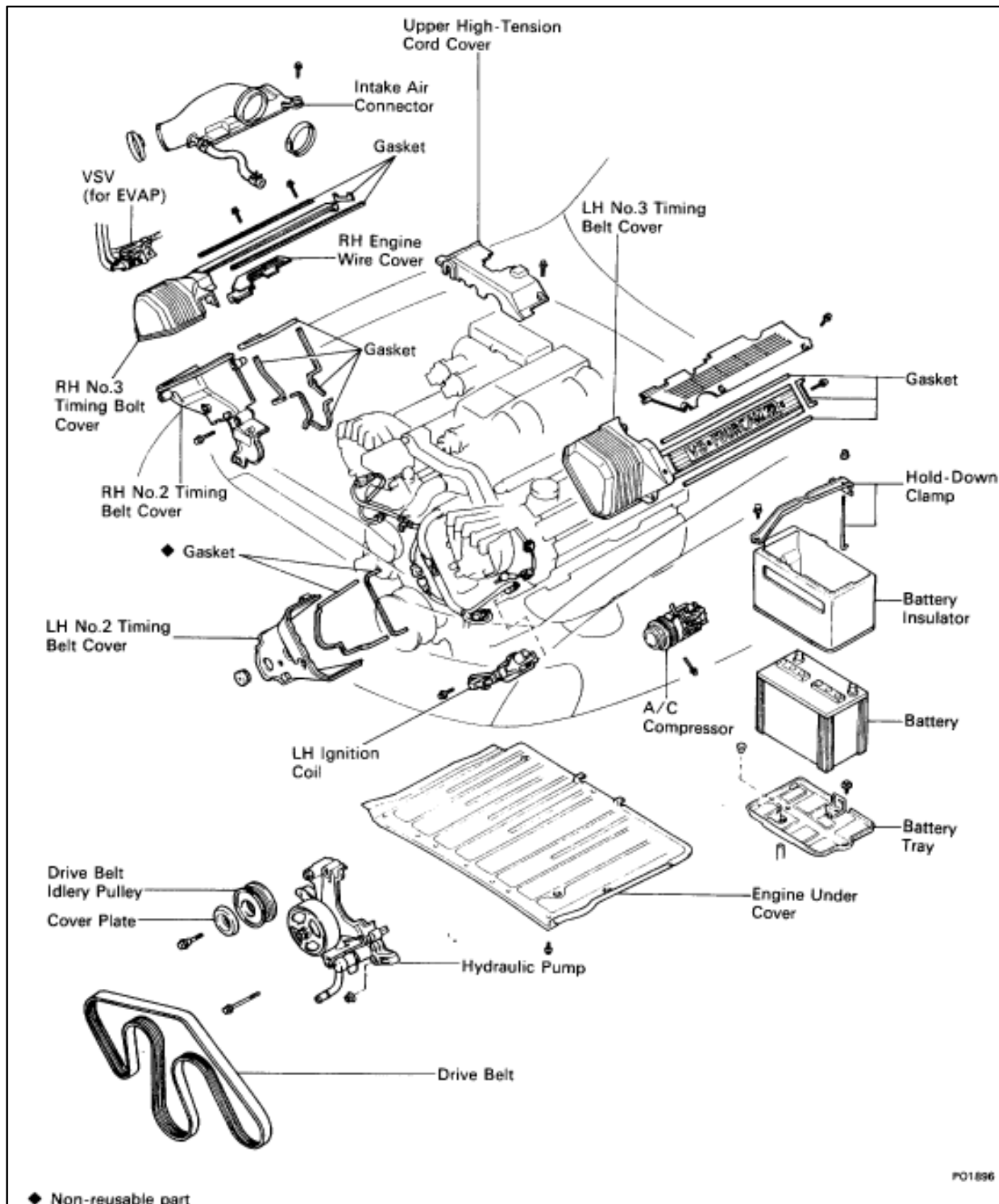
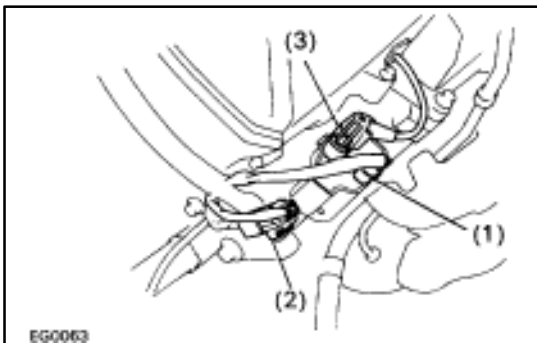
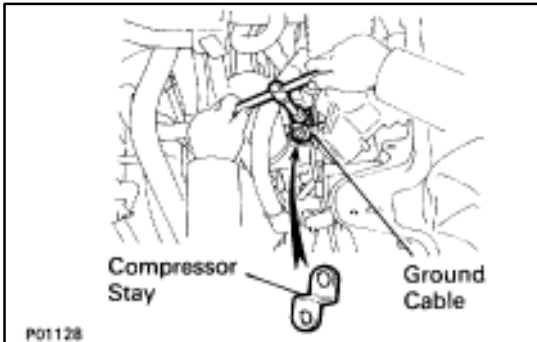
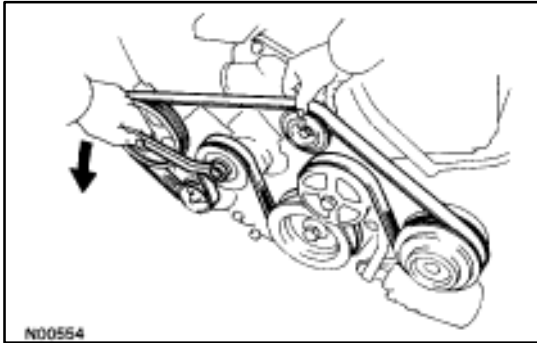
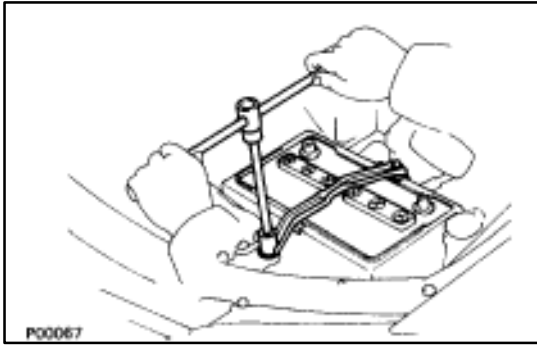


Hydraulic Pump COMPONENTS FOR REMOVAL AND INSTALLATION





REMOVAL OF HYDRAULIC PUMP

(See Components on page [CO-26](#))

1. REMOVE BATTERY

CAUTION: Work must be started after approx. 20 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (-) terminal cable is disconnected from the battery.

2. REMOVE ENGINE UNDER COVER

3. DRAIN ENGINE COOLANT (See page [CO-6](#))

4. REMOVE DRIVE BELT

Loosen the drive belt tension by turning the drive belt tensioner counterclockwise, and remove the drive belt.

HINT: The pulley bolt for the belt tensioner has a left-hand thread.

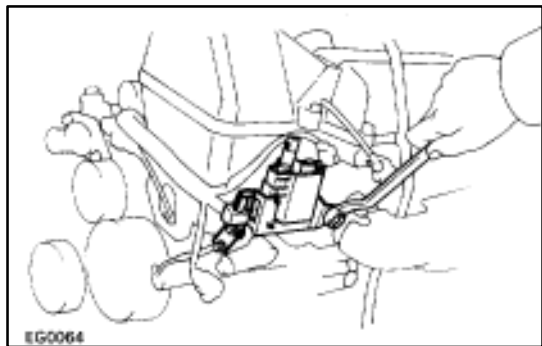
5. DISCONNECT A/C COMPRESSOR

- Disconnect the A/C compressor connector.
- Remove the nut, and disconnect the ground cable.
- Remove the bolt and A/C compressor stay.

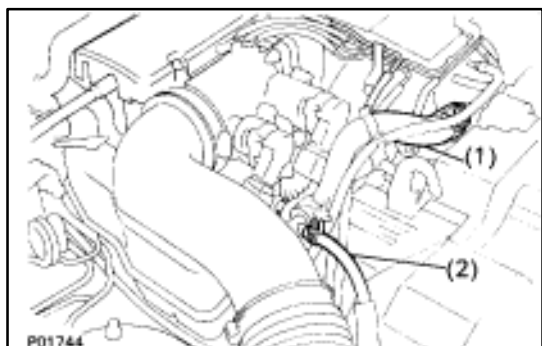
- Remove the two bolts, and disconnect the A/C compressor from the engine.

6. REMOVE LH IGNITION COIL

- Disconnect the following connectors and cord:
 - Ignition coil connector
 - Noise filter connector
 - High-tension cord

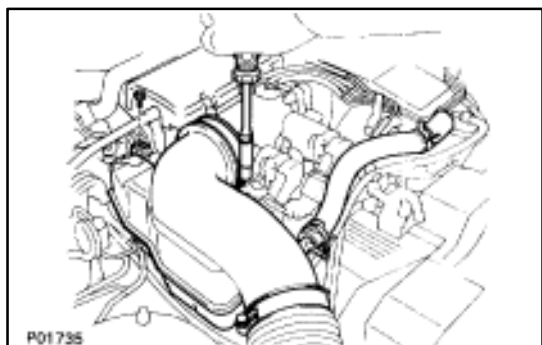


- (b) Remove the two bolts and ignition coil.

