STEERING

GENERAL DESCRIPTION

SR01E–01

- **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 SRS AIRBAG section.**

TROUBLESHOOTING

SR003–02

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the priority of the probable cause of trouble. Check each part in the order shown. If necessary, repair or replace the part.

See page / Parts Name / Trouble	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	Solenoid valve	Electronic control	Front wheel bearing (Worn)
See page	SA–3	SA–3	SR–28	SR–28	–	SA–46	–	–	SA–48	SR–70	SR–66	SA–10
Hard steering	1	4	2	3	5	6	7		10	8	9	
Poor return	1	2					3		4			
Excessive play					1	2		3	5			4
Abnormal noise			1		2				3			

V00492

GENERAL DESCRIPTION

SR01E–01

- **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 SRS AIRBAG section.**

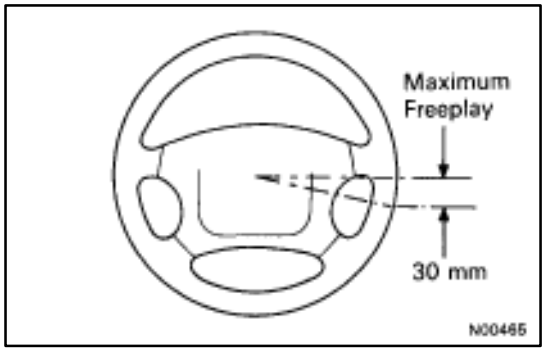
TROUBLESHOOTING

SR003–02

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the priority of the probable cause of trouble. Check each part in the order shown. If necessary, repair or replace the part.

See page / Parts Name / Trouble	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	Solenoid valve	Electronic control	Front wheel bearing (Worn)
See page	SA–3	SA–3	SR–28	SR–28	–	SA–46	–	–	SA–48	SR–70	SR–66	SA–10
Hard steering	1	4	2	3	5	6	7		10	8	9	
Poor return	1	2					3		4			
Excessive play					1	2		3	5			4
Abnormal noise			1		2				3			

V00492



ON–VEHICLE INSPECTION

SR004–02

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:

30mm (1.18in.)

If incorrect, repair.

SERVICE SPECIFICATIONS

SR02B–03

SERVICE DATA

Steering wheel freeplay (Maximum)		30mm (1.18in.) or less
STEERING COLUMN		
Pawl stopper	Mark	
	1 or A	12.68–12.74mm (0.4992–0.5016in.)
	2 or B	12.61–12.67mm (0.4965–0.4988in.)
	3 or C	12.54–12.60mm (0.4937–0.4961in.)
	4 or D	12.47–12.53mm (0.4909–0.4933in.)
	5 or E	12.40–12.46mm (0.4882–0.4906in.)
	6 or F	12.33–12.39mm (0.4854–0.4878in.)
	7 or G	12.26–12.32mm (0.4827–0.4850in.)
PS ON–VEHICLE INSPECTION		
Drive belt tension (New belt)		667–824N (68–84kgf, 150–185lbf)
Drive belt tension (Used belt)		422–598N (43–61kgf, 95–135lbf)
Maximum rise of oil level		5mm (0.20in.)
Oil pressure at idle speed with valve closed (Minimum)		9,316kpa (95kgf/cm•, 1,351psi)
Steering effort at idle speed (Maximum)		34N (3.5kgf, 7.7lbf)
PS PUMP		
Rotor shaft bushing oil clearance (STD)		0.03–0.05mm (0.0012–0.0020in.)
Rotor shaft bushing oil clearance (Maximum)		0.07mm (0.0028in.)
Vane plate to rotor groove clearance (Maximum)		0.035mm (0.0014in.)
Vane plate length (Minimum) for PS		14.99mm (0.5902in.)
Vane plate height (Minimum) for PS		8.6mm (0.339in.)
Vane plate thickness (Minimum) for PS		1.4mm (0.055in.)
Vane plate length (Minimum) for Hydraulic cooling fan		14.98mm (0.5898in.)
Vane plate height (Minimum) for Hydraulic cooling fan		8.1mm (0.319in.)
Vane plate thickness (Minimum) for Hydraulic cooling fan		1.8mm (0.071in.)
Vane plate length for PS		
(Cam ring mark)	(Rotor mark)	
2	None	15.003–15.005mm (0.59067–0.59075in.)
3	1	15.001–15.003mm (0.59059–0.59067in.)
4	2	14.999–15.001mm (0.59051–0.59059in.)
5	3	14.997–14.999mm (0.59043–0.59051in.)
6	4	14.995–14.997mm (0.59035–0.59043in.)
Vane plate length for Hydraulic cooling fan		
(Cam ring mark)	(Rotor mark)	
1	None	14.996–14.998mm (0.59039–0.59047in.)
2	1	14.994–14.996mm (0.59031–0.59039in.)
3	2	14.992–14.994mm (0.59024–0.59031in.)
4	3	14.990–14.992mm (0.59016–0.59024in.)
5	4	14.988–14.990mm (0.59008–0.59016in.)
Flow control valve spring length (Minimum)		37mm (1.46in.)
Pump rotating torque (Maximum)		0.3N·m (2.8kgf·cm, 2.4in.·lbf)
PS GEAR HOUSING		
Steering rack runout (Maximum)		0.3mm (0.012in.)
Total preload (Turning)		0.8–1.4N·m (8–14kgf·cm, 6.9–12.2in.·lbf)
Solenoid valve resistance		4–9 Ω

TORQUE SPECIFICATIONS

SR026–03

Part tightened	N·m	kgf·cm	ft·lbf
STEERING COLUMN			
Steering main shaft X Universal joint	35	360	26
Column bracket X Body	25	260	19
Steering wheel	35	360	26
Wheel pad	8.8	90	78in.·lbf
Tilt lever assembly installation bolt	2.9	30	26in.·lbf
Tilt pawl set nut	5.9	60	52in.·lbf
Tilt lever retainer set nut	15	150	11
Compression spring bushing bolt	7.8	80	69in.·lbf
POWER STEERING PUMP			
Pressure port union X Pump housing	83	850	62
Suction port union X Pump housing	13	130	9
Front housing X Rear housing	46	470	34
Control valve assembly	59	600	43
Pump pully X Pump shaft	43	440	32
Pressure tube X Pressure port union	44	450	33
PS pump installation bolt	43	440	32
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 Universal joint	35	360	26
Pressure and return tube X Gear housing	25	250	18
Tie rod end X Steering knuckle	49	500	36

STEERING COLUMN

PREPARATION

SST(SPECIAL SERVICE TOOLS)

SR02F–01

	09213–31021 Crankshaft Pulley Puller	Steering wheel
	09910–00015 Puller Set	
	(09911–00011) Puller Clamp	
	(09912–00010) Puller Slide Hammer	
	09950–20017 Universal Puller	

RECOMMENDED TOOLS

SR01G–01

	09042–00010 Torx Socket T30	Steering wheel pad
	09905–00012 Snap Ring No. 1 Expander	

EQUIPMENT

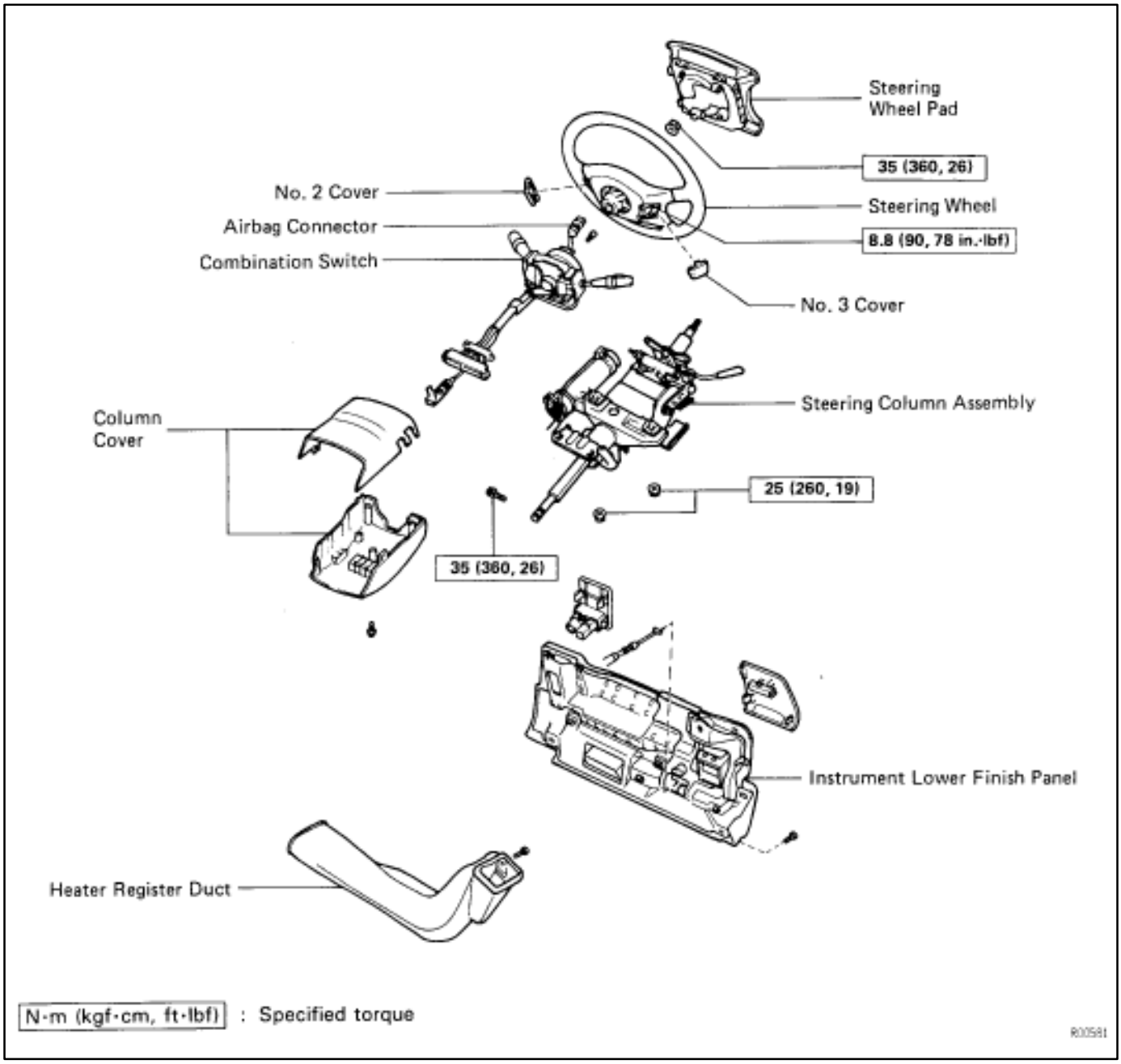
SR007–01

Torque wrench	

ASSEMBLY REMOVAL AND INSTALLATION

SR02G–01

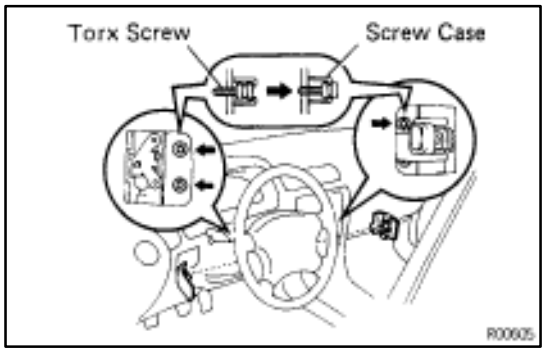
Remove and install the parts as shown.



(MAIN POINTS OF REMOVAL AND INSTALLATION)

CAUTION: Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the LOCK position and the negative (–) terminal cable is disconnected from the battery.

NOTICE: If the wiring connector of the airbag system is disconnected with the ignition switch at ON or ACC, diagnostic trouble codes will be recorded.



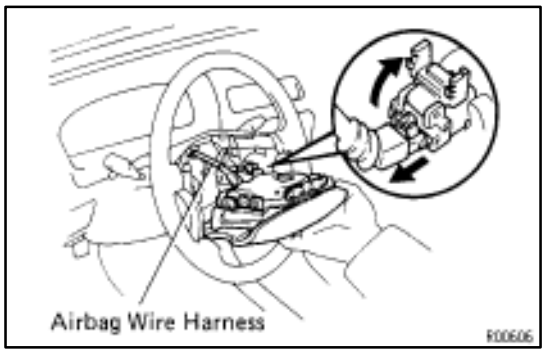
1. REMOVE STEERING WHEEL PAD

(a) Disconnect the battery negative (–) terminal.

(b) Place the front wheels facing straight ahead.

(c) Using a torx wrench, loosen the three screws.
Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool)

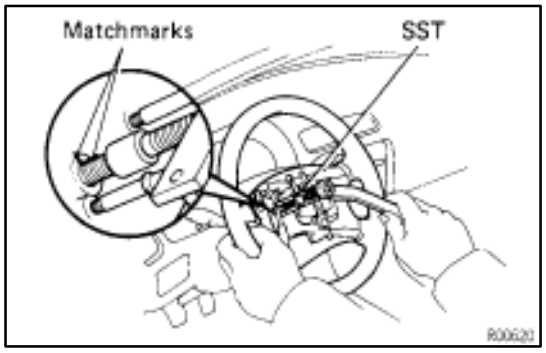
(d) Loosen the torx screws until the groove along the screw circumference catches on the screw case.



(e) Pull the wheel pad out from the steering wheel and disconnect the airbag 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.

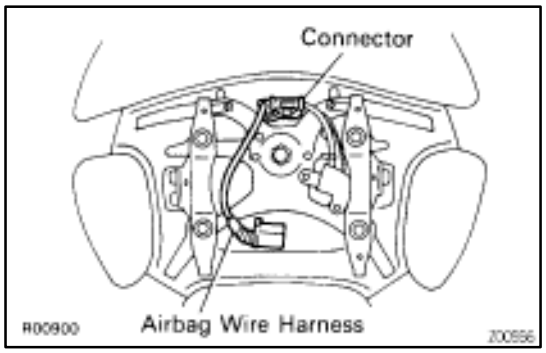


2. REMOVE STEERING WHEEL

(a) Disconnect the connector.

(b) Remove the set nut.

(c) Using SST, remove the steering wheel.
SST 09213–31021



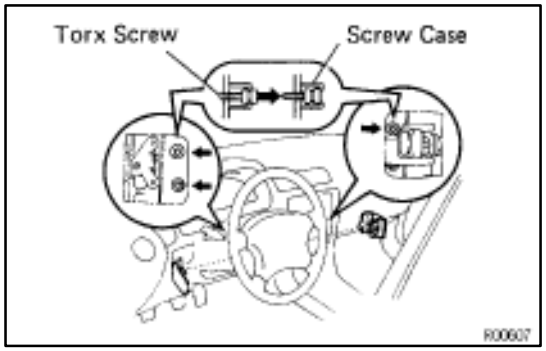
3. INSTALL STEERING WHEEL AND WHEEL PAD

(a) Check that the front wheels are facing straight ahead.

(b) Center the spiral cable.
(See page AB–15)

(c) Install the steering wheel and torque the set nut.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(d) Connect the connector.



(e) Install the wheel pad after confirming that the circumference groove of the torx screws is caught on the screw case.

(f) Using a torx wrench, tighten the three screws.

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

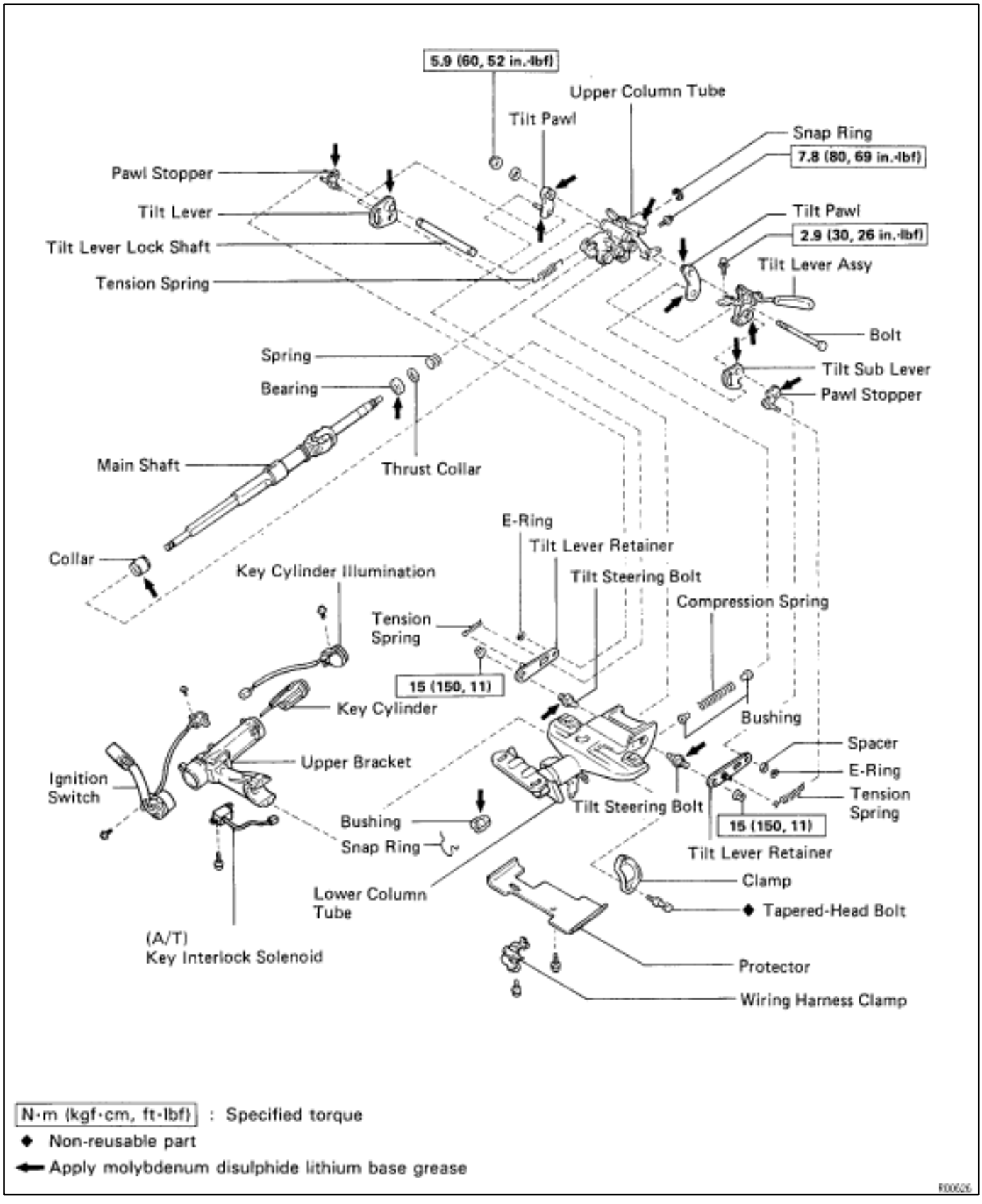
NOTICE:

- **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.**

4. CHECK STEERING WHEEL CENTER POINT AFTER INSTALLING STEERING COLUMN

STEERING COLUMN
COMPONENTS

SR006–02

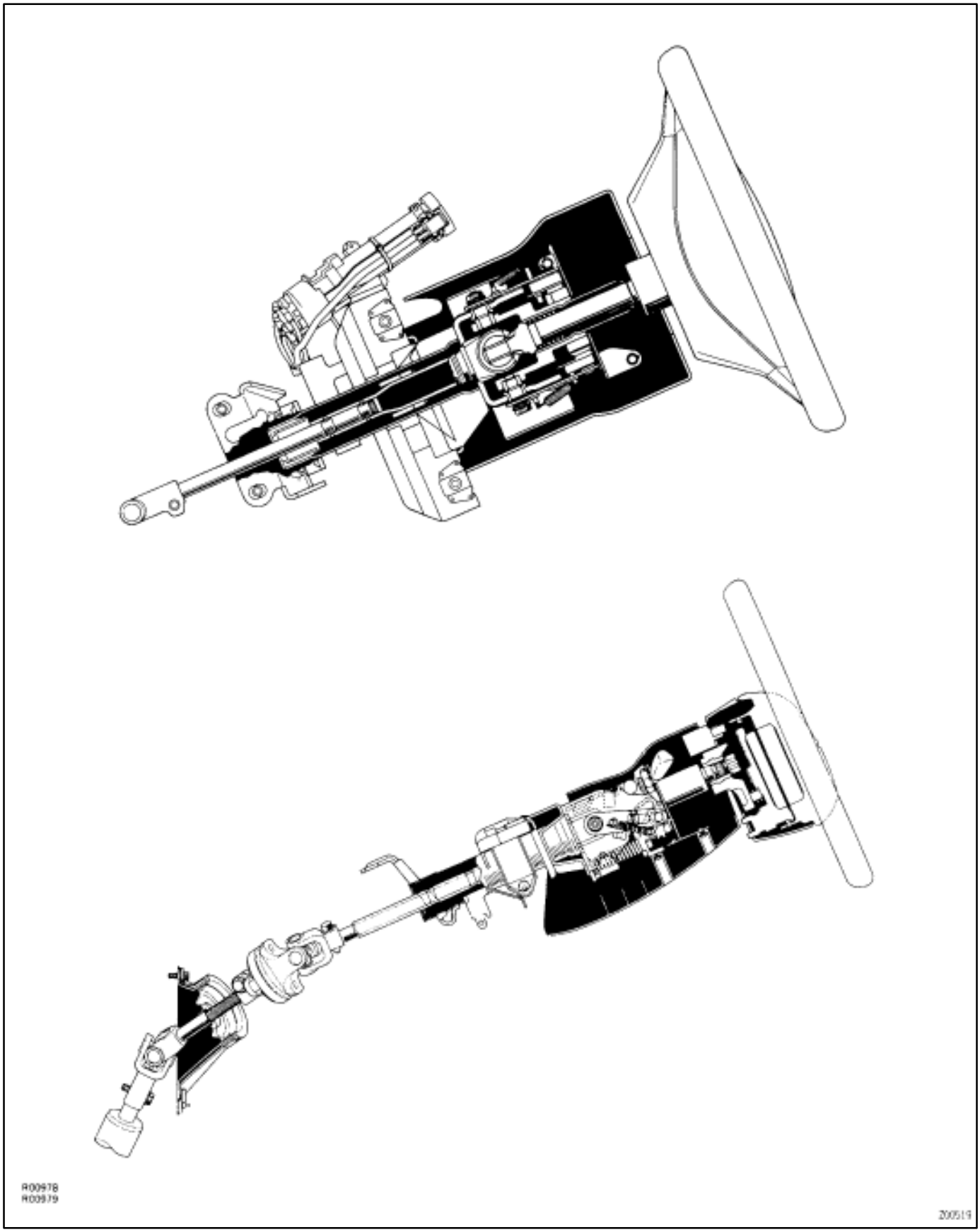


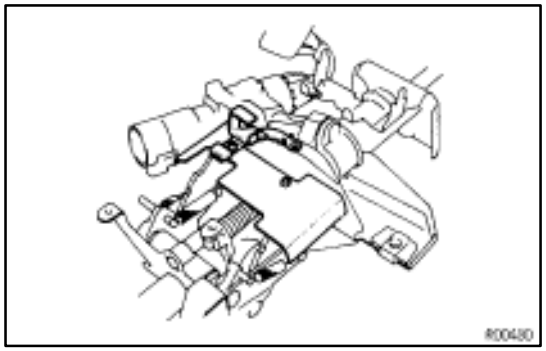
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
⬅ Apply molybdenum disulphide lithium base grease

R00620

SECTIONAL VIEW

SR02H–01





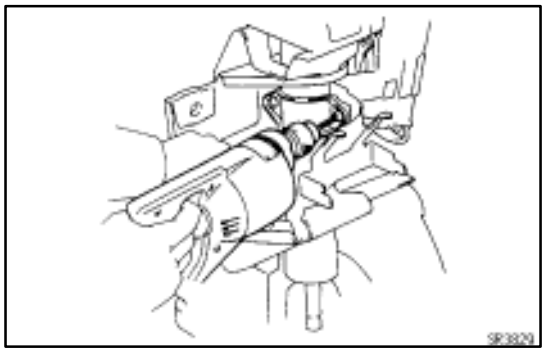
STEERING COLUMN DISASSEMBLY

SR02J–01

1. REMOVE IGNITION KEY CYLINDER ILLUMINATION

2. REMOVE WIRING HARNESS CLAMP

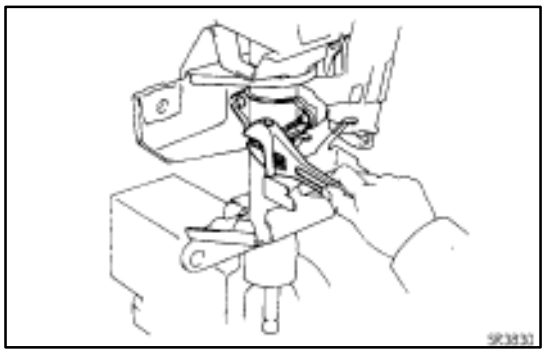
3. REMOVE PROTECTOR



4. REMOVE UPPER BRACKET

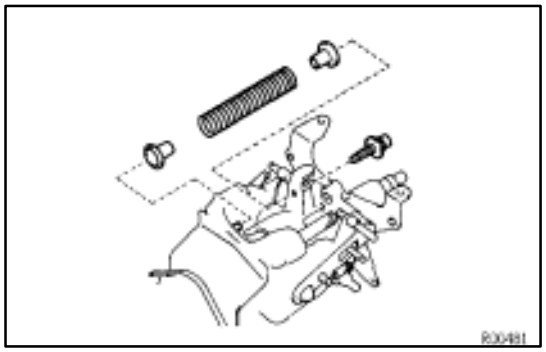
(a) Using a centering punch, mark the center of the tapered–head bolts.

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



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

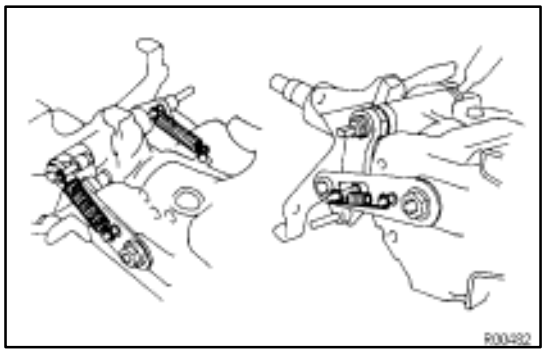
(d) Remove the two bolts, and separate the upper bracket and column tube.



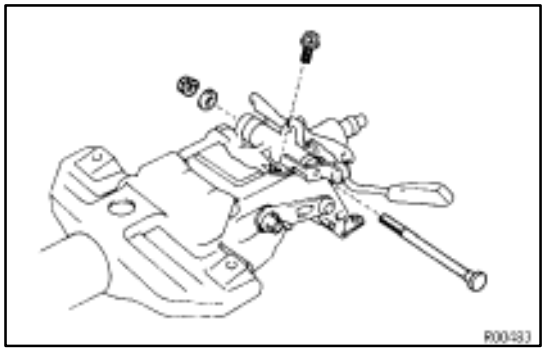
5. REMOVE COMPRESSION SPRING

(a) Using a torx wrench, remove the bolt and spring.
Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool)

(b) Remove the two bushings from the spring.

