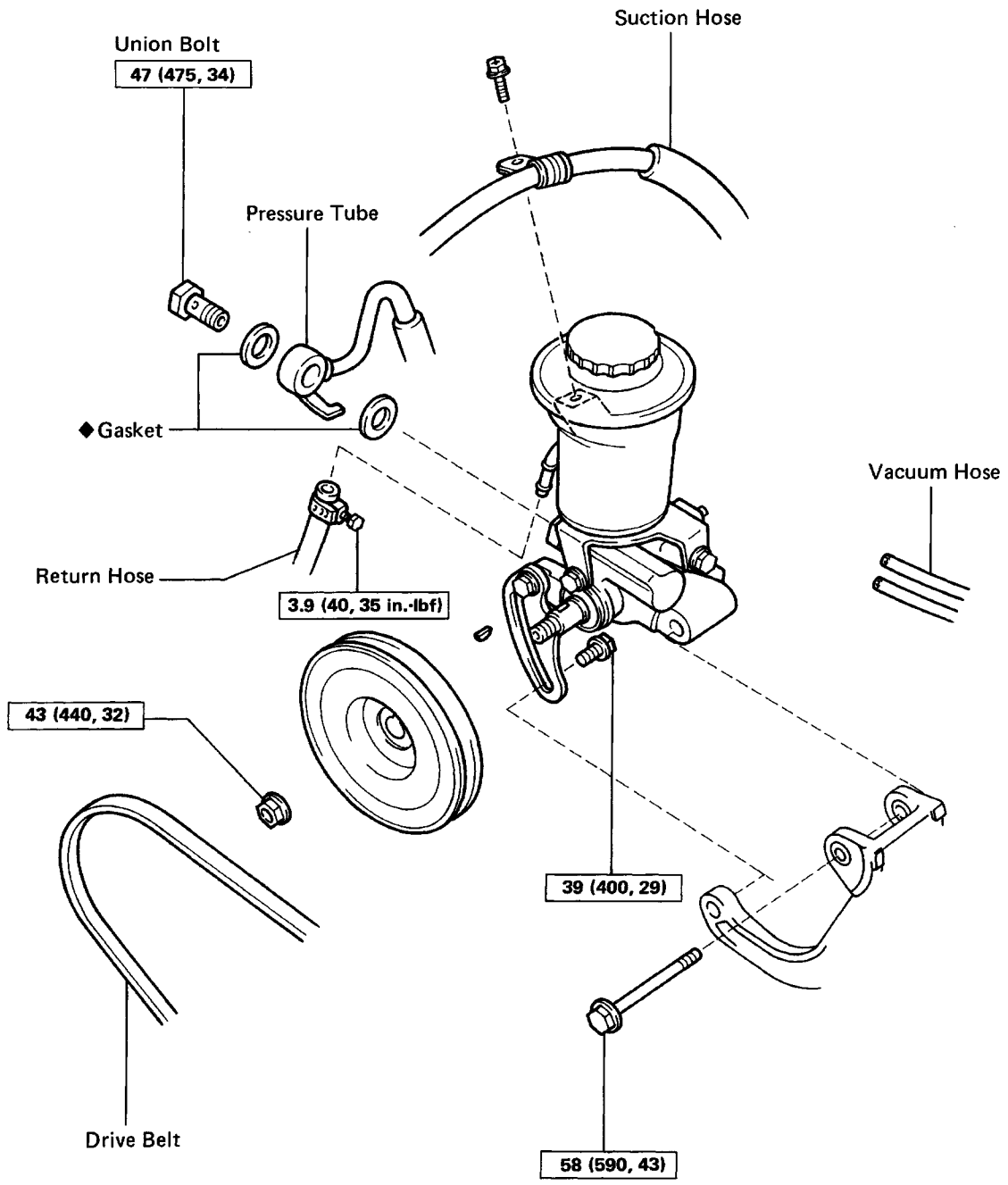
Power Steering Pump

REMOVAL AND INSTALLATION OF POWER STEERING PUMP

Remove and install the parts as shown.

VZN Series

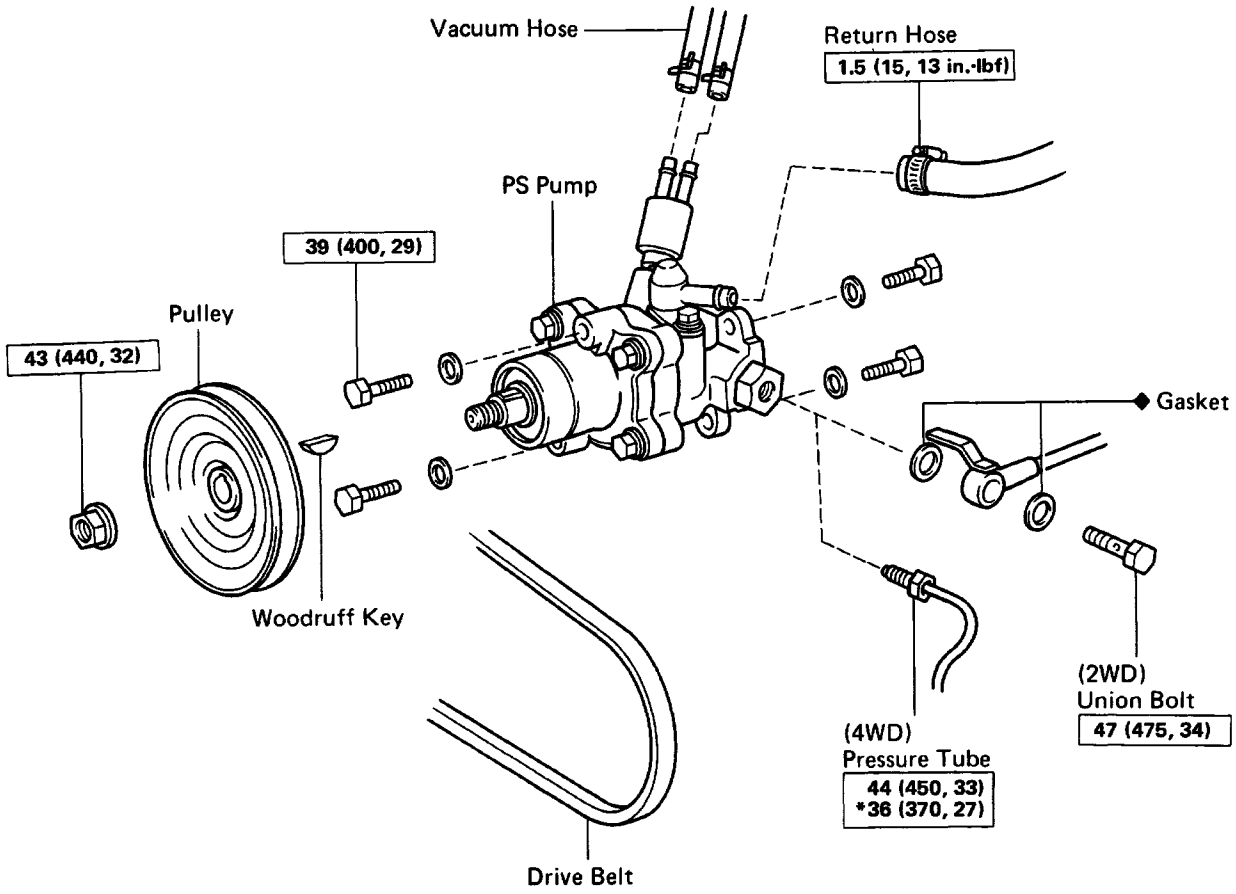


N·m (kgf·cm, ft·lbf) : Specified torque

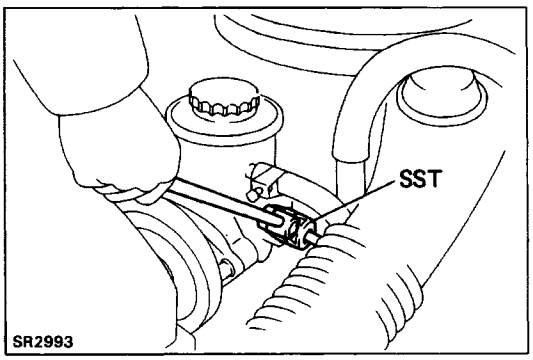
◆ Non-reusable part

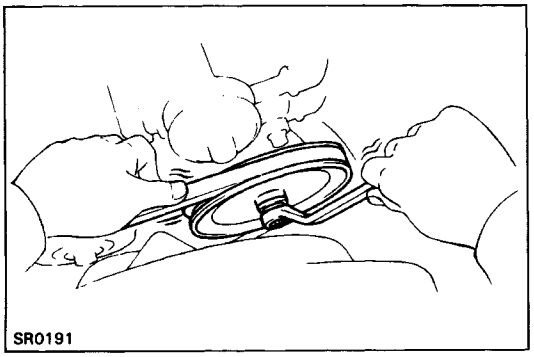
R01190

RN Series



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





(MAIN POINTS OF REMOVAL AND INSTALLATION)

