

Power Steering Rack Leak from Right Side: Overhaul Procedure

Service Category Steering

Section Steering Gear/Linkage

Market USA

Toyota Supports
 ASE Certification 

Applicability

YEAR(S)	MODEL(S)	ADDITIONAL INFORMATION
2004 – 2010	Sienna	Drive Type(s): 4WD, 2WD Engine(s): 3MZ, 2GR

SUPERSESION NOTICE

The information contained in this bulletin supersedes SB No. T-SB-0097-12.

- The entire bulletin has been updated to include Power Steering Rack Gasket overhaul.

Service Bulletin No. T-SB-0097-12 is Obsolete and any printed versions should be discarded. Be sure to review the entire content of this bulletin before proceeding.

Introduction

A new repair procedure and overhaul kit have been developed for repairing the power steering rack to improve the overall serviceability and reduce ownership cost. This repair procedure only applies to vehicles where the steering rack leak is originating from the right (passenger) side **and** is the OEM steering rack assembly.

NOTE

- This bulletin does NOT apply to aftermarket or rebuilt steering rack assemblies.
- The procedure in this bulletin is only one of several repair options which include, but are not limited to, complete steering rack overhaul and steering gear replacement. Please use your best judgment to recommend the most effective repair method for the customer.

Parts Information

PART NUMBER	PART NAME	QTY
04003-38208	Power Steering Rack Gasket Kit	1
95381-03020	Cotter Pin	2

Power Steering Rack Leak from Right Side: Overhaul Procedure

Warranty Information

OP CODE	DESCRIPTION	TIME	OFFP	T1	T2
ST1401	R & R Steering Gear Assembly and Overhaul Right (Passenger) Side Power Steering Rack	2.8	44250-08030 44250-08040	65	13

APPLICABLE WARRANTY

- This repair is covered under the Toyota Basic Warranty. This warranty is in effect for 36 months or 36,000 miles, whichever occurs first, from the vehicle's in-service date.
- Warranty application is limited to occurrence of the specified condition described in this bulletin.

Required Tools & Equipment

SPECIAL SERVICE TOOLS (SST)	PART NUMBER	QTY
Ball Joint Puller*	09628-62011-01	1
Rack & Pinion Holding Tool*	09612-00012-01	1
Variable Open Wrench*	09922-10010-01	2
Steering Socket*	09616-00010-02 / 09616-00011	1
Steering Rack Shaft Bushing Puller*	09613-22011	1
Steering Rack Oil Seal Test Tool*	09631-12071	1
Test Tool O-Ring*	09633-00010-01	2
Rear Axle Shaft Bearing Remover (or equivalent)	09527-21011	1
Drive Shaft Boot Clamping Tool (or equivalent)	09521-24010	1
Replacer Set #1* (Replacer 40)	09950-60010-01 (09951-00400-01)	1
Handle Set* (Handle Assembly 100 – 4.25")	09950-70010-01 (09951-07100-01)	1

* Essential SST.

NOTE

Additional SSTs may be ordered by calling 1-800-933-8335.

Power Steering Rack Leak from Right Side: Overhaul Procedure

Required Tools & Equipment (Continued)

REQUIRED TOOLS & MATERIAL	QUANTITY
Hand Vacuum Pump w/ Gauge	1
Soft Jaw Attachment (Bench Vise)	1
Union Nut Wrench, 17 mm (or equivalent)	1
Union Nut Wrench, 12 mm (or equivalent)	1
Power Steering Fluid (Dexron II, III, or equivalent)	As Needed
Silicone Grease	As Needed

Overview

1. Confirm origin of oil leak.
2. Remove the power steering rack.
3. Thoroughly clean and inspect the power steering rack.
4. Remove the right side steering rack bushing assembly and install new O-ring and seal.
5. Vacuum air test the power steering rack to confirm repair.
6. Reinstall the power steering rack to the vehicle.
7. Confirm by test driving and checking for leaks.

