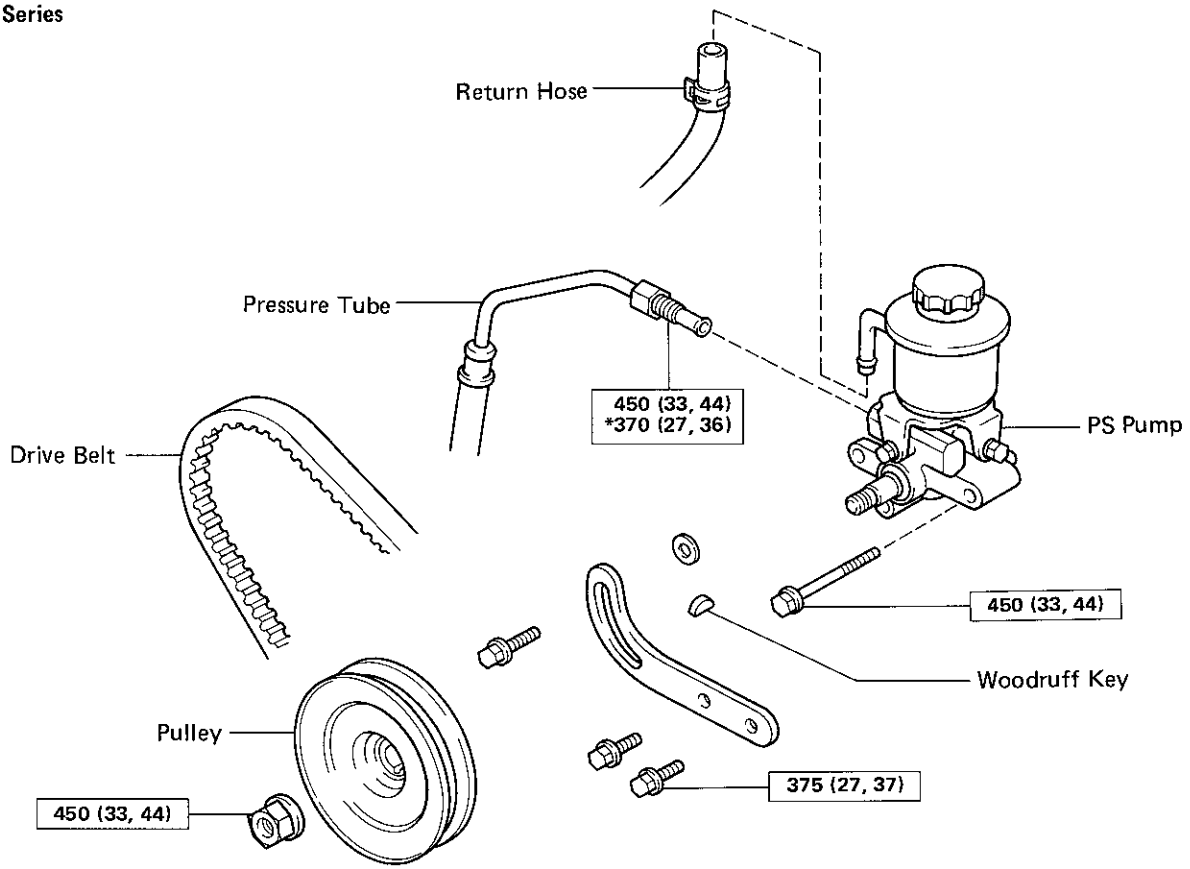
Power Steering Pump

REMOVAL AND INSTALLATION OF POWER STEERING PUMP

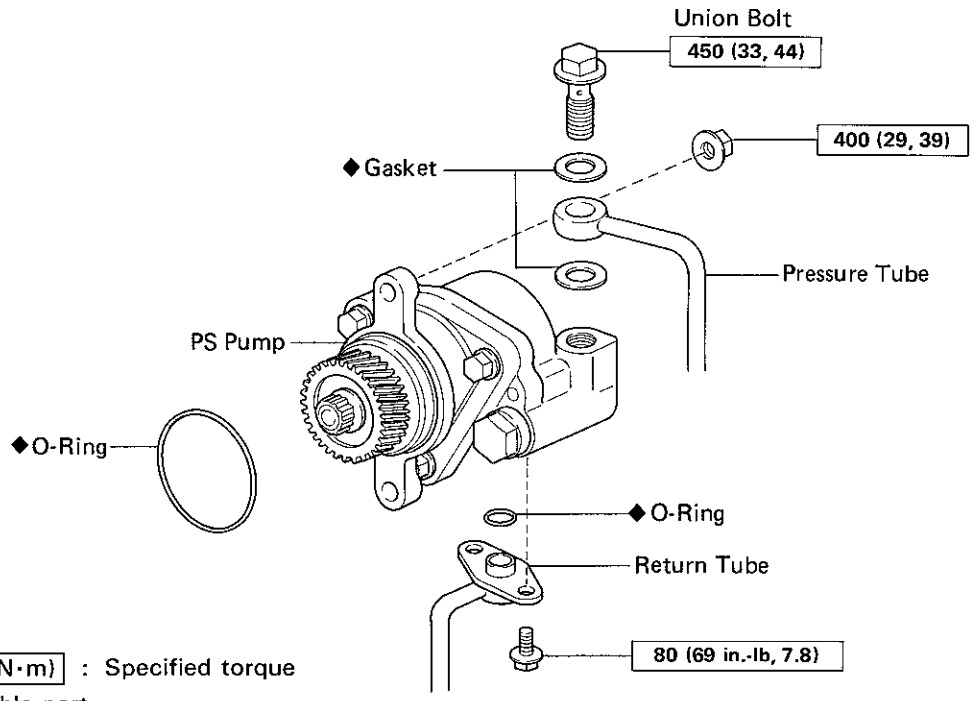
Remove and install the parts as shown.

FJ Series



SR3953

HZJ and PZJ Series



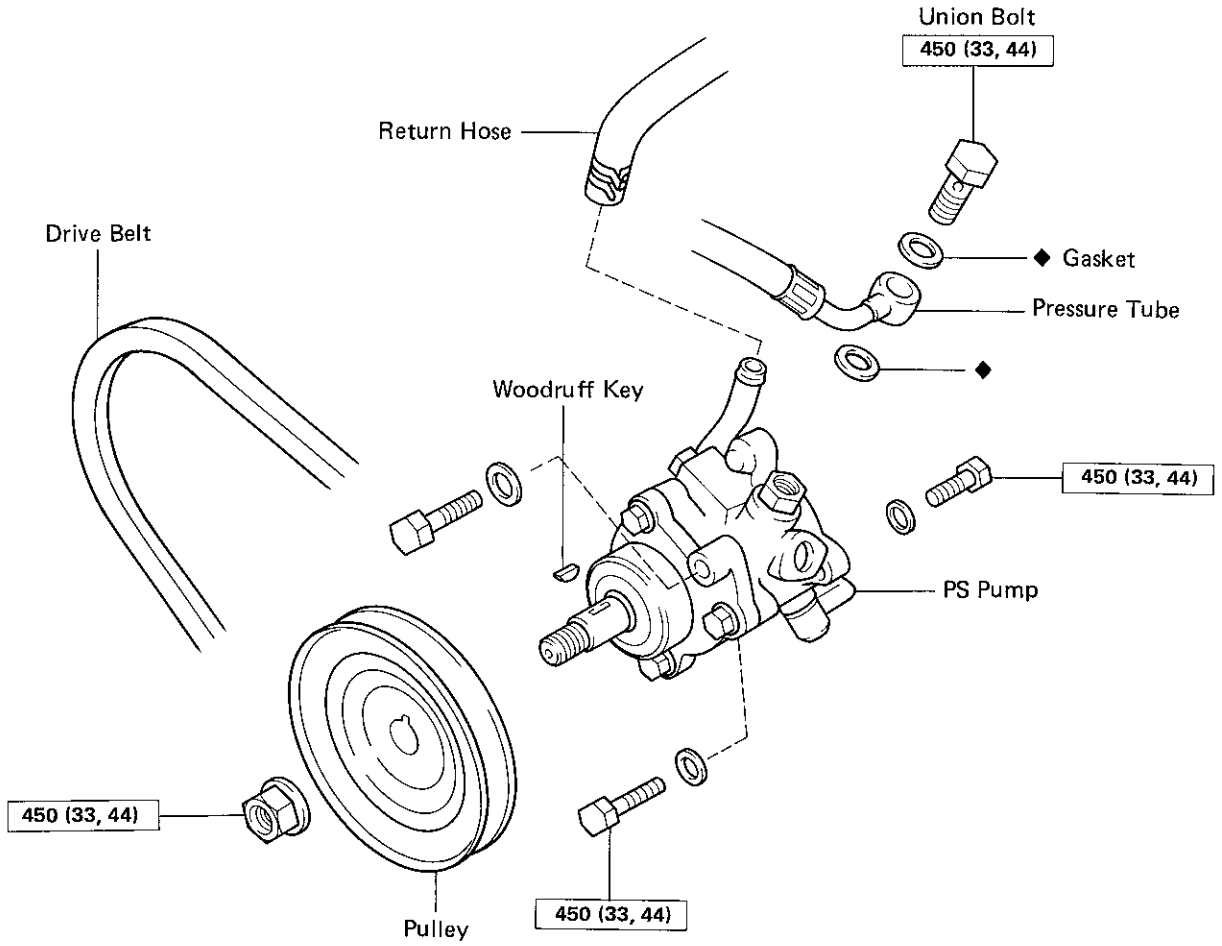
kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

* For use of SST

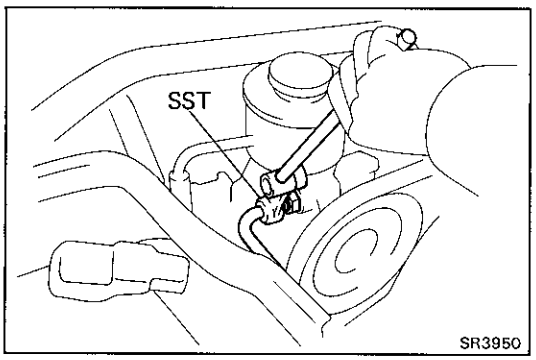
SR4139

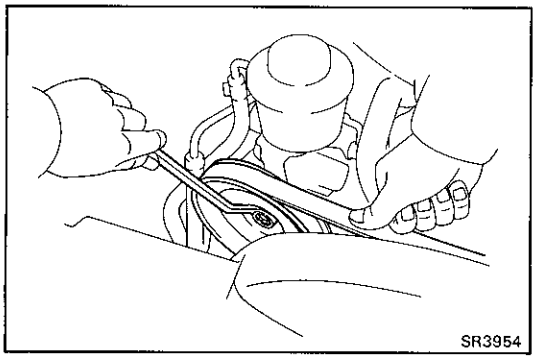
LJ and RJ Series



kg-cm (ft-lb, N·m) : Specified torque
◆ Non-reusable part

SR4145





(MAIN POINT OF REMOVAL AND INSTALLATION)

1. **(FJ Series)**
DISCONNECT AND CONNECT PRESSURE TUBE

Using SST, disconnect and connect the pressure tube from/to the PS pump.

