

STEERING

Steering Gear / Linkage (Preparation) - Sienna

STEERING GEAR / LINKAGE

SST

SST

	09521-24010	Drive Shaft Boot Clamping Tool	
	09612-00012	Rack & Pinion Steering Rack Housing Stand	
	09616-00011	Steering Worm Bearing Adjusting Socket	
	09616-00020	Steering Worm Bearing Adjusting Socket	

EQUIPMENT

EQUIPMENT

Vinyl tape	
Torque wrench	

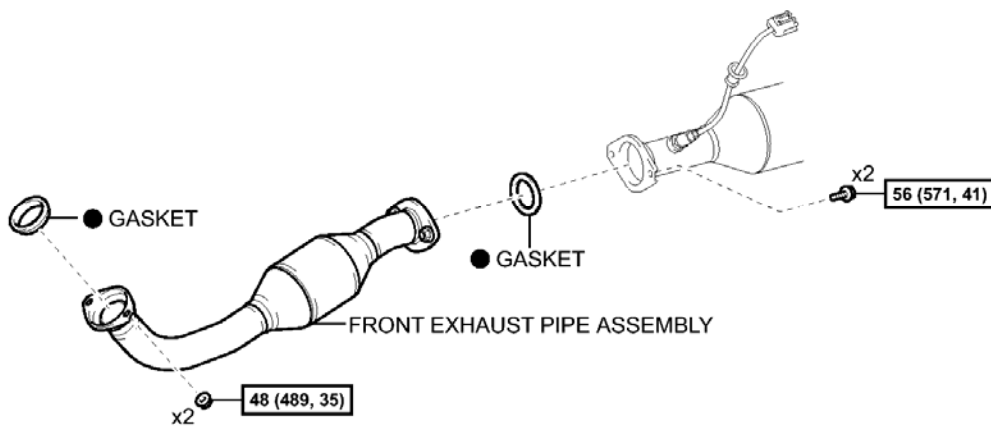
STEERING

Steering Gear / Linkage (Service Information) - Sienna

STEERING GEAR (FOR 1AR-FE)

COMPONENTS

ILLUSTRATION



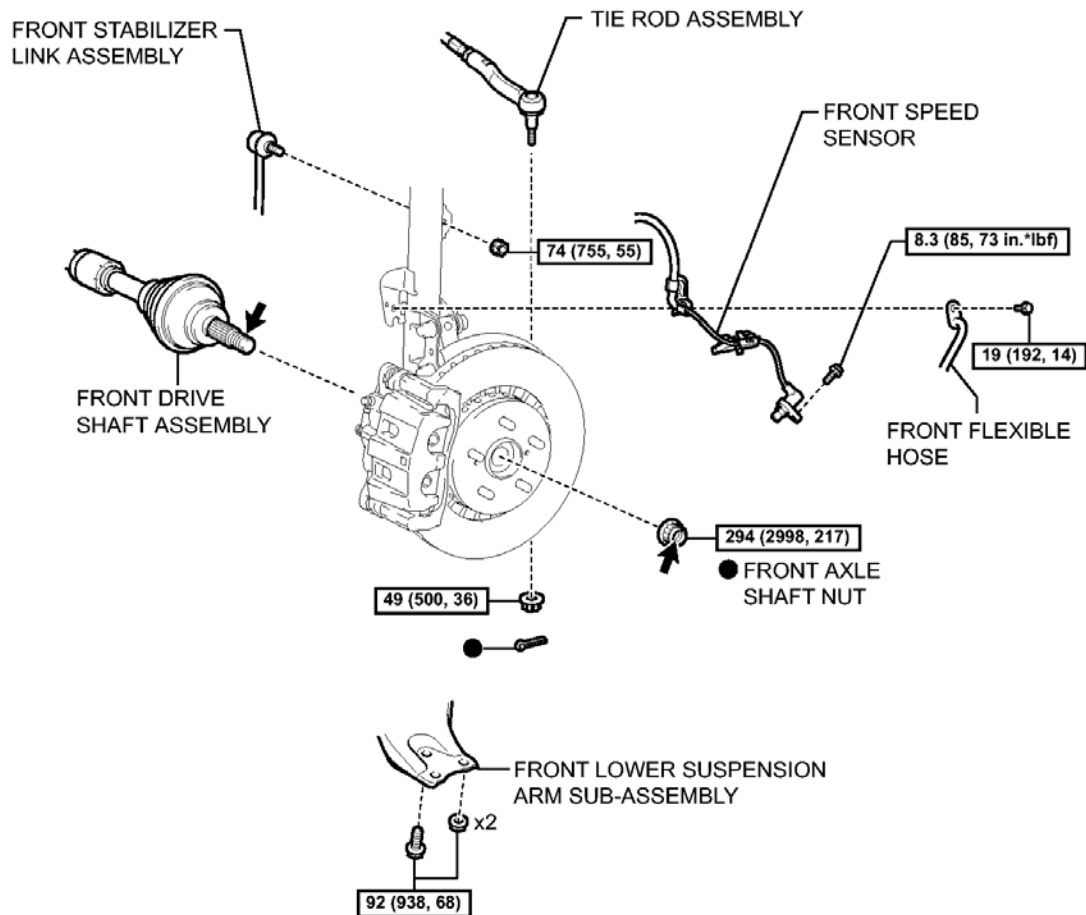
[N*m (kgf*cm, ft.*lbf)]: Specified torque

● Non-reusable part

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Fig. 1: Steering Gear Replacement Components With Torque Specifications (1 of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



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

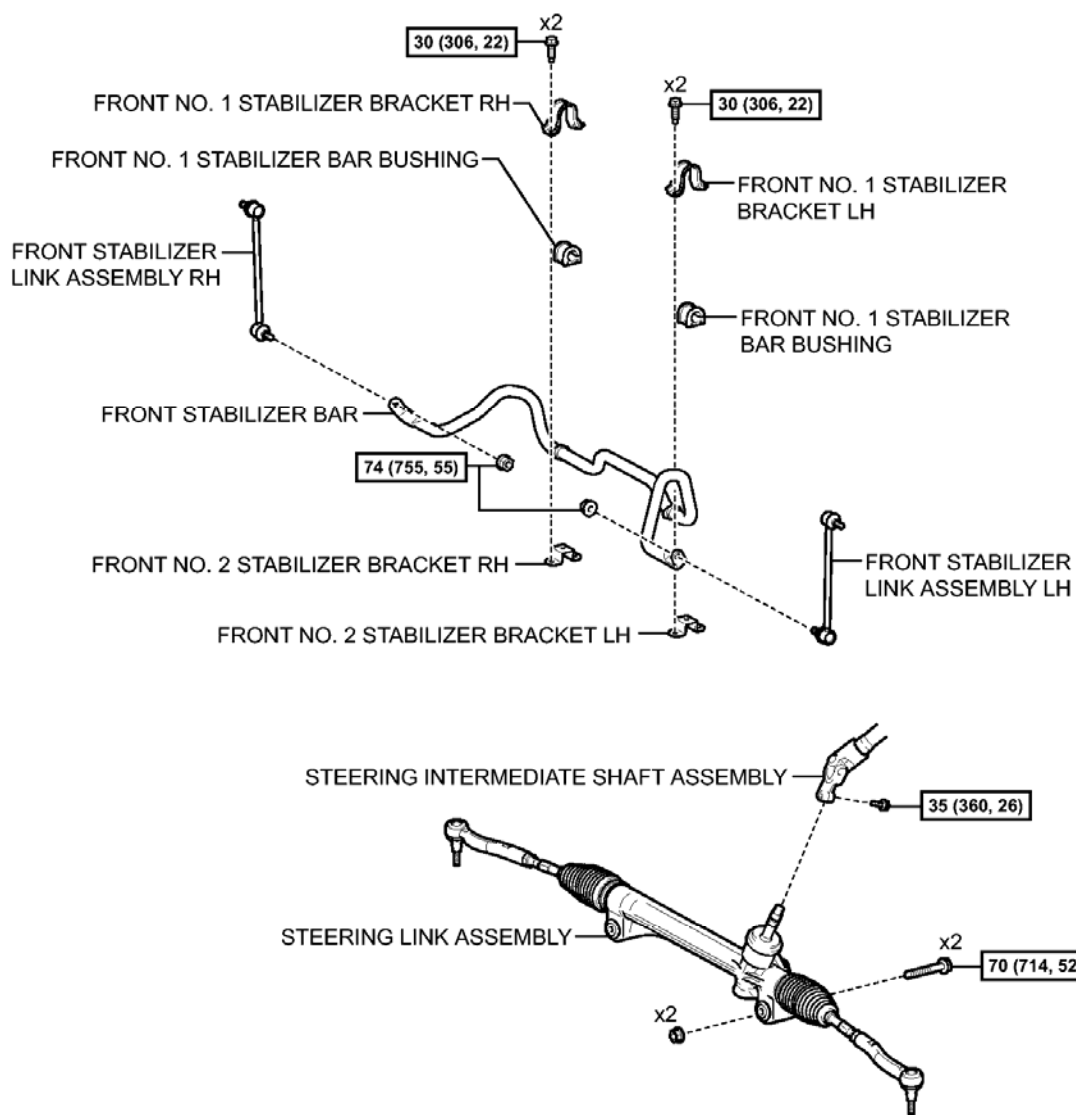
● Non-reusable part

◀ Do not apply lubricants to the threaded parts

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Fig. 2: Steering Gear Replacement Components With Torque Specifications (2 of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

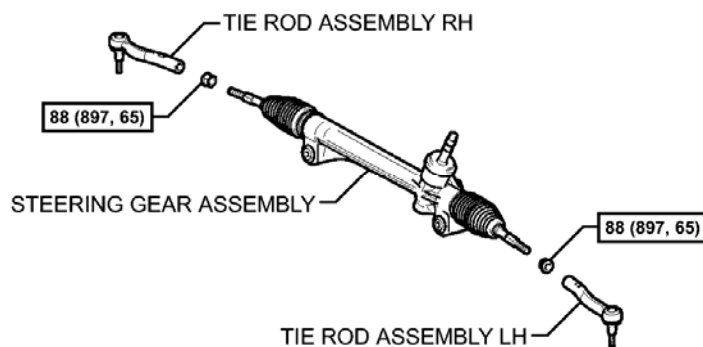
ILLUSTRATION



[N*m (kgf*cm, ft.*lbf)]: Specified torque

Fig. 3: Steering Gear Replacement Components With Torque Specifications (3 of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



