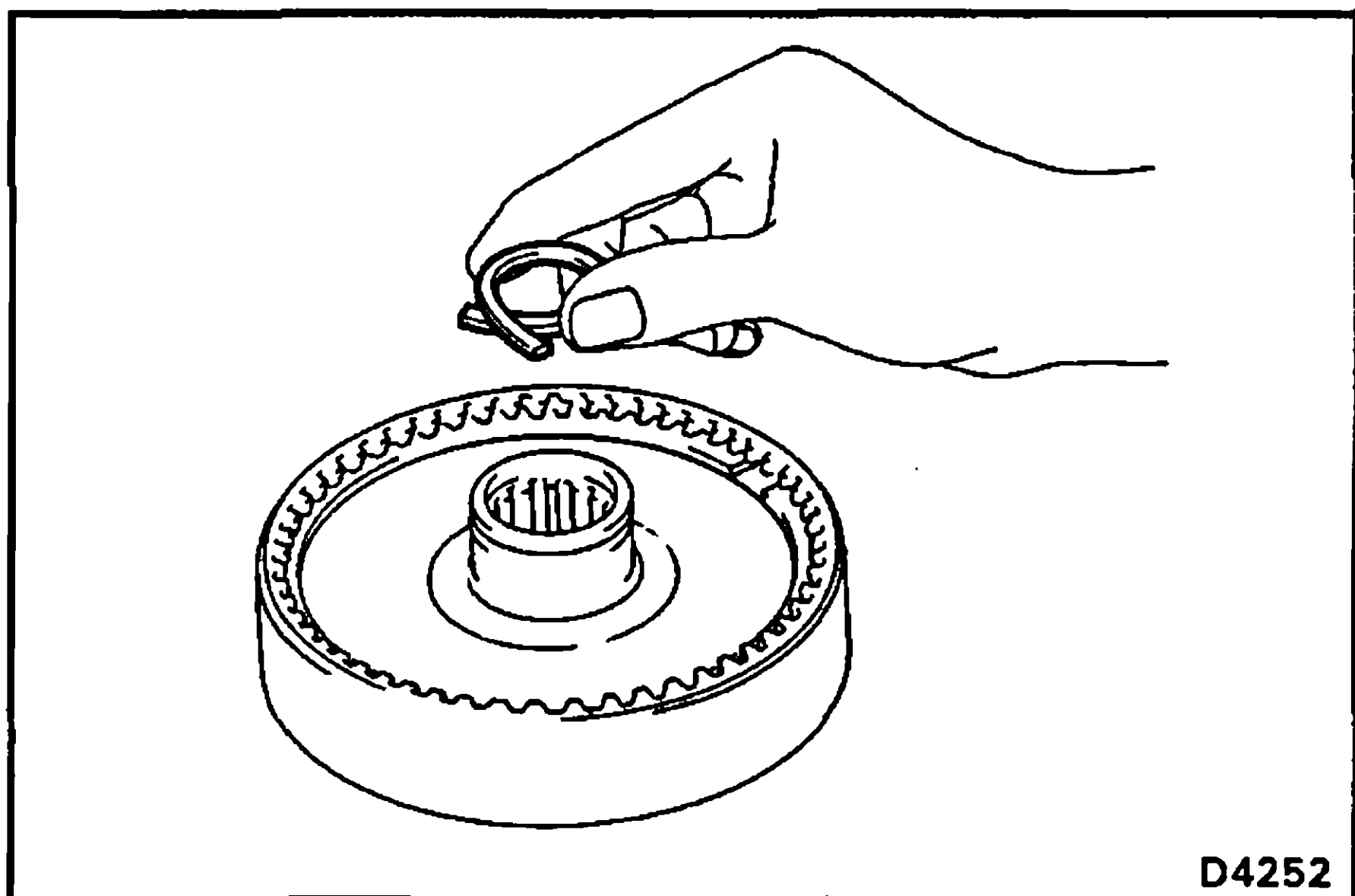


## 2. INSTALL RING GEAR FLANGE TO OVERDRIVE PLANETARY RING GEAR

(a) Install the ring gear flange as shown.



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

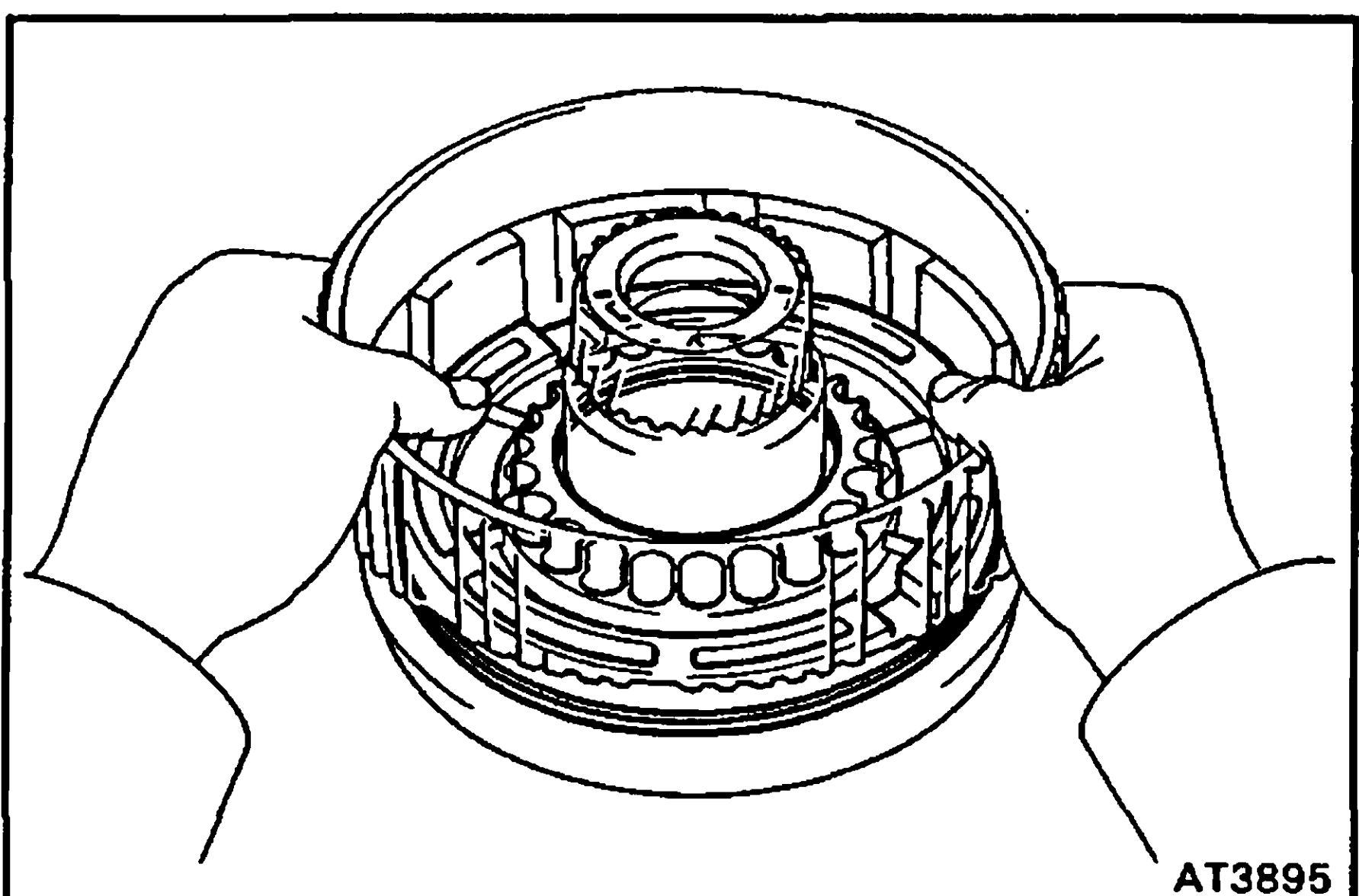


## 3. INSTALL OIL SEAL RING

Coat the oil seal ring with ATF, and install it to the ring gear flange.

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

**HINT:** After installing the oil seal ring, check that it moves smoothly.

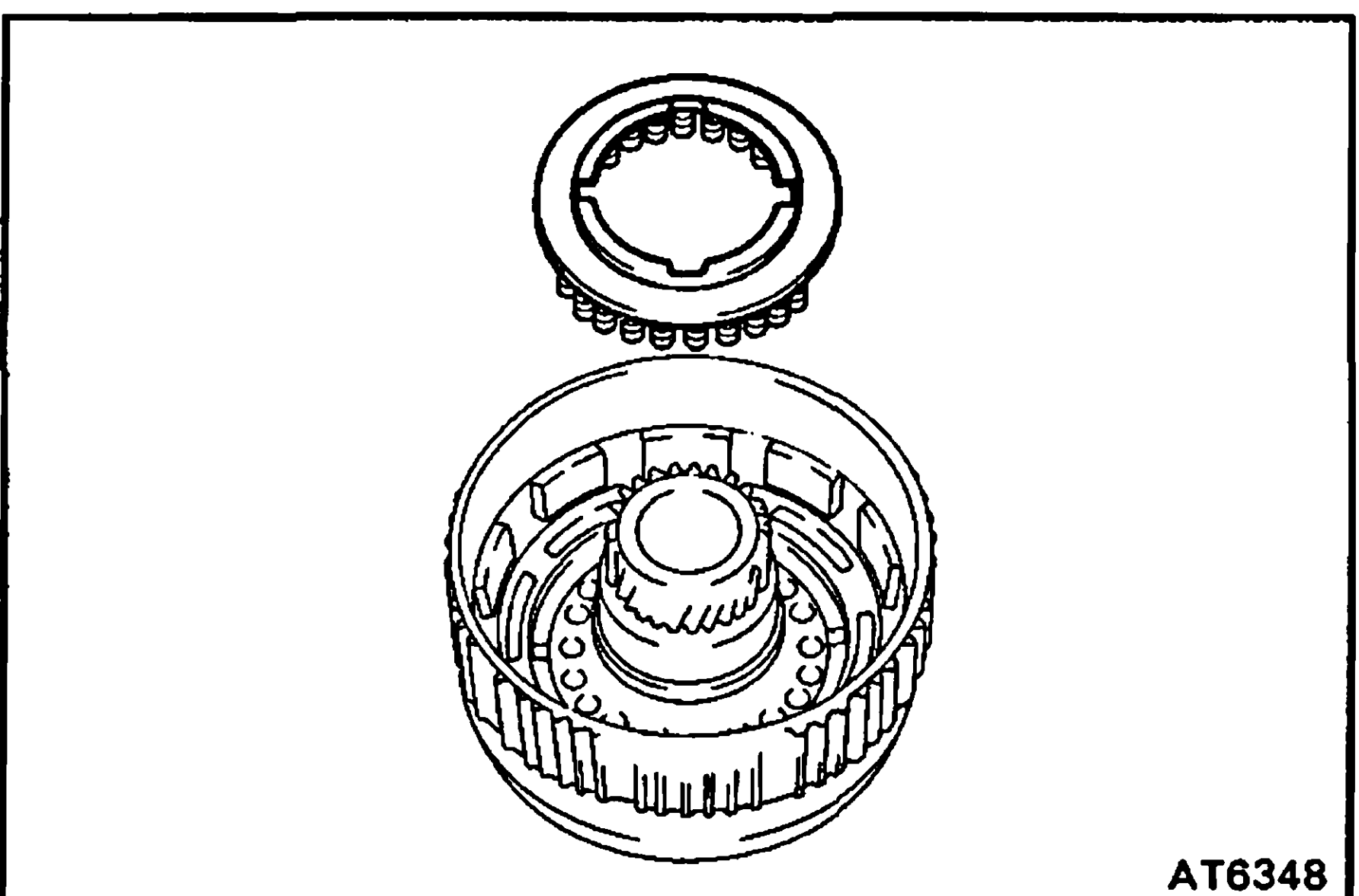


## 4. INSTALL OVERDRIVE DIRECT CLUTCH PISTON

(a) Coat new O-rings with ATF, and install them on the clutch piston.

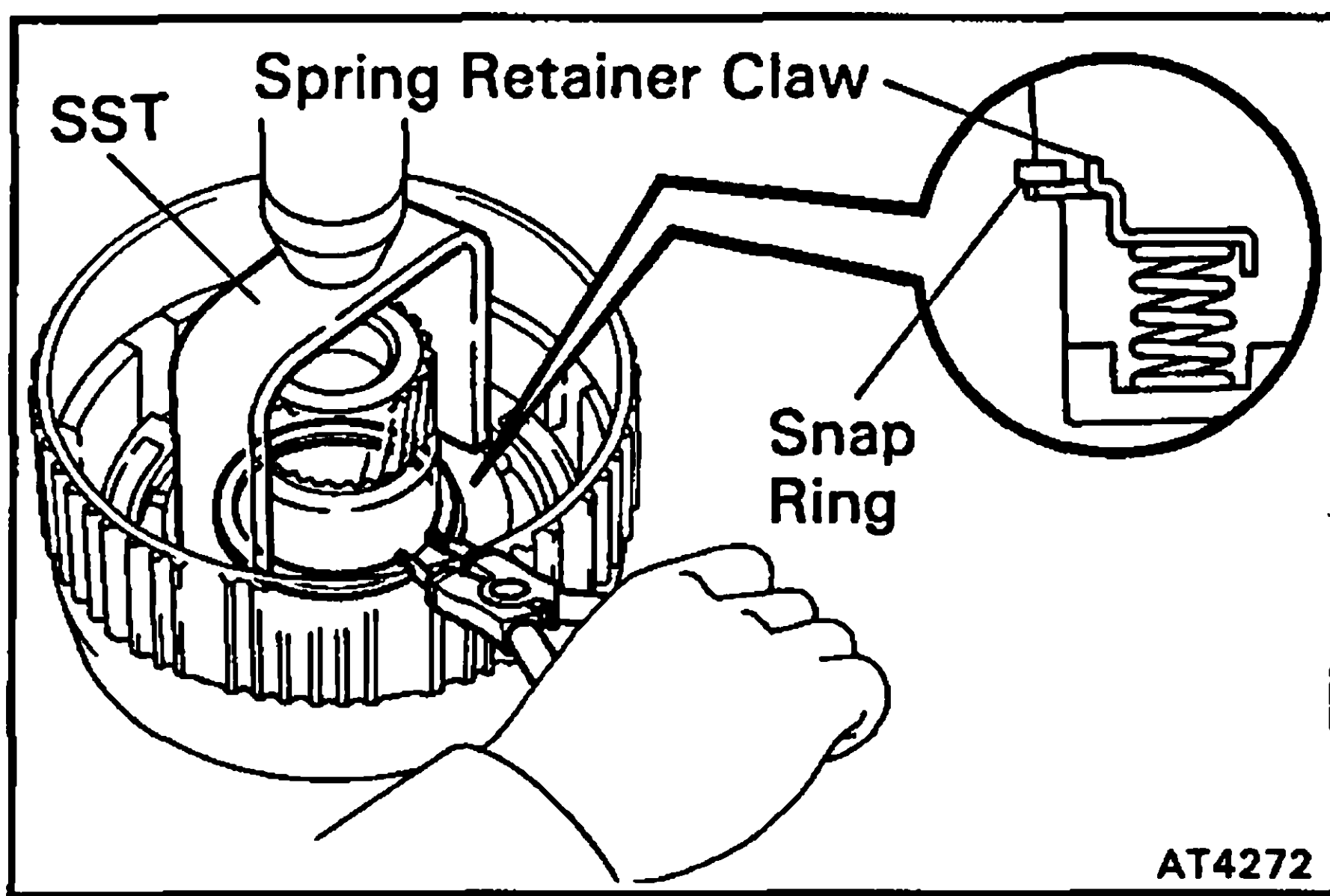
(b) Push in the clutch piston into the clutch drum with both hands.

**NOTICE:** Be careful not to damage the O-rings.



## 5. INSTALL PISTON RETURN SPRING

(a) Place the return spring on the clutch piston.



- (b) Place SST on the spring seat, and compress the re-  
turn spring with a shop press.

SST 09350-36010 (09350-06010)

- (c) Using snap ring pliers, install the snap ring.

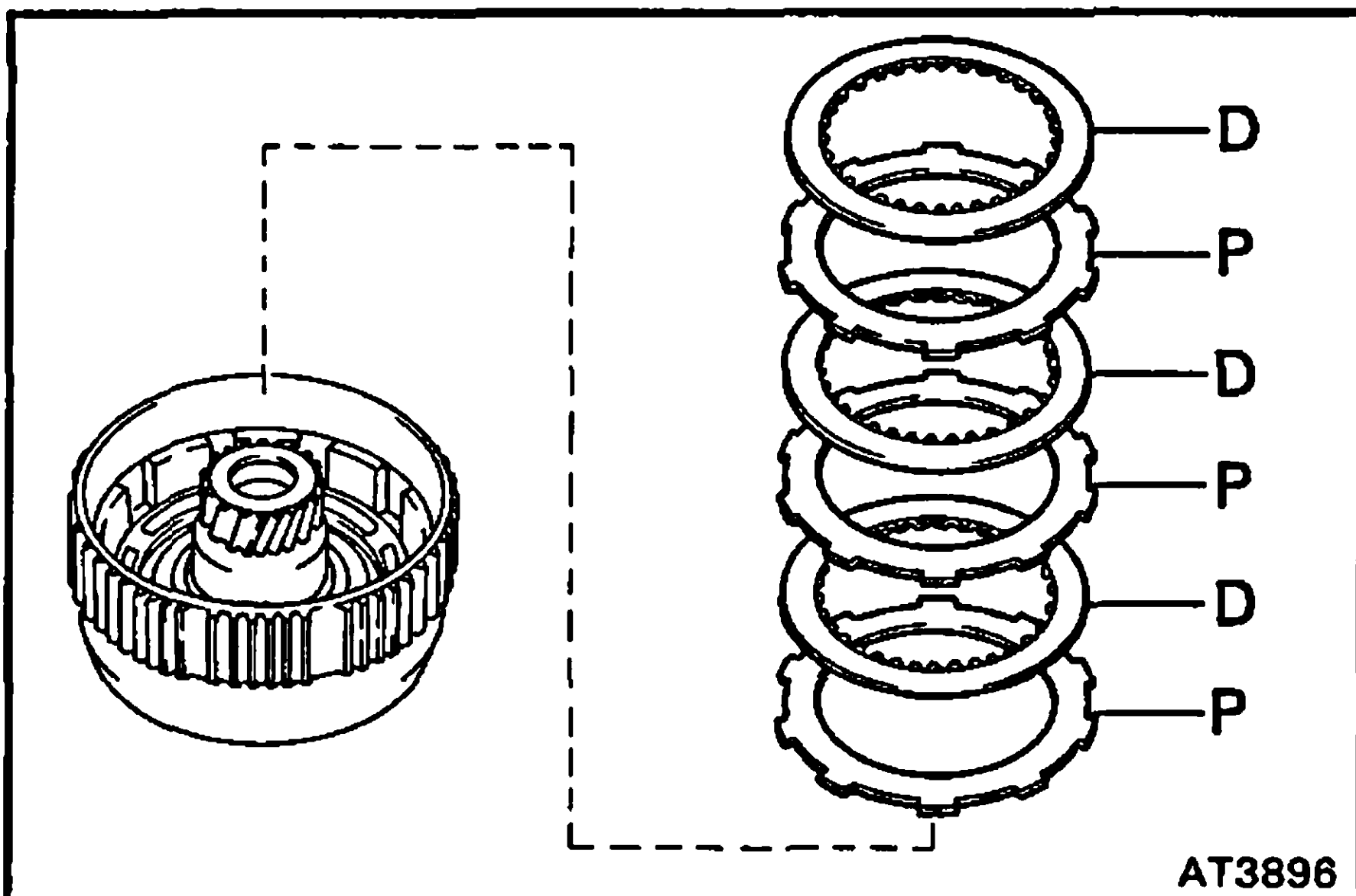
HINT: Be sure the end gap of the snap ring is not  
aligned with the spring retainer claw.

## 6. INSTALL PLATES, DISCS AND FLANGE

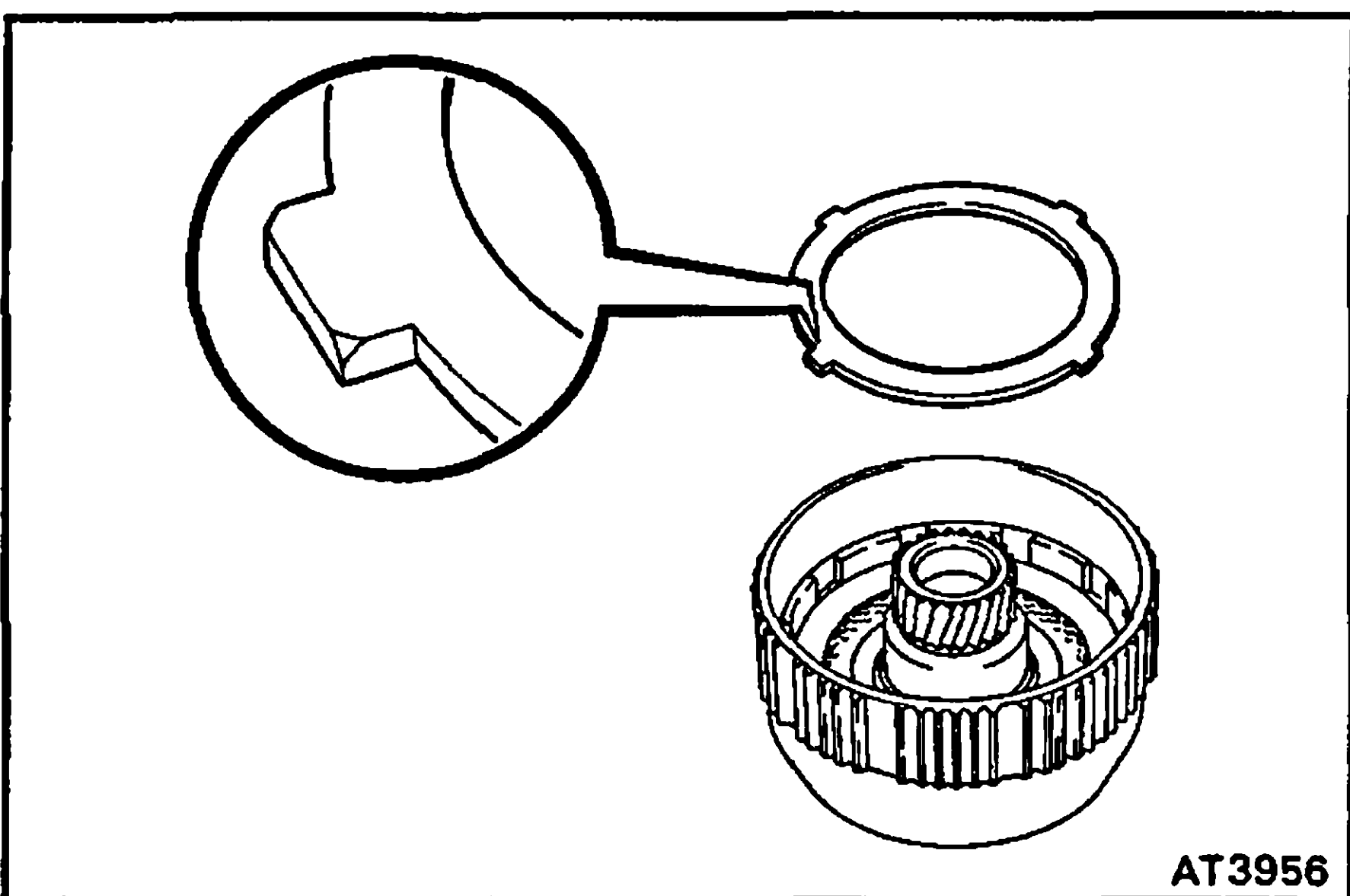
- (a) Install the three plates and three discs in order:

P = Plate D = Disc

P-D-P-D-P-D

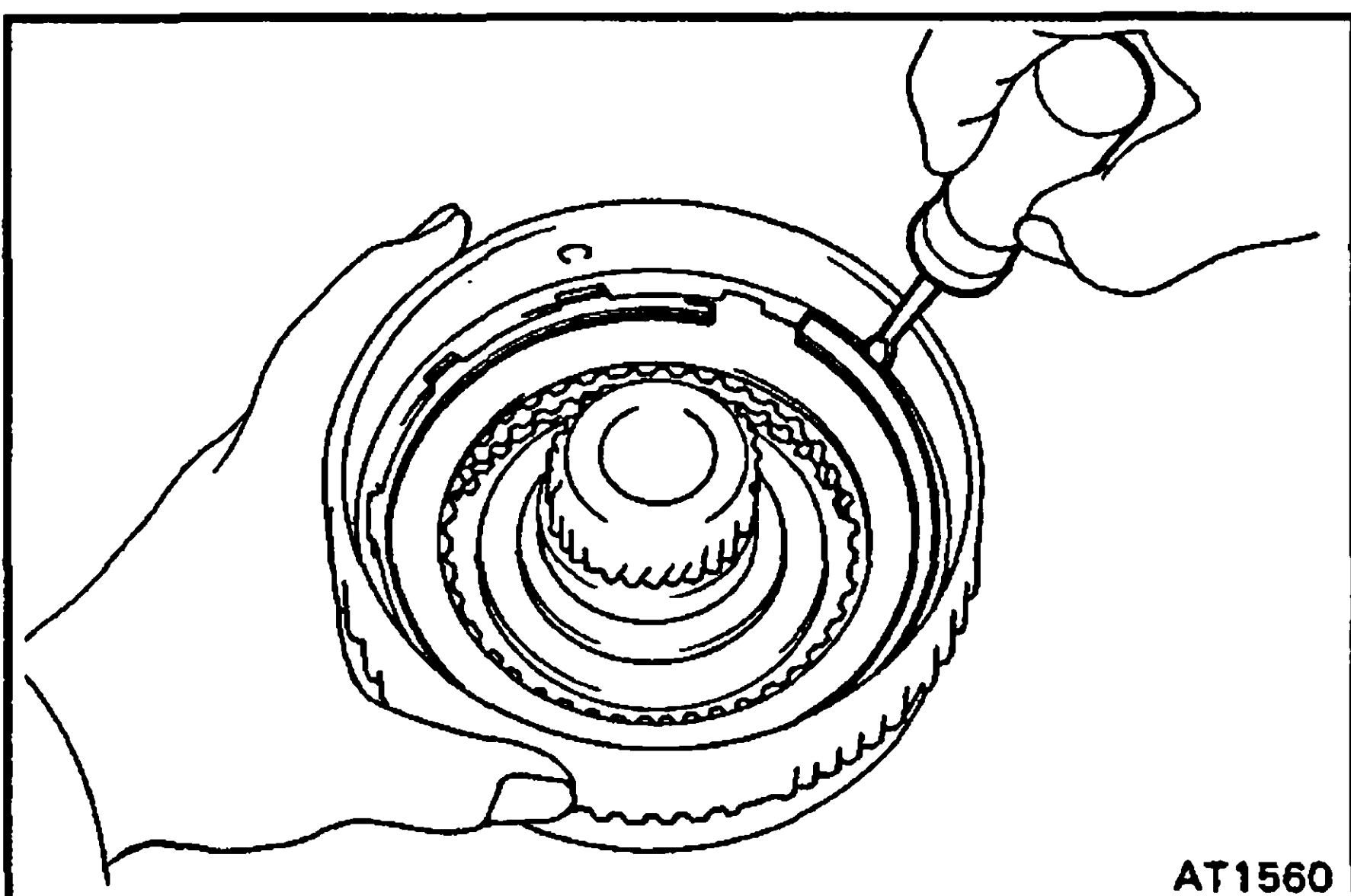


- (b) Install the flange, facing the rounded edge upward.



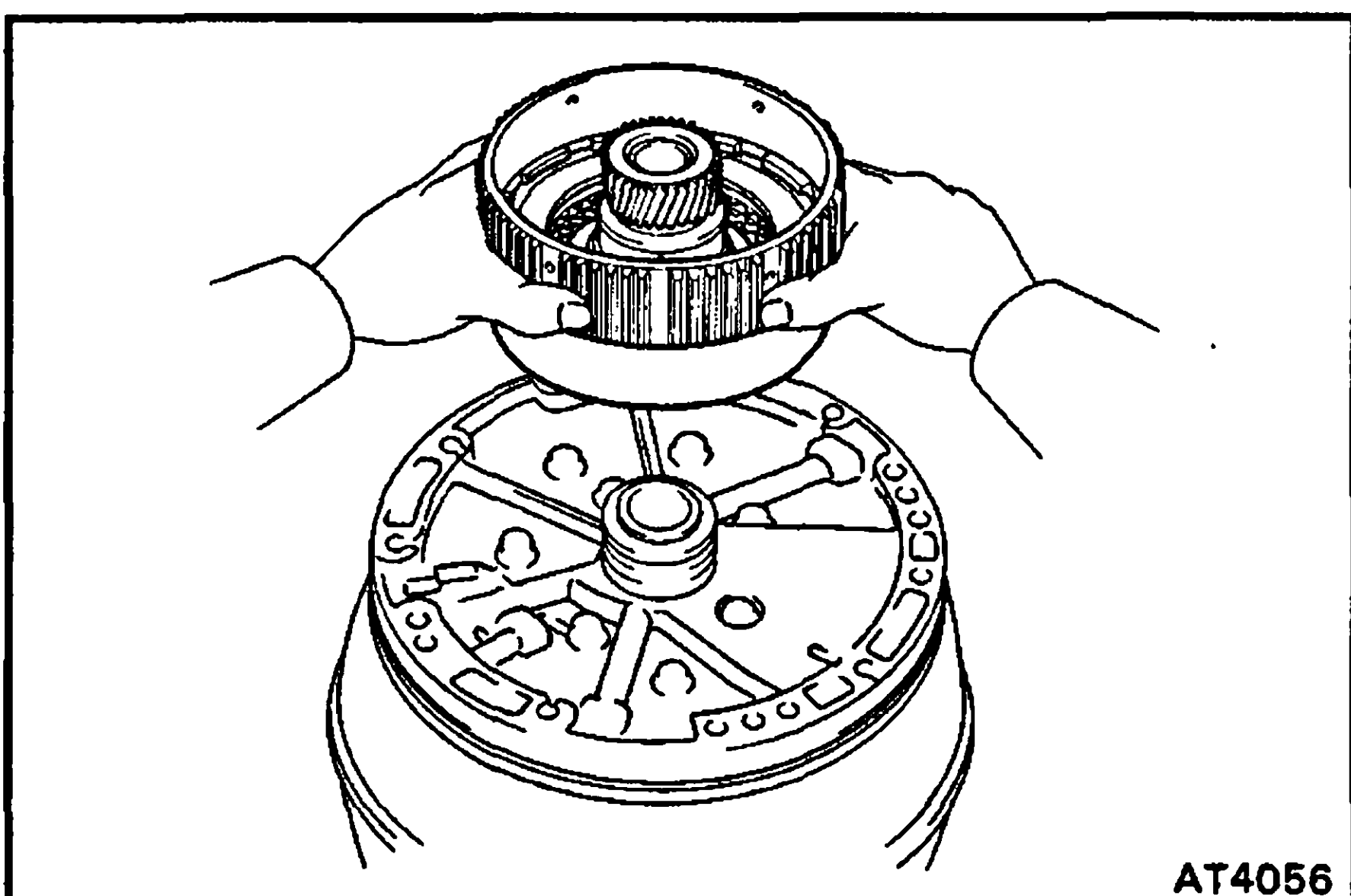
- (c) Using a screwdriver, install the snap ring.

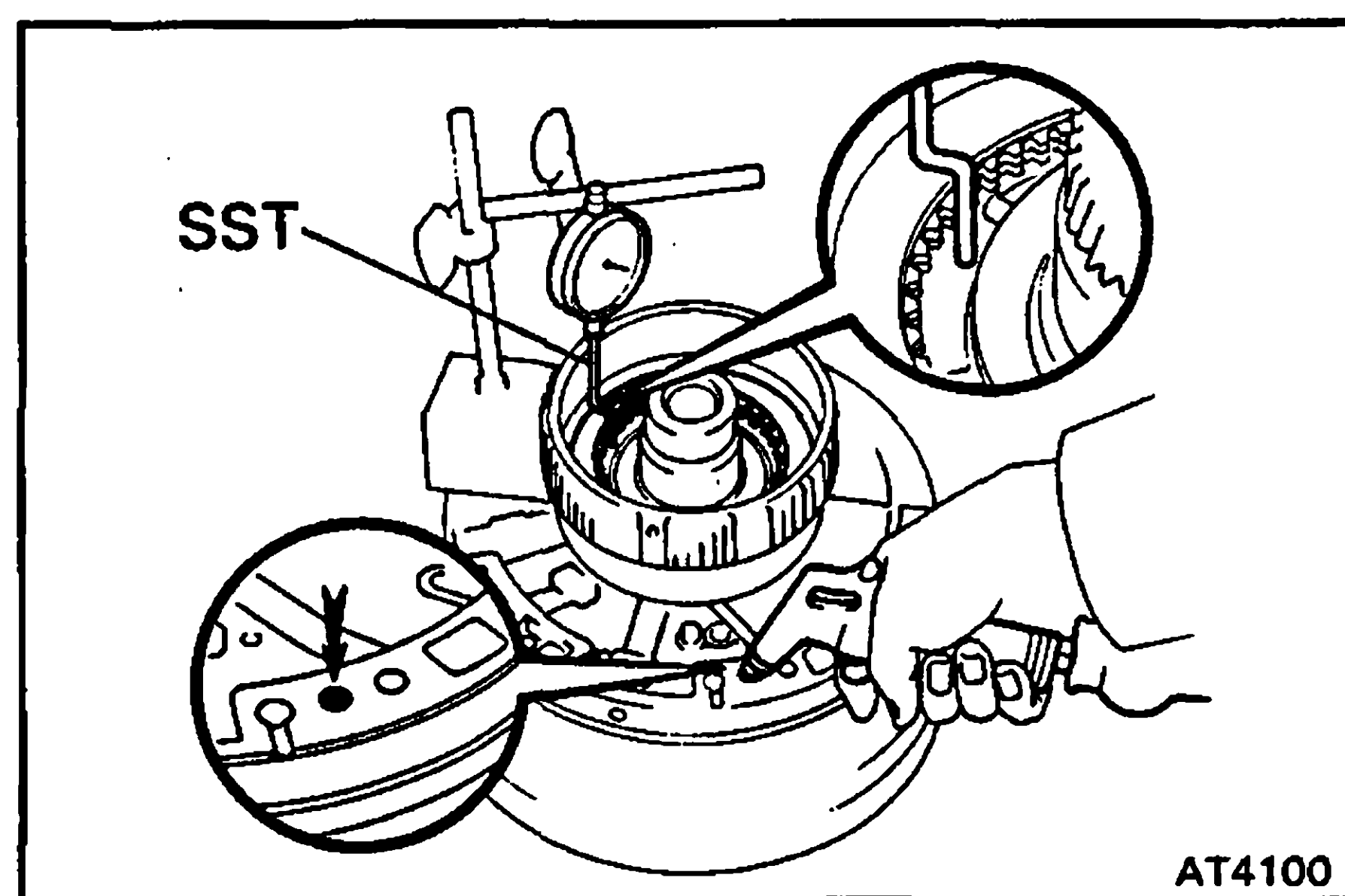
HINT: Be sure the end gap of the snap ring is not  
aligned with the cutout portion of the clutch drum.



## 7. CHECK PISTON STROKE OF OVERDRIVE DIRECT CLUTCH

- (a) Place the oil pump onto the torque converter, and  
then place the O/D direct clutch assembly onto the  
oil pump.



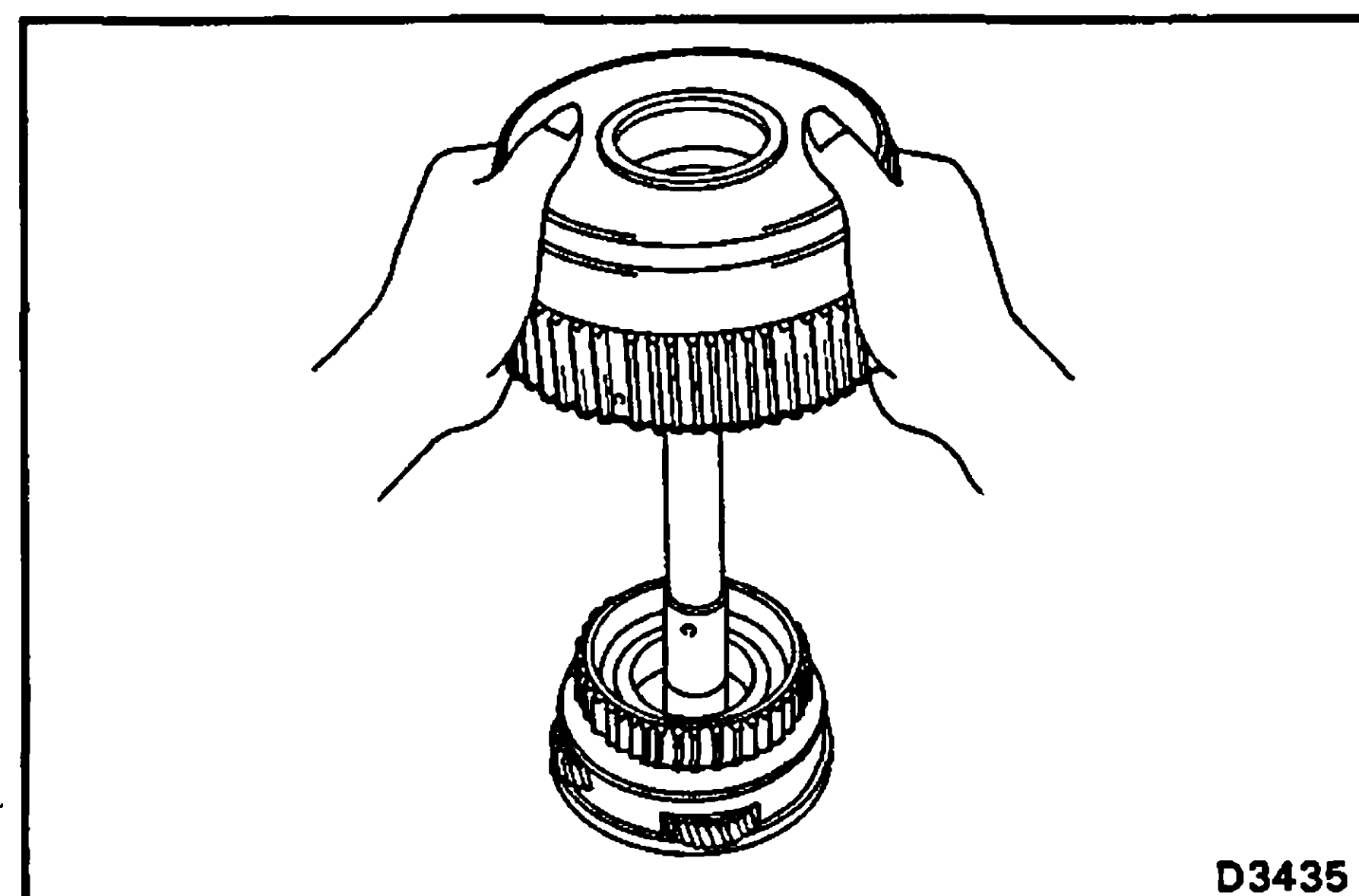


- (d) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air (4 — 8 kg/cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-36010 (09350-06110)

Piston stroke: 1.10 — 1.70 mm (0.0433 — 0.0669 in.)

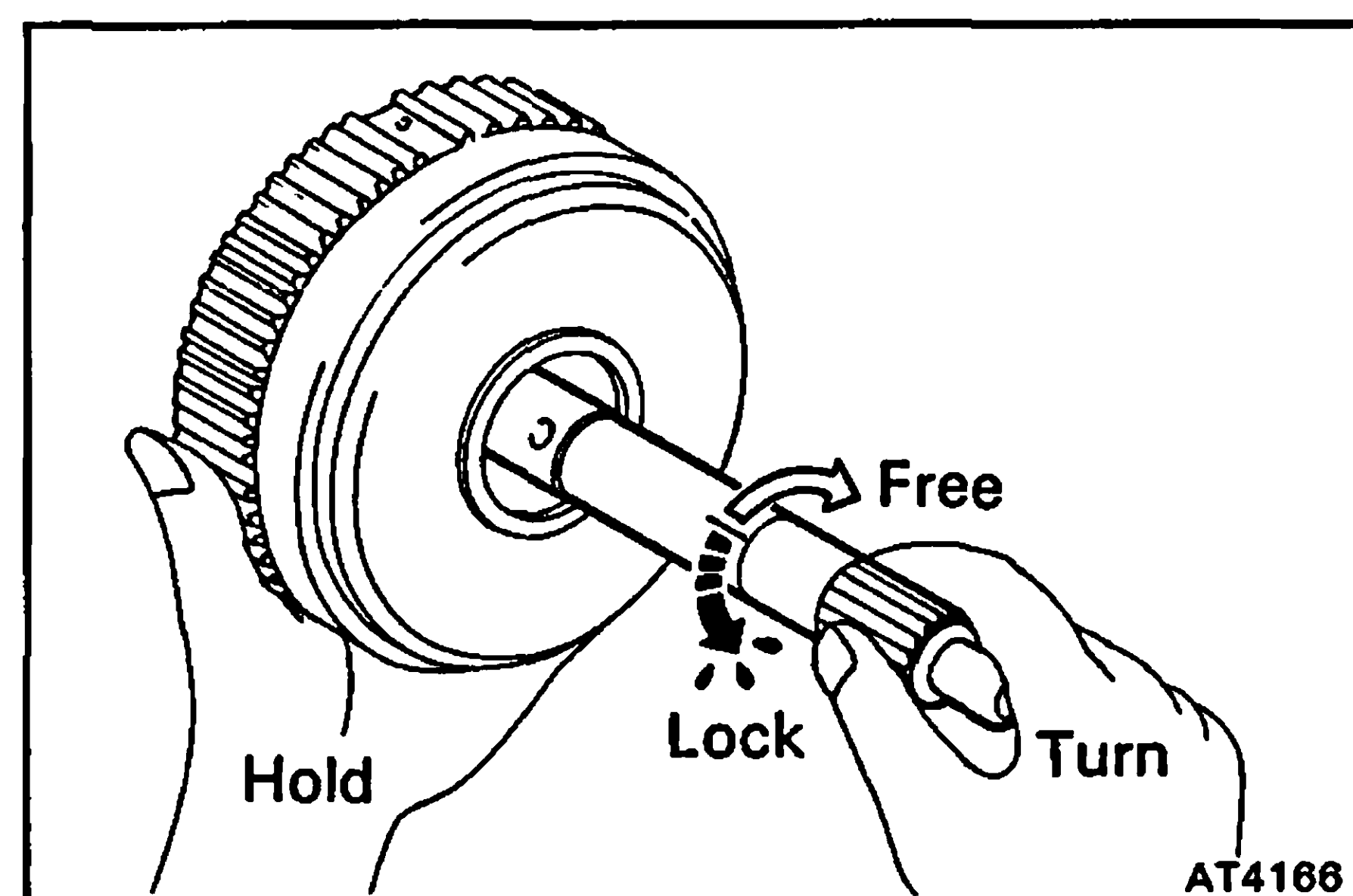
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.



## 8. INSTALL OVERDRIVE DIRECT CLUTCH ASSEMBLY

Install the direct clutch assembly onto the O/D planetary gear.

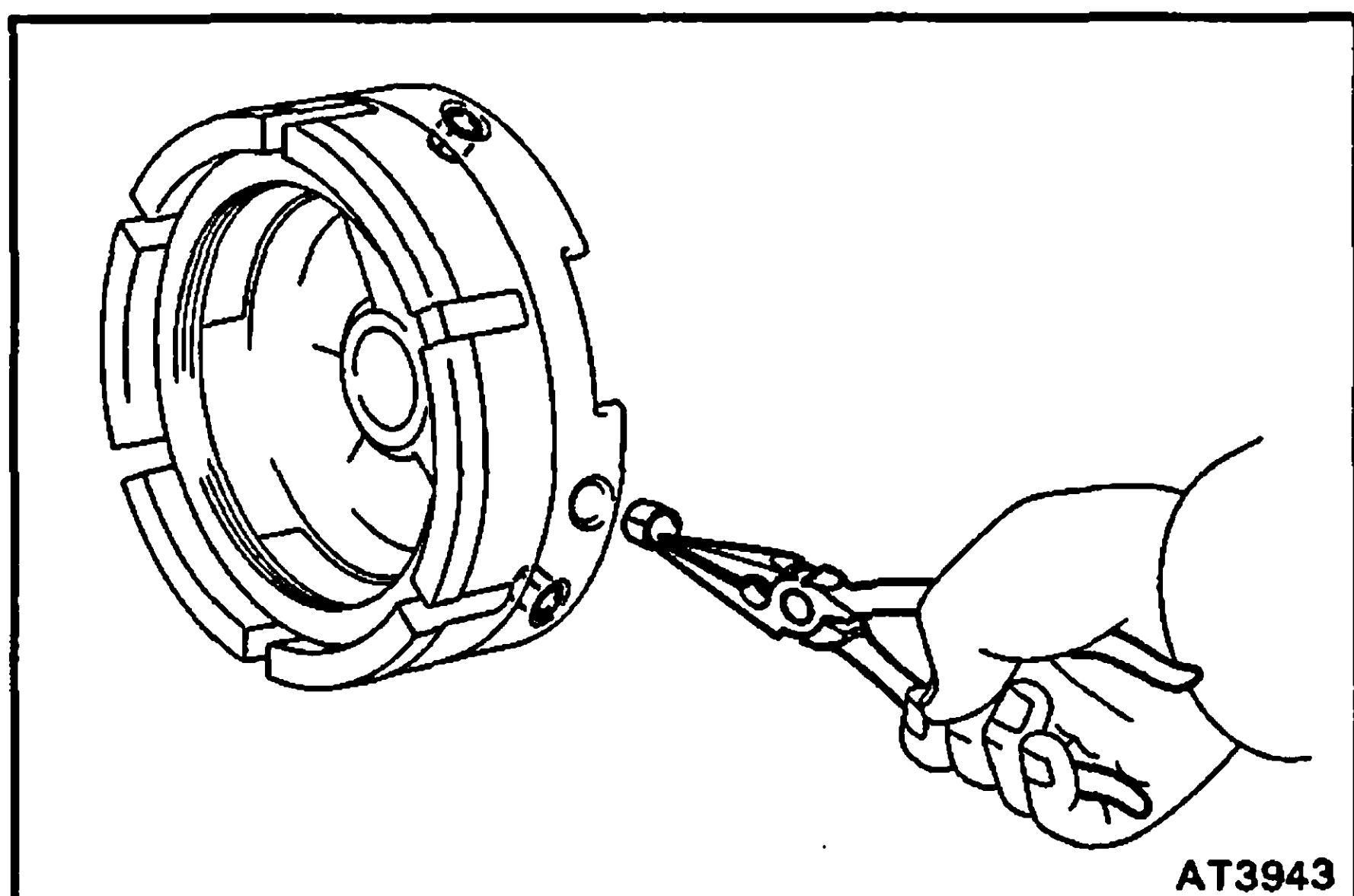
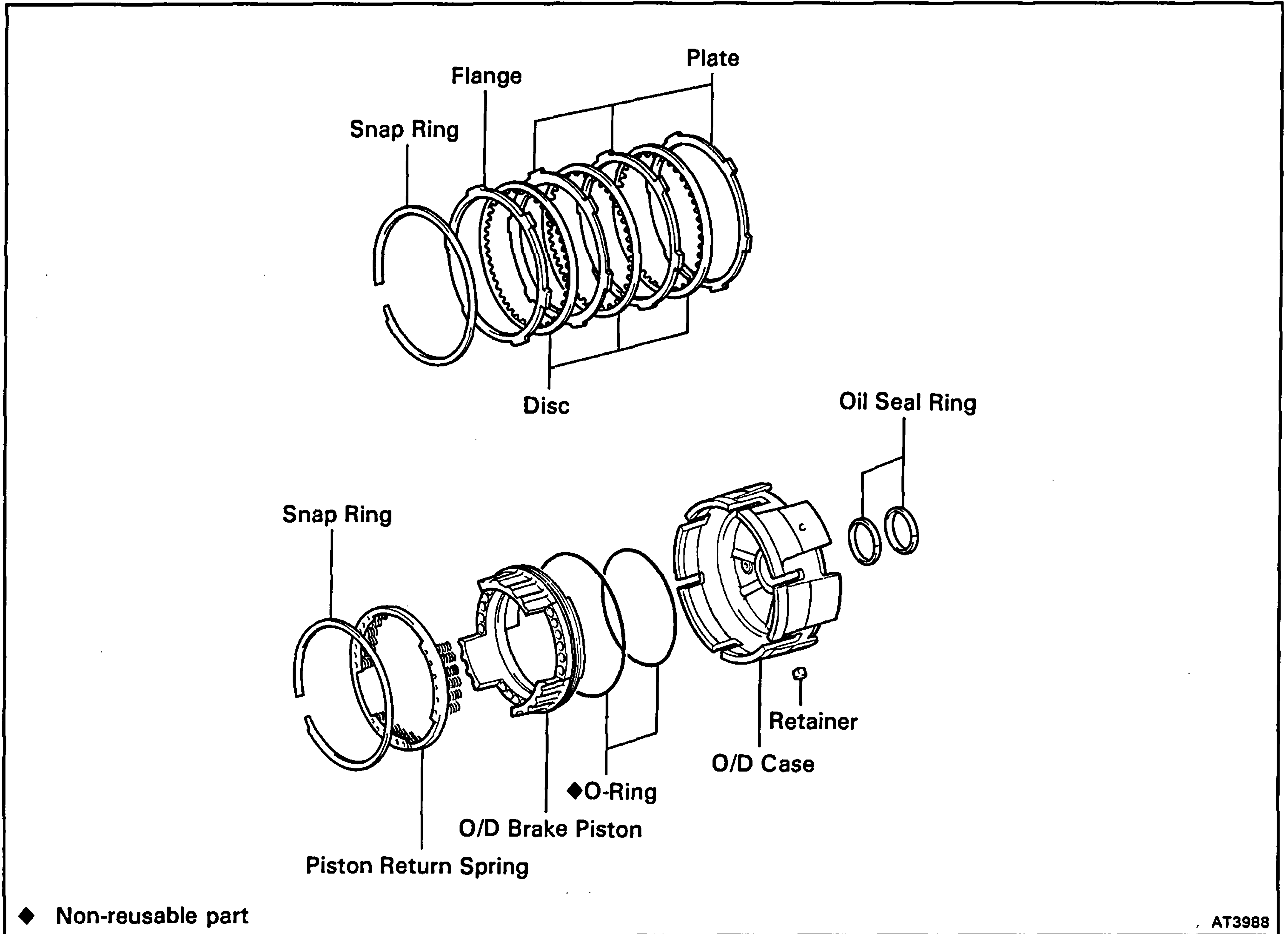
**HINT:** Mesh the spline of the O/D planetary gear with the flukes of the discs by rotating and pushing the O/D direct clutch counterclockwise.



## 9. CHECK OPERATION OF ONE-WAY CLUTCH

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

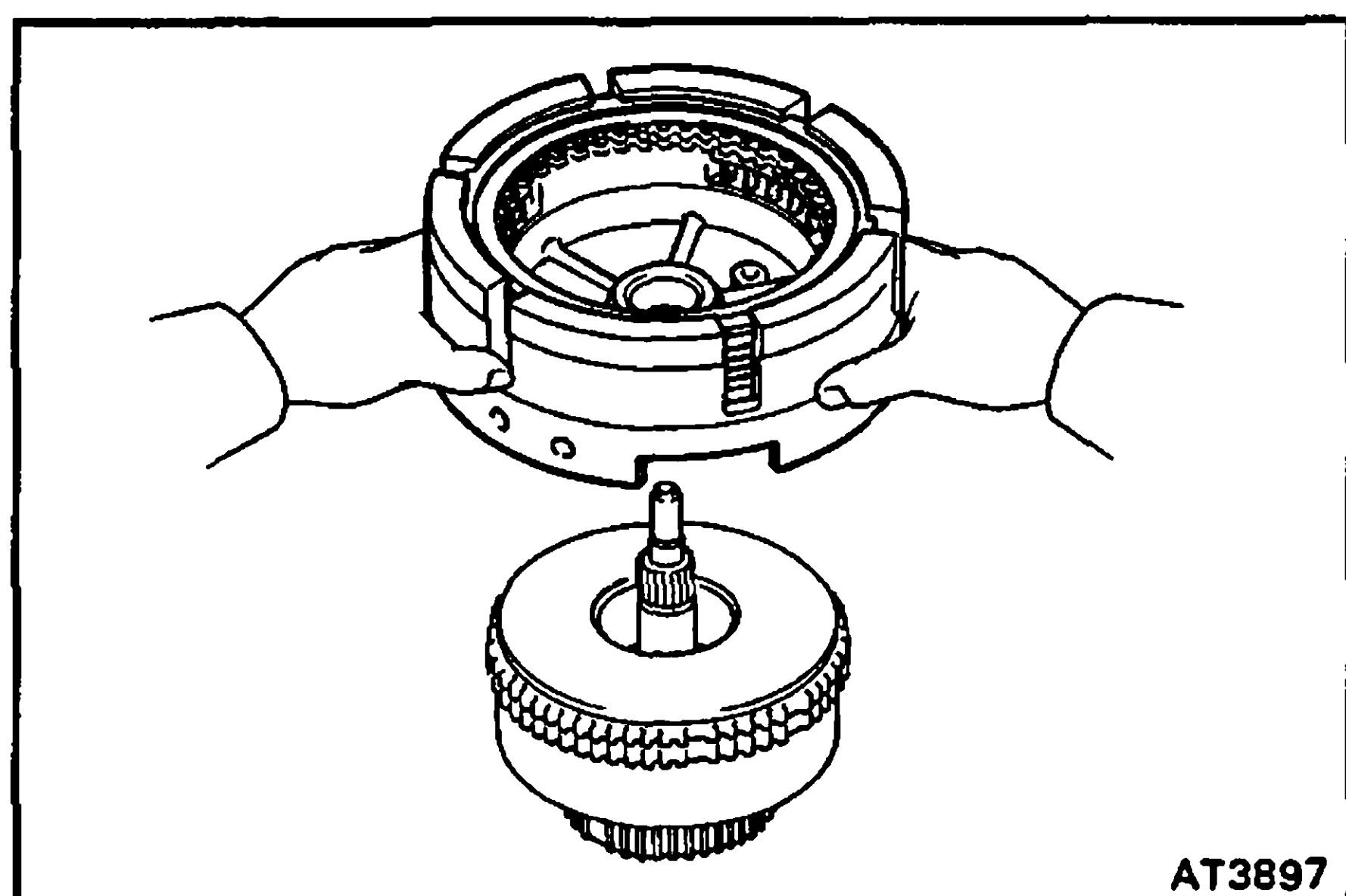
## Overdrive Brake (A440F, A441L) COMPONENTS



### DISASSEMBLY OF OVERDRIVE BRAKE

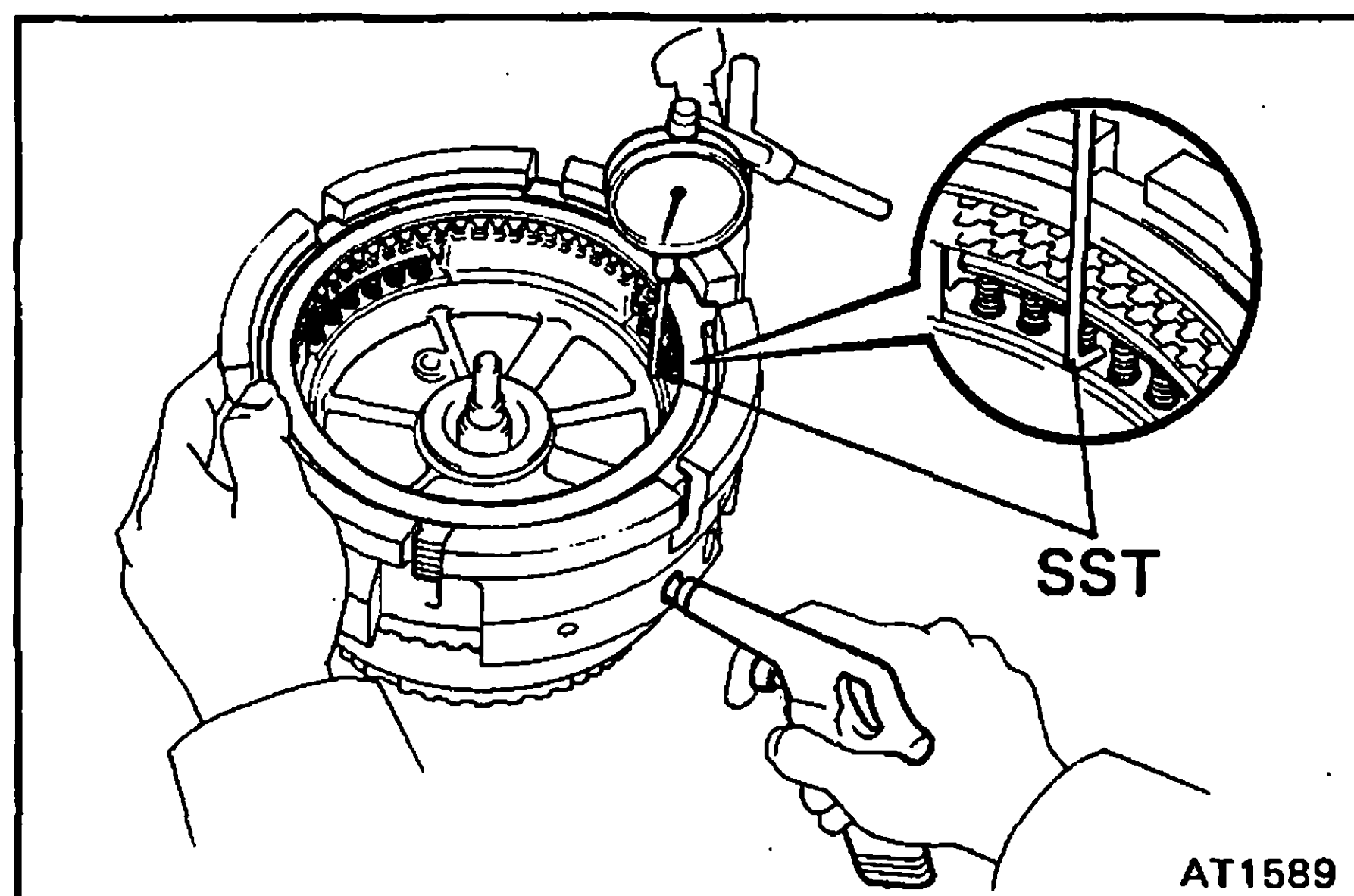
#### 1. REMOVE RING RETAINERS

Using needle nose pliers, remove the three ring retainers from the oil holes of the O/D case.



#### 2. CHECK PISTON STROKE OF OVERDRIVE BRAKE

- (a) Place the O/D case assembly onto the rear clutch assembly.

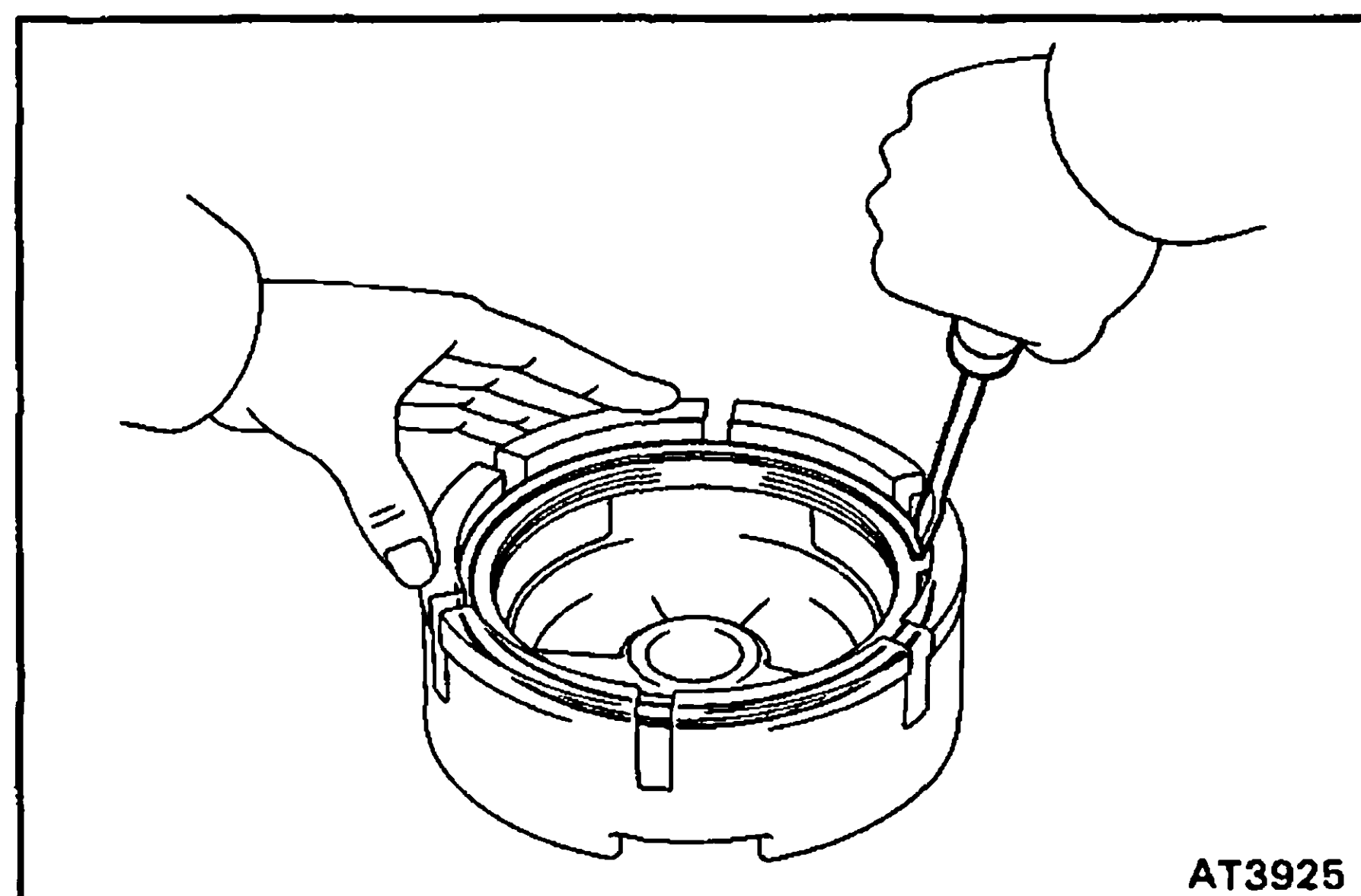


- (b) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air ( $4 - 8 \text{ kg-cm}^2$ ,  $57 - 114 \text{ psi}$  or  $392 - 785 \text{ kPa}$ ) as shown.

SST 09350-36010 (09350-06120)

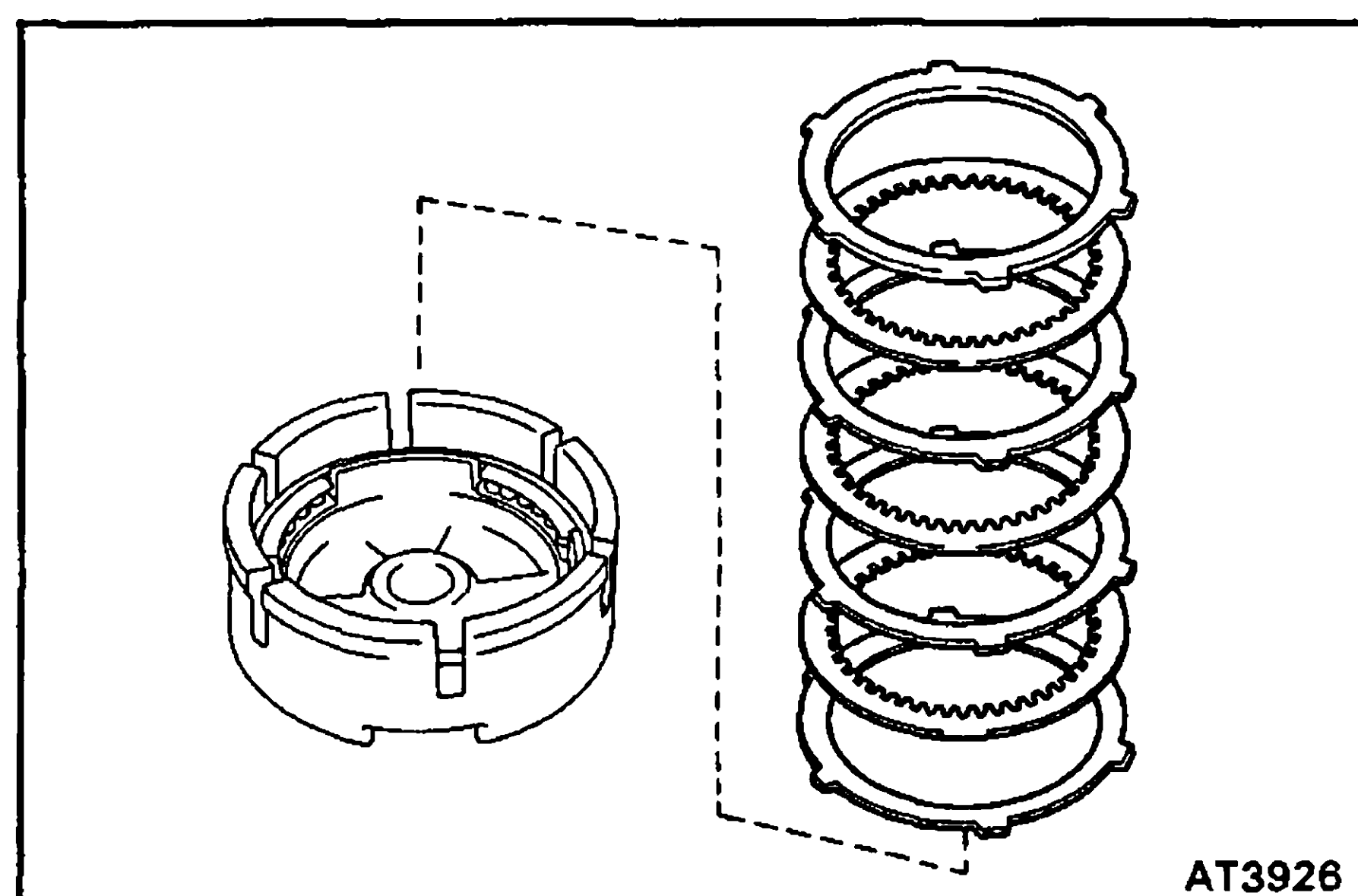
Piston stroke:  $1.25 - 1.85 \text{ mm}$  ( $0.0492 - 0.0728 \text{ in.}$ )

If the piston stroke is greater than specified, inspect the discs.

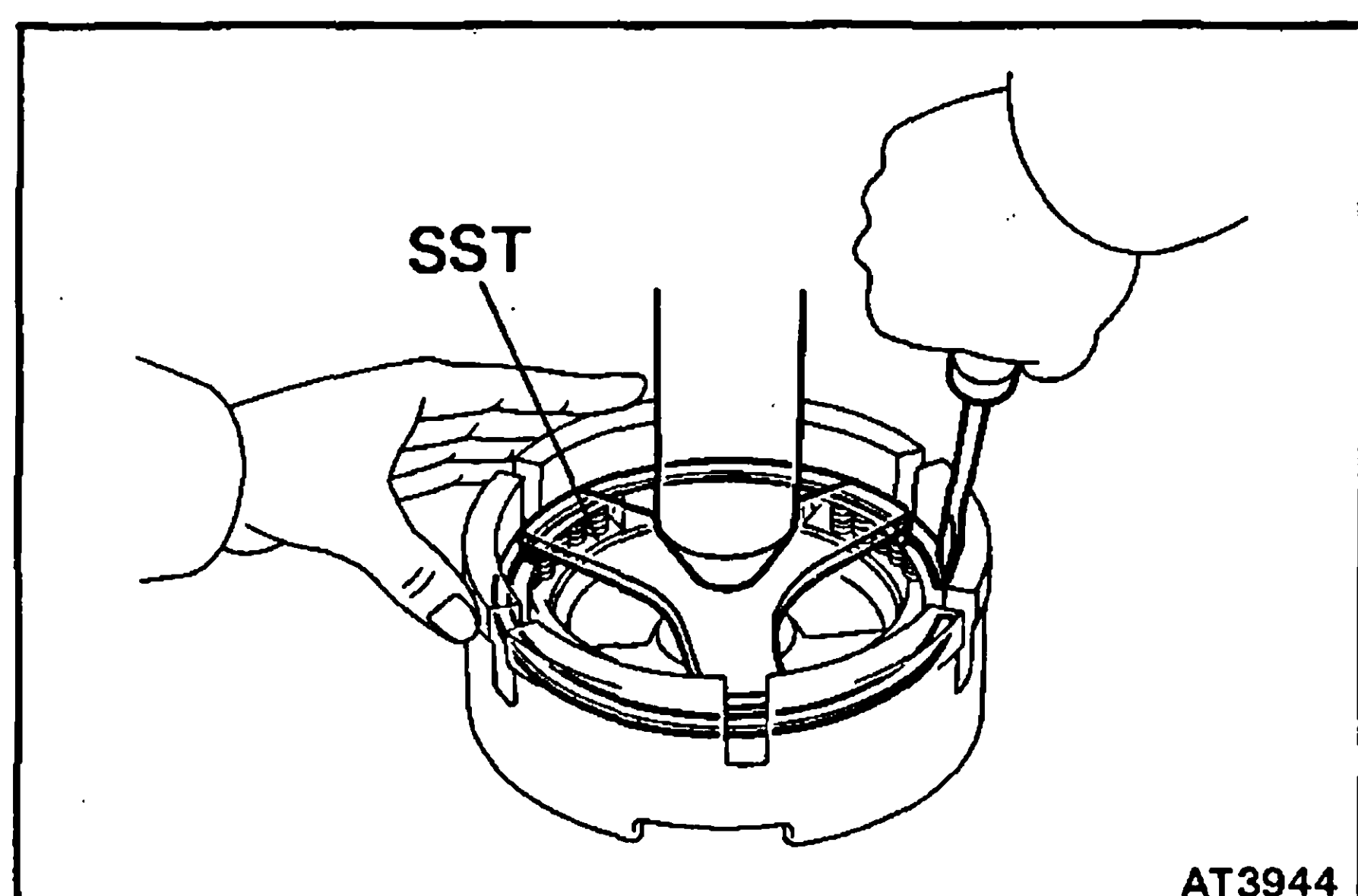


### 3. REMOVE FLANGE, DISCS AND PLATES

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



- (b) Remove the flange, three discs and three plates.

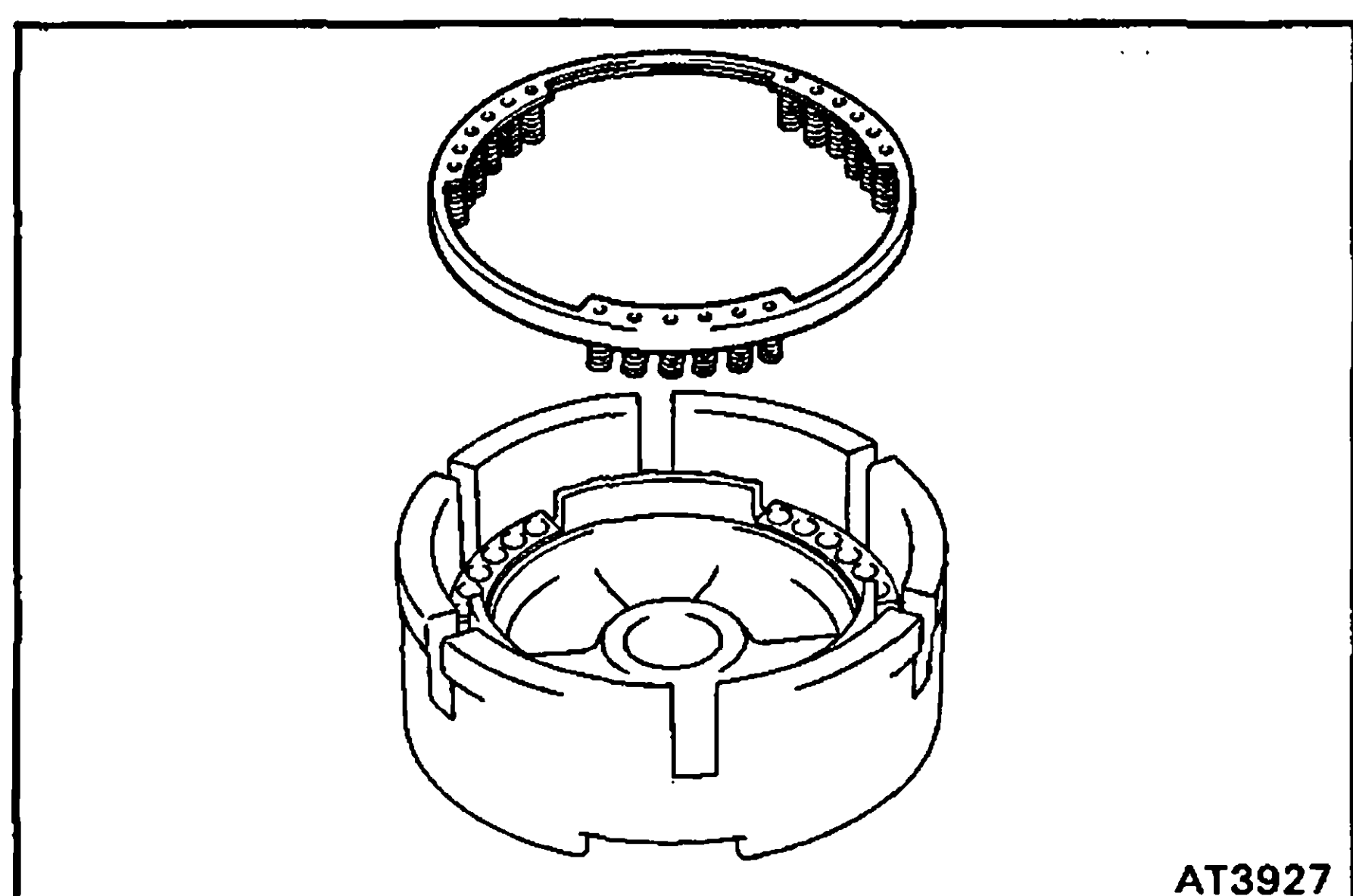


### 4. REMOVE PISTON RETURN SPRING

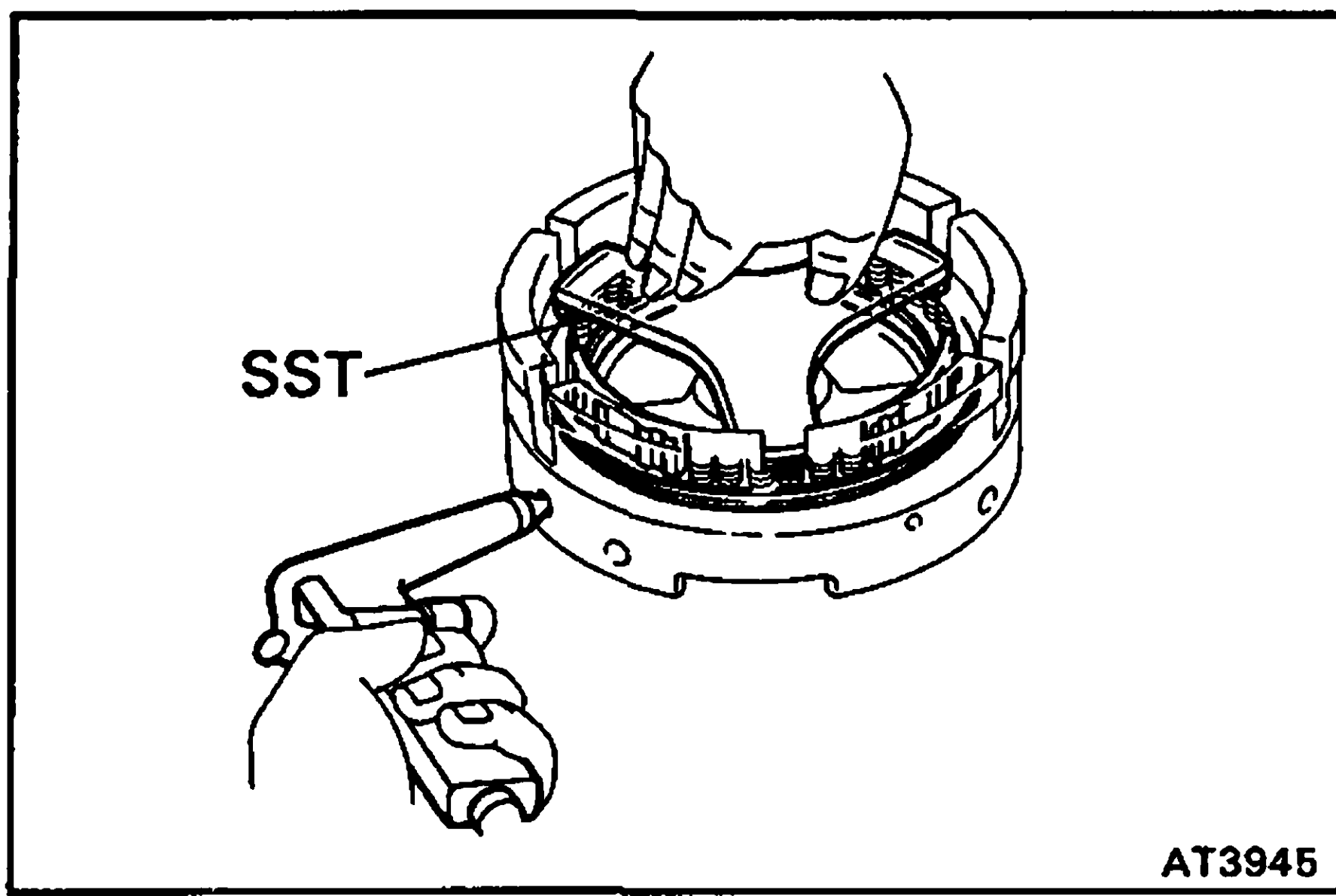
- (a) Place SST on the spring seat, and compress the return spring with a shop press.

SST 09350-36010 (09350-06020)

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



- (c) Remove the return spring.



## 5. REMOVE OVERDRIVE BRAKE PISTON

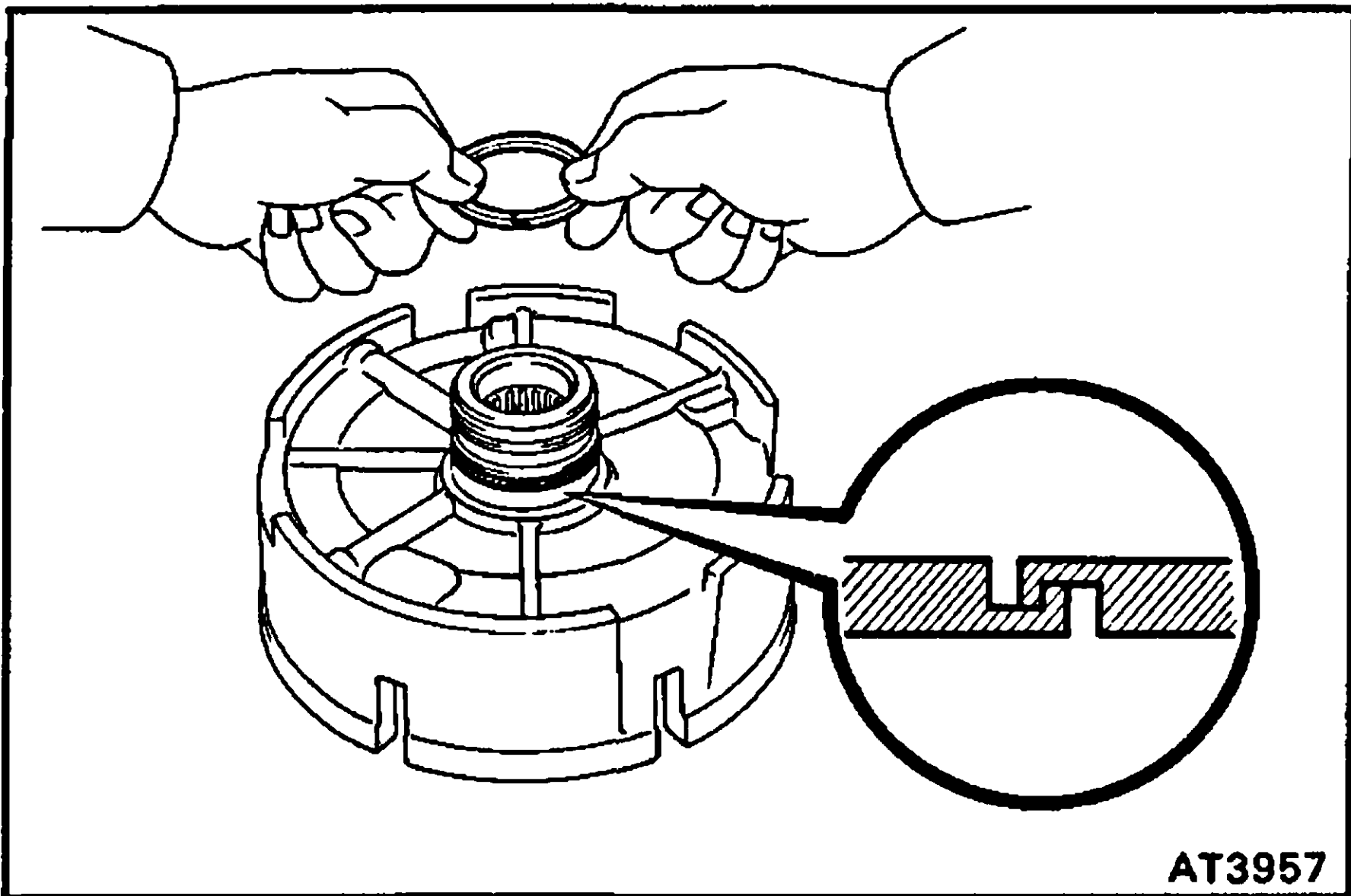
- (a) Place the return spring on the brake piston, and then place SST on the return spring.

SST 09350-36010 (09350-06020)

- (b) Hold SST so it does not slant, and apply compressed air into the oil hole of the O/D case to remove the brake piston.

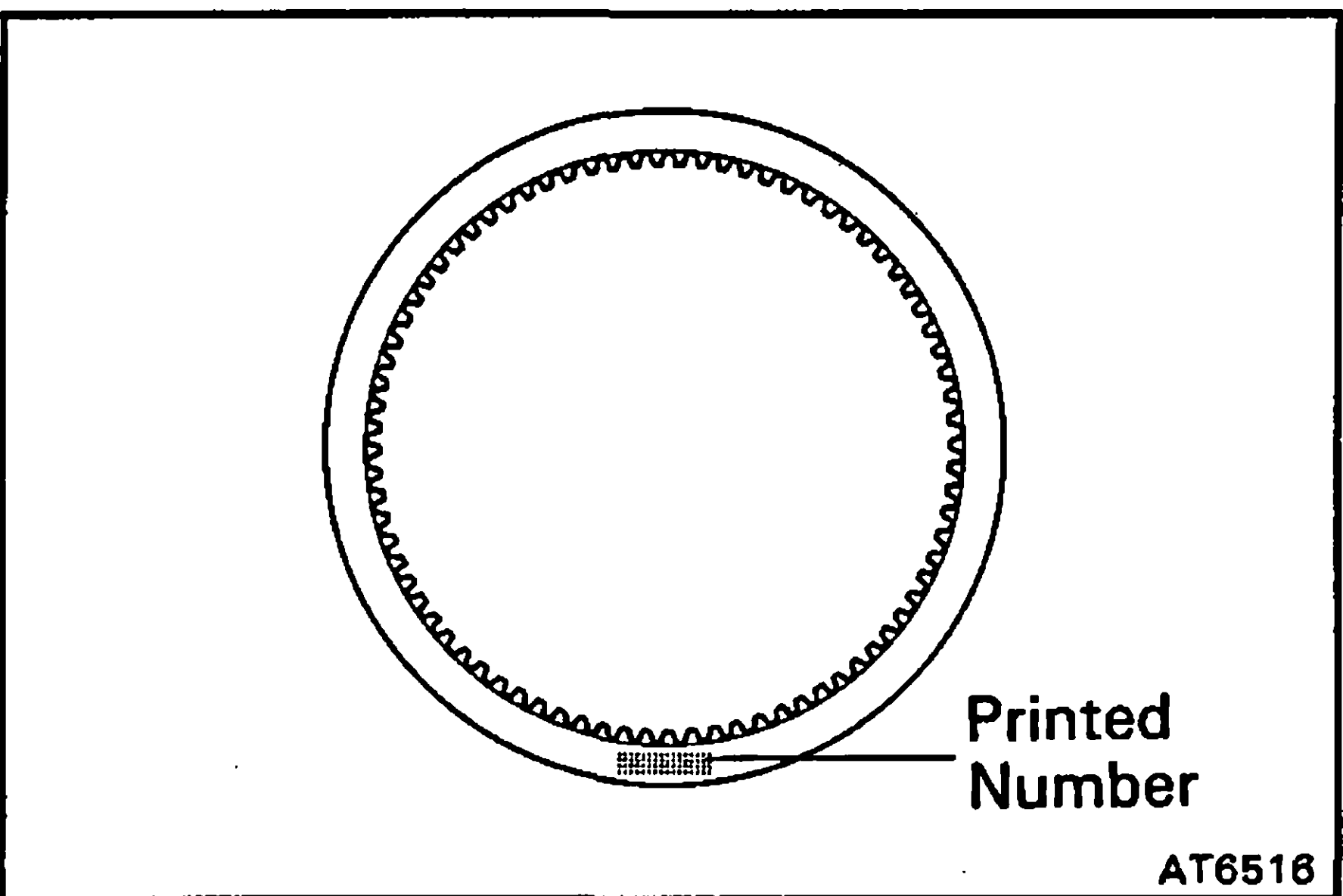
SST 09350-36010 (09350-06020)

- (c) Remove the two O-rings from the brake piston.



## 6. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the O/D case.



## INSPECTION OF OVERDRIVE BRAKE

### 1. INSPECT DISCS, PLATES AND FLANGE

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

#### HINT:

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

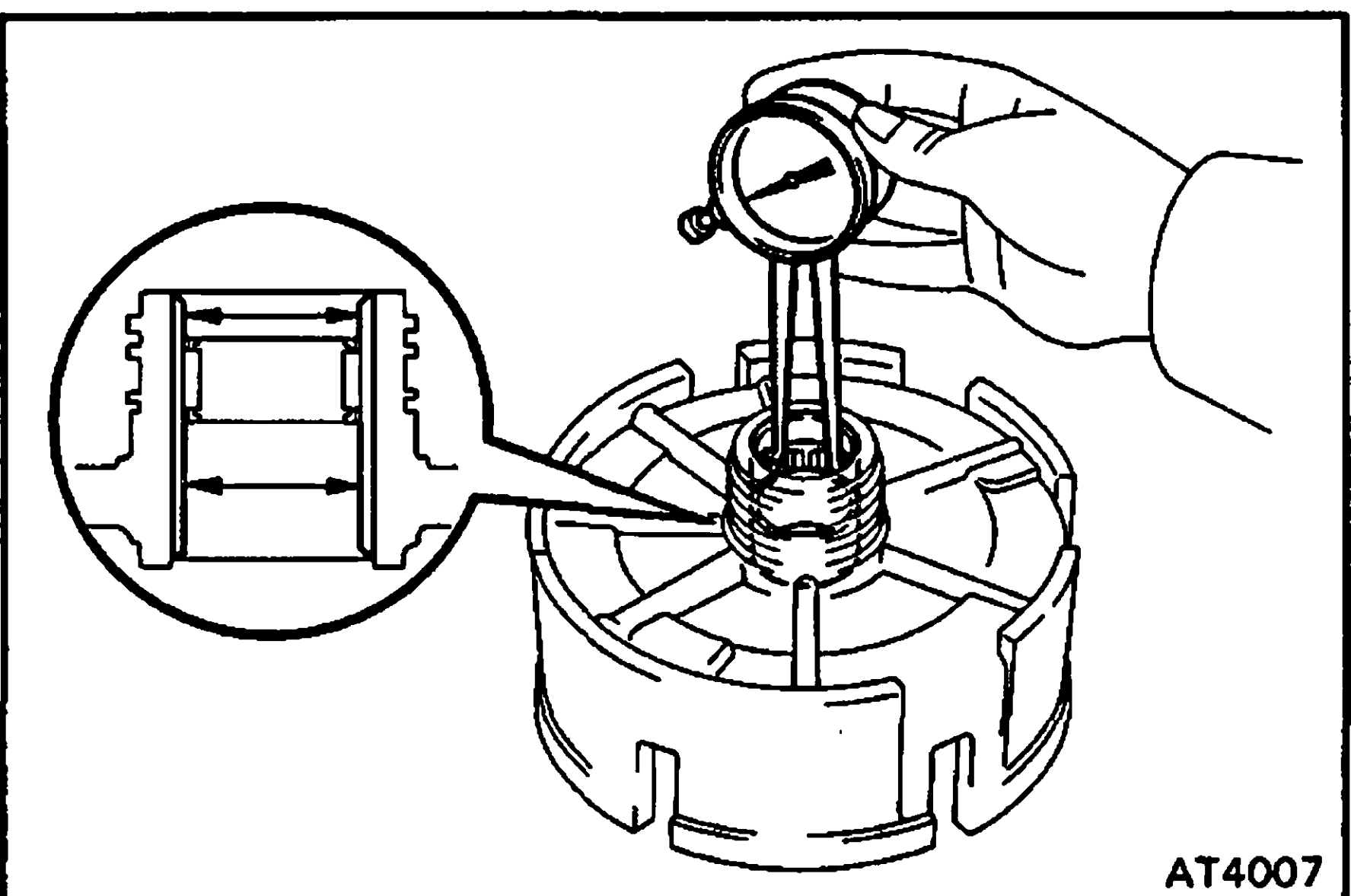
### 2. INSPECT BUSHING OF OVERDRIVE CASE

Using a dial indicator, measure the inside diameter.

Standard inside diameter: 33.100 — 33.150 mm  
(1.3031 — 1.3051 in.)

Maximum inside diameter: 33.20 mm (1.3071 in.)

If the inside diameter is greater than maximum, replace the O/D case.



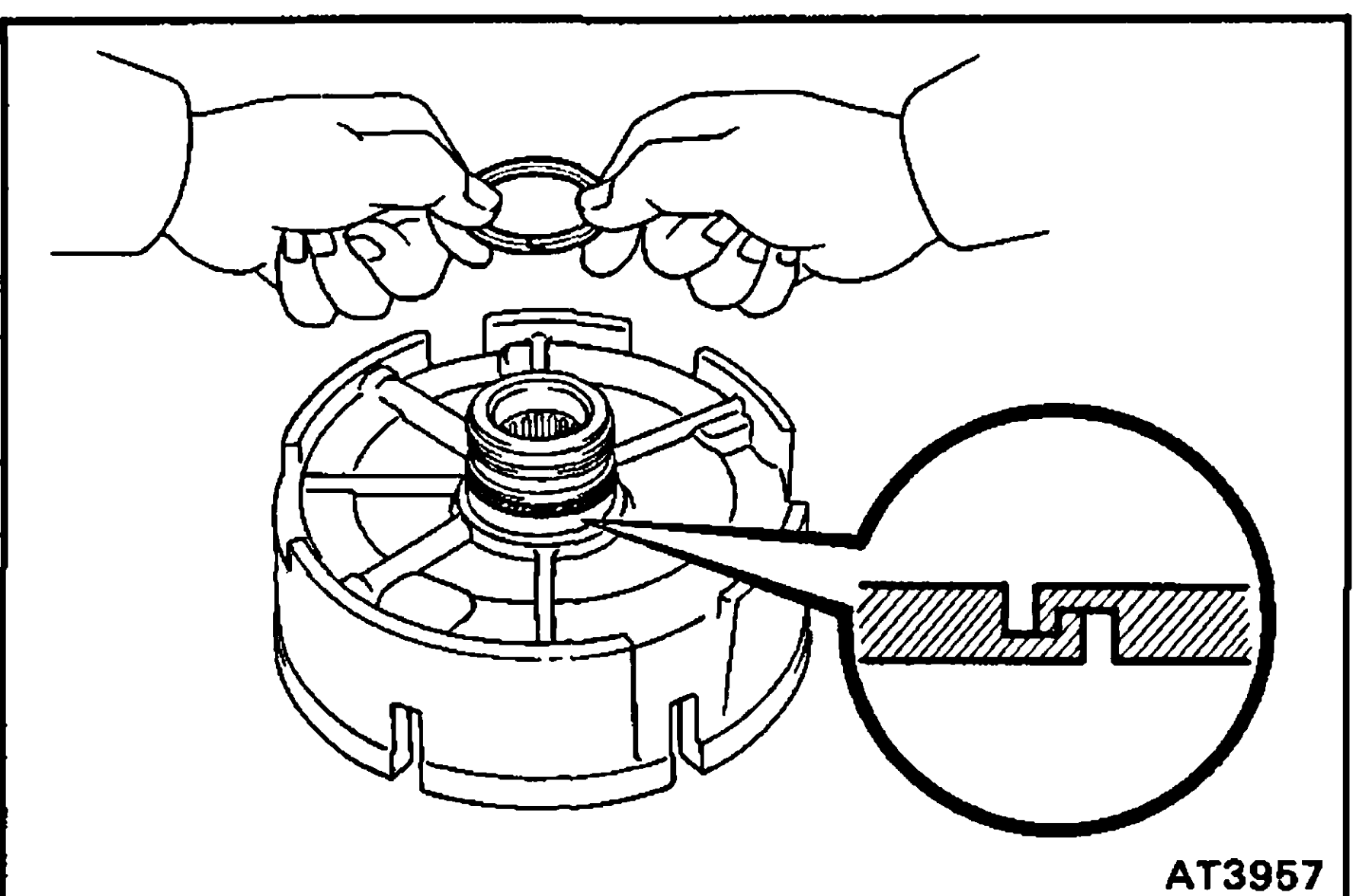
## ASSEMBLY OF OVERDRIVE BRAKE

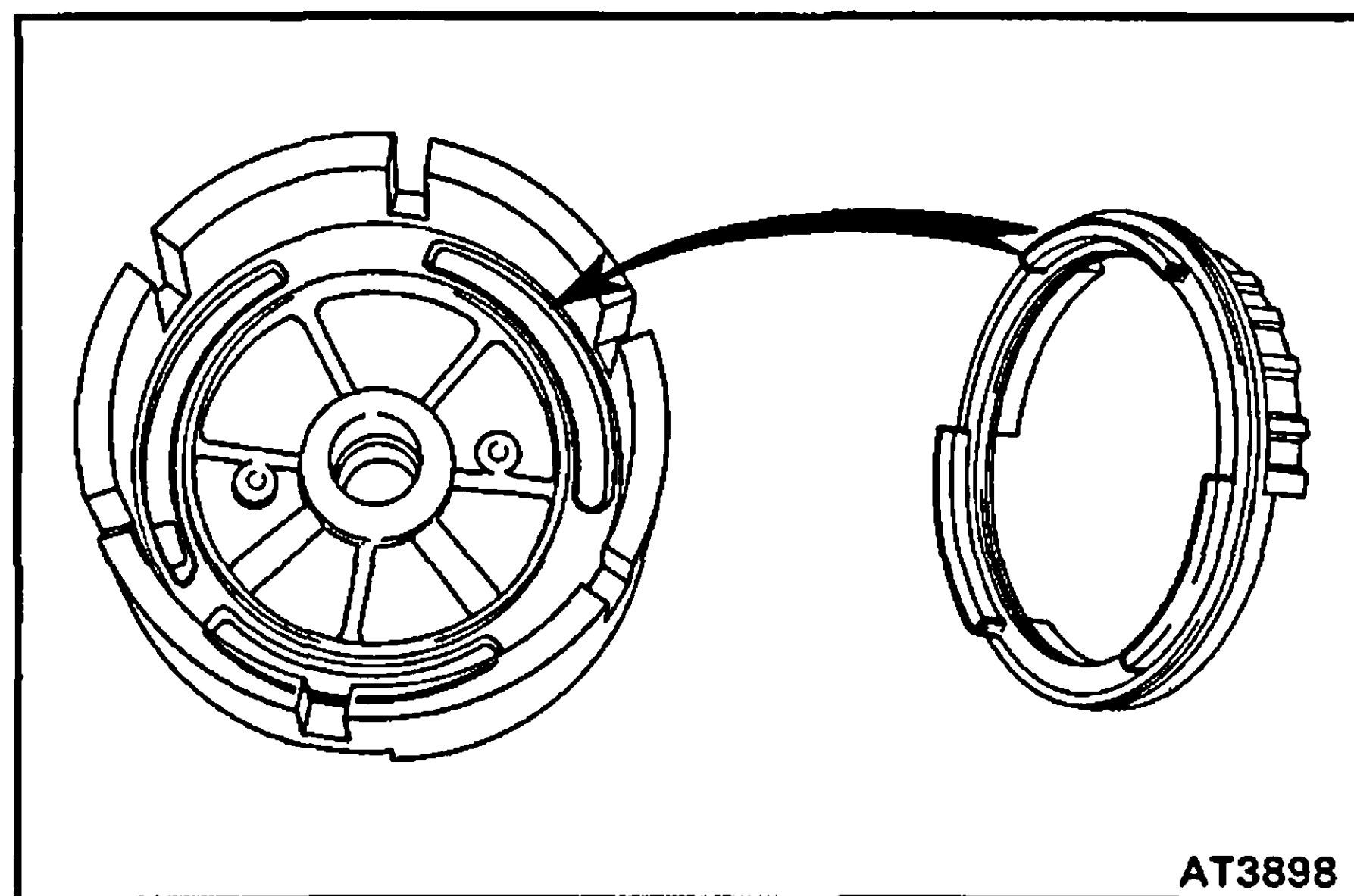
### 1. INSTALL OIL SEAL RINGS

- (a) Coat the two oil seal rings with ATF.
- (b) Contract the oil seals, and install them onto the O/D case.

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

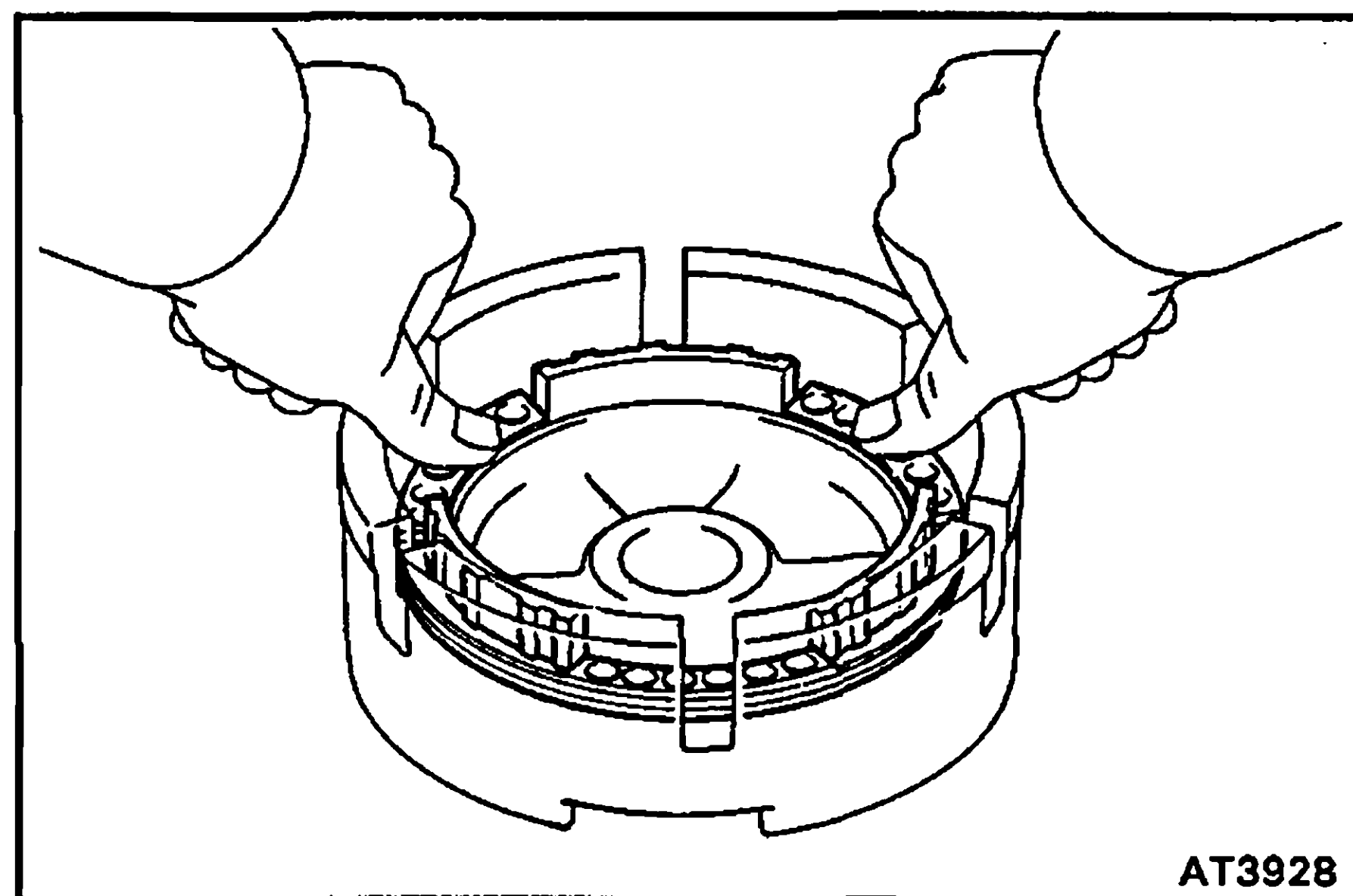
**HINT:** After installing the oil seal rings, check that they rotate smoothly.





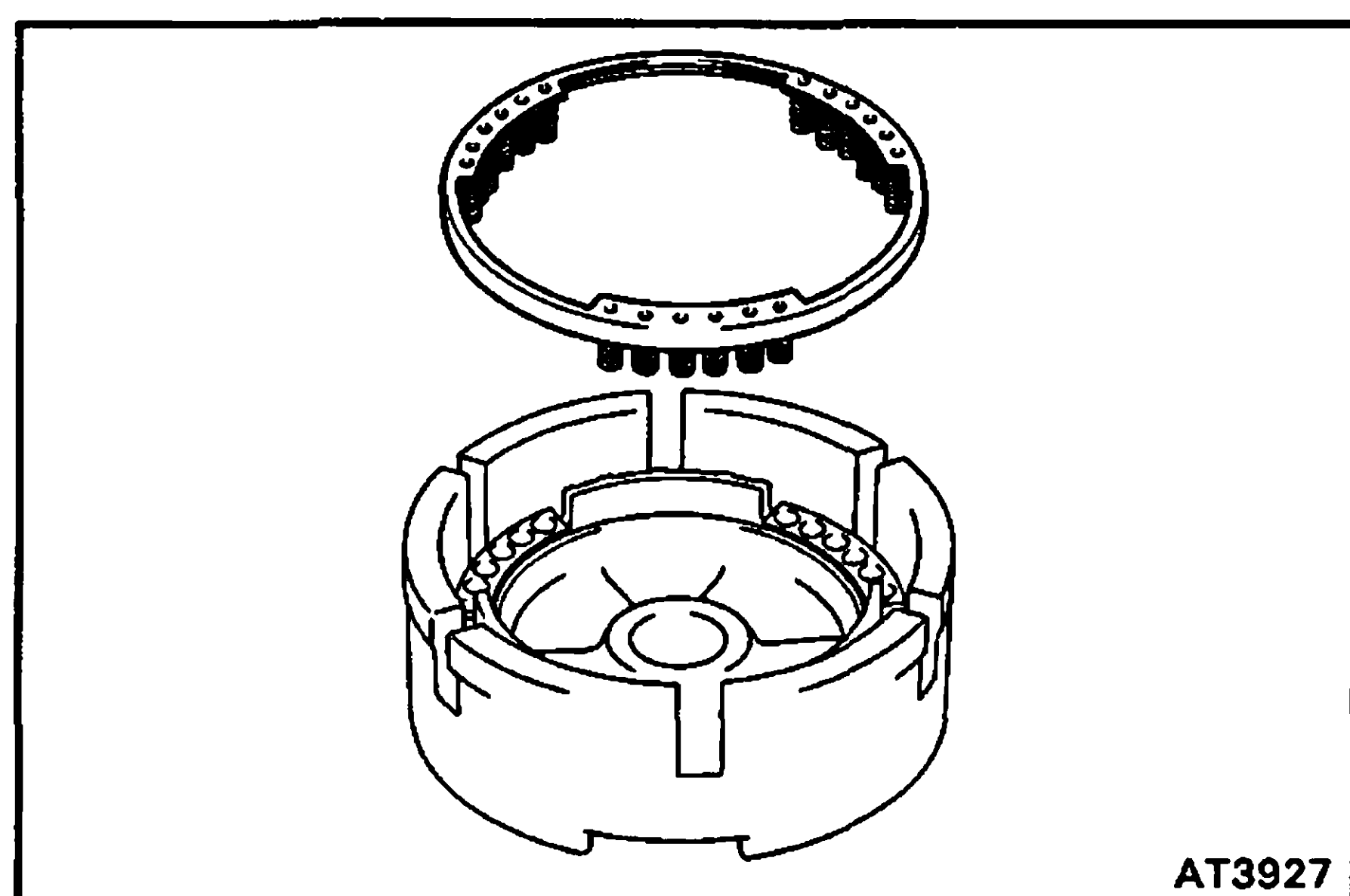
## 2. INSTALL OVERDRIVE BRAKE PISTON

- Coat new two O-rings with ATF, and install them on the brake piston.
- Align the protrusions of the brake piston with the grooves of the O/D case.



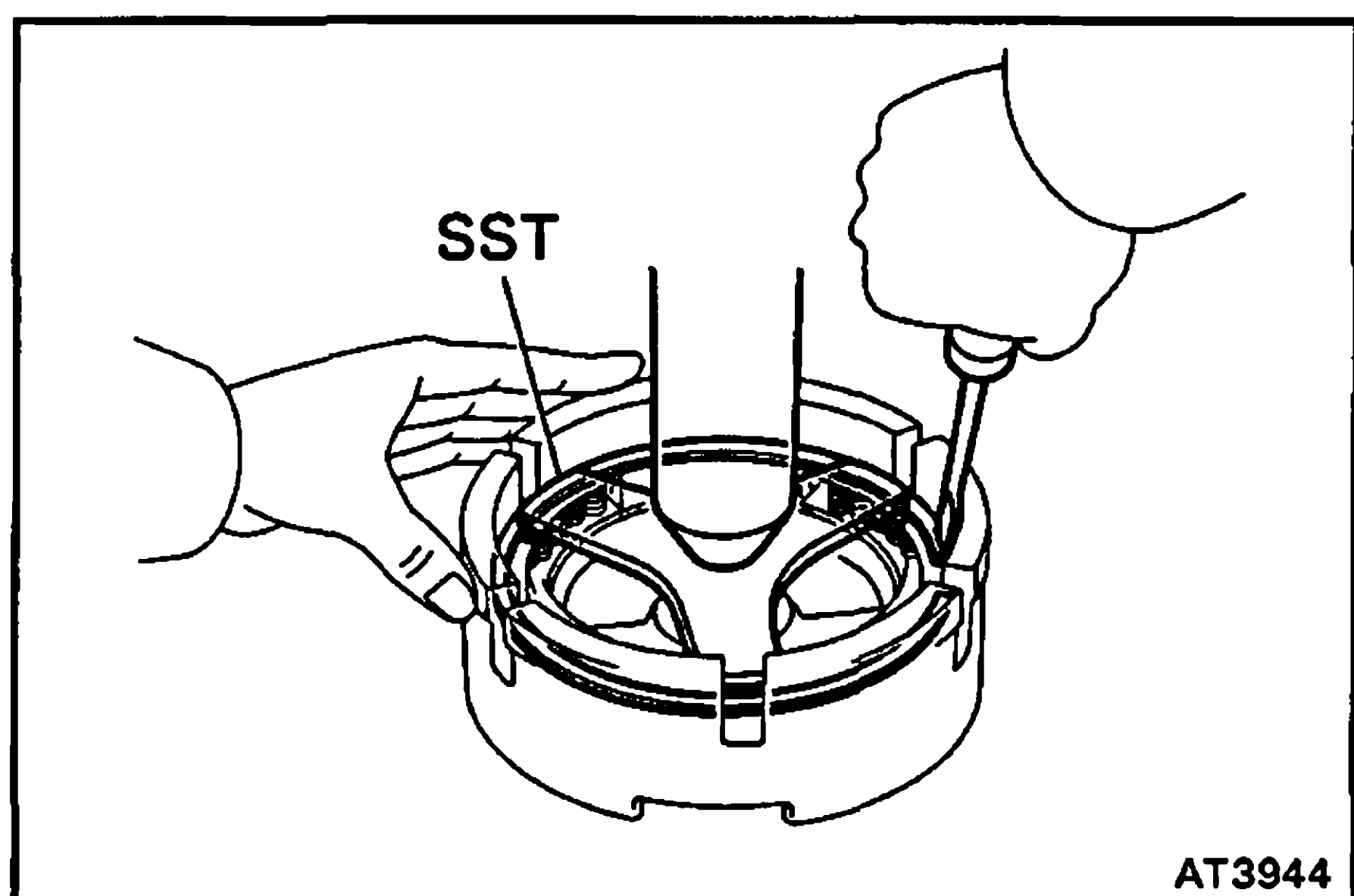
- Push in the brake piston into the O/D case with both hands.

**NOTICE:** Be careful not to damage the O-rings.



## 3. INSTALL PISTON RETURN SPRING

- Place the return spring on the brake piston.

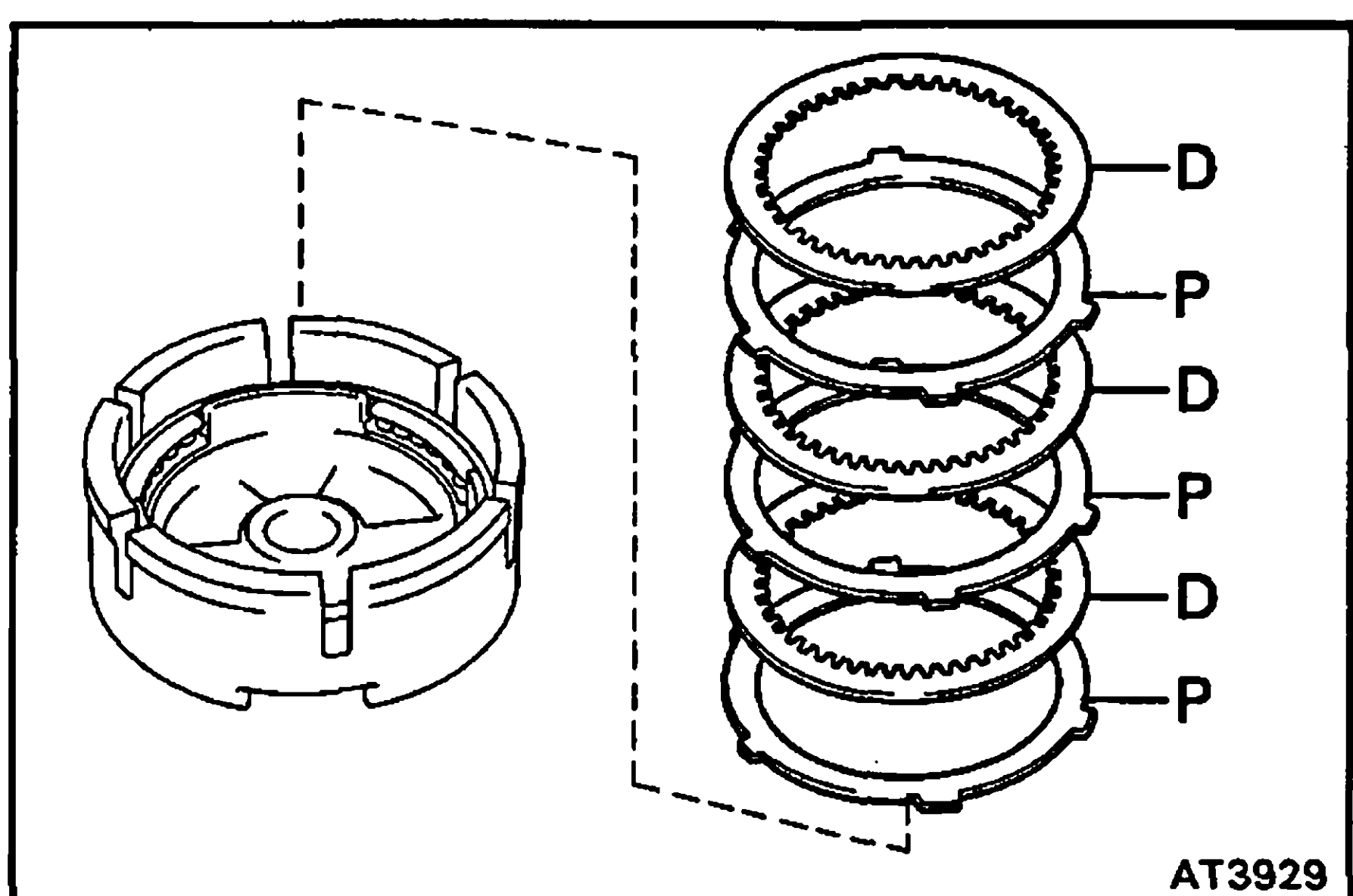


- Place SST on the spring seat, and compress the return spring with a shop press.

SST 09350-36010 (09350-06020)

- Using a screwdriver, install the snap ring.

**HINT:** Be sure the end gap of the snap ring is not aligned with the cutout portion of the O/D case.

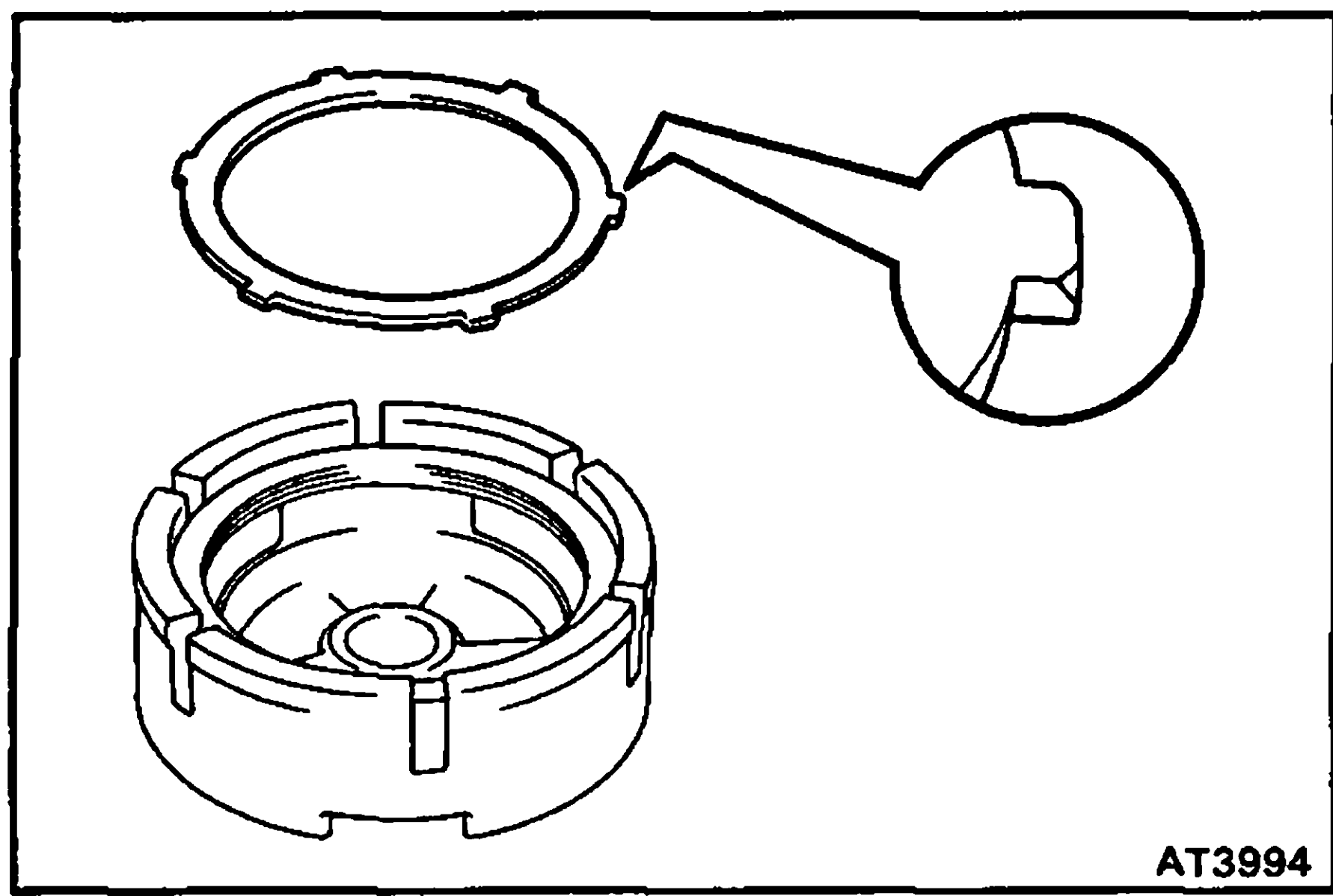


## 4. INSTALL PLATES, DISCS AND FLANGE

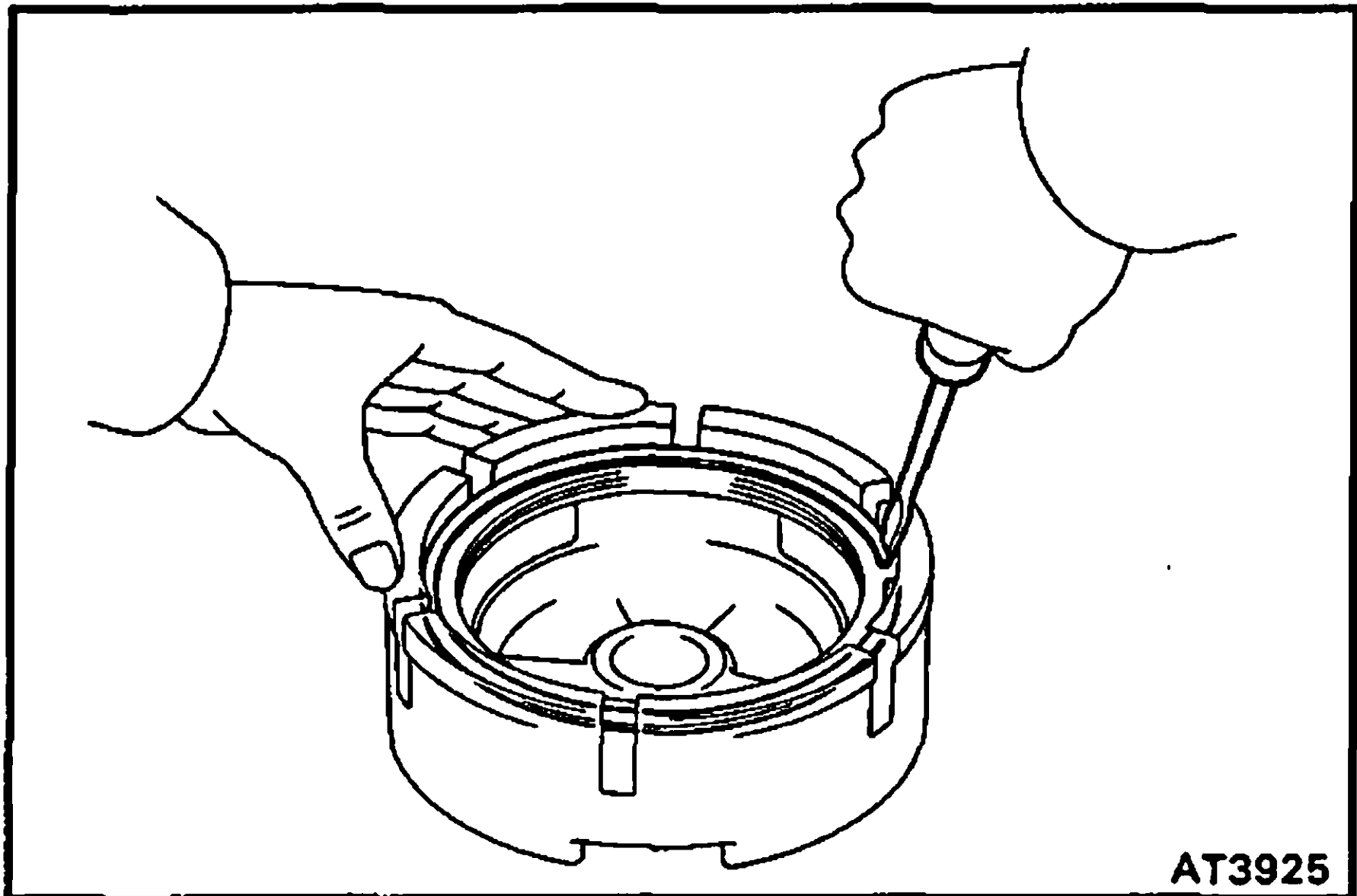
- Install the three plates and three discs in order:

P = Plate D = Disc

P—D—P—D—P—D

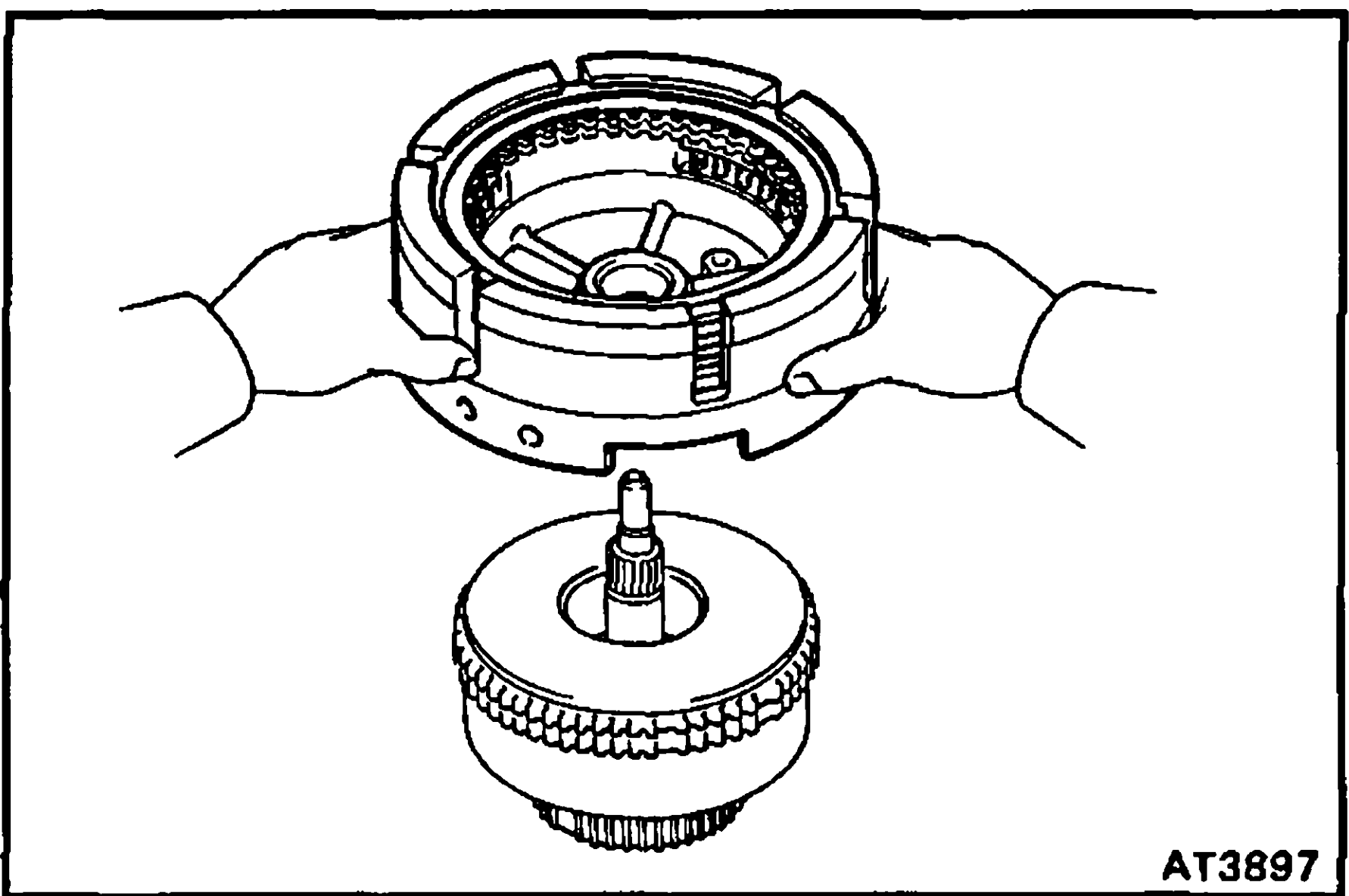


(b) Install the flange, facing the rounded edge upward.



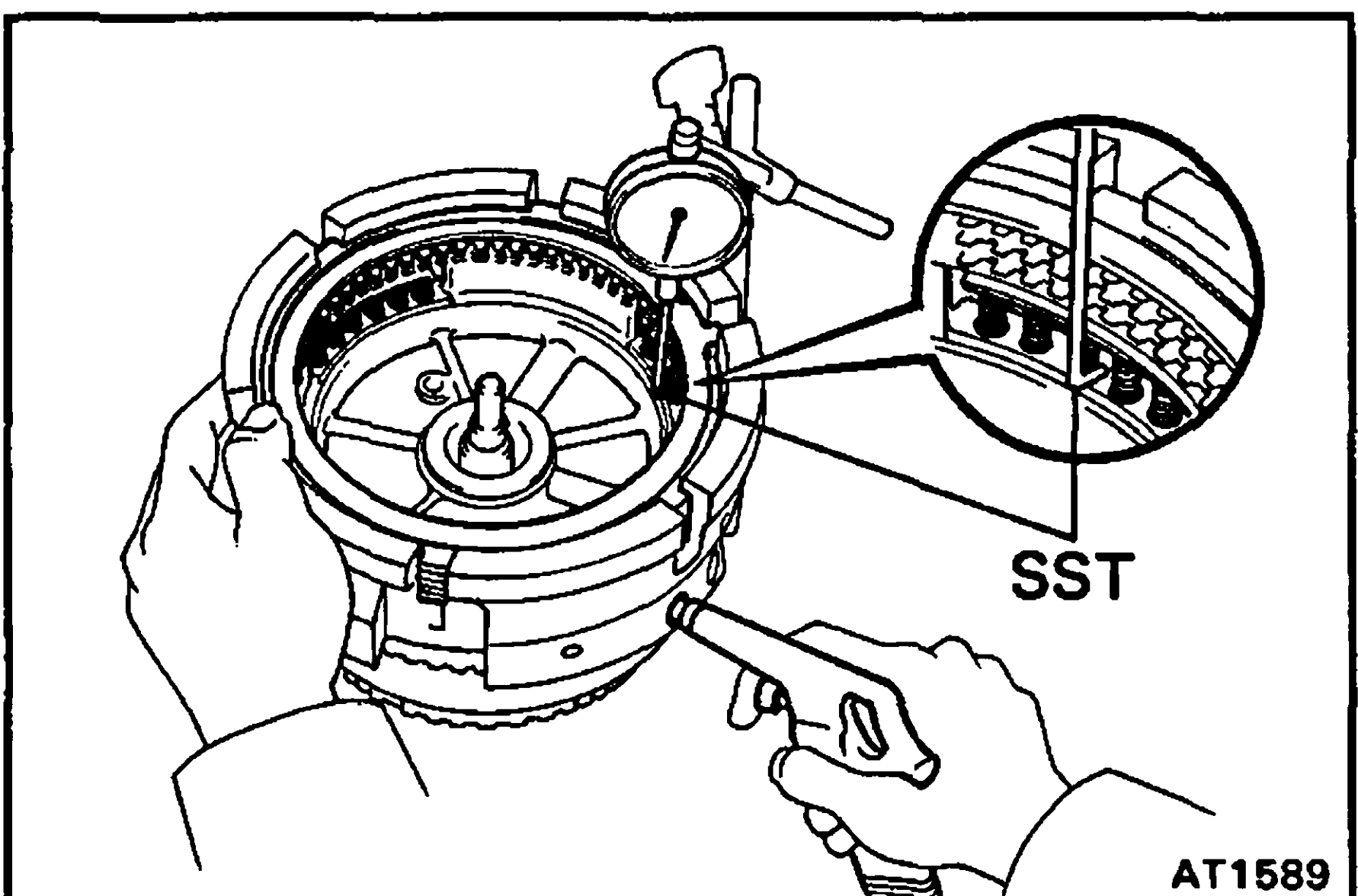
(c) Using a screwdriver, install the snap ring.

**HINT:** Be sure the end gap of the snap ring is not aligned with the cutout portion of the O/D case.



## 5. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place the O/D case assembly onto the rear clutch assembly.

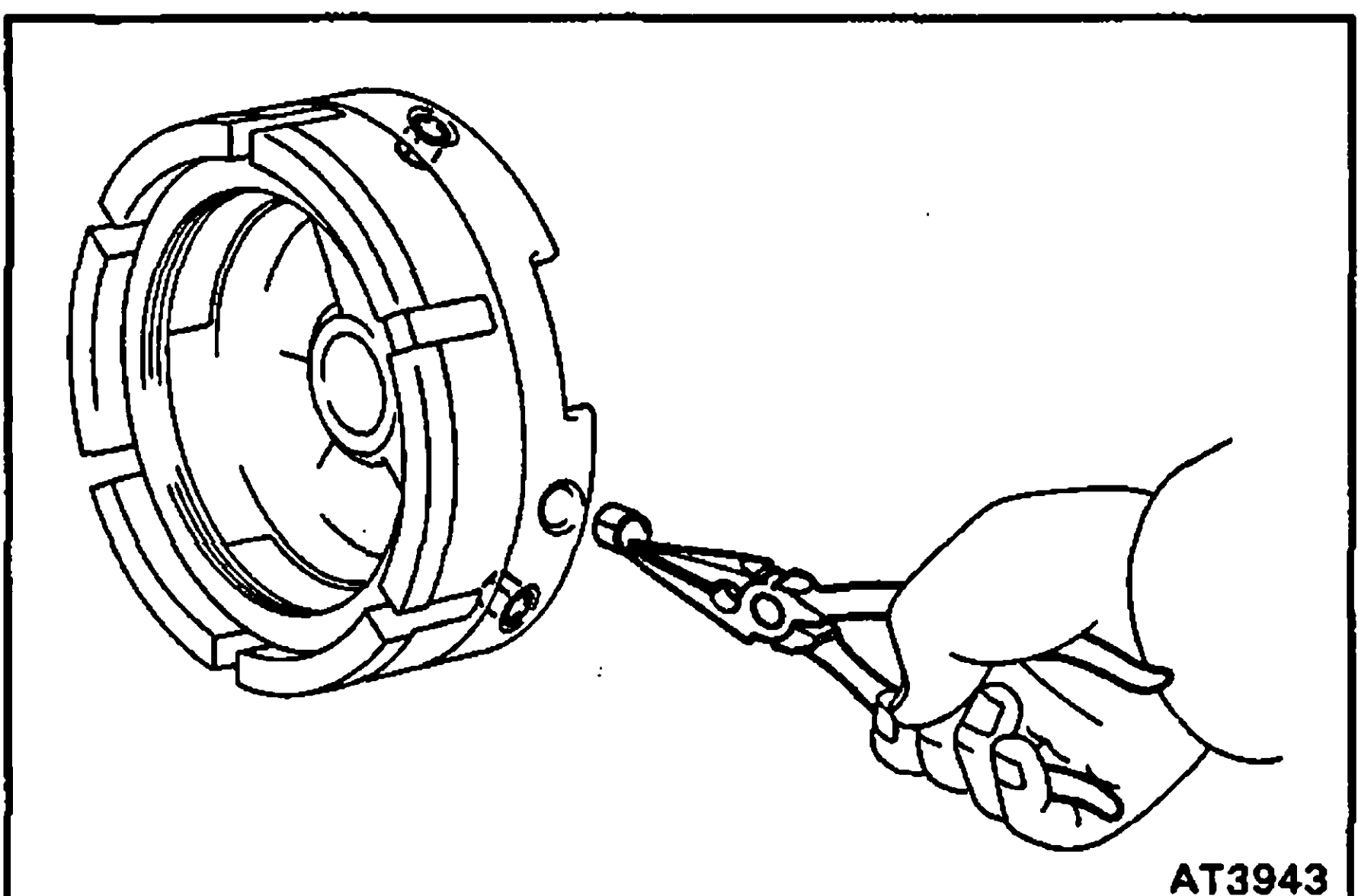


(b) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air (4 — 8 kg/cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

**SST 09350-36010 (09350-06120)**

**Piston stroke: 1.25 — 1.85 mm (0.0492 — 0.0728 in.)**

If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

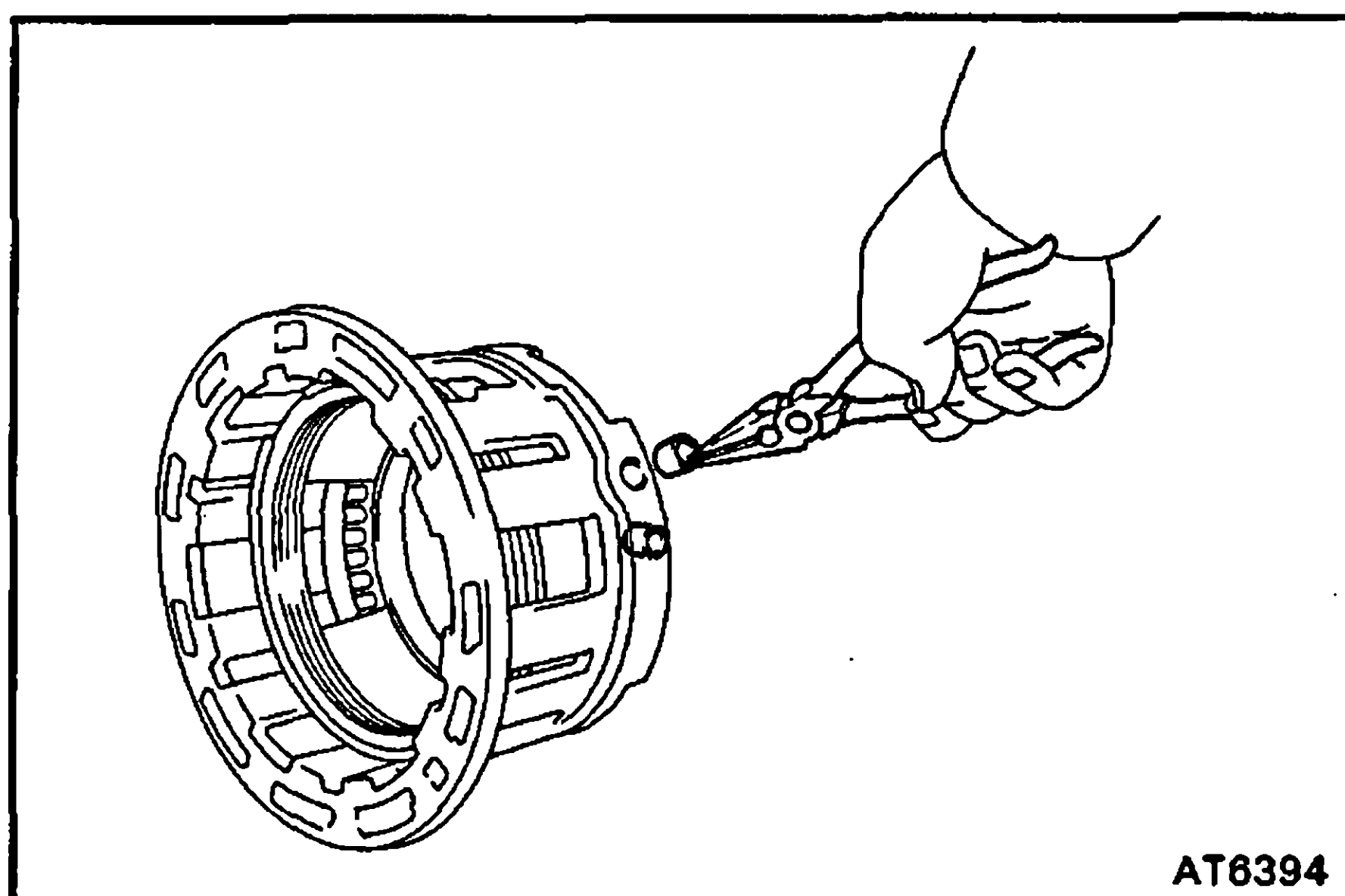
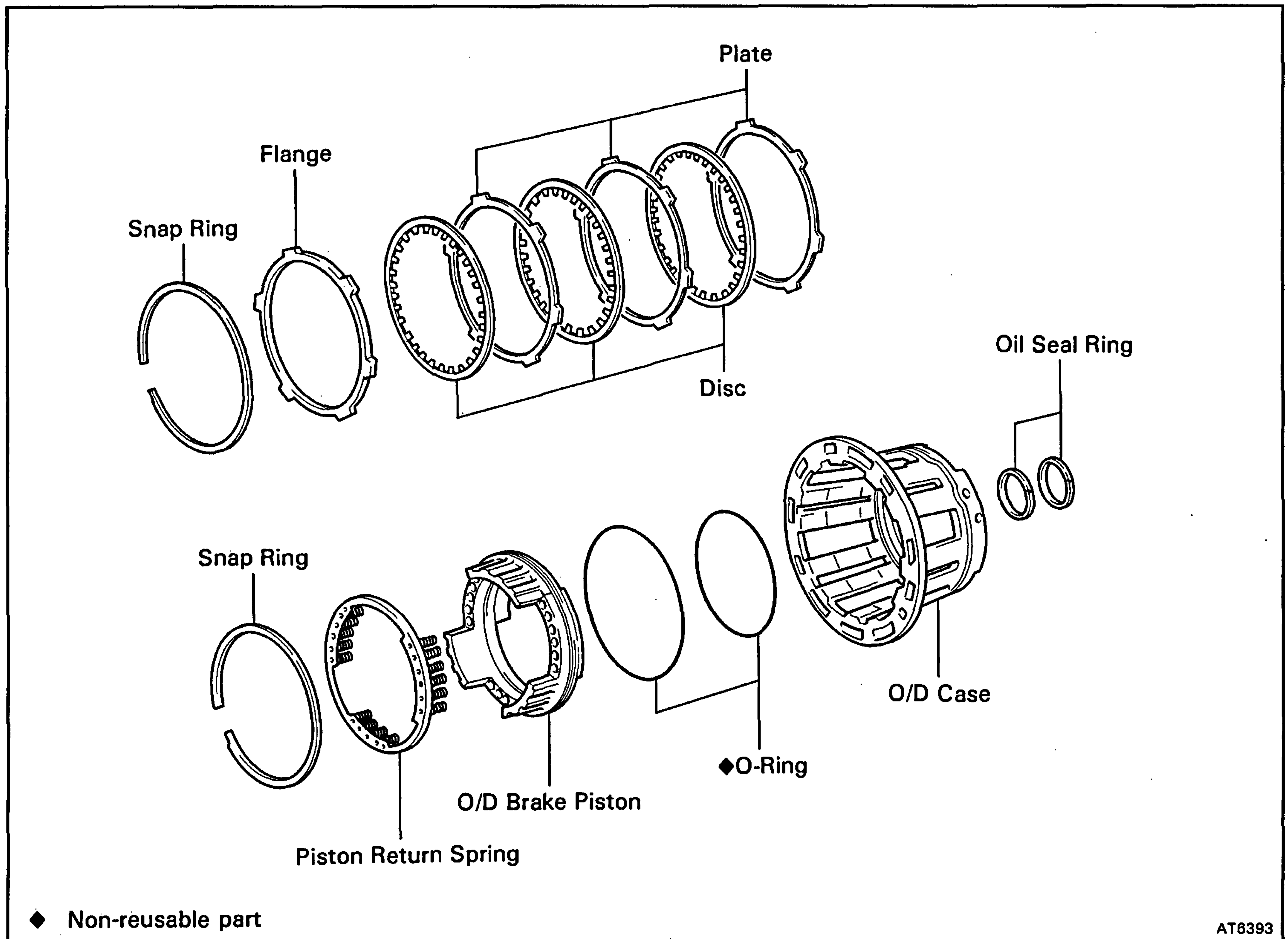


## 6. INSTALL RING RETAINERS

Using needle nose pliers, install the three ring retainers into the oil holes of the O/D case.

## Overdrive Brake (A442F)

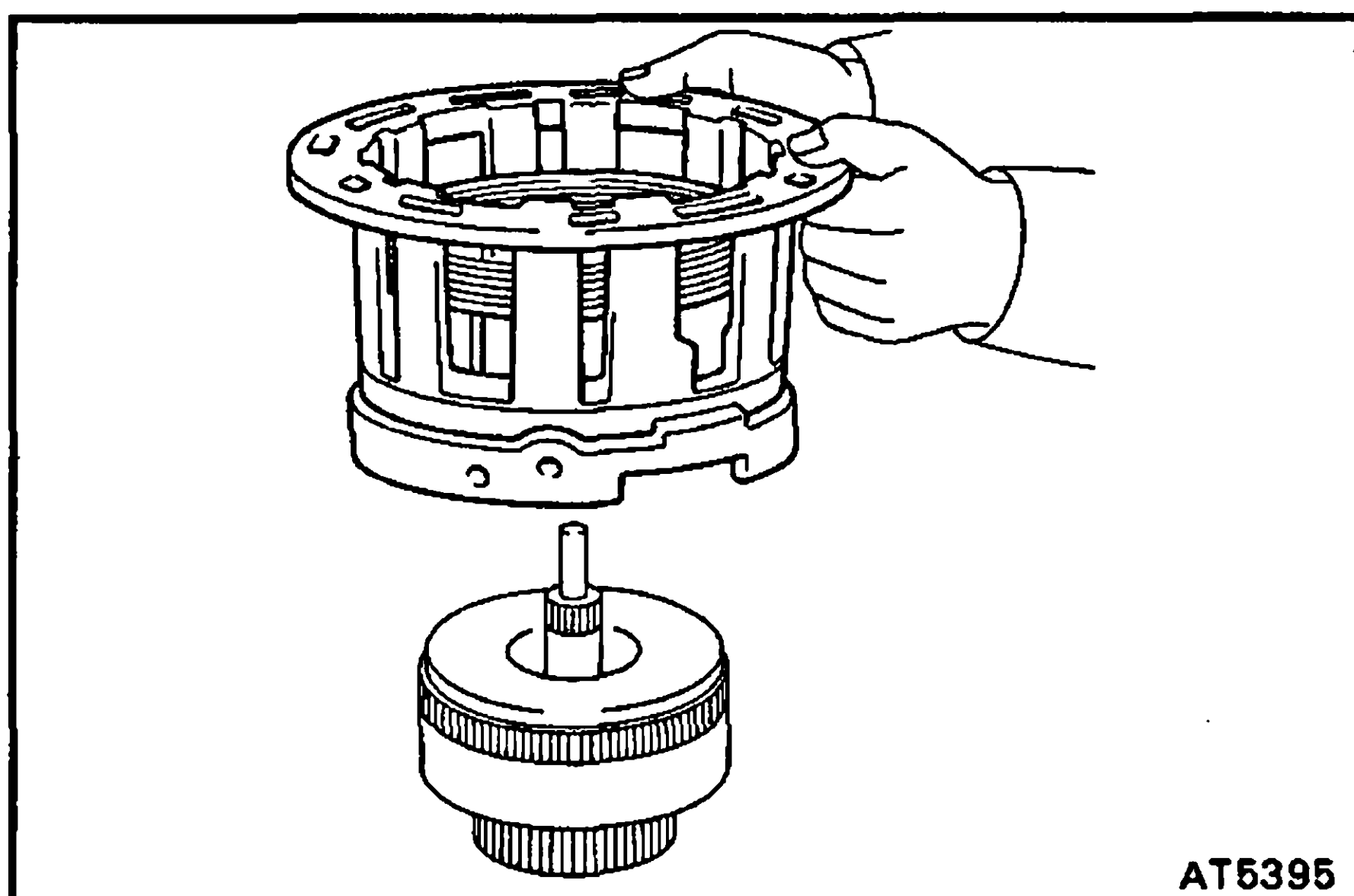
### COMPONENTS



## DISASSEMBLY OF OVERDRIVE BRAKE

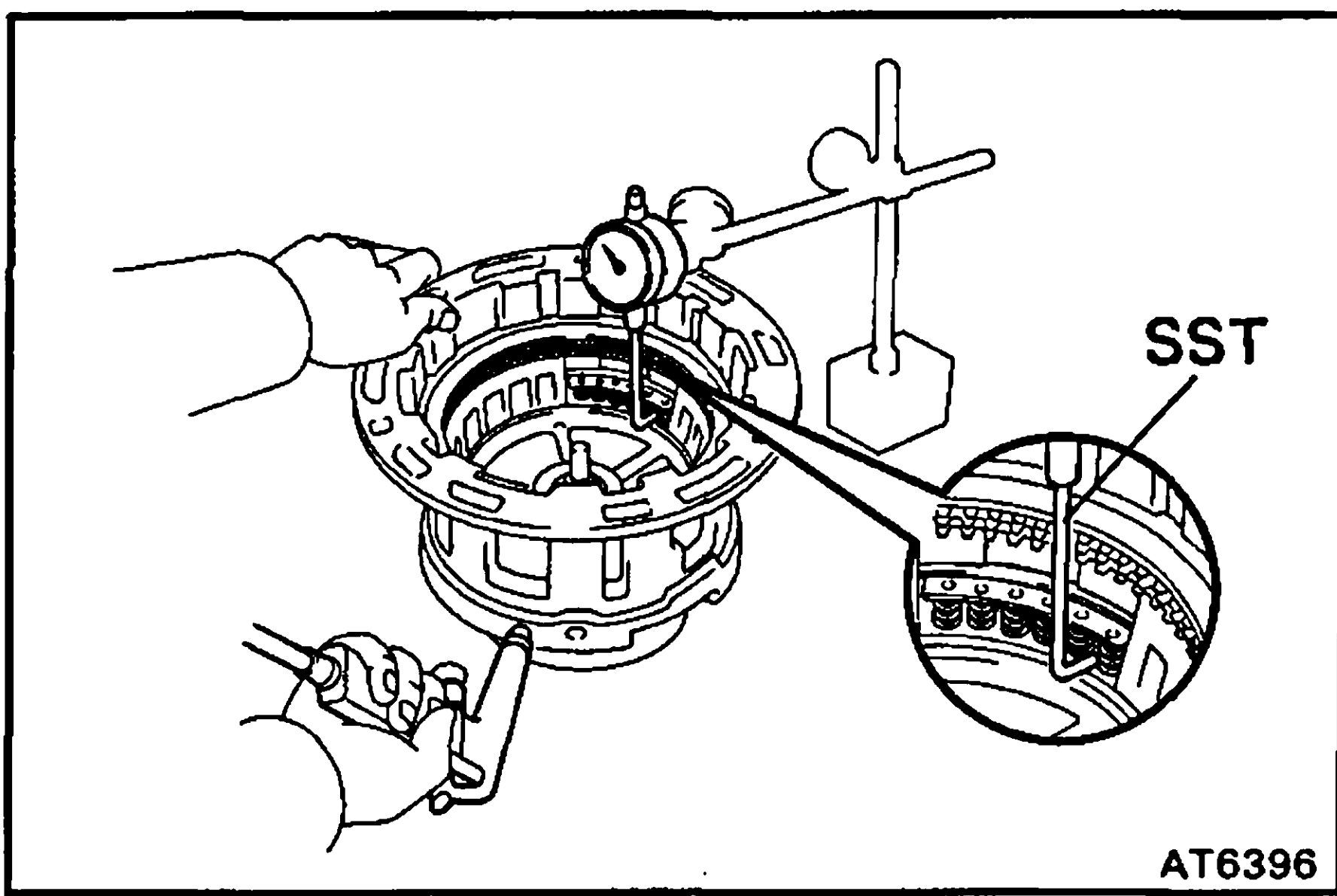
### 1. REMOVE RING RETAINERS

Using needle nose pliers, remove the three ring retainers from the oil holes of the O/D case.



### 2. CHECK PISTON STROKE OF OVERDRIVE BRAKE

- (a) Place the O/D case assembly onto the rear clutch assembly.

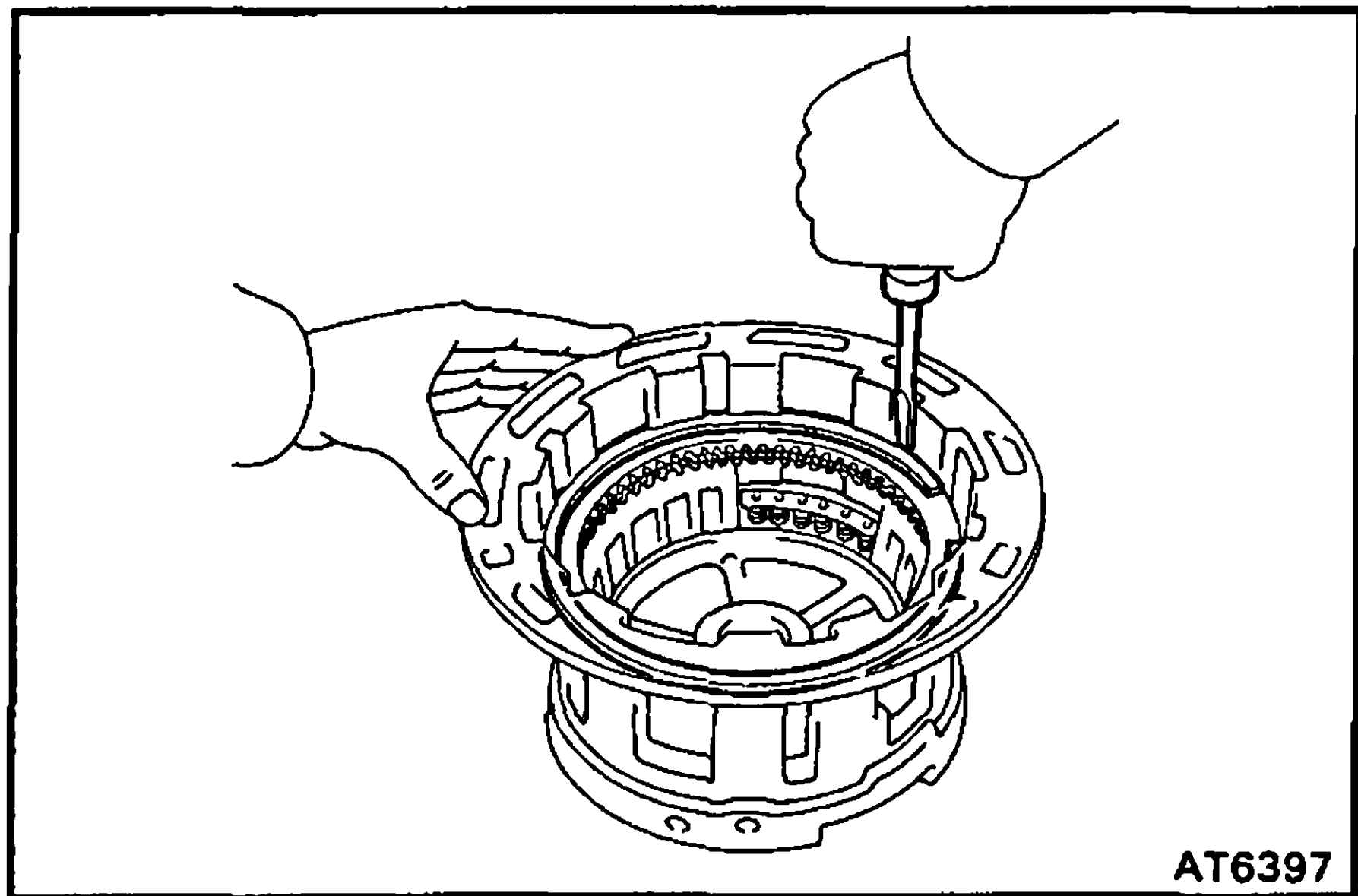


- (b) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air (4 — 8 kg-cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-36010 (09350-06120)

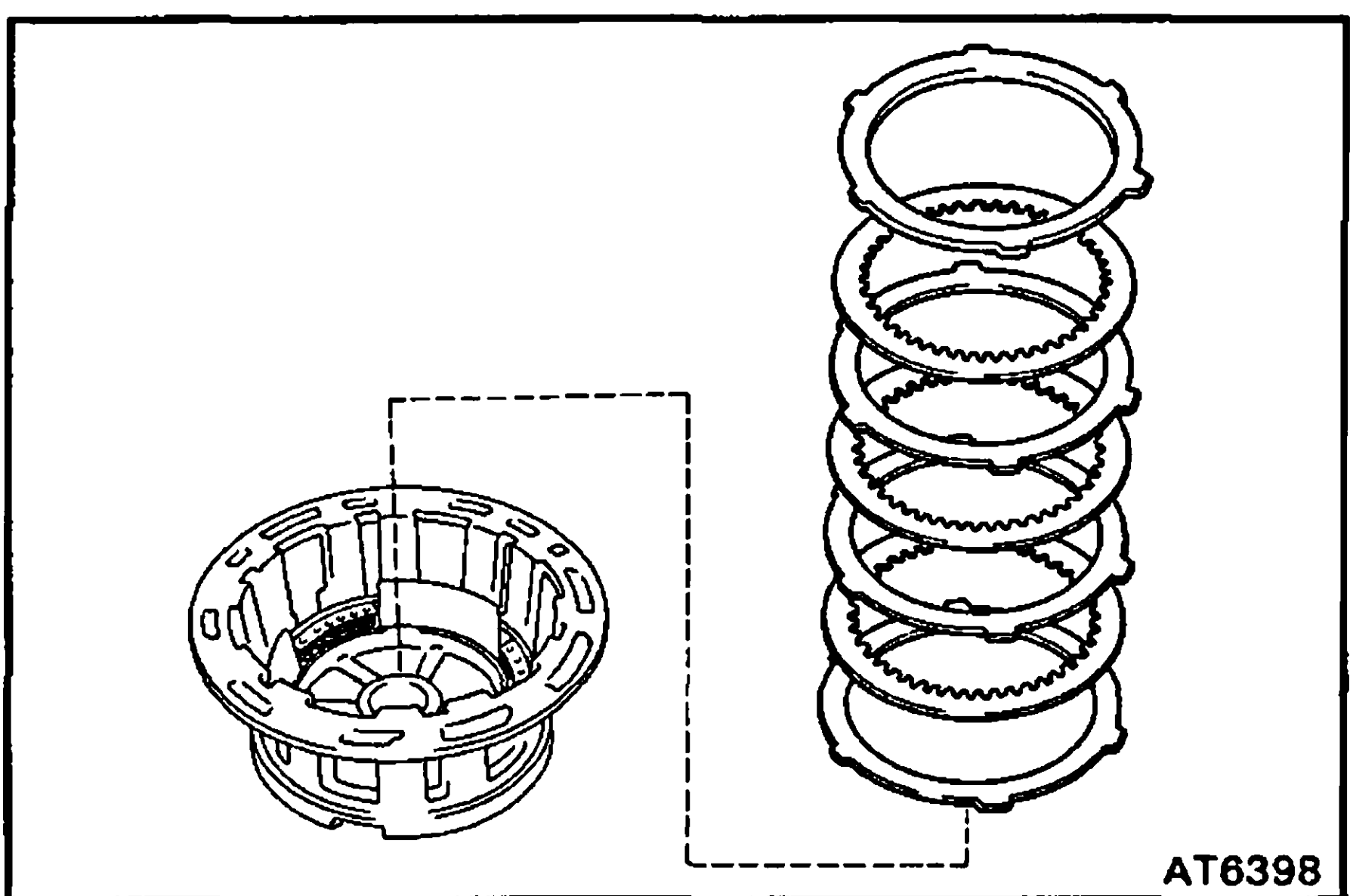
**Piston stroke: 1.25 — 1.85 mm (0.0492 — 0.0728 in.)**

If the piston stroke is greater than specified, inspect the discs.

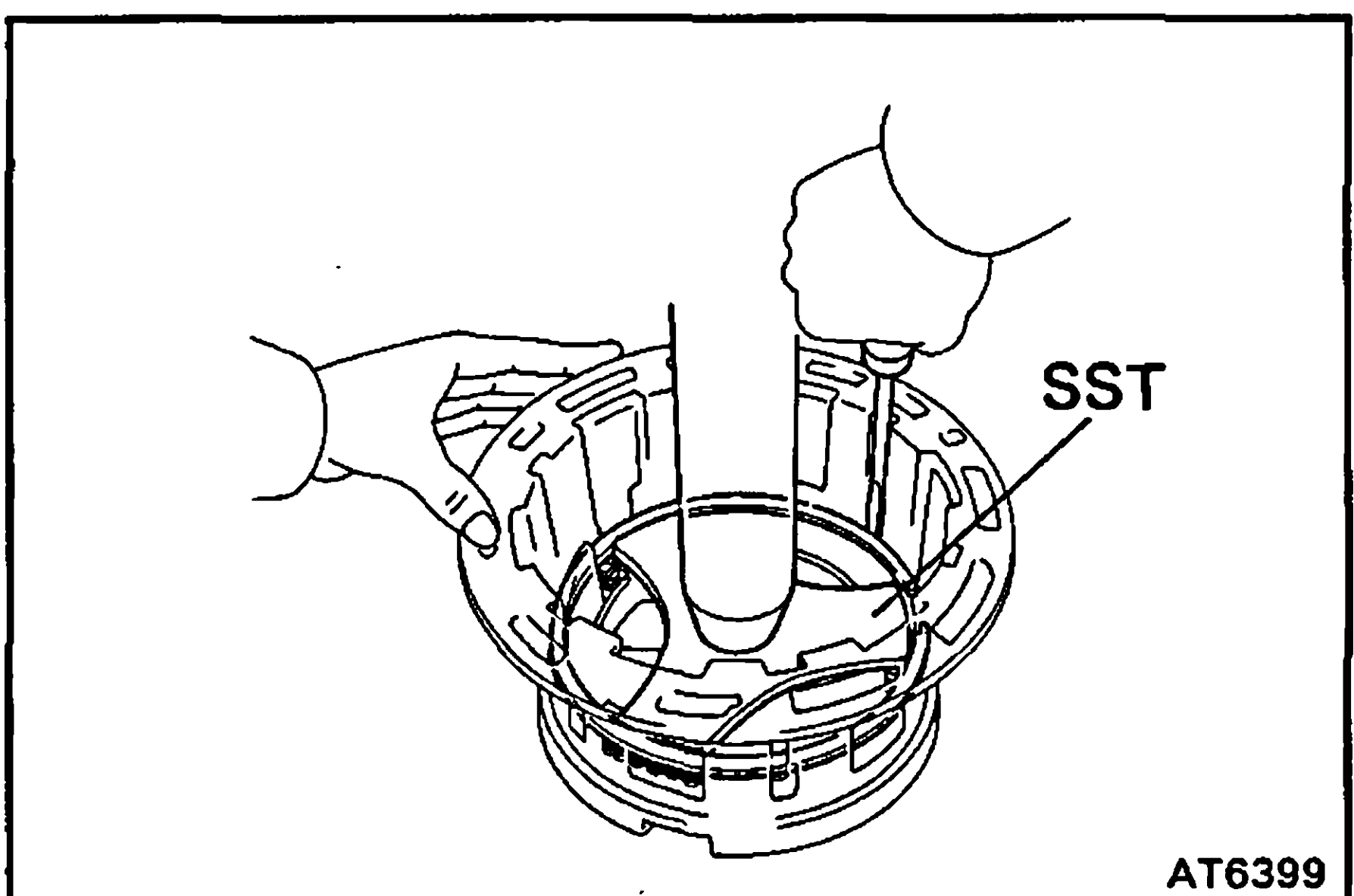


### 3. REMOVE FLANGE, DISCS AND PLATES

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



- (b) Remove the flange, three discs and three plates.

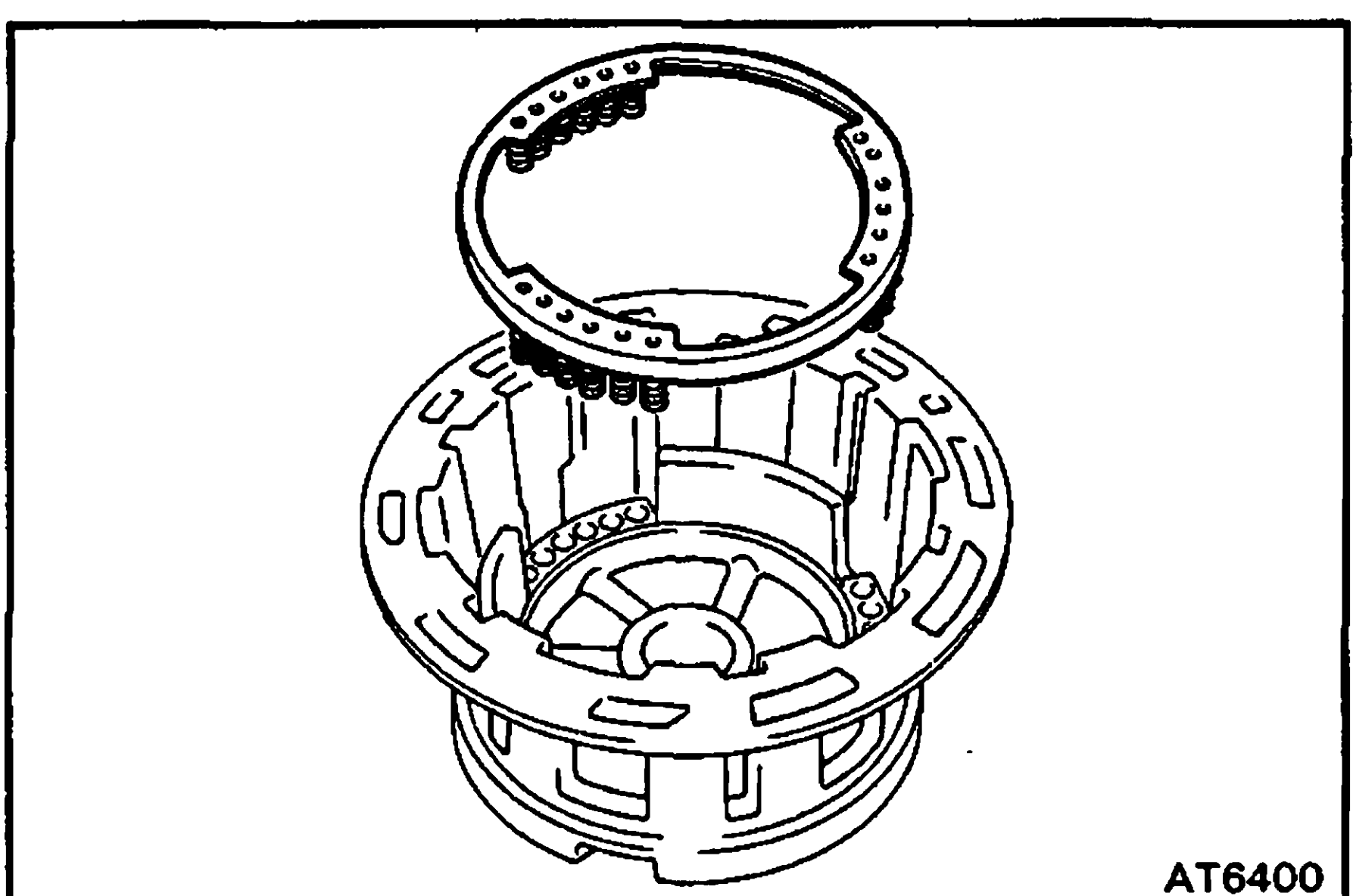


### 4. REMOVE PISTON RETURN SPRING

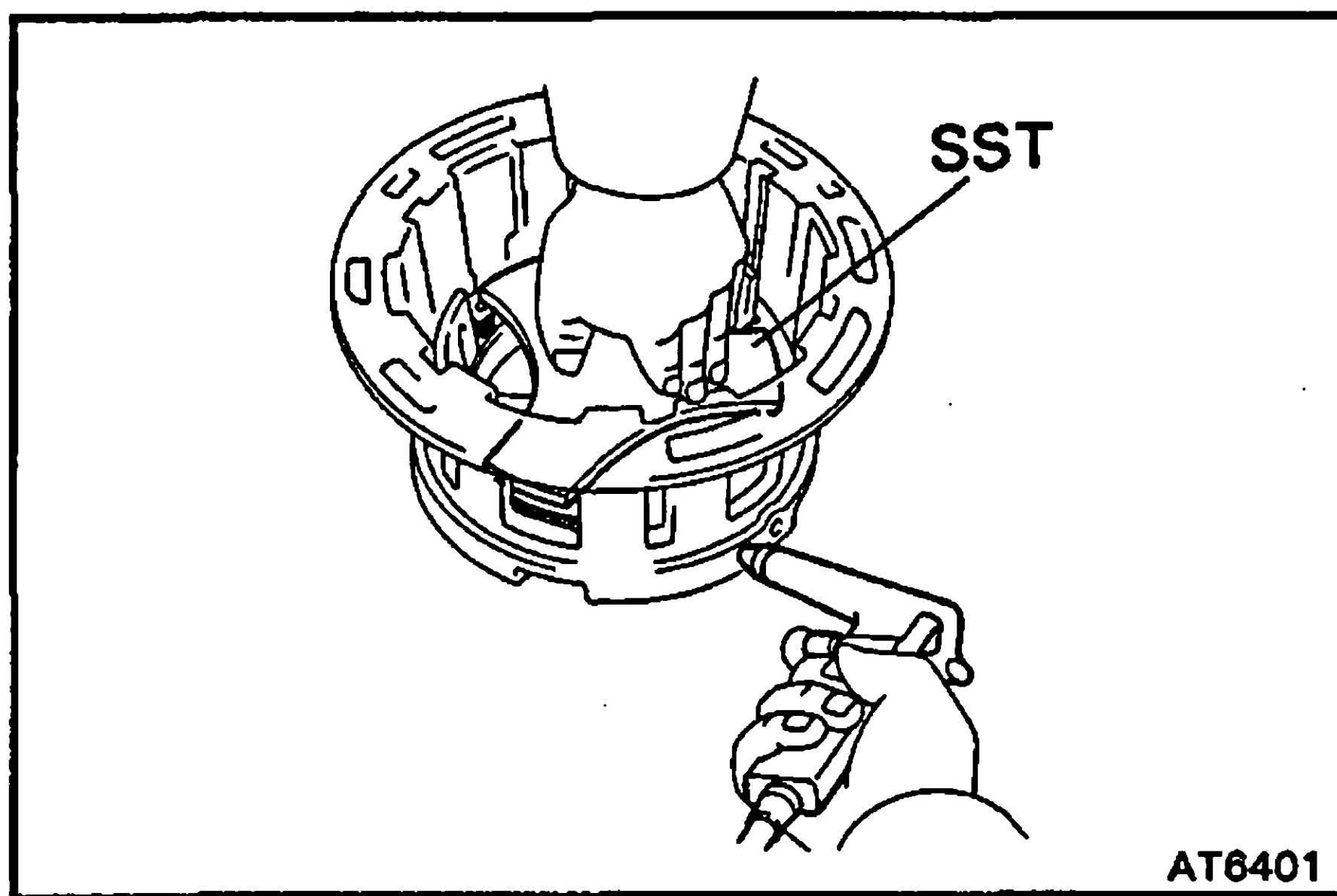
- (a) Place SST on the spring seat, and compress the return spring with a shop press.

SST 09350-36010 (09350-06020)

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



- (c) Remove the return spring.



## 5. REMOVE OVERDRIVE BRAKE PISTON

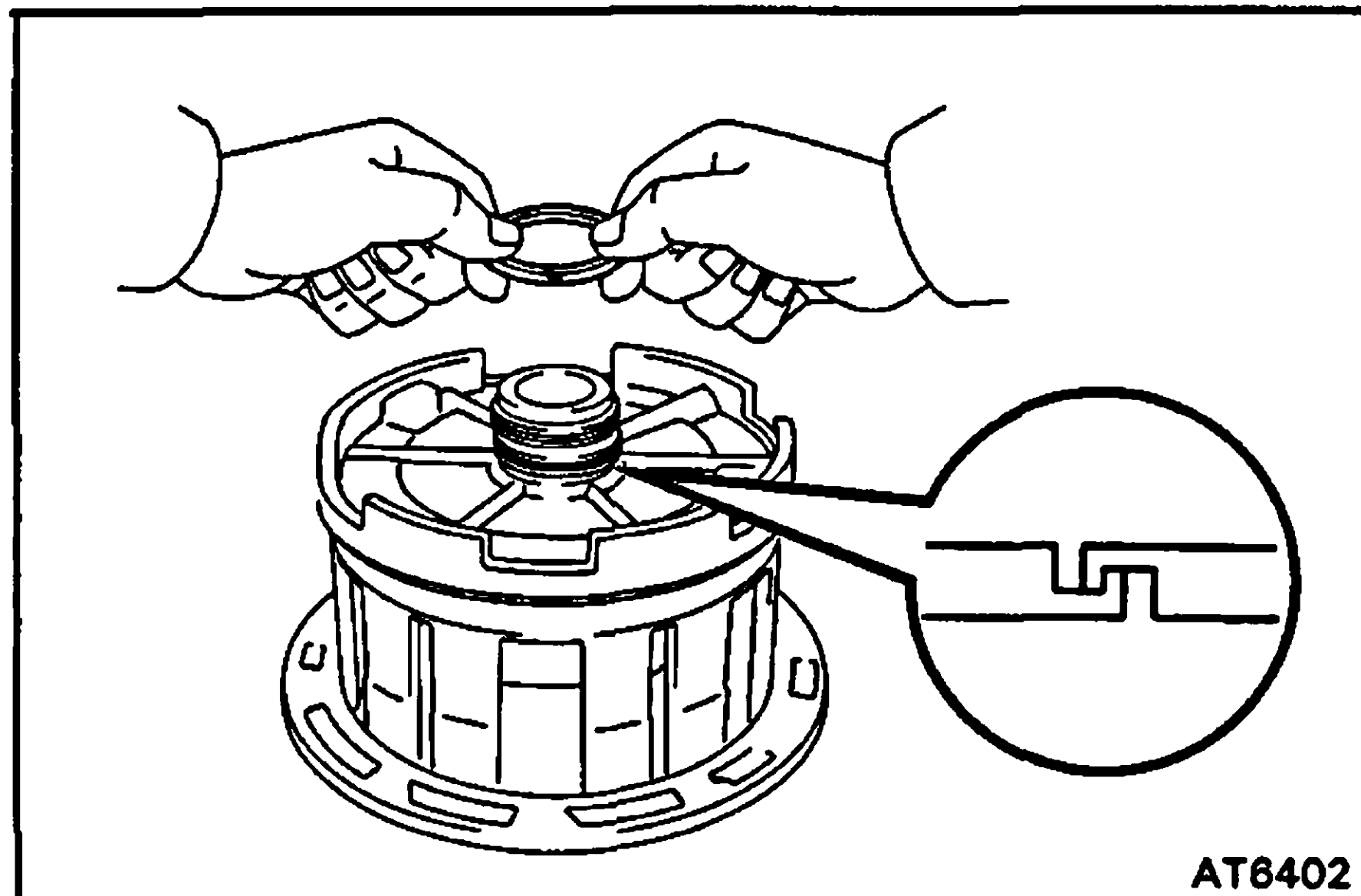
- (a) Place the return spring on the brake piston, and then place SST on the return spring.

SST 09350-36010 (09350-06020)

- (b) Hold SST so it does not slant, and apply compressed air into the oil hole of the O/D case to remove the brake piston.

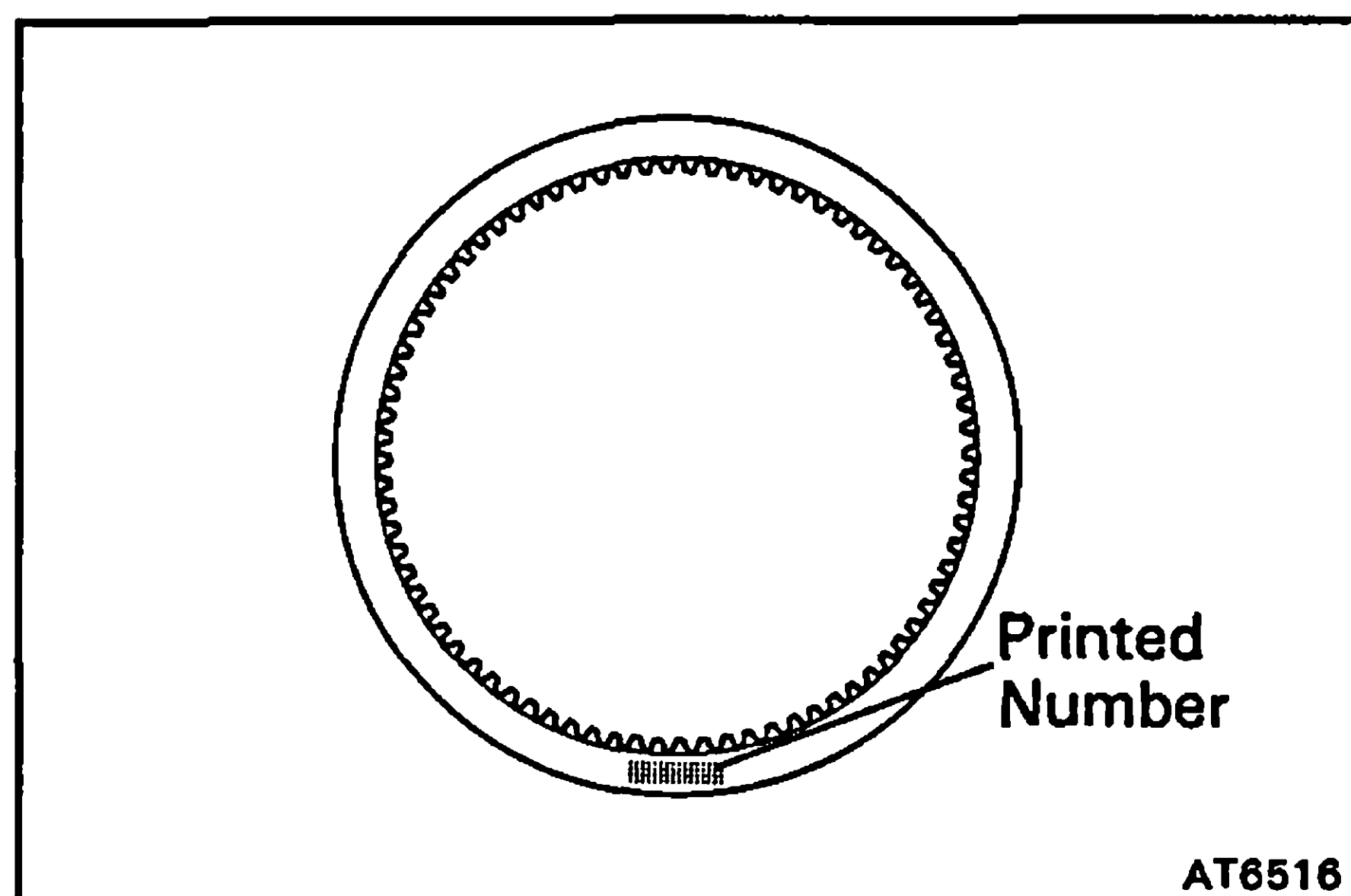
SST 09350-36010 (09350-06020)

- (c) Remove the two O-rings from the brake piston.



## 6. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the O/D case.



## INSPECTION OF OVERDRIVE BRAKE

### 1. INSPECT DISCS, PLATES AND FLANGE

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

HINT:

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

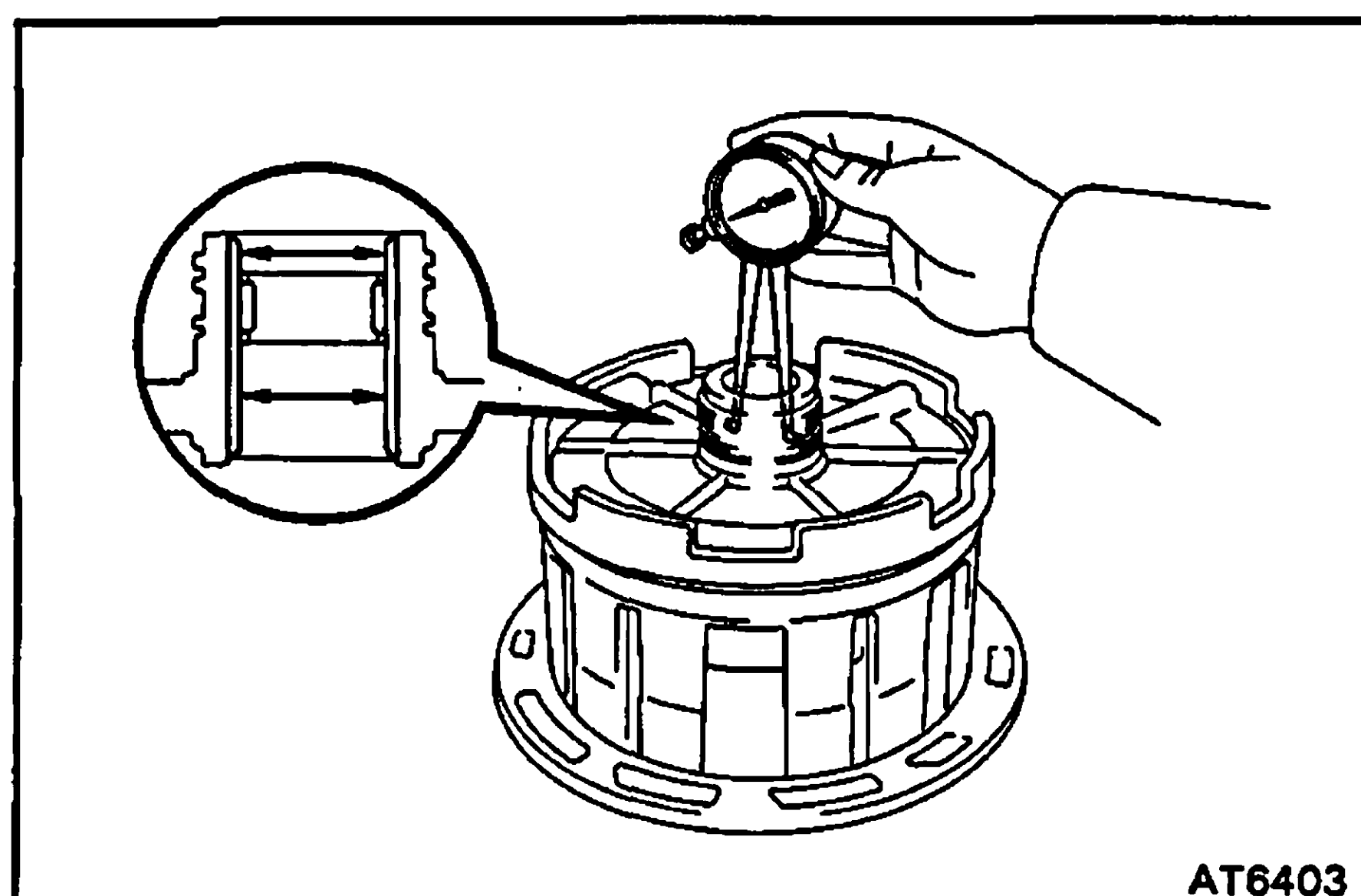
### 2. INSPECT BUSHING OF OVERDRIVE CASE

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:** 33.100 — 33.150 mm  
(1.3031 — 1.3051 in.)

**Maximum inside diameter:** 33.20 mm (1.3071 in.)

If the inside diameter is greater than maximum, replace the O/D case.



## ASSEMBLY OF OVERDRIVE BRAKE

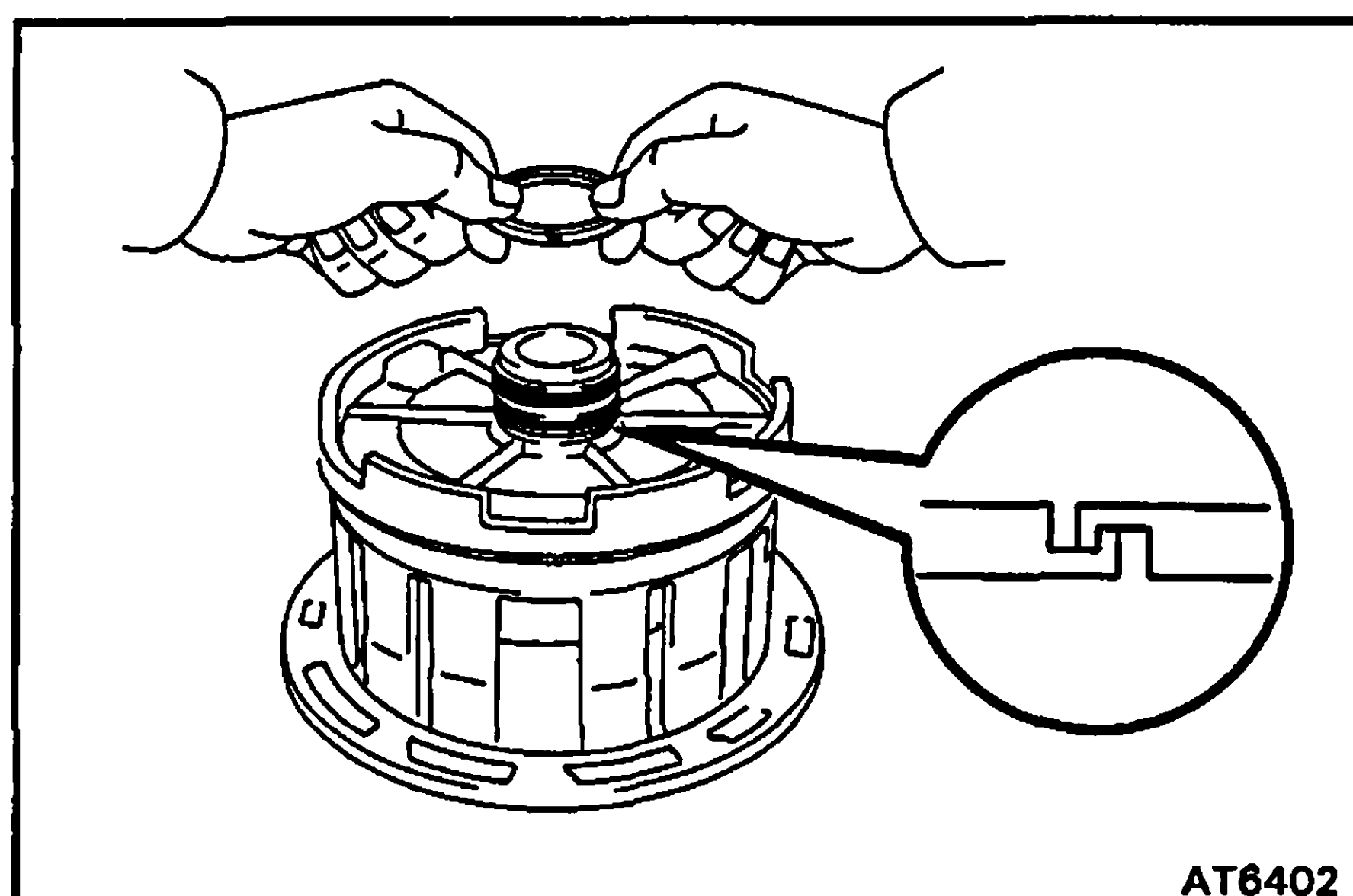
### 1. INSTALL OIL SEAL RINGS

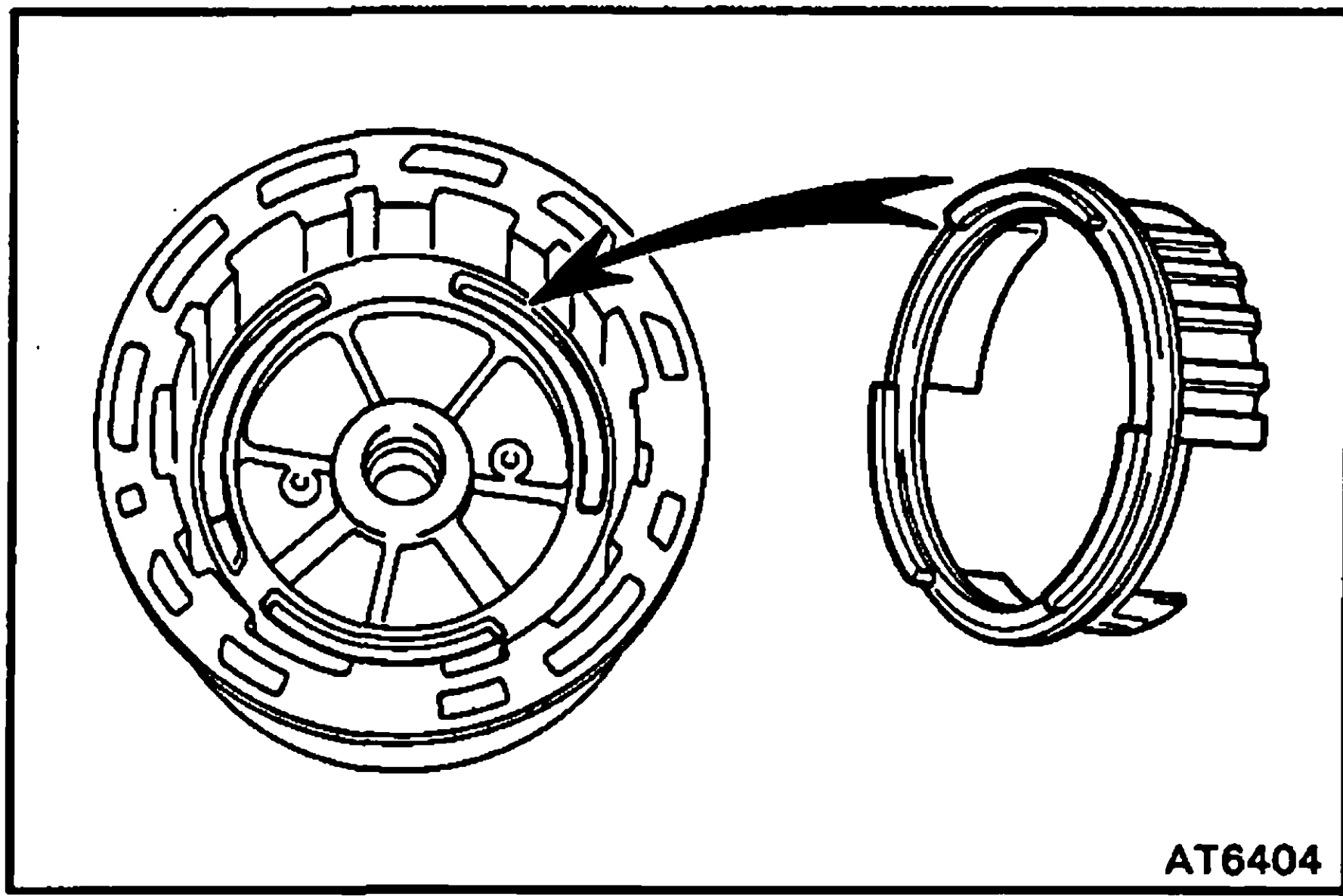
- (a) Coat the two oil seal rings with ATF.

- (b) Contract the oil seals, and install them onto the O/D case.

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

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



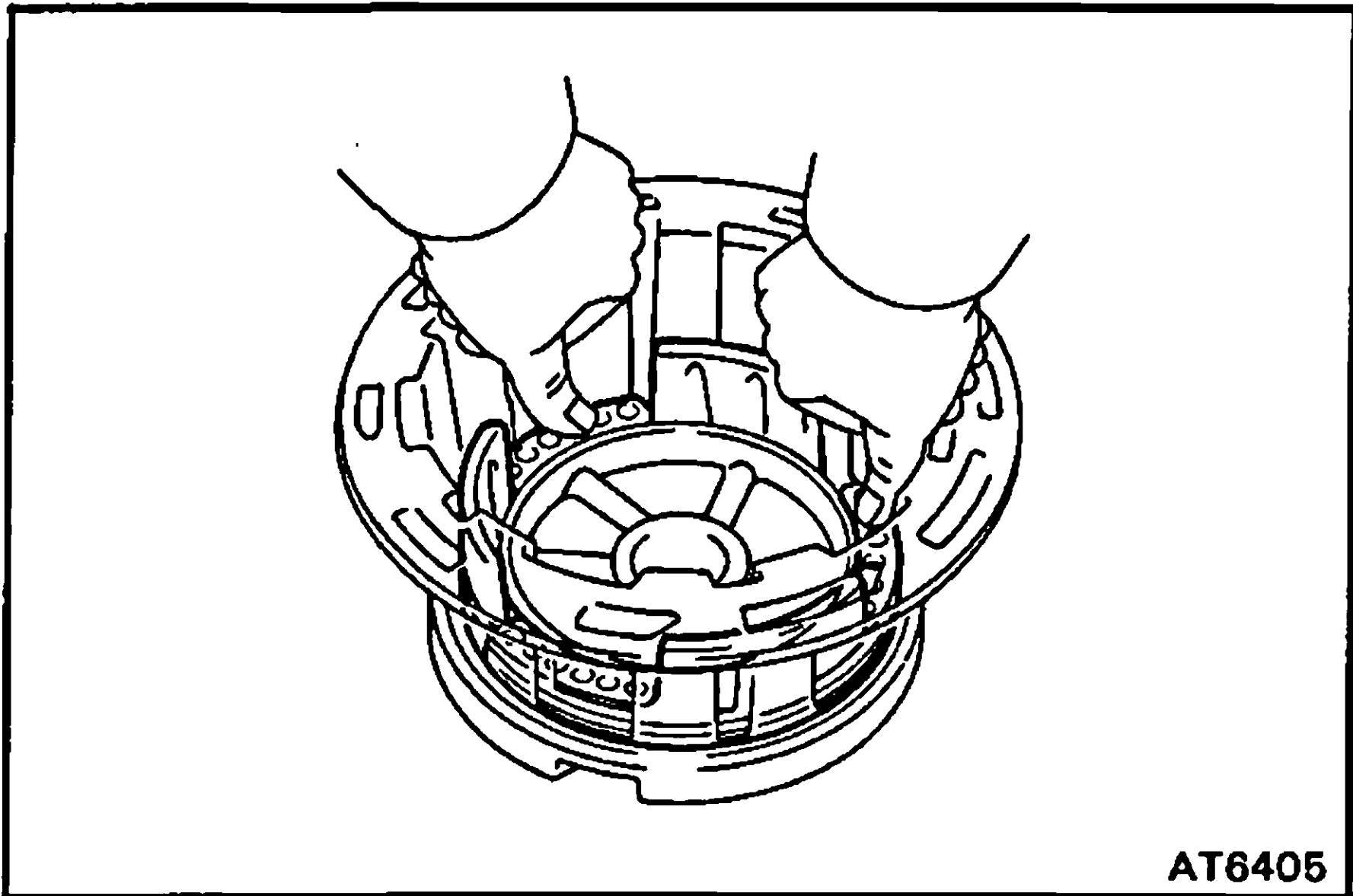


## 2. INSTALL OVERDRIVE BRAKE PISTON

- (a) Coat new two O-rings with ATF, and install them on the brake piston.
- (b) Align the protrusions of the brake piston with the grooves of the O/D case.

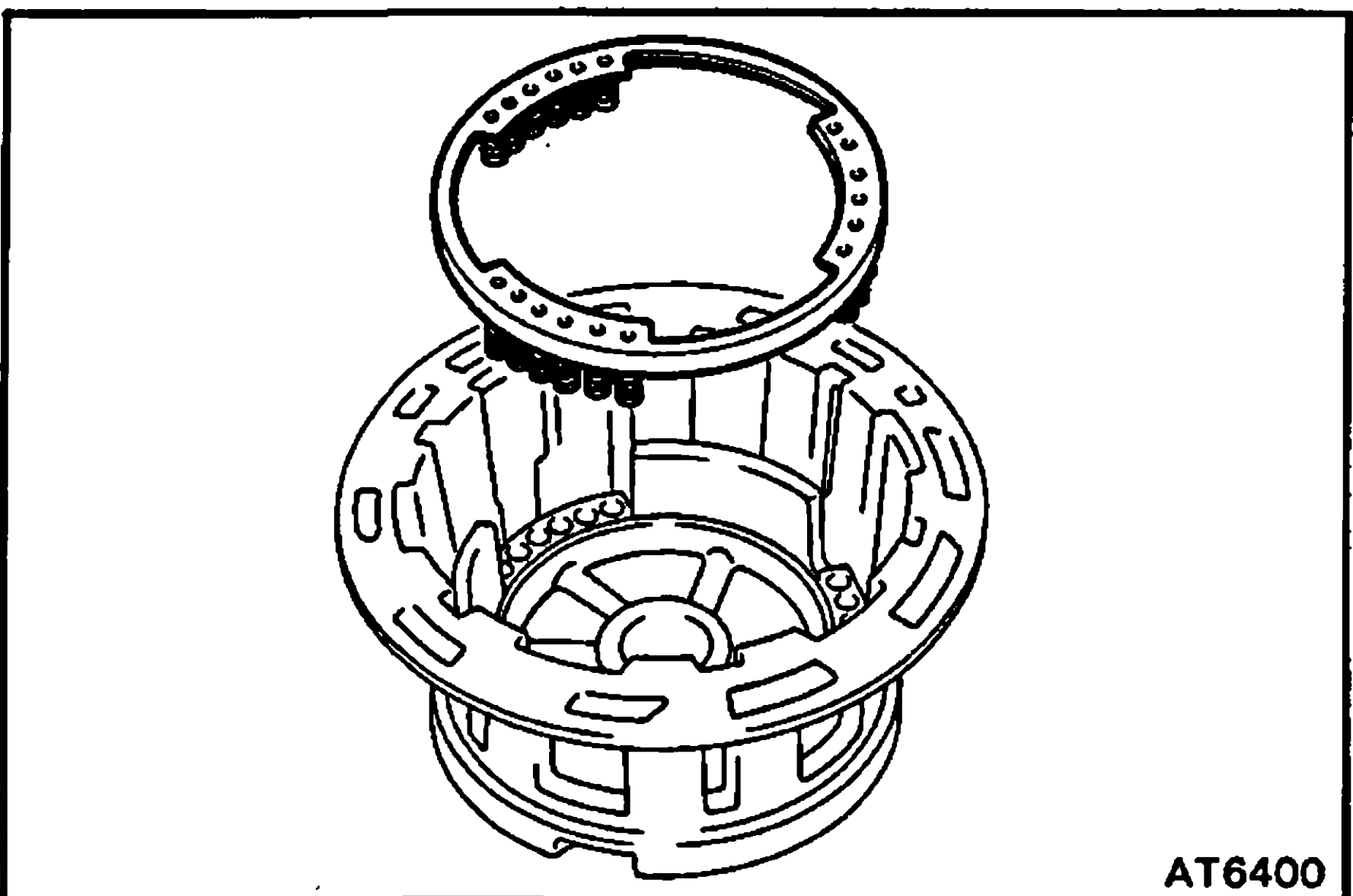
- (c) Push in the brake piston into the O/D case with both hands.

**NOTICE:** Be careful not to damage the O-rings.



## 3. INSTALL PISTON RETURN SPRING

- (a) Place the return spring on the brake piston.

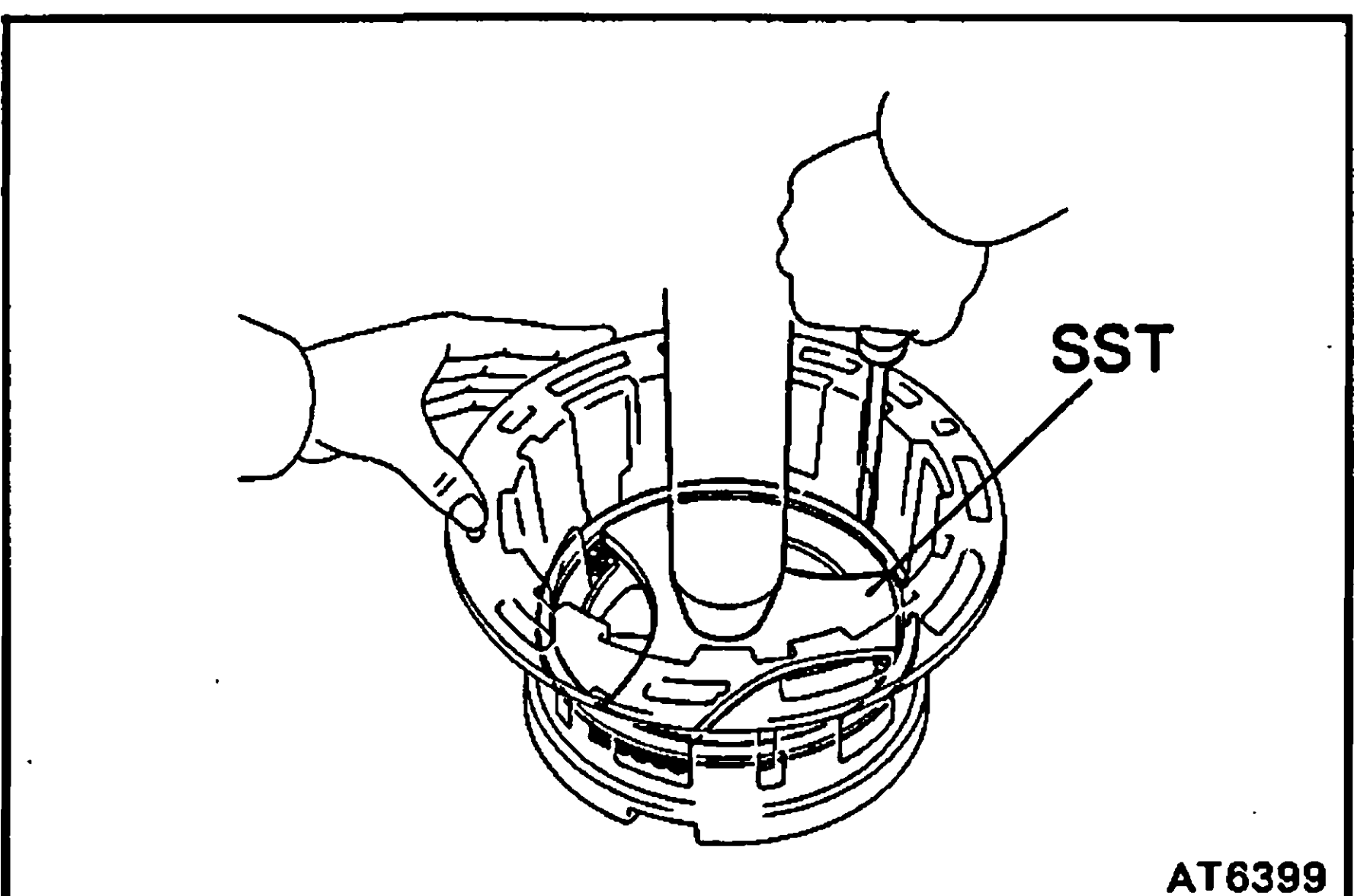


- (b) Place SST on the spring seat, and compress the return spring with a shop press.

SST 09350-36010 (09350-06020)

- (c) Using a screwdriver, install the snap ring.

**HINT:** Be sure the end gap of the snap ring is not aligned with the cutout portion of the O/D case.

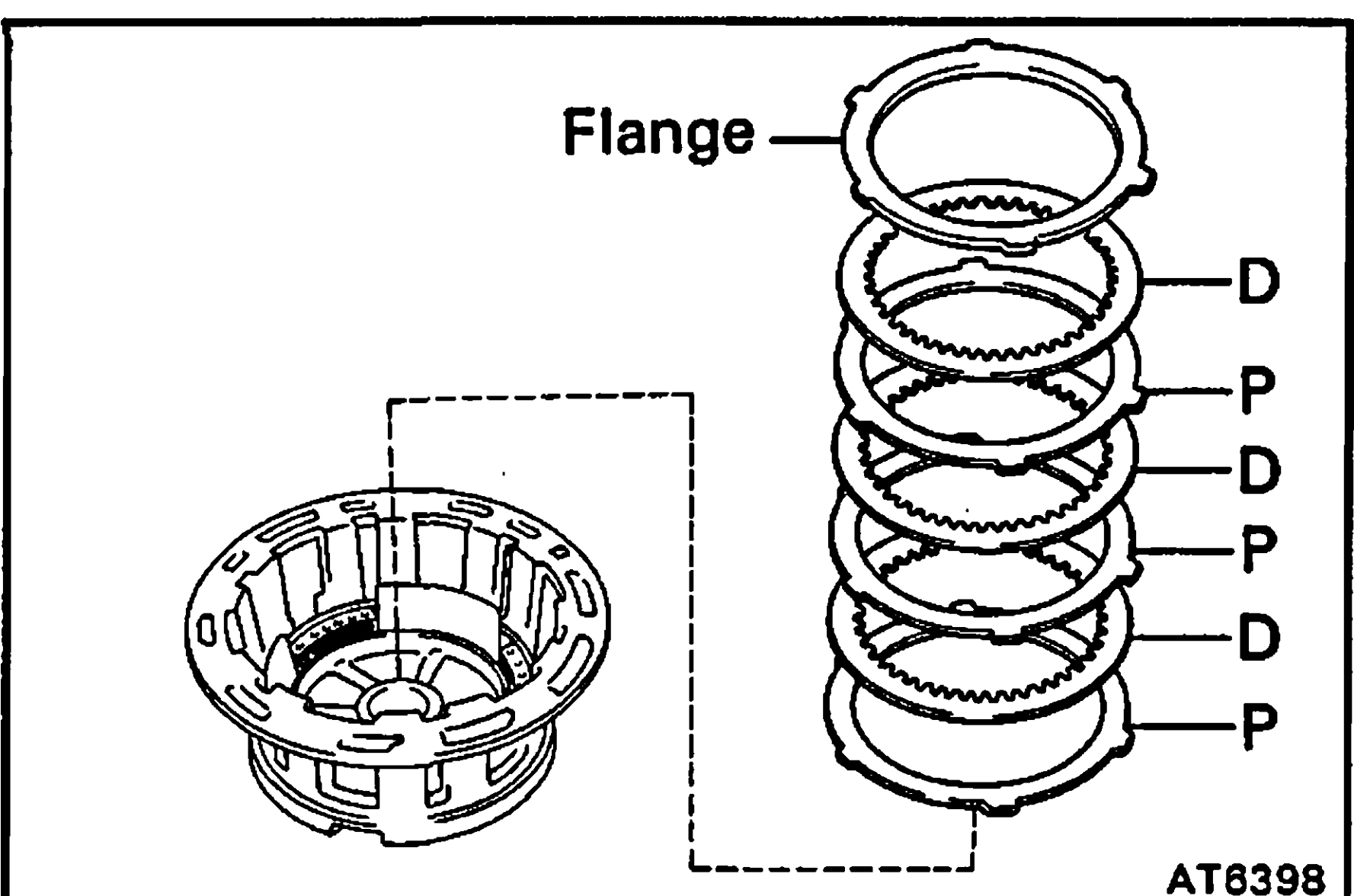


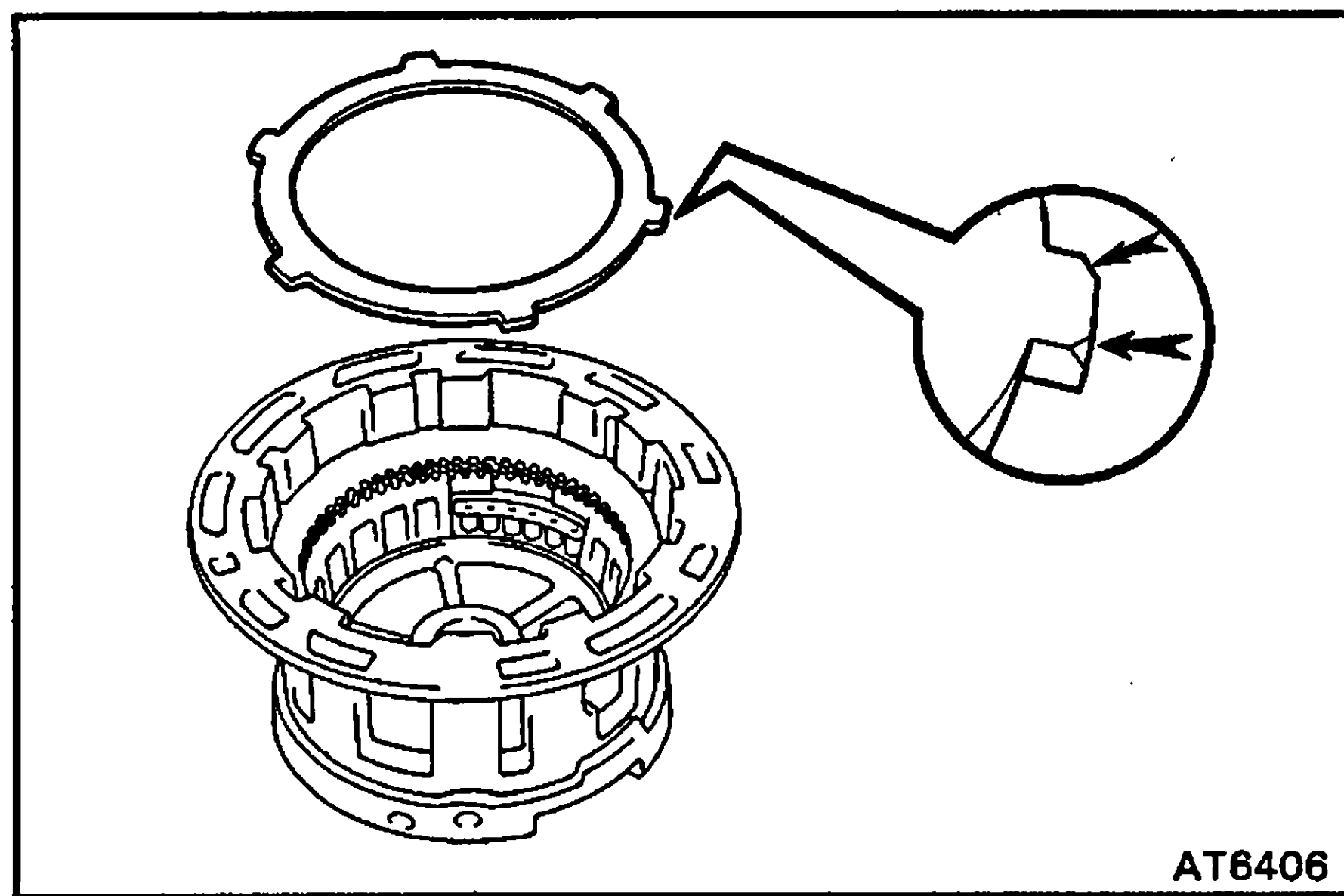
## 4. INSTALL PLATES, DISCS AND FLANGE

- (a) Install the three plates and three discs in order:

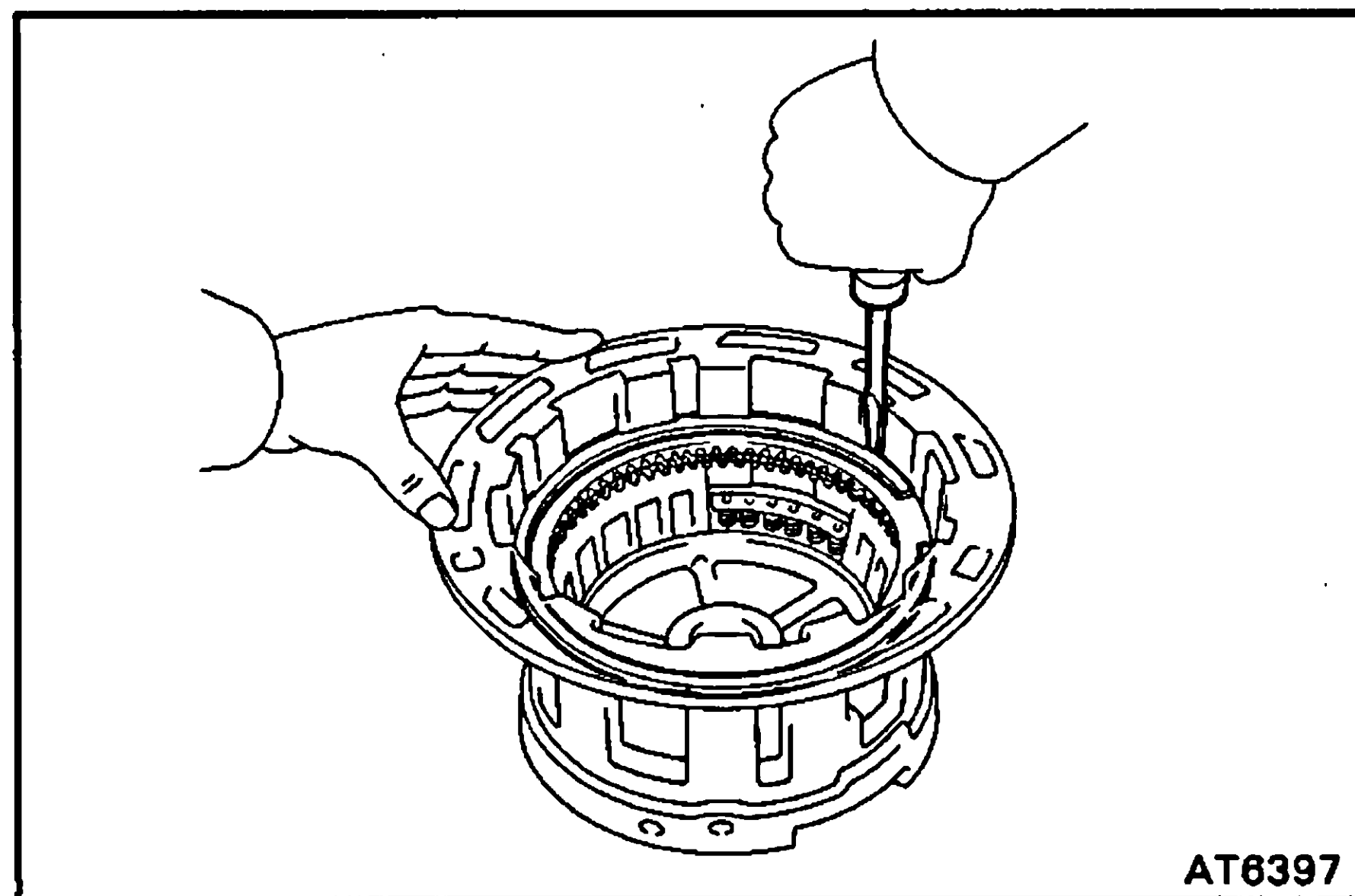
P = Plate D = Disc

P—D—P—D—P—D



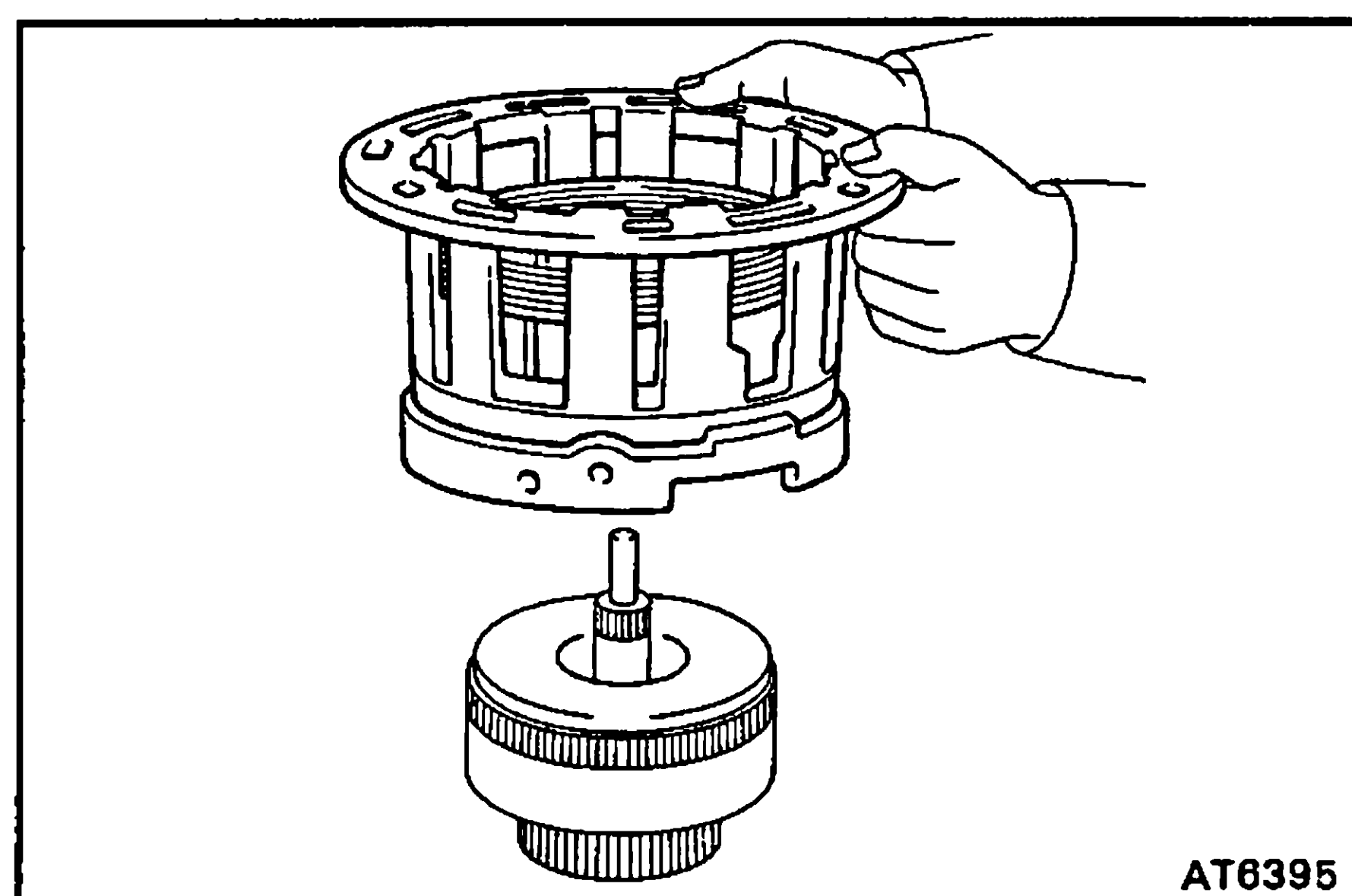


(b) Install the flange, facing the rounded edge upward.