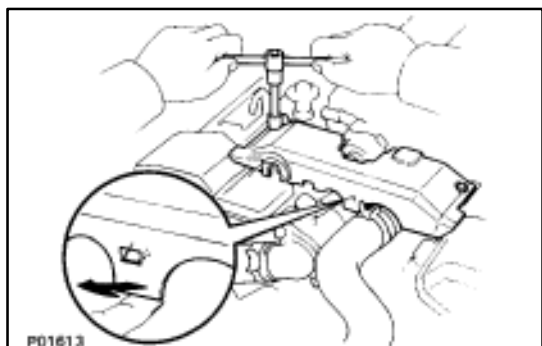


7. REMOVE INTAKE AIR CONNECTOR

- (a) Disconnect the following hoses:
- (1) Air hose from ISC valve
 - (2) Air hose (from PS air control valve) from intake air connector

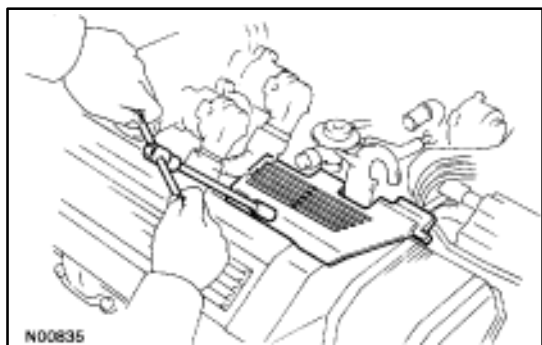


- (b) Remove the bolt holding the intake air connector to the cylinder head cover.
- (c) Loosen the two hose clamps.
- (d) Disconnect the intake air connector from the throttle body and air cleaner hose, and remove the throttle body.



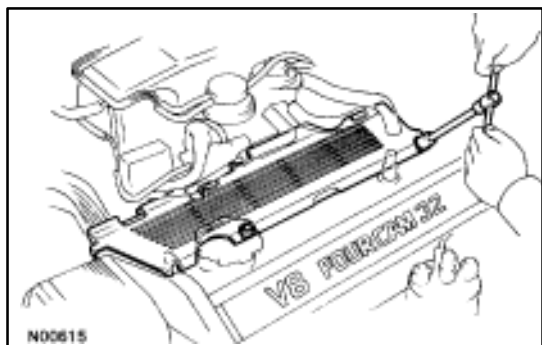
8. REMOVE UPPER HIGH-TENSION CORD COVER

- (a) Remove the two mounting bolts.
- (b) Disconnect the front side claw groove of the cord cover from the claw of the lower cover, and remove the cord cover.



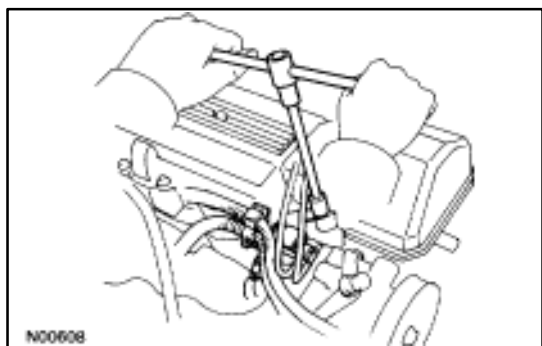
9. REMOVE RH ENGINE WIRE COVER

- Remove the bolt and engine wire cover.



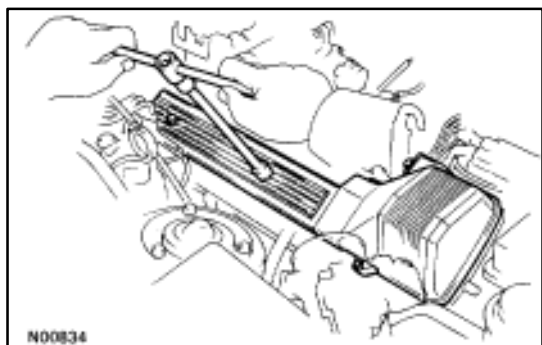
10. REMOVE LH ENGINE WIRE COVER

Remove the two bolts and engine wire cover.



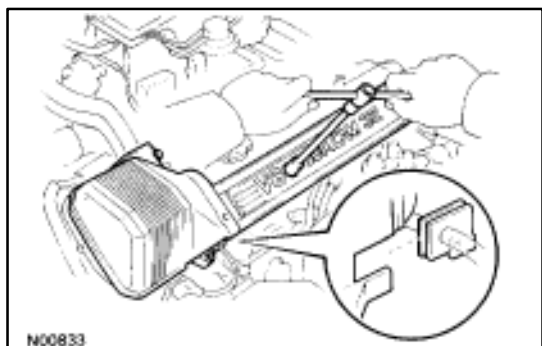
11. REMOVE VSV FOR EVAP SYSTEM

Remove the two bolts, and disconnect the VSV from cylinder head and timing belt cover.



12. REMOVE RH NO.3 TIMING BELT COVER

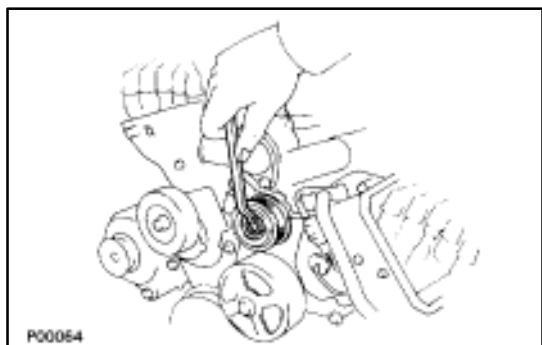
Remove the three bolts and timing belt cover.



13. REMOVE LH NO.3 TIMING BELT COVER

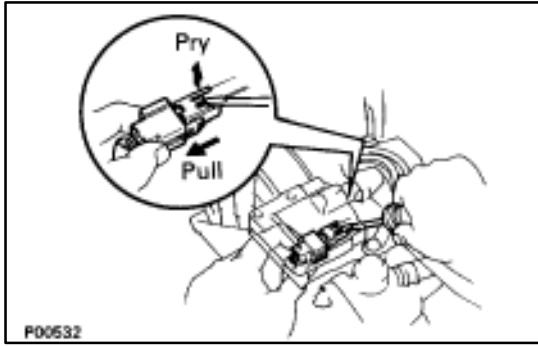
- Remove the four mounting bolts.
- Disconnect the cord grommet from the timing belt cover, and remove the timing belt cover.
- Remove the cord grommet from the high-tension cord.

14. DISCONNECT RADIATOR HOSE FROM WATER INLET

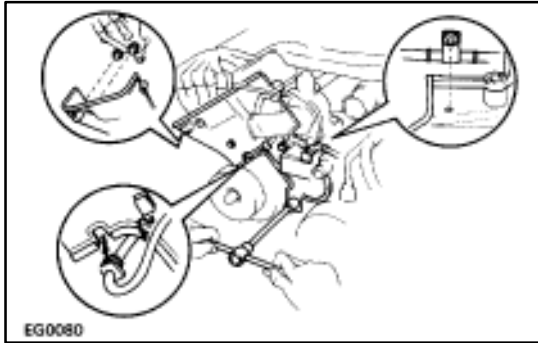


15. REMOVE DRIVE BELT IDLER PULLEY

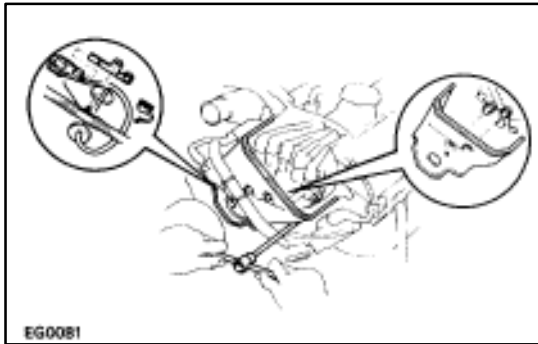
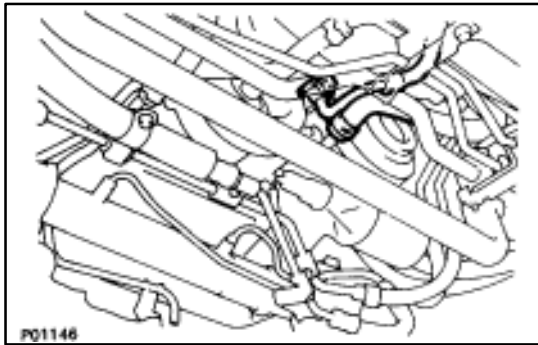
Remove the pulley bolt, cover plate and idler pulley.

**15. REMOVE RH NO.2 TIMING BELT COVER**

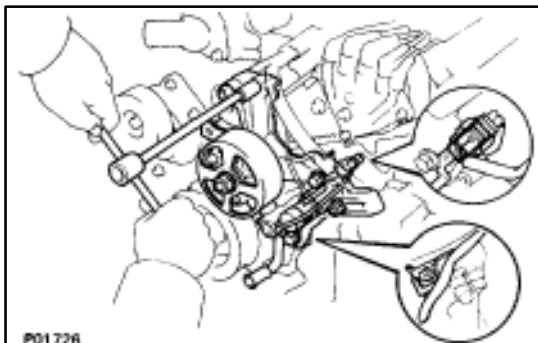
- (a) Disconnect the cam position sensor connector from the ignition coil bracket.
- (b) Disconnect the cam position sensor wire from the clamp on the timing belt cover.
- (c) Remove the five mounting bolts.
- (d) Disconnect the wire clamp from the timing belt cover, and remove the timing belt cover and four gasket.

