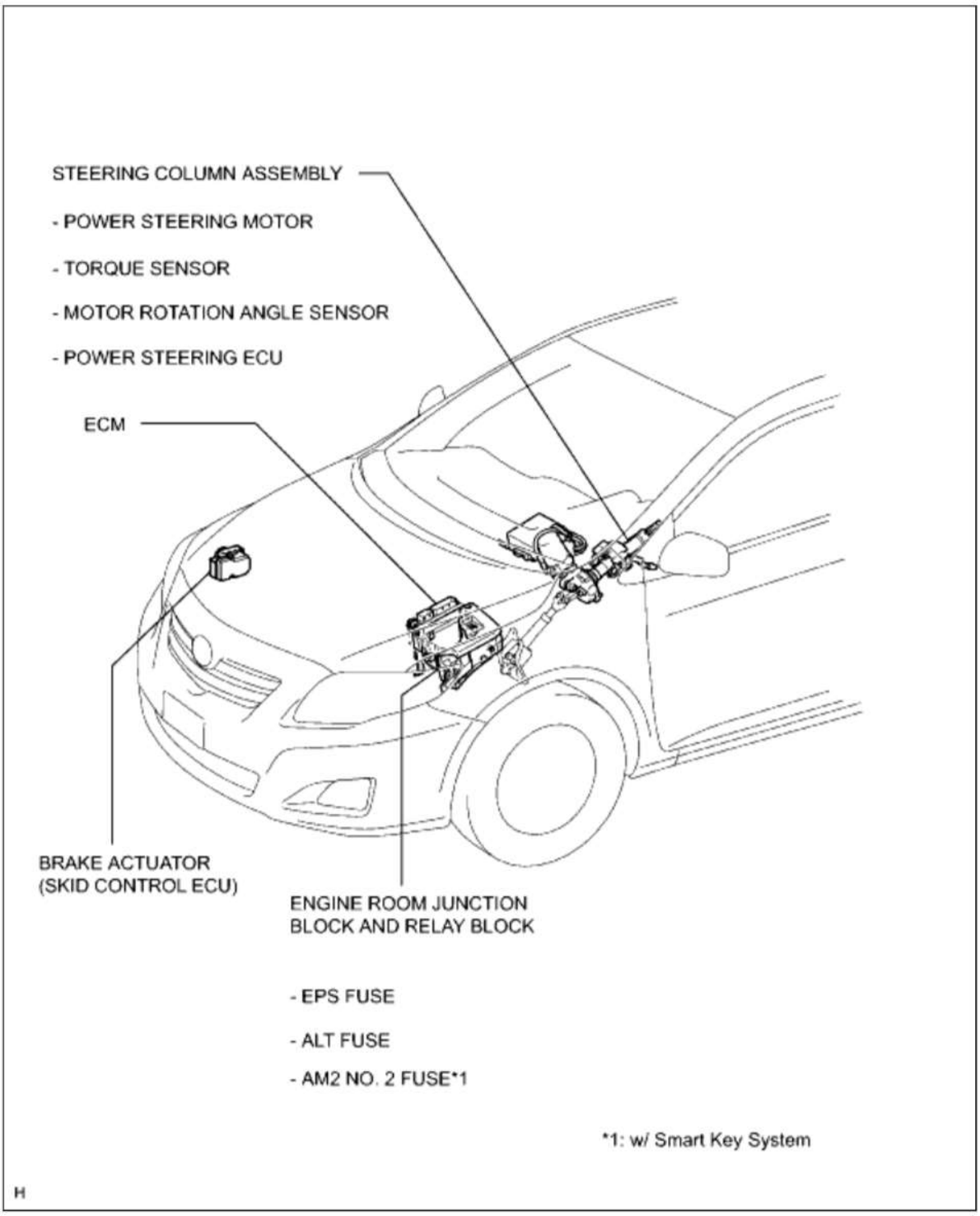
Last Modified: 3-10-2010	6.4 R	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274V00HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): PARTS LOCATION (2010 Corolla)		

PARTS LOCATION

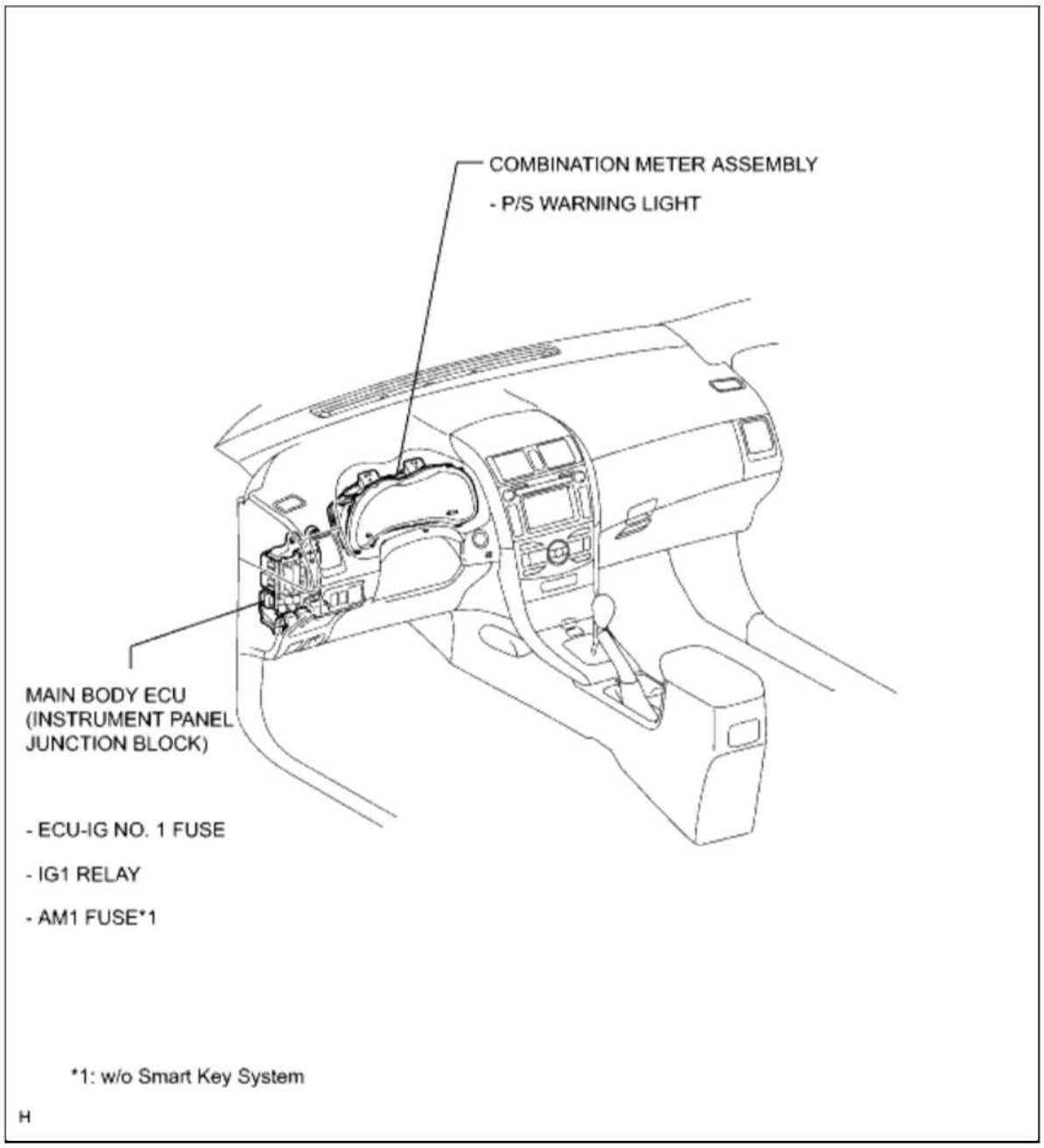
ILLUSTRATION

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ILLUSTRATION

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Last Modified: 3-10-2010	6.4 L	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274S00OX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): PRECAUTION (2010 Corolla)		

PRECAUTION

1. IGNITION SWITCH EXPRESSIONS

HINT:

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

SWITCH TYPE		IGNITION SWITCH (POSITION)	ENGINE SWITCH (CONDITION)
Expression	Ignition switch off	LOCK	Off
	Ignition switch on (IG)	ON	On (IG)
	Ignition switch on (ACC)	ACC	On (ACC)
	Engine start	START	Start

2. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

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

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

3. 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 gear assembly.

(b) If disconnecting the steering sliding yoke sub-assembly and the pinion shaft of the power steering gear assembly, be sure to place matchmarks before starting the operation.

(c) After replacing the power steering gear assembly or power steering ECU, clear the rotation angle sensor calibration value, initialize the rotation angle sensor, and calibrate the torque sensor zero point INFO .

4. HANDLING PRECAUTION

(a) When handling the electronic parts:

- Avoid any impact to electronic parts such as ECUs and relays. Replace them with new ones if dropped or subjected to a severe blow.
- Do not expose any electronic parts to high temperatures or humidity.
- Do not touch the connector terminals in order to prevent deformation or malfunctions due

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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 and reconnecting the connectors:

When disconnecting the connectors related to the power steering system, turn the ignition switch on (IG), center the steering wheel, turn the ignition switch off, and then disconnect the connectors.

5. 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, DTCs of the CAN communication line are output.

(b) Perform troubleshooting for the communication line problems when the CAN communication DTCs are output. Be sure to start troubleshooting on the power steering system after confirming that the CAN communication system is normal.

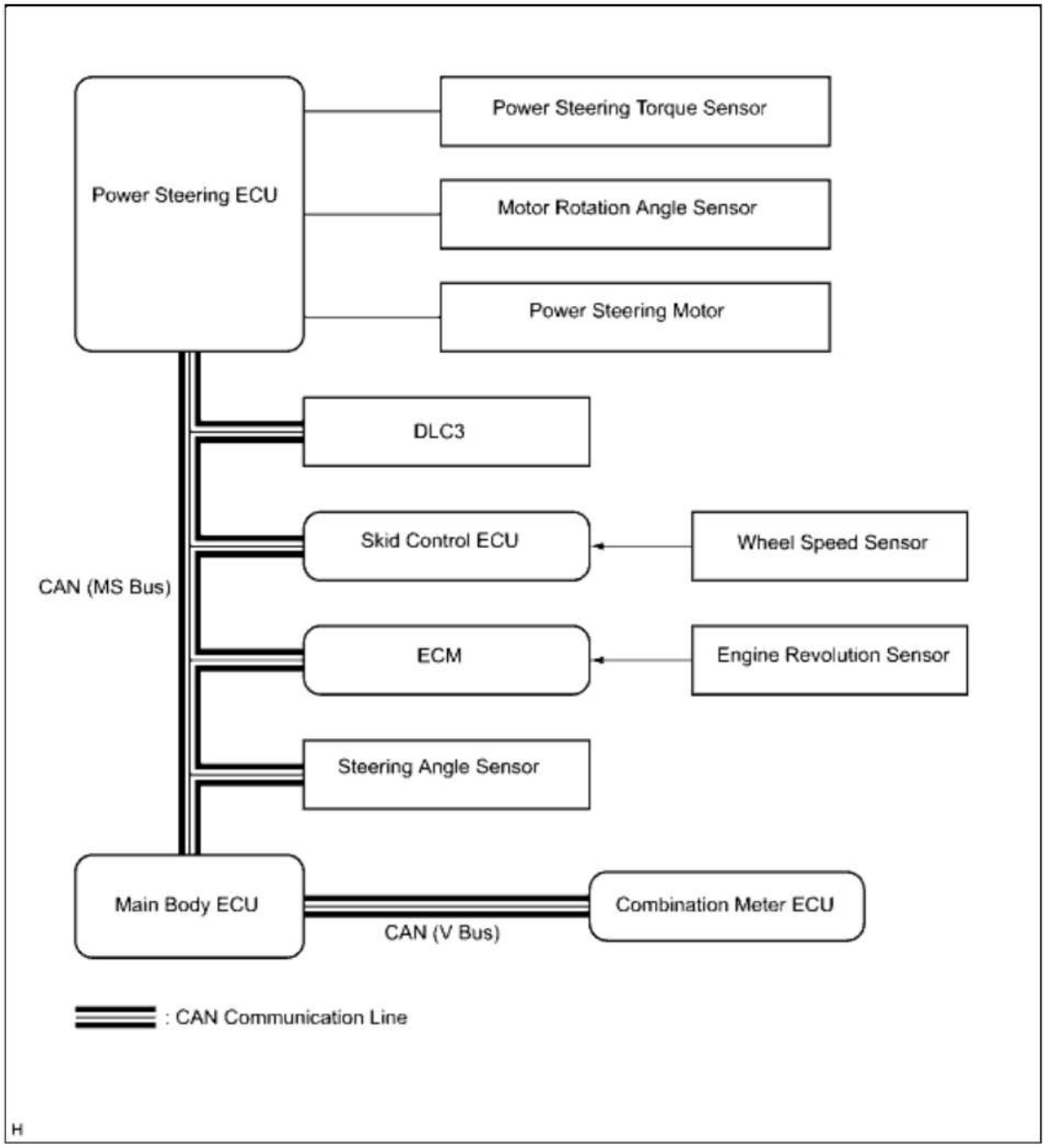
(c) Since the CAN communication line has its own length and route, it cannot be repaired temporarily with a bypass wire, etc.



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Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000275100HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): SYSTEM DIAGRAM (2010 Corolla)		

SYSTEM DIAGRAM



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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274T00VX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): HOW TO PROCEED WITH TROUBLESHOOTING (2010 Corolla)		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1.	**VEHICLE BROUGHT TO WORKSHOP**

NEXT

2.	**INSPECT BATTERY VOLTAGE**

Standard Voltage:
11 to 14 V

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

NEXT

3.	**CHECK DTC AND FREEZE FRAME DATA***

HINT:

Refer to Clear DTCs INFO .

NEXT

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4.	PROBLEM SYMPTOM CONFIRMATION

Result:

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

B ▶ **Go to step 6**

A ▼

5.	SYMPTOM SIMULATION

NEXT ▼

6.	CHECK CAN COMMUNICATION SYSTEM*

(a) Check for DTCs INFO .

Result:

RESULT	PROCEED TO
CAN system DTC is not output	A
CAN system DTC is output	B

HINT:

- If any CAN communication system DTCs are output, perform troubleshooting on 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 the power steering ECU, and the IG circuit of the power steering ECU.

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B ▶ INFO **PROCEED TO CAN COMMUNICATION SYSTEM**

A ▼

7.	**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 9**

A ▼

8.	**PROBLEM SYMPTOMS TABLE**

(a) Refer to Problem Symptoms Table INFO .

Result:

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**

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A

9.	OVERALL ANALYSIS AND TROUBLESHOOTING*

(a) Refer to Terminals of ECU INFO .

(b) Refer to Data List / Active Test INFO .

NEXT

10.	REPAIR OR REPLACE

NEXT

11.	CONFIRMATION TEST

NEXT END

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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274Y00HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): SYSTEM DESCRIPTION (2010 Corolla)		

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 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.

(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.

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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000002753012X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): CALIBRATION (2010 Corolla)		

CALIBRATION

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

NOTICE:

Clear the rotation angle sensor calibration value, initialize the rotation angle sensor, and calibrate the torque sensor zero point if any of the following has occurred:

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

(a) Inspection before calibration.

(1) Turn the ignition switch off.

(2) Connect the Techstream to the DLC3.

(3) Turn the ignition switch on (IG).

(4) Turn the Techstream on.

(5) Calibrate the power steering ECU. Enter the following menus: Chassis / EMPS / Data List.

(6) Check the values by referring to the table below.

Power Steering ECU

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
IG Power Supply	ECU power source voltage/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Ignition switch on (IG)

Standard voltage:
11 to 14 V

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 calibration value clear, 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 on (IG).

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(4) Turn the Techstream on.

(5) Enter the following menus: Chassis / EMPS / Utility / Torque Sensor Adjustment.

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 torque sensor zero point calibration (for 3 seconds).



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Last Modified: 3-10-2010	6.4 T	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274X014X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): PROBLEM SYMPTOMS TABLE (2010 Corolla)		

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
Heavy steering	Front tires (improperly inflated, unevenly worn)	INFO
	Front wheel alignment (incorrect)	INFO
	Front suspension (lower ball joint)	INFO
	Steering column	INFO
	Torque sensor (built into steering column)	INFO
	Power steering motor	INFO
	Speed sensor (w/ VSC)	INFO
	Speed sensor (w/o VSC)	INFO
	Skid control ECU (w/ VSC)	INFO
	Skid control ECU (w/o VSC)	INFO
	Battery and power source system	-
	Power steering ECU power source voltage and relay	INFO
	Power steering ECU	INFO
Steering effort differs between right and left, or steering effort is uneven.	Initialization of rotation angle sensor and calibration of torque sensor zero point are not completed	INFO
	Front tires (improperly inflated, unevenly worn)	INFO
	Front wheel alignment (incorrect)	INFO

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SYMPTOM	SUSPECTED AREA	SEE PAGE
	Front suspension (lower ball joint)	INFO
	Power steering gear	INFO
	Torque sensor (built into steering column)	INFO
	Steering column	INFO
	Power steering motor	INFO
	Power steering ECU	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 (w/ VSC)	INFO
	Speed sensor (w/o VSC)	INFO
	Skid control ECU (w/ VSC)	INFO
	Skid control ECU (w/o VSC)	INFO
	Combination meter	INFO
	Torque sensor (built into steering column)	INFO
	Power steering motor	INFO
	Power steering ECU	INFO
	CAN communication system	INFO
A knocking (or cranking) sound occurs when turning the steering wheel back and forth while power steering is in operation.	Front suspension (lower ball joint)	INFO
	Steering intermediate shaft	INFO
	Power steering ECU	INFO
Noise occurs when turning the steering wheel during low-speed driving.	Power steering gear	INFO
	Steering column	INFO
Friction occurs when turning the steering wheel during low-speed driving.	Power steering motor	INFO
	Steering column	INFO
A high-pitched sound (squeaking) occurs when turning the steering wheel slowly with the vehicle stopped.	Power steering motor	INFO
The steering wheel vibrates and noise occurs when turning the steering wheel from lock to lock with the vehicle stopped.	Power steering gear	INFO
	Steering column	INFO
P/S warning is always indicated on the combination meter	Power source voltage of power steering ECU	INFO

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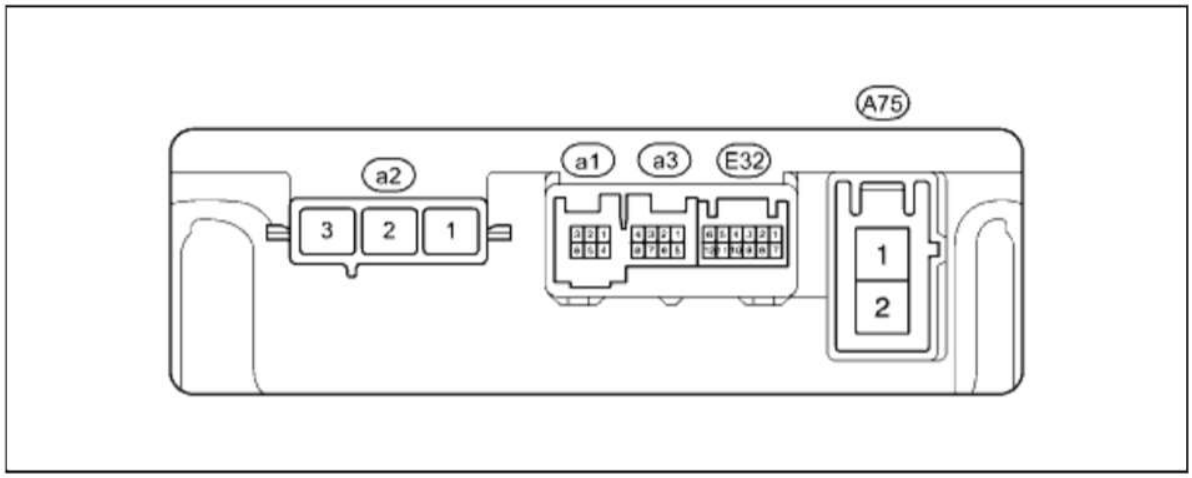
SYMPTOM	SUSPECTED AREA	SEE PAGE
	Combination meter	INFO
	Power steering ECU	INFO

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Last Modified: 3-10-2010	6.4 U	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274W00HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): TERMINALS OF ECU (2010 Corolla)		

TERMINALS OF ECU

1. CHECK POWER STEERING ECU



HINT:

As connector a2 uses a lock lever, each terminal cannot be checked while the connector is still connected to the power steering ECU.

TERMINAL NO. (SYMBOLS)	WIRING COLOR	TERMINAL DESCRIPTION
a2-1 (V)	W	V phase motor output
a2-2 (U)	B	U phase motor output
a2-3 (W)	R	W phase motor output

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

NOTICE:

When the P/S warning light is illuminated during a malfunction, the fail-safe function may cause the voltage of the power steering ECU's terminals to become 0 V.