N*m (kgf*cm, ft*lb) : Specified torque

Fig. 4: Steering Gear Replacement Components With Torque Specifications (4 of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

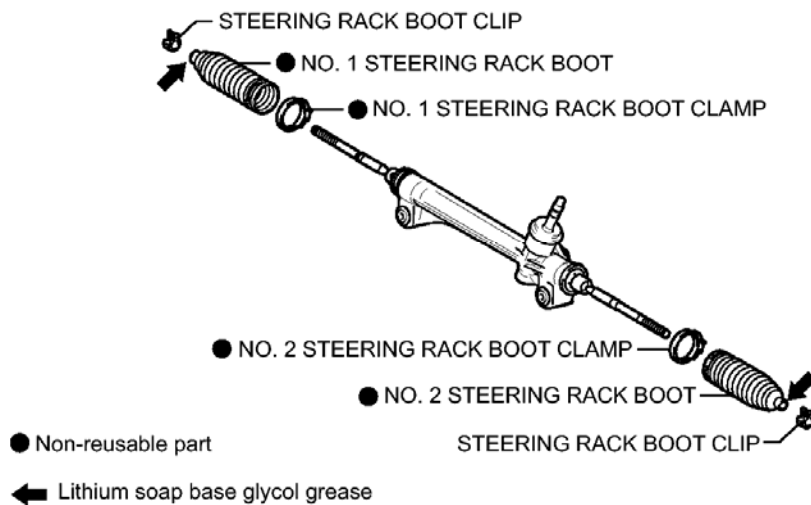


Fig. 5: Steering Gear Replacement Components (5 of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

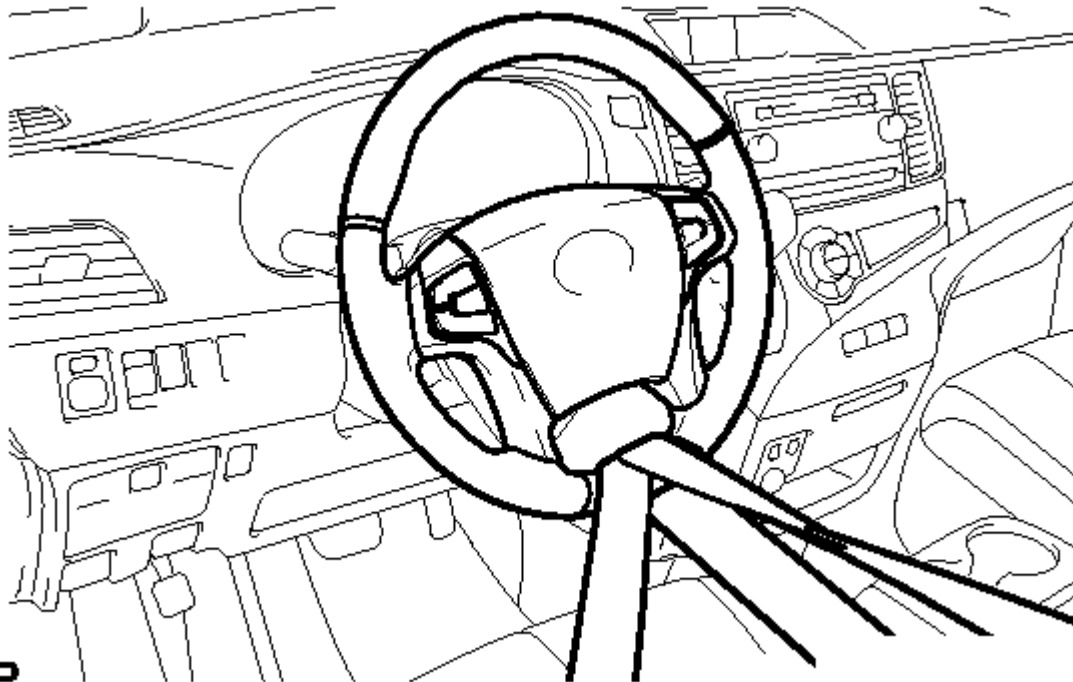
REMOVAL

REMOVAL

NOTE: When disconnecting the steering intermediate shaft assembly and pinion shaft of steering link assembly, be sure to place matchmarks before servicing.

1. SECURE STEERING WHEEL

- a. Secure the steering wheel with the seat belt in order to prevent it from rotating.



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Fig. 6: Securing Steering Wheel With Seat Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

This operation is necessary to prevent damage to the spiral cable.

- 2. REMOVE FRONT WHEELS**
- 3. REMOVE FRONT EXHAUST PIPE ASSEMBLY** . Refer to **REMOVAL - Step 2**
- 4. SEPARATE FRONT SPEED SENSOR LH** . Refer to **REMOVAL - Step 5**
- 5. REMOVE FRONT AXLE SHAFT NUT LH** . Refer to **REMOVAL - Step 3**
- 6. SEPARATE TIE ROD ASSEMBLY LH** . Refer to **REMOVAL - Step 6**
- 7. SEPARATE TIE ROD ASSEMBLY RH**

HINT:

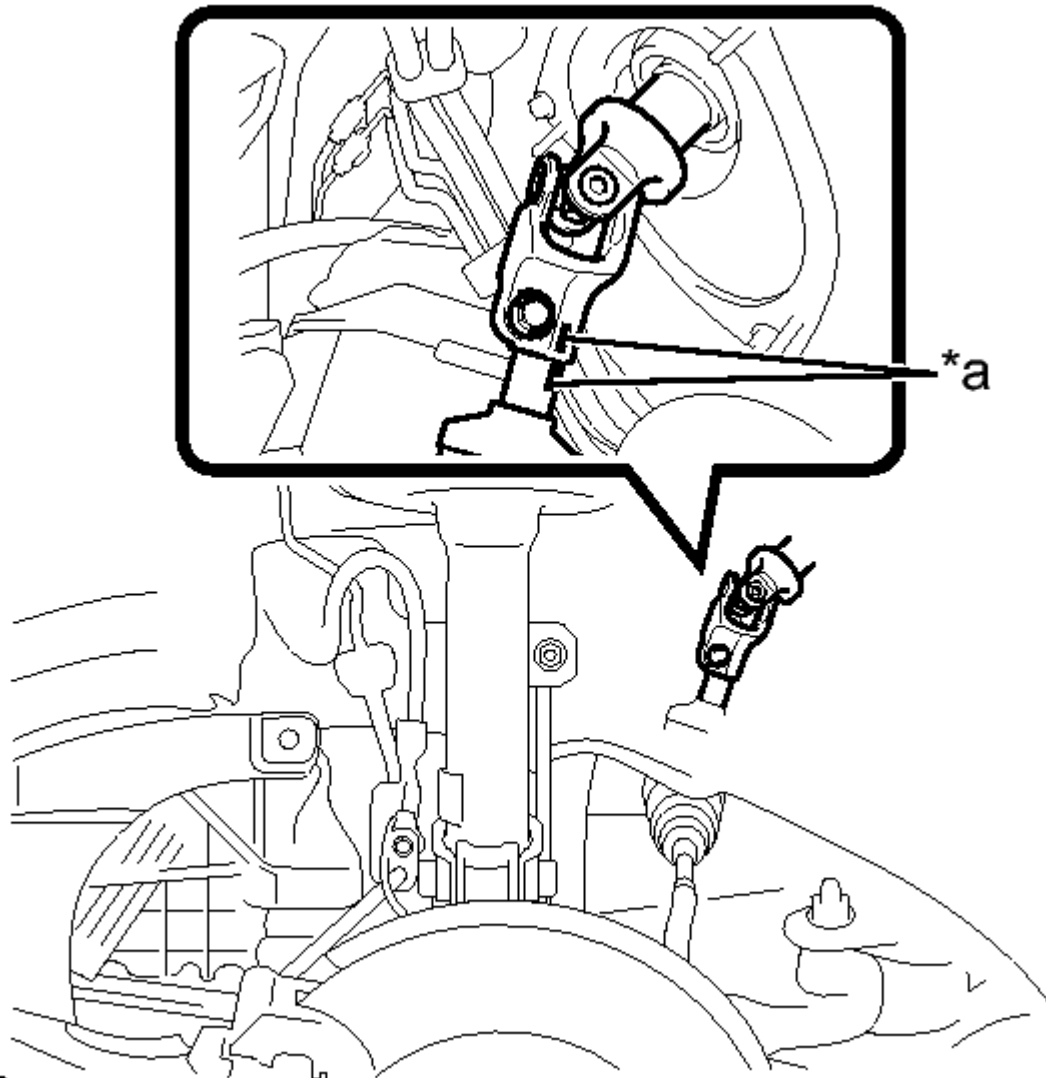
Perform the same procedure as for the LH side.

- 8. REMOVE FRONT STABILIZER LINK ASSEMBLY LH** . Refer to **REMOVAL - Step 8**
- 9. REMOVE FRONT STABILIZER LINK ASSEMBLY RH**

HINT:

Perform the same procedure as for the LH side.

10. **SEPARATE FRONT LOWER SUSPENSION ARM SUB ASSEMBLY LH** . Refer to **REMOVAL - Step 9**
11. **SEPARATE FRONT DRIVE SHAFT ASSEMBLY LH** . Refer to **REMOVAL - Step 10**
12. **SEPARATE STEERING INTERMEDIATE SHAFT ASSEMBLY**
 - a. Put matchmarks on the steering intermediate shaft assembly and steering link assembly.



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Fig. 7: Identifying Steering Intermediate Shaft & Steering Link Assembly Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a Matchmark

- b. Remove the bolt and separate the steering intermediate shaft assembly from the steering link

assembly.