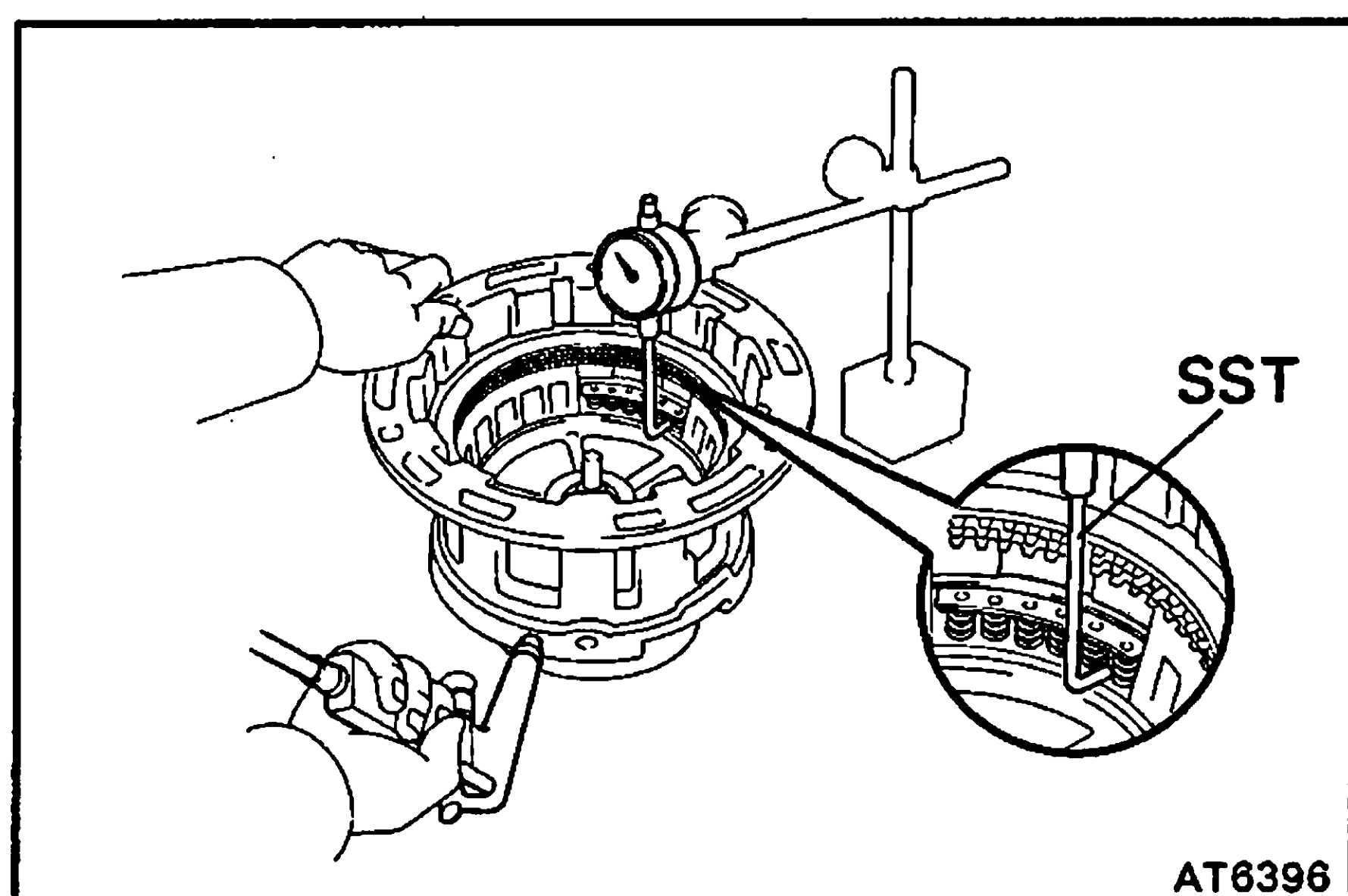
(c) Using a screwdriver, install the snap ring.

HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the O/D case.



## 5. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place the O/D case assembly onto the rear clutch assembly.

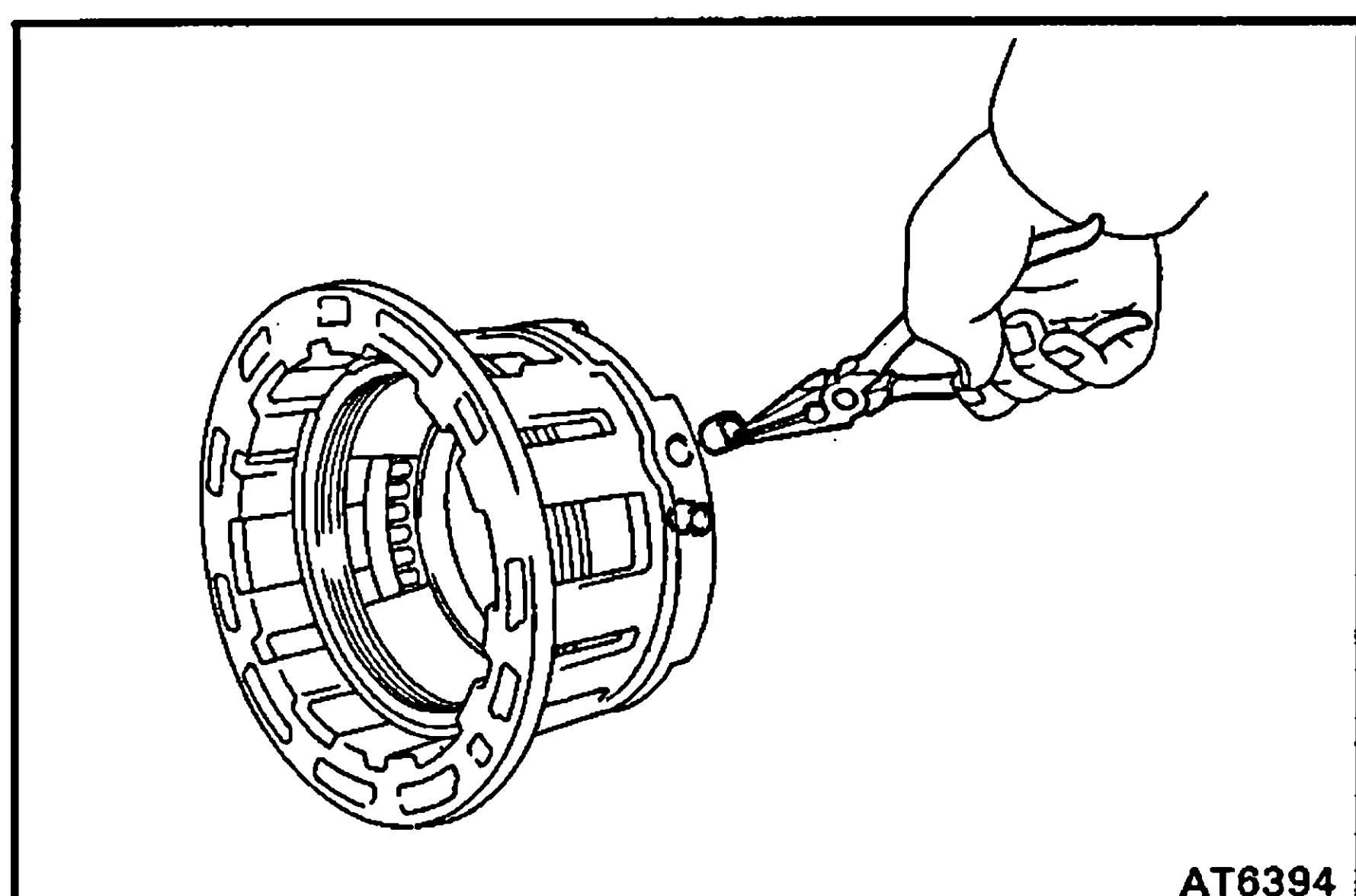


(b) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air (4 — 8 kg/cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-36010 (09350-06120)

Piston stroke: 1.25 — 1.85 mm (0.0492 — 0.0728 in.)

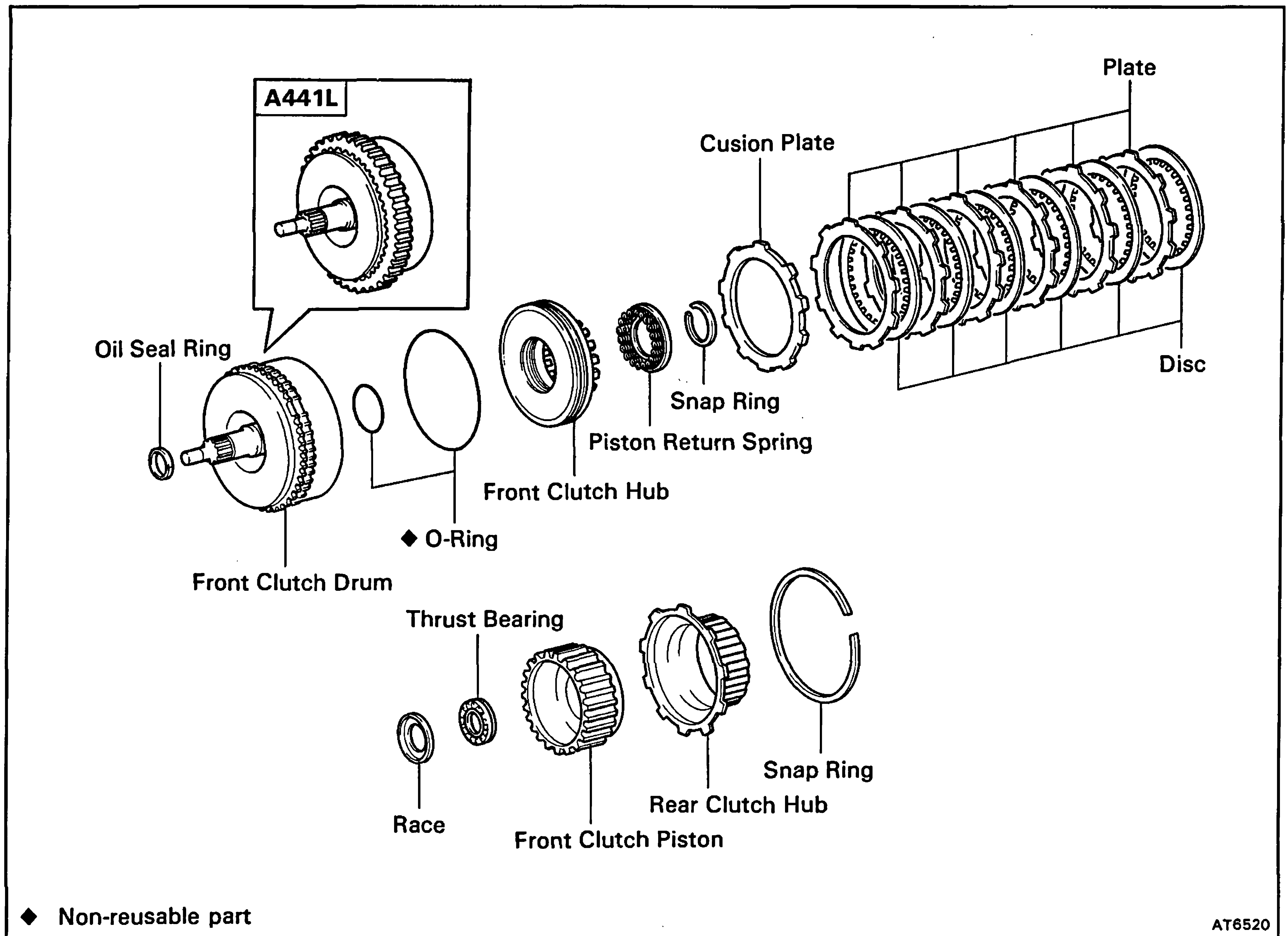
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.



## 6. INSTALL RING RETAINERS

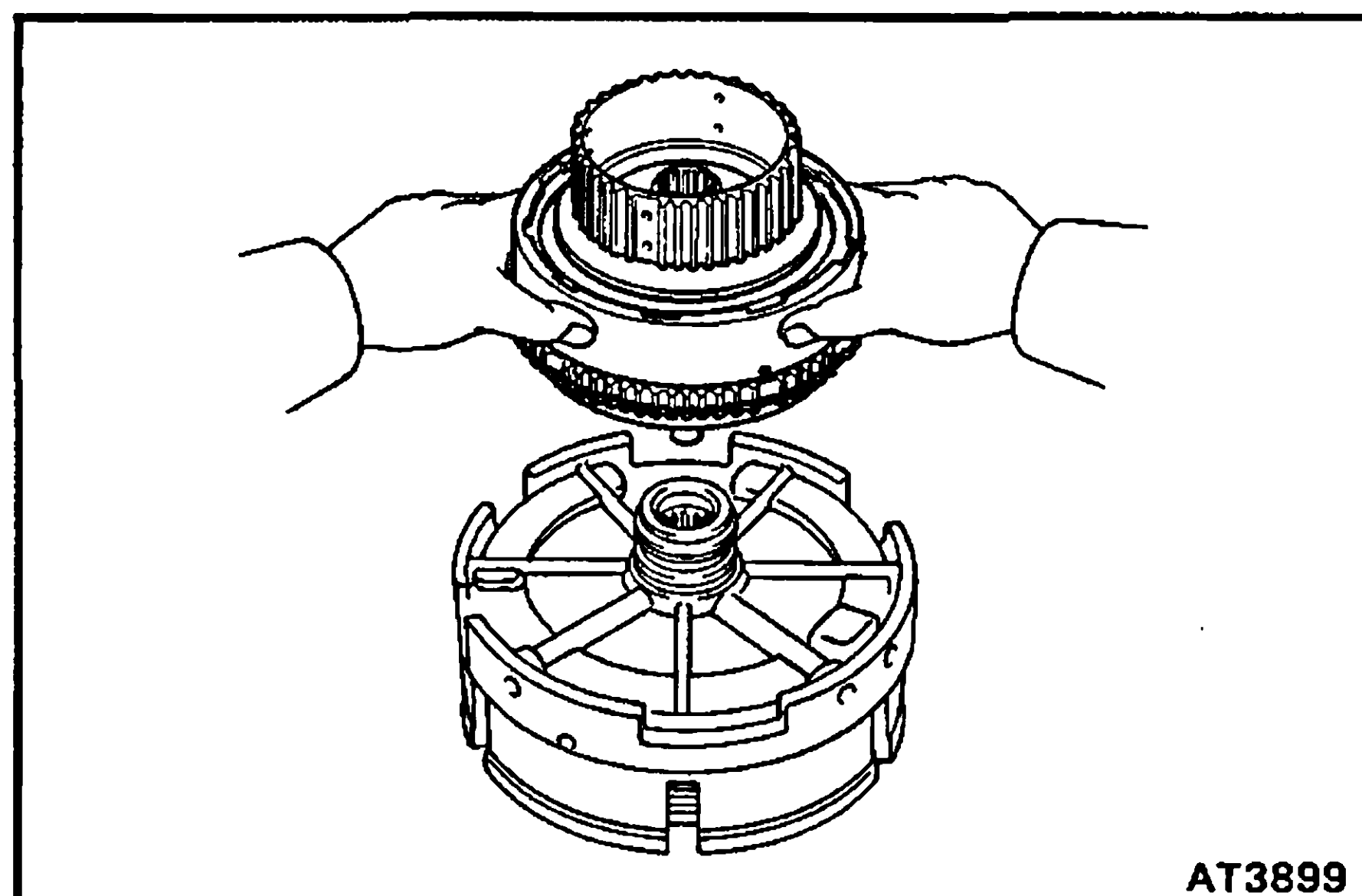
Using needle nose pliers, install the three ring retainers into the oil holes of the O/D case.

## Front Clutch COMPONENTS



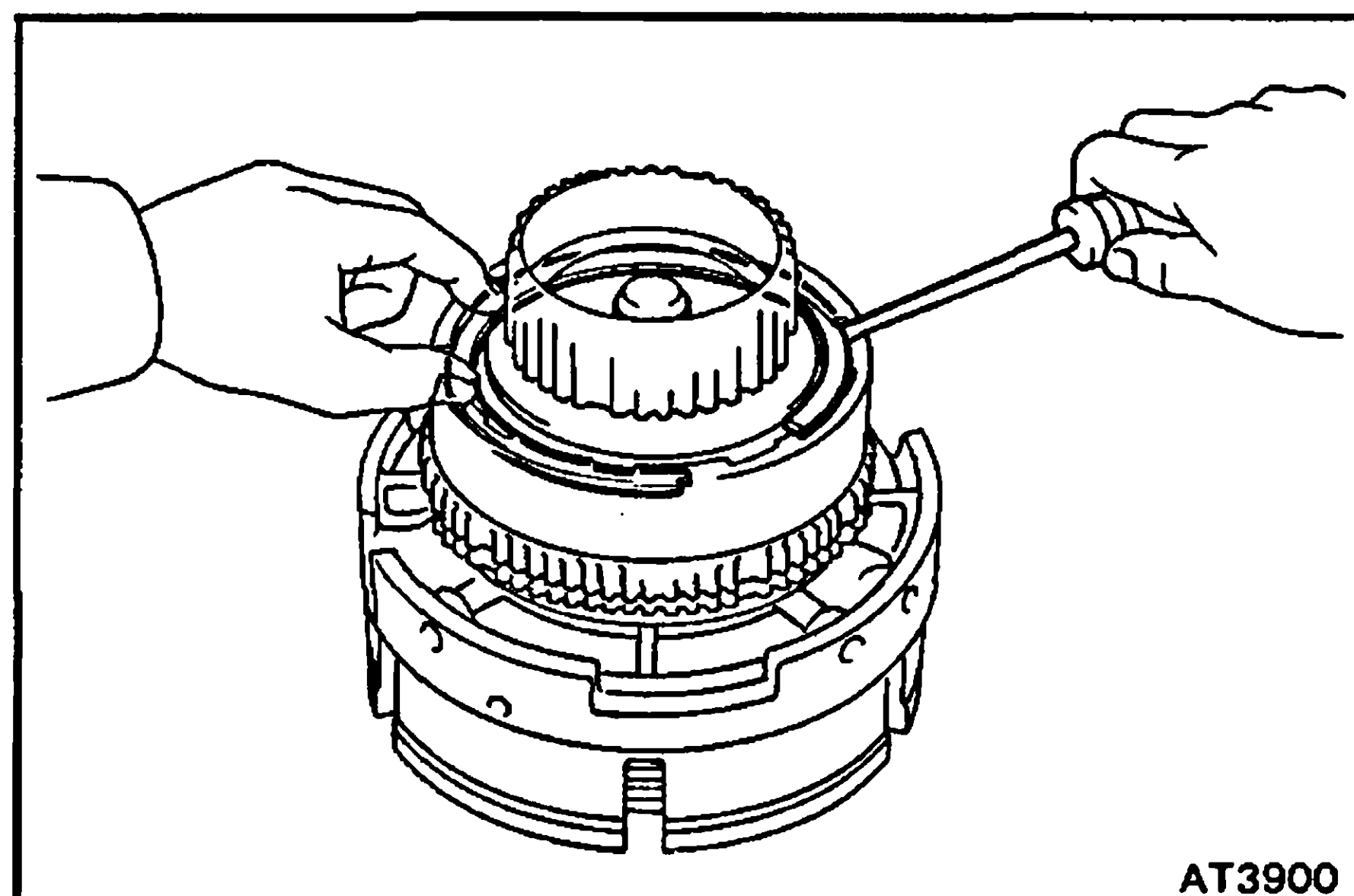
### DISASSEMBLY OF FRONT CLUTCH

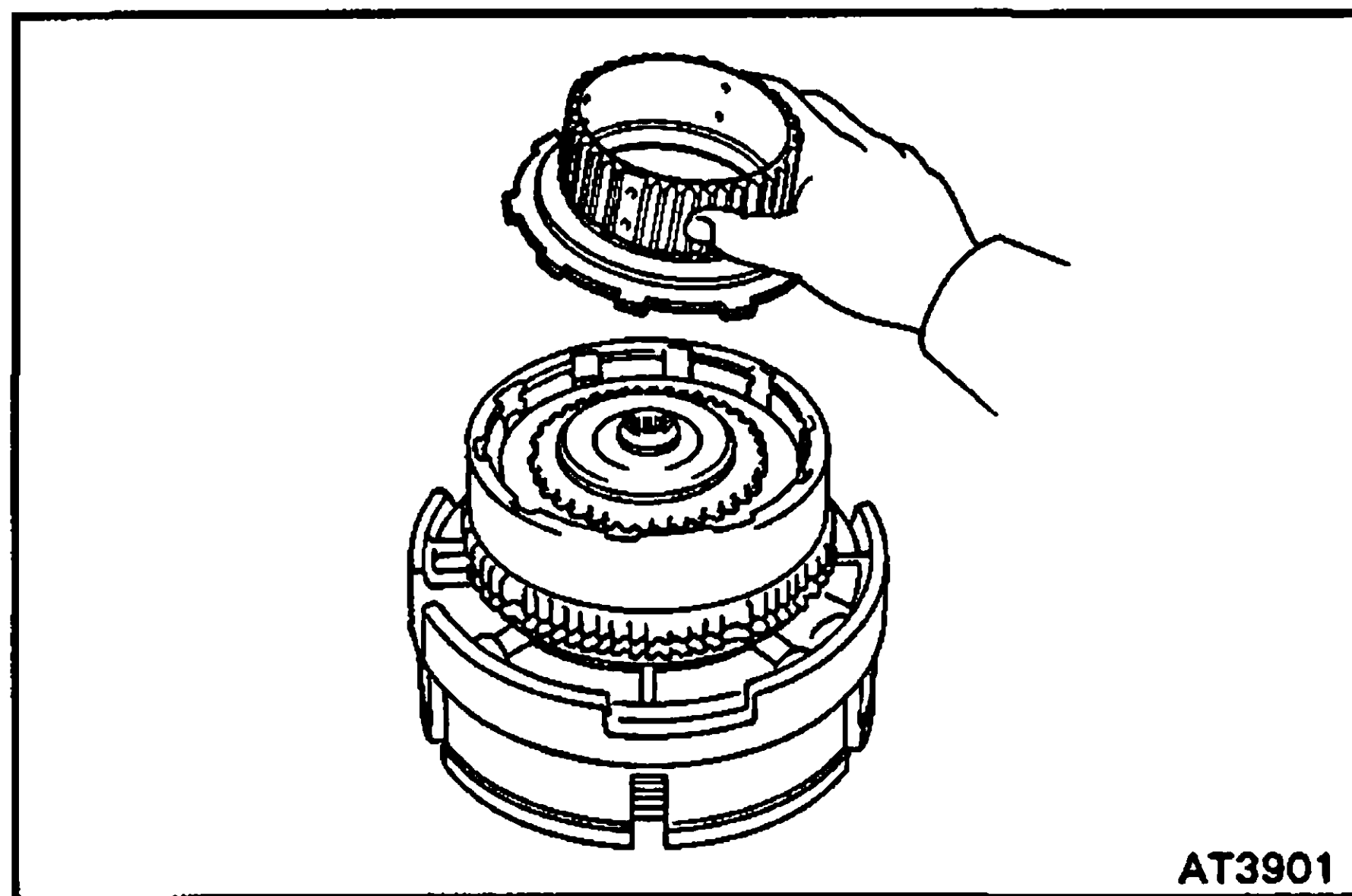
1. PLACE FRONT CLUTCH ASSEMBLY ONTO OVERDRIVE CASE ASSEMBLY



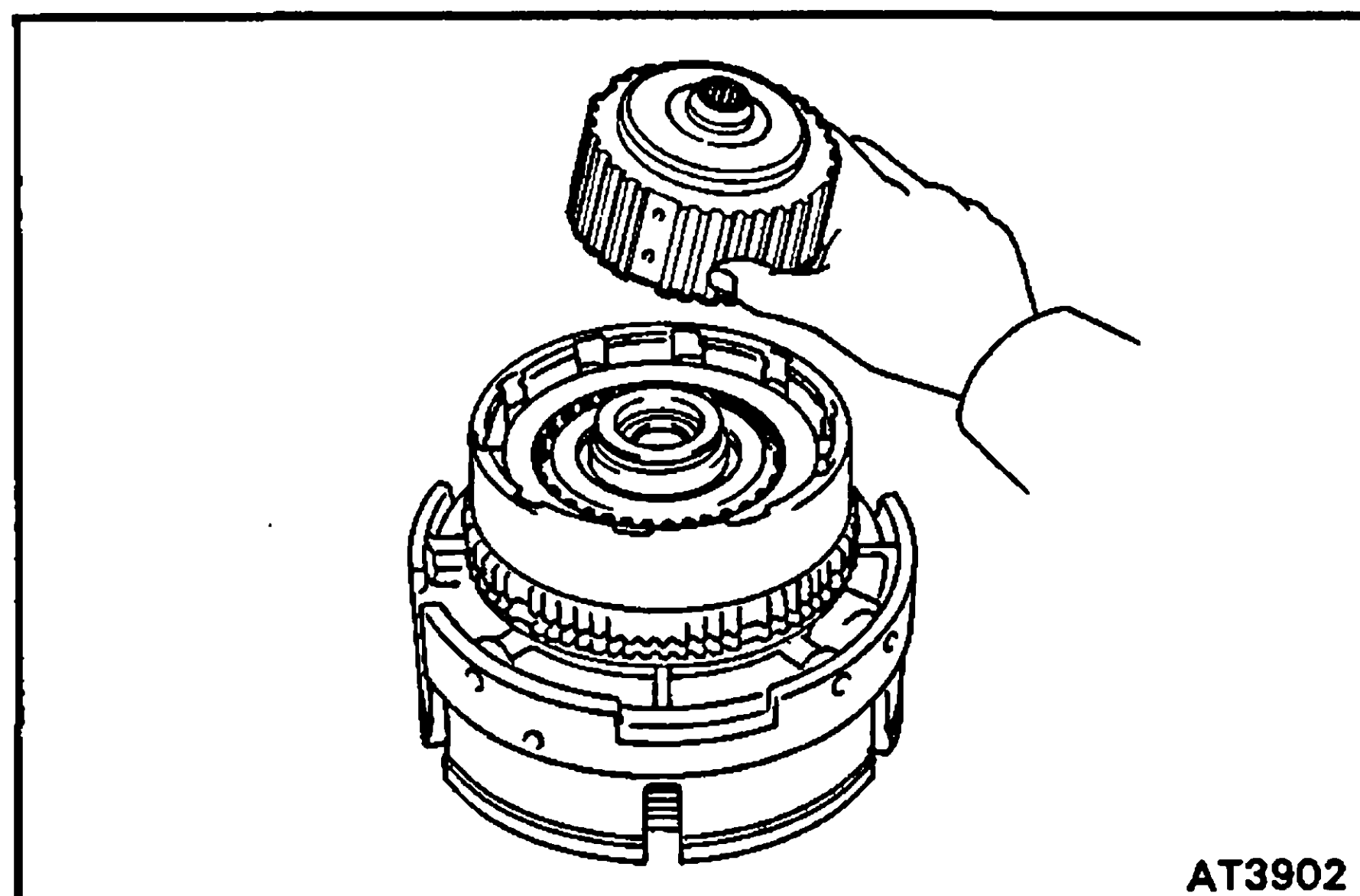
2. REMOVE REAR AND FRONT CLUTCH HUBS

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

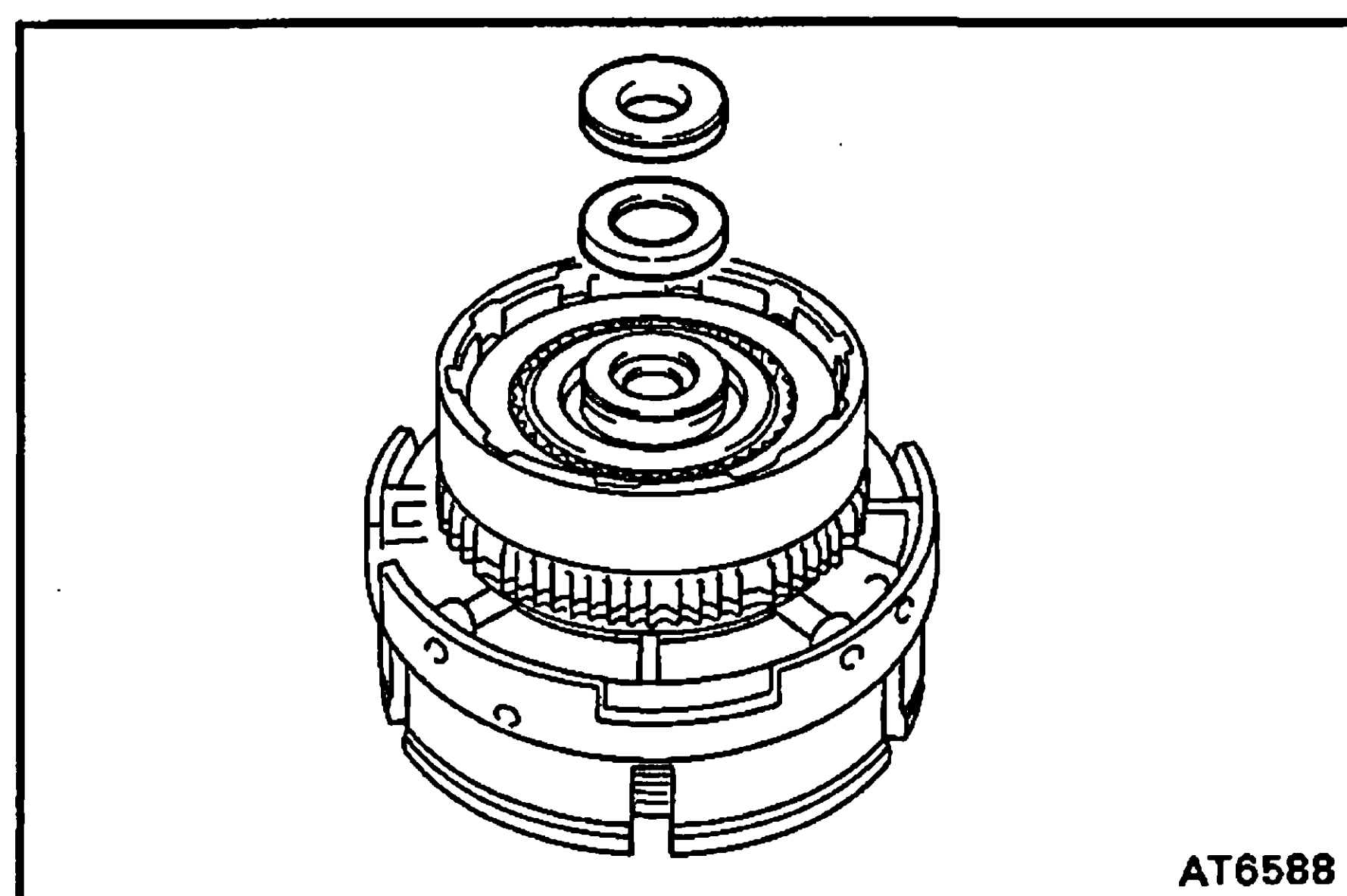




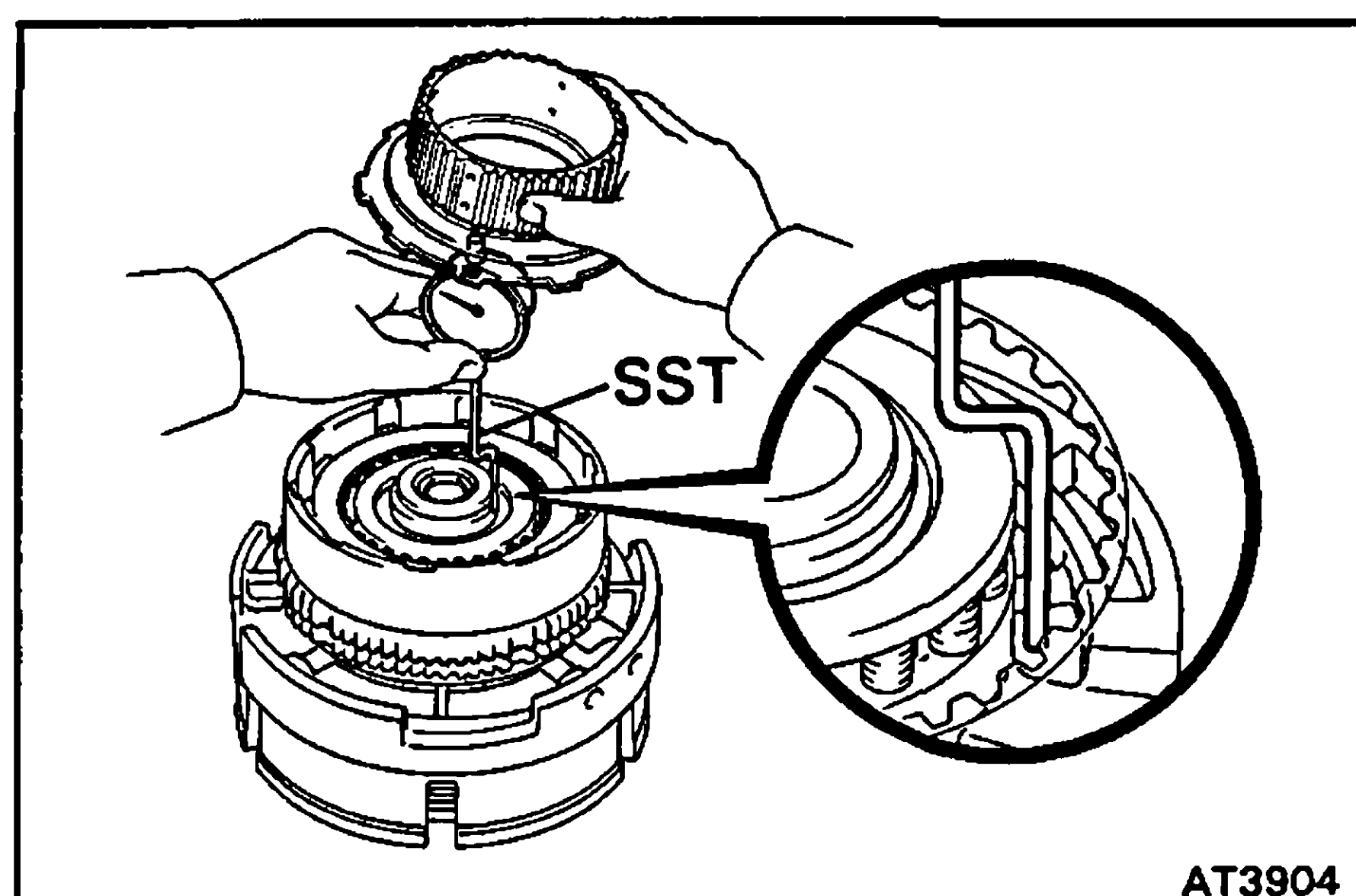
(b) Remove the rear clutch hub.



(c) Remove the front clutch hub.



(d) Remove the race and assembled bearing and race.



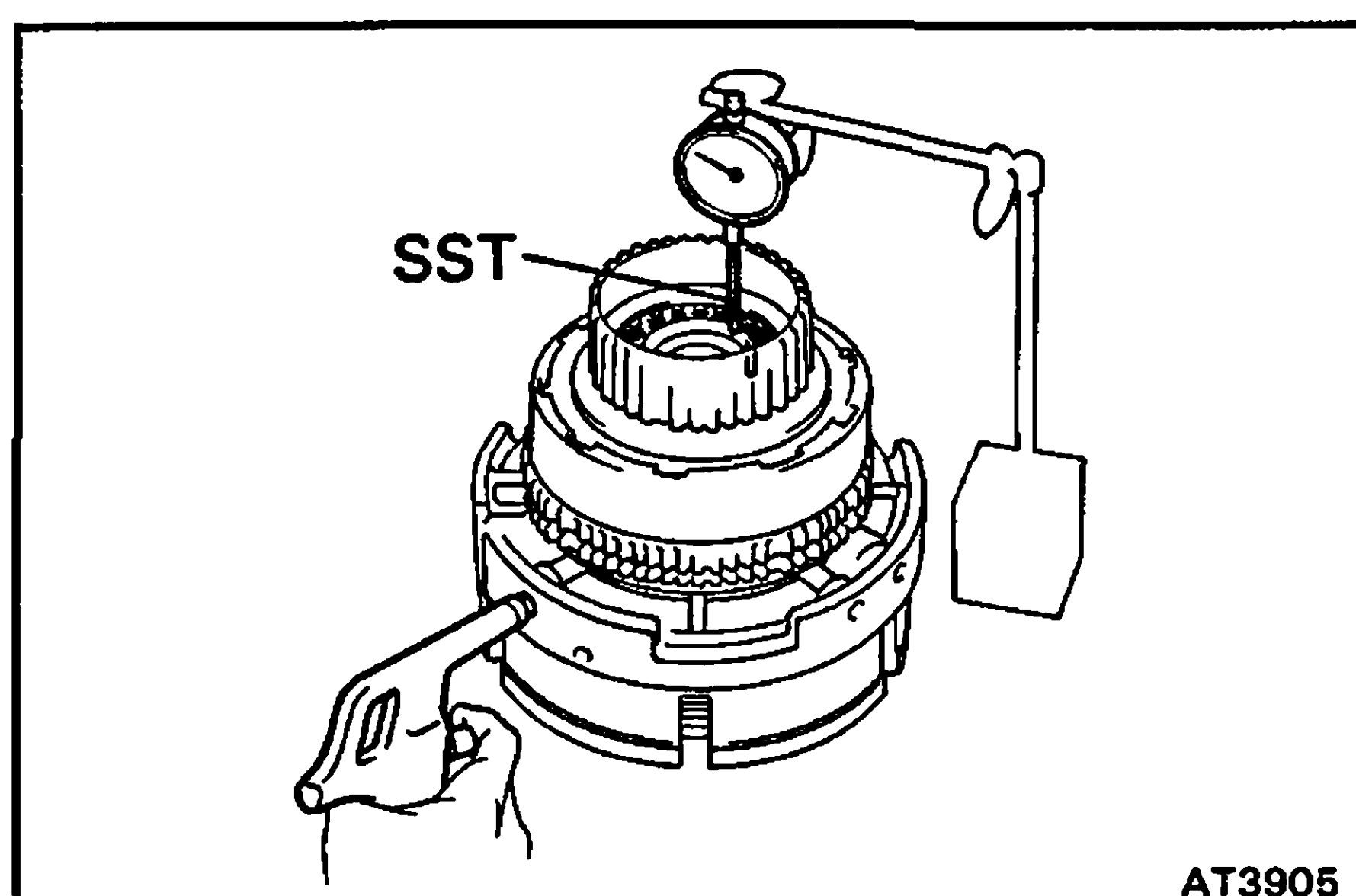
### 3. CHECK PISTON STROKE OF FRONT CLUTCH

(a) Install SST to a dial indicator.

SST 09350-36010 (09350-06110)

(b) Place the assembled SST and a dial indicator on the clutch piston.

(c) Install the rear clutch hub with the snap ring.



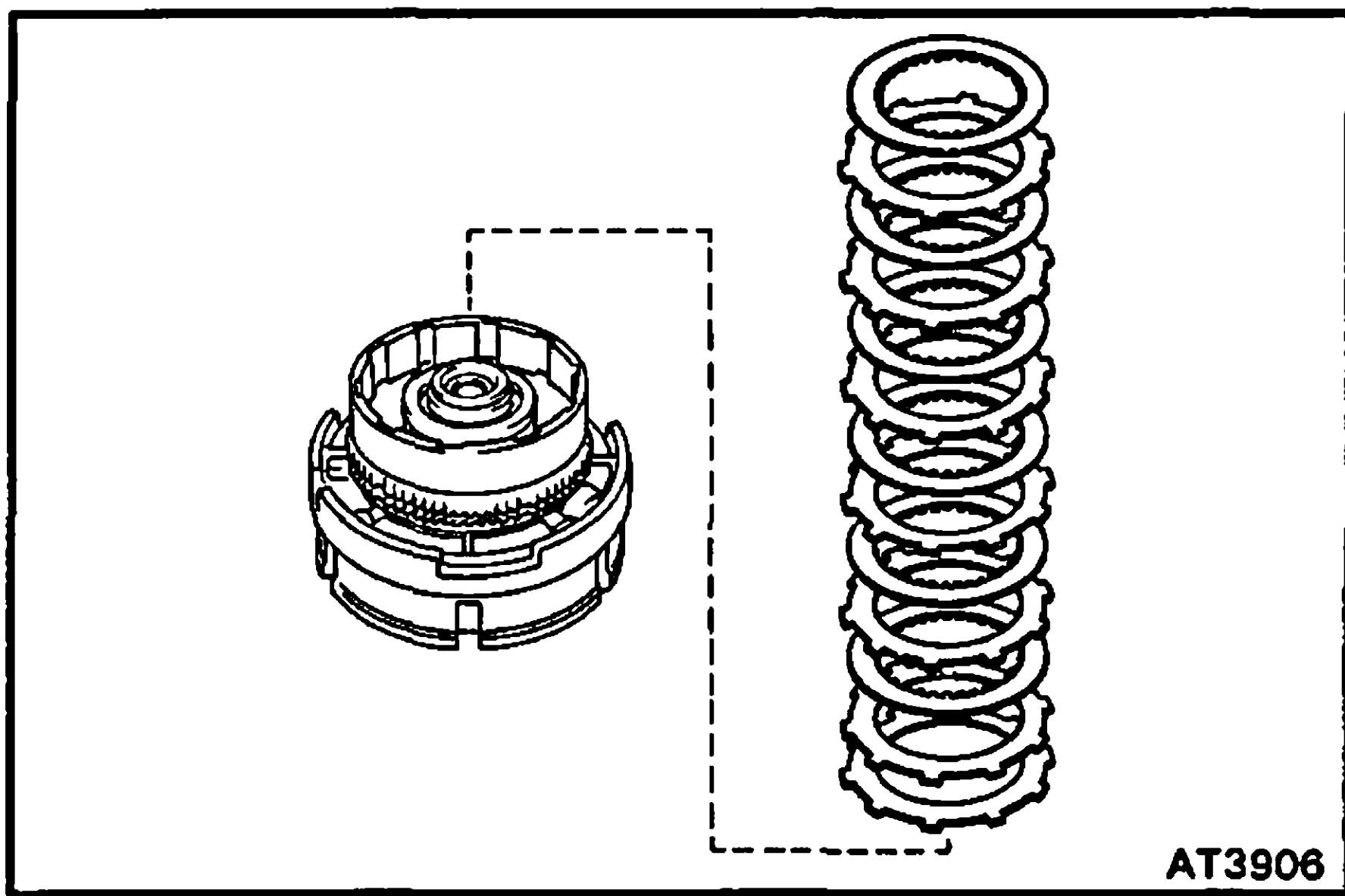
(d) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air (4 — 8 kg/cm<sup>2</sup>, 57 — 114 psi or 392 — 785 kPa) as shown.

SST 09350-36010 (09350-06110)

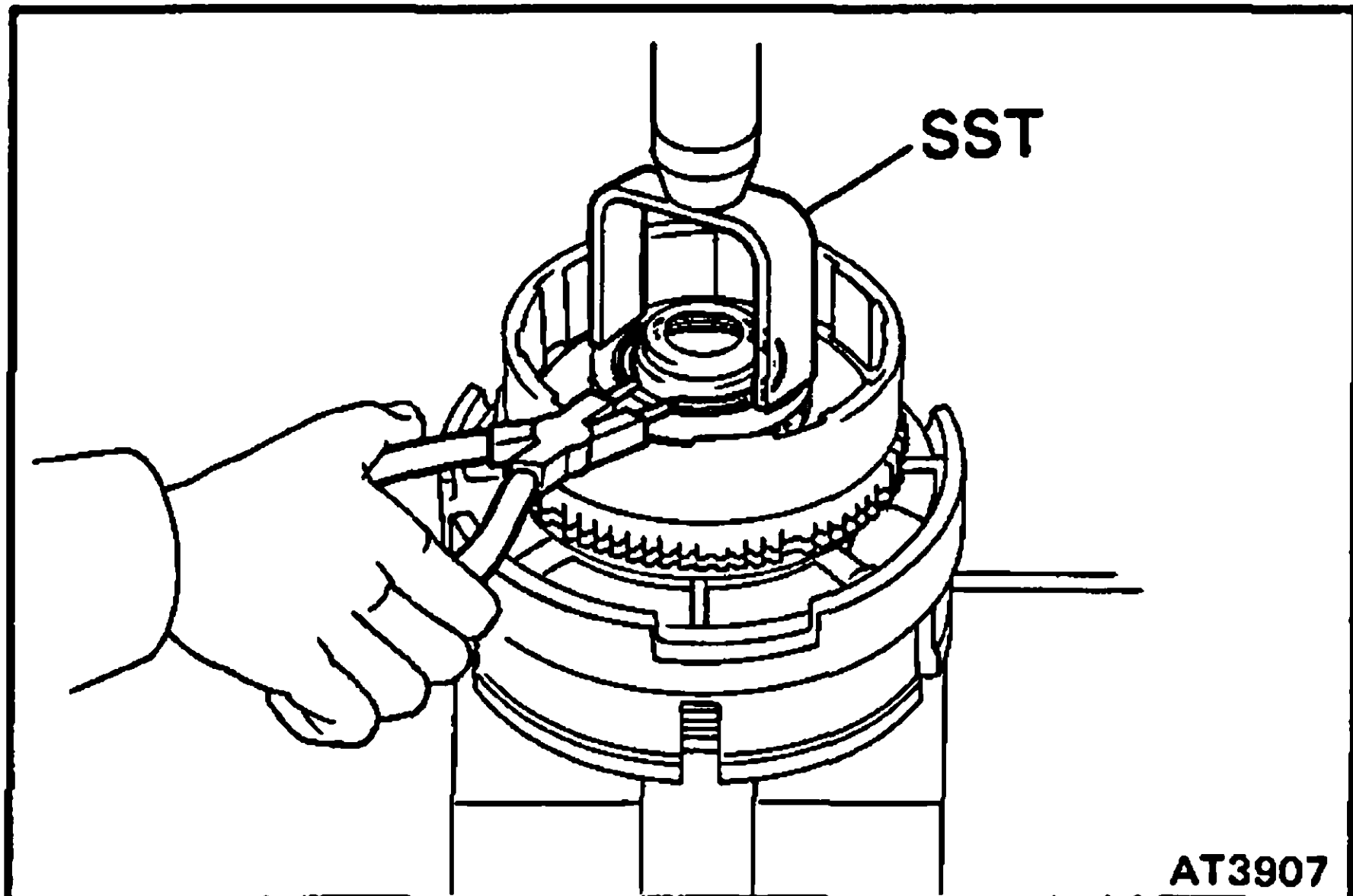
**Piston stroke: 3.93 — 4.23 mm (0.1547 — 0.1665 in.)**

If the piston stroke is greater than specified, inspect the discs.

(e) Remove the snap ring and rear clutch hub.

**4. REMOVE DISCS, PLATES AND CUSHION PLATE**

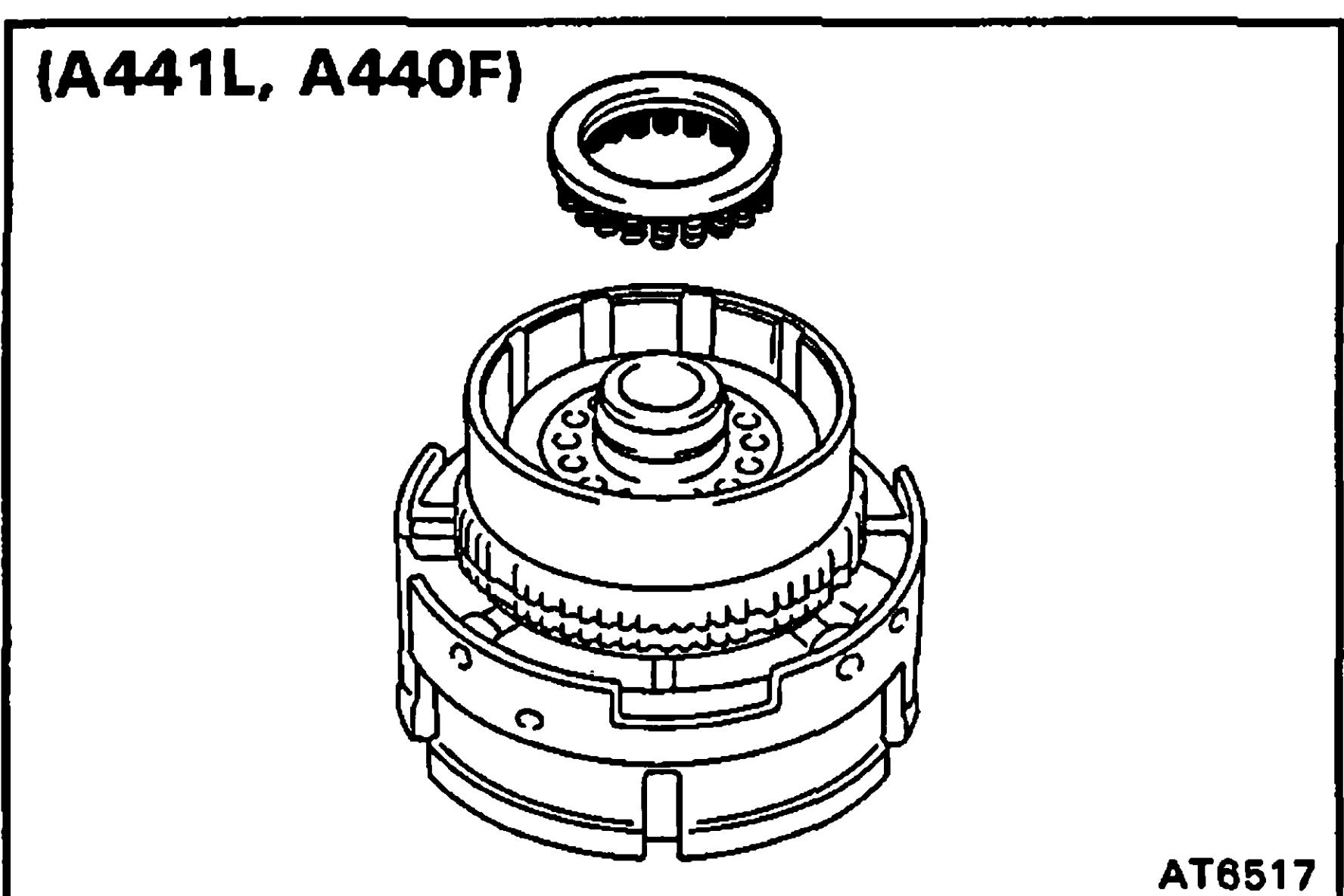
Remove the six discs, six plates and cushion plate.

**6. REMOVE PISTON RETURN SPRINGS**

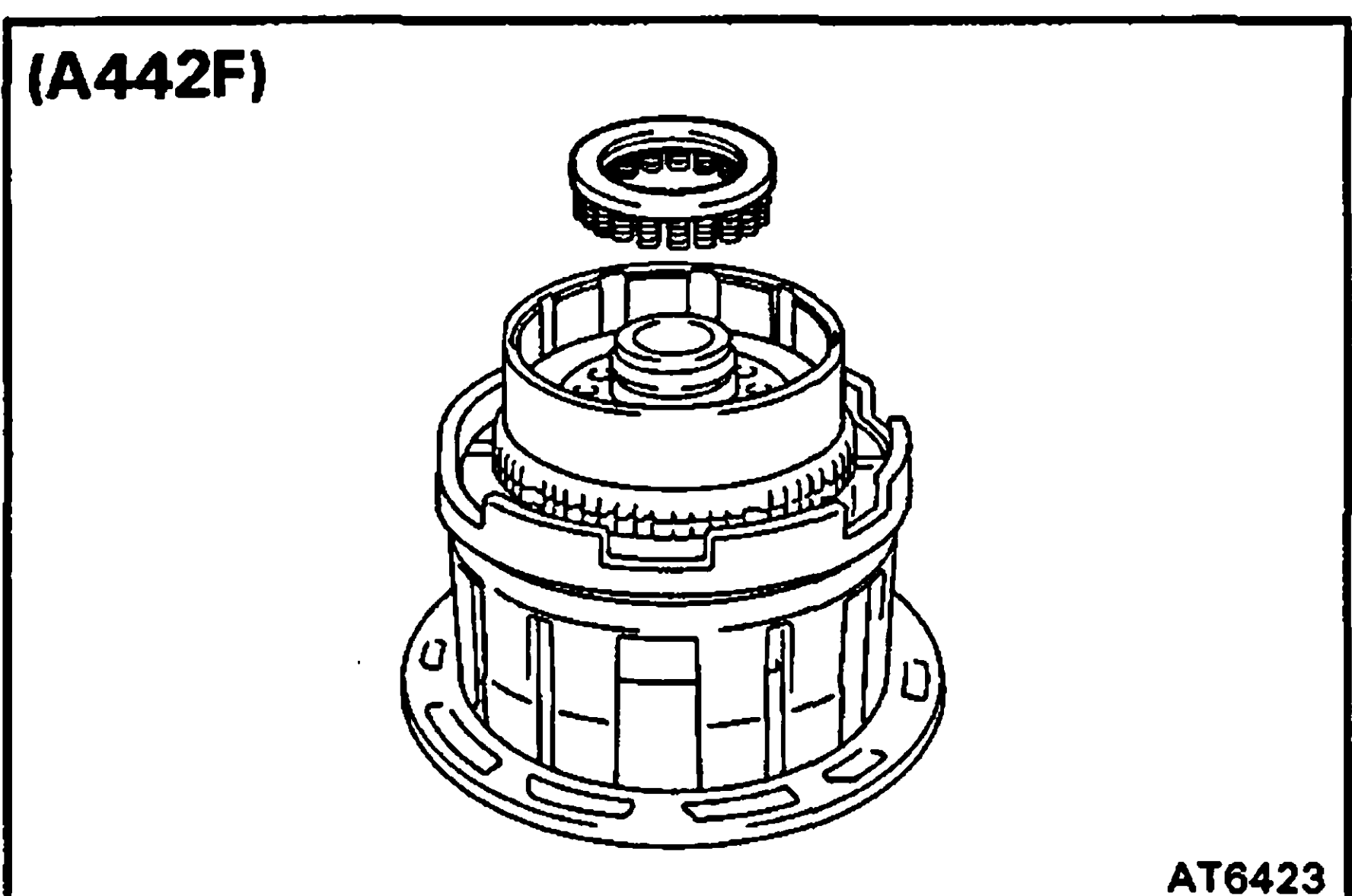
- (a) Place SST on the spring seat, and compress the return springs with a shop press.

SST 09350-36010 (09350-06010)

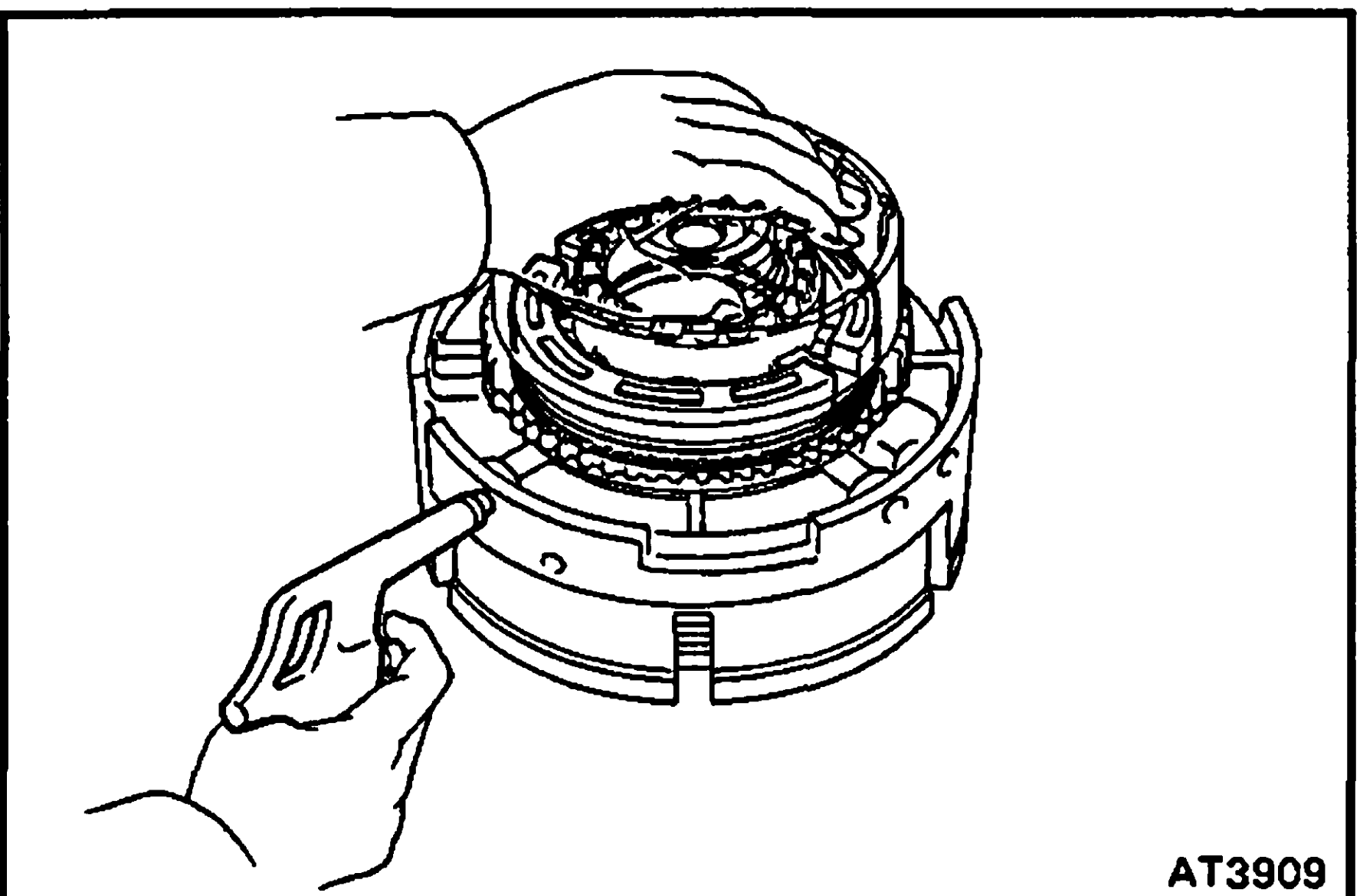
- (b) Using snap ring pliers, remove the snap ring.

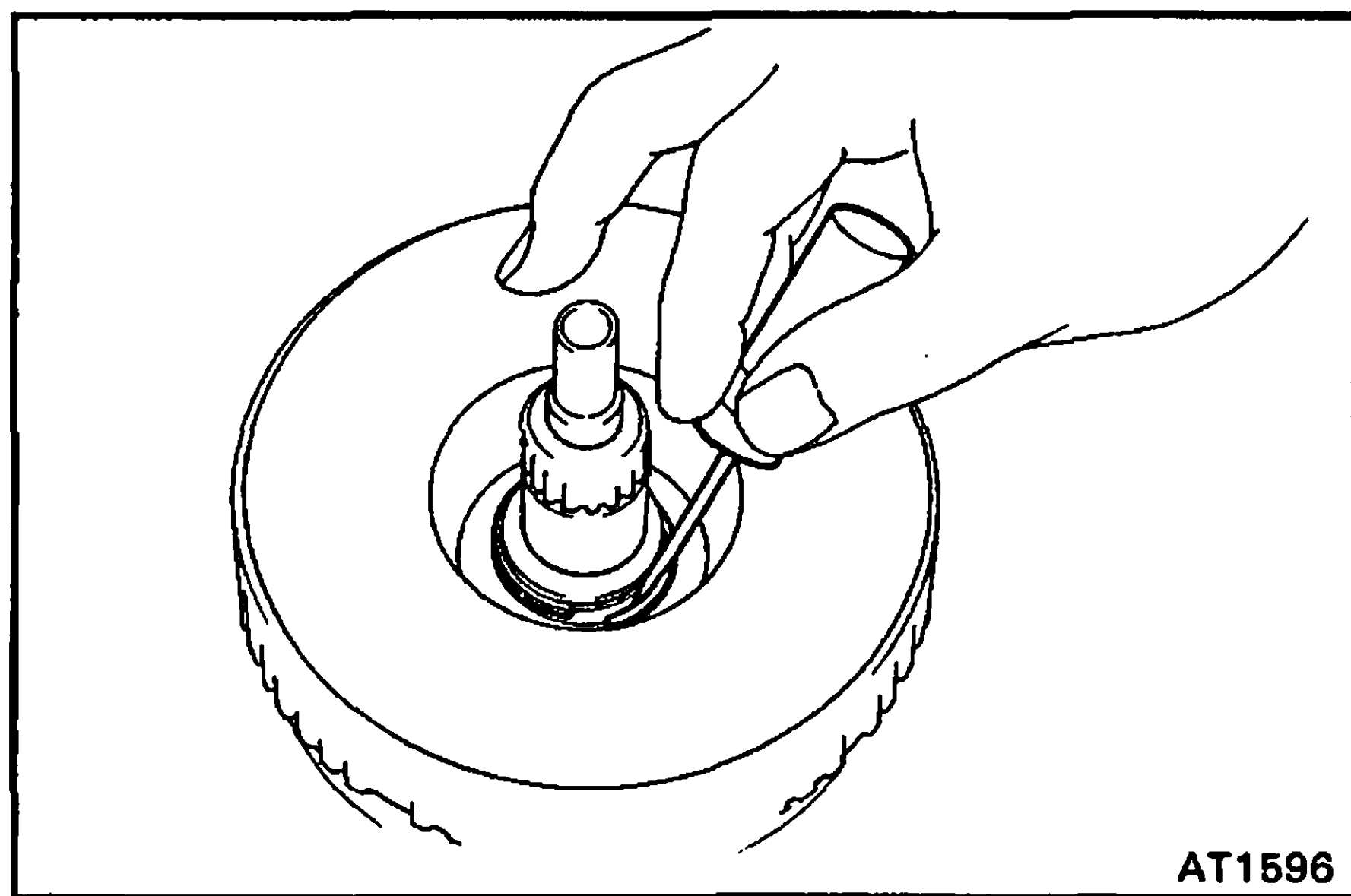


- (c) Remove the piston return spring.

**6. REMOVE FRONT CLUTCH PISTON**

- (a) Hold the clutch piston by hand, apply compressed air into the oil hole of the O/D case to remove the clutch piston.

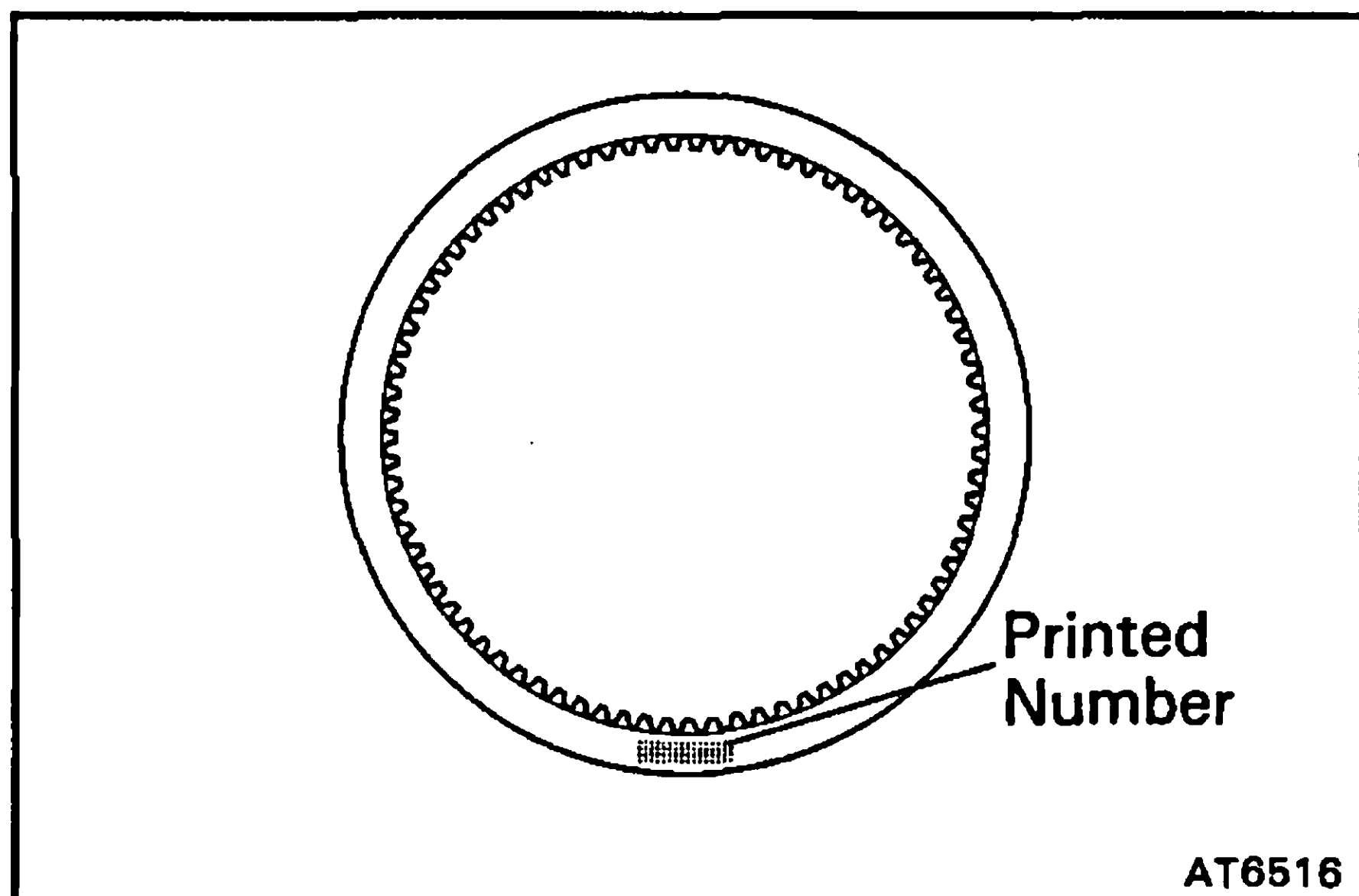




AT1596

## 7. REMOVE OIL SEAL RING

Using a small screwdriver, remove the oil seal ring from the clutch drum.



AT6516

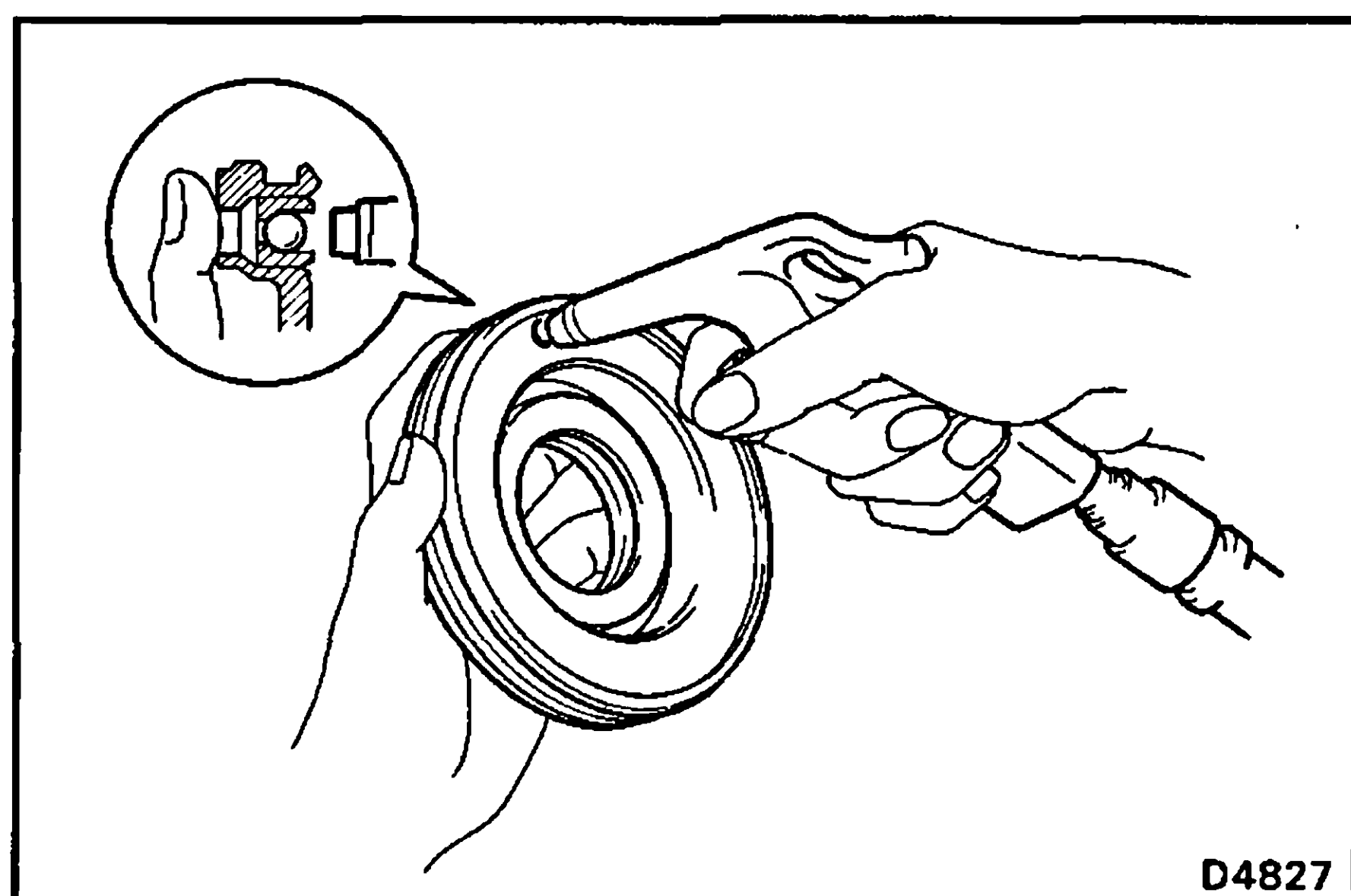
## INSPECTION OF FRONT CLUTCH

### 1. INSPECT DISCS, PLATES AND CUSHION PLATE

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

#### HINT:

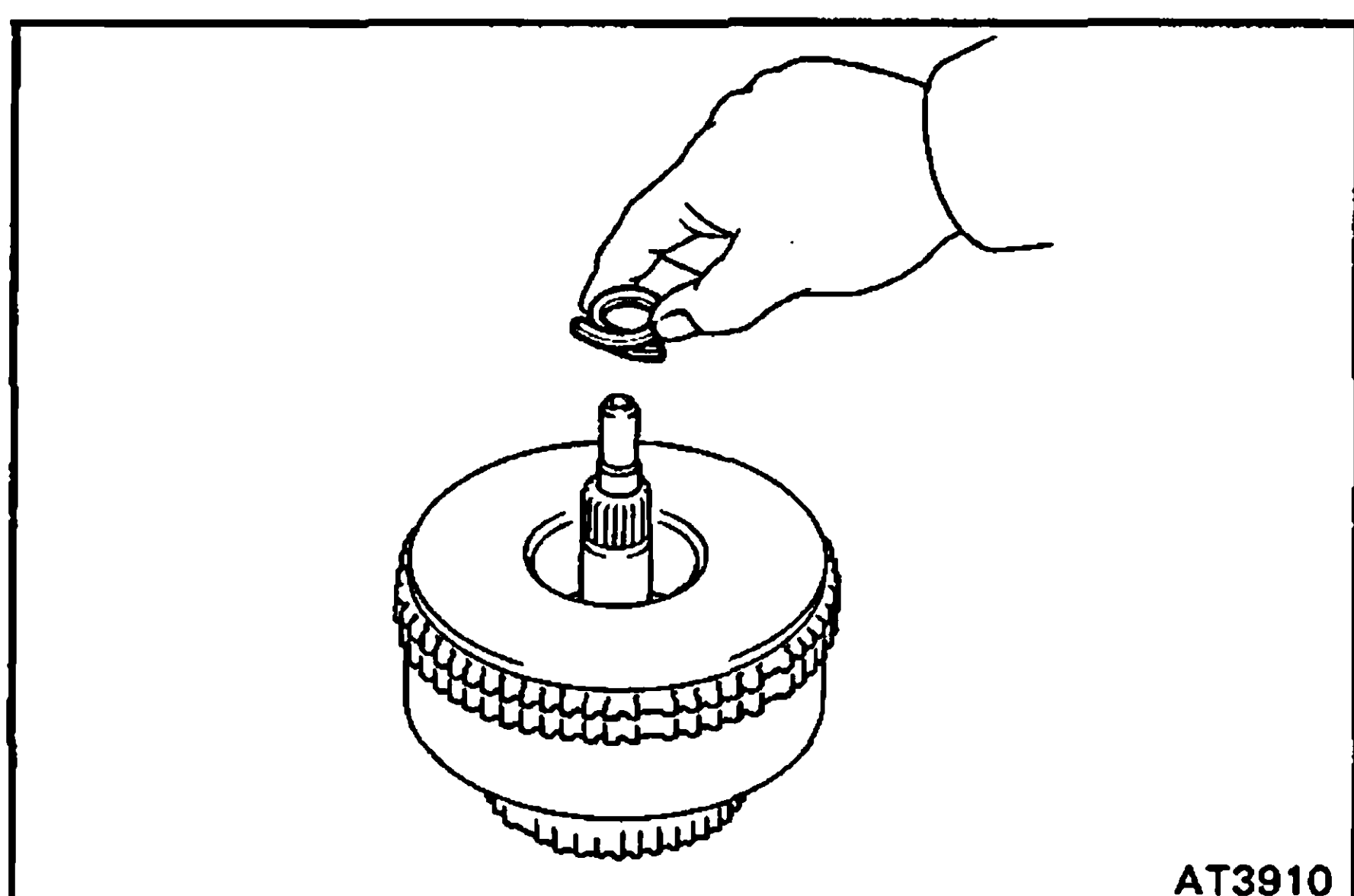
- If the lining of the disc is peeling off or discolored, or even if parts of the printed numbers are defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least fifteen minutes.



D4827

### 2. INSPECT FRONT CLUTCH PISTON

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



AT3910

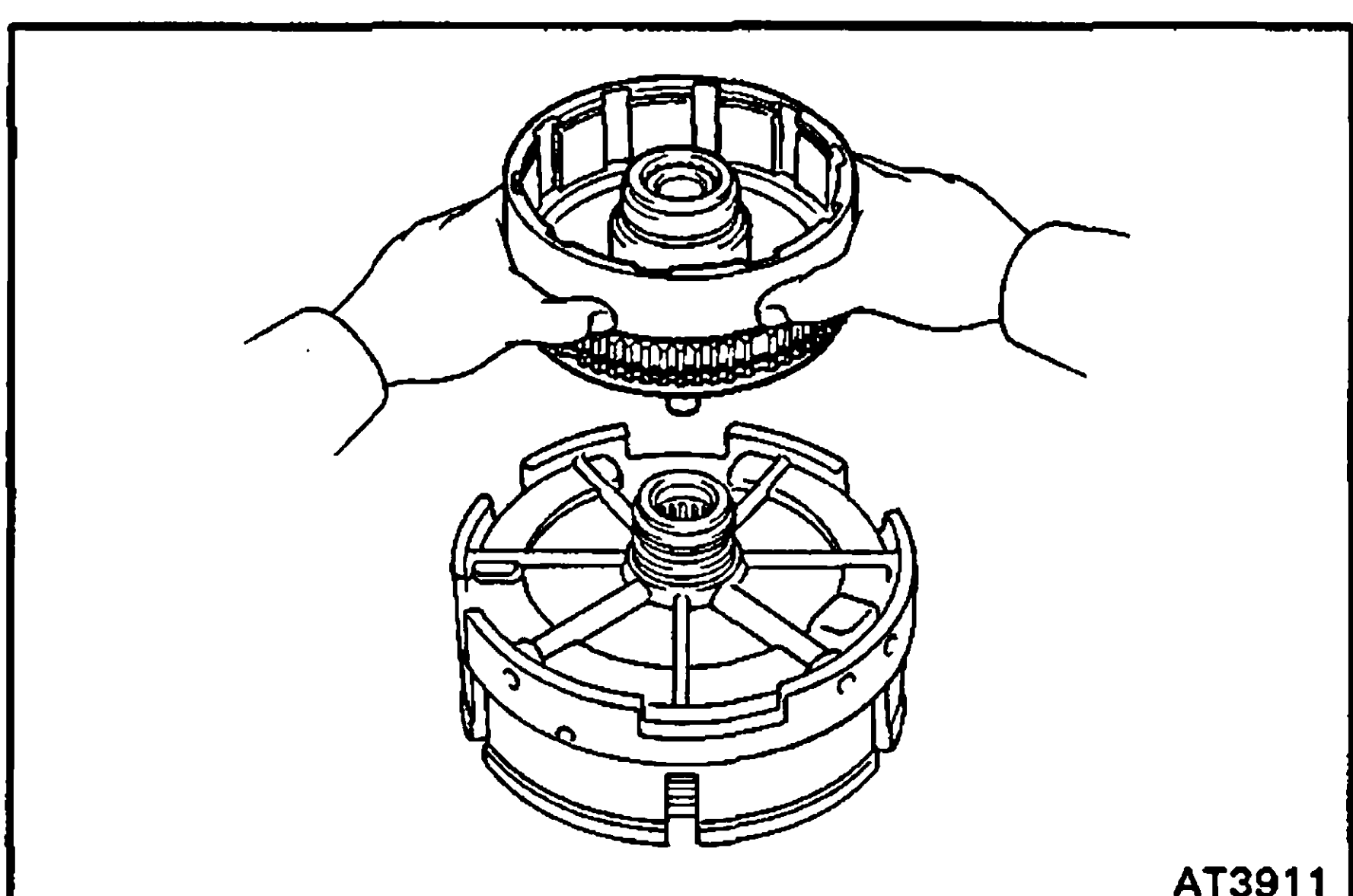
## ASSEMBLY OF FRONT CLUTCH

### 1. INSTALL OIL SEAL RING

- Coat the oil seal ring with ATF.
- Contract the oil seal rings as shown, and install it onto the clutch drum.

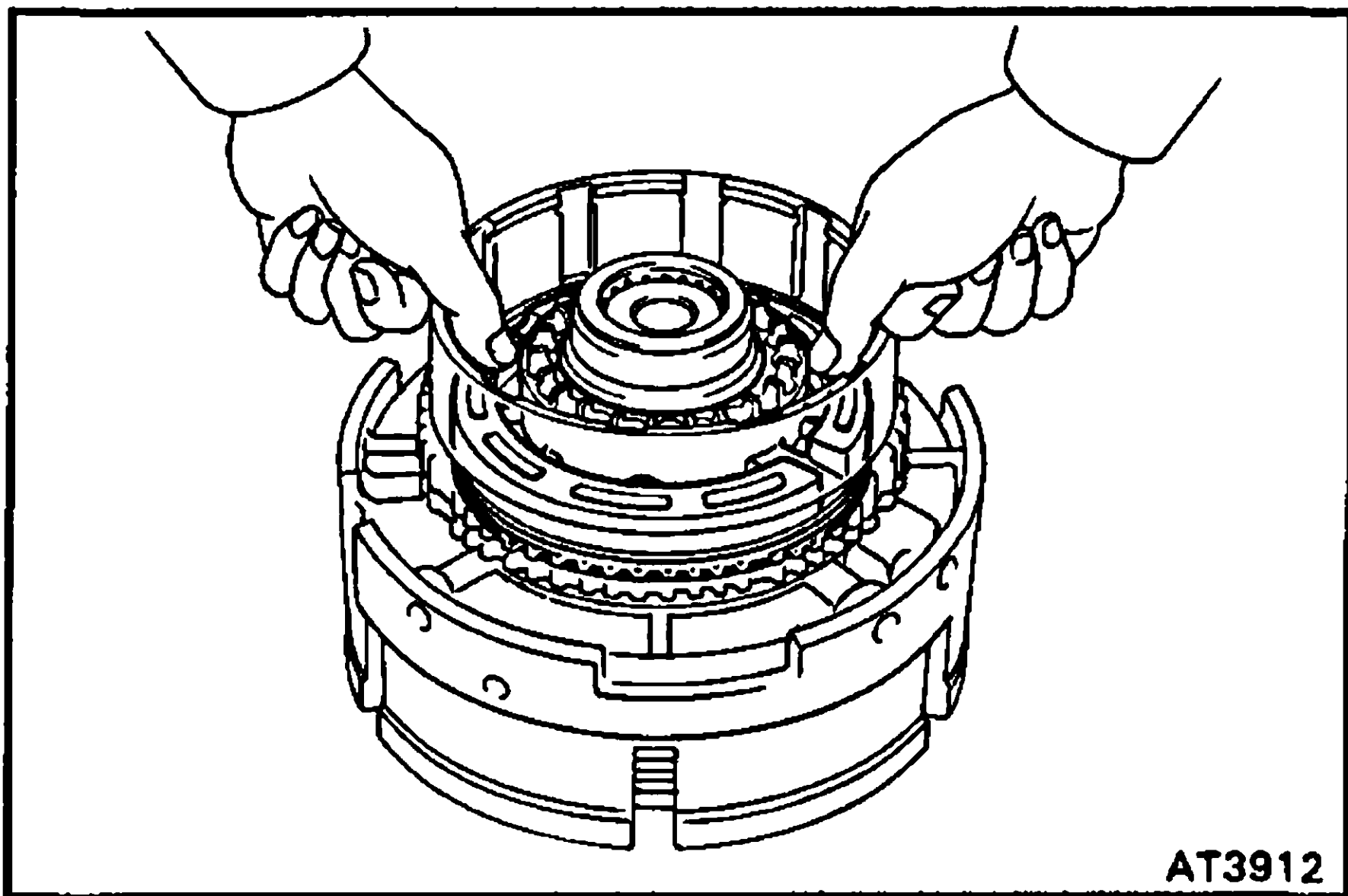
**NOTICE:** Do not spread the ring ends more than necessary.

**HINT:** After installing the oil seal ring, check that they rotate smoothly.



AT3911

### 2. PLACE FRONT CLUTCH DRUM ONTO OVERDRIVE CASE ASSEMBLY

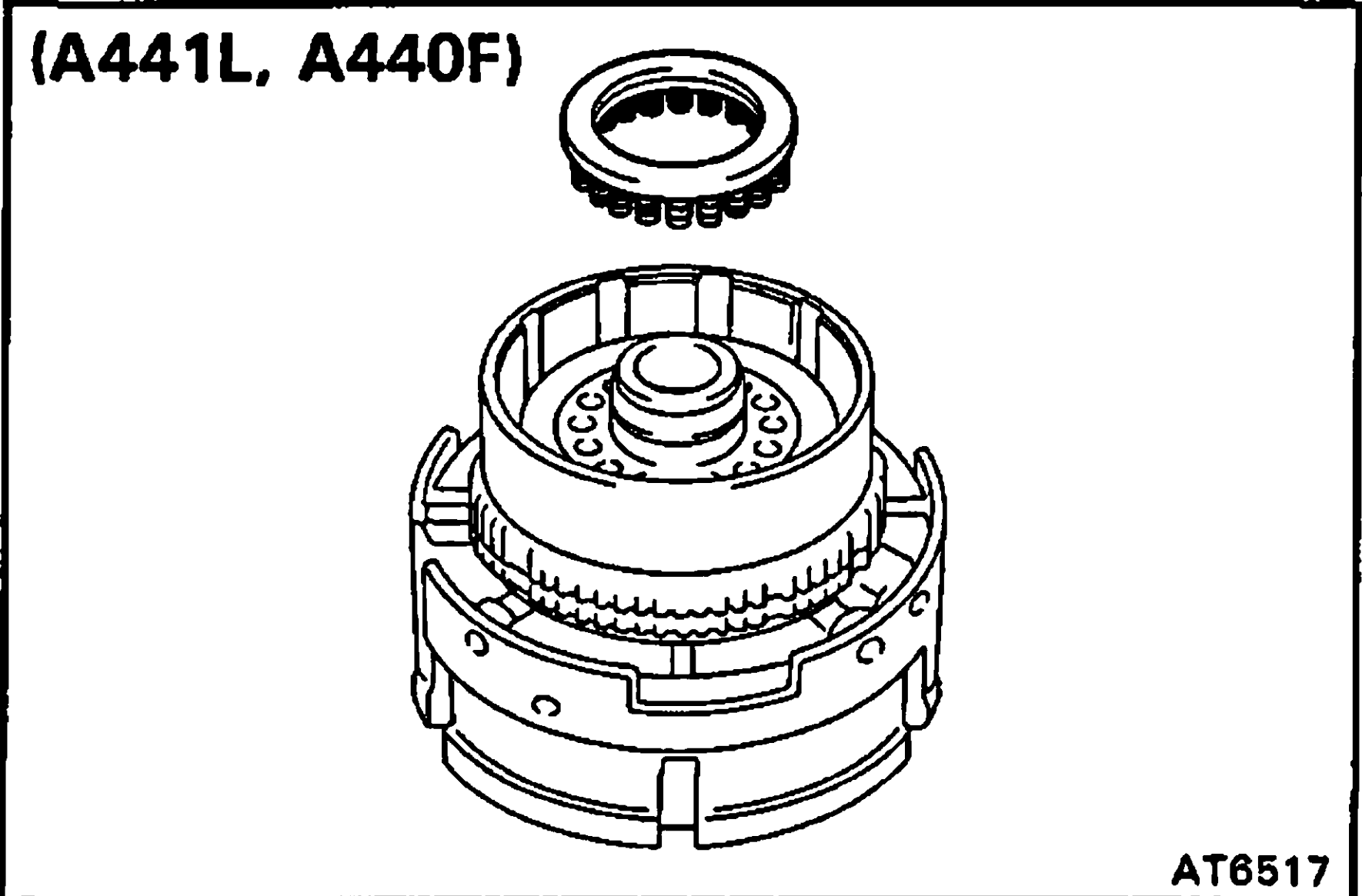


### 3. INSTALL FRONT CLUTCH PISTON

- (a) Coat new two O-rings with ATF, and install them on the clutch piston.
- (b) Push in the clutch piston into the clutch drum by both hands.

**NOTICE:** Be careful not to damage the O-rings.

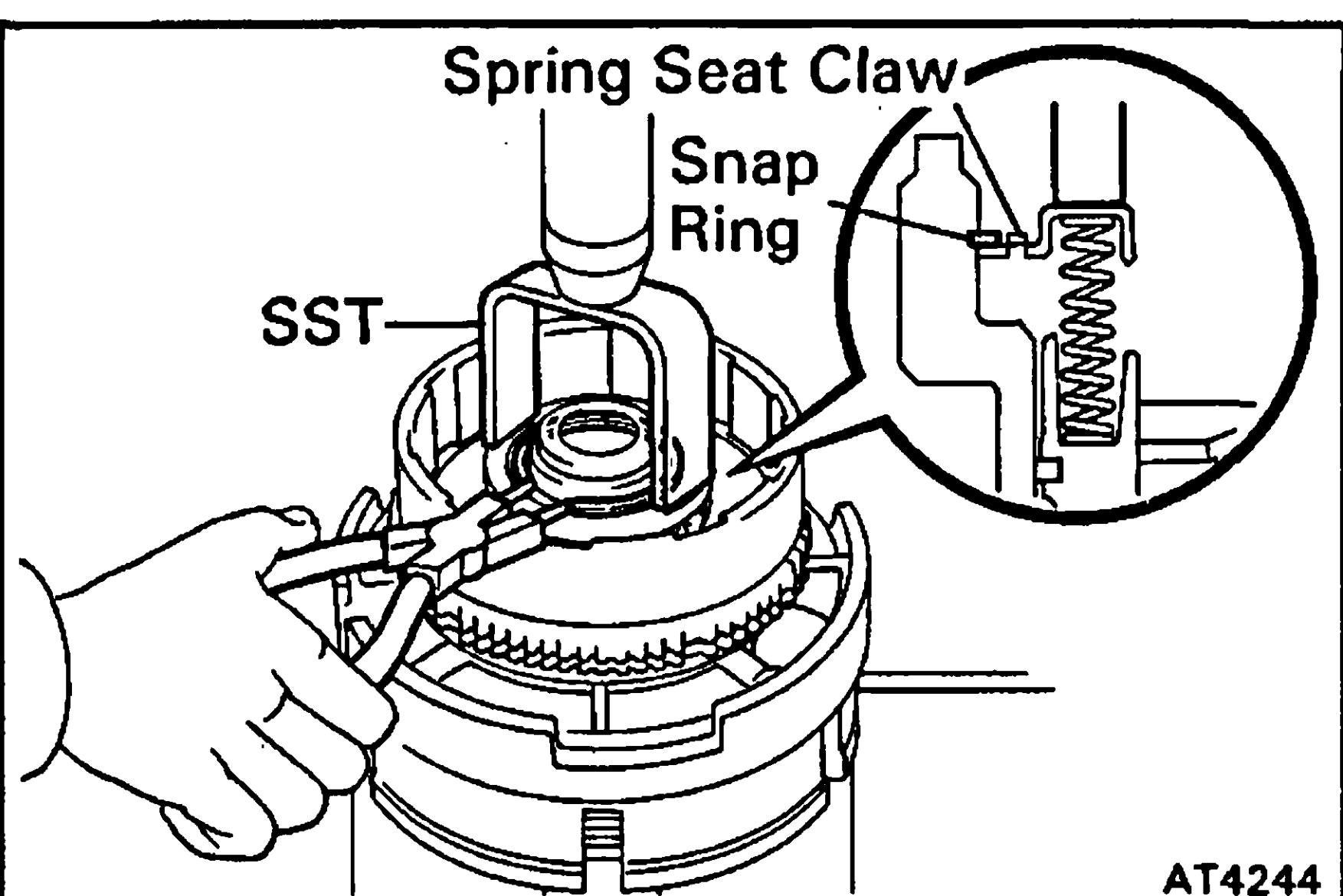
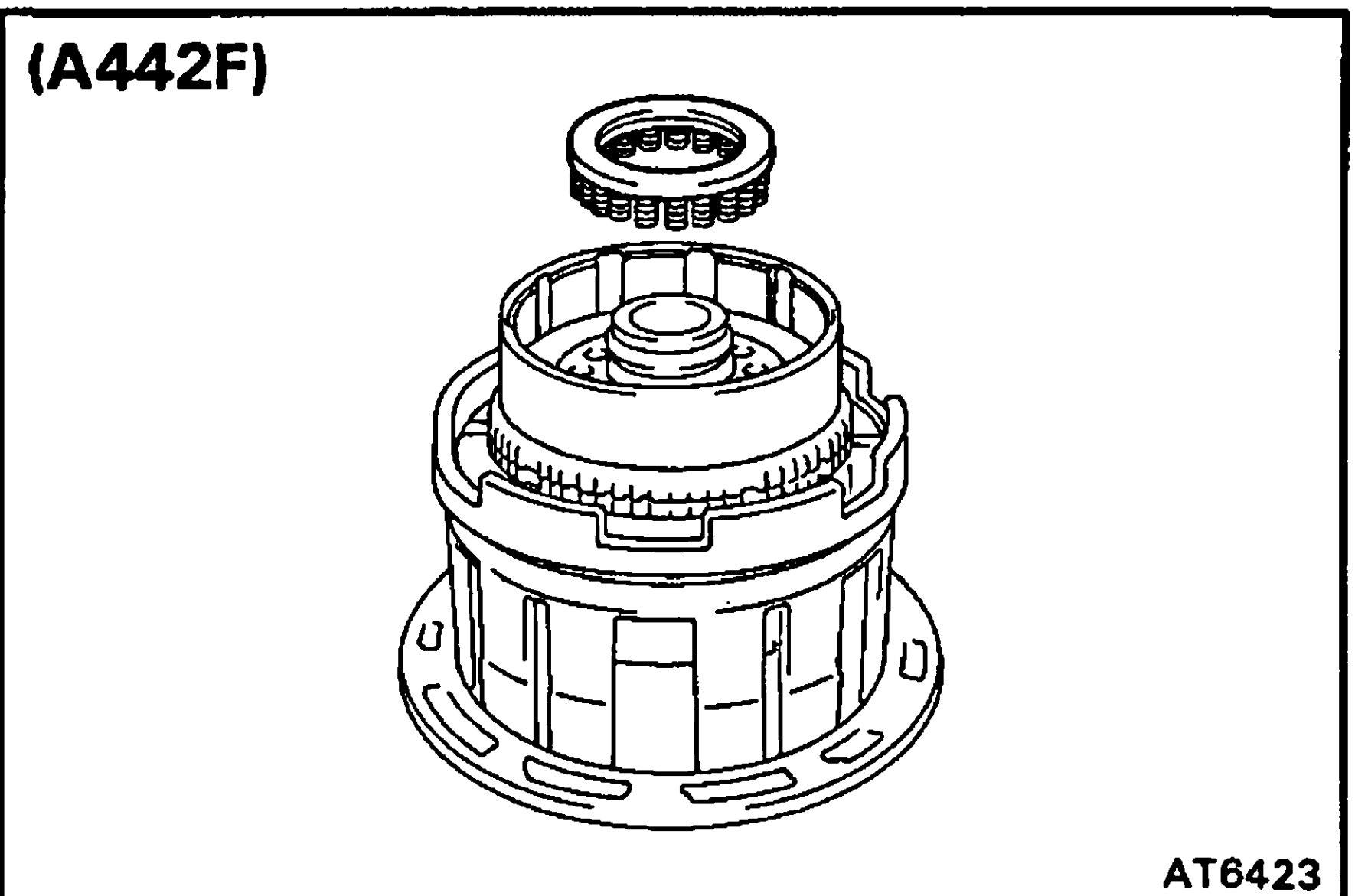
(A441L, A440F)



### 4. INSTALL PISTON RETURN SPRINGS

- (a) Place the piston return spring on the clutch piston.

(A442F)



- (b) Place SST on the spring seat, and compress the return springs with a shop press.

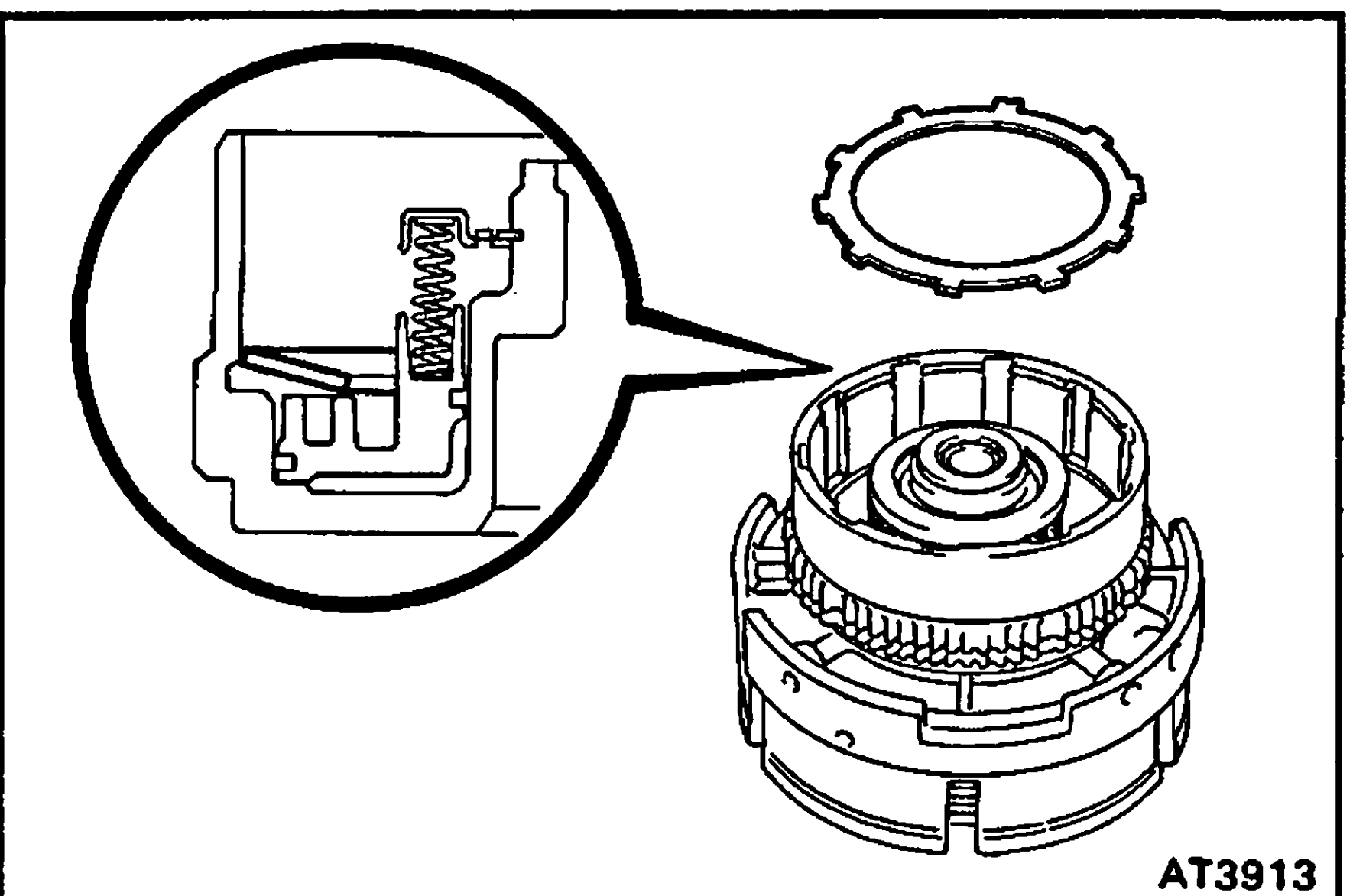
SST 09350-36010 (09350-06010)

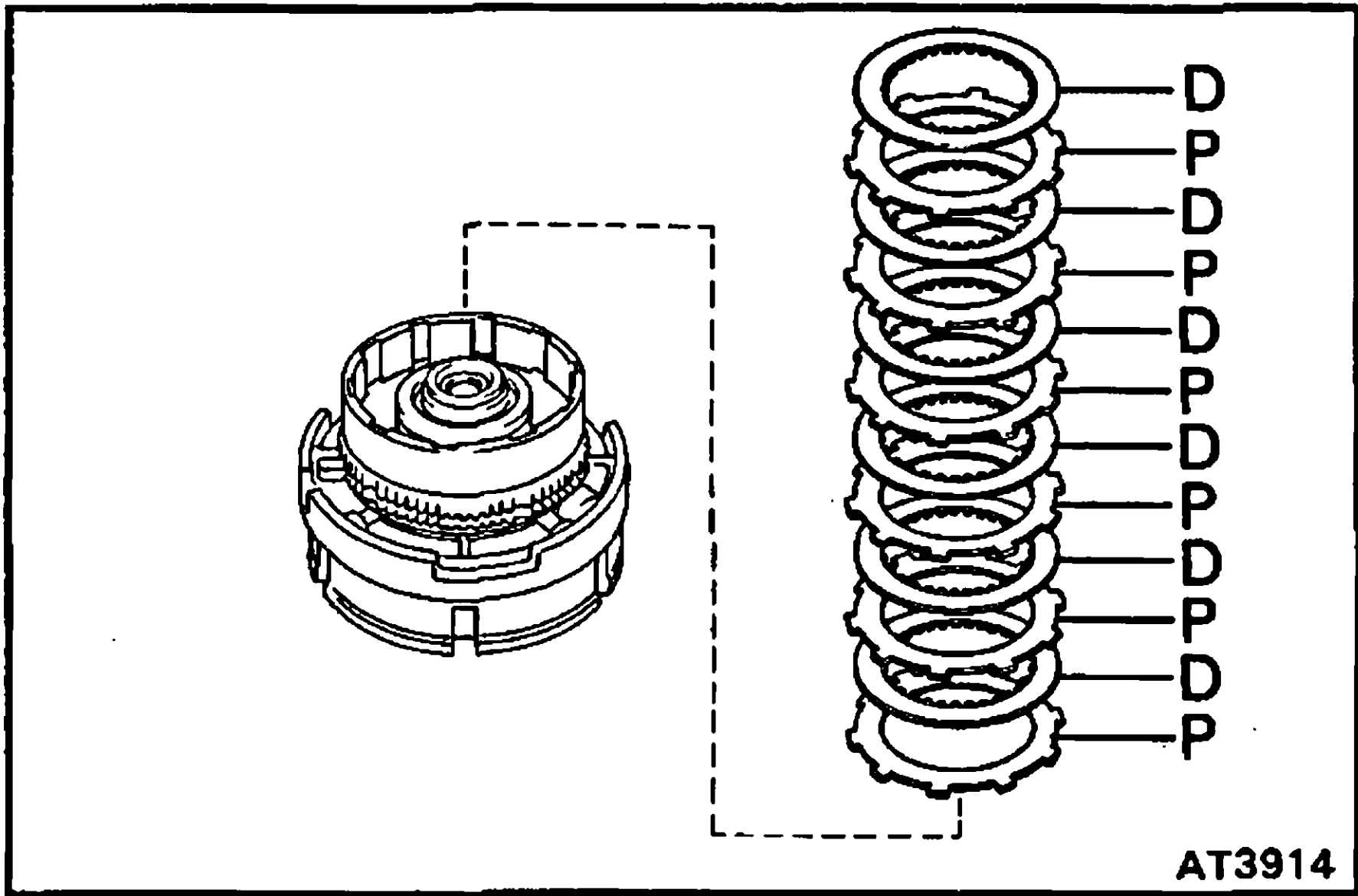
- (c) Using snap ring pliers, install the snap ring.

**HINT:** Be sure the end gap of the ring is not aligned with the spring seat claw.

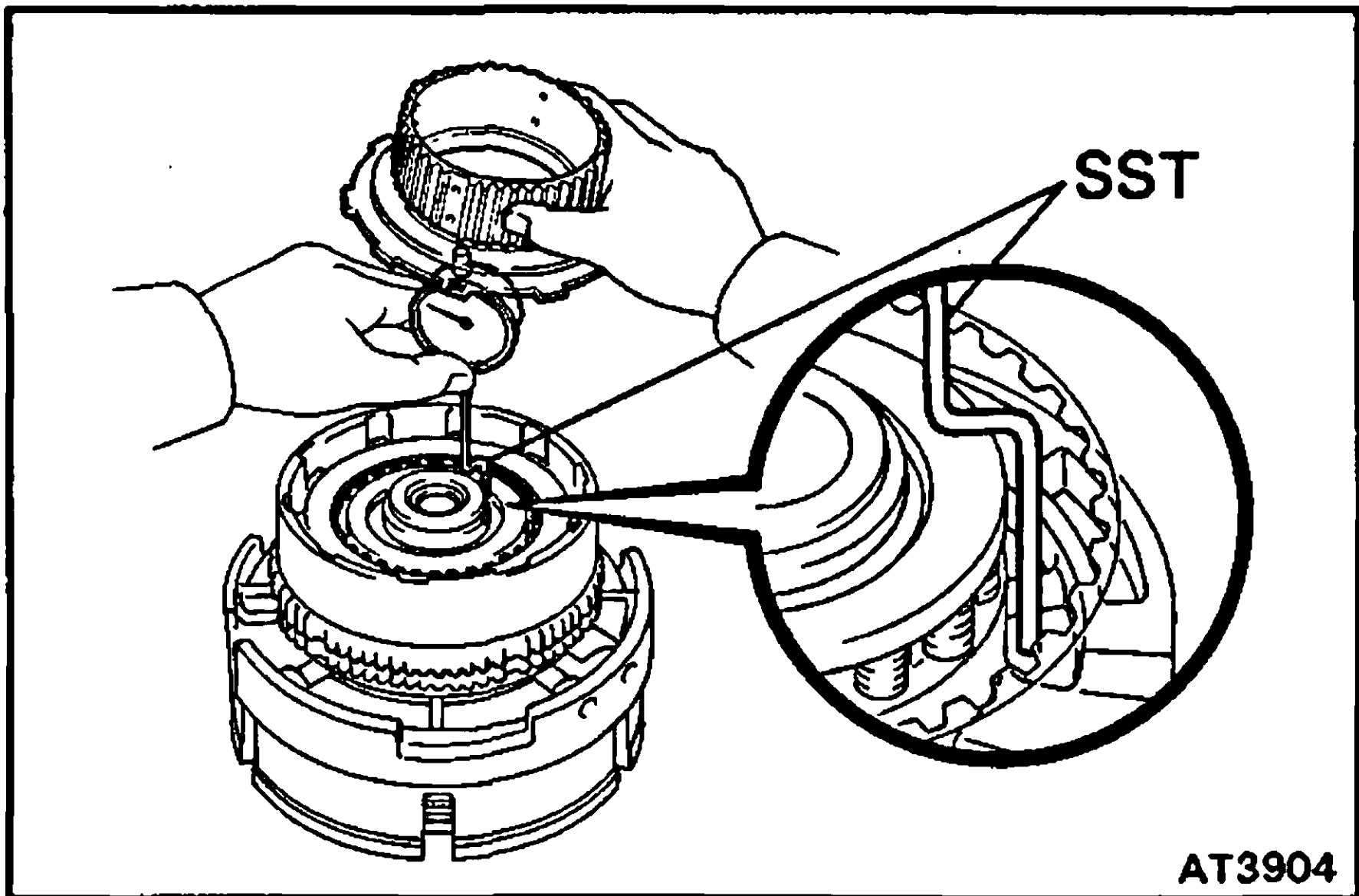
### 5. INSTALL CUSHION PLATE, PLATES AND DISCS

- (a) Install the cushion plate, facing the rounded edge downward.



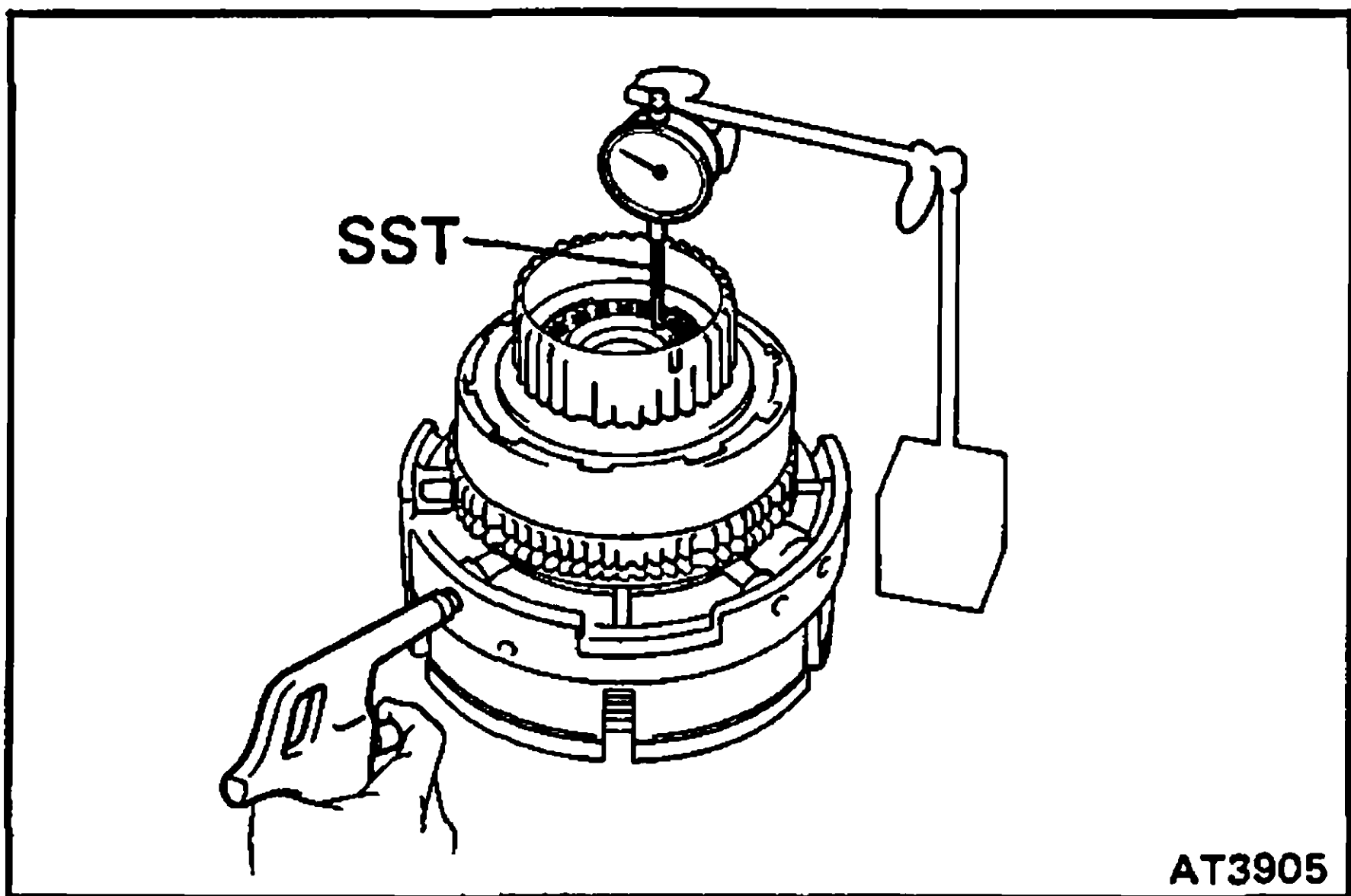


- (b) Install the six plates and six discs in order:  
P = Plate D = Disc  
P—D—P—D—P—D—P—D—P—D—P—D



6. CHECK PISTON STROKE OF FRONT CLUTCH

- (a) Install SST to a dial indicator.  
SST 09350-36010 (09350-06110)  
(b) Place the assembled SST and a dial indicator on the clutch piston.  
(c) Install the rear clutch hub with the snap ring.



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

SST 09350-36010 (09350-06110)

**Piston stroke: 3.93 — 4.23 mm (0.1547 — 0.1665 in.)**  
If the piston stroke is greater than specified, select another plate.

**HINT:** There are four different thicknesses for plate.

mm (in.)

| Thickness   |             |
|-------------|-------------|
| 1.8 (0.071) | 2.2 (0.087) |
| 2.0 (0.079) | 2.4 (0.094) |

- (e) Remove the snap ring and rear clutch hub.

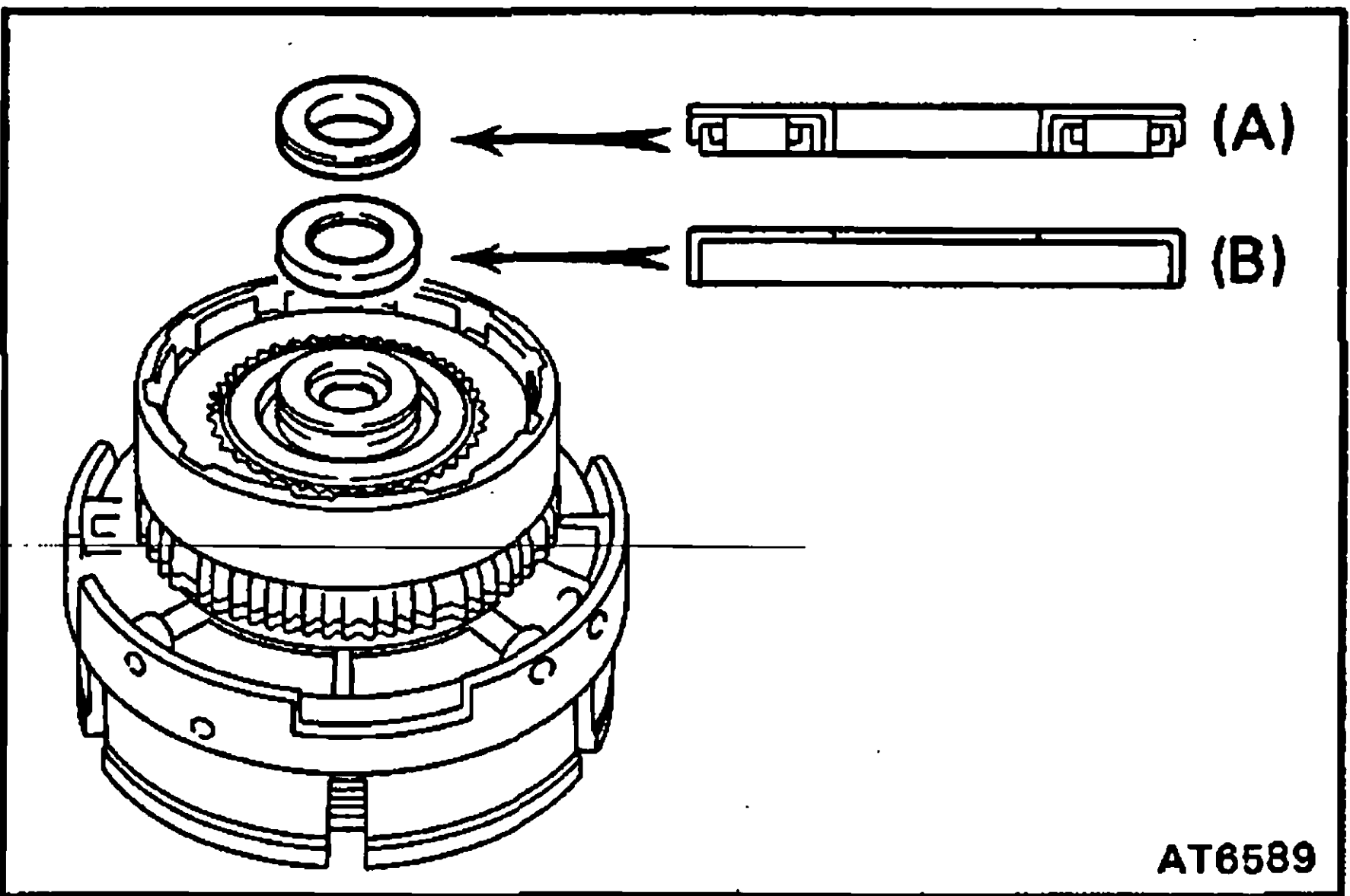
7. INSTALL FRONT AND REAR CLUTCH HUBS

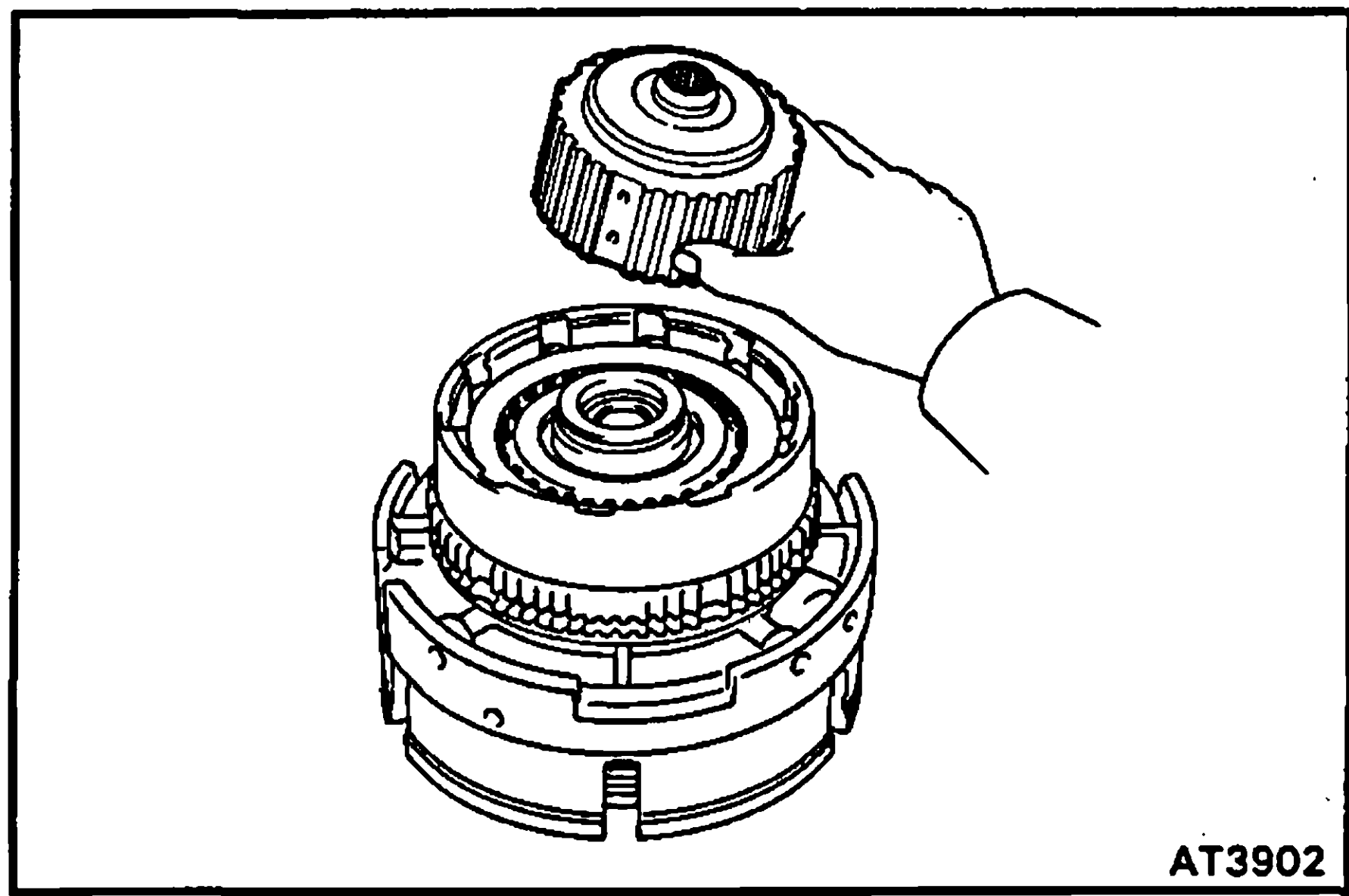
- (a) Coat the race and assembled bearing with petroleum jelly, and install them onto the front clutch drum.

**HINT:** Race and assembled bearing diameter

mm (in.)

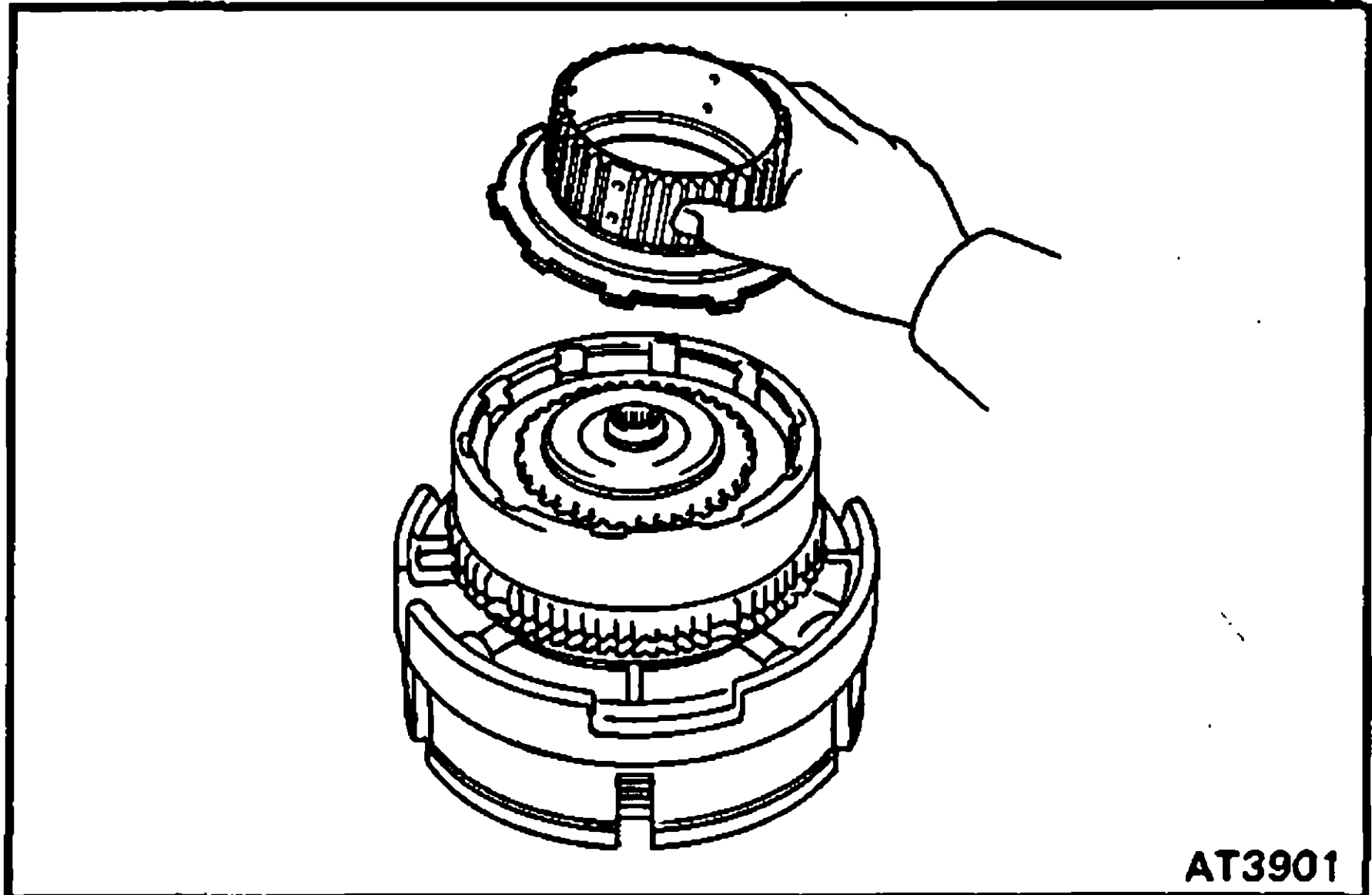
|                                | Inside       | Outside      |
|--------------------------------|--------------|--------------|
| Assembled bearing and race (A) | 32.8 (1.291) | 50.4 (1.984) |
| Race (B)                       | 37.0 (1.457) | 52.0 (2.047) |



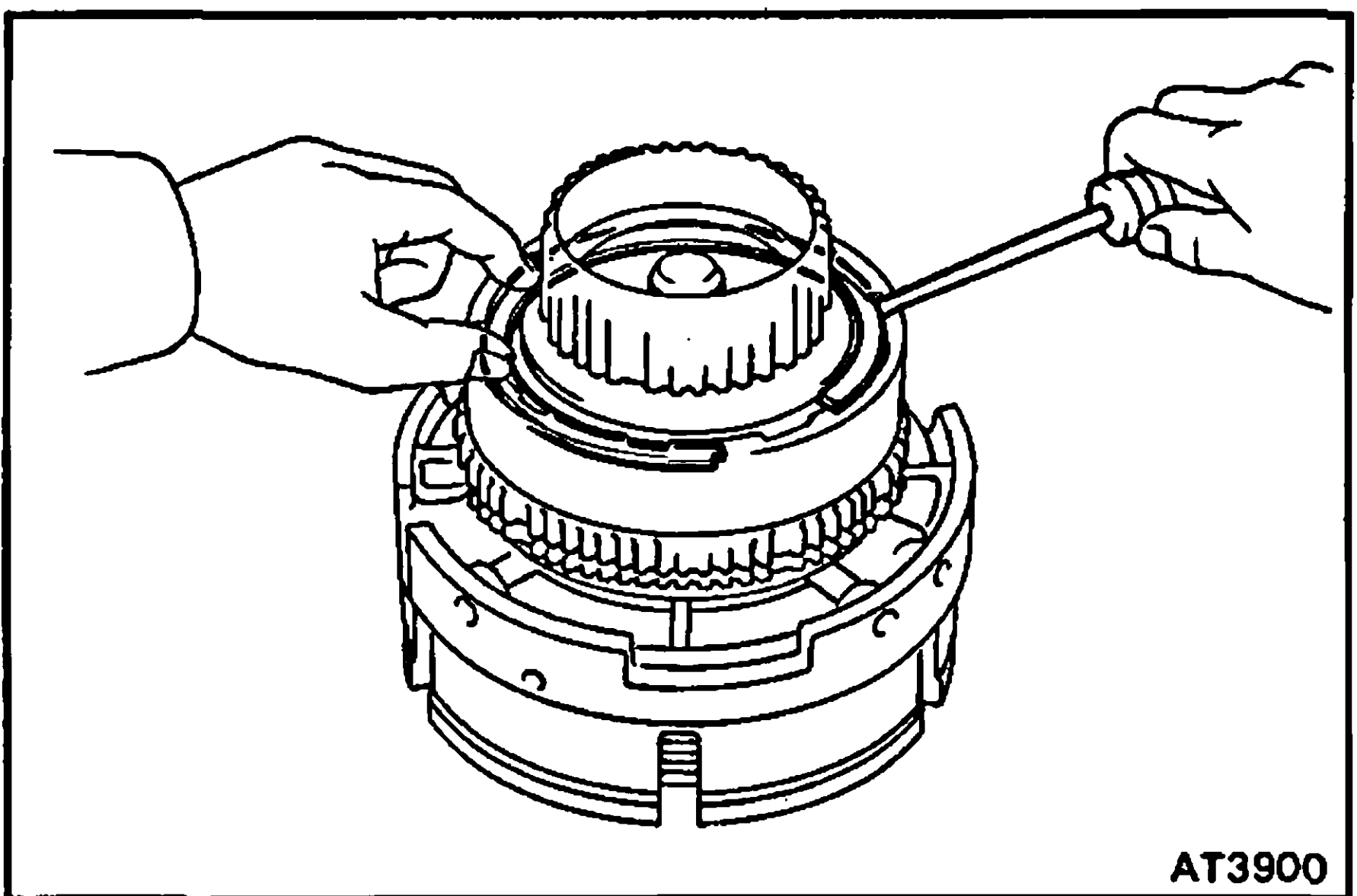


(b) Install the front clutch hub into the clutch drum.

HINT: Mesh the spline of the front clutch hub with the flukes of the discs by rotating the front clutch hub clockwise or counterclockwise.



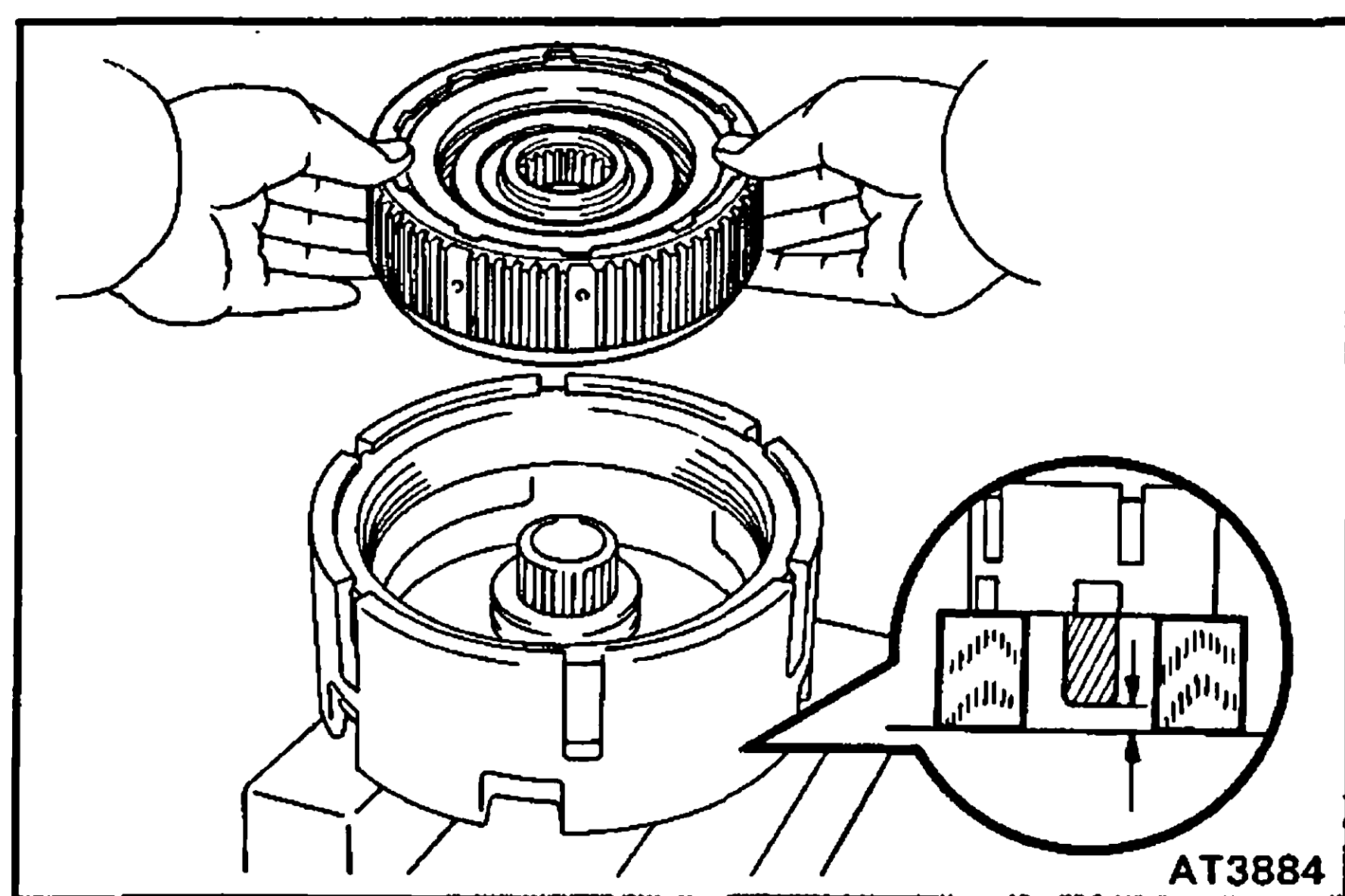
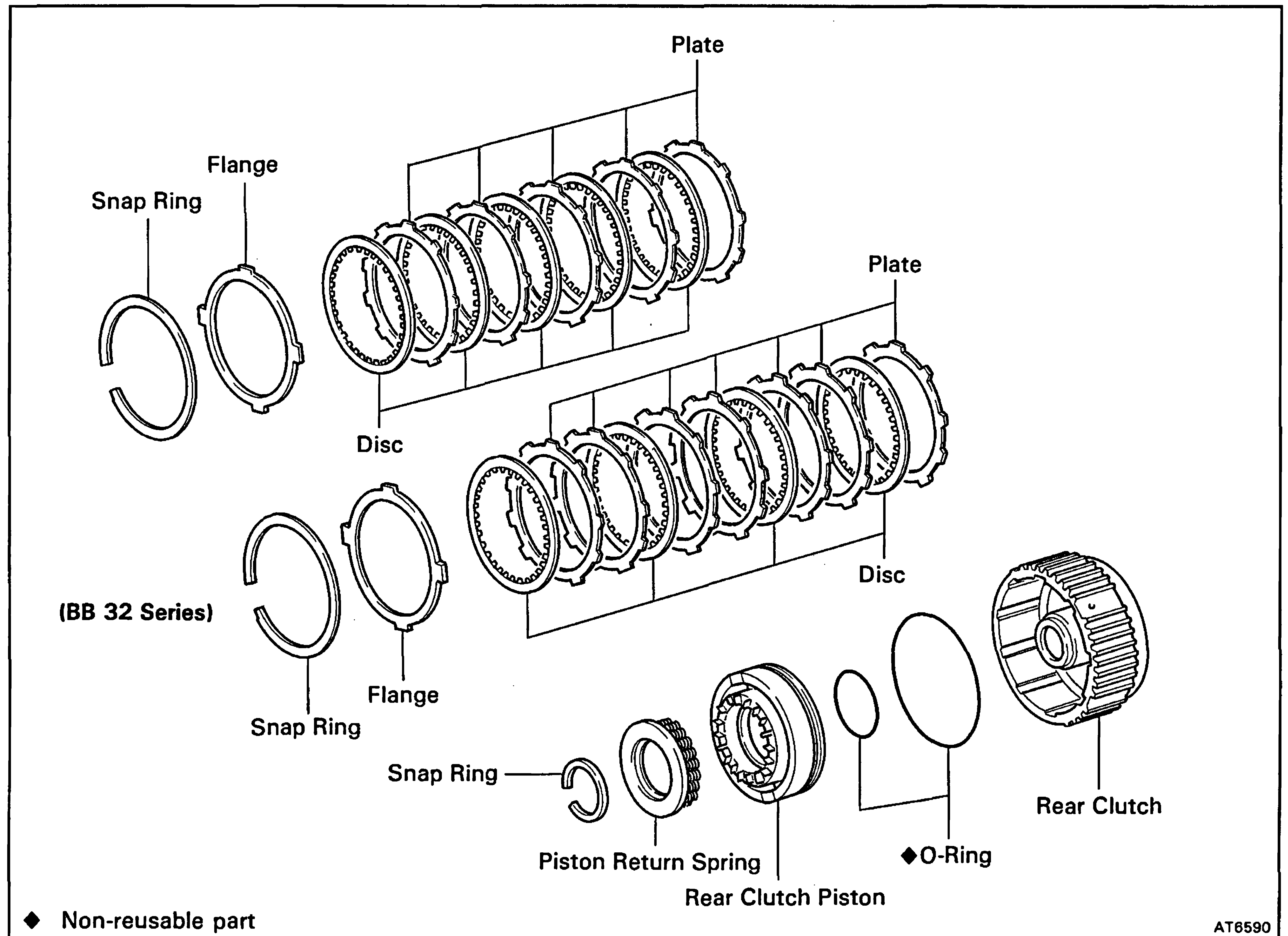
(c) Install the rear clutch hub onto the clutch drum.



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

HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the front clutch drum.

## Rear Clutch COMPONENTS



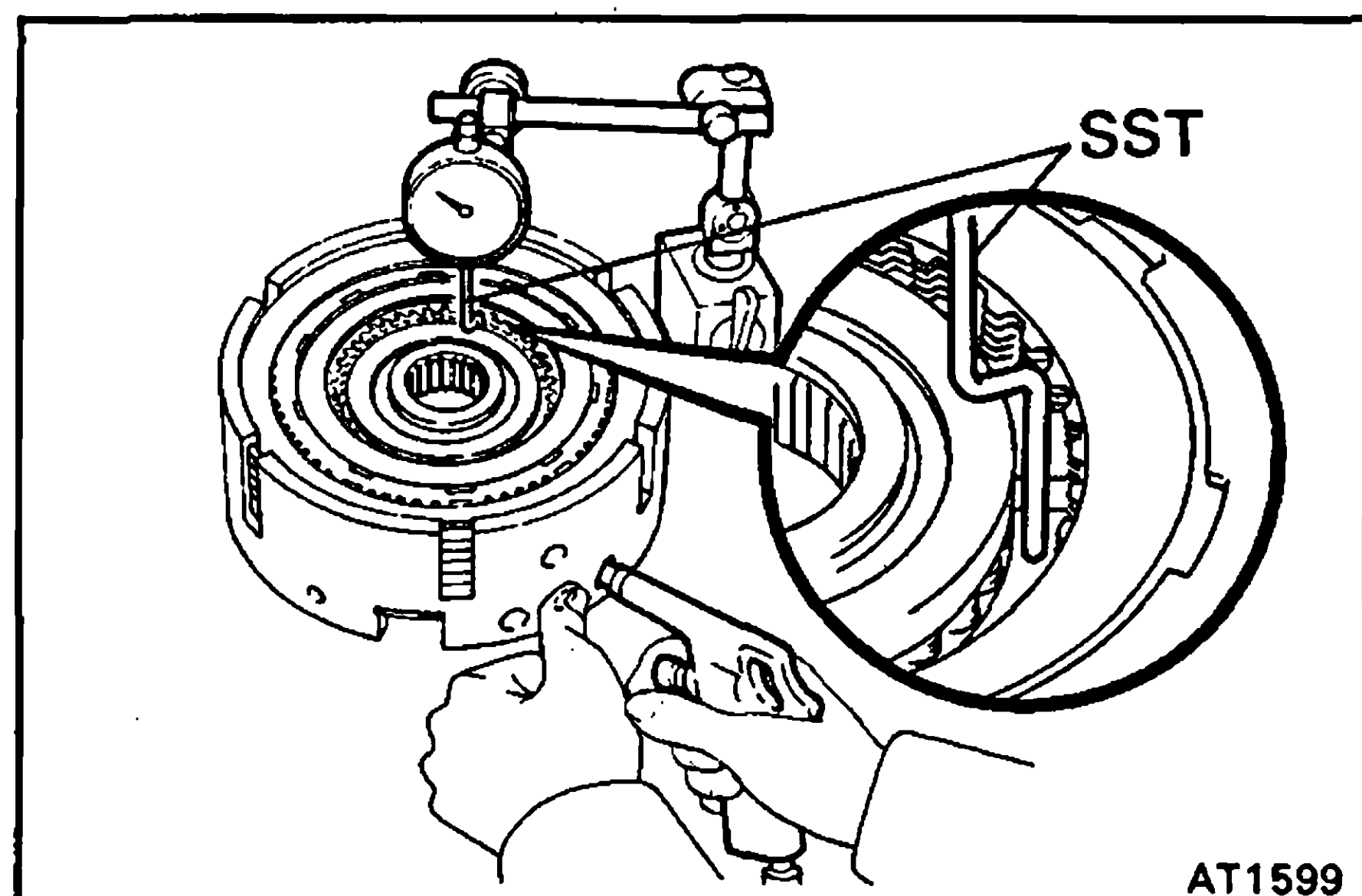
### DISASSEMBLY OF REAR CLUTCH

#### 1. CHECK PISTON STROKE OF REAR CLUTCH

- (a) Place the center support assembly on wooden blocks.

HINT: Provide clearance so that the sun gear does not touch the rear clutch drum.

- (b) Place the rear clutch assembly into the center support assembly.

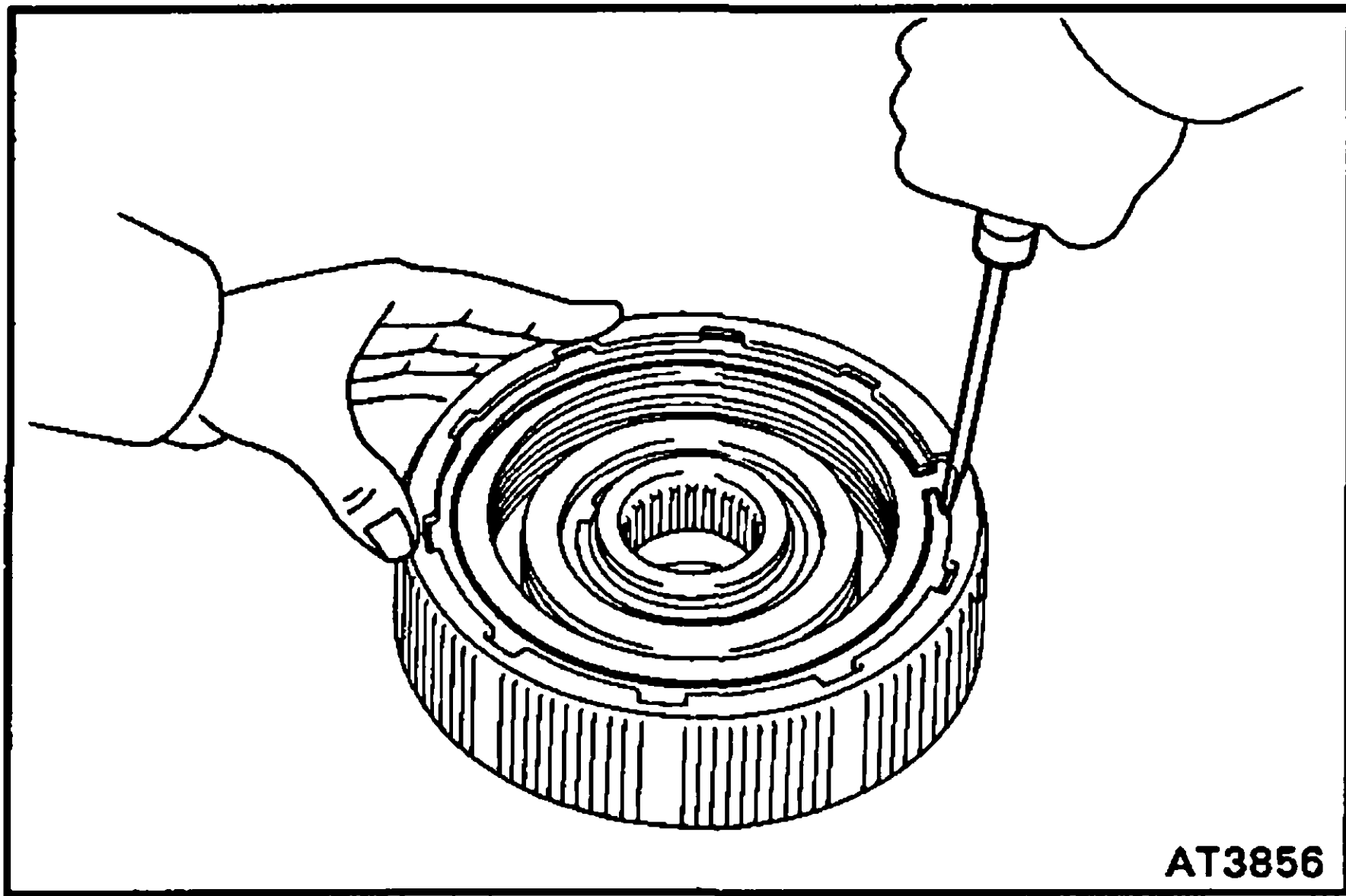


- (b) Using SST and a dial indicator, measure the piston stroke by applying and releasing the compressed air ( $4 - 8 \text{ kg/cm}^2$ ,  $57 - 114 \text{ psi}$  or  $392 - 785 \text{ kPa}$ ) as shown.

SST 09350-36010 (09350-06110)

Piston stroke:  $1.70 - 1.90 \text{ mm}$  ( $0.0669 - 0.0748 \text{ in.}$ )

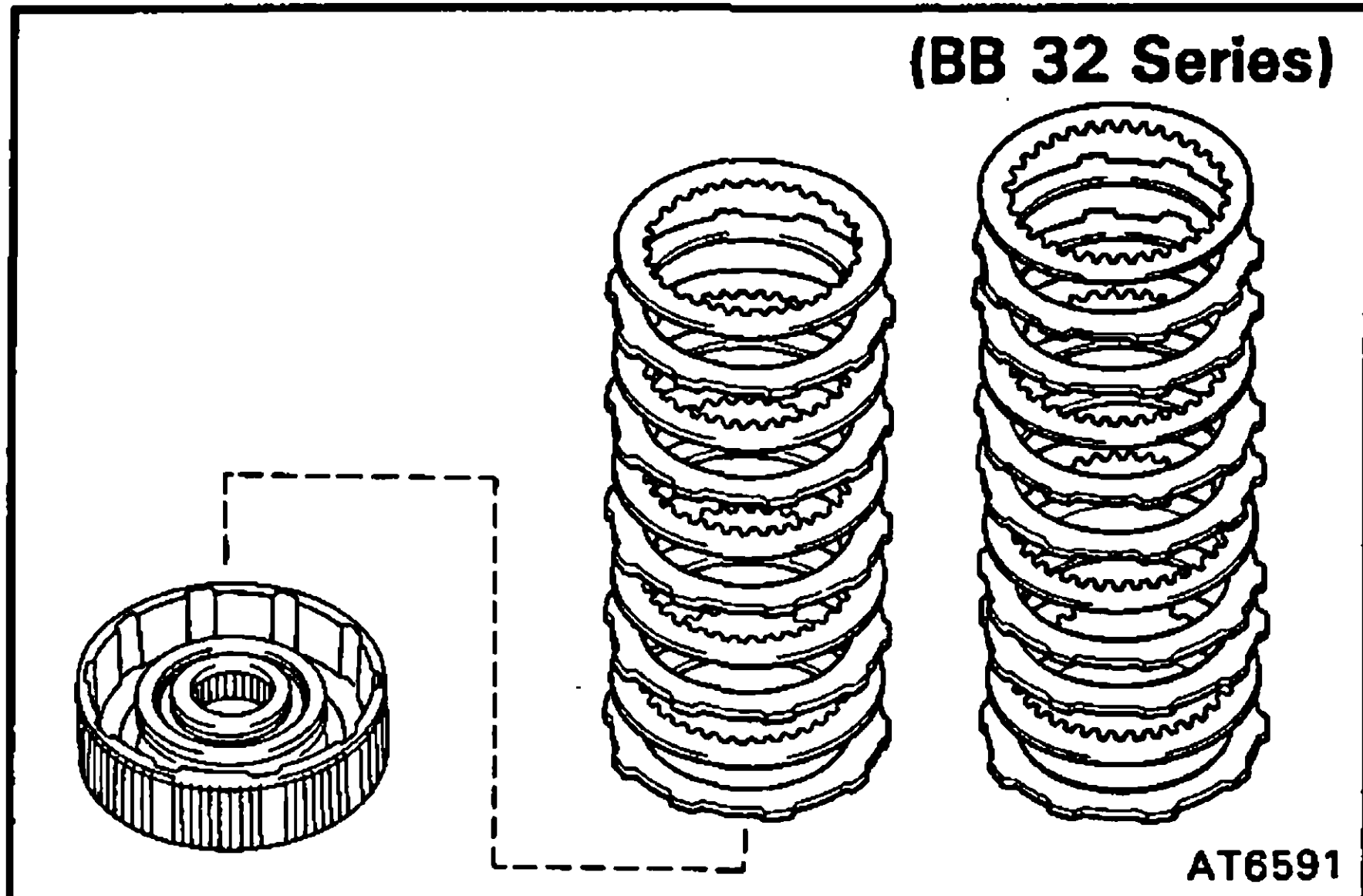
If the piston stroke is greater than specified, inspect the discs.



AT3856

## 2. REMOVE FLANGE, DISCS AND PLATES

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

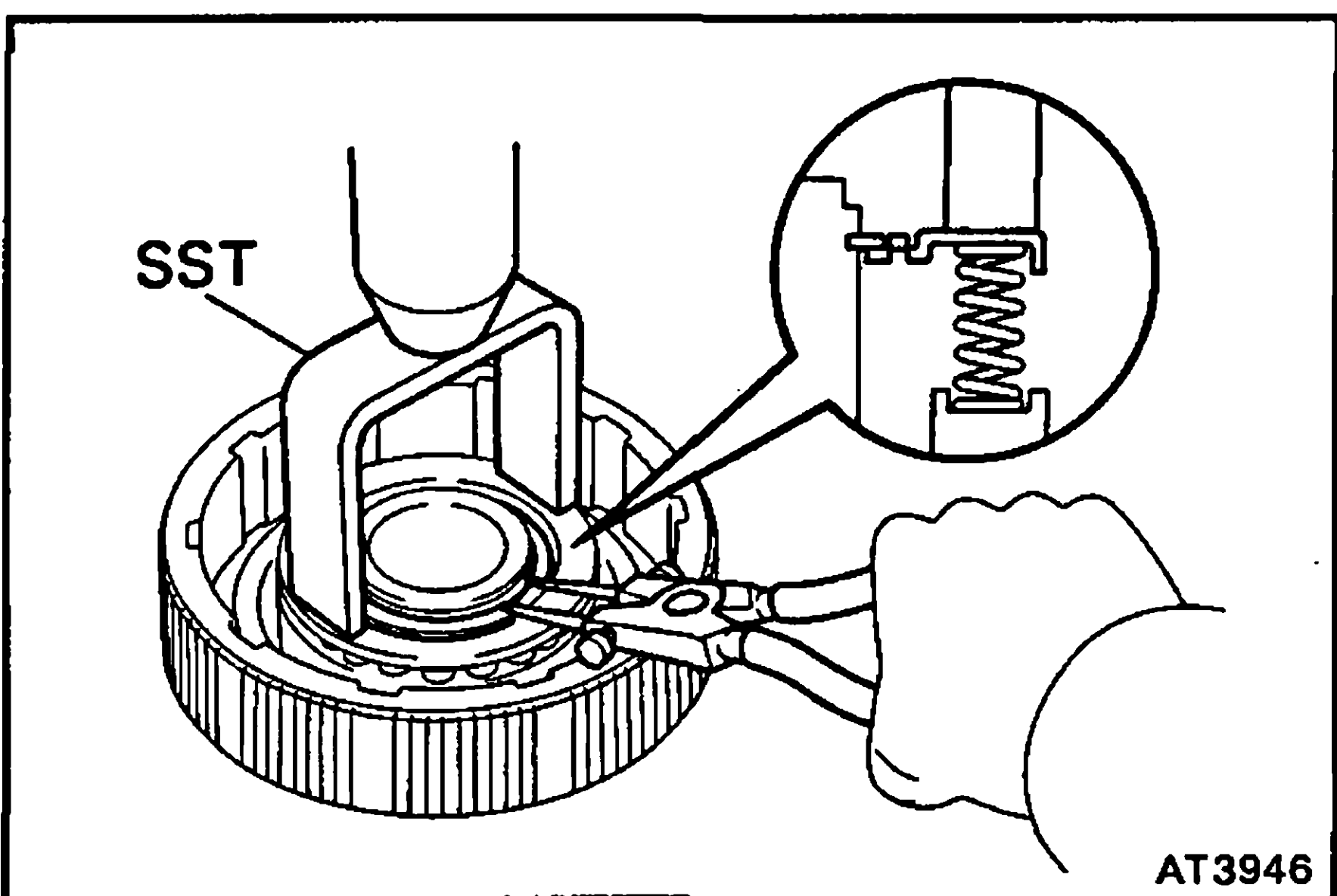


AT6591

(b) Remove the flange, five discs and five plates.

**(BB32 Series)**

(b) Remove the flange, four discs and seven plates.



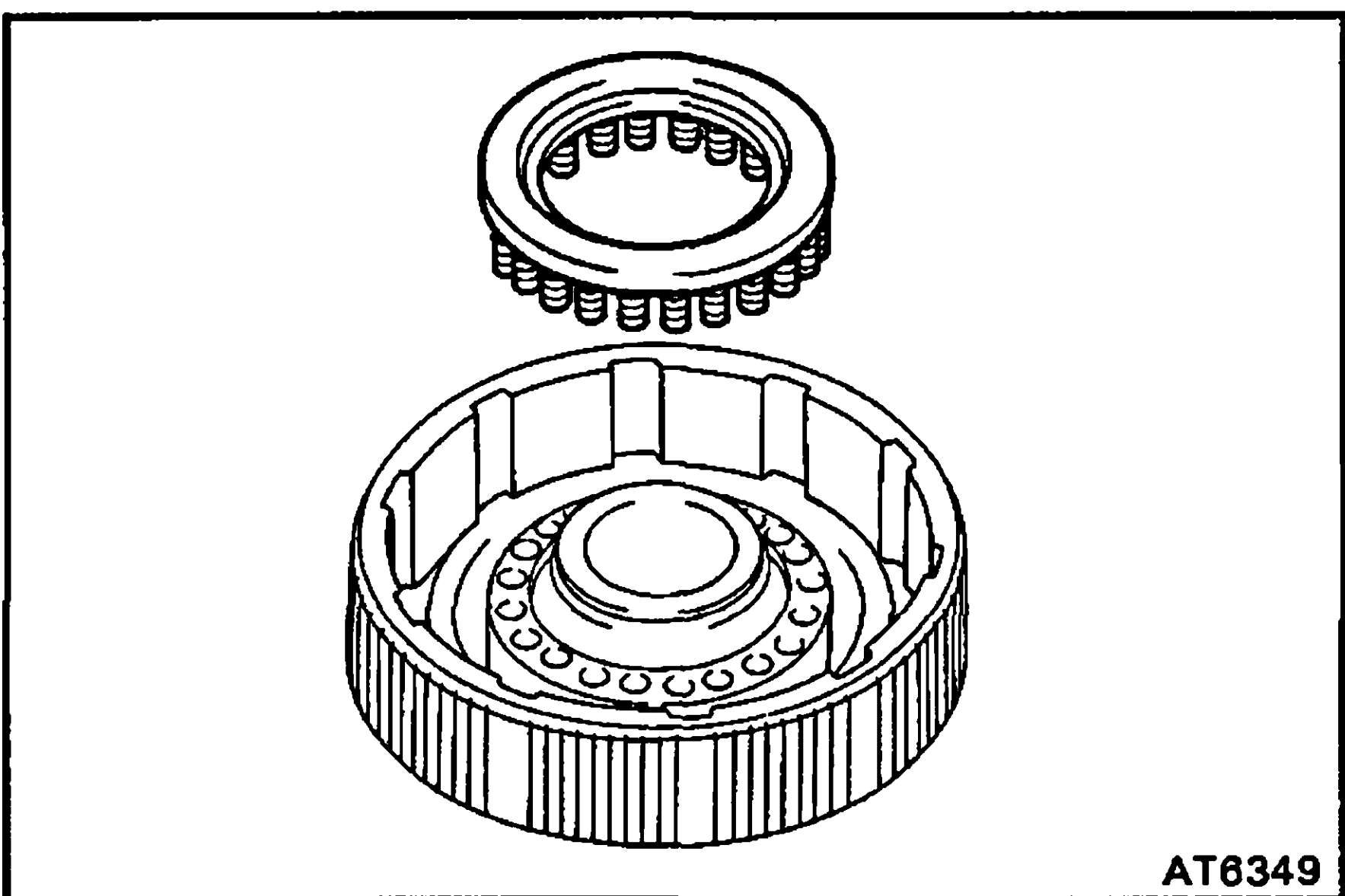
AT3946

## 3. REMOVE PISTON RETURN SPRINGS

(a) Place SST on the spring seat, and compress the return spring with a shop press.

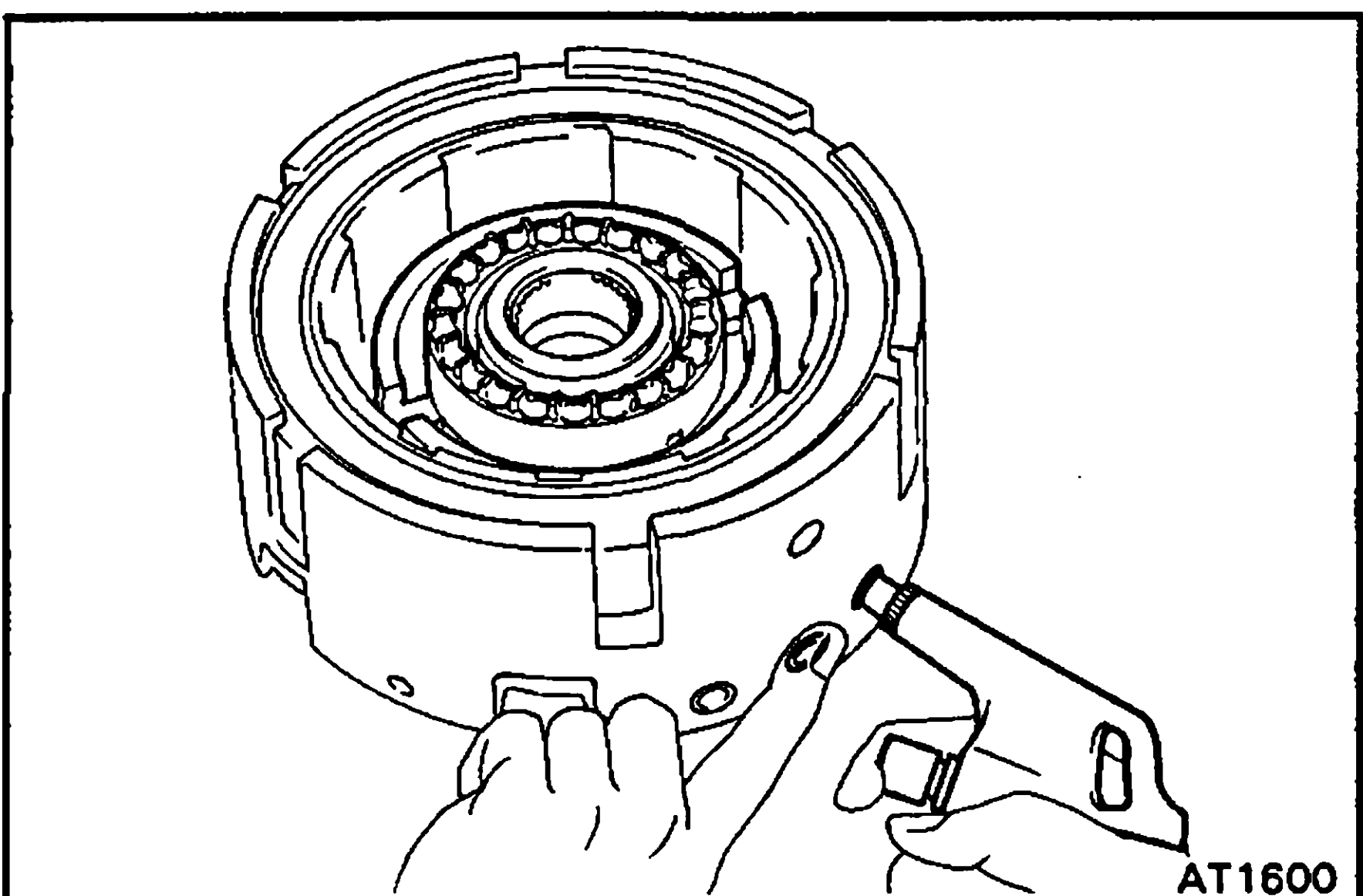
SST 09350-36010 (09350-06010)

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



AT6349

(c) Remove the piston return spring.



AT1600

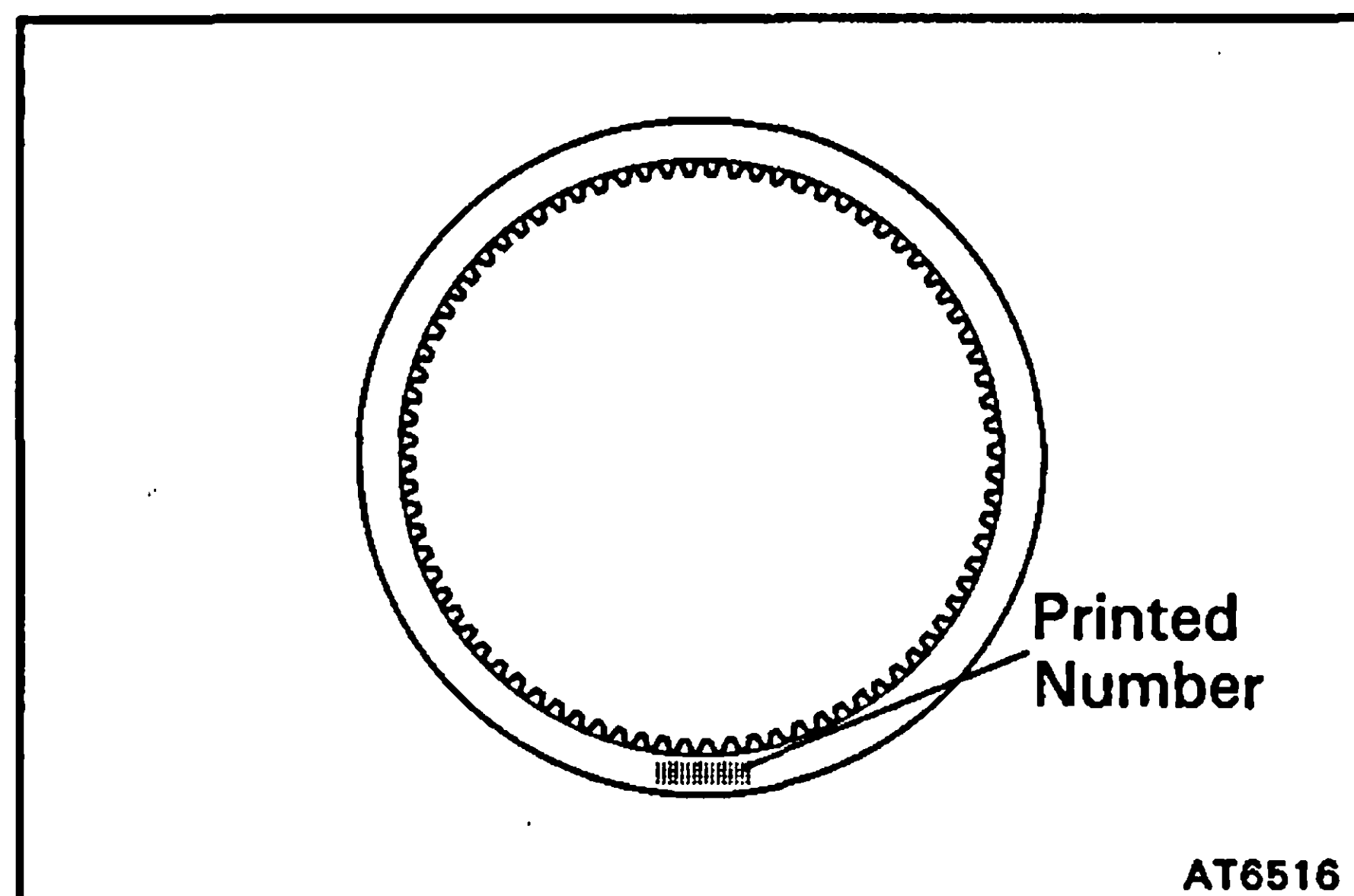
## 4. REMOVE REAR CLUTCH PISTON

(a) Place the center support assembly on wooden blocks. (See step (1) on page AT-58)

(b) Place the clutch drum onto the center support assembly.

(c) Hold the piston with hand, apply compressed air into the oil hole of the center support to remove the clutch piston.

(d) Remove the two O-rings from the clutch piston.



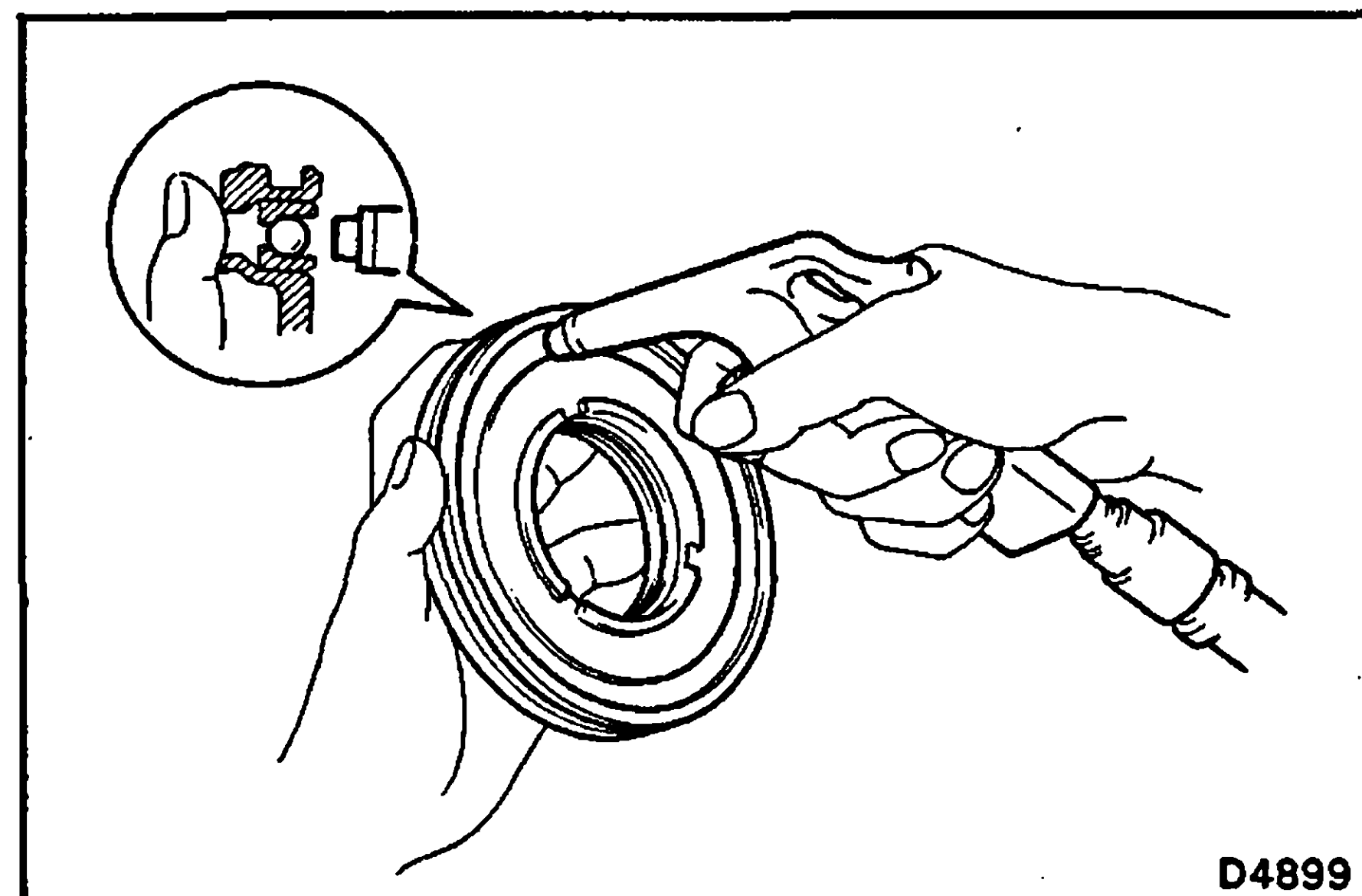
## INSPECTION OF REAR CLUTCH

### 1. INSPECT DISCS, PLATES AND FLANGE

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

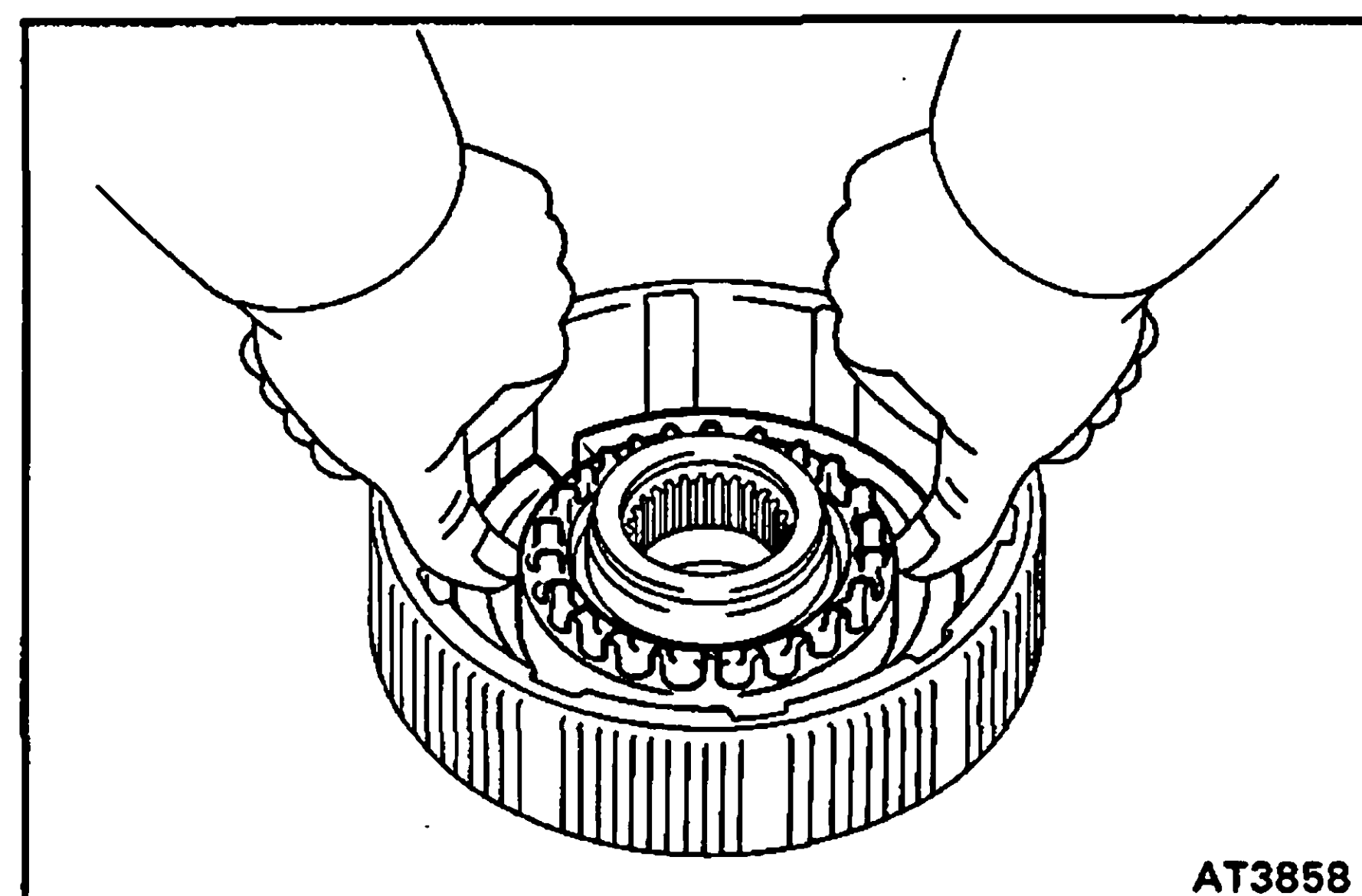
#### HINT:

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



### 2. INSPECT REAR CLUTCH PISTON

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

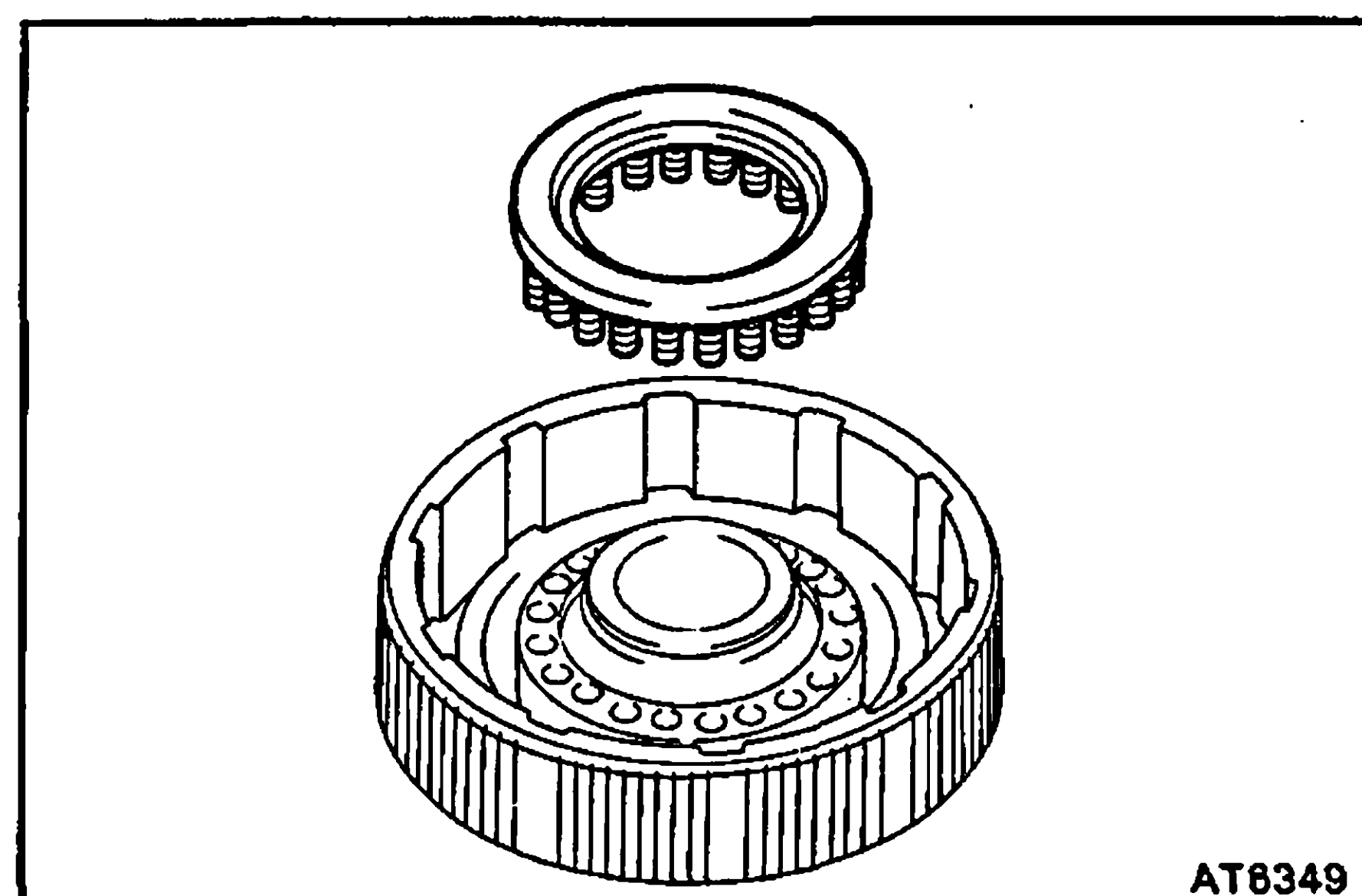


## ASSEMBLY OF REAR CLUTCH

### 1. INSTALL REAR CLUTCH PISTON

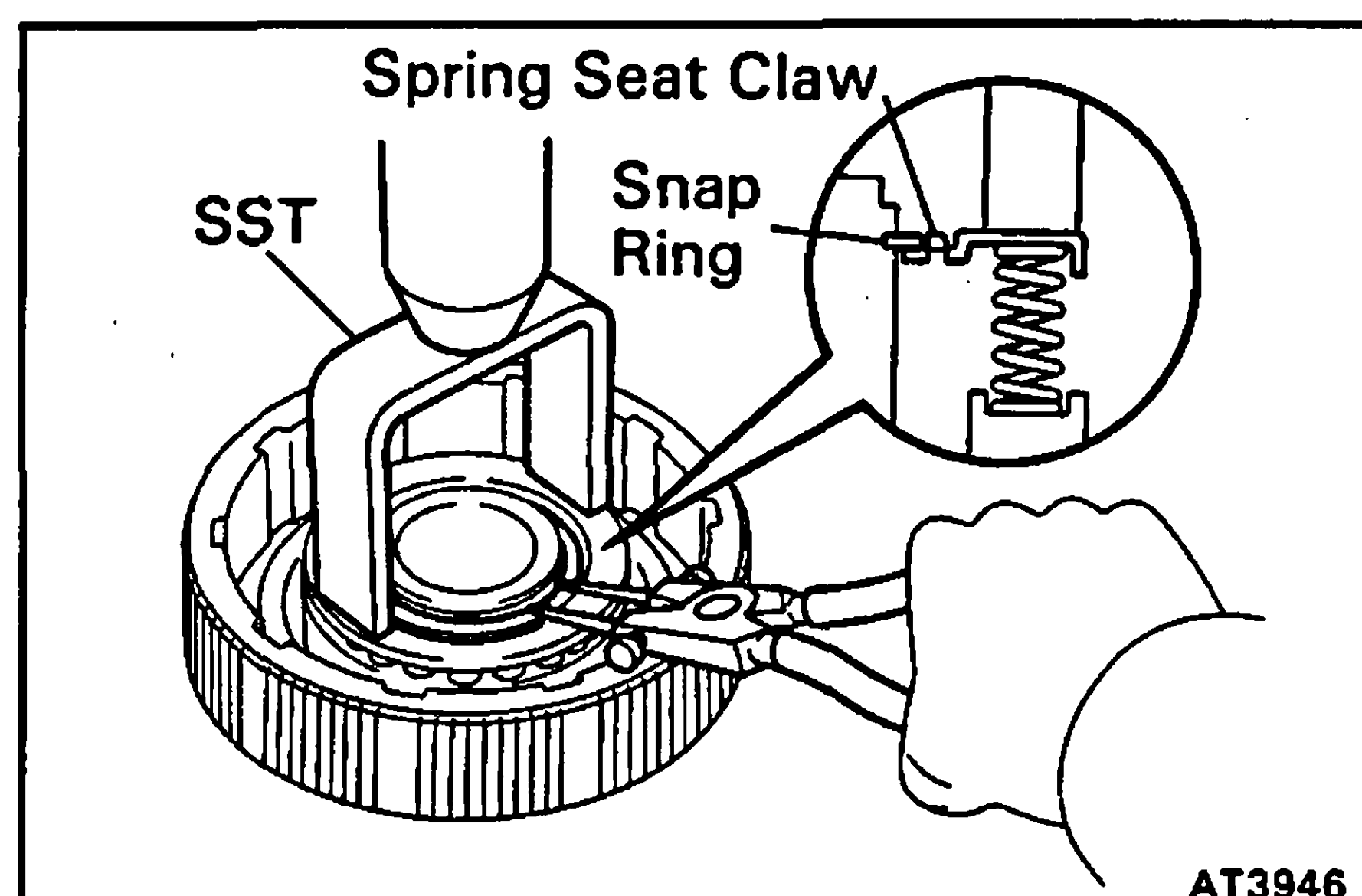
- Coat new O-rings with ATF, and install them on the clutch drum.
- Push in the clutch piston into the clutch drum with both hands.

**NOTICE:** Be careful not to damage the O-rings.



### 2. INSTALL PISTON RETURN SPRINGS

- Place the piston return spring on the clutch piston.

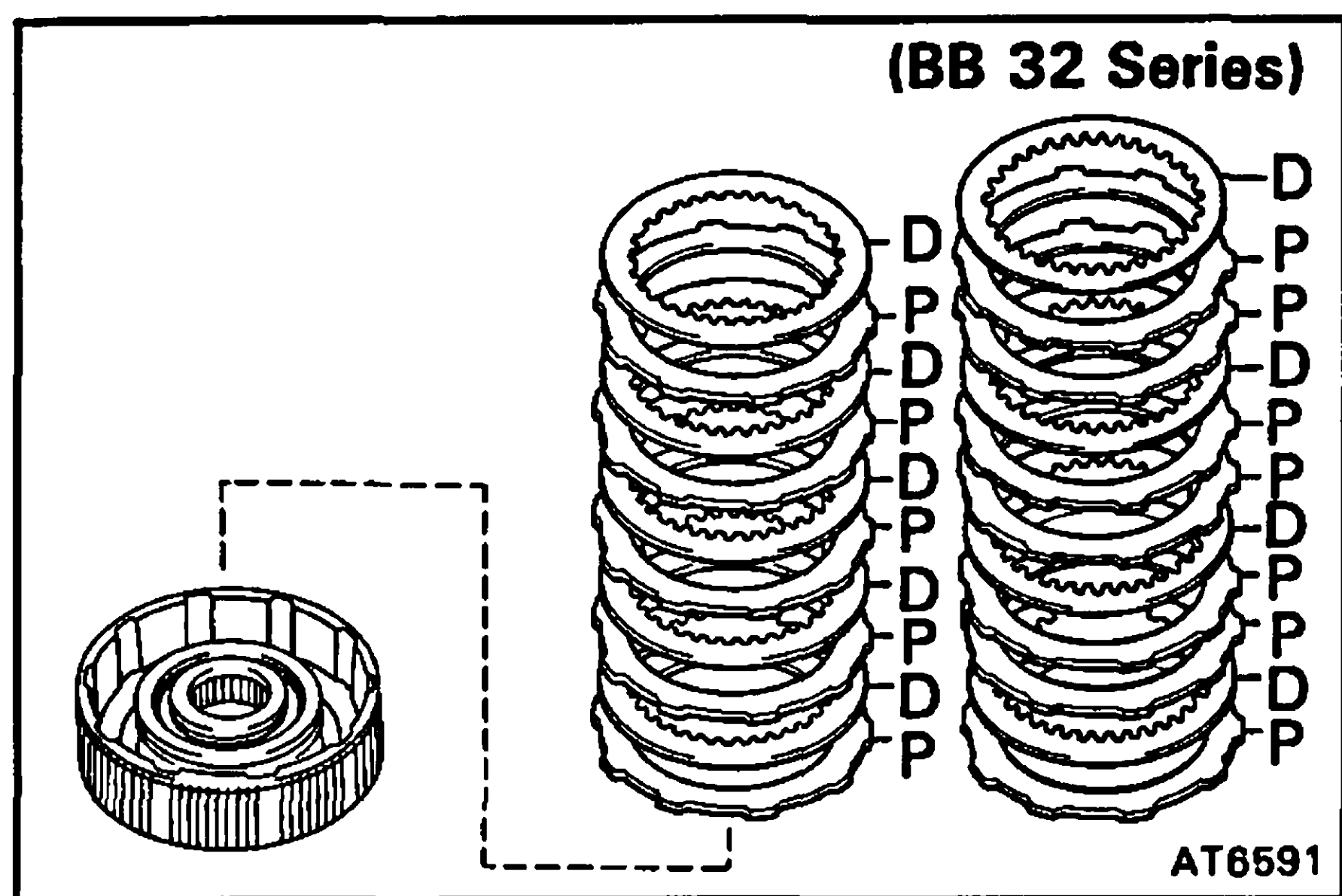


- Place SST on the spring seat, and compress the return springs with a shop press.

SST 09350-36010 (09350-06010)

- Using snap ring pliers, install the snap ring.

**HINT:** Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



### 3. INSTALL PLATES, DISCS AND FLANGE

(a) Install the five plates and five discs in order:

P = Plate D = Disc

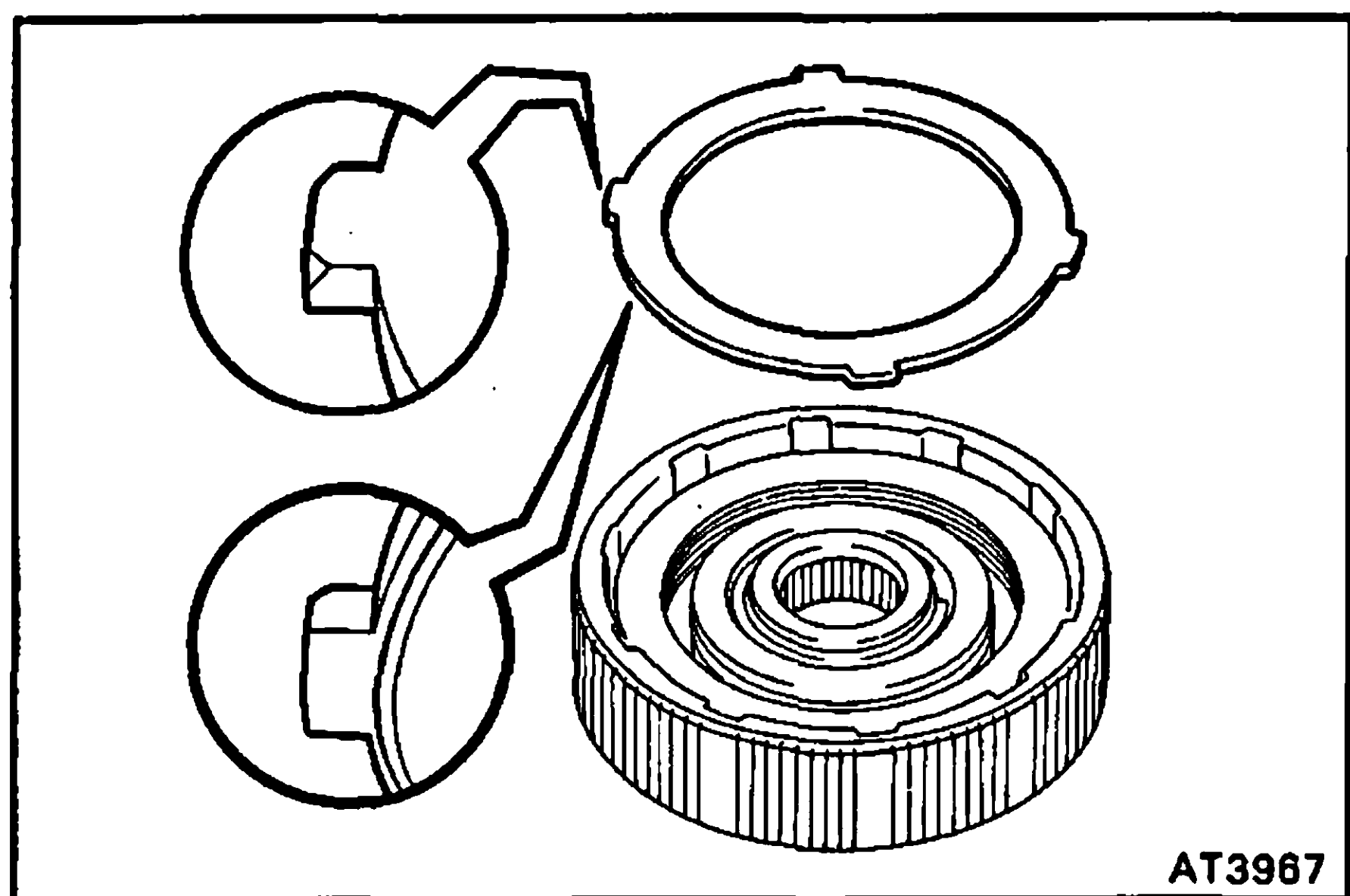
P-D-P-D-P-D-P-D-P-D

(BB32 Series)

(b) Install the seven plates and four discs in order:

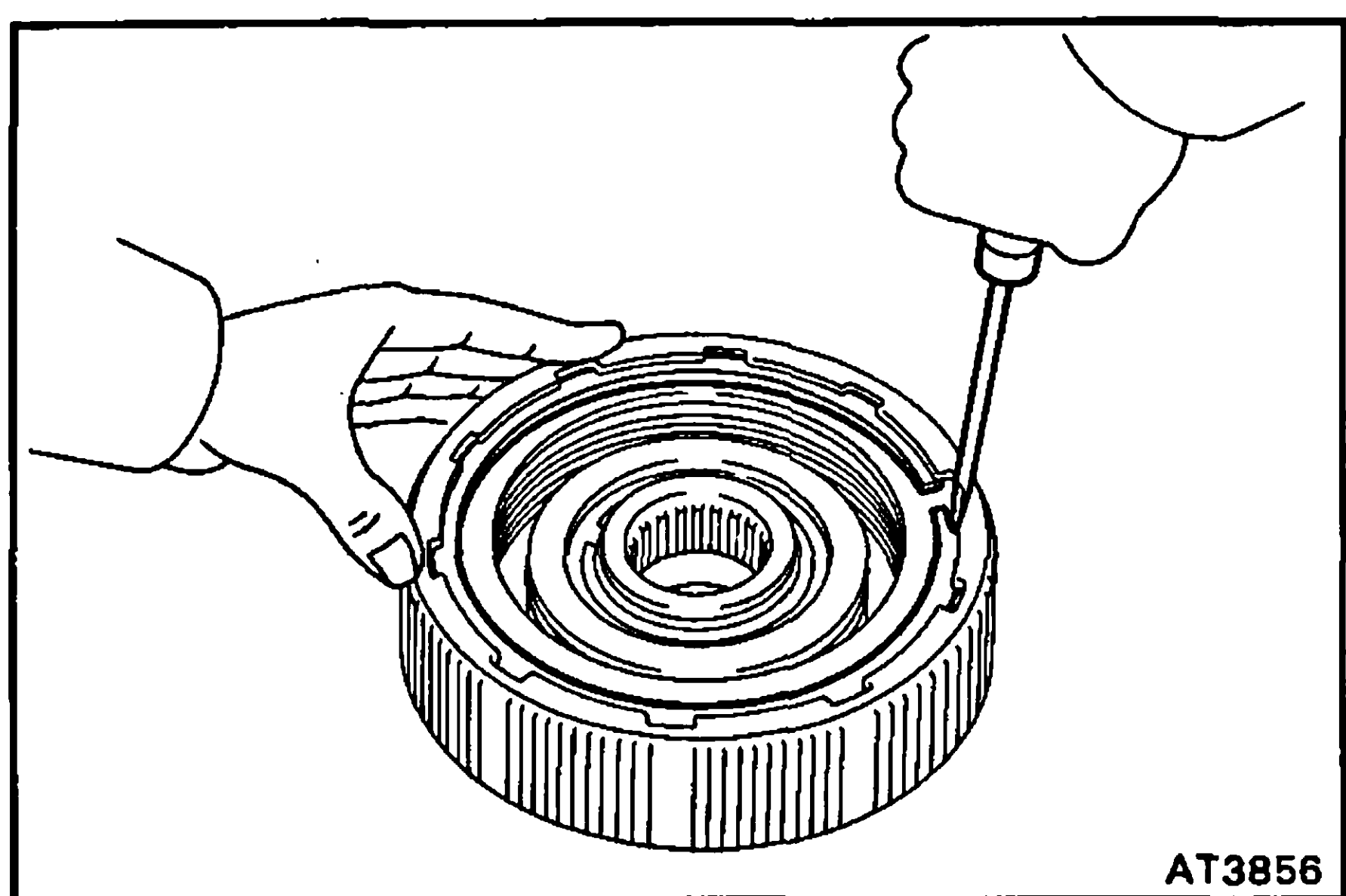
P = Plate D = Disc

P-D-P-P-D-P-P-D-P-P-D



(b) Install the flange, facing the rounded edge upward.

HINT: If the flange is step-edged, install the flange with the step-edge, facing downward.



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

HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the rear clutch drum.

### 4. CHECK PISTON STROKE OF REAR CLUTCH

(a) Place the center support assembly on wooden blocks.

HINT: Provide clearance so that the sun gear does not touch the rear clutch drum.

(b) Place the rear clutch assembly onto the center support assembly.

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

SST 09350-36010 (09350-06110)

Piston stroke: 1.70 — 1.90 mm (0.0669 — 0.0748 in.)

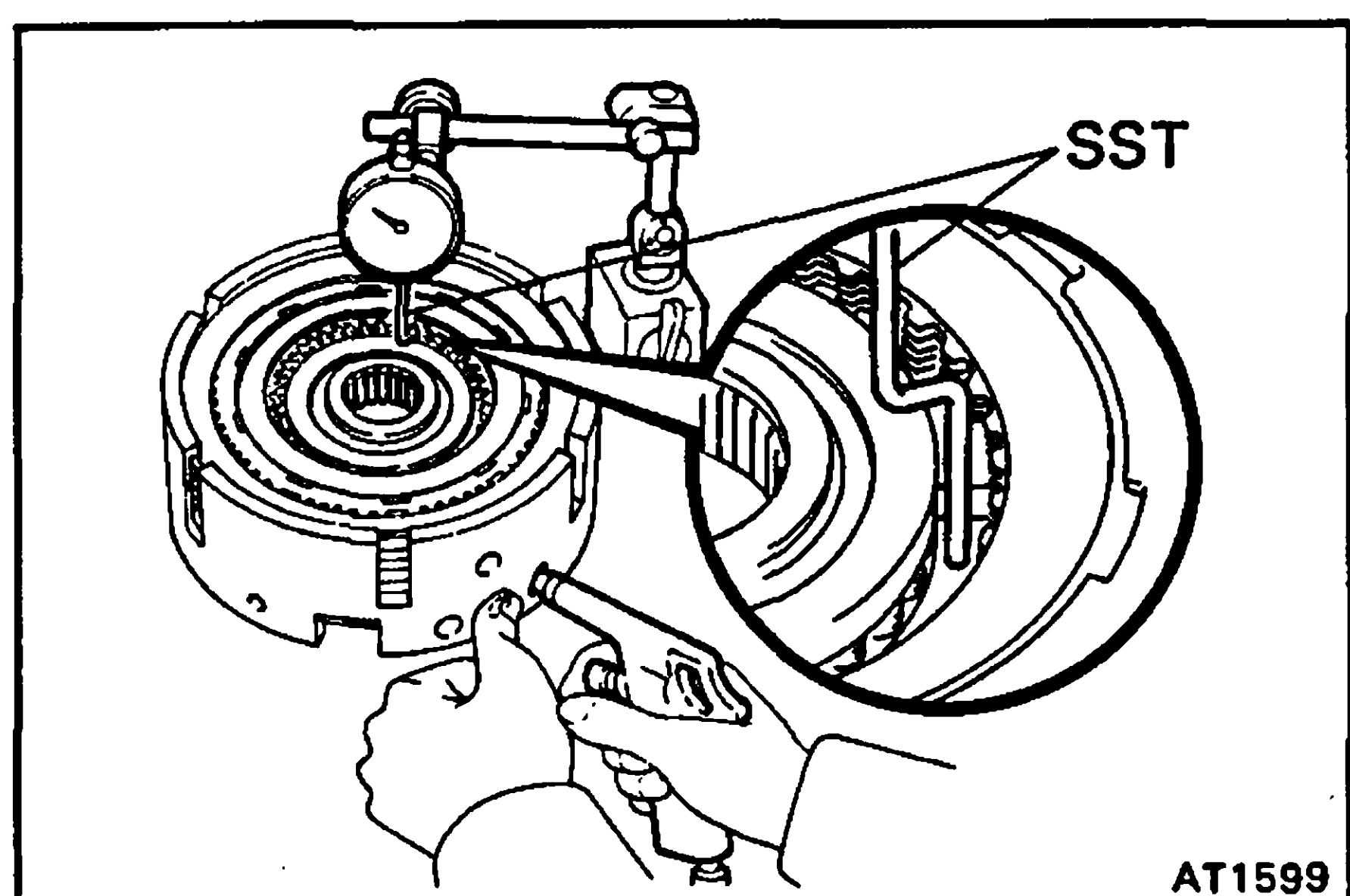
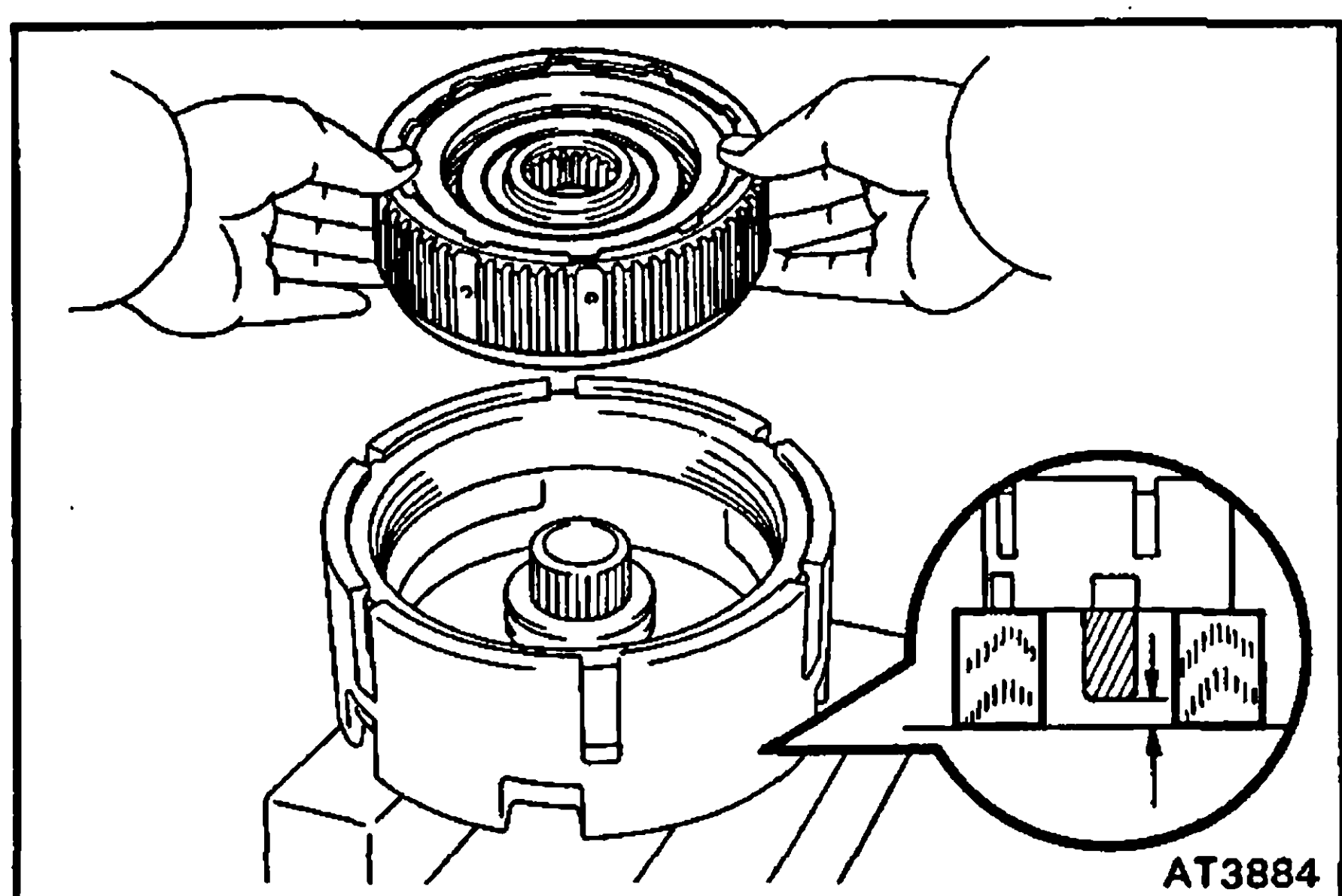
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

If the piston stroke is not as specified, select another flange.

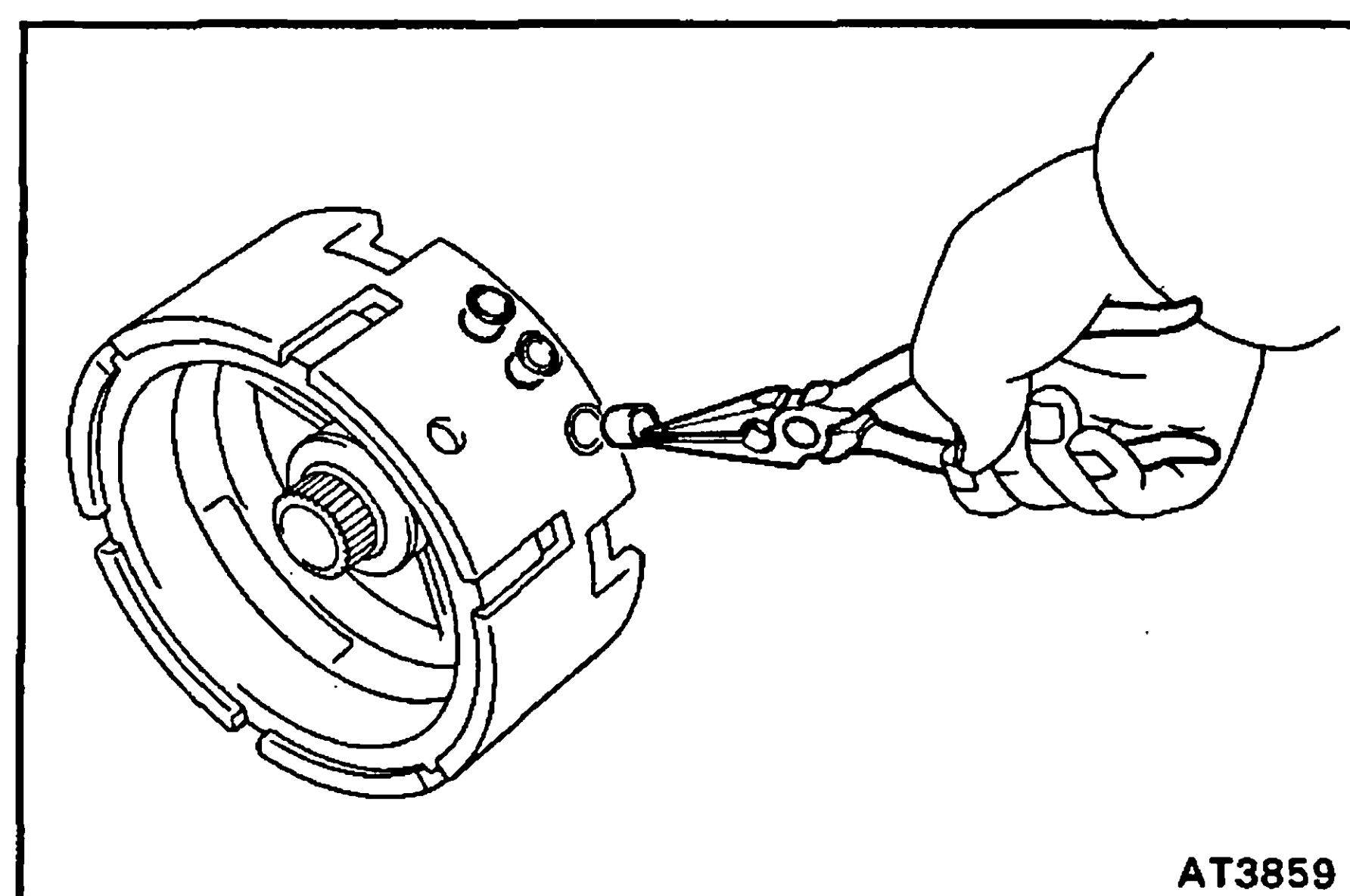
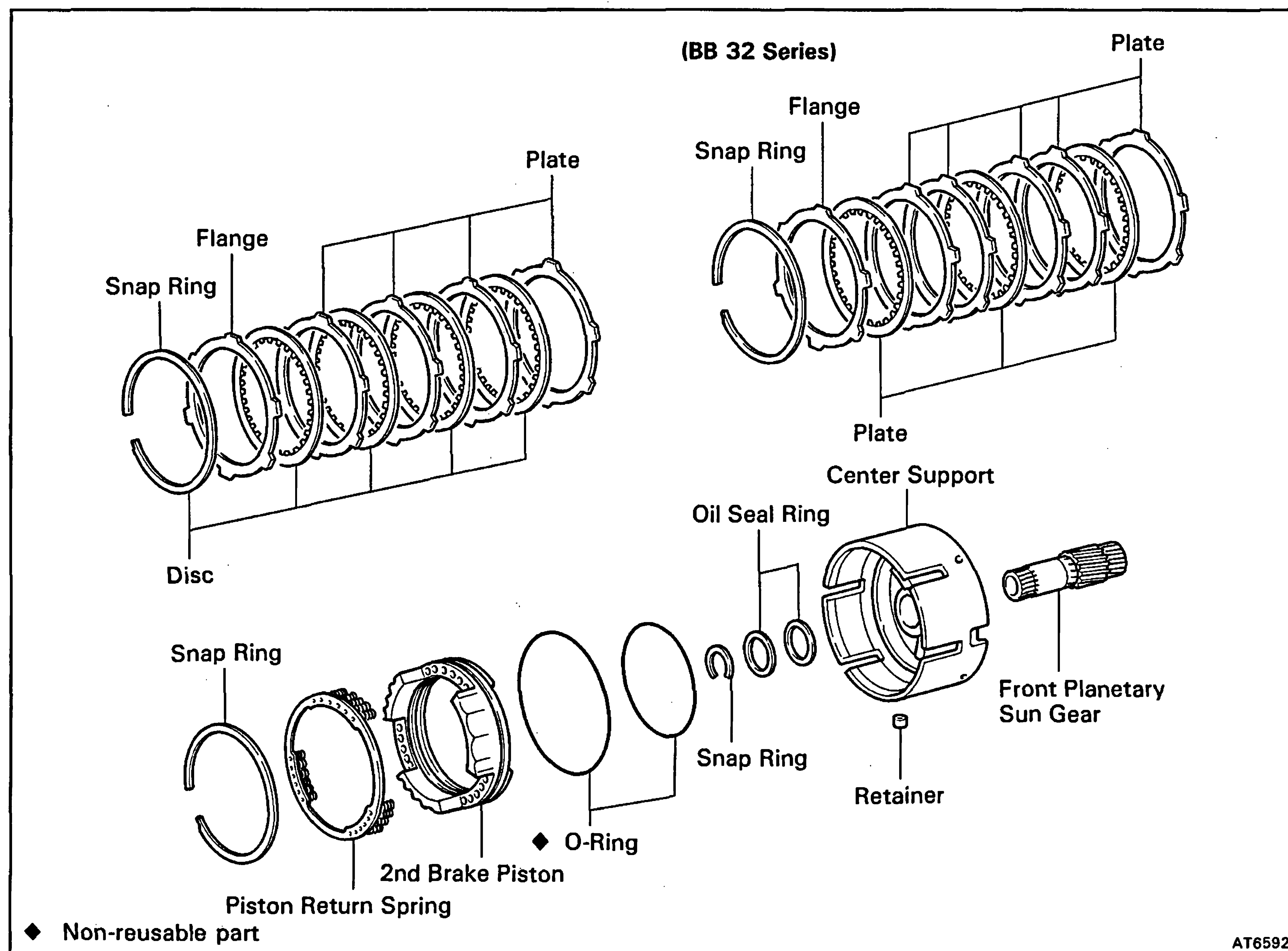
HINT: There are four different thicknesses for flange.

mm (in.)

| No.  | Thickness   | No. | Thickness   |
|------|-------------|-----|-------------|
| None | 5.0 (0.197) | 2   | 5.4 (0.213) |
| 1    | 5.2 (0.205) | 3   | 5.6 (0.220) |



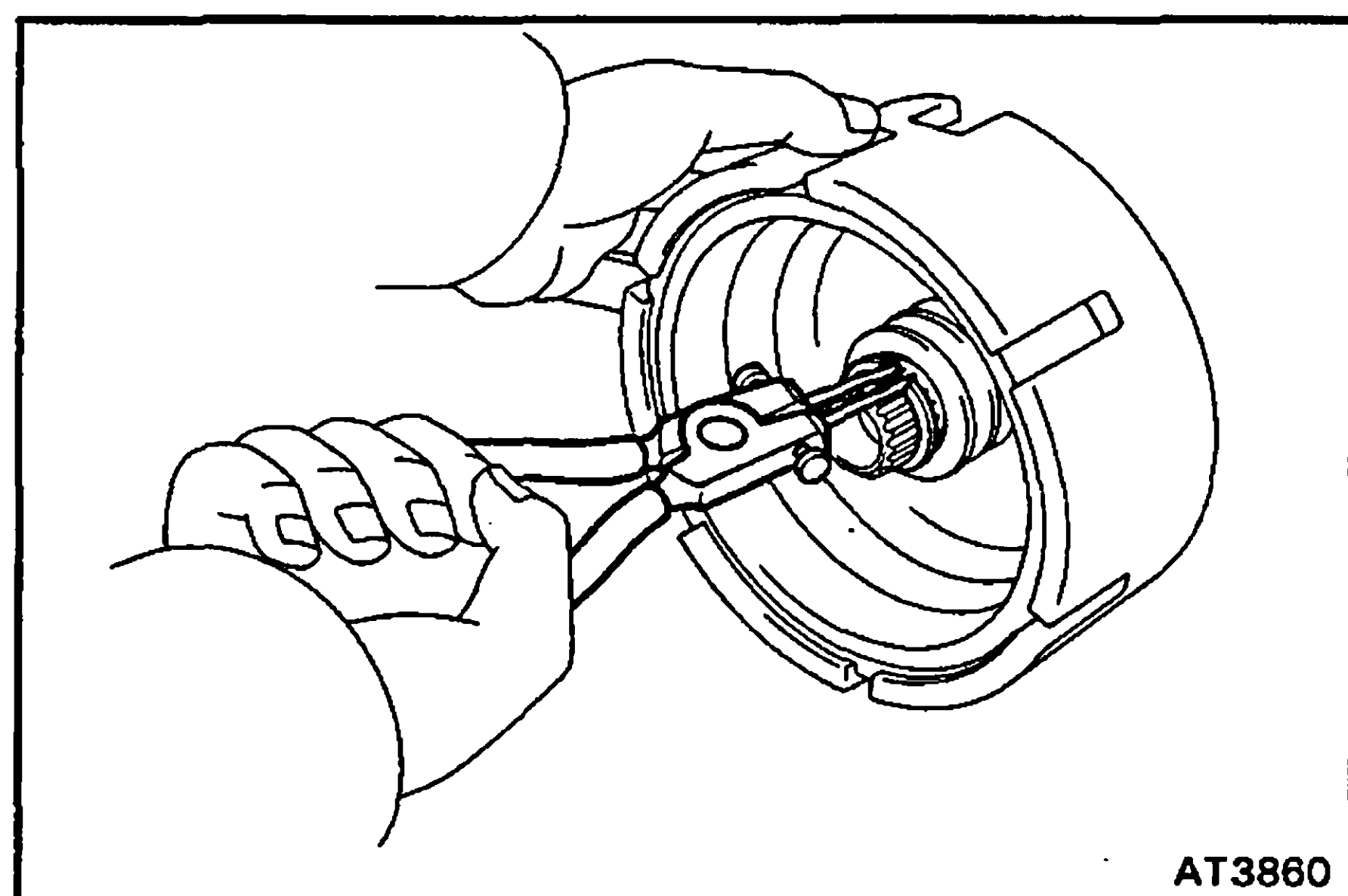
## Second Brake COMPONENTS



### DISASSEMBLY OF SECOND BRAKE

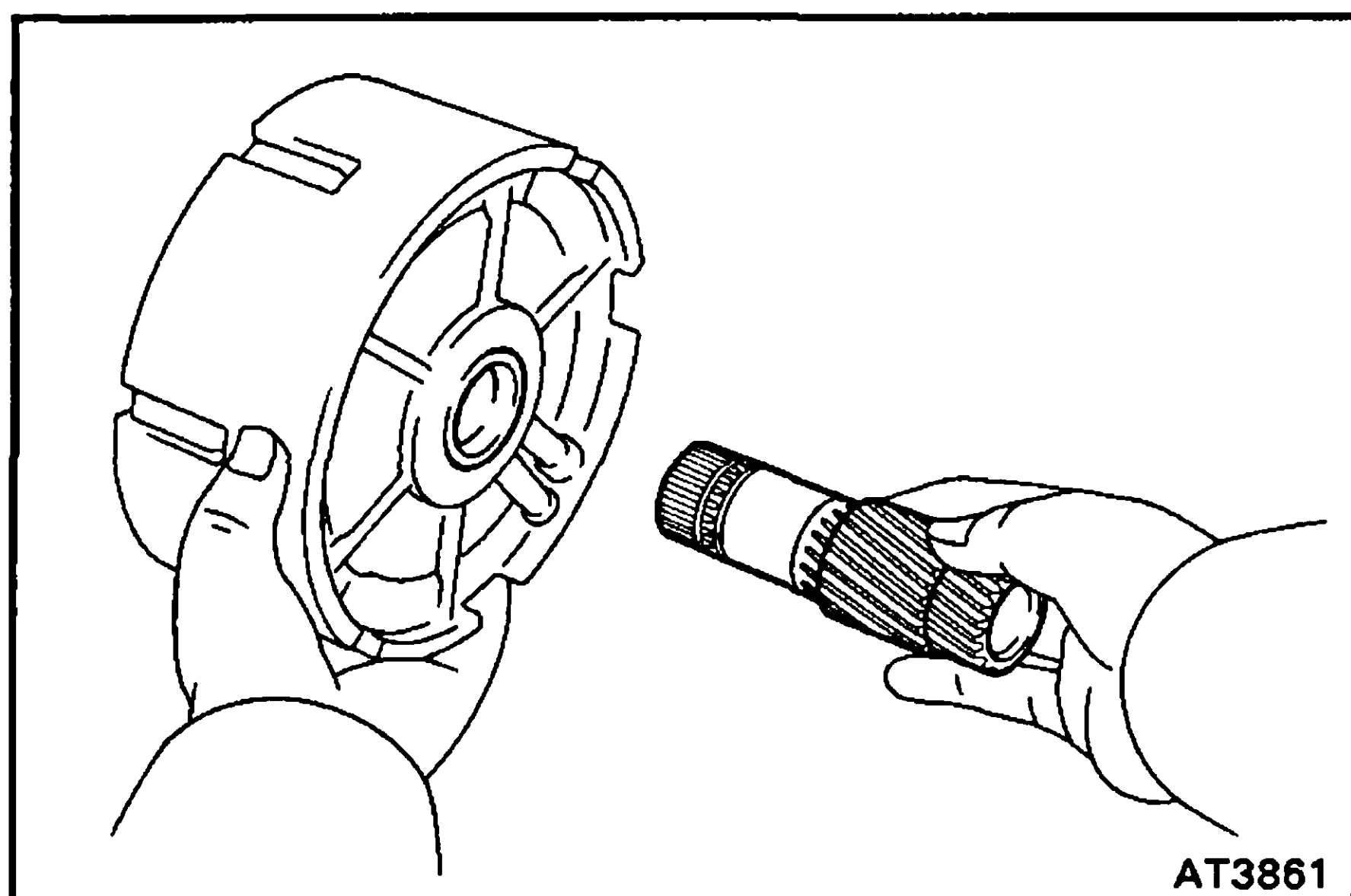
#### 1. REMOVE RING RETAINERS

Using needle nose pliers, remove the three ring retainers from the oil holes of the center support.