SST 09631-22020

Torque: 370 kg-cm (27 ft-lb, 36 N·m)

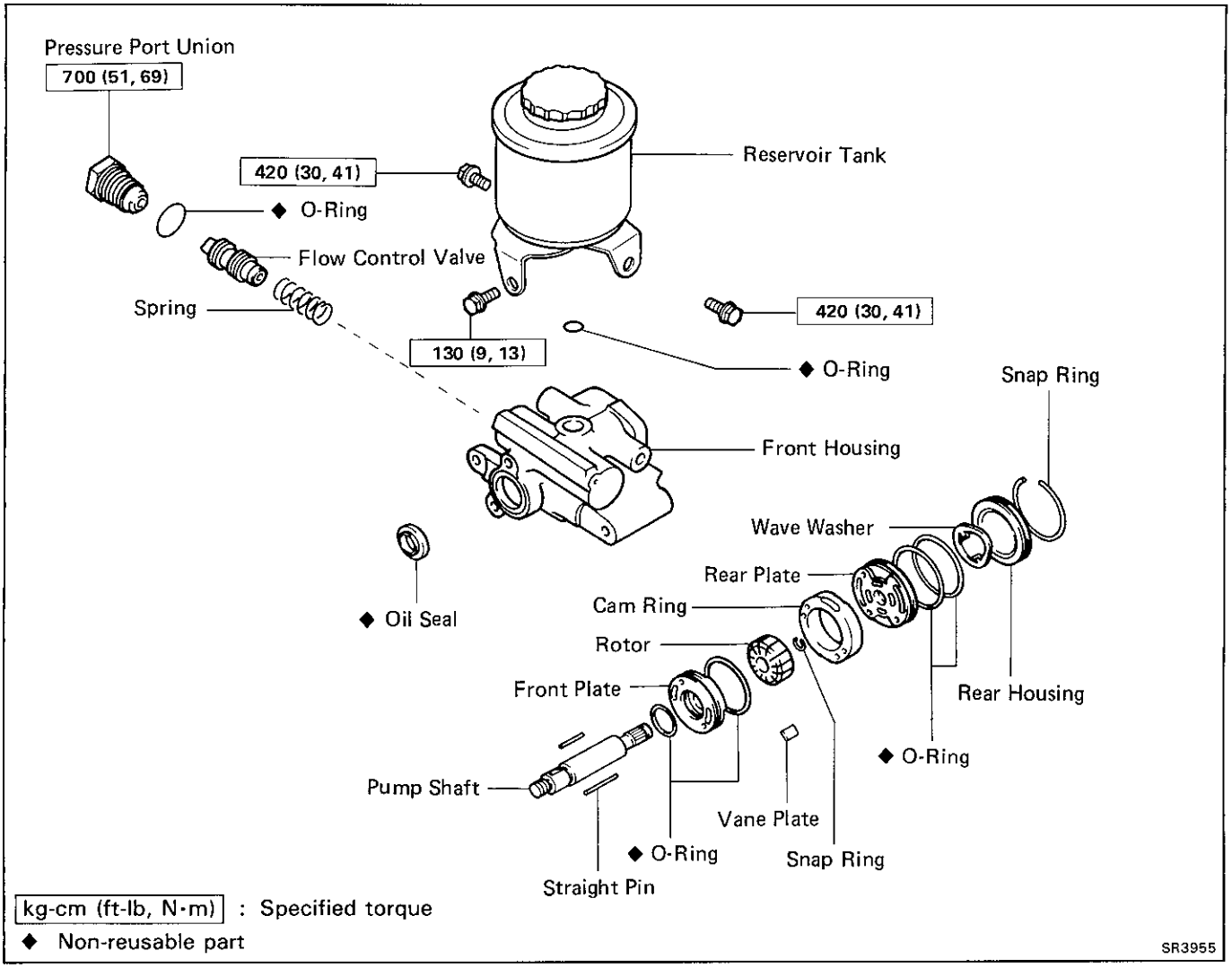
HINT: Use a torque wrench with a fulcrum length of 300mm (11.81 in.).

2. **(Ex. HZJ and PZJ Series)**
LOOSEN PULLEY NUT

Push on the drive belt with your hand to hold the pulley in place and loosen the pulley nut.

3. **(Ex. HZJ and PZJ Series)**
ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP
(See page SR-33)

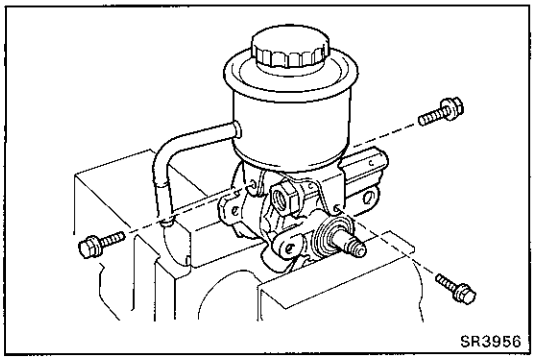
COMPONENTS (FJ series)



DISASSEMBLY OF POWER STEERING PUMP

1. **CLAMP PS PUMP IN VISE**

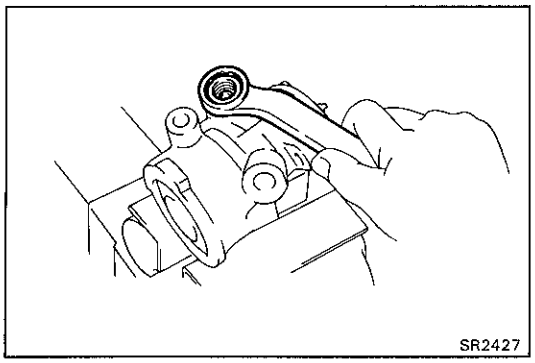
   NOTICE: Do not tighten the vise too tight.



2. **REMOVE RESERVOIR TANK**

   (a) Remove the three bolts and reservoir tank.

   (b) Remove the O-ring from the reservoir tank.

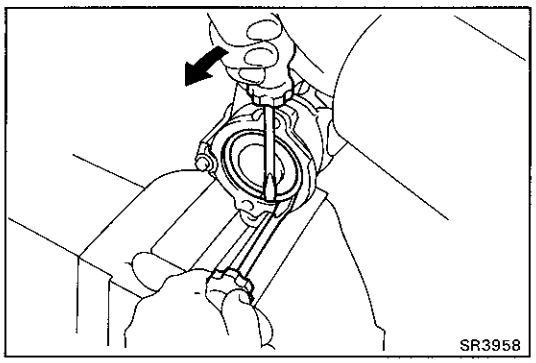


3. REMOVE PRESSURE PORT UNION AND FLOW CONTROL VALVE

(a) Remove the pressure port union.

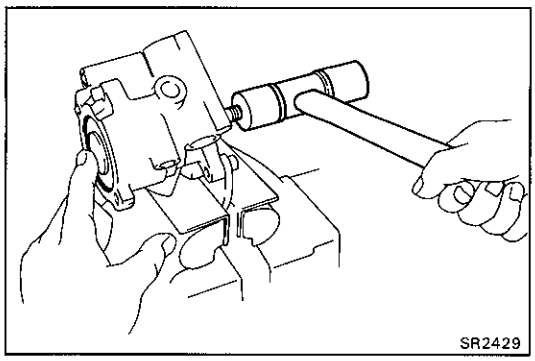
(b) Remove the O-ring from the pressure port union.

(c) Remove the flow control valve and spring.



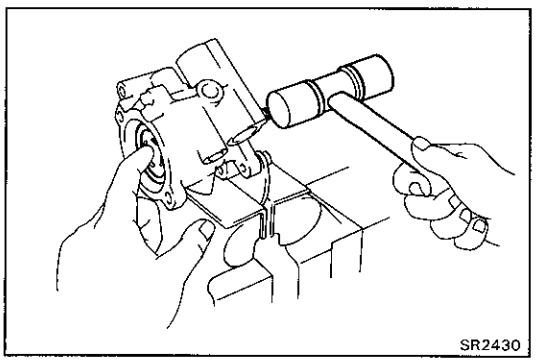
4. REMOVE REAR HOUSING

(a) Using two screwdrivers, remove the snap ring.



(b) Using a plastic hammer, tap out the rear housing and wave washer.

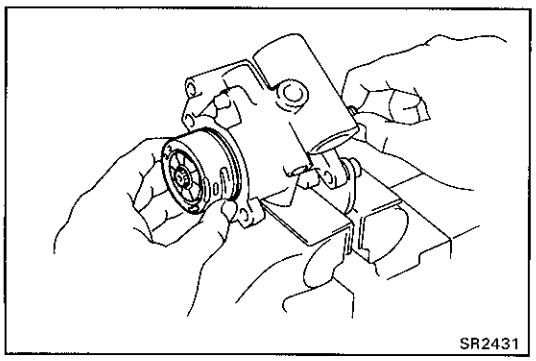
(c) Remove the O-ring from the rear housing.



5. REMOVE REAR PLATE

(a) Using a plastic hammer, tap the shaft end and remove the rear plate.

(b) Remove the O-ring from the rear plate.

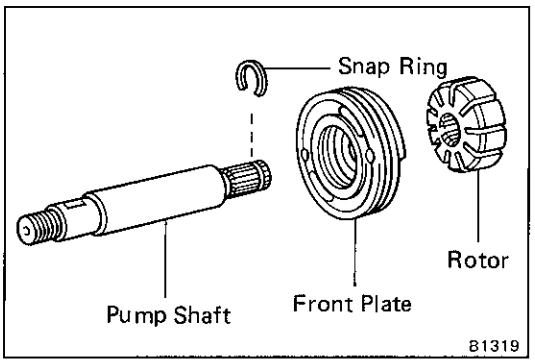


6. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES

(a) Remove the pump shaft with the cam ring, vane plates from the front housing.

(b) Remove the cam ring and ten vane plates from the pump shaft.

(c) Remove the longer straight pin from the front housing.



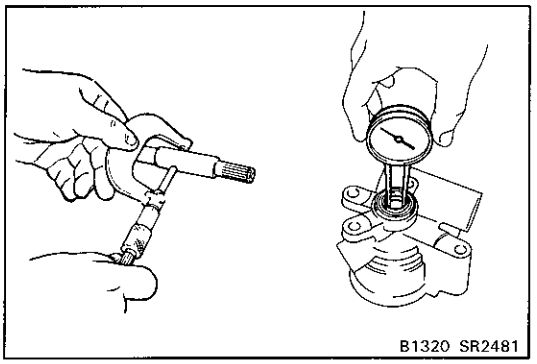
7. REMOVE ROTOR AND FRONT PLATE

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

(b) Remove the rotor and front plate from the pump shaft.

(c) Remove the two O-rings from the front plate.

(d) Remove the straight pin from the front plate.



INSPECTION OF POWER STEERING PUMP

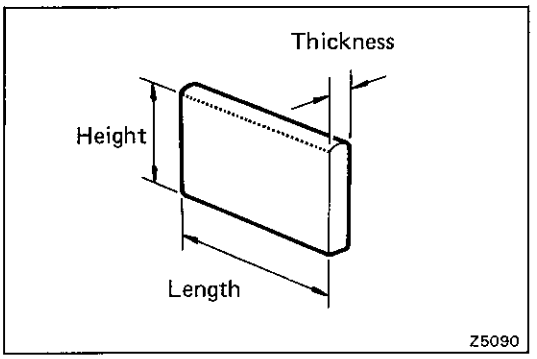
1. CHECK OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, check the oil clearance.

Standard clearance: **0.01—0.03 mm (0.0004—0.0012 in.)**

Maximum clearance: **0.07 mm (0.0028 in.)**

If more than maximum, replace the entire PS pump.



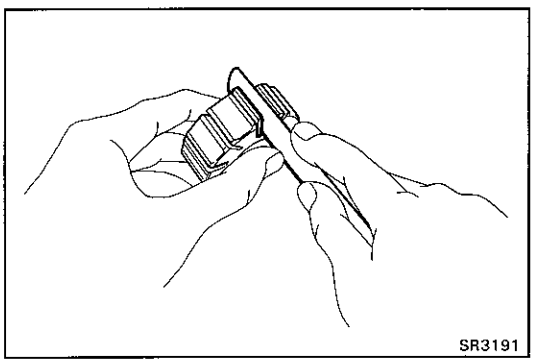
2. INSPECT ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the vane plate.

Minimum height: **8.1 mm (0.319 in.)**

Minimum thickness: **1.797 mm (0.0707 in.)**

Minimum length: **14.988 mm (0.5901 in.)**



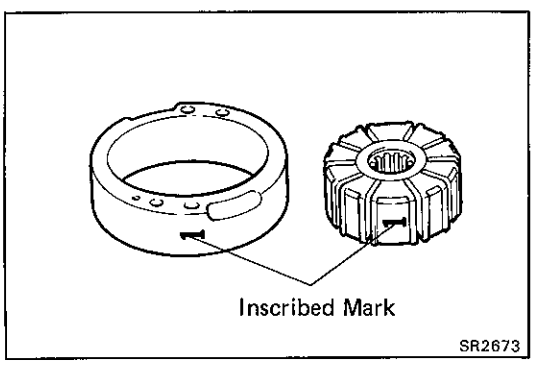
(b) Using a feeler gauge, measure the clearance between the rotor groove and vane plate.

