

2009 Toyota Highlander Limited

2009 STEERING Steering Column - Highlander

2009 STEERING

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STEERING SYSTEM

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 article.

IGNITION SWITCH REFERENCE CHART

Expression	Switch Type	
	Ignition Switch (position)	Engine Switch (condition)
Ignition Switch off	LOCK	Off
Ignition Switch on (IG)	ON	On (IG)
Ignition Switch on (ACC)	ACC	On (ACC)
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 driving hazards.

3. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

- The vehicle is equipped with SRS (Supplemental Restraint System). 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 (See **AIRBAG SYSTEM**).

4. HANDLING PRECAUTIONS FOR STEERING COLUMN

- When handling the steering column assembly:
 - Avoid any impact to the steering column assembly, especially to the motor or the 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 disconnecting or reconnecting the connectors:
 - When disconnecting the connectors related to the electronic motor power steering system, turn the ignition switch on (IG) (the engine is stopped), center the steering wheel, turn the ignition switch off, and then disconnect the connectors.

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2. When reconnecting the connectors related to the electronic motor power steering system, make sure that the ignition switch is turned off, center the steering wheel and then turn the ignition switch on (IG) (the engine is stopped).

NOTE: **Do not turn the ignition switch on (IG) without the steering wheel being centered.**

PROBLEM SYMPTOMS TABLE

HINT:

Use the table below to help determine the cause of a problem. The likely causes of the problem are indicated in descending order. Check each suspected area in order. Repair or replace faulty parts or perform adjustments as necessary.

STEERING SYSTEM

STEERING SYSTEM - PROBLEM SYMPTOMS CHART

Symptom	Suspected Area	See page
Hard steering	Tires (Improperly inflated)	<u>INSPECTION</u>
	Front wheel alignment (Incorrect)	<u>FRONT WHEEL ALIGNMENT</u>
	Steering system joints (Worn)	-
	Suspension arm ball joints (Worn)	<u>INSPECTION</u>
	Steering column (Binding)	<u>STEERING COLUMN ASSEMBLY</u>
	Power steering gear (for 1AR-FE)	<u>REMOVAL</u>
	Power steering gear (for 2GR-FE)	<u>REMOVAL</u>
Poor return	Tires (Improperly inflated)	<u>INSPECTION</u>
	Front wheel alignment (Incorrect)	<u>FRONT WHEEL ALIGNMENT</u>
	Steering column (Binding)	<u>STEERING COLUMN ASSEMBLY</u>
	Power steering gear (for 1AR-FE)	<u>REMOVAL</u>
	Power steering gear (for 2GR-FE)	<u>REMOVAL</u>
Excessive free play	Steering system joints (Worn)	-
	Suspension arm ball joints (Worn)	<u>INSPECTION</u>
	Intermediate shaft, universal joint, sliding yoke (Worn)	-
	Front wheel bearing (Worn)	<u>ON-VEHICLE INSPECTION</u>
	Power steering gear (for 1AR-FE)	<u>REMOVAL</u>
	Power steering gear (for 2GR-FE)	<u>REMOVAL</u>
Abnormal noise	Steering system joints (Worn)	-
	Power steering gear (for 1AR-FE)	<u>REMOVAL</u>
	Power steering gear (for 2GR-FE)	<u>REMOVAL</u>

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ON-VEHICLE INSPECTION**1. INSPECT STEERING WHEEL FREE PLAY**

- a. Stop the vehicle and position the front wheels straight ahead.
- b. 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 (See **ON-VEHICLE INSPECTION**).

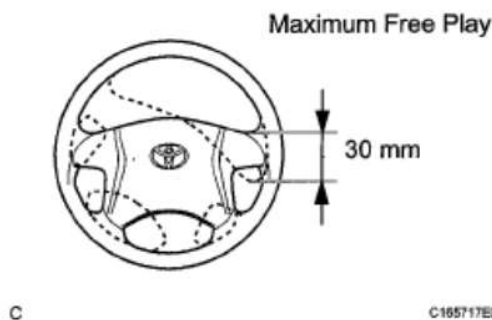


Fig. 1: Checking Steering Wheel Free Play

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

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.
 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.

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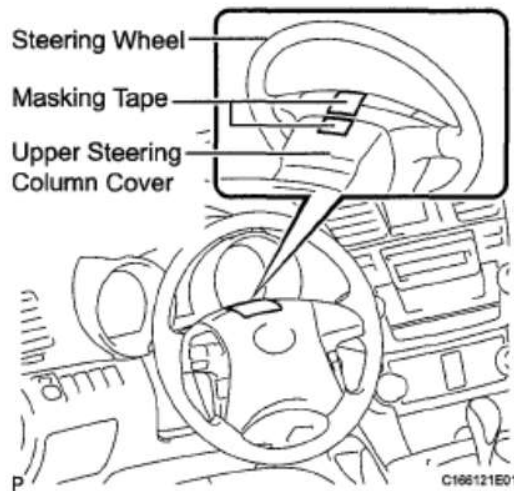


Fig. 2: Inspecting Steering Wheel Off Center
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Draw a line on the masking tape as shown in the illustration.
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.

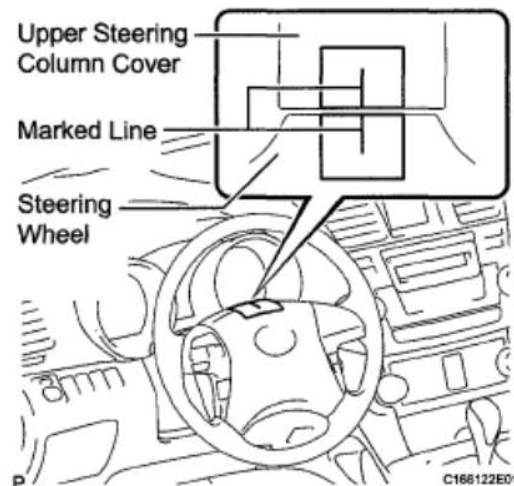


Fig. 3: Identifying Line On Masking Tape
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. Draw a new line on the masking tape on the steering wheel as shown in the illustration.
6. Measure the distance between the 2 lines on the masking tape on the steering wheel.
7. Convert the measured distance to steering angle.

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HINT:

- Measured distance 1 mm (0.04 in.) = Steering angle of approximately 1 degree.
- Make a note of the steering angle.

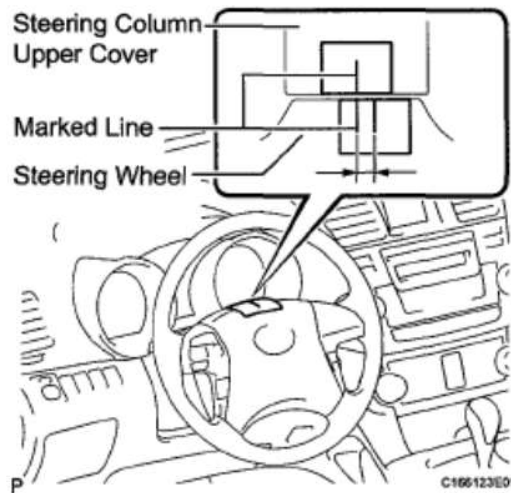


Fig. 4: Measuring Distance Between Lines On Masking Tape
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Adjust steering angle.

1. Draw a line on the RH and LH tie rod ends and rack ends respectively where it can be easily seen.
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.

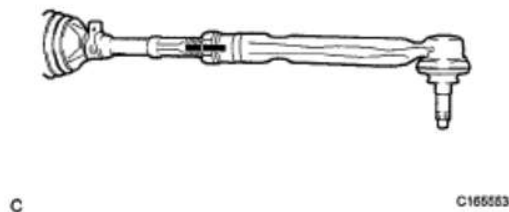


Fig. 5: Identifying Line On RH And LH Tie Rod Ends
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Remove the RH and LH boot clips from the rack boots.
4. Loosen the RH and LH lock nuts.

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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 (0.059 in.) horizontal movement) equals to 12 degrees of steering angle.

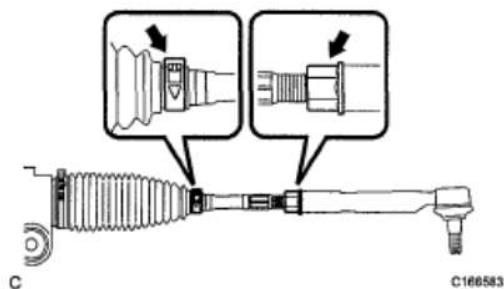


Fig. 6: Locating RH And LH Boot Clips From Rack Boots
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 (0.059 in.).

7. Install the RH and LH boot clips.

STEERING LOCK SYSTEM

PRECAUTION

1. PRECAUTION FOR DISCONNECTING THE BATTERY CABLE

NOTE: When disconnecting the battery negative (-) terminal, initialize the following system after the terminal is reconnected:

SYSTEM REFERENCE

System	See procedure
Power back door system	INITIALIZATION

2. PRECAUTIONS WHEN WORKING ON STEERING LOCK SYSTEM

- a. After replacing the steering lock actuator assembly (steering lock ECU), perform the key ID code registration.

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- b. If the steering lock actuator assembly is replaced, open and close the driver's door. The engine may not start until the driver's door is opened or closed.

HINT:

Opening and closing the driver's door causes the steering lock actuator assembly (steering lock ECU) to memorize the correct steering lock bar position.

- c. If checking for DTCs of the smart key system or if checking the DATA LIST with the engine switch off, make sure that the driver's door is open.

HINT:

When the engine switch is off, the main body ECU may be in sleep mode. If the main body ECU is in this sleep mode, it will not be possible for Techstream to communicate with it. Opening and closing the driver's door will cause the ECU to exit sleep mode.

3. PRECAUTIONS FOR STEERING LOCK ACTUATOR

NOTE: If the steering lock actuator assembly (steering lock ECU) is replaced, with the engine switch off and the shift lever in the N position, open and close the driver's door to record the current steering lock position into the steering lock ECU. If this is not performed, the engine may not start.

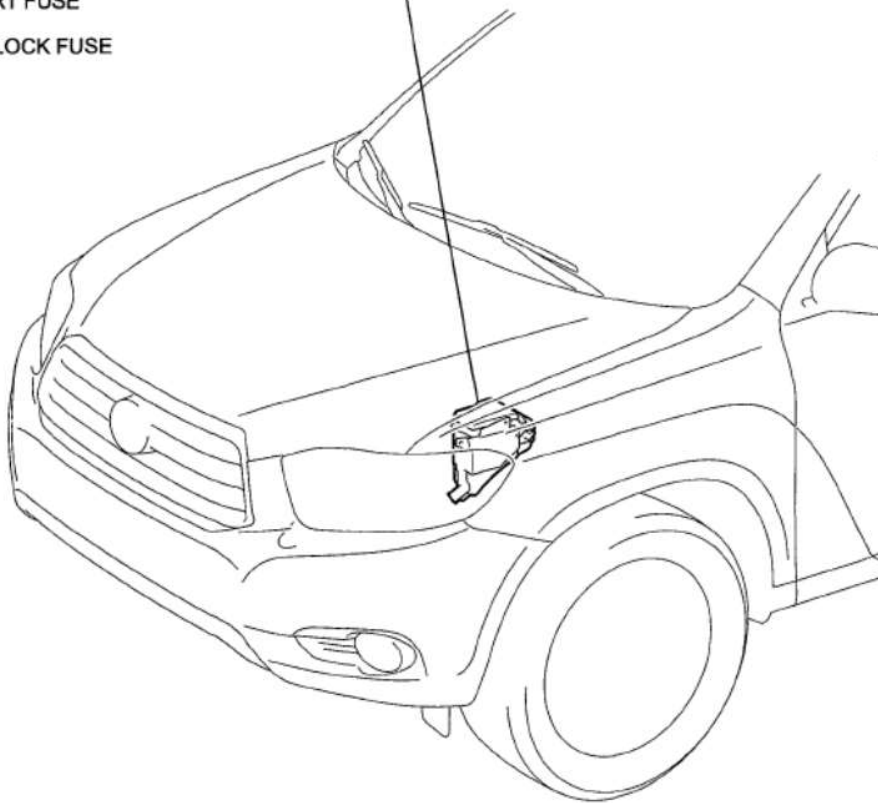
PARTS LOCATION

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ENGINE ROOM RELAY BLOCK

- IG2 RELAY
- IG2 FUSE
- AM2 FUSE
- SHORT FUSE
- STR LOCK FUSE



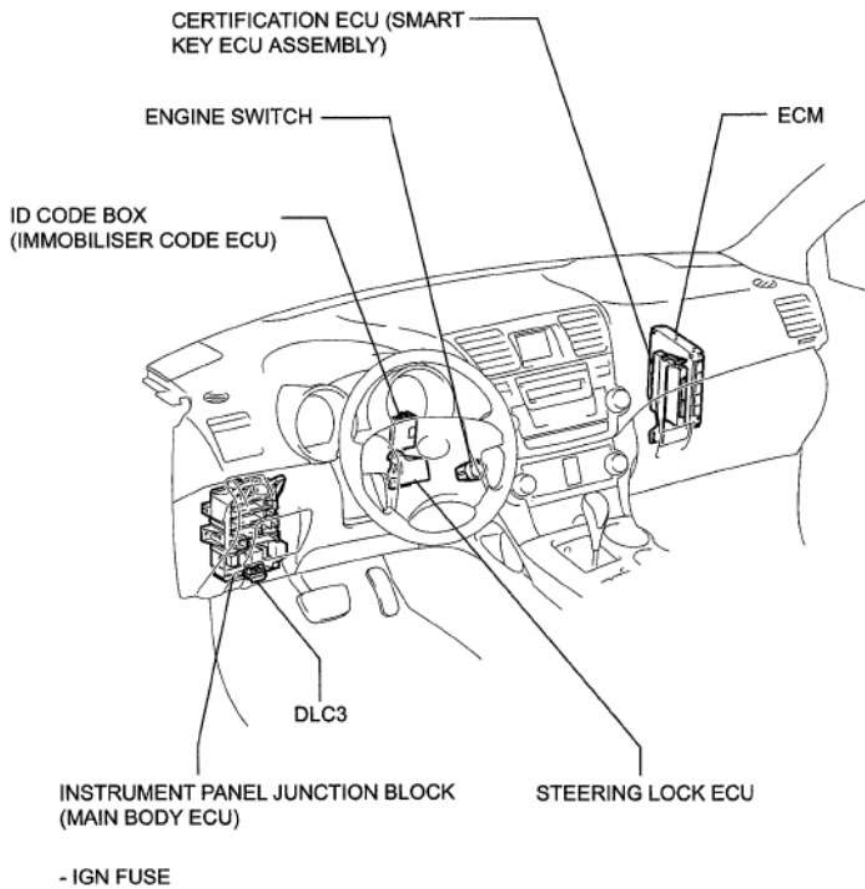
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Fig. 7: Identifying Steering Lock System Parts Location (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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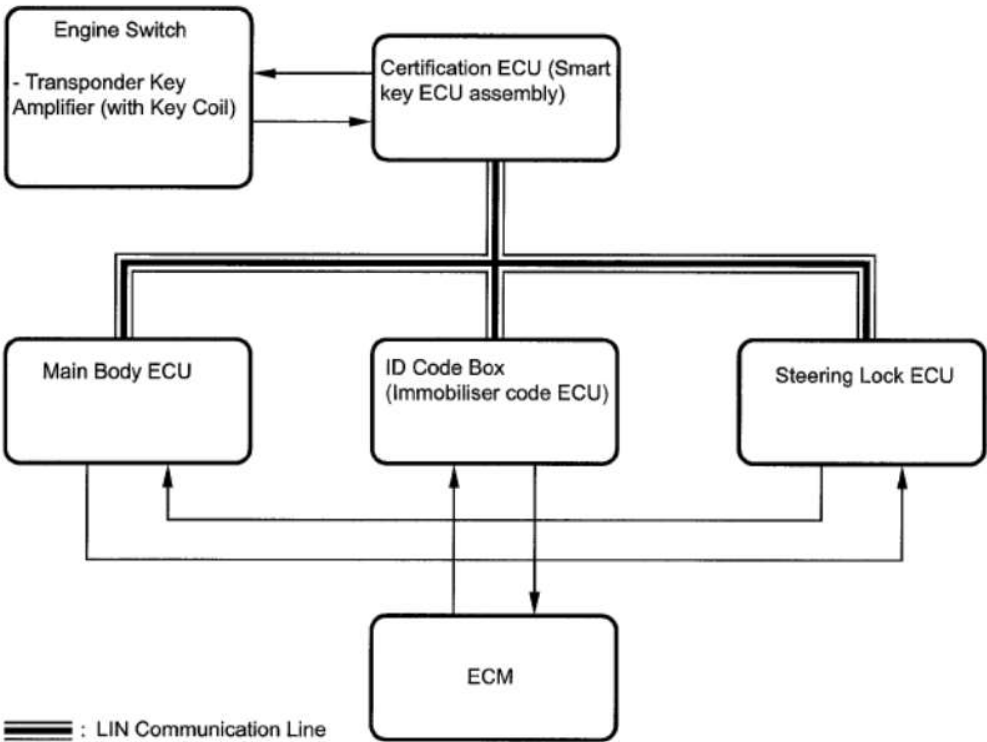
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Fig. 8: Identifying Steering Lock System Parts Location (2 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SYSTEM DIAGRAM

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Fig. 9: Steering Lock System Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Input and output signals of each ECU:

TRANSMITTER INPUT AND OUTPUT SIGNALS OF ECU REFERENCE CHART

Transmitting ECU (transmitter)	Receiving ECU	Signals	Communication Method
Main Body ECU	Steering Lock ECU	Power supply status (to steering lock motor)	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Sleep available status	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Lock/Unlock sensor status	LIN
	• Certification ECU (Smart		

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Steering Lock ECU	- key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Steering lock status	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Motor control status	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Diagnostic response status	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Lock/Unlock sensor malfunction	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Power supply malfunction (to steering lock motor)	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Motor driver malfunction	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Lock bar (stuck) status	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Push start status	LIN
	• Certification ECU (Smart		

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Steering Lock ECU	key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Lock/Unlock relay drive status	LIN
Steering Lock ECU	• Certification ECU (Smart key ECU assembly) • Main Body ECU • ID Code Box (Immobiliser code ECU)	Engine start control status	LIN

SYSTEM DESCRIPTION

1. DESCRIPTION

- a. The steering lock system locks or unlocks the steering by activating the steering bar with a motor. The steering lock ECU activates the motor based on signals from the certification ECU (smart key ECU assembly) and main body ECU.
- b. A LIN (Local Interconnect Network) is used for communication between different ECUs in this system.

2. FUNCTIONS OF COMPONENTS

- a. The steering lock ECU controls the system based on information from the following components:

FUNCTION CHART

Item	Function
Steering lock actuator assembly	Consists of a motor, lock bar, lock and unlock position sensors, etc. Activated by the steering lock ECU.
Steering lock ECU	Included in the steering lock actuator assembly. This ECU activates the steering lock motor based on permission signals from the main body ECU and certification ECU (smart key ECU assembly). Detects steering lock or unlock state and transmits this status to other ECUs.
Main body ECU	Permits the steering lock ECU to supply power to activate the motor. The main body ECU and certification ECU (smart key ECU assembly) permit engine start after receiving an unlock signal from the steering lock ECU.
Certification ECU (Smart key ECU assembly)	Orders the steering lock ECU to lock/unlock the steering. The main body ECU and certification ECU (smart key ECU assembly) permit engine start after receiving an unlock signal from the steering lock ECU.
IG2 relay	Controlled by the main body ECU. This ECU sends IG signals to the steering lock ECU.
ID Code Box (Immobiliser code ECU)	Transmits command to set or cancel immobiliser to the ECM based on permission signals from the certification ECU (smart key ECU assembly).

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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- Perform troubleshooting in accordance with the following flowchart.
- *: Use Techstream.

1. **VEHICLE BROUGHT TO WORKSHOP**
2. **INSPECT BATTERY VOLTAGE**

Standard voltage:**11 to 14 V**

If the voltage is below 11 V, recharge or replace the battery before proceeding to the next step.

