

STEERING

Power Steering System (Diagnostic Codes & Symptom Tests) - Sienna

POWER STEERING SYSTEM

ON-VEHICLE INSPECTION

ON-VEHICLE INSPECTION

1. CHECK STEERING EFFORT (TORQUE)

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

- 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.
- c. Remove the steering pad. Refer to **REMOVAL - Step 4**.
- d. Connect the cable to the negative battery terminal.
- e. Using a torque wrench, check that the steering wheel set nut is properly tightened.

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

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

Steering effort (Reference)

5.5 N*m (56 kgf*cm, 49 in.*lbf)

- h. Align the front wheels facing straight ahead.
- i. Disconnect the cable from the negative battery terminal.
- j. Install the steering pad. Refer to **INSTALLATION - Step 1**.
- k. Connect the cable to the negative battery terminal.
- l. Clear the DTCs. Refer to **DTC CHECK / CLEAR**.
- m. Inspect the airbag warning light. Refer to **DIAGNOSIS SYSTEM**.

2. CHECK STEERING WHEEL FREEPLAY

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

Maximum freeplay

30 mm (1.18 in.)

HINT:

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

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 C1521: MOTOR CIRCUIT MALFUNCTION; DTC C1524: MOTOR CIRCUIT MALFUNCTION; DTC C1528: MOTOR ROTATION ANGLE SENSOR MALFUNCTION; DTC C1531: ECU MALFUNCTION; DTC C1532: ECU MALFUNCTION; DTC C1533: ECU MALFUNCTION; DTC C1534: ECU MALFUNCTION; DTC C1555: MOTOR RELAY WELDING FAILURE

DESCRIPTION

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

The power steering ECU, power steering torque sensor, power steering motor and motor rotation angle sensor are built into the steering column assembly.

DTC No.	DTC Detection Condition	Trouble Area
C1511	Torque sensor (TRQ1) signal error or stop	Steering column assembly
C1512	Torque sensor (TRQ2) signal error or stop	
C1513	Deviation between torque sensors TRQ1 and TRQ2 exceeds specified value	
C1514	Torque sensor power source voltage error	
C1521	Short (or open) in motor circuit or abnormal voltage or current in motor circuit	
C1524	Short (or open) in motor circuit or abnormal voltage or current in motor circuit	
C1528	Motor rotation angle sensor malfunction	
C1531	ECU internal malfunction (CPU malfunction)	
C1532	ECU internal malfunction	

	(Peripheral circuit malfunction)	
C1533	ECU internal malfunction (Substrate temperature sensor malfunction)	
C1534	ECU internal malfunction (EEPROM error)	
C1555	Motor relay circuit malfunction	