Maximum clearance: **0.028 mm (0.0011 in.)**

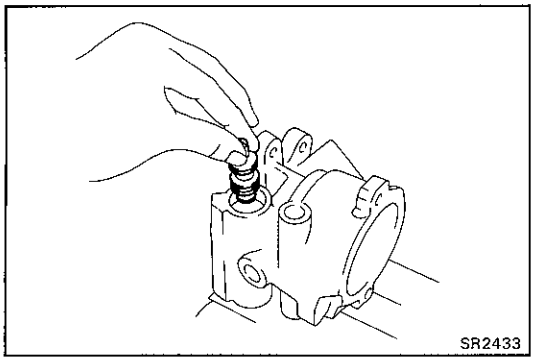
If more than maximum, replace the pump plate and/or rotor with one having the same mark stamped on the cam ring.

Inscribed mark: **1, 2, 3, 4 or None**

HINT: There are five vane lengths with the following rotor and cam ring marks:

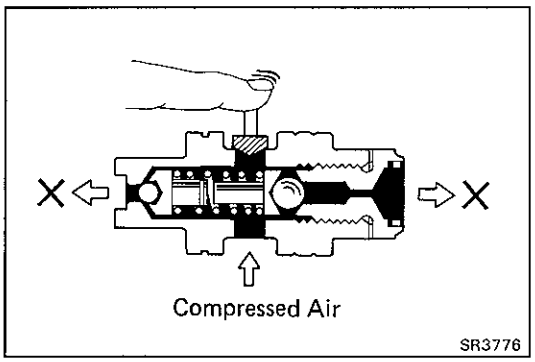


Rotor and cam ring mark	Vane length mm (in.)
None	14.996 — 14.998 (0.5904 — 0.5905)
1	14.994 — 14.996 (0.5903 — 0.5904)
2	14.992 — 14.994 (0.5902 — 0.5903)
3	14.990 — 14.992 (0.59016 — 0.59024)
4	14.988 — 14.990 (0.5901 — 0.5902)


SR2433

3. INSPECT FLOW CONTROL VALVE

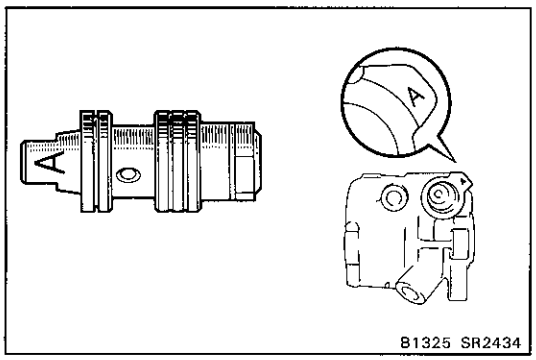
(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.



SR3776

(b) Check the flow control valve for leakage.

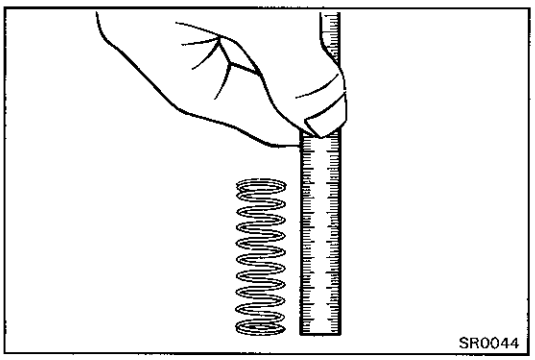
Close one of the holes and apply compressed air [4 or 5 kg/cm^2 (57 or 71 psi, 392 or 490 kPa)] into the opposite side, and confirm that air does not come out from the end hole.



B1325 SR2434

If necessary, replace the valve with one having the same letter as inscribed on the front housing.

Inscribed mark: A, B, C, D, E or F

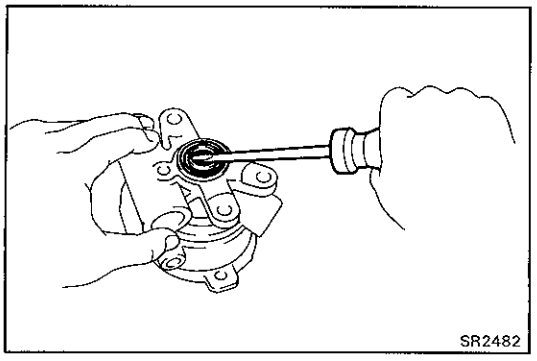

SR0044

4. INSPECT FLOW CONTROL SPRING

Using a scale, measure the free length of the spring.

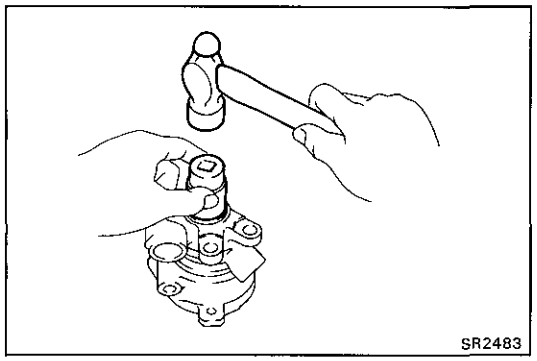
Spring length: 35 — 37 mm (1.38 — 1.46 in.)

If not within specification, replace the spring.


SR2482

5. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

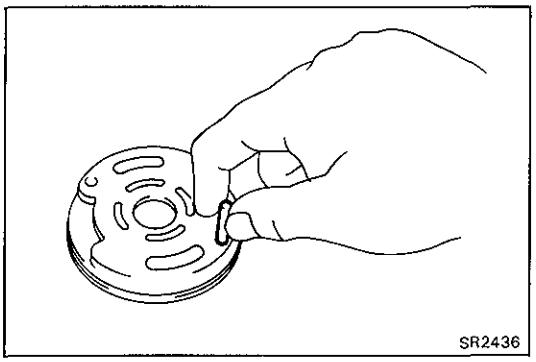


(b) Using a socket wrench and hammer, drive in a new oil seal.

ASSEMBLY OF POWER STEERING PUMP

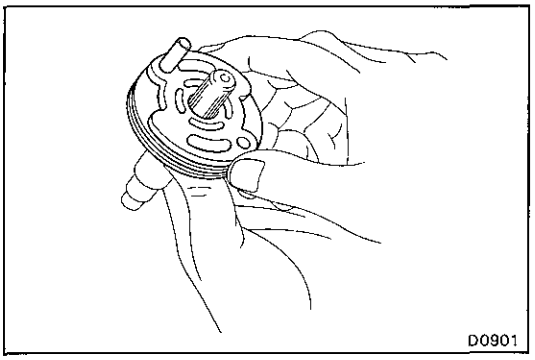
(See page SR-40)

1. COAT ALL SLIDING SURFACES WITH POWER STEERING FLUID BEFORE ASSEMBLY



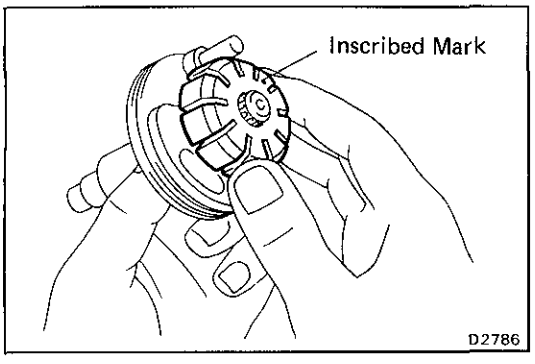
2. INSTALL FRONT PLATE AND ROTOR TO PUMP SHAFT

(a) Install the shorter straight pin to the front plate.



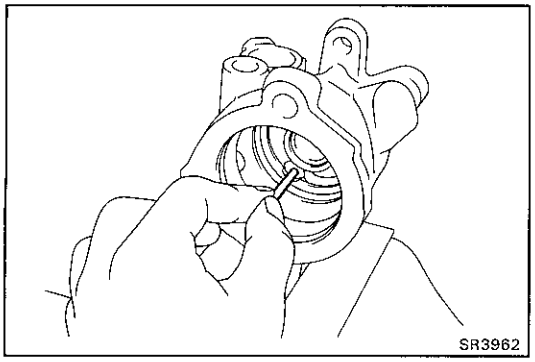
(b) Install two new O-rings to the front plate.

(c) Install the front plate to the pump shaft.



(d) Install the rotor to the pump shaft with the inscribed mark facing outward.

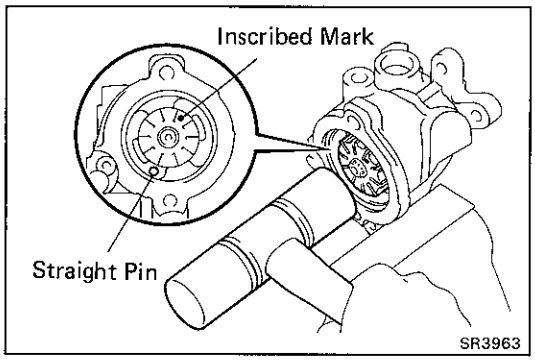
(e) Install the snap ring.



3. INSTALL PUMP SHAFT TO FRONT HOUSING

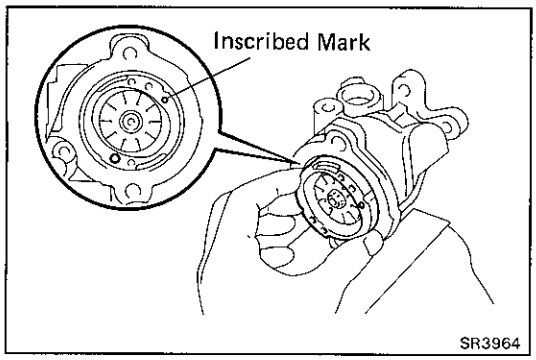
(a) Coat the oil seal lip with MP grease.

(b) Install the longer straight pin to the front housing.



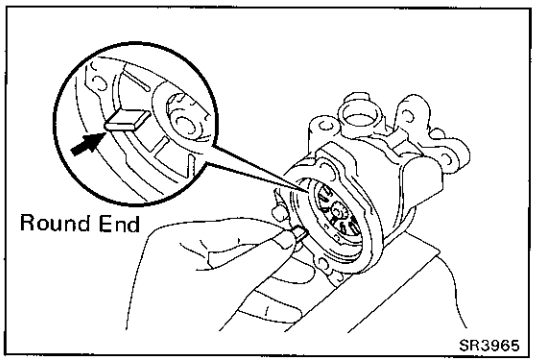
(c) Align the hole of the front plate and straight pin and tap in the pump shaft with a plastic hammer.

HINT: Be careful not to damage the oil seal and O-rings.



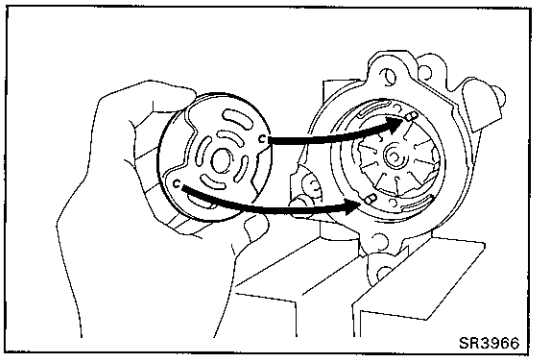
4. INSTALL CAM RING

Align the oval hole of the cam ring and longer straight pin, and insert the cam ring with the inscribed mark facing outward.



5. INSTALL VANE PLATES

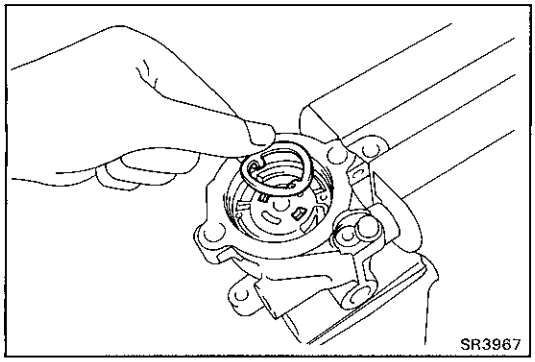
Install the ten vane plates with the round end facing outward.



6. INSTALL REAR PLATE

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

(b) Align the holes of the rear plate with the pins, and install the plate.