3. **CHECK AND CLEAR DTCS***
4. **PROBLEM SYMPTOM CONFIRMATION**

Result**RESULT CHART**

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B: GO TO STEP 6**A: Go to next step**

5. **SYMPTOM SIMULATION**
6. **CHECK CAN COMMUNICATION SYSTEM***

HINT:

Check that there are no problems in the CAN communication system before troubleshooting the steering lock system.

7. **DTC CHECK***
 - a. Check for DTCs (See **DTC CHECK/CLEAR**).

Result**RESULT CHART**

Result	Proceed to
DTC is output.	A
DTC is not output.	B

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A: GO TO STEP 9

B: Go to next step

8. PROBLEM SYMPTOMS TABLE

Result

RESULT CHART

Result	Proceed to
Fault is not listed in problem symptoms table	A
Fault is listed in problem symptoms table	B

B: Go TO STEP 10

A: Go to next step

9. DTC CHART

10. CIRCUIT INSPECTION*

11. PROBLEM IDENTIFICATION

12. REPAIR OR REPLACEMENT

13. CONFIRMATION TEST*

NEXT: END

INITIALIZATION

HINT:

In vehicles equipped with the smart key system, the starting function may not operate after recharging or while jump-starting a discharged battery. This condition is most common if the battery voltage drops below 9 V. The following procedure has been developed to address this condition.

1. INITIALIZATION PROCEDURE

- a. Confirm that the SHORT fuse is installed.

HINT:

If the SHORT fuse is not installed, install it at this time.

- b. Move the shift lever to the N position.
- c. Turn the engine switch off.
- d. Open the driver's door.

HINT:

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Opening the driver's door will start an initialization process between the steering lock ECU and the engine room junction block.

- e. Depress the brake pedal.
- f. Press the "START STOP" switch.

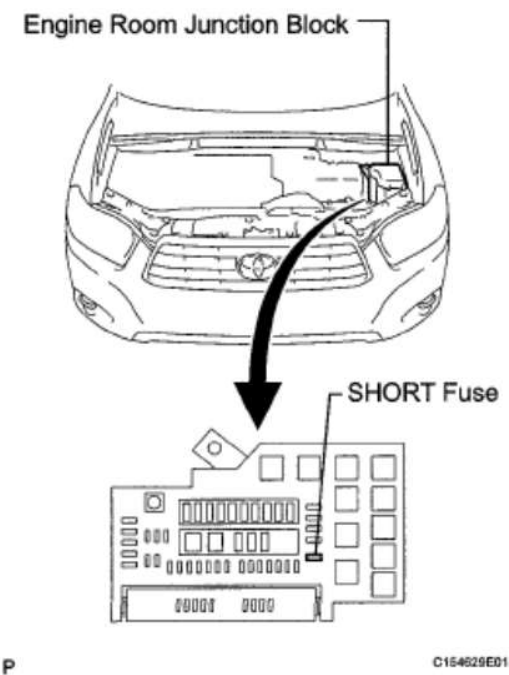


Fig. 10: Identifying Engine Room Junction Block And Short Fuse
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PROBLEM SYMPTOMS TABLE

Use the table below to help determine the cause of a problem. The likely causes of the problem are indicated in descending order. Check each suspected area in order. Repair or replace faulty parts or perform adjustments as necessary.

STEERING LOCK SYSTEM FUNCTION:

STEERING LOCK SYSTEM FUNCTION - PROBLEM SYMPTOMS CHART

Symptom	Suspected Area	See page
Steering wheel cannot be unlocked	Initialization	<u>INITIALIZATION</u>
	Check for DTCs in the smart key system.	<u>DTC CHECK/CLEAR</u>
	Check for DTCs in the engine immobiliser system.	<u>DIAGNOSIS SYSTEM</u>
	Check that the Lck/Unlck Rec item in the DATA LIST of the certification ECU (smart key ECU assembly) displays YES within 10 seconds after starting the engine. (If it displays NO, see "No steering unlock" command in this	<u>DTC CHECK/CLEAR</u>

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(the engine cannot be started).	table.)	
	Steering lock ECU power source circuit	<u>POWER SOURCE CIRCUIT</u>
	Check the input signal from the IGE terminal of the steering lock ECU.	<u>STEERING LOCK MOTOR DRIVE POWER CIRCUIT</u>
	Replace the steering lock ECU.	<u>STEERING COLUMN ASSEMBLY</u>
Steering wheel cannot be unlocked (no steering unlock command).	Check that the S Code Chk item in the DATA LIST of the certification ECU (smart key ECU assembly) displays OK. (If it displays NG, replace the ID code box (immobiliser code ECU).)	-
	Check that the L Code Chk item in the DATA LIST of the certification ECU (smart key ECU assembly) displays OK. (If it displays NG, replace the ID code box (immobiliser code ECU).)	-
	Replace the certification ECU (smart key ECU assembly).	<u>REMOVAL</u>
Steering wheel cannot be locked.	Check for DTCs in the smart key system.	<u>DTC CHECK/CLEAR</u>
	Check for DTCs in the engine immobiliser system.	<u>DIAGNOSIS SYSTEM</u>
	With the engine switch off and the shift in the P position, open and close the drivers door. After that, check that the Lck/Unlck Rec item in the DATA LIST of the certification ECU (smart key ECU assembly) displays YES within 10 seconds. (If it displays NO, see "No steering lock" command in this table.)	<u>DTC CHECK/CLEAR</u>
	Steering lock ECU power source circuit	<u>POWER SOURCE CIRCUIT</u>
	Check the input signal from the IGE terminal of the steering lock ECU.	<u>STEERING LOCK MOTOR DRIVE POWER CIRCUIT</u>
	Replace the steering lock ECU.	<u>STEERING COLUMN ASSEMBLY</u>
Steering wheel cannot be locked (no steering lock command).	Courtesy light switch circuit	<u>DOOR COURTESY SWITCH CIRCUIT</u>
	Check that the S Code Chk item in the DATA LIST of the certification ECU (smart key ECU assembly) displays OK. (If it displays NG, replace the ID code box (immobiliser code ECU).)	-
	Check that the L Code Chk item in the DATA LIST of the certification ECU (smart key ECU assembly) displays OK. (If it displays NG, replace the ID code box (immobiliser code ECU).)	-
	Replace the certification ECU (smart key ECU assembly).	<u>REMOVAL</u>

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SMART KEY SYSTEM FUNCTION:

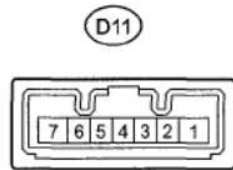
SMART KEY SYSTEM FUNCTION - PROBLEM SYMPTOMS CHART

Symptom	Suspected Area	See page
Engine does not start.	Initialization	<u>INITIALIZATION</u>
	Check for DTCs in the smart key system.	<u>DTC CHECK/CLEAR</u>
	Check for DTCs in the engine immobiliser system.	<u>DIAGNOSIS SYSTEM</u>
	Check that the engine switch is turned on (IG).	-
	Check cranking operation. (If cranking operation is possible, see "Engine does not start due to the engine immobiliser" in this table.)	-
	Check Shift P Sig in the DATA LIST of the main body ECU and confirm that the shift signal is normal.	-
	Check whether the steering wheel is locked or unlocked. (If it is locked, see "Steering wheel cannot be unlocked" in the steering lock function table.)	-
	Steering lock ECU power source circuit	-
	Check the output from the SLP terminal of the steering lock ECU.	<u>UNLOCK POSITION SENSOR SIGNAL CIRCUIT</u>
	Check the output signal from the ST SW of the certification ECU (smart key ECU assembly) (DTC B2275).	<u>DTC B2275 STSW MONITOR MALFUNCTION</u>
Engine does not start due to the engine immobiliser.	Replace the main body ECU.	-
	Check that the L Code Chk item in the DATA LIST of the certification ECU (smart key ECU assembly) displays OK. (If it displays NG, replace the ID code box (immobiliser code ECU).)	-
	Check that the Start Rqst item in the DATA LIST of the certification ECU (smart key ECU assembly) displays YES. (If it displays NO, replace the certification ECU (smart key ECU assembly).)	-
	Check that the S Code Chk item in the DATA LIST of the certification ECU (smart key ECU assembly) displays OK. (If it displays NG, replace the ID code box (immobiliser code ECU).)	-
	Replace the ID Code Box (immobiliser code ECU).	<u>REMOVAL</u>

TERMINALS OF ECU

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Fig. 11: Identifying D11 And ECU Connector Terminals

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

1. STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)

TERMINAL DESCRIPTION

Terminal No. (Symbols)	Wiring Color	Terminal Description	Condition	Specified Condition
D11-1 (GND) - Body ground	W-B - Body ground	Ground	Always	Below 1 V
D11-2 (SGND) - Body ground	W - Body ground	Signal ground	Always	Below 1 V
D11-3(IGE) - D11-1 (GND)	Y - W-B	Power source for driving motor	Motor is in operation	Below 1 V
			Motor is not in operation	11 to 14 V
D11-4 (SLP1) - D11-2 (SGND)	O - W	Unlock position sensor output signal	Steering is locked	11 to 14 V
			Steering lock is released	Below 1 V
D11-5 (LIN) - D11-2 (SGND)	GR - W	LIN communication bus	Engine switch on (IG)	Pulse generation
D11-6 (IG2) - D11-1 (GND)	V - W-B	IG signal input	Engine switch on (IG)	11 to 14 V
D11-7 (B) - D11-1 (GND)	G - W-B	Power source	Always	11 to 14 V

DIAGNOSIS SYSTEM

1. DESCRIPTION

a. DIAGNOSTIC SYSTEM

When troubleshooting a vehicle with a diagnostic system, the only difference from the usual troubleshooting procedure is connecting Techstream to the vehicle and reading various data output from the vehicle's steering lock ECU. The steering lock ECU records DTCs when the ECU detects a malfunction in the ECU itself or in system circuits.

To check the DTCs, connect the Techstream to the DLC3 on the vehicle. Techstream enables the DTCs to be cleared, the indicators to be activated, and the DATA LIST to be checked.

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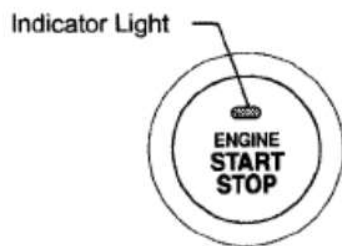
- b. The steering lock ECU diagnosis information cannot be read directly from the steering lock ECU by Techstream. The diagnosis information from the steering lock ECU is transmitted Techstream via the certification ECU (smart key ECU assembly) using the Controller Area Network (CAN).

2. CHECK DLC3

- a. Check the DLC3 (See **HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**).

3. WARNING FUNCTION OF ENGINE SWITCH INDICATOR

- a. The steering lock ECU blinks the LED indicator of the engine switch when any of the following problems occurs in the system:



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Fig. 12: Identifying Engine Switch Indicator Light
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ITEM DETECTION INDICATION STATUS CHART

Detection Item	Indicator Light Blink Pattern	Indication Status	Countermeasure
Steering lock is still not released	- Blinks in green at 1-second intervals - Goes off 15 seconds after blinking starts	The motor operates to release the steering lock, but the steering lock cannot be released (e.g. the lock bar is stuck in the steering column).	Push the engine switch while turning the steering wheel left or right.
Malfunction in smart key system	- Blinks in amber at 2-second intervals - Goes off 15 seconds after the engine switch is turned off while blinking	- There is a short in the devices activating the motor. - There is a problem in the steering lock ECU or main body ECU.	Troubleshoot by following <u>"HOW TO PROCEED WITH TROUBLESHOOTING"</u> .

4. WARNING FUNCTION OF COMBINATION METER

- a. The steering lock ECU displays a warning on the combination meter if any of the following

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problems occurs in the system:

ITEM DETECTION INDICATION STATUS CHART

Detection Item	Display	Indication Status	Countermeasure
Steering lock is still not released	"Steering Lock is still active"	The motor operates to release the steering lock, but the steering lock cannot be released (e.g. the lock bar is stuck in the steering column).	Push the engine switch while turning the steering wheel left or right.
Malfunction in smart key system	"Check Steering Lock System"	- There is a short in the devices activating the motor. - There is a problem in the steering lock ECU or main body ECU.	Troubleshoot by following " <u>HOW TO PROCEED WITH TROUBLESHOOTING</u> ".

DTC CHECK/CLEAR

1. CHECK DTC

- Connect Techstream to the DLC3.
- Turn the engine switch on (IG).
- Turn the tester on.
- Enter the following menus:
 - Select: Body Electrical/Smart Access/Trouble Codes/
- Read the DTCs.

2. CLEAR DTC

- Connect Techstream to the DLC3.
- Turn the engine switch on (IG).
- Turn the tester on.
- Enter the following menus:
 - Select: Body Electrical/Smart Access/Trouble Codes/
- Erase the DTCs.

DATA LIST/ACTIVE TEST

1. DATA LIST

HINT:

Using Techstream to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading

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the Data List information early in troubleshooting is one way to save diagnostic time.

NOTE: In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

- a. Turn the engine switch off.
- b. Connect Techstream to the DLC3.
- c. Turn the engine switch on (IG).
- d. Turn Techstream on.
- e. Enter the following menus: Body Electrical/Smart Access/Data List.
- f. According to the display on the tester, read the "Data List".

Smart Access:

SMART ACCESS - DATA LIST

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Steering Lock Sleep bond	Steering lock ECU sleep condition/YES or NO	YES: Steering lock ECU sleep mode can be entered NO: Steering lock ECU sleep mode cannot be entered	-
Steering Lock Start Cond	Steering lock ECU start signal/YES or NO	YES: Steering lock ECU sent a start signal NO: Steering lock ECU did not send a start signal	-
Engine Start Condition	Engine start condition/OK or NG	OK: Engine is allowed to start NG: Engine is not allowed to start	-
Sensor Value	Sensor malfunction/NG (PAST) or OK	NG (PAST): Sensor malfunction OK: No malfunction	-
Power Supply Short	Short in ECU/NG (PAST) or OK	NG (PAST): Short in ECU OK: No malfunction	-
Power Supply Open	Open in ECU/NG (PAST) or OK	NG (PAST): Open in ECU OK: No malfunction	-
Motor Driver Short	Short in driver ECU/NG (PAST) or OK	NG (PAST): Short in driver ECU OK: No malfunction	-
Motor Driver Open	Open in driver ECU/NG (PAST) or OK	NG (PAST): Open in driver ECU OK: No malfunction	-
Lock/Unlock	Steering lock command reception	YES: Steering lock/unlock signal received	-

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Receive	record/YES or NO	NO: Steering lock/unlock signal not received	
Lock Bar Stuck Error	Lock bar stuck malfunction/NG (PAST) or OK	NG (PAST): Lock bar stuck malfunction OK: No malfunction	-
Push Start Error	Push button start function malfunction/NG (PAST) or OK	NG (PAST): Malfunction in push button start OK: No malfunction	-
IG2 Status	IG2 voltage/ON or OFF	ON: 10 to 14 V OFF: Below 1 V	-
IG (Lin)	LIN bus IG status/ON or OFF	ON: LIN bus IG ON status OFF: LIN bus IG OFF status	-

2. ACTIVE TEST

HINT:

Using Techstream to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

- a. Turn the engine switch off.
- b. Connect Techstream to the DLC3.
- c. Turn the engine switch on (IG).
- d. Turn Techstream on.
- e. Enter the following menus: Body Electrical/Main Body/Active Test.
- f. According to the display on the tester, perform the "Active Test".

Main Body:

MAIN BODY - ACTIVE TEST

Tester Display	Test Part	Control Range	Diagnostic Note
S Supply for Steering Lock	Power supply for steering lock system	ON or OFF	-

DIAGNOSTIC TROUBLE CODE CHART

If a trouble code is displayed during the DTC check, check the parts listed for that code in the table below and proceed to the appropriate page.

HINT:

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The steering lock ECU does not store DTCs regarding the past problems.

STEERING LOCK SYSTEM:

STEERING LOCK SYSTEM - DIAGNOSTIC TROUBLE CODE CHART

DTC Code	Detection Item	Trouble Area	See page
<u>B2781</u>	Open/Short in Steering Lock ECU	Steering lock actuator assembly (Steering lock ECU)	
<u>B2782</u>	Power Source Control ECU Malfunction	1. Wire harness 2. Steering lock actuator assembly (Steering lock ECU) 3. Main body ECU	
<u>B2788</u>	IG2 Signal Malfunction	1. IG2 relay 2. Wire harness 3. Main body ECU 4. Steering lock actuator assembly (Steering lock ECU)	

DTC B2781 OPEN/SHORT IN STEERING LOCK ECU

DESCRIPTION

If the steering lock ECU determines that there is a malfunction inside the ECU, it outputs this DTC. The steering lock ECU diagnosis information cannot be read directly from the steering lock ECU by the tester. The diagnosis information from the steering lock ECU is transmitted to the tester via the certification ECU (smart key ECU assembly) using the Controller Area Network (CAN).

DTC DETECTING CONDITION REFERENCE

DTC No.	DTC Detecting Condition	Trouble Area
B2781	• Steering lock motor drive circuit is defective. • Both lock and unlock position sensors detect "ON".	Steering lock actuator assembly (Steering lock ECU)

INSPECTION PROCEDURE

HINT:

When the engine switch is off, the main body ECU may occasionally go into a non-active state called sleep mode. Therefore, before proceeding with the inspection, it is necessary to perform the following step to wake up the ECU:

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Before starting the inspection, with the engine switch off, open the driver's door. Then (with the engine switch still off) open and close any door several times in 1.5-second intervals.

NOTE: If the steering lock actuator assembly (steering lock ECU) is replaced, with the engine switch off and the shift lever in the N position, open and close the driver's to record the current lock position into the steering lock ECU. If this is not performed, the engine may not start.

1. REPLACE STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)

HINT:

The steering lock ECU and steering lock actuator assembly are supplied as a unit.

- a. Replace the steering lock actuator assembly (See **REMOVAL**).

NEXT: END

DTC B2782 POWER SOURCE CONTROL ECU MALFUNCTION

DESCRIPTION

The steering lock ECU activates the steering lock motor by the power from the main body ECU (*) through the IGE circuit. This prevents the steering from being locked while the vehicle is moving.

The diagnosis information of the steering lock ECU is transmitted to the tester via the certification ECU (smart key ECU assembly) as the steering lock ECU is not connected to the CAN communication system.

HINT:

*: The power source control ECU is not a physical part. This code refers to the power source control function performed by the main body ECU.

DTC DETECTING CONDITION REFERENCE

DTC No.	DTC Detecting Condition	Trouble Area
B2782	Steering lock motor drive control circuit is defective.	• Wire harness • Steering lock actuator assembly (Steering lock ECU) • Main body ECU

WIRING DIAGRAM

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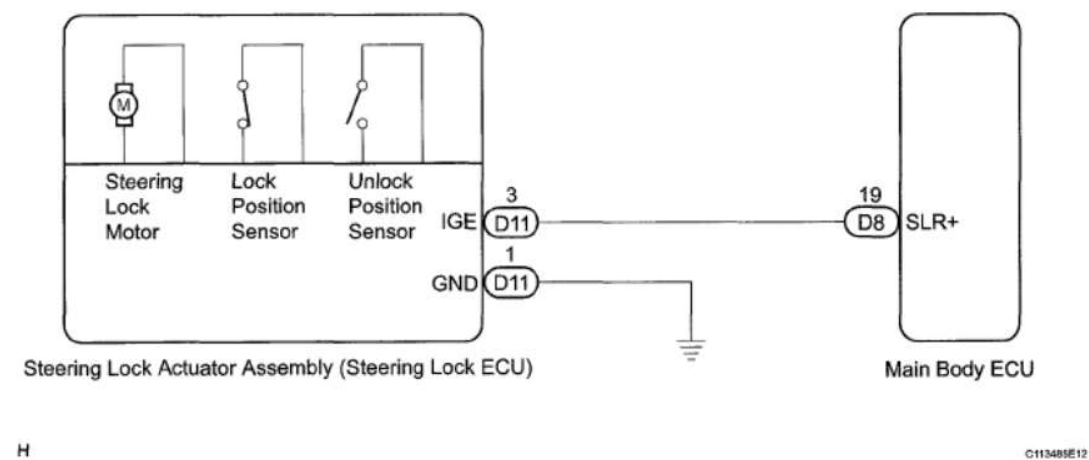


Fig. 13: Steering Lock Actuator Assembly (Steering Lock ECU) - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

When the engine switch is off, the main body ECU may occasionally go into a non-active state called sleep mode. Therefore, before proceeding with the inspection, it is necessary to perform the following step to wake up the ECU:

Before starting the inspection, with the engine switch off, open the driver's door. Then (with the engine switch still off) open and close any door several times in 1.5-second intervals.

