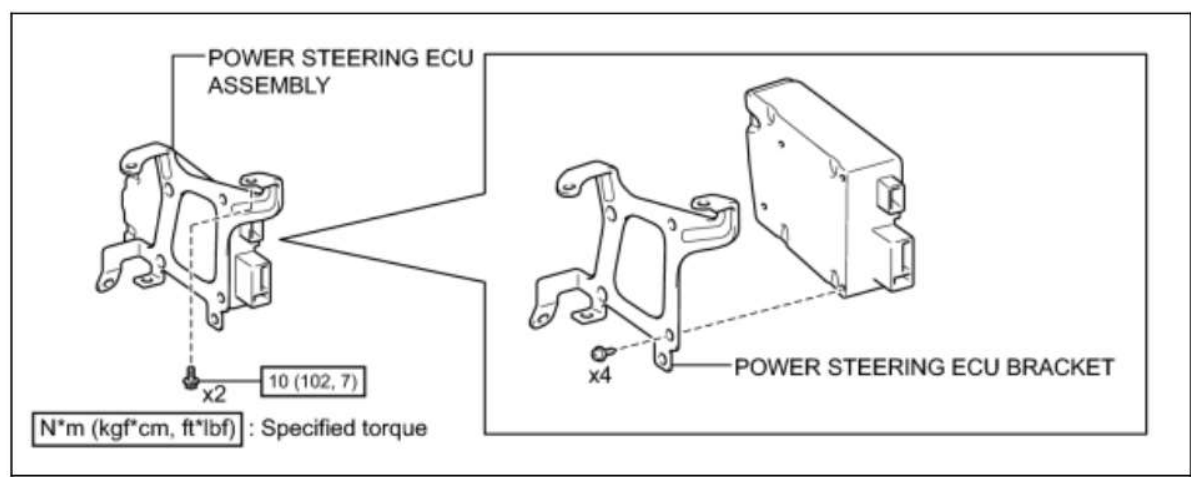


Last Modified: 3-27-2012	6.4 K	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM000002XN502YX
Title: POWER ASSIST SYSTEMS: POWER STEERING ECU: COMPONENTS (2013 FR-S)		

COMPONENTS

ILLUSTRATION



Last Modified: 3-27-2012	6.4 A	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM000002XN404SX
Title: POWER ASSIST SYSTEMS: POWER STEERING ECU: INSTALLATION (2013 FR-S)		

INSTALLATION

1. PRECAUTION

CAUTION:
Be sure to read Precaution thoroughly before servicing INFO .

2. INSTALL POWER STEERING ECU BRACKET

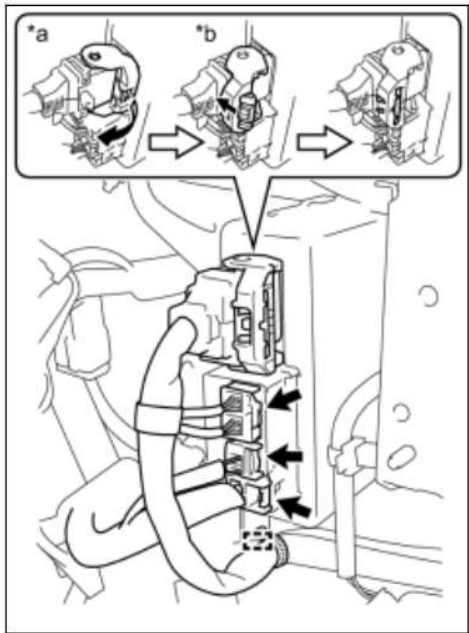
- (a) Install the power steering ECU bracket with 4 screws.

3. INSTALL POWER STEERING ECU ASSEMBLY

- (a) Install the power steering ECU assembly with the 2 bolts.

Torque: 10 N·m (102 kgf·cm, 7ft·lbf)

- (b) Engage the clamp.
(c) Connect the 3 connectors to the power steering ECU assembly.



- (d) Connect the connector to the power steering ECU assembly.
(1) As shown in the illustration, return the lock lever to its original position to connect the connector and securely push in the lock of the lock lever.

Text in Illustration

*a	Return the lock lever
*b	Push the lock

- (e) Engage the clamp.

4. INSTALL INSTRUMENT PANEL JUNCTION BLOCK ASSEMBLY

INFO

5. INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT

INFO



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Last Modified: 3-27-2012	6.4 A	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM000002XN604SX
Title: POWER ASSIST SYSTEMS: POWER STEERING ECU: REMOVAL (2013 FR-S)		

REMOVAL

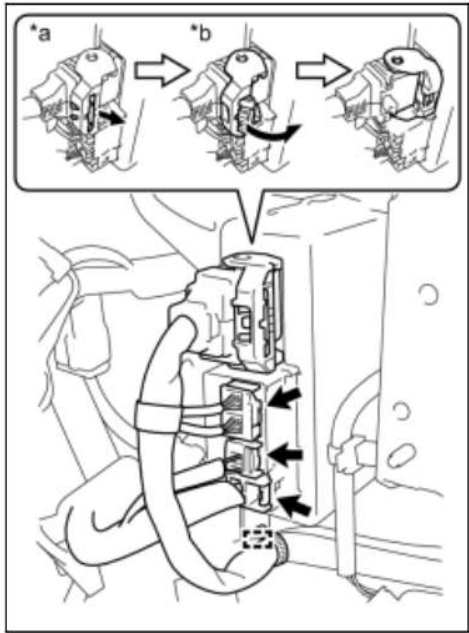
1. PRECAUTION

CAUTION:
Be sure to read Precaution thoroughly before servicing INFO .

2. REMOVE INSTRUMENT PANEL JUNCTION BLOCK ASSEMBLY

INFO

3. REMOVE POWER STEERING ECU ASSEMBLY



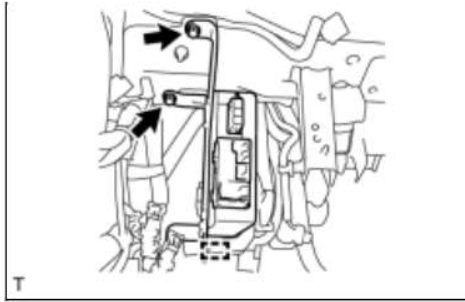
(a) Disengage the clamp.

- (b) Disconnect the connector from the power steering ECU assembly.
- (1) As shown in the illustration, pull out the lock of the lock lever and turn the lock lever to disconnect the connector.

Text in Illustration

*a	Pull out the lock
*b	Turn the lock lever

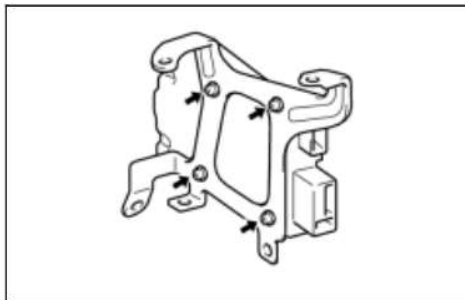
- (c) Disconnect the 3 connectors from the power steering ECU assembly.



(d) Disengage the clamp.

(e) Remove the 2 bolts and power steering ECU assembly.

4. REMOVE POWER STEERING ECU BRACKET



(a) Remove the 4 screws and power steering ECU bracket.



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277F040X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1511-C1514,C1517: Torque Sensor Circuit Malfunction (2013 FR-S)		

DTC	C1511	Torque Sensor Circuit Malfunction
------------	--------------	--

DTC	C1512	Torque Sensor Circuit Malfunction
------------	--------------	--

DTC	C1513	Torque Sensor Circuit Malfunction
------------	--------------	--

DTC	C1514	Torque Sensor Power Supply Abnormal
------------	--------------	--

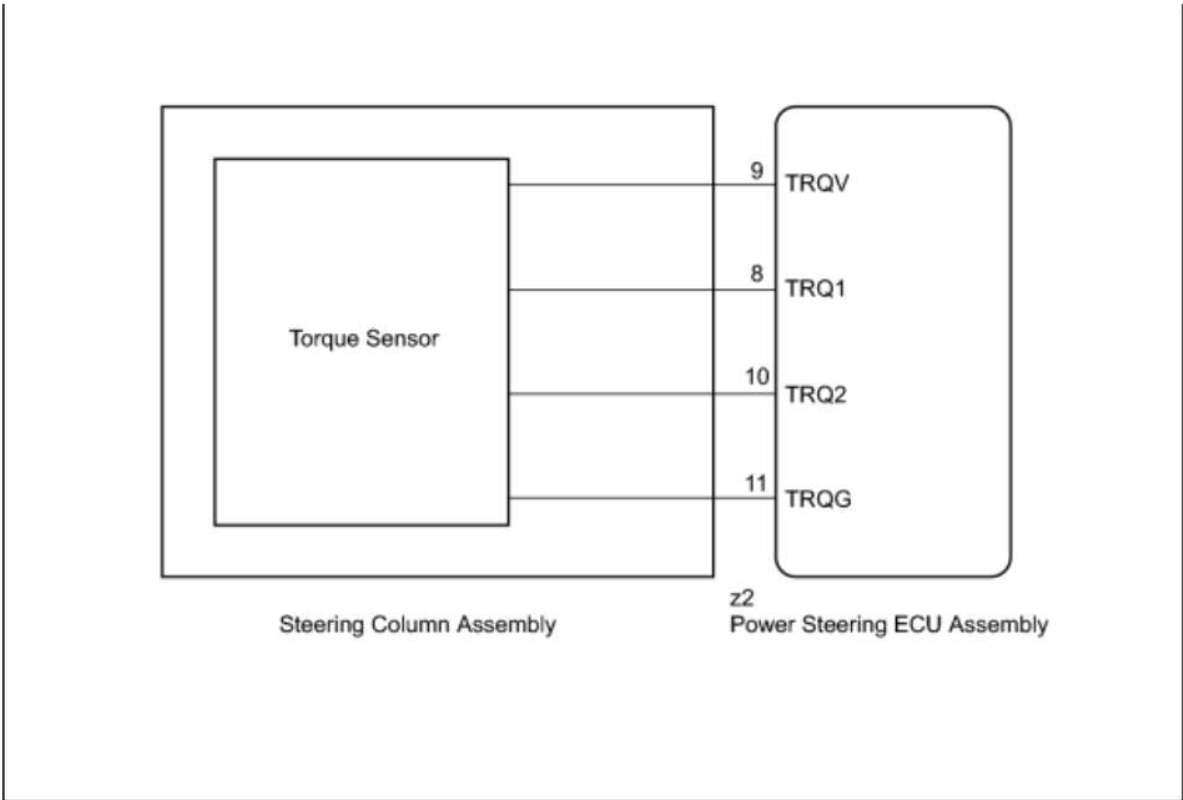
DTC	C1517	Torque Hold Abnormal
------------	--------------	-----------------------------

DESCRIPTION

The torque sensor converts the rotation torque input to the steering wheel into an electrical signal and sends it to the power steering ECU assembly. Based on this signal, the ECU detects steering effort.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1511	A torque sensor (TRQ1) signal error or stop	- Steering column assembly (torque sensor) - Power steering ECU assembly
C1512	A torque sensor (TRQ2) signal error or stop	
C1513	The deviation between torque sensor TRQ1 and TRQ2 exceeds a specified value.	
C1514	A torque sensor power supply voltage error	
C1517	Temporary control due to a malfunction related to the torque sensor continues for long time.	

WIRING DIAGRAM



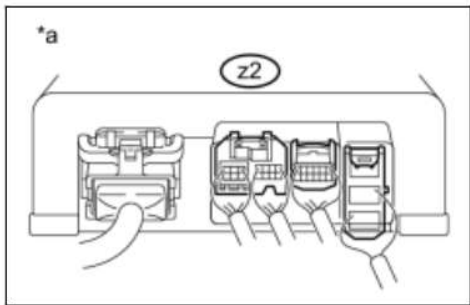
INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly or steering column assembly is replaced, perform rotation angle sensor initialization and torque sensor zero point calibration [INFO](#) .

