

Power Steering - LS430

POWER STEERING SYSTEM

PRECAUTION

1. HANDLING PRECAUTIONS FOR STEERING SYSTEM

- a. Care must be taken when replacing parts. Incorrect replacement could affect the performance of the steering system and result in a driving hazard.

2. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

- a. The vehicle is equipped with SRS (Supplemental Restraint System) such as airbags. If service operation is not carried out properly, in a step by step fashion, sudden deployment of the airbags may result in serious injury. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notice for the supplemental restraint system (see **PRECAUTION**).

NOTE: **Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

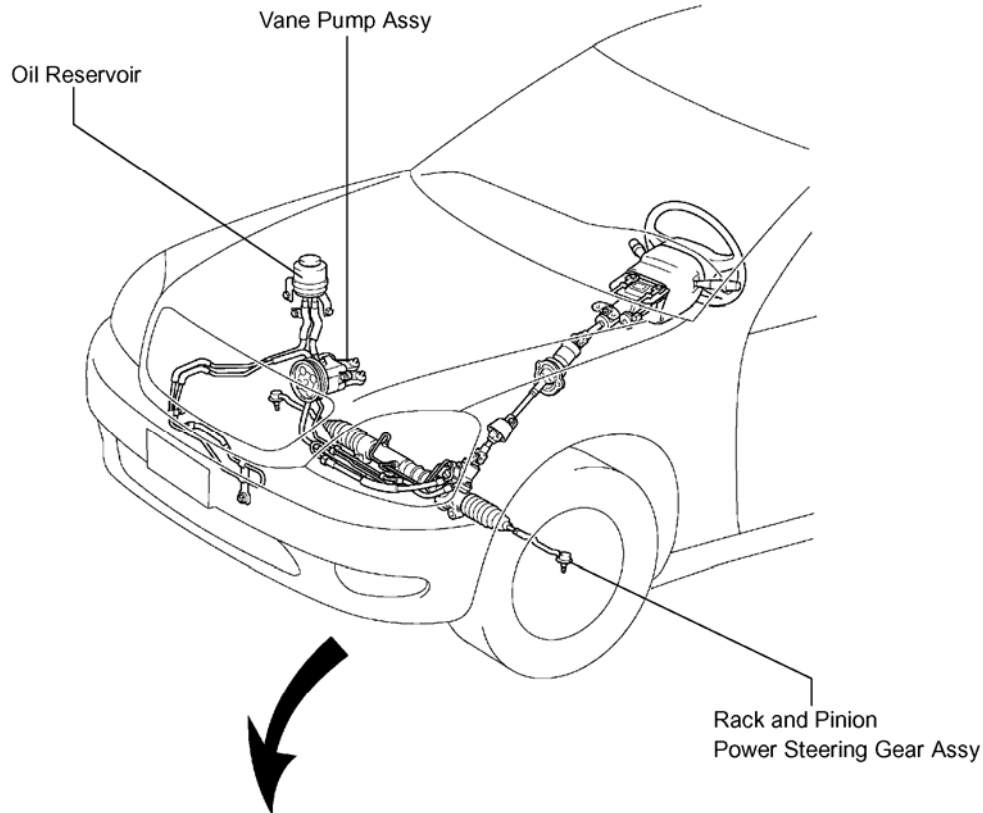
SYSTEM REFERENCE TABLE

System Name	Proceed To
Front Power Seat Control System	<u>INITIALIZATION</u>

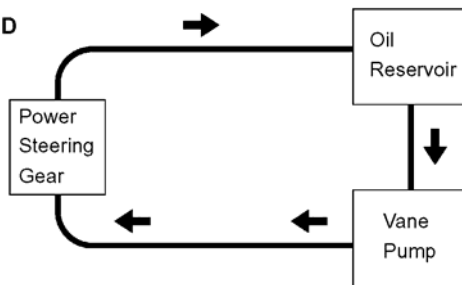
SYSTEM DESCRIPTION

LEXUS LS430 uses the rack and pinion type steering gear, and the vehicle speed sensing hydraulic reaction type electronically controlled PPS (Progressive Power Steering) system.

**COMPONENTS:
LHD MODEL**



**POWER STEERING FLUID
FLOWCHART:**



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Fig. 1: Power Steering System Description
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PROBLEM SYMPTOMS TABLE

HINT:

Use the table below, with suspected areas listed in numerical order, to determine the cause of the problem. Inspect and repair or replace parts as necessary according to the steps in the following information .

Symptom	Suspected area
Hard steering	<ol style="list-style-type: none"> 1. Tires (Improperly inflated) 2. Power steering fluid level (Low) 3. Drive belt (Loose) 4. Front wheel alignment (Incorrect) 5. Steering system joints (Worn) 6. Suspension arm ball joints (Worn) 7. Steering column (Binding) 8. Vane pump assy 9. Power steering gear assy 10. PPS system
Poor return	<ol style="list-style-type: none"> 1. Tires (Improperly inflated) 2. Front wheel alignment (Incorrect) 3. Steering column (Binding) 4. Power steering gear assy 5. Steering system joints (Worn) 6. Suspension arm ball joints (Worn)
Excessive free play	<ol style="list-style-type: none"> 1. Steering system joints (Worn) 2. Suspension arm ball joints (Worn) 3. Intermediate shaft, universal joint, sliding yoke (Worn) 4. Front wheel bearing (Worn) 5. Power steering gear assy 6. PPS system
Abnormal noise	<ol style="list-style-type: none"> 1. Power steering fluid level (Low) 2. Steering system joints (Worn) 3. Vane pump assy 4. Power steering gear assy

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Fig. 2: Problem Symptoms Table
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

1. INSPECT DRIVE BELT

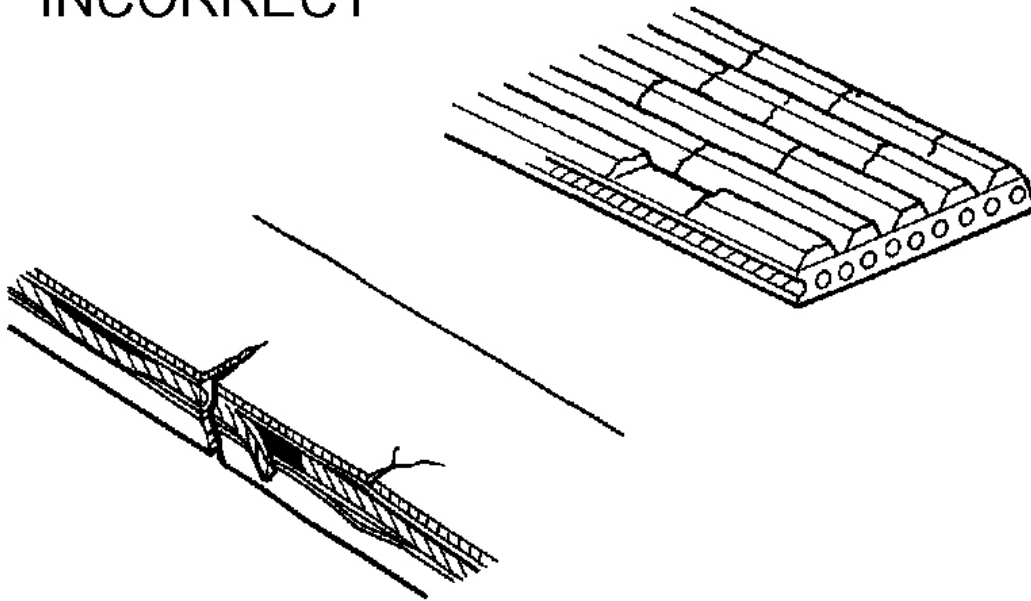
- a. Visually check the belt for excessive wear, frayed cords, etc.

If any defect is found, replace the drive belt.

HINT:

Cracks on the rib side of a belt are considered acceptable. Replace the belt if there are any missing ribs.

INCORRECT

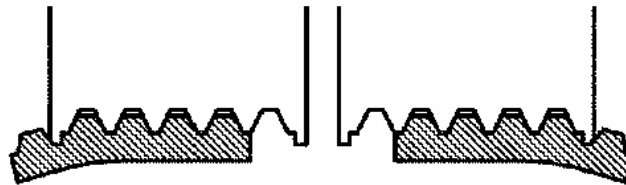


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Fig. 3: Inspecting Drive Belt (1 Of 2)
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CORRECT



INCORRECT

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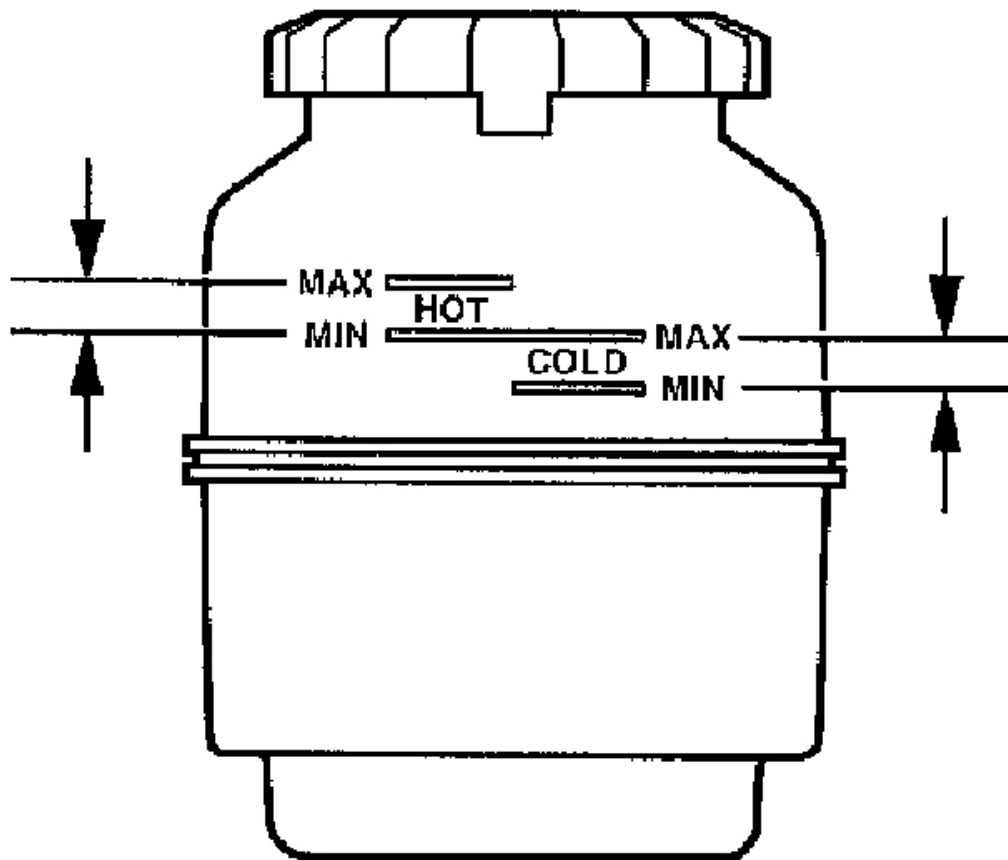
Fig. 4: Inspecting Drive Belt (2 Of 2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. CHECK FLUID LEVEL

- a. Keep the vehicle level.
- b. With the engine stopped, check the fluid level in the oil reservoir. If necessary, add fluid.

Fluid: ATF DEXRON® II or III



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Fig. 5: Checking Fluid Level In Oil Reservoir

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HINT:

When hot, check that the fluid level is within the HOT LEVEL range on the reservoir.

If the fluid is cold, check that it is within the COLD LEVEL range.

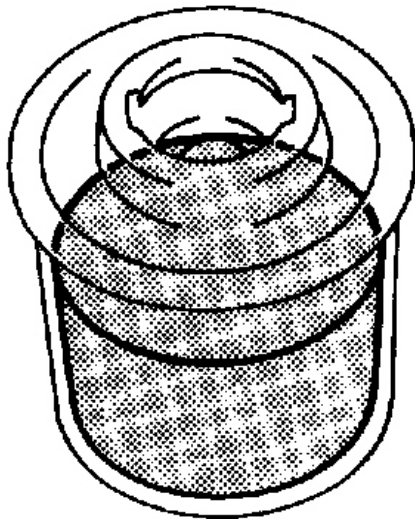
- c. Start the engine and run at idle.
- d. Turn the steering wheel from lock to lock several times to raise fluid temperature.

Fluid temperature: 75 to 80°C (167 to 176°F)

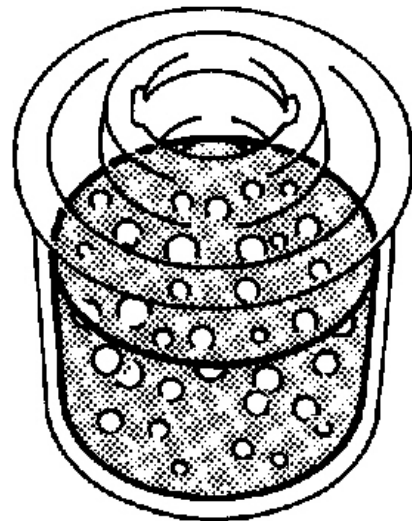
- e. Check for foaming or emulsification.

If foaming or emulsification is identified, bleed air in the power steering system (see step 3).

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INCORRECT



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Fig. 6: Checking For Foaming Or Emulsification
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- f. With the engine idling, measure the fluid level in the reservoir.

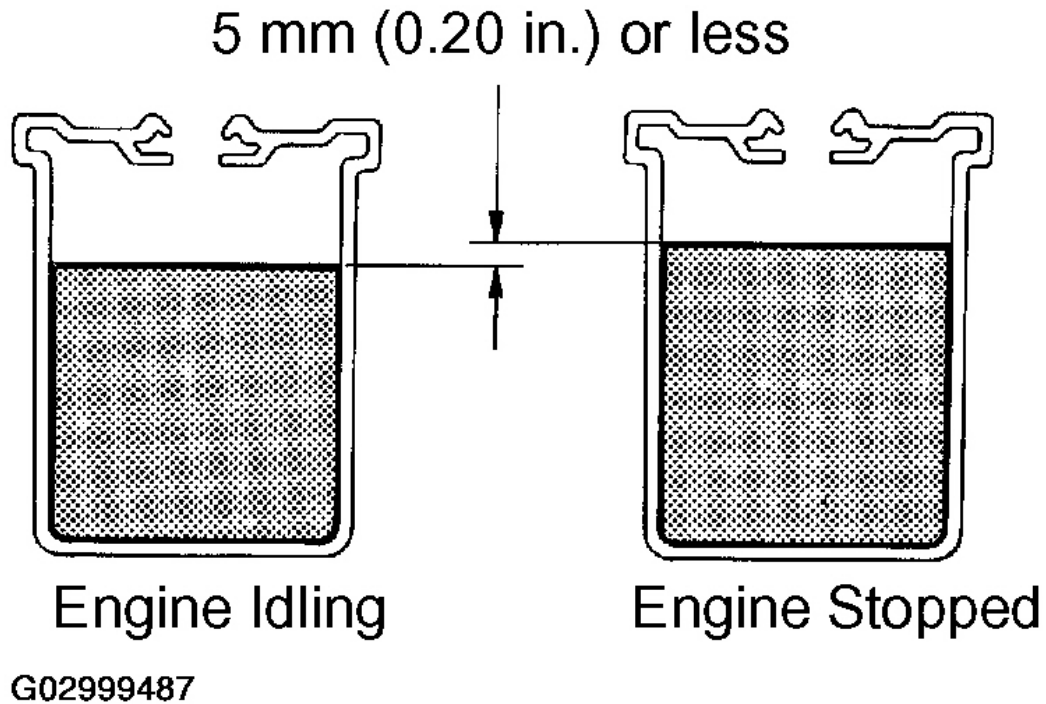


Fig. 7: Measuring Fluid In Reservoir (With Engine Idling)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Stop the engine.
- h. Wait a few minutes and measure the fluid level in the reservoir again.

Maximum fluid level rise: 5 mm (0.20 in.) or less

If the fluid level rise exceeds the maximum, bleed air in the power steering system (see step 3).

- i. Check the fluid level.

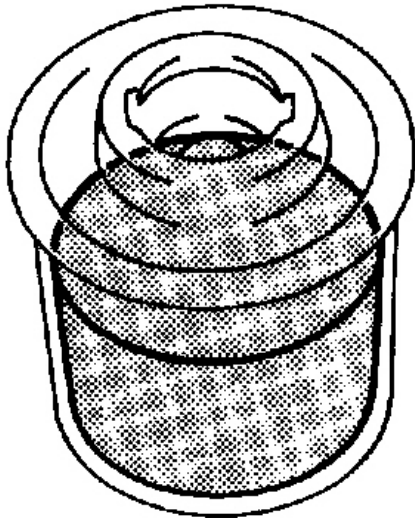
3. BLEED AIR IN POWER STEERING SYSTEM

NOTE: **If you replace or separate the components for power steering oil pressure line, bleed air in the power steering system after the operation.**

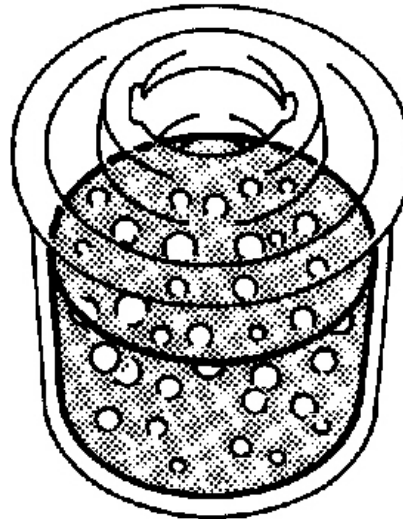
- a. Idle the engine at 1,000 rpm or less until bubbles in the fluid disappear. (Be sure not to turn the steering wheel.)
- b. When the bubbles disappear, slowly turn the steering wheel from lock to lock 2 or 3 times.
- c. Repeat procedures (a) and (b) until the fluid level in the reservoir becomes stable and bubbles disappear. If the fluid level goes below the MAX line, add fluid.

- d. When the fluid level becomes stable, increase and decrease oil pressure 2 or 3 times for both left and right by turning the steering wheel to the full lock positions and jiggling it there.
- e. Make sure that no bubbles exist in the reservoir. When turning the steering wheel quickly or turning it from lock to lock position, check that the steering wheel is not heavy to turn and there is no abnormal noise or vibration.
- f. When there are fluid leaks or abnormalities after bleeding air, repair them and repeat procedures (a) to (e). If the abnormalities still exist, replace the related parts.

CORRECT



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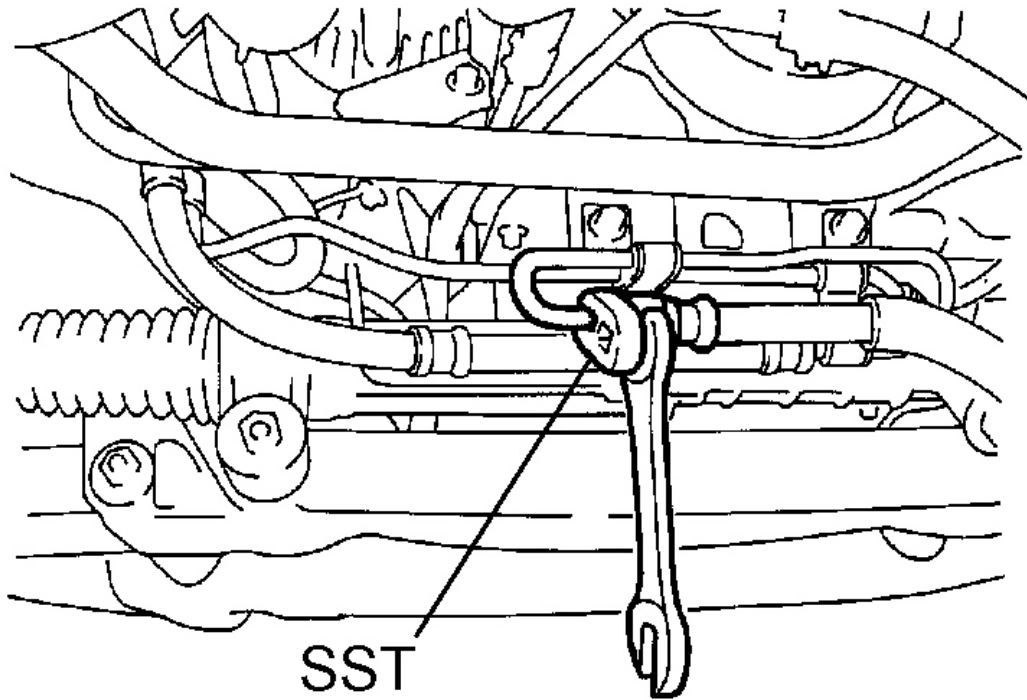
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Fig. 8: Bleeding Air In Power Steering System
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. CHECK STEERING FLUID PRESSURE

- a. Put a wrench on the pressure feed tube hose to secure it.
- b. Put SST on the flare nut as shown in **Fig. 9** .

SST 09023-12700



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Fig. 9: Installing SST On Flare Nut

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- c. Joint a spinner handle to the SST.

HINT:

Use an extension bar or universal joint according to a situation.

- d. Loosen and disconnect the pressure feed tube.
e. Connect SST, as shown in **Fig. 10** .

SST 09640-10010 (09641-01010, 09641-01030, 09641-01040)

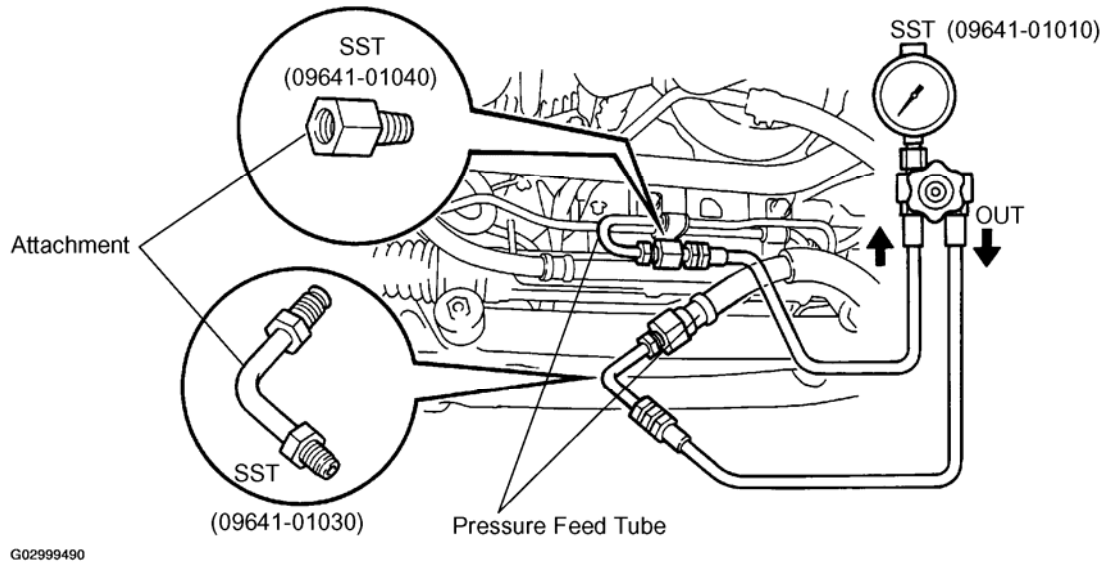


Fig. 10: Connecting SST
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Check that the valve of the SST is in the open position.

- f. Bleed air in the power steering system (see step 2).
- g. Start the engine and run at idle.
- h. Turn the steering wheel from lock to lock several times to raise fluid temperature.

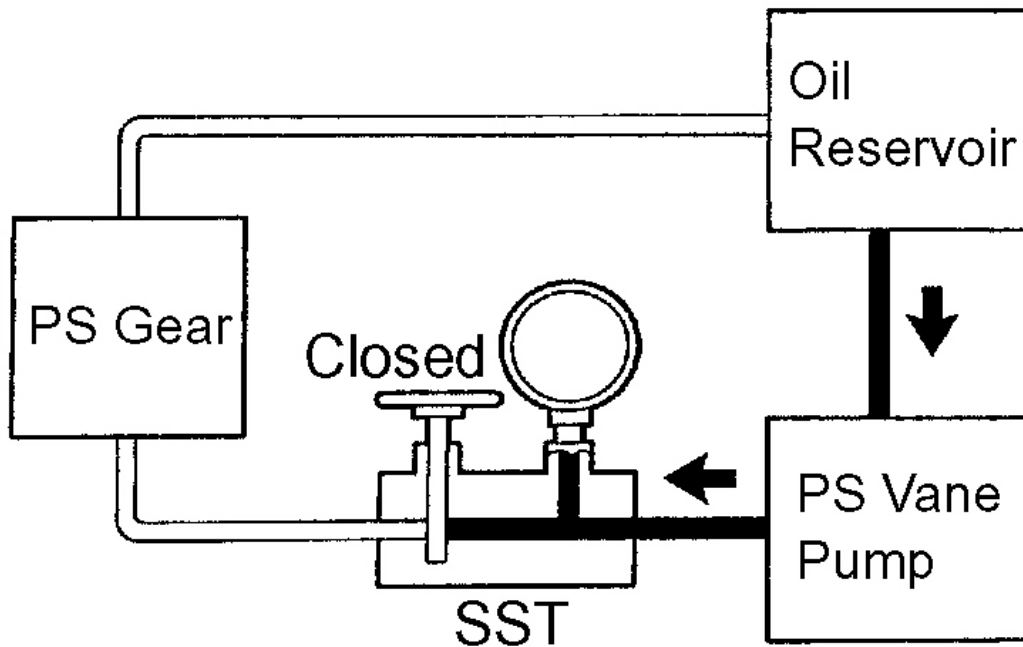
Fluid temperature: 75 to 80°C (167 to 176°F)

- i. With the engine idling, close the valve of the SST and observe the reading on the SST.

Standard fluid pressure: 8,336 to 8,826 kPa (85 to 90 kgf/cm², 1,209 to 1,280 psi)

NOTE:

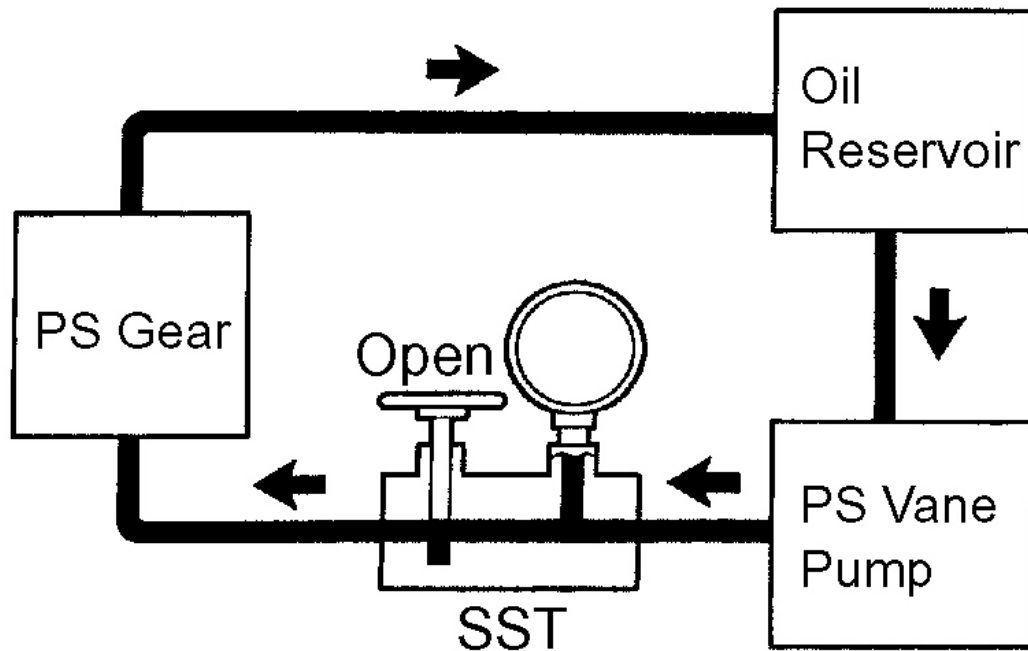
- Do not keep the valve closed for more than 10 seconds.
- Do not allow the fluid temperature to become too high.



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Fig. 11: Observing Reading On SST Closing Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- j. With the engine idling, fully open the valve.



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Fig. 12: Fully Opening Valve (With Engine Idling)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

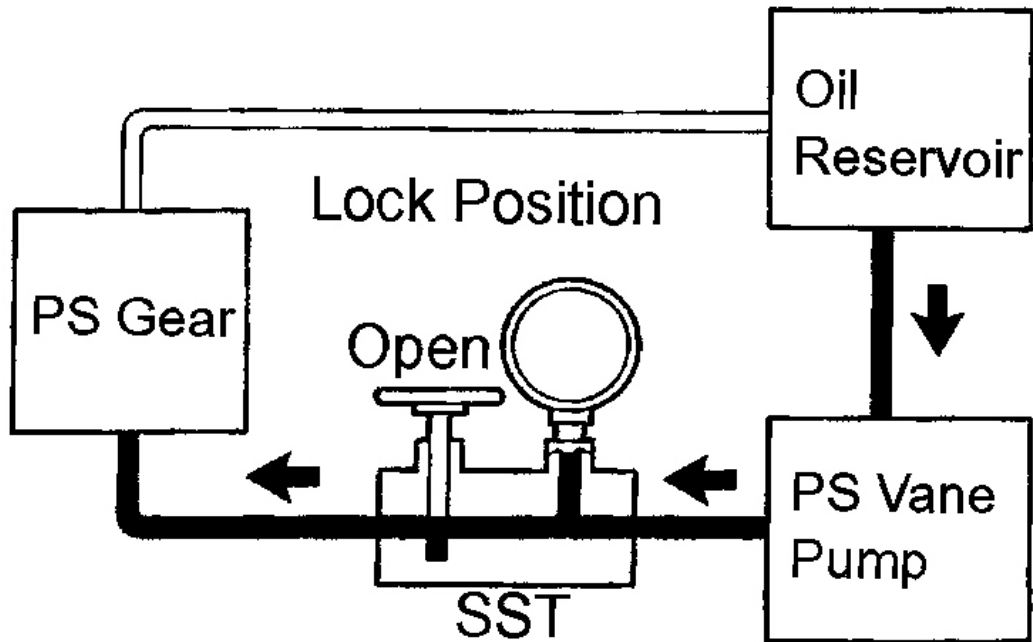
- k. Measure the fluid pressure at engine speeds of 1,000 rpm and 3,000 rpm.
Standard fluid pressure difference: 490 kPa (5 kgf/cm² , 71 psi) or less

NOTE: Do not turn the steering wheel.

If the observed value exceeds the standard, check the flow control valve.

- l. With the engine idling and the valve fully opened, turn the steering wheel to the right or left full lock position.

Standard fluid pressure: 8,336 to 8,826 kPa (85 to 90 kgf/cm² , 1,209 to 1,280 psi)



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Fig. 13: Turning Steering Wheel To Right Or Left Full Lock Position
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Do not keep the steering wheel in the full lock position for more than 10 seconds.
- Do not allow the fluid temperature to become too high.

m. Disconnect the SST.

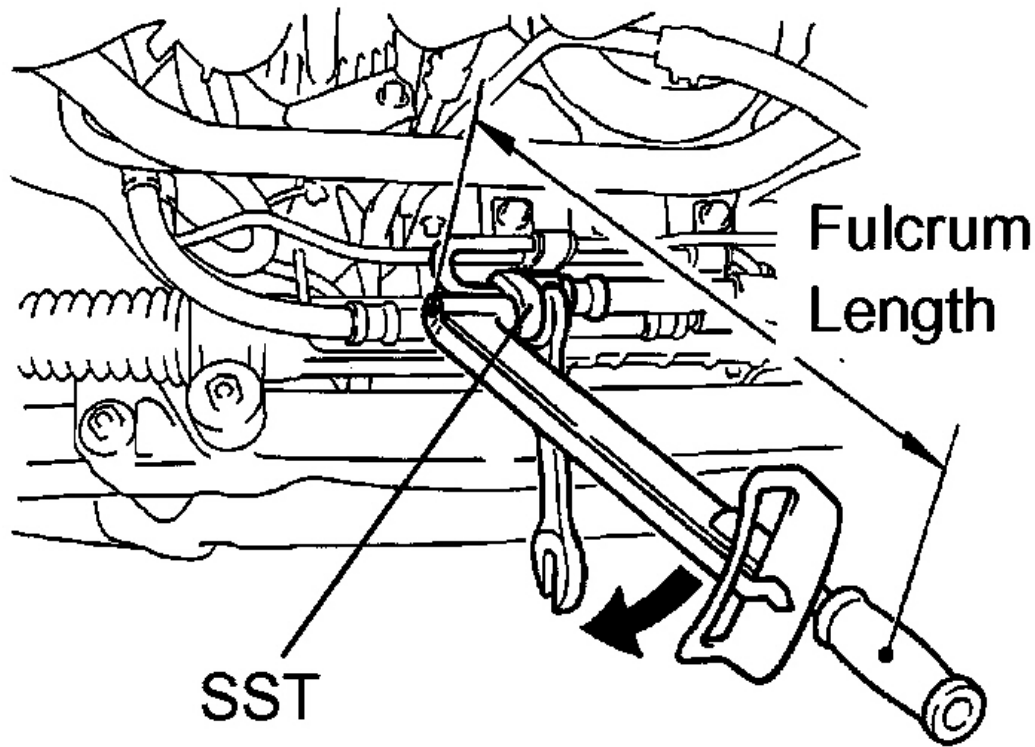
SST 09640-10010 (09641-01010, 09641-01030, 09641-01040)

n. Connect the pressure feed tube.

o. Put a wrench on the pressure feed tube hose side to hold it.

p. Put SST on the flare nut as shown in **Fig. 14** .

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Fig. 14: Putting SST On Flare Nut

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- q. Using a torque wrench, tighten the flare nut.

Torque: 40 N.m (410 kgf.cm, 30 ft.lbf)

HINT:

- Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective when SST is parallel to the torque wrench.

- r. Bleed air in the power steering system (see step 2).

5. CHECK AIR CONTROL VALVE

- a. Turn the air conditioning switch off.
- b. Start the engine and run at idle.
- c. Fully turn the steering wheel.
- d. Check the air control valve.

1. Pinch the vacuum hose of the air control valve.

Standard:

The engine speed decreases.

2. Release the vacuum hose of the air control valve.

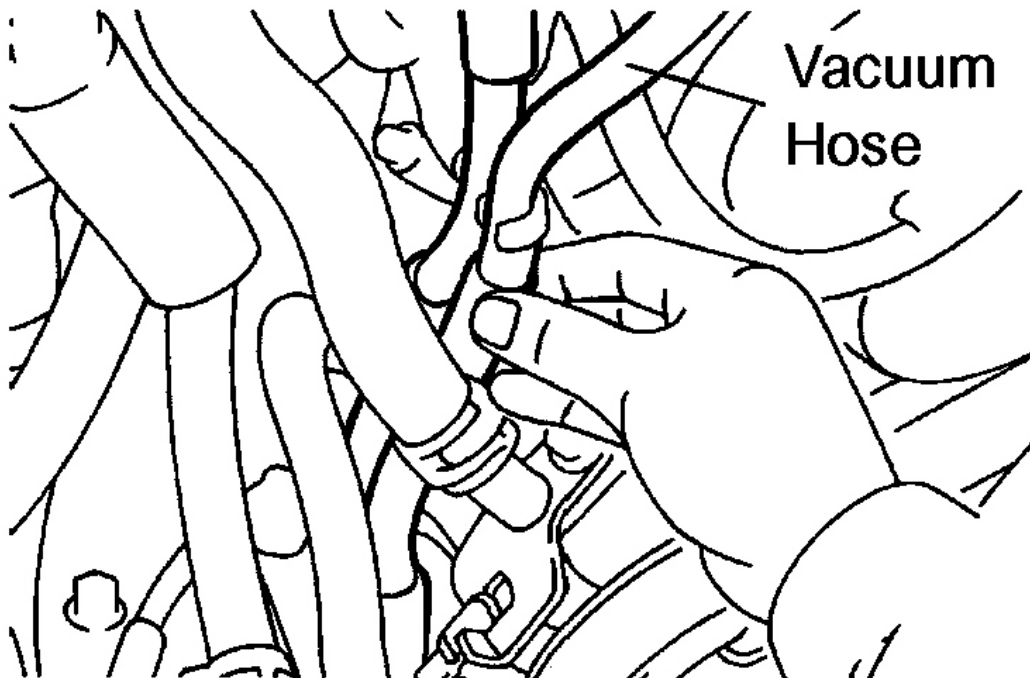
Standard:

The engine speed increases.