NOTE: If the steering lock actuator assembly (steering lock ECU) is replaced, with the engine switch off and the shift lever in the N position, open and close the driver's door to record the current lock position into the steering lock ECU. If this is not performed, the engine may not start.

1. INSPECT STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)

- a. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
D11-3 (IGE) - D11-1 (GND)	The specified condition should be checked after performing the following: 1. Turn the engine switch off 2. Turn the engine switch on (ACC or IG)	- Motor activated: Below 1 V - Motor not activated: 11 to 14 V
D11-3 (IGE) - D11-1	The specified condition should be checked after performing the following:	Motor activated: Below 1 V

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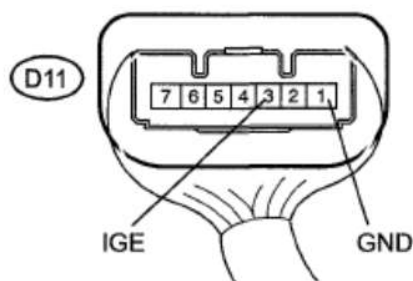
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(GND)	1. Move the shift lever to the P position 2. Turn the engine switch off 3. Open the driver's door	• Motor not activated: 11 to 14 V
-------	---	---

HINT:

The steering lock ECU and steering lock actuator assembly are supplied as a unit.

Component with harness connected:
(Steering Lock ECU)



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Fig. 14: Identifying Steering Lock ECU And D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: Go to step 2

OK: REPLACE STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)
(See **REMOVAL**)

2. CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BODY GROUND)

- Disconnect the D11 connector from the steering lock actuator assembly.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-1 (GND) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector:
(to Steering Lock ECU)

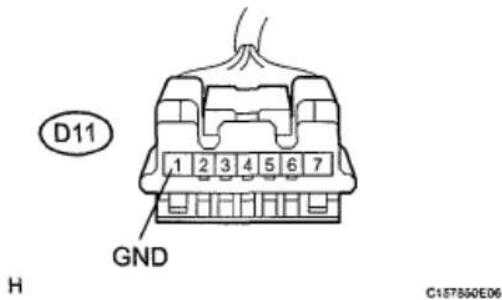


Fig. 15: Identifying Steering Lock ECU And D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - MAIN BODY ECU)**
- a. Disconnect the D8 connector from the main body ECU.
 - b. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

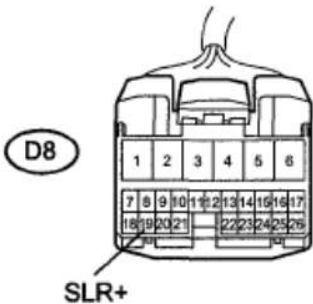
Tester Connection	Switch Condition	Specified Condition
D11-3 (IGE) - D8-19 (SLR+)	Always	Below 1 ohms
D11-3 (IGE) - Body ground	Always	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector:
(to Main Body ECU)



Front view of wire harness connector:
(to Steering Lock ECU)

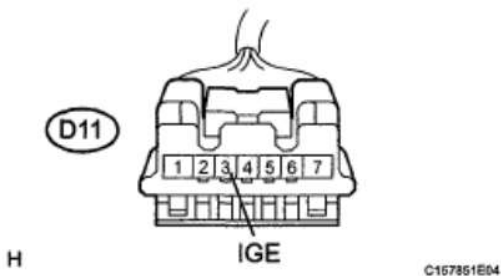


Fig. 16: Identifying Main Body ECU And D8 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE MAIN BODY ECU

DTC B2788 IG2 SIGNAL MALFUNCTION

DESCRIPTION

The steering lock ECU determines the on/off status of the engine switch through the IG2 signal circuit. After receiving an IG2 relay ON signal, the steering lock ECU determines that the vehicle is moving. The steering lock ECU does not lock the steering when it receives the IG2 relay ON signal. This prevents the steering from being locked while the vehicle is moving.

The diagnosis information of the steering lock ECU is transmitted to the tester via the certification ECU (smart key ECU assembly) as the steering lock ECU is not connected to the CAN communication system.

DTC DETECTING CONDITION REFERENCE

DTC No.	DTC Detecting Condition	Trouble Area
		IG2 relay

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B2788	Different information is obtained from IG2 signals received directly from the IG2 circuit, and from IG2 signals sent via LIN communication for a period of 1 second.	• Wire harness • Main body ECU • Steering lock actuator assembly (Steering lock ECU)
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WIRING DIAGRAM

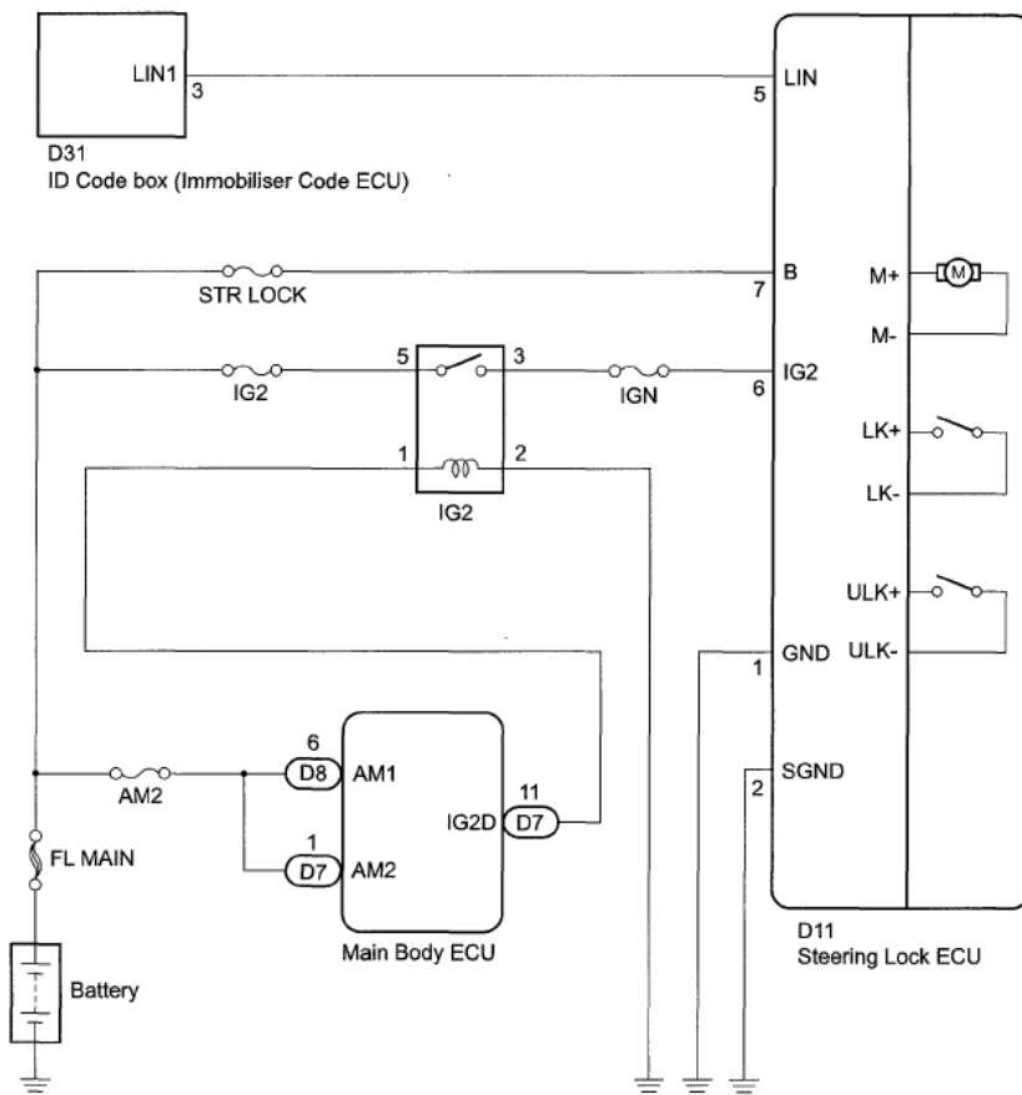


Fig. 17: IG2 Signal Malfunction - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

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When the engine switch is off, the main body ECU may occasionally go into a non-active state called sleep mode. Therefore, before proceeding with the inspection, it is necessary to perform the following step to wake up the ECU:

Before starting the inspection, with the engine switch off, open the driver's door. Then (with the engine switch still off) open and close any door several times in 1.5-second intervals.

NOTE: If the steering lock actuator assembly (steering lock ECU) is replaced, with the engine switch off and the shift lever in the N position, open and close the driver's door to record the current lock position into the steering lock ECU. If this is not performed, the engine may not start.

1. INSPECT IGNITION RELAY NO. 2 (IG2)
- a. Remove the IG2 relay from the engine room relay block.

b. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
3 - 5	Always	10 kohms or higher
3 - 5	Battery voltage is applied to terminals 1 and 2	Below 1 ohms

NG: REPLACE IGNITION RELAY NO. 2 (IG2)

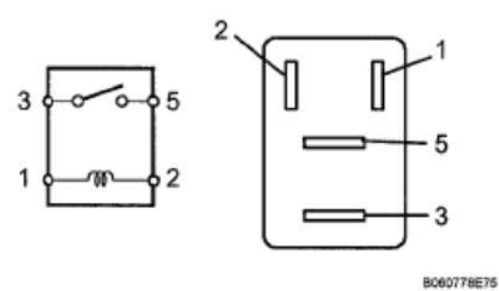


Fig. 18: Inspecting Ignition Relay No. 2 (IG2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BODY GROUND)
- a. Disconnect the D11 connector from the steering lock actuator assembly.

b. Measure the resistance according to the value(s) in the table below.

Standard resistance

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RESISTANCE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-1 (GND) - Body ground	Always	Below 1 ohms
D11-2 (SGND) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of wire harness connector:
(to Steering Lock ECU)

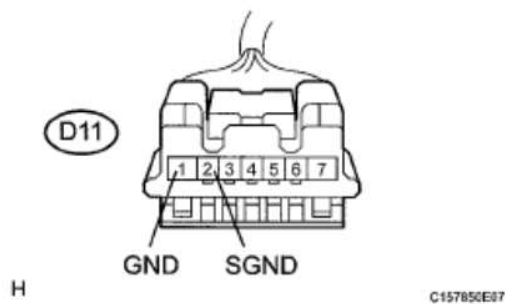


Fig. 19: Identifying Steering Lock ECU And D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BATTERY)

- a. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-6 (IG2) - D11-1 (GND)	Engine switch on (IG)	11 to 14 V
D11-6 (IG2) - D11-2 (SGND)	Engine switch on (IG)	11 to 14 V

- b. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
⁽¹⁾ D11-6 (IG2) - D11-7 (B)	Engine switch off	10 kohms or higher

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- (1) This measurement is performed with the engine switch off to check for a short between IG2 and battery voltage.

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BATTERY)

Front view of wire harness connector:
(to Steering Lock ECU)

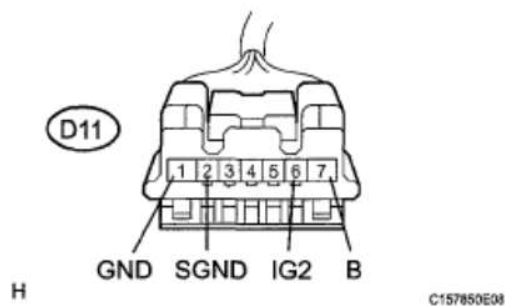


Fig. 20: Identifying Steering Lock ECU And D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)
(See **REMOVAL**)

STEERING LOCK MOTOR DRIVE POWER CIRCUIT

DESCRIPTION

The steering lock ECU is connected to the main body ECU and certification ECU (smart key ECU assembly). The steering lock ECU cannot activate the motor unless it receives permission signals from both ECUs. (The main body ECU permits the steering lock ECU to supply power to activate the motor.)

WIRING DIAGRAM

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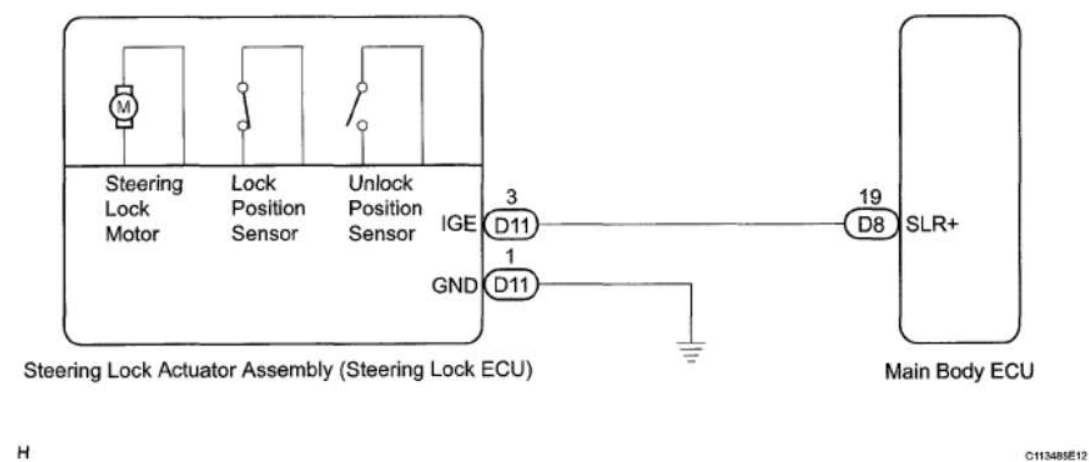


Fig. 21: Steering Lock Motor Drive Power - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

- 1. CHECK VEHICLE CONDITION**
- a. Check the problem symptom of the steering lock system.

Result

RESULT CHART

Condition	Proceed to
Steering lock cannot be released	A
Steering cannot be locked	B

B: Go to step 6

A: Go to next step

- 2. READ VALUE USING TECHSTREAM**
- a. Turn the engine switch off.
 - b. Connect Techstream to the DLC3.
 - c. Turn the engine switch on (IG).
 - d. Turn Techstream on.
 - e. Enter the following menus: Body Electrical/Smart Access/Data List.
 - f. Select the item below in the Data List, and read its value displayed on Techstream.

Smart Access:

SMART ACCESS - DATA LIST

			Diagnostic
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Tester Display	Measurement Item/Range	Normal Condition	Note
Lock/Unlock Receive	Steering lock command reception record/YES or NO	YES: Steering lock/unlock signal received NO: Steering lock/unlock signal not received	-

- g. Check if a steering unlock command signal has been received.

OK:

"YES" is displayed on the tester display.

NG: CHECK SMART KEY SYSTEM (See INSTALLATION)

OK: Go to next step

3. INSPECT STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)

- a. Measure the voltage according to the value(s) in the table below.

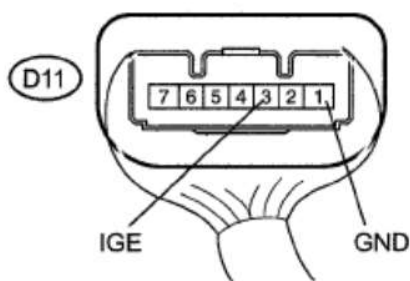
Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-3 (IGE) - D11-1 (GND)	1. Engine switch off 2. Engine switch on (ACC or IG)	• Motor activated: Below 1 V • Motor not activated: 11 to 14 V

NG: Go to step 4

Component with harness connected:
(Steering Lock ECU)



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Fig. 22: Identifying Steering Lock ECU And D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See PROBLEM SYMPTOMS TABLE)

4. CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BODY GROUND)

- a. Disconnect the D11 connector from the steering lock actuator assembly.
- b. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-1 (GND) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of wire harness connector:
(to Steering Lock ECU)

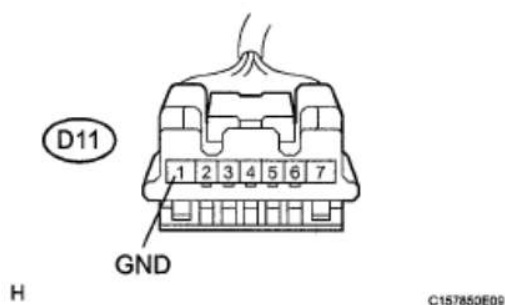


Fig. 23: Identifying Steering Lock ECU And GND, D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

5. CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - MAIN BODY ECU)

- a. Disconnect the D8 connector from the main body ECU.
- b. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-3 (IGE) - D8-19 (SLR+)	Always	Below 1 ohms

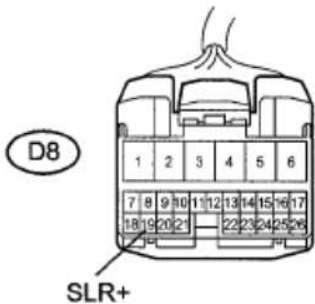
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D11-3 (IGE) - Body ground	Always	10 kohms or higher
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NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of wire harness connector:
(to Main Body ECU)



Front view of wire harness connector:
(to Steering Lock ECU)

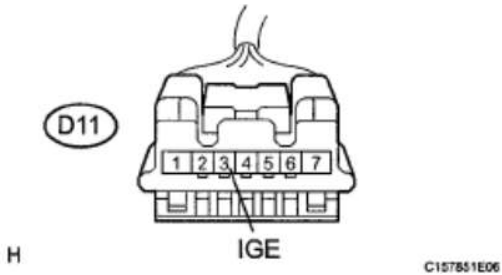


Fig. 24: Identifying Main Body ECU And D8 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE MAIN BODY ECU

6. INSPECT STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)
- a. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
D11-3 (IGE) - D11-1 (GND)	The specified condition should be checked after performing the following: 1. Move the shift lever to the N position 2. Turn the engine switch off	• Motor activated: Below 1 V • Motor not activated:

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	3. Open the driver's door	11 to 14 V
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NG: Go to step 7

Component with harness connected:
(Steering Lock ECU)

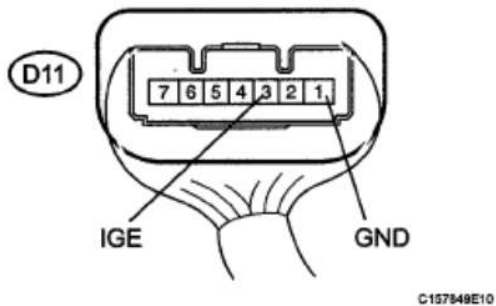


Fig. 25: Identifying Steering Lock ECU And IGE, D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See PROBLEM SYMPTOMS TABLE)

7. **CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - MAIN BODY ECU)**
- a. Disconnect the D11 connector from the steering lock actuator assembly.
 - b. Disconnect the D8 connector from the main body ECU.
 - c. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

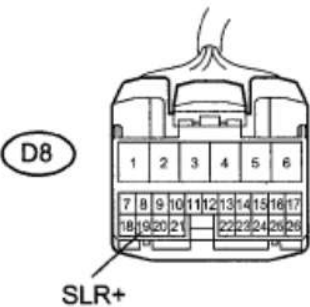
Tester Connection	Switch Condition	Specified Condition
D11-3(IGE) - D8-19 (SLR+)	Always	Below 1 ohms
D11-3 (IGE) - Body ground	Always	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector:
(to Main Body ECU)



Front view of wire harness connector:
(to Steering Lock ECU)

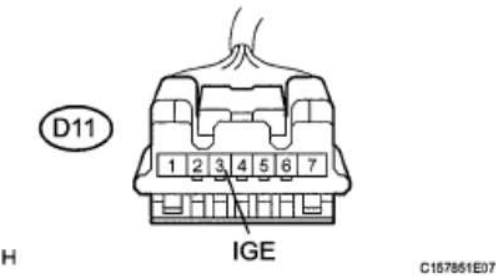


Fig. 26: Identifying Main Body ECU And D8 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE MAIN BODY ECU

UNLOCK POSITION SENSOR SIGNAL CIRCUIT

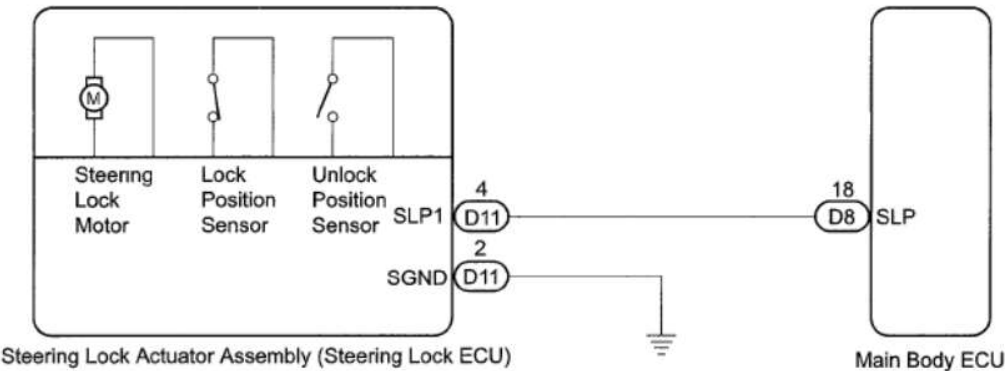
DESCRIPTION

The unlock position sensor is one of the components of the steering lock actuator assembly. The sensor switch contact closes when the steering lock is released. The steering lock release signal is then sent to the main body ECU. Receiving the signal, the ECU permits engine start. (This prevents the engine from being started with the steering locked.)

