

2008 Scion xD
2008 STEERING Power Steering - xD

2008 STEERING**Power Steering - xD****POWER STEERING SYSTEM****PRECAUTION****1. HANDLING PRECAUTION**

- a. When handling the electronic parts;
 - Avoid any impact to a ECU. Replace with new one if dropped or subjected to a severe blow.
 - Do not expose to high temperatures or humidity.
 - Do not touch the connector terminals, in order to prevent deformation or malfunctions due to static electricity.
 - When the power steering ECU has been replaced with a new one, perform the torque sensor zero point calibration. (See **CALIBRATION**)
- b. When handling the steering column assembly;
 - Avoid any impact to the steering column assembly, especially to the motor and torque sensor. Replace with new ones if dropped or subjected to a severe blow.
 - Do not pull the wire harness when moving the steering column assembly.
 - When the steering column assembly has been replaced, perform the torque sensor zero point calibration after initializing the torque sensor zero point. (See **CALIBRATION**)
- c. When disconnecting and reconnecting the connectors;
 - When disconnecting the connectors related to the electronic power steering system, turn the ignition switch to ON, center the steering wheel, turn the ignition switch to OFF, and then disconnect the connectors.
 - When reconnecting the connectors related to the electronic power steering system, ensure that the ignition switch is OFF. Center the steering wheel and then turn the ignition switch to ON.

NOTE: **Do not turn the ignition switch to ON when the steering wheel is not centered.**

- If the above operations are not carried out properly, the steering center point (zero point) will deviate, which may lead to a difference in steering effort between turning right and left. If there is a difference in steering effort between turning right and left, perform the torque sensor zero point calibration. (See **CALIBRATION**)

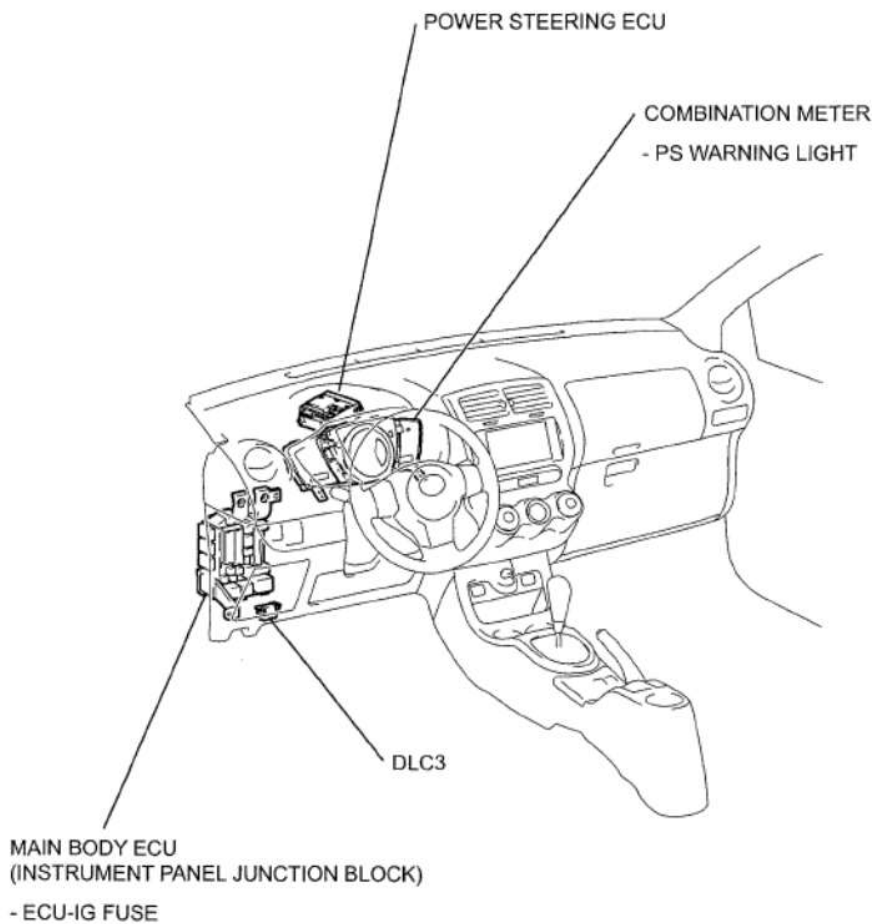
2. PRECAUTIONS FOR CAN COMMUNICATION

- a. CAN communication lines are used to receive information from the skid control ECU and the ECM, and to transmit warnings to the combination meter. When there are any problems in the CAN communication lines, CAN communication line DTCs are output.
- b. Perform troubleshooting of the communication line problems when the CAN communication DTCs are output. Be sure to start troubleshooting on the electronic power steering system after confirming

2008 Scion xD**2008 STEERING Power Steering - xD**

that the CAN communication system is normal.

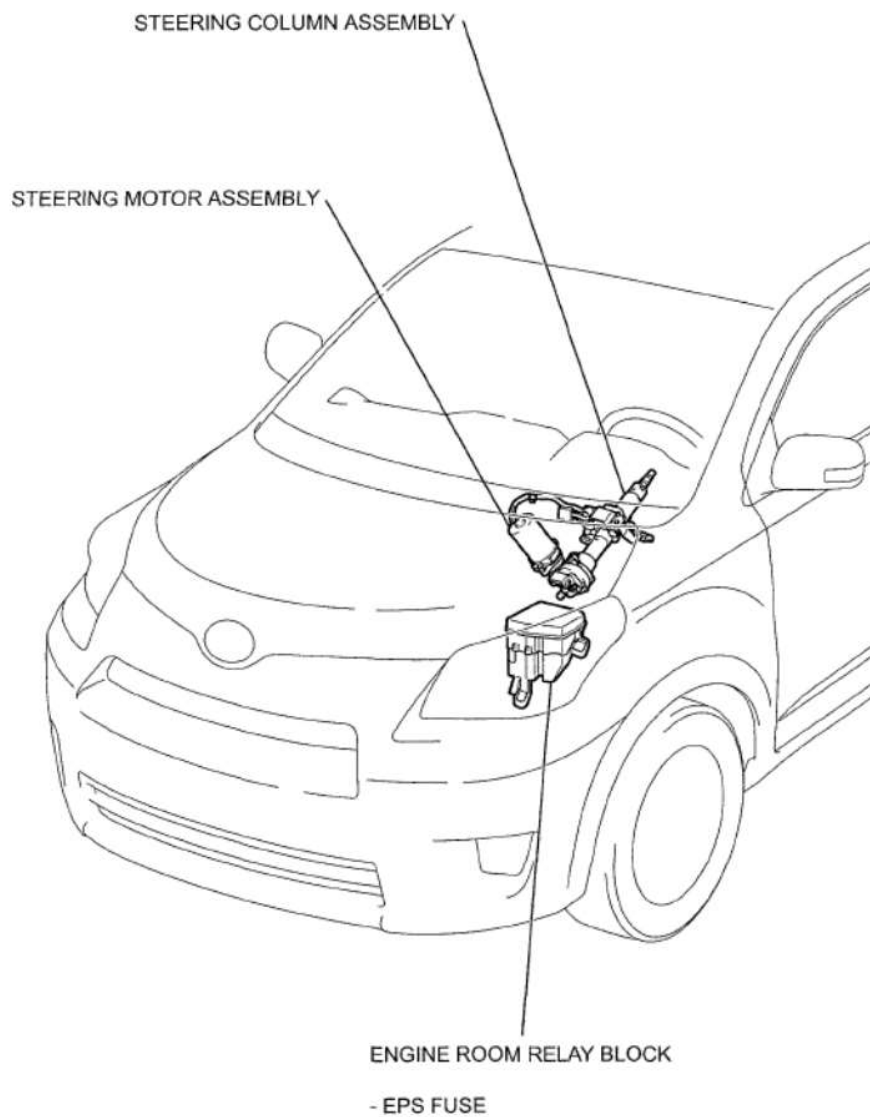
- c. Since the CAN communication line has its own length and route, it cannot be repaired temporarily with a bypass wire, etc.

PARTS LOCATION

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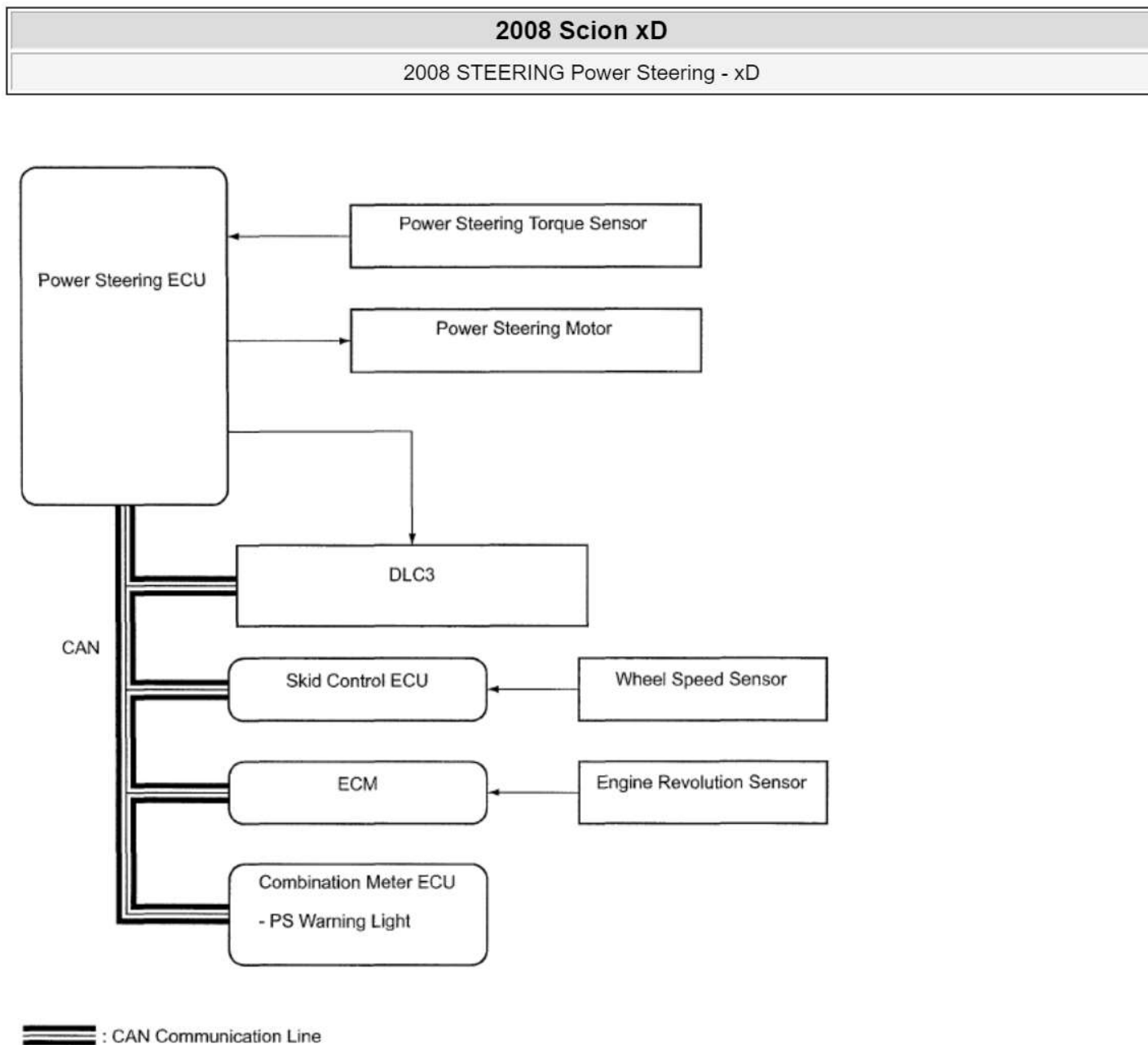
Fig. 1: Identifying Power Steering System Parts Location (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2008 Scion xD**2008 STEERING Power Steering - xD**

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Fig. 2: Identifying Power Steering System Parts Location (2 Of 2)**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****SYSTEM DIAGRAM**



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Fig. 3: Power Steering System Diagram

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

SYSTEM DESCRIPTION**1. DESCRIPTION**

The power steering system generates torque through the operation of the motor and the reduction gear installed on the column shaft in order to assist power steering effort.

The power steering ECU determines the direction and the amount of assisting power in accordance with the vehicle speed signals and signals from the torque sensor built into the steering column assembly. As a

2008 Scion xD

2008 STEERING Power Steering - xD

result, steering effort is controlled to be light during low speed driving and moderately high during high speed driving.

a. Power steering ECU:

The power steering ECU calculates assisting power based on steering torque signals from the torque sensor and vehicle speed signals from the skid control ECU.

b. Torque sensor:

The torque sensor detects the steering effort generated when the steering wheel is turned and converts it to an electrical signal.

c. Power steering motor:

The power steering motor is activated by the current from the power steering ECU and generates torque to assist the steering effort.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use these procedures to troubleshoot the power steering system.
- *: Use a Techstream.

1. VEHICLE BROUGHT TO WORKSHOP

2. INSPECT BATTERY VOLTAGE

Standard voltage: 11 to 14 V

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

3. CHECK DTC AND FREEZE FRAME DATA*

4. PROBLEM SYMPTOM CONFIRMATION

5. CHECK CAN COMMUNICATION SYSTEM*

- a. Check for DTCs (See **DIAGNOSIS SYSTEM**).

Result

RESULT REFERENCE

Result	Proceed to
CAN system DTC is not output	A
CAN system DTC is output	B

HINT:

2008 Scion xD**2008 STEERING Power Steering - xD**

- When any CAN communication system DTCs are output, perform troubleshooting on the CAN communication system first.
- When communication to the power steering ECU is not established through a Techstream, inspect terminals CANH and CANL of the DLC3 and the power steering ECU, and the IG circuit of the power steering ECU.

B : PROCEED TO CAN COMMUNICATION SYSTEM**A: Go to Next Step****6. CHECK DTC***

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

Result**RESULT REFERENCE**

Result	Proceed to
DTC output	A
DTC not output	B

A: Go to step 9**B:** Go to Next Step**7. PROBLEM SYMPTOMS TABLE****Result****RESULT REFERENCE**

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

B: Go to step 9**A:** Go to Next Step**8. OVERALL ANALYSIS AND TROUBLESHOOTING***

- Terminals of ECU (See **TERMINALS OF ECU**).
- Data List / Active Test (See **DATA LIST / ACTIVE TEST**).

9. REPAIR OR REPLACE**10. CONFIRMATION TEST*****NEXT : END**

2008 Scion xD
2008 STEERING Power Steering - xD

CALIBRATION**1. TORQUE SENSOR ZERO POINT CALIBRATION (USING TECHSTREAM)**

NOTE: Perform the torque sensor zero point calibration when any of the following conditions occur.

- The steering column assembly (containing the torque sensor) has been replaced.
- The power steering ECU has been replaced.
- The steering wheel has been replaced.
- The steering gear assembly has been replaced.
- There is a difference in steering effort between turning right and left.
- a. Center the steering wheel and align the front wheels straight ahead.
- b. Connect a Techstream to the DLC3.
- c. Turn the ignition switch to ON and turn the tester on.
- d. Enter the following menus:

Chassis / EMPS / Utility / Torque Sensor Adjustment.

- e. Initialize the torque sensor zero point calibration signal and perform the zero point calibration by following the prompts on the tester screen.

NOTE: Do not touch the steering wheel during the calibration.

- f. Confirm that no DTCs are output after the zero point calibration is completed.
 1. When DTC C1515/15 is output, see **DTC C1515/15 TORQUE SENSOR ZERO POINT ADJUSTMENT IS NOT INITIALIZED**.
 2. When DTC C1516/16 is output, see **DTC C1516/16 TORQUE SENSOR ZERO POINT ADJUSTMENT INCOMPLETE**.
 3. When DTC C1534/34 is output, see **DTC C1531/31 EPS ECU CIRCUIT MALFUNCTION; DTC C1532/32 EPS ECU CIRCUIT MALFUNCTION; DTC C1533/33 EPS ECU CIRCUIT MALFUNCTION; DTC C1534/34 EPS ECU CIRCUIT MALFUNCTION; DTC C1535/35 STEERING WHEEL LOCATION DATA ERROR**.

2. TORQUE SENSOR ZERO POINT CALIBRATION (USING SST CHECK WIRE)

- a. Center the steering wheel and align the front wheels straight ahead.
- b. Initialize the torque sensor zero point calibration signal.

HINT:

If the power steering ECU is replaced, initialization is not necessary.