If engine speed does not change as specified, check and repair or replace the air control valve and vacuum hoses.

If you replace the air control valve, tighten it to the specified torque.

Torque: 31.4 to 41.2 N.m (320 to 420 kgf.cm, 23 to 30 ft.lbf)



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Fig. 15: Checking Air Control Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. CHECK STEERING EFFORT

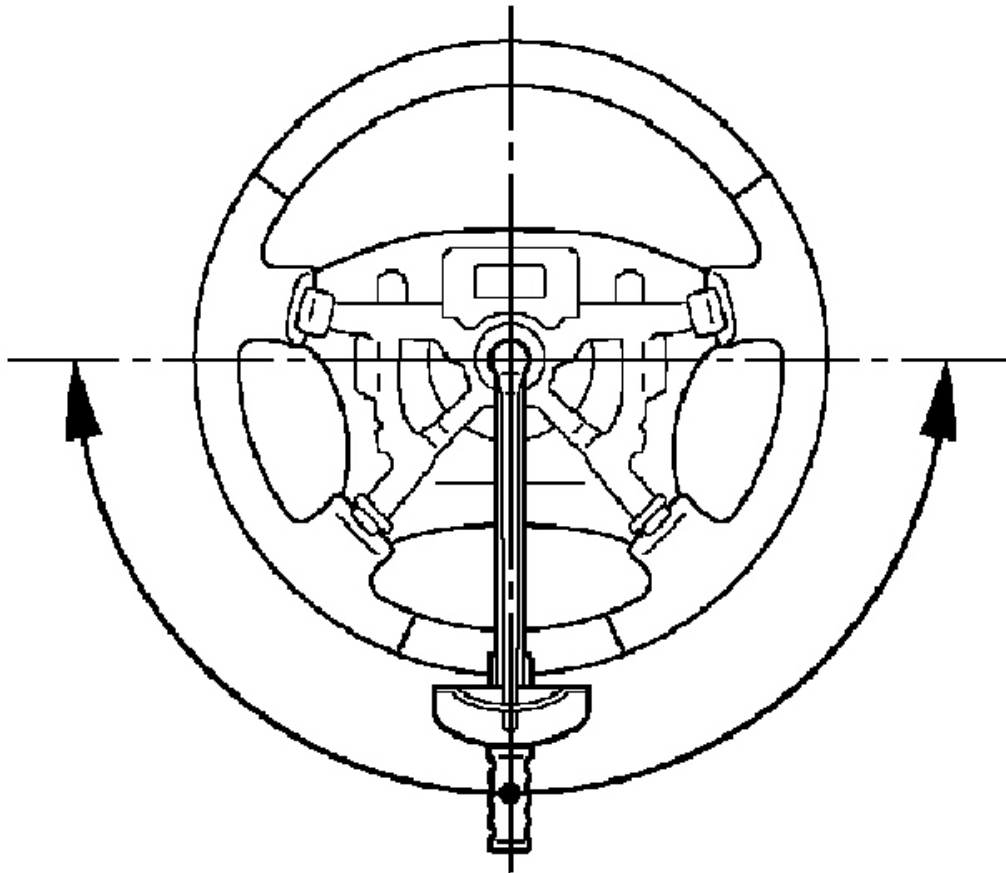
- a. Center the steering wheel.

- b. Remove the horn button assy (see step 5 in **REPLACEMENT**).
- c. Start the engine and run at idle.
- d. Measure the steering effort in both directions.

Steering effort (Reference): 6.9 N.m (70 kgf.cm, 61 in.lbf) or less

HINT:

Check tire type, pressure and road surface before making a diagnosis.

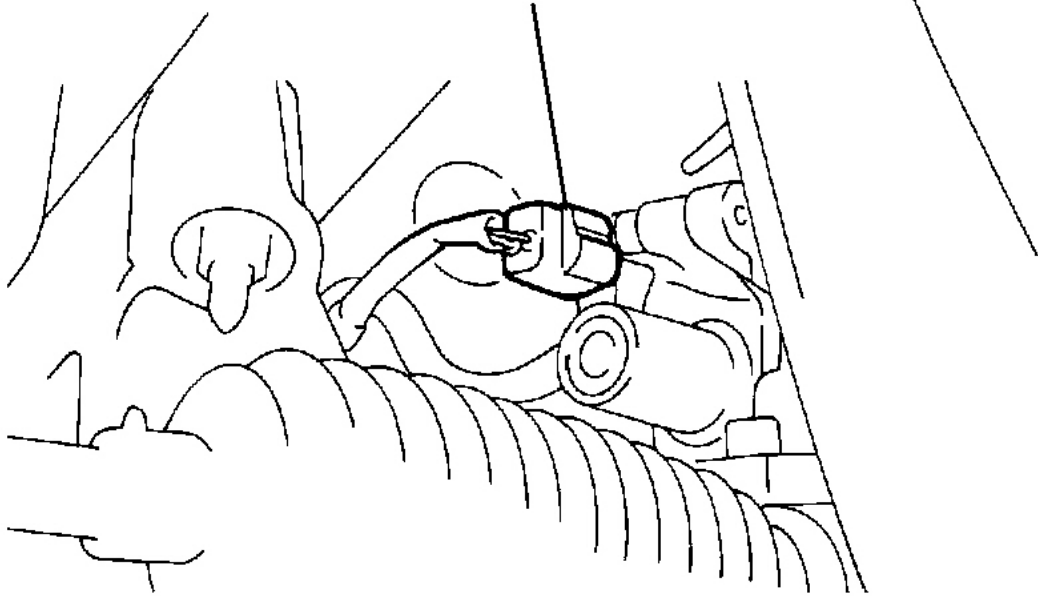


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Fig. 16: Measuring Steering Effort
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Disconnect the PPS solenoid connector.

PPS Solenoid Connector



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Fig. 17: Disconnecting PPS Solenoid Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Measure steering effort in both directions.

Standard:

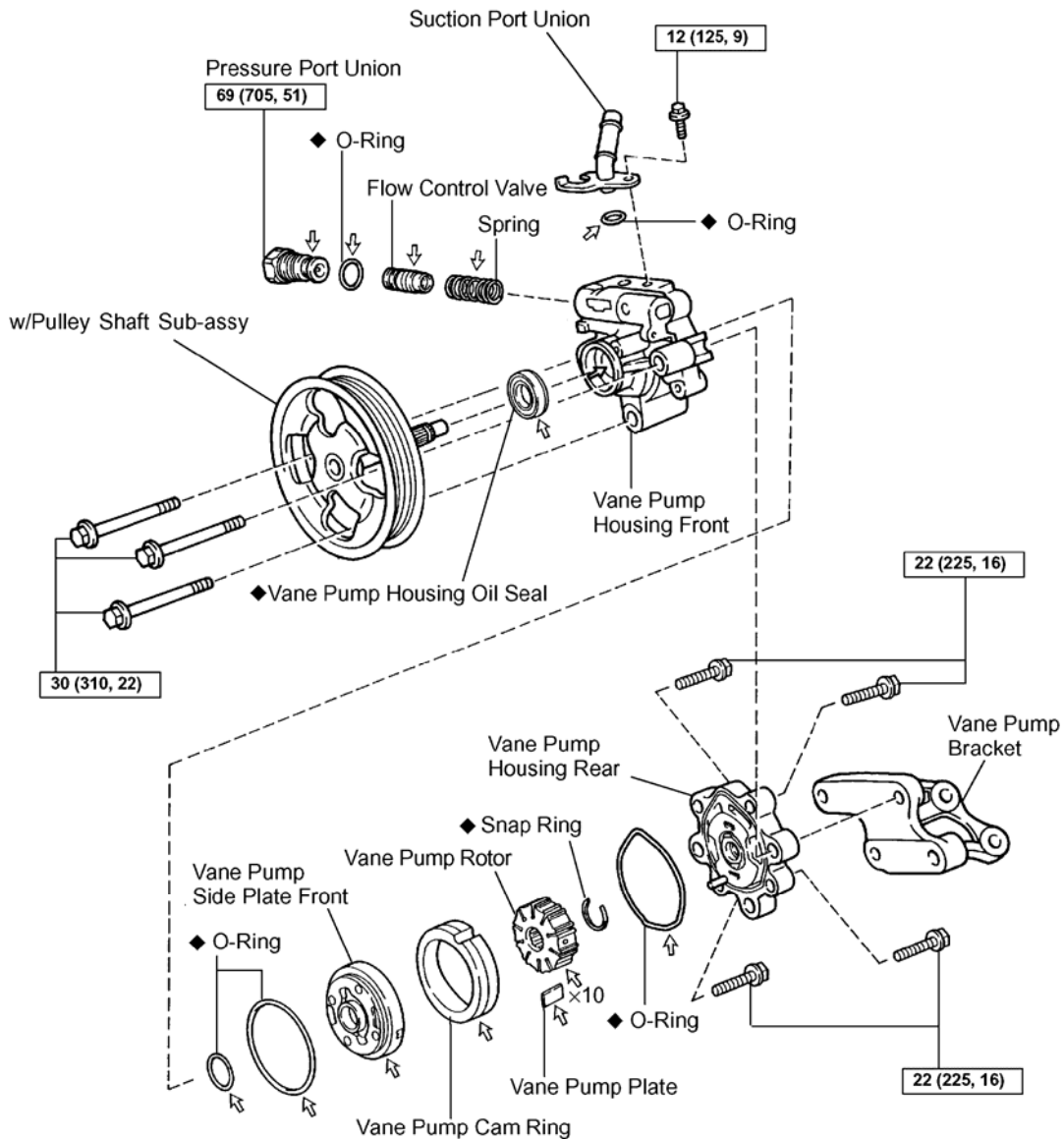
Steering effort is heavier than the reference values in procedure (d), and that the power assist is operating.

If steering effort is not as specified, check the PPS solenoid valve (see **PPS LINEAR SOLENOID CIRCUIT**).

- g. Connect the PPS solenoid connector.
- h. Check that the steering wheel assy set nut is tightened.
Torque: 50 N.m (510 kgf.cm, 37 ft.lbf)
- i. Install the horn button (see step 6 in **REPLACEMENT**).

VANE PUMP ASSY

COMPONENTS



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

◆ Non-reusable part

↔ Power steering fluid

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Fig. 18: Exploded View Of Vane Pump Assy Components (With Torque Specifications)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OVERHAUL

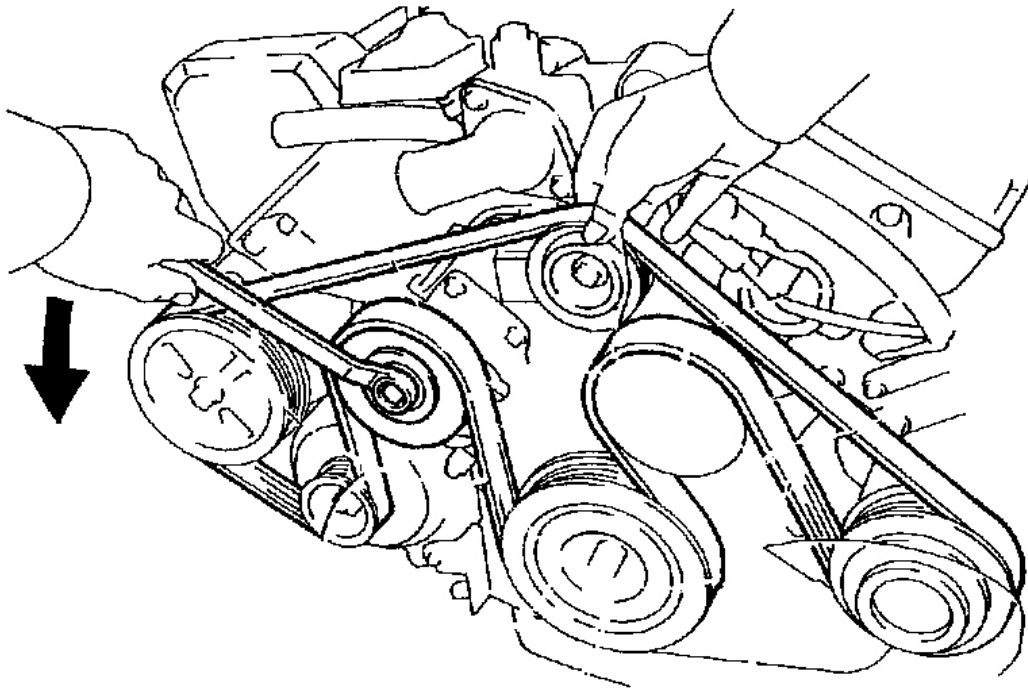
- NOTE:**
- Do not overtighten when using a vice.
 - When installing the parts indicated by arrows, coat them with power

steering fluid (see COMPONENTS).

1. **REMOVE ENGINE UNDER COVER NO. 1 (See COMPONENTS)**
2. **DRAIN POWER STEERING FLUID**
3. **REMOVE AIR CLEANER INLET NO. 1**
 - a. Remove the 2 bolts and the air cleaner inlet No. 1.
4. **DISCONNECT INTAKE AIR CONNECTOR PIPE**
 - a. Loosen the throttle body side clamp.
 - b. Disconnect the intake air connector pipe from the throttle body.
5. **REMOVE AIR CLEANER ASSY**
 - a. Disconnect the air flow meter connector from the air cleaner.
 - b. Remove the 2 bolts and air cleaner with the intake air connector pipe.
6. **REMOVE FAN AND GENERATOR V BELT**
 - a. Put a wrench on the drive belt tensioner set bolt.
 - b. Turn the drive belt tensioner set bolt counterclockwise and hold it.

NOTE:

- **The drive belt tensioner set bolt is a left-hand screw.**
 - **The drive belt tensioner set bolt comes loose when turning it clockwise.**
- c. Remove the fan and generator V belt.
 - d. Release the drive belt tensioner.

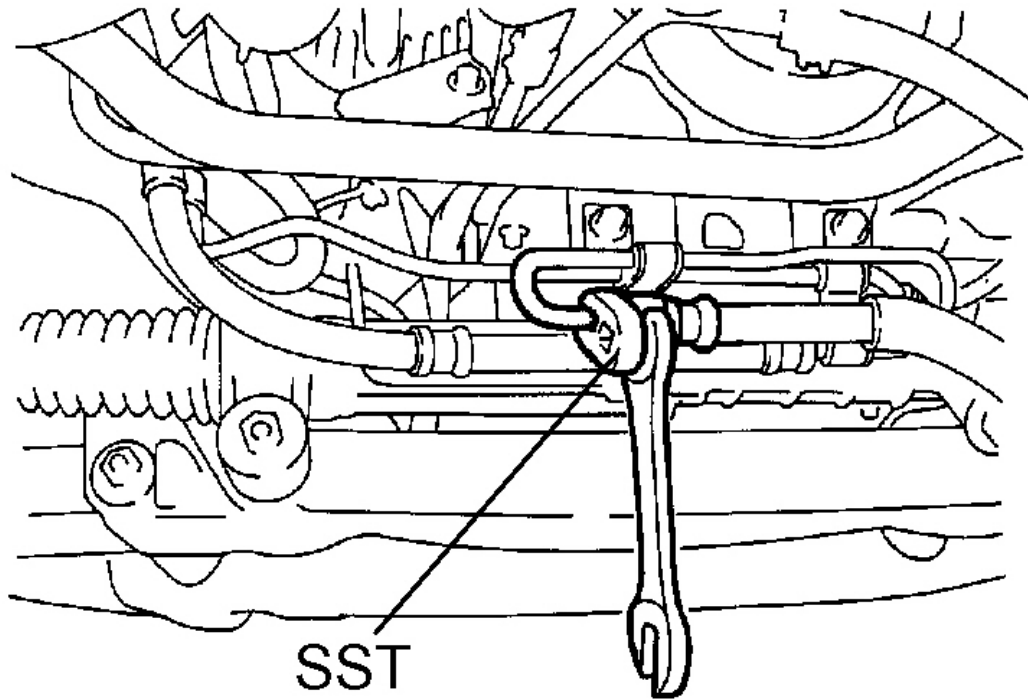


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Fig. 19: Removing Fan And Generator V Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **DISCONNECT OIL RESERVOIR TO VANE PUMP HOSE**
 - a. Using pliers, disengage the vane pump side hose clip and slide it.
 - b. Disconnect the oil reservoir to vane pump hose from the vane pump.
8. **DISCONNECT PRESSURE FEED TUBE ASSY**
 - a. Remove the 3 bolts and 3 clamps.
 - b. Disconnect the vacuum hoses from the vacuum switch.
 - c. Using pliers, disengage the vacuum hose clips and slide them to disconnect the vacuum hoses.
 - d. Put a wrench on the pressure feed tube hose side to hold it.
 - e. Put SST on the flare nut as shown in **Fig. 20** .

SST 09023-12700



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Fig. 20: Putting SST On Flare Nut

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Joint a spinner handle to the SST.

HINT:

Use an extension bar or universal joint according to the situation.

- g. Loosen and disconnect the pressure feed tube.

9. REMOVE VANE PUMP ASSY

- a. Remove the nut and 2 bolts.
- b. Remove the vane pump assy with the pressure feed tube.

10. REMOVE PRESSURE FEED TUBE ASSY

- a. Remove the union bolt and gasket.
- b. Remove the pressure feed tube from the vane pump.

11. REMOVE VANE PUMP BRACKET

- a. Remove the 3 bolts and the vane pump bracket from the vane pump.

12. **FIX VANE PUMP ASSY**

- a. Using SST, hold the vane pump in a vice.
SST 09630-00014 (09631-00132)

HINT:

Detach SST according to the situation.

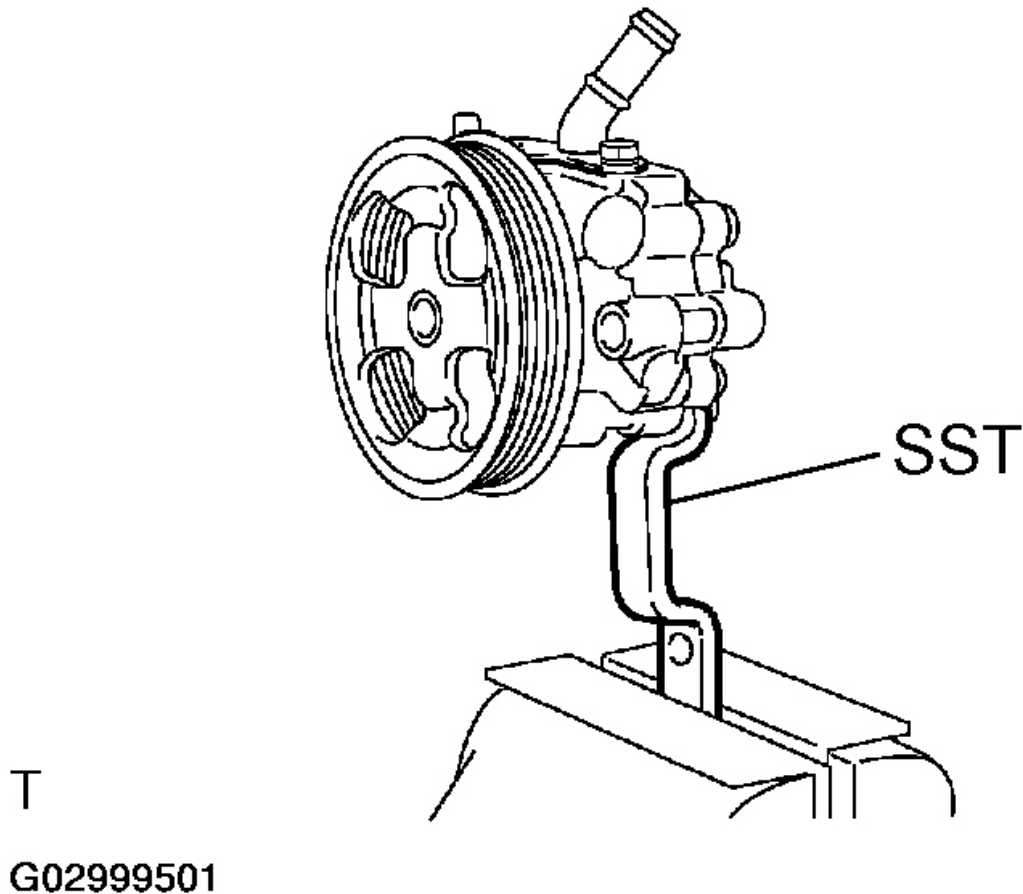


Fig. 21: Fixing Vane Pump Assy

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **REMOVE POWER STEERING SUCTION PORT UNION**

- a. Remove the bolt and the suction port union from the vane pump housing front.
- b. Using a small screwdriver, remove the O-ring from the suction port union.

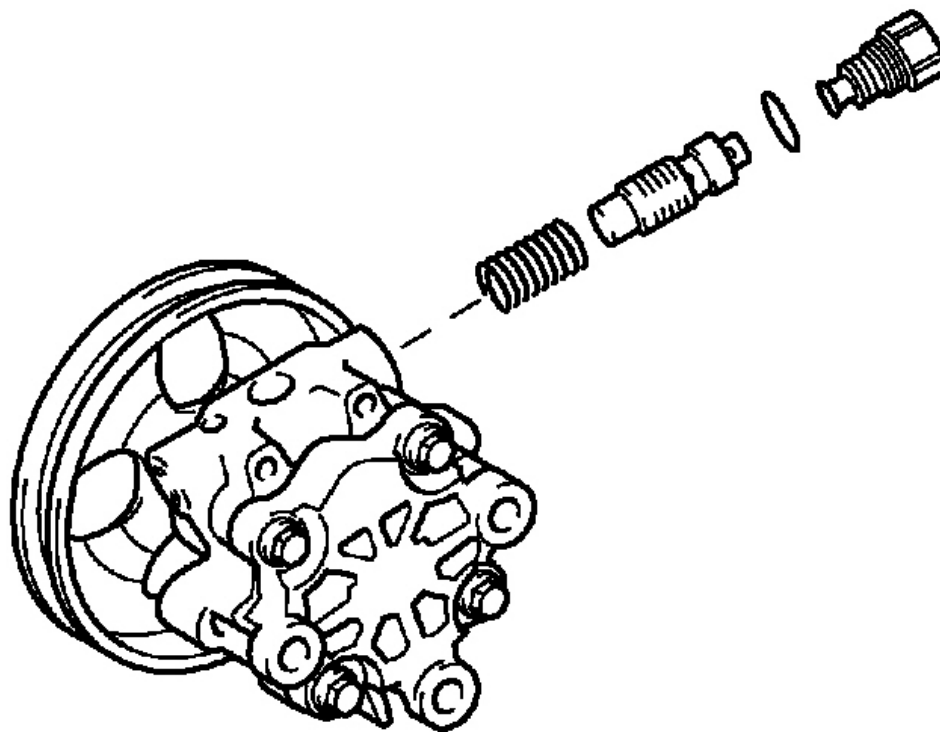
NOTE: Be careful not to damage the suction port union.

14. **REMOVE FLOW CONTROL VALVE**

- a. Using a socket wrench (27 mm), remove the pressure port union.
- b. Using a small screwdriver, remove the O-ring from the pressure port union.

NOTE: Be careful not to damage the pressure port union.

- c. Remove the flow control valve and spring.



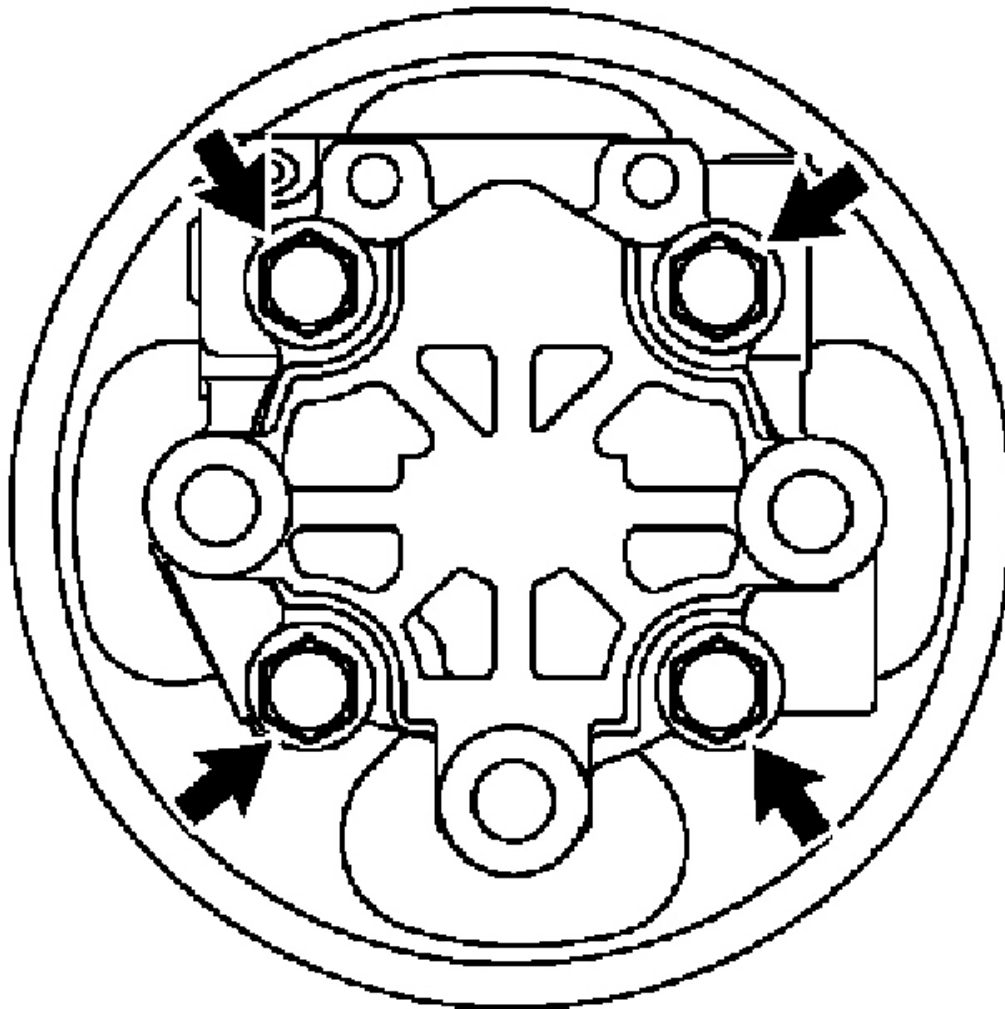
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Fig. 22: Removing Flow Control Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **REMOVE VANE PUMP HOUSING REAR**

- a. Remove the 4 bolts and the vane pump housing rear from the vane pump housing front.
- b. Remove the O-ring from the vane pump housing rear.



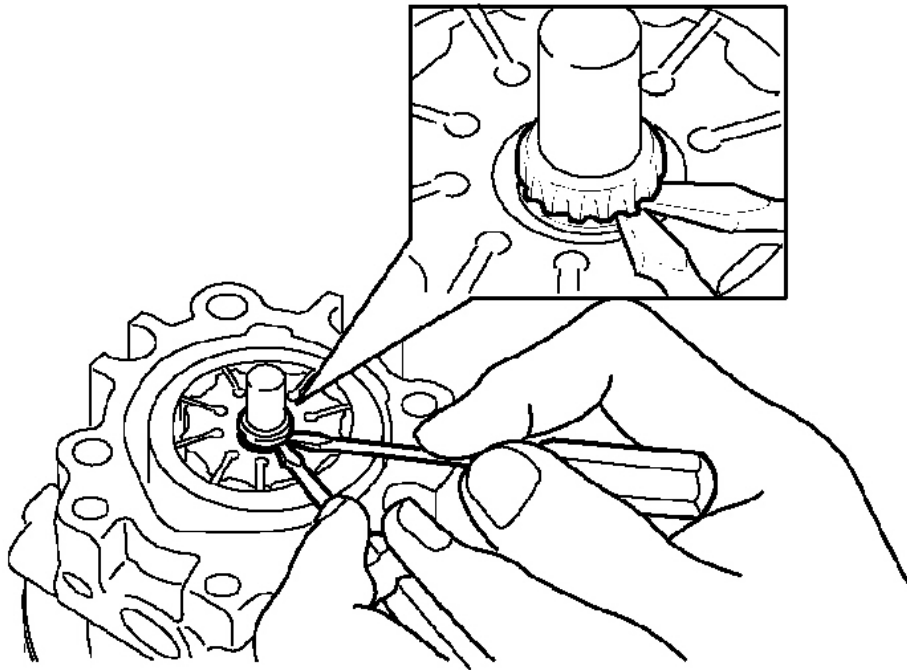
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Fig. 23: Removing Vane Pump Housing Rear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. REMOVE W/PULLEY SHAFT SUB-ASSY

- a. Using 2 small screwdrivers, remove the snap ring from the w/pulley shaft.
- b. Remove the w/pulley shaft from the vane pump housing front.

NOTE: If you remove the w/pulley shaft sub-assy, replace the vane pump housing oil seal.



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Fig. 24: Removing W/Pulley Shaft Sub-Assy
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

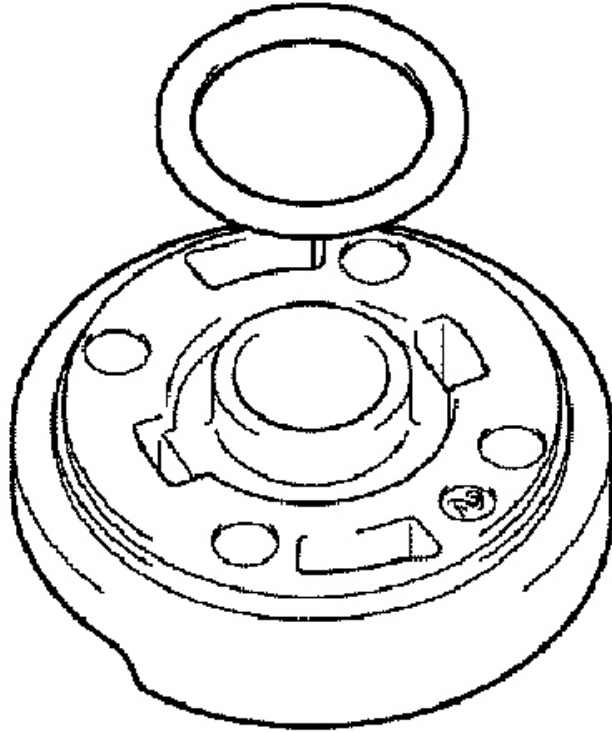
17. REMOVE VANE PUMP ROTOR

- a. Remove the 10 vane pump plates.
- b. Remove the vane pump rotor.

18. REMOVE VANE PUMP CAM RING

19. REMOVE VANE PUMP SIDE PLATE FRONT

- a. Remove the vane pump side plate front from the vane pump housing front.
- b. Remove the O-ring from the vane pump side plate front.

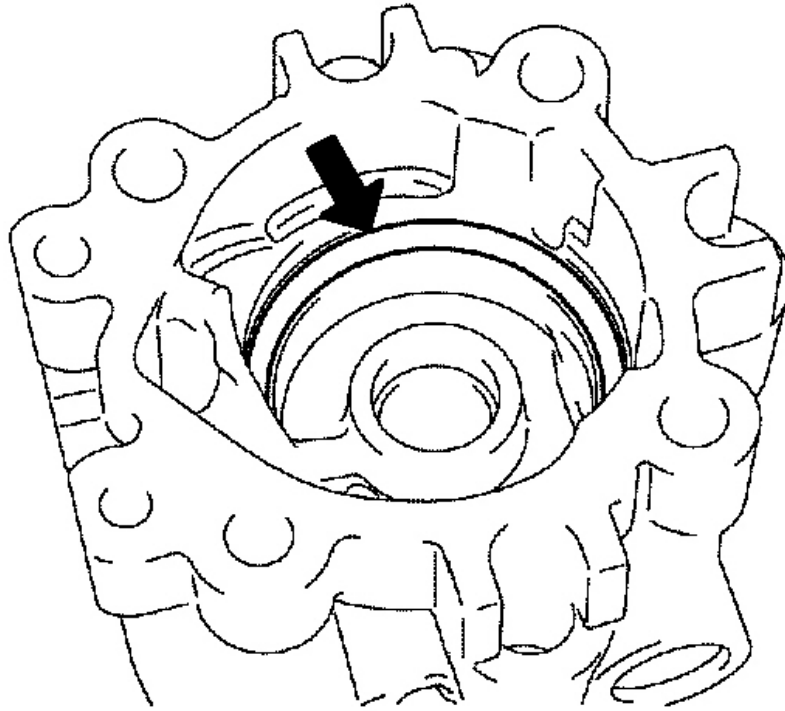


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Fig. 25: Removing O-Ring From Vane Pump Side Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the O-ring from the vane pump housing front.



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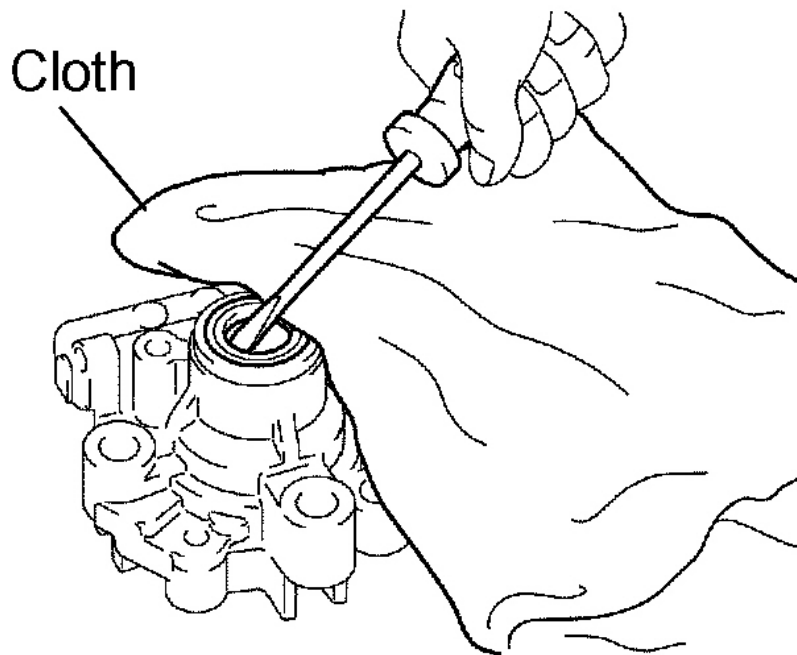
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Fig. 26: Removing O-Ring From Vane Pump Housing Front
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **REMOVE VANE PUMP HOUSING OIL SEAL**

- a. Using a screwdriver and shop rag, remove the vane pump housing oil seal from the vane pump housing front.

NOTE: **Be careful not to damage the vane pump housing front.**



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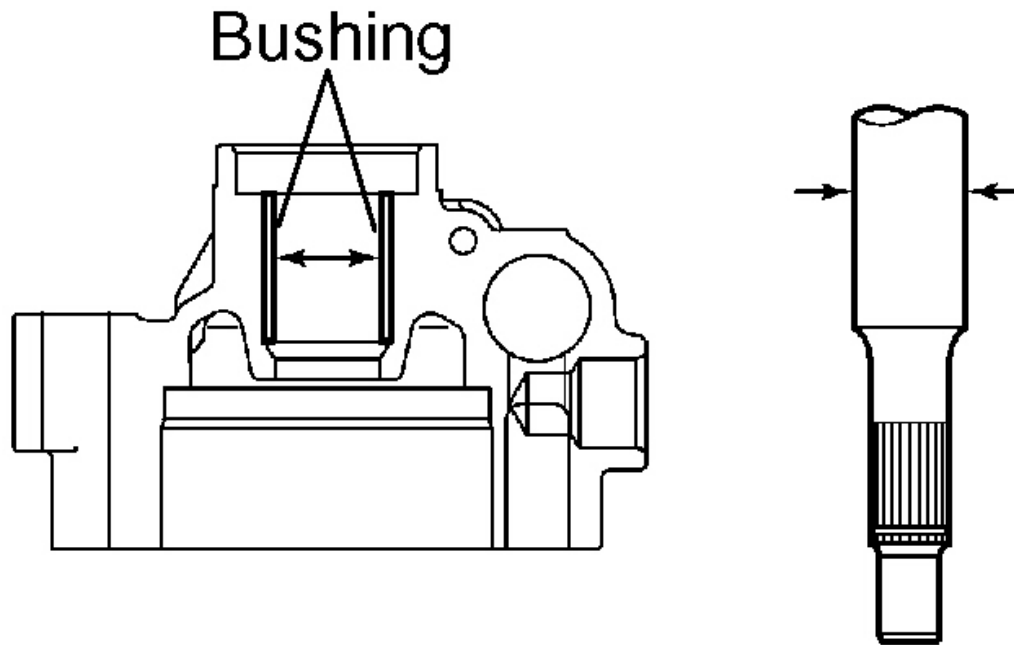
Fig. 27: Removing Vane Pump Housing Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. INSPECT VANE PUMP SHAFT AND BUSH IN HOUSING FRONT

- a. Using a micrometer and a vernier calipers, measure the oil clearance.