Repair Procedure

Confirmation of Steering Rack Oil Leak Source

Place the vehicle on the lift to confirm that only the right side steering rack boot is leaking.

Is the leak from the right side of the rack only?

- **YES** — Proceed with this bulletin.
- **NO** — Steering rack is leaking from the left side, both sides, or another location. **STOP.** This bulletin does NOT apply. Order the complete Power Steering Rack Gasket Kit and rebuild the steering rack assembly using the procedure outlined in the applicable Repair Manual.

NOTE

This bulletin does NOT apply to aftermarket or rebuilt steering rack assemblies.

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure (Continued)

Power Steering Rack Removal

Remove the power steering rack assembly.

Refer to the Technical Information System (TIS), applicable model and model year Repair Manual:

- [2004](#) / [2005](#) Sienna:
Steering – Power Assist Systems – “Rack & Pinion Power Steering Gear Assy: Overhaul”
- [2006](#) / [2007](#) / [2008](#) / [2009](#) Sienna:
Steering – Power Assist Systems – “Power Steering: Rack and Pinion Power Steering Gear: Disassembly”
- [2010](#) Sienna:
Steering – Power Assist Systems – “Power Steering: Steering Gear: Disassembly”

Power Steering Rack Cleaning & Inspection

Clean power steering rack and inspect for defects.

- If the steering rack housing is damaged, repair the damaged or worn parts as necessary.
- If replacement parts are NOT available or cannot restore the housing integrity/operability, do **NOT** proceed with this bulletin.
- Replace steering rack housing if damaged.

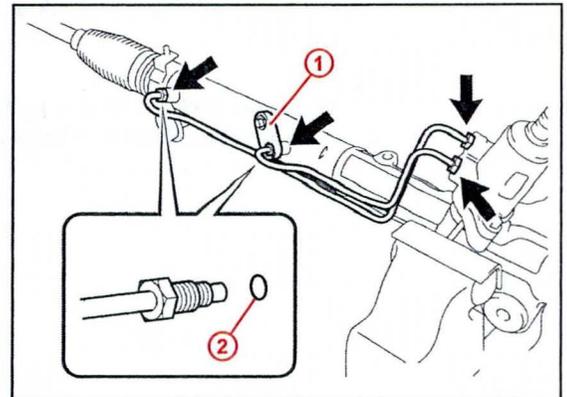
Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure (Continued)

Right Side Steering Rack Bushing Removal

1. Prepare the steering rack by steering the rack to the left-hand lock (clockwise).
2. Remove the steering left turn pressure tube.
 - A. Remove the tube clamp from the turn pressure tubes.
 - B. Using a 12 mm union nut wrench (or equivalent), disconnect the left turn pressure tube.
 - C. Remove the 2 O-rings from the left turn pressure tube and discard.

Figure 1.



1	Union Nut Wrench, 12 mm (or equivalent)
2	O-ring

3. Remove the steering right turn pressure tube.
 - A. Disconnect the right turn pressure tube using the procedure above.
 - B. Remove the 2 O-rings from the right turn pressure tube and discard.

HINT

Wrap the steering rack in cloth or shop rags to capture any excess power steering fluid that will leak during the repair.

Figure 2.



Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

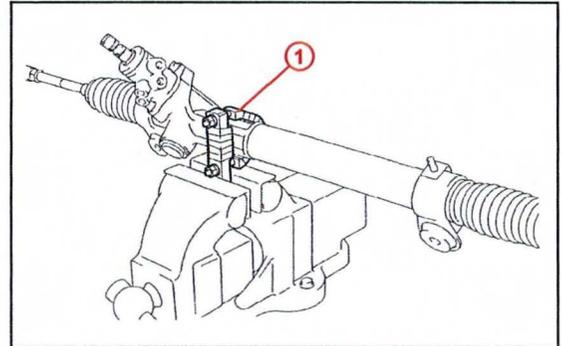
Right Side Steering Rack Bushing Removal (Continued)

4. Using the Rack & Pinion Holding Tool SST, secure the steering link assembly to prevent damage.
SST: 09612-00012-01, Rack & Pinion Holding Tool

NOTICE

Wrap the SST with tape before use, in order to prevent damaging the steering link assembly.

