

STEERING

GENERAL DESCRIPTION

- Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.
- The steering wheel pad has an airbag built in, so take all due precautions when handling it. For more details, see the **SUPPLEMENTAL RESTRAINT SYSTEM (SRS)** section.

TROUBLESHOOTING

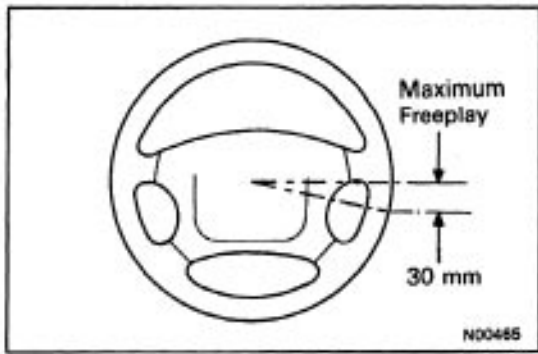
Use the table below to help you find the cause of the problem.

The numbers indicate the priority of the likely cause of the problem. Check each parts in order. If necessary, replace these parts.

SR503-56

See page	SA-4	SA-4	SR-24	SR-24	-	SA-63, 72	-	-		SA-10
Parts Name	Tires (improperly inflated)	Front wheel alignment (Incorrect)	Fluid level (Low)	Drive belt (Loose)	Steering system joints (Worn)	Suspension arm ball joints (Worn)	Steering column (Binding)	Sliding yoke (Worn)	Steering gear housing	Front wheel bearing (Worn)
Trouble										
Hard steering	1	4	2	3	5	6	7		8	
Poor return	1	2					3		4	
Excessive play					1	2		3	5	4
Abnormal noise			1		2				3	

V00014



ON-VEHICLE INSPECTION

CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and tires pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

Freeplay should not exceed the maximum.

Maximum freeplay:

30 mm (1.18 in.)






If incorrect, repair.

STEERING COLUMN

PREPARATION




SST (SPECIAL SERVICE TOOLS)

SR01F-06

	09213-31021 Crankshaft Pulley Puller	Steering wheel
	09612-22011 Tilt Handle Bearing Replacer	
	09309-37010 Transmission Bearing Replacer	
	09236-00101 Water Pump Overhaul Tool Set	
	(09237-00010) Water Pump Bearing Remover & Replacer	

RECOMMENDED TOOLS

SR01B-04

	09042-00010 Torx Socket T30	Steering wheel pad
	09904-00010 Expander Set	
	(09904-00050) No. 4 Claw	

EQUIPMENT

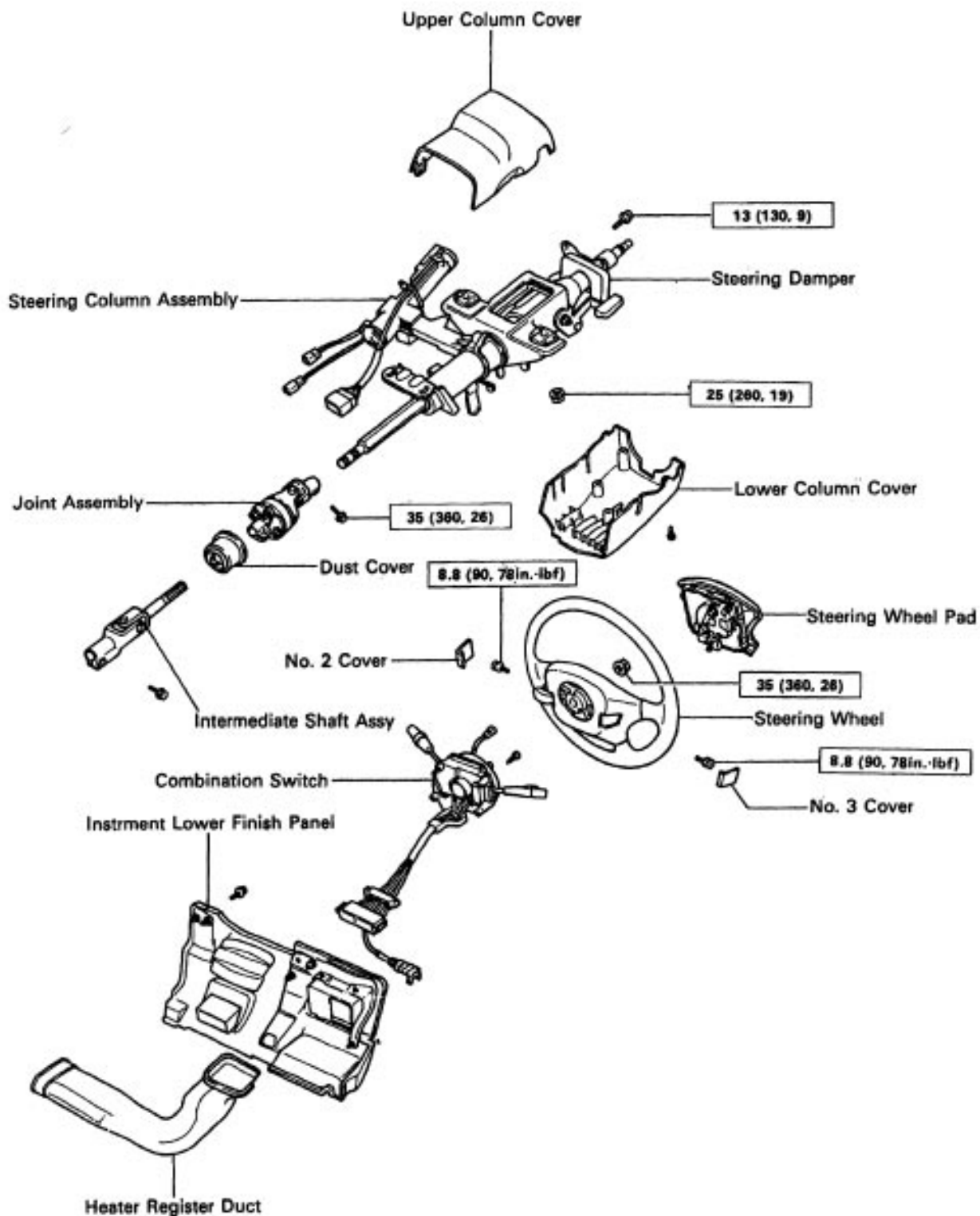
SR00T-01

Torque wrench	
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ASSEMBLY REMOVAL AND INSTALLATION

Remove and install the parts, as shown.

SR04-01

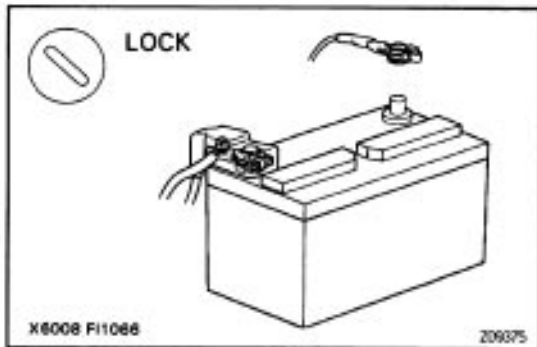


N-m (kgf-cm, ft-lbf) : Specified torque

MAIN POINTS OF REMOVAL AND INSTALLATION

NOTICE:

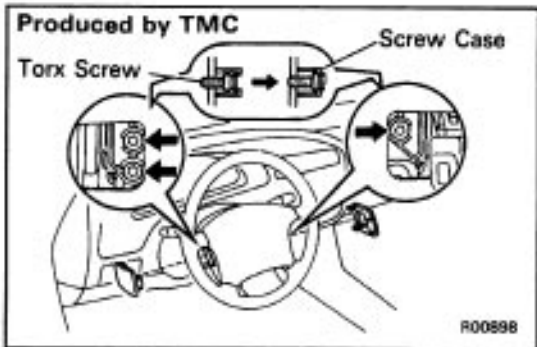
- If the SRS (Supplemental Restraint System) connector is disconnected with the ignition switch at ON or ACC, diagnostic trouble codes will be recorded.
- Never use SRS parts from another vehicle. When replacing parts, replace with new parts.



1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

(See RS section)



2. REMOVE STEERING WHEEL PAD

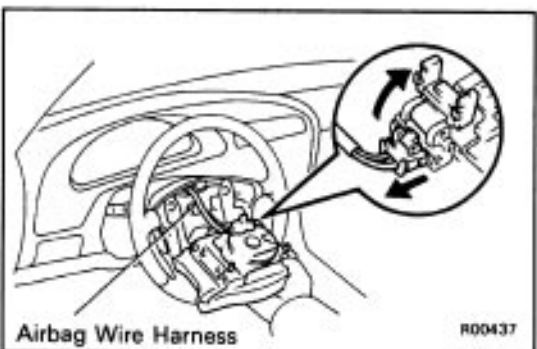
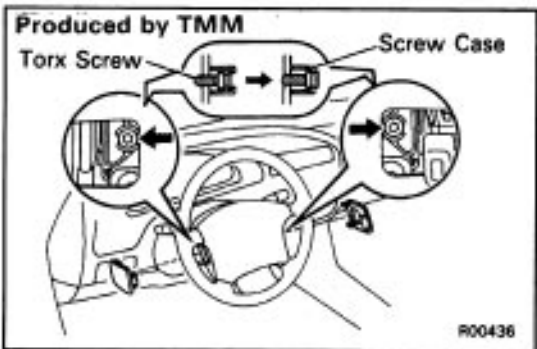
- Place the front wheels facing straight ahead.
- Remove the No.2 and No.3 covers.
- Using a torx wrench, loosen the screws.

Produced by TMC: 3 screws

Produced by TMM: 2 screws

Torx wrench: T30 (Part No. 09042-00010 or locally manufactured tool)

HINT: Loosen the torx screws until groove along the screw circumference catches on the screw case.

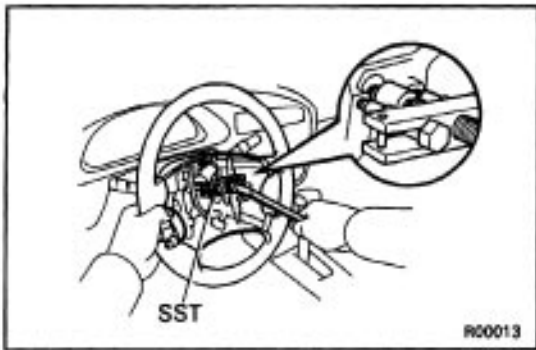


- Pull the wheel pad out from the steering wheel and disconnect the SRS connector.

NOTICE: When removing the wheel pad, take care not to pull the airbag wire harness.

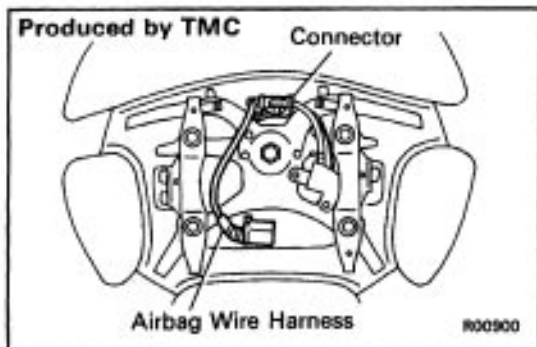
CAUTION:

- When storing the wheel pad, keep the upper surface of the pad facing upward.
- Never disassemble the wheel pad.



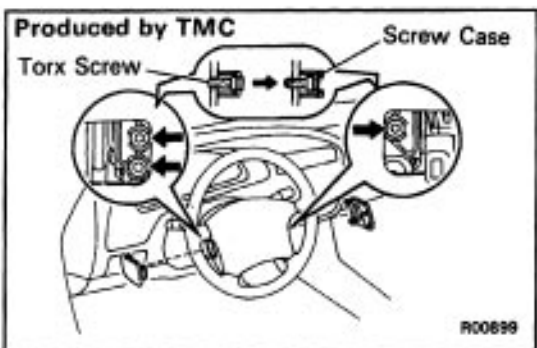
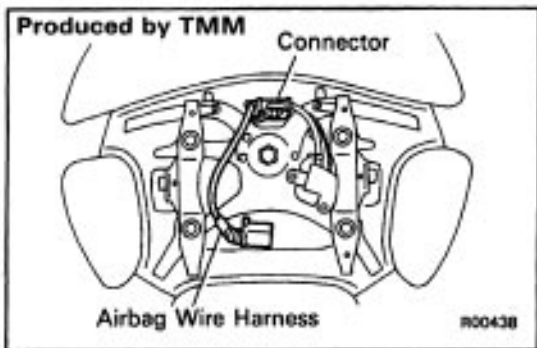
3. REMOVE STEERING WHEEL

- Disconnect the connector.
 - Remove the set nut.
 - Place matchmarks on the steering wheel and main shaft.
 - Using SST, remove the steering wheel.
- SST 09213-31021



4. INSTALL STEERING WHEEL

- Align matchmarks on the steering wheel and main shaft, and install the wheel to the shaft.
 - Tighten the wheel set nut.
- Torque: 35 N-m (360 kgf-cm, 26 ft-lbf)**
- Connect the connector.



5. INSTALL STEERING WHEEL PAD

- Connect the SRS connector.
- Install the wheel pad after confirming that the circumference groove of the torx screws is caught on the screw case.
- Using a torx wrench, tighten the screws.

Produced by TMC: 3 screws

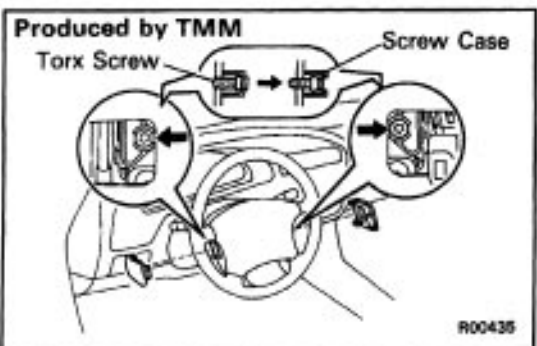
Produced by TMM: 2 screws

Torque: 8.8 N-m (90 kgf-cm, 78 in-lbf)

NOTICE:

- Make sure the wheel pad is installed to the specified torque.
- If the wheel pad has been dropped, or there are cracks, dents or other defects in the case or connector, replace the wheel pad with a new one.
- When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.

- Install the No.2 and No.3 covers.

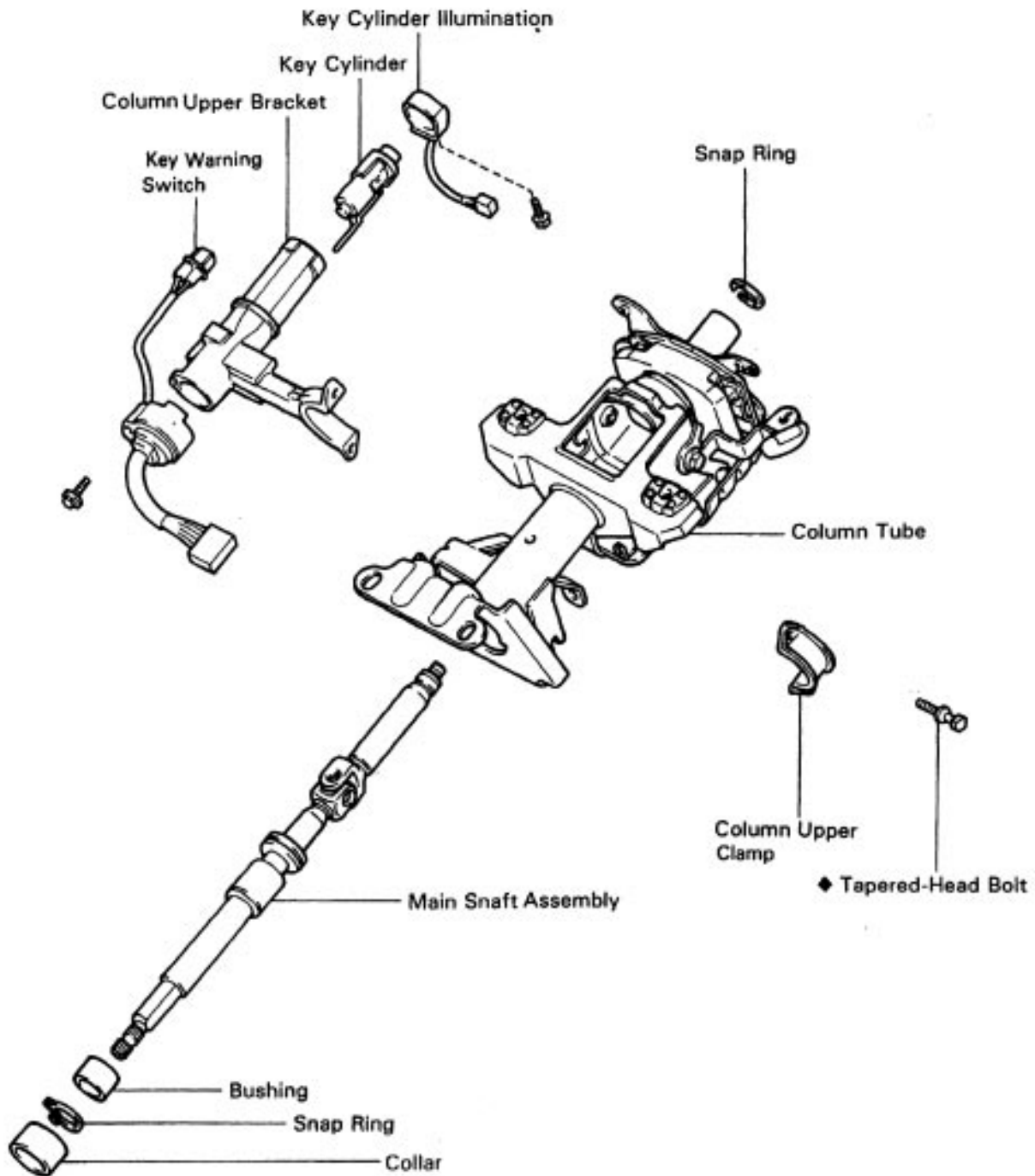


**6. CHECK STEERING WHEEL CENTER POINT AFTER
INSTALLING STEERING COLUMN**

**7. CONNECT NEGATIVE (–) TERMINAL CABLE TO
BATTERY**

STEERING COLUMN COMPONENTS

WJ008-02



R06458

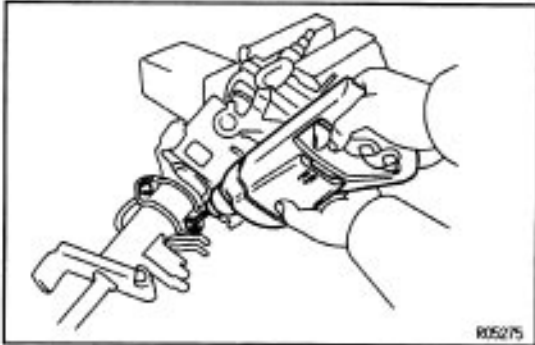
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

Z11003

STEERING COLUMN DISASSEMBLY

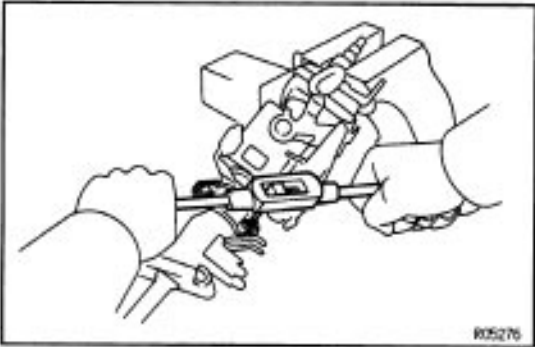
1. REMOVE IGNITION KEY CYLINDER ILLUMINATION



2. REMOVE COLUMN UPPER BRACKET

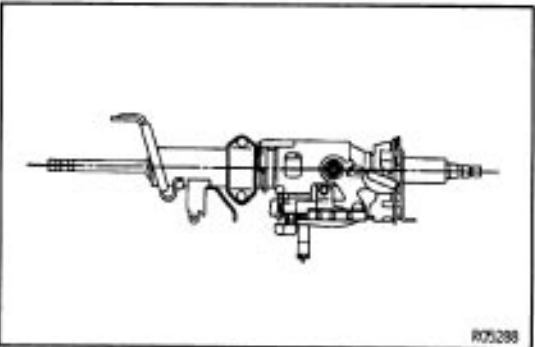
(a) Using a centering punch, mark the center of the 2 tapered-head bolts.

(b) Using a 3–4 mm (0.12–0.16 in.) drill, drill into the 2 tapered-head bolts.



(c) Using a screw extractor, remove the 2 tapered-head bolts.

(d) Remove the column upper clamp bracket and the column tube.



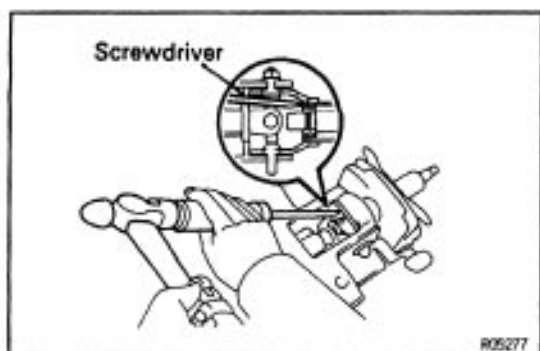
3. ALIGN STEERING COLUMN

Align the upper column tube and lower column tube.

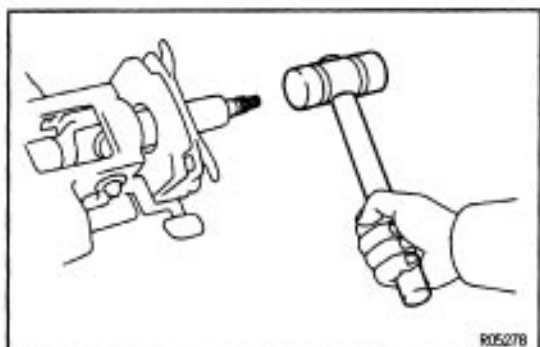


4. REMOVE MAIN SHAFT

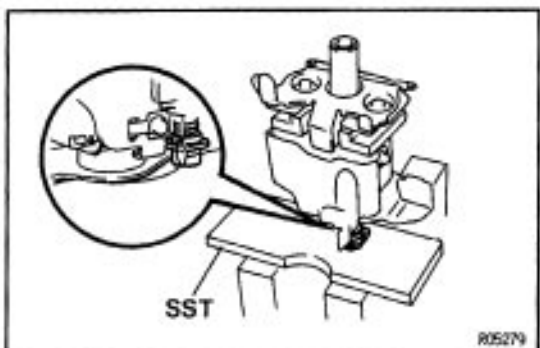
(a) Using snap ring pliers, remove the snap ring.



(b) Using a screwdriver, loosen the staked parts of the upper column tube.

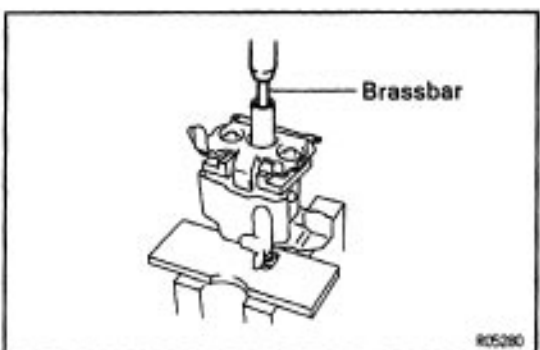


(c) Using a plastic hammer, tap the main shaft until the main stopper contacts the collar.



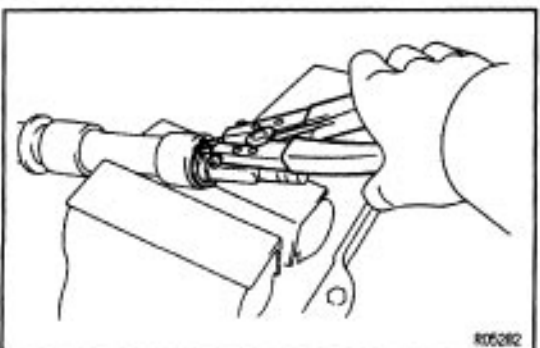
(d) Using SST, set the steering column on a press, as shown.

SST 09236 -00101 (09237-00010)



(e) Using a brass bar, press out the main shaft.

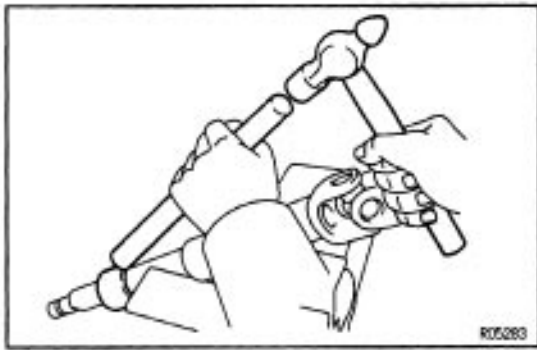
NOTICE: To prevent damage to the main shaft avoid dropping it.



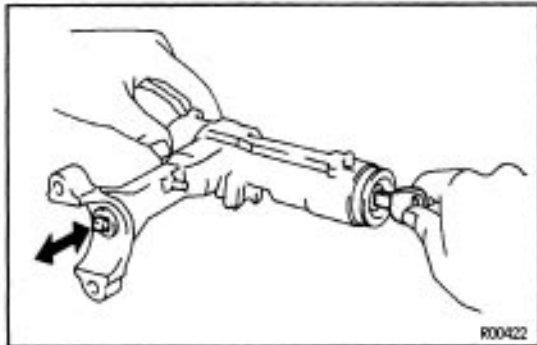
5. REMOVE MAIN SHAFT COLLAR AND BUSHING

(a) Remove the collar from the main shaft.

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



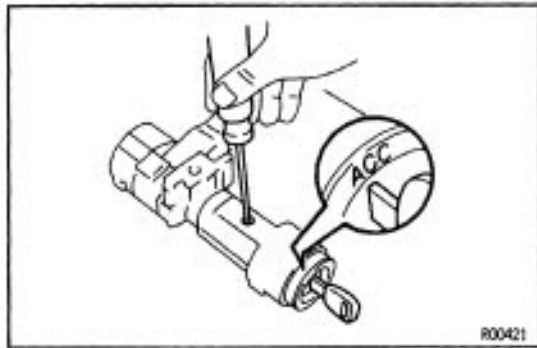
(c) Using a brassbar, tap the bushing off the main shaft.



STEERING COLUMN INSPECTION AND REPLACEMENT

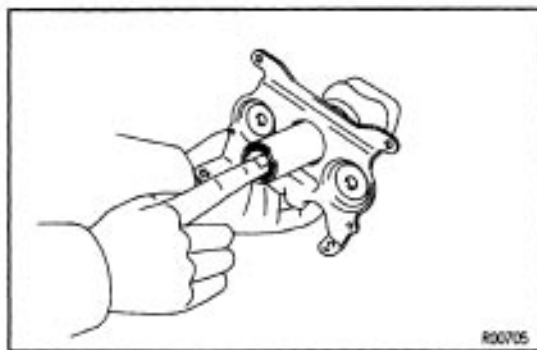
1. INSPECT STEERING LOCK OPERATION

Check that the steering lock mechanism operates properly.



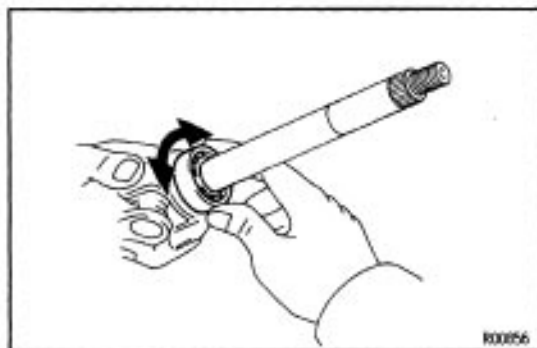
2. IF NECESSARY, REPLACE KEY CYLINDER

- (a) Place the ignition key at the ACC position.
- (b) Push down the stop pin with a thin rod, and pull out the key cylinder.
- (c) Make sure the ignition key is at the ACC position.
- (d) Install a new key cylinder.



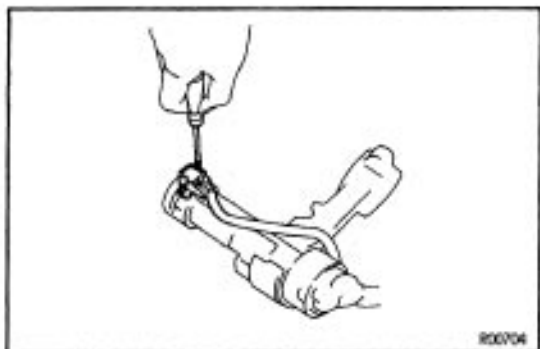
3. INSPECT UPPER BEARING

Check the upper bearing condition by manually turning the load bearing surface inside the column tube. If there is resistance to turning, or an uneven force is required to turn the bearing surface, replace the column tube.



4. INSPECT LOWER BEARING

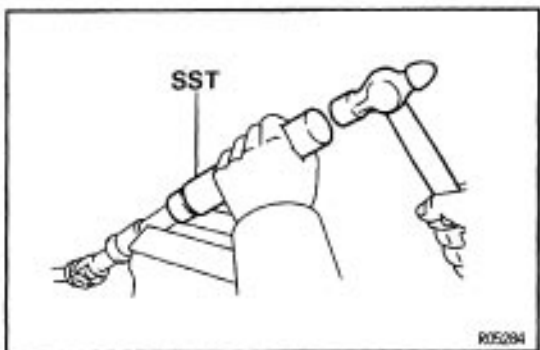
Check the lower bearing condition by manually turning the load bearing surface outside the main shaft. If there is resistance to turning, or an uneven force is required to turn the bearing surface, replace the main shaft.