2008 Scion xD

2008 STEERING Power Steering - xD

Front view of DLC3:

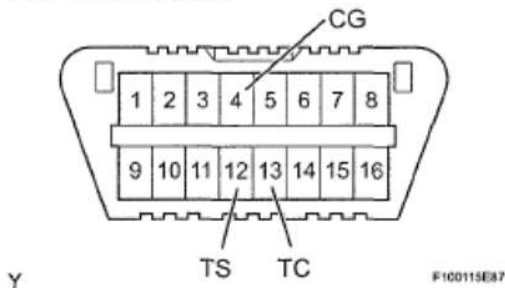


Fig. 4: Identifying Front View Of DLC3 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Stop the vehicle and turn the ignition switch to OFF.
2. Turn the ignition switch to ON and wait for 3 seconds or more.
3. Using SST, connect terminals TS and CG of the DLC3.

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4. Using SST, connect terminals TC and CG of the DLC3.

SST 09843-18040

5. Disconnect and reconnect terminal TC of the DLC3 20 times or more within 20 seconds.
6. Check that PS warning light comes on and DTC C1515/15 is output.
7. Turn the ignition switch to OFF.

HINT:

Perform the torque sensor zero point calibration after turning the ignition switch to OFF.

- c. Perform the torque sensor zero point calibration.

NOTE: Do not touch the steering wheel during the calibration.

HINT:

Check whether any DTCs except C1515/15 are output.

1. Stop the vehicle and turn the ignition switch to OFF.
2. Using SST, connect terminals TS and CG of the DLC3 and turn the ignition switch to ON.

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3. Wait for 5 seconds after the PS warning light comes on.

2008 Scion xD

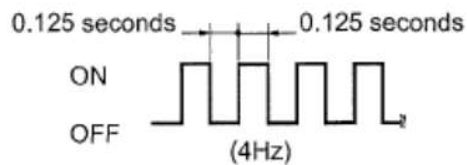
2008 STEERING Power Steering - xD

4. Confirm that the PS warning light blinks at intervals of 0.125 seconds (4Hz blink).
5. Disconnect the SST.

SST 09843-18040

6. Confirm that no DTCs are output.
 1. When DTC C1515/15 is output, see **DTC C1515/15 TORQUE SENSOR ZERO POINT ADJUSTMENT IS NOT INITIALIZED**.
 2. When DTC C1516/16 is output, see **DTC C1516/16 TORQUE SENSOR ZERO POINT ADJUSTMENT INCOMPLETE**.
 3. When DTC C1534/34 is output, see **DTC C1531/31 EPS ECU CIRCUIT MALFUNCTION; DTC C1532/32 EPS ECU CIRCUIT MALFUNCTION; DTC C1533/33 EPS ECU CIRCUIT MALFUNCTION; DTC C1534/34 EPS ECU CIRCUIT MALFUNCTION; DTC C1535/35 STEERING WHEEL LOCATION DATA ERROR**.

PS Warning Light 4Hz Blink



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Fig. 5: PS Warning Light 4Hz Blinking Pattern
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

PROBLEM SYMPTOMS TABLE

Power steering system

POWER STEERING SYSTEM REFERENCE

Symptom	Suspected Area	See
Heavy steering	Front tires (improperly inflated, unevenly worn)	<u>TIRE AND WHEEL SYSTEM</u>
	Front wheel alignment (incorrect)	<u>FRONT WHEEL ALIGNMENT</u>
	Front suspension (lower ball joint)	<u>REMOVAL</u>
	Steering gear assembly	<u>POWER STEERING GEAR</u>
	Power steering motor	<u>REMOVAL</u>
	Battery and power source system	-

2008 Scion xD

2008 STEERING Power Steering - xD

	Power source voltage of power steering ECU	<u>TERMINALS OF ECU</u>
	Power steering ECU	<u>POWER STEERING ECU</u>
Steering effort differs between turning right and left or uneven	Steering center point (zero point) recorded incorrectly	<u>CALIBRATION</u>
	Front tires (improperly inflated, unevenly worn)	<u>TIRE AND WHEEL SYSTEM</u>
	Front wheel alignment (incorrect)	<u>FRONT WHEEL ALIGNMENT</u>
	Front suspension (lower ball joint)	<u>REMOVAL</u>
	Steering gear assembly	<u>POWER STEERING GEAR</u>
	Torque sensor (built into steering column)	<u>REMOVAL</u>
	Steering column assembly	<u>REMOVAL</u>
	Power steering motor	<u>REMOVAL</u>
	Power steering ECU	<u>POWER STEERING ECU</u>
While driving, steering effort does not change in accordance with vehicle speed or steering wheel does not return properly	Front suspension (lower ball joint)	<u>REMOVAL</u>
	Speed sensor (for ABS)	<u>TEST MODE PROCEDURE</u>
	Speed sensor (for VSC)	<u>TEST MODE PROCEDURE</u>
	Skid control ECU (for ABS)	<u>TERMINALS OF ECU</u>
	Skid control ECU (for VSC)	<u>TERMINALS OF ECU</u>
	Torque sensor (built into steering column)	<u>REMOVAL</u>
	Power steering motor	<u>REMOVAL</u>
	Power steering ECU	<u>POWER STEERING ECU</u>
	CAN communication system	<u>HOW TO PROCEED WITH TROUBLESHOOTING</u>
Friction occurs when turning steering wheel during low speed driving	Power steering motor	<u>REMOVAL</u>
	Steering column assembly	<u>REMOVAL</u>
High-pitched sound (squeaking) occurs when turning steering wheel slowly with vehicle stopped	Power steering motor	<u>REMOVAL</u>
Steering wheel vibrates and noise occurs when turning steering wheel with vehicle stopped	Power steering motor	<u>REMOVAL</u>
	Steering column assembly	<u>REMOVAL</u>
PS warning always indicated on combination meter	Power source voltage of power steering ECU	<u>TERMINALS OF ECU</u>
	Combination meter	<u>REMOVAL</u>

2008 Scion xD

2008 STEERING Power Steering - xD

Calibration cannot be performed	Power steering ECU	<u>POWER STEERING ECU</u>
	TS and CG terminal circuit	<u>TS AND CG TERMINAL CIRCUIT</u>
	Power steering ECU	<u>POWER STEERING ECU</u>

TERMINALS OF ECU

Power Steering ECU:

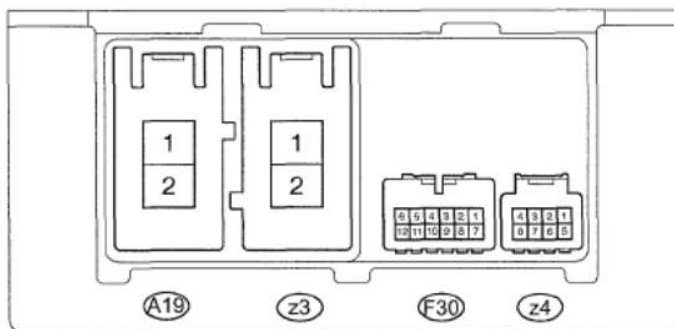


Fig. 6: Identifying Power Steering ECU Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

VOLTAGE SPECIFICATION

Terminals No. (Symbols)	Wiring Color	Terminal Description	Condition	Specified Condition
A19-1 (PIG) - A19-2 (PGND)	W - W-B	EPS fuse	Always	11 to 14 V
A19-2 (PGND) - Body ground	W-B - Body ground	Body ground	Always	Below 1 ohms
z3-1 (M1) - A19-2 (PGND)	R - W-B	Power steering motor	With ignition switch ON, turn steering wheel to left	11 to 14 V
			With ignition switch ON, turn steering wheel to right	Below 1 V
z3-2 (M2) - A19-2 (PGND)	B - W-B	Power steering motor	With ignition switch ON, turn steering wheel to left	Below 1 V
			With ignition switch ON, turn steering wheel to right	11 to 14 V
F30-1 (CANH) - F30-7 (CANL)	SB - W	CAN BUS	Ignition switch OFF	108 to 132 ohms
F30-6 (IG) - A19-2 (PGND)	L - W-B	ECU-IG fuse	Ignition switch ON	11 to 14 V
F30-11 (TS) - A19-2 (PGND)	LG - W-B	DLC3	Ignition switch ON	11 to 14 V
z4-5 (TRQ1) - A19-2			With ignition switch ON, turn	

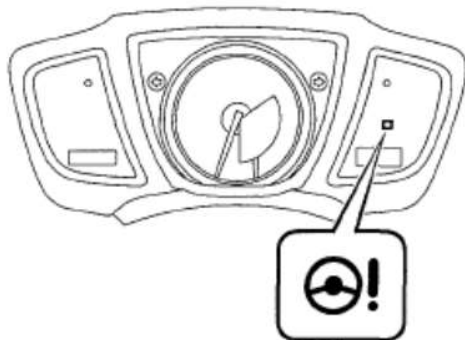
2008 Scion xD				
2008 STEERING Power Steering - xD				

(PGND)	W - W-B	Torque sensor	steering wheel to left and right	0.3 to 4.7 V
z4-6 (TRQV) - A19-2 (PGND)	R - W-B	Torque sensor	Ignition switch ON	7.5 to 8.5 V
z4-7 (TRQ2) - A19-2 (PGND)	Y - W-B	Torque sensor	With ignition switch ON, turn steering wheel to left and right	0.3 to 4.7 V
z4-8 (TRQG) - A19-2 (PGND)	B - W-B	Torque sensor	Always	Below 1 ohms

DIAGNOSIS SYSTEM

1. **CHECK DLC3** (See **HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**)
2. **WARNING LIGHT**
 - a. When a problem occurs in the power steering system, the PS warning light on the combination meter comes on to inform the driver of the problem.

PS Warning Light:



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Fig. 7: Identifying PS Warning Light
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC CHECK / CLEAR

1. **CHECK DTC**
 - a. When using a Techstream;
 1. Connect the Techstream to the DLC3.
 2. Turn the ignition switch to ON and turn the tester on.
 3. Read the DTCs by following the prompts on the Techstream.

HINT:

Refer to the Techstream operator's manual for further details.

2008 Scion xD

2008 STEERING Power Steering - xD

- b. When not using a Techstream;
1. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

SST 09843-18040

2. Turn the ignition switch to ON.

Front view of DLC3:

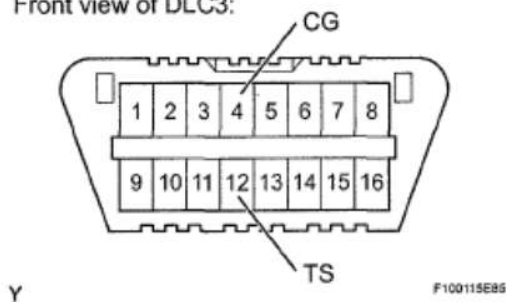


Fig. 8: Connecting Terminals 13 (TC) And 4 (CG) Of DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. Read and write down any DTCs indicated by the PS warning light on the combination meter.

Refer to the chart on the left for examples of a normal code and DTCs 21 and 22.

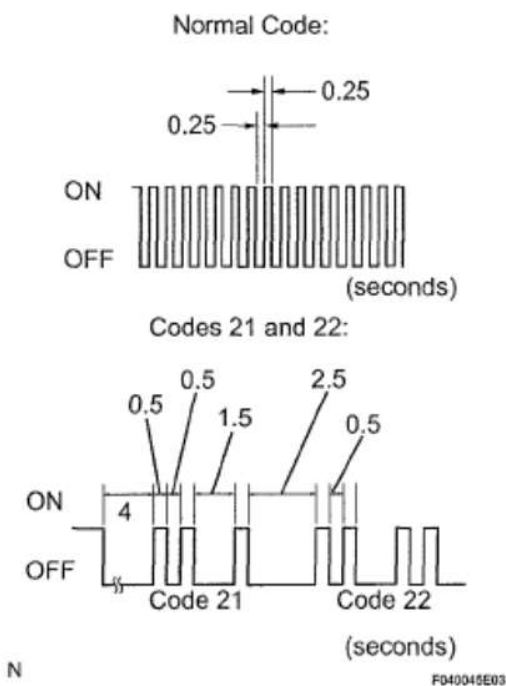


Fig. 9: PS Warning Light Blinking Pattern
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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HINT:

- If the PS warning light does not blink to display any DTCs set or the normal code, inspect the circuit shown in the table below.

WARNING LIGHT REFERENCE

Trouble Area	See
EPS warning light circuit	EPS WARNING LIGHT CIRCUIT

- If two or more malfunctions are detected simultaneously, DTCs will be displayed in ascending numerical order.

4. Refer to the **DIAGNOSTIC TROUBLE CODE CHART** for DTC information.

2. CLEAR DTC

a. When using a Techstream;

1. Connect the Techstream to the DLC3.
2. Turn the ignition switch to ON and turn the tester on.
3. Clear the DTCs by following the prompts on the Techstream.
4. Turn the ignition switch to OFF.
5. Disconnect the Techstream from the DLC3.

b. When not using a Techstream;

1. Using SST, connect terminals 12 (TS) and 4 (CG) of the DLC3.

SST 09843-18040

Front view of DLC3:

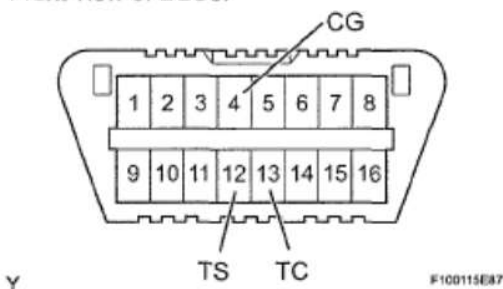


Fig. 10: Identifying Front View Of DLC3 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Turn the ignition switch to ON and wait for 3 seconds or more.
3. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
4. Disconnect and reconnect terminal 13 (TC) of the DLC3 4 times or more within 8 seconds.
5. Check that the PS warning light blinks a code to indicate normality.
6. Turn the ignition switch to OFF.

2008 Scion xD

2008 STEERING Power Steering - xD

7. Remove the SST from the DLC3.

FREEZE FRAME DATA

1. FREEZE FRAME DATA

NOTE:

- It is difficult to show the specified values (judgment values) clearly because freeze frame data values change significantly due to differences in measurement conditions, surroundings, or vehicle conditions. For this reason, there may be a problem even when the values are within specifications.
- Turn the ignition switch to ON and park the vehicle on level ground. Check the freeze frame data by using the Techstream.

- a. Turn the ignition switch to OFF.
- b. Connect a Techstream to the DLC3.
- c. Turn the ignition switch to ON.
- d. Check the freeze frame data by following the prompts on the Techstream display.

EMPS:

FREEZE FRAME DATA CHART

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Meter Vehicle Velocity	Vehicle speed from meter: Minimum: 0 km/h (mph), Maximum: 300 km/h (186.4 mph)	0 km/h (mph): Vehicle stopped	-
		Vehicle driven at constant speed	No significant fluctuation
Engine Revolution	Engine revolution: Minimum: 0 rpm, Maximum 12800 rpm	Engine running at constant speed	No significant fluctuation
Motor Actual Current	Current to motor: Minimum: -327.68 A, Maximum: 327.67 A	Value changes in proportion to steering effort	-
Command Value Current	Requested current to motor: Minimum: -327.68 A, Maximum: 327.67 A	Value changes in proportion to steering effort	-
Thermistor Temperature	ECU substrate temperature: Minimum: -40°C, Maximum: 150°C	-	-
PIG Power Supply	Power source voltage to activate motor: Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Always	-
	ECU power source voltage:		

2008 Scion xD**2008 STEERING Power Steering - xD**

IG Power Supply	Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Ignition switch ON	-
Torque Sensor 1 Output	Torque sensor 1 output value: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
Torque Sensor 2 Output	Torque sensor 2 output value: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
Torque Sensor 3 Output	Torque value for assist control: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
TRQ1 Zero Point Value	Zero point value of torque sensor 1: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	-
TRQ2 Zero Point Value	Zero point value of torque sensor 2: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	-
TRQ3 Zero Point Value	Zero point value of torque sensor for assist control: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	-
Motor Terminal Volt (+)	Motor terminal M1 voltage: Minimum: 0 V, Maximum: 25.5 V	Below 1 V: Steering wheel turned to right	-
		11 to 14 V: Steering wheel turned to left	-
Motor Terminal Volt (-)	Motor terminal M2 voltage: Minimum: 0 V, Maximum: 25.5 V	11 to 14 V: Steering wheel turned to right	-
		Below 1 V: Steering wheel turned to left	-

FAIL-SAFE CHART

When a problem occurs in the power steering system, the PS warning light on the combination meter comes on, and the ECU stops the steering power assist. maintains the amount of power assist constant. or reduces the

2008 Scion xD

2008 STEERING Power Steering - xD

amount of power assist to protect the system.