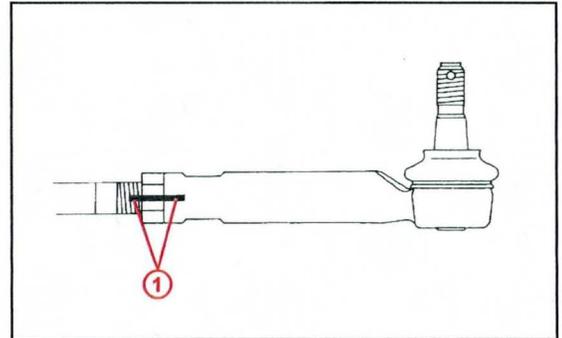
Figure 3.



1 Rack & Pinion Holding Tool

5. Put matchmarks on the tie rod assembly and the rack end.

Figure 4.



1 Matchmarks

6. Loosen the lock nut and remove the tie rod assembly RH and the lock nut.
7. Remove the tie rod assembly RH.
8. Remove the 2 RH steering rack boot clips.
9. Using pliers, remove the steering rack boot No. 2 clamp.
10. Remove the steering rack boot No. 1 clamp.
11. Remove the steering rack boot No. 2.
12. Remove the steering rack boot No. 1.

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Right Side Steering Rack Bushing Removal (Continued)

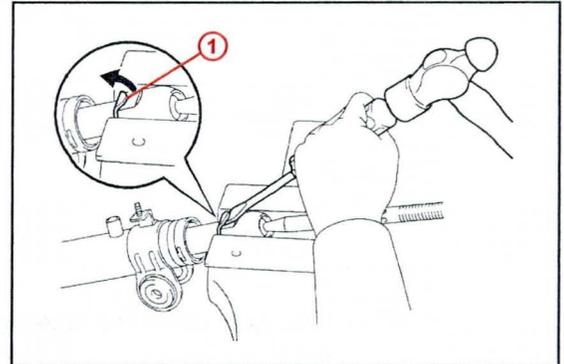
13. Remove the steering rack end sub-assembly.

- A. Using soft jaws, clamp the steering rack end as shown.

NOTICE

This step is necessary to avoid transmitting impact to the steering rack gear and steering pinion gear which may cause damage.

Figure 5.



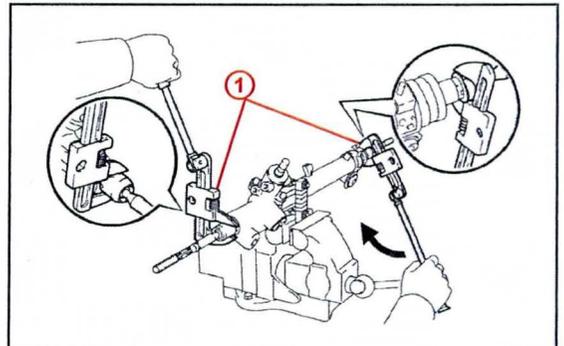
1 Claw Washer

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

- C. Using the Variable Open Wrench SST, remove the right-hand rack end and the claw washer.

SST: 09922-10010-01, Variable Open Wrench

Figure 6.



1 Variable Open Wrench

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Right Side Steering Rack Bushing Removal (Continued)

14. Inspect the left-hand and right-hand tie rod ends for excessive wear and play. Push and pull the tie rod to confirm condition. Replace as necessary.

Figure 7.



15. Thoroughly clean the steering rack assembly.

NOTICE

Be sure to clean the inside of the rack assembly to prevent foreign material from damaging the rack surface (for example, when boot has torn and allowed debris to collect around the inside of the rack).