PROCEDURE

1.	CHECK CONNECTOR CONNECTION CONDITION (TORQUE SENSOR - POWER STEERING ECU ASSEMBLY)
----	--



(a) Check the connection condition of the z2 torque sensor connector.

OK:
Torque sensor connector is securely connected to the power steering ECU assembly.

Text in Illustration

*a	Component with harness connected (Power Steering ECU Assembly)
----	---

NG CONNECT CONNECTOR SECURELY

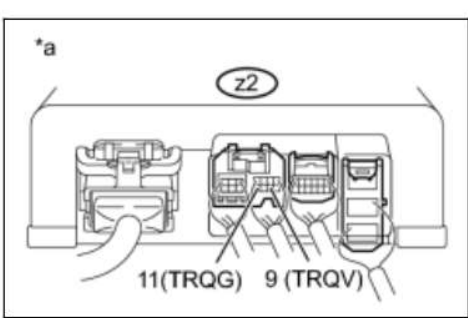
OK

▼

2. CHECK POWER STEERING ECU ASSEMBLY (TRQV VOLTAGE)

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

Standard Voltage:



TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
z2-9 (TRQV) - z2-11 (TRQG)	Ignition switch ON	4.5 to 5.5 V

HINT:
When the value is within the specified range, record the value.

Text in Illustration

*a	Component with harness connected (Power Steering ECU Assembly)
----	---

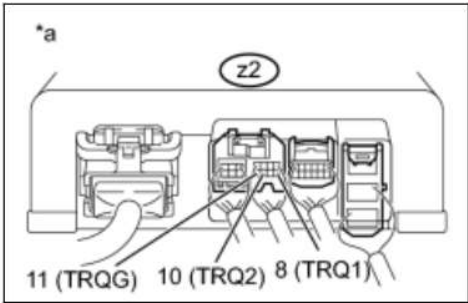
NG

▶ REPLACE POWER STEERING ECU ASSEMBLY

OK

▼

3. CHECK POWER STEERING ECU ASSEMBLY (TRQ1, TRQ2 VOLTAGE)



- (a) Start the engine.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
z2-8 (TRQ1) - z2-11 (TRQG)	Engine running, steering wheel not turned (without load)	2.3 to 2.7 V
	Engine running, steering wheel turned to right with vehicle stopped	2.3 to 3.8 V
	Engine running, steering wheel turned to left with vehicle stopped	1.2 to 2.7 V
z2-10 (TRQ2) - z2-11 (TRQG)	Engine running, steering wheel not turned (without load)	2.3 to 2.7 V
	Engine running, steering wheel turned to right with vehicle stopped	1.2 to 2.7 V
	Engine running, steering wheel turned to left with vehicle stopped	2.3 to 3.8 V

(c) Calculate the difference between the value recorded when measuring the voltage at terminal TRQV in the previous step, and the sum of the output of torque sensor 1 and torque sensor 2.

OK:

0.3 V or less (Absolute value)

Text in Illustration

*a	Component with harness connected (Power Steering ECU Assembly)
----	---

NG ► REPLACE STEERING COLUMN ASSEMBLY

OK ► REPLACE POWER STEERING ECU ASSEMBLY



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277G03MX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1515,C1525: Torque Sensor Zero Point Adjustment Undone (2013 FR-S)		

DTC	C1515	Torque Sensor Zero Point Adjustment Undone
------------	--------------	---

DTC	C1525	Rotation Angle Sensor Initialization Undone
------------	--------------	--

DESCRIPTION

These DTCs do not indicate a malfunction. The power steering ECU assembly stores these DTCs when it determines that the rotation angle sensor value initialization and torque sensor zero point calibration have not been performed.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1515	Torque sensor zero point calibration has not been performed.	There is no malfunction if this DTC is not output again after performing torque sensor zero point calibration.
C1525	Rotation angle sensor value initialization has not been performed.	There is no malfunction if this DTC is not output again after performing rotation angle sensor value initialization.

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly or steering column assembly is replaced, perform rotation angle sensor initialization and torque sensor zero point calibration [INFO](#) .

PROCEDURE

1.	INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT
-----------	--

(a) Initialize the rotation angle sensor and calibrate the torque sensor zero point [INFO](#) .

NEXT



2.	CHECK FOR DTC
-----------	----------------------

(a) Check for DTCs [INFO](#) .

NOTICE:

If DTC C1515 or C1525 is output even though the rotation angle sensor value initialization and torque sensor zero point calibration have been performed, check the procedure again, and perform calibration and initialization 3 times.

Result

CONDITION	PROCEED TO
DTC C1515 or C1525 is still output after performing rotation angle sensor initialization and torque sensor zero point calibration 3 times.	A
DTC C1515 or C1525 is not output.	B

B  **END**

A


3.	REPLACE POWER STEERING ECU ASSEMBLY
-----------	--

(a) Replace the power steering ECU assembly  .

NEXT


4.	INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT
-----------	--

(a) Initialize the rotation angle sensor and calibrate the torque sensor zero point  .

NEXT


5.	CHECK FOR DTC
-----------	----------------------

(a) Check for DTCs  .

NOTICE:

If DTC C1515 or C1525 is output even though the rotation angle sensor value initialization and torque sensor zero point calibration have been performed, check the procedure again, and perform calibration and initialization 3 times.

Result

CONDITION	PROCEED TO
DTC C1515 or C1525 is still output after performing rotation angle sensor initialization and torque sensor zero point calibration 3 times.	A
DTC C1515 or C1525 is not output.	B

B ► **END**

A ► **REPLACE STEERING COLUMN ASSEMBLY**



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM0000027BY03IX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1516,C1526: Torque Sensor Zero Point Adjustment Incomplete (2013 FR-S)		

DTC	C1516	Torque Sensor Zero Point Adjustment Incomplete
------------	--------------	---

DTC	C1526	Rotation Angle Sensor Initialization Incomplete
------------	--------------	--

DESCRIPTION

These DTCs do not indicate a malfunction. The power steering ECU assembly stores these DTCs when it determines that the rotation angle sensor value initialization and torque sensor zero point calibration are incomplete.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1516	Torque sensor zero point calibration is incomplete due to the steering wheel being touched during calibration.	There is no malfunction if this DTC is not output again after clearing the DTC and torque sensor calibration value, and performing zero point calibration.
C1526	Rotation angle sensor value initialization is incomplete due to the steering wheel being touched during calibration.	There is no malfunction if this DTC is not output again after clearing the DTC and torque sensor calibration value, and performing rotation angle sensor value initialization.

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly or steering column assembly is replaced, perform rotation angle sensor initialization and torque sensor zero point calibration [INFO](#) .

PROCEDURE

1.	CLEAR DTC
-----------	------------------

(a) Clear the DTC(s) [INFO](#) .

NEXT



2.	INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT
-----------	--

(a) Initialize the rotation angle sensor and calibrate the torque sensor zero point INFO .

NEXT



3.

CHECK FOR DTC

(a) Check for DTCs INFO .

NOTICE:
If DTC C1516 or C1526 is output even though the rotation angle sensor value initialization and torque sensor zero point calibration have been performed, check the procedure again, and perform the calibration and initialization 3 times.

Result

CONDITION	PROCEED TO
DTC C1516 or C1526 is still output after performing rotation angle sensor initialization and torque sensor zero point calibration 3 times.	A
DTC C1516 or C1526 is not output.	B

B ▶ END

A
▼

4.

REPLACE POWER STEERING ECU ASSEMBLY

(a) Replace the power steering ECU assembly INFO .

NEXT



5.

CLEAR DTC

(a) Clear the DTC(s) INFO .

NEXT



6.

INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT

(a) Initialize the rotation angle sensor and calibrate the torque sensor zero point INFO .

NEXT

▼

7.

CHECK FOR DTC

(a) Check for DTCs INFO .

NOTICE:
If DTC C1516 or C1526 is output even though the rotation angle sensor value initialization and torque sensor zero point calibration have been performed, check the procedure again, and perform calibration and initialization 3 times.

Result

CONDITION	PROCEED TO
DTC C1516 or C1526 is still output after performing rotation angle sensor initialization and torque sensor zero point calibration 3 times.	A
DTC C1516 or C1526 is not output.	B

B ► END

A ► REPLACE STEERING COLUMN ASSEMBLY

Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM0000027BZ03OX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1521,C1531-C1534,C1554: Motor Circuit Malfunction (2013 FR-S)		

DTC	C1521	Motor Circuit Malfunction
------------	--------------	----------------------------------

DTC	C1531	ECU Malfunction
------------	--------------	------------------------

DTC	C1532	ECU Malfunction
------------	--------------	------------------------

DTC	C1533	ECU Malfunction
------------	--------------	------------------------

DTC	C1534	ECU Malfunction
------------	--------------	------------------------

DTC	C1554	Power Supply Relay Failure
------------	--------------	-----------------------------------

DESCRIPTION

If the power steering ECU assembly stores these DTCs, it will shut off the power supply relay circuit (built into the power steering ECU assembly) and stop power assist. However, power assist continues if DTC C1533 or C1534 is stored.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1521	Motor overcurrent	Power steering ECU assembly
C1531	An ECU internal malfunction (CPU malfunction)	
C1532	An ECU internal malfunction (peripheral circuit malfunction)	
C1533	An ECU internal malfunction (substrate temperature sensor malfunction)	
C1534	An ECU internal malfunction (EEPROM error)	
C1554	A power supply relay circuit malfunction	

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration .

PROCEDURE

1.	CHECK FOR DTC
----	---------------

- (a) Clear the DTC(s) INFO .
- (b) Check for DTCs INFO .

Result

RESULT	PROCEED TO
DTC is not output.	A
DTC is output.	B

B ► REPLACE POWER STEERING ECU ASSEMBLY

A ► USE SIMULATION METHOD TO CHECK



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Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277N03JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1522-C1555: Motor Circuit Malfunction (2013 FR-S)		

DTC	C1522	Motor Circuit Malfunction
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DTC	C1523	Motor Circuit Malfunction
------------	--------------	----------------------------------

DTC	C1524	Motor Circuit Malfunction
------------	--------------	----------------------------------

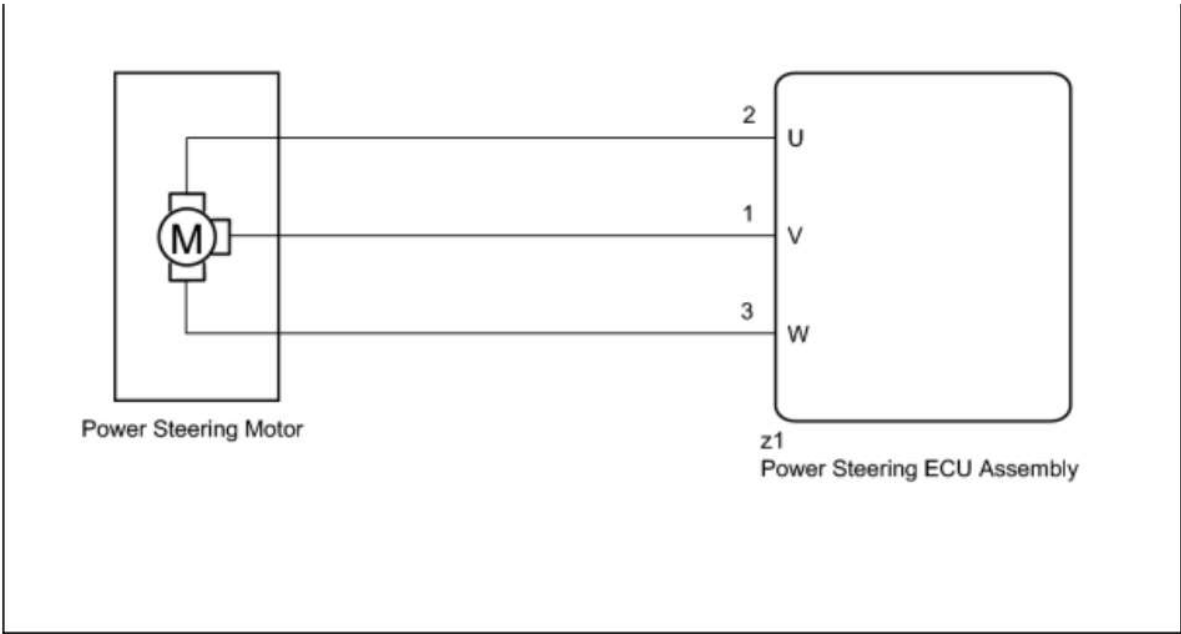
DTC	C1555	Motor Relay Welding Failure
------------	--------------	------------------------------------

DESCRIPTION

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

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1522	A motor current sensor malfunction	- Steering column assembly - Power steering ECU assembly
C1523	An excessively large current deviation	
C1524	A short or open in the motor circuit or abnormal voltage or current in the motor circuit	
C1555	A motor relay malfunction	

WIRING DIAGRAM

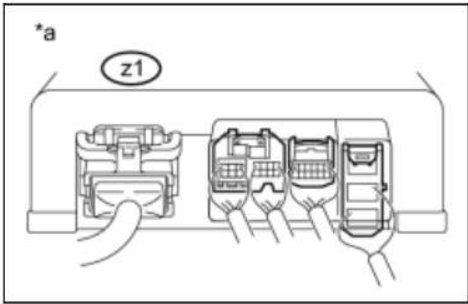


INSPECTION PROCEDURE

NOTICE:
If the power steering ECU assembly or steering column assembly is replaced, perform rotation angle sensor initialization and torque sensor zero point calibration INFO .