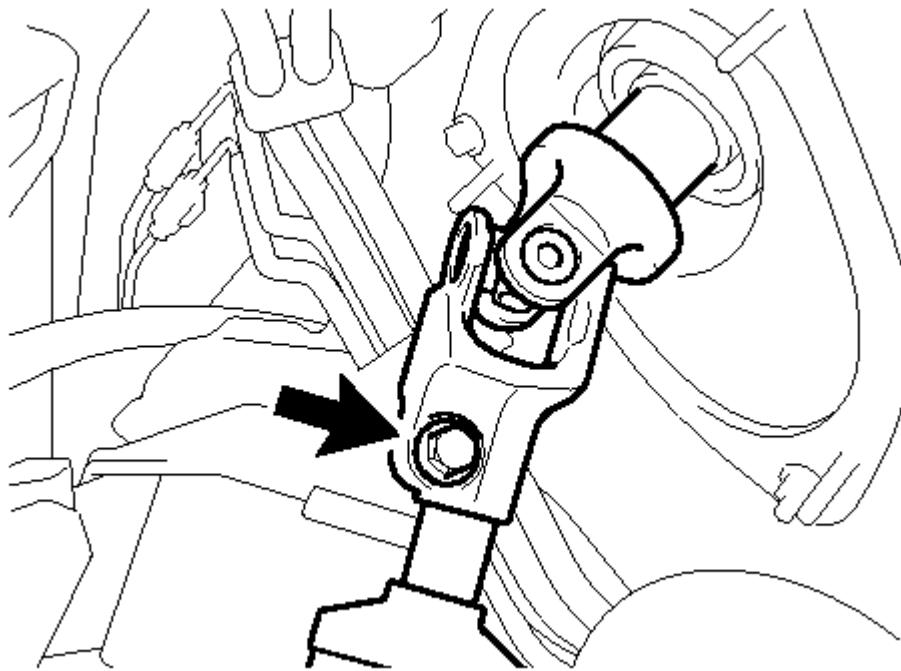


Fig. 8: Identifying Steering Intermediate Shaft Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **REMOVE FRONT NO. 1 STABILIZER BRACKET LH** . Refer to **REMOVAL - Step 13**
14. **REMOVE FRONT NO. 1 STABILIZER BRACKET RH**

HINT:

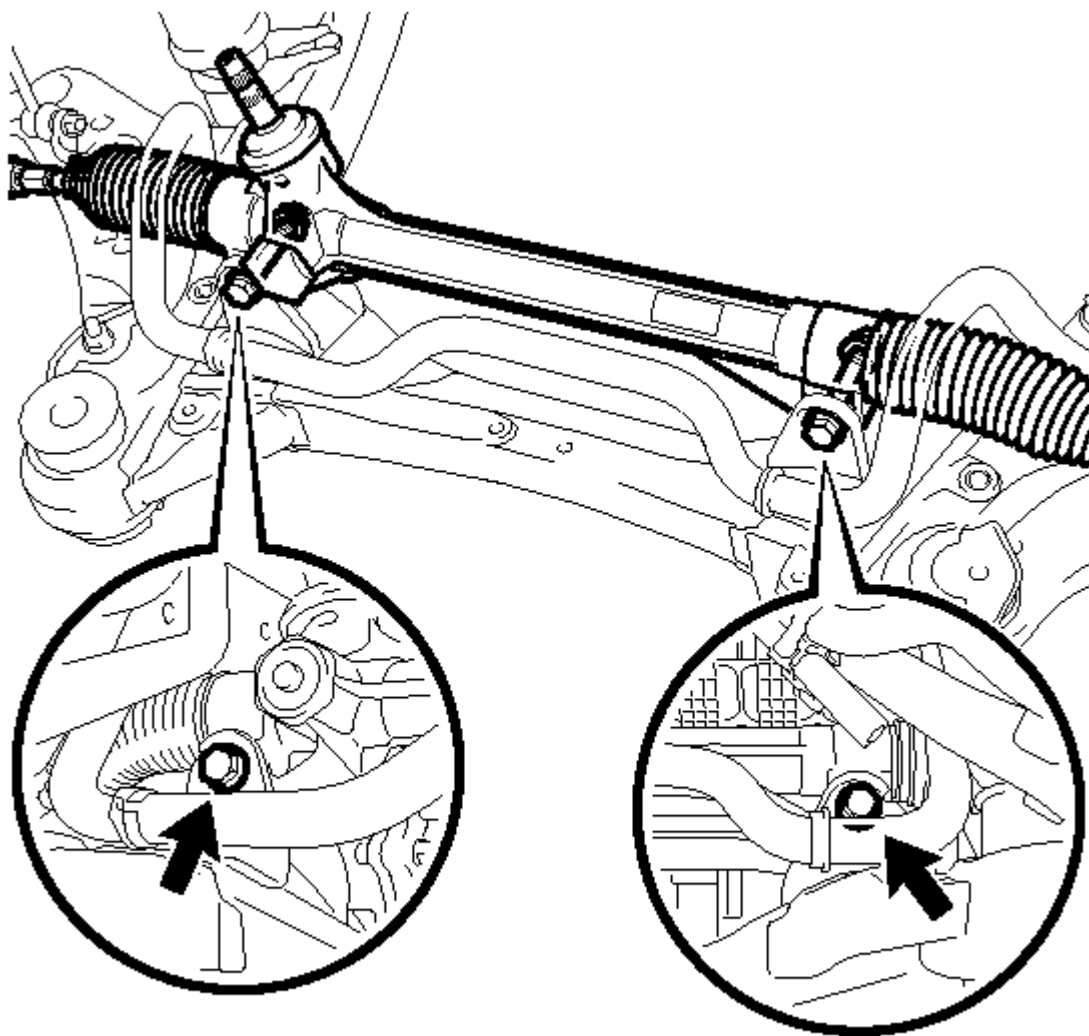
Perform the same procedure as for the LH side.

15. **REMOVE FRONT NO. 2 STABILIZER BRACKET LH** . Refer to **REMOVAL - Step 15**
16. **REMOVE FRONT NO. 2 STABILIZER BRACKET RH**

HINT:

Perform the same procedure as for the LH side.

17. **REMOVE FRONT NO. 1 STABILIZER BAR BUSHING** . Refer to **REMOVAL - Step 17**
18. **REMOVE STEERING LINK ASSEMBLY**
 - a. Remove the 2 bolts and 2 nuts and steering link assembly.



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Fig. 9: Identifying Steering Link Assembly Bolts

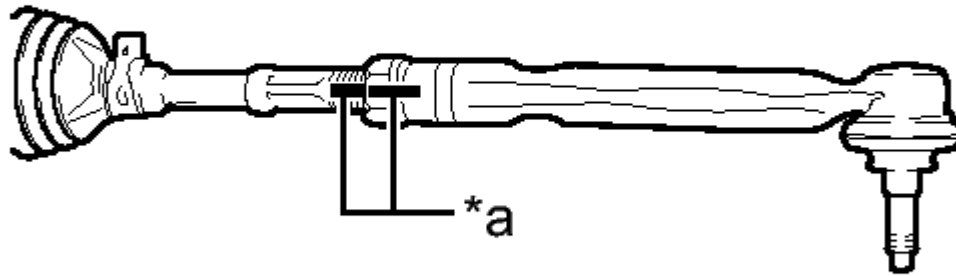
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Because the nut has its own stopper, do not turn the nut. Loosen the bolt with the nut secured.

b. Pull out the steering link assembly towards the left side of the vehicle.

19. REMOVE TIE ROD ASSEMBLY LH

a. Put matchmarks on the tie rod assembly LH and steering gear assembly.



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Fig. 10: Identifying Tie Rod & Steering Gear Assembly LH Matchmarks
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

***a** Matchmark

- b. Loosen the lock nut, and remove the tie rod assembly LH and lock nut.

20. REMOVE TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

DISASSEMBLY

DISASSEMBLY

1. **REMOVE STEERING RACK BOOT CLIP (for LH Side)**
 - a. Using pliers, remove the steering rack boot clip.
2. **REMOVE STEERING RACK BOOT CLIP (for RH Side)**

HINT:

Perform the same procedure as for the LH side.

3. **REMOVE NO. 2 STEERING RACK BOOT CLAMP**

- a. Using a screwdriver, remove the No. 2 steering rack boot clamp.

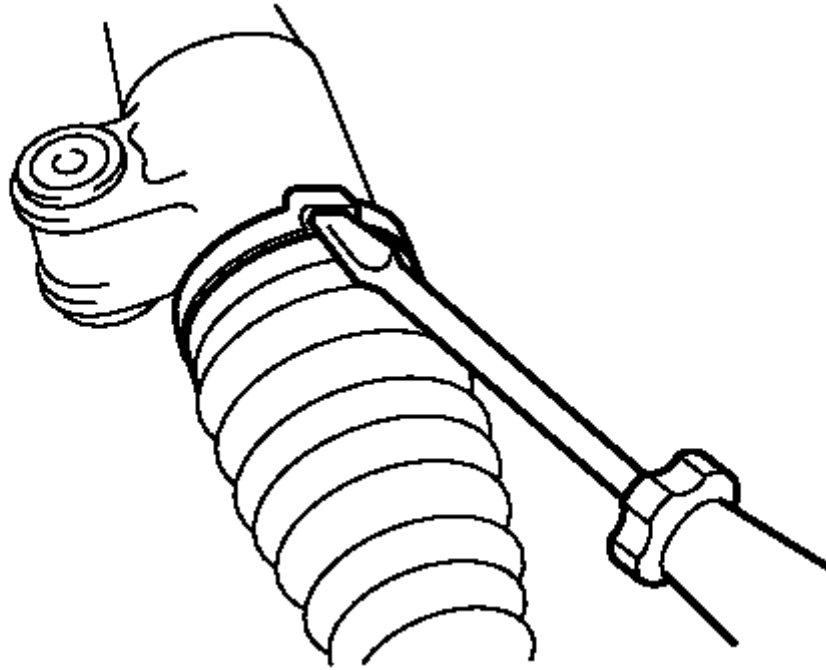


Fig. 11: Identifying No. 2 Steering Rack Boot Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE NO. 1 STEERING RACK BOOT CLAMP

HINT:

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

5. REMOVE NO. 2 STEERING RACK BOOT

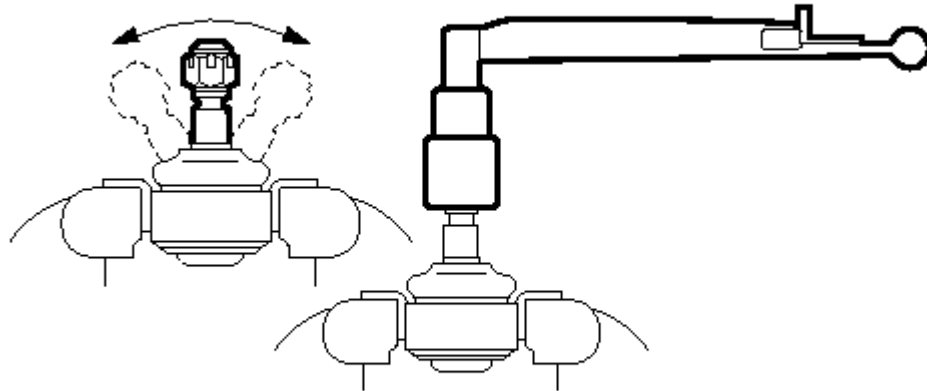
6. REMOVE NO. 1 STEERING RACK BOOT

INSPECTION

INSPECTION

1. INSPECT TIE ROD ASSEMBLY LH

- a. Secure the tie rod assembly LH in a vise.