FREEZE FRAME DATA CHART

DTC No.	Malfunction	Fail-safe
C1511/11 C1512/12 C1513/13 C1514/14	Torque sensor malfunction	Assist force restricted
C1515/15 C1516/16	Torque sensor calibration malfunction	Power assist stops
C1517/17	Torque sensor malfunction	Power assist stops
C1524/24	Motor malfunction	Power assist stops
C1531/31 C1532/32	Power steering ECU malfunction	Power assist stops
C1533/33	Temperature sensor malfunction in power steering ECU	Overheat prevention control continues without using substrate temperature sensor
C1534/34	EEPROM abnormal	• Malfunction occurs while zero point calibration: Power assist stops • Otherwise above: Power assist permitted using default value
C1535/35	Steering wheel location data error	Power assist stops
C1551/51	IG power source voltage error	Assist force restricted
C1552/52	PIG power source voltage error	Assist force restricted
C1553/53	Over voltage at IG and PIG terminals	Assist force restricted
C1554/54	Power source relay malfunction	Power assist stops
C1555/55	Motor relay malfunction	Power assist stops
C1581/81	ECU malfunction (Assist map is not written)	Power assist permitted using default value
U0100/92	ECM communication error	Power assist stops
U0129/93	Skid control ECU communication error	Amount of power assist is locked at speed of 70 km/h (43 mph)
-	Extremely high temperature in ECU	Assist force restricted until normal ECU temperature recovers
-	Power source voltage drop	Assist force suspended until voltage recovers

HINT:

The amount of power assist may be decreased to prevent the motor and ECUs from overheating if the steering wheel is continuously turned when the vehicle is either stopped or driven at a low speed, or if the steering wheel is kept at either full lock position for a long time. In such cases, the amount of power assist returns to normal if the steering wheel is not turned for approximately 10 minutes with the engine idling.

DATA LIST / ACTIVE TEST

2008 Scion xD

2008 STEERING Power Steering - xD

1. DATA LIST

HINT:

Using a 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 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 ignition switch to OFF.
- b. Connect a Techstream to the DLC3.
- c. Turn the ignition switch to ON.
- d. Turn the Techstream on.
- e. Enter the following menus: Chassis / EMPS / Data List.
- f. According to the display on the tester, read the "Data List".

EMPS:

DATA LIST REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Meter Vehicle Velocity	Vehicle speed from meter: Minimum: 0 km/h (mph), Maximum: 300 km/h (186.4 mph)	0 km/h (mph): Vehicle stopped	-
		Vehicle driven at constant speed	No significant fluctuation
Engine Revolution	Engine revolution: Minimum: 0 rpm, Maximum 12800 rpm	Engine running at constant speed	No significant fluctuation
Motor Actual Current	Current to motor: Minimum: -327.68 A, Maximum: 327.67 A	Value changes in proportion to steering effort	-
Command Value Current	Requested current to motor: Minimum: -327.68 A, Maximum: 327.67 A	Value changes in proportion to steering effort	-
Thermistor Temperature	ECU substrate temperature: Minimum: -40°C, Maximum: 150°C	-	-
PIG Power Supply	Power source voltage to activate motor: Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Always	-

2008 Scion xD

2008 STEERING Power Steering - xD

IG Power Supply	ECU power source voltage: Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Ignition switch ON	-
Torque Sensor 1 Output	Torque sensor 1 output value: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
Torque Sensor 2 Output	Torque sensor 2 output value: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
Torque Sensor 3 Output	Torque value for assist control: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
TRQ1 Zero Point Value	Zero point value of torque sensor 1: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	-
TRQ2 Zero Point Value	Zero point value of torque sensor 2: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	-
TRQ3 Zero Point Value	Zero point value of torque sensor for assist control: Minimum: 0 V, Maximum: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	-
Motor Terminal Volt (+)	Motor terminal M1 voltage: Minimum: 0 V, Maximum: 25.5 V	Below 1 V: Steering wheel turned to right	-
		11 to 14 V: Steering wheel turned to left	-
Motor Terminal Volt (-)	Motor terminal M2 voltage: Minimum: 0 V, Maximum: 25.5 V	11 to 14 V: Steering wheel turned to right	-
		Below 1 V: Steering wheel turned to left	-
IG ON/OFF Times	Number of times ignition switch turned to ON after DTC detection: Minimum: 0 times, Maximum:	-	-

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	255 times		
Motor Overheat Record	Continuous overheat prevention control record: Unrec or Rec	Unrec	-
Motor Lo Power Record	PIG power source voltage drop record: Unrec or Rec	Unrec	-
Spd Sig Invalid Record	Record of vehicle speed signal invalid: Unrec or Rec	Unrec	-
The Number of DTCs	Number of detected DTCs when freeze frame data stored: Minimum: 0, Maximum: 255	-	-

DIAGNOSTIC TROUBLE CODE CHART

If any DTCs are displayed during the DTC check, inspect the circuit listed for those DTCs. For details of each DTC, refer to the page indicated in the DTC chart.

Power Steering System**DIAGNOSTIC TROUBLE CODE CHART**

DTC Code	Detection Item	Trouble Areas	Normal Return	PS Warning Light
<u>C1511/11</u>	Torque Sensor 1 Malfunction	- Steering column assembly (Torque sensor) - Power steering ECU	Ignition switch ON again	Comes on
<u>C1512/12</u>	Torque Sensor Circuit Malfunction	- Steering column assembly (Torque sensor) - Power steering ECU	Ignition switch ON again	Comes on
<u>C1513/13</u>	Torque Sensor Circuit Malfunction	- Steering column assembly (Torque sensor) - Power steering ECU	Ignition switch ON again	Comes on
<u>C1514/14</u>	Torque Sensor Power Source Circuit Malfunction	- Steering column assembly (Torque sensor) - Power steering ECU	Ignition switch ON again	Comes on

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<u>C1515/15</u>	Torque Sensor Zero Point Adjustment is not Initialized	○ Torque sensor zero point calibration not performed ○ Steering column assembly	After calibrating torque sensor zero point	Comes on
<u>C1516/16</u>	Torque Sensor Zero Point Adjustment Incomplete	○ Torque sensor zero point calibration failure ○ Steering column assembly	After calibrating torque sensor zero point normally	Comes on
<u>C1517/17</u>	Torque Sensor Hold Malfunction	○ Steering column assembly (Torque sensor) ○ Power steering ECU	Ignition switch ON again	Comes on
<u>C1524/24</u>	Motor Circuit Malfunction	○ Steering column assembly ○ Power steering ECU	Ignition switch ON again	Comes on
<u>C1531/31</u>	EPS ECU Circuit Malfunction	○ Power steering ECU	Ignition switch ON again	Comes on
<u>C1532/32</u>	EPS ECU Circuit Malfunction	○ Power steering ECU	Ignition switch ON again	Comes on
<u>C1533/33</u>	EPS ECU Circuit Malfunction	○ Power steering ECU	Ignition switch ON again	Comes on
<u>C1534/34</u>	EPS ECU Circuit Malfunction	○ Power steering ECU	Ignition switch ON again	Comes on
<u>C1535/35</u>	Steering Wheel Location Data Error	○ Power steering ECU	-	Comes on
<u>C1551/51</u>	IG Power Source Circuit Malfunction	○ ECU-IG fuse ○ IG power source circuit ○ Power steering ECU	Ignition switch ON again or after normal confirmation	Comes on
<u>C1552/52</u>	PIG Power Source Circuit	○ EPS fuse ○ PIG power source circuit ○ Power steering	Ignition switch ON again or after normal confirmation	Comes on

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		ECU		
<u>C1553/53</u>	When Resetting Voltage, Vehicle is Being Driven	- IG and PIG power source circuits - Power steering ECU	Ignition switch ON again or after normal confirmation	Comes on
<u>C1554/54</u>	EPS Relay Circuit	- EPS fuse - PIG power source circuit - Power steering ECU	Ignition switch ON again	Comes on
<u>C1555/55</u>	EPS Motor Relay Circuit	- Power steering ECU - Steering column assembly (Power steering motor)	Ignition switch ON again	Comes on
<u>C1581/81</u>	Assist Map Un-Writing	- CAN communication system - Power steering ECU - ECM	Assist map write	Comes on
<u>U0100/92</u>	Lost Communication with ECM/PCM "A"	ECM	Ignition switch ON again or after normal confirmation	Comes on
<u>U0129/93</u>	Lost Communication with Brake System Control Module	- CAN communication system - Skid control ECU	Ignition switch ON again or after normal confirmation	Comes on

ON-VEHICLE INSPECTION

1. CHECK STEERING EFFORT (TORQUE)

NOTE: Some of these service operations may affect the SRS airbags. Be sure to read the precautionary notices concerning the SRS airbags before servicing.

- Stop the vehicle on a level, paved road and align the wheels facing straight ahead.

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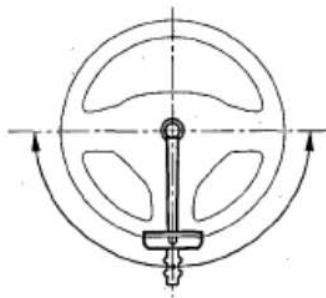
- b. Disconnect the cable from the negative battery terminal.
- c. Remove the steering pad (See **INSPECTION PROCEDURE**).
- d. Connect the cable to the negative battery terminal.
- e. Using a torque wrench, check that the steering wheel set nut is properly tightened.

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

- f. Turn the ignition switch to ON (the engine is stopped) so that the power steering is ready to operate.
- g. Turn the steering wheel 90 degrees to the right and check the steering effort (torque) while turning. Check the opposite direction in the same manner.

Steering effort (Reference): 5.5 N*m (56 kgf*cm, 49 in.*lbf)

- h. Align the front wheels facing straight ahead.
- i. Disconnect the cable from the negative battery terminal.
- j. Install the steering pad (See **STEERING PAD**).
- k. Connect the cable to the negative battery terminal.
- l. Clear the DTCs (See **DTC CHECK / CLEAR**).
- m. Inspect the airbag warning light (See **DIAGNOSIS SYSTEM**).



P

F100174

Fig. 11: Turning Steering Wheel

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

2. CHECK STEERING WHEEL FREEPLAY

- a. Turn the ignition switch to ON so that the power steering is ready to operate.
- b. Align the wheels facing straight ahead.
- c. Gently turn the steering wheel right and left with your finger and check the steering wheel freeplay.

Maximum freeplay: 30 mm (1.18 in.)

HINT:

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If the freeplay is outside the specifications, replace intermediate shaft No. 2 or the power steering gear with a new one.

DTC C1511/11 TORQUE SENSOR 1 MALFUNCTION; DTC C1512/12 TORQUE SENSOR CIRCUIT MALFUNCTION; DTC C1513/13 TORQUE SENSOR CIRCUIT MALFUNCTION; DTC C1514/14 TORQUE SENSOR POWER SOURCE CIRCUIT MALFUNCTION; DTC C1517/17 TORQUE SENSOR HOLD MALFUNCTION

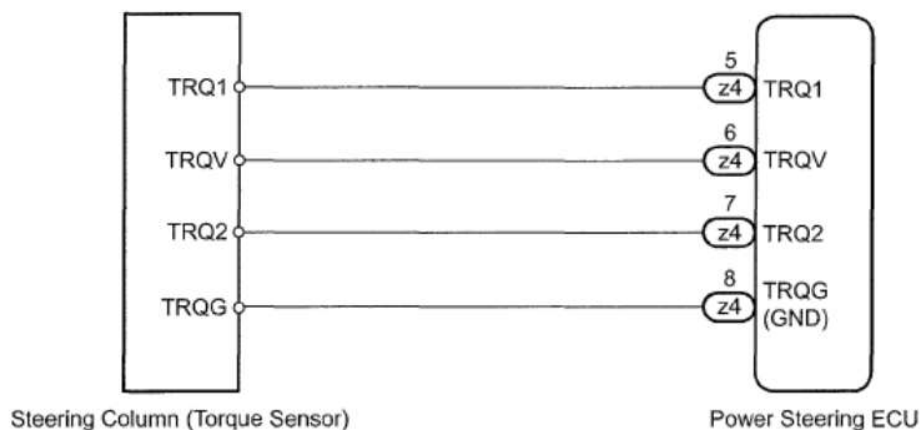
DESCRIPTION

The torque sensor converts the rotation torque input from the steering wheel into electric signals and sends them to the power steering ECU.

DIAGNOSTIC TROUBLE CODE CHART

DTC No.	DTC Detection Condition	Trouble Area
C1511/11	Torque sensor (TRQ1) signal error or stop	• Torque sensor (built into steering column assembly) • Power steering ECU
C1512/12	Torque sensor (TRQ2) signal error or stop	
C1513/13	Deviation between torque sensors TRQ1 and TRQ2 exceeds specified value	
C1514/14	Torque sensor power source voltage error	
C1517/17	Temporary control due to malfunction related to torque sensor continues for long time	

WIRING DIAGRAM



C162258E03

Fig. 12: Steering Column And Power Steering - Wiring Diagram
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

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1. READ VALUE USING TECHSTREAM (TORQUE SENSOR OUTPUT)

- a. Connect a Techstream to the DLC3.
- b. Turn the ignition switch to ON.
- c. Turn the Techstream on.
- d. Enter the following menus: Chassis / EMPS / Data List.
- e. Select the items "Torque Sensor 1 Output" and "Torque Sensor 2 Output" in the Data List and read the value displayed on the Techstream.

EMPS:

EMPS REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Torque Sensor 1 Output	Torque sensor 1 voltage: Min.: 0 V Max.: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped
Torque Sensor 2 Output	Torque sensor 2 voltage: Min. : 0 V Max.: 5 V	2.3 to 2.7 V: Steering wheel not turned (without load)	Read value with vehicle stopped
		2.5 to 4.7 V: Steering wheel turned to right	Read value with vehicle stopped
		0.3 to 2.5 V: Steering wheel turned to left	Read value with vehicle stopped

- f. Check the difference in the values between "Torque Sensor 1 Output" and "Torque Sensor 2 Output".

OK: The voltage difference is below 0.3 V.

NG: Go to step 2

OK : CHECK FOR INTERMITTENT PROBLEMS (See HOW TO PROCEED WITH TROUBLESHOOTING)

2. INSPECT POWER STEERING ECU (TRQV VOLTAGE)

- a. Turn the ignition switch to ON.
- b. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

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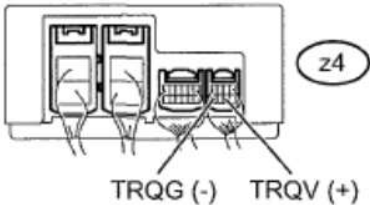
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Tester Connection	Switch Condition	Specified Condition
z4-6 (TRQV) - z4-8 (TRQG)	Ignition switch ON	7.5 to 8.5 V

NG: REPLACE POWER STEERING ECU (See **REMOVAL**)

Component with harness connected:
(Power Steering ECU)



C162259E04

Fig. 13: Identifying Z4 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. INSPECT STEERING COLUMN ASSEMBLY (TORQUE SENSOR)
- a. Turn the ignition switch to ON.

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

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
z4-5 (TRQ1) - z4-8 (TRQG)	Ignition switch ON and steering wheel not turned (without load)	2.3 to 2.7 V
	Ignition switch ON and steering wheel turned to right with vehicle stopped	2.5 to 4.7 V
	Ignition switch ON and steering wheel turned to left with vehicle stopped	0.3 to 2.5 V
z4-7 (TRQ2) - z4-8 (TRQG)	Ignition switch ON and steering wheel not turned (without load)	2.3 to 2.7 V
	Ignition switch ON and steering wheel turned to right with vehicle stopped	2.5 to 4.7 V
	Ignition switch ON and steering wheel turned to left	

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with vehicle stopped

0.3 to 2.5 V

Component with harness connected:
(Power Steering ECU)

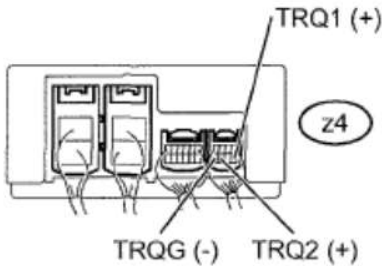


Fig. 14: Identifying Z4, TRQ1, TRQG And TRQ2 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPLACE STEERING COLUMN ASSEMBLY (See **REMOVAL**)

OK : REPLACE POWER STEERING ECU (See **REMOVAL**)

DTC C1515/15 TORQUE SENSOR ZERO POINT ADJUSTMENT IS NOT INITIALIZED

DESCRIPTION

This DTC does not indicate a malfunction. The power steering ECU outputs this DTC when it determines that the torque sensor zero point calibration has not been performed.

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1515/15	Torque sensor zero point calibration not performed.	• Torque sensor zero point calibration not performed • Steering column assembly

INSPECTION PROCEDURE

1. **PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR)**

a. Perform torque sensor zero point calibration (See **CALIBRATION**).
2. **CONFIRM DTC**

a. Check for DTCs.