WIRING DIAGRAM

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Fig. 27: Unlock Position Sensor Signal - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT STEERING LOCK ACTUATOR ASSEMBLY (STEERING LOCK ECU)
- a. Measure the voltage according to the value(s) in the table below.

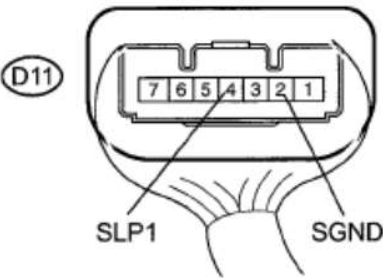
Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-4 (SLP1) - D11-2 (SGND)	1. Engine switch off 2. Engine switch on (ACC or IG)	Below 1 V

NG: Go to step 2

Component with harness connected:
(Steering Lock ECU)



C157848E11

Fig. 28: Identifying Steering Lock ECU And SLP1, D11 Connector Terminals

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

OK: CHECK SMART KEY SYSTEM (See INSTALLATION)

2. **CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - MAIN BODY ECU)**
- a. Disconnect the D11 connector from the steering lock actuator assembly.
 - b. Disconnect the D8 connector from the main body ECU.
 - c. Measure the resistance according to the value(s) in the table below.

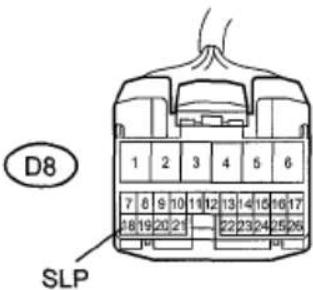
Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-4 (SLP1) - D8-18 (SLP)	Always	Below 1 ohms
D11-4 (SLP1) - Body ground	Always	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of wire harness connector:
(to Main Body ECU)



Front view of wire harness connector:
(to Steering Lock ECU)

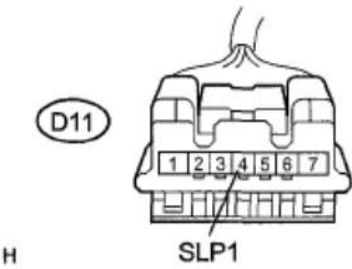


Fig. 29: Identifying Main Body ECU And D8 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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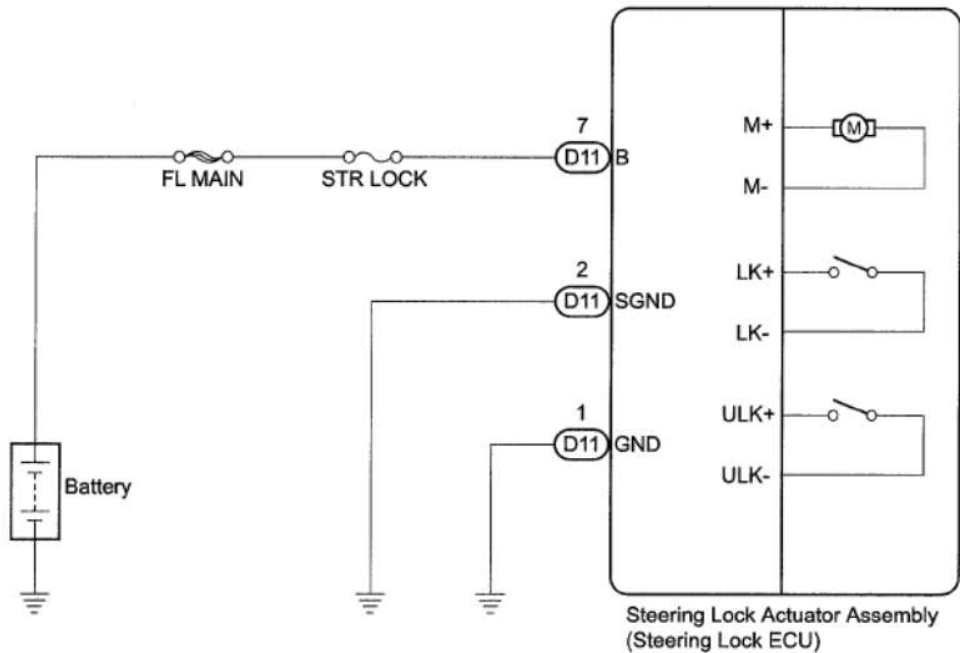
OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See PROBLEM SYMPTOMS TABLE)

POWER SOURCE CIRCUIT

DESCRIPTION

This circuit supplies voltage from the battery to terminal B of the steering lock ECU. This circuit is used as power source for the steering lock ECU, motor, communication, and peripheral circuits.

WIRING DIAGRAM



H C113504E07

Fig. 30: Power Source - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. **CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BODY GROUND)**
 - a. Disconnect the D11 connector from the steering lock actuator assembly.
 - b. Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

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Tester Connection	Switch Condition	Specified Condition
D11-1 (GND) - Body ground	Always	Below 1 ohms
D11-2 (SGND) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of wire harness connector:
(to Steering Lock ECU)

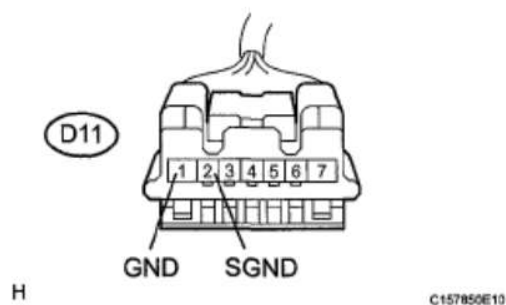


Fig. 31: Identifying Steering Lock ECU And SGND, D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. CHECK HARNESS AND CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY BATTERY)

- a. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
D11-7(B) - Body ground	Always	11 to 14 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR (STEERING LOCK ACTUATOR ASSEMBLY - BATTERY)

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Front view of wire harness connector:
(to Steering Lock ECU)

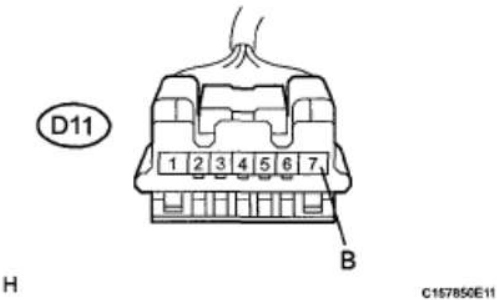


Fig. 32: Identifying Steering Lock ECU And B, D11 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

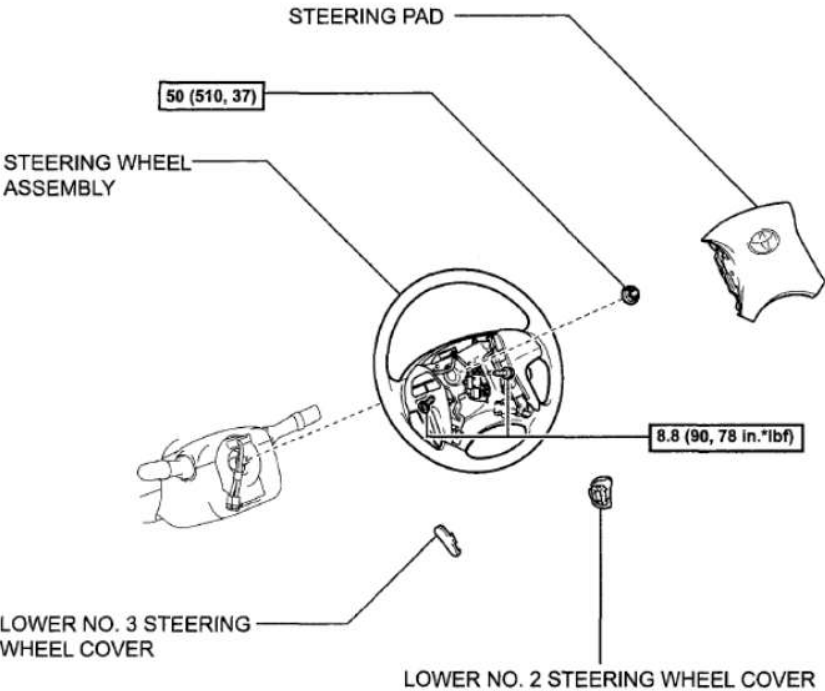
OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (See PROBLEM SYMPTOMS TABLE)

STEERING COLUMN ASSEMBLY

COMPONENTS

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

P C168554E01

Fig. 33: Identifying Steering Column Assembly Components With Torque Specification (1 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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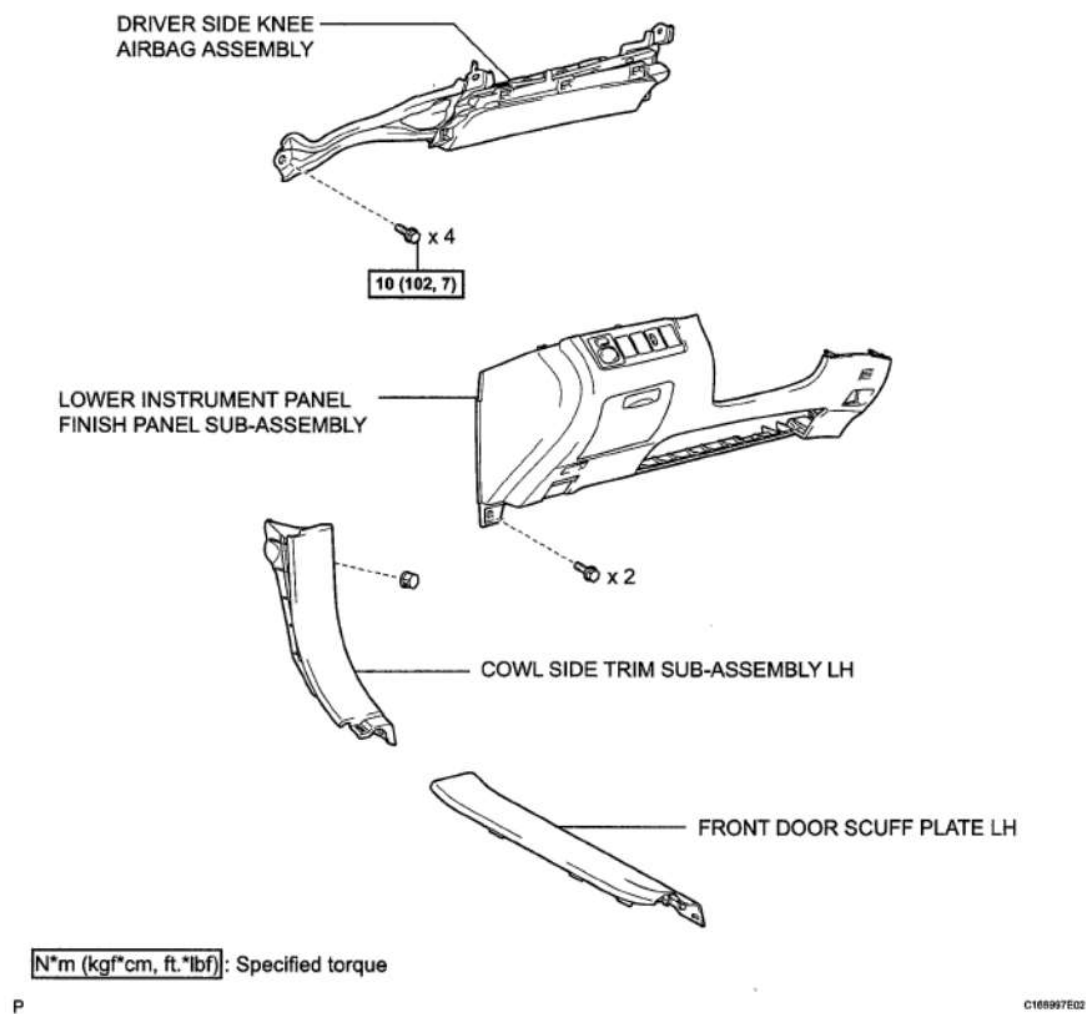


Fig. 34: Identifying Steering Column Assembly Components With Torque Specification (2 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 STEERING Steering Column - Highlander

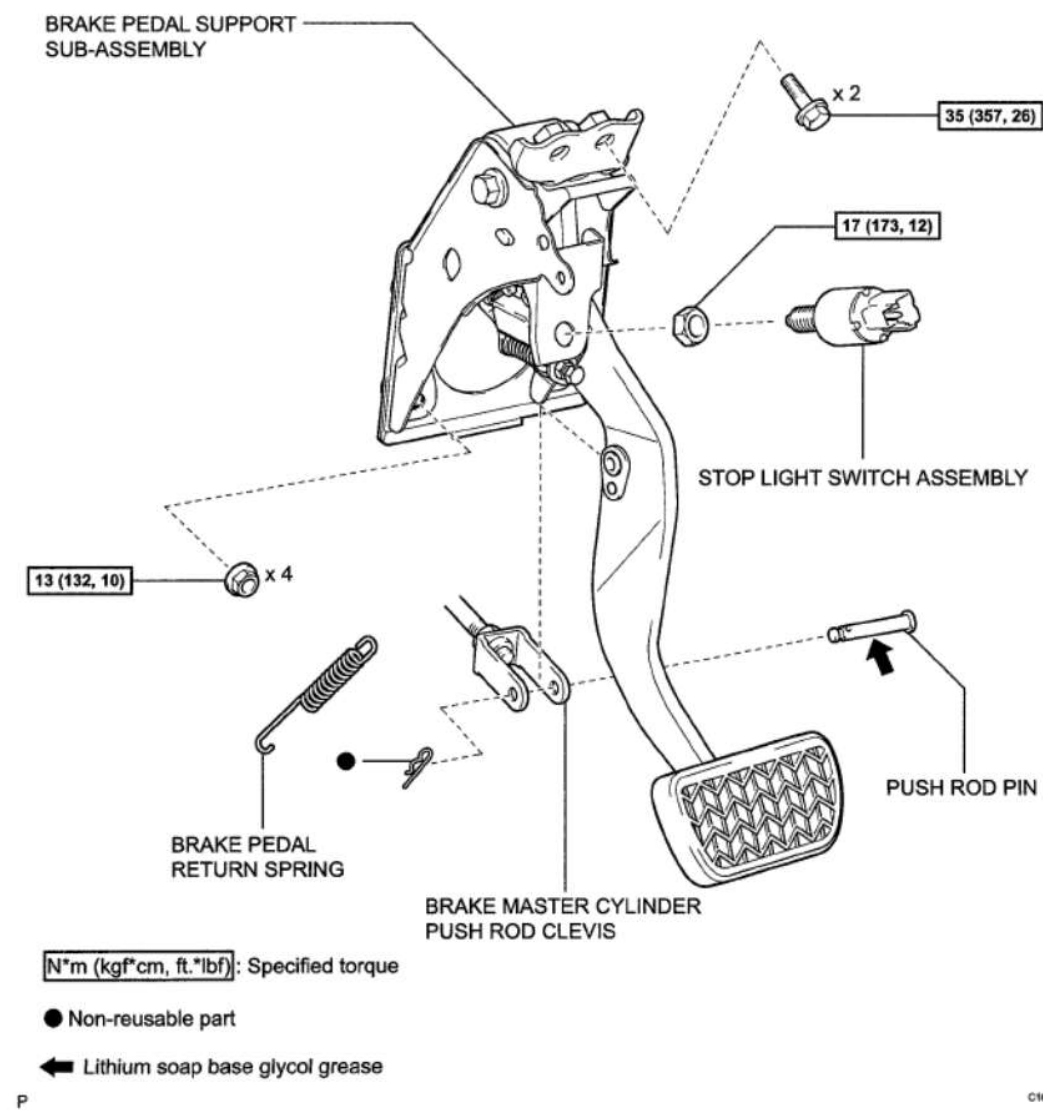
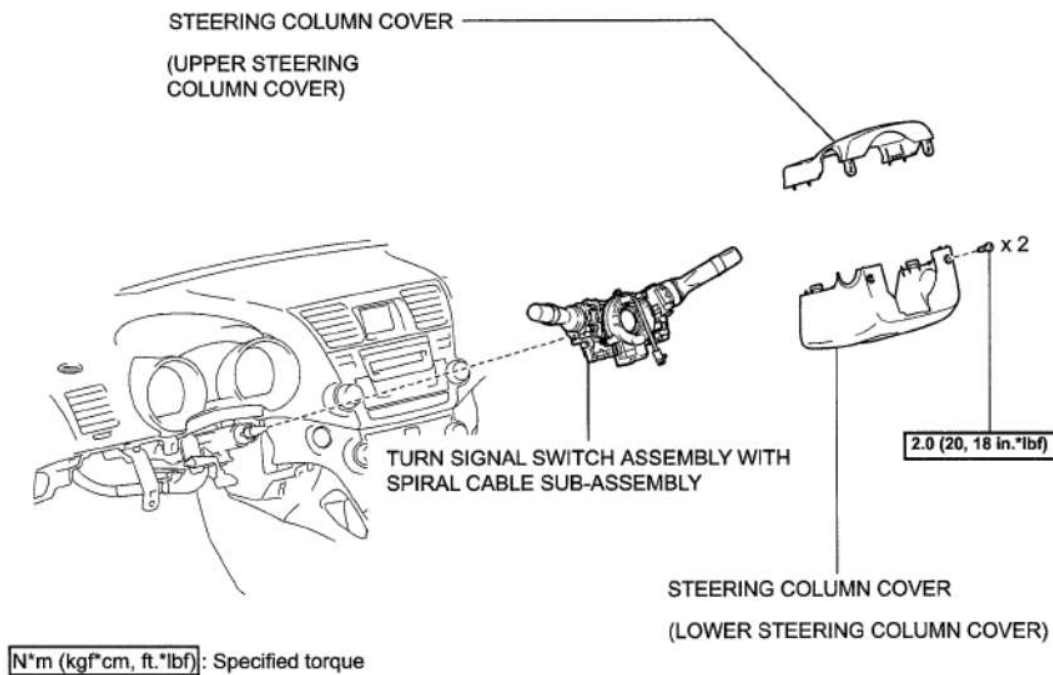