TERMINAL NO. (SYMBOLS)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
A75-1 (PIG) - A75-2 (PGND)	L - W-B	Power source	Always	11 to 14 V
A75-2 (PGND) - Body ground	W-B - Body ground	Power ground	Always	Below 1 Ω

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TERMINAL NO. (SYMBOLS)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
E32-1 (CANH) - E32-7 (CANL)	SB - W	CAN communication line	Ignition switch off	54 to 69 Ω
E32-6 (IG) - A75-2 (PGND)	L - W-B	IG power source	Ignition switch on (IG)	11 to 14 V
a1-1 (RZV) - A75-2 (PGND)	- W-B	Rotation angle sensor excitation output signal	Ignition switch on (IG) Steering wheel is turned	0.68 to 4.42 V
a1-3 (RZG) - A75-2 (PGND)	- W-B	Rotation angle sensor excitation circuit GND	Always	Below 1 Ω
a1-5 (RZCS) - A75-2 (PGND)	- W-B	Rotation angle sensor COS aspect output signal	Ignition switch on (IG) Steering wheel is turned	0.68 to 4.42 V
a1-6 (RZSN) - A75-2 (PGND)	- W-B	Rotation angle sensor SIN aspect output signal	Ignition switch on (IG) Steering wheel is turned	0.68 to 4.42 V
a3-5 (TRQ1) - a3-8 (TRQG)	-	Torque sensor signal	Ignition switch on (IG) Steering wheel not turned (without load)	2.3 to 2.7 V
			Ignition switch on (IG) Steering wheel turned to right with vehicle stopped	2.5 to 3.8 V
			Ignition switch on (IG) Steering wheel turned to left with vehicle stopped	1.2 to 2.5 V
a3-6 (TRQV) - a3-8 (TRQG)	-	Torque sensor voltage source	Ignition switch on (IG)	4.5 to 5.5 V
a3-7 (TRQ2) - a3-8 (TRQG)	-	Torque sensor signal	Ignition switch on (IG) Steering wheel not turned (without load)	2.3 to 2.7 V
			Ignition switch on (IG) Steering wheel turned to right with vehicle stopped	1.2 to 2.5 V
			Ignition switch on (IG) Steering wheel turned to left with vehicle stopped	2.5 to 3.8 V
a3-8 (TRQG) - Body ground	- Body ground	Torque sensor ground	Always	Below 1 Ω

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



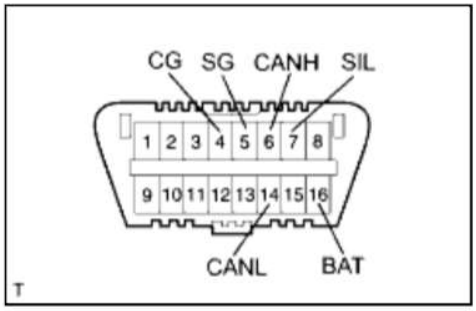
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Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274Z00WX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): DIAGNOSIS SYSTEM (2010 Corolla)		

DIAGNOSIS SYSTEM

1. CHECK DLC3

(a) The ECU uses ISO 15765-4 for communication. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.



SYMBOL (TERMINAL NO.)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	11 to 14 V
CANH (6) - CANL (14)	CAN bus line	Ignition switch off*	54 to 69 Ω
CANH (6) - CG (4)	HIGH-level CAN bus line	Ignition switch off*	200 Ω or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch off*	200 Ω or higher
CANH (6) - BAT (16)	HIGH-level CAN bus line	Ignition switch off*	6 Ω or higher
CANL (14) - BAT (16)	LOW-level CAN bus line	Ignition switch off*	6 Ω or higher

NOTICE:

***: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the ignition switch or any other switches or the doors.**

(b) If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

Connect the Techstream cable to the DLC3, turn the ignition switch on (IG) and attempt to use the Techstream.

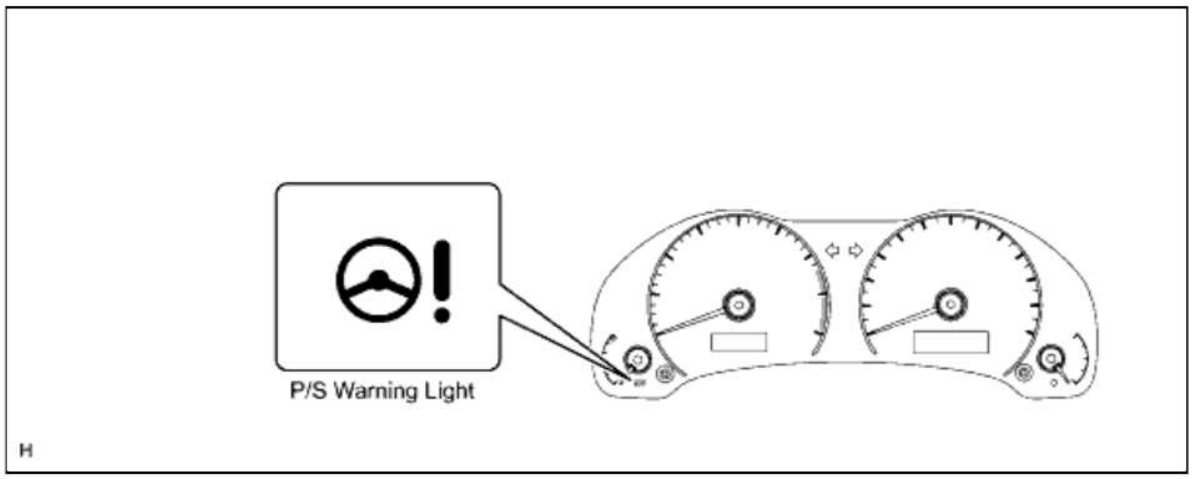
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If the display indicates that a communication error has occurred, there is a problem either with the vehicle or with the Techstream.

- If communication is normal when the Techstream is connected to another vehicle, inspect the DLC3 of the original vehicle.
- If communication is still not possible when the Techstream is connected to another vehicle, the problem may be in the Techstream itself. Consult the Service Department listed in the Techstream instruction manual.

2. CHECK WARNING LIGHT

(a) When a problem occurs in the power steering system, the P/S warning light on the combination meter comes on to inform the driver of the problem.



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Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000002750010X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): DTC CHECK / CLEAR (2010 Corolla)		

DTC CHECK / CLEAR

1. CHECK DTC

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Read the DTCs following the display on the Techstream. Enter the following menus: Chassis / EMPS / Trouble Codes.

(f) Refer to the Diagnostic Trouble Code Chart for DTC information INFO .

2. CLEAR DTC

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Clear the DTCs following the display on the Techstream. Enter the following menus: Chassis / EMPS / Trouble Codes.

(f) According to the display on the Techstream, select the trouble code data display with the clear button.

(g) Turn the ignition switch off.

(h) Disconnect the Techstream from the DLC3.

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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000002755012X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): FREEZE FRAME DATA (2010 Corolla)		

FREEZE FRAME DATA

1. FREEZE FRAME DATA

NOTICE:

- 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 on (IG) and park the vehicle on level ground. Check the freeze frame data by using the Techstream.

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Check the freeze frame data on the Techstream.

EMPS

TESTER DISPLAY	ITEM DESCRIPTION/RANGE (DISPLAY)	INSPECTION CONDITION	REFERENCE VALUE
Meter Vehicle Velocity	Vehicle speed from meter/ Min.: 0 km/h (0 mph) Max.: 300 km/h (186.4 mph)	Vehicle stopped	0 km/h (0 mph)
		Vehicle driven at a constant speed	No significant fluctuation
Engine Revolution	Engine revolution/ Min.: 0 rpm Max.: 12800 rpm	Engine is running at a constant speed	No significant fluctuation
Motor Actual Current	Amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Power steering is in operation	Value changes in proportion to steering effort
Command Value Current	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Power steering is in operation	Value changes in proportion to steering effort
Steering Angle Velocity	Steering angle speed/ Min.: -32768 deg/s Max.: 32767 deg/s	Steering wheel is turned	Value changes in proportion to steering effort

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TESTER DISPLAY	ITEM DESCRIPTION/RANGE (DISPLAY)	INSPECTION CONDITION	REFERENCE VALUE
Thermistor Temperature	ECU substrate temperature/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	Ignition switch on (IG)	-
PIG Power Supply	Power source voltage to activate motor/ Min.: 0 V Max.: 20.1531 V	Power steering is in operation	11 to 14 V
IG Power Supply	ECU power source voltage/ Min.: 0 V Max.: 20.1531 V	Ignition switch on (IG)	11 to 14 V
Motor Rotation Angle	Motor rotation angle/ Min.: 0 deg Max.: 1441.77 deg	Power steering is in operation	During steering operation, motor rotation angle value changes from 0 to 360°
Command Val Current 2	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Power steering is in operation	Value changes in proportion to steering effort
PIG2 Voltage	Coil rear pressurization voltage/ Min.: 0 V Max.: 45.955 V	Ignition switch on (IG) Steering wheel is not turned	Approximately 27 V
		Ignition switch on (IG) Steering wheel is turned	Value changes within 4 to 35 V range
Motor Voltage	Motor power supply voltage/ Min.: 0 V Max.: 45.955 V	Ignition switch on (IG) Steering wheel is not turned	Approximately 27 V
		Ignition switch on (IG) Steering wheel is turned	Value changes within 4 to 35 V range
Motor Terminal Volt(U)	Motor terminal voltage (U phase)/ Min.: 0 V Max.: 46.667 V	Steering wheel is turned	Value changes within 4 to 35 V range
Motor Terminal Volt(V)	Motor terminal voltage (V phase)/ Min.: 0 V Max.: 46.667 V	Steering wheel is turned	Value changes within 4 to 35 V range
Motor Terminal Volt(W)	Motor terminal voltage (W phase)/ Min.: 0 V	Steering wheel is turned	Value changes within 4 to 35 V range

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TESTER DISPLAY	ITEM DESCRIPTION/RANGE (DISPLAY)	INSPECTION CONDITION	REFERENCE VALUE
	Max.: 46.667 V		
Torque Sensor 1 Output	Torque sensor voltage/ Min.: 0 V Max.: 5 V	Ignition switch on (IG) Steering wheel not turned (without load)	2.3 to 2.7 V
		Ignition switch on (IG) Steering wheel turned to right with vehicle stopped	2.5 to 3.8 V
		Ignition switch on (IG) Steering wheel turned to left with vehicle stopped	1.2 to 2.5 V
Torque Sensor 2 Output	Torque sensor voltage/ Min.: 0 V Max.: 5 V	Ignition switch on (IG) Steering wheel not turned (without load)	2.3 to 2.7 V
		Ignition switch on (IG) Steering wheel turned to right with vehicle stopped	1.2 to 2.5 V
		Ignition switch on (IG) Steering wheel turned to left with vehicle stopped	2.5 to 3.8 V
TRQ1 Zero Point Value	Torque sensor voltage/ Min.: 0 V Max.: 5 V	Steering wheel is not turned	Values differ depending on vehicle
TRQ2 Zero Point Value	Torque sensor voltage/ Min.: 0 V Max.: 5 V	Steering wheel is not turned	Values differ depending on vehicle
PS Assist Signal	Power steering assist signal/ ON or OFF	No steering load (in neutral position)	OFF
		Ignition switch on (IG) Steering wheel is turned	ON

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Last Modified: 3-10-2010	6.4 U	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000000275200HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): DATA LIST / ACTIVE TEST (2010 Corolla)		

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.

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Enter the following menus: Chassis / EMPS / Data List.

(f) 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 meter/ Min.: 0 km/h (0 mph) Max.: 300 km/h (186.4 mph)	0 km/h (0 mph)	Vehicle stopped
		No significant fluctuation	Vehicle driven at a constant speed
Engine Revolution	Engine revolution/ Min.: 0 rpm Max.: 12800 rpm	No significant fluctuation	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	Power steering is in operation
Command Value Current	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	Power steering is in operation

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Steering Angle Velocity	Steering angle speed/ Min.: -32768 deg/s Max.: 32767 deg/s	Value changes in proportion to steering effort	Steering wheel is turned
Thermistor Temperature	ECU substrate temperature/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	-40°C to 150°C (-40°F to 302°F)	Ignition switch on (IG)
PIG Power Supply	Power source voltage to active motor/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Power steering is in operation
IG Power Supply	ECU power source voltage/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Ignition switch on (IG)
Steering Angle Sens Sig	Steering angle sensor signal state/ OK or NG(1) or NG(2) or NG(3)	OK: Steering angle sensor signal is received NG(1): The learning has not completed NG(2): Steering Sensor Abnormal NG(3): Communication Error	-
Steering Wheel Torque	Steering wheel torque/ Min.: -327.68 Nm Max.: 7 Nm	Value changes in proportion to steering effort	Ignition switch on (IG) and power steering is in operation
Motor Rotation Angle	Motor rotation angle/ Min.: 0 deg Max.: 1441.77 deg	During steering operation, motor rotation angle value changes from 0 to 360°	Power steering in operation
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	Power steering is in operation
PIG2 Voltage	Coil rear pressurization voltage/ Min.: 0 V Max.: 45.955 V	Approximately 27 V	Ignition switch on (IG) and steering wheel is not turned
		Value changes within 4 to 35 V range	Ignition switch on (IG) and steering wheel is turned
Motor Voltage	Motor power supply voltage/ Min.: 0 V Max.: 45.955 V	Approximately 27 V	Ignition switch on (IG) and steering wheel is not turned
		Value changes within 4 to 35 V range	Ignition switch on (IG) and steering wheel is turned

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Motor Terminal Volt(U)	Motor terminal voltage (U phase)/ Min.: 0 V Max.: 46.667 V	Value changes within 4 to 35 V range	Ignition switch on (IG) and steering wheel is turned
Motor Terminal Volt(V)	Motor terminal voltage (V phase)/ Min.: 0 V Max.: 46.667 V	Value changes within 4 to 35 V range	Ignition switch on (IG) and steering wheel is turned
Motor Terminal Volt(W)	Motor terminal voltage (W phase)/ Min.: 0 V Max.: 46.667 V	Value changes within 4 to 35 V range	Ignition switch on (IG) and steering wheel is turned
Torque Sensor 1 Output	Torque sensor voltage/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Ignition switch on (IG) and steering wheel is not turned (without load)
		2.5 to 3.8 V	Ignition switch on (IG) and steering wheel turned to right with vehicle stopped
		1.2 to 2.5 V	Ignition switch on (IG) and steering wheel turned to left with vehicle stopped
Torque Sensor 2 Output	Torque sensor voltage/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Ignition switch on (IG) and steering wheel is not turned (without load)
		1.2 to 2.5 V	Ignition switch on (IG) and steering wheel turned to right with vehicle stopped
		2.5 to 3.8 V	Ignition switch on (IG) and steering wheel turned to left with vehicle stopped
TRQ1 Zero Point Value	Torque sensor voltage/ Min.: 0 V Max.: 5 V	Values differ depending on vehicle	Steering wheel is not turned
TRQ2 Zero Point Value	Torque sensor voltage/ Min.: 0 V Max.: 5 V	Values differ depending on vehicle	Steering wheel is not turned
IG ON/OFF Times	Number of times of ignition switch ON/OFF after fail detection/ Min.: 0 time Max.: 65535 times	-	This value indicate the number of times of IG ON/OFF after the latest DTC detection.

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
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	-
Eng Rev Inter Record	Record of engine revolution signal interruption/ Unrec or Rec	Unrec	-
Str Angle Inter Record	Record of steering sensor signal interruption occurrence display/ Unrec or Rec	Unrec	-
Spd Sig Invalid Record	Record of vehicle speed signal invalid/ Unrec or Rec	Unrec	-
PS Assist Signal	Power steering assist signal/ ON or OFF	OFF	No steering load (in neutral position)
		ON	Ignition switch on (IG) and steering wheel is turned
The Number of DTCs	Number of detected DTCs when freeze frame data stored/ Min.: 0 Max.: 255	0 to 255	-

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Last Modified: 3-10-2010	6.4 U	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000275400HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): FAIL-SAFE CHART (2010 Corolla)		

FAIL-SAFE CHART

If a problem occurs in the power steering system, the P/S warning light will come on in the combination meter and power steering assist will be stopped, fixed at a particular point, or decreased simultaneously to protect the system.

Power Steering System

DTC NO.	DETECTION CONDITION	FAIL-SAFE
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	
C1532		
C1533		Assist force restricted
C1534		
C1541	Skid control malfunction	Amount of power assist is locked at 100 km/h (62 mph) level of power assist
C1551	IG power source voltage error	Power assist stops
C1552	PIG power source voltage error	
C1554	Power source relay malfunction	

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DTC NO.	DETECTION CONDITION	FAIL-SAFE
C1555	Motor relay malfunction	
C1581	ECU malfunction	
U0100	ECM communication	
U0129	Skid control ECU communication error	Amount of power assist is locked at 100 km/h (62 mph) level of power assist

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.



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Last Modified: 3-10-2010	6.4 S	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274U00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): DIAGNOSTIC TROUBLE CODE CHART (2010 Corolla)		

DIAGNOSTIC TROUBLE CODE CHART

HINT:

If a trouble code is displayed 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	TROUBLE AREA	RETURN-TO-NORMAL CONDITION	P/S WARNING LIGHT	SEE PAGE
C1511	Torque Sensor Circuit Malfunction	1. Steering column assembly (torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1512	Torque Sensor Circuit Malfunction	1. Steering column assembly (torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1513	Torque Sensor Circuit Malfunction	1. Steering column assembly (torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1514	Torque Sensor Power Supply Abnormal	1. Steering column assembly (torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1515	Torque Sensor Zero Point Adjustment Undone	-	Zero point calibration occurs	○	INFO
C1516	Torque Sensor Zero Point Adjustment Incomplete	-	Clear DTC	○	INFO
C1517	Torque Hold Abnormal	1. Steering column assembly (torque sensor) 2. Power steering	Ignition switch on (IG) again	○	INFO

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DTC CODE	DETECTION ITEM	TROUBLE AREA	RETURN-TO-NORMAL CONDITION	P/S WARNING LIGHT	SEE PAGE
		ECU			
C1521	Motor Circuit Malfunction	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1522	Motor Circuit Malfunction	1. Steering column assembly 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1523	Motor Circuit Malfunction	1. Steering column assembly 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1524	Motor Circuit Malfunction	1. Steering column assembly 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1525	Rotation Angle Sensor Initialization Undone	-	Rotation angle sensor calibration occurs	○	INFO
C1526	Rotation Angle Sensor Initialization Incomplete	-	Clear DTC	○	INFO
C1528	Motor Rotation Angle Sensor Malfunction	1. Steering column assembly 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1531	ECU Malfunction	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1532	ECU Malfunction	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1533	ECU Malfunction	Power steering ECU	After normal judgment	X	INFO
C1534	ECU Malfunction	Power steering ECU	After normal judgment	X	INFO
C1541	Vehicle Speed Signal Malfunction	1. Speed sensor circuit 2. Skid control ECU 3. CAN communication system 4. Power steering ECU	Ignition switch on (IG) again	○	INFO

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DTC CODE	DETECTION ITEM	TROUBLE AREA	RETURN-TO-NORMAL CONDITION	P/S WARNING LIGHT	SEE PAGE
C1551	IG Power Supply Voltage Malfunction	1. ECU-IG No. 1 fuse 2. IG power source circuit 3. Power steering ECU	Ignition switch on (IG) again or after normal confirmation	○	INFO
C1552	PIG Power Supply Voltage Malfunction	1. PIG power source circuit 2. Power steering ECU	Ignition switch on (IG) again or after normal confirmation	○	INFO
C1554	Power Supply Relay Failure	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1555	Motor Relay Welding Failure	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1581	Assist Map Number Un-Writing	Power steering ECU	Assist map write or ignition switch on (IG) again	○	INFO
U0100	Lost Communication with ECM / PCM "A"	1. CAN communication system 2. ECM	Ignition switch on (IG) again or after normal confirmation	X	INFO
U0129	Lost Communication with Brake System Control Module	1. CAN communication system 2. Skid control ECU	Ignition switch on (IG) again or after normal confirmation	○	INFO

HINT:

- ○: Warning light comes on
- X: Warning light turns off (normal reset)

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277F00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1511-C1514,C1517: Torque Sensor Circuit Malfunction (2010 Corolla)		

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**

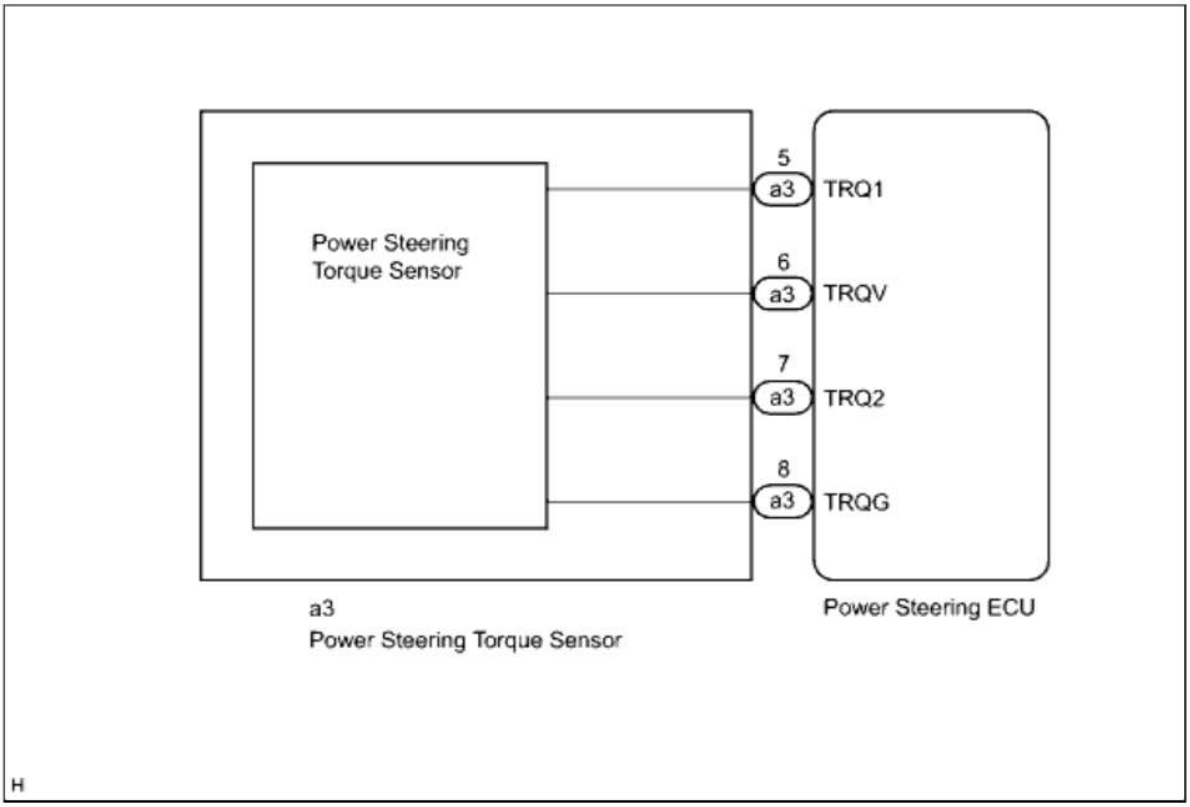
DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1511	Torque sensor malfunction	• Steering column assembly (torque sensor) • Power steering ECU
C1512		
C1513		
C1514		
C1517		

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

PROCEDURE

1.	**CHECK CONNECTOR CONNECTION CONDITION (TORQUE SENSOR - ECU)**

(a) Check the installation condition of the torque sensor connector.