**5. (A/T)****INSPECT KEY INTERLOCK SOLENOID**

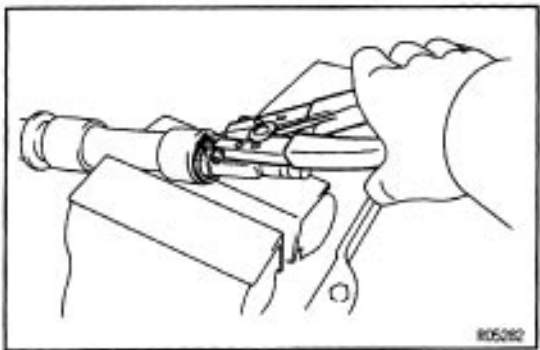
(See AX section)

6. (A/T)**IF NECESSARY, REPLACE KEY INTERLOCK SOLENOID**

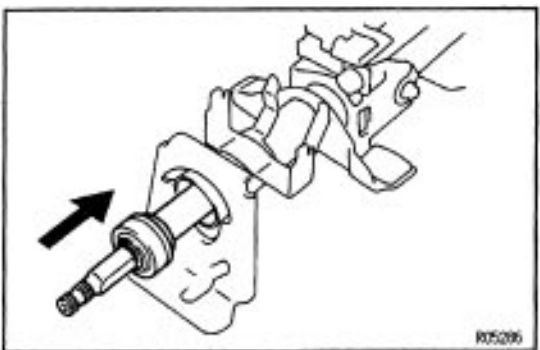
- (a) Remove the 2 screws and the solenoid.
- (b) Install a new solenoid with the 2 screws.

**STEERING COLUMN ASSEMBLY****1. COAT ALL RUBBING PARTS WITH MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE****2. INSTALL MAIN SHAFT BUSHING AND COLLAR**

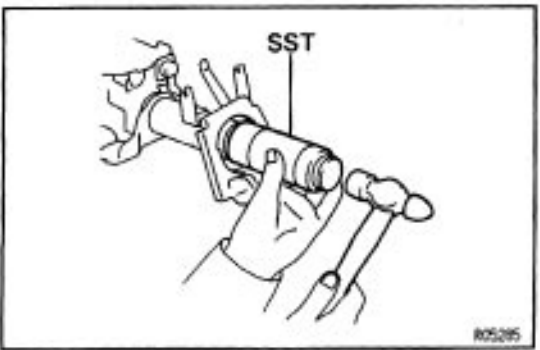
- (a) Using SST, tap the bushing onto the main shaft.
SST 09612-22011



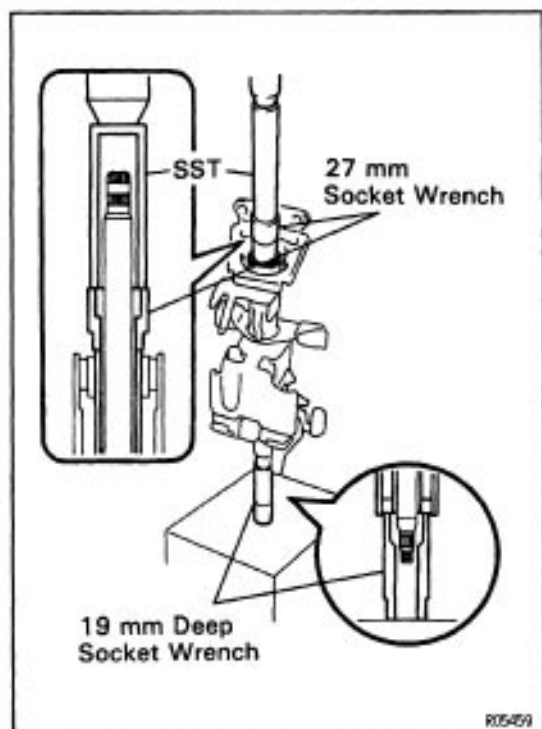
- (b) Using snap ring pliers, install the snap ring.
- (c) Install the collar on the bushing.



- (d) Insert the main shaft in the column tube.

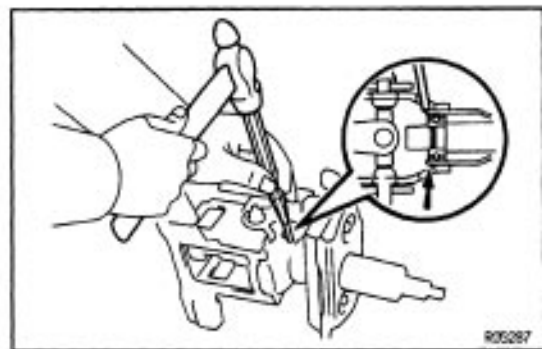


- (e) Using SST, tap in the collar to the column tube.
SST 09309-37010

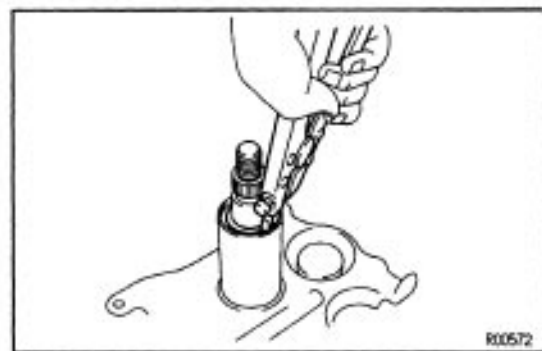


(f) Using SST, a 27 mm socket wrench (insert extension bar into the socket 19 mm) and a 19mm deep socket wrench, press in the main shaft.

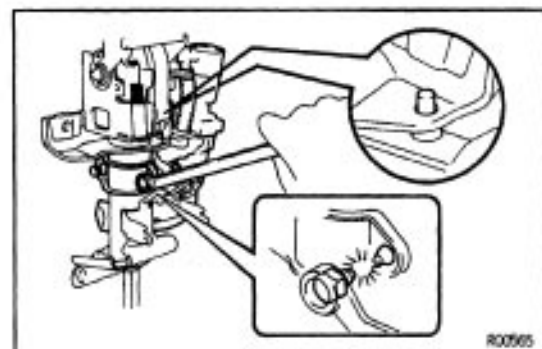
SST 09612 – 22011



(g) Using a pin punch and hammer, stake the upper column tube.



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



3. INSTALL UPPER BRACKET

(a) Install the upper bracket with 2 new tapered-head bolts.

(b) Tighten the 2 tapered-head bolts until the bolt head breaks off.

4. INSTALL IGNITION KEY CYLINDER ILLUMINATION

POWER STEERING

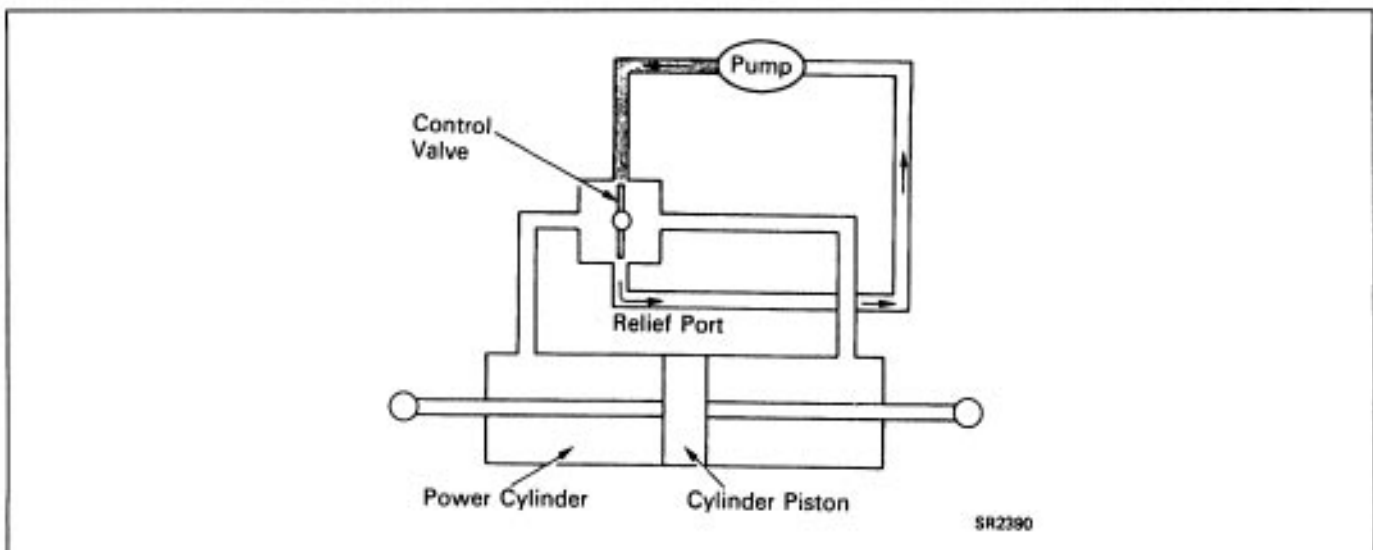
DESCRIPTION

POWER STEERING PRINCIPLES

Power steering is a hydraulic device which utilizes engine power to reduce steering effort. Consequently, the engine is used to drive a pump to develop fluid pressure, and this pressure acts on a piston within the power cylinder so that the piston assists the rack effort. The amount of this assistance depends on the extent of pressure acting on the piston. Therefore, if more steering force is required, the pressure must be raised. The variation in the fluid pressure is accomplished by a control valve which is linked to the steering main shaft.

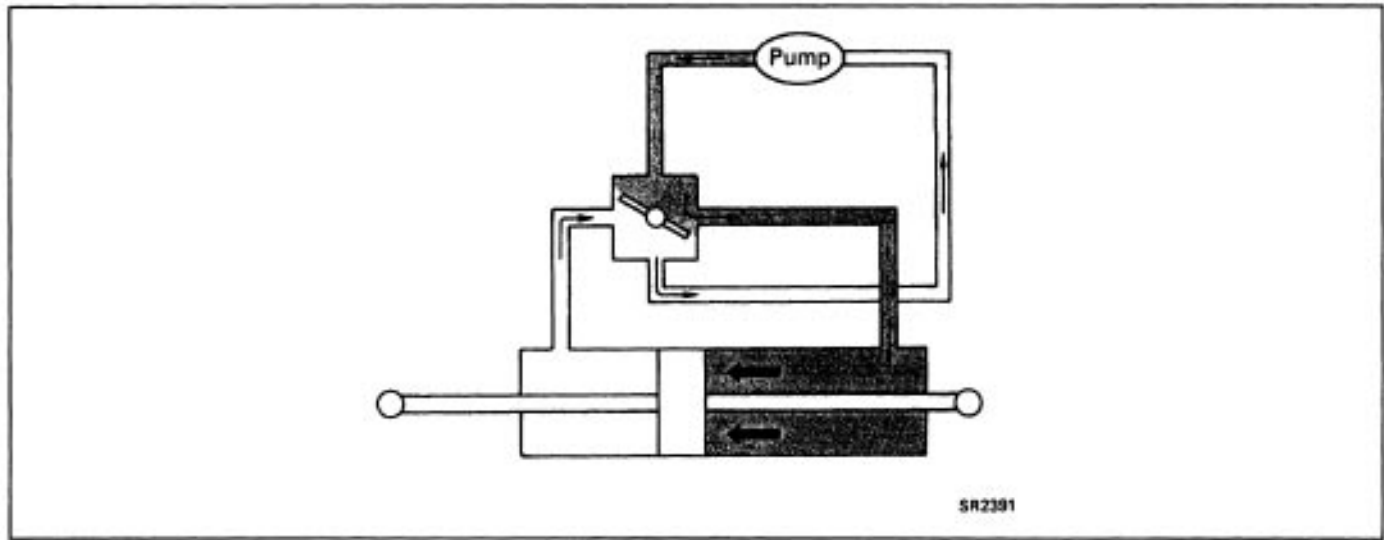
NEUTRAL (STRAIGHT-AHEAD) POSITION

Fluid from the pump is sent to the control valve. If the control valve is in the neutral position, all the fluid will flow through the control valve into the relief port and back to the pump. At this time, hardly any pressure is created and because the pressure on the cylinder piston is equal on both sides, the piston will not move in either direction.



WHEN TURNING

When the steering main shaft is turned in either direction, the control valve also moves, closing one of the fluid passages. The other passage then opens wider, causing a change in fluid flow volume and, at the same time, a differential pressure is created between both sides of the piston. Consequently, the piston moves in the direction of the lower pressure so that the fluid in the cylinder is forced back to the pump through the control valve.



SR2391-06

SERVICE HINT

Trouble with the power steering system usually involves hard steering resulting from lack of assistance. In such cases, before attempting to make repairs, you should determine whether the trouble lies with the pump or with the gear housing. To do this, use a pressure gauge to perform an on-vehicle inspection.

(1MZ – FE Engine)

This model is fitted with a hydraulic cooling fan system which is driven by the power steering fluid. Accordingly, when inspecting the power steering system, you should also inspect the fluid passages of the hydraulic cooling fan system.

ON-VEHICLE INSPECTION

Power steering is a hydraulic device and problems are normally due to insufficient fluid pressure acting on the piston. This could be caused by either the pump not producing the specified fluid pressure or the control valve in the gear housing not functioning properly so that the proper fluid pressure can not be obtained.

If the fault lies with the pump, the same symptoms will generally occur whether the steering wheel is turned fully to the right or left. On the other hand, if the fault lies with the control valve, there will generally be a difference between the amount of assistance when the steering wheel is turned to the left and right, causing harder steering. However, if the piston seal of the power cylinder is worn, there will be a loss of fluid pressure whether the steering wheel is turned to the right or left and the symptoms will be the same for both.

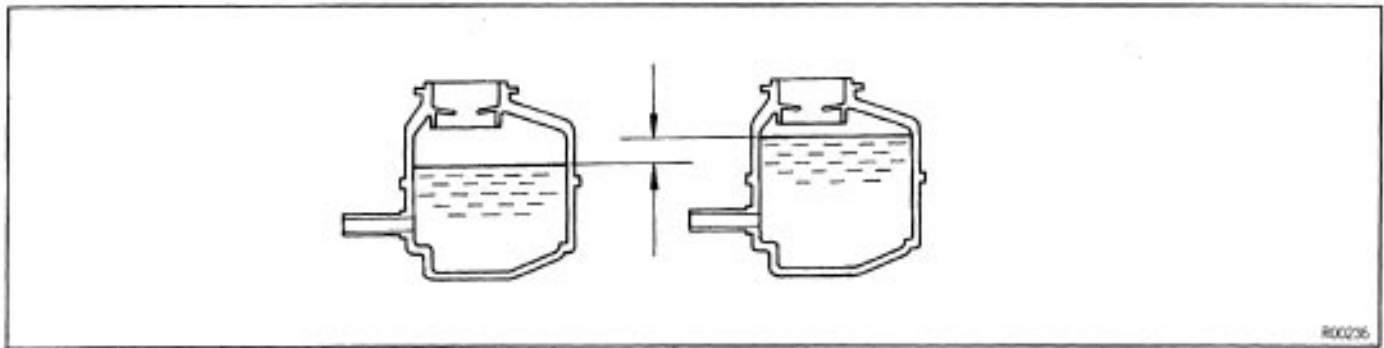
Before performing an on-vehicle inspection, a check must first be made to confirm that the

power steering system is completely free of any air. If there is any air in the system, the volume of this air will change when the fluid pressure is raised, causing a fluctuation in the fluid pressure so that the power steering will not function properly. To determine if there is any air in the system, check if there is a change of fluid level in the reservoir tank when the steering wheel is turned fully to the right or left.

If there is air in the system, it will be compressed to a smaller volume when the steering wheel is turned, causing a considerable drop in the fluid level. If the system is free of air, there will be very little change in the level even when the fluid pressure is raised. This is because the fluid, being a liquid, does not change volume when compressed. The small change in the fluid level is due to expansion of the hoses between the pump and gear housing when pressure rises.

Also, air in the system sometimes causes abnormal noise in the pump or gear housing when the steering wheel is fully turned in either direction.

This on-vehicle inspection must be performed every time after overhauling or repairing the pump or gear housing to ensure that the power steering system is working properly.

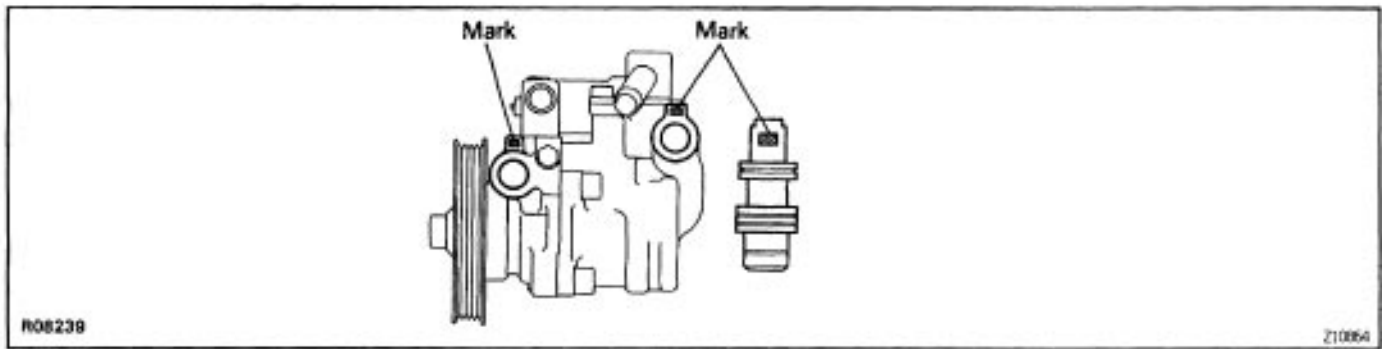


VANE PUMP

The main component parts of the vane pump, such as the cam ring, rotor, vanes and flow control valve are high precision parts and must be handled carefully. Also, because this pump produces a very high fluid pressure, O-rings are used for sealing each part. When reassembling the pump, always use new O – rings.

In the flow control valve, there is a relief valve which controls the maximum pressure of the pump. The amount of this maximum pressure is very important; if it is too low, there will be insufficient power steering assistance and if too high, it will have an adverse effect on the pressure hoses, oil seals, etc. If the maximum pressure is either too high or too low due to a faulty relief valve, do not disassemble or adjust the relief valve, but replace the flow control valve as an assembly.

The clearance between the flow control valve and pump body installation hole is very important. After manufacture, the factory measures the size of the installation hole and outer circumference of the flow control valve, and punches a mark accordingly. Therefore, when replacing the flow control valve, be sure to do so with one having the same mark in order to ensure the proper clearance.



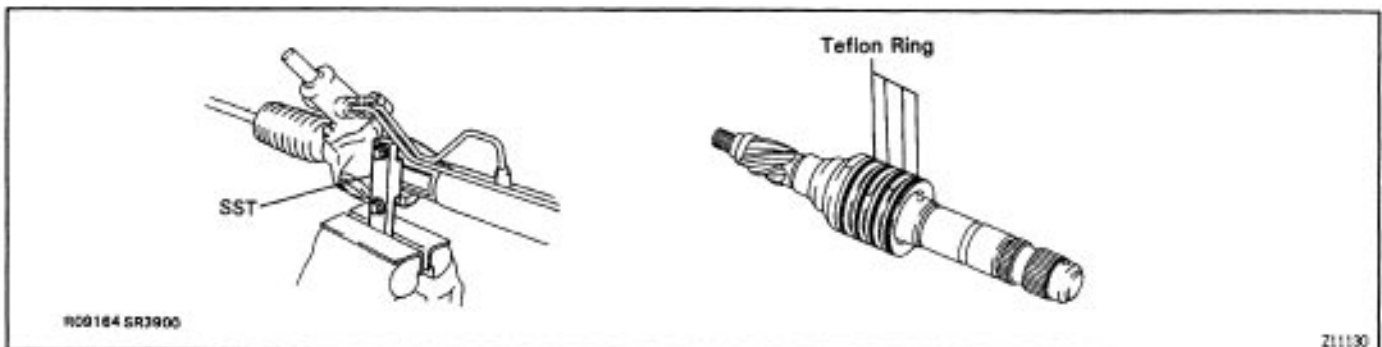
The functional parts of the pump which produce fluid pressure are the cam ring, rotor and vanes, and these should be checked for wear. If the clearance between each is not within standard when reassembling, any worn parts should be replaced.

In this case, the replaced cam ring and rotor should be of the same length (have the same mark), and the vanes should be replaced with those having a length corresponding to that mark, otherwise the proper thrust clearance cannot be obtained. If there is too much thrust clearance, there will be insufficient fluid pressure at low speeds. If there is too little thrust clearance, it may result in seizure of the vanes.



GEAR HOUSING

If the gear housing is secured directly in a vise during overhaul, there is danger of deforming it, so always first secure it in the SST provided (rack and pinion steering rack housing stand) before placing it in the vise.



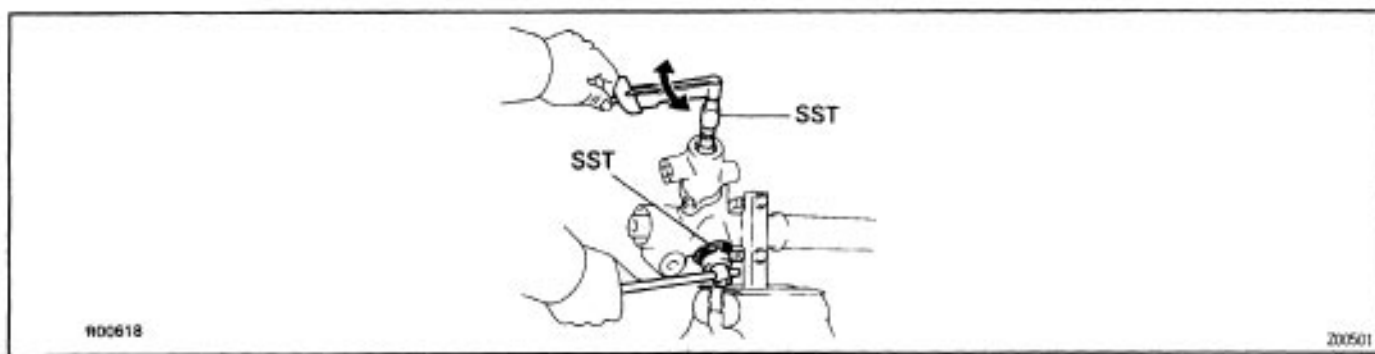
The oil seals on both sides of the power cylinder are for the prevention of leakage of the high pressure fluid which acts on the piston. Always use new oil seals when reassembling and be very careful not to scratch or damage them.

Because of the high pressure, even the slightest scratch will cause fluid leakage, resulting in an inoperative power steering system.

Also, be very careful not to scratch the sliding portion of the rack which makes contact with the oil seals. When removing the rack ends from the rack, it is very easy to cause a burr when holding the tip of the rack with a wrench. Therefore, before assembling the rack, first check the tip for burrs and remove any with an oil stone.

Teflon rings are used for the piston and control valve. These teflon rings are highly durable against wear, but if it is necessary to replace them, be careful not to stretch the new ones. After installing a teflon ring into its groove, snug it down into the groove before assembly of the cylinder or housing to prevent possible damage.

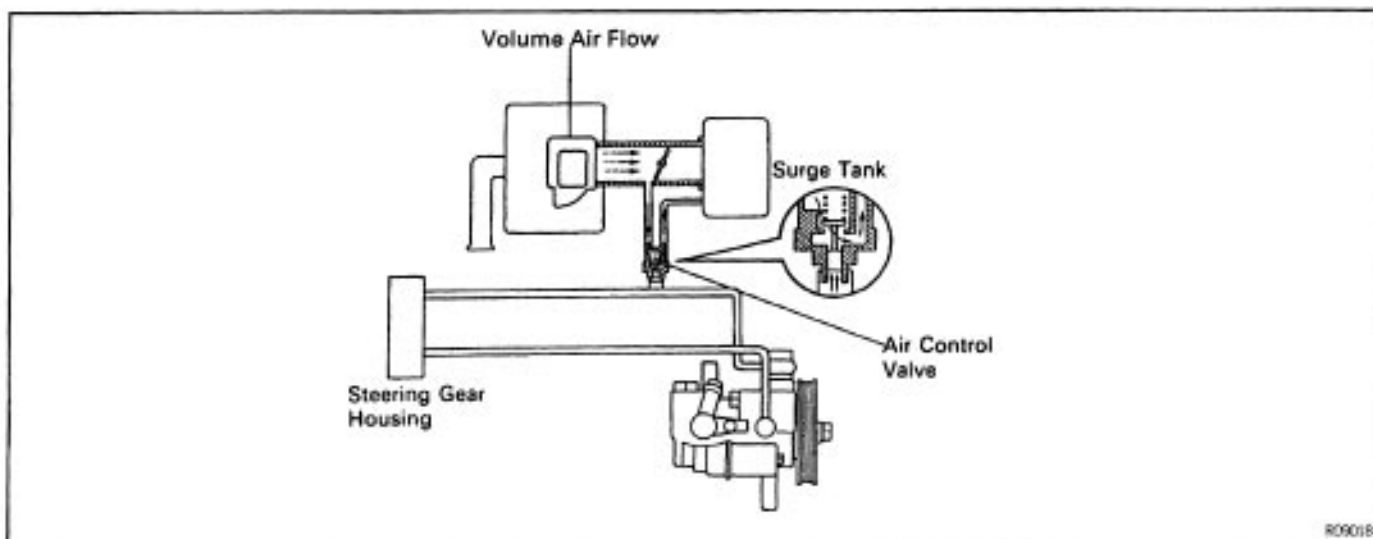
As with the rack and pinion type steering, preload is very important. If the preload is not correct, it could result in such trouble as steering wheel play or shimmy or lack of durability, so always make sure that it is correct.



IDLE-UP DEVICE

The pump produces the maximum fluid pressure when the steering wheel is turned fully to the right or left and, at this time, there is a maximum load on the pump which causes a decrease in engine idle rpm. To solve this problem, vehicles are equipped with an idle-up device which acts to raise the engine idle rpm whenever there is a heavy load on the pump.














On EFI engines, when the piston of the air control valve is pushed by fluid pressure, the air valve opens and the volume of air by-passing the throttle valve is increased to regulate engine rpm.

















PREPARATION

SST (SPECIAL SERVICE TOOLS)

MPC04-6A

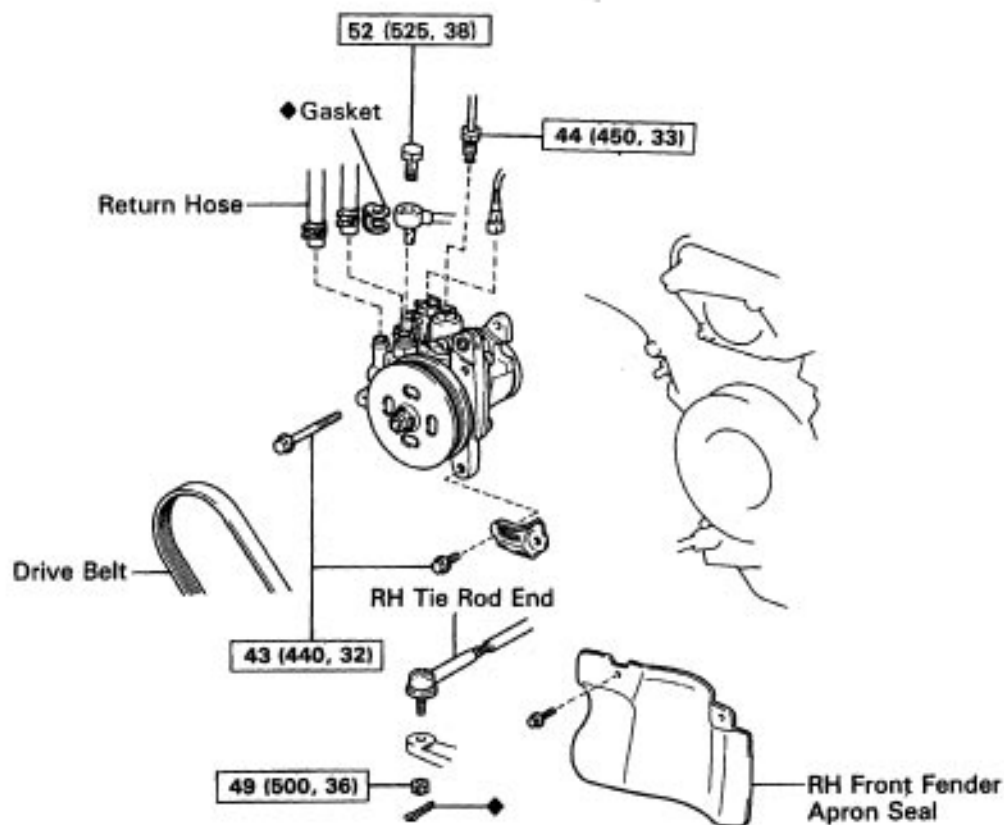
	09238-47012 Water Pump Bearing Remover & Replacer	PS pump bearing (3VZ-FE)
	09608-12010 Front Hub & Drive Pinion Bearing Replacer Set	Gear housing oil seal
	(09608-00080) Replacer	
	09612-00012 Rack & Pinion Steering Rack Housing Stand	
	09612-22011 Tilt Handle Bearing Replacer	Control valve oil seal
	09612-24014 Steering Gear Housing Overhaul Tool Set	
	(09613-22011) Steering Rack Shaft Bushing Puller	
	(09617-24020) Steering Pinion Bearing Adjusting Screw Lock Nut Wrench	
	(09617-24030) Steering Rack End Wrench	
	09616-00010 Steering Worm Bearing Adjusting Socket	
	09616-30020 Steering Worm Bearing Adjusting Screw Wrench	
	09617-14010 Steering Rack End Wrench	
	09620-30010 Steering Gear Box Replacer Set	

	(09623–30010) Steering Worm Bearing & Oil Seal Replacer	
	(09631 –00020) Handle	
	09628–62011 Ball Joint Puller	Tie rod end
	09630–24013 Steering Rack Oil Seal Tool Set	
	(09620–24010) Valve Cup Oil Seal Remover	
	(09620–24020) Valve Cup Oil Seal Replacer	
	09631–10021 Rack Stopper Wrench	
	09631 –10030 Oil Seal Remover	
	09631 –12020 Handle	
	09631–12071 Steering Rack Oil Seal Test Tool	
	09631–16010 Cylinder End Stopper Nut Wrench	
	09631–20081 Seal Ring Tool	
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	
	09631–33010 Steering Rack Cover "I"	

POWER STEERING PUMP (1 MZ-FE)

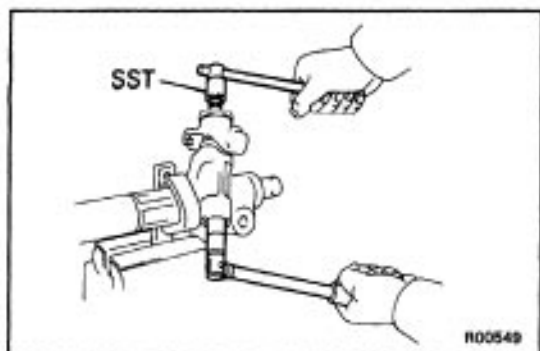
POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts, as shown.