**16. REMOVE LH NO.2 TIMING BELT COVER**

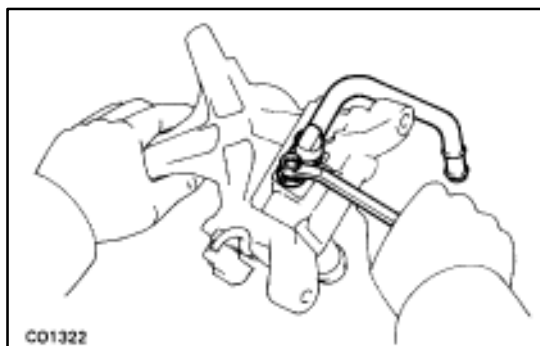
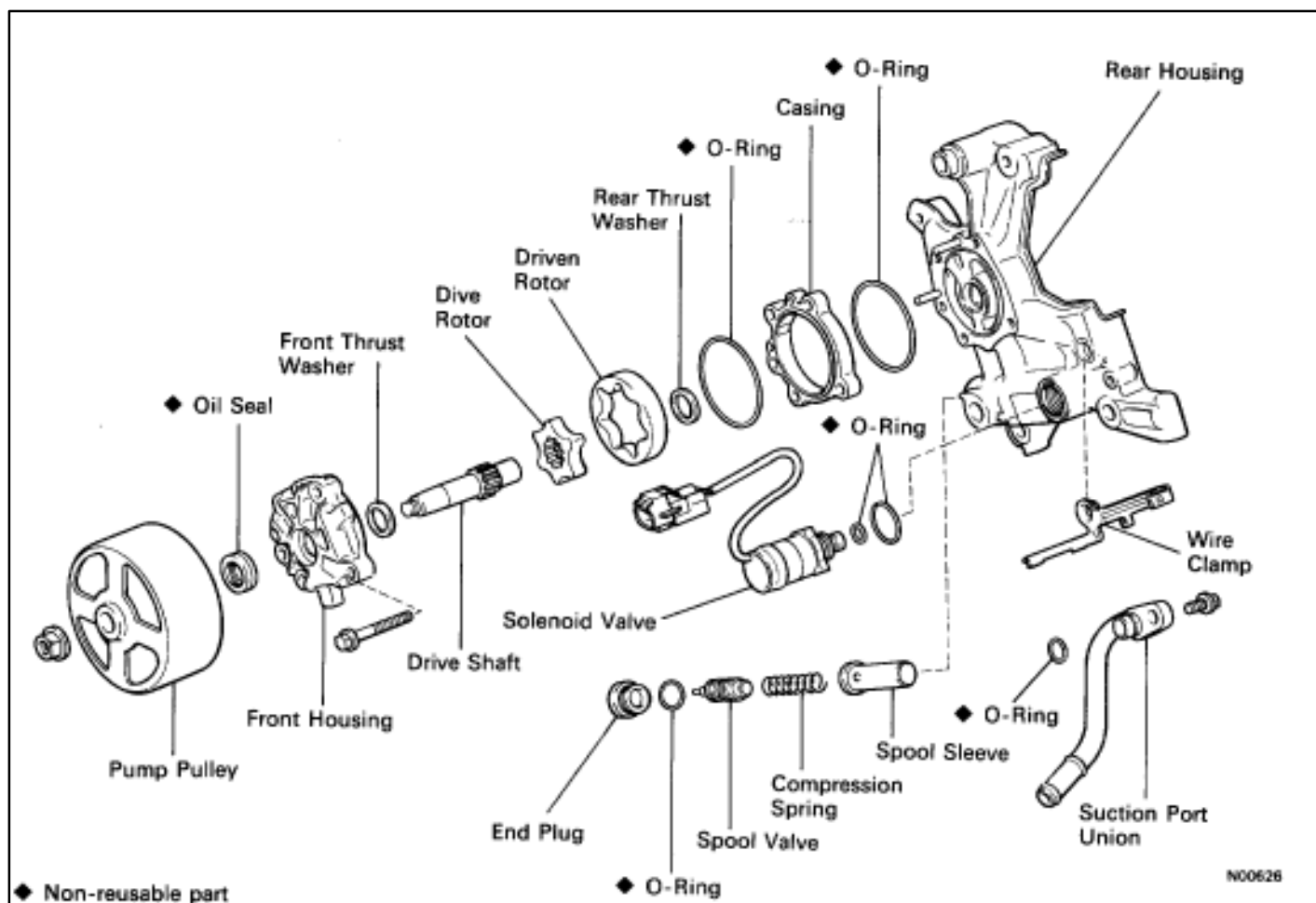
- (a) Disconnect the cam position sensor wire from the clamp on the timing belt cover.
- (b) Disconnect the cam position sensor connector.
- (c) Remove the three mounting bolts.
- (d) Disconnect the connector grommet from the timing belt cover, and remove the timing belt cover and two gaskets.

**17. DISCONNECT PRESSURE AND SUCTION HOSES FROM HYDRAULIC PUMP****18. REMOVE HYDRAULIC PUMP**

- (a) Disconnect the solenoid valve connector.
- (b) Remove the two mounting bolts and two nuts.
- (c) Disconnect the engine speed sensor wire clamp.
- (d) Remove the hydraulic pump.



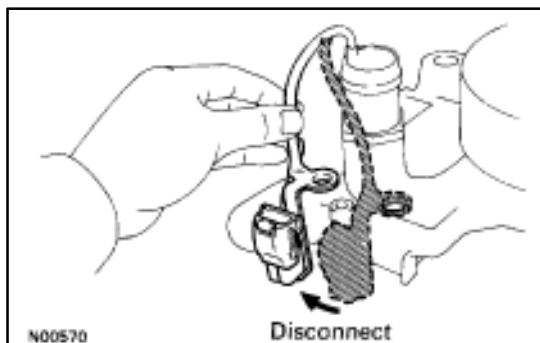
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



DISASSEMBLY OF HYDRAULIC PUMP

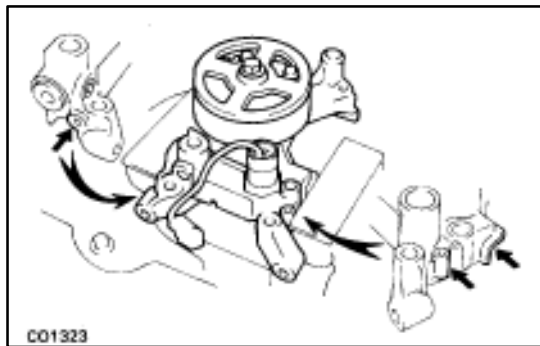
1. REMOVE SUCTION PORT UNION

- Remove the mounting bolt.
- Pull out the port union.
- Remove the O-ring from the port union.

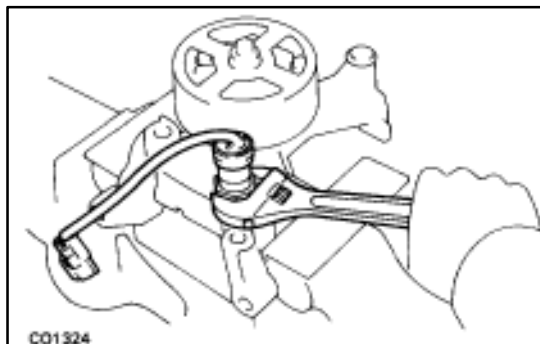


2. REMOVE WIRE CLAMP

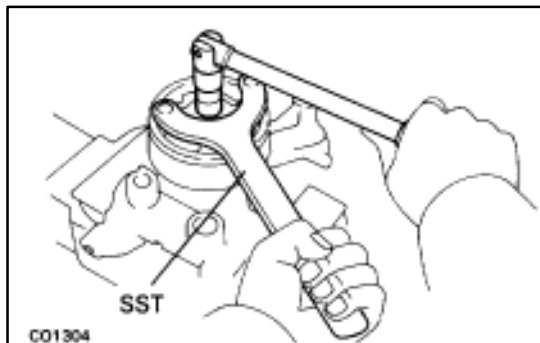
- Disconnect the wire clamp from the rear housing.
- Remove the wire clamp from the read wire.

**3. MOUNT REAR HOUSING**

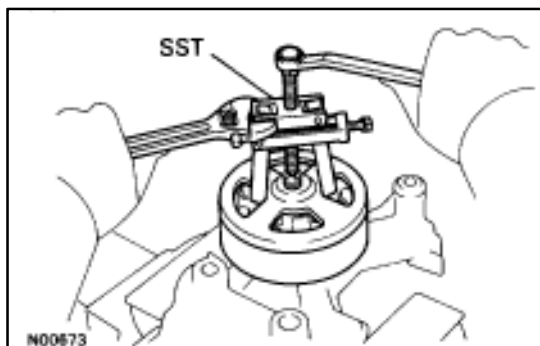
HINT: Mount the parts in a vise as shown in the illustration.

**4. REMOVE SOLENOID VALVE**

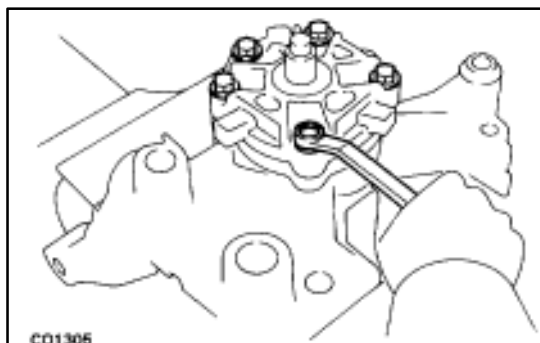
- (a) Remove the solenoid valve.
- (b) Remove the O-ring from the solenoid valve.
- (c) Remove the O-ring from the rear housing.

**5. REMOVE PUMP PULLEY**

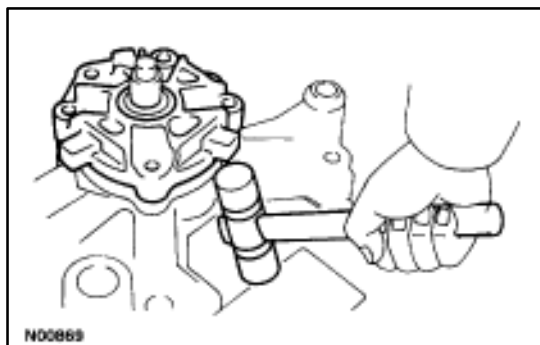
- (a) Using SST, remove the pulley nut by turning it clockwise.
SST 09278-54012



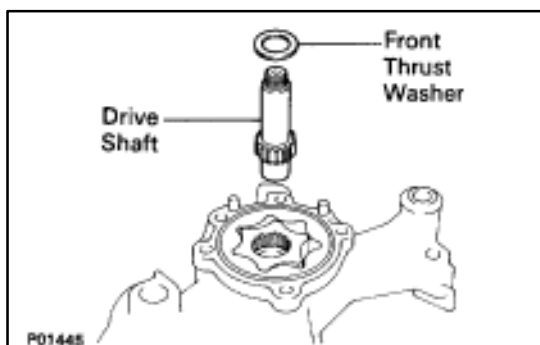
- (b) Using SST, remove the pulley.
SST 09286-46011

**6. REMOVE FRONT HOUSING**

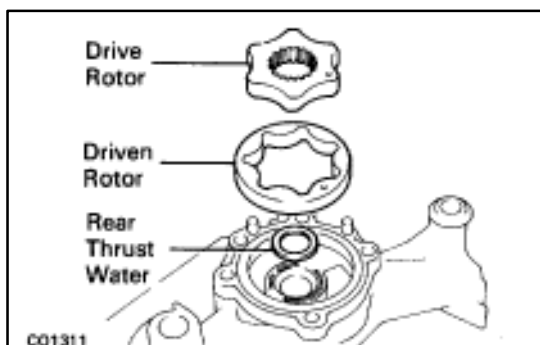
- (a) Remove the five mounting bolts.