OK:

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

NG ▶ **CONNECT CONNECTOR**

OK ▼

2.	**READ VALUE USING TECHSTREAM (TORQUE SENSOR1, TORQUE SENSOR2)**

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(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Enter the following menus: Chassis / EMPS / Data List.

(f) 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

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Torque Sensor 1 Output	Torque sensor voltage/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Steering wheel not turned (without load)
		2.5 to 3.8 V	Steering wheel turned to right with vehicle stopped
		1.2 to 2.5 V	Steering wheel turned to left with vehicle stopped
Torque Sensor 2 Output	Torque sensor voltage/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Steering wheel not turned (without load)
		1.2 to 2.5 V	Steering wheel turned to right with vehicle stopped
		2.5 to 3.8 V	Steering wheel turned to left with vehicle stopped

OK:
Normal condition value is displayed on the Techstream during each steering operation.

NG ▶ **CHECK POWER STEERING ECU (TRQV VOLTAGE)**

OK ▶ **REPLACE POWER STEERING ECU**

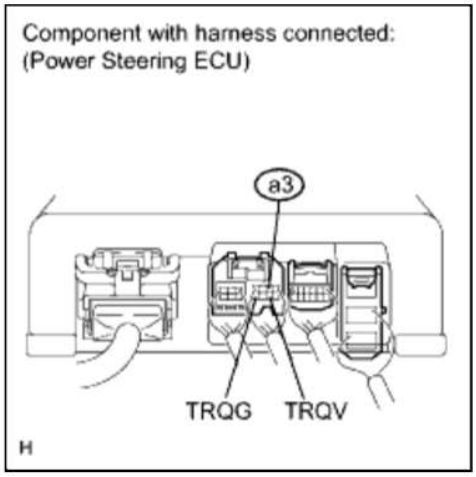
3.	**CHECK POWER STEERING ECU (TRQV VOLTAGE)**

(a) Turn the ignition switch on (IG).

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

Standard Voltage:

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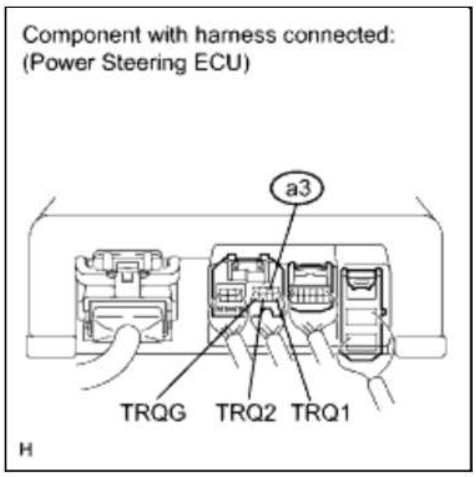


TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
a3-6 (TRQV) - a3-8 (TRQG)	Ignition switch on (IG)	4.5 to 5.5 V

NG ▶ **REPLACE POWER STEERING ECU**

OK ▼

4.	CHECK POWER STEERING ECU (TRQ1, TRQ2 VOLTAGE)



(a) Turn the ignition switch on (IG).

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION (STEERING POSITION)	SPECIFIED CONDITION
a3-5 (TRQ1) - a3-8 (TRQG)	Ignition switch on (IG) Steering wheel not turned (without load)	2.3 to 2.7 V
	Ignition switch on (IG) Steering wheel turned to right with vehicle stopped	2.5 to 3.8 V

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TESTER CONNECTION	SWITCH CONDITION (STEERING POSITION)	SPECIFIED CONDITION
	Ignition switch on (IG) Steering wheel turned to left with vehicle stopped	1.2 to 2.5 V
a3-7 (TRQ2) - a3-8 (TRQG)	Ignition switch on (IG) Steering wheel not turned (without load)	2.3 to 2.7 V
	Ignition switch on (IG) Steering wheel turned to right with vehicle stopped	1.2 to 2.5 V
	Ignition switch on (IG) Steering wheel turned to left with vehicle stopped	2.5 to 3.8 V

NG ▶ **REPLACE STEERING COLUMN ASSEMBLY**

OK ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 G	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000000WF601MX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): ON-VEHICLE INSPECTION (2010 Corolla)		

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.

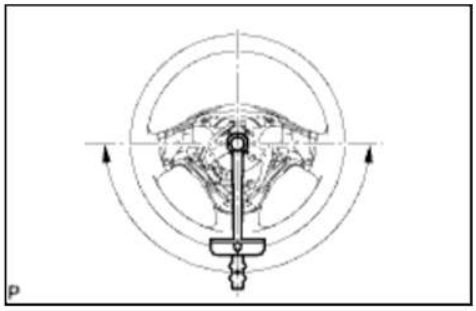
(c) Remove the steering pad INFO .

(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, 37ft·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 continuing to turn it further in the same direction.

Standard steering effort (Reference):
5.5 N*m (56 kgf*cm, 49 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 INFO .

(k) Connect the cable to the negative (-) battery terminal.

(l) Clear the DTCs INFO .

(m) Inspect the airbag warning light INFO .

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277G00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1515,C1525: Torque Sensor Zero Point Adjustment Undone (2010 Corolla)		

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 outputs these DTCs when it determines that the rotation angle sensor value initialization and torque sensor zero point calibration have not been performed.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1515	This DTC is detected when torque sensor zero point calibration has not been performed.	There is no malfunction if this DTC is not output again after performing zero point calibration.
C1525	This DTC is detected when 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 steering column assembly or power steering ECU has been replaced, perform the 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 value and calibrate the torque sensor zero point INFO .

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NEXT

2.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

Result:

CONDITION	PROCEED TO
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times*1.	A
DTCs are still output even after performing rotation angle sensor value initialization and steering zero point calibration once or twice*2.	B
Normal system code is output.	C

HINT:

- *1: The power steering ECU must be replaced if DTC C1515 or C1525 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1515 or C1525 is still output even after the calibration is performed once or twice.

C ▶ **END**

B ▶ **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

A

3.	**REPLACE POWER STEERING ECU**

(a) Replace the power steering ECU INFO .

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NEXT

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

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

NEXT

5.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

Result:

CONDITION	PROCEED TO
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times*1.	A
DTCs are still output even after performing rotation angle sensor value initialization and steering zero point calibration twice*2.	B
Normal system code is output.	C

HINT:

- *1: The steering column assembly must be replaced if DTC C1515 or C1525 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1515 or C1525 is still output even after the calibration is performed twice.

NOTICE:

If replacing the steering column assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point INFO .

C ▶ END

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B ▶ PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)

A ▶ REPLACE STEERING COLUMN ASSEMBLY

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM0000027BY00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1516,C1526: Torque Sensor Zero Point Adjustment Incomplete (2010 Corolla)		

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 outputs these DTCs when it determines that the rotation angle sensor value initialization and torque sensor zero point calibration are incomplete.

DTC NO.	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 DTCs 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 DTCs and torque sensor calibration value, and performing rotation angle sensor value initialization.

INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

PROCEDURE

1.	**CLEAR DTC**

(a) Clear the DTCs INFO .

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NEXT

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

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

NEXT

3.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

Result:

CONDITION	PROCEED TO
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times*1.	A
DTCs are still output even after performing rotation angle sensor value initialization and steering zero point calibration once or twice*2.	B
Normal system code is output.	C

HINT:

- *1: The power steering ECU must be replaced if DTC C1516 or C1526 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1516 or C1526 is still output even after the calibration is performed once or twice.

C ▶ **END**

B ▶ **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

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A

4.	**REPLACE POWER STEERING ECU**

(a) Replace the power steering ECU INFO .

NEXT

5.	**CLEAR DTC**

(a) Clear the DTCs INFO .

NEXT

6.	**INITIALIZE ROTATION ANGLE SENSOR AND CALIBRATE TORQUE SENSOR ZERO POINT**

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

NEXT

7.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

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Result:

CONDITION	PROCEED TO
DTCs are still output after performing rotation angle sensor value initialization and steering zero point calibration 3 times*1.	A
DTCs are still output even after performing rotation angle sensor value initialization and steering zero point calibration twice*2.	B
Normal system code is output.	C

HINT:

- *1: The steering column assembly must be replaced if DTC C1516 or C1526 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1516 or C1526 is still output even after the calibration is performed twice.

NOTICE:

If replacing the steering column assembly, clear the rotation angle sensor calibration value, initialize the rotation angle sensor value, and calibrate the torque sensor zero point INFO **.**

C ▶ **END**

B ▶ **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

A ▶ **REPLACE STEERING COLUMN ASSEMBLY**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM0000027BZ00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1521,C1531-C1534,C1554: Motor Circuit Malfunction (2010 Corolla)		

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 detects these DTCs, it will shut off the motor relay circuit (built into the power steering ECU) and stop power assist. However, power assist continues if DTC C1533 or C1534 is output.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1521	Motor overcurrent	Power steering ECU
C1531	ECU internal malfunction (CPU malfunction)	Power steering ECU
C1532	ECU internal malfunction (Peripheral circuit malfunction)	Power steering ECU
C1533	ECU internal malfunction (Substrate temperature sensor malfunction)	Power steering ECU
C1534	ECU internal malfunction (EEPROM error)	Power steering ECU
C1554	Power source relay circuit malfunction	Power steering ECU

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INSPECTION PROCEDURE

NOTICE:

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

PROCEDURE

1.	CHECK FOR DTC

(a) Clear the DTCs INFO .

(b) Check for DTCs. INFO

OK:

DTC is not output.

NG ▶ REPLACE POWER STEERING ECU

OK ▶ CHECK INTERMITTENT PROBLEMS

TOYOTA

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277N00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1522-C1555: Motor Circuit Malfunction (2010 Corolla)		

DTC	**C1522**	**Motor Circuit Malfunction**

DTC	**C1523**	**Motor Circuit Malfunction**

DTC	**C1524**	**Motor Circuit Malfunction**

DTC	**C1555**	**Motor Relay Welding Failure**

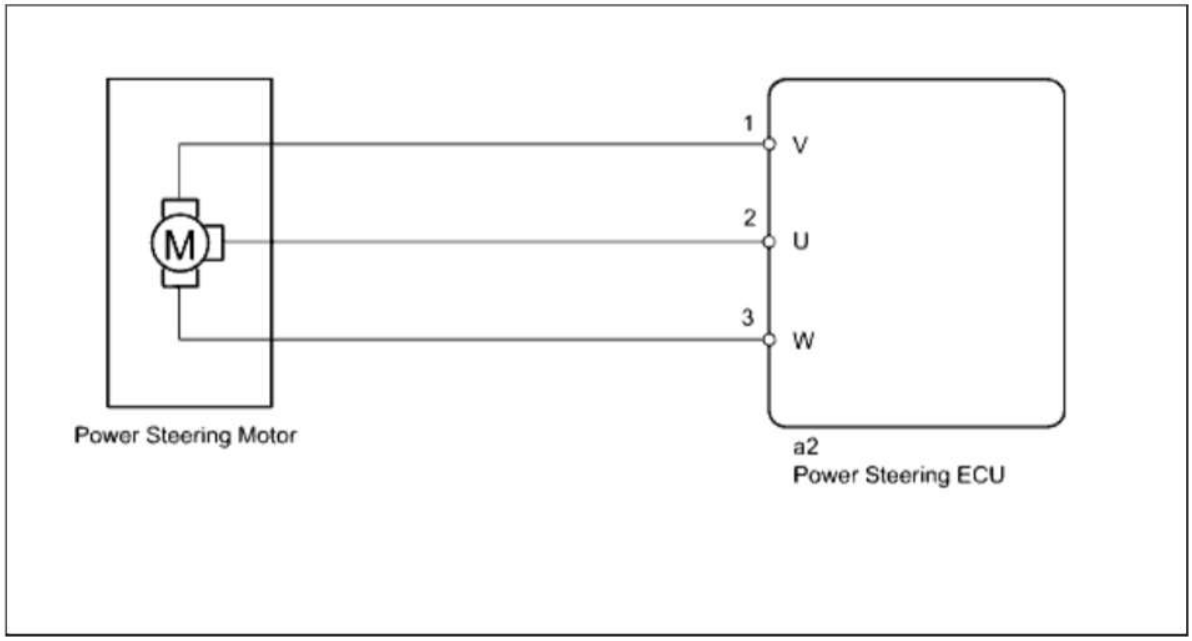
DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1522	Motor current sensor malfunction	• Steering column assembly • Power steering ECU
C1523	Excessively large current deviation	
C1524	Short (or open) in motor circuit or abnormal voltage or current in motor circuit	
C1555	Motor relay circuit malfunction	

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

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

PROCEDURE

1.	**READ VALUE USING TECHSTREAM (MOTOR VOLTAGE)**

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(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 V	During steering operation, value changes within 4 to 35 V range	Steering wheel is turned

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
	Max.: 46.667 V		
Motor Terminal Volt(V)	Motor terminal voltage (V phase)/ Min.: 0 V Max.: 46.667 V	During steering operation, value changes within 4 to 35 V range	Steering wheel is turned
Motor Terminal Volt(W)	Motor terminal voltage (W phase)/ Min.: 0 V Max.: 46.667 V	During steering operation, value changes within 4 to 35 V range	Steering wheel is turned

Result:

RESULT	PROCEED TO
During steering operation, value changes within 4 to 35 V range	A
During steering operation, voltage is not generated	B

B ▶ REPLACE STEERING COLUMN ASSEMBLY

A ▶ REPLACE POWER STEERING ECU

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000000277O00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1528: Motor Rotation Angle Sensor Malfunction (2010 Corolla)		

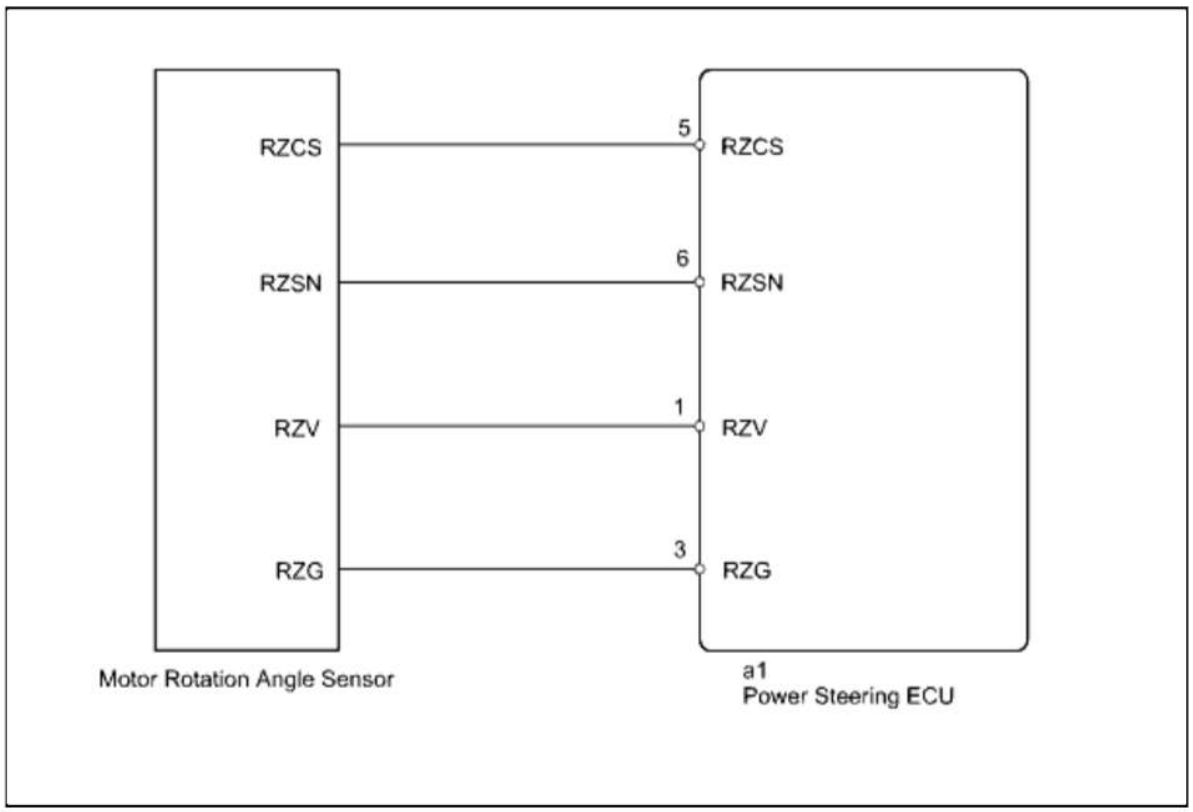
DTC	**C1528**	**Motor Rotation Angle Sensor Malfunction**

DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1528	Motor rotation angle sensor malfunction	• Motor rotation angle sensor (built into steering column assembly) • Power steering ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

NOTICE:

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

PROCEDURE

1.	CHECK CONNECTOR CONNECTION CONDITION

(a) Check the installation condition of the motor rotation angle sensor connector.

OK:

Motor rotation angle sensor connector is securely connected to the power steering ECU.

NG ▶ CONNECT CONNECTOR

OK ▼

2.	READ VALUE USING TECHSTREAM (MOTOR ROTATION ANGLE SENSOR)

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Enter the following menus: Chassis / EMPS / Data List.

(f) Select the item "Motor Rotation Angle" in the Data List and read the value displayed on the Techstream.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Motor Rotation Angle	Motor rotation angle/ Min.: 0 deg Max.: 1441.77 deg	During steering operation, motor rotation angle value changes from 0 to 360°	Power steering in operation

OK:

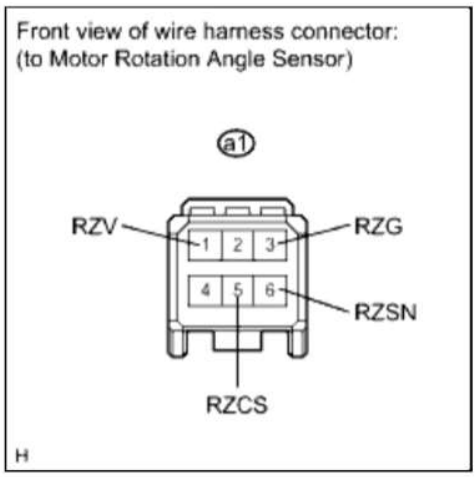
During steering operation, motor rotation angle value changes from 0 to 360°.

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NG ▶ CHECK STEERING COLUMN ASSEMBLY

OK ▶ REPLACE POWER STEERING ECU

3.	CHECK STEERING COLUMN ASSEMBLY



(a) Disconnect the connector from the motor rotation angle sensor.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
a1-6 (RZSN) - a1-3 (RZG)	Always	75.2 to 112.8 Ω
a1-1 (RZV) - a1-3 (RZG)	Always	27.6 to 41.4 Ω
a1-5 (RZCS) - a1-3 (RZG)	Always	73.2 to 110.8 Ω

NG ▶ REPLACE STEERING COLUMN ASSEMBLY

OK ▶ END

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM0000027C000JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1541: Vehicle Speed Signal Malfunction (2010 Corolla)		

DTC	**C1541**	**Vehicle Speed Signal Malfunction**

DESCRIPTION

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

If the ECU detects this DTC, it adjusts the amount of power assistance for a speed of 100 km/h (62 mph) and continues the system control.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1541	This DTC is detected when vehicle speed signals via CAN communication are cut off for 3 seconds or more.	• Speed sensor circuit • Skid control ECU • CAN communication system • Power steering ECU

INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

PROCEDURE

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

(a) Check if DTC U0129 is output.

Result:

RESULT	PROCEED TO
No output	A
U0129 is output	B

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HINT:

DTC U0129 indicates a ABS ECU communication malfunction in the power steering system.

B ▶ **GO TO CAN COMMUNICATION SYSTEM**

A ▼

2.	CHECK OTHER DTC OUTPUT (BRAKE CONTROL SYSTEM)

(a) Check for DTCs of the brake control system.