#### 2. REMOVE FRONT PLANETARY SUN GEAR

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



(b) Remove the sun gear.

### 3. CHECK PISTON STROKE OF SECOND BRAKE

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

SST 09350-36010 (09350-06120)

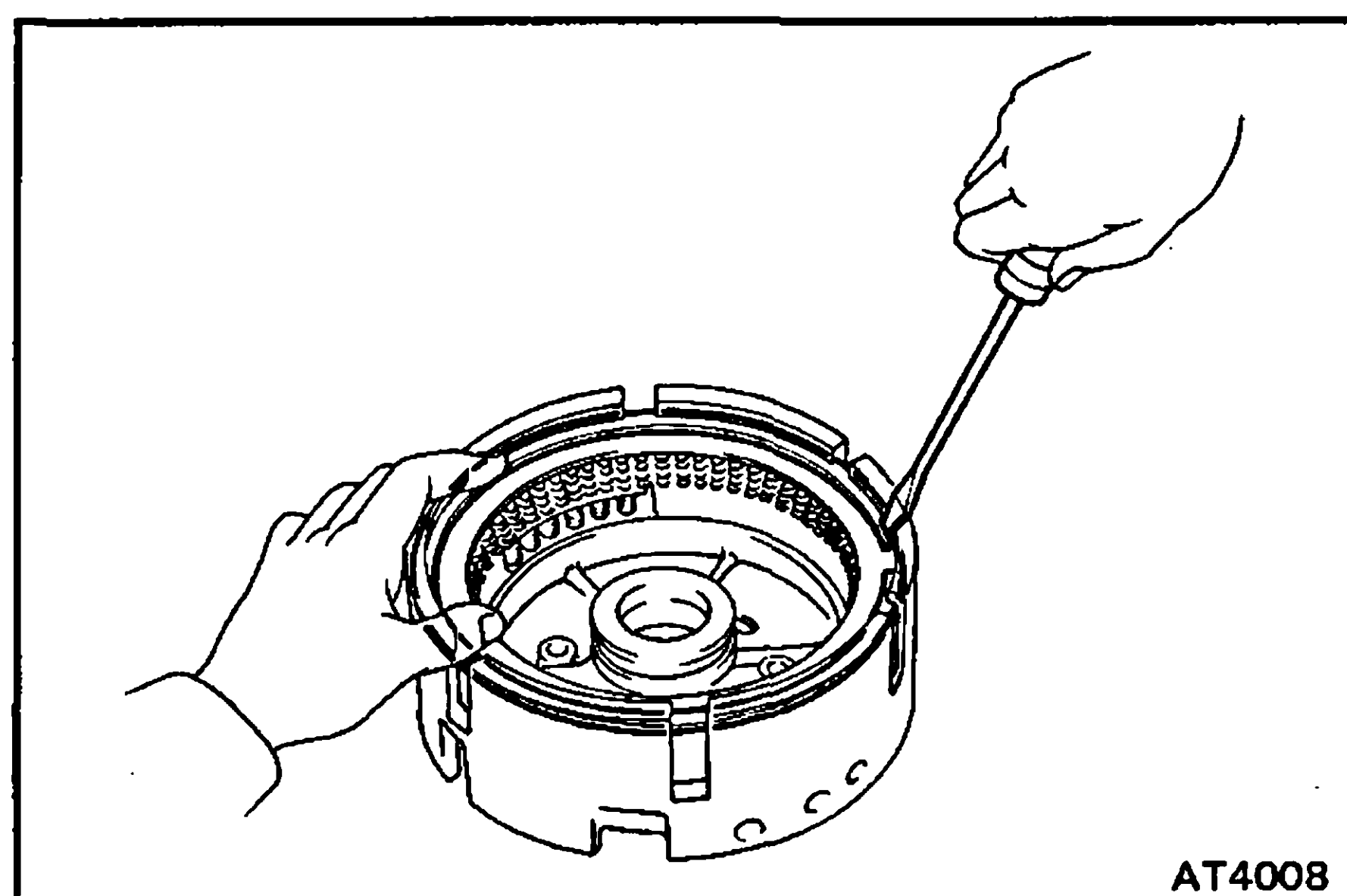
Piston stroke: 1.60 — 1.80 mm (0.0630 — 0.0709 in.)  
(A442F)

Piston stroke: 1.86 — 2.06 mm (0.0732 — 0.0811 in.)

If the piston stroke is greater than specified, inspect the discs.

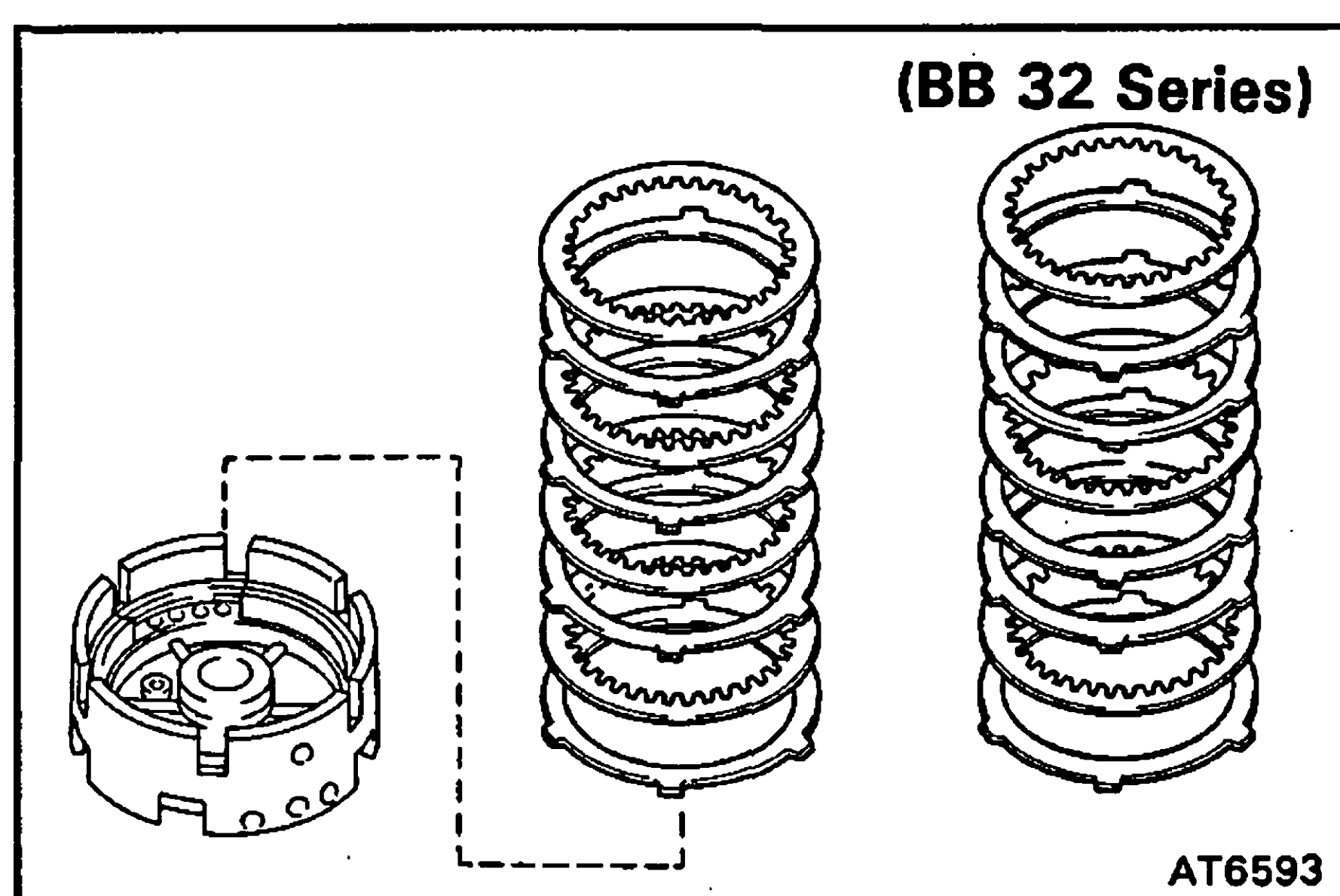
### 4. REMOVE FLANGE, DISCS AND PLATES

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



(b) Remove the flange, four discs and four plates.  
(BB32 Series)

(b) Remove the flange, three discs and five plates.

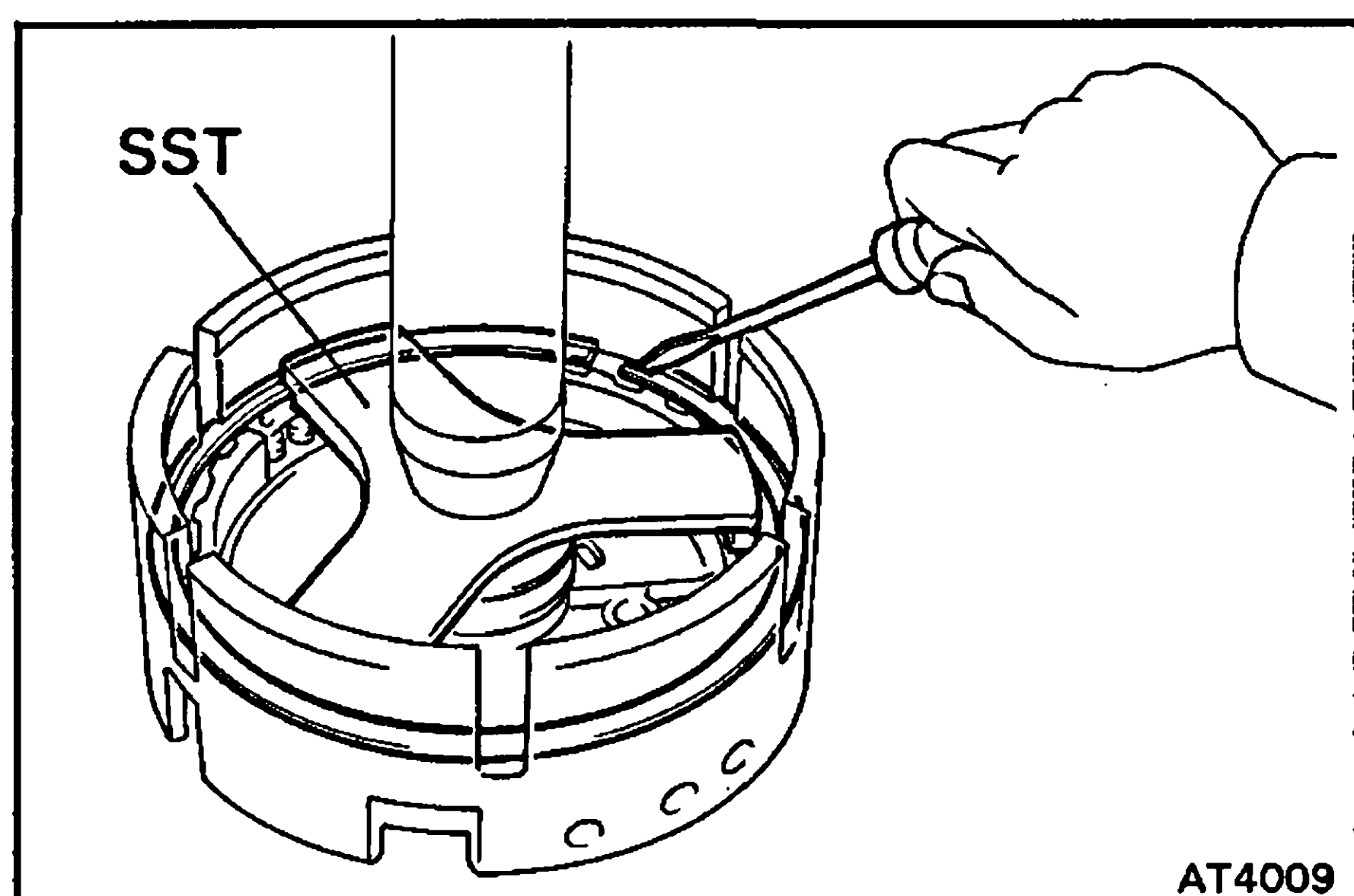


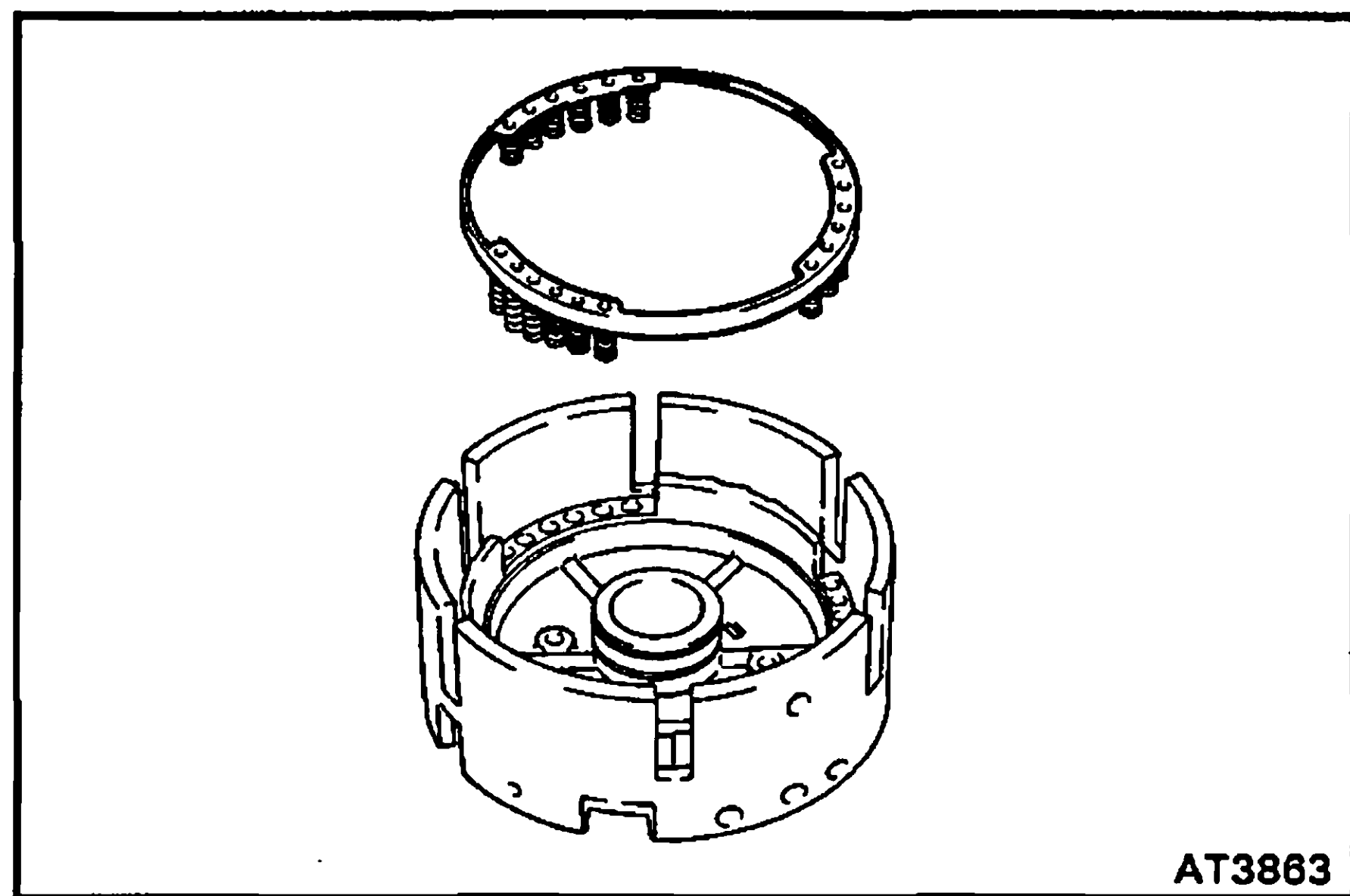
### 5. REMOVE PISTON RETURN SPRING

(a) Place SST on the spring seat, and compress the return spring with a shop press.

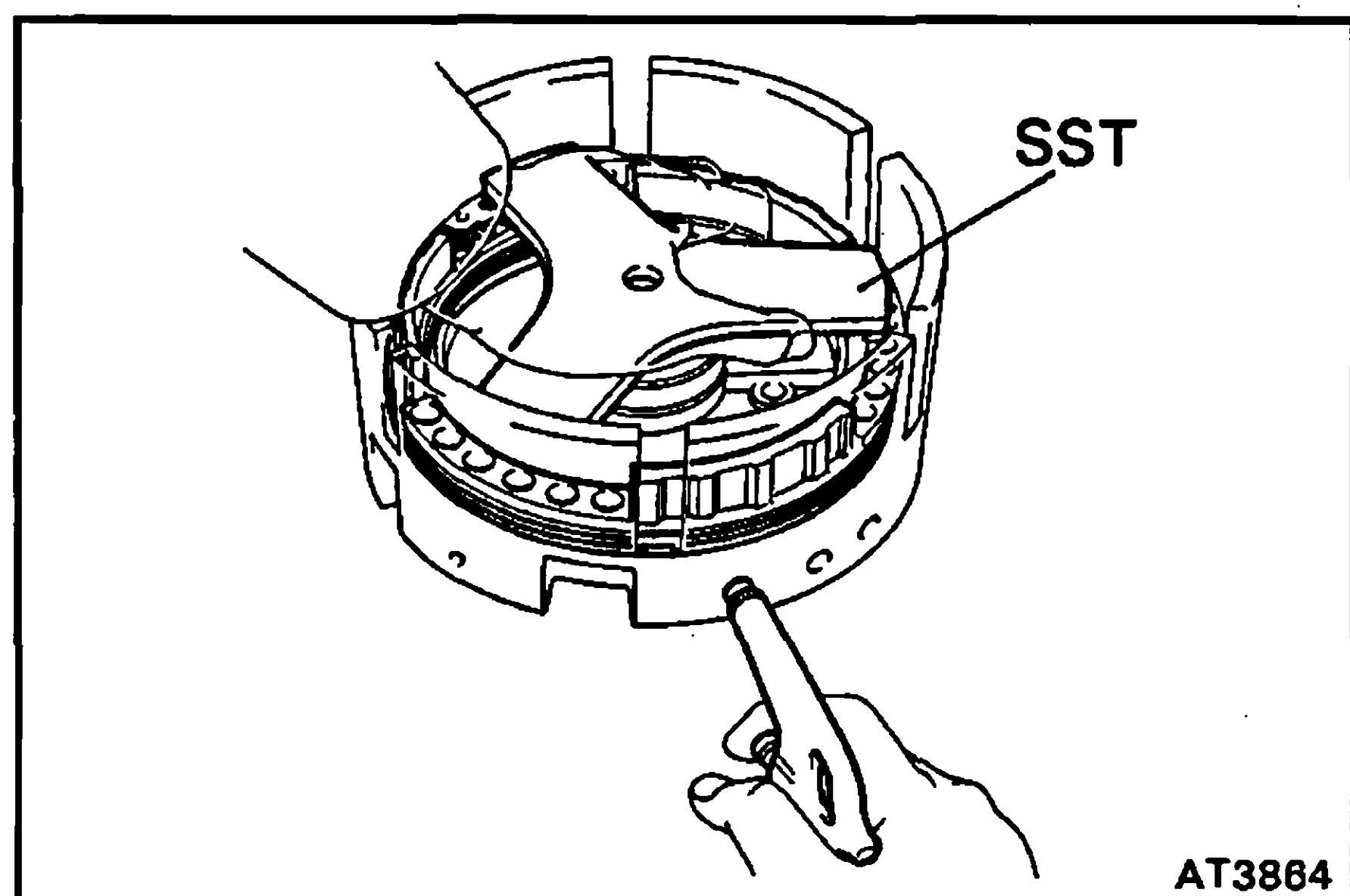
SST 09350-36010 (09350-06020)

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





(c) Remove the return spring.



## 6. REMOVE SECOND BRAKE PISTON

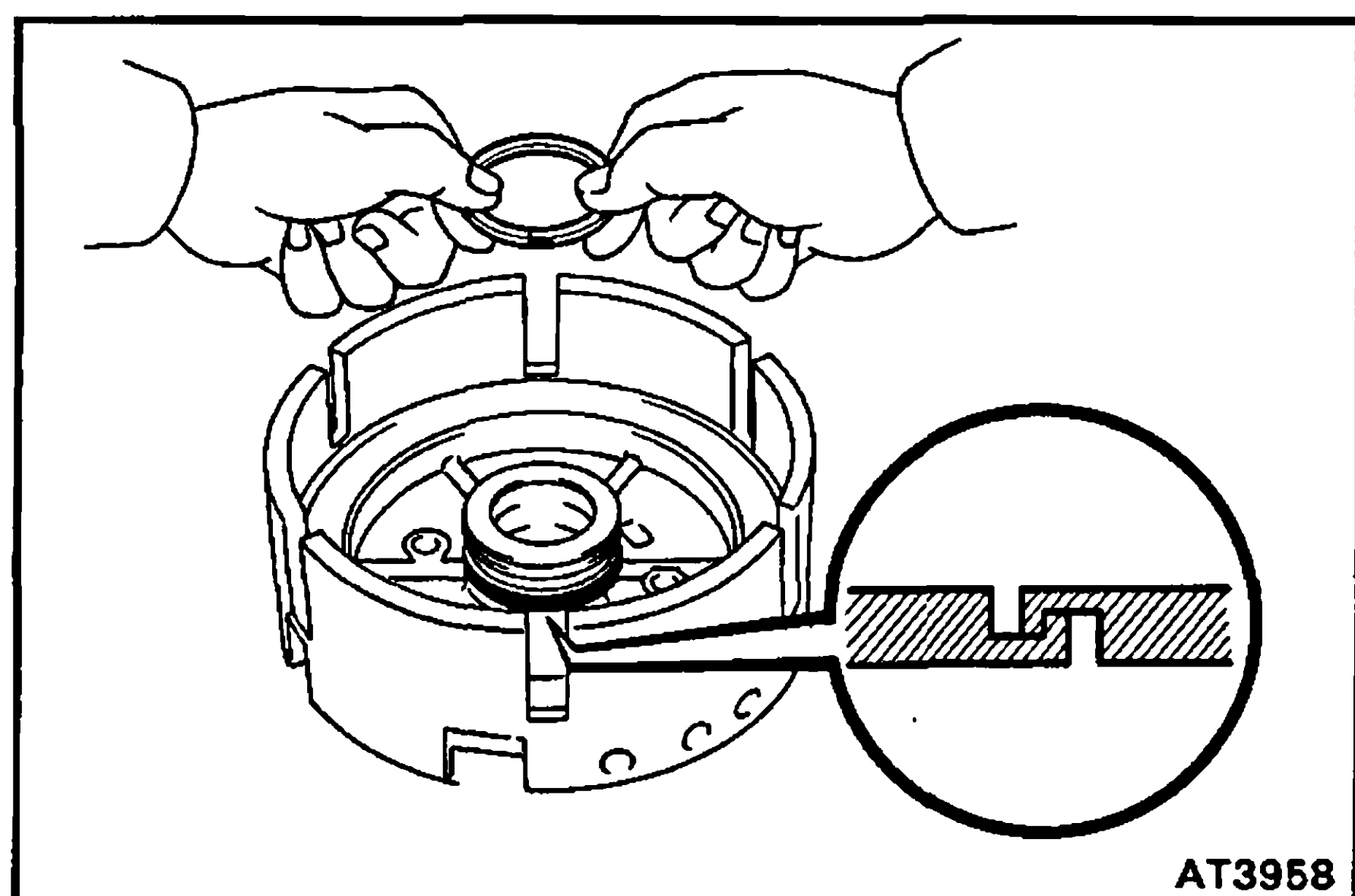
(a) Place the return spring on the brake piston, and then place SST on the return spring.

SST 09350-36010 (09350-06020)

(b) Hold SST so it does not slant, and apply compressed air into the oil hole of the center support to remove the brake piston.

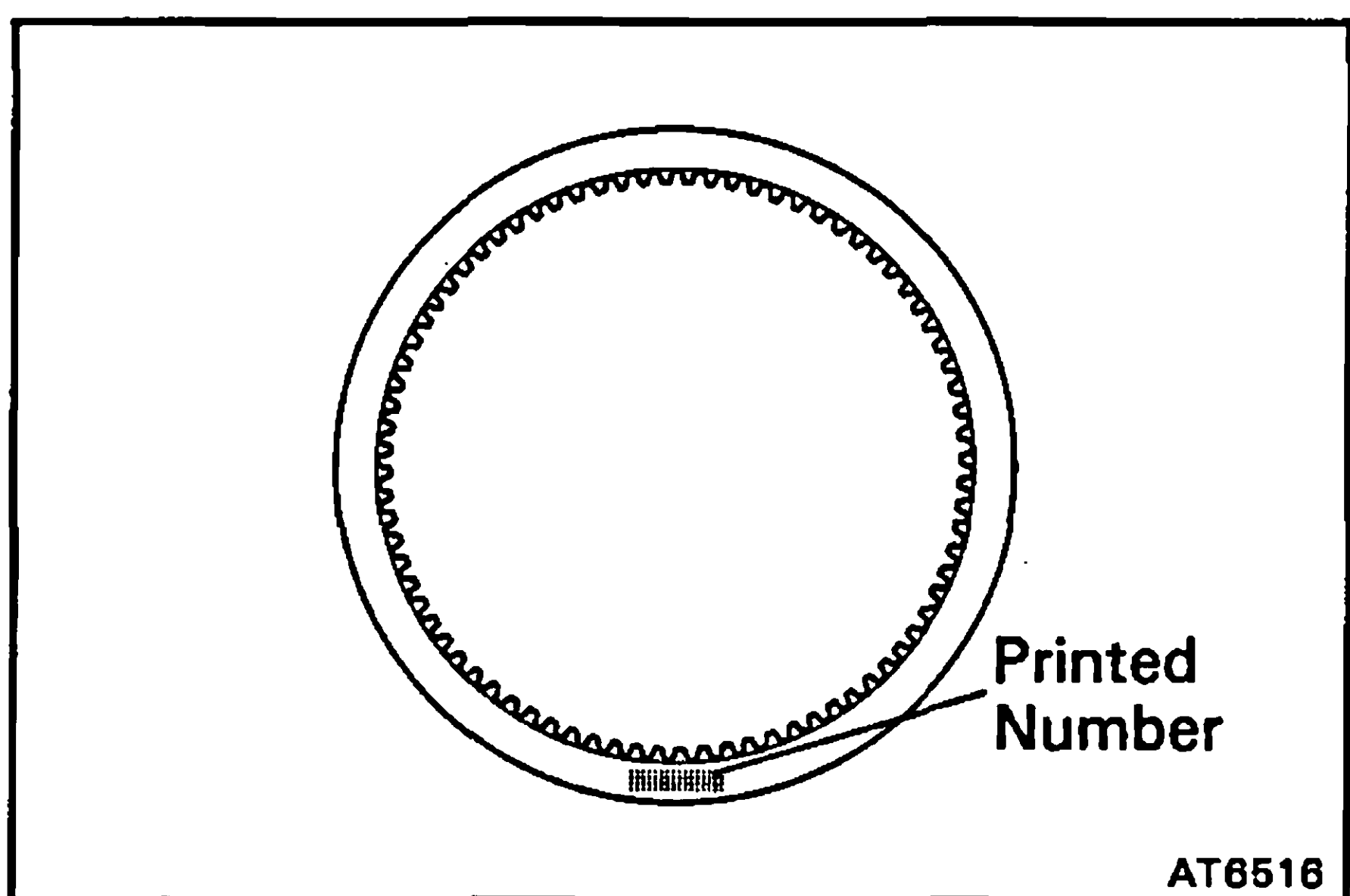
SST 09350-36010 (09350-06020)

(c) Remove the two O-rings from the brake piston.



## 7. REMOVE OIL SEAL RINGS

Remove the two oil seal rings from the center support.



## INSPECTION OF SECOND BRAKE

### 1. INSPECT DISCS, PLATES AND FLANGE

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

#### HINT:

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

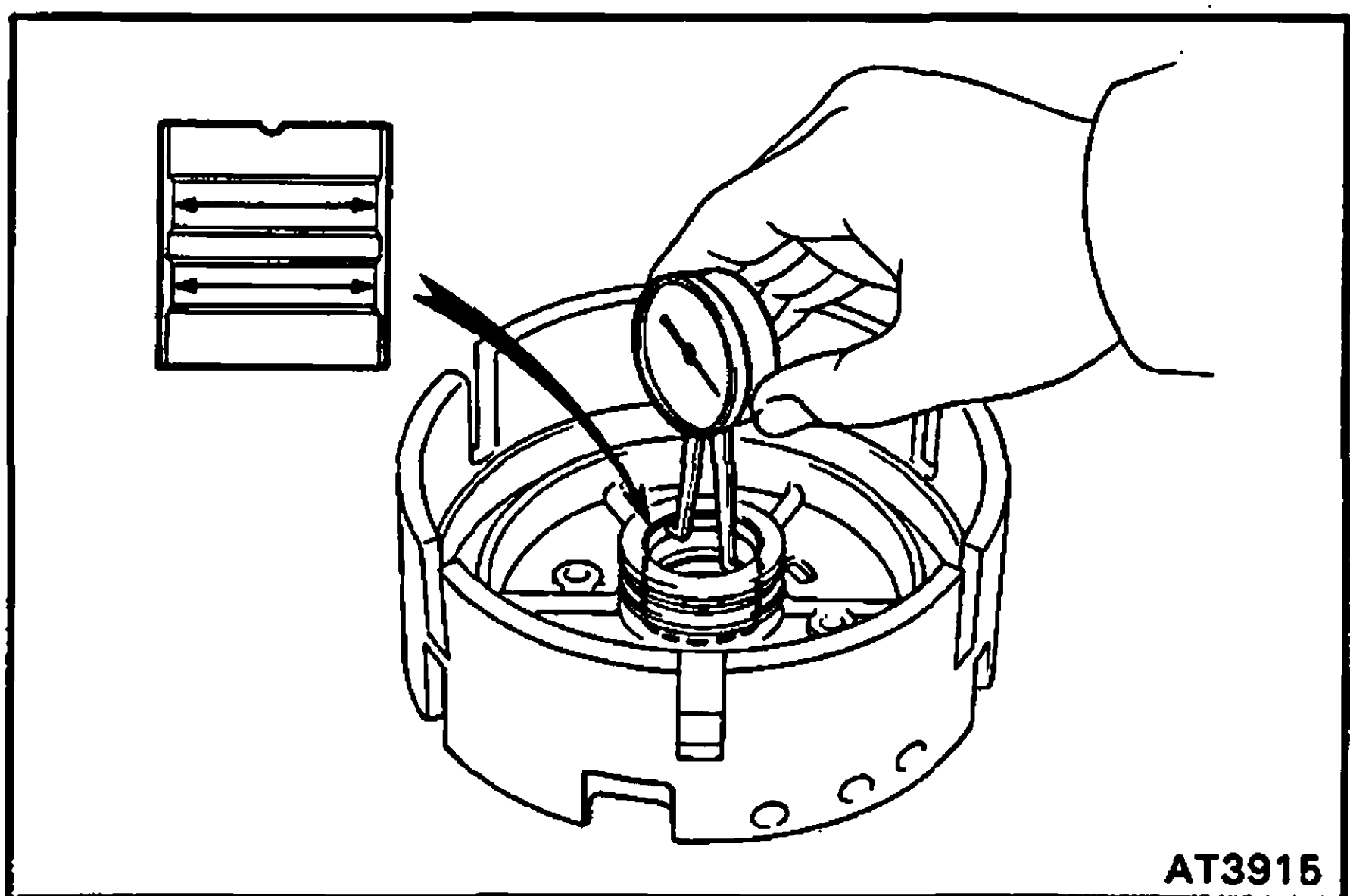
### 2. INSPECT BUSHING OF CENTER SUPPORT

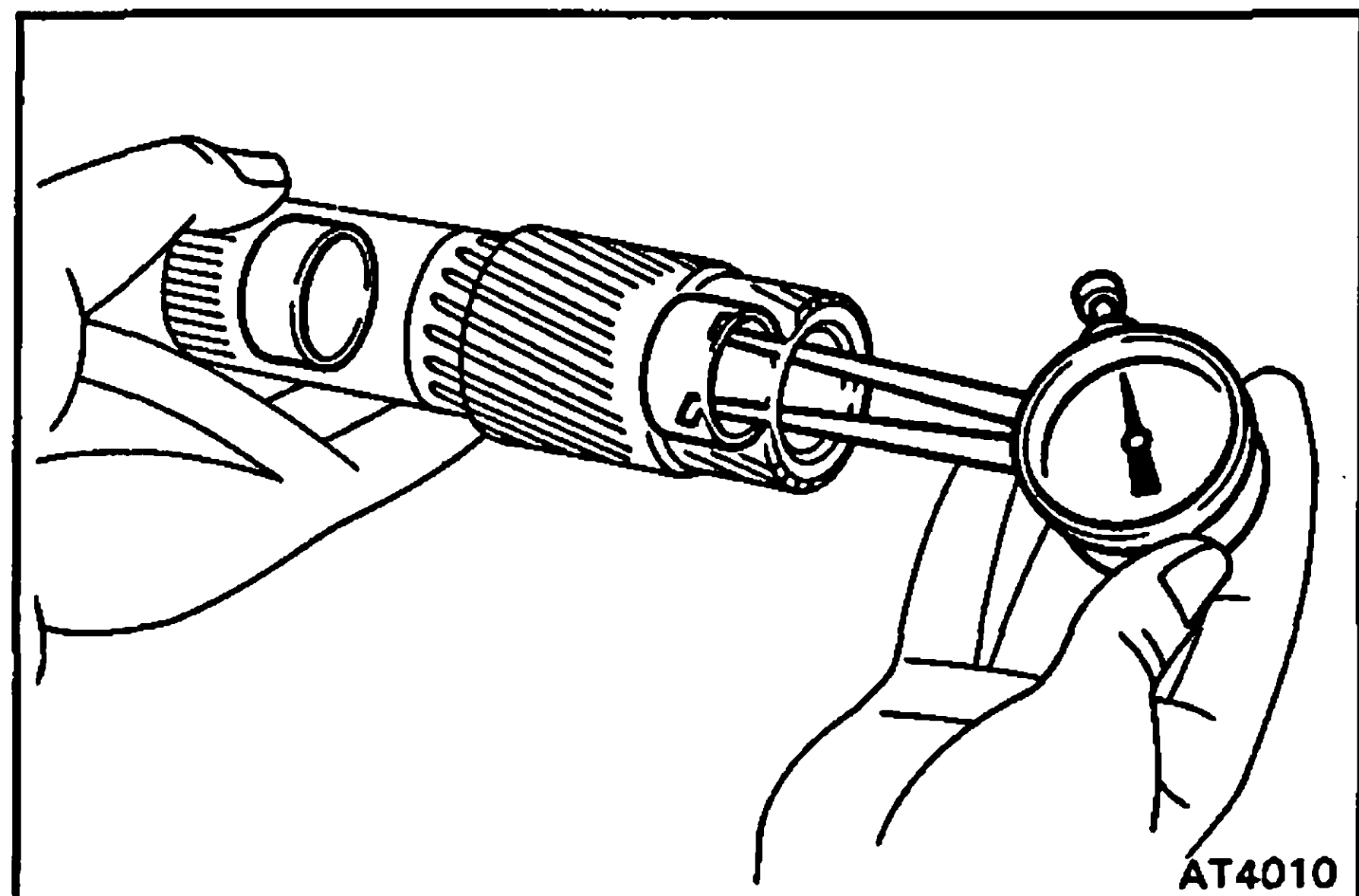
Using a dial indicator, measure the inside diameter.

**Standard inside diameter:** 35.000 — 35.025 mm  
(1.3780 — 1.3789 in.)

**Maximum inside diameter:** 35.08 mm (1.3811 in.)

If the inside diameter is greater than maximum, replace the center support.





### 3. INSPECT BUSHINGS OF FRONT PLANETARY SUN GEAR

Using a dial indicator, measure the inside diameter.

**Standard inside diameter:** 24.000 — 24.021 mm  
(0.9449 — 0.9457 in.)

**(A442F)**

**Standard inside diameter:** 25.000 — 25.021 mm  
(0.9843 — 0.9851 in.)

**Maximum inside diameter:** 24.07 mm (0.9476 in.)

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

## ASSEMBLY OF SECOND BRAKE

### 1. INSTALL OIL SEAL RINGS

- (a) Coat the two oil seal rings with ATF.
- (b) Contract the oil seals, and install them onto the center support.

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

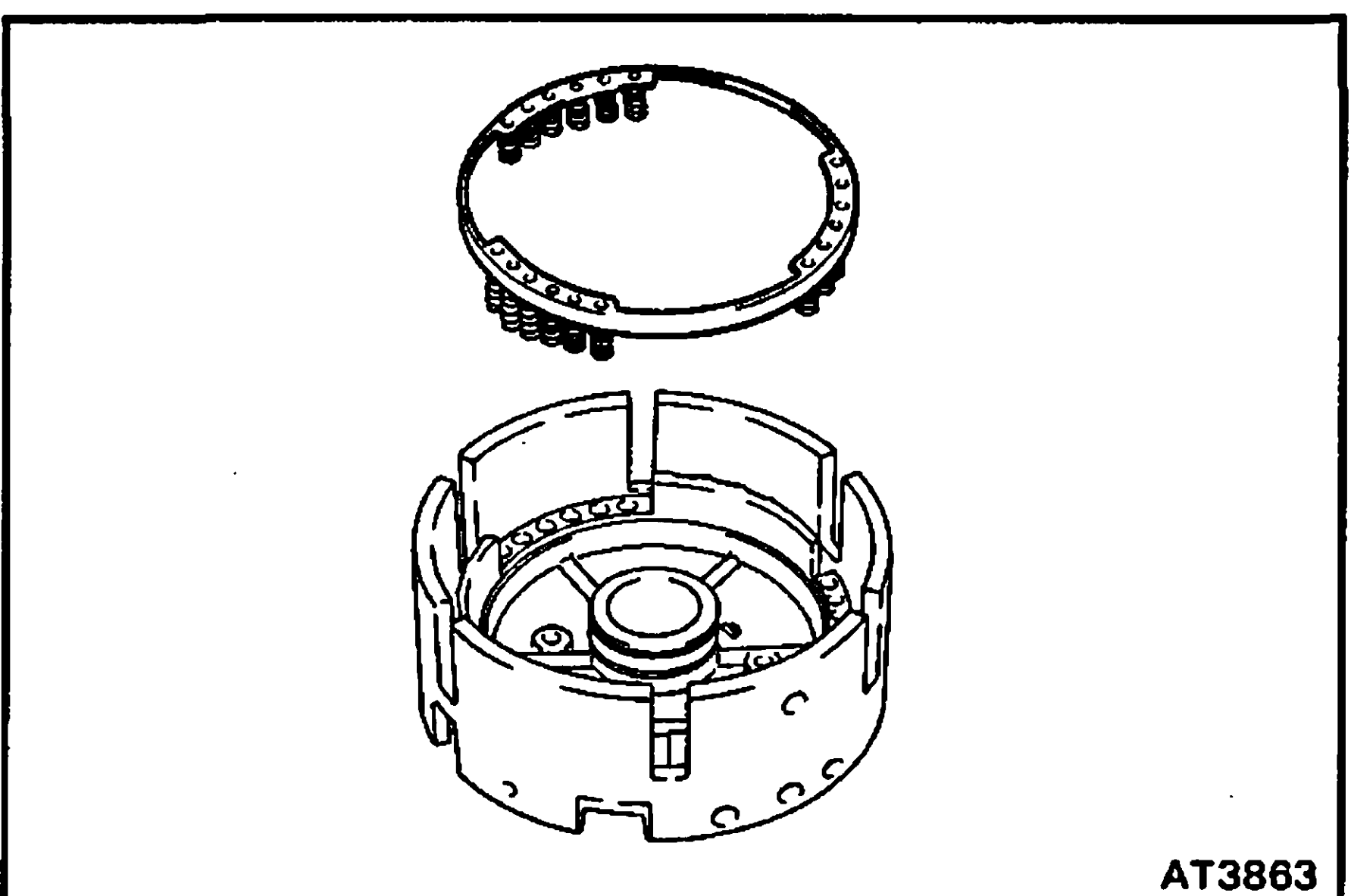
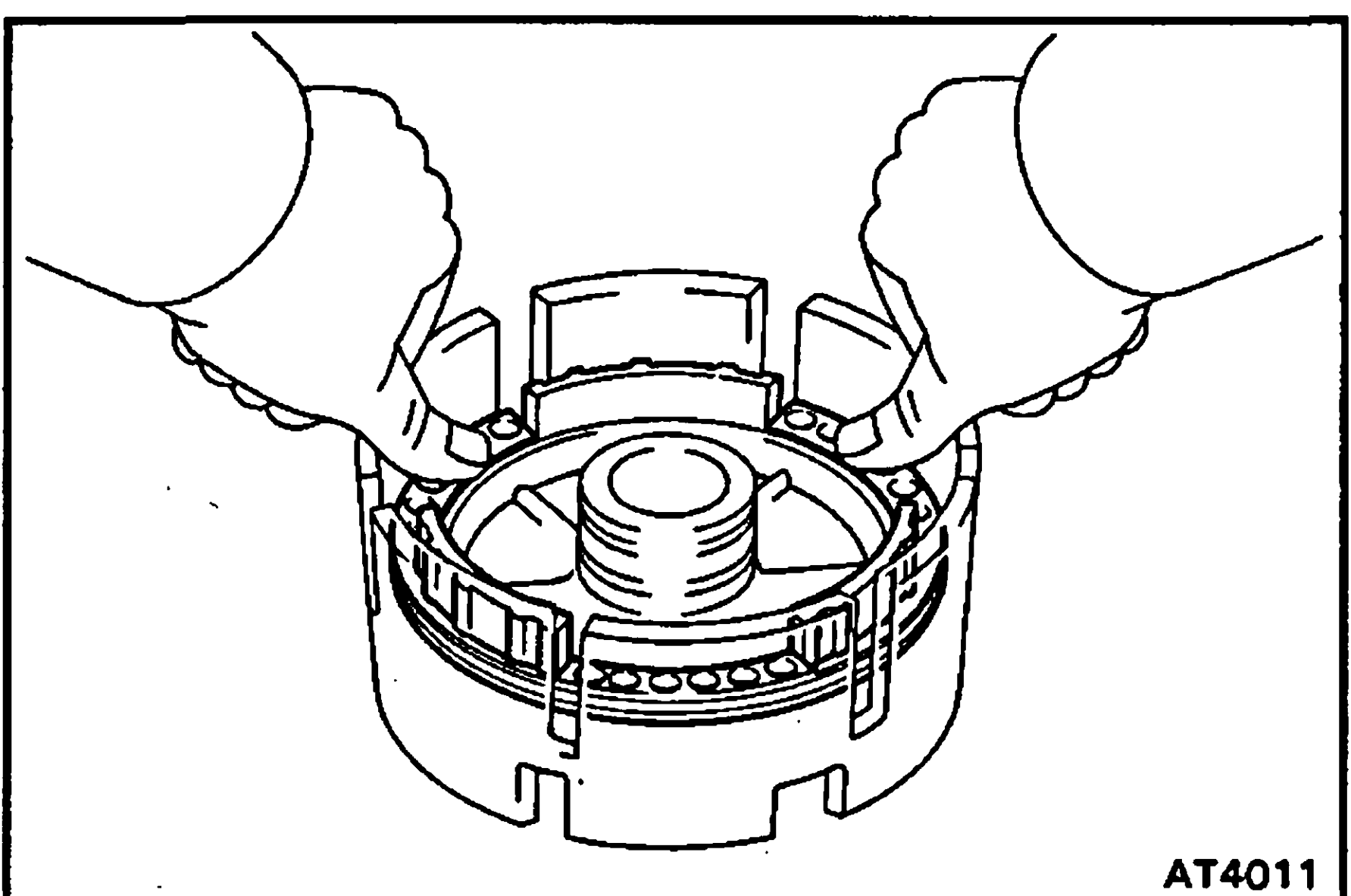
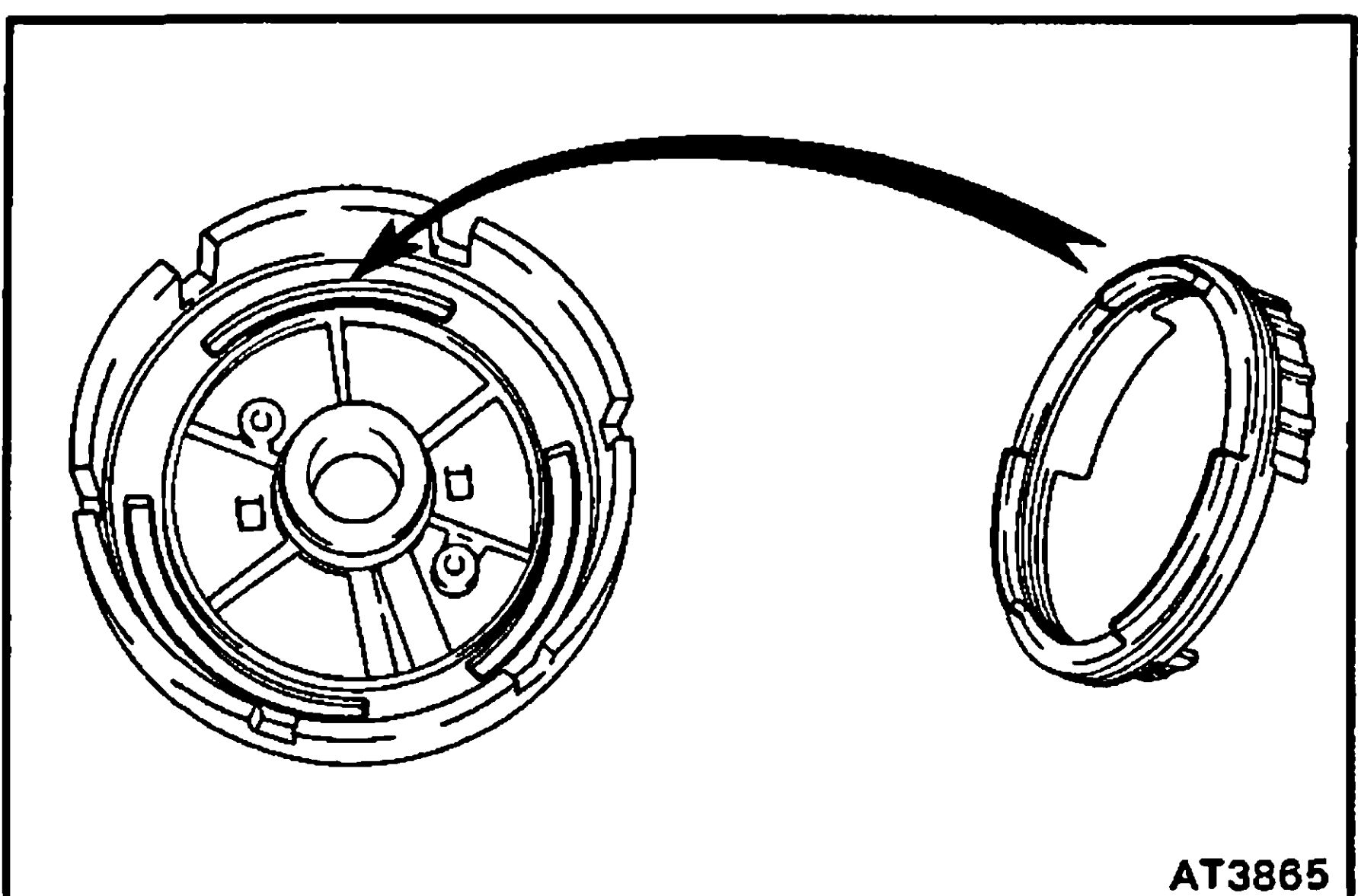
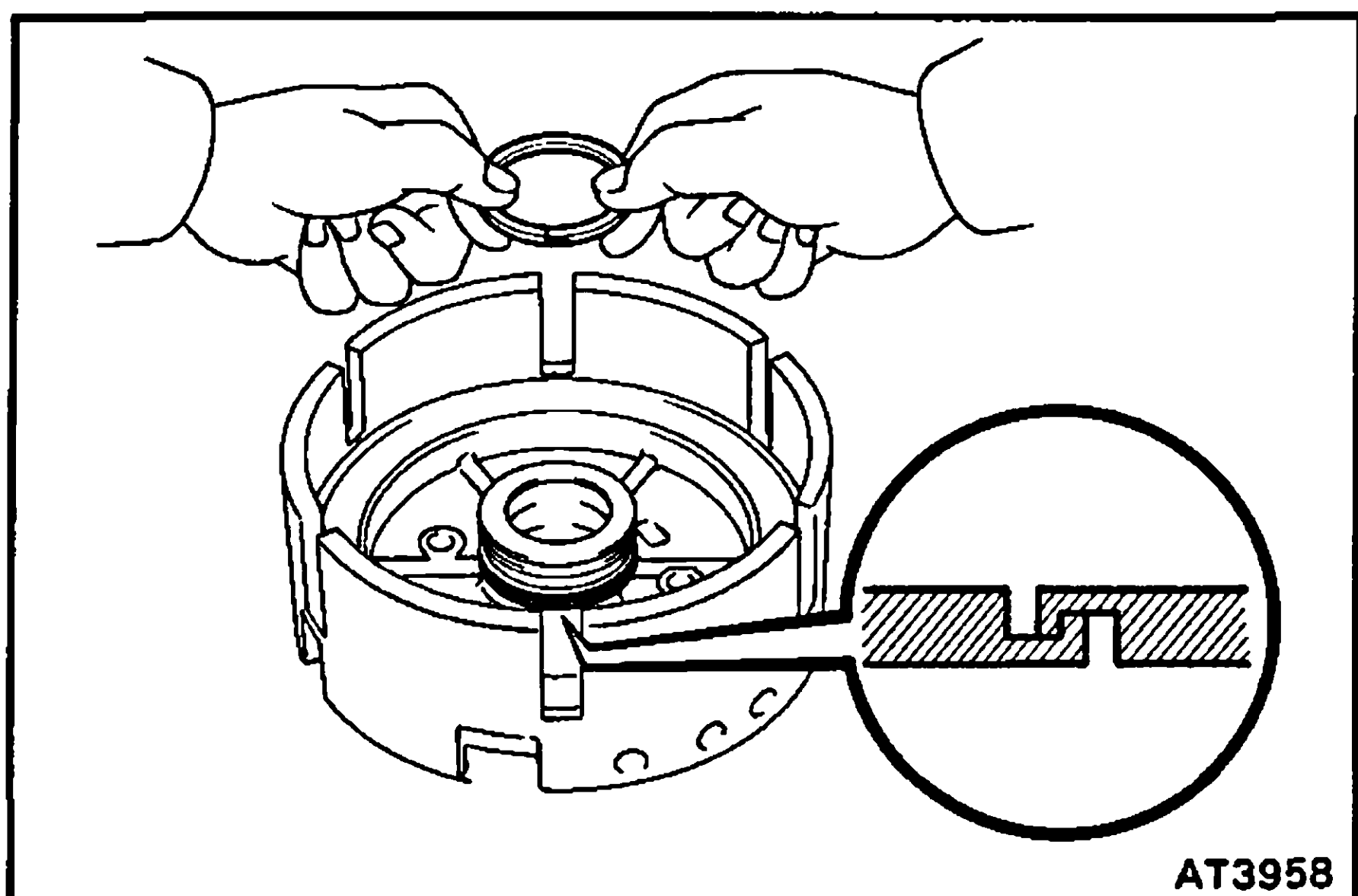
**HINT:** After installing the oil seal rings, check that they rotate smoothly.

### 2. INSTALL SECOND BRAKE PISTON

- (a) Coat new two O-rings with ATF, and install them on the brake piston.
- (b) Align the protrusions of the brake piston with the grooves of the center support.

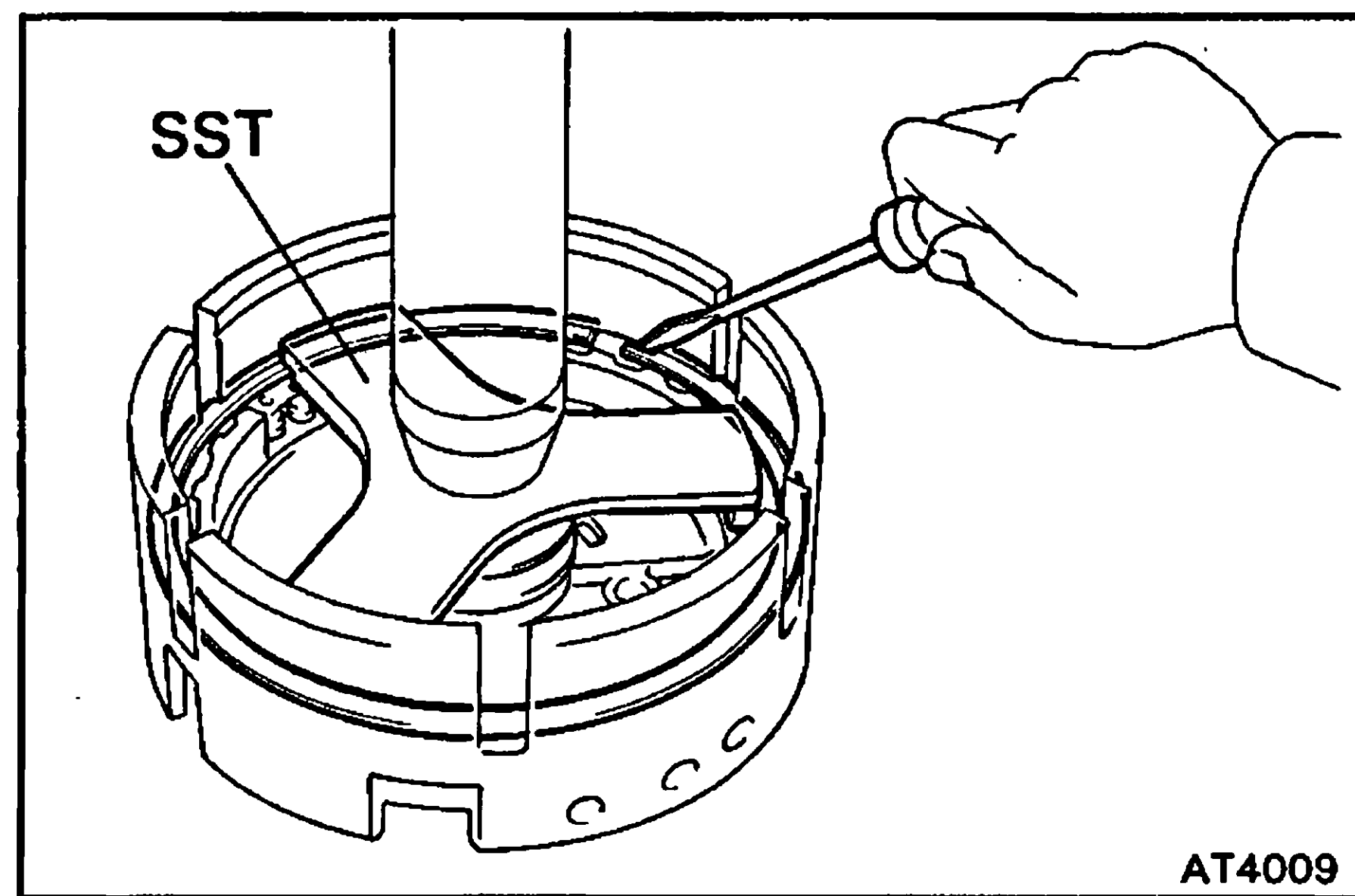
- (c) Push in the brake piston into the center support with both hands.

**NOTICE:** Be careful not to damage the O-rings.



### 3. INSTALL PISTON RETURN SPRING

- (a) Place the return spring on the brake piston.

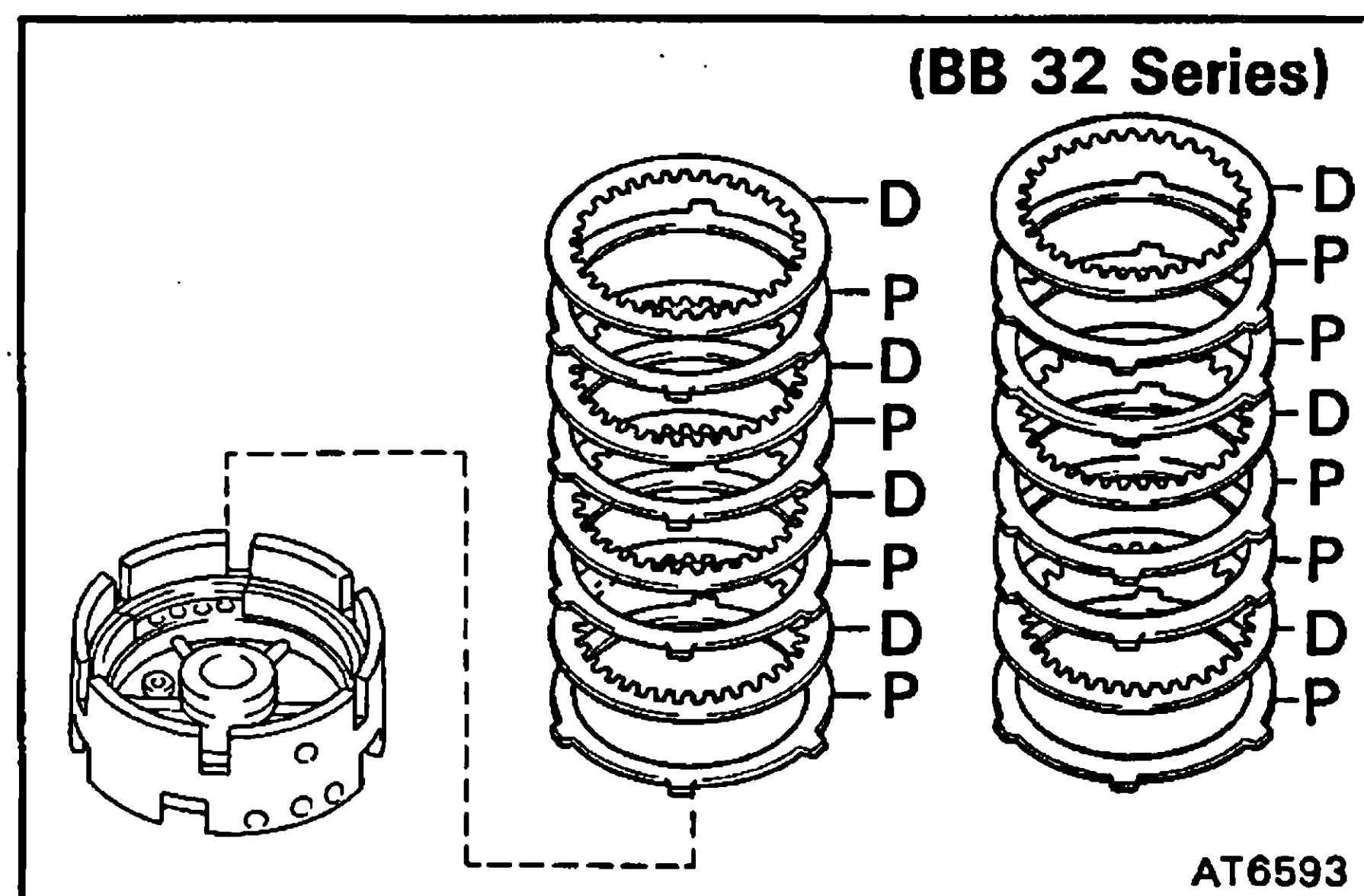


- (b) Place SST on the return spring, and compress the return spring with a shop press.

SST 09350-36010 (09350-06020)

- (c) Using a screwdriver, install the snap ring.

HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the center support.



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

- (a) Install the four plates and four discs in order:

P = Plate D = Disc

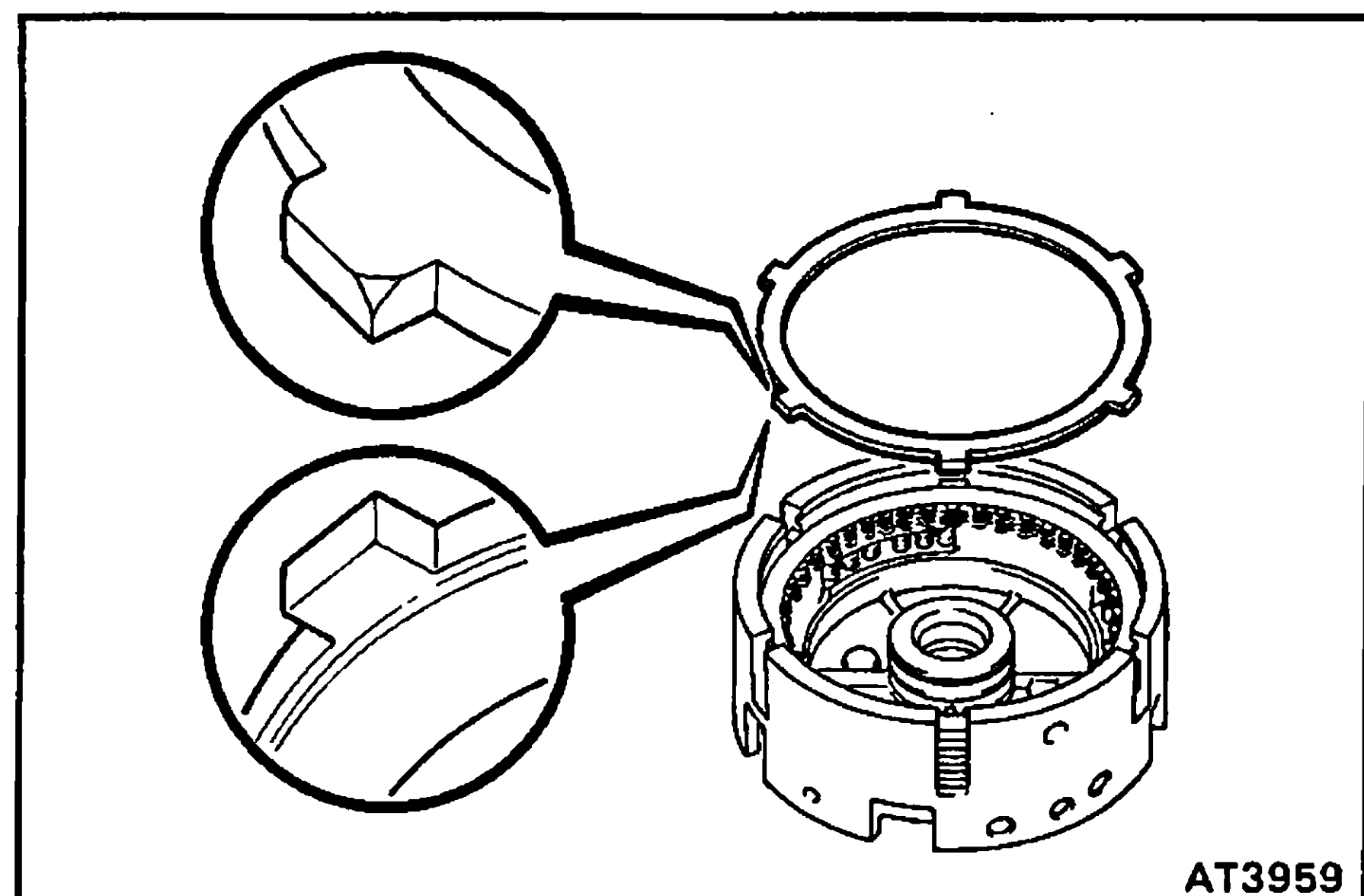
P-D-P-D-P-D-P-D

(BB 32 Series)

- (a) Install the five plates and three discs in order:

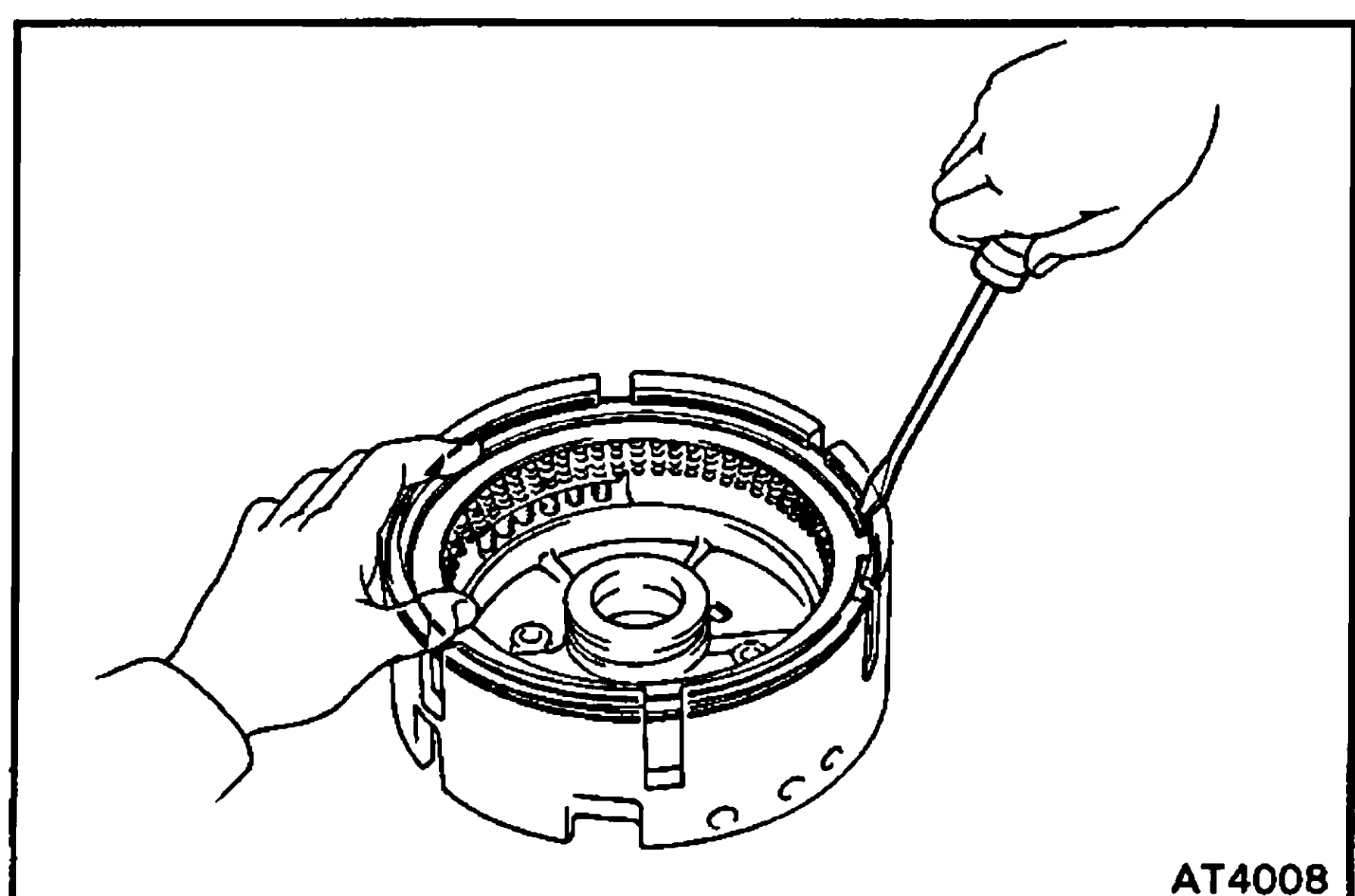
P = Plate D = Disc

P-D-P-P-D-P-P-D



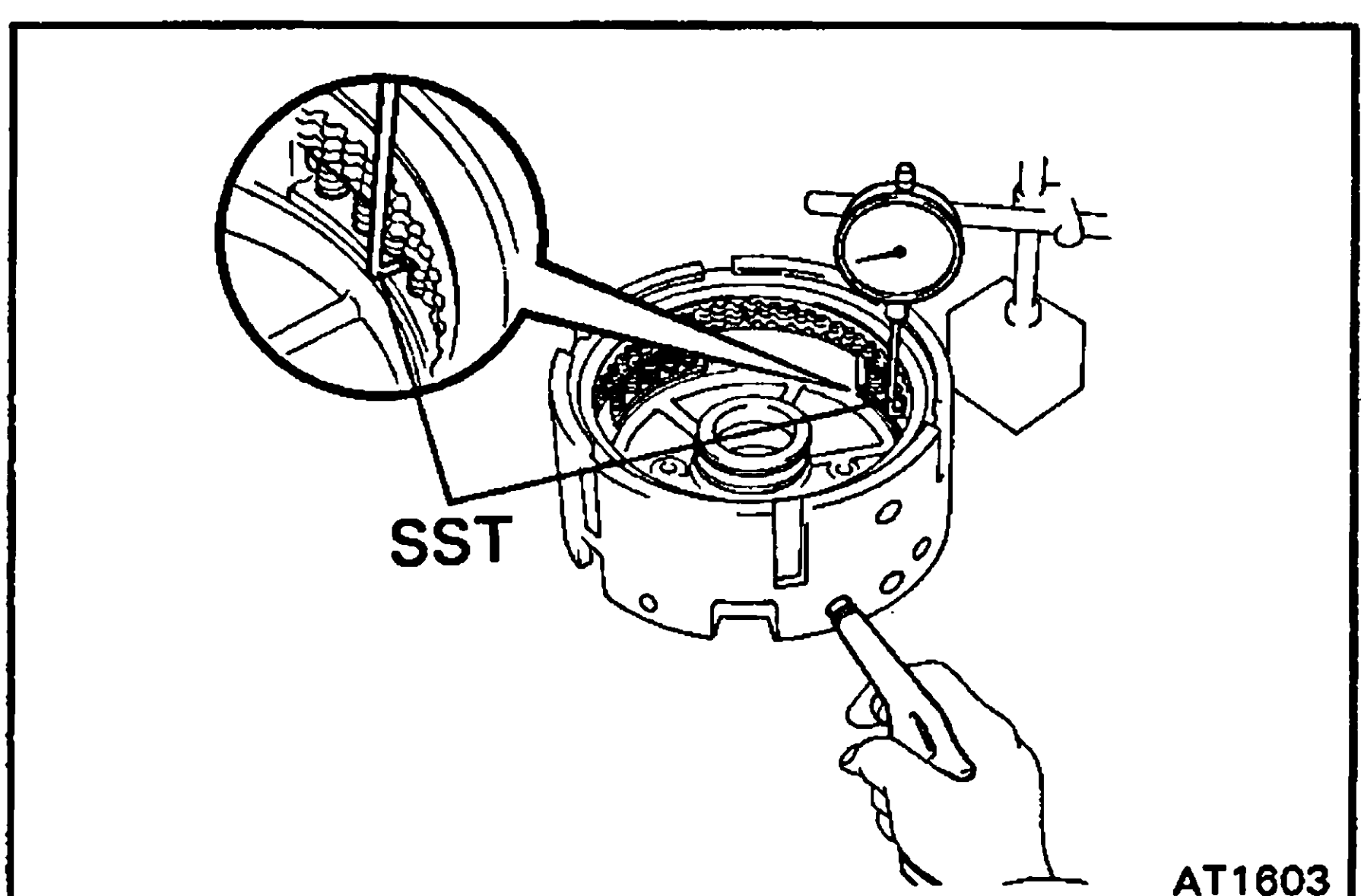
- (b) Install the flange, facing the rounded edge upward.

HINT: If the flange is step-edged, install the flange with the step-edge, facing downward.



- (c) Using a screwdriver, install the snap ring.

HINT: Be sure the end gap of the snap ring is not aligned the cutout portion of the center support.



#### 5. CHECK PISTON STROKE OF SECOND BRAKE

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

SST 09350-36010 (09350-06120)

Piston stroke: 1.60 — 1.80 mm (0.0630 — 0.0785 in.)  
(A442F)

Piston stroke: 1.86 — 2.06 mm (0.0732 — 0.0811 in.)

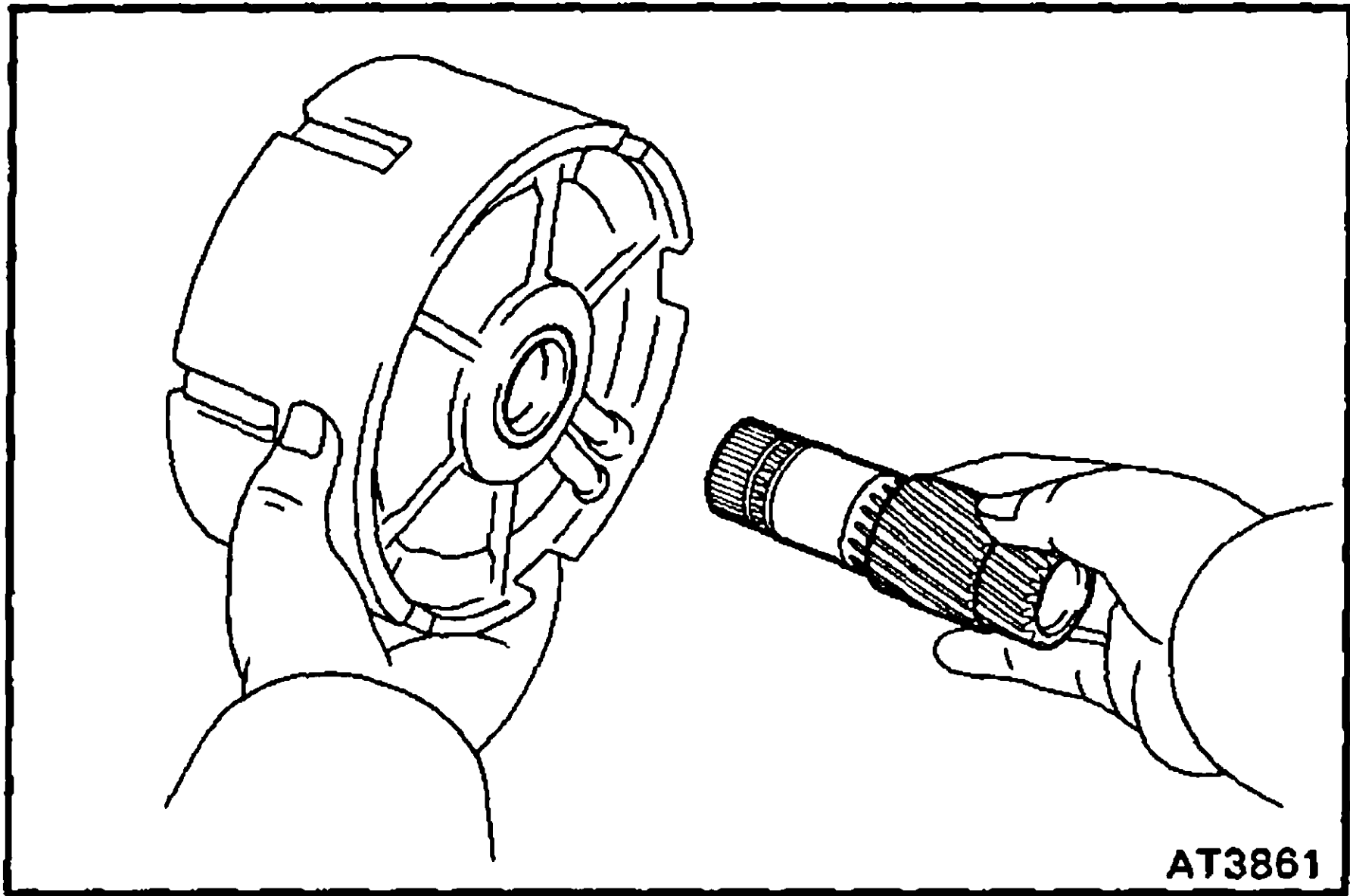
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

If the piston stroke is not as specified, select another flange.

**HINT:** There are four different thicknesses for flange.

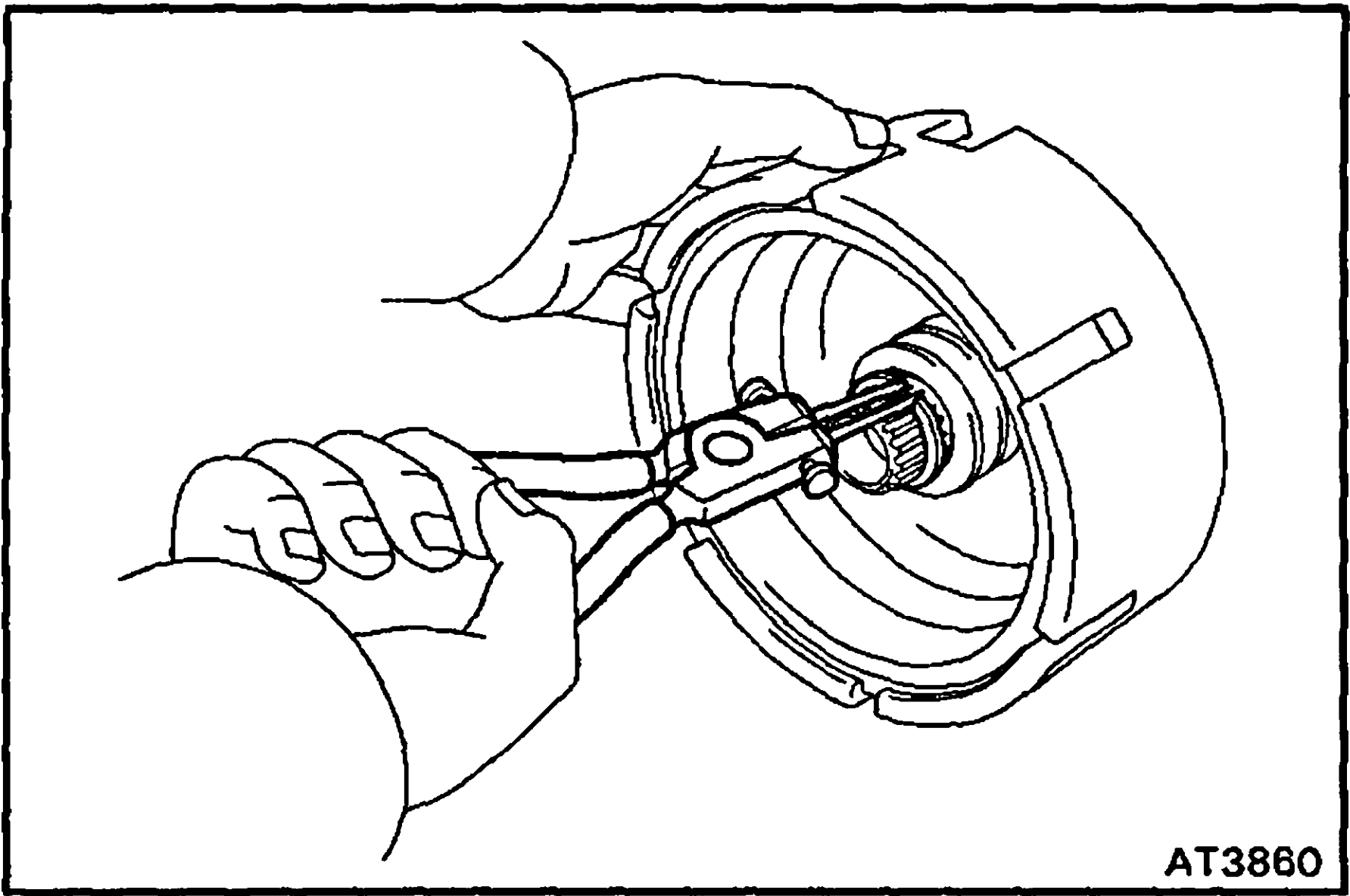
mm (in.)

| No.  | Thickness   | No. | Thickness   |
|------|-------------|-----|-------------|
| None | 5.0 (0.197) | 2   | 5.4 (0.213) |
| 1    | 5.2 (0.205) | 3   | 5.6 (0.220) |

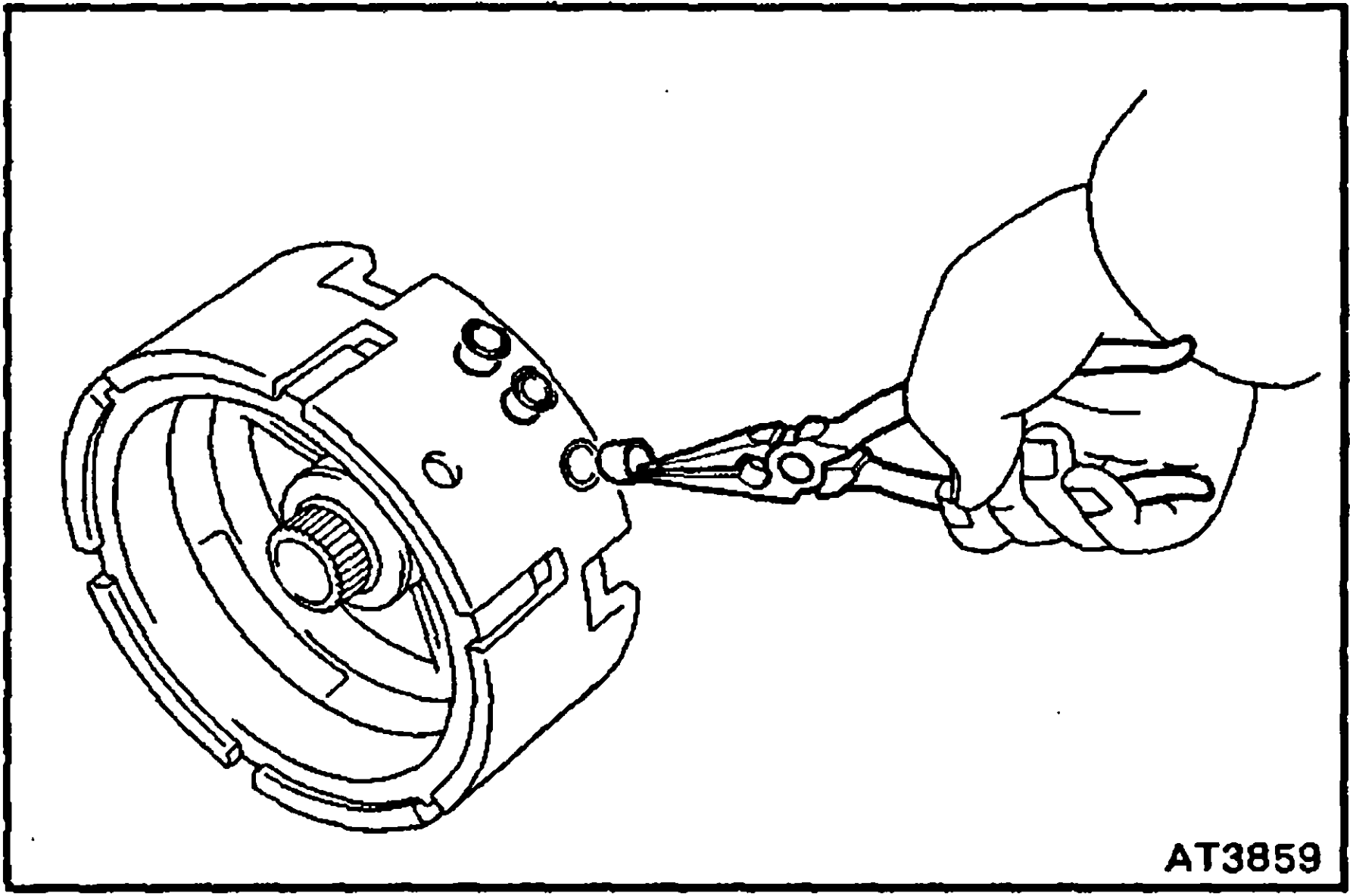


**6. INSTALL FRONT PLANETARY SUN GEAR**

(a) Install the sun gear.



(b) Using snap ring pliers, install the snap ring.

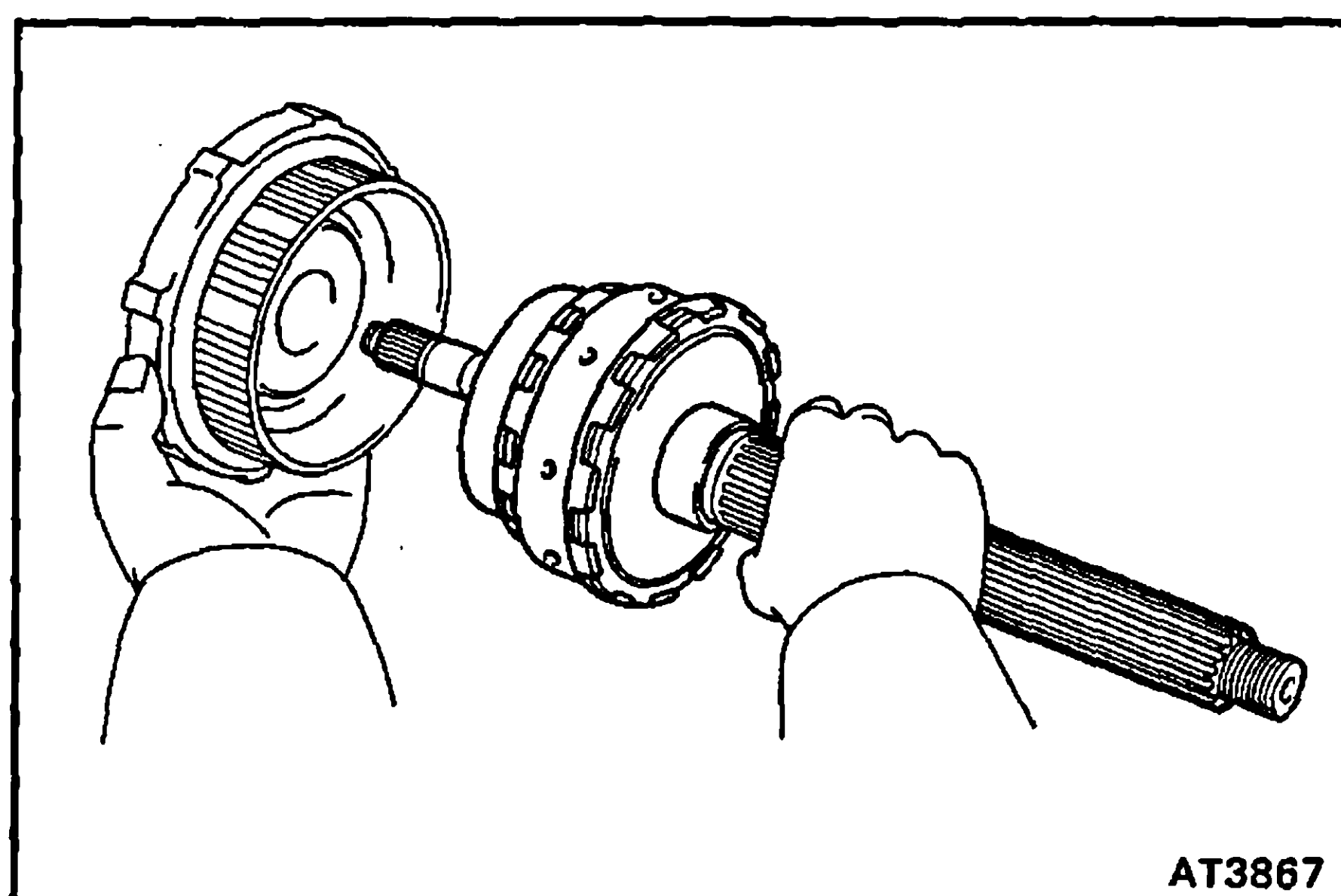
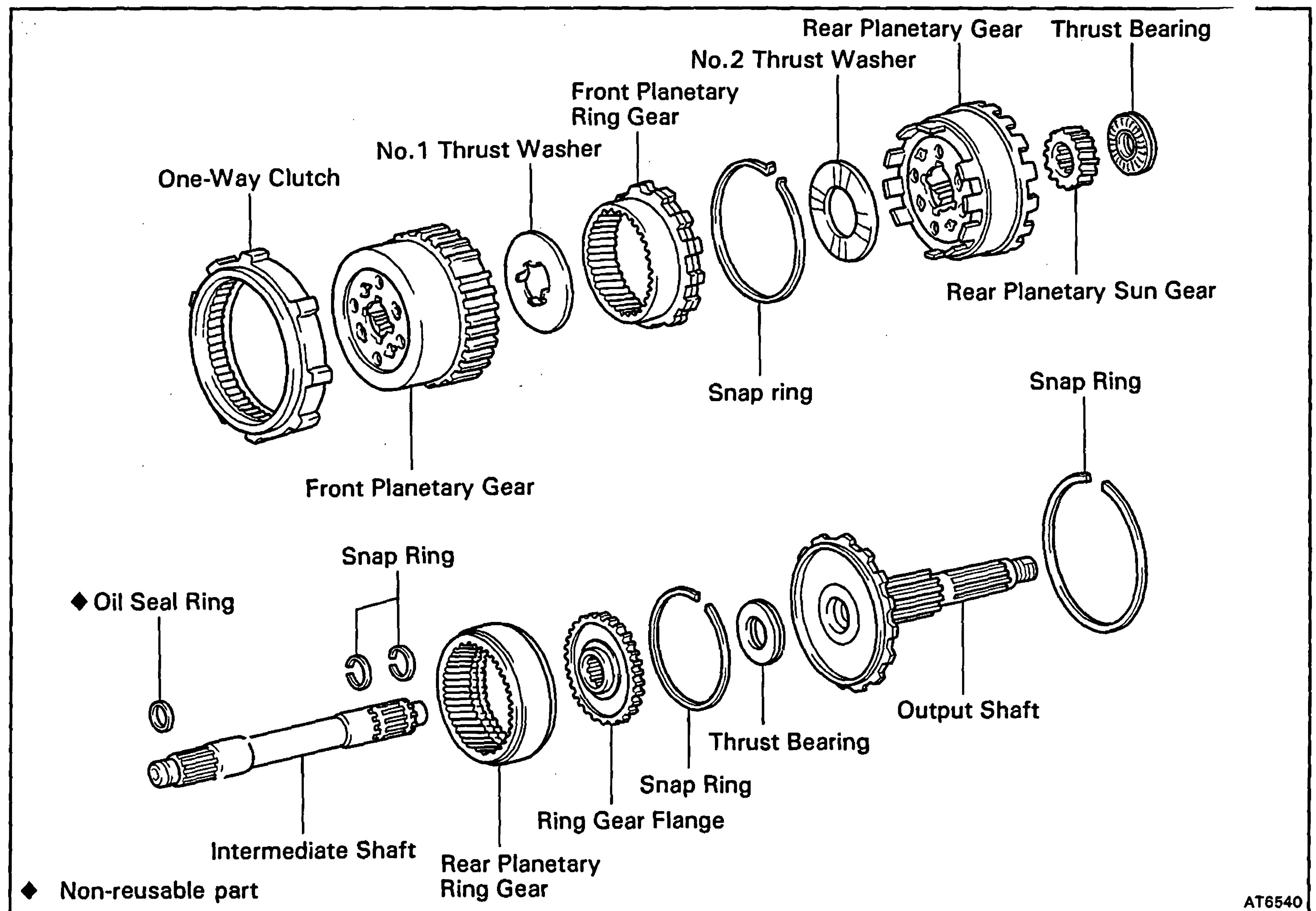


**7. INSTALL RING RETAINERS**

Using needle nose pliers, install the three ring retainers into the oil holes of the center support.

# Planetary Gears, One-Way Clutch and Output Shaft

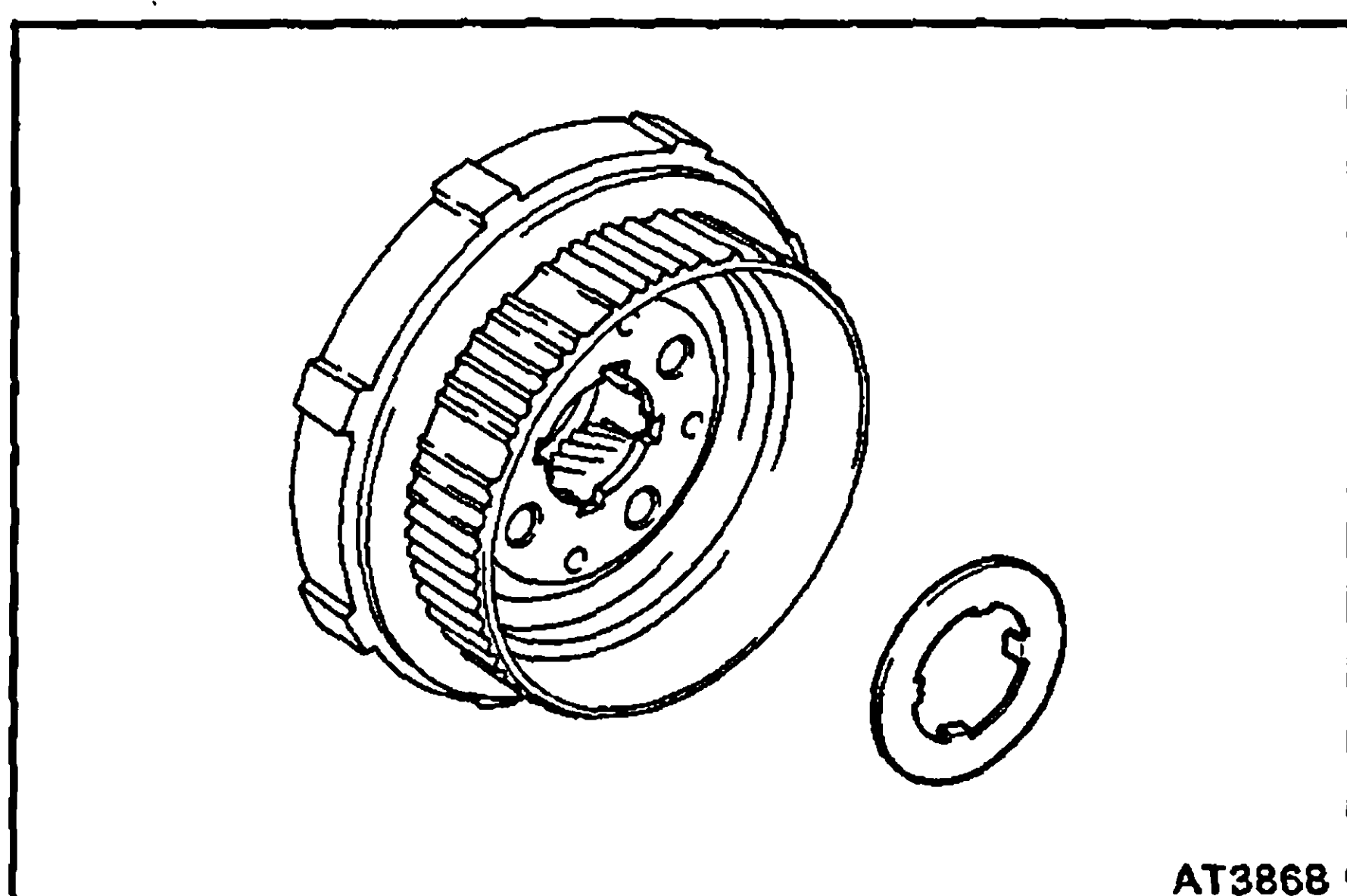
## COMPONENTS



### DISASSEMBLY OF PLANETARY GEARS, ONE-WAY CLUTCH AND OUTPUT SHAFT

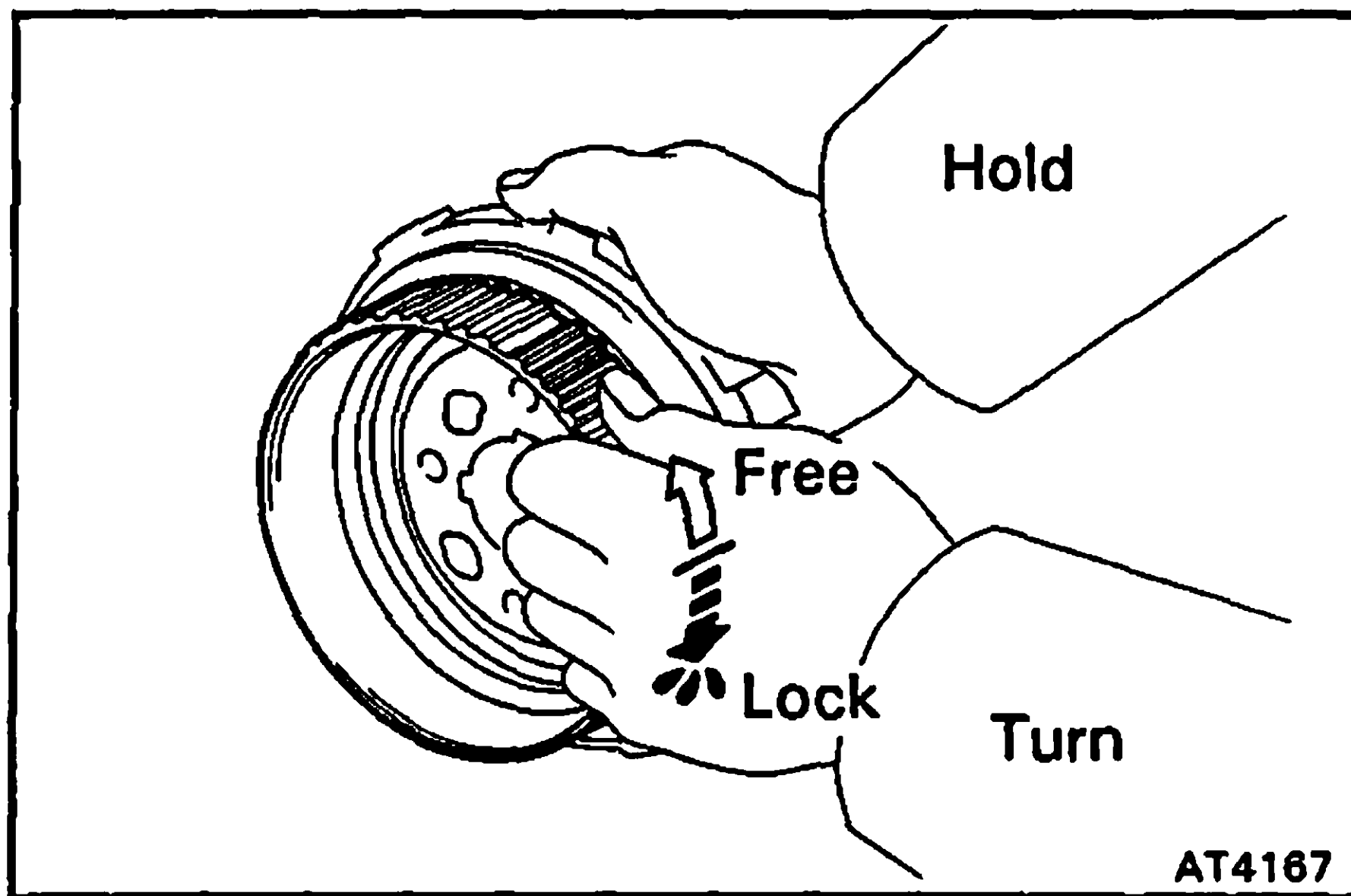
#### 1. REMOVE REAR PLANETARY GEAR AND OUTPUT SHAFT ASSEMBLY

Remove the rear planetary gear and output shaft assembly from the front planetary gear.



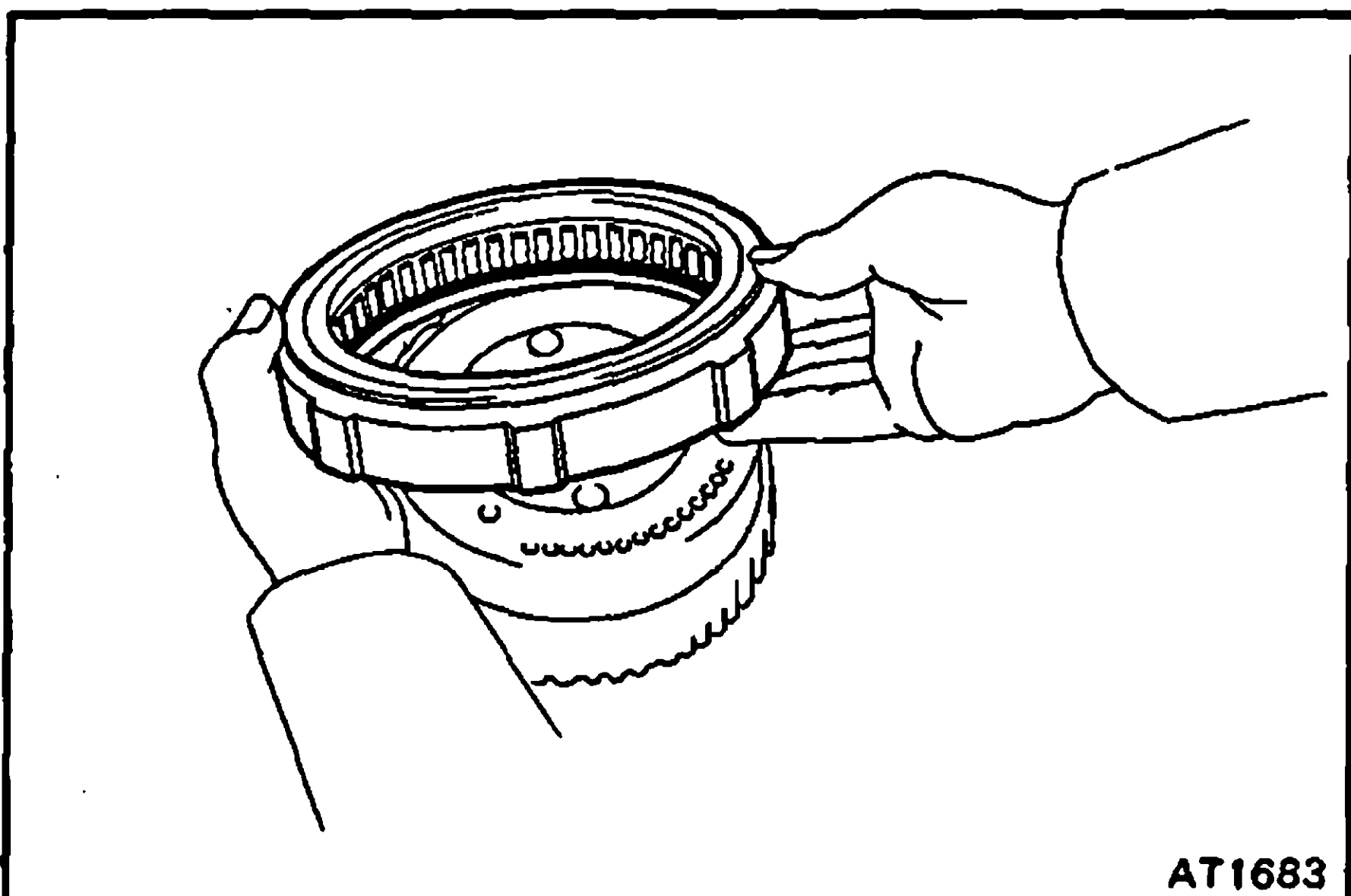
#### 2. REMOVE NO.1 REAR THRUST WASHER

Remove the thrust washer from the rear side of the front planetary gear.

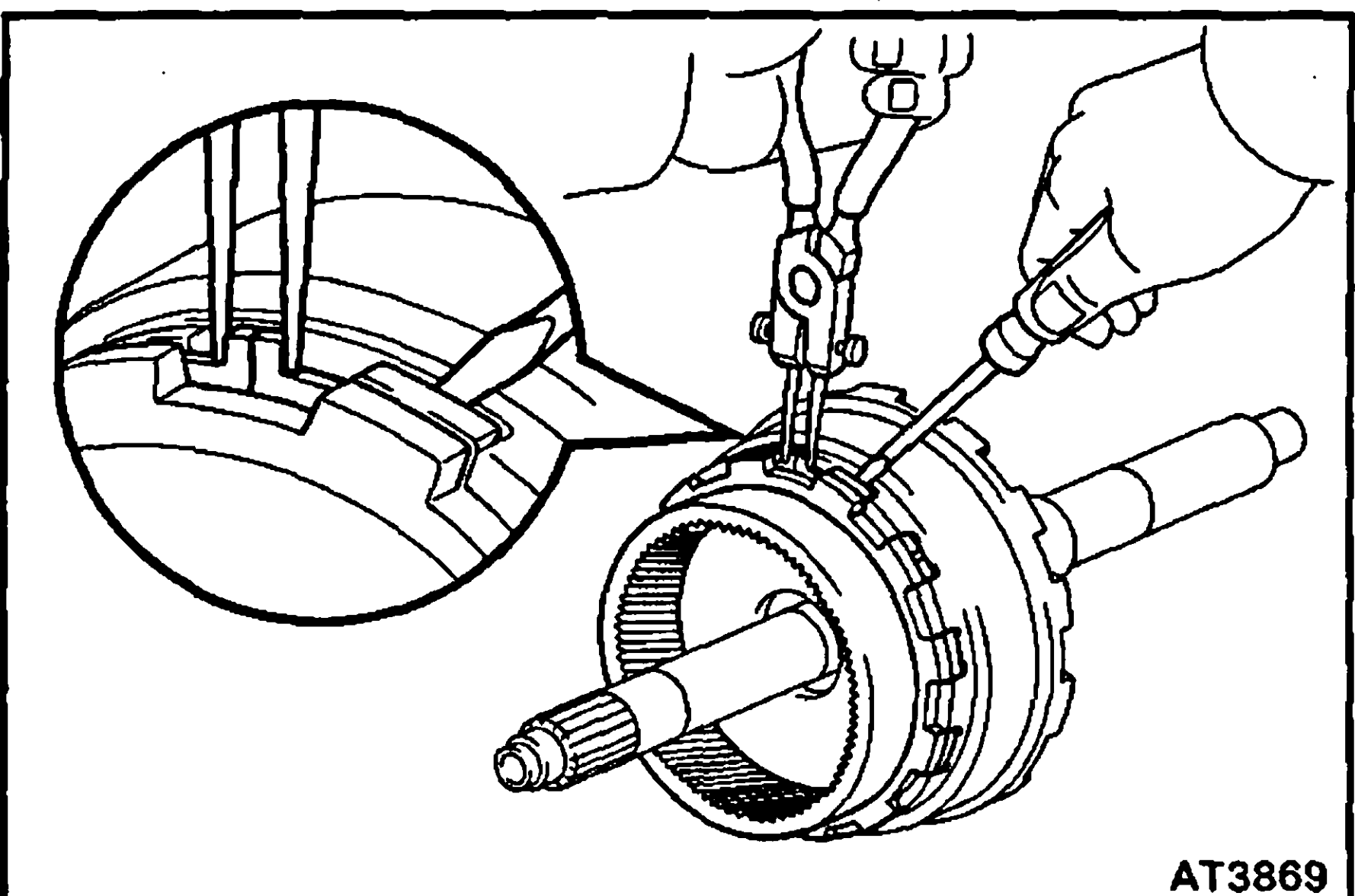
**3. CHECK OPERATION OF ONE-WAY CLUTCH**

Hold the one-way clutch outer race and turn the front planetary gear. The front planetary gear should turn freely counterclockwise and should lock clockwise.

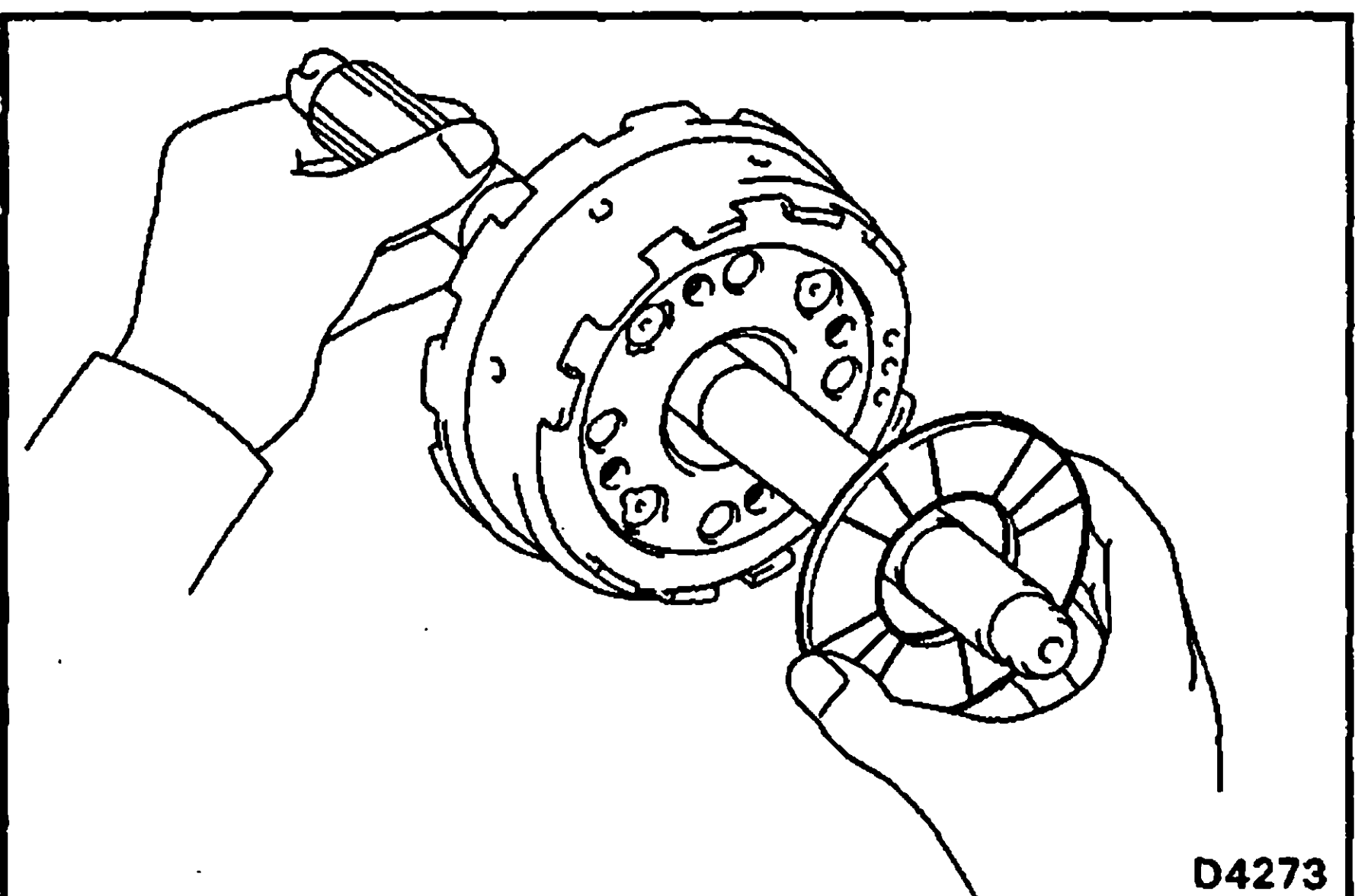
If operation is not as specified, replace the one-way clutch.

**4. REMOVE ONE-WAY CLUTCH**

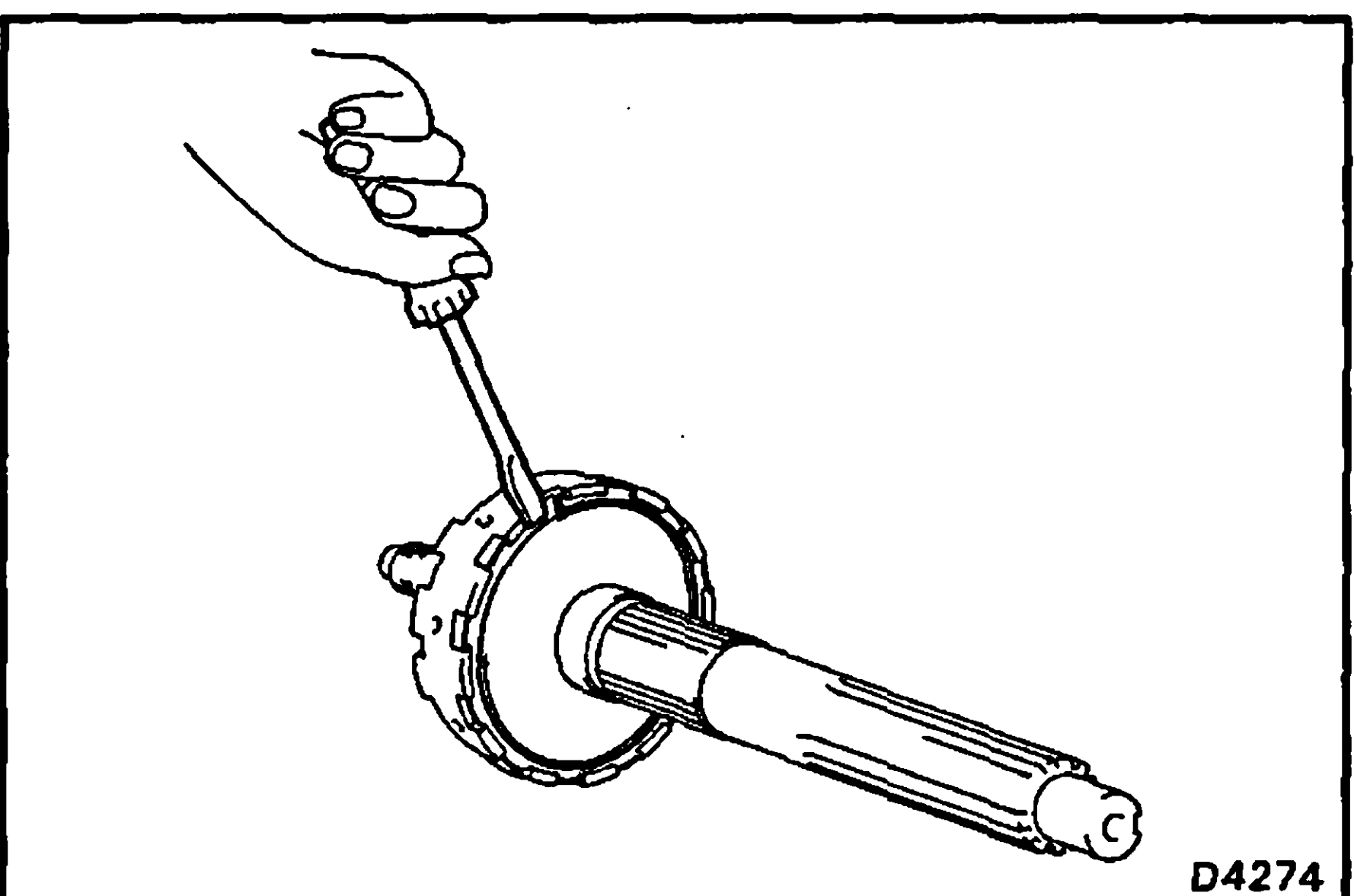
Remove the one-way clutch from the front planetary gear.

**5. REMOVE FRONT PLANETARY RING GEAR**

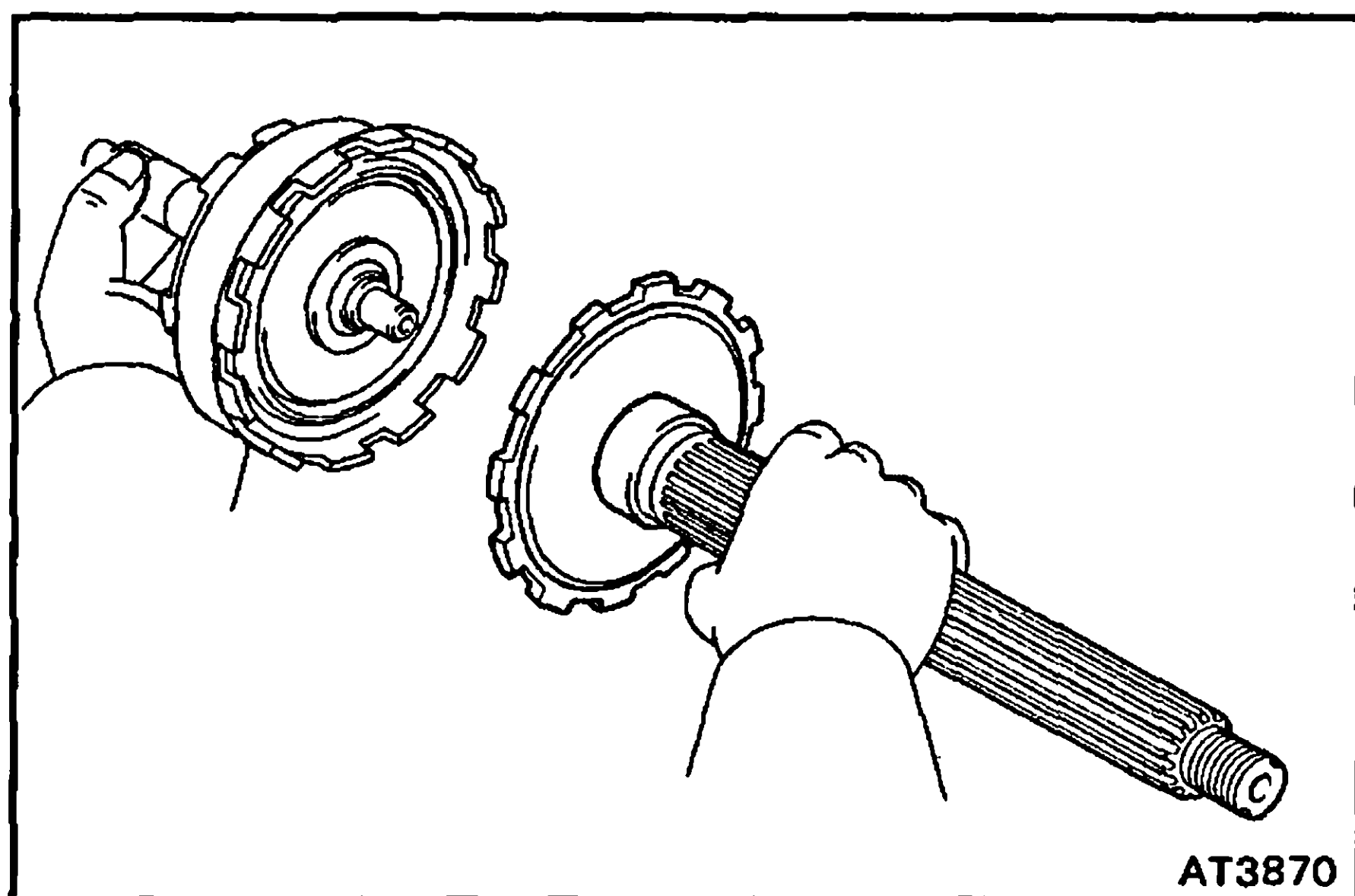
Using snap ring pliers and screwdriver, pry out the ring gear while compressing the snap ring.

**6. REMOVE NO.2 THRUST WASHER**

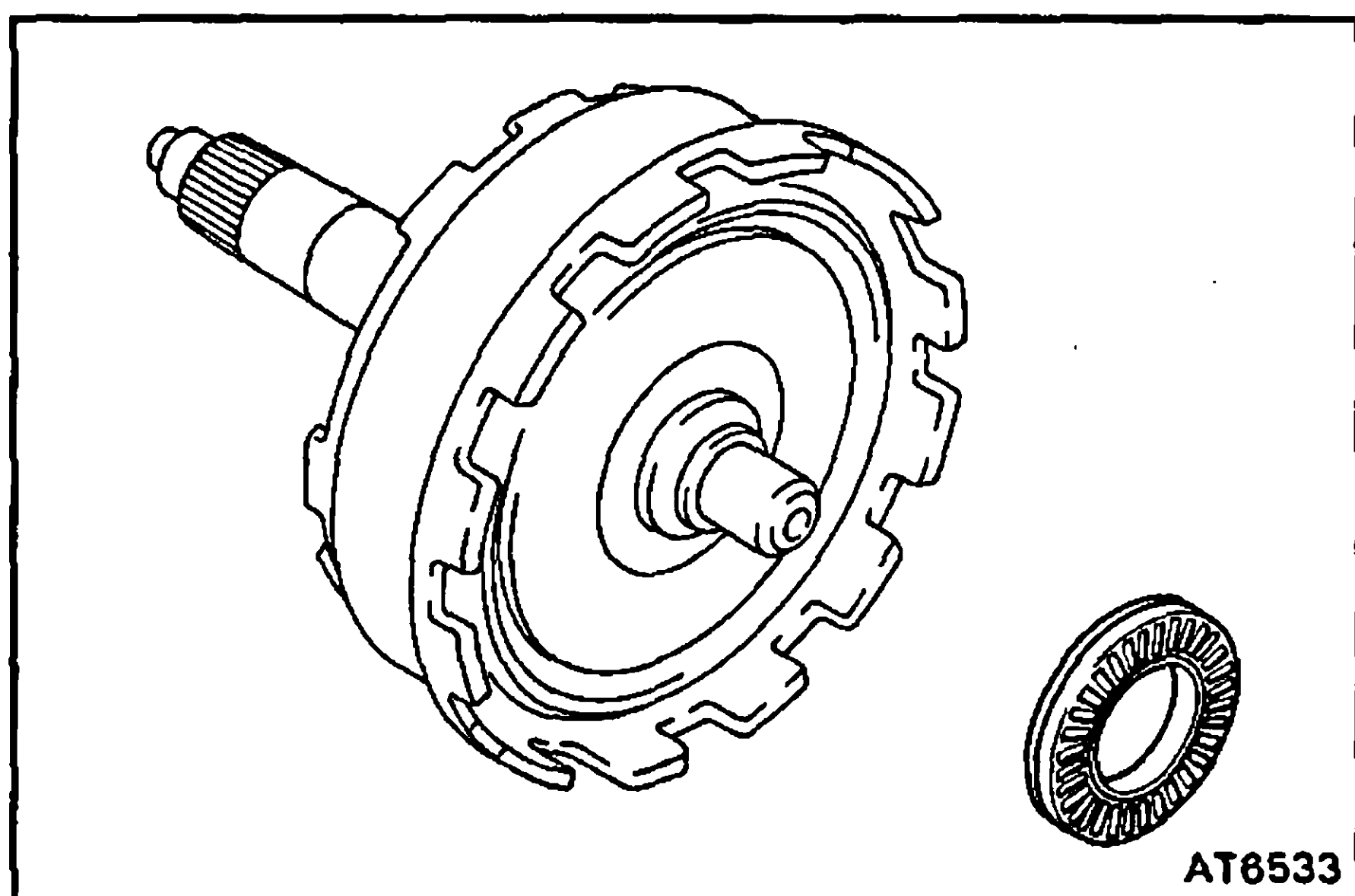
Remove the thrust washer from the rear planetary gear.

**7. REMOVE OUTPUT SHAFT**

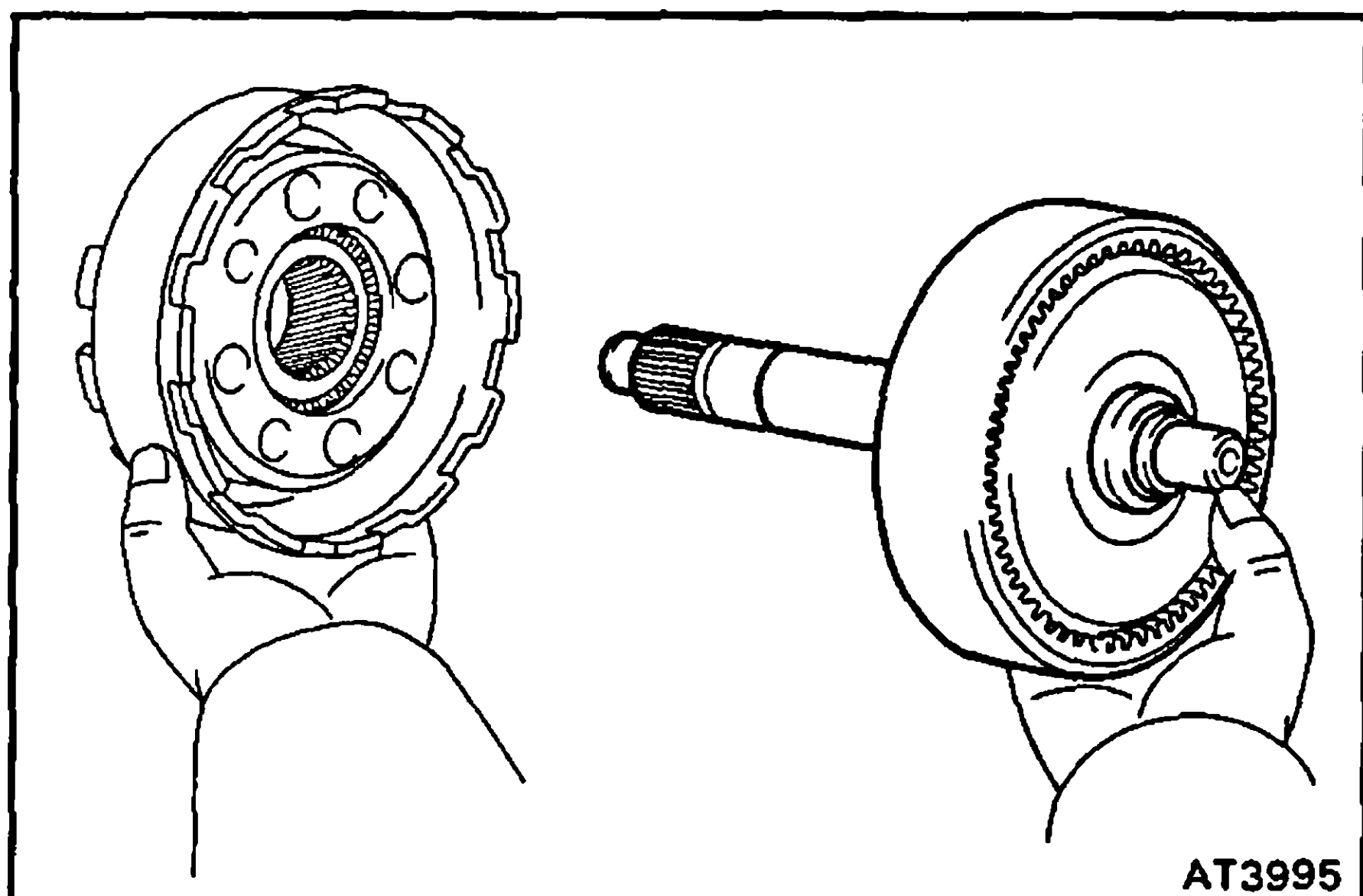
(a) Using a screwdriver, remove the snap ring.



- (b) Remove the output shaft from the rear planetary gear.

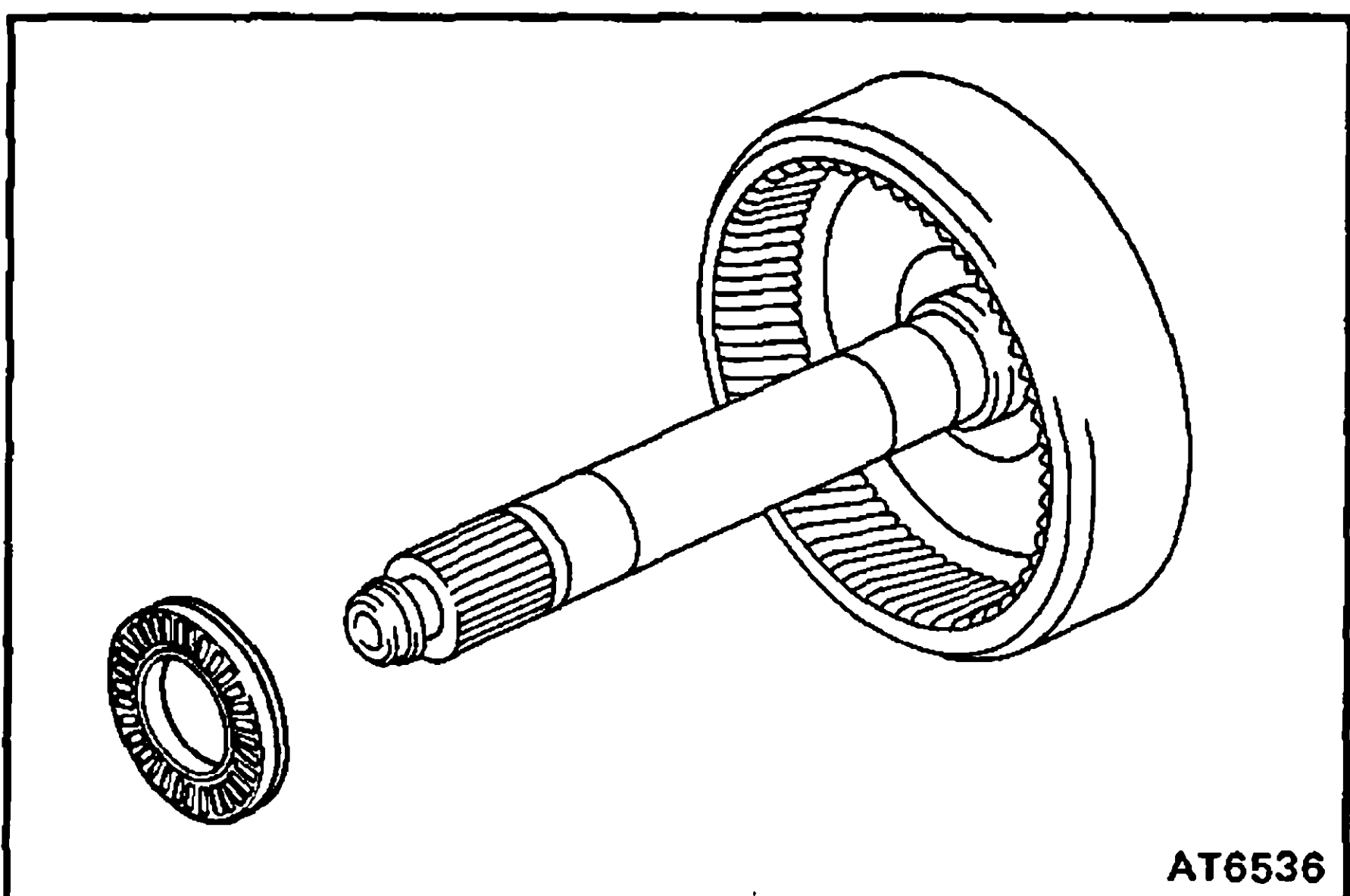


- (c) Remove the assembled bearing and race from the rear side of the ring gear flange.

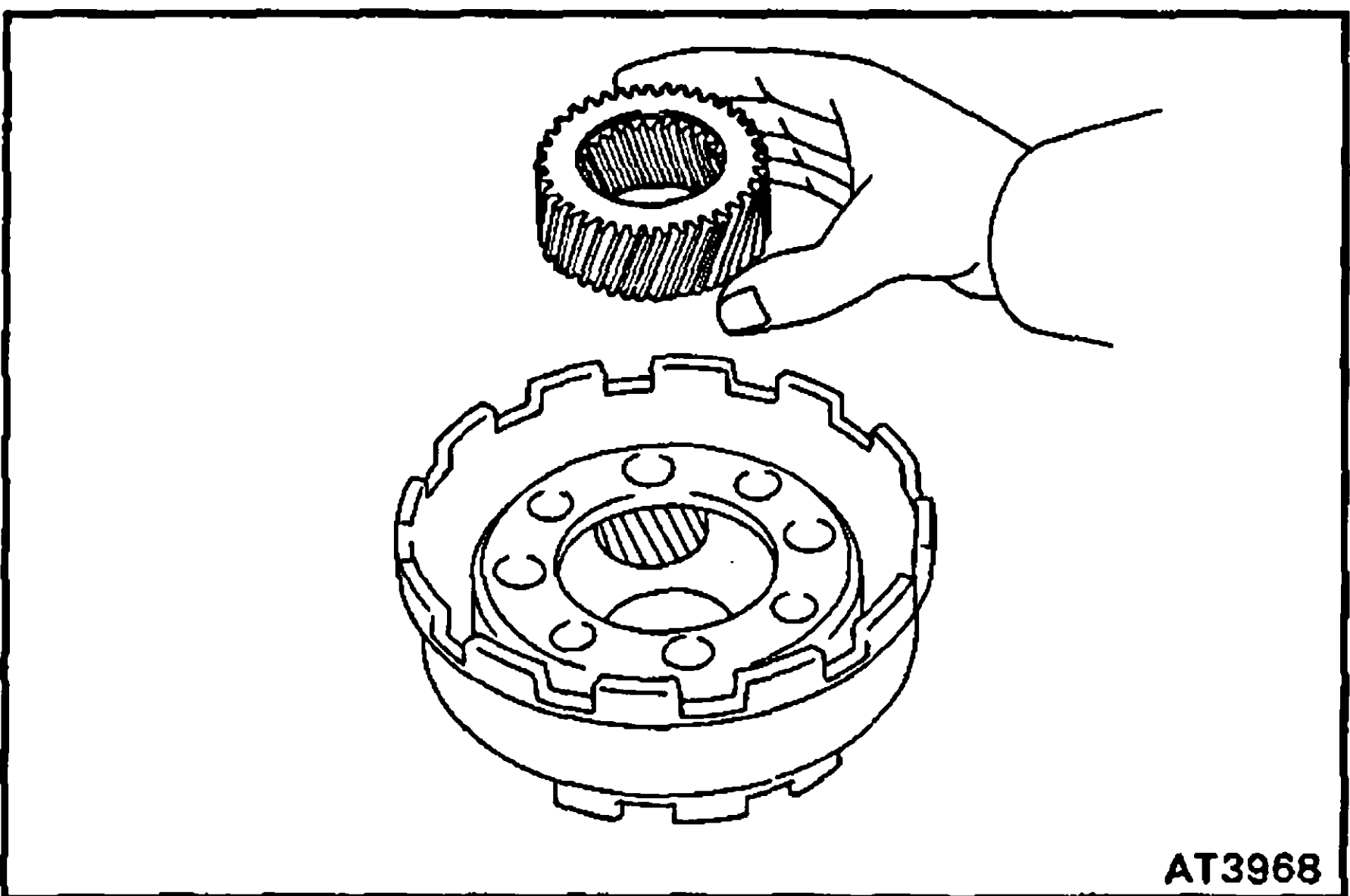


#### 8. REMOVE REAR PLANETARY RING GEAR AND INTERMEDIATE SHAFT ASSEMBLY

- (a) Remove the ring gear and intermediate shaft assembly from the rear planetary gear.



- (b) Remove the assembled bearing and race from the front side of the ring gear flange.

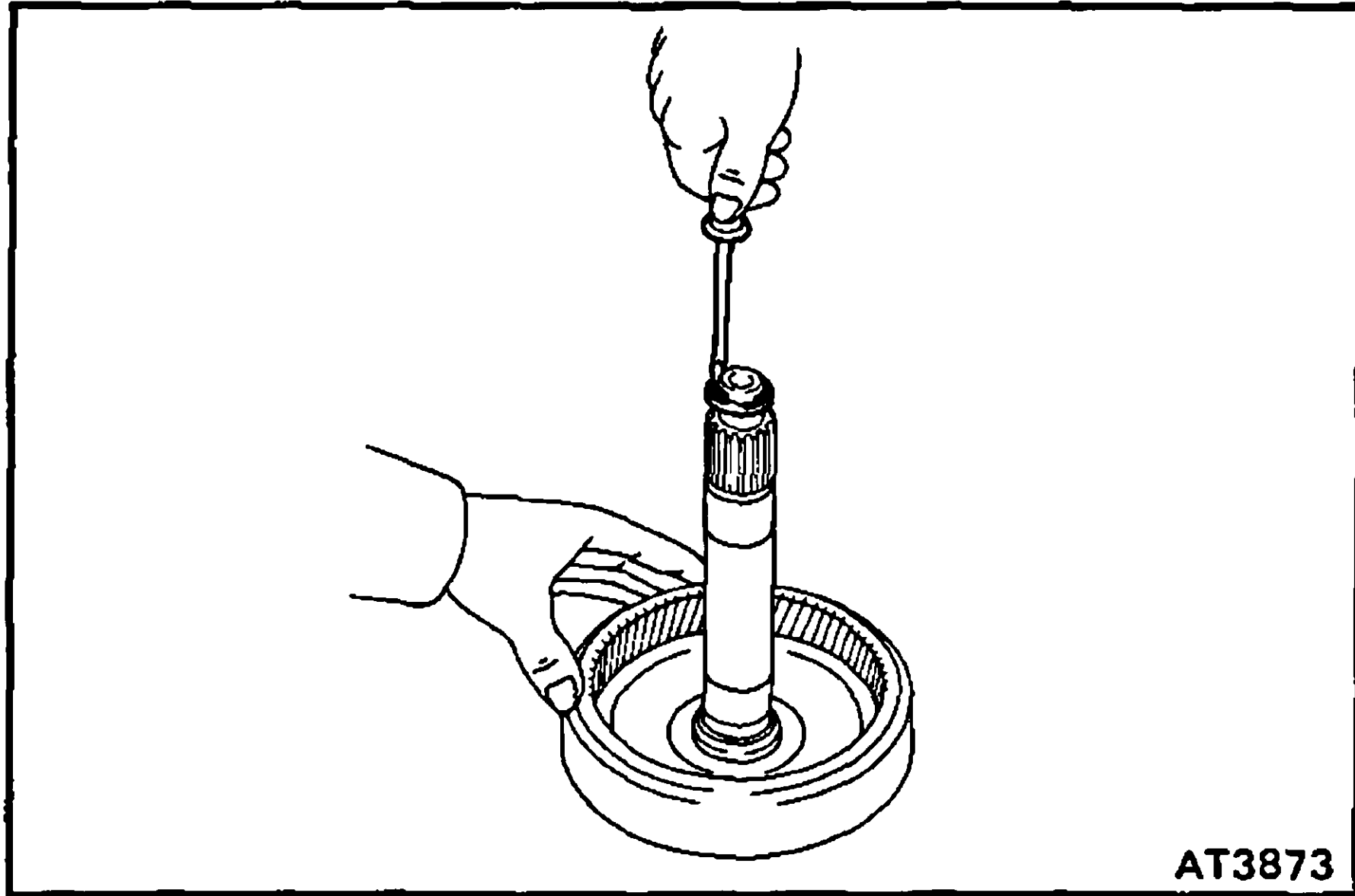


#### 9. REMOVE REAR PLANETARY SUN GEAR

Remove the sun gear from the rear planetary gear.

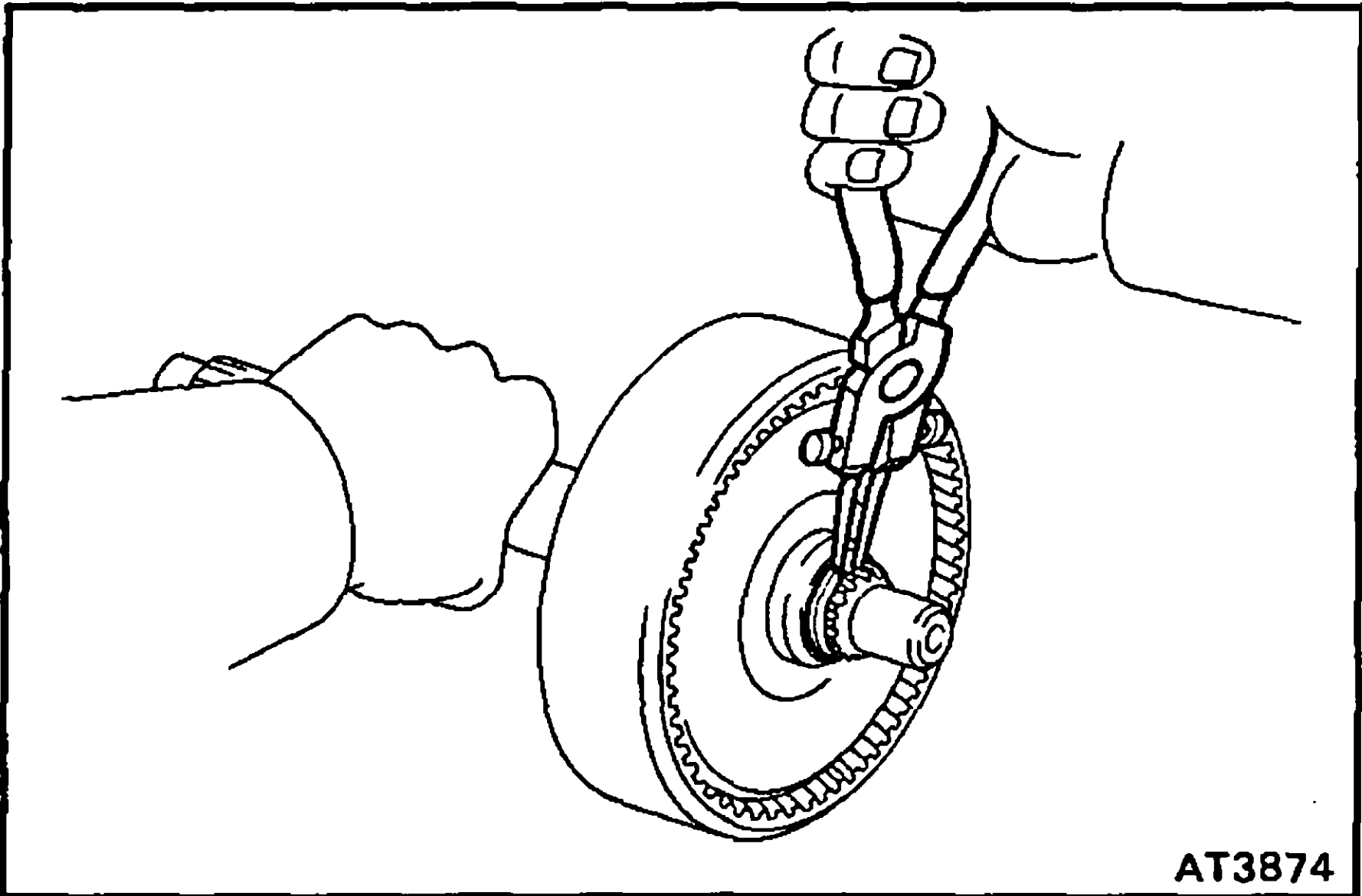
**10. REMOVE OIL SEAL RING**

Using a small screwdriver, pry out the oil seal ring.

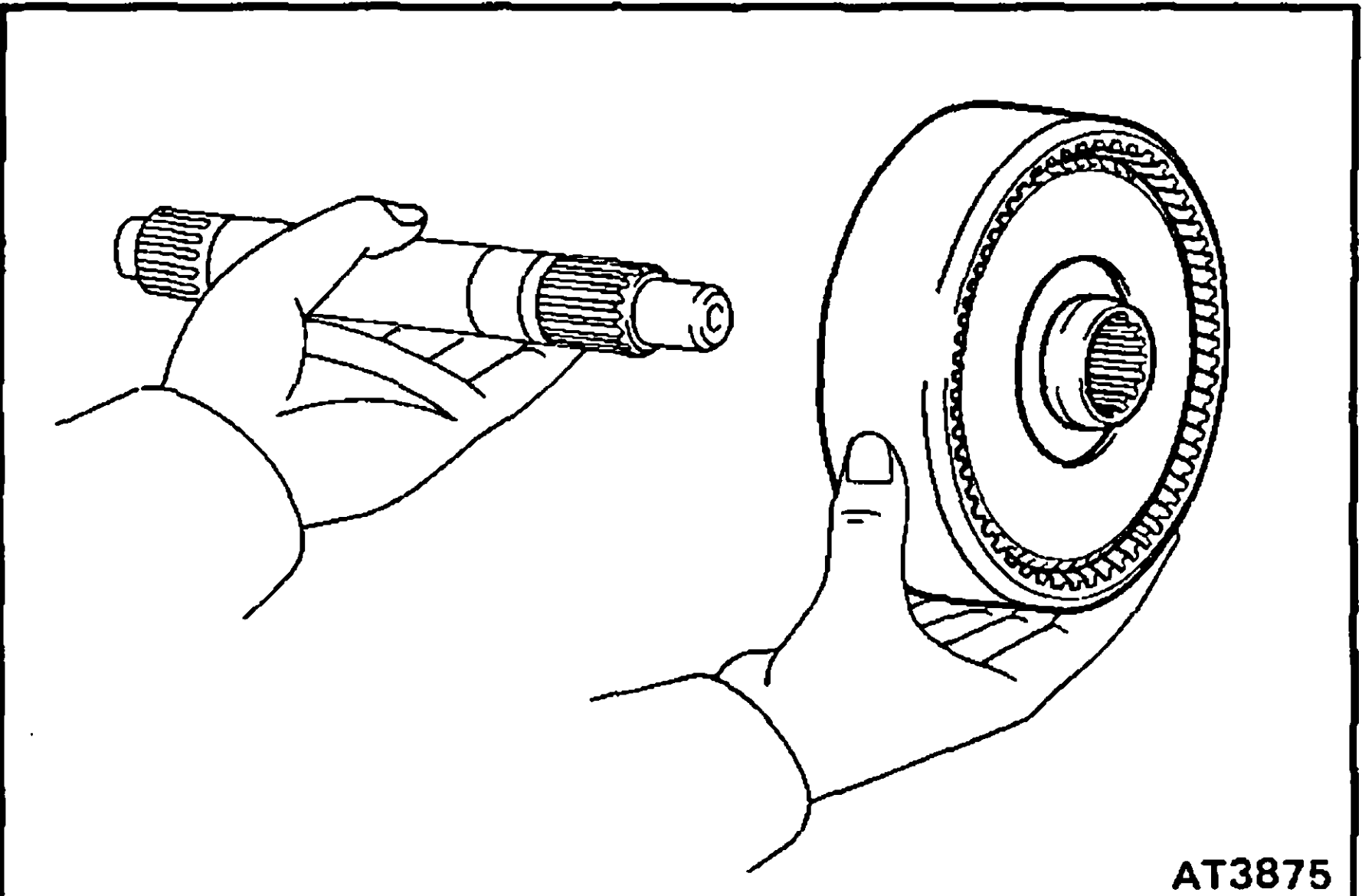


**11. REMOVE REAR PLANETARY RING GEAR AND FLANGE ASSEMBLY**

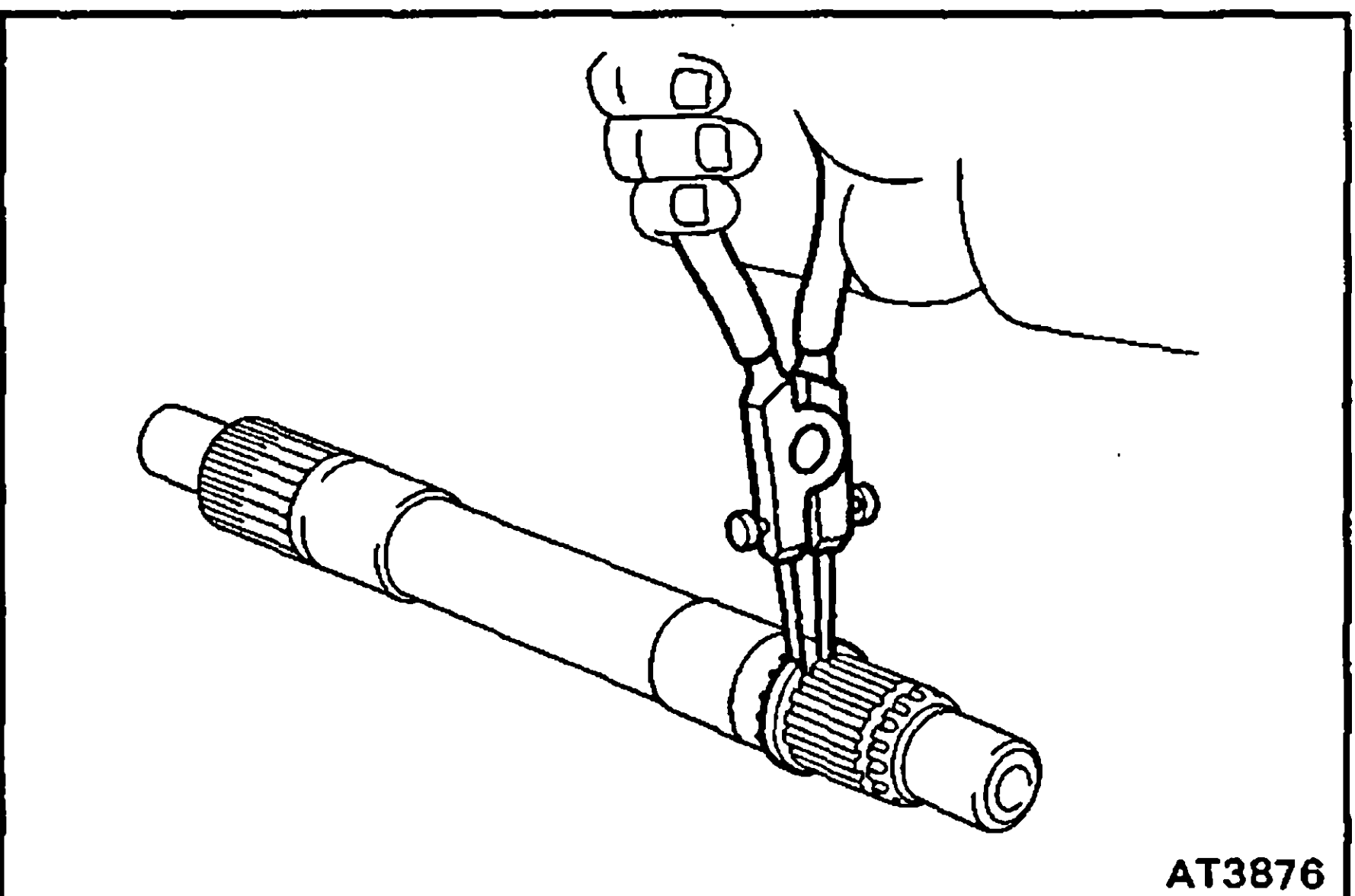
(a) Using snap ring pliers, remove the snap ring from the rear side of the intermediate shaft.



(b) Remove the ring gear and flange assembly from the intermediate shaft.

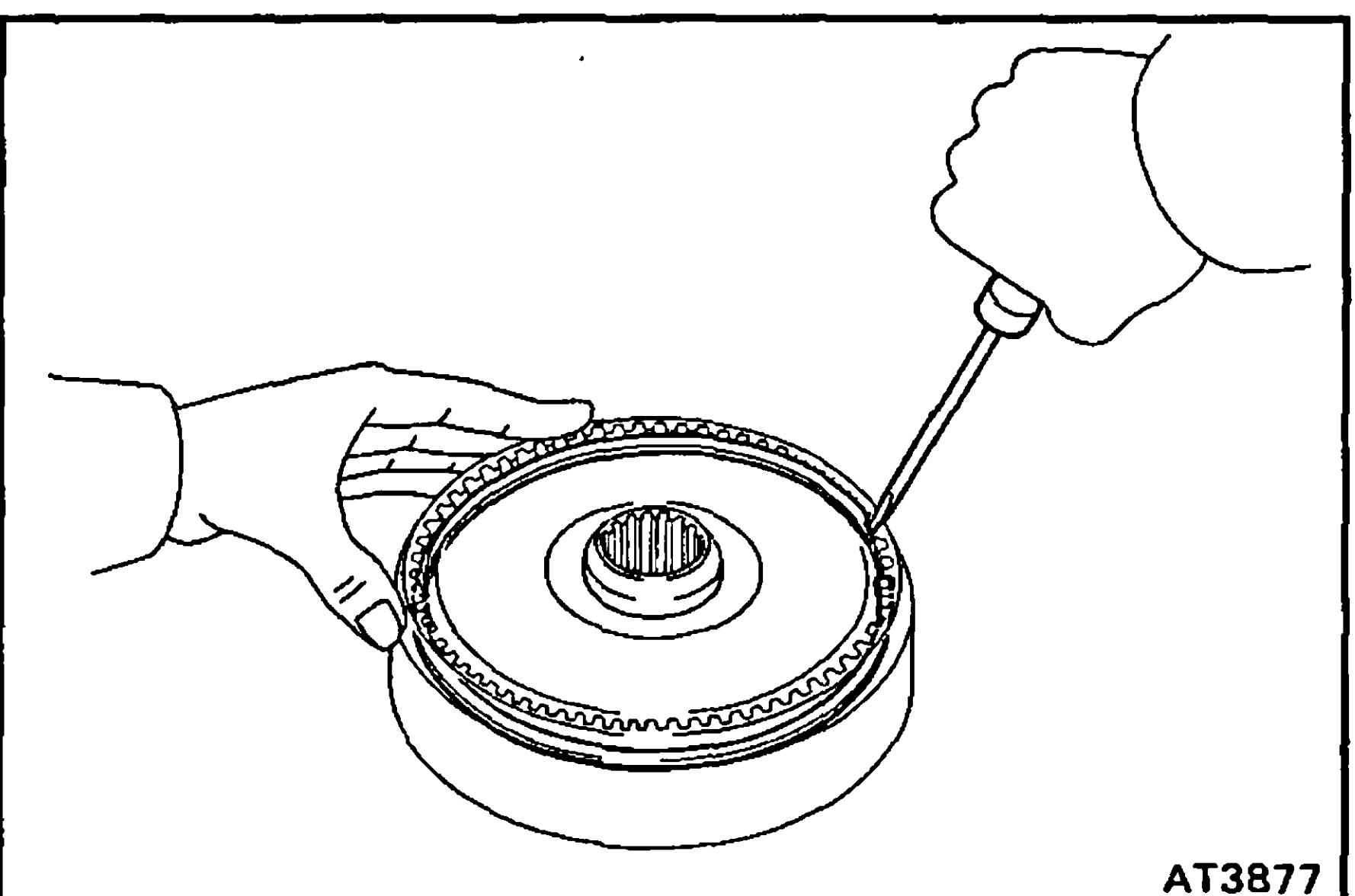


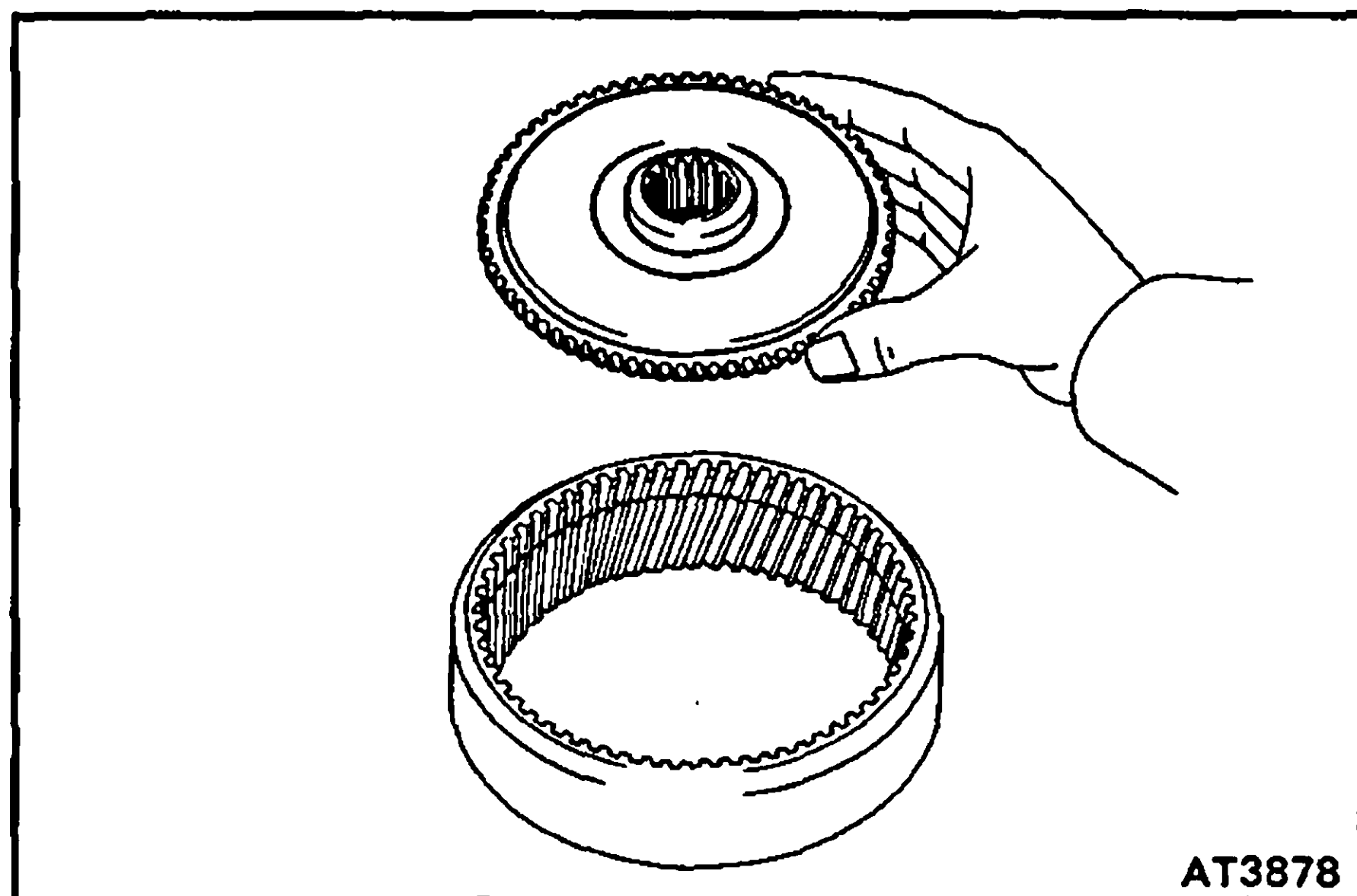
(c) Using snap ring pliers, remove the snap ring from the front side of the intermediate shaft.



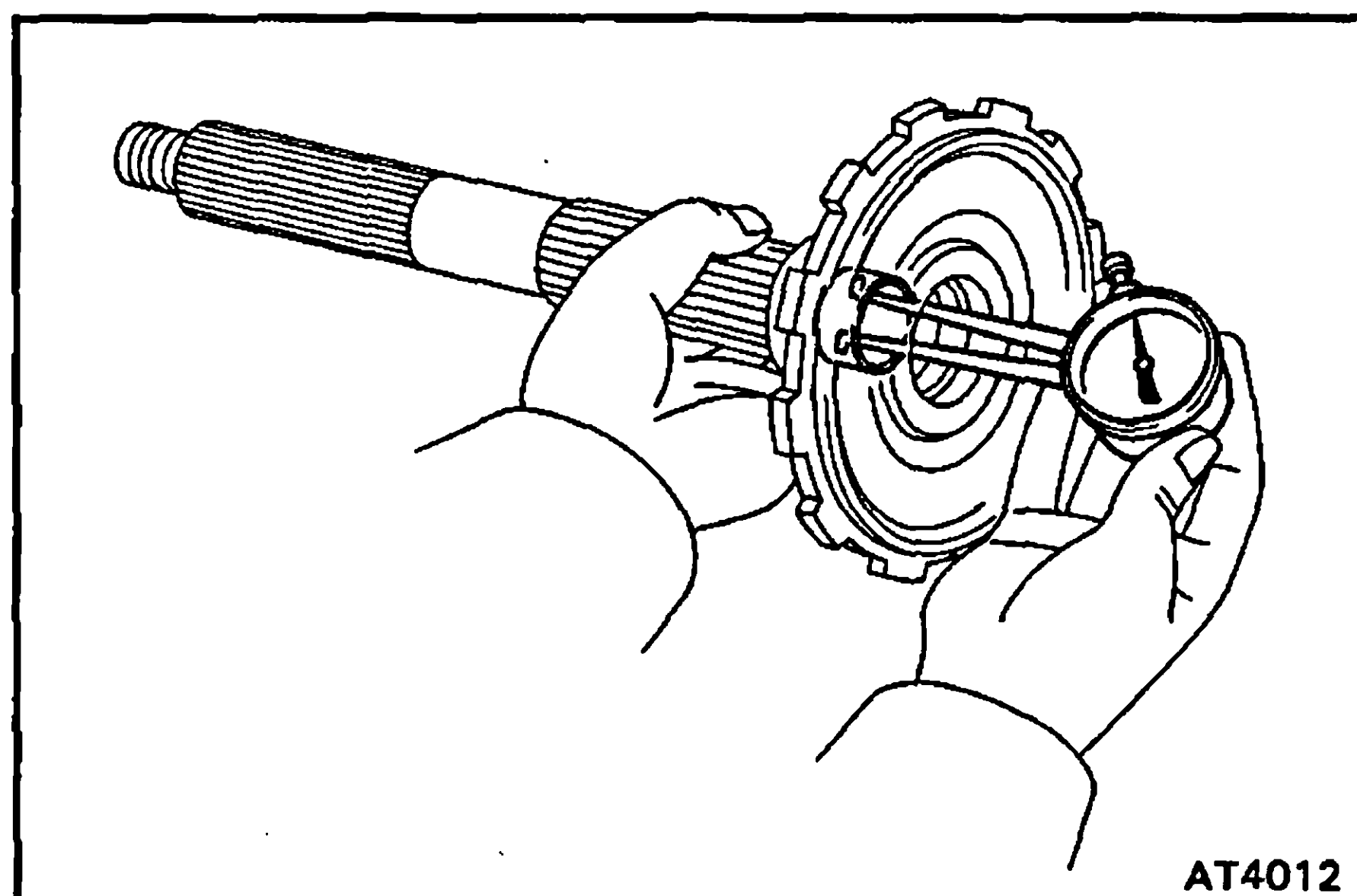
**12. REMOVE REAR PLANETARY RING GEAR FLANGE**

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





- (b) Remove the ring gear flange from the rear planetary ring gear.



## INSPECTION OF PLANETARY GEARS AND OUTPUT SHAFT

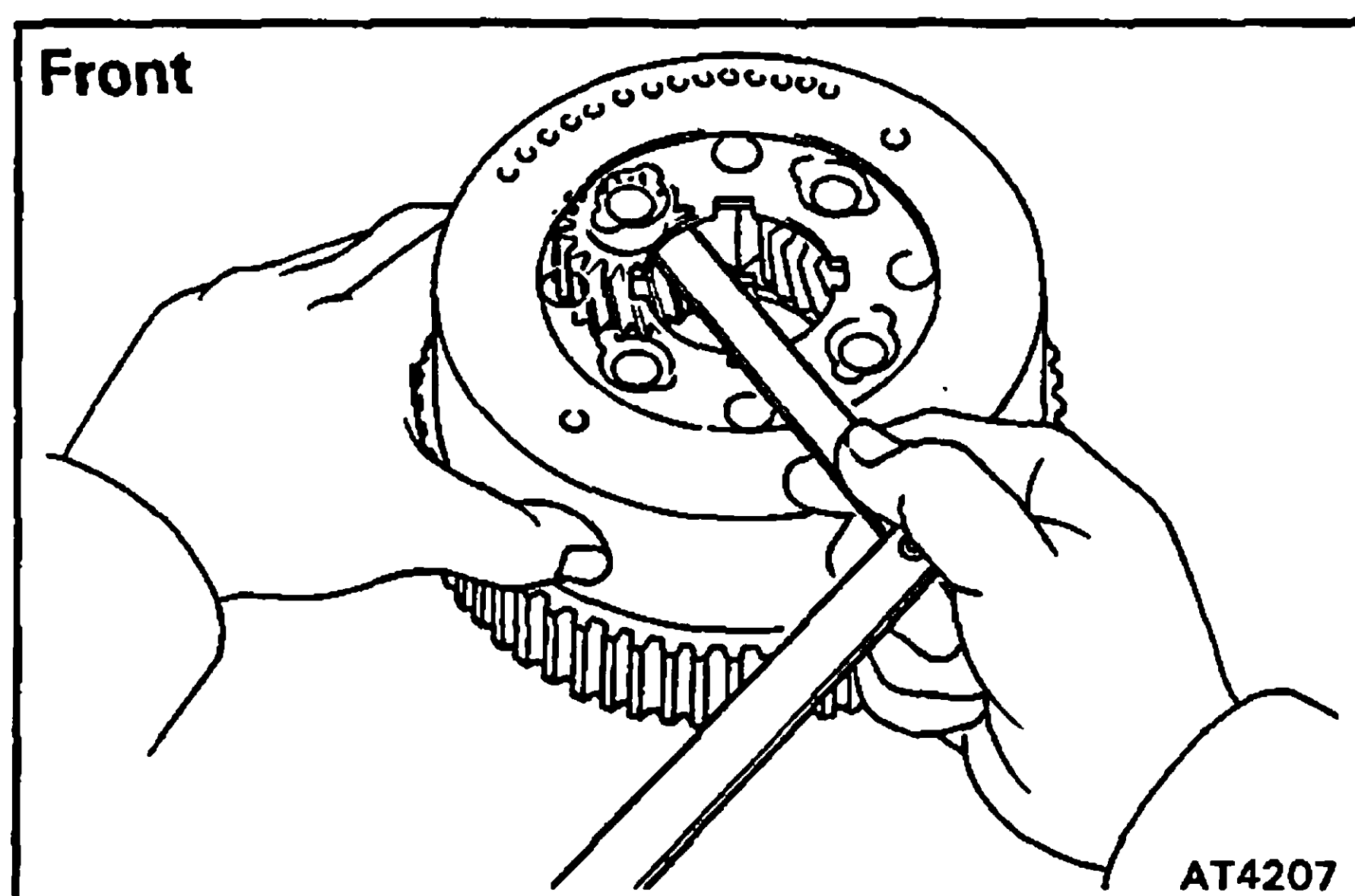
### 1. INSPECT BUSHING OF OUTPUT SHAFT

Using a dial indicator, measure the inside diameter.

Standard inside diameter: 17.000 – 17.021 mm  
(0.6693 – 0.6701 in.)

Maximum inside diameter: 17.07 mm (0.6720 in.)

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



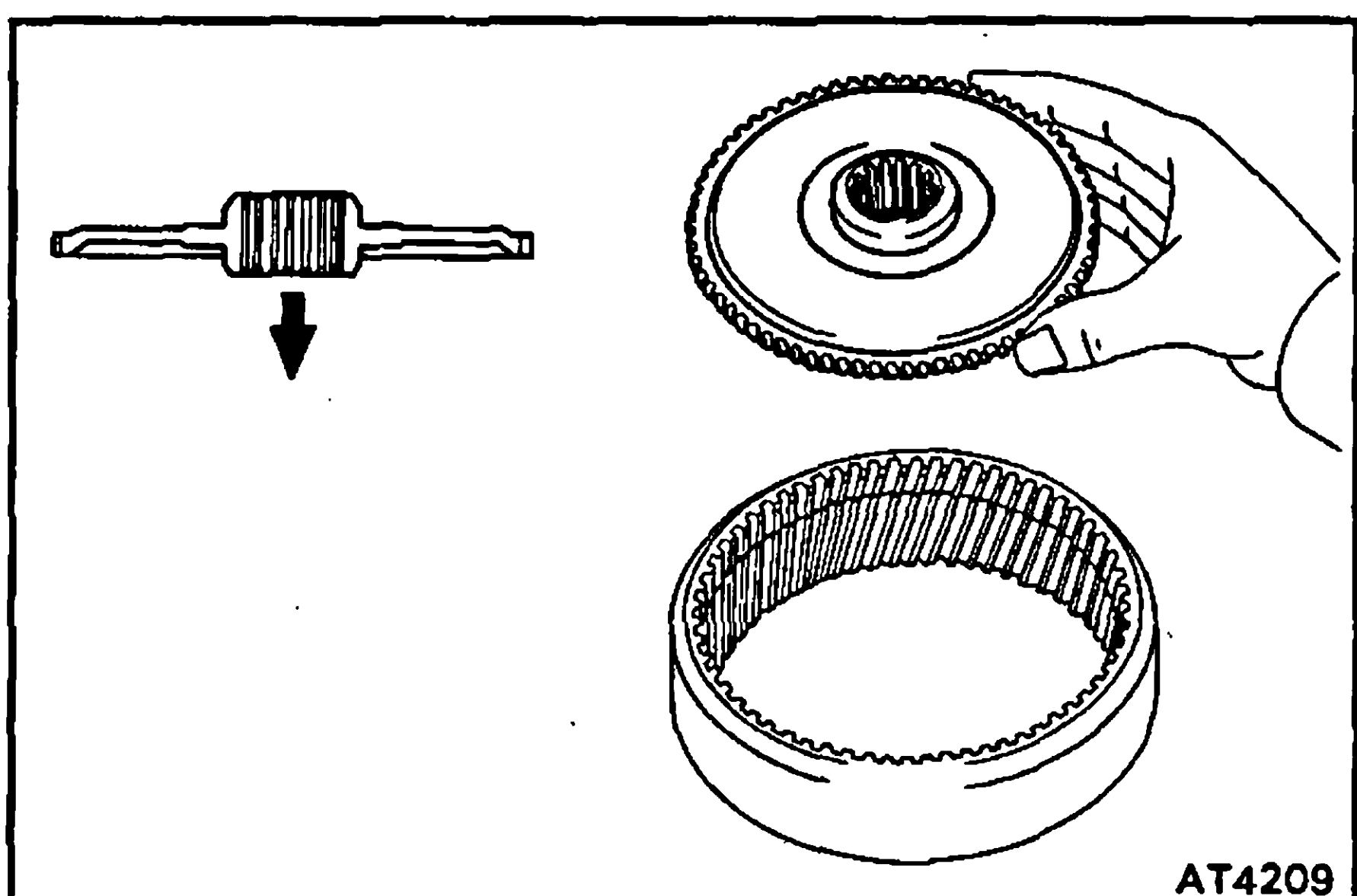
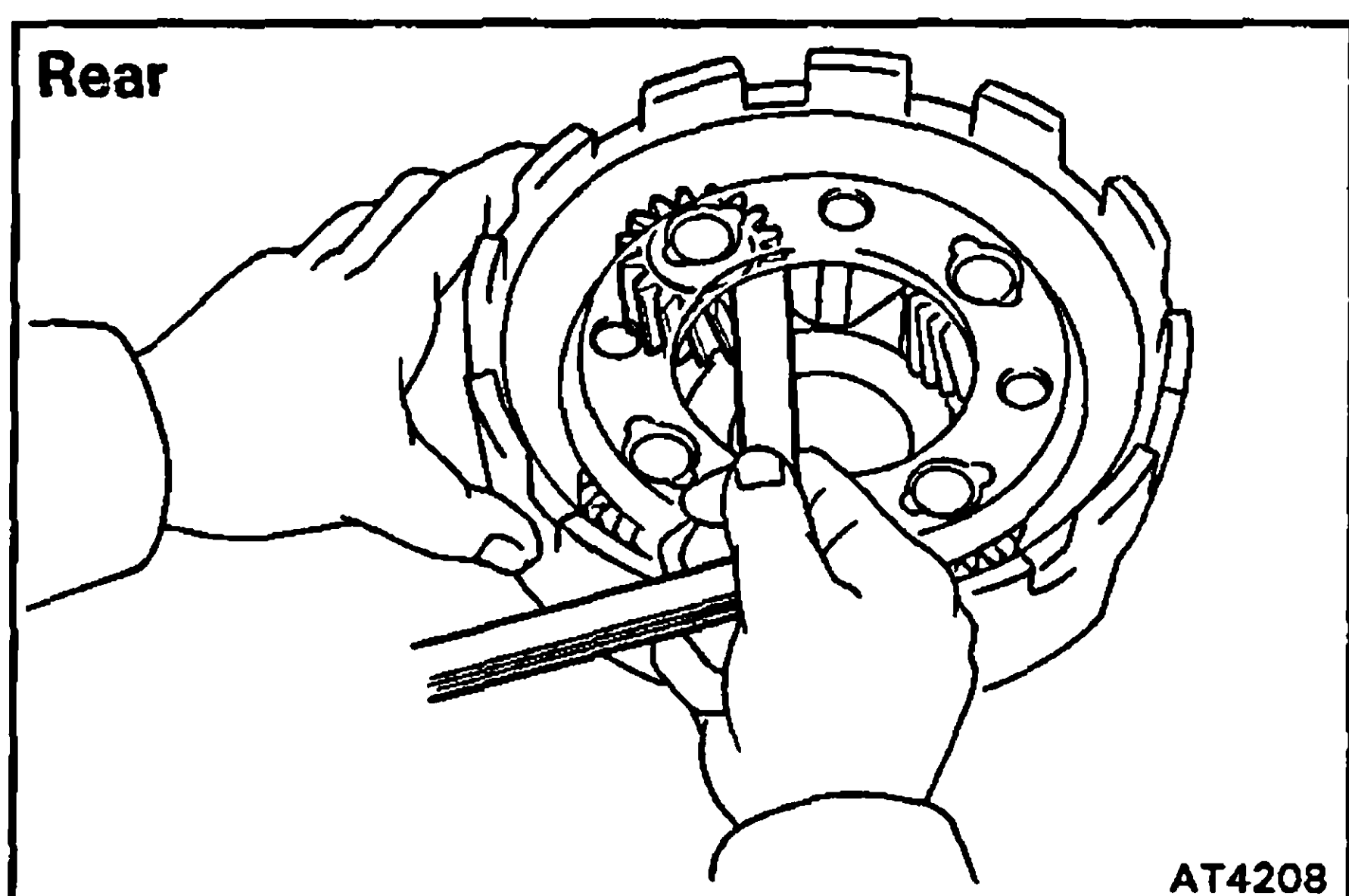
### 2. INSPECT PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance between the pinions and carrier.

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

Maximum clearance: 0.75 mm (0.0295 in.)

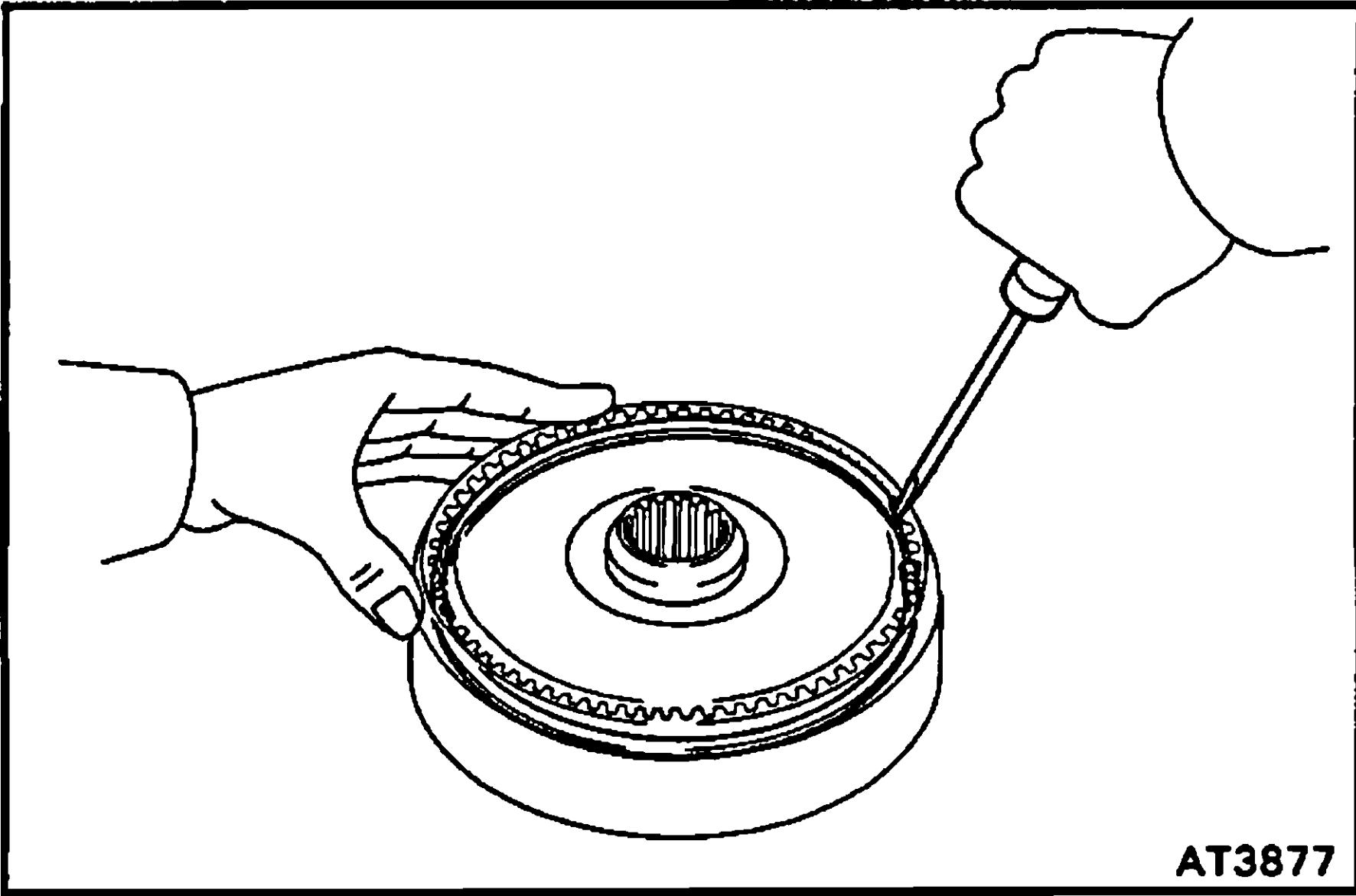
If the thrust clearance is greater than maximum, replace the planetary gear.



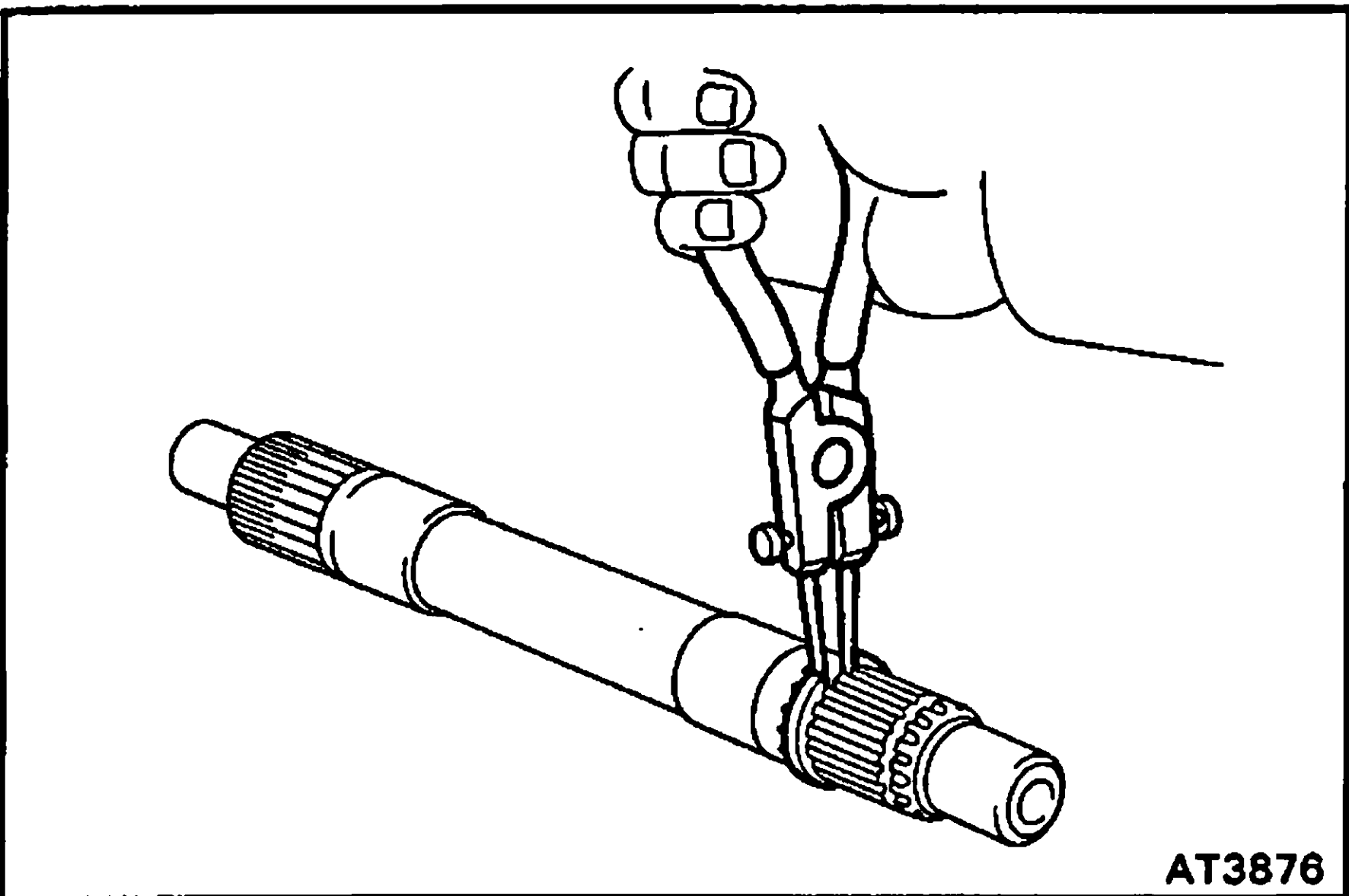
## ASSEMBLY OF PLANETARY GEARS, ONE-WAY CLUTCH AND OUTPUT SHAFT

### 1. INSTALL REAR PLANETARY RING GEAR FLANGE

- (a) Install the ring gear flange to the rear planetary ring gear.

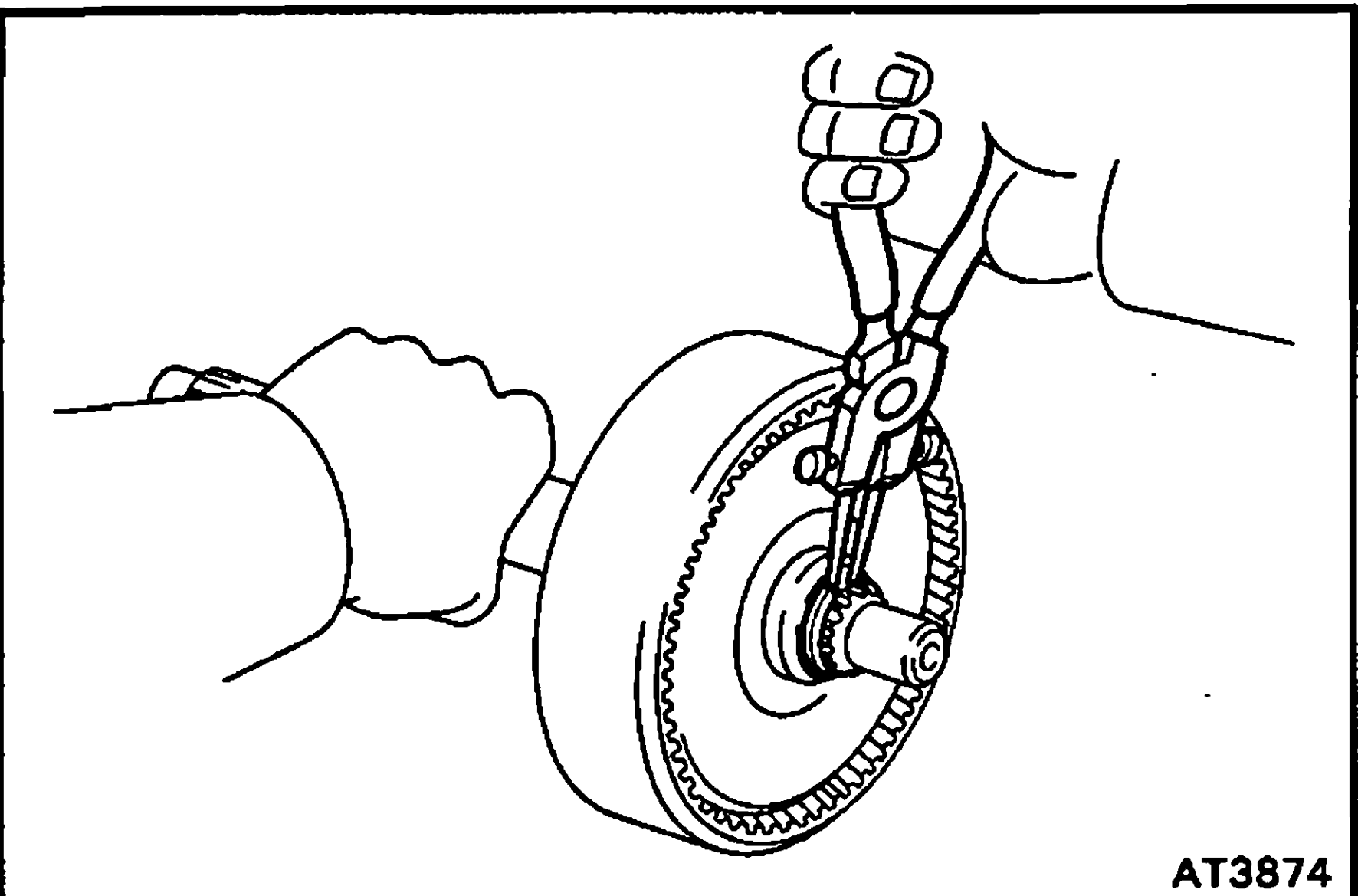


(b) Using a small screwdriver, install the snap ring.



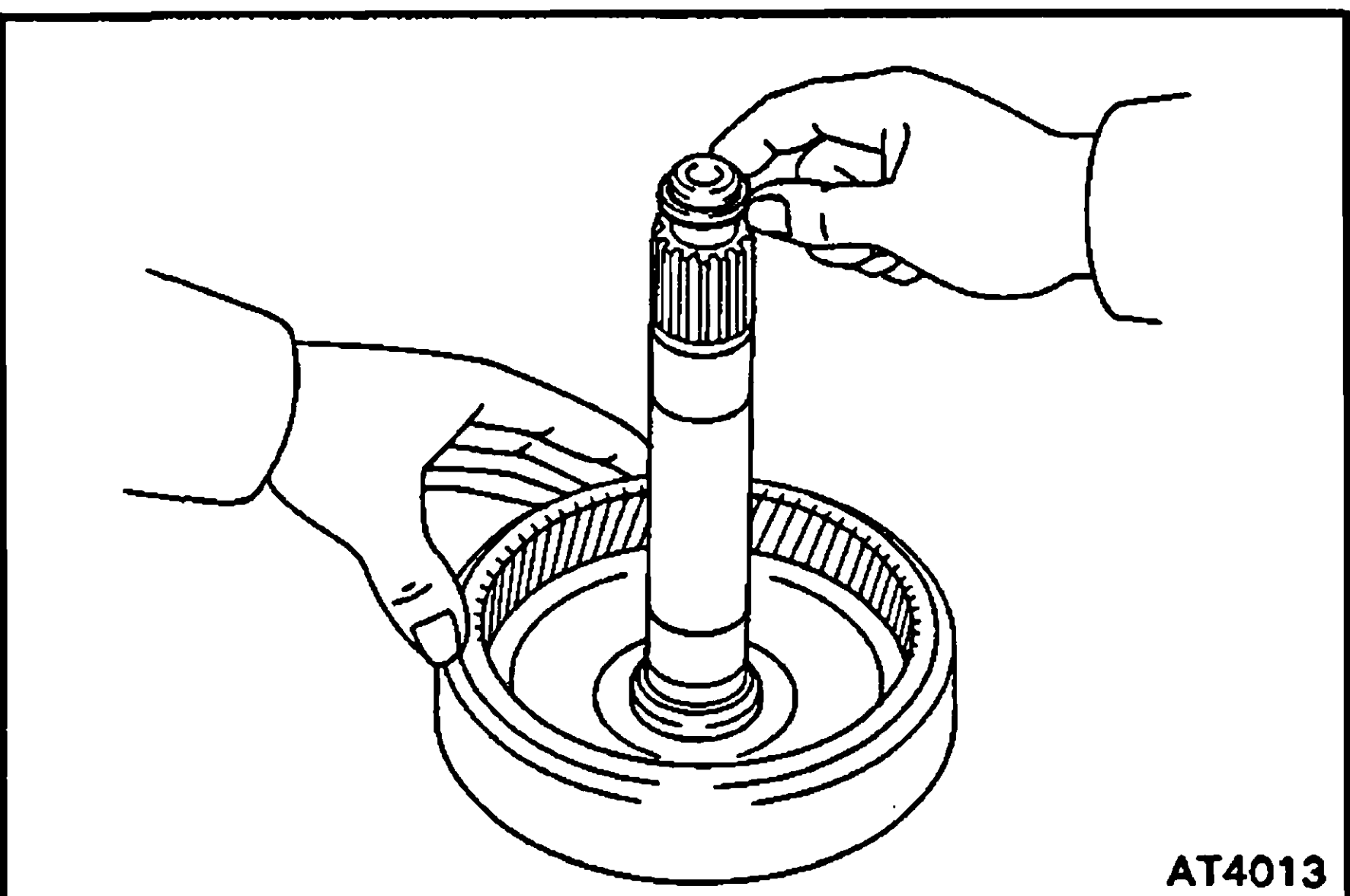
## 2. INSTALL REAR PLANETARY RING GEAR AND FLANGE ASSEMBLY

(a) Using snap ring pliers, install the snap ring on the front side of the intermediate shaft.



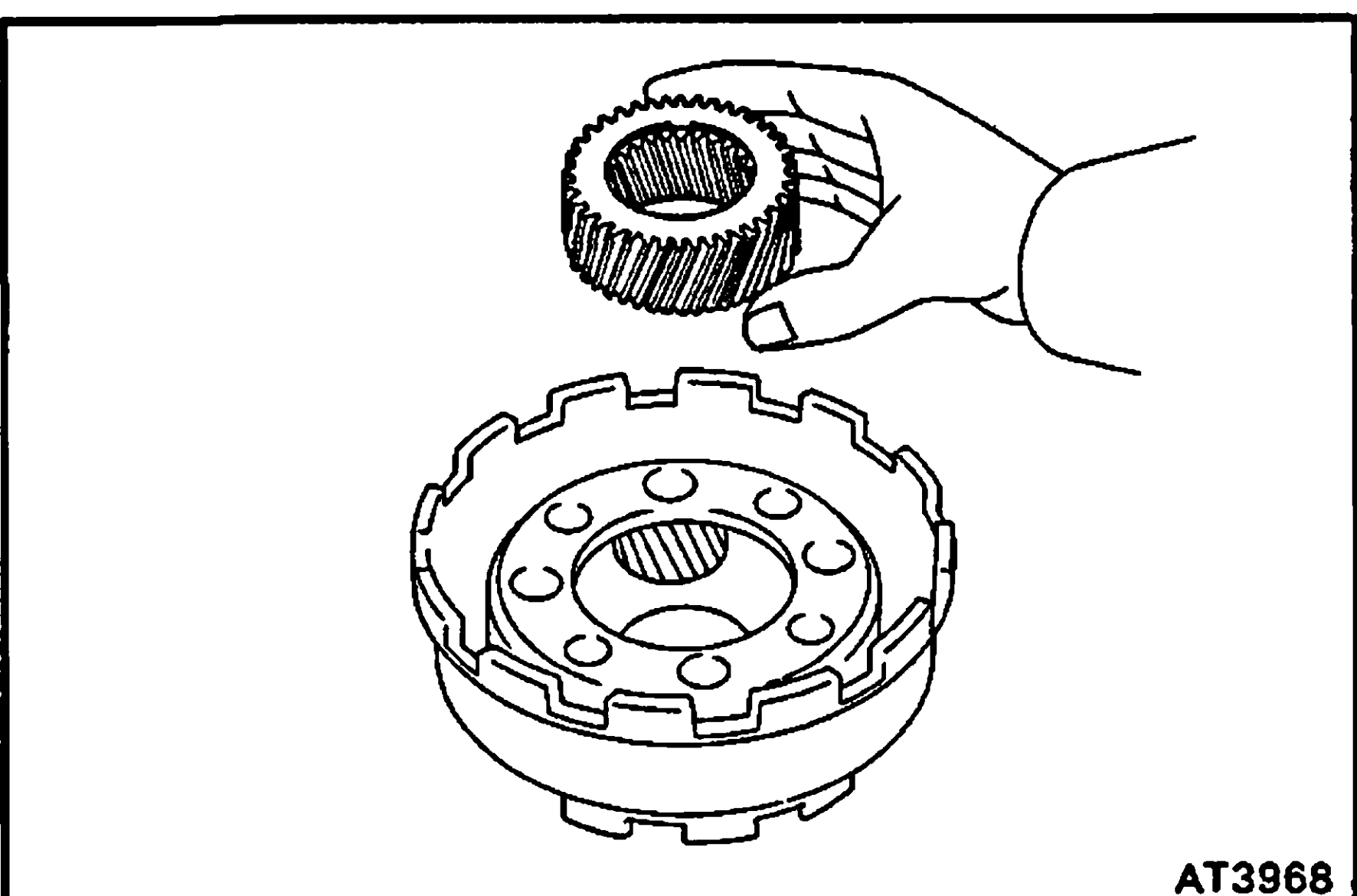
(b) Install the ring gear and flange assembly.

(c) Using snap ring pliers, install the snap ring on the rear side of the intermediate shaft.



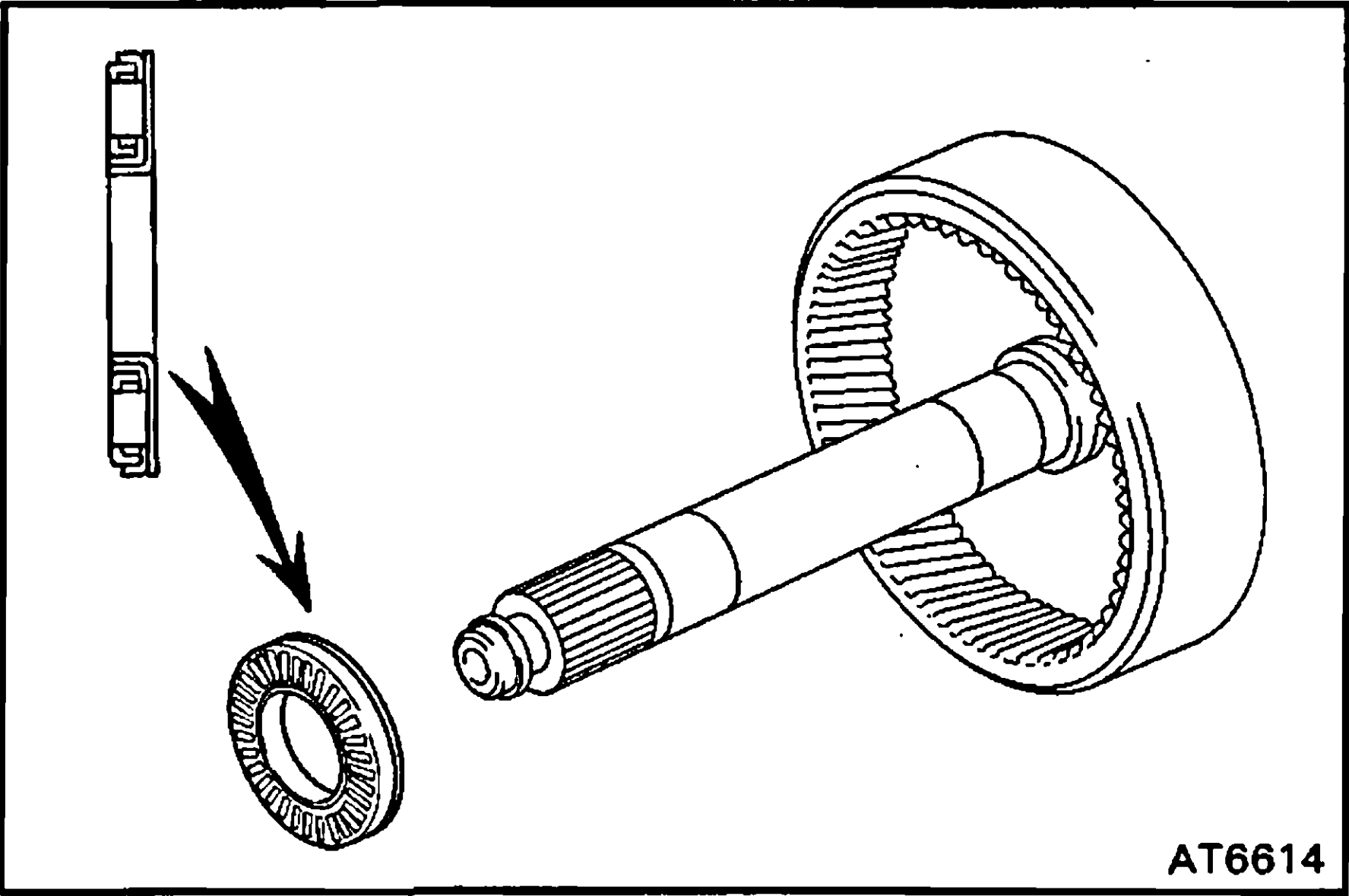
## 3. INSTALL OIL SEAL RING

Coat a new oil seal ring with ATF, and install it on the intermediate shaft.



## 4. INSTALL REAR PLANETARY SUN GEAR

Install the sun gear to the rear planetary gear.



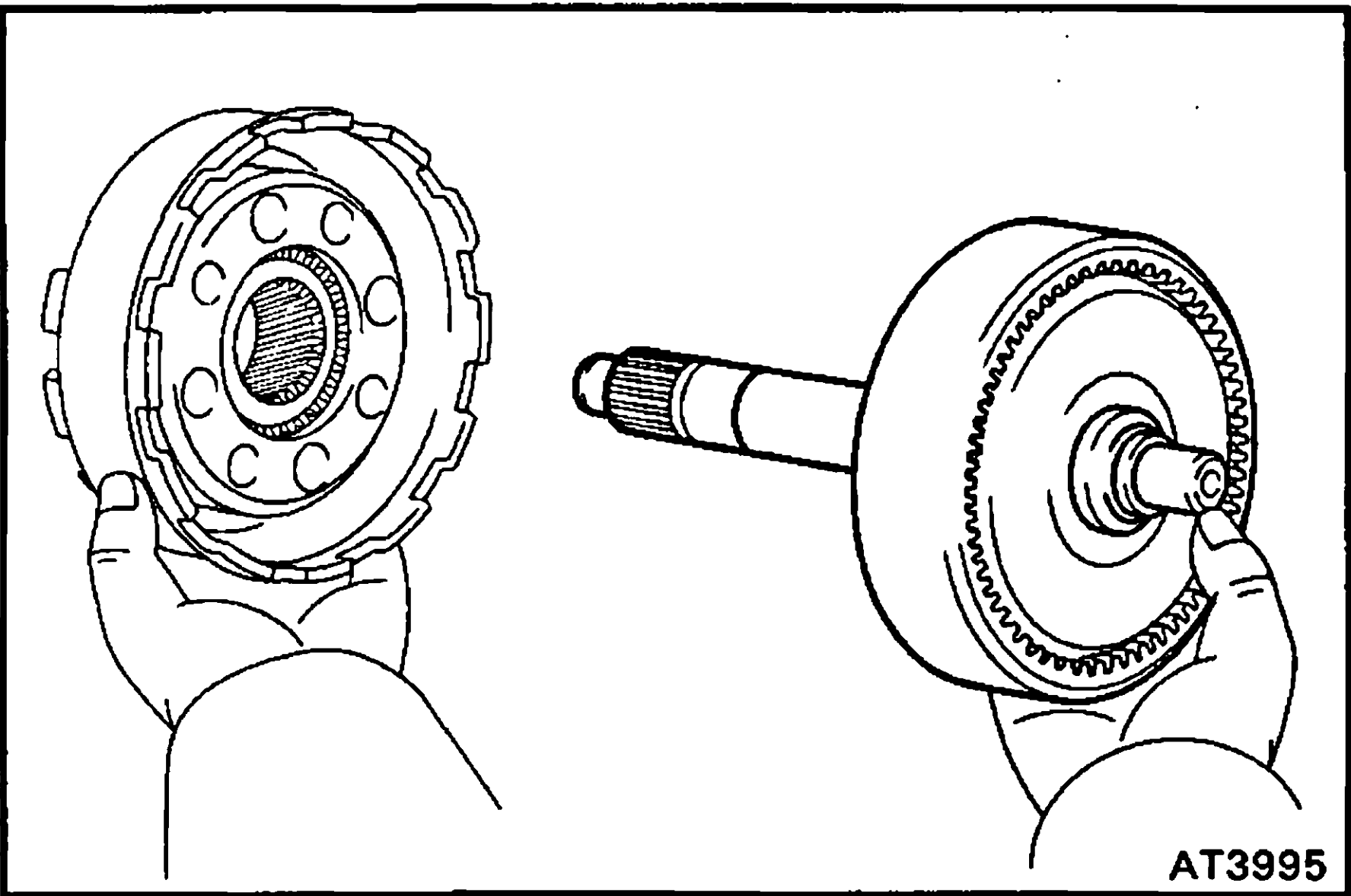
5. INSTALL REAR PLANETARY RING GEAR AND INTERMEDIATE SHAFT ASSEMBLY

- (a) Coat the assembled bearing and race with petroleum jelly.
- (b) Install the assembled bearing and race onto the front side of the ring gear flange.

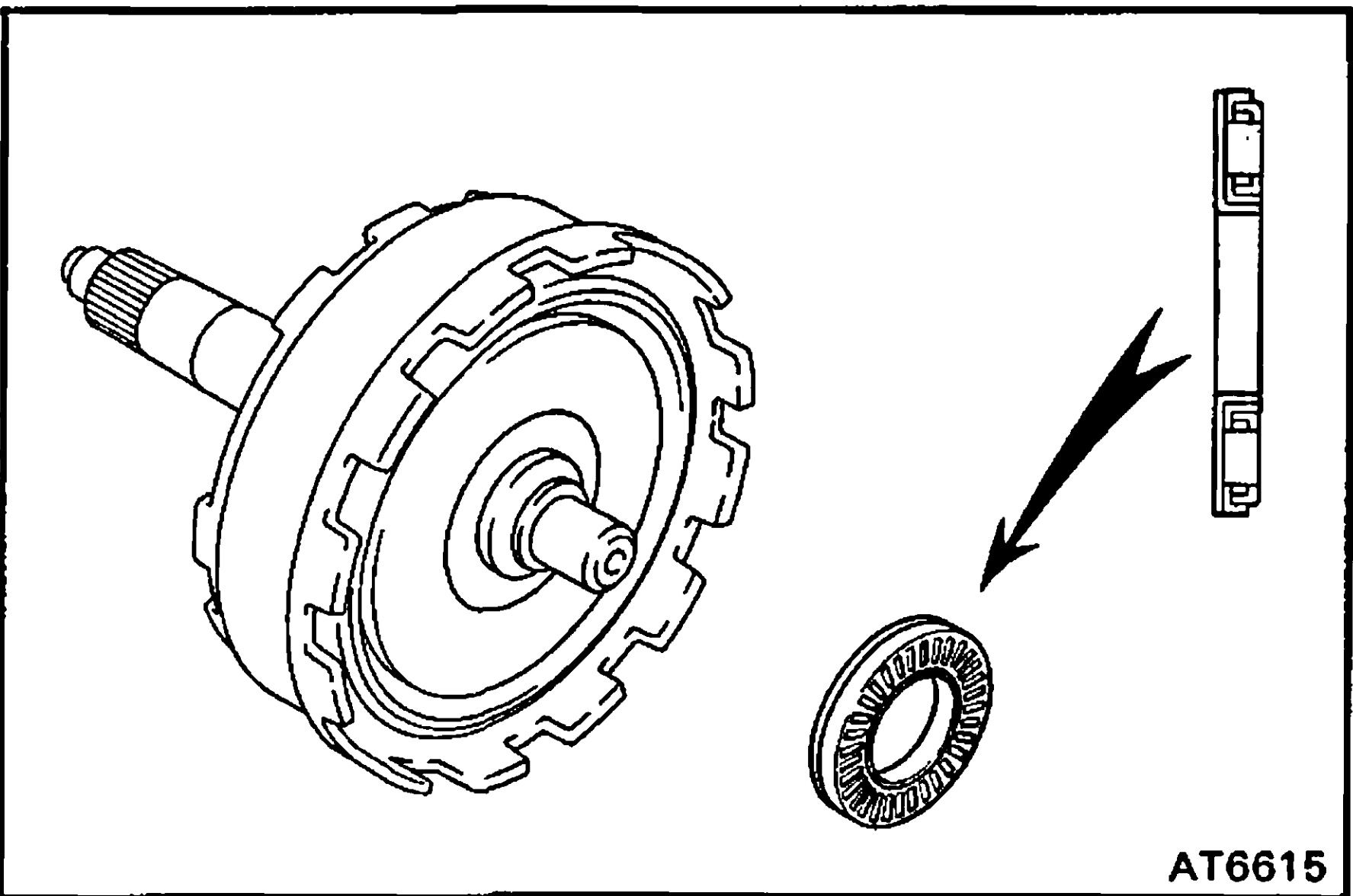
HINT: Assembled bearing and race diameter

mm (in.)

|                            | Inside       | Outside      |
|----------------------------|--------------|--------------|
| Assembled bearing and race | 32.8 (1.291) | 50.4 (1.984) |



- (c) Install the ring gear and intermediate shaft assembly to the rear planetary gear.



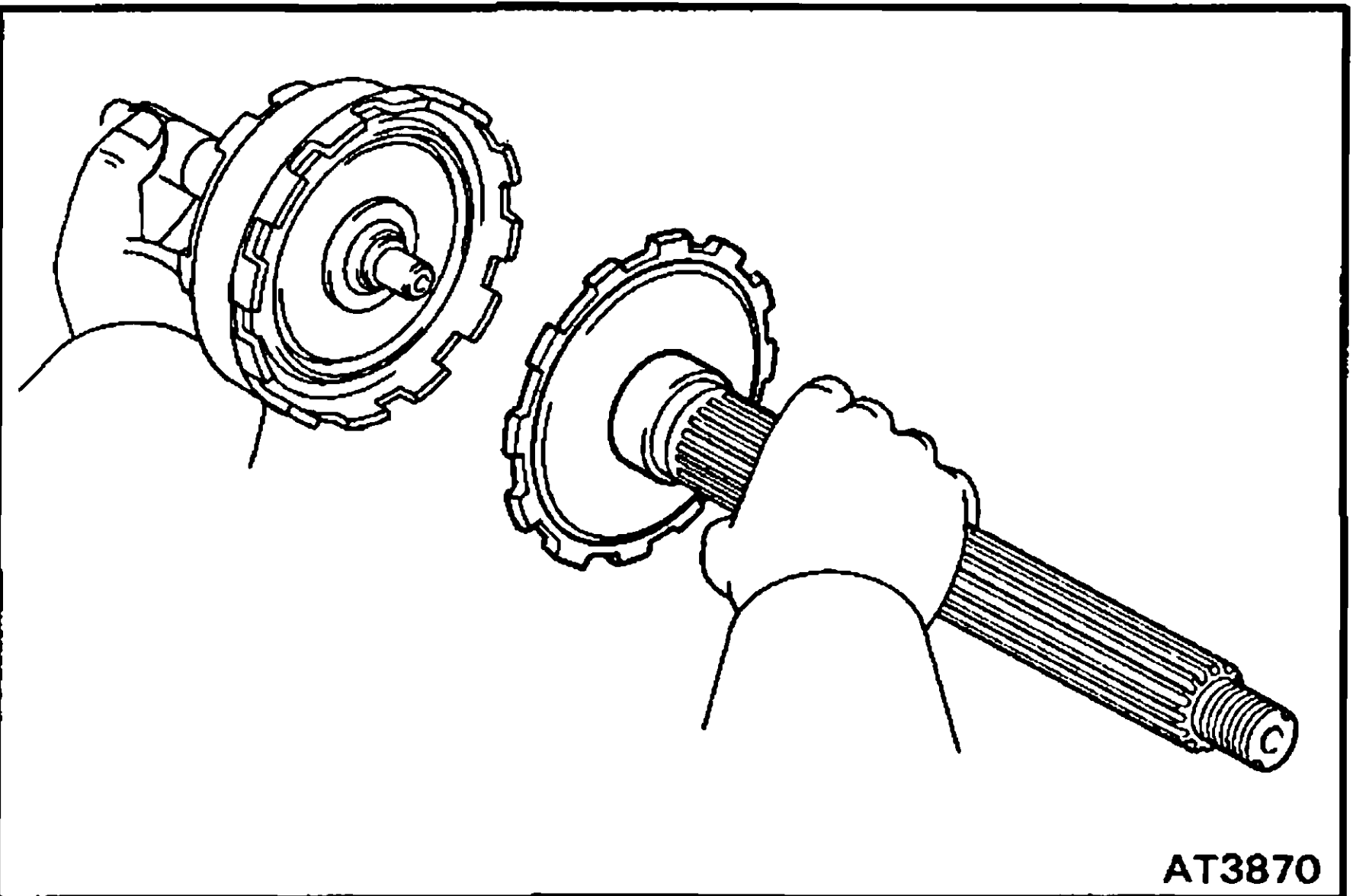
6. INSTALL OUTPUT SHAFT

- (a) Coat the assembled bearing and race with petroleum jelly.
- (b) Install the assembled bearing and race onto the rear side of the ring gear flange.