1. (RN Series/4WD)

DISCONNECT AND CONNECT PRESSURE TUBE

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

SST 09631–22020

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

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

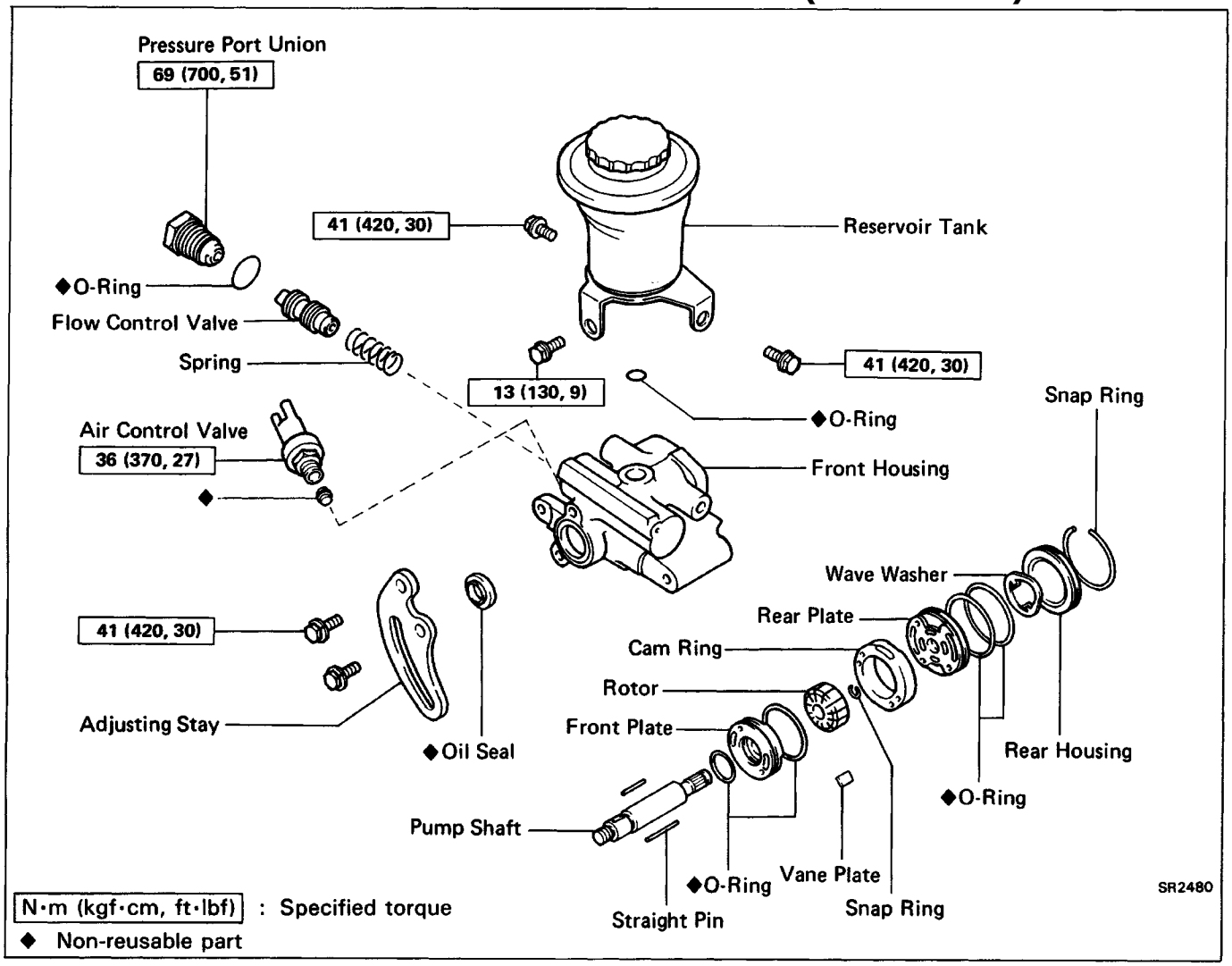
2. LOOSEN PULLEY NUT

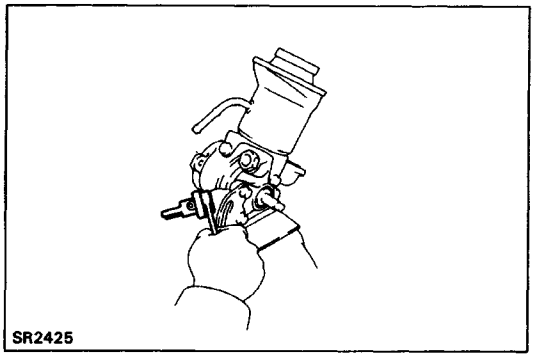
Push on the drive belt with your hand to hold the pulley in place and loosen the pulley nut.

3. ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP

(See page SR–40)

COMPONENTS (VZN series)





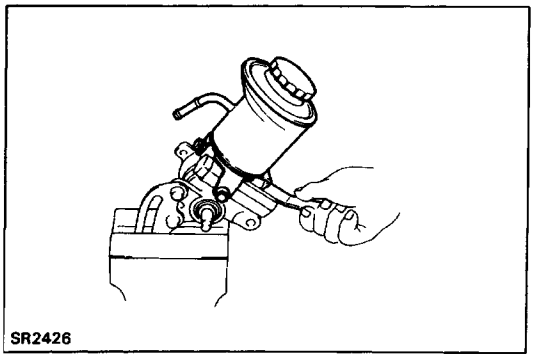
DISASSEMBLY OF POWER STEERING PUMP

1. CLAMP PS PUMP IN VISE

NOTICE: Do not tighten the vise too tight.

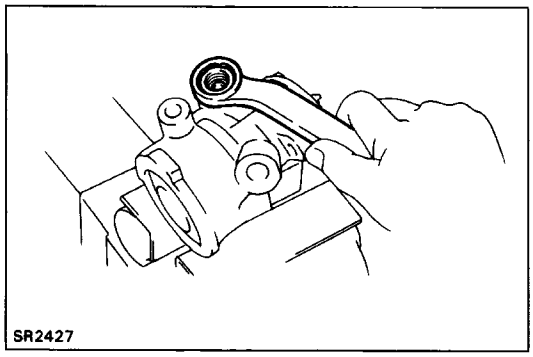
2. REMOVE AIR CONTROL VALVE

(a) Remove the air control valve.
(b) Remove the union seat.



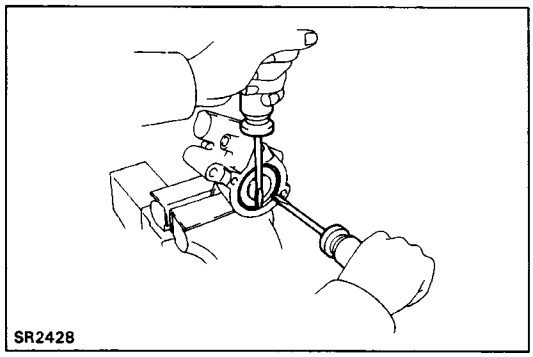
3. REMOVE RESERVOIR TANK

(a) Remove three bolts and the reservoir tank.
(b) Remove the 0–ring from the reservoir tank.



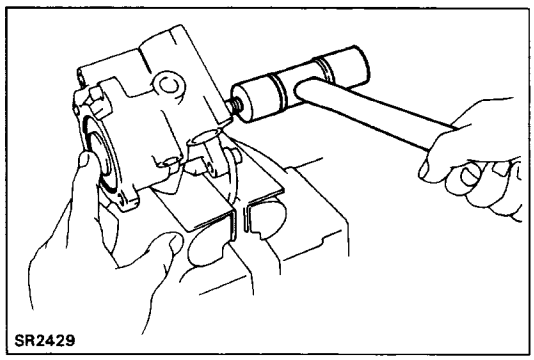
4. REMOVE PRESSURE PORT UNION AND FLOW CONTROL VALVE

(a) Remove the pressure port union.
(b) Remove the O–ring from the pressure port union.
(c) Remove the flow control valve and spring.