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

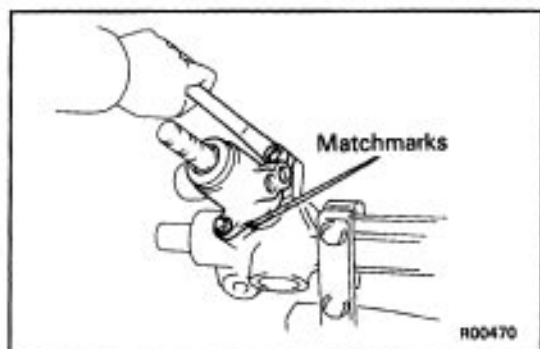
◆ Non-reusable part



10. REMOVE SELF- LOCKING NUT

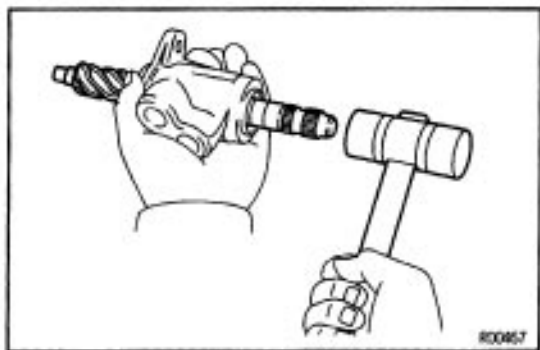
Using SST to hold the control valve, remove the self-locking nut.

SST 09616 – 00010



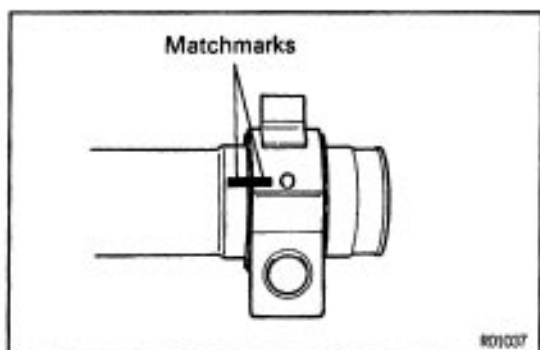
11. REMOVE CONTROL VALVE HOUSING

- Remove the dust cover.
- Place matchmarks on the valve housing and rack housing.
- Remove the 2 bolts.
- Pull out the valve with the valve housing.
- Remove the gasket from the rack housing.



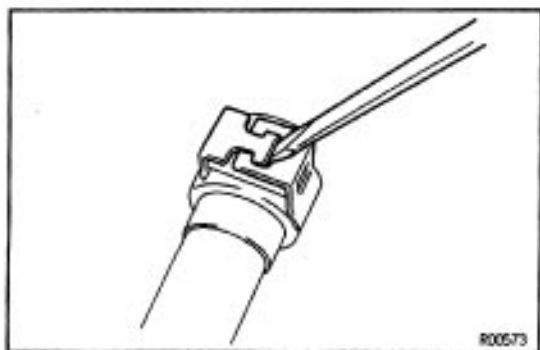
12. REMOVE CONTROL VALVE FROM HOUSING

Tap out the control valve and oil seal.

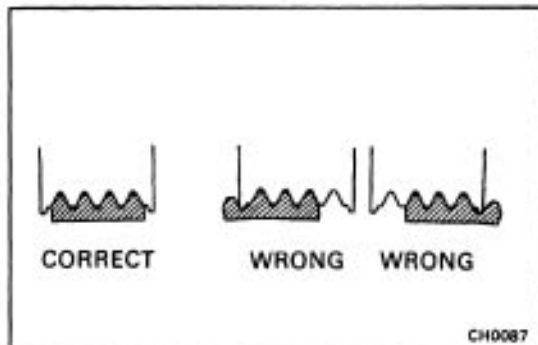
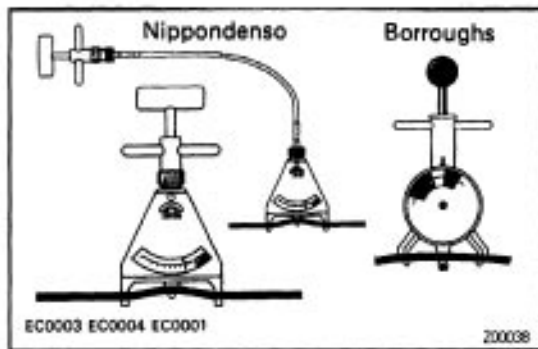


13. REMOVE NO.2 BRACKET

- Place matchmarks on the bracket and rack housing.



- Using a screwdriver, pry apart the clasp of the No.2 bracket.
- Remove the bushing and bracket from the rack housing.
- Remove the bushing from the bracket.



ON-VEHICLE INSPECTION DRIVE BELT TENSION CHECK

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG-20 (95506-00020) or
Borroughs No.BT-33-73F

Drive belt tension:

1 MZ-FE

New belt

667-824 N (68-84 kgf, 150-185 lbf)

Used belt

422-598 N (43-61 kgf, 95-135 lbf)

5S-FE

New belt

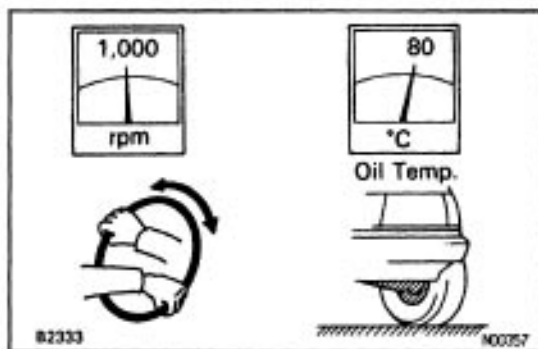
441-667 N (45-68 kgf, 100-150 lbf)

Used belt

275-441 N (28-45 kgf, 60-100 lbf)

HINT:

- "New belt" refers to a belt which has been less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.



FLUID LEVEL CHECK

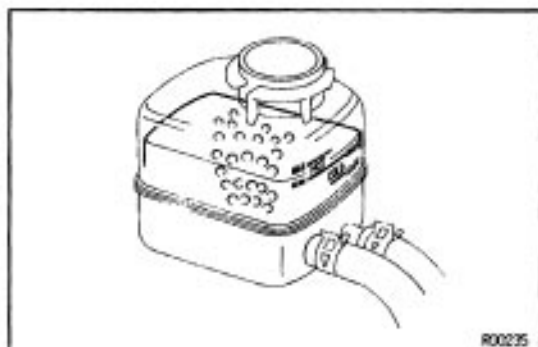
1. KEEP VEHICLE LEVEL

2. BOOST FLUID TEMPERATURE

With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature:

80°C (176°F)



3. CHECK FOR FOAMING OR EMULSIFICATION

HINT: Foaming and emulsification indicate either the existence of air in the system or that the fluid level is too low.

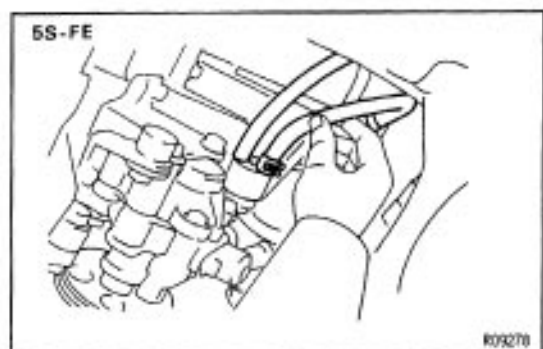
4. CHECK FLUID LEVEL IN OIL RESERVOIR

Check the fluid level and add fluid if necessary.

Fluid:

ATF DEXRON®II

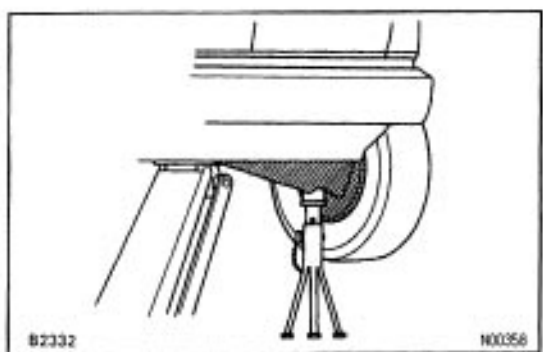
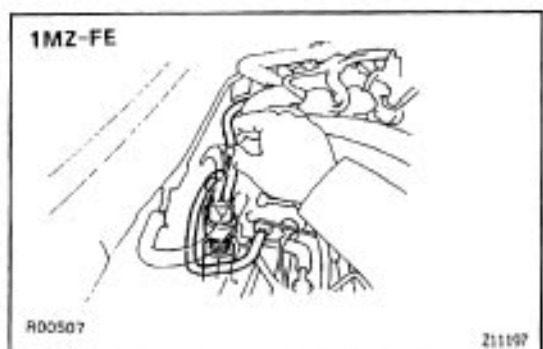
HINT: Check that the fluid level is within the HOT LEVEL of the tank. If the fluid is cold, check that it is within the COLD LEVEL of the tank.



IDLE-UP CHECK

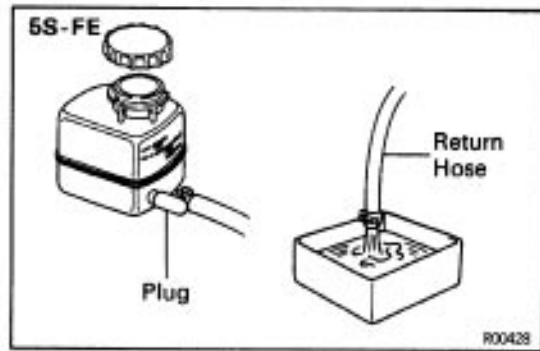
1. WARM UP ENGINE
2. TURN AIR CONDITIONER SWITCH OFF
3. CHECK IDLE-UP

- (a) Fully turn the steering wheel.
- (b) Check that the engine rpm decreases when the air control valve hose is pinched.
- (c) Check that the engine rpm increases when the air control valve hose is released.

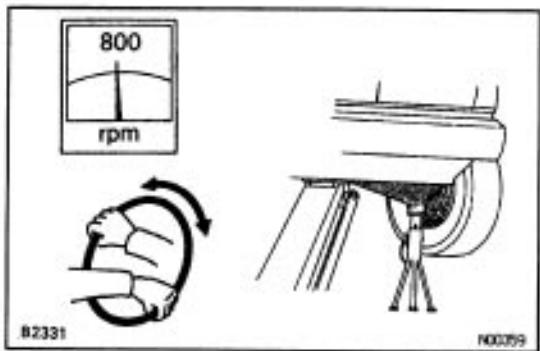
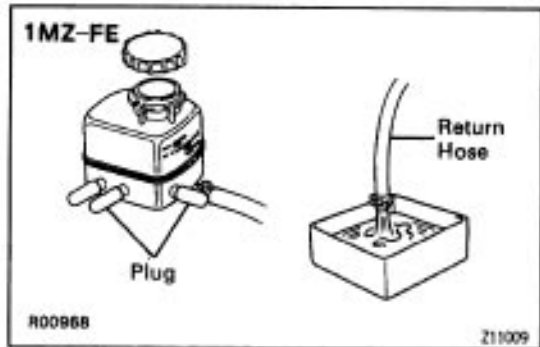


POWER STEERING FLUID REPLACEMENT

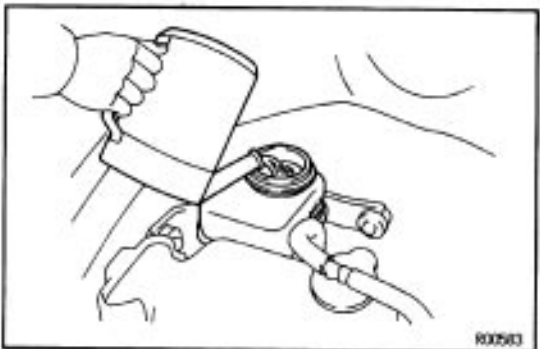
1. JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS



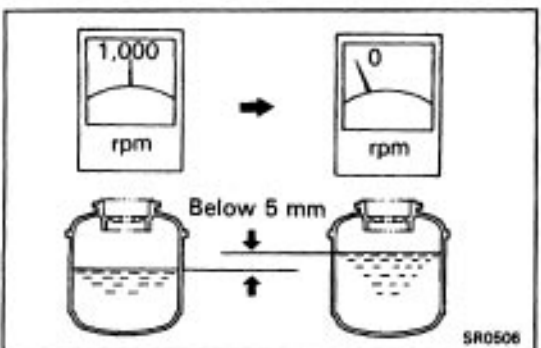
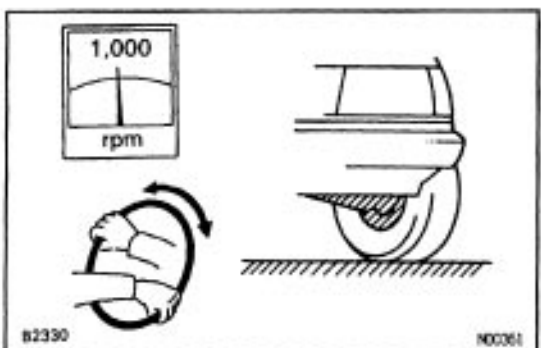
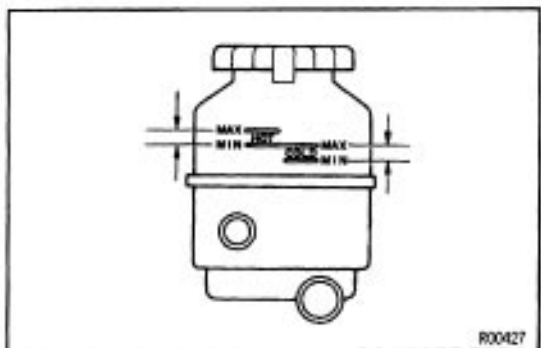
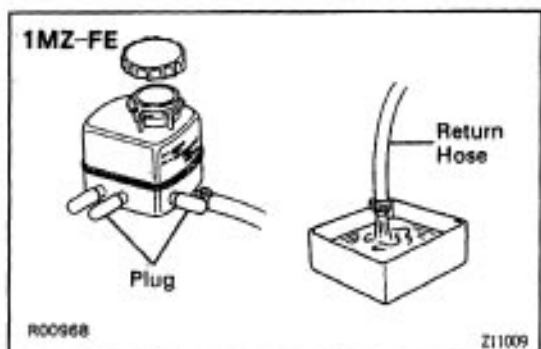
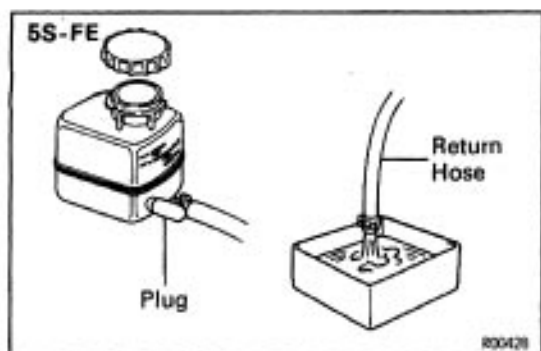
2. REMOVE FLUID RETURN HOSE FROM OIL RESERVOIR AND DRAIN FLUID INTO CONTAINER



3. TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID



4. FILL OIL RESERVOIR WITH FRESH FLUID
Fluid:
ATF DEXRON®II



5. START ENGINE AND RUN IT AT 1,000 RPM

After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.

NOTICE: Take care that some fluid remains left in the oil reservoir.

6. REPEAT STEPS 5 AND 6 FOUR OR FIVE TIMES UNTIL THERE IS NO MORE AIR IN FLUID

7. CONNECT RETURN HOSE TO OIL RESERVOIR

8. BLEED POWER STEERING SYSTEM

POWER STEERING SYSTEM BLEEDING

1. CHECK FLUID LEVEL IN OIL RESERVOIR

Check the fluid level and add fluid if necessary.

Fluid:

ATF DEXRON® II

HINT: Check that the fluid level is within the HOT LEVEL of the dipstick of the oil reservoir. If the fluid is cold, check that it is within the COLD LEVEL of the dipstick.

2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK 3 OR 4 TIMES

With the engine speed below 1,000 rpm, turn the steering wheel to left or right full lock and keep it there for 2–3 seconds, then turn the wheel to the opposite full lock and keep it there for 2–3 seconds.

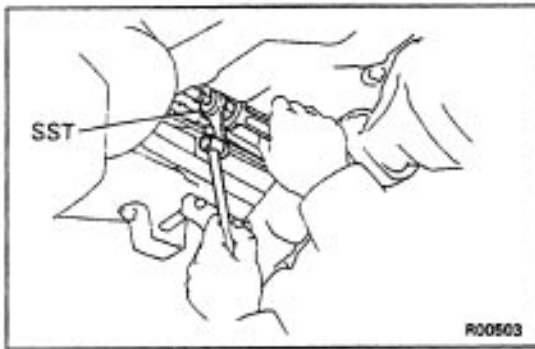
3. CHECK THAT FLUID IN OIL RESERVOIR IS NOT FOAMY OR CLOUDY AND DOES NOT RISE OVER MAXIMUM WHEN ENGINE IS STOPPED

Measure the fluid level with the engine running. Stop the engine and measure the fluid level.

Maximum rise:

5 mm (0.20 in.)

If a problem is found, repeat steps 5 to 6 on page [SR-27](#). Repair the PS if the problem persists.



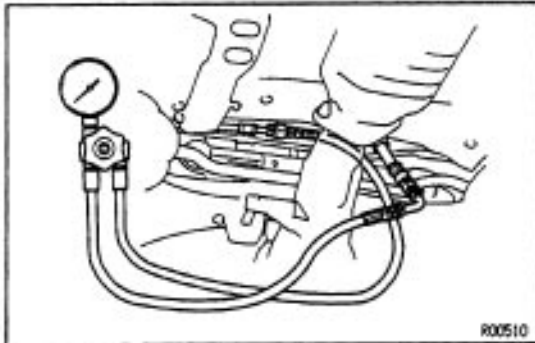
OIL PRESSURE CHECK

1. CONNECT OIL PRESSURE GAUGE

1 MZ-FE

(a) Using SST, disconnect the pressure line joint.

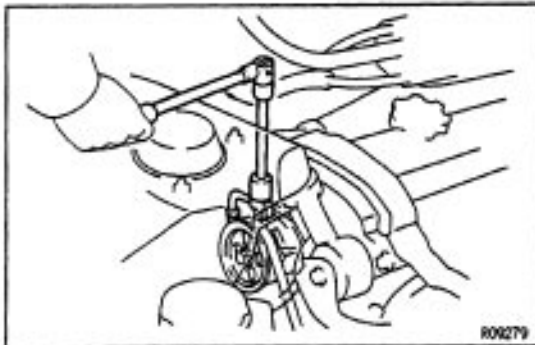
SST 09631 -22020



(b) Connect the gauge side of the pressure gauge to the PS pump side and the valve side to the gear housing side.

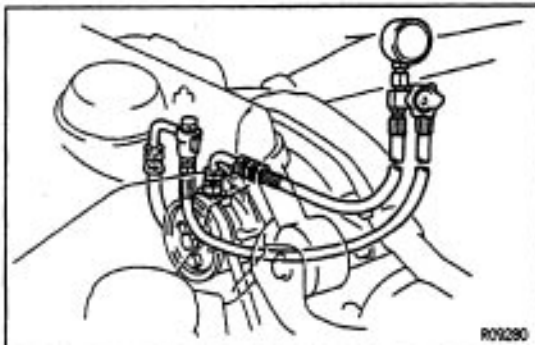
2. BLEED POWER STEERING SYSTEM

(See page [SR-27](#))



5S-FE

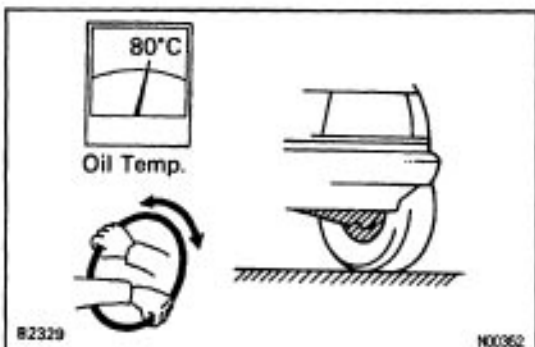
(a) Disconnect the pressure tube from the PS pump.



(b) Connect the gauge side of the pressure gauge to the PS pump and the valve side to the pressure line.

3. BLEED POWER STEERING SYSTEM

(See page [SR-27](#))

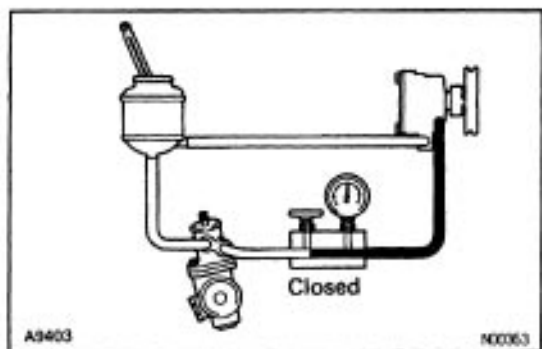


4. START ENGINE AND RUN IT AT IDLE

5. BOOST FLUID TEMPERATURE

With the engine idling at 1,000 rpm or less, turn the steering wheel from lock to lock several times to boost fluid temperature.

Fluid temperature: 80 °C (176 °F)



6. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

Close the oil pressure gauge valve and observe the reading on the gauge.

Minimum pressure:

1 MZ – FE

9,120 kPa (93 kgf/cm², 1,323 psi)

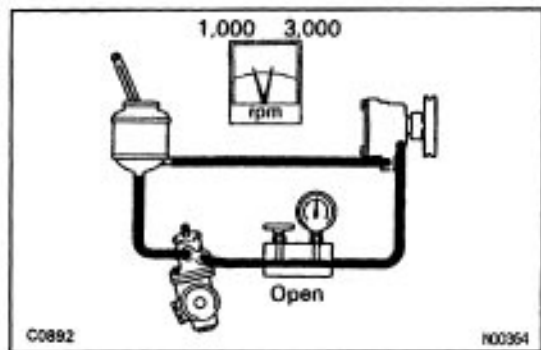
5S-FE

8,336 kPa (85 kgf/cm², 1,209 psi)

NOTICE:

- Do not keep the valve closed for more than 10 seconds.
 - Do not let the fluid temperature become too high.
- If pressure is low, repair or replace the PS pump.

7. OPEN VALVE FULLY

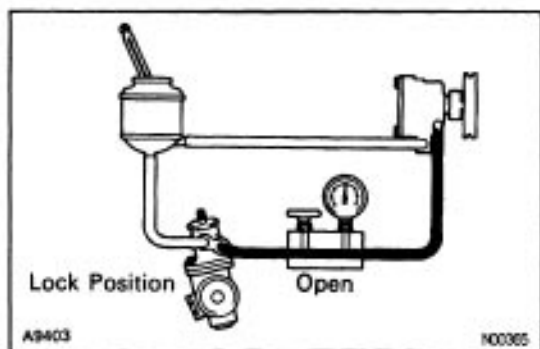


8. CHECK AND RECORD PRESSURE READING AT 1,000 RPM

9. CHECK AND RECORD PRESSURE READING AT 3,000 RPM

Check that there is 490 kPa (5 kgf/cm², 71 psi) or less difference in pressure between the 1,000 rpm and 3,000 rpm checks.

If the difference is excessive, repair or replace the flow control valve of the PS pump.



10. CHECK PRESSURE READING WITH STEERING WHEEL TURNED TO FULL LOCK

Be sure the pressure gauge valve is fully opened and the engine idling.

Minimum pressure:

1 MZ-FE

9,120 kPa (93 kgf/cm², 1,323 psi)

5S-FE

8,336 kPa (85 kgf/cm², 1,209 psi)

NOTICE:

- Do not maintain lock position for more than 10 seconds.
- Do not let the fluid temperature become too high.

If pressure is low, the gear housing has an internal leak and must be repaired or replaced.

11. MEASURE STEERING EFFORT

(a) Center the steering wheel and run the engine at idle.

(b) Using a spring scale, measure the steering effort in both directions.

Maximum steering effort:

39 N (4 kgf, 8.8 lbf)

If steering effort is excessive, repair the PS unit.

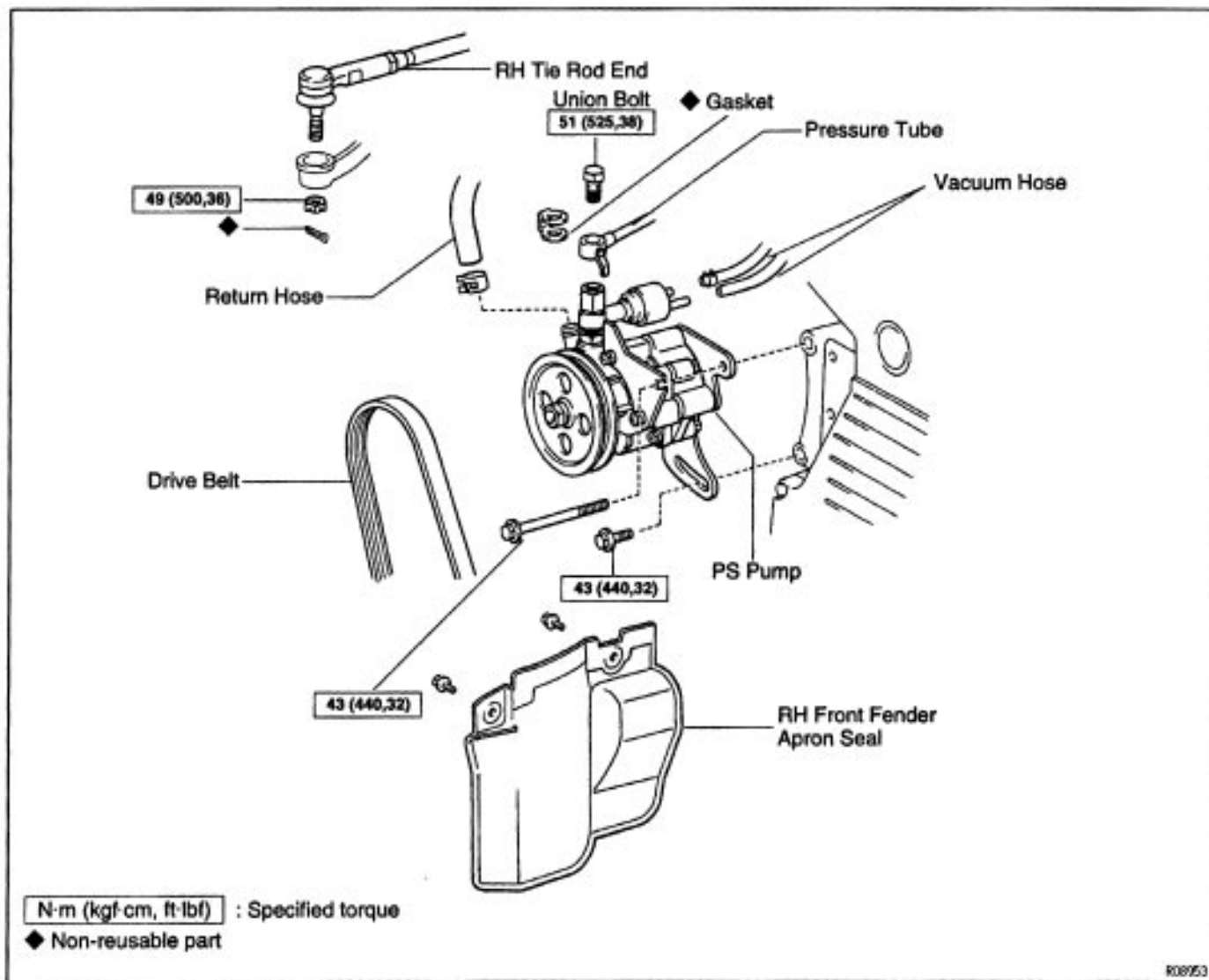
HINT: Be sure to consider the tire type, pressure and contact surface before making your diagnosis.



POWER STEERING PUMP (5S-FE)

POWER STEERING PUMP REMOVAL AND INSTALLATION

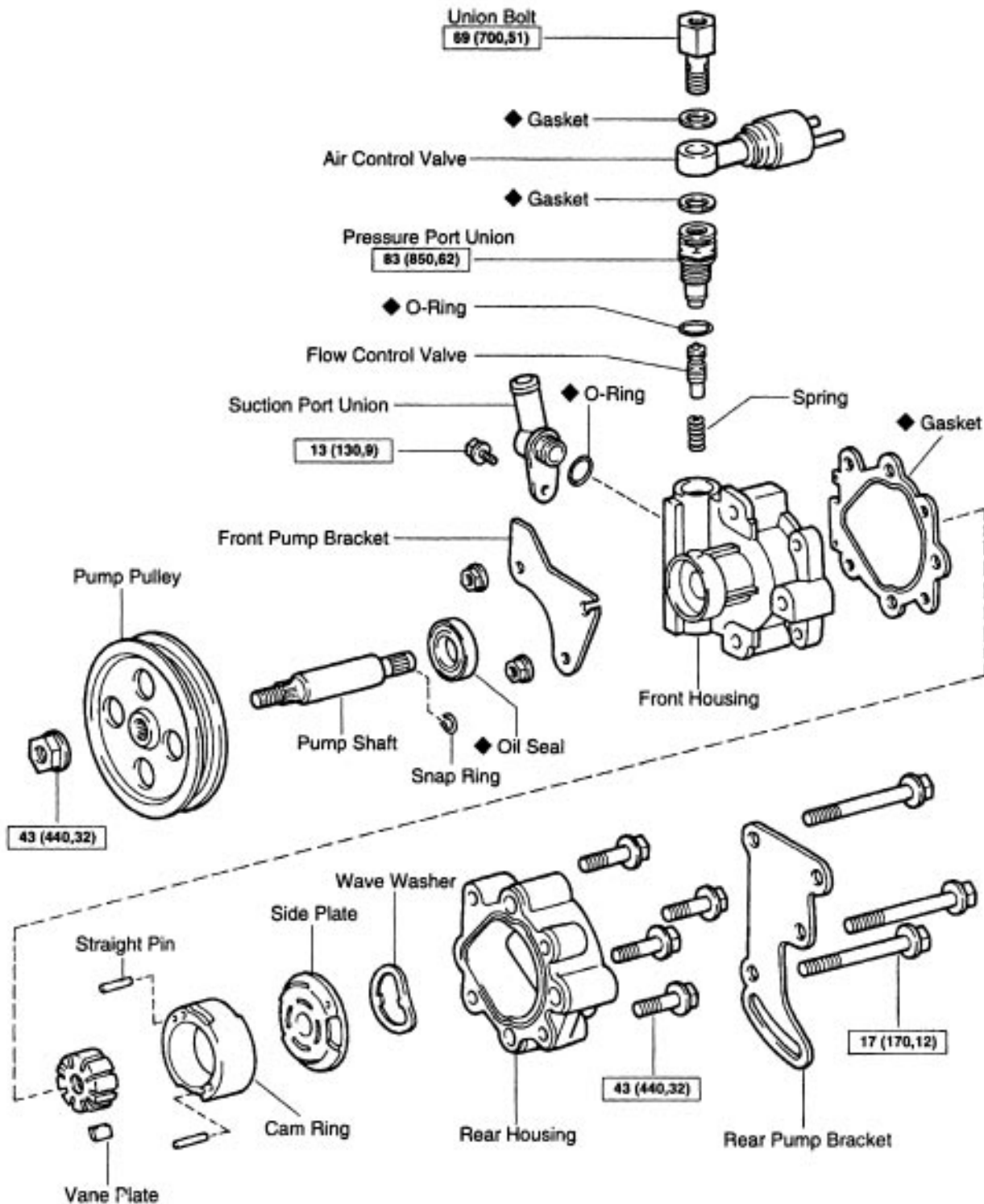
Remove and install the parts, as shown.