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Fig. 12: Securing Tie Rod Assembly In Vise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the nut to the stud bolt.
- c. Flip the ball joint back and forth 5 times.
- d. Set a torque wrench to the nut, turn the ball joint continuously at a rate of 2 to 4 seconds per turn, and check the turning torque on the 5th turn.

Standard turning torque

0.9 to 3.4 N*m (8.5 to 34.9 kgf*cm, 3.4 to 30.3 in.*lbf)

If the turning torque is not within the specified range, replace the tie rod assembly LH.

2. INSPECT TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

3. INSPECT TOTAL PRELOAD

NOTE: **Inspect the total preload around the steering rack center position.**

- a. Using SST, secure the steering link assembly in a vise.
 - SST: 09612-00012

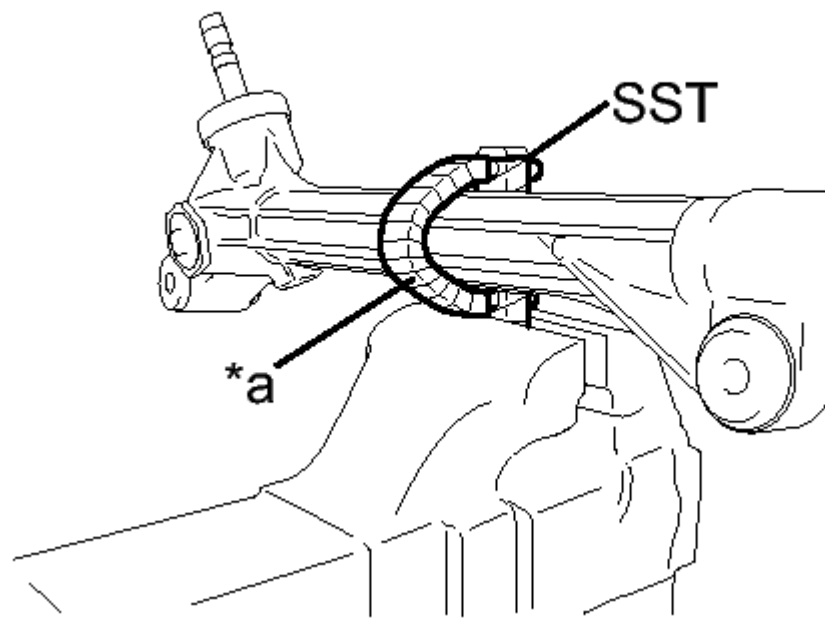


Fig. 13: Securing Steering Link Assembly With Vise Using SST
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Protective Tape
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HINT:

Tape SST before use.

- b. Using SST and a torque wrench, turn the pinion shaft continuously at a rate of 6 seconds per turn, and check the turning torque.
 - SST: 09616-00020

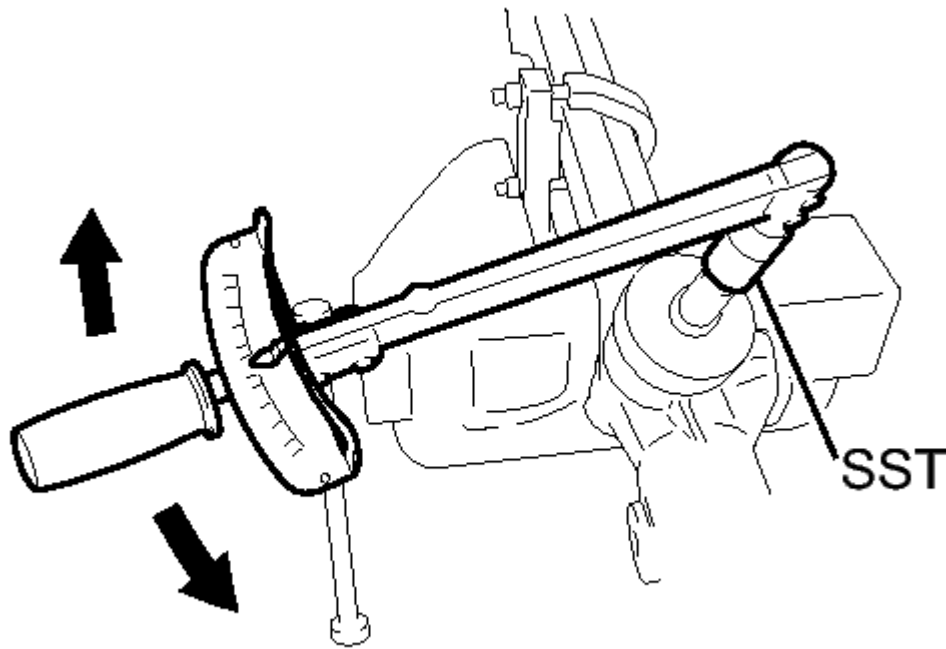


Fig. 14: Checking Steering Link Assembly Turning Torque Using SST & Torque Wrench
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard preload

0.83 to 0.87 N*m (8.5 to 8.8 kgf*cm, 7.4 to 7.7 in.*lbf) at 15 to 25°C (59 to 77°F)

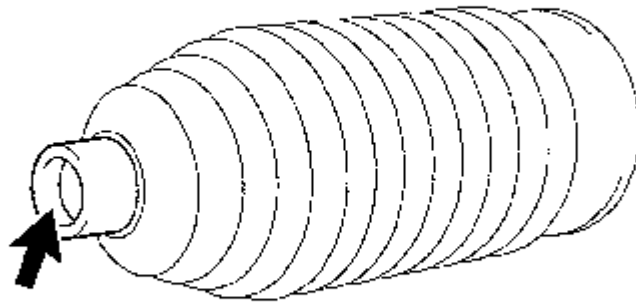
If the total preload is not within the specified range, replace the steering gear assembly with a new one.

REASSEMBLY

REASSEMBLY

1. INSTALL NO. 2 STEERING RACK BOOT

- a. Apply lithium soap base glycol grease to the inside of the small opening of a new No. 2 steering rack boot.



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Fig. 15: Applying Silicon Grease To Inside Of Small End Of Rack Boot
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the No. 2 steering rack boot to the groove on the rack housing.

NOTE:

- Be careful not to damage or twist the boot.
- Make sure that the boot is free of rust and foreign matter.

2. INSTALL NO. 1 STEERING RACK BOOT

HINT:

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

3. INSTALL NO. 2 STEERING RACK BOOT CLAMP

- a. Using SST, tighten a new No. 2 steering rack boot clamp, as shown in the illustration.

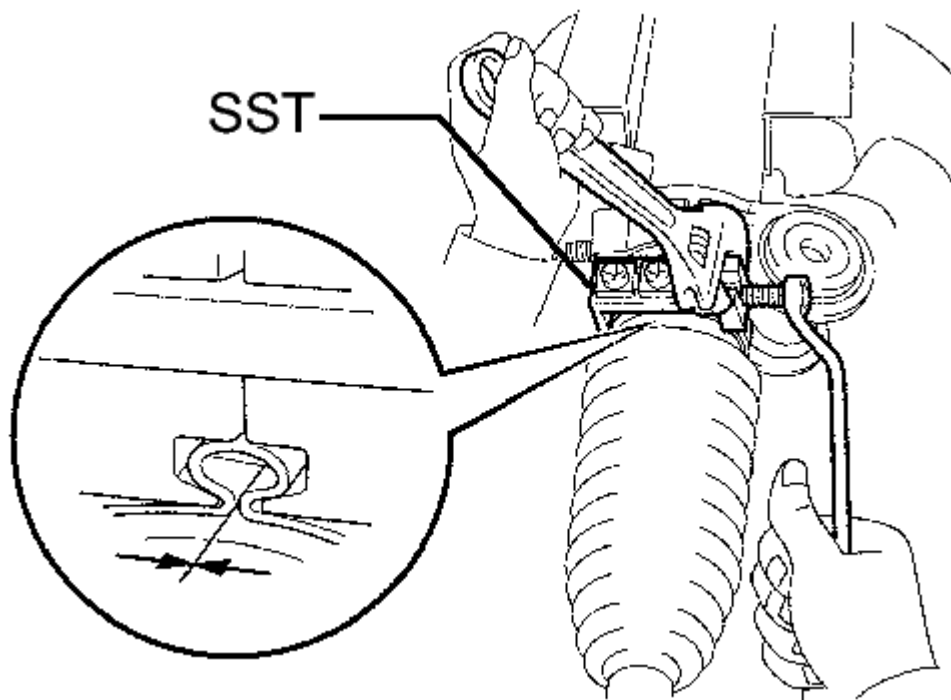


Fig. 16: Identifying SST & No. 2 Steering Rack Boot Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09521-24010

Clearance

3.0 mm (0.118 in.) or less

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

4. INSTALL NO. 1 STEERING RACK BOOT CLAMP

HINT:

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

- SST: 09521-24010

5. INSTALL STEERING RACK BOOT CLIP (for LH Side)

- a. Using pliers, install the steering rack boot clip.