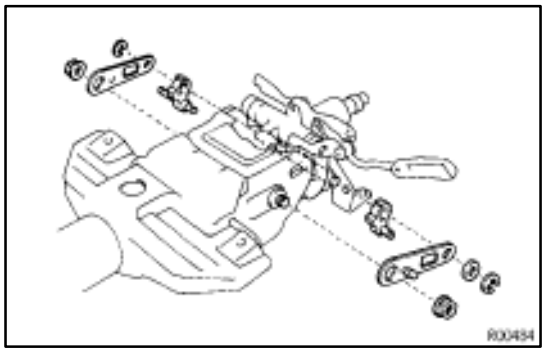


6. REMOVE THREE TENSION SPRINGS

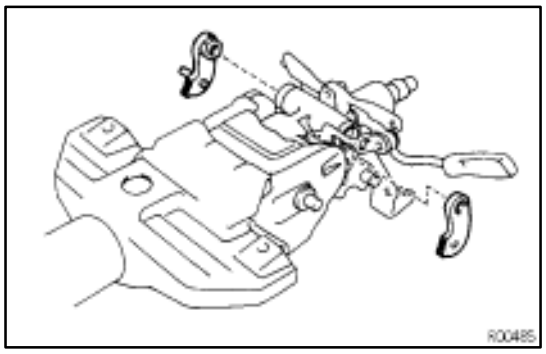


7. REMOVE TILT LEVER RETAINERS AND PAWL STOPPERS

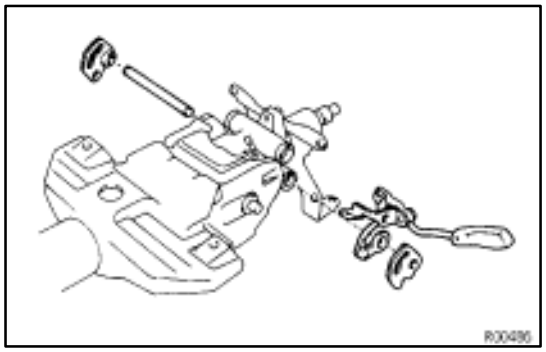
(a) Remove the nut and washer.
(b) Pull out the bolt.
(c) Remove the tilt lever assembly installation bolt.



(d) Remove the two E–rings from the tilt lever lock shaft.
(e) Remove the spacer.
(f) Remove the two nuts from the tilt steering bolts.
(g) Remove the two tilt lever retainers and two pawl stoppers.

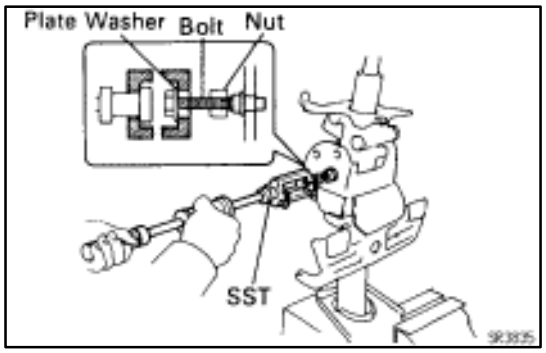


8. REMOVE TILT PAWLS



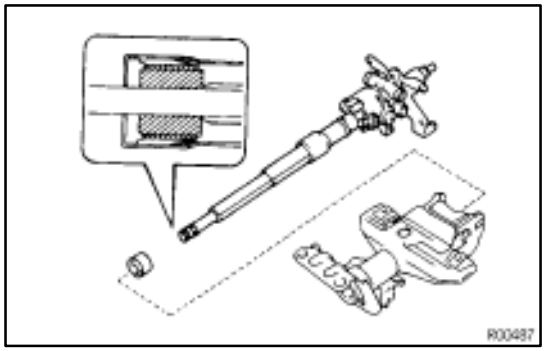
9. REMOVE TILT LEVER, TILT SUB LEVER, TILT LEVER ASSEMBLY AND TILT LEVER LOCK SHAFT

(a) Remove the tilt lever, tilt sub lever and tilt lever assembly from the tilt lever lock shaft.
(b) Pull out the tilt lever lock shaft.

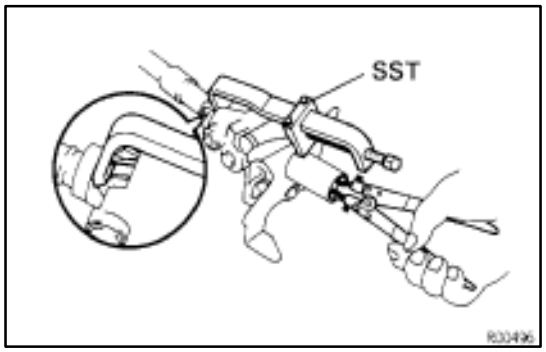


10. REMOVE UPPER COLUMN TUBE

(a) Set SST, the nut (10 mm diameter, 1.25 mm pitch), plate washer (36 mm outer diameter) and bolt (10 mm diameter, 1.25 mm pitch, 50 mm length) as shown.
And then remove the two tilt steering bolts.
SST 09910–00015 (09911–00011, 09912–00010)
(Reference)
Nut: 90170–10004
Plate washer: 90201–10201
Bolt: 91111–51050

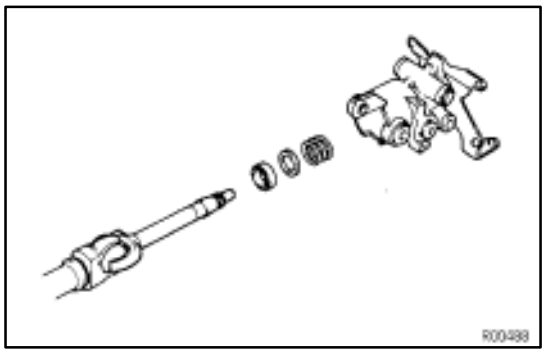


(b) Remove the upper column tube from the lower column tube.
(c) Remove the collar from the main shaft.

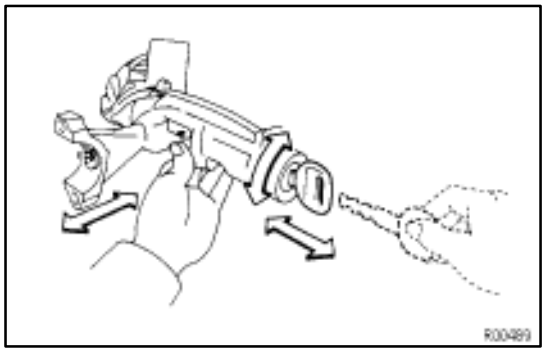


11. REMOVE MAIN SHAFT

(a) Using SST to compress the main shaft spring, remove the snap ring with snap ring pliers.
SST 09950–20017



(b) Remove the main shaft from the column tube.
(c) Remove the spring, thrust collar and bearing.

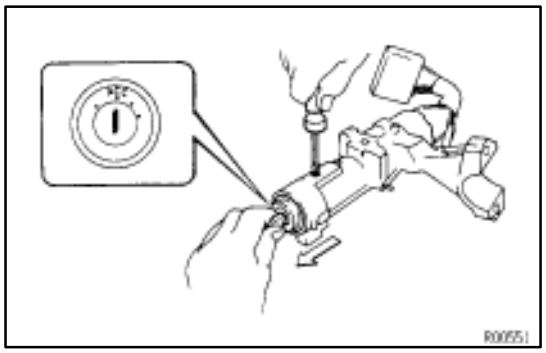


STEERING COLUMN INSPECTION AND REPLACEMENT

SR02K–01

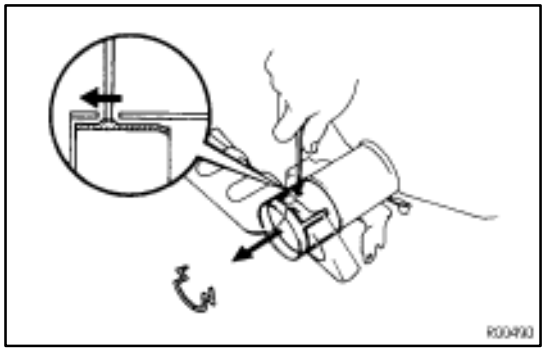
1. INSPECT KEY CYLINDER

Check that the steering lock mechanism operates properly.



2. IF NECESSARY, REPLACE KEY CYLINDER

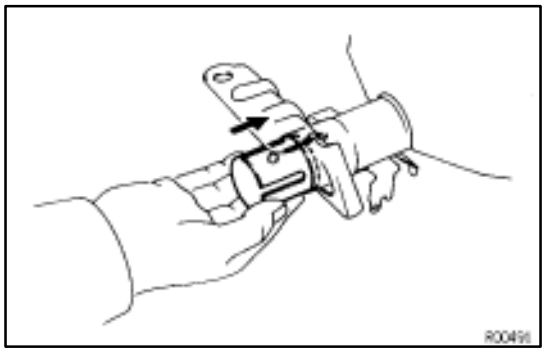
(a) Place the ignition key at the ACC position.
(b) Push down the stop pin with a thin rod, and pull out the key cylinder.
(c) Make sure the ignition key is at the ACC position.
(d) Install a new key cylinder.



3. IF NECESSARY, REPLACE MAIN SHAFT BUSHING

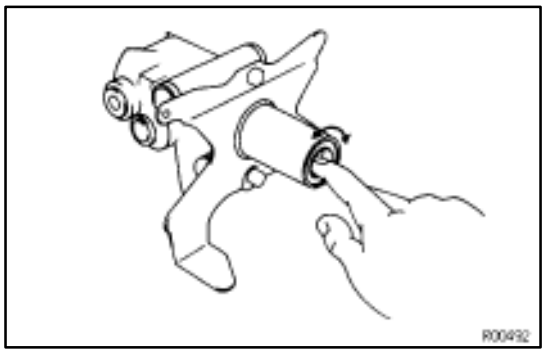
(a) Remove the snap ring.

(b) Using a screwdriver, remove the bushing.



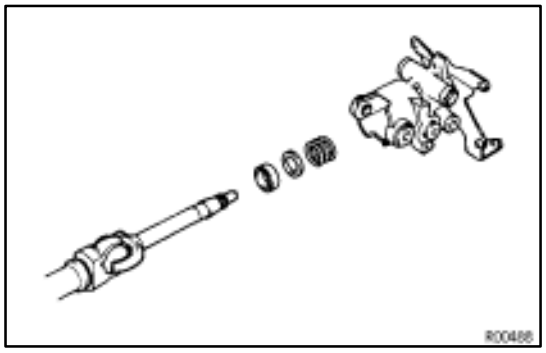
(c) Align the holes of the tube and projections of a new bushing, and insert the bushing in the column tube.

(d) Install the snap ring.



4. INSPECT UPPER BEARING

Check the upper bearing rotation condition and check for abnormal noise.



STEERING COLUMN ASSEMBLY

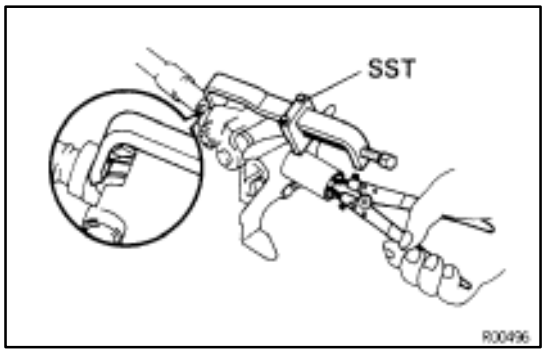
SR02L–01

1. APPLY MOLYBDENUM DISULPHID LITHIUM BASE GREASE (See page SR–8)

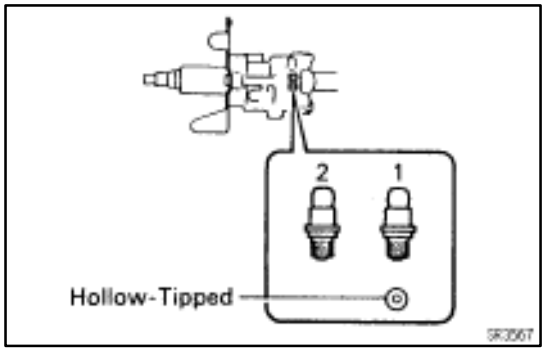
2. INSTALL MAIN SHAFT

(a) Install the bearing, thrust collar and spring to the main shaft.

(b) Insert the main shaft into the upper column tube.

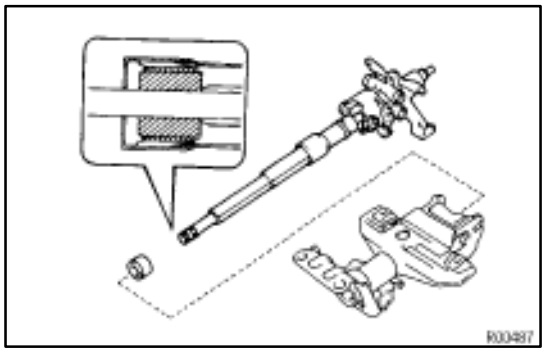


(c) Using SST to compress the main shaft spring, install the snap ring with snap ring pliers.
SST 09950–20017



3. SELECT TILT STEERING BOLTS

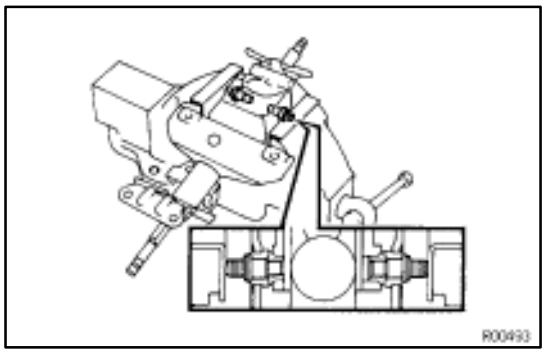
Select the bolt with the plain thread end when the upper column tube mark is 2, and the bolt with the hollow–tipped thread end when the mark is 1.



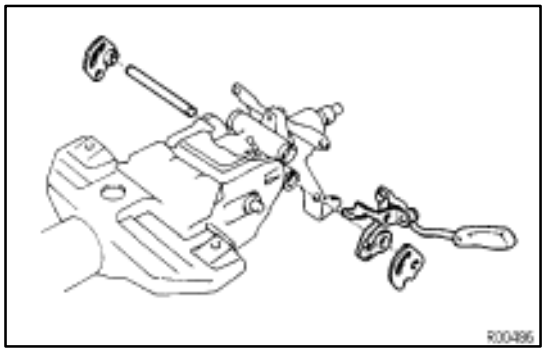
4. INSTALL MAIN SHAFT WITH UPPER COLUMN TUBE

(a) Install the collar to the main shaft.

(b) Insert the main shaft with the upper column tube into the lower column tube.



(c) Using a vise, press in the two tilt steering bolts.
HINT: Make sure the upper tube turns smoothly.

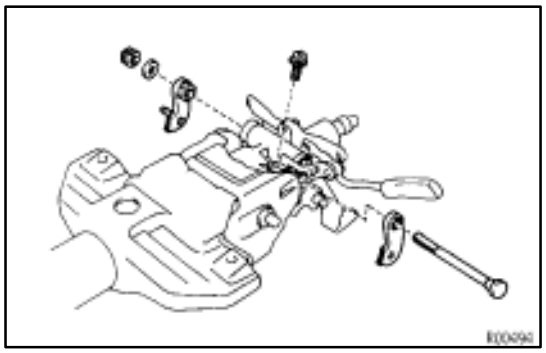


5. INSTALL TILT LEVER LOCK SHAFT, TILT LEVER ASSEMBLY, TILT SUB LEVER AND TILT LEVER

(a) Insert the tilt lever lock shaft into the upper column tube.

(b) Install the tilt lever assembly.

(c) Install the tilt lever and tilt sub lever.



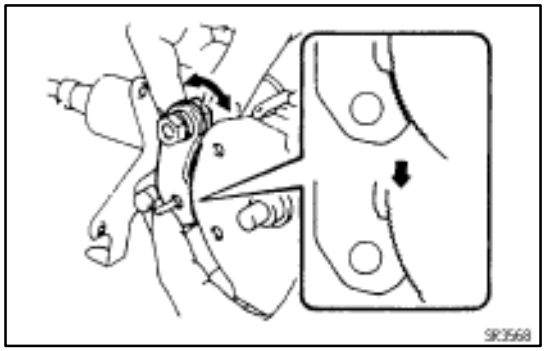
6. INSTALL TILT PAWLS

(a) Install the two tilt pawls to the upper column tube.
HINT: Insert the pawl pin into the long hole of the tilt lever and tilt sub lever.

(b) Install the bolt through the tilt pawls and tilt lever assembly.

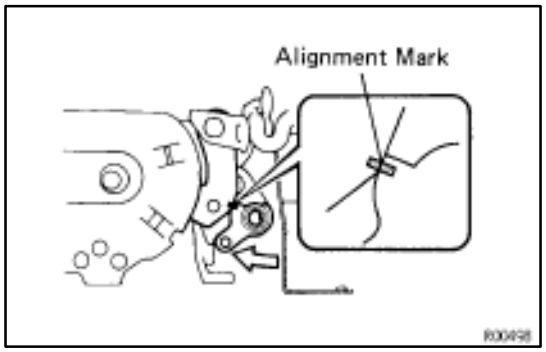
(c) Temporarily install the washer and nut.

(d) Install and torque the tilt lever assembly installation bolt.
Torque: 2.9 N·m (30 kgf·cm, 26 in.·lbf)



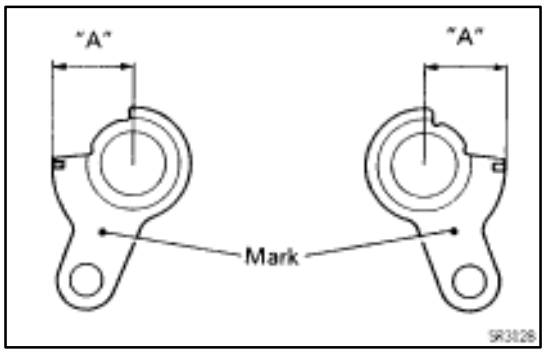
7. ENGAGE AND ADJUST TILT PAWL

(a) Engage the tilt sub lever side pawl to the center of the ratchet.
(b) While turning the tilt lever side collar, completely engage the tilt lever side pawl to the ratchet.
(c) Tighten the nut.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
(d) Check that the pawls rotate smoothly.



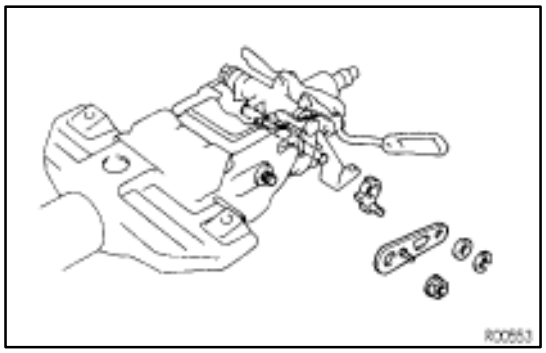
8. SELECT PAWL STOPPERS

(a) With the tilt pawl and ratchet engaged, install two pawl stoppers.
(b) Check that the alignment marks on the stopper and pawl align when the stopper is lightly rotated to the pawl side.
(c) If the alignment marks do not align, select pawl stoppers according to the following table.



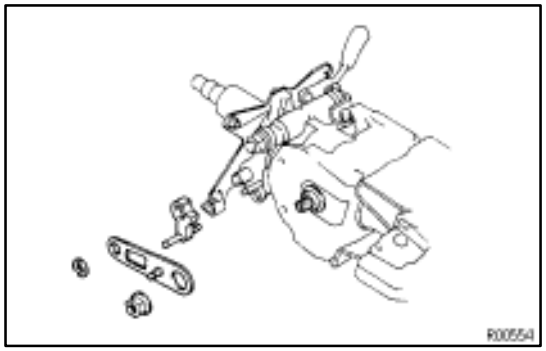
Tilt lever side	Tilt sub lever side	Dimension"A"mm (in.)
1	A	12.68–12.74 (0.4992–0.5016)
2	B	12.61–12.67 (0.4965–0.4988)
3	C	12.54–12.60 (0.4937–0.4961)
4	D	12.47–12.53 (0.4909–0.4933)
5	E	12.40–12.46 (0.4882–0.4906)
6	F	12.33–12.39 (0.4854–0.4878)
7	G	12.26–12.32 (0.4827–0.4850)

(d) After selecting the stoppers, check that on both sides the pawl and ratchet are fully engaged.

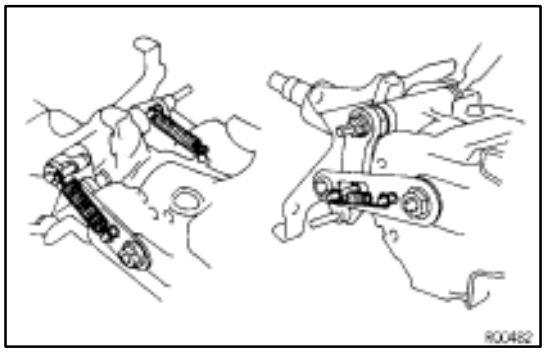


9. INSTALL PAWL STOPPERS AND TILT LEVER RETAINERS

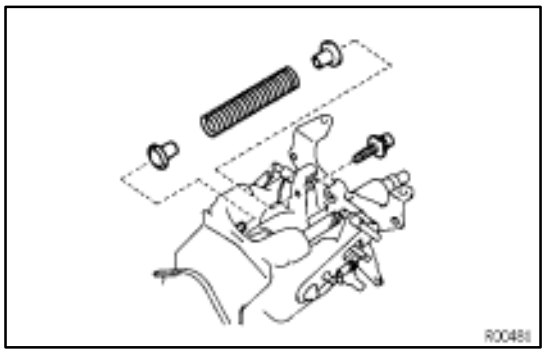
(a) Install the tilt sub lever side pawl stopper and tilt lever retainer.
(b) Install the spacer.
(c) Install the E–ring.
(d) Install and torque the nut.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



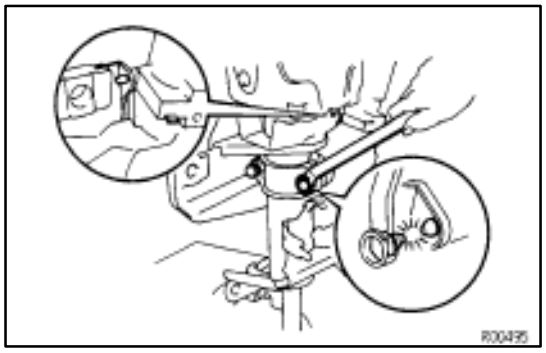
(e) Install the tilt lever side pawl stopper and tilt lever retainer.
(f) Install the E–ring.
(g) Install and torque the nut.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



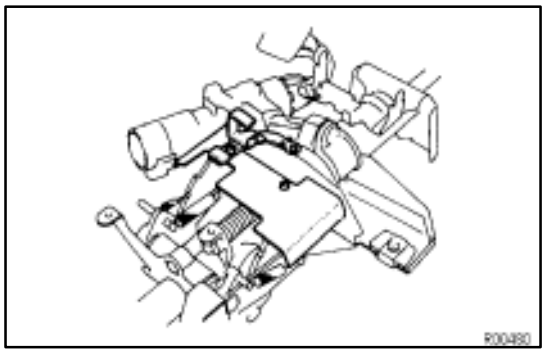
10. INSTALL THREE TENSION SPRINGS



11. INSTALL COMPRESSION SPRING
(a) Install the two bushings to the spring.
(b) Install the spring and bolt.
(c) Using a torx wrench, tighten the bolt.
Torx wrench: T30 (part No. 09042–00010 or locally manufactured tool)
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)



12. INSTALL UPPER BRACKET
(a) Install the upper bracket with two new tapered–head bolts.
HINT: Insert the upper bracket pin into the column tube hole.
(b) Tighten the tapered–head bolts until the bolt heads break off.



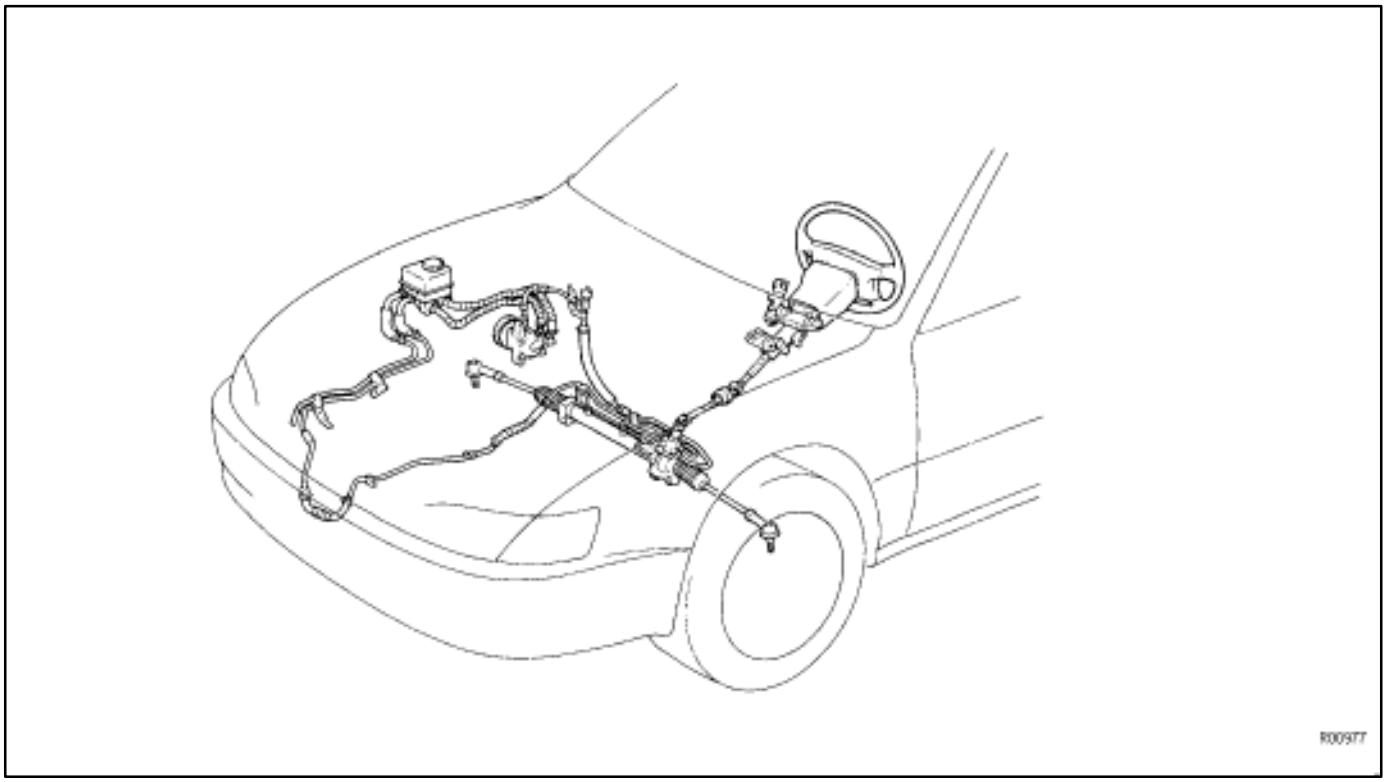
13. INSTALL PROTECTOR
14. INSTALL WIRING HARNESS CLAMP
15. INSTALL IGNITION KEY CYLINDER ILLUMINATION
16. CHECK OPERATION OF TILT STEERING
(a) With the main shaft in the neutral position, push the tilt lever and check that the main shaft rises to the uppermost position.
(b) Lower the main shaft, and check that it locks in the uppermost position.

POWER STEERING

DESCRIPTION

SR02M–01

The Progressive Power Steering (PPS) is basically a power rack and pinion gear with a rotary control valve. In addition the unit incorporates an electronically controlled hydraulic reaction chamber. The PPS varies the amount of hydraulic assist with respect to vehicle road speed.



OPERATION

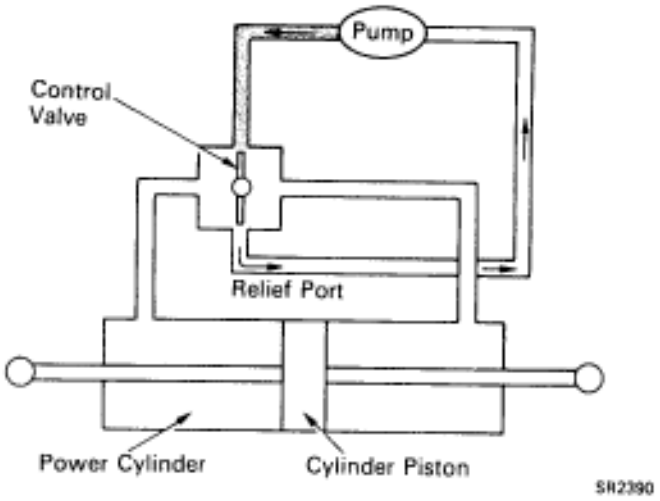
POWER STEERING PRINCIPLES

SR00Z–02

Power steering is one type of hydraulic device for utilizing 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.