- (b) Using a plastic-faced hammer, carefully tap out the front housing.
- (c) Remove the O-ring from the casing.

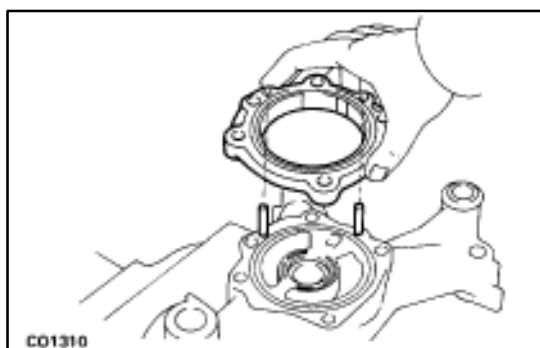


7. REMOVE FRONT THRUST WASHER AND DRIVE SHAFT



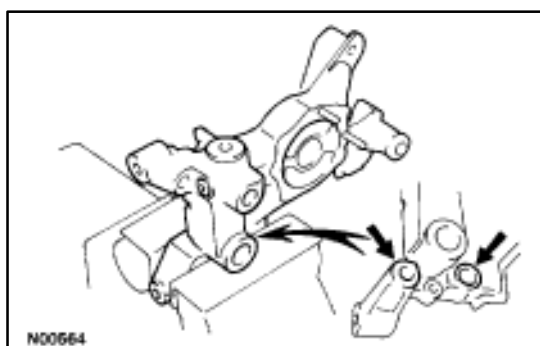
8. REMOVE DRIVE AND DRIVEN ROTORS

9. REMOVE REAR THRUST WASHER



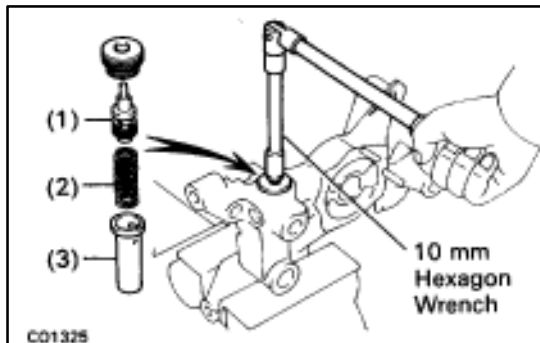
10. REMOVE CASING

- (a) Remove the casing.
- (b) Remove the O-ring from the rear housing.



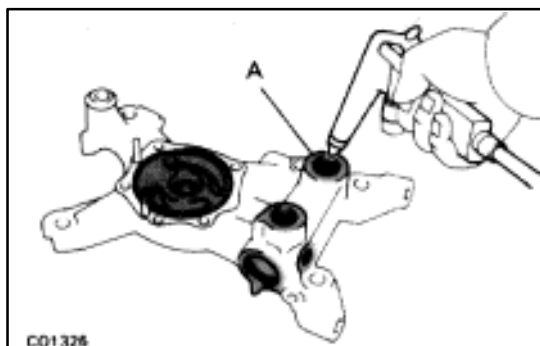
11. REMOUNT REAR HOUSING

HINT: Mount the parts in a vise as shown in the illustration.



12. REMOVE SPOOL VALVE

- Using a 10 mm hexagon wrench, remove the end plug and following parts:
 - Spool valve
 - Compression spring
 - Spool sleeve
- Remove the O-ring from the end plug.

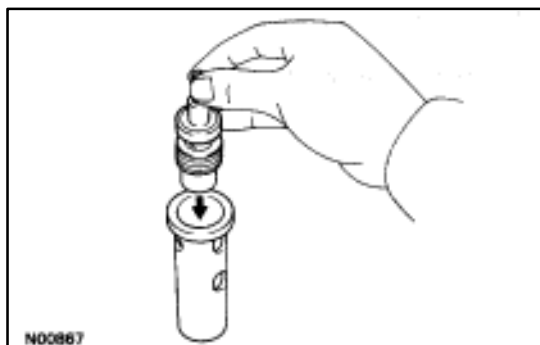


INSPECTION OF HYDRAULIC PUMP

1. CLEAN DISASSEMBLED PARTS

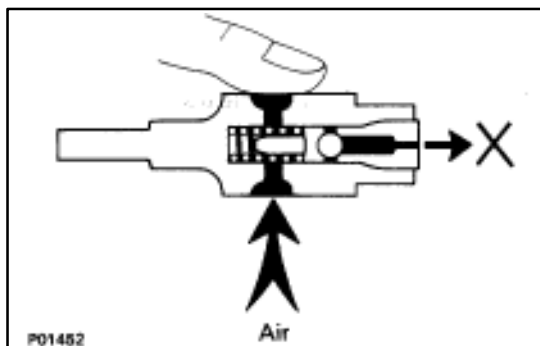
Using a cleaner and compressed air, clean the disassembled parts.

CAUTION: Thoroughly clean the oil passages of the rear housing. Oil passage A includes a filter which should be cleaned carefully.

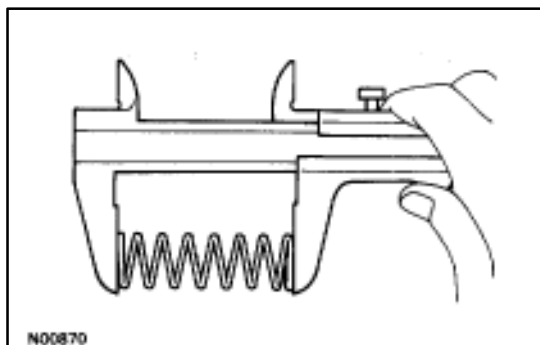


2. INSPECT SPOOL VALVE

- Coat the spool valve with PS fluid, and check that it falls smoothly into the spool sleeve by its own weight.



- Check the spool valve for leakage.
Close one of the holes and apply compressed air 392–490 kPa (4–5 kgf/cm², 57–71 psi) into the opposite side, check that air does not come out of the end hole. If it doesn't, replace the spool valve and sleeve as a set.

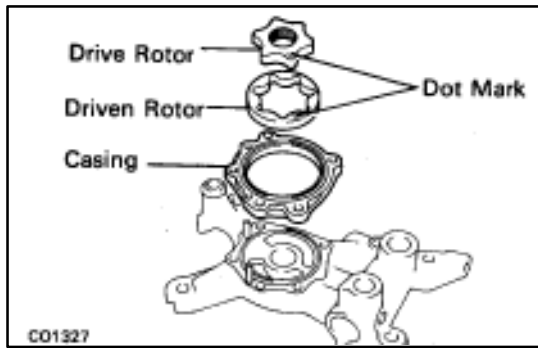


3. INSPECT SPOOL COMPRESSION SPRING

Using a vernier calipers, measure the free length of the compression spring.

Free length: 45.8 mm (1.803 in.)

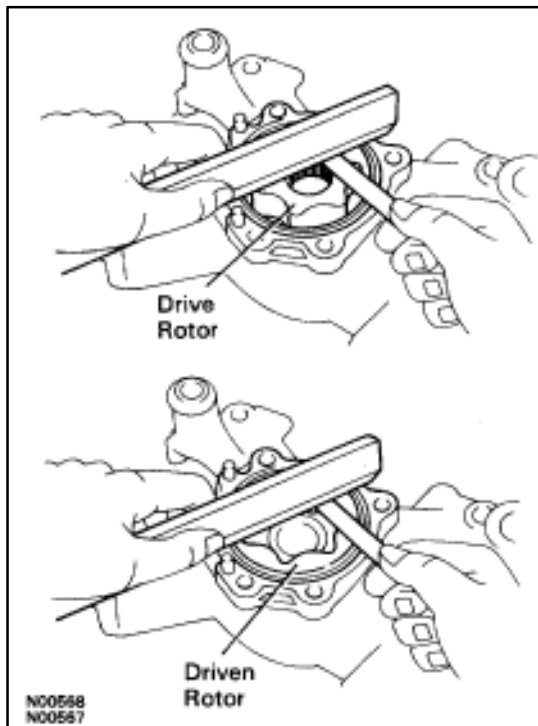
If the free length is not as specified, replace the compression spring.



4. INSPECT DRIVE AND DRIVEN ROTORS

A. Install casing and rotors to rear housing

Face the dot mark of the rotors upward.



B. Inspect rotor side clearance

HINT: Before measuring the clearance, remove one side of the rotor.

Using a feeler gauge and precision straight edge, measure the clearance between the rotor and precision straight edge.

Standard side clearance:

Drive rotor 0.02 mm (0.0008 in.)

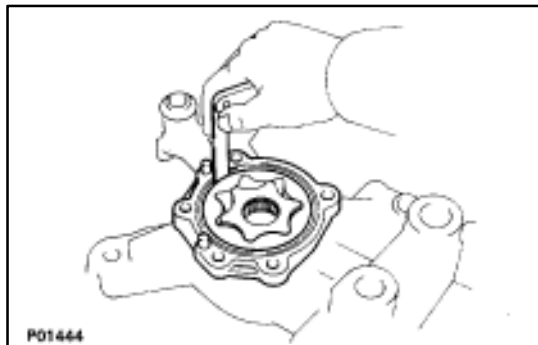
Driven rotor 0.03 mm (0.0012 in.)

Maximum side clearance:

Drive rotor 0.03 mm (0.0012 in.)

Driven rotor 0.04 mm (0.0016 in.)

If the clearance is greater than maximum, replace the rotors as a set. If necessary, replace the housings.



C. Inspect rotor body clearance

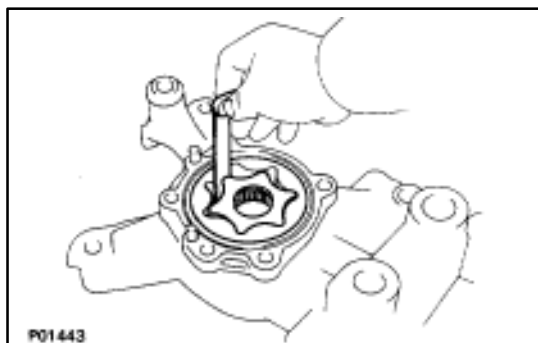
Using a feeler gauge, measure the clearance between the driven rotor and casing.