WIRING DIAGRAM

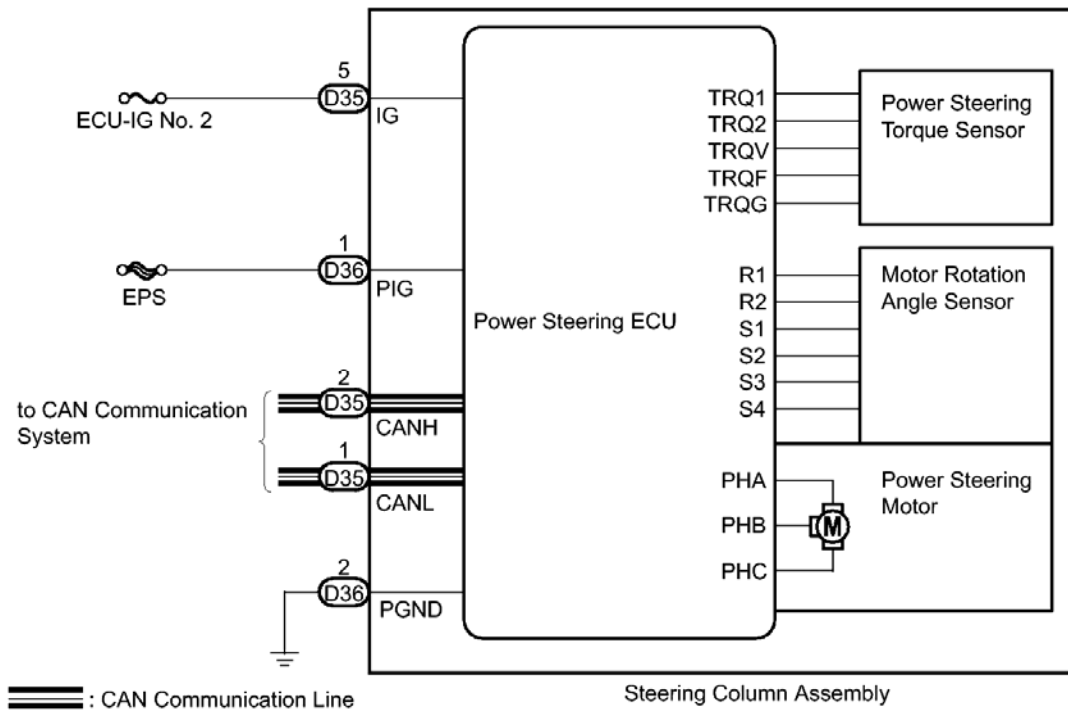


Fig. 1: Steering Column Assembly Wiring Diagram
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE:

- When the steering column assembly is replaced, perform the assist map writing. Refer to REGISTRATION .
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

PROCEDURE

1. **CHECK CONNECTOR CONNECTION CONDITION (STEERING COLUMN ASSEMBLY)**
 - a. Check the installation condition of the torque sensor, power steering motor and rotation sensor connectors.

OK

Torque sensor, power steering motor and rotation angle sensor connectors are securely connected to the power steering ECU.

NG --> **CONNECT CONNECTOR**

OK --> **See step 2**

2. REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL

DTC C1541: VEHICLE SPEED SIGNAL MALFUNCTION

DESCRIPTION

The vehicle speed signal from the brake actuator assembly (skid control ECU) is input to the steering column assembly (power steering ECU) through CAN communication.

DTC No.	DTC Detection Condition	Trouble Area
C1541	Vehicle speed signal malfunction	• CAN communication system • Vehicle stability control system • Steering column assembly

WIRING DIAGRAM

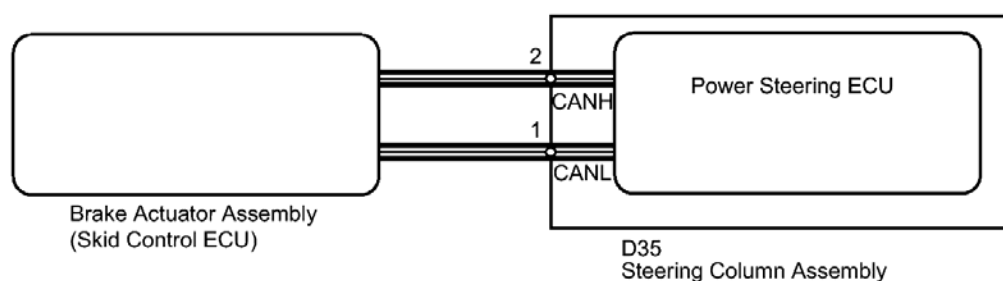


Fig. 2: Skid Control ECU Circuit Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: When the steering column assembly is replaced, perform the assist map writing. Refer to REGISTRATION .

PROCEDURE

1. CHECK DTC OUTPUT (CAN COMMUNICATION SYSTEM)

- a. Check for DTCs of the CAN communication system. Refer to **DIAGNOSIS SYSTEM** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 4

A: Go to next step

2. CHECK DTC OUTPUT (VEHICLE STABILITY CONTROL SYSTEM)

- a. Check for DTCs of the vehicle stability control system. Refer to **DTC CHECK / CLEAR** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 5

A --> See step 3

3. REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL

4. GO TO CAN COMMUNICATION SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING

5. REPAIR CIRCUIT INDICATED BY OUTPUT CODE. Refer to DIAGNOSTIC TROUBLE CODE CHART

DTC C1551: IG POWER SUPPLY VOLTAGE MALFUNCTION

DESCRIPTION

The steering column assembly (power steering ECU) distinguishes the ignition switch status as ON 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 power source circuit - Steering column assembly