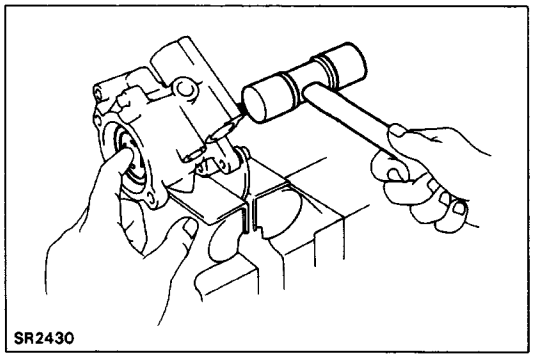


5. REMOVE REAR HOUSING

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

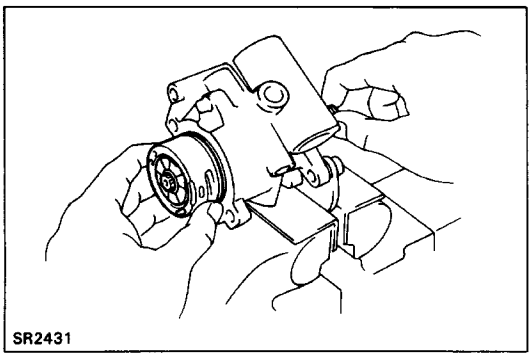


(b) Using a plastic hammer, tap out the rear housing and wave washer.
(c) Remove the O–ring from the rear housing.



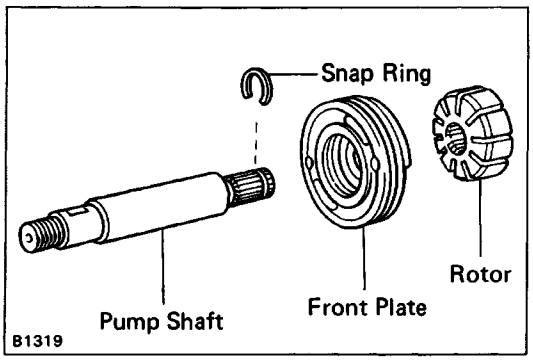
6. REMOVE REAR PLATE

(a) Using a plastic hammer, tap the shaft end and remove the rear plate.
(b) Remove the 0–ring from the rear plate.



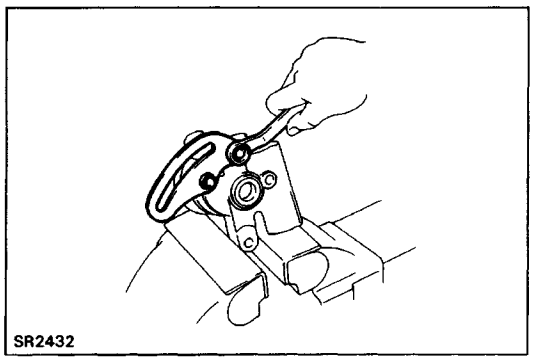
7. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES

(a) Remove the pump shaft with the cam ring and 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.



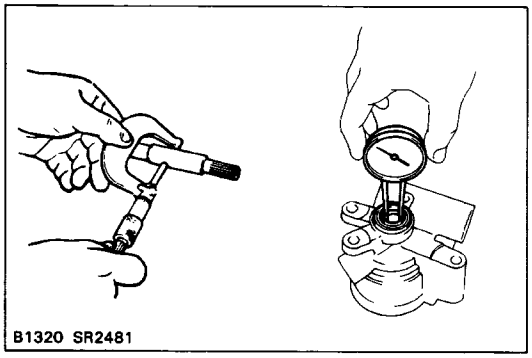
8. REMOVE ROTOR AND FRONT PLATE

(a) Using a screwdriver, remove the snap ring.
(b) Remove the rotor and front plate from the pump shaft.
(c) Remove the two 0–rings from the front plate.
(d) Remove the straight pin from the front plate. .



9. REMOVE ADJUSTING STAY

Remove the two bolts and adjusting stay.


B1320 SR2481

INSPECTION OF POWER STEERING PUMP

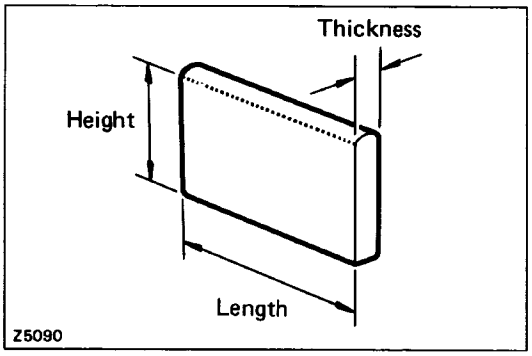
1. CHECK OIL CLEARANCE OF SHAFT AND BUSHING

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.



Z5090

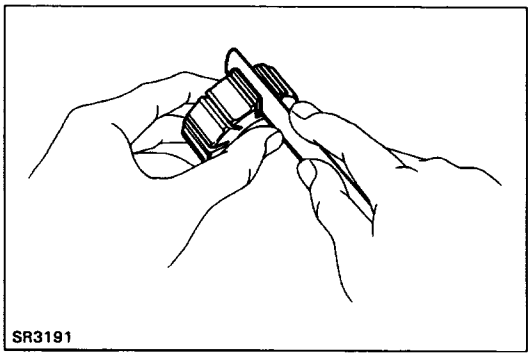
2. INSPECT ROTOR AND VANE PLATES

(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.)


SR3191

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

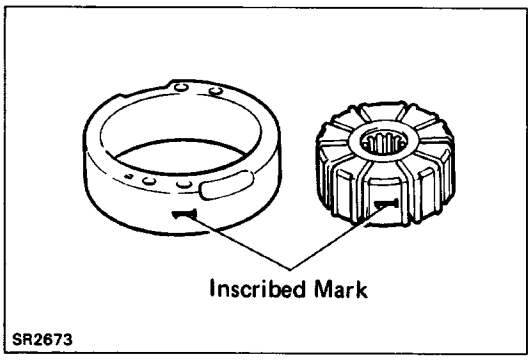
Maximum clearance: 0.03 mm (0.0012 in.)

If more than maximum, replace the vane 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:

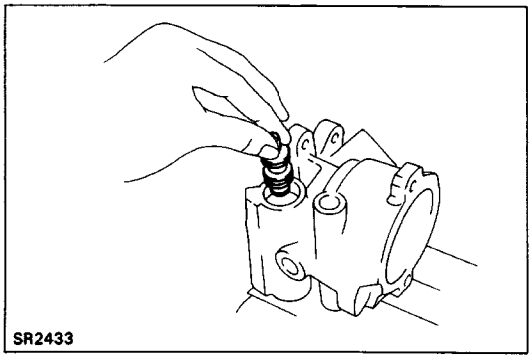
Rotor and cam ring mark	Vane length mm (in.)
None	14.996 – 14.998 (0.59039 – 0.59047)
1	14.994 – 14.996 (0.59032 – 0.59039)
2	14.992 – 14.994 (0.59024 – 0.59032)
3	14.990 – 14.992 (0.59016 – 0.59024)
4	14.988 – 14.990 (0.59008 – 0.59016)

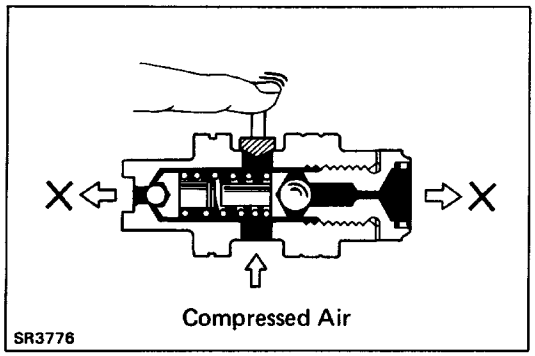


SR2673

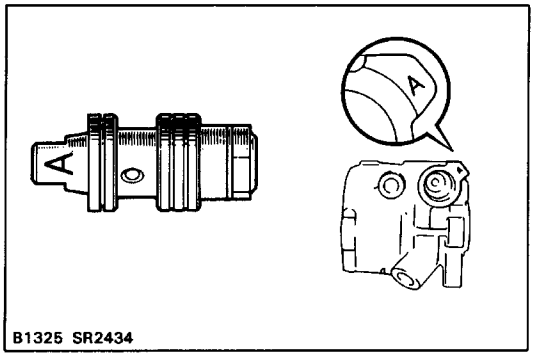
3. INSPECT FLOW CONTROL VALVE

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

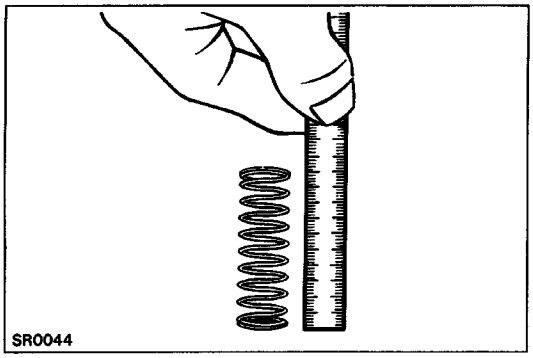

SR2433



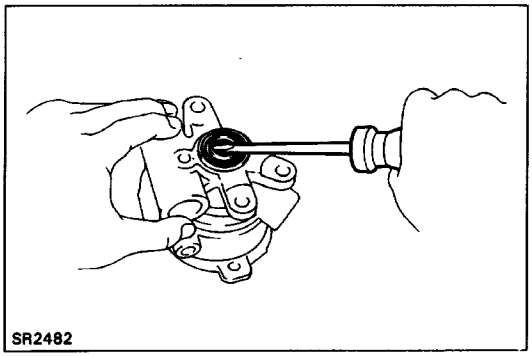
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air [392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi)] into the opposite side, and confirm that air does not come out from the end hole.