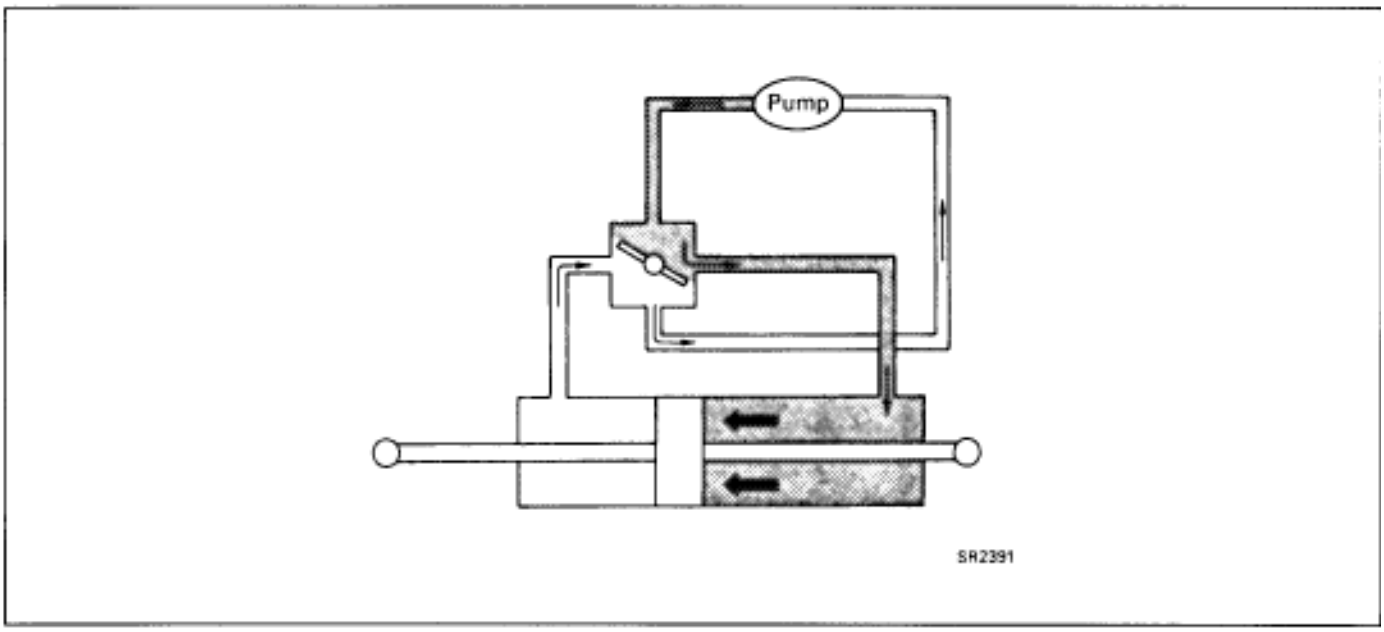
NEUTRAL (STRAIGHT–AHEAD) POSITION

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 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, pressure is created. Consequently, a pressure difference occurs between both sides of the piston and 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.



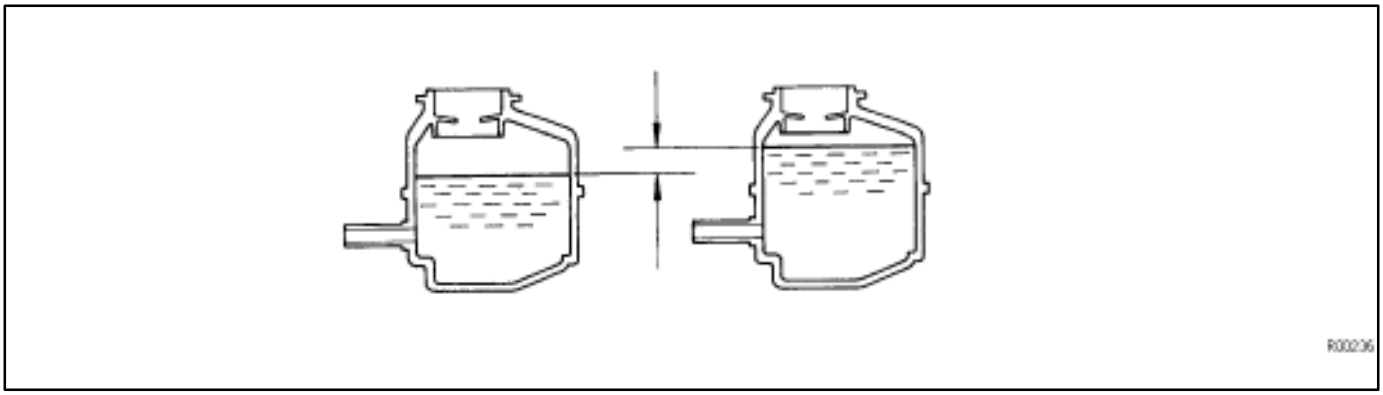
SERVICE HINT

Trouble with the power steering system usually involves hard steering resulting from lack of assist. 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.
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 assist 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

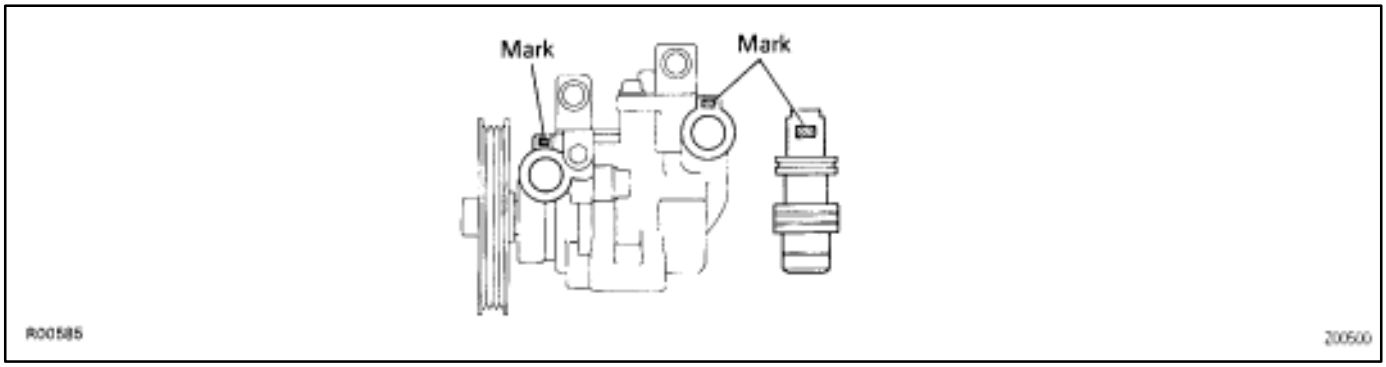
of this air will change when the fluid pressure is raised, causing a fluctuation in the fluid pressure so that the power steering will not function properly. To determine if there is any air in the system, check if there is a change of fluid level in the reservoir tank when the steering wheel is turned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



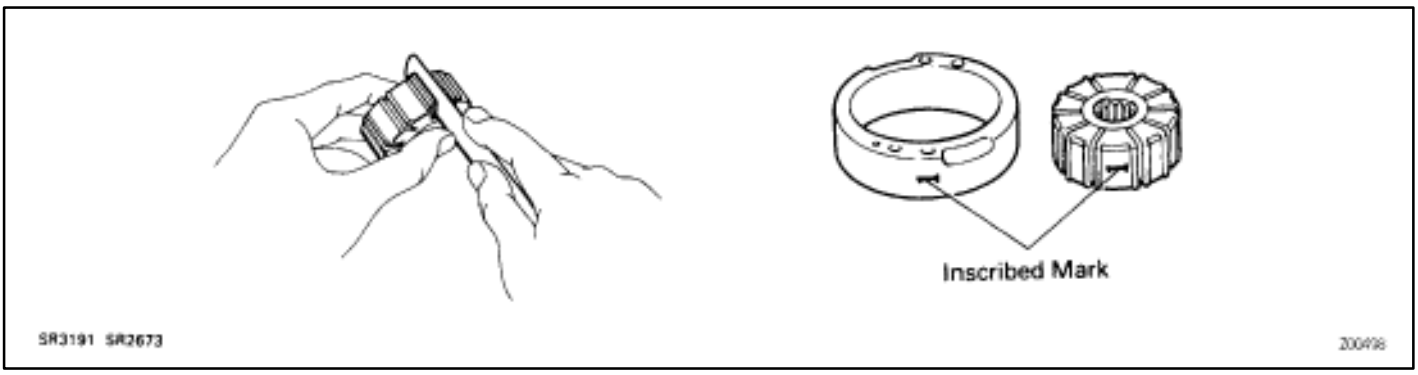
VANE PUMP

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 assist 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 insure the proper clearance.

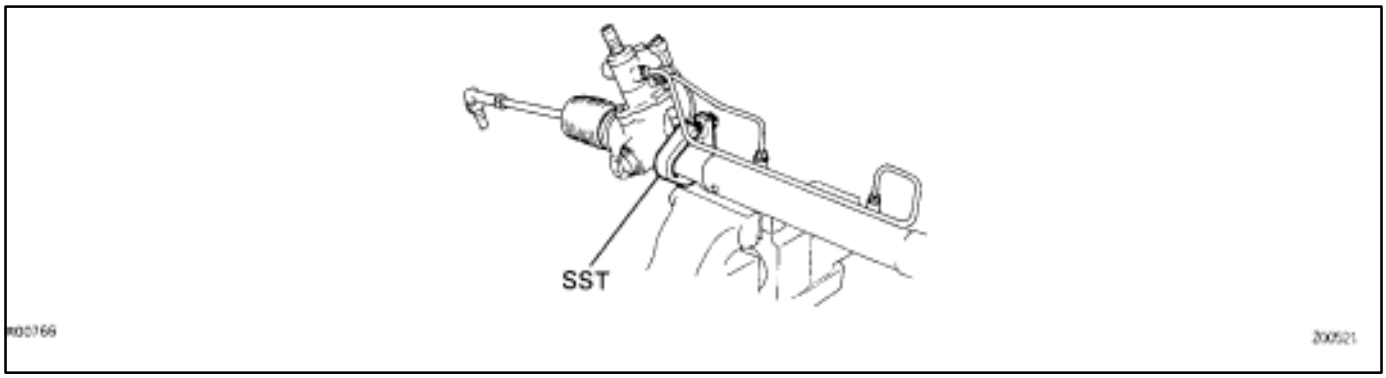


The functional parts of the pump which produce fluid pressure are the cam ring, rotor and vanes, and these should be checked for wear. If the clearance between each is not within standard when reassembling, any worn parts should be replaced.
In this case, the replaced cam ring and rotor should be of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

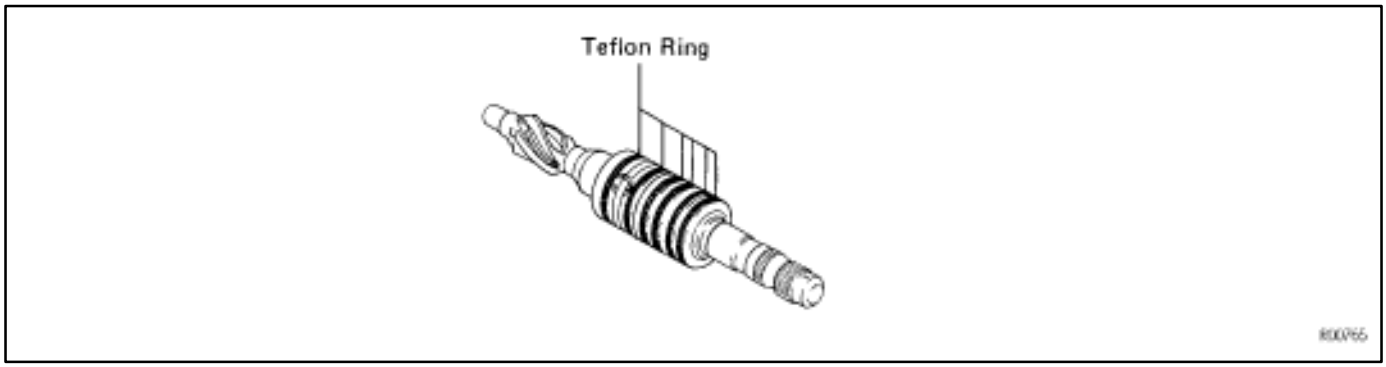


The oil seals on both sides of the power cylinder are for the prevention of leakage of the high pressure fluid which acts on the piston. Always use new oil seals when reassembling and be very careful not to scratch or damage them.

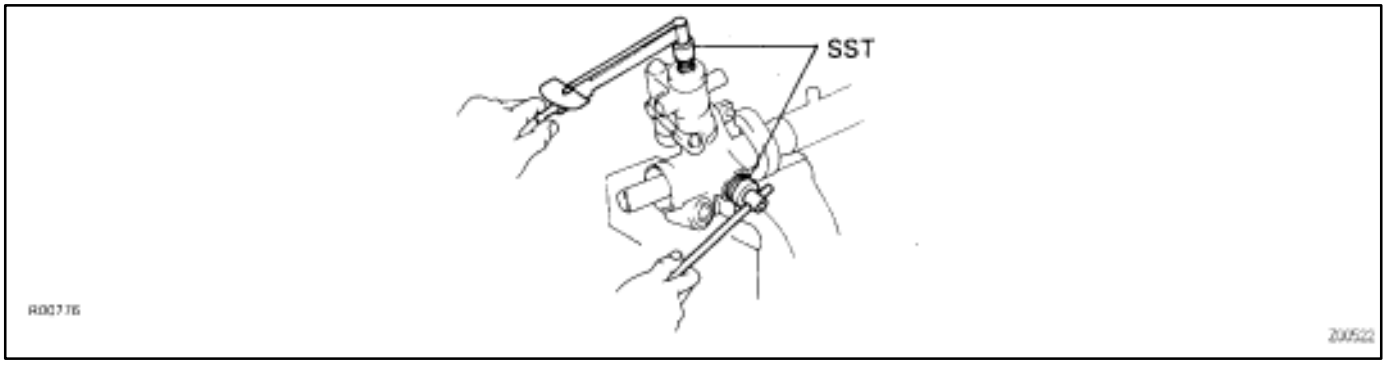
Because of the high pressure, even the slightest scratch will cause fluid leakage, resulting in an inoperative power steering system.

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 so 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.

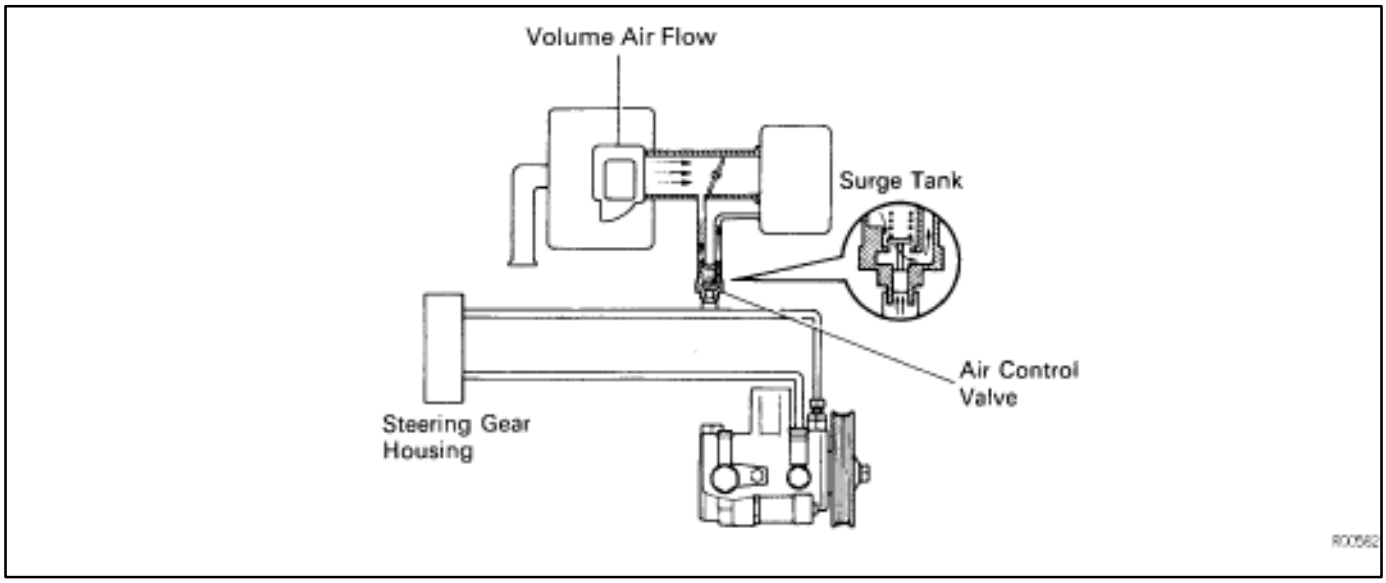


IDLE–UP DEVICE

SR01N–02

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 SFI 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.

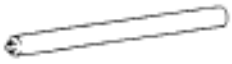


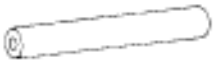
PREPARATION

SR029–02

SST (SPECIAL SERVICE TOOLS)

	09238–47012	Water Pump Bearing Remover & Replacer	PS pump bearing
	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 Wrnech	
	(09617–24030)	Steering Rack End Wrench	PS pump control valve
	09616–00010	Steering Worm Bearing Adjusting Socket	
	09616–30020	Steering Worm Bearing Adjusting Screw Wrench	PS pump pulley
	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	
	(09620–24040)	Seal Ring Guide	
	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	
	09631–20070	Seal Ring Guide	
	09631–20081	Seal Ring Tool	

	09631–22020	Power Steering Hose Nut 14 x 17 mm Wrench Set	
	09631–32010	Oil Seal Replacer	
	09631–33010	Steering Rack Cover "I"	
	09633–00020	Power Steering Hose Nut Wrench	
	09910–00015	Puller Set	
	(09911–00011)	Puller Clamp	
	(09912–00010)	Puller Slide Hammer	

RECOMMENDED TOOLS

SR01P–02

	09025–00010	Small Torque Wrench	For measuring preload
	09082–00015	TOYOTA Electrical Tester	
	09905–00012	Snap Ring No. 1 Expander	
	09905–00013	Snap Ring Pliers	

EQUIPMENT

SR027–02

Belt tension gauge	
Calipers	
Dial indicator	

Micrometer	
Oil pressure gauge	
Torque wrench	
Vacuum gauge	

LUBRICANT

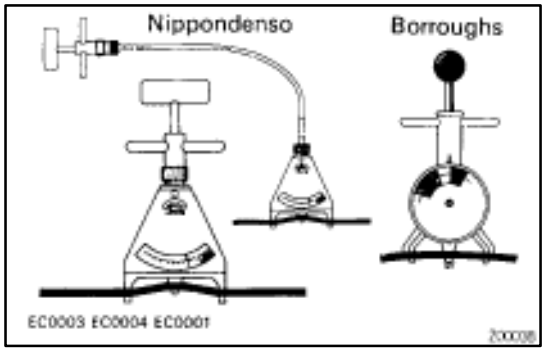
SR015–02

Item	Capacity	Classification
Power steering fluid Total	2.2 liters (2.3 US qts, 1.9 lmp.qts)	ATF DEXRON® II

SSM (SPECIAL SERVICE MATERIALS)

SR016–03

08833–0008	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Rack housing cap Rack guide spring cap Rack guide spring cap lock nut



ON–VEHICLE INSPECTION

DRIVE BELT TENSION CHECK

SR01Q–02

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:

New belt

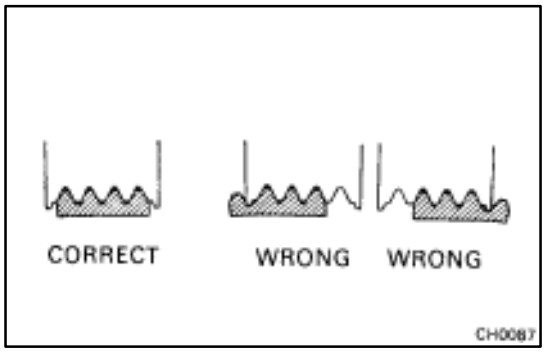
667–824 N (68–84 kgf, 150–185 lbf)

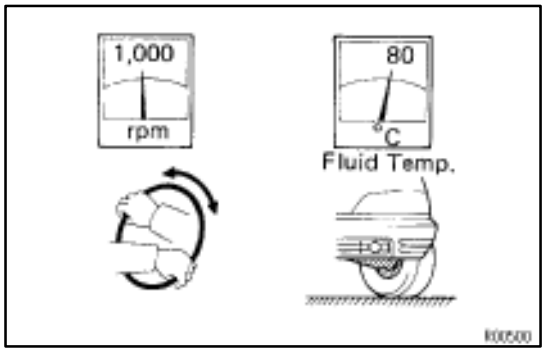
Used belt

422–598 N (43–61 kgf, 95–135 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

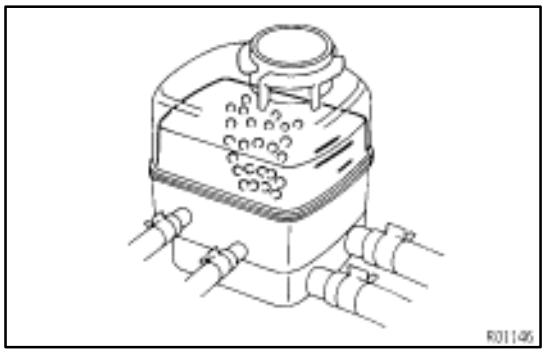
SR00F–03

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 FORMING OR EMULSIFICATION**

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

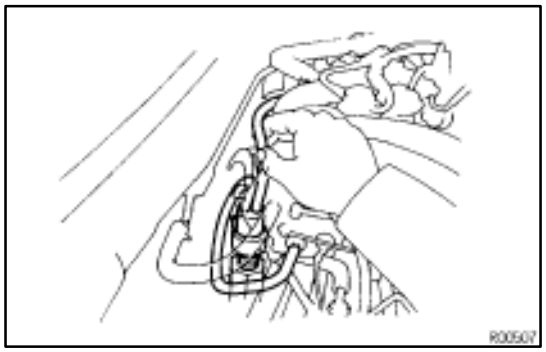
4. **CHECK FLUID LEVEL IN RESERVOIR**

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

SR01R–01

1. WARM UP ENGINE

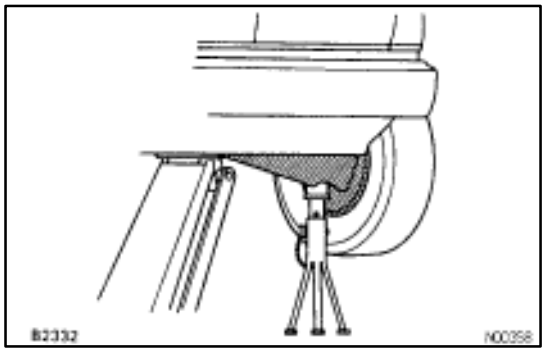
2. TURN AIR CONDITIONING SWITCH OFF

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.

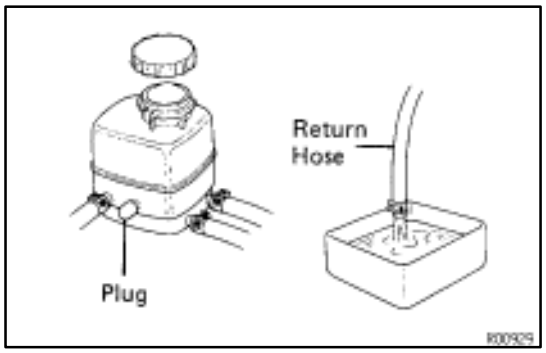
(c) Check that the engine rpm increases when the air control valve hose is released.



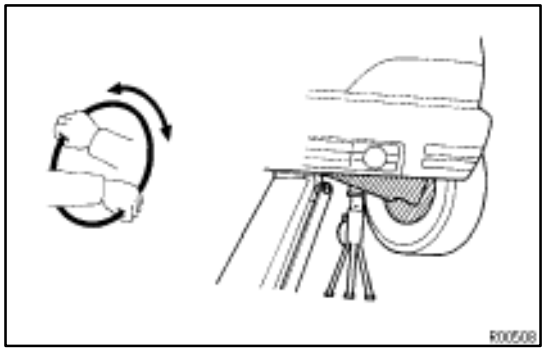
POWER STEERING FLUID REPLACEMENT

SR018–01

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

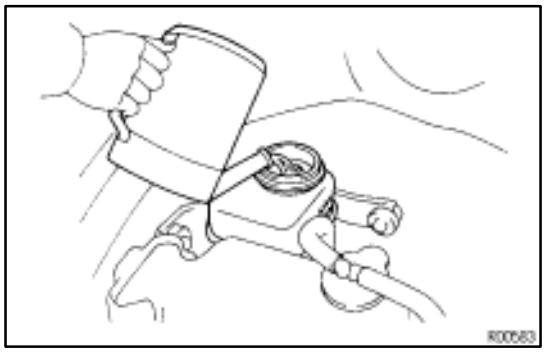


2. REMOVE FLUID RETURN HOSE FROM RESERVOIR TANK AND DRAIN FLUID INTO CONTAINER



3. WITH ENGINE IDLING, TURN STEERING WHEEL FROM LOCK TO LOCK WHILE DRAINING FLUID

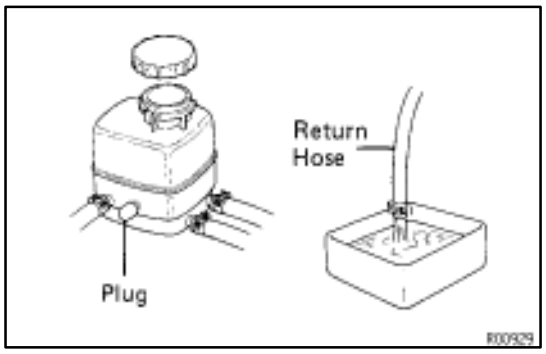
4. STOP ENGINE



5. FILL RESERVOIR TANK WITH FRESH FLUID

Fluid:

ATF DEXRON® II



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

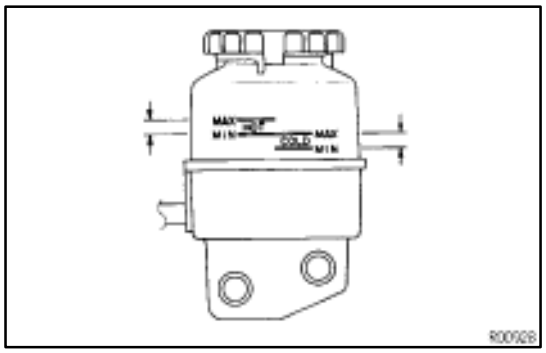
After 1 or 2 seconds, fluid will begin to discharge from the return hose. Stop the engine immediately at this time.

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

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

8. CONNECT RETURN HOSE TO RESERVOIR TANK

9. BLEED POWER STEERING SYSTEM



POWER STEERING SYSTEM BLEEDING

SR00G–02

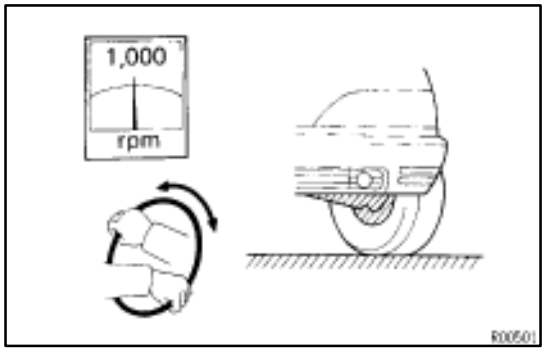
1. CHECK FLUID LEVEL IN RESERVOIR TANK

Check the fluid level and add fluid if necessary.