HINT:

- Anti-lock brake system: INFO .
- Vehicle stability control system: INFO .

Result:

RESULT	PROCEED TO
No output	A
C0200 or C0210 is output (for Anti-lock Brake System)	B
C0200 or C0210 is output (for Vehicle Stability Control System)	C

HINT:

These DTCs indicate a speed sensor signal malfunction in the Anti-lock Brake System or Vehicle Stability Control System.

NOTICE:

If replacing the power steering ECU, initialize the rotation angle sensor and calibrate the torque sensor zero point INFO .

C ▶ **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (for Vehicle Stability Control System)**

B ▶ **REPAIR CIRCUIT INDICATED BY OUTPUT CODE (for Anti-lock Brake System)**

A ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000000277I00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1551: IG Power Supply Voltage Malfunction (2010 Corolla)		

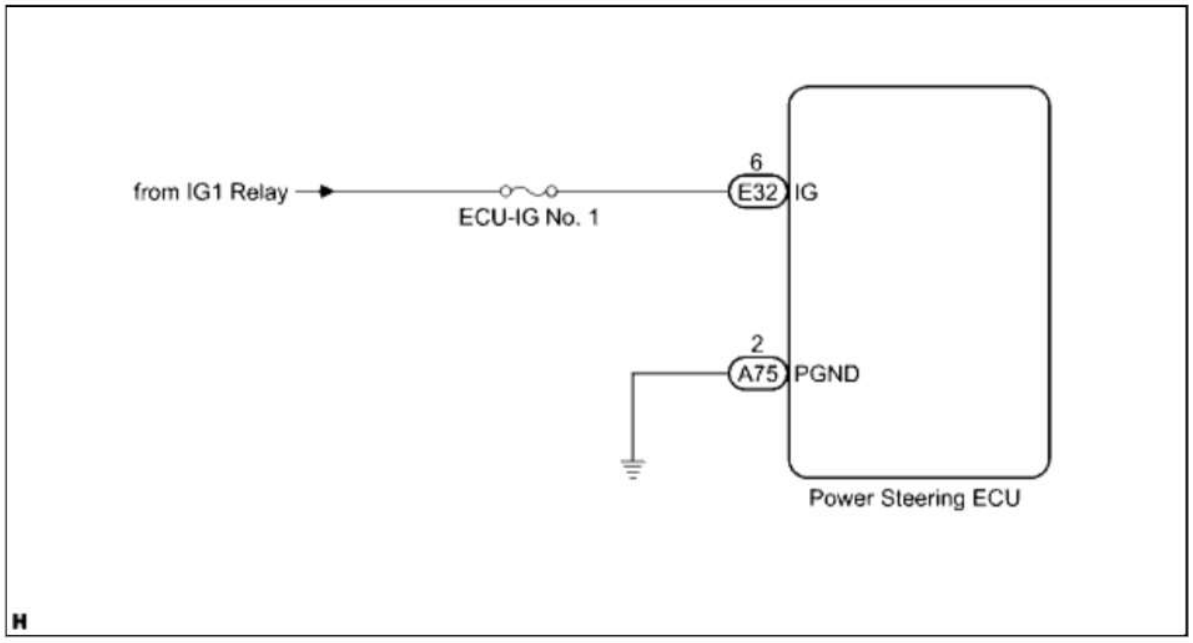
DTC	**C1551**	**IG Power Supply Voltage Malfunction**

DESCRIPTION

The power steering ECU distinguishes the ignition switch status as on (IG) or off through the IG power source circuit.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1551	IG power source circuit malfunction inside ECU	• ECU-IG No. 1 fuse • IG power source circuit • Power steering ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

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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 on (IG).

(d) Turn the Techstream on.

(e) Enter the following menus: Chassis / EMPS / Data List.

(f) Select the item "IG power supply" in the Data List and read the value displayed on the Techstream.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
IG power supply	IG power supply/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Ignition switch on (IG)

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

NG ▶ **INSPECT FUSE (ECU-IG NO. 1)**

OK ▶ **CHECK INTERMITTENT PROBLEMS**

2.	INSPECT FUSE (ECU-IG NO. 1)

(a) Remove the ECU-IG No. 1 fuse from the instrument panel junction block.

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

Standard Resistance:

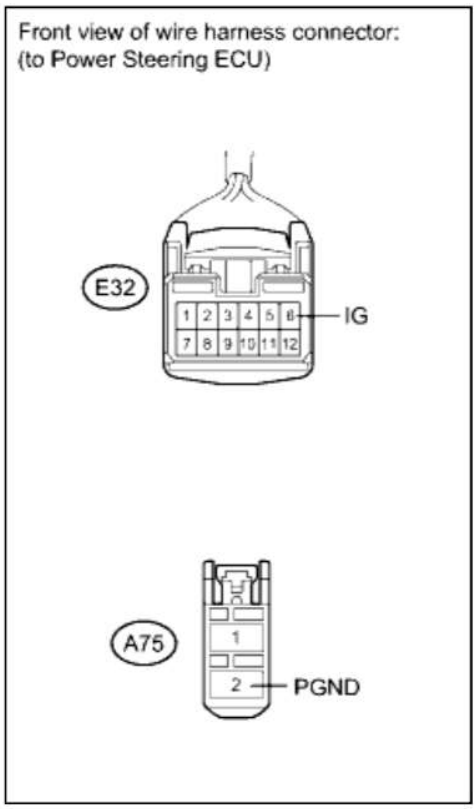
FUSE	CONDITION	SPECIFIED CONDITION
ECU-IG No. 1	Always	Below 1 Ω

NG ▶ **REPLACE FUSE**

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OK

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



(a) Disconnect the connectors from the power steering ECU.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E32-6 (IG) - Body ground	Ignition switch on (IG)	11 to 14 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

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OK ▶ REPLACE POWER STEERING ECU

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000000277J00JX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1552: PIG Power Supply Voltage Malfunction (2010 Corolla)		

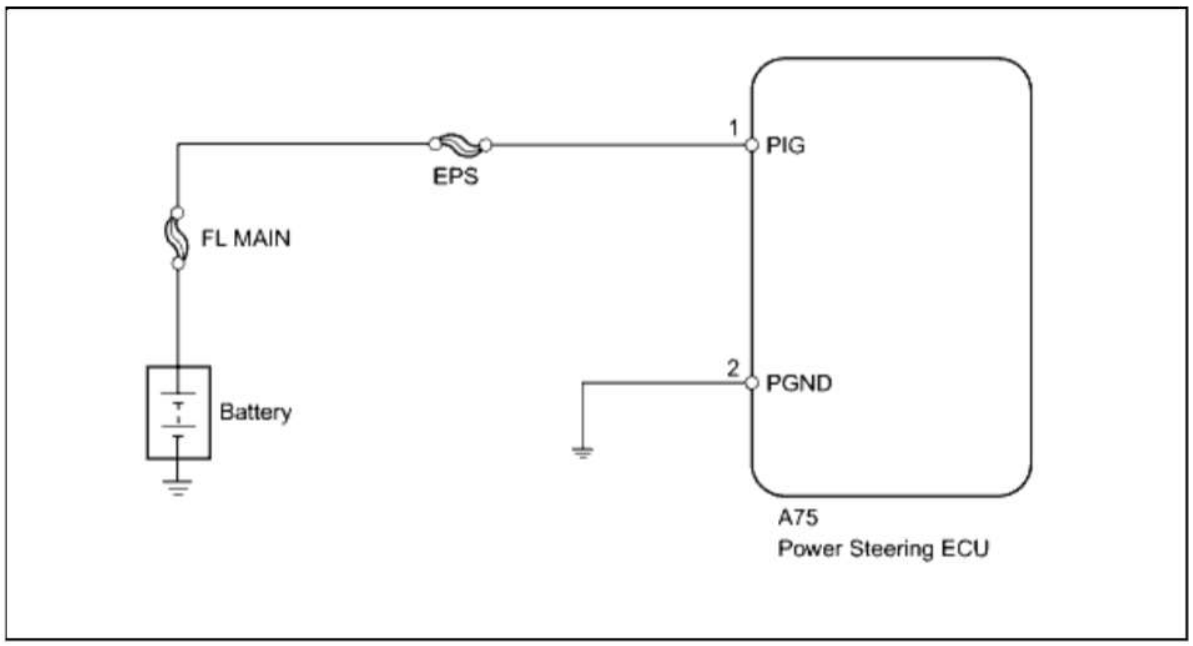
DTC	**C1552**	**PIG Power Supply Voltage Malfunction**

DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1552	PIG power source circuit malfunction inside ECU	• PIG power source circuit • Power steering ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

PROCEDURE

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1.	READ VALUE USING TECHSTREAM (PIG POWER SUPPLY)

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Enter the following menus: Chassis / EMPS / Data List.

(f) Select the item "PIG power supply" in the Data List and read the value displayed on the Techstream.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
PIG power supply	PIG power supply/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Power steering in operation

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

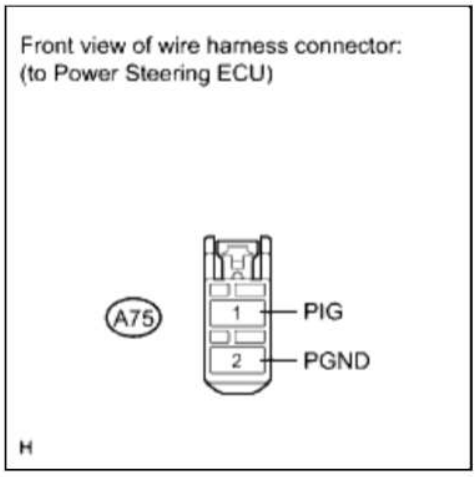
NG ▶ **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - BATTERY AND BODY GROUND)**

OK ▶ **CHECK INTERMITTENT PROBLEMS**

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

(a) Disconnect the connector from the power steering ECU.

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

Standard Voltage:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-1 (PIG) - Body ground	Always	11 to 14 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277L014X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): C1581: Assist Map Number Un-Writing (2010 Corolla)		

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

DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1581	Assist map not written in power steering ECU	Power steering ECU

INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

PROCEDURE

1.	**PERFORM ASSIST MAP WRITING**

(a) Turn the ignition switch on (IG).

(b) Wait for 1 second or more.

(c) Check for DTCs.

HINT:

Approximately 1 second after turning the ignition switch on (IG), the assist map writing is automatically performed. After the automatic assist map writing, DTC C1581 is erased.

OK:
DTC C1581 is not output.

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

OK ▶ **END (COMPLETION OF ASSIST MAP WRITING RETURNS SYSTEM TO NORMAL)**

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2.	CHECK FOR DTC (CAN COMMUNICATION SYSTEM)

(a) Check for DTCs.

OK:
DTC is not output.

NG ▶ GO TO CAN COMMUNICATION SYSTEM

OK ▶ REPLACE POWER STEERING ECU

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Last Modified: 3-10-2010	6.4 J	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277E00HX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): EPS Warning Light Circuit (2010 Corolla)		

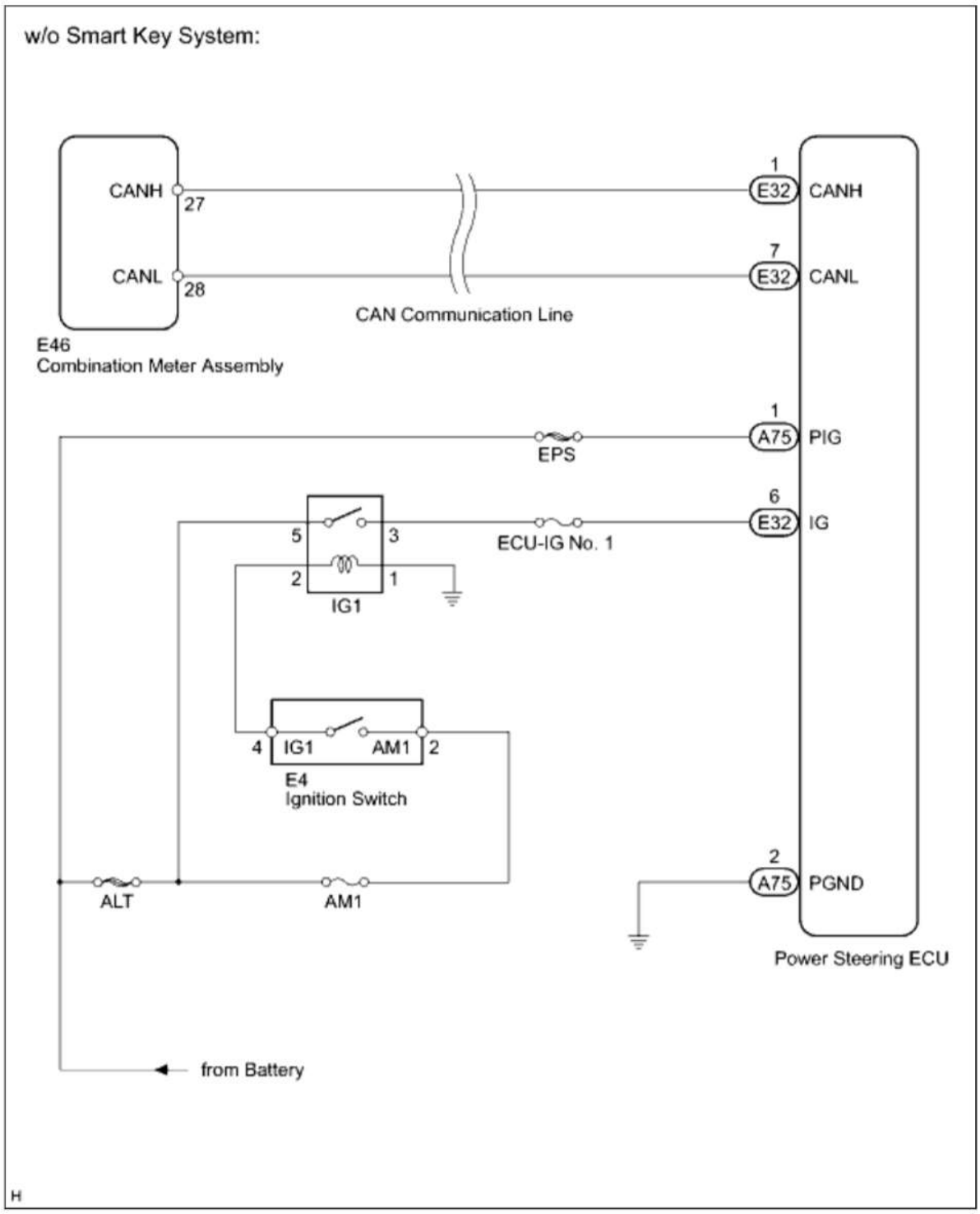
EPS Warning Light Circuit

DESCRIPTION

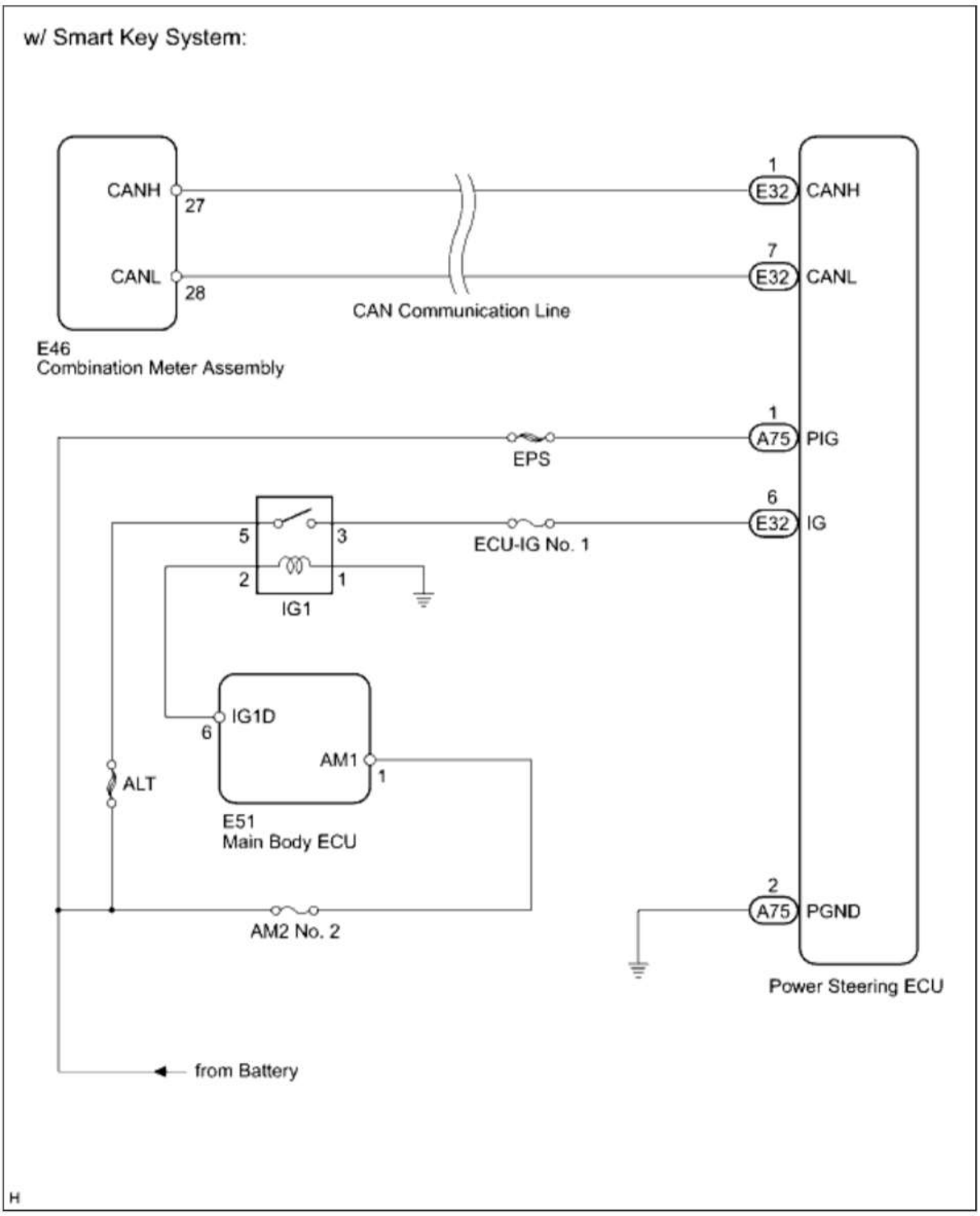
If the power steering ECU detects a malfunction, the P/S warning light comes on. At this time, the power steering ECU stores a DTC in its memory.

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

If the steering column assembly or power steering ECU has been replaced, perform the rotation angle sensor initialization and torque sensor zero point calibration INFO **.**

PROCEDURE

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

(a) Check for DTCs.

OK:
DTC is not output.

NG ▶ **GO TO CAN COMMUNICATION SYSTEM**

OK ▼

2.	**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:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E32-6 (IG) - A75-2 (PGND)	Ignition switch on (IG)	11 to 14 V

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

Standard Resistance:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

B ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

A ▼

3.	**REPLACE POWER STEERING ECU**

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(a) Replace the power steering ECU INFO .

(b) Check the P/S warning light condition.

OK:
P/S warning light operates normally.

NG ▶ GO TO COMBINATION METER SYSTEM

OK ▶ PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE



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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277M010X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2AZ-FE): U0100,U0129: Lost Communication with ECM / PCM "A" (2010 Corolla)		

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

DTC	**U0129**	**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 NO.	DTC DETECTION CONDITION	TROUBLE AREA
U0100	Lost communication with ECM/PCM "A"	• CAN communication system • ECM
U0129	Lost communication with brake system control module	• CAN communication system • Skid control ECU

INSPECTION PROCEDURE

PROCEDURE

1.	**CHECK FOR DTC**

(a) Clear the DTCs INFO.

(b) Check for DTCs INFO.

OK:

DTC is not output.