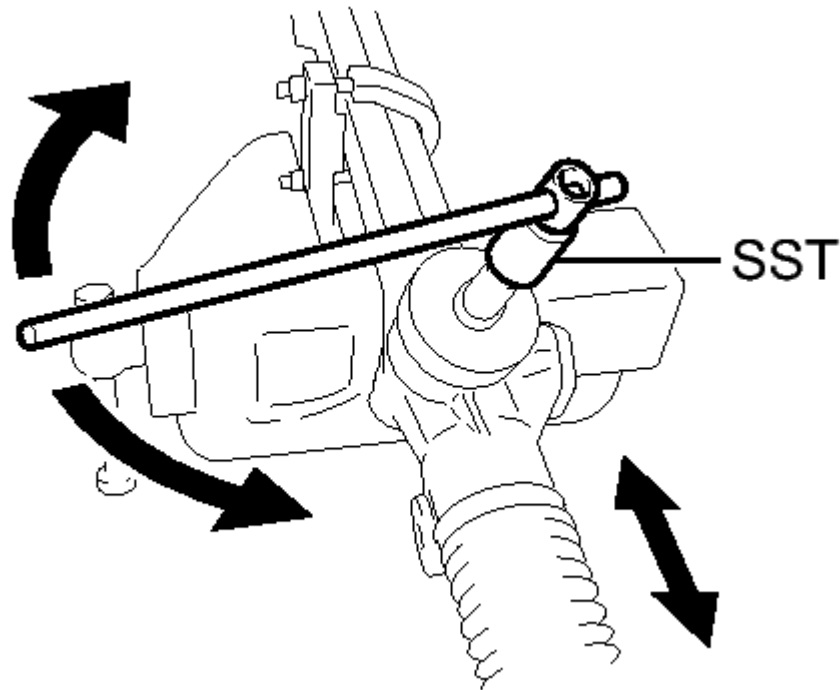
6. INSTALL STEERING RACK BOOT CLIP (for RH Side)

HINT:

Perform the same procedure as for the LH side.

7. INSPECT STEERING GEAR ASSEMBLY

- a. Using SST, rotate the pinion shaft to see if both the left and the right steering rack boots expand and contract smoothly.



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Fig. 17: Rotating Pinion Shaft

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

- SST: 09616-00011

HINT:

If the operation cannot be done as specified, use a new steering rack boot clamp and reinstall the steering rack boots.

INSTALLATION

INSTALLATION

NOTE: When disconnecting the steering intermediate shaft assembly and pinion shaft of the steering link gear assembly, be sure to place matchmarks before servicing.

1. INSTALL TIE ROD ASSEMBLY LH

- a. Install the lock nut and tie rod assembly LH to the steering rack end sub-assembly until the matchmarks are aligned.

HINT:

After adjusting toe-in, tighten the lock nut.

2. INSTALL TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

3. INSTALL STEERING LINK ASSEMBLY

- a. Install the steering link assembly with the 2 bolts and 2 nuts.

Torque: 70 N*m (714 kgf*cm, 52 ft.*lbf)

NOTE:

- Make sure to tighten the bolts starting from the left side of the vehicle.
- Because the nut has its own stopper, do not turn the nut. Tighten the bolt with the nut secured.

4. INSTALL FRONT NO. 1 STABILIZER BAR BUSHING . Refer to INSTALLATION - Step 3

5. INSTALL FRONT NO. 2 STABILIZER BRACKET LH . Refer to INSTALLATION - Step 4

6. INSTALL FRONT NO. 2 STABILIZER BRACKET RH

HINT:

Perform the same procedure as for the LH side.

7. INSTALL FRONT NO. 1 STABILIZER BRACKET LH . Refer to INSTALLATION - Step 6

8. INSTALL FRONT NO. 1 STABILIZER BRACKET RH

HINT:

Perform the same procedure as for the LH side.

9. INSTALL STEERING INTERMEDIATE SHAFT ASSEMBLY

- a. Align the matchmarks on the steering intermediate shaft assembly and steering link assembly.
- b. Install the bolt.

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

10. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH . Refer to INSTALLATION - Step 3

11. INSTALL FRONT LOWER SUSPENSION ARM SUB-ASSEMBLY LH . Refer to INSTALLATION - Step 7

12. INSTALL FRONT STABILIZER LINK ASSEMBLY LH . Refer to INSTALLATION - Step 11

13. INSTALL FRONT STABILIZER LINK ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

14. **CONNECT TIE ROD ASSEMBLY LH** . Refer to **INSTALLATION - Step 5**
15. **CONNECT TIE ROD ASSEMBLY RH**

HINT:

Perform the same procedure as for the LH side.

16. **INSTALL FRONT AXLE SHAFT NUT LH** . Refer to **INSTALLATION - Step 8**
17. **INSTALL FRONT SPEED SENSOR LH** . Refer to **INSTALLATION - Step 6**
18. **INSTALL FRONT EXHAUST PIPE ASSEMBLY** . Refer to **INSTALLATION - Step 8**
19. **INSTALL FRONT WHEELS**

Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)

20. **INSPECT FOR EXHAUST GAS LEAK**
21. **INSPECT SPEED SENSOR SIGNAL**

Refer to **TEST MODE PROCEDURE**

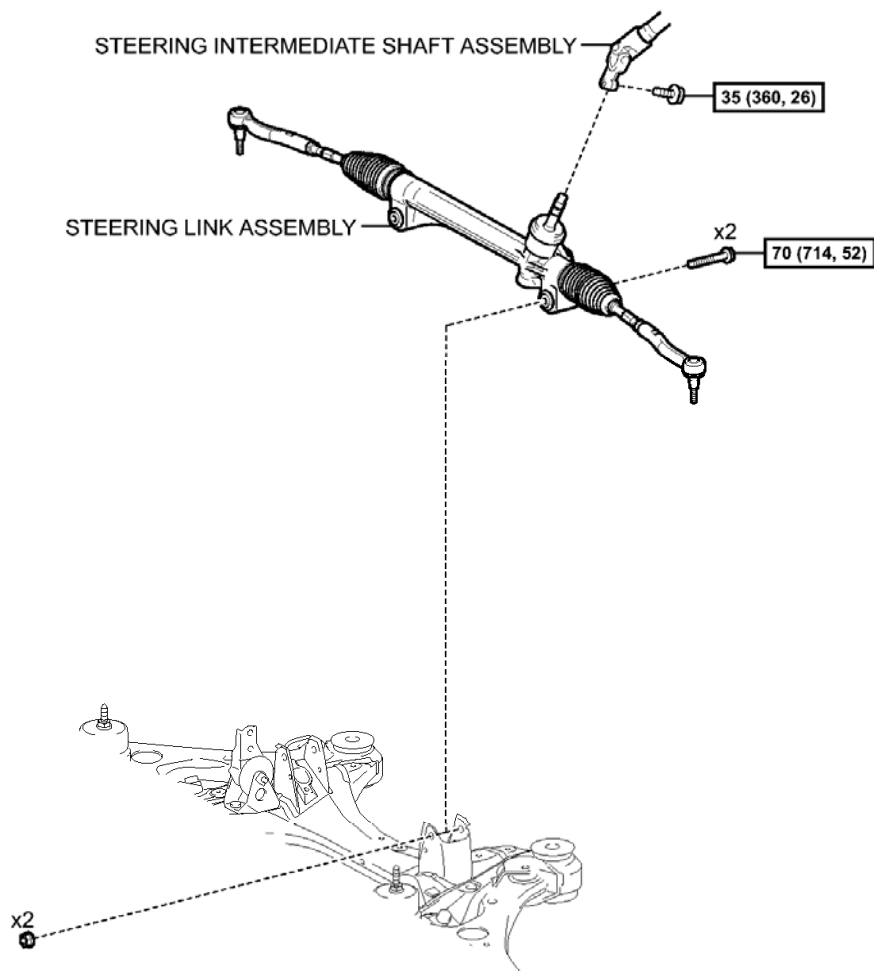
22. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

Refer to **ADJUSTMENT**

STEERING GEAR (FOR 2GR-FE)

COMPONENTS

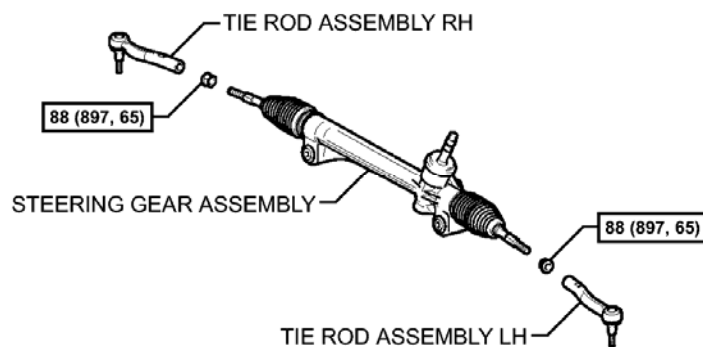
ILLUSTRATION



N*m (kgf*cm, ft*lb) : Specified torque

Fig. 18: Steering Gear Replacement Components With Torque Specifications (1 of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION



N*m (kgf*cm, ft*lb) : Specified torque

Fig. 19: Steering Gear Replacement Components With Torque Specifications (2 of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ILLUSTRATION