MAIN POINTS OF REMOVAL AND INSTALLATION

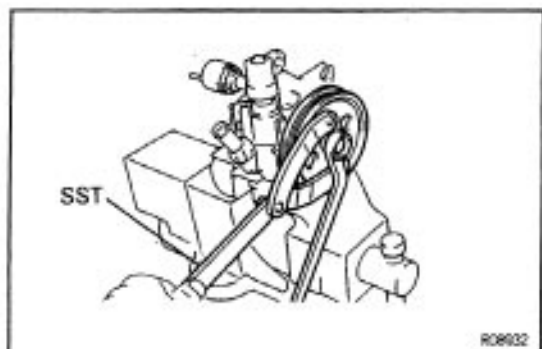
1. ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP
2. BLEED POWER STEERING SYSTEM

COMPONENTS



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

◆ Non-reusable part



-1-01

POWER STEERING PUMP DISASSEMBLY

1. MOUNT POWER STEERING PUMP IN VISE

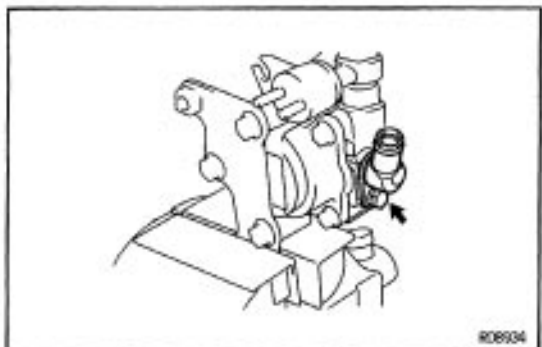
NOTICE: Do not tighten the vise too tight.

2. REMOVE PS PUMP PULLEY

(a) Using SST, remove the pulley set nut.

SST 09960-10010 (09963-01000)

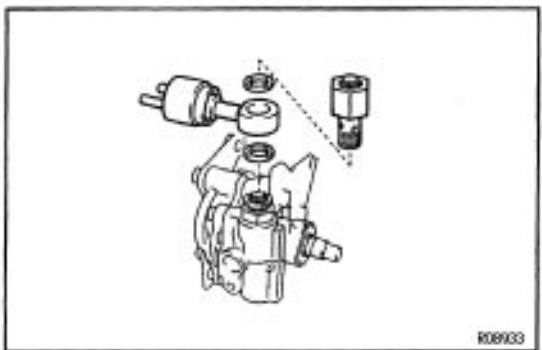
(b) Remove the pump pulley from the shaft.



3. REMOVE SUCTION PORT UNION

(a) Remove the bolt and union.

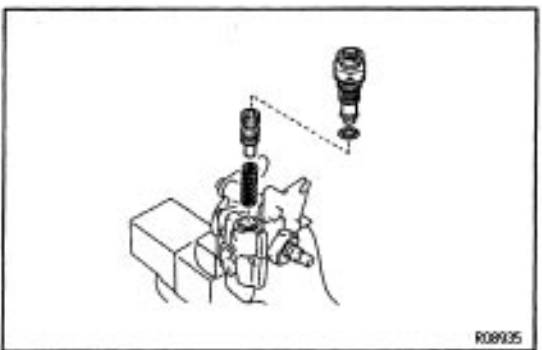
(b) Remove the O-ring from the union.



4. REMOVE AIR CONTROL VALVE

(a) Remove the air control valve.

(b) Remove the gasket.

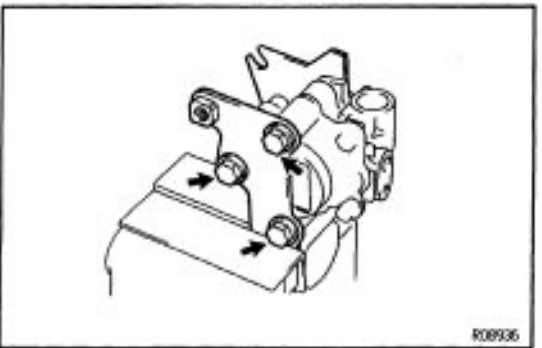


5. REMOVE FLOW CONTROL VALVE

(a) Remove the pressure port union.

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

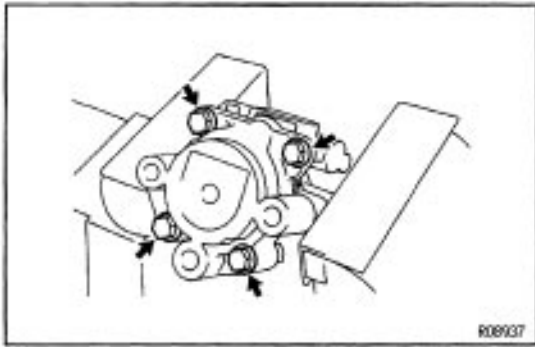
(c) Remove the flow control valve and spring.



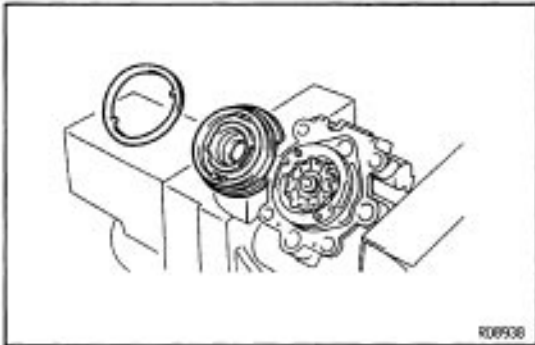
6. REMOVE PUMP BRACKET

(a) Remove the 3 bolt.

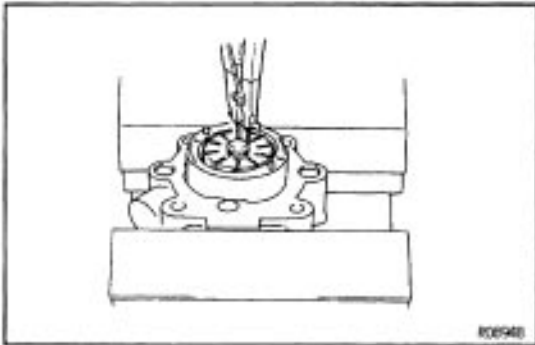
(b) Remove the pump bracket from the pump assy.

**7. REMOVE REAR HOUSING**

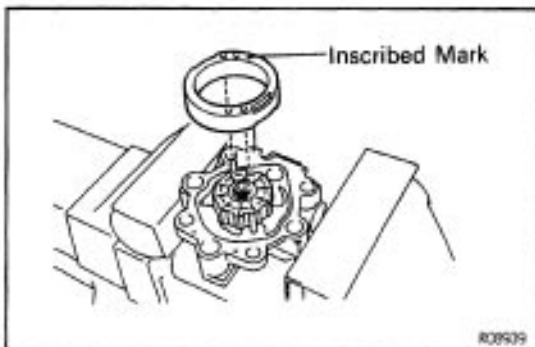
- (a) Remove the 4 bolt.
- (b) Remove the rear housing.



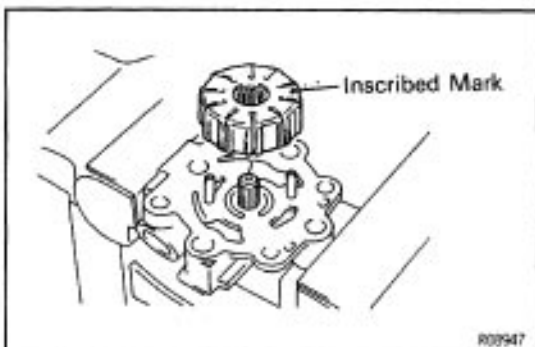
- (c) Remove the wave washer.
- (d) Remove the side plate.

**8. REMOVE PUMP SHAFT, CAM RING AND VANE PLATES**

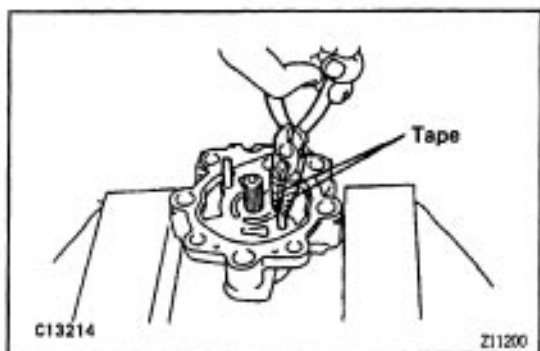
- (a) Using snap ring pliers, remove the snap ring.



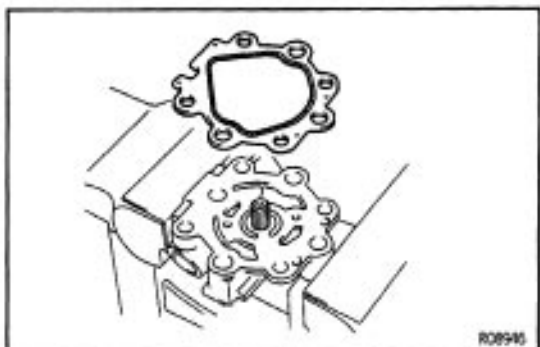
- (b) Remove the cam ring and 10 vane plates from the front housing.

**9. REMOVE ROTER**

- (a) Remove the roter from the pump shaft.

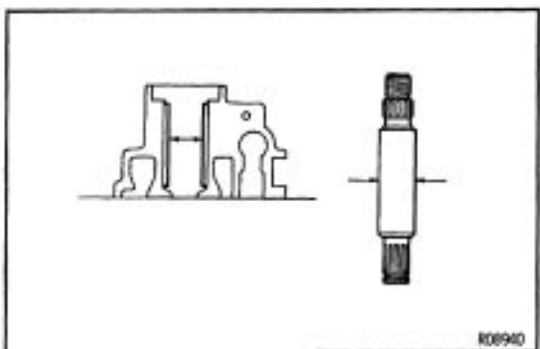


(b) Remove the 2 straight pins from the front housing.



(c) Remove the gasket.

(d) Remove the pump shaft.



POWER STEERING PUMP INSPECTION AND REPLACEMENT

1. MEASURE OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, measure the oil clearance.

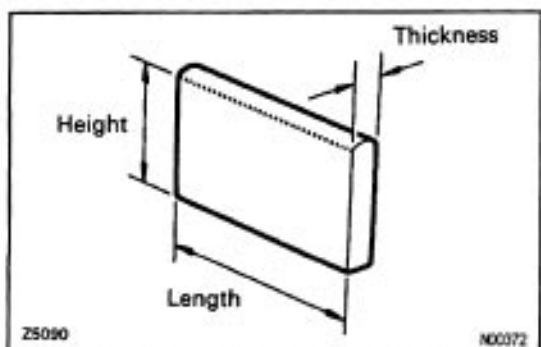
Standard clearance:

0.03–0.05 mm (0.0012–0.0020 in.)

Maximum clearance:

0.07 mm (0.0028 in.)

If more than maximum, replace the entire power steering pump.



2. INSPECT ROTOR AND VANE PLATES

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

Minimum height:

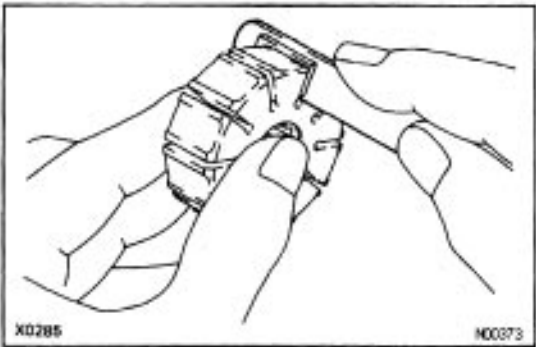
8.6 mm (0.339 in.)

Minimum thickness:

1.4 mm (0.055 in.)

Minimum length:

14.99 mm (0.5902 in.)



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

Maximum clearance:

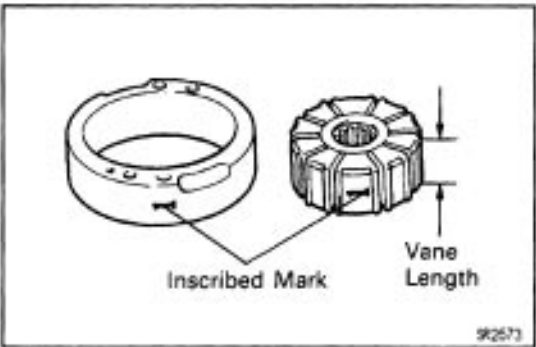
0.03 mm (0.0012 in.)

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

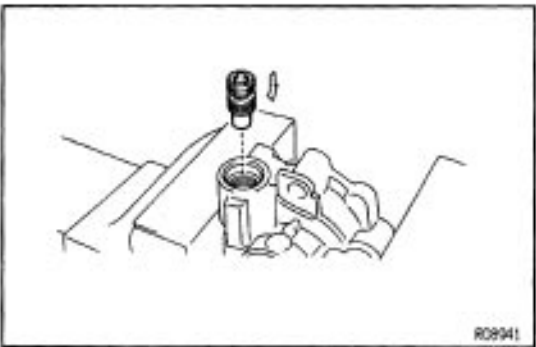
HINT: There are 5 vane lengths with the following rotor and cam ring marks:



Rotor and cam ring mark	Vane length mm (in.)
None	14.999 –15.001 (0.59051 –0.59059)
1	14.997–14.999 (0.59043–0.59051)
2	14.995–14.997 (0.59035–0.59043)
3	14.993–14.995 (0.59027–0.59035)
4	14.911 –14.993 (0.59020–0.59027)

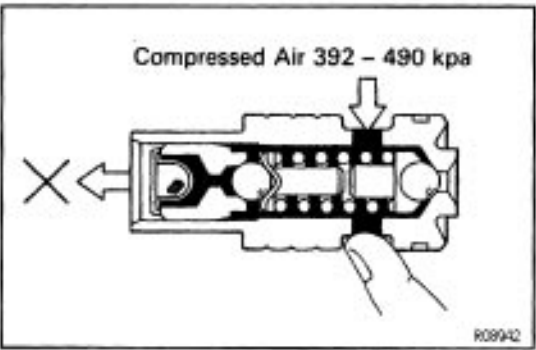
3. INSPECT FLOW CONTROL VALVE

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



(b) Check the flow control valve for leakage.

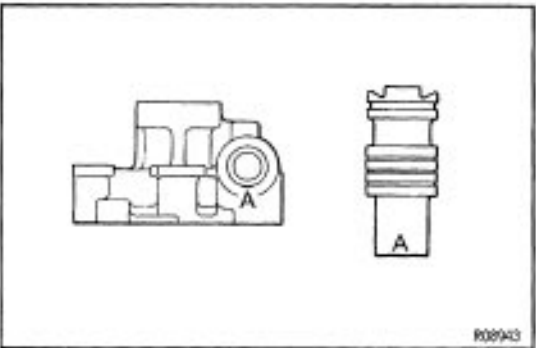
Close one of the holes and apply compressed air [392 –490 kPa (4–5 kgf/cm², 57–71 psi)] into the opposite side, and confirm that air does not come out from the end holes.

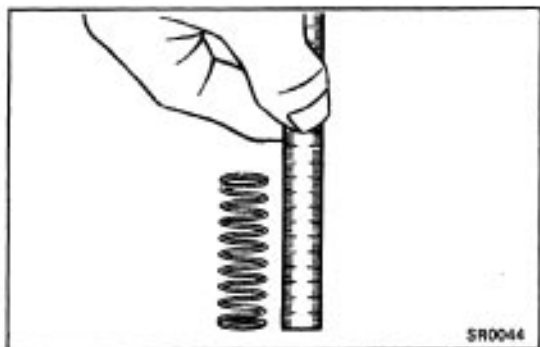


If necessary, replace the valve with one having the same letter as inscribed on the front housing.

Inscribed mark:

A, B, C, D, E or F





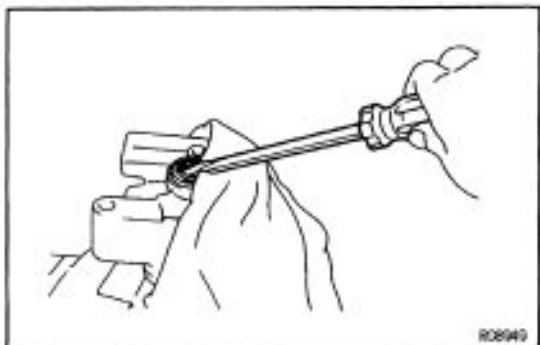
4. INSPECT FLOW CONTROL SPRING

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

Spring length:

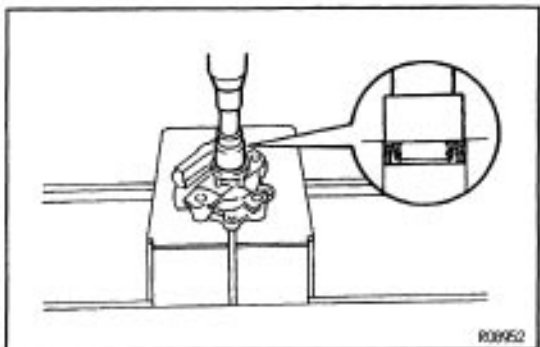
36–38 mm (1.42–1.49 in.)

If not within specification, replace the spring.



5. IF NECESSARY, REPLACE OIL SEAL

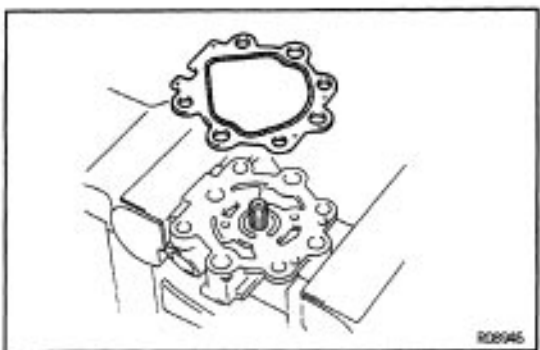
(a) Using a screwdriver, pry out the oil seal.



(b) Coat a new oil seal lip with power steering fluid.

NOTICE: Make sure you install the oil seal facing the correct direction.

(c) Using a socket wrench (24mm) and hammer, drive in a new oil seal.

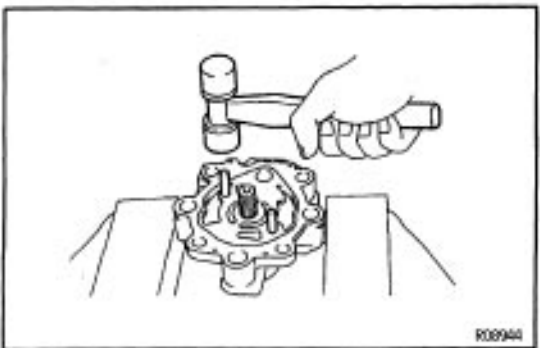


POWER STEERING PUMP ASSEMBLY

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

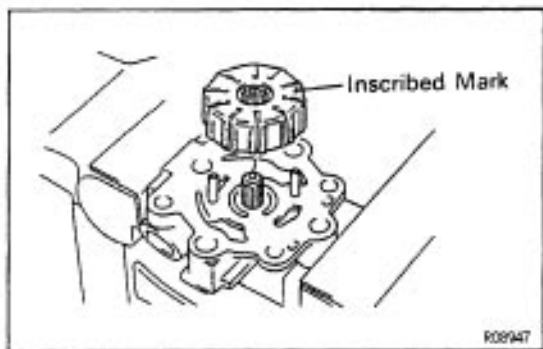
2. INSTALL PUMP SHAFT

3. INSTALL GASKET

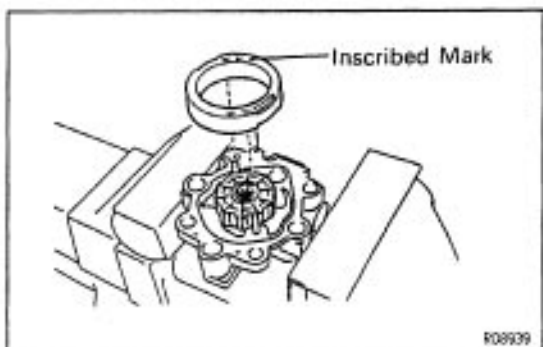


4. INSTALL STRAIGHT PINS

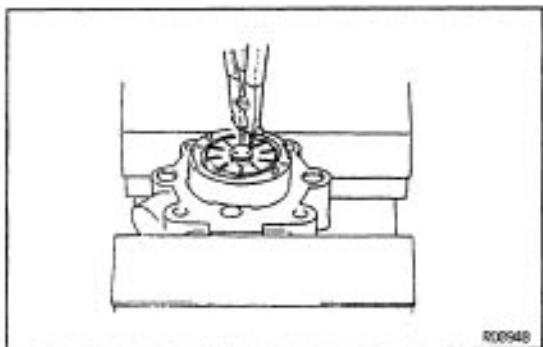
Using a plastic hammer, drive the 2 straight pin to the front plate.

**5. INSTALL CAM RING, ROTOR AND VANE PLATES**

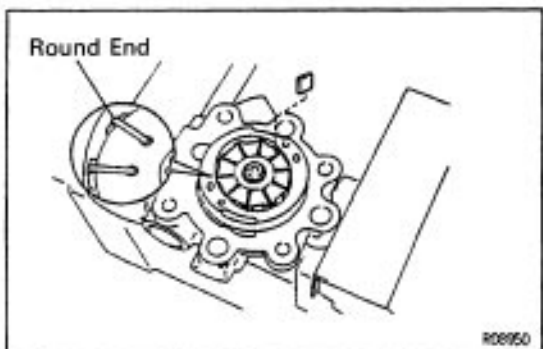
(a) Install the rotor to the shaft with the inscribed mark facing outward.



(b) Align the holes of the cam ring and straight pins, and install the cam ring with the inscribed mark facing outward.

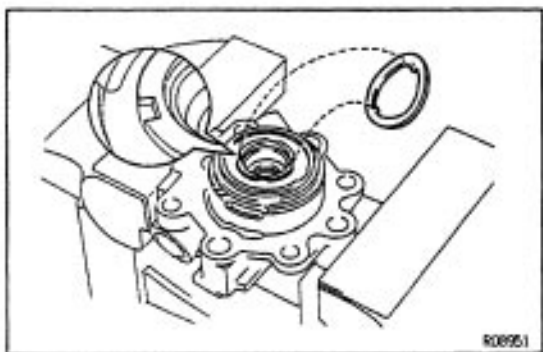


(c) Using snap ring pliers, install the snap ring.



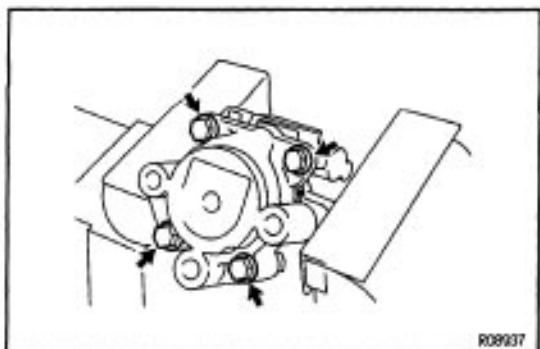
(d) Coat the vane plates with power steering fluid.

(e) Install the 10 vane plates with the round end facing outward.

**6. INSTALL SIDE PLATE AND WAVE WASHER**

(a) Align the holes of the side plate with the pins, and install the plate.

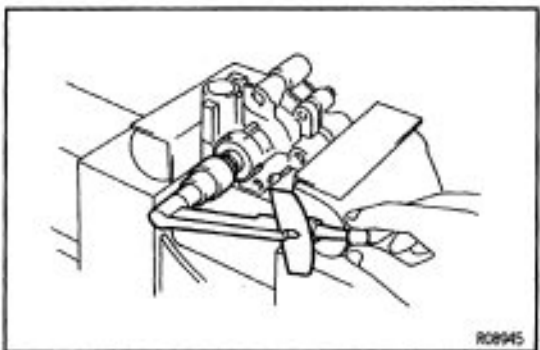
(b) Install the wave washer.



7. INSTALL REAR HOUSING

Install and torque the 4 bolts.

Torque: 43 N-m (440 kgf-cm, 22 ft-lbf)

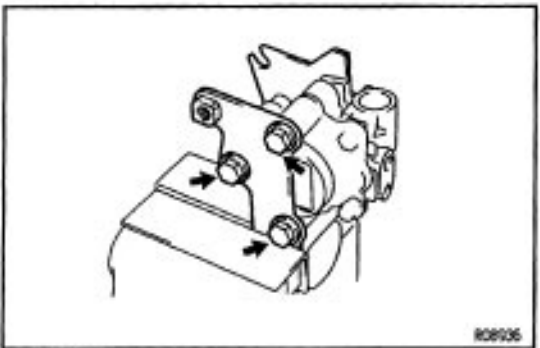


8. MEASURE PUMP SHAFT PRELOAD

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

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

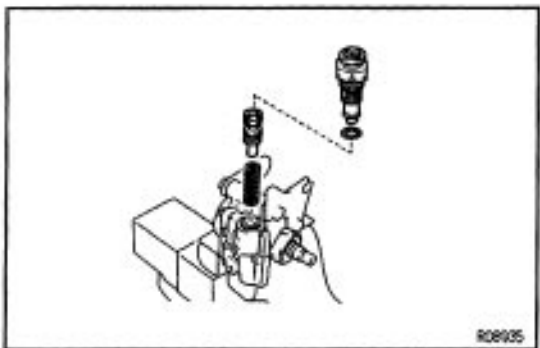
Rotating torque: 0.3 N-m (2.8 kgf-cm, 2.4 in.-lbf) or less



9. INSTALL PUMP BRACKET

Install the pump bracket with the 3 bolts.

Torque: 17 N-m (170 kgf-cm, 12 ft-lbf)



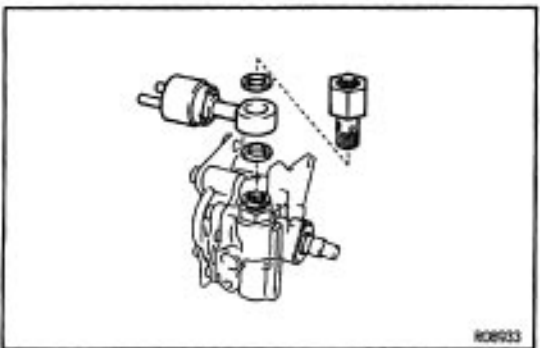
10. INSTALL FLOW CONTROL VALVE

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

(b) Coat a new O-ring with power steering fluid, and install it to the pressure port union.

(c) Install and torque the pressure port union.

Torque: 83 N-m (850 kgf-cm, 62 ft-lbf)

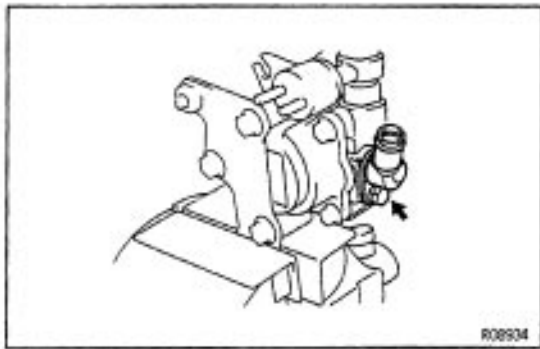


11. INSTALL AIR CONTROL VALVE

(a) Install a new gasket.

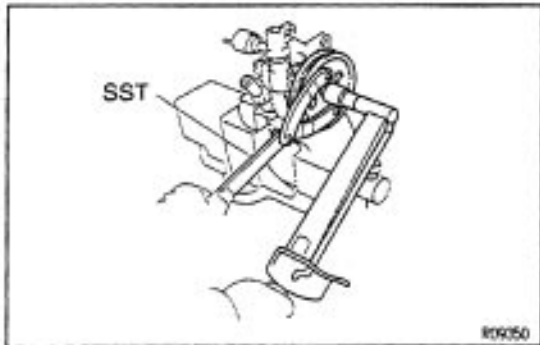
(b) Install the air control valve.

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

**12. INSTALL SUCTION PORT UNION**

- (a) Coat a new O-ring with power steering fluid, and install it to the suction port union.
- (b) Install the suction port union.
- (c) Install and torque the bolt.

Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)

**13. INSTALL PS PUMP PULLEY**

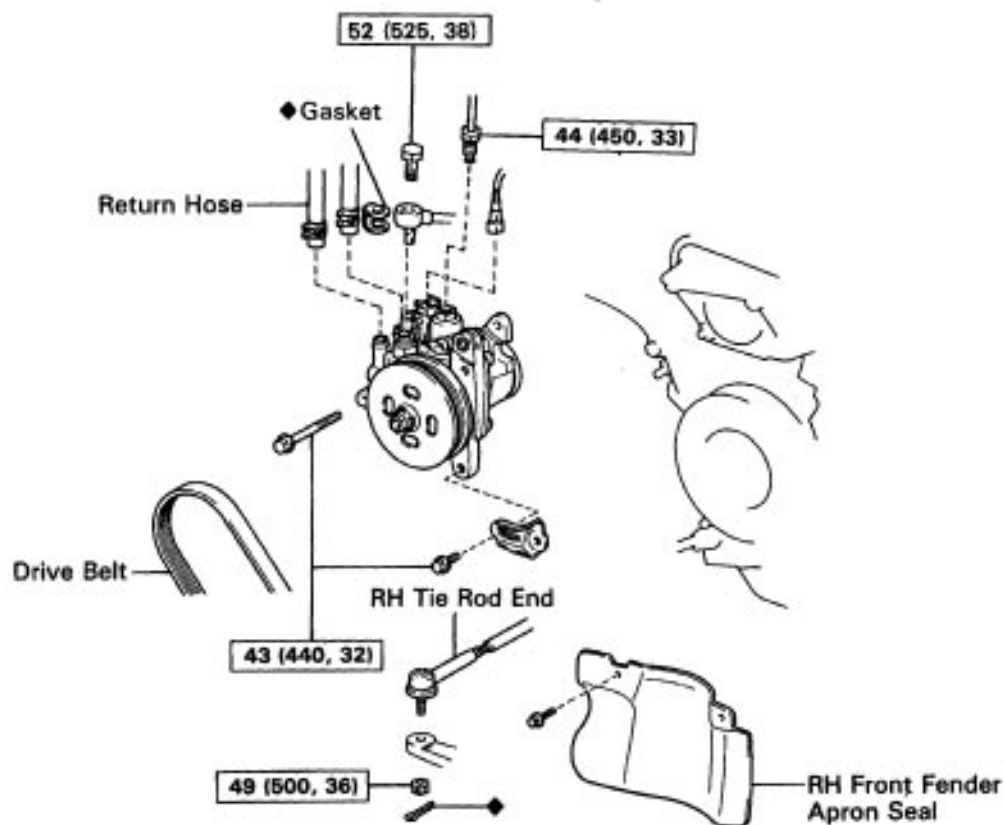
- (a) Install the pump pulley to the shaft.
 - (b) Using SST, install and torque the pulley set nut.
- SST 09960-10010 (09963-01000)

Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

POWER STEERING PUMP (1MZ-FE)

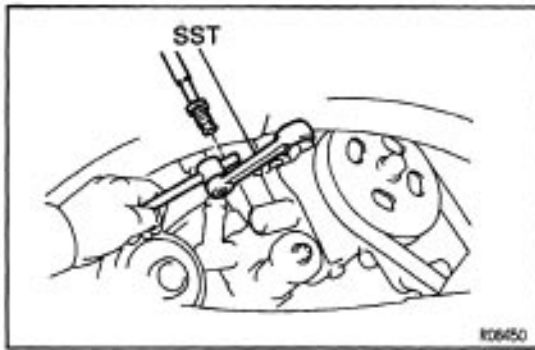
POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts, as shown.



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

◆ Non-reusable part



MAIN POINTS OF REMOVAL AND INSTALLATION

1. REMOVE PRESSURE TUBES

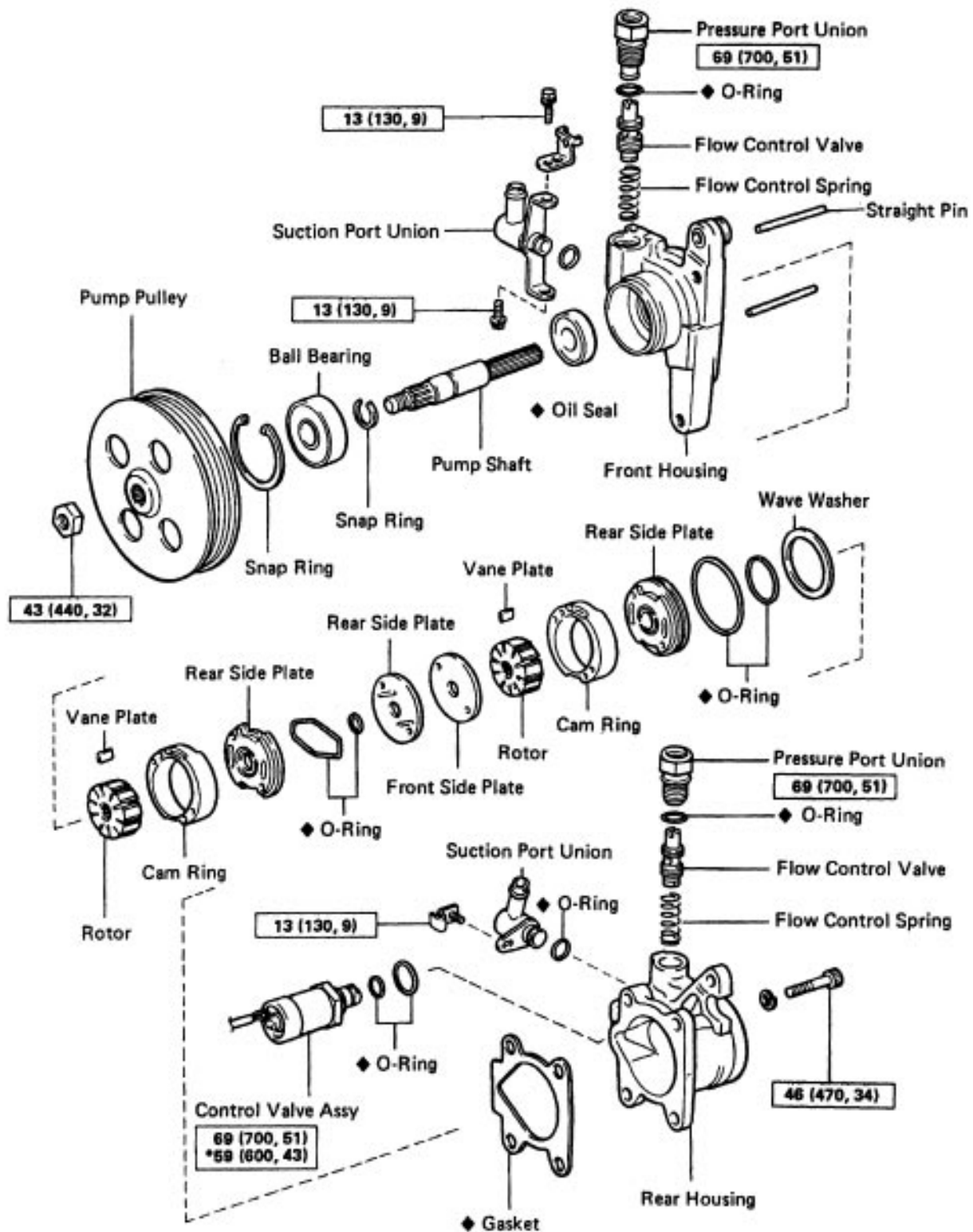
Using SST, remove the pressure tubes.

SST 09631-22020

2. ADJUST DRIVE BELT TENSION AFTER INSTALLING PS PUMP

3. BLEED POWER STEERING SYSTEM

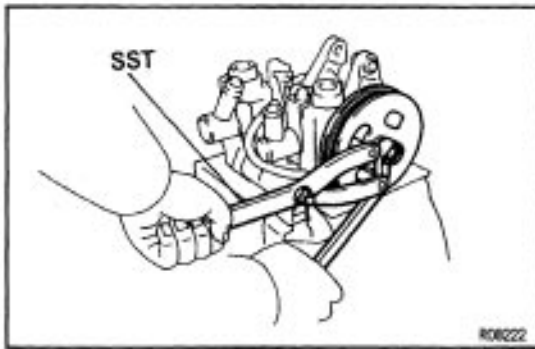
COMPONENTS



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

◆ Non-reusable part

* For use with SST



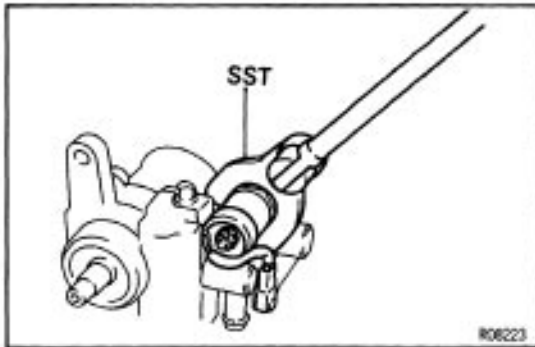
POWER STEERING PUMP DISASSEMBLY

1. MOUNT POWER STEERING PUMP IN VISE

NOTICE: Do not tighten the vise to tight.

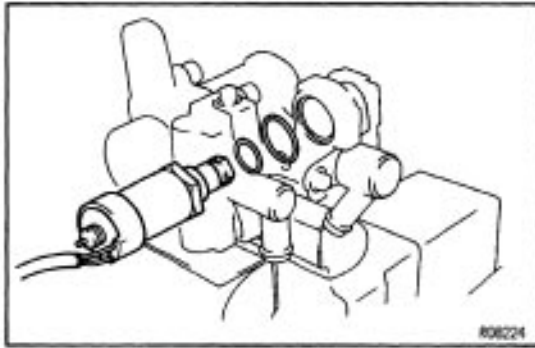
2. REMOVE PS PUMP PULLEY

- (a) Using SST, remove the pulley set nut.
SST 09960-10010 (09963-01000)
- (b) Remove the pump pulley from the shaft.

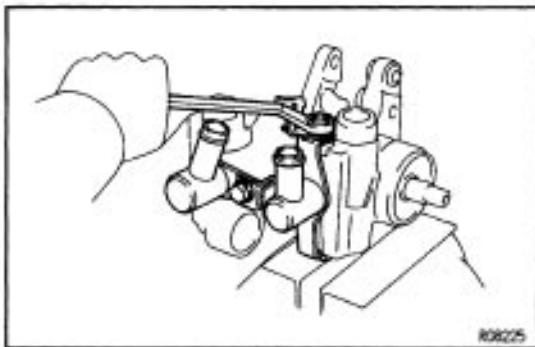


3. REMOVE CONTROL VALVE

- (a) Using SST, remove the control valve.
SST 09612-24014 (09617-24030)

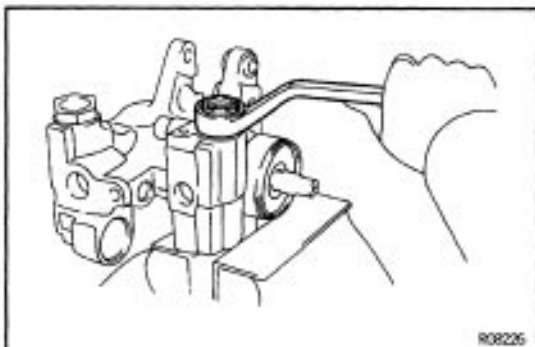


- (b) Remove the O-ring from the control valve.
- (c) Remove the O-ring from the rear housing.



4. REMOVE SUCTION PORT UNIONS

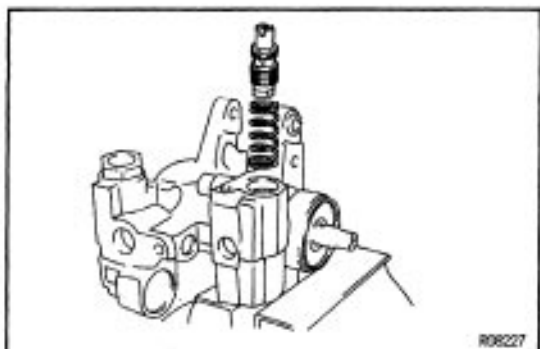
- (a) Remove the 3 bolts and 2 suction port unions.
- (b) Remove the O-ring from each suction port union.



5. REMOVE FLOW CONTROL VALVE

For PS:

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



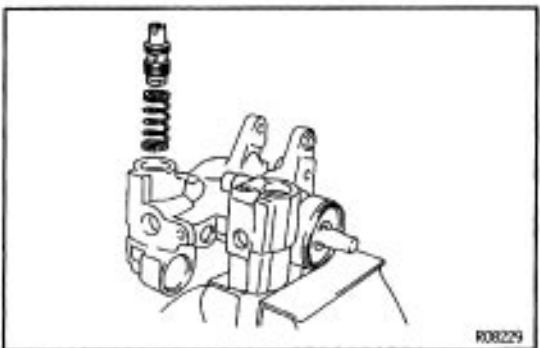
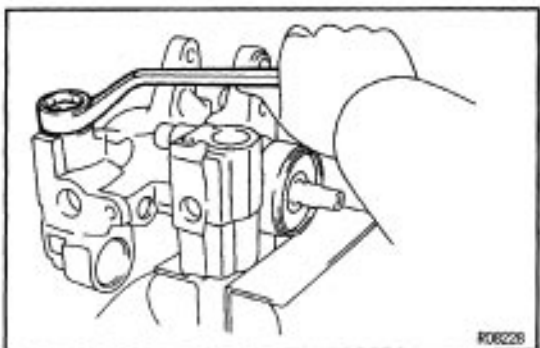
(c) Using a magnetic finger, remove the flow control valve and spring.

NOTICE: Be careful not to confuse the flow control valve of the PS with that of the hydraulic cooling fan system.

6. REMOVE FLOW CONTROL VALVE

For Hydraulic Cooling Fan System:

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

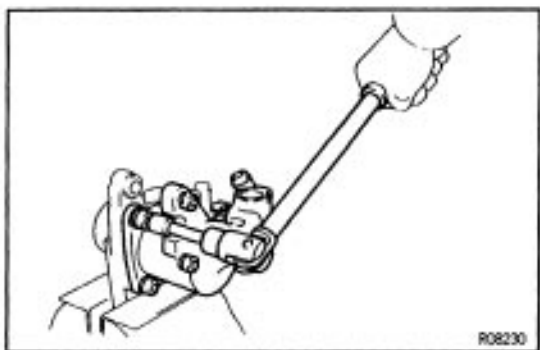


(c) Using a magnetic finger, remove the flow control valve and spring.

NOTICE: Be careful not to confuse the flow control valve of the hydraulic cooling fan system with that of the PS.

7. REMOVE REAR HOUSING

Using a hexagon wrench (8 mm), remove the 4 bolts, rear housing and gasket.

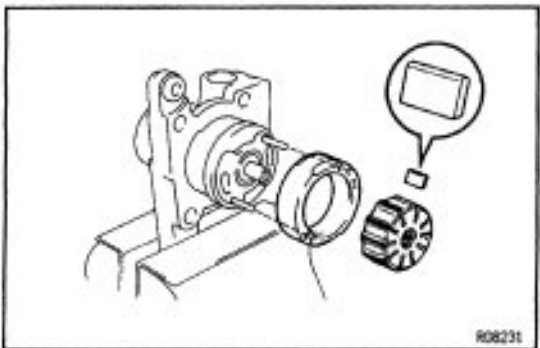


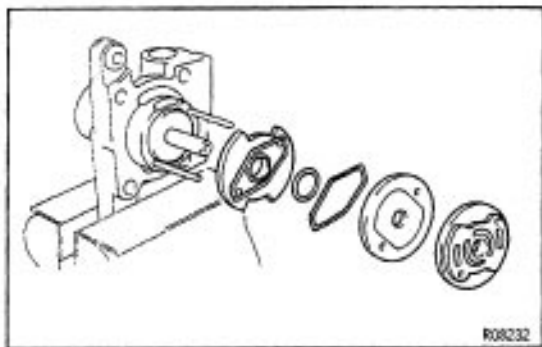
8. REMOVE CAM RING, ROTOR AND VANE PLATE

For Hydraulic Cooling Fan System:

Remove the cam ring, rotor and 10 vane plates.

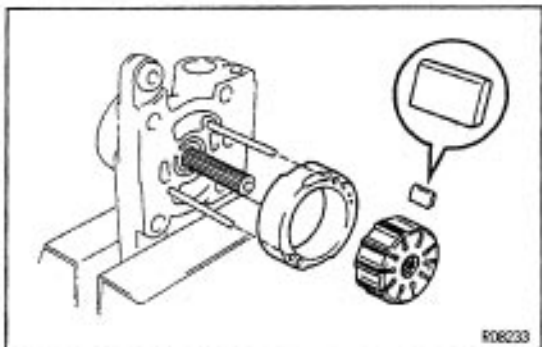
NOTICE: Be careful not to confuse the cam ring, rotor and vane plates of the hydraulic cooling fan system with those of the PS.





9. REMOVE FRONT SIDE PLATE AND 2 REAR SIDE PLATES

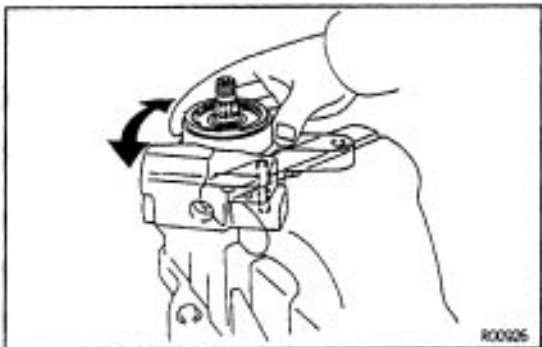
- (a) Remove the front side plate and 2 rear side plates.
- (b) Remove the 2 O-rings from the rear side plate.



10. REMOVE CAM RING, ROTOR AND VANE PLATES For PS:

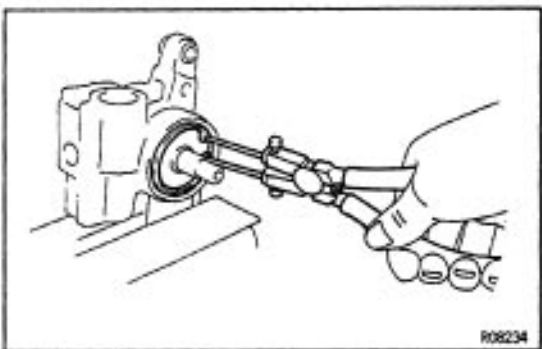
Remove the cam ring, rotor and 10 vane plates.

NOTICE: Be careful not to confuse the cam ring, rotor and vane plates of the PS with those of the hydraulic cooling fan system.



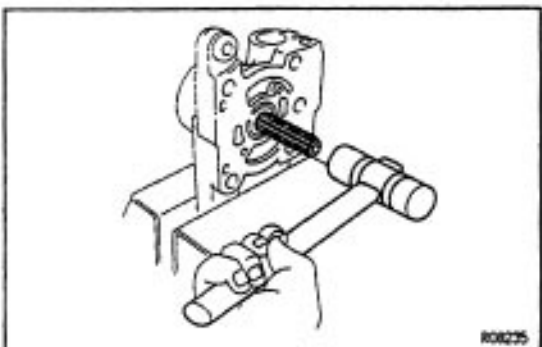
11. REMOVE STRAIGHT PINS

Put each straight pin in the vise and rotate the housing to pull the straight pin out from the housing.

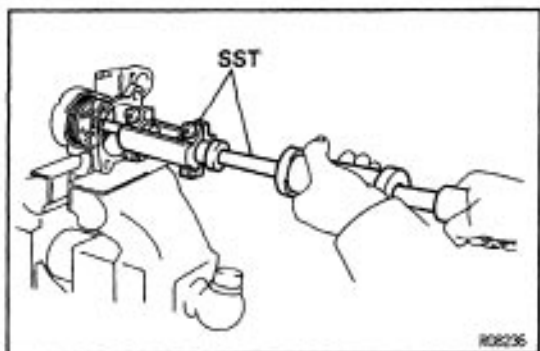


12. REMOVE PUMP SHAFT

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



- (b) Using a plastic hammer, tap out the pump shaft.

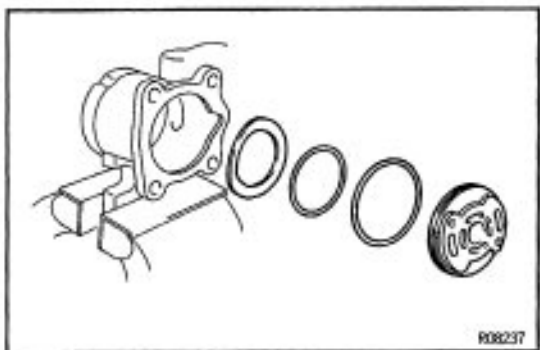


13. REMOVE REAR SIDE PLATE AND WAVE WASHER FROM REAR HOUSING

(a) Install a suitable bolt and plate washer to the rear plate.

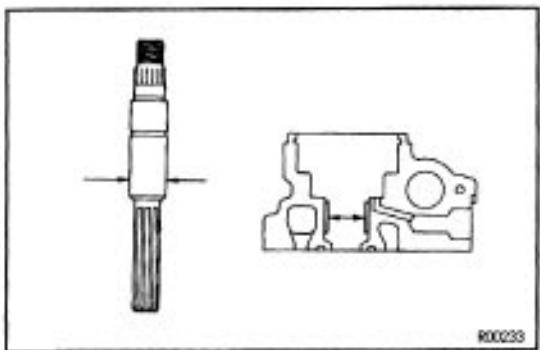
(b) Using SST, remove the rear plate.

SST 09910 – 00015 (09911– 00011, 09912 – 00010)



(c) Remove the 2 O-rings from the rear side plate.

(d) Remove the wave washer.



POWER STEERING PUMP INSPECTION AND REPLACEMENT

NOTICE: Be careful not to confuse the parts of the PS with those of the hydraulic cooling fan system.

1. MEASURE OIL CLEARANCE OF SHAFT AND BUSHING

Using a micrometer and calipers, measure the oil clearance.

Standard clearance:

0.03–0.05 mm (0.0012–0.0020 in.)

Maximum clearance:

0.07 mm (0.0028 in.)

If more than maximum, replace the entire power steering pump.

2. INSPECT ROTOR AND VANE PLATES

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

For PS

Minimum height:

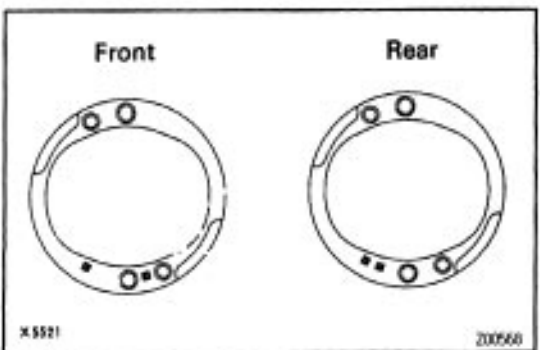
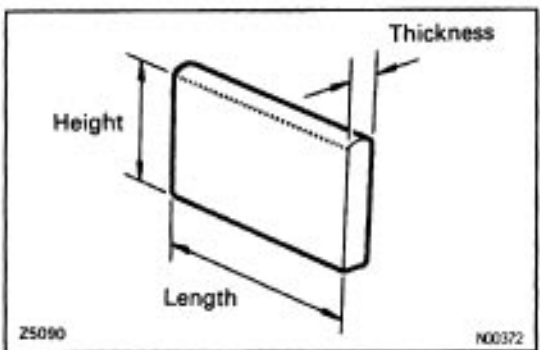
8.6 mm (0.339 in.)

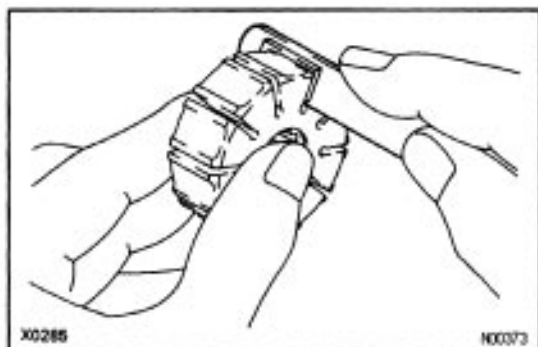
Minimum thickness:

1.4 mm (0.055 in.)

Minimum length:

14.99 mm (0.5902 in.)



For Hydraulic Cooling Fan System**Minimum height:****8.1 mm (0.319 in.)****Minimum thickness:****1.8 mm (0.071 in.)****Minimum length:****14.98 mm (0.5898 in.)**

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

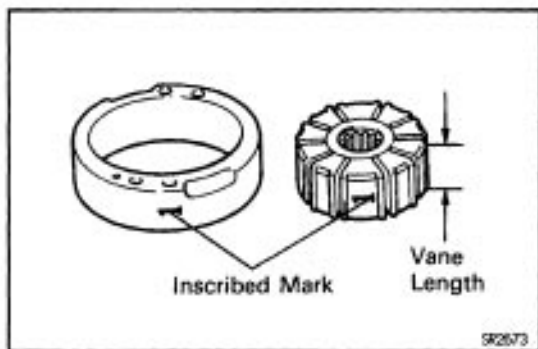
Maximum clearance:**0.035 mm (0.0014 in.)**

If more than maximum, replace the vane plate and/or rotor.

HINT: There are 5 lengths with the following rotor and cam ring marks.

Power Steering Vane Lengths

Cam ring mark	Rotor mark	Vane length mm (in.)
2	None	15.003 – 15.005 (0.59067 – 0.59075)
3	1	15.001 – 15.003 (0.59059 – 0.59067)
4	2	14.999 – 15.001 (0.59051 – 0.59059)
5	3	14.997 – 14.999 (0.59043 – 0.59051)
6	4	14.995 – 14.997 (0.59035 – 0.59043)

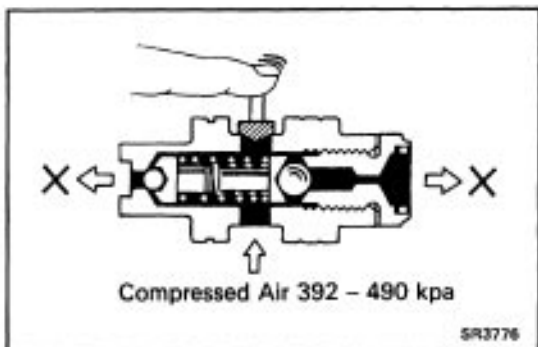
**Hydraulic Cooling Fan System Vane Lengths**

Cam ring mark	Rotor mark	Vane length mm (in.)
None	1	14.996 – 14.998 (0.59039 – 0.59047)
1	2	14.994 – 14.996 (0.59031 – 0.59039)
2	3	14.992 – 14.994 (0.59024 – 0.59031)
3	4	14.990 – 14.992 (0.59016 – 0.59024)

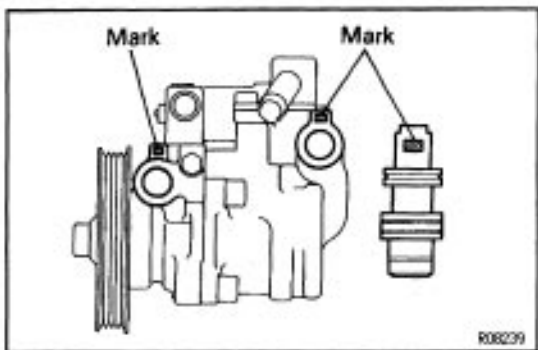


3. INSPECT FLOW CONTROL VALVE

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



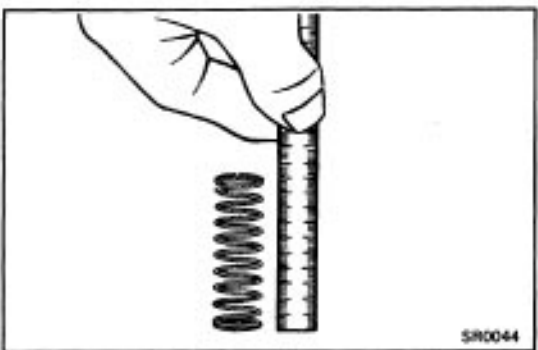
(b) Check the flow control valve for leakage. Close one of the holes and apply compressed air [392–490 kPa (4–5 kgf/cm², 57–71 psi)] into the opposite side, and confirm that air does not come out from the end holes.



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

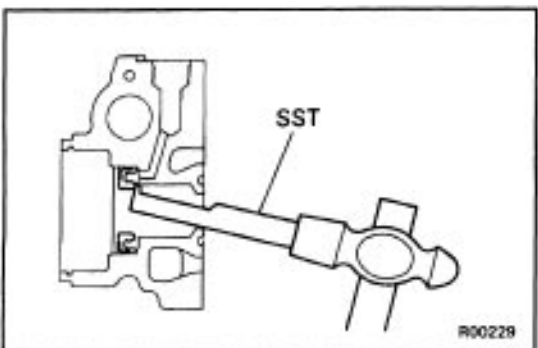


4. INSPECT FLOW CONTROL SPRING

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

Spring length:

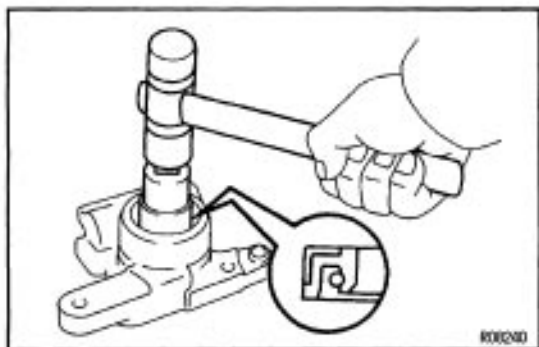
37–39 mm (1.46–1.54 in.)



5. IF NECESSARY, REPLACE OIL SEAL

(a) Using SST and a hammer, drive out the oil seal.

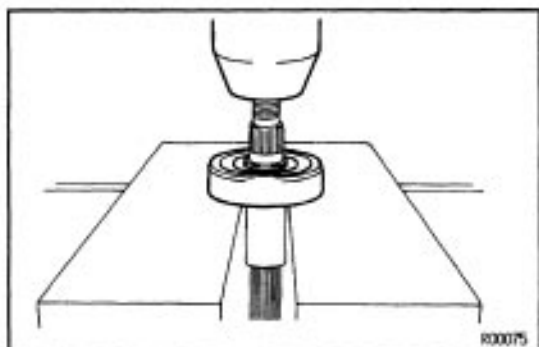
SST 09631–10030



(b) Coat a new oil seal lip with power steering fluid.