NG ▶ **GO TO CAN COMMUNICATION SYSTEM**

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OK ▶ CHECK INTERMITTENT PROBLEMS

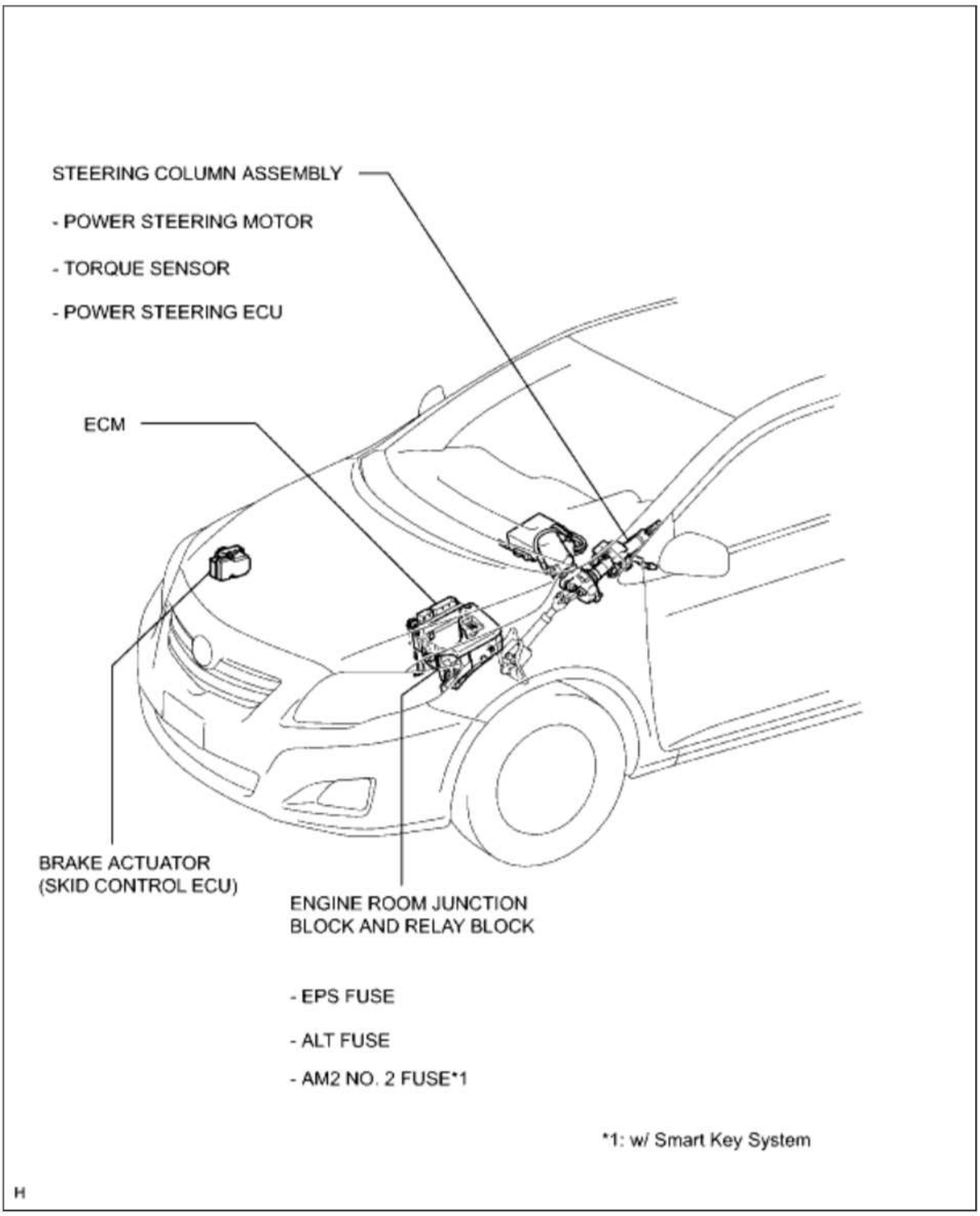
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Last Modified: 3-10-2010	6.4 R	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKE010X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): PARTS LOCATION (2010 Corolla)		

PARTS LOCATION

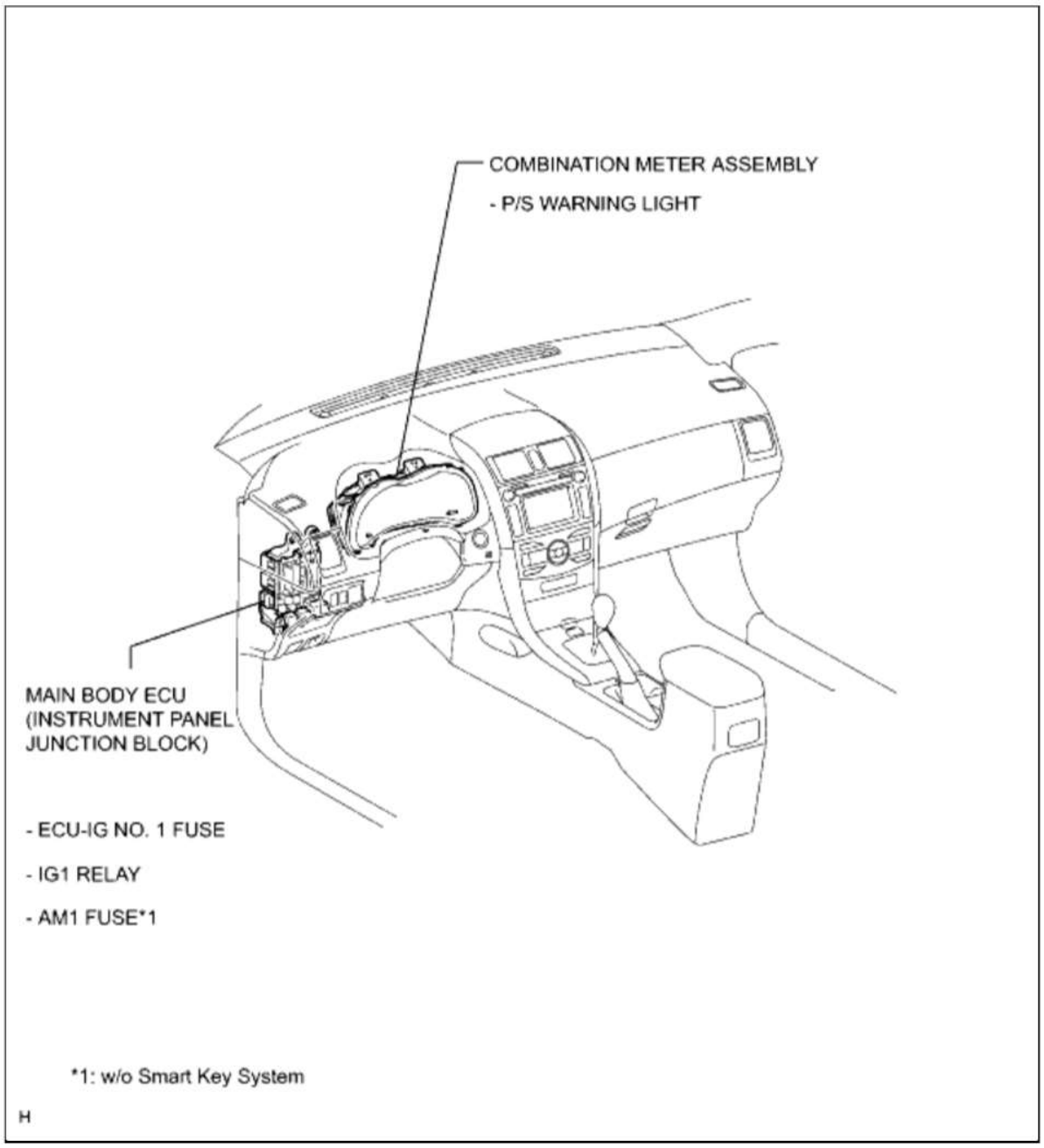
ILLUSTRATION

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ILLUSTRATION

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Last Modified: 3-10-2010	6.4 L	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKB016X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): PRECAUTION (2010 Corolla)		

PRECAUTION

1. IGNITION SWITCH EXPRESSIONS

HINT:

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

SWITCH TYPE		IGNITION SWITCH (POSITION)	ENGINE SWITCH (CONDITION)
Expression	Ignition switch off	LOCK	Off
	Ignition switch on (IG)	ON	On (IG)
	Ignition switch on (ACC)	ACC	On (ACC)
	Engine start	START	Start

2. HANDLING PRECAUTIONS FOR SRS AIRBAG SYSTEM

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

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

3. 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 gear assembly.

(b) If disconnecting the steering sliding yoke sub-assembly and the pinion shaft of the power steering gear assembly, be sure to place matchmarks before starting the operation.

(c) After replacing the steering column assembly or power steering ECU, calibrate the torque sensor zero point INFO .

4. HANDLING PRECAUTION

(a) When handling electronic parts:

(1) Avoid any impact to parts such as ECUs and relays. Replace them with new ones if dropped or subjected to a severe blow.

(2) Do not expose to high temperatures or humidity.

(3) In order to prevent deformation or malfunctions due to static electricity, do not touch the connector terminals.

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(b) When handling power steering ECU:

(1) When the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .

(c) When handling the steering column assembly:

(1) 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.

(2) Do not pull the wire harness when moving the steering column assembly.

(3) When the steering column assembly has been replaced, perform the torque sensor zero point calibration after initializing the torque sensor zero point INFO .

(d) When disconnecting and reconnecting the connectors:

(1) Before disconnecting the connectors related to the power steering system, turn the ignition switch on (IG), center the steering wheel, turn the ignition switch off, and then disconnect the connectors.

(2) Before reconnecting the connectors related to the power steering system, ensure that the ignition switch is off. Then center the steering wheel and turn the ignition switch on (IG).

NOTICE:

Do not turn the ignition switch on (IG) when the steering wheel is not centered.

(3) 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 after initializing the torque sensor zero point INFO .

5. 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, DTCs of the CAN communication line are output.

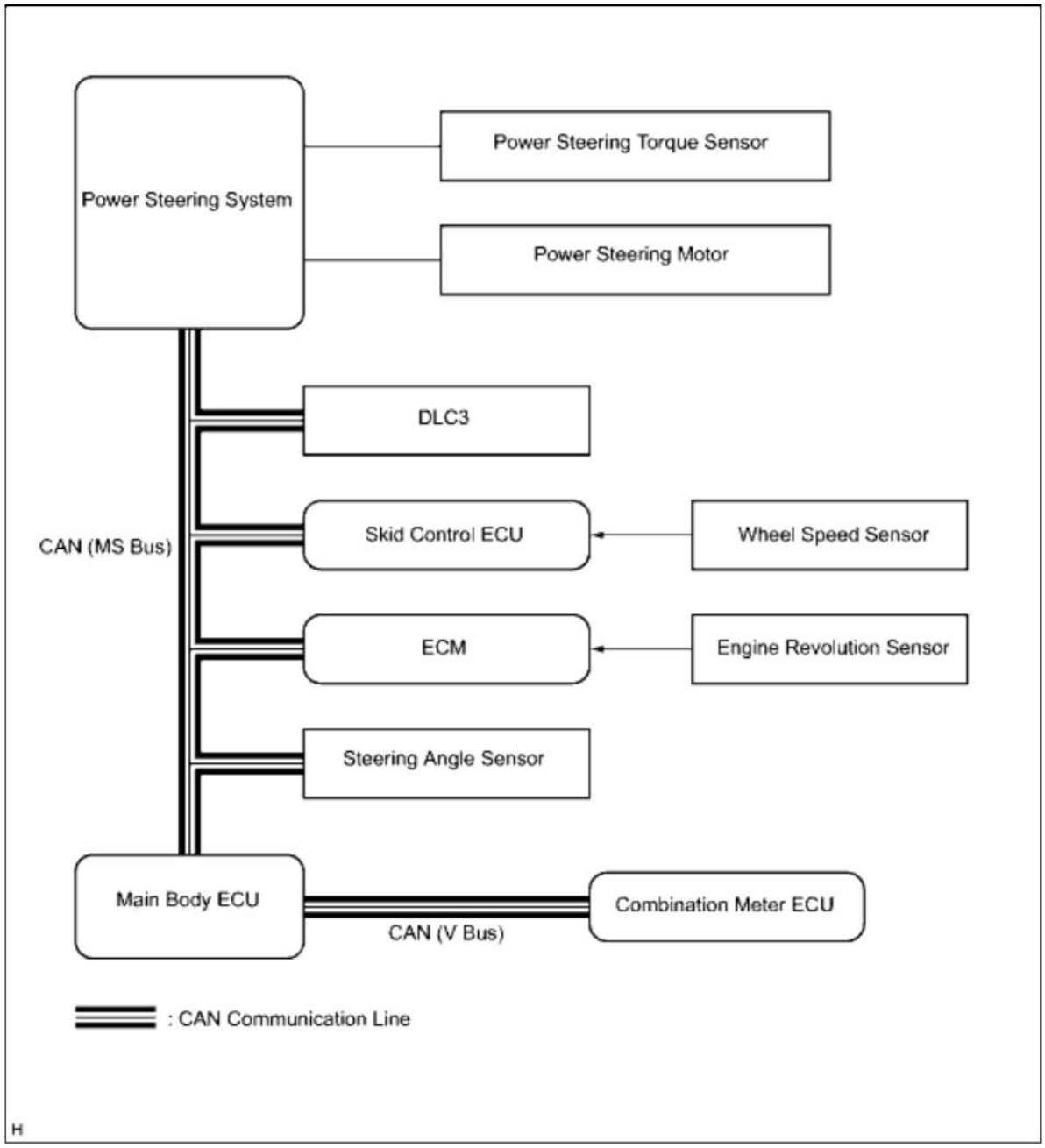
(b) Perform troubleshooting of the communication line problems when the CAN communication DTCs are output. Be sure to start troubleshooting on the electronic power steering system after confirming that the CAN communication system is normal.

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

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Last Modified: 3-10-2010	6.4 U	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AL7010X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): SYSTEM DIAGRAM (2010 Corolla)		

SYSTEM DIAGRAM



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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKC00YX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): HOW TO PROCEED WITH TROUBLESHOOTING (2010 Corolla)		

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1.	**VEHICLE BROUGHT TO WORKSHOP**

NEXT

2.	**INSPECT BATTERY VOLTAGE**

Standard Voltage:
11 to 14 V

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

NEXT

3.	**CHECK DTC AND FREEZE FRAME DATA***

HINT:

Refer to Clear DTCs INFO .

NEXT

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4.	PROBLEM SYMPTOM CONFIRMATION

Result:

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

B ▶ **Go to step 6**

A ▼

5.	SYMPTOM SIMULATION

NEXT ▼

6.	CHECK CAN COMMUNICATION SYSTEM*

(a) Check for DTCs INFO .

Result:

RESULT	PROCEED TO
CAN system DTC is not output	A
CAN system DTC is output	B

HINT:

- If any CAN communication system DTCs are output, perform troubleshooting on 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 the power steering ECU, and the IG circuit of the power steering ECU.

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B ▶ INFO **PROCEED TO CAN COMMUNICATION SYSTEM**

A ▼

7.	**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 9**

A ▼

8.	**PROBLEM SYMPTOMS TABLE**

(a) Refer to Problem Symptoms Table INFO .

Result:

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**

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A

9.	OVERALL ANALYSIS AND TROUBLESHOOTING*

(a) Refer to Terminals of ECU INFO .

(b) Refer to Data List / Active Test INFO .

NEXT

10.	REPAIR OR REPLACE

NEXT

11.	CONFIRMATION TEST

NEXT END

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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AL4010X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): SYSTEM DESCRIPTION (2010 Corolla)		

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 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 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.

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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000002753013X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): CALIBRATION (2010 Corolla)		

CALIBRATION

1. TORQUE SENSOR ZERO POINT CALIBRATION (USING TECHSTREAM)

NOTICE:

Perform the torque sensor zero point calibration if any of the following conditions occur:

- The steering column assembly (containing the torque sensor) has been replaced.
- The power steering ECU has been replaced.
- There is a difference in steering effort between turning right and left.

HINT:

When torque sensor zero point calibration is performed, the assist map is written automatically at the same time.

(a) Perform the 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.

(1) Set the steering wheel to the center point and align the front wheels straight ahead.

(2) Turn the ignition switch off.

(3) Connect the Techstream to the DLC3.

(4) Start the engine.

(5) Turn the Techstream on.

(6) Calibrate the power steering ECU. Enter the following menus: Chassis / EMPS / Utility / Torque Sensor Adjustment.

NOTICE:

- Do not touch the steering wheel during the torque sensor zero point calibration.
- Perform the calibration only when the vehicle is stopped.

(7) Check for DTCs INFO.

NOTICE:

- After zero point calibration is completed normally, confirm that DTC is not output.
- If DTC C1515, C1516, C1534 or C1581 is output, perform troubleshooting for the corresponding DTC.

Result:

RESULT	SEE PROCEDURE
DTC C1515 is output.	INFO
DTC C1516 is output.	INFO

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RESULT	SEE PROCEDURE
DTC C1534 is output.	INFO
DTC C1581 is output.	INFO

2. ASSIST MAP WRITING (USING TECHSTREAM)

HINT:

If DTC C1581 is output after torque sensor zero point calibration, perform assist map writing.

(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 / Utility / Signal Check.

HINT:

- Follow the instructions on the Techstream to perform Signal Check.
- With DTC C1581 output, performing Signal Check will cause the power steering ECU to enter Test Mode and the assist map will be written automatically.

(f) Check for DTCs INFO .

HINT:

After writing the assist map, if DTC C1581 is output, perform the troubleshooting procedure for DTC C1581 INFO .



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Last Modified: 3-10-2010	6.4 T	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274X015X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): PROBLEM SYMPTOMS TABLE (2010 Corolla)		

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
Heavy steering	Front tires (improperly inflated, unevenly worn)	INFO
	Front wheel alignment (incorrect)	INFO
	Front suspension (lower ball joint)	INFO
	Steering gear assembly	INFO
	Torque sensor (built into steering column)	INFO
	Power steering motor	INFO
	Battery and power source system	-
	Power steering ECU power source voltage and relay	INFO
	Power steering ECU	INFO
Steering effort differs between turning right and left, or steering effort is uneven.	Steering center point (zero point) recorded incorrectly	INFO
	Front tires (improperly inflated, unevenly worn)	INFO
	Front wheel alignment (incorrect)	INFO
	Front suspension (lower ball joint)	INFO
	Steering gear assembly	INFO

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SYMPTOM	SUSPECTED AREA	SEE PAGE
	Torque sensor (built into steering column)	INFO
	Steering column assembly	INFO
	Power steering motor	INFO
	Power steering ECU	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
	Torque sensor (built into steering column)	INFO
	Power steering motor	INFO
	Power steering ECU	INFO
	CAN communication system	INFO
A knocking (or cranking) sound occurs when turning the steering wheel back and forth while operating the power steering.	Front suspension (lower ball joint)	INFO
	Steering intermediate shaft	INFO
	Power steering ECU	INFO
Noise occurs when turning the steering wheel during low-speed driving.	Power steering gear	INFO
	Steering column assembly	INFO
Friction occurs when turning the steering wheel during low-speed driving.	Power steering motor	INFO
	Steering column assembly	INFO
A high-pitched sound (squeaking) occurs when turning the steering wheel slowly with the vehicle stopped.	Power steering motor	INFO
The steering wheel vibrates and noise occurs when turning the steering wheel from lock to lock with the vehicle stopped.	Power steering gear	INFO
	Steering column assembly	INFO
The P/S warning light does not come on, or is always on.	Power source voltage of power steering ECU	INFO
	EPS warning light circuit	INFO
	Power steering ECU	INFO

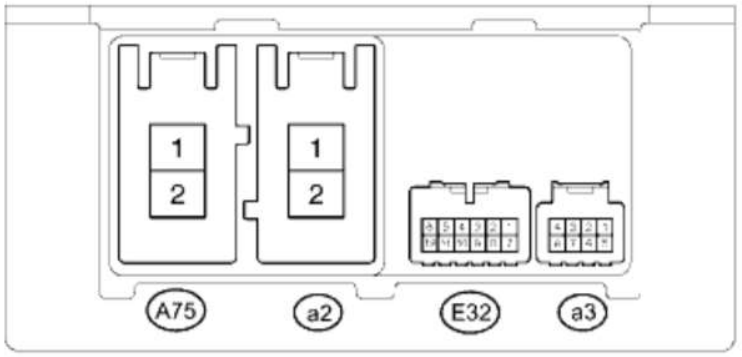
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Last Modified: 3-10-2010	6.4 U	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKF011X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): TERMINALS OF ECU (2010 Corolla)		

TERMINALS OF ECU

1. CHECK POWER STEERING ECU

Power Steering ECU:



N

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

NOTICE:

- Check if the power steering ECU connectors are securely connected by pulling on them from the backside.
- If the P/S warning light is illuminated due to a malfunction, the fail-safe function may cause the voltage of the power steering ECU's terminals to become 0 V.

TERMINALS NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
A75-1 (PIG) - Body ground	L - Body ground	Power steering motor power supply input signal	Always	11 to 14 V
A75-2 (PGND) - Body ground	W-B - Body ground	Power ground	Always	Below 1 Ω
a2-1 (M1) - Body ground	R - Body ground	Power steering motor output signal 1	Ignition switch on (IG), steering wheel turned to left	11 to 14 V
			Ignition switch on (IG), steering wheel turned to right	Below 1 V

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TERMINALS NO. (SYMBOL)	WIRING COLOR	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
a2-2 (M2) - Body ground	B - Body ground	Power steering motor output signal 2	Ignition switch on (IG), steering wheel turned to left	Below 1 V
			Ignition switch on (IG), steering wheel turned to right	11 to 14 V
E32-1 (CANH) - E32-7 (CANL)	SB - W	CAN communication line (CAN HI signal)	Ignition switch off	54 to 69 Ω
E32-6 (IG) - Body ground	L - Body ground	IG power source	Ignition switch on (IG)	11 to 14 V
E32-7 (CANL) - E32-1 (CANH)	W - SB	CAN communication line (CAN LO signal)	Ignition switch off	54 to 69 Ω
a3-5 (TRQ1) - Body ground	W - Body ground	Torque sensor 1 input signal	Ignition switch on (IG), steering wheel is not turned (without load)	2.3 to 2.7 V
			Ignition switch on (IG), steering wheel is turned to right	2.5 to 4.7 V
			Ignition switch on (IG), steering wheel is turned to left	0.3 to 2.5 V
a3-6 (TRQV) - Body ground	R - Body ground	Torque sensor power source	Ignition switch on (IG)	7.5 to 8.5 V
a3-7 (TRQ2) - Body ground	Y - Body ground	Torque sensor 2 input signal	Ignition switch on (IG), steering wheel is not turned (without load)	2.3 to 2.7 V
			Ignition switch on (IG), steering wheel is turned to right	2.5 to 4.7 V
			Ignition switch on (IG), steering wheel is turned to left	0.3 to 2.5 V
a3-8 (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.