Standard body clearance: 0.05–0.09 mm

(0.0020–0.0035 in.)

Maximum body clearance: 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the rotors as a set. If necessary, replace the casing.



D. Inspect rotor tip clearance

Using a feeler gauge, measure the clearance of all the six drive rotor tips between the drive and driven rotors.

Standard tip clearance: 0.02 mm (0.0008 in.)

Maximum tip clearance: 0.03 mm (0.0012 in.)

If the clearance is greater than maximum, replace the rotors as a set.

E. Remove rotors and causing from rear housing

5. INSPECT OIL CLEARANCE OF DRIVE SHAFT

- (a) Using a caliper gauge, measure the bushing inside diameter on the housing.

Bushing inside diameter: 17.00–17.05 mm
(0.6693–0.6713 in.)

- (b) Using a micrometer, measure the drive shaft diameter.

Shaft diameter: 16.97–16.98 mm
(0.6681–0.6685 in.)

- (c) Subtract the drive shaft diameter measurement from the bushing inside diameter measurement.

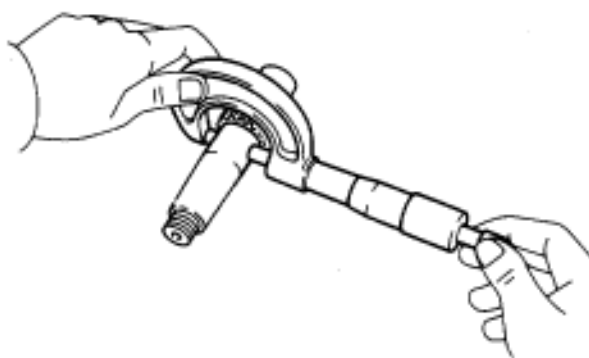
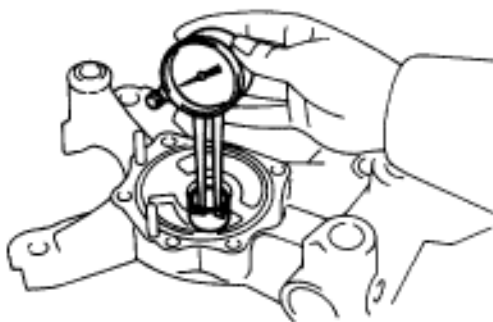
Standard clearance: 0.02–0.08 mm
(0.0008–0.0031 in.)

Maximum clearance: 0.08 mm (0.0031 in.)

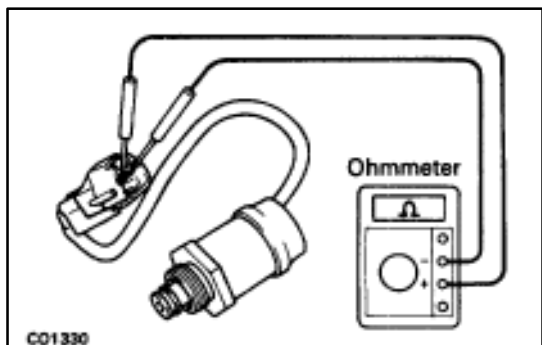
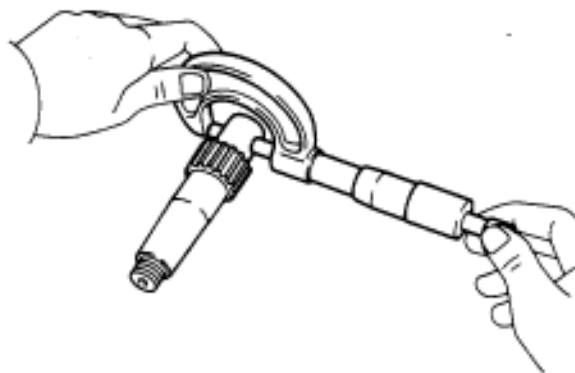
If the clearance is greater than maximum, replace the shaft.
If necessary, replace the housings.

Front Side

C01328 C01306

**Rear Side**

C01329 C01307

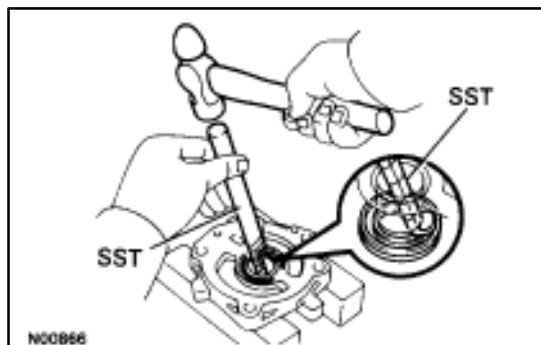


C01330

6. INSPECT SOLENOID VALVE RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

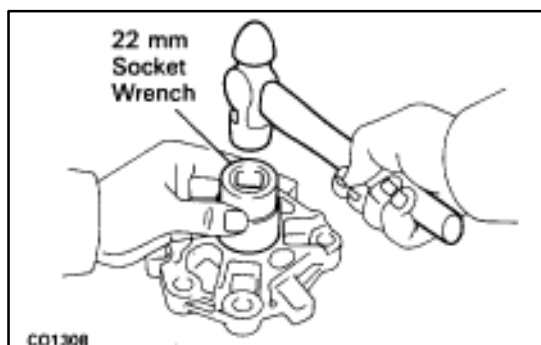
Resistance (Cold): 7.5–8.5 Ω



REPLACEMENT OF OIL SEAL

1. REMOVE OIL SEAL

Using SST and a hammer, tap out the oil seal.
SST 09631-10030



2. INSTALL OIL SEAL

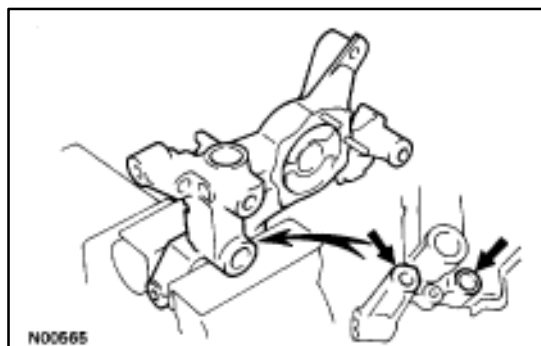
- Using a 22 mm socket wrench and hammer, tap in a new oil seal until its surface is flush with the housing edge.
- Apply fluid to the oil seal lip.

ASSEMBLY OF HYDRAULIC PUMP

(See Components on page [CO-31](#))

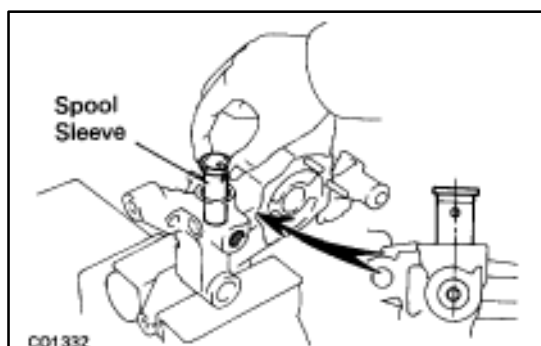
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new fluid to all sliding and rotating surfaces.



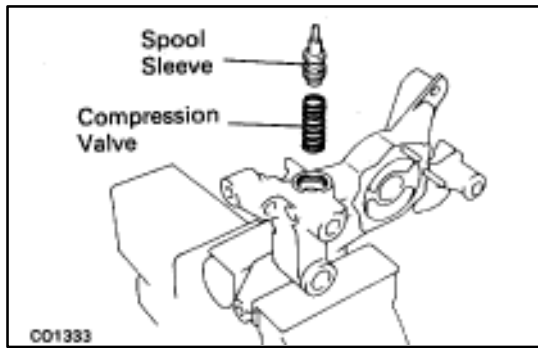
1. MOUNT REAR HOUSING

HINT: Mount the parts in a vise as shown in the illustration.

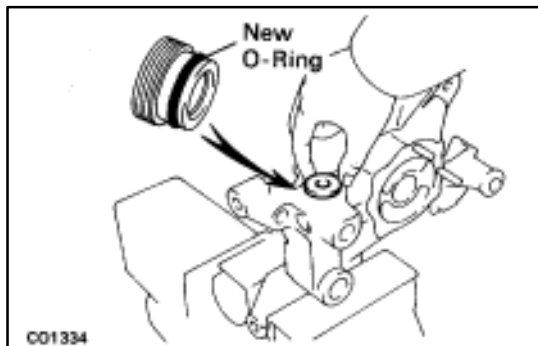


2. INSTALL SPOOL VALVE

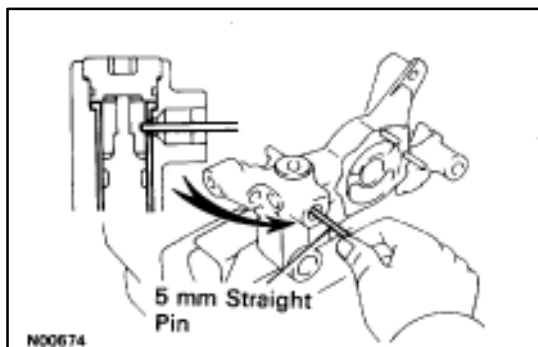
- Align the small hole of the spool sleeve with the hole of the rear housing, and insert the spool body into the rear housing.



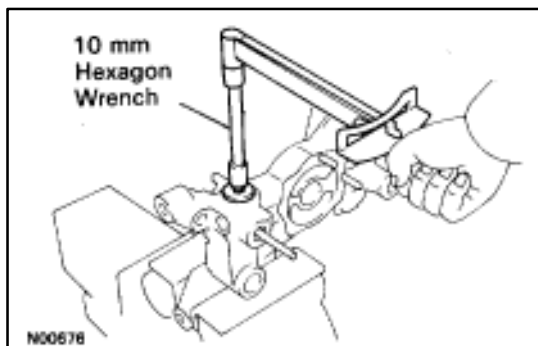
- (b) Insert the compression spring and spool valve into the rear housing.