Result

2008 Scion xD**2008 STEERING Power Steering - xD****RESULT REFERENCE**

Result	Proceed to
DTC still output even after performing torque sensor zero point calibration.	A
Normal system code output.	B

B : END**A: Go to Next Step****3. PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR)**

- a. Perform torque sensor zero point calibration again (See **CALIBRATION**).

4. CONFIRM DTC

- a. Check for DTCs.

Result**RESULT REFERENCE**

Result	Proceed to
DTC still output even after performing torque sensor zero point calibration twice.	A
Normal system code output.	B

B : END**A: Go to Next Step****5. PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR)**

- a. Perform torque sensor zero point calibration again (See **CALIBRATION**).

6. CONFIRM DTC

- a. Check for DTCs.

Result**RESULT REFERENCE**

Result	Proceed to
DTC still output even after performing torque sensor zero point calibration 3 times.	A
Normal system code output.	B

HINT:

The steering column assembly must be replaced if C1515/15 is still output even after the torque sensor zero point calibration is performed 3 times.

B : END

2008 Scion xD

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A : REPLACE STEERING COLUMN ASSEMBLY (See REMOVAL)**DTC C1516/16 TORQUE SENSOR ZERO POINT ADJUSTMENT INCOMPLETE****DESCRIPTION**

This DTC does not indicate a malfunction. The power steering ECU outputs this DTC when it determines that the torque sensor zero point calibration has not been completed successfully.

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1516/16	Torque sensor zero point calibration not completed successfully.	• Torque sensor zero point calibration failure • Steering column assembly

INSPECTION PROCEDURE

1. **CLEAR DTC**
 - a. Clear the DTC (See DTC CHECK / CLEAR).
2. **PERFORM INITIALIZATION (TORQUE SENSOR ZERO POINT)**
 - a. Perform initialization (See CALIBRATION).
3. **PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR)**
 - a. Perform torque sensor zero point calibration (See CALIBRATION).
4. **CONFIRM DTC**
 - a. Check for DTCs.

Result**RESULT REFERENCE**

Result	Proceed to
DTC still output even after performing torque sensor zero point calibration once.	A
Normal system code output.	B

B : END**A: Go to Next Step**

5. **CLEAR DTC**
 - a. Clear the DTC (See DTC CHECK / CLEAR).
6. **PERFORM INITIALIZATION**
 - a. Perform initialization again (See CALIBRATION).
7. **PERFORM ZERO POINT CALIBRATION**

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- a. Perform torque sensor zero point calibration again (See **CALIBRATION**).

8. CONFIRM DTC

- a. Check for DTCs.

Result**RESULT REFERENCE**

Result	Proceed to
DTC still output even after performing torque sensor zero point calibration twice.	A
Normal system code output.	B

B : END**A: Go to Next Step****9. CLEAR DTC**

- a. Clear the DTC (See **DTC CHECK / CLEAR**).

10. PERFORM INITIALIZATION

- a. Perform initialization again (See **CALIBRATION**).

11. PERFORM ZERO POINT CALIBRATION

- a. Perform torque sensor zero point calibration again (See **CALIBRATION**).

12. CONFIRM DTC

- a. Check for DTCs.

Result**RESULT REFERENCE**

Result	Proceed to
DTC still output even after performing torque sensor zero point calibration 3 times.	A
Normal system code output.	B

HINT:

The steering column assembly must be replaced if C1516/16 is still output even after the torque sensor zero point calibration is performed 3 times.

B : END**A : REPLACE STEERING COLUMN ASSEMBLY (See **REMOVAL**)****DTC C1524/24 MOTOR CIRCUIT MALFUNCTION****DESCRIPTION**

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The power steering ECU supplies the current to the power steering motor through the motor circuit.

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1524/24	Short (or open) in motor circuit or abnormal voltage or current in motor circuit.	- Steering column assembly - Power steering ECU

WIRING DIAGRAM

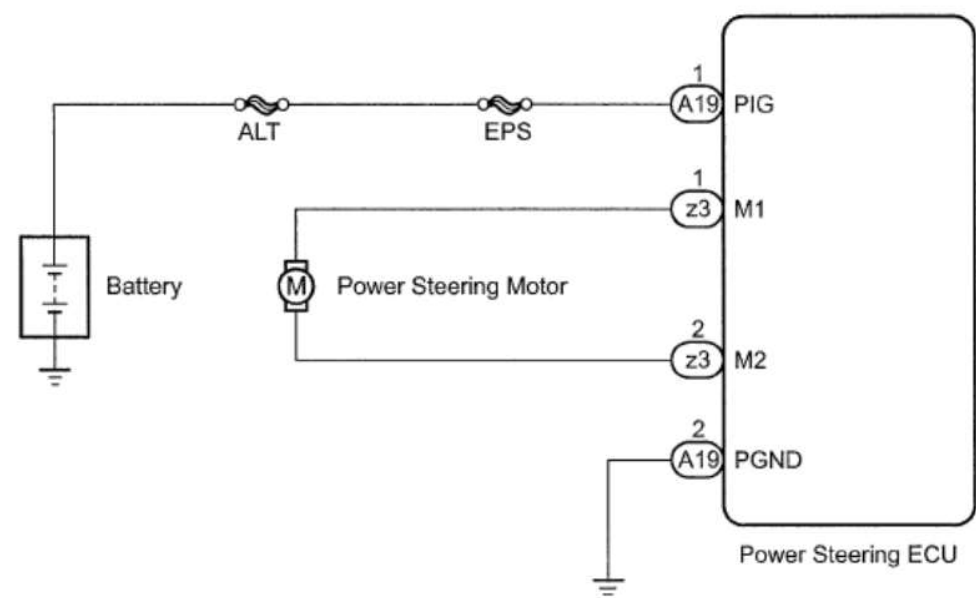


Fig. 15: Power Steering Motor And Power Steering ECU - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. **READ VALUE USING TECHSTREAM (MOTOR ACTUAL CURRENT AND COMMAND VALUE CURRENT)**
 - a. Connect a Techstream to the DLC3.
 - b. Turn the ignition switch to ON.
 - c. Turn the Techstream on.
 - d. Enter the following menus: Chassis / EMPS / Data List.
 - e. Select the item "Motor Actual Current" and "Command Value Current" in the Data List and read the value displayed on the Techstream.

2008 Scion xD**2008 STEERING Power Steering - xD****Standard current****STANDARD CURRENT REFERENCE**

Data List Item	Steering Position (Left Turned)	Steering Position (Center)	Steering Position (Right Turned)
Motor Actual Current	10 A to 55 A	-1 A to +1 A	-55 A to -10 A
Command Value Current	55 A	0 A	-55 A

HINT:

The current changes when steering wheel is turned.

NG: Go to step 2

OK : CHECK FOR INTERMITTENT PROBLEMS (See **HOW TO PROCEED WITH TROUBLESHOOTING**)

2. INSPECT POWER STEERING ECU

- Turn the ignition switch to ON.
- Measure the voltage according to the value(s) in the table below.

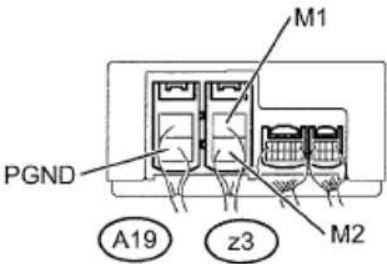
Standard voltage**VOLTAGE SPECIFICATION**

Tester Connection	Condition	Specified Condition
z3-1 (M1) - A19-2 (PGND)	Ignition switch ON and steering wheel turned to right	Below 1 V
z3-1 (M1) - A19-2 (PGND)	Ignition switch ON and steering wheel turned to left	11 to 14 V
z3-2 (M2) - A19-2 (PGND)	Ignition switch ON and steering wheel turned to right	11 to 14 V
z3-2 (M2) - A19-2 (PGND)	Ignition switch ON and steering wheel turned to left	Below 1 V

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Component with harness connected:
(Power Steering ECU)



C162259E06

Fig. 16: Identifying A19 And Z3 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT REFERENCE

Result	Proceed to
NG	A
OK	B

B: Go to step 4

A: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - BATTERY AND BODY GROUND)**
- a. Disconnect the connector from the power steering ECU.
 - b. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
A19-1 (PIG) - Body ground	Always	11 to 14 V

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

Standard resistance

RESISTANCE REFERENCE

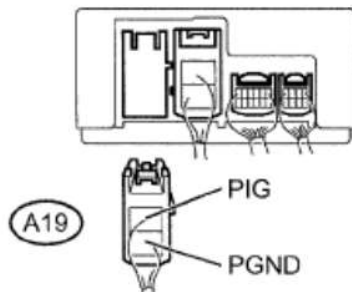
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Tester Connection	Condition	Specified Condition
A19-2 (PGND) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Rear view of wire harness connector:
(to Power Steering ECU)



C162260E02

Fig. 17: Identifying A19, PIG And PGND Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

4. INSPECT STEERING COLUMN ASSEMBLY (POWER STEERING MOTOR)

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

Standard resistance

RESISTANCE REFERENCE

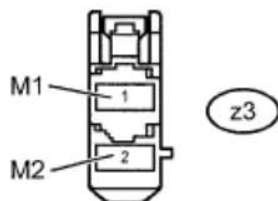
Tester Connection	Condition	Specified Condition
z3-1 (M1) - z3-2 (M2)	Always	0.08 to 0.15 ohms
z3-1 (M1) - Body ground	Always	1 Mohms or higher
z3-2 (M2) - Body ground	Always	1 Mohms or higher

NG: REPLACE STEERING COLUMN ASSEMBLY (See REMOVAL)

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



C162261E02

Fig. 18: Identifying M1 And M2 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK : REPLACE POWER STEERING ECU (See REMOVAL)

DTC C1531/31 EPS ECU CIRCUIT MALFUNCTION; DTC C1532/32 EPS ECU CIRCUIT MALFUNCTION; DTC C1533/33 EPS ECU CIRCUIT MALFUNCTION; DTC C1534/34 EPS ECU CIRCUIT MALFUNCTION; DTC C1535/35 STEERING WHEEL LOCATION DATA ERROR

DESCRIPTION

The fail-safe function operates to stop power assist when DTCs indicating ECU malfunctions are output. However, the power assist operation continues when DTC C1534/34 is output because it indicates an EEPROM error in the ECU.

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1531/31	ECU internal malfunction (CPU malfunction)	Power steering ECU
C1532/32	ECU internal malfunction (Peripheral circuit malfunction)	
C1533/33	ECU internal malfunction (Substrate temperature sensor malfunction)	
C1534/34	ECU internal malfunction (EEPROM error)	
C1535/35	Steering wheel location data error (LHD or RHD)	

INSPECTION PROCEDURE

1. CONFIRM DTC

- Check for DTCs.

OK: DTCs other than C1531/31, C1532/32, C1533/33, C1534/34 and C1535/35 are not output.

NG: REPAIR CIRCUITS INDICATED BY OUTPUT DTCs (See DIAGNOSTIC TROUBLE

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CODE CHART)

OK : REPLACE POWER STEERING ECU (See REMOVAL)

DTC C1551/51 IG POWER SOURCE CIRCUIT MALFUNCTION

DESCRIPTION

The power steering ECU distinguishes the ignition switch status as ON or OFF through the IG power source circuit.

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1551/51	Open or short in IG power source circuit with ignition switch ON.	- ECU-IG fuse - IG power source circuit - Power steering ECU

WIRING DIAGRAM

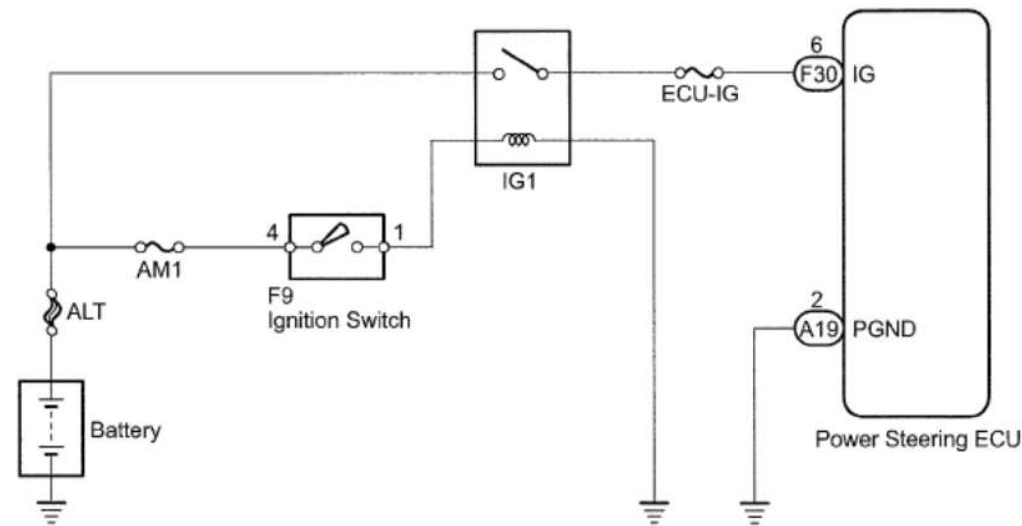


Fig. 19: Ignition Switch And Power Steering ECU - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

- 1. READ VALUE USING TECHSTREAM (IG POWER SUPPLY)

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- a. Connect a Techstream to the DLC3.
- b. Turn the ignition switch to ON.
- c. Turn the Techstream on.
- d. Enter the following menus: Chassis / EMPS / Data List.
- e. Select the item "IG Power Supply" in the Data List and read the value displayed on the Techstream.

EMPS**DATA LIST REFERENCE**

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
IG Power Supply	ECU power source voltage: Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Ignition switch ON	-

OK: The normal condition value is displayed on the Techstream.

NG: Go to step 2

OK : CHECK FOR INTERMITTENT PROBLEMS (See **HOW TO PROCEED WITH TROUBLESHOOTING**)

2. INSPECT FUSE (ECU-IG)

- a. Remove the ECU-IG fuse from the main body ECU.
- b. Measure the resistance according to the value(s) in the table below.

Standard resistance**RESISTANCE REFERENCE**

Tester Connection	Condition	Specified Condition
ECU-IG fuse	Always	Below 1 ohms

NG: CHECK FOR SHORT IN ALL HARNESSES AND CONNECTORS CONNECTED TO FUSE AND REPLACE FUSE

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Main Body ECU:

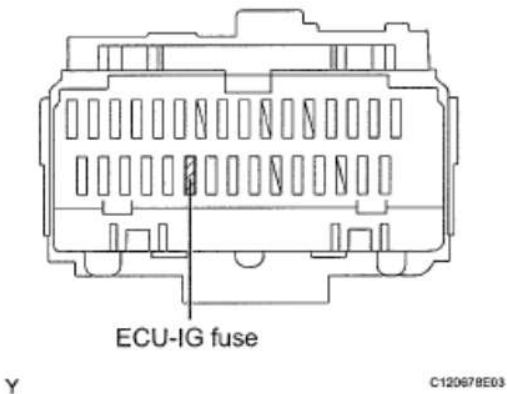


Fig. 20: Identifying ECU-IG Fuse From Main Body ECU
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - BODY GROUND)**
- a. Disconnect the connectors from the power steering ECU.
 - b. Measure the voltage according to the value(s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
F30-6 (IG) - Body ground	Ignition switch ON	11 to 14 V

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

Standard resistance

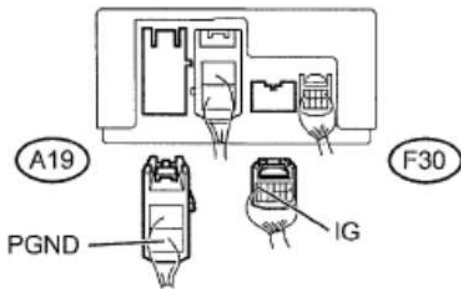
RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
A19-2 (PGND) - Body ground	Always	Below 1 ohms

2008 Scion xD

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Rear view of wire harness connector:
(to Power Steering ECU)



C162292E02

Fig. 21: Identifying A19 And F30 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK : REPLACE POWER STEERING ECU (See REMOVAL)

DTC C1552/52 PIG POWER SOURCE CIRCUIT; DTC C1553/53 WHEN RESETTING VOLTAGE, VEHICLE IS BEING DRIVEN; DTC C1554/54 EPS RELAY CIRCUIT; DTC C1555/55 EPS MOTOR RELAY CIRCUIT

DESCRIPTION

When a problem occurs in the system, the power source relay circuit and the motor relay circuit are shut off to stop the power assist. The ECU must be replaced when there is a problem with the relays because each relay is built into the ECU.