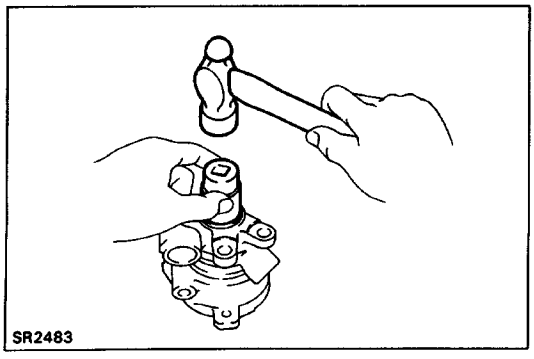
If necessary, replace the valve with one having the same letter as inscribed on the front housing.
Inscribed mark: A, B, C, D, E or F



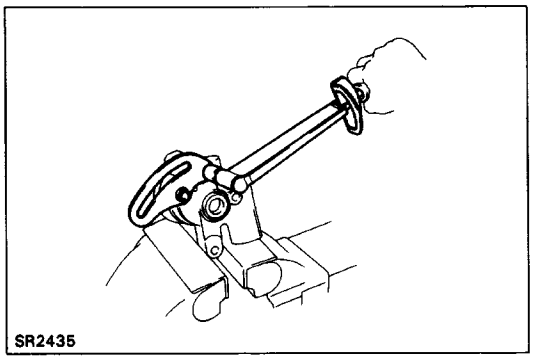
4. INSPECT FLOW CONTROL SPRING
Using a scale, measure the free length of the spring.
Spring length: 35–37 mm (1.38–1.46 in.)
If not within specification, replace the spring.



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.


SR2435

ASSEMBLY OF POWER STEERING PUMP

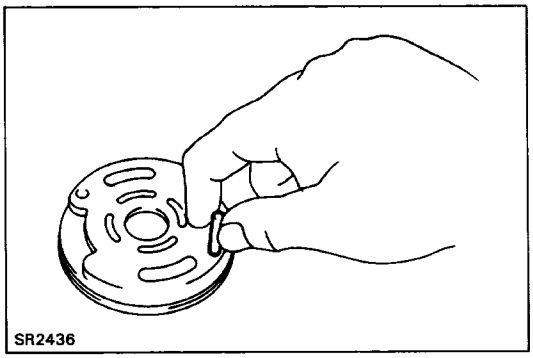
(See page SR–47)

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

2. INSTALL ADJUSTING STAY

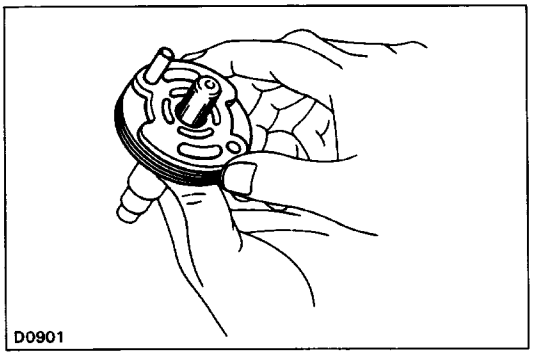
Install the adjusting stay and torque the two bolts.

Torque: 41 N–m (420 kgf–cm, 30 ft–lbf)


SR2436

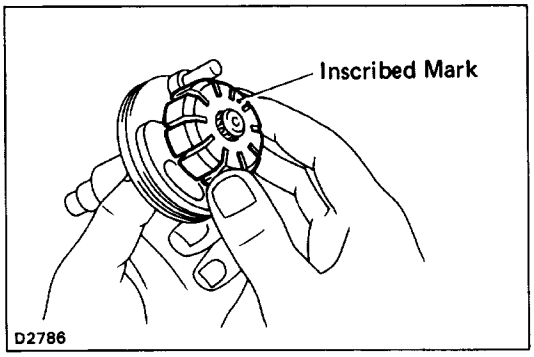
3. INSTALL FRONT PLATE AND ROTOR TO PUMP SHAFT

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


D0901

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

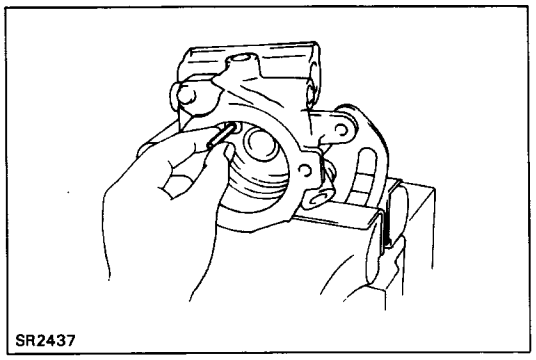
(c) Install the front plate to the pump shaft.



D2786

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

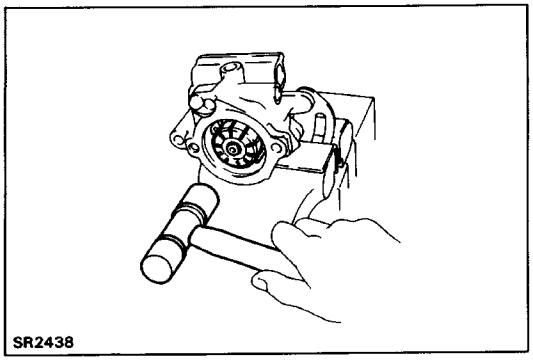
(e) Install the snap ring.


SR2437

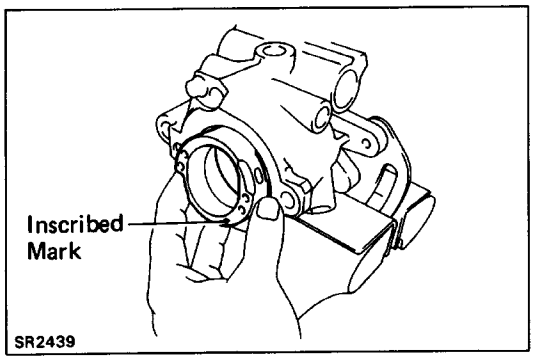
4. INSTALL PUMP SHAFT TO FRONT HOUSING

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

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

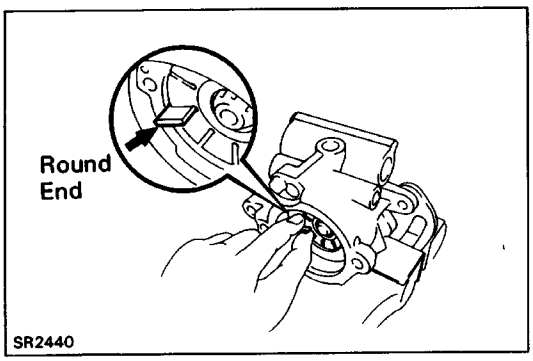

SR2438

(c) Align the hole of the front plate and straight pin and tap in the pump shaft with a plastic hammer.
NOTICE: Be careful not to damage the oil seal and 0–rings.



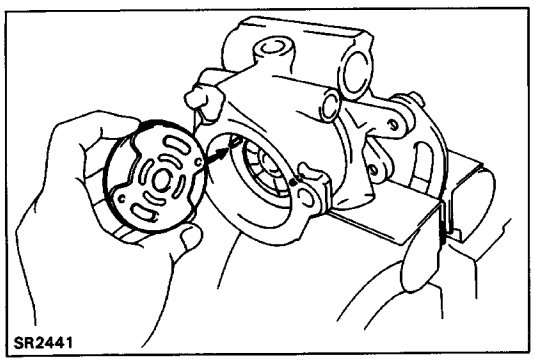
SR2439

5. 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.