PROCEDURE

1.	CHECK CONNECTOR CONNECTION CONDITION (POWER STEERING MOTOR - POWER STEERING ECU ASSEMBLY)
----	---



- (a) Check the connection condition of the z1 power steering motor connector.
- OK:
Power steering motor connector is securely connected and locked to the power steering ECU assembly.

Text in Illustration

*a	Component with harness connected (Power Steering ECU Assembly)
----	--

NG ▶ CONNECT CONNECTOR SECURELY

OK
▼

2. READ VALUE USING TECHSTREAM (MOTOR VOLTAGE)

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Start the engine.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Data List.
- (f) Select the items "Motor Terminal Volt(U)", "Motor Terminal Volt(V)" and "Motor Terminal Volt(W)" in the Data List and read the value displayed on the Techstream.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Motor Terminal Volt(U)	Motor terminal voltage (U phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(V)	Motor terminal voltage (V phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(W)	Motor terminal voltage (W phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.

Result

RESULT	PROCEED TO
During steering operation, value changes between 4 and 35 V.	A
During steering operation, voltage is not generated or voltage outside specified range is generated.	B

B ► REPLACE STEERING COLUMN ASSEMBLY

A ► REPLACE POWER STEERING ECU ASSEMBLY



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277O03JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1528: Motor Rotation Angle Sensor Malfunction (2013 FR-S)		

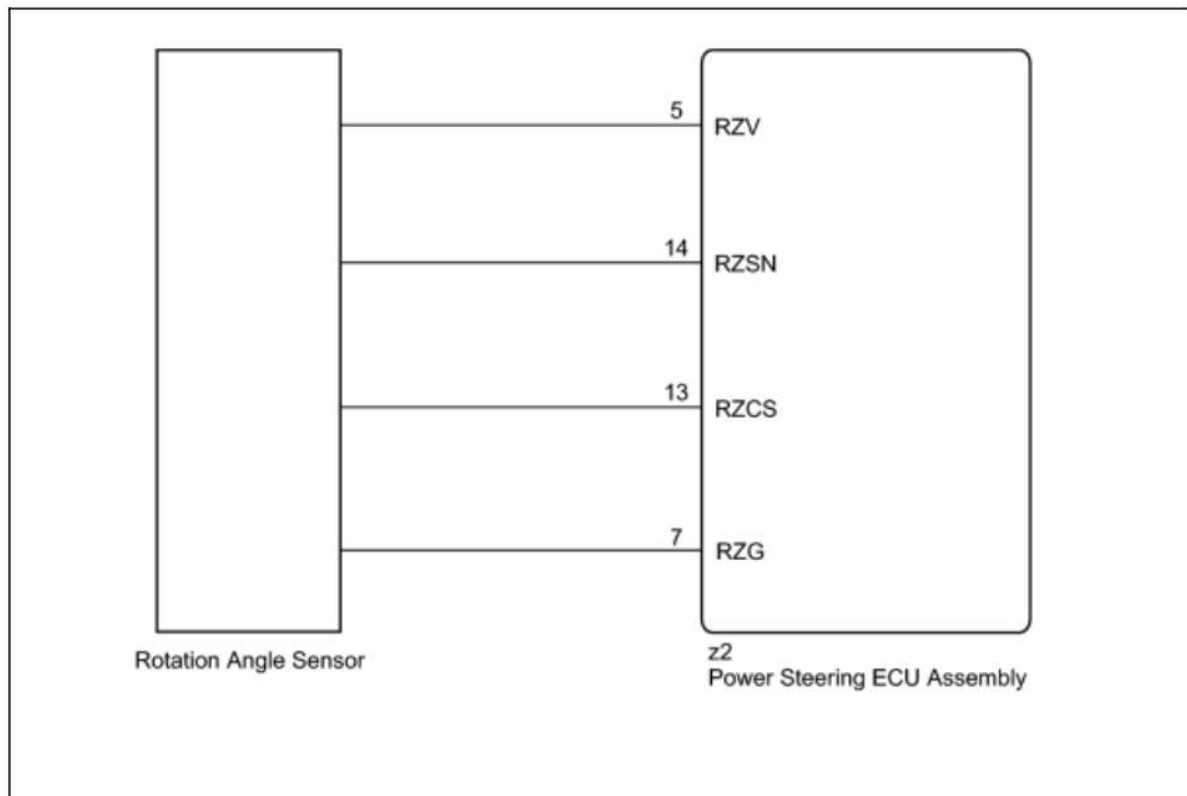
DTC	C1528	Motor Rotation Angle Sensor Malfunction
------------	--------------	--

DESCRIPTION

The rotation angle sensor detects the motor rotation angle and sends this information to the power steering ECU assembly.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1528	A rotation angle sensor malfunction	- Rotation angle sensor (built into steering column assembly) - Power steering ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

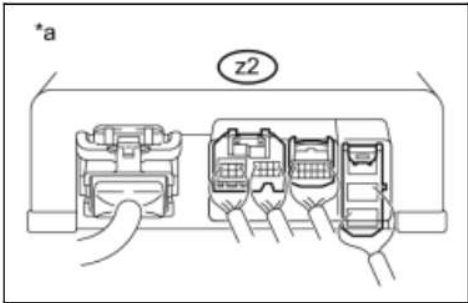
If the power steering ECU assembly or steering column assembly is replaced, perform rotation

angle sensor initialization and torque sensor zero point calibration INFO .

PROCEDURE

1.

CHECK CONNECTOR CONNECTION CONDITION (ROTATION ANGLE SENSOR - POWER STEERING ECU ASSEMBLY)



(a) Check the connection condition of the z2 rotation angle sensor connector.

OK:
Rotation angle sensor connector is securely connected to the power steering ECU assembly.

Text in Illustration

*a	Component with harness connected (Power Steering ECU Assembly)
----	---

NG ▶ CONNECT CONNECTOR SECURELY

OK
▼

2.

READ VALUE USING TECHSTREAM (MOTOR ROTATION ANGLE)

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Start the engine.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Data List.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Motor Rotation Angle	Motor rotation angle/ Min.: 0.000 deg Max.: 360.000 deg	Motor rotation angle value changes from 0 to 360°	The engine is running and the steering wheel is being turned.

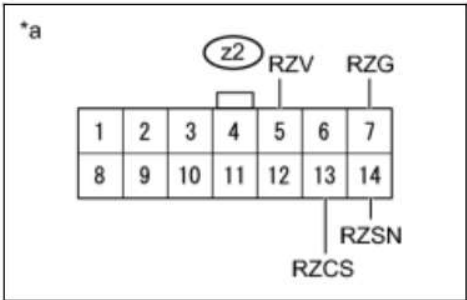
OK:

During steering operation, motor rotation angle value changes from 0 to 360°.

- NG▶CHECK STEERING COLUMN ASSEMBLY
- OK▶REPLACE POWER STEERING ECU ASSEMBLY

3.

CHECK STEERING COLUMN ASSEMBLY



(a) Disconnect the z2 rotation angle sensor connector from the power steering ECU assembly.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
z2-14 (RZSN) - z2-7 (RZG)	At 23°C (73°F)	75.2 to 112.8 Ω
z2-5 (RZV) - z2-7 (RZG)	At 23°C (73°F)	27.6 to 41.4 Ω
z2-13 (RZCS) - z2-7 (RZG)	At 23°C (73°F)	73.6 to 110.4 Ω

Text in Illustration

*a	Front view of wire harness connector (to Rotation Angle Sensor)
----	--

- NG▶REPLACE STEERING COLUMN ASSEMBLY
- OK▶REPLACE POWER STEERING ECU ASSEMBLY

Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM0000027C005LX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1541: Vehicle Speed Signal Malfunction (2013 FR-S)		

DTC	C1541	Vehicle Speed Signal Malfunction
------------	--------------	---

DESCRIPTION

The power steering ECU assembly receives vehicle speed signals from the skid control ECU via CAN communication. The power steering ECU assembly provides appropriate assisting force in accordance with the vehicle speed, based on the signals.

If the power steering ECU assembly stores this DTC, it adjusts the amount of power assist to the amount provided for a speed of 100 km/h (62 mph) and continues the system control.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1541	The vehicle speed signals malfunction	- Speed sensor circuit - Skid control ECU - CAN communication system - Power steering ECU assembly

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration [INFO](#).

PROCEDURE

1.	CHECK OTHER DTC OUTPUT (CAN COMMUNICATION SYSTEM)
-----------	--

(a) Check if DTC U0416 is output [INFO](#).

Result

RESULT	PROCEED TO
DTC U0416 is not output.	A
DTC U0416 is output.	B

HINT:

DTC U0416 indicates a skid control ECU communication malfunction in the power steering system.

B  **GO TO CAN COMMUNICATION SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)**

A
▼

2.

CHECK OTHER DTC OUTPUT (BRAKE CONTROL SYSTEM)

(a) Using the Techstream, check for DTCs and confirm that there are no problems in the brake control system INFO .

Result

RESULT	PROCEED TO
DTC is not output.	A
DTC is output.	B

B ► GO TO VEHICLE STABILITY CONTROL SYSTEM (DIAGNOSTIC TROUBLE CODE CHART)

A ► REPLACE POWER STEERING ECU ASSEMBLY



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277I03TX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1551: IG Power Supply Voltage Malfunction (2013 FR-S)		

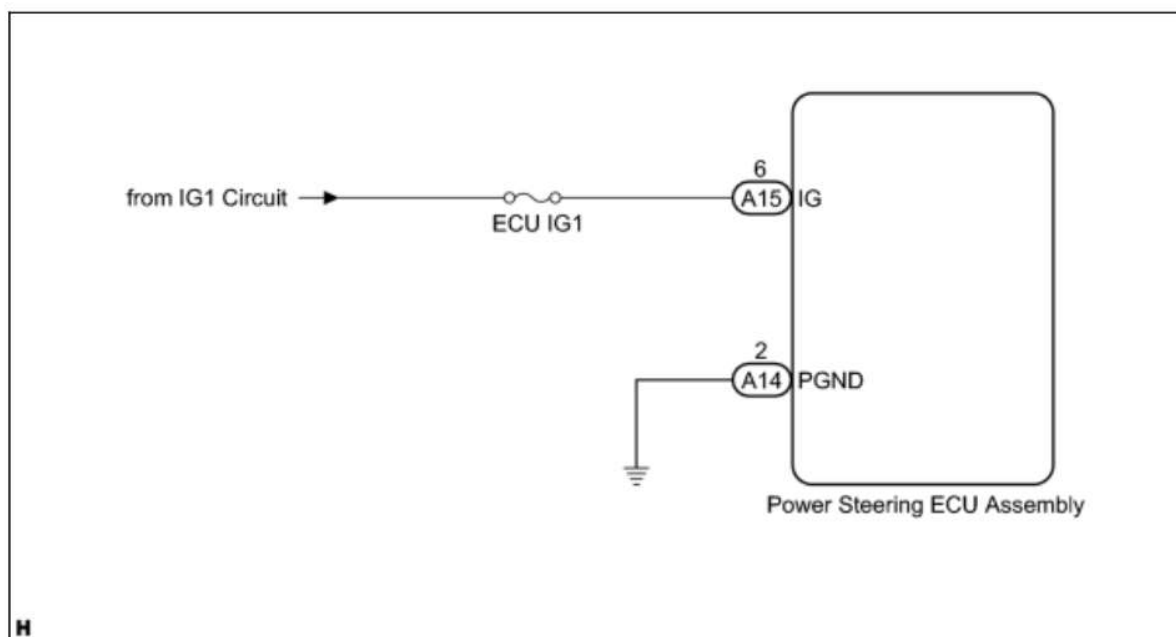
DTC	C1551	IG Power Supply Voltage Malfunction
------------	--------------	--

DESCRIPTION

The power steering ECU assembly determines whether the Ignition switch status is ON or off through the IG power supply circuit.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1551	An IG power supply circuit malfunction inside the ECU	• ECU IG1 fuse • IG power supply circuit • Power steering ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

- If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration INFO.
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

PROCEDURE

1. READ VALUE USING TECHSTREAM (IG POWER SUPPLY)

- (a) Turn the ignition switch off.
- (b) Connect the 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.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
IG Power Supply	ECU power source voltage/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The ignition switch is ON.