Figure 8.



Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

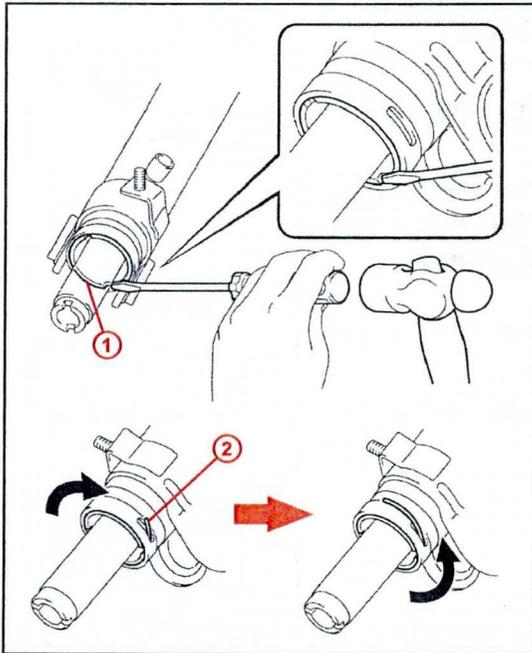
Right Side Steering Rack Bushing Removal (Continued)

16. Remove the cylinder end stopper.
 - A. Using a screwdriver and a hammer, turn the cylinder end stopper clockwise until the wire end is visible through the service hole.
 - B. Using a screwdriver and a hammer, turn the cylinder end stopper counterclockwise, and remove the wire and the cylinder end stopper.

HINT

Use the hooked wire end or a 90 degree angle hooked pick to pull the end stopper out.

Figure 9.



1	Cylinder End Stopper
2	Wire

Figure 10.



Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Right Side Steering Rack Bushing Removal (Continued)

17. Remove the power steering rack bushing.

Plug the port while simultaneously turning the input shaft counterclockwise.

HINT

The internal air pressure will cause the rack bushing to get pushed out.

NOTICE

Do NOT turn the input shaft clockwise; it may cause damage to the center seal on the rack bar if it goes beyond its normal travel.

Figure 11.



18. Remove the power steering rack bushing seal and O-ring.

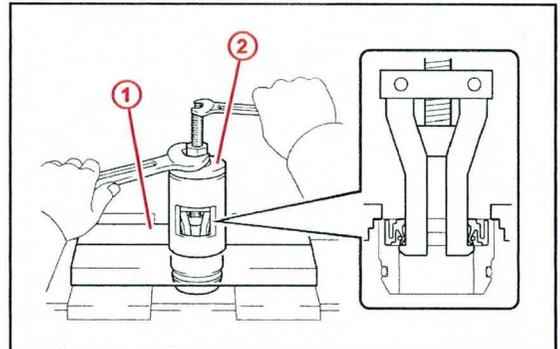
- A. Using the SSTs listed below, remove the rack bushing oil seal from the rack bushing.

SST: 09527-21011, Rear Axle Shaft Bearing Remover (or equivalent)

SST: 09613-22011, Steering Rack Shaft Bushing Puller

- B. Using a small screwdriver or pick, remove the O-ring from the rack bushing.

Figure 12.



1	Rear Axle Shaft Bearing Remover
2	Steering Rack Shaft Bushing Puller

19. Thoroughly clean the accumulated debris from the steering rack bushing and the steering rack housing before reassembly.

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Right Side Steering Rack Bushing Removal (Continued)

20. Install the power steering rack bushing seal.

- A. Coat the new rack bushing oil seal lip and outside diameter surface with power steering fluid.
- B. Using the SSTs listed below and a press, install the rack bushing oil seal to the rack bushing.

