

STEERING

Steering System (Inspection) - Sienna

STEERING SYSTEM

PRECAUTION

PRECAUTION

1. IGNITION SWITCH EXPRESSIONS

HINT:

The type of ignition switch used on this model differs according to the specifications of the vehicle. The expressions listed in the table below are used in this information.

Expression	Switch Type	
	Ignition Switch (Position)	Engine Switch (Condition)
Ignition Switch off	LOCK	Off
Ignition Switch ACC	ACC	On (ACC)
Ignition Switch ON	ON	On (IG)
Engine Start	START	Start

2. HANDLING PRECAUTIONS FOR STEERING SYSTEM

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

3. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

- The vehicle is equipped with a Supplemental Restraint System (SRS). Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing. This may cause a serious accident. Before servicing (including inspection, replacement, removal, and installation of parts), be sure to read the precautionary notices for the Supplemental Restraint System. Refer to **PRECAUTION**.

4. HANDLING PRECAUTIONS FOR STEERING COLUMN

- When handling the electronic parts:
 - Avoid any impact to electronic parts such as ECUs and relays. Replace them with new ones if dropped or subjected to a severe blow.

- Do not expose any electronic parts to high temperatures or humidity.
- In order to prevent deformation or malfunctions due to static electricity, do not touch the connector terminals.

b. When handling the steering column assembly:

- Avoid any impact to the steering column assembly, especially to the power steering motor, motor rotation angle sensor and torque sensor. Replace the steering column assembly with a new one if it is dropped or subjected to any severe impacts.
- Do not pull the wire harness when moving the steering column assembly.
- Do not release the tilt lever when the steering column assembly is not installed on the vehicle.
- When the steering column assembly has been replaced, perform the assist map writing. Refer to **REGISTRATION**.

PROBLEM SYMPTOMS TABLE

PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- Inspect the fuses and relays related to this system before inspecting the suspected areas below.

STEERING SYSTEM

Symptom	Suspected Area	See
Steering is heavy.	Front tires (Improperly inflated, unevenly worn)	Refer to <u>INSPECTION</u>
	Front wheel alignment (Incorrect)	Refer to <u>ADJUSTMENT</u>
	Front suspension (Lower ball joint)	Refer to <u>INSPECTION</u>
	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>
	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly (Torque sensor, Power steering motor, Power steering ECU)	Refer to <u>REMOVAL</u>
	Speed sensor	Refer to <u>TEST MODE PROCEDURE</u>
	Brake actuator (Skid control ECU)	Refer to <u>REMOVAL</u>

	Battery and power source system	Refer to <u>PROBLEM SYMPTOMS TABLE</u>
	Power source voltage of steering column assembly (Power steering ECU)	Refer to <u>HOW TO PROCEED WITH TROUBLESHOOTING</u>
Poor return.	Front tires (Improperly inflated, unevenly worn)	Refer to <u>INSPECTION</u>
	Front wheel alignment (Incorrect)	Refer to <u>ADJUSTMENT</u>
	Steering column assembly	Refer to <u>REMOVAL</u>
	Power steering system	Refer to <u>HOW TO PROCEED WITH TROUBLESHOOTING</u>
Excessive free play.	Front tires (Improperly inflated, unevenly worn)	Refer to <u>INSPECTION</u>
	Front suspension (Lower ball joint)	Refer to <u>INSPECTION</u>
	Intermediate shaft, universal joint, sliding yoke (Worn)	-
	Front axle hub bearing (Worn)	Refer to <u>ON-VEHICLE INSPECTION</u>
Steering effort differs between right and left or is uneven.	Front tires (Improperly inflated, unevenly worn)	Refer to <u>INSPECTION</u>
	Front wheel alignment (Incorrect)	Refer to <u>ADJUSTMENT</u>
	Front suspension (Lower ball joint)	Refer to <u>INSPECTION</u>
	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>
	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly (Torque sensor, Power steering motor, Power steering ECU)	Refer to <u>REMOVAL</u>
While driving, steering effort does not change in accordance with vehicle speed or the steering wheel does not return properly.	Front suspension (Lower ball joint)	Refer to <u>INSPECTION</u>
	CAN communication system	Refer to <u>HOW TO PROCEED WITH TROUBLESHOOTING</u>
	Speed sensor	Refer to <u>TEST MODE PROCEDURE</u>
	Brake actuator (Skid control ECU)	Refer to <u>REMOVAL</u>
	Combination meter	Refer to <u>HOW TO PROCEED WITH TROUBLESHOOTING</u>
	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>