Fig. 35: Identifying Steering Column Assembly Components With Torque Specification (3 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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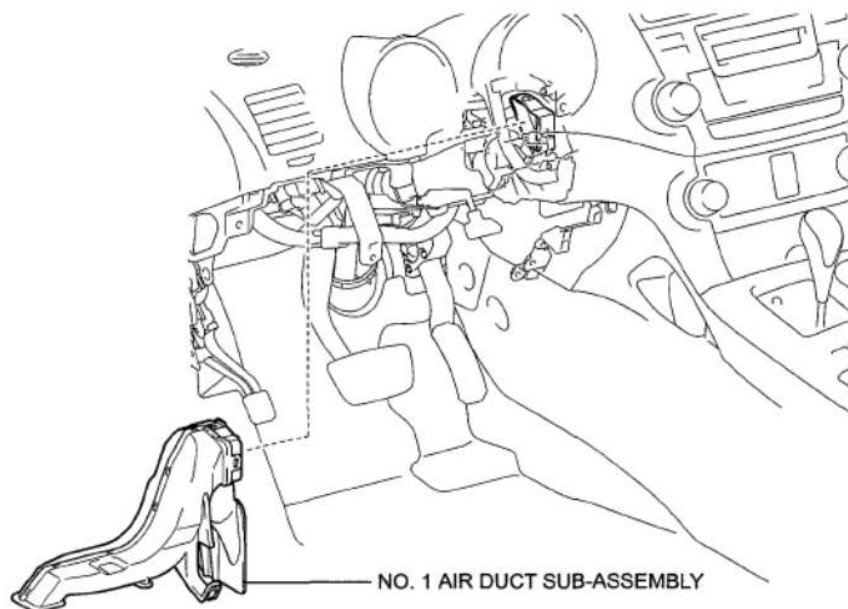
2009 STEERING Steering Column - Highlander



P

C166557E01

Fig. 36: Identifying Steering Column Assembly Components With Torque Specification (4 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



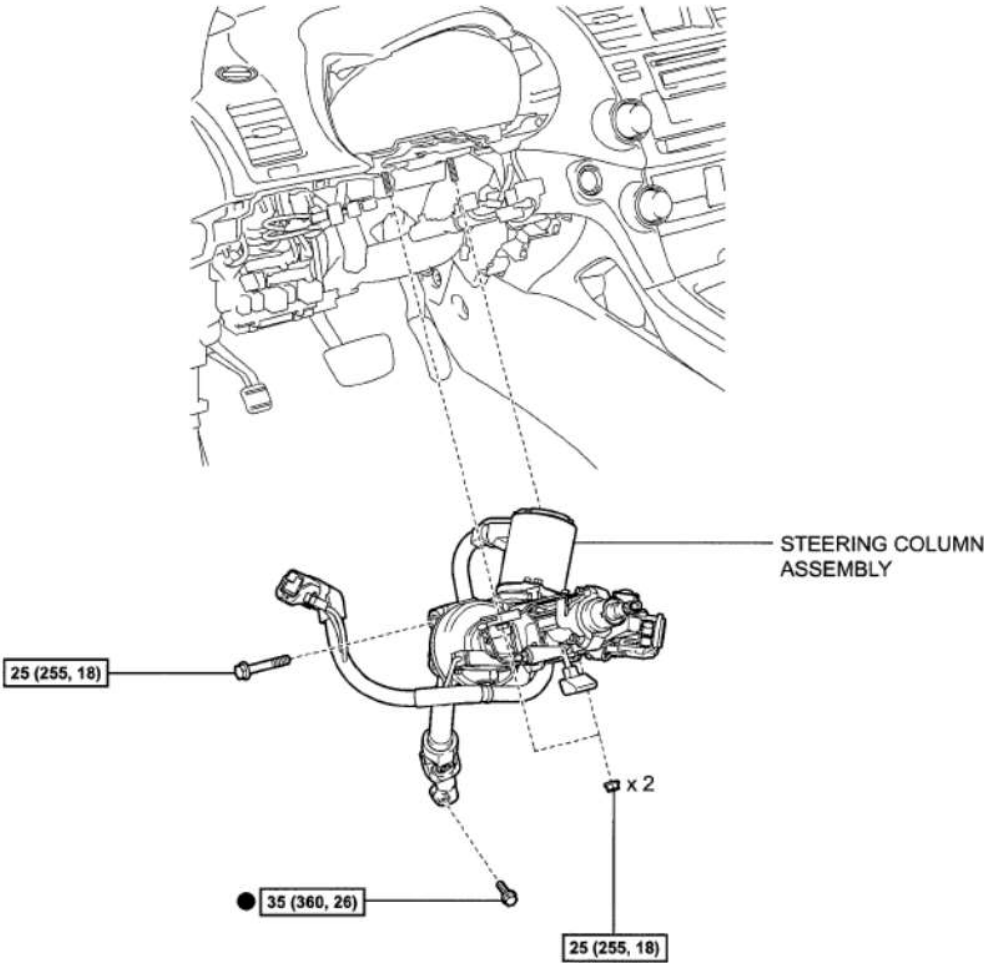
P

C166558E02

Fig. 37: Identifying Steering Column Assembly Components With Torque Specification (5 Of 8)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

● Non-reusable part

P

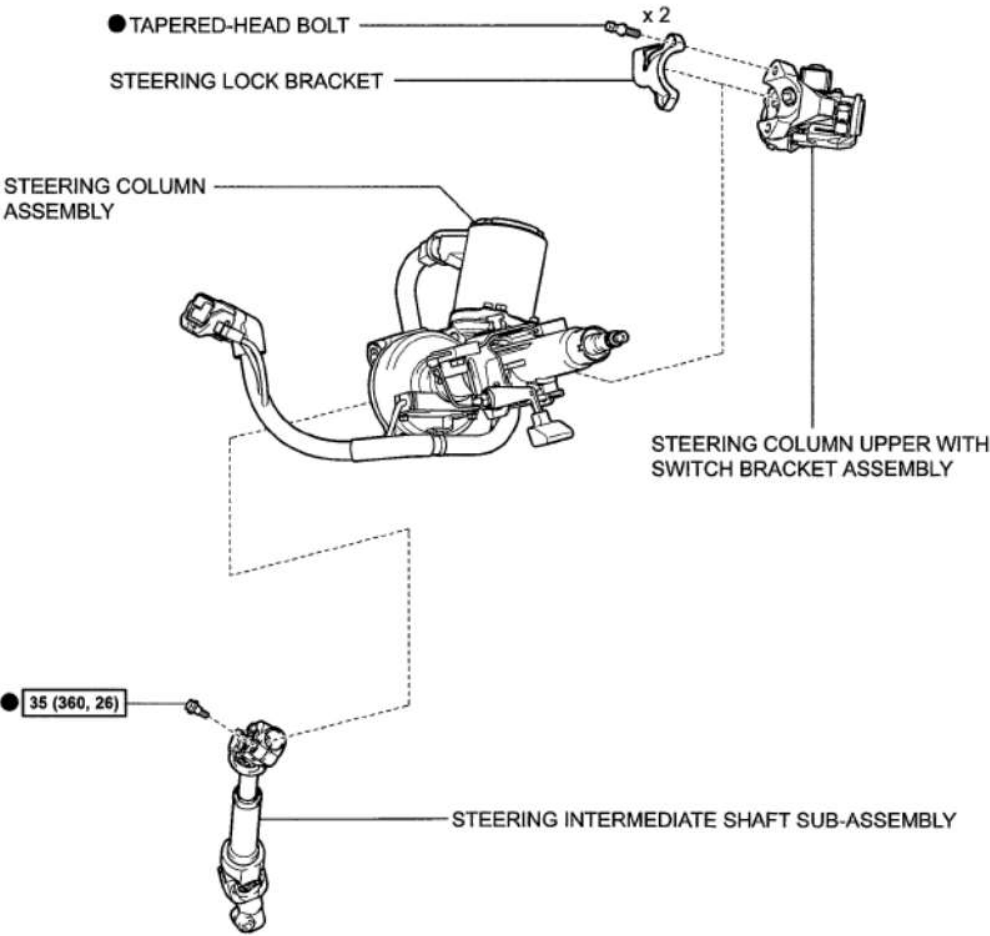
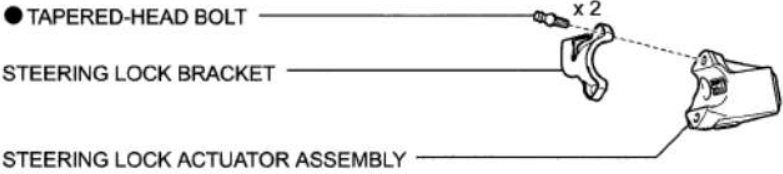
C160558501

Fig. 38: Identifying Steering Column Assembly Components With Torque Specification (6 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 STEERING Steering Column - Highlander

w/ Smart Key System:



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

● Non-reusable part

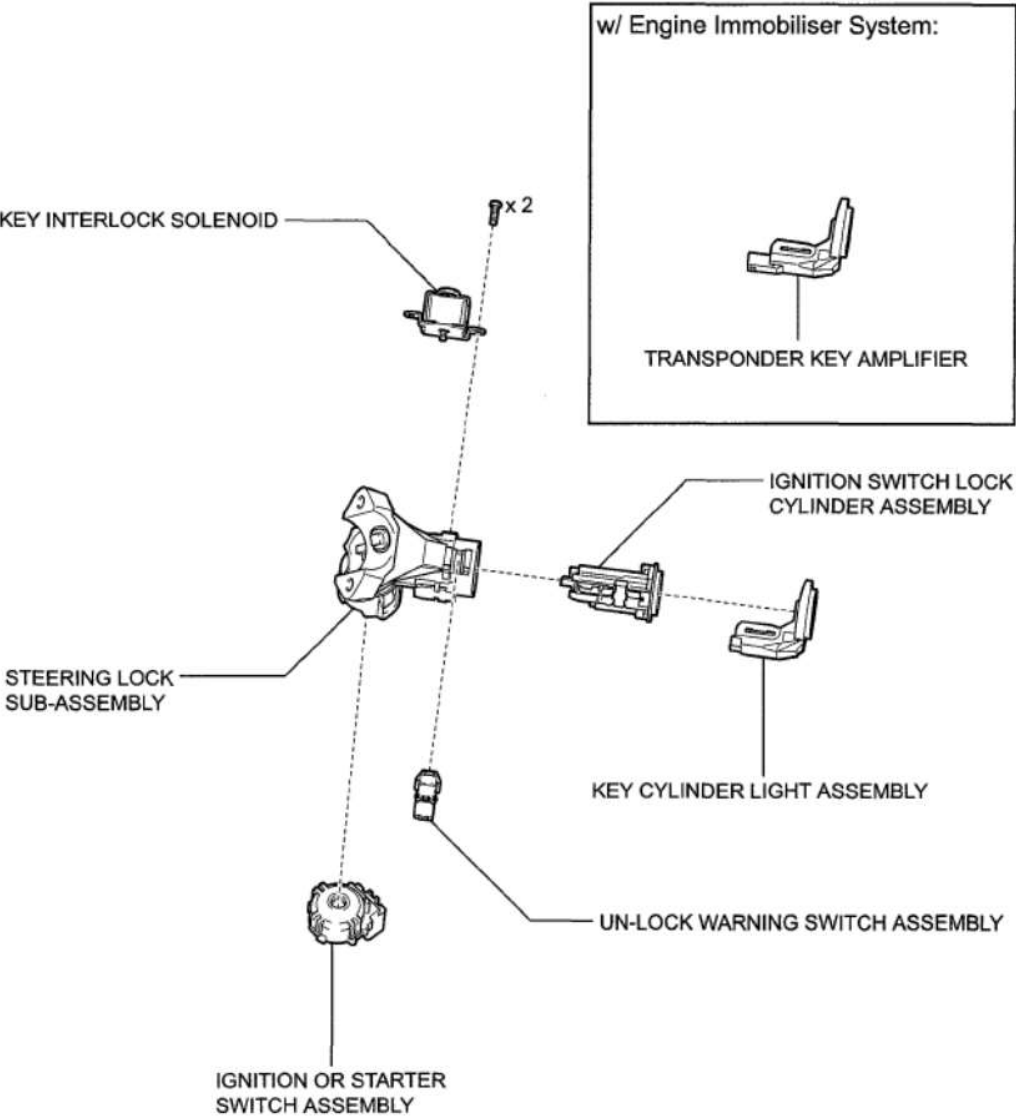
P C166559E03

Fig. 39: Identifying Steering Column Assembly Components With Torque Specification (7 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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w/o Smart Key System:



C C172132E02

Fig. 40: Identifying Steering Column Assembly Components With Torque Specification (8 Of 8)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

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CAUTION: Some of these service operations affect the SRS airbag system. Read the precautionary notices concerning the SRS airbag system before servicing the steering column (see AIRBAG SYSTEM).

1. PRECAUTION

HINT:

(See PRECAUTION)

2. ALIGN FRONT WHEELS FACING STRAIGHT AHEAD**3. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION: Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

- 4. REMOVE FRONT WHEEL LH**
- 5. REMOVE LOWER NO. 3 STEERING WHEEL COVER (See REMOVAL)**
- 6. REMOVE LOWER NO. 2 STEERING WHEEL COVER (See REMOVAL)**
- 7. REMOVE STEERING PAD (See REMOVAL)**
- 8. REMOVE STEERING WHEEL ASSEMBLY (See REMOVAL)**
- 9. REMOVE FRONT DOOR SCUFF PLATE LH (See REMOVAL)**
- 10. REMOVE COWL SIDE TRIM SUB-ASSEMBLY LH (See REMOVAL)**
- 11. REMOVE LOWER INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY (for Manual Air Conditioning System) (See REMOVAL)**
- 12. REMOVE LOWER INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY (for Automatic Air Conditioning System) (See REMOVAL)**
- 13. REMOVE DRIVER SIDE KNEE AIRBAG ASSEMBLY (See REMOVAL)**
- 14. REMOVE BRAKE PEDAL RETURN SPRING (See REMOVAL)**
- 15. REMOVE STOP LIGHT SWITCH ASSEMBLY (See INSPECTION)**
- 16. SEPARATE BRAKE MASTER CYLINDER PUSH ROD CLEVIS (See REMOVAL)**
- 17. REMOVE BRAKE PEDAL SUPPORT SUB-ASSEMBLY (See REMOVAL)**
- 18. REMOVE STEERING COLUMN COVER**
 - a. Remove the 2 screws.

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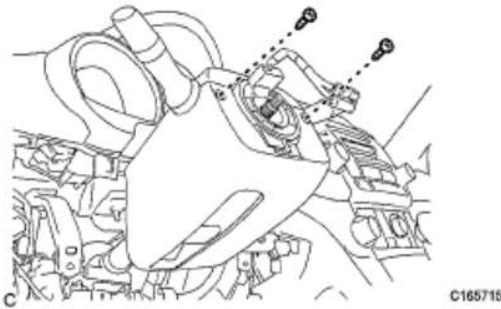


Fig. 41: Identifying Steering Column Cover And Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disengage the 2 claws to remove the lower steering column cover.

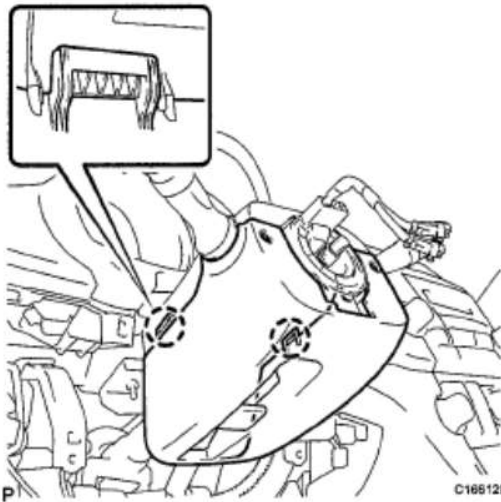


Fig. 42: Identifying Lower Steering Column Cover And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Disengage the claw to remove the upper steering column cover.
19. **REMOVE TURN SIGNAL SWITCH ASSEMBLY WITH SPIRAL CABLE SUB-ASSEMBLY**
 - a. Disconnect the connectors from the turn signal switch assembly with spiral cable sub-assembly.

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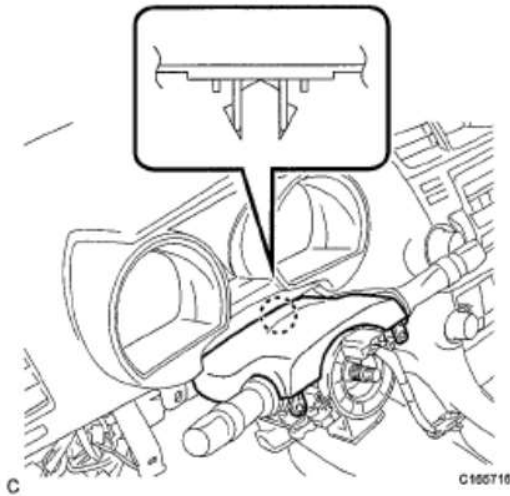


Fig. 43: Identifying Upper Steering Column Cover And Claw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using pliers, grip the claws of the clip and remove the turn signal switch assembly with spiral cable sub-assembly.

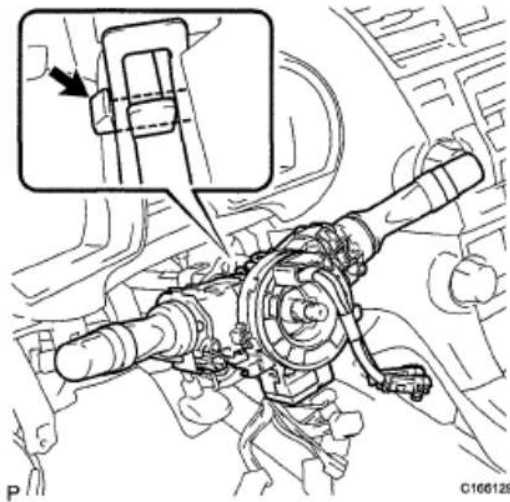


Fig. 44: Identifying Spiral Cable Sub-Assembly With Claws And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE NO. 1 AIR DUCT SUB-ASSEMBLY

- a. Disengage the 2 claws and remove the No. 1 air duct sub-assembly.

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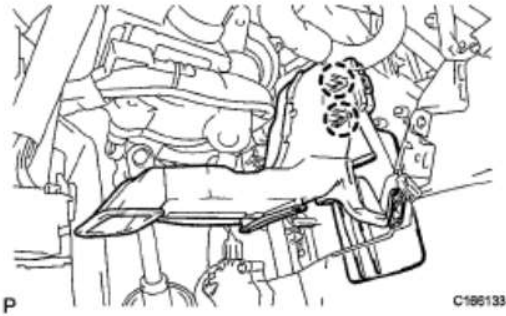


Fig. 45: Identifying No. 1 Air Duct Sub-Assembly And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. SEPARATE STEERING INTERMEDIATE SHAFT SUB-ASSEMBLY

- a. Loosen the bolt.

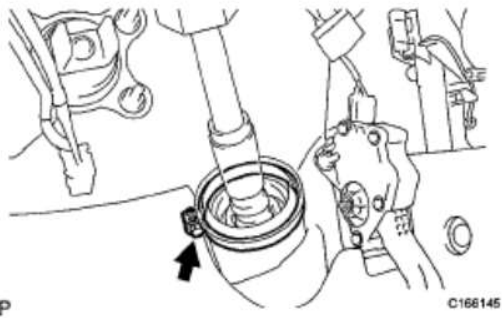


Fig. 46: Locating Bolt And Steering Intermediate Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the bolt and slide the steering intermediate shaft sub-assembly.

NOTE: Do not separate the steering intermediate shaft sub-assembly from the power steering link assembly.

2009 Toyota Highlander Limited**2009 STEERING Steering Column - Highlander**

Fig. 47: Identifying Steering Intermediate Shaft Sub-Assembly And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Put matchmarks on the steering intermediate shaft sub-assembly and the power steering link assembly.
- d. Separate the steering intermediate shaft sub-assembly from the power steering link assembly.