Standard clearance: Less than 0.07 mm (0.0028 in.)

If the bushing or shaft is damaged, replace the vane pump. If the oil clearance exceeds the standard, replace the vane pump.



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Fig. 28: Inspecting Vane Pump Shaft And Bush In Housing Front
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

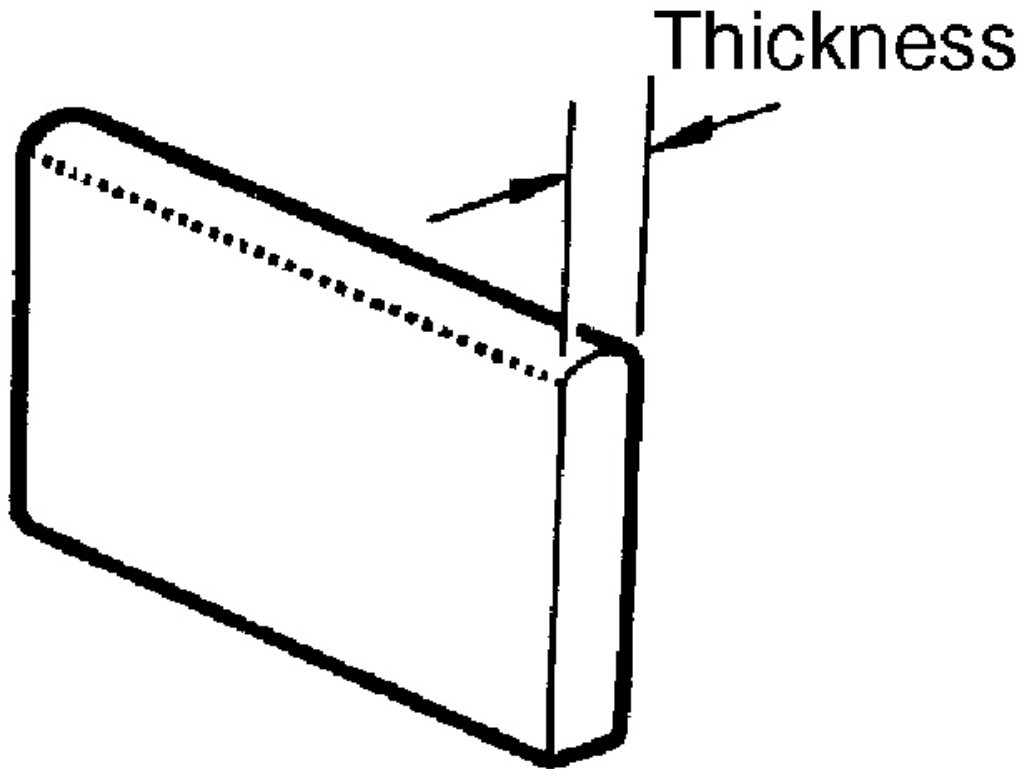
22. INSPECT VANE PUMP ROTOR AND VANE PUMP PLATE

- a. Using a micrometer, measure the thickness of the vane pump plates.

Standard thickness:

1.405 to 1.411 mm (0.05531 to 0.05555 in.)

If the thickness is less than the standard, replace the vane pump.



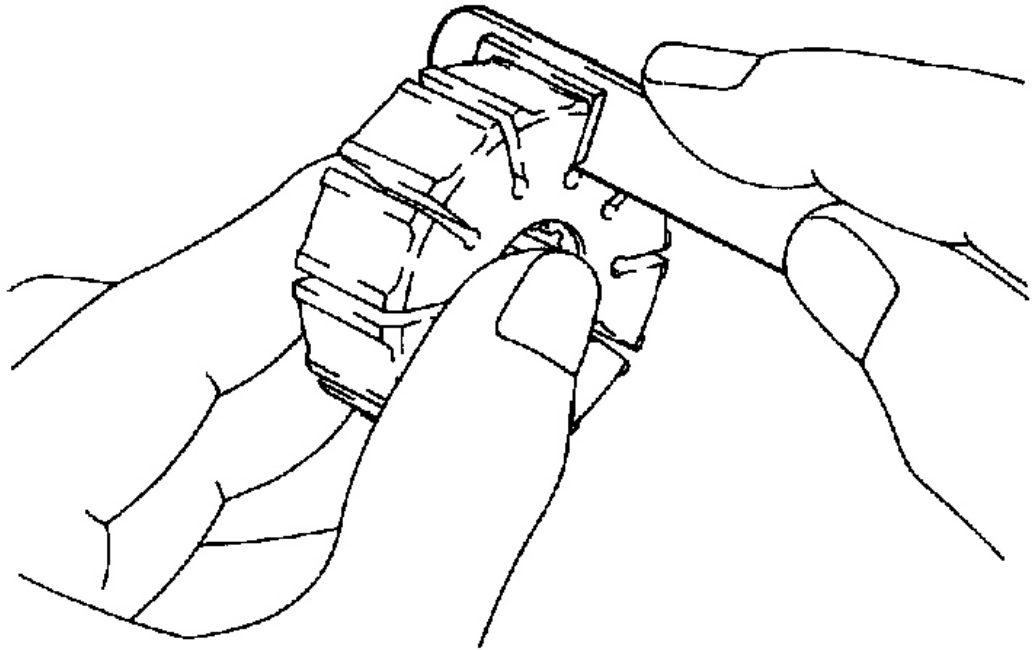
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Fig. 29: Measuring Thickness Of Vane Pump Plates
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a feeler gauge, measure the clearance between a side face of the vane pump rotor groove and the vane pump plate.

Standard clearance: Less than 0.03 mm (0.0012 in.)

If the clearance exceeds the standard, replace the vane pump.



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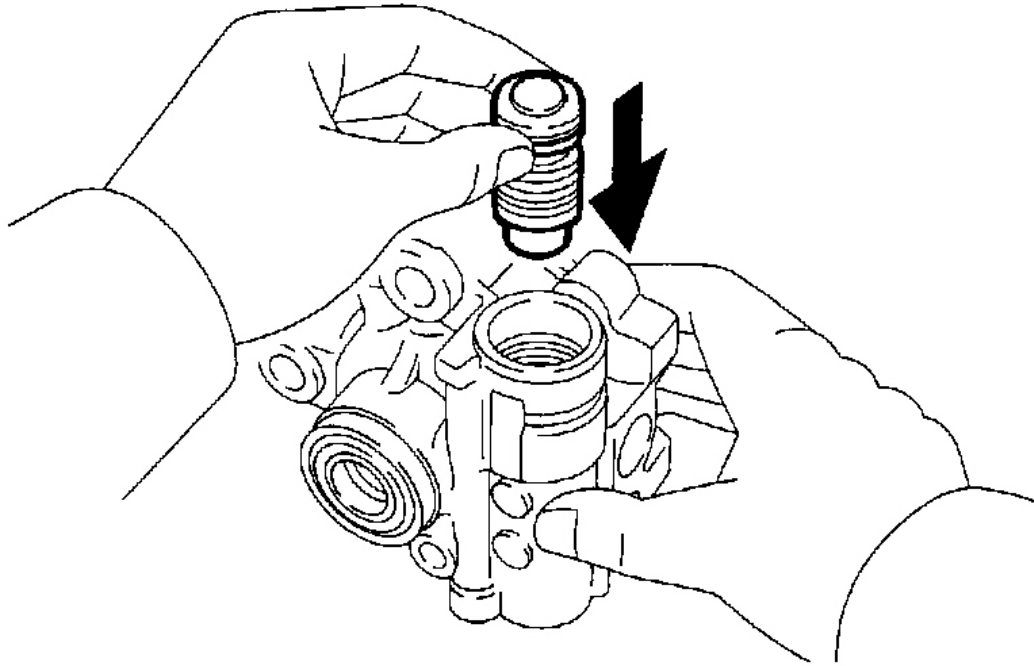
Fig. 30: Measuring Clearance Between Vane Pump Rotor Groove And Vane Pump Plate

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. INSPECT FLOW CONTROL VALVE

- a. Coat the flow control valve with power steering fluid and check that it falls smoothly into the flow control valve hole under its own weight.

If it is not smooth, replace the vane pump.



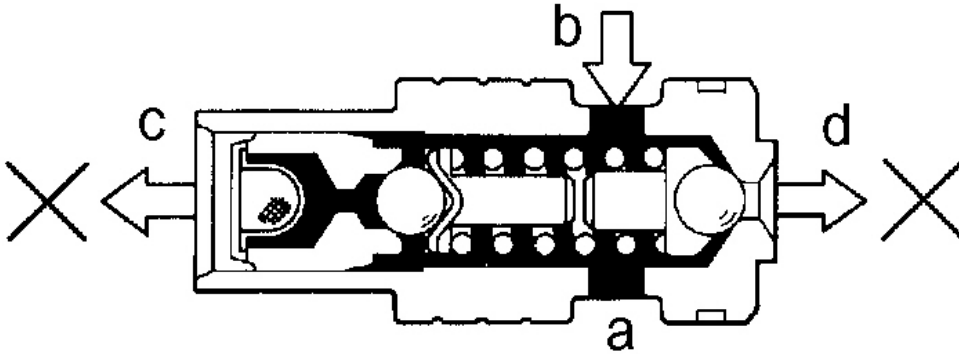
G02999511

Fig. 31: Checking Flow Control Valve Falls Smoothly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check the flow control valve for leakage. Close hole `a', apply compressed air into hole `b', and confirm that air does not come out from holes `c' and `d'.

If air leaks from holes `c' and `d', replace the vane pump.

Compressed Air
0.39 to 0.49 MPa
{4 to 5 kgf·cm², 57 to 71 psi}



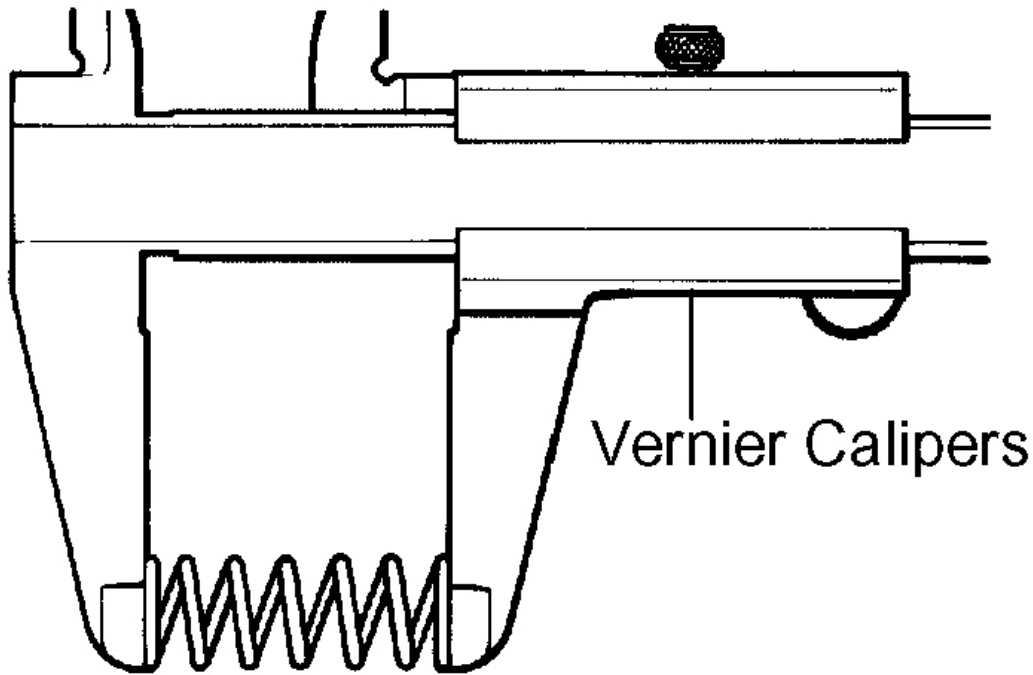
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Fig. 32: Checking Flow Control Valve For Leakage
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **INSPECT FLOW CONTROL VALVE COMPRESSION SPRING**

- a. Using vernier calipers, measure the free length of the compression spring.
Minimum free length: 30.3 mm (1.193 in.)

If the free length is less than the minimum, replace the vane pump.



G02999513

Fig. 33: Measuring Free Length Of Compression Spring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. INSPECT PRESSURE PORT UNION

If the union seat in the pressure port union is severely damaged, it may cause fluid leakage. In that case, replace the vane pump.

26. INSTALL VANE PUMP HOUSING OIL SEAL

- a. Apply power steering fluid to the new vane pump housing oil seal lip.
- b. Using SST and a press, install the vane pump housing oil seal.

SST 09950-60010 (09951-00280), 09950-70010 (09951-07100)

NOTE: Be careful not to damage the vane pump housing oil seal. And do not install the vane pump housing oil seal in reverse.

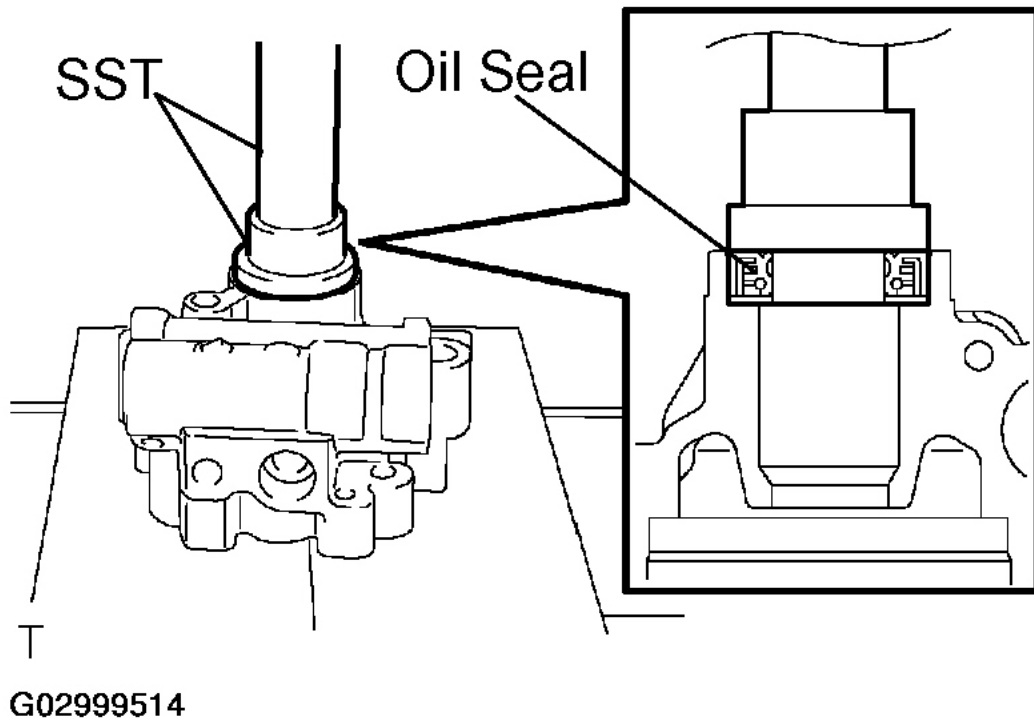


Fig. 34: Installing Vane Pump Housing Oil Seal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. INSTALL W/PULLEY SHAFT SUB-ASSY

- a. Coat the bushing surface of the vane pump housing front with power steering fluid.
- b. Gradually insert the w/pulley shaft.

NOTE: Be careful not to damage the vane pump housing oil seal lip.

HINT:

Wrap the shaft surface with vinyl tape before inserting.

NOTE: After installing the w/pulley shaft sub-assy, make sure that the vane pump housing oil seal lip is not damaged.

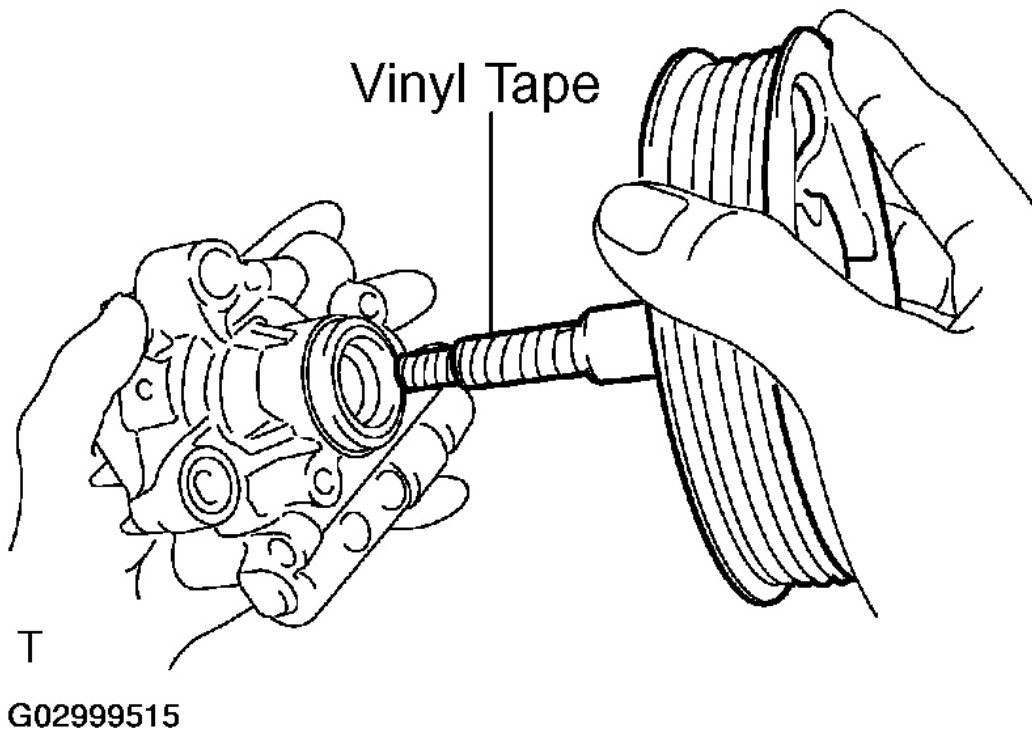
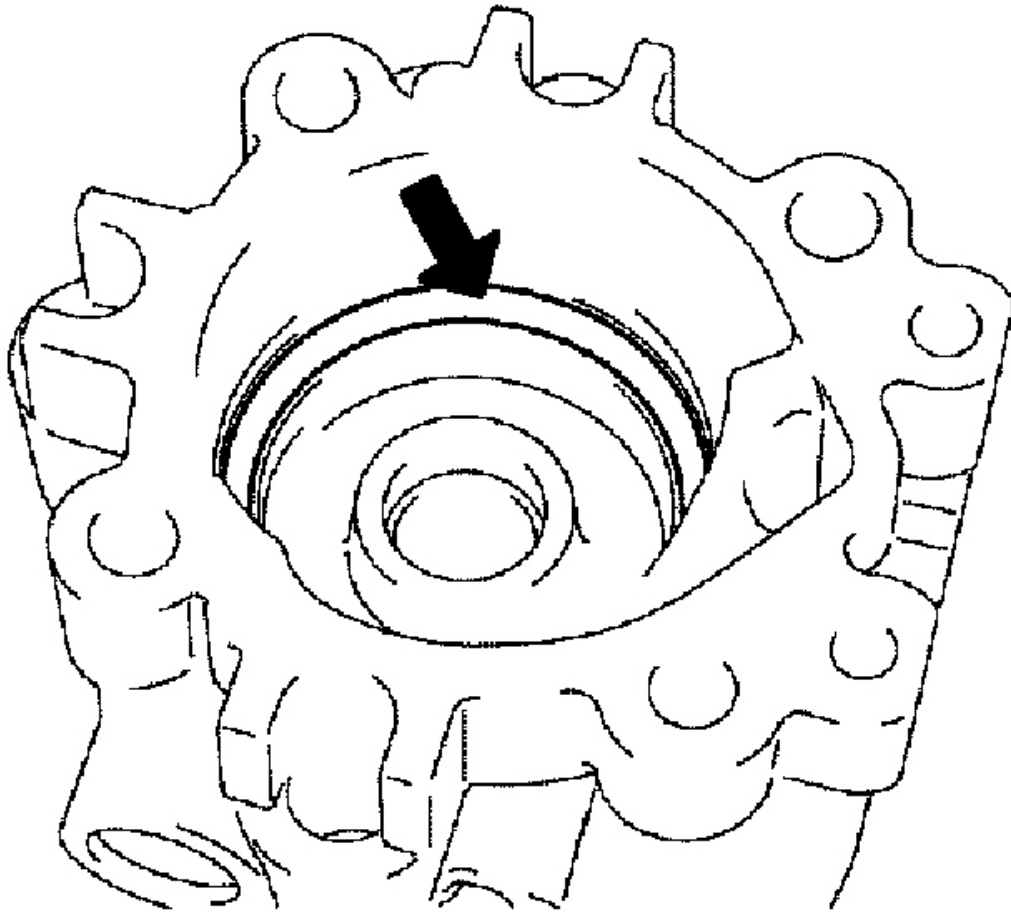


Fig. 35: Installing W/Pulley Shaft Sub-Assy
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. INSTALL VANE PUMP SIDE PLATE FRONT

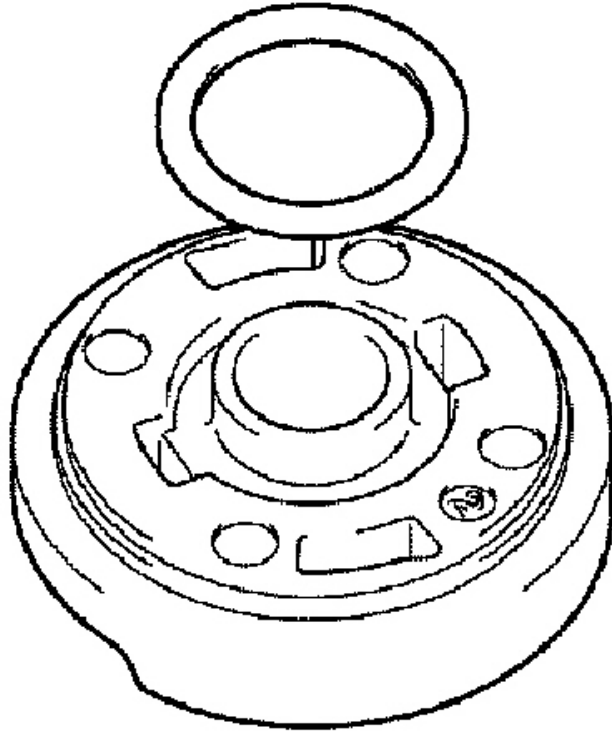
- a. Coat a new O-ring (bigger one) with power steering fluid and install it to the vane pump housing front.



G02999516

Fig. 36: Coating O-Ring With Power Steering Fluid (Bigger One)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat a new O-ring (smaller one) with power steering fluid and install it to the vane pump side plate front.



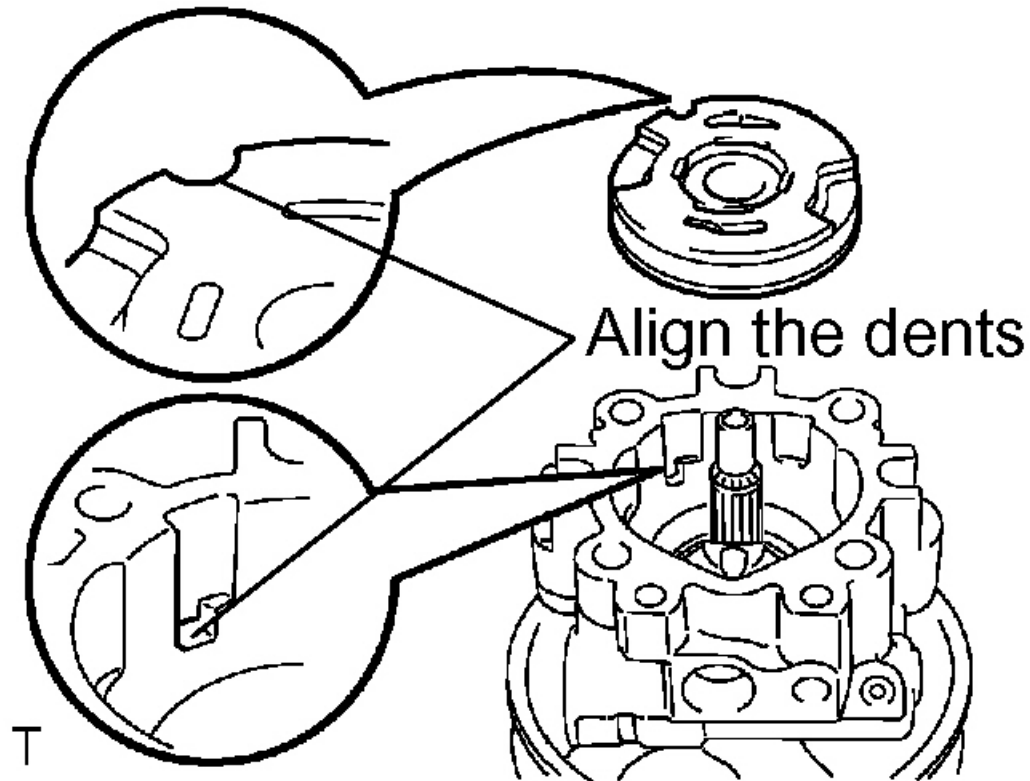
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Fig. 37: Coating O-Ring With Power Steering Fluid (Smaller One)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Align the dent of the vane pump side plate front with that of the vane pump housing front to install.

NOTE: **Make sure that the vane pump side plate front is installed in the correct direction.**



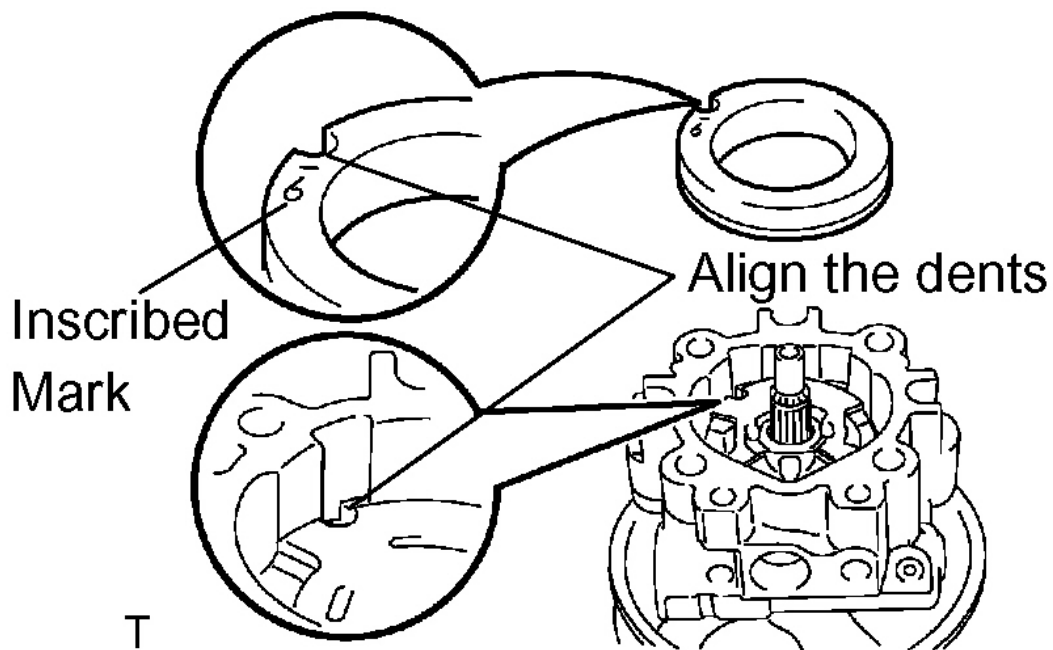
G02999518

Fig. 38: Aligning Dent Of Vane Pump Side Plate Front With Vane Pump Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **INSTALL VANE PUMP CAM RING**

- a. Align the dent of the vane pump cam ring with that of the vane pump side plate front, and install the vane pump cam ring with the inscribed mark facing upward (the vane pump housing rear side).

NOTE: Make sure that the vane pump cam ring is installed in the correct direction.



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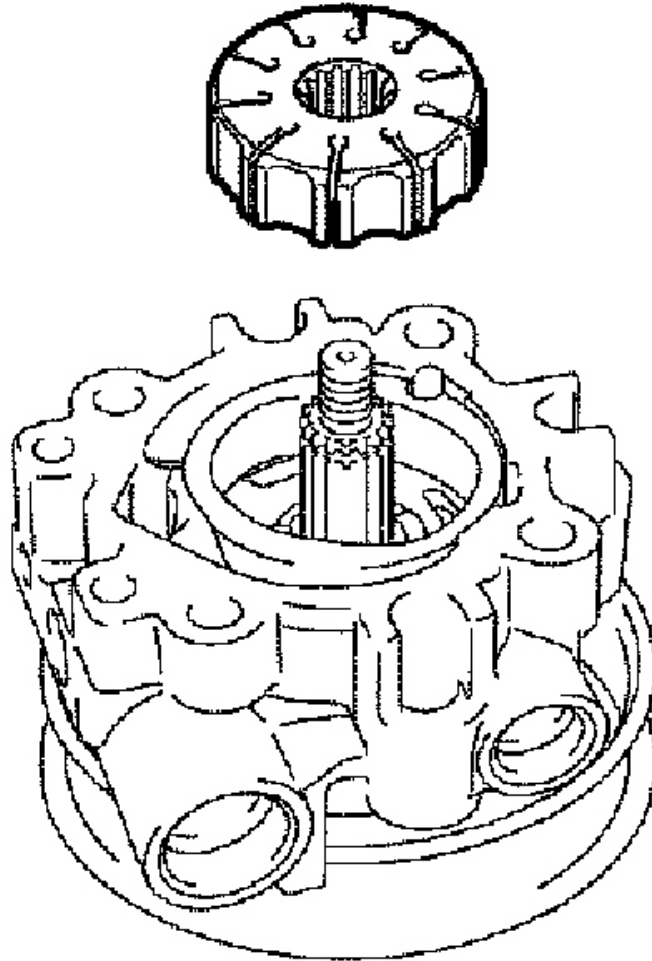
Fig. 39: Installing Vane Pump Cam Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. **INSTALL VANE PUMP ROTOR**

- a. Install the vane pump rotor.

HINT:

The vane pump rotor has no specific direction.



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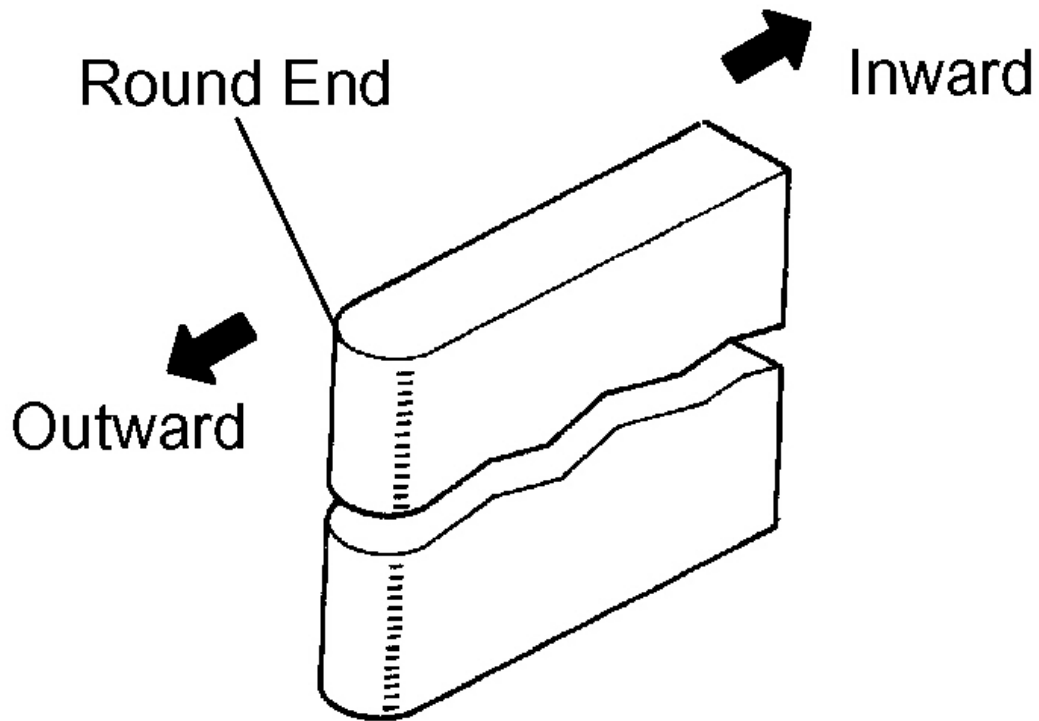
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Fig. 40: Installing Vane Pump Rotor

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat the 10 vane pump plates with power steering fluid.
- c. Install the vane pump plates.

NOTE: **make sure the round ends of the vane pump are facing outward.**



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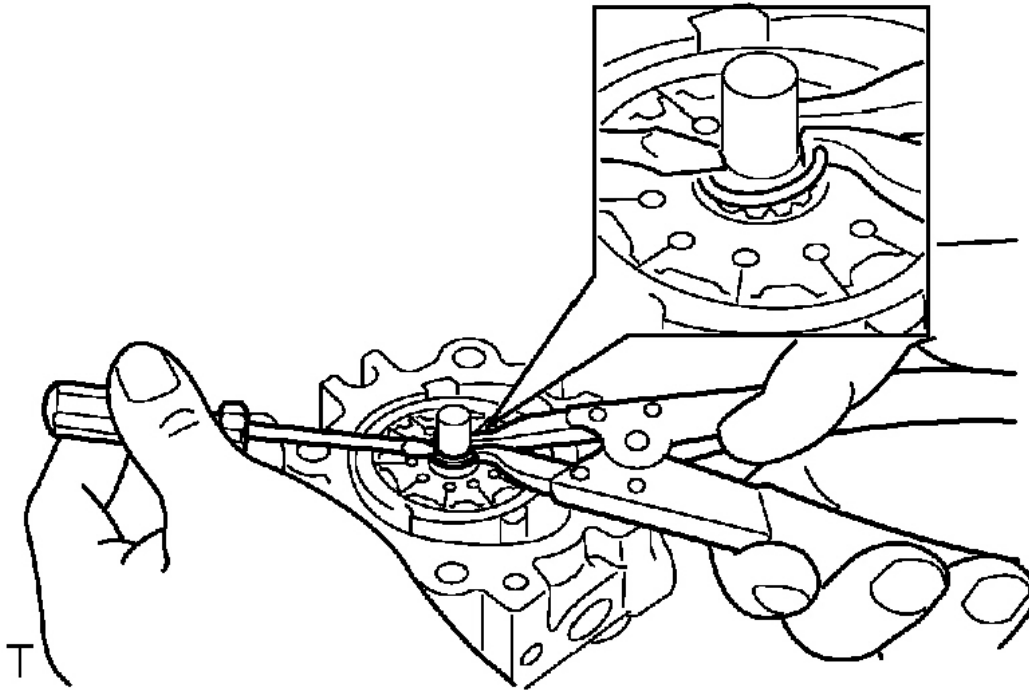
Fig. 41: Installing Vane Pump Plates
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. INSTALL VANE PUMP SHAFT SNAP RING

- a. Using a small screwdriver and a snap ring expander, install a new snap ring to the w/pulley shaft.

NOTE:

- Do not overly expand the snap ring.
- Do not damage the vane pump rotor and w/pulley shaft.
- Make sure that the snap ring fits in the w/pulley shaft groove.