	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly (Torque sensor, Power steering motor, Power steering ECU)	Refer to <u>REMOVAL</u>
A knocking (or cranking) sound occurs when turning the steering wheel while power steering is operating.	Front suspension (Lower ball joint)	Refer to <u>INSPECTION</u>
	Steering intermediate shaft	-
	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>
	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly	Refer to <u>REMOVAL</u>
Noise occurs when turning the steering wheel during low speed driving.	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>
	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly	Refer to <u>REMOVAL</u>
High-pitched sounds (squeaking) occur when turning the steering wheel slowly with the vehicle stopped.	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>
	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly (Power steering motor)	Refer to <u>REMOVAL</u>
The steering wheel vibrates and noise occurs when turning the steering wheel from lock to lock.	Power steering gear (for 2GR-FE)	Refer to <u>INSPECTION</u>
	Power steering gear (for 1AR-FE)	Refer to <u>INSPECTION</u>
	Steering column assembly	Refer to <u>REMOVAL</u>
EPS warning light remains on.	Proceed to PS warning light remains on	Refer to <u>PS Warning Light Remains ON</u>

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. INSPECT STEERING WHEEL FREE PLAY

- Stop the vehicle and position the front wheels straight ahead.
- Gently turn the steering wheel right and left, and check the steering wheel free play.

Maximum free play

30 mm (1.18 in.)

HINT:

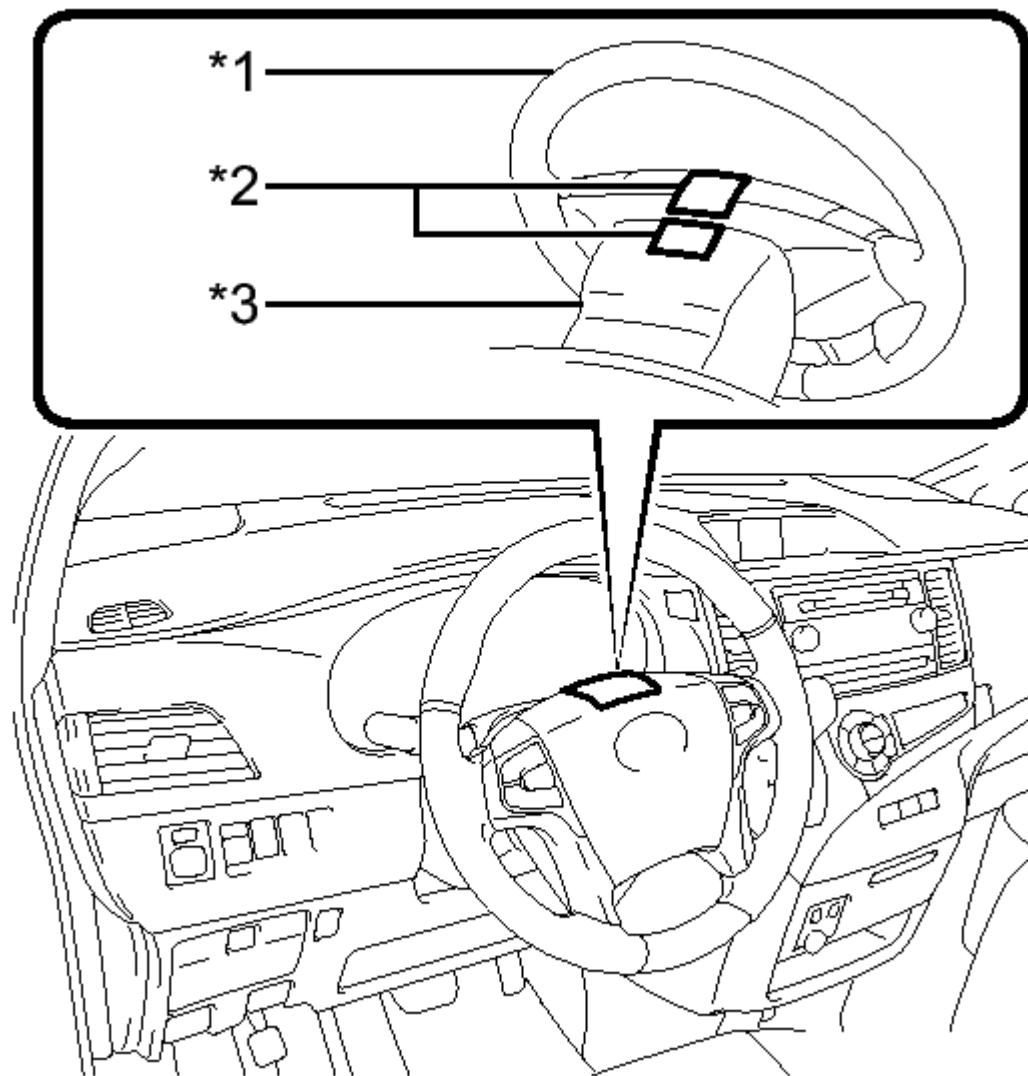
If the free play exceeds the maximum, check the steering system. Refer to **PROBLEM SYMPTOMS TABLE**.

ADJUSTMENT

ADJUSTMENT

1. ADJUST STEERING WHEEL OFF CENTER

- a. Inspect steering wheel off center.
 1. Apply masking tape on the top center of the steering wheel and steering column upper cover.