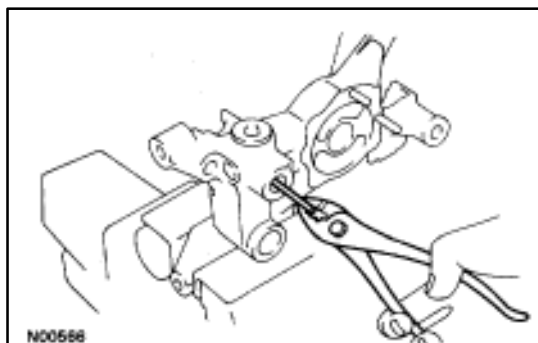
- (c) Install a new O-ring to the end plug.
(d) Apply fluid to the O-ring.
(e) Temporarily install the end plug.



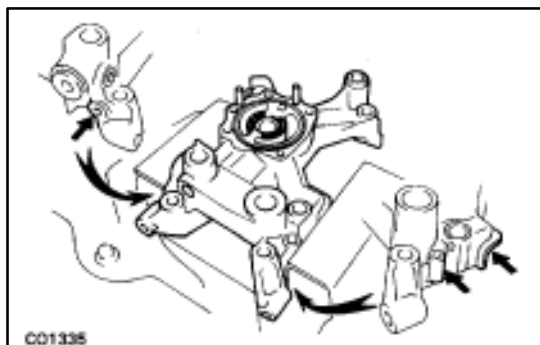
- (f) Insert a 5 mm (0.19 in.) straight pin through the holes of the rear housing and spool sleeve.



- (g) Using a 10 mm hexagon wrench, install the end plug.
Torque: 19 N·m (200 kgf·cm, 14 ft·lbf)

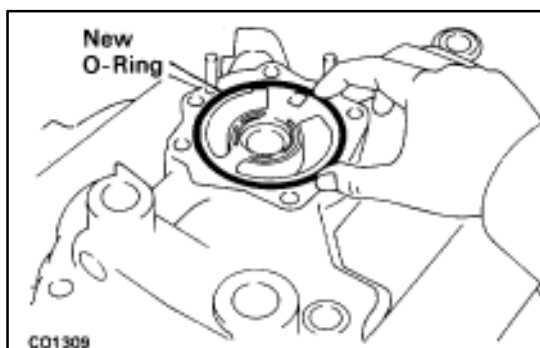


- (h) Pull out the straight pin.



3. REMOUNT REAR HOUSING

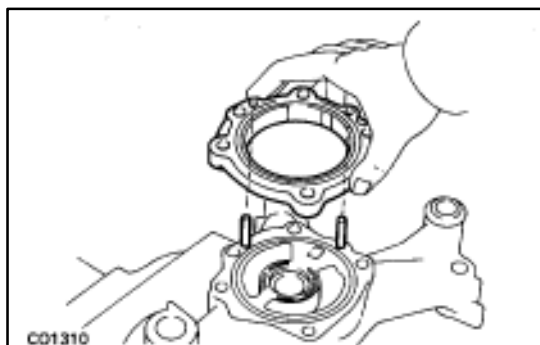
HINT: Mount the parts in a vise as shown in the illustration.



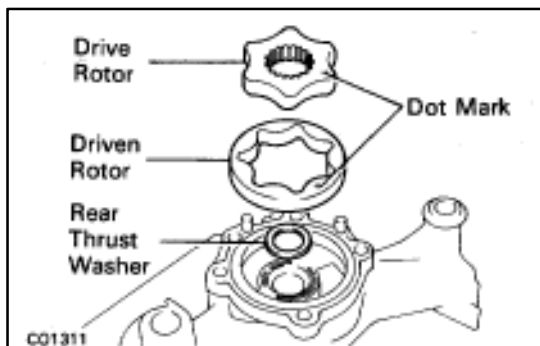
4. INSTALL CASING

HINT: If rubber from the O-rings adheres to the O-ring installation location, replace the casing.

(a) Install a new O-ring to the rear housing groove.



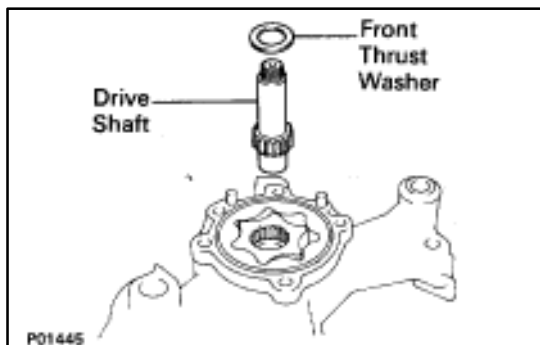
(b) Align the pin hole of the casing with the straight pin on the rear housing, and install the casing.



5. INSTALL REAR THRUST WASHER

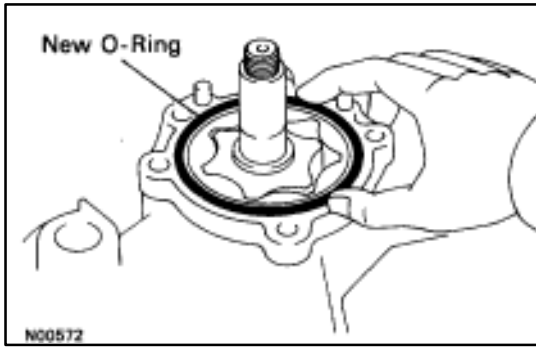
6. INSTALL DRIVEN AND DRIVE ROTORS

Install the drive and driven rotors with the dot mark facing upward.



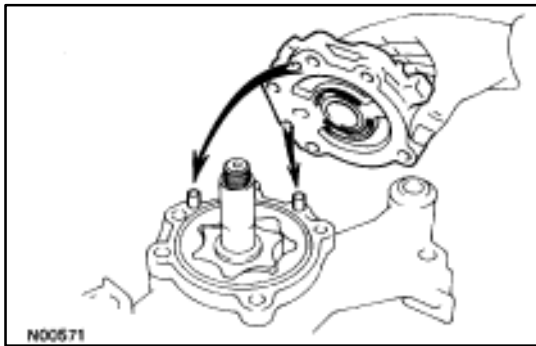
7. INSTALL DRIVE SHAFT

8. INSTALL FRONT THRUST WASHER

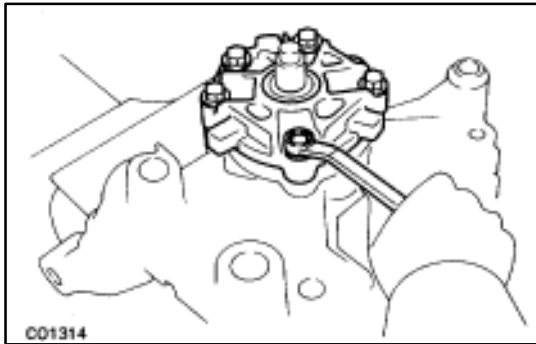


9. INSTALL FRONT HOUSING

- (a) Install a new O-ring to the casing groove.



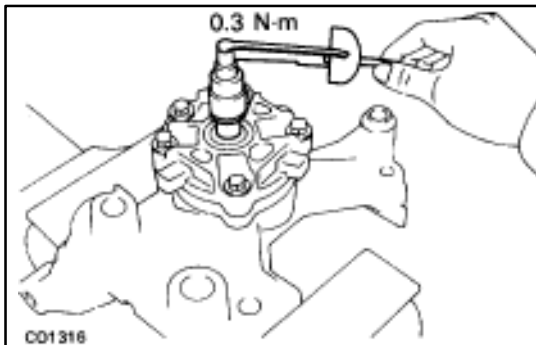
- (b) Align the pin holes of the front housing with the straight pin.



- (c) Apply a light coat of fluid on the threads and under the heads of the mounting bolts.

- (d) Install the front housing with the five bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



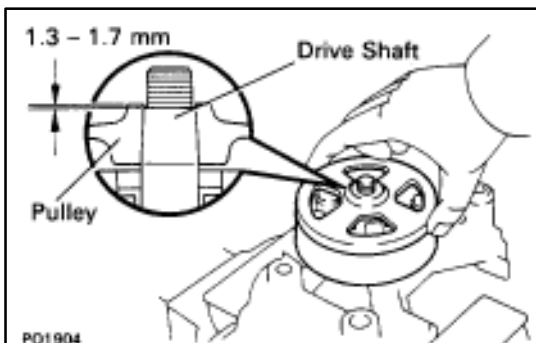
10. INSTALL DRIVE SHAFT PRELOAD

- (a) Check that the drive shaft rotates smoothly without abnormal noise.

- (b) Temporarily install the pulley nut, and check the rotating torque.

Rotating torque:

0.3 N·m (3.0 kgf·cm, 2.6 in·lbf)



11. INSTALL PUMP PULLEY

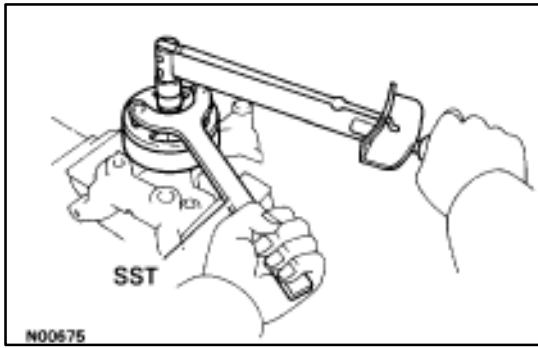
- (a) Slide the pulley onto the drive shaft.

- (b) Measure the clearance between the pulley end and drive shaft end.

Standard: 1.3–1.7 mm (0.051–0.067 in.)

Minimum: 1.0 mm (0.039 in.)

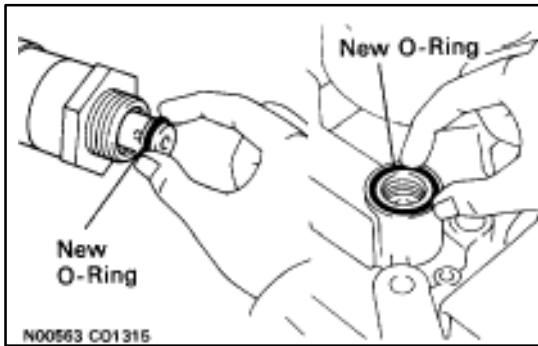
If the clearance is less than minimum, replace the pulley.



- (c) Using SST, install the pulley with the nut. Tighten the nut by turning it counterclockwise.