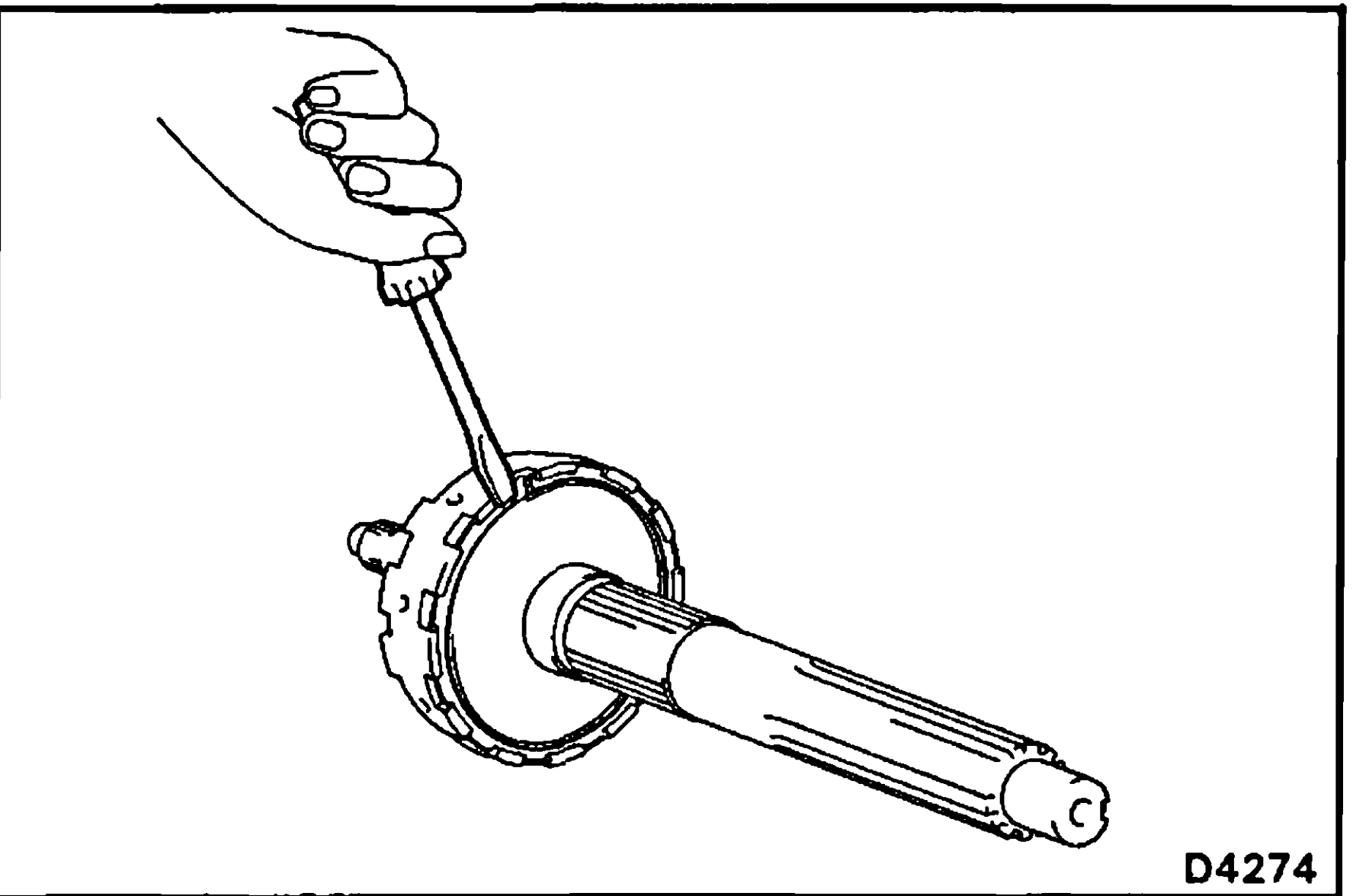
HINT: Assembled bearing and race diameter

mm (in.)

|                            | Inside       | Outside      |
|----------------------------|--------------|--------------|
| Assembled bearing and race | 32.8 (1.291) | 50.4 (1.984) |

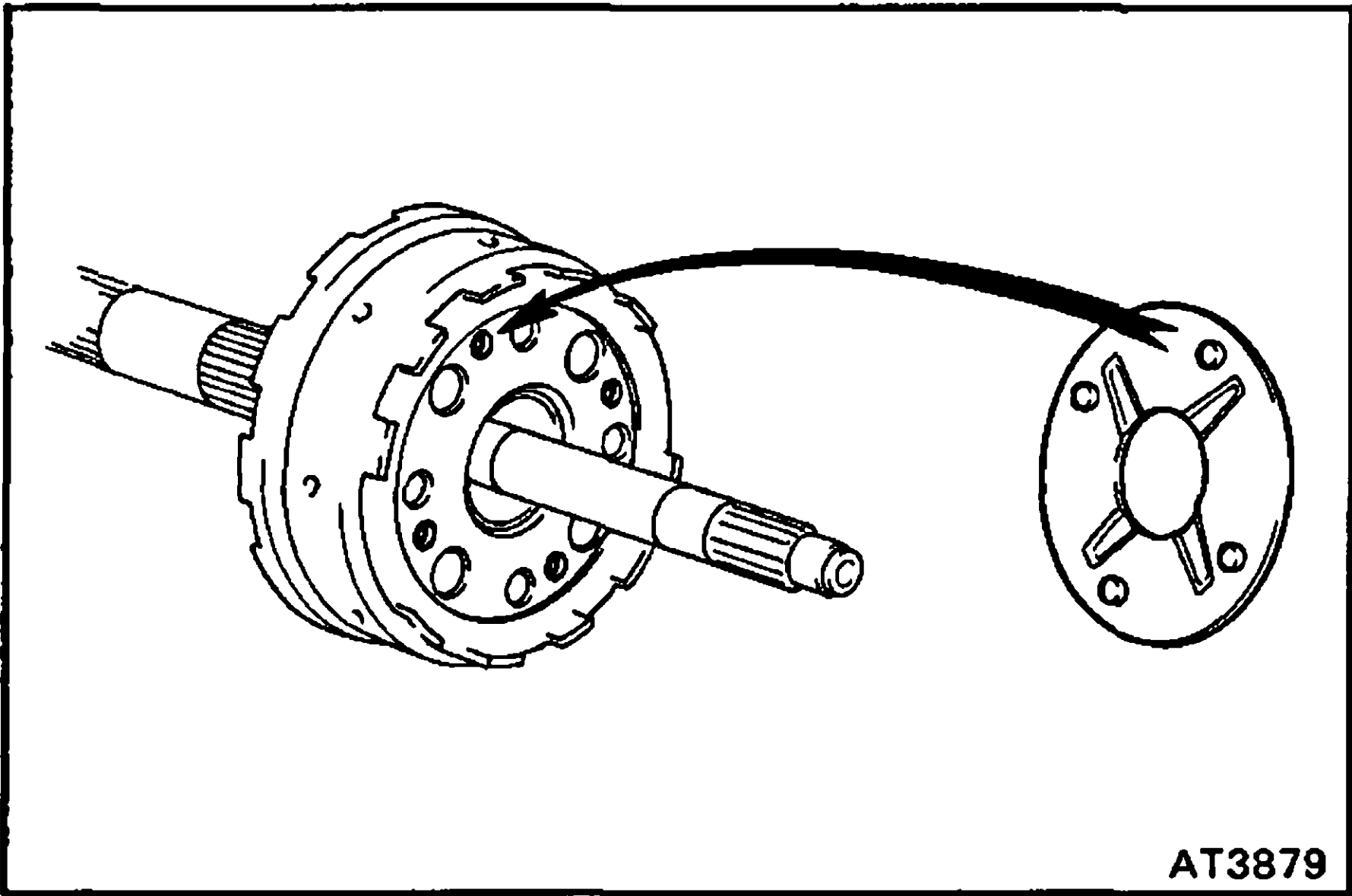


- (c) Install the output shaft to the rear planetary gear.



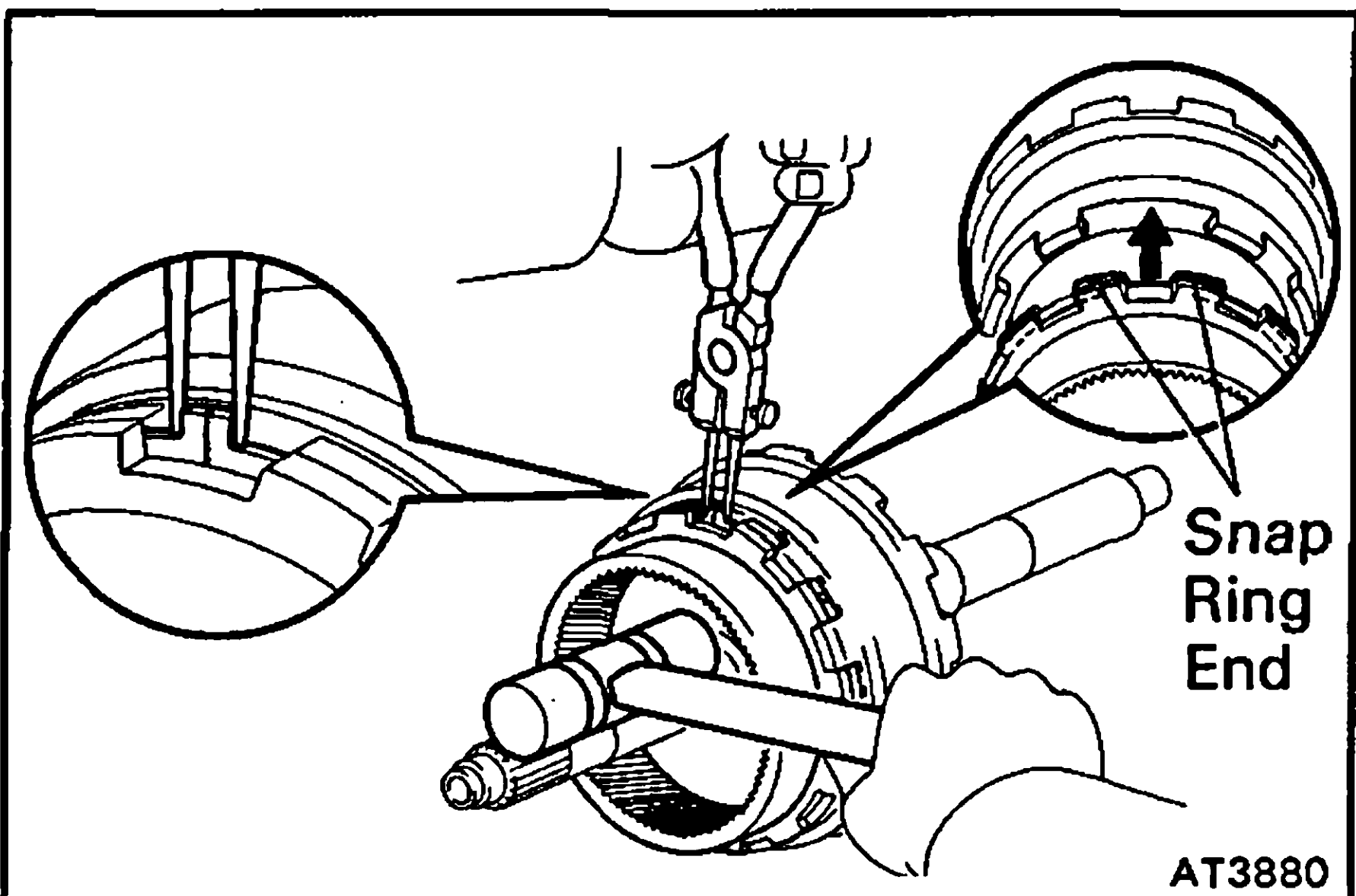
- (d) Using a screwdriver, install the snap ring.

HINT: Be sure the end gap of the snap ring is not aligned with the cutout portion of the rear planetary gear.

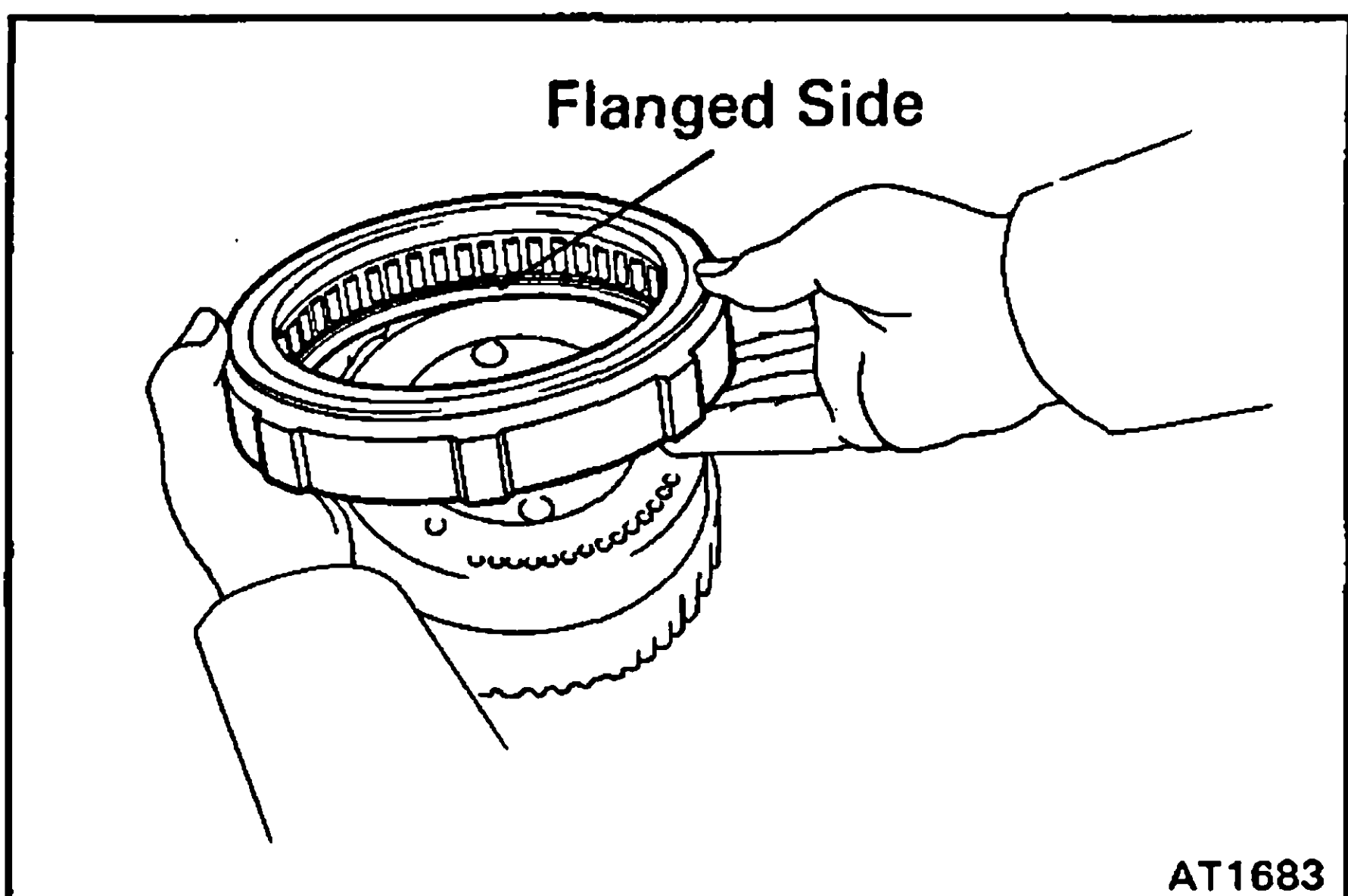
**7. INSTALL NO.2 THRUST WASHER**

Coat the thrust washer with petroleum jelly, and install it onto the rear planetary gear.

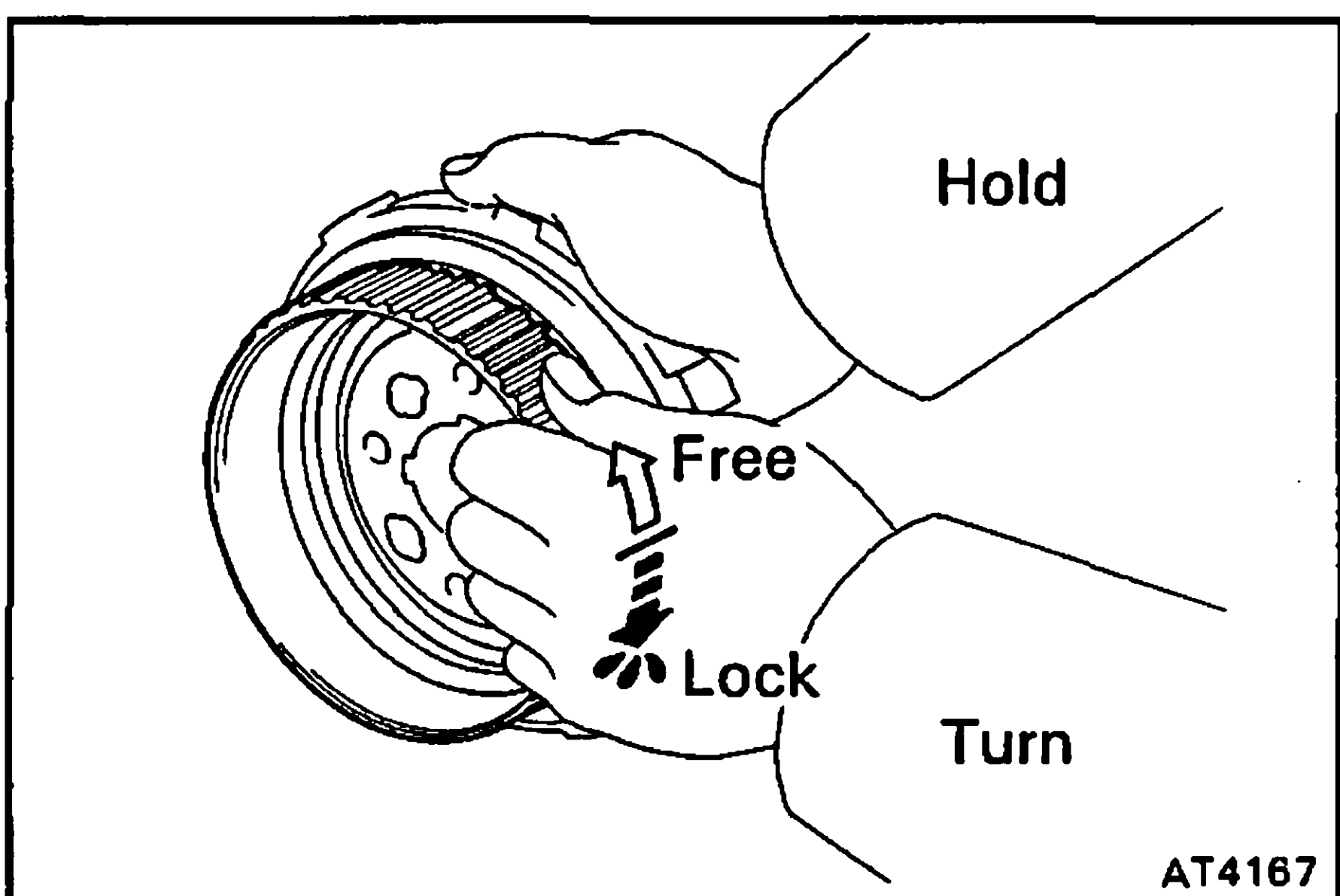
**HINT:** Securely fit the lips of the thrust washer into the holes of the rear planetary gear.

**8. INSTALL FRONT PLANETARY RING GEAR**

- Align the snap ring end with the wide cutout portion of the rear planetary gear.
- Using snap ring pliers and plastic-faced hammer, tap in the ring gear while compressing the snap ring.
- Check that the snap ring is installed into the groove of the rear planetary gear.

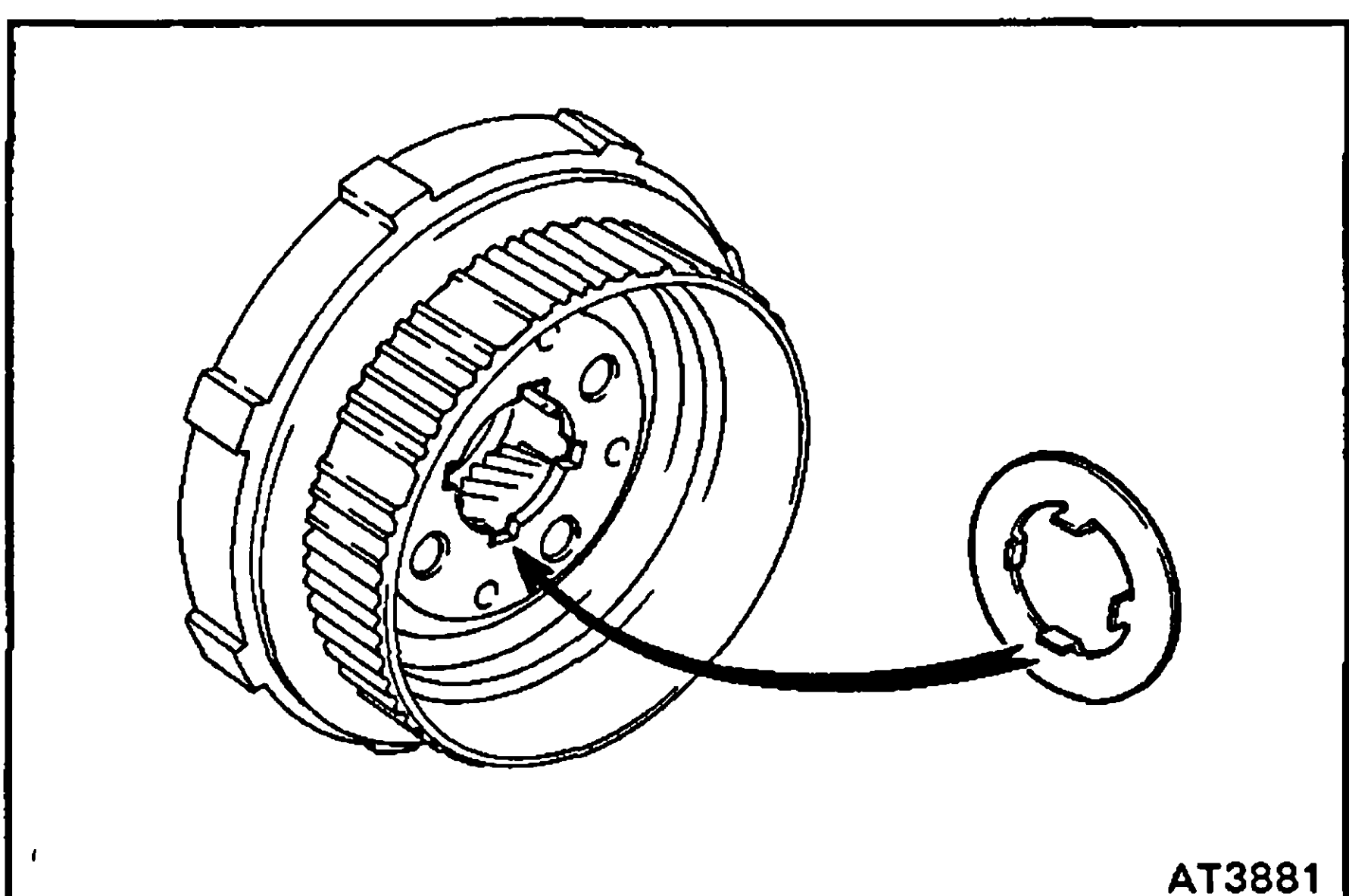
**9. INSTALL ONE-WAY CLUTCH**

- Position the one-way clutch on the front planetary gear, facing the flanged side of the one-way clutch downward.
- Install the one-way clutch to the front planetary gear by rotating the one-way clutch counterclockwise.

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

Hold the one-way clutch outer race and turn the front planetary gear. The front planetary gear should turn freely counterclockwise and should lock clockwise.

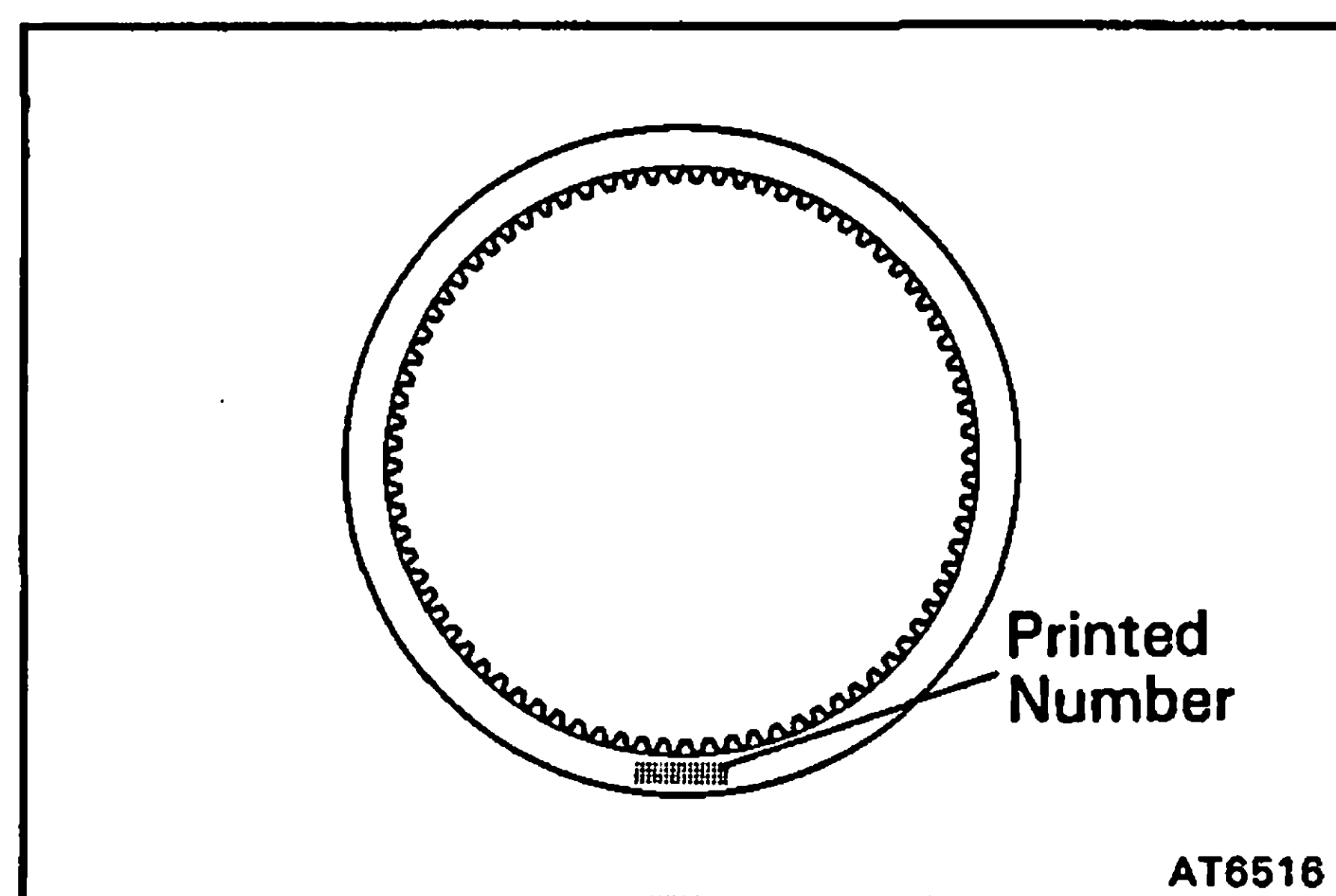
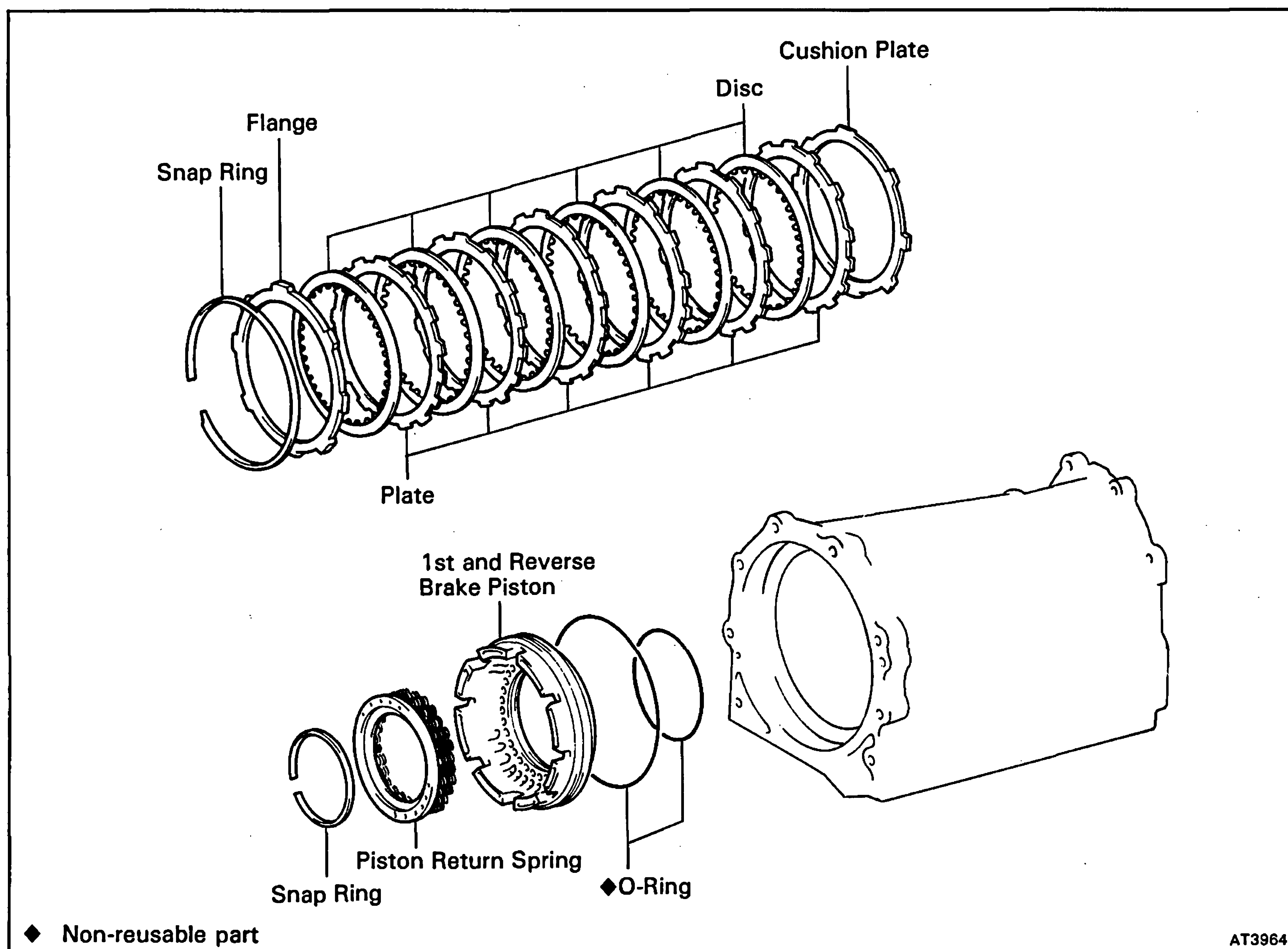
If operation is not as specified, replace the one-way clutch.

**11. INSTALL NO.1 REAR THRUST WASHER**

Coat the thrust washer with petroleum jelly, and install it onto the rear side of the front planetary gear.

**HINT:** Securely fit the claws of the thrust washer into the grooves of the front planetary gear.

## First and Reverse Brake COMPONENTS



### INSPECTION OF FIRST AND REVERSE BRAKE

#### 1. INSPECT DISCS, PLATES AND CUSHION PLATE

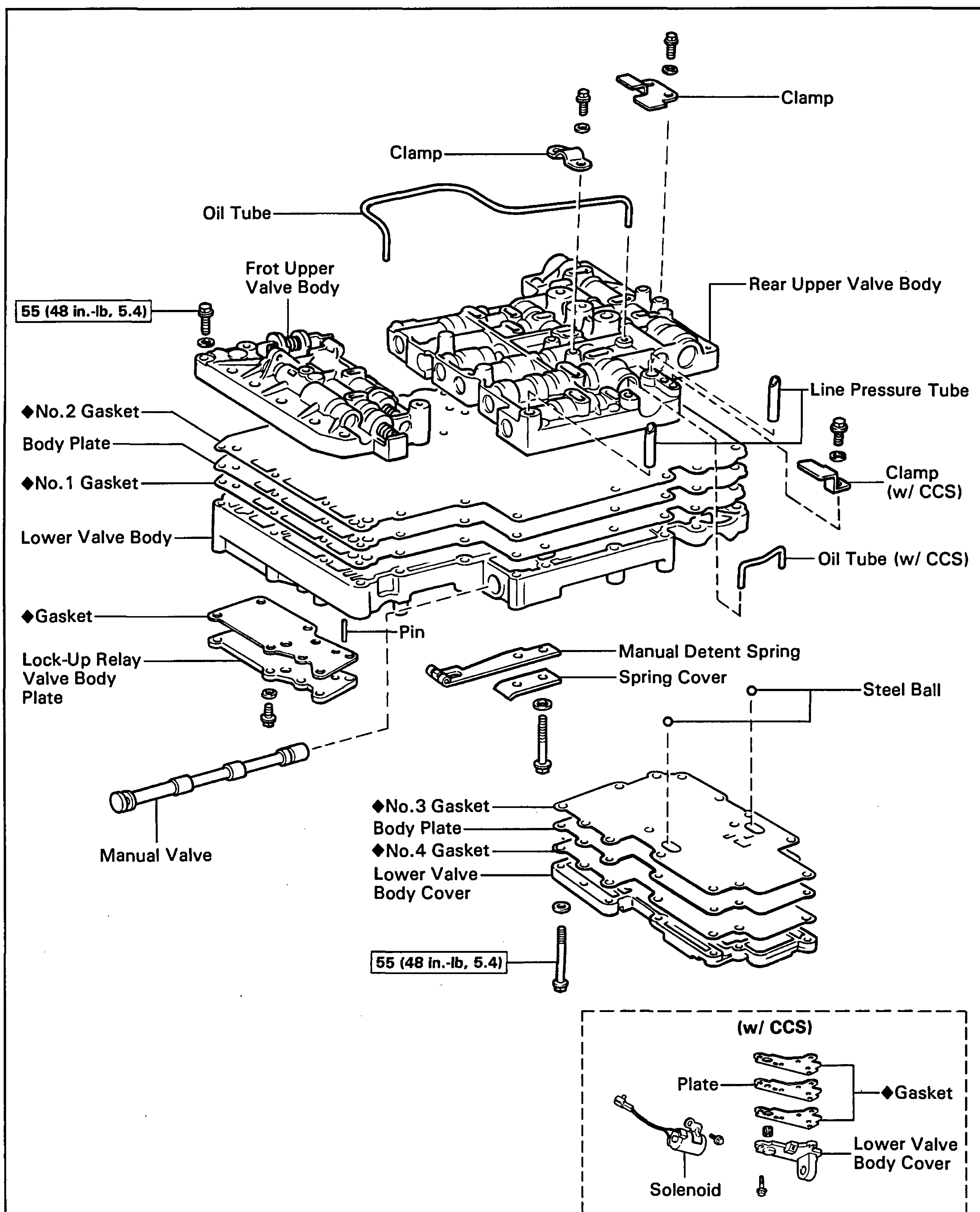
Check to see if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

#### HINT:

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

# Valve Body (A440F)

## COMPONENTS

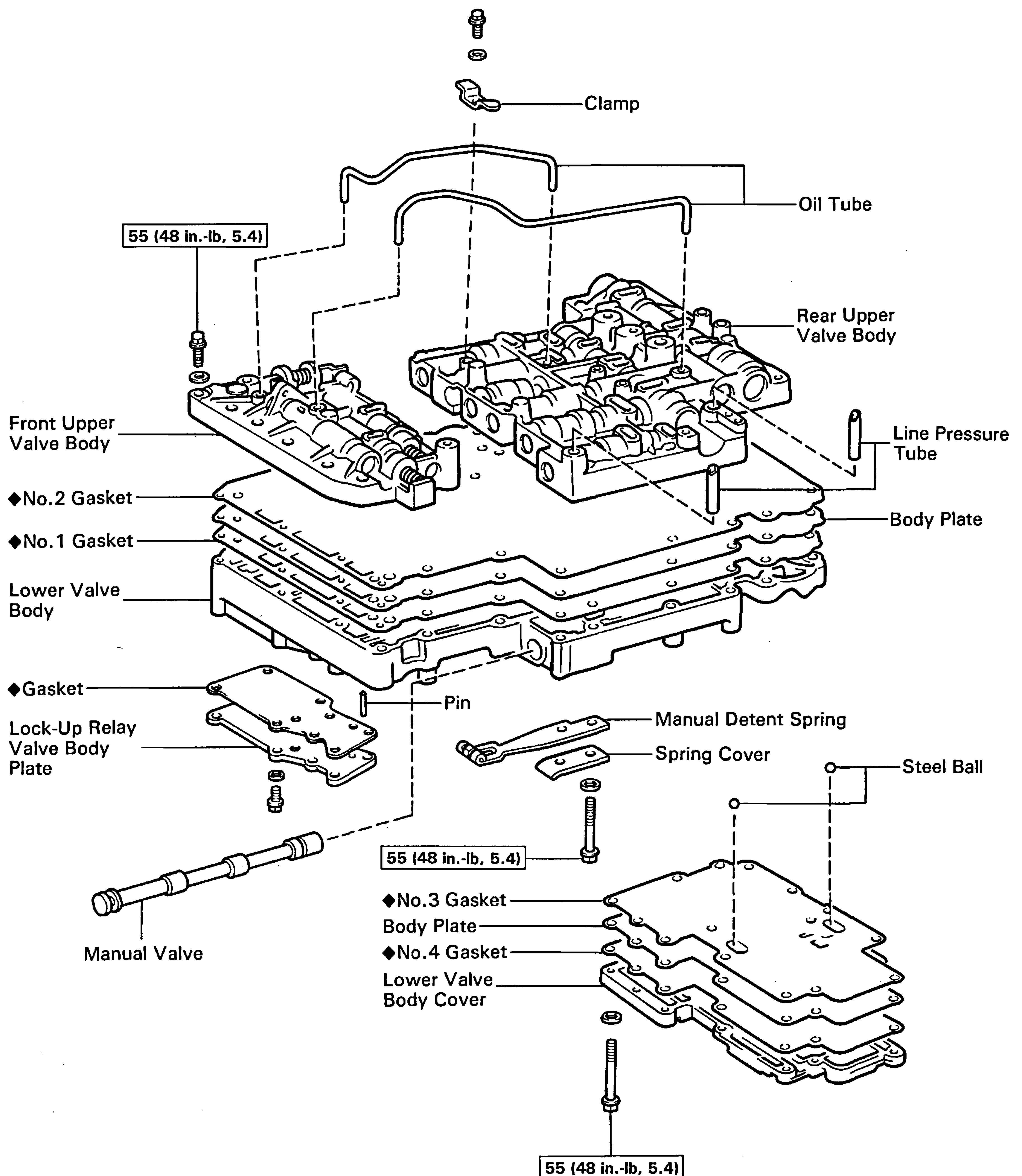


kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

# Valve Body (A442F)

## COMPONENTS

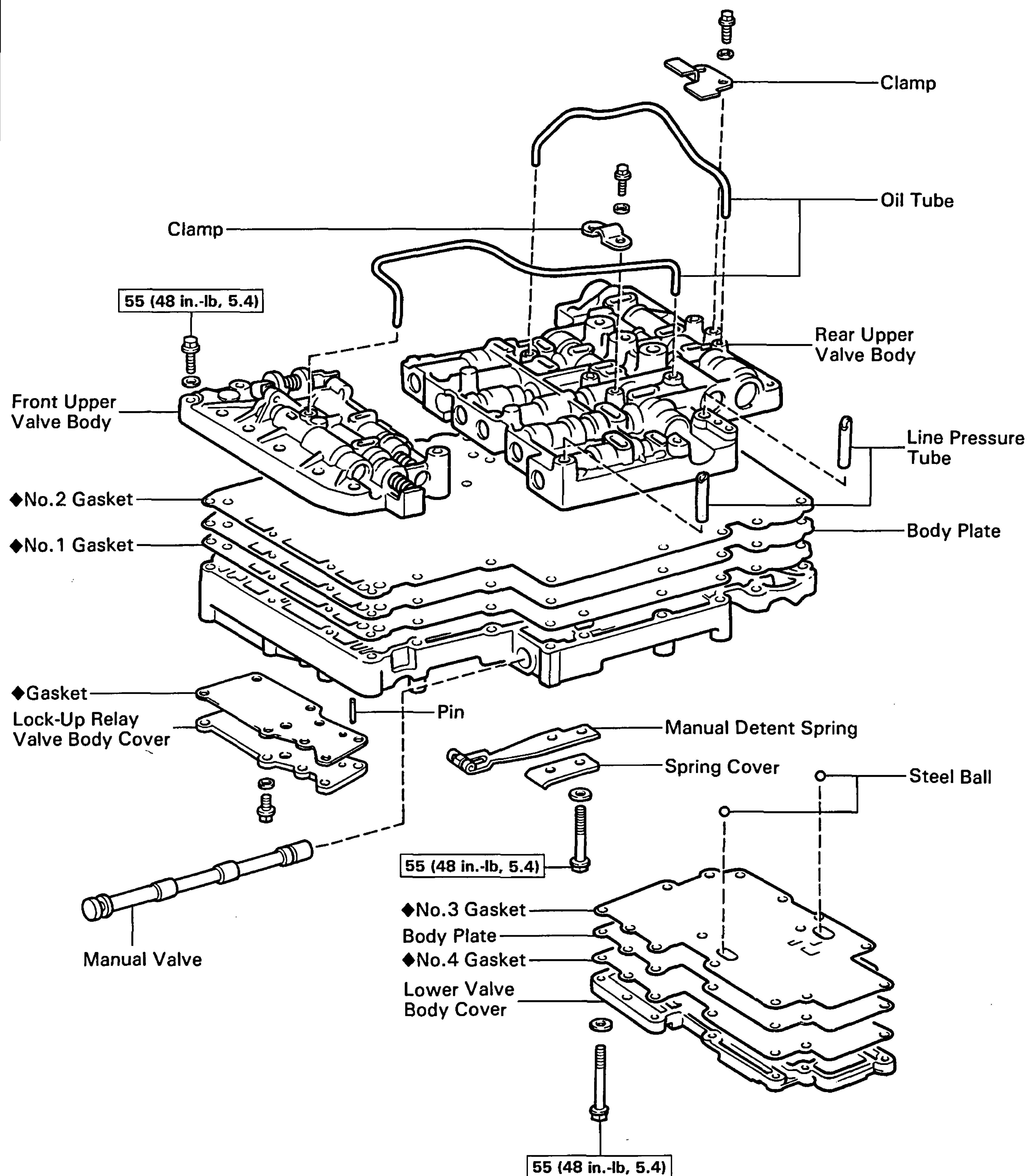


kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

## Valve Body (A441L)

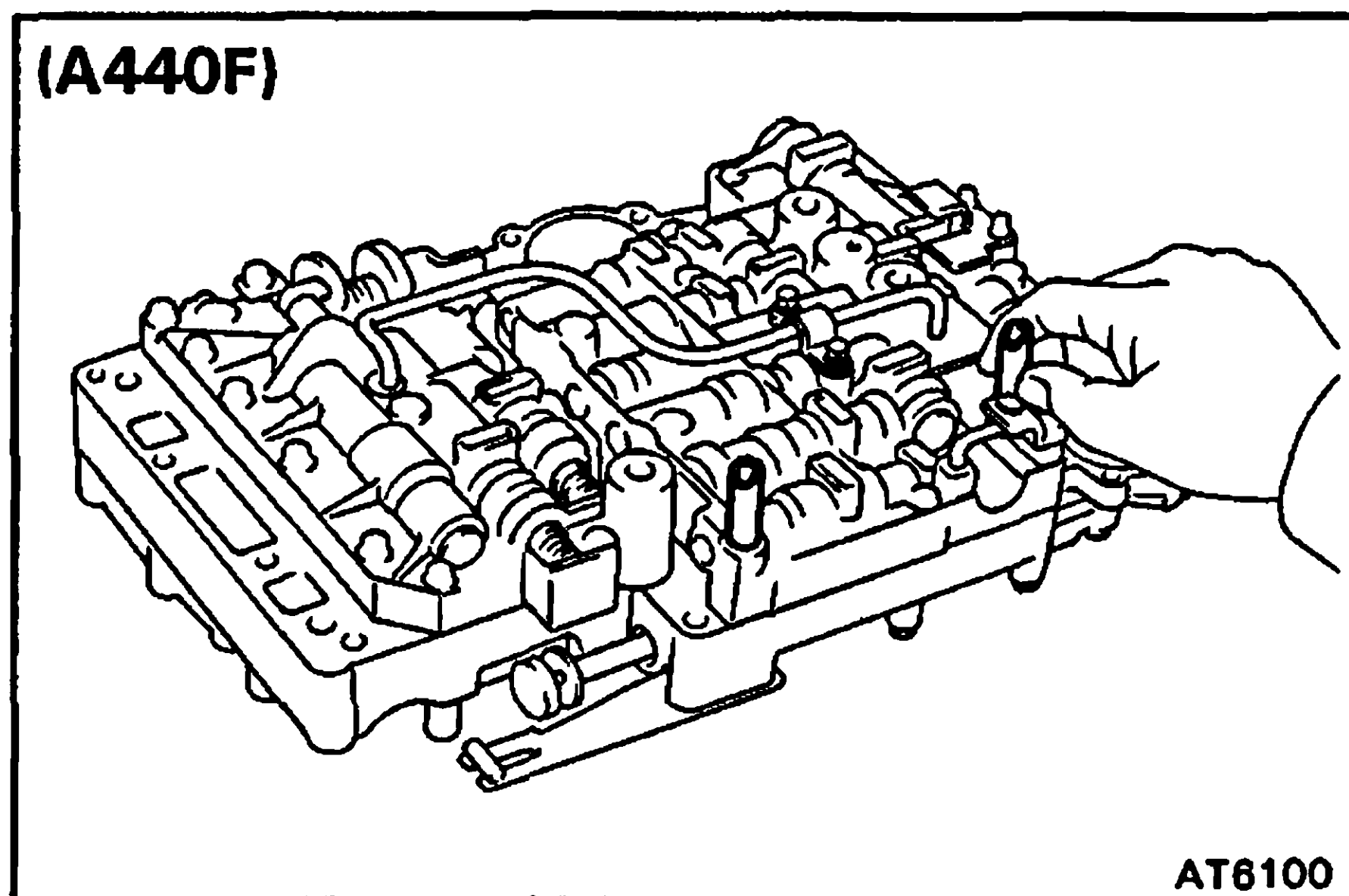
### COMPONENTS



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

(A440F)

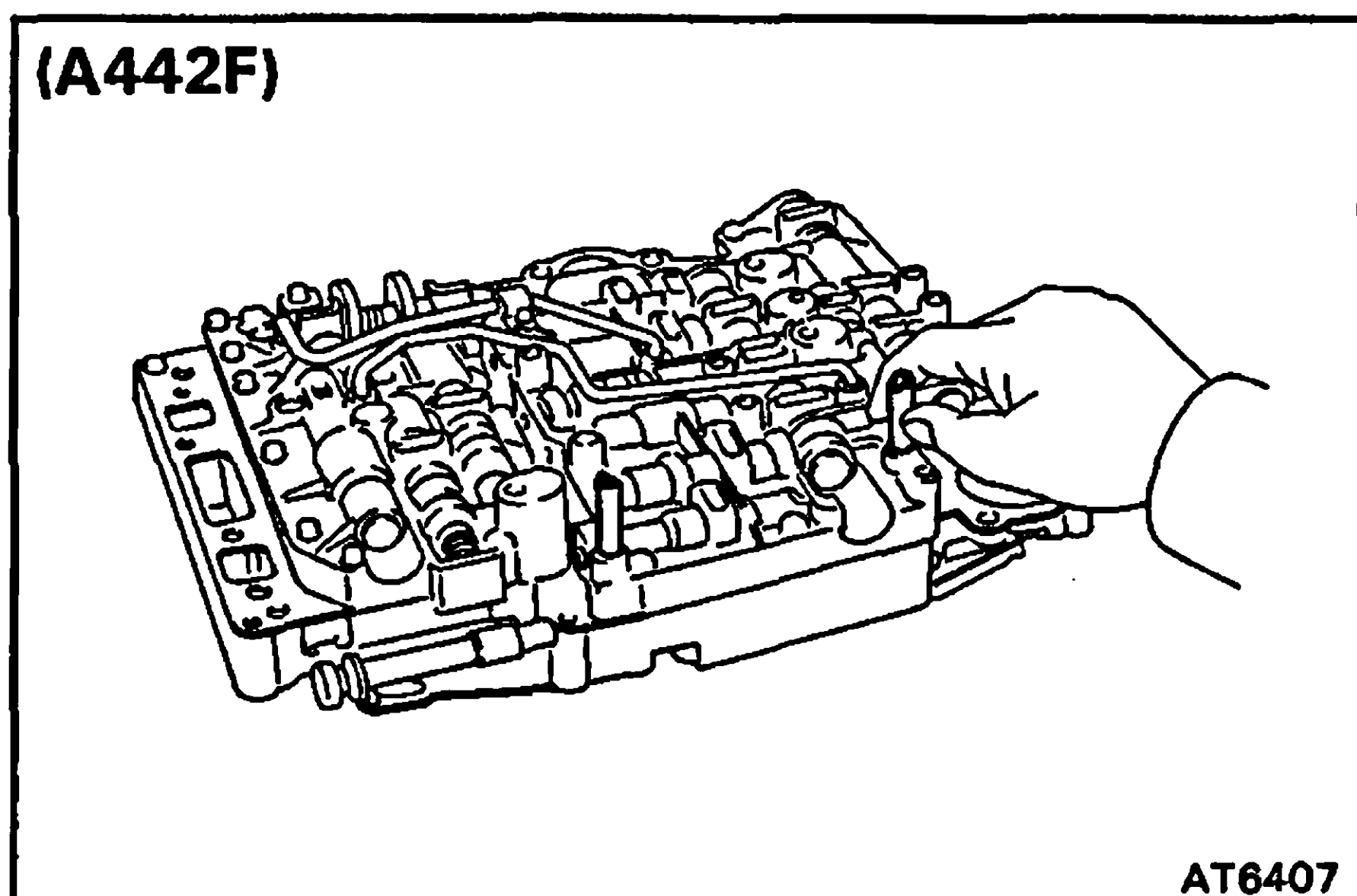


## (Disassembly of Valve Body)

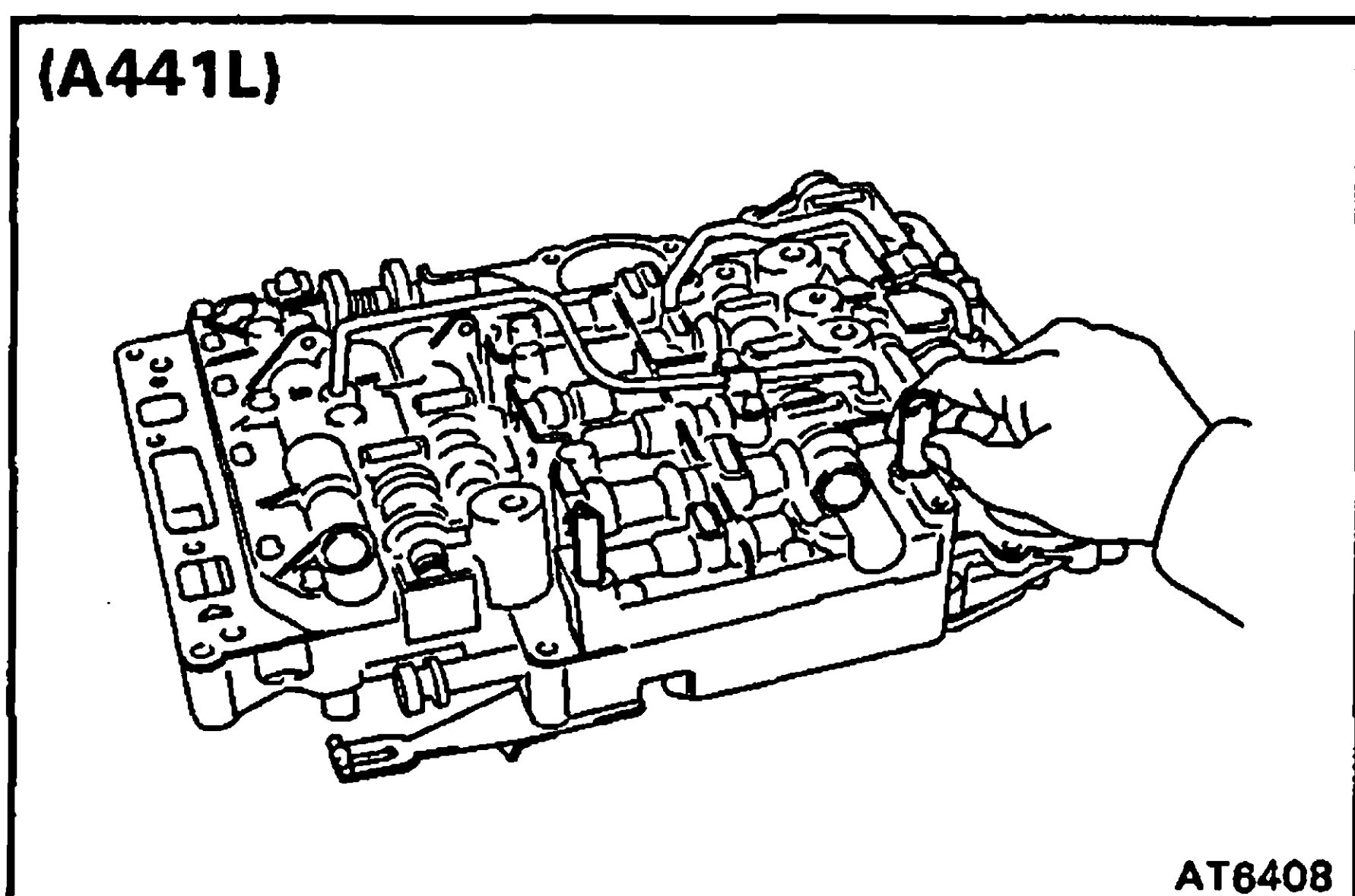
### 1. REMOVE LINE PRESSURE TUBES

Remove the two pressure tubes.

(A442F)

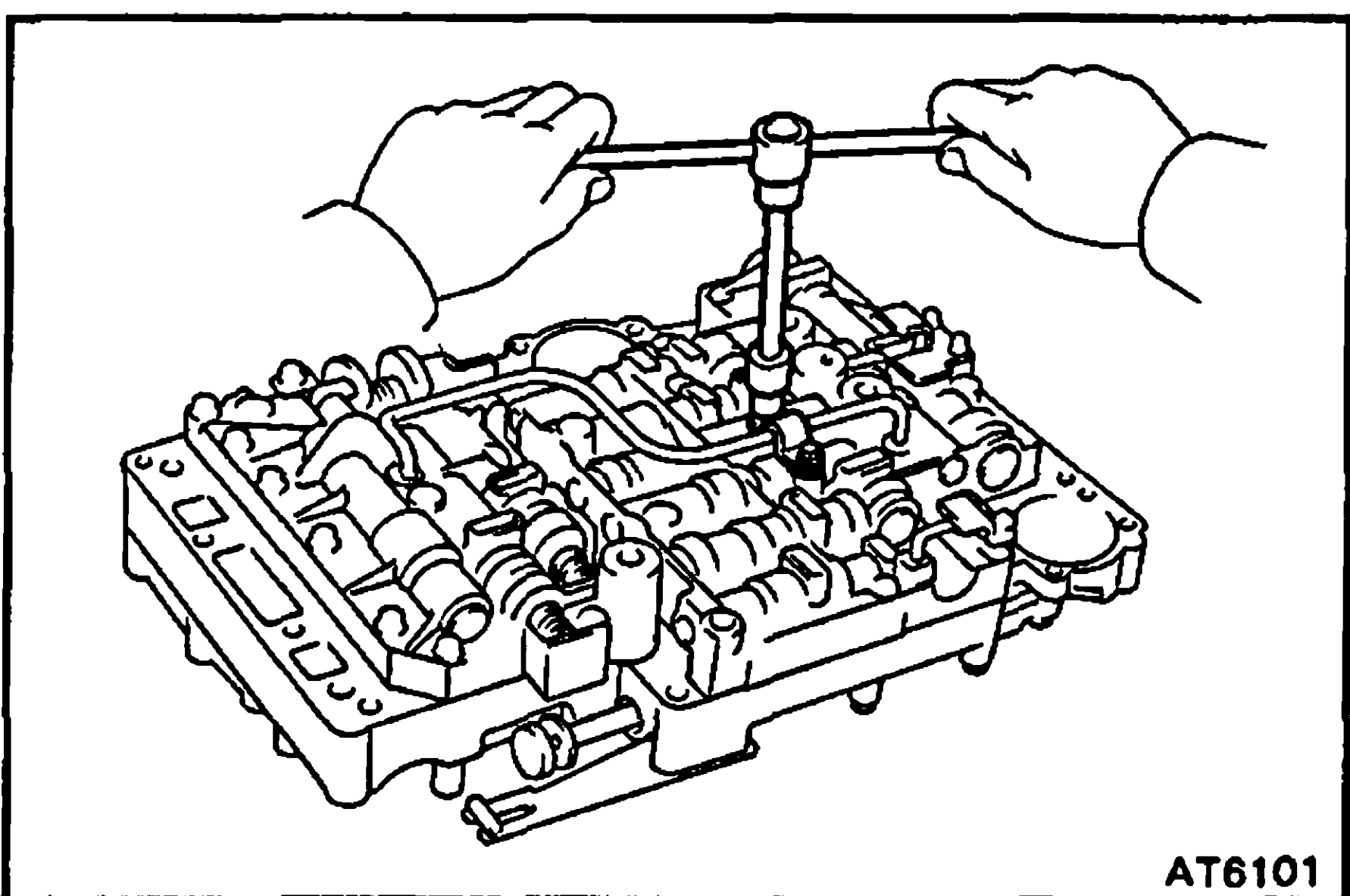


(A441L)



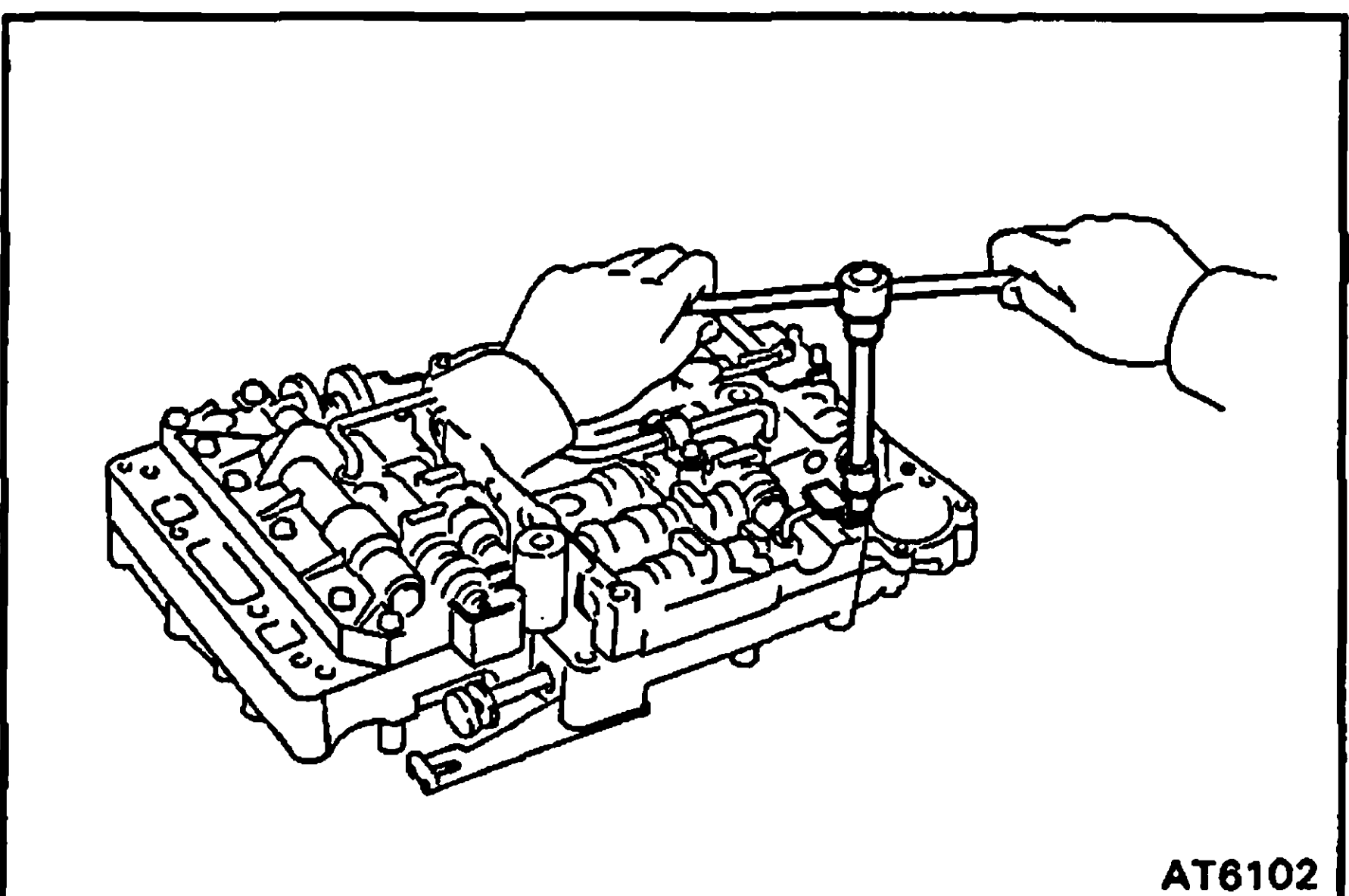
### 2. REMOVE OIL TUBE(S) (A440F)

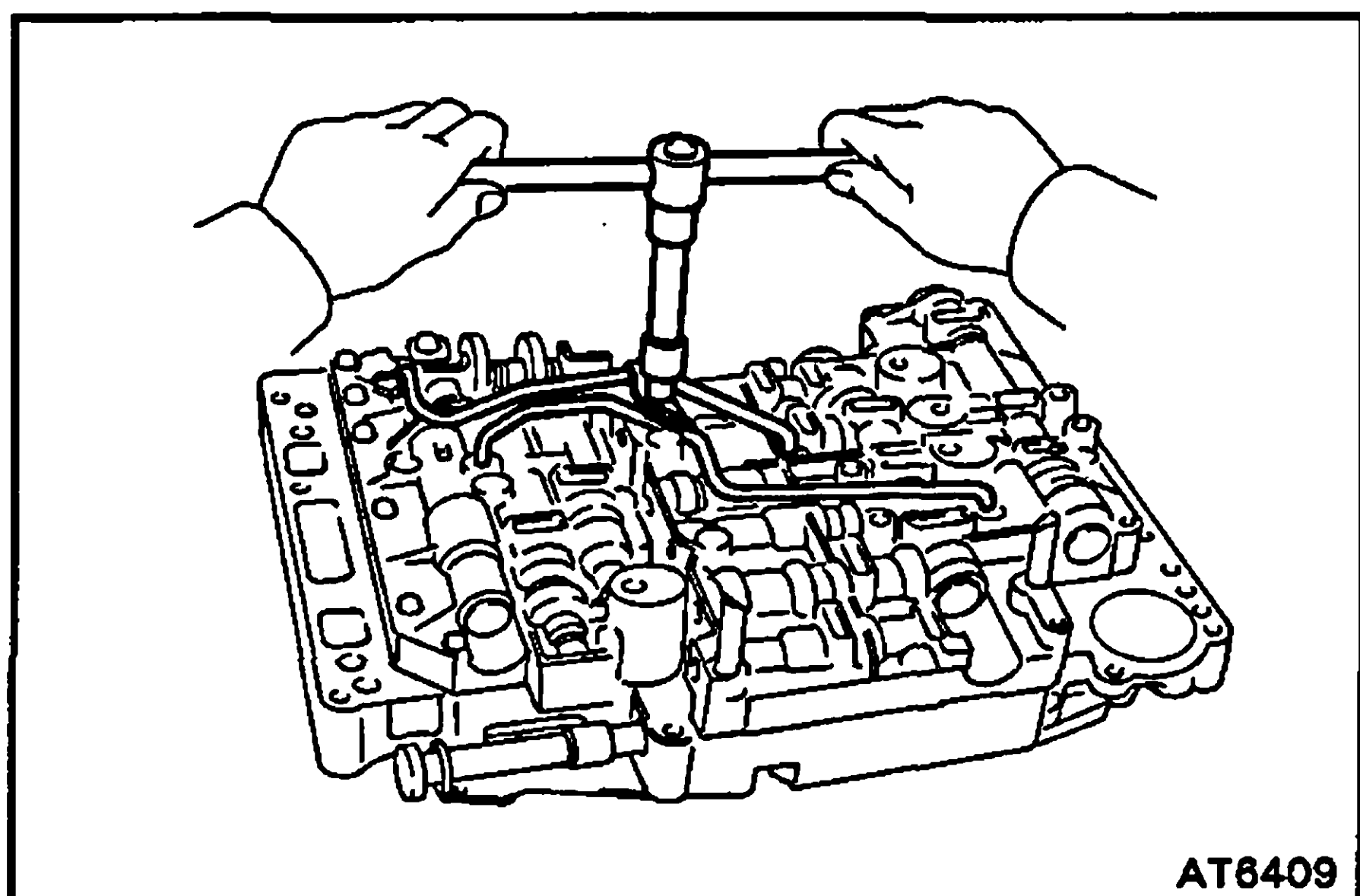
(a) Remove the two bolts, wave washers and the tube clamp.



(A440F: w/ Cruise Control System)

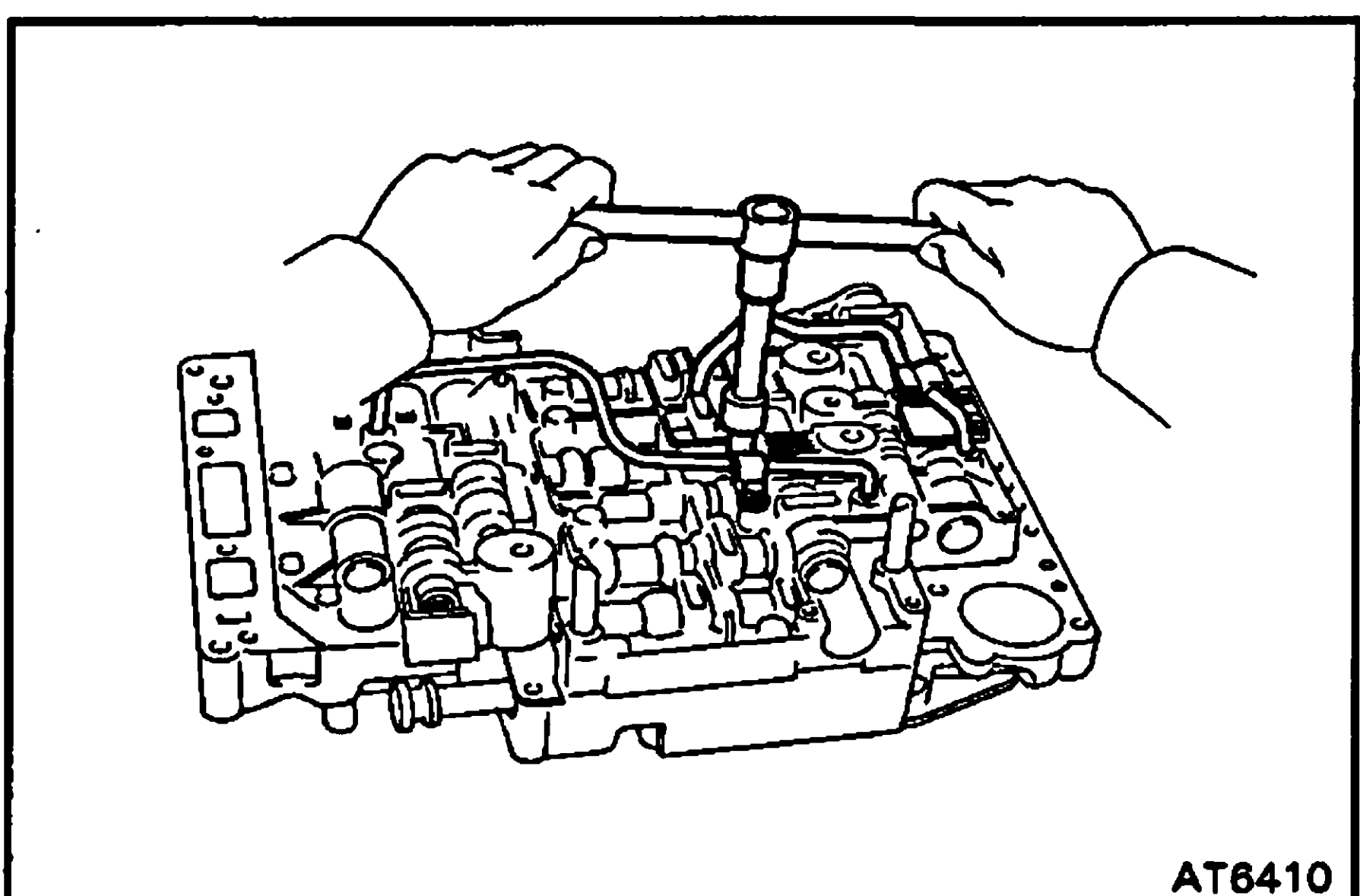
Remove the three bolts, wave washers and the two tube clamps.





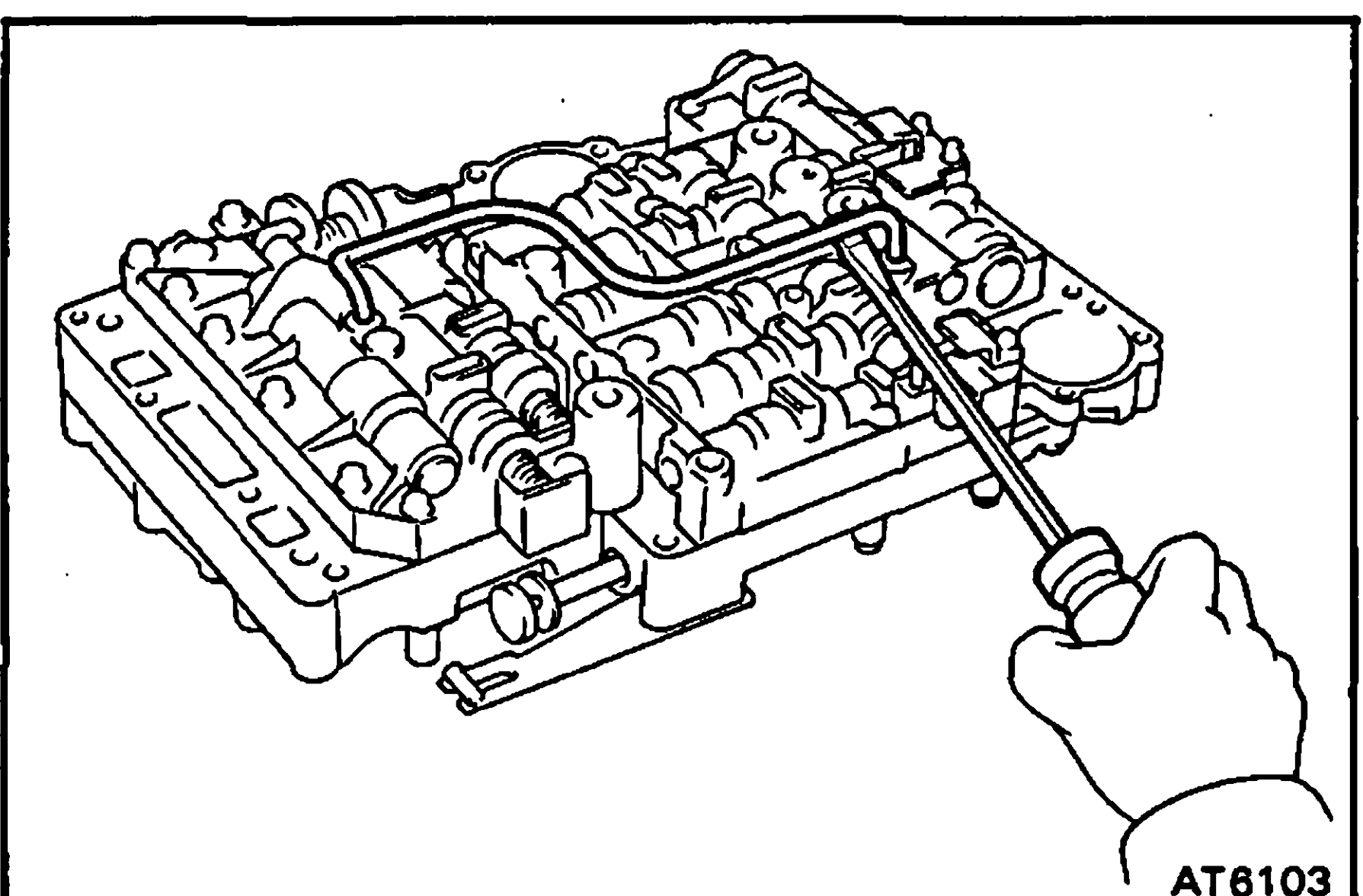
**(A442F)**

(a) Remove the bolt, wave washer and the tube clamp.



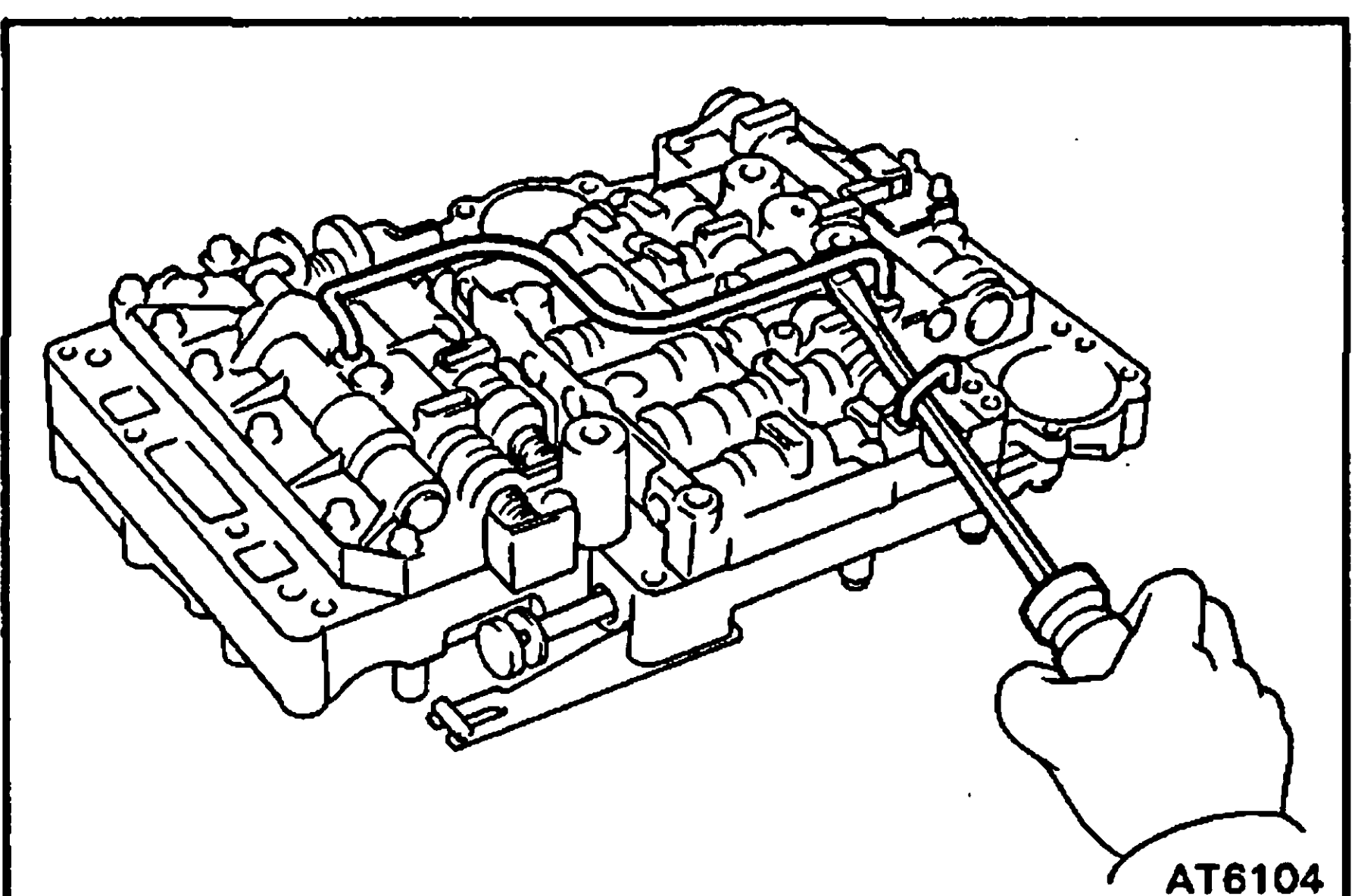
**(A441L)**

(a) Remove four bolts, wave washers and the two tube clamps.



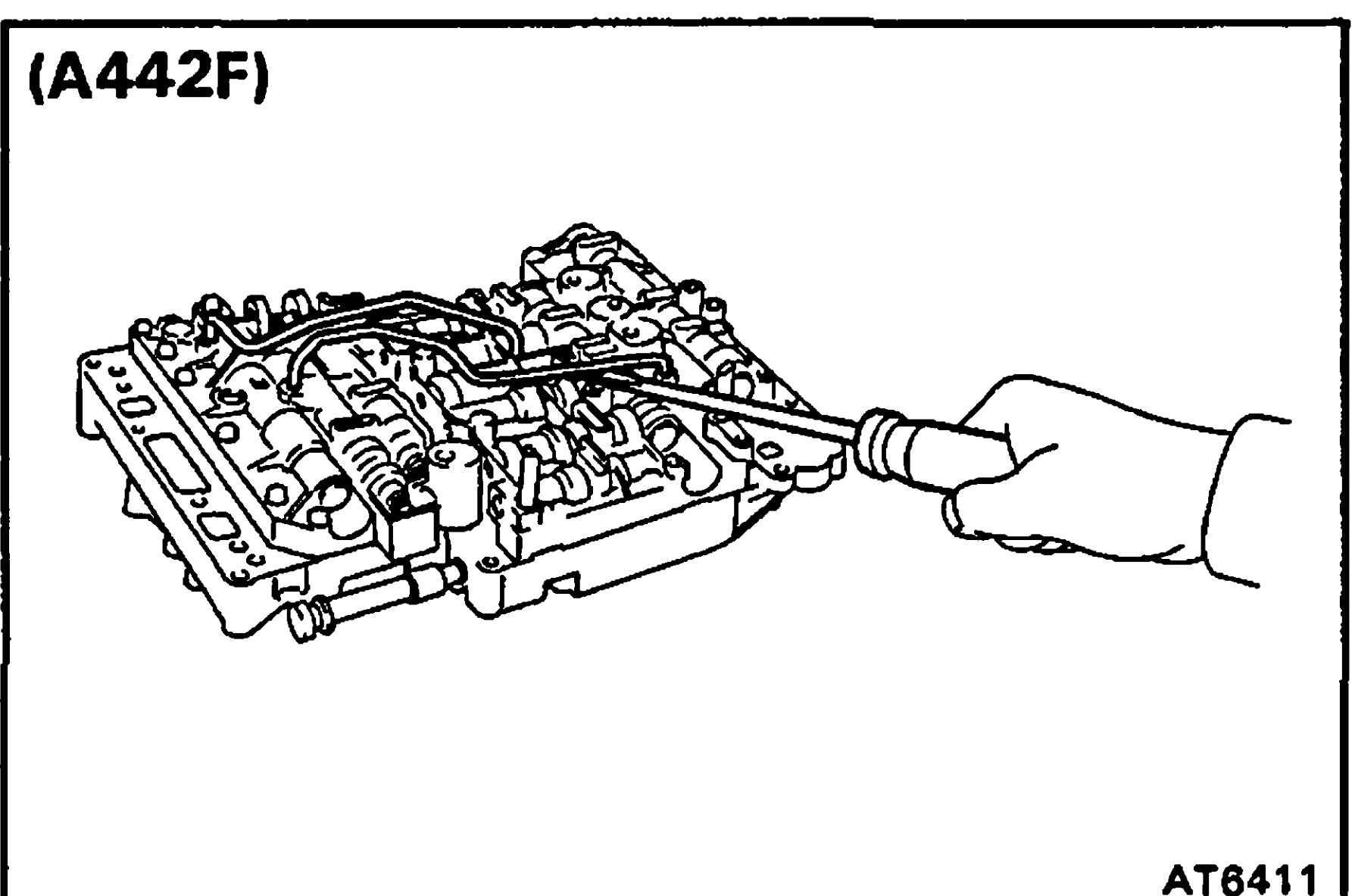
**(A440F)**

(b) Using a large screwdriver, pry out the oil tube.



**(A440F: w/ Cruise Control System)**

Using a large screwdriver, pry out the two oil tubes.

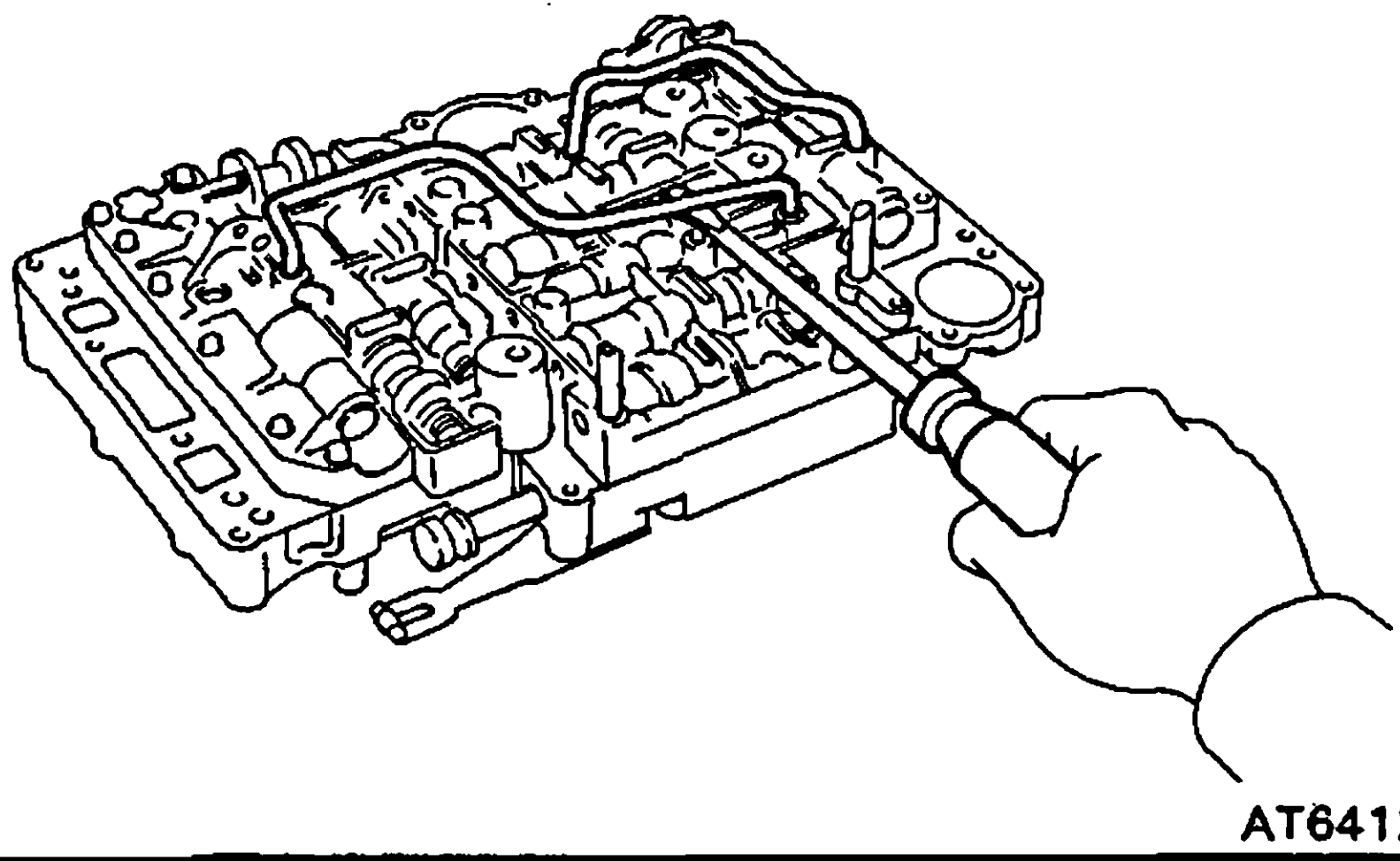


**(A442F)**

**(A442F, A441L)**

(b) Using a large screwdriver, pry out the two oil tubes.

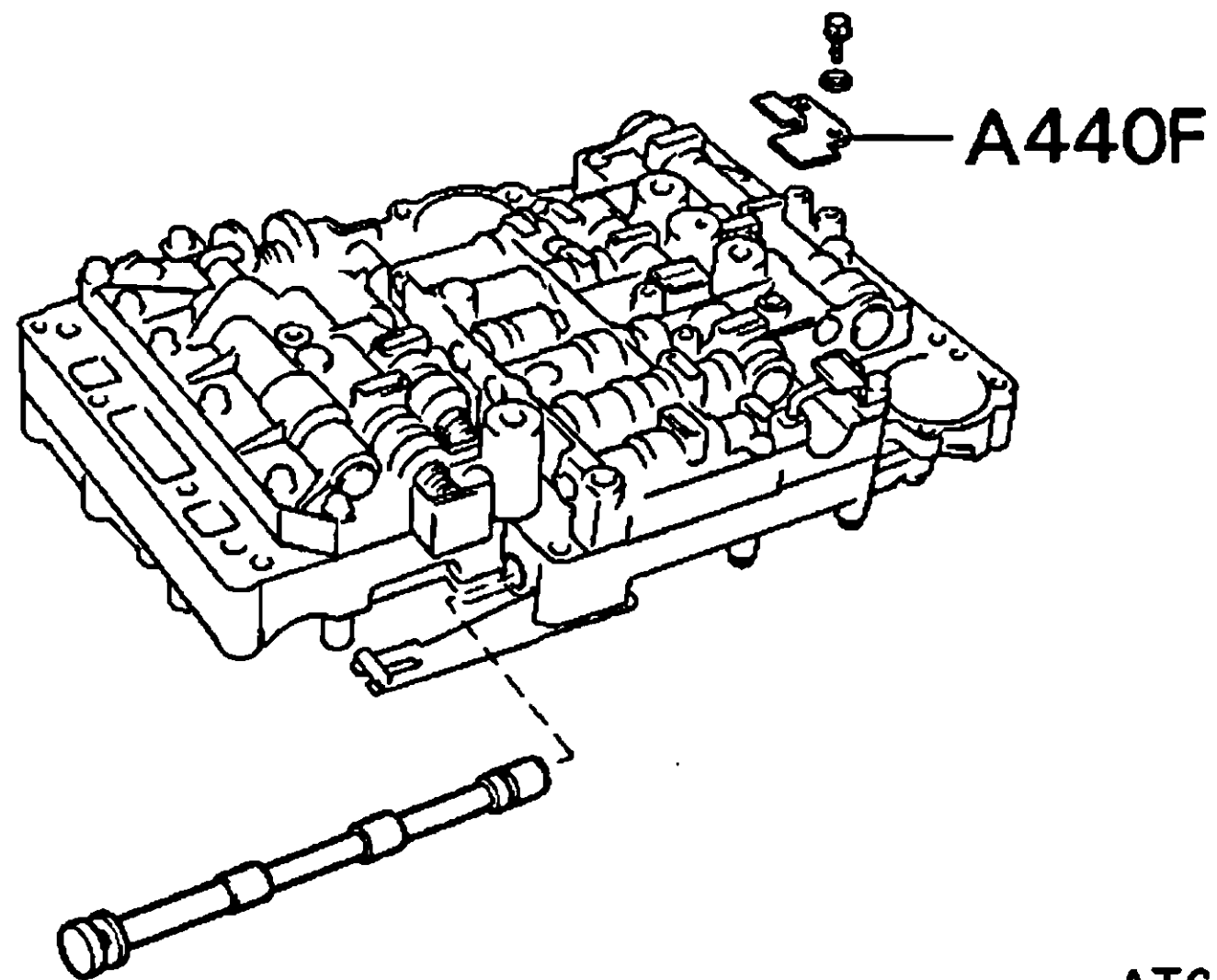
(A441L)



AT6412

**3. REMOVE CLAMP (A440F)**

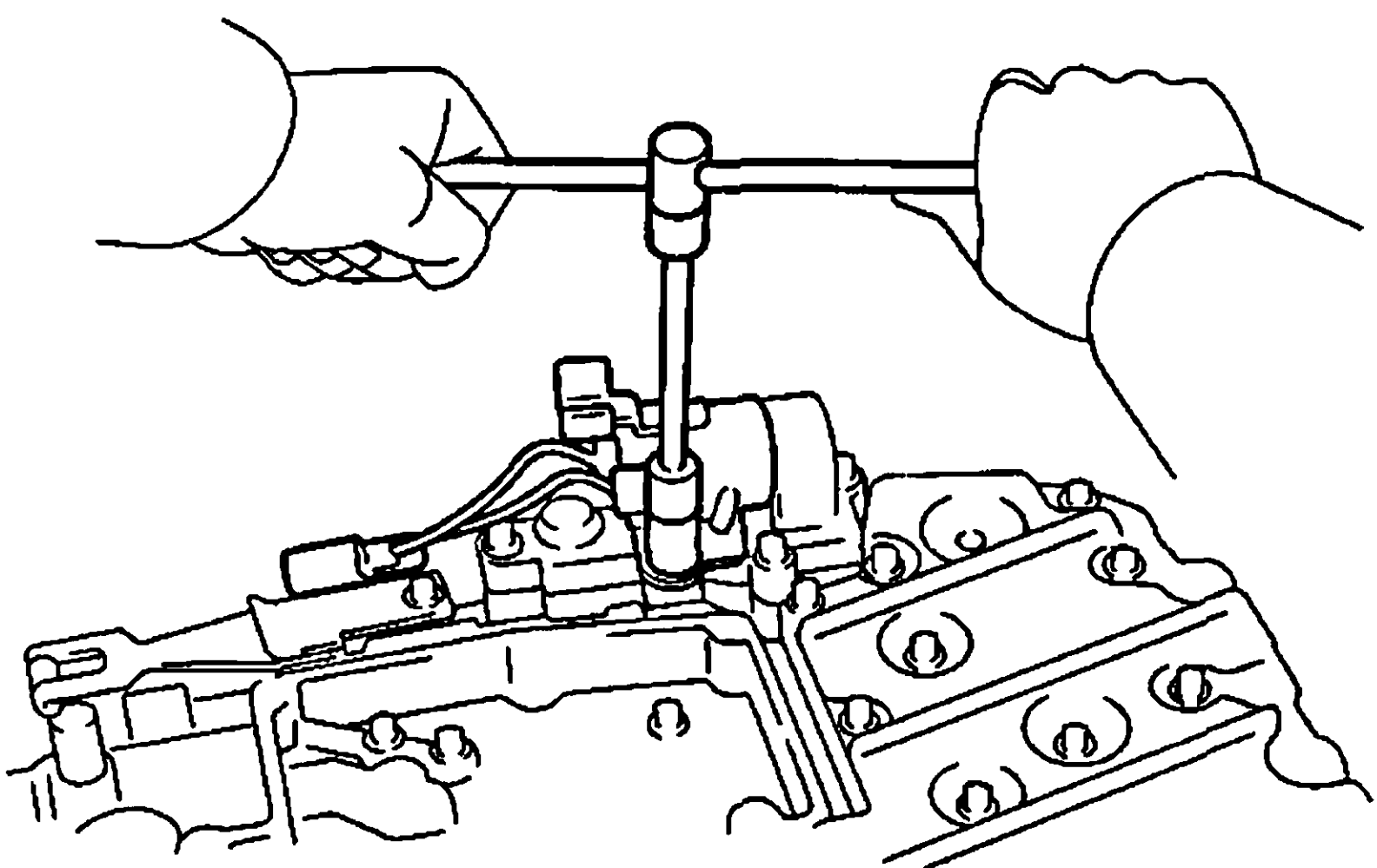
Remove the two bolts, wave washers and clamp.

**4. REMOVE MANUAL VALVE**

AT6105

**5. (w/ Cruise Control System)  
REMOVE SOLENOID**

Remove the bolt and the solenoid.

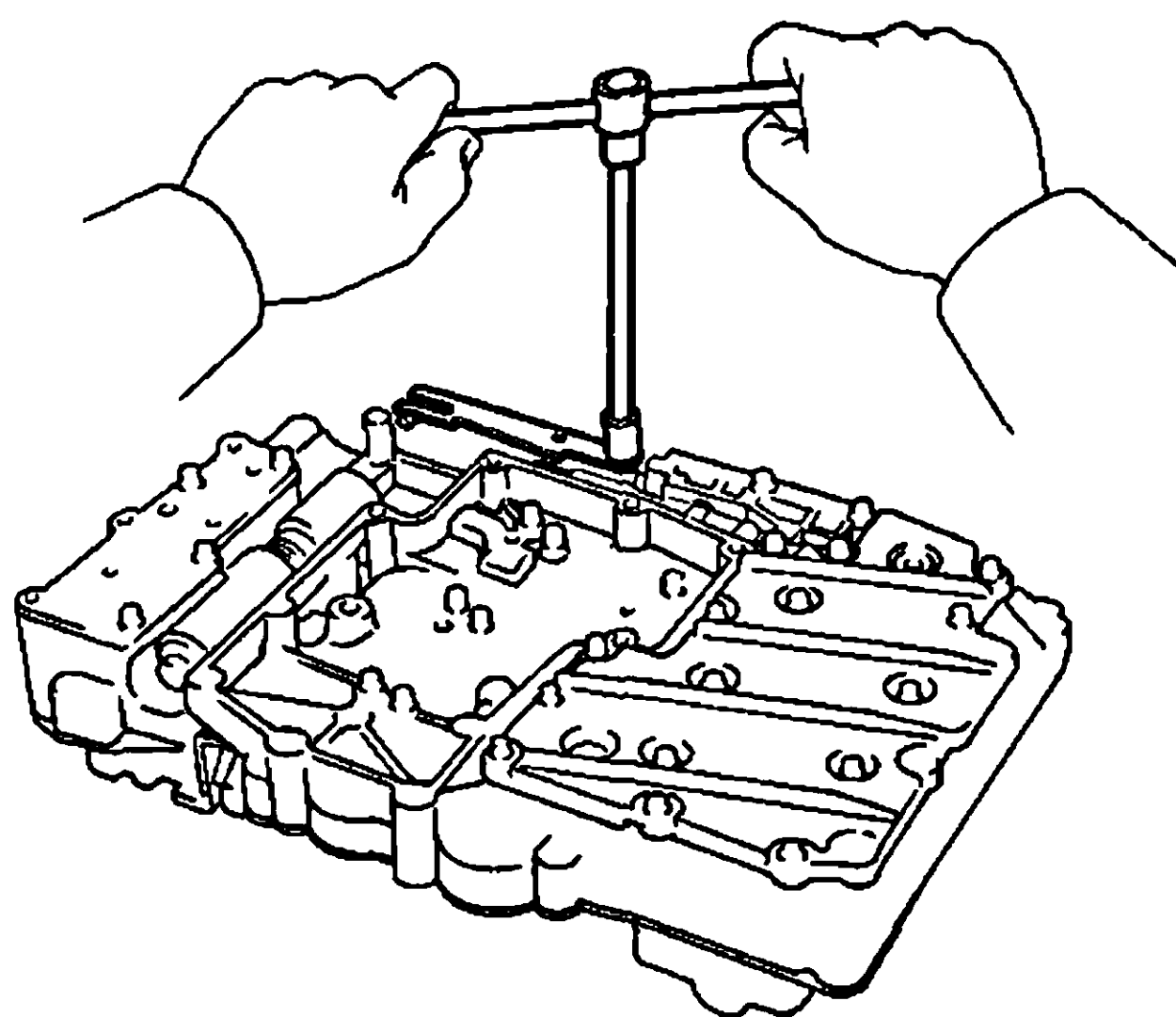


AT6106

**6. REMOVE MANUAL DETENT SPRING**

(a) Turn over the valve body assembly.

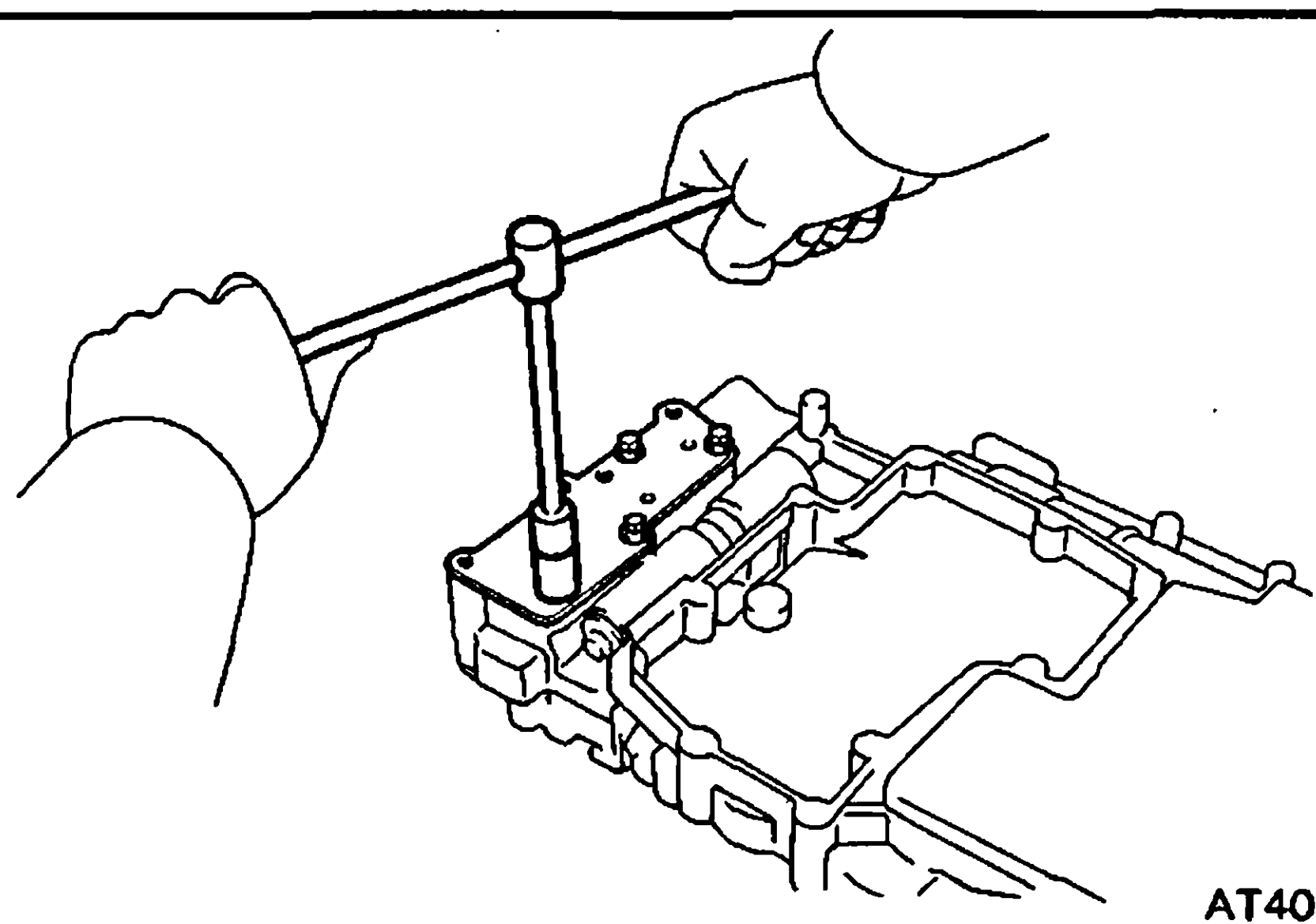
(b) Remove the bolt, wave washer, spring cover and detent spring.



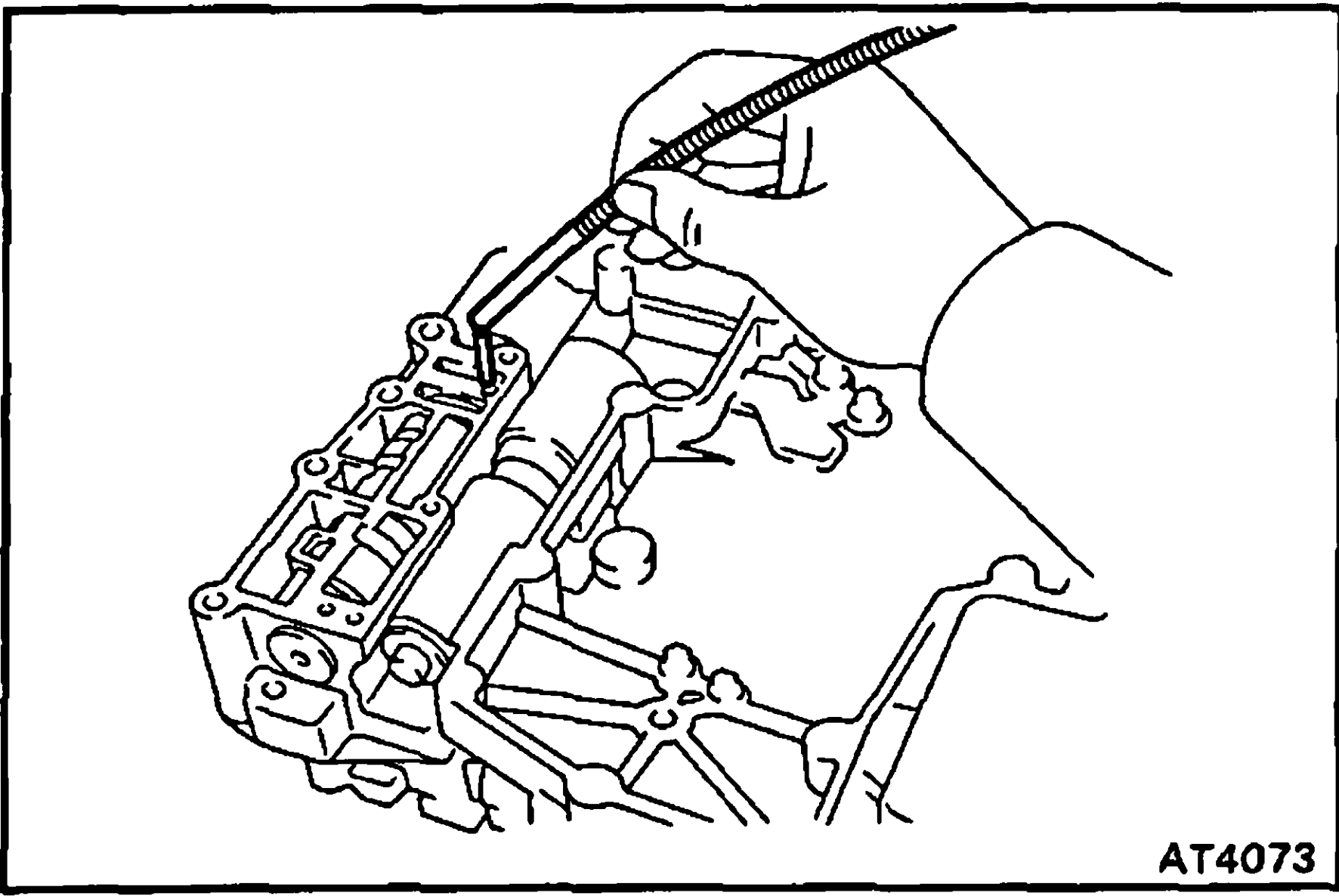
AT6107

**7. REMOVE LOCK-UP RELAY VALVE BODY PLATE**

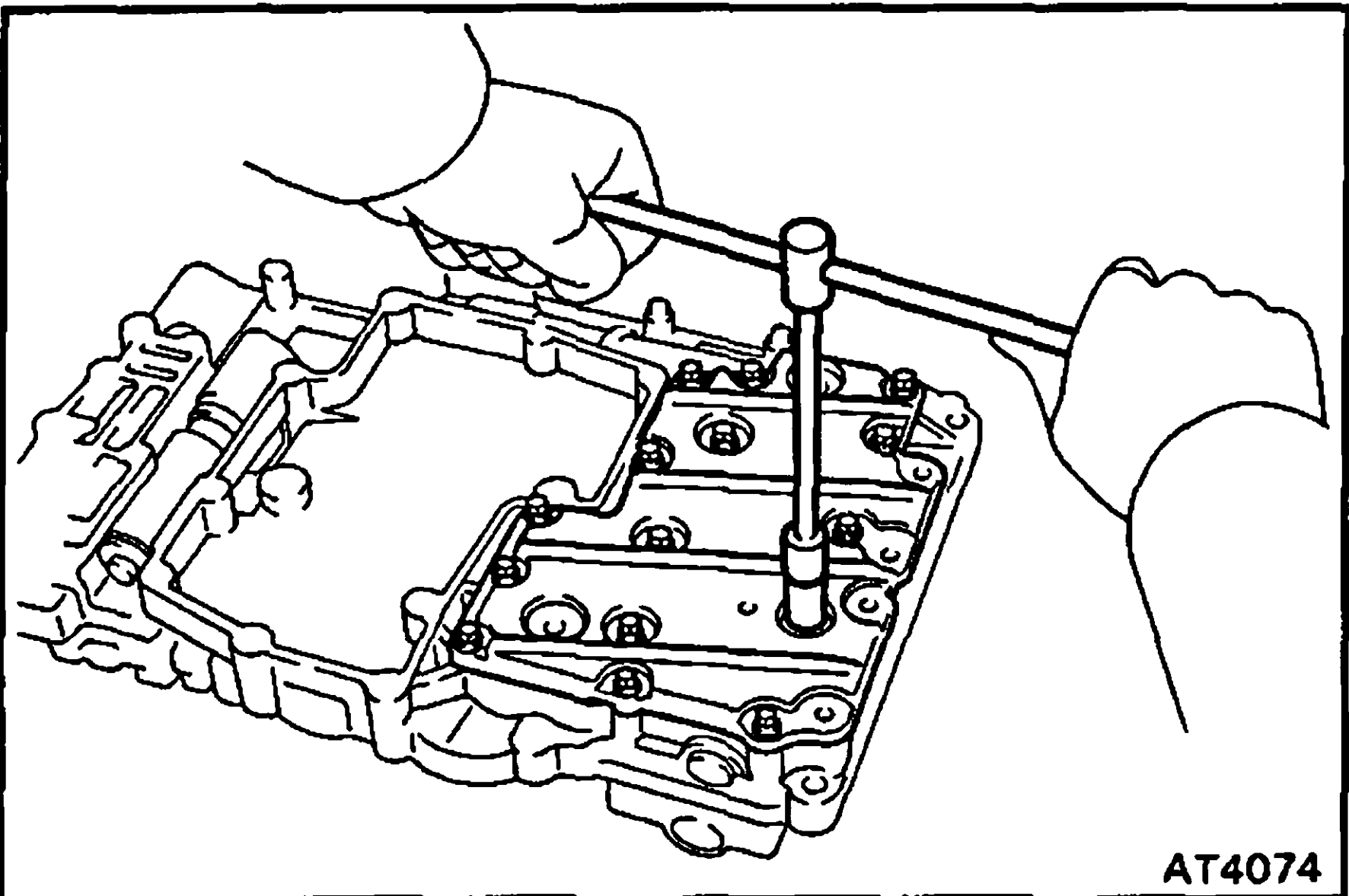
Remove the four bolts, wave washers, body plate and gasket.



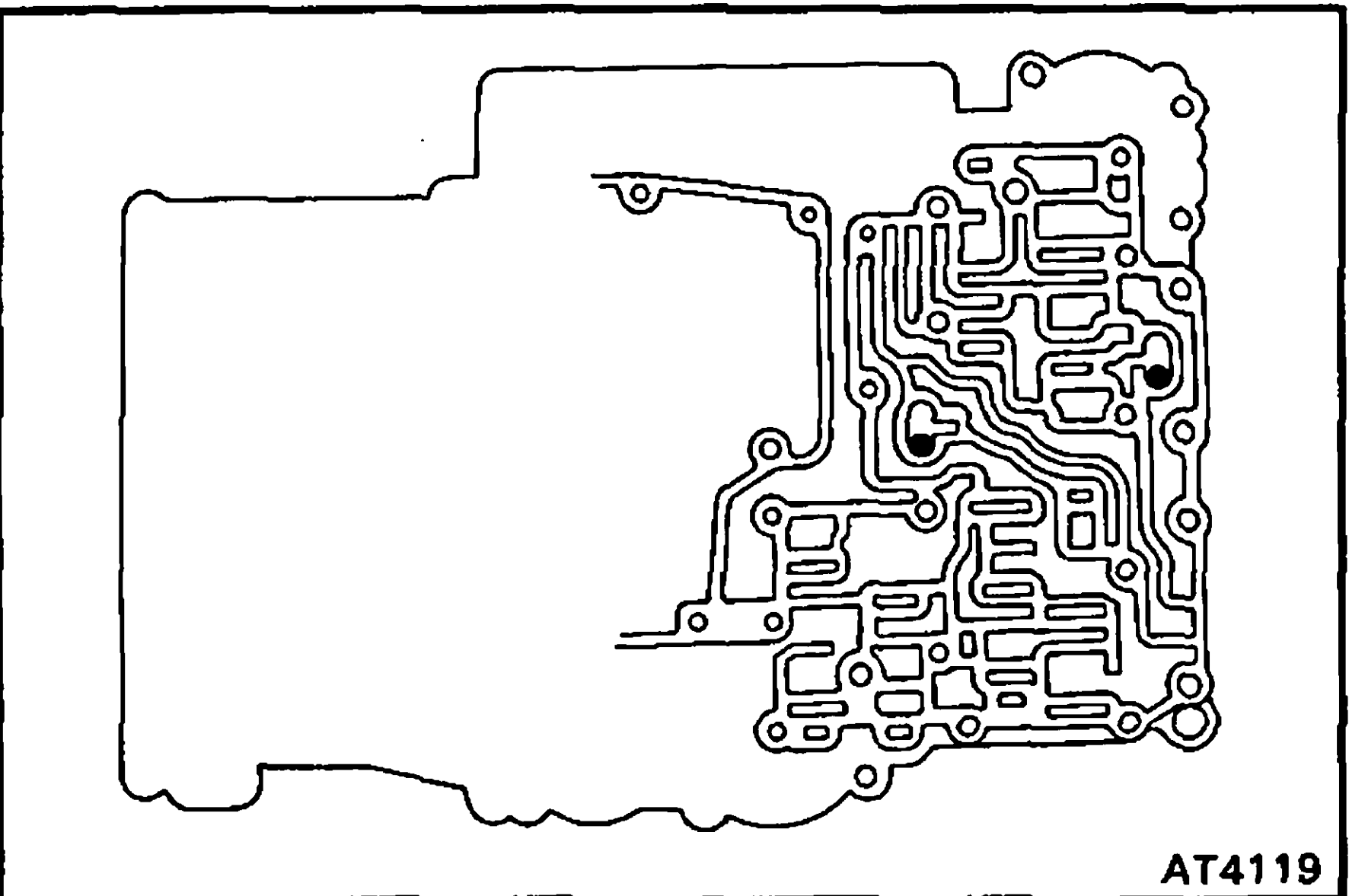
AT4072

**8. REMOVE LOCK-UP RELAY VALVE SLEEVE PIN**

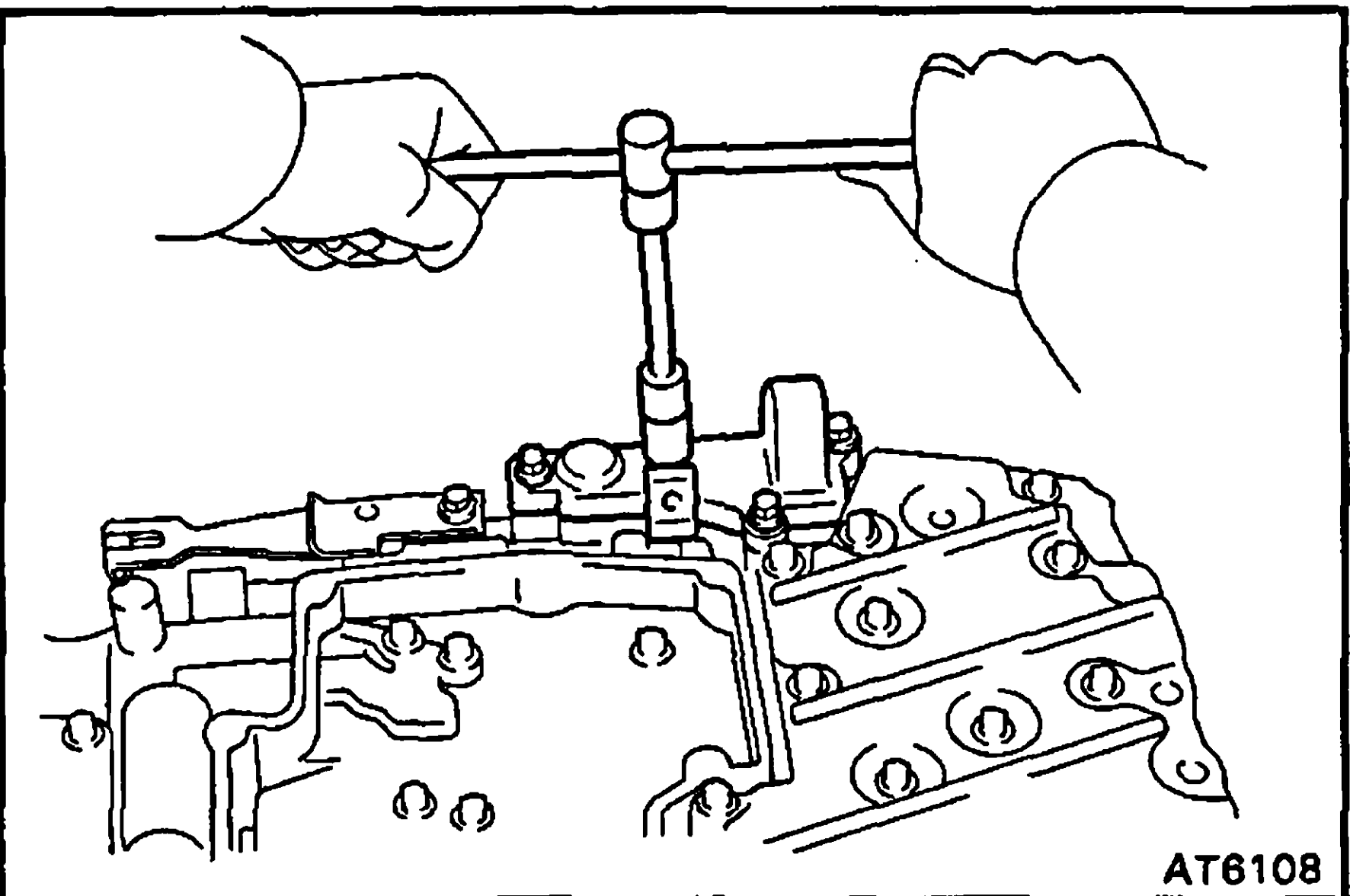
Using a magnetic finger, remove the sleeve pin.

**9. REMOVE LOWER VALVE BODY COVER AND PLATE**

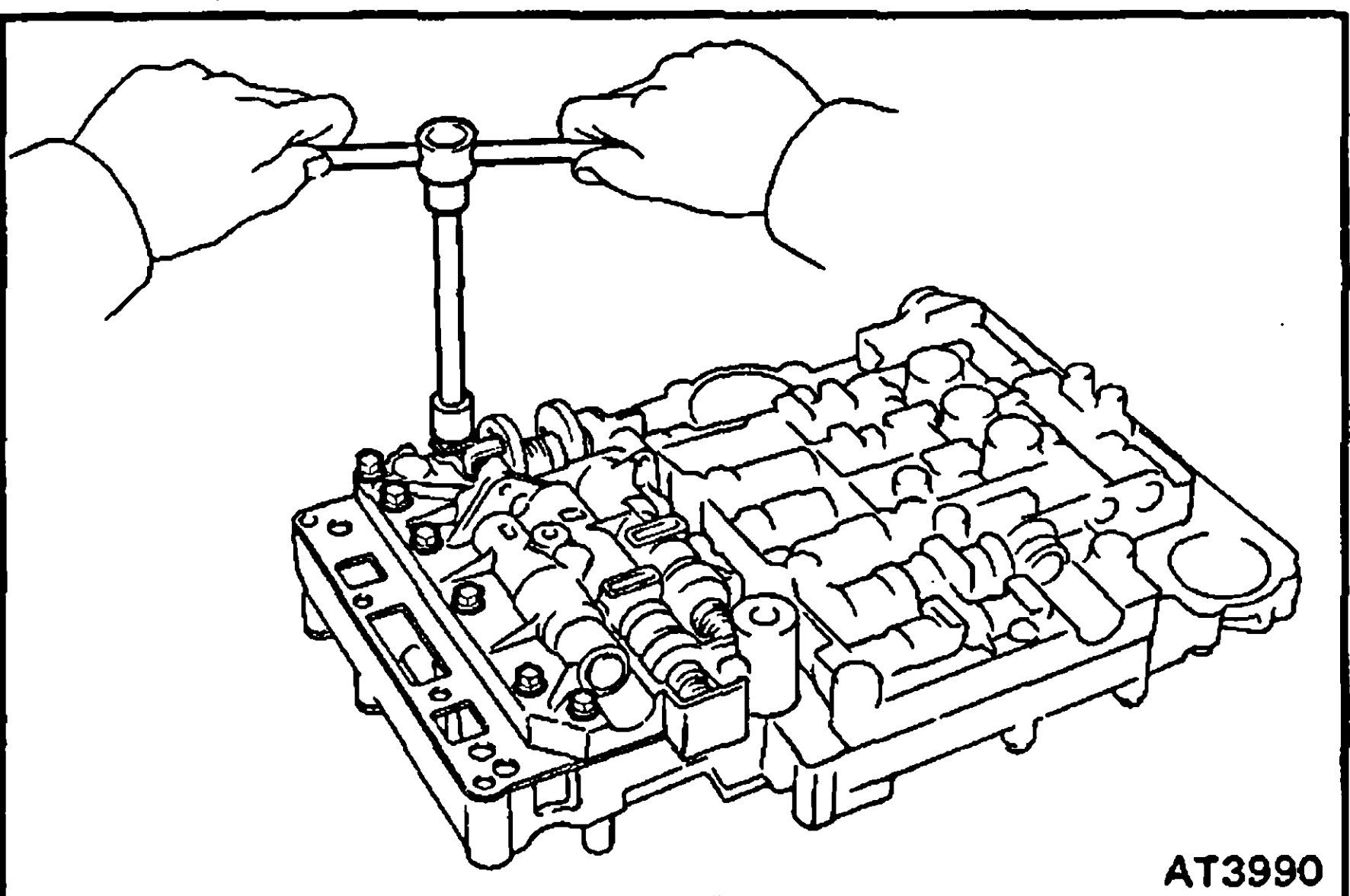
Remove the sixteen bolts, wave washers, body cover, two gaskets and body plate.

**10. REMOVE CHECK BALL**

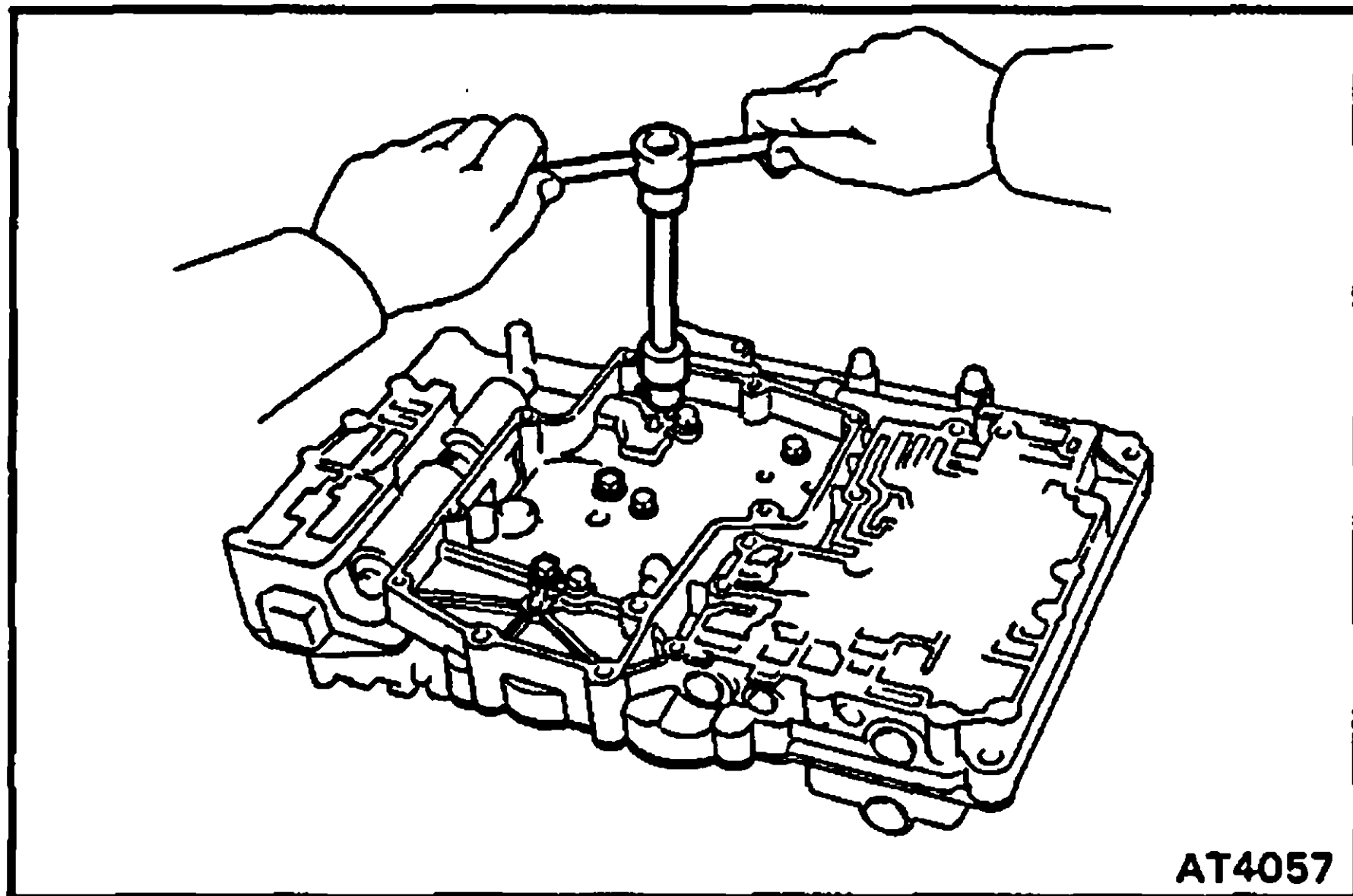
Remove the two check balls from the lower valve body.

**11. (w/ Cruise Control System)  
REMOVE LOWER VALVE BODY COVER**

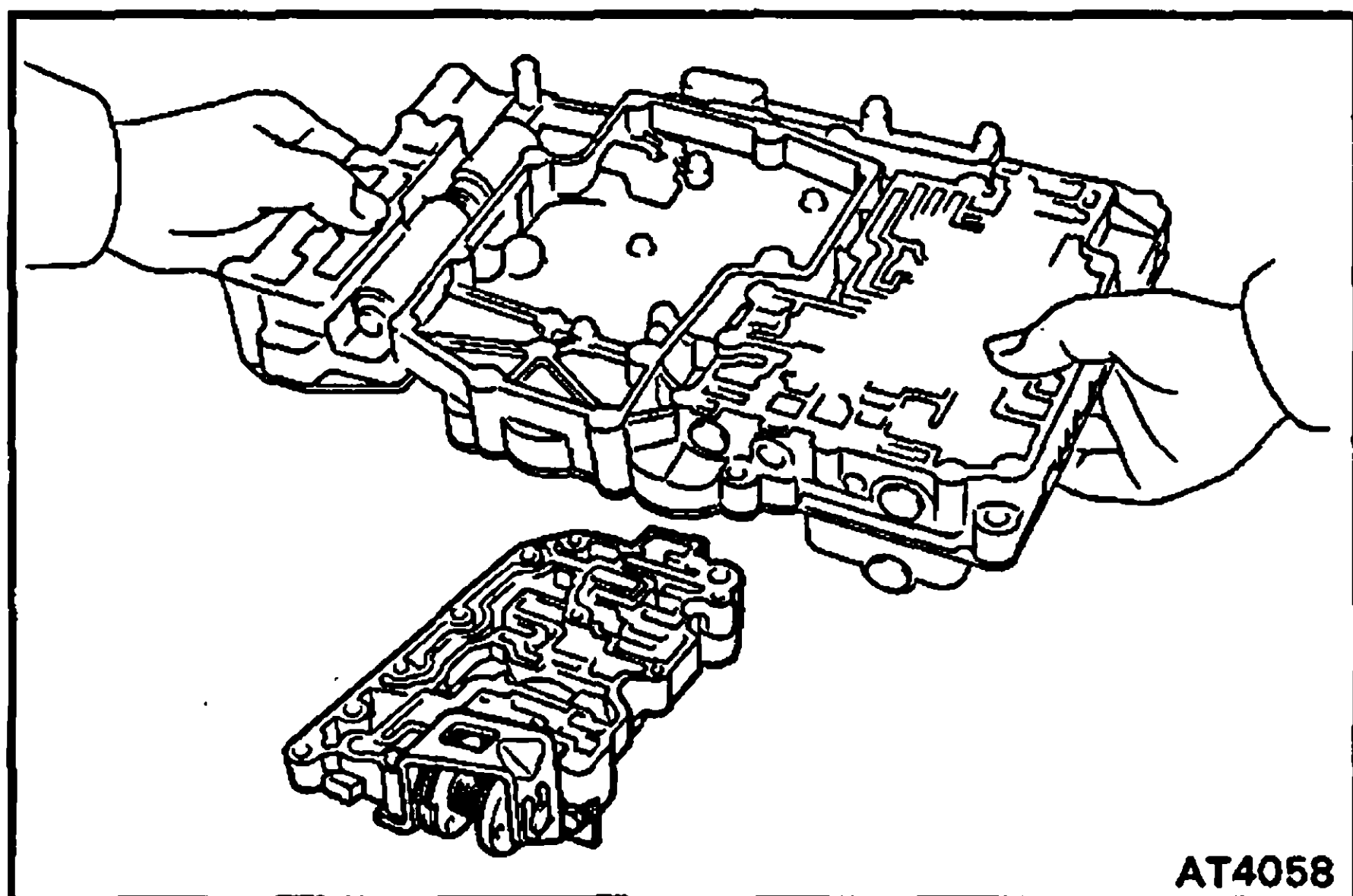
- (a) Remove the four bolts and the cover.
- (b) Remove the two gaskets.

**12. REMOVE FRONT UPPER VALVE BODY**

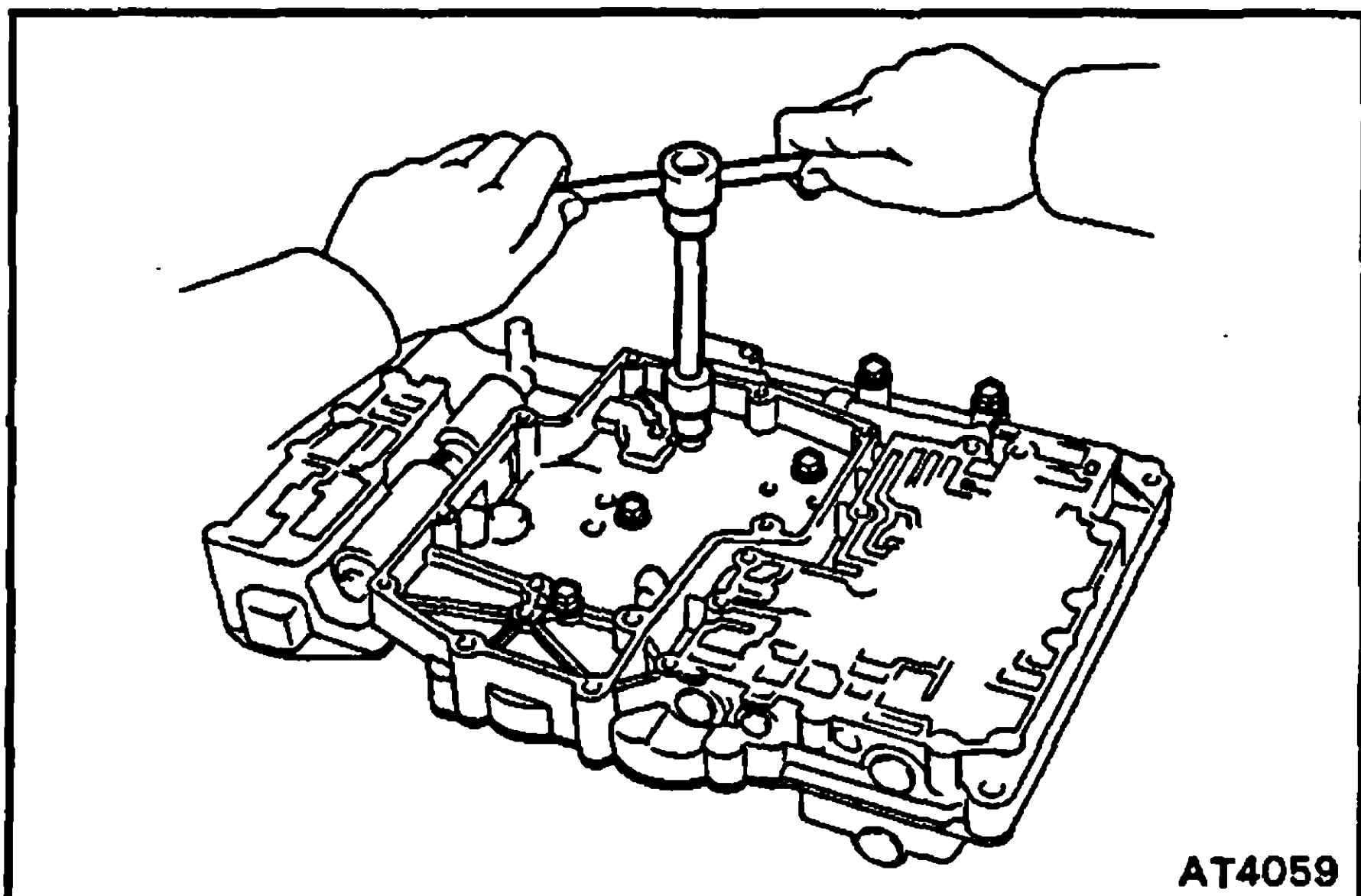
- (a) Turn over the valve body assembly.
- (b) Remove the seven bolts and wave washers.



- (c) Turn over the valve body assembly.
- (d) Remove the three bolts and wave washers.

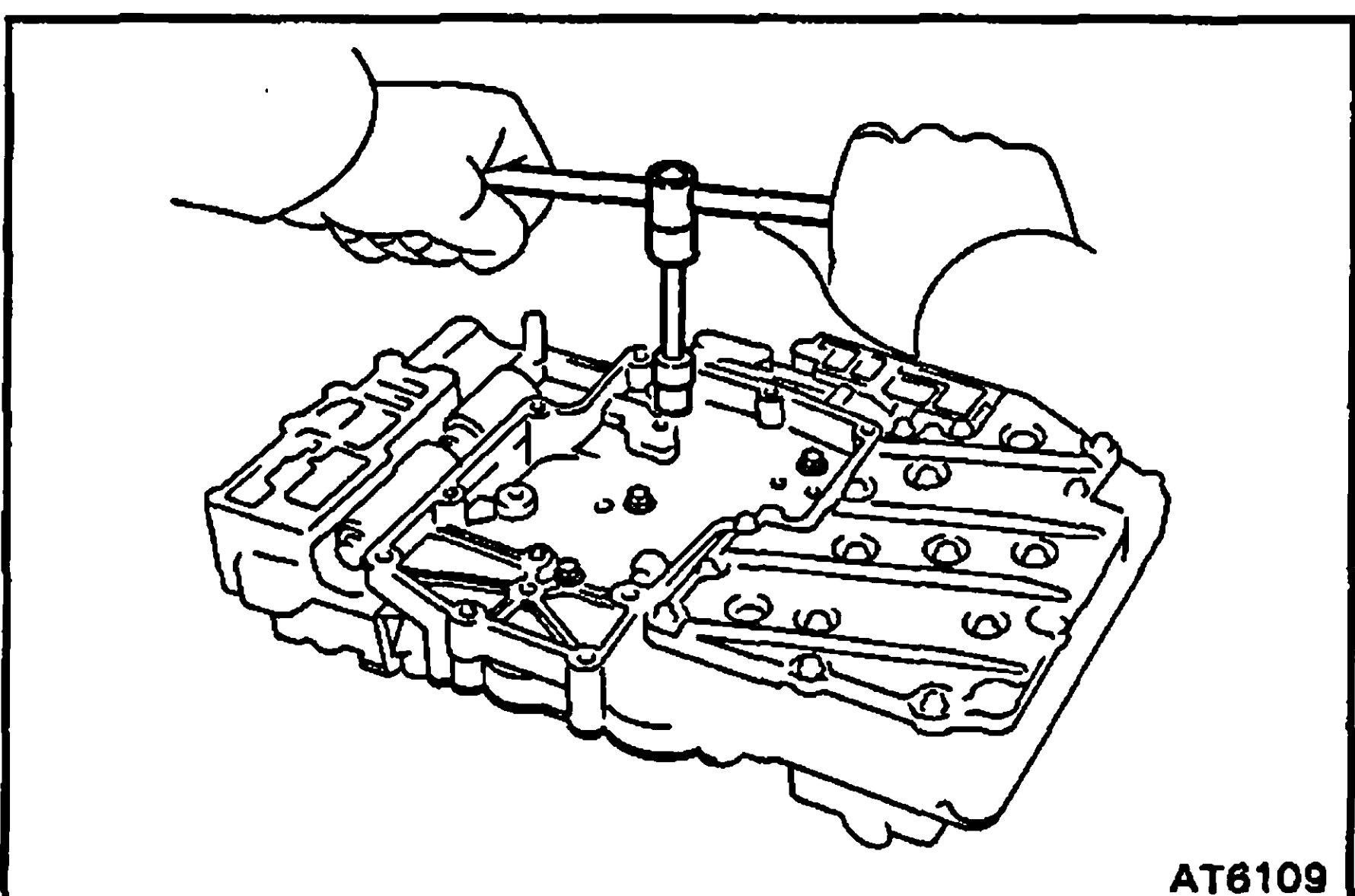


- (e) Remove the front upper valve body by lifting up the lower valve body.



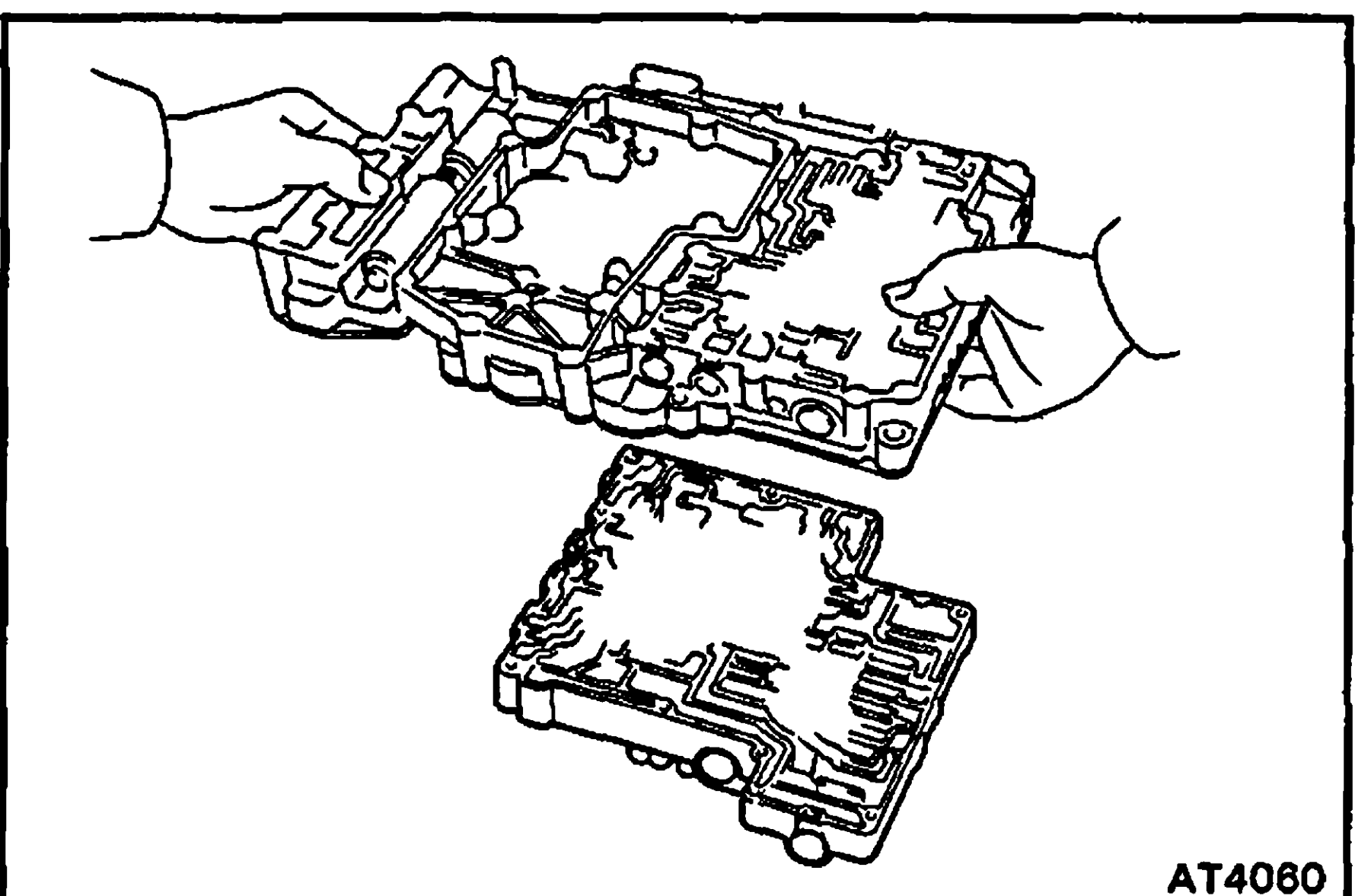
### 13. REMOVE REAR UPPER VALVE BODY

- (a) Remove the six bolts and wave washers.
- (b) Hold the valve body plate to the lower valve plate.



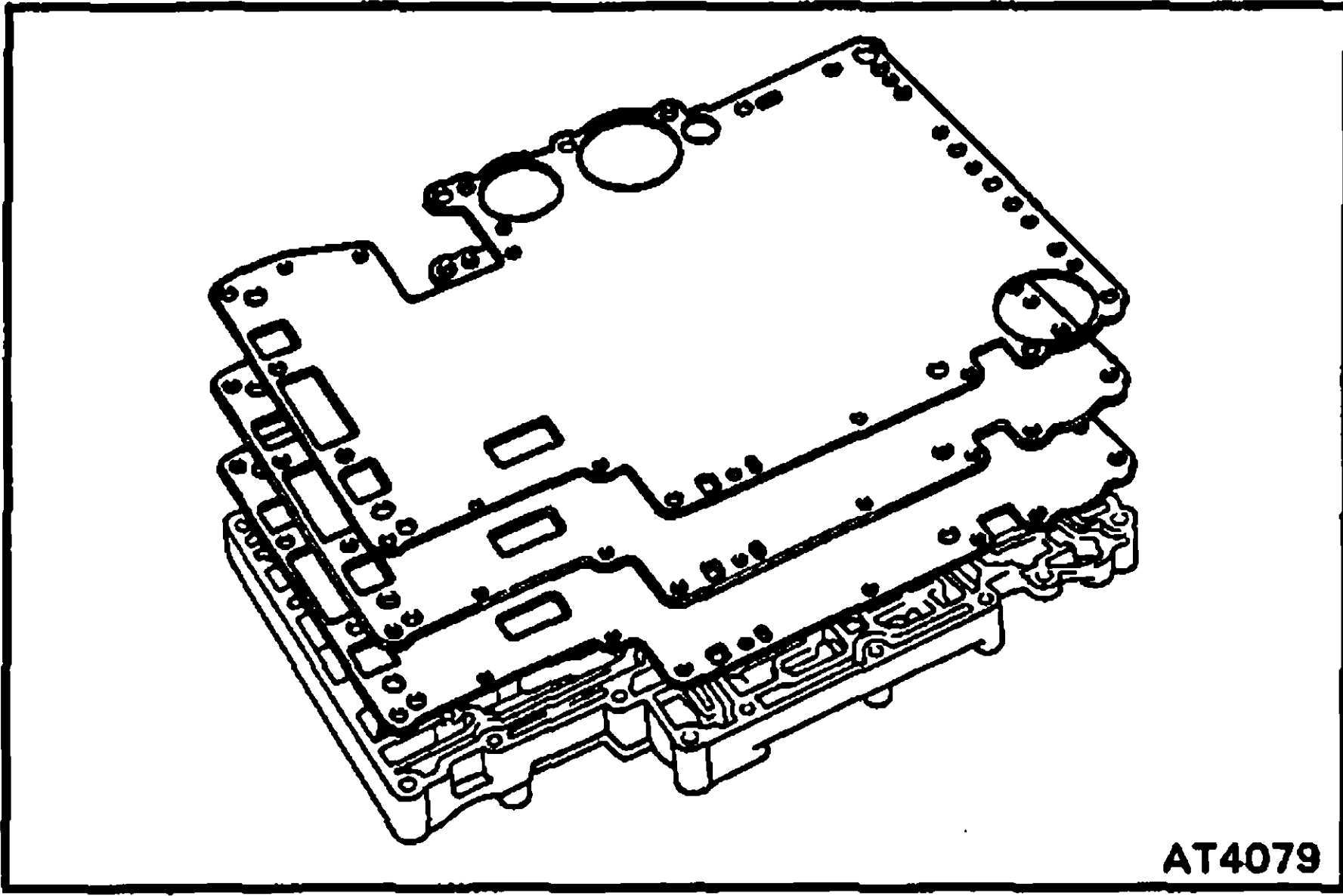
#### (w/ Cruise Control System)

- (a) Remove the four bolts and wave washers.
- (b) Hold the valve body plate to the lower valve plate.



- (c) Remove the rear upper valve body by lifting up the lower valve body.

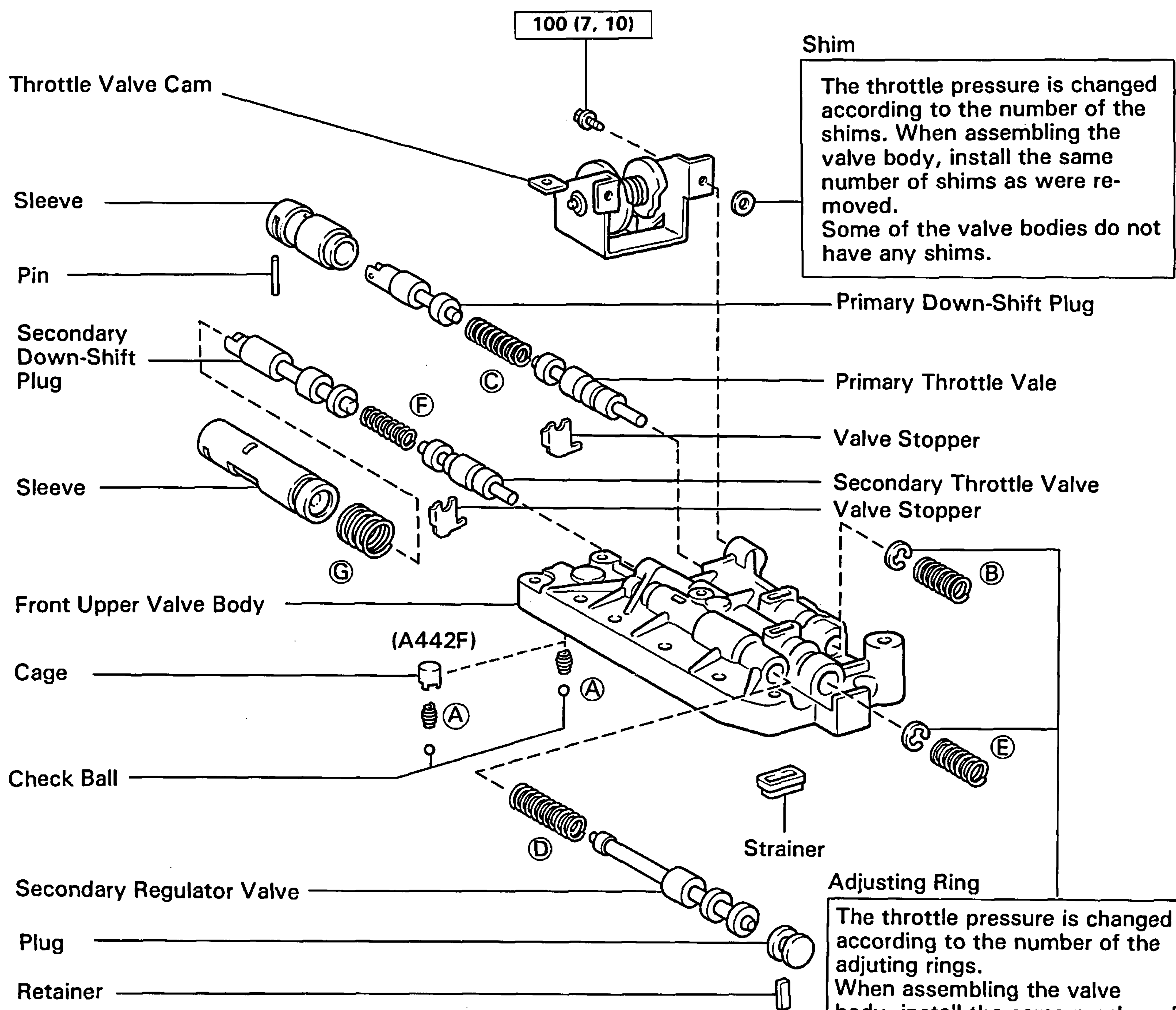
**HINT:** Be careful that the check balls and springs do not fall out.

**14. REMOVE VALVE BODY PLATE**

- (a) Turn over the valve body assembly.
- (b) Remove the two gasket and body plate.

# (Front Upper Valve Body)

## COMPONENTS

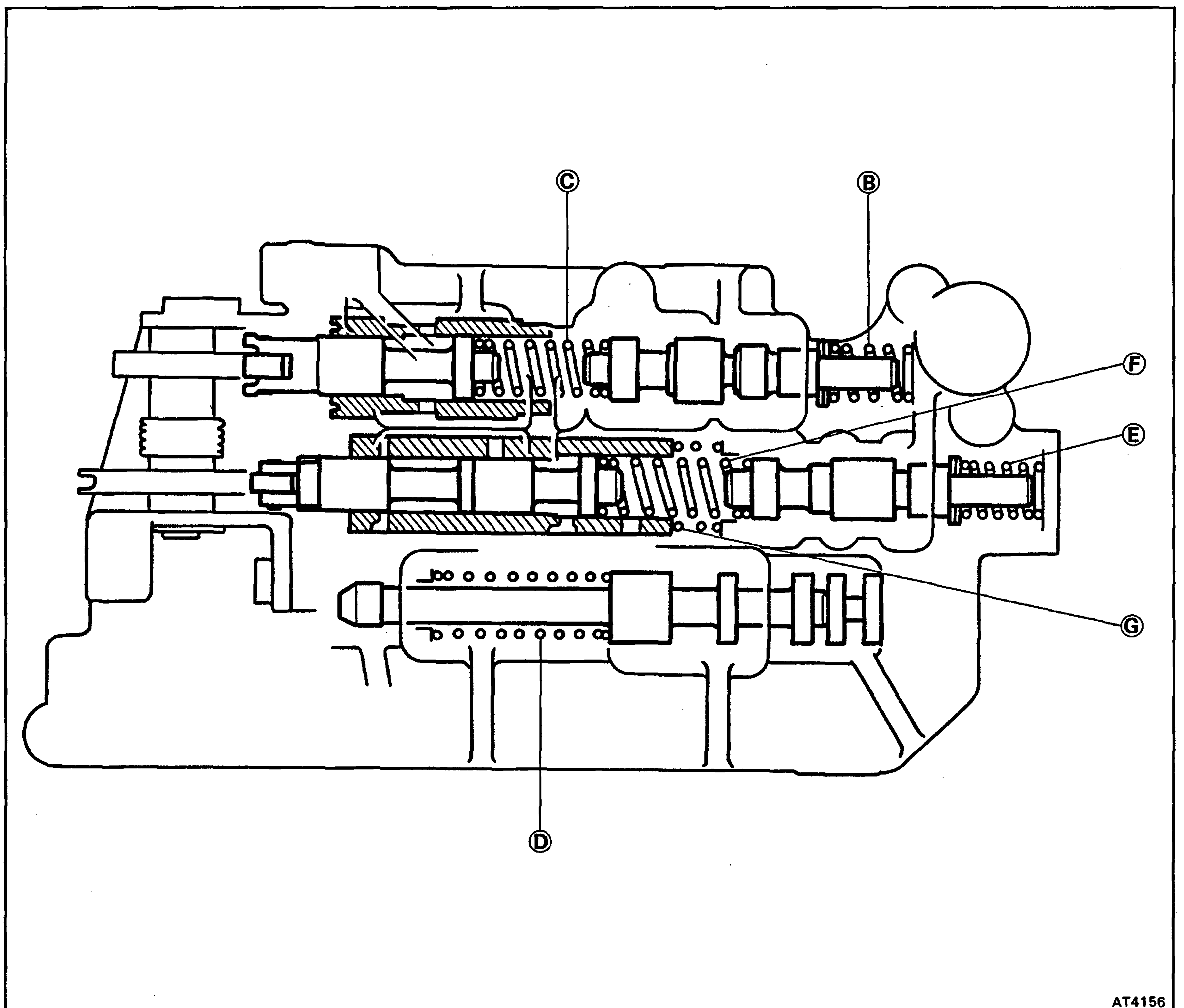


## SPECIFICATIONS OF VALVE BODY SPRINGS

| Spring |                           | Free length<br>mm (in.) | Coil outer diameter<br>mm (in.) | Total No.<br>of coils | Color |
|--------|---------------------------|-------------------------|---------------------------------|-----------------------|-------|
| Ⓐ      | Check ball                | 13.0 (0.512)            | 8.4 (0.331)                     | 8.0                   | None  |
|        | (1HD-T)                   | 14.0 (0.551)            | 9.8 (0.386)                     | 8.0                   | Pink  |
| Ⓑ      | Primary throttle valve    | 25.3 (0.996)            | 9.2 (0.362)                     | 9.5                   | White |
| Ⓒ      | Primary down-shift plug   | 26.9 (1.059)            | 9.0 (0.354)                     | 10.5                  | Blue  |
| Ⓓ      | Secondary regulator valve | 46.0 (1.811)            | 13.3 (0.524)                    | 15.0                  | None  |
|        | (1HD-T)                   | 31.7 (1.248)            | 11.3 (0.445)                    | 12.0                  | Green |
| Ⓔ      | Secondary throttle valve  | 25.3 (0.996)            | 9.2 (0.362)                     | 9.5                   | White |
| Ⓕ      | Secondary down-shift plug | 32.6 (1.283)            | 9.7 (0.382)                     | 13.0                  | White |
|        | (1HZ, 1HD-T)              | 31.8 (1.252)            | 9.7 (0.382)                     | 13.0                  | Green |
| Ⓖ      | Throttle valve sleeve     | 10.8 (0.425)            | 18.2 (0.717)                    | 4.0                   | None  |

HINT: During reassembly, please refer to the spring specifications above to help differentiate the different springs.

## SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINER, PINS, STOPPERS, CHECK BALL, SPRING AND STRAINER

1. RETAINER, PINS AND STOPPERS

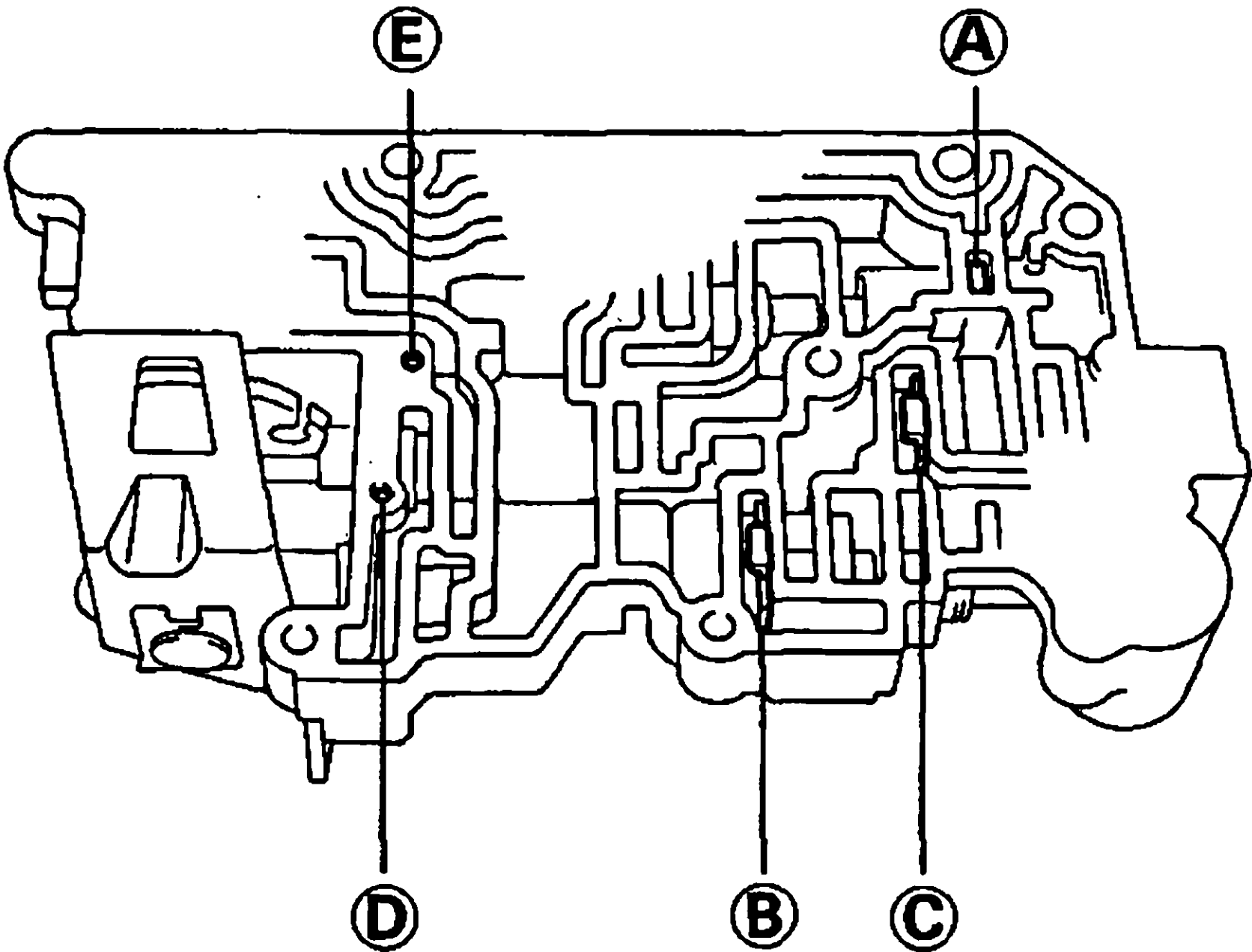


Diagram showing the locations of Retainer, Pins, and Stoppers in the valve body. Labels A through E indicate specific components.

|   |                                         |              |              | mm (in.)              |
|---|-----------------------------------------|--------------|--------------|-----------------------|
|   | Item                                    | Length       | Width        | Thickness or diameter |
| A | Retainer for secondary regulator valve  | 13.5 (0.531) | 5.0 (0.197)  | 3.2 (0.126)           |
| B | Stopper for primary throttle valve      | —            | 22.1 (0.870) | —                     |
| C | Stopper for secondary throttle valve    | —            | 19.1 (0.752) | —                     |
| D | Pin for primary throttle valve sleeve   | 23.8 (0.937) | —            | 3.0 (0.118)           |
| E | Pin for secondary throttle valve sleeve | 23.8 (0.937) | —            | 3.0 (0.118)           |

AT1648

2. CHECK BALL AND SPRING

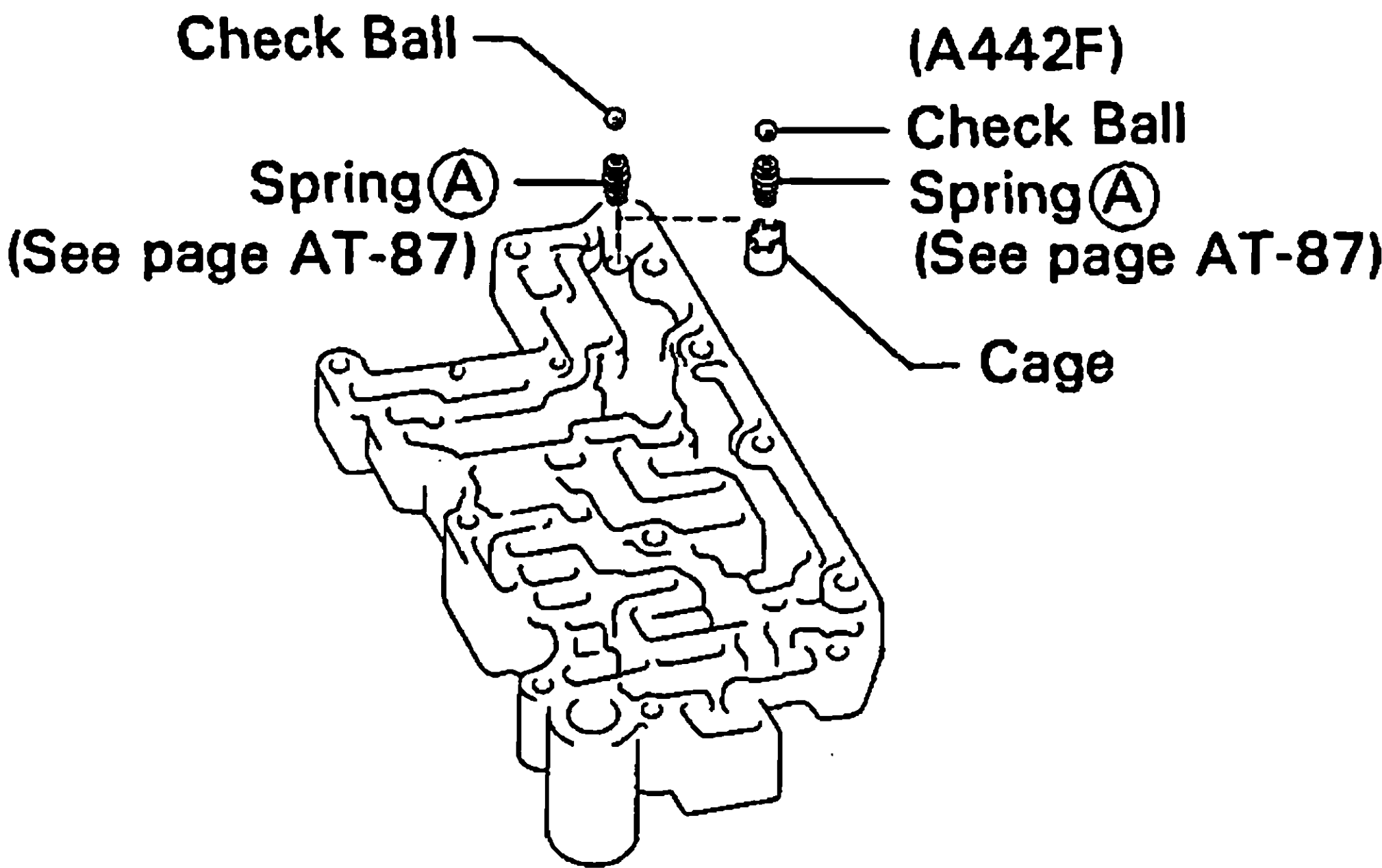


Diagram showing the locations of Check Ball and Spring in the valve body. Labels A indicate specific components. (See page AT-87) is noted for Spring A.

|  |                    | mm (in.)     |
|--|--------------------|--------------|
|  | Item               | Diameter     |
|  | Check ball         | 8.7 (0.343)  |
|  | Check ball (A442F) | 10.0 (0.039) |

AT6595

3. STRAINER

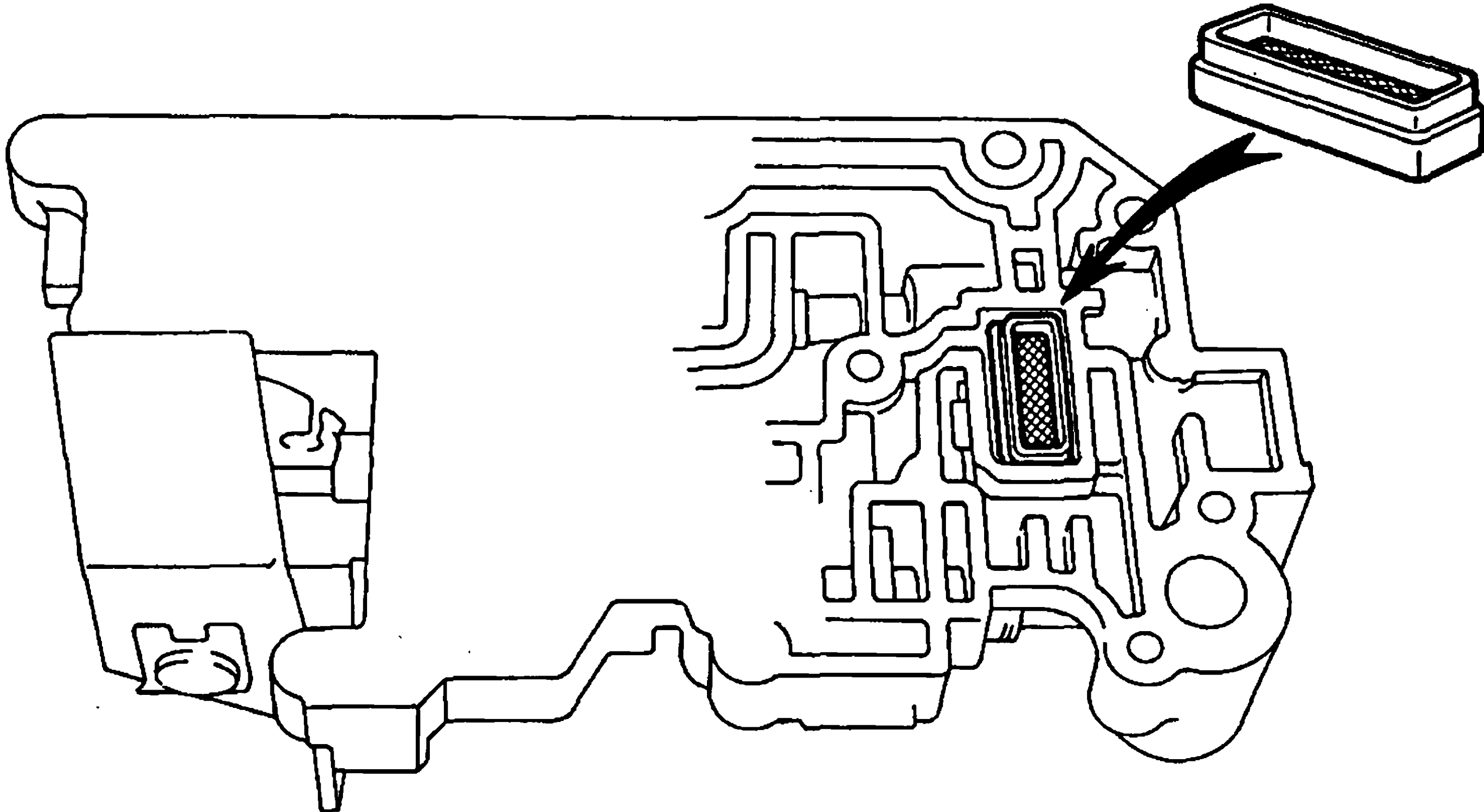
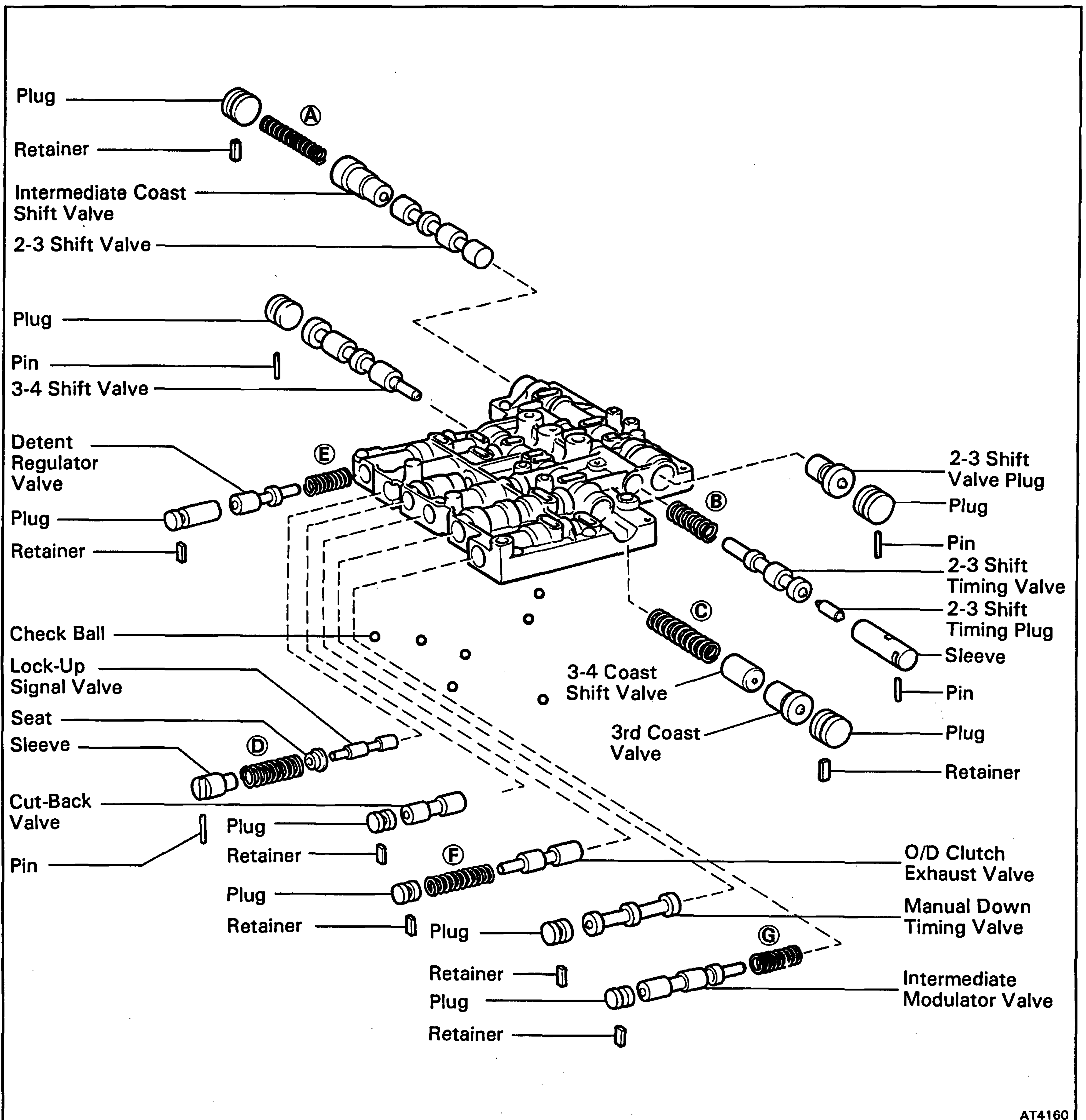


Diagram showing the location of the Strainer in the valve body.

AT4103

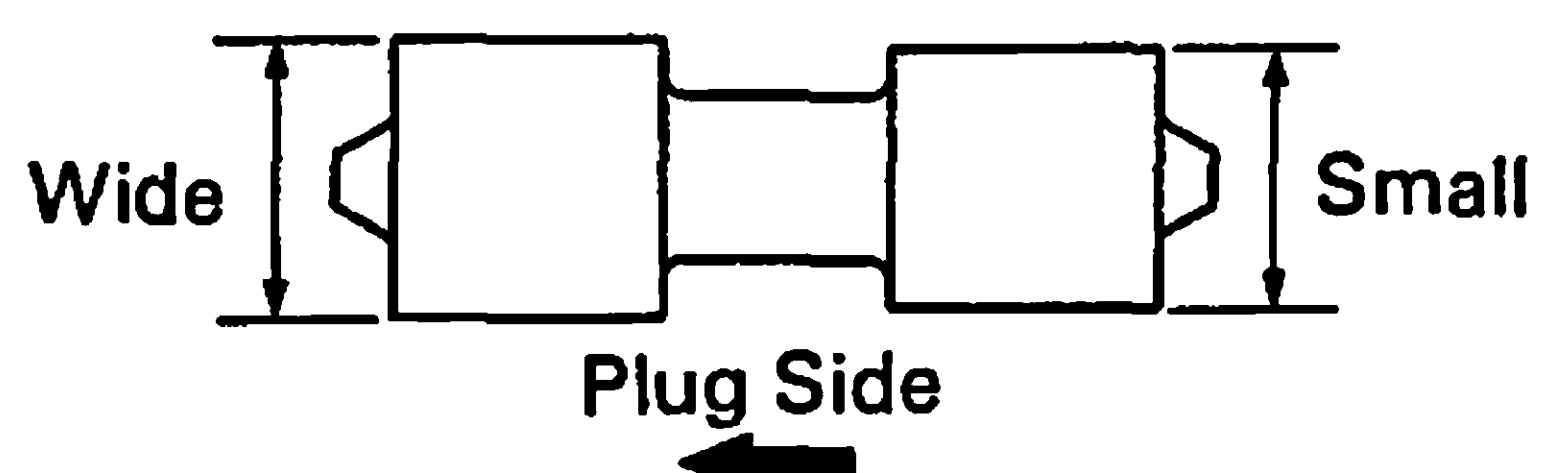
## (Rear Upper Valve Body) COMPONENTS



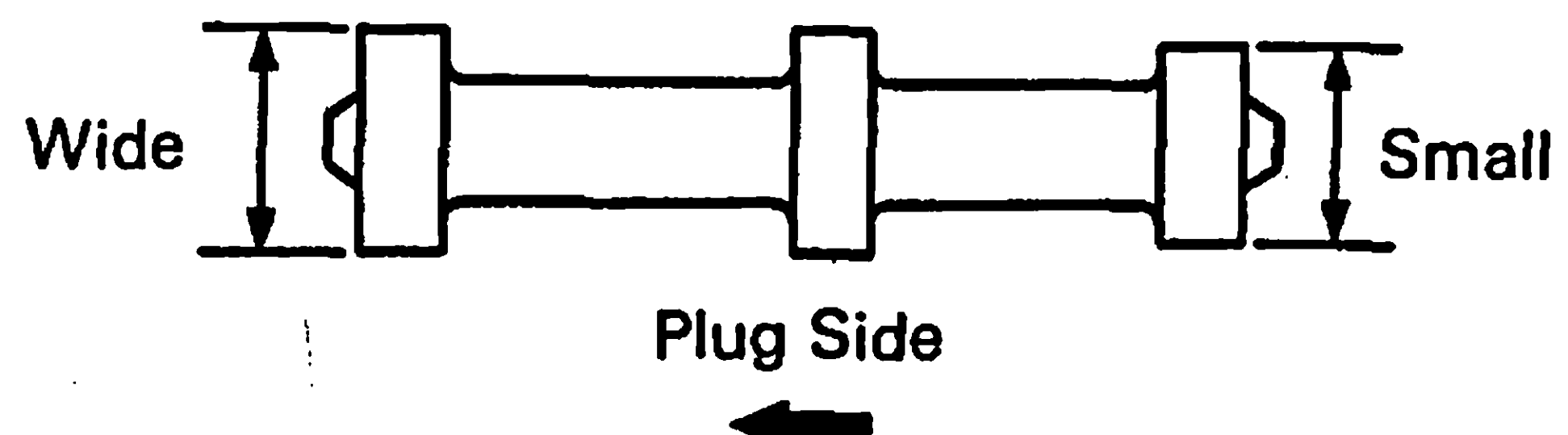
AT4160

**HINT:**

Cut-Back Valve



Manual Down Timing Valve



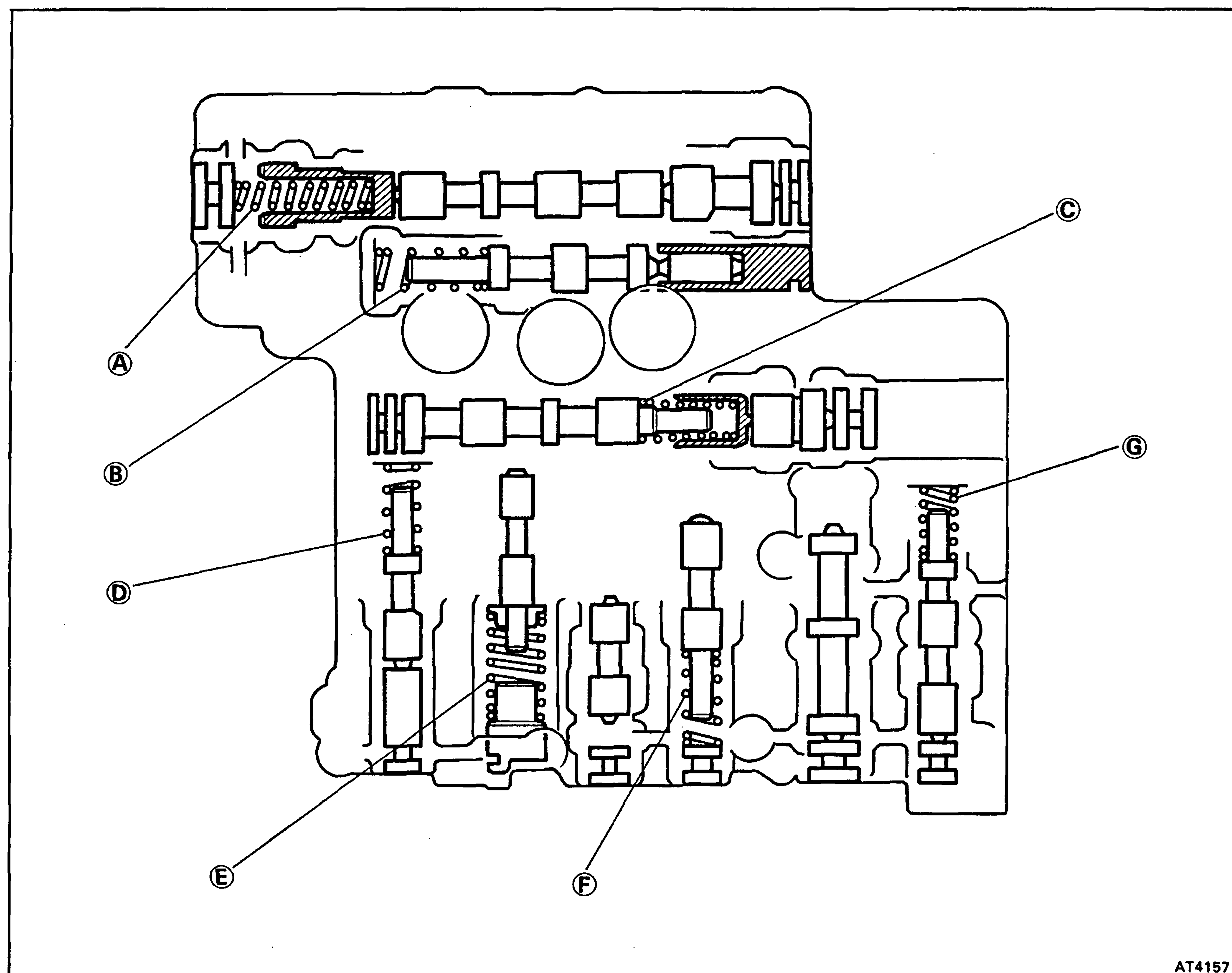
AT4211 AT4210

## SPECIFICATIONS OF VALVE BODY SPRINGS

| Spring |                                  | Free length<br>mm (in.) | Coil outer diameter<br>mm (in.) | Total No.<br>of coils | Color  |
|--------|----------------------------------|-------------------------|---------------------------------|-----------------------|--------|
| Ⓐ      | 2-3 shift valve (3F-E)           | 42.2 (1.661)            | 8.9 (0.350)                     | 22.0                  | White  |
|        | (BB32 series, 3F)                | 44.7 (1.760)            | 8.9 (0.350)                     | 22.0                  | None   |
|        | (1HZ)                            | 41.6 (1.638)            | 8.9 (0.350)                     | 22.0                  | Blue   |
|        | (1HD-T)                          | 43.3 (1.705)            | 8.9 (0.350)                     | 22.0                  | Brown  |
| Ⓑ      | 2-3 shift timing valve           | 29.4 (1.157)            | 8.6 (0.339)                     | 15.5                  | None   |
|        | (1HD-T)                          | 38.3 (1.508)            | 9.2 (0.362)                     | 18.0                  | Green  |
| Ⓒ      | 3-4 shift valve (3F, 3F-E)       | 38.3 (1.508)            | 9.7 (0.382)                     | 17.0                  | None   |
|        | (BB32 series)                    | 39.4 (1.551)            | 9.7 (0.382)                     | 17.0                  | None   |
|        | (1HZ)                            | 35.2 (1.386)            | 9.7 (0.382)                     | 17.0                  | Brown  |
|        | (1HD-T)                          | 35.7 (1.406)            | 9.7 (0.382)                     | 17.0                  | Yellow |
| Ⓓ      | Detent regulator (3F, 3F-E, 1HZ) | 30.4 (1.197)            | 7.4 (0.291)                     | 16.0                  | White  |
|        | valve (BB32 series, 1HD-T)       | 29.3 (1.154)            | 7.4 (0.291)                     | 16.0                  | Green  |
| Ⓔ      | Lock-up signal (3F, 3F-E, 1HZ)   | 47.6 (1.874)            | 13.7 (0.539)                    | 16.0                  | Blue   |
|        | valve (BB32 series)              | 55.3 (2.177)            | 13.7 (0.539)                    | 16.0                  | Yellow |
|        | (1HD-T)                          | 50.2 (1.976)            | 13.7 (0.539)                    | 16.0                  | White  |
| Ⓕ      | O/D clutch exhaust valve         | 33.3 (1.311)            | 8.2 (0.323)                     | 14.0                  | Yellow |
| Ⓖ      | Intermediate modulator valve     | 22.5 (0.886)            | 7.7 (0.303)                     | 12.0                  | Pink   |

HINT: During reassembly, please refer to the spring specifications above to help differentiate the different springs.

## SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS, PINS AND CHECK BALLS

1. RETAINERS AND PINS

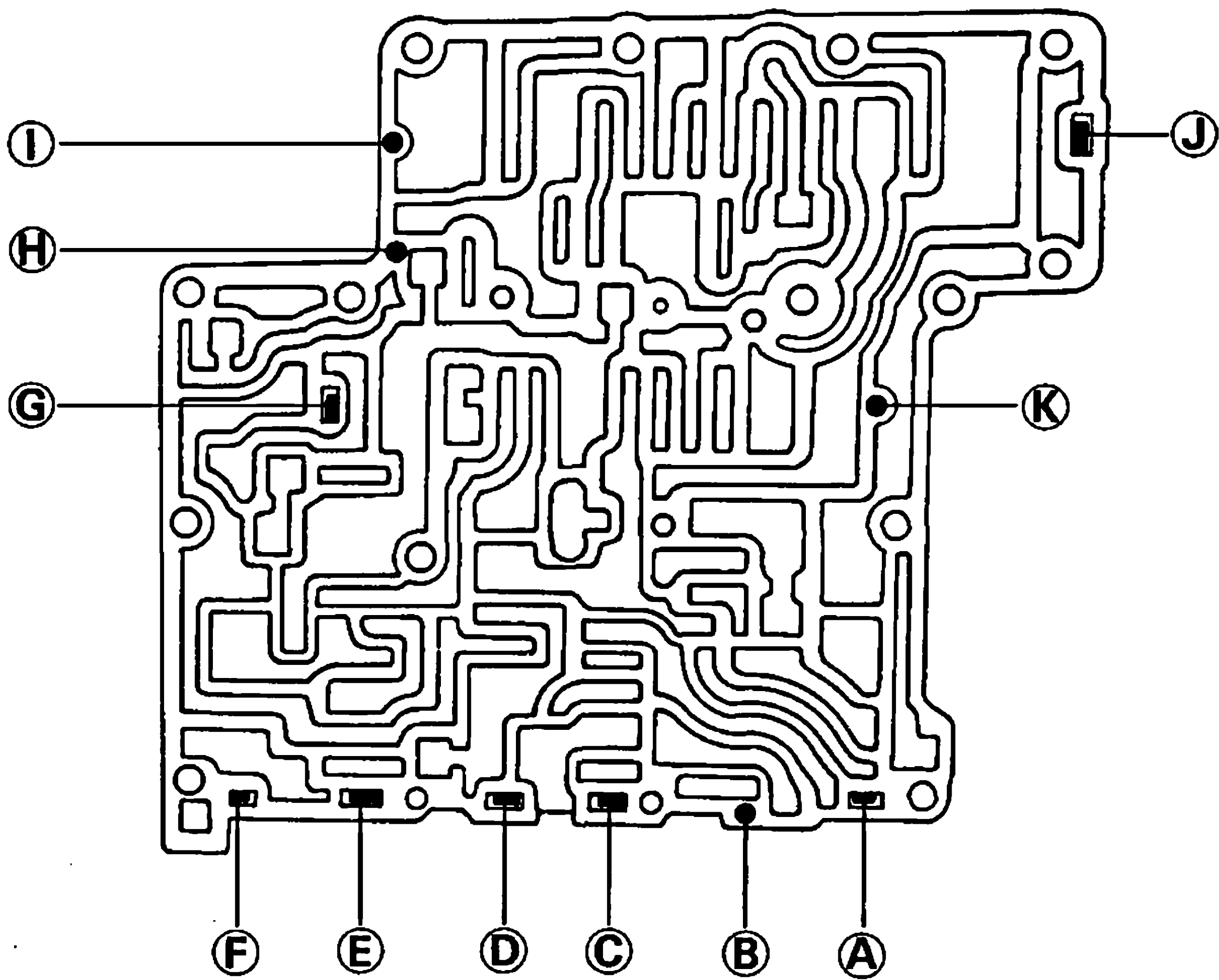


Diagram of the valve body showing the locations of retainers and pins labeled A through K. The diagram includes a complex network of passages and ports. Labels A through K point to specific components: A (bottom center), B (bottom center), C (bottom center), D (bottom center), E (bottom center), F (bottom center), G (left side), H (left side), I (left side), J (top right), and K (right side).

|   |                                                | mm (in.)     |             |                       |
|---|------------------------------------------------|--------------|-------------|-----------------------|
|   | Item                                           | Length       | Width       | Thickness or diameter |
| A | Retainer for detent regulator valve plug       | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.196)           |
| B | Pin for lock-up signal valve plug              | 21.8 (0.858) | —           | 2.5 (0.098)           |
| C | Retainer for cut-back valve plug               | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| D | Retainer for O/D clutch exhaust valve plug     | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| E | Retainer for manual down timing valve plug     | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| F | Retainer for intermediate modulator valve plug | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| G | Retainer for 3rd coast valve plug              | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| H | Pin for 2-3 shift timing valve sleeve          | 21.8 (0.858) | —           | 2.5 (0.098)           |
| I | Pin for 2-3 shift valve plug                   | 12.8 (0.504) | —           | 2.0 (0.079)           |
| J | Retainer for 2-3 shift valve plug              | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| K | Pin for 3-4 shfit valve plug                   | 12.8 (0.504) | —           | 2.0 (0.079)           |

AT4120

2. CHECK BALLS

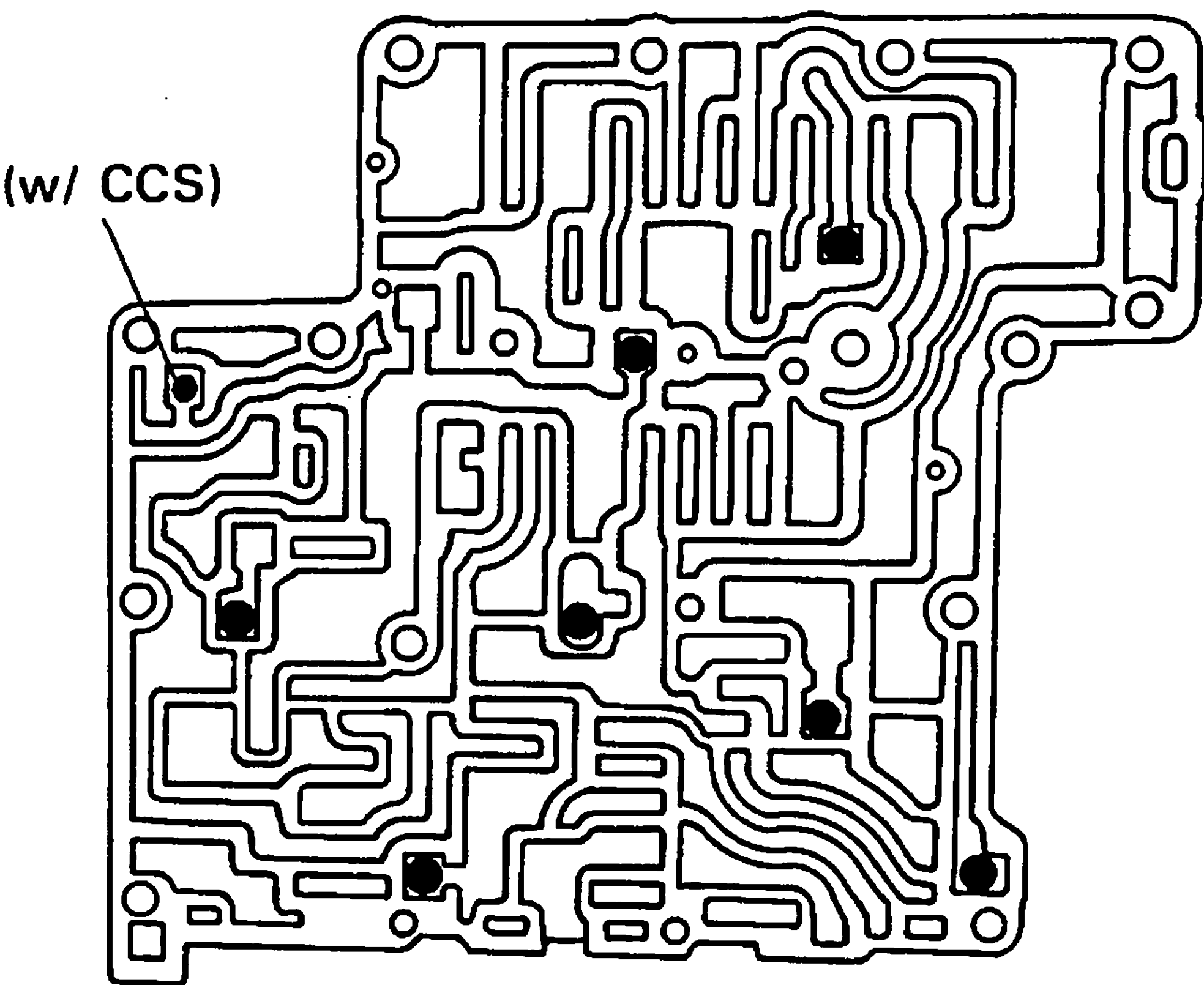


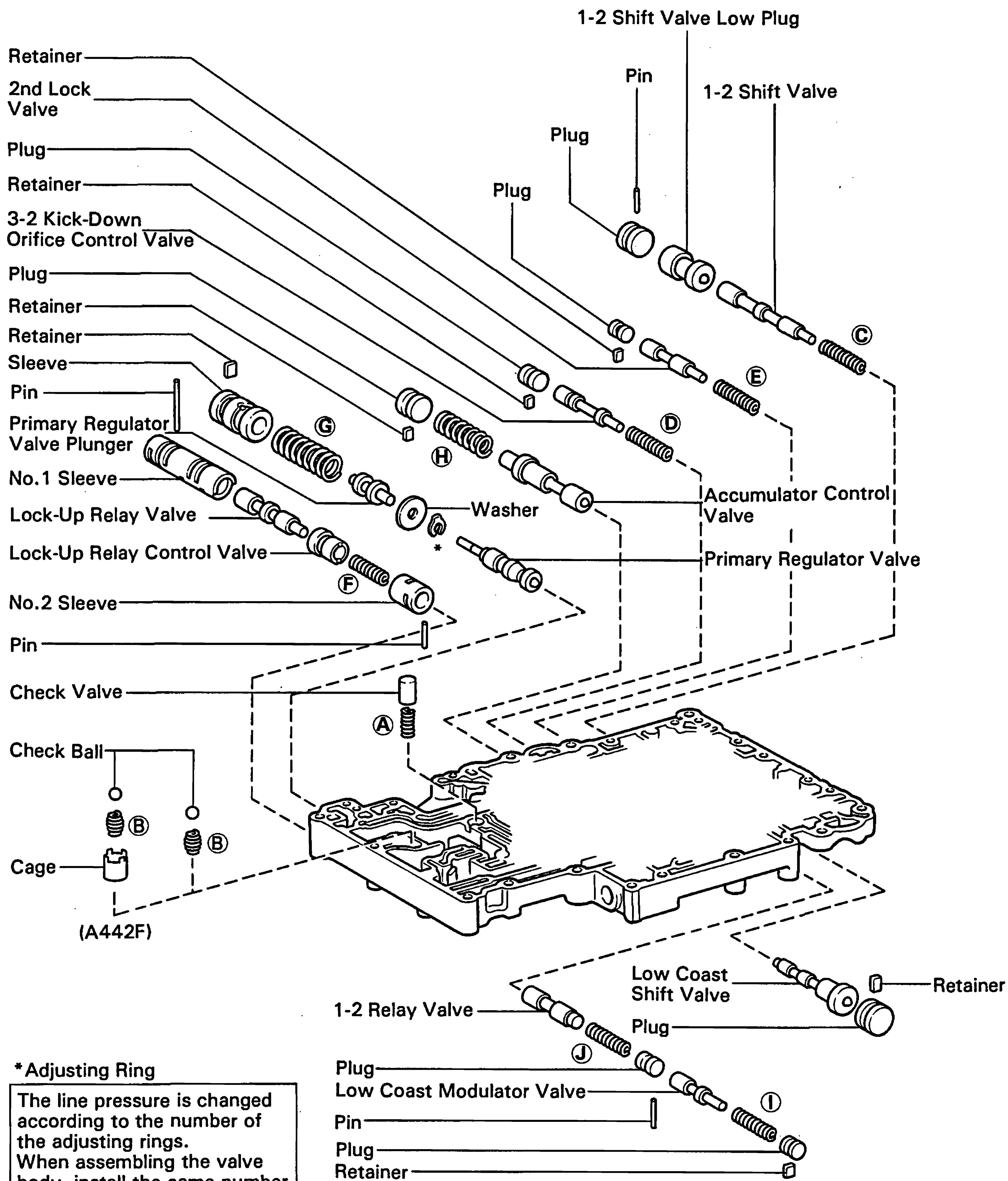
Diagram of the valve body showing the locations of check balls. The diagram includes a complex network of passages and ports. A label (w/ CCS) points to a specific location on the left side.

|  |            | mm (in.)    |
|--|------------|-------------|
|  | Item       | Diameter    |
|  | Check ball | 6.4 (0.252) |

AT4121

## (Lower Valve Body)

### COMPONENTS

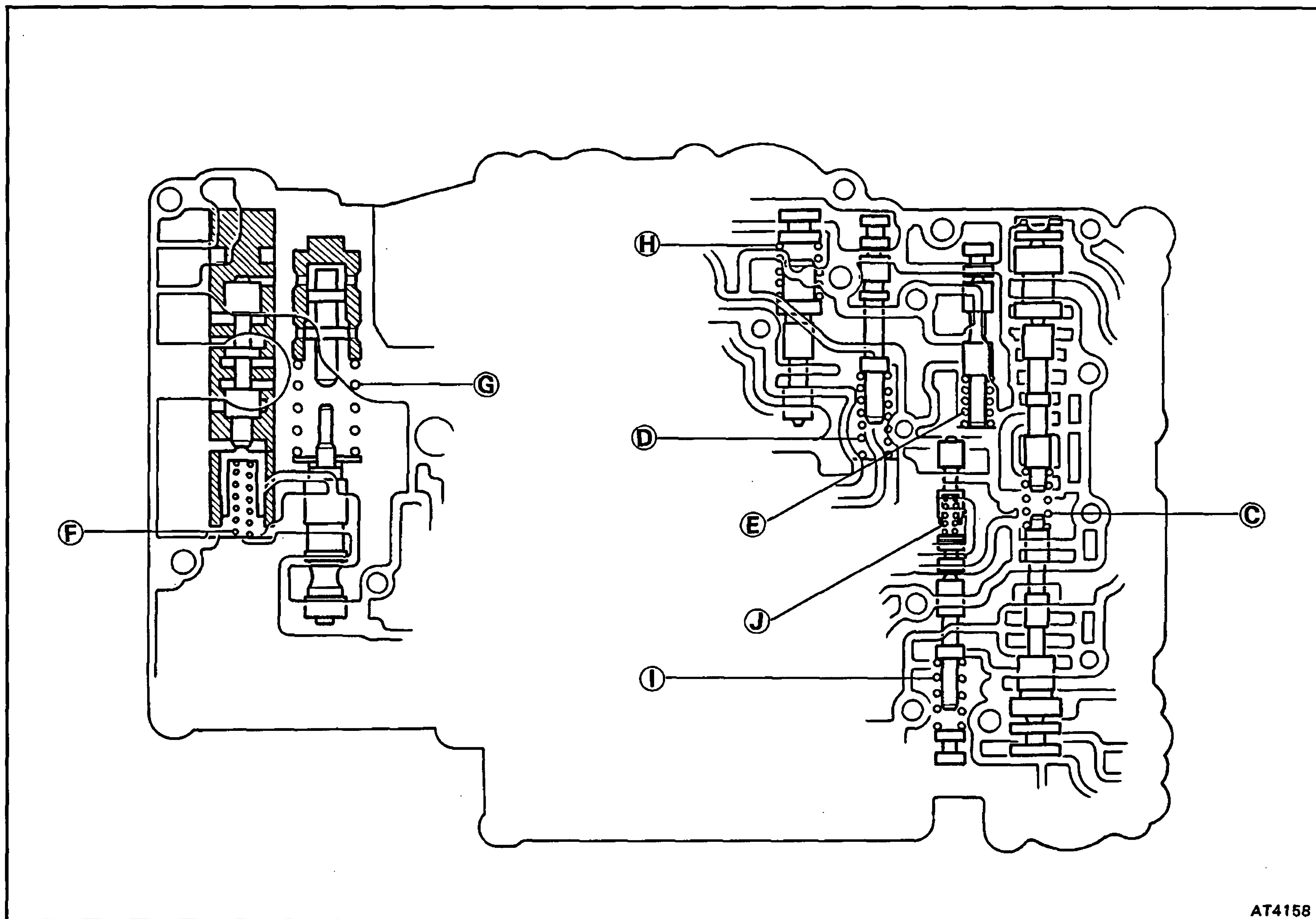


## SPECIFICATIONS OF VALVE BODY SPRINGS

| Spring |                                                                   | Free length<br>mm (in.) | Coil outer diameter<br>mm (in.)     | Total No.<br>of coils | Color  |
|--------|-------------------------------------------------------------------|-------------------------|-------------------------------------|-----------------------|--------|
| Ⓐ      | Check valve<br>(1HD-T)                                            | 27.7 (1.091)            | 8.2 (0.323)                         | 13.0                  | None   |
|        |                                                                   | 24.0 (0.945)            | 8.2 (0.323)                         | 12.0                  | White  |
| Ⓑ      | Check ball<br>(1HD-T)                                             | 13.0 (0.512)            | 8.4 (0.331)                         | 8.0                   | None   |
|        |                                                                   | 14.0 (0.551)            | 9.8 (0.386)                         | 8.0                   | Pink   |
| Ⓒ      | 1-2 shift valve                                                   | 26.6 (1.047)            | 6.9 (0.272)                         | 16.0                  | None   |
| Ⓓ      | 3-2 kick-down orifice control valve                               | 32.5 (1.280)            | 8.3 (0.327)                         | 14.0                  | Blue   |
| Ⓔ      | 2nd lock valve                                                    | 29.4 (1.158)            | (Except BB32 series)<br>8.3 (0.327) | 14.0                  | Brown  |
| Ⓕ      | Lock-up relay valve                                               | 32.4 (1.276)            | 9.3 (0.366)                         | 15.0                  | Pink   |
| Ⓖ      | Primary regulator valve<br>(1HD-T)                                | 58.2 (2.291)            | 20.9 (0.823)                        | 11.0                  | None   |
|        |                                                                   | 58.2 (2.291)            | 20.9 (0.823)                        | 11.0                  | Red    |
| Ⓗ      | Accumulator control valve<br>(1HD-T)                              | 25.1 (0.988)            | 12.5 (0.492)                        | 8.5                   | Red    |
|        |                                                                   | 27.4 (1.079)            | 10.3 (0.406)                        | 8.5                   | Green  |
| Ⓘ      | Low coast modulator valve<br>(3F-E)<br>(3F, 1HZ)<br>(BB32 series) | 30.0 (1.181)            | 7.3 (0.287)                         | 16.0                  | Yellow |
|        |                                                                   | 31.8 (1.252)            | 7.3 (0.287)                         | 16.0                  | Red    |
|        |                                                                   | 29.7 (1.169)            | 7.5 (0.295)                         | 15.0                  | Gray   |
| Ⓙ      | 1-2 relay valve                                                   | 22.9 (0.902)            | 5.1 (0.201)                         | 15.0                  | None   |

**HINT:** During reassembly, please refer to the spring specifications above to help differentiate the different springs.

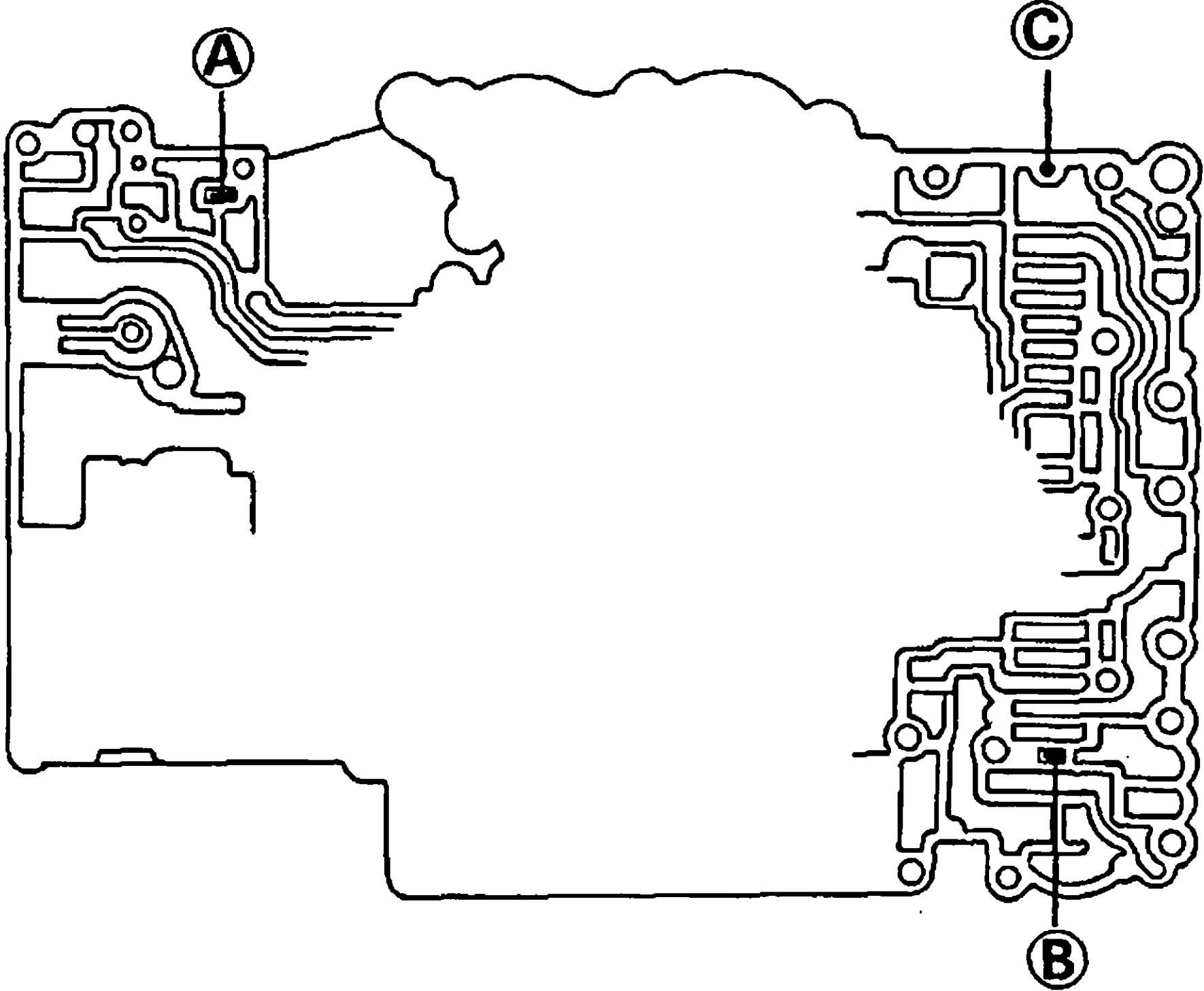
## SECTIONAL VIEW OF VALVE BODY



LOCATION OF RETAINERS, PINS, CHECK VALVE, BALL AND SPRINGS

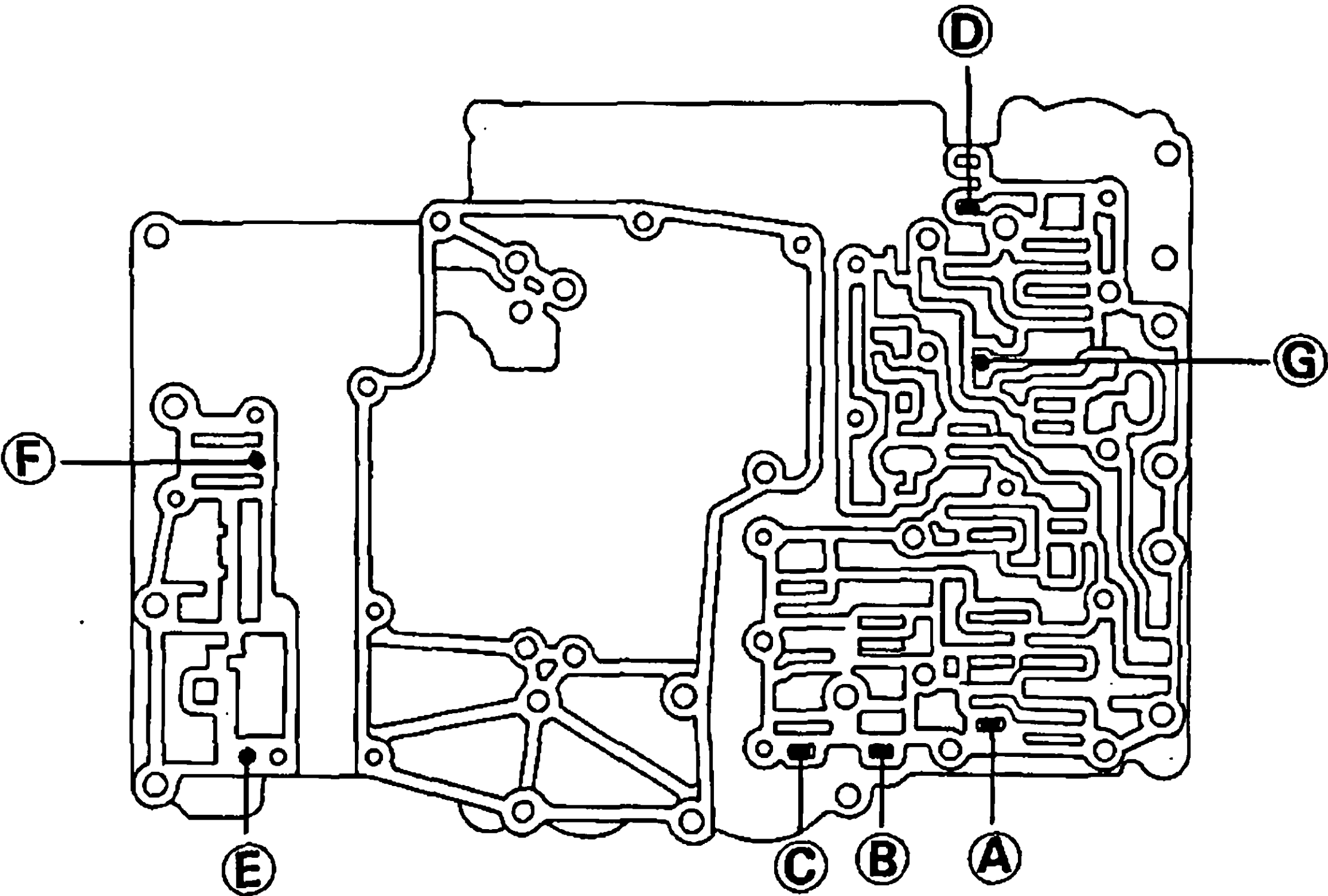
1. RETAINERS AND PINS

Upper Side



|   |                                             | mm (in.)     |             |                       |
|---|---------------------------------------------|--------------|-------------|-----------------------|
|   | Item                                        | Length       | Width       | Thickness or diameter |
| A | Retainer for primary regulator valve sleeve | 17.0 (0.669) | 8.5 (0.335) | 3.2 (0.126)           |
| B | Retainer for low coast shift valve plug     | 13.5 (0.531) | 5.0 (0.197) | 3.2 (0.126)           |
| C | Pin for 1-2 shift valve low plug            | 13.8 (0.543) | —           | 2.5 (0.098)           |

Lower Side



|   |                                                       | mm (in.)     |             |                       |
|---|-------------------------------------------------------|--------------|-------------|-----------------------|
|   | Item                                                  | Length       | Width       | Thickness or diameter |
| A | Retainer for 2nd lock valve plug                      | 6.0 (0.236)  | 6.0 (0.236) | 3.2 (0.126)           |
| B | Retainer for 3-2 kick-down orifice control valve plug | 8.5 (0.335)  | 5.0 (0.197) | 3.2 (0.126)           |
| C | Retainer for accumulator control valve plug           | 8.5 (0.335)  | 5.0 (0.197) | 3.2 (0.126)           |
| D | Retainer for low coast modulator valve plug           | 8.5 (0.335)  | 5.0 (0.197) | 3.2 (0.126)           |
| E | Pin for lock-up relay valve No.1 sleeve               | 21.8 (0.858) | —           | 2.5 (0.098)           |
| F | Pin for lock-up relay valve No.2 sleeve               | 45.0 (1.772) | —           | 4.0 (0.157)           |
| G | Pin for 1-2 relay valve plug                          | 21.8 (0.858) | —           | 2.5 (0.098)           |

2. CHECK VALVE, BALL AND SPRINGS

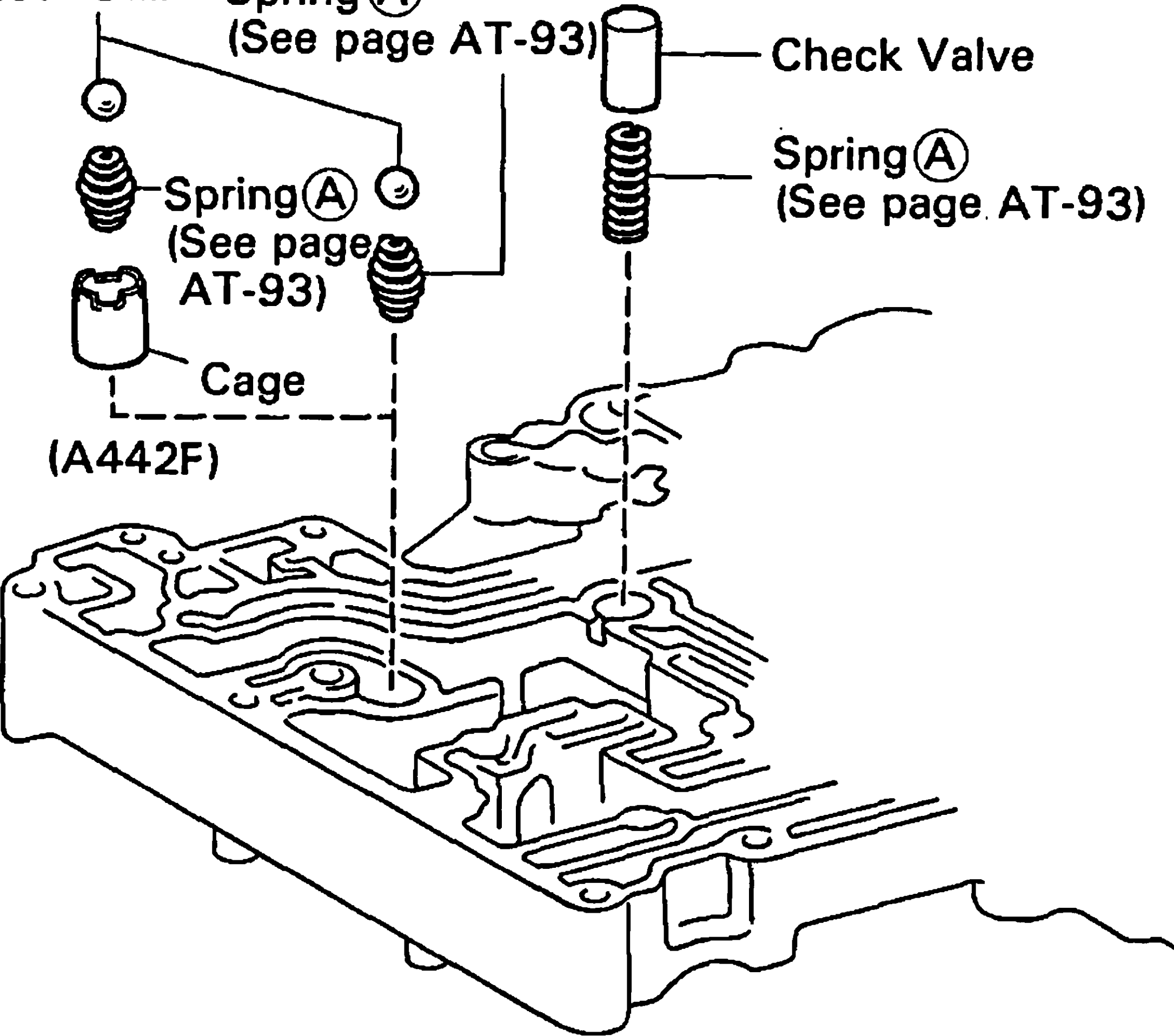
Check Ball

Spring A (See page AT-93)

Check Valve

Spring A (See page AT-93)

Cage (A442F)



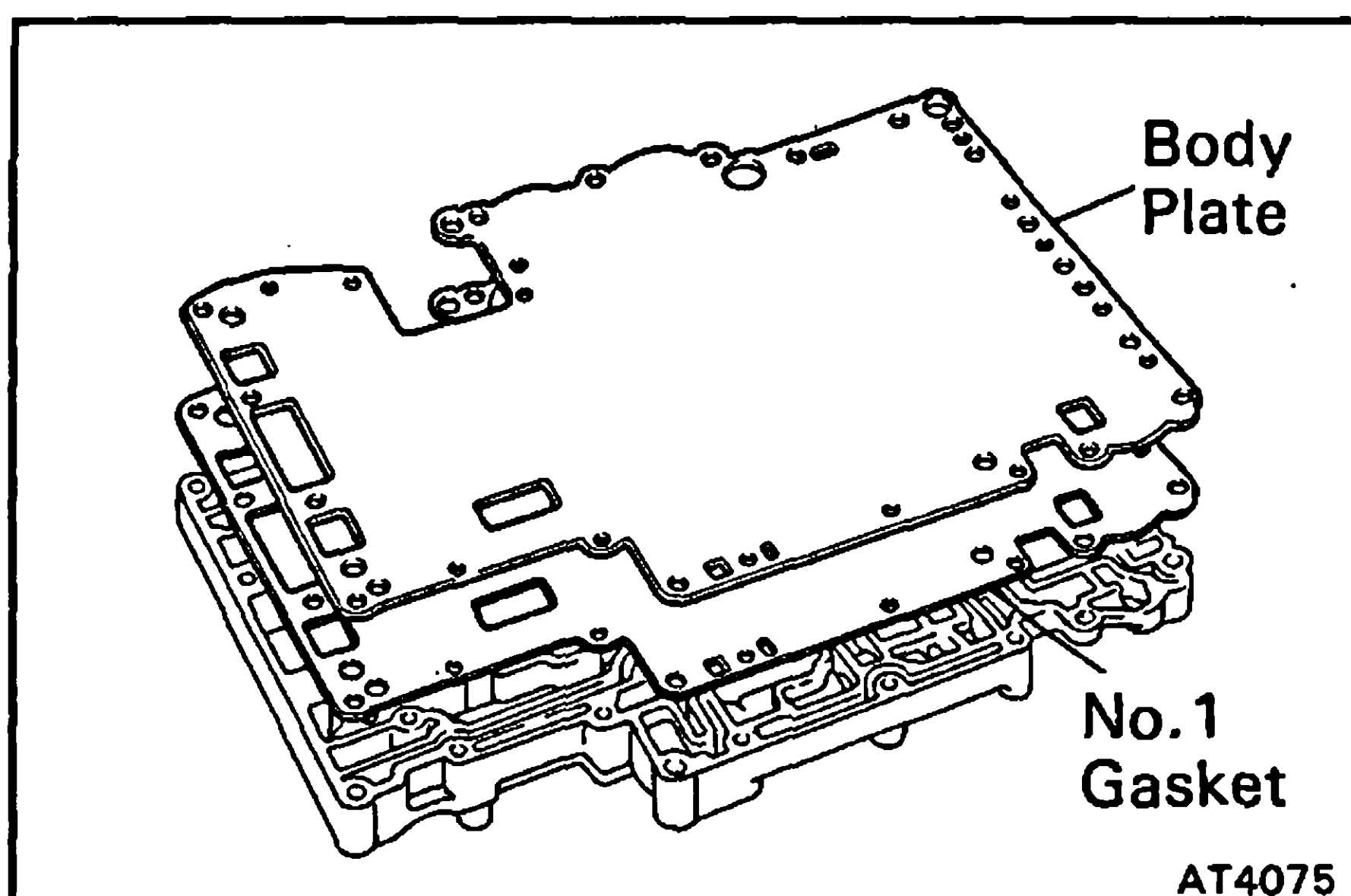
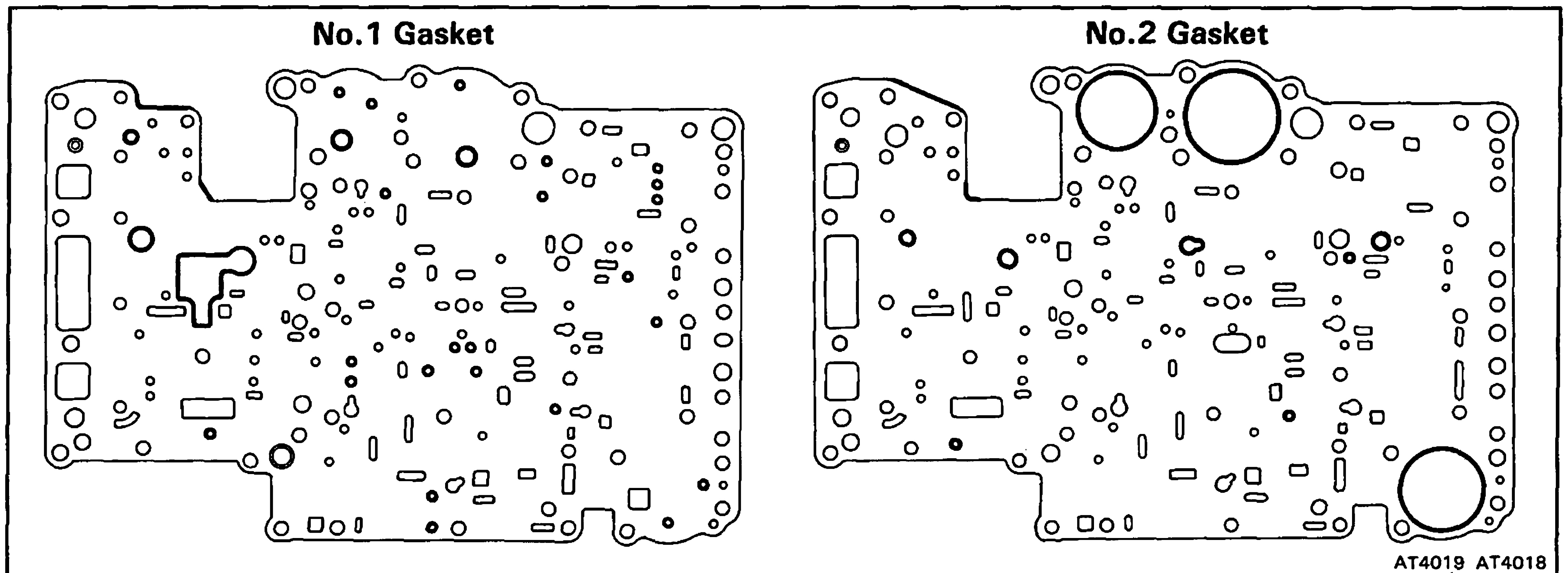
|  |                    | mm (in.)     |
|--|--------------------|--------------|
|  | Item               | Diameter     |
|  | Check ball         | 8.7 (0.343)  |
|  | Check ball (A442F) | 10.0 (0.393) |

## (Assembly of Valve Body)

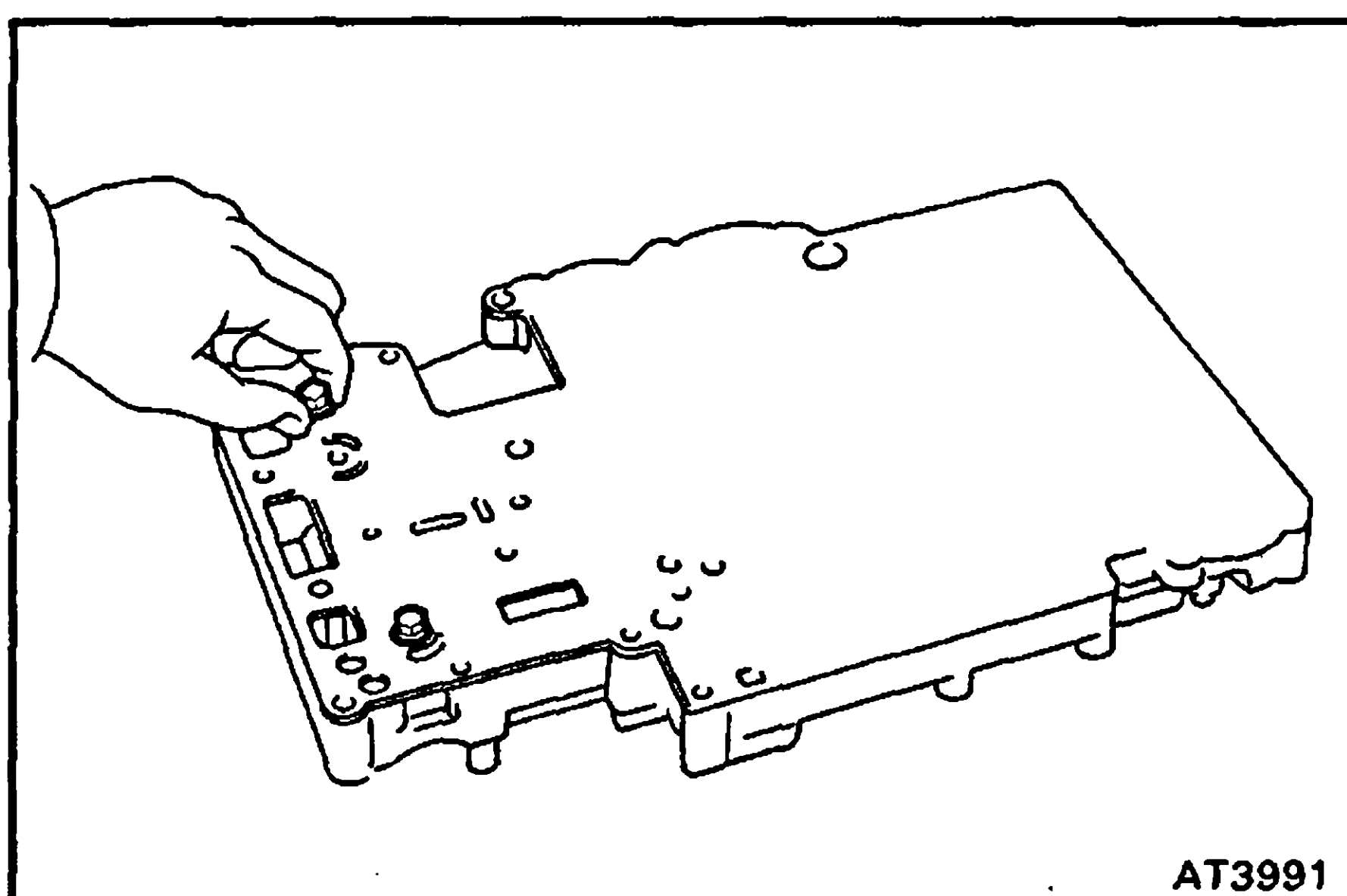
(See page AT-77 to 79)

### 1. INSTALL VALVE BODY PLATE

HINT: Since No.1 and No.2 gaskets look similar, use the illustrations below to differentiate them.