Fluid:

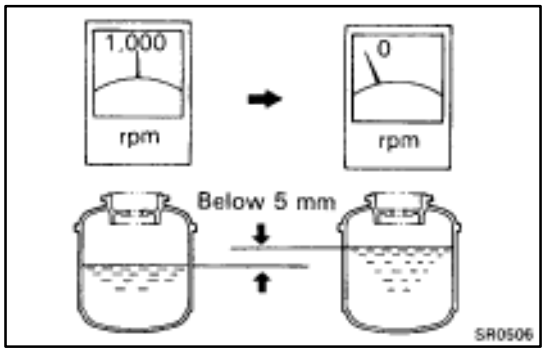
ATF DEXRON® II

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.



2. START ENGINE AND TURN STEERING WHEEL FROM LOCK TO LOCK THREE OR FOUR 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 reverse full lock and keep it there for 2–3 seconds.



3. CHECK THAT FLUID IN 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.

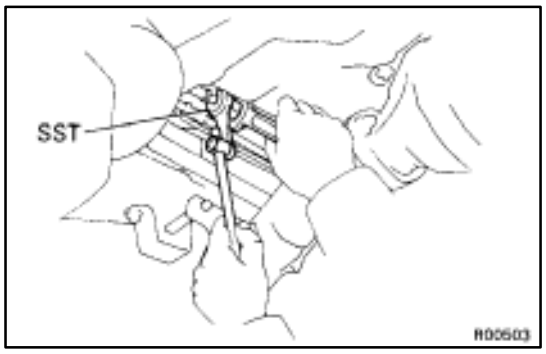
Maximum rise:

5mm (0.20in.)

If a problem is found, repeat steps 5 to 8 on page SR –30. Repair the PS if the problem persists.

OIL PRESSURE CHECK

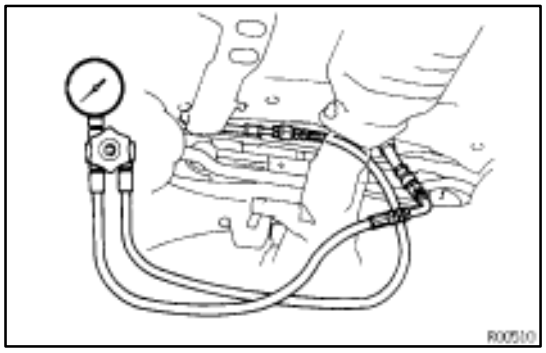
SR02P–01



1. CONNECT PRESSURE GAUGE

(a) Remove the tube clamp.

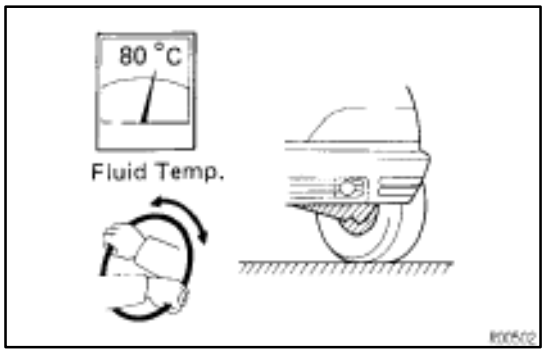
(b) Using SST, disconnect the pressure line joint.
SST 09631–22020



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

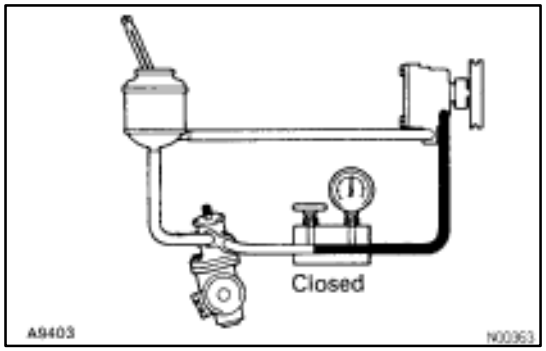
(d) Bleed the system. Start the engine and turn the steering wheel from lock to lock two or three times.

(e) Check that the fluid level is correct.



2. CHECK THAT FLUID TEMPERATURE IS AT LEAST 80°C (176° F)

3. START ENGINE AND RUN IT AT IDLE



4. CHECK FLUID PRESSURE READING WITH VALVE CLOSED

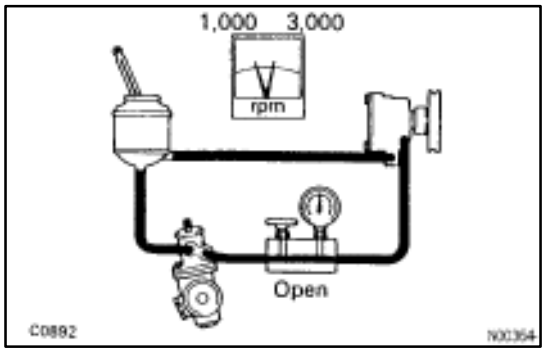
Close the pressure gauge valve and observe the reading on the gauge.

Minimum pressure:

9,316 kPa (95 kgf/cm•, 1,351 psi)

NOTICE:

- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**



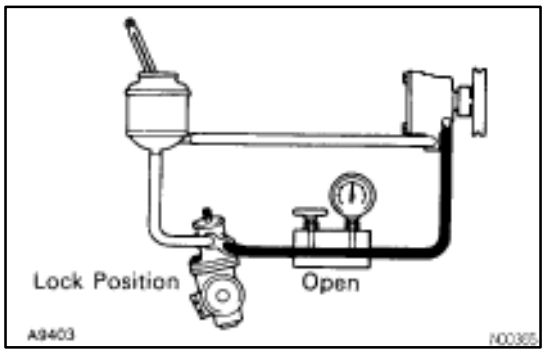
If pressure is low, repair or replace the PS pump.

5. OPEN VALVE FULLY

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

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

Check that there is 490 kPa (5 kgf/cm•, 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.

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

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

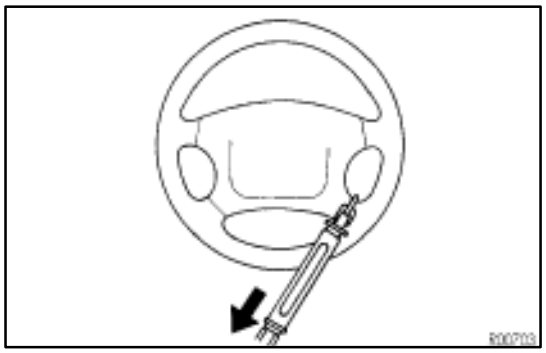
Minimum pressure:

9,316 kPa (95 kgf/cm•, 1,351 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.



9. MEASURE STEERING EFFORT

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

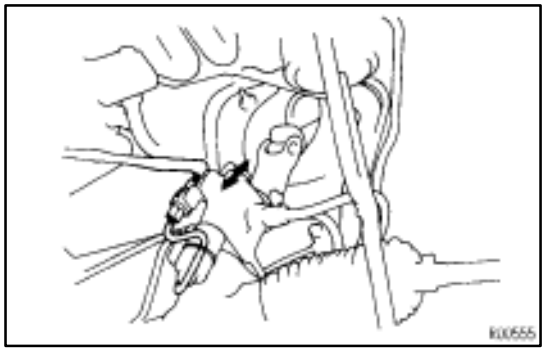
(b) Using a spring scale, measure the steering effort in both directions.

Maximum steering effort:

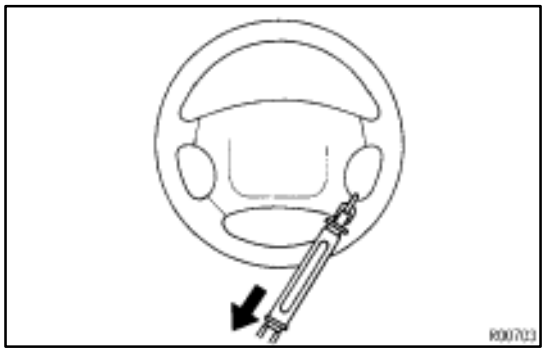
34 N (3.5 kgf, 7.7 lbf)

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.



(c) Disconnect the solenoid connector.



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

(Reference)

Maximum steering effort:

78 N (8 kgf, 17.6 lbf)

If steering effort is not heavier than (b), check the solenoid.

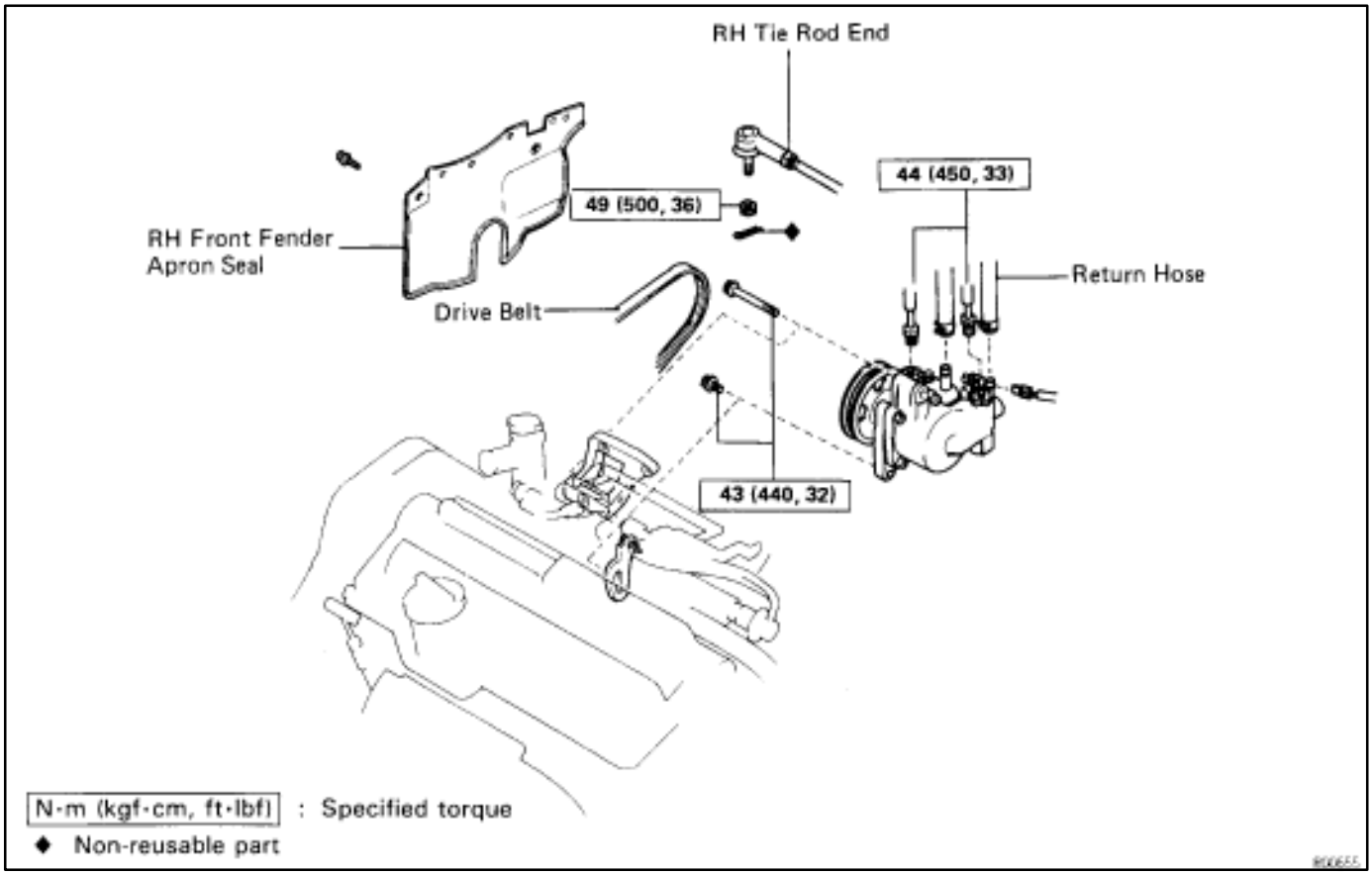
HINT: Be sure to consider the tire type, pressure and contact surface before making your diagnosis.

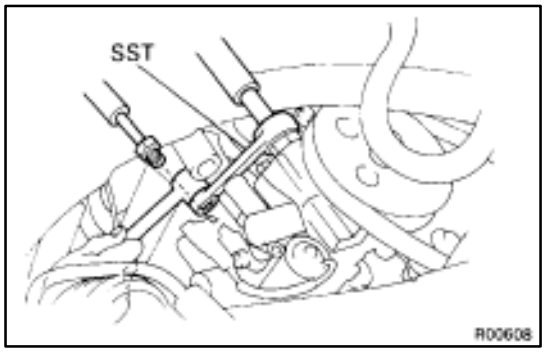
POWER STEERING PUMP

SR01X–01

POWER STEERING PUMP REMOVAL AND INSTALLATION

Remove and install the parts as shown.



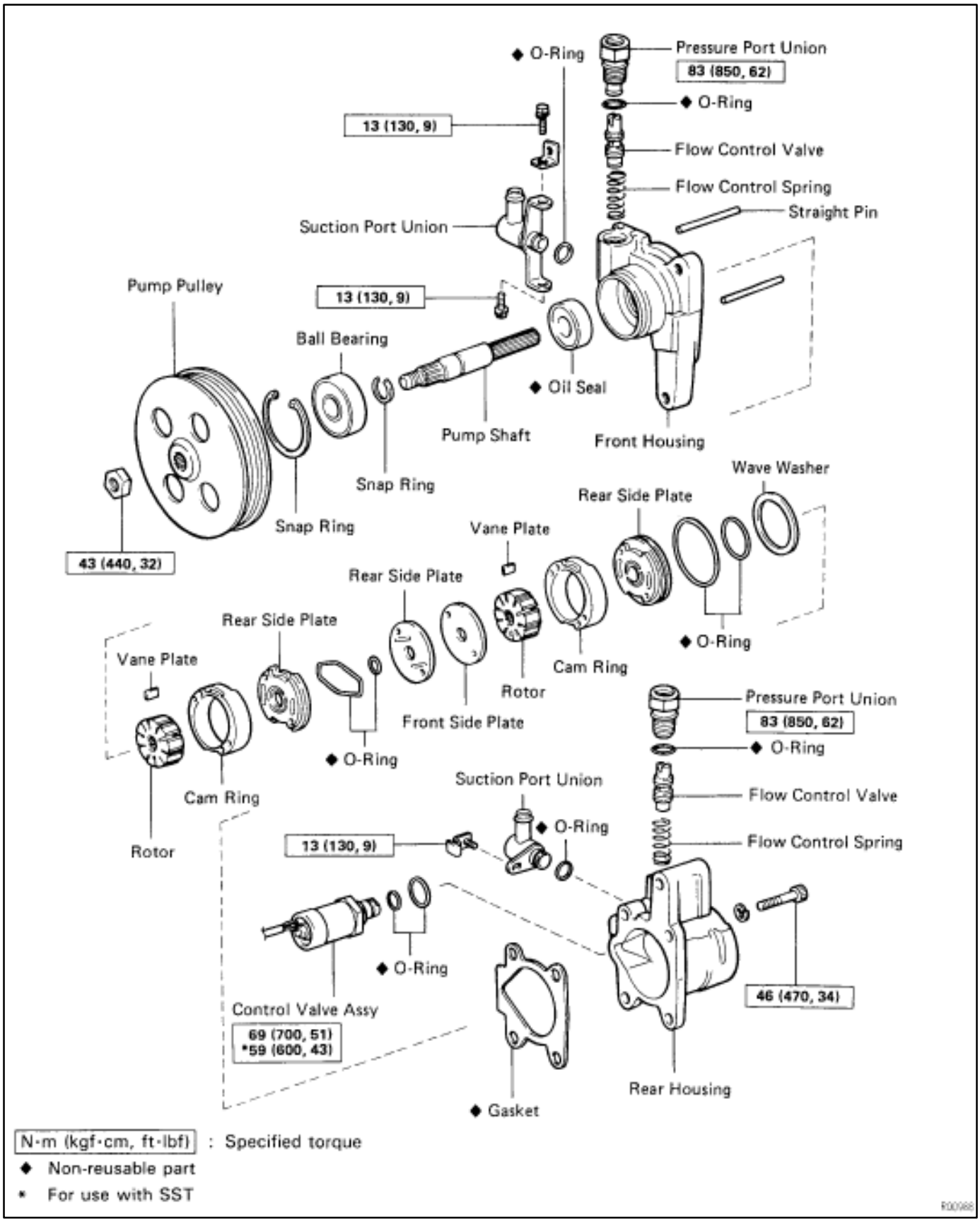


(MAIN POINTS OF REMOVAL AND INSTALLATION)

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**

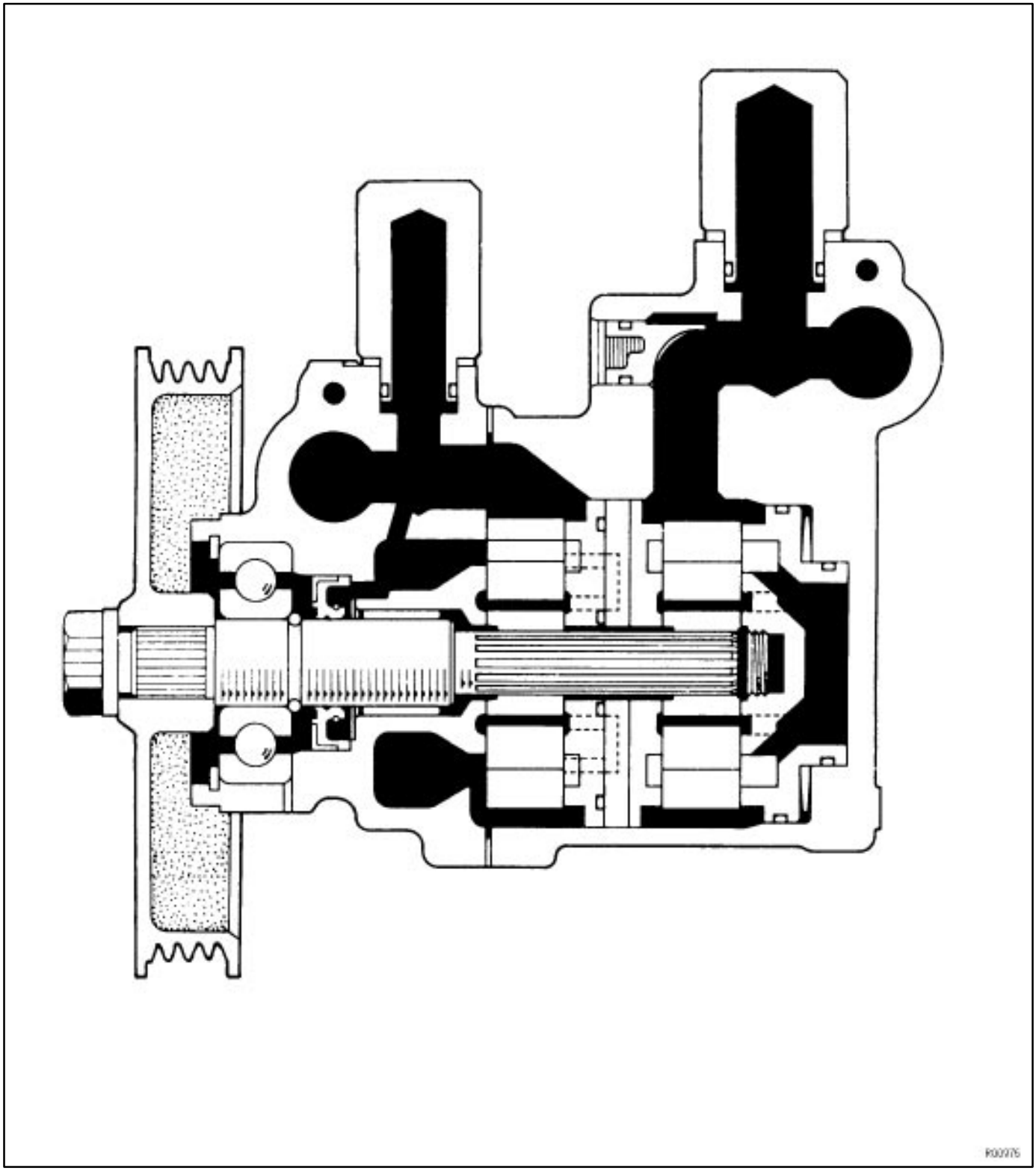
COMPONENTS

SR00K–03



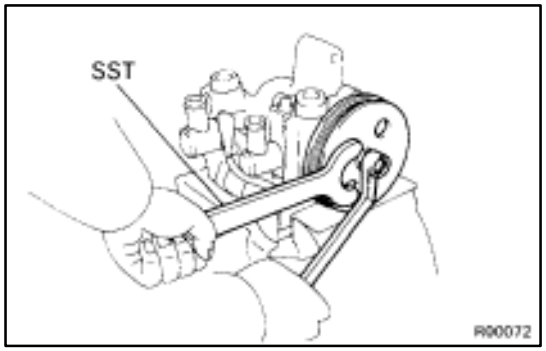
SECTIONAL VIEW

SR02Q–01



POWER STEERING PUMP DISASSEMBLY

SR01Y–01

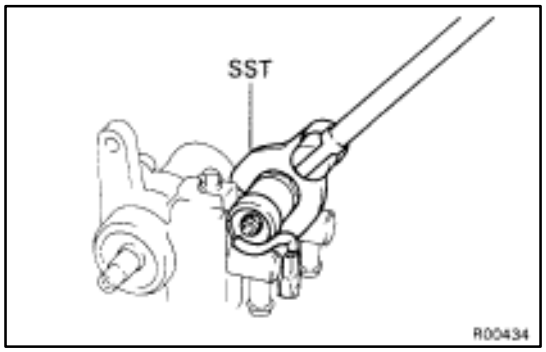


1. MOUNT POWER STEERING PUMP IN VISE
NOTICE: Do not tighten the vise to tight.

2. REMOVE PS PUMP PULLEY

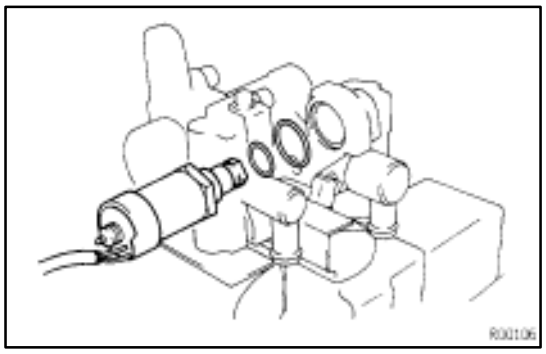
(a) Using SST, remove the pulley set nut.
SST 09616–30020

(b) Remove the pump pulley from the shaft.



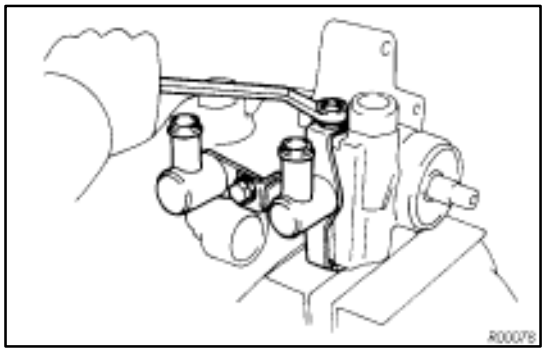
3. REMOVE CONTROL VALVE

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



(b) Remove the O–ring from the control valve.

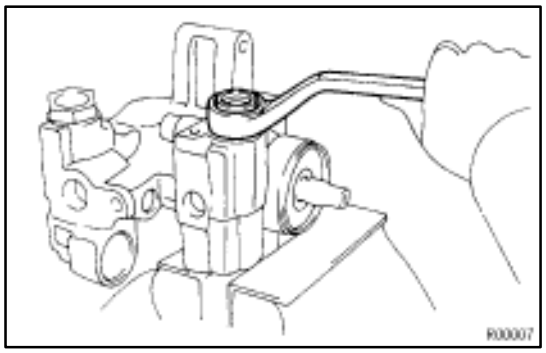
(c) Remove the O–ring from the rear housing.



4. REMOVE SUCTION PORT UNIONS

(a) Remove the three bolts and two suction port unions.

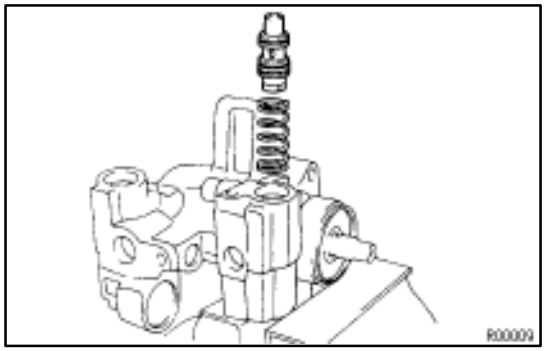
(b) Remove the O–ring from each suction port union.



5. REMOVE FLOW CONTROL VALVE (For PS)

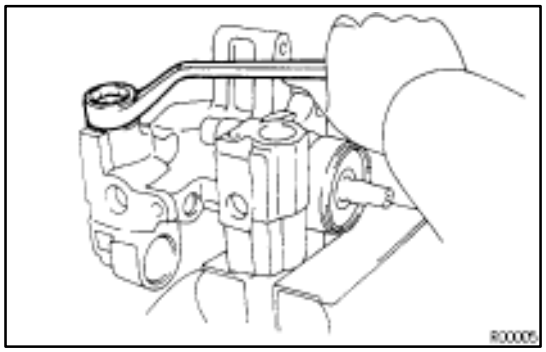
(a) Remove the pressure port union.

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



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

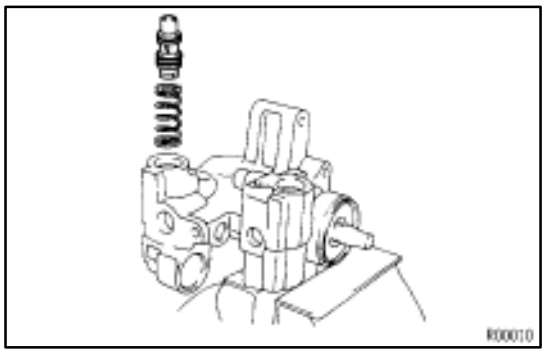
NOTICE: Be careful not to confuse the flow control valve of the PS with that of the hydraulic cooling fan system.



6. REMOVE FLOW CONTROL VALVE (For Hydraulic Cooling Fan System)

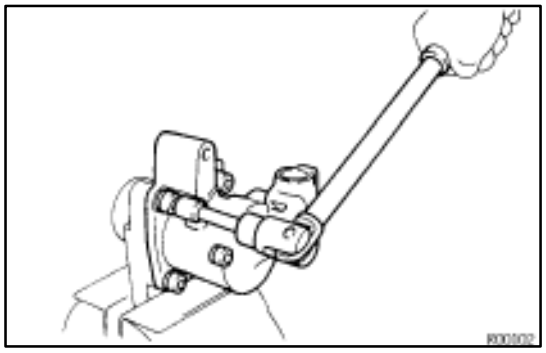
(a) Remove the pressure port union.

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



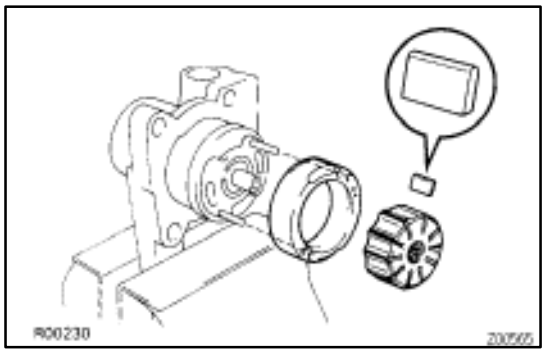
(c) Using a magnetic finger, remove the flow control valve and spring.

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

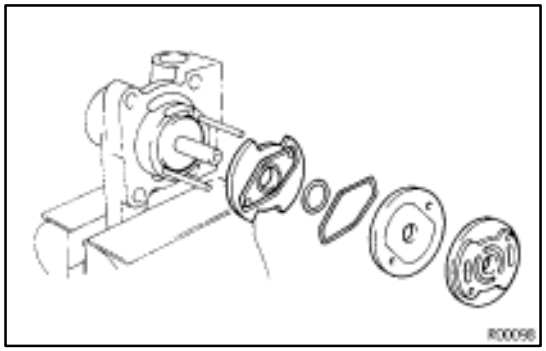
Using a hexagon wrench (8 mm), remove the four bolts, rear housing and gasket.