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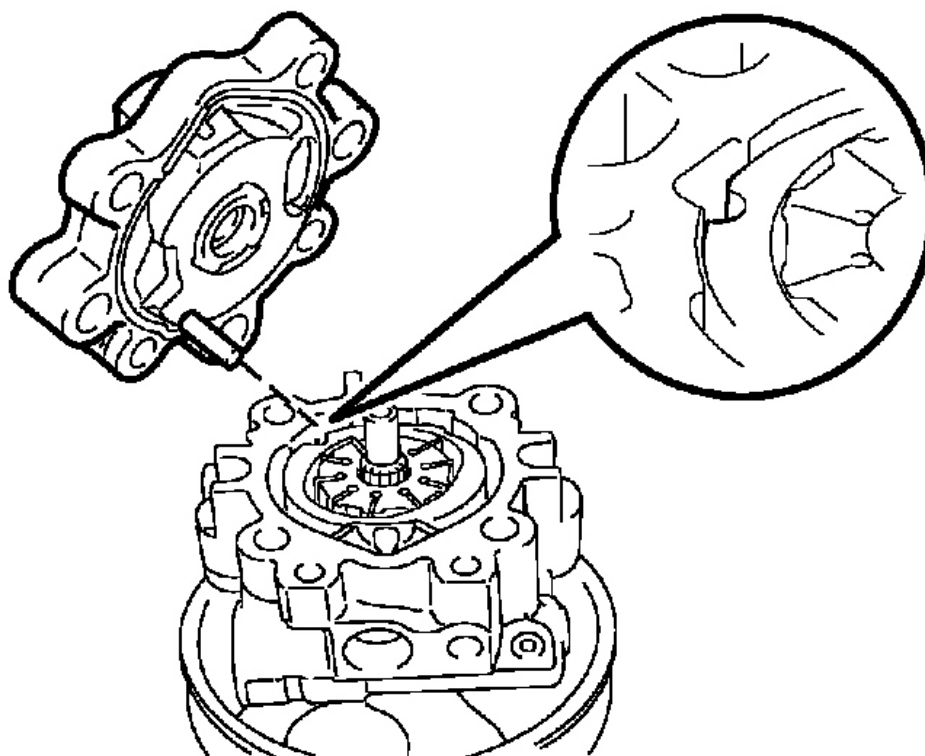
Fig. 42: Installing Vane Pump Shaft Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. INSTALL VANE PUMP HOUSING REAR

- a. Coat a new O-ring with power steering fluid and install it to the vane pump housing rear.
- b. Align the straight pin of the vane pump housing rear with the dents of the vane pump cam ring and vane pump side plate front.
- c. Install the vane pump housing rear to the vane pump housing front.
- d. Tighten the 4 bolts.

Torque: 22 N.m (225 kgf.cm, 16 ft.lbf)

NOTE: Check that the O-ring is in the correct position before tightening the 4 bolts.



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Fig. 43: Installing Vane Pump Housing Rear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. INSPECT PRELOAD

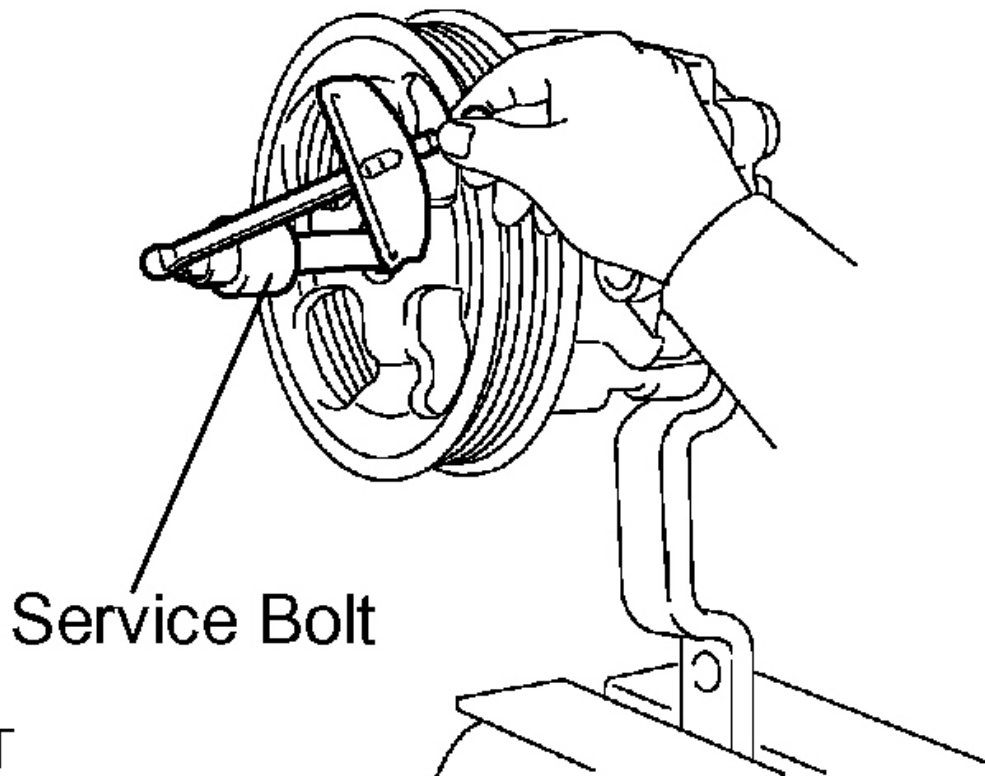
- a. Hold the vane pump assy in a vice.
- b. Check that the pump rotates smoothly without abnormal noise.
- c. Temporarily install the service bolt.

Recommend service bolt: (91111-51050)

Thread diameter: 10 mm (0.39 in.)

Thread pitch: 1.25 mm (0.0492 in.)

Bolt length: 50 mm (1.97 in.)



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Fig. 44: Installing Service Bolt Temporarily
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

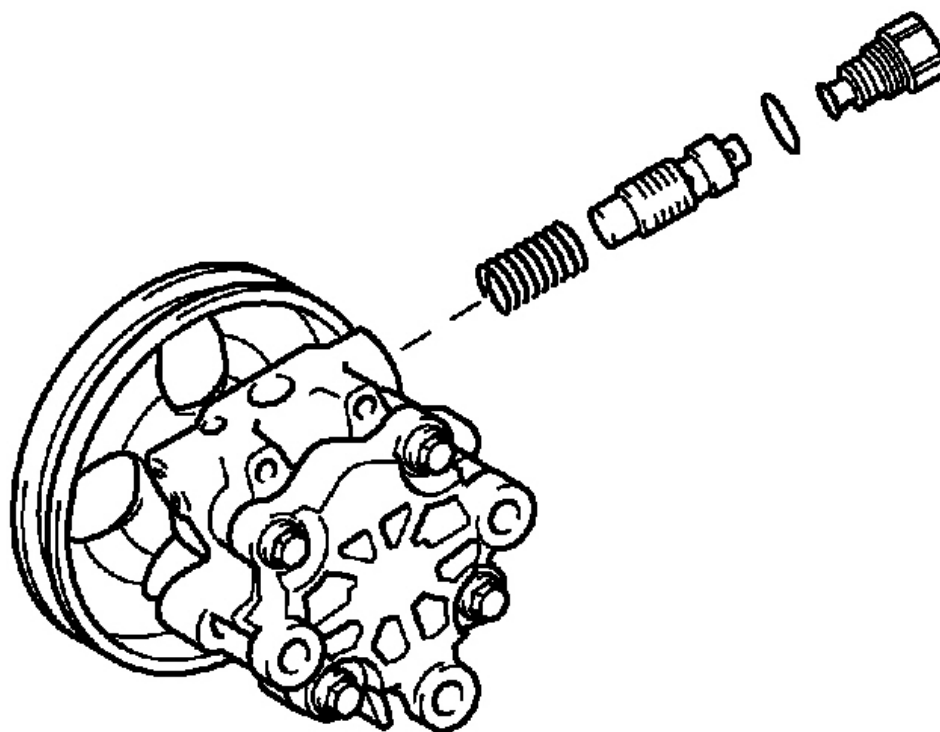
- d. Using a torque wrench, check the pump rotating torque.
Rotating torque: 0.27 N.m (2.8 kgf.cm, 2.4 in.lbf) or less

If the rotating torque is not as specified above, check installation of the vane pump housing oil seal.

34. **INSTALL FLOW CONTROL VALVE**

- a. Coat the spring and the flow control valve with power steering fluid.
- b. Install the spring and the flow control valve in the correct direction as shown in **Fig. 45** .
- c. Coat a new O-ring with power steering fluid and install it to the pressure port union.
- d. Install the pressure port union to the vane pump housing front.

Torque: 69 N.m (705 kgf.cm, 51 ft.lbf)



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Fig. 45: Installing Flow Control Valve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. INSTALL POWER STEERING SUCTION PORT UNION

- a. Coat a new O-ring with power steering fluid and install it to the suction port union.
- b. Install the suction port union with the bolt to the vane pump housing front.

Torque: 12 N.m (125 kgf.cm, 9 ft.lbf)

36. INSTALL VANE PUMP BRACKET

- a. Install the vane pump bracket with the 3 bolts.

Torque: 30 N.m (310 kgf.cm, 22 ft.lbf)

37. INSTALL PRESSURE FEED TUBE ASSY

Install the pressure feed tube and a new gasket to the vane pump with the union bolt.

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

HINT:

Make sure that the stopper of the pressure feed tube touches the vane pump housing front as shown in the illustration, then install the union bolt.

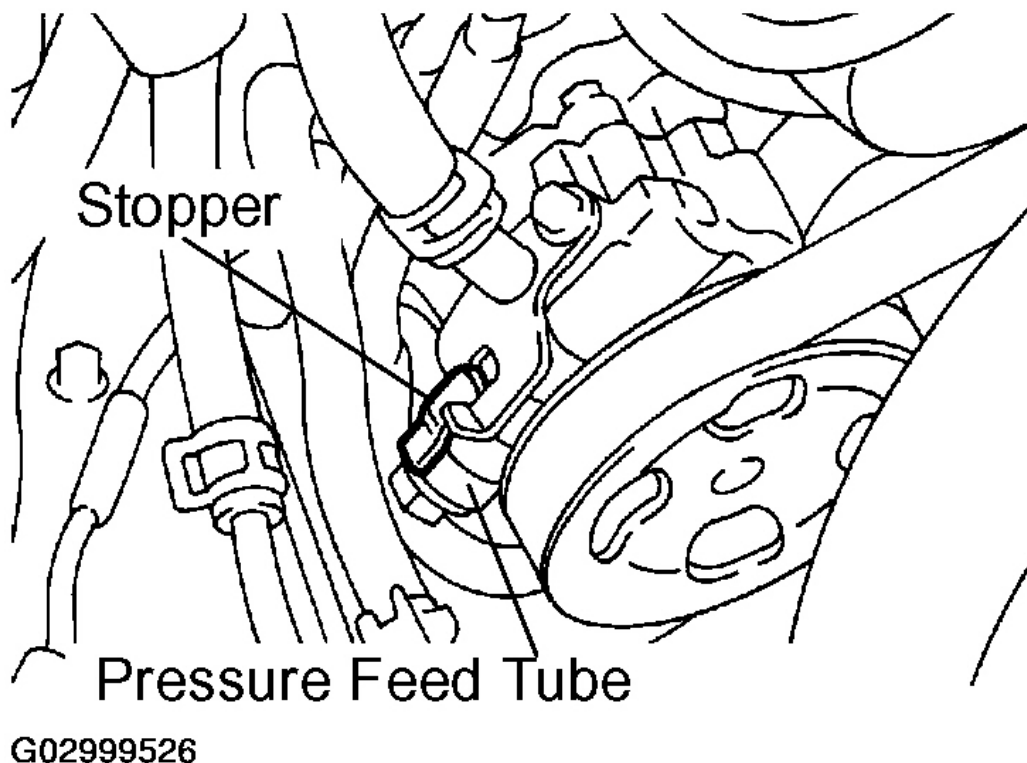


Fig. 46: Installing Pressure Feed Tube Assy
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. INSTALL VANE PUMP ASSY

- a. Install the vane pump together with the pressure feed tube assy with the nut and 2 bolts.

Torque:

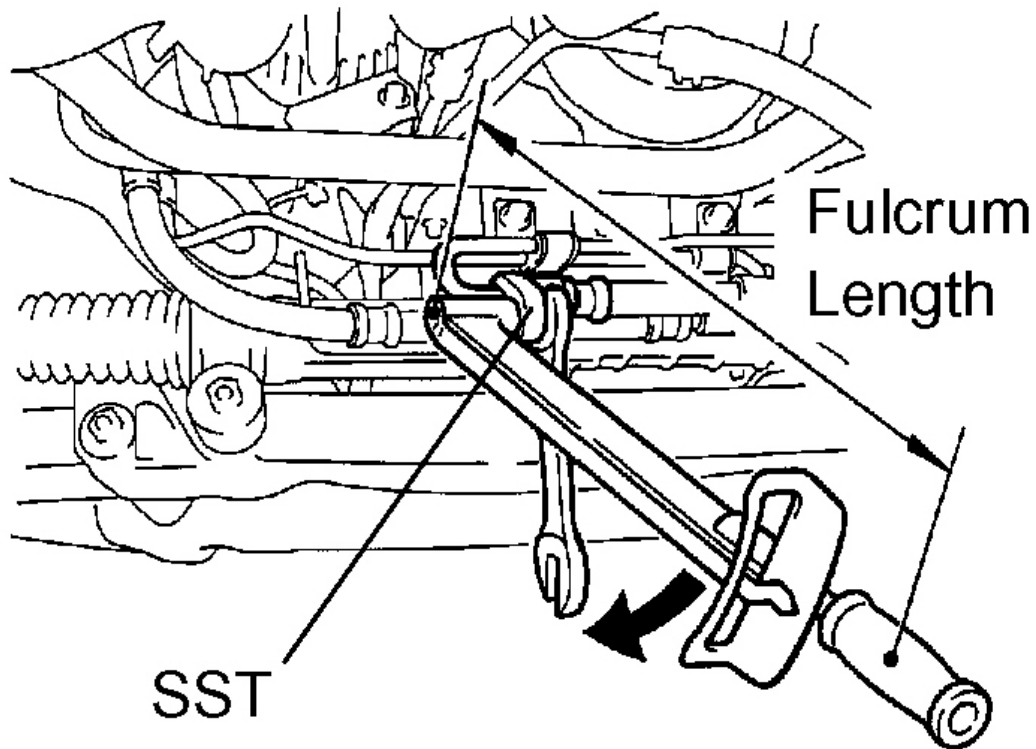
Nut: 43 N.m (440 kgf.cm, 32 ft.lbf)

Bolt: 39 N.m (400 kgf.cm, 29 ft.lbf)

39. CONNECT PRESSURE FEED TUBE ASSY

- a. Connect the pressure feed tube.
- b. Put a wrench on the pressure feed tube hose side to hold it.
- c. Put SST on the flare nut as shown in the illustration on the left.

SST 09023-12700



G02999527

Fig. 47: Putting SST On Flare Nut

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a torque wrench, tighten the flare nut.

Torque: 40 N.m (410 kgf.cm, 30 ft.lbf)

HINT:

- Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).
- This torque value is effective when SST is parallel to the torque wrench.

- e. Install the 3 clips and the 3 bolts.
 f. Connect the vacuum hoses to the vacuum switch.
 g. Using pliers, engage the vacuum hose clips.

40. CONNECT OIL RESERVOIR TO VANE PUMP HOSE

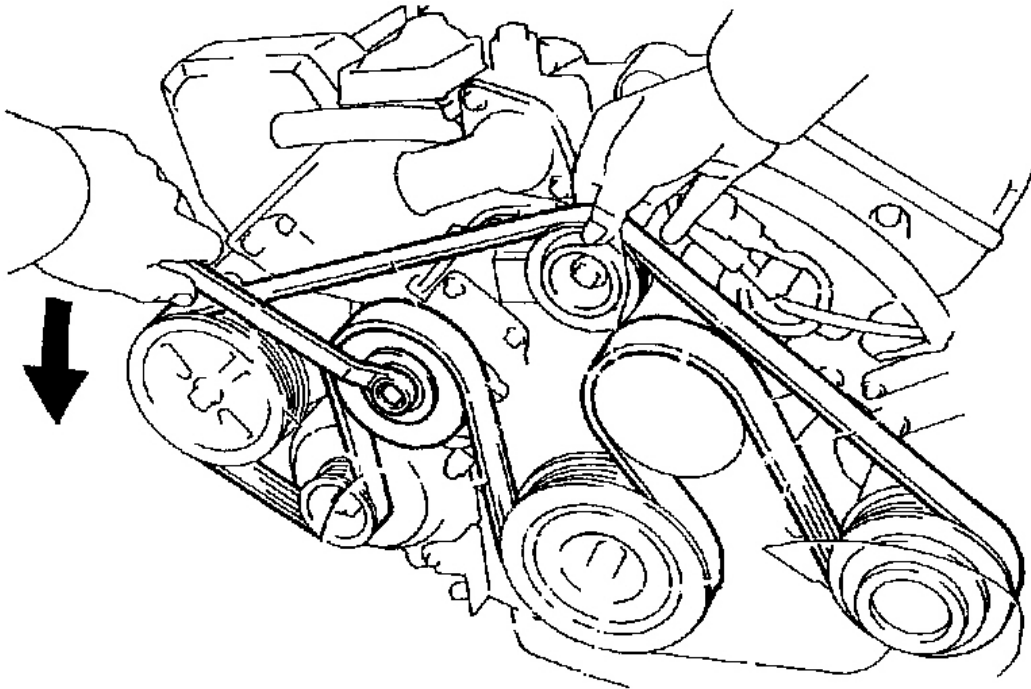
- a. Connect the oil reservoir to vane pump hose.
 b. Using pliers, engage the hose clip.

41. INSTALL FAN AND GENERATOR V BELT

- a. Put a wrench on the drive belt tensioner set bolt.
- b. Turn the drive belt tensioner set bolt counterclockwise and hold it.

NOTE:

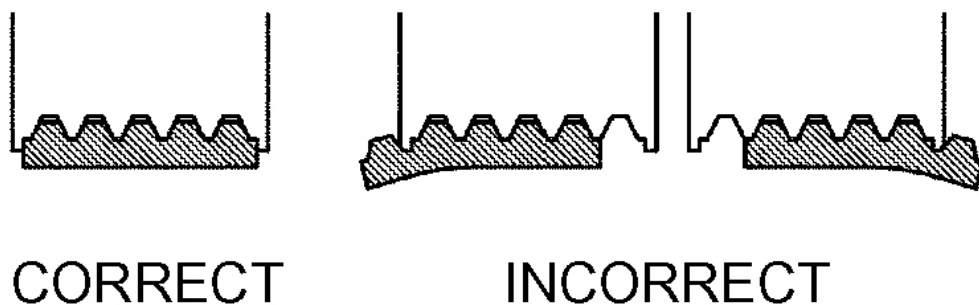
- The drive belt tensioner set bolt is a left-hand screw.
- The drive belt tensioner set bolt comes loose when turning it clockwise.



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Fig. 48: Holding Drive Belt Tensioner Set Bolt Turning Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the fan and generator V belt.



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Fig. 49: Installing Fan And Generator V Belt
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Release the drive belt tensioner.

HINT:

The drive belt tensioner is an auto tensioner.

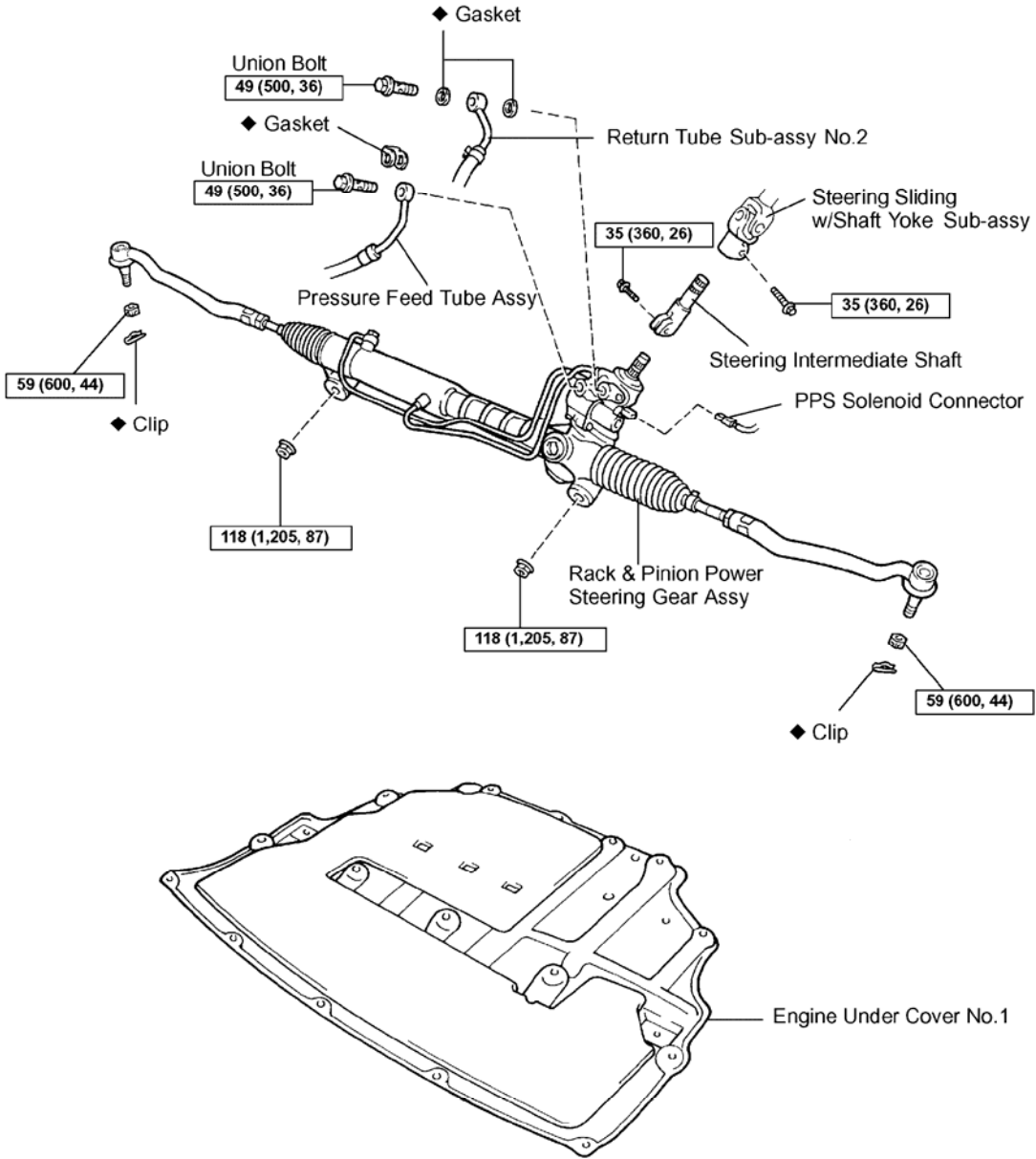
- 42. **INSTALL AIR CLEANER ASSY**
 - a. Install the air cleaner together with the intake air connector pipe with the 2 bolts.
 - b. Connect the air flow meter connector to the air cleaner.
- 43. **CONNECT INTAKE AIR CONNECTOR PIPE**
 - a. Connect the intake air connector pipe to the throttle body.
 - b. Tighten the clamp to hold the intake air connector pipe and the throttle body.
- 44. **INSTALL AIR CLEANER INLET NO. 1**
 - a. Install the air cleaner inlet No. 1 with the 2 bolts.
- 45. **BLEED AIR IN POWER STEERING SYSTEM (See ON-VEHICLE INSPECTION)**
- 46. **CHECK FOR POWER STEERING FLUID LEAKAGE**

If any leakage is found on the power steering system, repair or replace the related parts.

- 47. **CHECK POWER STEERING FLUID LEVEL IN RESERVOIR (See ON-VEHICLE INSPECTION)**
- 48. **INSTALL ENGINE UNDER COVER NO. 1 (See COMPONENTS)**

RACK & PINION POWER STEERING GEAR ASSY

COMPONENTS

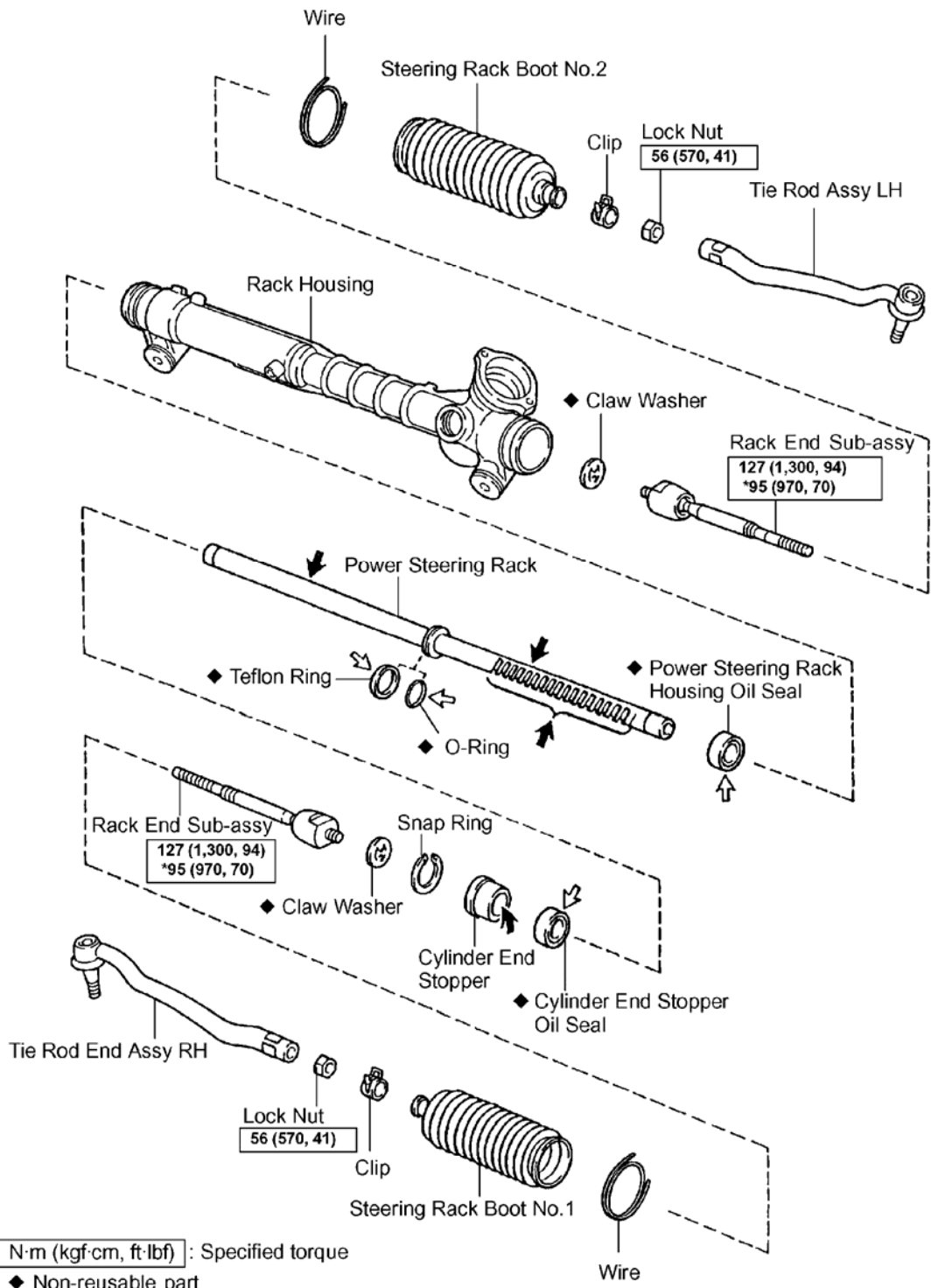


N-m (kgf-cm, ft-lbf) : Specified torque

N ◆ Non-reusable part

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Fig. 50: Removal And Installation Of Rack & Pinion Power Steering Gear Assy (With Specifications)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

- ◆ Non-reusable part
- ◀ Molybdenum disulfide lithium base grease
- ↻ Power steering fluid

* For use with SST

N

OVERHAUL

- NOTE:**
- Remove the steering wheel assy before the rack & pinion power steering gear removal, because there is a possibility of breaking of the spiral cable.
 - When installing, apply power steering fluid or molybdenum disulfide lithium base grease to the parts indicated by arrows (see COMPONENTS).

HINT:

See COMPONENTS (for steering column) , COMPONENTS (for vane pump assy) .

1. **PRECAUTION** (See PRECAUTION)
2. **PLACE FRONT WHEELS FACING STRAIGHT AHEAD**
3. **DISCONNECT BATTERY NEGATIVE TERMINAL**
4. **REMOVE STEERING WHEEL COVER LOWER NO. 2** (See step 5 in OVERHAUL)
5. **REMOVE SWITCH & VOLUME CASE** (See OVERHAUL)
6. **REMOVE HORN BUTTON ASSY** (See step 6 in OVERHAUL)
7. **REMOVE STEERING WHEEL ASSY** (See step 7 in OVERHAUL)
SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)
8. **REMOVE FRONT WHEELS**
9. **REMOVE ENGINE UNDER COVER NO. 1**
 - a. Remove the 9 bolts, 6 screws, 2 clips and under cover.
10. **SEPARATE TIE ROD ASSY LH**
 - a. Remove the clip and nut from the tie rod.
 - b. Using SST, separate the tie rod from the lower ball joint.
SST 09610-20012

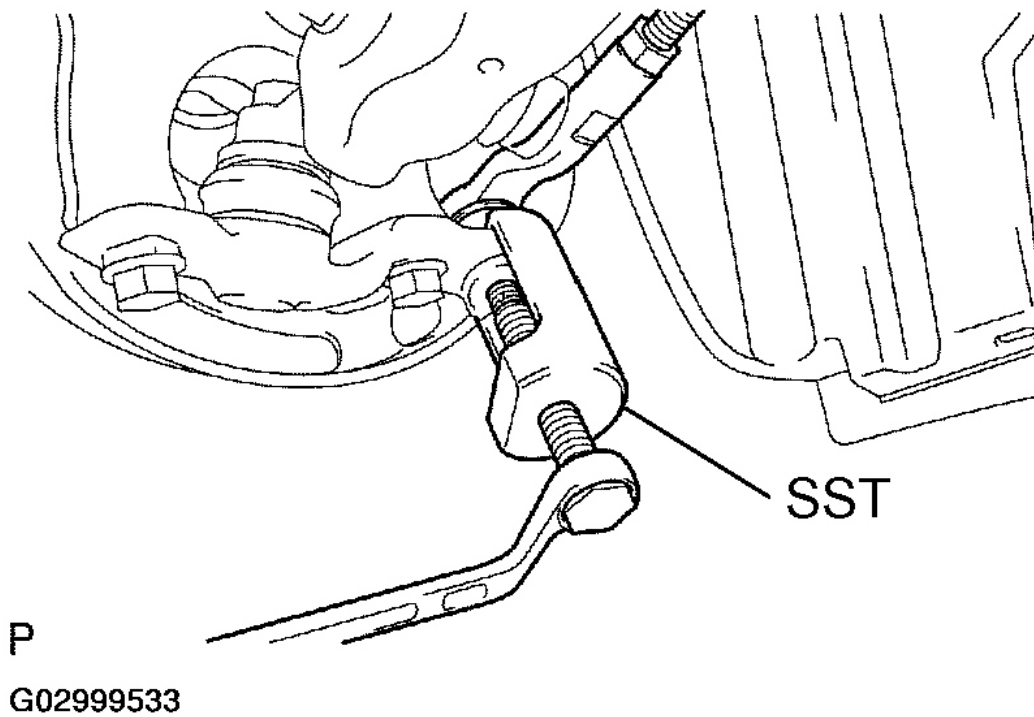


Fig. 53: Separating Tie Rod Assy LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. SEPARATE TIE ROD ASSY RH
SST 09610-20012

HINT:

Perform the same procedures as for the LH.

- 12. SEPARATE STEERING SLIDING W/SHAFT YOKE SUB-ASSY**
- a. Put matchmarks on the sliding w/shaft yoke and intermediate shaft.
 - b. Loosen bolt A.
 - c. Remove bolt B and the sliding w/shaft yoke.

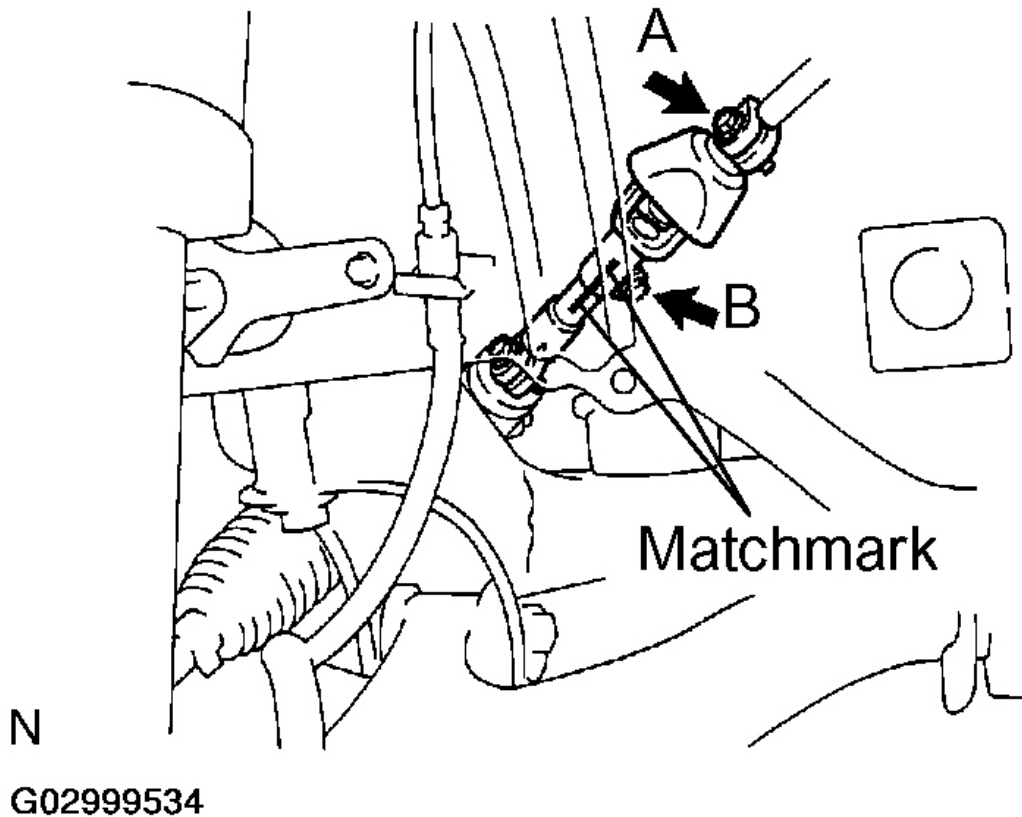


Fig. 54: Separating Steering Sliding W/Shaft Yoke Sub-Assy
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **DISCONNECT PRESSURE FEED TUBE ASSY**
 - a. Remove the union bolt and gasket, and disconnect the pressure feed tube.
14. **DISCONNECT RETURN TUBE SUB-ASSY NO. 2**
 - a. Remove the union bolt and 2 gaskets, and disconnect the return tube.
15. **REMOVE RACK & PINION POWER STEERING GEAR ASSY**
 - a. Disconnect the PPS solenoid connector.
 - b. Remove the 2 nuts and power steering gear.

NOTE: Do not damage the left and right turn pressure tubes.

16. **REMOVE STEERING INTERMEDIATE SHAFT**
 - a. Put matchmarks on the intermediate shaft and control valve shaft.
 - b. Remove the bolt and intermediate shaft from the control valve shaft.