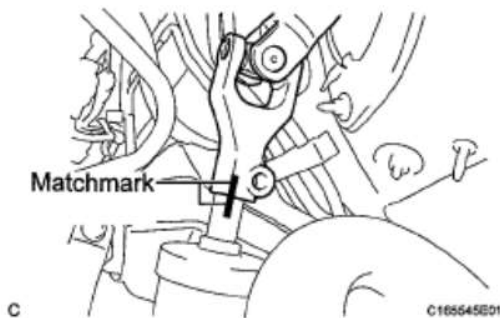


Fig. 48: Identifying Matchmarks On Steering Intermediate Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. REMOVE STEERING COLUMN ASSEMBLY

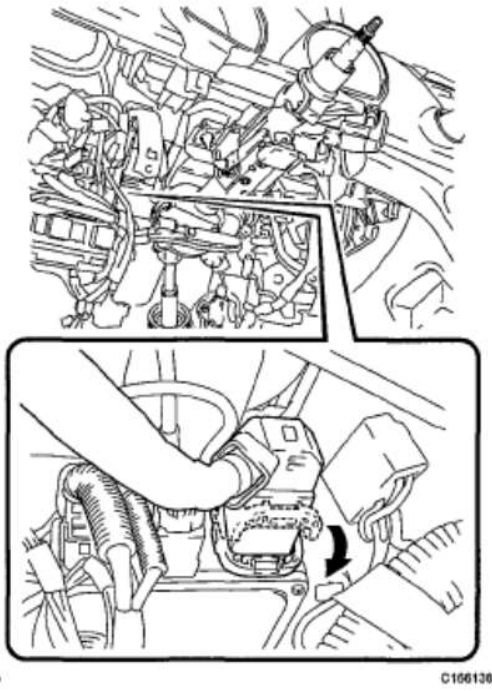
- a. Disconnect the connector from the power steering ECU assembly.

HINT:

As shown in the illustration, turn the lock lever to disconnect the connector.

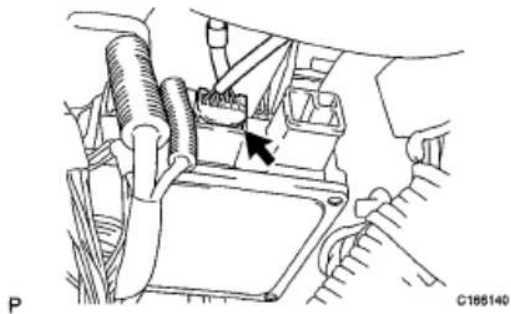
2009 Toyota Highlander Limited

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**Fig. 49: Removing Steering Column Assembly**

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

- b. Disconnect the connector from the power steering ECU assembly.
- c. Disconnect the connectors and disengage the wire harness clamps from the steering column assembly.

**Fig. 50: Locating Power Steering ECU Assembly And Connector**

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

- d. Remove the bolt, 2 nuts, and the steering column assembly.

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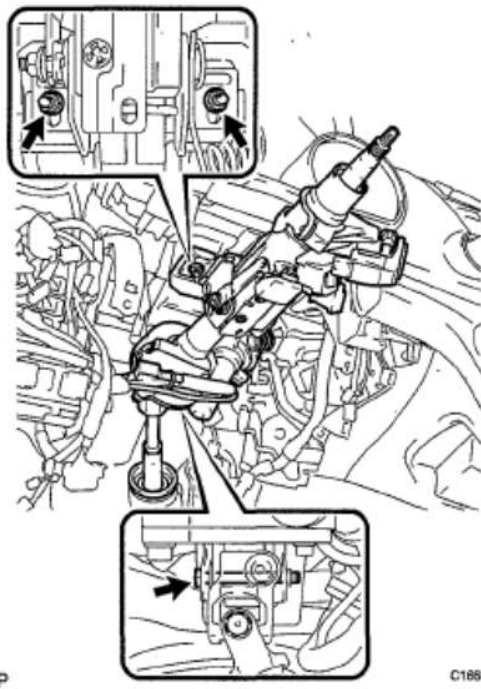


Fig. 51: Locating Bolt And Nuts With Steering Column Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. REMOVE STEERING INTERMEDIATE SHAFT SUB-ASSEMBLY

- a. Remove the bolt.

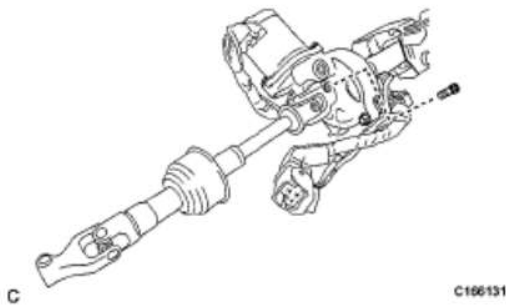


Fig. 52: Identifying Steering Intermediate Shaft Sub-Assembly And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Put matchmarks on the steering intermediate shaft sub-assembly and the steering column assembly.
- c. Remove the steering intermediate shaft sub-assembly from the steering column assembly.

DISASSEMBLY

NOTE: When using a vise, do not overtighten it.

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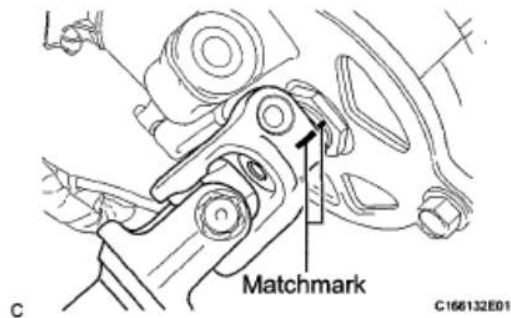


Fig. 53: Identifying Matchmarks On Steering Intermediate Shaft Sub-Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. REMOVE STEERING LOCK ACTUATOR ASSEMBLY (w/ Smart Key System)

- Secure the steering column assembly in a vise.
- Using a center punch, mark the center of the 2 tapered-head bolts.
- Using a 3 to 4 mm (0.12 to 0.16 in.) drill, drill a hole in each tapered-head bolt.
- Using a screw extractor, remove the 2 tapered-head bolts, and then remove the steering lock actuator assembly and the steering lock bracket from the steering column assembly.

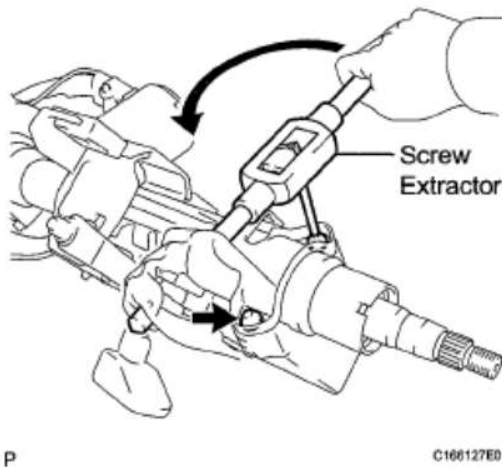


Fig. 54: Removing Steering Lock Actuator Assembly And Tapered-Head Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE KEY CYLINDER LIGHT ASSEMBLY (w/o Engine Immobiliser System)

- Using a screwdriver, widen the claws hanging onto the upper bracket by approximately 1.0 mm (0.039 in.).
- Pull out the key cylinder light assembly with the claw open.

NOTE: Using excessive force may damage the case.

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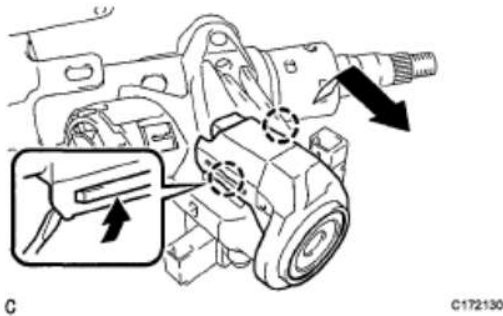


Fig. 55: Pulling Out Key Cylinder Light Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE TRANSPONDER KEY AMPLIFIER (w/ Engine Immobiliser System)

- Using a screwdriver, widen the claws hanging onto the upper bracket by approximately 1.0 mm (0.039 in.).
- Pull out the transponder key amplifier with the claw open.

NOTE: Using excessive force may damage the case.

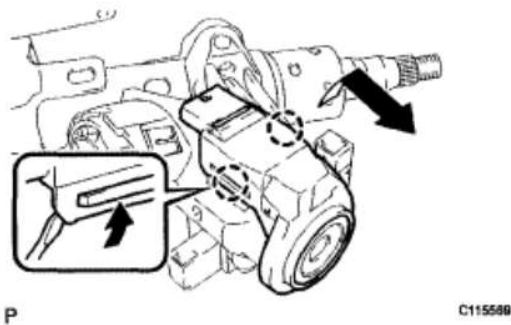


Fig. 56: Pulling Out Transponder Key Amplifier
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY (w/o Smart Key System)

- Secure the steering column assembly in a vise.
- Using a center punch, mark the center of the 2 tapered-head bolts.
- Using a 3 to 4 mm (0.12 to 0.16 in.) diameter drill bit, drill a hole in each tapered-head bolt.
- Using a screw extractor, remove the 2 tapered-head bolts, and then remove the steering column upper with switch bracket assembly and the steering lock bracket from the steering column assembly.

5. REMOVE IGNITION SWITCH LOCK CYLINDER ASSEMBLY (w/o Smart Key System)

- Turn the ignition switch lock cylinder assembly to the ACC position.

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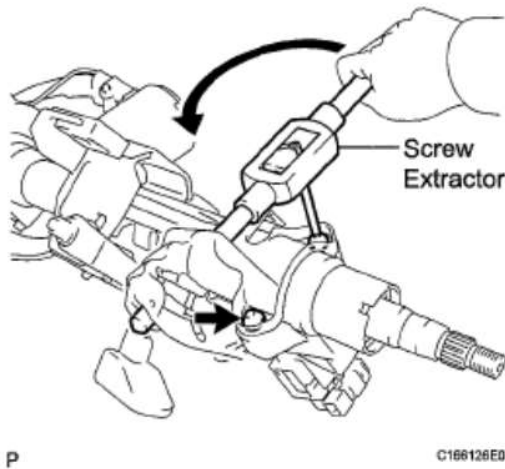


Fig. 57: Removing Steering Column Assembly And Tapered-Head Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Insert a screwdriver into the hole of the steering column upper with switch bracket assembly as shown in the illustration. Pull the ignition switch lock cylinder assembly until its claw contacts the stopper of the steering column upper with switch bracket assembly.

NOTE: Make sure to pull the ignition switch lock cylinder assembly until its claw contacts the stopper of the steering column upper with switch bracket assembly. Failure to do so will affect later work operations.

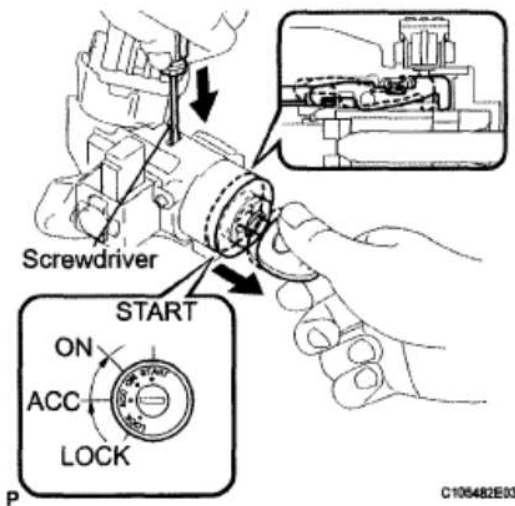


Fig. 58: Pushing Screwdriver Into Hole Of Steering Column Upper With Switch Bracket Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Insert a screwdriver into the hole of the steering column upper with switch bracket assembly. Push the screwdriver downward as shown in the illustration to disengage the claw of the ignition switch

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lock cylinder assembly, and pull out the ignition switch lock cylinder assembly.

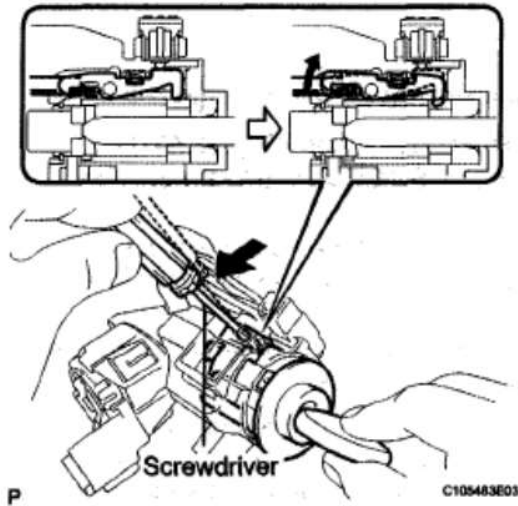


Fig. 59: Inserting Screwdriver Into Hole Of Steering Column Upper With Switch Bracket Assembly

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

6. REMOVE UN-LOCK WARNING SWITCH ASSEMBLY (w/o Smart Key System)

- Remove the un-lock warning switch assembly by pushing up the center part and releasing the 2 claws.

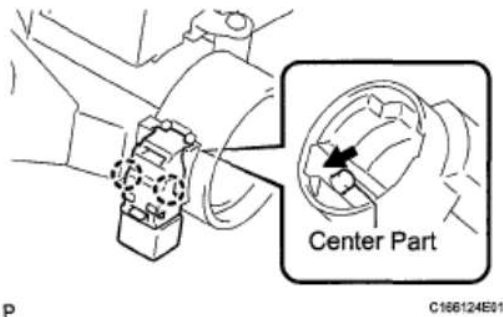


Fig. 60: Identifying Center Part And Claws

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

7. REMOVE KEY INTERLOCK SOLENOID (w/o Smart Key System)

- Remove the 2 screws and the key interlock solenoid from the steering lock sub-assembly.

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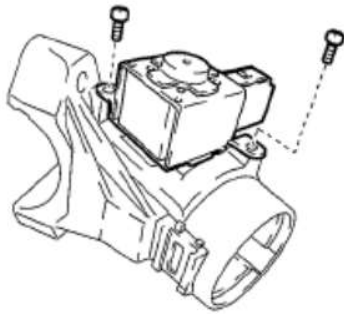


Fig. 61: Identifying Key Interlock Solenoid And Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE IGNITION OR STARTER SWITCH ASSEMBLY (w/o Smart Key System)

- Disengage the 2 claws and remove the ignition or starter switch assembly from the steering lock sub-assembly.



Fig. 62: Identifying Ignition Or Starter Switch Assembly Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT STEERING LOCK OPERATION (w/o Smart Key System)

- Check that the steering lock mechanism is activated when the key is removed.

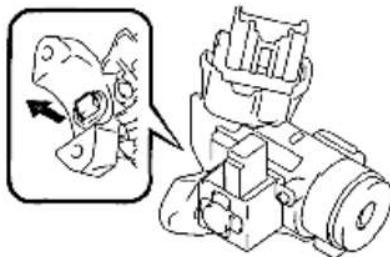


Fig. 63: Checking Steering Lock Function
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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- b. Check that the steering lock mechanism is deactivated when the key is inserted and turned to the ACC position.

HINT:

If there is any abnormality, replace the ignition switch lock cylinder assembly.

REASSEMBLY**1. INSTALL STEERING LOCK ACTUATOR ASSEMBLY (w/ Smart Key System)**

- a. Temporarily install the steering lock actuator assembly and the steering lock bracket with 2 new tapered-head bolts.

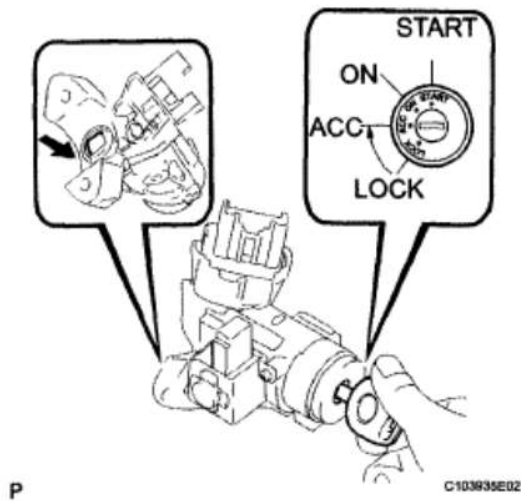


Fig. 64: Checking Steering Lock

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

- b. Tighten the 2 tapered-head bolts until the bolt heads break off.

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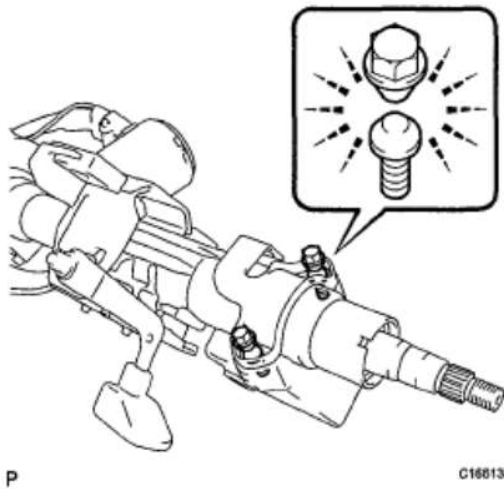


Fig. 65: Identifying Tapered-Head Bolts Until Bolt Heads Break Off
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL IGNITION OR STARTER SWITCH ASSEMBLY (w/o Smart Key System)

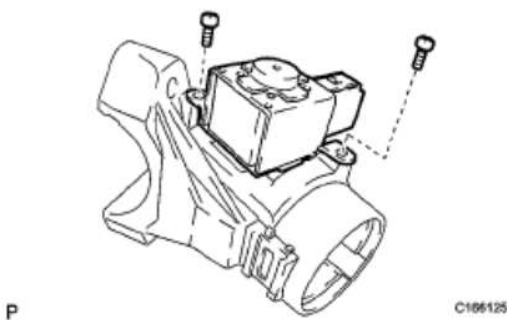
- Engage the 2 claws to install the ignition or starter switch assembly to the steering lock sub-assembly.



Fig. 66: Identifying Ignition Or Starter Switch Assembly Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL KEY INTERLOCK SOLENOID (w/o Smart Key System)

- Install the key interlock solenoid to the steering lock sub-assembly with the 2 screws.



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Fig. 67: Identifying Key Interlock Solenoid And Screws

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

4. **INSTALL UN-LOCK WARNING SWITCH ASSEMBLY (w/o Smart Key System)**
 - a. Engage the 2 claws to install the un-lock warning switch assembly to the steering lock sub-assembly.
5. **INSTALL IGNITION SWITCH LOCK CYLINDER ASSEMBLY (w/o Smart Key System)**
 - a. Make sure that the ignition switch lock cylinder assembly is in the ACC position.

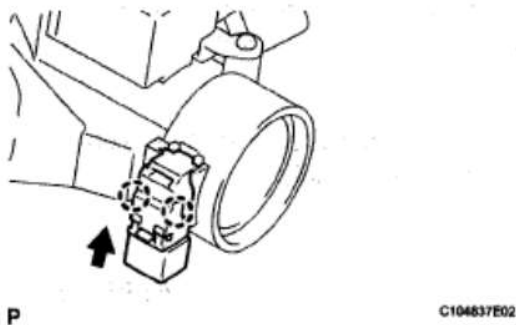


Fig. 68: Identifying Un-Lock Warning Switch Assembly Claws

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

- b. Install the ignition switch lock cylinder assembly to the steering lock sub-assembly.
 - c. Make sure that the ignition switch lock cylinder assembly is securely installed.
6. **INSPECT STEERING LOCK OPERATION (w/o Smart Key System)** (See **INSPECTION**)
7. **INSTALL STEERING COLUMN UPPER WITH SWITCH BRACKET ASSEMBLY (w/o Smart Key System)**
 - a. Temporarily install the assembled steering lock and its bracket to the steering column assembly with 2 new tapered-head bolts.

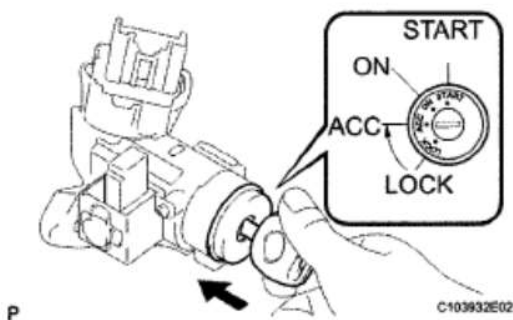


Fig. 69: Identifying Steering Column Assembly With Tapered-Head Bolts

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

- b. Tighten the 2 tapered-head bolts until the bolt heads break off.
8. **INSTALL KEY CYLINDER LIGHT ASSEMBLY (w/o Engine Immobiliser System)**

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- a. Align the key cylinder light assembly with the upper bracket. Tilt the amplifier slightly and slide it into the position as shown in the illustration.