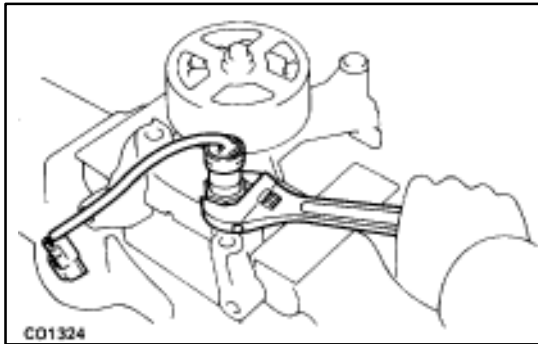
SST 09278-54012

Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)



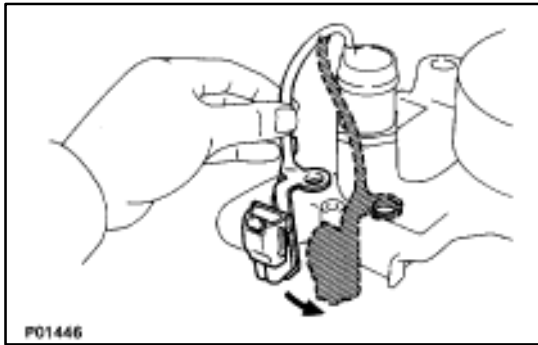
12. INSTALL SOLENOID VALVE

- (a) Install a new O-ring to the solenoid valve.
(b) Install a new O-ring to the rear housing groove.
(c) Apply fluid to the two O-rings.



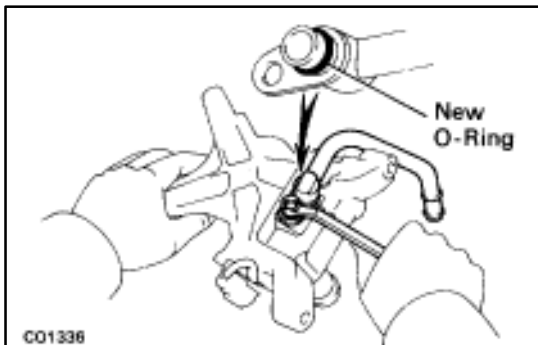
- (d) Install the solenoid valve.

Torque: 39 N·m (400 kgf·cm, 28 ft·lbf)



13. INSTALL WIRE CLAMP

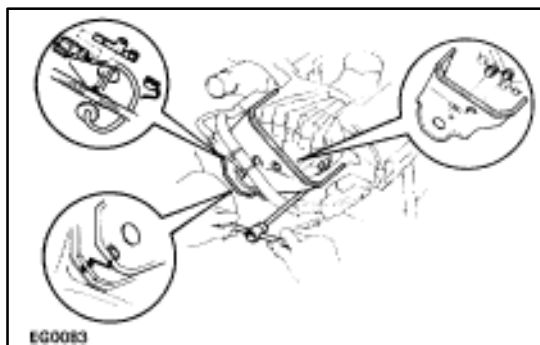
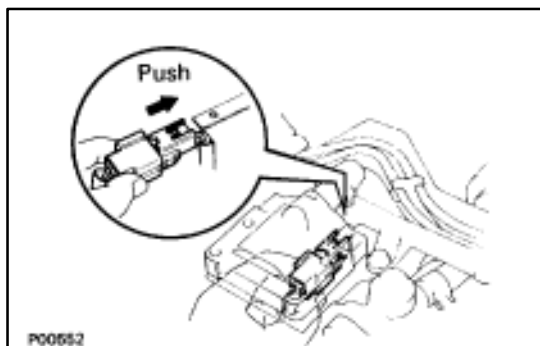
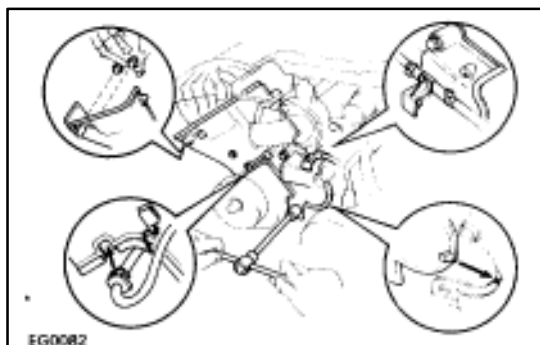
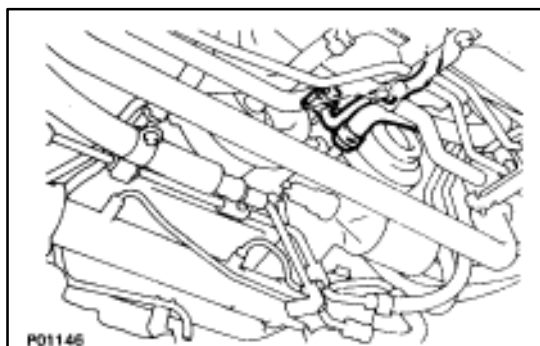
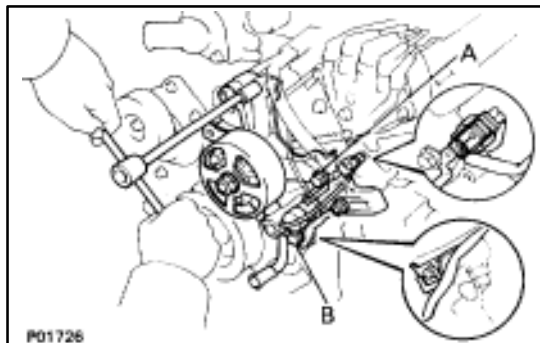
- (a) Install the wire clamp to the read wire.
(b) Install the wire clamp to the rear housing.



14. INSTALL SUCTION PORT UNION

- (a) Install the O-ring to the port union.
(b) Apply fluid to the O-ring.
(c) Install the port union with the bolt.

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)



INSTALLATION OF HYDRAULIC PUMP

(See Components on page CO-26)

1. INSTALL HYDRAULIC PUMP

- Install the hydraulic pump, solenoid valve connector clamp and engine speed sensor wire clamp with the two bolts and two nuts.

Torque:

12 mm head 16 N·m (160 kgf·cm, 12 ft·lbf)

14 mm head 20 N·m (310 kgf·cm, 22 ft·lbf)

HINT: Each bolt length is indicated in the illustration.

Bolt length:

A 106 mm (4.17 in.) for 12 mm head

B 114 mm (4.49 in.) for 14 mm head

- Connect the solenoid valve connector.

2. CONNECT PRESSURE AND SUCTION HOSES TO HYDRAULIC PUMP

- Connect the pressure hose with new gasket and union bolt.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

- Connect suction hose.

3. INSTALL RH NO.2 TIMING BELT COVER

- Install the four gaskets to the timing belt cover.
- Install the connector grommet to the timing belt cover.
- Install the timing belt cover with the five bolts.

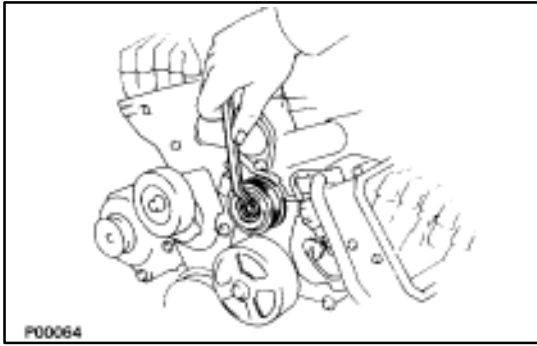
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

HINT (12 mm head bolt): Use bolts 106 mm (4.17 in.) in length.

- Install the wire clamp to the timing belt cover.
- Install the cam position sensor wire to the wire clamp on the timing belt cover.
- Install the cam position sensor connector to the ignition coil bracket.

4. INSTALL LH NO.2 TIMING BELT COVER

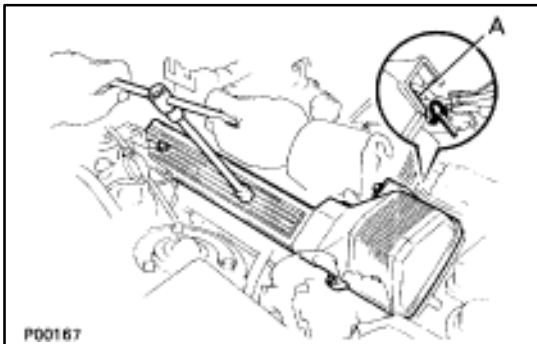
- Install the two gaskets to the timing belt cover.
- Run the cam position sensor wire through the timing belt cover hole.
- Install the timing belt cover and connector bracket with the three bolts.
- Connect the cam position sensor connector.
- Install the cam position sensor connector to the connector bracket.
- Install the cam position sensor wire to the wire clamp on the timing belt cover.
- Install the connector grommet to the timing belt cover.



5. INSTALL DRIVE BELT IDLER PULLEY

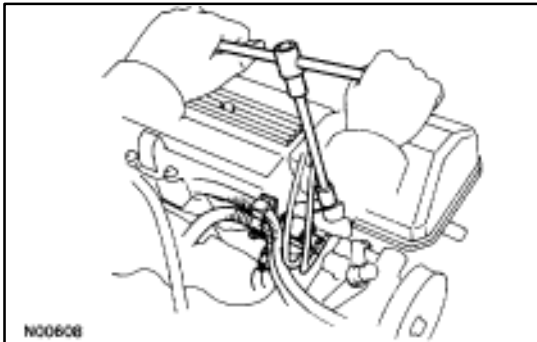
Install the idler pulley and cover plate with the pulley bolt.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

6. CONNECT RADIATOR HOSE TO WATER INLET



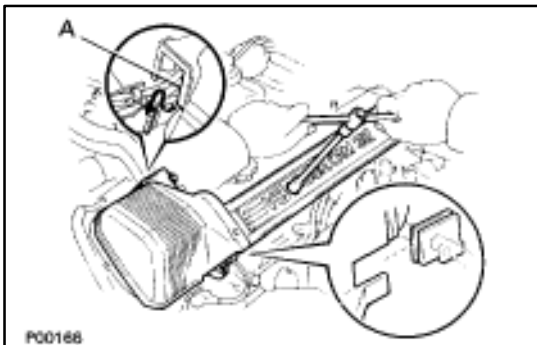
7. INSTALL RH NO.3 TIMING BELT COVER

- Install the three gaskets to the timing belt cover.
- Fit portion A of the timing belt cover, matching it with the lower high-tension cord cover.
- Install the timing belt cover with the three bolts.