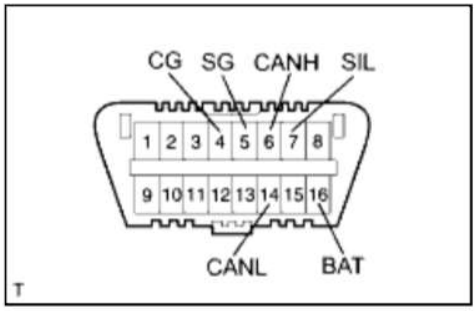
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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000274Z00XX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): DIAGNOSIS SYSTEM (2010 Corolla)		

DIAGNOSIS SYSTEM

1. CHECK DLC3

(a) The ECU uses ISO 15765-4 for communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.



SYMBOL (TERMINAL NO.)	TERMINAL DESCRIPTION	CONDITION	SPECIFIED CONDITION
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	11 to 14 V
CANH (6) - CANL (14)	CAN bus line	Ignition switch off*	54 to 69 Ω
CANH (6) - CG (4)	HIGH-level CAN bus line	Ignition switch off*	200 Ω or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch off*	200 Ω or higher
CANH (6) - BAT (16)	HIGH-level CAN bus line	Ignition switch off*	6 Ω or higher
CANL (14) - BAT (16)	LOW-level CAN bus line	Ignition switch off*	6 Ω or higher

NOTICE:

***: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the ignition switch or any other switches or the doors.**

(b) If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

Connect the Techstream cable to the DLC3, turn the ignition switch on (IG) and attempt to use the Techstream.

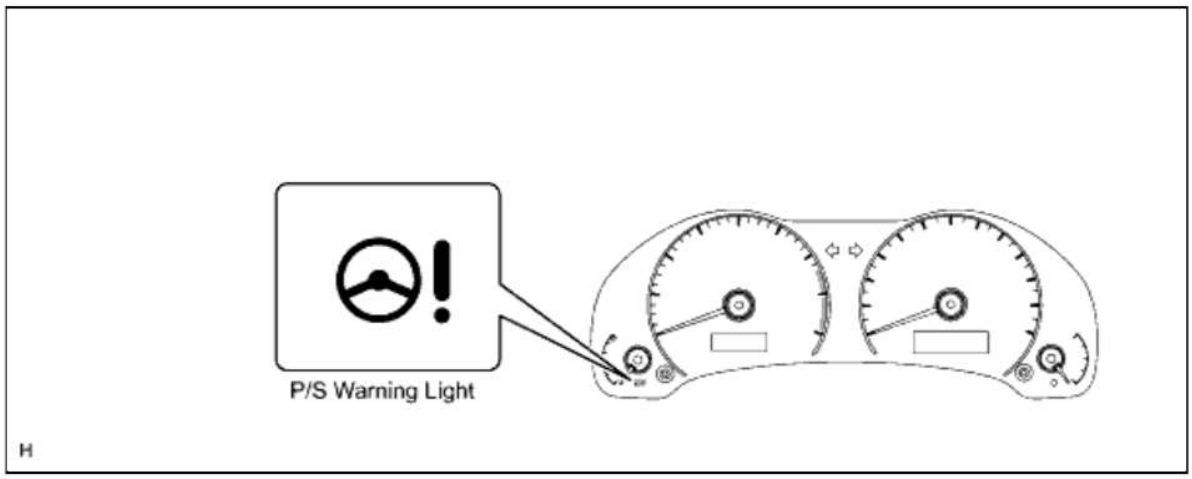
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If the display indicates that a communication error has occurred, there is a problem either with the vehicle or with the Techstream.

- If communication is normal when the Techstream is connected to another vehicle, inspect the DLC3 of the original vehicle.
- If communication is still not possible when the Techstream is connected to another vehicle, the problem may be in the Techstream itself. Consult the Service Department listed in the Techstream instruction manual.

2. CHECK WARNING LIGHT

(a) If a problem occurs in the power steering system, the P/S warning light on the combination meter comes on to inform the driver of the problem.



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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000002750011X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): DTC CHECK / CLEAR (2010 Corolla)		

DTC CHECK / CLEAR

1. CHECK DTCs

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Read the DTCs following the display on the Techstream. Enter the following menus: Chassis / EMPS / Trouble Codes.

(f) Refer to the Diagnostic Trouble Code Chart for DTC information INFO .

2. CLEAR DTCs

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Start the engine.

(d) Turn the Techstream on.

(e) Clear the DTCs following the display on the Techstream. Enter the following menus: Chassis / EMPS / Trouble Codes.

(f) According to the display on the Techstream, select the trouble code data display with the clear button.

(g) Turn the ignition switch off.

(h) Disconnect the Techstream from the DLC3.

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Last Modified: 3-10-2010	6.4 D	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000002755013X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): FREEZE FRAME DATA (2010 Corolla)		

FREEZE FRAME DATA

1. FREEZE FRAME DATA

NOTICE:

- Freeze frame data values will vary depending on the measurement conditions, surroundings, or vehicle conditions. For this reason, there may be a problem even if the values are within specifications.
- Turn the ignition switch on (IG) and park the vehicle on level ground. Check the freeze frame data by using the Techstream.

(a) Turn the ignition switch off.

(b) Connect the Techstream to the DLC3.

(c) Turn the ignition switch on (IG).

(d) Turn the Techstream on.

(e) Check the freeze frame data on the Techstream.

EMPS

TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
Meter Vehicle Velocity	Vehicle speed from meter/ Min.: 0 km/h (0 mph) Max.: 300 km/h (186.4 mph)	0 km/h (0 mph)	Vehicle stopped
		No significant fluctuation	Vehicle driven at a constant speed
Engine Revolution	Engine revolution/ Min.: 0 rpm Max.: 12800 rpm	No significant fluctuation	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	Engine running, power steering is in operation
Command Value Current	Demanded amount of current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	Engine running, power steering is in operation
Thermistor Temperature	ECU substrate temperature/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	-40 to 150°C (-40 to 302°F)	-

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
PIG Power Supply	Power source voltage to activate motor/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Ignition switch on (IG)
IG Power Supply	ECU power source voltage/ Min.: 0 V Max.: 20.1531 V	11 to 14 V	Ignition switch on (IG)
Torque Sensor 1 Output	Torque sensor 1 output value/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Engine running, steering wheel not turned (without load)
		2.5 to 4.7 V	Engine running, steering wheel turned to right with vehicle stopped
		0.3 to 2.5 V	Engine running, steering wheel turned to left with vehicle stopped
Torque Sensor 2 Output	Torque sensor 2 output value/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Engine running, steering wheel not turned (without load)
		2.5 to 4.7 V	Engine running, steering wheel turned to right with vehicle stopped
		0.3 to 2.5 V	Engine running, steering wheel turned to left with vehicle stopped
Torque Sensor 3 Output	Torque sensor output value for assist control/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Engine running, steering wheel not turned (without load)
		2.5 to 4.7 V	Engine running, steering wheel turned to right with vehicle stopped
		0.3 to 2.5 V	Engine running, steering wheel turned to left with vehicle stopped
TRQ1 Zero Point Value	Zero point value of torque sensor 1/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Engine running, steering wheel not turned (without load)
TRQ2 Zero Point Value	Zero point value of torque sensor 2/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Engine running, steering wheel not turned (without load)

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TESTER DISPLAY	MEASUREMENT ITEM/RANGE	NORMAL CONDITION	DIAGNOSTIC NOTE
TRQ3 Zero Point Value	Zero point value of torque sensor for assist control/ Min.: 0 V Max.: 5 V	2.3 to 2.7 V	Engine running, steering wheel not turned (without load)
Motor Terminal Volt(+)	Motor terminal M1 voltage/ Min.: 0 V Max.: 25.5 V	11 to 14 V	Engine running, steering wheel turned to right
		Below 1 V	Engine running, steering wheel turned to left
Motor Terminal Volt(-)	Motor terminal M2 voltage/ Min.: 0 V Max.: 25.5 V	Below 1 V	Engine running, steering wheel turned to right
		11 to 14 V	Engine running, steering wheel turned to left



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Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001ALA016X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): FAIL-SAFE CHART (2010 Corolla)		

FAIL-SAFE CHART

If a problem occurs in the power steering system, the P/S warning light on the combination meter comes on, and the ECU stops the steering power assist, maintains a constant amount of power assist, or reduces the amount of power assist to protect the system.

DTC CODE	MALFUNCTION	FAIL-SAFE
C1511 C1512 C1513 C1514 C1515 C1516	Torque sensor malfunction	Power assist stopped
C1517	Torque sensor malfunction	Power assist stopped
C1524	Motor malfunction	Power assist stopped
C1531 C1532	Power steering ECU malfunction	Power assist stopped
C1533	Temperature sensor malfunction in power steering ECU	Assist force restricted
C1534	EEPROM abnormal	Power assist stopped
C1535	Steering wheel location data error	Power assist stopped
C1551	IG power source voltage error	Power assist stopped
C1552	PIG power source voltage error	Power assist stopped
C1553	Overvoltage at IG and PIG terminals	Power assist stopped
C1554	Power source relay malfunction	Power assist stopped
C1555	Motor relay malfunction	Power assist stopped
C1581	ECU malfunction (Assist map number un-writing)	Permission of control assist map
U0100	ECM communication error	Power assist stopped
U0129	Skid control ECU communication error	Amount of power assist remains constant at speed of 70 km/h (43 mph)

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

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wheel is kept in 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.



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Last Modified: 3-10-2010	6.4 S	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKD01AX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): DIAGNOSTIC TROUBLE CODE CHART (2010 Corolla)		

DIAGNOSTIC TROUBLE CODE CHART

HINT:

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

DTC CODE	DETECTION ITEM	TROUBLE AREA	RETURN-TO-NORMAL CONDITION	P/S WARNING LIGHT	SEE PAGE
C1511	Torque Sensor Circuit Malfunction	1. Steering column assembly (Torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1512	Torque Sensor Circuit Malfunction	1. Steering column assembly (Torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1513	Torque Sensor Circuit Malfunction	1. Steering column assembly (Torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1514	Torque Sensor Power Supply Abnormal	1. Steering column assembly (Torque sensor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1515	Torque Sensor Zero Point Adjustment Undone	-	After calibrating torque sensor zero point	○	INFO
C1516	Torque Sensor Zero Point Adjustment Incomplete	-	After calibrating torque sensor zero point normally	○	INFO
C1517	Torque Hold Abnormal	1. Steering column assembly (Torque sensor) 2. Power steering	Ignition switch on (IG) again	○	INFO

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DTC CODE	DETECTION ITEM	TROUBLE AREA	RETURN-TO-NORMAL CONDITION	P/S WARNING LIGHT	SEE PAGE
		ECU			
C1524	Motor Circuit Malfunction	1. Steering column assembly (Power steering motor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1531	ECU Malfunction	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1532	ECU Malfunction	Power steering ECU	Ignition switch on (IG) again	○*1	INFO
C1533	ECU Malfunction	Power steering ECU	Ignition switch on (IG) again	○	INFO
C1534	ECU Malfunction	Power steering ECU	Ignition switch on (IG) again	○*1	INFO
C1535	ECU Malfunction	Power steering ECU	-	○	INFO
C1551	IG Power Supply Voltage Malfunction	1. ECU-IG No. 1 fuse 2. IG power source circuit 3. Power steering ECU	Ignition switch on (IG) again and after normal confirmation	○	INFO
C1552	PIG Power Supply Voltage Malfunction	1. EPS fuse 2. PIG power source circuit 3. Power steering ECU	Ignition switch on (IG) again and after normal confirmation	○	INFO
C1553	PIG Power Supply Overvoltage	1. IG and PIG power source circuit 2. Power steering ECU	Ignition switch on (IG) again and after normal confirmation	○	INFO
C1554	Power Supply Relay Failure	1. EPS fuse 2. PIG power source circuit 3. Power steering ECU	Ignition switch on (IG) again	○	INFO
C1555	Motor Relay Welding Failure	1. Steering column assembly (Power steering motor) 2. Power steering ECU	Ignition switch on (IG) again	○	INFO

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DTC CODE	DETECTION ITEM	TROUBLE AREA	RETURN-TO-NORMAL CONDITION	P/S WARNING LIGHT	SEE PAGE
C1581	Assist Map Number Un-Writing	1. Power steering ECU 2. SFI system 3. CAN communication system	-	○	INFO
U0100	Lost Communication with ECM / PCM "A"	1. CAN communication system 2. ECM	Ignition switch on (IG) again or after normal confirmation	○	INFO
U0129	Lost Communication with Brake System Control Module	1. CAN communication system 2. Skid control ECU	Ignition switch on (IG) again or after normal confirmation	○	INFO

○: Warning light comes on

*1: Depending on some detection conditions, there is a case that the warning light does not come on.



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Last Modified: 3-10-2010	6.4 U	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AL8012X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): DATA LIST / ACTIVE TEST (2010 Corolla)		

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.

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the Techstream to the DLC3.

(d) Turn the ignition switch on (IG).

(e) Turn the Techstream on.

(f) Enter the following menus: Chassis / EMPS / Data List.

(g) 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 meter/ Min.: 0 km/h (mph) Max.: 300 km/h (186.4 mph)	0 km/h (0 mph)	Vehicle stopped
		No significant fluctuation	Vehicle driven at constant speed
Engine Revolution	Engine revolution/ Min.: 0 rpm Max.: 12800 rpm	No significant fluctuation	Engine is running at a constant speed
Motor Actual Current	Current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	Engine running, power steering is in operation
Command Value Current	Requested current to motor/ Min.: -327.68 A Max.: 327.67 A	Value changes in proportion to steering effort	Engine running, power steering is in operation
Thermistor Temperature	ECU substrate temperature/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	-40 to 150°C (-40 to 302°F)	
	Power source voltage to		

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKH013X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1511-C1514,C1517: Torque Sensor Circuit Malfunction (2010 Corolla)		

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**

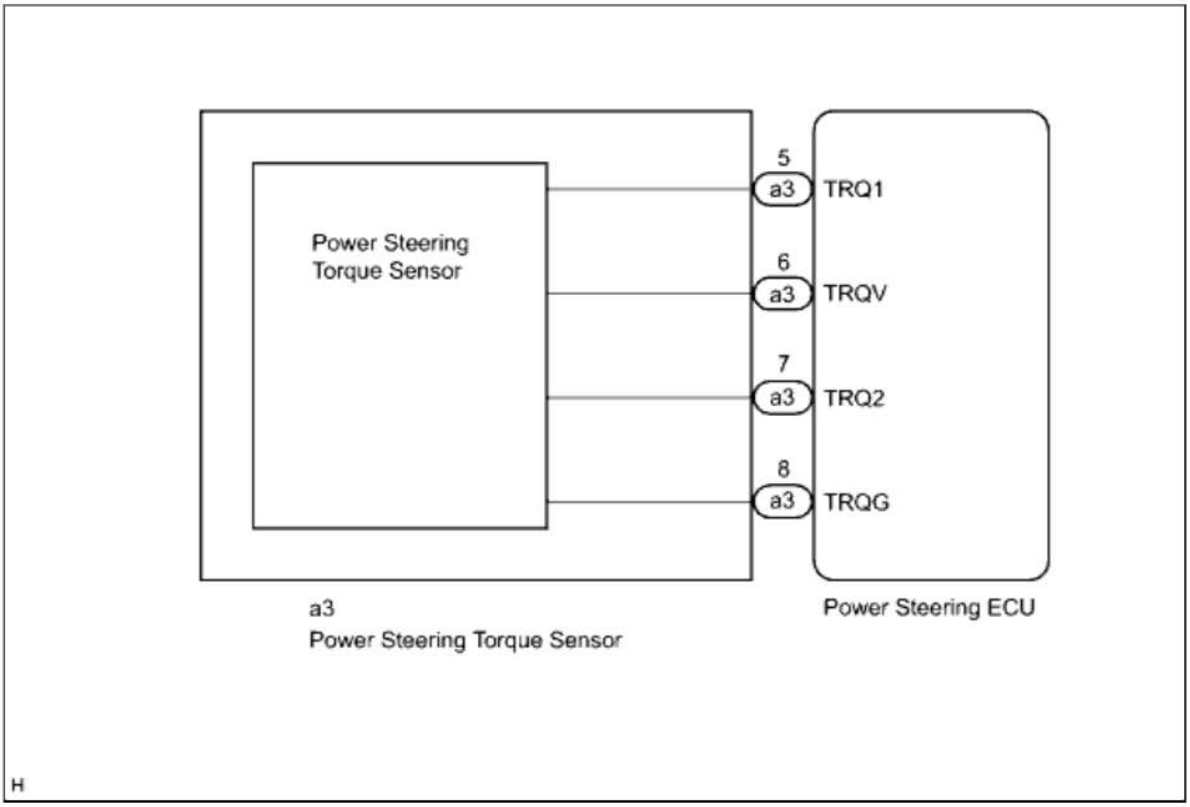
DESCRIPTION

The power steering ECU calculates assisting power based on steering torque signals from the torque sensor. If these DTCs are stored in the power steering ECU, the ECU stops steering power assist as a fail-safe function.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1511	Torque sensor (TRQ1) signal error or stop	• Steering column assembly (torque sensor) • Power steering ECU
C1512	Torque sensor (TRQ2) signal error or stop	
C1513	Deviation between torque sensor TRQ1 and TRQ2 exceeds specified value	
C1514	Torque sensor power source voltage error	
C1517	Temporary control due to malfunction related to torque sensor continues for long time	

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

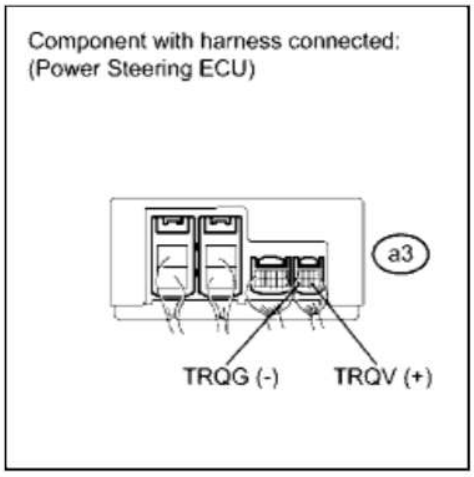
- If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .
- If the steering column assembly has been replaced with a new one, perform the torque sensor zero point calibration after performing the initialization of the torque sensor zero point value INFO .

PROCEDURE

1.	**CHECK POWER STEERING ECU (TOQUE SENSOR OUTPUT)**

(a) Turn the ignition switch on (IG).

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

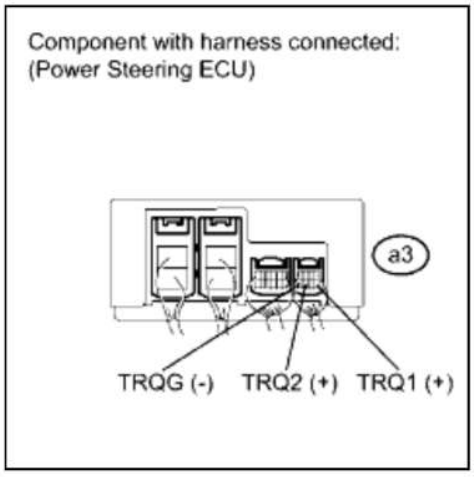
Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
a3-6 (TRQV) - a3-8 (TRQG)	Ignition switch on (IG)	7.5 to 8.5 V

NG ▶ **REPLACE POWER STEERING ECU**

OK ▼

2.	**CHECK STEERING COLUMN ASSEMBLY (TORQUE SENSOR)**



(a) Turn the ignition switch on (IG).

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

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Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION (STEERING POSITION)	SPECIFIED CONDITION
a3-5 (TRQ1) - a3-8 (TRQG)	Ignition switch on (IG) Center position	2.3 to 2.7 V
a3-7 (TRQ2) - a3-8 (TRQG)	Ignition switch on (IG) Center position	2.3 to 2.7 V
a3-5 (TRQ1) - a3-8 (TRQG)	Ignition switch on (IG) Turned to right	2.5 to 4.7 V
a3-7 (TRQ2) - a3-8 (TRQG)	Ignition switch on (IG) Turned to right	2.5 to 4.7 V
a3-5 (TRQ1) - a3-8 (TRQG)	Ignition switch on (IG) Turned to left	0.3 to 2.5 V
a3-7 (TRQ2) - a3-8 (TRQG)	Ignition switch on (IG) Turned to left	0.3 to 2.5 V

NG ▶ **REPLACE STEERING COLUMN ASSEMBLY**

OK ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 G	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001T31013X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): ON-VEHICLE INSPECTION (2010 Corolla)		

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 road and align the wheels facing 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.

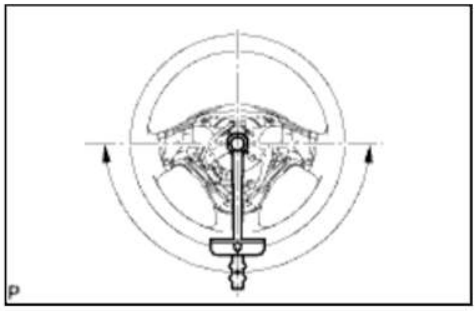
(c) Remove the steering pad INFO .

(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, 37ft·lbf)

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

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

(k) Connect the cable to the negative (-) battery terminal.

(l) Clear the DTCs INFO .

(m) Inspect the airbag warning light INFO .