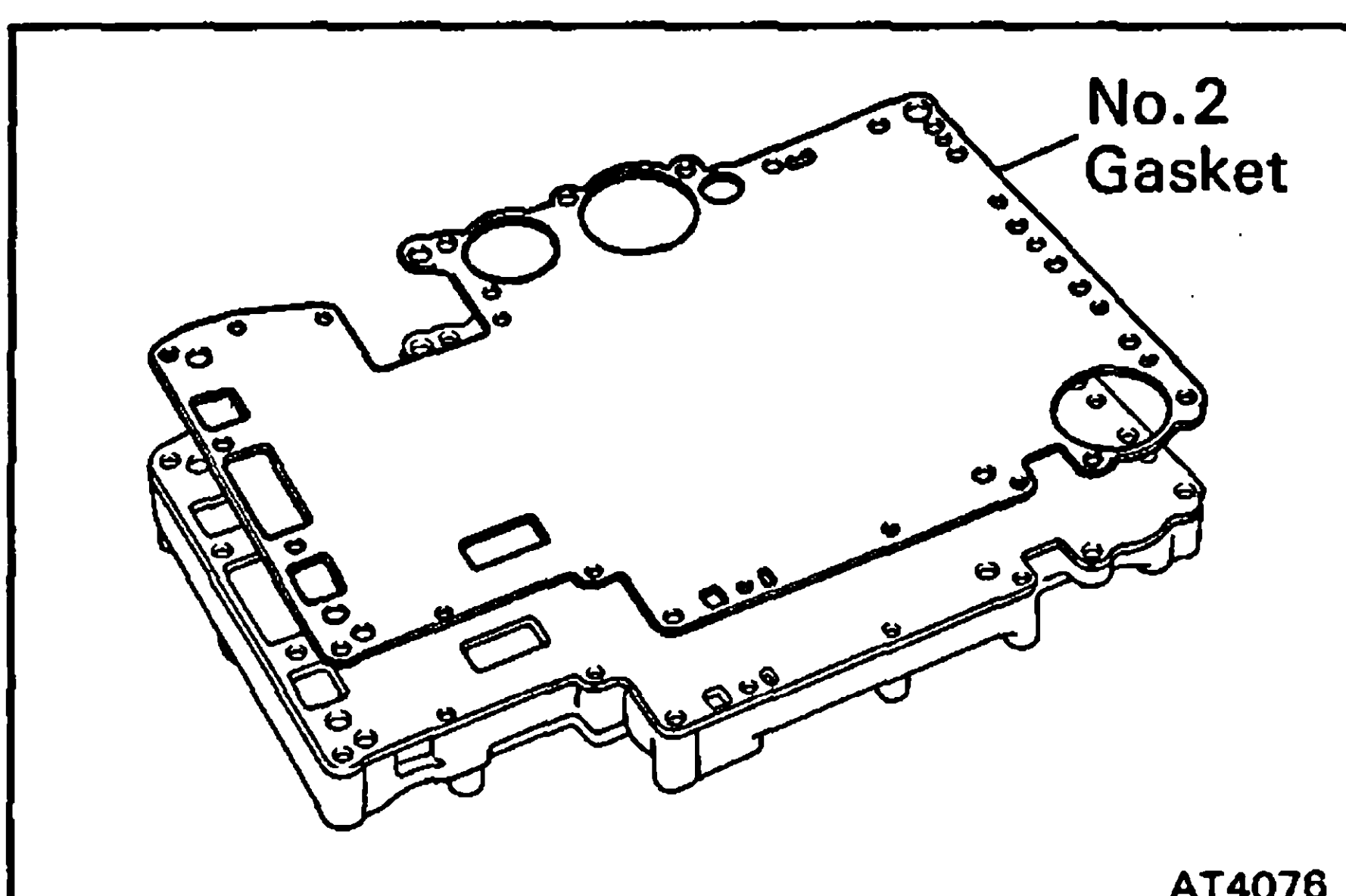


- (a) Place a new No.1 gasket and the body plate on the lower valve body.

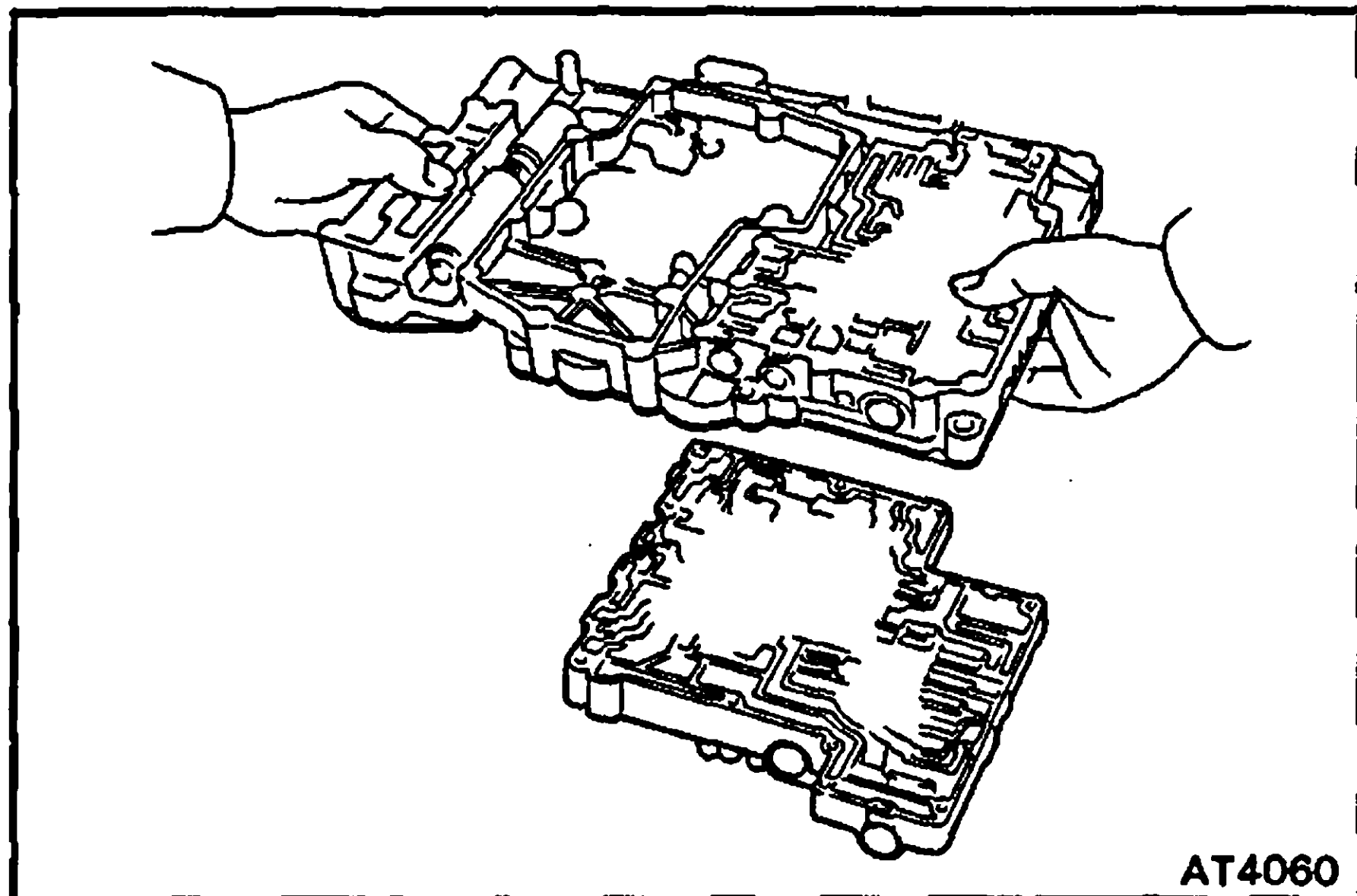


- (b) Temporarily secure the body plate with the two bolts.

HINT: Use the two bolts for the oil tube clamp.



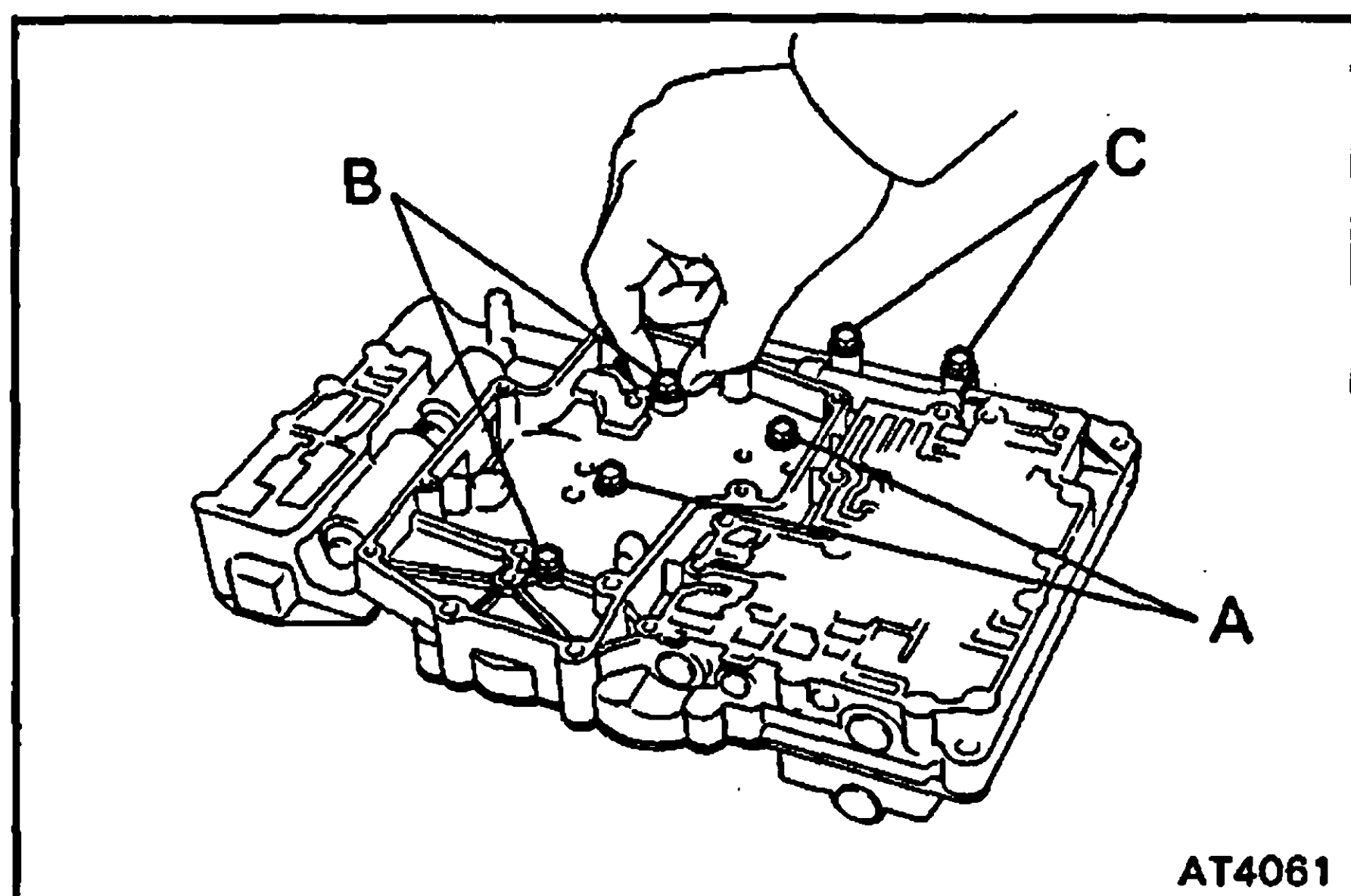
- (c) Place a new No.2 gasket on the body plate.



AT4060

## 2. INSTALL REAR UPPER VALVE BODY

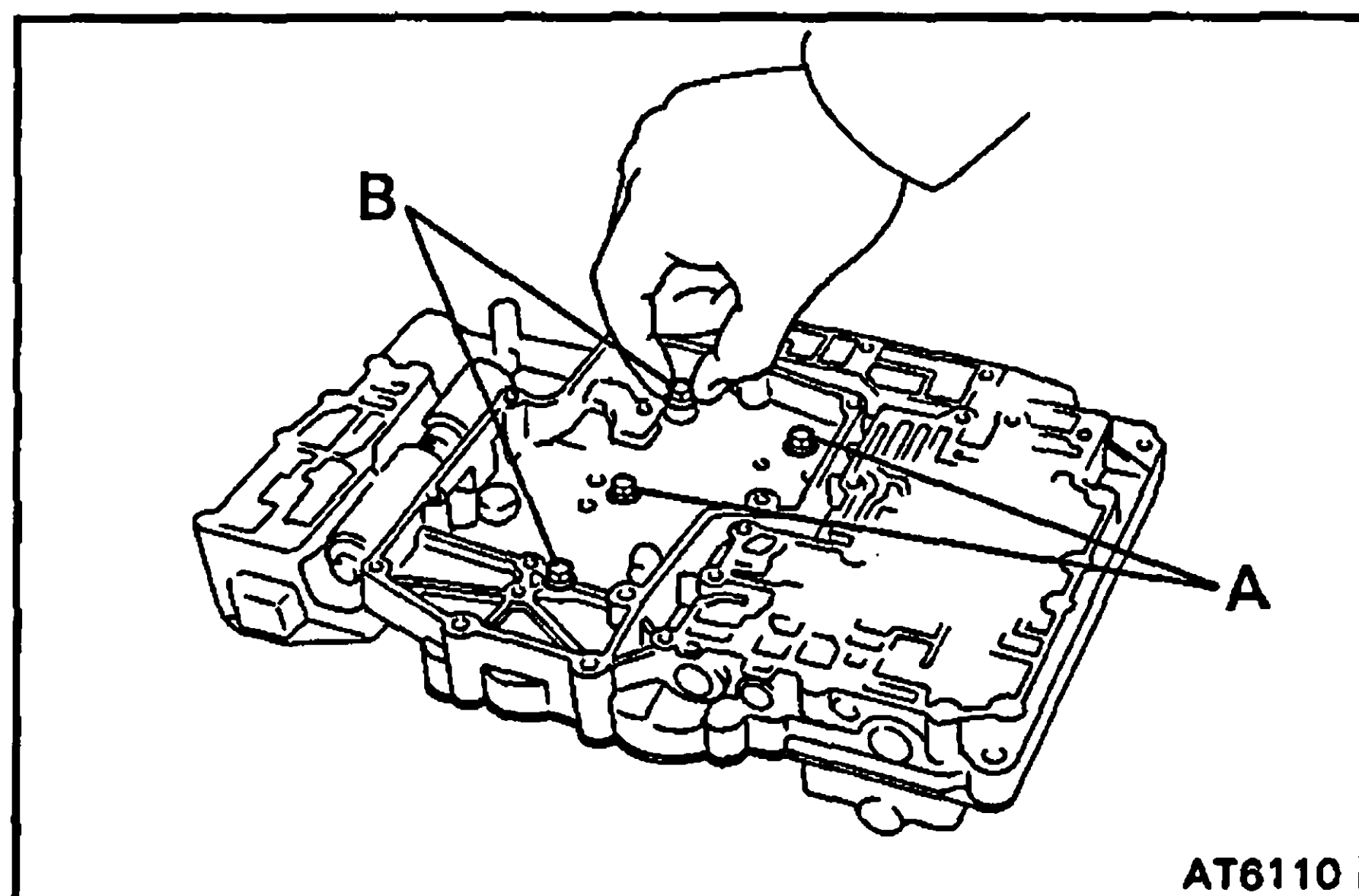
(a) Place the valve body on the rear upper valve body.



AT4061

(b) Temporarily install the six wave washers and bolts.  
HINT: Each bolt length mm (in.) is indicated in the figure.

**Bolt length:** A 29.5 mm (1.161 in.)  
B 35 mm (1.38 in.)  
C 44 mm (1.73 in.)

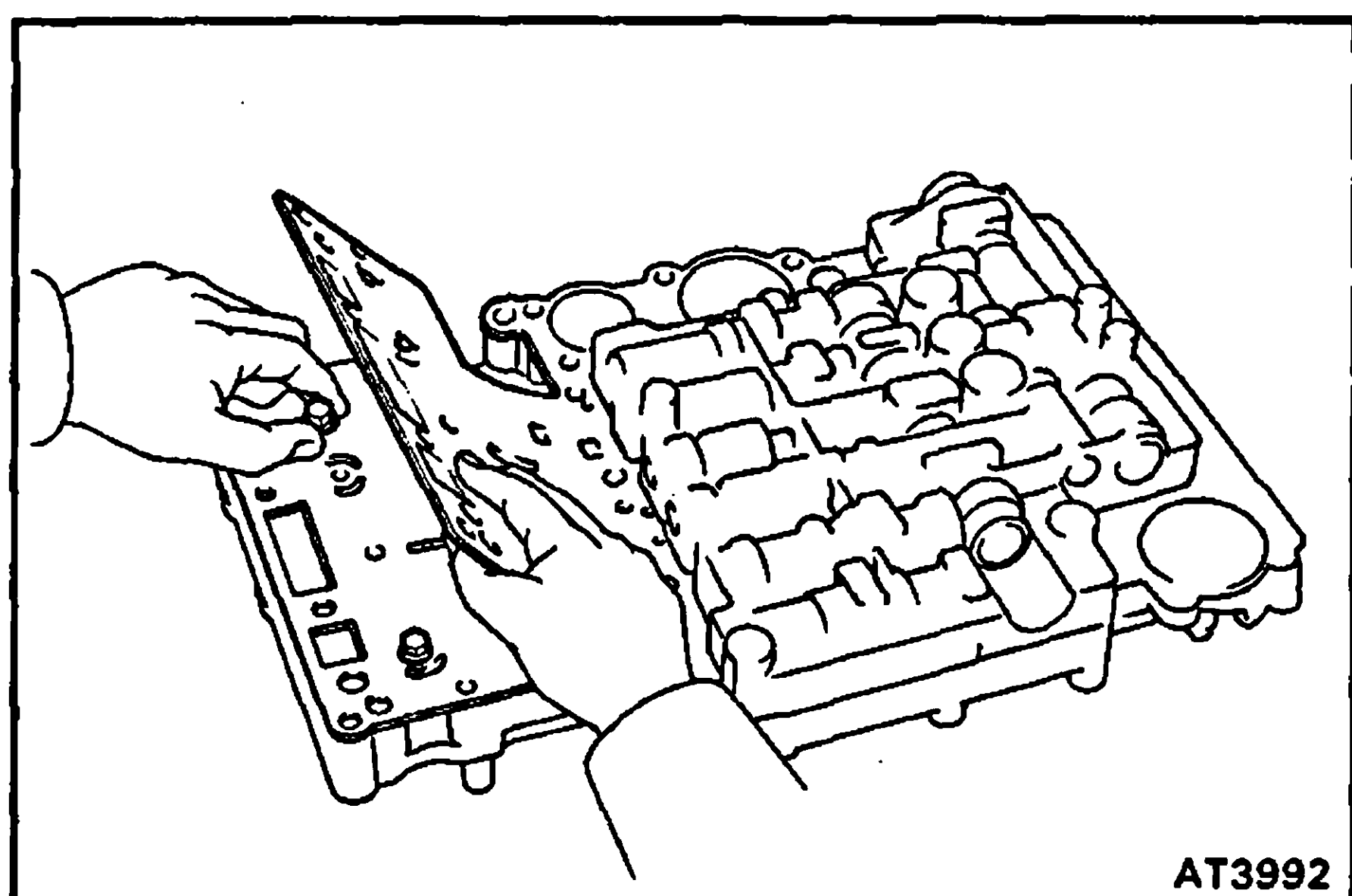


AT6110

(b) (w/ Cruise Control System)  
Temporarily install the four wave washers and the bolts.

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

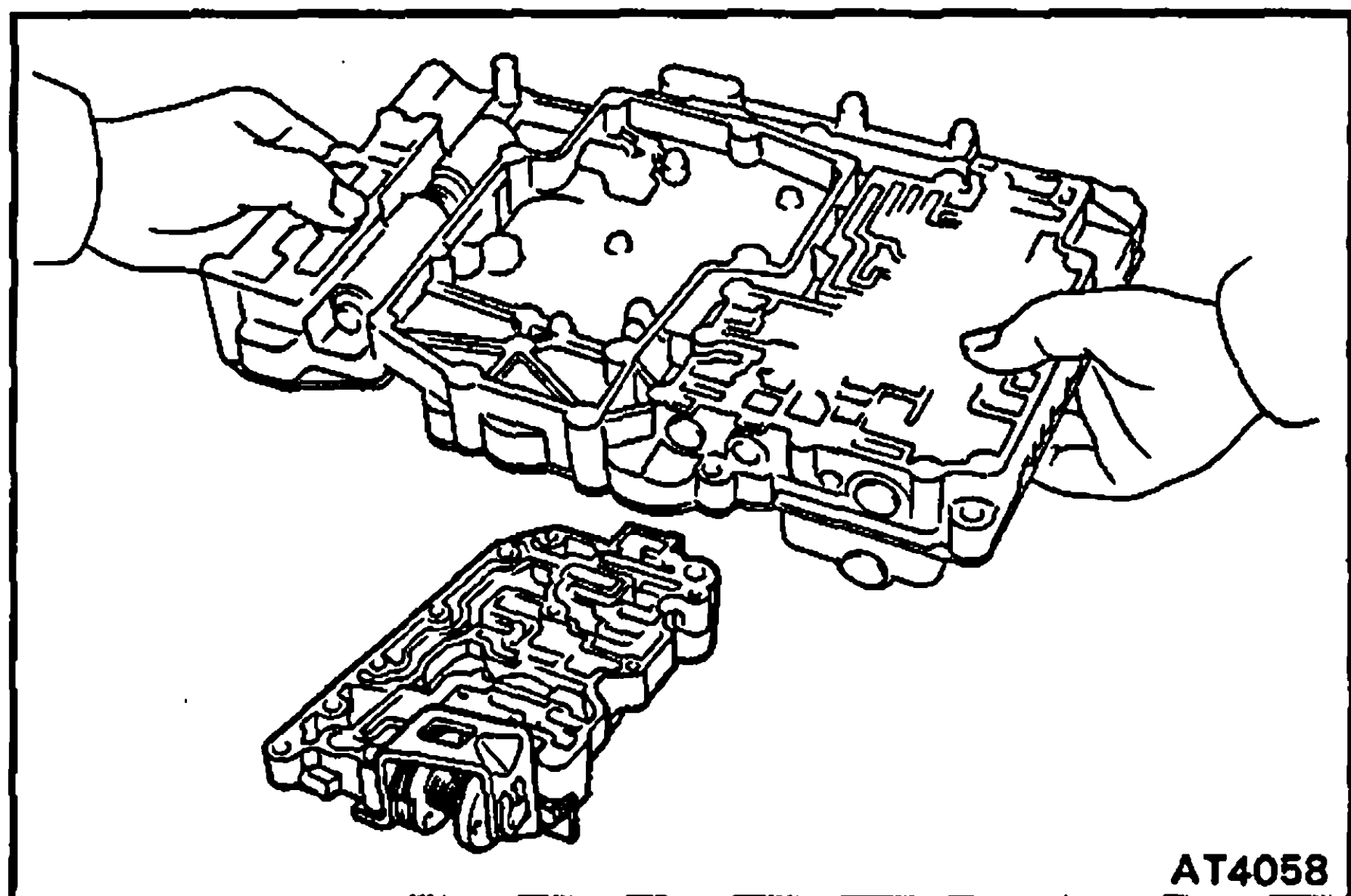
**Bolt length:** A 29.5 mm (1.161 in.)  
B 35 mm (1.38 in.)



AT3992

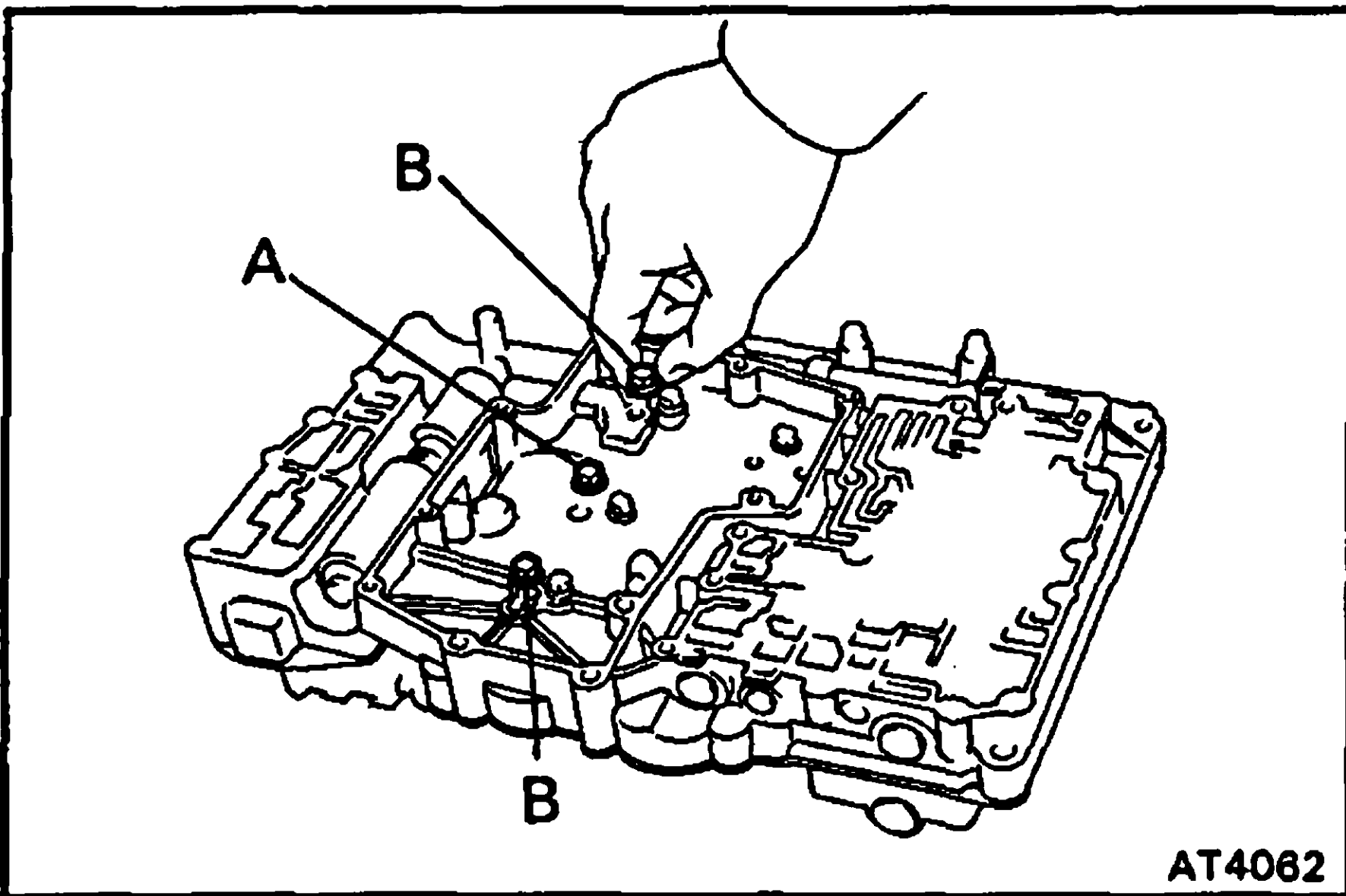
## 3. INSTALL FRONT UPPER VALVE BODY

(a) Remove the two temporarily installed bolts.



AT4058

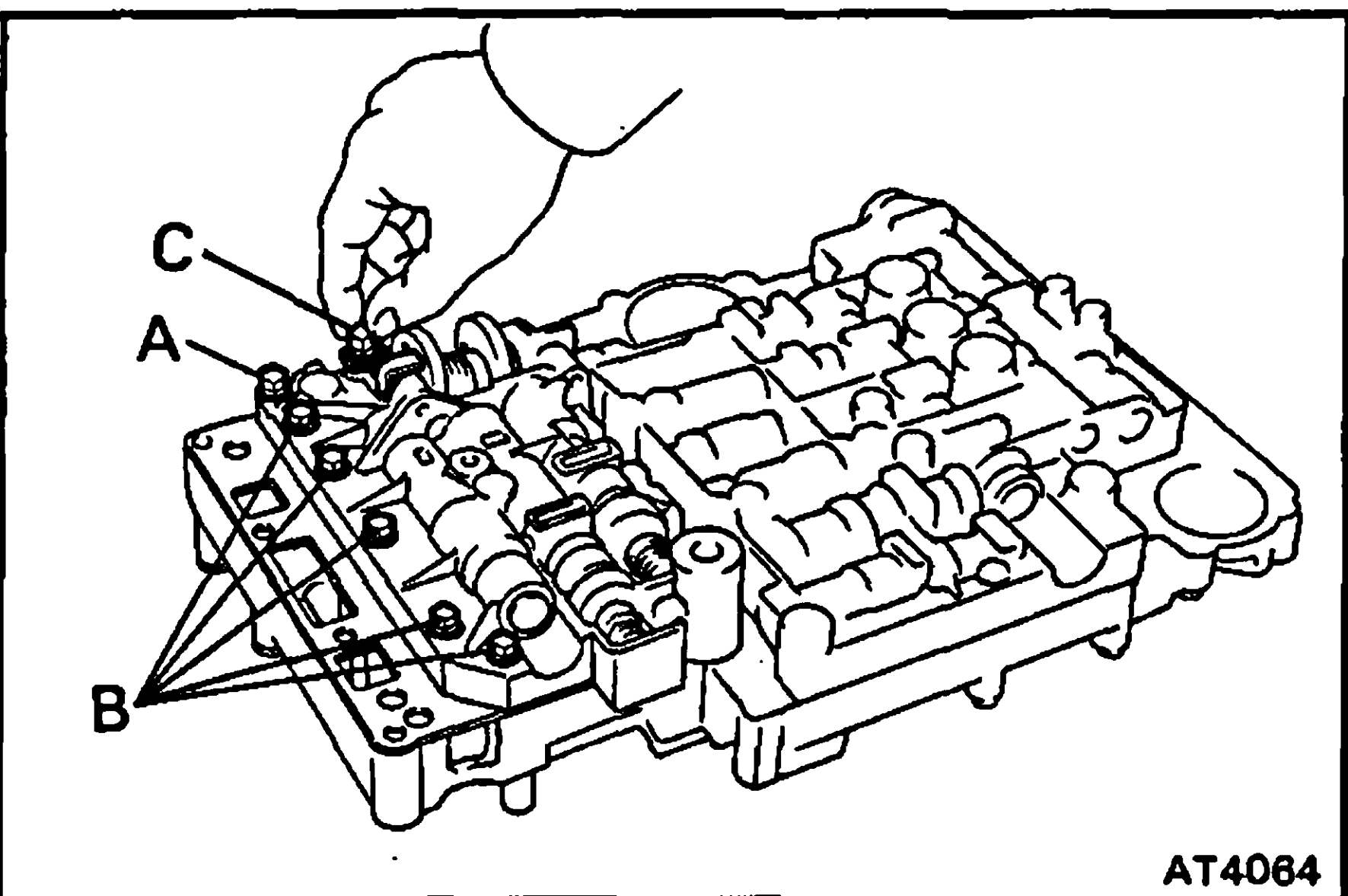
(b) Place the lower valve body on the front upper valve body.



(c) Temporarily install the three wave washers and bolts.

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

**Bolt length** A 29.5 mm (1.161 in.)  
B 35 mm (1.38 in.)

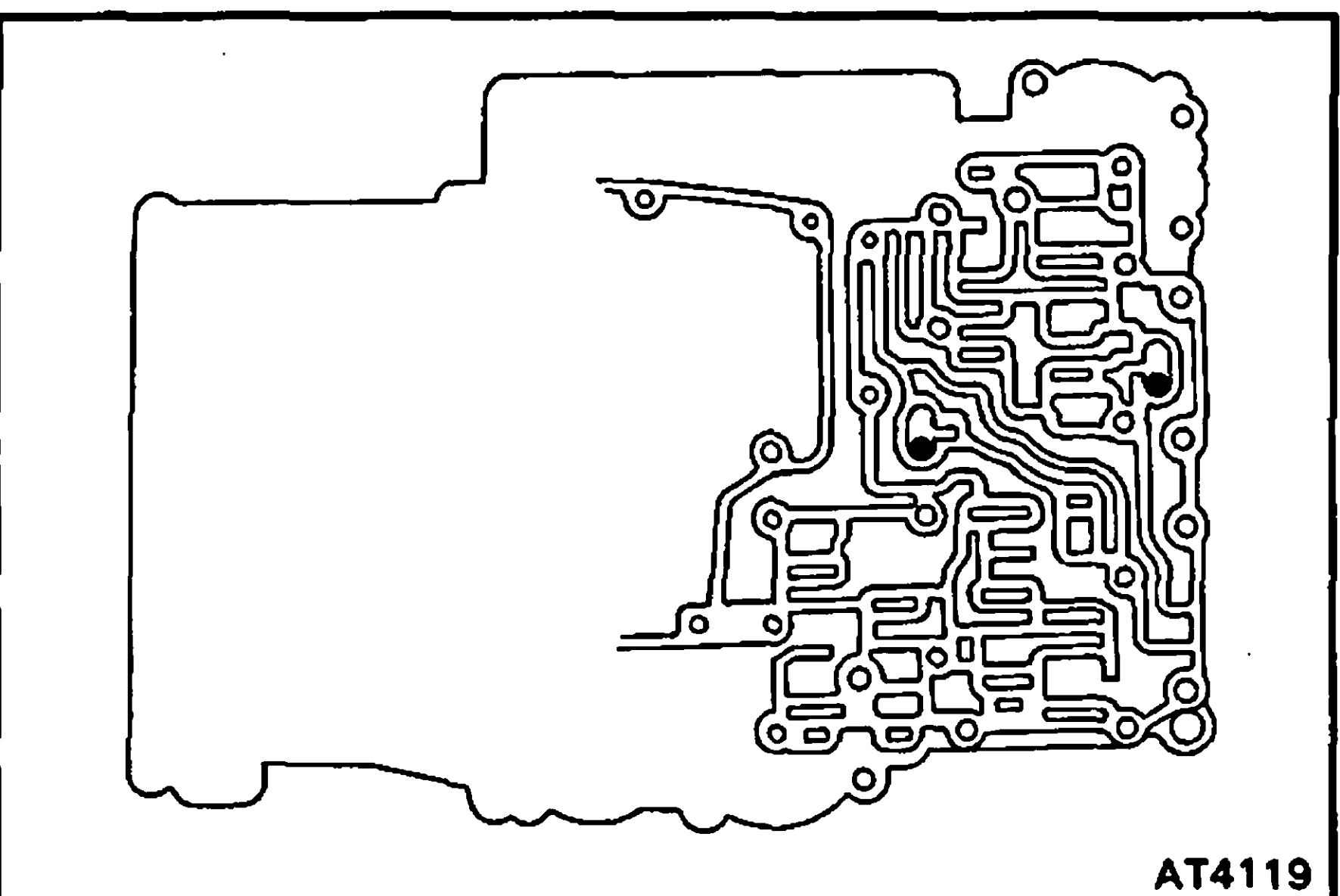


(d) Turn over the valve body assembly.

(e) Temporarily install the seven wave washers and the bolts.

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

**Bolt length** A 25 mm (0.98 in.)  
B 29.5 mm (1.161 in.)  
C 39 mm (1.54 in.)



#### **4. INSTALL CHECK BALLS**

(a) Turn over the valve body assembly.

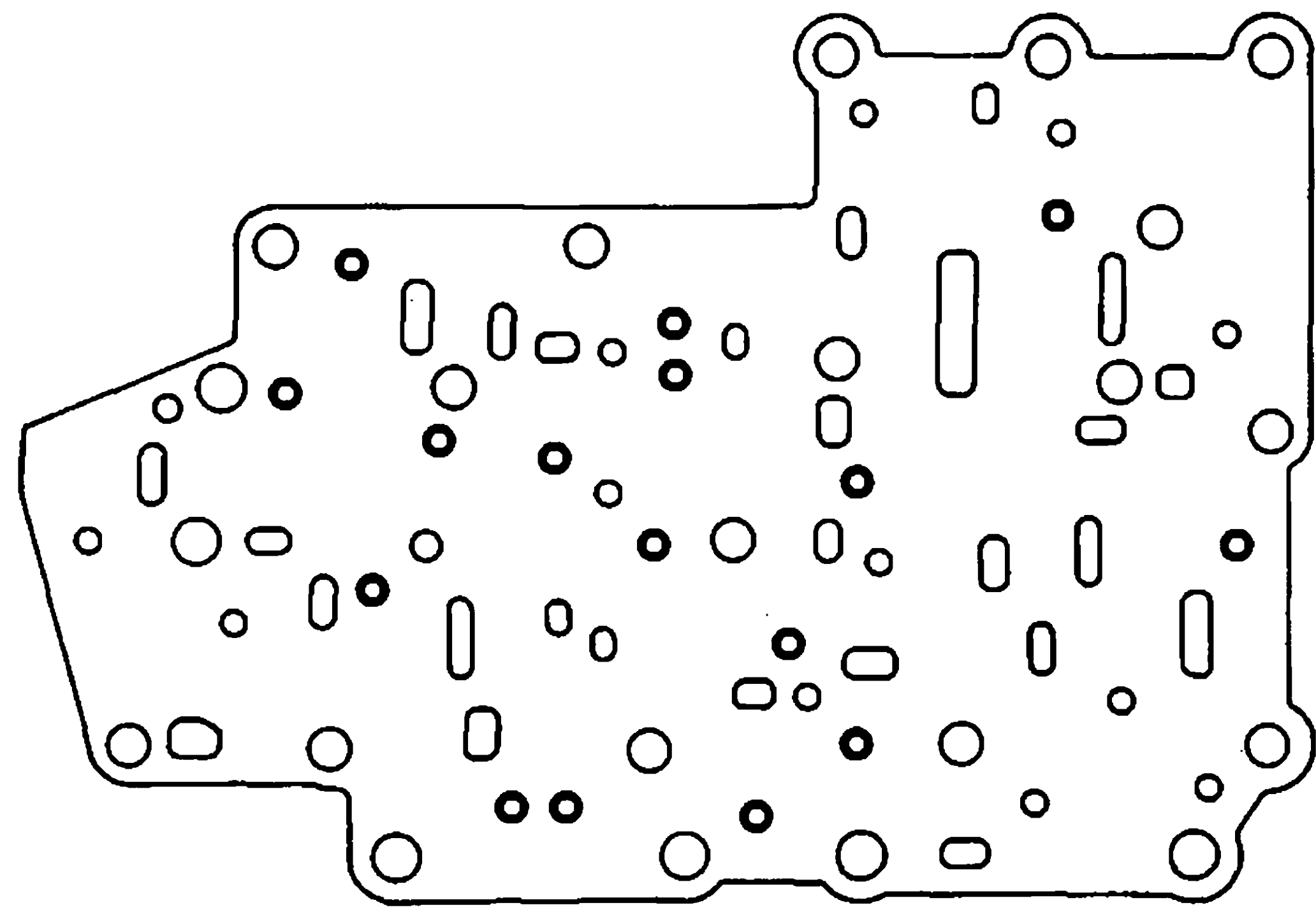
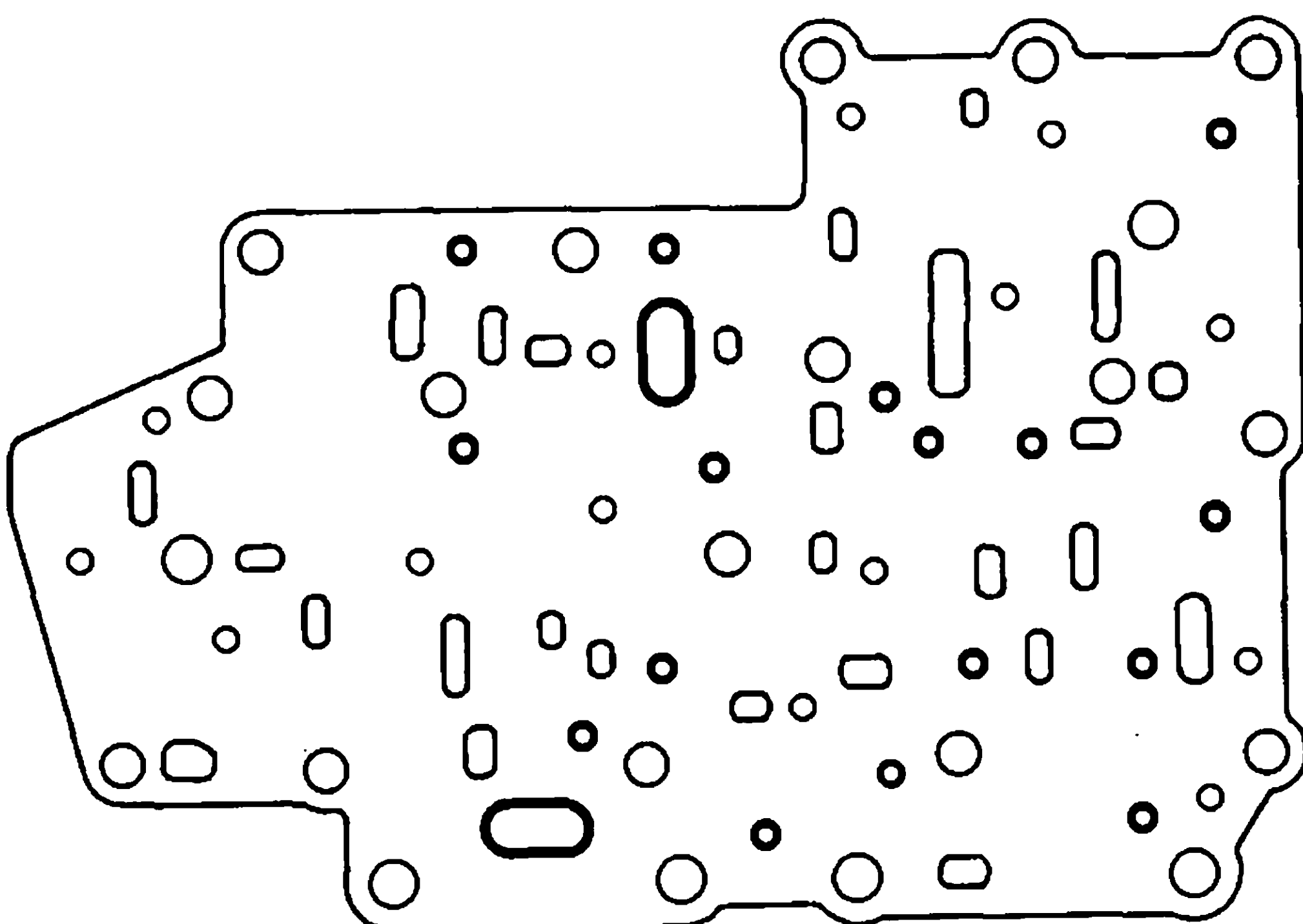
(b) Install the two check balls into the lower valve body.

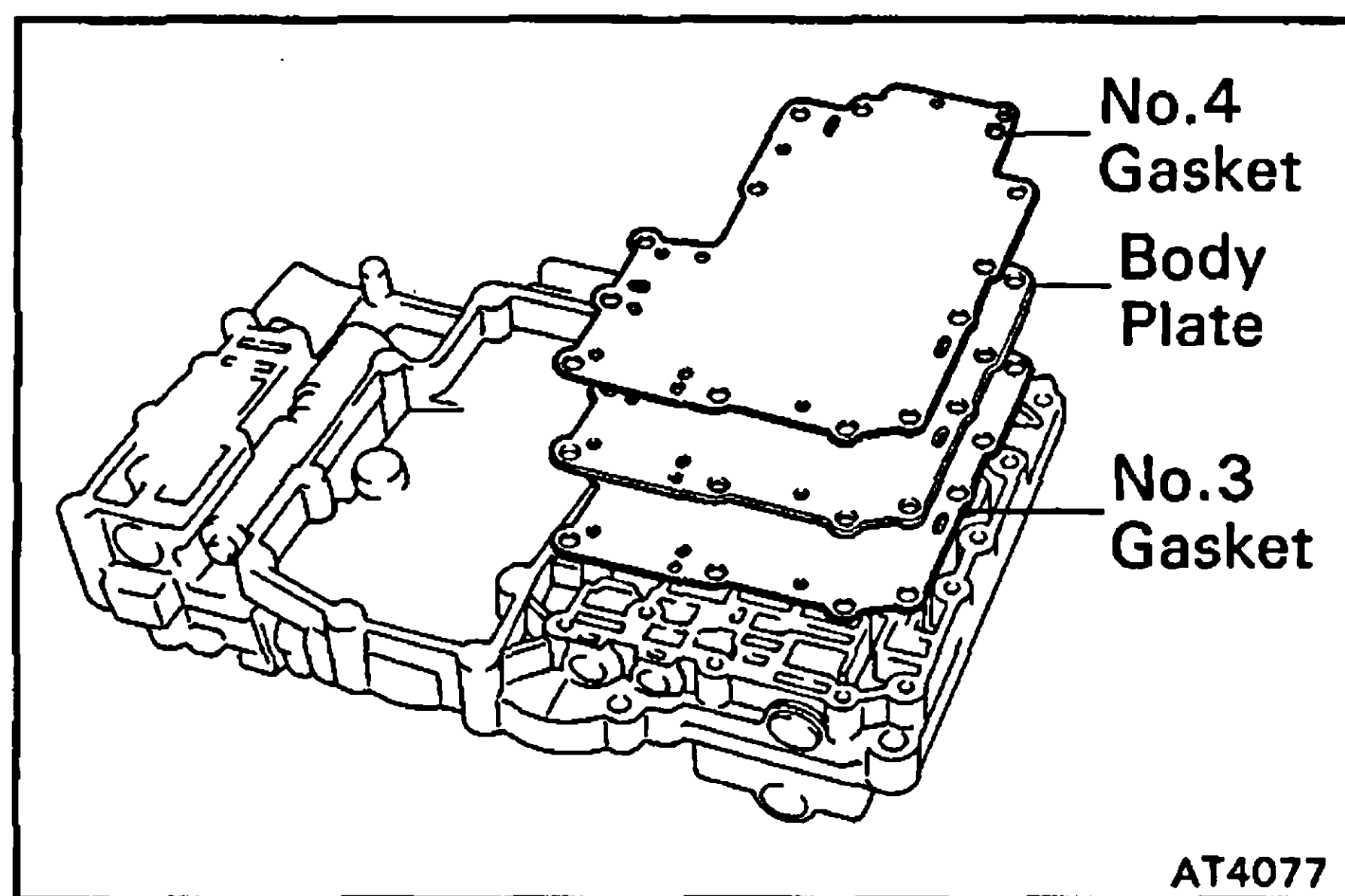
#### **5. INSTALL LOWER VALVE BODY PLATE AND COVER**

HINT: Since No.3 and No.4 gasket look similar, use the illustrations below to differentiate them.

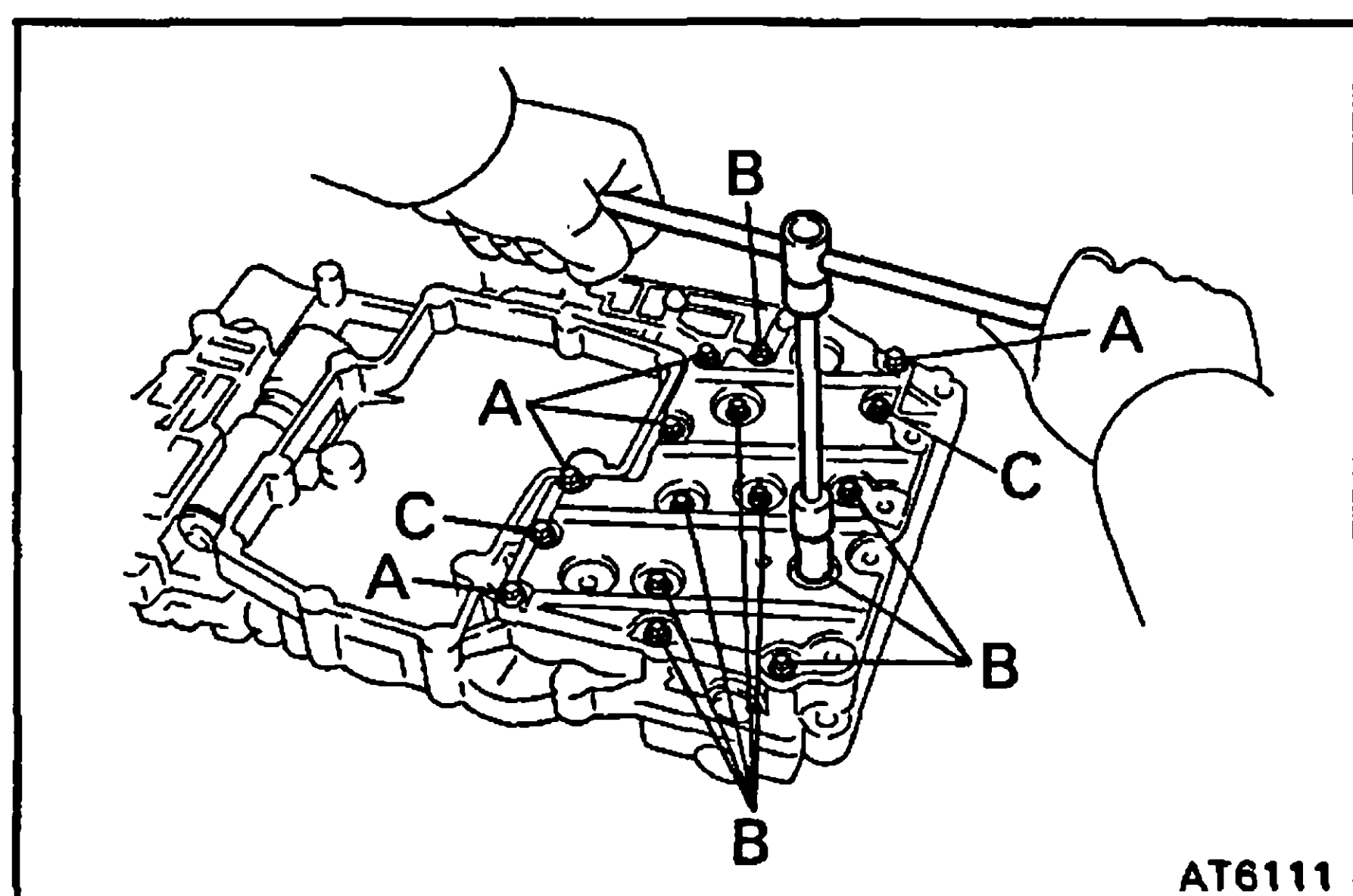
**No.3 Gasket**

**No.4 Gasket**





- (a) Place a new No.3 gasket, the body plate and a new No.4 gasket on the lower valve body.

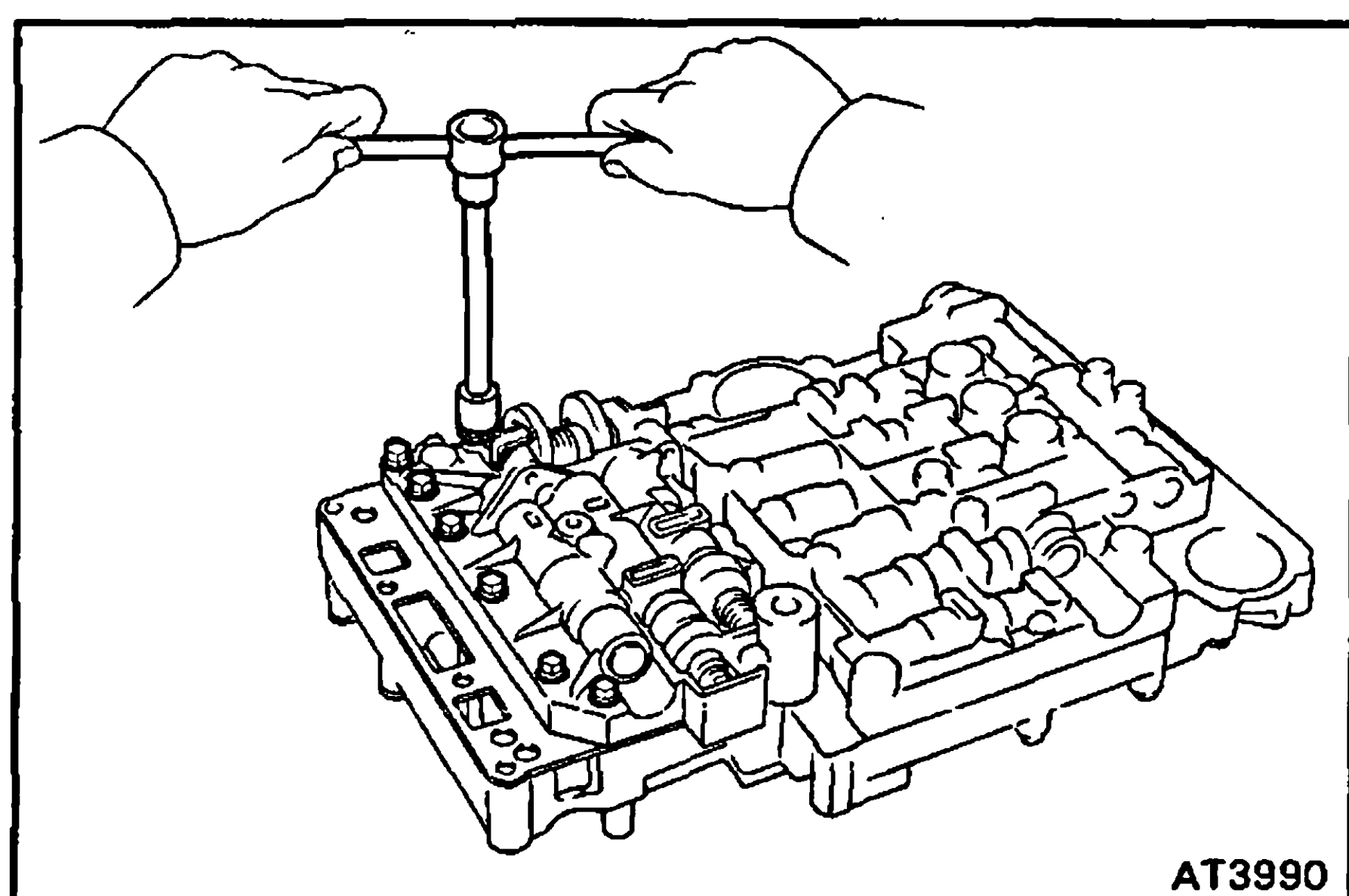


- (b) Install the body cover with the sixteen wave washers and bolts.

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

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

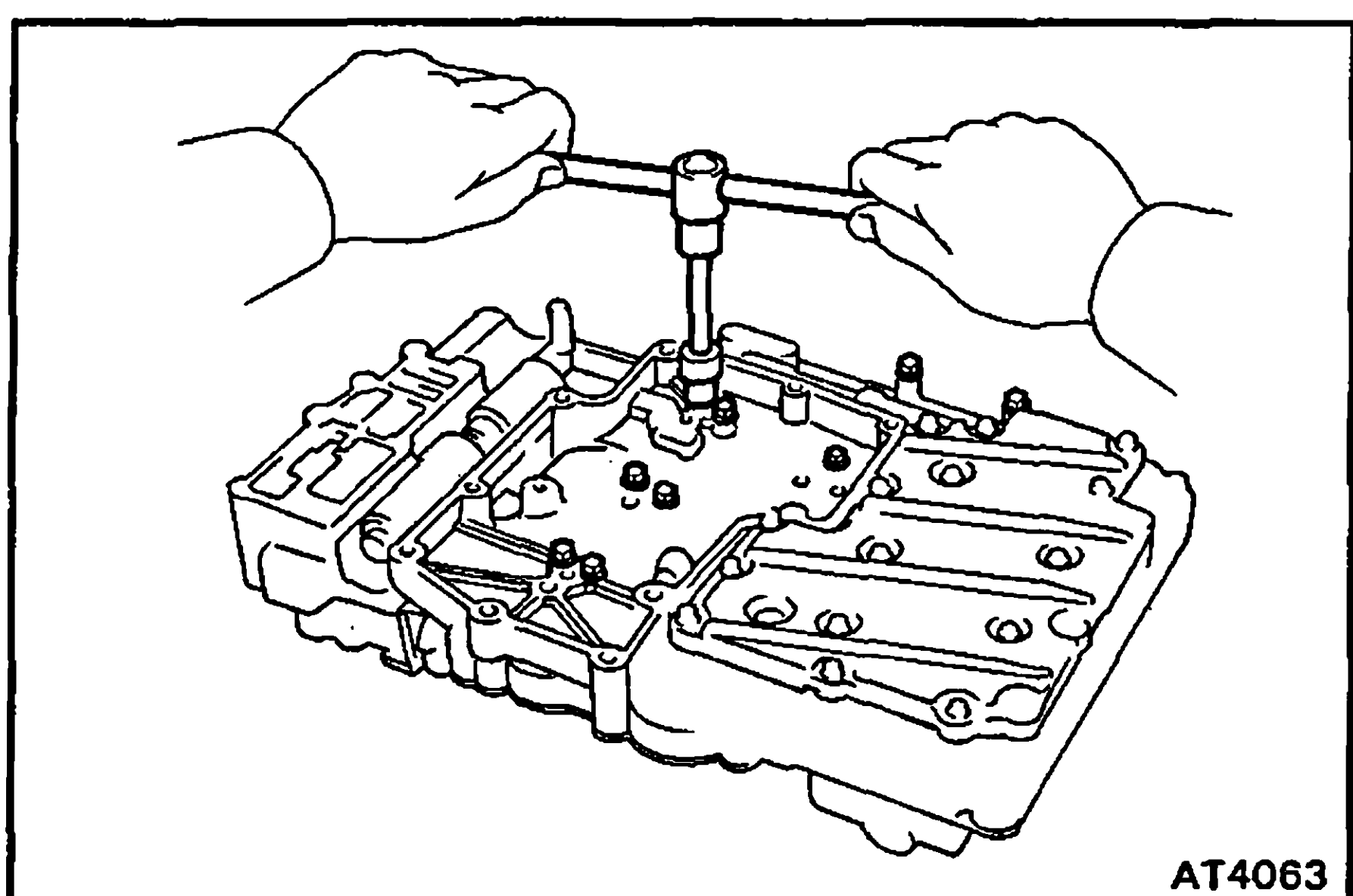
**Bolt length:** A 18 mm (0.71 in.)  
B 56 mm (2.20 in.)  
C 60 mm (2.36 in.)



## 6. TIGHTEN BOLTS OF UPPER AND LOWER VALVE BODIES

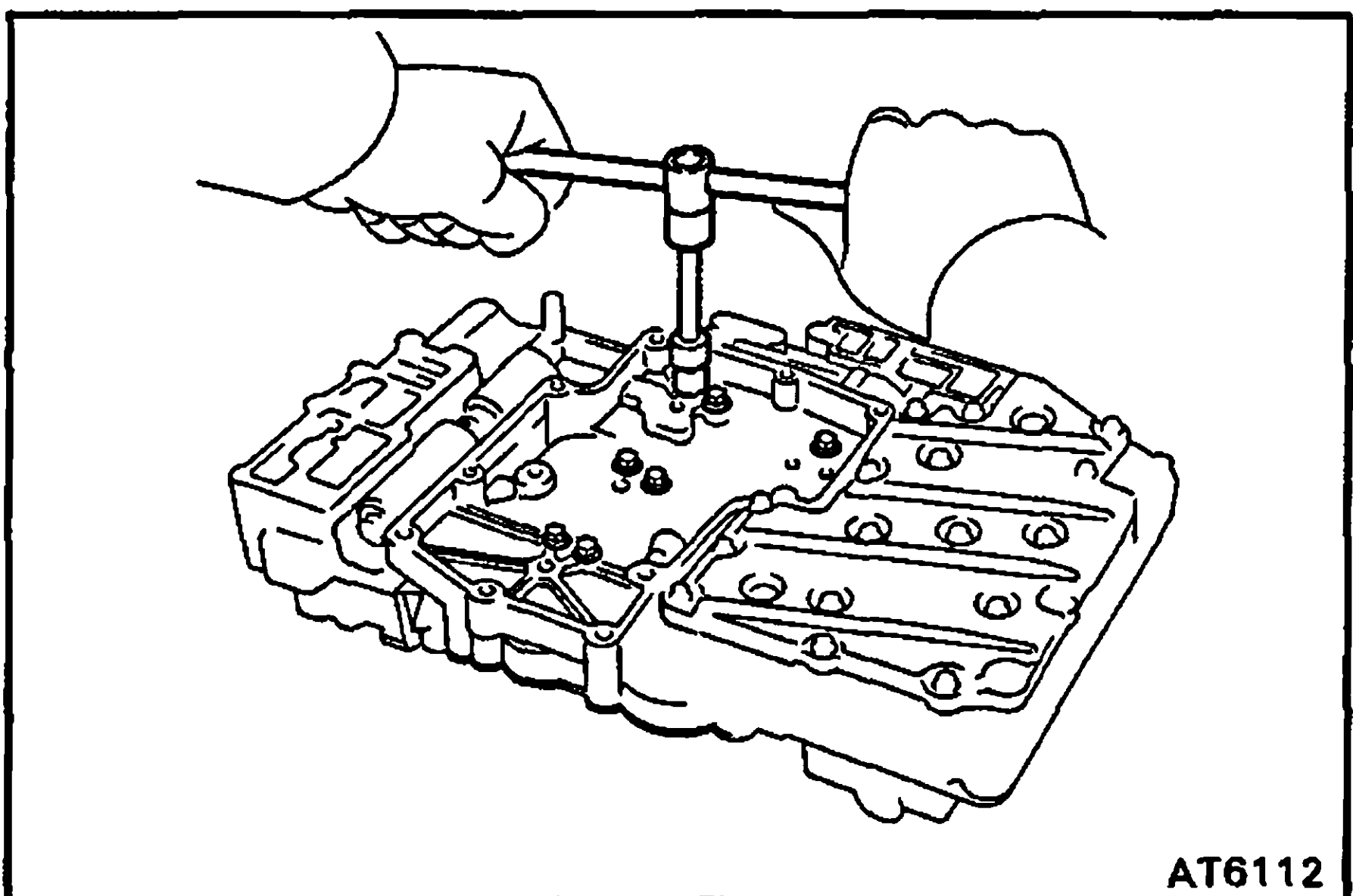
- (a) (Upper Side)  
Tighten the seven bolts.

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



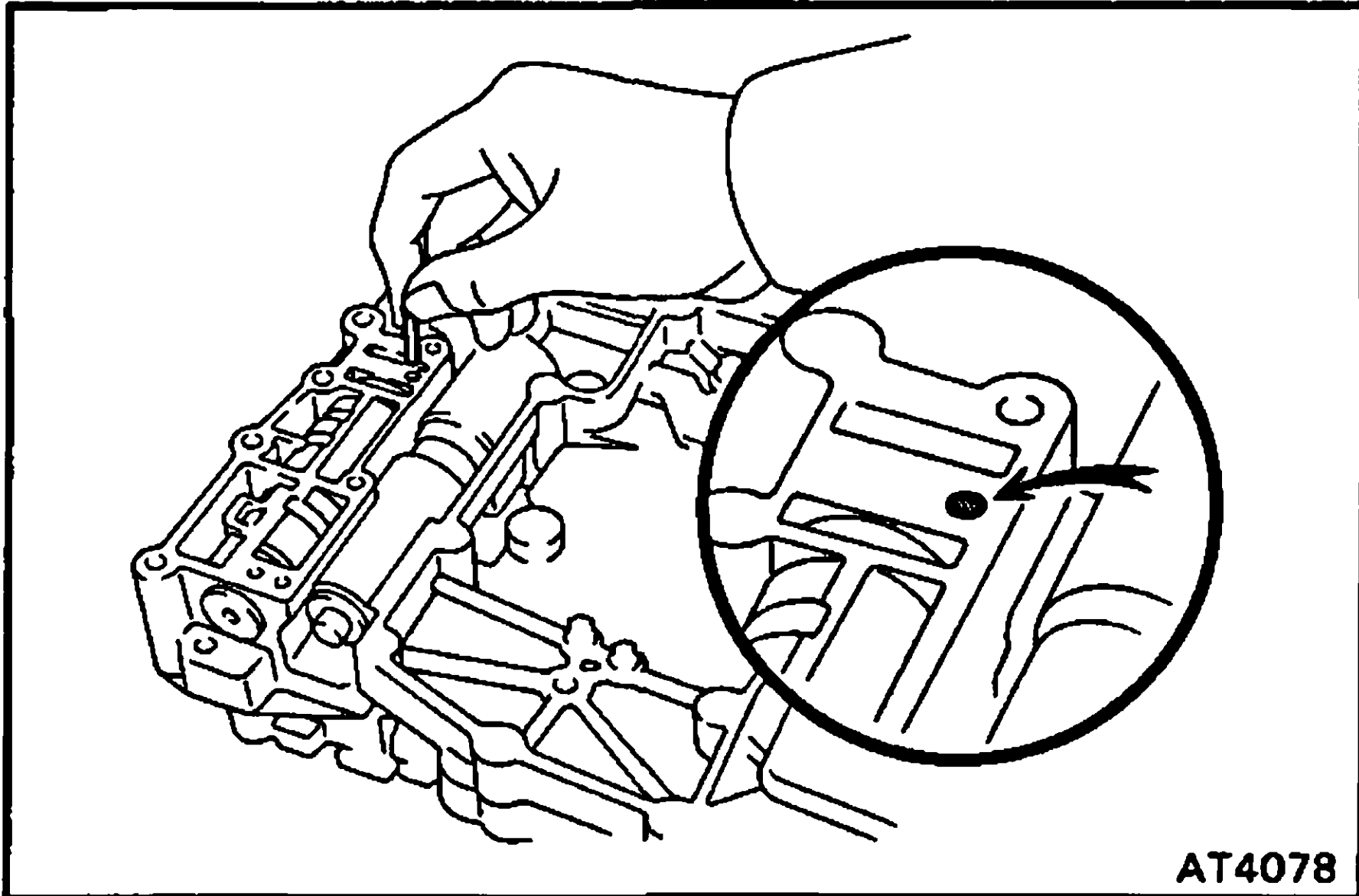
- (b) (Lower Side)  
Tighten the nine bolts.

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



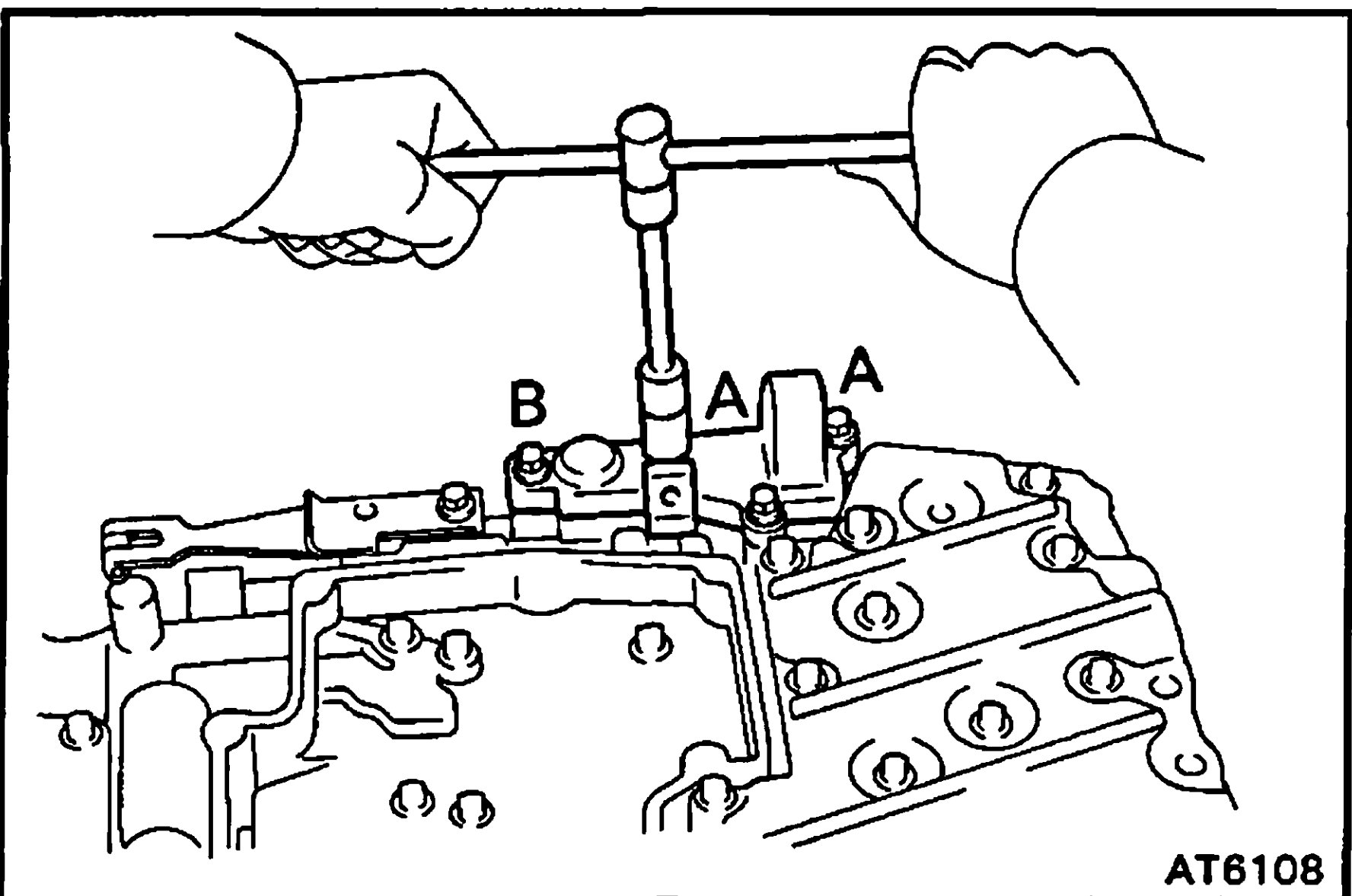
- (b) (w/ Cruise Control System)  
Tighten the seven bolts.

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



AT4078

**7. INSTALL LOCK-UP RELAY VALVE SLEEVE PIN**



AT6108

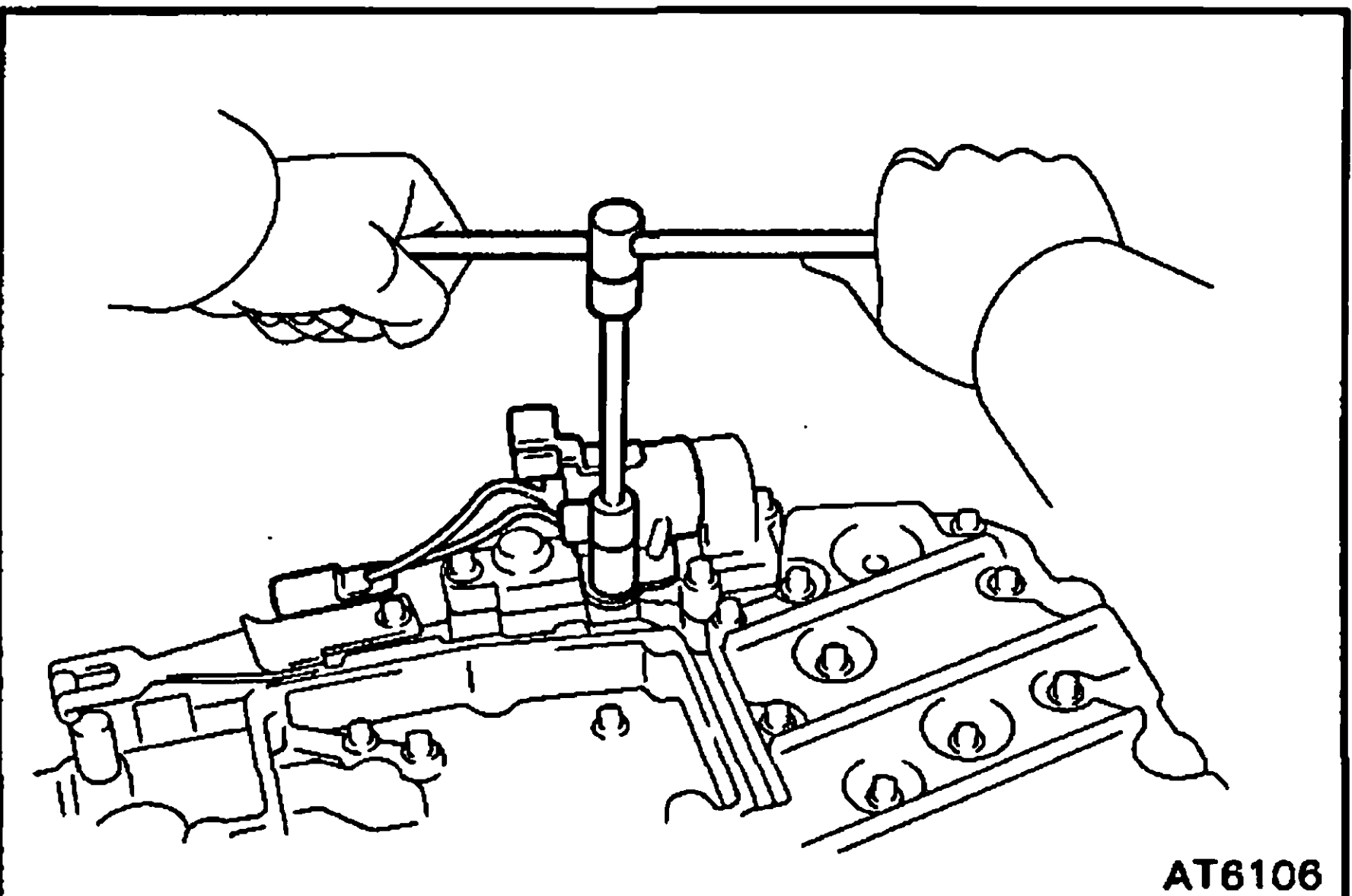
**8. (w/ Cruise Control System)  
INSTALL LOWER VALVE BODY COVER**

Install the four bolts and the cover.

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

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

**Bolt length: A 56 mm (2.205 in.)  
B 18 mm (0.709 in.)**

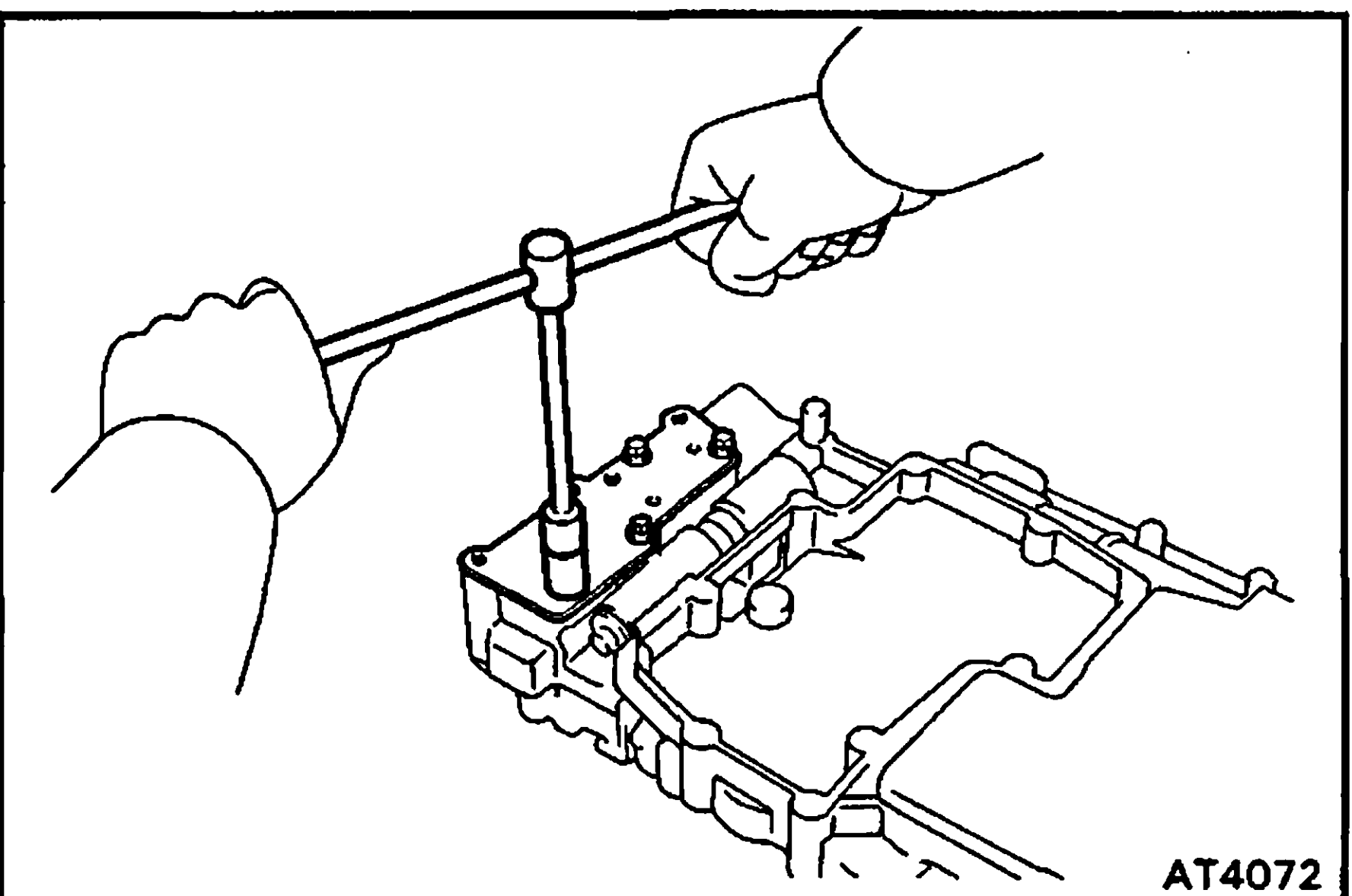


AT6106

**9. (w/ Cruise Control System)  
INSTALL SOLENOID**

Install the bolt and the solenoid.

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



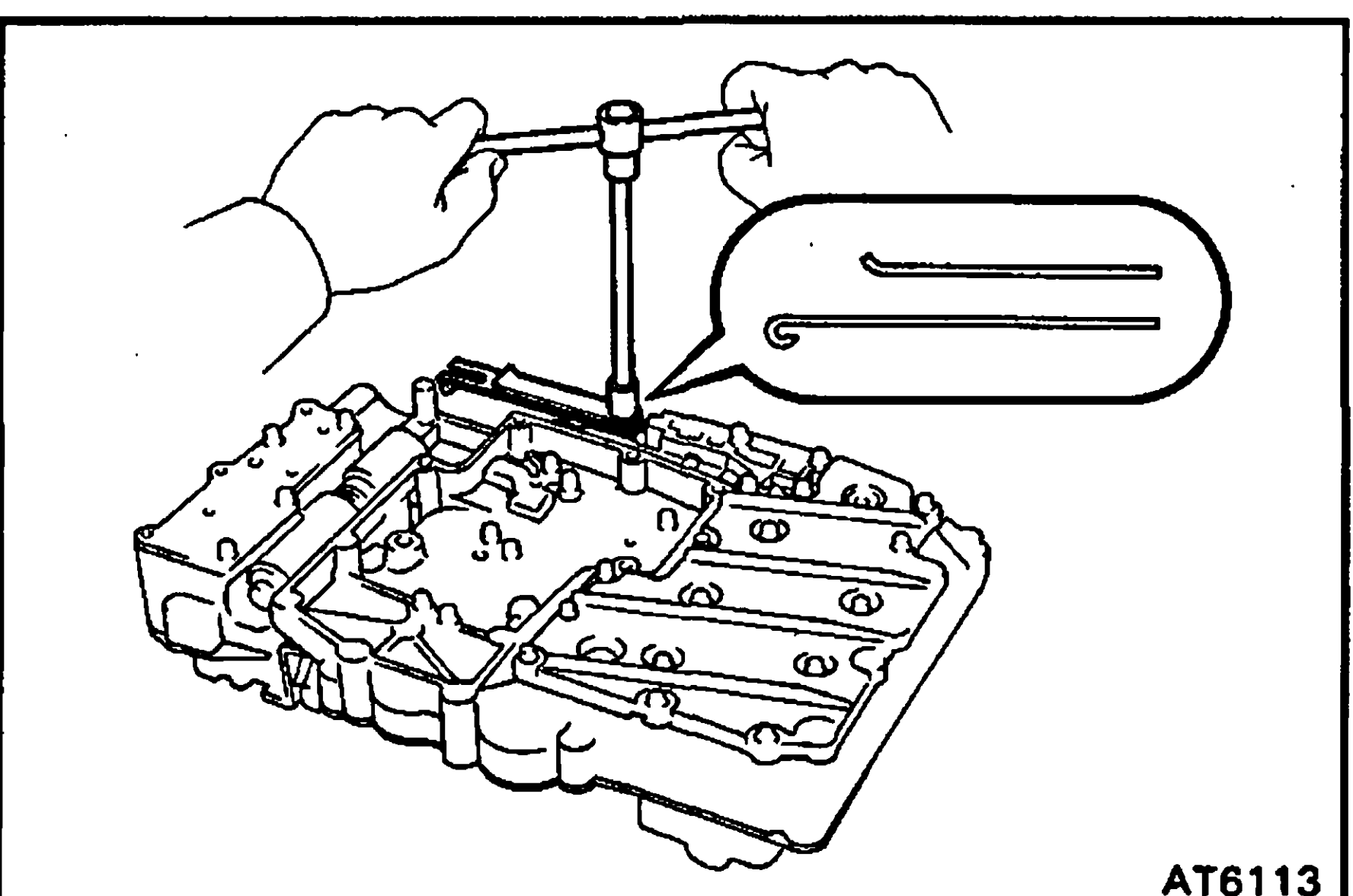
AT4072

**10. TEMPORARILY INSTALL LOCK-UP RELAY VALVE BODY PLATE**

Install the body plate with the four bolts.

**HINT:**

- Use the bolt which is 12 mm (0.47 in.) in length.
- Fully install the body plate when the valve body is installed in the transmission case.



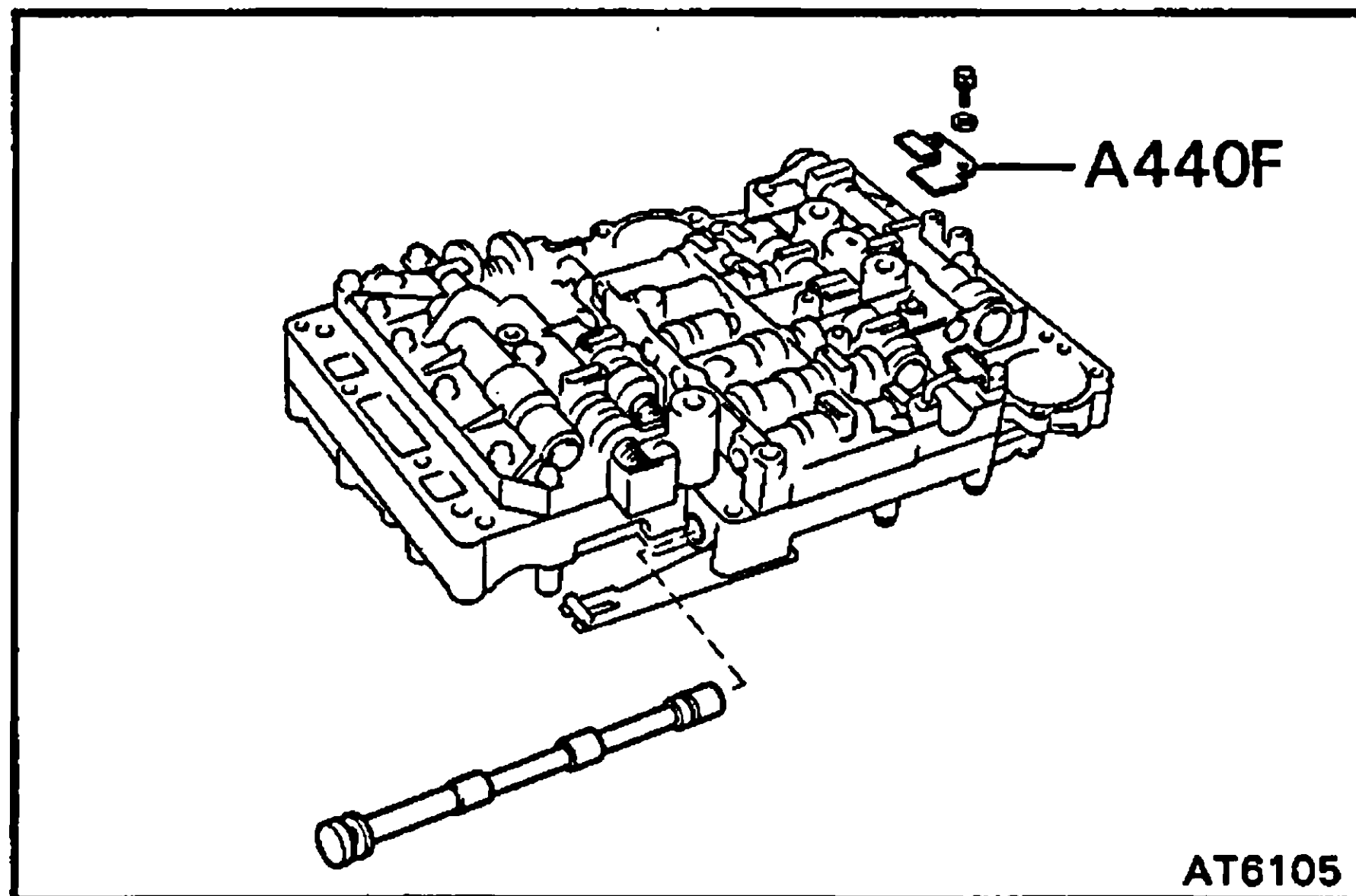
AT6113

**11. INSTALL MANUAL DETENT SPRING**

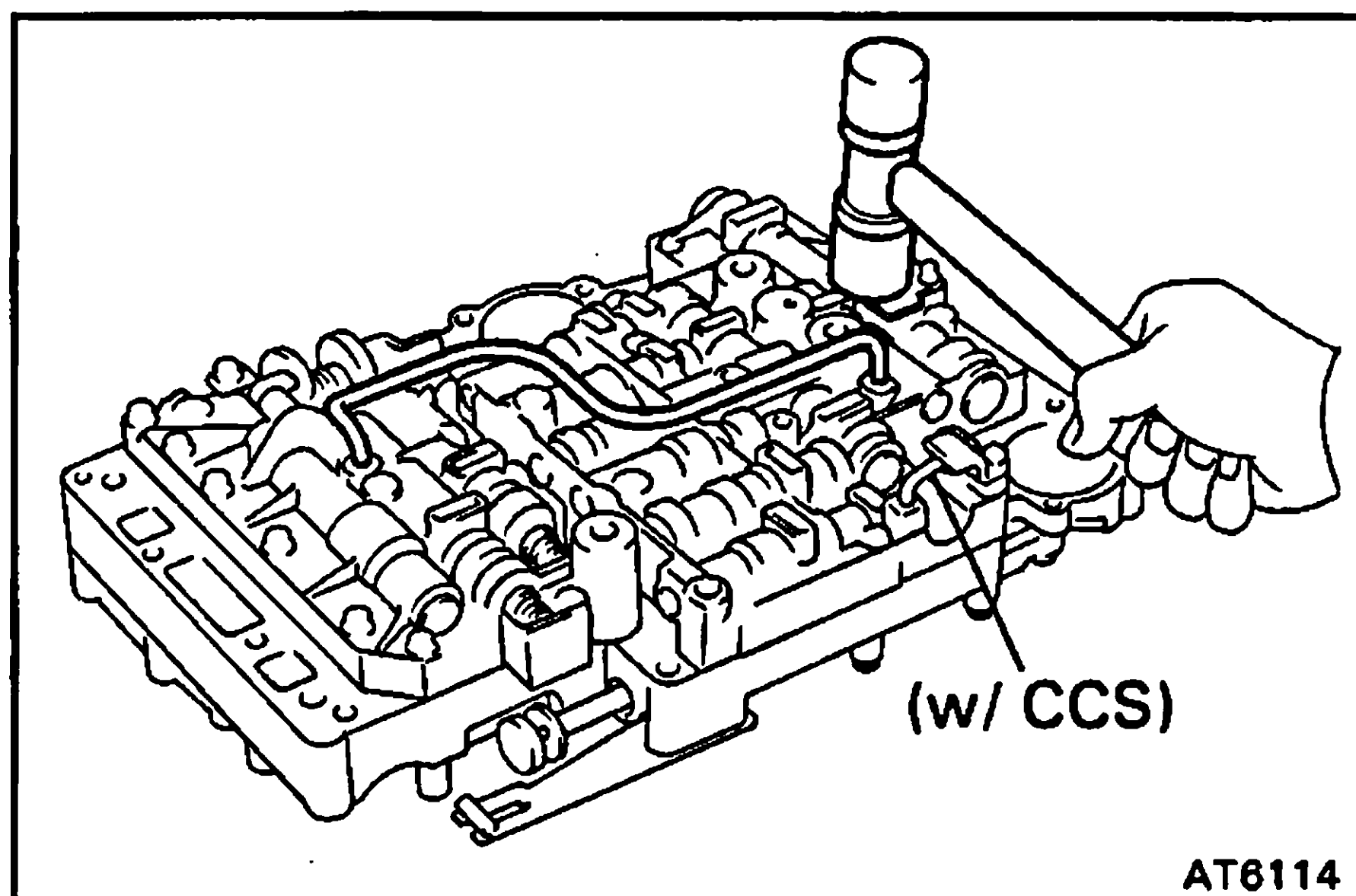
Install the detent spring and cover with the wave washer and bolt.

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

**HINT:** Use the bolt which is 43 mm (1.69 in.) in length.

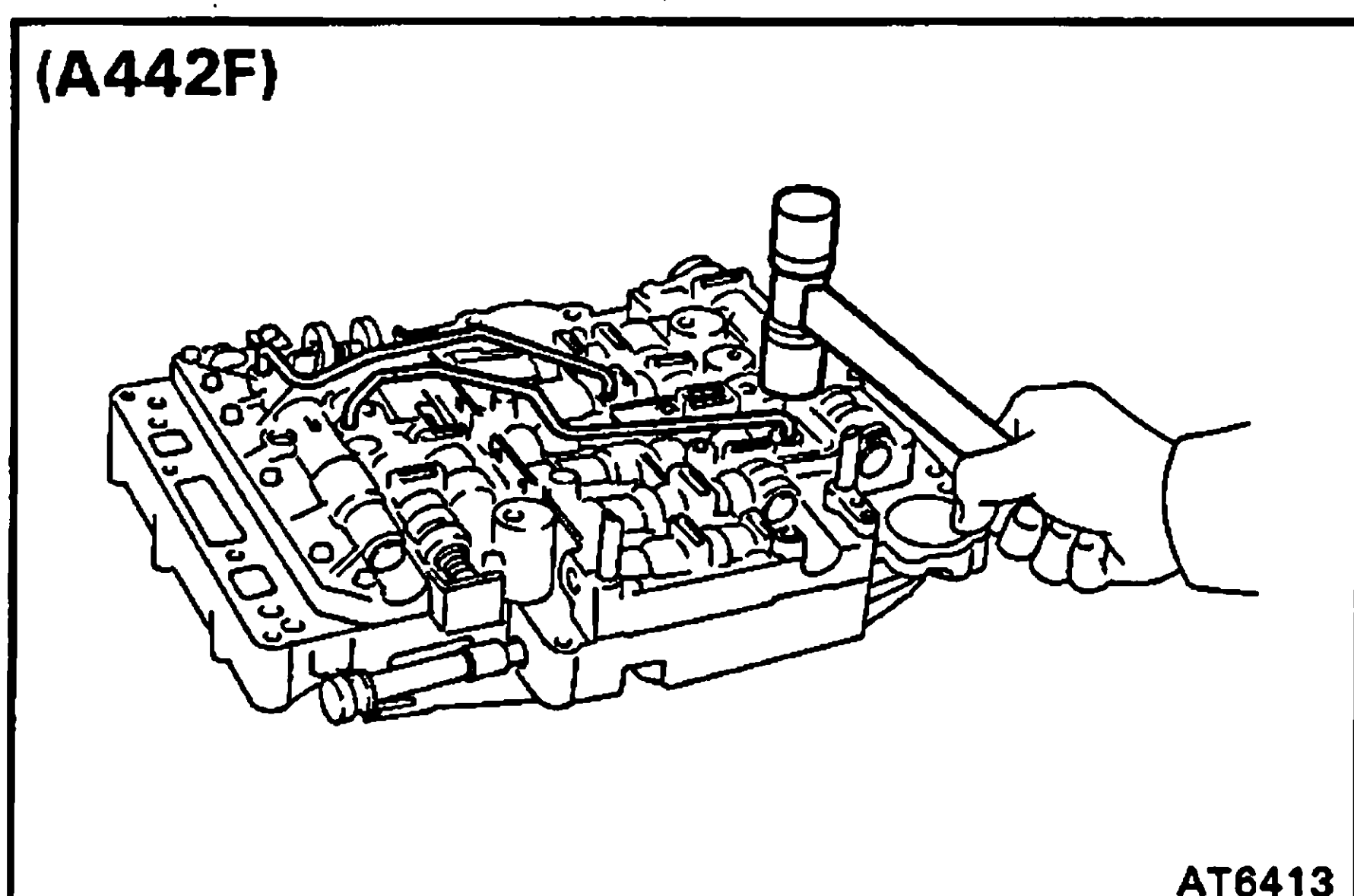
**12. INSTALL MANUAL VALVE****13. INSTALL CLAMP (A440F)**

Install the clamp with the two bolts and wave washers.  
**HINT:** Use the bolt which is 12 mm (0.47 in.) in length.

**14. INSTALL OIL TUBE(S) (A440F)**

(a) Using a plastic-faced hammer, tap in the oil tube(s).

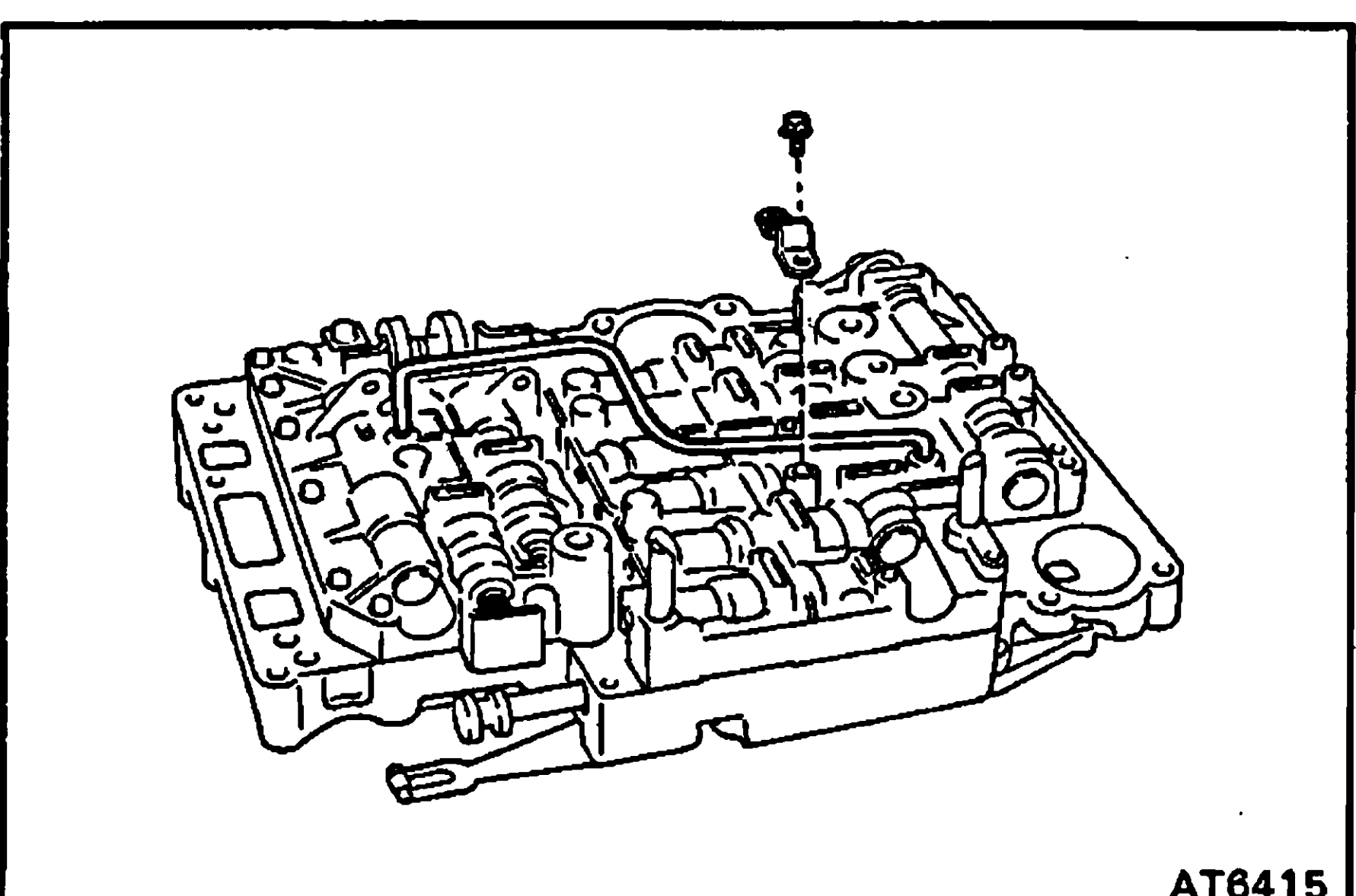
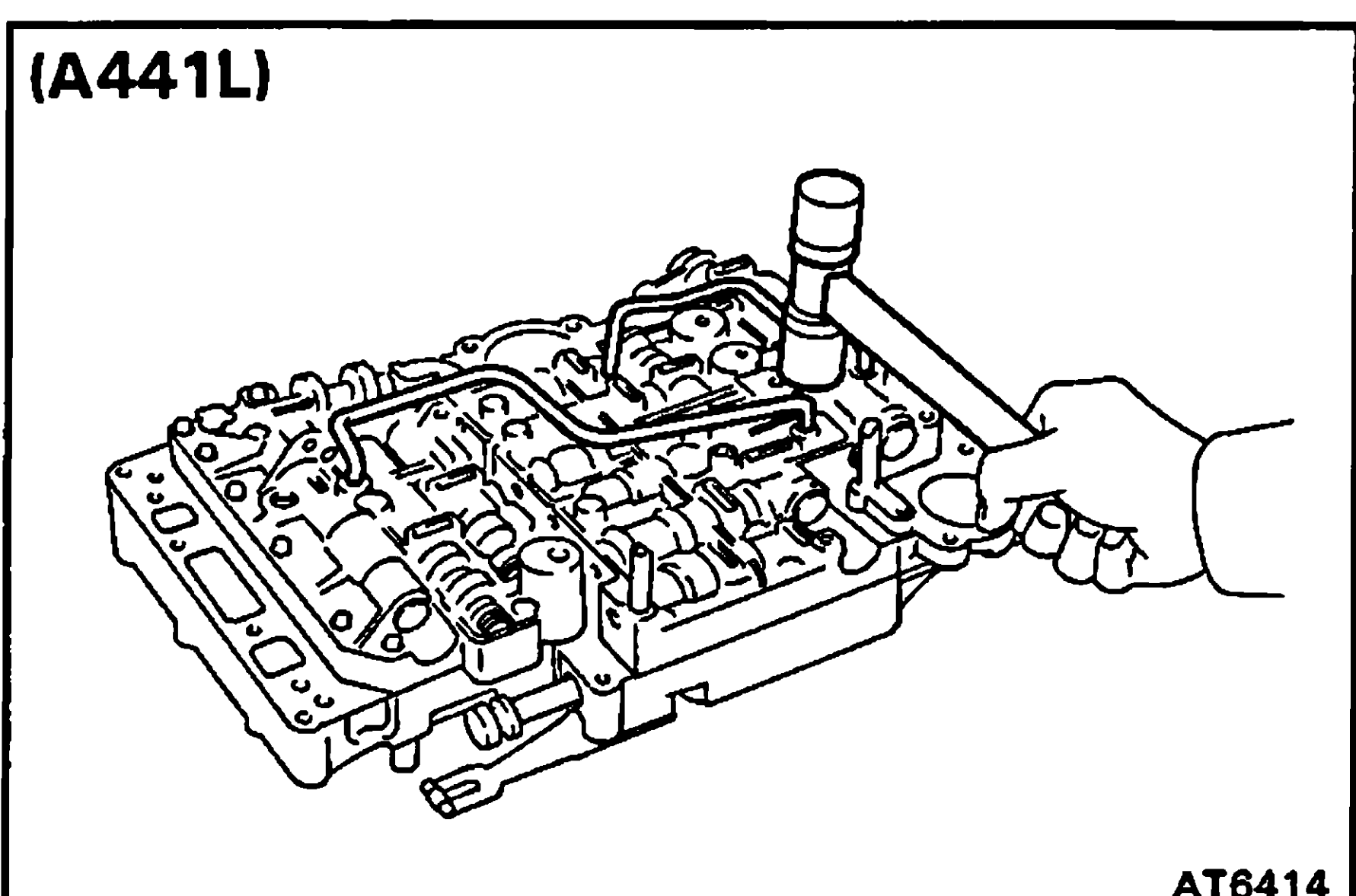
**NOTICE:** Be careful not to bend or damage the tube(s).



**(A442F, A441L)**

(a) Using a plastic-faced hammer, tap in the two oil tubes.

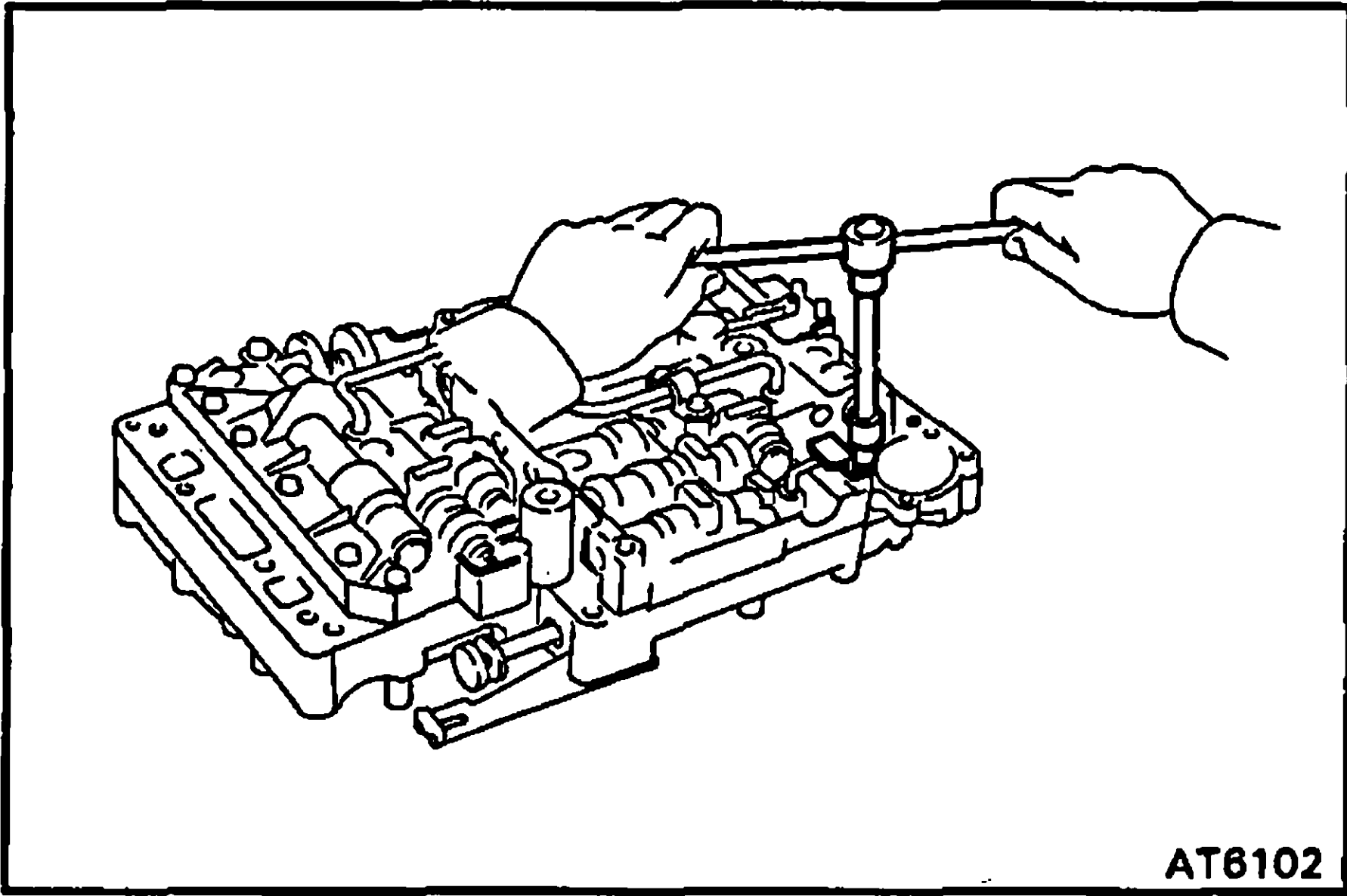
**NOTICE:** Be careful not to bend or damage the tubes.



**(A440F)**

(b) Install the tube clamp with the two wave washers and bolts.

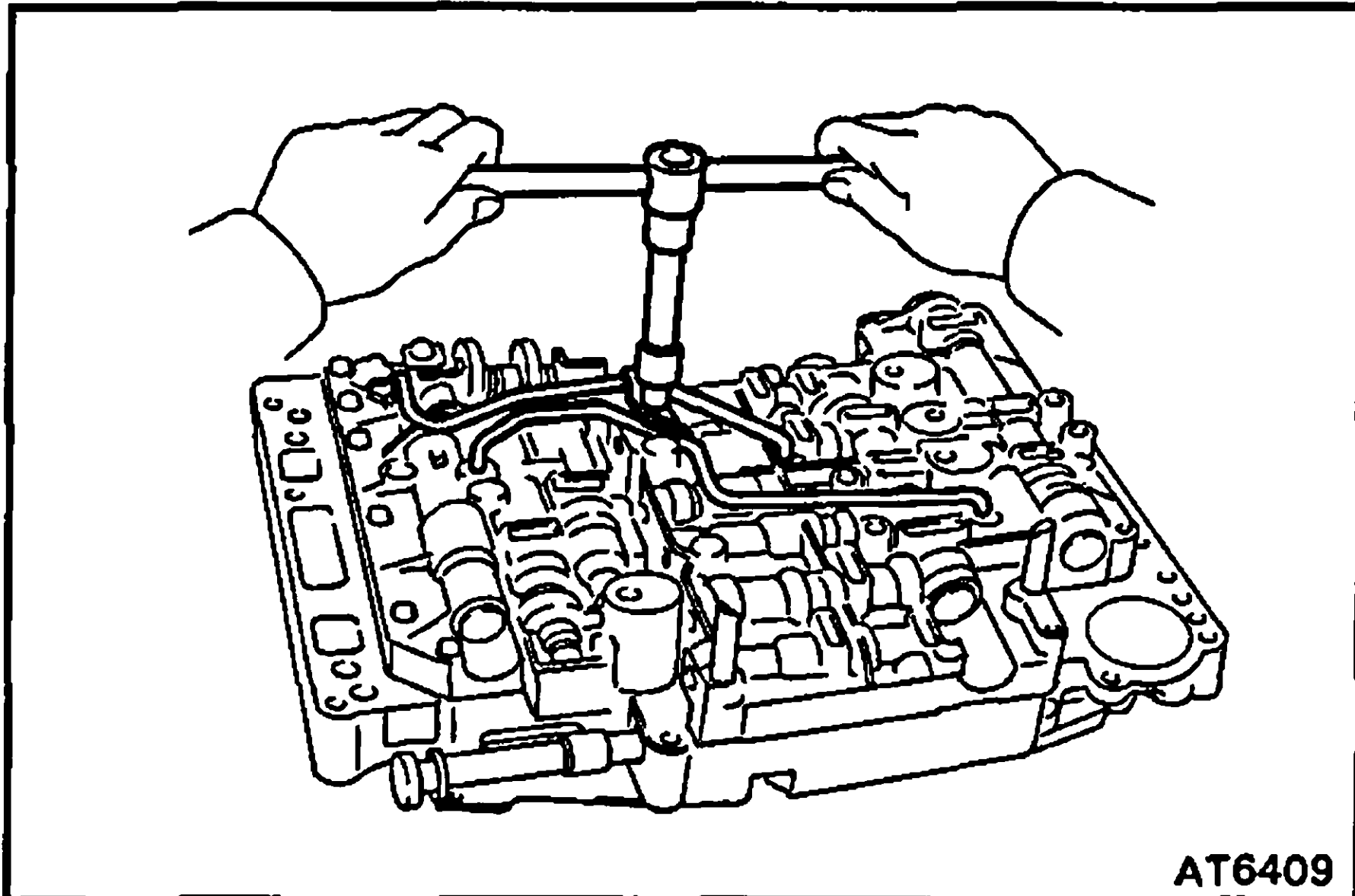
**HINT:** Use the bolt which is 12 mm (0.47 in.) in length.



(A440F: w/ Cruise Control System)

(b) Install the two tube clamps with the three wave washers and bolts.

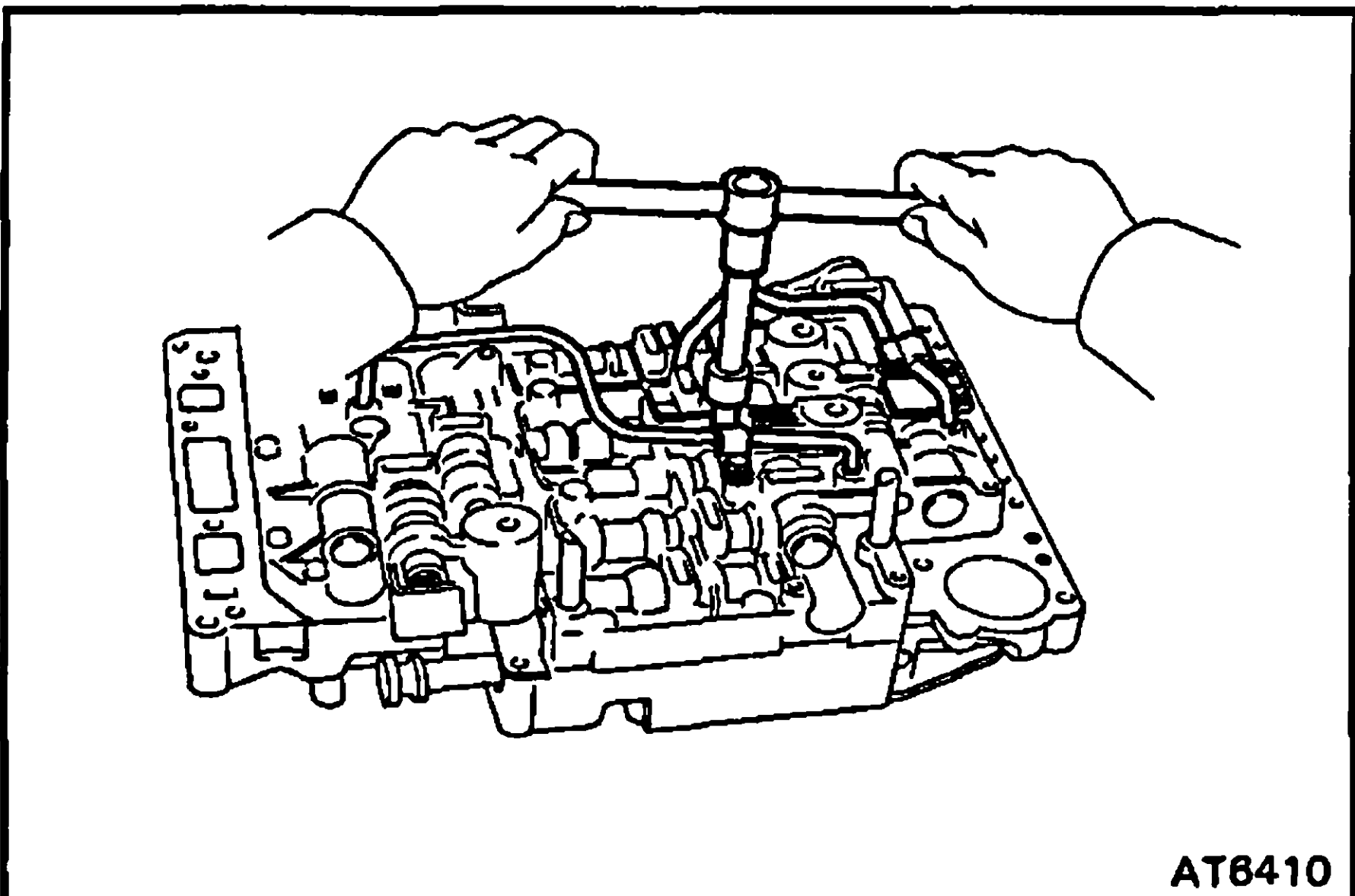
HINT: Use the bolt which is 12 mm (0.47 in.) in length.



(A442F)

(b) Install the tube clamp with the wave washer and bolt.

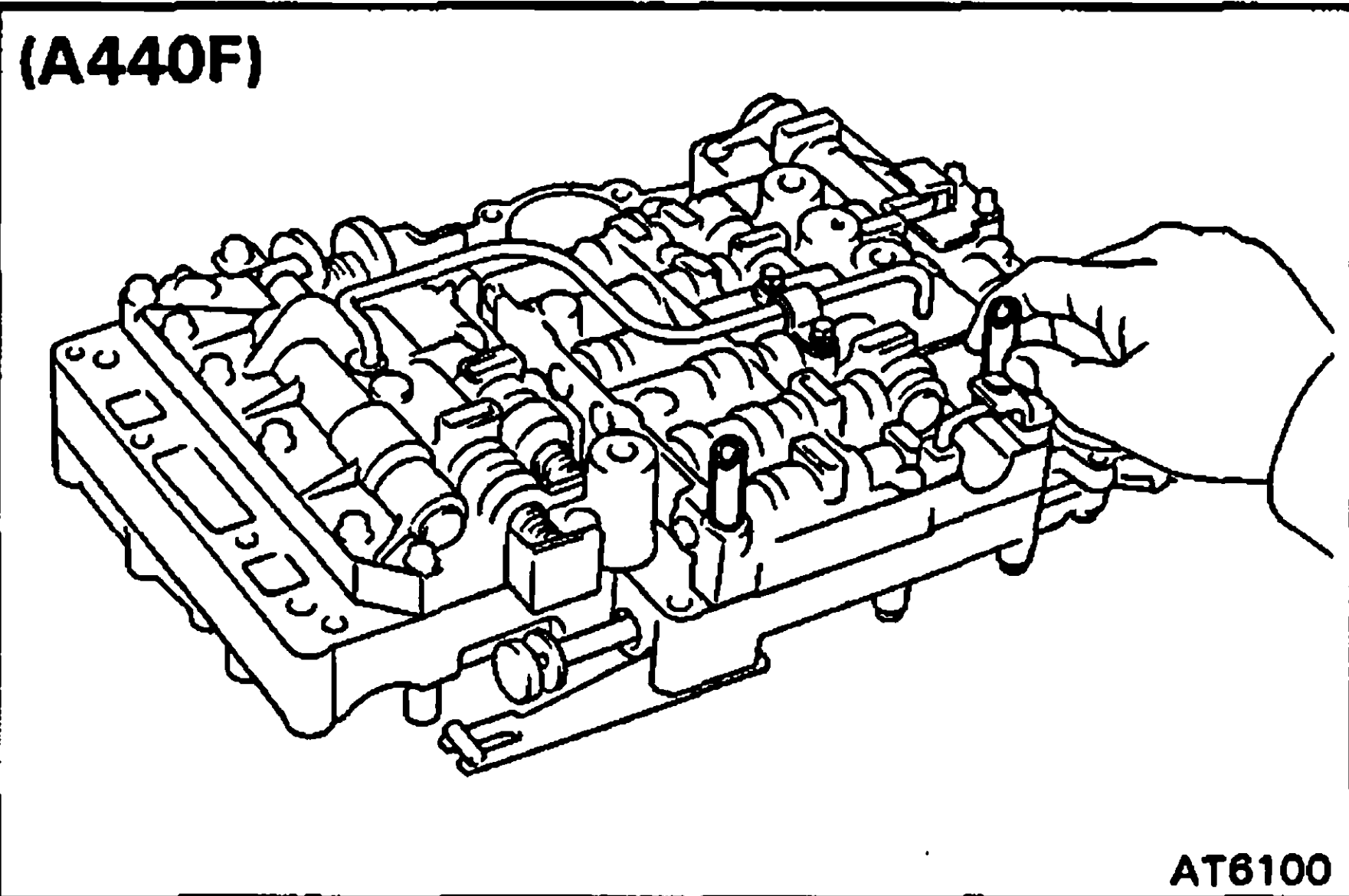
HINT: Use the bolt which is 12 mm (0.47 in.) in length.



(A441L)

(b) Install the two tube clamps with the four wave washers and bolts.

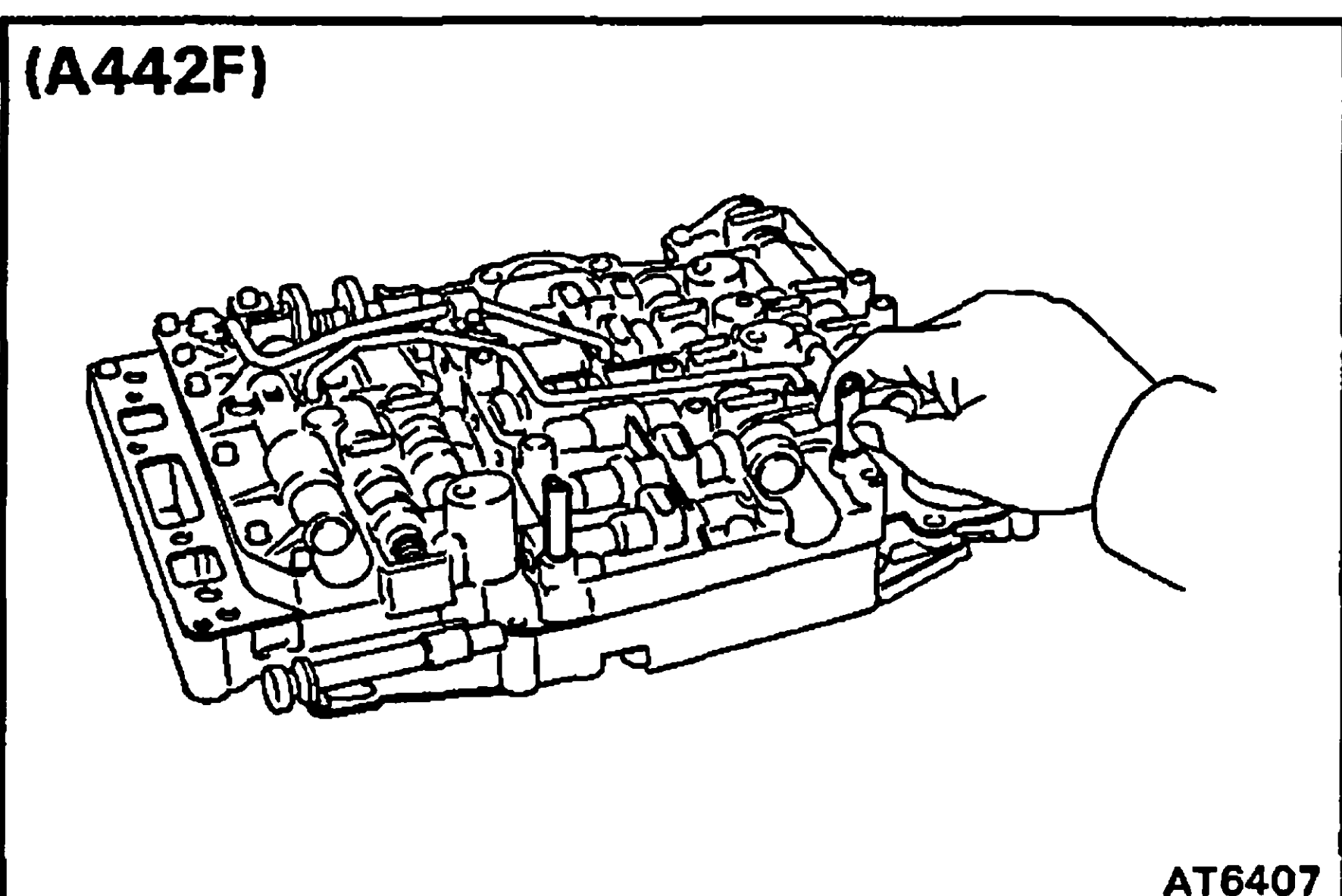
HINT: Use the bolt which is 12 mm (0.47 in.) in length.



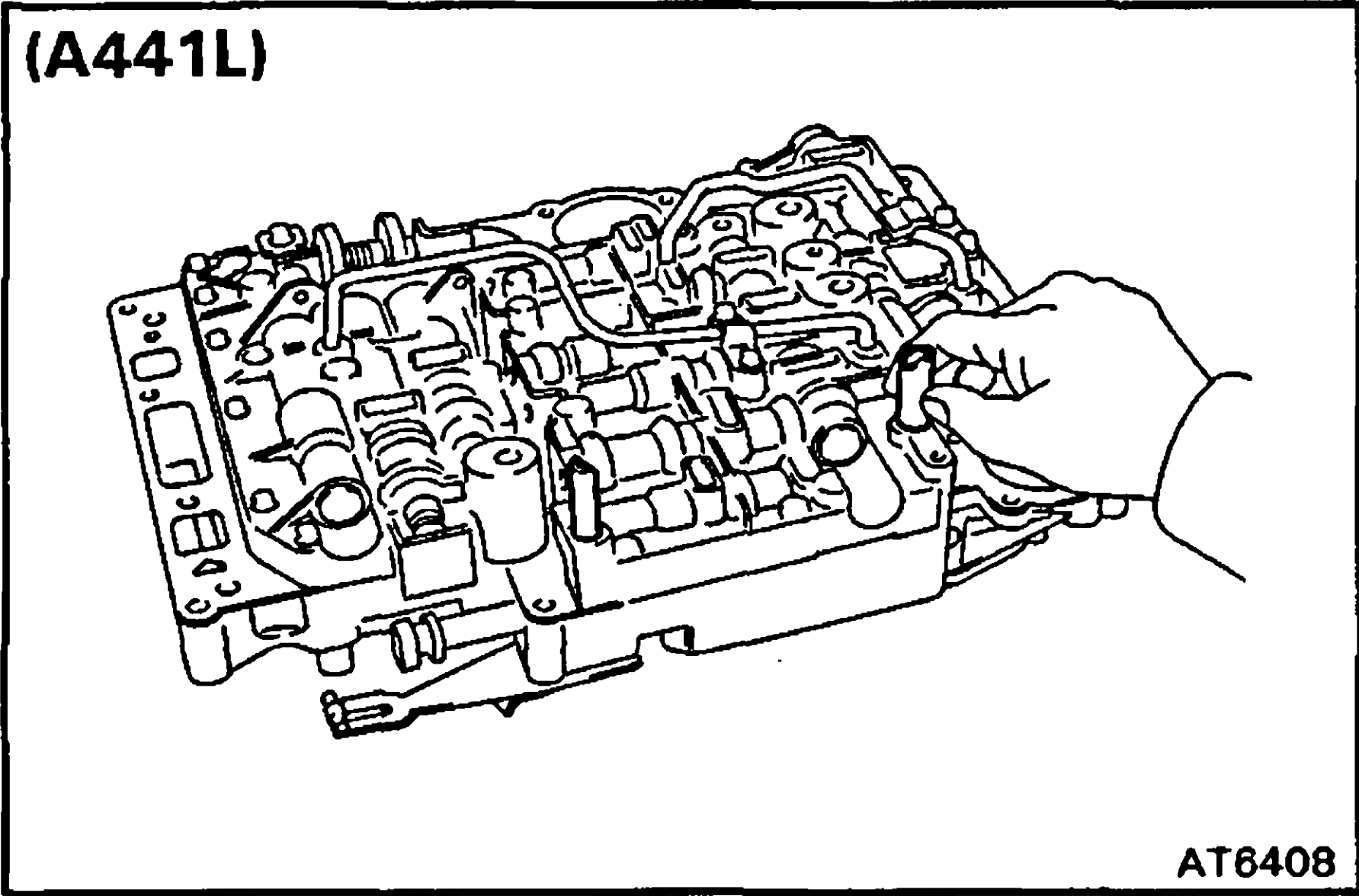
(A440F)

## 15. INSTALL LINE PRESSURE TUBES

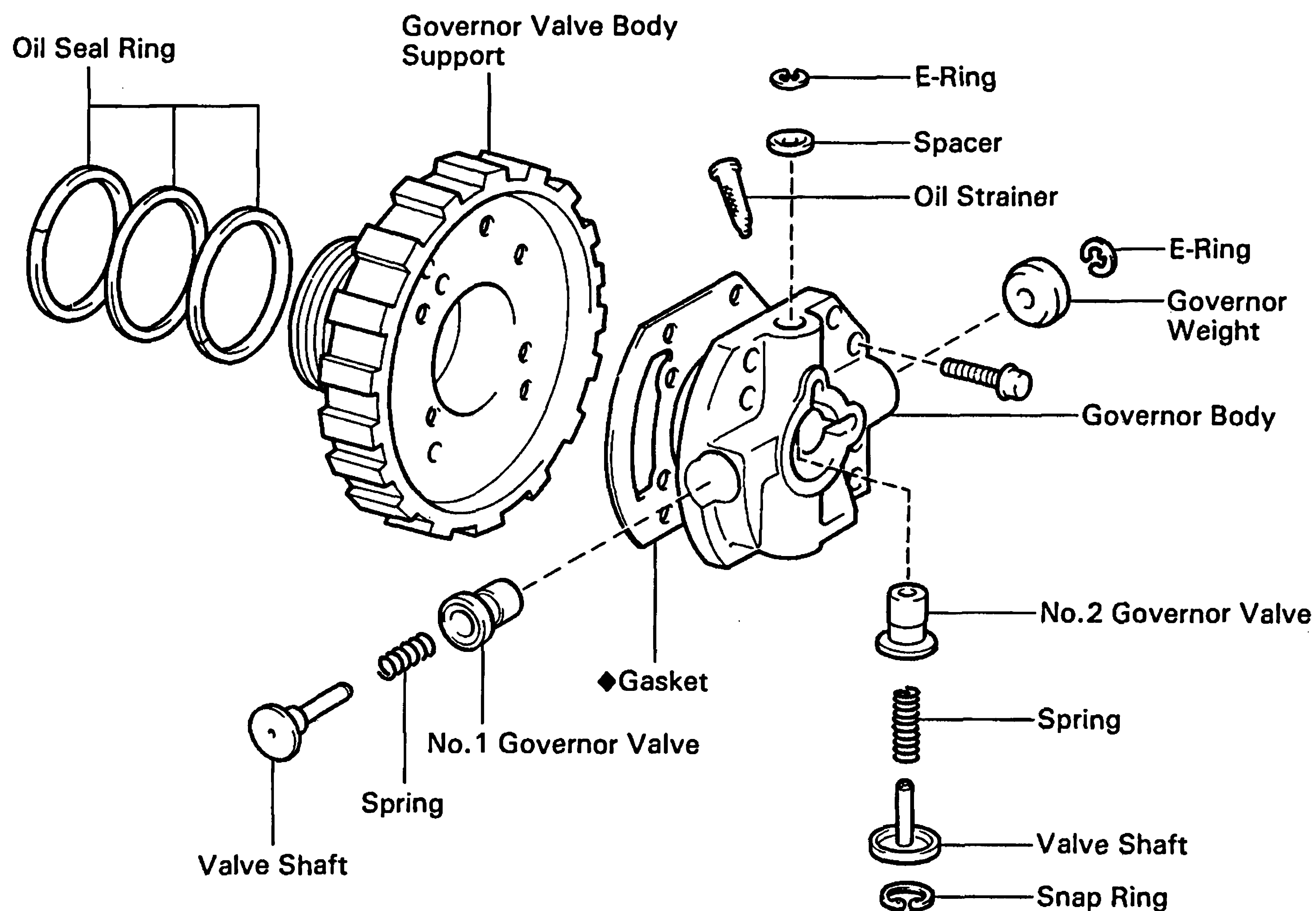
Install the two pressure tubes.



(A442F)



## Governor Body COMPONENTS



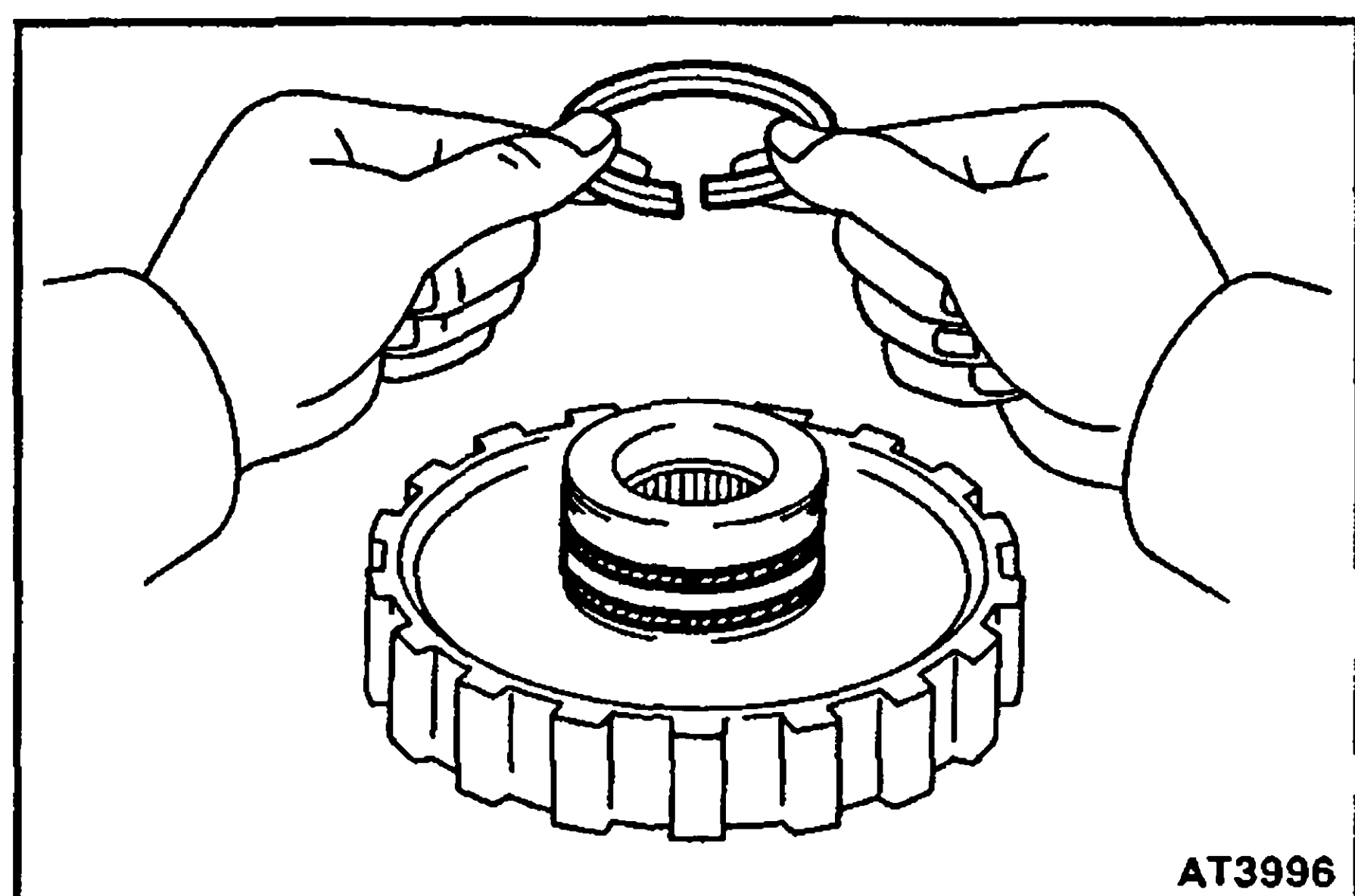
◆ Non-reusable part

AT3965

### DISASSEMBLY OF GOVERNOR BODY

#### 1. REMOVE OIL SEAL RINGS

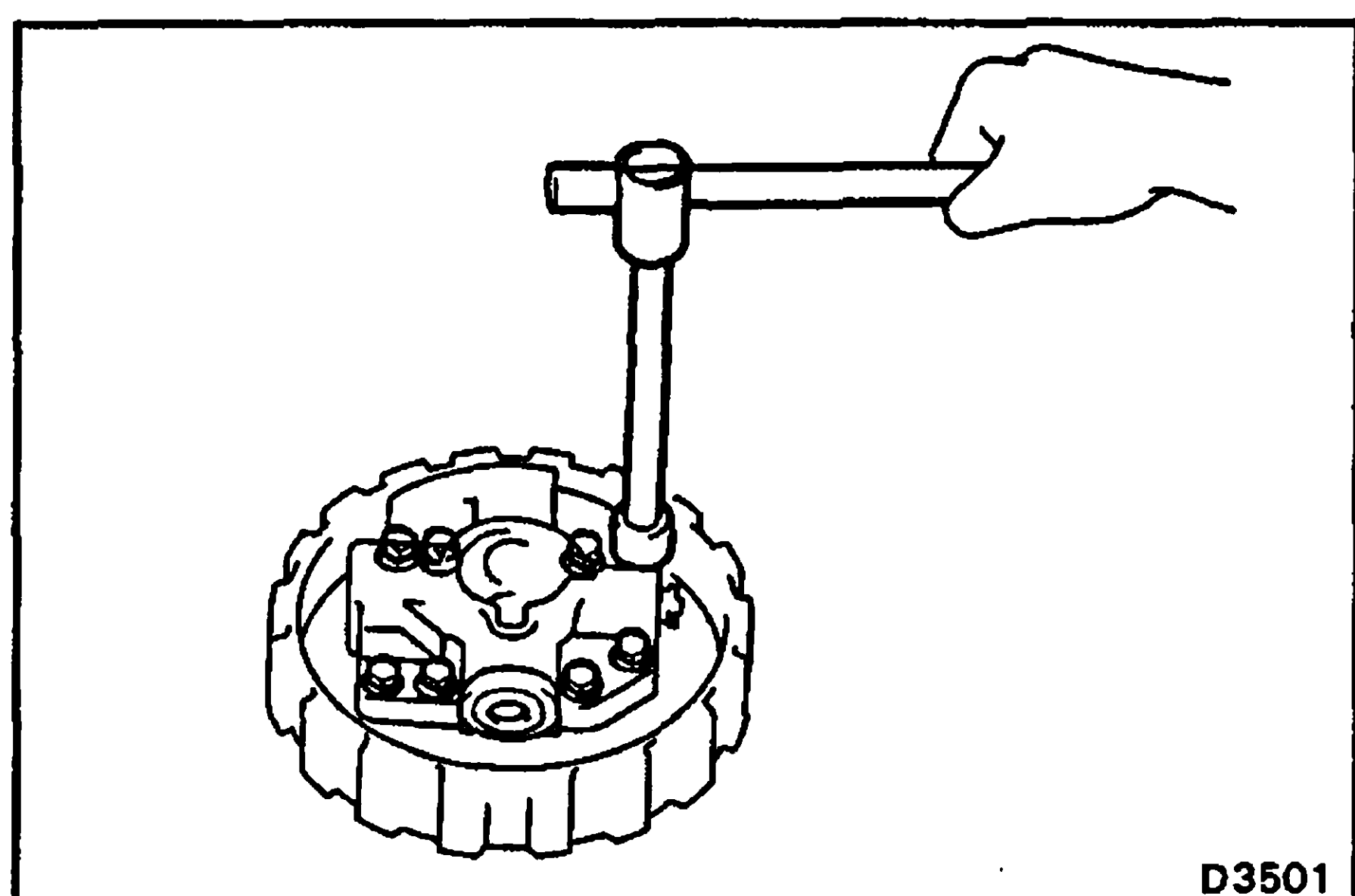
Remove the three oil seal rings by hand.



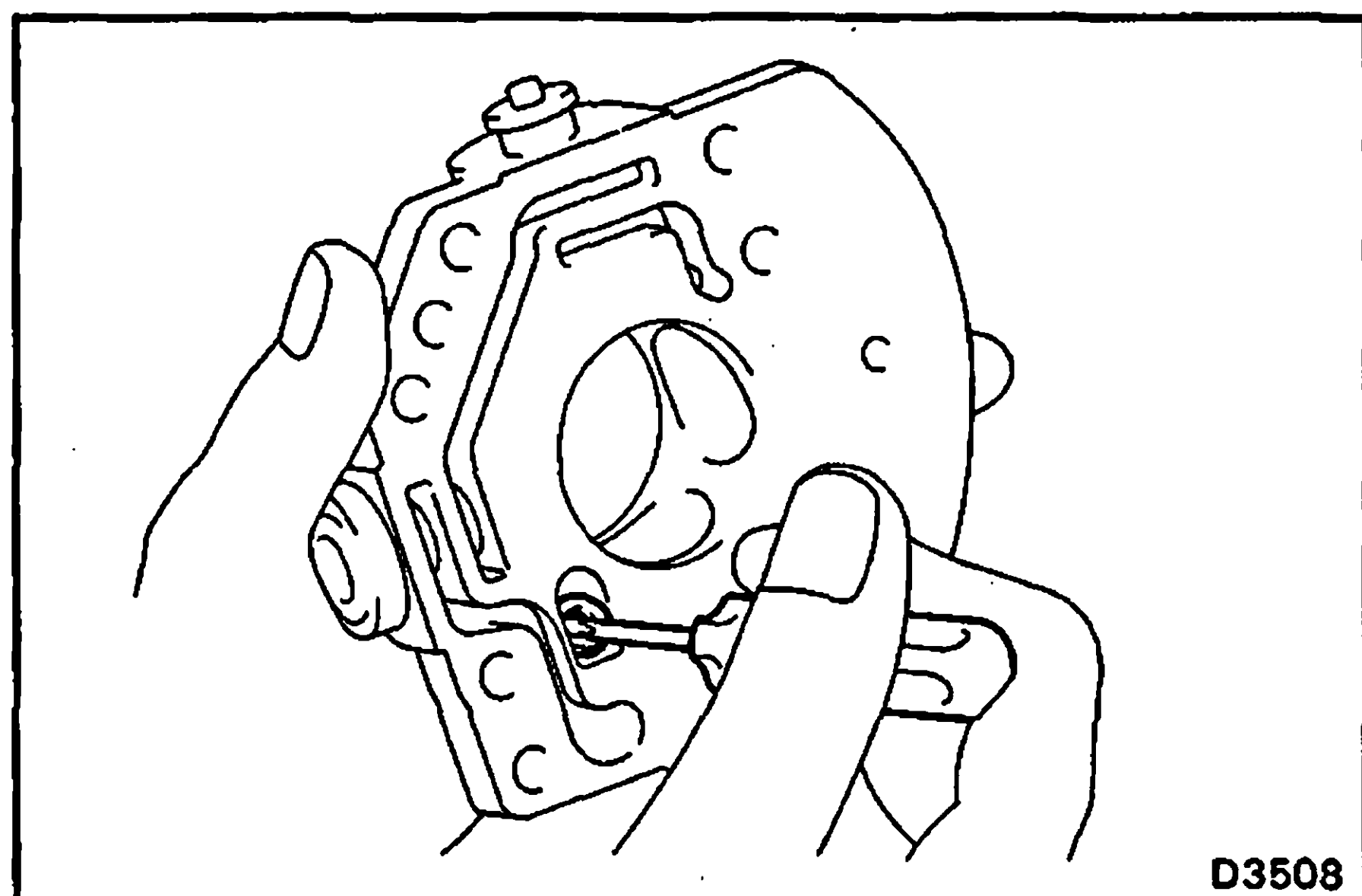
AT3996

#### 2. REMOVE GOVERNOR BODY

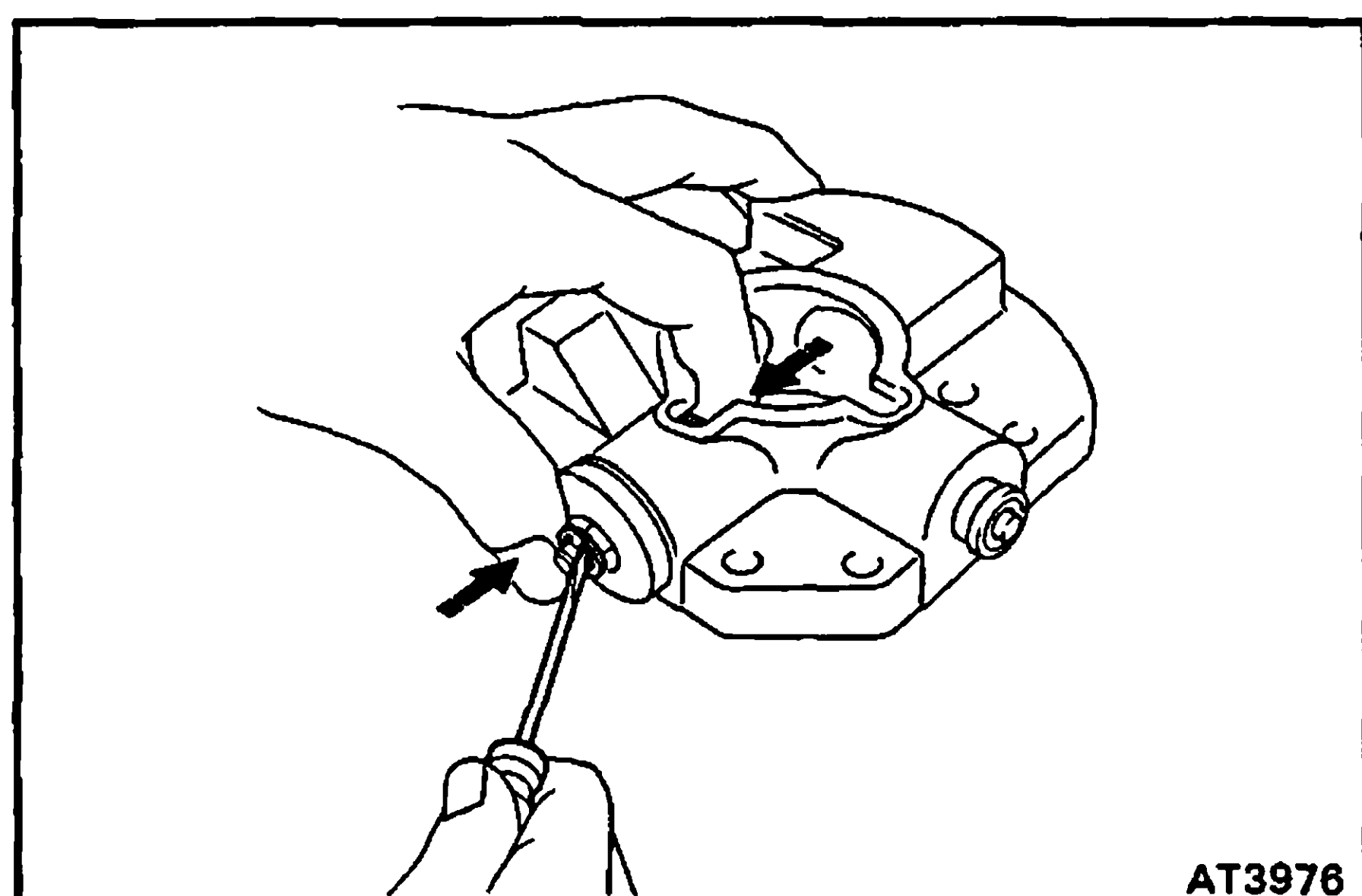
Remove the eight bolts, governor body and gasket.



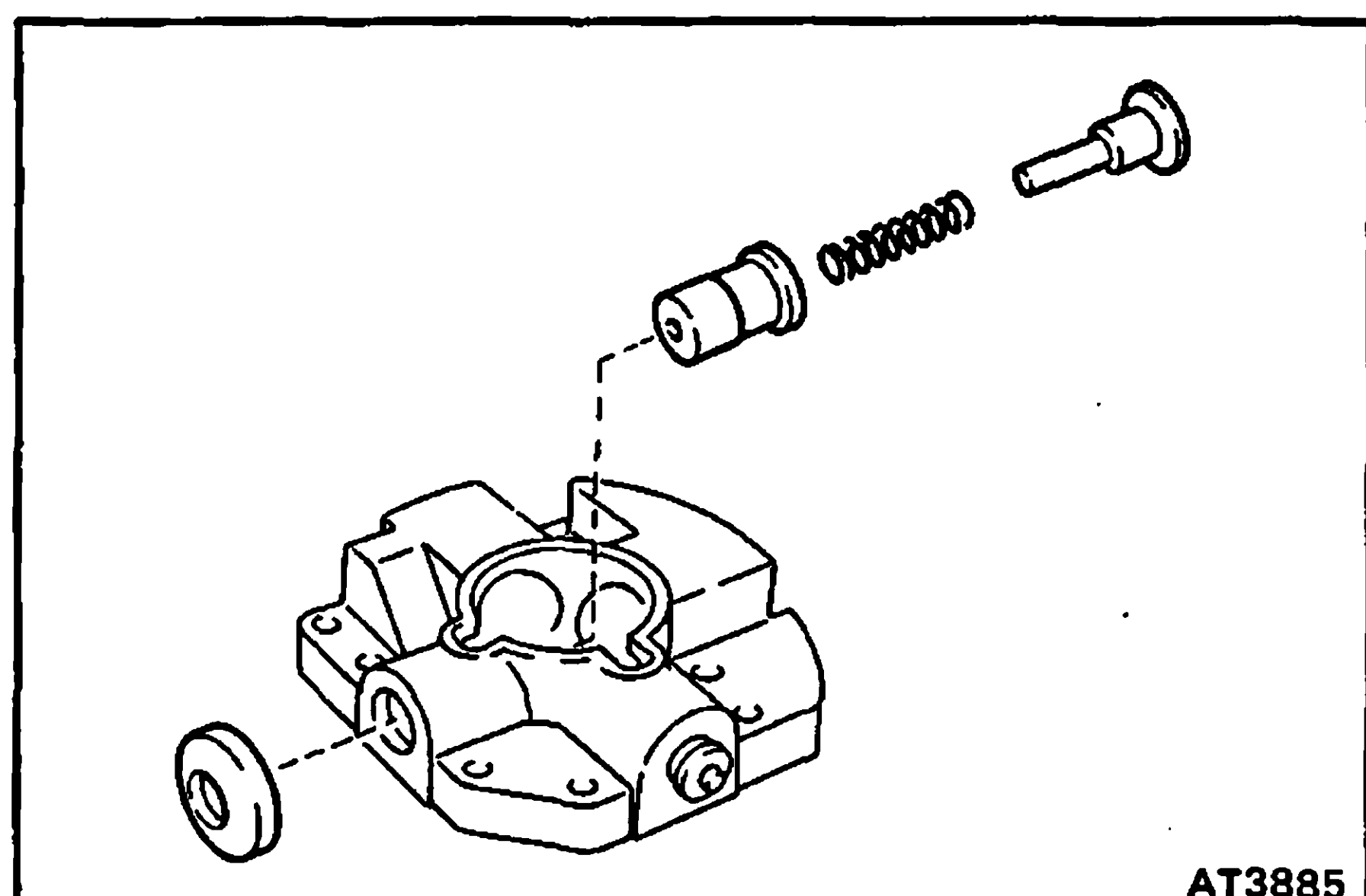
D3501

**3. REMOVE GOVERNOR OIL STRAINER**

Using a small screwdriver, remove the oil strainer.

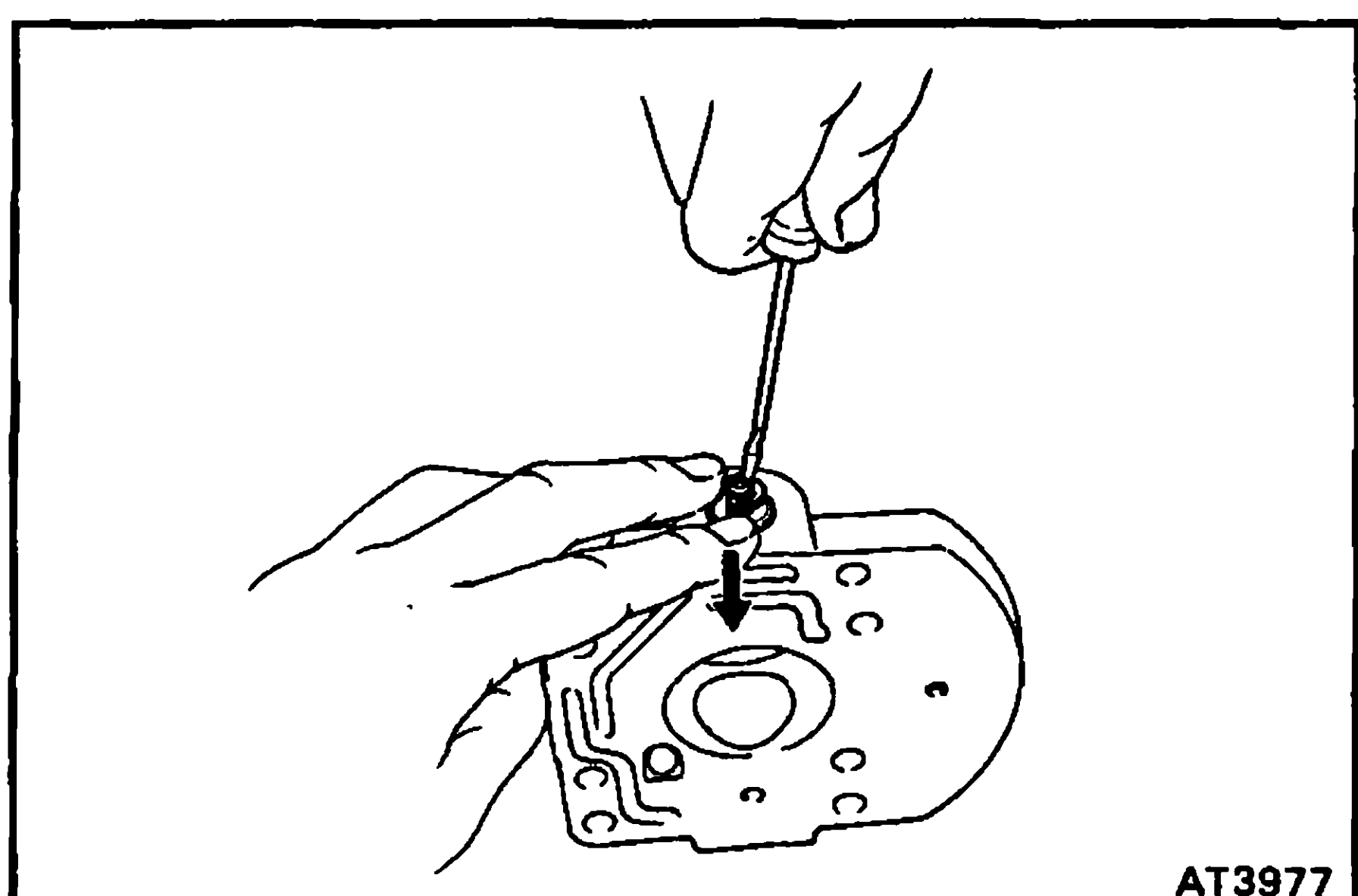
**4. REMOVE NO.1 GOVERNOR VALVE**

(a) Using a small screwdriver, remove the E-ring.



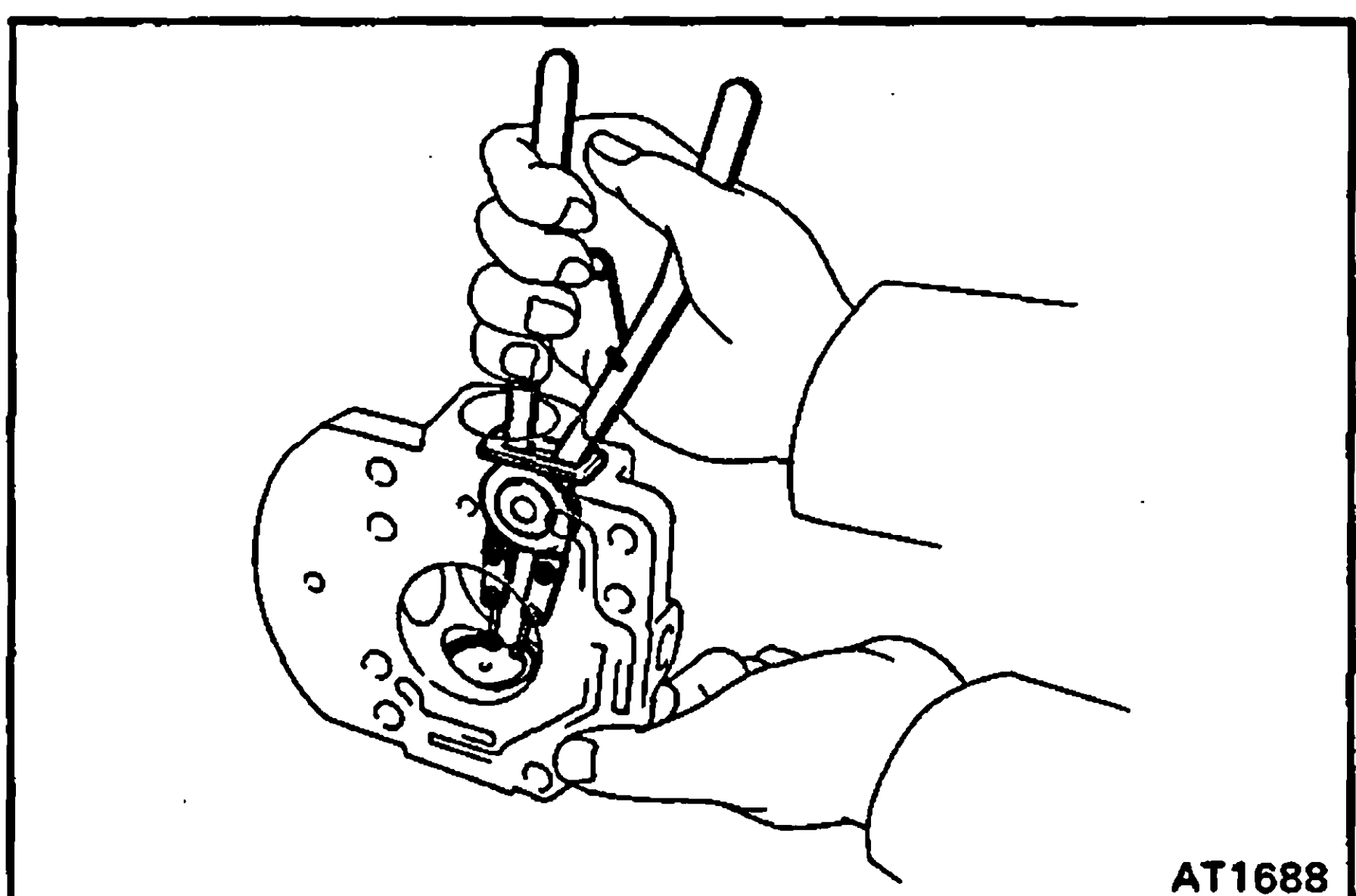
(b) Remove the governor weight from the outside of the governor body.

(c) Remove the valve shaft, spring and governor valve from the inside of the governor body.

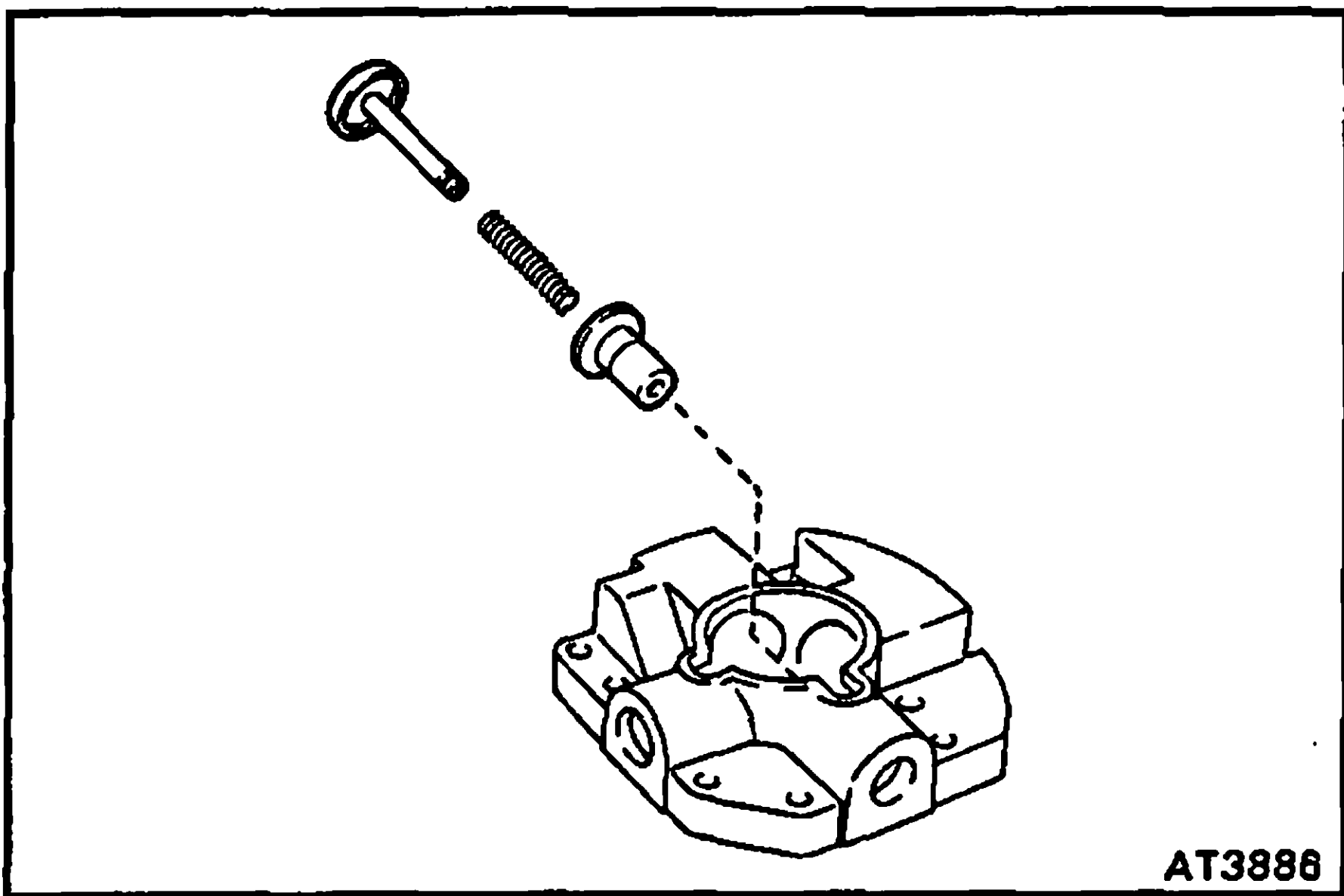
**5. REMOVE NO.2 GOVERNOR VALVE**

(a) Using a small screwdriver, remove the E-ring.

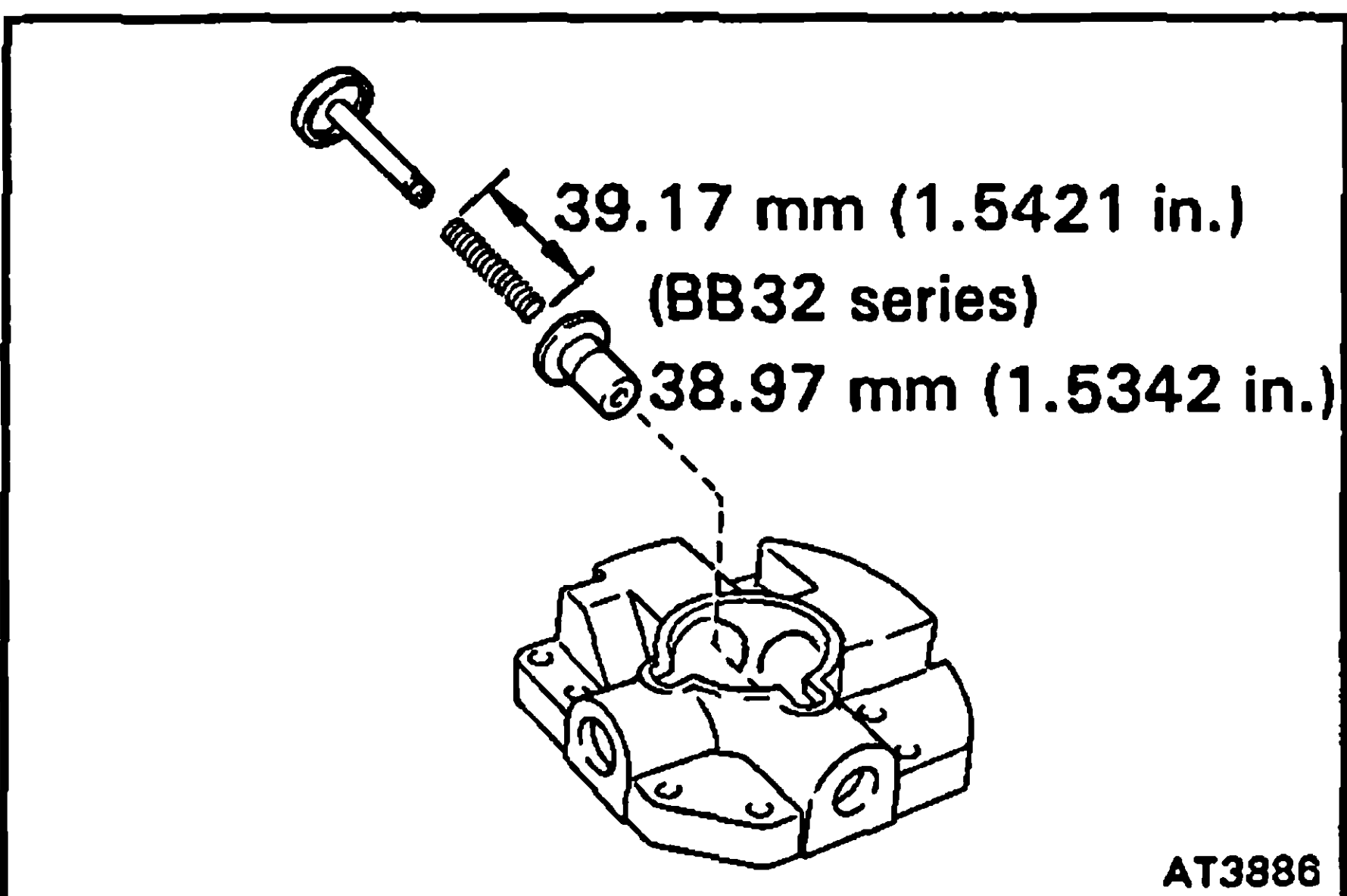
(b) Remove the spacer.



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



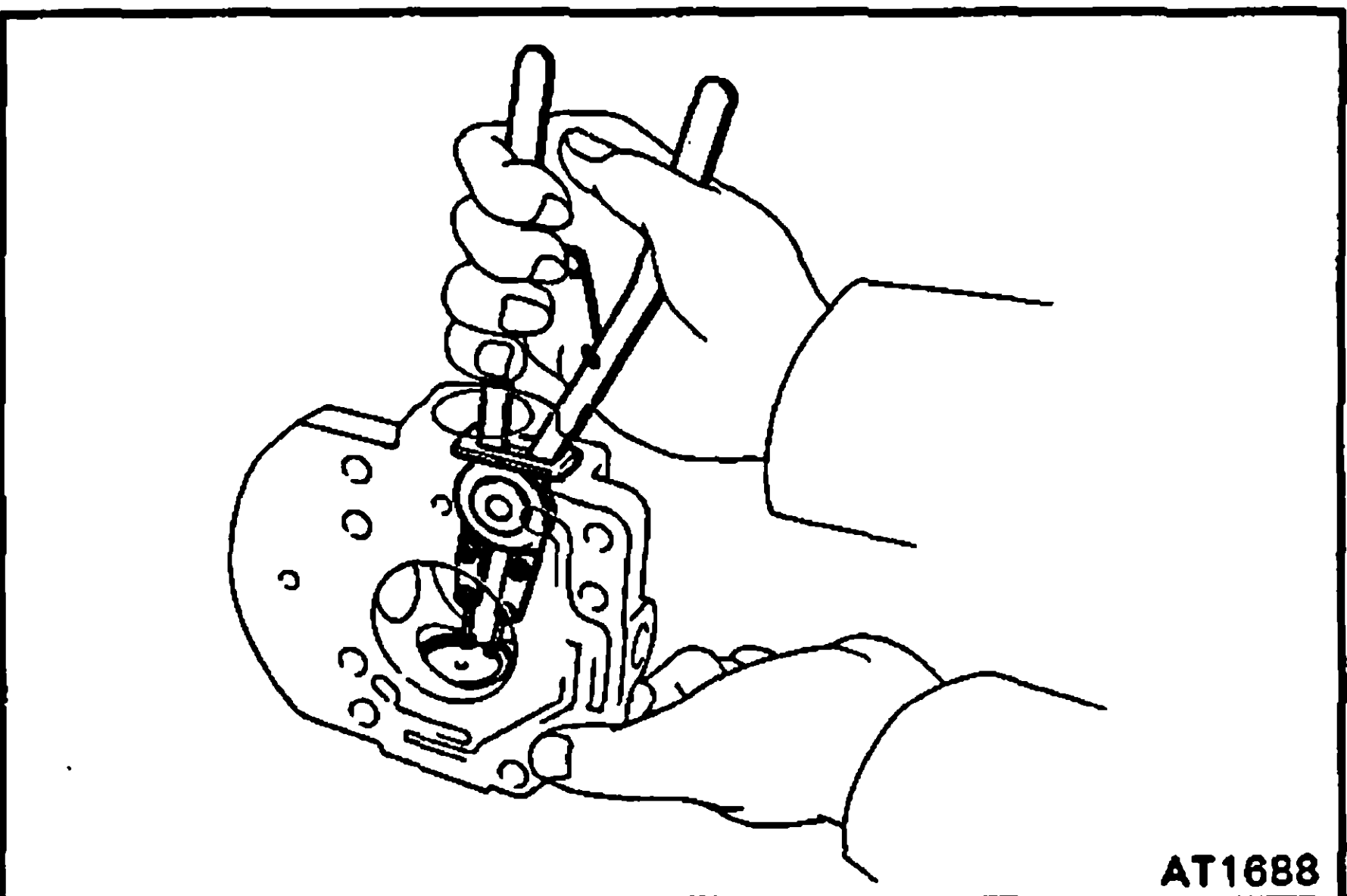
- (d) Remove the valve shaft, spring and governor valve from the inside of the governor body.



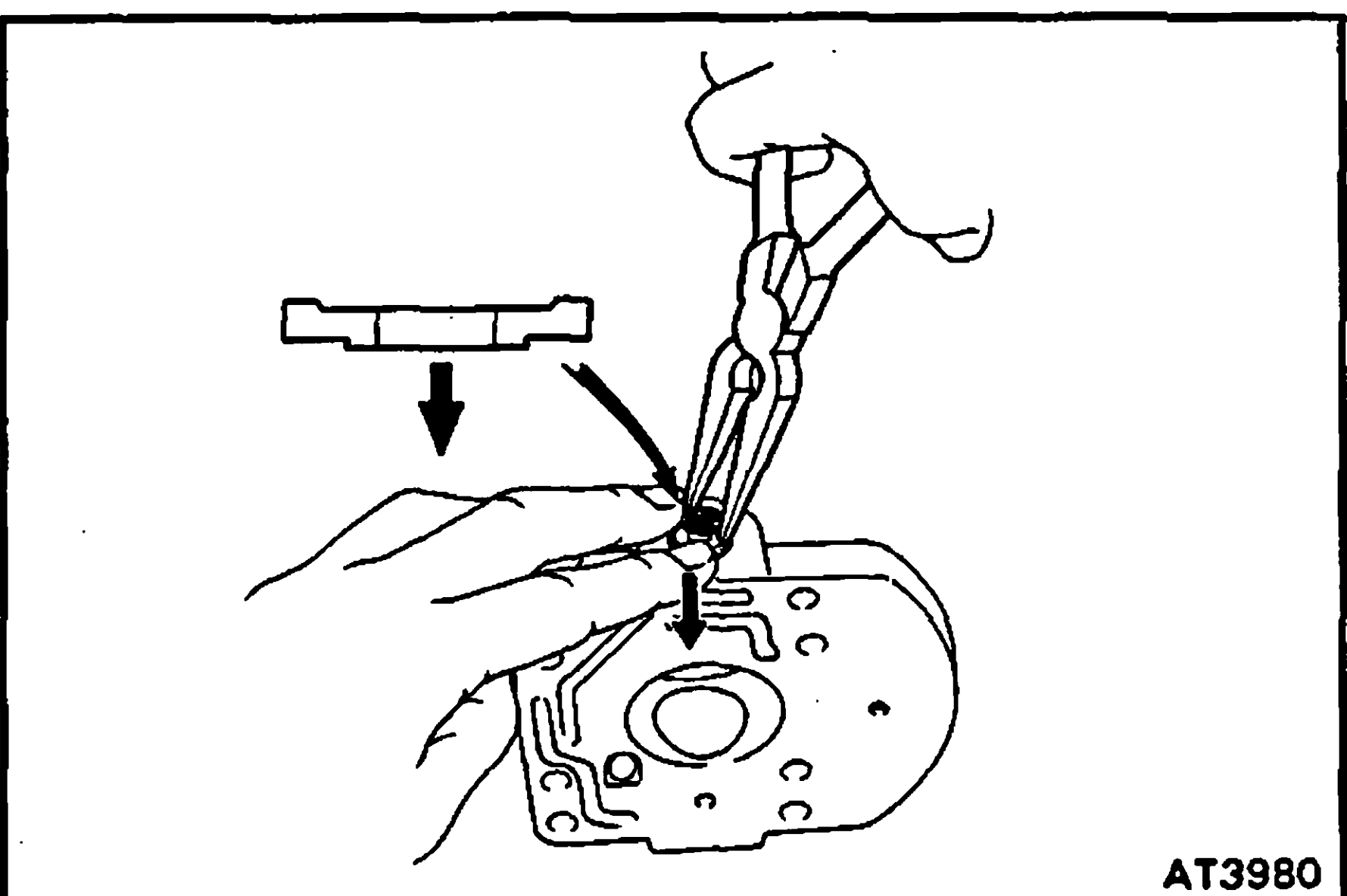
## ASSEMBLY OF GOVERNOR BODY

### 1. INSTALL NO.2 GOVERNOR VALVE

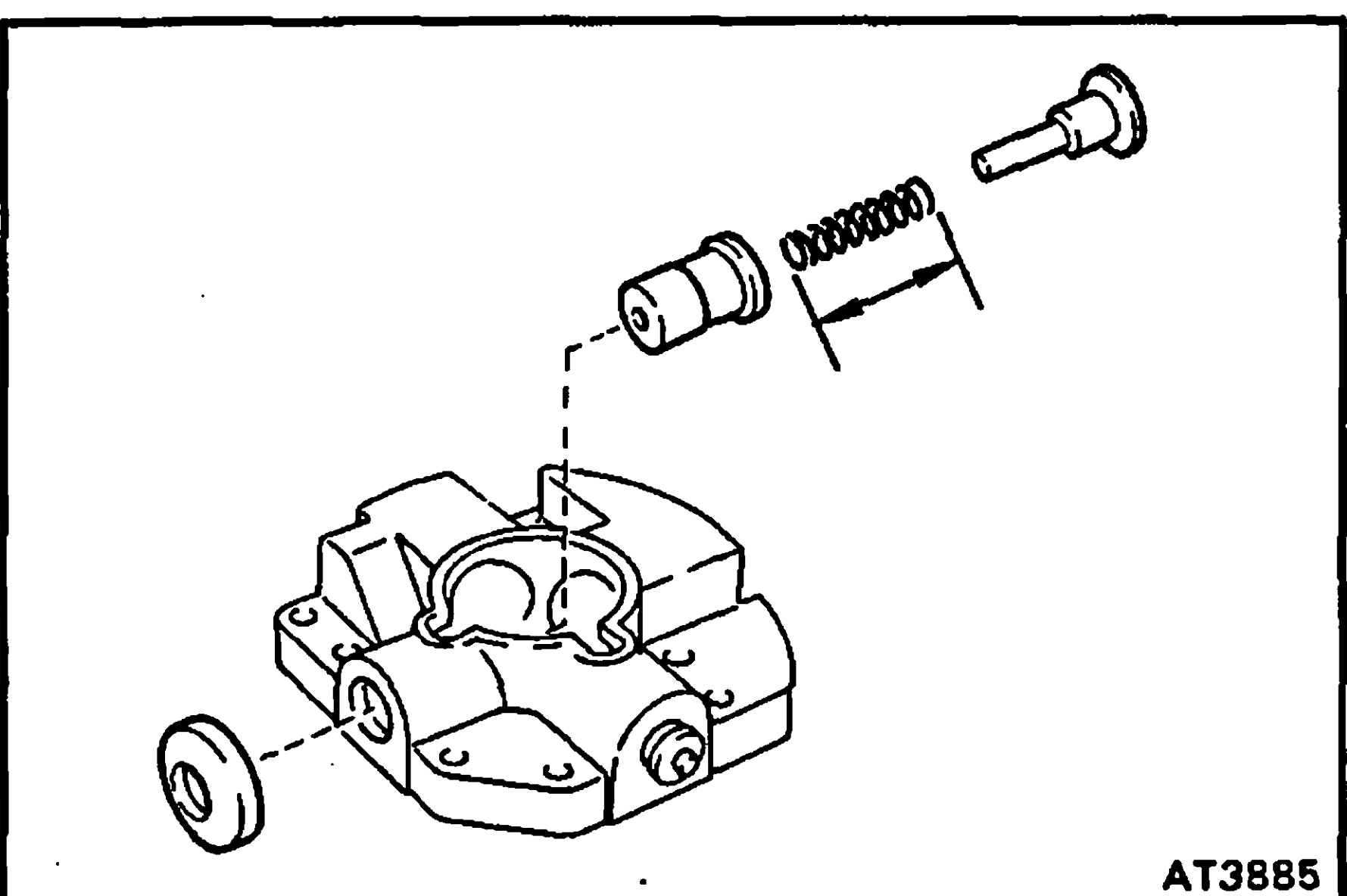
- (a) Coat the governor valve and shaft with ATF.  
 (b) Install the governor valve, spring and valve shaft into the inside of the governor body.



- (c) Using snap ring pliers, install the snap ring.



- (d) Install the spacer.  
 (e) Using needle nose pliers, install the E-ring.

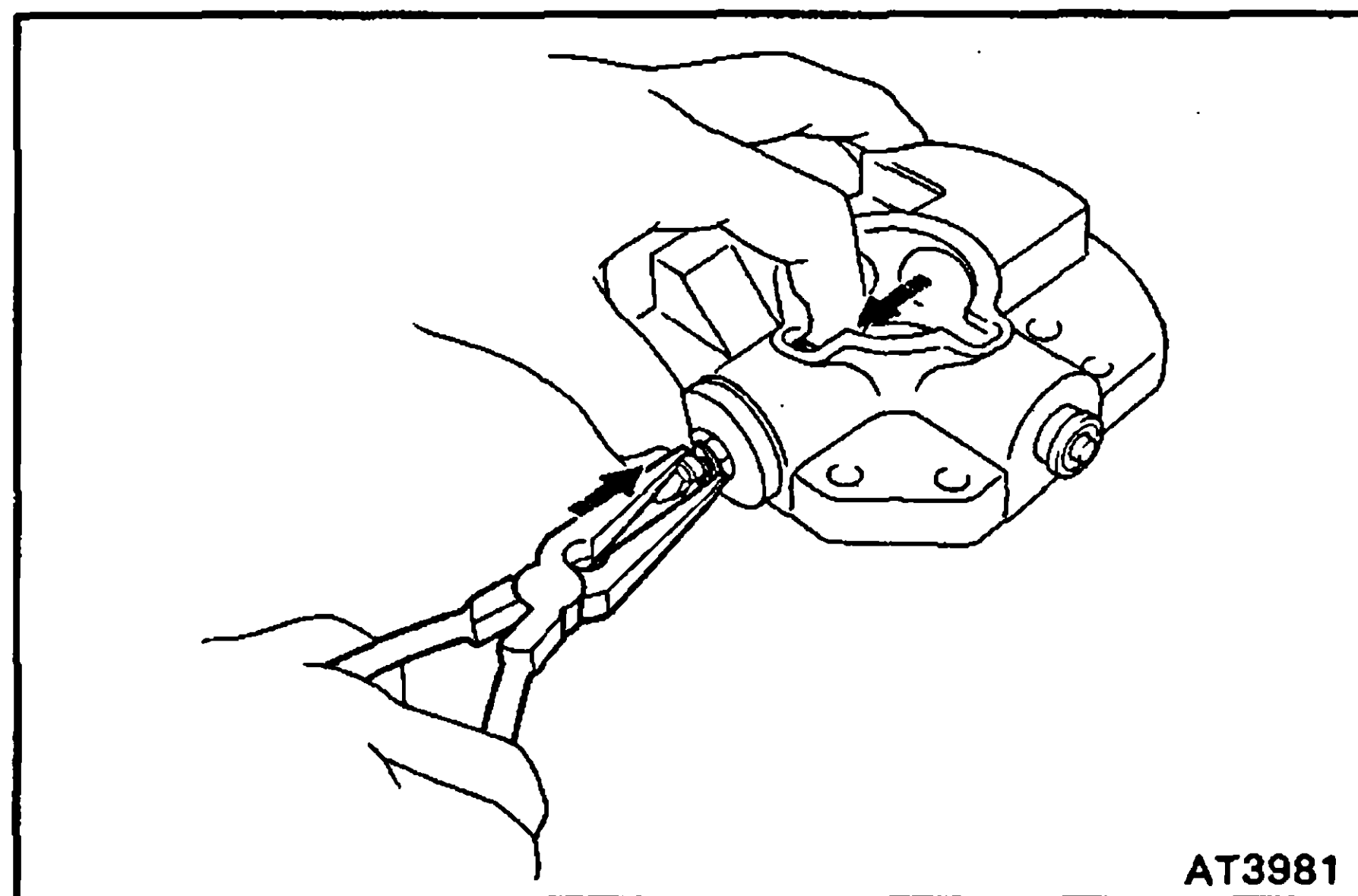


### 2. INSTALL NO.1 GOVERNOR VALVE

- (a) Coat the governor valve and shaft with ATF.  
 (b) Install the governor valve, spring and valve shaft into the inside of the governor body.  
 (c) Install the governor weight.

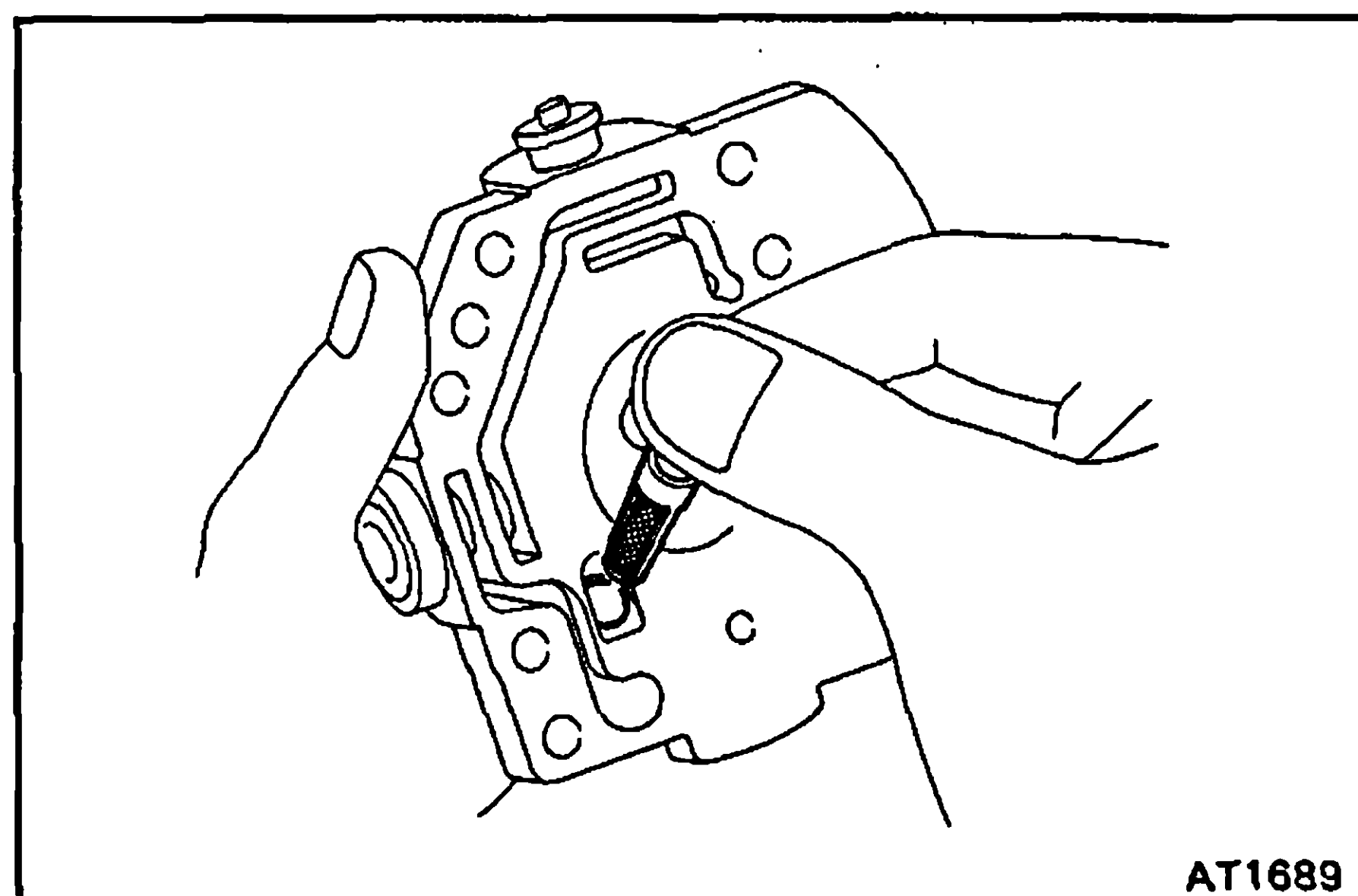
HINT: Spring diameter

|             |                       |
|-------------|-----------------------|
| 3F, 1HZ     | 25.88 mm (1.0189 in.) |
| 3F-E        | 23.00 mm (0.9055 in.) |
| 1HD-T       | 27.58 mm (1.0858 in.) |
| BB32 series | 24.34 mm (0.9583 in.) |



AT3981

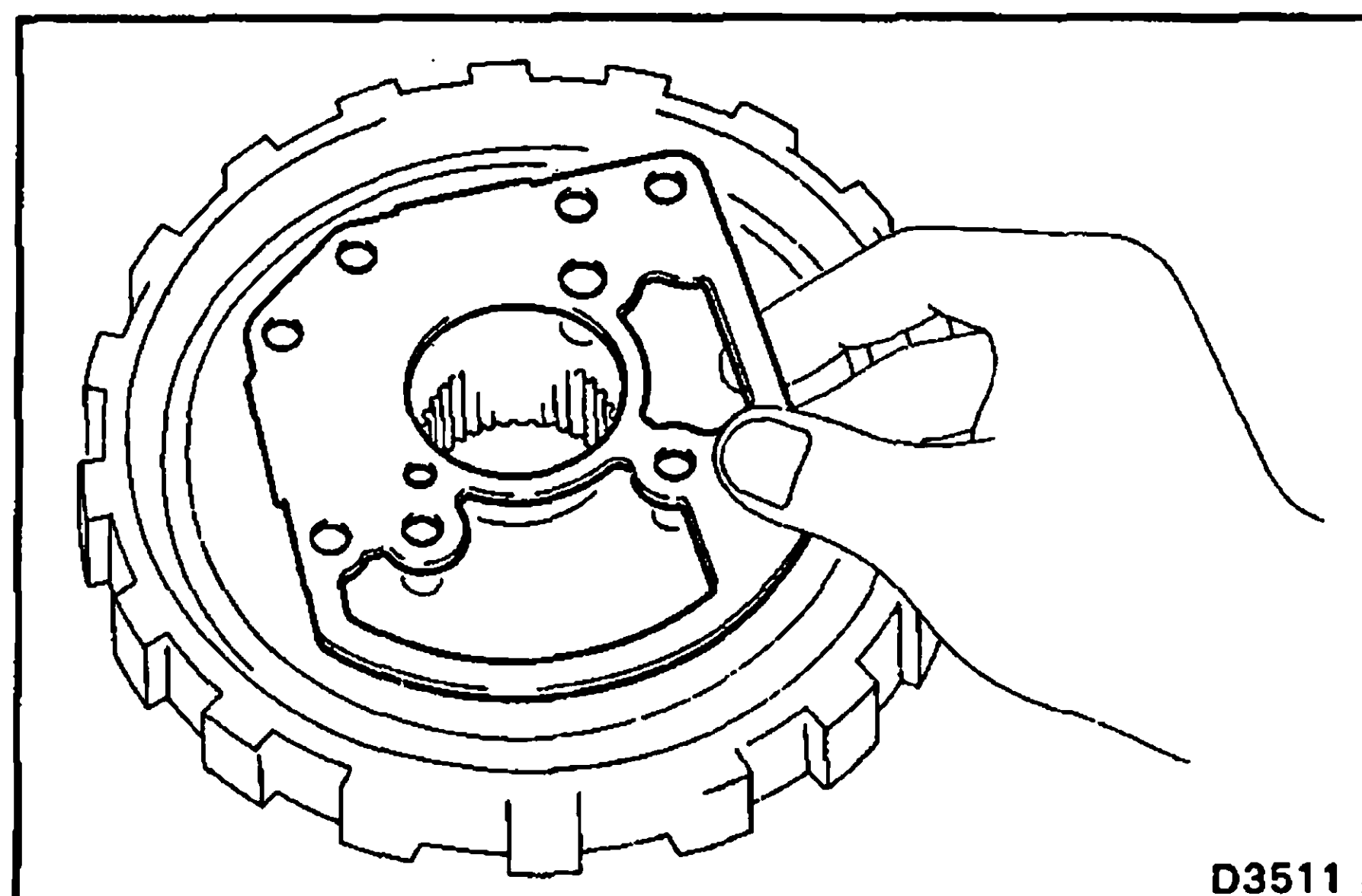
(d) Using needle nose pliers, install the E-ring.



AT1689

### 3. INSTALL GOVERNOR OIL STRAINER

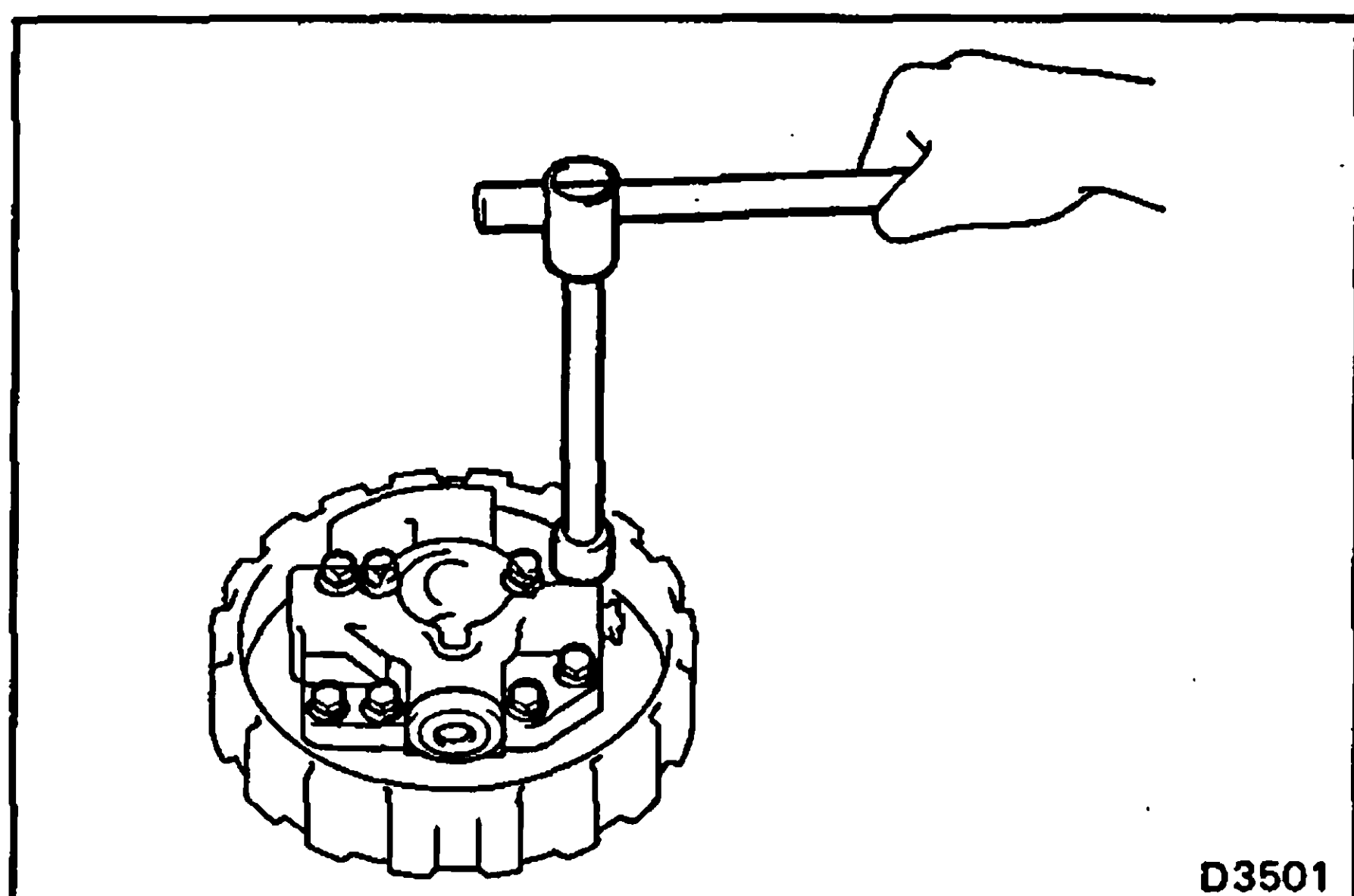
Install the oil strainer into the governor body.



D3511

### 4. INSTALL GOVERNOR BODY

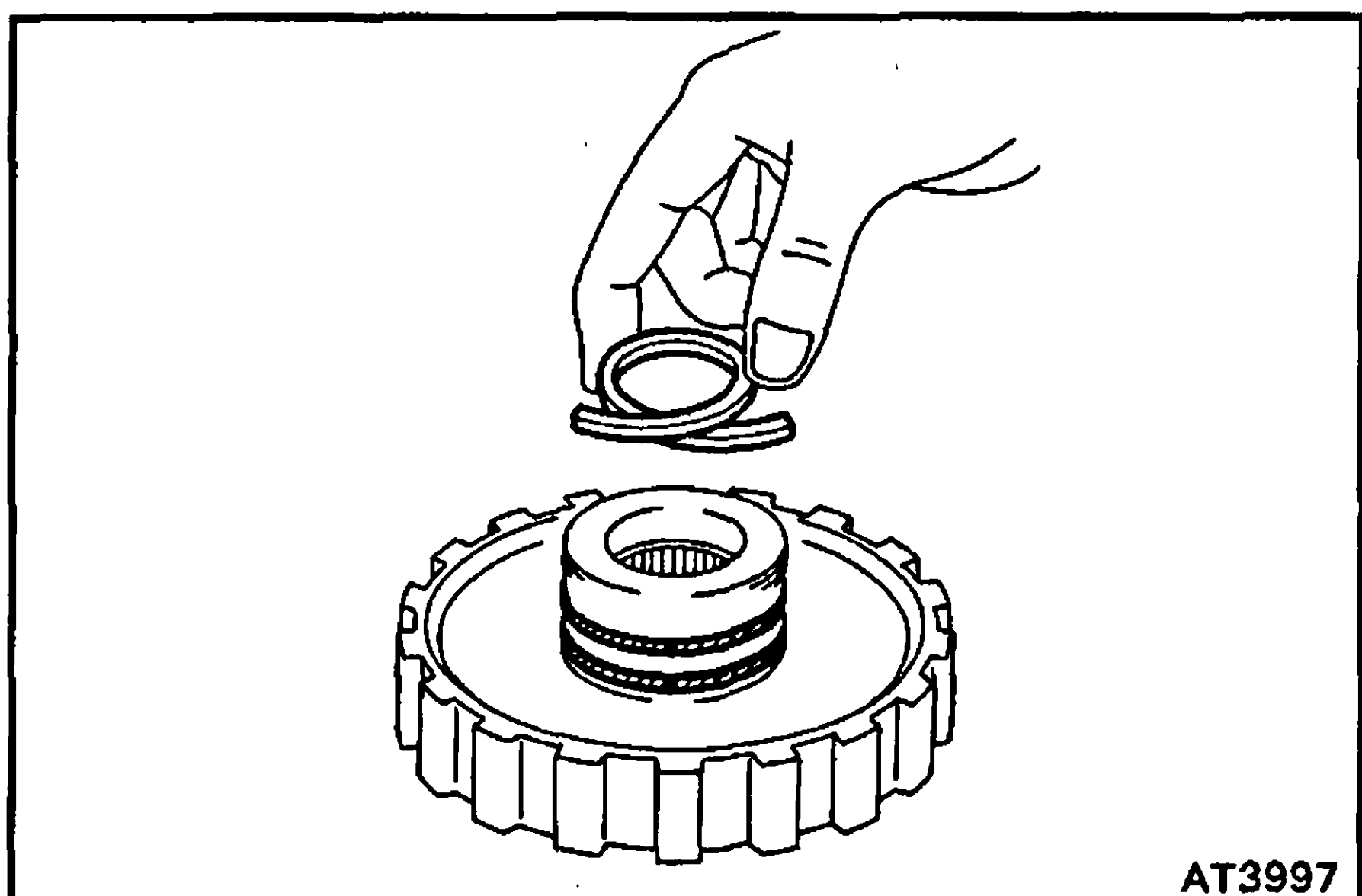
(a) Coat a new gasket with ATF, and install it to the body support.



D3501

(b) Temporarily install the governor body with the eight bolts. Do not torque the bolts yet.

HINT: Tighten the bolts after adjusting the clearance between the output shaft and governor body.



AT3997

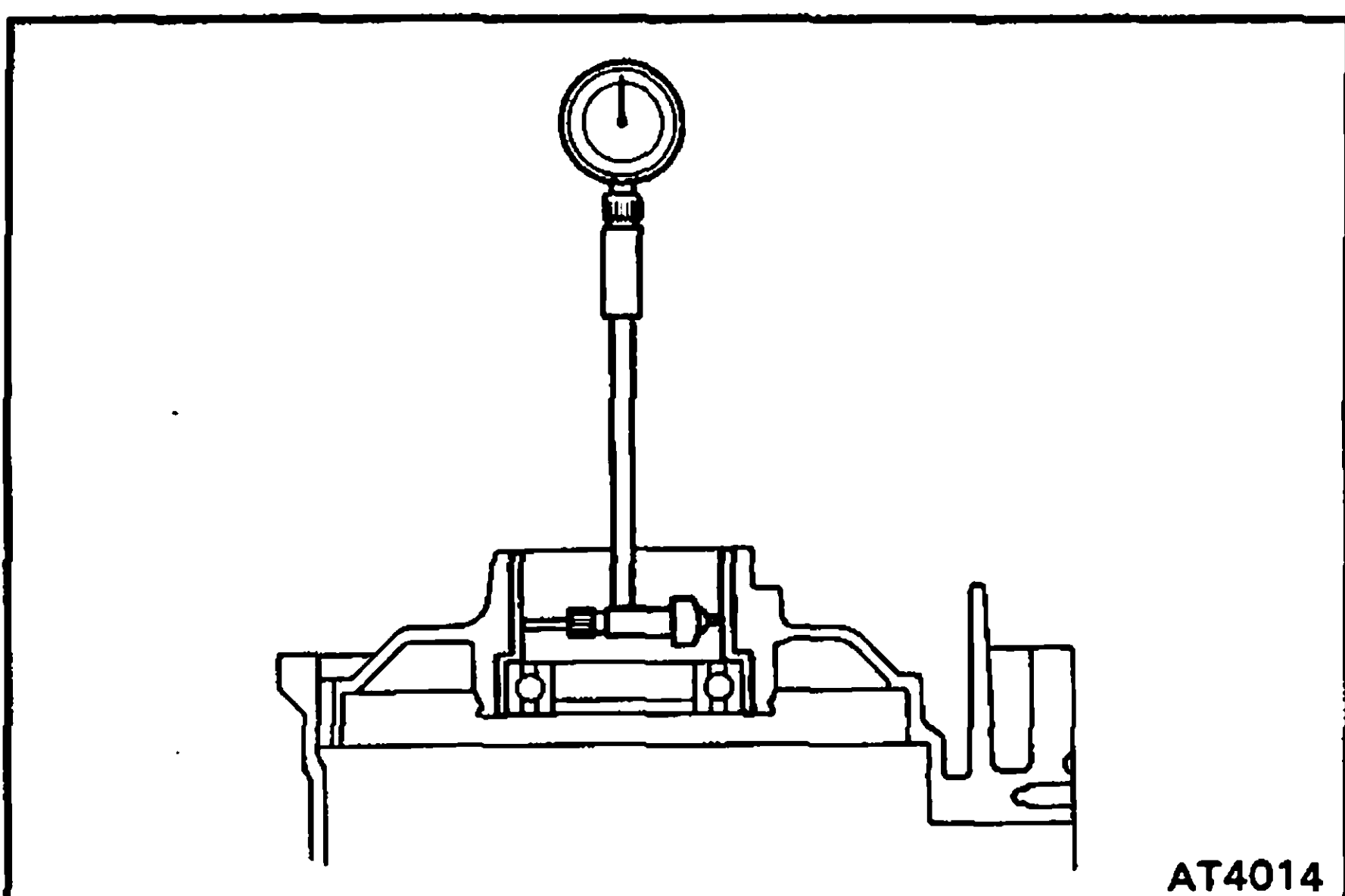
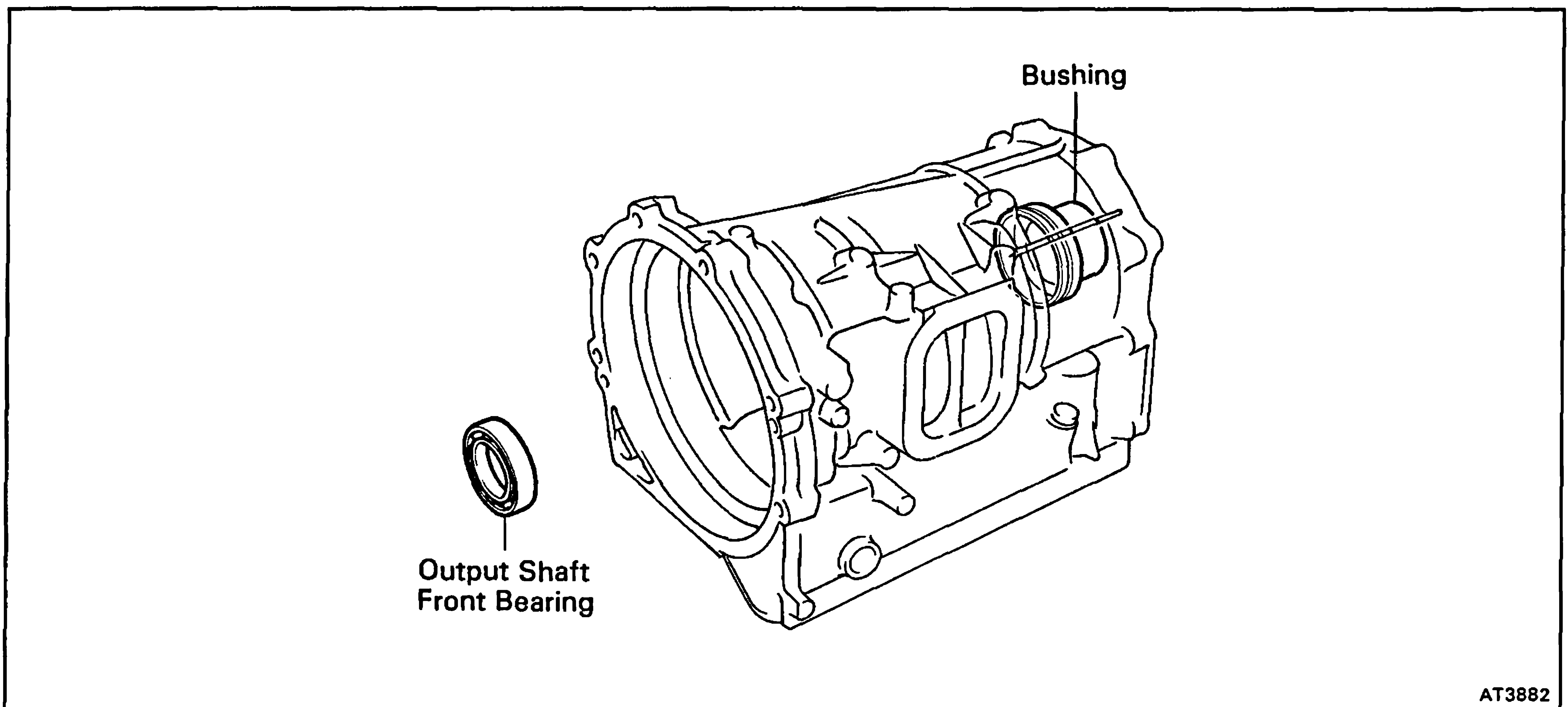
### 5. INSTALL OIL SEAL RINGS

Coat the three oil seal rings with ATF, and install them to the body support.