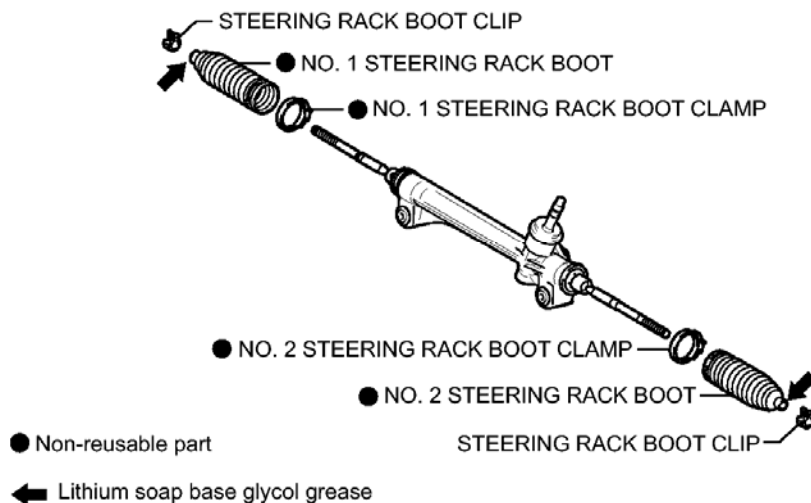


Fig. 20: Steering Gear Replacement Components (5 of 5)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

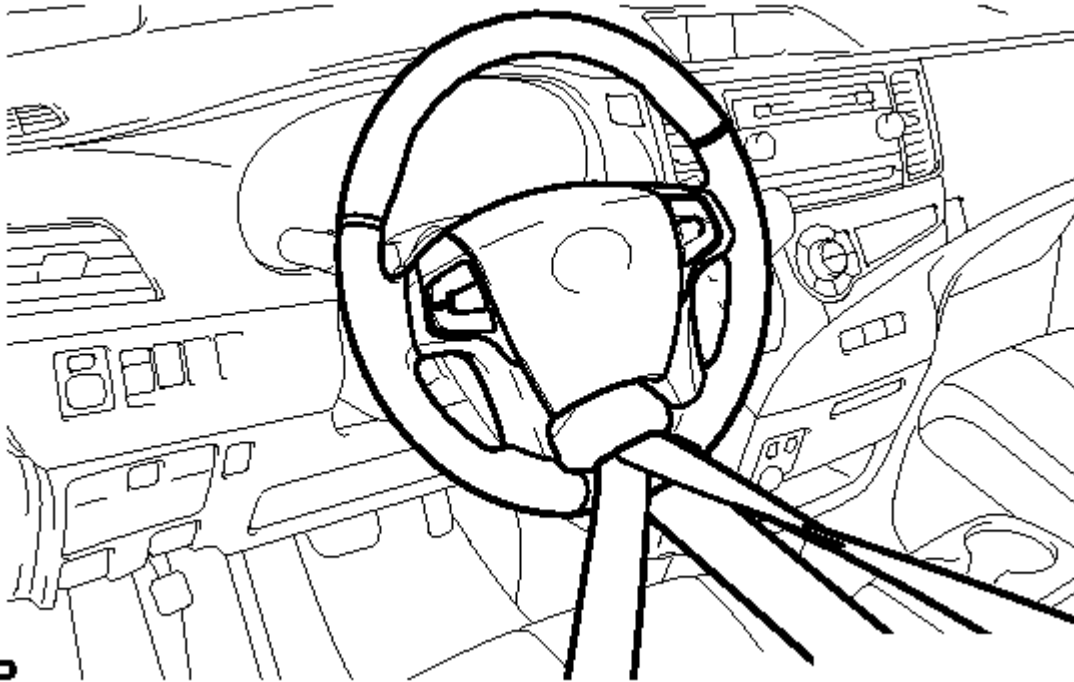
REMOVAL

REMOVAL

NOTE: When disconnecting the steering intermediate shaft assembly and pinion shaft of steering gear assembly, be sure to place matchmarks before servicing.

1. SECURE STEERING WHEEL

- a. Secure the steering wheel with the seat belt in order to prevent it from rotating.



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Fig. 21: Securing Steering Wheel With Seat Belt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

This operation is necessary to prevent damage to the spiral cable.

2. REMOVE FRONT STABILIZER BAR (for 2WD)

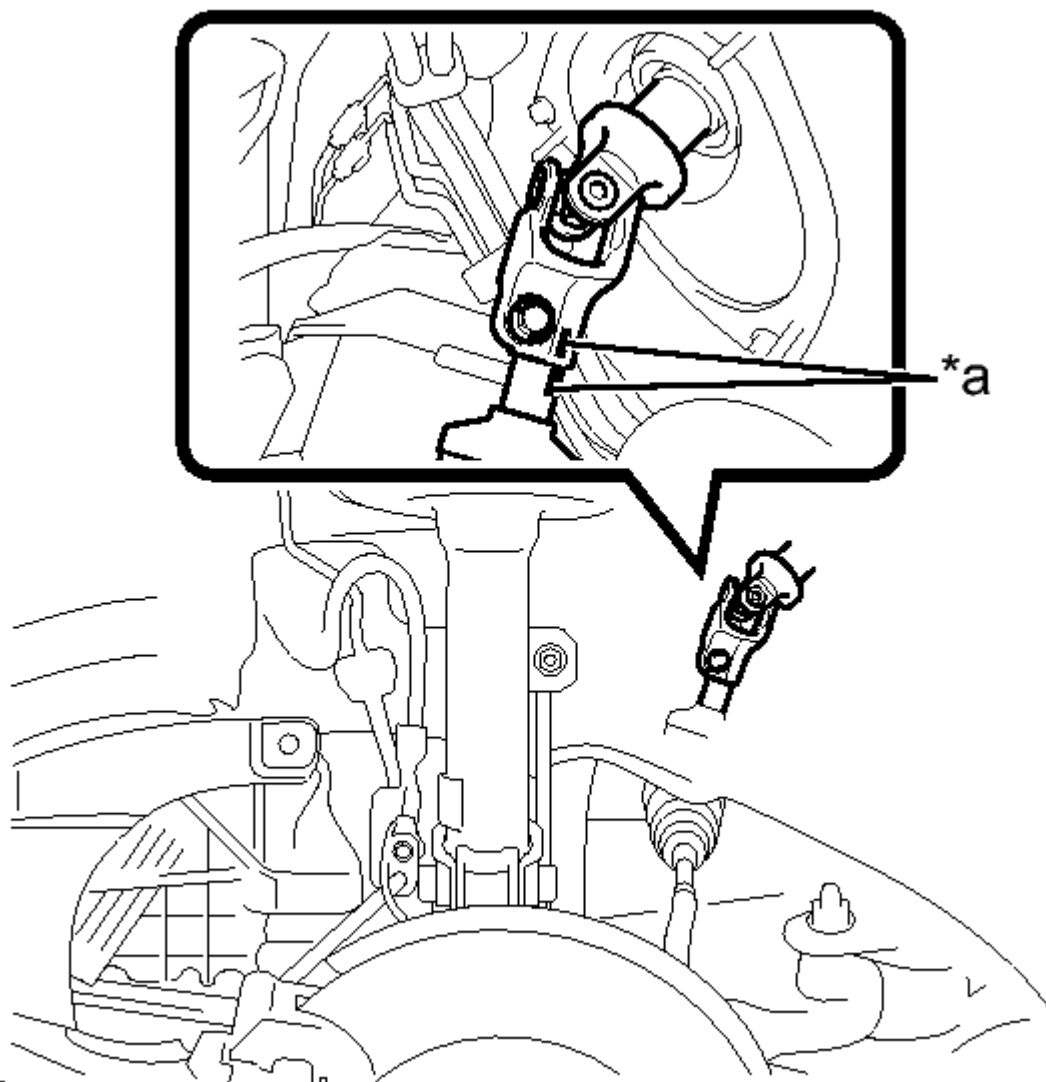
Refer to **REMOVAL**

3. REMOVE FRONT STABILIZER BAR (for AWD)

Refer to **REMOVAL**

4. SEPARATE STEERING INTERMEDIATE SHAFT ASSEMBLY

- a. Put matchmarks on the steering intermediate shaft assembly and steering link assembly.



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Fig. 22: Identifying Steering Intermediate Shaft & Steering Link Assembly Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

***a Matchmark**

- b. Remove the bolt. and separate the steering intermediate shaft assembly from the steering link assembly.

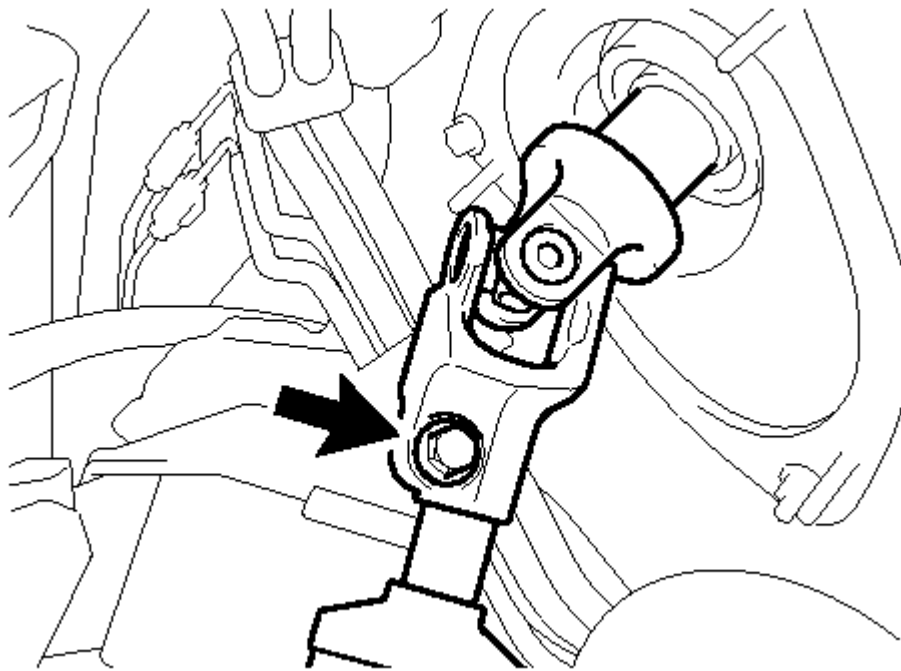


Fig. 23: Identifying Steering Intermediate Shaft Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE STEERING LINK ASSEMBLY

- a. Remove the 2 bolts and 2 nuts and steering link assembly.