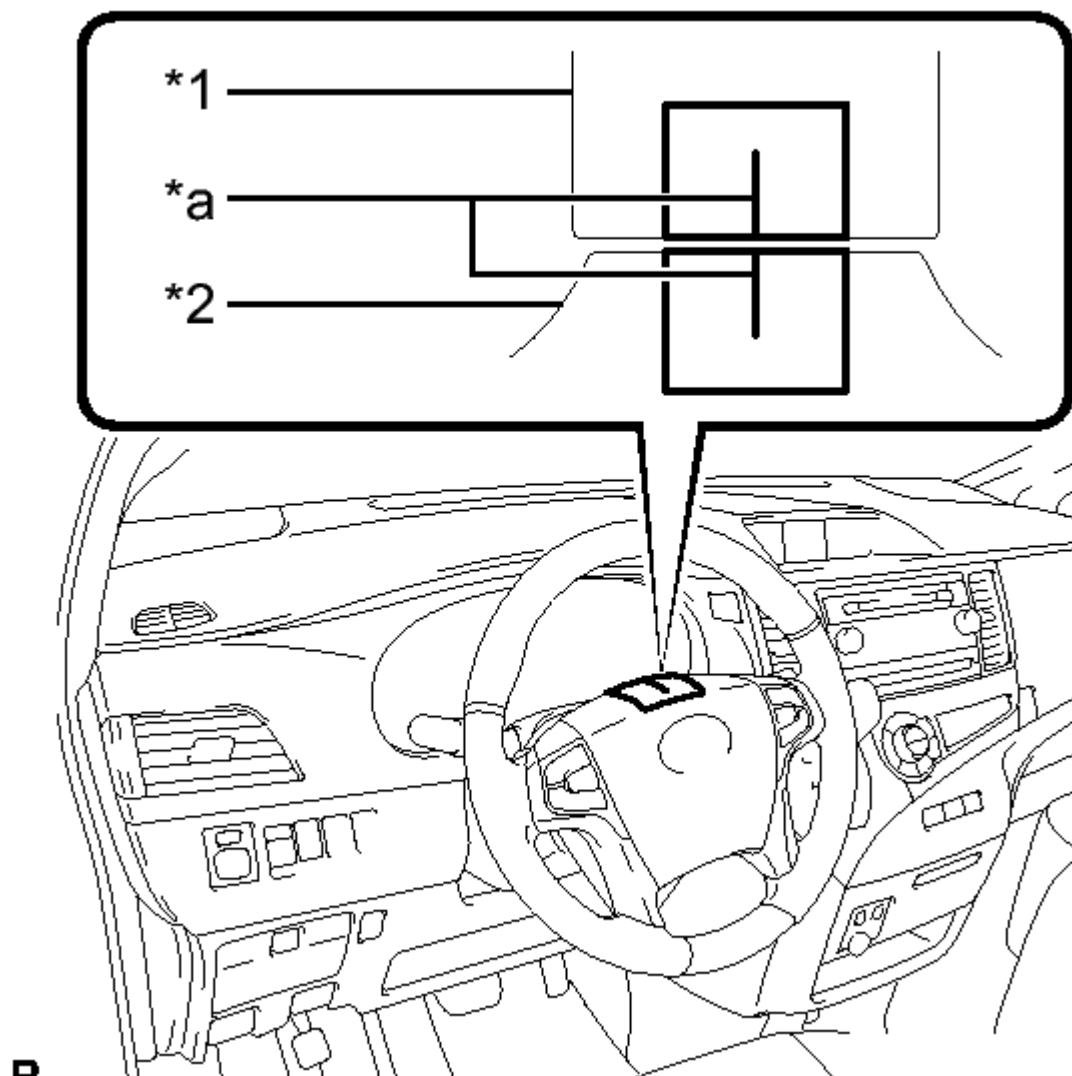
P

Fig. 1: Identifying Steering Wheel, Masking Tape & Upper Steering Column Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*1	Steering Wheel
*2	Masking Tape
*3	Upper Steering Column Cover

2. Drive the vehicle in a straight line for 100 meters at a constant speed of 56 km/h (35 mph), while holding the steering wheel to maintain the course.
3. Draw a line on the masking tape as shown in the illustration.