WIRING DIAGRAM

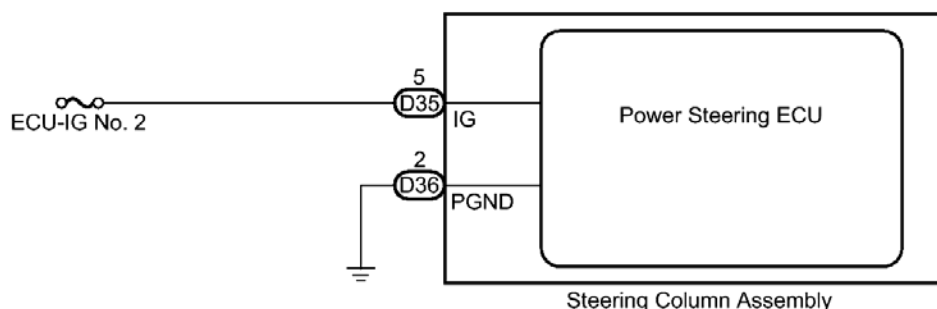


Fig. 3: Power Steering ECU Power Supply Circuit Wiring Diagram
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE:

- When the steering column assembly is replaced, perform the assist map writing. Refer to REGISTRATION .
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

PROCEDURE

1. **CHECK HARNESS AND CONNECTOR (STEERING COLUMN ASSEMBLY - IG POWER SUPPLY AND BODY GROUND)**
 - a. Disconnect the connectors from the steering column assembly (power steering ECU).

*a

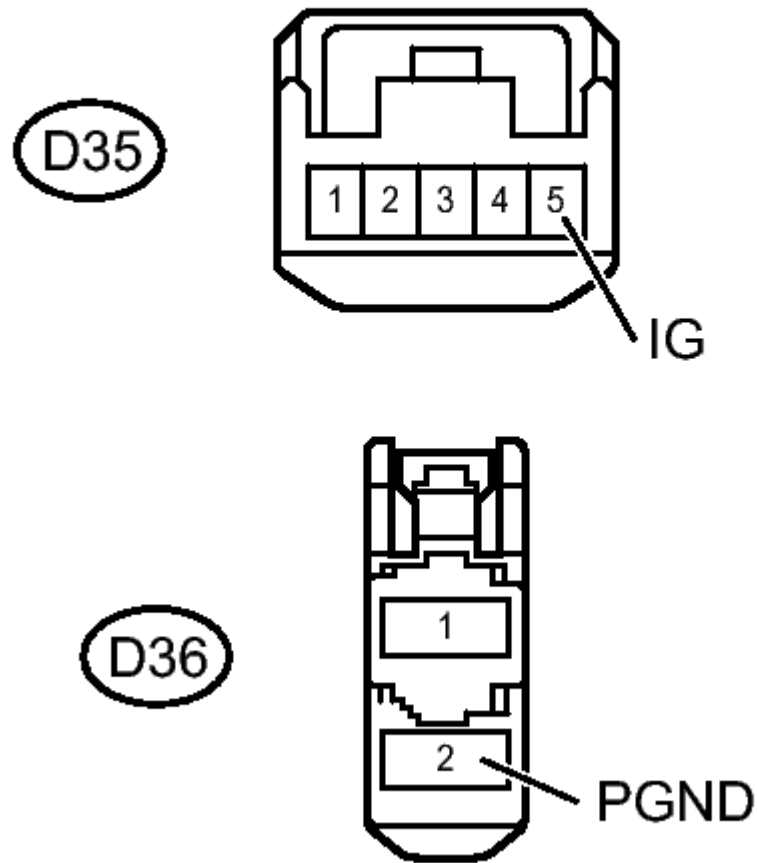


Fig. 4: Checking Harness And Connector (Steering Column Assembly - IG Power Supply And Body Ground)

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

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

Standard Voltage

Tester Connection	Switch Condition	Specified Condition
D35-5 (IG) - Body ground	Ignition switch ON	11 to 14 V

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

Standard Resistance

Tester Connection	Condition	Specified Condition
D36-2 (PGND) - Body ground	Always	Below 1 ohms

TEXT IN ILLUSTRATION

*a	Front view of wire harness connector: (to Steering Column Assembly (Power Steering ECU))
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NG --> REPAIR OR REPLACE HARNESS OR CONNECTOR

OK --> See step 2

2. REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL

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 each relay is built into the ECU.