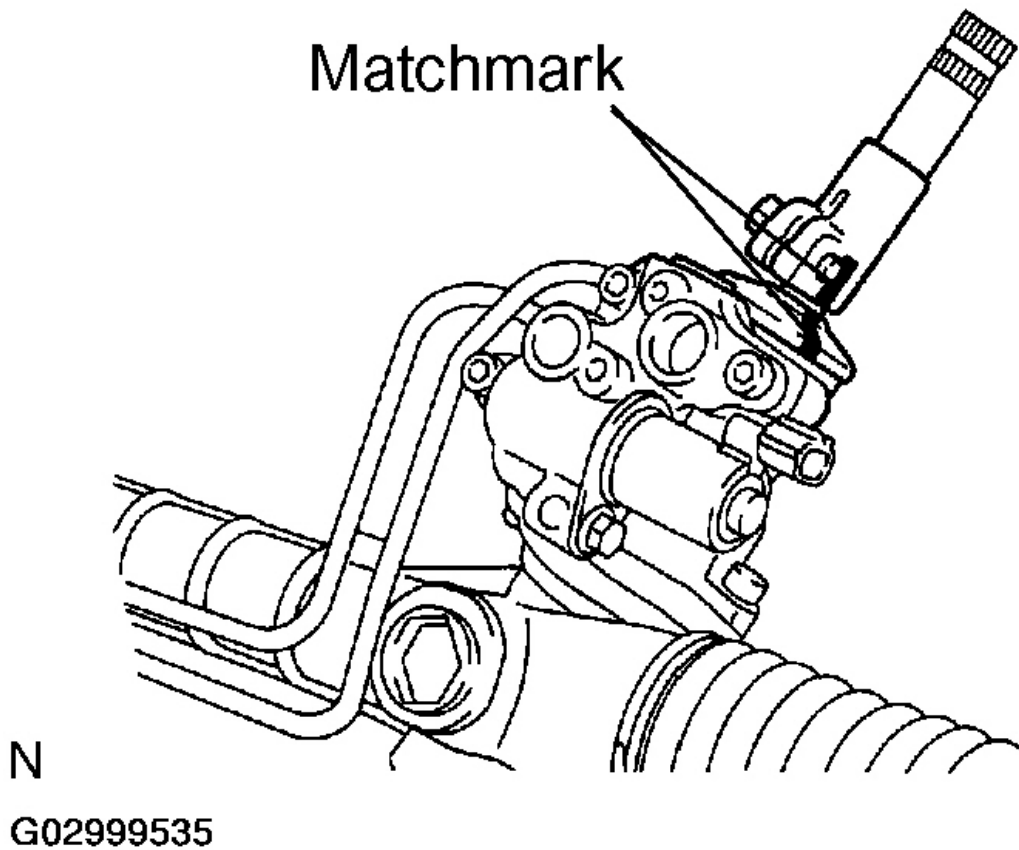
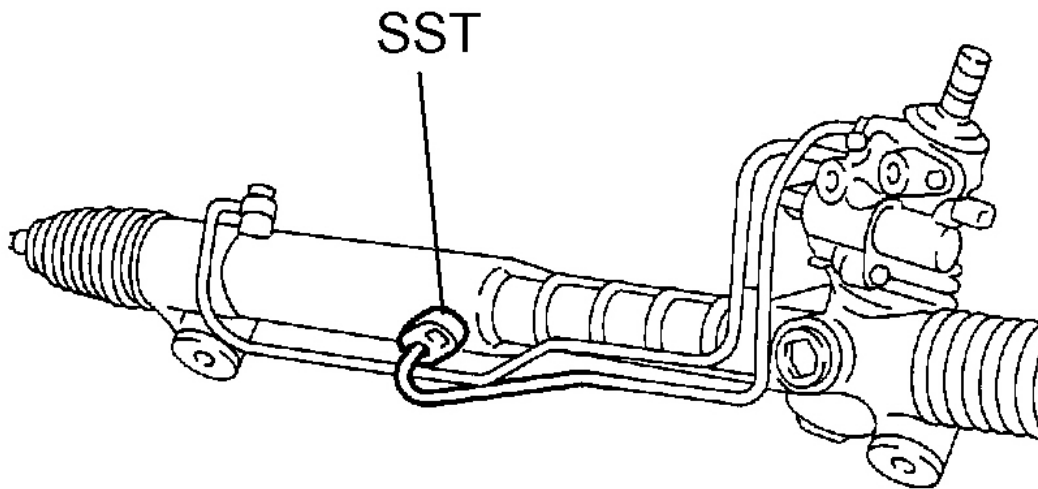


Fig. 55: Removing Steering Intermediate Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. REMOVE STEERING LEFT TURN PRESSURE TUBE

- a. Using SST, remove the left turn pressure tube.
SST 09023-38200
- b. Remove the tube clamp.
- c. Remove the union bolt and 2 gaskets, and disconnect the left turn pressure tube from the control valve housing.



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Fig. 56: Removing Steering Left Turn Pressure Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **REMOVE STEERING RIGHT TURN PRESSURE TUBE**
 - a. Remove the 2 union bolts, 4 gaskets and right turn pressure tube.
19. **FIX RACK & PINION POWER STEERING GEAR ASSY**
 - a. Using SST, secure the power steering gear in a vise.
SST 09612-00012

HINT:

Wrap the SST with vinyl tape before use, in order to prevent damaging the power steering gear.

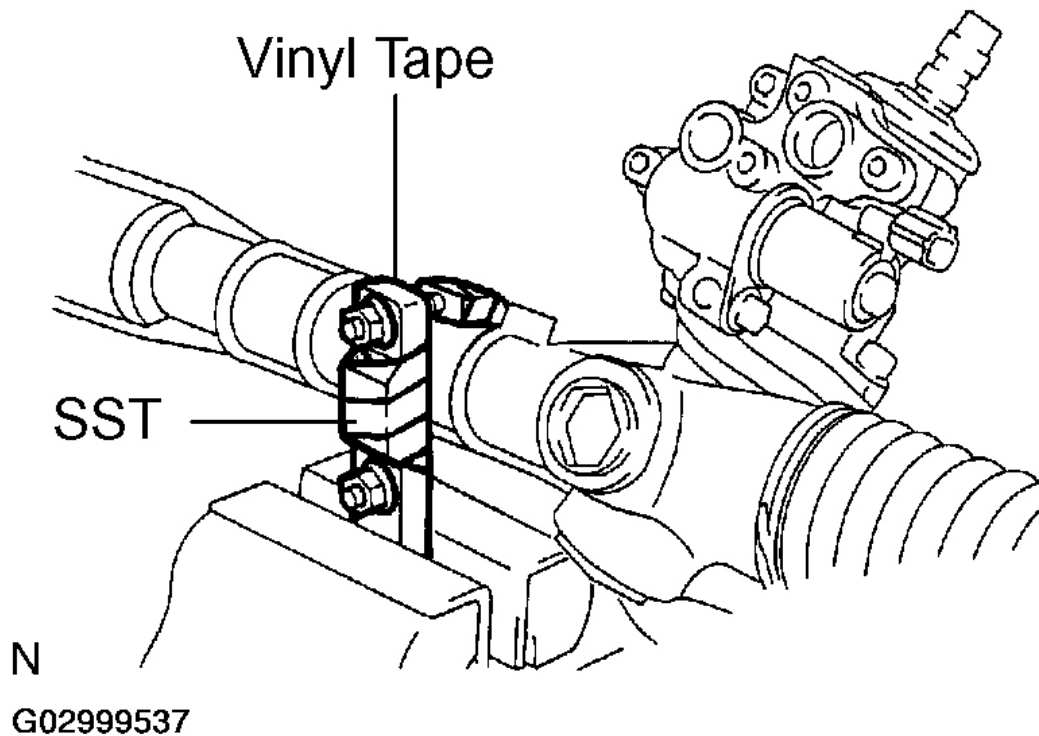
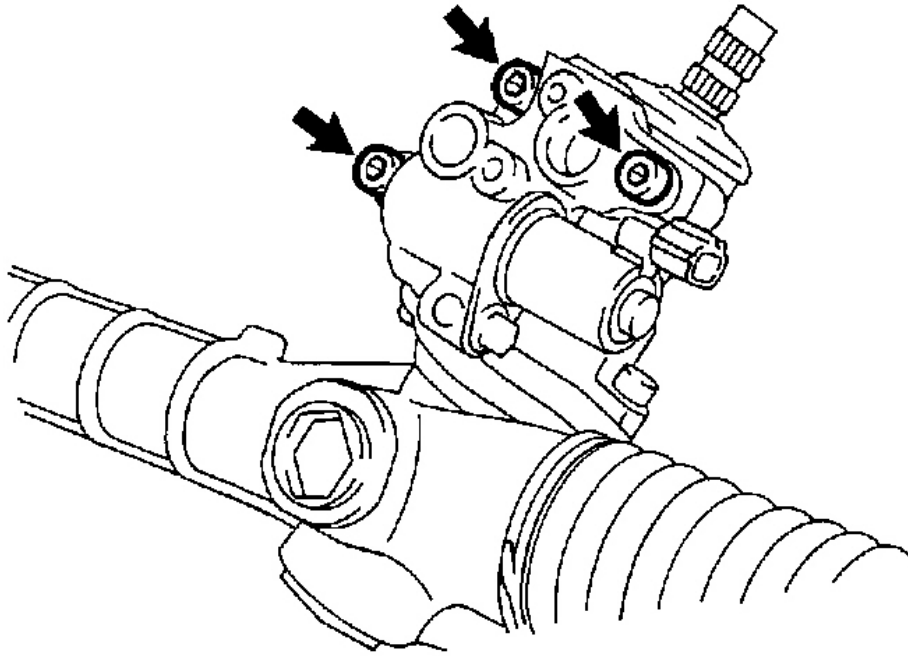


Fig. 57: Fixing Rack And Pinion Power Steering Gear Assy
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE PRESSURE CONTROL VALVE

- a. Using a hexagon wrench (6 mm), remove the 3 bolts and pressure control valve.
- b. Remove the 4 O-rings from the pressure control valve.



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Fig. 58: Removing Pressure Control Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. REMOVE TIE ROD ASSY LH

- a. Put matchmarks on the tie rod LH and rack end.
- b. Loosen the lock nut and remove the tie rod and lock nut.

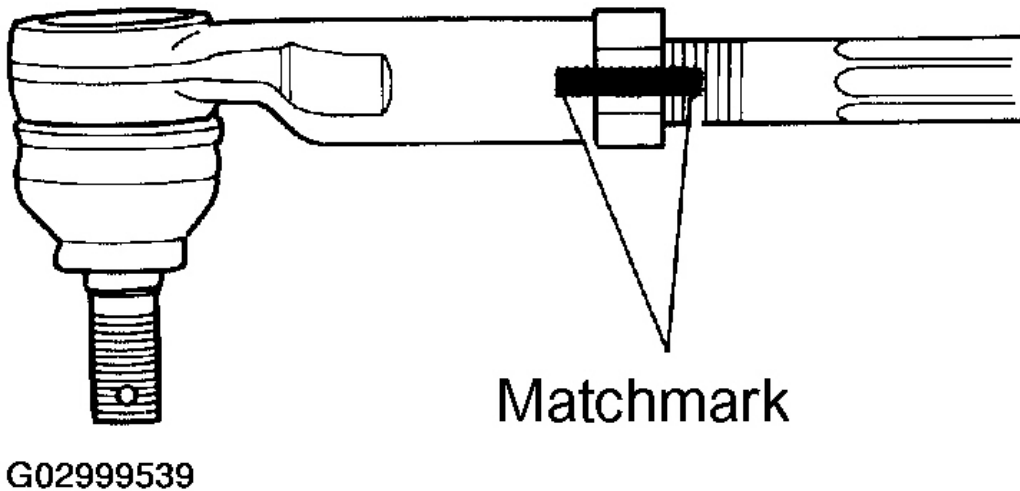


Fig. 59: Removing Tie Rod Assy LH

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. REMOVE TIE ROD ASSY RH

HINT:

Perform the same procedures as for the LH.

23. REMOVE STEERING RACK BOOT NO. 2

- a. Using needle nose pliers, loosen the wire.
- b. Remove the clip and rack boot.

NOTE: Be careful not to damage the steering rack boot No. 2.

HINT:

Mark the rack boot No. 1 to distinguish No. 1 from No. 2.

24. REMOVE STEERING RACK BOOT NO. 1

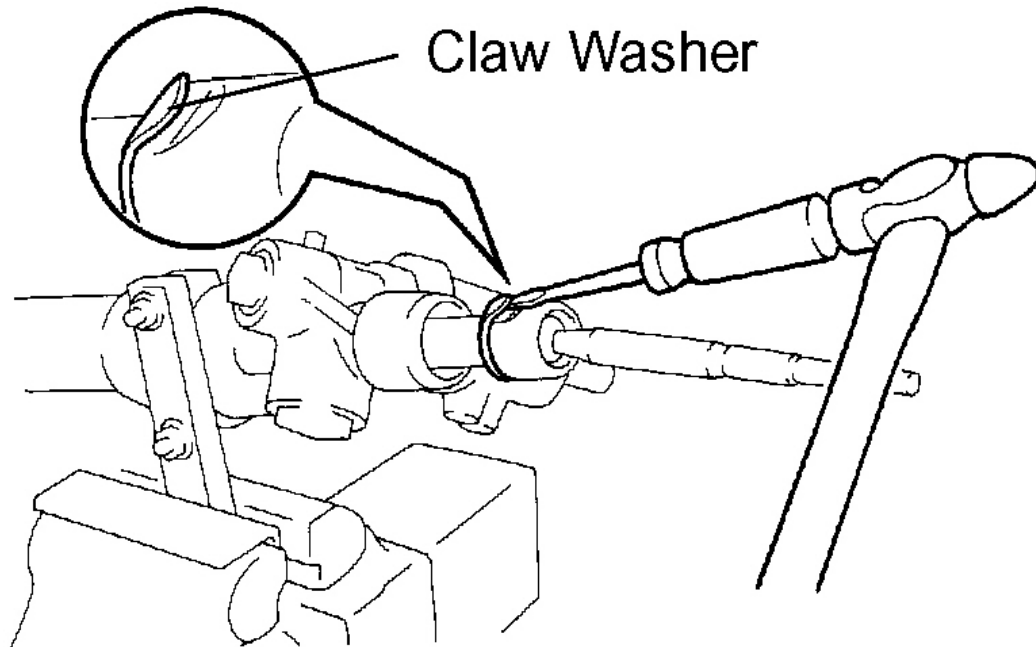
HINT:

Perform the same procedures as for the rack boot.

25. REMOVE STEERING RACK END SUB-ASSY

- a. Using a screwdriver and a hammer, unstake the claw washer.

NOTE: **Avoid any impact to the steering rack.**



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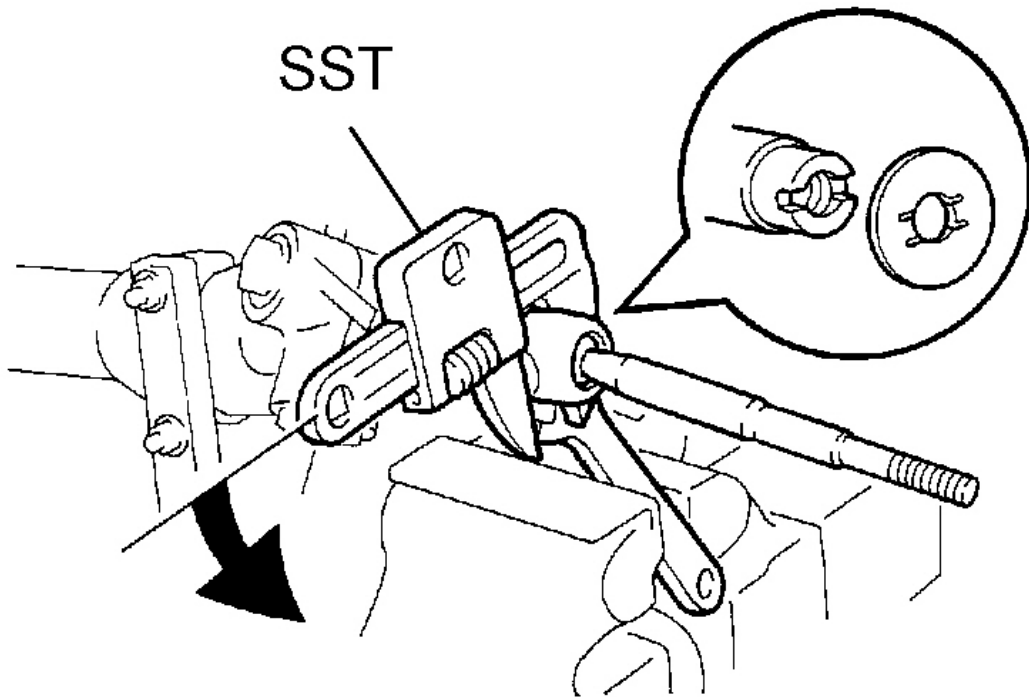
Fig. 60: Unstaking Claw Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a wrench, hold the steering rack securely and using SST, remove the rack end.

SST 09922-10010

NOTE: **Use SST 09922-10010 in the direction shown in Fig. 61 .**



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Fig. 61: Holding Steering Rack Securely Using SST
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Mark the rack end to distinguish between the RH and LH sides.

- c. Remove the claw washer.
- d. Use the same manner described above on the other side.

26. REMOVE STEERING RACK GUIDE

- a. Using SST, remove the rack guide spring cap nut.
 SST 09922-10010

NOTE: Use SST 09922-10010 in the direction shown in the illustration.

- b. Using a hexagon wrench (24 mm), remove the rack guide spring cap from the rack housing.
- c. Remove the rack guide spring from the rack housing.
- d. Remove the steering rack guide from the rack housing.

- e. Remove the O-ring from the rack guide.

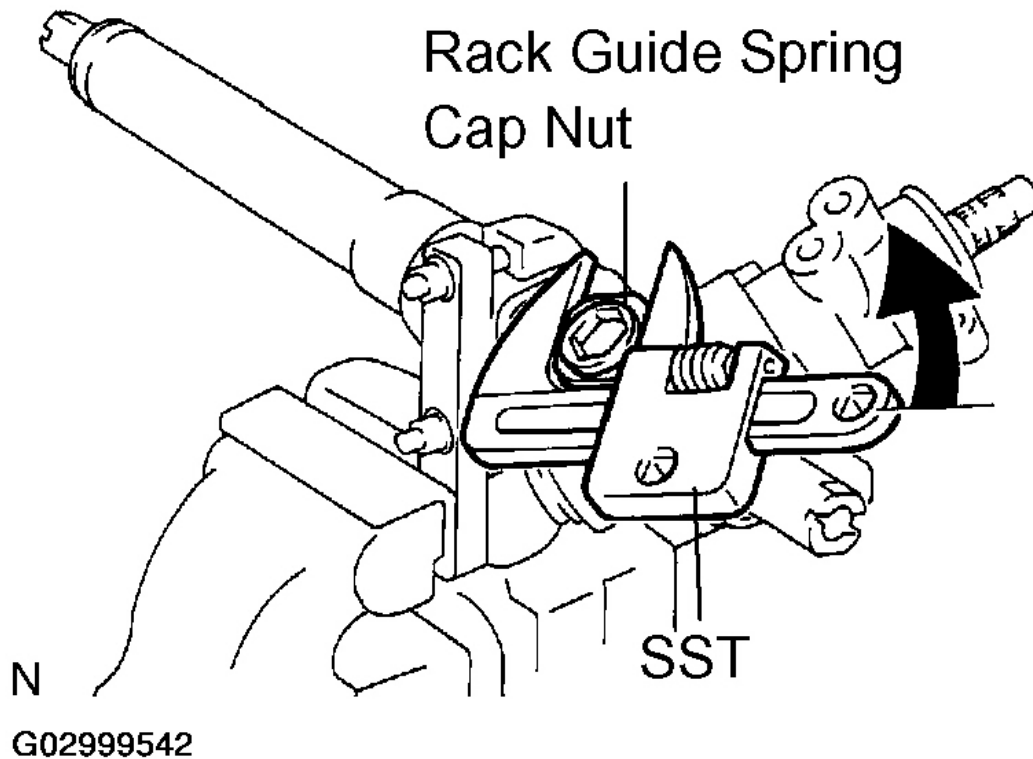


Fig. 62: Removing Steering Rack Guide
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. REMOVE POWER STEERING CONTROL VALVE

- a. Using a socket wrench (27 mm), remove the rack housing cap from the rack housing.
- b. Using SST, keep the control valve shaft from rotating and remove the self-locking nut.
SST 09616-00011

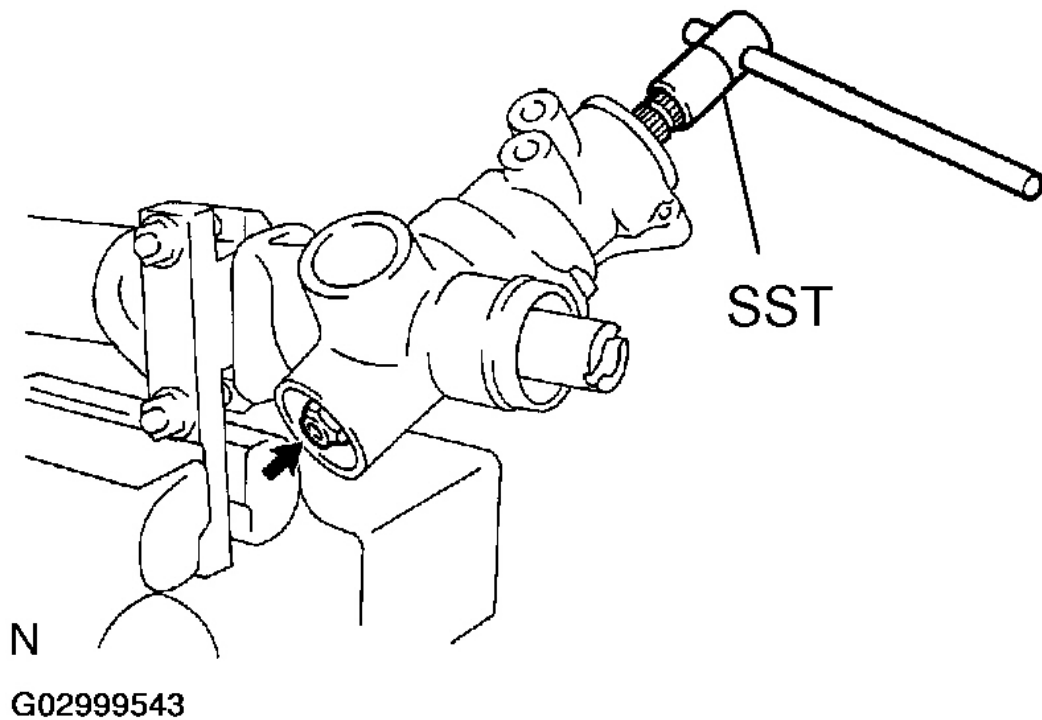
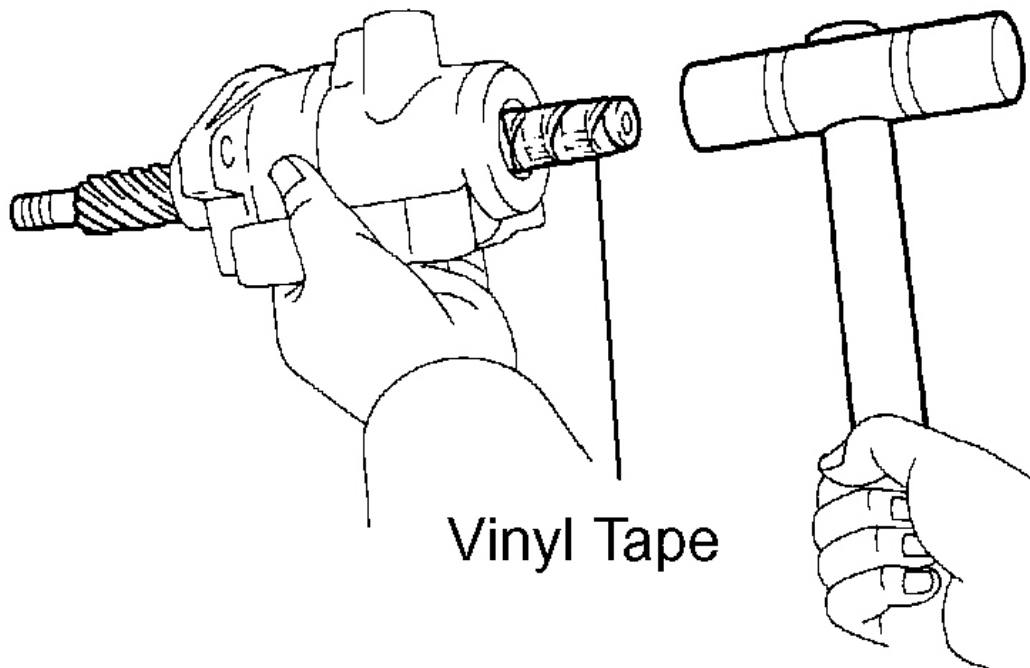


Fig. 63: Removing Self-Lock Nut Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the dust cover.
- d. Using a hexagon wrench (6 mm), remove the 2 bolts from the control valve housing.
- e. Pull out the control valve housing with the power steering control valve.
- f. Remove the O-ring from the control valve housing.
- g. To prevent oil seal lip damage, wind vinyl tape around the serrated part of the control valve shaft.

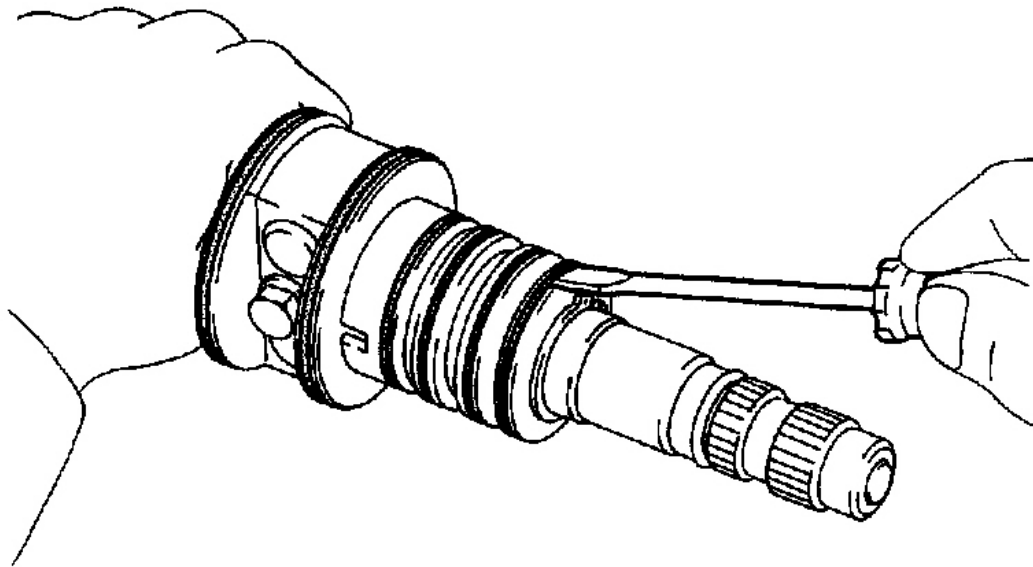


G02999544

Fig. 64: Winding Vinyl Tape Around Serrated Part Of Control Valve Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Using a plastic hammer, tap out the power steering control valve.
- i. Using a screwdriver, remove the 4 teflon rings from the power steering control valve.

NOTE: Be careful not to damage the ring grooves.

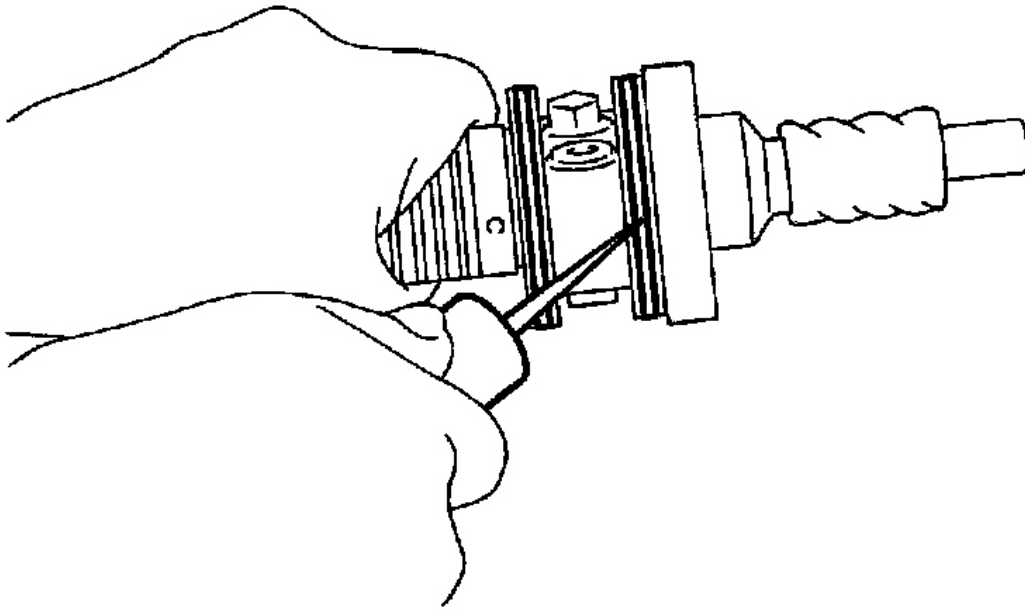


G02999545

Fig. 65: Removing Teflon Rings From Power Steering Control Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- j. Using a screwdriver, remove the 2 teflon rings and 2 O-rings from the power steering control valve.

NOTE: **Be careful not to damage the ring grooves.**

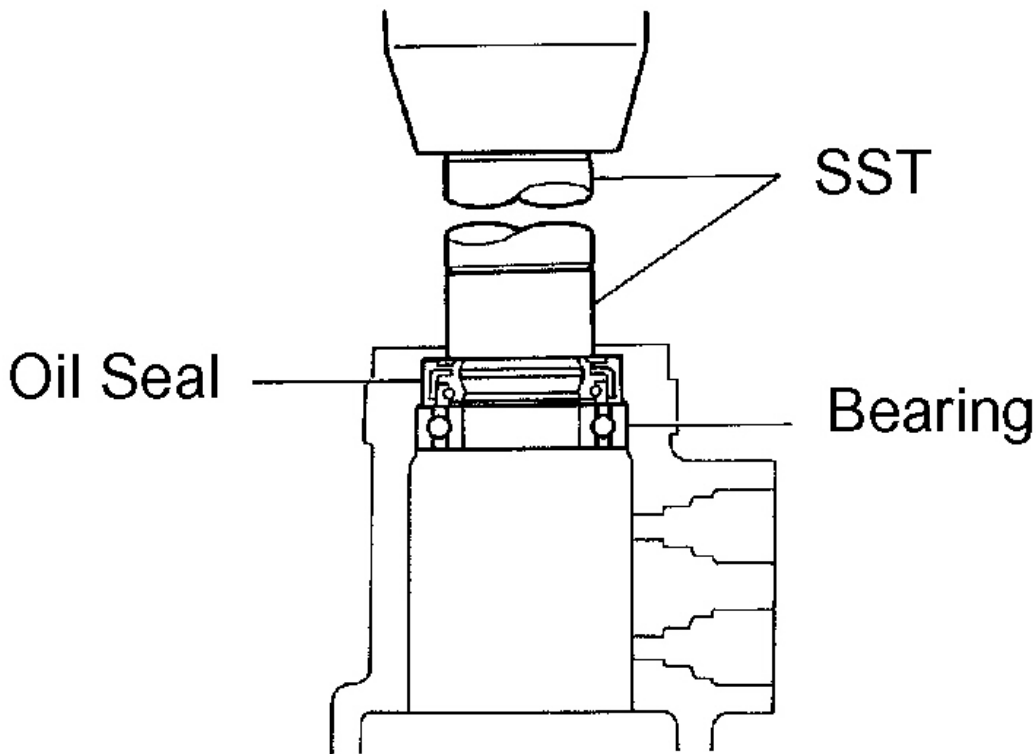


G02999546

Fig. 66: Removing Teflon Rings And O-Rings From Power Steering Control Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. REMOVE POWER STEERING CONTROL VALVE UPPER BEARING

- a. Using SST and a press, press out the oil seal and upper bearing from the control valve housing.
SST 09950-60010 (09951-00240), 09950-70010 (09951-07100)



G02999547

Fig. 67: Removing Power Steering Control Valve Upper Bearing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **REMOVE POWER STEERING CONTROL VALVE LOWER BEARING**
 - a. Remove the lower bearing from the rack housing.
30. **REMOVE POWER STEERING CONTROL VALVE SPACER**
 - a. Remove the spacer from the rack housing.
31. **REMOVE POWER STEERING RACK**
 - a. Using snap ring pliers, remove the snap ring from the rack housing.
 - b. Using a brass bar and a press, press the steering rack until the cylinder end stopper slightly touches the press block.
 - c. Pull out the steering rack with the cylinder end stopper and oil seal.

HINT:

If necessary, slightly tap the rack end with a brass bar and a hammer.

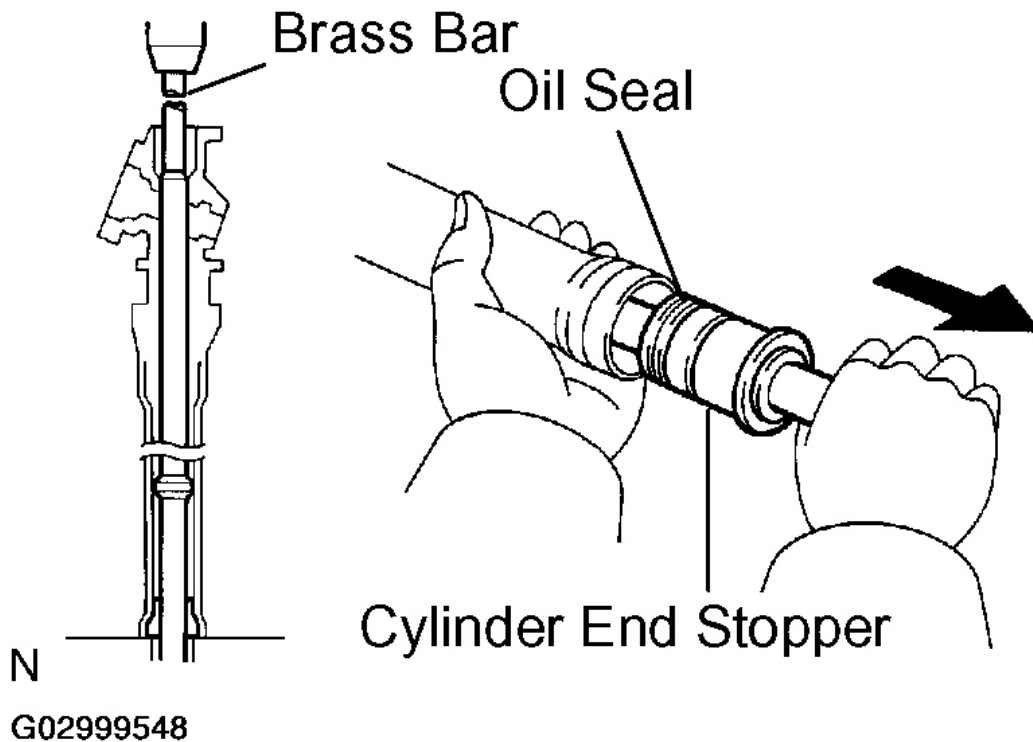


Fig. 68: Removing Power Steering Rack

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. REMOVE CYLINDER END STOPPER

- a. Remove the cylinder end stopper from the steering rack.

33. REMOVE CYLINDER END STOPPER OIL SEAL

- a. Remove the oil seal from the steering rack.

34. INSPECT POWER STEERING RACK

- a. Using a dial indicator, check for runout of the steering rack and teeth wear.

Maximum runout: 0.3 mm (0.0118 in.)

If runout exceeds the maximum, replace the rack & pinion power steering gear assy.

- b. Check the rack surface for wear and damage.

If the steering rack is worn or damaged, replace the rack & pinion power steering gear assy.