P

Fig. 2: Identifying Upper Steering Column Cover, Steering Wheel & Marked Line

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

TEXT IN ILLUSTRATION

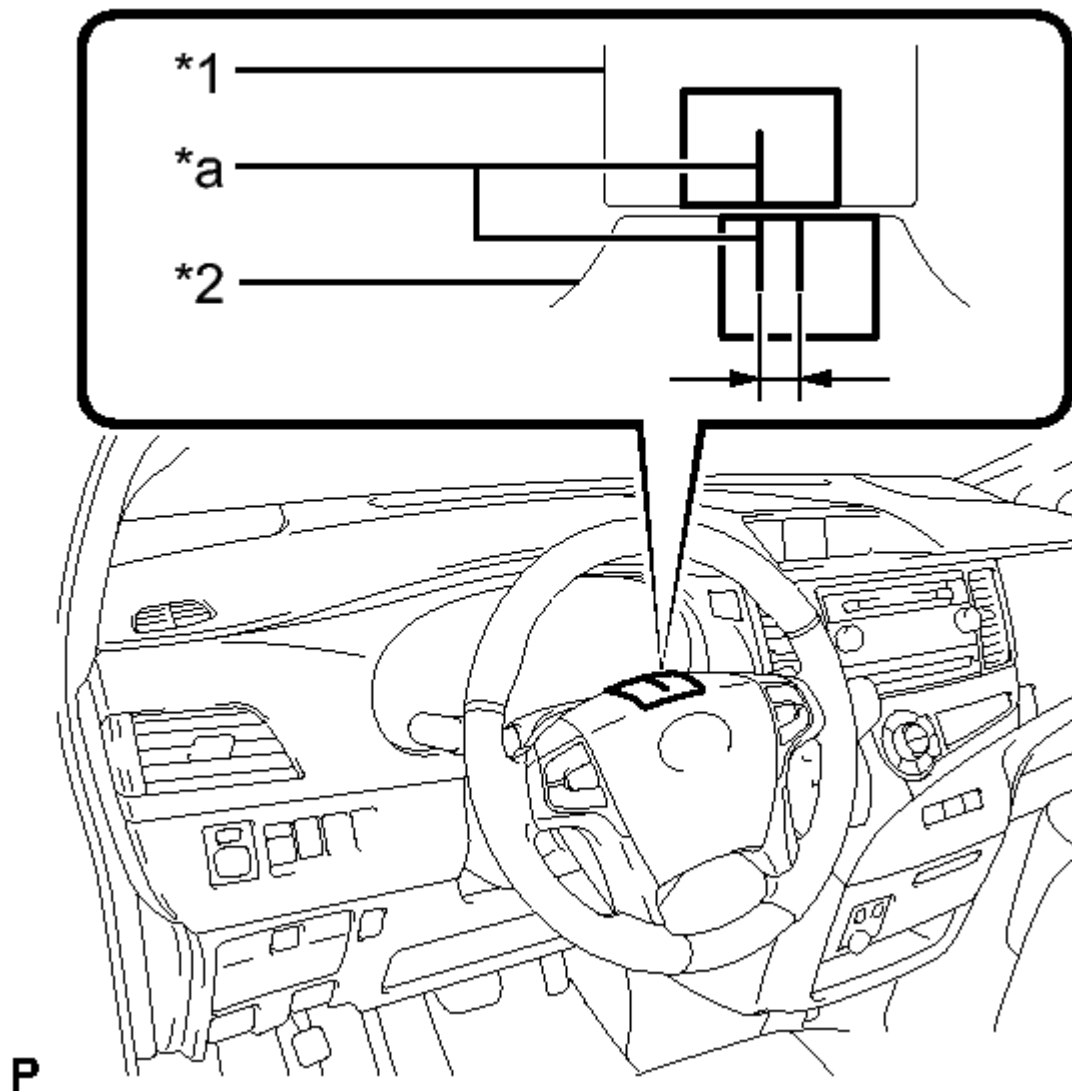
*1	Upper Steering Column Cover
*2	Steering Wheel
*a	Marked Line

4. Turn the steering wheel to the center position.

HINT:

Look at the upper surface of the steering wheel, steering spoke, and SRS airbag line to find the center position.

5. Draw a new line on the masking tape on the steering wheel as shown in the illustration.



P
Fig. 3: Identifying Upper Steering Column Cover, Steering Wheel & Marked Lines
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

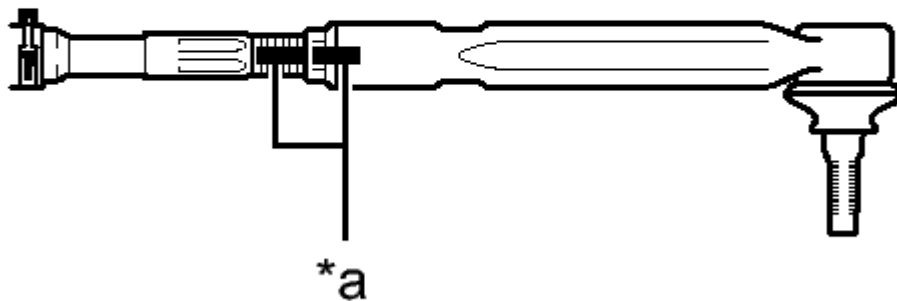
TEXT IN ILLUSTRATION

*1	Upper Steering Column Cover
*2	Steering Wheel
*a	Marked Line

6. Measure the distance between the 2 lines on the masking tape on the steering wheel.
7. Convert the measured distance to steering angle.