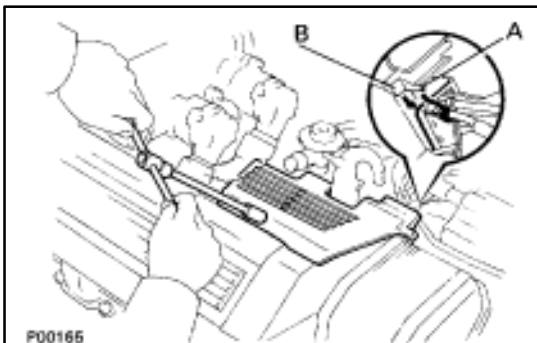
8. INSTALL VSV FOR EVAP SYSTEM

Install the VSV with the two bolts.



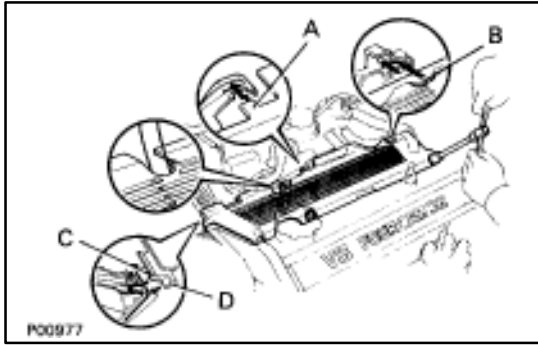
9. INSTALL LH NO.3 TIMING BELT COVER

- Install the three gaskets to the timing belt cover.
- Install the cord grommet to the high-tension cord.
- Install the cord grommet to the timing belt cover.
- Fit portion A of the timing belt cover, matching it with the lower high-tension cord cover.
- Install the timing belt cover with the four bolts.

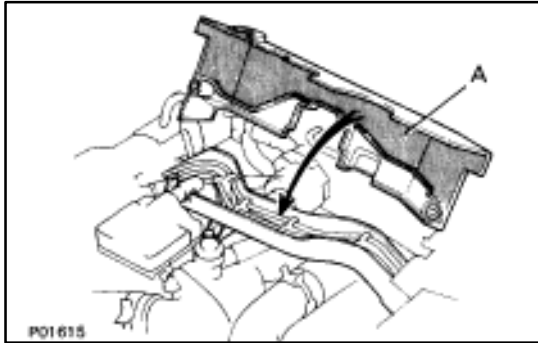


10. INSTALL RH ENGINE WIRE COVER

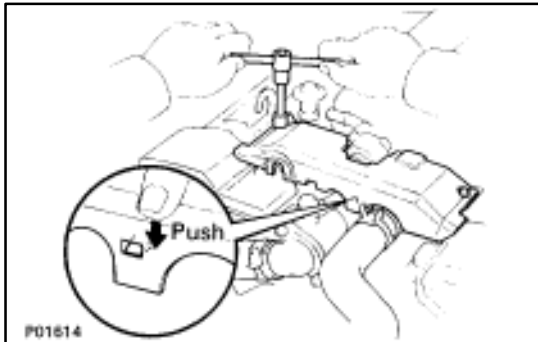
- Fit portions A and B of the engine wire cover, matching them with the lower high-tension cord cover and No.3 timing belt cover.
- Install the engine wire cover with the bolt.

**11. INSTALL LH ENGINE WIRE COVER**

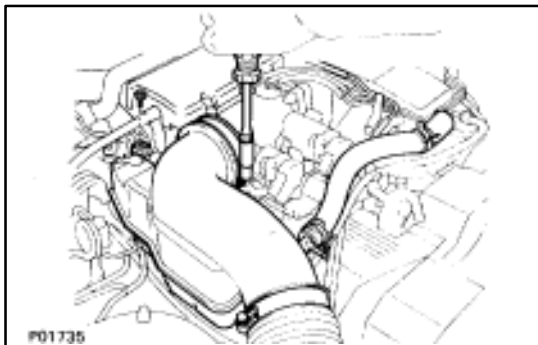
- (a) Connect portions A and B engine wire cover to the wire brackets.
- (b) Set the VSV (for fuel pressure control system) wire in original position.
- (c) Fit portions C and D of the engine wire cover, matching them with the lower high-tension cord cover and No.3 timing belt cover.
- (d) Install the engine wire cover with the two bolts.

**12. INSTALL UPPER HIGH-TENSION CORD COVER**

- (a) Fit portion A of the upper high-tension cover, matching it with the top of the lower high-tension cord cover.



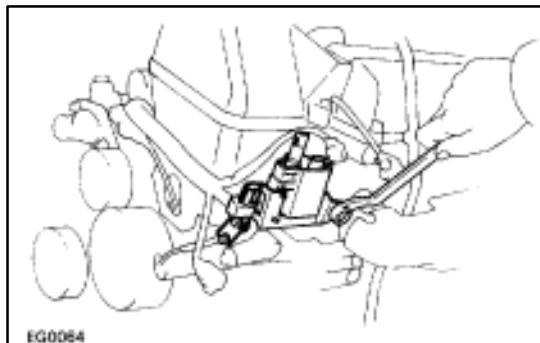
- (b) Push the front side of the high-tension cord cover, and connect the front side claw groove of the upper high-tension cord cover to the claw of the lower high-tension cord cover.
- (c) Install the upper high-tension cord cover with the two bolts.

**13. INSTALL INTAKE AIR CONNECTOR**

- (a) Connect the end portions of the intake air connector to the throttle body and air cleaner hose.
- (b) Tighten the two hose clamps.
- (c) Install the bolt holding the intake air connector to the cylinder head cover.

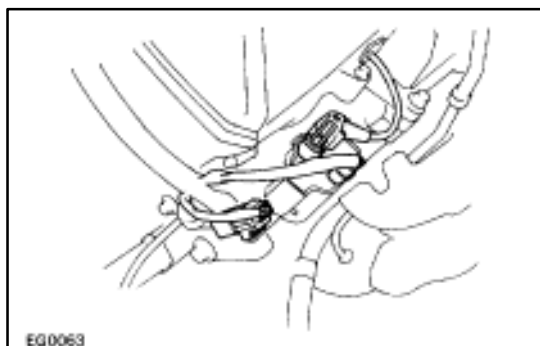


- (d) Connect the following hoses:
 - (1) Air hose to ISC valve
 - (2) Air hose (from PS air control valve) to intake air connector



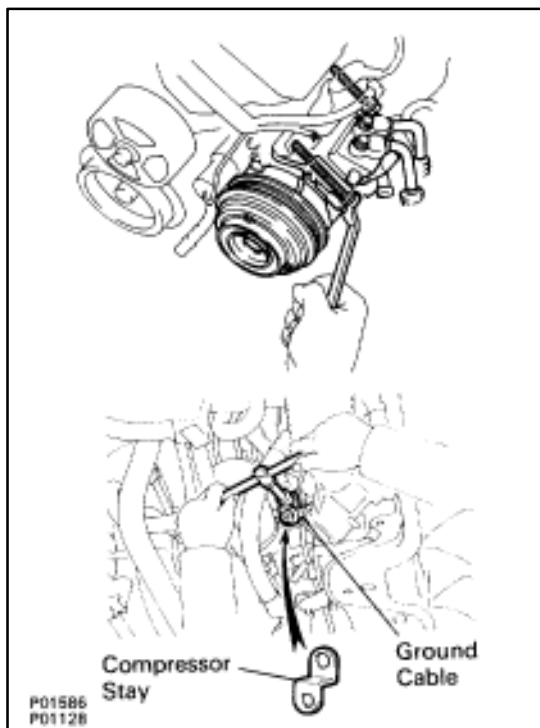
14. INSTALL IGNITION COIL

(a) Install the ignition coil with the two bolts.



(b) Connect the following connectors and cord:

- (1) Ignition coil connector
- (2) Noise filter connector
- (3) High-tension cord



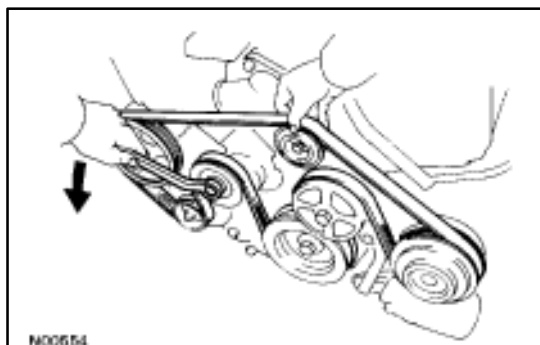
15. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor, compressor stay and ground cable with the three bolts and nut.

Torque: Bolt 49 N·m (500 kgf·cm, 36 ft·lbf)

Nut 29 N·m (300 kgf·cm, 22 ft·lbf)

(b) Connect the A/C compressor connector.

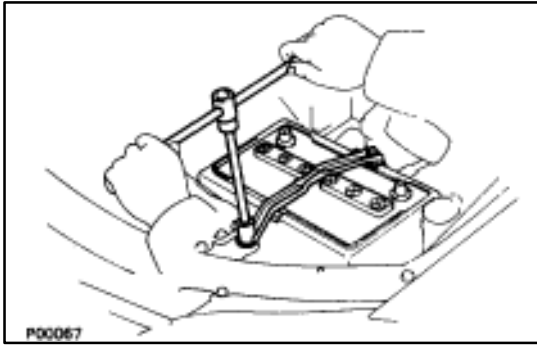


16. INSTALL DRIVE BELT

Install the drive belt by turning the drive belt tensioner counterclockwise.

HINT: The pulley bolt for the belt tensioner has a left-hand thread.

17. CONNECT RADIATOR HOSE TO WATER INLET

**18. INSTALL BATTERY**

- 19. FILL ENGINE WITH COOLANT (See page [CO-7](#))
- 20. FILL COOLING FAN RESERVOIR TANK WITH FLUID
(See pages [CO-23](#) and 24)
- 21. START ENGINE AND CHECK FOR LEAKS
- 22. INSTALL ENGINE UNDER COVER