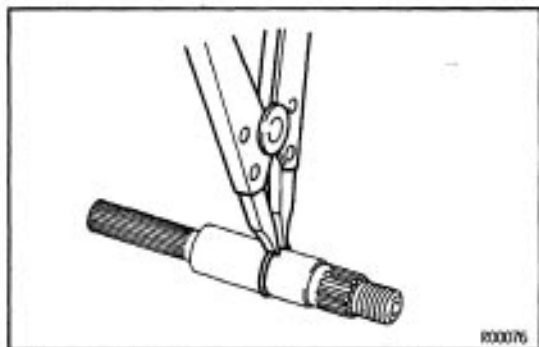
NOTICE: Make sure you install the oil seal facing the correct direction.

(c) Using a socket wrench (24 mm) and hammer, drive in a new oil seal.

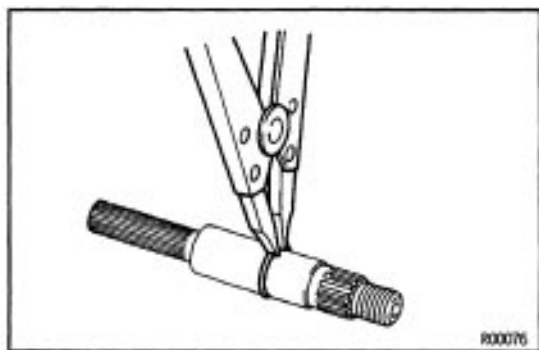


6. IF NECESSARY, REPLACE BALL BEARING

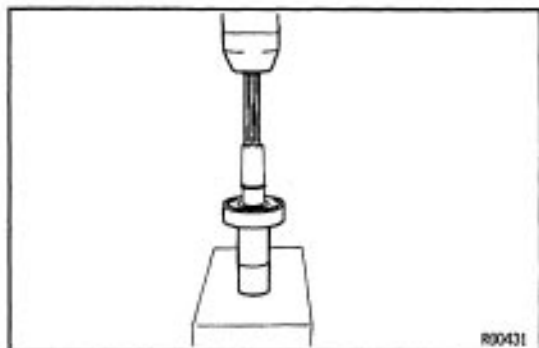
(a) Using a press, remove the ball bearing from the pump shaft.



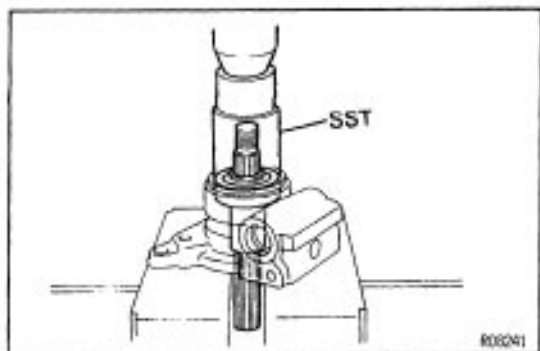
(b) Using snap ring pliers, remove the snap ring from the pump shaft.



(c) Using snap ring pliers, install the snap ring to the pump shaft.



(d) Using a press and deep socket wrench (17 mm), install a new ball bearing to the pump shaft.



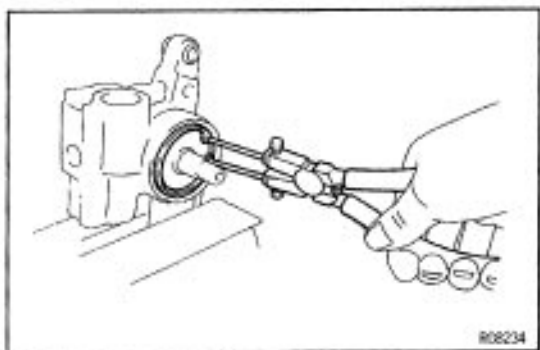
POWER STEERING PUMP ASSEMBLY

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

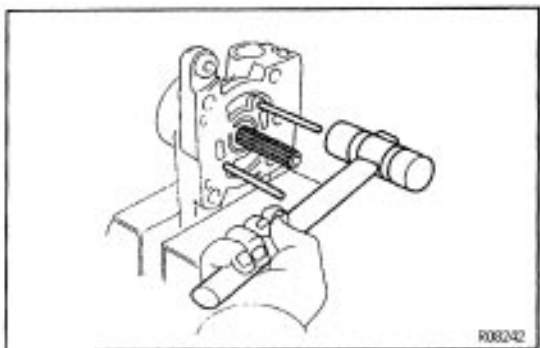
2. INSTALL PUMP SHAFT

(a) Using SST and a press, install the pump shaft with the ball bearing.

SST 09238-47012

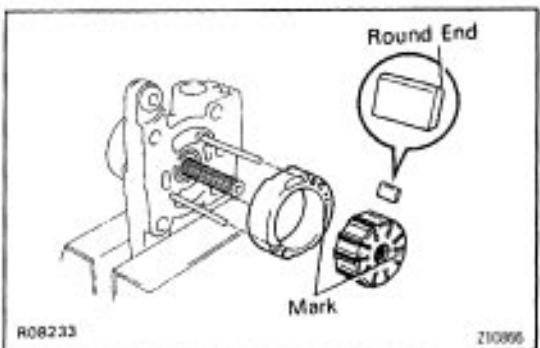


(b) Using snap ring pliers, install the snap ring.



3. INSTALL STRAIGHT PINS

Using a plastic hammer, tap in the 2 straight pins.



4. INSTALL CAM RING, ROTOR AND VANE PLATES

For PS:

(a) Align the holes of the cam ring and straight pins, and install the cam ring with the inscribed mark facing outward.

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

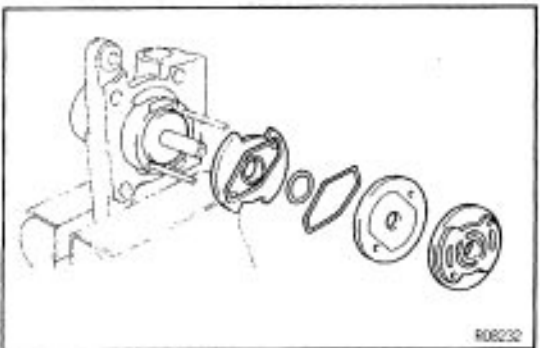
(c) Coat the vane plates with power steering fluid.

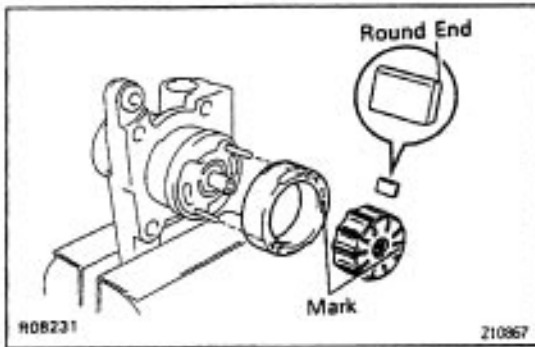
(d) Install the 10 vane plates with the round end facing outward.

5. INSTALL FRONT SIDE PLATE AND 2 REAR SIDE PLATES

(a) Install 2 new O-rings to the rear side plate.

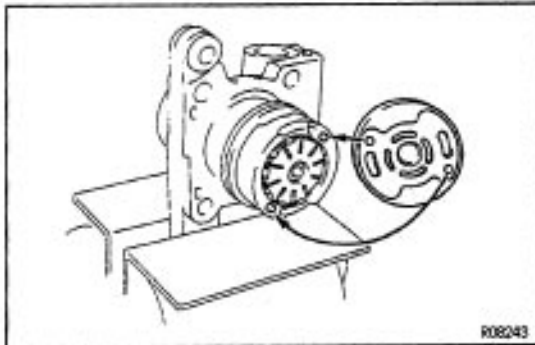
(b) Align the holes of the plates and straight pins, and install the plates.





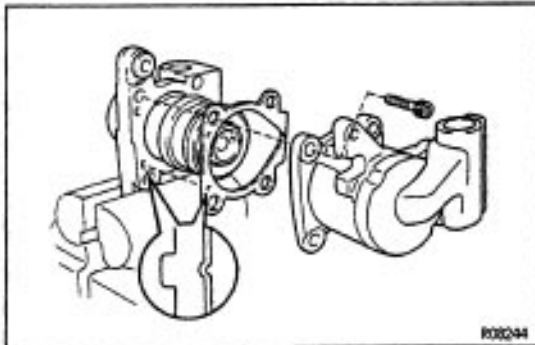
6. INSTALL CAM RING, ROTOR AND VANE PLATES For Hydraulic Cooling Fan System:

- Align the holes of the cam ring and straight pins, and install the cam ring with the inscribed mark facing outward.
- Install the rotor to the shaft with the inscribed mark facing outward.
- Coat the vane plates with power steering fluid.
- Install the 10 vane plates with the round end facing outward.



7. INSTALL REAR SIDE PLATE AND WAVE WASHER

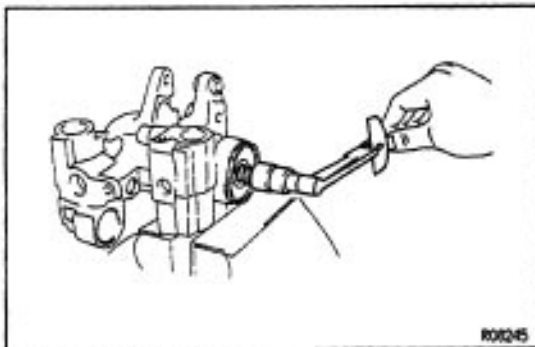
- Install 2 new O-rings to the rear side plate.
- Align the holes of the side plate with the pins, and install the plate.
- Install the wave washer.



8. INSTALL REAR HOUSING

- Install a new gasket and the rear housing.
HINT: Be careful when aligning the gasket.
- Using a hexagon wrench (8 mm), install and torque the 4 bolts.

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

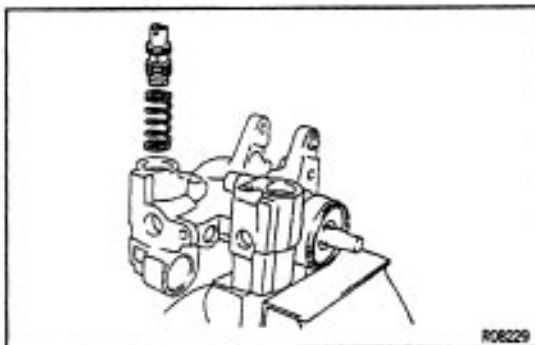


9. MEASURE PUMP SHAFT PRELOAD

- Check that the shaft rotates smoothly with out abnormal noise.
- Temporarily install the pulley nut and check the rotating torque.

Rotating torque:

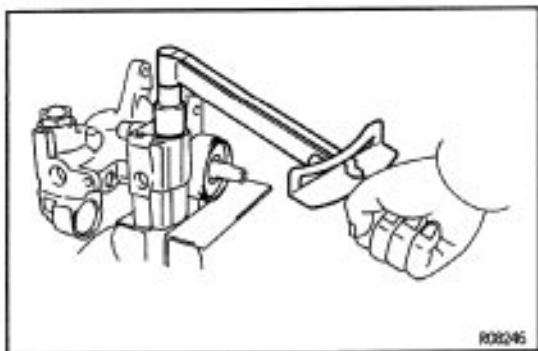
0.3 N-m (2.8 kgf-cm, 2.4 in.-lbf) or less



10. INSTALL FLOW CONTROL VALVE

For Hydraulic Cooling Fan System:

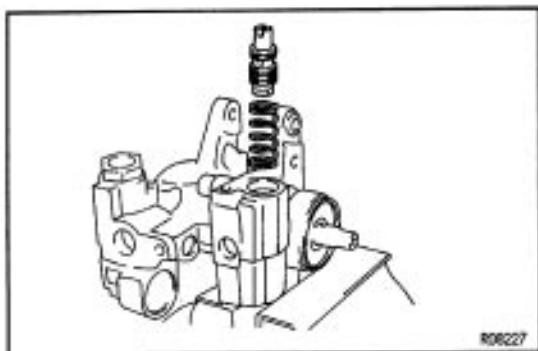
- Install the spring and flow control valve into the housing.



(b) Coat a new O-ring with power steering fluid, and install it to the pressure port union.

(c) Install and torque the pressure port union.

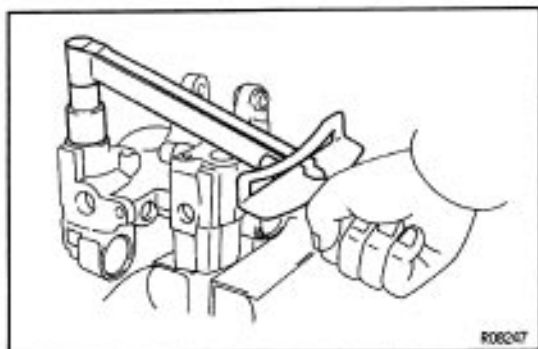
Torque: 69 N-m (700 kgf-cm, 61 ft-lbf)



11. INSTALL FLOW CONTROL VALVE

For PS:

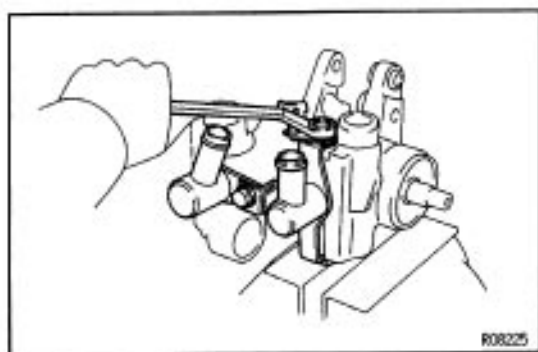
(a) Install the spring and flow control valve into the housing.



(b) Coat a new O-ring with power steering fluid, and install it to the pressure port union.

(c) Install and torque the pressure port union.

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

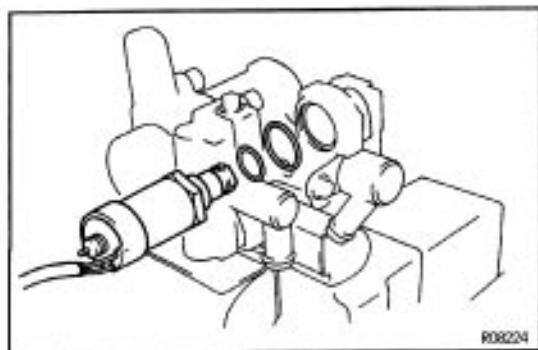


12. INSTALL SUCTION PORT UNIONS

(a) Coat 2 new O-rings with power steering fluid, and install them to each suction port union.

(b) Install the suction port union with the 3 bolts.

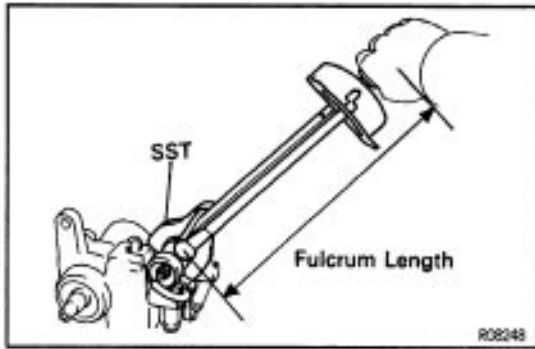
Torque: 13 N-m (130 kgf-cm, 9 ft-lbf)



13. INSTALL CONTROL VALVE

(a) Coat a new O-ring with power steering fluid, and install it to the rear housing.

(b) Install a new O-ring to the control valve.

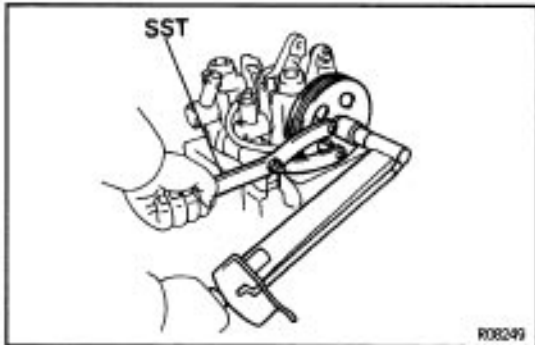


(c) Using SST, install and torque the control valve.

SST 09612-24014 (09617-24030)

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

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).



14. INSTALL PS PUMP PULLEY

(a) Install the pump pulley to the shaft.

(b) Using SST, install and torque the pulley set nut.

SST 09960-10010 (09963-01000)

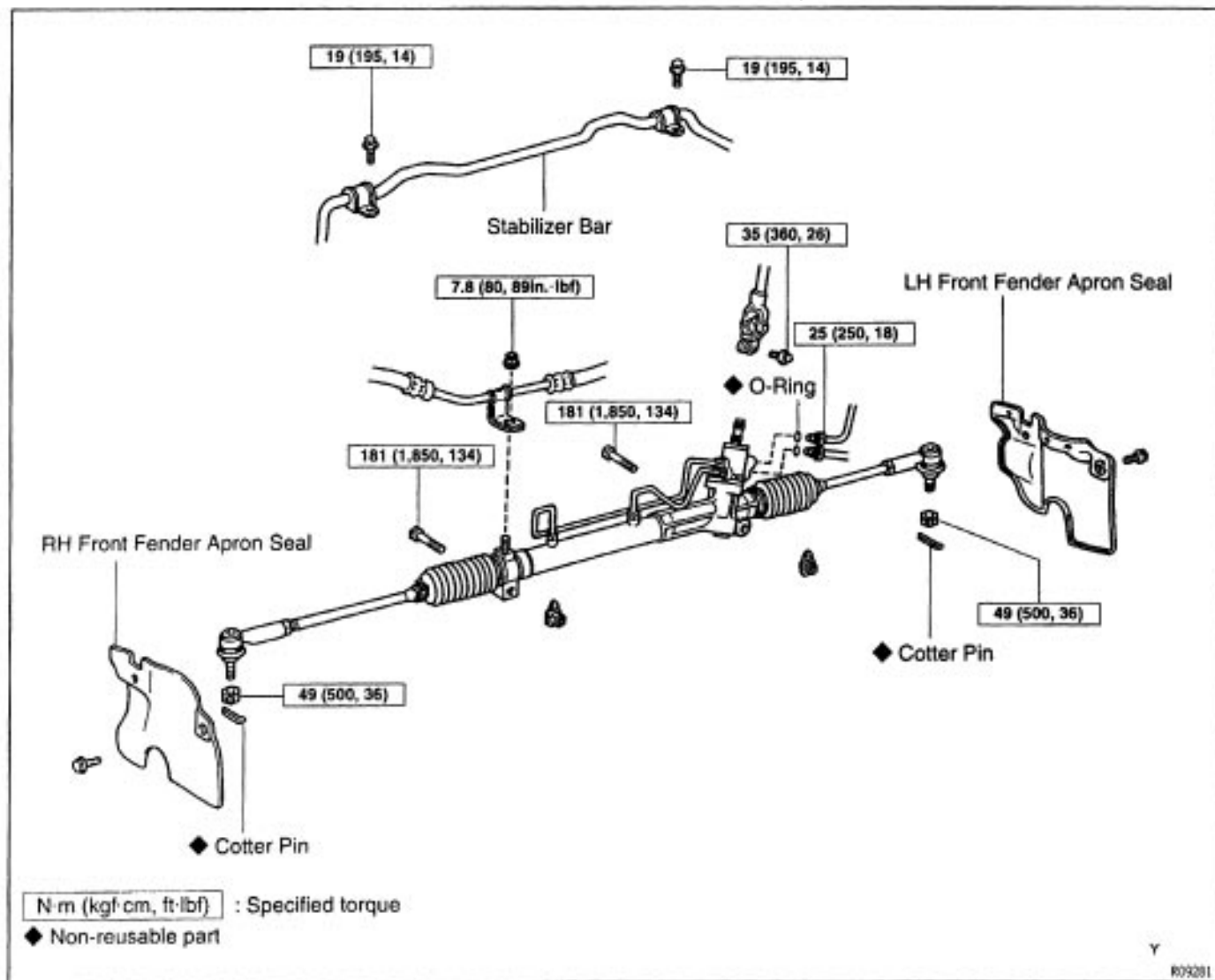
Torque: 43 N-m (440 kgf-cm, 32 ft-lbf)

GEAR HOUSING

STEERING GEAR HOUSING REMOVAL AND INSTALLATION

SR551-54

Remove and install the parts, as shown.

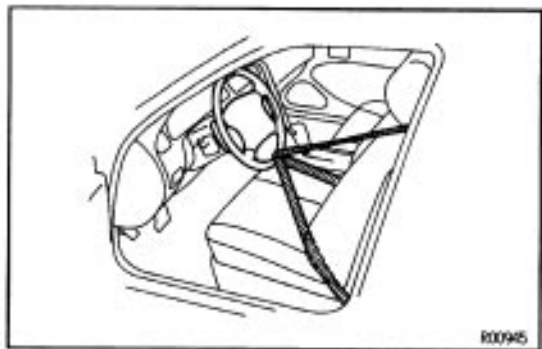


MAIN POINTS OF REMOVAL AND INSTALLATION

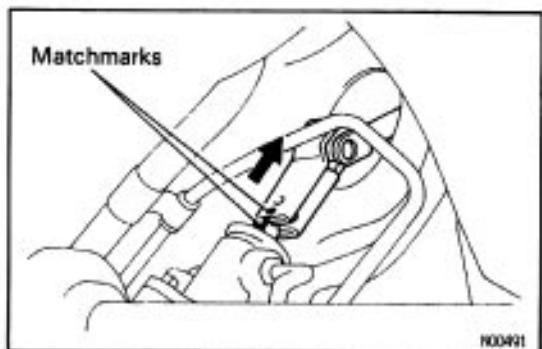
NOTICE: When disconnecting the sliding yoke during removal of the gear housing, remove the steering wheel and perform centering of the spiral cable.

(See page [RS-20](#))

If the operation is performed without removing the steering wheel, use the procedure below to make sure the steering wheel is firmly fixed in position and cannot turn.

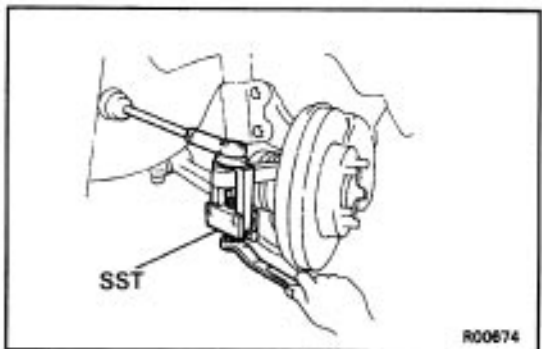
**1. DISCONNECT SLIDING YOKE**

- (a) Position the front wheels facing straight ahead.
- (b) Using the seat belt of the driver's seat, fix the steering wheel so that it does not turn.



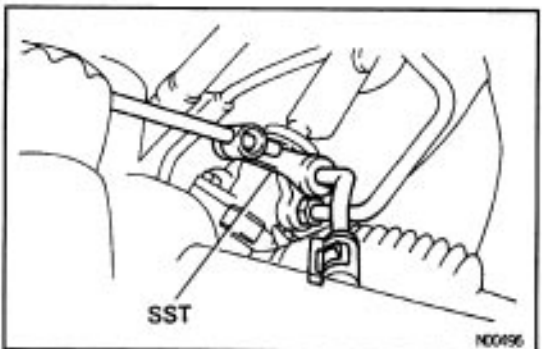
- (c) Place matchmarks on the sliding yoke and control valve shaft.

- (d) Loosen the bolt on the upper side of the sliding yoke, remove the bolt on the lower side and disconnect the sliding yoke.

**2. DISCONNECT TIE ROD ENDS**

- (a) Remove the cotter pins and nuts.
- (b) Using SST, disconnect the tie rod end from the knuckle arm.

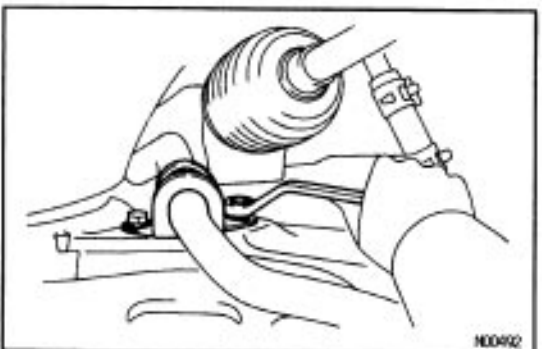
SST 09628-62011

**3. DISCONNECT PRESSURE AND RETURN TUBES**

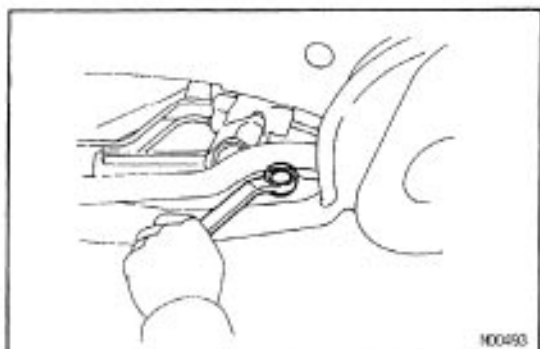
Using SST, disconnect and connect the pressure and return tubes.

SST 09631-22020

Torque: 25 N-m (250 kgf-cm, 18 ft.-lbf)

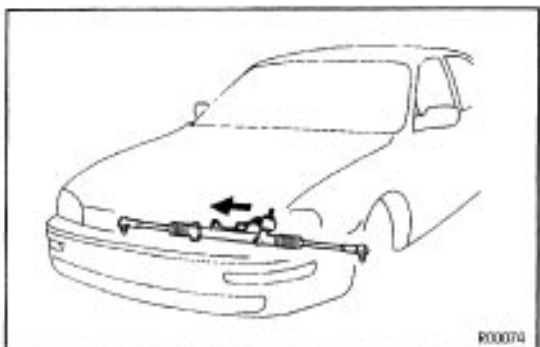
**4. REMOVE STABILIZER BAR SET BOLTS**

Remove the 4 stabilizer bar set bolts.



5. REMOVE GEAR HOUSING

(a) Remove the 2 set bolts.

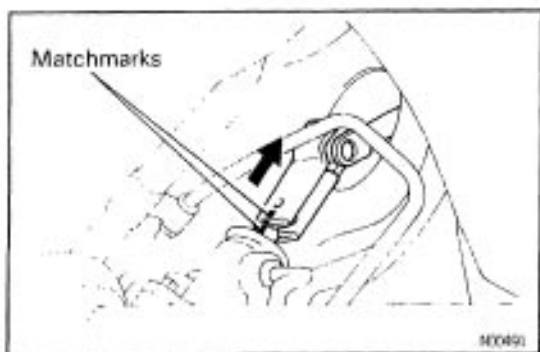
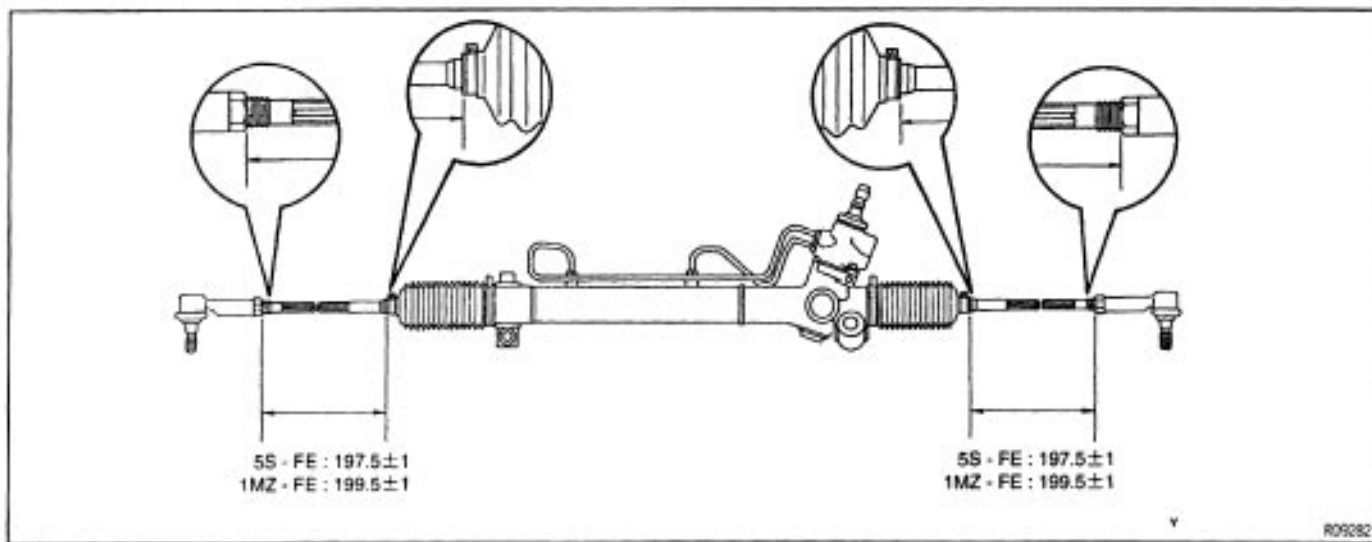


(b) Slide the gear housing to the RH side.

NOTICE: Do not damage the turn pressure tube.

6. CONNECT SLIDING YOKE

(a) Set the gear housing so that it matches the dimensions shown below, with the gear housing at the center point.



(b) Align matchmarks on the sliding yoke and control valve shaft and connect them.