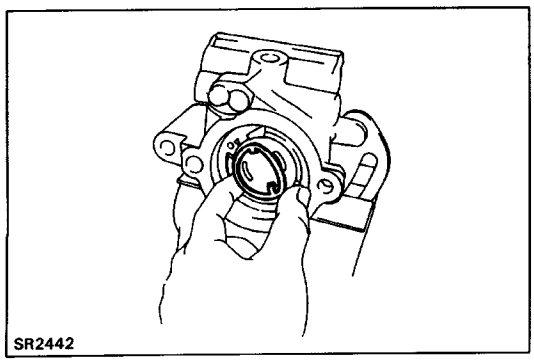


SR2440

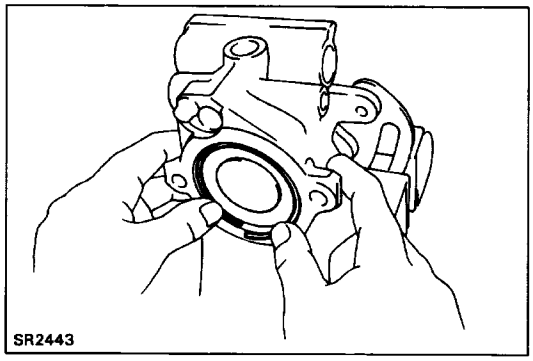
6. INSTALL VANE PLATES
Install the ten vane plates with the round end facing outward.


SR2441

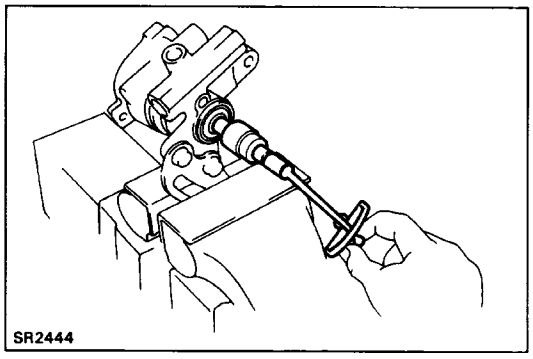
7. INSTALL REAR PLATE
(a) Install a new O–ring to the rear plate.
(b) Align the holes of the rear plate with the pins, and install the plate.


SR2442

8. INSTALL REAR HOUSING
(a) Install the wave washer.
(b) Install a new 0–ring to the rear housing.
(c) Using a plastic hammer, tap in the rear housing.



(d) Install the snap ring.



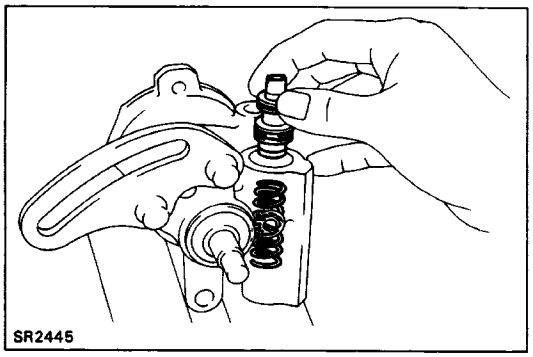
9. CHECK PUMP SHAFT PRELOAD

(a) Check that the shaft rotates smoothly without ab–normal noise.

(b) Temporarily install the pulley nut and check the ro–tating torque.

Rotating torque:

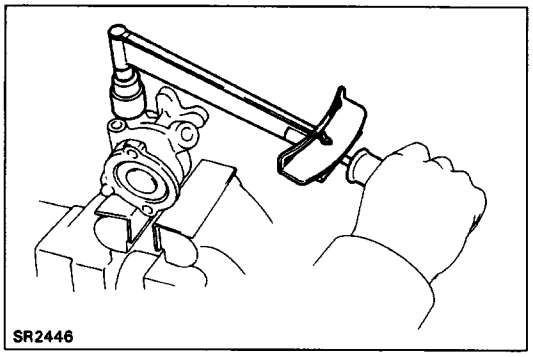
0 .3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less



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

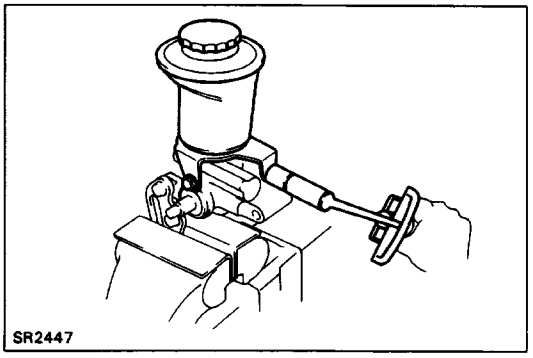
(a) Install the spring and the valve into the housing.

(b) Install a new 0–ring in the groove of the pressure port union.



(c) Install and torque the pressure port union.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)



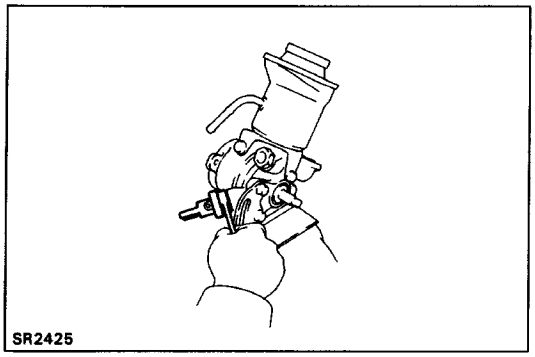
11. INSTALL RESERVOIR TANK

(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 13 N–m (130 kgf–cm, 9 ft–lbf)

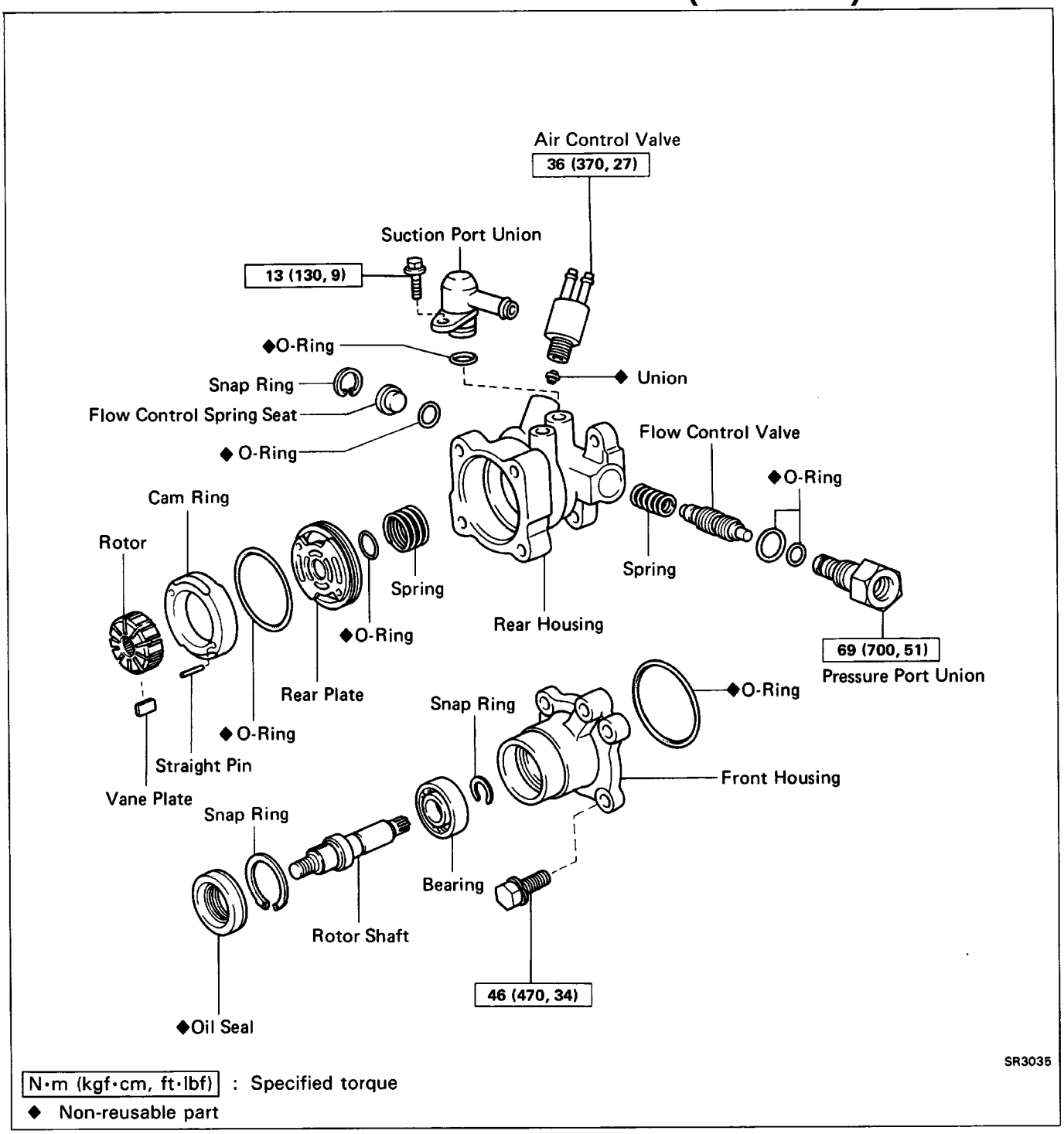
14 mm bolt 41 N–m (420 kgf–cm, 30 ft–lbf)