**NOTICE:** Do not spread the ring end more than necessary.

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

## Transmission Case COMPONENTS



### INSPECTION OF TRANSMISSION CASE

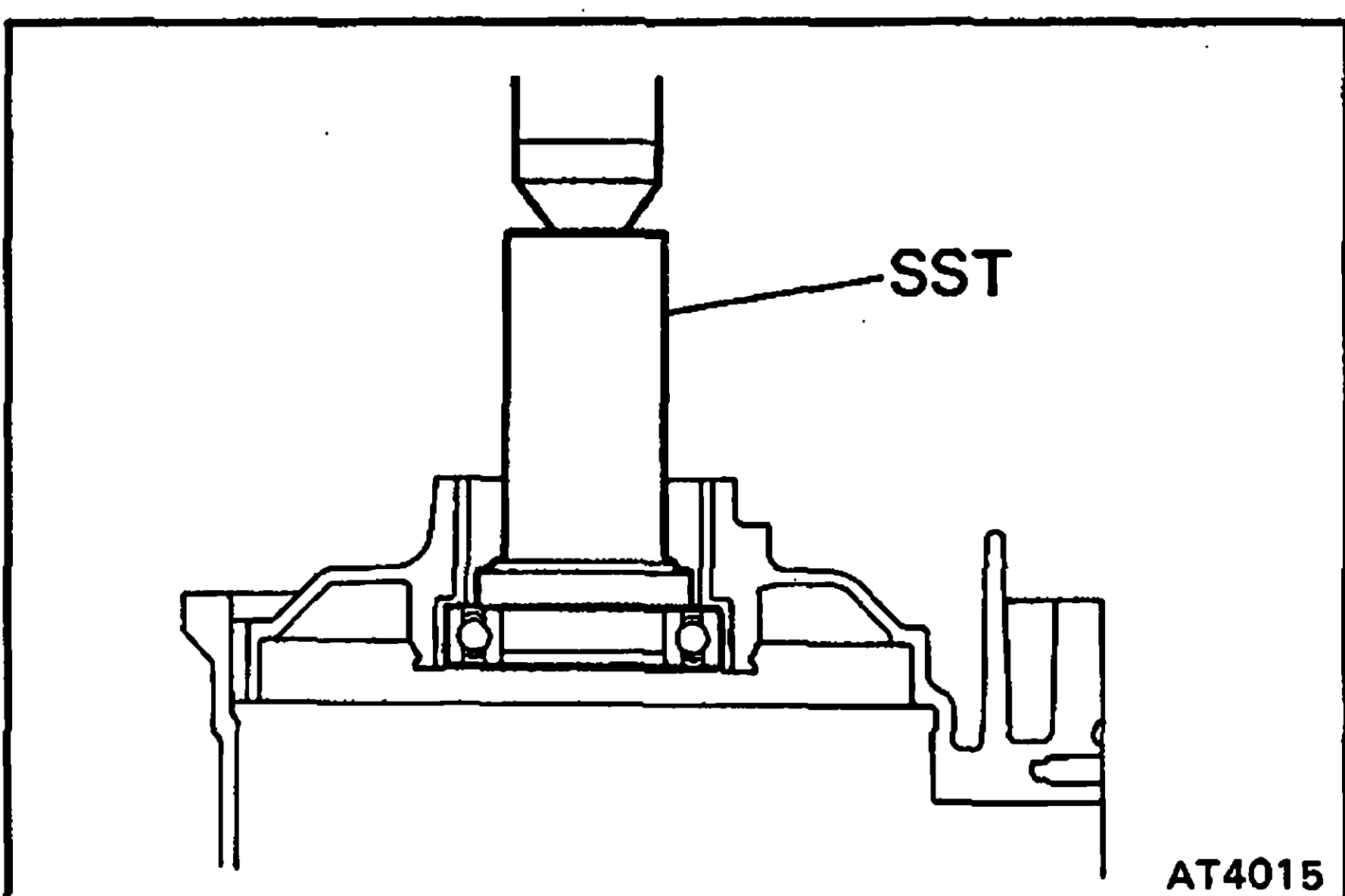
#### 1. INSPECT BUSHING OF TRANSMISSION CASE

Using a cylinder gauge, measure the inside diameter of the transmission case rear bushing.

**Standard inside diameter:** 64.000 — 64.050 mm  
(2.5197 — 2.5216 in.)

**Maximum inside diameter:** 64.10 mm (2.5236 in.)

If the inside diameter is greater than the maximum, replace the transmission case.

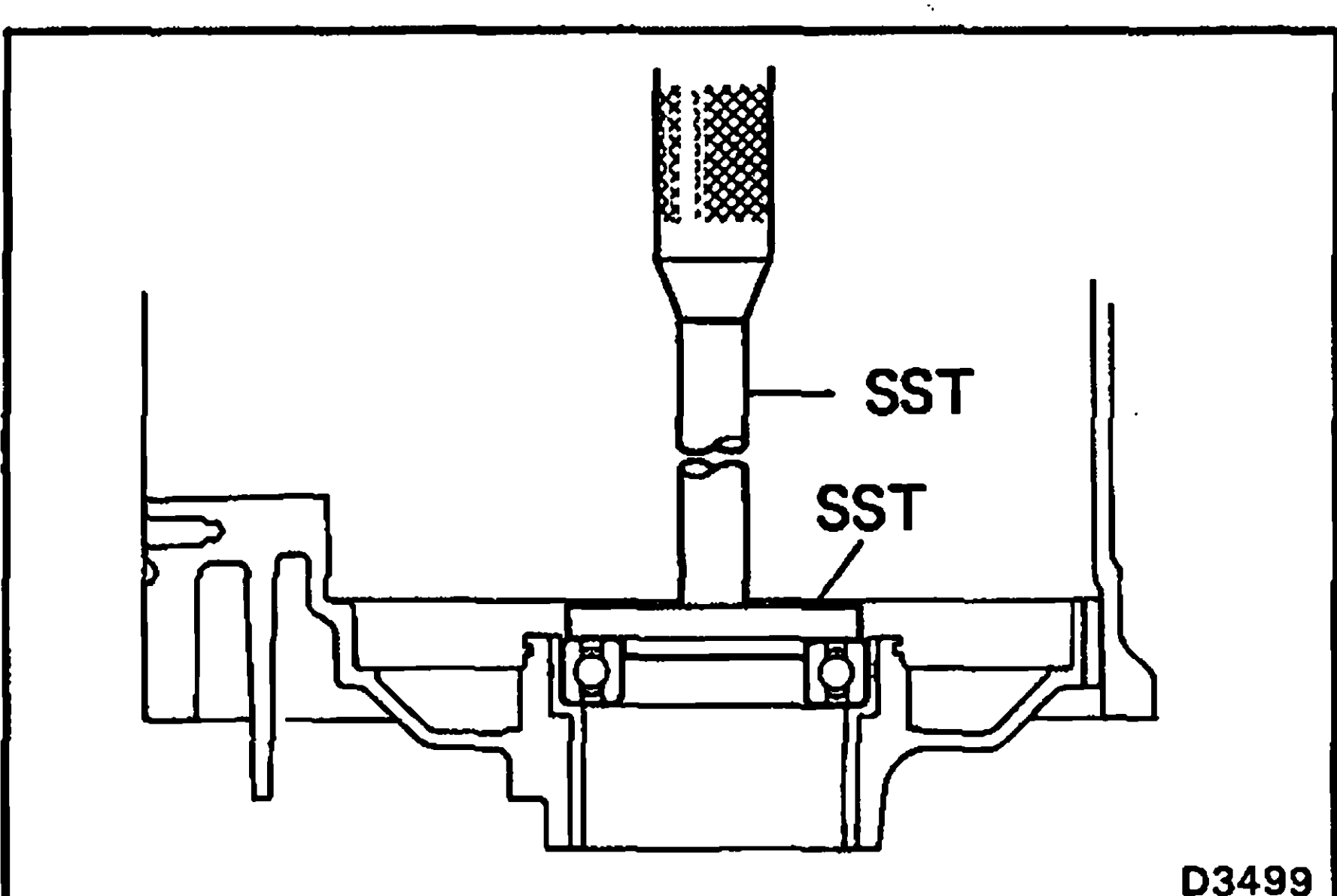


#### 2. IF NECESSARY, REPLACE OUTPUT SHAFT FRONT BEARING

(a) Using SST and a press, press out the bearing.  
SST 09350-36010 (09350-06040)

(b) Using SST and a press, press in a new bearing.  
SST 09350-36010 (09350-06050, 09350-06060)

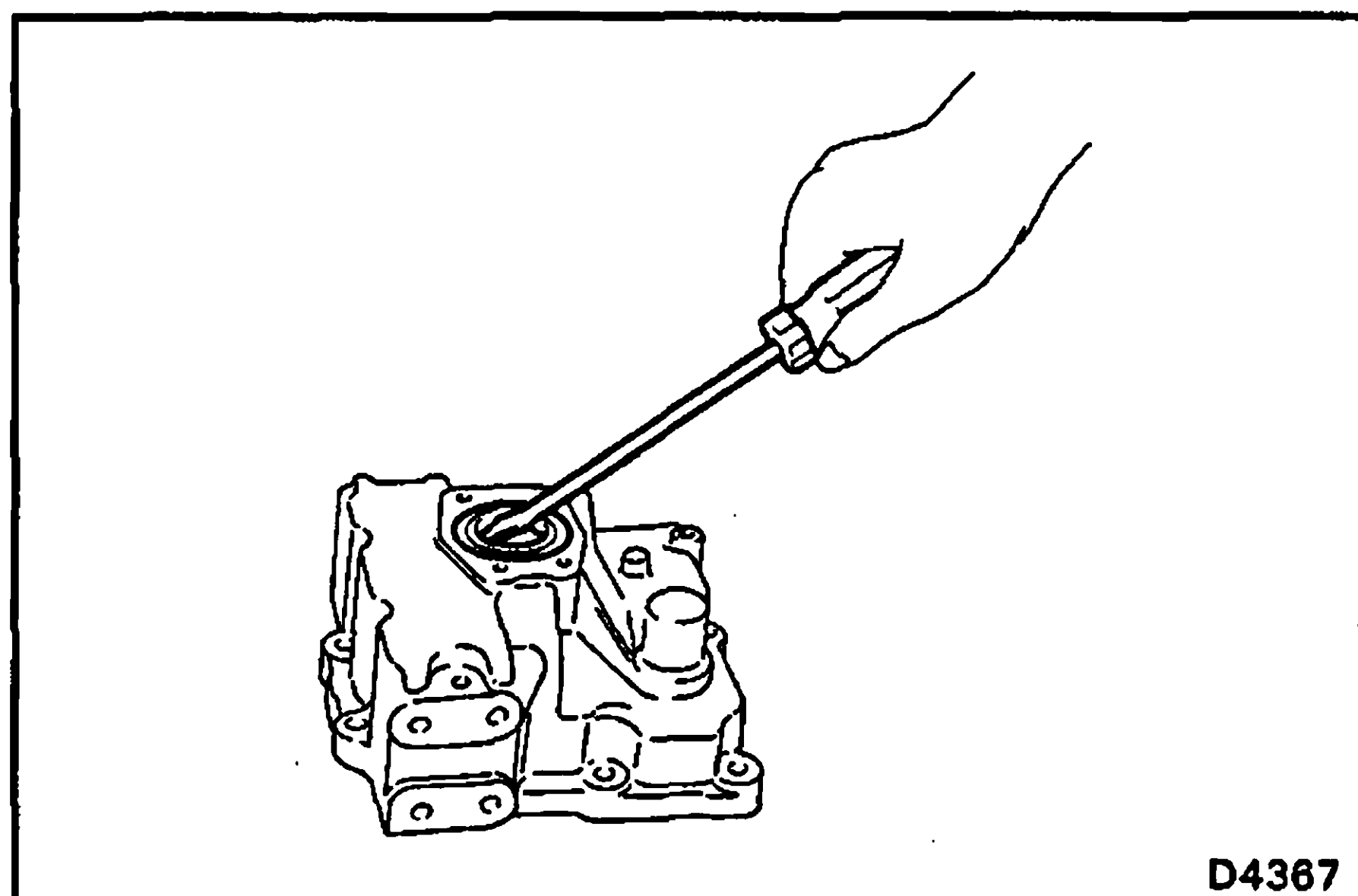
(c) Check that the bearing rotates smoothly.



## Extension Housing (A441L)

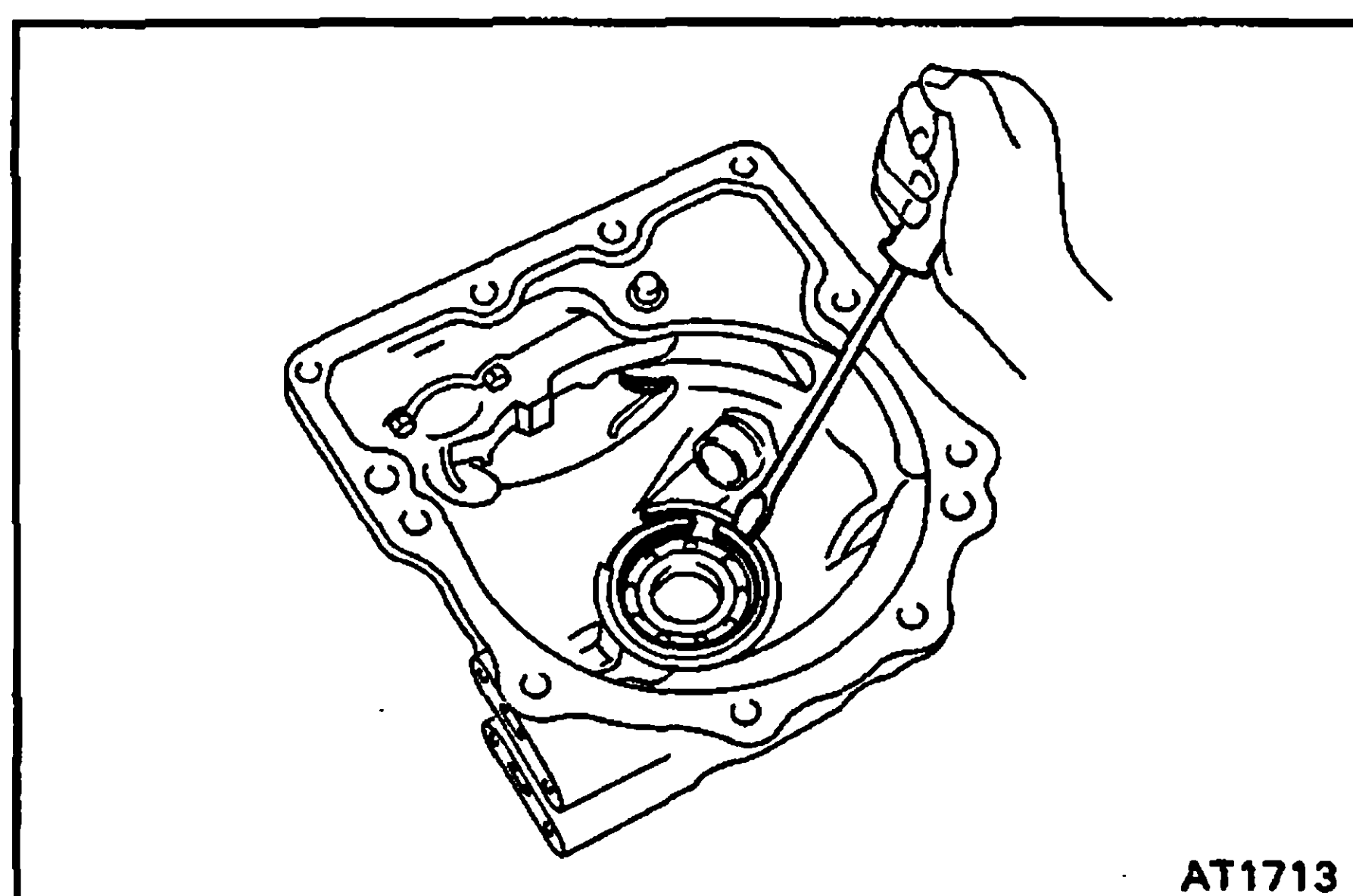
### 1. REMOVE OIL SEAL

Using a screwdriver, remove the oil seal.



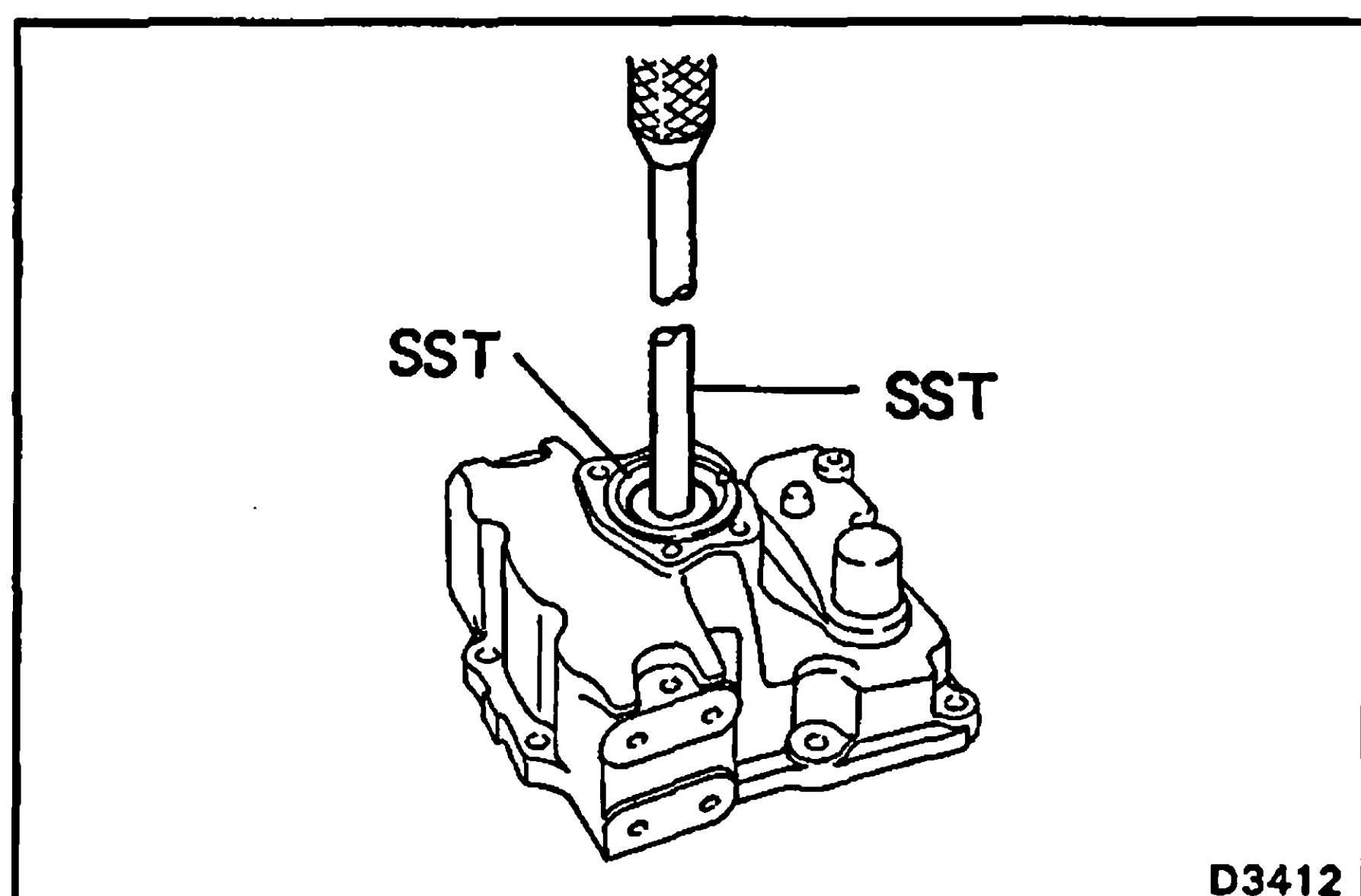
### 2. REMOVE OUTPUT SHAFT REAR BEARING

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



(b) Using SST, press out the bearing from the extension housing.

SST 09350-36010 (09350-06050, 09350-06070)



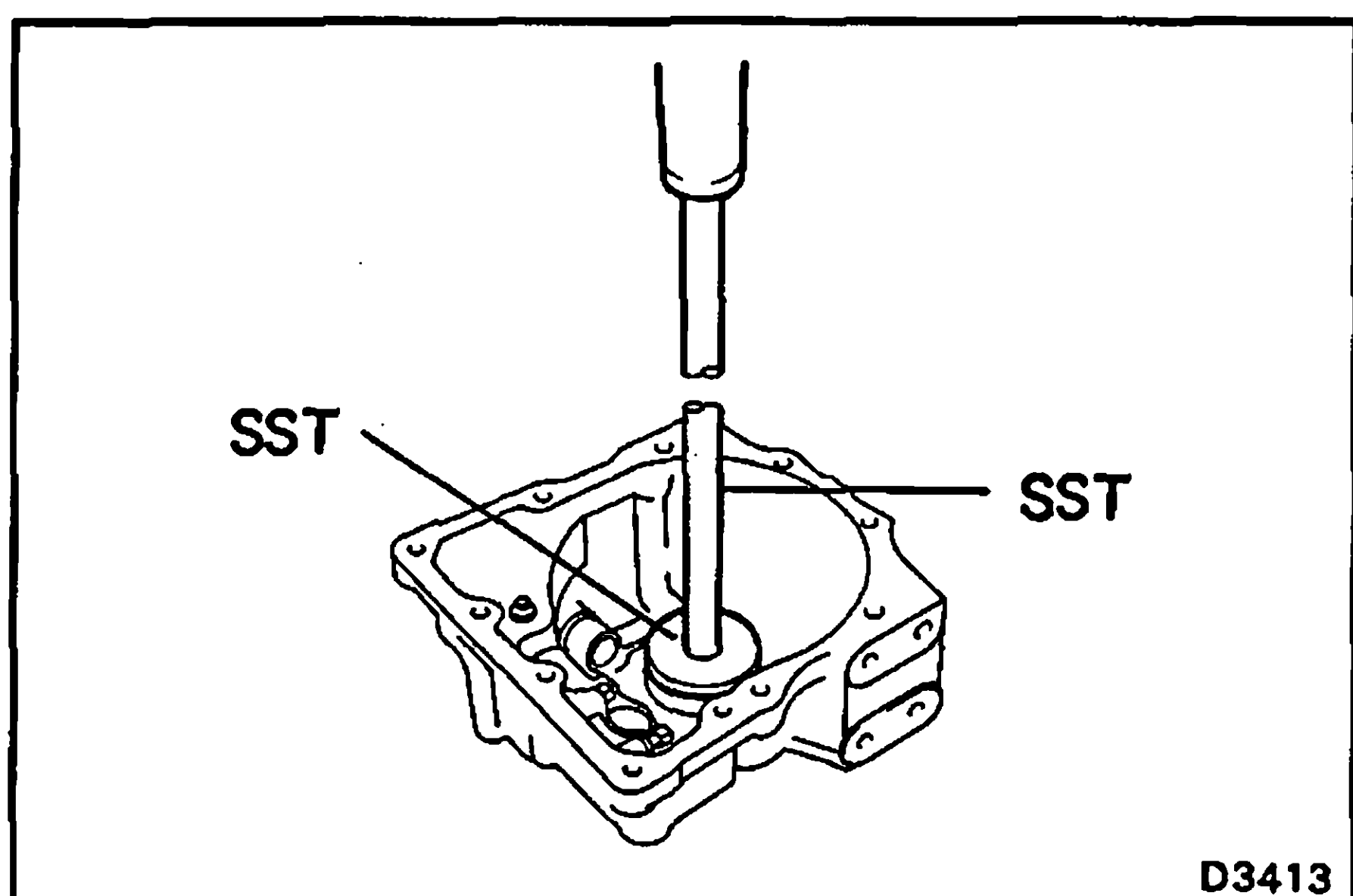
### 3. INSTALL OUTPUT SHAFT REAR BEARING

(a) Using SST, press the bearing into the extension housing.

SST 09350-36010 (09350-06050, 09350-06070)

(b) Install the snap ring.

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



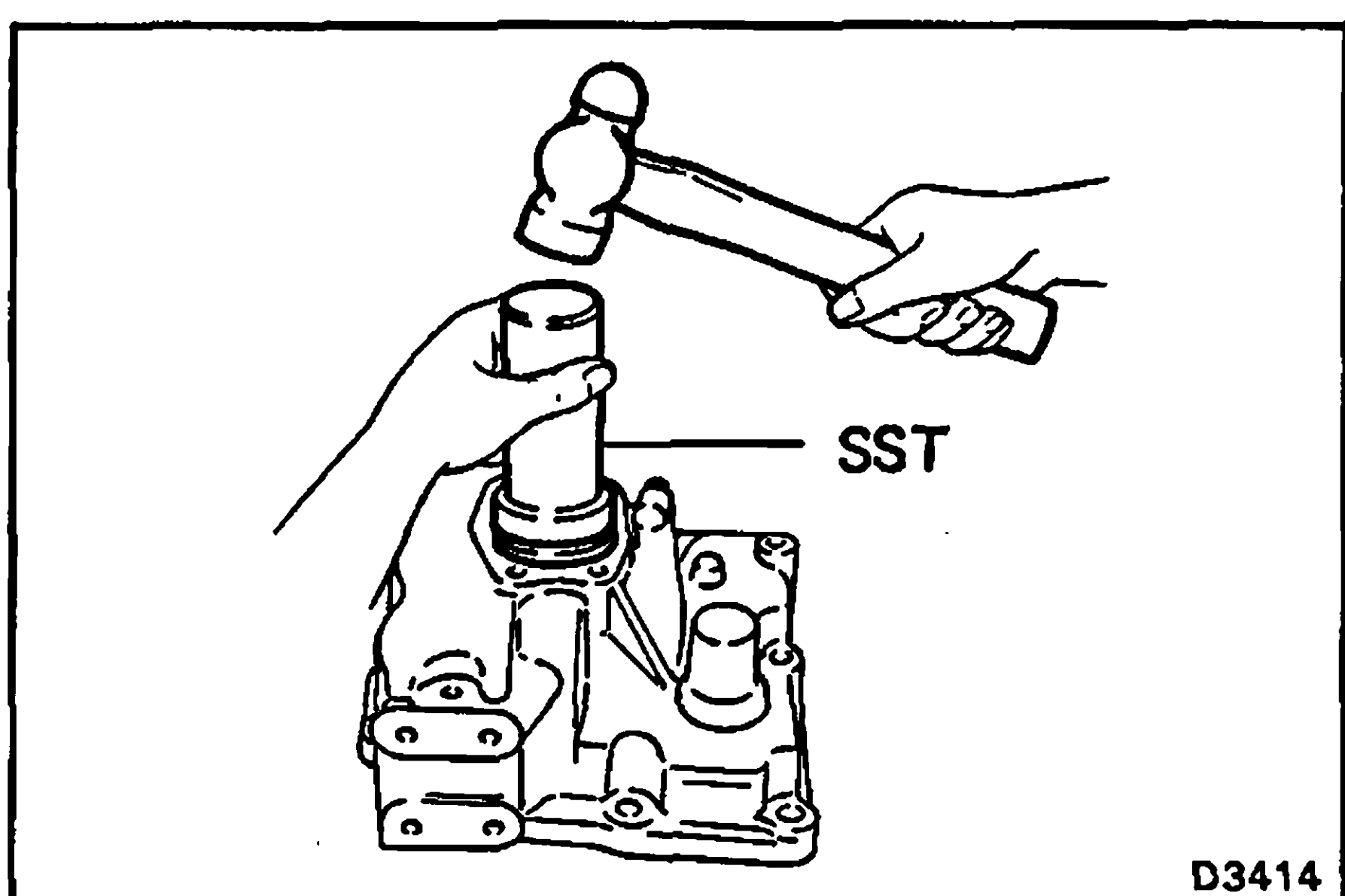
### 4. INSTALL NEW OIL SEAL

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

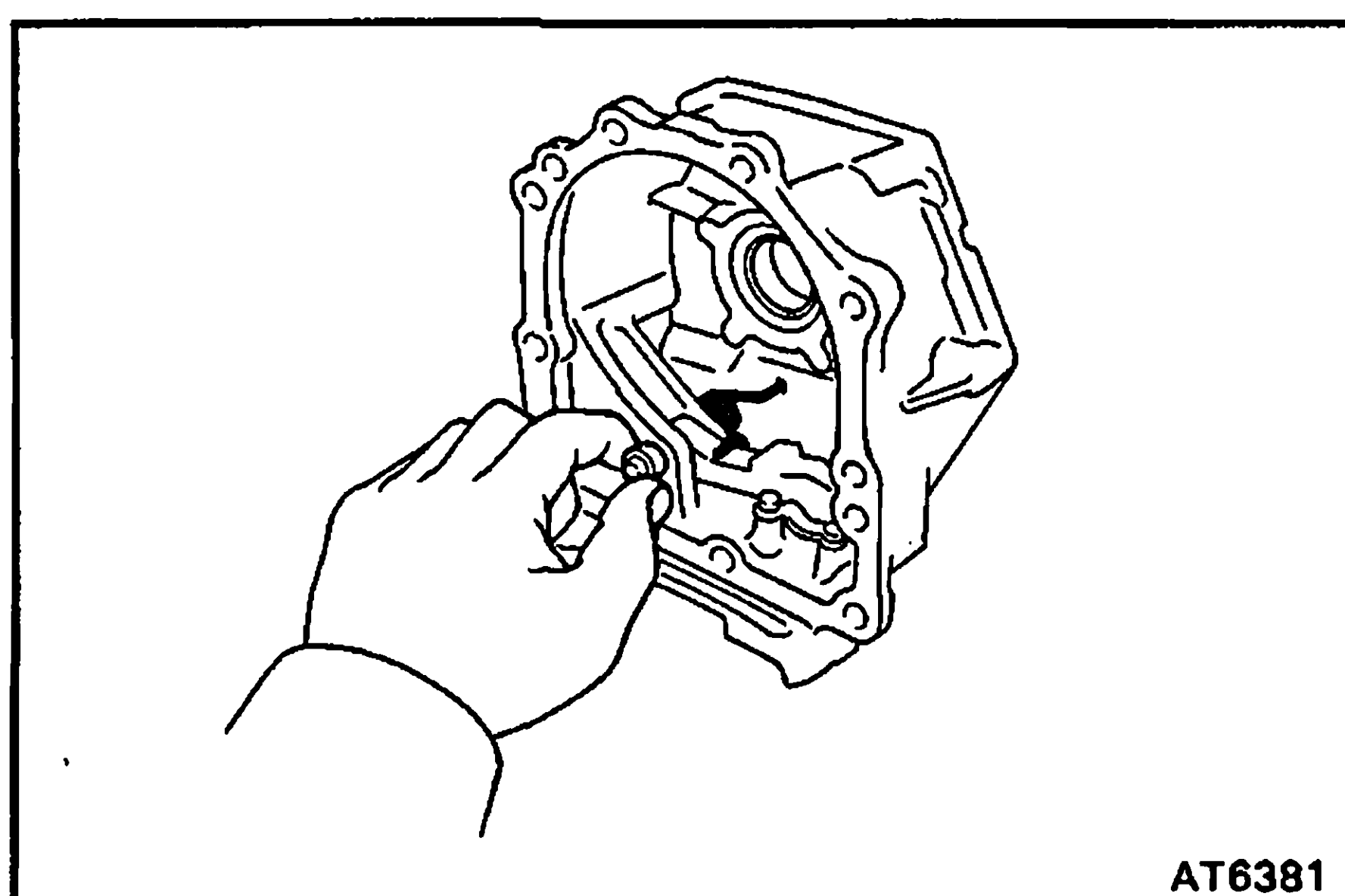
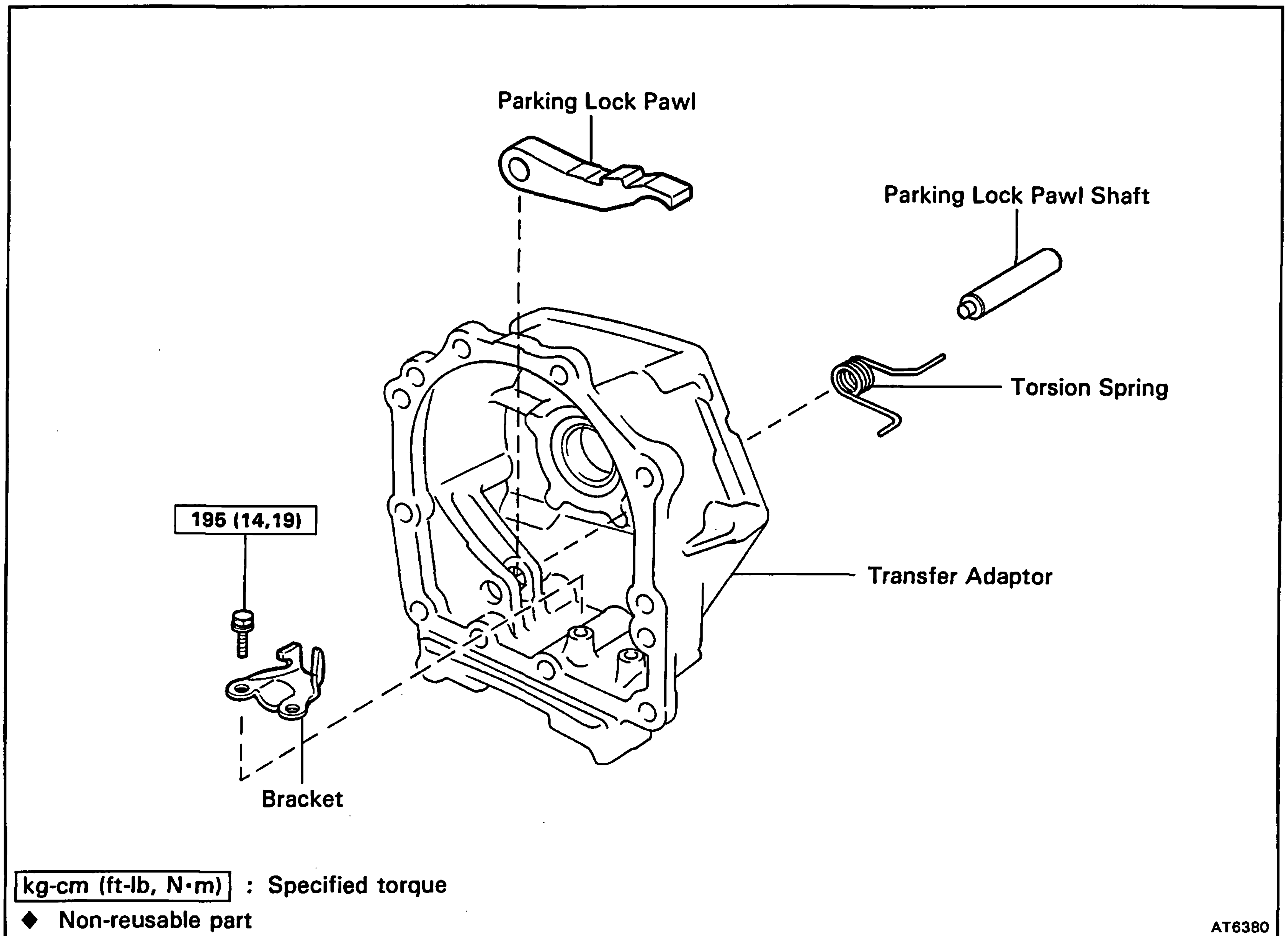
(b) Using SST, drive in the oil seal.

The oil seal end should be flush with the outer edge of the extension housing.

SST 09350-36010 (09350-06040)



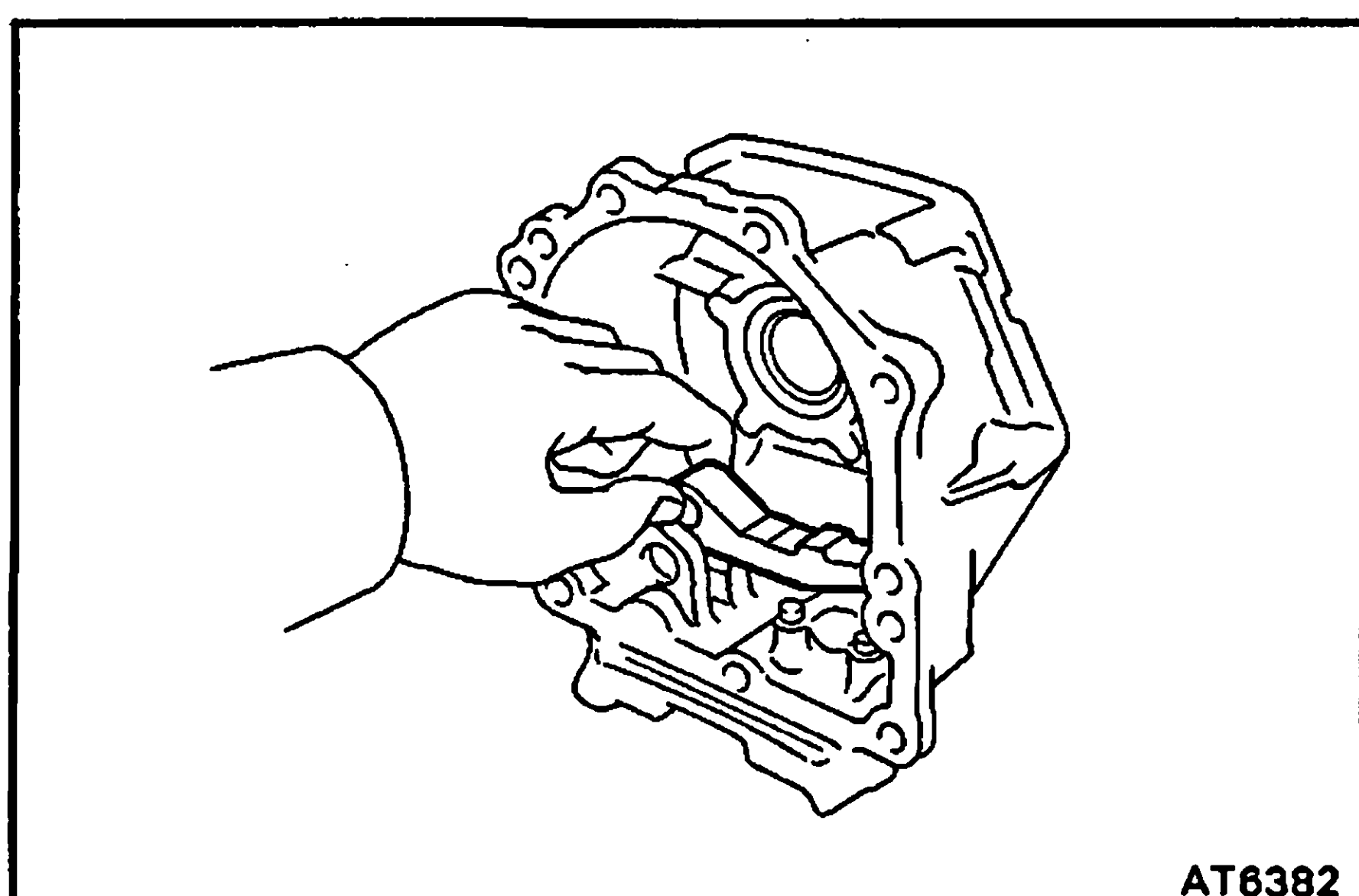
## Parking Lock Pawl (A440F, A442F) COMPONENTS



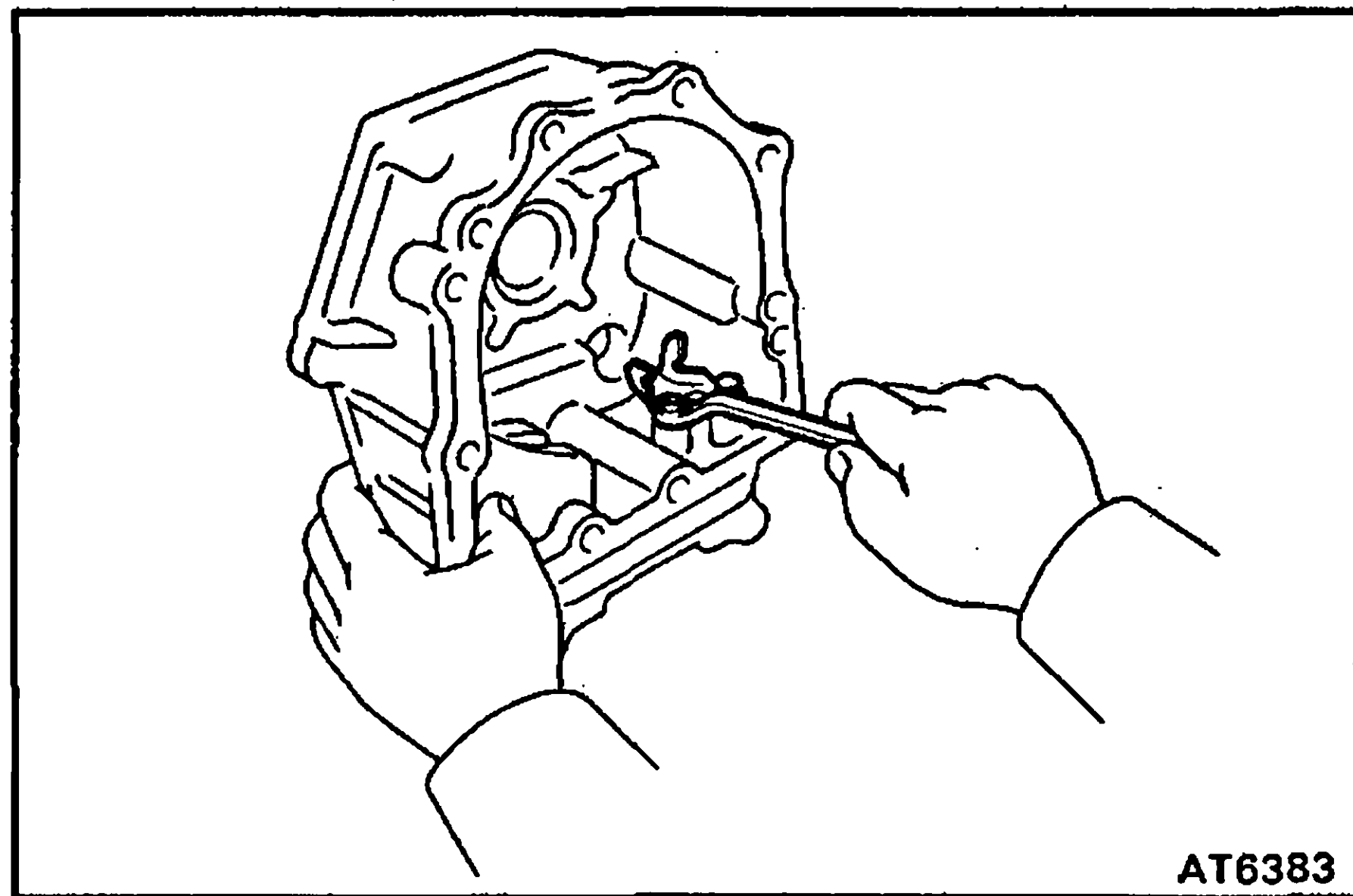
### DISASSEMBLY OF PARKING LOCK PAWL

#### 1. REMOVE PARKING LOCK PAWL SHAFT

Remove the pawl shaft and spring.

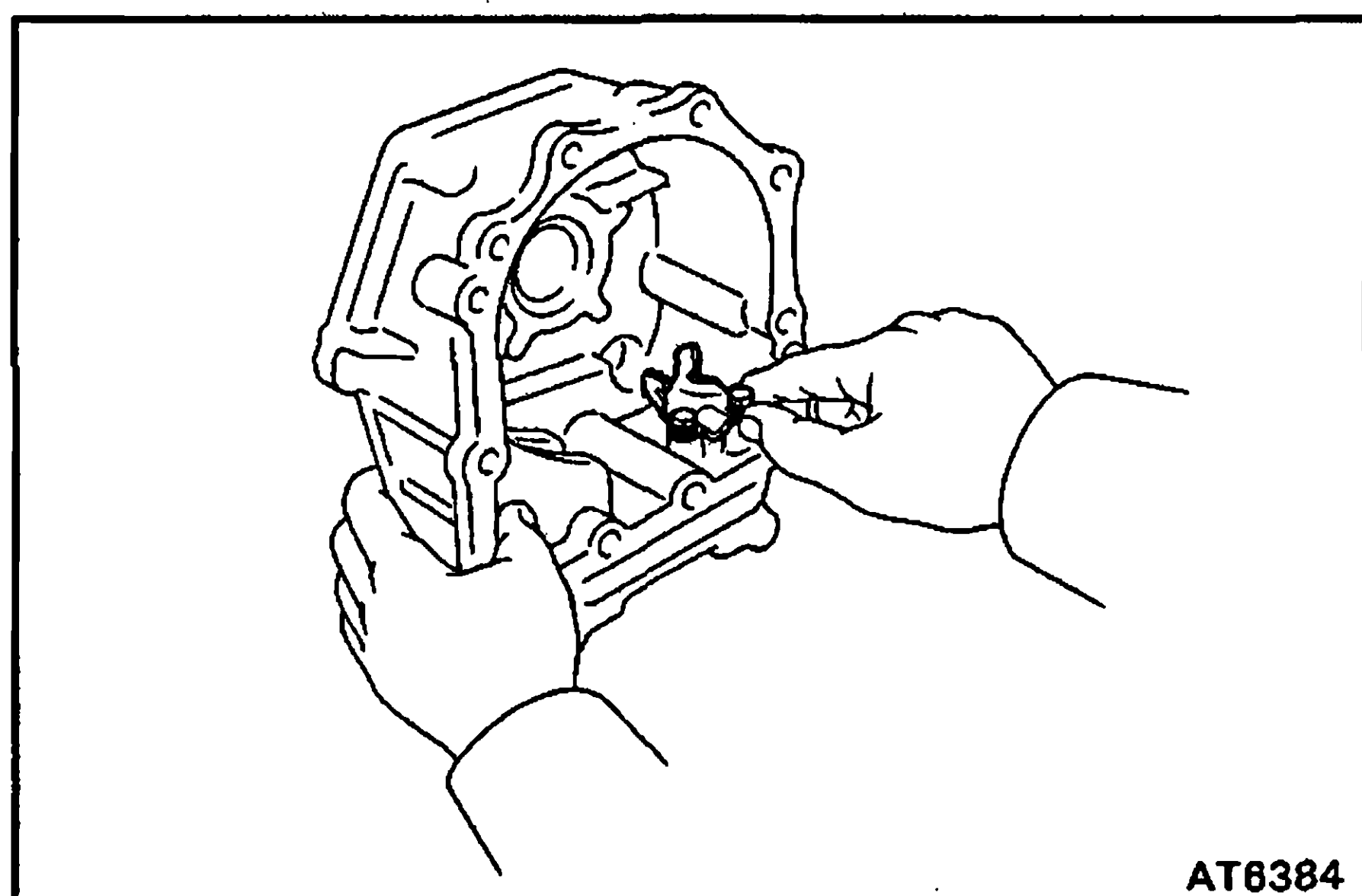


#### 2. REMOVE PARKING LOCK PAWL



### 3. REMOVE PARKING LOCK PAWL BRACKET

Remove the two bolts and pawl bracket.



## ASSEMBLY OF PARKING LOCK PAWL

### 1. INSTALL PARKING LOCK PAWL BRACKET

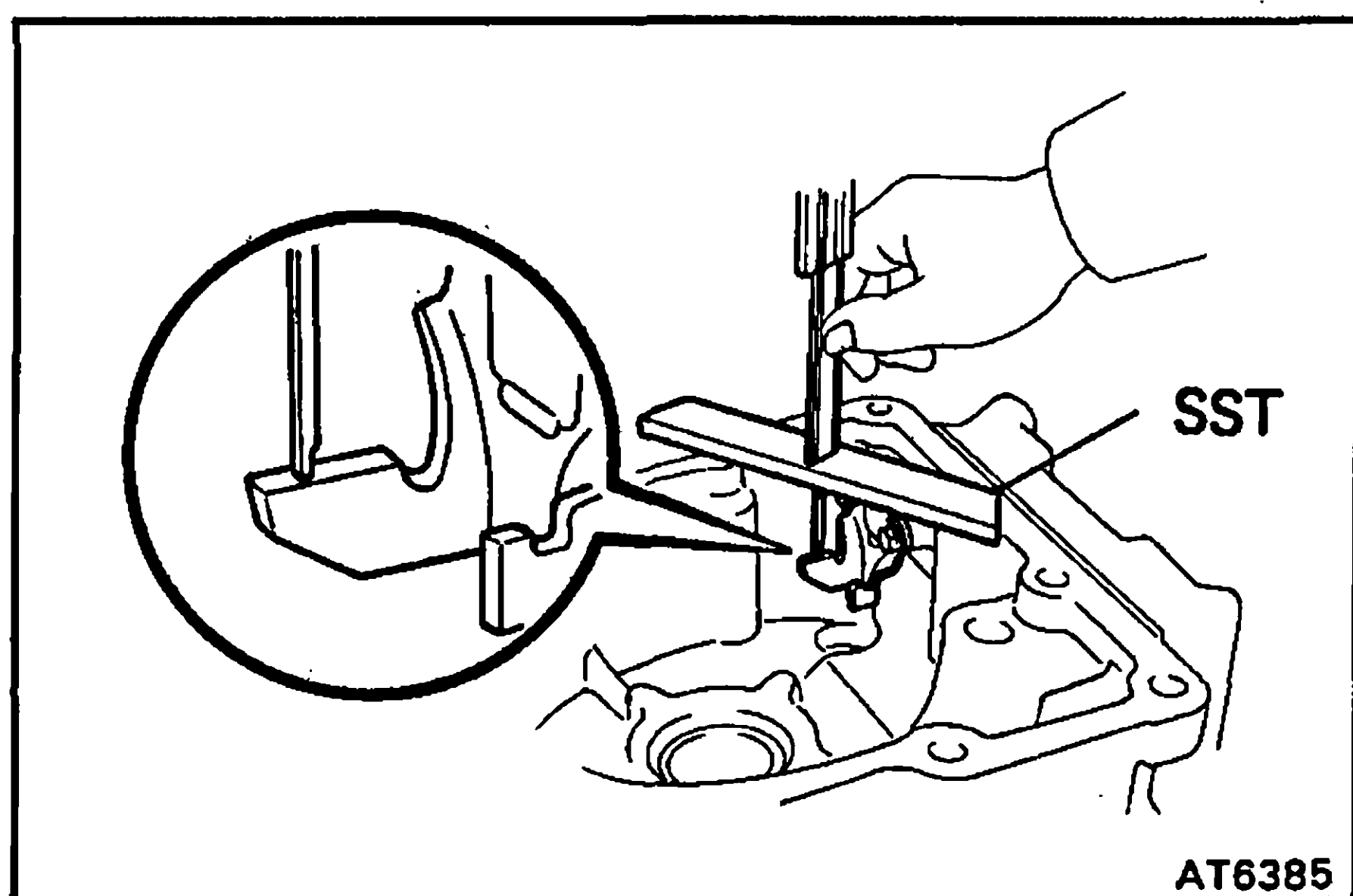
(a) Temporarily install the pawl bracket with the two bolts.

(b) Using SST and calipers, set the pawl bracket so that the distance between the transfer adaptor surface and the top of the bracket tab is specified distance.

**Standard distance = Total distance - SST thickness**

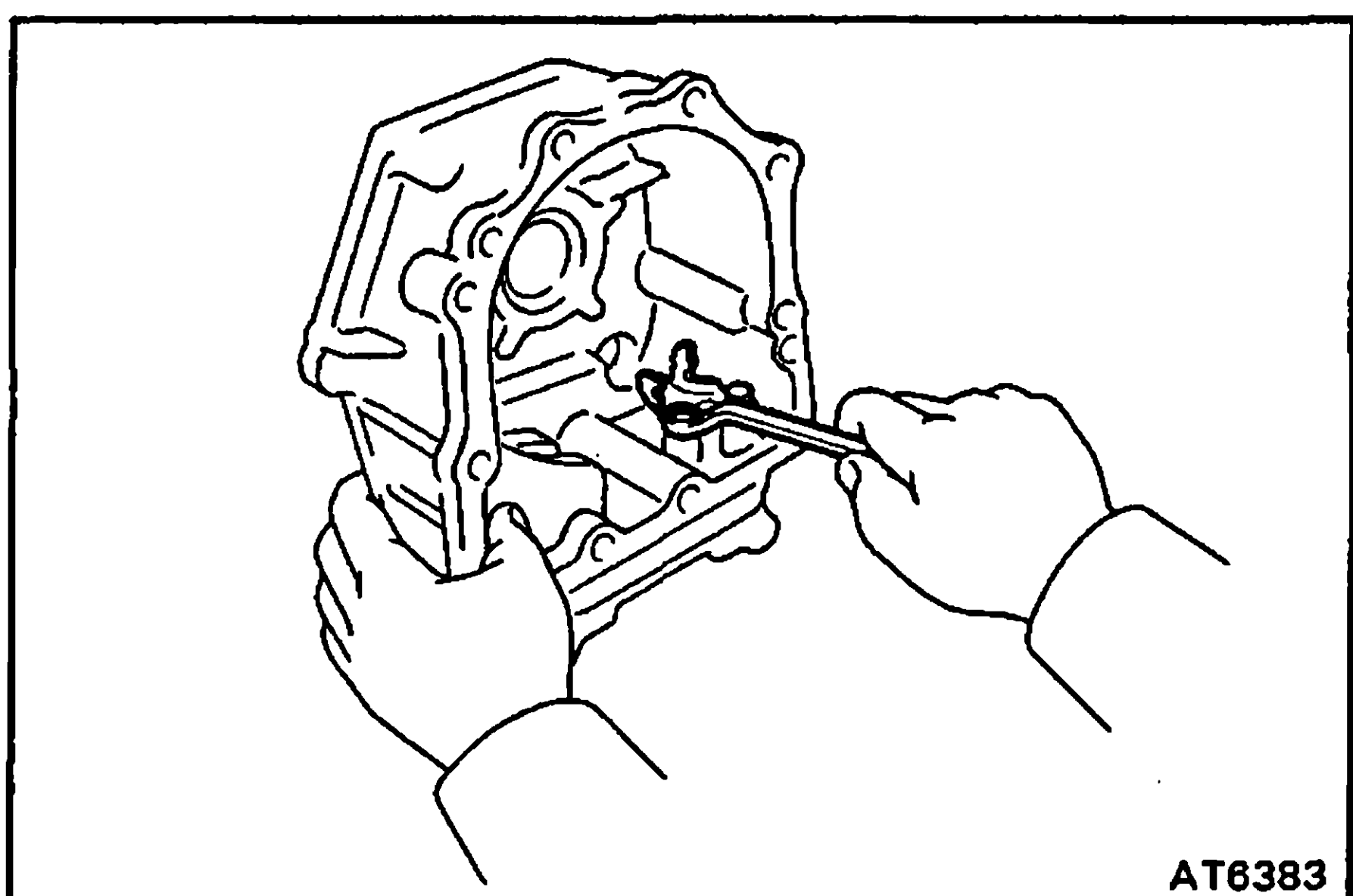
**Standard distance: 47.5 – 47.6 mm  
(1.870 – 1.874 in.)**

**SST 09350-36010 (09350-06090)**

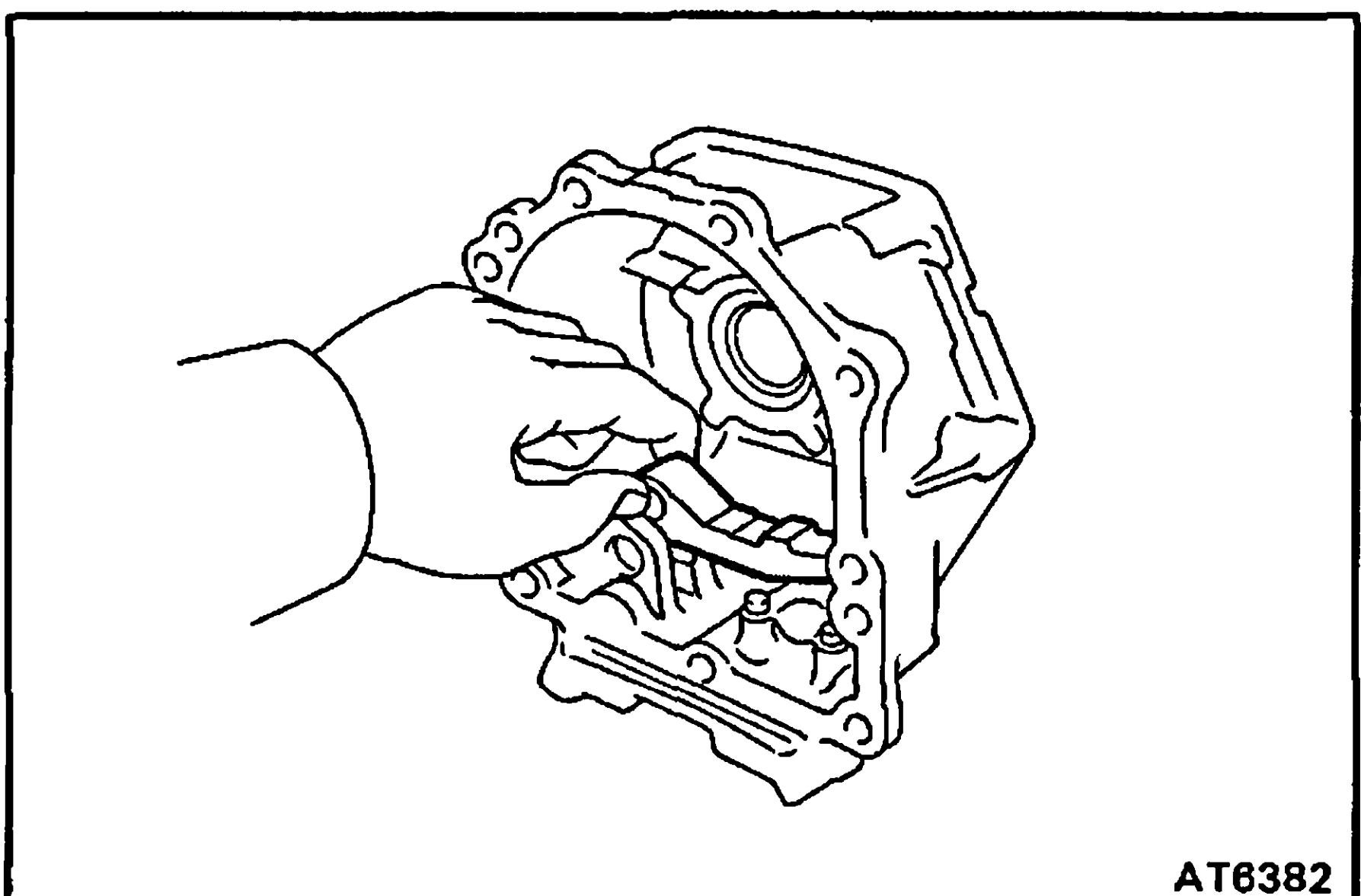


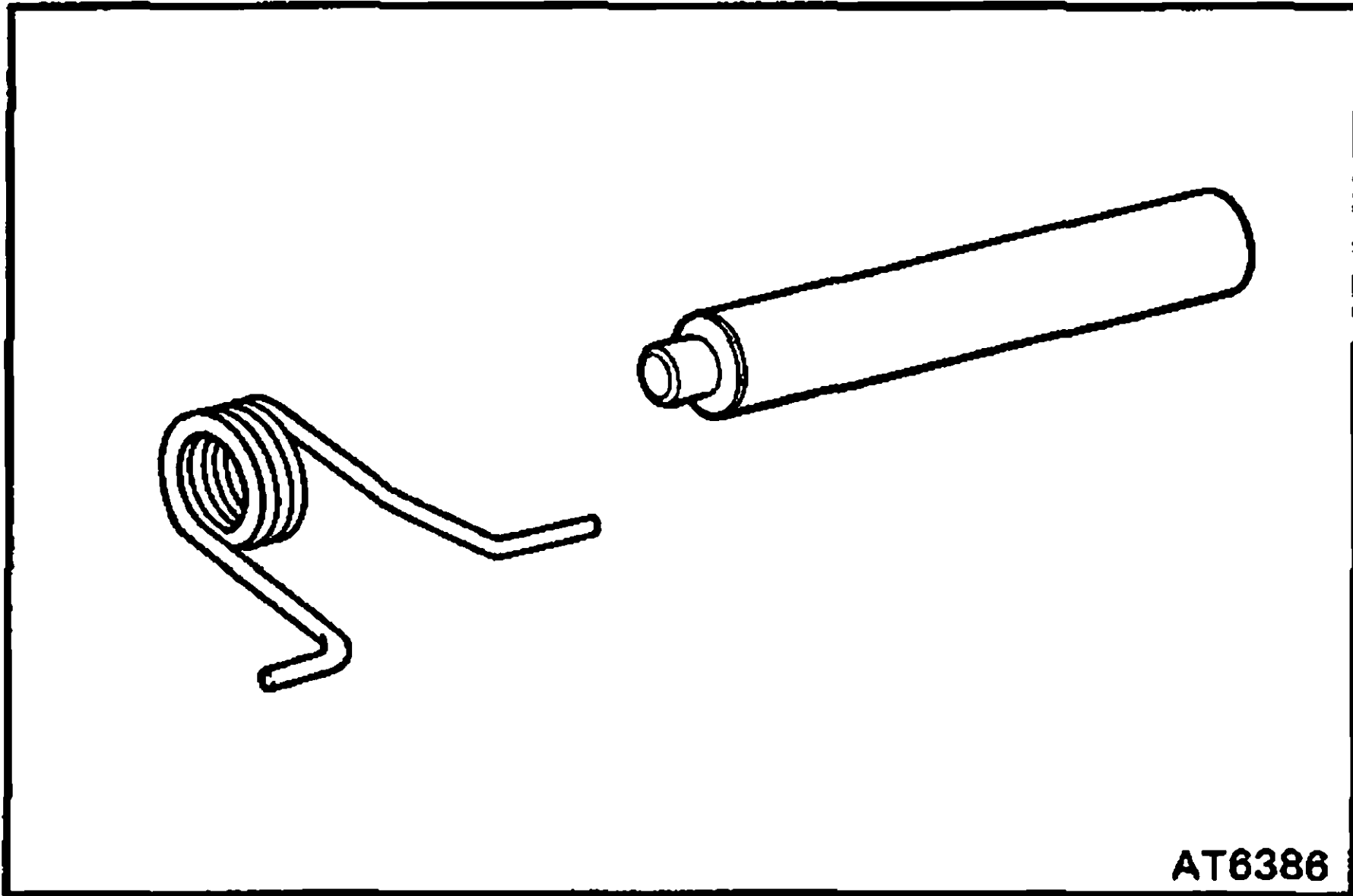
(c) Tighten the bolts.

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

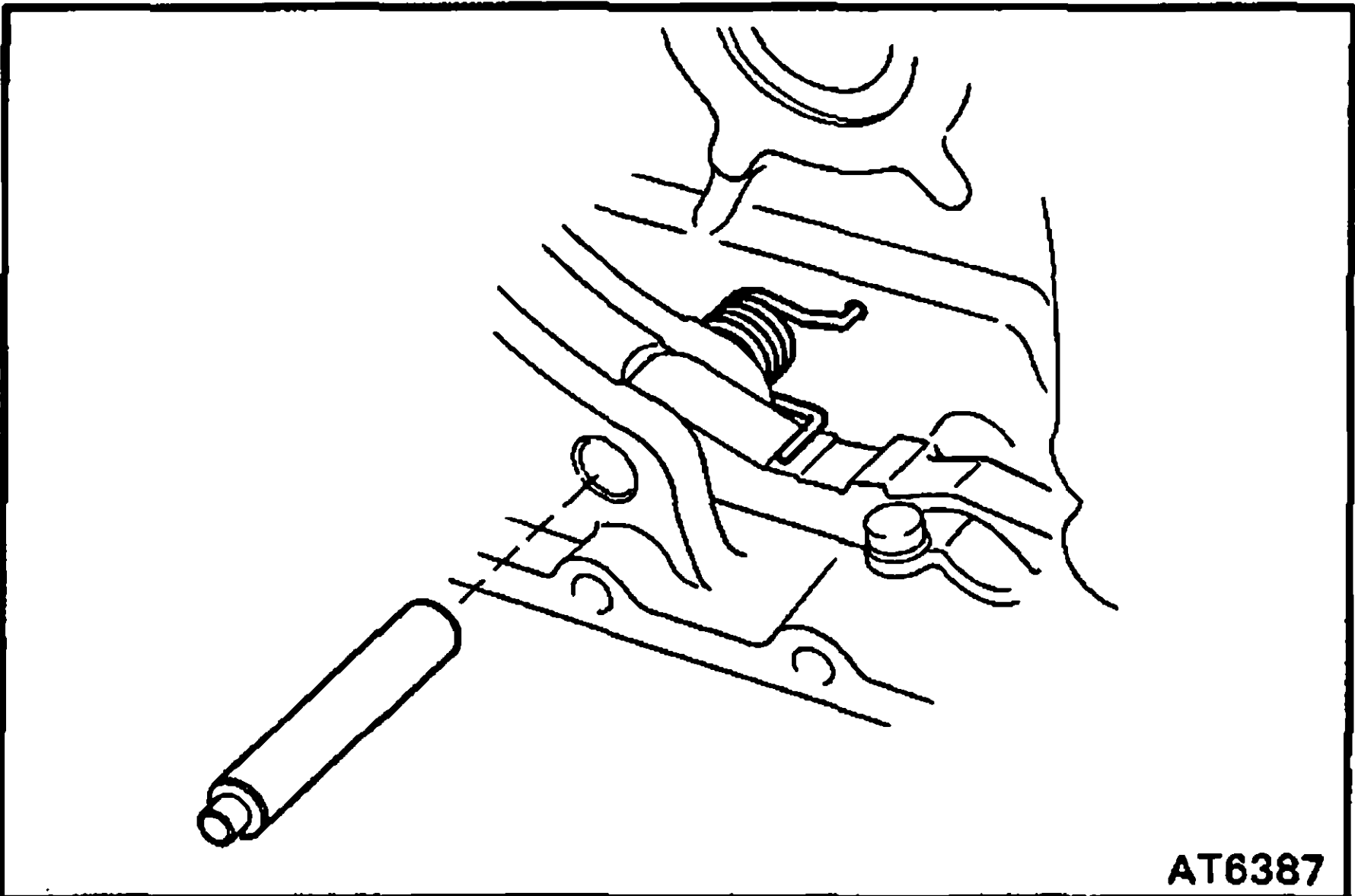


### 2. INSTALL PARKING LOCK PAWL

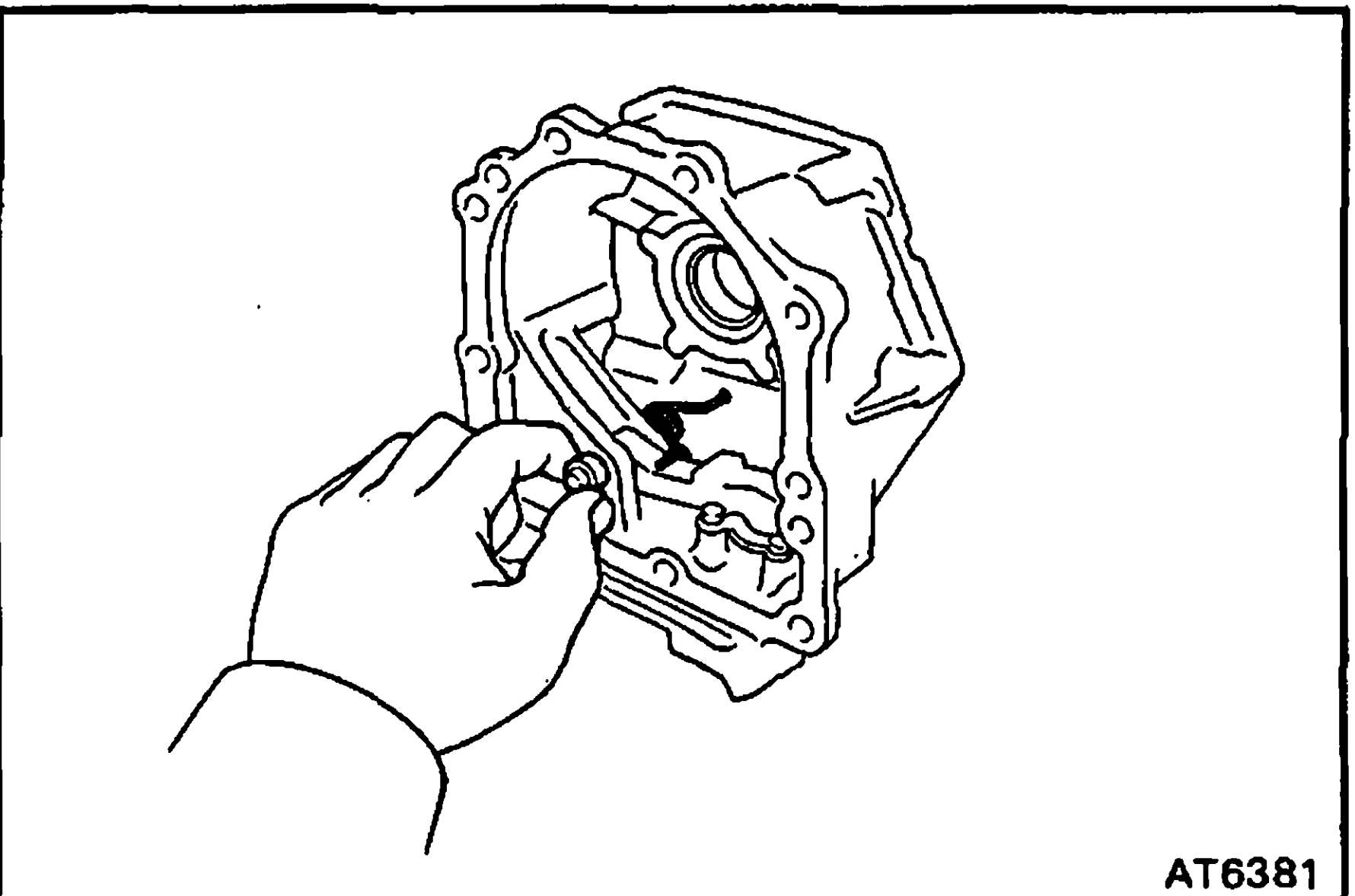


**3. INSTALL PARKING LOCK PAWL SHAFT**

(a) Install the spring to the pawl shaft.



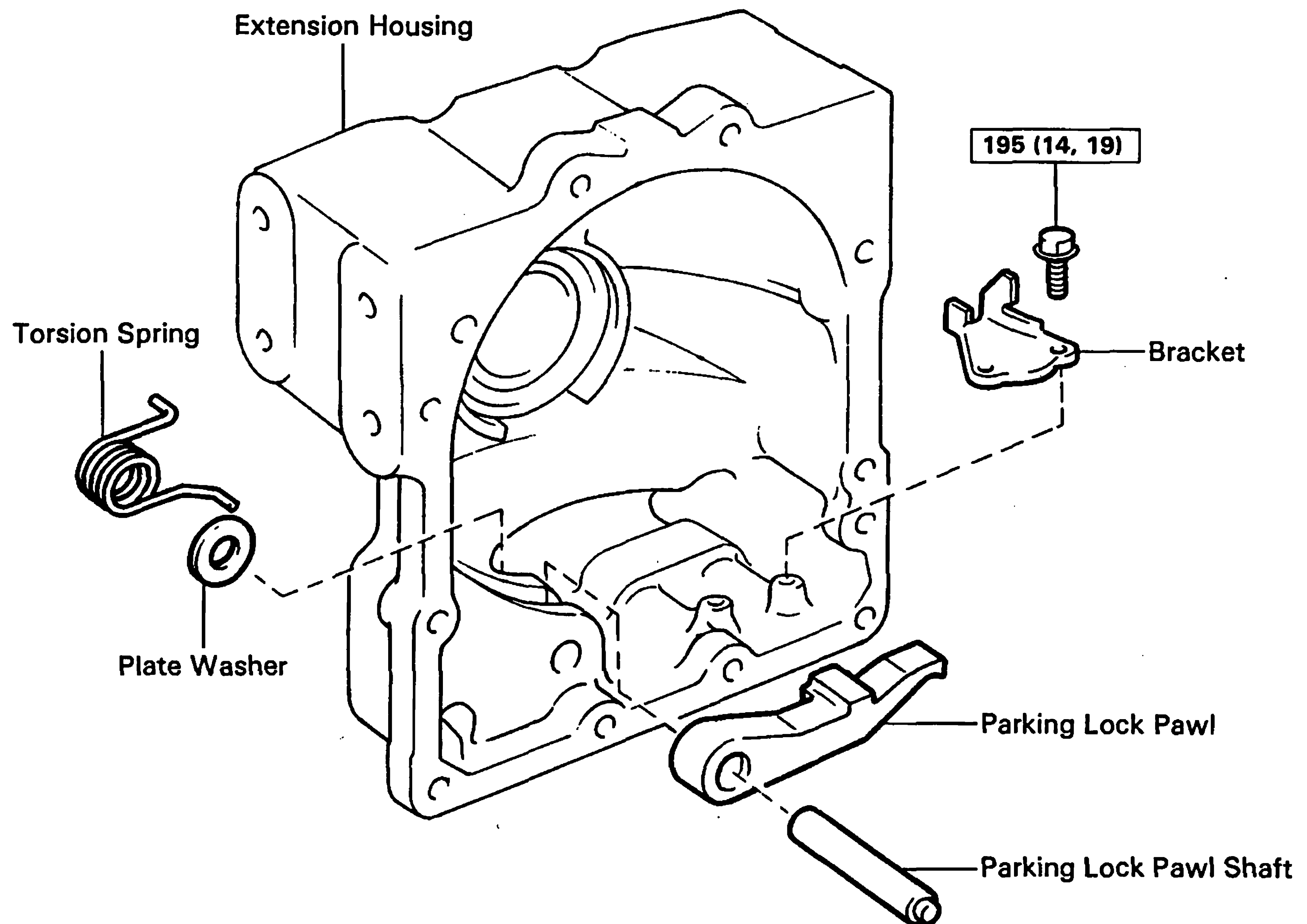
(b) Insert the spring end to the hole of the transfer adaptor, and install the pawl shaft.



(c) Hold the pawl shaft, hook another spring end to the pawl with a screwdriver.

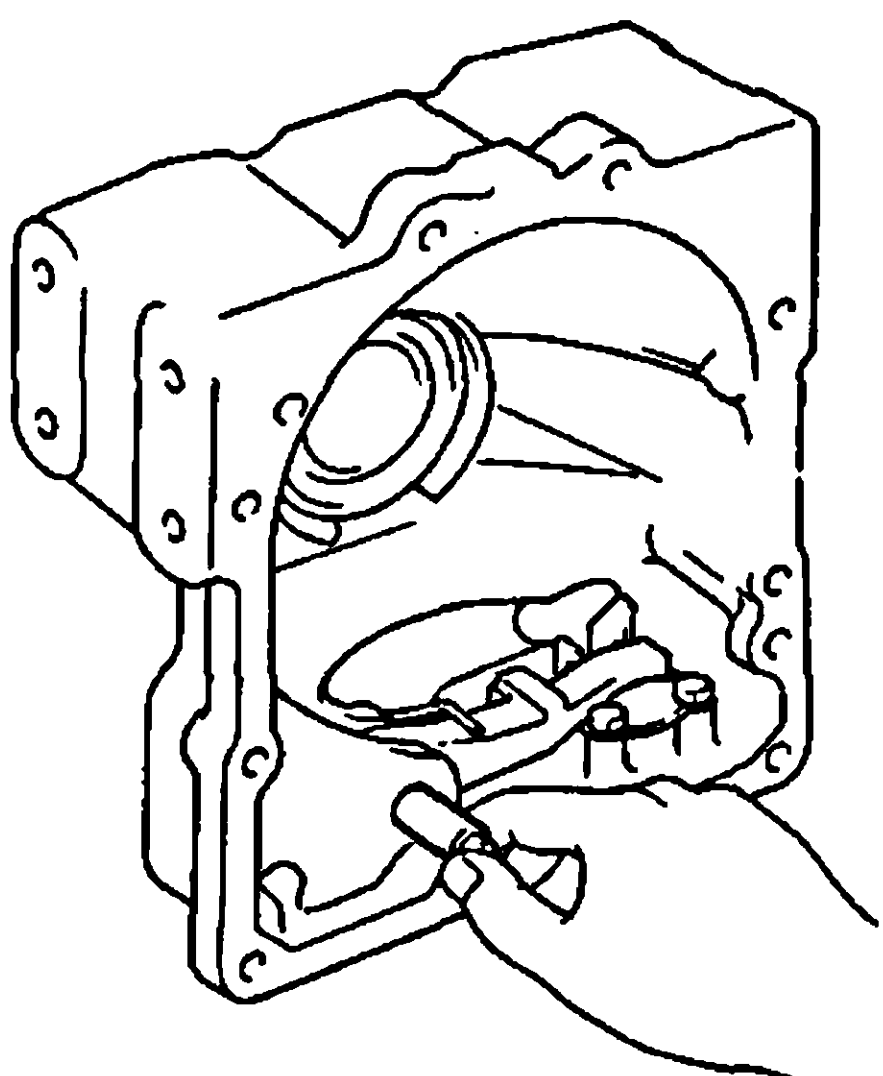
(d) Make sure the pawl moves smoothly.

## Parking Lock Pawl (A441L)



kg-cm (ft-lb, N·m) : Specified torque

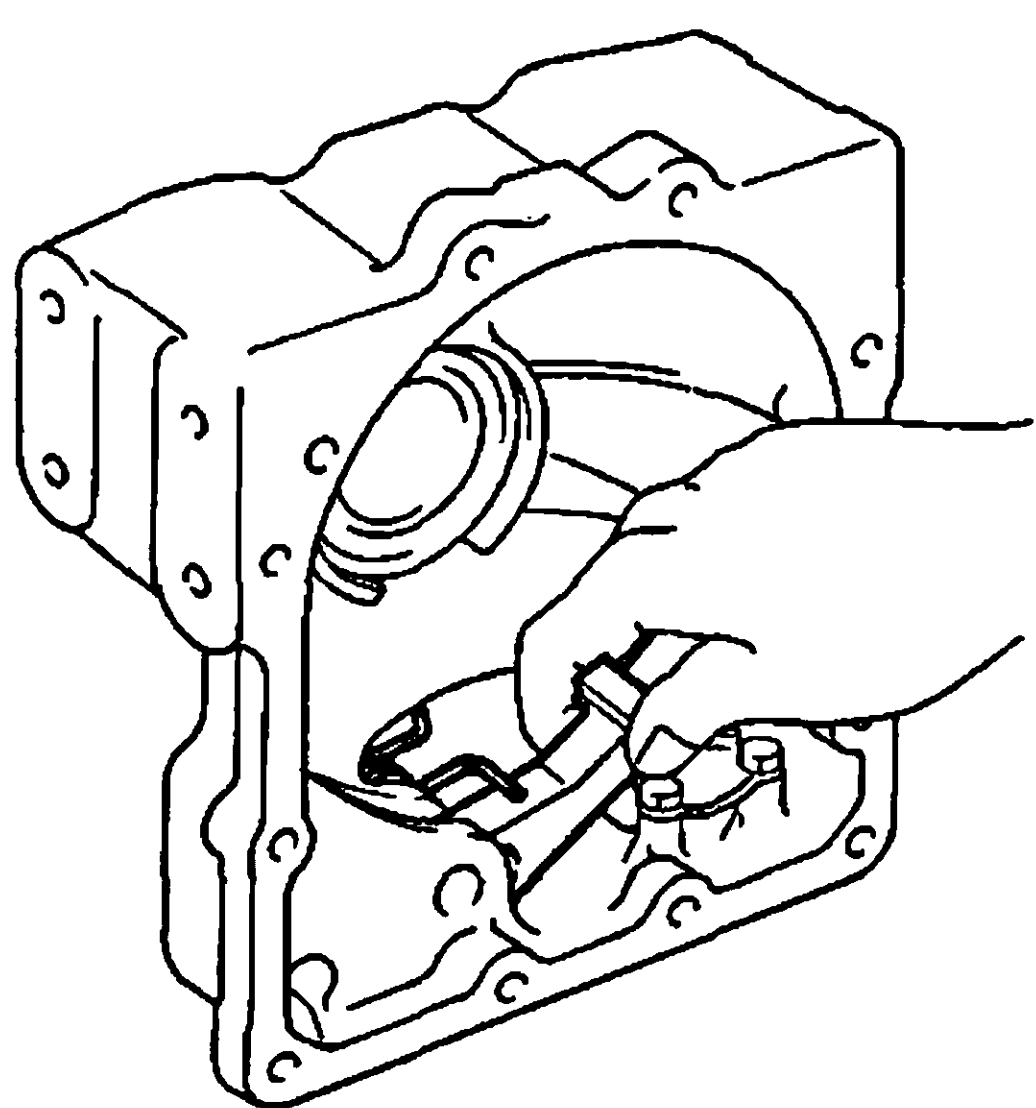
AT6370



D2155

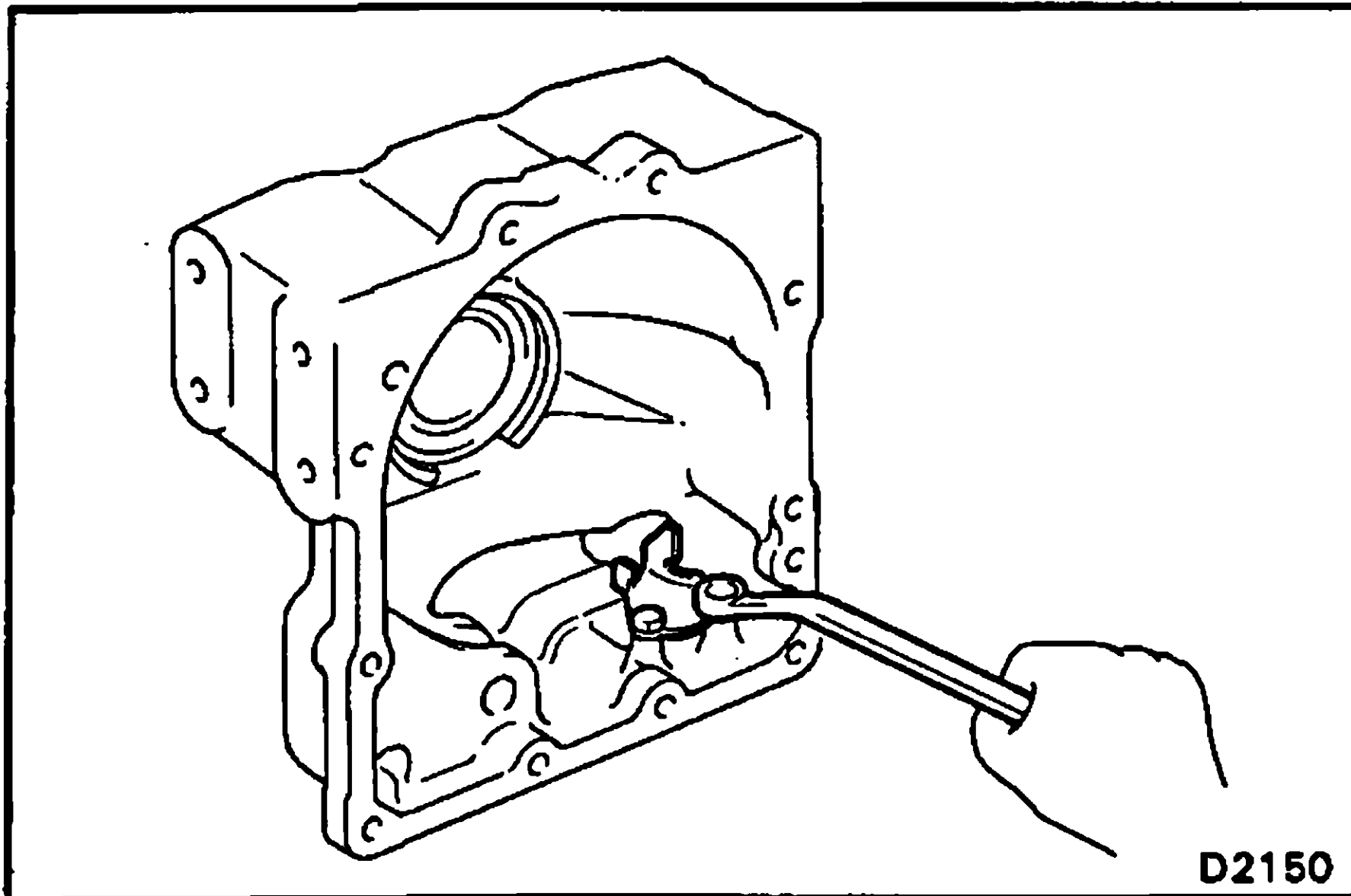
### DISASSEMBLY OF PARKING LOCK PAWL

#### 1. REMOVE PARKING LOCK PAWL SHAFT

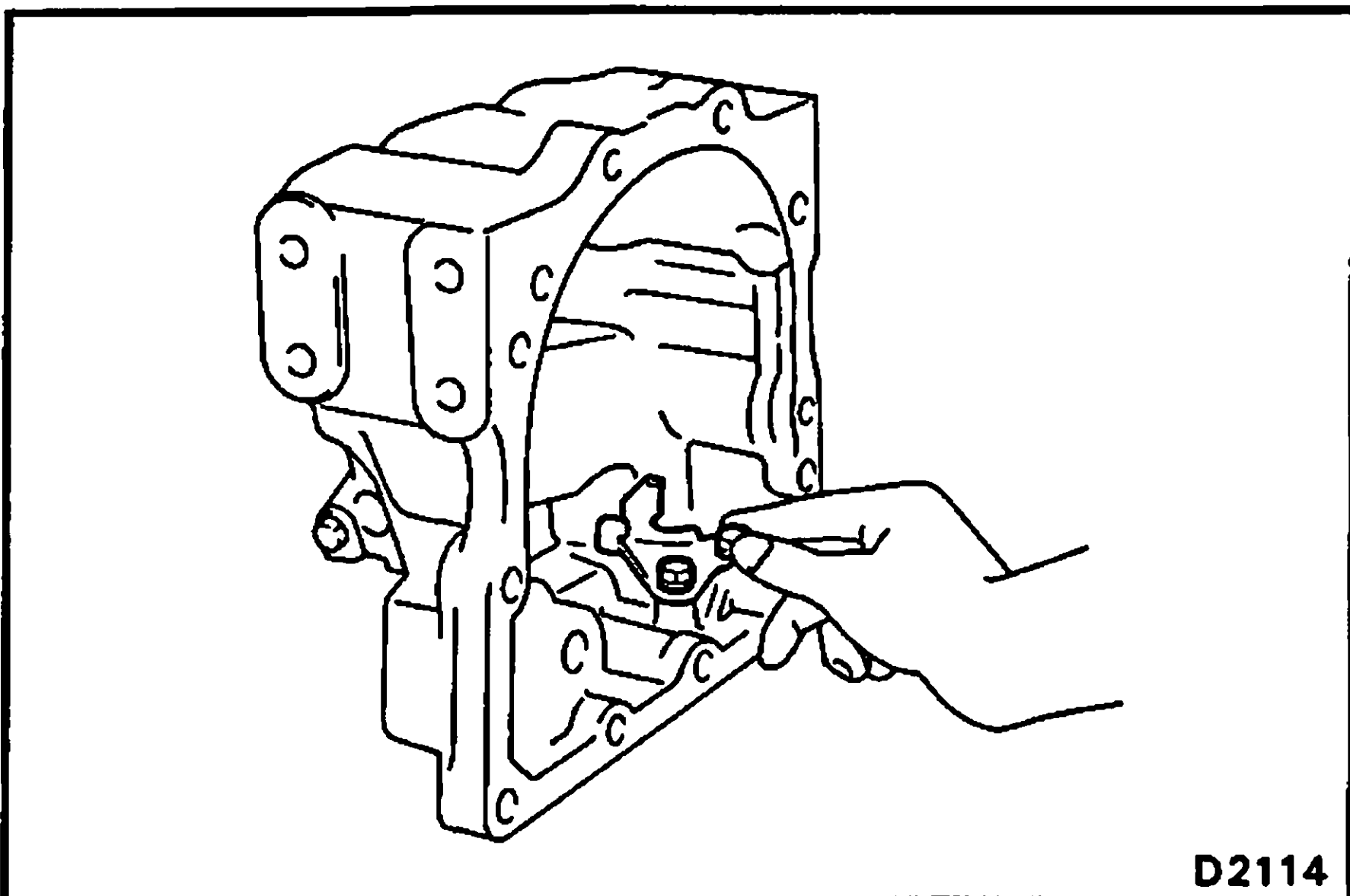


D2149

#### 2. REMOVE PARKING LOCK PAWL, TORSION SPRING AND PLATE WASHER



### 3. REMOVE BRACKET



## ASSEMBLY OF PARKING LOCK PAWL

### 1. INSTALL BRACKET TO EXTENSION HOUSING

(a) Temporarily install the bracket with the two bolts.

(b) Using SST and calipers, set the bracket so that the distance between the extension housing surface and the top of the bracket tab is the standard distance.

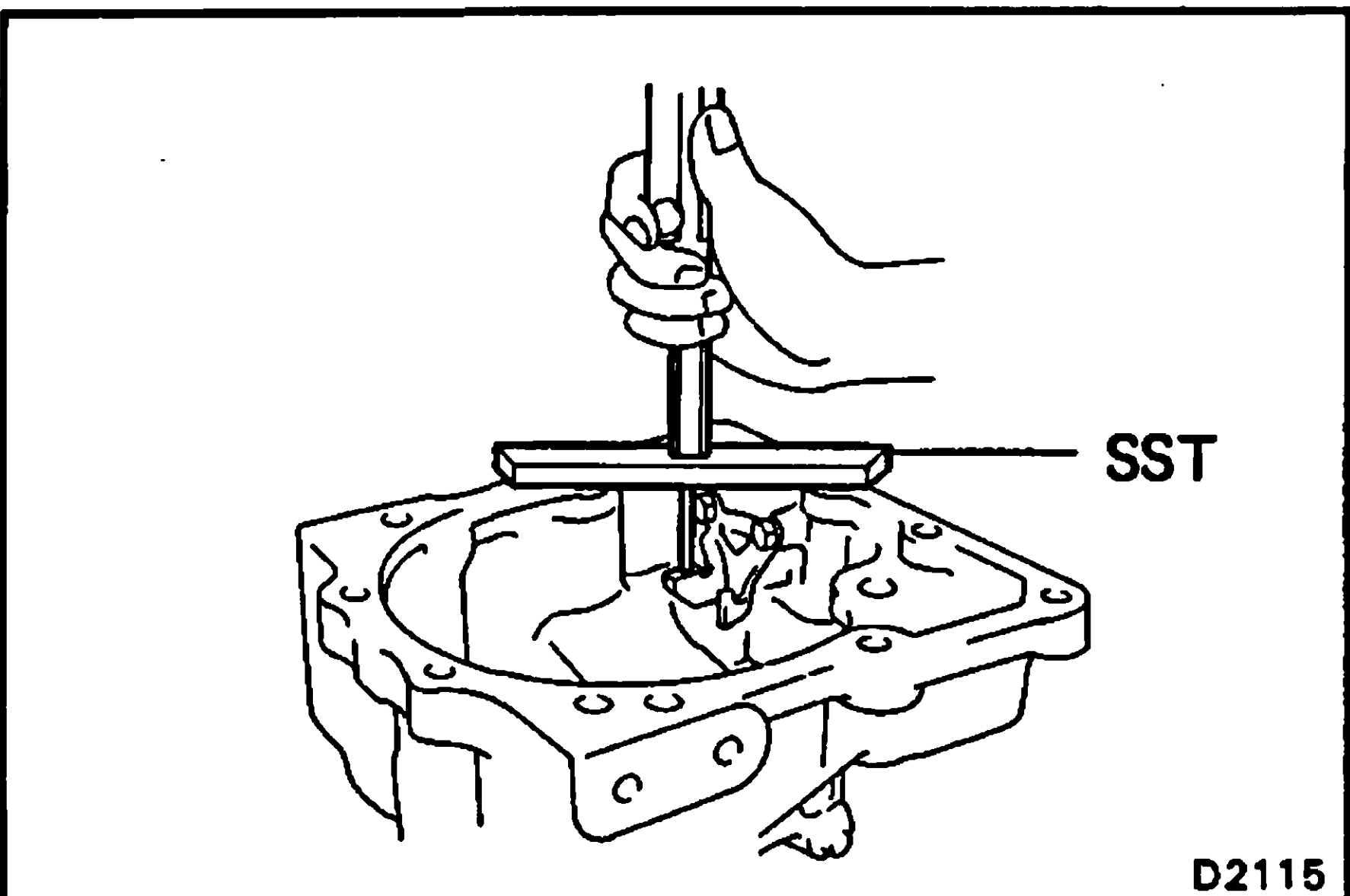
**Total distance - SST thickness = STD distance**

**STD distance: 47.5 — 47.6 mm (1.870 — 1.874 in.)**

**SST 09350-36010 (09350-06090)**

(c) Tighten the two bolts.

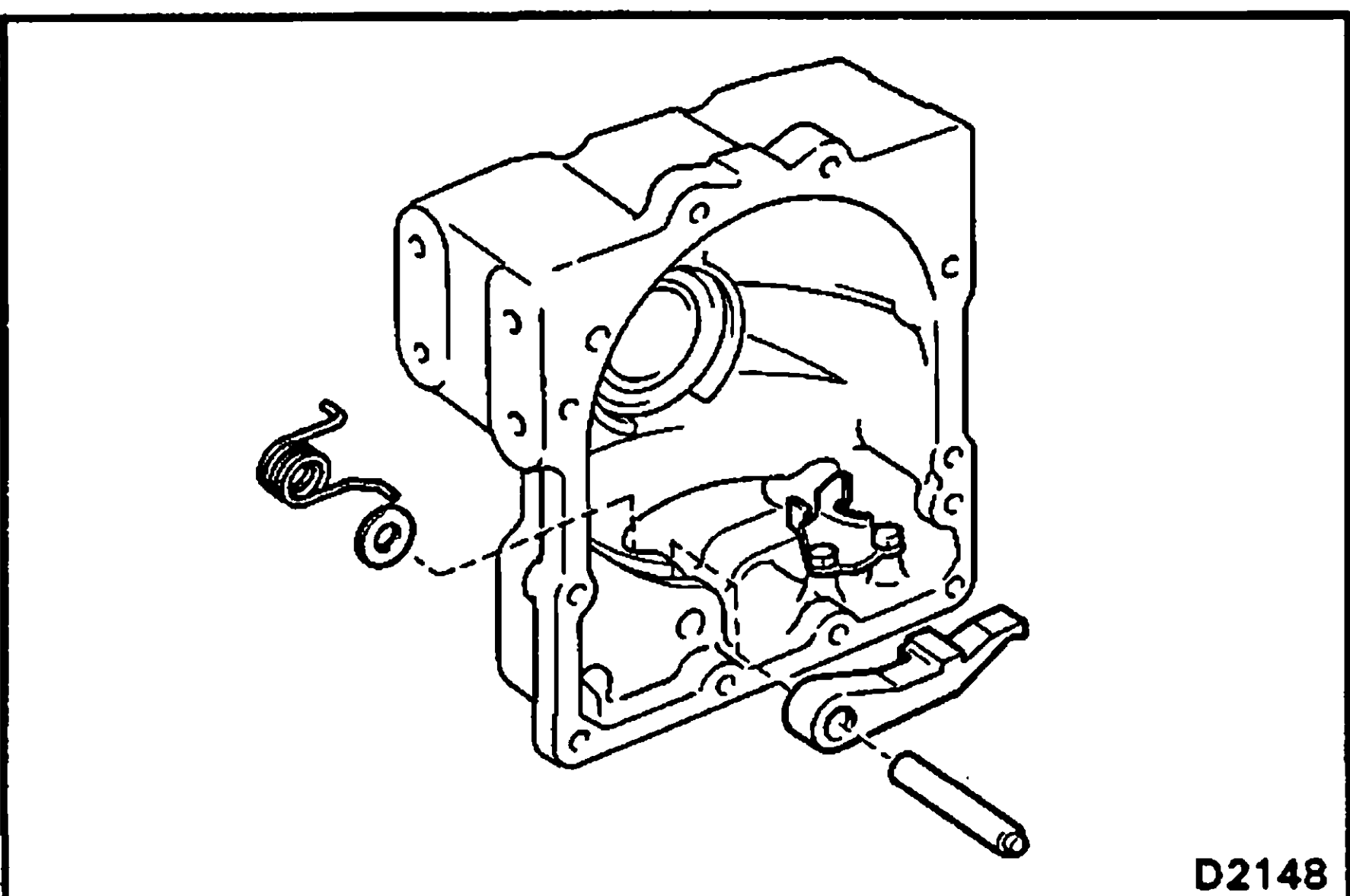
**Torque: 195 kg-cm (14 ft-lb, 19 N·m)**



### 2. INSTALL PARKING LOCK PAWL

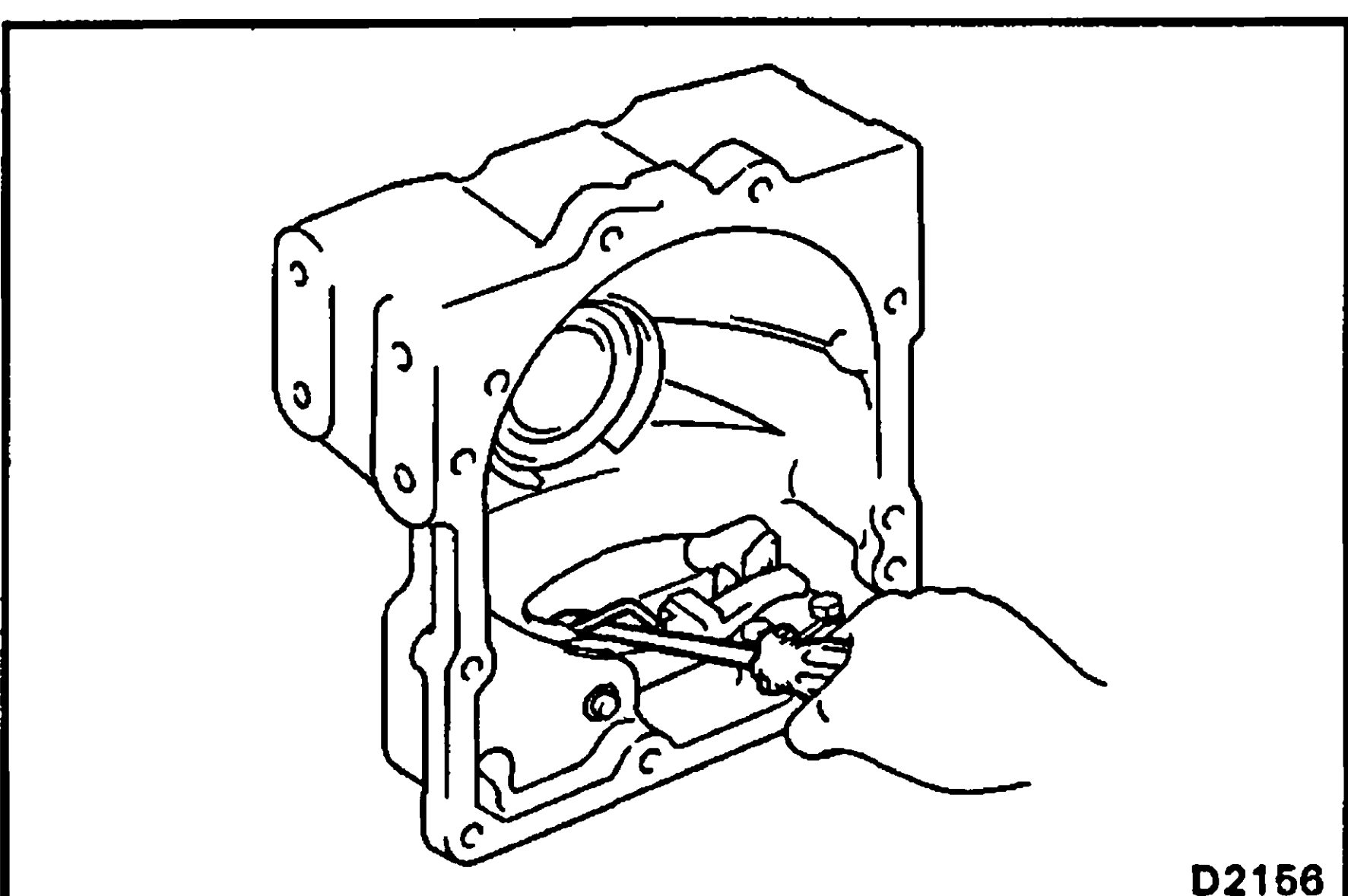
(a) Insert the torsion spring end to the hole of the extension housing.

(b) Install the parking lock pawl, shaft and plate washer.



(c) Hook another spring end to the parking lock pawl.

(d) Make sure the parking lock pawl moves smoothly.



## INSTALLATION OF COMPONENT PARTS

(See page AT-2 to 7)

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

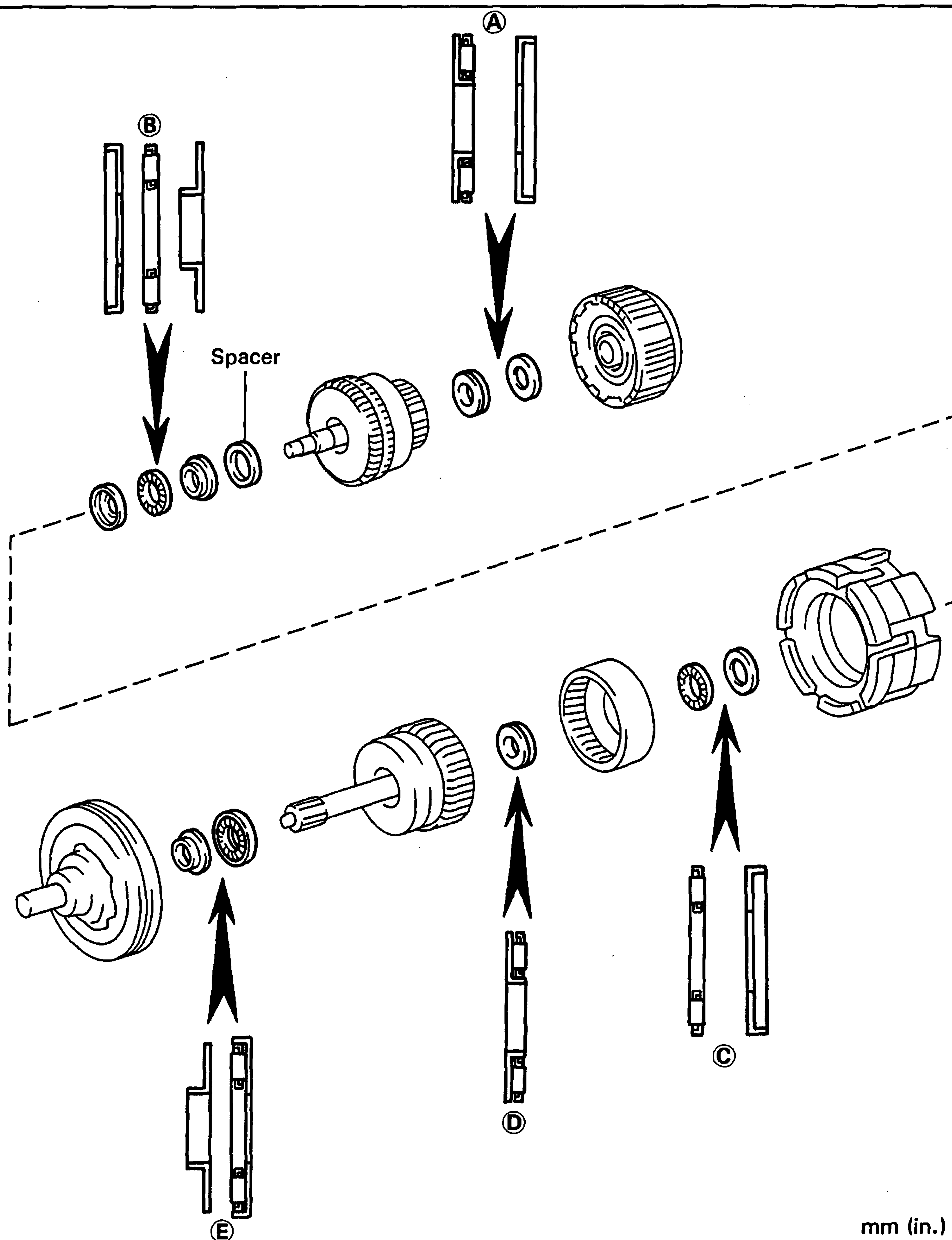
If something wrong is found in a certain component group during assembly, inspect and repair this group immediately.

Recommended ATF: DEXRON® II

### GENERAL INSTALLATION NOTES:

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

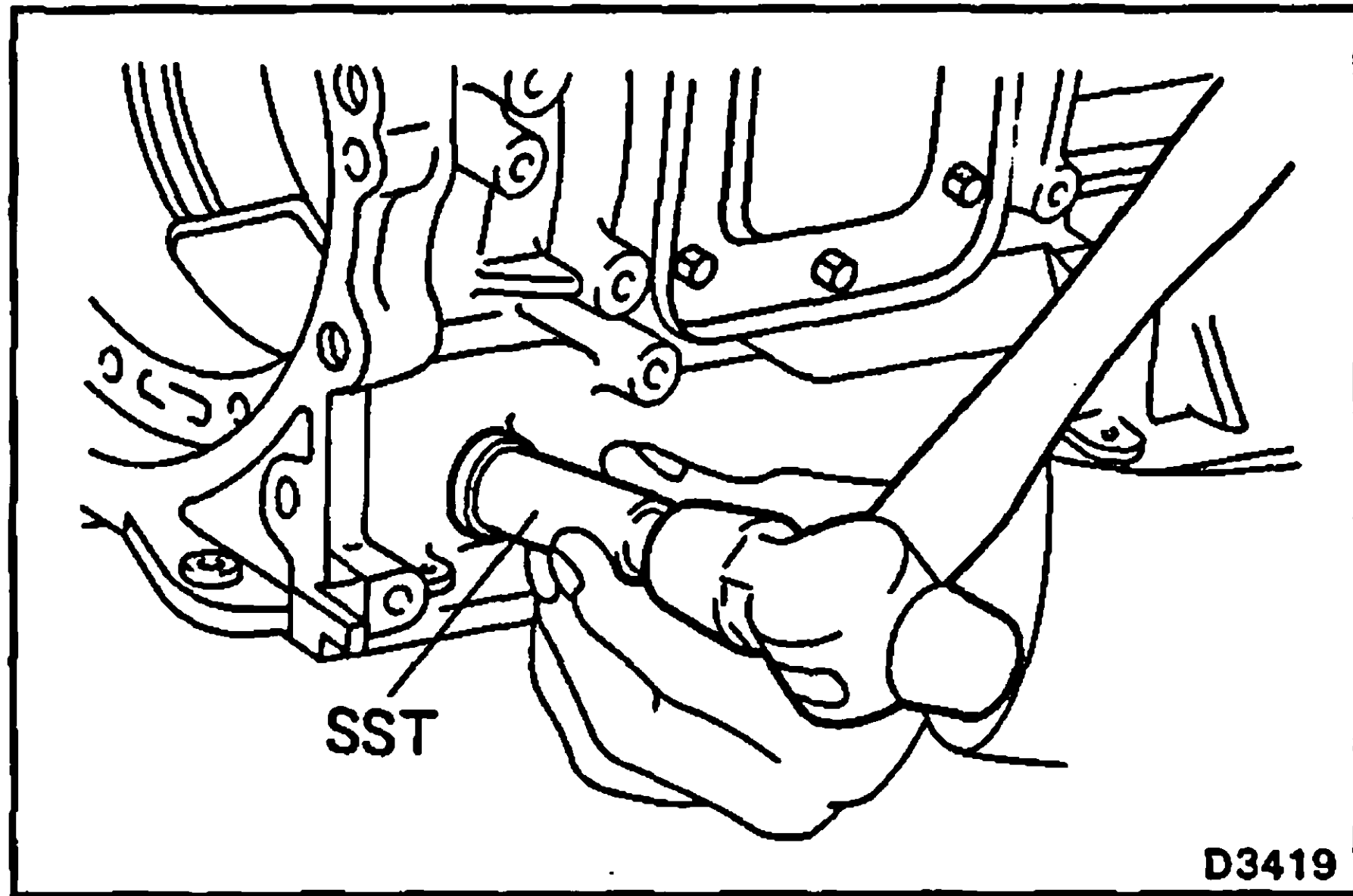
## INSTALLATION POSITION AND DIRECTION OF BEARING AND RACES



mm (in.)

AT6534

|   | Thrust bearing diameter |              | Bearing race diameter                            |              |              |              |
|---|-------------------------|--------------|--------------------------------------------------|--------------|--------------|--------------|
|   |                         |              | Front                                            |              | Rear         |              |
|   | Inside                  | Outside      | Inside                                           | Outside      | Inside       | Outside      |
| Ⓐ | 34.7 (1.366)            | 52.0 (2.047) | —                                                | —            | 37.0 (1.457) | 52.0 (2.047) |
| Ⓑ | 34.7 (1.366)            | 52.0 (2.047) | 37.0 (1.457)                                     | 52.0 (2.047) | 32.8 (1.291) | 50.4 (1.984) |
| Ⓒ | 34.7 (1.366)            | 52.0 (2.047) | —                                                | —            | 37.0 (1.457) | 52.0 (2.047) |
| Ⓓ | 25.0 (0.894)            | 42.0 (1.654) | —                                                | —            | —            | —            |
| Ⓔ | 28.5 (1.122)            | 46.2 (1.819) | 27.1 (1.067),<br>27.9 (1.098)<br>or 28.3 (1.114) | 43.0 (1.693) | —            | —            |

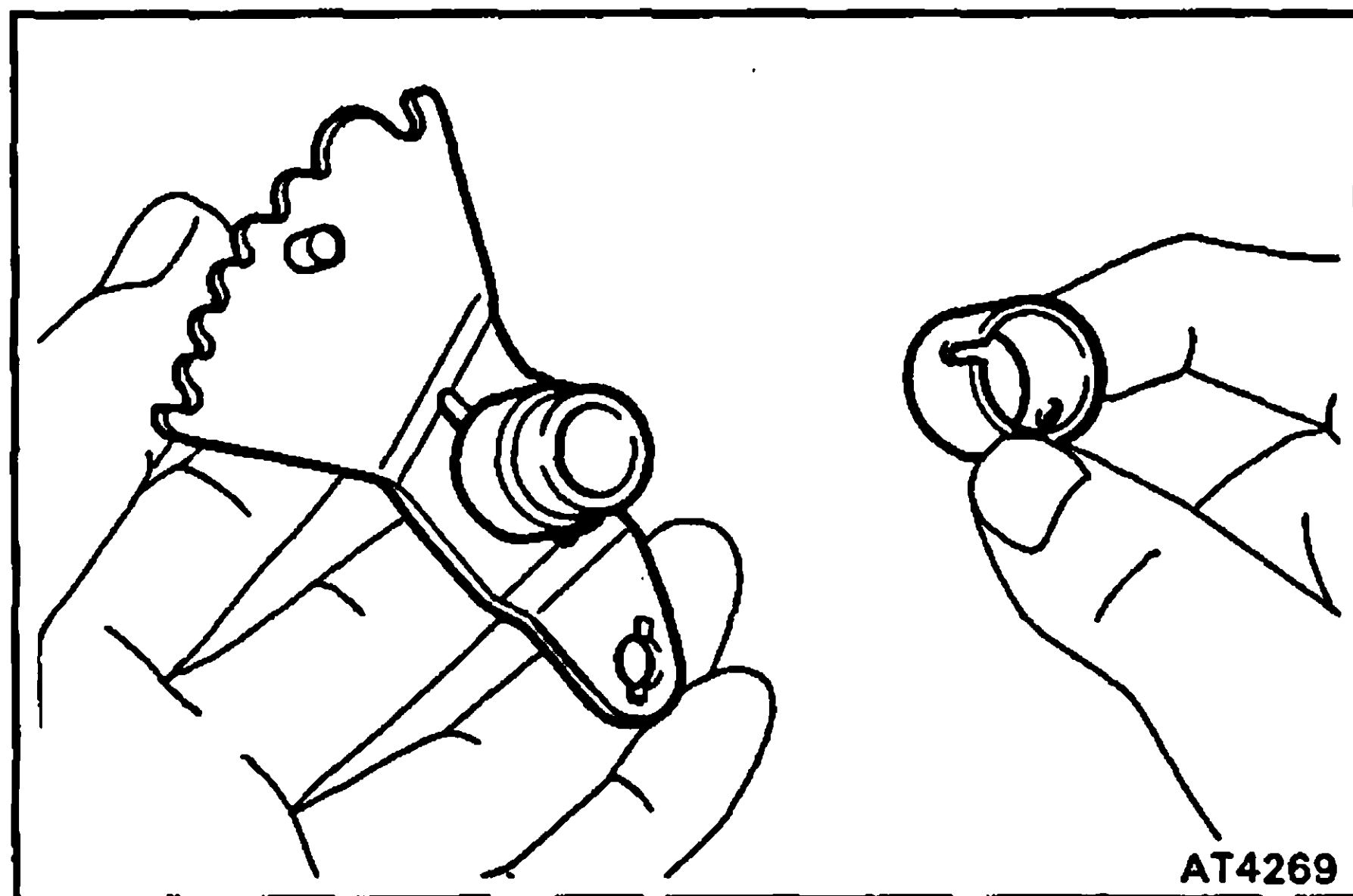


**1. INSTALL MANUAL VALVE LEVER, SHAFT AND OIL SEALS**

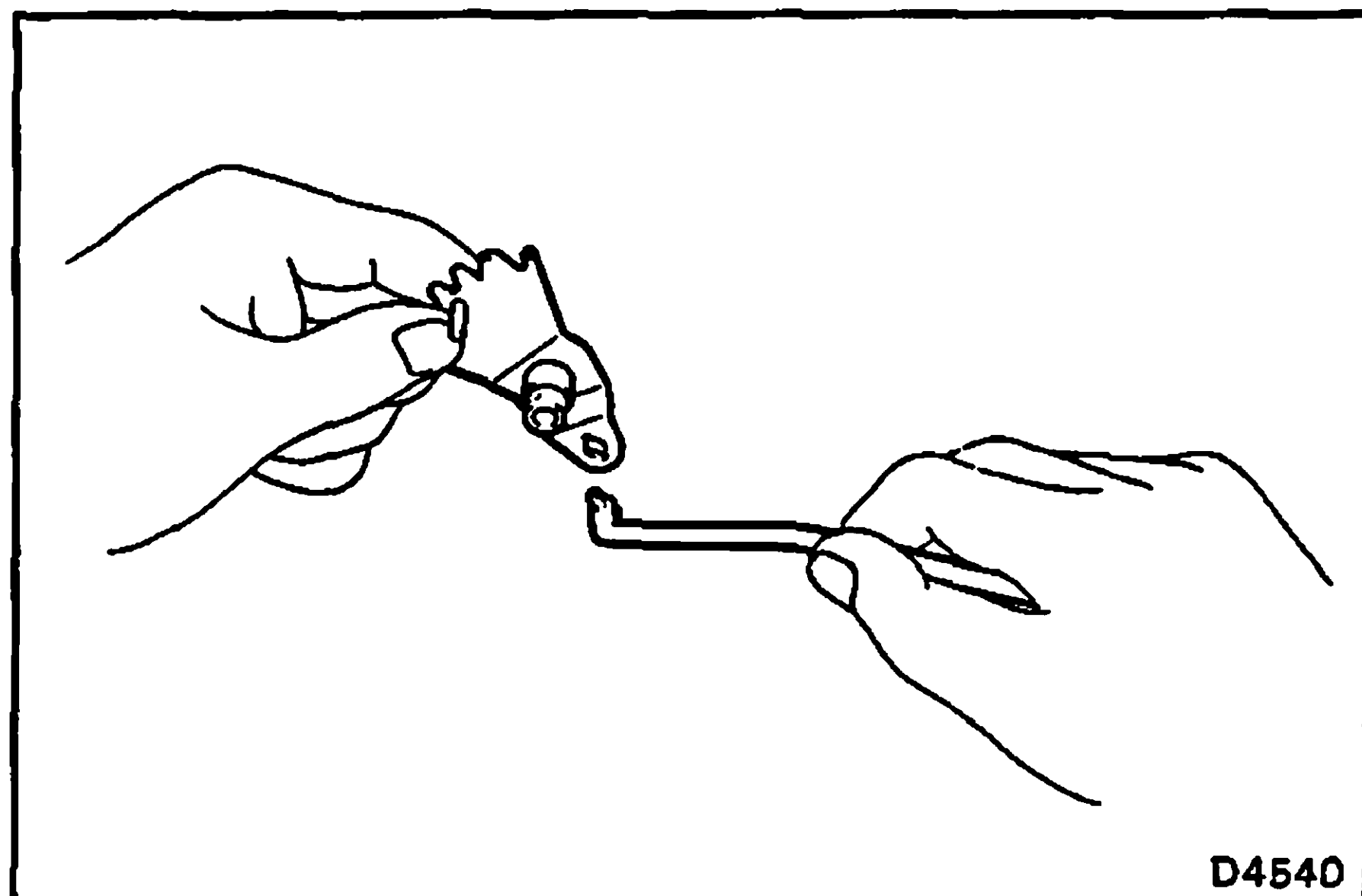
(a) Using SST, tap in new two oil seals.

SST 09350-36010 (09350-06150)

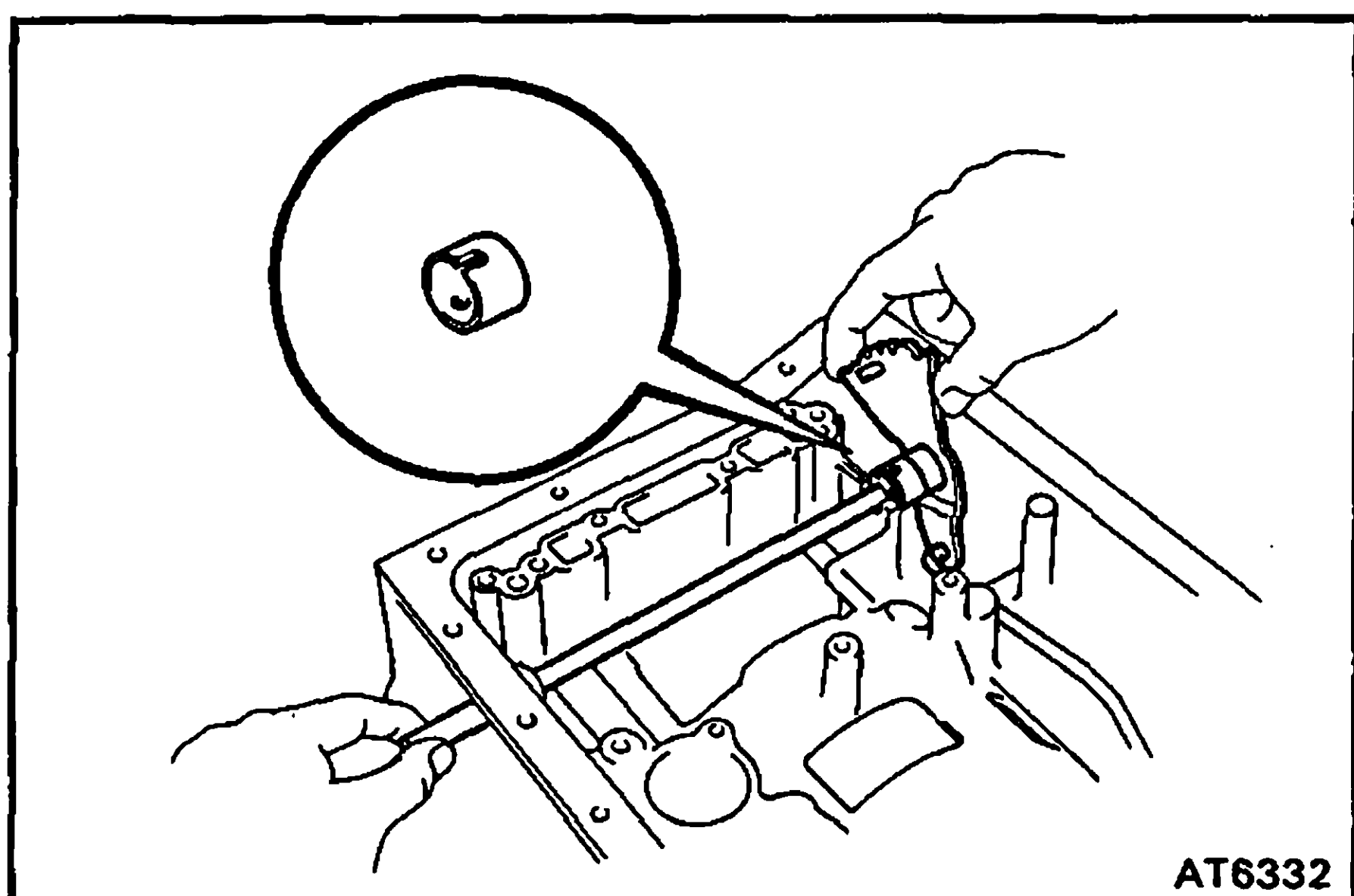
(b) Apply MP grease to the oil seal lip.



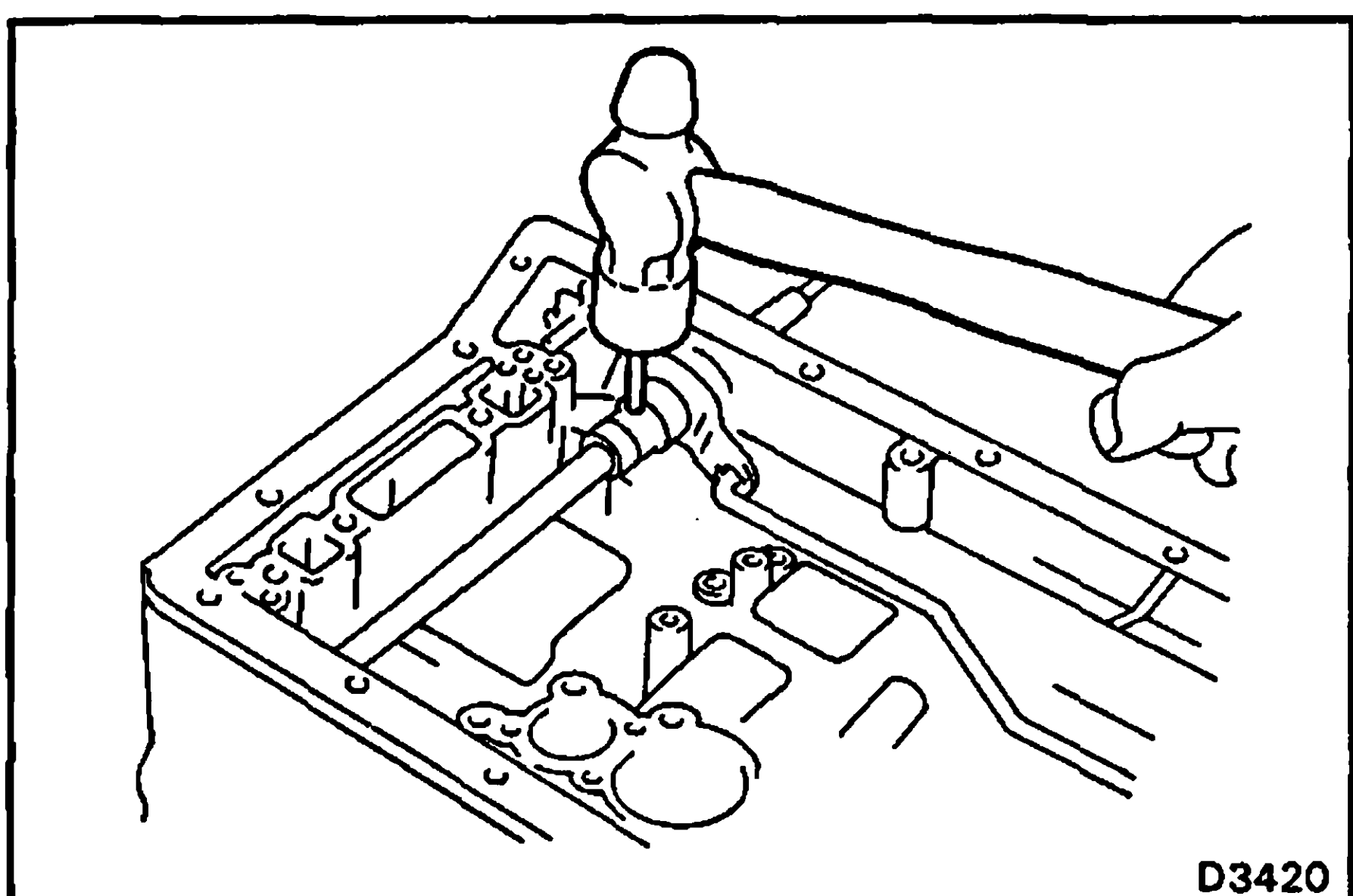
(c) Assemble a new spacer to the manual valve lever.



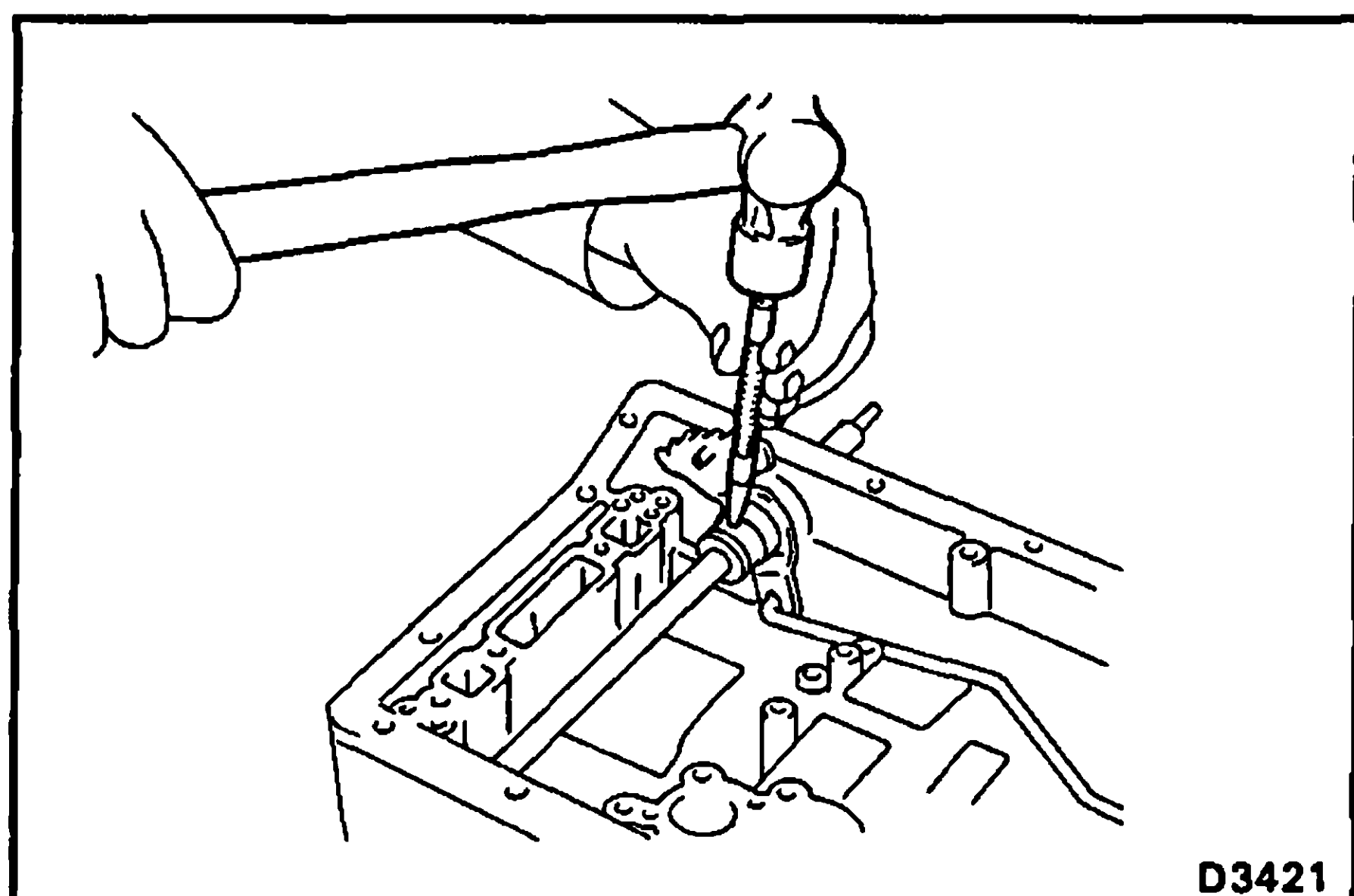
(d) Connect the parking lock rod to the manual valve lever.



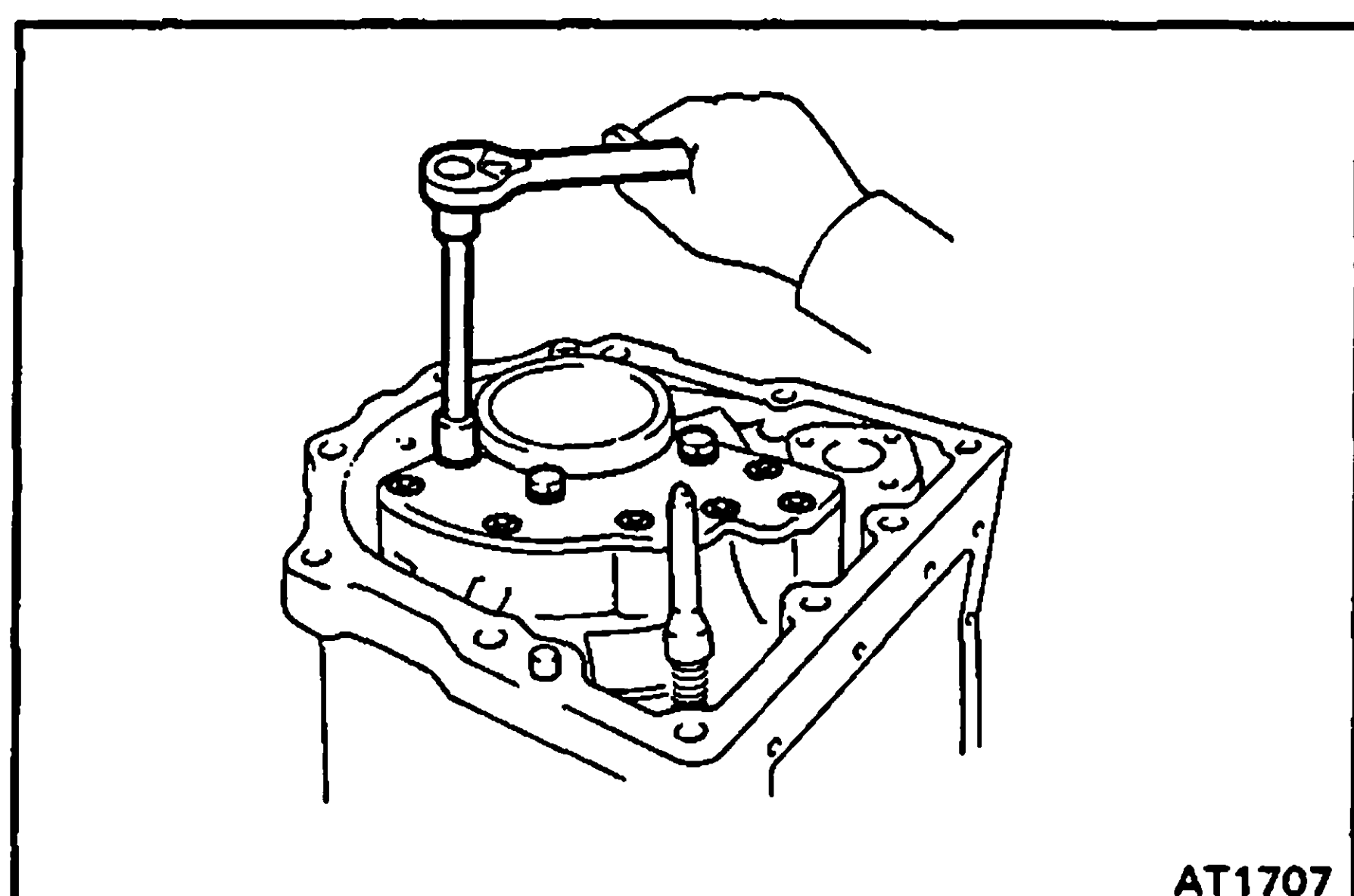
(e) Install the manual valve lever shaft to the transmission case through the manual valve lever.



(f) Using a hammer, tap in the pin with the slot at a right angle to the shaft.



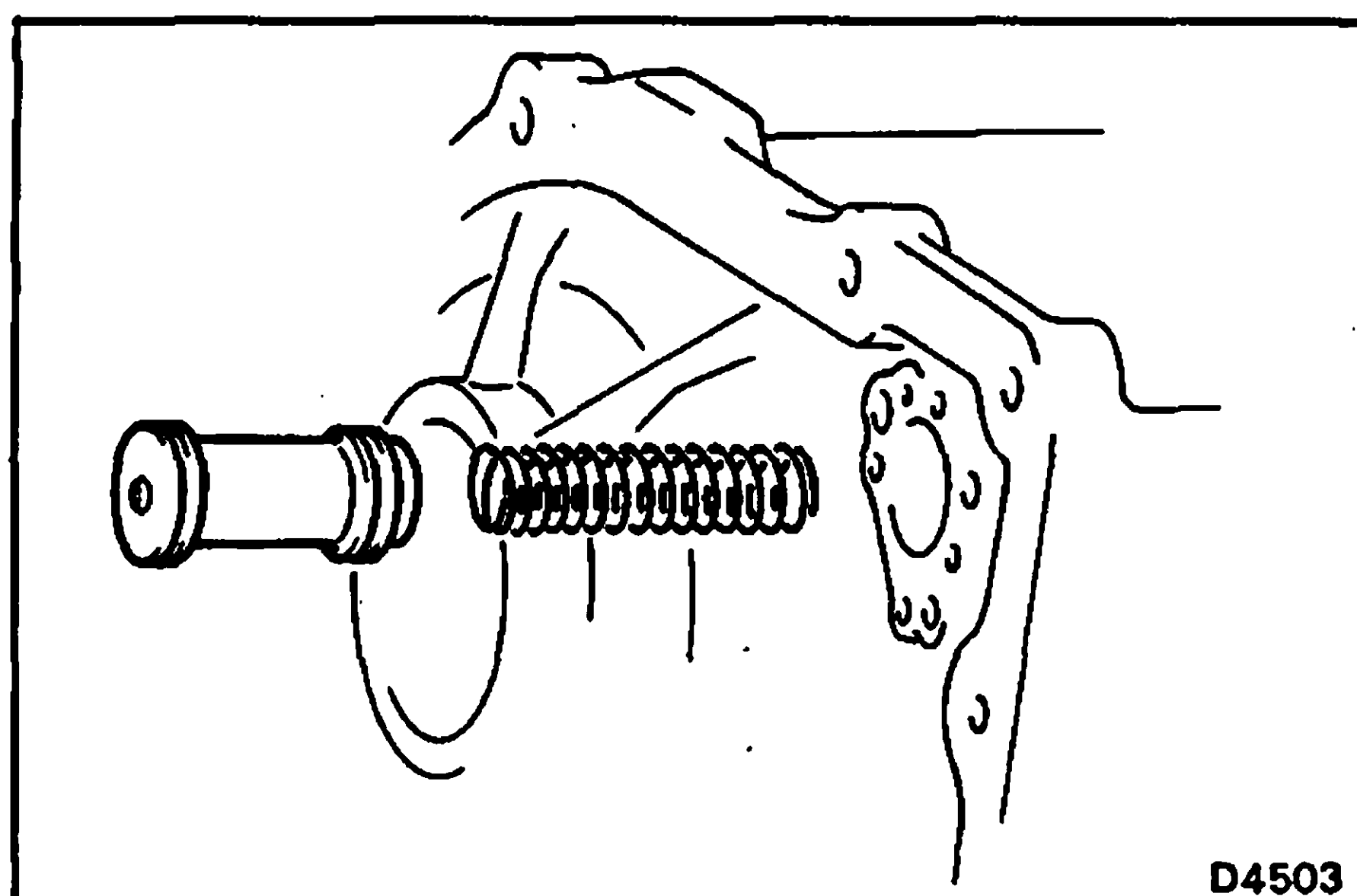
- (g) Match the spacer hole to the lever calking hollow and calk the spacer to the lever.
- (h) Make sure the manual valve lever shaft turns smoothly.



## 2. INSTALL TRANSMISSION REAR COVER

Install a new gasket and rear cover with the three bolts and six screws.

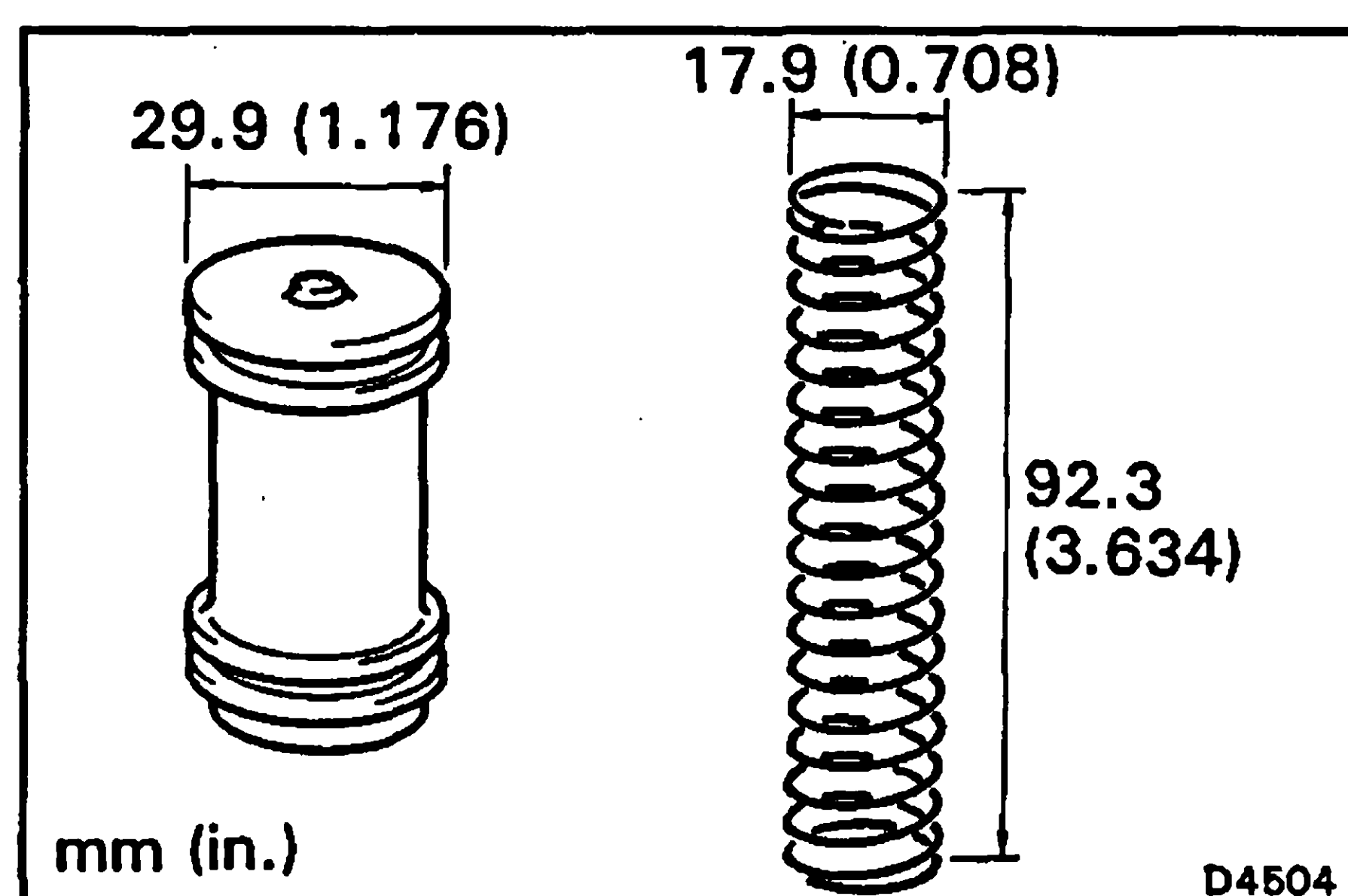
**Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)**



## 3. INSTALL C<sub>1</sub> ACCUMULATOR PISTON AND SPRING

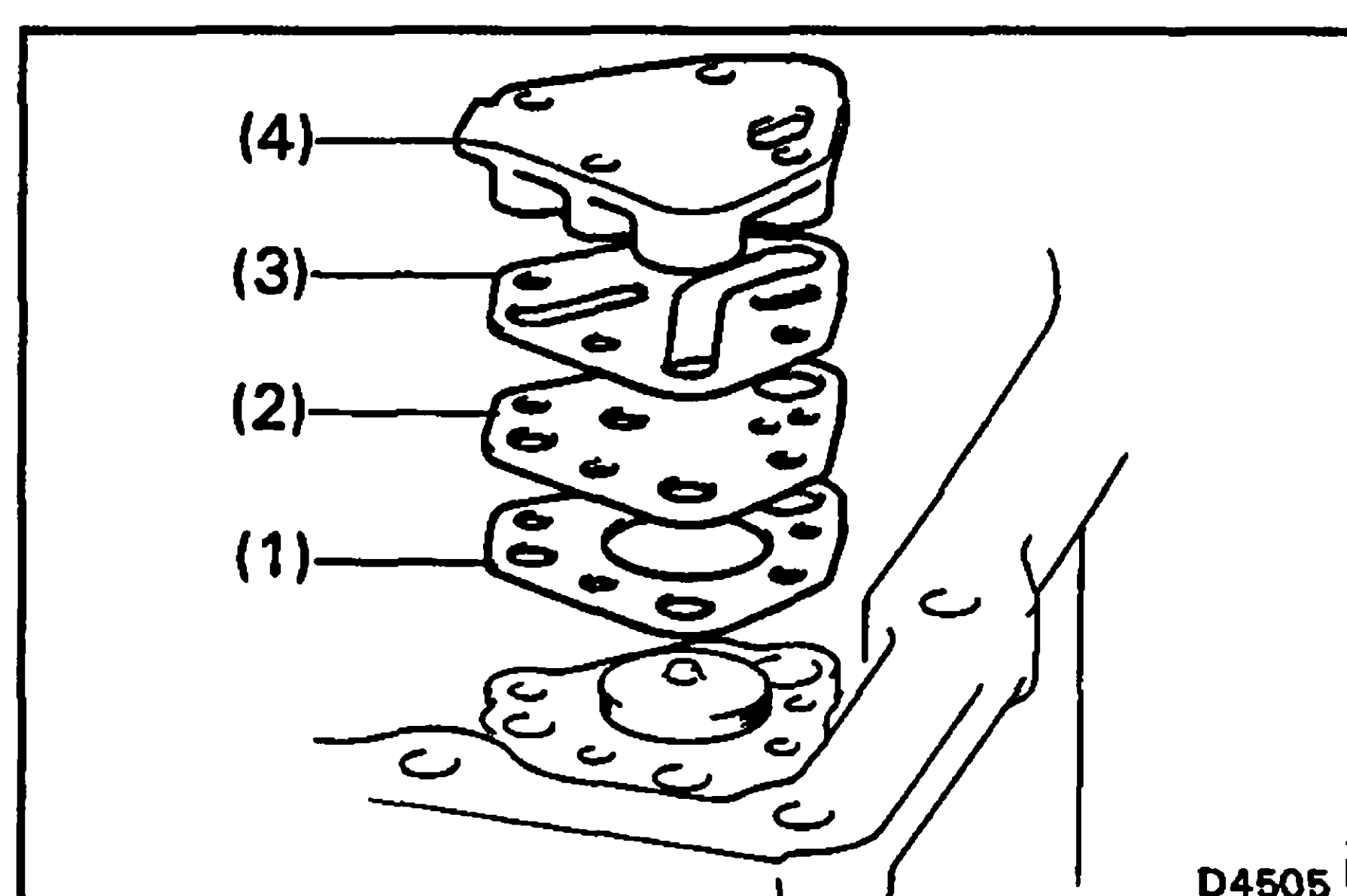
- (a) Coat new O-rings with ATF, and install them to the piston.
- (b) Install the spring and accumulator piston into the bore of the transmission case.

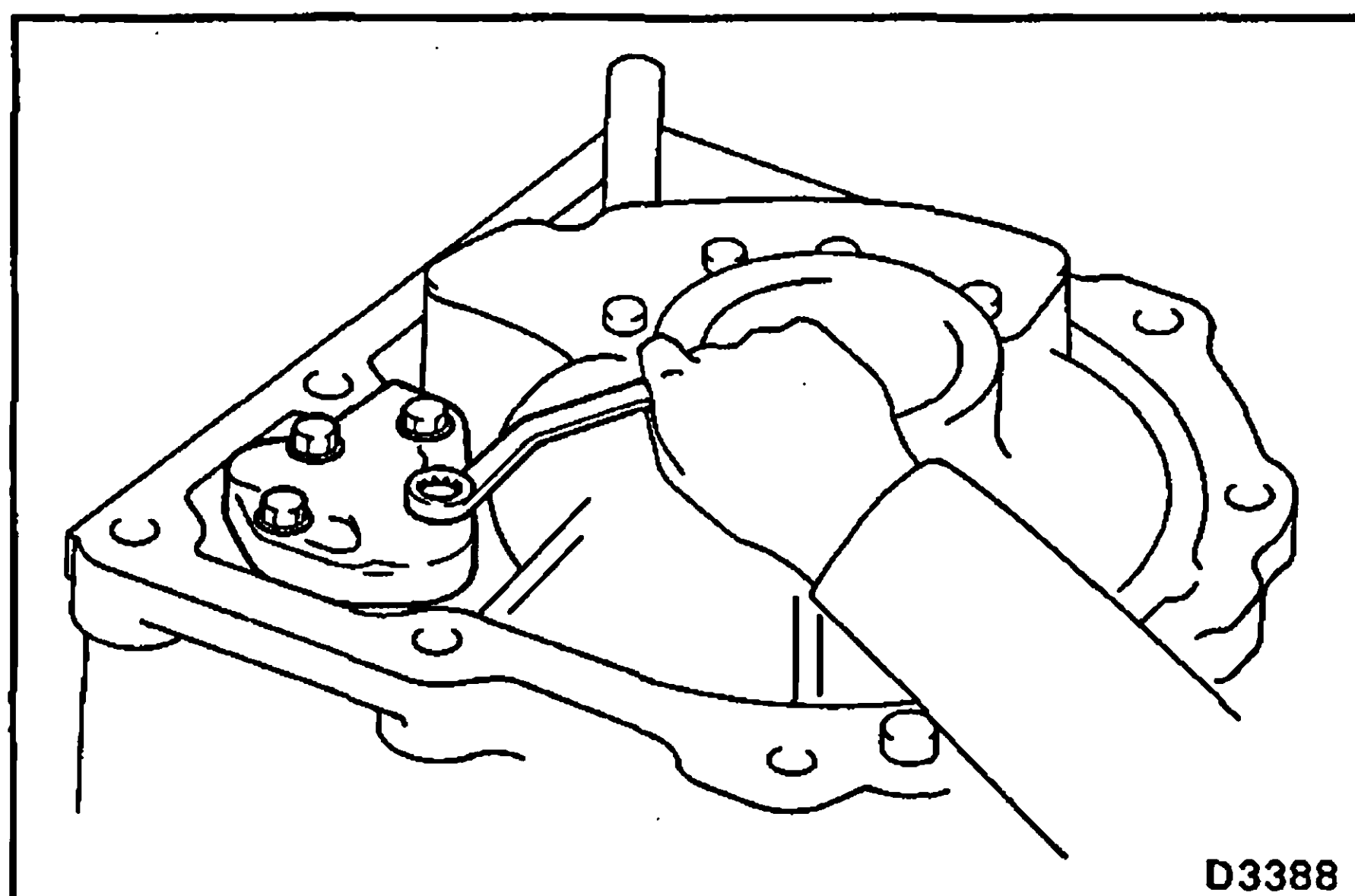
**HINT:** Piston, spring diameters and spring free length are shown in the figure.



- (c) Place the following parts on the transmission case.

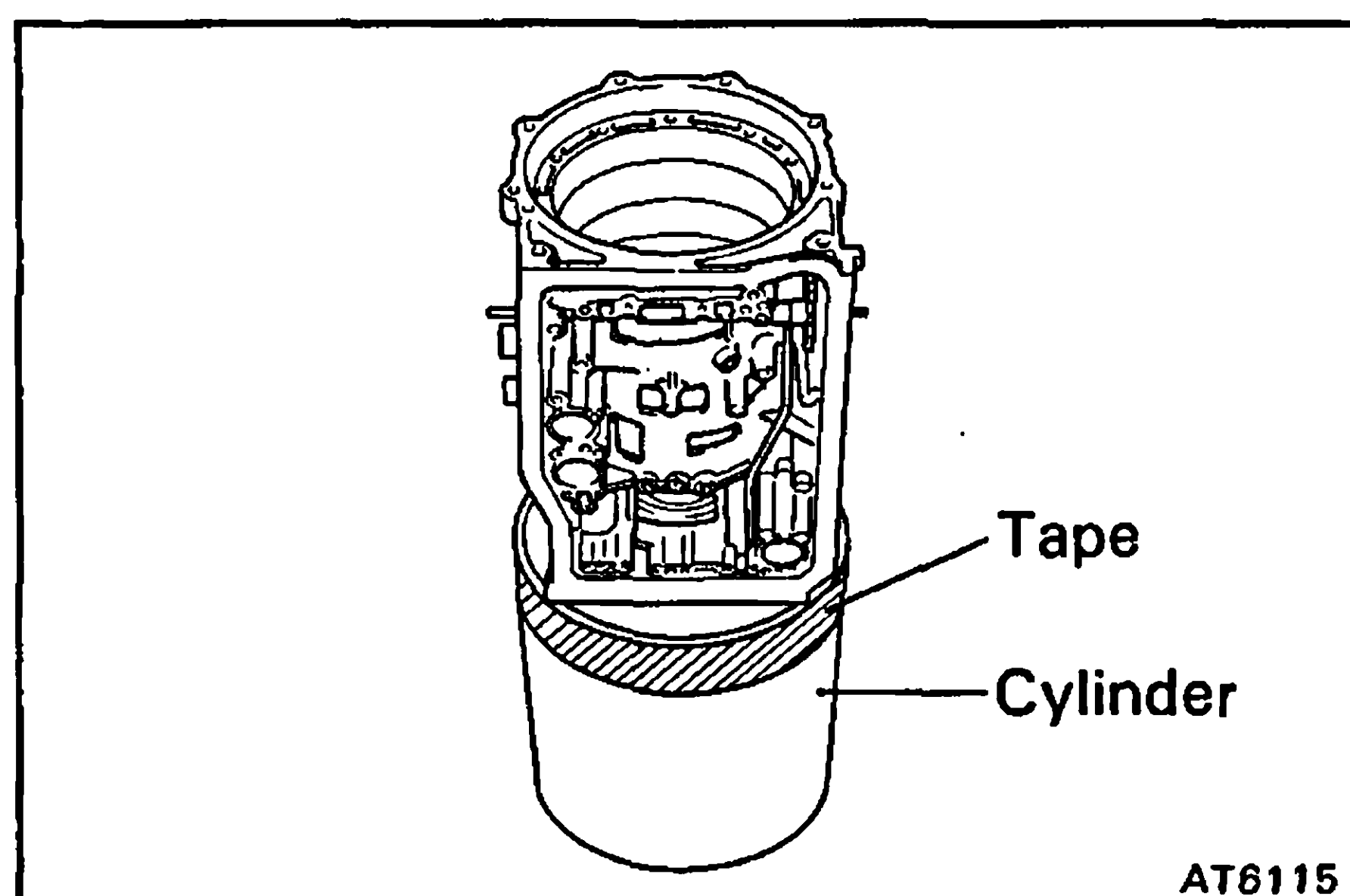
- (1) New gasket
- (2) Plate
- (3) New gasket
- (4) Front clutch accumulator cover





(d) Install the four bolts.

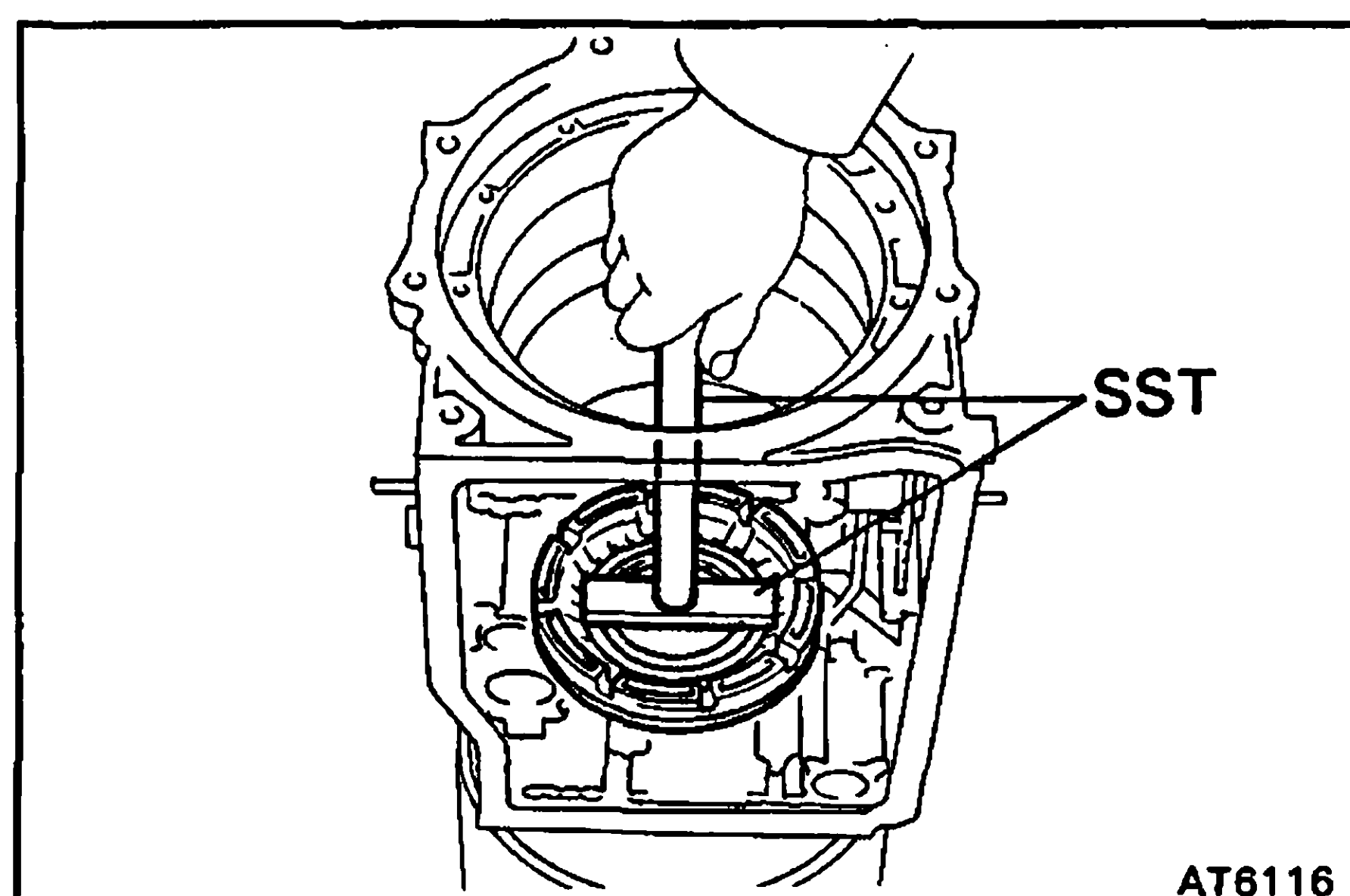
**Torque: 80 kg-cm (69 in.-lb, 7.8 N·m)**



#### 4. INSTALL FIRST AND REVERSE BRAKE PISTON

(a) Place the transmission case on a cylinder.

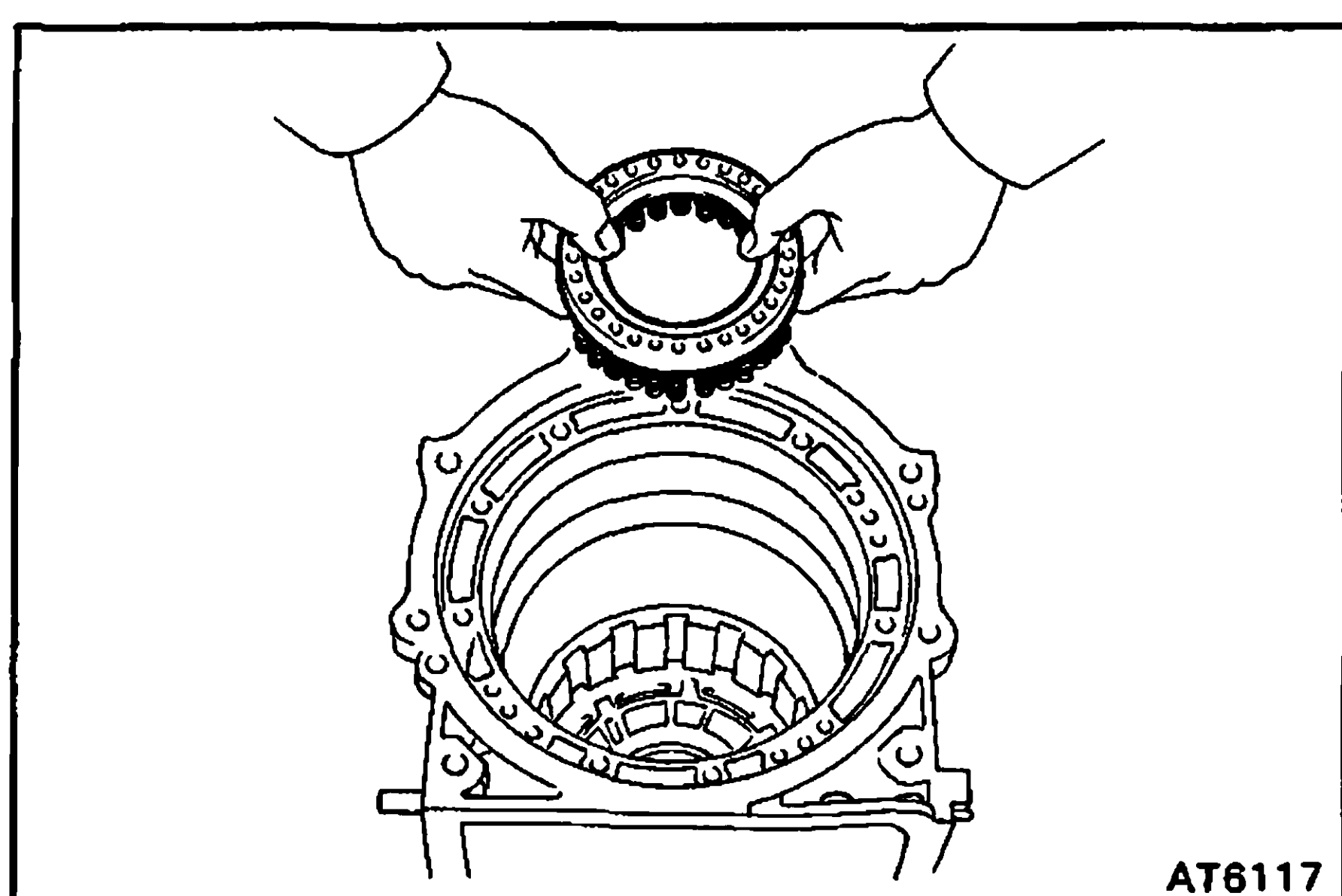
**NOTICE:** Be careful not to damage the transmission case. Tape the top of the cylinder.



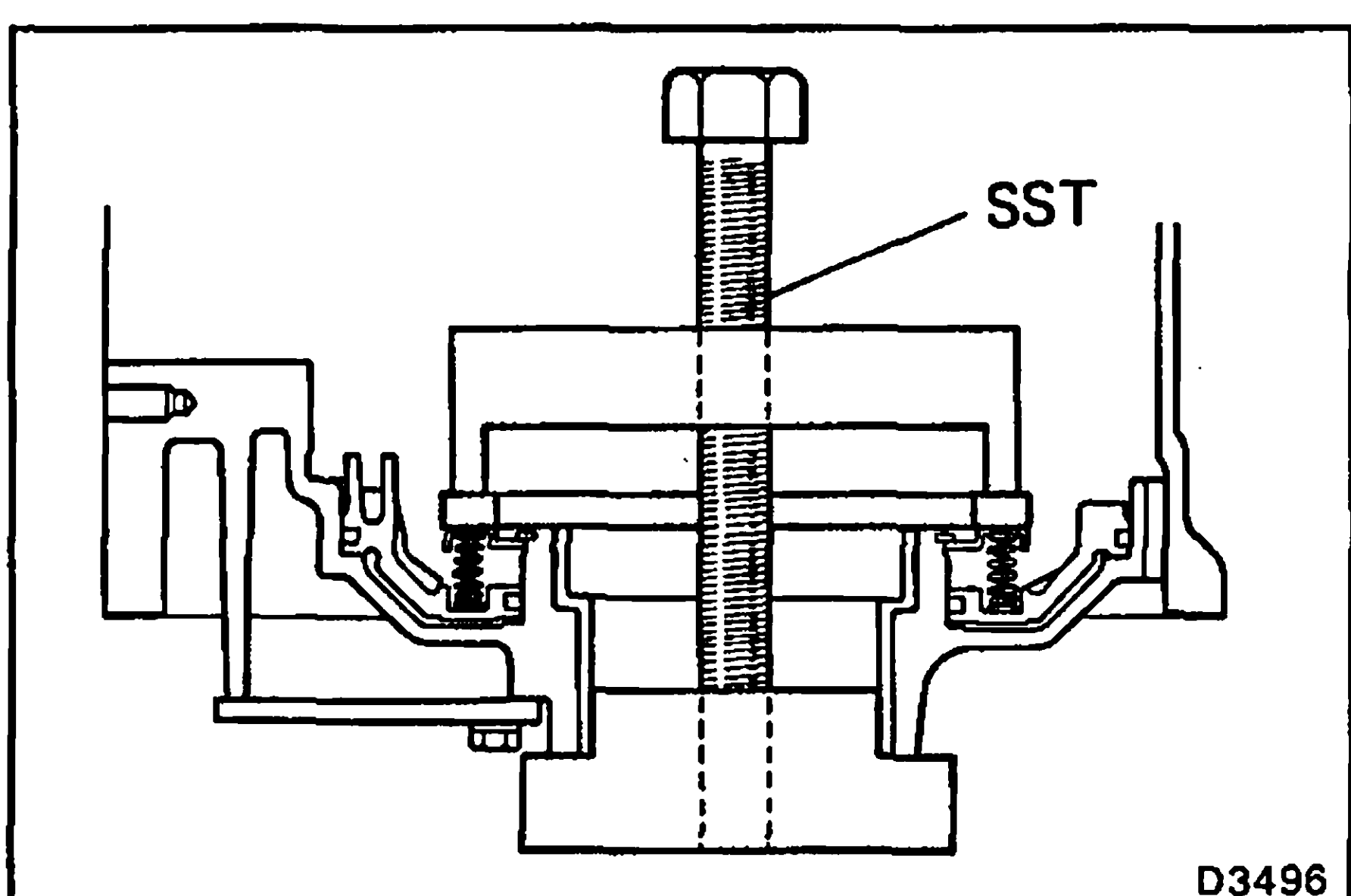
(b) Coat new two O-rings with ATF, and install them to the brake piston.

(c) Using SST, push in the brake piston.

**SST 09350-36010 (09350-06035, 09350-06050)**

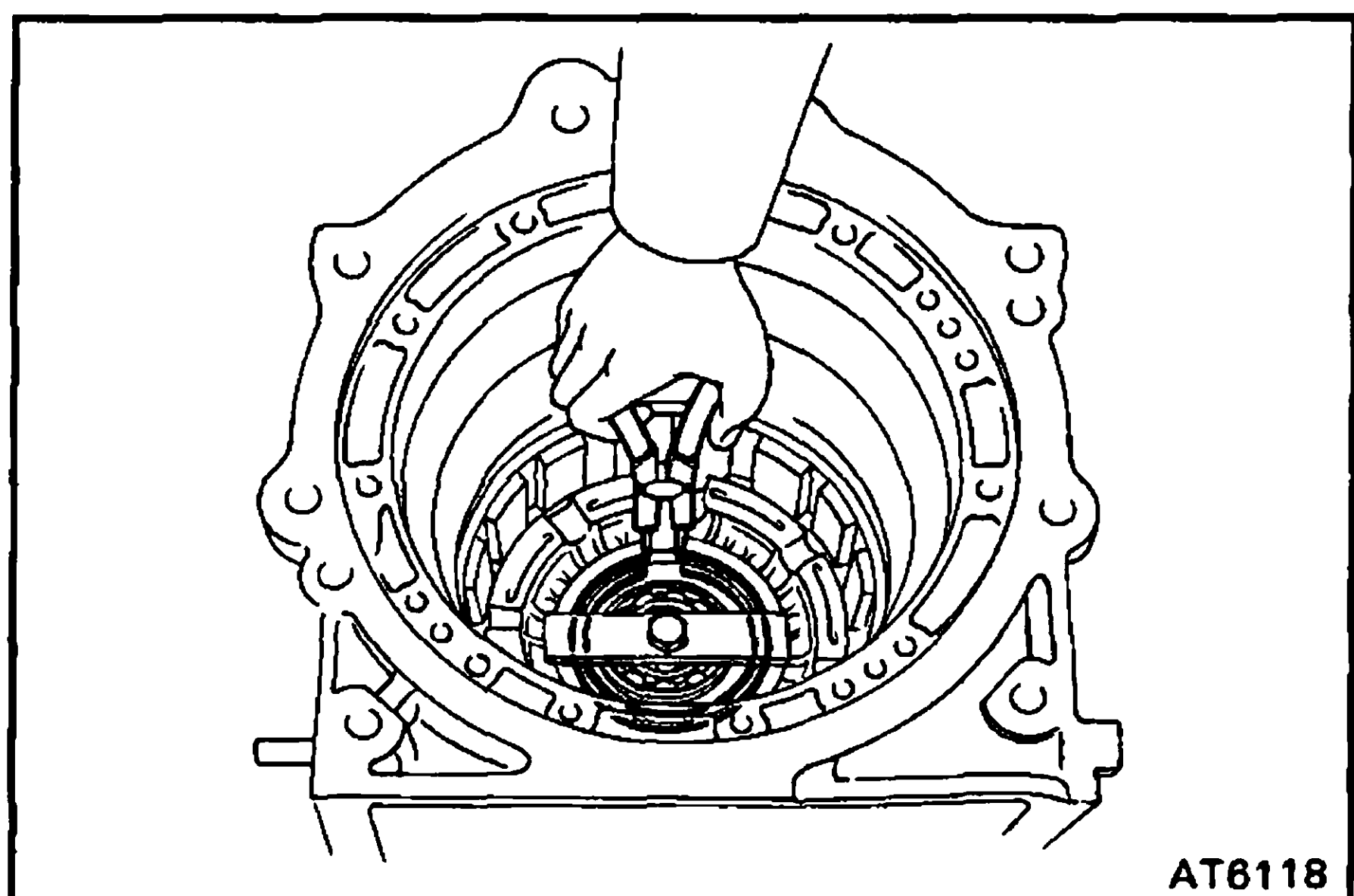


(d) Place the return spring on the brake piston.

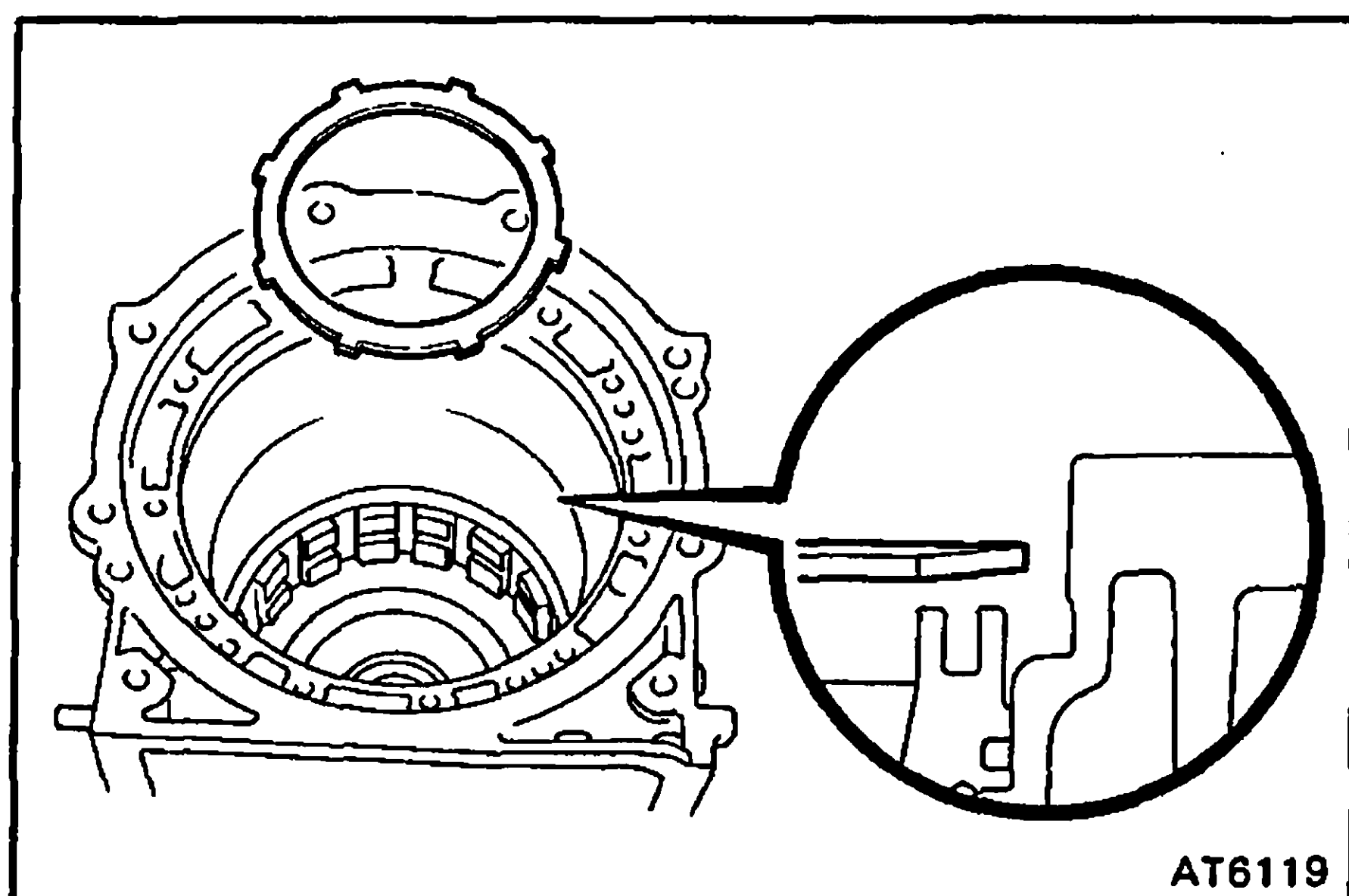


(e) Using SST, compress the return spring.

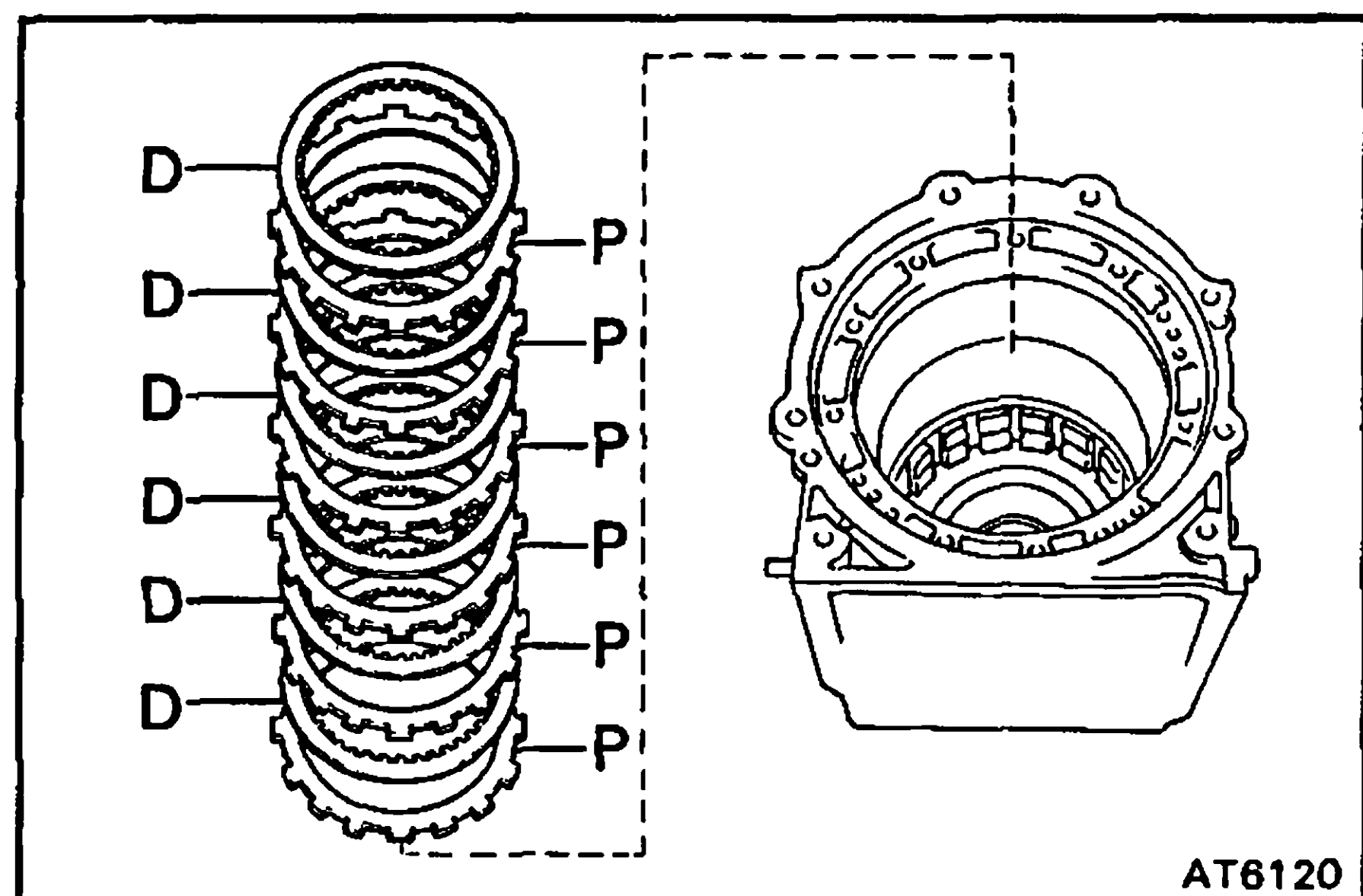
**SST 09350-36010 (09350-06030)**



(f) Using snap ring pliers, install the snap ring.



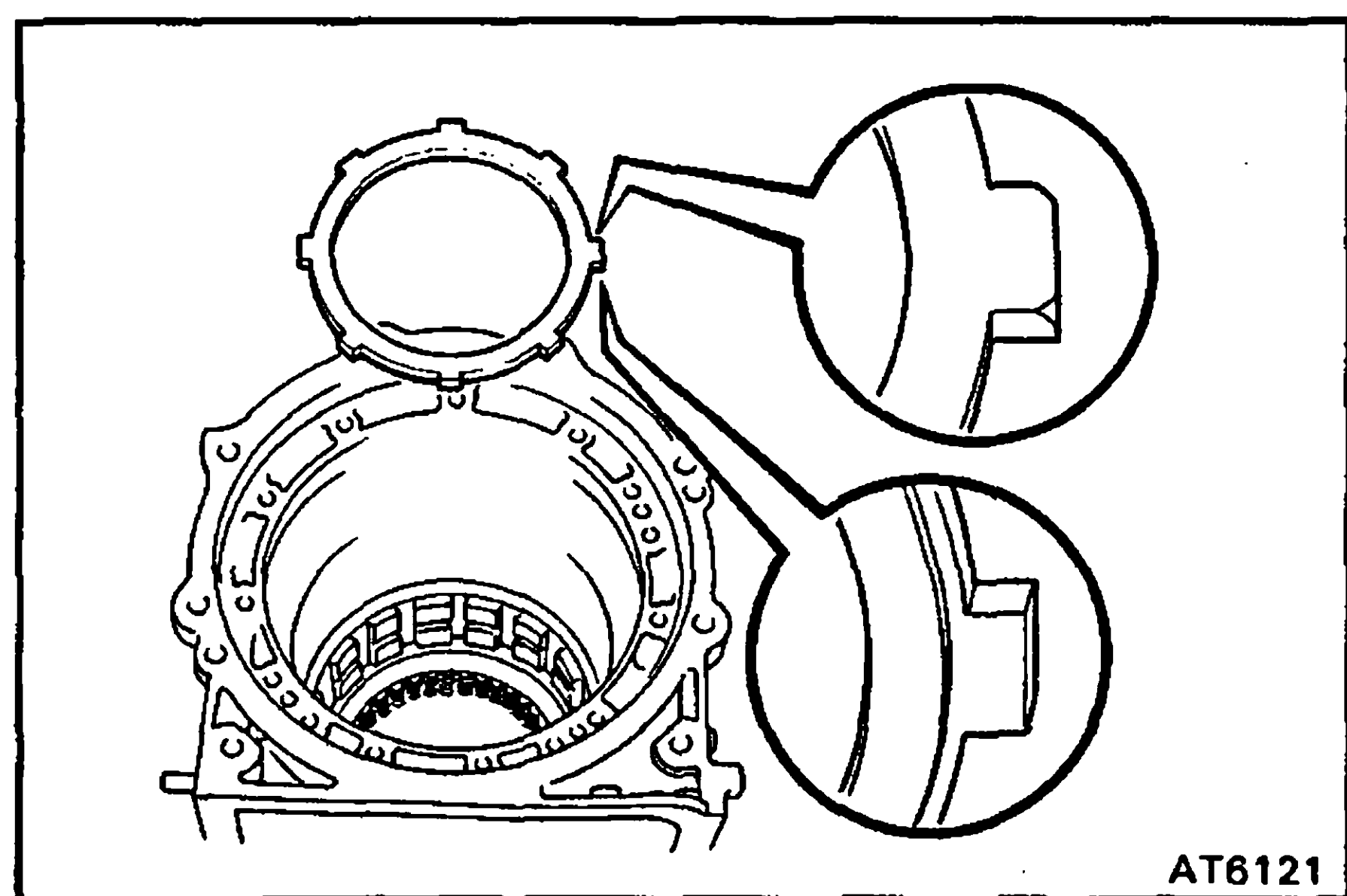
(g) Install the cushion plate, facing the rounded edge inward.



(h) Install the six plates and six discs in order:

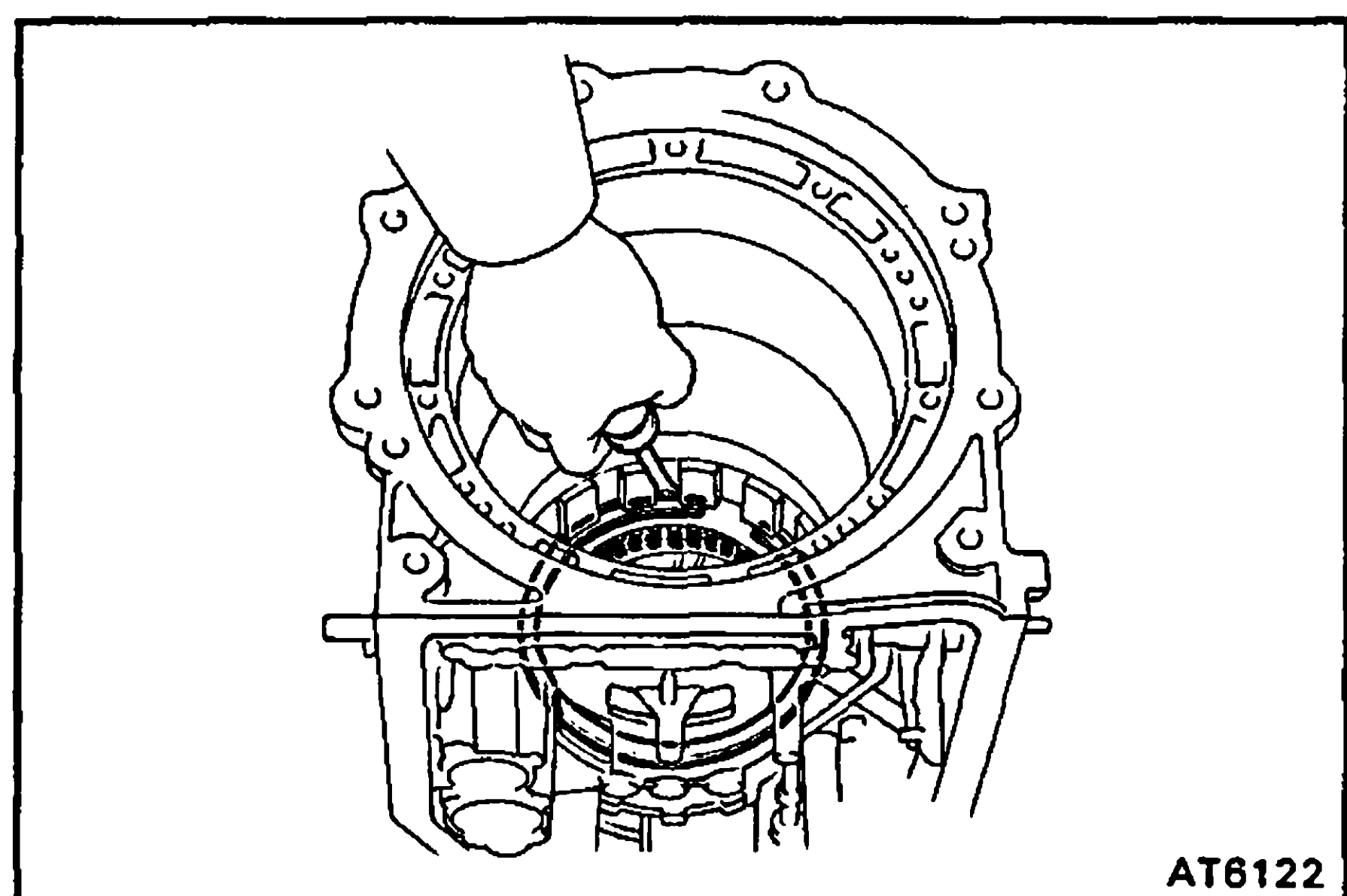
P = Plate D = Disc

P-D-P-D-P-D-P-D-P-D-P-D



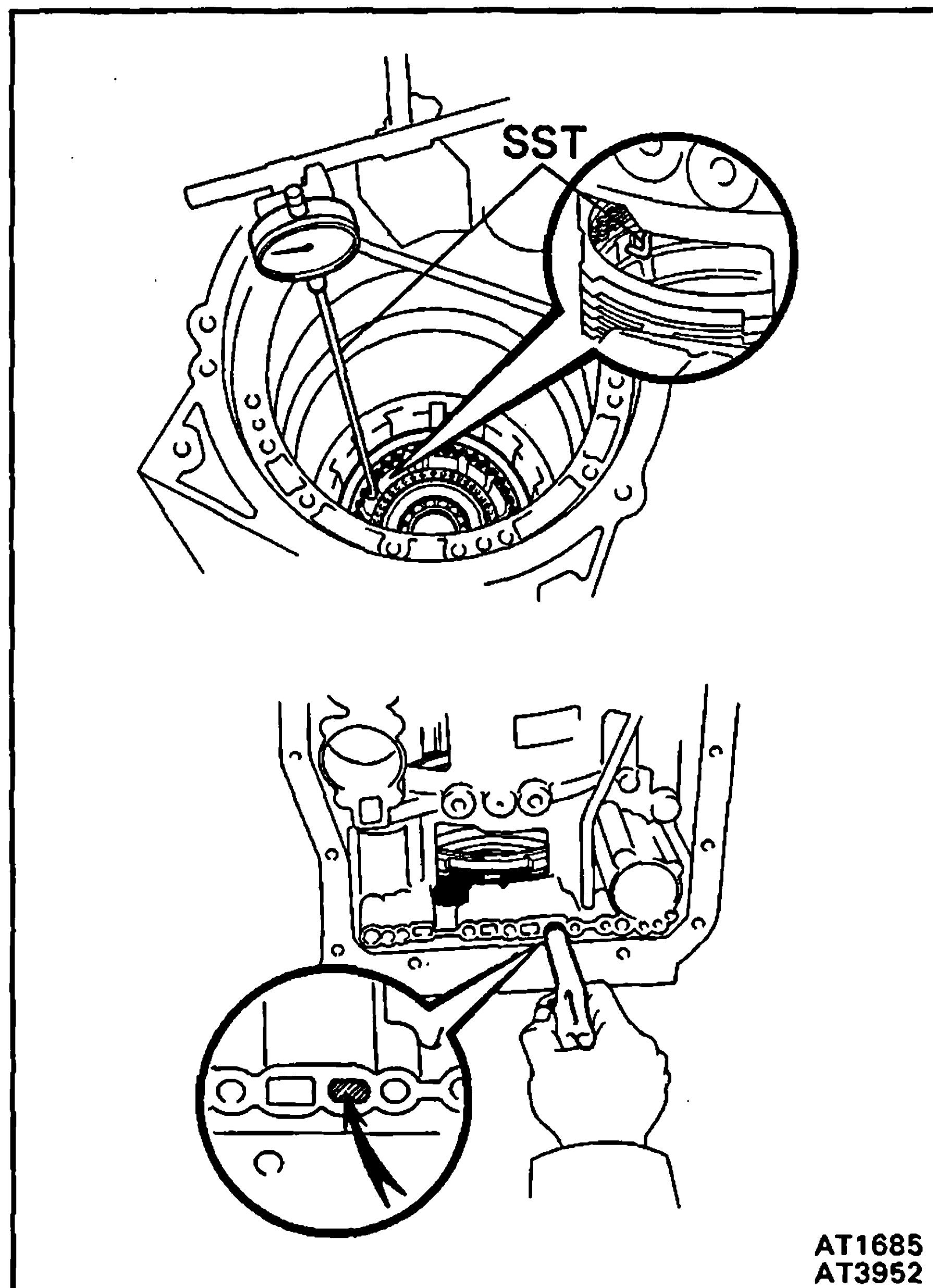
(i) Install the flange, facing the rounded edge outward.

HINT: If the flange is step-edged, install the flange with the step-edge, facing inward.



(j) Install snap ring.

HINT: Be sure the end of the snap ring is not aligned with the cutout portion of the transmission case.



## 5. CHECK PISTON STROKE OF FIRST AND REVERSE BRAKE

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

SST 09350-36010 (09350-06120, 09350-06130)

**Piston stroke: 3.3 — 3.8 mm (0.130 — 0.150 in.)**

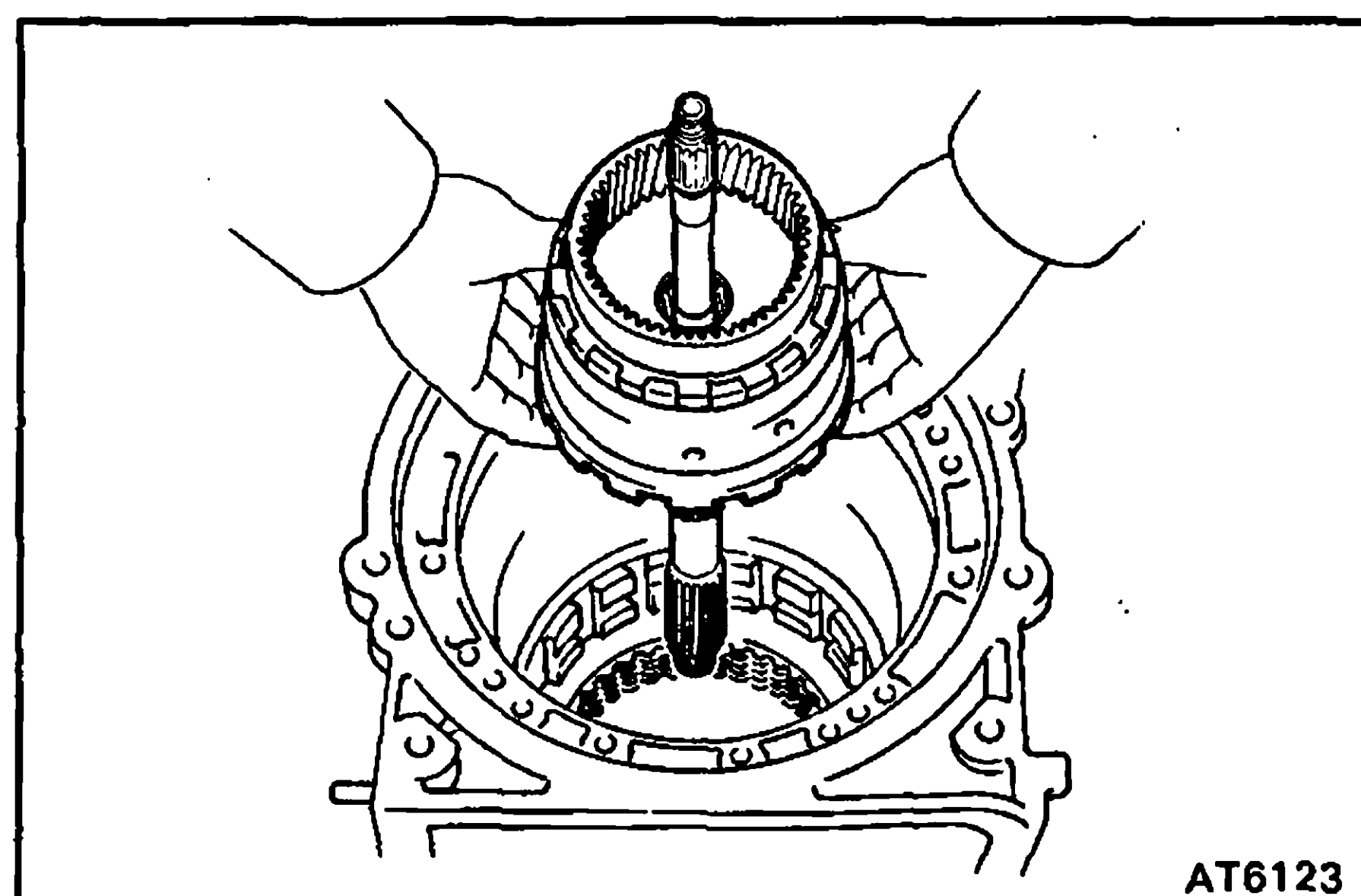
If the piston stroke is less than specified, parts may have been assembled incorrectly, check and reassemble again.

If the piston stroke is not as specified, select another flange.

**HINT:** There are three different thicknesses for flange.

mm (in.)

| NO.  | Thickness     |
|------|---------------|
| None | 6.65 (0.2618) |
| 1    | 7.05 (0.2776) |
| 2    | 7.45 (0.2933) |

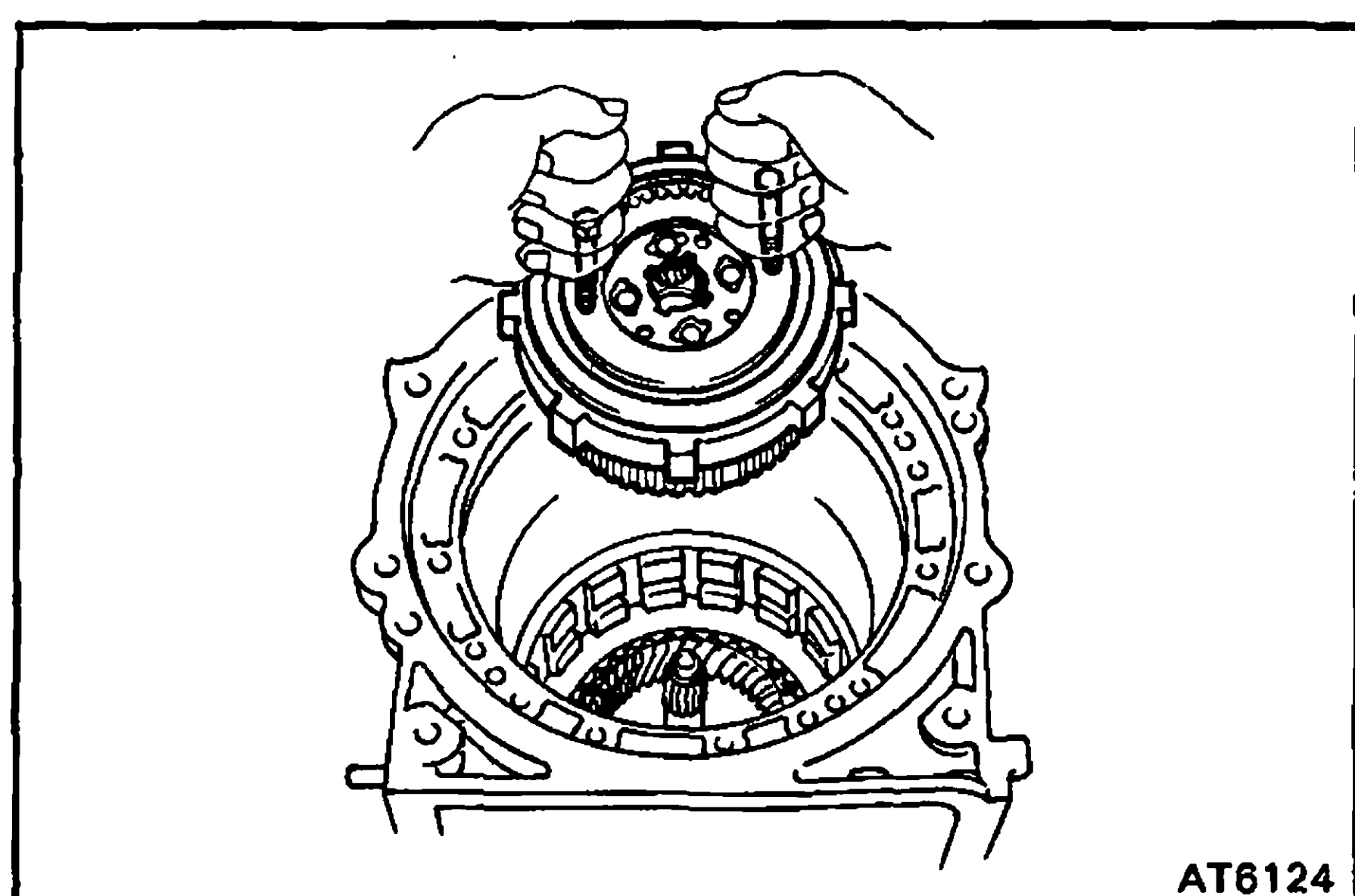


## 6. INSTALL PLANETARY GEARS, ONE-WAY CLUTCH AND OUTPUT SHAFT ASSEMBLY

(a) Place the transmission case on a cylinder.

(See step 4 on page AT-118)

(b) Install the rear planetary carrier and output shaft assembly to the transmission case.



(c) Install two bolts to the front planetary carrier.

**HINT:** Use two 6 mm (1 mm pitch) bolts. Do not screw over 5 revolutions.

(d) Align the spline of the one-way clutch assembly into the transmission case.

(e) Install the front planetary carrier and one-way clutch assembly into the transmission case.

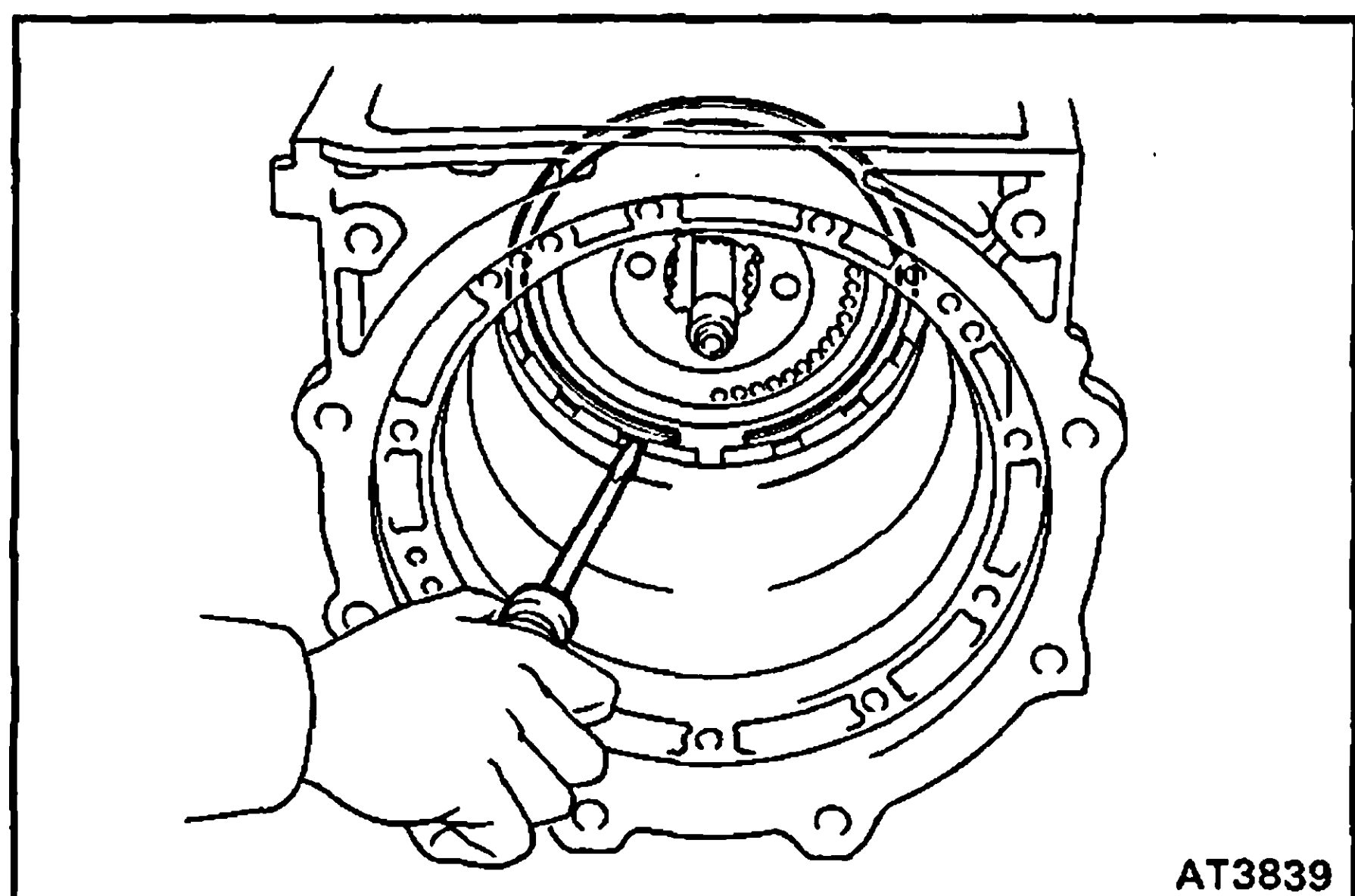
**HINT:**

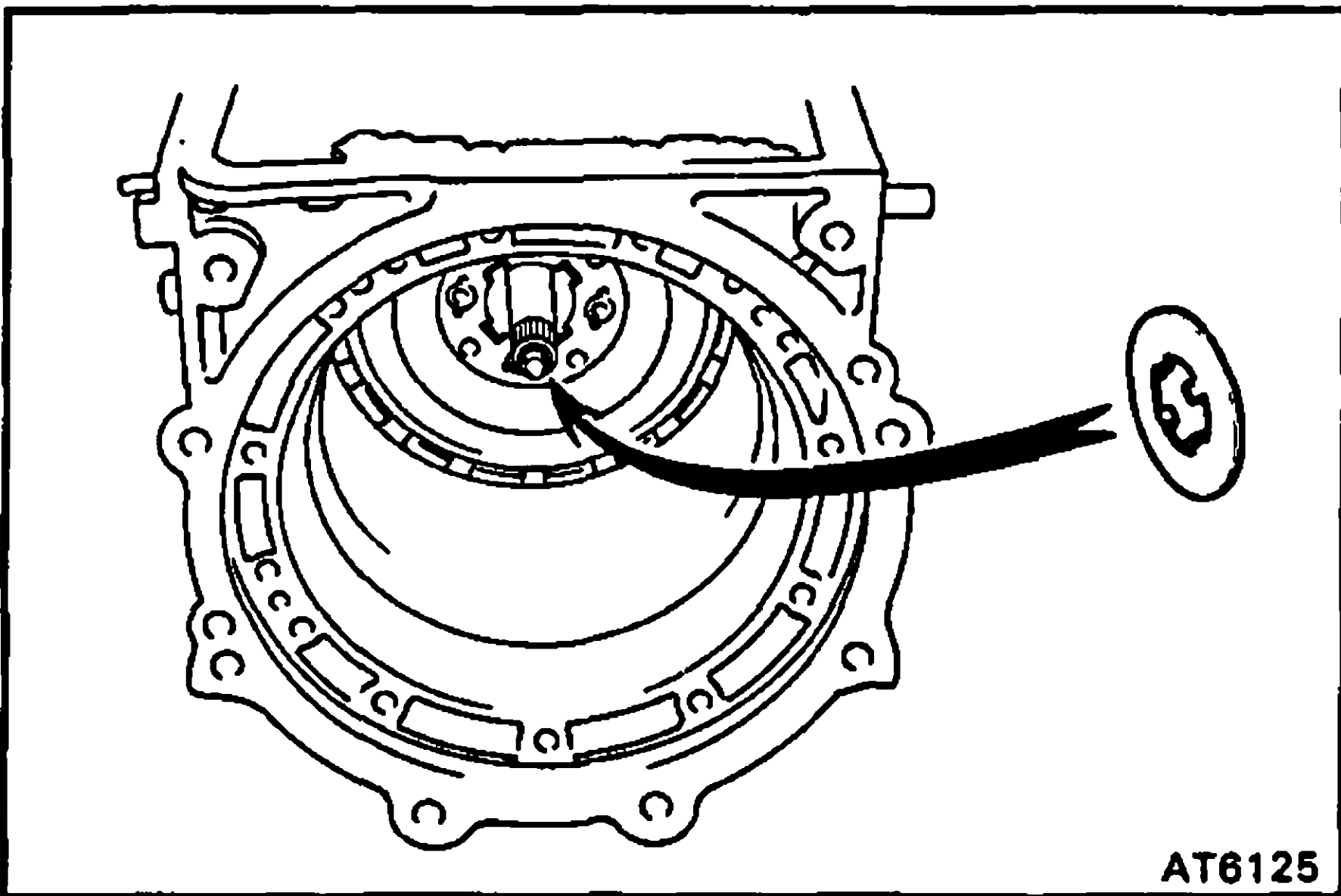
- Mesh the spline of the front planetary carrier with the flukes of the discs by rotating and pushing the front planetary carrier clockwise.

- If the front planetary carrier will not rotate clockwise, check the installation of the one-way clutch.

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

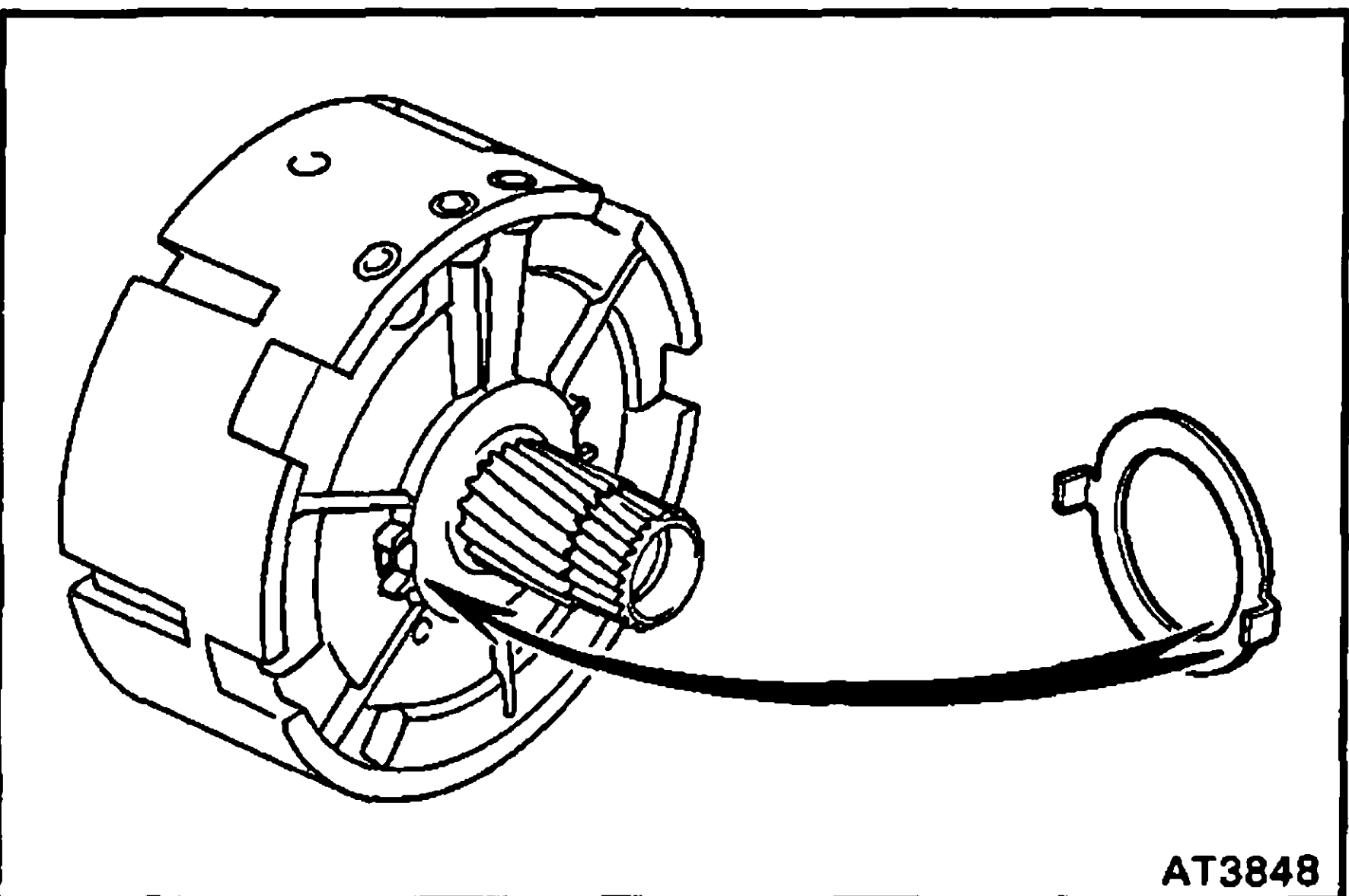
**HINT:** Be sure the end of the snap ring is not aligned with the cutout portion of the transmission case.





- (g) Coat the thrust washer with petroleum jelly, and install it onto the front planetary carrier.

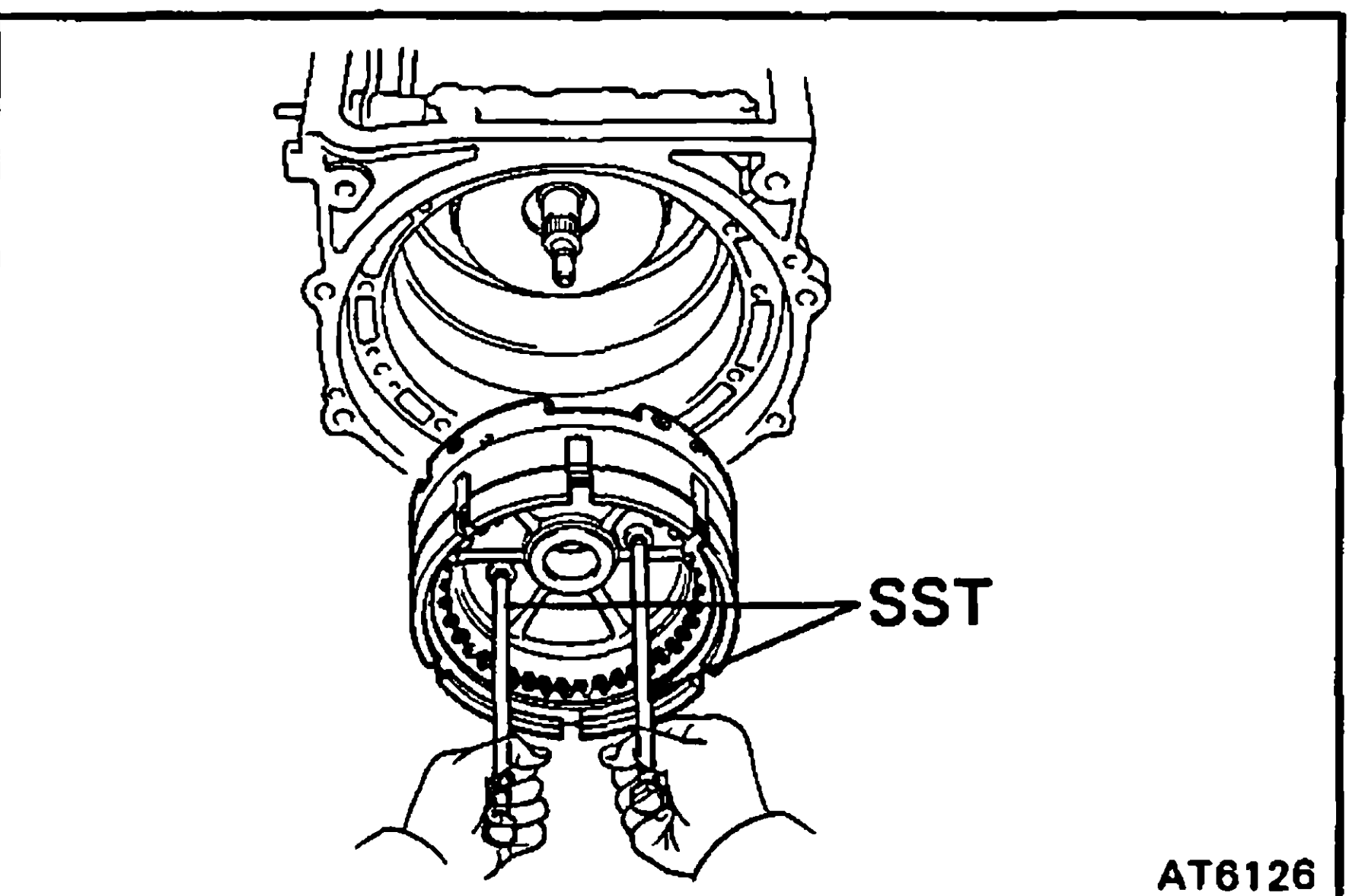
**HINT:** Securely fit the claws of the thrust washer into the grooves of the front planetary gear.