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1552/52	PIG power source circuit malfunction	• EPS fuse • PIG power source circuit • Power steering ECU
C1553/53	Abnormal over voltage	• IG and PIG power source circuits • Power steering ECU
C1554/54	Power source relay circuit malfunction	• EPS fuse • PIG power source circuit • Power steering ECU
C1555/55	Motor relay circuit malfunction	• Power steering ECU

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-
- Steering column assembly (Power steering motor)

WIRING DIAGRAM

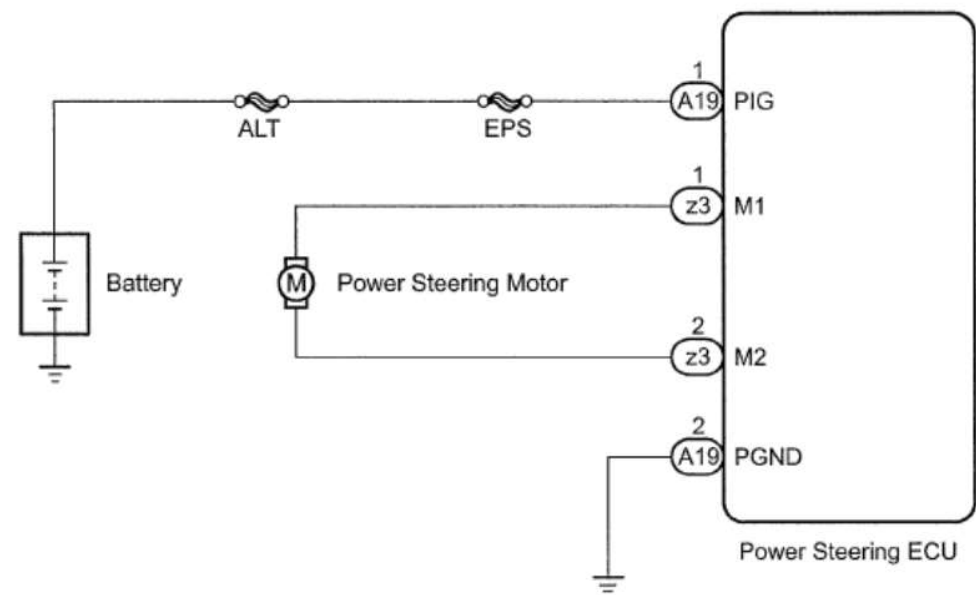


Fig. 22: Power Steering ECU And Power Steering Motor - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

- 1. READ VALUE USING TECHSTREAM (PIG POWER SUPPLY)**
 - Connect a Techstream to the DLC3.
 - Turn the ignition switch to ON.
 - Turn the Techstream on.
 - Enter the following menus: Chassis / EMPS / Data List.
 - Select the item "PIG Power Supply" in the Data List and read the value displayed on the Techstream.

EMPS:

DATA LIST REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
PIG Power Supply	Power source voltage to activate motor: Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Always	-

2008 Scion xD

2008 STEERING Power Steering - xD

OK: The normal condition value is displayed on the Techstream.

NG: Go to step 2

OK : CHECK FOR INTERMITTENT PROBLEMS (See HOW TO PROCEED WITH TROUBLESHOOTING)

2. **INSPECT FUSE (EPS FUSE)**

- a. Remove the EPS fuse from the engine room relay block.
- b. Measure the resistance according to the value(s) in the table below.

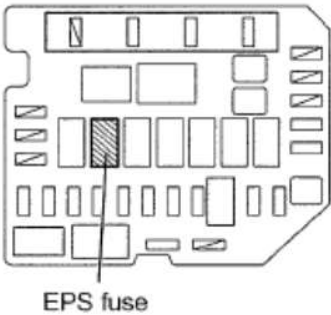
Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
EPS fuse	Always	Below 1 ohms

NG: CHECK FOR SHORT IN ALL HARNESSES AND CONNECTORS CONNECTED TO FUSE AND REPLACE FUSE

Engine Room Relay Block:



C117909E02

Fig. 23: Identifying EPS Fuse
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - BATTERY AND BODY GROUND)**

- a. Disconnect the connector from the power steering ECU.
- b. Measure the voltage according to the value(s) in the table below.

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Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
A19-1 (PIG) - Body ground	Always	11 to 14 V

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

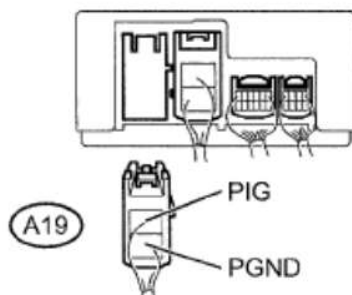
Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
A19-2 (PGND) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Rear view of wire harness connector:
(to Power Steering ECU)



C162260E02

Fig. 24: Identifying A19, PIG And PGND Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

4. INSPECT STEERING COLUMN ASSEMBLY (POWER STEERING MOTOR)

- Disconnect the connector from the power steering ECU.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

RESISTANCE REFERENCE

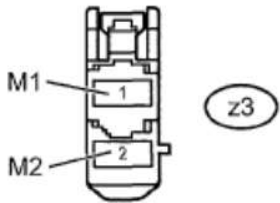
Tester Connection	Condition	Specified Condition
z3-1 (M1) - z3-2 (M2)	Always	0.08 to 0.15 ohms

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z3-1 (M1) - Body ground	Always	1 Mohms or higher
z3-2 (M2) - Body ground	Always	1 Mohms or higher

NG: REPLACE STEERING COLUMN ASSEMBLY (See REMOVAL)

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



C162261E02

Fig. 25: Identifying M1 And M2 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK : REPLACE POWER STEERING ECU (See REMOVAL)

DTC C1581/81 ASSIST MAP UN-WRITING

DESCRIPTION

The power steering ECU outputs this DTC when it determines that the assist map is not written in the ECU.

The power steering ECU must be replaced when this DTC is output because this malfunction cannot be repaired.

HINT:

The assist map data is written in the power steering ECU to control assisting power. The assist map is selected from five types based on the vehicle specification communication data (designation and grade package information).

DTC DESCRIPTION

DTC No.	DTC Detection Condition	Trouble Area
C1581/81	Assist map not written in power steering ECU	• CAN communication system • Power steering ECU • ECM

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INSPECTION PROCEDURE

NOTE: If replacing the power steering ECU, initialize and calibrate the torque sensor zero point (See CALIBRATION).

1. PERFORM ASSIST MAP WRITING

- a. Connect a Techstream to the DLC3.
- b. Turn the ignition switch to ON.
- c. Turn the Techstream on.
- d. Set the Techstream to Test Mode (select "Signal Check").

HINT:

Refer to the Techstream operator's manual for further details.

- e. Wait for 5 seconds or more.

HINT:

Assist map is automatically written when approximately 5 seconds have elapsed after setting the Techstream to Test Mode. DTC C1581/81 will be cleared after the assist map is written.

- f. Check for DTCs (See DTC CHECK / CLEAR).

OK: DTC C1581/81 is not output.

NG: Go to step 2

OK : END

2. CHECK CAN COMMUNICATION SYSTEM

- a. Check for DTCs of the CAN communication system (See DIAGNOSIS SYSTEM).

OK: DTCs are not output.

NG: GO TO CAN COMMUNICATION SYSTEM (See HOW TO PROCEED WITH TROUBLESHOOTING)

OK: Go to Next Step

3. CHECK ECM

- a. Check if a qualified ECM is installed.

OK: A qualified ECM is installed.

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NG: REPLACE ECM

OK : REPLACE POWER STEERING ECU

DTC U0100/92 LOST COMMUNICATION WITH ECM/PCM "A"; DTC U0129/93 LOST COMMUNICATION WITH BRAKE SYSTEM CONTROL MODULE

DESCRIPTION

The power steering ECU receives signals from the ECM and the skid control ECU via the CAN communication system.

DTC DESCRIPTION

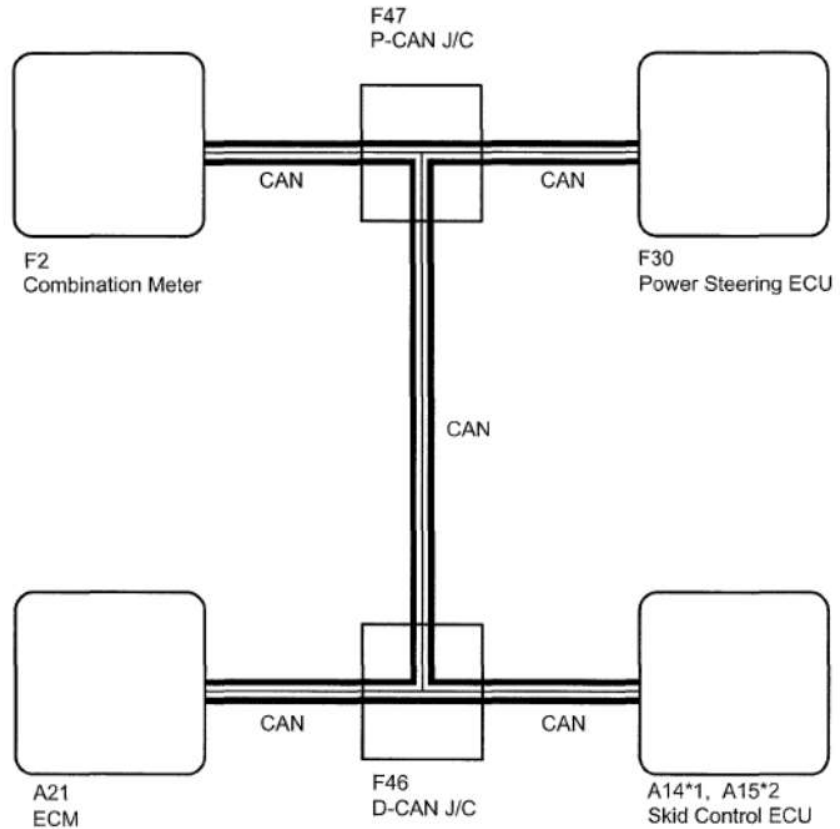
DTC No.	DTC Detection Condition	Trouble Area
U0100/92	ECM communication error	• CAN communication system • ECM
U0129/93	Skid control ECU communication error	• CAN communication system • Skid control ECU

HINT:

When two or more DTCs starting with [U] are output simultaneously, inspect the connectors and wire harness of each ECU.

WIRING DIAGRAM

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*1: w/o Vehicle Stability Control System

*2: w/ Vehicle Stability Control System

C100930E02

Fig. 26: Power Steering ECU And Combination Meter - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. RECONFIRM DTC

- Clear the DTCs (See **DTC CHECK / CLEAR**).
- Check for DTCs.

OK: DTC U0100/92 and/or U0129/93 is not output.

NG: GO TO CAN COMMUNICATION SYSTEM (See **HOW TO PROCEED WITH TROUBLESHOOTING**)

OK : CHECK FOR INTERMITTENT PROBLEMS (See **HOW TO PROCEED WITH TROUBLESHOOTING**)

EPS WARNING LIGHT CIRCUIT

2008 Scion xD**2008 STEERING Power Steering - xD****DESCRIPTION**

If the power steering ECU detects a malfunction, the PS warning light comes on. At this time, the power steering ECU stores a DTC in its memory.

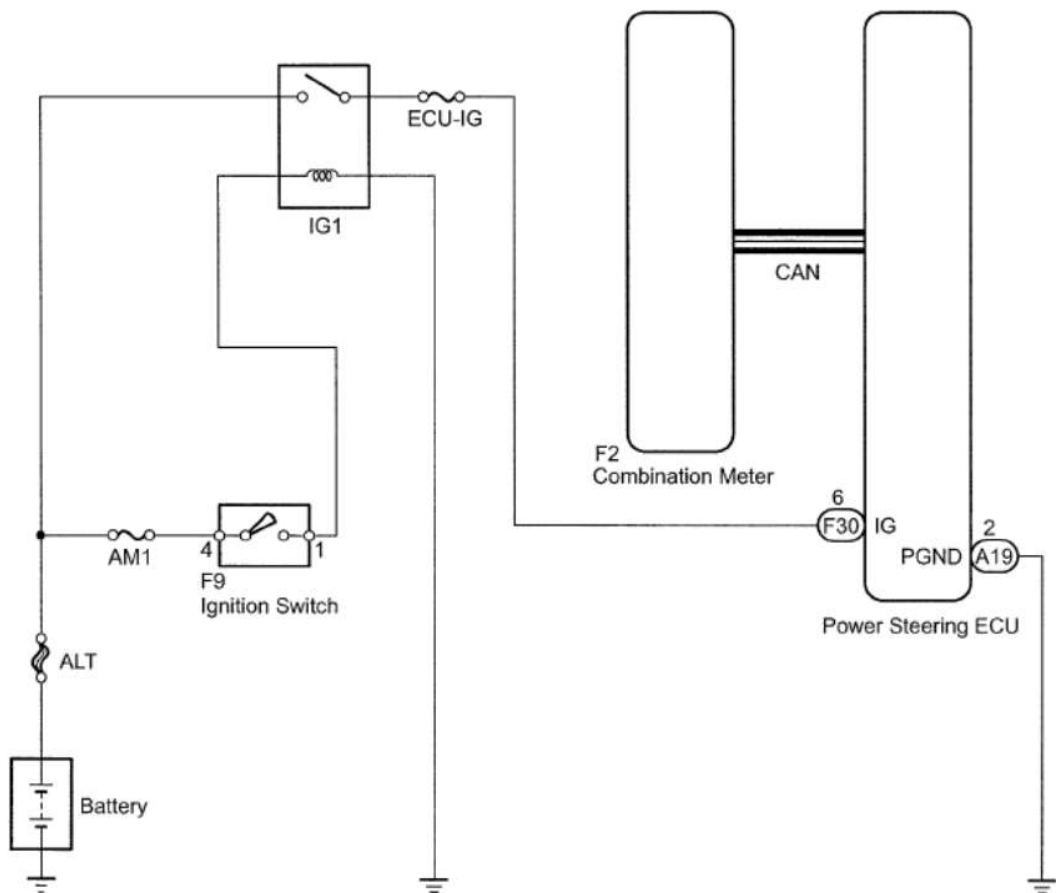
WIRING DIAGRAM

Fig. 27: Ignition Switch And Combination Meter - Wiring Diagram

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

INSPECTION PROCEDURE**1. INSPECT CAN COMMUNICATION SYSTEM**

- Using a Techstream, check for DTCs and confirm that there are no problems in the CAN communication system.

OK: DTCs are not output.

NG: GO TO CAN COMMUNICATION SYSTEM (See HOW TO PROCEED WITH

2008 Scion xD**2008 STEERING Power Steering - xD****TROUBLESHOOTING)****OK: Go to Next Step****2. READ VALUE USING TECHSTREAM (IG POWER SUPPLY)**

- a. Connect a Techstream to the DLC3.
- b. Turn the ignition switch to ON.
- c. Turn the Techstream on.
- d. Enter the following menus: Chassis / EMPS / Data List.
- e. Select the item "IG Power Supply" in the Data List and read the value displayed on the Techstream.

EMPS:**DATA LIST REFERENCE**

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
IG Power Supply	ECU power source voltage: Minimum: 0 V, Maximum: 20.1531 V	11 to 14 V: Ignition switch ON	-

OK: The normal condition value is displayed on the Techstream.**HINT:**

If the voltage is not standard value, inspect the IG power source circuit (See **DTC C1551/51 IG POWER SOURCE CIRCUIT MALFUNCTION**).

NG: INSPECT IG POWER SOURCE CIRCUIT (See **DTC C1551/51 IG POWER SOURCE CIRCUIT MALFUNCTION**)

OK: Go to Next Step**3. CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - BATTERY AND BODY GROUND)**

- a. Disconnect the connectors from the power steering ECU.
- b. Measure the voltage according to the value(s) in the table below.

Standard voltage**VOLTAGE SPECIFICATION**

Tester Connection	Switch Condition	Specified Condition
F30-6 (IG) - Body ground	Ignition switch ON	11 to 14 V

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

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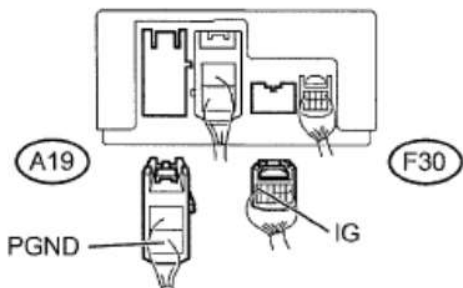
2008 STEERING Power Steering - xD

Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
A19-2 (PGND) - Body ground	Always	Below 1 ohms

Rear view of wire harness connector:
(to Power Steering ECU)



C162262E02

Fig. 28: Identifying A19 And F30 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: Go to Next Step

4. REPLACE POWER STEERING ECU
- a. Replace the power steering ECU (See **REMOVAL**).

NOTE: After replacing the power steering ECU, perform the torque sensor zero point calibration (See **CALIBRATION**).

5. CHECK PS WARNING LIGHT (COMBINATION METER)
- a. Check that the PS warning light comes on for 3 seconds after the ignition switch is turned to ON.

OK: The PS warning light operates normally.