DTC No.	DTC Detection Condition	Trouble Area
C1552	PIG power source circuit malfunction	- PIG power source circuit - Steering column assembly
C1554	Power source relay circuit malfunction	

WIRING DIAGRAM

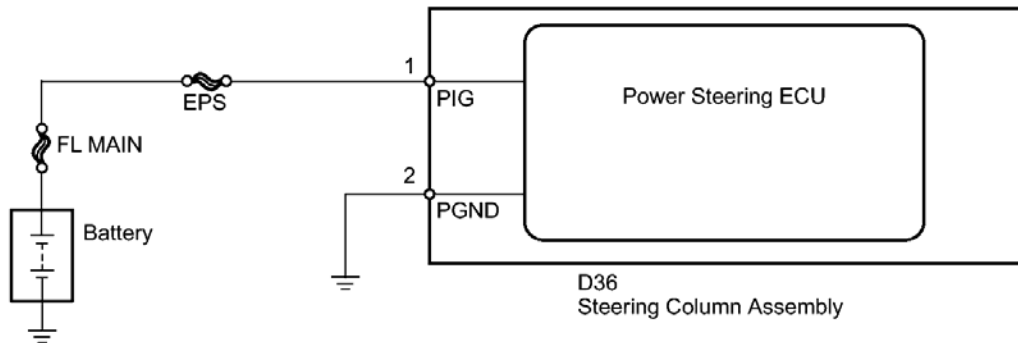


Fig. 5: Steering Column Assembly Power Source Wiring Diagram

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

INSPECTION PROCEDURE

NOTE:

- When the steering column assembly is replaced, perform the assist map writing. Refer to REGISTRATION .
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

PROCEDURE

1. **CHECK HARNESS AND CONNECTOR (STEERING COLUMN ASSEMBLY - BATTERY AND BODY GROUND)**
 - a. Disconnect the connector from the steering column assembly (power steering ECU).

*a

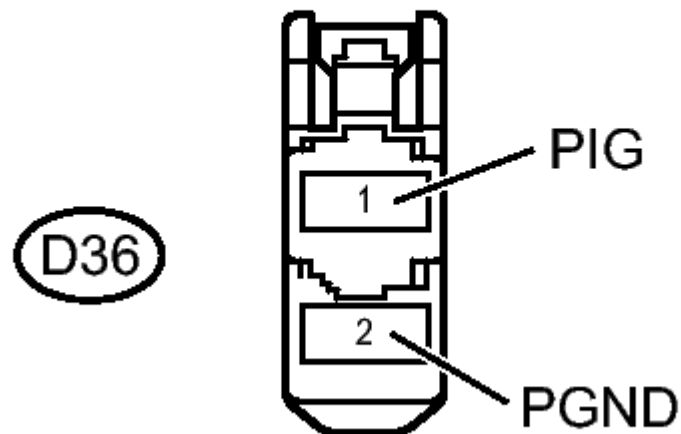


Fig. 6: Checking Harness And Connector (Steering Column Assembly - Battery And Body Ground)

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

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

Standard Voltage

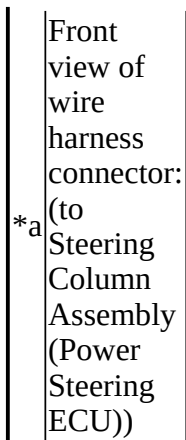
Tester Connection	Condition	Specified Condition
D36-1 (PIG) - Body ground	Always	11 to 14 V

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

Standard Resistance

Tester Connection	Condition	Specified Condition
D36-2 (PGND) - Body ground	Always	Below 1 ohms

TEXT IN ILLUSTRATION



NG --> REPAIR OR REPLACE HARNESS OR CONNECTOR

OK --> See step 2

2. REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL

DTC C1581: ASSIST MAP NUMBER UN-WRITING

DESCRIPTION

When a map is not recorded in the steering column assembly (power steering ECU), then this DTC is stored.

DTC No.	DTC Detection Condition	Trouble Area
C1581	Assist map not written in power steering ECU	• Assist map is not written • CAN communication system • SFI system • Vehicle stability control system • Steering column assembly

INSPECTION PROCEDURE

NOTE: When the steering column assembly is replaced, perform the assist map writing. Refer to REGISTRATION .

PROCEDURE

1. PERFORM ASSIST MAP WRITING

- a. Perform the assist map writing. Refer to REGISTRATION .