## 7. TEMPORARILY INSTALL CENTER SUPPORT ASSEMBLY

- (a) Coat the thrust washer with petroleum jelly, and install it onto the rear side of the center support.

**HINT:** Securely fit the claws of the thrust washer into the grooves of the center support.

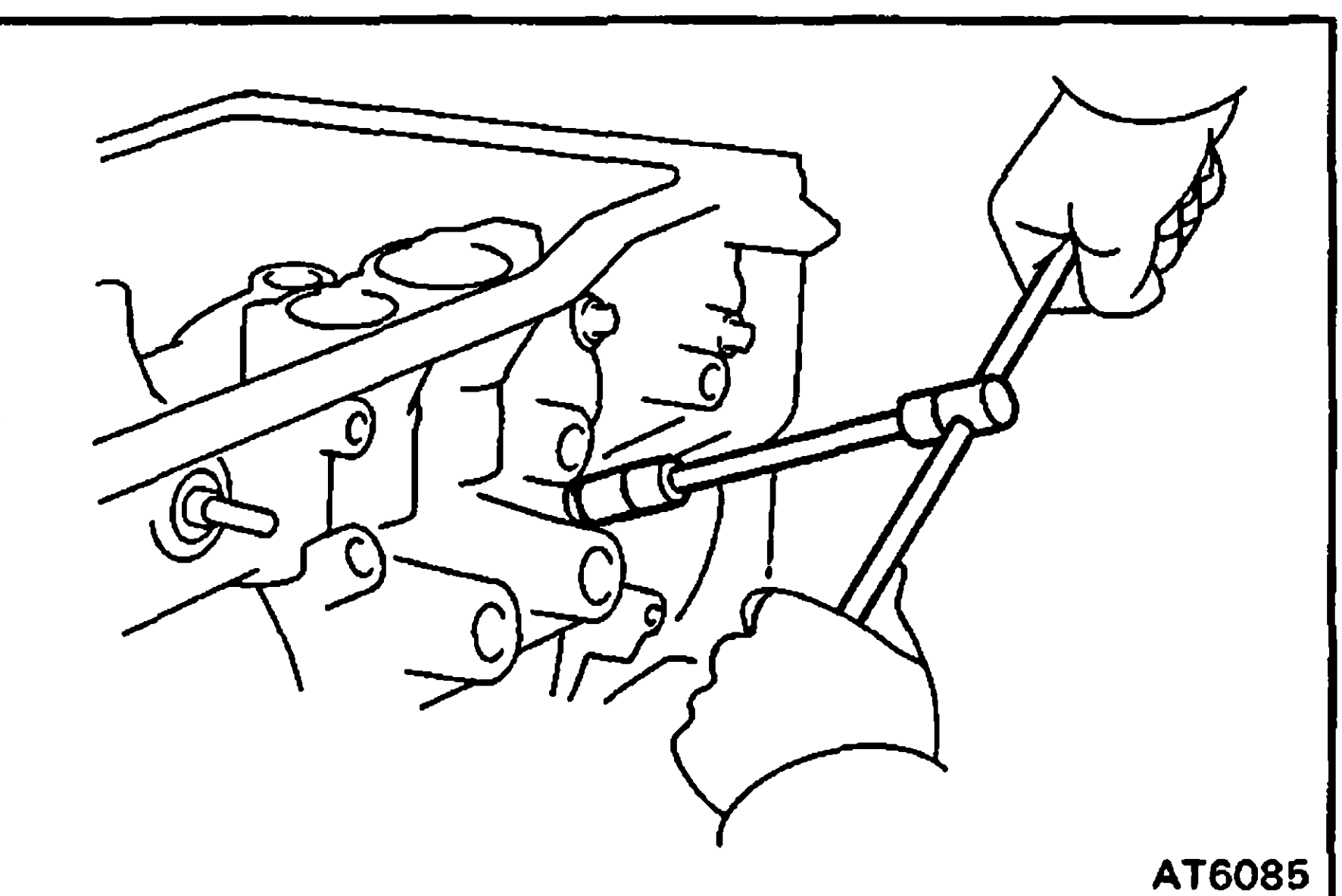


- (b) Install SST (two bolts) to the center support.

SST 09350-36010 (09350-06140)

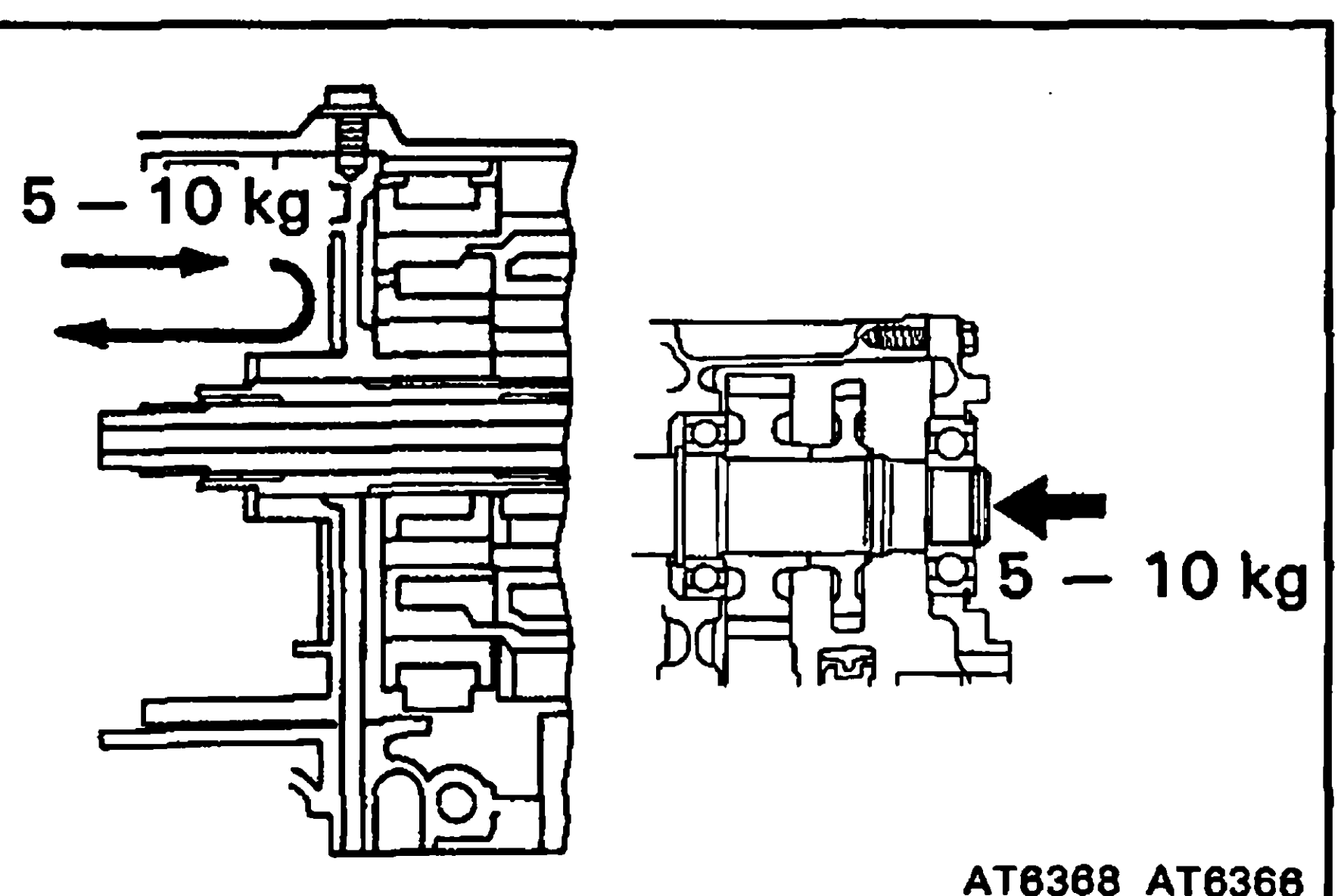
- (c) Align the oil holes and bolt holes of the center support and transmission case.

- (d) Install the center support assembly into the transmission case.



- (e) Install the three center support bolts.

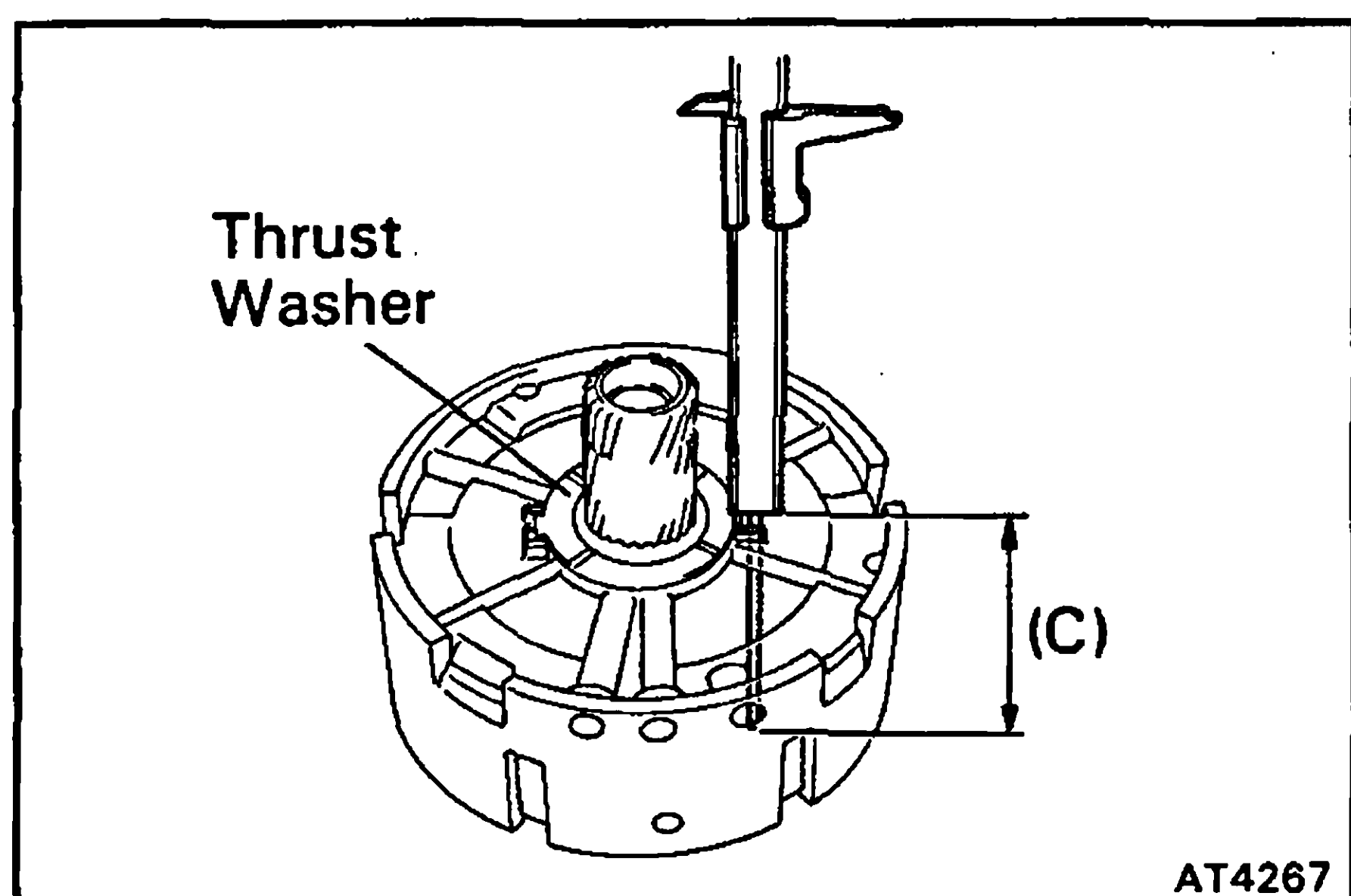
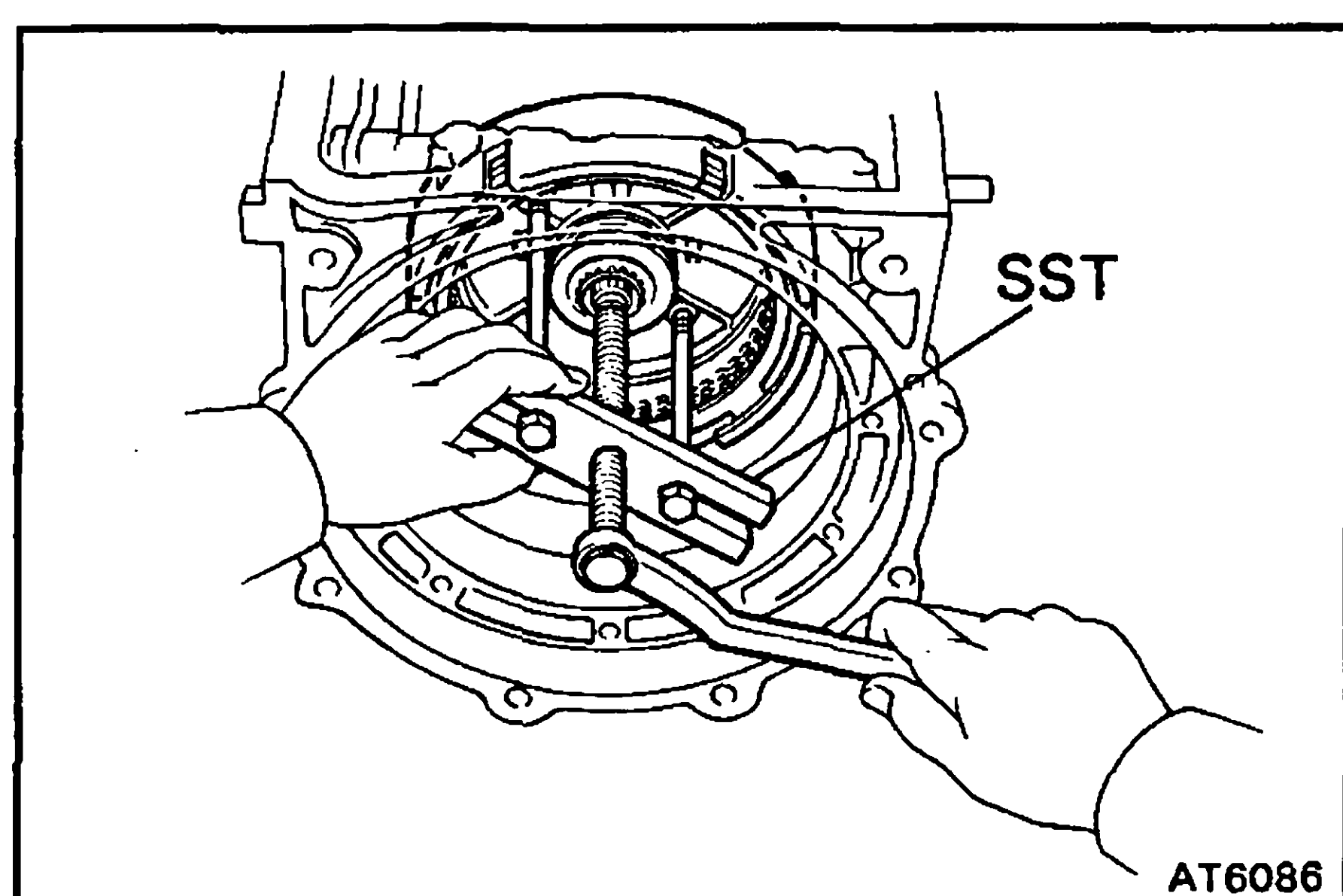
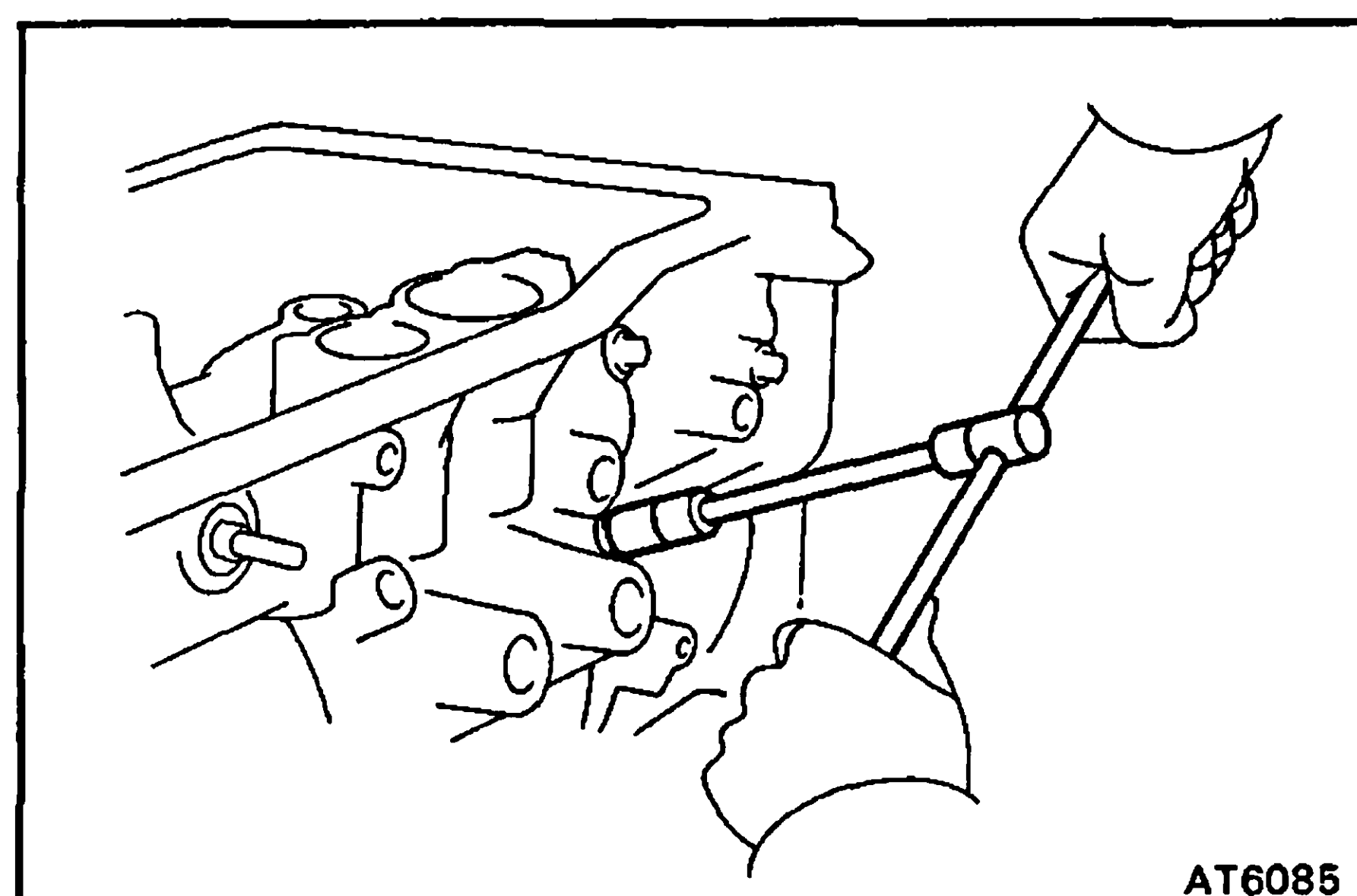
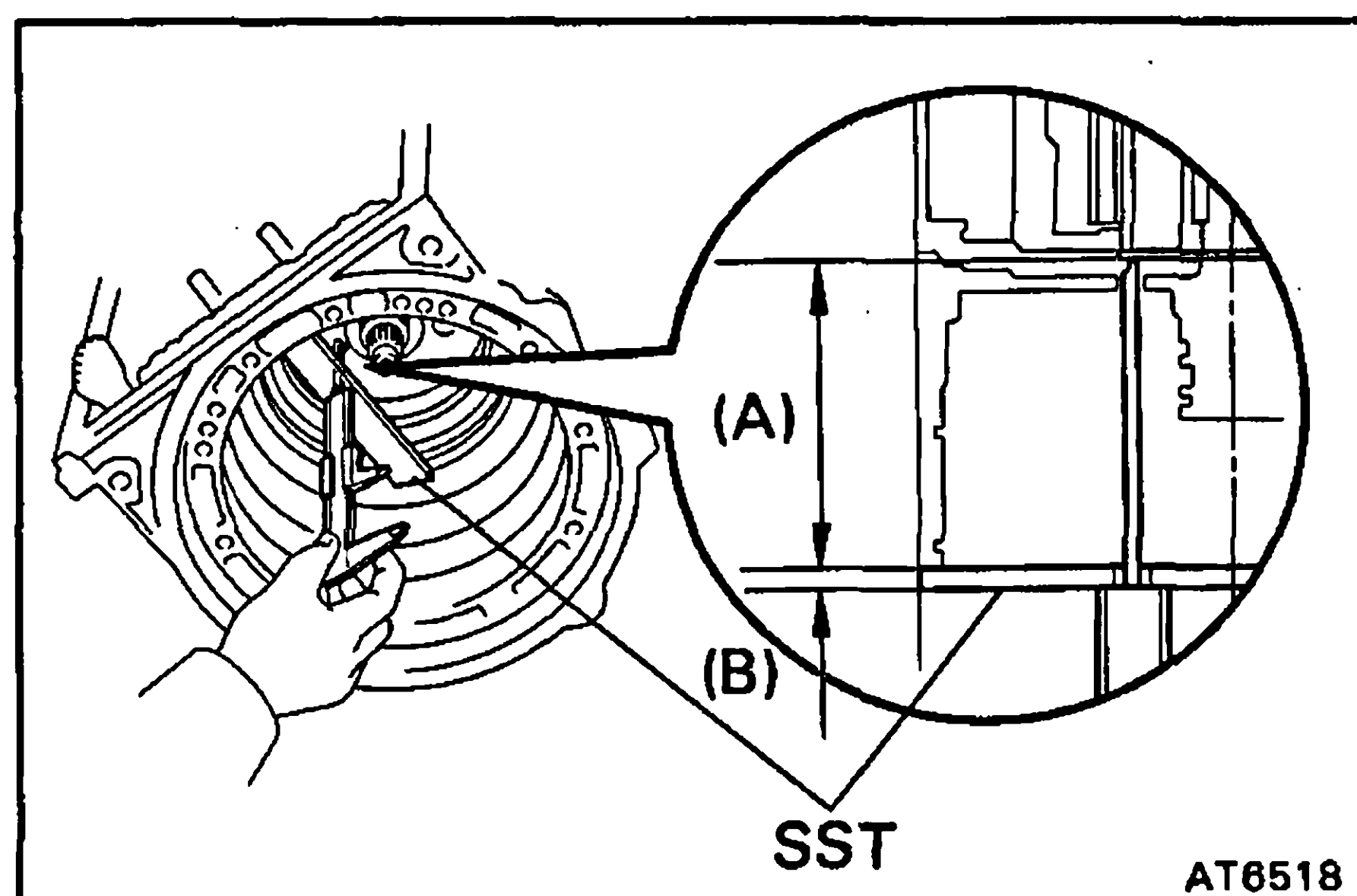
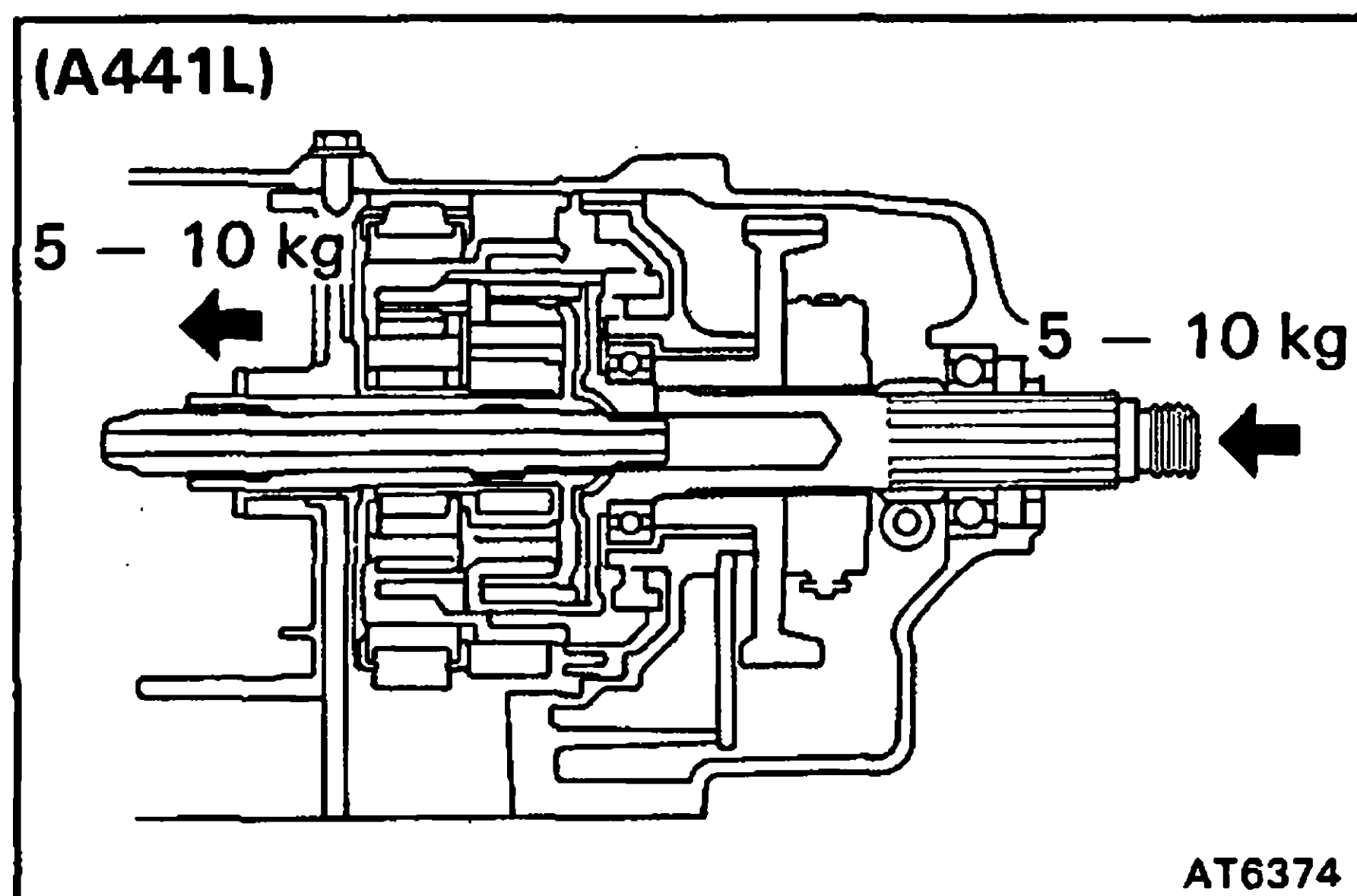
**Torque:** 250 kg-cm (18 ft-lb, 25 N·m)



## 8. ADJUST THRUST CLEARANCE OF CENTER SUPPORT

- (a) Push the transmission output shaft toward the front of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).

- (b) Push the center support toward the rear of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N), then pull with the same amount of force.



(c) Place SST on the center support.

SST 09350-36010 (09350-06090)

(d) Using calipers, measure distance (A) between the tops of SST and the thrust washer on the front planetary gear.

(e) Using calipers, measure thickness (B) of SST.

(f) Remove the three center support set bolts.

(g) Using SST, remove the center support assembly from the transmission case.

SST 09350-36010 (09350-06140)

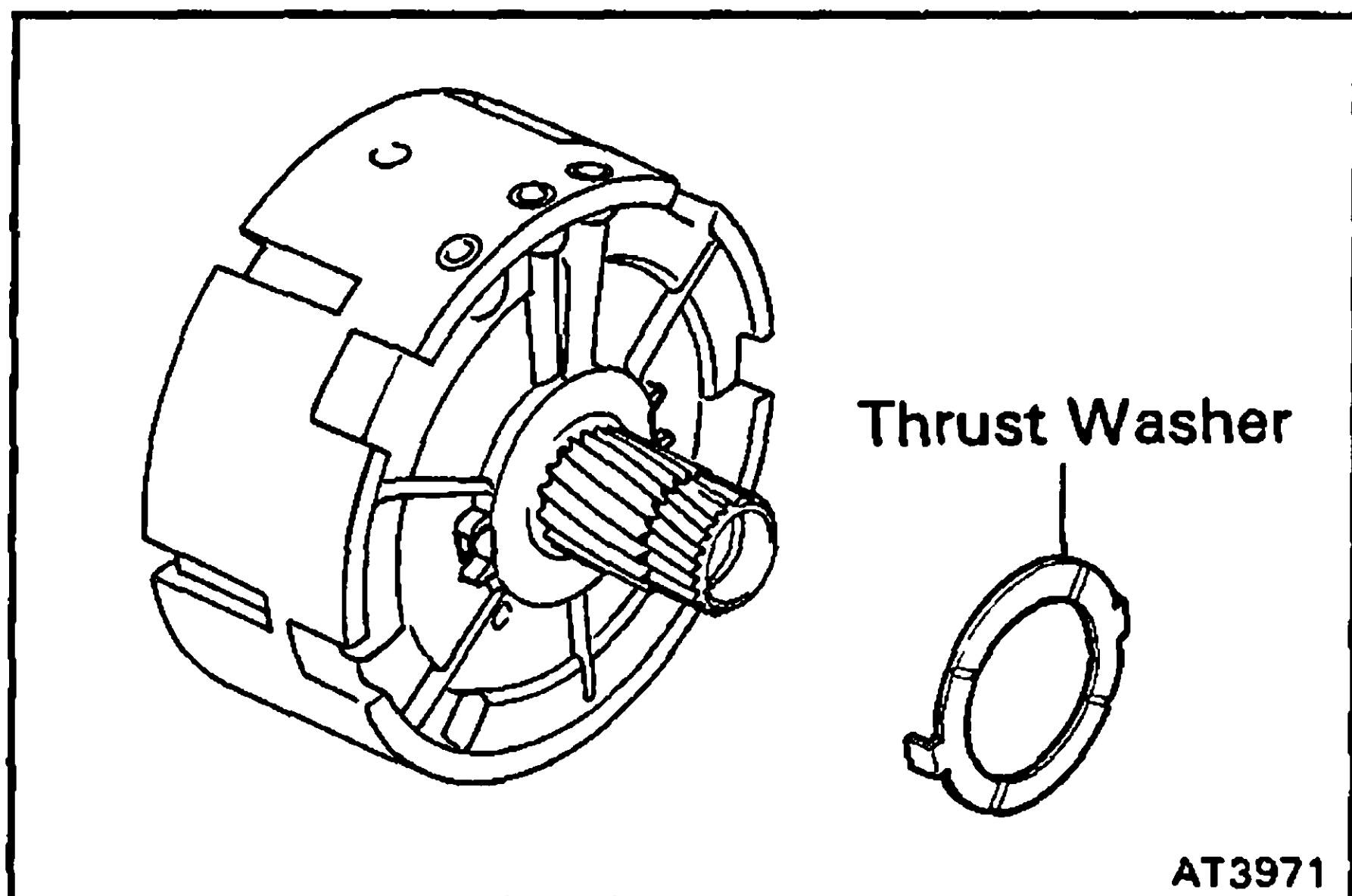
(h) Turn over the center support together with the thrust washer, and place it on a flat surface.

(i) Inserting calipers into the thrust washer hole, measure the distance (C) between it and the flat surface.

**Center support thrust clearance:  $A - (B + C)$**

**Standard thrust clearance: 0.30 - 0.70 mm  
(0.0118 - 0.0276 in.)**

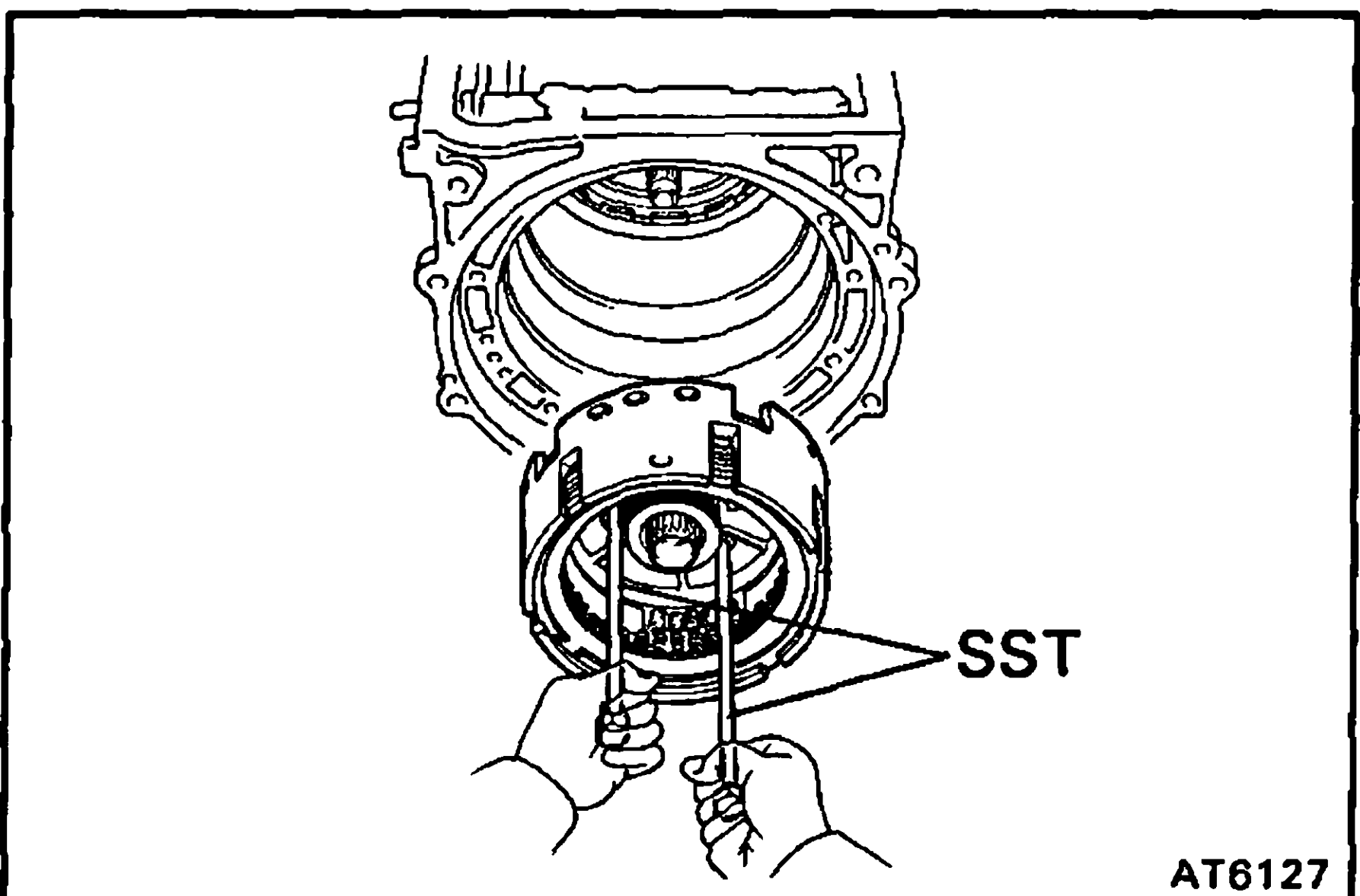
**Maximum thrust clearance: 0.90 mm (0.0354 in.)**



If the thrust clearance is greater than maximum, select and install a thrust washer.

HINT: There are four different thicknesses for thrust washer.

| Thrust washer thickness |             | mm (in.) |
|-------------------------|-------------|----------|
| 1.8 (0.071)             | 2.4 (0.094) |          |
| 2.1 (0.083)             | 2.6 (0.102) |          |

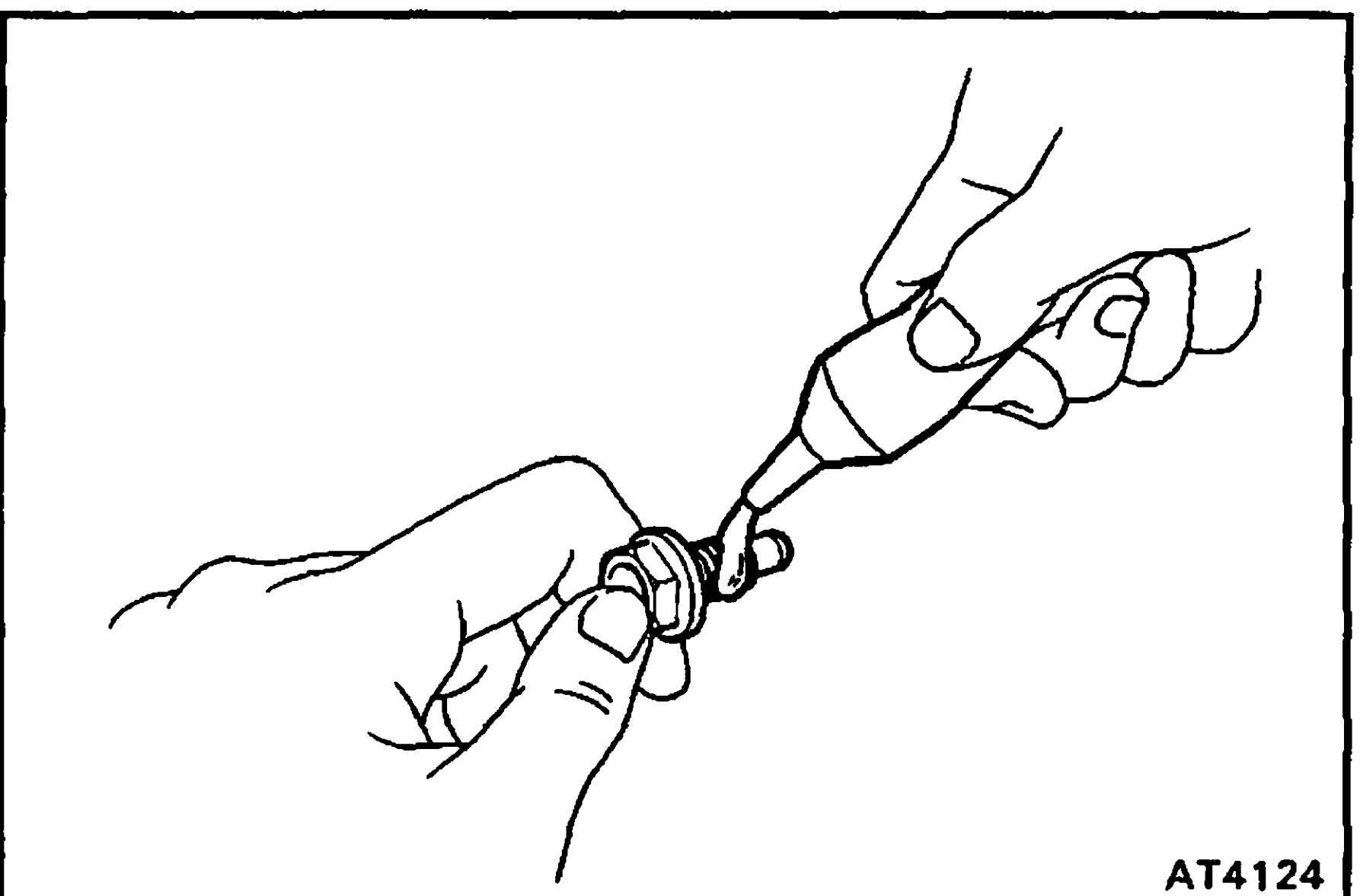


## 9. INSTALL CENTER SUPPORT ASSEMBLY

- Coat new three O-rings with ATF, and install them to the oil holes of the center support.
- Install SST (two bolts) to the center support.  
SST 09350-36010 (09350-06140)
- Align the oil holes and bolt holes of the center support and transmission case.
- Install the center support assembly into the transmission case.

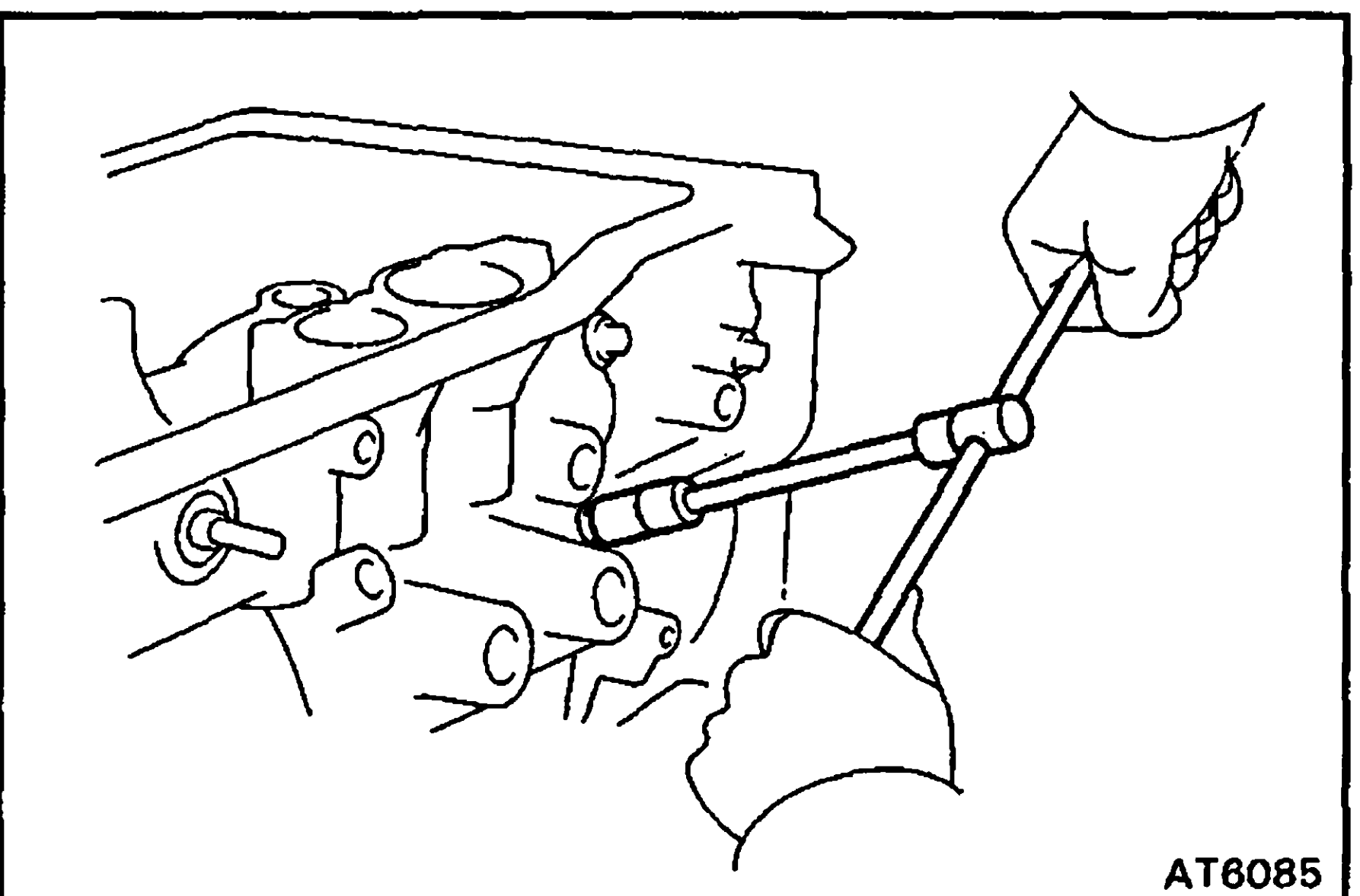
- Apply sealant to the threads of the center support set bolts.

**Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent**



- Install the three center support set bolts.

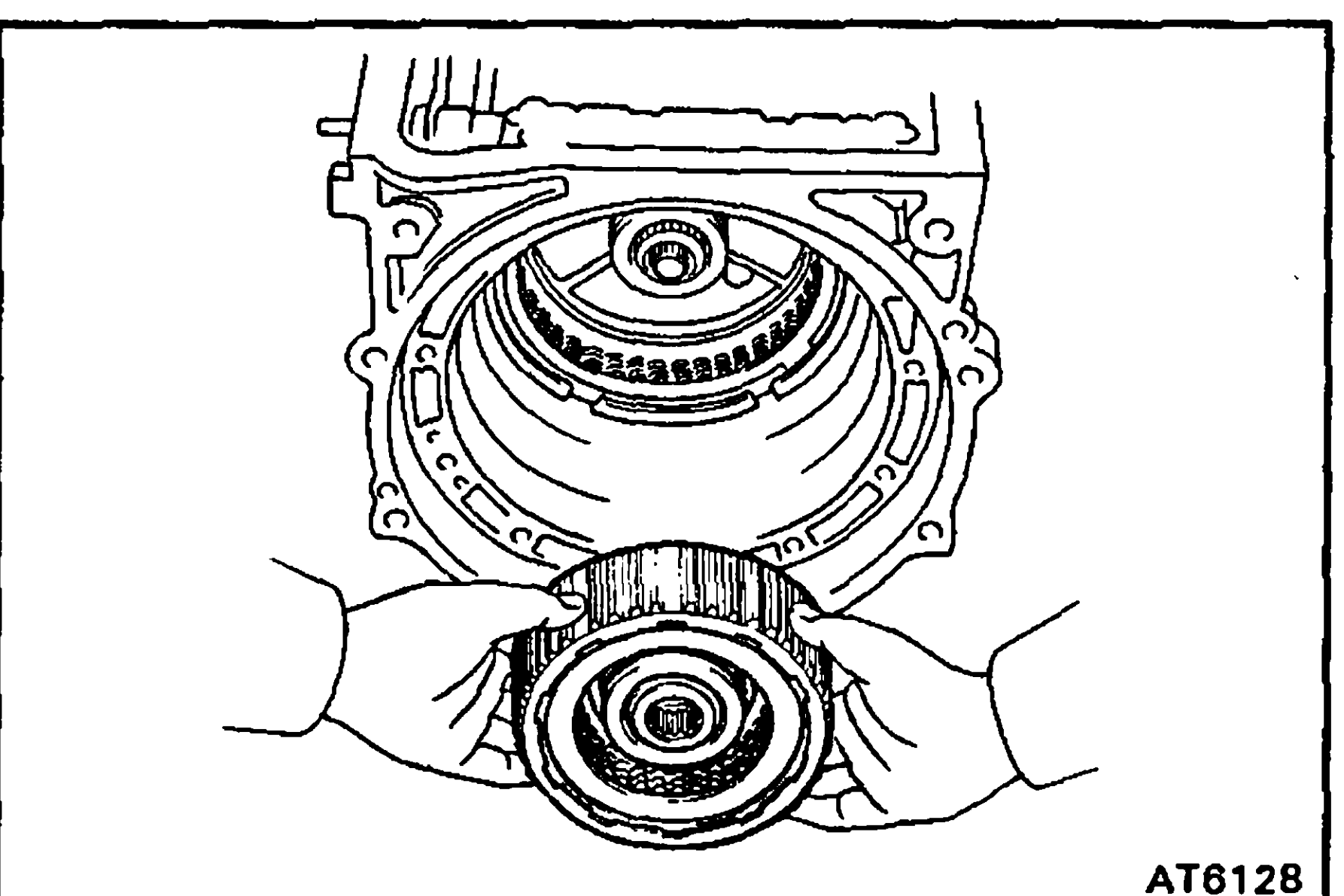
**Torque: 250 kg-cm (18 ft-lb, 25 N-m)**

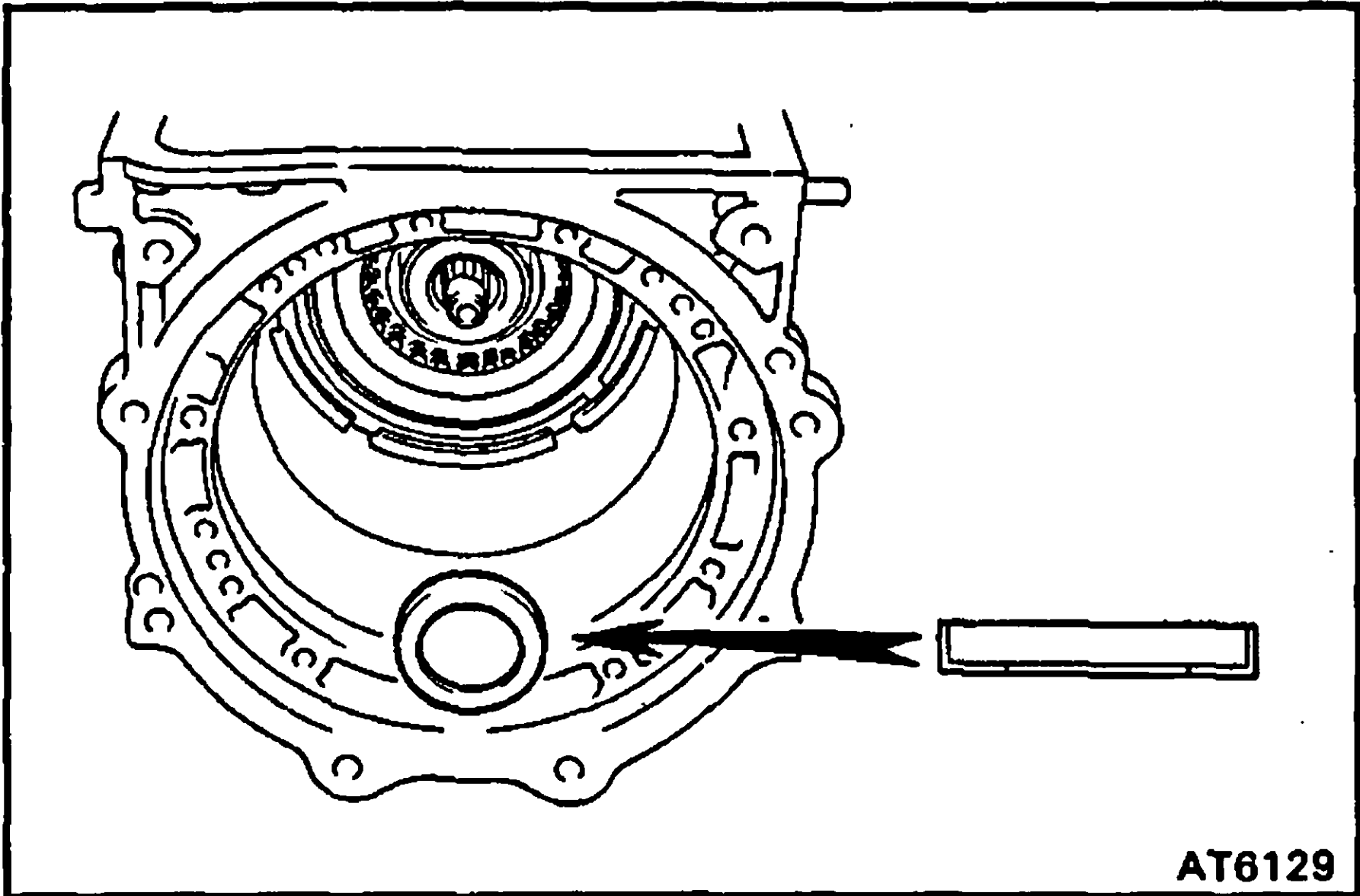


## 10. INSTALL REAR CLUTCH ASSEMBLY

Install the rear clutch assembly into the transmission case.

HINT: Mesh the spline of the rear clutch drum with the flukes of the discs by rotating and pushing the rear clutch drum clockwise or counterclockwise.





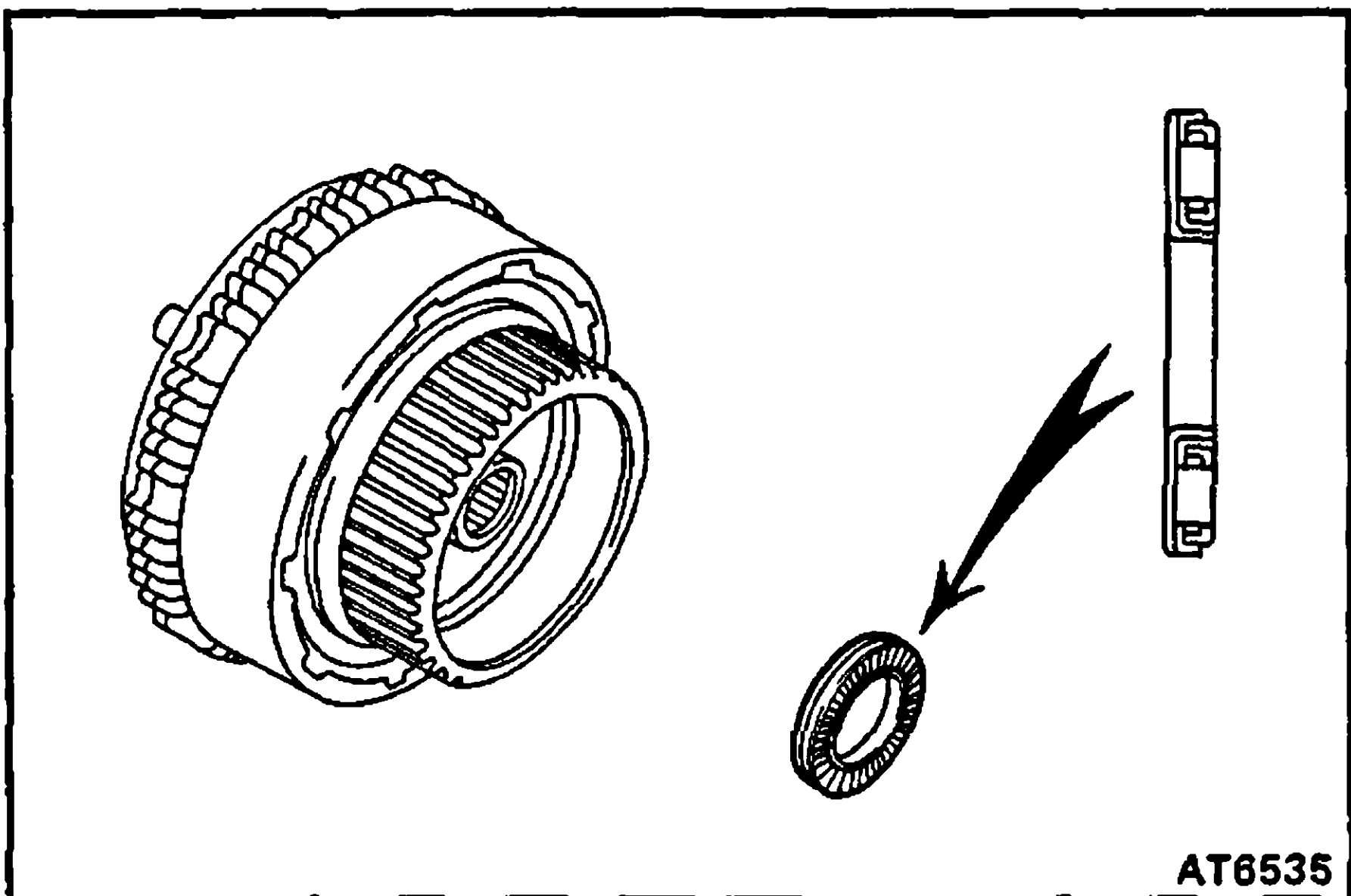
11. INSTALL FRONT CLUTCH ASSEMBLY

- (a) Coat the race with petroleum jelly, and install it onto the rear clutch drum.

HINT: Race diameter

mm (in.)

|      | Inside       | Outside      |
|------|--------------|--------------|
| Race | 37.0 (1.457) | 52.0 (2.047) |

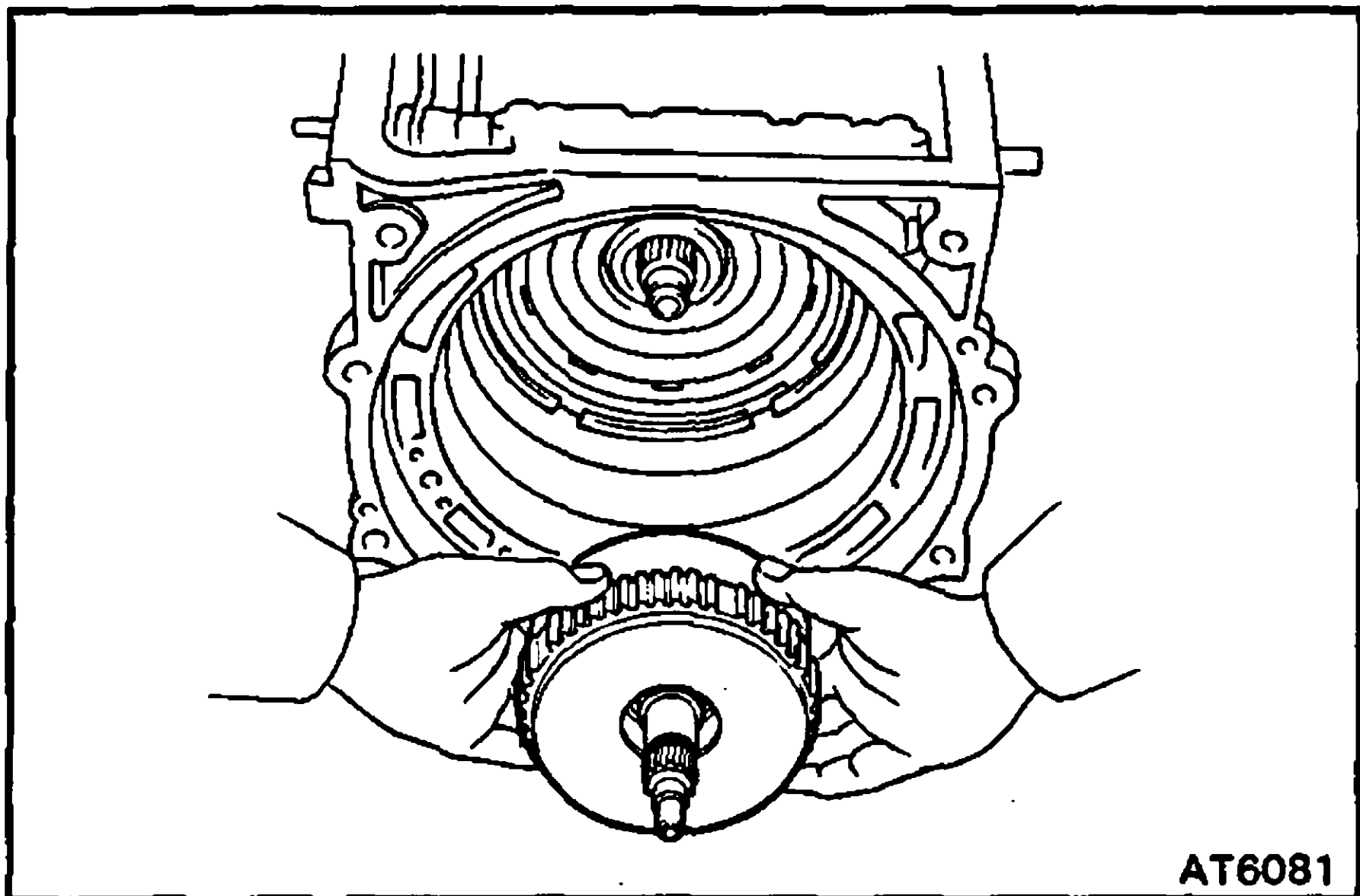


- (b) Coat the race and bearing with petroleum jelly, and install them onto the front clutch hub.

HINT: Bearing and race diameters

mm (in.)

|                            | Inside       | Outside      |
|----------------------------|--------------|--------------|
| Assembled bearing and race | 32.8 (1.291) | 50.4 (1.984) |



- (c) Install the front clutch assembly into the transmission case.

HINT: Mesh the spline of the front clutch hub with the flukes of the discs by rotating and pushing the front clutch drum clockwise or counterclockwise.

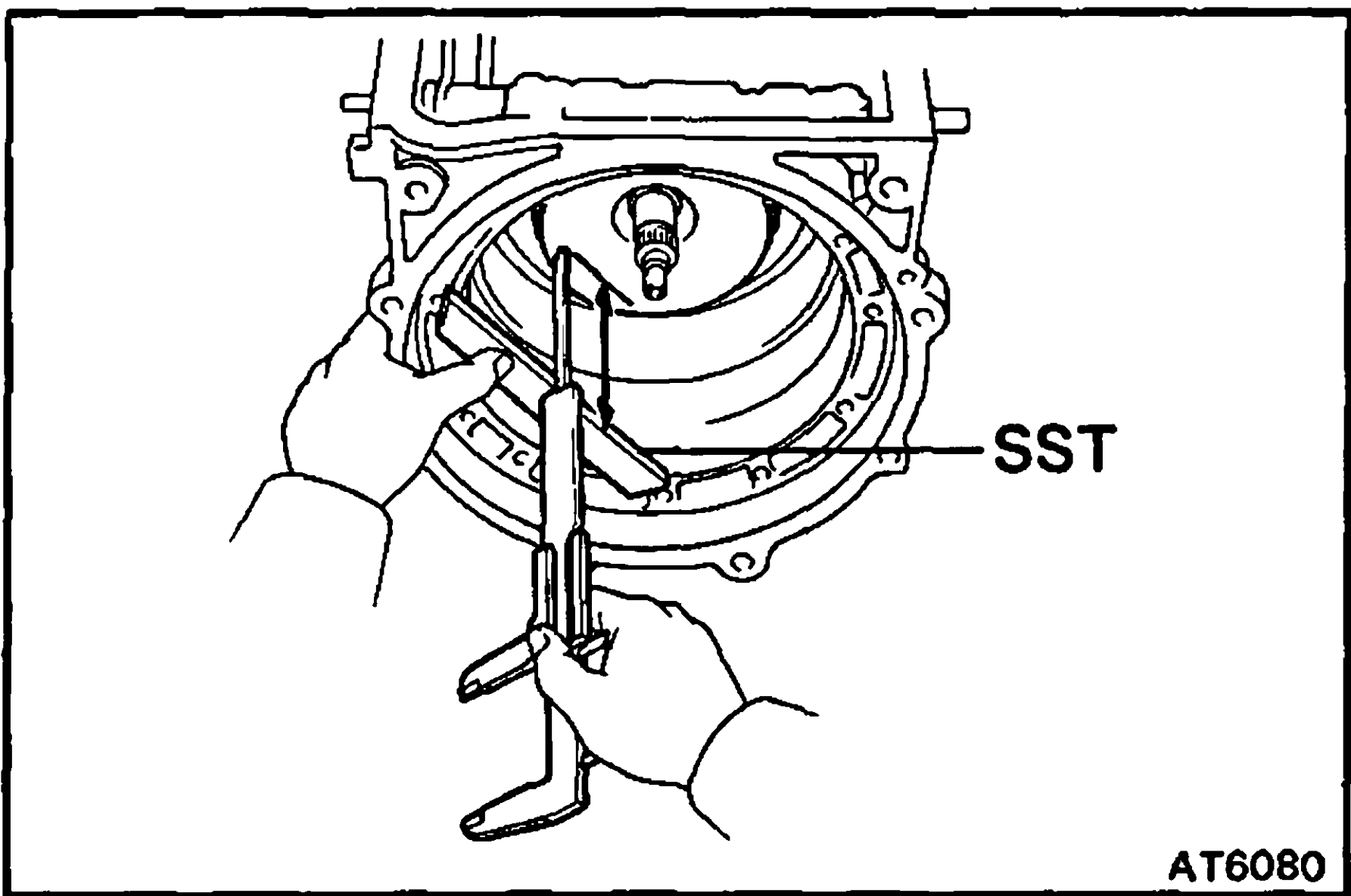
12. CHECK CORRECT INSTALLATION OF FRONT CLUTCH ASSEMBLY

- (a) Place SST on the installation surface of the oil pump.

SST 09350-36010 (09350-06090)

- (b) Using calipers, measure the distance between the tops of SST and the clutch drum.

If the distance corresponds to that during disassembly, the front clutch assembly is installed correctly.



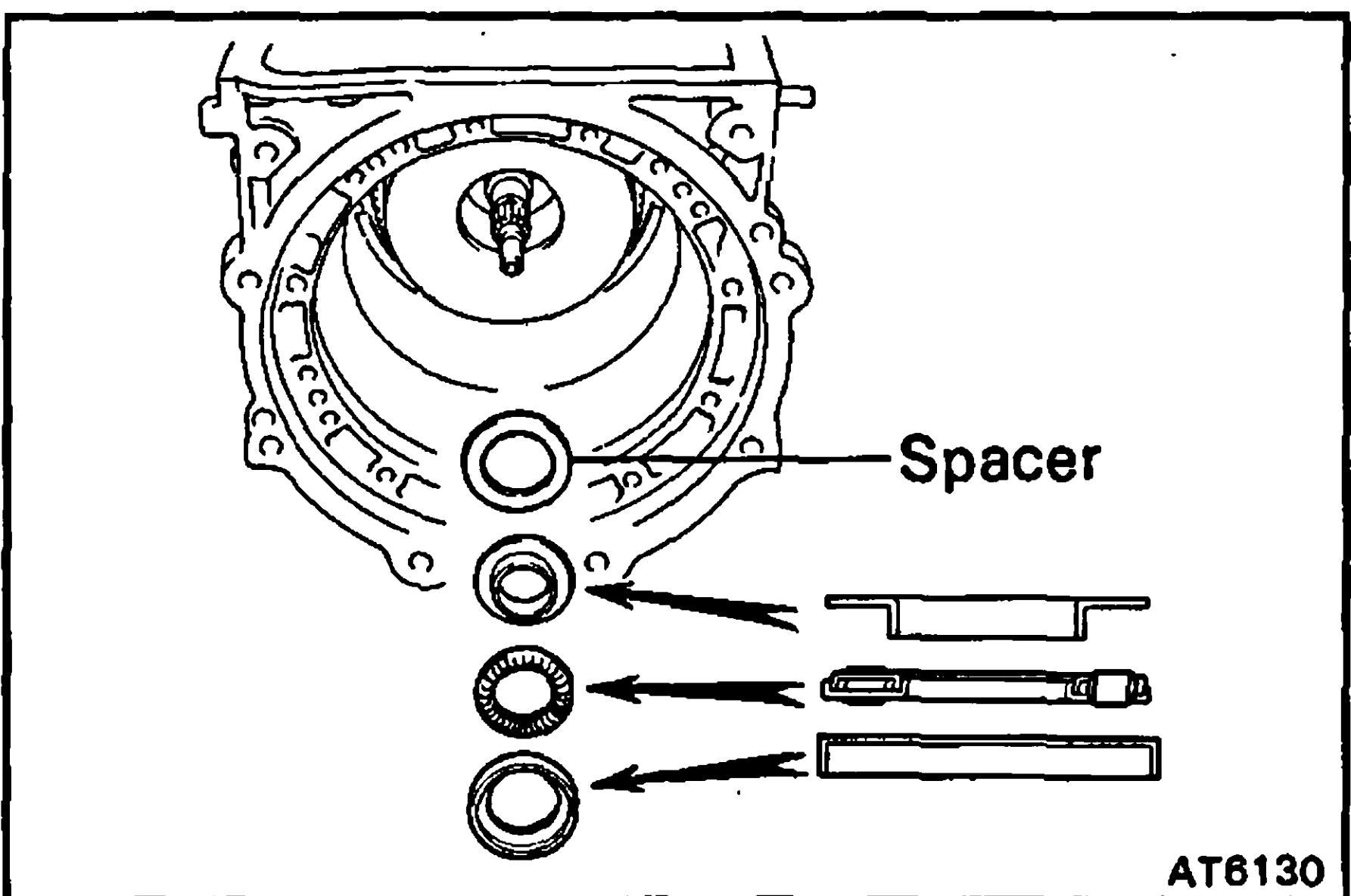
13. TEMPORARILY INSTALL OVERDRIVE CASE ASSEMBLY

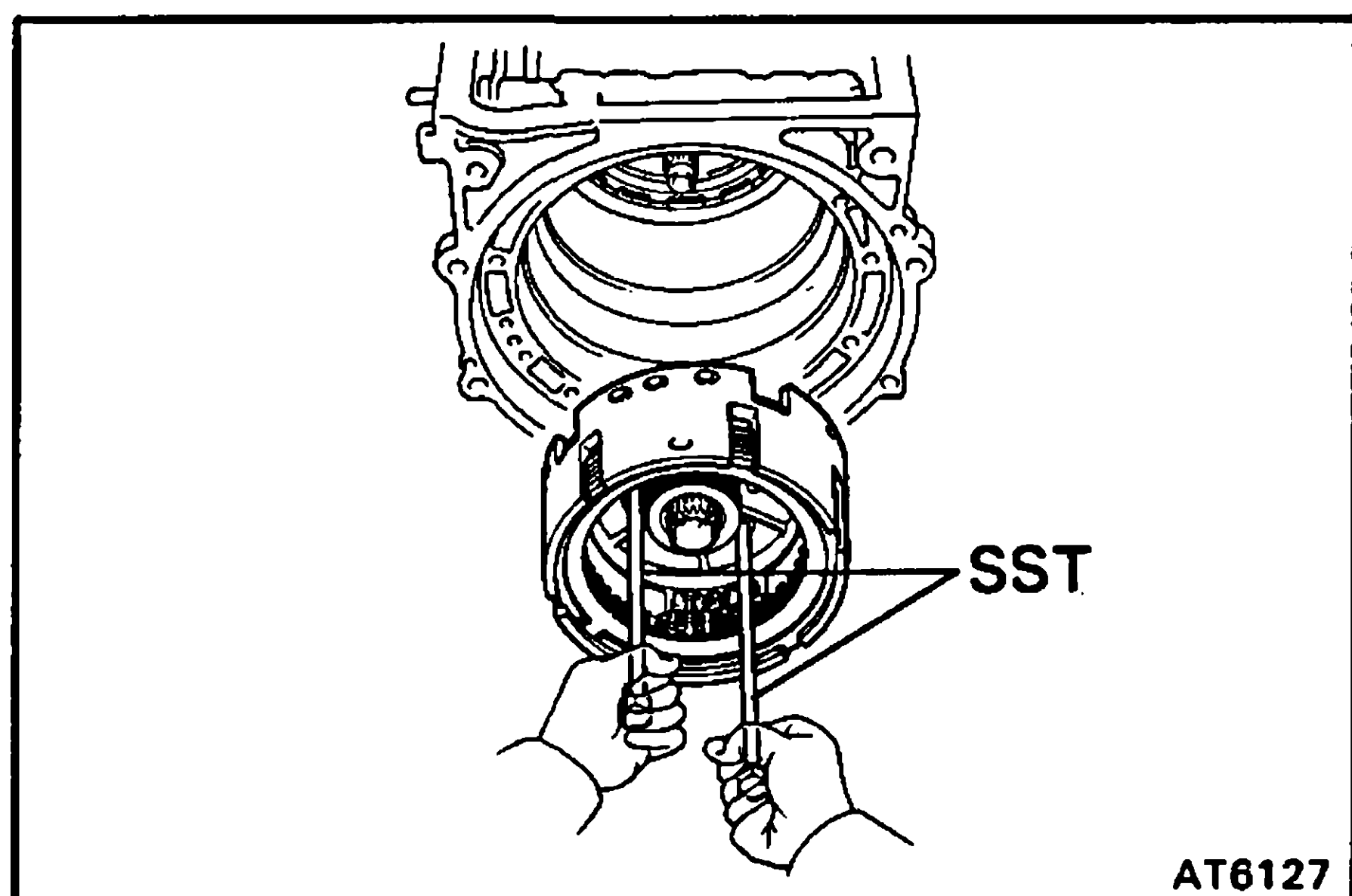
- (a) Remove the oil seal ring from the input shaft.
- (b) Coat the two races and bearing with petroleum jelly, and install the spacer and them onto the front clutch drum.

HINT: Bearing and race diameter

mm (in.)

|              | Inside       | Outside      |
|--------------|--------------|--------------|
| Bearing      | 34.7 (1.366) | 52.0 (2.047) |
| Race (Front) | 37.0 (1.457) | 52.0 (2.047) |
| Race (Rear)  | 32.8 (1.291) | 50.4 (1.984) |



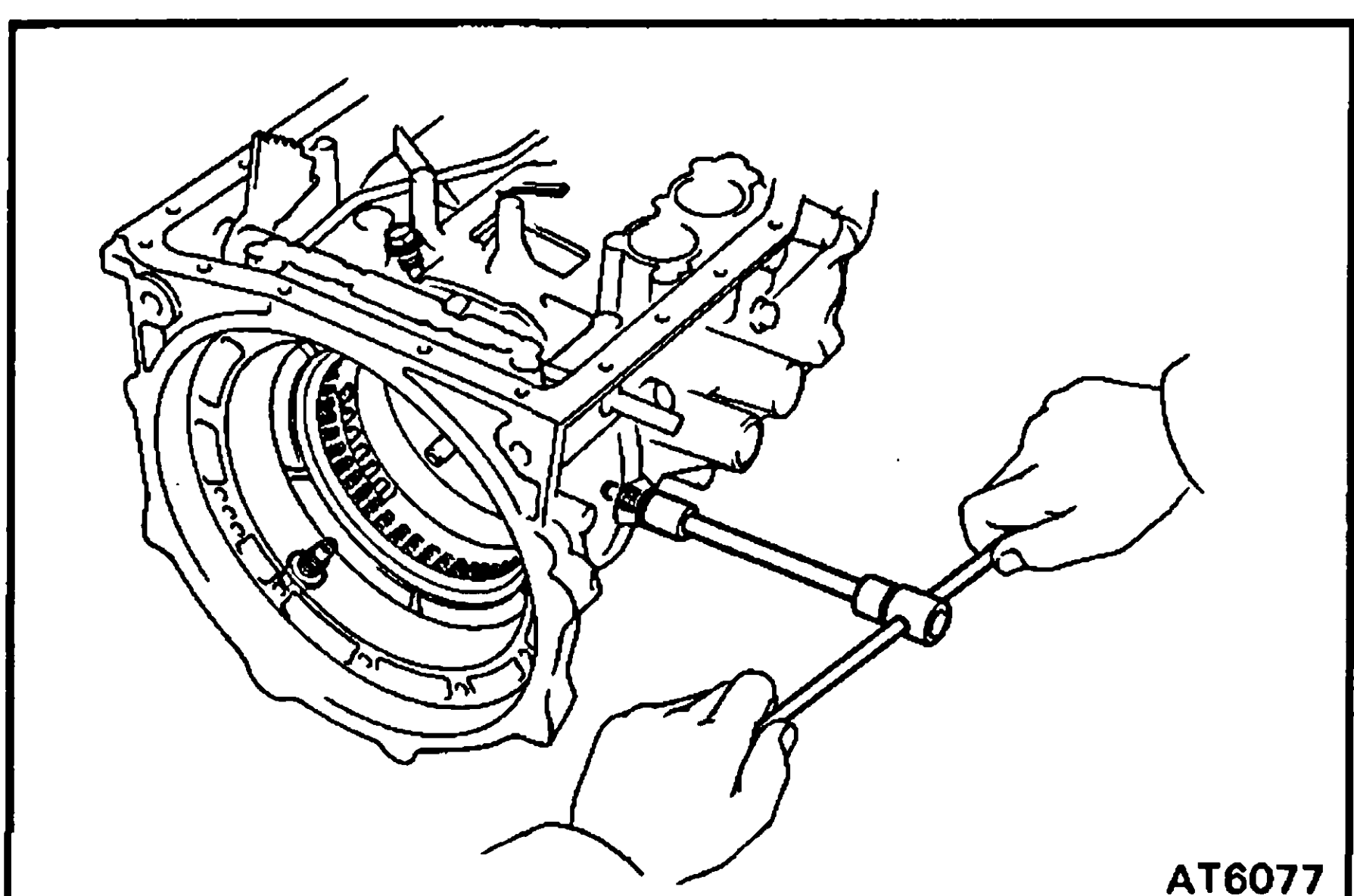


(c) Install SST (two bolts) to the O/D case.

SST 09350-36010 (09350-06140)

(d) Align the oil holes and bolt holes of the O/D case and transmission case.

(e) Install the O/D case set bolts.

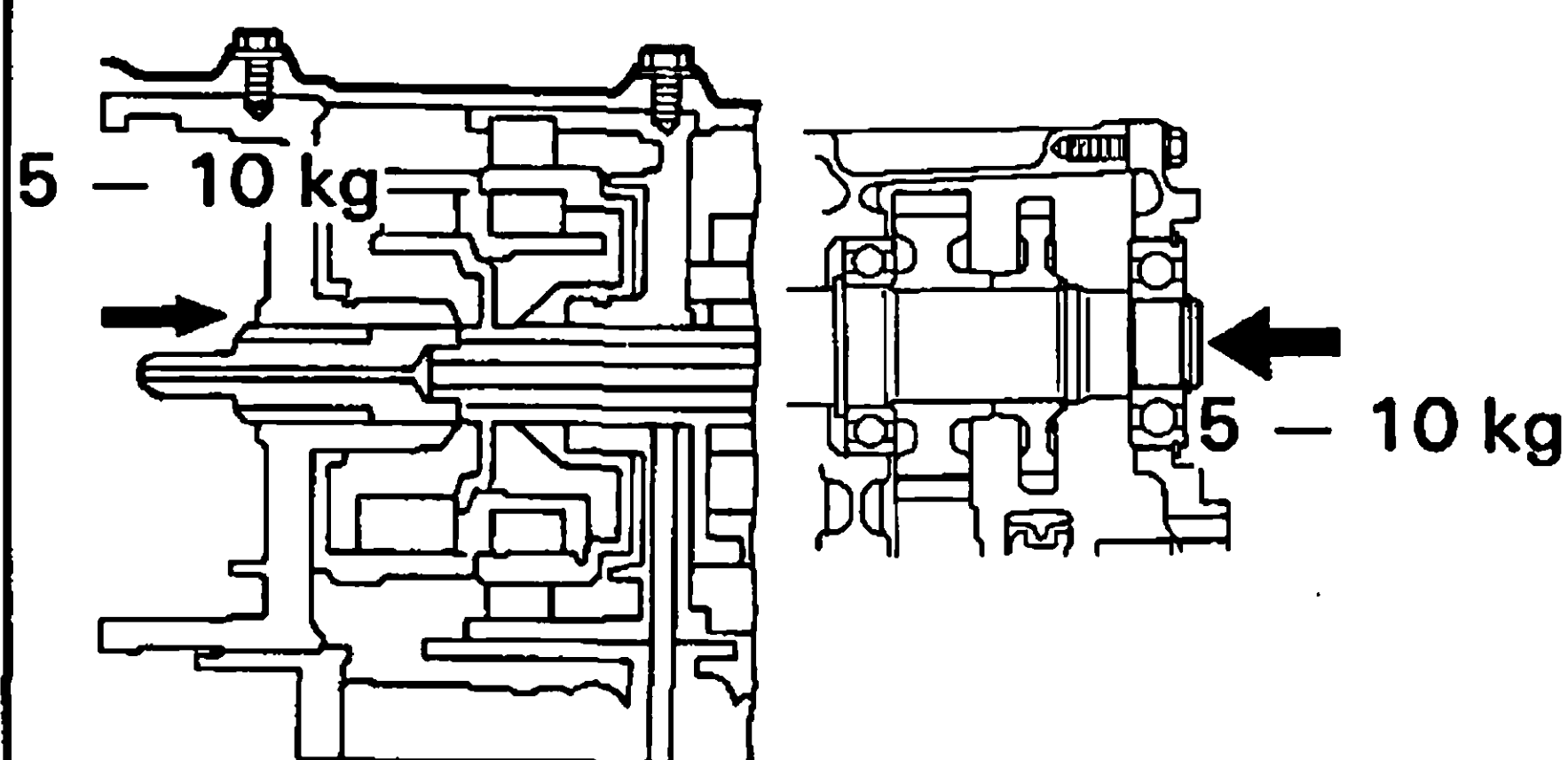


**(A440F, A441L)**

(f) Install the three O/D case set bolts.

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

**(A440F, A442F)**

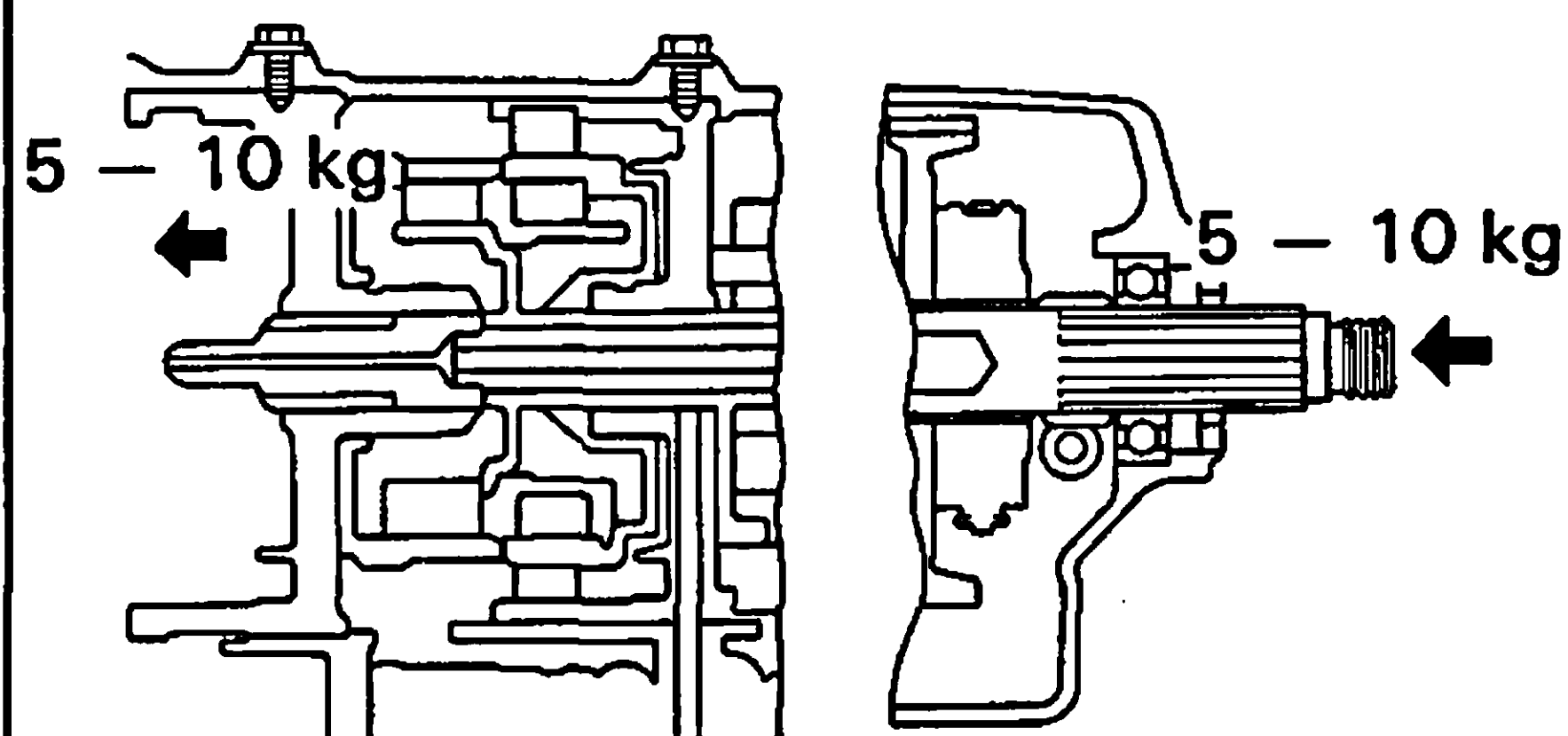


#### **14. ADJUST THRUST CLEARANCE OF INPUT SHAFT (FRONT CLUTCH DRUM)**

(a) Push the transmission output shaft toward the front of the transmission by applying a force of 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).

(b) Push the O/D case toward the rear of the transmission by applying a force 5 — 10 kg (11.0 — 22.0 lb, 49 — 98 N).

**(A441L)**



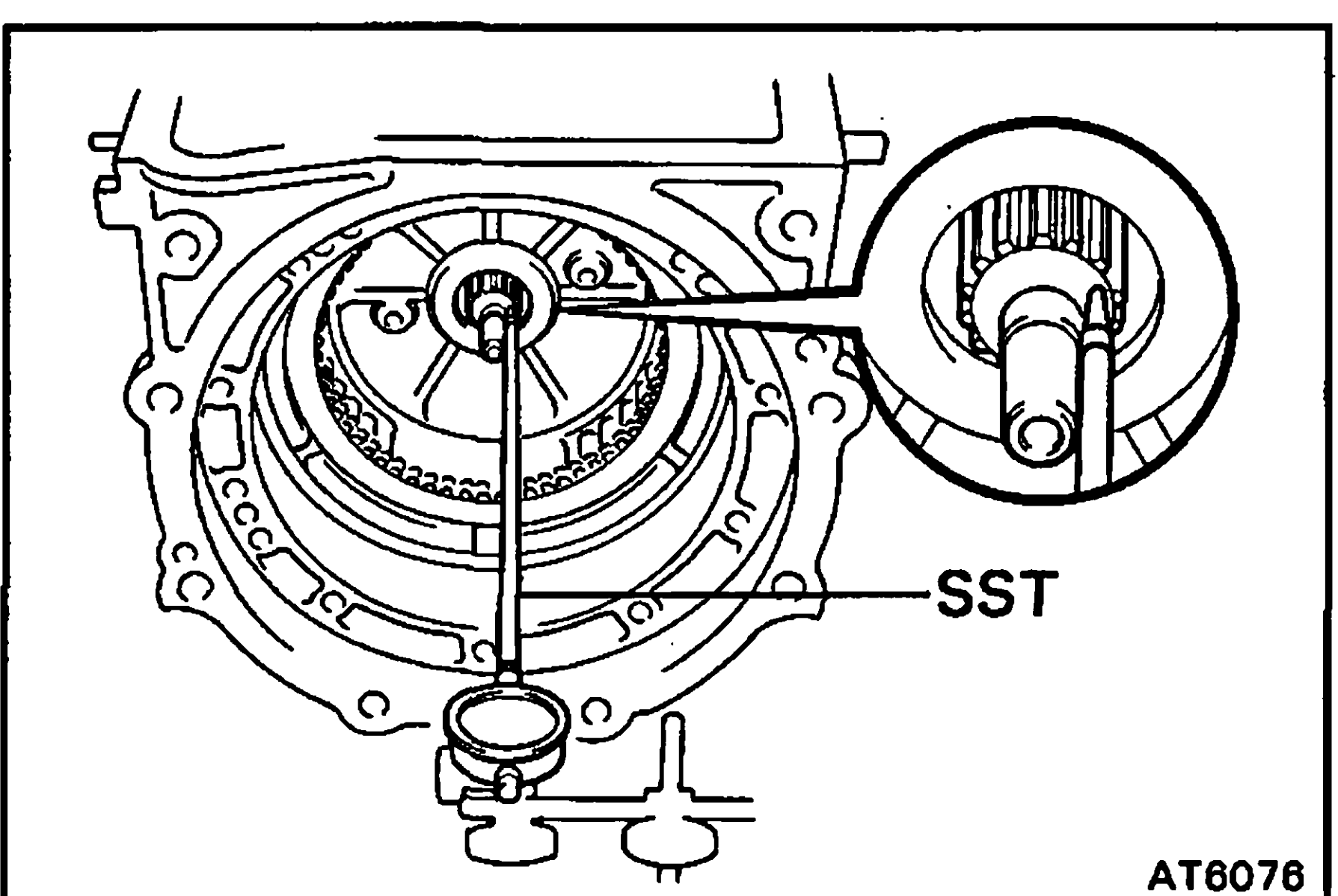
(c) Using SST and a dial indicator, measure the thrust clearance of the input shaft.

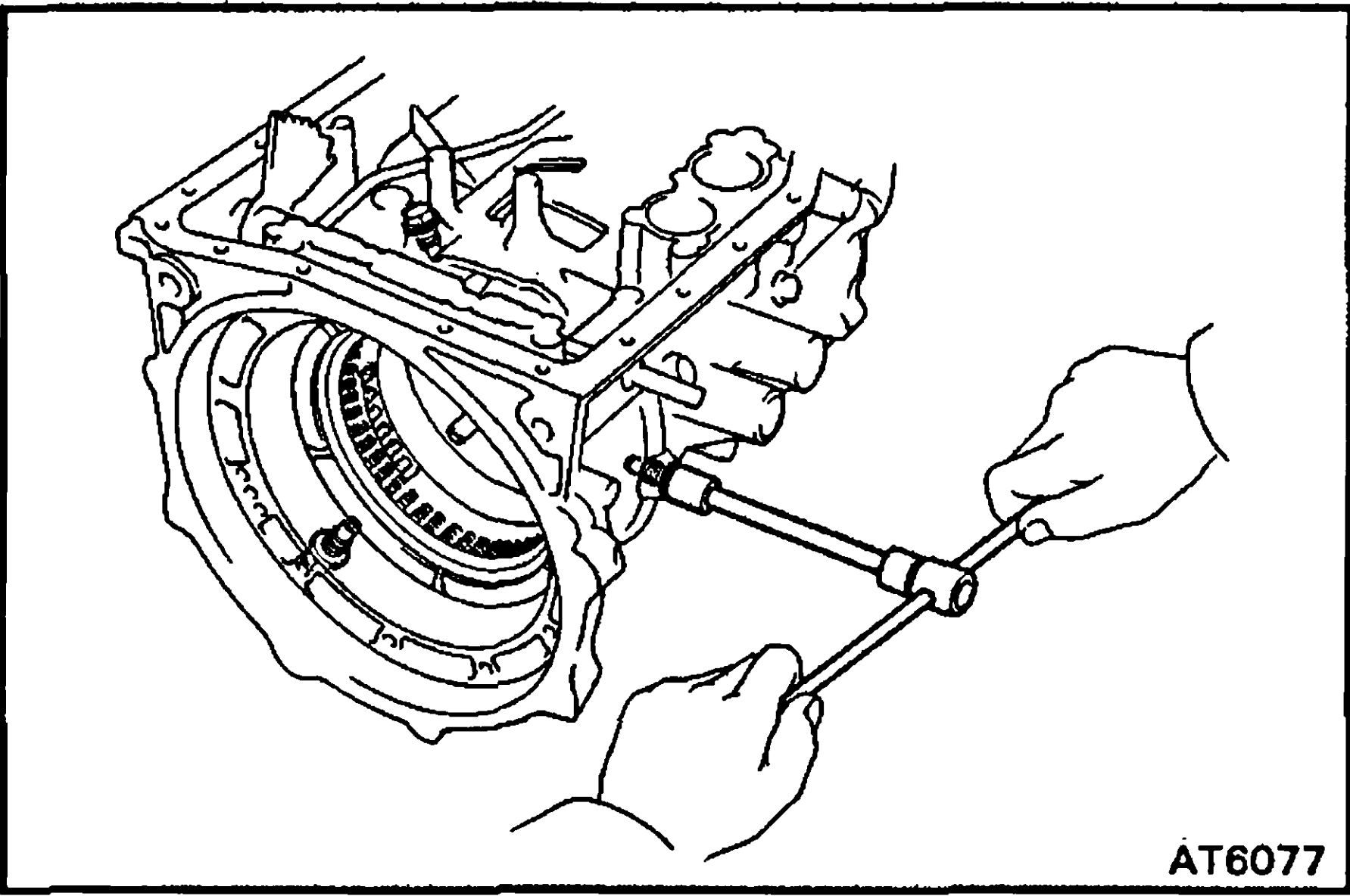
SST 09350-36010 (09350-06130)

**Standard thrust clearance: 0.30 — 0.70 mm (0.0118 — 0.0276 in.)**

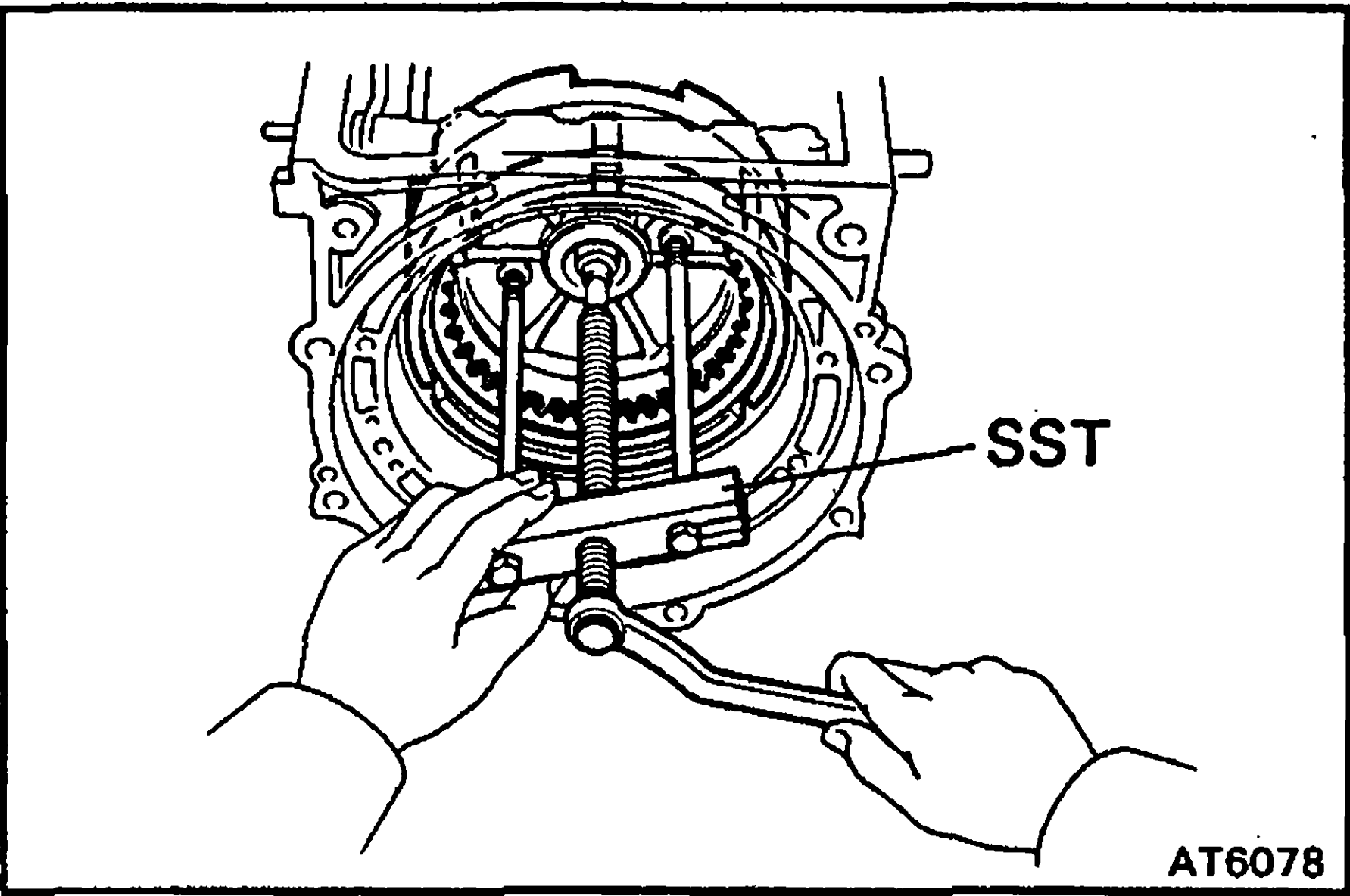
**Maximum thrust clearance: 0.70 mm (0.0276 in.)**

If the thrust clearance is greater than the maximum, adjust with a spacer.

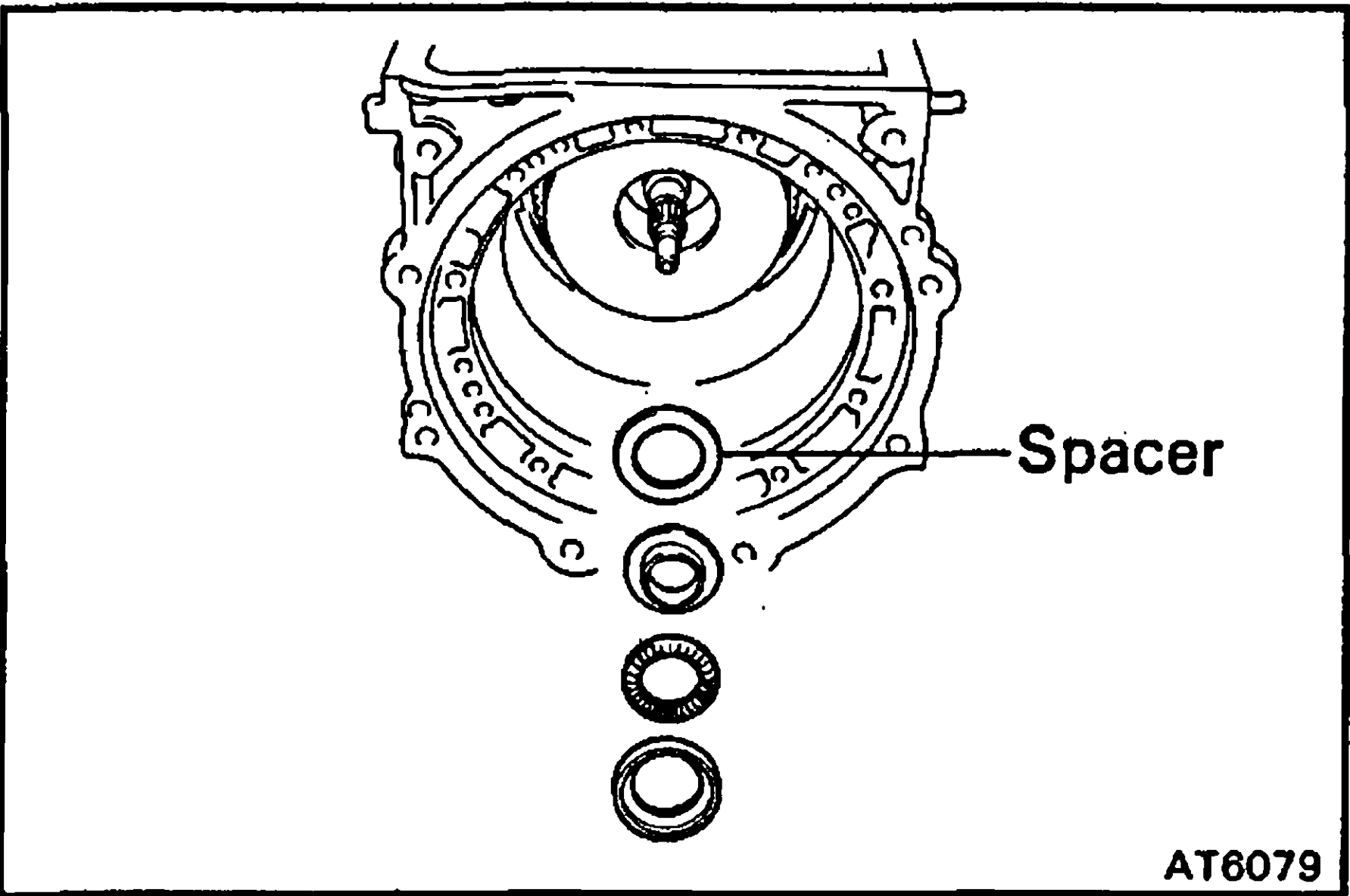




- (A440F, A441L)
- (d) Remove the three O/D case set bolts.

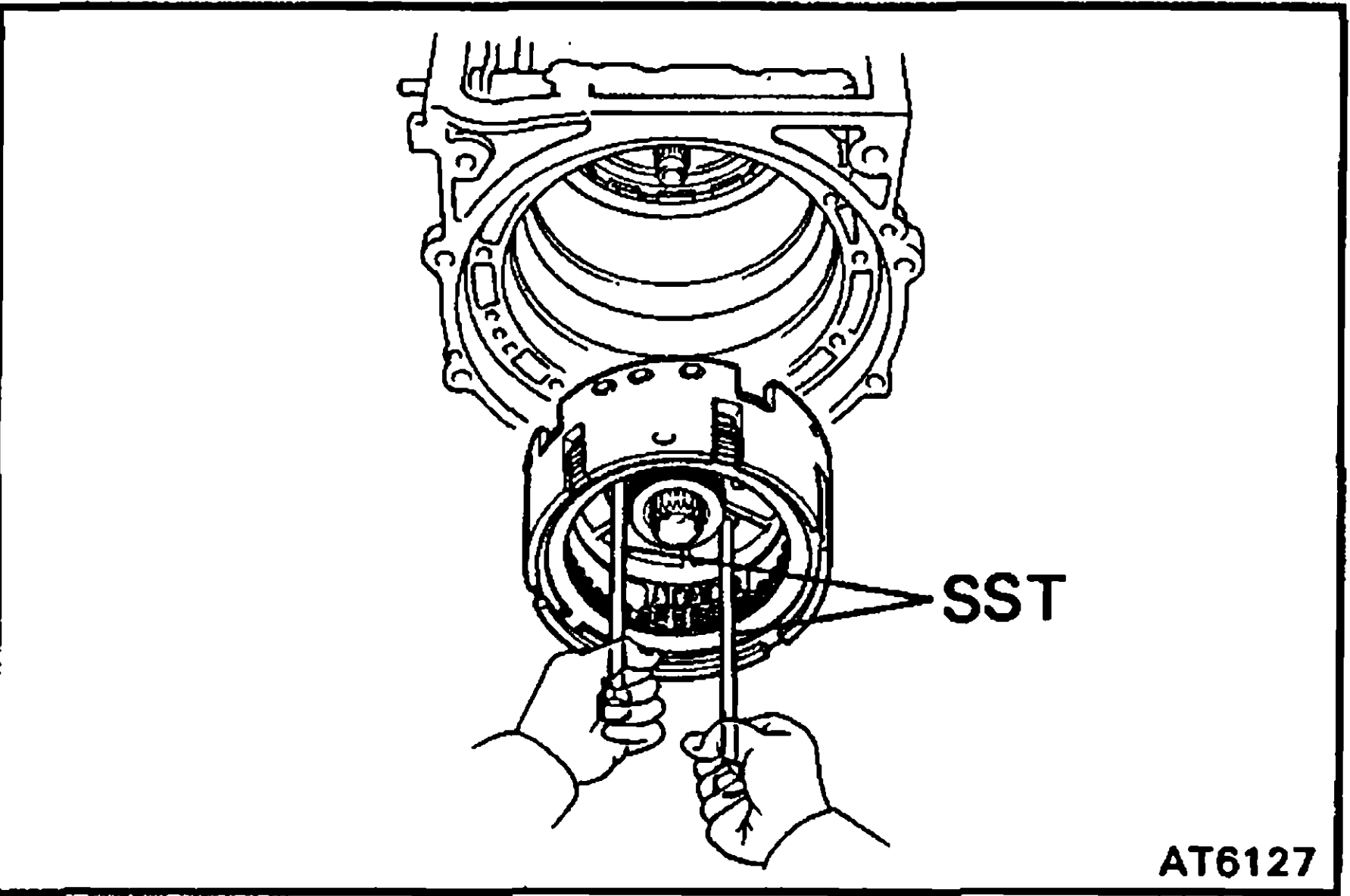


- (e) Using SST, remove the O/D case assembly.  
SST 09350-36010 (09350-06140)



- (f) Remove the two thrust bearing and spacer from the front clutch drum or O/D case.
- (g) Select a spacer.
- HINT: There are five different thicknesses for spacer.

| Spacer thickness |             | mm (in.) |
|------------------|-------------|----------|
| 0.9 (0.035)      | 1.8 (0.071) |          |
| 1.2 (0.047)      | 2.1 (0.083) |          |
| 1.5 (0.059)      |             |          |



- (h) Install the spacer, two races and bearing onto the front clutch drum.
- (i) Reinstall the oil seal ring to the input shaft.

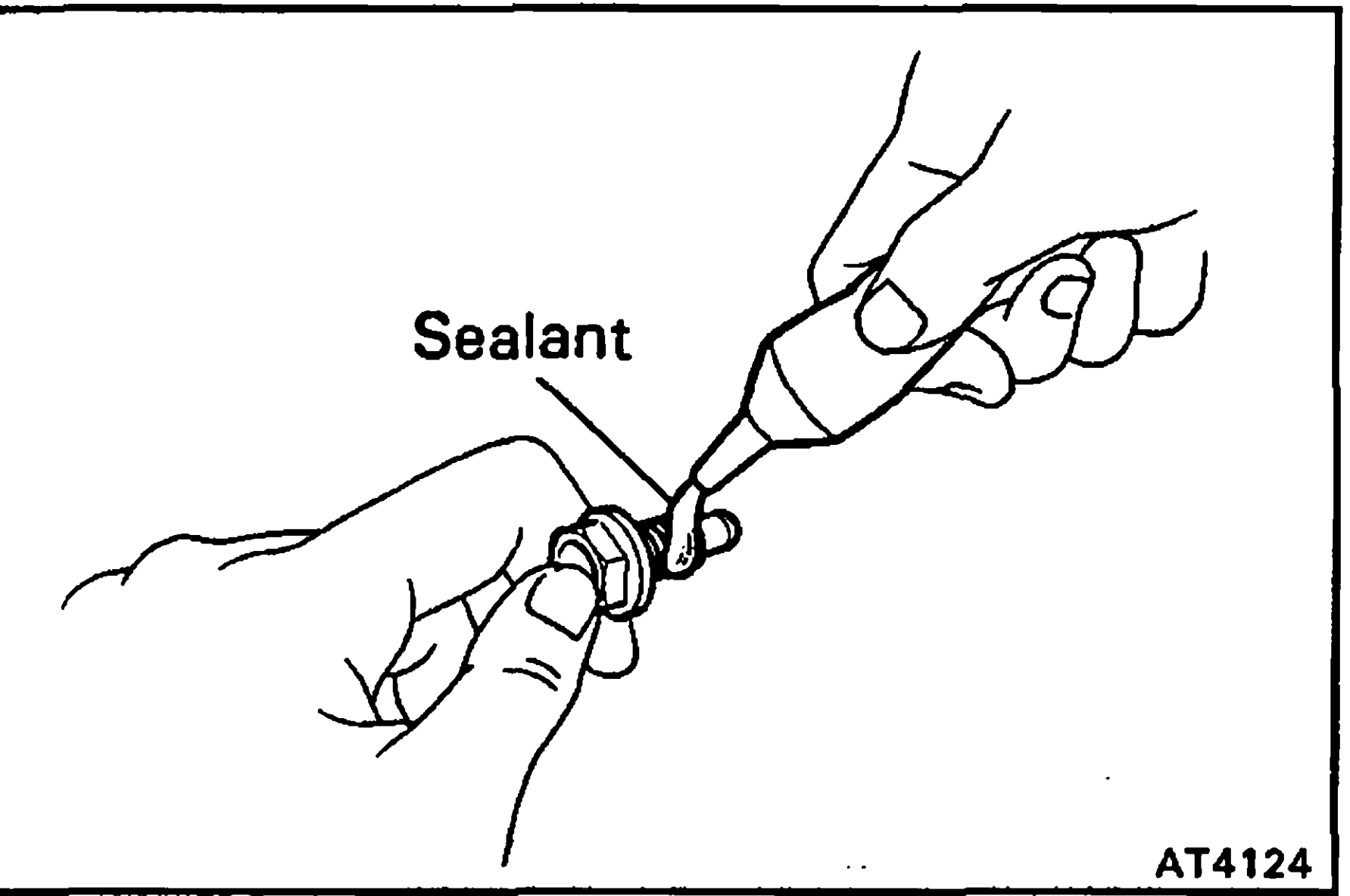
15. INSTALL OVERDRIVE CASE ASSEMBLY

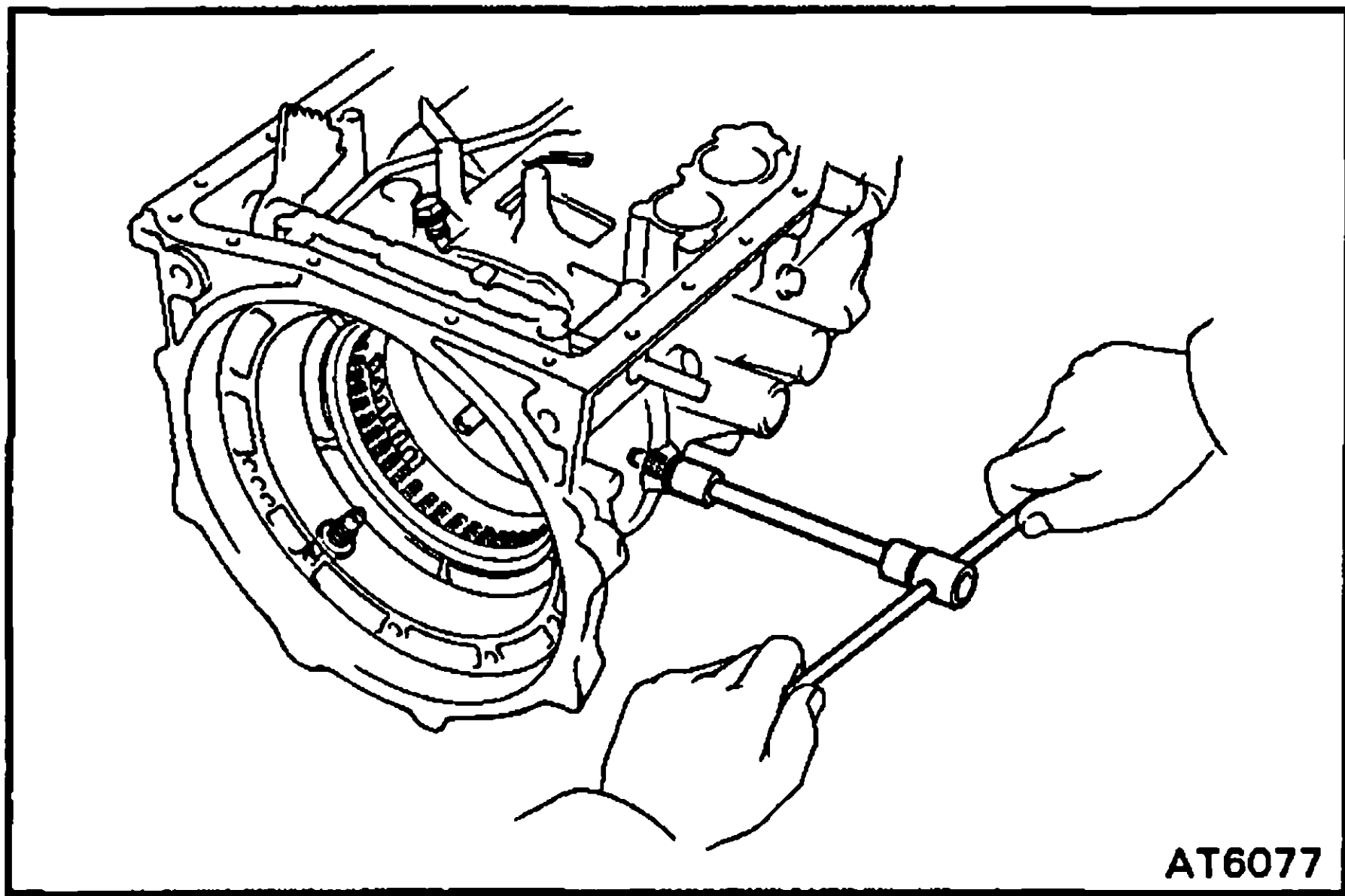
- (a) Coat new three O-rings with ATF, and install them to the oil holes of the O/D case.
- (b) Install SST (two bolts) to the O/D case.  
SST 09350-36010 (09350-06140)
- (c) Align the oil holes and bolt holes of the O/D case and transmission case.

(A440F, A441L)

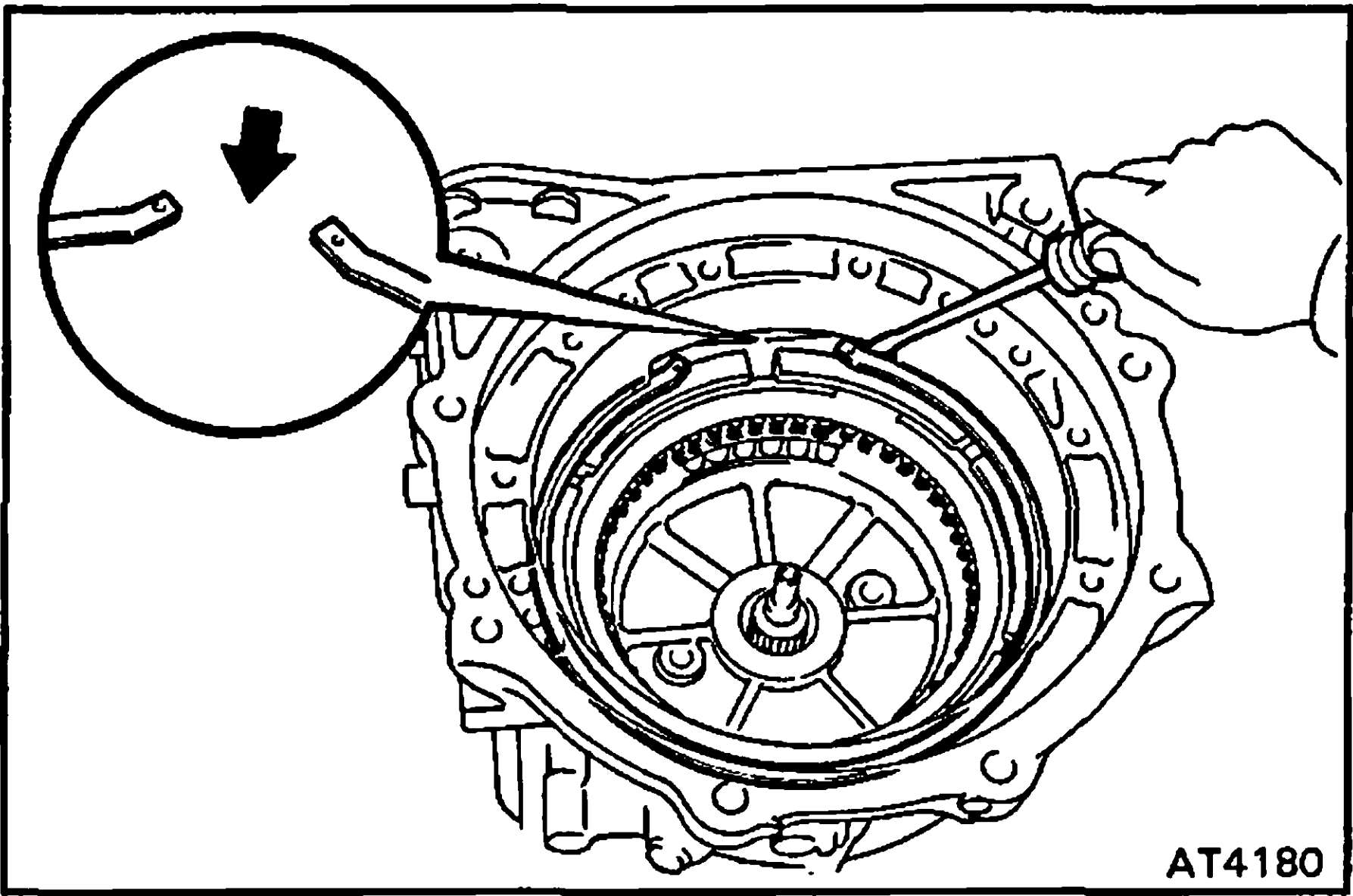
- (d) Apply sealant to the threads of the O/D case set bolts.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent

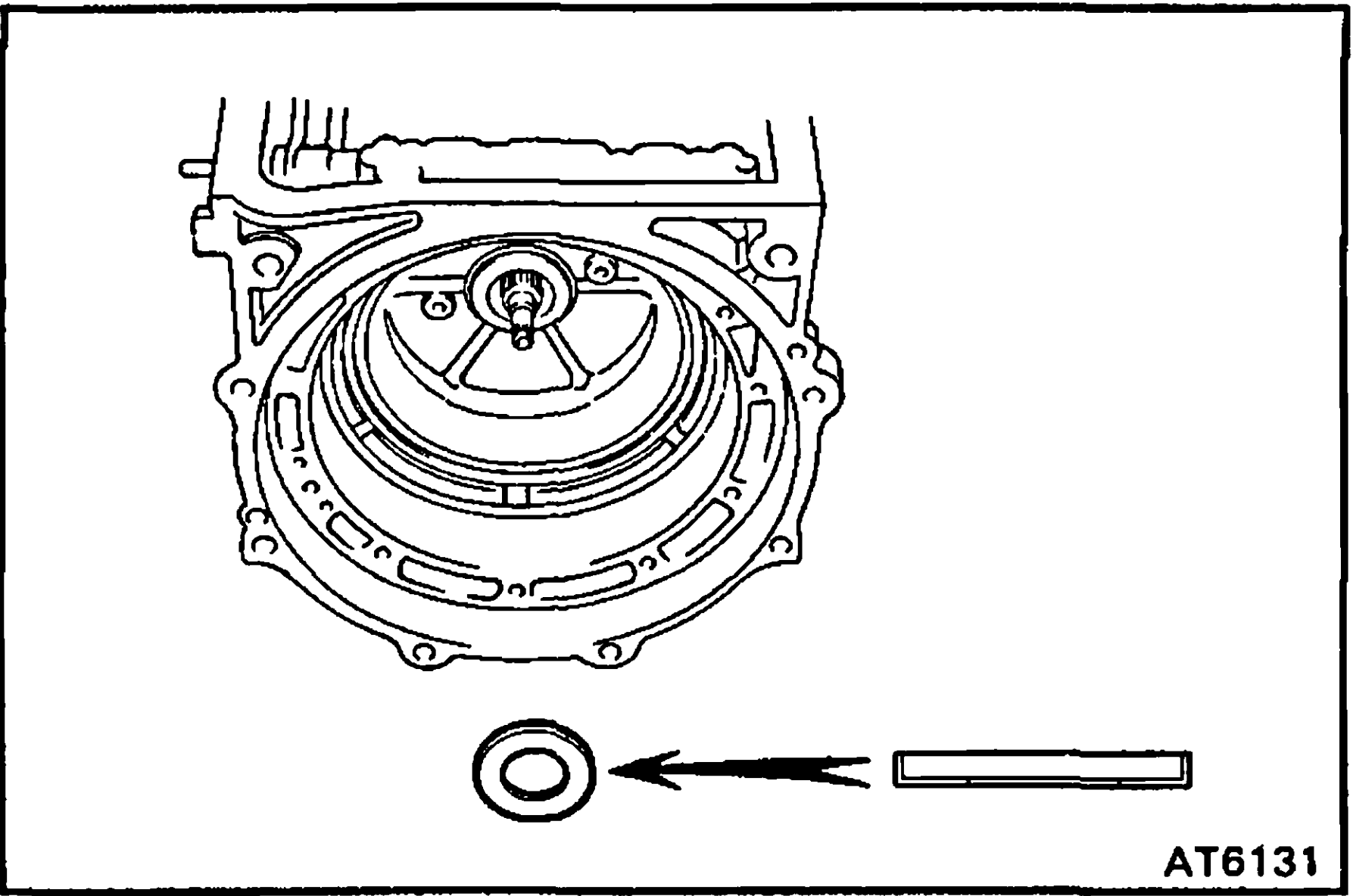




- (A440F, A441L)
- (e) Install the three O/D case set bolts.  
Torque: 250 kg-cm (18 ft-lb, 25 N·m)



- (f) Using a screwdriver, install the snap ring.



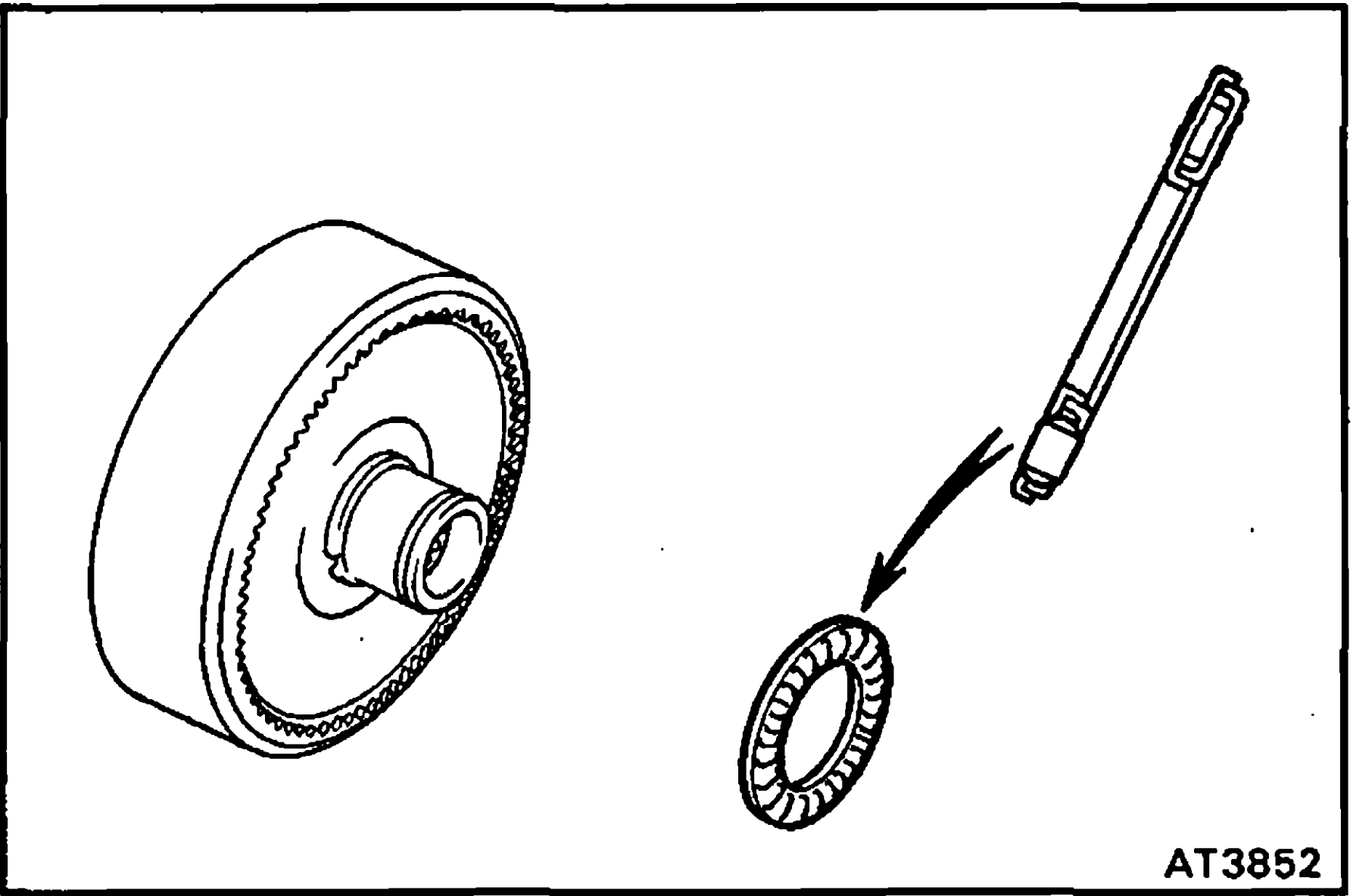
16. INSTALL OVERDRIVE RING GEAR ASSEMBLY

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

HINT: Race diameter

mm (in.)

|      | Inside       | Outside     |
|------|--------------|-------------|
| Race | 37.0 (1.457) | 52.0(2.047) |

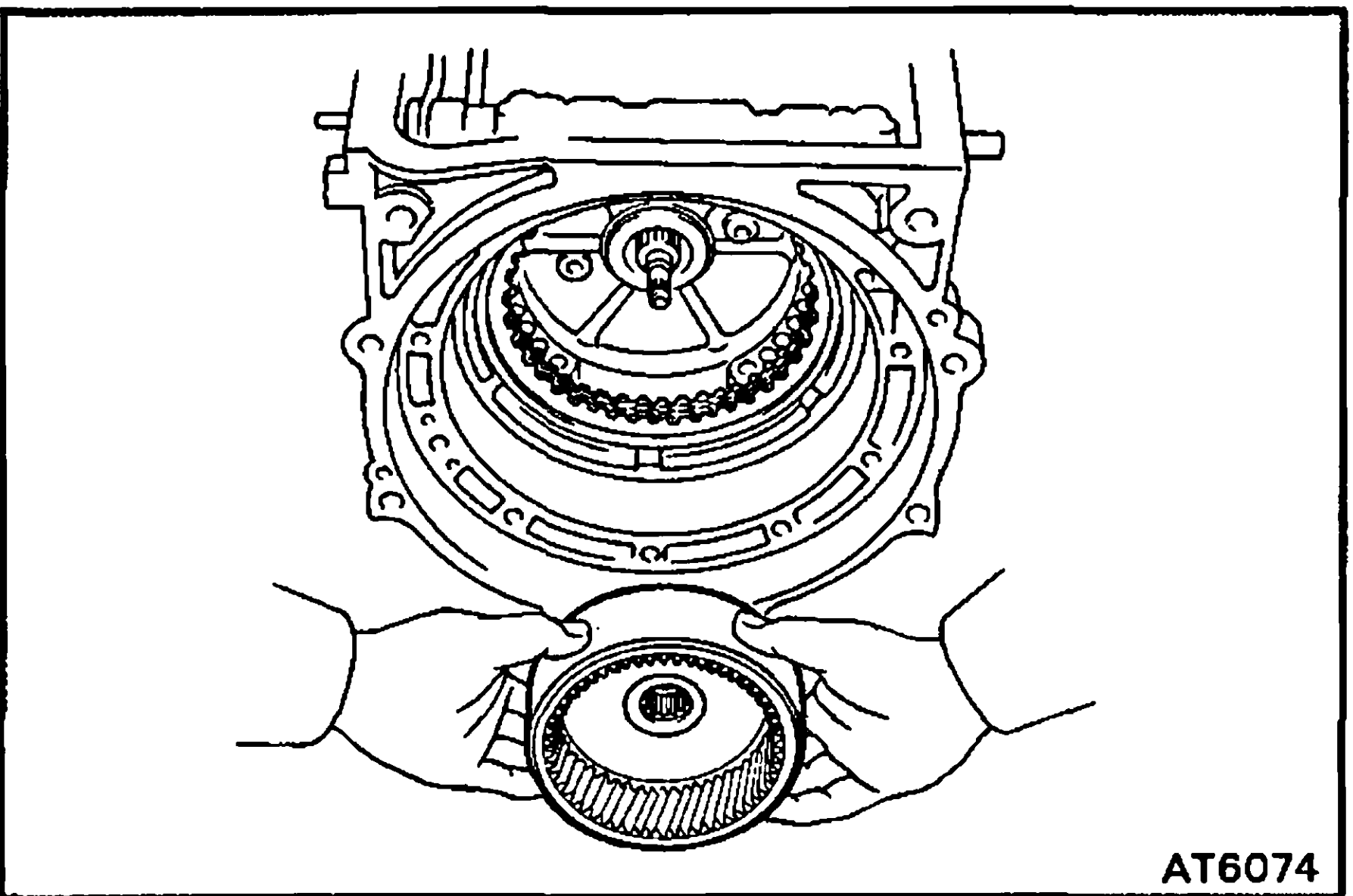


- (b) Coat the bearing with petroleum jelly, and install it onto the ring gear flange.

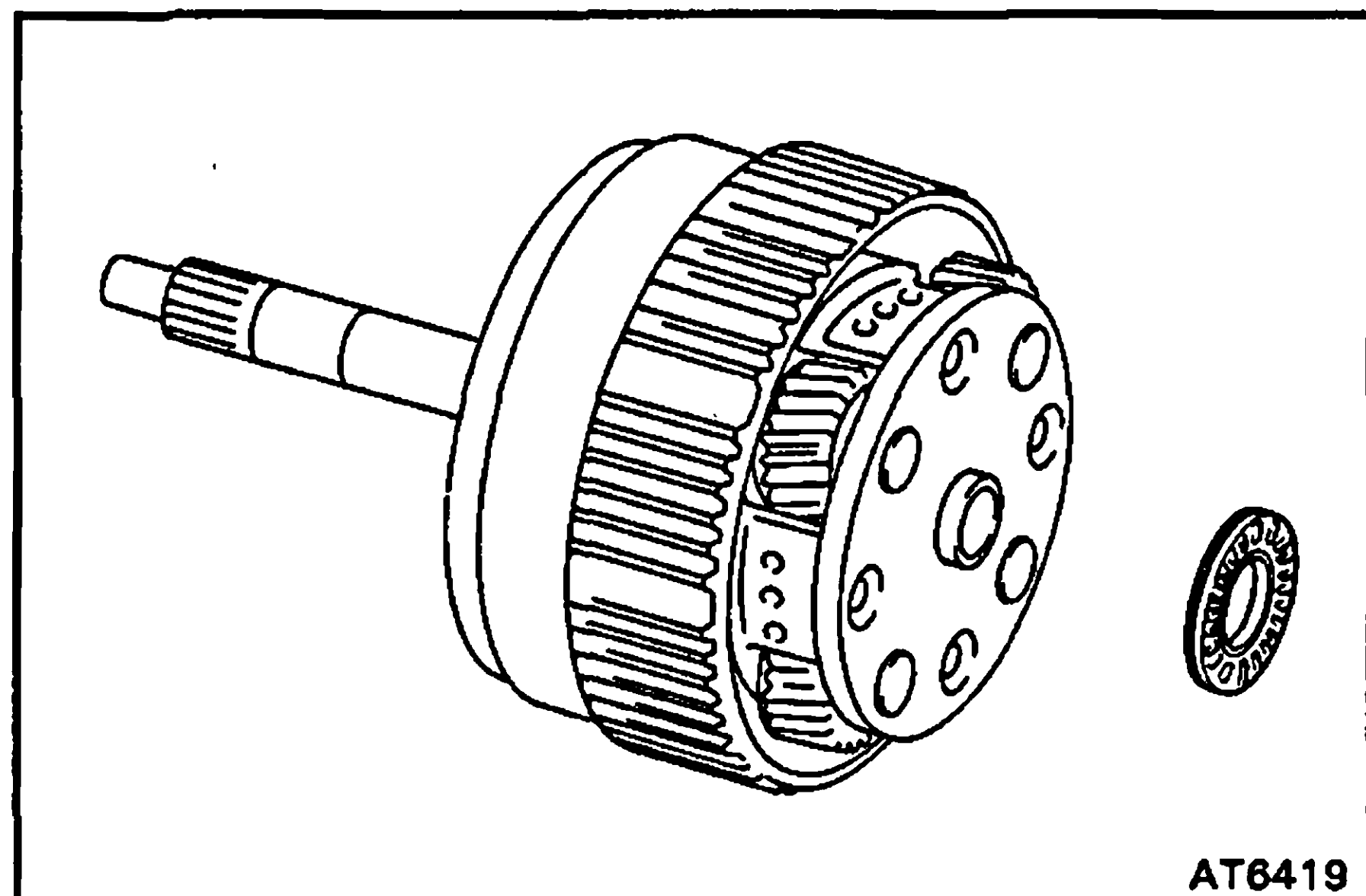
HINT: Bearing diameter

mm (in.)

|         | Inside       | Outside     |
|---------|--------------|-------------|
| Bearing | 34.7 (1.366) | 52.0(2.047) |



- (c) Install the ring gear assembly into the O/D case.



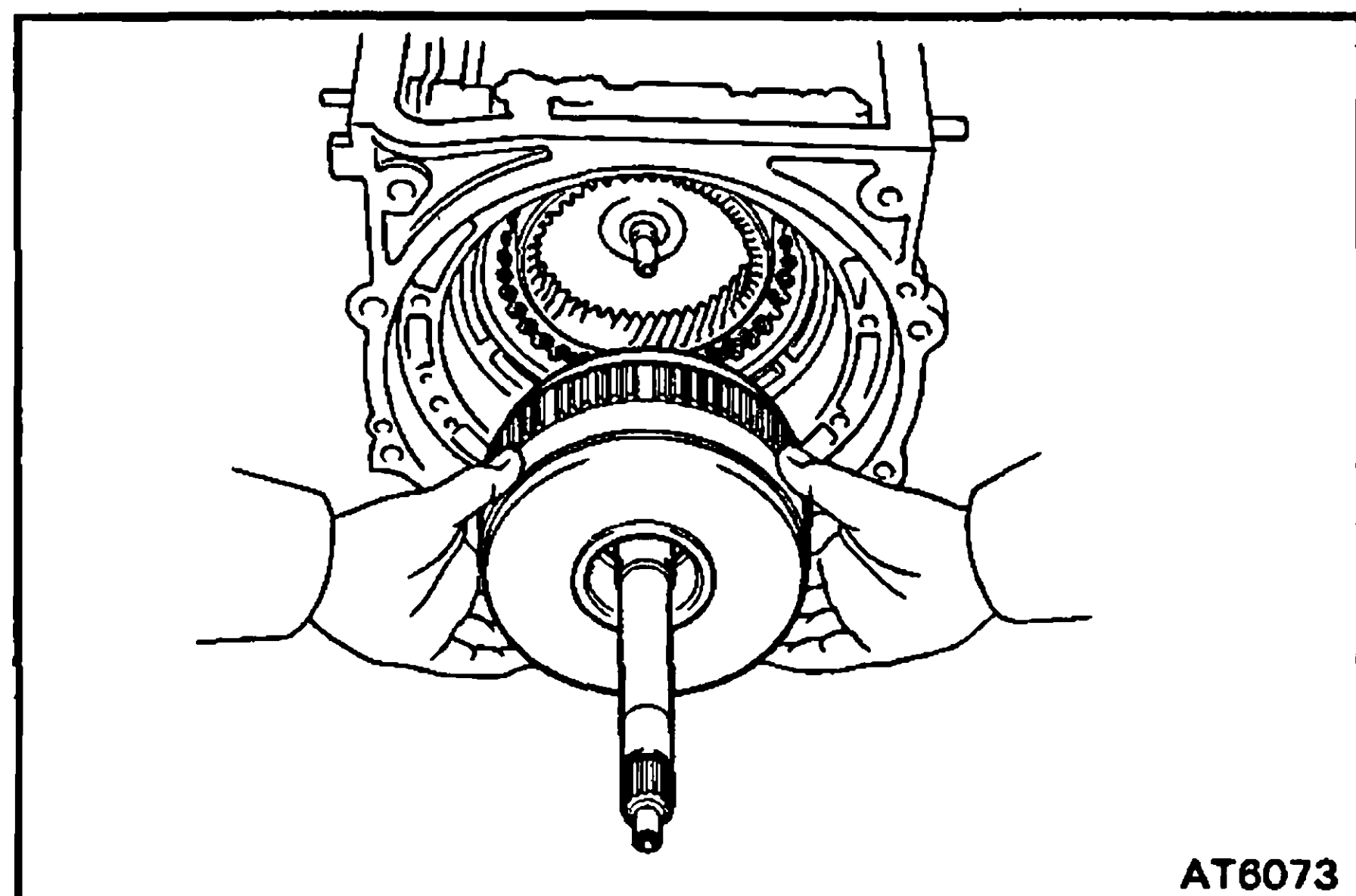
### 17. INSTALL OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH ASSEMBLY

- (a) Coat the assembled bearing and race with petroleum jelly, and install it onto the planetary gear.

HINT: Assembled bearing and race diameter

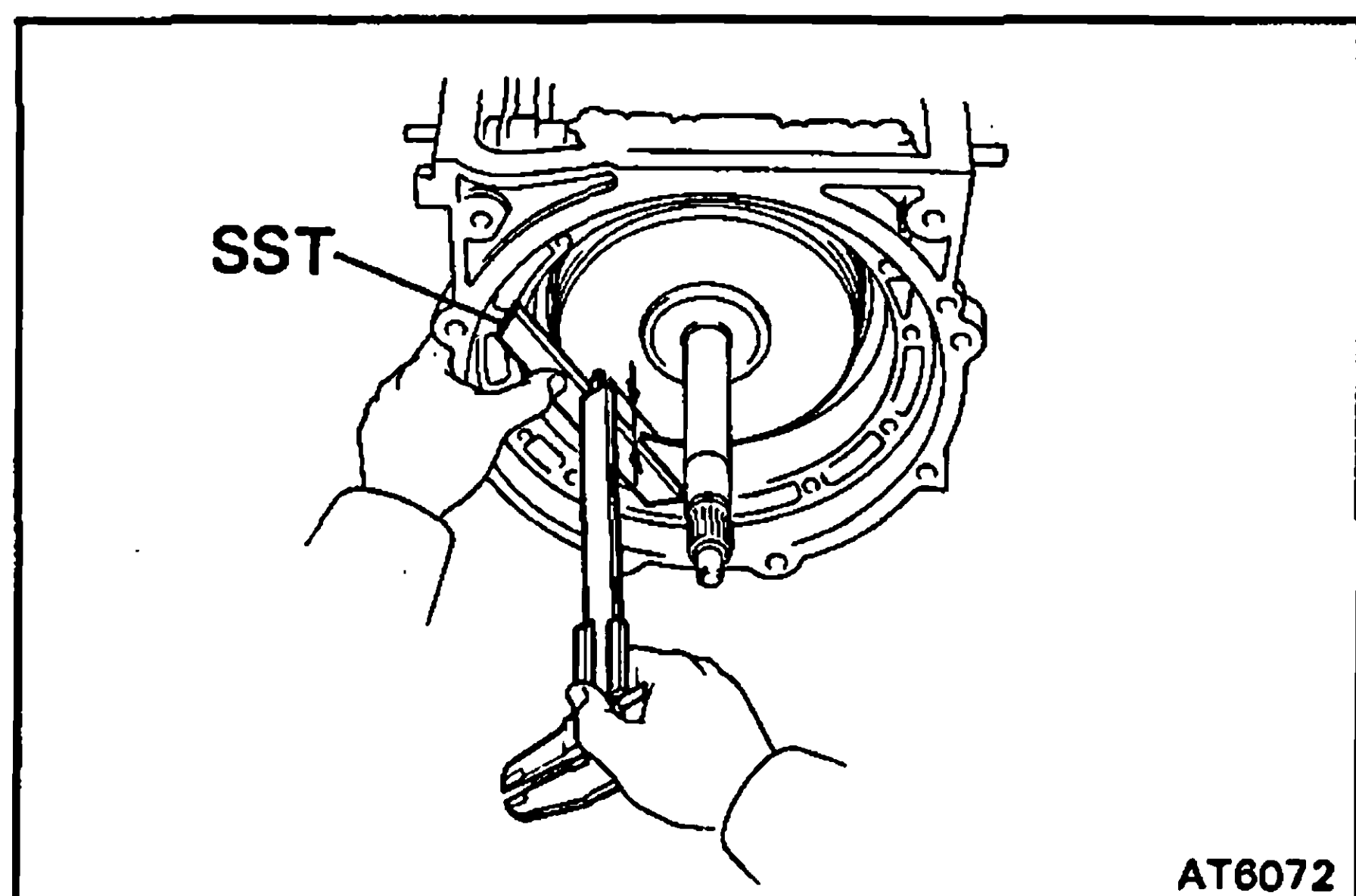
mm (in.)

|                            | Inside       | Outside      |
|----------------------------|--------------|--------------|
| Assembled bearing and race | 23.2 (0.913) | 42.0 (1.654) |



- (b) Install planetary gear, direct clutch and one-way clutch assembly into transmission case.

HINT: Mesh the spline of the O/D direct clutch drum with the flukes of the discs by rotating and pushing the O/D direct clutch drum clockwise or counterclockwise.



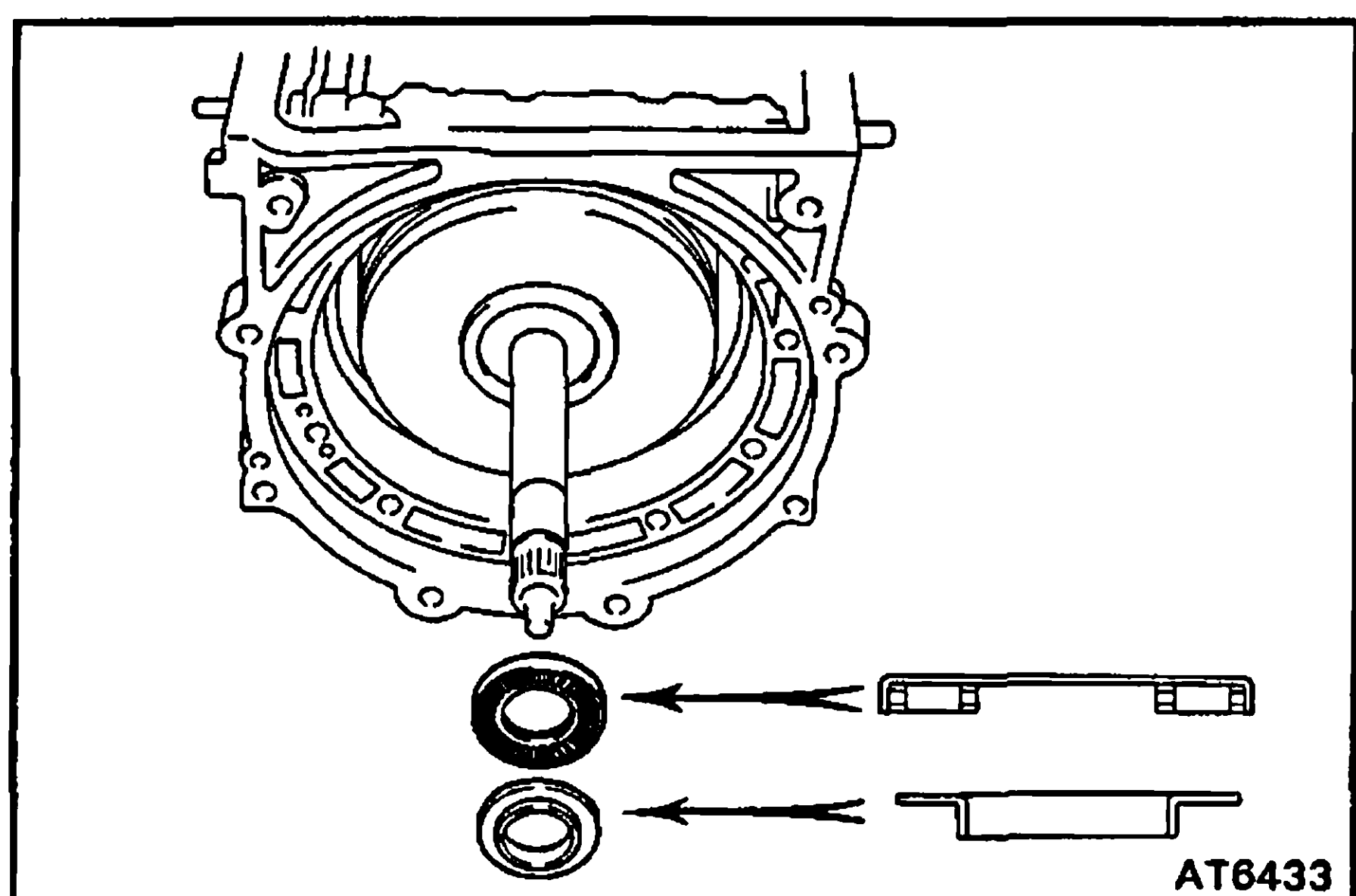
### 18. CHECK CORRECT INSTALLATION OF OVERDRIVE PLANETARY GEAR, OVERDRIVE DIRECT CLUTCH AND ONE-WAY CLUTCH ASSEMBLY

- (a) Place SST on the installation surface of the oil pump.

SST 09350-36010 (09350-06090)

- (b) Using calipers, measure the distance between the tops of SST and clutch drum.

If the distance corresponds to that during disassembly, the O/D planetary gear, O/D direct clutch and one-way clutch assemblies installed correctly.



### 19. TEMPORARILY INSTALL OIL PUMP

- (a) Coat the assembled bearing and race with petroleum jelly, and install them onto the clutch drum.

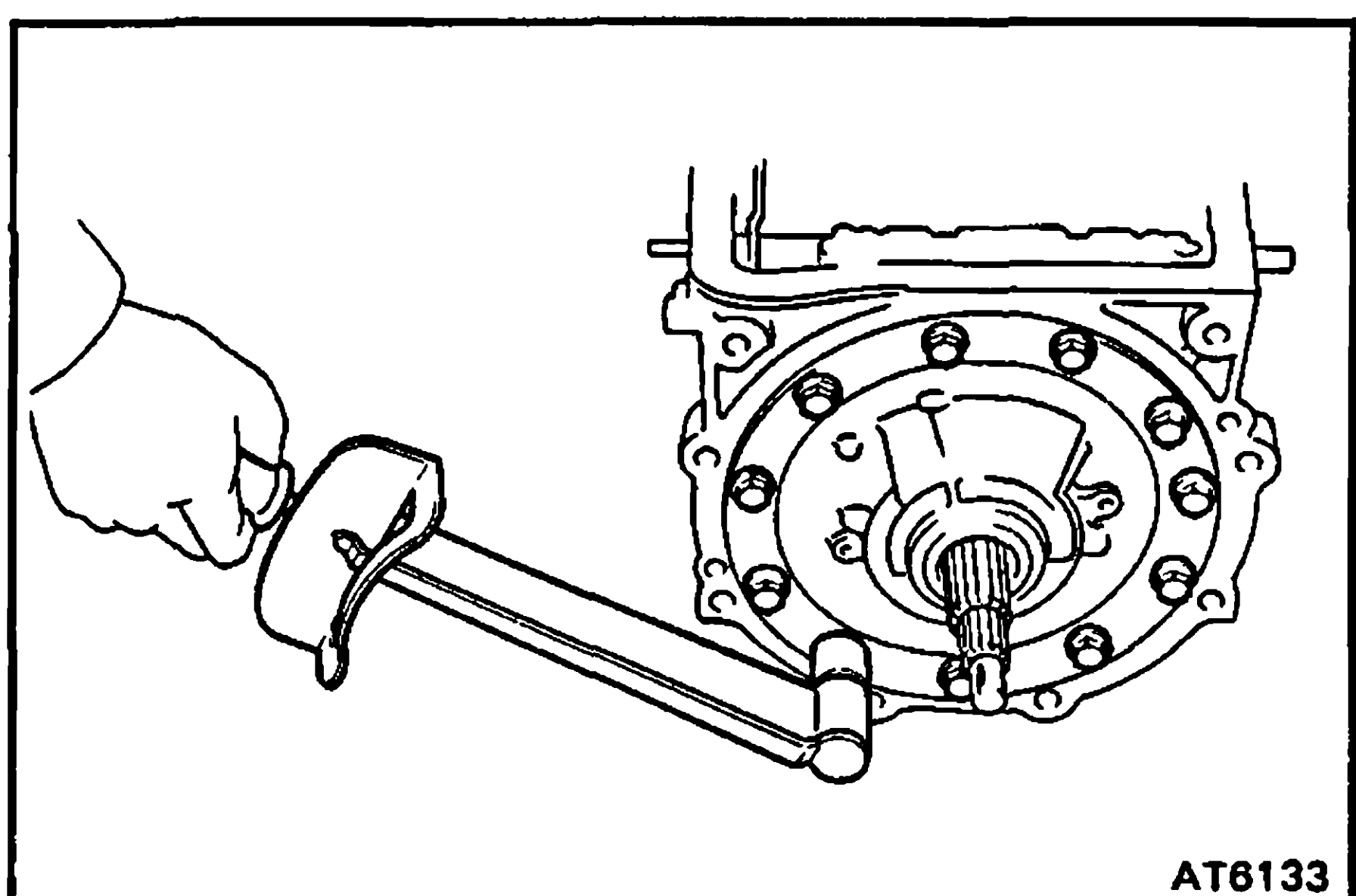
HINT: Assembled bearing and race diameters

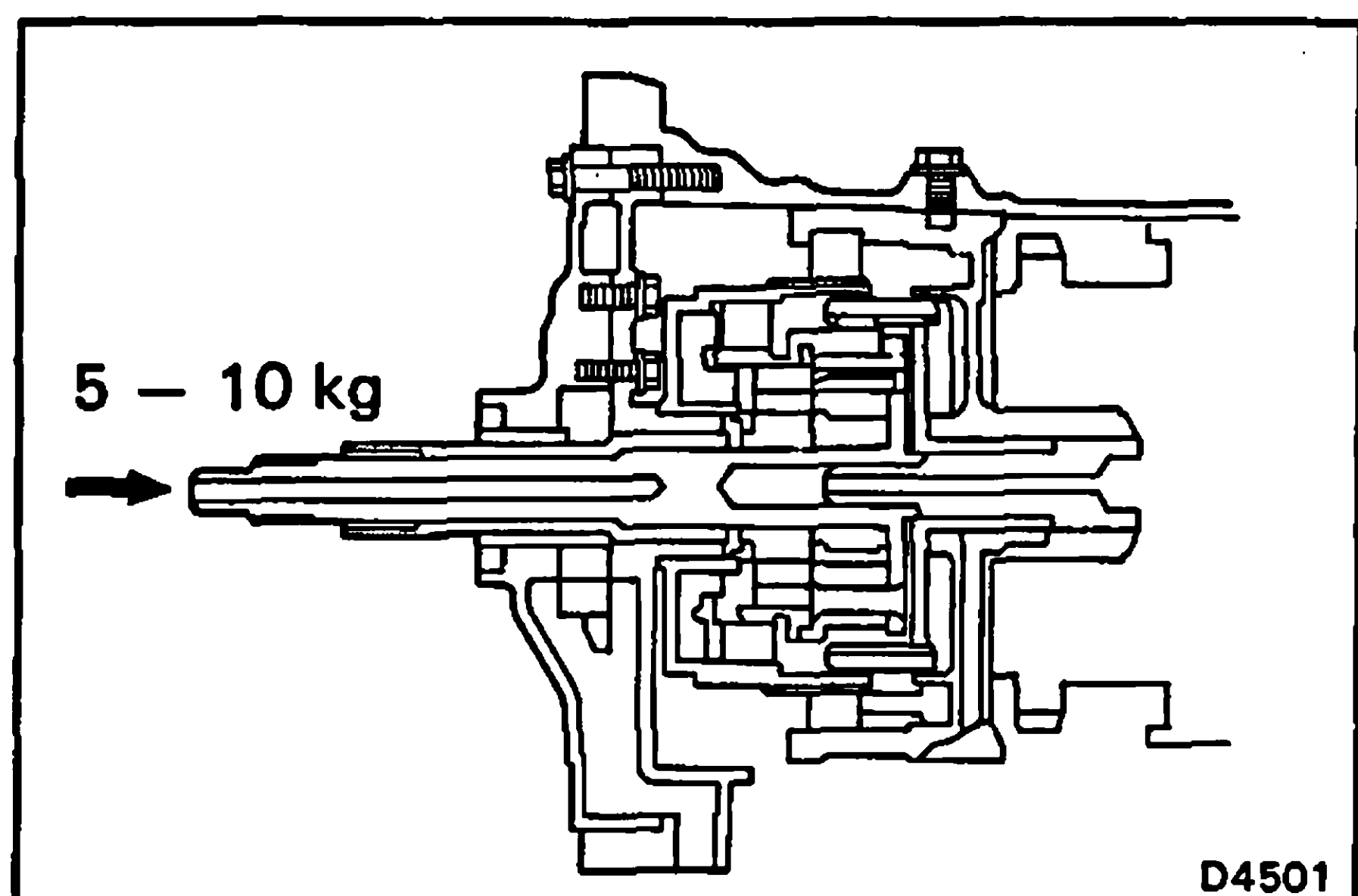
mm (in.)

|                            | Inside       | Outside      |
|----------------------------|--------------|--------------|
| Race                       | 28.5 (1.122) | 48.0 (1.890) |
| Assembled bearing and race | 28.5 (1.122) | 46.2 (1.819) |

- (b) Place the gasket on the transmission case.  
 (c) Align the bolt holes of the pump body and transmission case, and slide it.  
 (d) Install and tighten the eleven bolts.

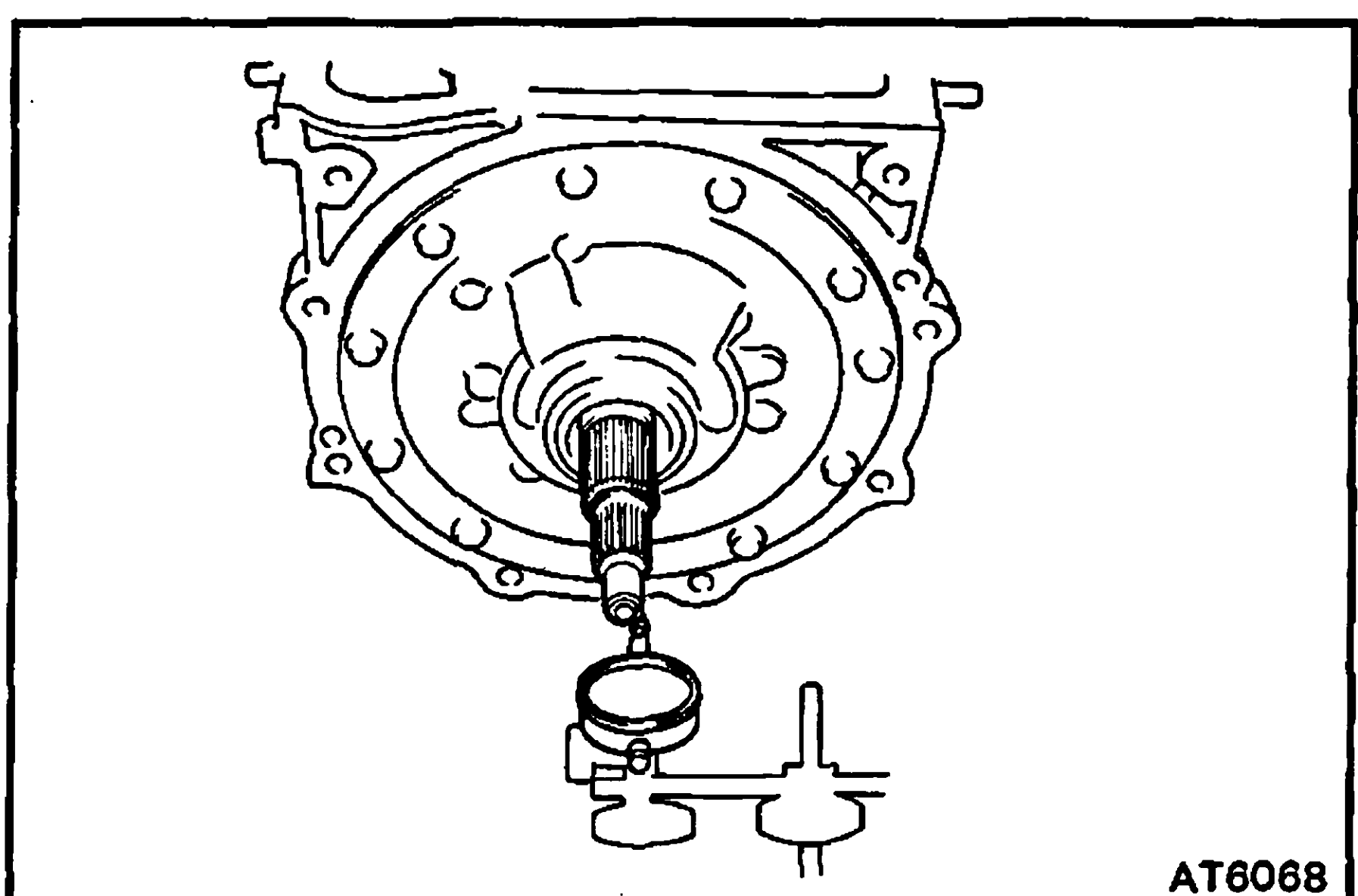
Torque: 210 kg-cm (16 ft-lb, 21 N·m)





## 20. ADJUST THRUST CLEARANCE OF OVERDRIVE INPUT SHAFT (OVERDRIVE PLANETARY GEAR)

- (a) Push the O/D input shaft toward the rear of transmission by applying a force 5 – 10 kg (11.0 – 22.0 lb, 49 – 98 N).

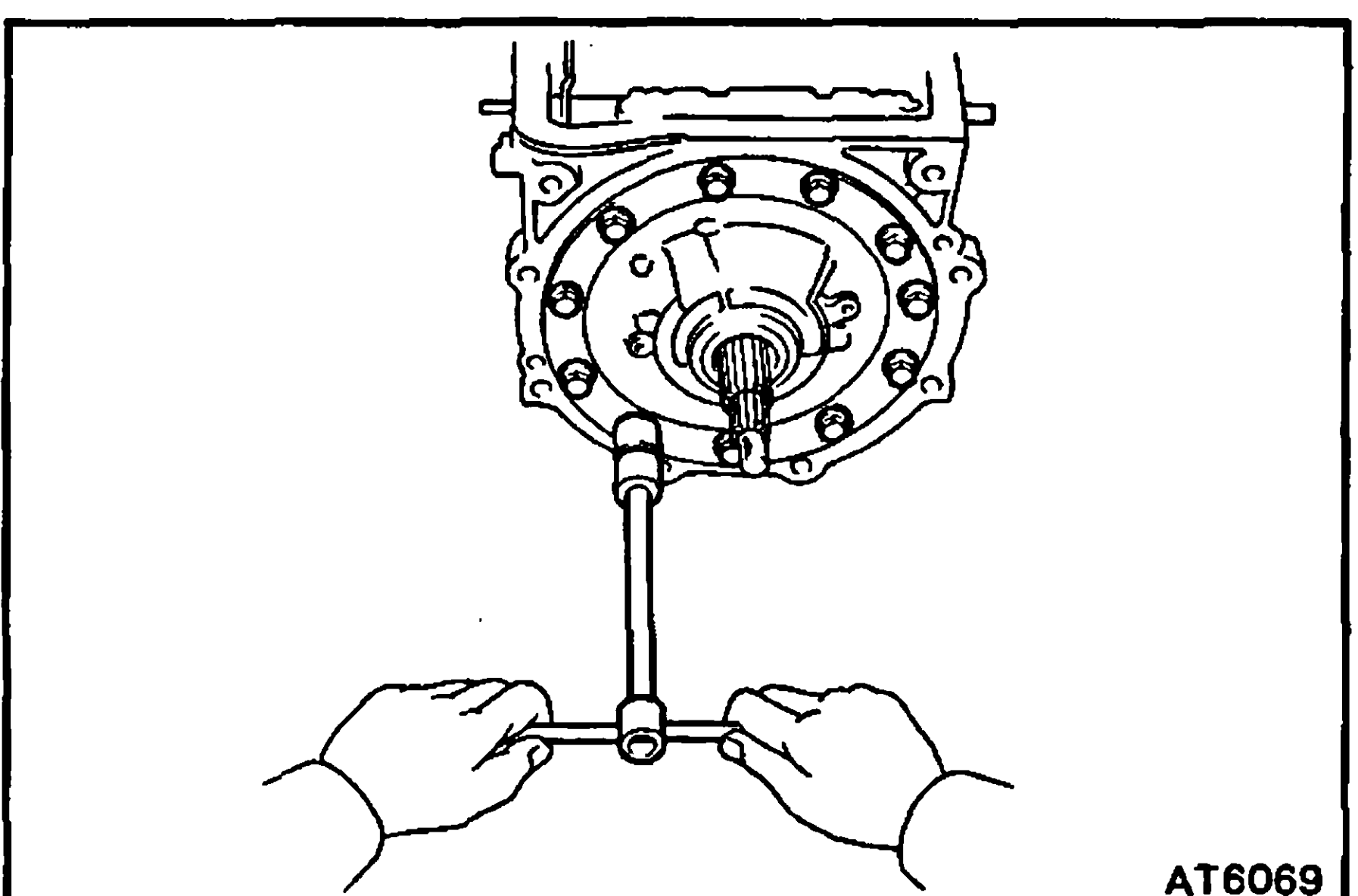


- (b) Using a dial indicator, measure the thrust clearance of the input shaft.

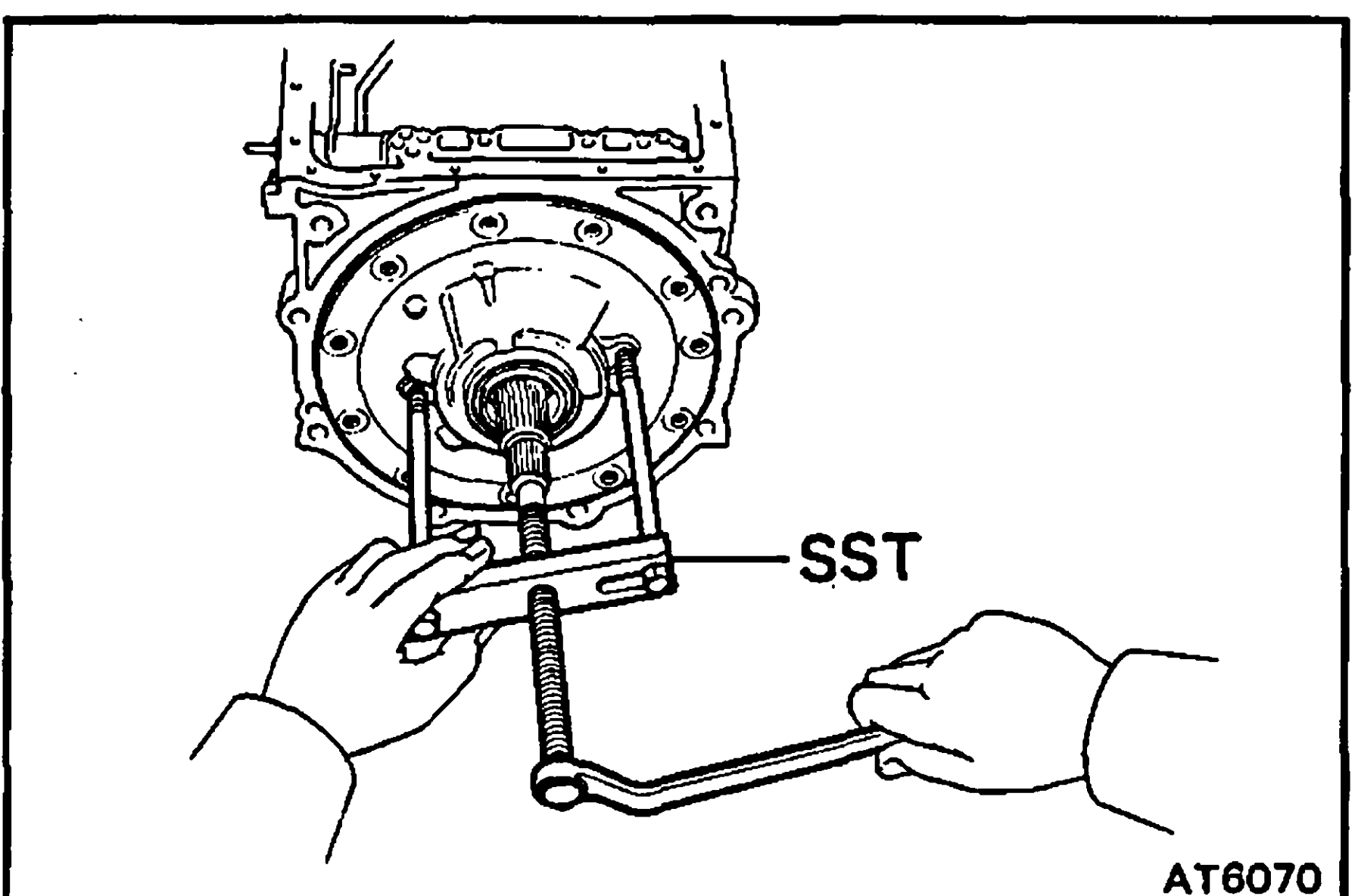
**Standard thrust clearance:** 0.40 – 0.90 mm  
(0.0157 – 0.0354 in.)

**Maximum thrust clearance:** 0.90 mm (0.0354 in.)

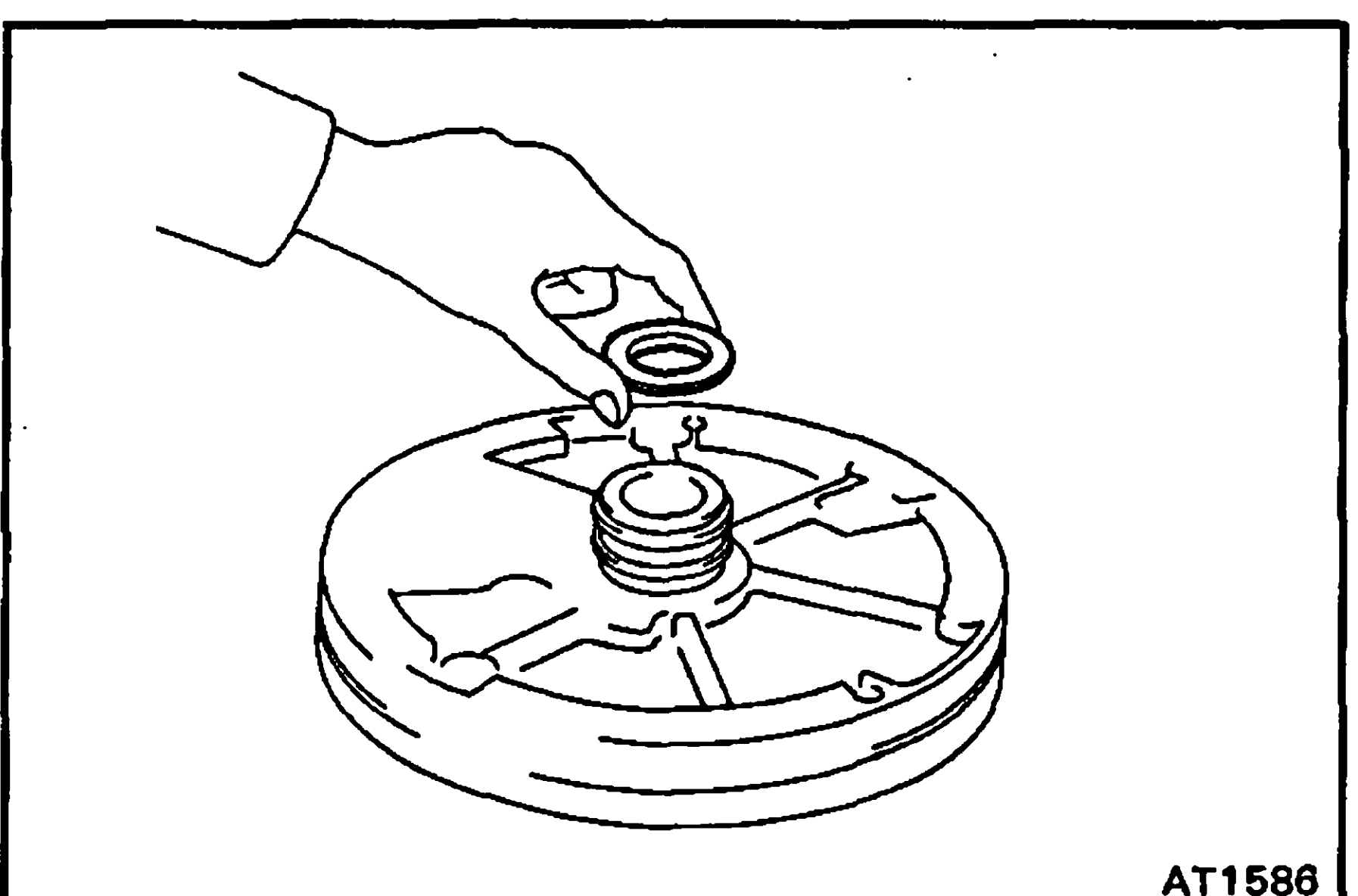
If the thrust clearance is greater than maximum, adjust with a race.



- (c) Remove the eleven oil pump set bolts.



- (d) Using SST, remove the oil pump and gasket.  
SST 09350-36010 (09350-06140)



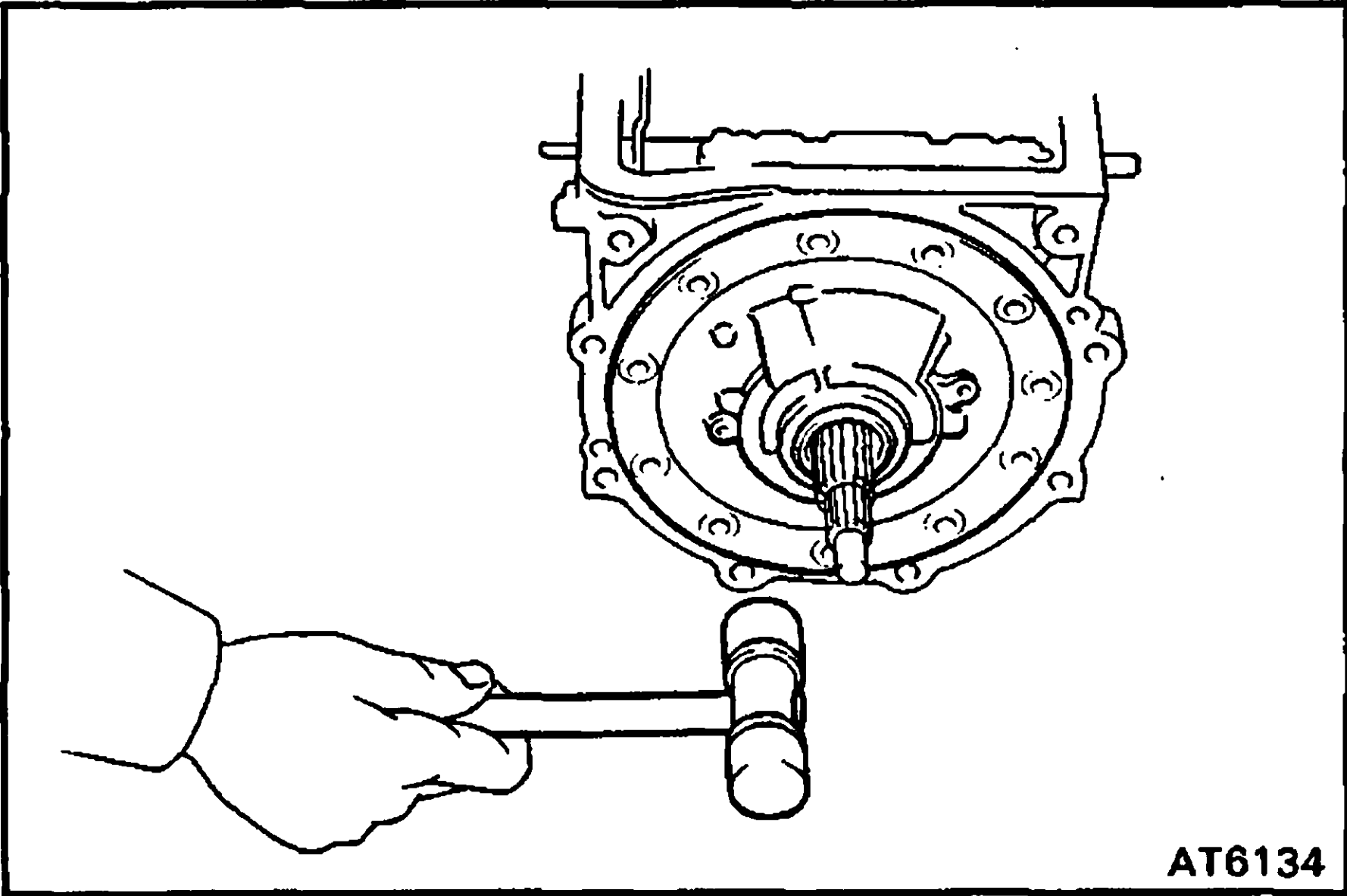
- (e) Remove the race from the oil pump cover.

- (f) Select a race.

**HINT:** There are three different thicknesses for race.

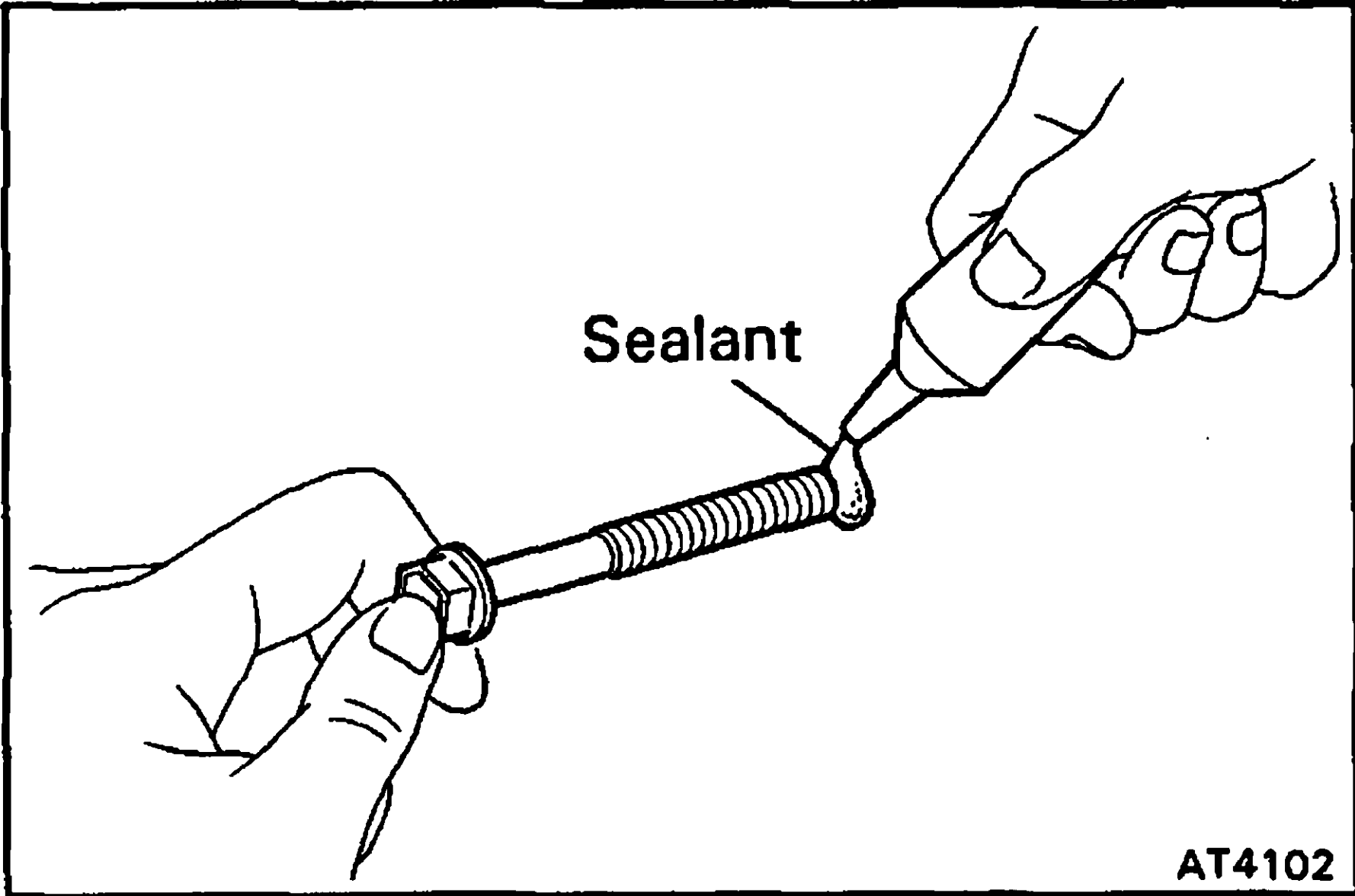
| Race thickness |             | mm (in.) |
|----------------|-------------|----------|
| 0.8 (0.031)    | 1.4 (0.055) |          |
| 1.0 (0.039)    |             |          |

- (g) Coat the race with petroleum jelly, and install the oil pump cover.



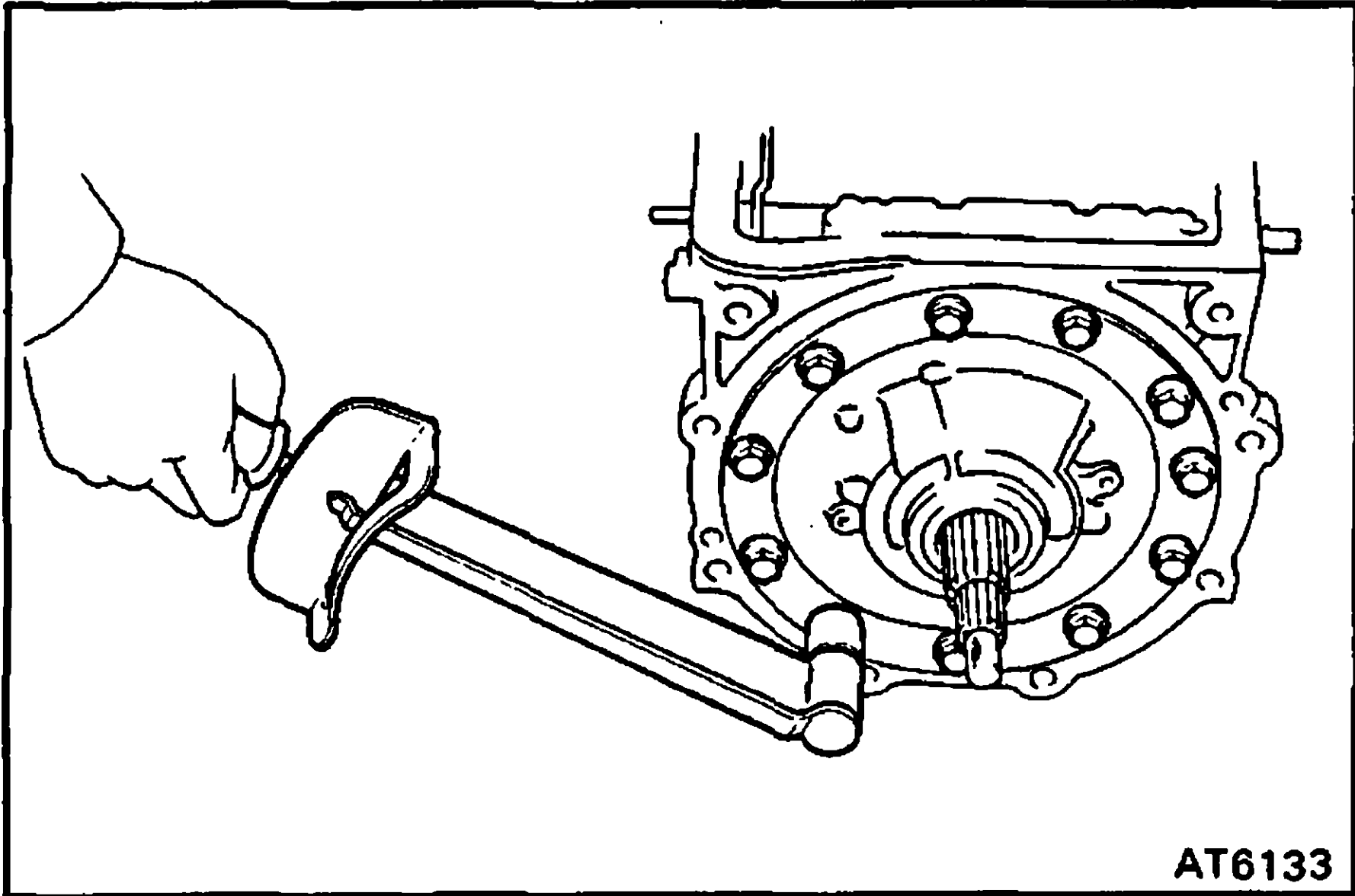
21. INSTALL OIL PUMP

- (a) Place a new gasket on the transmission case.
- (b) Coat a new O-ring with ATF, and install it to the oil pump body.
- (c) Align the bolt holes of the pump body and transmission case.
- (d) Using a plastic-faced hammer, lightly tap in the oil pump to transmission case.

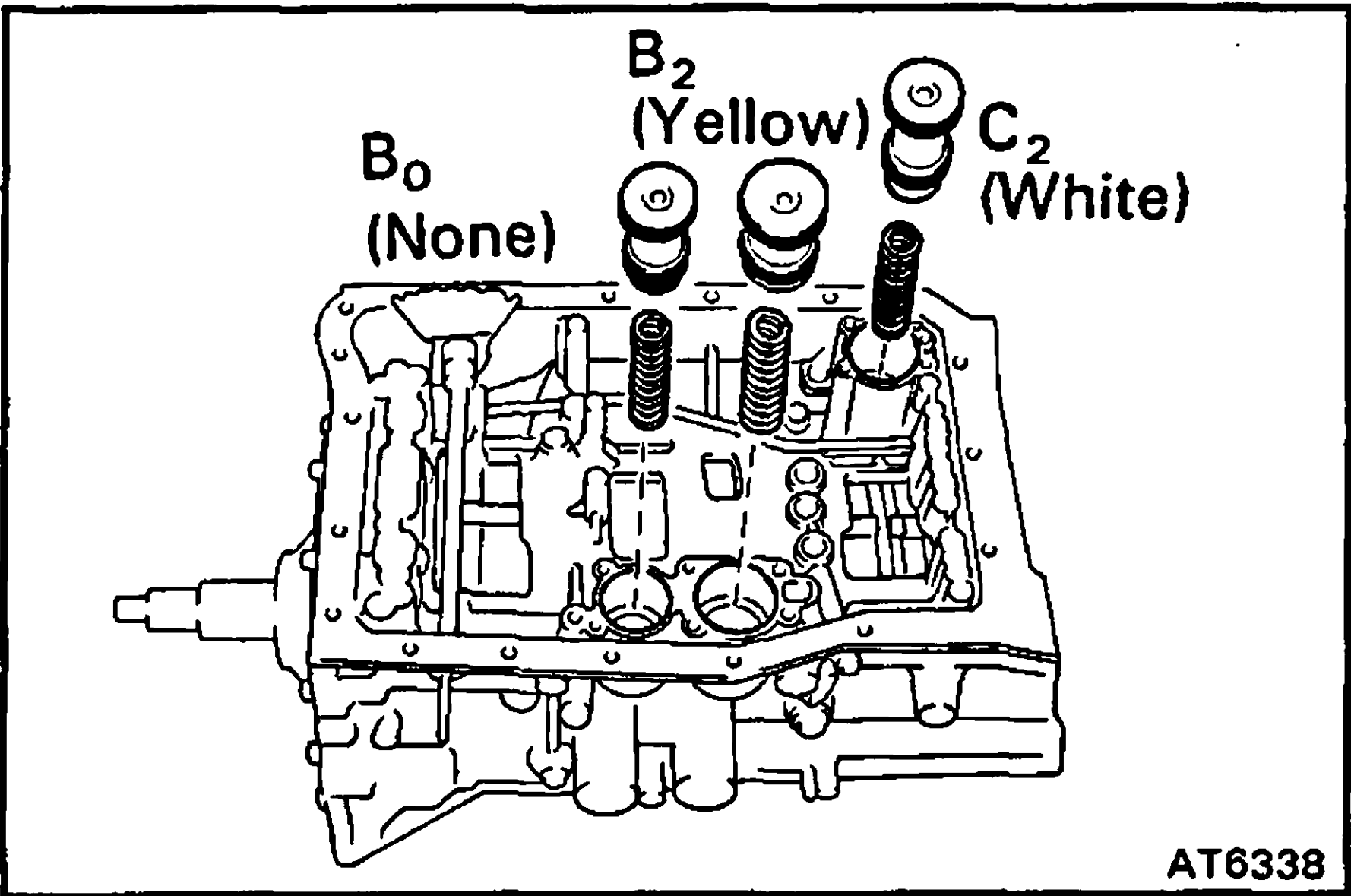


- (e) Apply sealant to the threads of the oil pump set bolts.

Sealant: Part No.08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



- (f) Install and tighten the eleven bolts.
- Torque: 210 kg-cm (16 ft-lb, 21 N·m)



22. INSTALL C<sub>2</sub>, B<sub>0</sub>, B<sub>2</sub> ACCUMULATOR SPRINGS AND PISTONS

- (a) Coat a new O-rings with ATF, and install them to the pistons.
- (b) Install the three springs and accumulator pistons into the bore of the transmission case as shown.

HINT: Piston diameter

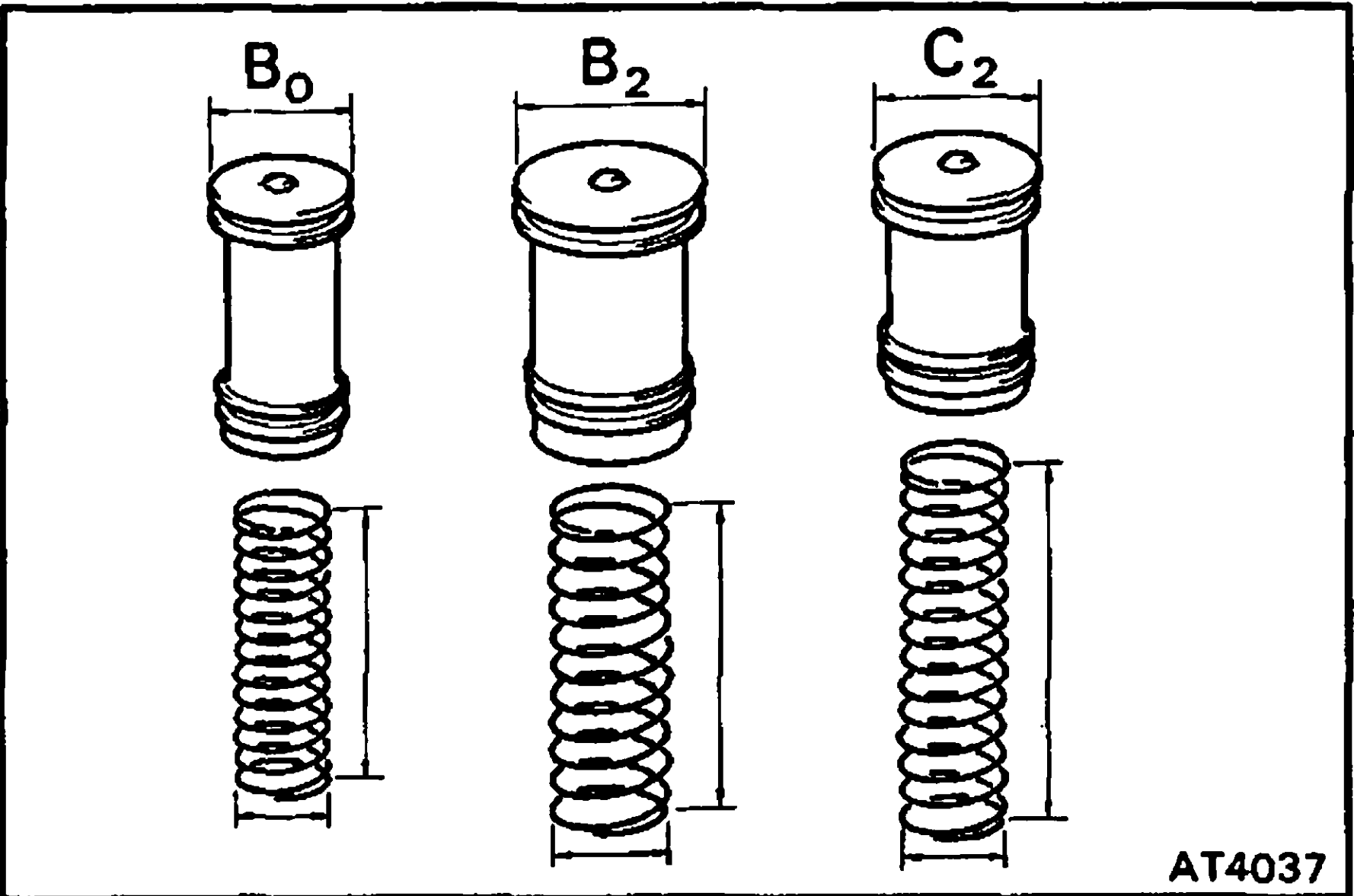
mm (in.)

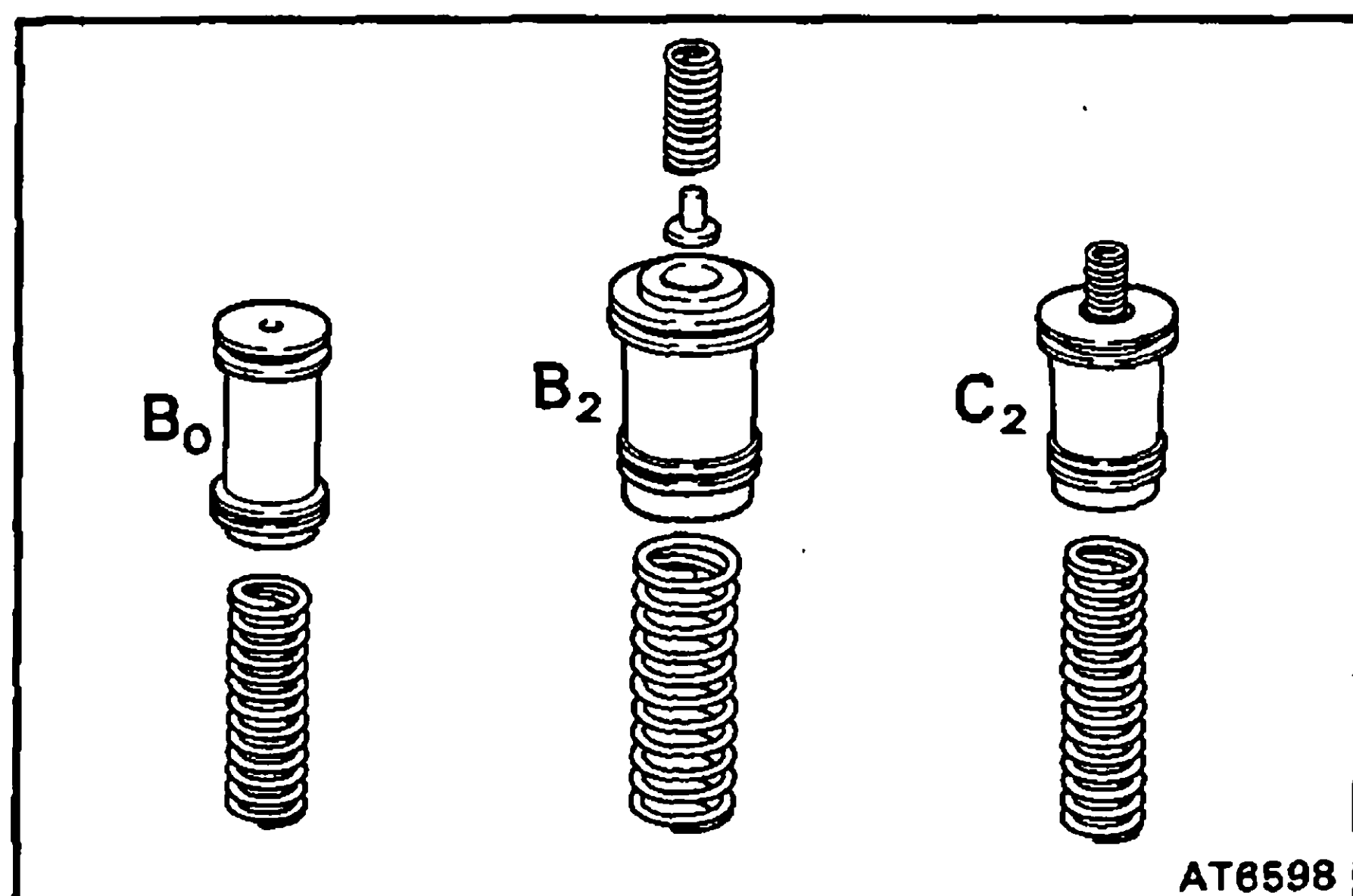
| Piston diameter |              |
|-----------------|--------------|
| B <sub>0</sub>  | 35.9 (1.413) |
| B <sub>2</sub>  | 43.9 (1.728) |
| C <sub>2</sub>  | 39.9 (1.571) |

HINT: Spring diameter and free length  
(3F, 3F-E 1HZ)

mm (in.)

| Spring         | Free length  | Diameter     | Color  |
|----------------|--------------|--------------|--------|
| B <sub>0</sub> | 64.1 (2.524) | 21.1 (0.831) | None   |
| B <sub>2</sub> | 65.0 (2.559) | 25.1 (0.988) | Yellow |
| C <sub>2</sub> | 80.0 (3.150) | 21.8 (0.858) | White  |



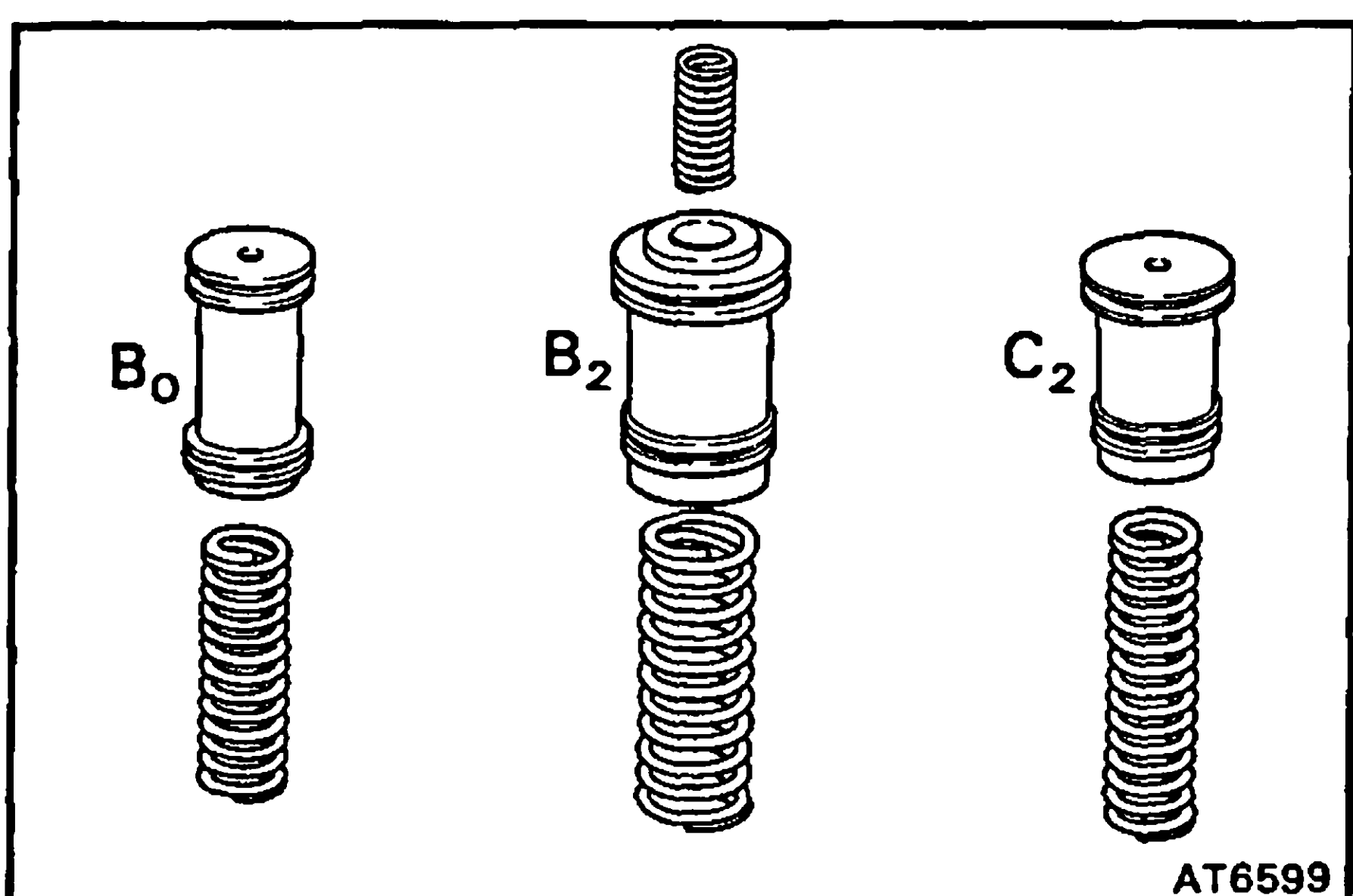


AT6598

**(1HD-T)**

mm (in.)

| Spring         | Free length    | Diameter     | Color |
|----------------|----------------|--------------|-------|
| B <sub>0</sub> | 65.93 (2.5957) | 21.1 (0.831) | Blue  |
| B <sub>2</sub> | Upper          | 11.0 (0.433) | Pink  |
|                | Lower          | 25.1 (0.988) | Green |
| C <sub>2</sub> | 80.0 (3.150)   | 21.8 (0.858) | White |

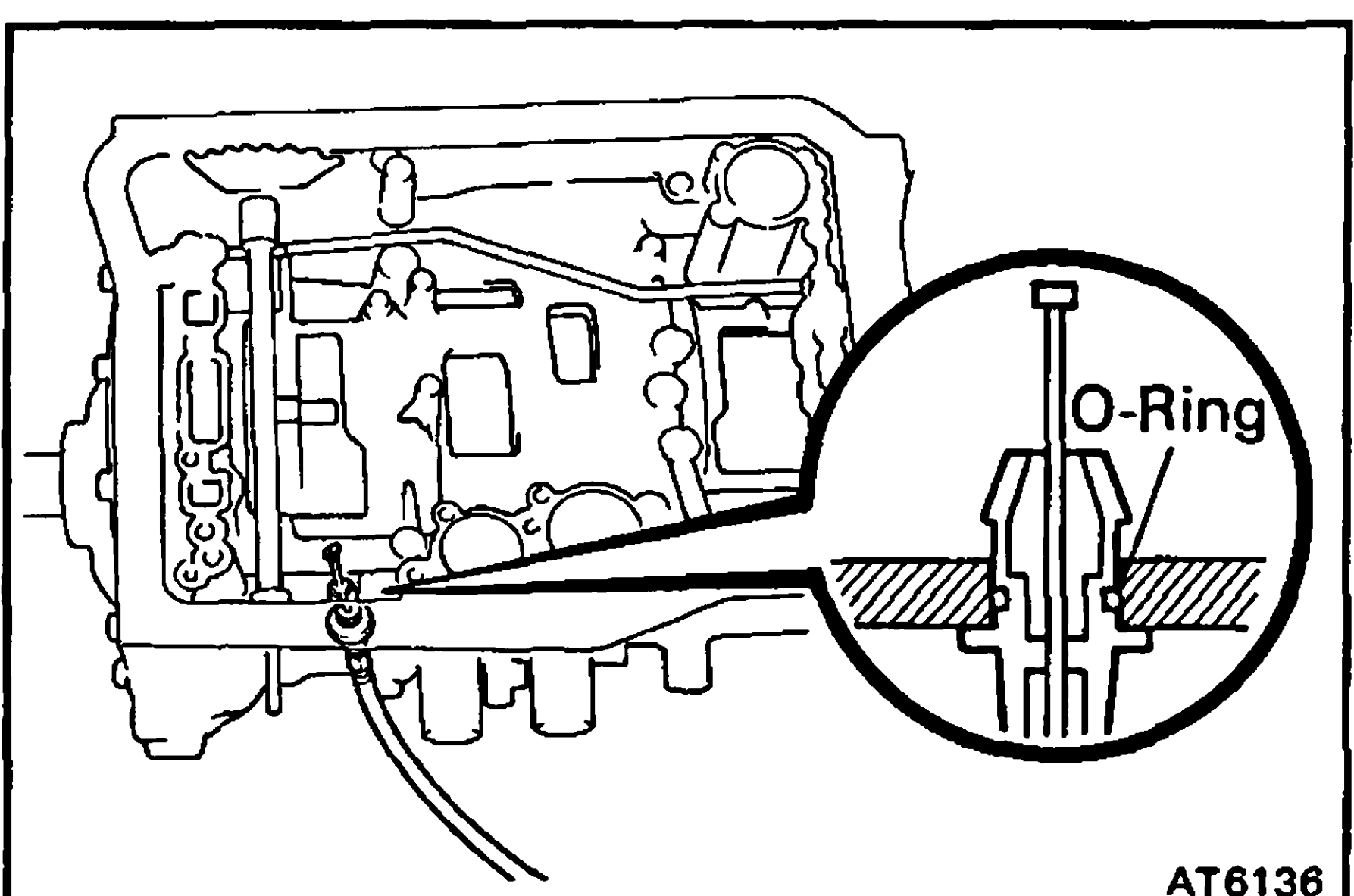


AT6599

**(BB32 series))**

mm (in.)

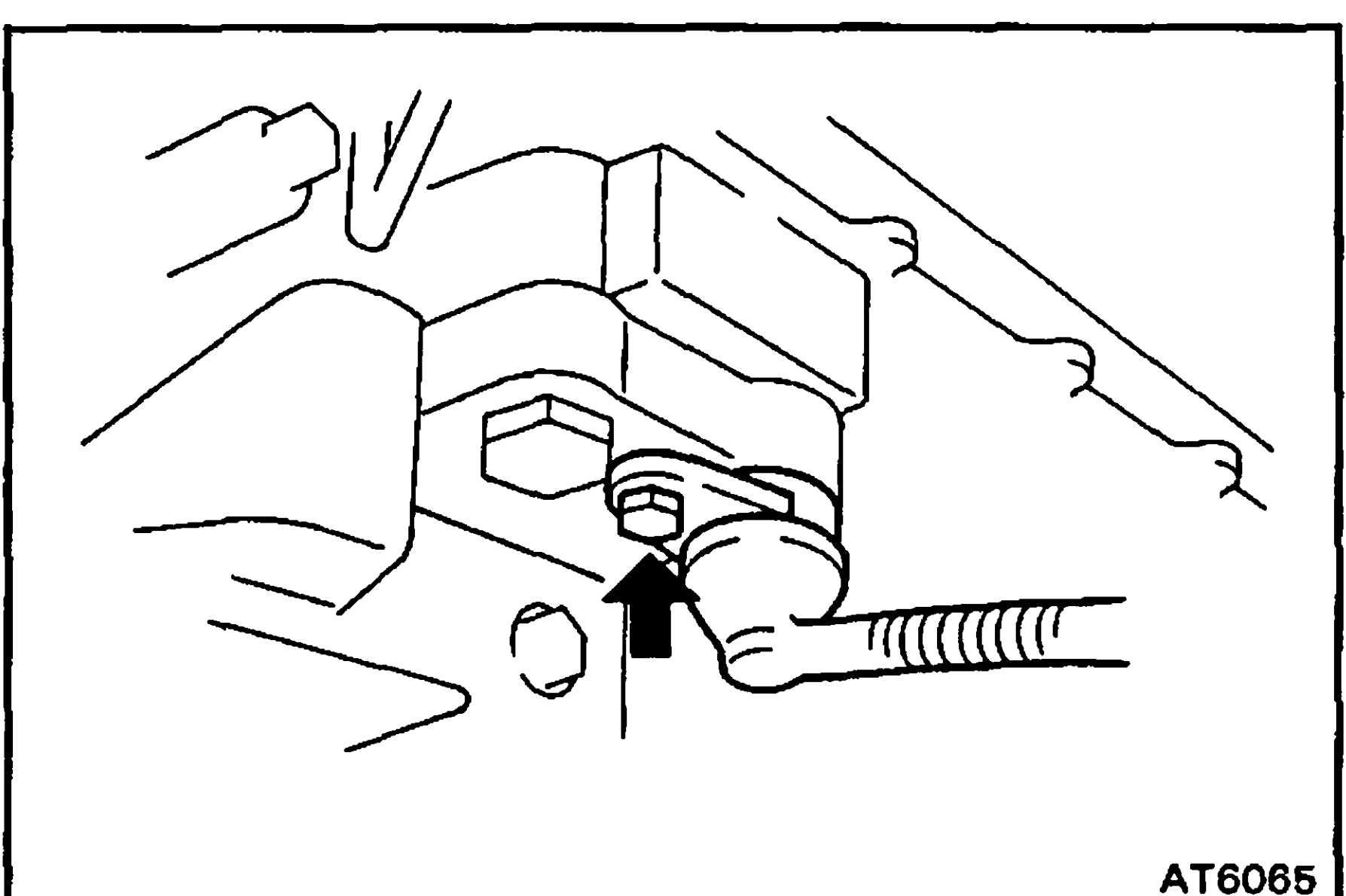
| Spring         | Free length    | Diameter     | Color  |
|----------------|----------------|--------------|--------|
| B <sub>0</sub> | 63.09 (2.4839) | 20.7 (0.815) | None   |
| B <sub>2</sub> | Upper          | 11.0 (0.433) | Yellow |
|                | Lower          | 24.9 (0.980) | Gray   |
| C <sub>2</sub> | 80.0 (3.150)   | 21.8 (0.858) | White  |



AT6136

**23. INSTALL THROTTLE CABLE**

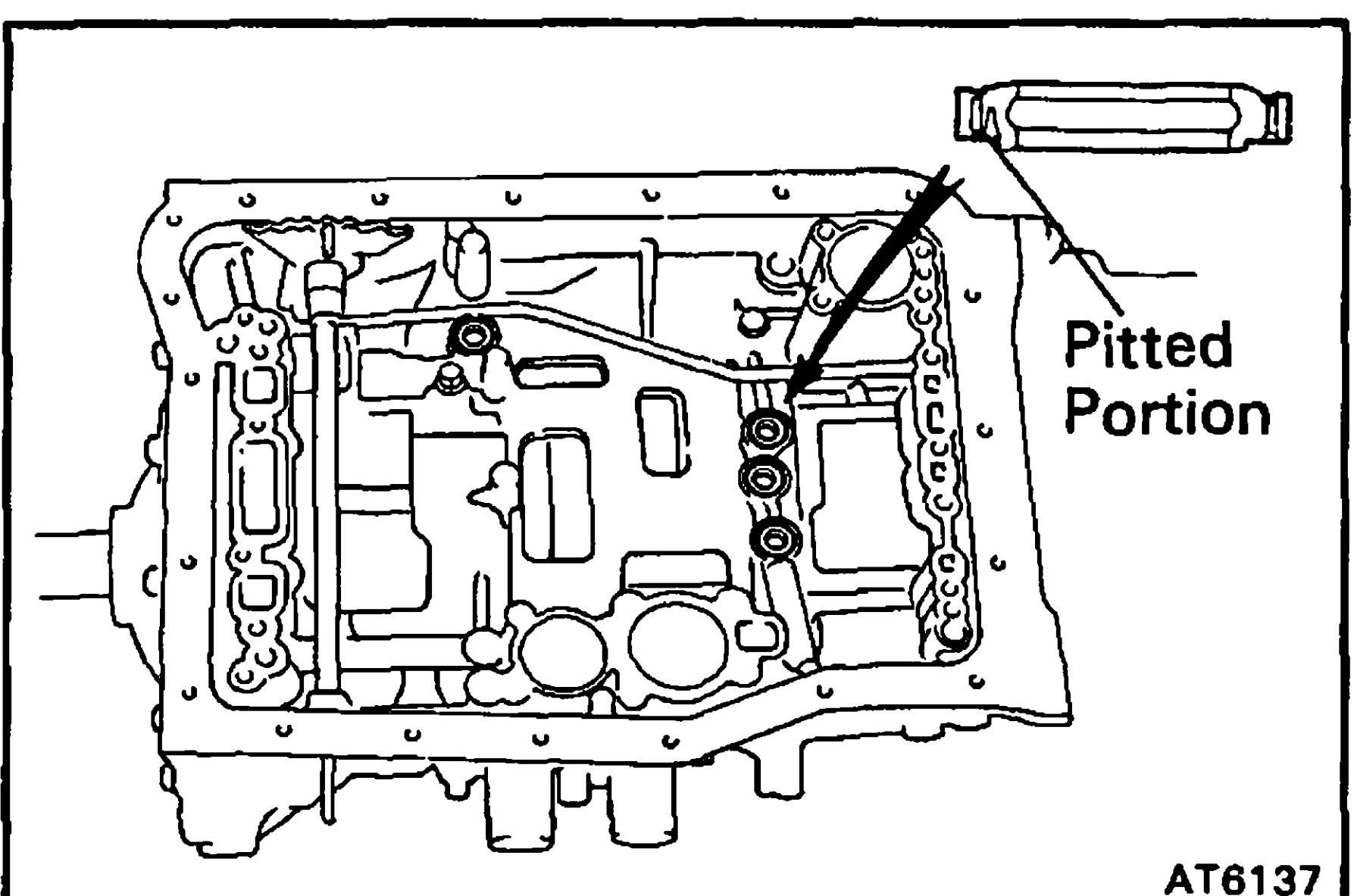
- Coat a new O-ring with ATF, and install it to the cable.
- Install the cable to the transmission case.



AT6065

**24. (w/ Cruise Control System)  
INSTALL SOLENOID WIRING**

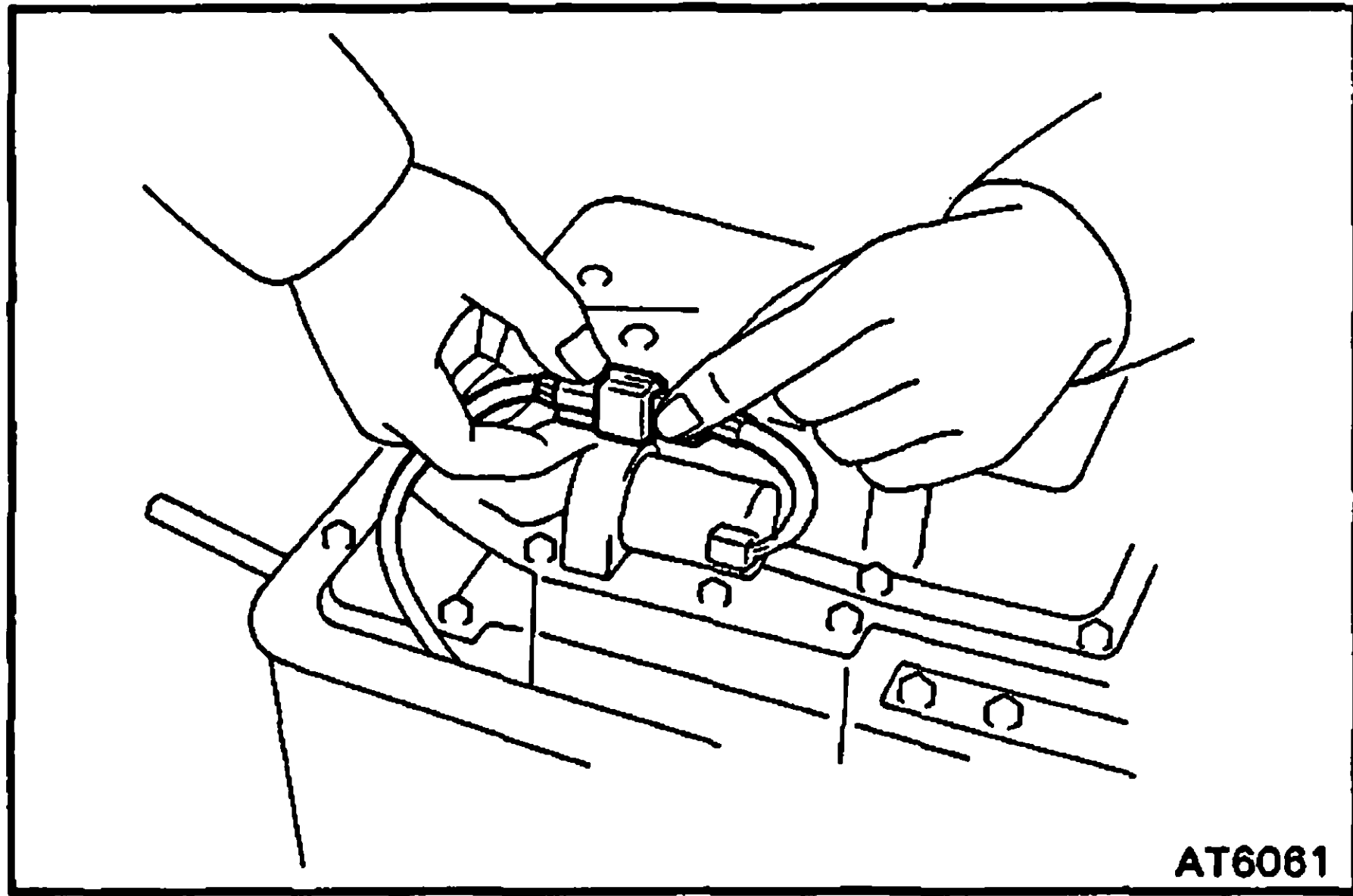
- Coat a new O-ring with ATF, and install it to the wiring.
- Install the solenoid wiring to the transmission case.