NG: REPLACE COMBINATION METER (See **REMOVAL**)

OK : END

TS AND CG TERMINAL CIRCUIT

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DESCRIPTION

The power steering ECU can be changed from normal mode to the mode for the torque sensor zero point calibration by turning the ignition switch to ON after the DLC3 TS and CG terminals have been connected.

WIRING DIAGRAM

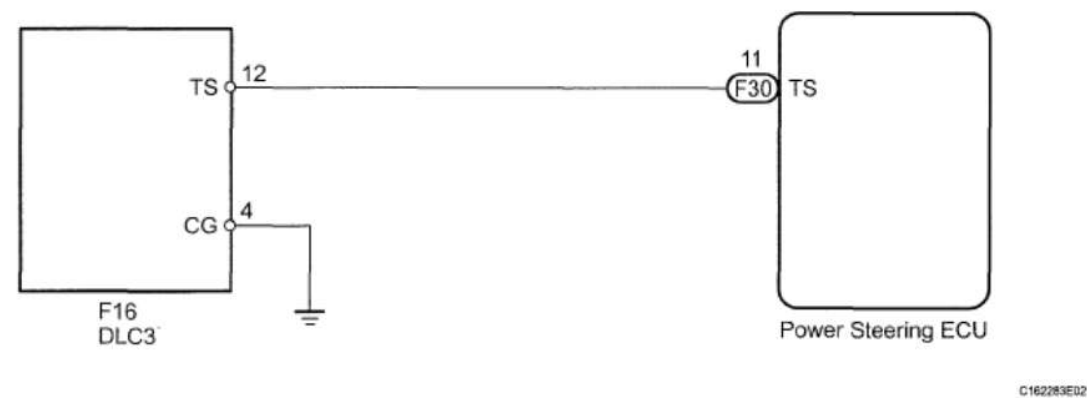


Fig. 29: Power Steering ECU And DLC3 - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT DLC3 TERMINAL VOLTAGE
- a. Turn the ignition switch to ON.

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

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
F16-12 (TS) - F16-4 (CG)	Ignition switch ON	11 to 14 V

NG: Go to step 2

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Front view of DLC3:

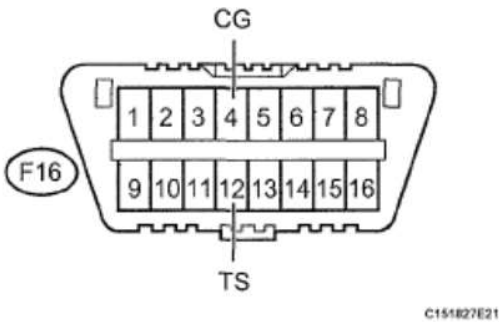


Fig. 30: Identifying F16 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

2. **CHECK HARNESS AND CONNECTOR (DLC3 - BODY GROUND)**
- a. Measure the resistance according to the value(s) in the table below.

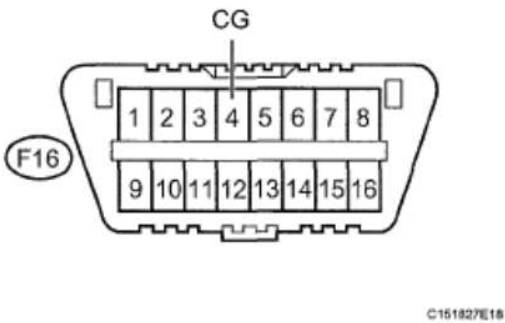
Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
F16-4 (CG) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of DLC3:



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2008 STEERING Power Steering - xD

Fig. 31: Identifying F16 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - DLC3)**
- a. Disconnect the connector from the power steering ECU.
 - b. Measure the resistance according to the value(s) in the table below.

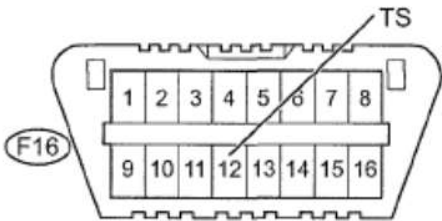
Standard resistance

RESISTANCE REFERENCE

Tester Connection	Condition	Specified Condition
F30-11 (TS) - F16-12 (TS)	Always	Below 1 ohms
F30-11 (TS) - Body ground	Always	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of DLC3:



Rear view of wire harness connector:
(to Power Steering ECU)

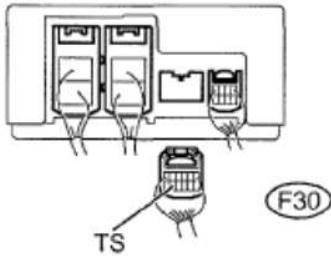


Fig. 32: Identifying F16 And F30 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK : REPLACE POWER STEERING ECU (See REMOVAL)

POWER STEERING GEAR

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COMPONENTS

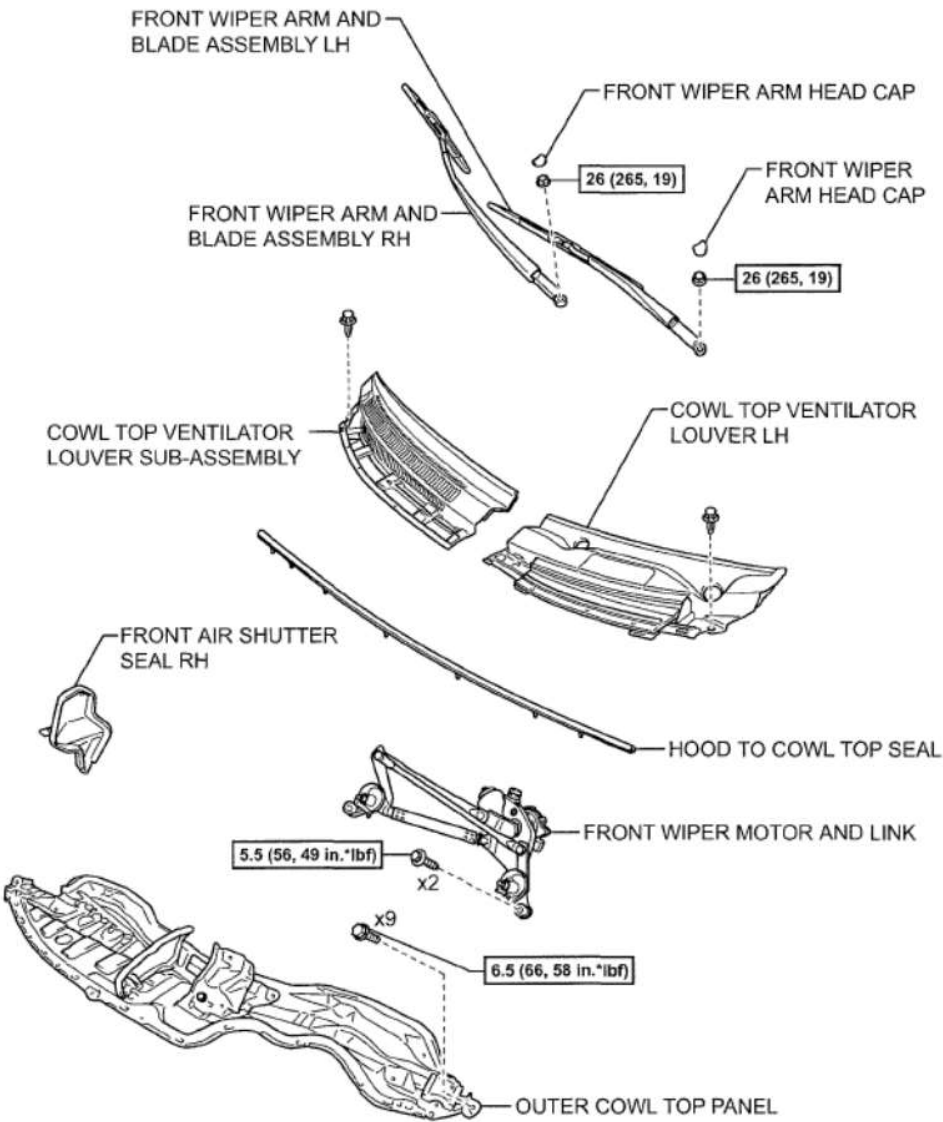


Fig. 33: Identifying Power Steering Gear Components With Torque Specifications (1 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

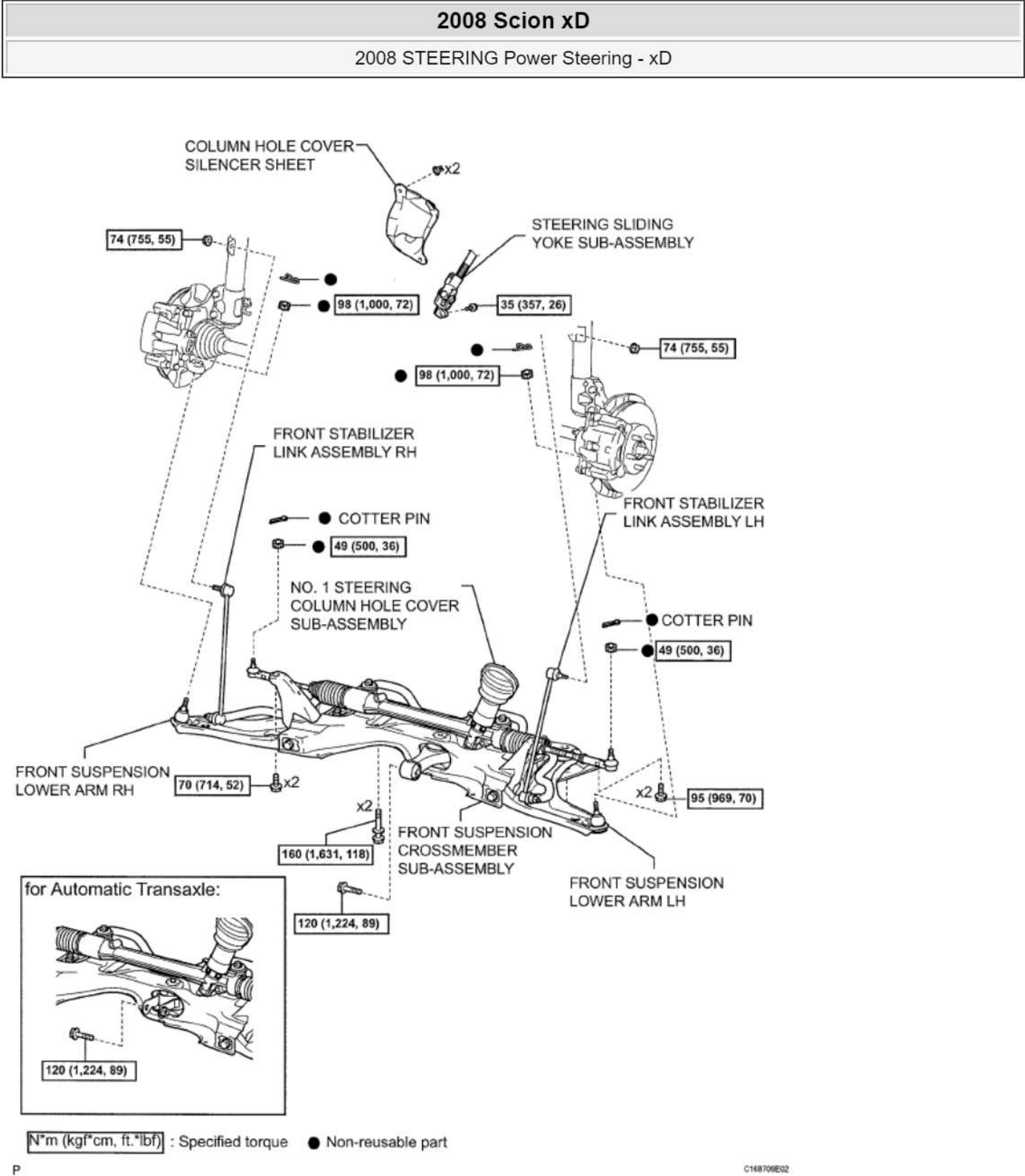
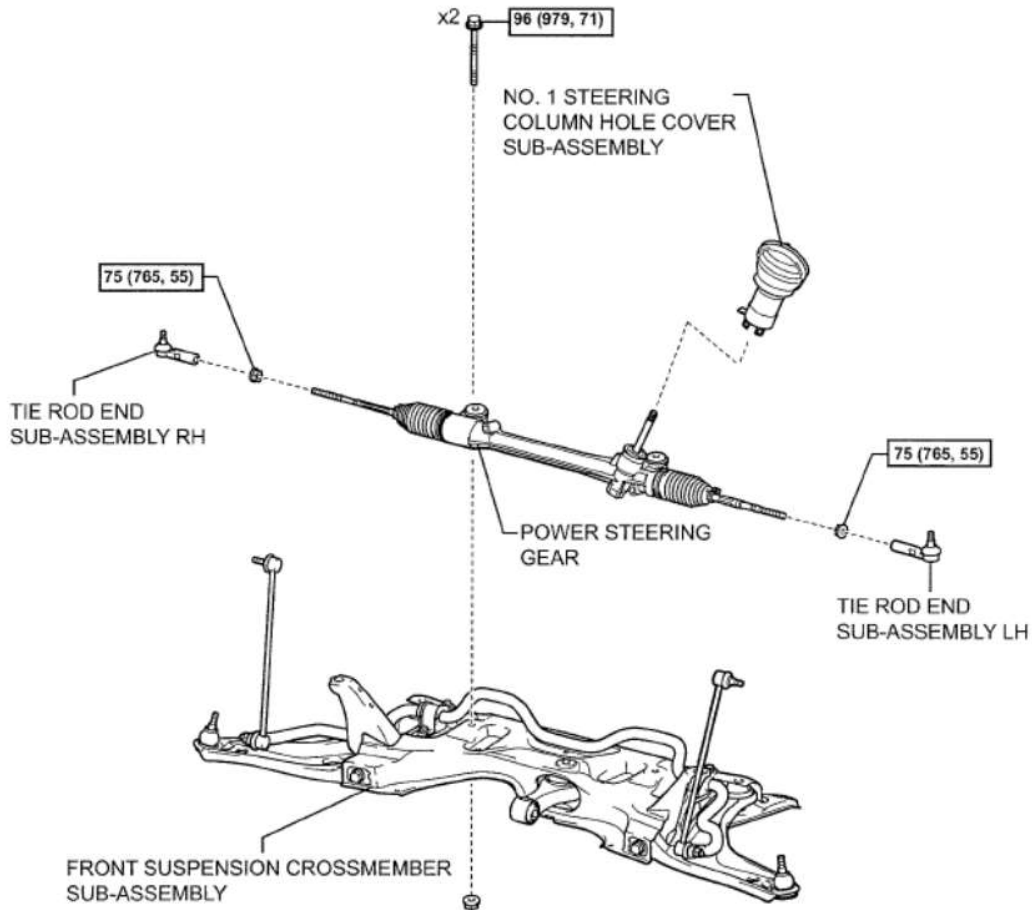


Fig. 34: Identifying Power Steering Gear Components With Torque Specifications (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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$\boxed{\text{N}^*\text{m (kgf}^*\text{cm, ft.}^*\text{lb)}} : \text{Specified torque}$

P

C168710E01

Fig. 35: Identifying Power Steering Gear Components With Torque Specifications (3 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. POSITION FRONT WHEELS FACING STRAIGHT AHEAD
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL
3. REMOVE FRONT WIPER ARM HEAD CAP (See REMOVAL)
4. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH (See REMOVAL)
5. REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH (See REMOVAL)

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2008 STEERING Power Steering - xD

6. **REMOVE HOOD TO COWL TOP SEAL** (See REMOVAL)
7. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See REMOVAL)
8. **REMOVE COWL TOP VENTILATOR LOUVER LH** (See REMOVAL)
9. **REMOVE FRONT WIPER MOTOR AND LINK** (See REMOVAL)
10. **REMOVE FRONT AIR SHUTTER SEAL RH** (See REMOVAL)
11. **REMOVE OUTER COWL TOP PANEL** (See REMOVAL)
12. **REMOVE COLUMN HOLE COVER SILENCER SHEET**
 - a. Remove the floor carpet and 2 clips and remove the column hole cover silencer.

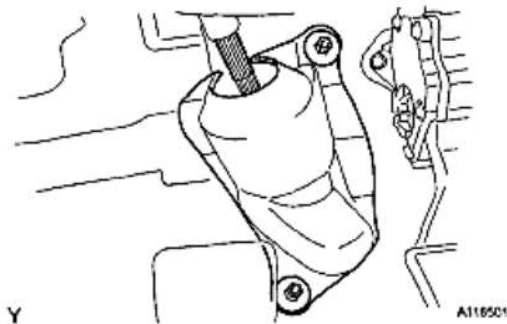


Fig. 36: Identifying Column Hole Cover Silencer Sheet
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **REMOVE STEERING SLIDING YOKE SUB-ASSEMBLY**
 - a. Use a seat belt to fix the steering wheel assembly in place, in order to avoid breaking of the spiral cable.