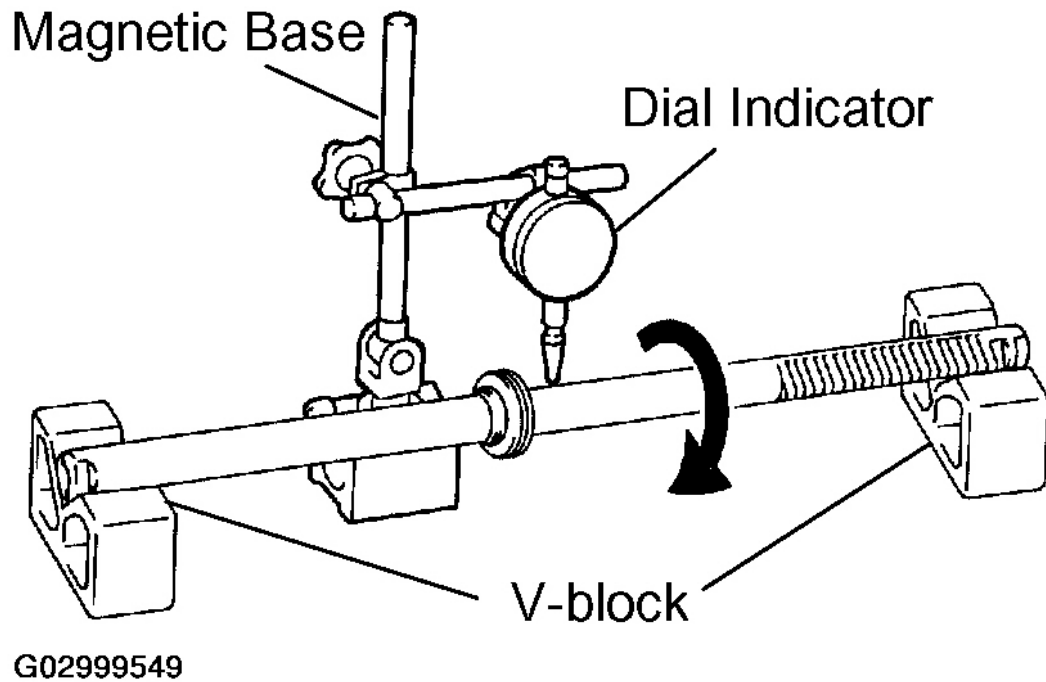
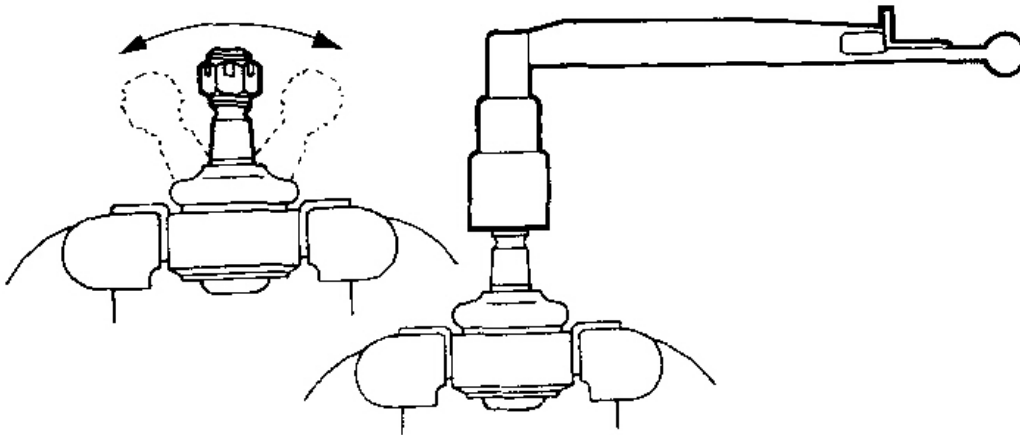


Fig. 69: Inspecting Power Steering Rack
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. INSPECT TIE ROD ASSY LH

- a. Secure the tie rod assy LH in a vise.
- b. Install the nut to the stud bolt.
- c. Flip the ball joint stud back and forth 5 times.
- d. Using a torque wrench, turn the nut continuously at a rate of 2 to 4 seconds per turn and take the torque reading on the 5th turn.

Turning torque: 0.49 to 3.43 N.m (5.0 to 35.0 kgf.cm, 4.3 to 30.4 in.lbf)



G02999550

Fig. 70: Inspecting Tie Rod Assy LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. INSPECT TIE ROD ASSY RH

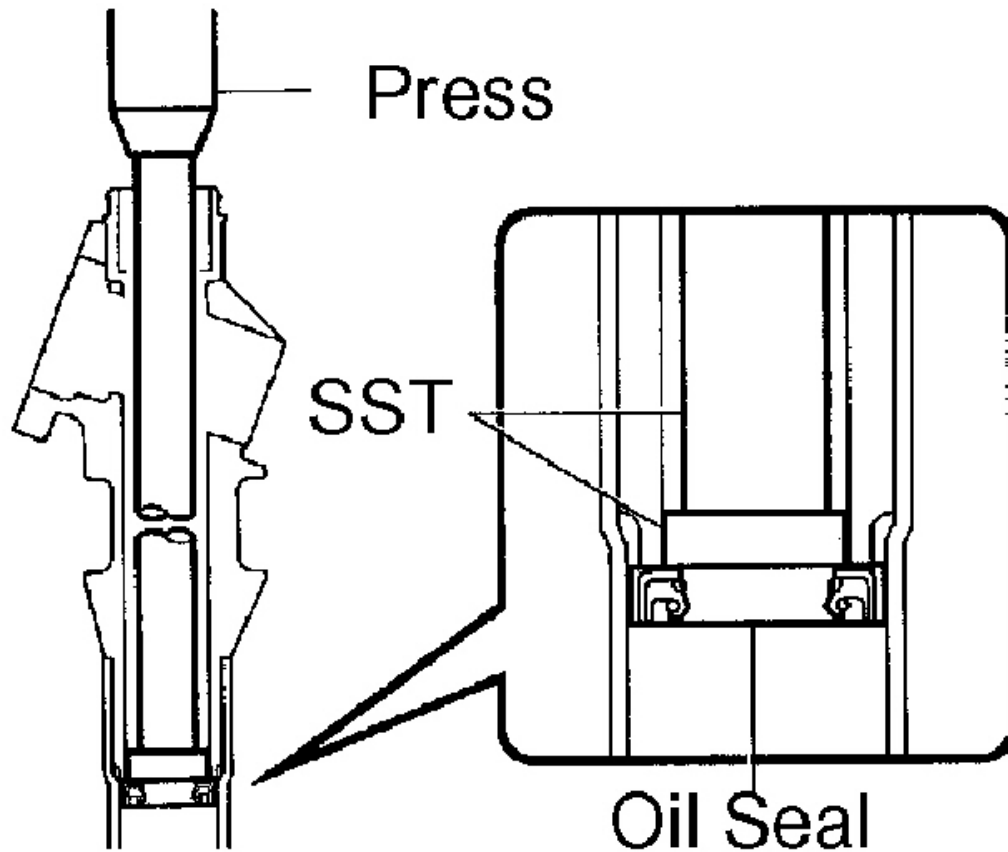
HINT:

Perform the same procedures as for the LH.

37. REMOVE POWER STEERING RACK HOUSING OIL SEAL

- a. Using SST and a press, press out the oil seal.

SST 09950-60010 (09951-00310), 09950-70010 (09951-07360)



G02999551

Fig. 71: Removing Power Steering Rack Housing Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. REMOVE POWER STEERING CONTROL VALVE CENTER BEARING

- a. Using SST, remove the center bearing from the rack housing.

SST 09612-30012

NOTE: Be careful not to damage the rack housing.

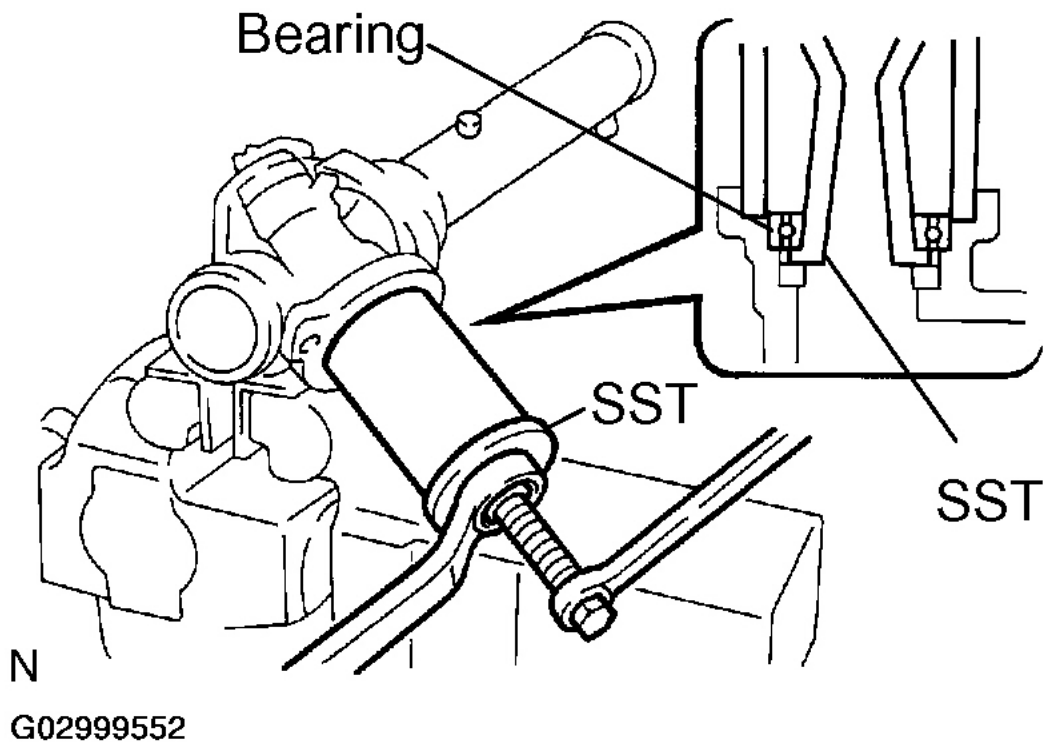


Fig. 72: Removing Power Steering Control Valve Center Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **REMOVE POWER STEERING CYLINDER TUBE OIL SEAL**

- a. Using SST and a press, remove the oil seal from the rack housing.
SST 09612-30012

NOTE: Be careful not to damage the rack housing.

HINT:

When using SST, fit the tips of the SST into the cutouts in the rack housing.

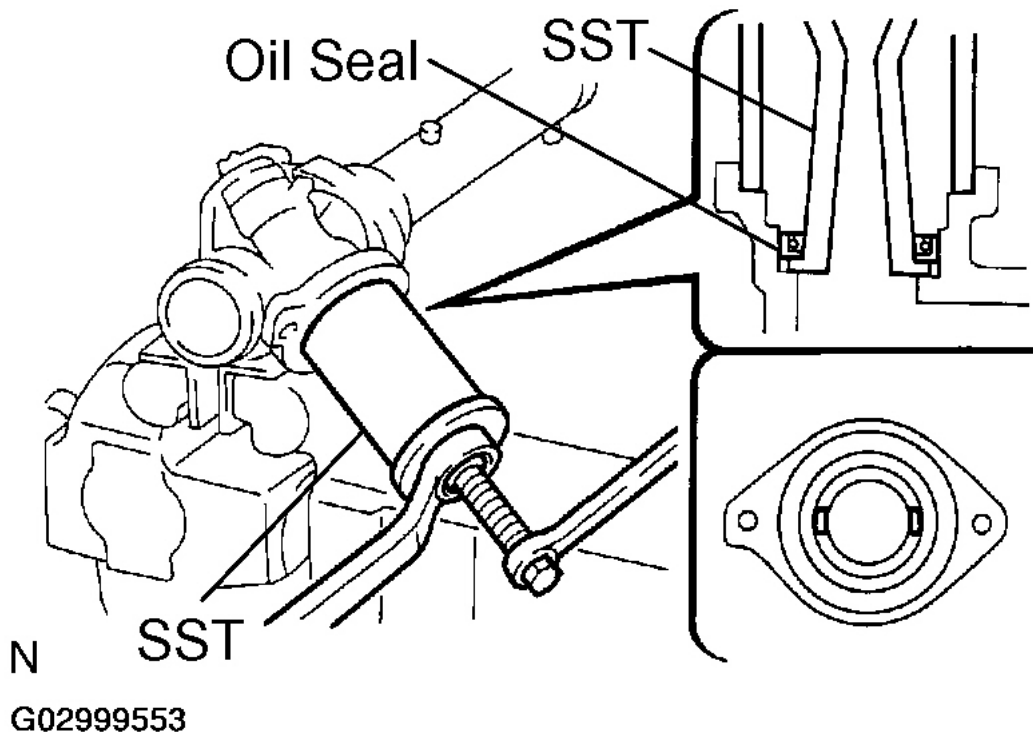
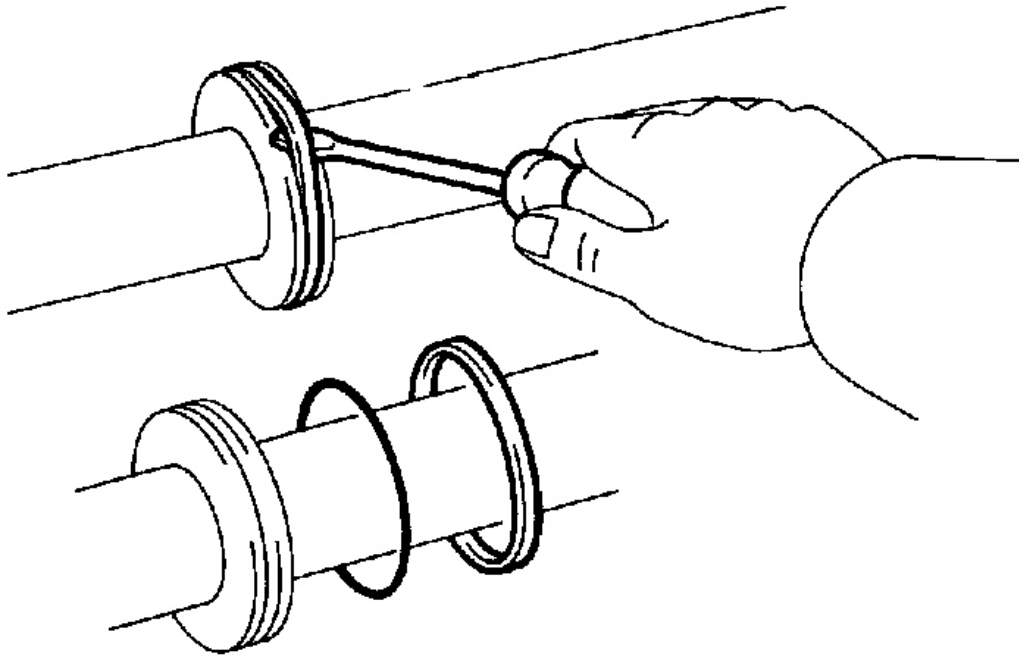


Fig. 73: Removing Power Steering Cylinder Tube Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. **REMOVE RACK STEERING PISTON RING**

- a. Using a screwdriver, remove the teflon ring and O-ring from the steering rack.

NOTE: Be careful not to overexpand the teflon ring.



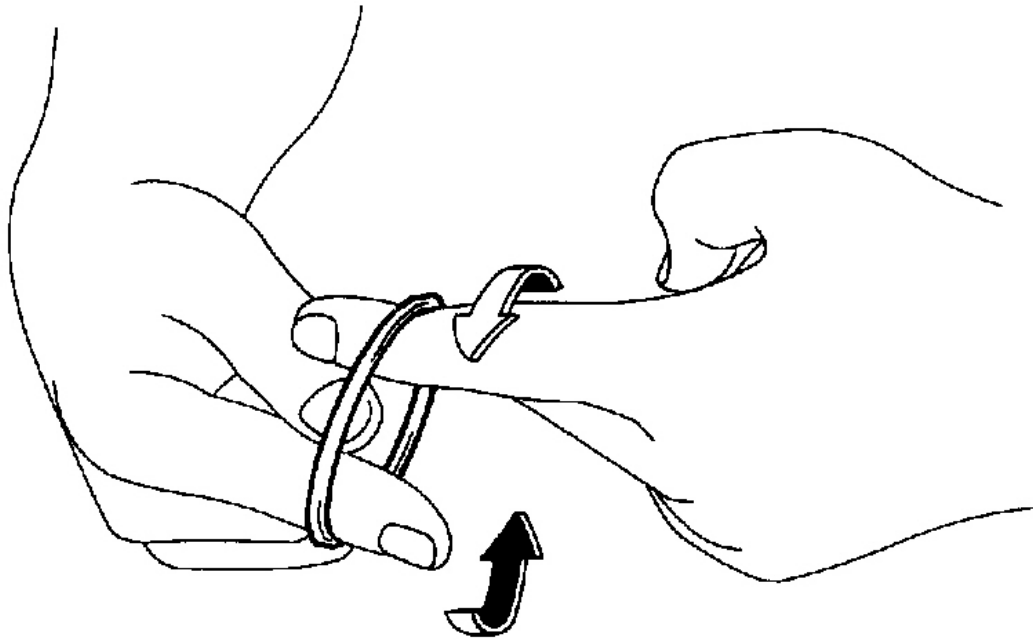
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Fig. 74: Removing Rack Steering Piston Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. INSTALL RACK STEERING PISTON RING

- a. Coat a new O-ring with power steering fluid and install it to the steering rack.
- b. Expand a new teflon ring with your fingers.

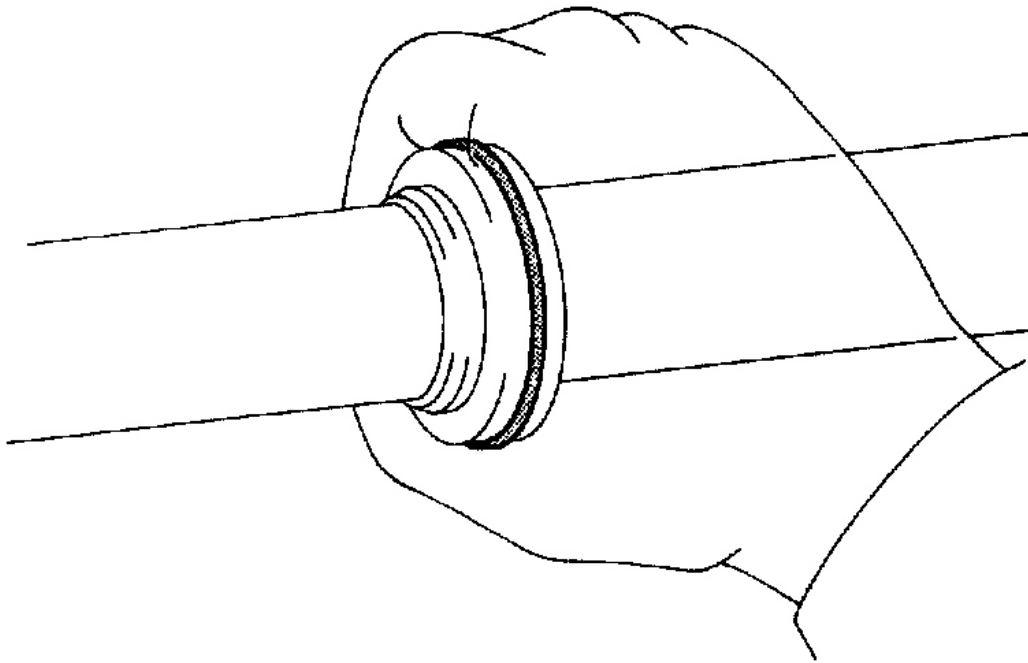
NOTE: Be careful not to overexpand the teflon ring.



G02999555

Fig. 75: Expanding Teflon Ring With Fingers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Coat the teflon ring with power steering fluid.
- d. Install the teflon ring to the steering rack and adjust with your fingers.



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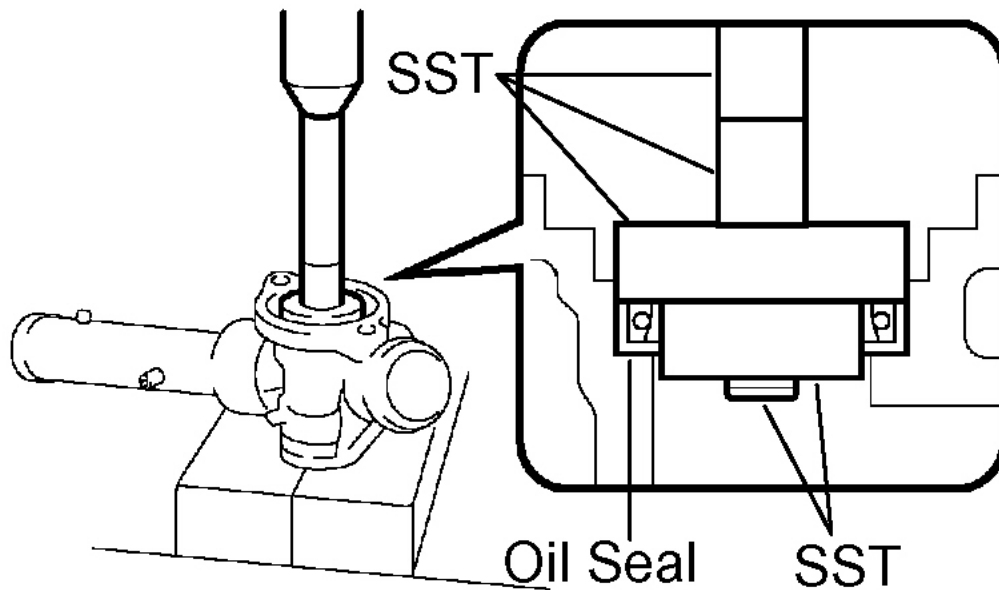
Fig. 76: Installing Teflon Ring To Steering Rack
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. INSTALL POWER STEERING CYLINDER TUBE OIL SEAL

- a. Coat a new oil seal lip with power steering fluid.
- b. Using SST and a press, press in the oil seal.

SST 09950-60010 (09951-00280, 09951-00400, 09952-06010), 09950-70010 (09951-07100)

NOTE: **Make sure that the oil seal is installed in the correct direction.**



N

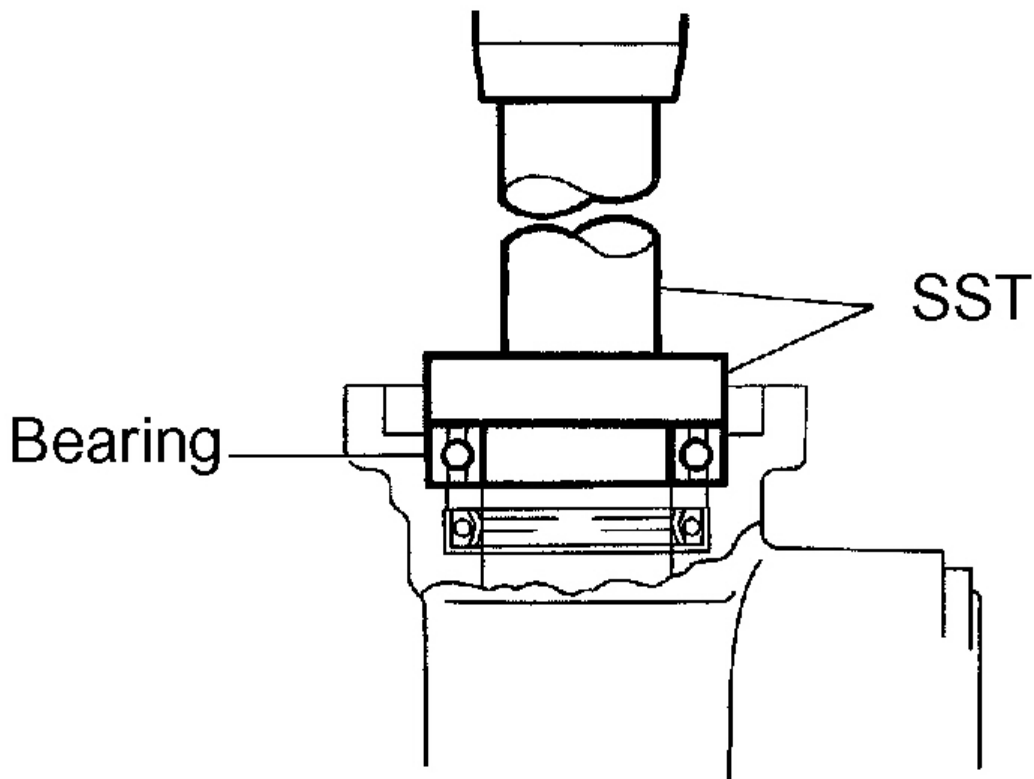
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Fig. 77: Installing Power Steering Cylinder Tube Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. INSTALL POWER STEERING CONTROL VALVE CENTER BEARING

- a. Using SST and a press, press in the center bearing.

SST 09950-60010 (09951-00460), 09950-70010 (09951-07100)



G02999558

Fig. 78: Installing Power Steering Control Valve Center Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

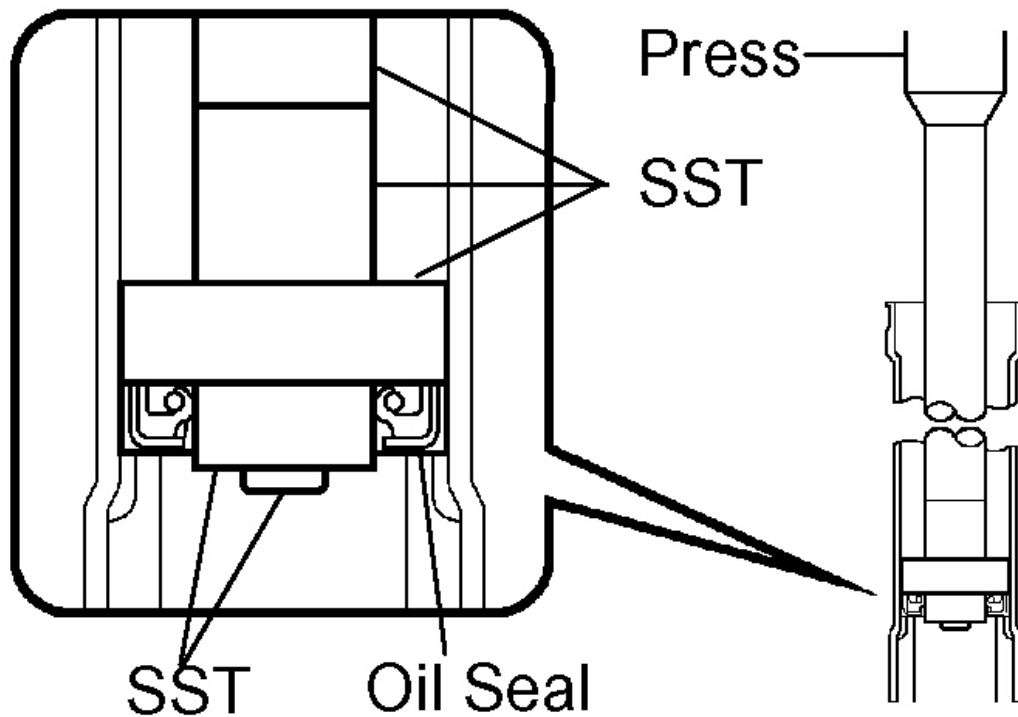
44. INSTALL POWER STEERING RACK HOUSING OIL SEAL

- a. Coat a new oil seal lip with power steering fluid.
- b. Using SST and a press, press in the oil seal.

SST 09950-60010 (09951-00240, 09951-00430, 09952-06010), 09950-70010 (09951-07360)

NOTE:

- **Make sure that the oil seal is installed in the correct direction.**



G02999559

Fig. 79: Installing Power Steering Rack Housing Oil Seal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. INSTALL POWER STEERING RACK

- a. Install SST to the steering rack.

SST 09631-20102

HINT:

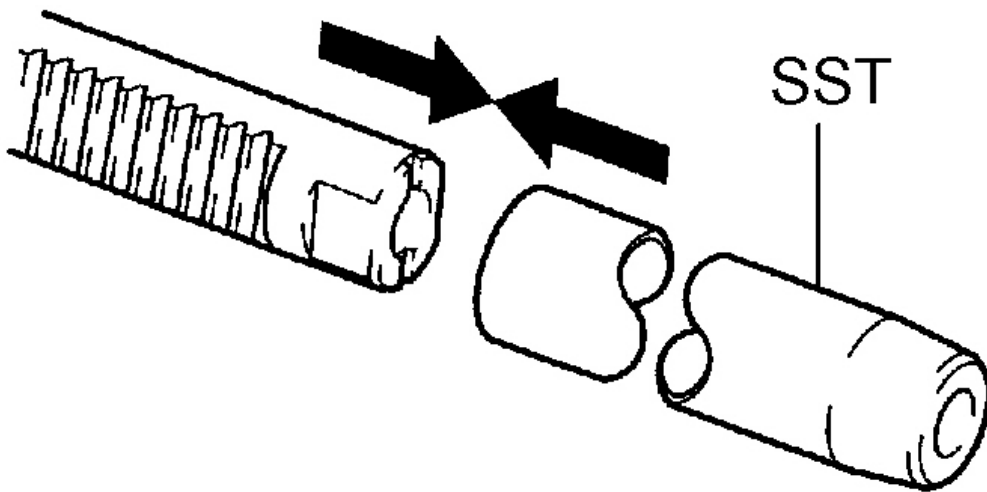
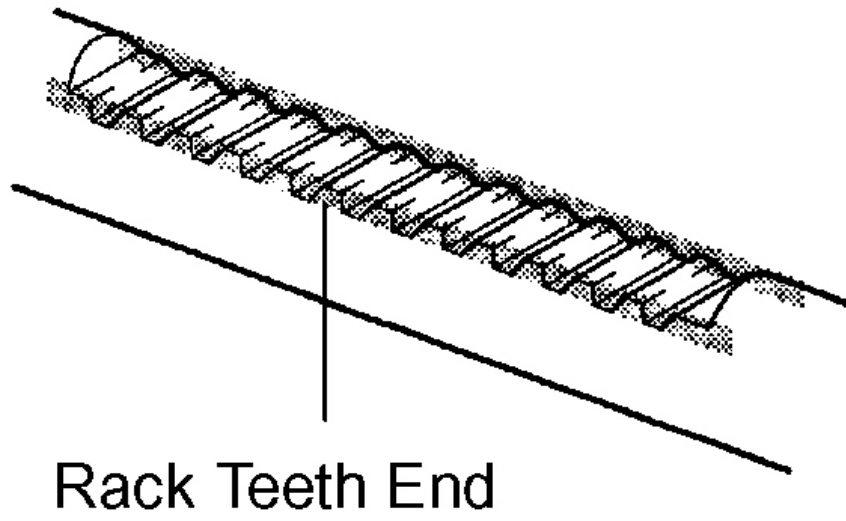
If necessary, scrape the burrs off the rack teeth end and burnish.

- b. Coat the SST with power steering fluid.
- c. Install the steering rack into the rack housing.

NOTE: Be careful not to damage the oil seal lip.

- d. Remove the SST.

SST 09631-20102



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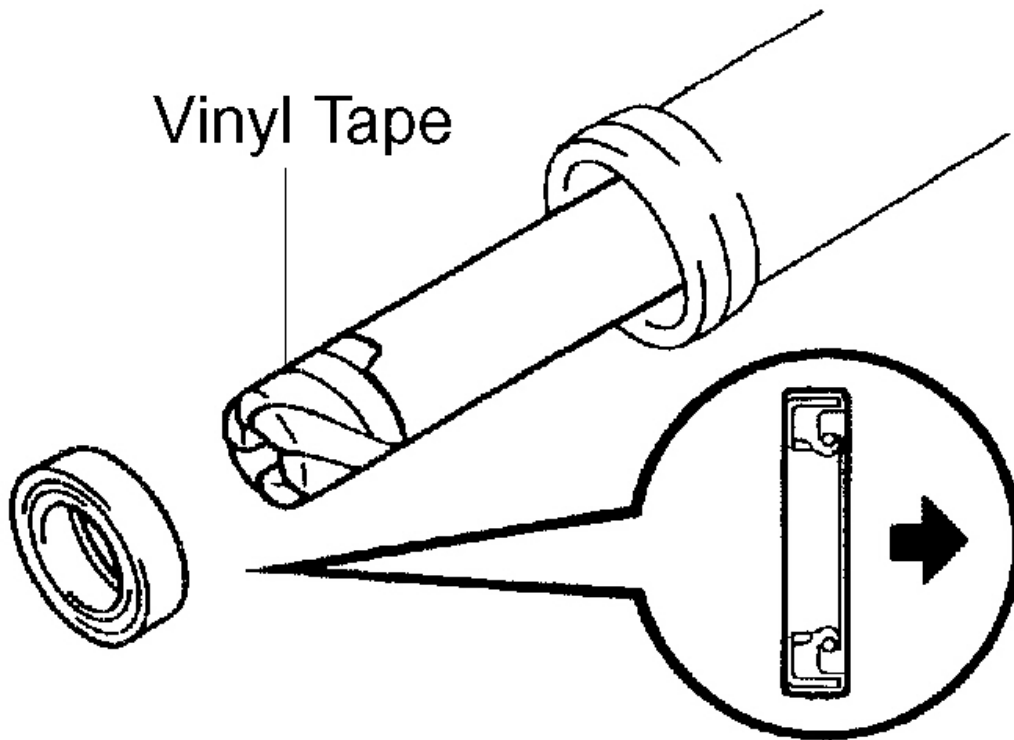
Fig. 80: Installing Power Steering Rack
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. **INSTALL CYLINDER END STOPPER OIL SEAL**

- a. Coat a new oil seal lip with power steering fluid.
- b. To prevent oil seal lip damage, wind vinyl tape around the steering rack end, and apply power steering fluid.
- c. Install the oil seal by pushing it into the rack housing without tilting.

NOTE:

- **Make sure that the oil seal is installed in the correct direction.**
- **Be careful not to damage the oil seal lip.**

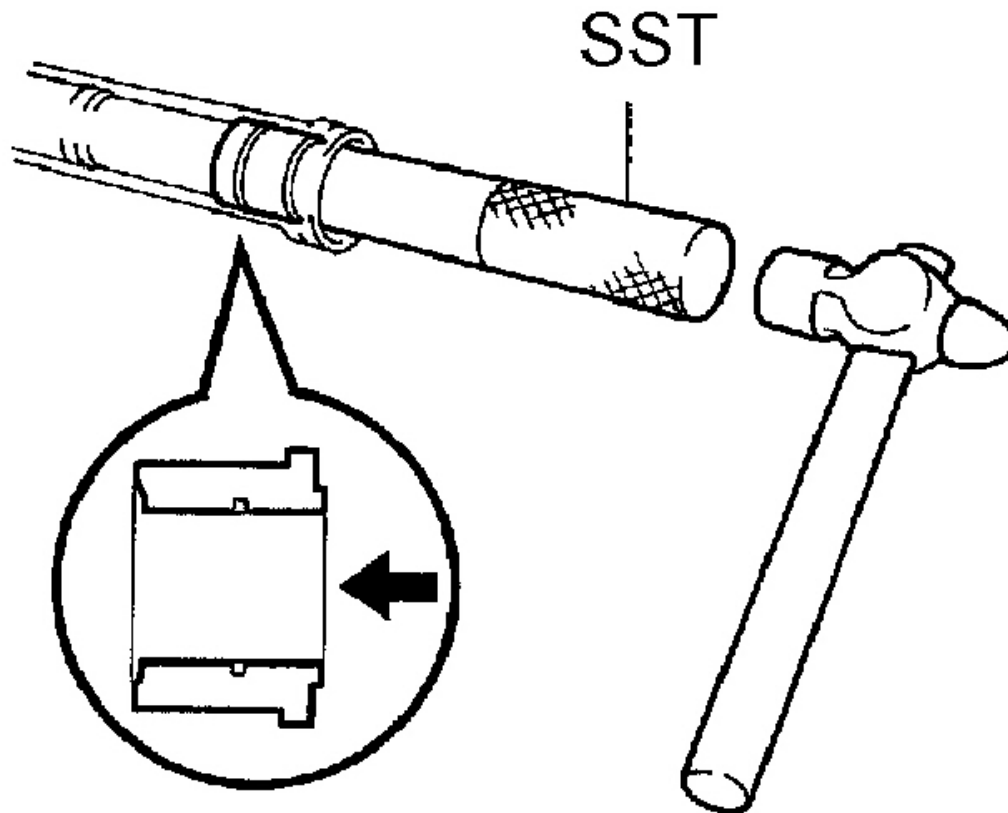


G02999561

Fig. 81: Installing Cylinder End Stopper Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. **INSTALL CYLINDER END STOPPER**

- a. Using SST and a hammer, drive in the cylinder end stopper.
SST 09612-2201 1
- b. Using snap ring pliers, install the snap ring to the rack housing.