OK:

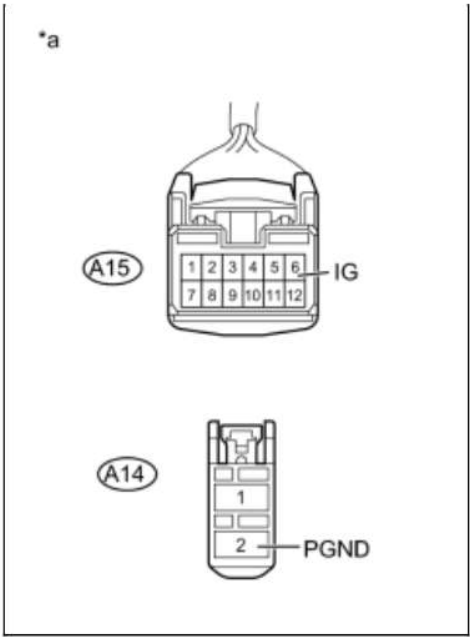
The normal condition value is displayed the Techstream.

NG ► **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)**

OK ► **REPLACE POWER STEERING ECU ASSEMBLY**

2. CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)

- (a) Disconnect the A14 and A15 power steering ECU assembly connectors.



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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A15-6 (IG) - Body ground	Ignition switch ON	9 to 16 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A14-2 (PGND) - Body ground	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Power Steering ECU Assembly)
----	--

NG **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK **REPLACE POWER STEERING ECU ASSEMBLY**



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277J03TX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1552: PIG Power Supply Voltage Malfunction (2013 FR-S)		

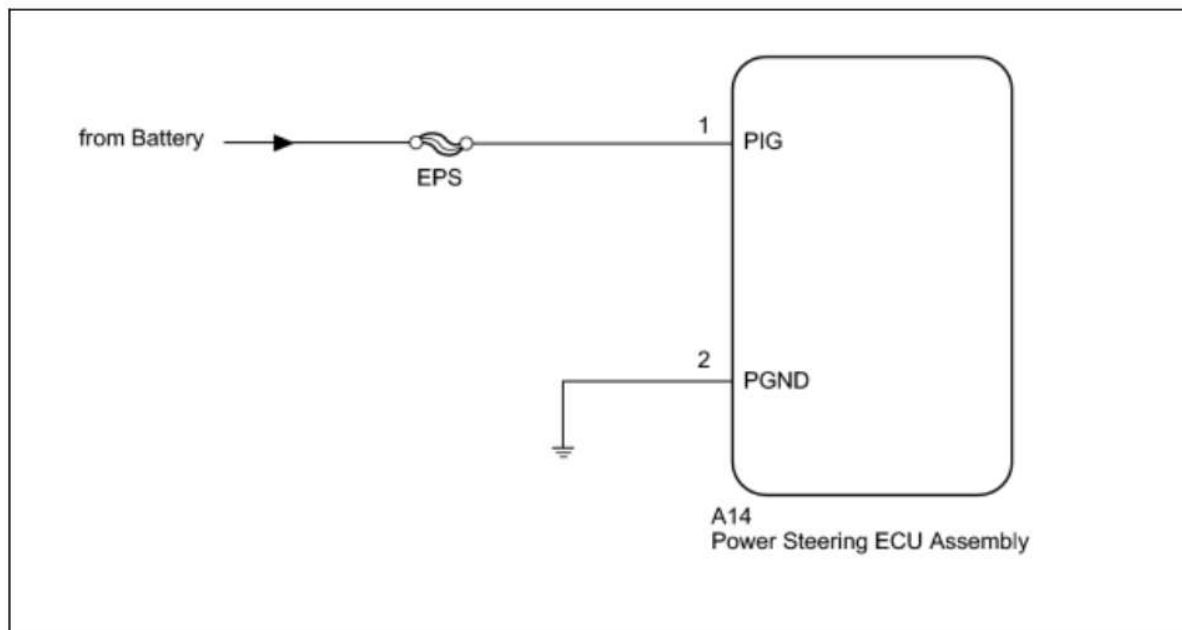
DTC	C1552	PIG Power Supply Voltage Malfunction
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DESCRIPTION

When a problem occurs in the power steering system, the power supply relay circuit is shut off to stop the power assist.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1552	A PIG power supply circuit malfunction inside the ECU	• EPS fuse • PIG power supply circuit • Power steering ECU assembly

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

- If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration [INFO](#) .
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

PROCEDURE

1. READ VALUE USING TECHSTREAM (PIG POWER SUPPLY)

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Start the engine.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Data List.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
PIG Power Supply	Power source voltage to active motor/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The engine is running and power steering is operating.

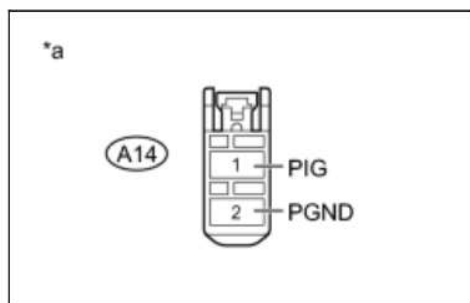
OK:

The normal condition value is displayed the Techstream.

NG ► **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)**

OK ► **REPLACE POWER STEERING ECU ASSEMBLY**

2. CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)



(a) Disconnect the A14 power steering ECU assembly connector .

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A14-1 (PIG) - Body ground	Always	9 to 16 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A14-2 (PGND) - Body ground	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Power Steering ECU Assembly)
----	--

NG  **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK  **REPLACE POWER STEERING ECU ASSEMBLY**



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277L090X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1581: Assist Map Number Un-Writing (2013 FR-S)		

DTC	C1581	Assist Map Number Un-Writing
------------	--------------	-------------------------------------

DESCRIPTION

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

HINT:

The assist map is data written in the power steering ECU assembly to control the degree of power assist. The assist map is selected based on the vehicle's specified communication data.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1581	The assist map is not written in the power steering ECU assembly.	• assist map not written • CAN communication system • ECM • Power steering ECU assembly

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration [INFO](#).

PROCEDURE

1.	INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT
-----------	--

(a) Initialize the rotation angle sensor and calibrate the torque sensor zero point [INFO](#).

HINT:

The assist map is automatically written during the rotation angle sensor initialization and torque sensor zero point calibration.

NEXT



2. CHECK FOR DTC

(a) Check for DTCs .

OK:

DTC C1581 is not output.

HINT:

DTC C1581 is cleared after the assist map is written.

NG ► **CHECK FOR DTC (CAN COMMUNICATION SYSTEM)**

OK ► **END**

3. CHECK FOR DTC (CAN COMMUNICATION SYSTEM)

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

OK:

DTC is not output.

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

OK

**4. CHECK ECM**

(a) Check if an ECM that complies with the vehicle specifications is installed.

NG ► **REPLACE ECM**

OK ► **REPLACE POWER STEERING ECU ASSEMBLY**



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM000003TY800IX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: C1582: Assist Map Number Mismatch (2013 FR-S)		

DTC	C1582	Assist Map Number Mismatch
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DESCRIPTION

If an incorrect power steering ECU assembly or ECM or skid control ECU is installed, DTC C1582 is stored as the vehicle specification and data do not match.

HINT:

The assist map is data written in the power steering ECU assembly to control the degree of assistance. The assist map is selected based on the vehicle's specified communication data.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
C1582	Data that does not match the vehicle specification is received through CAN communication.	- CAN communication system - ECM (wrong assembly) - Skid control ECU (wrong assembly) - Power steering ECU assembly (wrong assembly)

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration .

PROCEDURE

1.	CHECK FOR DTC (CAN COMMUNICATION SYSTEM)
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(a) Using the Techstream, check for DTCs and confirm that there are no problems in the CAN communication system .

OK:

DTC is not output.

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

OK

**2. CHECK ECM**

(a) Check if an ECM that complies with the vehicle specifications is installed.

NG ► **REPLACE ECM**

OK

**3. CHECK SKID CONTROL ECU (BRAKE ACTUATOR ASSEMBLY)**

(a) Check if a skid control ECU (brake actuator assembly) that complies with the vehicle specifications is installed.

NG ► **REPLACE SKID CONTROL ECU (BRAKE ACTUATOR ASSEMBLY)**

OK ► **REPLACE POWER STEERING ECU ASSEMBLY**



TOYOTA

Last Modified: 3-27-2012	6.4 D	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000275304ZX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: CALIBRATION (2013 FR-S)		

CALIBRATION

1. ROTATION ANGLE SENSOR INITIALIZATION AND TORQUE SENSOR ZERO POINT CALIBRATION

NOTICE:

Initialize the rotation angle sensor and calibrate the torque sensor zero point if any of the following conditions occur:

- The power steering ECU is replaced.
- The steering column assembly is replaced.
- Steering effort differs between turning left and right.

HINT:

When rotation angle sensor initialization and torque sensor zero point calibration are performed, the assist map writing, the rotation angle sensor value initialization and the torque sensor zero point calibration are performed at the same time.

(a) Inspection before calibration

- (1) Turn the ignition switch off.
- (2) Connect the Techstream to the DLC3.
- (3) Turn the ignition switch to ON.
- (4) Turn the Techstream on.
- (5) Enter the following menus: Chassis / EMPS / Data List.
- (6) Check the values by referring to the table below.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
IG Power Supply	ECU power source voltage/ Min.: 0 V Max.: 20.1531 V	9 to 16 V	The ignition switch is ON.

Standard voltage:
10 V or more

NOTICE:

If the IG power supply voltage is 9 V or less, calibration cannot be performed. In this case, charge or replace the battery, and then perform calibration.

(b) Rotation angle sensor initialization and torque sensor zero point calibration

NOTICE:

- If DTC C1516 (Torque Sensor Zero Point Adjustment Incomplete) is stored, the torque sensor zero point cannot be calibrated. Clear the DTC before starting calibration.
- If DTC C1526 (Rotation Angle Sensor Initialization Incomplete) is stored, the rotation angle sensor cannot be initialized. Clear the DTC before starting initialization.

- (1) Turn the ignition switch off.

- (2) Connect the Techstream to the DLC3.
- (3) Turn the ignition switch to ON.
- (4) Turn the Techstream on.
- (5) Enter the following menus: Chassis / EMPS / Utility / Torque Sensor Adjustment.
- (6) According to the display on the Techstream, perform calibration.

NOTICE:

- Set the steering wheel to the center point and align the front tires straight ahead.
- Do not turn the steering wheel sharply.
- Do not touch the steering wheel during the rotation angle sensor initialization and torque sensor zero point calibration (for 3 seconds).