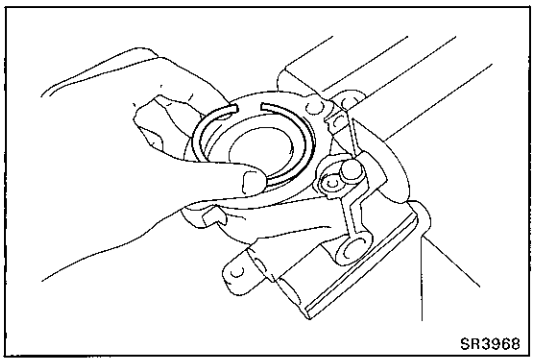

SR3967

7. INSTALL REAR HOUSING

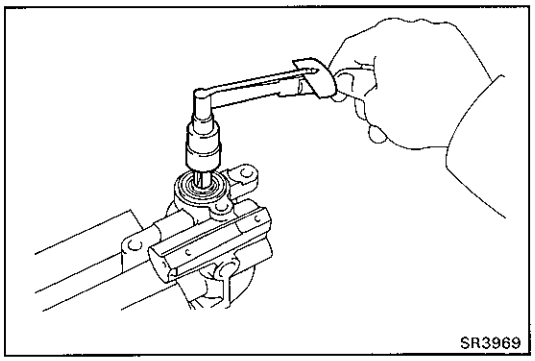
(a) Install the wave washer.

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

(c) Using a plastic hammer, tap in the rear housing.


SR3968

(d) Install the snap ring.

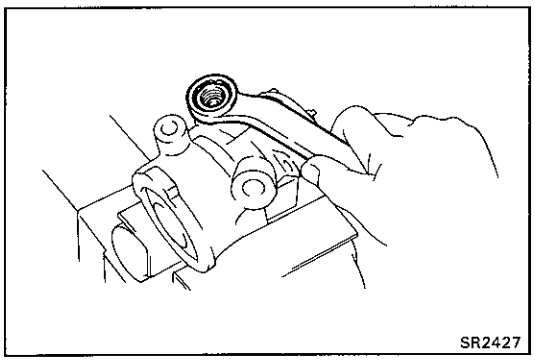

SR3969

8. CHECK PUMP SHAFT PRELOAD

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

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

Rotating torque: 2.8 kg-cm (2.4 in.-lb, 0.3 N·m) or less


SR2427

9. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

(a) Install the spring and the valve into the housing.

(b) Install a new O-ring in the groove of the pressure port union.

(c) Install and torque the pressure port union.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

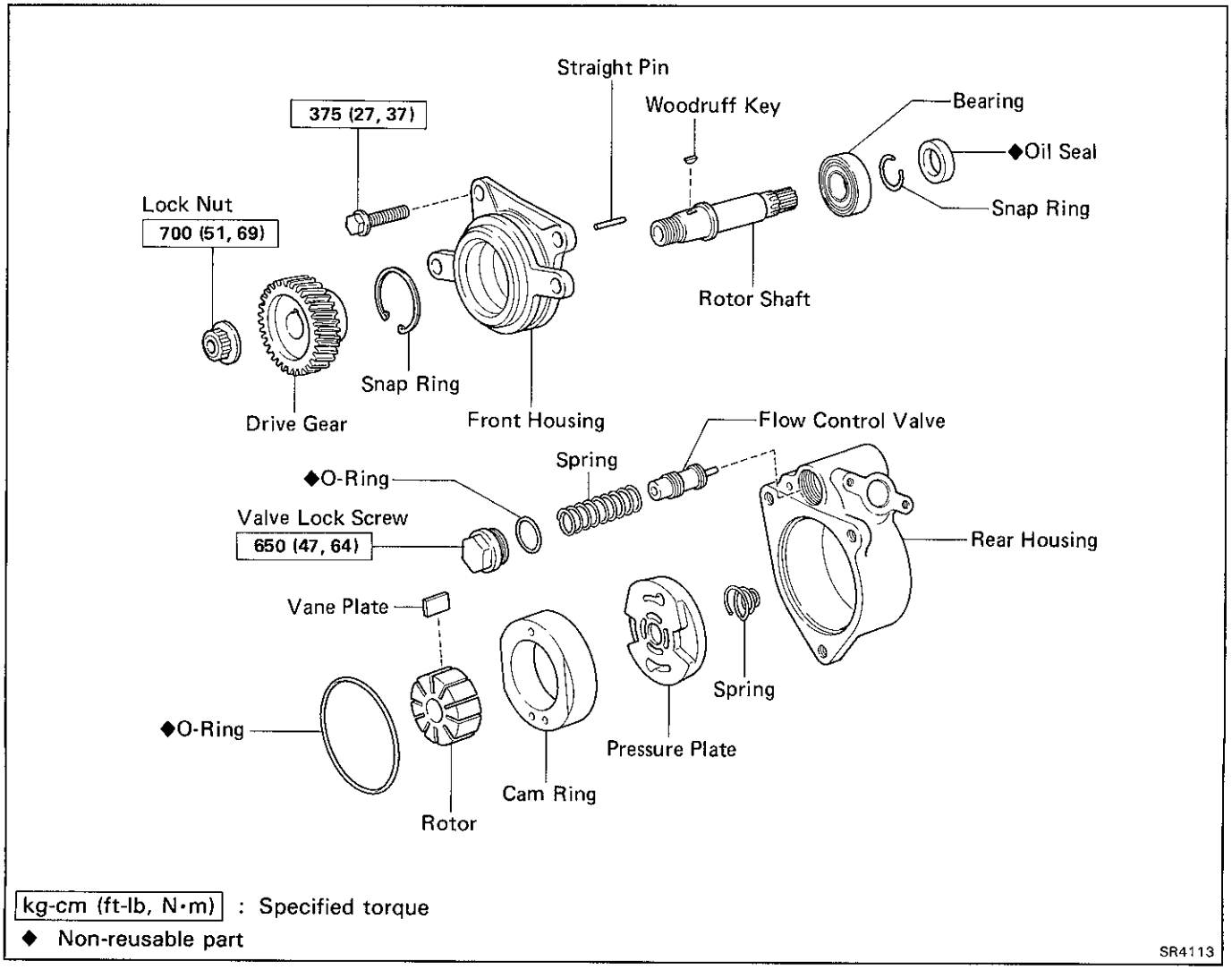
10. INSTALL RESERVOIR TANK

(a) Install a new O-ring to the reservoir tank.

(b) Install the reservoir tank to the housing and torque the three bolts.

Torque: 12 mm bolt 130 kg-cm (9 ft-lb, 13 N·m)
14 mm bolt 420 kg-cm (30 ft-lb, 41 N·m)

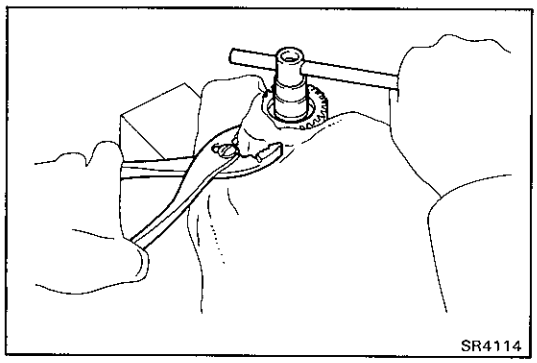
COMPONENTS (HZJ and PZJ series)



kg-cm (ft-lb, N·m) : Specified torque

◆ Non-reusable part

SR4113



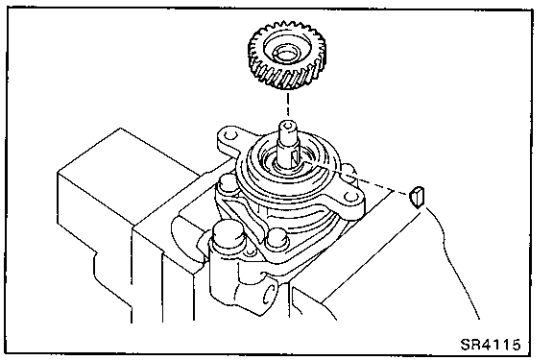
SR4114

DISASSEMBLY OF POWER STEERING PUMP

1. REMOVE DRIVE GEAR

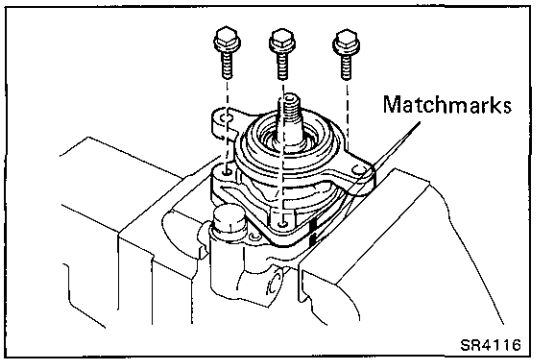
(a) While holding the driver gear with pliers, remove the lock nut.

HINT: Place the workshop rag over the gear to prevent damaging it.



SR4115

(b) Remove the gear and woodruff key.

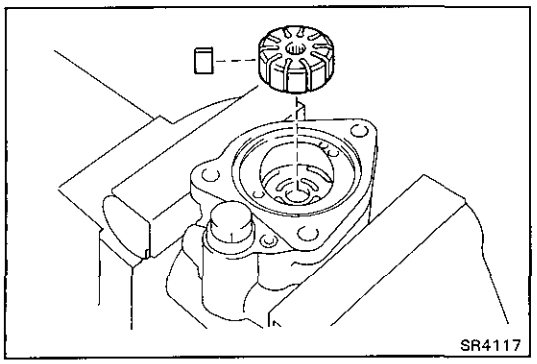


2. **REMOVE FRONT HOUSING**

(a) Place matchmarks on the front and rear housing.

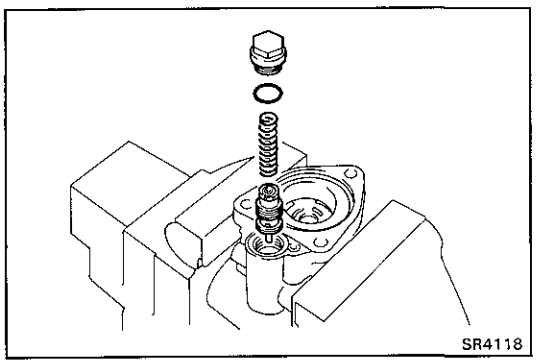
(b) Remove three bolts and the front housing.

(c) Remove the O-ring from the front housing.



3. **REMOVE ROTOR AND VANE PLATE**

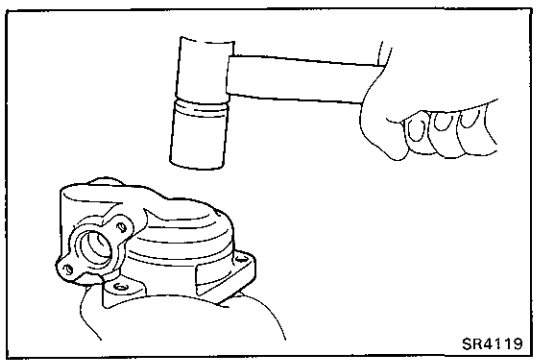
NOTICE: Be careful that the vane plates and rotor do not fall out.



4. **REMOVE VALVE LOCK SCREW, SPRING AND FLOW CONTROL VALVE**

(a) Remove the valve lock screw, spring and control valve.

(b) Remove the O-ring from the valve lock screw.

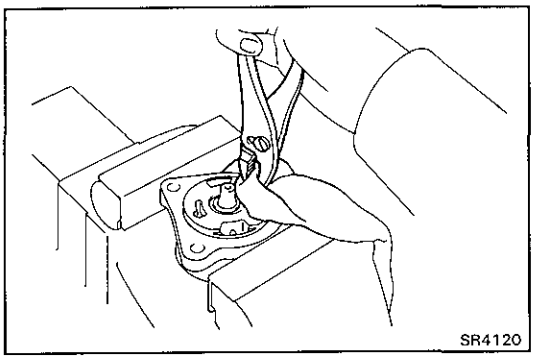


5. ***REMOVE CAM RING, PRESSURE PLATE AND SPRING***

(a) Using a plastic hammer, tap the bottom end of the rear housing, and remove the pressure plate and spring.

NOTICE: Be careful not to scratch the front side of the pressure plate.