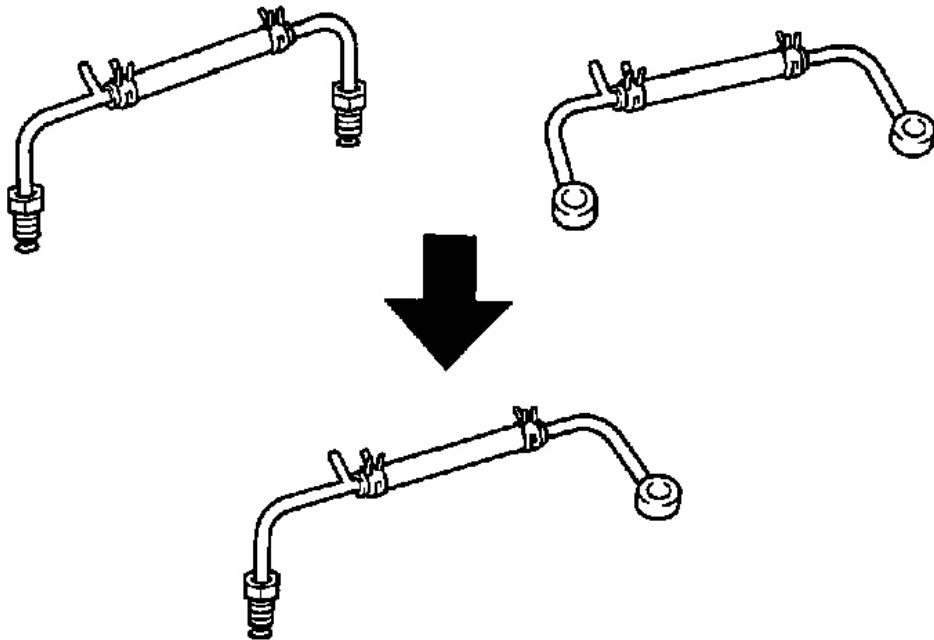


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Fig. 82: Installing Cylinder End Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **AIR TIGHTNESS TEST**

- a. Connect the 2 SST as shown in **Fig. 83** .
SST 09631-12071, 09631-22030



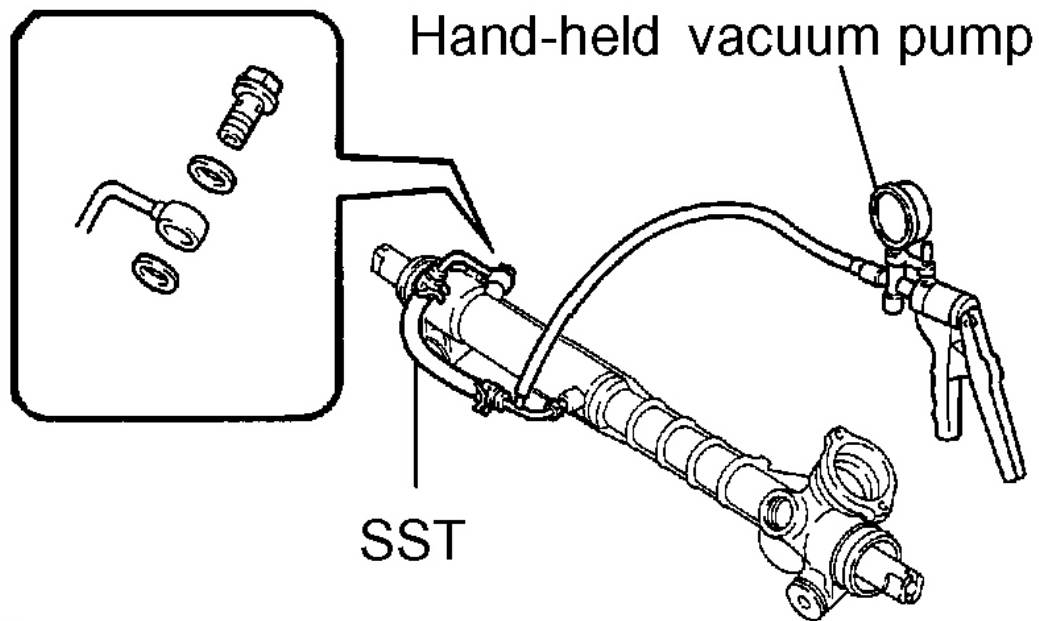
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Fig. 83: Connecting SSTs

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install SST to the rack housing
- c. Using the hand-held vacuum pump, apply 53 kPa (400 mmHg, 15.75 in.Hg) of vacuum for approximately 30 seconds.



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Fig. 84: Applying Vacuum Using Hand-Held Vacuum Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

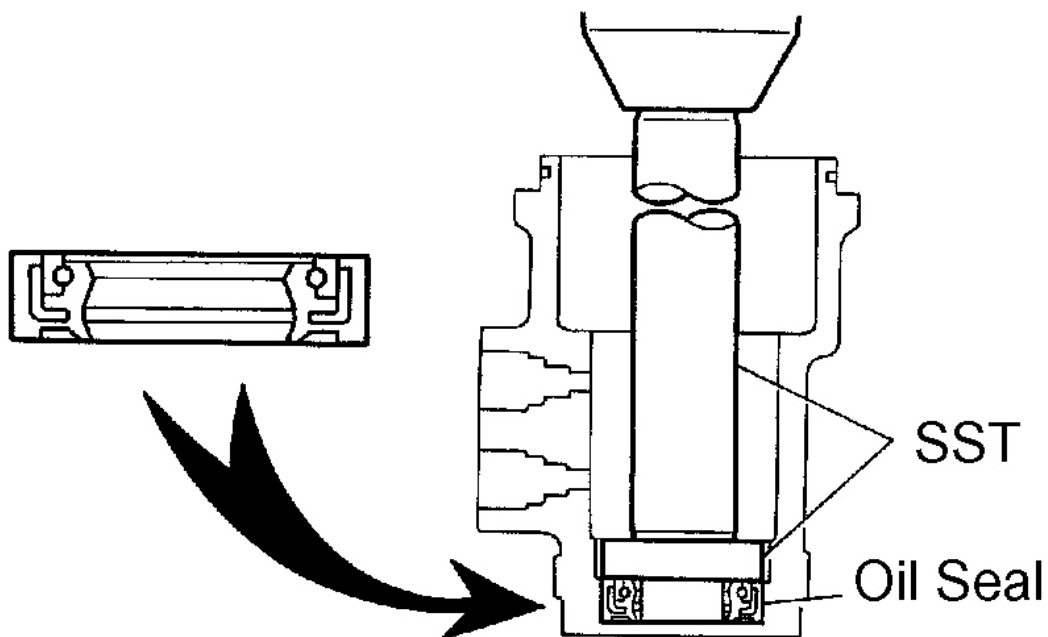
- d. Check that there is no change in the vacuum pressure. If there is a change in the vacuum pressure, check the installation of the oil seals.

49. INSTALL POWER STEERING CONTROL VALVE OIL SEAL

- a. Coat a new oil seal lip with power steering fluid.
- b. Using SST and a press, press in the oil seal.

SST 09950-60010 (09951-00320), 09950-70010 (09951-07200)

NOTE: **Make sure that the oil seal is installed in the correct direction.**



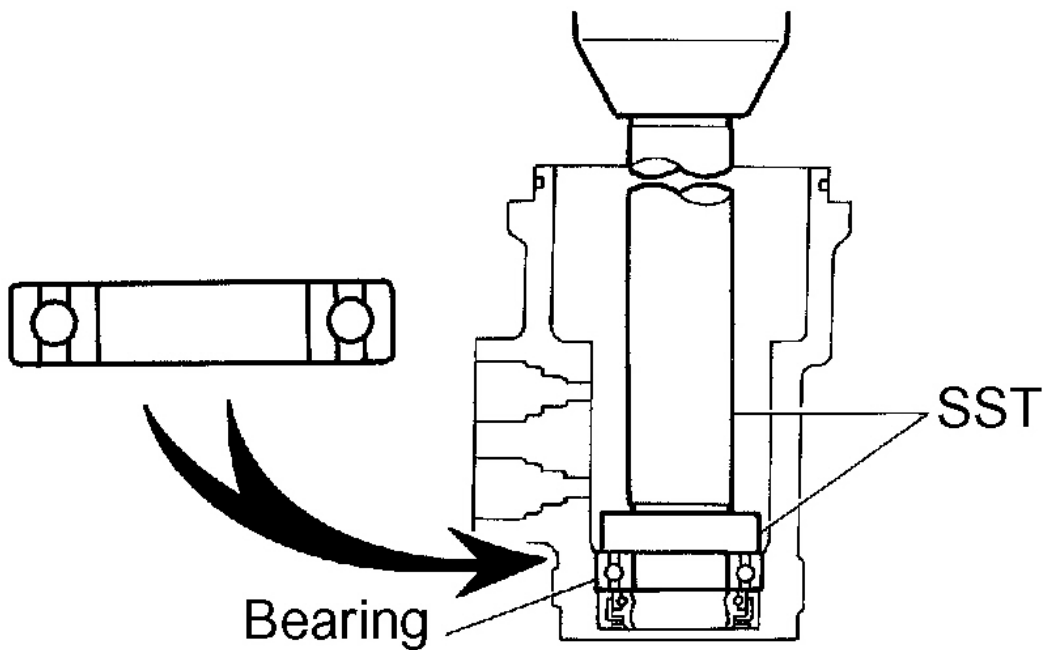
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Fig. 85: Installing Power Steering Control Valve Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. INSTALL POWER STEERING CONTROL VALVE UPPER BEARING

- a. Using SST and a press, press in the upper bearing.

SST 09950-60010 (09951-00340), 09950-70010 (09951-07200)



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Fig. 86: Installing Power Steering Control Valve Upper Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

51. INSTALL POWER STEERING CONTROL VALVE

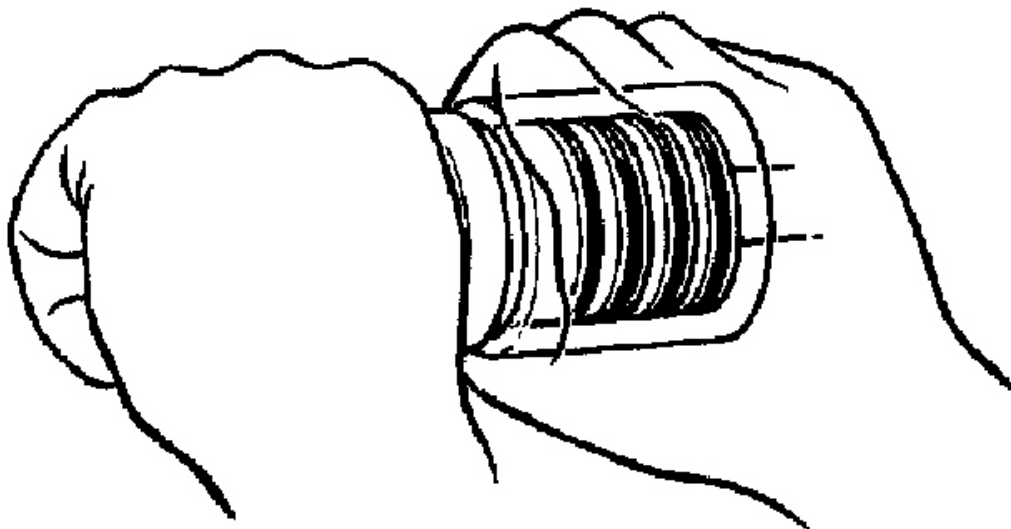
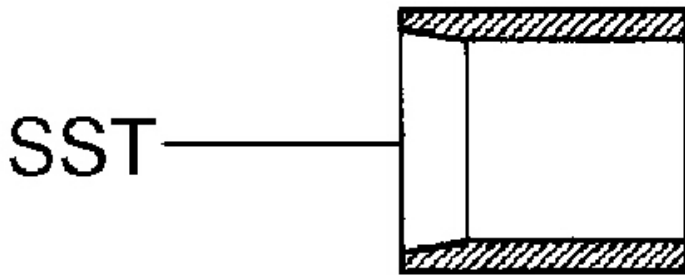
- a. Expand 4 new teflon rings with your fingers.

NOTE: Be careful not to overexpand the teflon rings.

- b. Coat the 4 teflon rings with power steering fluid.
- c. Install the 4 teflon rings to the power steering control valve, and adjust with your fingers.
- d. Carefully slide the tapered end of SST over the teflon rings until they fit to the power steering control valve.

SST 09631-32020

NOTE: Be careful not to damage the teflon rings.



G02999567

Fig. 87: Sliding Tapered End Of SST Over Teflon Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Coat 2 new O-rings with power steering fluid and install them to the power steering control valve.
- f. Expand 2 new teflon rings with your fingers.

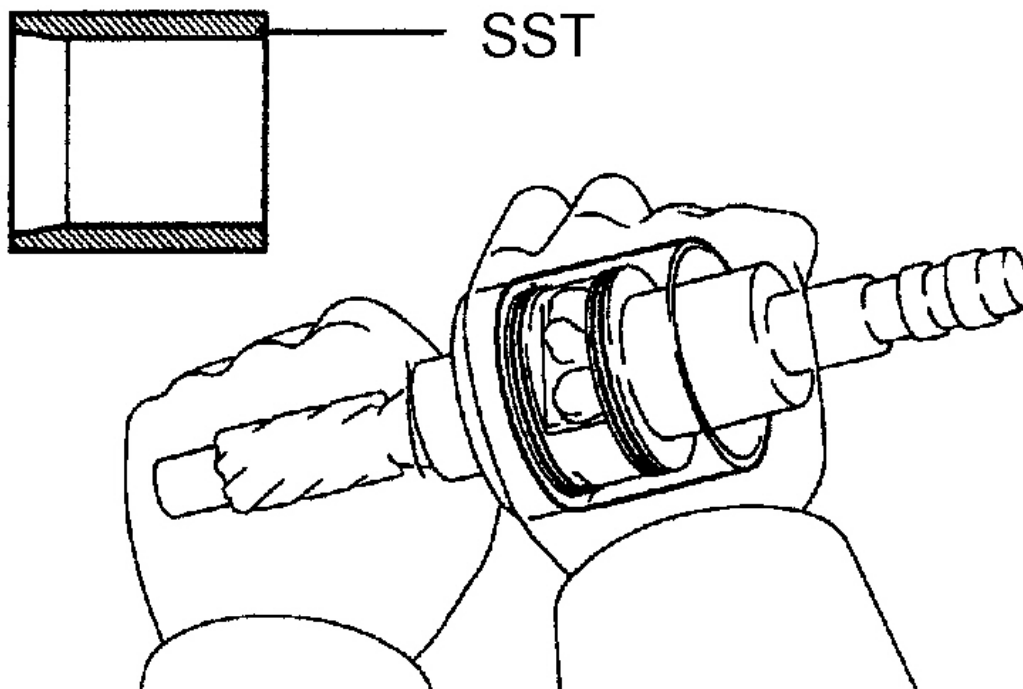
NOTE: Be careful not to overexpand the teflon rings.

- g. Coat the teflon rings with power steering fluid.
- h. Install the 2 teflon rings to the power steering control valve, and adjust with your fingers.
- i. Carefully slide the tapered end of SST over the rings until they fit to the power steering control

valve.

SST 09631-32020

NOTE: Be careful not to damage the rings.



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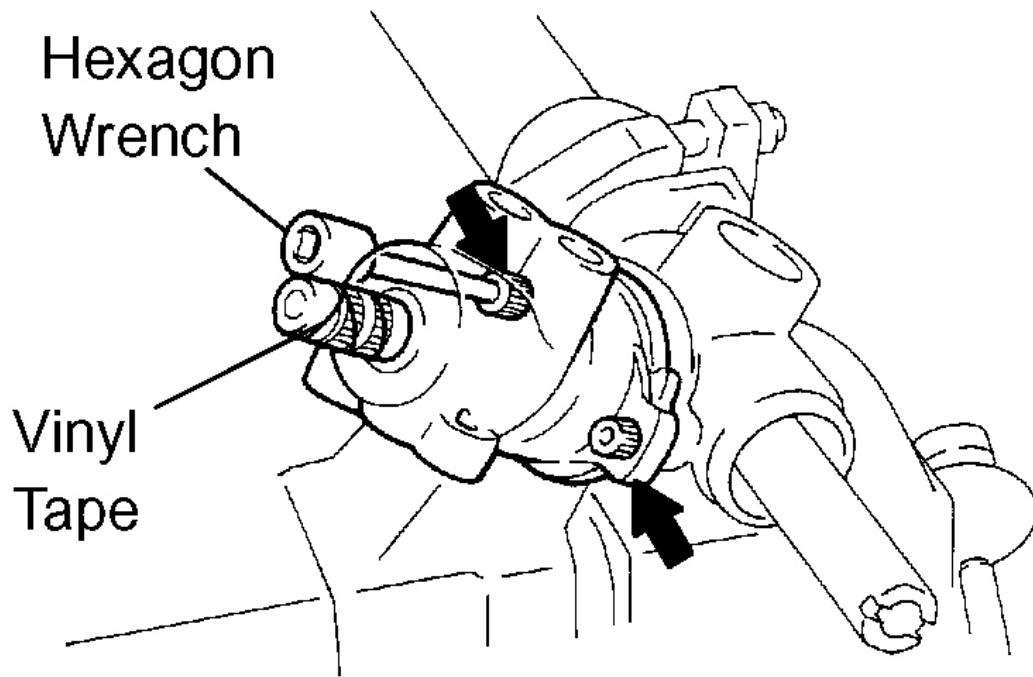
Fig. 88: Sliding Tapered End Of SST Over Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- j. Coat the teflon rings of the power steering control valve with power steering fluid.
- k. To prevent oil seal lip damage, wind vinyl tape around the serrated part of the control valve shaft.
- l. Install the power steering control valve into the control valve housing.

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

- m. Coat a new O-ring with power steering fluid and install it to the control valve housing.
- n. Using a hexagon wrench (6 mm), install the control valve housing with the 2 bolts.

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



G02999569

Fig. 89: Installing Control Valve Housing Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- o. Install the dust cover.
- p. Install the lower bearing to the rack housing.
- q. Install the spacer to the rack housing.
- r. Using SST, keep the control valve shaft from rotating and install a new self-locking nut.

Torque: 59 N.m (600 kgf.cm, 44 ft.lbf)

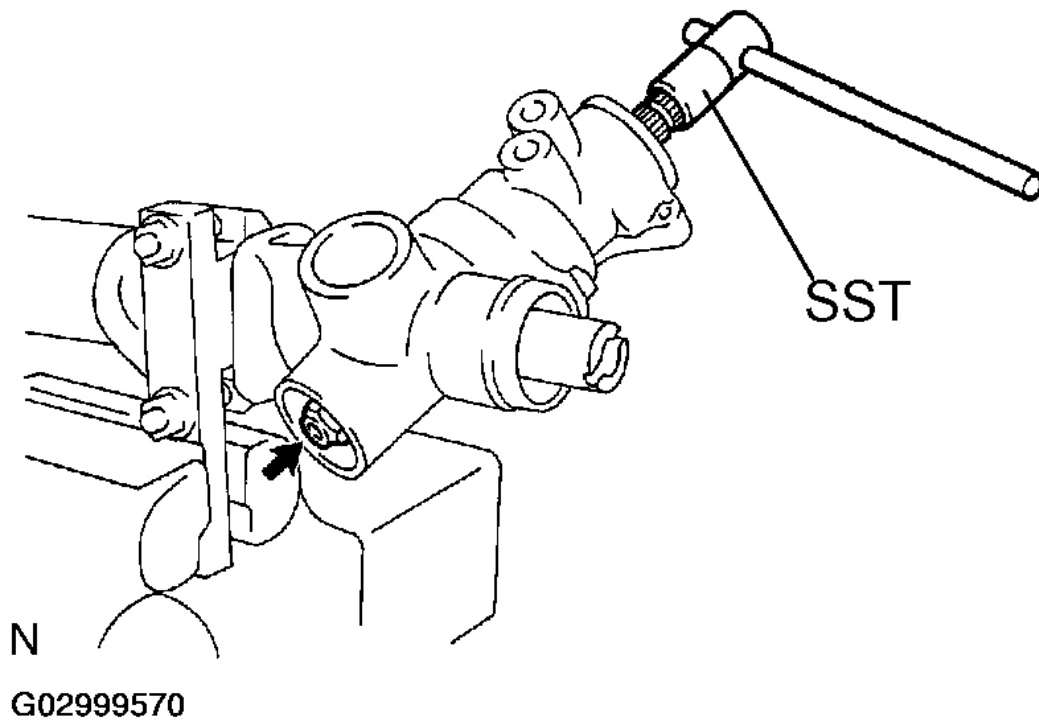


Fig. 90: Installing Self-Locking Nut Using SST
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- s. Apply sealant to 2 or 3 threads of the rack housing cap.

Sealant:

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

- t. Install the rack housing cap.

Torque: 69 N.m (705 kgf.cm, 51 ft.lbf)

52. INSTALL STEERING RACK GUIDE

- a. Coat a new O-ring with power steering fluid and install it to the steering rack guide.
- b. Apply grease to the rack guide spring and contact surface of the steering rack guide (see **COMPONENTS**).
- c. Install the rack guide to the steering rack housing.
- d. Install the rack guide spring.
- e. Apply sealant to 2 or 3 threads of the rack guide spring cap.

Sealant:

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

- f. Temporarily install the rack guide spring cap.

53. ADJUST TOTAL PRELOAD

- a. To prevent the steering rack teeth from damaging the oil seal lip, temporarily install the RH and LH rack ends.
- b. Using a hexagon wrench (24 mm), torque the rack guide spring cap.
Torque: 25 N.m (255 kgf.cm, 18 ft.lbf)

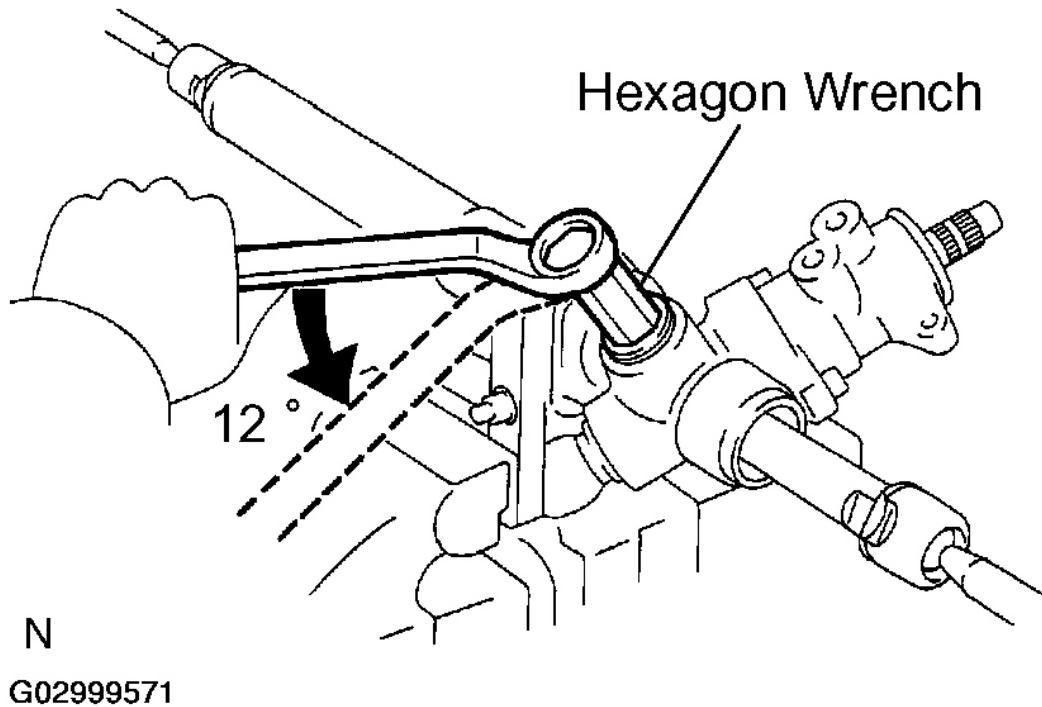


Fig. 91: Tightening Rack Guide Spring Cap
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a hexagon wrench (24 mm), loosen the rack guide spring cap 12°.
- d. Using SST, turn the control valve shaft right and left 1 or 2 times.
SST 09616-00011

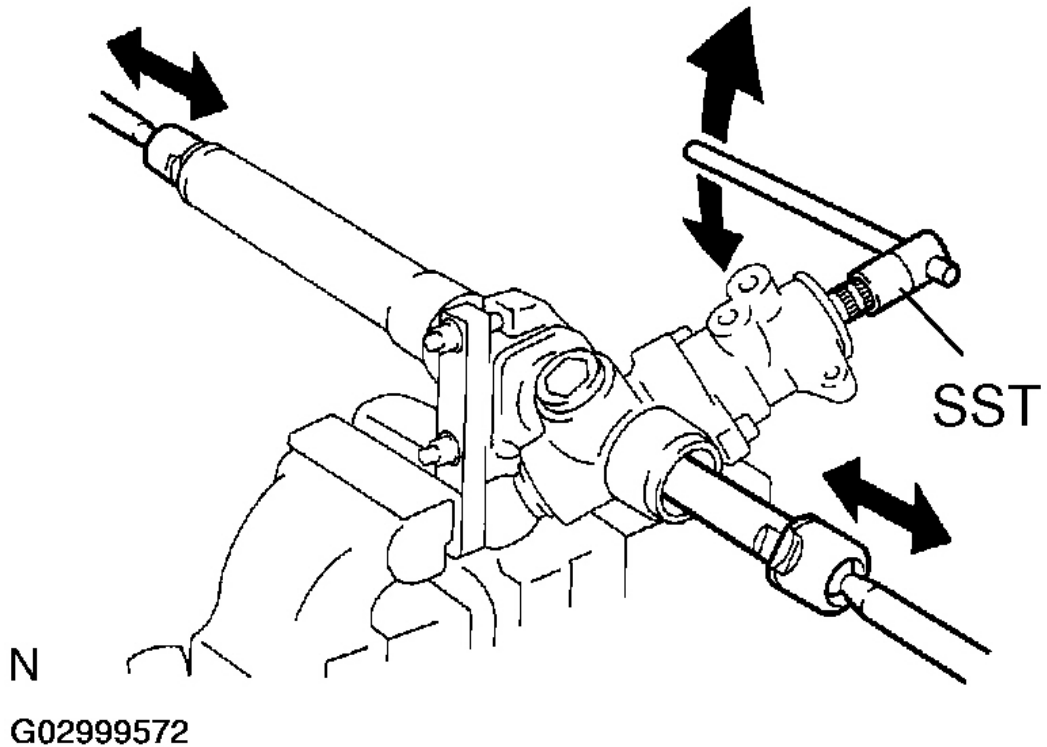


Fig. 92: Turning Control Valve Shaft Right And Left
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using a hexagon wrench (24 mm), loosen the rack guide spring cap until the rack guide spring stops functioning.
- f. Using SST, a torque wrench and hexagon wrench (24 mm), tighten the rack guide spring cap until the preload is within specification.

SST 09616-0001 1

Preload (turning): 0.8 to 1.6 N.m (8 to 16 kgf.cm, 7 to 14 in.lbf)

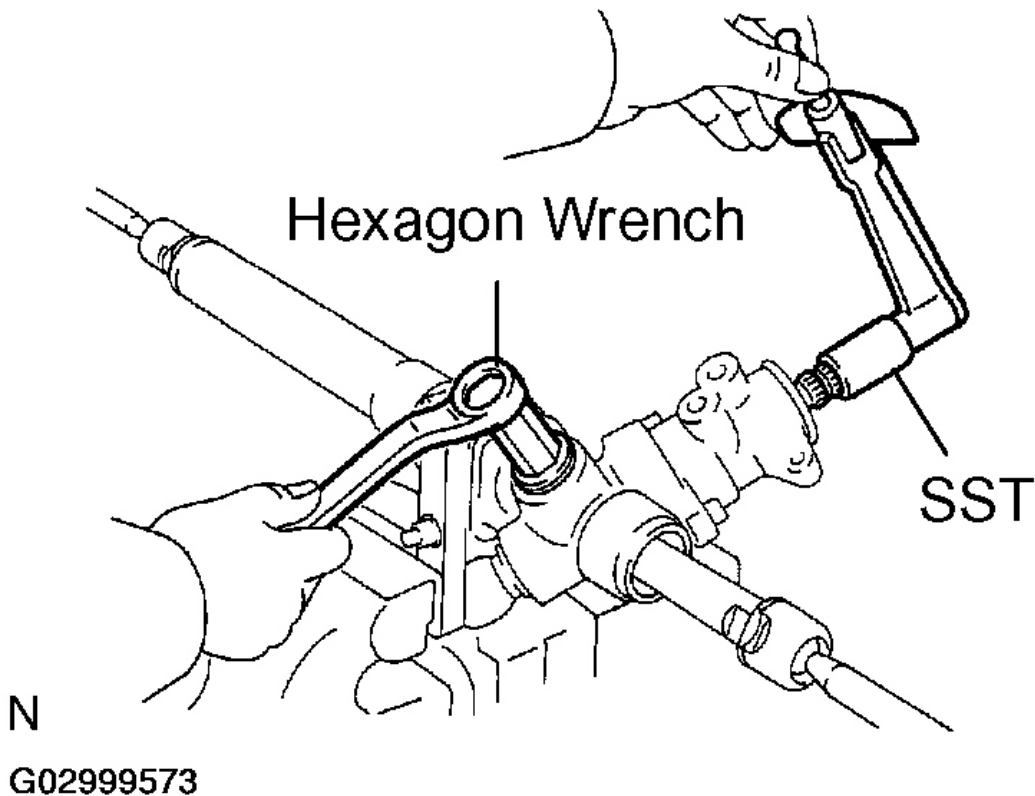


Fig. 93: Tightening Rack Guide Spring Cap
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

54. INSTALL STEERING RACK GUIDE SPRING CAP NUT

- a. Apply sealant to 2 or 3 threads of the rack guide spring cap nut.

Sealant:

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

- b. Temporarily install the rack guide spring cap nut.
- c. Using a hexagon wrench (24 mm), hold the rack guide spring cap and using SST, torque the rack guide spring cap nut.

Torque: 50 N.m (510 kgf.cm, 37 ft.lbf)

NOTE: Using SST 09922-10010 in the direction shown in Fig. 94 .

HINT:

Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

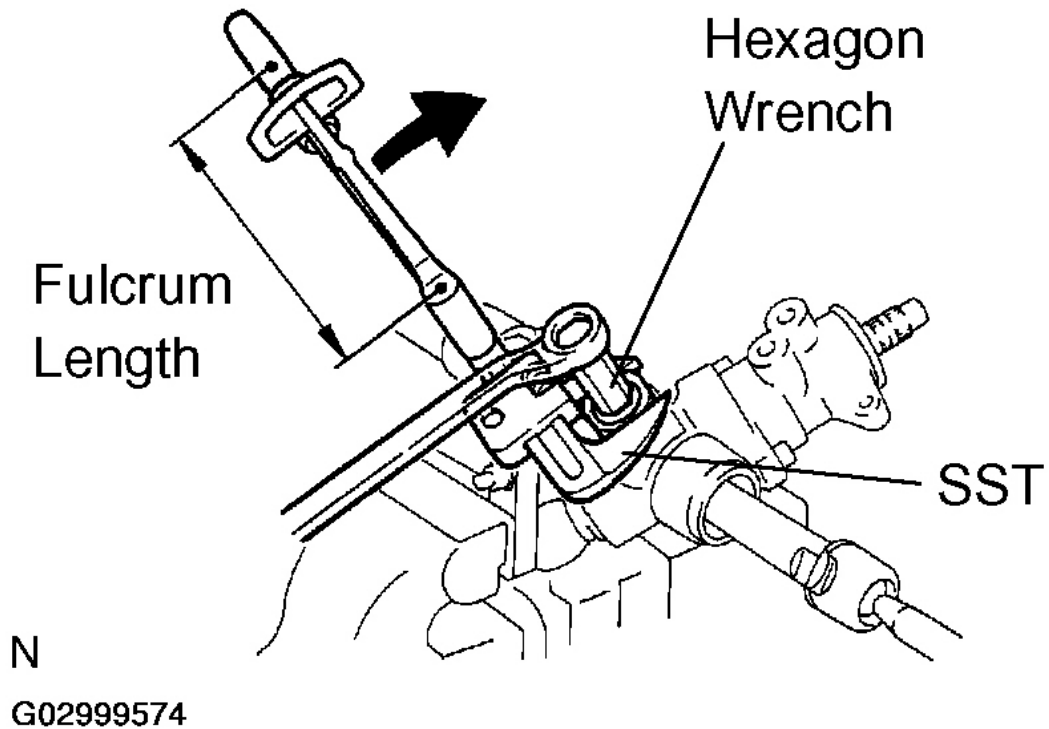


Fig. 94: Tightening Rack Guide Spring Cap Nut
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Recheck the total preload.

Preload (turning): 0.8 to 1.6 N.m (8 to 16 kgf.cm, 7 to 14 in..lbf)

If preload is not within the specified, repeat step 53 and 54 until preload falls within the specified range.

- e. Remove the RH and LH rack ends.

55. INSTALL STEERING RACK END SUB-ASSY

- a. Install a new claw washer, and temporarily install the rack end.

HINT:

Align the claws of the washer with the steering rack grooves.

- b. Using a wrench, hold the steering rack securely and using SST, torque the rack end.

SST 09922-10010

Torque: 95 N.m (970 kgf.cm, 70 ft.lbf)

NOTE: Use SST 09922-10010 in the direction shown in Fig. 95 .

HINT:

Use a torque wrench with a fulcrum length of 380 mm (14.96 in.).

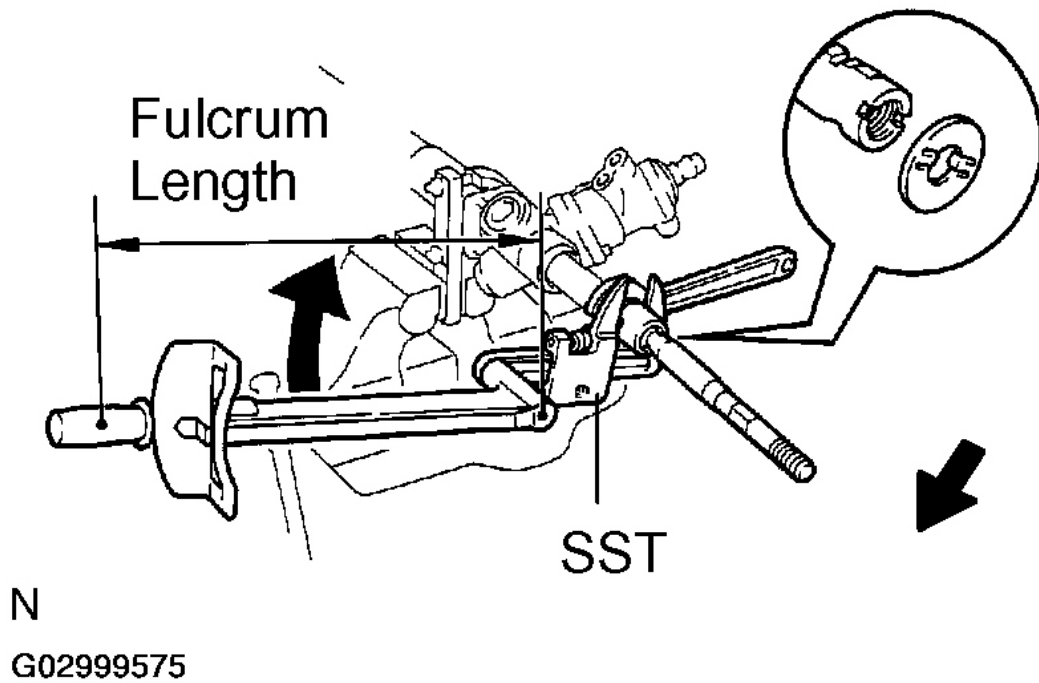
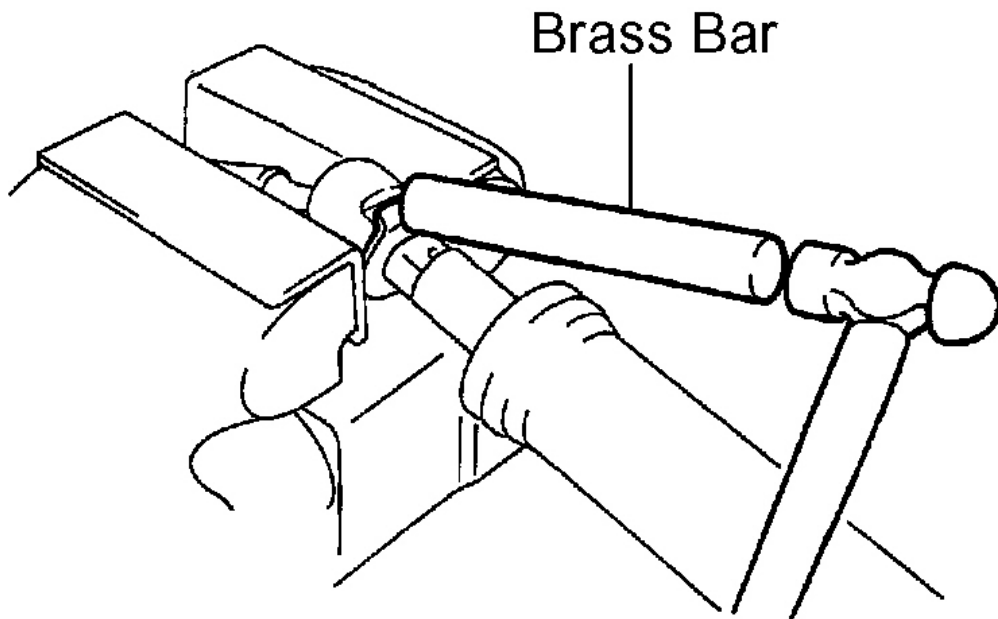


Fig. 95: Tightening Rack End
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a brass bar and hammer, stake the washer.