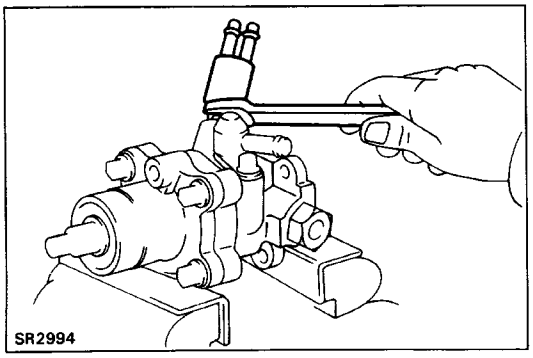


12. INSTALL AIR CONTROL VALVE

(a) Install a new union seat to the housing.
(b) Install and torque the air control valve.
Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

COMPONENTS (RN series)





DISASSEMBLY OF POWER STEERING PUMP

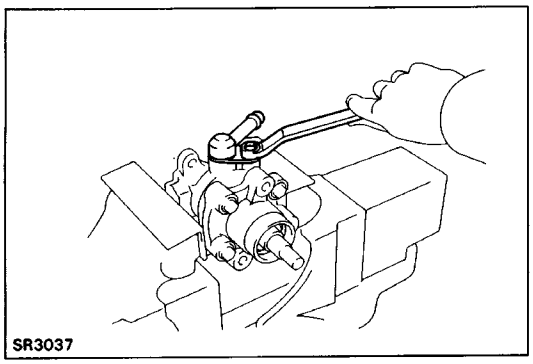
1. CLAMP PS PUMP IN VISE

NOTICE: Do not tighten the vise too tight.

2. REMOVE AIR CONTROL VALVE

(a) Remove the air control valve.

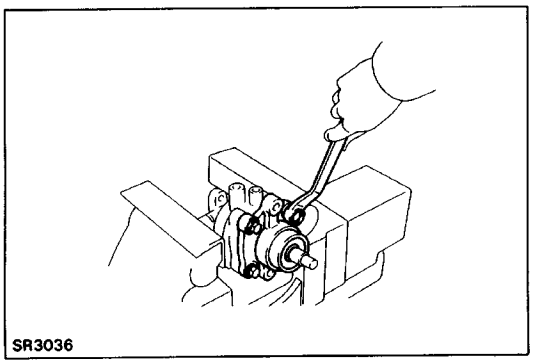
(b) Remove the union seat.


SR3037

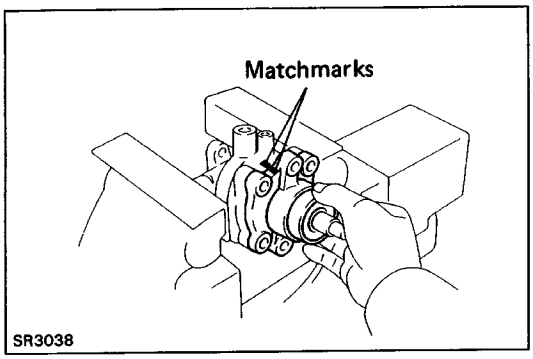
3. REMOVE SUCTION PORT UNION

(a) Remove the bolt and union.

(b) Remove the 0–ring from the union.


SR3036

4. REMOVE FOUR FRONT HOUSING BOLTS



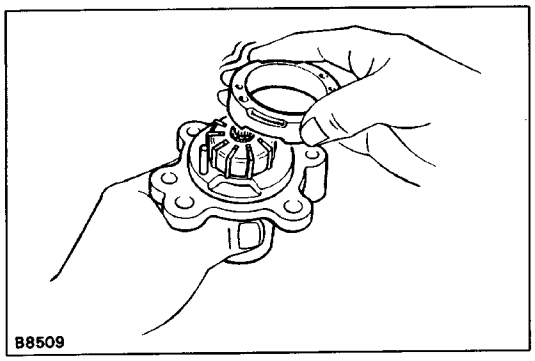
SR3038

5. REMOVE FRONT HOUSING

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

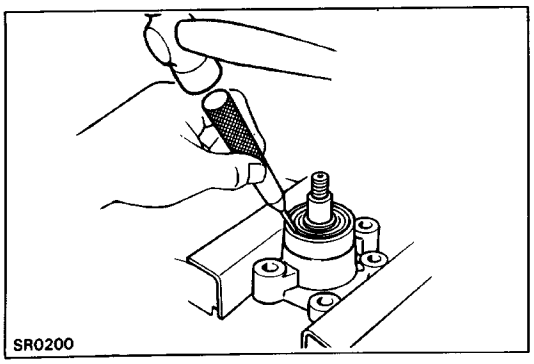
(b) Using a plastic hammer, tap off the front housing.

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


B8509

6. REMOVE CAM RING, ROTOR AND VANE PLATES

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


SR0200

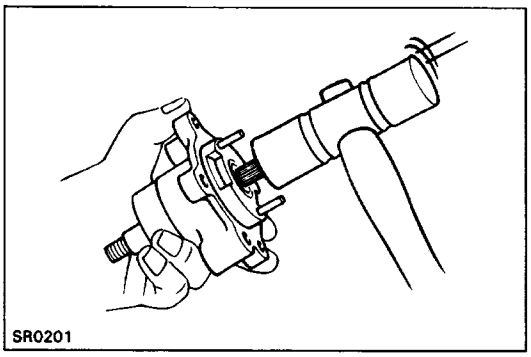
7. REMOVE ROTOR SHAFT

(a) Clamp the front housing in a vise.

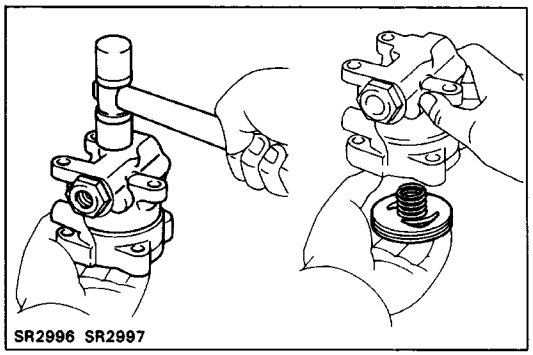
NOTICE: Do not tighten the vise too tight.

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

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

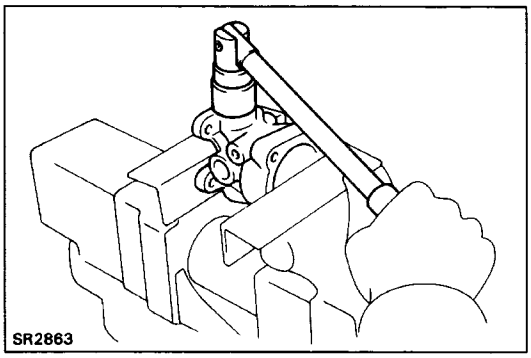

SR0201

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


SR2996 SR2997

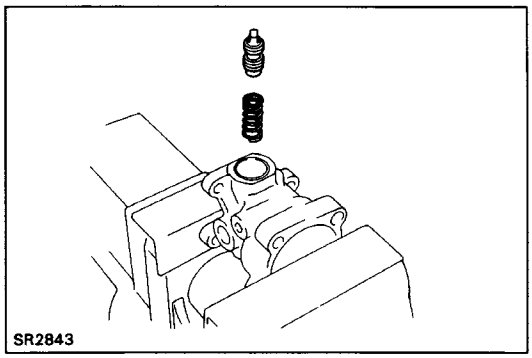
8. REMOVE REAR PLATE AND SPRING

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


SR2863

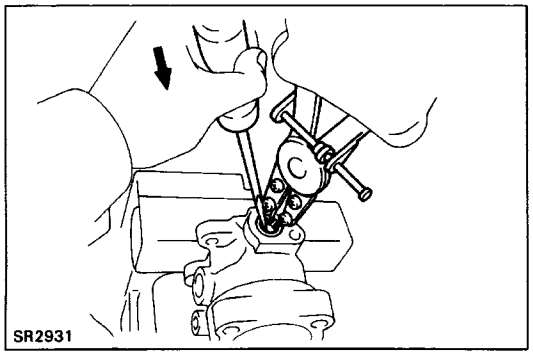
9. REMOVE PRESSURE PORT UNION

(a) Remove the pressure port union.
(b) Remove the two 0–rings from the union and housing.