8. REMOVE CAM RING, ROTOR AND VANE PLATE (For Hydraulic Cooling Fan System)

Remove the cam ring, rotor and ten vane plates.

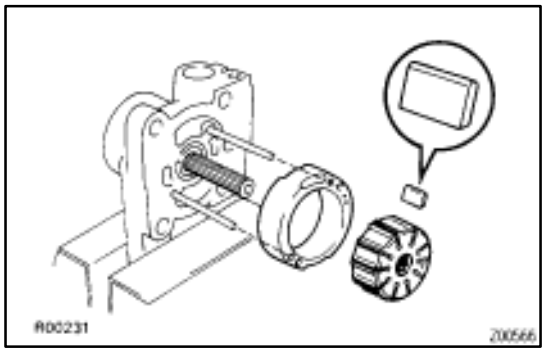
NOTICE: Be careful not to confuse the cam ring, rotor and vane plates of the hydraulic cooling fan system with those of the PS.



9. REMOVE FRONT SIDE PLATE AND TWO REAR SIDE PLATES

(a) Remove the front side plate and two rear side plates.

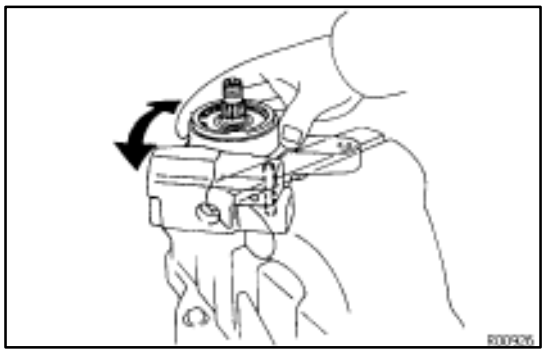
(b) Remove the two O–rings from the rear side plate.



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

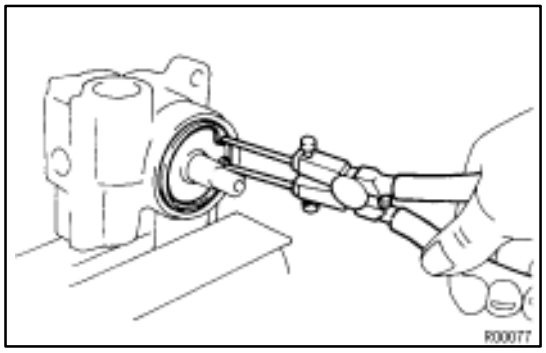
Remove the cam ring, rotor and ten vane plates.

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



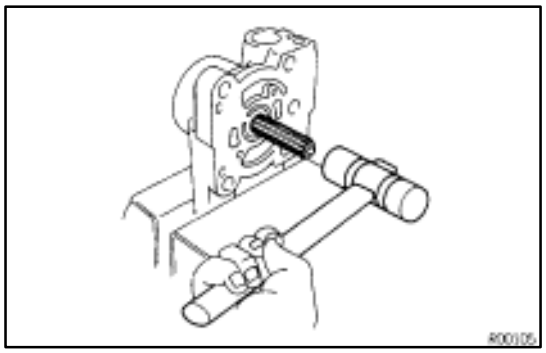
11. REMOVE STRAIGHT PINS

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

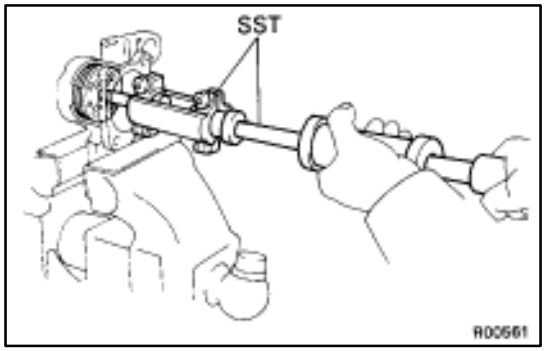


12. REMOVE PUMP SHAFT

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



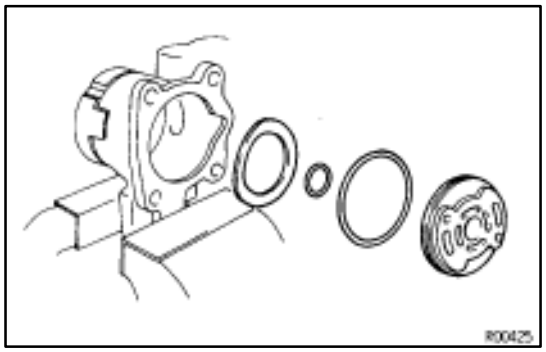
(b) Using a plastic hammer, tap out the pump shaft.



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

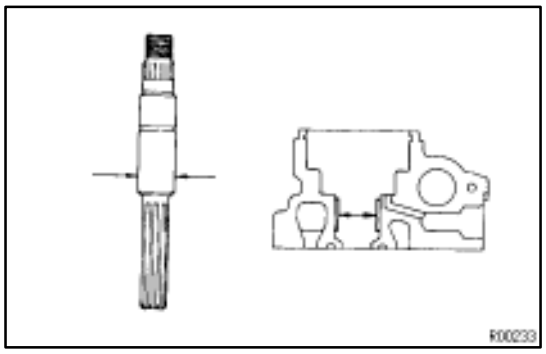
(a) Install a suitable bolt and plate washer to the rear plate.

(b) Using SST, remove the rear plate.
SST 09910–00015 (09911–00011, 09912–00010)



(c) Remove the two O–rings from the rear side plate.

(d) Remove the wave washer.



POWER STEERING PUMP INSPECTION AND REPLACEMENT

SR01Z–02

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.

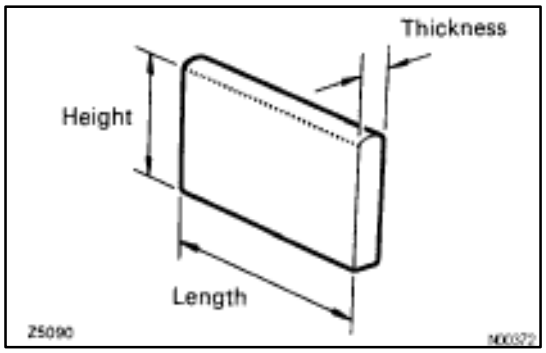
Standard clearance:

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)

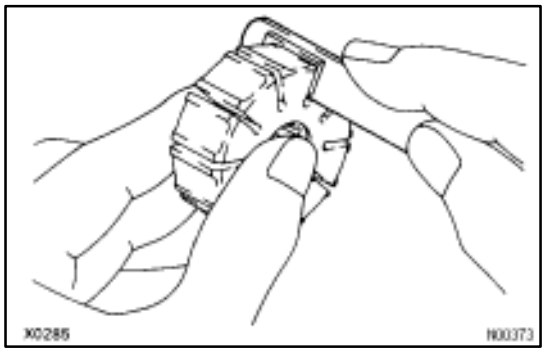
Minimum height:

8.6 mm (0.339 in.)

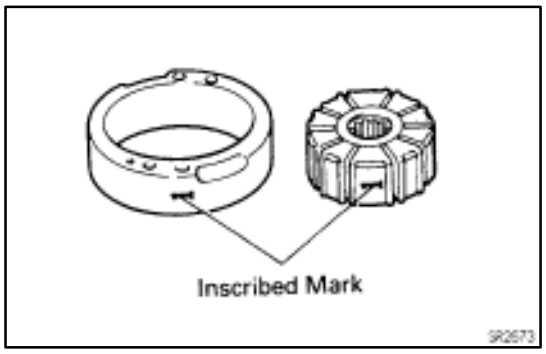
Minimum thickness:

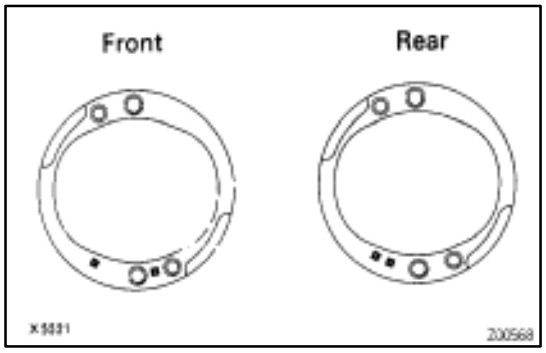
1.4 mm (0.055 in.)

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 five lengths with the following rotor and cam ring marks.



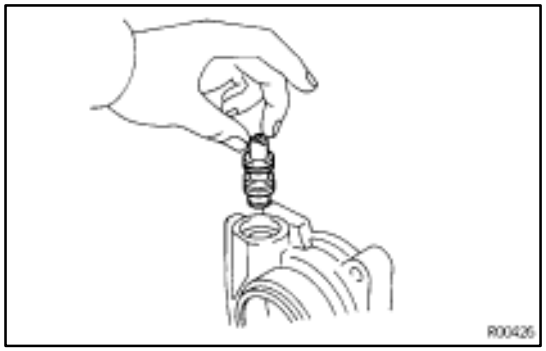


(For PS)

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)

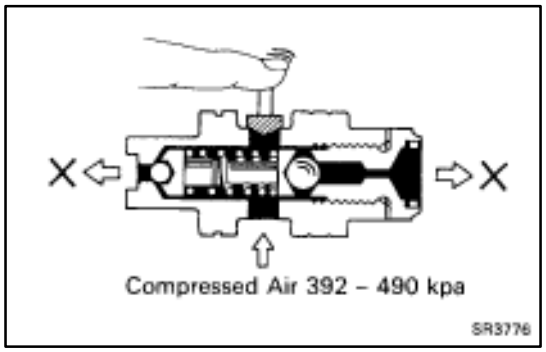
(For Hydraulic Cooling Fan System)

Cam ring mark	Rotor mark	Vane length mm (in.)
1	None	14.996–14.998 (0.59039–0.59047)
2	1	14.994–14.996 (0.59031–0.59039)
3	2	14.992–14.994 (0.59024–0.59031)
4	3	14.990–14.992 (0.59016–0.59024)
5	4	14.988–14.990 (0.59008–0.59016)

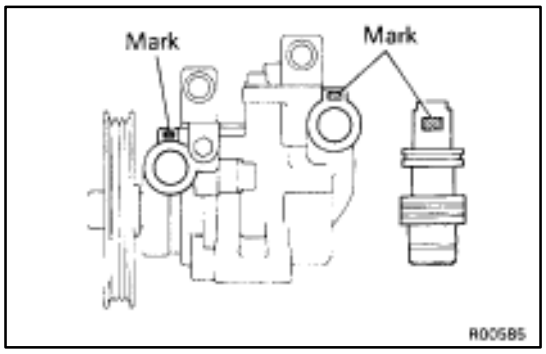


3. INSPECT FLOW CONTROL VALVE

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



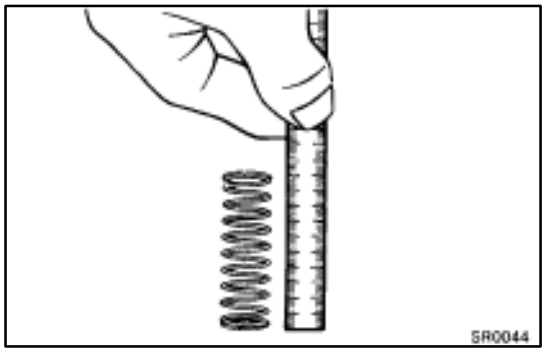
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air [392 –490 kPa (4–5 kgf/cm•, 57–71 psi)] into the opposite side, and confirm that air does not come out from the end holes.



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

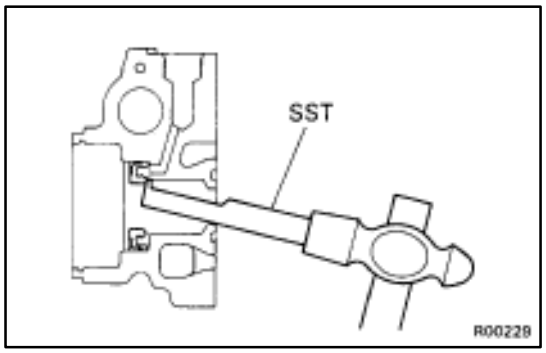


4. INSPECT FLOW CONTROL SPRING

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

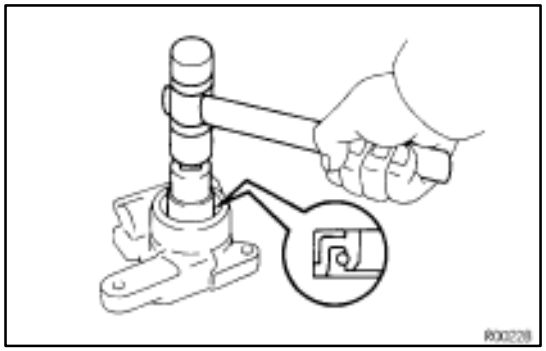
Spring length:

37–39 mm (1.46–1.54 in.)

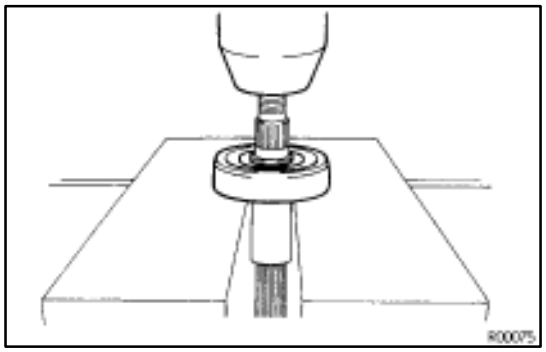


5. IF NECESSARY, REPLACE OIL SEAL

(a) Using SST and a hammer, drive out the oil seal.
SST 09631–10030

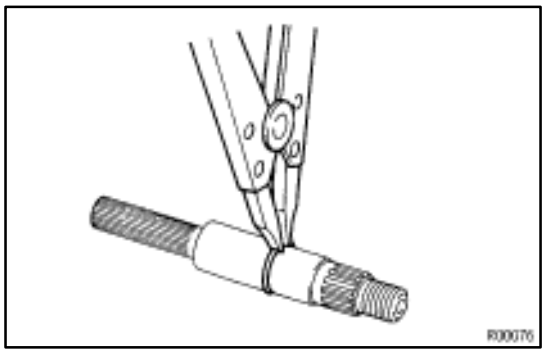


(b) Using a socket wrench (24 mm) and hammer, drive in a new oil seal.

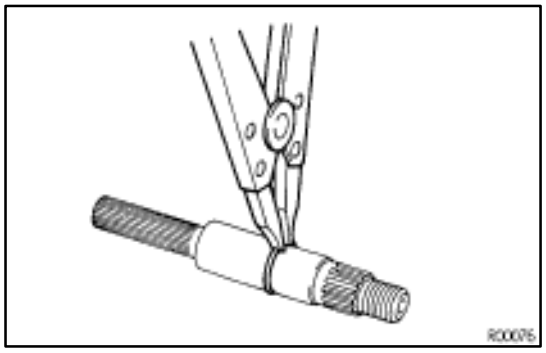


6. IF NECESSARY, REPLACE BALL BEARING

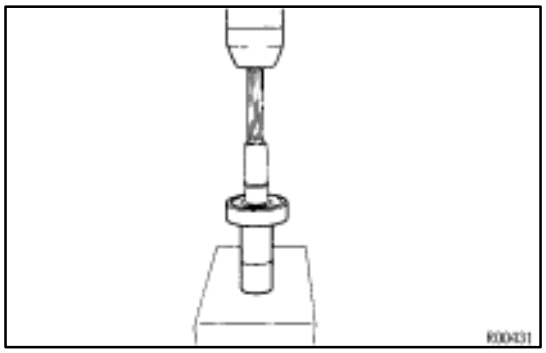
(a) Using a press, remove the ball bearing from the pump shaft.



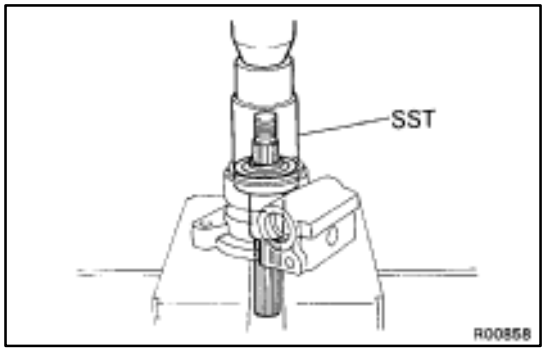
(b) Using snap ring pliers, remove the snap ring from the pump shaft.



(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.



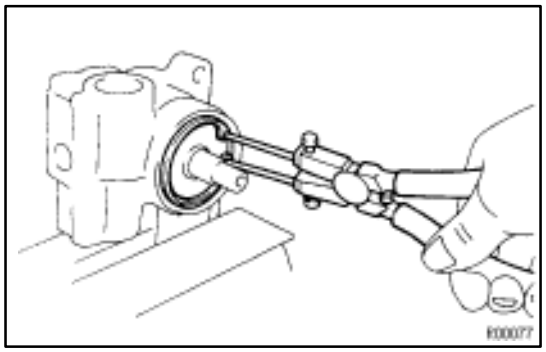
POWER STEERING PUMP ASSEMBLY

SR020–01

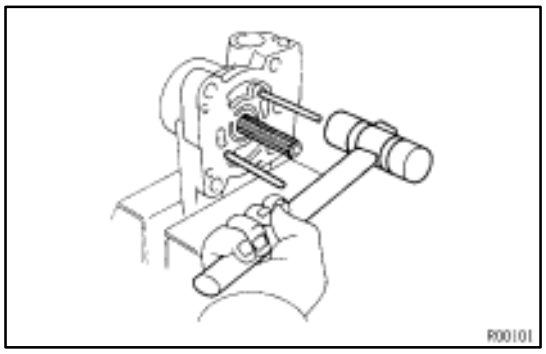
1. COAT ALL SLIDING SURFACES WITH POWER STEERING FLUID BEFORE ASSEMBLY

2. INSTALL PUMP SHAFT

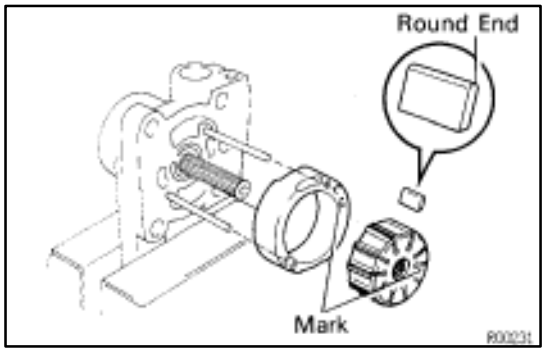
(a) Using SST and a press, install the pump shaft with the ball bearing.
SST 09238–47012



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

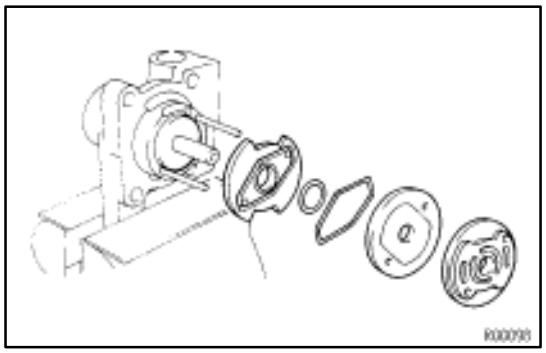


3. INSTALL STRAIGHT PINS
Using a plastic hammer, tap in the two straight pins.



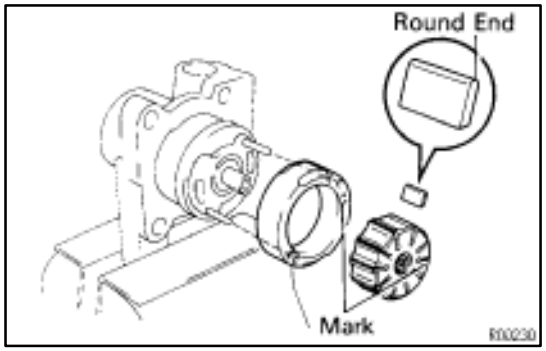
4. INSTALL CAM RING, ROTOR AND VANE PLATES (For PS)

(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 ten vane plates with the round end facing outward.



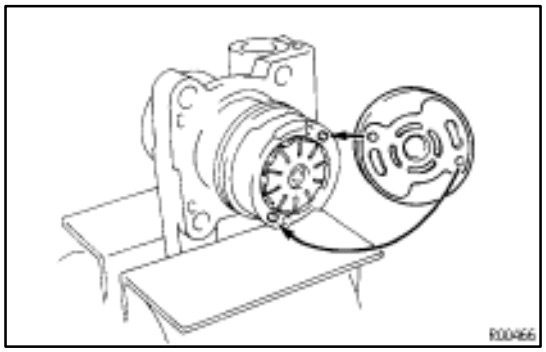
5. INSTALL FRONT SIDE PLATE AND TWO REAR SIDE PLATES

(a) Install two new O–rings to the rear side plate.
(b) Align the holes of the plates and straight pins, and install the plates.



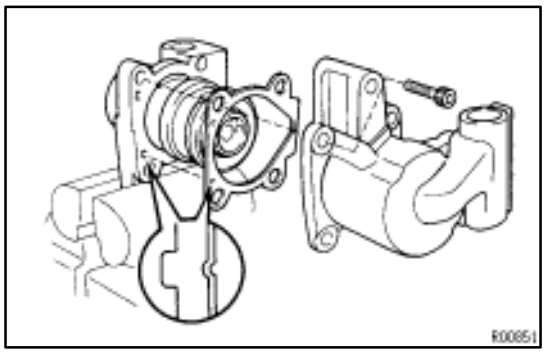
6. INSTALL CAM RING, ROTOR AND VANE PLATES (For Hydraulic Cooling Fan System)

(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 ten vane plates with the round end facing outward.



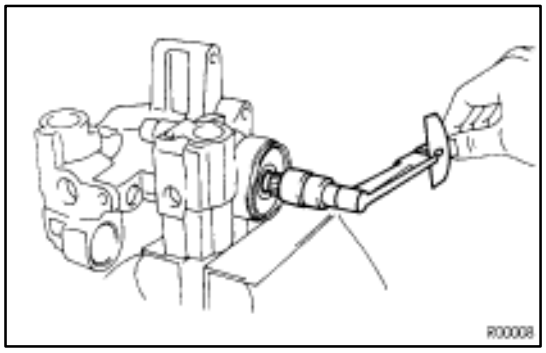
7. INSTALL REAR SIDE PLATE AND WAVE WASHER

(a) Install two new O–rings to the rear side plate.
(b) Align the holes of the side plate with the pins, and install the plate.
(c) Install the wave washer.



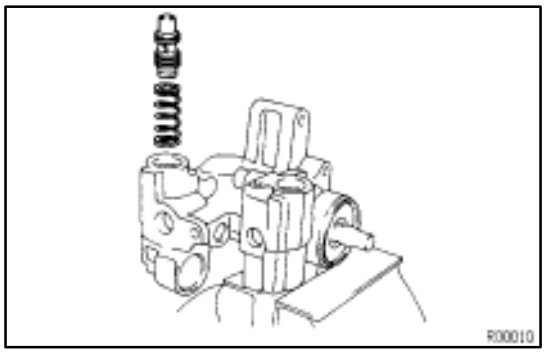
8. INSTALL REAR HOUSING

(a) Install a new gasket and the rear housing.
HINT: Be careful in the direction of the gasket.
(b) Using a hexagon wrench (8 mm), install and torque the four bolts
Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)



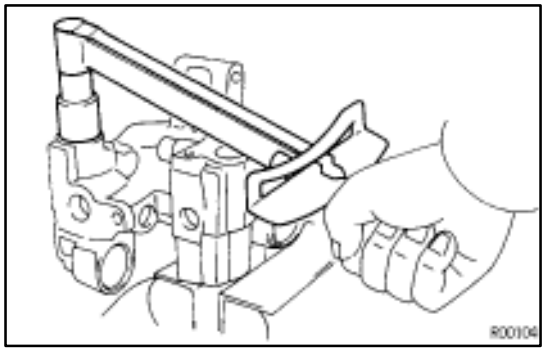
9. MEASURE PUMP SHAFT PRELOAD

(a) Check that the shaft rotates smoothly with out 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

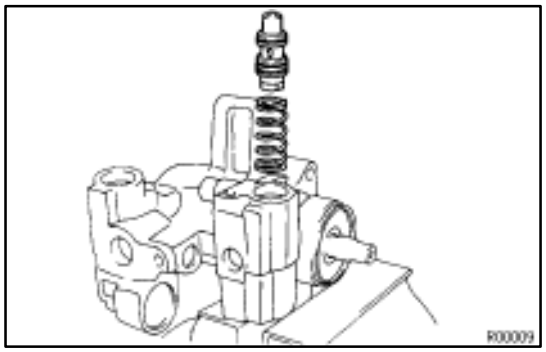


10. INSTALL FLOW CONTROL VALVE (For Hydraulic Cooling Fan System)

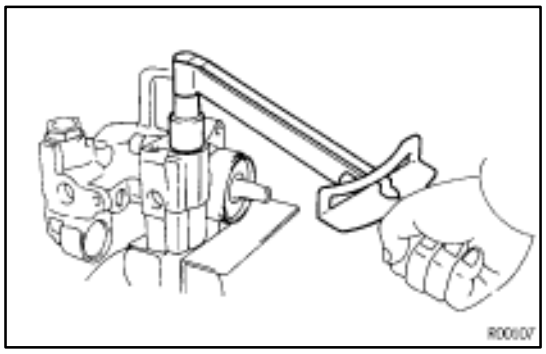
(a) Install the spring and flow control valve into the housing.



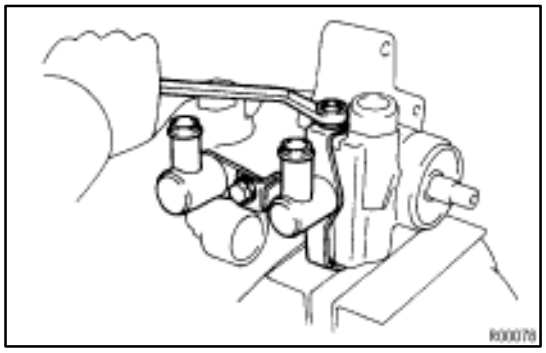
(b) Install a new O–ring to the pressure port union.
(c) Install and torque the pressure port union.
Torque: 83 N·m (850 kgf·cm, 62 ft·lbf)



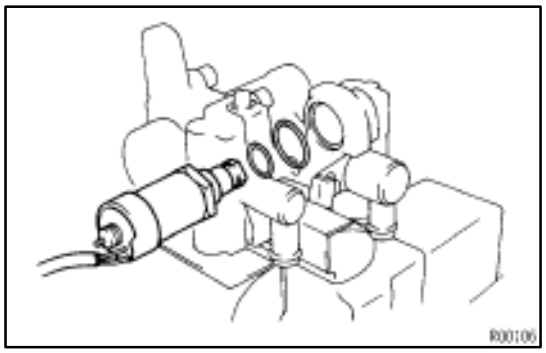
11. INSTALL FLOW CONTROL VALVE (For PS)
(a) Install the spring and flow control valve into the housing.