SST: 09950-60010-01, Replacer Set #1 (09951-00400-01, Replacer 40)

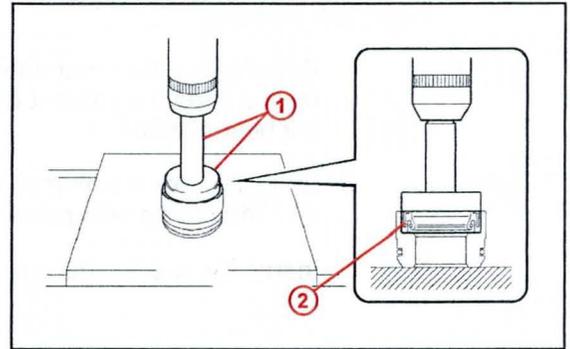
SST: 09950-70010-01, Handle Set (09951-07100-01, Handle Assembly 100 - 4.25")

- C. Coat a new O-ring with power steering fluid and install it to the rack bushing.

21. Inspect and clean the inside of the rack housing.

Look down inside the rack housing to confirm it is clean before reinstalling the rack bushing.

Figure 13.



1	Replacer 40, Handle Assembly 100 - 4.25"
2	Oil Seal

Figure 14.



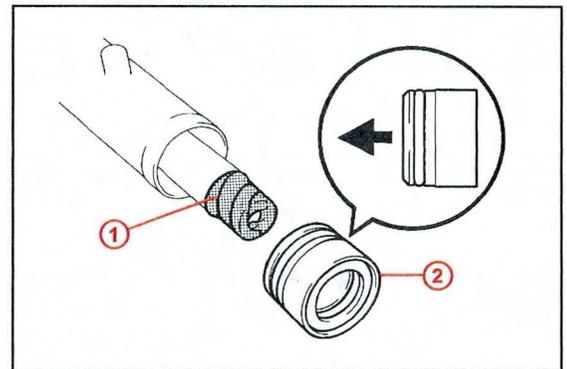
Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Right Side Steering Rack Bushing Removal (Continued)

22. Install the power steering rack bushing to the rack housing.
 - A. Wrap vinyl tape around the end of the steering rack in order to prevent damaging the rack bushing oil seal.
 - B. Coat the rack bushing oil seal lip, vinyl tape, and the O-ring with power steering fluid.
 - C. Install the rack bushing to the rack housing.

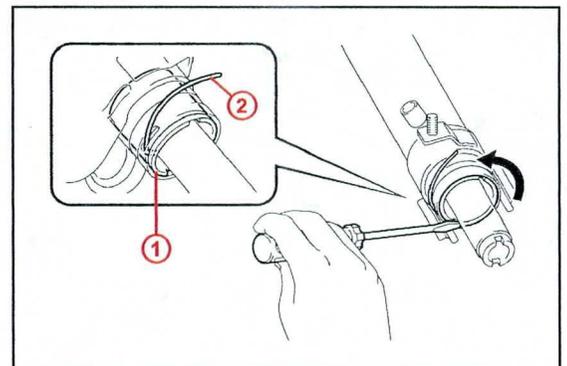
Figure 15.



1	Vinyl Tape
2	Rack Bushing

23. Install the cylinder end stopper.
 - A. Align the installation hole for the wire of the cylinder end stopper with the slot of the rack housing.
 - B. Install a new wire into the cylinder end stopper.
 - C. Using a screwdriver, turn the cylinder end stopper counterclockwise by $450^{\circ} \pm 50^{\circ}$.

Figure 16.