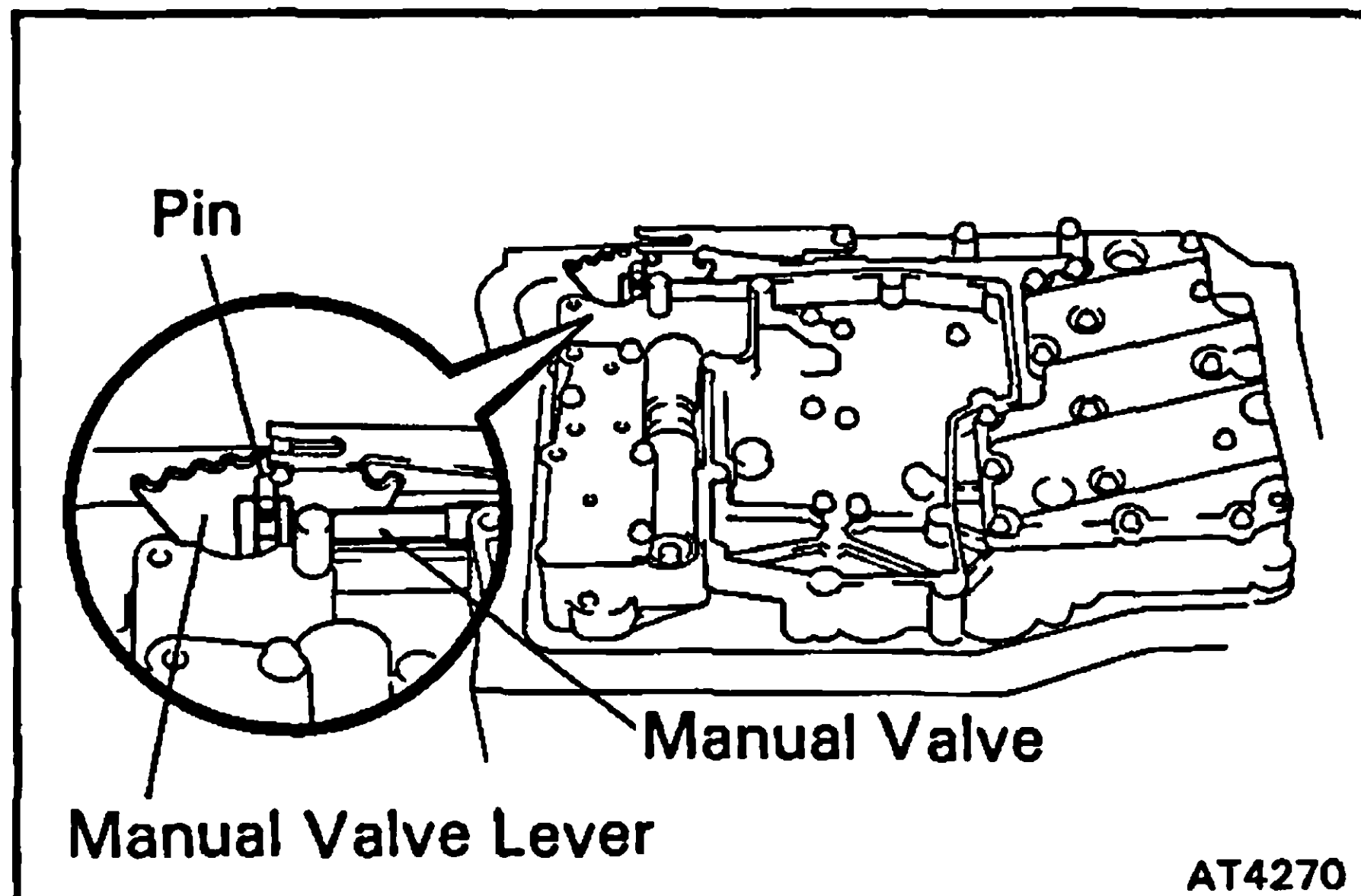
AT6137

**25. INSTALL CENTER SUPPORT APPLY GASKET**

Install new four gaskets, facing the pitted side toward the transmission case.

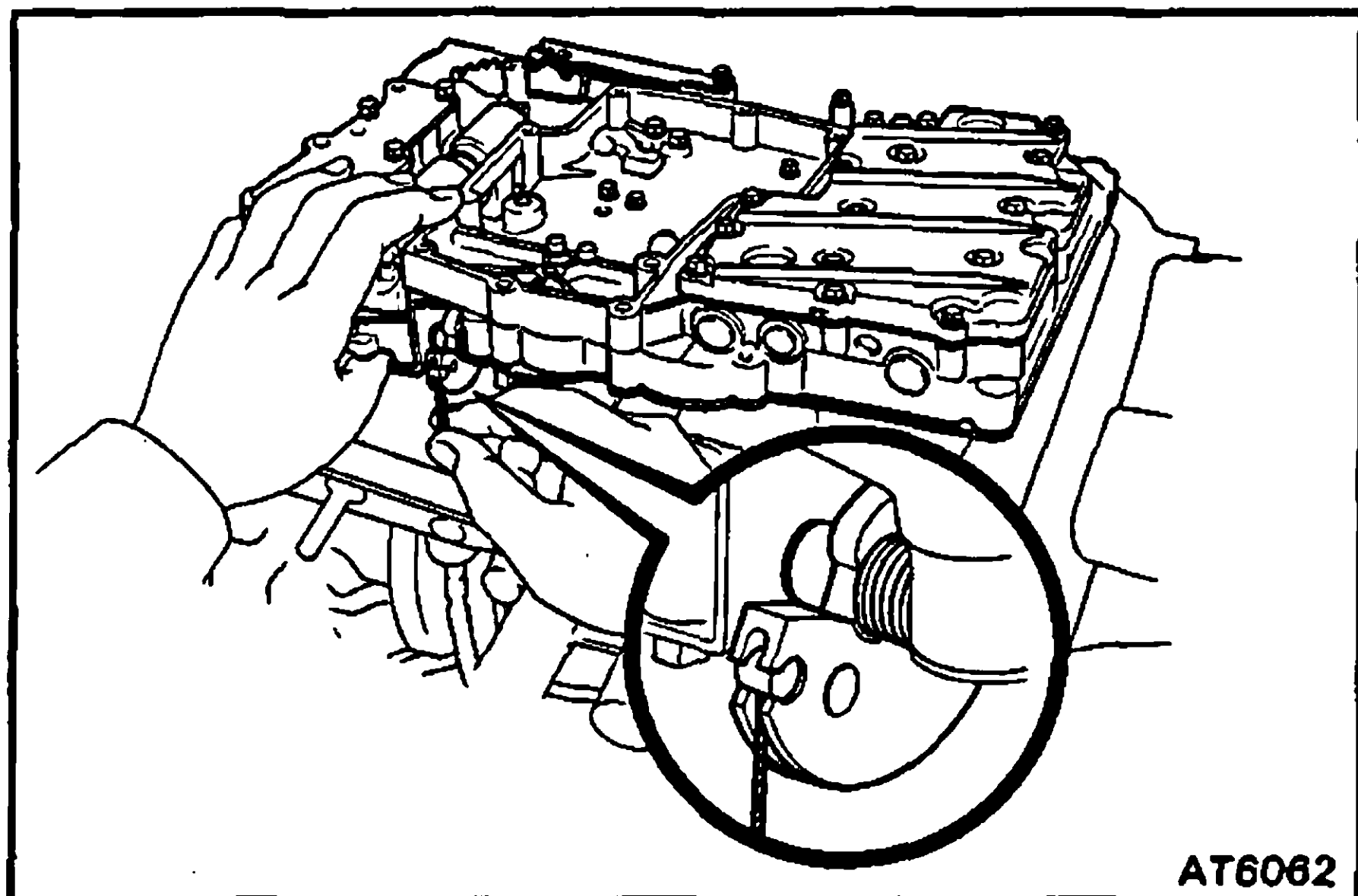


## 26. (w/ Cruise Control System) CONNECT SOLENOID CONNECTOR



## 27. INSTALL VALVE BODY

- (a) Align the groove of the manual valve with the pin of the manual valve lever.



- (b) Connect the throttle cable to the cam.

- (c) Install the three bolts indicated by arrows.

- (d) Install the other bolts.

HINT: Each bolt length is indicated below.

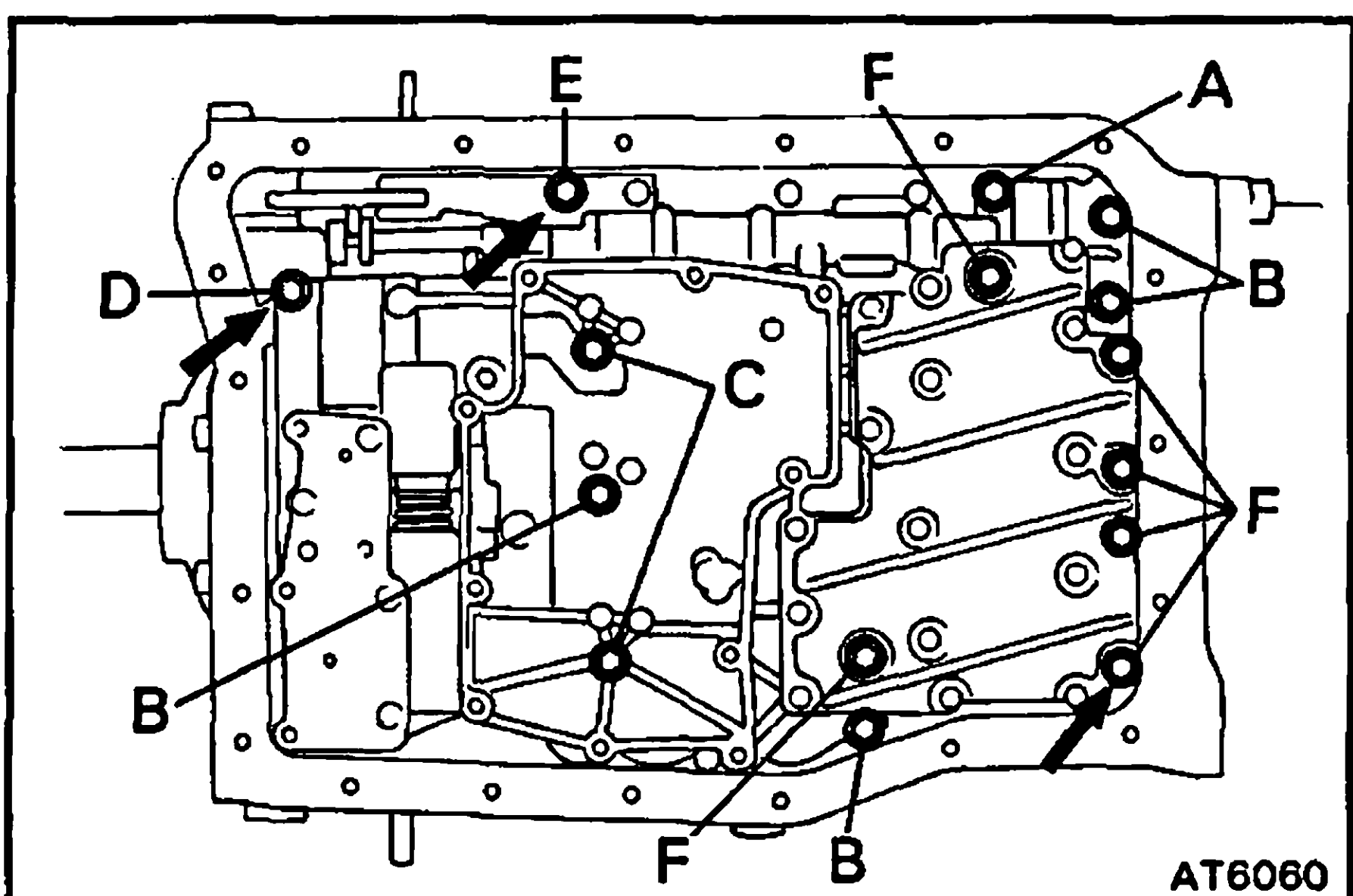
**Bolt length:**

- A 22 mm (0.87 in.)
- B 32 mm (1.26 in.)
- C 36 mm (1.42 in.)
- D 41 mm (1.61 in.)
- E 45 mm (1.77 in.)
- F 57 mm (2.24 in.)

- (e) Check that the manual valve lever contacts the center of the roller at the tip of the detent spring.

- (f) Tighten the bolts.

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



## 28. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the seven wave washers (for 8mm head bolts) and ten bolts.

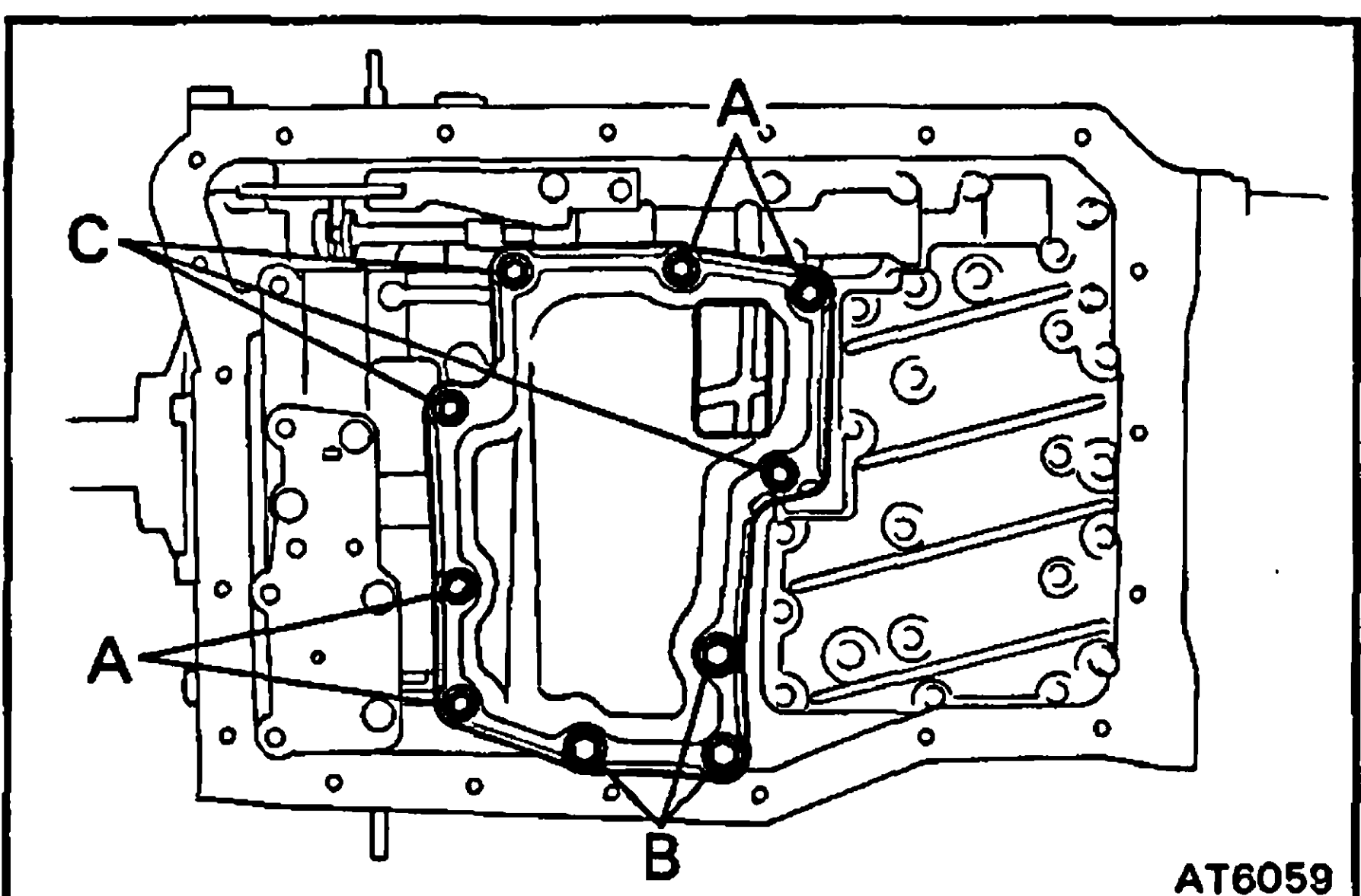
**Torque:**

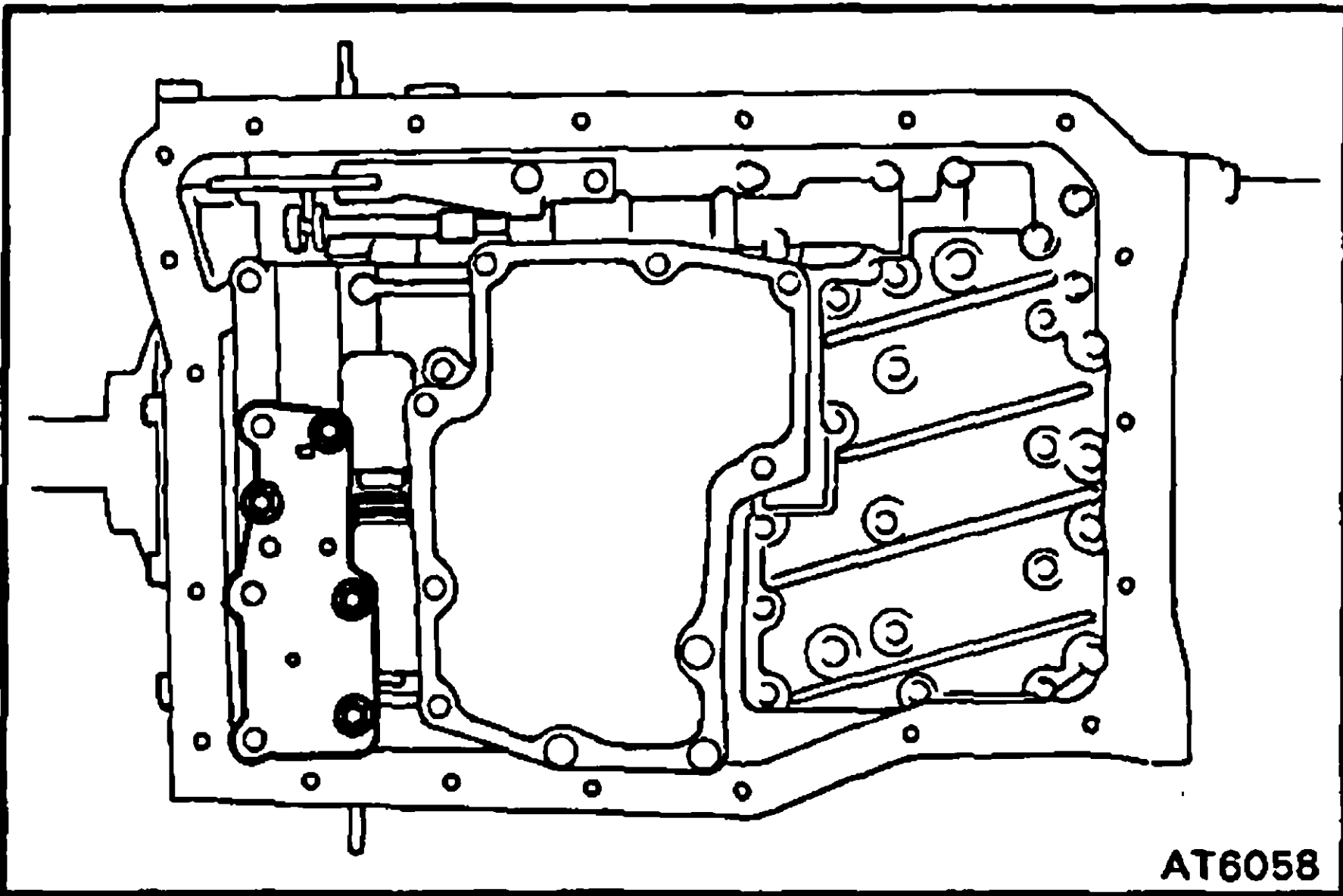
8 mm head bolt 55 kg-cm (48 in.-lb, 5.4 N·m)  
10 mm head bolt 100 kg-cm (7 ft-lb, 10 N·m)

HINT: Each bolt length is indicated below.

**Bolt length:**

- A 12 mm (0.47 in.)
- B 45 mm (1.77 in.)
- C 47 mm (1.85 in.)

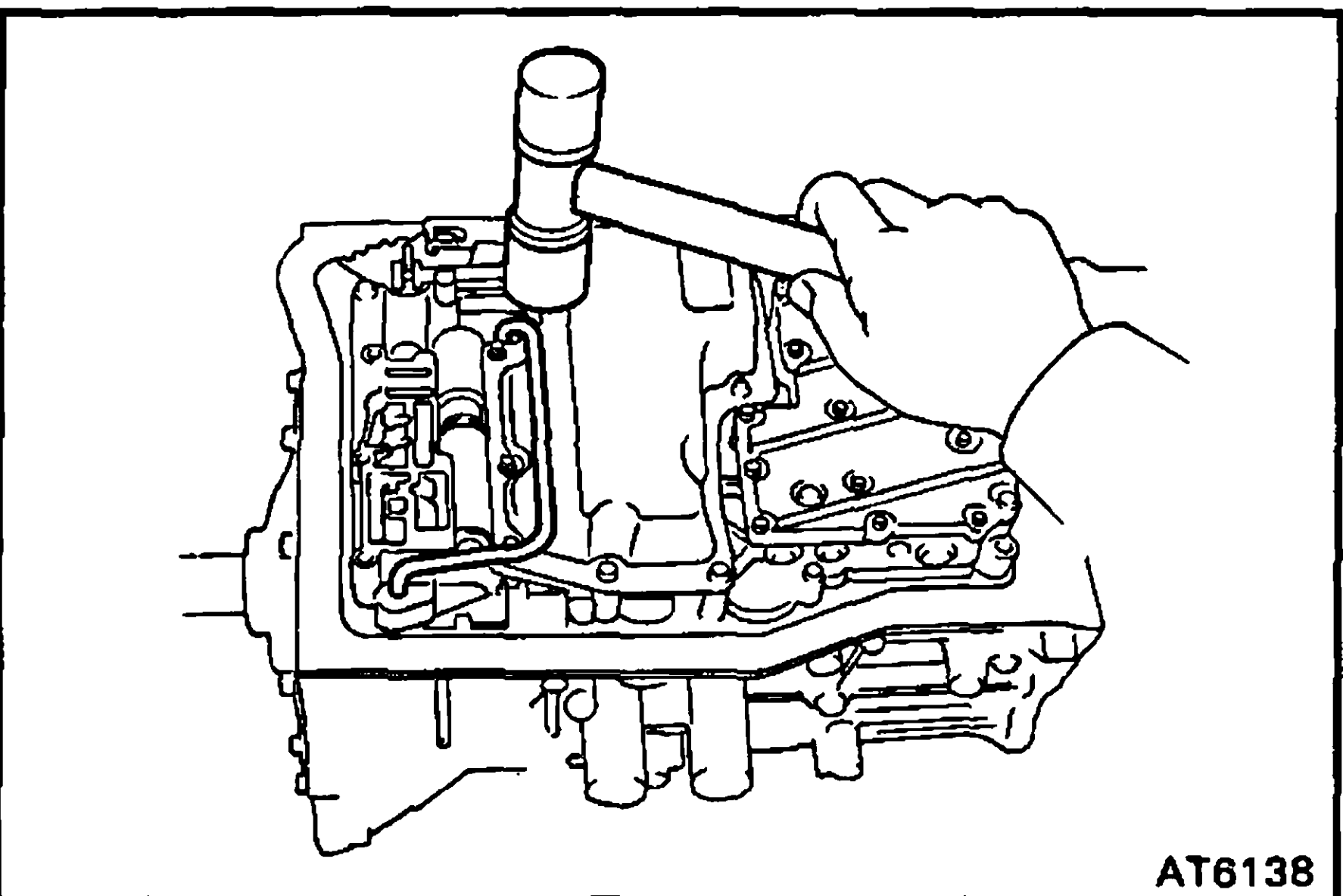




## 29. INSTALL OIL TUBE

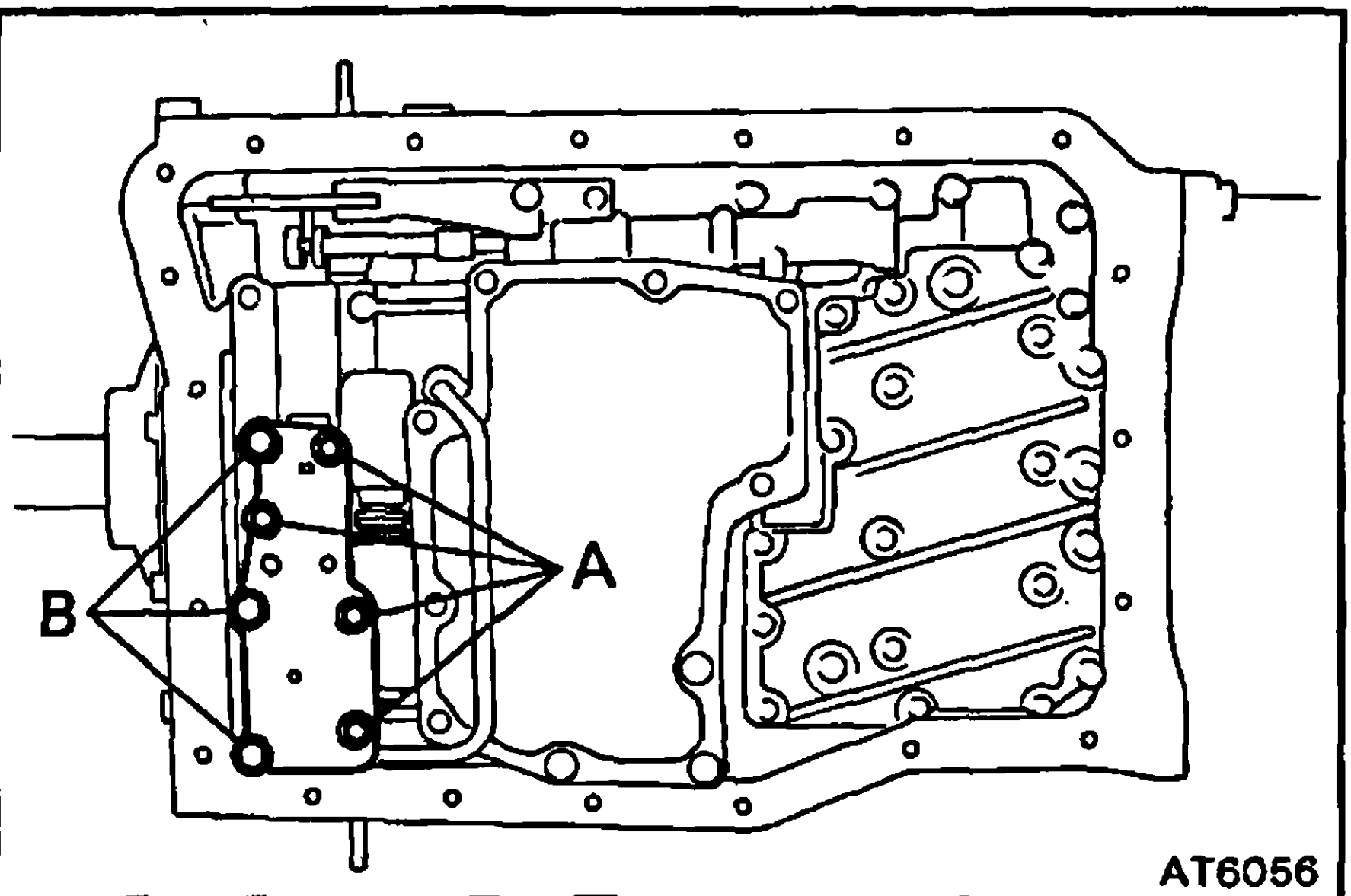
(a) Remove the lock-up relay valve body plate.

**NOTICE:** Do not drop the lock-up relay valve pins.



(b) Using a plastic-faced hammer, install the tube into position.

**NOTICE:** Be careful not to bend or damage the tube.



(c) Install a new gasket and the lock-up relay valve body plate with the four wave washers (for short bolts) and seven bolts.

**Torque:**

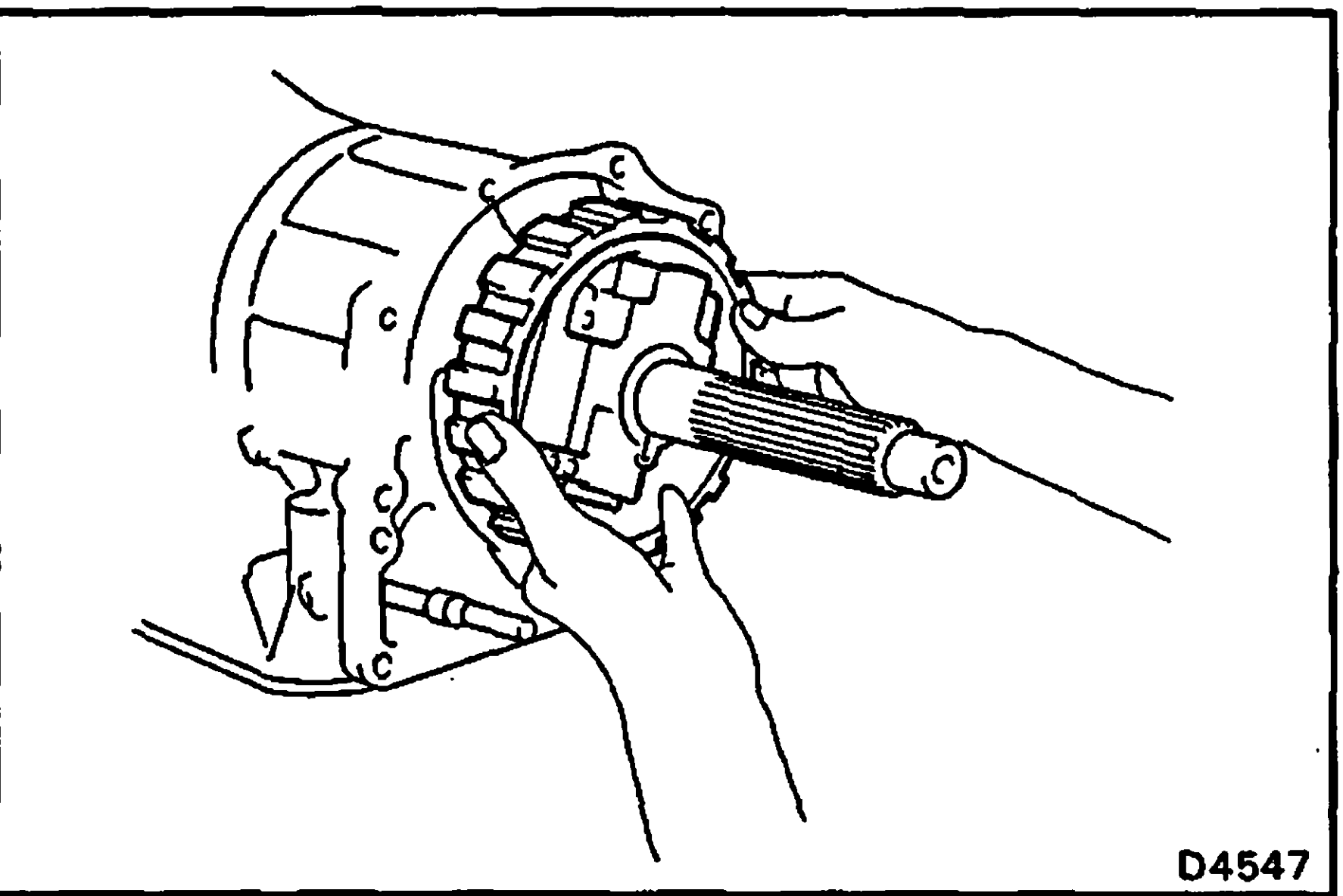
8 mm head bolt 55 kg-cm (48 in.-lb, 5.4 N·m)

10 mm head bolt 100 kg-cm (7 ft-lb, 10 N·m)

**HINT:** Each bolt length is indicated below.

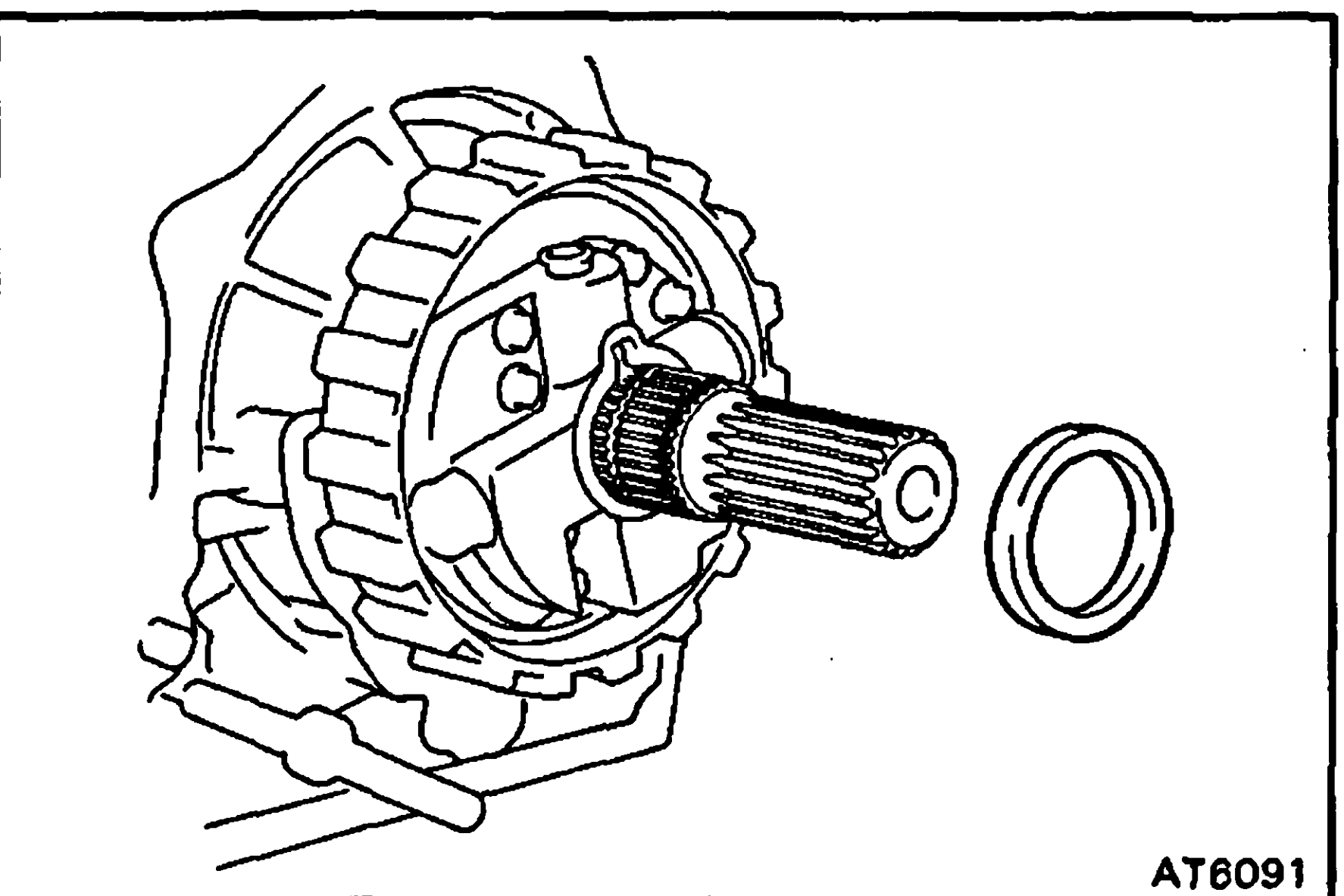
**Bolt length:** A 12 mm (0.47 in.)

B 64 mm (2.52 in.)



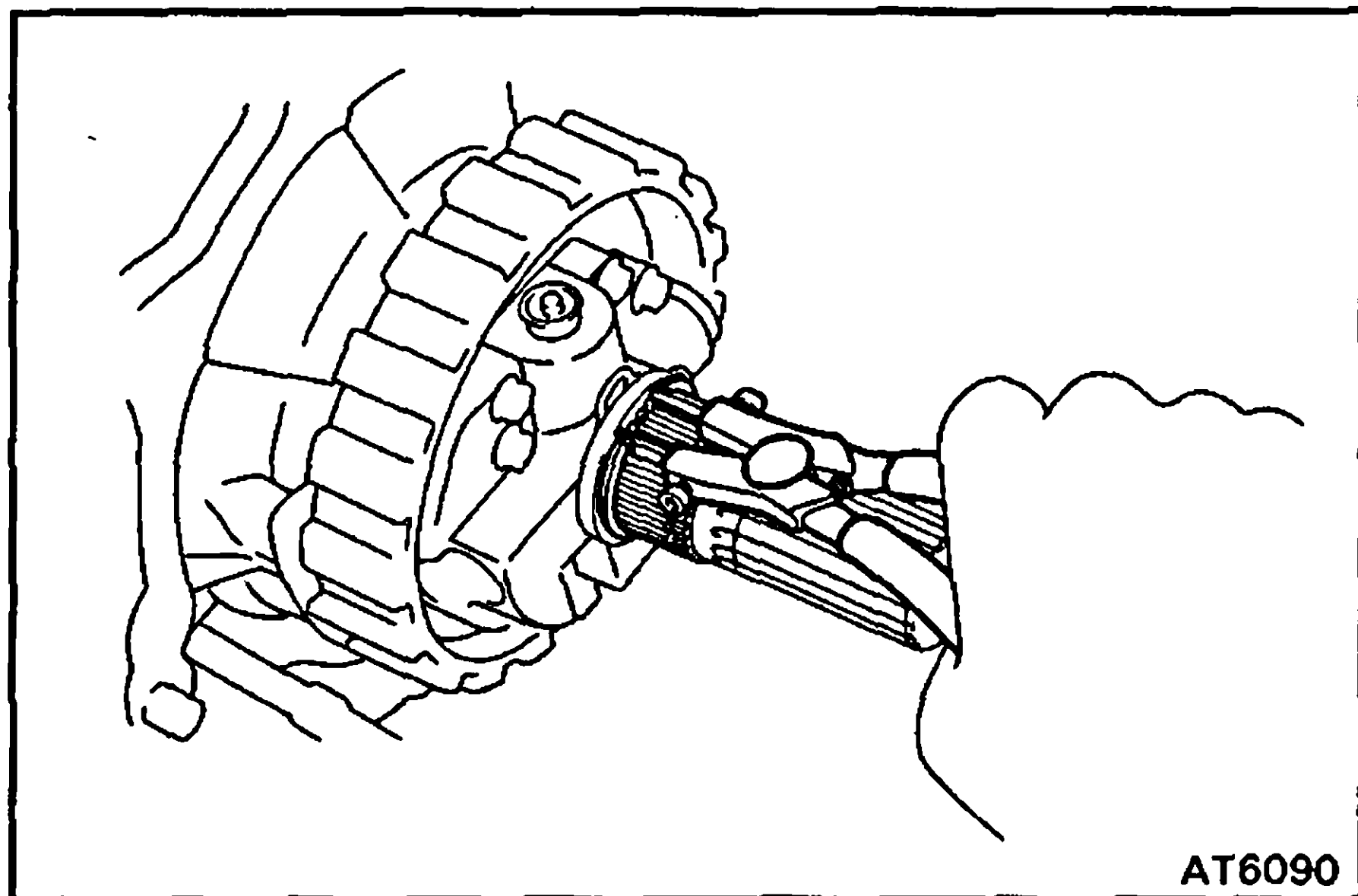
## 30. INSTALL GOVERNOR BODY

Install the governor body onto the output shaft.

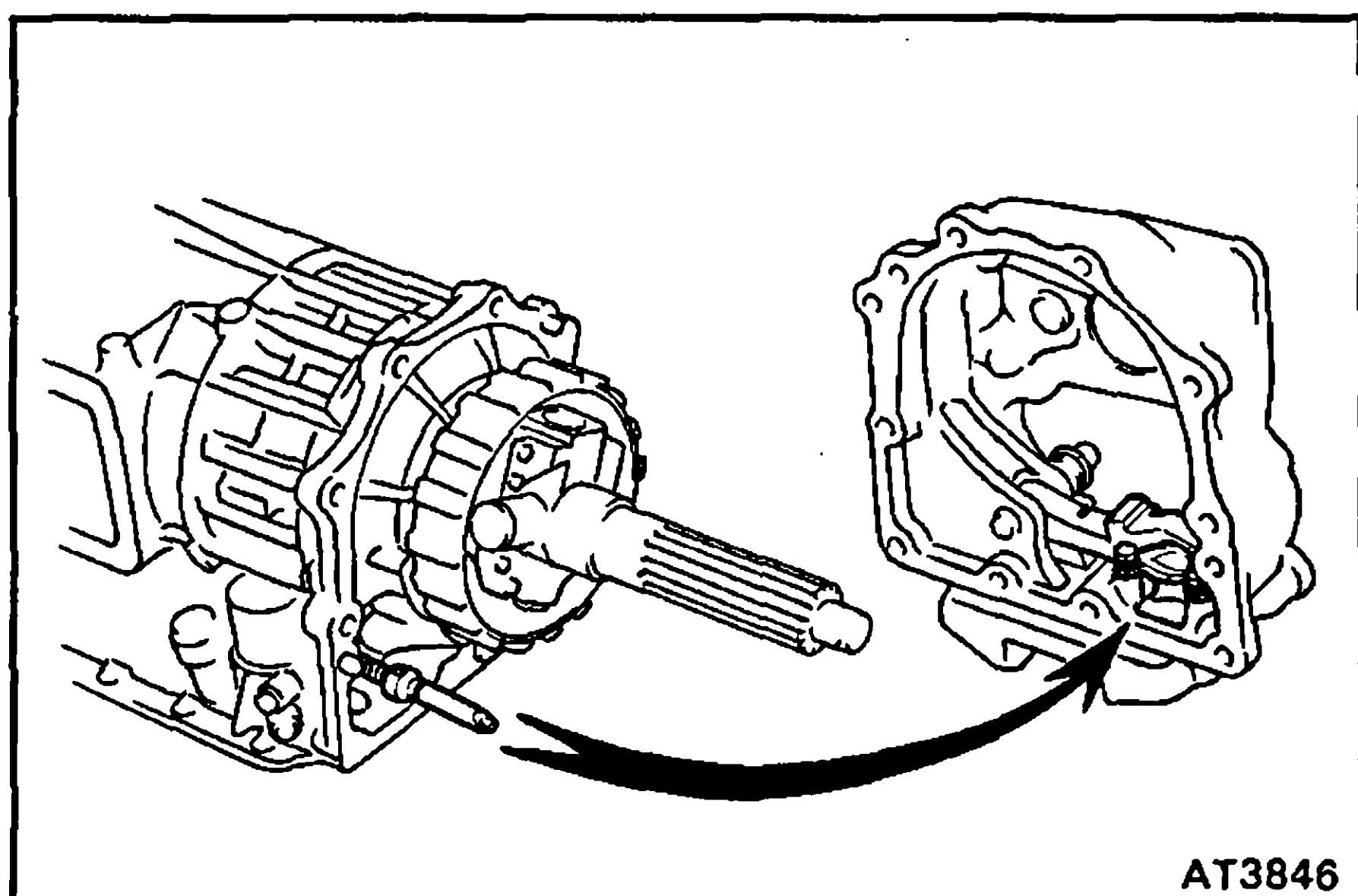


## 31. INSTALL OUTPUT SHAFT SPACER

(a) Install the output shaft spacer.

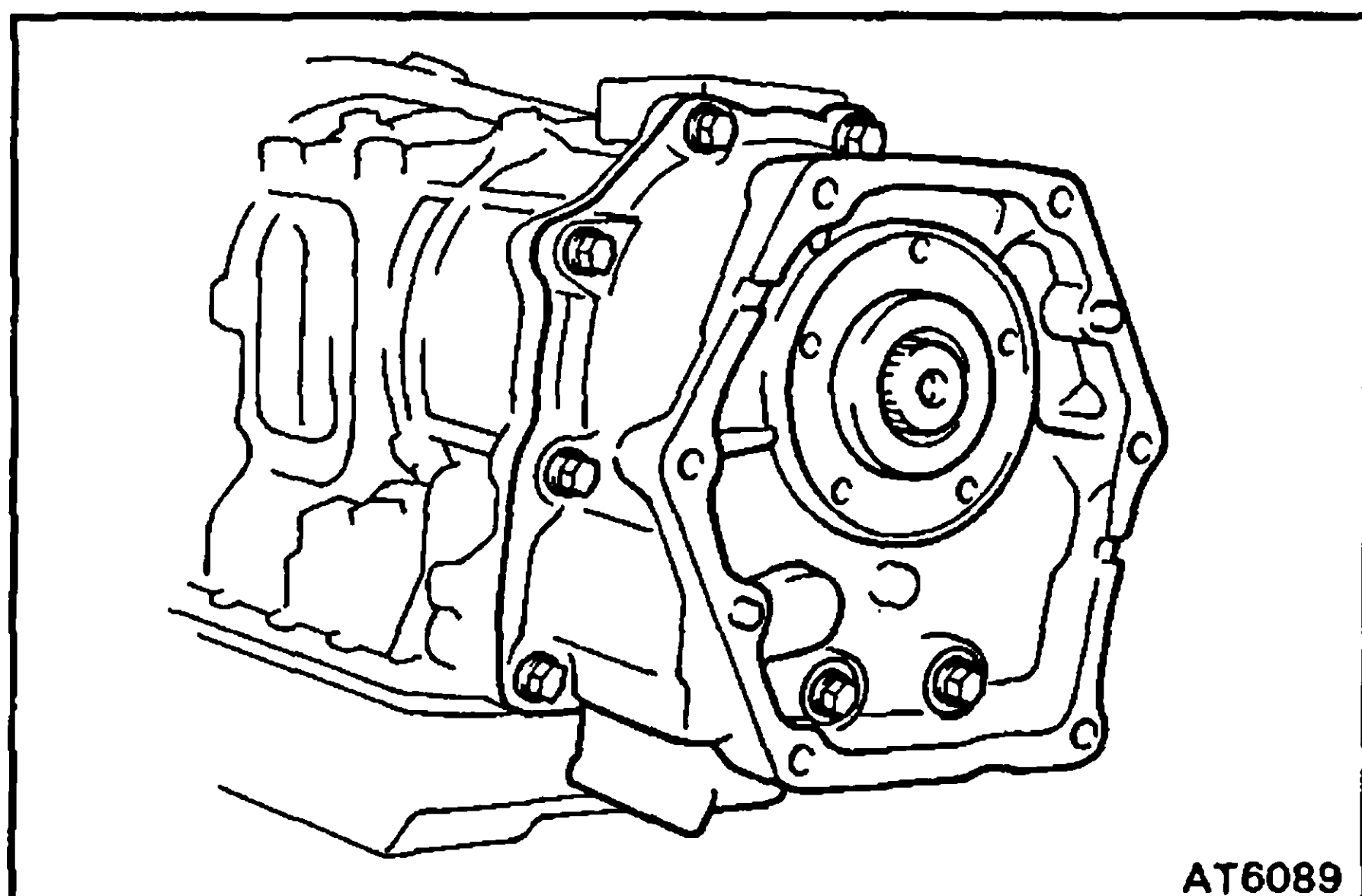


- (b) Using snap ring pliers, install the snap ring.

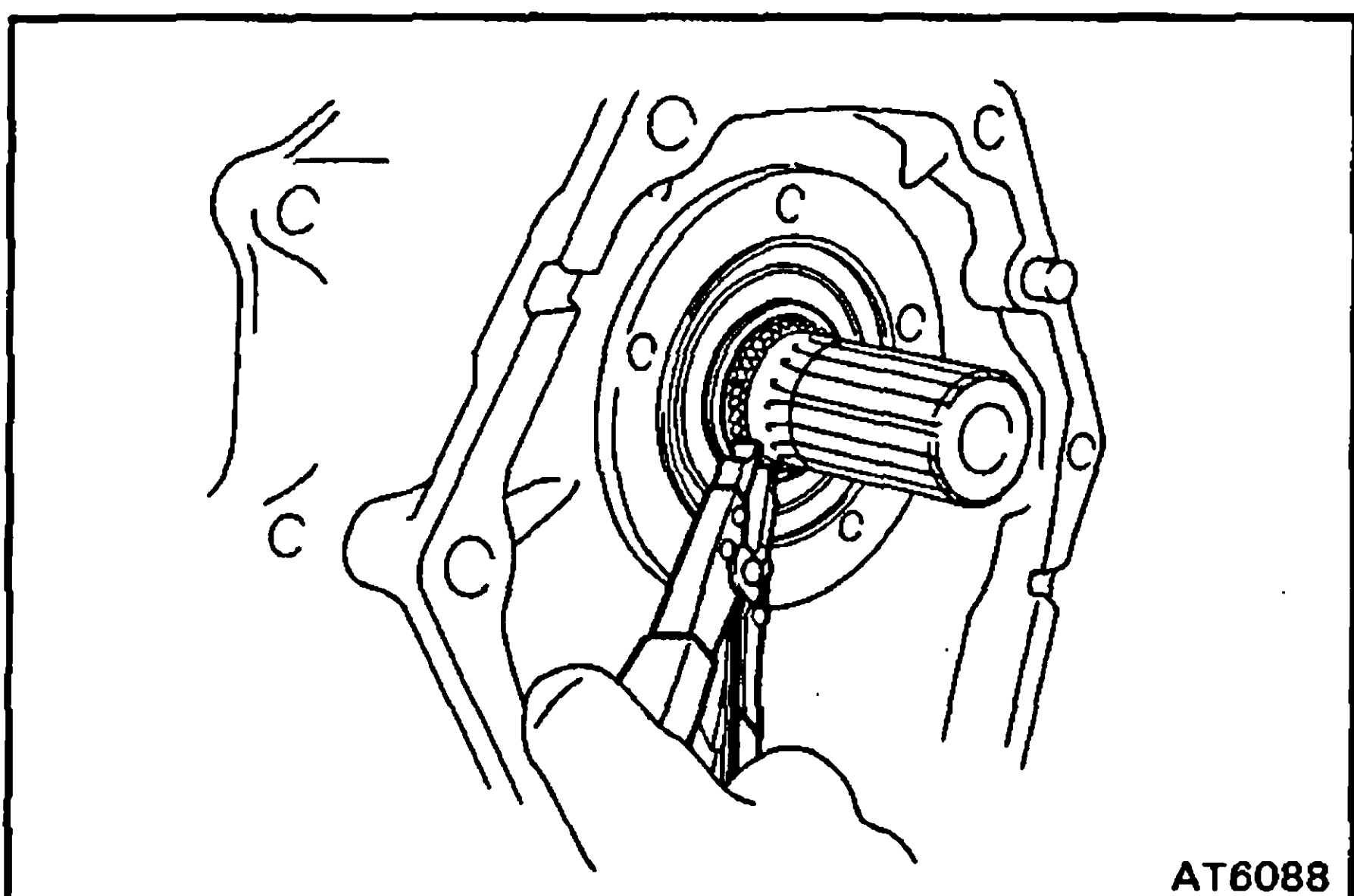


**32. (A440F, A442F)  
INSTALL TRANSFER ADAPTOR AND OUTPUT SHAFT  
REAR BEARING**

- (a) Place a new gasket on the transmission case.  
(b) Insert the parking lock rod between the parking lock pawl and bracket, and attach the transfer adaptor on the transmission case.

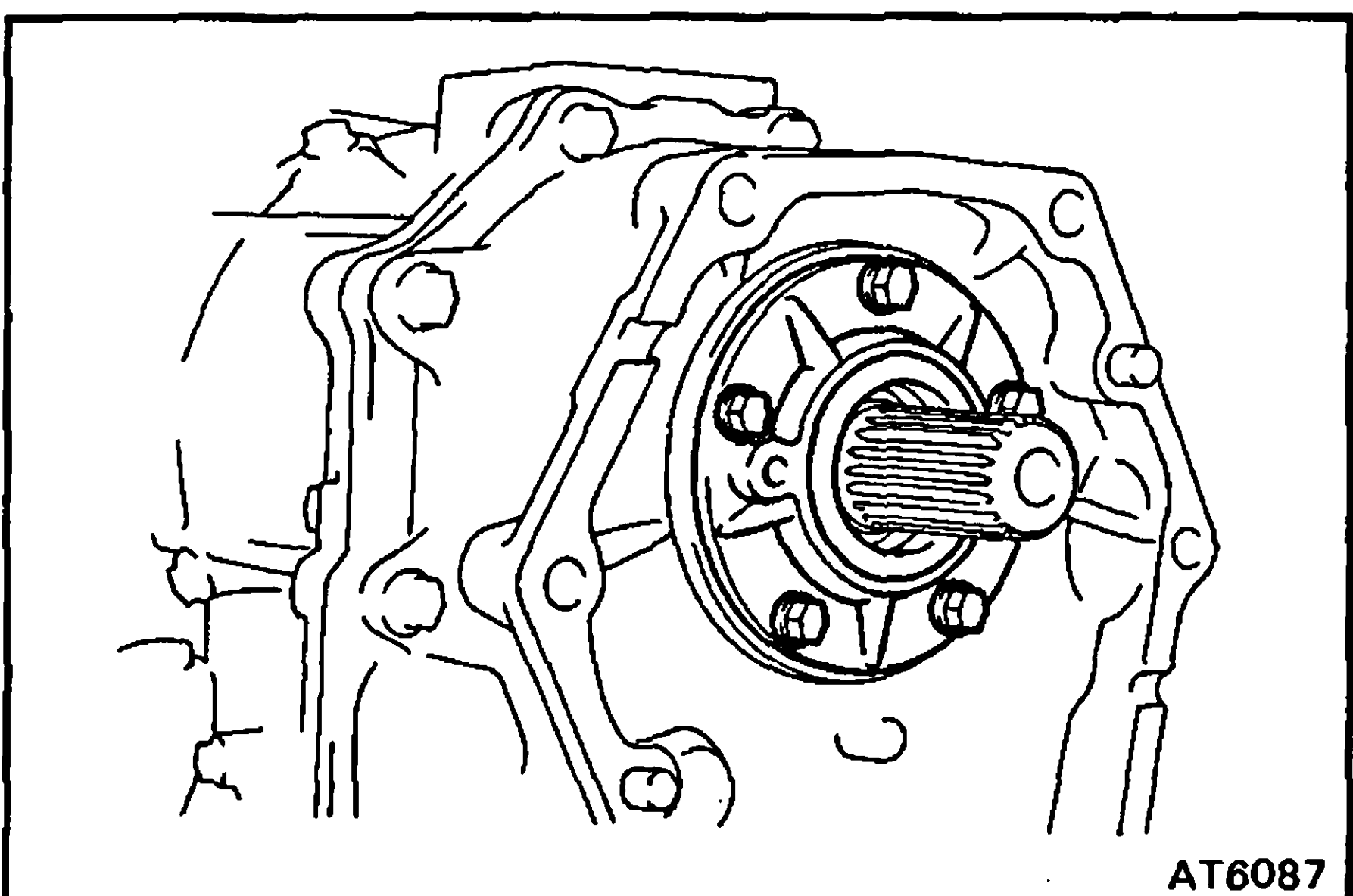


- (c) Install the transfer adaptor with ten bolts.  
**Torque: 380 kg-cm (27 ft-lb, 37 N·m)**



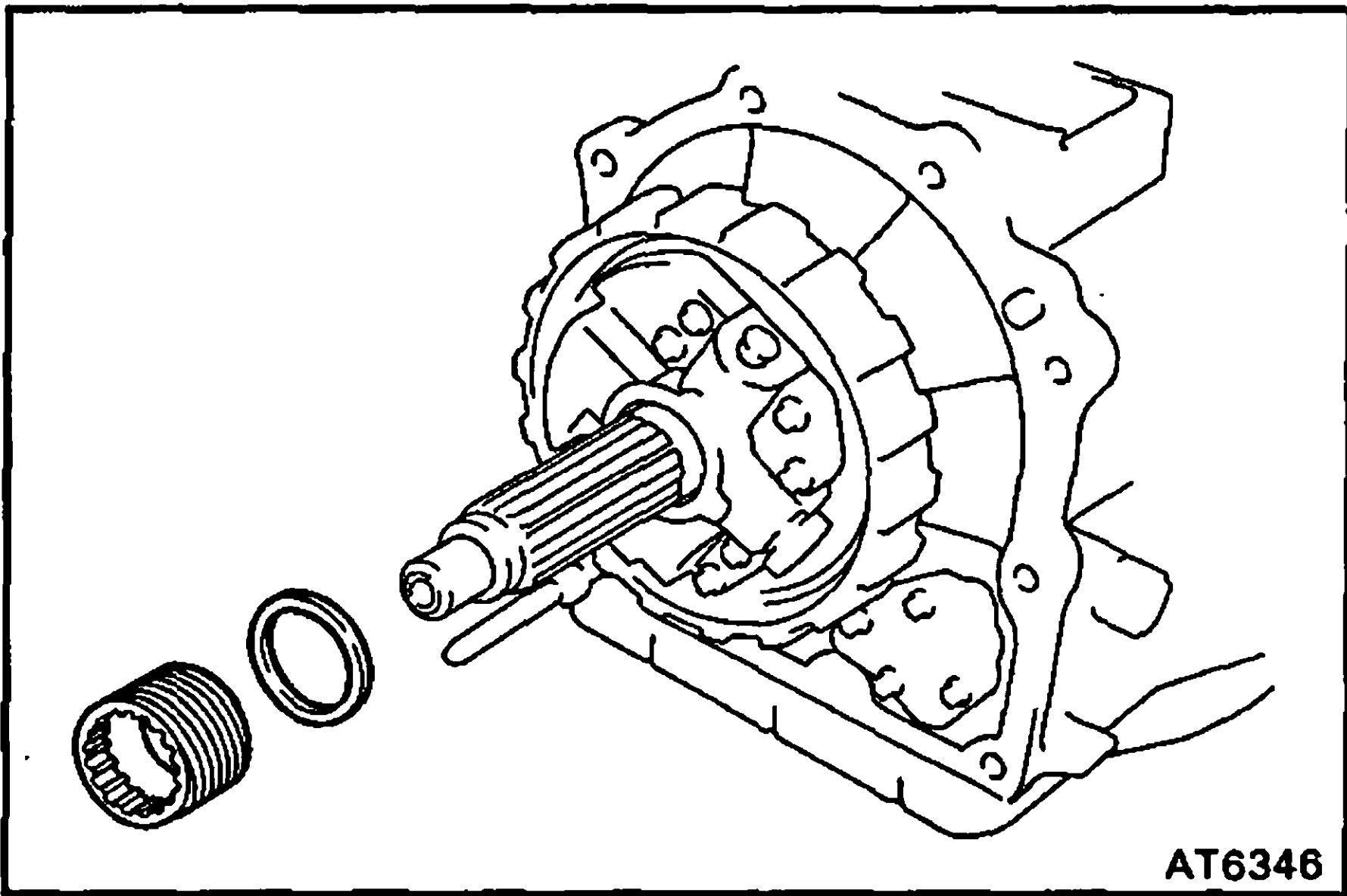
**33. INSTALL OUTPUT SHAFT SPACER**

- (a) Slide the spacer onto the output shaft.  
(b) Using snap ring pliers, install the snap ring.

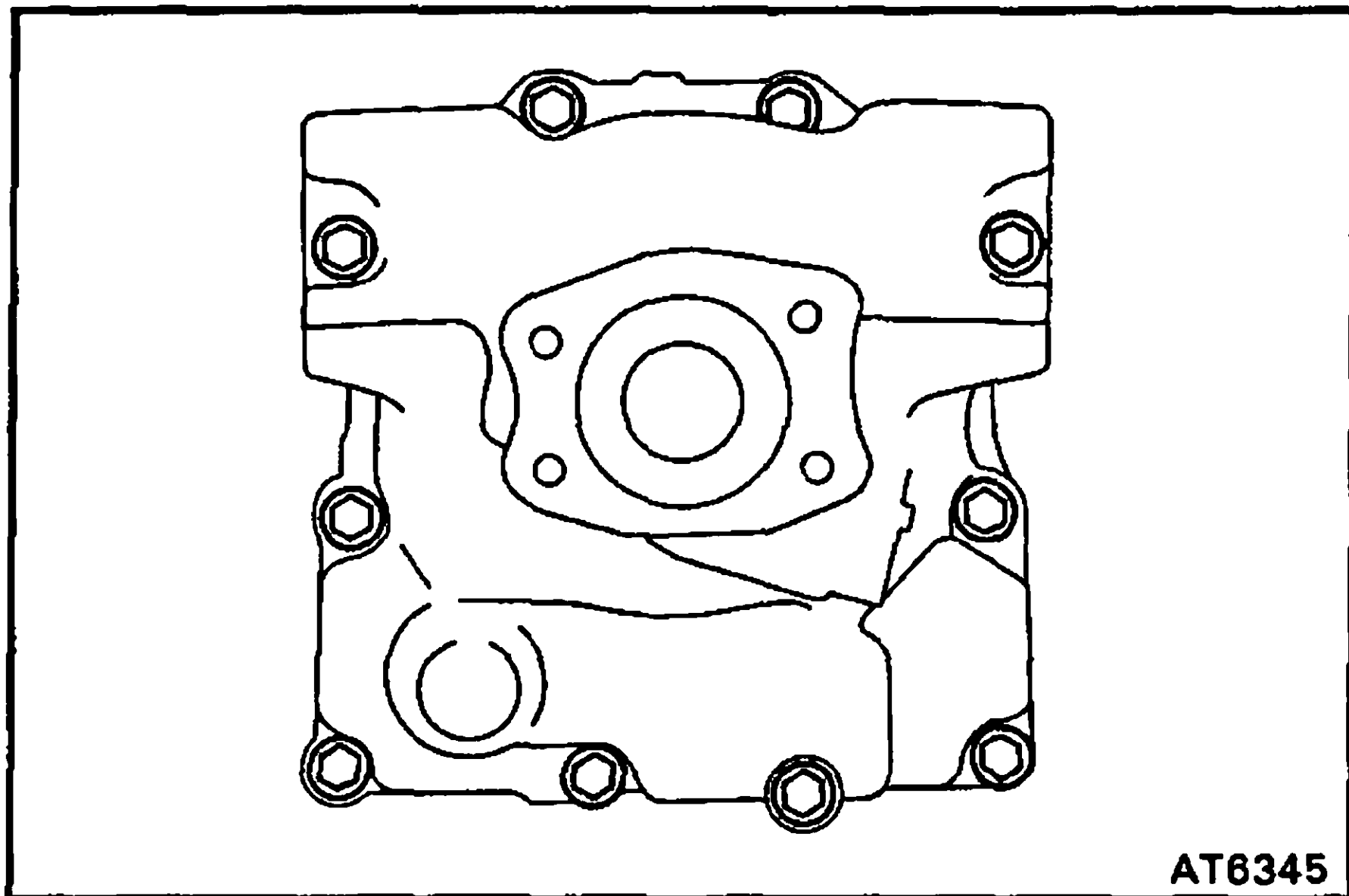


**34. INSTALL OUTPUT SHAFT REAR BEARING RETAINER**

Install the output shaft rear bearing retainer with five bolts.



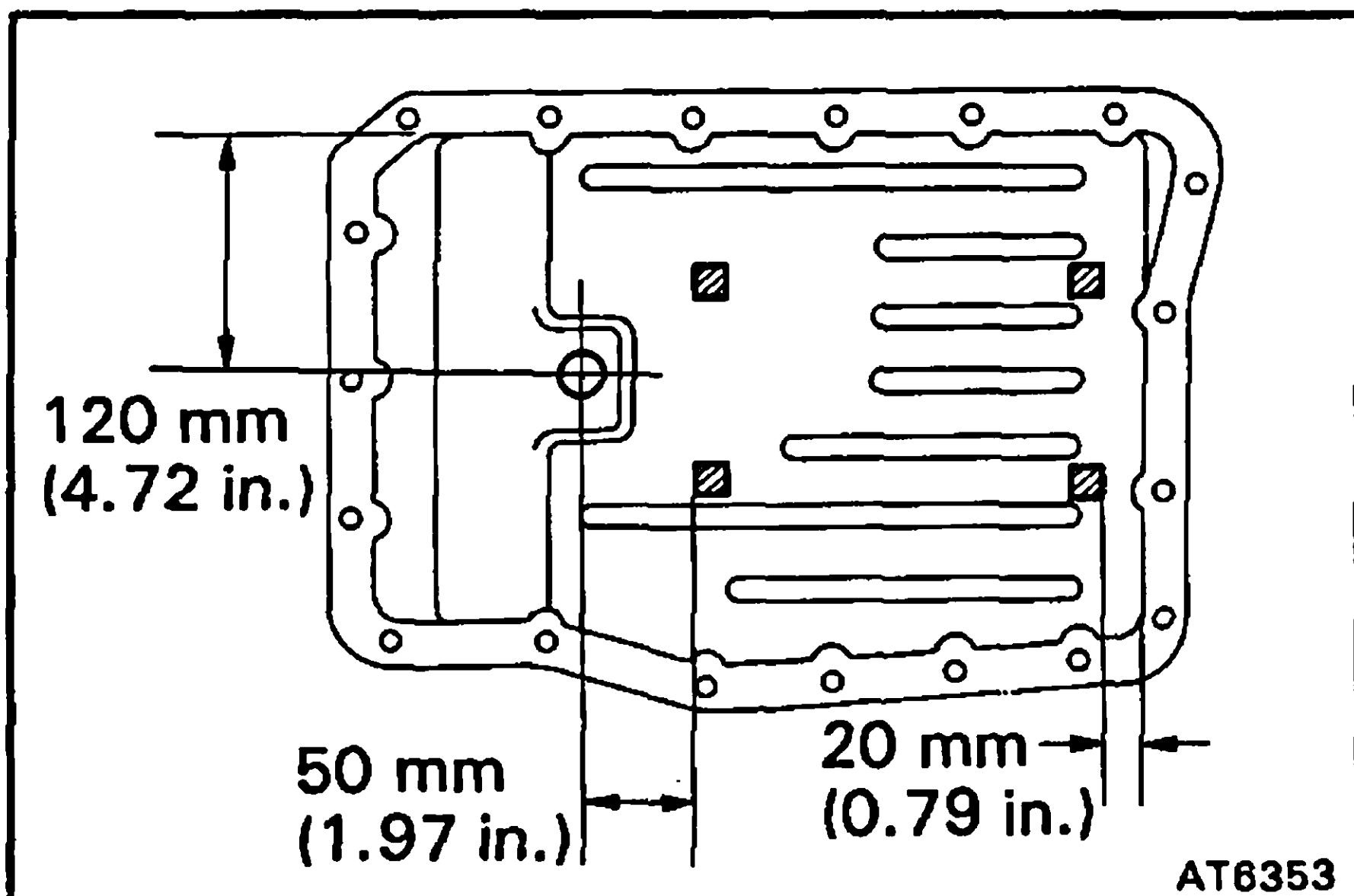
**35. (A441L)  
INSTALL SPEEDOMETER DRIVE GEAR AND SPACER**



**36. (A441L)  
INSTALL EXTENSION HOUSING**

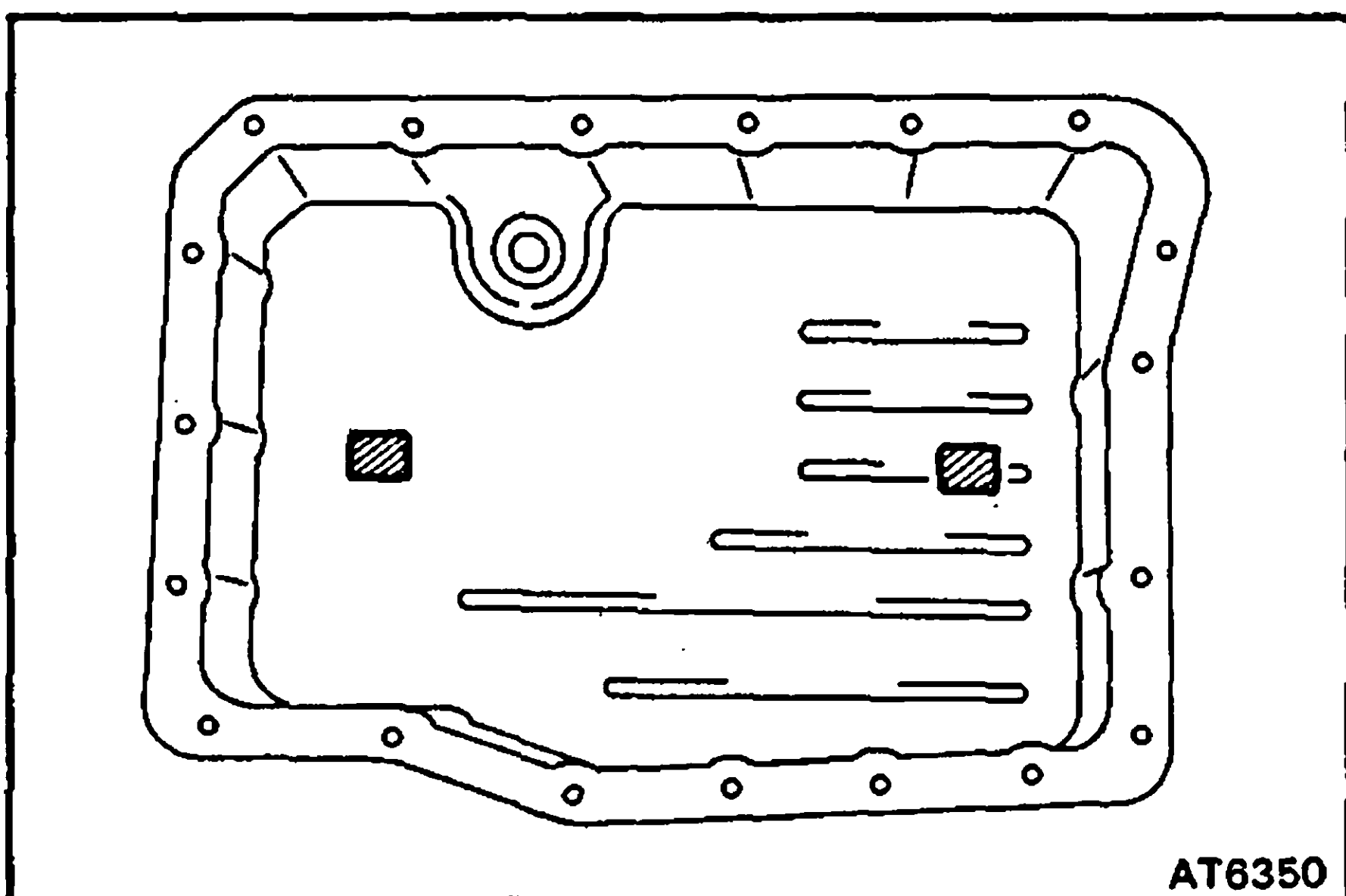
- (a) Install the extension housing with a new gasket.
- (b) Install and torque the ten bolts.

**Torque: 380 kg-cm (27 ft-lb, 37 N·m)**



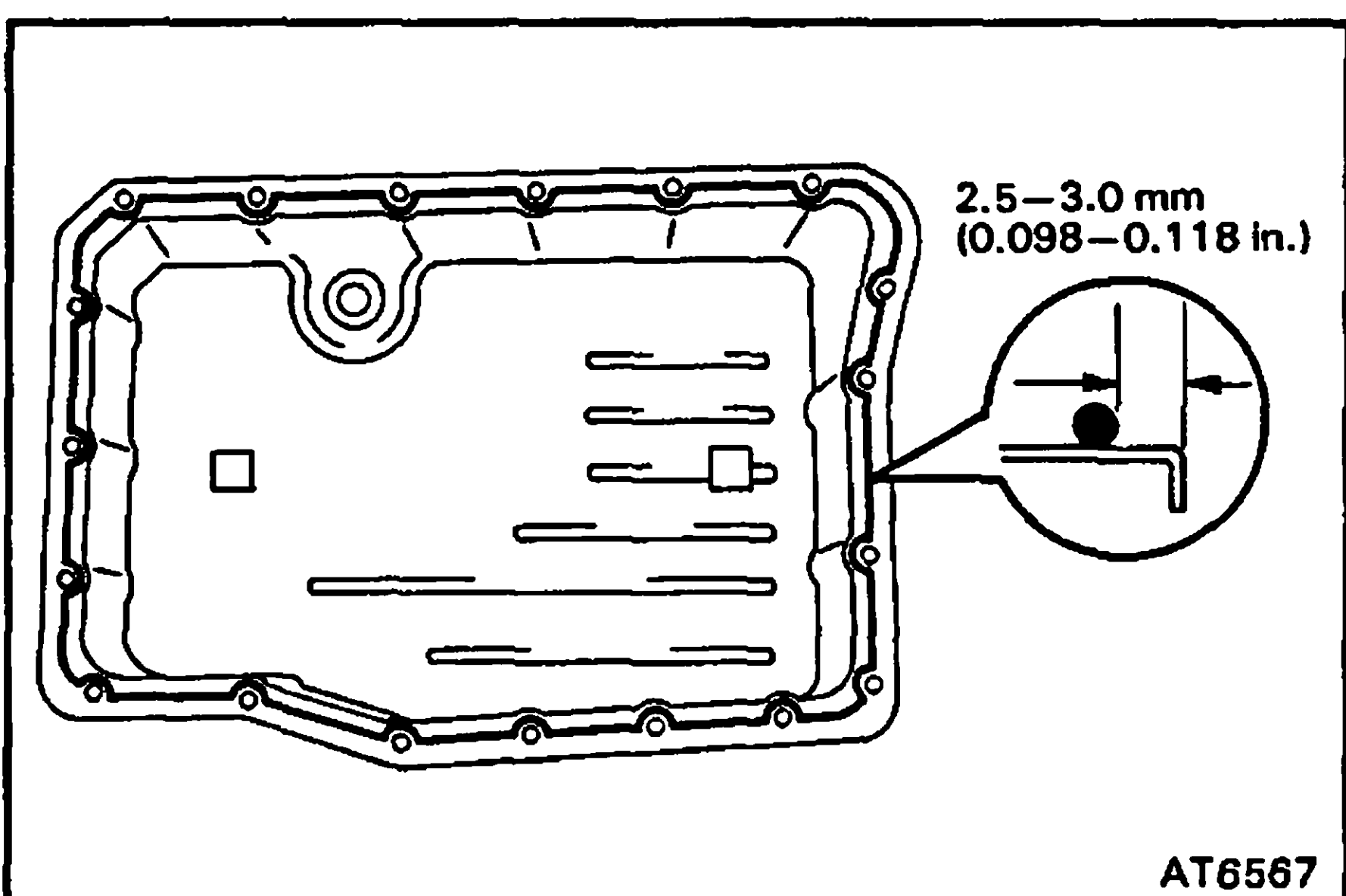
**37. (A440F, A442F)  
INSTALL MAGNETS IN PAN**

Install the four magnets in the oil pan as shown in the figure.



**(A441L)**

Install the two magnets in the oil pan as shown in the figure.



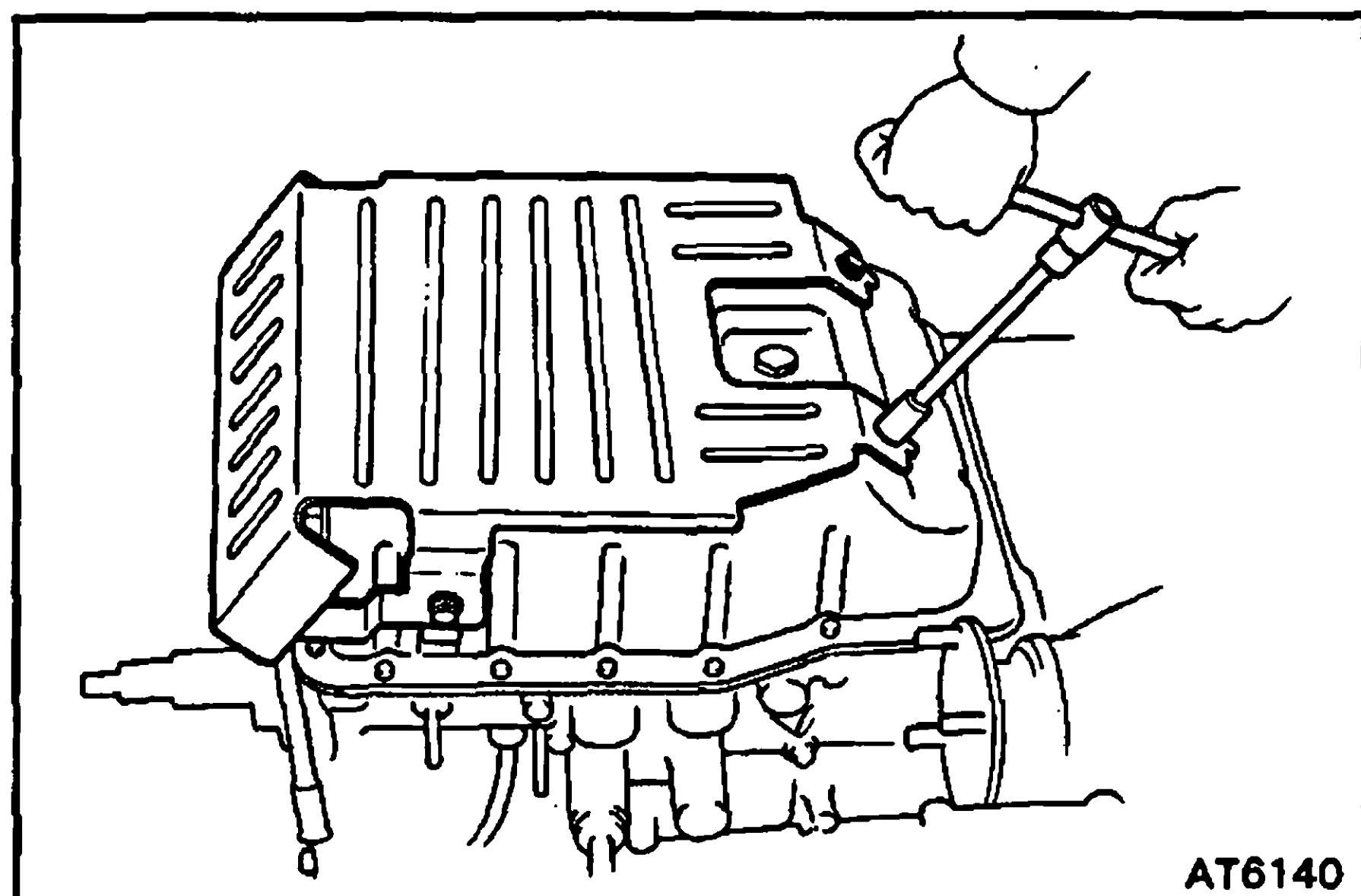
**38. INSTALL OIL PAN**

- (a) Remove any packing material and be careful not to drop oil on the contacting surface of the transmission case and oil pan.
- (b) Apply seal packing to the oil pan.

**Seal packing: Part No. 08826-00090, THREE BOND 1281 B or equivalent**

- (c) Install and torque the twenty bolts.

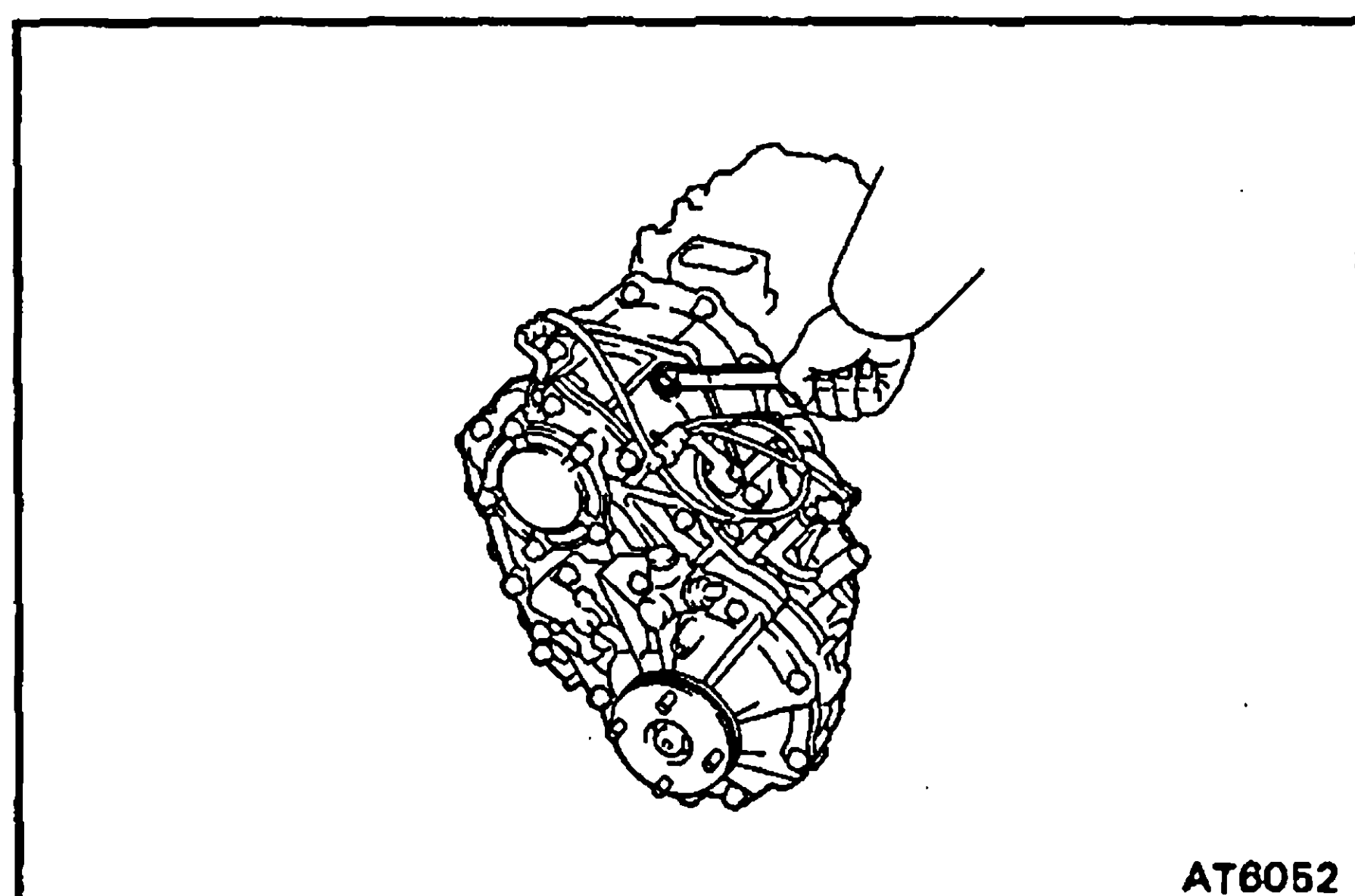
**Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)**



AT6140

**39. (A440F, A442F)****INSTALL OIL PAN PROTECTOR**

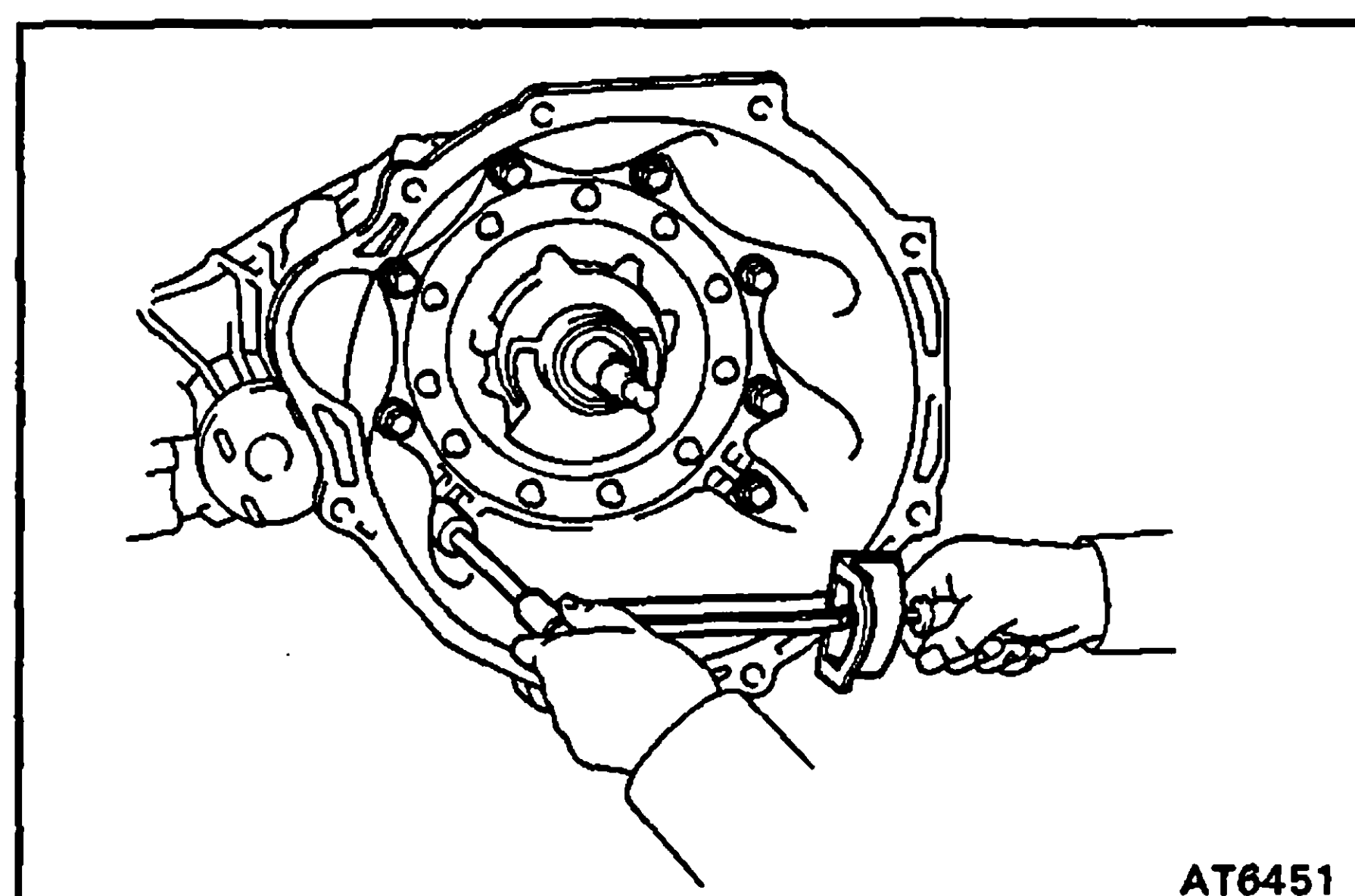
Install the protector with the four bolts.



AT6052

**40. (A440F, A442F)****INSTALL TRANSFER ASSEMBLY**

Install the transfer assembly with six bolts.



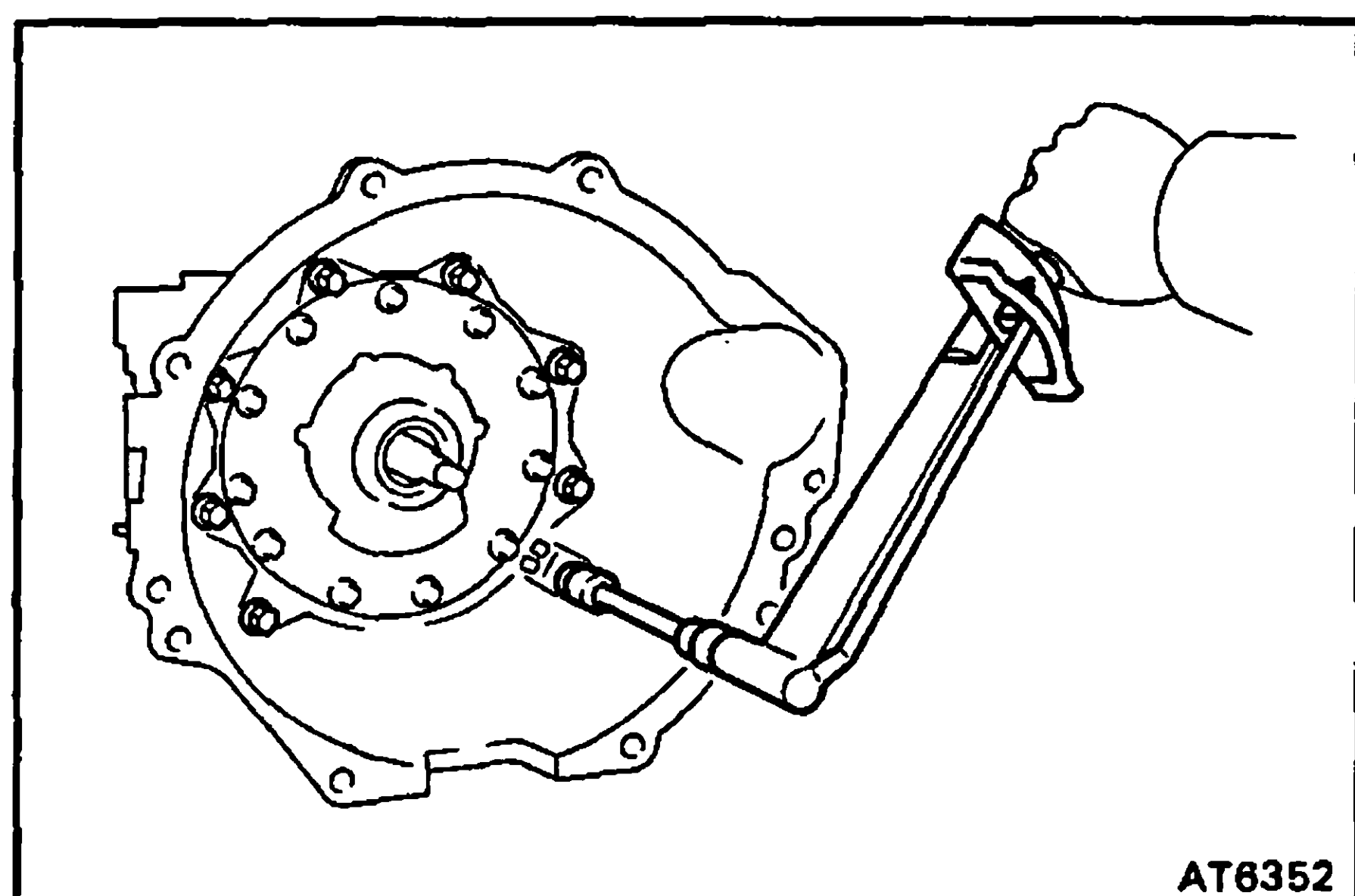
AT6451

**41. INSTALL TRANSMISSION HOUSING****(A440F)**

(a) Install the transmission housing with the eight bolts.

**Torque: 650 kg-cm (47 ft-lb, 64 N·m)**

(b) Install the throttle cable to the transmission case with the bolt.

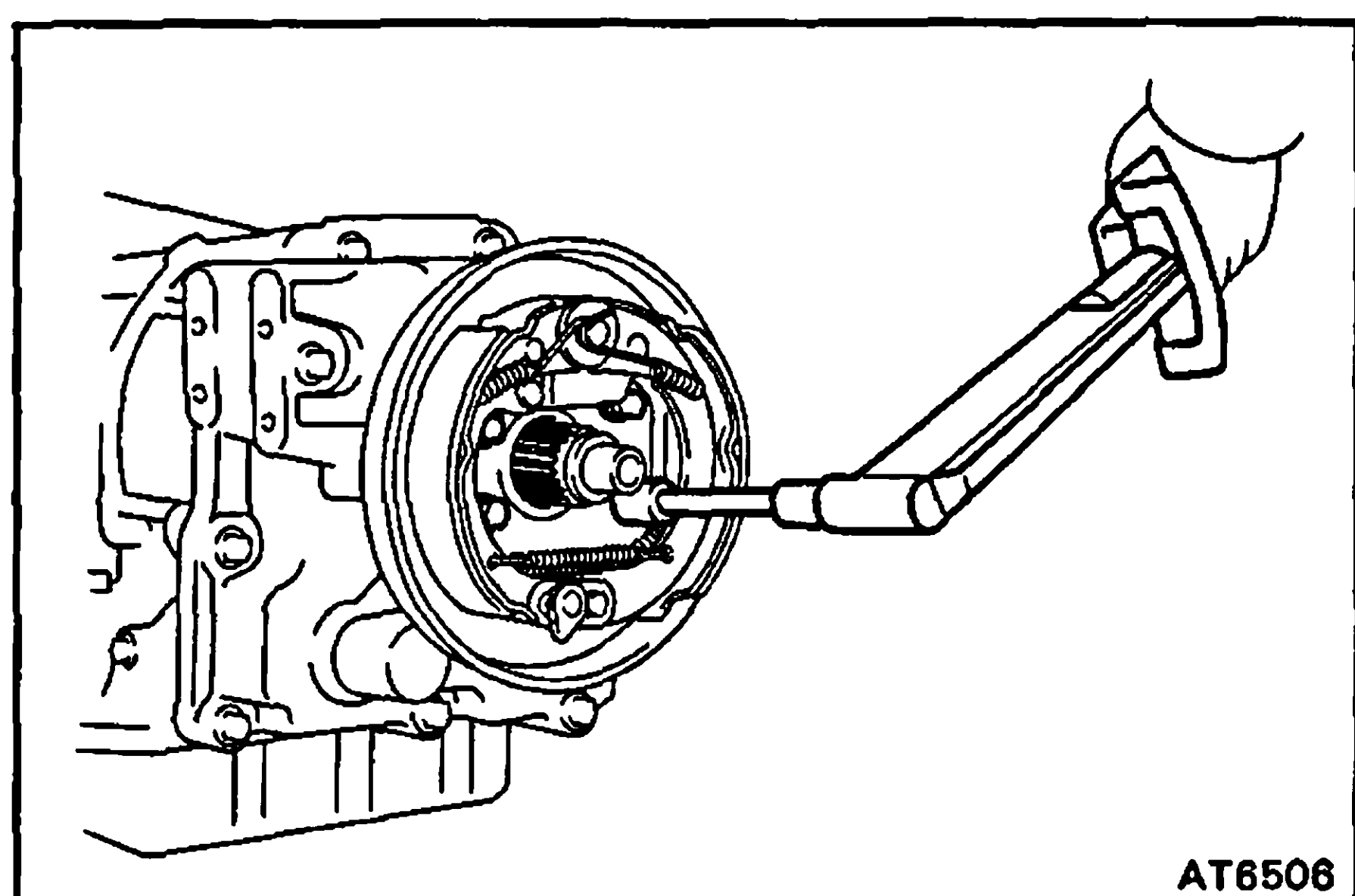


AT6352

**(A441L, A442F)**

Install the transmission housing with the eight bolts.

**Torque: 650 kg-cm (47 ft-lb, 64 N·m)**

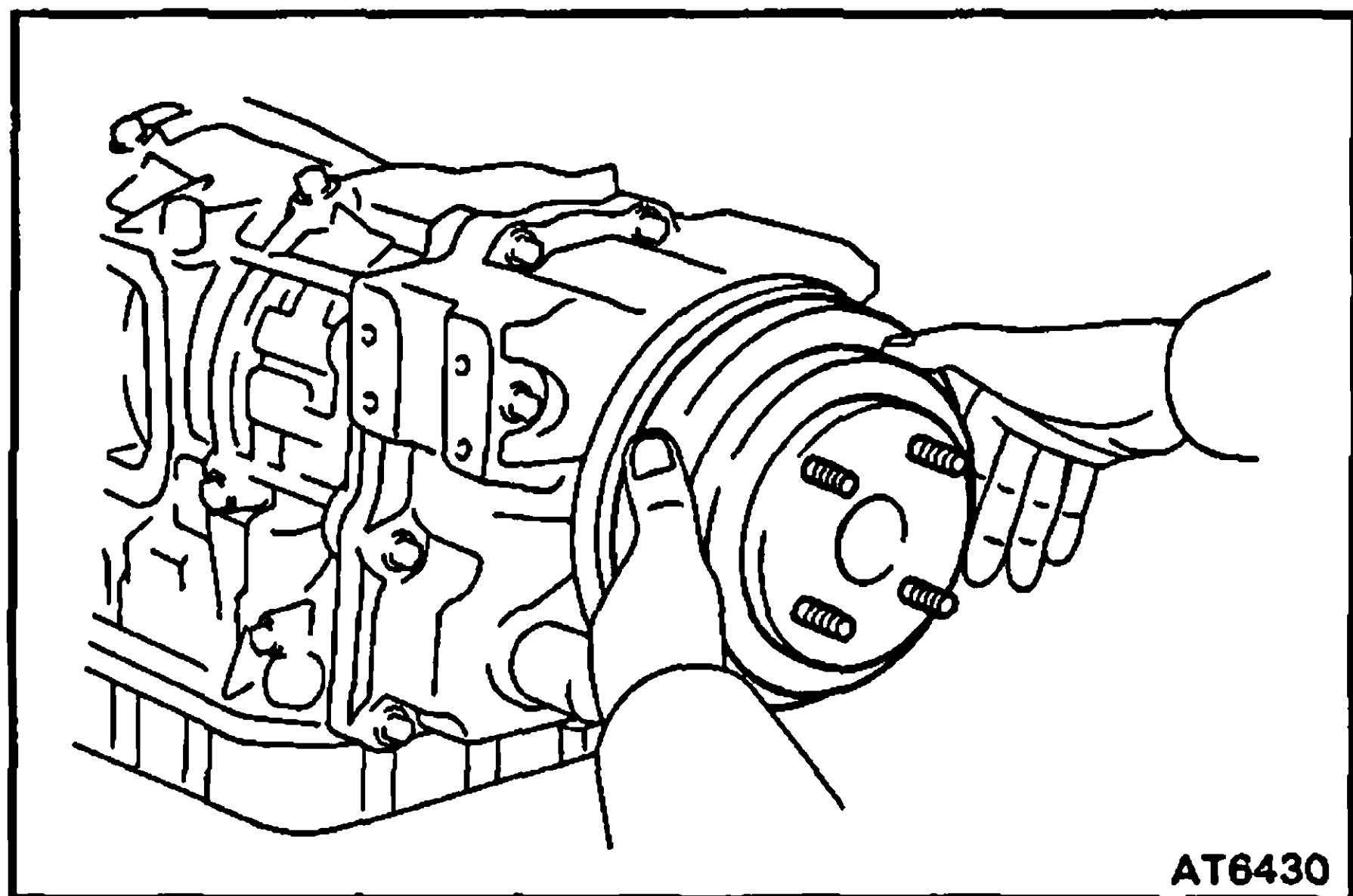


AT6506

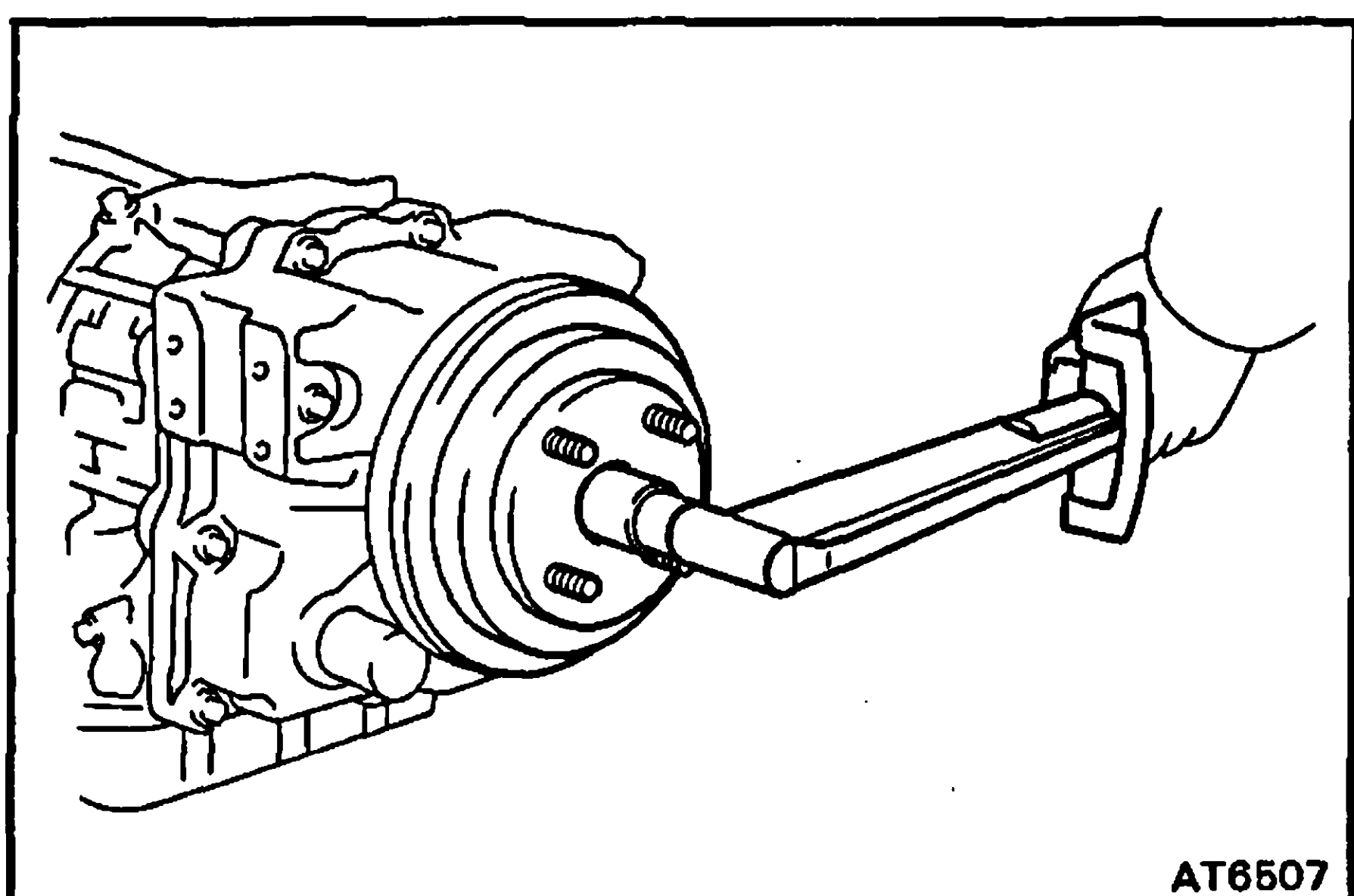
**42. (A441L)****INSTALL PARKING BRAKE ASSEMBLY**

(a) Install the parking brake assembly with four bolts.

**Torque: 475 kg-cm (34 ft-lb, 47 N·m)**



- (b) Turn the shoe adjuster counterclockwise to fully.
- (c) Install parking brake drum.

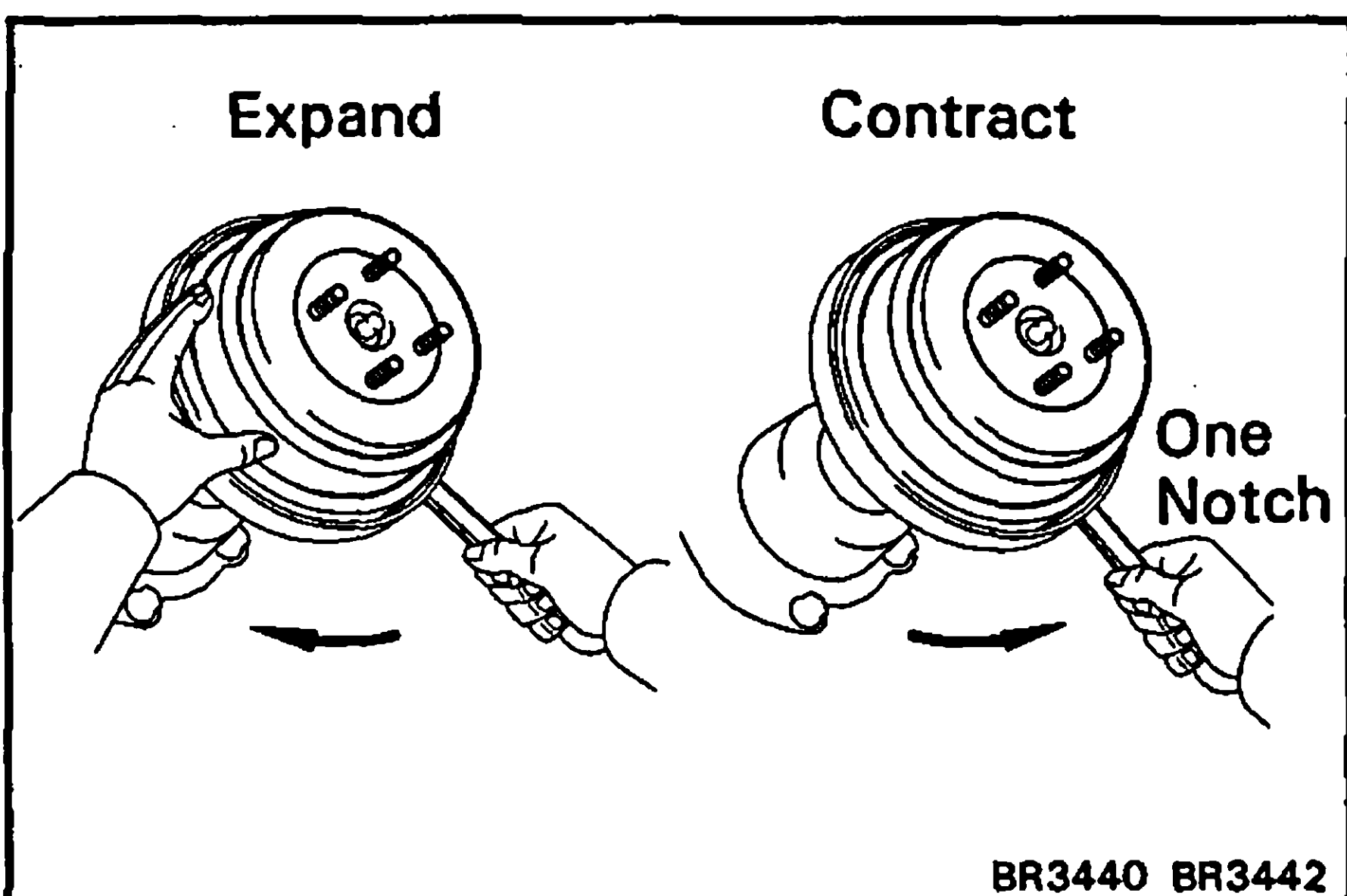


- (d) Using a manual valve lever, shift into the P position.
- (e) Install the O-ring and new lock washer.
- (f) Torque the nut.

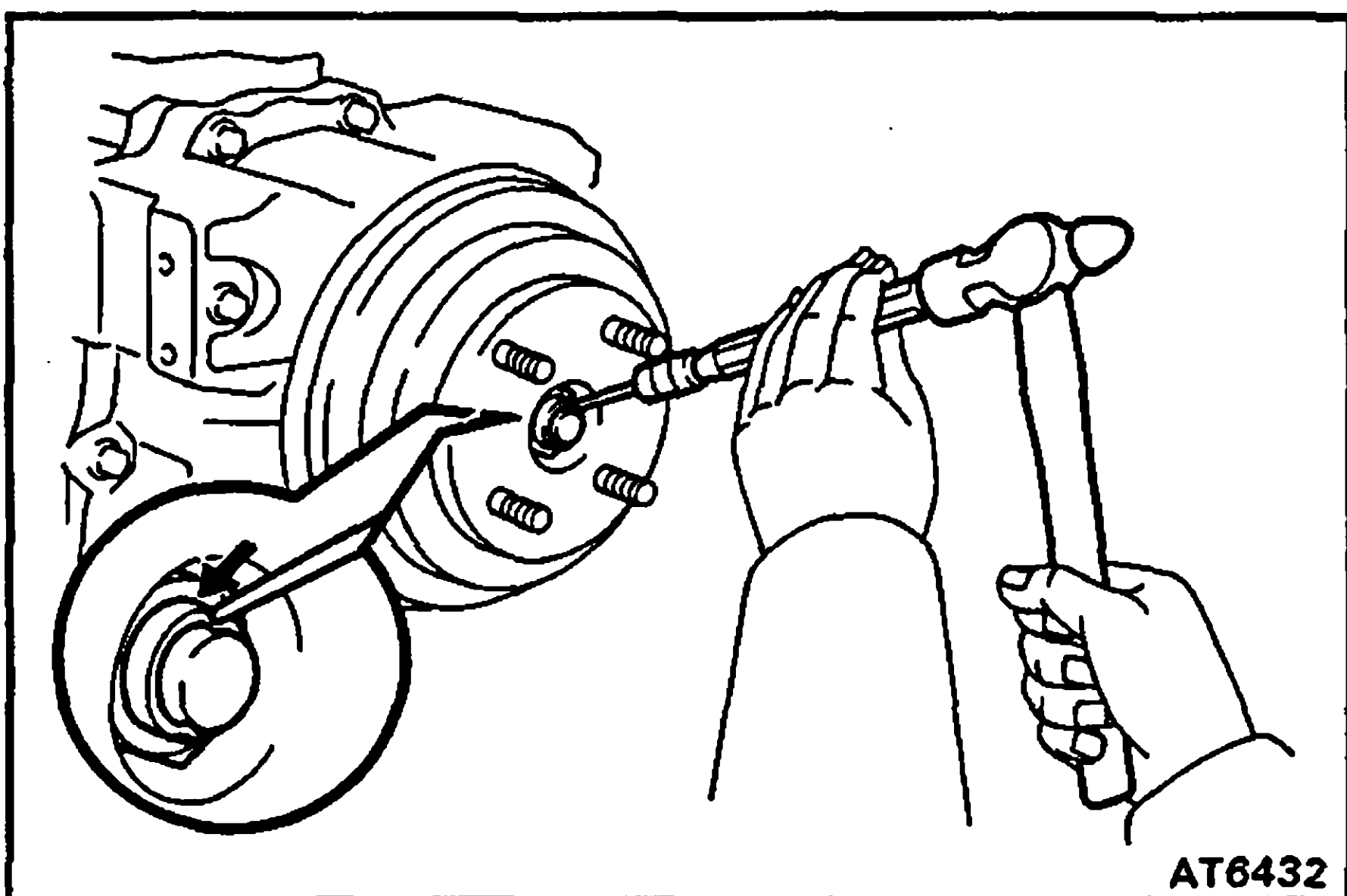
**Torque: 1,300 kg-cm (94 ft-lb, 127 N·m)**

#### **43. (A441L) ADJUST PARKING BRAKE**

- (a) Turn the shoe adjuster clockwise until the brake shoes are fully expanded.
- (b) Turn the shoe adjuster counterclockwise one notch.



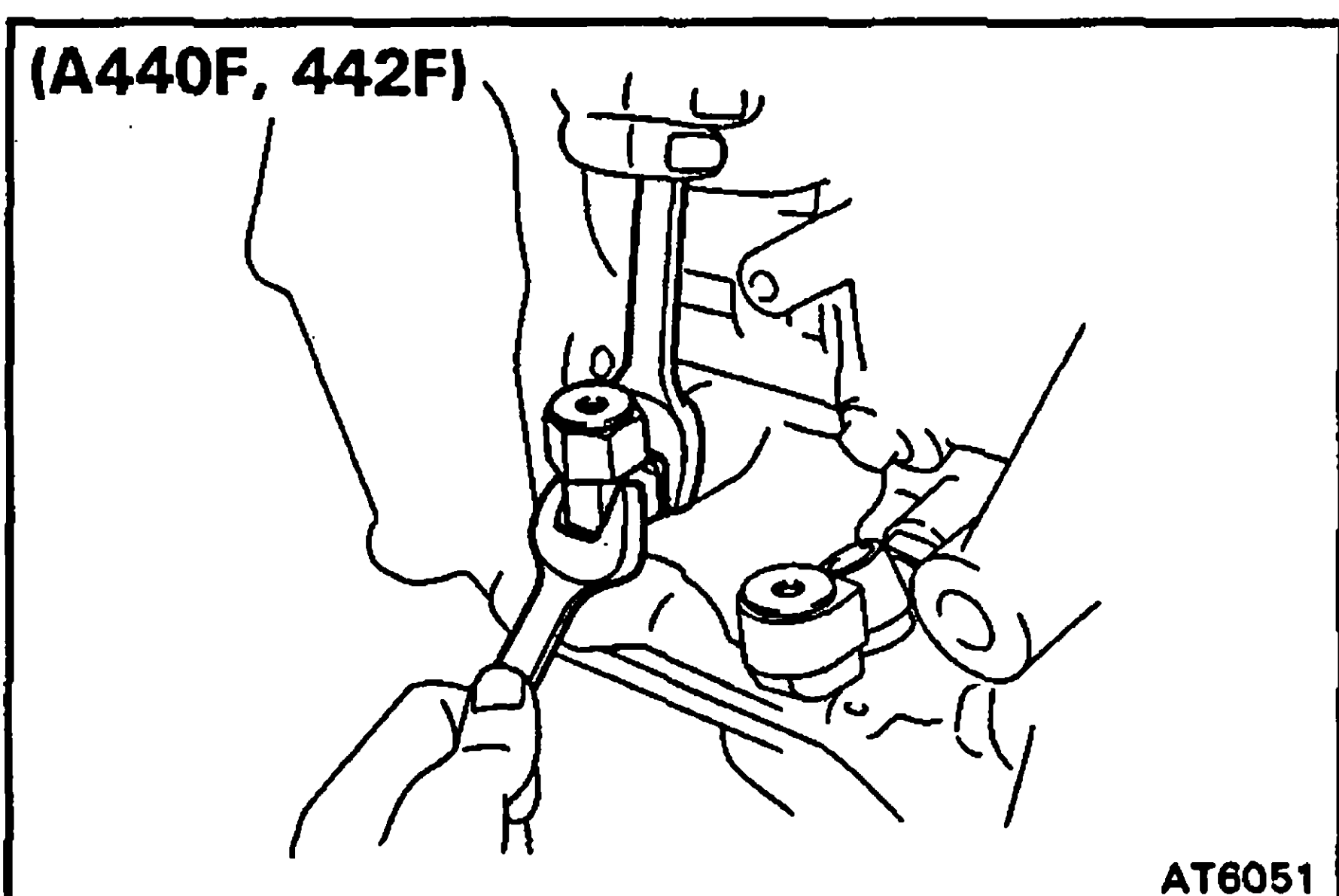
- (c) Using pin punch and hammer, stake the nut.

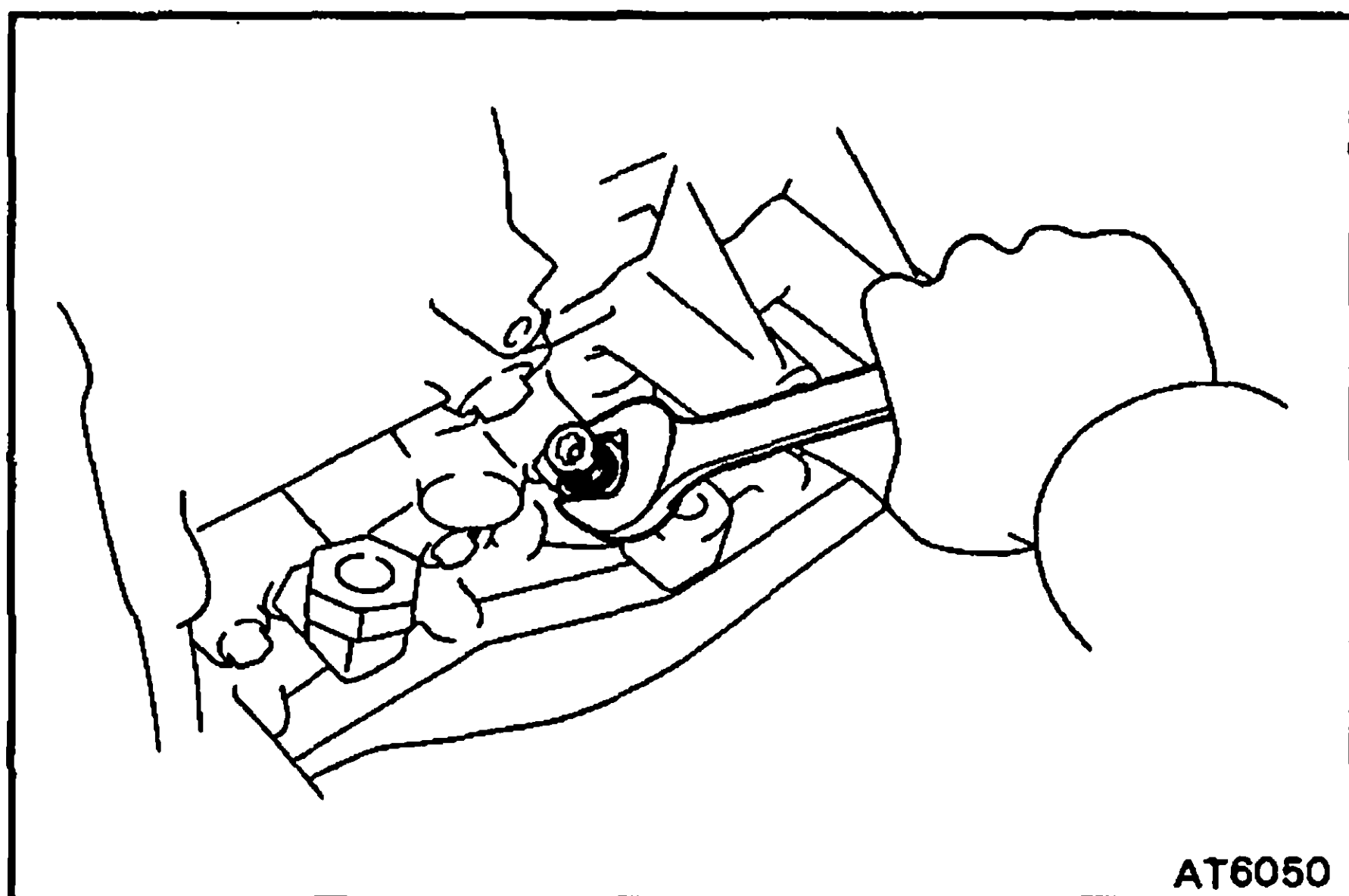
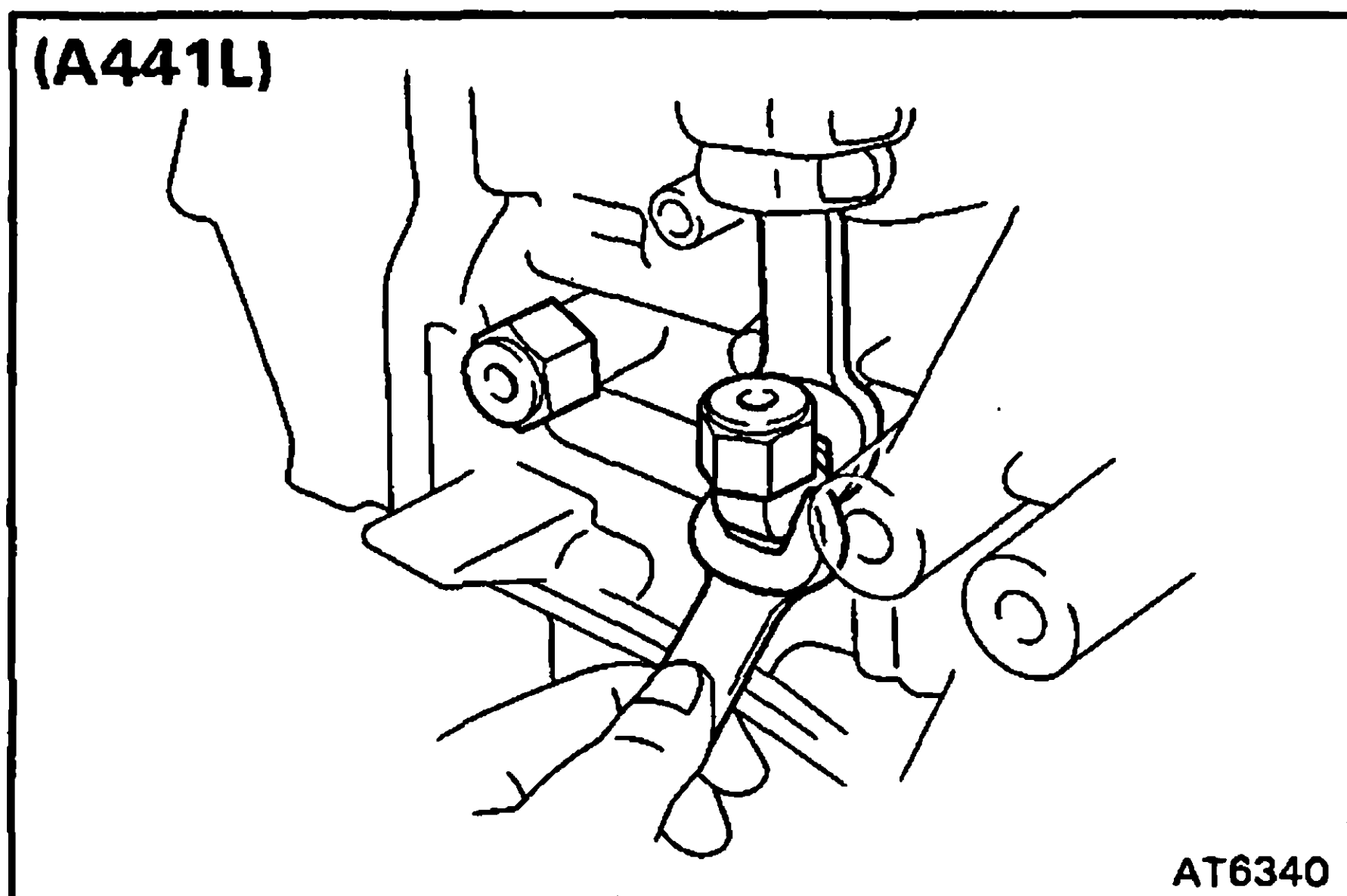


#### **44. INSTALL TWO OIL COOLER UNIONS**

- (a) Coat new O-rings with ATF, and install them to each union.
- (b) Install the two unions.

**Torque: 300 kg-cm (22 ft-lb, 29 N·m)**



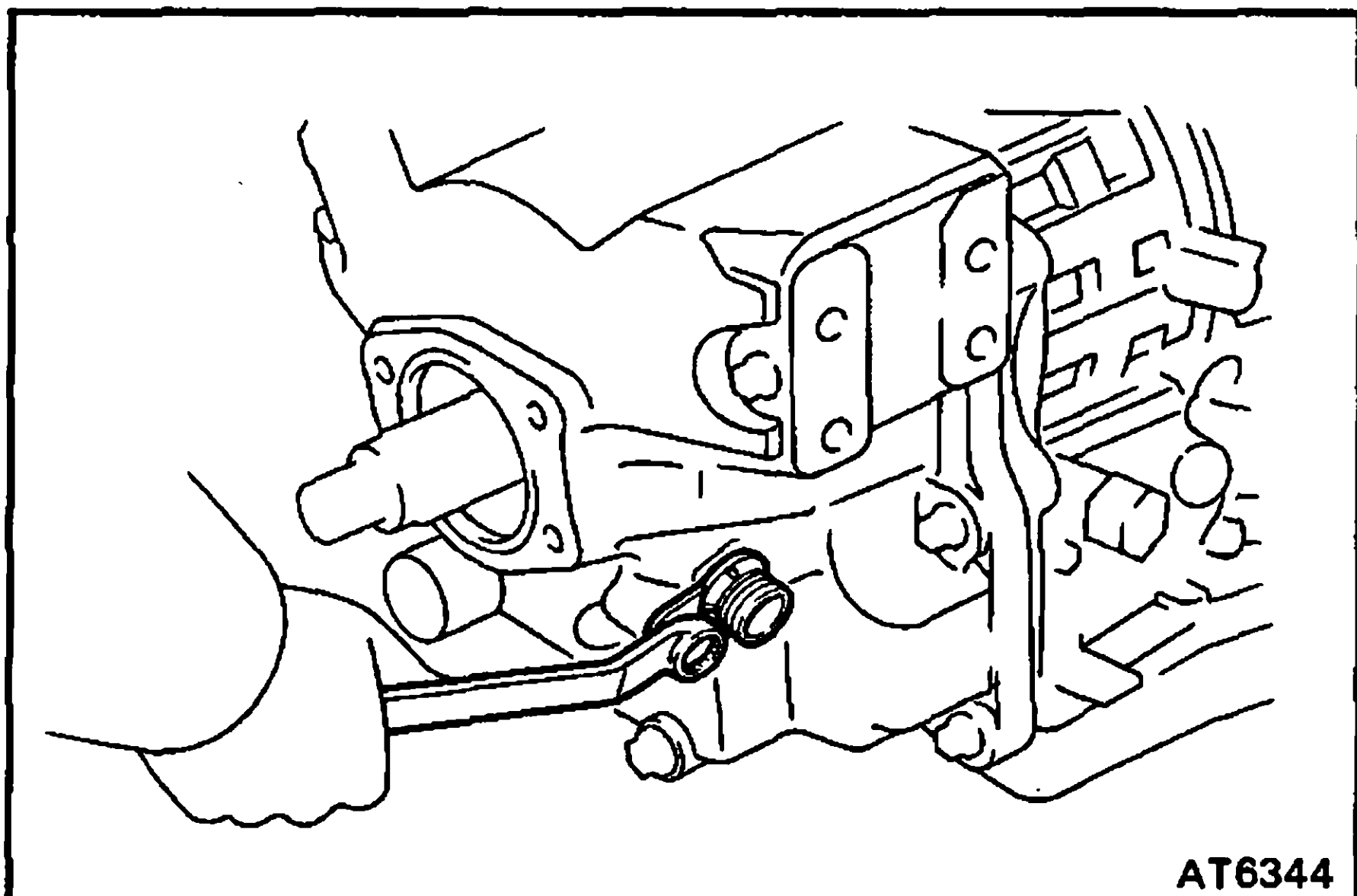


**45. (A440F, A442F)  
INSTALL A/T FLUID TEMPERATURE SENSOR**

(a) Coat a new O-ring with ATF, and install it to the sensor.

(b) Install the sensor to the front union.

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

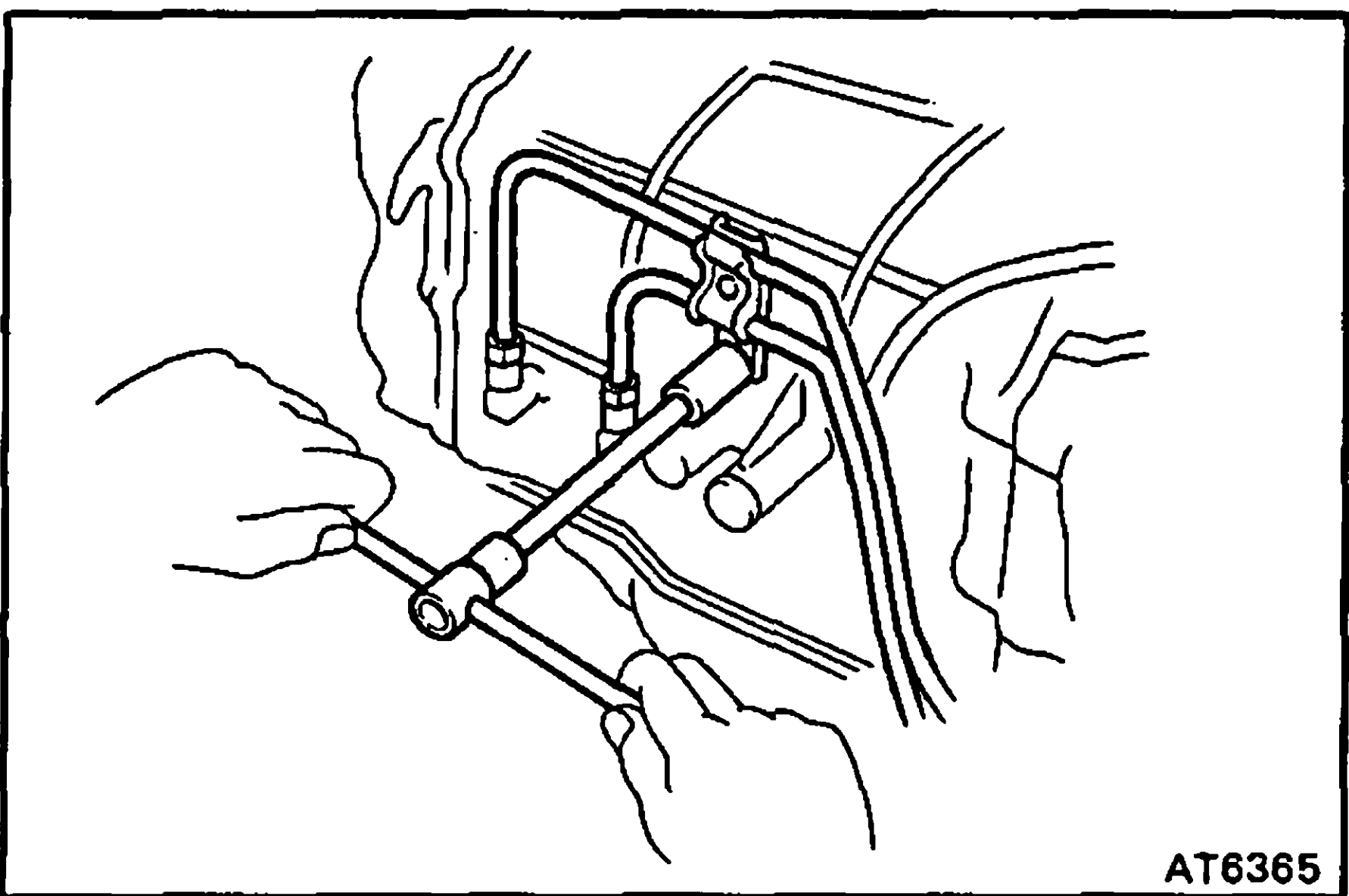


**46. (A441L)  
INSTALL SPEEDOMETER DRIVEN GEAR**

(a) Coat a new O-ring with ATF, and install it to the driven gear.

(b) Install the speedometer driven gear with the lock plate.

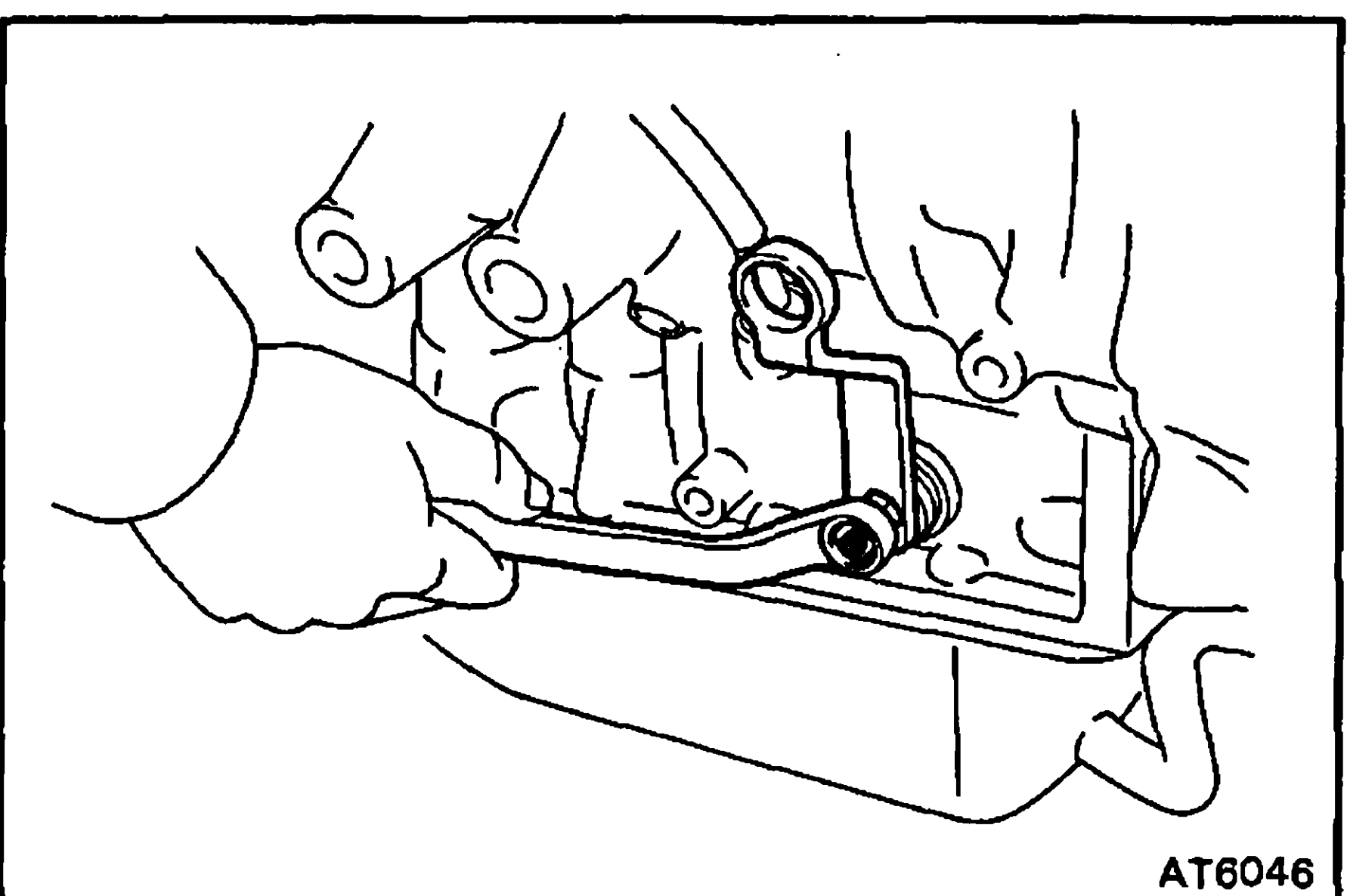
**Torque: 130 kg-cm (9 ft-lb, 13 N·m)**



**47. INSTALL OIL COOLER PIPES**

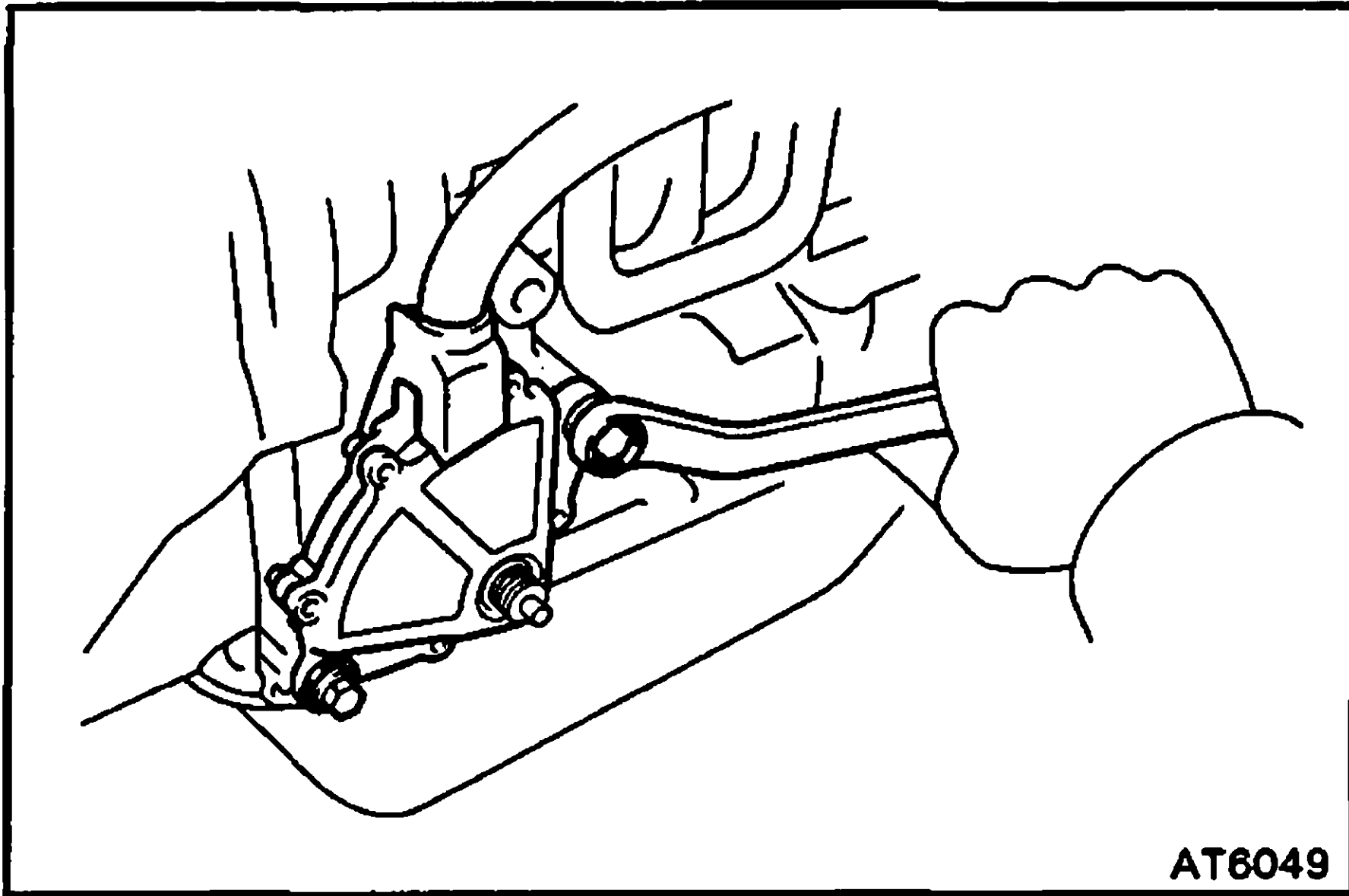
Install the oil cooler pipes with the two unions and bolts.

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



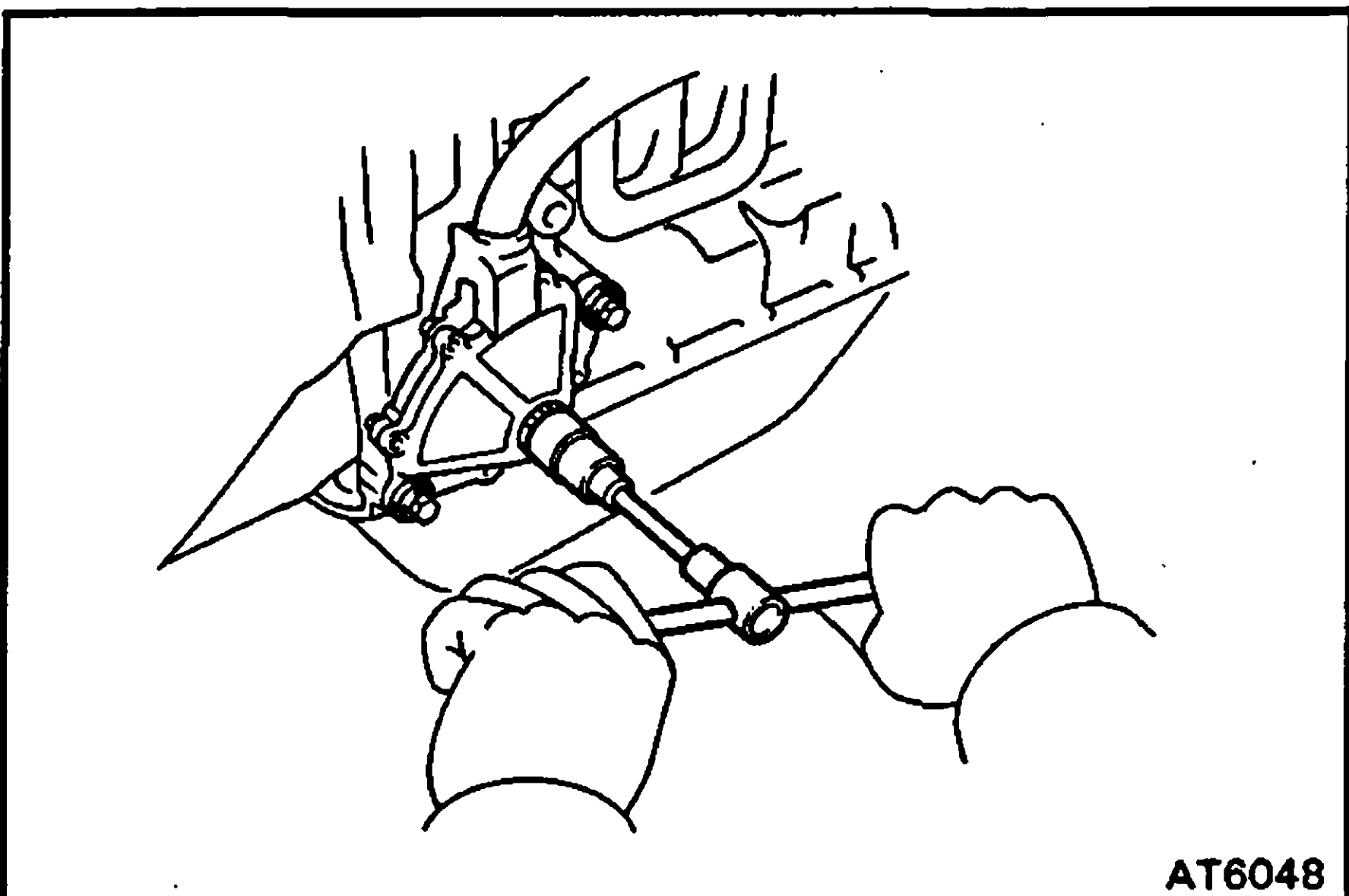
**48. (A440F, A442F)  
INSTALL CONTROL SHAFT LEVER**

**Torque: 130 kg-cm (9 ft-lb, 13 N·m)**

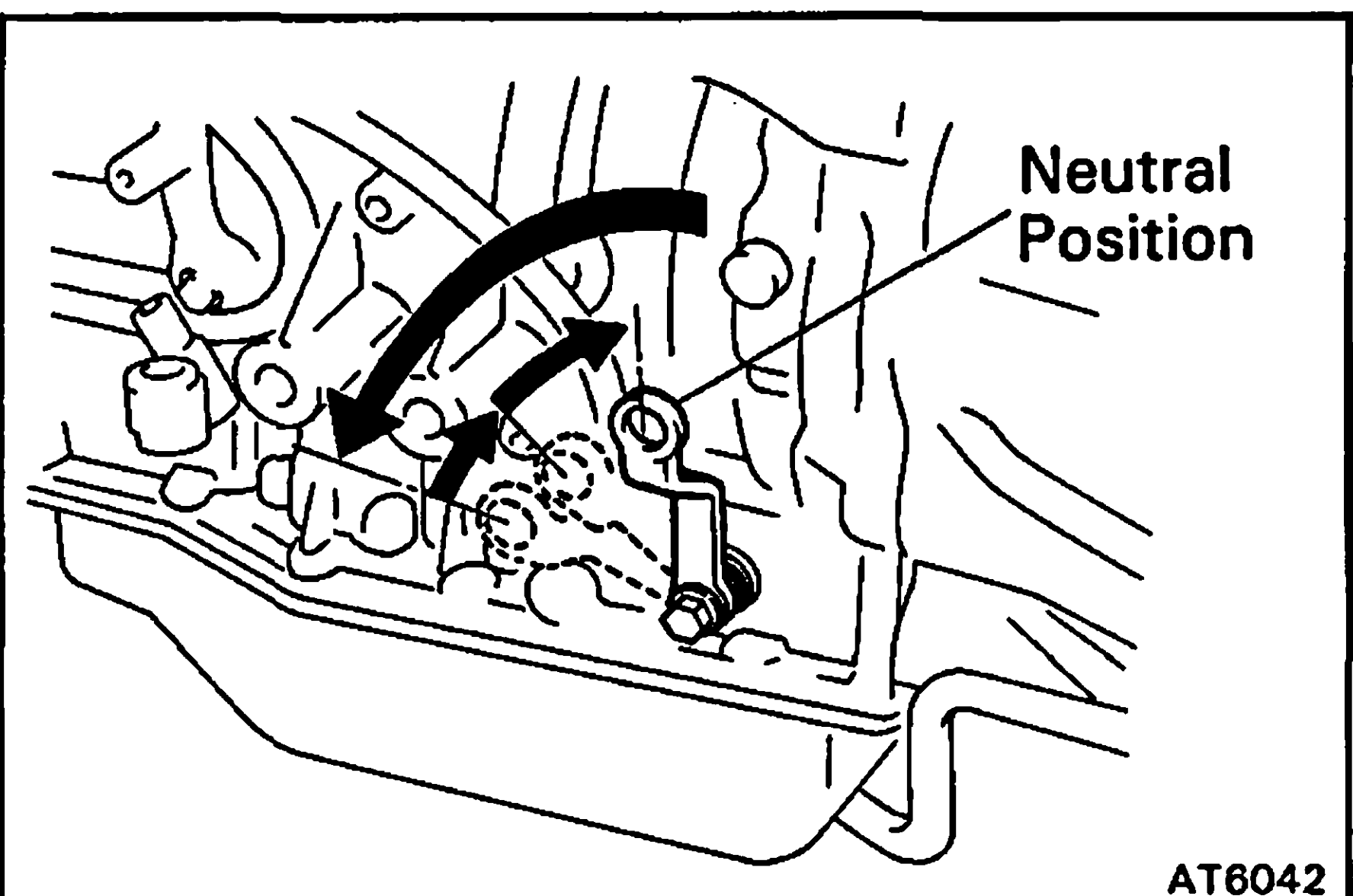


**49. (A440F, A442F)  
INSTALL NEUTRAL START SWITCH**

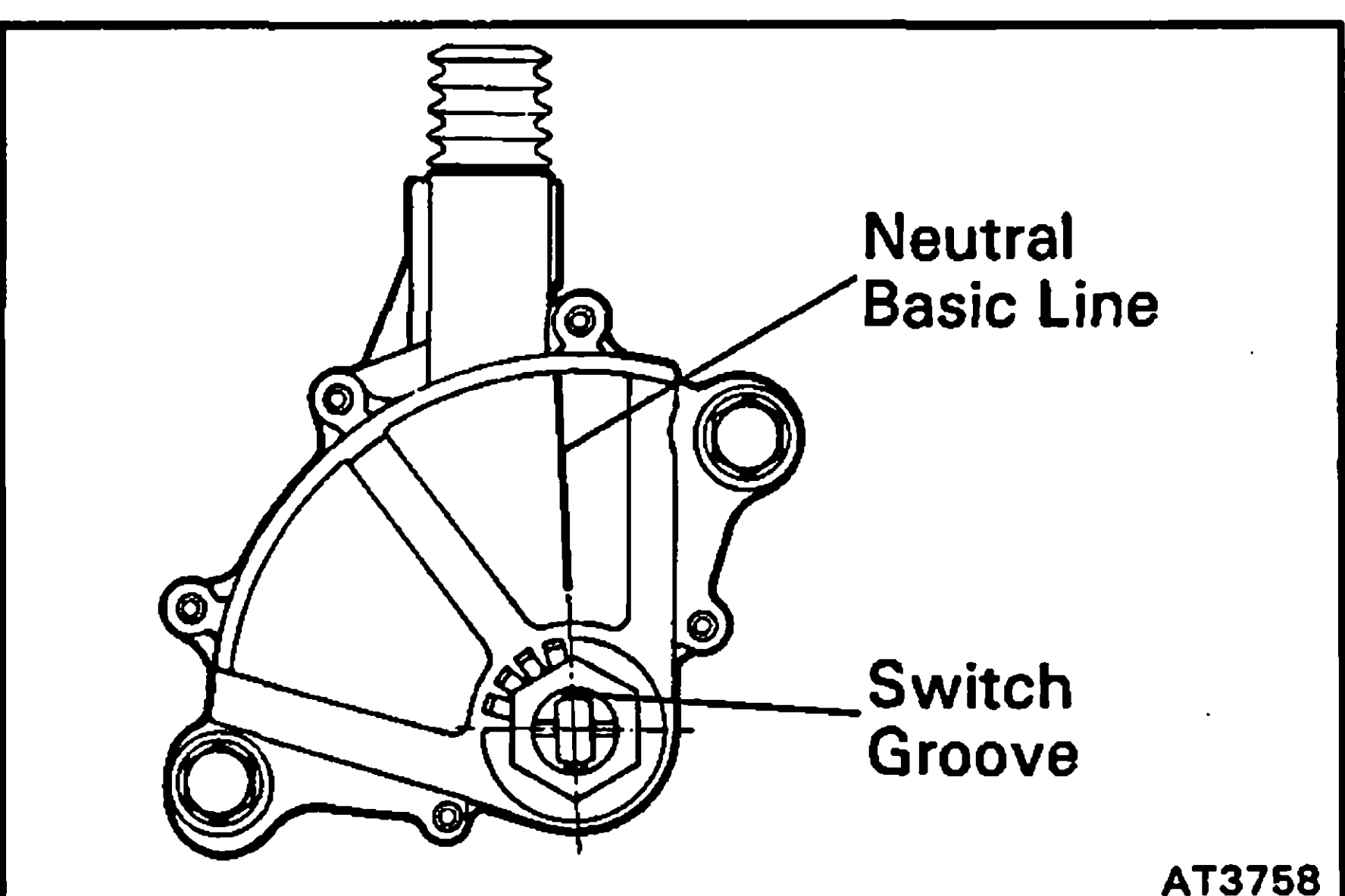
- (a) Temporarily install the neutral start switch with the two bolts.



- (b) Install the grommet, a new lock washer and the nut.  
**Torque: 70 kg-cm (61 in.-lb, 6.9 N·m)**



- (c) Fully turn the control shaft lever back and return two notches. It is now in neutral position.

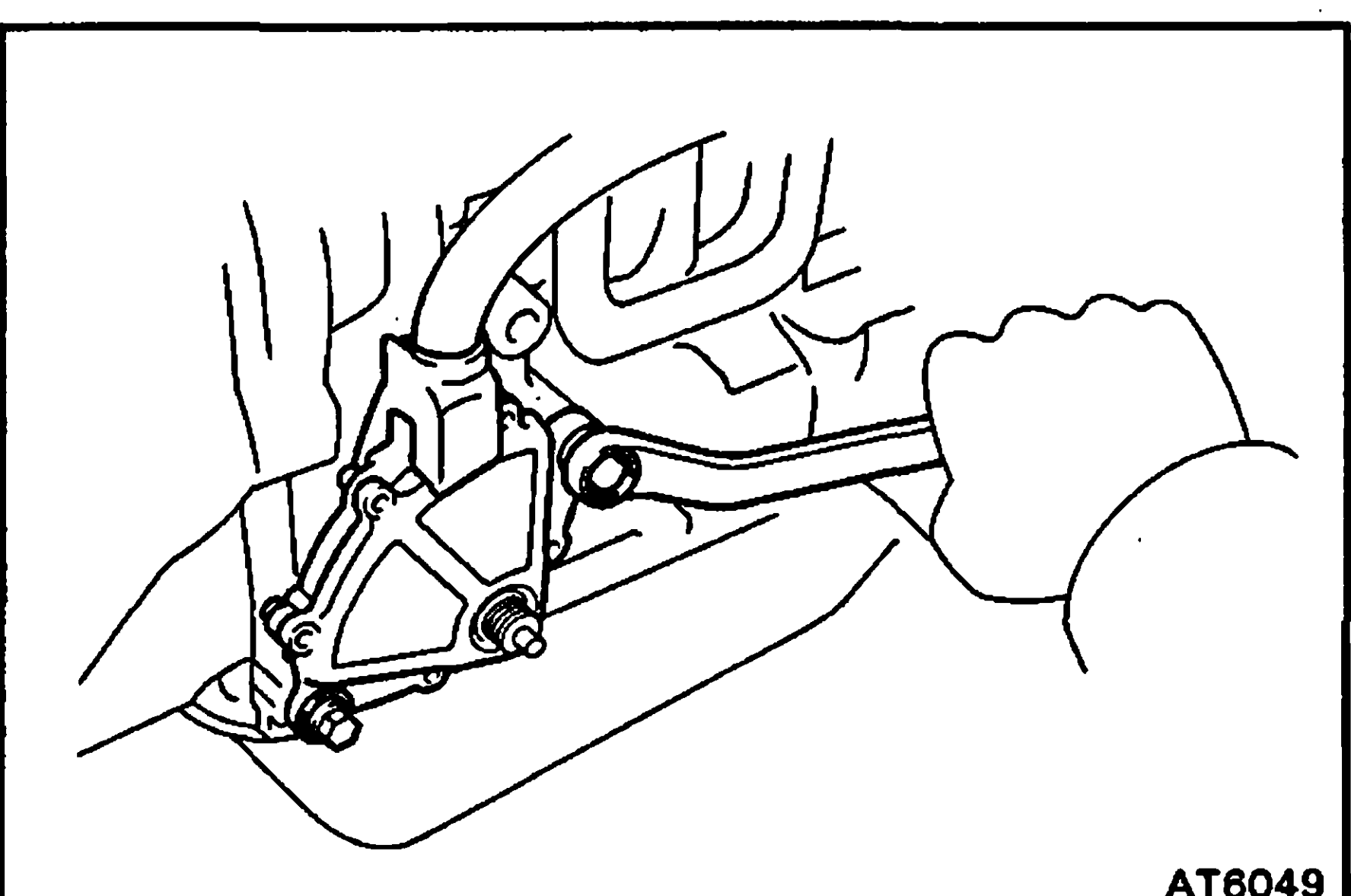


- (d) Align the neutral basic line with the switch groove, and tighten the two bolts.

**Torque: 130 kg-cm (9 ft-lb, 13 N·m)**

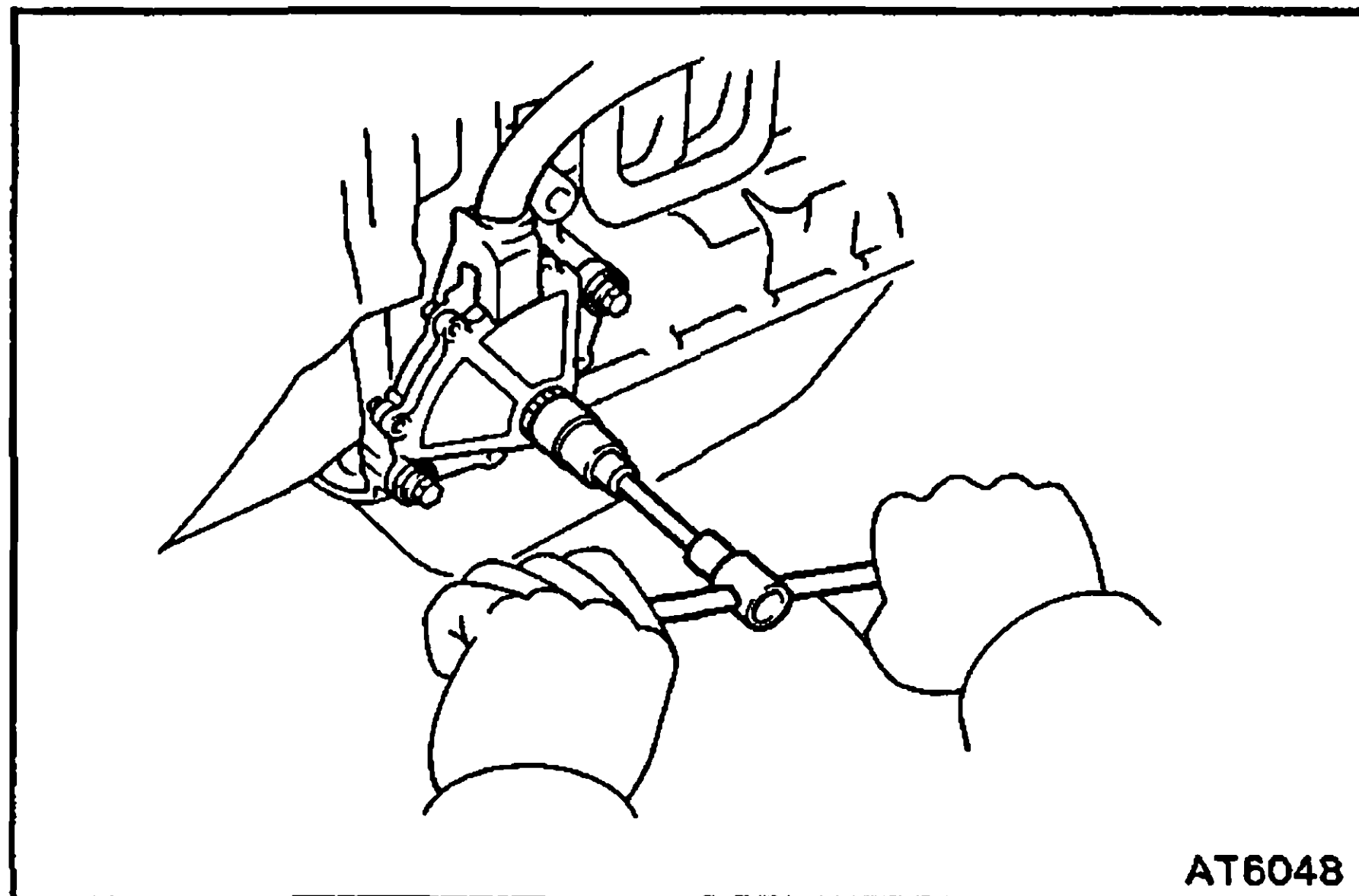
- (e) Bend the tabs of the lock washer.

**HINT:** Bend at least two of the lock washer tabs.



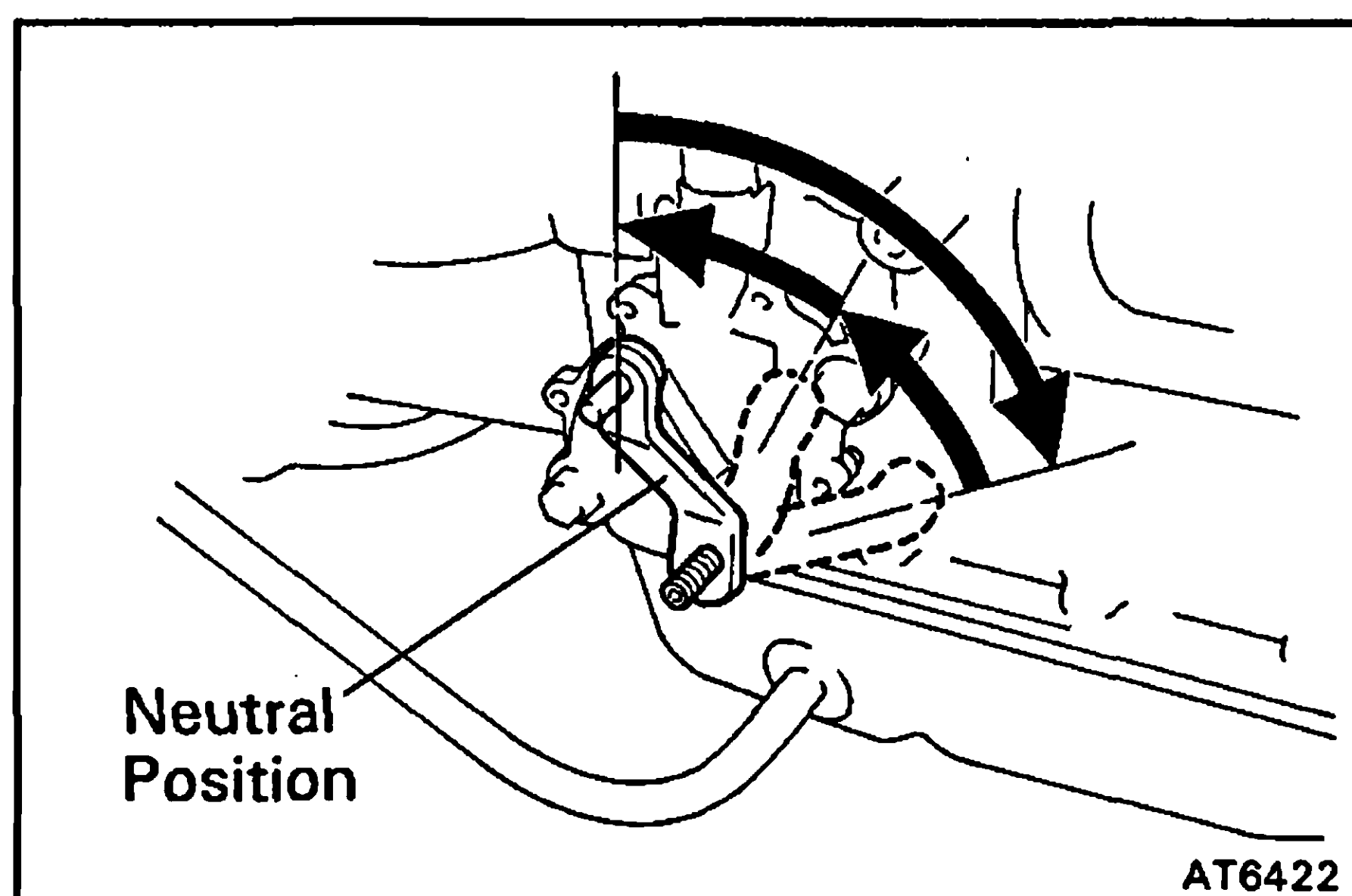
**50. (A441L)  
INSTALL NEUTRAL START SWITCH**

- (a) Temporarily install the neutral start switch with the two bolts.

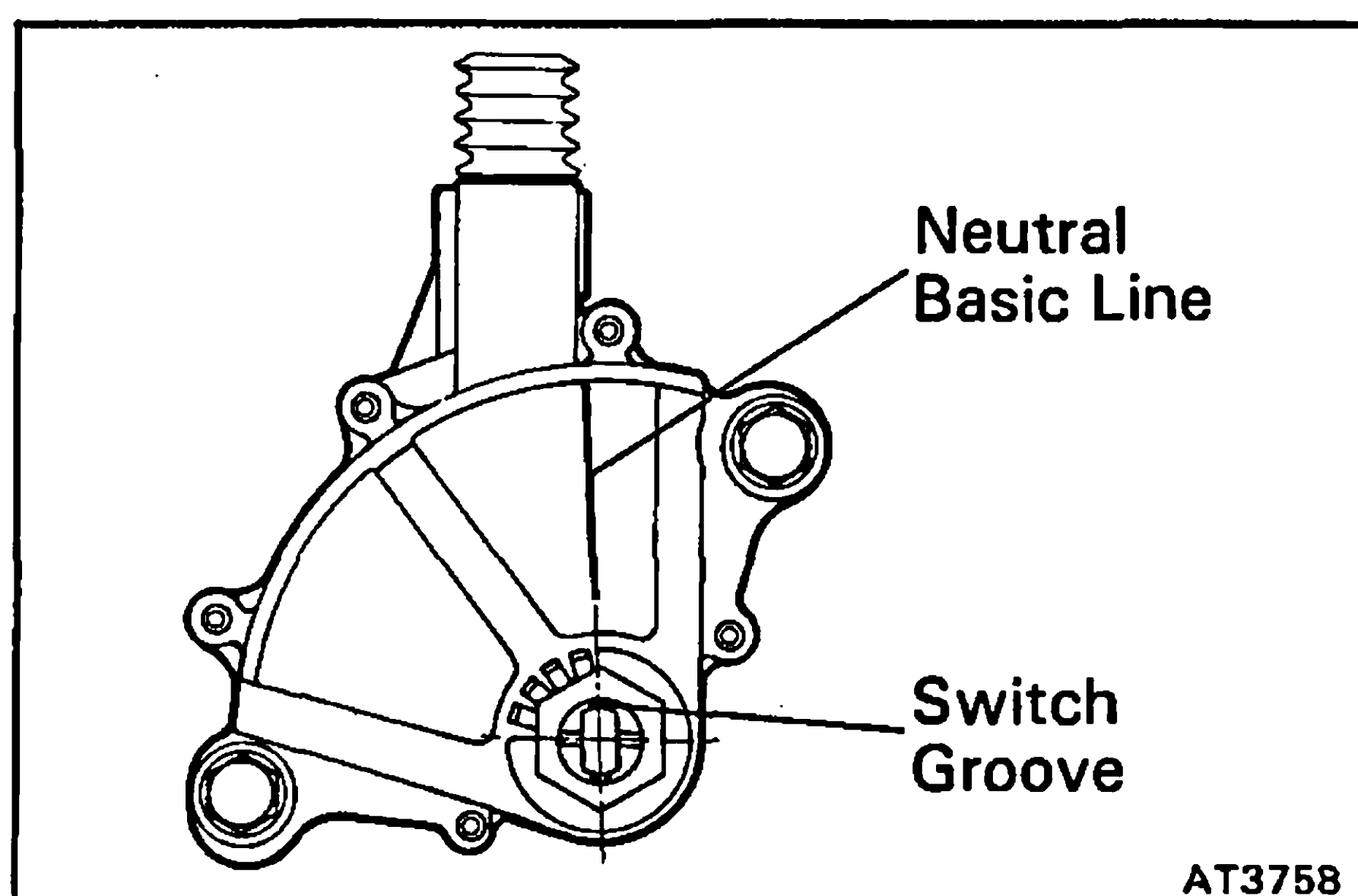


(b) Install the grommet, a new lock washer and the nut.

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



(c) Using control shaft lever, fully turn the control shaft lever back and return two notches. It is now in neutral position.

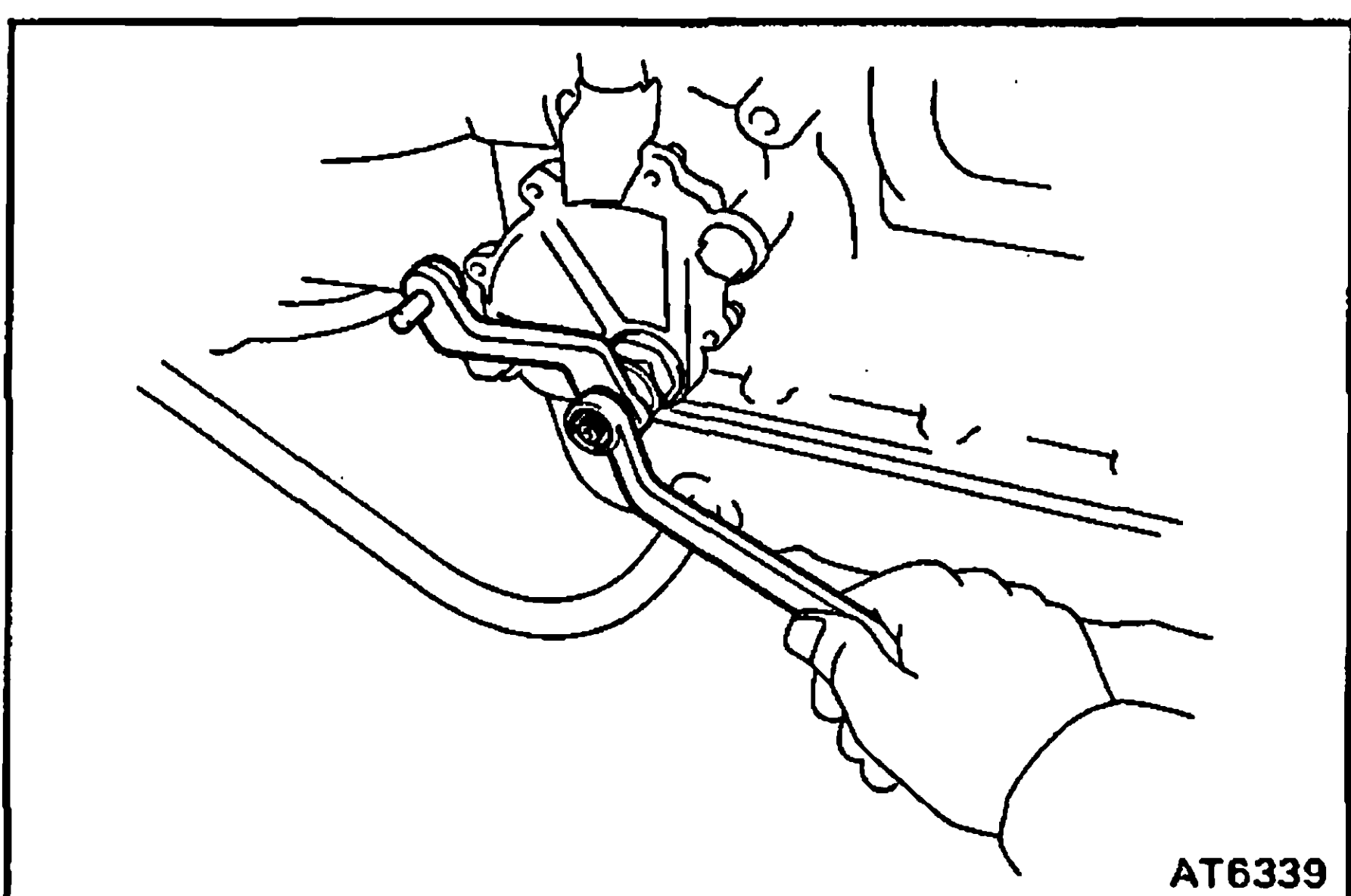


(d) Align the neutral basic line with the switch groove, and tighten the two bolts.

**Torque: 130 kg-cm (9 ft-lb, 13 N·m)**

(e) Bend the tabs of the lock washer.

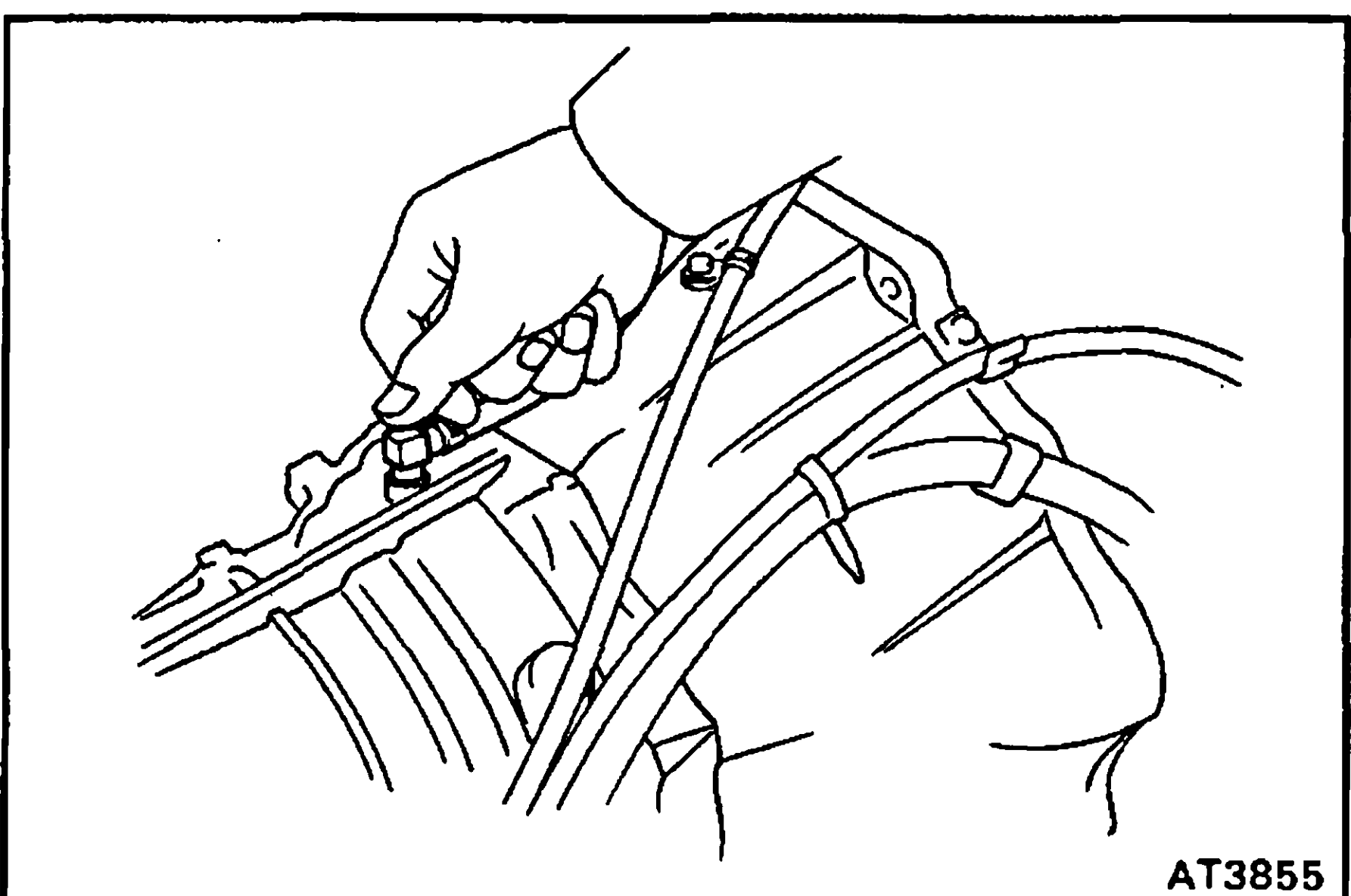
**HINT:** Bend at least two of the lock washer tabs.



## 51. (A441L)

### INSTALL CONTROL SHAFT LEVER

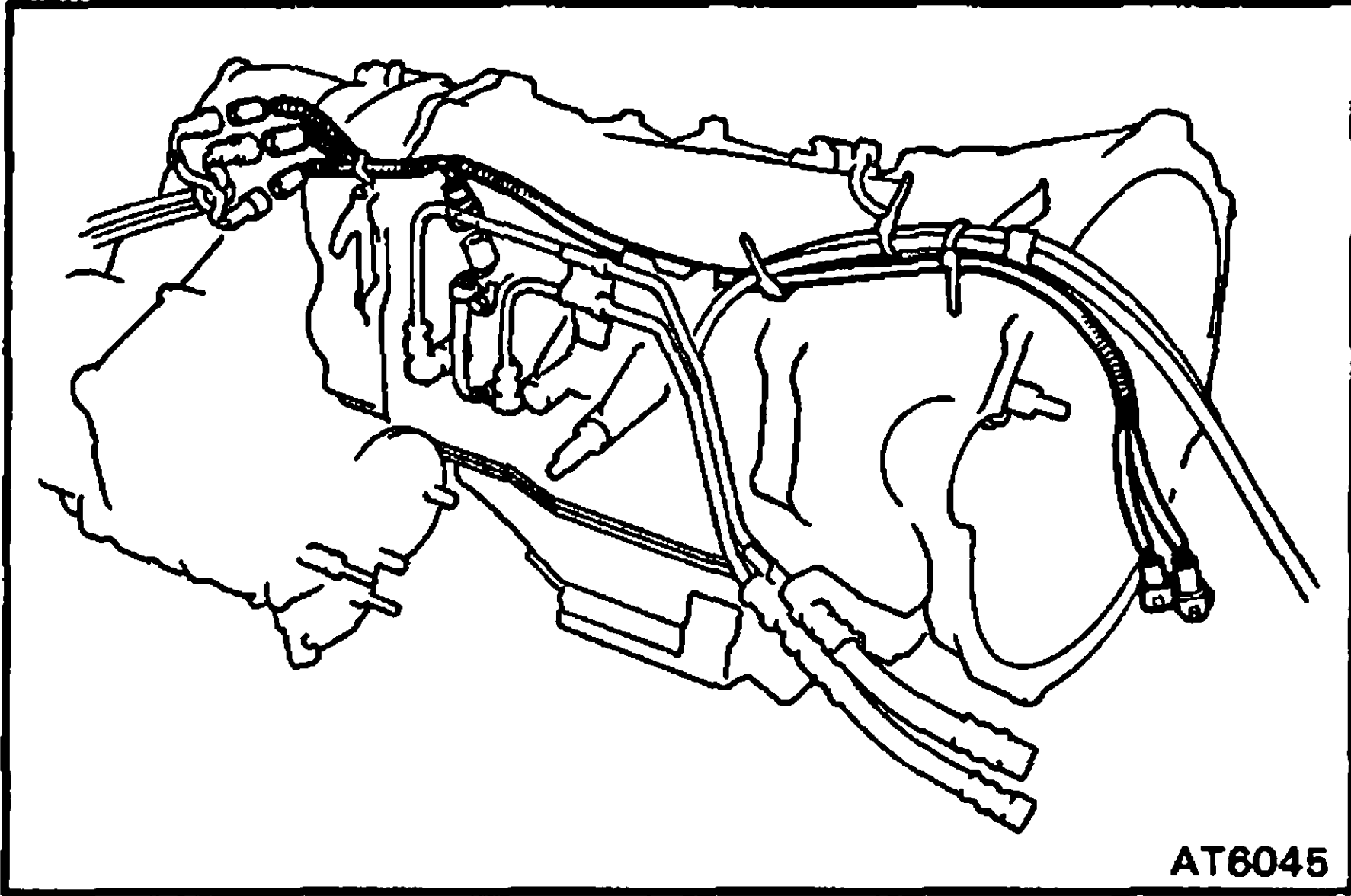
**Torque: 130 kg-cm (9 ft-lb, 13 N·m)**



## 52. INSTALL BREATHER PLUG AND HOSE

(a) Coat a new O-ring with ATF, and install it to the breather plug.

(b) Install the breather plug and hose.

**53. INSTALL TRANSMISSION WIRE**

Connect the connectors, and install the transmission wire.

# SERVICE SPECIFICATIONS

|                              |      |
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| AUTOMATIC TRANSMISSION ..... | A-2  |

**AUTOMATIC TRANSMISSION****Specifications**

|                                          |                                                       |       |                    |                     |
|------------------------------------------|-------------------------------------------------------|-------|--------------------|---------------------|
| Oil Pump                                 | Body clearance                                        | STD   | 0.07 — 0.15 mm     | 0.0028 — 0.0059 in. |
|                                          |                                                       | Limit | 0.3 mm             | 0.012 in.           |
|                                          | Tip clearance                                         | STD   | 0.14 — 0.24 mm     | 0.0055 — 0.0094 in. |
|                                          |                                                       | Limit | 0.3 mm             | 0.012 in.           |
|                                          | Side clearance                                        | STD   | 0.02 — 0.05 mm     | 0.0008 — 0.0020 in. |
|                                          |                                                       | Limit | 0.1 mm             | 0.004 in.           |
|                                          | Drive and driven gear thickness                       |       | 18.435 — 18.450 mm | 0.7258 — 0.7264 in. |
|                                          |                                                       |       | 18.451 — 18.486 mm | 0.7264 — 0.7278 in. |
|                                          | Pump body bushing inside diameter                     | STD   | 42.050 — 42.075 mm | 1.6555 — 1.6565 in. |
|                                          |                                                       | Limit | 42.13 mm           | 1.6587 in.          |
|                                          | Pump cover bushing inside diameter                    | STD   | 24.000 — 24.021 mm | 0.9449 — 0.9457 in. |
|                                          |                                                       |       |                    |                     |
|                                          |                                                       | Limit | 24.07 mm           | 0.9476 in.          |
|                                          |                                                       |       |                    |                     |
| O/D planetary gear and O/D direct clutch | O/D input shaft (O/D planetary gear) thrust clearance | STD   | 0.40 — 0.90 mm     | 0.0157 — 0.0354 in. |
|                                          |                                                       | Limit | 0.90 mm            | 0.0354 in.          |
|                                          | O/D input shaft thrust bearing race thickness         |       | 0.8 mm             | 0.031 in.           |
|                                          |                                                       |       | 1.0 mm             | 0.039 in.           |
|                                          |                                                       |       | 1.4 mm             | 0.055 in.           |
|                                          |                                                       |       | 1.10 — 1.70 mm     | 0.0433 — 0.0669 in. |
|                                          | O/D direct clutch drum bushing inside diameter        | STD   | 26.500 — 26.521 mm | 1.0433 — 1.0441 in. |
|                                          |                                                       | Limit | 26.57 mm           | 1.0461 in.          |
|                                          | O/D planetary gear bushing inside diameter            | STD   | 12.000 — 12.018 mm |                     |
|                                          |                                                       | Limit | 12.07 mm           | 0.4752 in.          |
|                                          | Planetary pinion gear thrust clearance                | STD   | 0.20 — 0.59 mm     | 0.0079 — 0.0232 in. |
|                                          |                                                       | Limit | 0.80 mm            | 0.315 in.           |
| O/D brake                                | Piston stroke                                         |       | 1.25 — 1.85 mm     | 0.0492 — 0.0728 in. |
|                                          | O/D case bushing inside diameter                      | STD   | 33.100 — 33.150 mm | 1.3031 — 1.3051 in. |
|                                          |                                                       | Limit | 33.20 mm           | 1.3071 in.          |
| Front clutch                             | Input shaft (forward clutch hub) thrust clearance     | STD   | 0.30 — 0.70 mm     | 0.0118 — 0.0276 in. |
|                                          |                                                       | Limit | 0.70 mm            | 0.0276 in.          |
|                                          | Input shaft spacer thickness                          |       | 0.9 mm             | 0.035 in.           |
|                                          |                                                       |       | 1.2 mm             | 0.047 in.           |
|                                          |                                                       |       | 1.5 mm             | 0.059 in.           |
|                                          |                                                       |       | 1.8 mm             | 0.071 in.           |
|                                          |                                                       |       | 2.1 mm             | 0.083 in.           |
|                                          |                                                       |       | 3.93 — 4.23 mm     | 0.1547 — 0.1665 in. |
|                                          | Piston stroke                                         |       | 1.8 mm             | 0.071 in.           |
|                                          | Front clutch plate thickness                          |       | 2.0 mm             | 0.079 in.           |
|                                          |                                                       |       | 2.2 mm             | 0.087 in.           |
|                                          |                                                       |       | 2.4 mm             | 0.094 in.           |
|                                          |                                                       |       |                    |                     |

**Specifications (Cont'd)**

|                                        |                                                     |         |                    |                     |
|----------------------------------------|-----------------------------------------------------|---------|--------------------|---------------------|
| Rear clutch                            | Piston stroke                                       |         | 1.70 — 1.90 mm     | 0.0669 — 0.748 in.  |
|                                        | Rear clutch flange thickness                        |         | 5.0 mm             | 0.197 in.           |
|                                        |                                                     |         | 5.2 mm             | 0.205 in.           |
|                                        |                                                     |         | 5.4 mm             | 0.213 in.           |
|                                        |                                                     |         | 5.6 mm             | 0.220 in.           |
| Second brake                           | Center support thrust clearance                     | STD     | 0.30 — 0.70 mm     | 0.0118 — 0.0276 in. |
|                                        |                                                     | Limit   | 0.90 mm            |                     |
|                                        | Center support thrust washer thickness              |         | 1.8 mm             | 0.071 in.           |
|                                        |                                                     |         | 2.1 mm             | 0.083 in.           |
|                                        |                                                     |         | 2.4 mm             | 0.094 in.           |
|                                        |                                                     |         | 2.6 mm             | 0.102 in.           |
|                                        | Piston stroke                                       |         | 1.60 — 1.80 mm     | 0.0630 — 0.0709 in. |
|                                        |                                                     | (A442F) | 1.86 — 2.06 mm     | 0.0732 — 0.0811 in. |
|                                        | Center support bushing<br>inside diameter           | STD     | 35.000 — 35.025 mm | 1.3780 — 1.3789 in. |
|                                        |                                                     | Limit   | 35.08 mm           | 1.3811 in.          |
|                                        | Front planetary sun gear bushing<br>inside diameter | STD     | 24.000 — 24.021 mm | 0.9449 — 0.9457 in. |
|                                        |                                                     | (A442F) | 25.000 — 25.021 mm | 0.9842 — 0.9851 in. |
|                                        | Second brake flange thickness                       | Limit   | 24.07 mm           | 0.9476 in.          |
|                                        |                                                     |         | 5.0 mm             | 0.197 in.           |
|                                        |                                                     |         | 5.2 mm             | 0.205 in.           |
|                                        |                                                     |         | 5.4 mm             | 0.213 in.           |
|                                        |                                                     |         | 5.6 mm             | 0.220 in.           |
| Planetary<br>gears and<br>output shaft | Output shaft bushing inside diameter                | STD     | 17.000 — 17.021 mm | 0.6693 — 0.6701 in. |
|                                        |                                                     | Limit   | 17.07 mm           | 0.6720 in.          |
|                                        | Planetary pinion gear thrust clearance              | STD     | 0.20 — 0.50 mm     | 0.0079 — 0.0197 in. |
|                                        |                                                     | Limit   | 0.75 mm            | 0.0295 in.          |
| 1st and re-<br>verse brake             | Piston stroke                                       |         | 3.30 — 3.80 mm     | 0.1299 — 0.1496 in. |
|                                        | 1st and reverse brake flange thickness              |         | 6.65 mm            | 0.2618 in.          |
|                                        |                                                     |         | 7.05 mm            | 0.2776 in.          |
|                                        |                                                     |         | 7.45 mm            | 0.2933 in.          |
| Transmission<br>case                   | Bushings inside diameter                            | STD     | 64.000 — 64.050 mm | 2.5197 — 2.5216 in. |
|                                        |                                                     | Limit   | 64.10 mm           | 2.5236 in.          |

## Specifications (Cont'd)

| Valve body spring | Spring                              | Free length<br>mm (in.) | Coil outer<br>diameter<br>mm (in.) | Total<br>No. of<br>coils | Color  |
|-------------------|-------------------------------------|-------------------------|------------------------------------|--------------------------|--------|
|                   | (Front upper valve body)            |                         |                                    |                          |        |
|                   | Check ball                          | 13.0 (0.512)            | 8.4 (0.331)                        | 8.0                      | None   |
|                   | (1HD-T)                             | 14.0 (0.551)            | 9.8 (0.386)                        | 8.0                      | Pink   |
|                   | Primary throttle valve              | 25.3 (0.996)            | 9.2 (0.362)                        | 9.5                      | White  |
|                   | Primary down-shift plug             | 26.9 (1.059)            | 9.0 (0.354)                        | 10.5                     | Blue   |
|                   | Secondary regulator valve           | 46.0 (1.811)            | 13.3 (0.524)                       | 15.0                     | None   |
|                   | (1HD-T)                             | 31.7 (1.248)            | 11.3 (0.445)                       | 12.0                     | Green  |
|                   | Secondary throttle valve            | 25.3 (0.996)            | 9.2 (0.362)                        | 9.5                      | White  |
|                   | Secondary down-shift plug           | 32.6 (1.283)            | 9.7 (0.382)                        | 13.0                     | White  |
|                   | (1HZ, 1HD-T)                        | 31.8 (1.252)            | 9.7 (0.382)                        | 13.0                     | Green  |
|                   | Throttle valve sleeve               | 10.8 (0.425)            | 18.2 (0.717)                       | 4.0                      | None   |
|                   | (Rear upper valve body)             |                         |                                    |                          |        |
|                   | 2-3 shift valve (3F-E)              | 42.2 (1.661)            | 8.9 (0.350)                        | 22.0                     | White  |
|                   | (BB 32 series, 3F)                  | 44.7 (1.760)            | 8.9 (0.350)                        | 22.0                     | None   |
|                   | (1HZ)                               | 41.6 (1.638)            | 8.9 (0.350)                        | 22.0                     | Blue   |
|                   | (1HD-T)                             | 43.3 (1.705)            | 8.9 (0.350)                        | 22.0                     | Brown  |
|                   | 2-3 shift timing valve              | 29.4 (1.157)            | 8.6 (0.339)                        | 15.5                     | None   |
|                   | (1HD-T)                             | 38.3 (1.508)            | 9.2 (0.362)                        | 18.0                     | Green  |
|                   | 3-4 shift valve (3F, 3F-E)          | 38.3 (1.508)            | 9.7 (0.382)                        | 17.0                     | None   |
|                   | (BB 32 series)                      | 39.4 (1.551)            | 9.7 (0.382)                        | 17.0                     | None   |
|                   | (1HZ)                               | 35.2 (1.386)            | 9.7 (0.382)                        | 17.0                     | Brown  |
|                   | (1HD-T)                             | 35.7 (1.406)            | 9.7 (0.382)                        | 17.0                     | Yellow |
|                   | Detent regulator (3F, 3F-E, 1HZ)    | 30.4 (1.197)            | 7.4 (0.291)                        | 16.0                     | White  |
|                   | valve (BB 32 series, 1HD-T)         | 29.3 (1.154)            | 7.4 (0.291)                        | 16.0                     | Green  |
|                   | Lock-up signal (3F, 3F-E, 1HZ)      | 47.6 (1.874)            | 13.7 (0.539)                       | 16.0                     | Blue   |
|                   | valve (BB 32 series)                | 55.3 (2.177)            | 13.7 (0.539)                       | 16.0                     | Yellow |
|                   | (1HD-T)                             | 50.2 (1.976)            | 13.7 (0.539)                       | 16.0                     | White  |
|                   | O/D clutch exhaust valve            | 33.3 (1.311)            | 8.2 (0.323)                        | 14.0                     | Yellow |
|                   | Intermediate moduator valve         | 22.5 (0.886)            | 7.7 (0.303)                        | 12.0                     | Pink   |
|                   | (Lower valve body)                  |                         |                                    |                          |        |
|                   | Check valve                         | 27.7 (1.091)            | 8.2 (0.323)                        | 13.0                     | None   |
|                   | (1HD-T)                             | 24.0 (0.945)            | 8.2 (0.323)                        | 12.0                     | White  |
|                   | Check ball                          | 13.0 (0.512)            | 8.4 (0.331)                        | 8.0                      | None   |
|                   | (1HD-T)                             | 14.0 (0.551)            | 9.8 (0.386)                        | 8.0                      | Pink   |
|                   | 1-2 shift valve                     | 26.6 (1.047)            | 6.9 (0.272)                        | 16.0                     | None   |
|                   | 3-2 kick-down orifice control valve | 32.5 (1.280)            | 8.3 (0.327)                        | 14.0                     | Blue   |
|                   | 2nd lock valve                      | 29.4 (1.158)            | 8.3 (0.327)                        | 14.0                     | Brown  |
|                   | (BB 32 series)                      | 29.4 (1.158)            | —                                  | 14.0                     | Brown  |
|                   | Lock-up relay valve                 | 32.4 (1.278)            | 9.3 (0.366)                        | 15.0                     | Pink   |
|                   | Primary regulator valve             | 58.2 (2.291)            | 20.9 (0.823)                       | 11.0                     | None   |
|                   | (1HD-T)                             | 58.2 (2.291)            | 20.9 (0.823)                       | 11.0                     | Red    |
|                   | Accumulator control valve           | 25.1 (0.988)            | 12.5 (0.492)                       | 8.5                      | Red    |
|                   | (1HD-T)                             | 27.4 (1.079)            | 10.3 (0.406)                       | 8.5                      | Green  |
|                   | Low coast modulator (3F-E)          | 30.0 (1.181)            | 7.3 (0.287)                        | 16.0                     | Yellow |
|                   | valve (3F, 1HZ)                     | 31.8 (1.252)            | 7.3 (0.287)                        | 16.0                     | Red    |
|                   | (BB 32 series)                      | 29.7 (1.169)            | 7.5 (0.295)                        | 15.0                     | Gray   |
|                   | 1-2 shift valve                     | 22.9 (0.902)            | 5.1 (0.201)                        | 15.0                     | None   |

**Specifications (Cont'd)**

| Accumulator spring | Spring                                                                                                        | Free length<br>mm (in.) | Diameter<br>mm (in.) | Color  |
|--------------------|---------------------------------------------------------------------------------------------------------------|-------------------------|----------------------|--------|
|                    | (3F, 3F-E, 1HZ)                                                                                               |                         |                      |        |
|                    | B <sub>0</sub>                                                                                                | 64.1 (2.524)            | 21.1 (0.831)         | None   |
|                    | B <sub>2</sub>                                                                                                | 65.0 (2.559)            | 25.1 (0.988)         | Yellow |
|                    | C <sub>1</sub>                                                                                                | 92.3 (3.634)            | 17.9 (0.708)         | None   |
|                    | C <sub>2</sub>                                                                                                | 80.0 (3.150)            | 21.8 (0.858)         | White  |
|                    | (1HD-T)                                                                                                       |                         |                      |        |
|                    | B <sub>0</sub>                                                                                                | 65.93 (2.5957)          | 21.1 (0.831)         | Blue   |
|                    | B <sub>2</sub>                                                                                                | 30.4 (1.197)            | 11.0 (0.433)         | Pink   |
|                    | Lower                                                                                                         | 65.0 (2.559)            | 24.9 (0.980)         | Green  |
|                    | C <sub>1</sub>                                                                                                | 92.3 (3.634)            | 17.9 (0.708)         | None   |
|                    | C <sub>2</sub>                                                                                                | 80.0 (3.150)            | 21.8 (0.858)         | White  |
|                    | (BB 32 series)                                                                                                |                         |                      |        |
|                    | B <sub>0</sub>                                                                                                | 63.09 (2.4839)          | 20.7 (0.815)         | None   |
|                    | B <sub>2</sub>                                                                                                | 30.4 (1.197)            | 11.0 (0.433)         | Yellow |
|                    | Lower                                                                                                         | 65.0 (2.559)            | 24.9 (0.980)         | Gray   |
|                    | C <sub>1</sub>                                                                                                | 92.3 (3.634)            | 17.9 (0.708)         | None   |
|                    | C <sub>2</sub>                                                                                                | 80.0 (3.150)            | 21.8 (0.858)         | White  |
| Parking lock pawl  | Bracket installation height<br>(Between the transfer adaptor and the surface and the top of the bracket tabs) | 47.5 — 47.6 mm          | 1.870 — 1.874 in.    |        |

**Torque Specifications**

| Part tightened                                      | kg-cm | ft-lb     | N·m |
|-----------------------------------------------------|-------|-----------|-----|
| Oil pump cover × Oil pump body                      | 90    | 78 in.-lb | 8.8 |
| 10 mm head bolt                                     | 210   | 15        | 21  |
| 12 mm head bolt                                     | 55    | 48 in.-lb | 5.4 |
| Lower valve body cover × Lower valve body           | 55    | 48 in.-lb | 5.4 |
| Front upper valve body × Lower valve body           | 55    | 48 in.-lb | 5.4 |
| Rear upper valve body × Lower valve body            | 55    | 48 in.-lb | 5.4 |
| Manual detent spring × Lower valve body             | 55    | 48 in.-lb | 5.4 |
| Parking lock pawl × Transfer adaptor (A440F, A442F) | 195   | 14        | 19  |
| Parking lock pawl × Extension housing (A441L)       | 195   | 14        | 19  |
| Transmission rear cover × Transmission case         | 80    | 69 in.-lb | 7.8 |
| Front accumulator cover × Transmission case         | 80    | 69 in.-lb | 7.8 |
| Governor cover × Governor valve body support        | 100   | 7         | 10  |
| Transfer adaptor × Transmission case (A440F, A442F) | 380   | 27        | 37  |
| Extension housing × Transmission case (A441L)       | 380   | 27        | 37  |
| Center support set bolt                             | 250   | 18        | 25  |
| O/D case set bolt (A441L, A440F)                    | 250   | 18        | 25  |
| Oil pump × Transmission case                        | 210   | 16        | 21  |
| Valve body × Transmission case                      | 100   | 7         | 10  |
| Oil stainer × Valve body                            | 55    | 48 in.-lb | 5.4 |
| 8 mm head bolt                                      | 100   | 7         | 10  |
| 10 mm head bolt                                     | 55    | 48 in.-lb | 5.4 |
| Lock-up relay valve body plate × Valve body         | 100   | 7         | 10  |
| 8 mm head bolt                                      | 55    | 48 in.-lb | 5.4 |
| 10 mm head bolt                                     | 100   | 7         | 10  |

**Torque Specifications (Cont'd)**

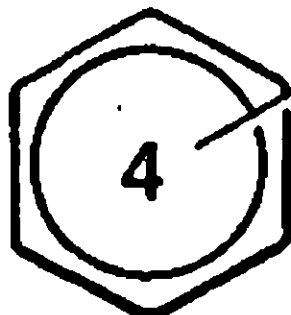
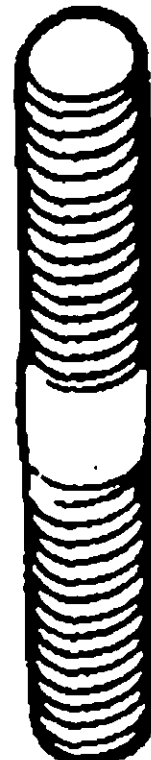
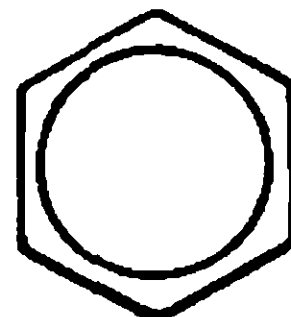
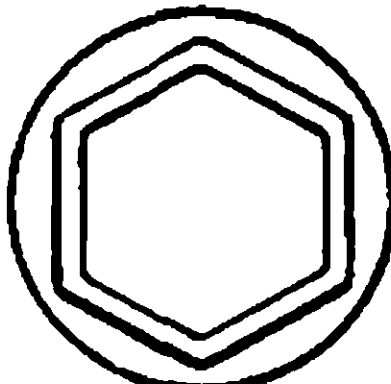
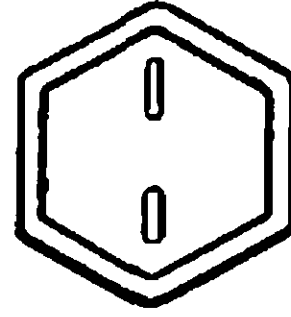
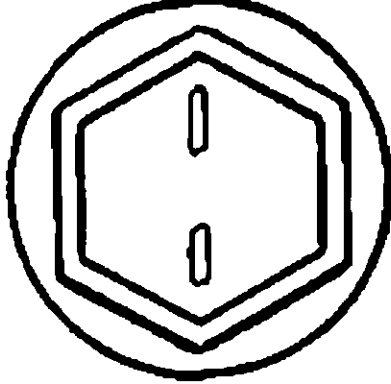
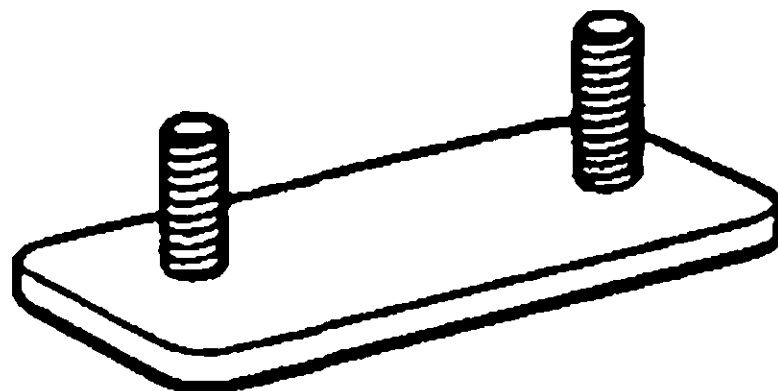
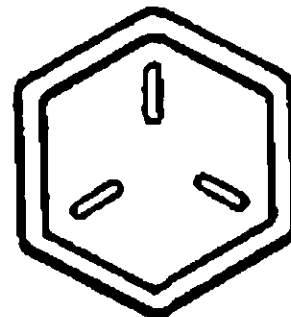
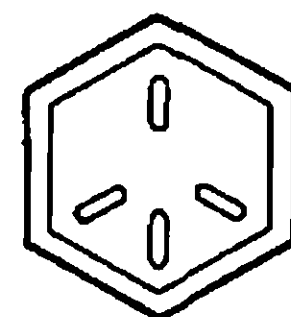
| Part tightened                                      | kg-cm | ft-lb     | N·m |
|-----------------------------------------------------|-------|-----------|-----|
| Oil pan × Transmission case                         | 70    | 61 in.-lb | 6.9 |
| Transmission housing × Transmission case            | 650   | 47        | 64  |
| A/T fluid temperature sensor × Elbow (A440F, A442F) | 350   | 25        | 34  |
| Oil cooler union × Transmission case                | 300   | 22        | 29  |
| Neutral start switch × Transmission case            | 130   | 9         | 13  |
| Neutral start switch × Manual valve shaft           | 70    | 61 in.-lb | 6.9 |
| Control shaft × Transmission case                   | 130   | 9         | 13  |

# STANDARD BOLT TORQUE SPECIFICATIONS

|                                           | Page |
|-------------------------------------------|------|
| STANDARD BOLT TORQUE SPECIFICATIONS ..... | B-2  |

STANDARD BOLT TORQUE SPECIFICATIONS

HOW TO DETERMINE BOLT STRENGTH

|                                            | Mark                                                                                                                                                                                                                                                             | Class       |                                                                                                                                  | Mark | Class |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------|------|-------|
| Hexagon head bolt                          | <div><div>4—<br/>5—<br/>6—<br/>7—<br/>8—<br/>9—<br/>10—<br/>11—</div><div><div>Bolt head No.</div></div></div> <div>4T<br/>5T<br/>6T<br/>7T<br/>8T<br/>9T<br/>10T<br/>11T</div> | Stud bolt   | <div><div>No mark</div></div> <div>4T</div>  |      |       |
|                                            | <div><div>No mark</div></div> <div>4T</div>                                                                                                                                    |             |                                                                                                                                  |      |       |
| Hexagon flange bolt w/ washer hexagon bolt | <div><div>No mark</div></div> <div>4T</div>                                                                                                                                   | Welded bolt | <div><div>Grooved</div></div> <div>6T</div> |      |       |
| Hexagon head bolt                          | <div><div>Two protruding lines</div></div> <div>5T</div>                                                                                                                      |             |                                                                                                                                  |      |       |
| Hexagon flange bolt w/ washer hexagon bolt | <div><div>Two protruding lines</div></div> <div>6T</div>                                                                                                                      | Welded bolt | <div><div>4T</div></div>                    |      |       |
| Hexagon head bolt                          | <div><div>Three protruding lines</div></div> <div>7T</div>                                                                                                                    |             |                                                                                                                                  |      |       |
| Hexagon head bolt                          | <div><div>Four protruding lines</div></div> <div>8T</div>                                                                                                                     |             |                                                                                                                                  |      |       |

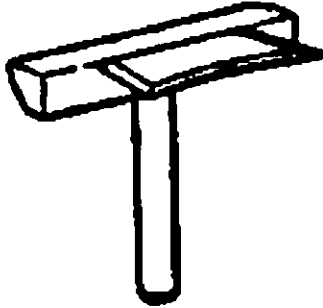
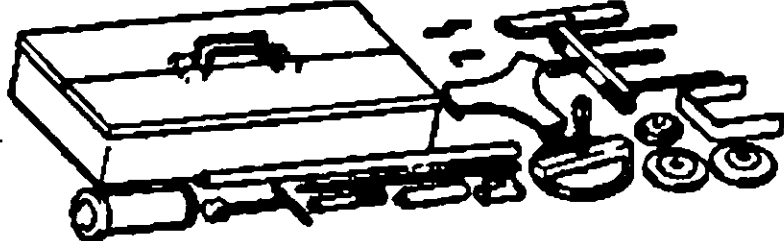
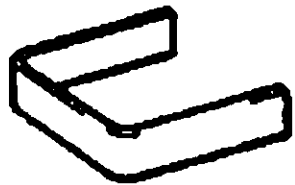
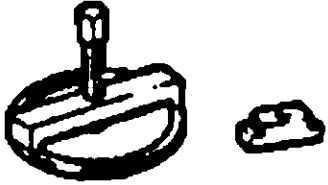
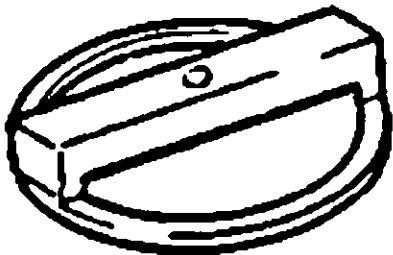
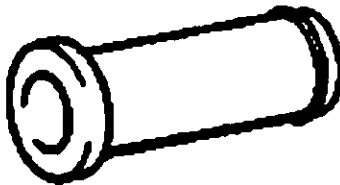
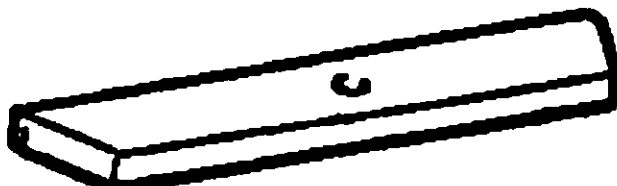
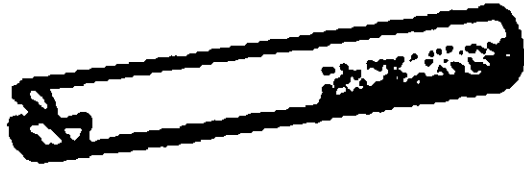
## SPECIFIED TORQUE FOR STANDARD BOLTS

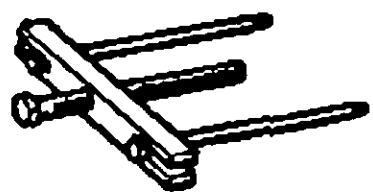
| Class | Diameter<br>mm | Pitch<br>mm | Specified torque  |           |      |                     |           |      |
|-------|----------------|-------------|-------------------|-----------|------|---------------------|-----------|------|
|       |                |             | Hexagon head bolt |           |      | Hexagon flange bolt |           |      |
|       |                |             | kg-cm             | ft-lb     | N·m  | kg-cm               | ft-lb     | N·m  |
| 4T    | 6              | 1           | 55                | 48 in.-lb | 5    | 60                  | 52 in.-lb | 6    |
|       | 8              | 1.25        | 130               | 9         | 12.5 | 145                 | 10        | 14   |
|       | 10             | 1.25        | 260               | 19        | 26   | 290                 | 21        | 29   |
|       | 12             | 1.25        | 480               | 35        | 47   | 540                 | 39        | 53   |
|       | 14             | 1.5         | 760               | 55        | 74   | 850                 | 61        | 84   |
|       | 16             | 1.5         | 1,150             | 83        | 115  | —                   | —         | —    |
| 5T    | 6              | 1           | 65                | 56 in.-lb | 6.5  | 75                  | 65 in.-lb | 7.5  |
|       | 8              | 1.25        | 160               | 12        | 15.5 | 175                 | 13        | 17.5 |
|       | 10             | 1.25        | 330               | 24        | 32   | 360                 | 26        | 36   |
|       | 12             | 1.25        | 600               | 43        | 59   | 670                 | 48        | 65   |
|       | 14             | 1.5         | 930               | 67        | 91   | 1,050               | 76        | 100  |
|       | 16             | 1.5         | 1,400             | 101       | 140  | —                   | —         | —    |
| 6T    | 6              | 1           | 80                | 69 in.-lb | 8    | 90                  | 78 in.-lb | 9    |
|       | 8              | 1.25        | 195               | 14        | 19   | 210                 | 15        | 21   |
|       | 10             | 1.25        | 400               | 29        | 39   | 440                 | 32        | 44   |
|       | 12             | 1.25        | 730               | 53        | 71   | 810                 | 59        | 80   |
|       | 14             | 1.5         | 1,100             | 80        | 110  | 1,250               | 90        | 125  |
|       | 16             | 1.5         | 1,750             | 127       | 170  | —                   | —         | —    |
| 7T    | 6              | 1           | 110               | 8         | 10.5 | 120                 | 9         | 12   |
|       | 8              | 1.25        | 260               | 19        | 25   | 290                 | 21        | 28   |
|       | 10             | 1.25        | 530               | 38        | 52   | 590                 | 43        | 58   |
|       | 12             | 1.25        | 970               | 70        | 95   | 1,050               | 76        | 105  |
|       | 14             | 1.5         | 1,500             | 108       | 145  | 1,700               | 123       | 165  |
|       | 16             | 1.5         | 2,300             | 166       | 230  | —                   | —         | —    |
| 8T    | 8              | 1.25        | 300               | 22        | 29   | 330                 | 24        | 33   |
|       | 10             | 1.25        | 620               | 45        | 61   | 690                 | 50        | 68   |
|       | 12             | 1.25        | 1,100             | 80        | 110  | 1,250               | 90        | 120  |
| 9T    | 8              | 1.25        | 340               | 25        | 34   | 380                 | 27        | 37   |
|       | 10             | 1.25        | 710               | 51        | 70   | 790                 | 57        | 78   |
|       | 12             | 1.25        | 1,300             | 94        | 125  | 1,450               | 105       | 140  |
| 10T   | 8              | 1.25        | 390               | 28        | 38   | 430                 | 31        | 42   |
|       | 10             | 1.25        | 800               | 58        | 78   | 890                 | 64        | 88   |
|       | 12             | 1.25        | 1,450             | 105       | 140  | 1,600               | 116       | 155  |
| 11T   | 8              | 1.25        | 430               | 31        | 42   | 480                 | 35        | 47   |
|       | 10             | 1.25        | 890               | 64        | 87   | 990                 | 72        | 97   |
|       | 12             | 1.25        | 1,600             | 116       | 155  | 1,800               | 130       | 175  |

# SST AND SSM

|                                       | Page |
|---------------------------------------|------|
| SST (SPECIAL SERVICE TOOLS) .....     | C-2  |
| SSM (SPECIAL SERVICE MATERIALS) ..... | C-3  |

SST (SPECIAL SERVICE TOOLS)

| Illustration                                                                        | Part No.      | Part Name                                 | Note |
|-------------------------------------------------------------------------------------|---------------|-------------------------------------------|------|
|    | 09032-00100   | Oil Pan Seal Cutter                       |      |
|    | 09350-36010   | TOYOTA Automatic Transmission Tool Set    |      |
|    | (09350-06010) | ( No. 2 Piston Spring )<br>Compressor     |      |
|    | (09350-06020) | ( No. 3 Piston Spring )<br>Compressor     |      |
|  | (09350-06030) | ( No. 1 Piston Spring )<br>Compressor     |      |
|  | (09350-06035) | (Attachment)                              |      |
|  | (09350-06040) | (Oil Seal Replacer)                       |      |
|  | (09350-06050) | (Handle)                                  |      |
|  | (09350-06060) | ( Transmission Rear )<br>Bearing Replacer |      |
|  | (09350-06070) | ( Extension Housing )<br>Bearing Remover  |      |
|  | (09350-06090) | (Plate)                                   |      |
|  | (09350-06100) | ( Check Ball Spring )<br>Compressor       |      |
|  | (09350-06110) | ( No. 1 Measure )<br>Terminal             |      |
|  | (09350-06120) | ( No. 2 Measure )<br>Terminal             |      |

| Illustration                                                                      | Part No.      | Part Name           | Note |
|-----------------------------------------------------------------------------------|---------------|---------------------|------|
|  | (09350-06130) | (Extension Bar)     |      |
|  | (09350-06140) | (Oil Pump Puller)   |      |
|  | (09350-06150) | (Oil Seal Replacer) |      |

## SSM (SPECIAL SERVICE MATERIALS)

| Part Name                                                       | Part No.    | Use etc.                                                                            |
|-----------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------|
| Seal packing 1281 B<br>Three bond 1281 B or equivalent          | 08826-00090 | Transmission case × Oil pan                                                         |
| Adhesive 1344,<br>Three bond 1344, Loctite<br>242 or equivalent | 08833-00080 | Center support set bolt<br>(A440F, A441L)<br>O/D case set bolt<br>Oil pump set bolt |