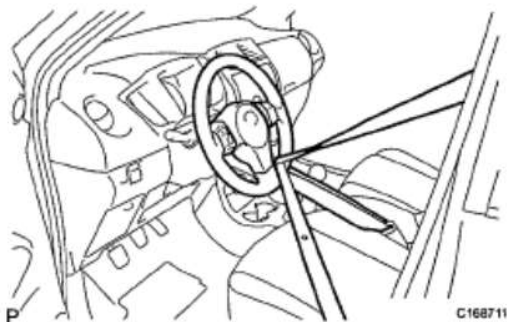


Fig. 37: Identifying Steering Sliding Yoke Sub-Assembly
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Place matchmarks on the sliding yoke of the steering intermediate shaft assembly and the power steering.

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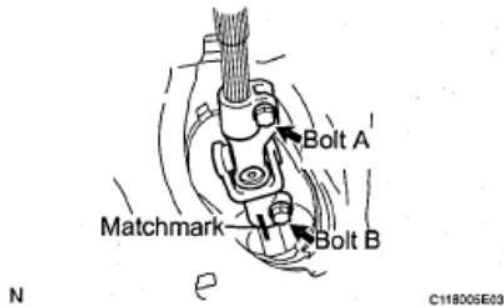


Fig. 38: Locating Matchmarks On Sliding Yoke Of Steering Intermediate Shaft Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Loosen bolt A, remove bolt B and separate the steering intermediate shaft assembly.

14. REMOVE NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY

a. Remove clip A, separate clip B from the body and separate steering column hole cover No. 1.

NOTE: Do not damage clip B.

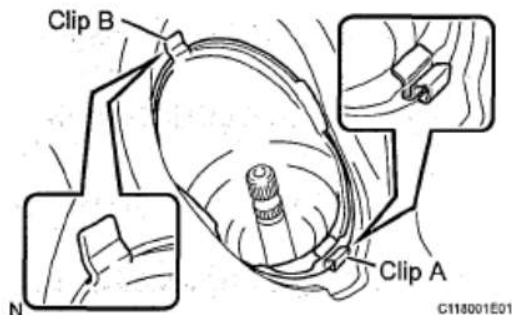


Fig. 39: Identifying Steering Column Hole Cover Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. REMOVE FRONT WHEEL

16. SEPARATE TIE ROD END SUB-ASSEMBLY LH (See REMOVAL)

17. SEPARATE TIE ROD END SUB-ASSEMBLY RH

HINT:

Use the same procedure for the RH side as for the LH side.

18. SEPARATE FRONT STABILIZER LINK ASSEMBLY LH (See REMOVAL)

19. SEPARATE FRONT STABILIZER LINK ASSEMBLY RH

HINT:

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Use the same procedure for the RH side as for the LH side.

20. **REMOVE FRONT SUSPENSION LOWER ARM LH** (See **REMOVAL**)
21. **REMOVE FRONT SUSPENSION LOWER ARM RH**

HINT:

Use the same procedure for the RH side as for the LH side.

22. **SUSPEND ENGINE ASSEMBLY (for 2ZR-FE)**
 - a. Remove the bolt and remove the wire harness clamp bracket.
 - b. Install the engine hanger with the bolt in the position shown in the illustration.

Part No.:

No. 1 engine hanger : 12281-37020

No. 2 engine hanger: 12282-37010

Bolt: 91552-81050

Torque: 43 N*m (439 kgf*cm, 32 ft.*lbf)

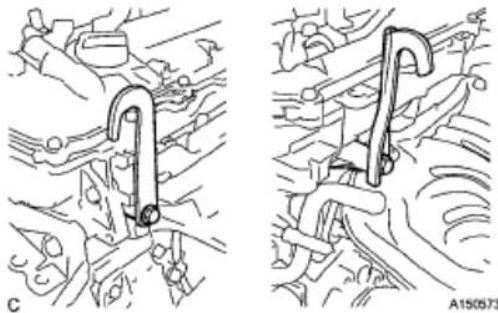


Fig. 40: Identifying Wire Harness Clamp Bracket Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using an engine sling device and a chain block, support the engine assembly.
23. **REMOVE FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY**
 - a. Remove the bolt and separate the engine moving control rod.

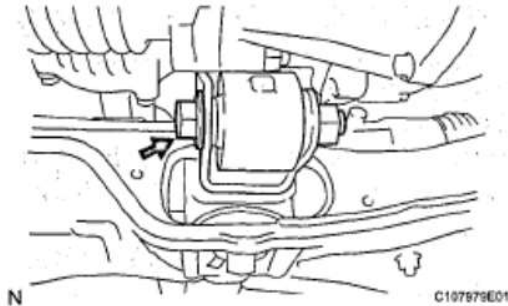
2008 Scion xD**2008 STEERING Power Steering - xD**

Fig. 41: Locating Engine Moving Control Rod Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Support the front suspension crossmember with a transmission jack.
- c. Remove the 6 bolts and remove the suspension crossmember.

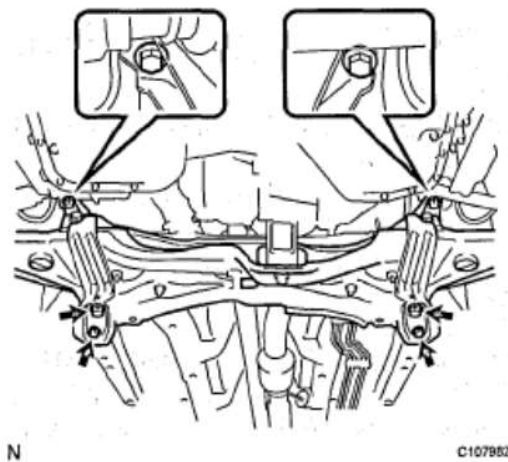


Fig. 42: Locating Suspension Crossmember Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. REMOVE POWER STEERING GEAR

- a. Remove the 2 bolts and 2 nuts and remove the power steering gear from the suspension crossmember.

NOTE: Keep the nut from rotating while turning the bolt.

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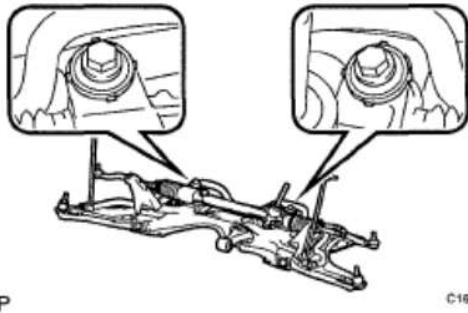


Fig. 43: Identifying Power Steering Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. SECURE POWER STEERING GEAR

- Using SST, secure the steering gear in a vise.

SST 09612-00012

HINT:

Tape SST before use.

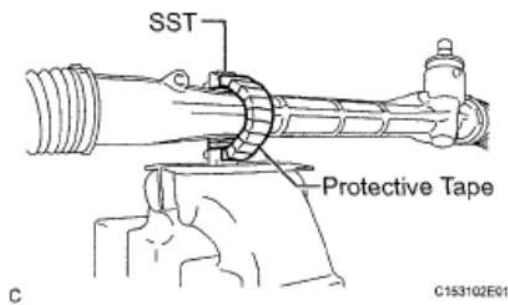


Fig. 44: Identifying Power Steering Gear With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. REMOVE TIE ROD END SUB-ASSEMBLY LH

- Put matchmarks on the tie rod end sub-assembly LH and steering gear.

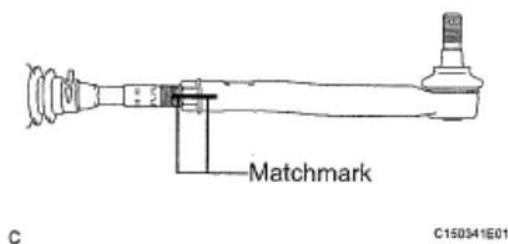


Fig. 45: Identifying Matchmarks On Tie Rod End Sub-Assembly LH And Steering Gear

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

- b. Remove the tie rod end sub-assembly LH and lock nut.

27. REMOVE TIE ROD END SUB-ASSEMBLY RH

HINT:

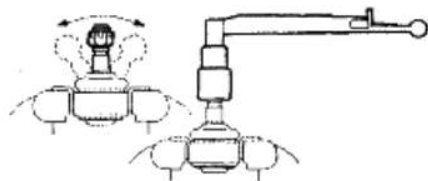
Perform the same procedure as for the LH side.

INSPECTION

1. INSPECT TIE ROD END SUB-ASSEMBLY LH

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

NOTE: Do not overtighten the vise.



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Fig. 46: Inspecting Tie Rod End Sub-Assembly LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the nut onto the stud bolt.
- c. Flip the ball joint back and forth 5 times.
- d. Set a torque wrench to the nut, turn the ball joint continuously at a rate of 3 to 5 seconds per turn, and check the turning torque on the 5th turn.

Standard turning torque: 0.29 to 1.96 N*m (2.96 to 20.0 kgf*cm, 2.57 to 17.3 in.*lbf)

HINT:

If turning torque is not within the specified range, replace the tie rod end sub-assembly LH with a new one.

2. INSPECT TIE ROD END SUB-ASSEMBLY RH

HINT:

Perform the same procedure as for the LH side.

2008 Scion xD**2008 STEERING Power Steering - xD****3. INSPECT TOTAL PRELOAD**

- a. Using SST and a torque wrench, inspect the total preload.

SST 09616-00011

Standard preload: 0.6 to 1.2 N*m (6.1 to 12.2 kgf*cm, 5.3 to 10.6 in.*lbf)

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

HINT:

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

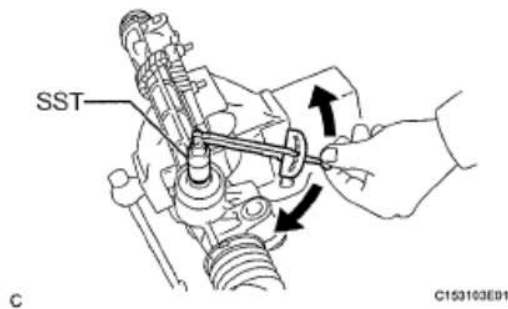


Fig. 47: Inspecting Total Preload

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

INSTALLATION**1. INSTALL TIE ROD END SUB-ASSEMBLY LH**

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

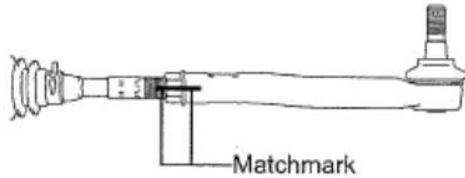
HINT:

After adjusting toe-in, tighten the lock nut.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

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Fig. 48: Identifying Match Mark On Steering Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL TIE ROD END SUB-ASSEMBLY RH

HINT:

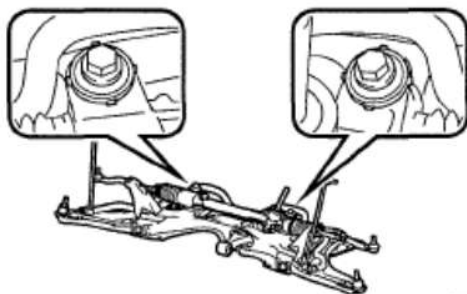
Perform the same procedure as for the LH side.

3. INSTALL POWER STEERING GEAR

- Install the power steering gear onto the front suspension crossmember with the 2 bolts and 2 nuts.

Torque: 96 N*m (979 kgf*cm, 71 ft.*lbf)

NOTE: Keep the nut from rotating while turning the bolt.



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Fig. 49: Identifying Power Steering Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL FRONT SUSPENSION CROSSMEMBER SUB-ASSEMBLY

- Support the front suspension crossmember with a transmission jack.
- Provisionally install the front suspension crossmember onto the body with the 6 bolts.

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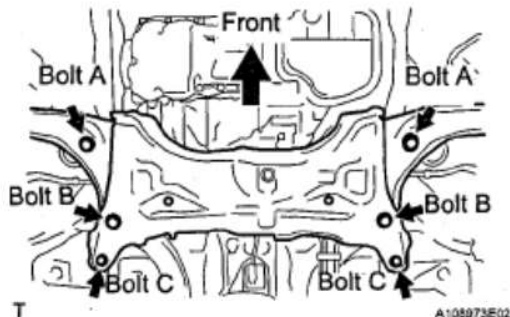


Fig. 50: Identifying Front Suspension Crossmember Sub-Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

BOLT LENGTH SPECIFICATION

Bolt	Underhead Length (mm)
A	38
B	99
C	41

- c. By inserting SST into the datum holes in the front suspension crossmembers RH and LH alternately, tighten bolts A, B and C on both sides to the specified torque, in several steps.

SST 09670-00011

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

160 N*m (1,631 kgf*cm, 118 ft.*lbf) for Bolt B

95 N*m (969 kgf*cm, 70 ft.*lbf) for Bolt C

NOTE:

- Insert SST into the datum hole in a vertical orientation.
- If SST can not be inserted into the datum hole vertically, loosen all the bolts and then insert SST again.

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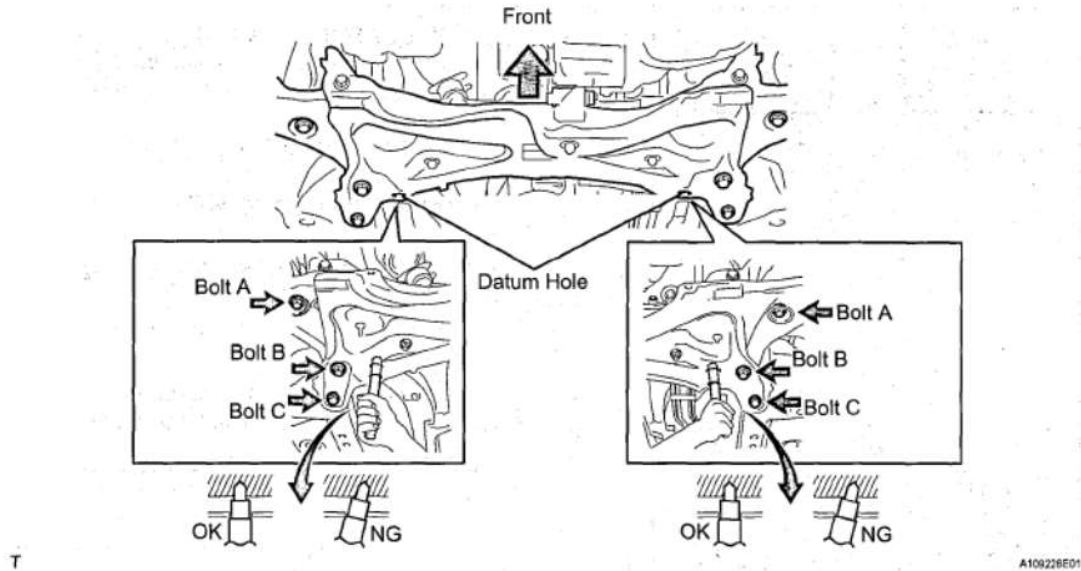


Fig. 51: Identifying Datum Holes In Front Suspension Crossmembers RH And LH
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the engine moving control rod with the bolt.

Torque: 120 N*m (1,224 kgf*cm, 89 ft.*lbf)

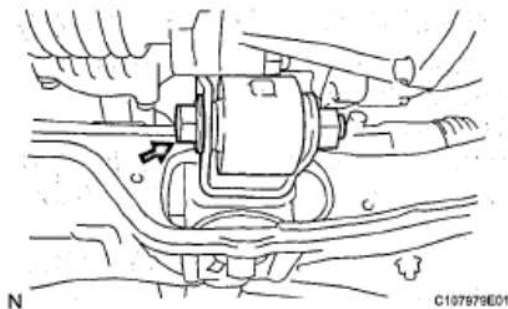


Fig. 52: Identifying Engine Moving Control Rod With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL FRONT SUSPENSION LOWER ARM LH** (See INSTALLATION)
6. **INSTALL FRONT SUSPENSION LOWER ARM RH**

HINT:

Use the same procedure for the LH side.

7. **INSTALL FRONT STABILIZER LINK ASSEMBLY LH** (See INSTALLATION)
8. **INSTALL FRONT STABILIZER LINK ASSEMBLY RH**

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9. **INSTALL TIE ROD END SUB-ASSEMBLY LH** (See INSTALLATION)
10. **INSTALL TIE ROD END SUB-ASSEMBLY RH**

HINT:

Use the same procedure for the LH side.

11. **INSTALL FRONT WHEEL**

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

12. **INSTALL NO. 1 STEERING COLUMN HOLE COVER SUB-ASSEMBLY**

- a. Install clip B onto the body portion and install column No. 1 onto the body portion with clip A.