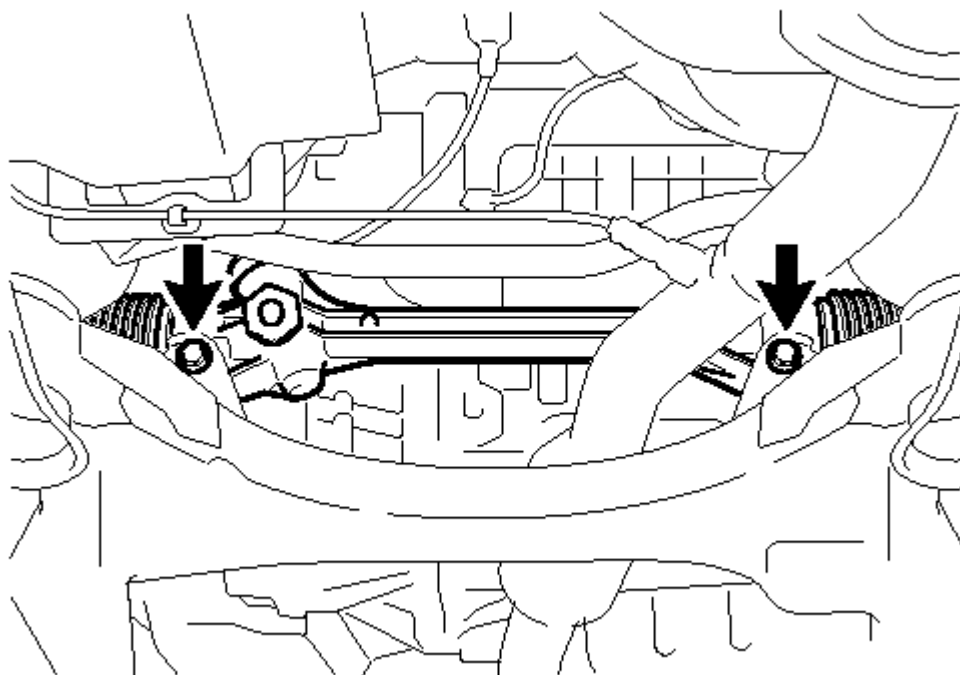


Fig. 24: Identifying Steering Link Assembly Nuts & Bolts

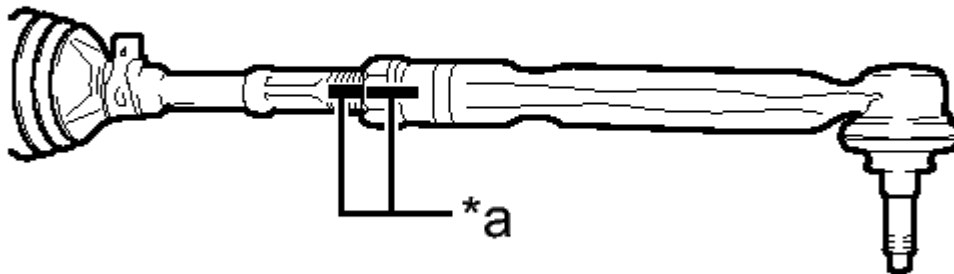
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Because the nut has its own stopper, do not turn the nut. Loosen the bolt with the nut secured.

b. Pull out the steering link assembly towards the left side of the vehicle.

6. REMOVE TIE ROD ASSEMBLY LH

a. Put matchmarks on the tie rod assembly LH and steering gear assembly.



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Fig. 25: Identifying Tie Rod & Steering Gear Assembly LH Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a	Matchmark
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b. Loosen the lock nut, and remove the tie rod assembly LH and lock nut.

7. REMOVE TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

DISASSEMBLY

DISASSEMBLY

1. REMOVE STEERING RACK BOOT CLIP (for LH Side)

- a. Using pliers, remove the steering rack boot clip.

2. REMOVE STEERING RACK BOOT CLIP (for RH Side)

HINT:

Perform the same procedure as for the LH side.

3. REMOVE NO. 2 STEERING RACK BOOT CLAMP

- a. Using a screwdriver, remove the No. 2 steering rack boot clamp.

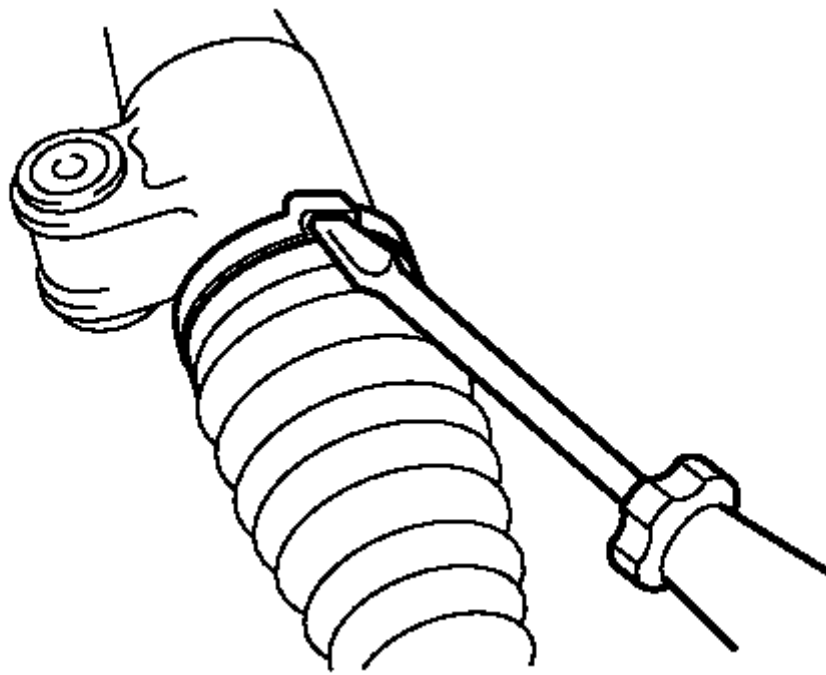


Fig. 26: Identifying No. 2 Steering Rack Boot Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be careful not to damage the steering rack boot.

4. REMOVE NO. 1 STEERING RACK BOOT CLAMP

HINT:

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

5. REMOVE NO. 2 STEERING RACK BOOT

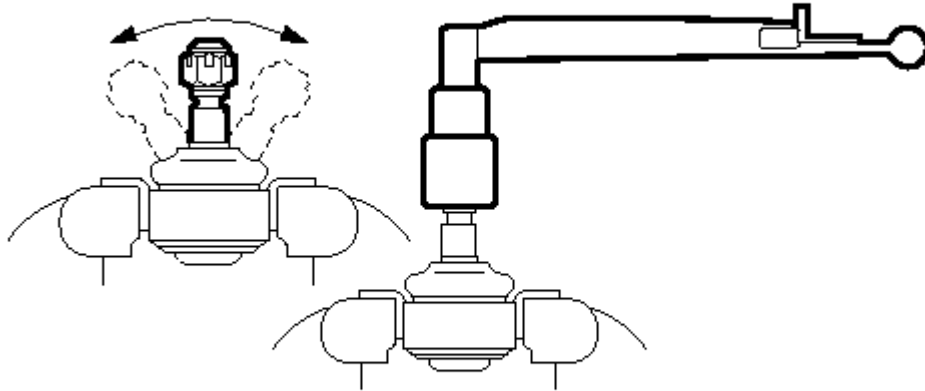
6. REMOVE NO. 1 STEERING RACK BOOT

INSPECTION

INSPECTION

1. INSPECT TIE ROD ASSEMBLY LH

- a. Secure the tie rod assembly LH in a vise.



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Fig. 27: Securing Tie Rod Assembly In Vise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the nut to the stud bolt.
- c. Flip the ball joint back and forth 5 times.
- d. Set a torque wrench to the nut, turn the ball joint continuously at a rate of 2 to 4 seconds per turn, and check the turning torque on the 5th turn.

Standard turning torque

0.49 to 3.43 N*m (5.0 to 35.0 kgf*cm, 4.3 to 30.3 in.*lbf)

If the turning torque is not within the specified range, replace the tie rod assembly LH.

2. INSPECT TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

3. INSPECT TOTAL PRELOAD

- a. Using SST, secure the steering link assembly in a vise.
- SST: 09612-00012

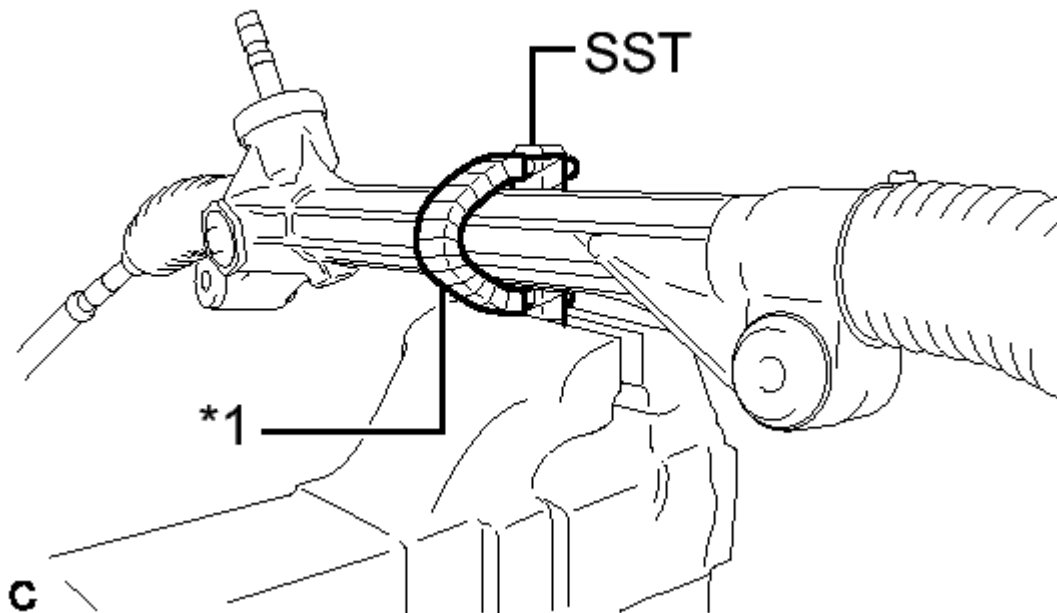


Fig. 28: Securing Steering Link Assembly With Vise Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