SR2843

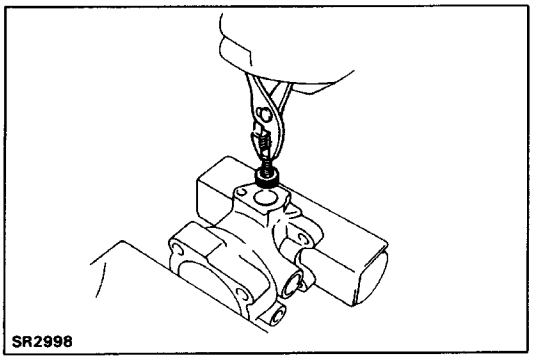
(c) Remove the flow control valve and spring.

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

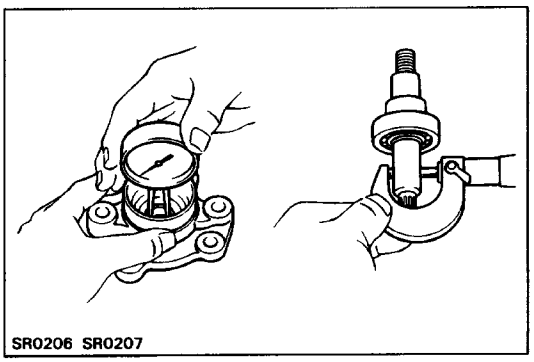

SR2931

10. 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

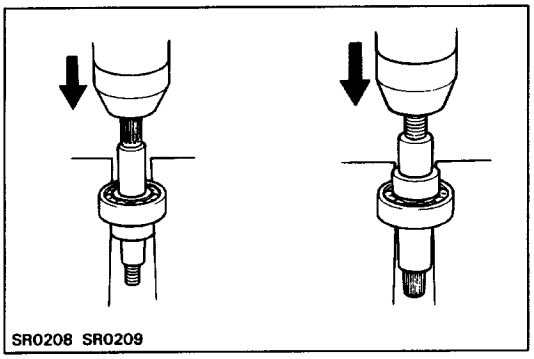
(c) Pull out the bolt and remove the spring seat.
(d) Remove the O–ring from the spring seat.


SR0206 SR0207

INSPECTION OF POWER STEERING PUMP

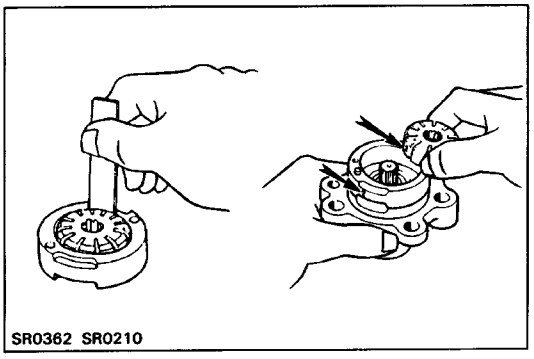
1. INSPECT BUSHING AND MEASURE BUSHING OIL CLEARANCE

(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

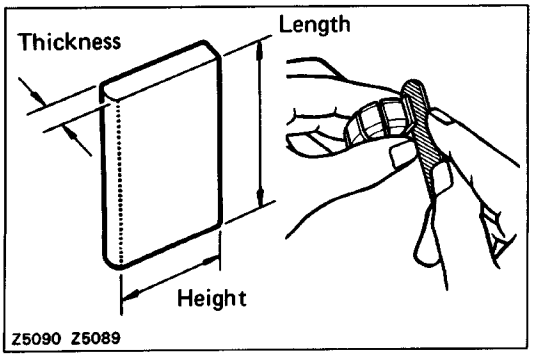
2. IF NECESSARY, REPLACE ROTOR SHAFT BEARING

(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.



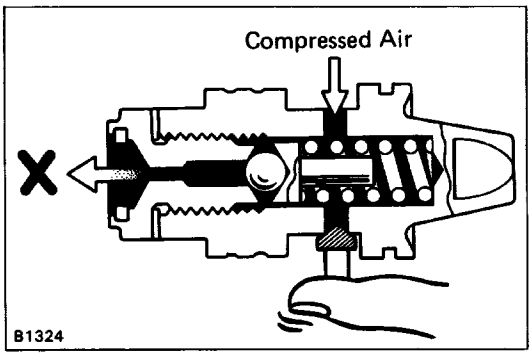
Z5090 Z5089

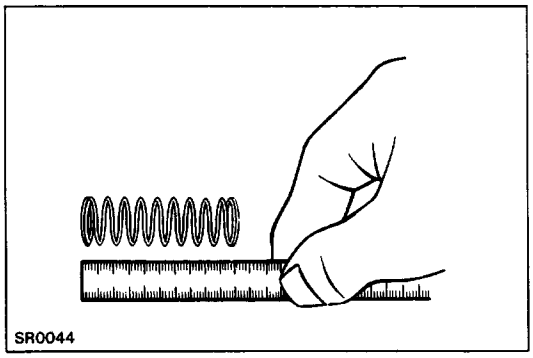
4. INSPECT AND MEASURE VANE PLATES

(a) Check the vane plates for wear or scratches.
(b) Measure the length, height and thickness of the vane plates.
Minimum length: 14.988 mm (0.5901 in.)
Minimum height: 8.1 mm (0.319 in.)
Minimum thickness: 1.797 mm (0.0707 in.)
(c) Measure the clearance between the vane plate and rotor groove.
Maximum clearance: 0.03 mm (0.0012 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 (0.59039 – 0.59047)
1	14.994 – 14.996 (0.59032 – 0.59039)
2	14.992 – 14.994 (0.59024 – 0.59032)
3	14.990 – 14.992 (0.59016 – 0.59024)
4	14.988 – 14.990 (0.59008 – 0.59016)





5. 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.

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

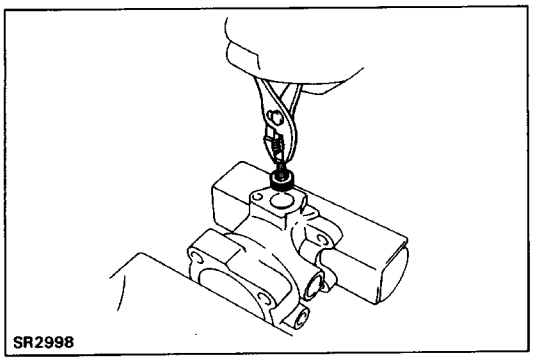
If necessary, replace the valve with one having the same letter as inscribed on the rear housing.

6. INSPECT FLOW CONTROL VALVE SPRING

Check that the spring is within specification.

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

If the spring is not within specification, replace it.



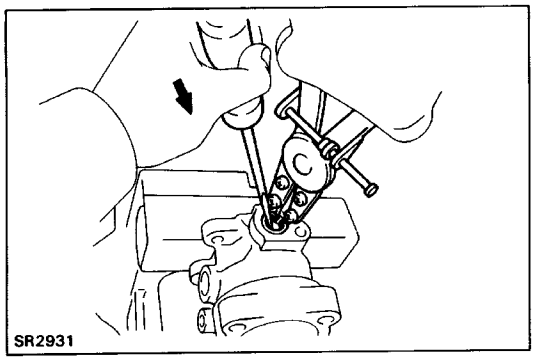
ASSEMBLY OF POWER STEERING PUMP

(See page SR–56)

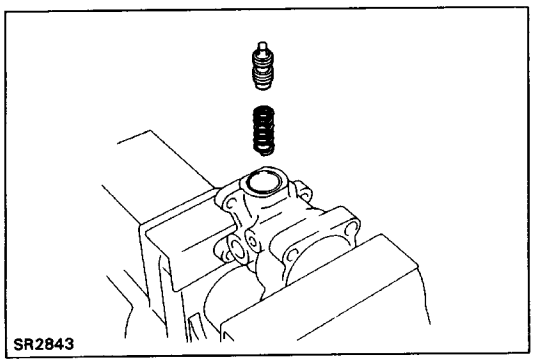
1. INSTALL FLOW CONTROL SPRING SEAT

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

(b) Install the spring seat to the housing.