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001WCS00YX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1515: Torque Sensor Zero Point Adjustment Undone (2010 Corolla)		

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

DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1515	Torque sensor zero point calibration not performed.	There is no malfunction if DTC is not output after performing the torque sensor zero point calibration.

INSPECTION PROCEDURE

NOTICE:

- If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .
- If the steering column assembly has been replaced with a new one, perform the torque sensor zero point calibration after performing the initialization of the torque sensor zero point value INFO .

PROCEDURE

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

(a) Perform the torque sensor zero point calibration INFO .

NEXT

2.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

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Result:

RESULT	PROCEED TO
DTC is still output even after performing torque sensor zero point calibration 3 times*1.	A
DTC is still output even after performing torque sensor zero point calibration once or twice*2.	B
Normal system code is output.	C

HINT:

- *1: The power steering ECU must be replaced if DTC C1515 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1515 is still output even after the calibration is performed once or twice.

C ▶ **END**

B ▶ **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

A
▼

3.	**REPLACE POWER STEERING ECU**

(a) Replace the power steering ECU INFO .

NEXT
▼

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

(a) Perform the torque sensor zero point calibration INFO .

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NEXT

5.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

Result:

RESULT	PROCEED TO
DTC is still output even after performing torque sensor zero point calibration 3 times*1.	A
DTC is still output even after performing torque sensor zero point calibration twice*2.	B
Normal system code is output.	C

HINT:

- *1: The steering column assembly must be replaced if DTC C1515 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1515 is still output even after the calibration is performed twice.

C ▶ **END**

B ▶ **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

A ▶ **REPLACE STEERING COLUMN ASSEMBLY**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001WCT00YX
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1516: Torque Sensor Zero Point Adjustment Incomplete (2010 Corolla)		

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

DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1516	Torque sensor zero point calibration is not completed successfully.	There is no malfunction if DTC is not output after performing the torque sensor zero point calibration.

INSPECTION PROCEDURE

NOTICE:

- If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .
- If the steering column assembly has been replaced with a new one, perform the torque sensor zero point calibration after performing the initialization of the torque sensor zero point value INFO .

PROCEDURE

1.	**CLEAR DTC**

(a) Clear the DTCs INFO .

NEXT

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

(a) Perform the torque sensor zero point calibration INFO .

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NEXT

3.	CHECK FOR DTC

(a) Check for DTCs INFO .

Result:

RESULT	PROCEED TO
DTC is still output even after performing torque sensor zero point calibration 3 times*1.	A
DTC is still output even after performing torque sensor zero point calibration once or twice*2.	B
Normal system code is output.	C

HINT:

- *1: The power steering ECU must be replaced if DTC C1516 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1516 is still output even after the calibration is performed once or twice.

C **END**

B **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

A

4.	REPLACE POWER STEERING ECU

(a) Replace the power steering ECU INFO .

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NEXT

5.	PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR)

(a) Perform the torque sensor zero point calibration INFO .

NEXT

6.	CHECK FOR DTC

(a) Check for DTCs INFO .

Result:

RESULT	PROCEED TO
DTC is still output even after performing torque sensor zero point calibration 3 times*1.	A
DTC is still output even after performing torque sensor zero point calibration twice*2.	B
Normal system code is output.	C

HINT:

- *1: The steering column assembly must be replaced if DTC C1516 is still output even after the torque sensor zero point calibration is performed 3 times.
- *2: Perform the torque sensor zero point calibration again if DTC C1516 is still output even after the calibration is performed twice.

C ▶ **END**

B ▶ **PERFORM ZERO POINT CALIBRATION AGAIN (TORQUE SENSOR)**

A ▶ **REPLACE STEERING COLUMN ASSEMBLY**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKN014X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1524,C1555: Motor Circuit Malfunction (2010 Corolla)		

DTC	**C1524**	**Motor Circuit Malfunction**

DTC	**C1555**	**Motor Relay Welding Failure**

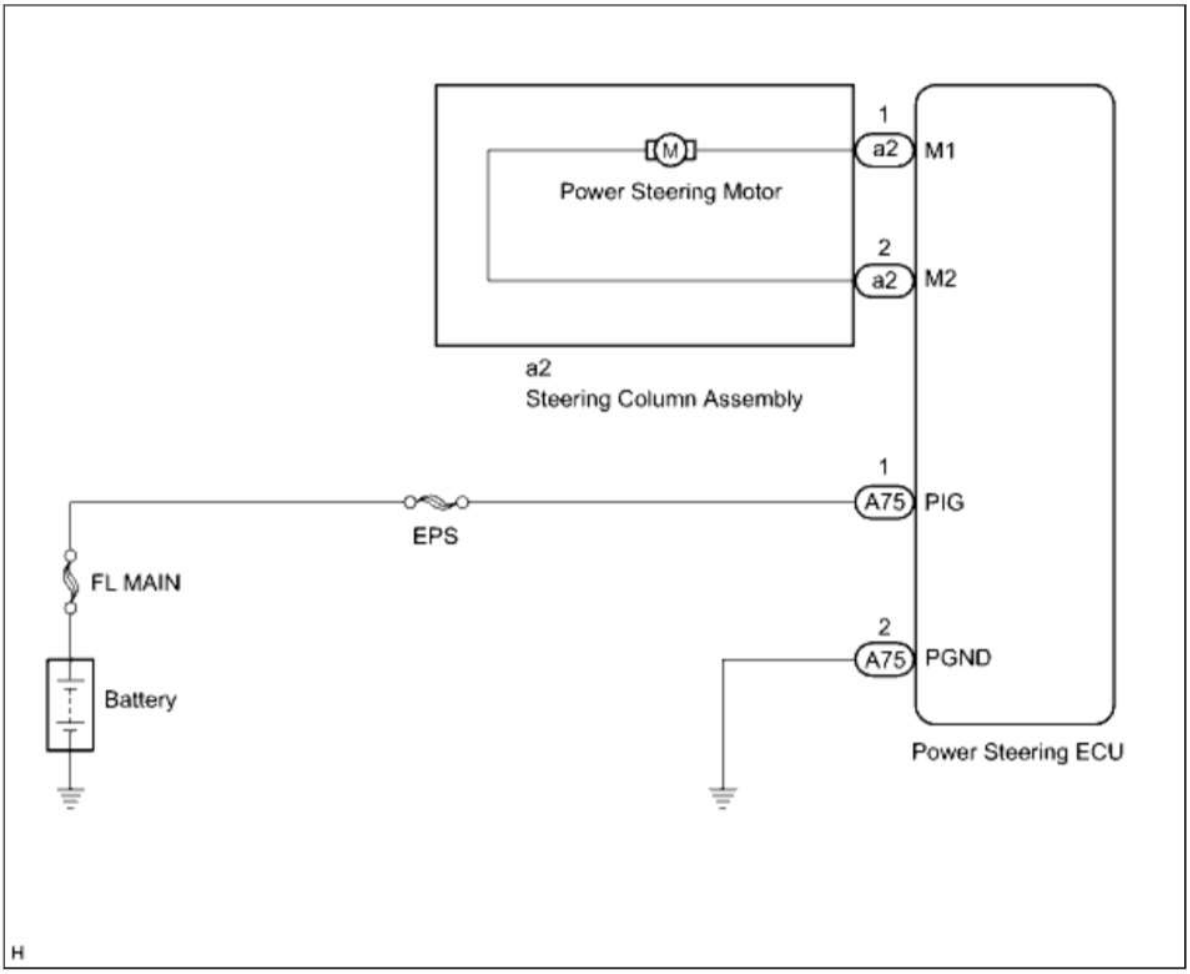
DESCRIPTION

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

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1524	Short (or open) in motor circuit or abnormal voltage in motor circuit.	• Steering column assembly (power steering motor) • Power steering ECU
C1555	Predriver (Motor relay circuit) malfunction	

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

- If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .
- If the steering column assembly has been replaced with a new one, perform the torque sensor zero point calibration after performing the initialization of the torque sensor zero point value INFO .

PROCEDURE

1.	**CHECK POWER STEERING ECU**

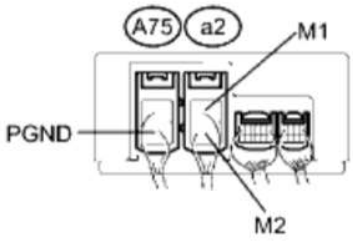
(a) Turn the ignition switch on (IG).

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

Standard Voltage:

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Component with harness connected:
(Power Steering ECU)



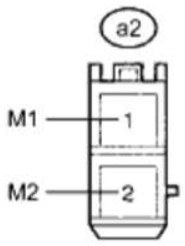
TESTER CONNECTION	CONDITION (STEERING POSITION)	SPECIFIED CONDITION
a2-1 (M1) - A75-2 (PGND)	Engine running (Turned to right)	Below 1 V
a2-1 (M1) - A75-2 (PGND)	Engine running (Turned to left)	11 to 14 V
a2-2 (M2) - A75-2 (PGND)	Engine running (Turned to right)	11 to 14 V
a2-2 (M2) - A75-2 (PGND)	Engine running (Turned to left)	Below 1 V

NG ▶ **CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - BODY GROUND)**

OK ▼

2.	**CHECK STEERING COLUMN ASSEMBLY (POWER STEERING MOTOR)**

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



(a) Disconnect the connector from the power steering ECU.

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
a2-1 (M1) - a2-2 (M2)	Always	0.08 to 0.15 Ω
a2-1 (M1) - Body ground	Always	1 MΩ or higher

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TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
a2-2 (M2) - Body ground	Always	1 MΩ or higher

NG ▶ **REPLACE STEERING COLUMN ASSEMBLY**

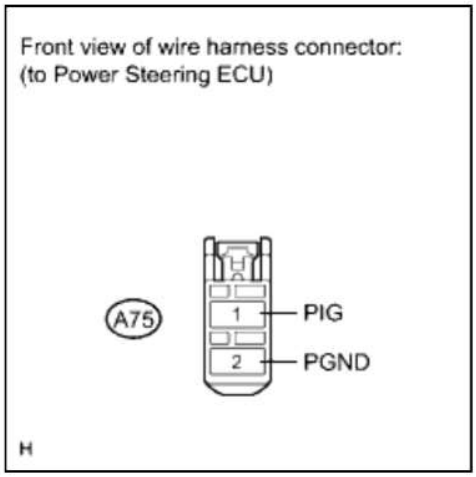
OK ▼

3.	CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - 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:



TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A75-1 (PIG) - Body ground	Ignition switch on (IG)	11 to 14 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE**

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HARNESS OR CONNECTOR

OK ▶ REPLACE POWER STEERING ECU



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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001CHX017X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1531-C1535: ECU Malfunction (2010 Corolla)		

DTC	**C1531**	**ECU Malfunction**

DTC	**C1532**	**ECU Malfunction**

DTC	**C1533**	**ECU Malfunction**

DTC	**C1534**	**ECU Malfunction**

DTC	**C1535**	**ECU Malfunction**

DESCRIPTION

The fail-safe function operates to stop power assist when DTCs indicating ECU malfunctions are stored. However, the power assist operation continues when DTC C1533 or C1534 is stored because it indicates an EEPROM error in the ECU.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1531	ECU internal malfunction (CPU malfunction)	Power steering ECU
C1532	ECU internal malfunction (Peripheral circuit malfunction)	
C1533	ECU internal malfunction (Substrate temperature sensor malfunction)	
C1534	ECU internal malfunction (EEPROM error)	
C1535	ECU internal malfunction (Steering wheel location data error)	

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .

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PROCEDURE

1.	CHECK FOR DTC

(a) Check for DTCs INFO .

OK:

DTCs other than C1531, C1532, C1533, C1534 and C1535 are not output.

NG ▶ REPAIR CIRCUITS INDICATED BY OUTPUT DTCS

OK ▶ REPLACE POWER STEERING ECU

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001CJG015X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1551: IG Power Supply Voltage Malfunction (2010 Corolla)		

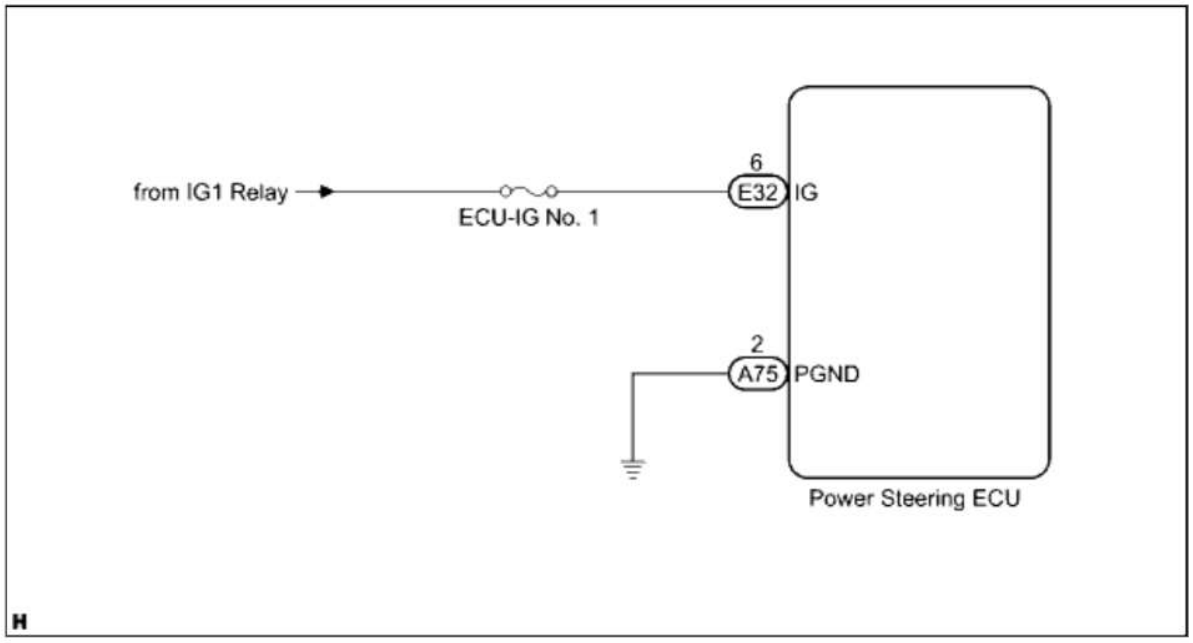
DTC	**C1551**	**IG Power Supply Voltage Malfunction**

DESCRIPTION

The power steering ECU distinguishes the ignition switch status as on (IG) or off through the IG power source circuit.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1551	Open or short in IG power source circuit with ignition switch on (IG).	• ECU-IG No. 1 fuse • IG power source circuit • Power steering ECU

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

If the power steering ECU has been replaced with a new one, perform the assist map writing and the

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torque sensor zero point calibration INFO .

PROCEDURE

1.	INSPECT FUSE (ECU-IG NO. 1)

(a) Remove the ECU-IG No. 1 fuse from the instrument panel junction block.

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

Standard Resistance:

FUSE	CONDITION	SPECIFIED CONDITION
ECU-IG No. 1 fuse	Always	Below 1 Ω

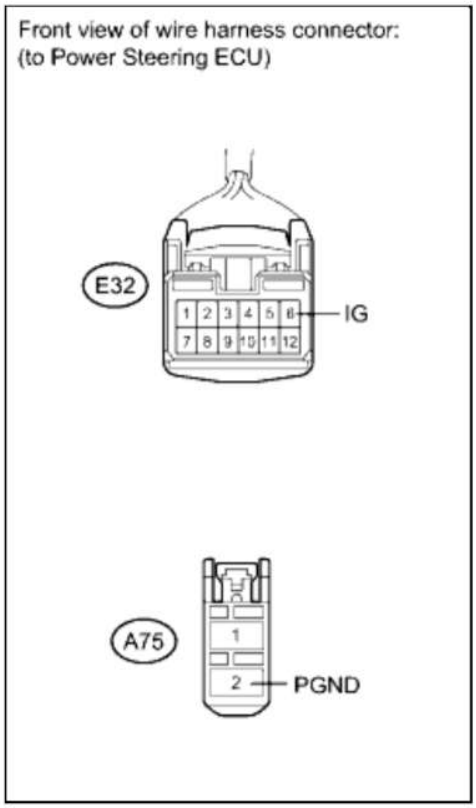
NG ▶ REPLACE FUSE

OK ▼

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

(a) Disconnect the connectors from the power steering ECU.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E32-6 (IG) - A75-2 (PGND)	Ignition switch on (IG)	11 to 14 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001CJH017X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1552,C1554: PIG Power Supply Voltage Malfunction (2010 Corolla)		

DTC	**C1552**	**PIG Power Supply Voltage Malfunction**

DTC	**C1554**	**Power Supply Relay Failure**

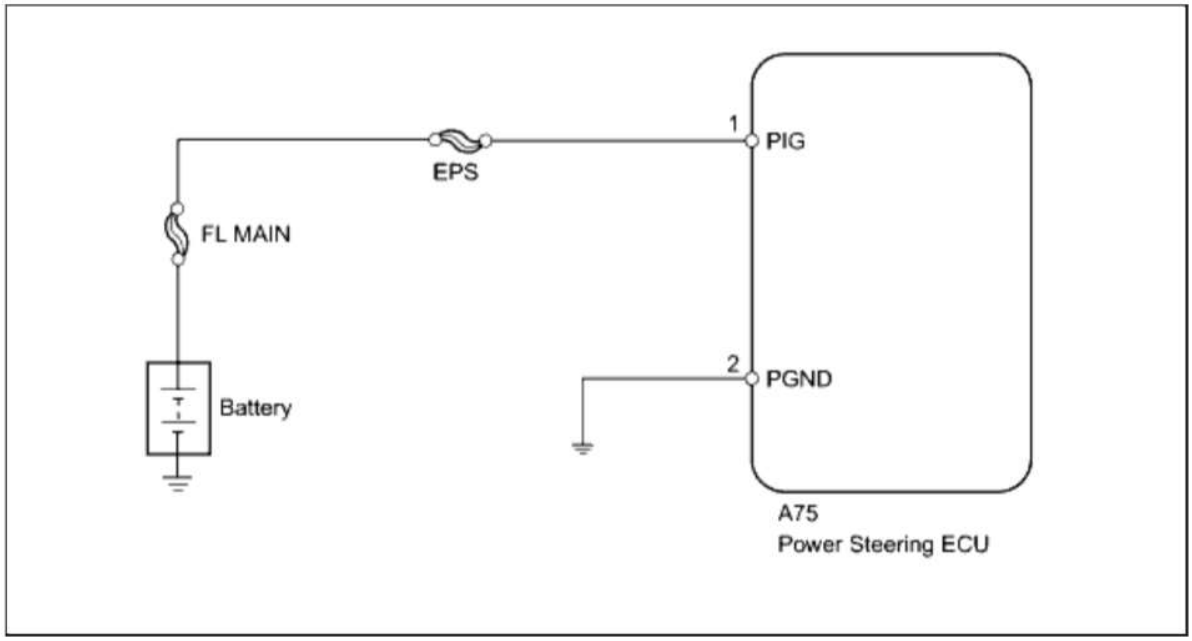
DESCRIPTION

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 the relays are built into the ECU.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1552	PIG power source circuit malfunction	• EPS fuse • PIG power source circuit • Power steering ECU
C1554	Power source relay circuit malfunction	• EPS fuse • PIG power source circuit • Power steering ECU

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .

PROCEDURE

1.	**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:

FUSE	CONDITION	SPECIFIED CONDITION
EPS fuse	Always	Below 1 Ω

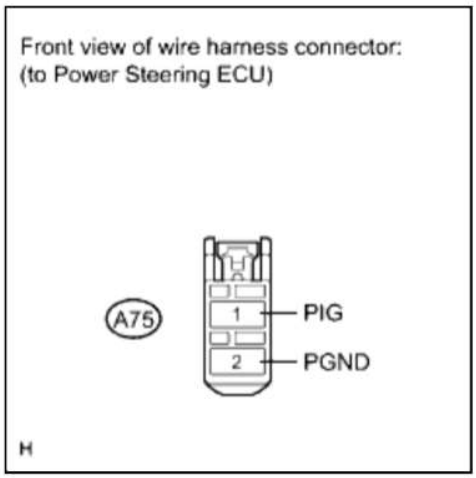
NG ▶ **REPLACE FUSE**

OK ▼

2.	**CHECK HARNESS AND CONNECTOR (BATTERY - POWER STEERING ECU - BODY**

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	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:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A75-1 (PIG) - Body ground	Ignition switch on (IG)	11 to 14 V

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

Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM0000037R3005X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1553: PIG Power Supply Overvoltage (2010 Corolla)		

DTC	**C1553**	**PIG Power Supply Overvoltage**

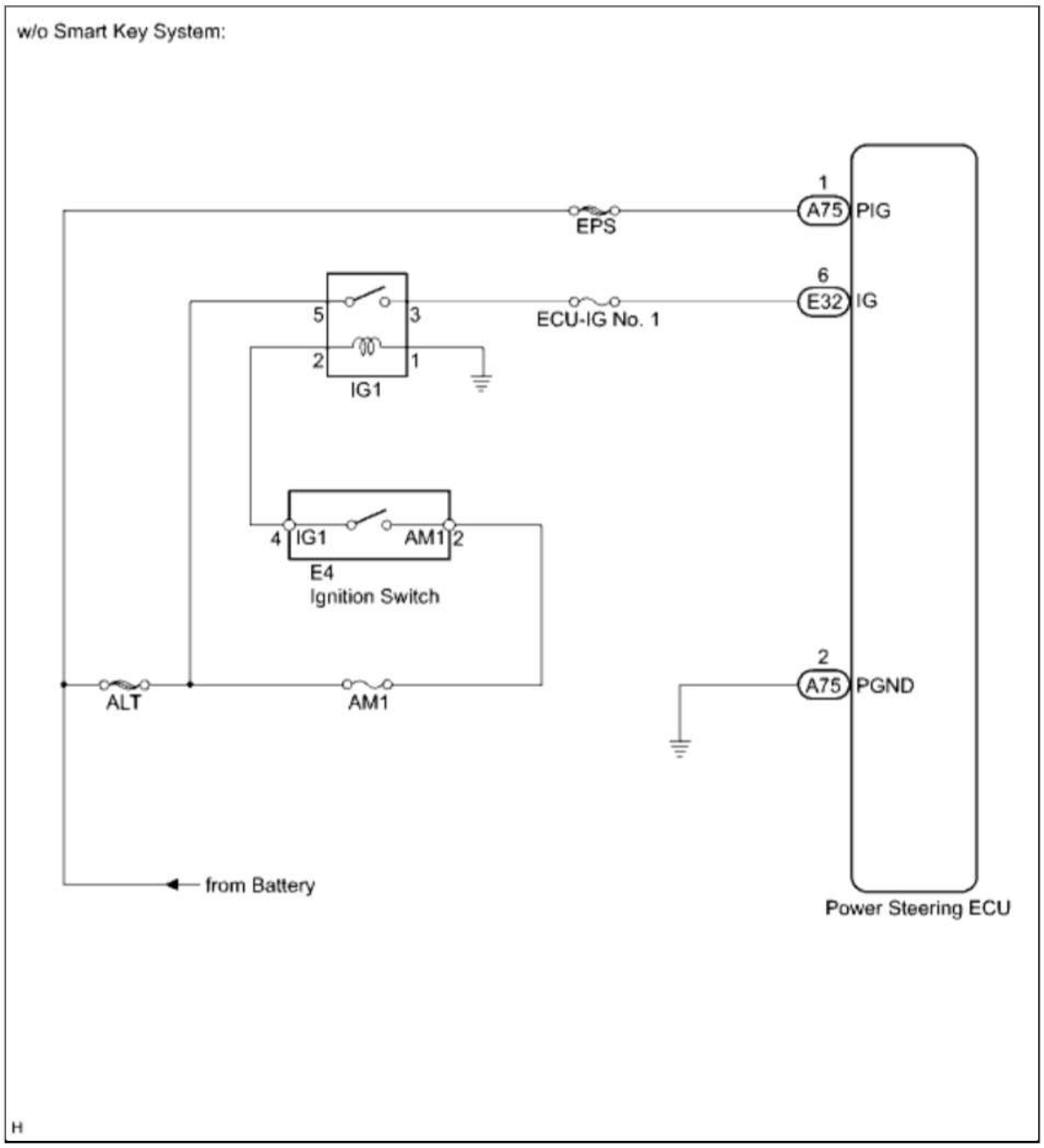
DESCRIPTION

If the power steering ECU determines that the motor power source voltage and the IG voltage are not within the specified range, it stops the power assist as a fail-safe function.

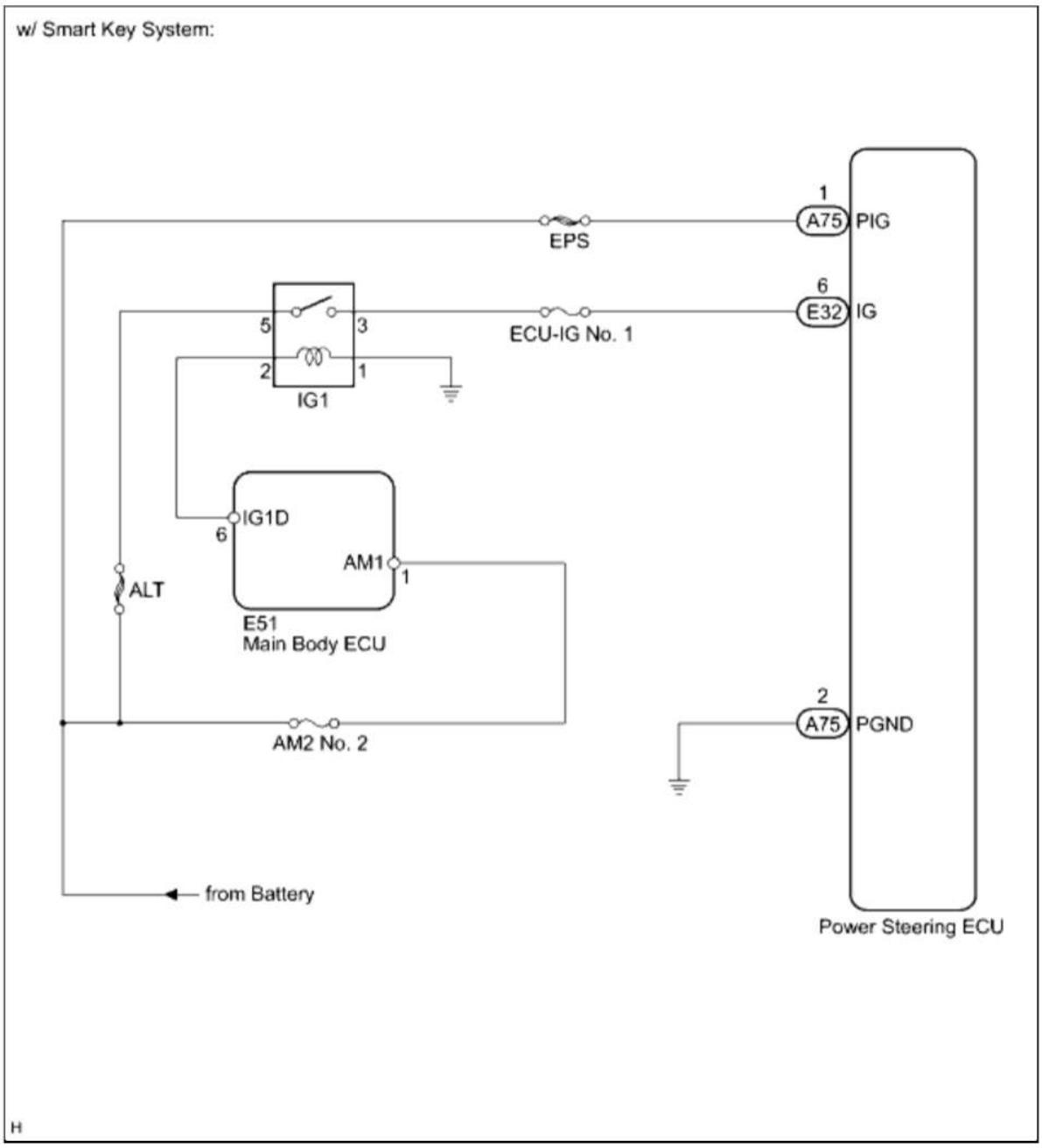
DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1553	• PIG power source overvoltage • IG power source overvoltage	• IG and PIG power source circuits • Power steering ECU

WIRING DIAGRAM

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INSPECTION PROCEDURE

NOTICE:

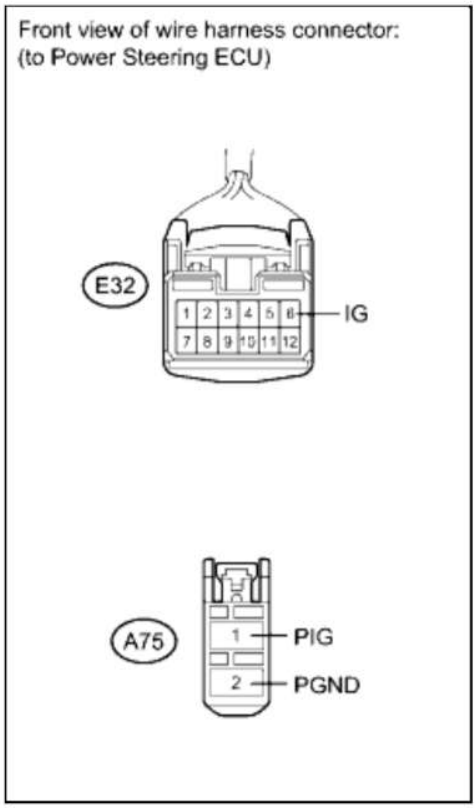
If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO **.**

PROCEDURE

1.	**CHECK HARNESS AND CONNECTOR (IG, PIG)**

(a) Disconnect the connectors from the power steering

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ECU.

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

Standard Voltage:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
A75-1 (PIG) - A75-2 (PGND)	Always	11 to 14 V
E32-6 (IG) - A75-2 (PGND)	Ignition switch on (IG)	11 to 14 V

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▶ **REPLACE POWER STEERING ECU**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277L015X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): C1581: Assist Map Number Un-Writing (2010 Corolla)		

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

DESCRIPTION

DTC C1581 will be stored if the power steering ECU determines that the assist map is not written in the ECU.

DTC NO.	DTC DETECTION CONDITION	TROUBLE AREA
C1581	Assist map is not written in power steering ECU	• Power steering ECU • SFI system • CAN communication system

INSPECTION PROCEDURE

NOTICE:

If the power steering ECU has been replaced with a new one, perform the assist map writing and the torque sensor zero point calibration INFO .

PROCEDURE

1.	**PERFORM ASSIST MAP WRITING**

(a) Perform the assist map writing INFO .

NEXT

2.	**CHECK FOR DTC**

(a) Check for DTCs INFO .

Result:

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RESULT	PROCEED TO
DTC is still output even after performing assist map writing 3 times.	A
DTC is still output even after performing assist map writing once or twice*1	B
DTC is not output.	C

HINT:

***1: Perform the assist map writing again if DTC C1581 is still output even after the assist map writing is performed once or twice.**

C ▶ END

B ▶ PERFORM ASSIST MAP WRITING AGAIN

A ▼

3.	CHECK FOR DTC (CAN COMMUNICATION SYSTEM)

(a) Check for DTCs INFO .

OK:

DTC is not output.

HINT:

If the CAN communication system DTC is output, first troubleshoot the CAN communication system malfunction, then perform the assist map writing again INFO .

NG ▶ GO TO CAN COMMUNICATION SYSTEM

OK ▼

4.	CHECK FOR DTC (SFI SYSTEM)

(a) Check for DTCs INFO .

OK:

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DTC is not output.

HINT:

If the SFI system DTC is output, first troubleshoot the SFI system, then perform the assist map writing again



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NG ▶ **REPAIR CIRCUITS INDICATED BY OUTPUT DTCS**

OK ▶ **REPLACE POWER STEERING ECU**



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Last Modified: 3-10-2010	6.4 J	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM000001AKY017X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): EPS Warning Light Circuit (2010 Corolla)		

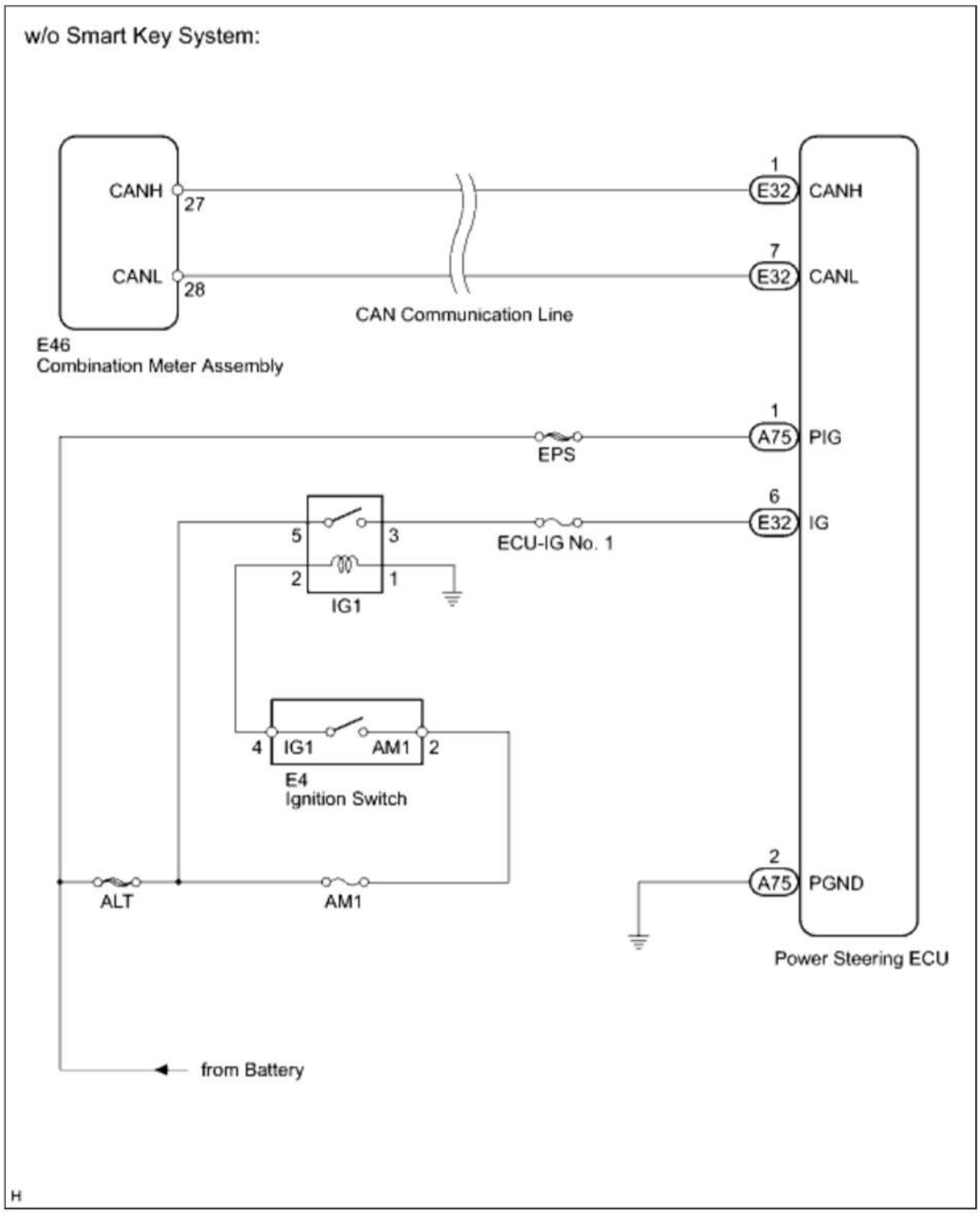
EPS Warning Light Circuit

DESCRIPTION

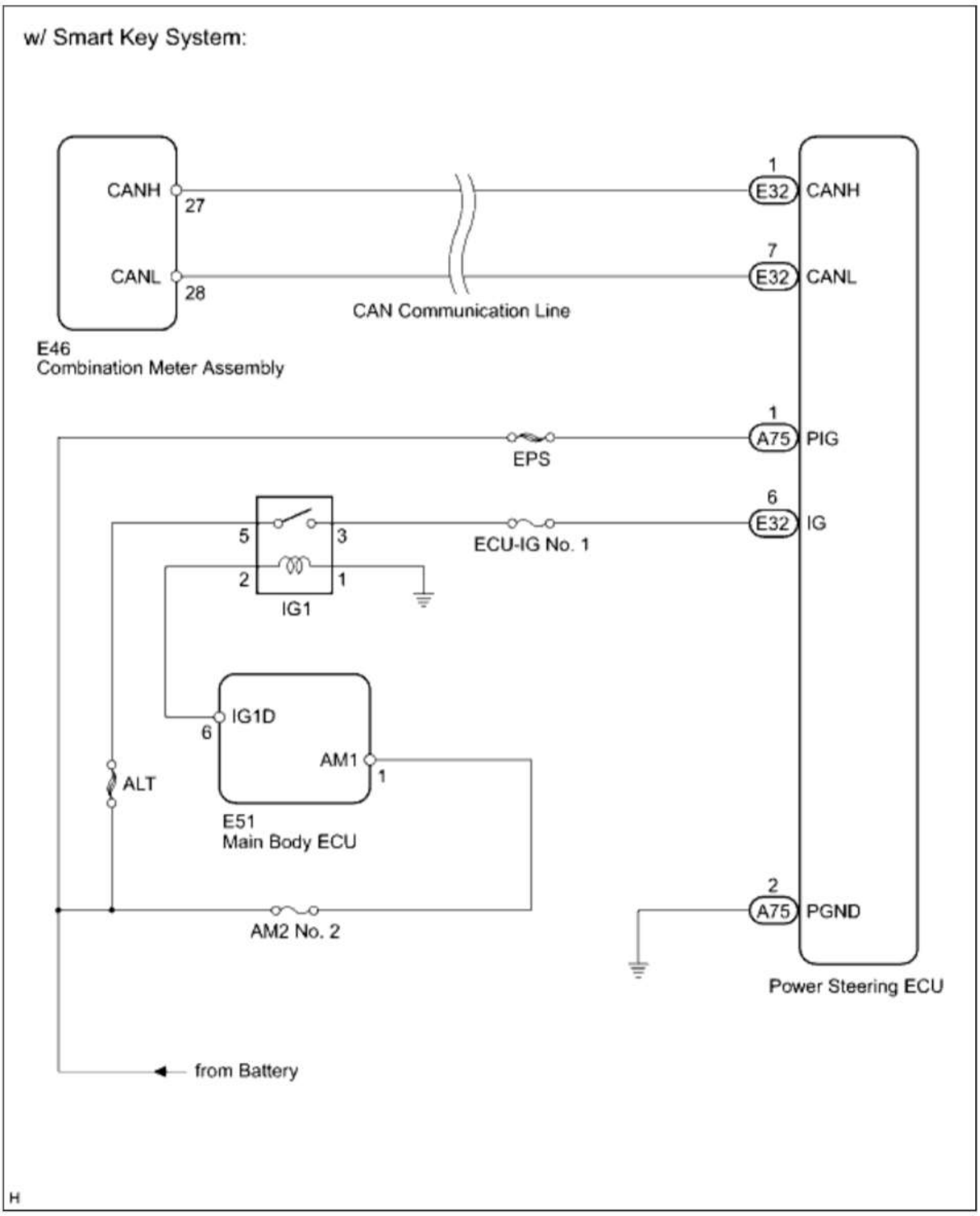
If the power steering ECU detects a malfunction, the P/S warning light comes on. At this time, the power steering ECU stores the appropriate DTC in its memory.

WIRING DIAGRAM

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INSPECTION PROCEDURE

PROCEDURE

1.	CHECK FOR DTC (CAN COMMUNICATION SYSTEM)

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(a) Check for DTCs INFO .

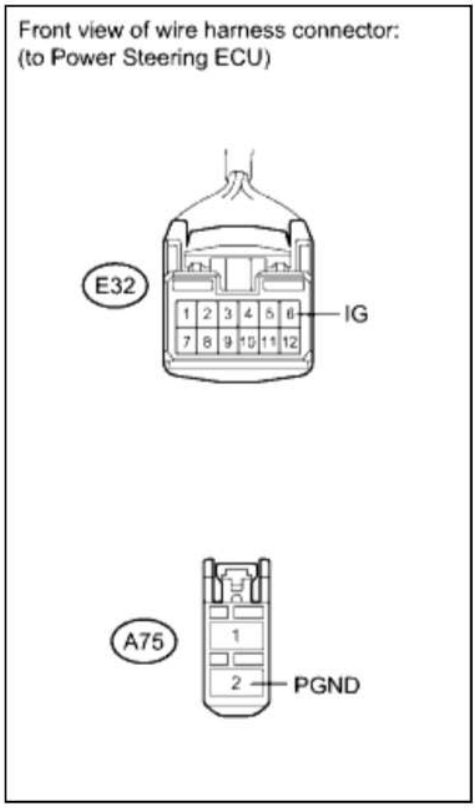
OK:

DTC is not output.

NG ▶ GO TO CAN COMMUNICATION SYSTEM

OK ▼

2.	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:

TESTER CONNECTION	SWITCH CONDITION	SPECIFIED CONDITION
E32-6 (IG) - A75-2 (PGND)	Ignition switch on (IG)	11 to 14 V

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

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Standard Resistance:

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
A75-2 (PGND) - Body ground	Always	Below 1 Ω

NG ▶ **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK ▼

3.	**REPLACE POWER STEERING ECU**

(a) Replace the power steering ECU INFO .

(b) Check the P/S warning light condition.

OK:
P/S warning light operates normally.

NG ▶ **GO TO COMBINATION METER SYSTEM**

OK ▶ **PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE**

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Last Modified: 3-10-2010	6.4 C	**From:** 200901
Model Year: 2010	**Model:** Corolla	**Doc ID:** RM00000277M011X
Title: POWER ASSIST SYSTEMS: POWER STEERING SYSTEM (for 2ZR-FE): U0100,U0129: Lost Communication with ECM / PCM "A" (2010 Corolla)		

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

DTC	**U0129**	**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 NO.	DTC DETECTION CONDITION	TROUBLE AREA
U0100	Lost communication with ECM/PCM "A"	• CAN communication system • ECM
U0129	Lost communication with brake system control module	• CAN communication system • Skid control ECU

INSPECTION PROCEDURE

PROCEDURE

1.	**CHECK FOR DTC**

(a) Clear the DTCs INFO.

(b) Check for DTCs INFO.

OK:

DTC is not output.

NG ▶ GO TO CAN COMMUNICATION SYSTEM

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OK ▶ CHECK INTERMITTENT PROBLEMS

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