1	Cylinder End Stopper
2	Wire

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure (Continued)

Vacuum Air Test of Power Steering Rack System

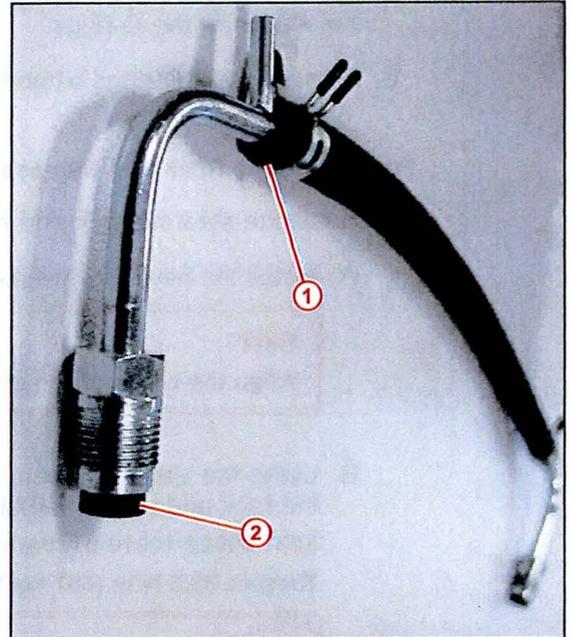
1. Coat the Test Tool O-ring with power steering fluid and pre-install the O-ring onto the tester as shown.

SST: 09633-00010-01, Test Tool O-ring

HINT

Pre-installing the O-ring will help ensure proper positioning and therefore ensure complete sealing between the two surfaces.

Figure 17.



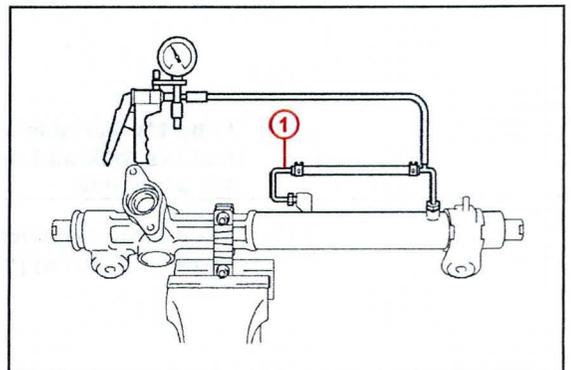
1	Vacuum Pressure Tester
2	O-ring

2. Install the following SSTs to the rack housing.
SST: 09631-12071, Steering Rack Oil Seal Test Tool
SST: 09633-00010-01, Test Tool O-ring (2)

NOTICE

Be sure NOT to over-torque the SST as it can crush the opening of the seal shut and cause a false reading.

Figure 18.



1	Steering Rack Oil Seal Test Tool, O-ring
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3. Apply a vacuum of 53 kPa for about 30 seconds.
Vacuum Pressure: 53 kPa (400 mmHg, 15.75 in.Hg)

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Vacuum Air Test of Power Steering Rack System (Continued)

4. Check that there is no change in the vacuum. If there is a change in the vacuum, check the installation of the O-rings.
5. Remove the 2 O-rings when the SST is removed from the steering rack housing.

Power Steering Rack End Sub-assembly Installation

1. Install the steering rack end sub-assembly.
 - A. Install the new claw washers, and temporarily install the rack end sub-assembly.

HINT

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

- B. Using the Variable Open Wrench SST, install the rack end sub-assembly.

SST: 09922-10010-01, Variable Open Wrench
Torque: 58.5 N*m (597 kgf*cm, 43 ft*lbf)