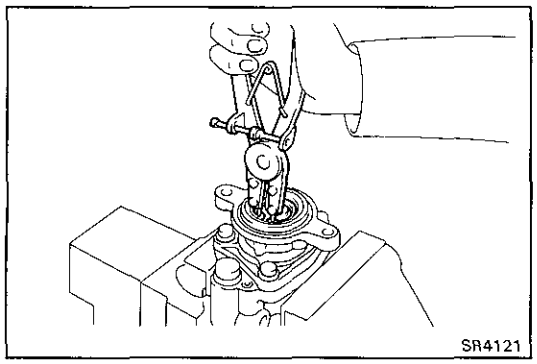
(b) Remove the O-ring from the pressure plate.



6. **REMOVE STRAIGHT PIN**

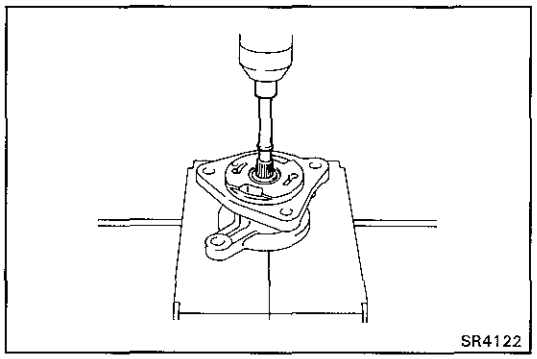
Using pliers, remove the straight pin.

HINT: Place a workshop rag over the pin to prevent damaging it.

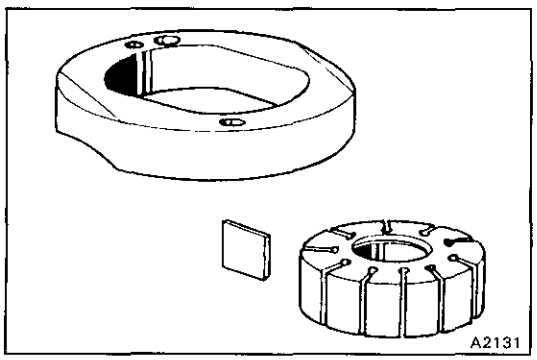

SR4121

7. REMOVE ROTOR SHAFT

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


SR4122

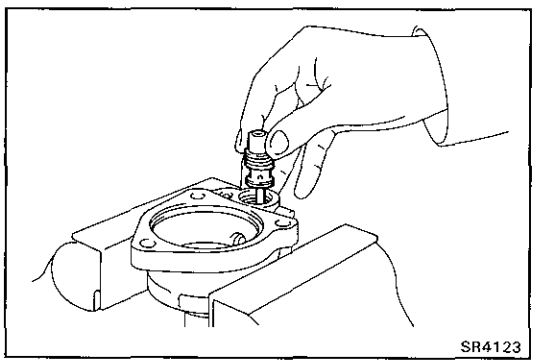
(b) Using a extension bar and press, press out the rotor shaft with bearing.


A2131

INSPECTION OF POWER STEERING PUMP

1. INSPECT ROTOR, CAM RING AND VANE PLATES

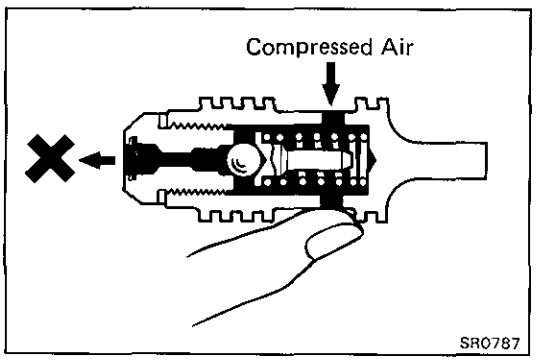
Check the cam ring for wear or scratches. If necessary, replace the cam ring with the rotor and the vane plates.


SR4123

2. INSPECT FLOW CONTROL VALVE

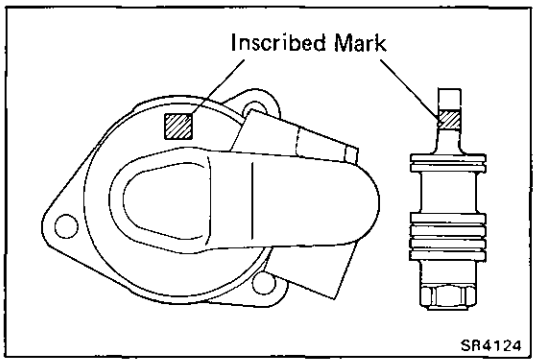
(a) Check the flow control valve for wear or damage.

(b) Apply fluid to the valve and check that it falls smoothly into the valve hole by its own weight.



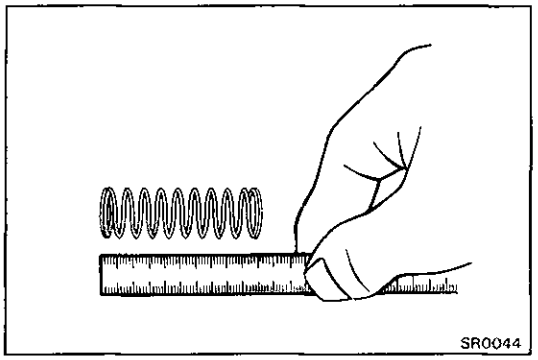
SR0787

(c) Check the flow control valve for leakage. Close one of the holes and apply compressed air [4 or 5 kg/cm^2 (57 or 71 psi, 392 or 490 kPa)] into the opposite side, and confirm that air does not come out from the end hole.



(d) If necessary, replace the valve with one having the letter as inscribed on the rear housing.

Pump housing number	Valve cutter mark
0	II
1	I
2	None

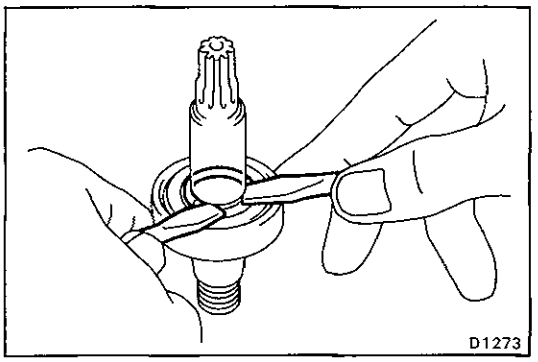


3. INSPECT FLOW CONTROL VALVE SPRING

Check that the spring length is within specification.

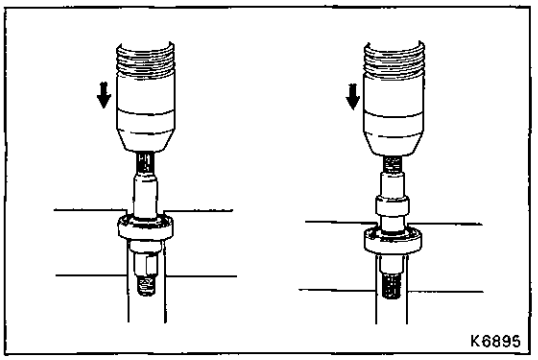
Spring length: 50 — 55 mm (1.97 — 2.17 in.)

If the spring is not within specification, replace it.



4. IF NECESSARY, REPLACE ROTOR SHAFT BEARING

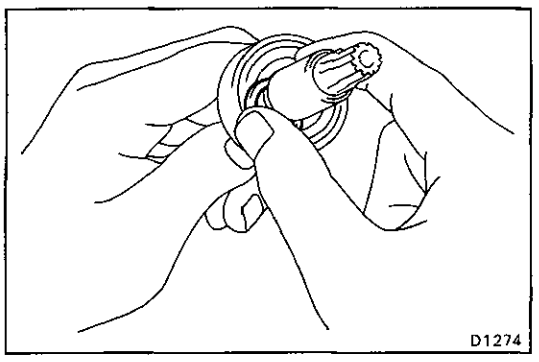
(a) Using two screwdrivers, remove the snap ring.



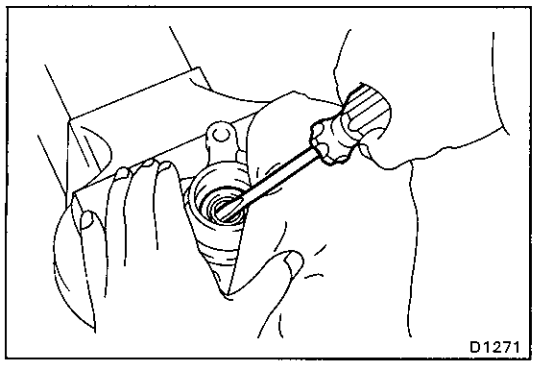
(b) Using a press, press out the bearing.

(c) Using a press, press in a new bearing.

NOTICE: Be careful not to scratch the rotor shaft contact surface with oil seal and bearing.



(d) Install the snap ring.



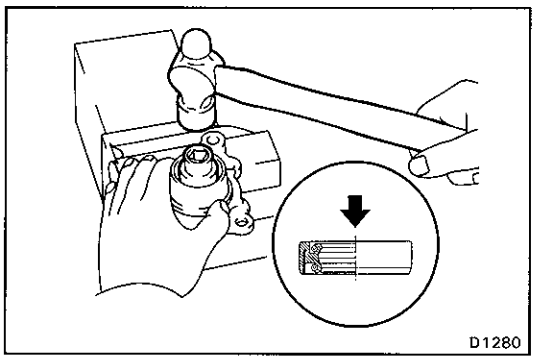
5. **IF NECESSARY, REPLACE OIL SEAL**

(a) Clamp the front housing in a vise.

NOTICE: Do not tighten the vise too tight.

(b) Using a screwdriver, remove the oil seal.

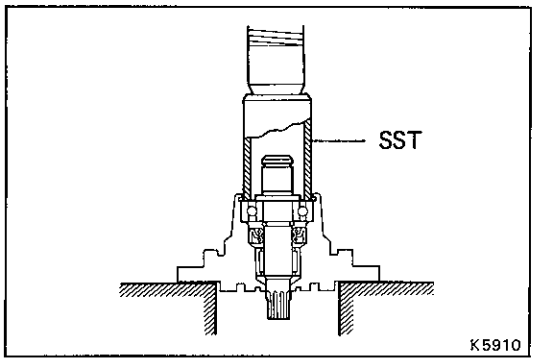
NOTICE: Be careful not to scratch the housing with a screwdriver.



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

(d) Using 23 mm socket wrench, install a new oil seal.

NOTICE: Be careful not to scratch the frictional surface of the rotor.



ASSEMBLY OF POWER STEERING PUMP

(See page SR-47)

1. COAT POWER STEERING FLUID ON EACH PARTS

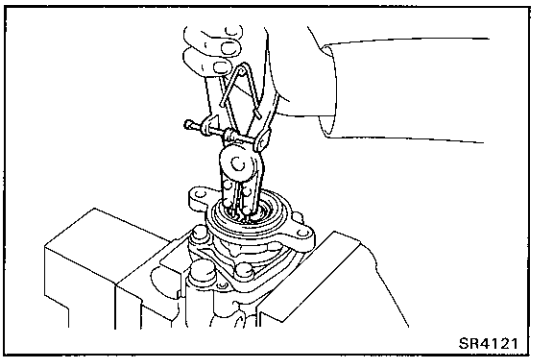
2. INSTALL ROTOR SHAFT

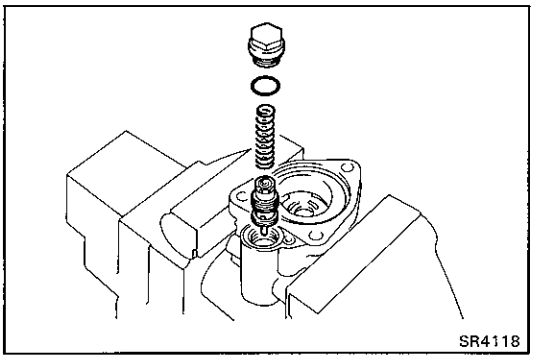
(a) Using SST and a press, press in the rotor shaft to the front housing.

SST 09632-36010

NOTICE: Be careful not to scratch the oil seal lip and the rotor frictional surface.

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





3. INSTALL FLOW CONTROL VALVE, SPRING AND VALVE LOCK CONTROL VALVE

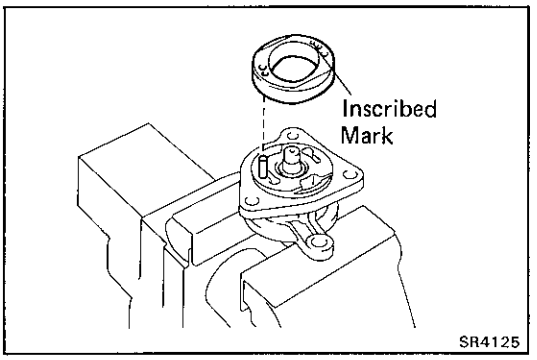
(a) Coat power steering fluid to new O-ring.