Last Modified: 3-27-2012	6.4 U	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000275203PX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: DATA LIST / ACTIVE TEST (2013 FR-S)		

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

Using the 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.

NOTICE:

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.

- Turn the ignition switch off.
- Connect the Techstream to the DLC3.
- Turn the ignition switch to ON.
- Turn the Techstream on.
- Enter the following menus: Chassis / EMPS / Data List.
- According to the display on the Techstream, read the Data List.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Meter Vehicle Velocity	Vehicle speed from skid control ECU/ Min.: 0.0 km/h (0.0 mph) Max.: 300.0 km/h (186.4 mph)	0 km/h (0 mph)	The vehicle is stopped.
		No significant fluctuation	The vehicle is driven at a constant speed.
Engine Revolution	Engine speed/ Min.: 0 rpm Max.: 12800 rpm	No significant fluctuation	The engine is running at a constant speed.
Motor Actual Current	Amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Command Value Current	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Steering Angle Velocity	Steering angle speed/ Min.: -32768 deg/s Max.: 32767 deg/s	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
	ECU substrate		

Thermistor Temperature	temperature/ Min.: -50.0°C (-58.0°F) Max.: 150.0°C (302.0°F)	-	The Ignition switch is ON.
PIG Power Supply	Power source voltage to active motor/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The engine is running and power steering is operating.
IG Power Supply	ECU power source voltage/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The Ignition switch is ON.
Steering Wheel Torque	Steering wheel torque/ Min.: -7.00 Nm Max.: 7.00 Nm	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Motor Rotation Angle	Motor rotation angle/ Min.: 0.000 deg Max.: 360.000 deg	Motor rotation angle value changes from 0 to 360°	The engine is running and the steering wheel is being turned.
Command Val Current 2	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
PIG2 Voltage	Coil rear pressurization voltage/ Min.: 0.000 V Max.: 98.000 V	Approximately 27 V	The engine is running and the steering wheel is not being turned.
		Value changes between 16 and 35 V	The engine is running and the steering wheel is being turned.
Motor Voltage	Motor power supply voltage/ Min.: 0.000 V Max.: 98.000 V	Approximately 27 V	The engine is running and the steering wheel is not being turned.
		Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(U)	Motor terminal voltage (U phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(V)	Motor terminal voltage (V phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(W)	Motor terminal voltage (W phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
	Torque sensor 1 output	2.3 to 2.7 V	The engine is running and the steering wheel is not turned (without load).
			The engine is running and the steering

Torque Sensor 1 Output	voltage/ Min.: 0.0000 V Max.: 5.0000 V	2.3 to 3.8 V	wheel is turned to the right when the vehicle is stopped.
		1.2 to 2.7 V	The engine is running and the steering wheel is turned to the left when the vehicle is stopped.
Torque Sensor 2 Output	Torque sensor 2 output voltage/ Min.: 0.0000 V Max.: 5.0000 V	2.3 to 2.7 V	The engine is running and the steering wheel is not turned (without load).
		1.2 to 2.7 V	The engine is running and the steering wheel is turned to the right when the vehicle is stopped.
		2.3 to 3.8 V	The engine is running and the steering wheel is turned to the left when the vehicle is stopped.
TRQ1 Zero Point Value	Torque sensor 1 zero point voltage/ Min.: 0.0000 V Max.: 5.0000 V	Values differ depending on vehicle	The engine is running and the steering wheel is not being turned.
TRQ2 Zero Point Value	Torque sensor 2 zero point voltage/ Min.: 0.0000 V Max.: 5.0000 V	Values differ depending on vehicle	The engine is running and the steering wheel is not being turned.
IG ON/OFF Times	Number of times ignition switch turned to ON/off after fail detection/ Min.: 0 times Max.: 65535 times	-	This value indicates the number of times the ignition switch is turned to ON and off after the latest DTC detection.
Motor Overheat Record	Continuous overheat prevention control record/ Unrec or Rec	Unrec	-
Motor Lo Power Record	PIG power supply voltage drop record/ Unrec or Rec	Unrec	-
Eng Rev Inter Record	Record of engine speed interruption/ Unrec or Rec	Unrec	-
Spd Sig Invalid Record	Record of vehicle speed signal invalid/ Unrec or Rec	Unrec	-
Battery Voltage Lo Record	Battery voltage reduction history/ Min.: 0 times, Max.: 65535 times	0 to 65535	-
The Number of DTCs	Number of stored DTCs when freeze frame data stored/ Min.: 0	0 to 255	-

	Max.: 255		
	 TOYOTA		

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Last Modified: 3-27-2012	6.4 D	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274Z04YX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: DIAGNOSIS SYSTEM (2013 FR-S)		

DIAGNOSIS SYSTEM

1. CHECK DLC3

- (a) Check the DLC3 INFO .

2. FUNCTION OF EPS WARNING LIGHT

- (a) When a malfunction is detected in the power steering system, the EPS warning light in the combination meter comes on to inform the driver of the malfunction.

HINT:

When power assist is stopped or reduced, the EPS warning light comes on.

Power assist is stopped:

- When a malfunction occurs in the power steering system (including lost CAN communication, etc.)
- When the engine stalls (not a malfunction)
- During the period after the ignition switch is turned to ON until the engine is started (not a malfunction)

Power assist is reduced:

- When a malfunction occurs in the power steering system (including lost CAN communication, etc.)
- When the battery voltage decreases (not a malfunction)



Last Modified: 3-27-2012	6.4 S	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274U04GX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: DIAGNOSTIC TROUBLE CODE CHART (2013 FR-S)		

DIAGNOSTIC TROUBLE CODE CHART

HINT:

If a trouble code is output during the DTC check, inspect the trouble areas listed for that code. For details of the code, refer to the "See page" below.

Power Steering System

DTC CODE	DETECTION ITEM	RETURN-TO-NORMAL CONDITION	EPS WARNING LIGHT	SEE PAGE
C1511	Torque Sensor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1512	Torque Sensor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1513	Torque Sensor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1514	Torque Sensor Power Supply Abnormal	Ignition switch ON again	*1	INFO
C1515	Torque Sensor Zero Point Adjustment Undone	Zero Point calibration completes	*1	INFO
C1516	Torque Sensor Zero Point Adjustment Incomplete	Clear DTC	*1	INFO
C1517	Torque Hold Abnormal	Ignition switch ON again	*1	INFO
C1521	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1522	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1523	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1524	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1525	Rotation Angle Sensor Initialization Undone	Rotation Angle Sensor calibration completes	*1	INFO
C1526	Rotation Angle Sensor Initialization Incomplete	Clear DTC	*1	INFO
C1528	Motor Rotation Angle Sensor Malfunction	Ignition switch ON again	*1	INFO
C1531	ECU Malfunction	Ignition switch ON again	*1	INFO
C1532	ECU Malfunction	Ignition switch ON again	*1	INFO
C1533	ECU Malfunction	After normal confirmation	*2	INFO
C1534	ECU Malfunction	Ignition switch ON again	*1	INFO
C1541	Vehicle Speed Signal Malfunction	After normal confirmation	*1	INFO
C1551	IG Power Supply Voltage Malfunction	After normal confirmation	*1	INFO
C1552	PIG Power Supply Voltage Malfunction	After normal confirmation	*1	INFO

C1554	Power Supply Relay Failure	Ignition switch ON again	*1	INFO
C1555	Motor Relay Welding Failure	Ignition switch ON again	*1	INFO
C1581	Assist Map Number Un-Writing	Assist Map write	*1	INFO
C1582	Assist Map Number Mismatch	After normal confirmation	*2	INFO
U0100	Lost Communication with ECM / PCM "A"	After normal confirmation	*1	INFO
U0122	Lost Communication with Vehicle Dynamics Control Module	After normal confirmation	*1	INFO
U0416	Invalid Data Received from Vehicle Dynamics Control Module	Ignition switch ON again	*1	INFO

*1: Warning light comes on

*2: Warning light turns off



Last Modified: 3-27-2012	6.4 S	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274U04GX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: DIAGNOSTIC TROUBLE CODE CHART (2013 FR-S)		

DIAGNOSTIC TROUBLE CODE CHART

HINT:

If a trouble code is output during the DTC check, inspect the trouble areas listed for that code. For details of the code, refer to the "See page" below.

Power Steering System

DTC CODE	DETECTION ITEM	RETURN-TO-NORMAL CONDITION	EPS WARNING LIGHT	SEE PAGE
C1511	Torque Sensor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1512	Torque Sensor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1513	Torque Sensor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1514	Torque Sensor Power Supply Abnormal	Ignition switch ON again	*1	INFO
C1515	Torque Sensor Zero Point Adjustment Undone	Zero Point calibration completes	*1	INFO
C1516	Torque Sensor Zero Point Adjustment Incomplete	Clear DTC	*1	INFO
C1517	Torque Hold Abnormal	Ignition switch ON again	*1	INFO
C1521	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1522	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1523	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1524	Motor Circuit Malfunction	Ignition switch ON again	*1	INFO
C1525	Rotation Angle Sensor Initialization Undone	Rotation Angle Sensor calibration completes	*1	INFO
C1526	Rotation Angle Sensor Initialization Incomplete	Clear DTC	*1	INFO
C1528	Motor Rotation Angle Sensor Malfunction	Ignition switch ON again	*1	INFO
C1531	ECU Malfunction	Ignition switch ON again	*1	INFO
C1532	ECU Malfunction	Ignition switch ON again	*1	INFO
C1533	ECU Malfunction	After normal confirmation	*2	INFO
C1534	ECU Malfunction	Ignition switch ON again	*1	INFO
C1541	Vehicle Speed Signal Malfunction	After normal confirmation	*1	INFO
C1551	IG Power Supply Voltage Malfunction	After normal confirmation	*1	INFO
C1552	PIG Power Supply Voltage Malfunction	After normal confirmation	*1	INFO

C1554	Power Supply Relay Failure	Ignition switch ON again	*1	INFO
C1555	Motor Relay Welding Failure	Ignition switch ON again	*1	INFO
C1581	Assist Map Number Un-Writing	Assist Map write	*1	INFO
C1582	Assist Map Number Mismatch	After normal confirmation	*2	INFO
U0100	Lost Communication with ECM / PCM "A"	After normal confirmation	*1	INFO
U0122	Lost Communication with Vehicle Dynamics Control Module	After normal confirmation	*1	INFO
U0416	Invalid Data Received from Vehicle Dynamics Control Module	Ignition switch ON again	*1	INFO

*1: Warning light comes on

*2: Warning light turns off



Last Modified: 3-27-2012	6.4 D	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM000002750059X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: DTC CHECK / CLEAR (2013 FR-S)		

DTC CHECK / CLEAR

1. CHECK DTC

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Turn the ignition switch to ON.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Trouble Codes.
- (f) Read the DTCs following the display on the Techstream.
- (g) Refer to Diagnostic Trouble Code Chart for DTC information  .

2. CLEAR DTC

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Turn the ignition switch to ON.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Trouble Codes.
- (f) Clear the DTCs by following the display on the Techstream.
- (g) Turn the ignition switch off.
- (h) Disconnect the Techstream from the DLC3.