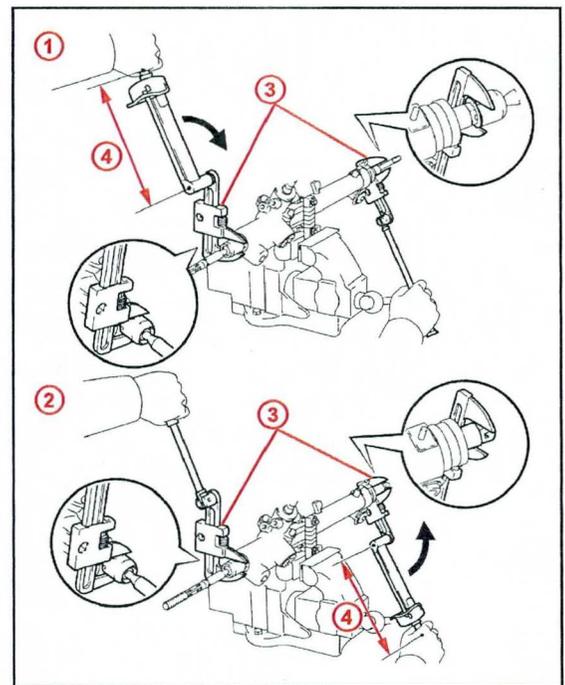
NOTICE

Use SST 09922-10010-01 (Variable Open Wrench) following the direction shown in the illustration. Failure to follow this procedure will result in the tie rod not being tightened to the proper torque.

HINT

- Using the Variable Open Wrench SST, hold the rack and install the rack end sub-assembly.
- Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

Figure 19.



1	LH
2	RH
3	Variable Open Wrench
4	Fulcrum Length

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

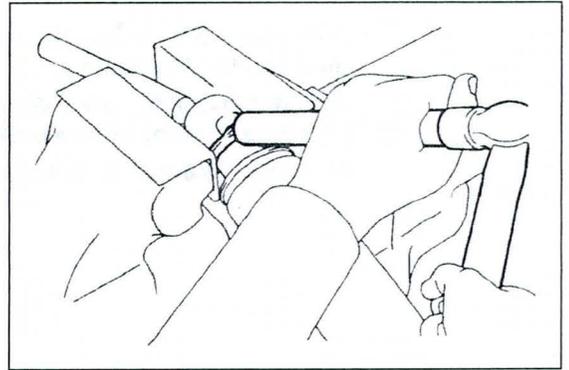
Power Steering Rack End Sub-assembly Installation (Continued)

2. Use a brass bar and a hammer to stake the claw washer.

NOTICE

Clamp the tie rod as shown to help avoid any impact to the steering rack.

Figure 20.

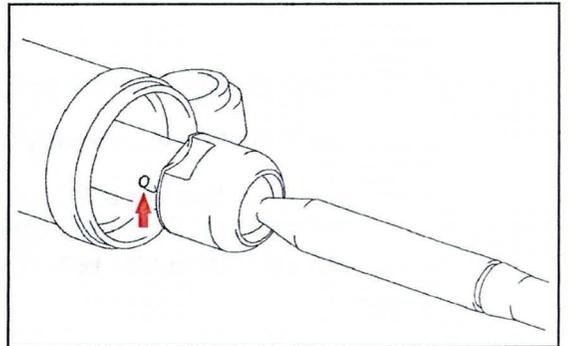


3. Inspect the power steering rack end. Ensure that the holes of the rack ends are NOT clogged with grease.

NOTE

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

Figure 21.



4. Install the steering rack boot.
 - A. Apply a small coat of silicone grease to the inside clamping surface of the small end of the boot as shown.
 - B. Install the steering rack boot.
 - C. Install the steering rack boot clip using pliers.

Figure 22.



Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

Power Steering Rack End Sub-assembly Installation (Continued)

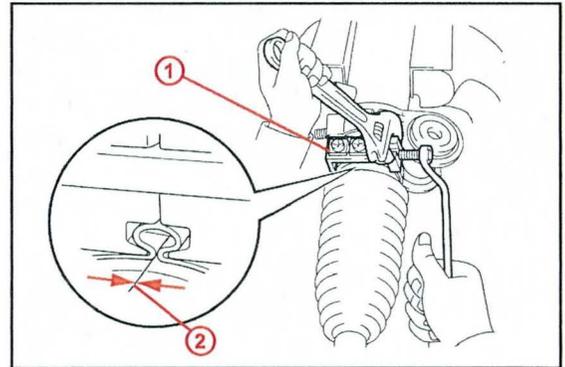
5. Install the steering rack boot clamp.

Using the SST, tighten the rack boot clamp as shown in the illustration.