(b) Install the O-ring to the valve lock screw.

(c) Install the flow control valve and the spring.

(d) Install the valve lock screw.

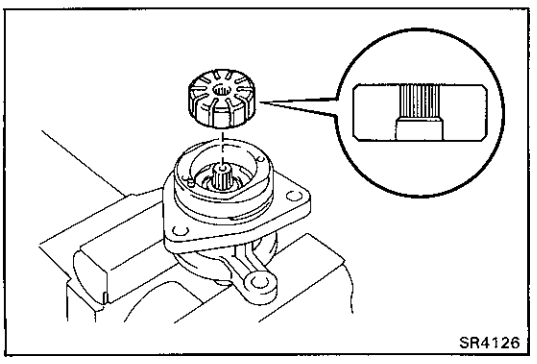
Torque: 650 kg-cm (47 ft-lb, 64 N·m)



4. INSTALL CAM RING

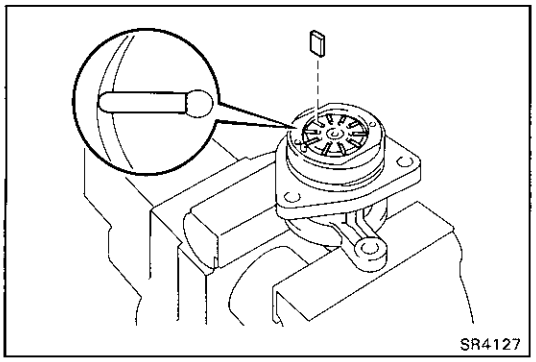
(a) Install the straight pin to the front housing.

(b) Install the cam ring with the inscribed mark facing upper side.



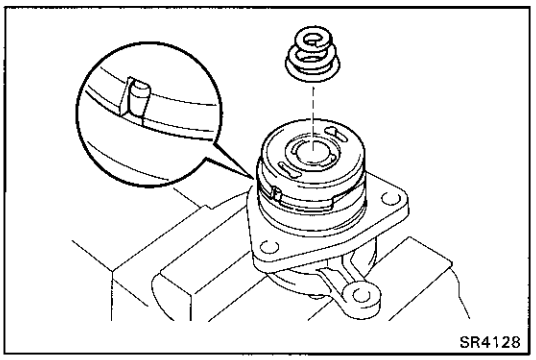
5. INSTALL ROTOR

Install the rotor as shown.



6. INSTALL VANE PLATES

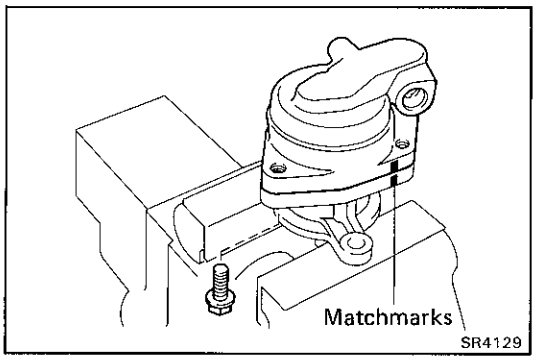
Install the vane plates with the round end facing outward.



7. INSTALL PRESSURE PLATE AND SPRING

(a) Align the cut portion of the pressure plate to the straight pin and install it.

(b) Place the spring on the pressure plate.



8. INSTALL REAR HOUSING

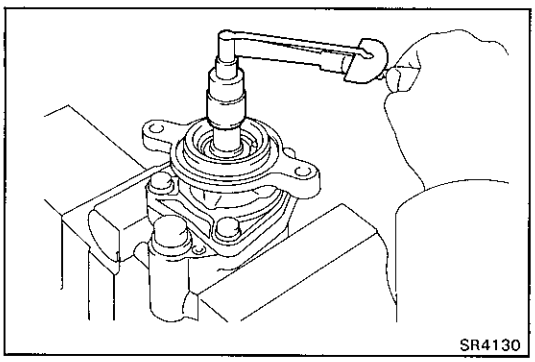
(a) Coat a new O-ring with power steering fluid.

(b) Install the O-ring to the rear housing.

(c) Align the matchmarks on the front and rear housing and assemble them.

(d) Torque the three bolts.

Torque: 375 kg-cm (27 ft-lb, 37 N·m)

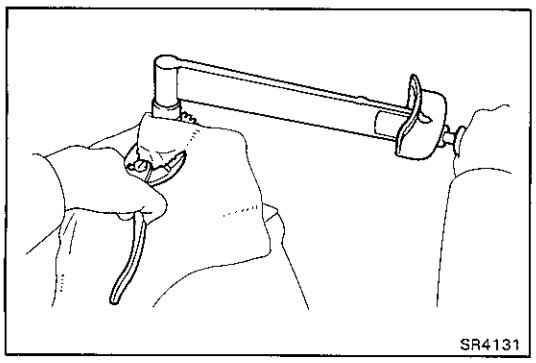


9. CHECK ROTOR SHAFT ROTATION CONDITION

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

(b) Temporarily install the gear lock nut and check the rotation torque.

Rotation torque: 2.8 kg-cm (2.4 in.-lb, 0.3 N·m) or less



10. INSTALL DRIVE GEAR

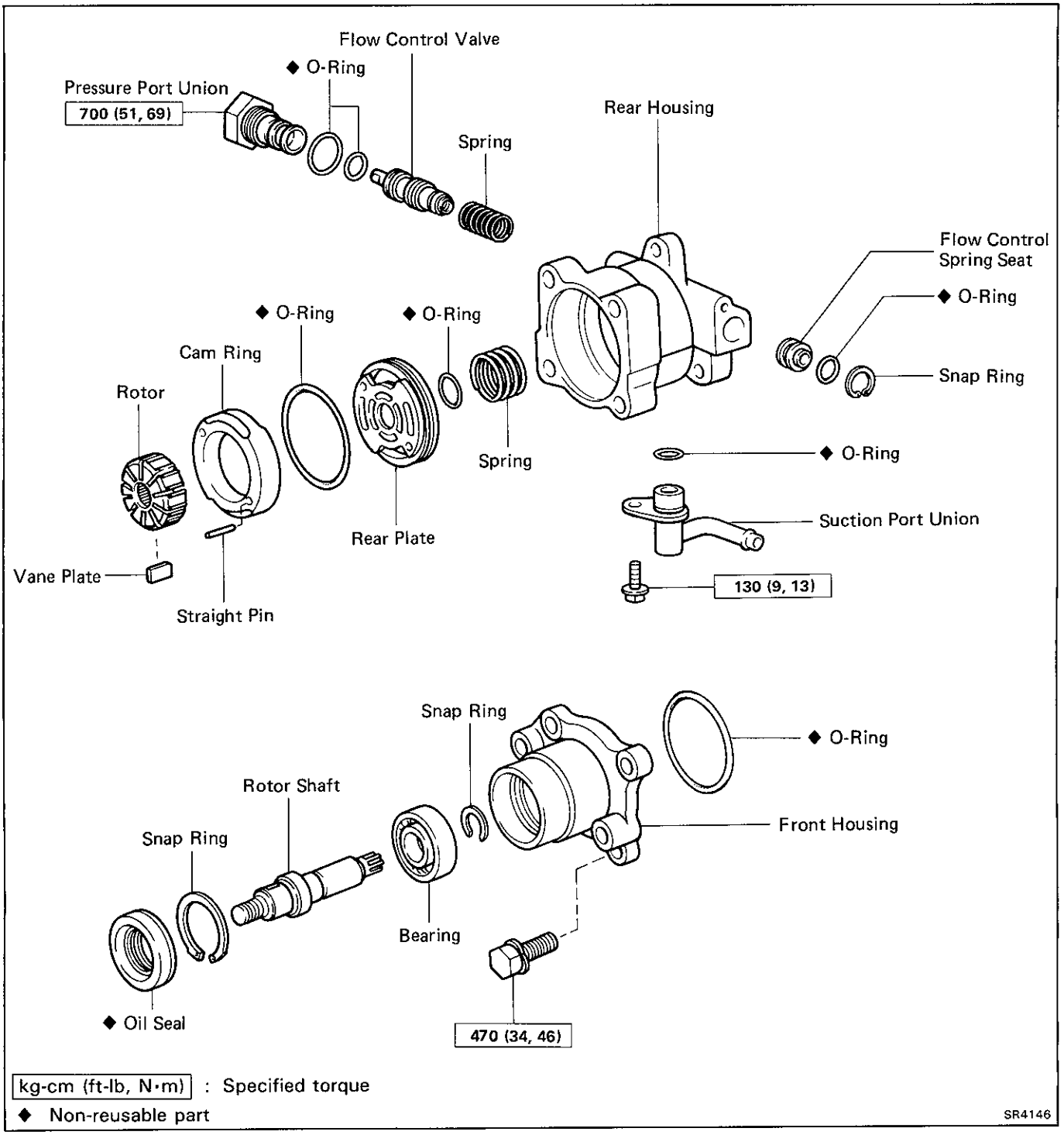
(a) Install the gear and woodruff key.

(b) While holding the gear with pliers, install the lock nut.

HINT: Place the workshop rag over the gear to prevent damaging it.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

COMPONENTS (LJ and RJ series)



kg-cm (ft-lb, N·m) : Specified torque

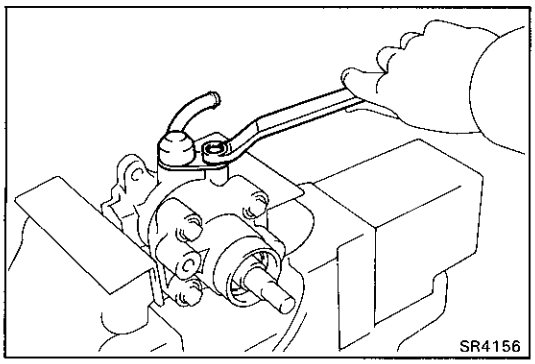
◆ Non-reusable part

SR4146

DISASSEMBLY OF POWER STEERING PUMP

1. **CLAMP PS PUMP IN VISE**

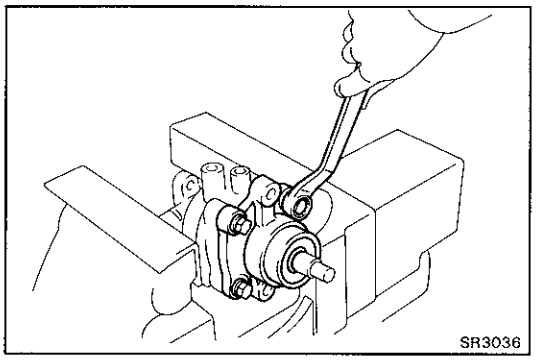
   NOTICE: Do not tighten the vise too tight.



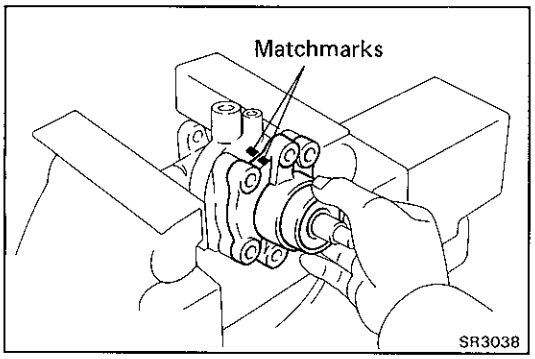
2. REMOVE SUCTION PORT UNION

(a) Remove the bolt and union.

(b) Remove the O-ring from the union.



3. REMOVE FOUR FRONT HOUSING BOLTS

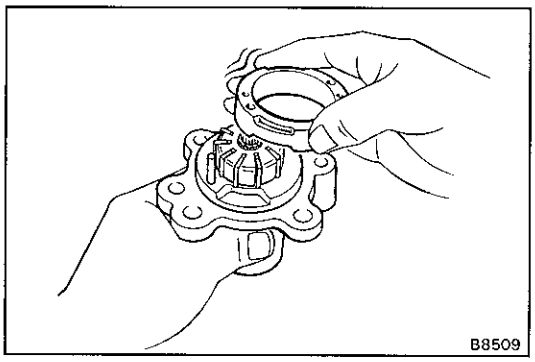


4. REMOVE FRONT HOUSING

(a) Place matchmarks on the front and rear housing.