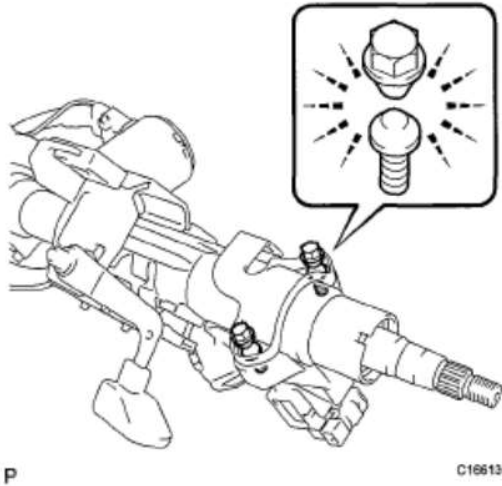


Fig. 70: Identifying Tapered-Head Bolts Until Bolt Heads Break Off
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Push the key cylinder light assembly to install it to the upper bracket with the 2 claws.

NOTE: Do not push the amplifier with excessive force.

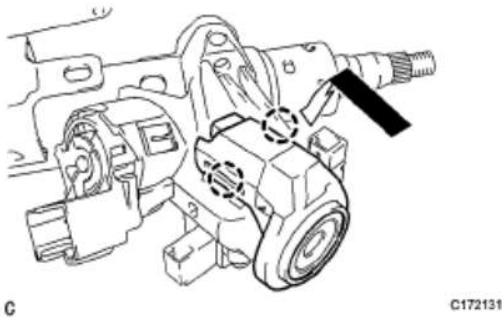


Fig. 71: Pushing Key Cylinder Light Assembly With Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL TRANSPONDER KEY AMPLIFIER (w/ Engine Immobiliser System)

- a. Align the transponder key amplifier with the upper bracket. Tilt the amplifier slightly and slide it into the position as shown in the illustration.
- b. Push the transponder key amplifier to install it to the upper bracket with the 2 claws.

NOTE: Do not push the amplifier with excessive force.

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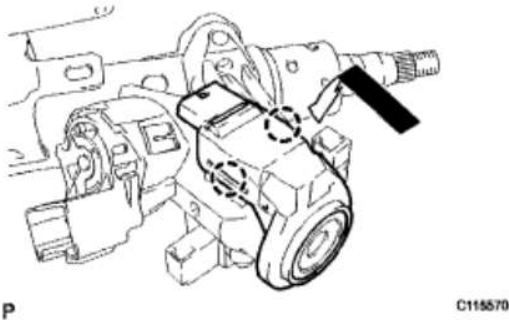


Fig. 72: Installing Transponder Key Amplifier
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL STEERING INTERMEDIATE SHAFT SUB-ASSEMBLY

- Align the matchmarks on the steering intermediate shaft sub-assembly and the steering column assembly.

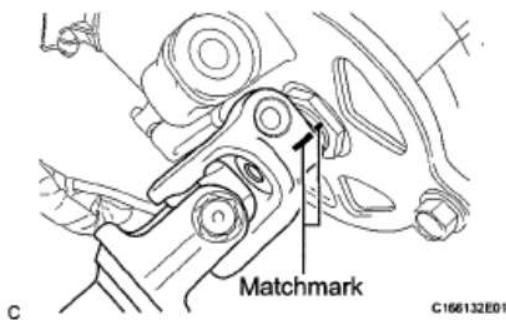


Fig. 73: Identifying Matchmarks On Steering Intermediate Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Install a new bolt.

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

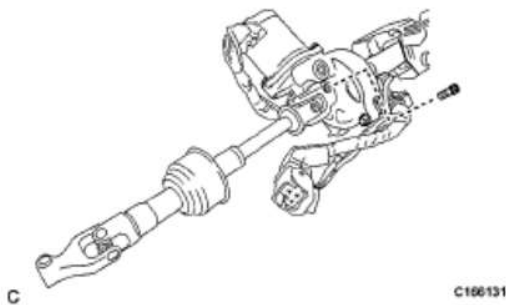


Fig. 74: Identifying Steering Intermediate Shaft Sub-Assembly And Bolt

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

2. INSTALL STEERING COLUMN ASSEMBLY

- a. Check that the 2 bushings are securely installed to the steering column assembly.

HINT:

If the bushings are missing or damaged, replace the steering column assembly with a new one.

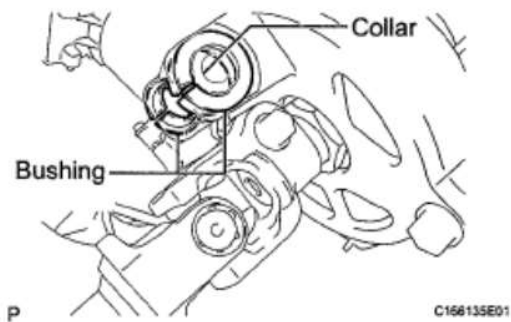


Fig. 75: Identifying Steering Column Assembly And Bushings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the steering column assembly with the bolt and 2 nuts.

Torque: 25 N*m (255 kgf*cm, 18 ft.*lbf)

- c. Connect the connectors and engage the wire harness clamps to the steering column assembly.

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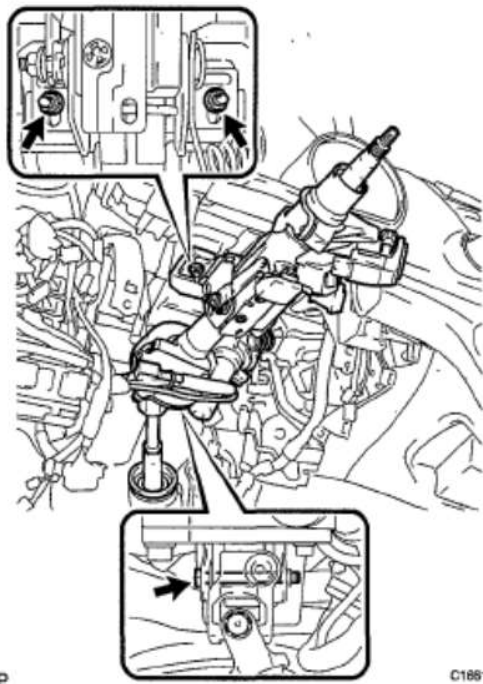


Fig. 76: Locating Bolt And Nuts With Steering Column Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Connect the connector to the power steering ECU assembly.

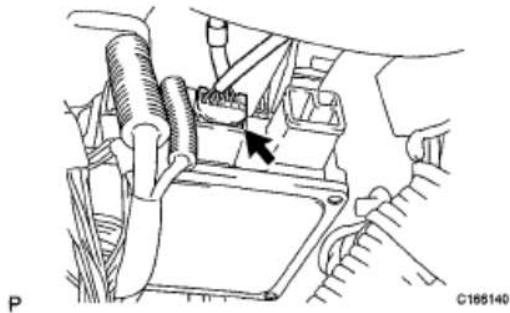


Fig. 77: Locating Power Steering ECU Assembly And Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Connect the connector to the power steering ECU assembly.

HINT:

As shown in the illustration, securely return the lock lever to its original position to connect the connector.

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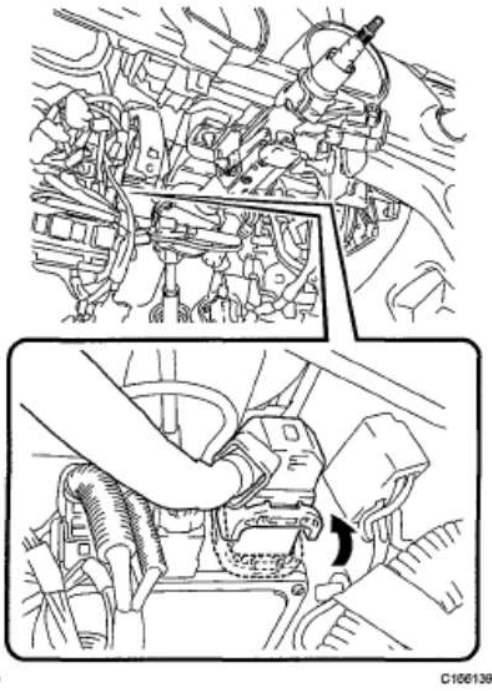


Fig. 78: Identifying Power Steering ECU Assembly And Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. CONNECT STEERING INTERMEDIATE SHAFT SUB-ASSEMBLY

- a. Align the matchmarks on the steering intermediate shaft sub-assembly and the power steering link assembly.

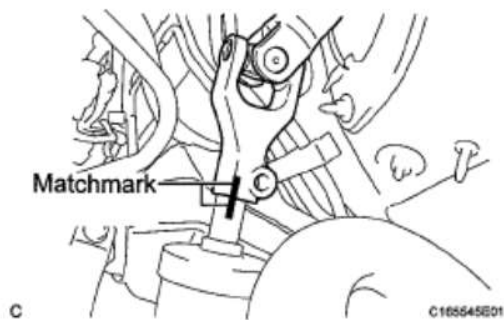


Fig. 79: Identifying Matchmarks On Steering Intermediate Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install a new bolt.

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

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Fig. 80: Identifying Steering Intermediate Shaft Sub-Assembly And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the steering intermediate shaft sub-assembly to the steering column hole shield.

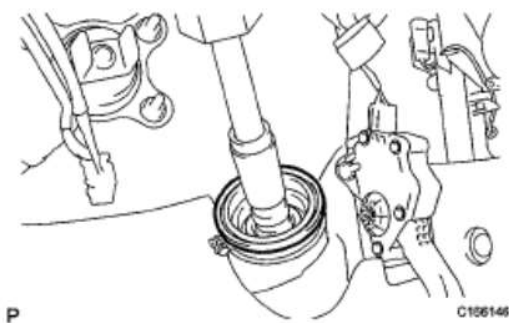


Fig. 81: Steering Intermediate Shaft Sub-Assembly To Steering Column Hole Shield
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Tighten the bolt.

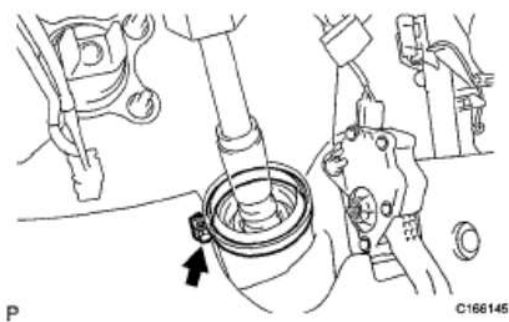


Fig. 82: Locating Bolt And Steering Intermediate Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2009 Toyota Highlander Limited**2009 STEERING Steering Column - Highlander****4. INSTALL NO. 1 AIR DUCT SUB-ASSEMBLY**

- a. Engage the 2 claws to install the No. 1 air duct sub-assembly.

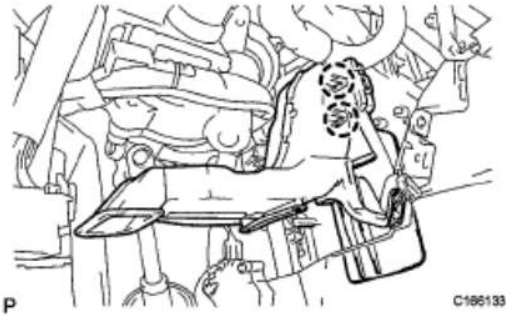
5. POSITION FRONT WHEELS STRAIGHT AHEAD

Fig. 83: Identifying No. 1 Air Duct Sub-Assembly And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL TURN SIGNAL SWITCH ASSEMBLY WITH SPIRAL CABLE SUB-ASSEMBLY

- a. Using pliers, engage the claw. Install the turn signal switch assembly with spiral cable sub-assembly to the steering column assembly.
- b. Connect the connectors to the turn signal switch assembly with spiral cable sub-assembly.

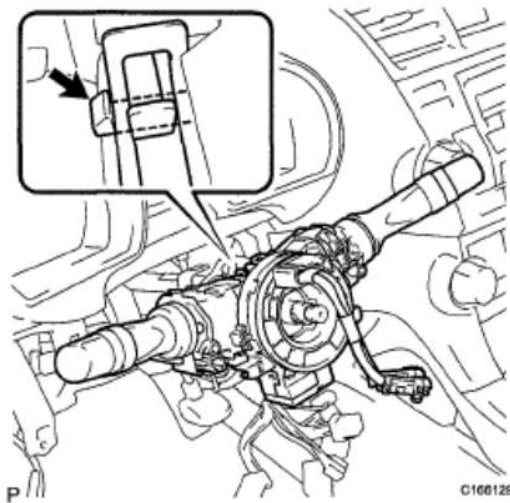


Fig. 84: Identifying Spiral Cable Sub-Assembly With Claws And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL STEERING COLUMN COVER

- a. Engage the claw to install the upper steering column cover.

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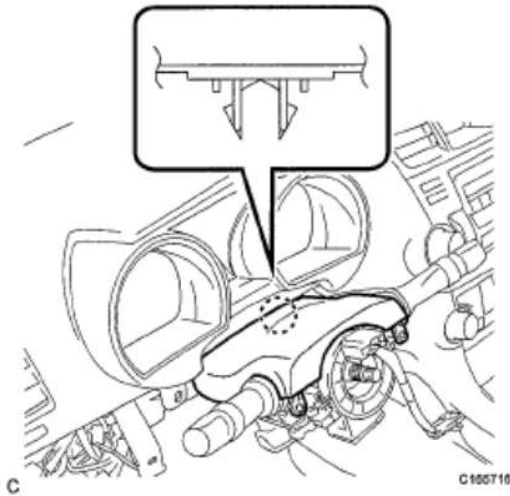


Fig. 85: Identifying Upper Steering Column Cover And Claw
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Engage the 2 claws to install the lower steering column cover.

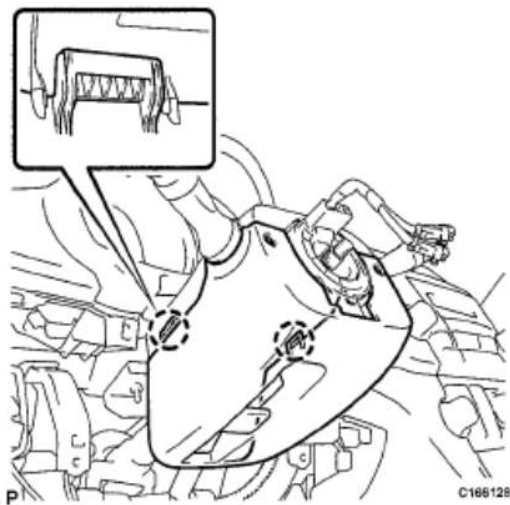


Fig. 86: Identifying Lower Steering Column Cover And Claws
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the 2 screws.

Torque: 2.0 N*m (20 kgf*cm, 18 in.*lbf)

8. **INSTALL BRAKE PEDAL SUPPORT SUB-ASSEMBLY** (See INSTALLATION)
9. **CONNECT BRAKE MASTER CYLINDER PUSH ROD CLEVIS** (See INSTALLATION)
10. **INSTALL BRAKE PEDAL RETURN SPRING** (See INSTALLATION)

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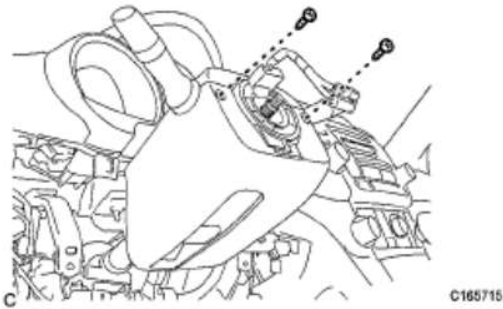


Fig. 87: Identifying Steering Column Cover And Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **INSTALL STOP LIGHT SWITCH ASSEMBLY** (See INSTALLATION)
12. **INSPECT AND ADJUST BRAKE PEDAL HEIGHT** (See ADJUSTMENT)
13. **INSPECT BRAKE PEDAL FREE PLAY** (See ADJUSTMENT)
14. **INSPECT BRAKE PEDAL RESERVE DISTANCE** (See ADJUSTMENT)
15. **INSTALL DRIVER SIDE KNEE AIRBAG ASSEMBLY** (See INSTALLATION)
16. **INSTALL LOWER INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY** (for Manual Air Conditioning System) (See INSTALLATION)
17. **INSTALL LOWER INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY** (for Automatic Air Conditioning System) (See INSTALLATION)
18. **INSTALL COWL SIDE TRIM SUB-ASSEMBLY LH** (See INSTALLATION)
19. **INSTALL FRONT DOOR SCUFF PLATE LH** (See INSTALLATION)
20. **ADJUST SPIRAL CABLE** (See INSTALLATION)
21. **INSTALL STEERING WHEEL ASSEMBLY** (See INSTALLATION)
22. **INSPECT STEERING WHEEL CENTER POINT**
23. **INSTALL STEERING PAD** (See INSTALLATION)
24. **INSTALL LOWER NO. 3 STEERING WHEEL COVER** (See INSTALLATION)
25. **INSTALL LOWER NO. 2 STEERING WHEEL COVER** (See INSTALLATION)
26. **INSTALL FRONT WHEEL LH**

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

27. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE:

- Make sure that the cable has been disconnected from the battery terminal for at least 2 seconds before reconnecting the cable.
- Connect the cable to the negative (-) battery terminal with the front wheels facing straight ahead.
- When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

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28. **INSPECT STEERING PAD** (See INSTALLATION)

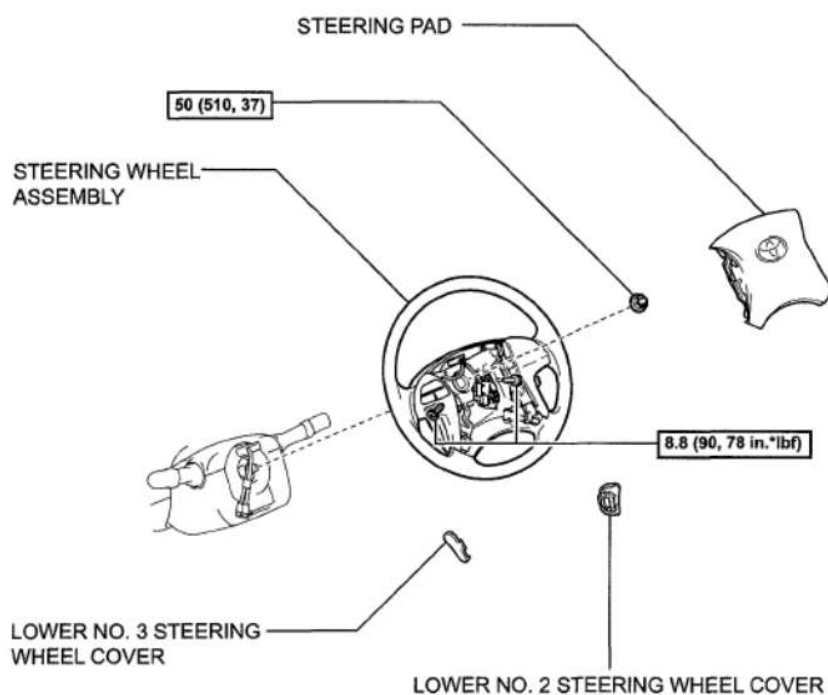
29. **INSPECT SRS WARNING LIGHT**

HINT:

(See DIAGNOSIS SYSTEM)