7. CENTER SPIRAL CABLE

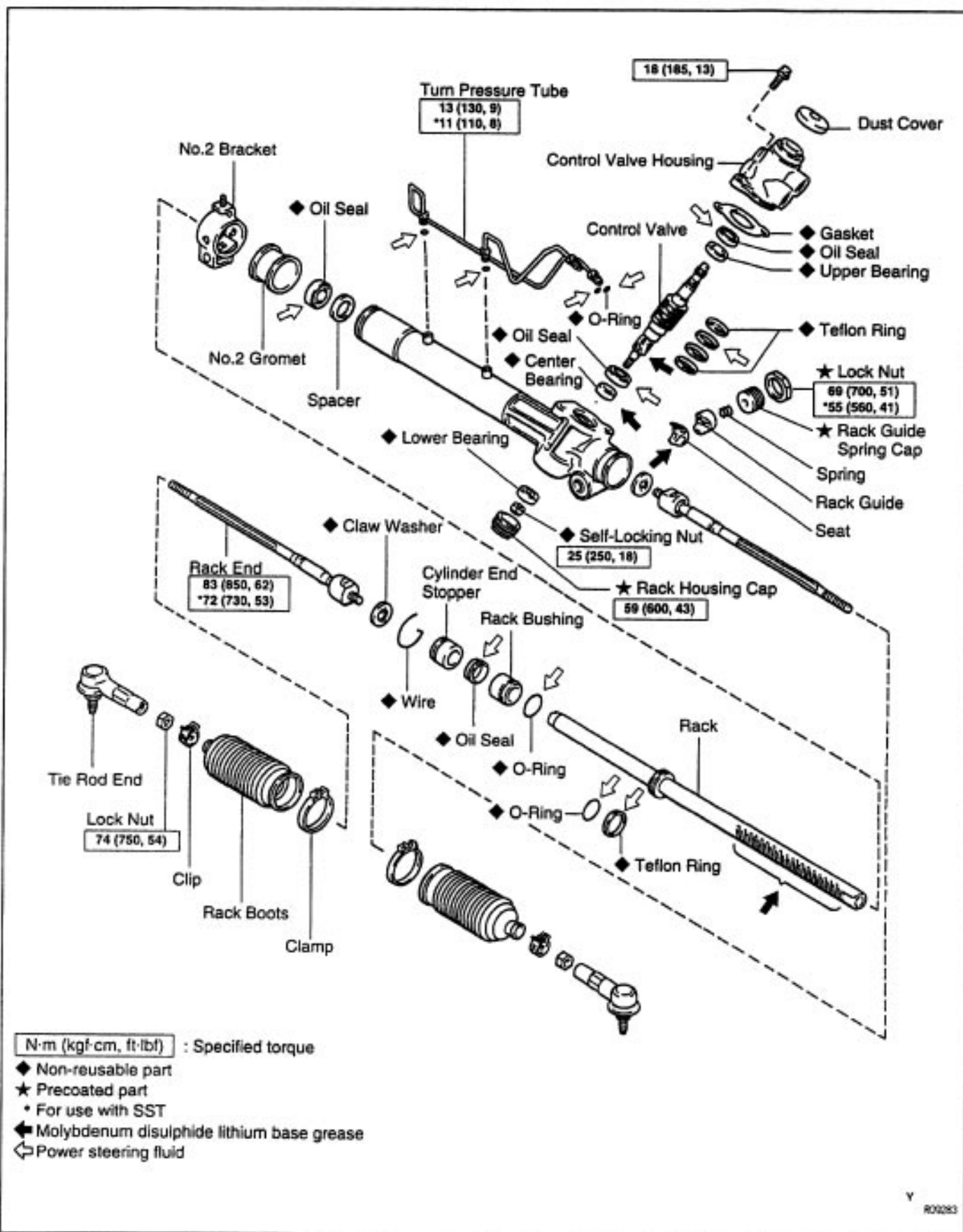
If the steering wheel has been removed, or the steering wheel may have moved during the operation, always perform centering of the spiral cable.

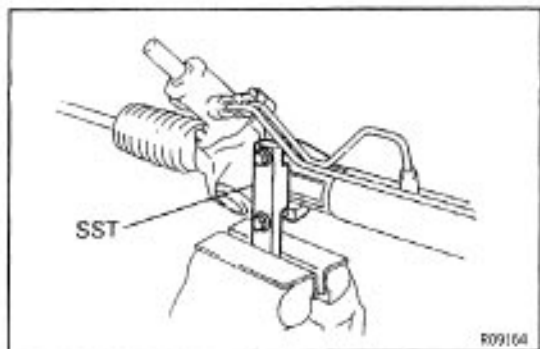
(See page [RS-20](#))

8. CHECK STEERING WHEEL CENTER POINT

9. CHECK TOE-IN

COMPONENTS



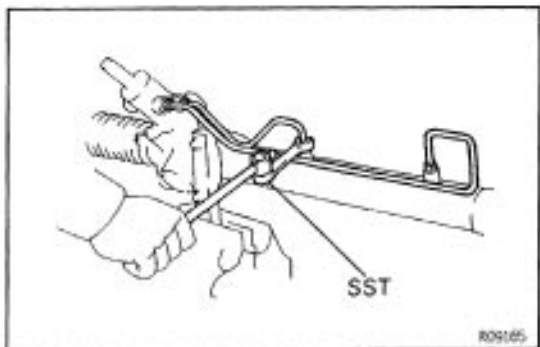


STEERING GEAR HOUSING DISASSEMBLY

1. CLAMP GEAR HOUSING IN VISE

Using SST, secure the steering gear in a vise.

SST 09612-00012

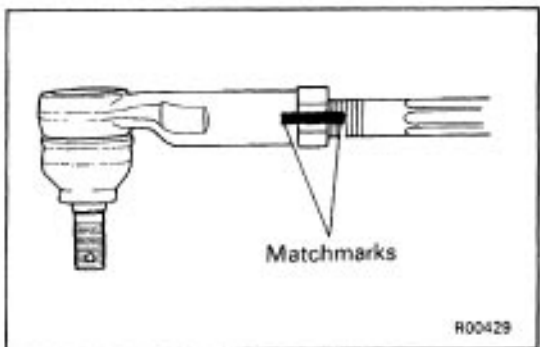


2. REMOVE LEFT AND RIGHT TURN PRESSURE TUBES

(a) Using SST, remove the turn pressure tubes.

SST 09630-00020

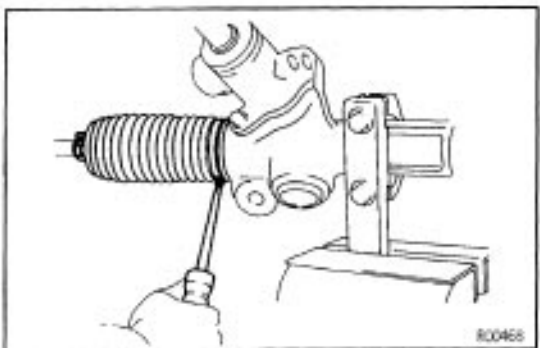
(b) Remove the O-rings from the turn pressure tubes.



3. REMOVE TIE ROD ENDS

(a) Loosen the lock nut and place matchmarks on the tie rod end and rack end.

(b) Remove the tie rod ends and lock nuts.

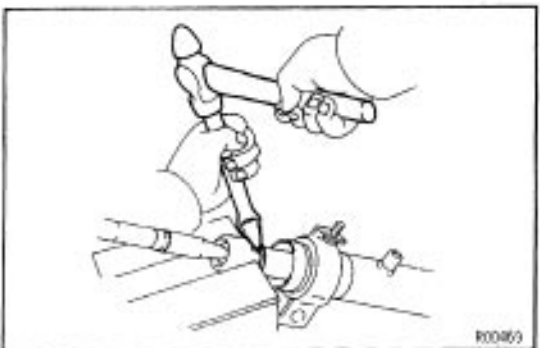


4. REMOVE RACK BOOTS

(a) Using a screwdriver, remove the clips and clamps.

(b) Remove the rack boots.

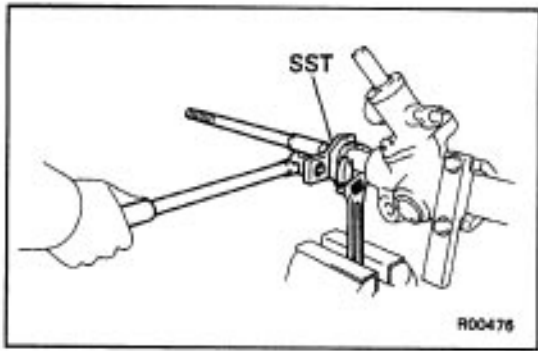
NOTICE: Be careful not to damage the rack boots and rack housing.



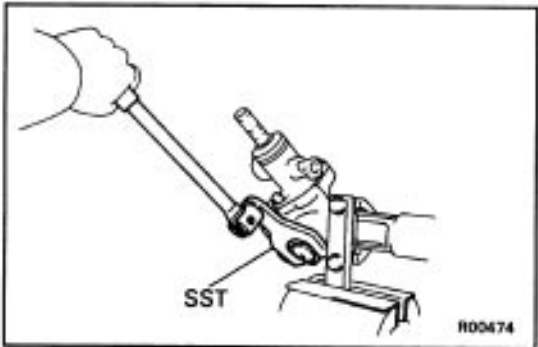
5. REMOVE RACK ENDS AND CLAW WASHERS

(a) Unstake the claw washers.

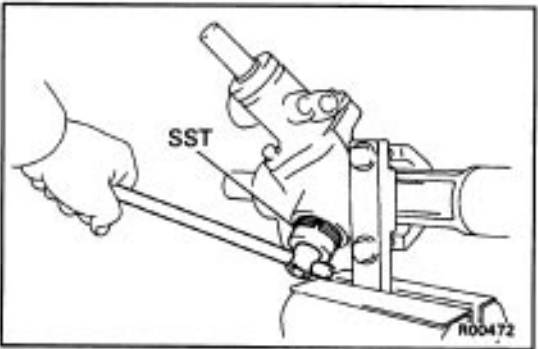
NOTICE: Avoid any impact to the rack.



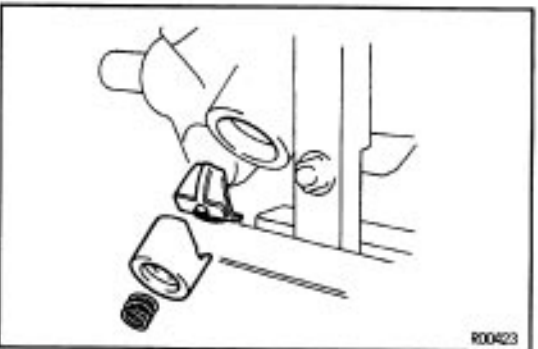
- (b) Using SST, remove the rack ends.
SST 09617-14010
- (e) Mark the left and right rack ends accordingly.
- (d) Remove the claw washers.



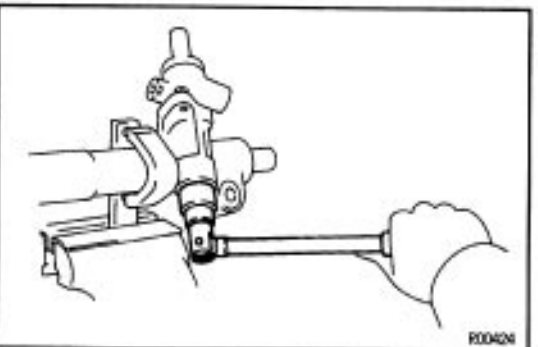
- 6. REMOVE RACK GUIDE SPRING CAP LOCK NUT**
Using SST, remove the rack guide spring cap lock nut.
SST 09612 – 24014 (09617 – 24020)



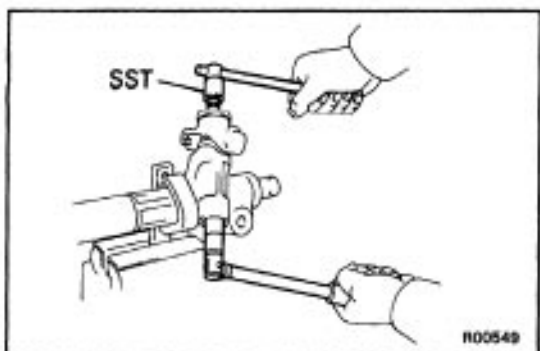
- 7. REMOVE RACK GUIDE SPRING CAP**
Using SST, remove the rack guide spring cap.
SST 09631 – 10021



- 8. REMOVE RACK GUIDE SPRING, RACK GUIDE AND SEAT**



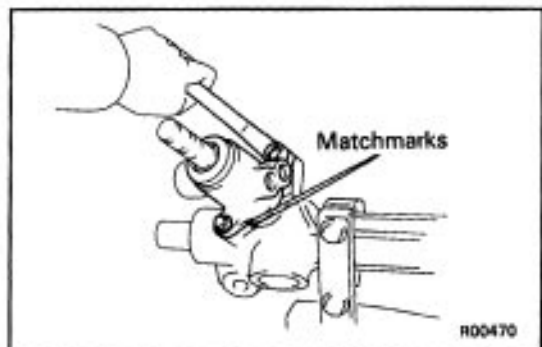
- 9. REMOVE RACK HOUSING GAP**



10. REMOVE SELF- LOCKING NUT

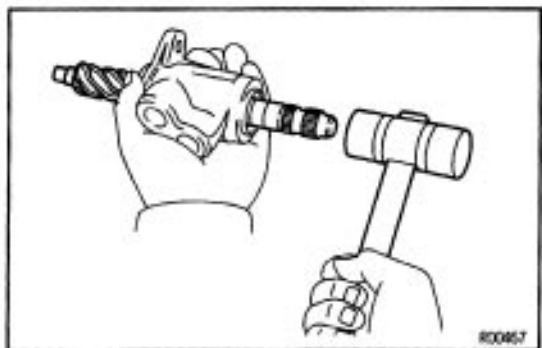
Using SST to hold the control valve, remove the self-locking nut.

SST 09616 – 00010



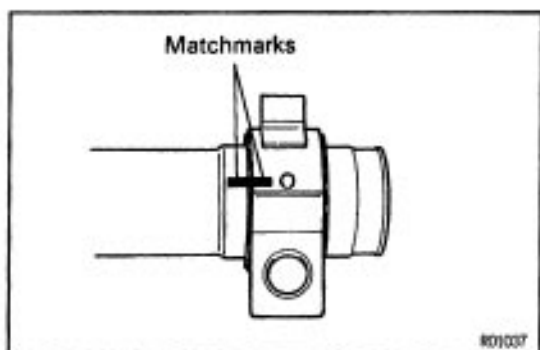
11. REMOVE CONTROL VALVE HOUSING

- Remove the dust cover.
- Place matchmarks on the valve housing and rack housing.
- Remove the 2 bolts.
- Pull out the valve with the valve housing.
- Remove the gasket from the rack housing.



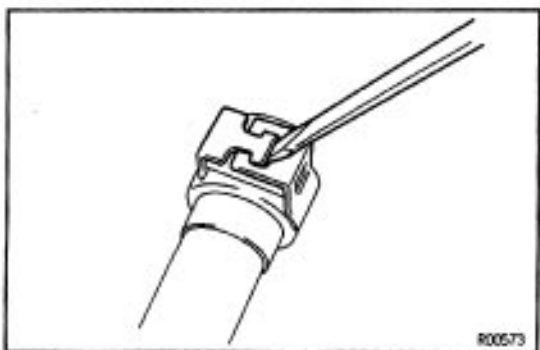
12. REMOVE CONTROL VALVE FROM HOUSING

Tap out the control valve and oil seal.

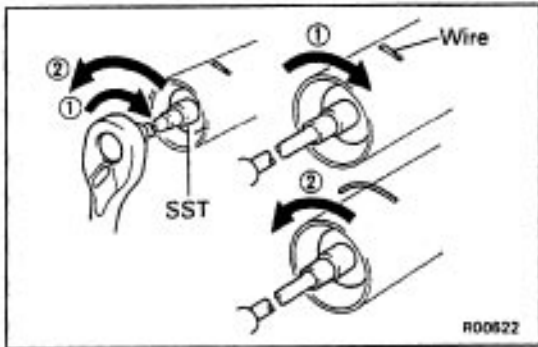


13. REMOVE NO.2 BRACKET

- Place matchmarks on the bracket and rack housing.



- Using a screwdriver, pry apart the clasp of the No.2 bracket.
- Remove the bushing and bracket from the rack housing.
- Remove the bushing from the bracket.

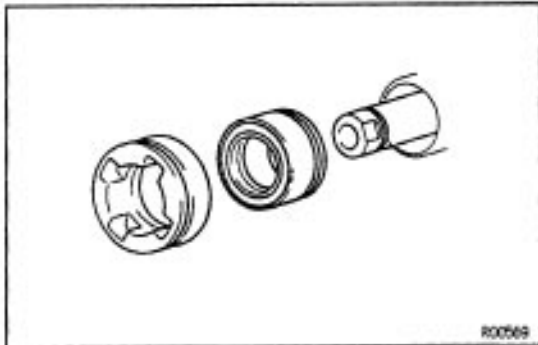
**14. REMOVE CYLINDER END STOPPER**

(a) Using SST, turn the cylinder end stopper clockwise until the wire end comes out.

SST 09631 -16010

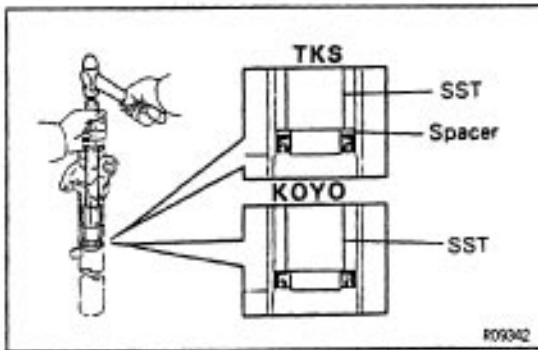
(b) Using SST, turn the cylinder end stopper counter-clockwise, and remove the wire.

SST 09631 -16010

**15. REMOVE RACK BUSHING AND RACK**

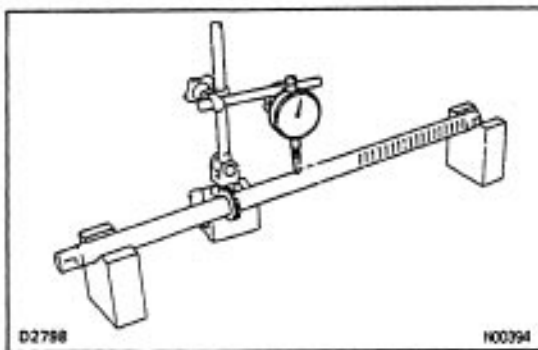
(a) Using a brass bar, tap out the rack with the rack busing.

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

**16. REMOVE CYLINDER SIDE OIL SEAL AND SPACER**

Using SST and a brass bar, drive out the oil seal and spacer.

SST 09620-30010 (09623-30010)

**STEERING GEAR HOUSING INSPECTION AND REPLACEMENT****1. INSPECT RACK**

(a) Using a dial indicator, check the rack for runout and for tooth wear or damage.

Maximum runout:

0.3 mm (0.012 in.)

(b) Check the back surface for wear or damage.

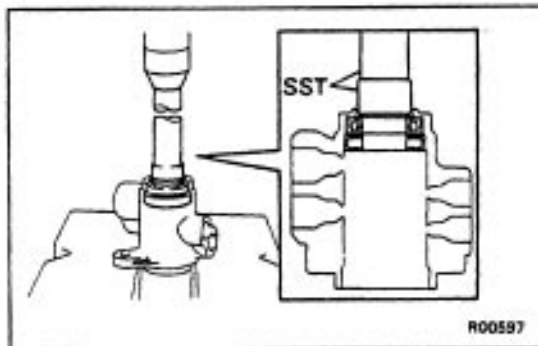
If faulty, replace it.

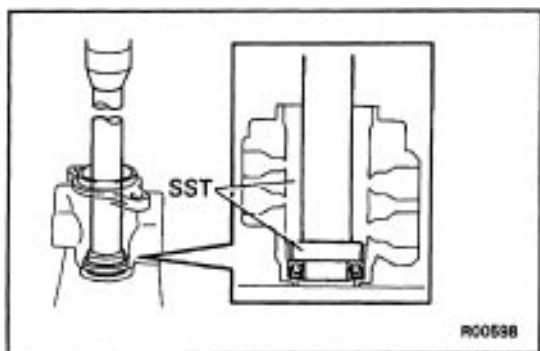
2. IF NECESSARY, REPLACE CONTROL VALVE HOUSING OIL SEAL AND UPPER BEARING

(a) Using SST, press out the oil seal and upper bearing.

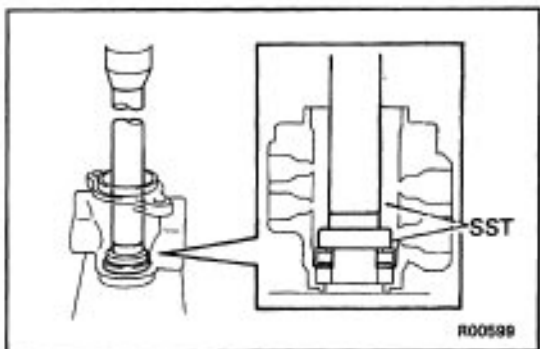
SST 09620-30010 (09631 -00020)

09630-24013 (09620-24020)



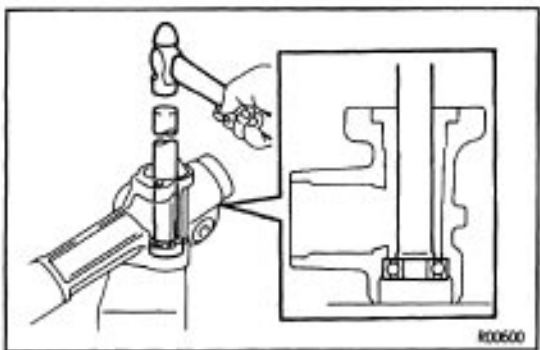


- (b) Coat a new oil seal with power steering fluid.
 (c) Using SST, press in a new oil seal, as shown.
 SST 09620-30010 (09631-00020)
 09630-24013 (09620-24020)



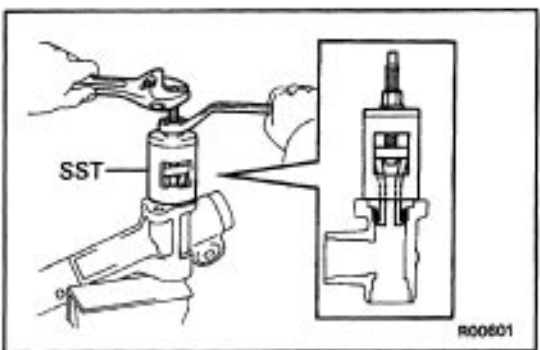
- (d) Using SST, press in a new upper bearing, as shown.
 SST 09620-30010 (09631-00020)
 09630-24013 (09620-24020)

NOTICE: Press in the bearing so that the inscribed mark on the bearing can be seen.

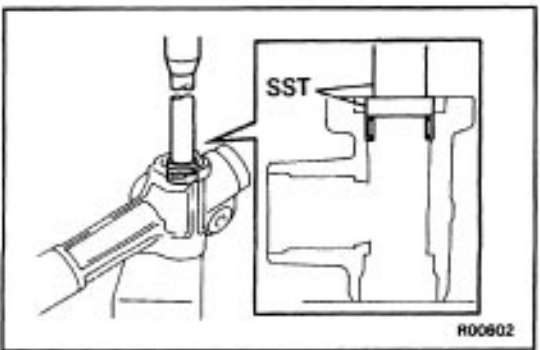


3. IF NECESSARY, REPLACE CONTROL VALVE LOWER BEARING AND CENTER BEARING

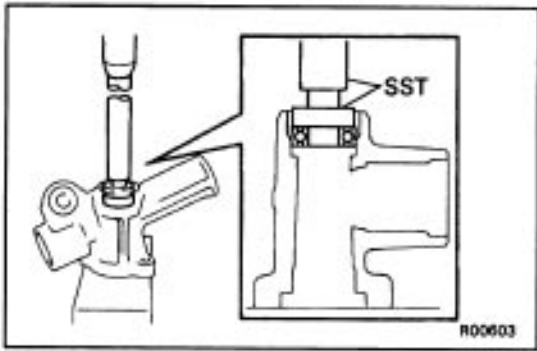
- (a) Using a brass bar, drive out the lower bearing.



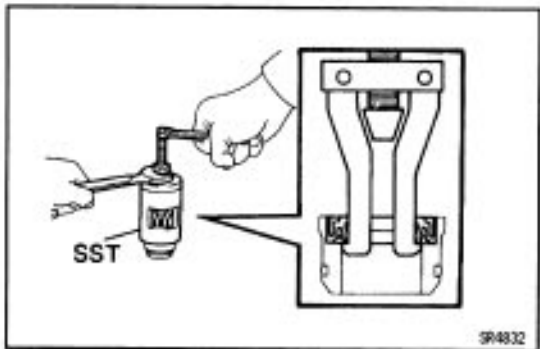
- (b) Using SST, remove the center bearing.
 SST 09612 - 24014 (09613 - 22011)



- (c) Coat a new center bearing with grease.
 (d) Using SST, press in a new center bearing, as shown.
 SST 09630-24013 (09620-24020),
 09631-12020

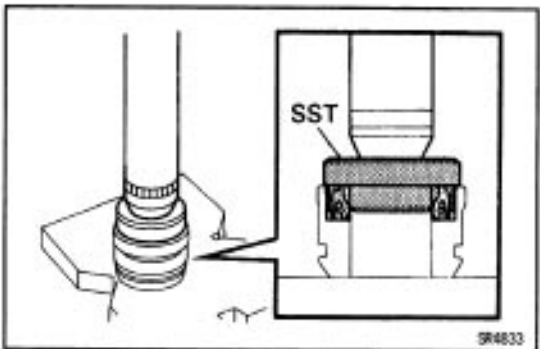


(e) Using SST, press in a new lower bearing.
SST 09630–24013 (09620–24020),
09631 –12020

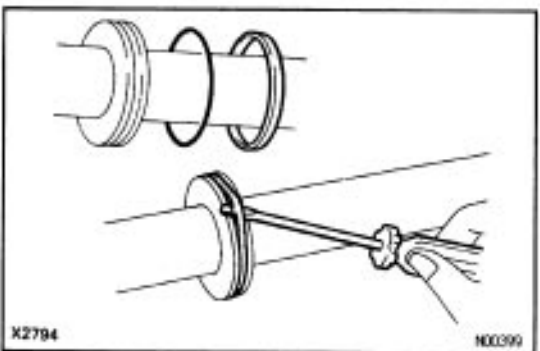


4. IF NECESSARY, REPLACE RACK BUSHING OIL SEAL

(a) Using SST, remove the oil seal.
SST 09612 – 24014 (09613 – 22011)



(b) Coat a new oil seal with power steering fluid.
(c) Using SST, press in the oil seal.
SST 09631–32010

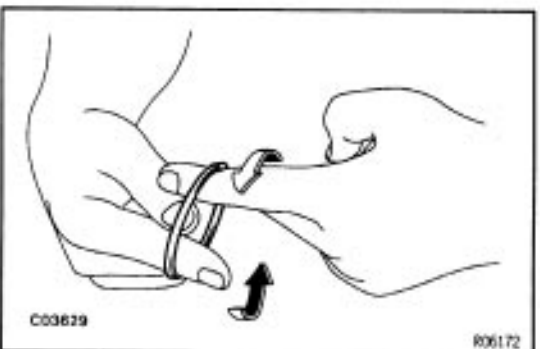


5. IF NECESSARY, REPLACE STEERING RACK TEFLON RING AND O-RING

(a) Using a screwdriver, remove the teflon ring and O-ring.

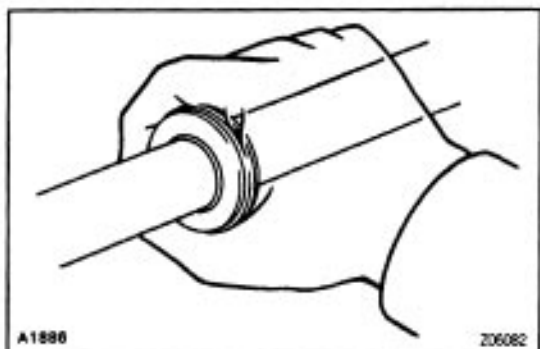
NOTICE: Be careful not to damage the groove for the teflon ring.

(b) Coat a new O-ring with power steering fluid and install it.



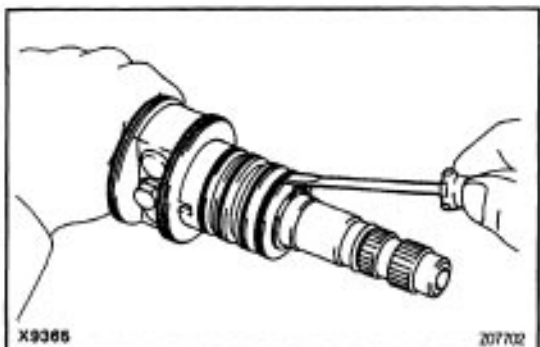
(c) Expand a new teflon ring with your fingers.

NOTICE: Be careful not to over-expand the teflon ring.



(d) Install the teflon ring to the rack.

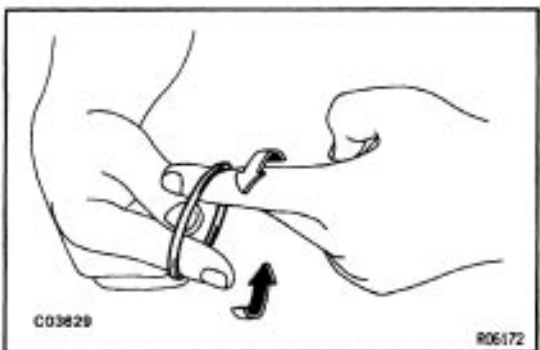
(e) Install the expanded teflon ring to the steering rack and snug it down with your fingers.



6. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RINGS

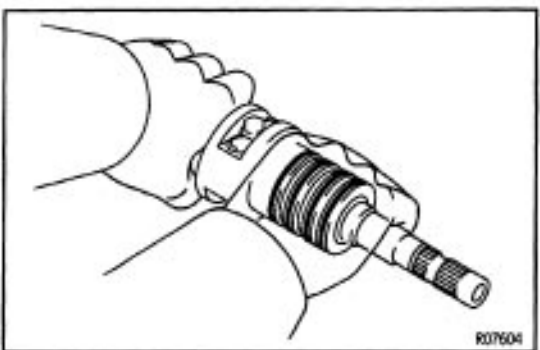
(a) Using a screwdriver, remove the 4 teflon rings.

NOTICE: Be careful not to damage the grooves for the teflon ring.



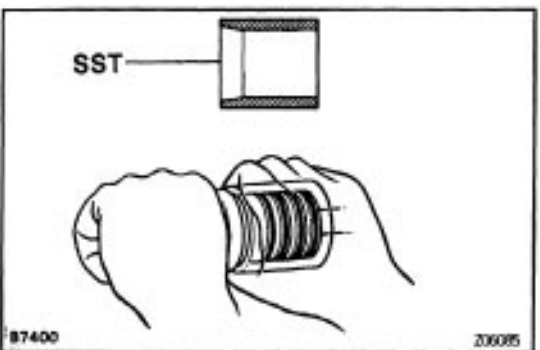
(b) Expand 4 new teflon rings with your fingers.