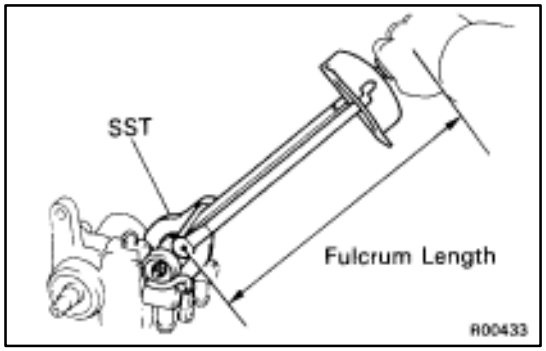
(b) Install a new O–ring to the pressure port union.
(c) Install and torque the pressure port union.
Torque: 83 N·m (850 kgf·cm, 62 ft·lbf)



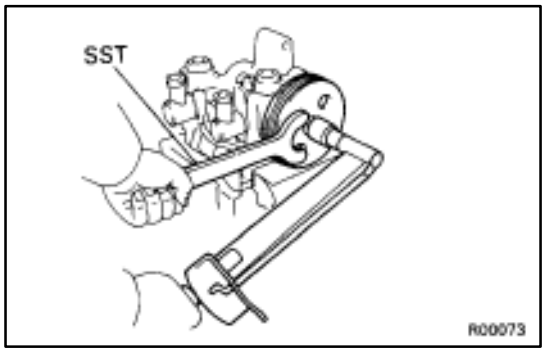
12. INSTALL SUCTION PORT UNIONS
(a) Install a new O–ring to each suction port union.
(b) Install the suction port union with the three bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



13. INSTALL CONTROL VALVE
(a) Install a new O–ring 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

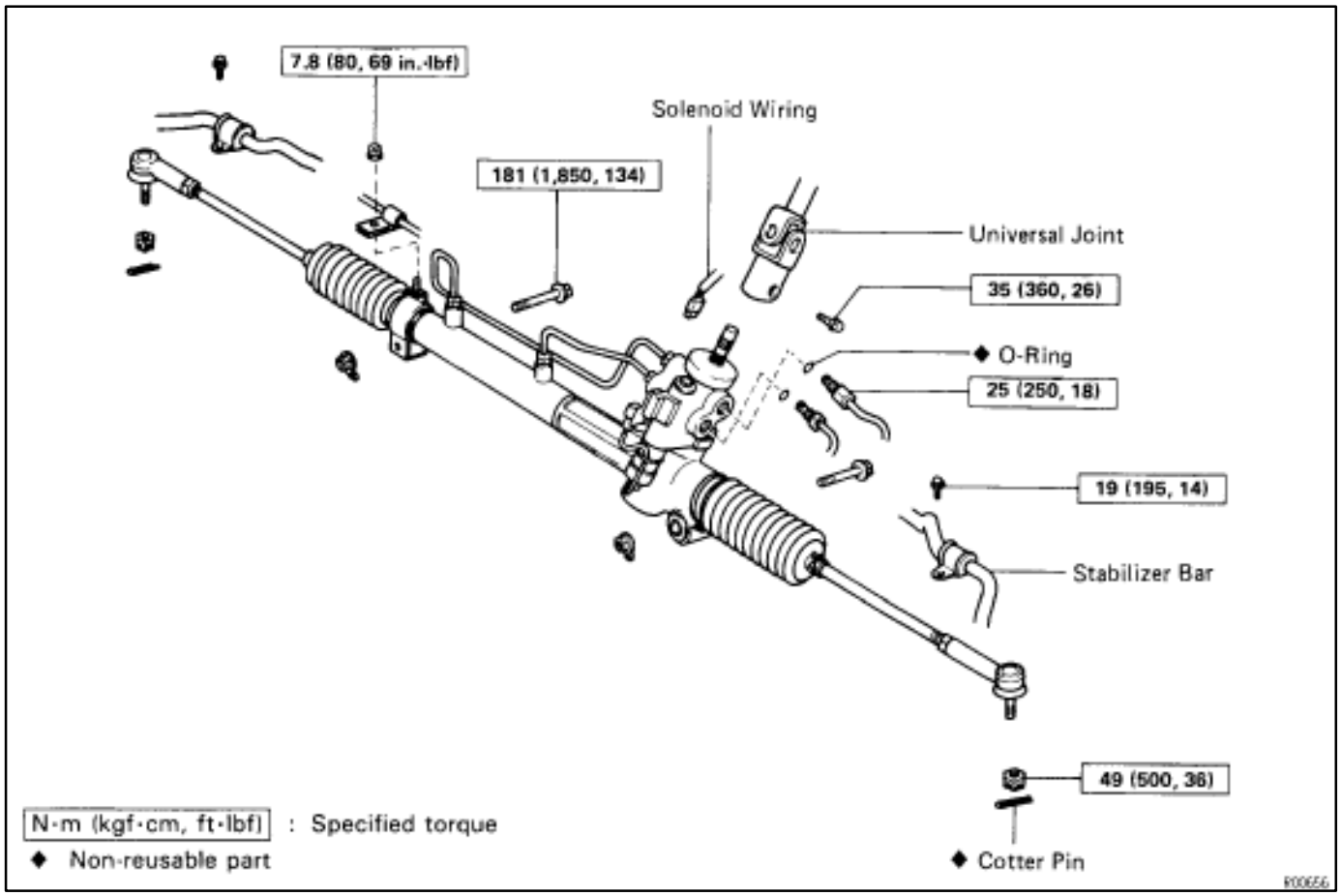
(a) Install the pump pulley to the shaft.
(b) Using SST, install and torque the pulley set nut.
SST 09616–30020
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

GEAR HOUSING

SR02R–01

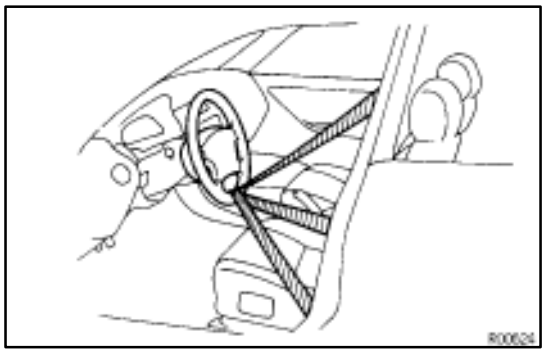
STEERING GEAR HOUSING REMOVAL AND INSTALLATION

Remove and install the parts as shown.



(MAIN POINTS OF REMOVAL AND INSTALLATION)

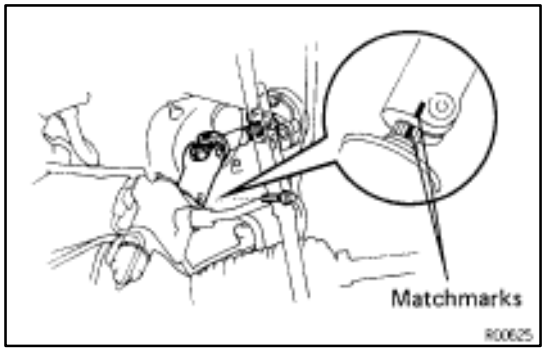
NOTICE: When disconnecting the universal joint during removal of the gear housing, remove the steering wheel and perform centering of the spiral cable.
(See page AB–14)
If the operation is performed without removing the steering wheel, use the procedure below to make sure the steering wheel is firmly fixed in position and cannot turn.



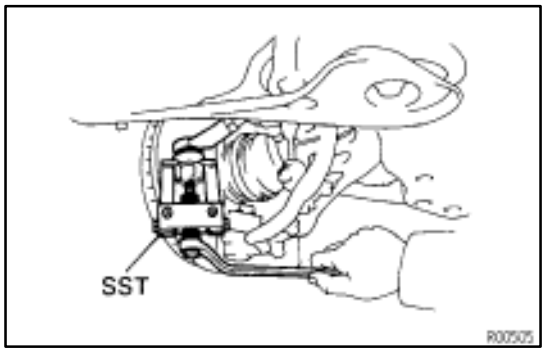
1. DISCONNECT UNIVERSAL JOINT

(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.

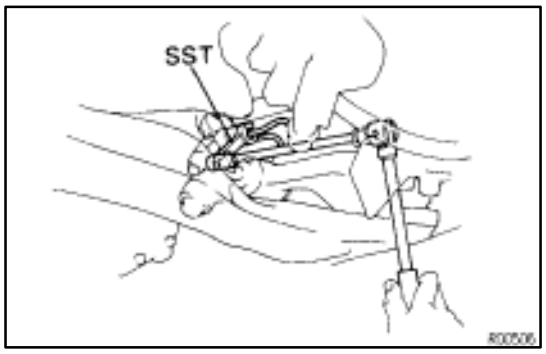


(c) Place matchmarks on the universal joint and control valve shaft.
(d) Loosen the bolt on the upper side of the universal joint, remove the bolt on the lower side and disconnect the universal joint.



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

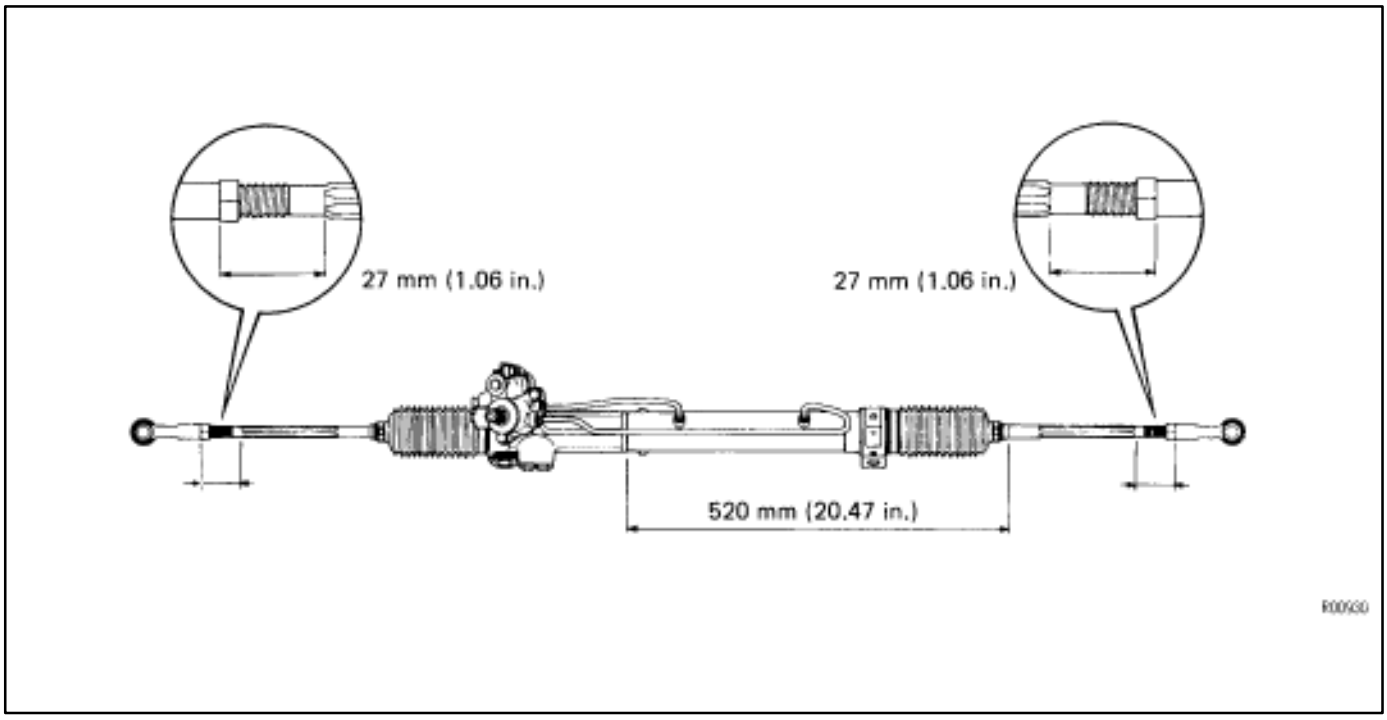


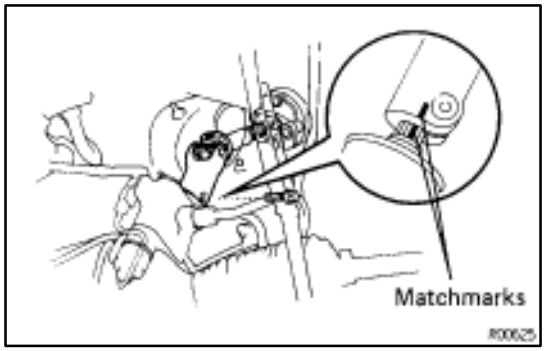
3. DISCONNECT PRESSURE AND RETURN TUBES

Using SST, disconnect and connect the pressure and return tubes.
SST 09631–22020
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

4. CONNECT UNIVERSAL JOINT

(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 universal joint and control valve shaft and connect them.

5. 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.

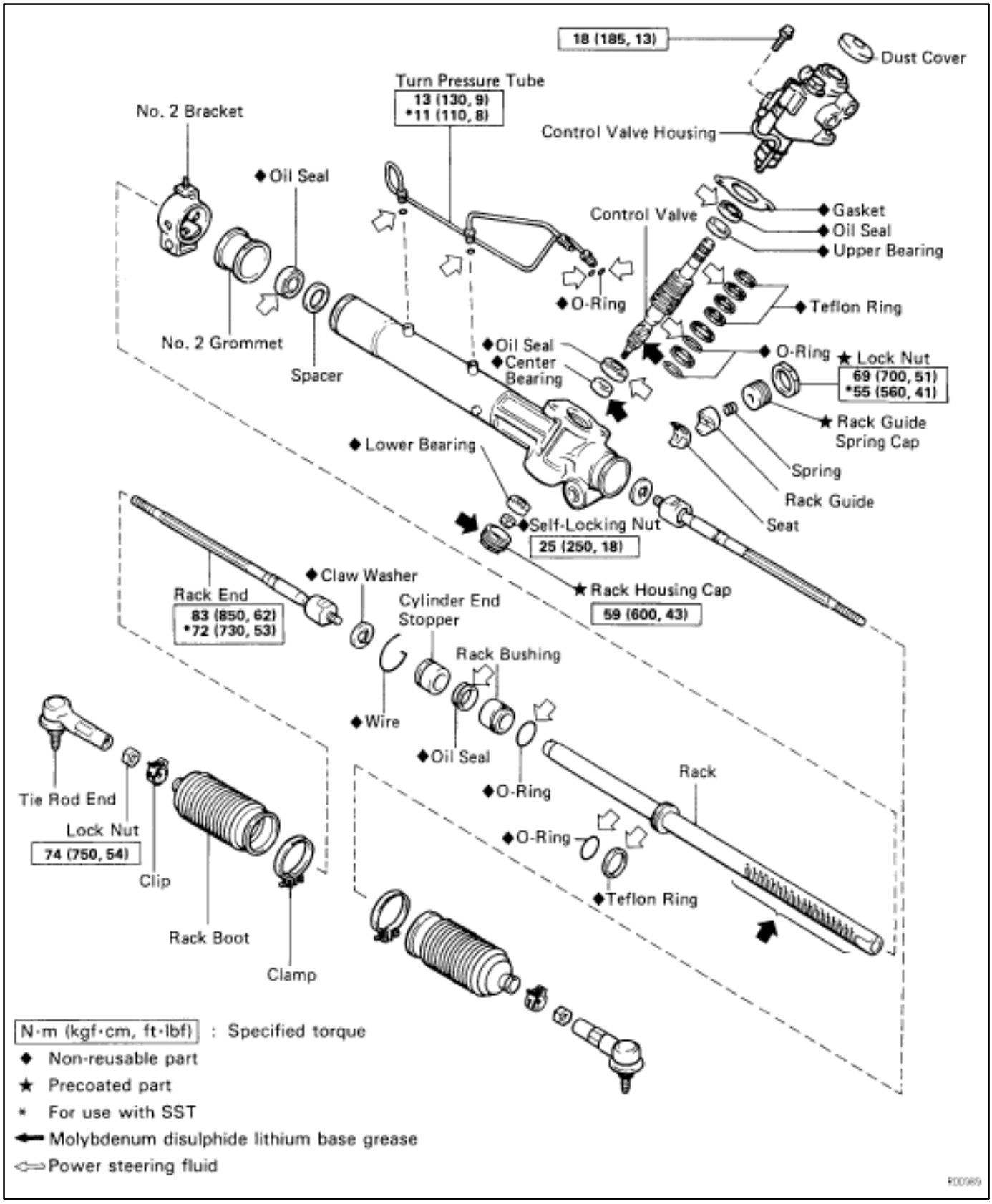
(See page AB–15)

6. CHECK STEERING WHEEL CENTER POINT

7. CHECK TOE–IN

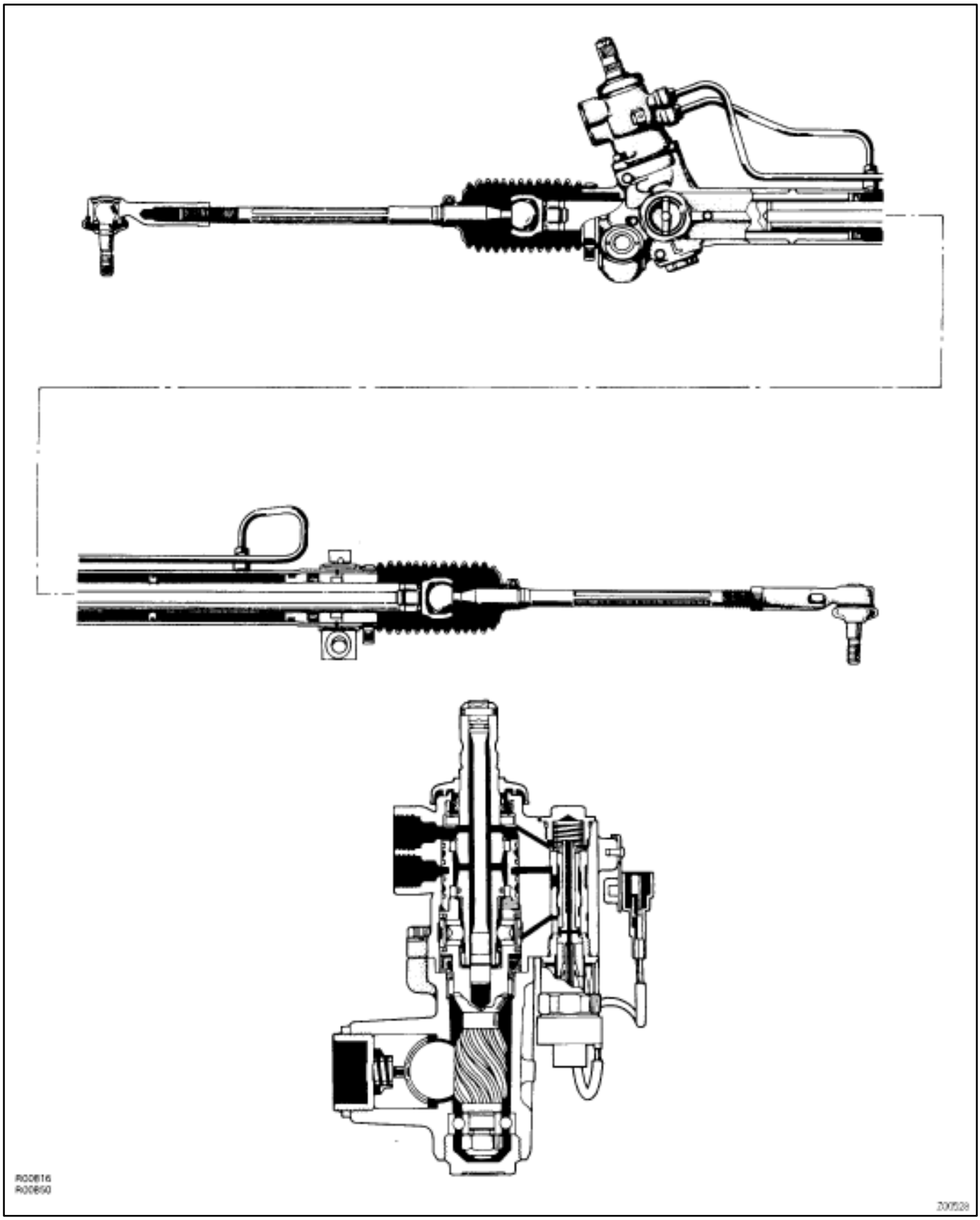
COMPONENTS

SR00N–02



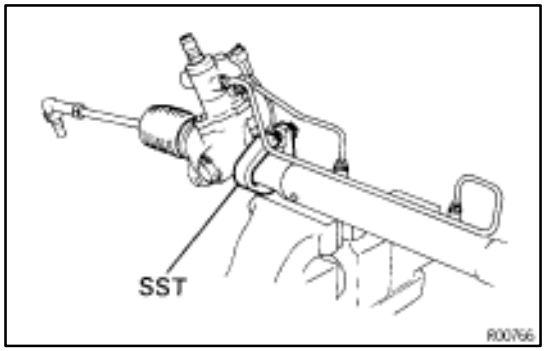
SECTIONAL VIEW

SR02S–01



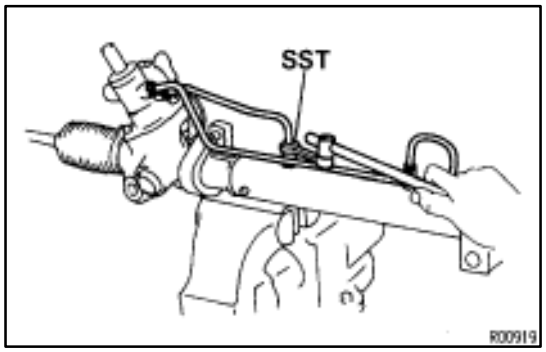
STEERING GEAR HOUSING DISASSEMBLY

SR022–02



1. CLAMP GEAR HOUSING IN VISE

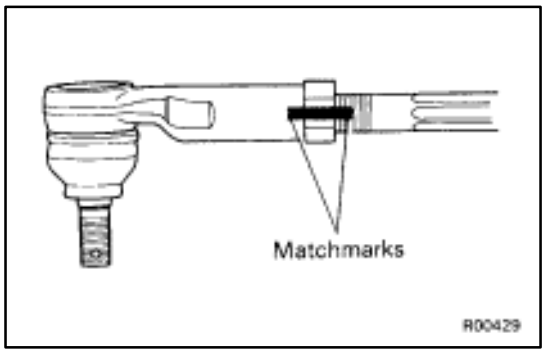
Using SST, secure the steering gear in a vise.
SST 09612–00012



2. REMOVE LEFT AND RIGHT TURN PRESSURE TUBES

(a) Using SST, remove the turn pressure tubes.
SST 09630–00020

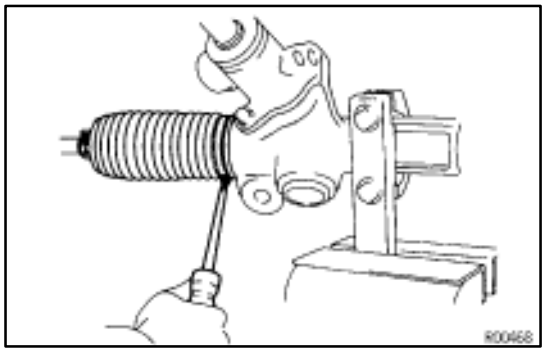
(b) Remove the O–rings from the turn pressure tubes.



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.

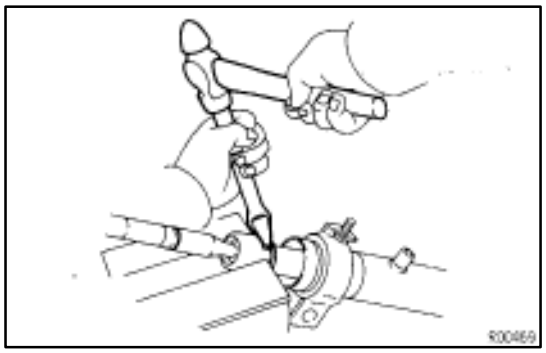


4. REMOVE RACK BOOTS

(a) Remove the clips and clamps.

(b) Remove the rack boots.

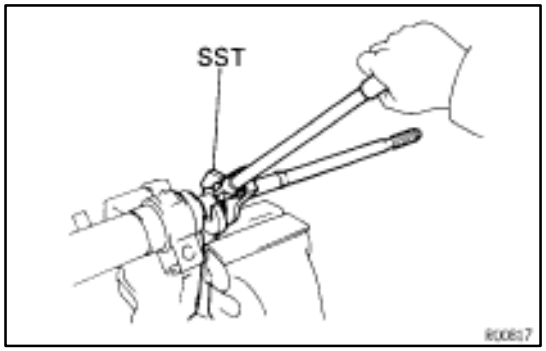
NOTICE: Be careful not to damage the rack boots and rack housing.



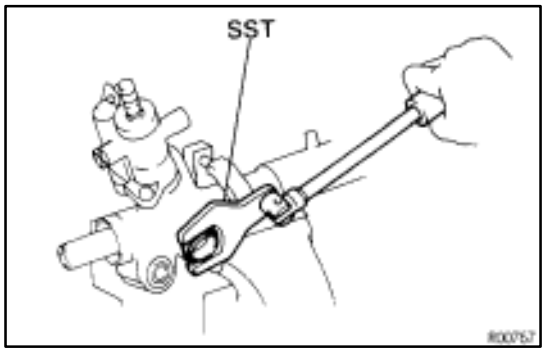
5. REMOVE RACK ENDS AND CLAW WASHERS

(a) Unstake the claw washers.

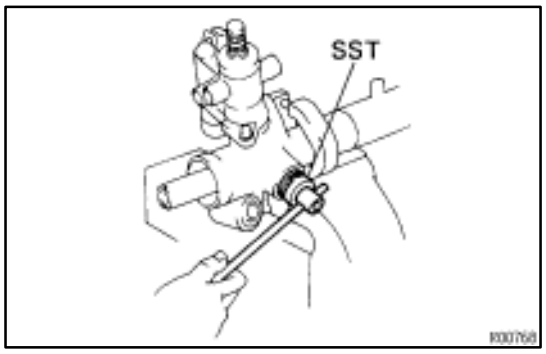
NOTICE: Avoid any impact to the rack.



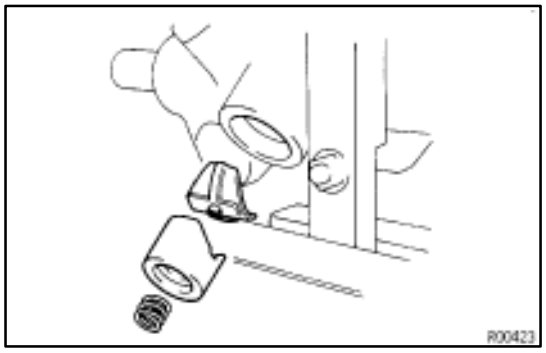
(b) Using SST, remove the rack ends.
SST 09617–14010
(c) Mark the left and right rack ends accordingly.
(d) Remove the claw washers.



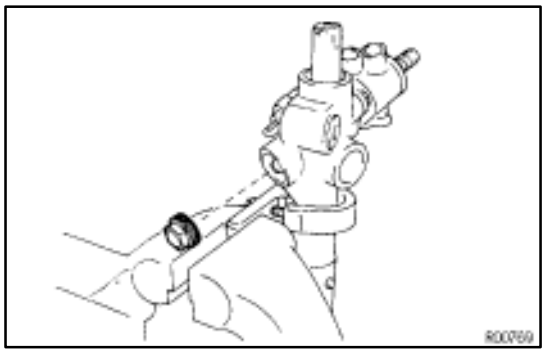
6. REMOVE RACK GUIDE SPRING CAP LOCK NUT
Using SST, remove the rack guide spring cap lock nut.
SST 09612–24014 (09617–24020)



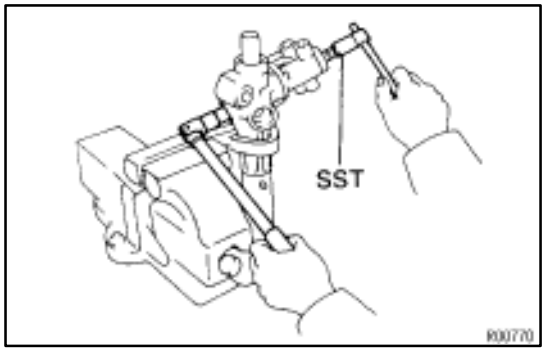
7. REMOVE RACK GUIDE SPRING CAP
Using SST, remove the rack guide spring cap.
SST 09631–10021



8. REMOVE RACK GUIDE SPRING, RACK GUIDE AND SEAT



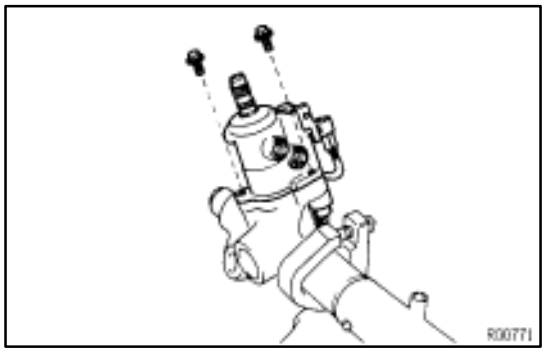
9. REMOVE RACK HOUSING GAP



10. REMOVE SELF–LOCKING NUT

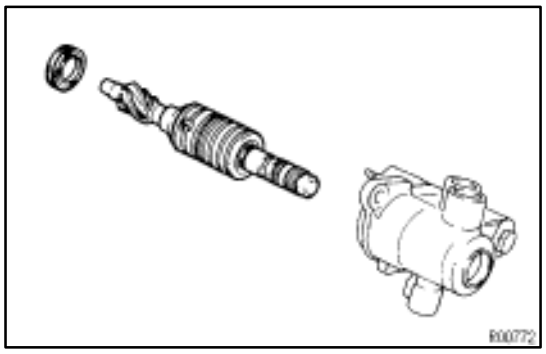
Using SST to hold the control valve, remove the self–locking nut.