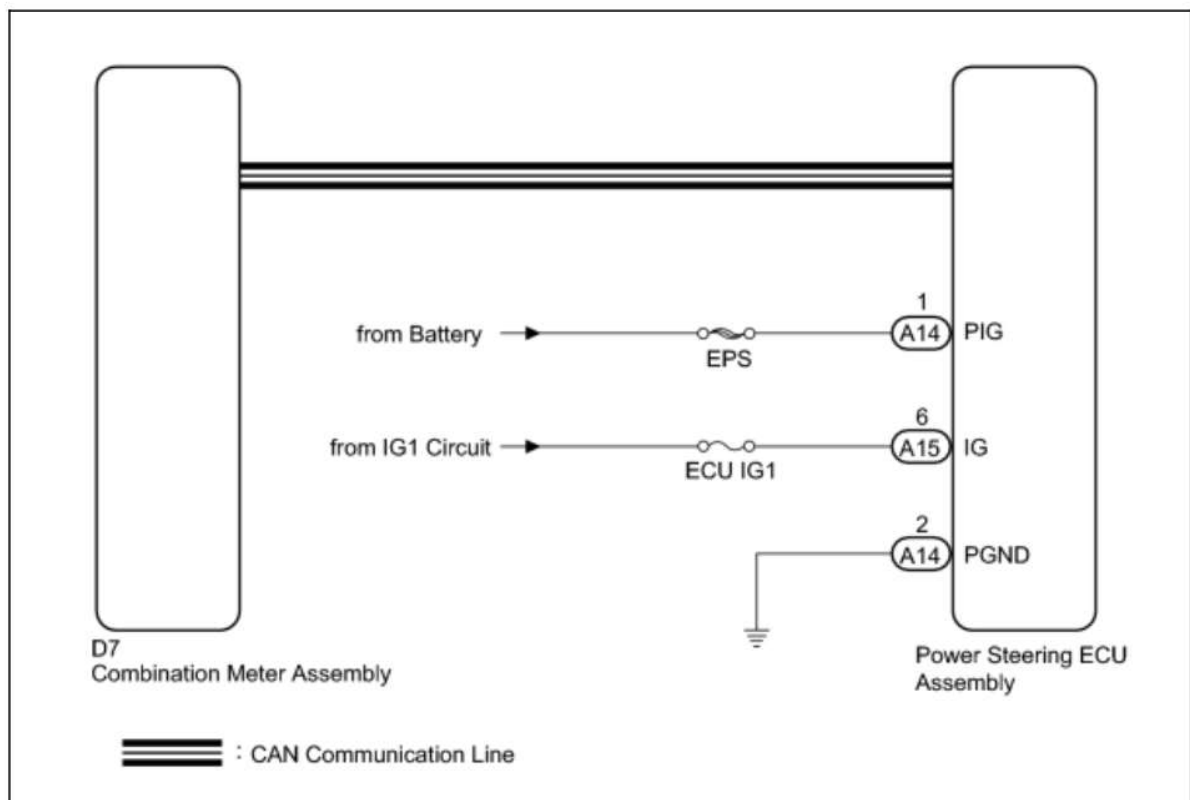
Last Modified: 3-27-2012	6.4 J	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277E04GX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: EPS Warning Light Circuit (2013 FR-S)		

EPS Warning Light Circuit

DESCRIPTION

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

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

- If the power steering ECU assembly is replaced with a new one, perform rotation angle sensor initialization and torque sensor zero point calibration **INFO**.
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

HINT:

When the power supply voltage to the power steering ECU assembly (terminals IG and PIG) drops, required steering effort increases and the EPS warning light turns on.

PROCEDURE

1. CHECK HARNESS AND CONNECTOR

- (a) Turn the ignition switch to ON.
- (b) Check the indication condition of the EPS warning light by wiggling the power steering ECU assembly connector and wire harness up and down, and right and left.

OK:

EPS warning light indication condition does not change.

NG ► **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK



2. CHECK FOR DTC (CAN COMMUNICATION SYSTEM)

- (a) Check for DTCs INFO.

OK:

DTC is not output.

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

OK



3. READ VALUE USING TECHSTREAM (IG POWER SUPPLY)

- (a) Turn the ignition switch off.
- (b) Connect the 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.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
----------------	------------------------	------------------	-----------------

IG Power Supply	ECU power source voltage/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The ignition switch is ON.
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OK:

The normal condition value is displayed the Techstream.

NG  **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)**

OK

4.	READ VALUE USING TECHSTREAM (PIG POWER SUPPLY)
-----------	---

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Start the engine.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Data List.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
PIG Power Supply	Power source voltage to active motor/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The engine is running and power steering is operating.

OK:

The normal condition value is displayed the Techstream.

NG  **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)**

OK

5.	PERFORM ACTIVE TEST USING TECHSTREAM (METER / GAUGE SYSTEM)
-----------	--

(a) Perform the Active Test of the combination meter using the Techstream INFO .

Combination Meter

TESTER DISPLAY	TEST PART	CONTROL RANGE	DIAGNOSTIC NOTE
Indicat. EPS	EPS warning light	OFF/ON	Vehicle is stopped and engine is idling

(b) Check that the EPS warning light operates in accordance with the Active Test.

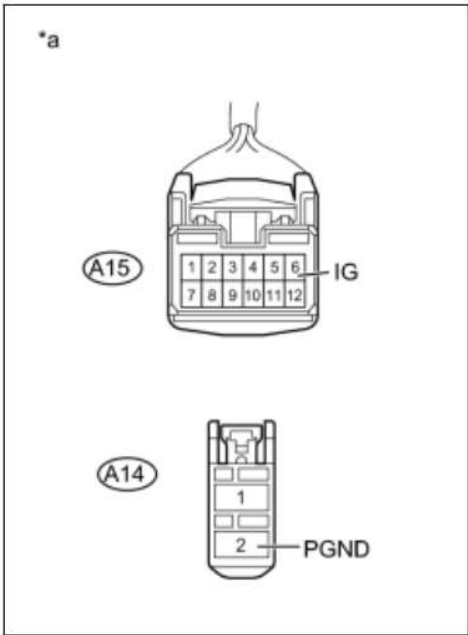
HINT:

Reconnect the connectors and restore the vehicle to its previous condition before checking the combination meter.

NG ► REPLACE COMBINATION METER ASSEMBLY

OK ► REPLACE POWER STEERING ECU ASSEMBLY

6.	CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)
----	---



(a) Disconnect the A14 and A15 power steering ECU assembly connectors.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A15-6 (IG) - Body ground	Ignition switch ON	9 to 16 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A14-2 (PGND) - Body ground	Always	Below 1 Ω

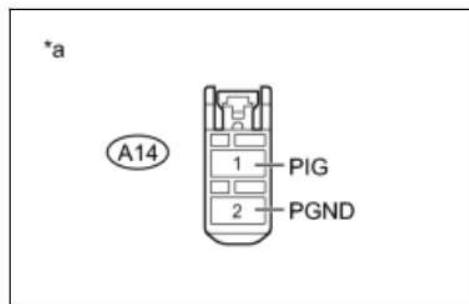
Text in Illustration

*a	Front view of wire harness connector (to Power Steering ECU Assembly)
----	--

NG ► REPAIR OR REPLACE HARNESS OR
CONNECTOR

OK ► REPLACE POWER STEERING ECU ASSEMBLY

7.	CHECK HARNESS AND CONNECTOR (POWER STEERING ECU ASSEMBLY - BATTERY/BODY GROUND)
-----------	--



(a) Disconnect the A14 power steering ECU assembly connector .

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A14-1 (PIG) - Body ground	Always	9 to 16 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A14-2 (PGND) - Body ground	Always	Below 1 Ω

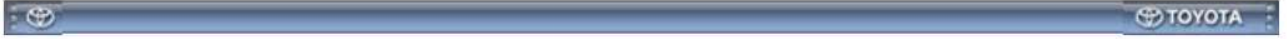
Text in Illustration

*a	Front view of wire harness connector
----	--------------------------------------

(to Power Steering ECU Assembly)

NG ► **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ► **REPLACE POWER STEERING ECU ASSEMBLY**



Last Modified: 3-27-2012	6.4 U	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000275402ZX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: FAIL-SAFE CHART (2013 FR-S)		

FAIL-SAFE CHART

If a problem occurs in the power steering system, the EPS warning light comes on in the combination meter and the power steering assist is stopped, locked at a particular point, or decreased simultaneously to protect the system.

Power Steering System

DTC CODE	DETECTION CONDITION	FAIL-SAFE OPERATION
C1511	Torque sensor malfunction	Power assist stops.
C1512		
C1513		
C1514		
C1515		
C1516		
C1517		
C1521	Motor circuit malfunction	
C1522		
C1523		
C1524		
C1525	Motor rotation angle sensor malfunction	
C1526		
C1528		
C1531	ECU malfunction	Assist force is restricted.
C1532		
C1533		
C1534		
C1541	Skid control malfunction	The amount of power assist is locked at the 100 km/h (62 mph) level of power assist.
C1551	IG power supply voltage error	Power assist stops.
C1552	PIG power supply voltage error	
C1554	Power supply relay malfunction	
C1555	Motor relay malfunction	
C1581	Assist map not written in power steering ECU	Control is performed using the default settings.
C1582	Assist map mismatch in power	Control is performed using the current assist map.

	steering ECU	
U0100	ECM communication error	Power assist continues as normal*1.
		Power assist stops*2.
U0122	Skid control ECU communication error	The amount of power assist is locked at the 100 km/h (62 mph) level of power assist.
U0416		

HINT:

- *1: When the DTC is stored while the engine is running.
- *2: When the DTC is stored before the engine is started.
- 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.
- If the battery is not sufficiently charged or the voltage decreases temporarily, the amount of power assist is reduced and the EPS warning light comes on. In such cases, the amount of power assist returns normal when the battery voltage recovers.



Last Modified: 3-27-2012	6.4 D	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000275504RX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: FREEZE FRAME DATA (2013 FR-S)		

FREEZE FRAME DATA

1. FREEZE FRAME DATA

- (a) Turn the ignition switch off.
- (b) Connect the Techstream to the DLC3.
- (c) Turn the ignition switch to ON.
- (d) Turn the Techstream on.
- (e) Enter the following menus: Chassis / EMPS / Trouble Codes.
- (f) According to the display on the Techstream, select the freeze frame data.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Meter Vehicle Velocity	Vehicle speed from skid control ECU/ Min.: 0.0 km/h (0.0 mph) Max.: 300.0 km/h (186.4 mph)	0 km/h (0 mph)	The vehicle is stopped.
		No significant fluctuation	The vehicle is driven at a constant speed.
Engine Revolution	Engine speed/ Min.: 0 rpm Max.: 12800 rpm	No significant fluctuation	The engine is running at a constant speed.
Motor Actual Current	Amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Command Value Current	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Steering Angle Velocity	Steering angle speed/ Min.: -32768 deg/s Max.: 32767 deg/s	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Thermistor Temperature	ECU substrate temperature/ Min.: -50.0°C (-58.0°F) Max.: 150.0°C	-	The ignition switch is ON.

	(302.0°F)		
PIG Power Supply	Power source voltage to active motor/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The engine is running and power steering is operating.
IG Power Supply	ECU power source voltage/ Min.: 0.0000 V Max.: 20.1531 V	9 to 16 V	The ignition switch is ON.
Steering Wheel Torque	Steering wheel torque/ Min.: -7.00 Nm Max.: 7.00 Nm	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
Motor Rotation Angle	Motor rotation angle/ Min.: 0.000 deg Max.: 360.000 deg	Motor rotation angle value changes from 0 to 360 deg	The engine is running and the steering wheel is being turned.
Command Val Current 2	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	The engine is running and the steering wheel is being turned.
PIG2 Voltage	Coil rear pressurization voltage/ Min.: 0.000 V Max.: 98.000 V	Approximately 27 V	The engine is running and the steering wheel is not being turned.
		Value changes between 16 and 35 V	The engine is running and the steering wheel is being turned.
Motor Voltage	Motor power supply voltage/ Min.: 0.000 V Max.: 98.000 V	Approximately 27 V	The engine is running and the steering wheel is not being turned.
		Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(U)	Motor terminal voltage (U phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(V)	Motor terminal voltage (V phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.
Motor Terminal Volt(W)	Motor terminal voltage (W phase)/ Min.: 0.000 V Max.: 98.000 V	Value changes between 4 and 35 V	The engine is running and the steering wheel is being turned.