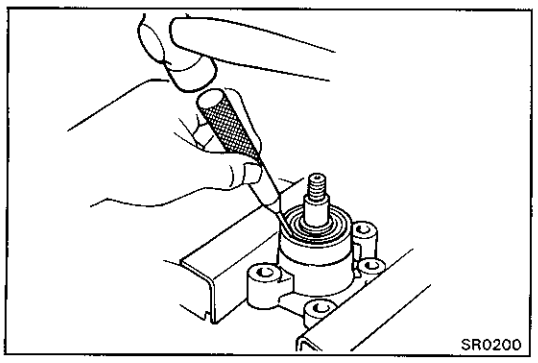
(b) Using a plastic hammer, tap off the front housing.

NOTICE: Be careful that the vane plates, rotor and cam ring do not fall out.



5. REMOVE CAM RING, ROTOR AND VANE PLATES

NOTICE: Be careful not to scratch the cam ring, rotor or vane plates.



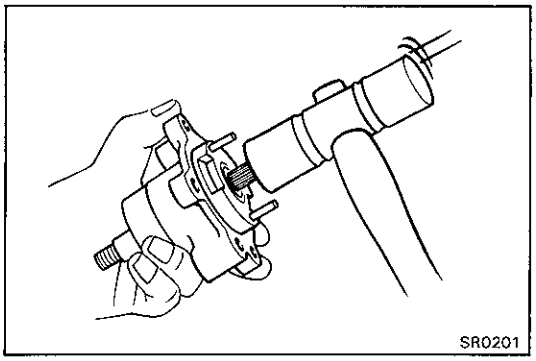
6. REMOVE ROTOR SHAFT

(a) Clamp the front housing in a vise.

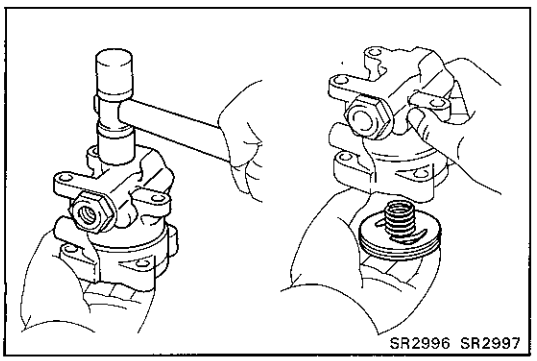
NOTICE: Do not tighten the vise too tight.

(b) Using a chisel and hammer, pry off the oil seal.

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

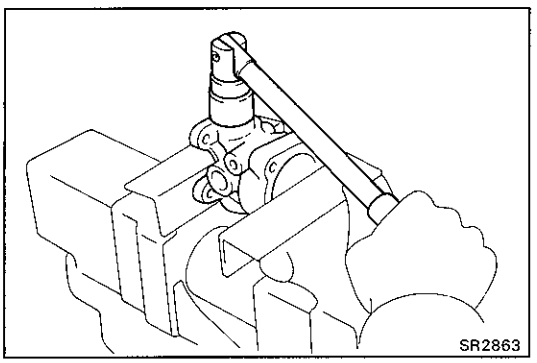

SR0201

(d) Using a plastic hammer, lightly tap the rotor shaft out of the front housing.


SR2996 SR2997

7. REMOVE REAR PLATE AND SPRING

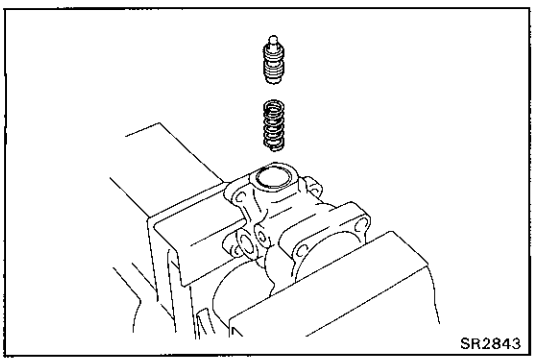
Using a plastic hammer, tap the bottom end of the rear housing, and remove the rear plate and spring.


SR2863

8. REMOVE PRESSURE PORT UNION

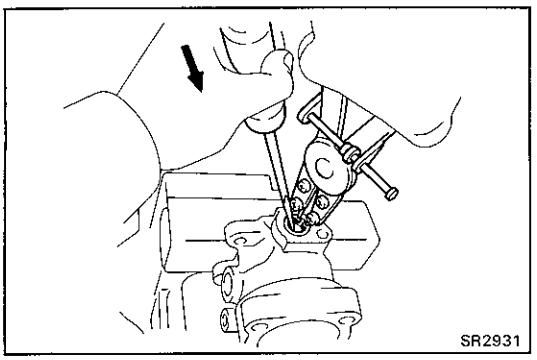
(a) Remove the pressure port union.

(b) Remove the O-rings from the union and housing.


SR2843

(c) Remove the flow control valve and spring.

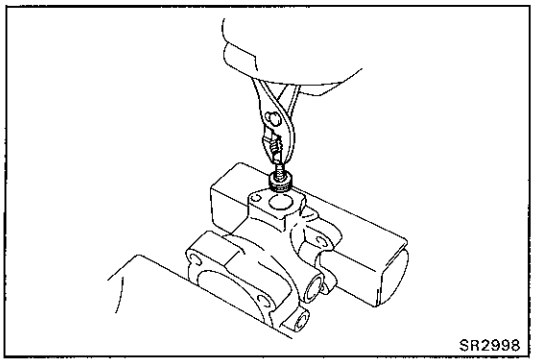
NOTICE: Use care not to drop, scratch or nick this valve.


SR2931

9. REMOVE FLOW CONTROL SPRING SEAT

(a) Temporarily install a bolt to the spring seat.

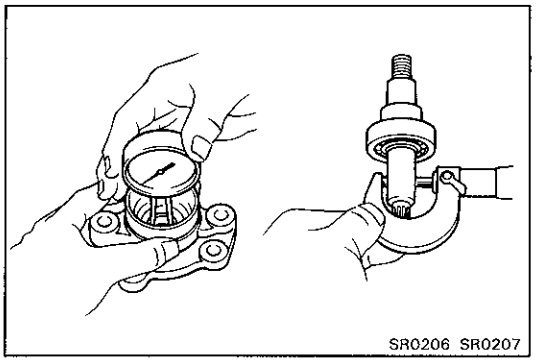
(b) Push the bolt and remove the snap ring with snap ring pliers.


SR2998

(c) Pull out the bolt and remove the spring seat.

(d) Remove the O-ring from the spring seat.

INSPECTION OF POWER STEERING PUMP


SR0206 SR0207

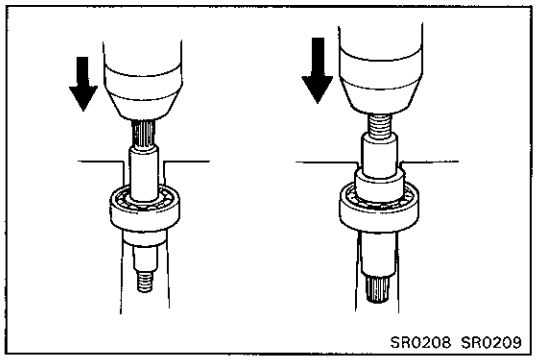
1. INSPECT BUSHING AND MEASURE BUSHING OIL CLEARANCE

(a) Check the bushing for wear or damage. The bushing cannot be replaced separately.

If wear or damage is found, replace entire housing.

(b) Check the oil clearance between the bushing and rotor shaft.

Maximum oil clearance: 0.07 mm (0.0028 in.)


SR0208 SR0209

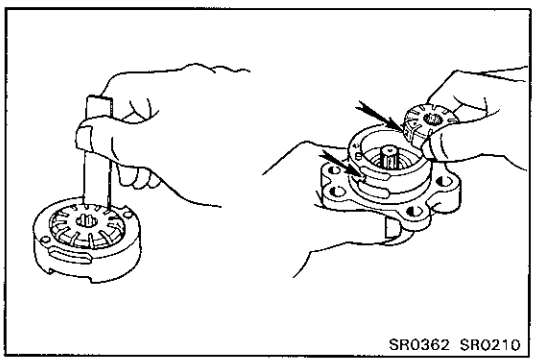
2. IF NECESSARY, REPLACE ROTOR SHAFT BEARING

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

(b) Using a press, press out the bearing.

(c) Using a press, press in a new bearing.

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

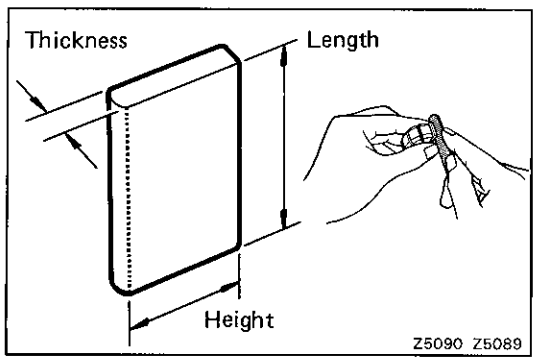

SR0362 SR0210

3. INSPECT ROTOR AND CAM RING

Measure the cam ring thickness. Check that the difference between the rotor and cam ring measurement is less than maximum.

Maximum difference: 0.06 mm (0.0024 in.)

If the difference is excessive, replace the cam ring with one having the same letter as on the rotor.



Z5090 Z5089

4. INSPECT AND MEASURE VANE PLATES

(a) Check the vane plates for wear or scratches.

(b) Measure the length, height and thickness of the vane plates.

Minimum length: 14.97 mm (0.5894 in.)

Minimum height: 7.8 mm (0.307 in.)

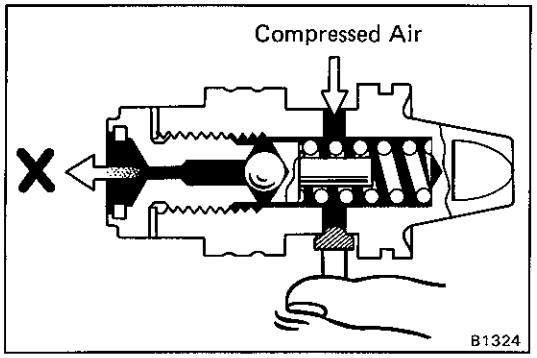
Minimum thickness: 1.7 mm (0.067 in.)

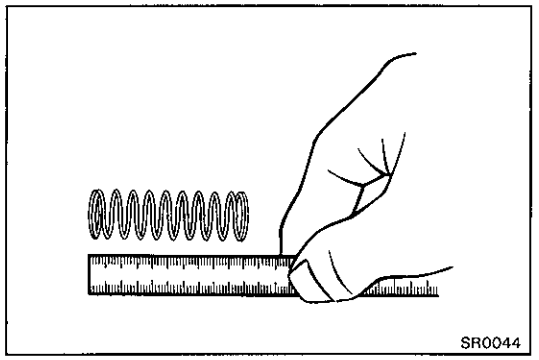
(c) Measure the clearance between the vane plate and rotor groove.

Maximum clearance: 0.06 mm (0.0024 in.)

HINT: There are five vane lengths with the following rotor and cam ring numbers:

Rotor and cam ring number	Vane length mm (in.)
None	14.996 — 14.998 (0.5904 — 0.5905)
1	14.994 — 14.996 (0.5903 — 0.5904)
2	14.992 — 14.994 (0.5902 — 0.5903)
3	14.990 — 14.992 (0.59016 — 0.59024)
4	14.988 — 14.990 (0.5901 — 0.5902)





5. INSPECT FLOW CONTROL VALVE

(a) Check the flow control valve for wear or damage.

(b) Apply fluid to the valve and check that if falls smoothly into the valve hole by its own weight.

(c) Check the flow control valve for leakage. Close one of the holes and apply compressed air [4 or 5 kg/cm^2 (57 or 71 psi, 392 or 490 kPa)] into the opposite side, and confirm that air does not come out from the end hole.