SST 09616–00010



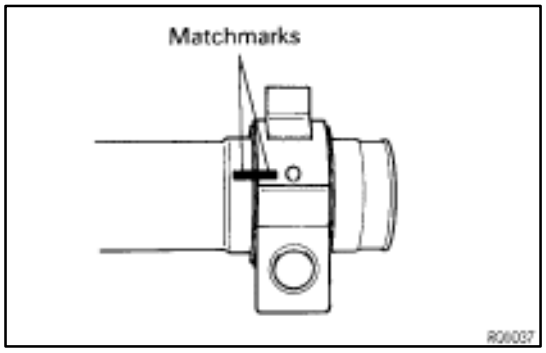
11. REMOVE CONTROL VALVE HOUSING

(a) Remove the dust cover.
(b) Remove the two bolts.
(c) Pull out the valve with the valve housing.
(d) Remove the gasket from the rack housing.



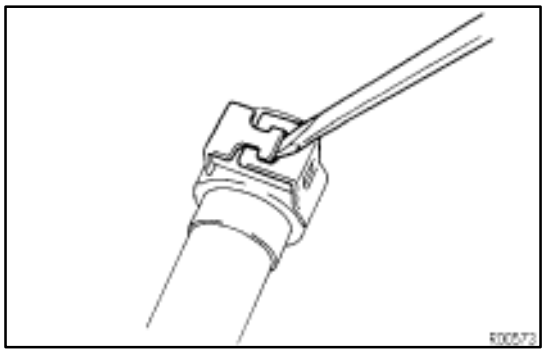
12. REMOVE CONTROL VALVE FROM HOUSING

Tap out the control valve and oil seal.

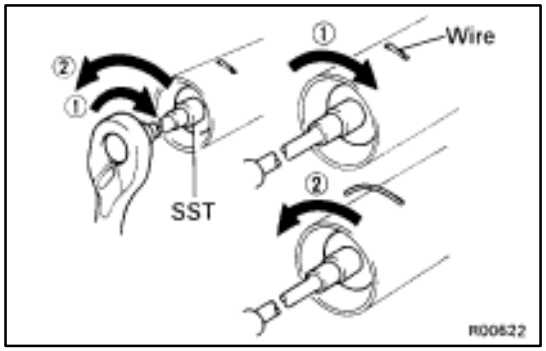


13. REMOVE NO.2 BRACKET

(a) Place matchmarks on the bracket and rack housing.



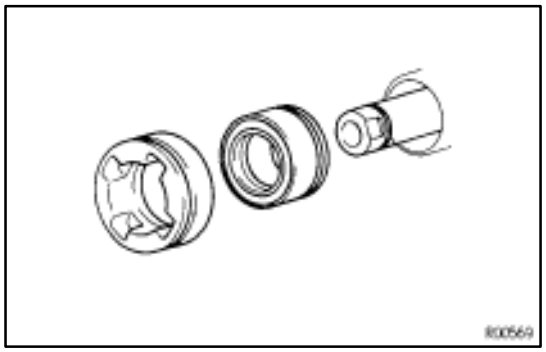
(b) Using a screwdriver, pry a part the clasp of the No.2 bracket.
(c) Remove the bushing and bracket from the rack housing.
(d) Remove the bushing from the bracket.



14. REMOVE CYLINDER END STOPPER

(a) Using SST, turn the cylinder end stopper clockwise until the wire end comes out.
SST 09631–16010

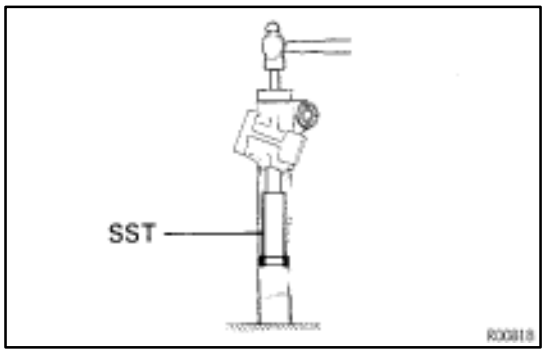
(b) Using SST, turn the cylinder end stopper counterclockwise, and remove the wire.
SST 09631–16010



15. REMOVE RACK BUSHING AND RACK

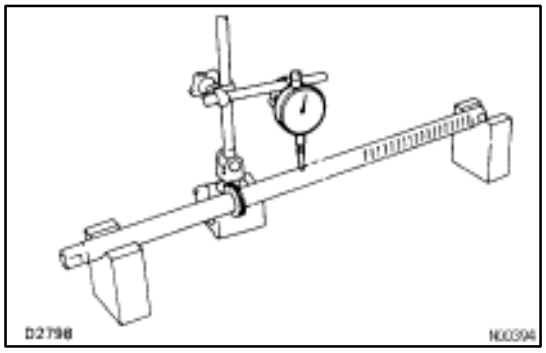
(a) Using a brass bar, tap out the rack with the rack busing.

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



16. REMOVE CYLINDER HOUSING OIL SEAL AND SPACER

Using SST and a brass bar, drive out the oil seal and spacer.
SST 09620–30010 (09623–30010)



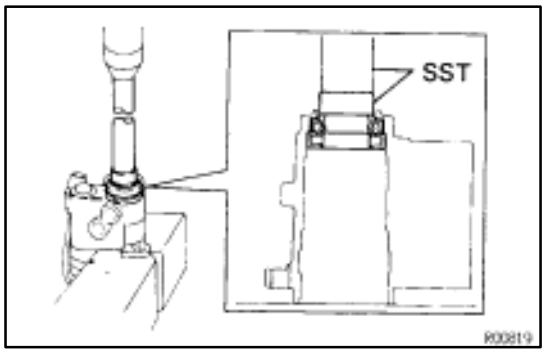
STEERING GEAR HOUSING INSPECTION AND REPLACEMENT

SR02T–01

1. INSPECT RACK

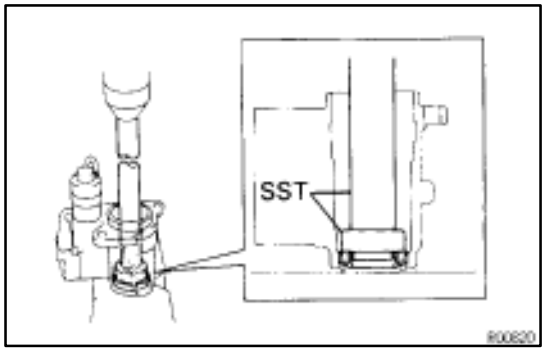
(a) Check the rack for runout and for tooth wear or damage.
Maximum runout:
0.3 mm (0.012 in.)

(b) Check the back surface for wear or damage.
If faulty, replace it.

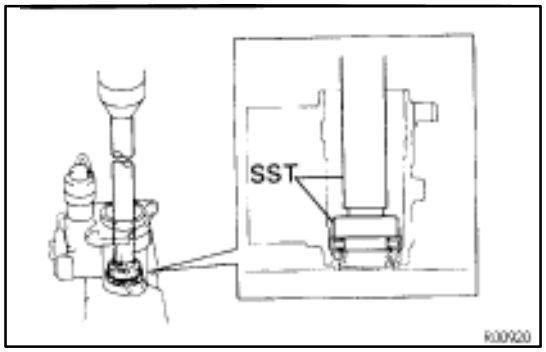


2. IF NECESSARY, REPLACE CONTROL VALVE HOUSING OIL SEAL AND UPPER BEARING

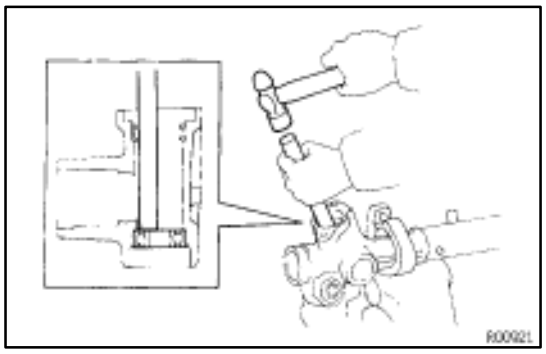
(a) Using SST, press out the oil seal and upper bearing.
SST 09620–30010 (09631–00020)
09630–24013 (09620–24010)



(b) Using SST, press in a new oil seal as shown.
SST 09620–30010 (09631–00020)
09630–24013 (09620–24020)

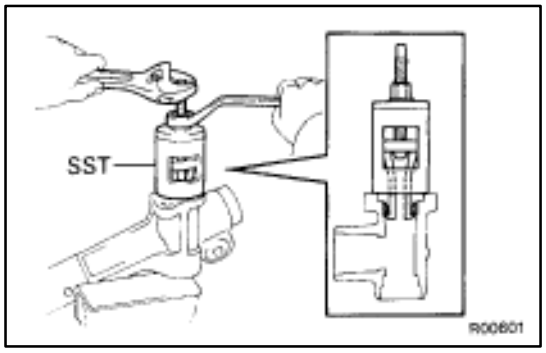


(c) Using SST, press in a new upper bearing as shown.
SST 09620–30010 (09631–00020)
09630–24013 (09620–24020)

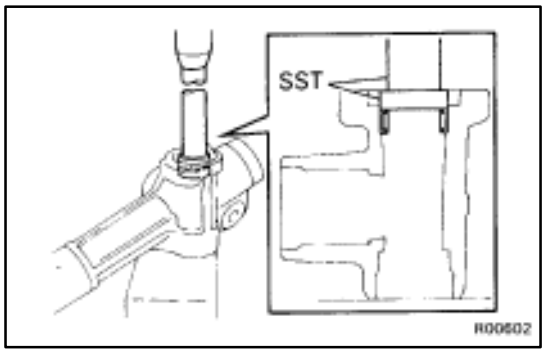


3. IF NECESSARY, REPLACE CONTROL VALVE LOWER BEARING AND CENTER BEARING

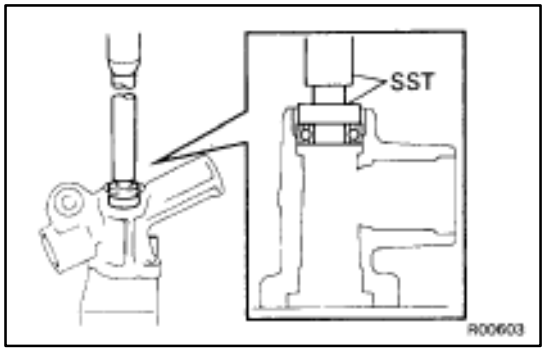
(a) Using a brass bar, drive out the lower bearing.



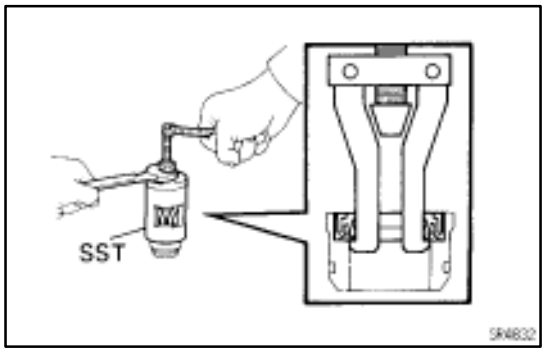
(b) Using SST, remove the center bearing.
SST 09612–24014 (09613–22011)



(c) Using SST, press in a new center bearing as shown.
SST 09630–24013 (09620–24020) 09631–12020

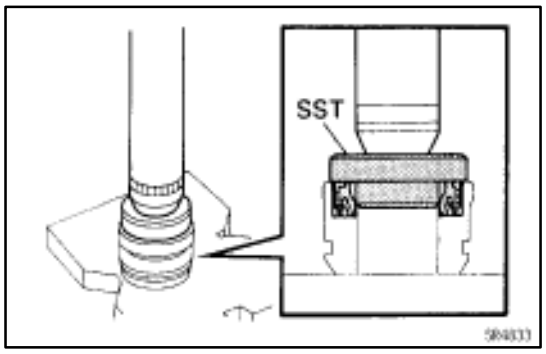


(d) Using SST, press in a new lower bearing.
SST 09630–24013 (09620–24020) 09631–12020

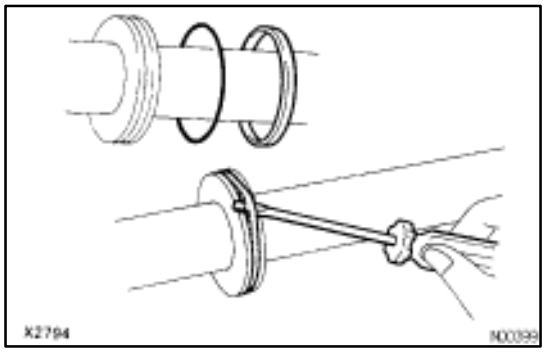


4. IF NECESSARY, REPLACE RACK BUSHING OIL SEAL

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

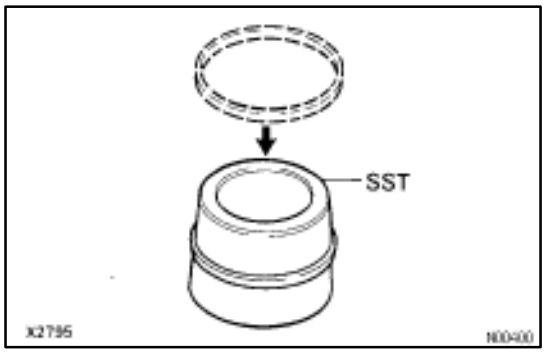


(b) Coat a new oil seal with power steering fluid.
(c) Using SST, press in the oil seal.
SST 09631–32010

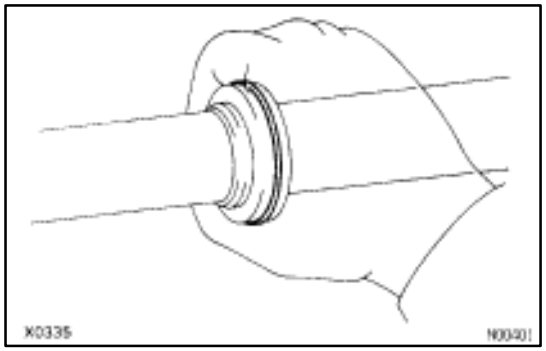


5. IF NECESSARY, REPLACE TEFLON RING AND ORING

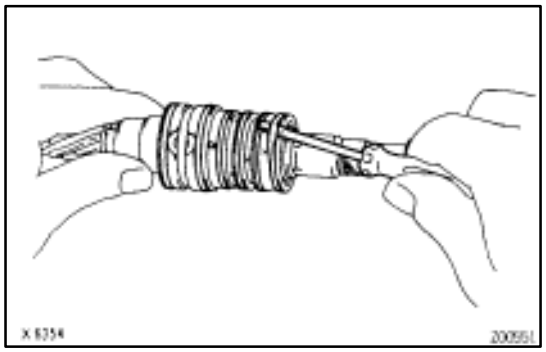
(a) Remove the teflon ring and O–ring.
NOTICE: Be careful not to damage the steering rack.
(b) Coat a new O–ring with power steering fluid and install it.



(c) Coat a new teflon ring with power steering fluid.
(d) Install the teflon ring to SST and expand it.
SST 09630–24013 (09620–24040)

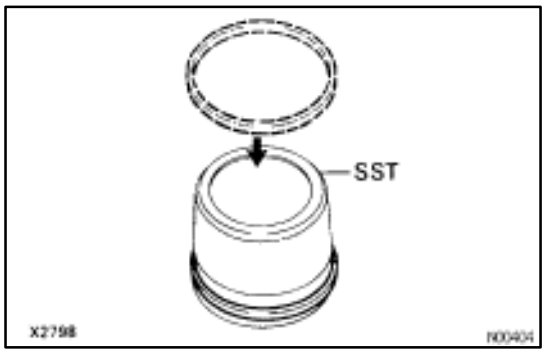


(e) Install the expanded teflon ring to the steering rack and sung it down with your fingers so that it fits tightly in the groove.

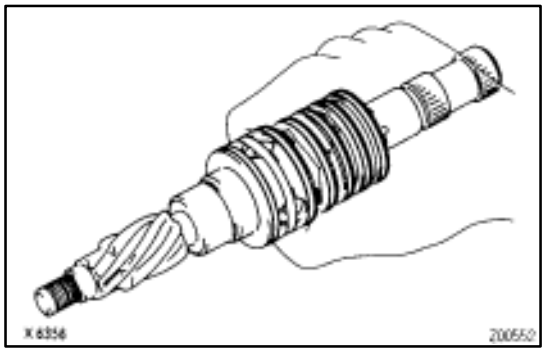


6. IF NECESSARY, REPLACE CONTROL VALVE TEFLON RING

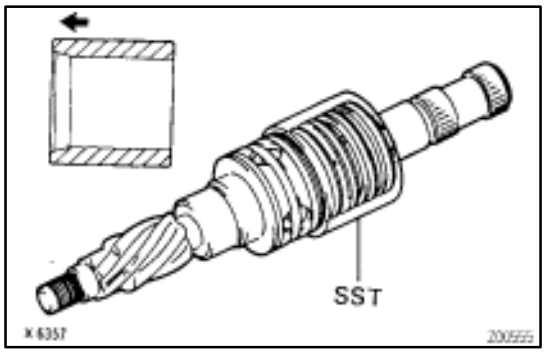
(a) Using a screwdriver, remove the teflon rings.
NOTICE: Be careful not to damage the control valve.



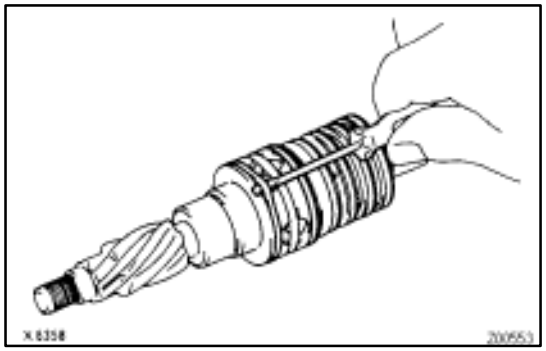
(b) Install new teflon rings to SST and expand them.
SST 09631–20070



(c) Install the expanded teflon rings to the control valve and snug them down with your fingers.



(d) Coat the teflon rings with power steering fluid, and carefully slide the tapered end of SST over the teflon rings to seat the ring.
SST 09631–20081

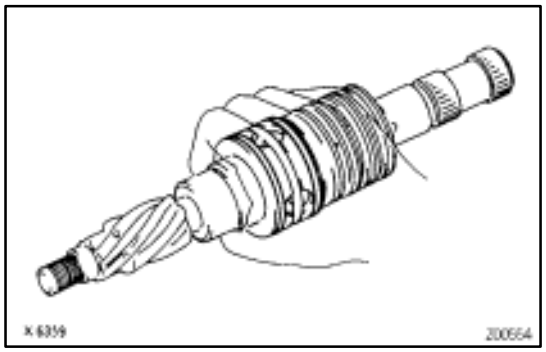


7. IF NECESSARY, REPLACE HYDRAULIC REACTION CHAMBER TEFLON RINGS AND O–RINGS

(a) Remove the teflon rings and O–rings.
NOTICE: Be careful not to damage the control valve.

(b) Coat two new O–rings with power steering fluid, and install them.

(c) Expand new teflon rings with your fingers.
NOTICE: Be careful not to over–expand the teflon rings.

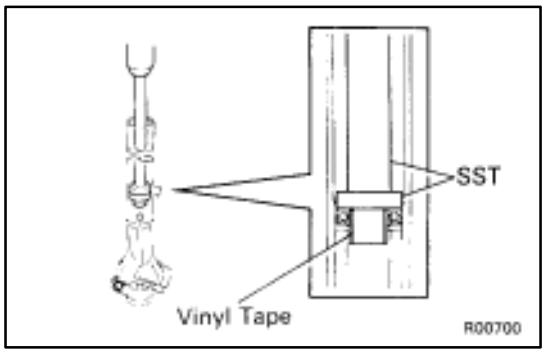


(d) Install the expanded teflon rings to the control valve.

(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

SR024–03

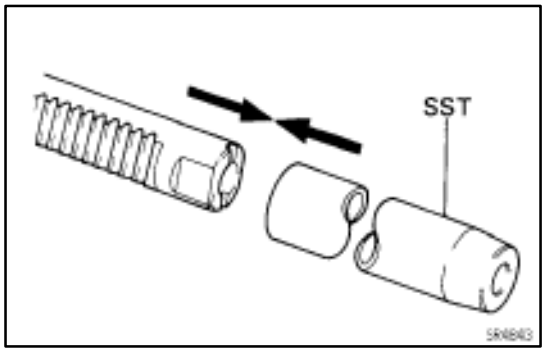


1. INSTALL CYLINDER HOUSING OIL SEAL AND SPACER

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

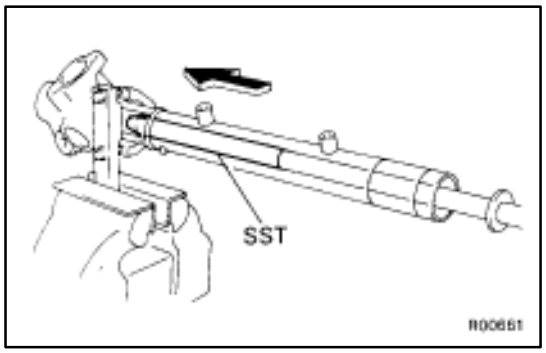
(b) Tape the showing part of SST before use.

(c) Install the oil seal and spacer to SST, and press in them.
SST 09608–12010 (09608–00080) 09631–12020



2. INSTALL RACK

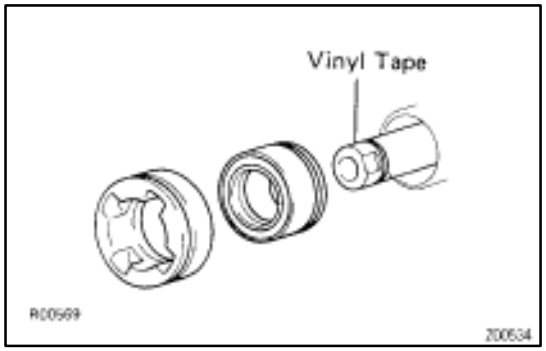
(a) Install SST to the rack.
HINT: If necessary, scrape the burrs off the rack teeth end and burnish.
SST 09631–33010



(b) Coat SST with power steering fluid.

(c) Insert the rack into the cylinder.

(d) Remove SST.
SST 09631–33010

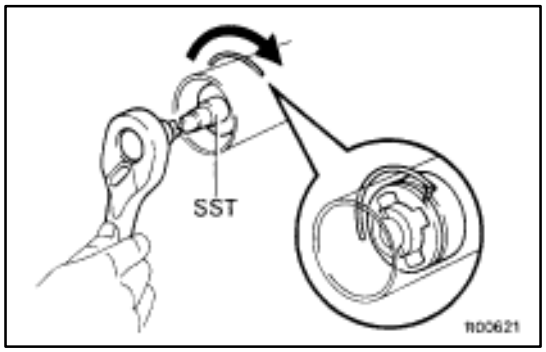


3. INSTALL RACK BUSHING AND CYLINDER END STOPPER

(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.

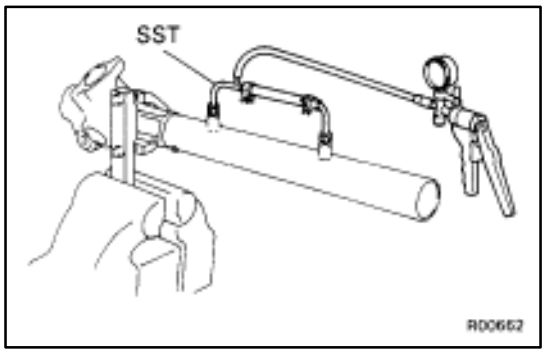
(c) Push in the rack bushing and cylinder end stopper until the wire installation hole appears.



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

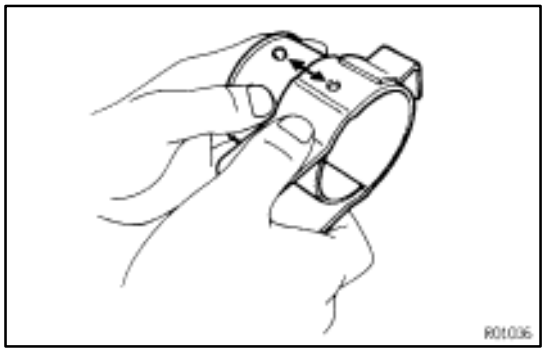


5. AIR TIGHTNESS TEST

(a) Install SST to the unions of the cylinder housing.
SST 09631–12071

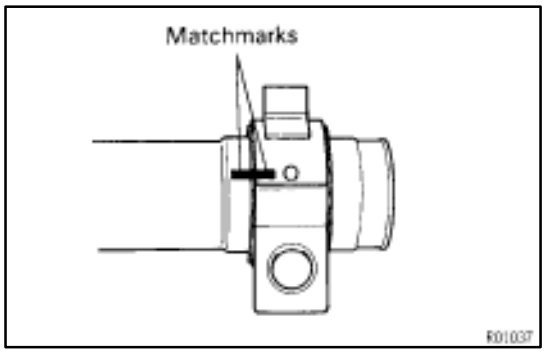
(b) Apply 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum for about 30 seconds.

(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.

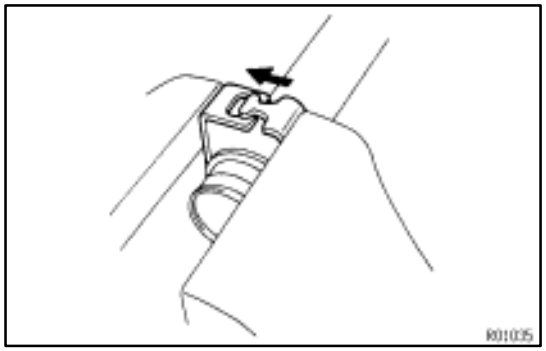


6. INSTALL NO.2 BRACKET

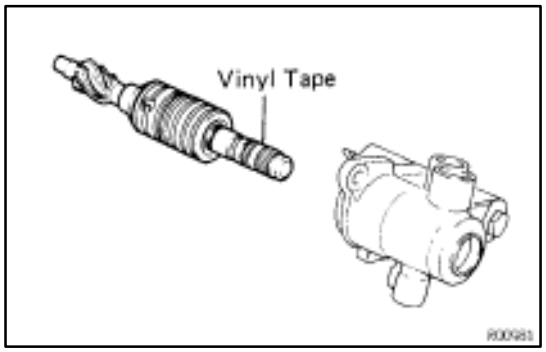
(a) Install the bushing to the bracket.



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



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



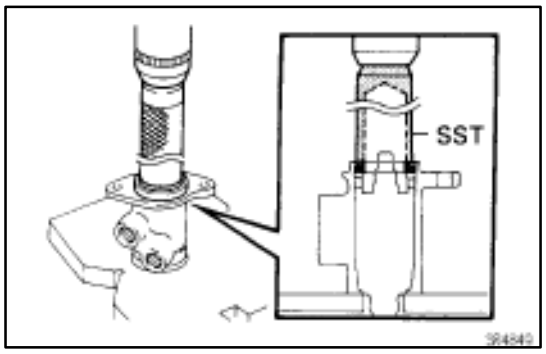
7. INSTALL CONTROL VALVE

(a) Wind vinyl tape on the control valve.