NEXT: Go to next step

2. CHECK DTC OUTPUT

- a. Check for DTCs. Refer to **DTC CHECK / CLEAR** .

RESULT

Result	Proceed to
DTC C1581 is not output	A
DTC C1581 is output	B

B --> See step 3

A --> END

3. CHECK CAN COMMUNICATION SYSTEM

- a. Check for DTCs of the CAN communication system. Refer to **DIAGNOSIS SYSTEM** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 9

A: Go to next step

4. CHECK ECM

- a. Check that the correct ECM is installed.

OK

The correct ECM is installed.

RESULT

Result	Proceed
--------	---------

	to
OK	A
NG (for 2GR- FE)	B
NG (for 1AR- FE)	C

B --> See step 10

C --> See step 14

A: Go to next step

5. CHECK SFI SYSTEM

- Check for DTCs of the SFI system.

For 2GR-FE Refer to **DTC CHECK / CLEAR** .

For 1AR-FE. Refer to **DTC CHECK / CLEAR** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output (for 2GR-FE)	B
DTCs are output (for 1AR-FE)	C

B --> See step 11

C --> See step 15

A: Go to next step

6. CHECK BRAKE ACTUATOR ASSEMBLY (SKID CONTROL ECU)

- a. Check that the correct brake actuator assembly (skid control ECU) is installed.

OK

The correct brake actuator assembly (skid control ECU) is installed.

NG --> See step 12

OK: Go to next step

7. CHECK VEHICLE STABILITY CONTROL SYSTEM

- a. Check the vehicle stability control system. Refer to **DTC CHECK / CLEAR** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 13

A --> See step 8

8. **REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL**
9. **GO TO CAN COMMUNICATION SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**
10. **REPLACE ECM. Refer to REMOVAL**
11. **GO TO SFI SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**
12. **REPLACE BRAKE ACTUATOR ASSEMBLY. Refer to REMOVAL**
13. **GO TO VEHICLE STABILITY CONTROL SYSTEM. Refer to DIAGNOSTIC TROUBLE CODE CHART**
14. **REPLACE ECM. Refer to REMOVAL**
15. **GO TO SFI SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**

DTC C1582: ASSIST MAP NUMBER MISMATCH

DESCRIPTION

When an incorrect ECM or brake actuator assembly (skid control ECU) is installed after the assist map has been recorded in the steering column assembly (power steering ECU), then DTC C1582 is stored because the data does not match the vehicle specifications.

DTC No.	DTC Detection Condition	Trouble Area
C1582	Assist map number mismatch	• CAN communication system • Incorrect ECM • Incorrect brake actuator assembly (Skid control ECU) • Steering column assembly

INSPECTION PROCEDURE

PROCEDURE

1. CHECK CAN COMMUNICATION SYSTEM

- Check for DTCs of the CAN communication system. Refer to **DIAGNOSIS SYSTEM** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 7

A: Go to next step

2. CHECK ECM

- Check that the correct ECM is installed.

OK

The correct ECM is installed.

RESULT

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Result	Proceed to
OK	A
NG (for 2GE- FE)	B
NG (for 1AR- FE)	C

B --> See step 8

C --> See step 12

A: Go to next step

3. CHECK SFI SYSTEM

- Check for DTCs of the SFI system.

For 2GR-FE Refer to **DTC CHECK / CLEAR** .

For 1AR-FE. Refer to **DTC CHECK / CLEAR** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output (for 2GR- FE)	B
DTCs are output (for 1AR- FE)	C

B --> See step 9

C --> See step 13

A: Go to next step

4. CHECK BRAKE ACTUATOR ASSEMBLY

- a. Check that the correct brake actuator assembly (skid control ECU) is installed.

OK

The correct brake actuator assembly (skid control ECU) is installed.