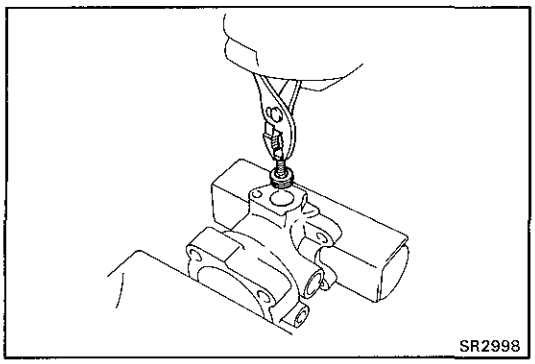
If necessary, replace the valve with one having the same letter as inscribed on the rear housing.

6. INSPECT FLOW CONTROL VALVE SPRING

Check that the spring is within specification.

Spring length: 47 — 50 mm (1.85 — 1.97 in.)

If the spring is not within specification, replace it.


SR2998

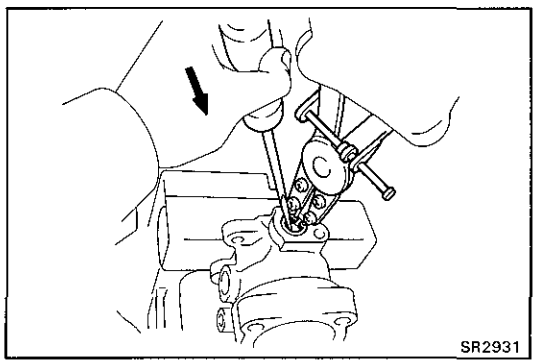
ASSEMBLY OF POWER STEERING PUMP

(See page SR-54)

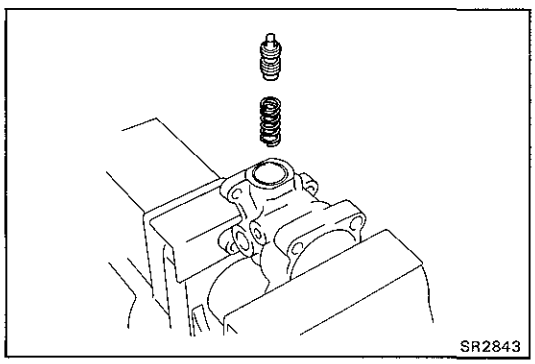
1. INSTALL FLOW CONTROL SPRING SEAT

(a) Install a new O-ring to the spring seat.

(b) Insert the spring seat to the housing.


SR2931

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


SR2843

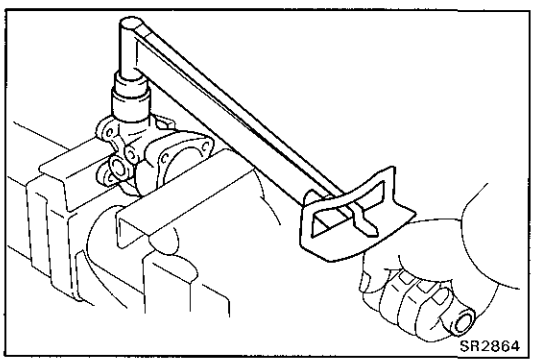
2. INSTALL FLOW CONTROL VALVE AND SPRING

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

(b) Insert the spring and valve to the housing.

HINT: Be sure the letter inscribed on the flow control valve matches the letter stamped on the rear of the pump body.

Inscribed mark: A, B, C, D, E or F

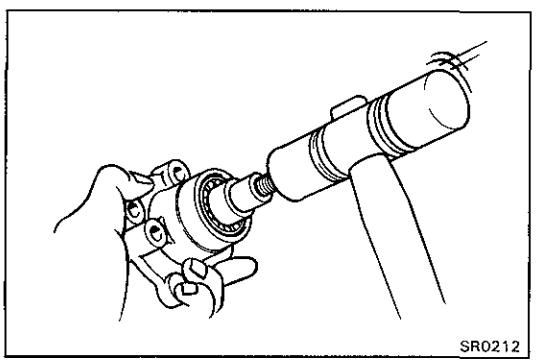

SR2864

3. INSTALL PRESSURE PORT UNION

(a) Install a new O-ring to the pressure port union.

(b) Install and torque the union.

Torque: 700 kg-cm (51 ft-lb, 69 N·m)

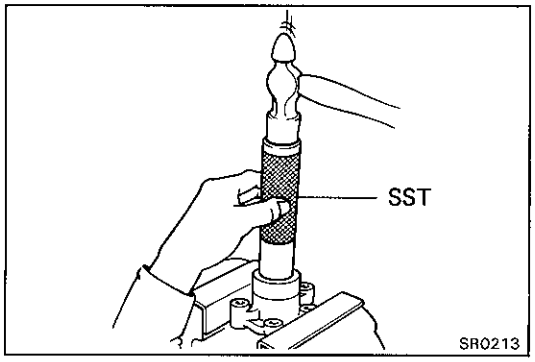

SR0212

4. INSTALL ROTOR SHAFT TO FRONT HOUSING

Install the rotor shaft into the front housing by tapping it in with a plastic hammer.

5. INSTALL SNAP RING

Using snap ring pliers, install the snap ring to the front housing.

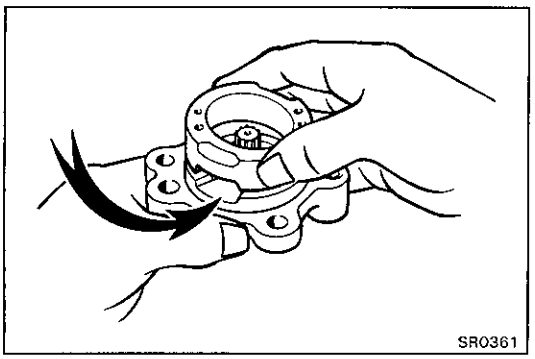


6. INSTALL OIL SEAL

(a) Apply a light coat of MP grease to the oil seal lip.

(b) Using SST and hammer, install the oil seal.

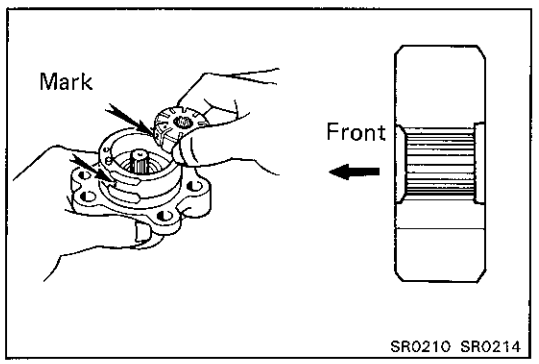
SST 09608-30012 (09608-04030)



7. INSTALL NEW O-RING

8. INSTALL CAM RING

Align the fluid passages of the cam ring and front housing, and install the cam ring.

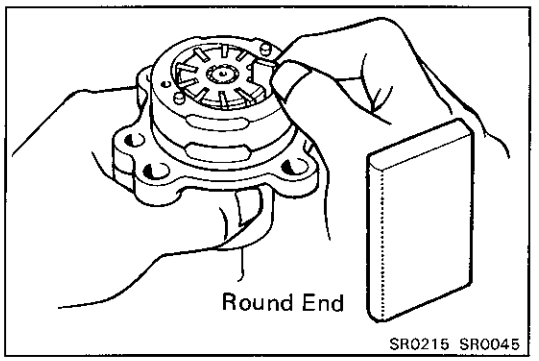


9. INSTALL ROTOR

Install the rotor with the chamfered end facing toward the front.

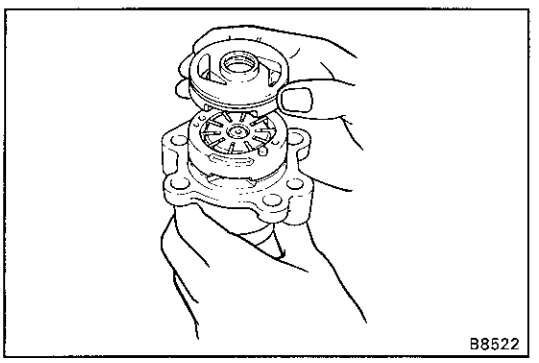
HINT: Be sure the letters inscribed on the cam ring and rotor match.

Inscribed mark: 1, 2, 3, 4, or None



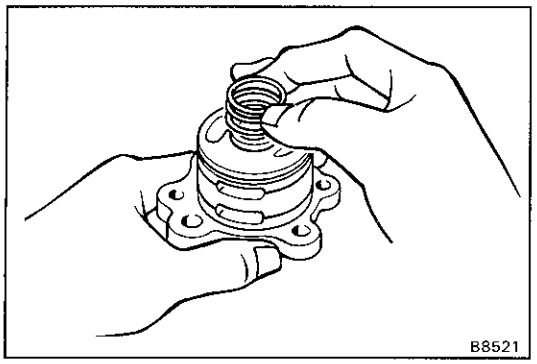
10. INSTALL VANE PLATES

Install the vane plates with the round end facing outward.

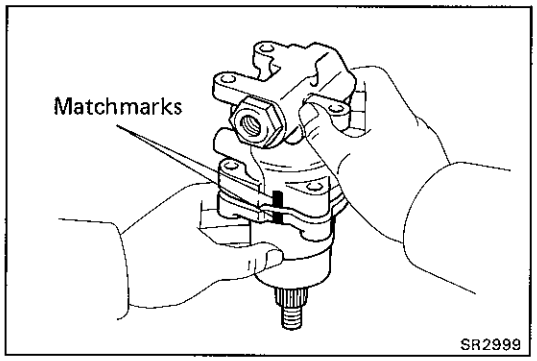


11. INSTALL REAR PLATE AND SPRING

(a) Align the fluid passages of the rear plate and cam ring, and install the rear plate.



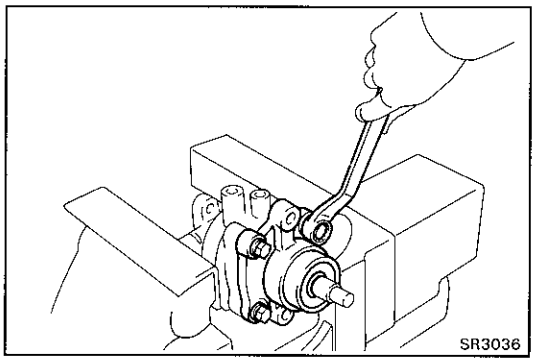
(b) Place the spring on the rear plate.



12. INSTALL REAR HOUSING

(a) Align the matchmarks on the front and rear housing and assemble them.

(b) Tighten the front and rear housing mount bolts by hand.



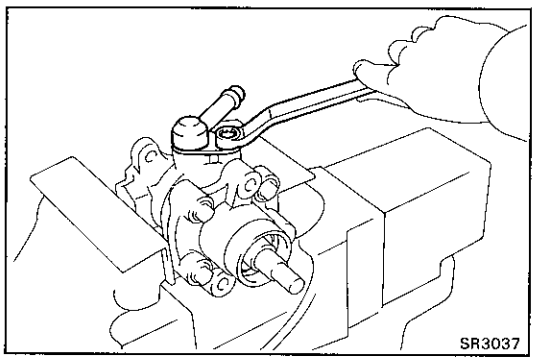
13. TIGHTEN FOUR HOUSING BOLTS

(a) Clamp the rear housing in a vise.

NOTICE: Do not tighten the vise too tight.

(b) Tighten the four housing bolts evenly in 3 or 4 passes.

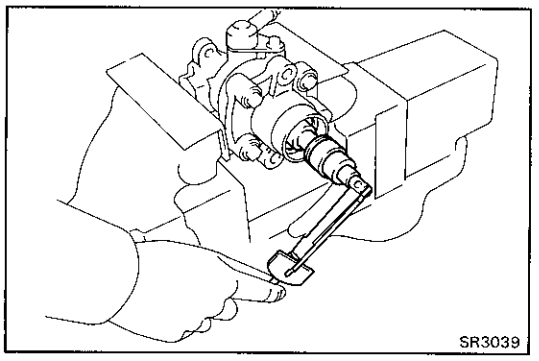
Torque: 470 kg-cm (34 ft-lb, 46 N·m)



14. INSTALL SUCTION PORT UNION

Insert and tighten the union.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)



15. CHECK ROTOR SHAFT ROTATION CONDITION

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

(b) Provisionally install the pulley nut and check the rotation torque.

Rotation torque: 2.8 kg-cm (2.4 in.-lb, 0.3 N·m) or less