Torque Sensor 1 Output	Torque sensor 1 output voltage/ Min.: 0.0000 V Max.: 5.0000 V	2.3 to 2.7 V	The engine is running and the steering wheel is not turned (without load).
		2.3 to 3.8 V	The engine is running and the steering wheel is turned to the right when the vehicle is stopped.
		1.2 to 2.7 V	The engine is running and the steering wheel is turned to the left when the vehicle is stopped.
Torque Sensor 2 Output	Torque sensor 2 output voltage/ Min.: 0.0000 V Max.: 5.0000 V	2.3 to 2.7 V	The engine is running and the steering wheel is not turned (without load).
		1.2 to 2.7 V	The engine is running and the steering wheel is turned to the right when the vehicle is stopped.
		2.3 to 3.8 V	The engine is running and the steering wheel is turned to the left when the vehicle is stopped.
TRQ1 Zero Point Value	Torque sensor 1 zero point voltage/ Min.: 0.0000 V Max.: 5.0000 V	Values differ depending on vehicle	The engine is running and the steering wheel is not being turned.
TRQ2 Zero Point Value	Torque sensor 2 zero point voltage/ Min.: 0.0000 V Max.: 5.0000 V	Values differ depending on vehicle	The engine is running and the steering wheel is not being turned.



Last Modified: 3-27-2012	6.4 D	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274T05UX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: HOW TO PROCEED WITH TROUBLESHOOTING (2013 FR-S)		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

*: Use the Techstream.

1.	VEHICLE BROUGHT TO WORKSHOP
-----------	------------------------------------

NEXT



2.	CUSTOMER PROBLEM ANALYSIS
-----------	----------------------------------

(a) Confirm problem symptoms [INFO](#) .

NEXT



3.	INSPECT BATTERY VOLTAGE*
-----------	---------------------------------

(a) Measure the voltage of the battery.

Standard voltage:

11 to 14 V

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

(b) Using the Techstream, inspect battery voltage reduction history "Battery Voltage Lo Record" in the Data List [INFO](#) .

NEXT



4.	CHECK DTC AND FREEZE FRAME DATA*
-----------	---

(a) Check and record DTCs and freeze frame data.

NEXT

5.	CLEAR DTC AND FREEZE FRAME DATA*
-----------	---

(a) Clear the DTCs and freeze frame data.

NEXT

6.	PROBLEM SYMPTOM CONFIRMATION
-----------	-------------------------------------

Result

RESULT	PROCEED TO
Symptom does not occur.	A
Symptom occurs.	B

B Go to step 8

A

7.	SYMPTOM SIMULATION
-----------	---------------------------

(a) Perform symptom simulation .

NEXT

8.	CHECK CAN COMMUNICATION SYSTEM*
-----------	--

(a) Check for DTCs .

Result

RESULT	PROCEED TO
--------	------------

CAN communication system DTC is not output.	A
CAN communication system DTC is output.	B

HINT:

- If any CAN communication system DTCs are output, perform troubleshooting for the CAN communication system first.
- If communication to the power steering ECU cannot be established through the Techstream, inspect terminals CANH and CANL of the DLC3 and power steering ECU, and the IG circuit of the power steering ECU.

B ▶ PROCEED TO CAN COMMUNICATION SYSTEM (HOW TO PROCEED WITH TROUBLESHOOTING)

A
▼

9.	CHECK FOR DTC*
-----------	-----------------------

(a) Check for DTCs INFO .

HINT:

Refer to Diagnostic Trouble Code Chart when any DTCs are output INFO .

Result

RESULT	PROCEED TO
DTC is not output.	A
DTC is output.	B

B ▶ Go to step 11

A
▼

10.	PROBLEM SYMPTOMS TABLE
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(a) Refer to Problem Symptoms Table INFO .

NEXT



11.	CIRCUIT INSPECTION
-----	--------------------

NEXT



12.	IDENTIFICATION OF PROBLEM
-----	---------------------------

NEXT



13.	REPAIR OR REPLACE
-----	-------------------

NEXT



14.	CONFIRMATION TEST
-----	-------------------

NEXT ► END

Last Modified: 3-27-2012	6.4 G	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM000000WF605FX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: ON-VEHICLE INSPECTION (2013 FR-S)		

ON-VEHICLE INSPECTION

1. CHECK STEERING EFFORT (TORQUE)

NOTICE:

Some of these service operations may affect the SRS airbags. Read the precautionary notices concerning the SRS airbag system before servicing.

- (a) Stop the vehicle on a level, paved surface and align the wheels straight ahead.
- (b) Disconnect the cable from the negative (-) battery terminal.

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to disable the SRS system.

- (c) Remove the steering pad .
- (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: 39 N·m (398 kgf·cm, 29ft·lbf)

- (f) Turn the ignition switch to ON 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 continuing to turn it further in the same direction.

Standard steering effort (Reference):

6.0 N·m (61 kgf·cm, 53 in.*lbf) or less

- (h) Align the front wheels facing straight ahead.
- (i) Disconnect the cable from the negative (-) battery terminal.

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to disable the SRS system.

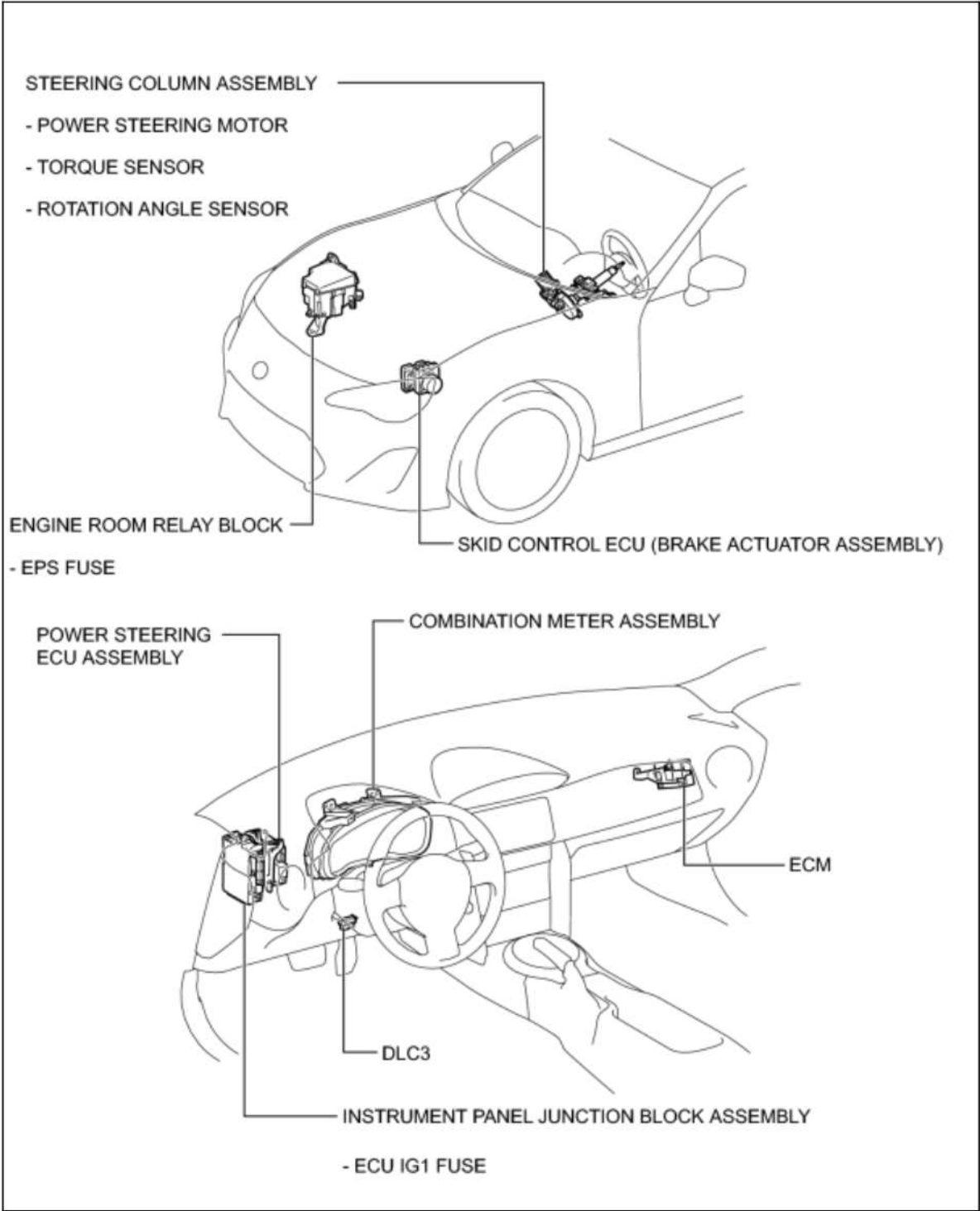
- (j) Install the steering pad .
- (k) Connect the cable to the negative (-) battery terminal.



Last Modified: 3-27-2012	6.4 R	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274V02QX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: PARTS LOCATION (2013 FR-S)		

PARTS LOCATION

ILLUSTRATION



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Last Modified: 3-27-2012	6.4 L	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274S03XX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: PRECAUTION (2013 FR-S)		

PRECAUTION

1. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

- (a) The vehicle is equipped with a Supplemental Restraint System (SRS). Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing. This may cause a serious accident.

Before servicing (including inspection, replacement, removal and installation of parts), be sure to read the precautionary notices for Supplemental Restraint System .

2. PRECAUTIONS FOR REMOVAL, INSTALLATION AND REPLACEMENT OF ELECTRONIC MOTOR POWER STEERING COMPONENTS

- (a) Be sure to align the front wheels straight ahead when removing and installing the power steering link assembly.
- (b) If disconnecting the steering intermediate shaft and pinion shaft of the power steering link assembly, be sure to place matchmarks before starting the operation.
- (c) If replacing the power steering ECU assembly, always replace it with a new one (if the power steering ECU assembly is not replaced with a new one, DTCs may be stored).

NOTICE:

Do not use the power steering ECU assembly from another vehicle (display model, etc.).

- (d) After replacing the steering column assembly or power steering ECU assembly, write the assist map, initialize the rotation angle sensor and calibrate the torque sensor zero point .

3. HANDLING PRECAUTION

- (a) When handling electronic parts:
- Avoid any impact to electronic parts such as ECUs and relays. Replace electronic parts with new ones if dropped or subjected to a severe blow.
 - Do not expose any electronic parts to high temperatures or humidity.
 - Do not touch the connector terminals in order to prevent deformation or malfunctions due to static electricity.
- (b) When handling the steering column assembly:
- Avoid any impact to the steering column assembly, especially to the motor and torque sensor. Replace them with new ones if dropped or subjected to a severe blow.
 - Do not pull the wire harness when moving the steering column assembly.
- (c) When disconnecting the connectors related to the power steering system, turn the ignition switch to ON, center the steering wheel, turn the ignition switch off, disconnect the negative (-) battery terminal, and then disconnect the connectors.

4. PRECAUTIONS FOR CAN COMMUNICATION

- (a) Perform troubleshooting for the communication line problems when DTCs of the CAN communication system are output. Be sure to start troubleshooting the power steering system after confirming that the CAN communication system is normal.
- (b) Since the CAN communication line has a specific length and route, it cannot be repaired temporarily with a bypass wire, etc.



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Last Modified: 3-27-2012	6.4 T	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM0000020NO01EX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: PROBLEM SYMPTOMS TABLE (2013 FR-S)		

PROBLEM SYMPTOMS TABLE

HINT:

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

Power Steering System

SYMPTOM	SUSPECTED AREA	SEE PAGE
Steering is heavy.	Front tires (Improperly inflated, unevenly worn)	INFO
	Front wheel alignment (Incorrect)	INFO
	Front suspension (Lower ball joint)	INFO
	Rack and pinion power steering gear assembly	INFO
	Steering column assembly	INFO
	Torque sensor (Built into steering column assembly)	-
	Power steering motor (Built into steering column assembly)	-
	Speed sensor	INFO
	Skid control ECU	INFO
	Battery and power source system	INFO
	Power steering ECU power supply voltage and relay	INFO
	Power steering ECU assembly	INFO
	Calibration of rotation angle sensor output and torque sensor	INFO
	Front tires (Improperly inflated, unevenly worn)	INFO
	Front wheel alignment (Incorrect)	INFO
	Front suspension (Lower ball	

Steering effort differs between right and left or is uneven.	joint)	INFO
	Rack and pinion power steering gear assembly	INFO
	Torque sensor (Built into steering column assembly)	-
	Steering column assembly	INFO
	Power steering motor (Built into steering column assembly)	-
	Power steering ECU assembly	INFO
While driving, steering effort does not change in accordance with vehicle speed or the steering wheel does not return properly.	Front suspension (Lower ball joint)	INFO
	Speed sensor	INFO
	Skid control ECU	INFO
	Torque sensor (Built into steering column assembly)	-
	Power steering motor (Built into steering column assembly)	-
	Rack and pinion power steering gear assembly	INFO
A knocking (or cranking) sound occurs when turning the steering wheel while power steering operating.	Power steering ECU assembly	INFO
	Front suspension (Lower ball joint)	INFO
	Steering intermediate shaft	-
Noise occurs when turning the steering wheel during low speed driving.	Rack and pinion power steering gear assembly	INFO
	Power steering motor (Built into steering column assembly)	-
	Steering column assembly	INFO
	Steering sensor	-
	Power steering ECU assembly	INFO
High-pitched sounds (squeaking) occur when turning the steering wheel slowly with the vehicle stopped.	Rack and pinion power steering gear assembly	INFO
	Power steering motor (Built into steering column assembly)	-
The steering wheel vibrates and noise occurs when turning the steering wheel from lock to lock.	Rack and pinion power steering gear assembly	INFO
	Power steering motor (Built into steering column assembly)	-
	Steering column assembly	INFO

EPS warning light remains on.