NG --> See step 10

OK: Go to next step

5. CHECK VEHICLE STABILITY CONTROL SYSTEM

- a. Check for DTCs of the vehicle stability control system. Refer to **DTC CHECK / CLEAR** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 11

A --> See step 6

6. **REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL**
7. **GO TO CAN COMMUNICATION SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**
8. **REPLACE ECM. Refer to REMOVAL**
9. **GO TO SFI SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**
10. **REPLACE BRAKE ACTUATOR ASSEMBLY. Refer to REMOVAL**
11. **GO TO VEHICLE STABILITY CONTROL SYSTEM. Refer to DIAGNOSTIC TROUBLE CODE CHART**
12. **REPLACE ECM. Refer to REMOVAL**
13. **GO TO SFI SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**

DTC U0100: LOST COMMUNICATION WITH ECM; 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	ECM communication error	• CAN communication system • ECM
U0129	Skid control ECU communication error	• CAN communication system • Brake actuator assembly (Skid control ECU)

HINT:

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

INSPECTION PROCEDURE

PROCEDURE

1. RECONFIRM DTC

- a. Clear the DTCs. Refer to **DTC CHECK / CLEAR** .
- b. Check for DTCs.

OK

DTC U0100 or U0129 is not output.

NG --> See step 3

OK --> See step 2

2. **CHECK FOR INTERMITTENT PROBLEMS.** Refer to **ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
3. **GO TO CAN COMMUNICATION SYSTEM.** Refer to **HOW TO PROCEED WITH TROUBLESHOOTING**

SYMPTOM TESTS

PS Warning Light Remains ON

DESCRIPTION

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

Also if the battery is not sufficiently charged or the voltage decreases temporarily, the amount of power assist may be reduced and the EPS warning light may come on.

WIRING DIAGRAM

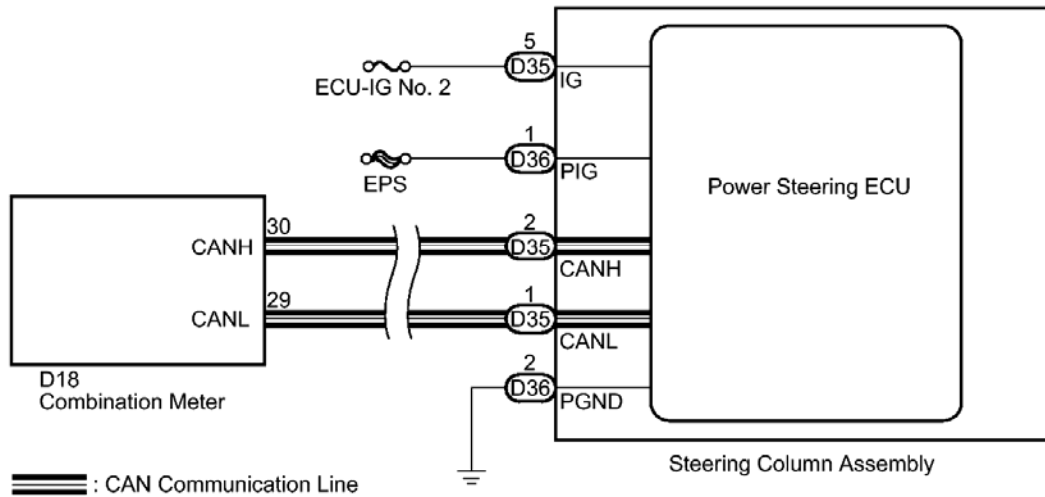


Fig. 7: Combination Meter Circuit Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE:

- When the steering column assembly is replaced, perform the assist map writing. Refer to REGISTRATION .
- Inspect the fuses for circuits related to this system before performing the following inspection procedure.

PROCEDURE

1. CHECK DTC OUTPUT

- Check for DTCs for power steering system. Refer to DTC CHECK / CLEAR .

RESULT

Result	Proceed to
DTCs are not	A

output	
DTCs are output	B

B --> See step 8

A: Go to next step

2. READ VALUE USING TECHSTREAM (BATTERY VOLTAGE LO RECORD)

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

EMPS

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Battery Voltage Lo Record	Battery voltage reduction history Minimum: 0 times, Maximum: 65535 times	0 times	-

OK

"Battery Voltage Lo Record" is 0 times.

RESULT

Result	Proceed to
OK	A
NG (for 2GR-FE)	B
NG (for 1AR-FE)	C

B --> See step 9

C --> See step 12

A: Go to next step

3. CHECK CAN COMMUNICATION SYSTEM

- a. Check for DTCs of the CAN communication system. Refer to **DIAGNOSIS SYSTEM** .