NOTE: Avoid any impact to the steering rack.



N

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Fig. 96: Staking Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Use the same manner described above on the other side.

56. **INSPECT POWER STEERING RACK**

- a. Ensure that the steering rack hole is not clogged with grease.

HINT:

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

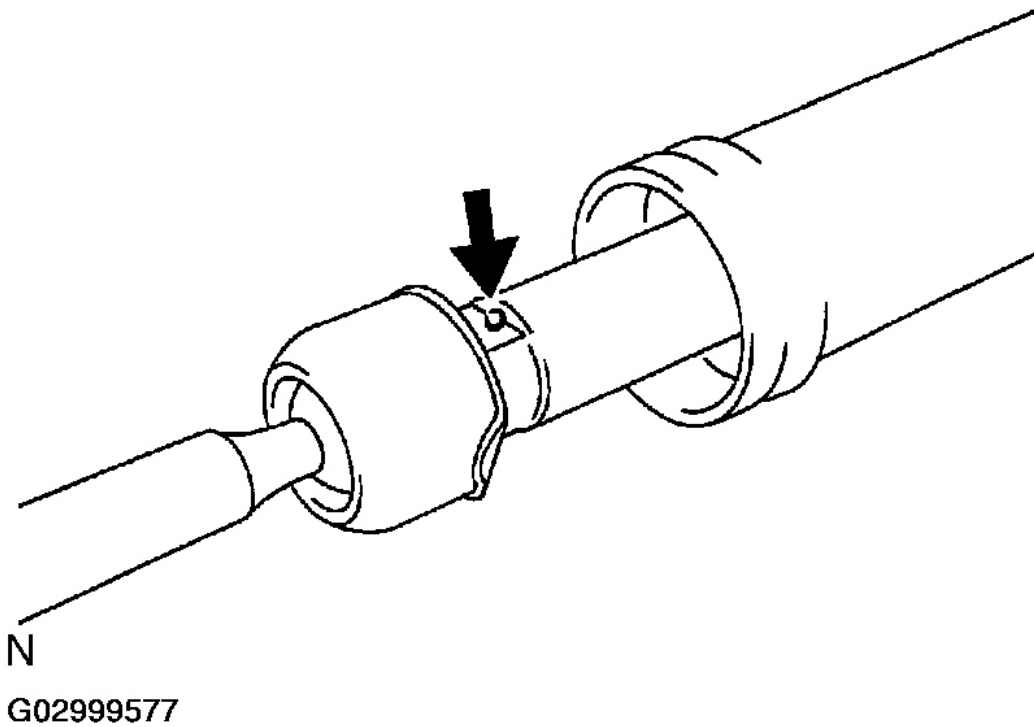
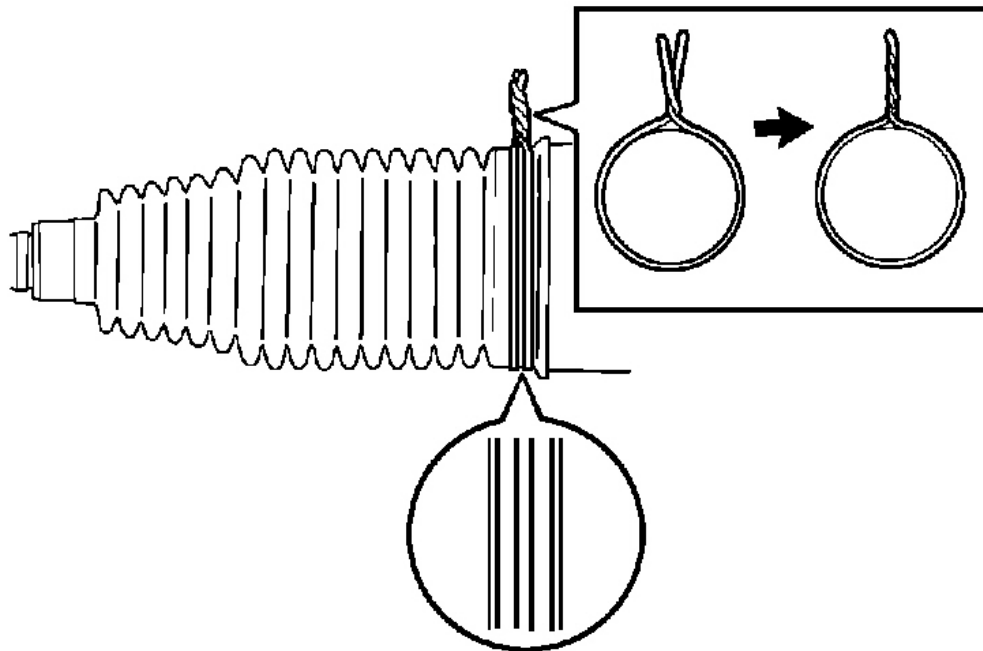


Fig. 97: Inspecting Power Steering Rack
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. INSTALL STEERING RACK BOOT NO. 2

- a. Install the steering rack boot No. 2 with the clip and clamp.

NOTE: Be careful not to damage or twist the steering rack boot No. 2.

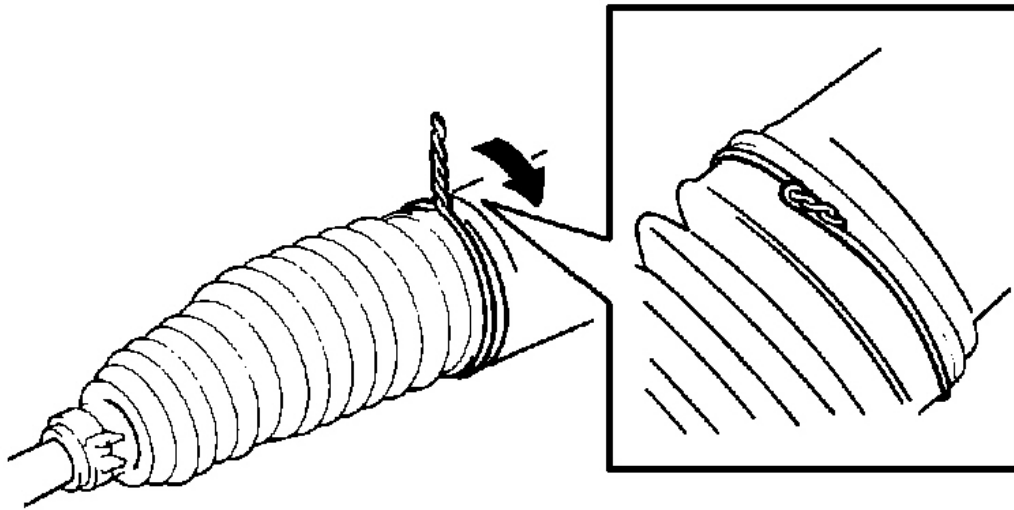


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Fig. 98: Installing Steering Rack Boot No. 2
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. After winding and tightening the wire around the circumference of the boot twice, twist it several times, and install it.
- c. As shown in **Fig. 99** , bend the wire to the circular direction to prevent damage to the steering rack boot No. 2.



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Fig. 99: Bending Wire In Circular Direction

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. INSTALL STEERING RACK BOOT NO. 1

HINT:

Perform the same procedure as for the steering rack boot No. 2.

59. INSTALL TIE ROD ASSY LH

- a. Screw the lock nut and tie rod assy LH onto the rack end until the matchmarks are aligned.
- b. After adjusting toe-in, torque the nut (see ADJUSTMENT).

Torque: 56 N.m (570 kgf.cm, 41 ft.lbf)

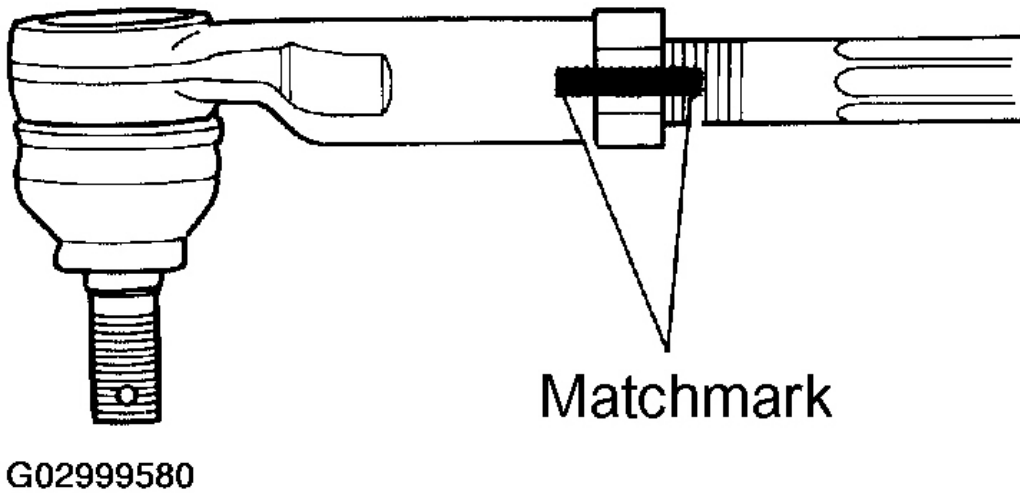


Fig. 100: Installing Tie Rod Assy LH

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. INSTALL TIE ROD ASSY RH

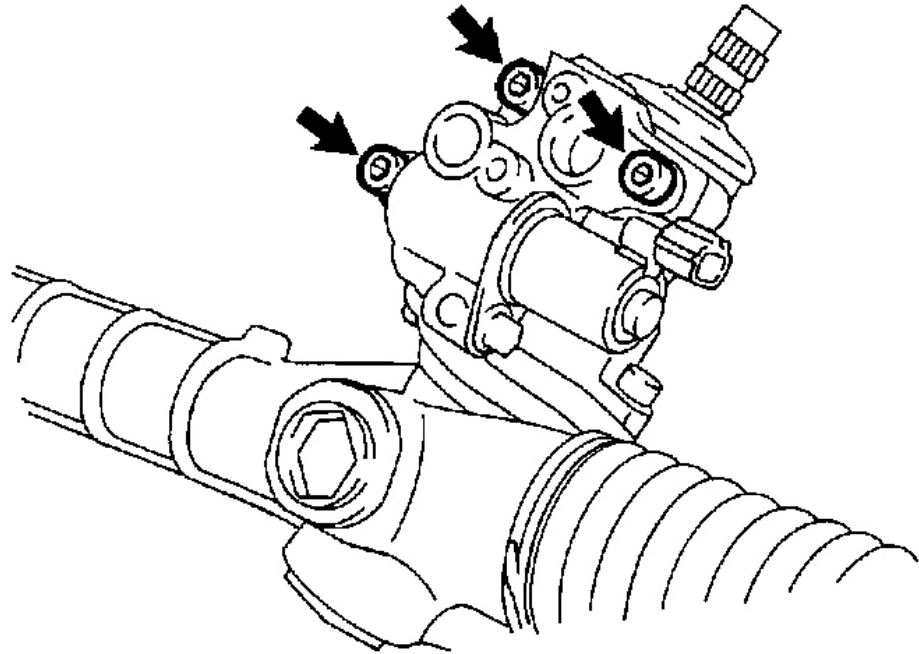
HINT:

Perform the same procedures as for the LH.

61. INSTALL PRESSURE CONTROL VALVE

- a. Coat 4 new O-rings with power steering fluid and install them to the pressure control valve.
- b. Using a hexagon wrench (6 mm), install the pressure control valve with the 3 bolts.

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



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Fig. 101: Installing Pressure Control Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

62. INSTALL STEERING LEFT TURN PRESSURE TUBE

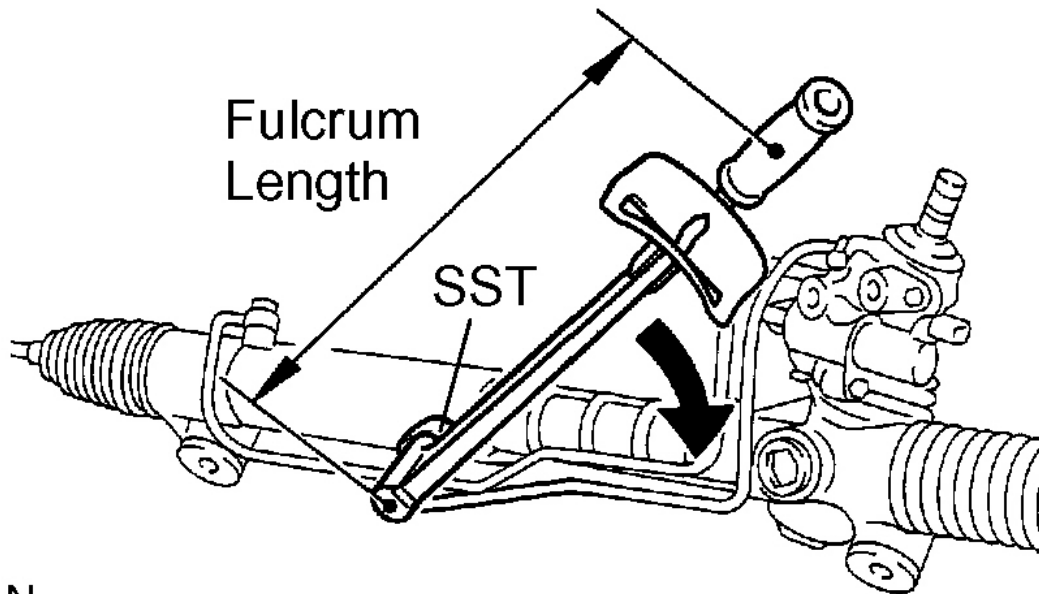
- a. Using SST, connect the left turn pressure tube.

SST 09023-38200

Torque: 23 N.m (235 kgf.cm, 17 ft.lbf)

HINT:

- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.)
- This torque value is effective when SST is parallel to the torque wrench.



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Fig. 102: Connecting Left Turn Pressure Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the left turn pressure tube and 2 new gaskets with the union bolt.

Torque: 34 N.m (350 kgf.cm, 25 ft.lbf)

- c. Install the tube clamp.

63. INSTALL STEERING RIGHT TURN PRESSURE TUBE

- a. Install the right turn pressure tube and 4 new gaskets with the 2 union bolts.

Torque: 34 N.m (350 kgf.cm, 25 ft.lbf)

64. CONNECT STEERING INTERMEDIATE SHAFT

- a. Align the matchmarks on the intermediate shaft and control valve shaft.

- b. Install the bolt.

Torque: 35 N.m (360 kgf.cm, 26 ft.lbf)

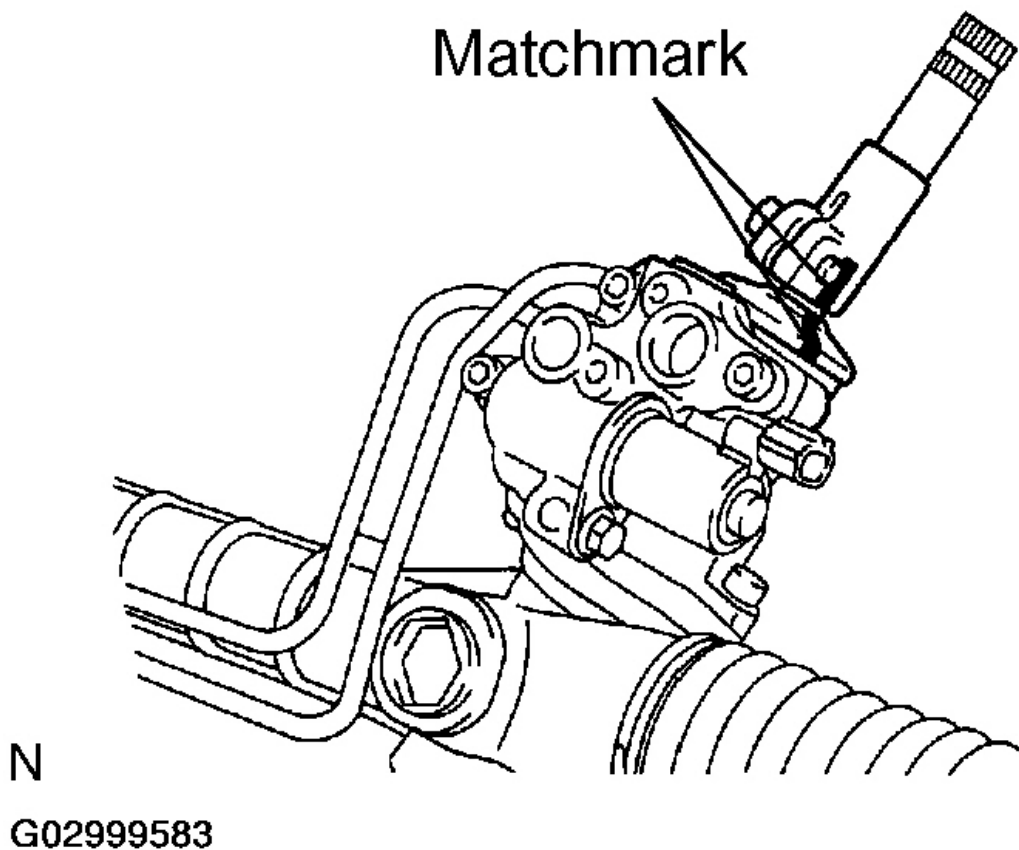


Fig. 103: Connecting Steering Intermediate Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

65. INSTALL RACK & PINION POWER STEERING GEAR ASSY

- a. Install the power steering gear with the 2 nuts.

Torque: 118 N.m (1,205 kgf.cm, 87 ft.lbf)

NOTE: Do not damage the turn pressure tubes.

- b. Connect the PPS solenoid connector.

66. CONNECT RETURN TUBE SUB-ASSY NO. 2

- a. Install 2 new gaskets on each side of the return tube and connect the return tube with the union bolt.

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

67. CONNECT PRESSURE FEED TUBE ASSY

- a. Install a new gasket, then connect the pressure feed tube with the union bolt.

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

68. CONNECT STEERING SLIDING W/SHAFT YOKE SUB-ASSY

- a. Align the matchmarks on the sliding w/shaft yoke and control valve shaft.
- b. Install the 2 bolts.

Torque: 35 N.m (360 kgf.cm, 26 ft.lbf)

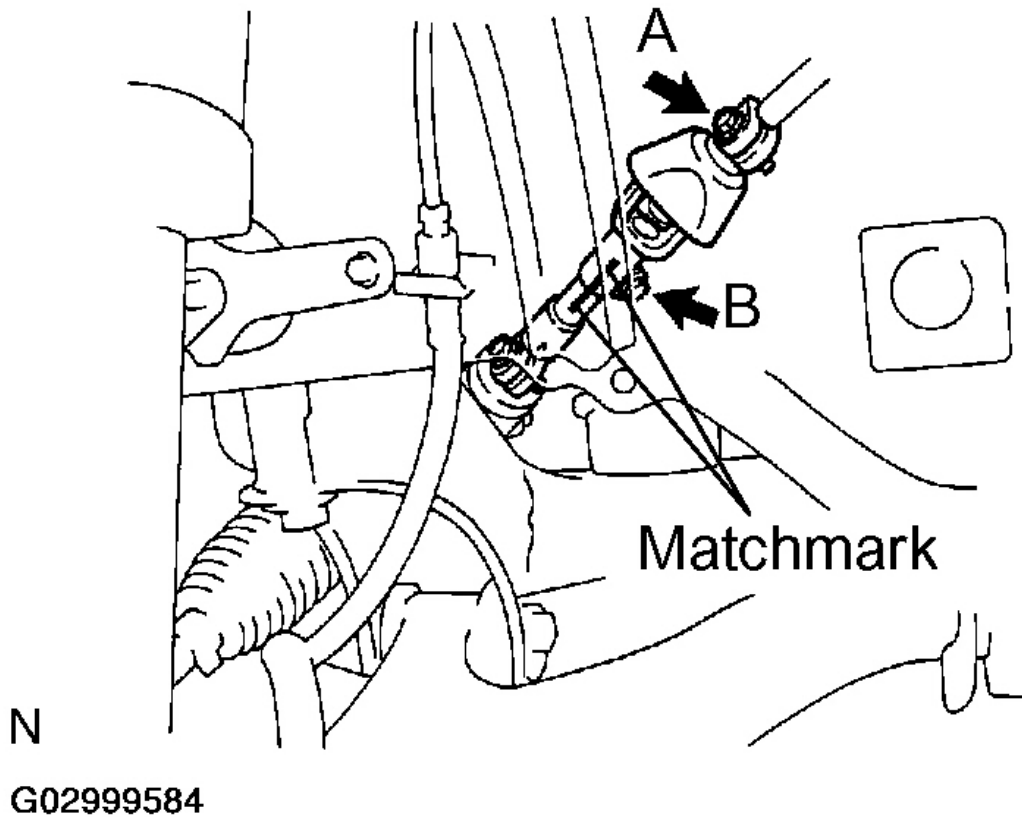


Fig. 104: Connecting Steering Sliding W/Shaft Yoke Sub-Assy
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

69. CONNECT TIE ROD ASSY LH

- a. Install the tie rod LH to the lower ball joint with the nut.

Torque: 59 N.m (600 kgf.cm, 44 ft.lbf)

- b. Install the clip.

70. CONNECT TIE ROD ASSY RH

HINT:

Perform the same procedures as for the LH.

71. INSTALL ENGINE UNDER COVER NO. 1

- a. Install the engine under cover No. 1 with the 9 bolts, 6 screws and 2 clips.

72. INSTALL FRONT WHEELS

Torque: 103 N.m (1,050 kgf.cm, 76 ft.lbf)

73. INSPECT CENTER FRONT WHEEL

HINT:

Inspect with the front of the vehicle jacked up.

74. CENTER SPIRAL CABLE (See step 93 in OVERHAUL)

75. INSTALL STEERING WHEEL ASSY

- a. Align the matchmarks on the steering wheel and main shaft.
- b. Temporarily tighten the steering wheel set nut.
- c. Connect the connector.

76. CONNECT BATTERY NEGATIVE TERMINAL

77. BLEED AIR IN POWER STEERING SYSTEM (See ON-VEHICLE INSPECTION)

78. CHECK FOR POWER STEERING FLUID LEAKAGE

If any leakage is found on the power steering system, repair or replace the related parts.

79. INSPECT STEERING WHEEL CENTER POINT

80. FULLY TIGHTEN STEERING WHEEL ASSY

- a. Tighten the steering wheel assy set nut.

Torque: 50 N.m (510 kgf.cm, 37 ft.lbf)

81. INSTALL HORN BUTTON ASSY (See step 98 in OVERHAUL)

82. INSTALL SWITCH & VOLUME CASE (See OVERHAUL)

83. INSTALL STEERING WHEEL COVER LOWER NO. 2 (See OVERHAUL)

84. CHECK POWER STEERING FLUID LEVEL IN RESERVOIR (See ON-VEHICLE INSPECTION)

85. PERFORM INITIALIZATION (See PRECAUTION)

86. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT (See ADJUSTMENT)

87. CLEAR ZERO POINT CALIBRATION FOR VSC (See CALIBRATION)

88. PERFORM ZERO POINT CALIBRATION OF YAW RATE SENSOR AND DECELERATION SENSOR (See CALIBRATION)

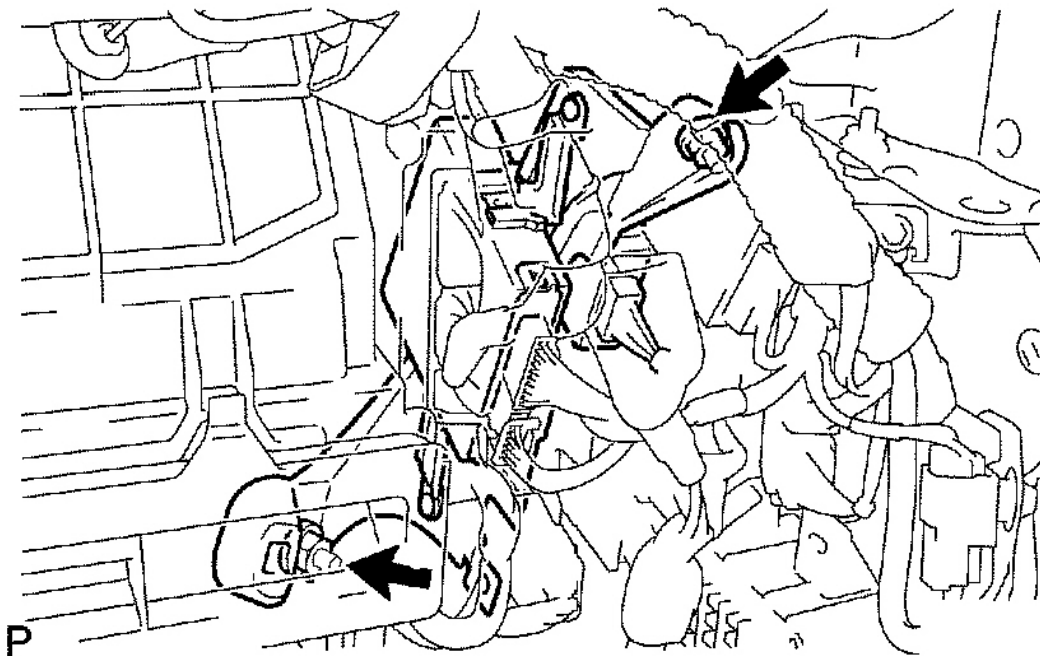
89. INSPECT ABS WARNING LIGHT AND VSC WARNING LIGHT (See DIAGNOSIS SYSTEM)

90. INSPECT SRS WARNING LIGHT (See DIAGNOSIS SYSTEM)

POWER STEERING ECU ASSY

REPLACEMENT

1. **PRECAUTION** (See PRECAUTION)
2. **DISCONNECT BATTERY NEGATIVE TERMINAL**
3. **REMOVE INSTRUMENT PANEL UNDER COVER SUB-ASSY NO. 2** (See step 21 in REPLACEMENT)
4. **REMOVE INSTRUMENT PANEL GARNISH SUB-ASSY LH** (See step 22 in REPLACEMENT)
5. **REMOVE GLOVE COMPARTMENT PLATE** (See step 23 in REPLACEMENT)
6. **REMOVE CHOKE KNOB HOLE COVER** (See REPLACEMENT)
7. **REMOVE GLOVE COMPARTMENT DOOR ASSY W/INSTRUMENT PANEL AIRBAG ASSY LOWER NO. 2** (See step 25 in REPLACEMENT)
8. **REMOVE POWER STEERING ECU ASSY**
 - a. Disconnect the power steering ECU connector and headlamp swivel ECU connector.



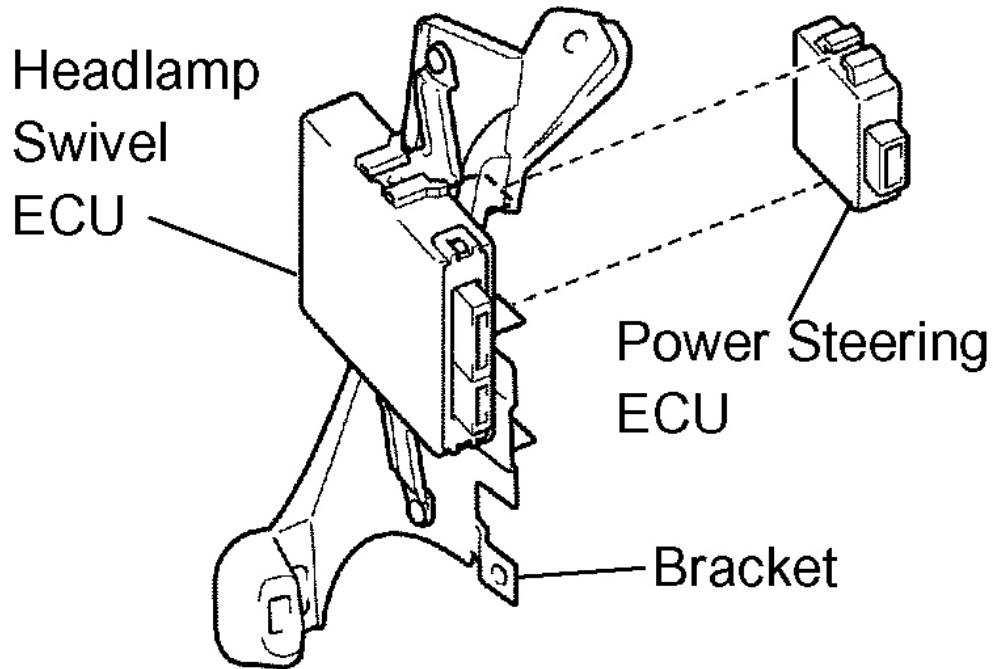
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Fig. 105: Disconnecting Power Steering ECU Connector And Headlamp Swivel ECU Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 nuts.
- c. Remove the power steering ECU with the bracket and headlamp swivel ECU.

If necessary, disconnect the connectors placed around the power steering ECU and headlamp swivel ECU.

- d. Remove the power steering ECU from the bracket.



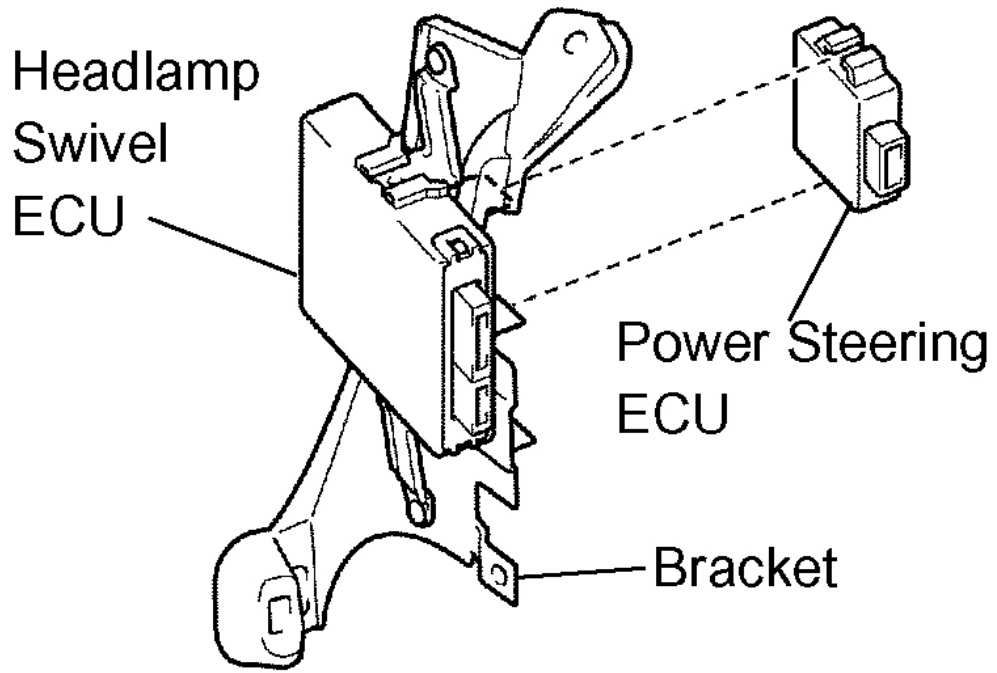
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Fig. 106: Removing Power Steering ECU
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL POWER STEERING ECU ASSY

- a. Install the power steering ECU to the bracket.



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Fig. 107: Installing Power Steering ECU To Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the power steering ECU with the bracket and headlamp swivel ECU.

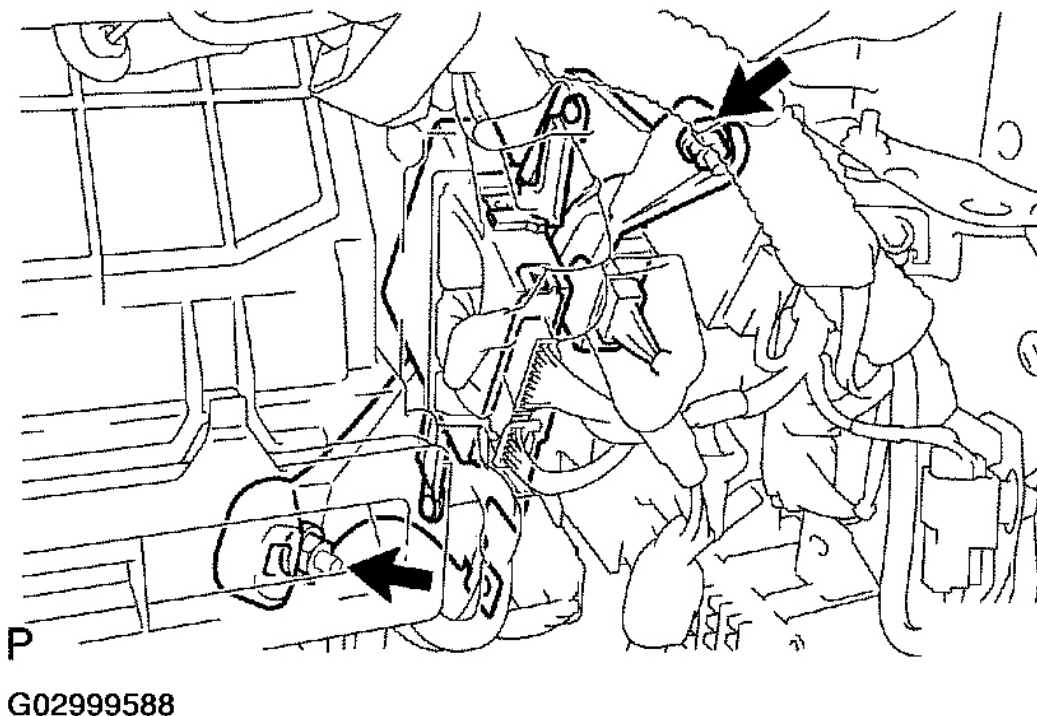


Fig. 108: Installing Power Steering ECU And Headlamp Swivel ECU
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Tighten the 2 nuts.

Torque: 5.5 N.m (56 kgf.cm, 48 in.lbf)

d. Connect the power steering ECU connector and headlamp swivel ECU connector.

If you disconnect the connectors placed around the power steering ECU and headlamp swivel ECU in step 8, reconnect them.

10. **INSTALL GLOVE COMPARTMENT DOOR ASSY W/INSTRUMENT PANEL AIRBAG ASSY LOWER NO. 2 (See step 25 in REPLACEMENT)**
11. **INSTALL CHOKE KNOB HOLE COVER (See REPLACEMENT)**
12. **INSTALL GLOVE COMPARTMENT PLATE (See step 23 in REPLACEMENT)**
13. **INSTALL INSTRUMENT PANEL GARNISH SUB-ASSY LH (See step 22 in REPLACEMENT)**
14. **INSTALL INSTRUMENT PANEL UNDER COVER SUB-ASSY NO. 2 (See step 21 in REPLACEMENT)**
15. **CONNECT BATTERY NEGATIVE TERMINAL**
16. **PERFORM INITIALIZATION (See PRECAUTION)**

17. **INSPECT SRS WARNING LIGHT (See DIAGNOSIS SYSTEM)**