EPS warning light circuit

INFO



TOYOTA

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Last Modified: 3-27-2012	6.4 D	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274Y02YX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: SYSTEM DESCRIPTION (2013 FR-S)		

SYSTEM DESCRIPTION

1. DESCRIPTION

- The power steering system generates torque through the operation of the motor and reduction gear installed on the column shaft in order to assist steering effort.
- The power steering ECU determines directions and the amount of assisting power in accordance with vehicle speed signals and signals from the torque sensor built into the steering column assembly. As a result, the power steering ECU adjusts the steering effort so that it is lighter during low speed driving and heavier during high speed driving.
- When there is a power supply voltage drop that may result in an increase in required steering effort, the power steering system has a function that warns the driver by illuminating the EPS warning light.

(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.

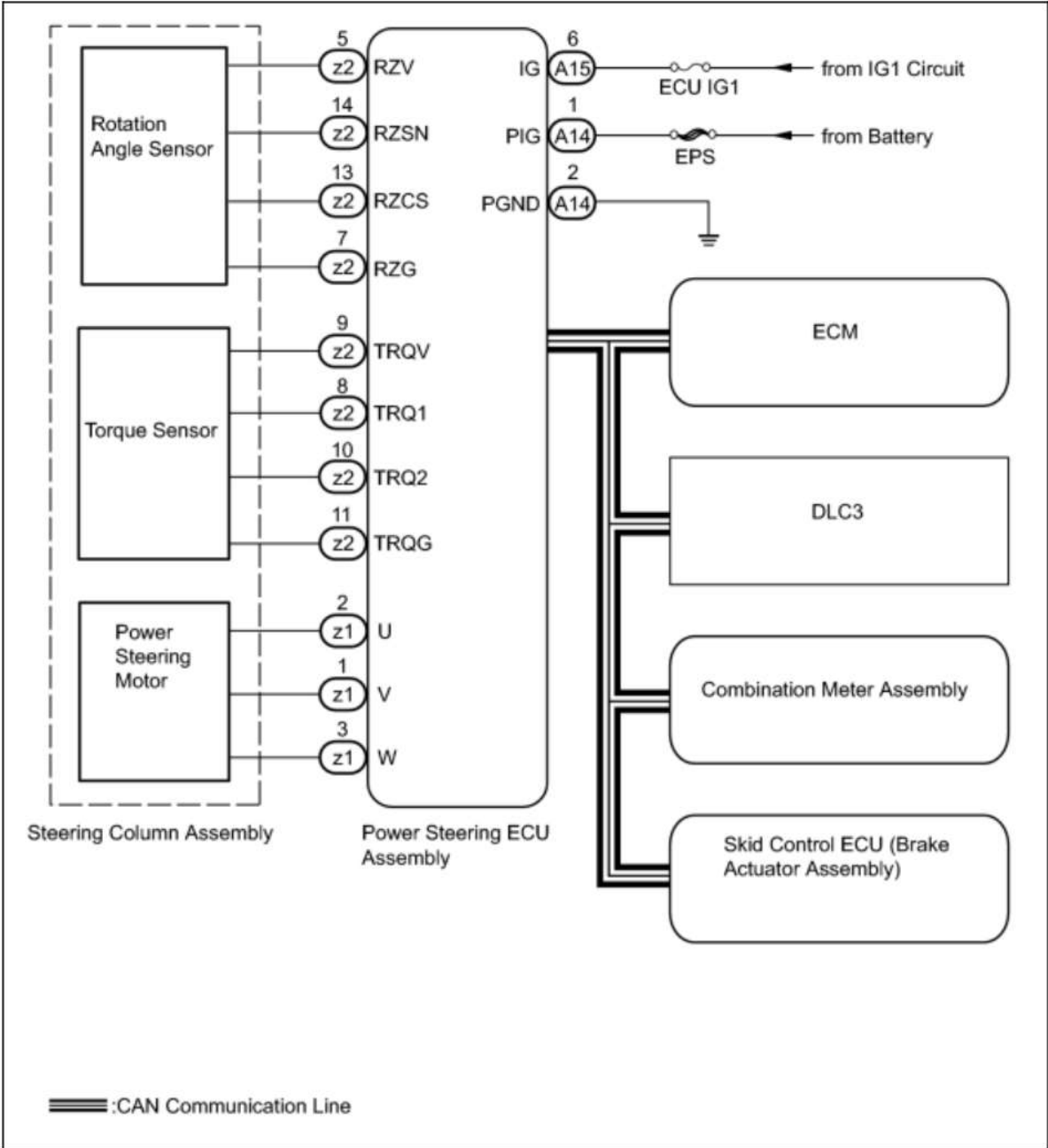
(d) Motor rotation angle sensor:

The motor rotation angle sensor consists of the resolver sensor, which excels in reliability and durability. The rotation angle sensor detects the rotation angle of the motor and outputs it to the power steering ECU. As a result, it ensures efficient EPS control.



Last Modified: 3-27-2012	6.4 U	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000275102ZX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: SYSTEM DIAGRAM (2013 FR-S)		

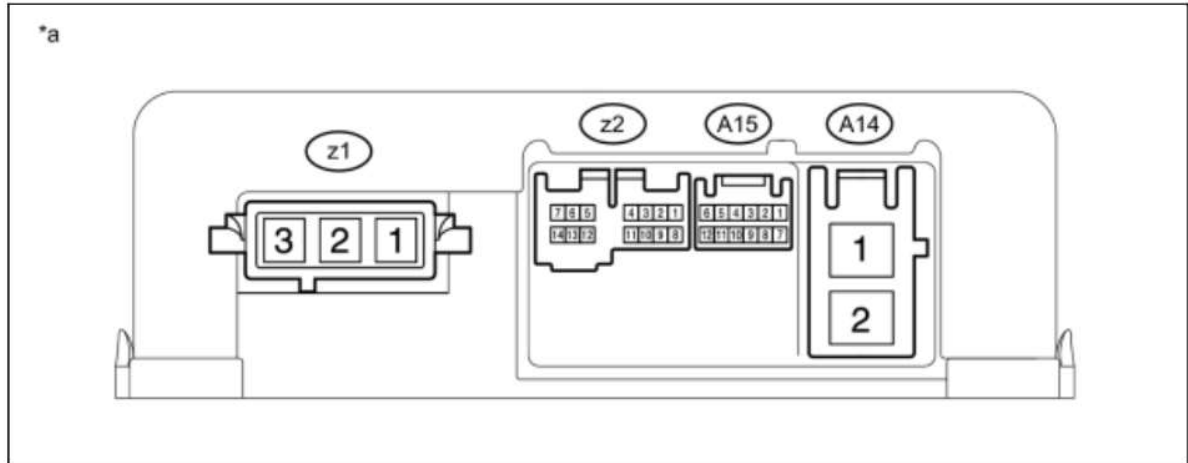
SYSTEM DIAGRAM



Last Modified: 3-27-2012	6.4 U	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000274W02YX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: TERMINALS OF ECU (2013 FR-S)		

TERMINALS OF ECU

1. CHECK POWER STEERING ECU



Text in Illustration

*a	Component without harness connected (Power Steering ECU Assembly)	-	-
----	--	---	---

HINT:

As connector z1 uses a lock lever, each terminal cannot be checked while the connector is still connected to the power steering ECU.

TERMINAL NO. (SYMBOL)	TERMINAL DESCRIPTION
z1-1 (V)	V phase motor output
z1-2 (U)	U phase motor output
z1-3 (W)	W phase motor output

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

TERMINAL NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
A14-1 (PIG) - A14-2 (PGND)	W - B	Motor power supply	Always	9 to 16 V
A14-2 (PGND) - Body ground	B - Body ground	Power ground	Always	Below 1 Ω
A15-1 (CANH) - A15-7 (CANL)	B - W	CAN communication line	Ignition switch off	57 to 63 Ω

A15-6 (IG) - A14-2 (PGND)	G - W - B	IG power supply	Ignition switch ON	9 to 16 V
z2-5 (RZV) - A14-2 (PGND)	R - B	Rotation angle sensor excitation output signal	Engine running, steering wheel being turned	0.68 to 4.42 V
z2-7 (RZG) - A14-2 (PGND)	B - B	Rotation angle sensor excitation circuit ground	Always	Below 1 Ω
z2-13 (RZCS) - A14-2 (PGND)	L - B	Rotation angle sensor COS aspect input signal	Engine running, steering wheel being turned	0.68 to 4.42 V
z2-14 (RZSN) - A14-2 (PGND)	Y - B	Rotation angle sensor SIN aspect input signal	Engine running, steering wheel being turned	0.68 to 4.42 V
z2-8 (TRQ1) - z2-11 (TRQG)	W - B	Torque sensor signal 1	Engine running, steering wheel not turned (without load)	2.3 to 2.7 V
			Engine running, steering wheel turned to right with vehicle stopped	2.3 to 3.8 V
			Engine running, steering wheel turned to left with vehicle stopped	1.2 to 2.7 V
z2-9 (TRQV) - z2-11 (TRQG)	R - B	Torque sensor power supply	Ignition switch ON	4.5 to 5.5 V
z2-10 (TRQ2) - z2-11 (TRQG)	Y - B	Torque sensor signal 2	Engine running, steering wheel not turned (without load)	2.3 to 2.7 V
			Engine running, steering wheel turned to right with vehicle stopped	1.2 to 2.7 V
			Engine running, steering wheel turned to left with vehicle stopped	2.3 to 3.8 V
z2-11 (TRQG) - Body ground	B - Body ground	Torque sensor ground	Always	Below 1 Ω

If the result is not as specified, the ECU may have a malfunction.



Last Modified: 3-27-2012	6.4 C	From: 201203
Model Year: 2013	Model: FR-S	Doc ID: RM00000277M064X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM: U0100,U0122,U0416: Lost Communication with ECM / PCM "A" (2013 FR-S)		

DTC	U0100	Lost Communication with ECM / PCM "A"
------------	--------------	--

DTC	U0122	Lost Communication with Vehicle Dynamics Control Module
------------	--------------	--

DTC	U0416	Invalid Data Received from Vehicle Dynamics Control Module
------------	--------------	---

DESCRIPTION

The power steering ECU assembly receives signals from the ECM and skid control ECU (brake actuator assembly) via the CAN communication system.

DTC CODE	DTC DETECTION CONDITION	TROUBLE AREA
U0100	Lost communication with the ECM/PCM "A"	- CAN communication system - ECM
U0122	Lost communication with the brake system control module	- CAN communication system - Skid control ECU (Brake actuator assembly)
U0416	The brake system control module signal malfunction	

INSPECTION PROCEDURE

PROCEDURE

1.	CHECK FOR DTC (CAN COMMUNICATION SYSTEM)
-----------	---

(a) Clear the DTC(s)  .

(b) Check for DTCs  .

OK:

DTC is not output.

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

OK ► **USE SIMULATION METHOD TO CHECK**



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