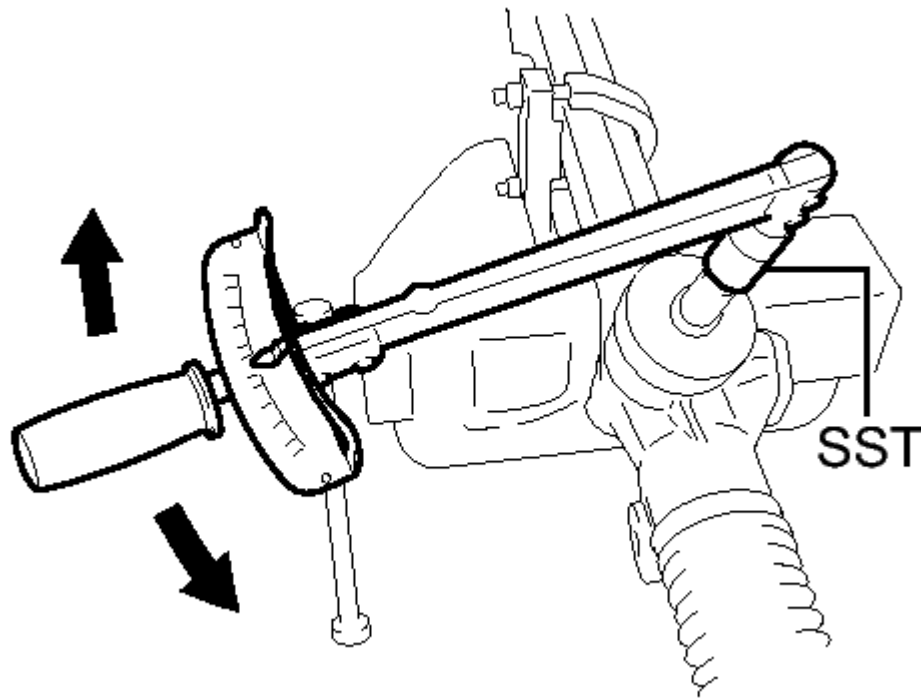
TEXT IN ILLUSTRATION

*1	Protective Tape
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HINT:

Tape SST before use.

- b. Using SST and a torque wrench, inspect the total preload.
- SST: 09616-00020



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Fig. 29: Inspecting Total Preload

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

Standard preload

0.7 to 1.0 N*m (7.0 to 10.7 kgf*cm, 5.8 to 9.2 in.*lbf)

NOTE: **Inspect the total preload around the steering rack center position.**

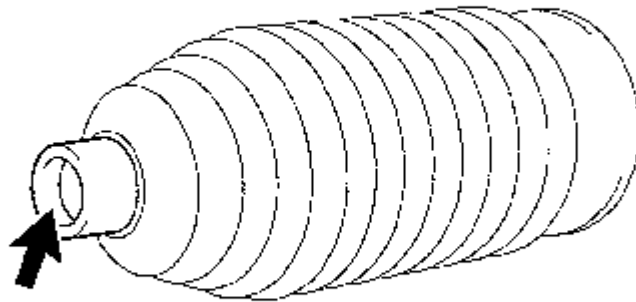
If the total preload is not within the specified range, replace the steering gear assembly with a new one.

REASSEMBLY

REASSEMBLY

1. INSTALL NO. 2 STEERING RACK BOOT

- a. Apply lithium soap base glycol grease to the inside of the small opening of a new No. 2 steering rack boot.



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Fig. 30: Applying Silicon Grease To Inside Of Small End Of Rack Boot
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the No. 2 steering rack boot to the groove on the rack housing.

NOTE:

- Be careful not to damage or twist the boot.
- Make sure that the boot is free of rust and foreign matter.

2. INSTALL NO. 1 STEERING RACK BOOT

HINT:

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

3. INSTALL NO. 2 STEERING RACK BOOT CLAMP

- a. Using SST, tighten a new No. 2 steering rack boot clamp, as shown in the illustration.

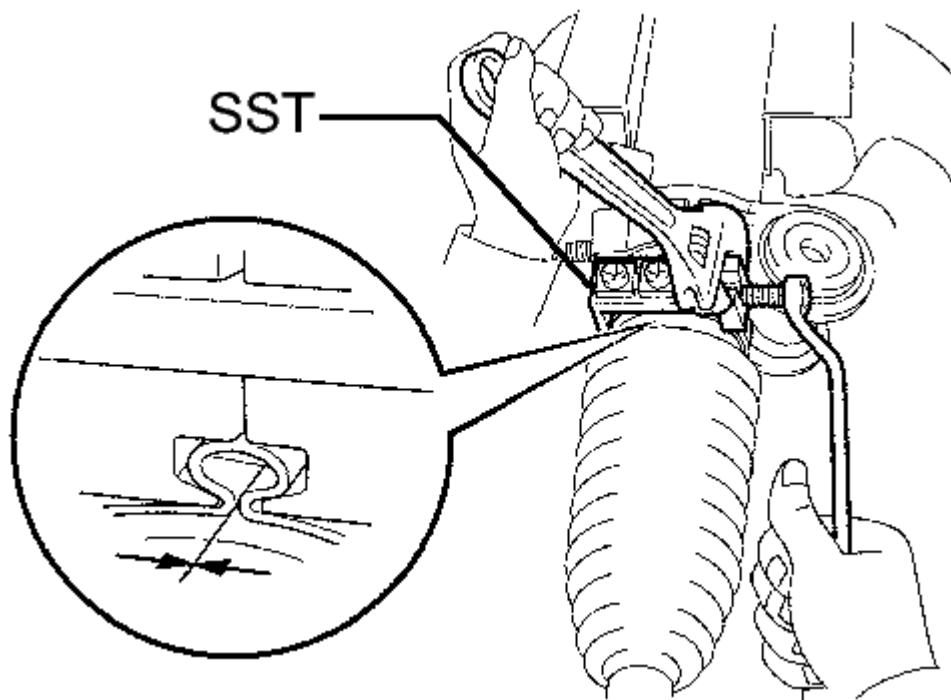


Fig. 31: Identifying SST & No. 2 Steering Rack Boot Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- SST: 09521-24010

Clearance

3.0 mm (0.118 in.) or less

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

4. INSTALL NO. 1 STEERING RACK BOOT CLAMP

HINT:

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

- SST: 09521-24010

5. INSTALL STEERING RACK BOOT CLIP (for LH Side)

- a. Using pliers, install the steering rack boot clip.

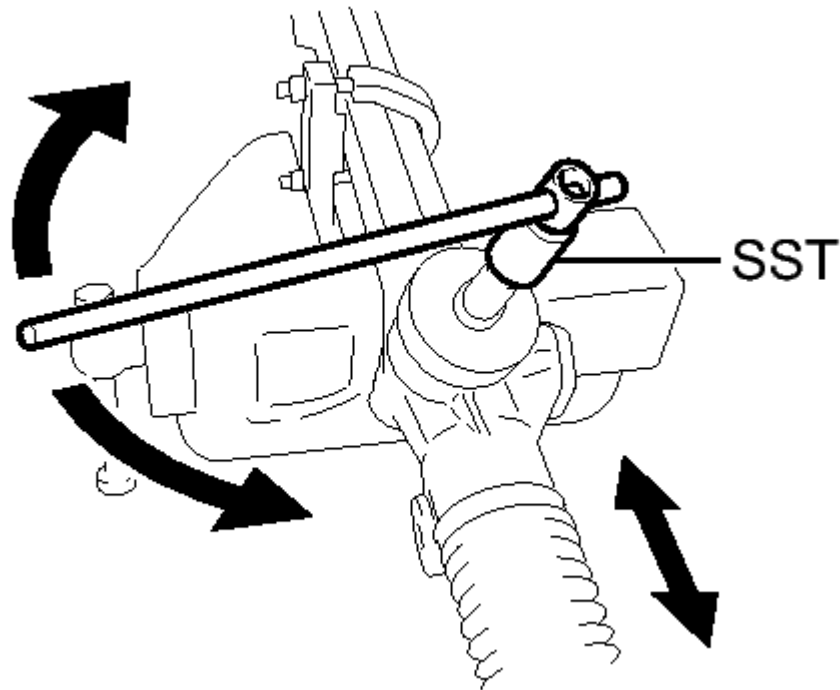
6. INSTALL STEERING RACK BOOT CLIP (for RH Side)

HINT:

Perform the same procedure as for the LH side.

7. INSPECT STEERING GEAR ASSEMBLY

- a. Using SST, rotate the pinion shaft to see if both the left and the right steering rack boots expand and contract smoothly.



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Fig. 32: Rotating Pinion Shaft

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

- SST: 09616-00011

HINT:

If the operation cannot be done as specified, use a new steering rack boot clamp and reinstall the steering rack boots.

INSTALLATION

INSTALLATION

NOTE: When disconnecting the steering intermediate shaft assembly and pinion shaft of steering gear assembly, be sure to place matchmarks before servicing.

1. INSTALL TIE ROD ASSEMBLY LH

- a. Install the lock nut and tie rod assembly LH to the steering rack end sub-assembly until the matchmarks are aligned.

HINT:

After adjusting toe-in, tighten the lock nut.

2. INSTALL TIE ROD ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

3. INSTALL STEERING LINK ASSEMBLY

- a. Install the steering link assembly with the 2 bolts and 2 nuts.

Torque: 70 N*m (714 kgf*cm, 52 ft.*lbf)

NOTE:

- Make sure to tighten the bolts starting from the left side of the vehicle.
- Because the nut has its own stopper, do not turn the nut. Tighten the bolt with the nut secured.

4. INSTALL STEERING INTERMEDIATE SHAFT ASSEMBLY

- a. Align the matchmarks on the steering intermediate shaft assembly and steering link assembly.
- b. Install the bolt.

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

5. INSTALL FRONT STABILIZER BAR (for 2WD)

Refer to **INSTALLATION**

6. INSTALL FRONT STABILIZER BAR (for AWD)

Refer to **INSTALLATION**