HINT:

- Measured distance 1 mm (0.0394 in.) = steering angle of approximately 1 degree.
 - Make a note of the steering angle.
- b. Adjust steering angle.
1. Draw a matchmark on the RH and LH tie rod ends and rack ends respectively where it can be easily seen.



C

Fig. 4: Identifying RH/LH Tie Rod Ends & Rack Ends Matchmarks
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TEXT IN ILLUSTRATION

*a Matchmark

2. Using a paper gauge, measure the distance from the RH and LH tie rod ends to the rack end screws.

HINT:

- Measure both the RH and LH sides.
 - Make a note of the measured values.
3. Remove the RH and LH boot clips from the rack boots.

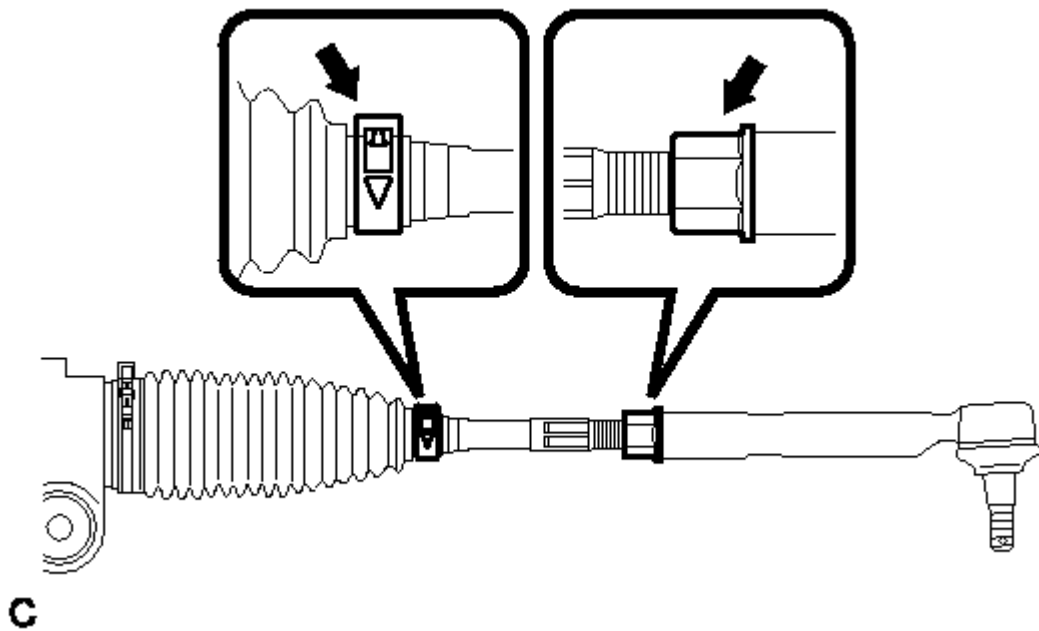


Fig. 5: Locating Boot Clips And Lock Nuts

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

4. Loosen the RH and LH lock nuts.
5. Turn the RH and LH rack ends by the same amount (but in different directions) according to the steering angle.

HINT:

One 360 degree turn of the rack end (1.5 mm (0.0591 in.) horizontal movement) equals to 12 degrees of steering angle.

6. Tighten the RH and LH lock nuts to the specified torque.

Torque: 88 N*m (897 kgf*cm, 65 ft.*lbf)

NOTE: Make sure that the difference in length between the RH and LH tie rod ends and rack end screws is within 1.5 mm (0.0591 in.).

7. Install the RH and LH boot clips.