RESULT

Result	Proceed to
DTCs are not output	A
DTCs are output	B

B --> See step 10

A: Go to next step

4. PERFORM ACTIVE TEST USING TECHSTREAM (INDICAT EPS)

- a. Connect the Techstream to the DLC3.
- b. Start the engine.
- c. Turn the Techstream on.
- d. Enter the following menus: Body Electrical / Combination Meter / Active Test.
- e. Check that the EPS warning light operates in accordance with the Active Test.

COMBINATION METER

Tester Display	Test Part	Control Range	Diagnostic Note
Indicat. EPS	EPS warning light	OFF or ON	Confirm that the vehicle is stopped with the engine idling

OK

The EPS warning light operation normally.

NG --> See step 11

OK: Go to next step

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

*a

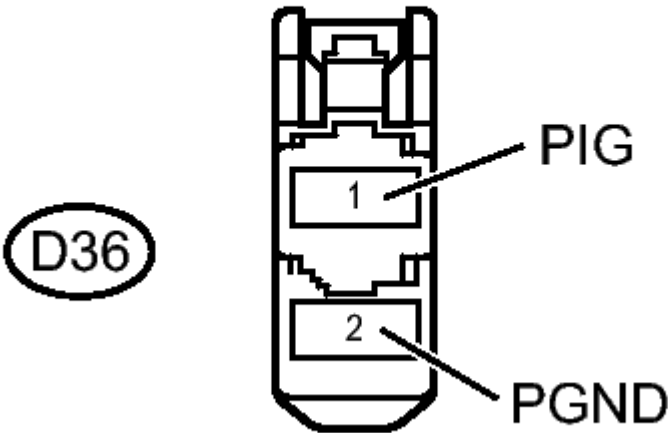


Fig. 8: Checking Harness And Connector (Steering Column Assembly - Battery And Body Ground)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Voltage

Tester Connection	Condition	Specified Condition
D36-1 (PIG) - Body ground	Always	11 to 14 V

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

Standard Resistance

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Tester Connection	Condition	Specified Condition
D36-2 (PGND) - Body ground	Always	Below 1 ohms

*a	Front view of wire harness connector: (to Steering Column Assembly (Power Steering ECU))
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NG --> REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: Go to next step

6. CHECK HARNESS AND CONNECTOR (STEERING COLUMN ASSEMBLY - IG POWER SUPPLY)

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

*a

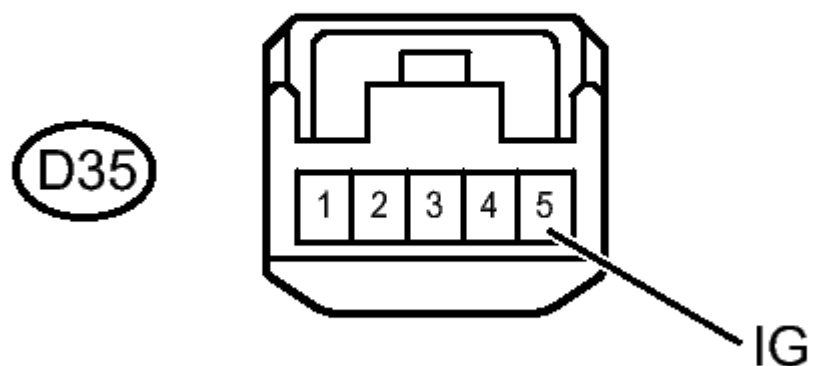


Fig. 9: Checking Harness And Connector (Steering Column Assembly - IG Power Supply)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Voltage

Tester Connection	Switch Condition	Specified Condition
D35-5 (IG) - Body ground	Ignition switch ON	11 to 14 V

*a	Front view of wire harness connector: (to Steering Column Assembly (Power Steering ECU))
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NG --> REPAIR OR REPLACE HARNESS OR CONNECTOR

OK --> See step 7

7. **REPLACE STEERING COLUMN ASSEMBLY. Refer to REMOVAL**
8. **GO TO DTC CHART. Refer to DIAGNOSTIC TROUBLE CODE CHART**
9. **GO TO CHARGING SYSTEM. Refer to PROBLEM SYMPTOMS TABLE**
10. **GO TO CAN COMMUNICATION SYSTEM. Refer to HOW TO PROCEED WITH TROUBLESHOOTING**
11. **GO TO METER / GAUGE SYSTEM. Refer to REMOVAL**
12. **GO TO CHARGING SYSTEM. Refer to PROBLEM SYMPTOMS TABLE**