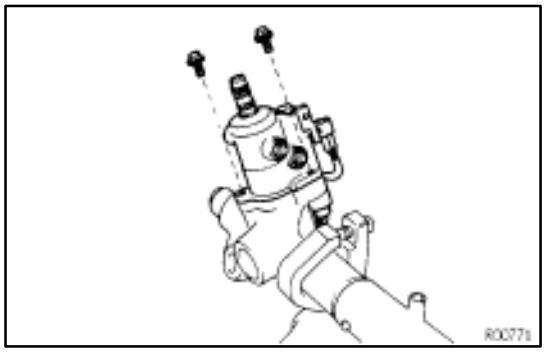
(b) Coat the teflon rings with power steering fluid.

(c) Push the control valve into the housing.

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



(d) Using SST, press in a new oil seal.
SST 09612–22011

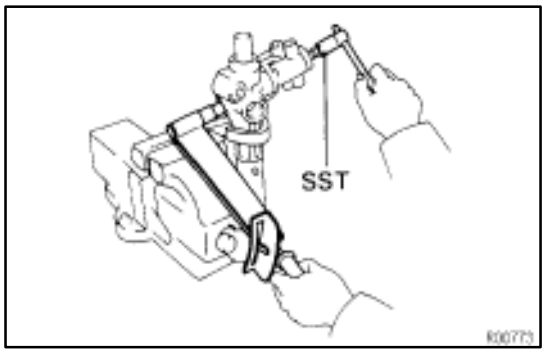


8. INSTALL CONTROL VALVE HOUSING

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

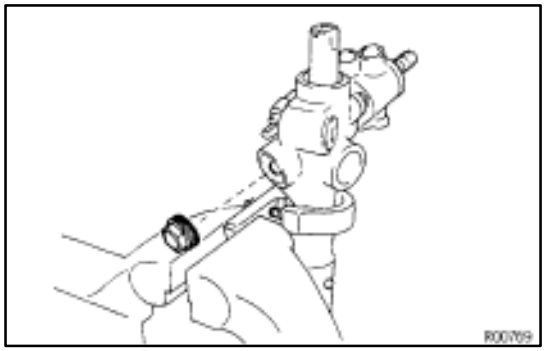
(b) Torque the two bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(c) Install the dust cover.



9. INSTALL SELF–LOCKING NUT

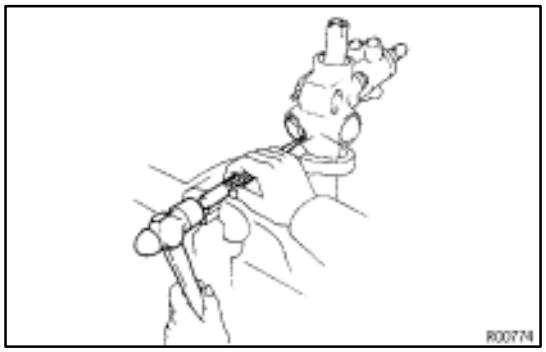
Using SST to hold the control valve, install a new self –locking nut.
SST 09616–00010
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



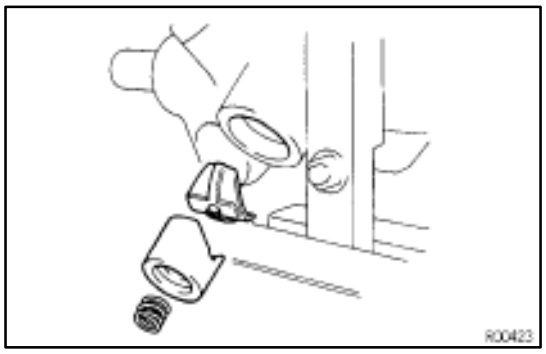
10. INSTALL RACK HOUSING CAP

(a) Apply sealant to 2 or 3 threads of the housing cap.
Sealant:
Part No.08833–00080, THREE BOND 1344, LOC–TIT 242 or equivalent

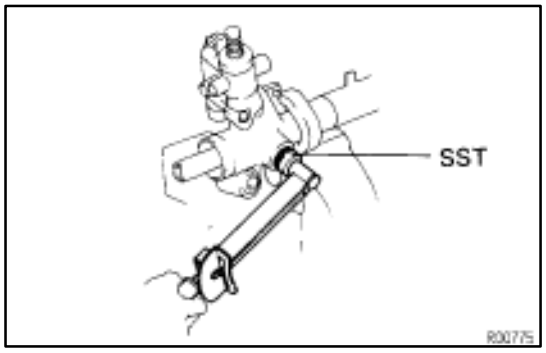
(b) Install the rack housing cap.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)



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



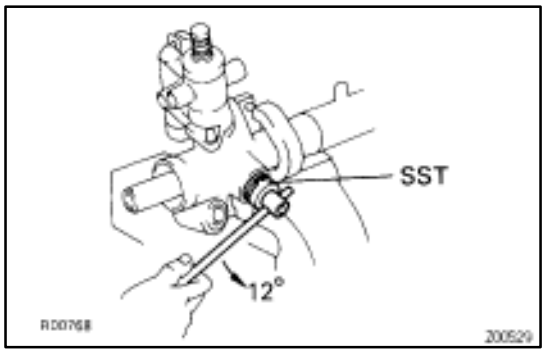
11. INSTALL RACK GUIDE SEAT, RACK GUIDE AND SPRING



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

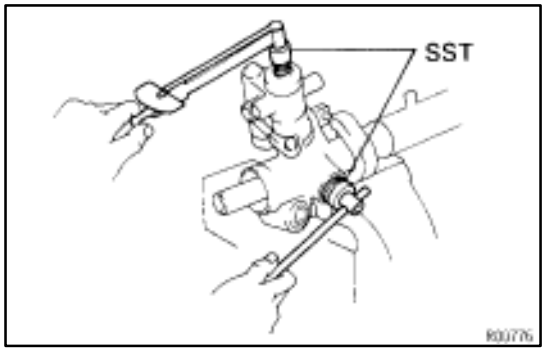
(b) Using SST, install and torque the spring cap.
SST 09631–10021
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



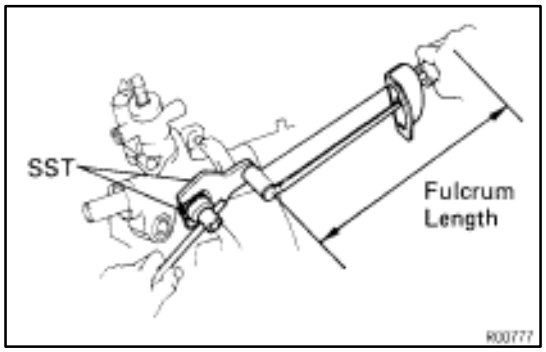
(c) Using SST, return the rack guide spring cap 12•.
SST 09631–10021

(d) Turn the control valve shaft right and left one or two times.

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



(f) Using SST and a 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)

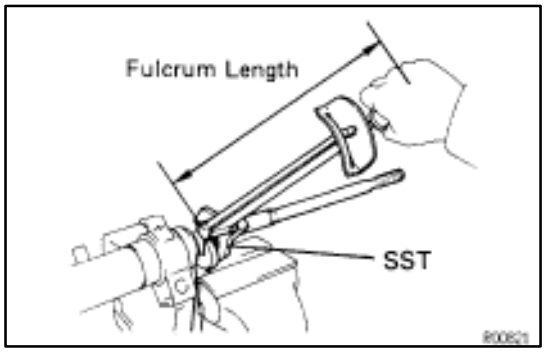


13. INSTALL RACK GUIDE SPRING CAP LOCK NUT

(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.).

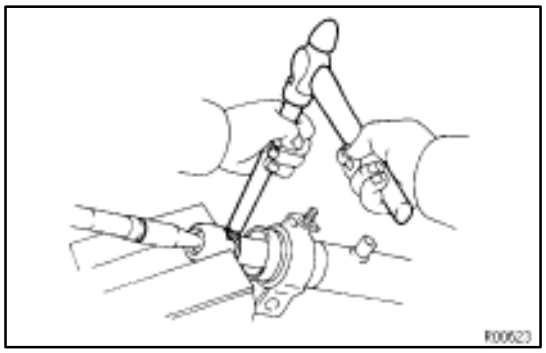
(c) Recheck the total preload.



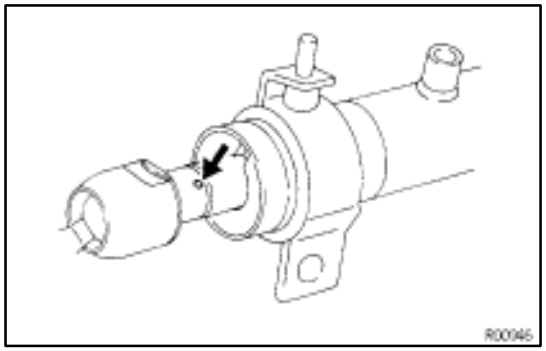
14. INSTALL RACK ENDS

(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.).



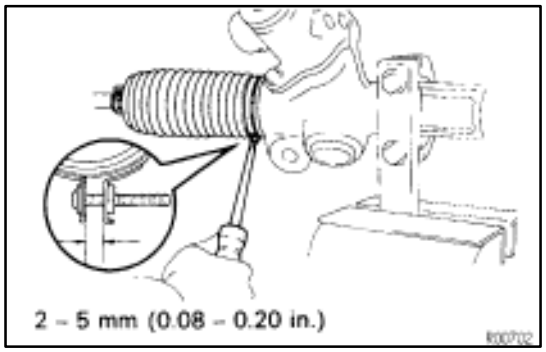
(c) Using a brass bar and hammer, stake the claw washers.



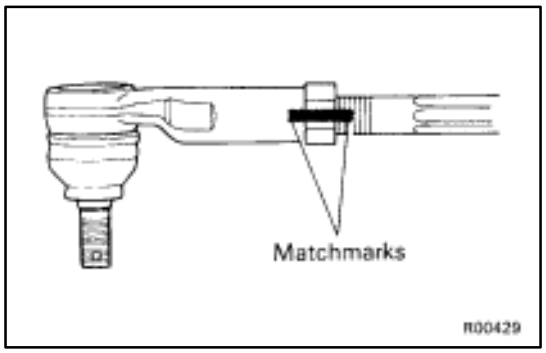
15. INSTALL RACK BOOTS

(a) Insure 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.



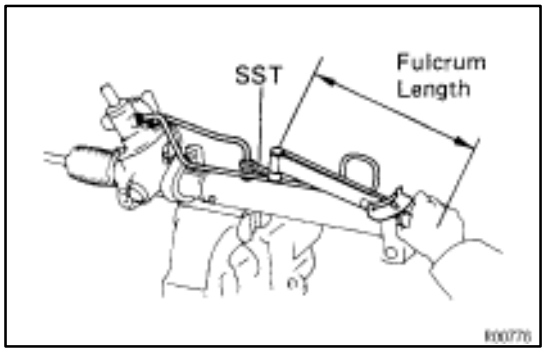
(c) Install the clamps and clips.



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.).

ELECTRONIC CONTROL SYSTEM

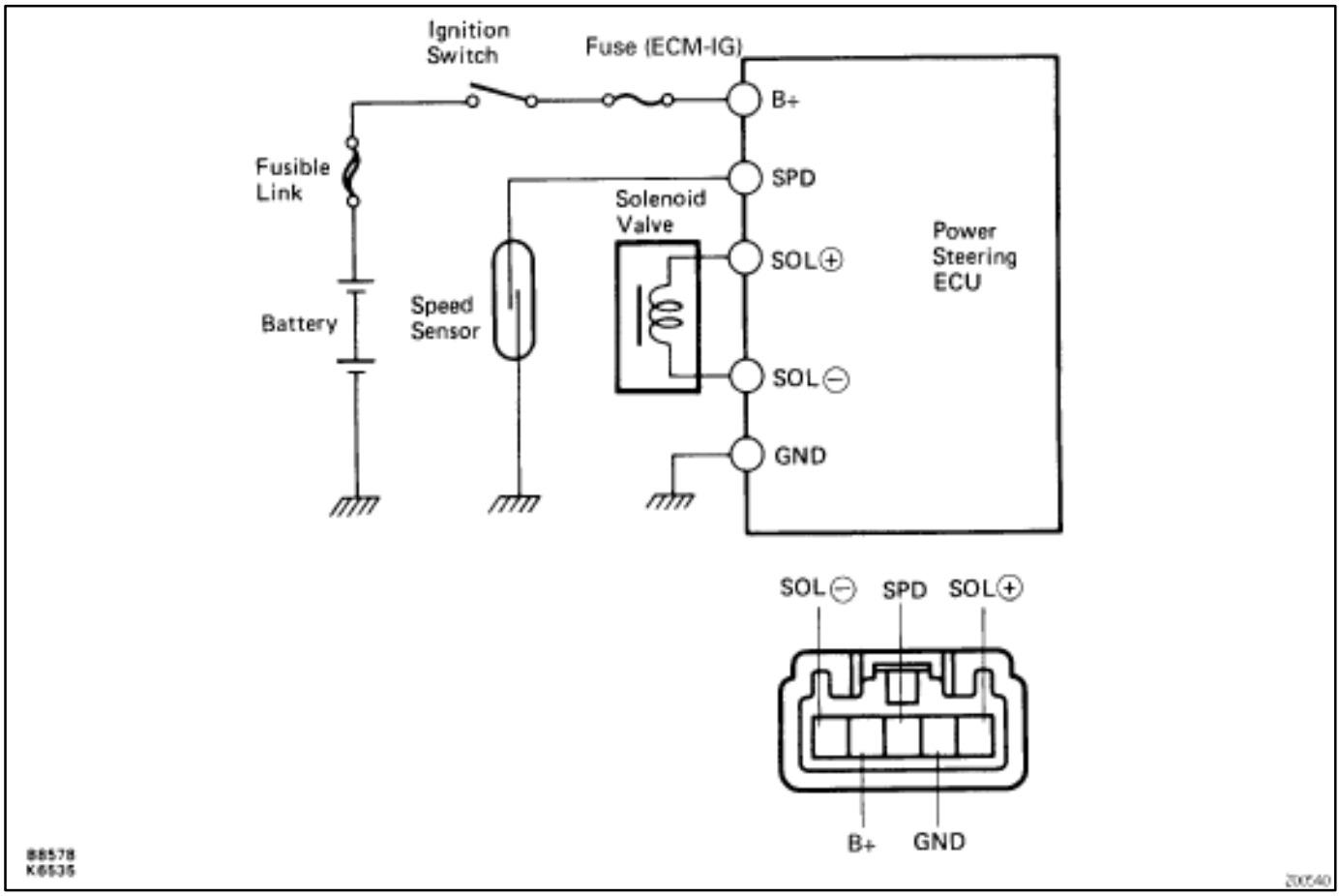
PRECAUTION

SR02U–01

Do not open the cover or the case of the ECU and various computers unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CIRCUIT

SR02V–01



TROUBLESHOOTING FLOW–CHART

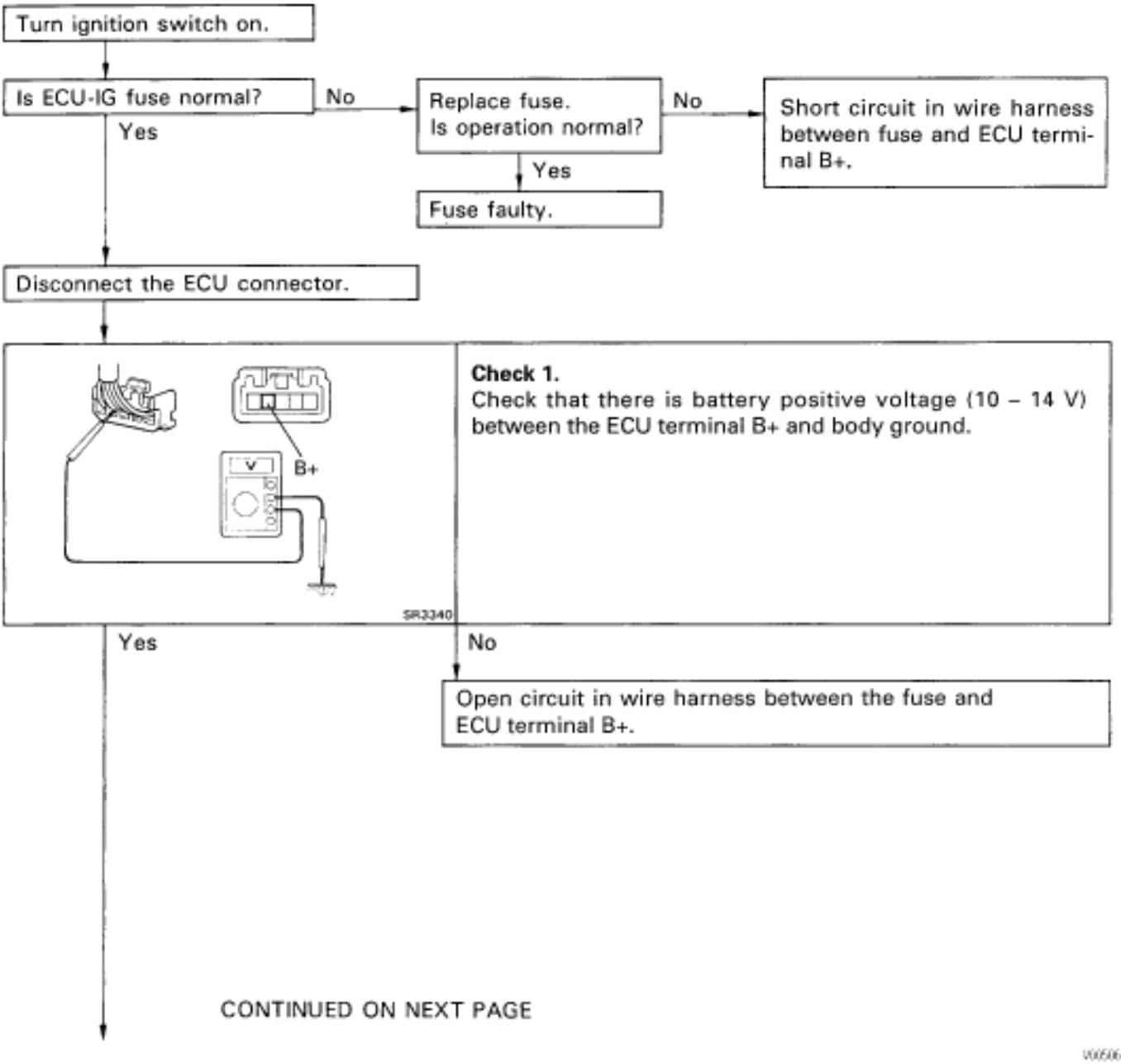
SR02W–01

Trouble

- Hard steering at idle or low–speed driving.
- Steering too sensitive during high–speed driving.

Preliminary Check

- Check tire pressure.
- Check lubrication of suspension and steering linkage.
- Check front wheel alignment.
- Check steering system joint and suspension arm ball joint.
- Check for bent steering column.
- Check that all connectors are secure.
- Check PS pump fluid pressure.



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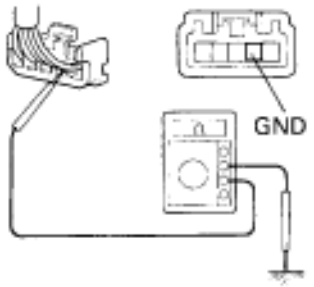
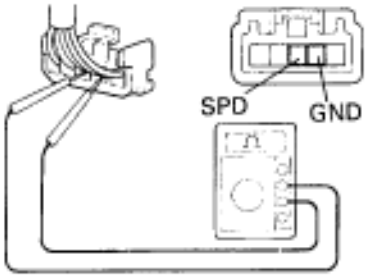


Check 2.
Check that there is continuity between the ECM terminal GND and body ground.

Yes

No

- Open circuit in wire harness between the ECU terminal GND and body ground.
- Body ground faulty.

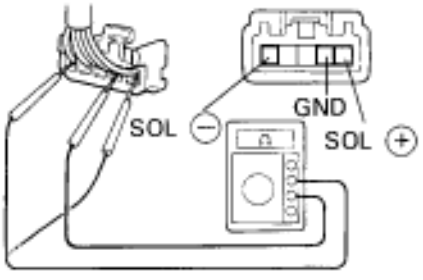


Check 3.
(a) Jack up a front wheel on one side.
(b) Connect an ohmmeter between the ECU connector terminals SPD and GND.
(c) Spin the wheel and check the resistance .
Resistance (Ω) 0 Ω → ∞ → 0 Ω

Yes

No

- Open or short circuit in wire harness between the ECU terminal SPD and speed sensor.
- Speed sensor faulty (See BE section).



Check 4.
Check that there is no continuity between terminals SOL ⊕ or SOL ⊖ and GND.

Yes

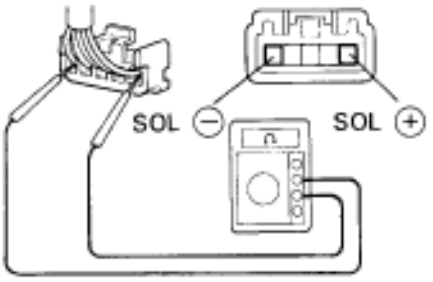
No

- Short circuit in wire harness between the terminals SOL ⊕ and SOL ⊖.
- Solenoid valve faulty.

CONTINUED ON NEXT PAGE

V00507

Yes CONTINUED FROM PREVIOUS PAGE



Check 5.
Measure the resistance between terminals SOL ⊕ and SOL ⊖.
Standard resistance: 4.0 – 9.0 Ω

Yes

No

- Open circuit in wire harness between the terminals SOL ⊕ and SOL ⊖.
- Solenoid valve faulty.

Check 6.
Inspect ECU.

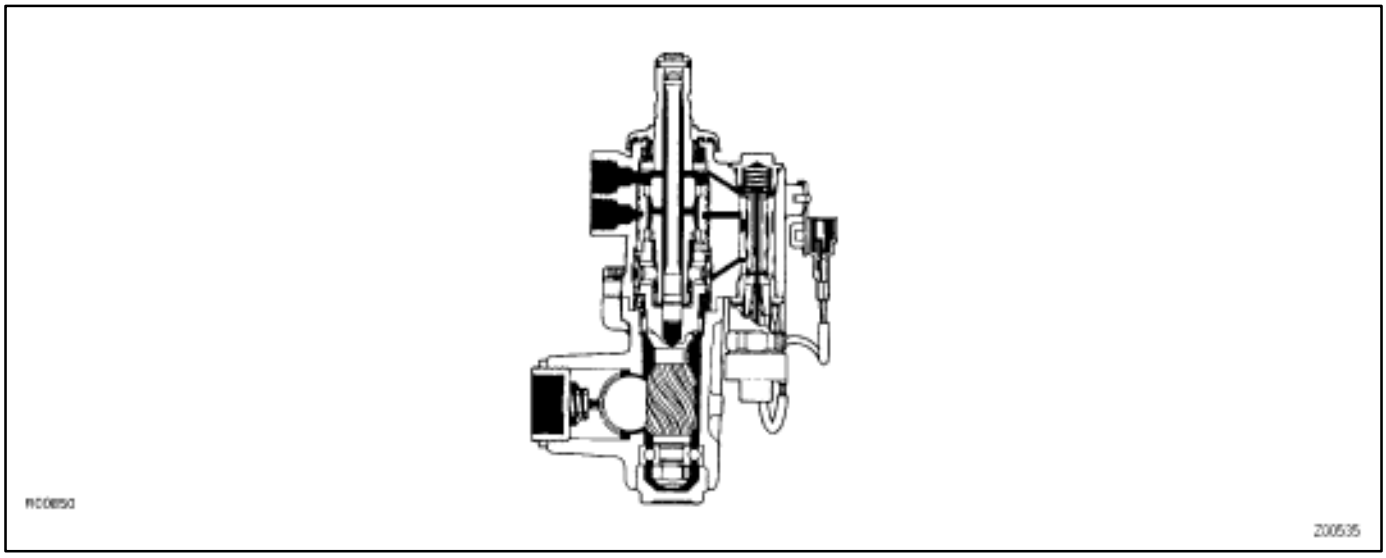
Bad → Replace ECU.

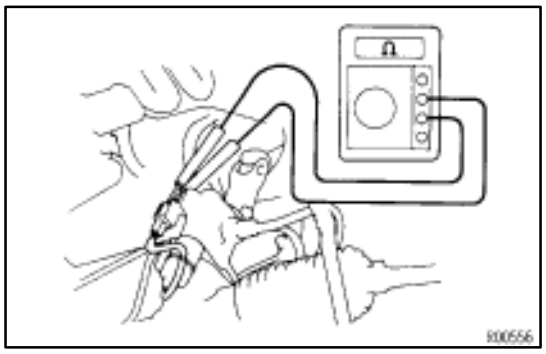
V00508

ELECTRONIC CONTROL COMPONENTS INSPECTION

SR02X–01

Solenoid Valve





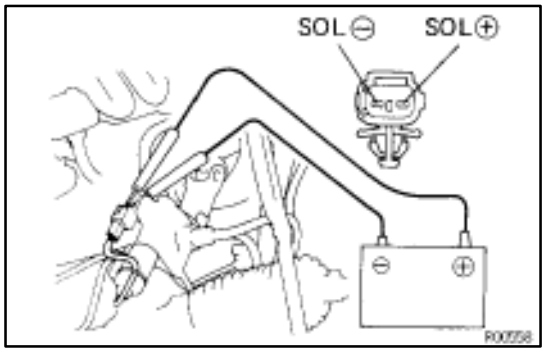
1. DISCONNECT WIRING CONNECTOR

2. MEASURE RESISTANCE

Measure the resistance between SOL and SOL.

Resistance:

4.0–9.0 Ω



3. CHECK SOLENOID OPERATION

(a) Connect the battery positive terminal to the solenoid terminal SOL⊕.

(b) Connect the battery negative terminal to the solenoid terminal SOL⊖.

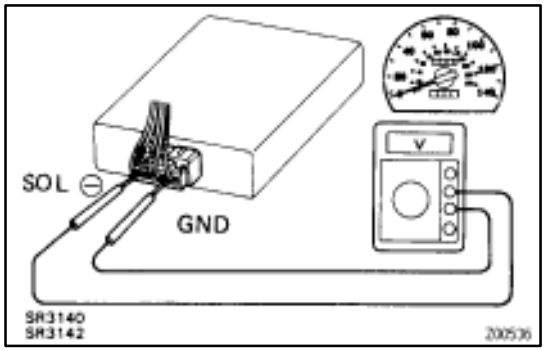
(c) Check that the solenoid is clicked.

If faulty, replace the control valve housing with the solenoid valve.

NOTICE:

- **Do not apply voltage for more than 30 seconds to avoid burning out the solenoid.**
- **If repeating this step, wait until the solenoid cools down enough that it can be touched by hand.**

4. CONNECT WIRING CONNECTOR



Power Steering ECU

1. JACK UP VEHICLE AND SUPPORT IT ON STANDS

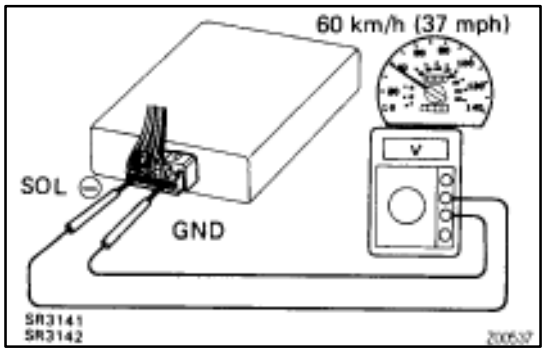
2. START ENGINE

3. MEASURE VOLTAGE OF ECU

(a) Using a voltmeter, measure the voltage between ECU terminals SOL⊖ and GND while the engine is idling.

Standard voltage:

0.43–0.56 V



(b) Place the transmission in gear and while running at about 60 km/h (37 mph), measure the voltage between ECU terminals SOL⊖ and GND.

Standard voltage:

Voltage measured in (a) above, minus 0.08–0.22 V

If no voltage, try another ECU.

4. LOWER VEHICLE