SST: 09521-24010, Drive Shaft Boot Clamping Tool (or equivalent)

Clearance: 3.0 mm (0.18 in.) or less

Figure 23.



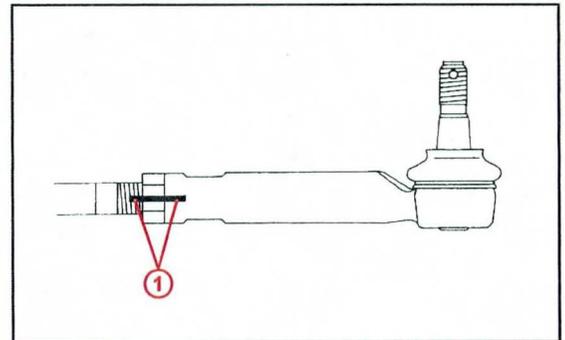
1	Drive Shaft Boot Clamping Tool
2	Clearance: 3.0 mm (0.18 in.) or Less

6. Install the steering rack boot clip using pliers.
7. Install the tie rod assembly.

Screw the lock nut and tie rod assembly on the rack end until the matchmarks are aligned.

Torque: 74 N*m (755 kgf*cm, 55 ft*lbf)

Figure 24.



1	Matchmarks
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Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure

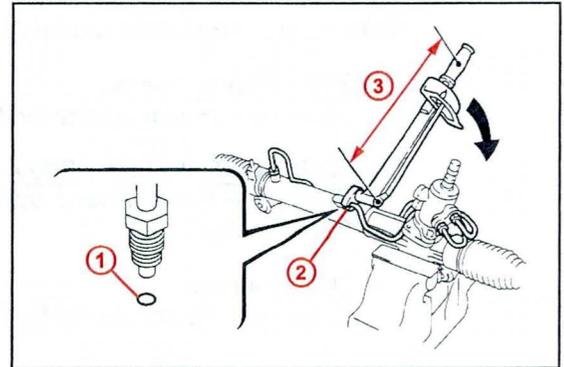
Power Steering Rack End Sub-assembly Installation (Continued)

8. Install the steering left turn pressure tube.
 - A. Coat 2 NEW O-rings with power steering fluid and install them to the left turn pressure tube.
 - B. Using a 12 mm union nut wrench (or equivalent), install the left turn pressure tube to the steering link assembly.
Torque: 12 N*m (117 kgf*cm, 8 ft*lbf)

HINT

Use a torque wrench with a fulcrum length of 250 mm (9.84 in.).

Figure 25.



1	O-ring
2	Union Nut Wrench, 12 mm (or equivalent)
3	Fulcrum Length

9. Install the steering right turn pressure tube.
 - A. Coat 2 NEW O-rings with power steering fluid and install them to the right turn pressure tube.
 - B. Using a 12 mm union nut wrench (or equivalent), install the right turn pressure tube to the steering link assembly.
Torque: 12 N*m (117 kgf*cm, 8 ft*lbf)

HINT

Use a torque wrench with a fulcrum length of 250 mm (9.84 in.).

Power Steering Rack Leak from Right Side: Overhaul Procedure

Repair Procedure (Continued)

Power Steering Rack Installation

Reinstall the power steering rack.

Refer to TIS, applicable model and model year Repair Manual:

- [2004](#) / [2005](#) Sienna:
Steering – Power Assist Systems – “Rack & Pinion Power Steering Gear Assy: Overhaul”
- [2006](#) / [2007](#) / [2008](#) / [2009](#) Sienna:
Steering – Power Assist Systems – “Power Steering: Rack & Pinion Power Steering Gear: Reassembly”
- [2010](#) Sienna:
Steering – Power Assist Systems – “Power Steering: Steering Gear: Reassembly”

Repair Confirmation

1. Confirm there is NO power steering leak by turning the steering wheel left and right with the engine running.
2. Test drive the vehicle and verify that the steering wheel is centered and NO other alignment or vehicle handling concerns are observed.