NOTE: Make sure that the lip portion of hole cover No. 1 is not damaged.

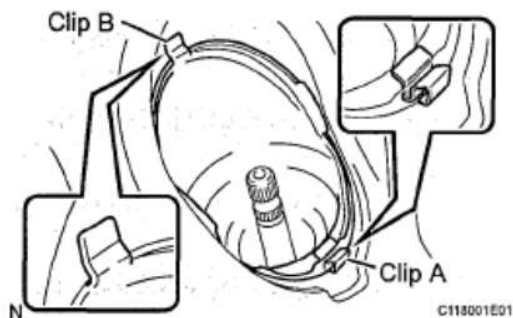


Fig. 53: Identifying Steering Column Hole Cover Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **INSTALL STEERING SLIDING YOKE SUB-ASSEMBLY**

- a. Align the matchmarks and install the sliding yoke onto the intermediate shaft.

Torque: 35 N*m (357 kgf*cm, 26 ft.*lbf)

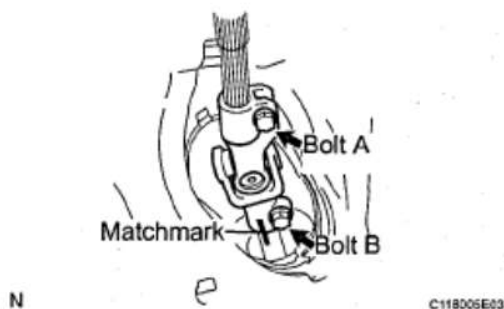


Fig. 54: Locating Matchmarks On Sliding Yoke Of Steering Intermediate Shaft Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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- b. Tighten bolt A.

Torque: 35 N*m (357 kgf*cm, 26 ft.*lbf)

14. INSTALL COLUMN HOLE COVER SILENCER SHEET

- a. Install the column hole cover silencer sheet with the 2 clips.

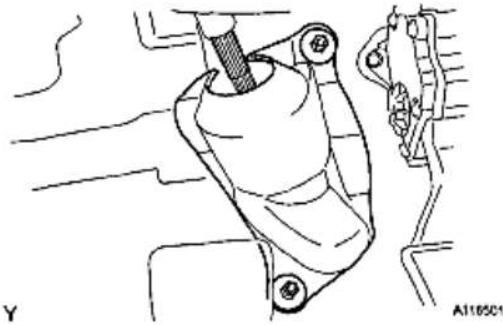


Fig. 55: Identifying Column Hole Cover Silencer Sheet
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the floor carpet.

15. **INSTALL OUTER COWL TOP PANEL** (See INSTALLATION)
16. **INSTALL FRONT AIR SHUTTER SEAL RH** (See INSTALLATION)
17. **INSTALL FRONT WIPER MOTOR AND LINK** (See INSTALLATION)
18. **INSTALL COWL TOP VENTILATOR LOUVER LH** (See INSTALLATION)
19. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See INSTALLATION)
20. **INSTALL HOOD TO COWL TOP SEAL** (See INSTALLATION)
21. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See INSTALLATION)
22. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See INSTALLATION)
23. **INSTALL FRONT WIPER ARM HEAD CAP** (See INSTALLATION)
24. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

Torque: 5.4 N*m (55 kgf*cm, 48 ft.*lbf)

25. **POSITION FRONT WHEELS FACING STRAIGHT AHEAD**
26. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**

(See ADJUSTMENT)

27. **CHECK ABS SPEED SENSOR SIGNAL**

(See DIAGNOSIS SYSTEM)

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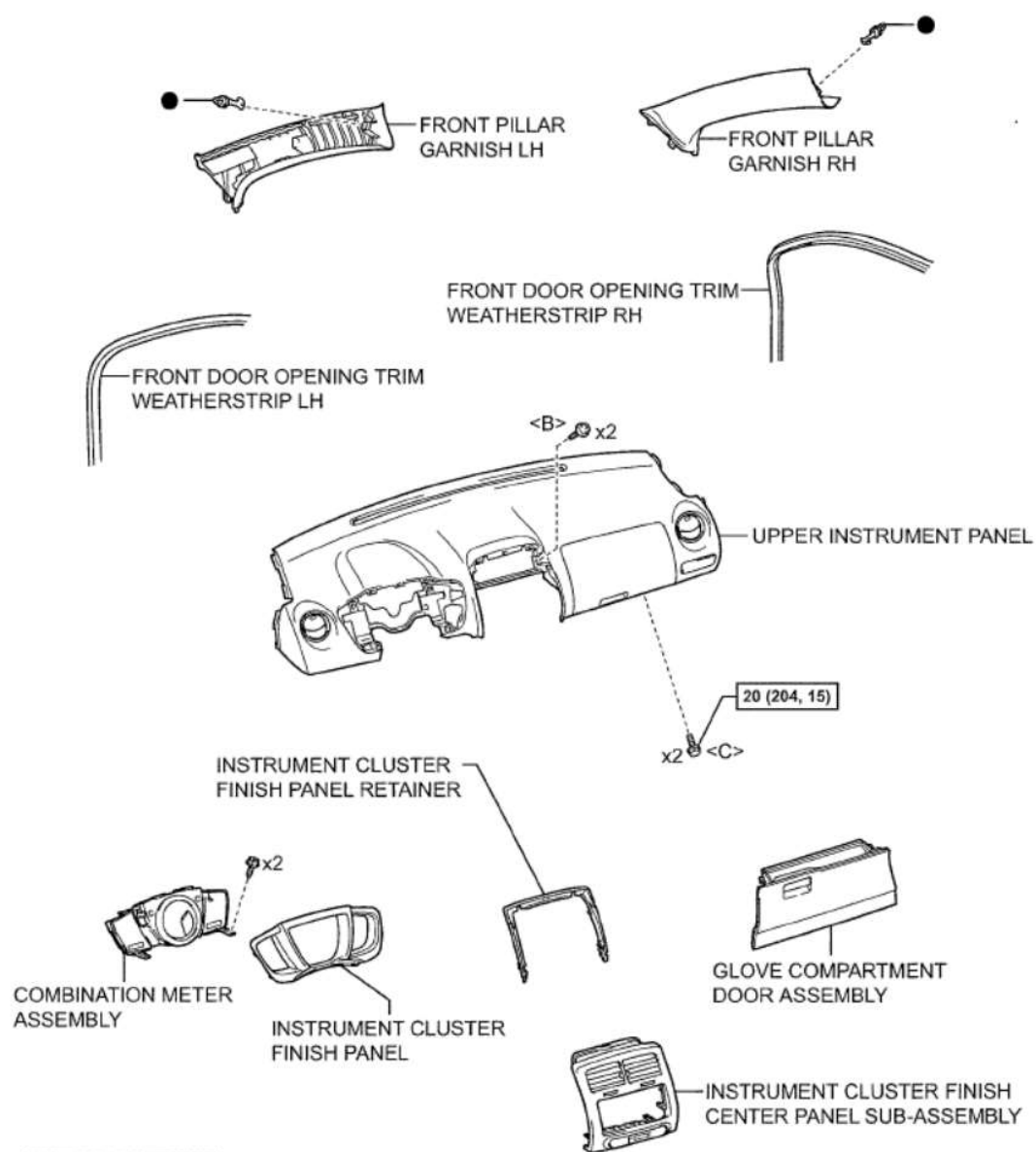
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28. CHECK VSC SENSOR SIGNAL

(See **DIAGNOSIS SYSTEM**)

POWER STEERING ECU

COMPONENTS



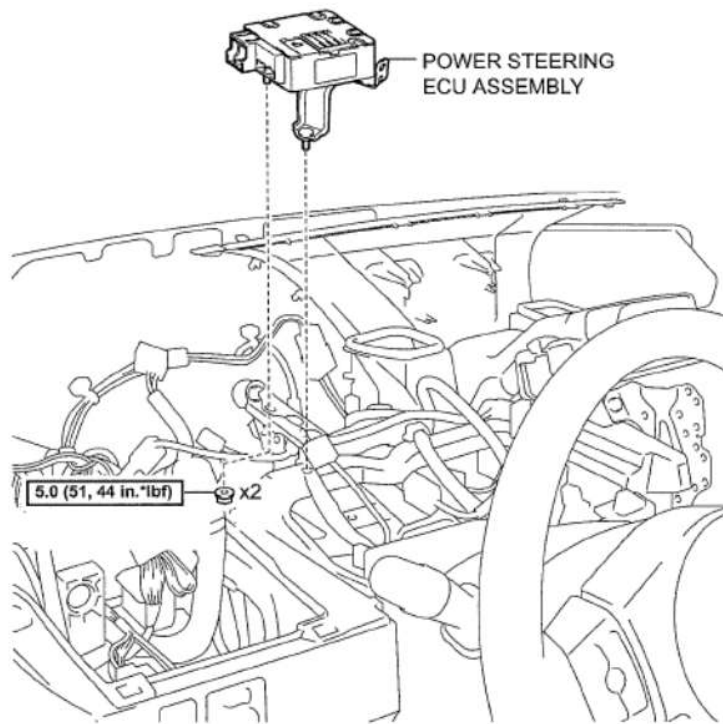
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Fig. 56: Identifying Power Steering ECU Components With Torque Specification (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



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

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Fig. 57: Identifying Power Steering ECU Components With Torque Specification (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL (See [REMOVAL](#))
3. SEPARATE FRONT DOOR OPENING TRIM WEATHERSTRIP RH (See [REMOVAL](#))
4. SEPARATE FRONT DOOR OPENING TRIM WEATHERSTRIP LH (See [REMOVAL](#))
5. REMOVE FRONT PILLAR GARNISH RH (See [REMOVAL](#))
6. REMOVE FRONT PILLAR GARNISH LH (See [REMOVAL](#))
7. REMOVE INSTRUMENT CLUSTER FINISH PANEL (See [REMOVAL](#))
8. REMOVE COMBINATION METER ASSEMBLY (See [REMOVAL](#))
9. REMOVE INSTRUMENT CLUSTER FINISH CENTER PANEL SUB-ASSEMBLY (See [REMOVAL](#))
10. REMOVE INSTRUMENT CLUSTER FINISH PANEL RETAINER (See [REMOVAL](#))

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11. **REMOVE GLOVE COMPARTMENT DOOR ASSEMBLY** (See **REMOVAL**)
12. **REMOVE UPPER INSTRUMENT PANEL** (See **REMOVAL**)
13. **REMOVE POWER STEERING ECU ASSEMBLY**
 - a. Separate the 2 wire harness clamps.

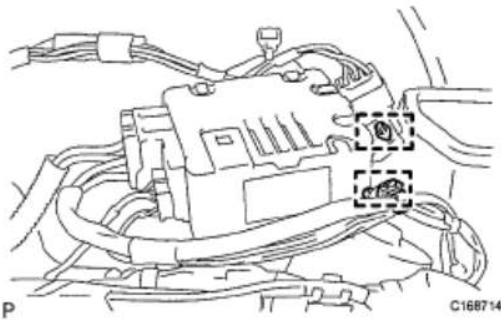


Fig. 58: Identifying Wire Harness Clamps

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

- b. Disconnect the 4 connectors.

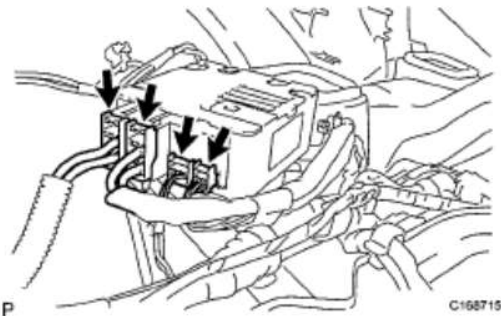


Fig. 59: Locating Connectors

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

- c. Remove the 2 nuts, and the power steering ECU.

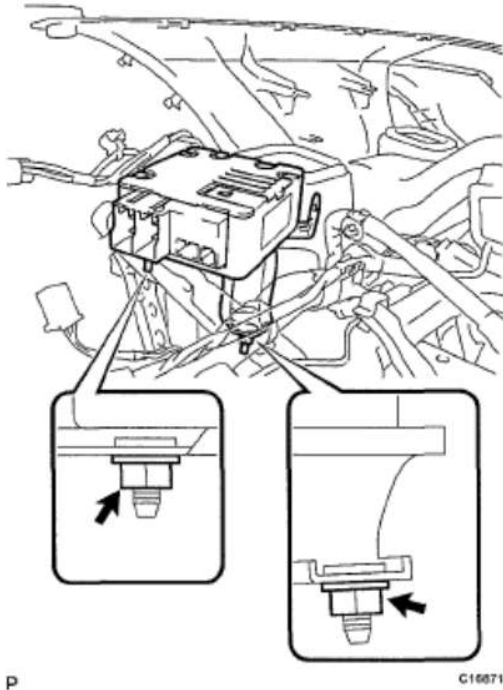
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Fig. 60: Locating Power Steering ECU Nuts

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

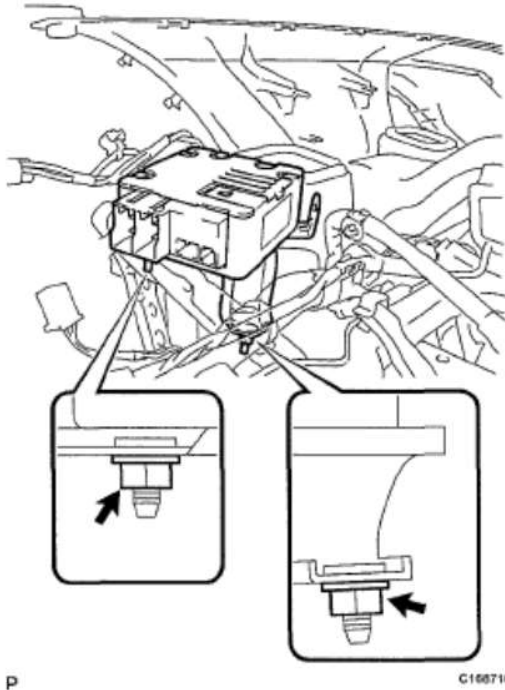
INSTALLATION**1. INSTALL POWER STEERING ECU ASSEMBLY**

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

Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)

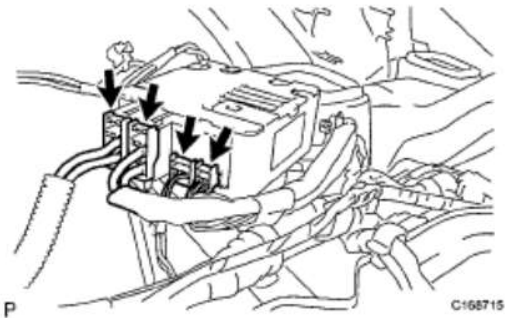
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**Fig. 61: Locating Power Steering ECU Nuts**

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

- b. Connect the 4 connectors.

**Fig. 62: Identifying Connectors**

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

- c. Install the wire harness clamp.

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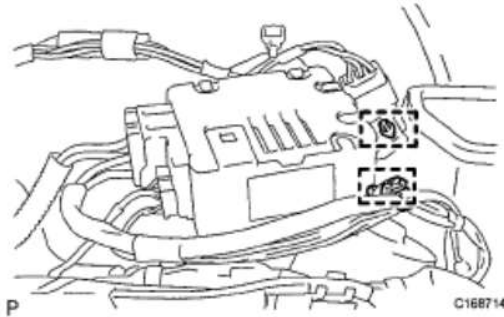


Fig. 63: Identifying Wire Harness Clamps

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

- d. Install the 2 wire harness clamps onto the power steering ECU assembly.
2. **INSTALL UPPER INSTRUMENT PANEL** (See INSTALLATION)
3. **INSTALL GLOVE COMPARTMENT DOOR ASSEMBLY** (See INSTALLATION)
4. **INSTALL INSTRUMENT CLUSTER FINISH PANEL RETAINER** (See INSTALLATION)
5. **INSTALL INSTRUMENT CLUSTER FINISH CENTER PANEL SUB-ASSEMBLY** (See INSTALLATION)
6. **INSTALL COMBINATION METER ASSEMBLY** (See INSTALLATION)
7. **INSTALL INSTRUMENT CLUSTER FINISH PANEL** (See INSTALLATION)
8. **INSTALL FRONT PILLAR GARNISH RH** (See INSTALLATION)
9. **INSTALL FRONT PILLAR GARNISH LH** (See INSTALLATION)
10. **INSTALL FRONT DOOR OPENING TRIM WEATHERSTRIP RH** (See INSTALLATION)
11. **INSTALL FRONT DOOR OPENING TRIM WEATHERSTRIP LH** (See INSTALLATION)
12. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL** (See INSTALLATION)
13. **INSPECT SRS WARNING LIGHT** (See INSTALLATION)
14. **INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT**

(See CALIBRATION)