STEERING WHEEL

COMPONENTS



P

C166554E01

Fig. 88: Identifying Steering Wheel Components With Torque Specification (1 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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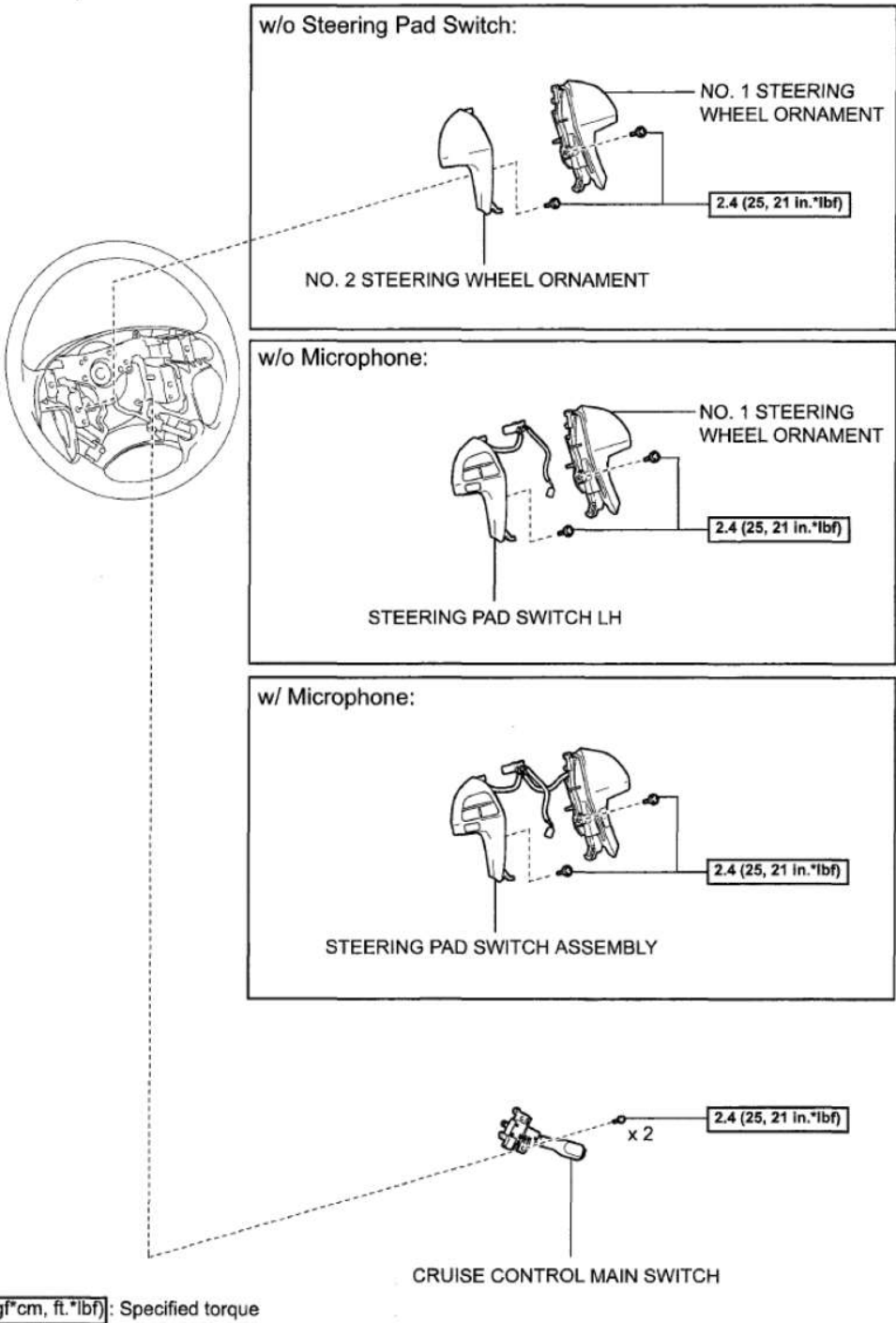
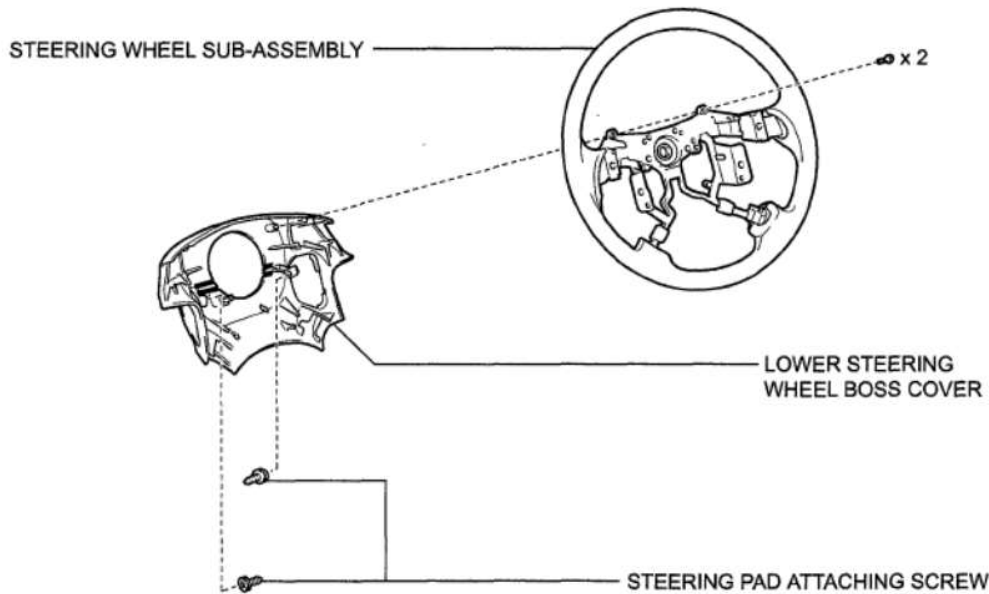


Fig. 89: Identifying Steering Wheel Components With Torque Specification (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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P

C16655E01

Fig. 90: Identifying Steering Wheel Components With Torque Specification (3 Of 3)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

CAUTION: Some of these service operations affect the SRS airbag system. Read the precautionary notices concerning the SRS airbag system before servicing the steering wheel (See AIRBAG SYSTEM).

1. ALIGN FRONT WHEELS FACING STRAIGHT AHEAD
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION: Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

3. REMOVE LOWER NO. 3 STEERING WHEEL COVER (See REMOVAL)

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4. **REMOVE LOWER NO. 2 STEERING WHEEL COVER** (See **REMOVAL**)
5. **REMOVE STEERING PAD** (See **REMOVAL**)
6. **REMOVE STEERING WHEEL ASSEMBLY**
 - a. Remove the steering wheel assembly set nut.
 - b. Put matchmarks on the steering wheel assembly and the steering main shaft.
 - c. Disconnect the connectors from the spiral cable.

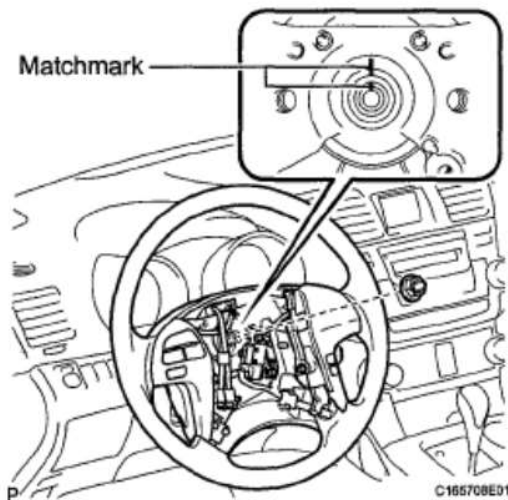


Fig. 91: Identifying Matchmarks On Steering Wheel Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using SST, remove the steering wheel assembly.

SST 09950-50013 (09951-05010, 09952-05010, 09953-05020, 09954-05021)

NOTE: Apply a small amount of grease to the threads and tip of SST (09953-05020) before use.

DISASSEMBLY

1. **REMOVE CRUISE CONTROL MAIN SWITCH** (See **INSPECTION**)

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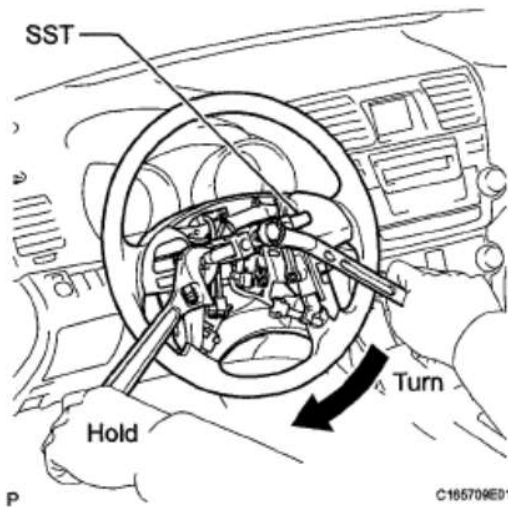


Fig. 92: Removing Steering Wheel Assembly

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

2. REMOVE NO. 2 STEERING WHEEL ORNAMENT (w/o Steering Pad Switch)

- a. Remove the screw.



Fig. 93: Identifying No. 2 Steering Wheel Ornament And Screw

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

- b. Disengage the 2 pins to remove the No. 2 steering wheel ornament from the steering wheel spoke sub-assembly.

3. REMOVE NO. 1 STEERING WHEEL ORNAMENT (w/o Steering Pad Switch)

HINT:

Perform the same procedure as for the No. 2 steering wheel ornament.

4. REMOVE STEERING PAD SWITCH LH (w/o Microphone) (See **REMOVAL**)

5. REMOVE NO. 1 STEERING WHEEL ORNAMENT (w/o Microphone)

HINT:

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Perform the same procedure as for the No. 2 steering wheel ornament.

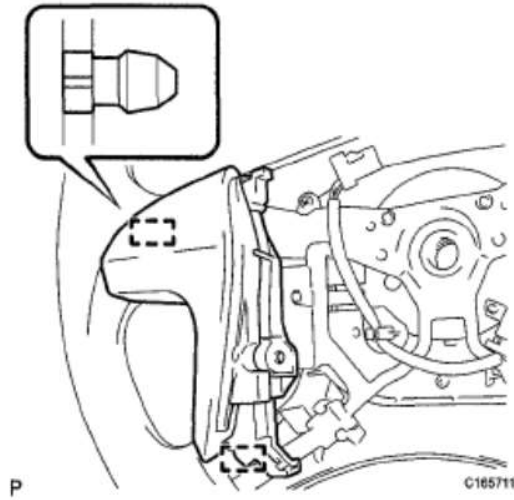


Fig. 94: Identifying No. 2 Steering Wheel Ornament And Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **REMOVE STEERING PAD SWITCH ASSEMBLY (w/ Microphone)** (See **REMOVAL**)
7. **REMOVE LOWER STEERING WHEEL BOSS COVER**
 - a. Remove the 2 screws.

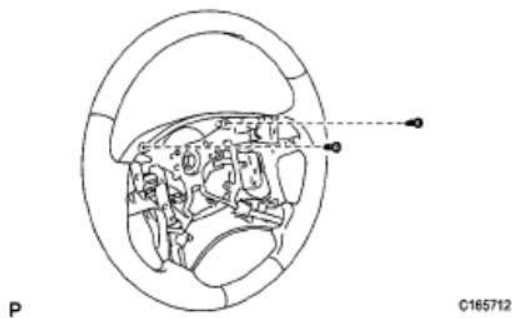


Fig. 95: Identifying Steering Pad Switch Assembly And Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Disengage the 4 claws to remove the lower steering wheel boss cover from the steering wheel spoke sub-assembly.

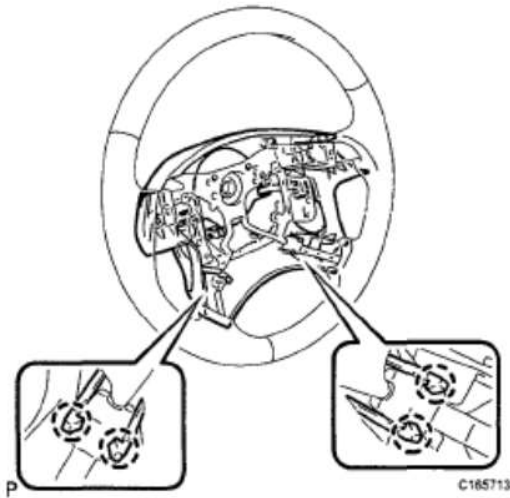
2009 Toyota Highlander Limited**2009 STEERING Steering Column - Highlander**

Fig. 96: Identifying Lower Steering Wheel Boss Cover And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE STEERING PAD ATTACHING SCREW

- a. Remove the 2 steering pad attaching screws from the lower steering wheel boss cover.

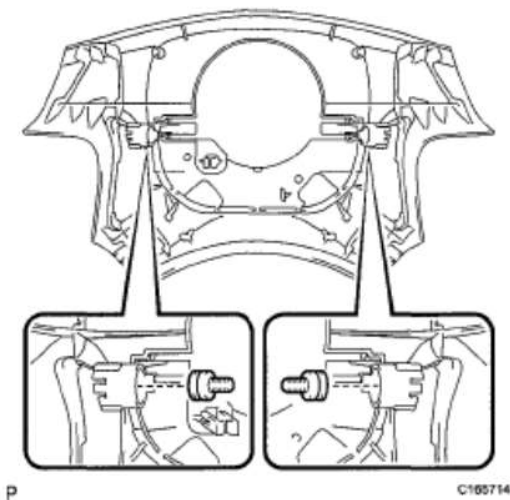


Fig. 97: Identifying Steering Pad Attaching Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY**1. INSTALL STEERING PAD ATTACHING SCREW**

- a. Install the 2 steering pad attaching screws to the lower steering wheel boss cover.

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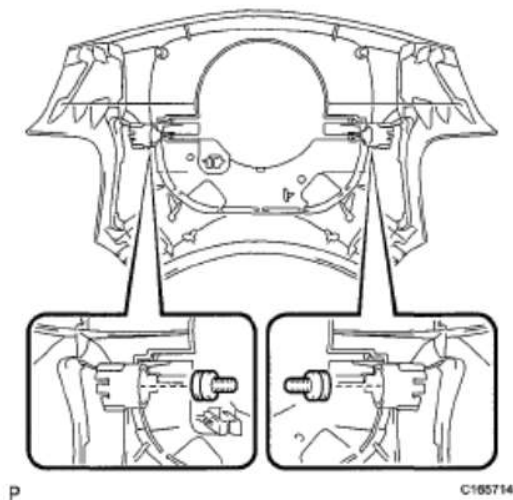


Fig. 98: Identifying Steering Pad Attaching Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL LOWER STEERING WHEEL BOSS COVER

- a. Engage the 4 claws to install the lower steering wheel boss cover to the steering wheel spoke sub-assembly.

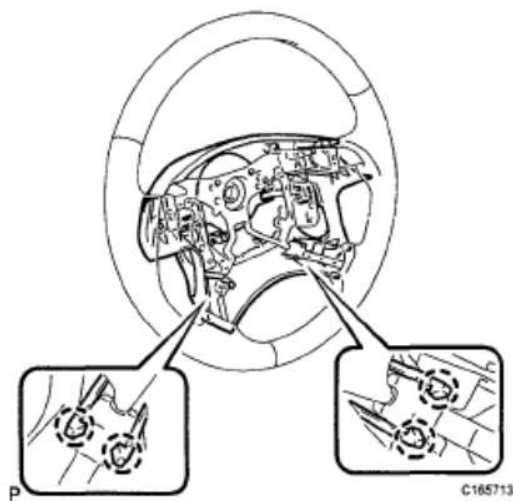


Fig. 99: Identifying Lower Steering Wheel Boss Cover And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the 2 screws.

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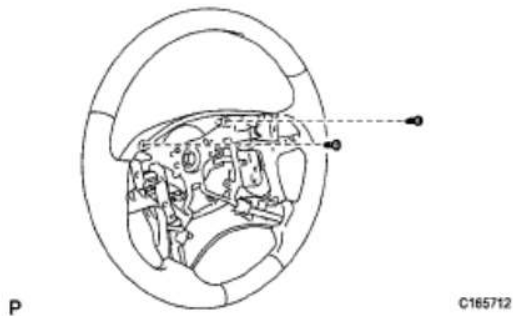


Fig. 100: Identifying Steering Pad Switch Assembly And Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL NO. 2 STEERING WHEEL ORNAMENT (w/o Steering Pad Switch)

- Engage the 2 pins to install the No. 2 steering wheel ornament to the steering wheel spoke sub-assembly.

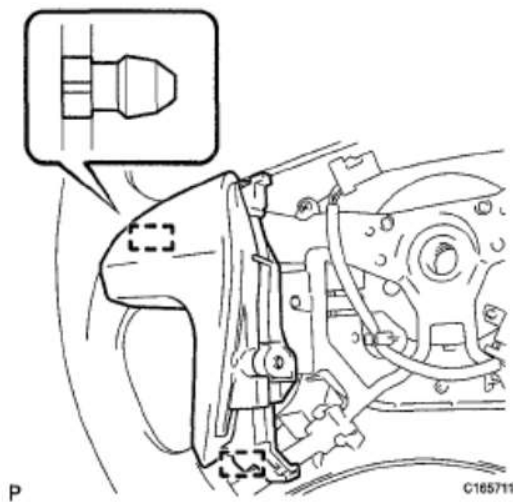


Fig. 101: Identifying No. 2 Steering Wheel Ornament And Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Install the screw.

Torque: 2.4 N*m (25 kgf*cm, 21 in.*lbf)

4. INSTALL NO. 1 STEERING WHEEL ORNAMENT (w/o Steering Pad Switch)

HINT:

Perform the same procedure as for the No. 2 steering wheel ornament.

5. INSTALL STEERING PAD SWITCH LH (w/o Microphone) (See INSTALLATION)

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Fig. 102: Identifying No. 2 Steering Wheel Ornament And Screw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL NO. 1 STEERING WHEEL ORNAMENT (w/o Microphone)

HINT:

Perform the same procedure as for the No. 2 steering wheel ornament.

7. INSTALL STEERING PAD SWITCH ASSEMBLY (w/ Microphone) (See INSTALLATION)

8. INSTALL CRUISE CONTROL MAIN SWITCH (See INSTALLATION)

INSTALLATION

1. ALIGN FRONT WHEELS FACING STRAIGHT AHEAD

2. ADJUST SPIRAL CABLE (See INSTALLATION)

3. INSTALL STEERING WHEEL ASSEMBLY

- Align the matchmarks on the steering wheel assembly and steering main shaft.
- Install the steering wheel assembly set nut.

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

- Connect the connectors to the spiral cable sub-assembly.

4. INSTALL STEERING PAD (See INSTALLATION)

5. INSTALL LOWER NO. 3 STEERING WHEEL COVER (See INSTALLATION)

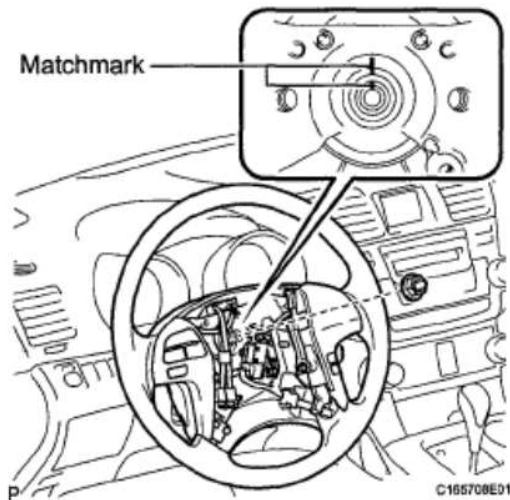
6. INSTALL LOWER NO. 2 STEERING WHEEL COVER (See INSTALLATION)

7. INSPECT STEERING WHEEL CENTER POINT

8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

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**Fig. 103: Identifying Matchmarks On Steering Wheel Assembly**

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

NOTE:

- Make sure that the cable has been disconnected from the battery terminal for at least 2 seconds before reconnecting the cable.
- Connect the cable to the negative (-) battery terminal with the front wheels facing straight ahead.
- When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

9. **INSPECT STEERING PAD** (See INSTALLATION)
10. **INSPECT SRS WARNING LIGHT**

HINT:See DIAGNOSIS SYSTEM .