NOTICE: Be careful not to over-expand the teflon ring.



(c) Install the 4 teflon rings to the control valve.

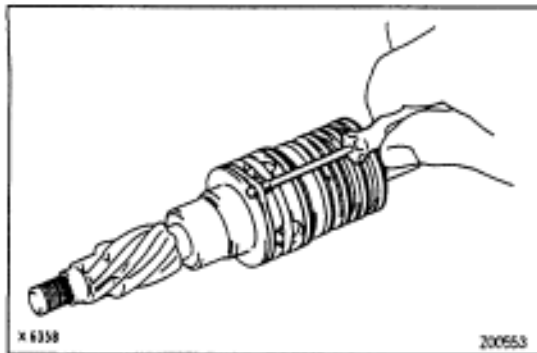
(d) Coat the 4 teflon rings with power steering fluid and snug them down with your fingers.



(e) Carefully slide the tapered end of the SST over the teflon rings to seat the rings.

SST 09631– 20081

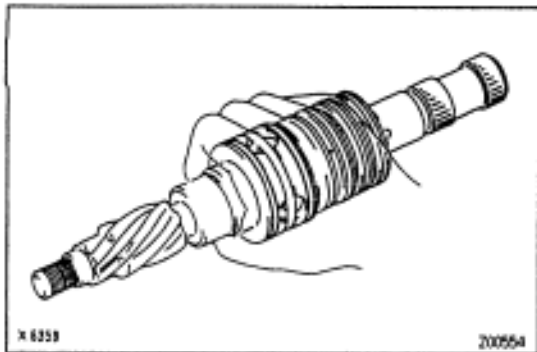
NOTICE: Be careful not to damage the teflon rings.



7. IF NECESSARY, REPLACE HYDRAULIC REACTION CHAMBER TEFLON RINGS AND O-RINGS

(a) Remove the teflon rings and O-rings.

NOTICE: Be careful not to damage the control valve.



(b) Install new O-rings to the control valve.

(c) Install the expanded new teflon rings to the control valve.

(d) Carefully position the teflon rings into the control valve grooves.

NOTICE: Be careful not over-expand the teflon rings.

(e) Coat the teflon rings with power steering fluid, and snug them down with your fingers.

NOTICE: Be careful not to damage the teflon rings.

STEERING GEAR HOUSING ASSEMBLY”

1. INSTALL CYLINDER HOUSING OIL SEAL AND SPACER

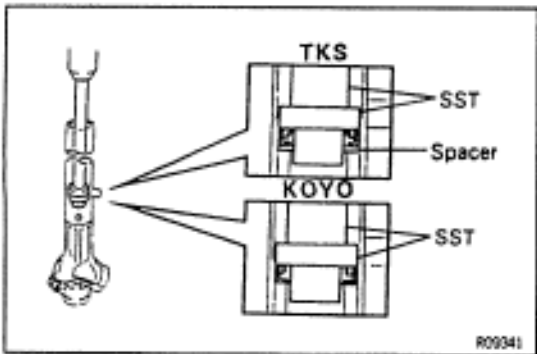
(a) Coat a new oil seal lip with power steering fluid.

(b) Tape the showing part of SST before use.

(c) Install the oil seal to SST, and press in it.

SST 09608-12010 (09608-00080),

09631 -12020

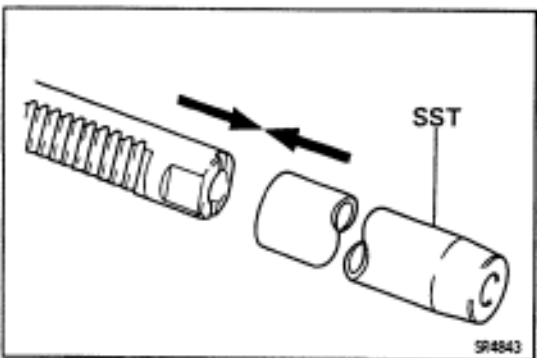


2. INSTALL RACK

(a) Install SST to the rack.

HINT: If necessary, scrape the burrs off the rack teeth end and burnish.

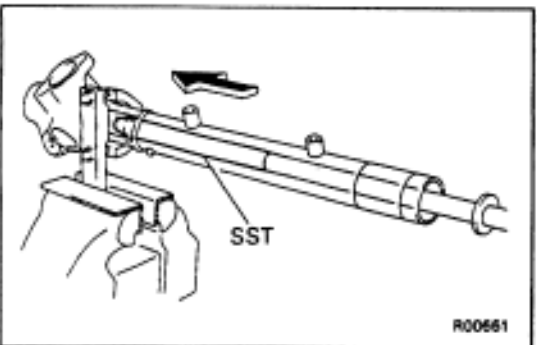
SST 09631 -33010

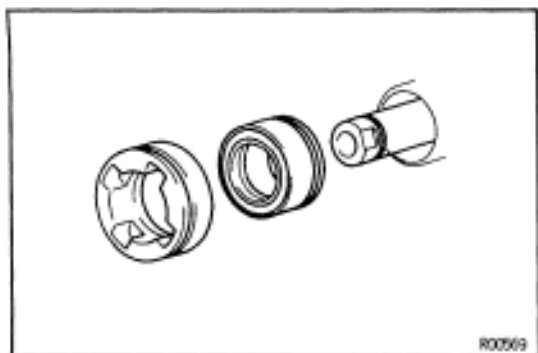


(b) Coat SST with power steering fluid.

(e) Insert the rack into the cylinder.

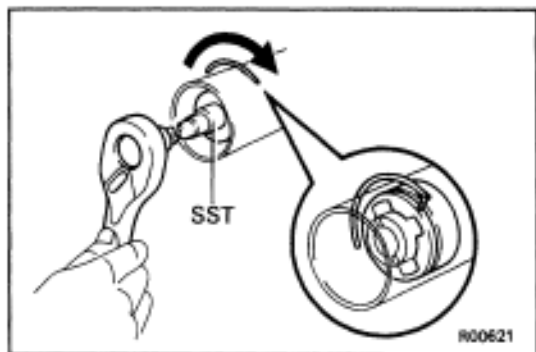
(d) Remove SST.





3. INSTALL RACK BUSHING AND CYLINDER END STOPPER

- (a) To prevent oil seal lip damage, wind vinyl tape on the steering rack end, and apply power steering fluid.
- (b) Coat a new O-ring with power steering fluid and install it to the bushing.
- (c) Push in the rack bushing and cylinder end stopper until the wire installation hole appears.

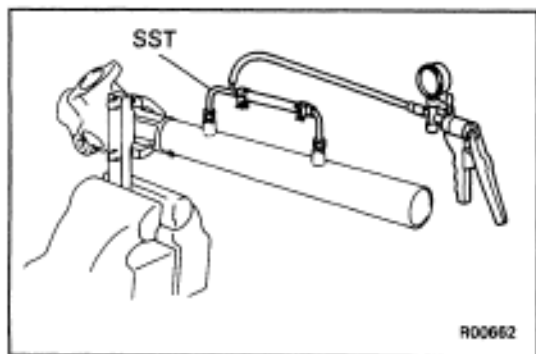


4. INSTALL WIRE

- (a) Insert a new wire end into the hole.
- (b) Using SST, turn the cylinder end stopper clockwise until the wire end disappears.

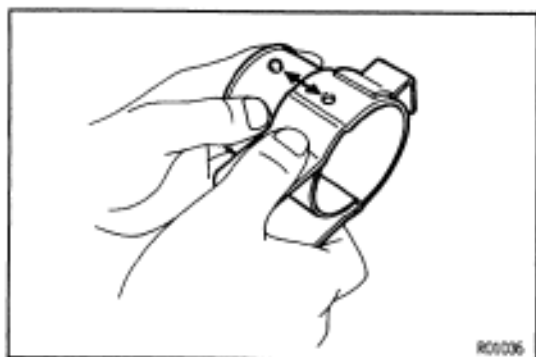
SST 09631-16010

NOTICE: Take care to avoid tightening the rack more than needed.



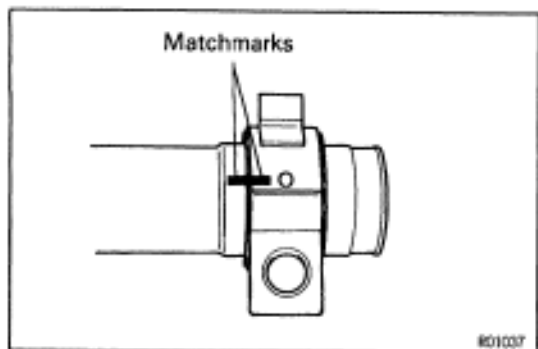
5. AIR TIGHTNESS TEST

- (a) Install SST to the unions of the cylinder housing.
SST 09631-12071
- (b) Apply 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum for about 30 seconds.
- (c) Check that there is no change in the vacuum.
If there is change in the vacuum, check the installation of the rack housing oil seal.

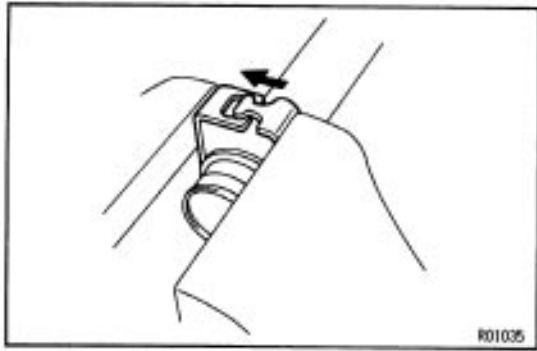


6. INSTALL NO.2 BRACKET

- (a) Coat the grommets inner edge with the grease.
- (b) Install the bushing to the bracket.

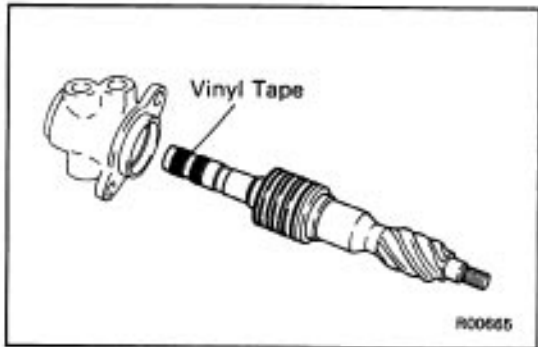


- (c) Install the bushing and bracket to the rack housing.
HINT: Align the matchmarks on the bracket and rack housing.



(d) Place the No.2 bracket in a vise and tighten the vise to fasten the clasp.

NOTICE: Take care not to drop the from the No.2 bracket.



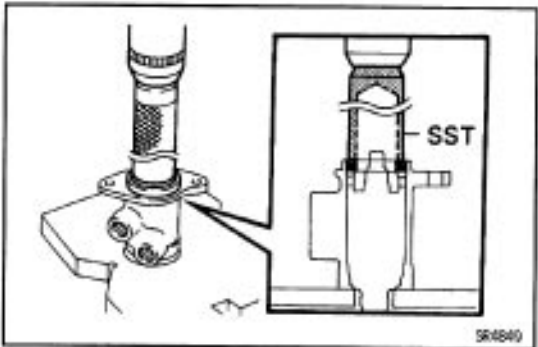
7. INSTALL CONTROL VALVE

(a) Wind vinyl tape on the control valve.

(b) Coat the teflon rings with power steering fluid.

(c) Push the control valve into the housing.

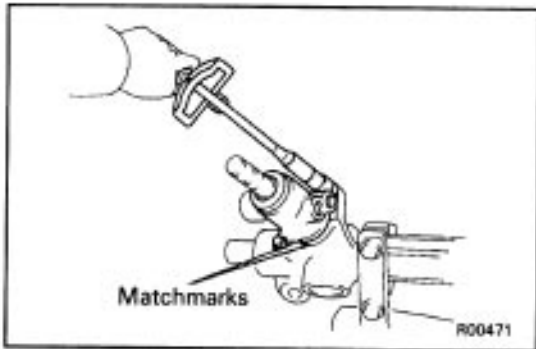
NOTICE: Be careful not to damage the teflon rings and oil seal.



(d) Coat a new oil seal with power steering fluid.

(e) Using SST, press in the new oil seal.

SST 09612-22011



8. INSTALL CONTROL VALVE HOUSING

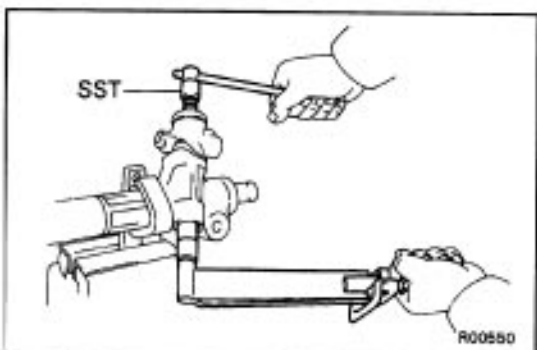
(a) Place a new gasket on the rack housing.

(b) Align the matchmarks on the valve housing and rack housing.

(c) Torque the 2 bolts.

Torque: 18 N-m (185 kgf-cm, 13 ft-lbf)

(d) Install the dust cover.



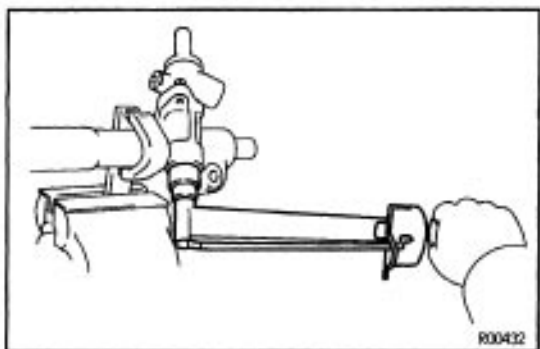
9. INSTALL SELF- LOCKING NUT

Using SST to hold the control valve, install a new self-locking nut.

SST 09616 - 00010

Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)

NOTICE: Take care to avoid tightening the rack more than needed.



10. INSTALL RACK HOUSING CAP

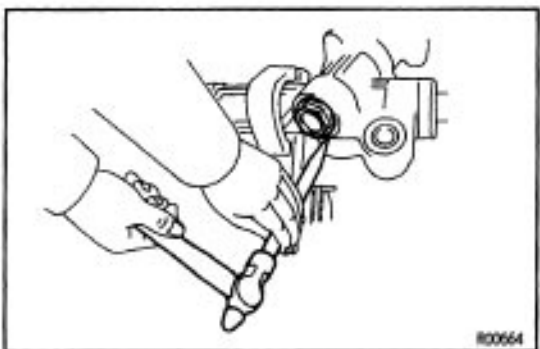
(a) Apply sealant to 2 or 3 threads of the housing cap.

Sealant:

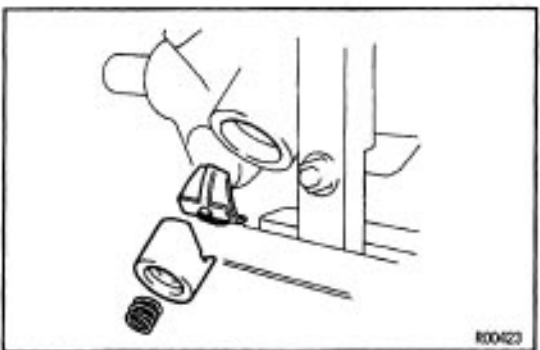
Part No.08833 – 00080, THREE BOND 1344, LOC-TITE 242 or equivalent

(b) Install the rack housing cap.

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



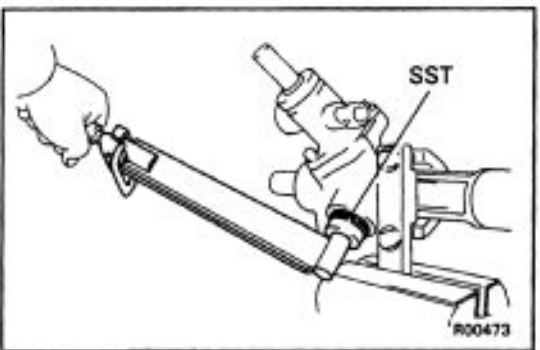
(c) Using a center punch, stake the housing at 2 places.



11. INSTALL RACK GUIDE SEAT, RACK GUIDE AND SPRING

(a) Coat the fitting surfaces between the rack guide seat and the rack guide with grease.

(b) Install the rack guide seat, rack guide and spring.



12. ADJUST TOTAL PRELOAD

(a) Apply sealant to 2 or 3 threads of the spring cap.

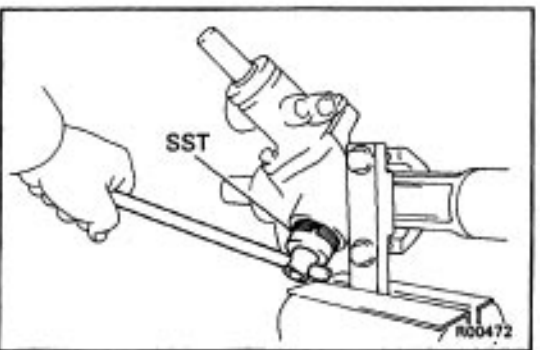
Sealant:

Part No.08833-00080, THREE BOND 1344, LOC-TITE 242 or equivalent

(b) Using SST, install and torque the spring cap.

SST 09631 –10021

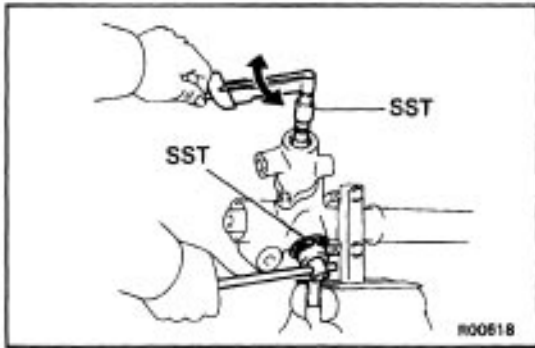
Torque: 25 N-m (250 kgf-cm, 18 ft-lbf)



(c) Using SST, return the rack guide spring cap 12°
SST 09631-10021

(d) Turn the control valve shaft right and left 1 or 2 times.

(e) Loosen the spring cap until the rack guide compression spring is not functioning.

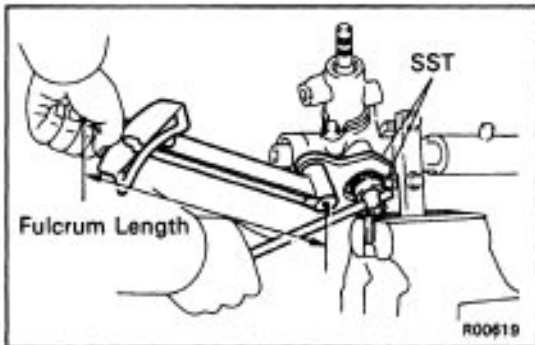


(f) Using SST and torque meter, tighten the rack guide spring cap until the preload is within specification.

SST 09616-00010, 09631-10021

Preload (turning):

0.8–1.4 N-m (8–14 kgf-cm, 6.9–12.2 in.-lbf)



13. INSTALL RACK GUIDE SPRING CAP LOCK NUT

(a) Apply sealant to 2 or 3 threads of the lock nut.

Sealant:

Part No.08833-00080, THREE BOND 1344, LOC-TITE 242 or equivalent

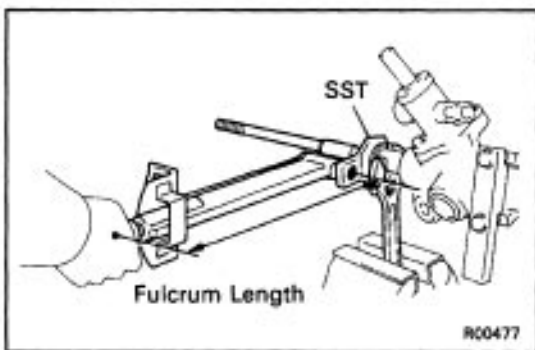
(b) Using SST, install and torque the lock nut.

SST 09612-24014 (09617-24020),
09631-10021

Torque: 55 N-m (560 kgf-cm, 41 ft-lbf)

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

(c) Recheck the total preload.



14. INSTALL RACK ENDS

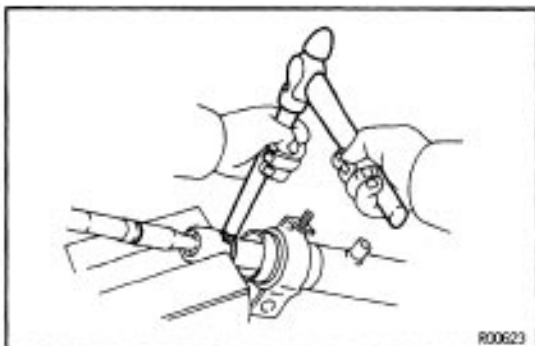
(a) Install a new claw washer.

(b) Using SST, install the rack ends.

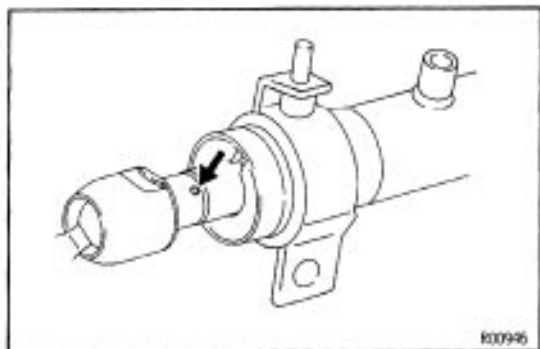
SST 09617-14010

Torque: 72 N-m (730 kgf-cm, 53 ft-lbf)

HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.).



(c) Using a brass bar and hammer, stake the claw washers.



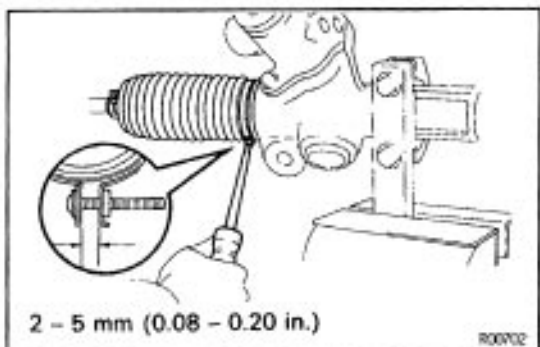
15. INSTALL RACK BOOTS

(a) Ensure that the tube hole is not clogged with grease.

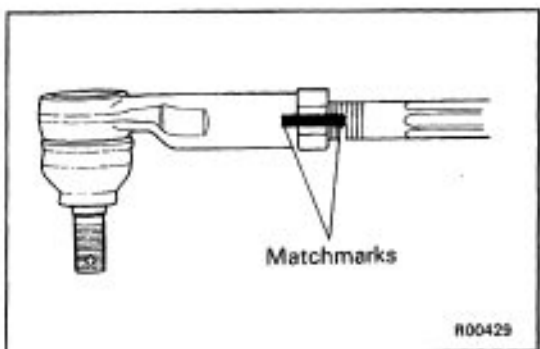
HINT: If the tube hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel turned.

(b) Install the boots.

HINT: Be careful not to damage or twist the boot.



(c) install the clamps and clips.

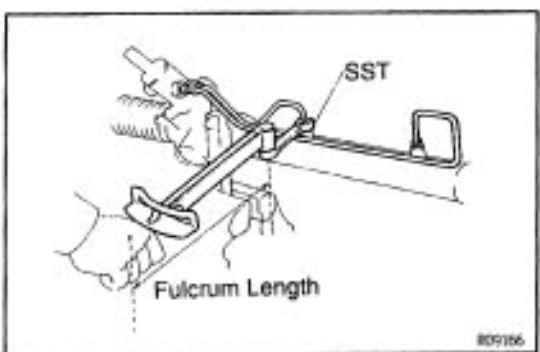


16. INSTALL TIE ROD ENDS

(a) Screw the lock nuts and tie rod ends onto the rack ends until the matchmarks are aligned.

(b) After adjusting toe-in, torque the lock nut.

Torque: 74 N-m (750 kgf-cm, 54 ft-lbf)



17. INSTALL RIGHT AND LEFT TURN PRESSURE TUBES

(a) Install new O-rings to the tube.

(b) Using SST, install and torque the tubes.

SST 09633-00020

Torque: 11 N-m (110 kgf-cm, 8 ft-lbf)

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

SERVICE SPECIFICATIONS

M1025-00

SERVICE DATA

Steering wheel freeplay (Maximum)		30mm (1.18in.) or less
PS ON-VEHICLE INSPECTION		
Drive belt tension 1 MZ- FE (New belt)		539–637 N (55–65 kgf, 121–143 lbf)
Drive belt tension 1 MZ-FE (Used belt)		245–392 N (25–40 kgf, 55–88 lbf)
Drive belt tension 5S-FE (New belt)		432–539 N (44–55 kgf, 97–121 lbf)
Drive belt tension 5S-FE (Used belt)		196–343 N (20–35 kgf, 44–77 lbf)
Maximum rise of oil level		5 mm (0.20 in.)
Oil pressure at idle speed with valve closed (Minimum) 1 MZ-FE		9,120 kpa (93 kgf/cm ² , 1,323 psi)
Oil pressure at idle speed with valve closed (Minimum) 5S-FE		8,336 kpa (85 kgf/cm ² , 1,209 psi)
Steering effort at idle speed (Maximum)		39 N (4 kgf, 8.8 lbf)
PS PUMP		
Rotor shaft bushing oil clearance (STD) 1 MZ- FE		0.03–0.05 mm (0.0012–0.0020 in.)
Rotor shaft bushing oil clearance (Maximum) 1 MZ-FE		0.07 mm (0.0028 in.)
Vane plate to rotor groove clearance (Maximum) 1 MZ-FE		0.035 mm (0.0014 in.)
Rotor shaft bushing oil clearance (STD) 5S-FE		0.01–0.03 mm (0.0004–0.0012 in.)
Rotor shaft bushing oil clearance (Maximum) 5S-FE		0.07 mm (0.0028 in.)
Vane plate to rotor groove clearance (Maximum) 5S-FE		0.03 mm (0.0012 in.)
Vane plate length (Minimum) 1 MZ-FE for PS		14.99 mm (0.5902 in.)
Vane plate height (Minimum) 1 MZ-FE for PS		8.6 mm (0.339 in.)
Vane plate thickness (Minimum) 1 MZ-FE for PS		1.4 mm (0.055 in.)
Vane plate length (Minimum) 1 MZ-FE for Hydraulic cooling fan		14.98 mm (0.5898 in.)
Vane plate height (Minimum) 1 MZ-FE for Hydraulic cooling fan		8.1 mm (0.319 in.)
Vane plate thickness (Minimum) 1 MZ-FE for Hydraulic cooling fan		1.8 mm (0.071 in.)
Vane plate length (Minimum) 5S-FE		14.97 mm (0.5894 in.)
Vane plate height (Minimum) 5S-FE		8.0 mm (0.315 in.)
Vane plate thickness (Minimum) 5S-FE		1.77 mm (0.0697 in.)
Vane plate length 1 MZ-FE for PS		
(Cam ring mark) (Rotor mark)		
2	None	15.003–15.005 mm (0.59067–0.59075 in.)
3	1	15.001–15.003 mm (0.59059–0.59067 in.)
4	2	14.999–15.001 mm (0.59051–0.59059 in.)
5	3	14.997–14.999 mm (0.59043–0.59051 in.)
6	4	14.995–14.997 mm (0.59035–0.59043 in.)
Vane plate length 1 MZ-FE for Hydraulic cooling fan		
(Cam ring mark) (Rotor mark)		
None	1	14.996–14.998 mm (0.59039–0.59047 in.)
1	2	14.994–14.996 mm (0.59031–0.59039 in.)
2	3	14.992–14.994 mm (0.59024–0.59031 in.)
3	4	14.990–14.992 mm (0.59016–0.59024 in.)
Vane plate length 5S-FE		
(Cam ring and rotor mark)		
None		14.996–14.998 mm (0.59039–0.59047 in.)
1		14.994–14.996 mm (0.59031–0.59039 in.)
2		14.992–14.994 mm (0.59024–0.59031 in.)

3	14.990 – 14.992 mm (0.59016 – 0.59024 in.)
4	14.988 – 14.990 mm (0.59008 – 0.59016 in.)
Flow control valve spring length (STD) 1 MZ-FE	39 mm (1.54 in.)
Flow control valve spring length (Minimum) 1 MZ-FE	37 mm (1.46 in.)
Flow control valve spring length (STD) 5S-FE	38 mm (1.49 in.)
Flow control valve spring length (Minimum) 5S-FE	36 mm (1.42 in.)
Pump rotating torque (Maximum)	0.3 N·m (2.8 kgf·cm, 2.4 in.-lbf)
PS GEAR HOUSING	
Steering rack runout (Maximum)	0.3 mm (0.012 in.)
Total preload (Turning)	0.8 – 1.4 N·m (8 – 14 kgf·cm, 6.9 – 12.2 in.-lbf)

MPSM-DC

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft-lbf
STEERING COLUMN			
Steering main shaft x Sliding yoke	35	360	26
Column bracket x Body	25	260	19
Steering wheel	35	360	26
Wheel pad	8.8	90	78 in.-lbf
Tilt lever x Column tube	23	225	16
POWER STEERING PUMP FOR 1 MZ-FE			
Pressure port union x Pump housing	69	700	51
Suction port union x Pump housing	13	130	9
Front housing x Rear housing	46	470	34
Control valve assy	59	600	43
Pump pulley x Pump shaft	43	440	32
Pressure tube x Pressure port union	44	450	33
PS pump installation bolt	43	440	32
POWER STEERING PUMP FOR 5S-FE			
Pressure port union x Pump housing	69	700	51
Suction port union x Pump housing	13	130	9
Pump pulley x Pump shaft	43	440	32
PS pump installation bolt (Adjusting bolt)	43	440	32
PS pump installation bolt (Through bolt)	43	440	32
PS pump x Pressure tube	51	525	38
POWER STEERING GEAR HOUSING			
Control valve housing x Rack housing	18	185	13
Control valve self-locking nut	25	250	18
Rack housing cap	59	600	43
Lock nut	55	560	41
Rack x Rack end	72	730	53
Tie rod end lock nut	74	750	54
Turn pressure tube union nut	11	110	8
Gear housing x Sub frame	181	1,850	134
Control valve shaft x Sliding yoke	35	360	26
Pressure and return tube x Gear housing	25	250	18
Tie rod end x Steering knuckle	49	500	36