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



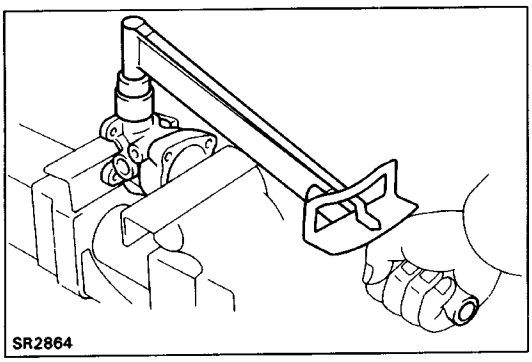
2. INSTALL FLOW CONTROL VALVE AND SPRING

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

(b) Install 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

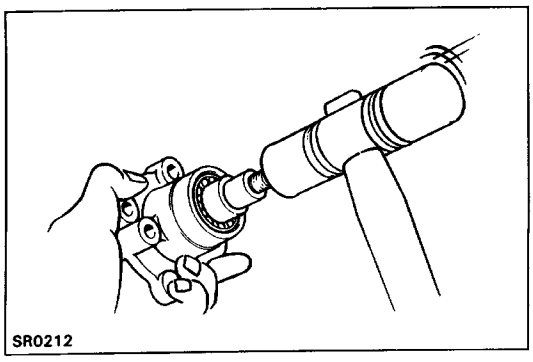


3. INSTALL PRESSURE PORT UNION

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

(b) Install and torque the union.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

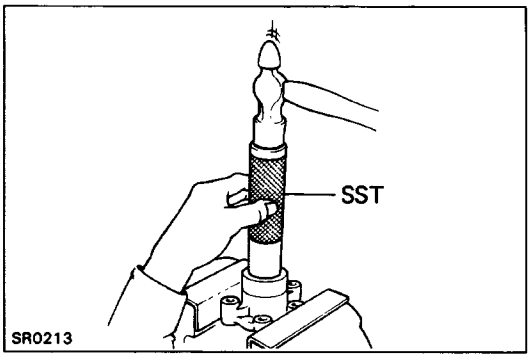


4. INSTALL ROTOR SHAFT TO FRONT HOUSING

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.

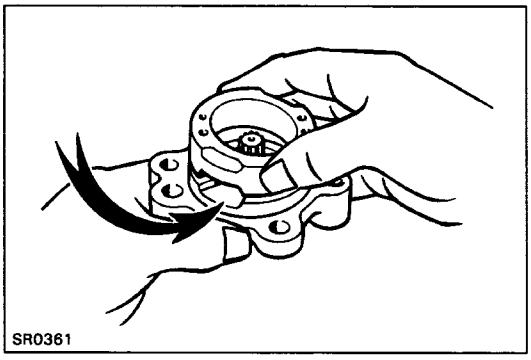


6. INSTALL OIL SEAL

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

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

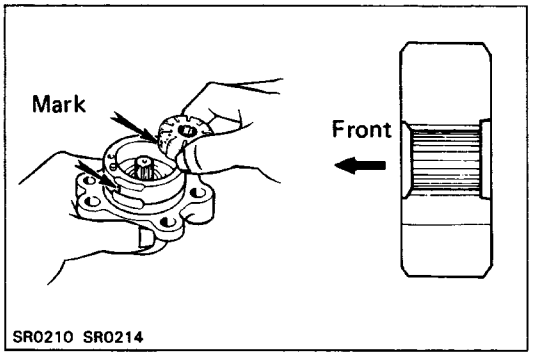
SST 09608–30012 (09608–04030)



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.

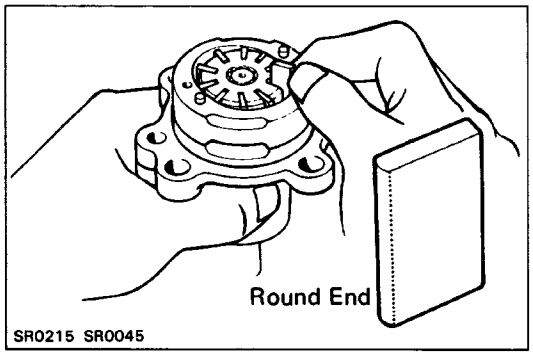


9. INSTALL ROTOR

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

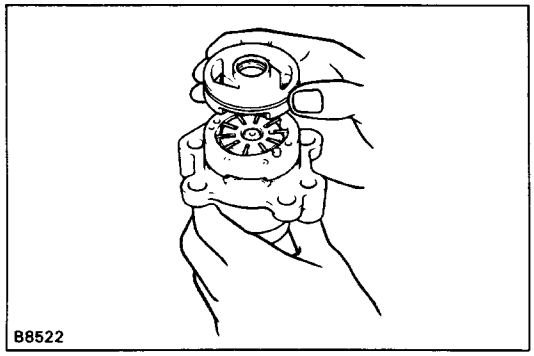
HINT: Be sure the letters inscribed on the cam ring and rotor match.

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



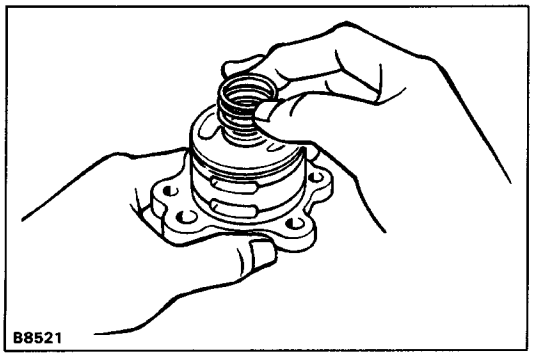
10. INSTALL VANE PLATES

Install the vane plates with the round end facing outward.

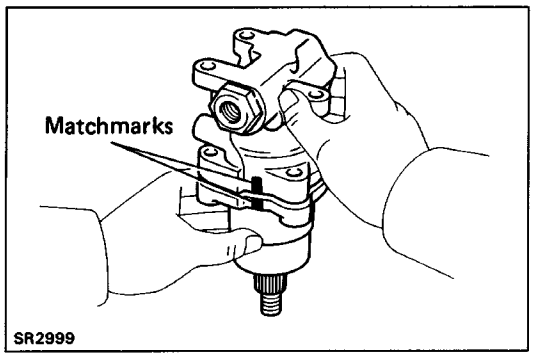


11. INSTALL REAR PLATE AND SPRING

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



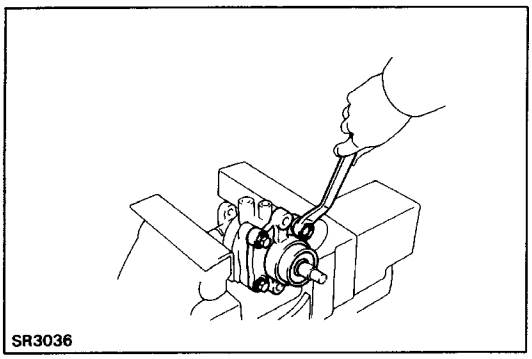
(b) Place the spring on the rear plate.



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.



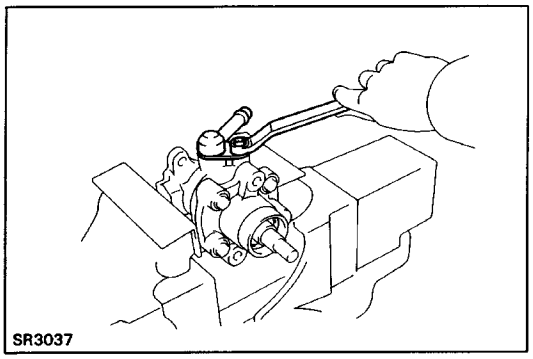
13. TIGHTEN FOUR HOUSING BOLTS

(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.

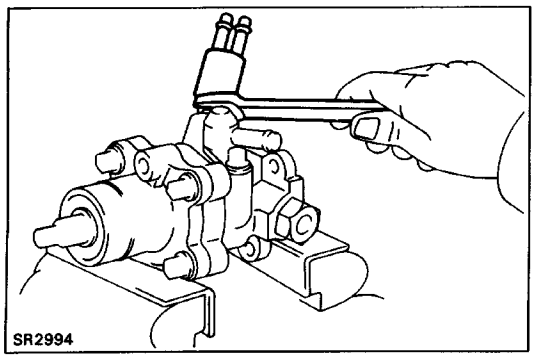
Torque: 46 N–m (470 kgf –cm, 34 ft–lbf)



14. INSTALL SUCTION PORT UNION

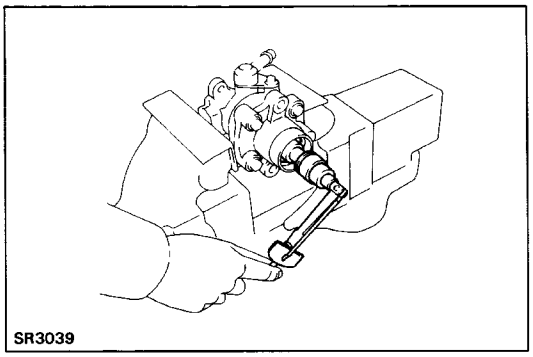
Install and tighten the union with a new O–ring.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



15. INSTALL AIR CONTROL VALVE

Install a *new union seat and the valve.



16. 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:

0.3 N–m (2.8 kgf–cm, 2.4 in.–lbf) or less