

POWER STEERING SYSTEM

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 airbags before servicing.

- Stop the vehicle on a level, paved road and align the wheels facing straight ahead.
- Disconnect the cable from the negative battery terminal.
- Remove the steering pad (See page [RS-309](#)).
- Connect the cable to the negative battery terminal.
- Using a torque wrench, check that the steering wheel set nut is properly tightened.

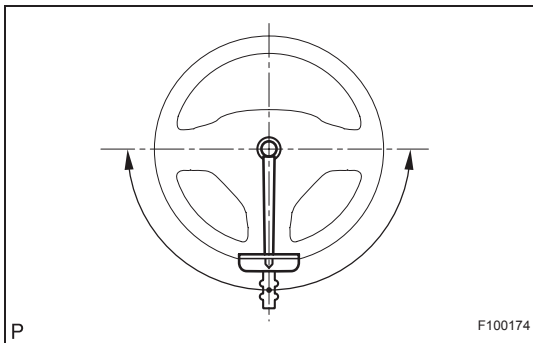
Torque: 50 N*m (510 kgf*cm, 37 ft.*lbf)

- Turn the ignition switch to ON (the engine is stopped) so that the power steering is ready to operate.
- 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)

- Align the front wheels facing straight ahead.
- Disconnect the cable from the negative battery terminal.
- Install the steering pad (See page [RS-310](#)).
- Connect the cable to the negative battery terminal.
- Clear the DTCs (See page [RS-38](#)).
- Inspect the airbag warning light (See page [RS-31](#)).



2. CHECK STEERING WHEEL FREE PLAY

- Turn the ignition switch to ON so that the power steering is ready to operate.
- Align the wheels facing straight ahead.
- 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 intermediate shaft No. 2 or the steering gear with a new one.

ELECTRONIC POWER STEERING SYSTEM

PRECAUTION

1. HANDLING PRECAUTION

- (a) When handling the electronic parts;
 - Avoid any impact to parts such as ECUs and relays. Replace with new ones if dropped or subjected to a severe blow.
 - Do not expose to high temperatures or humidity.
 - Do not touch the connector terminals, in order to prevent deformation or malfunctions due to static electricity.
 - When the power steering ECU has been replaced with a new one, perform the torque sensor zero point calibration. (See page [PS-12](#))
- (b) When handling the steering column assembly;
 - Avoid any impact to the steering column assembly, especially to the motor and torque sensor. Replace with new ones if dropped or subjected to a severe blow.
 - Do not pull the wire harness when moving the steering column assembly.
 - When the steering column assembly has been replaced, perform the torque sensor zero point calibration after initializing the torque sensor zero point. (See page [PS-12](#))
- (c) When disconnecting and reconnecting the connectors;
 - When disconnecting the connectors related to the electronic power steering system, turn the ignition switch on, center the steering wheel, turn the ignition switch off, and then disconnect the connectors.
 - When reconnecting the connectors related to the electronic power steering system, ensure that the ignition switch is off. Center the steering wheel and then turn the ignition switch on.

NOTICE:

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

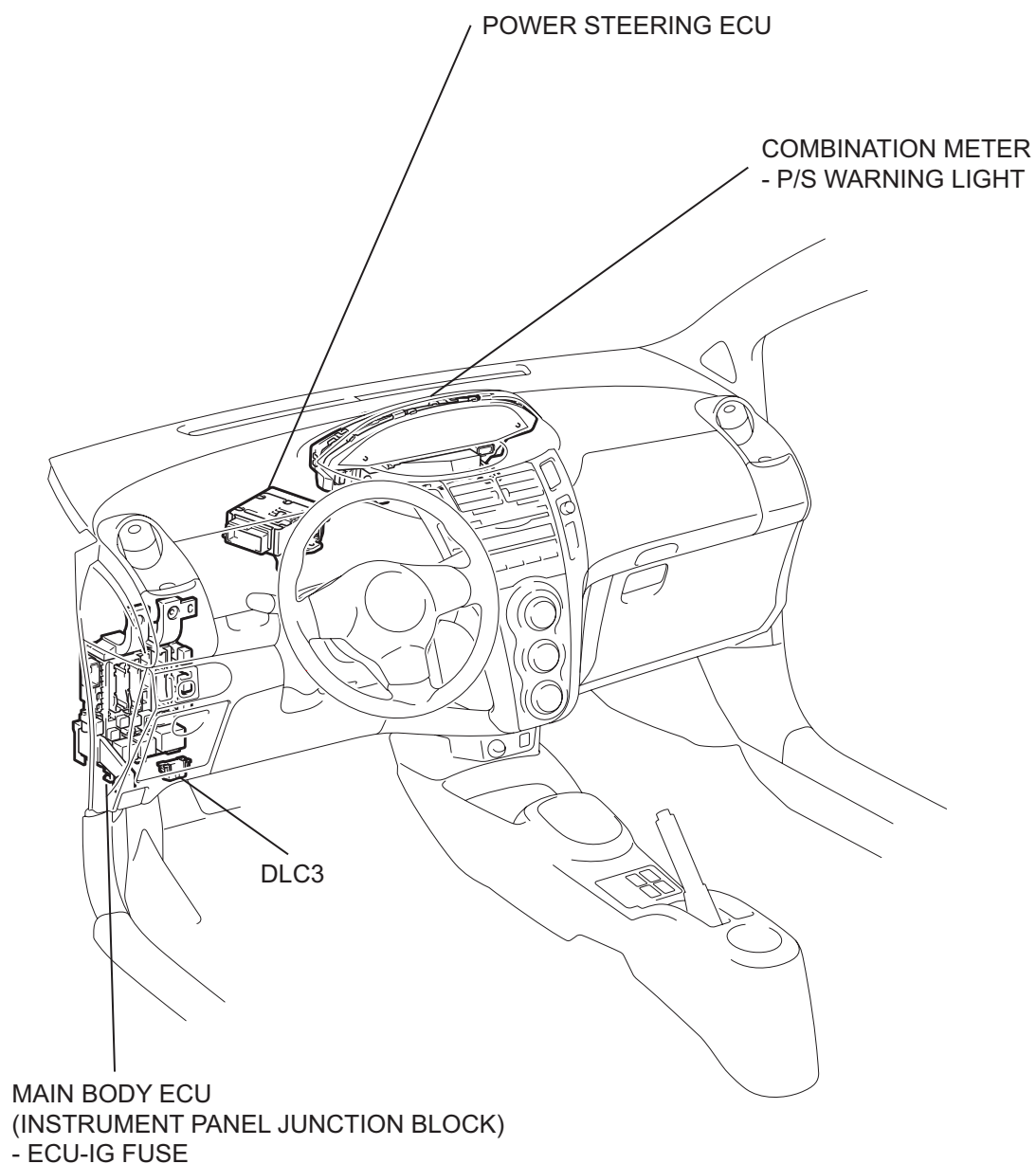
- If the above operations are not carried out properly, the steering center point (zero point) will deviate, which may lead to a difference in steering effort between turning right and left. If there is a difference in steering effort between turning right and left, perform the torque sensor zero point calibration. (See page [PS-12](#))

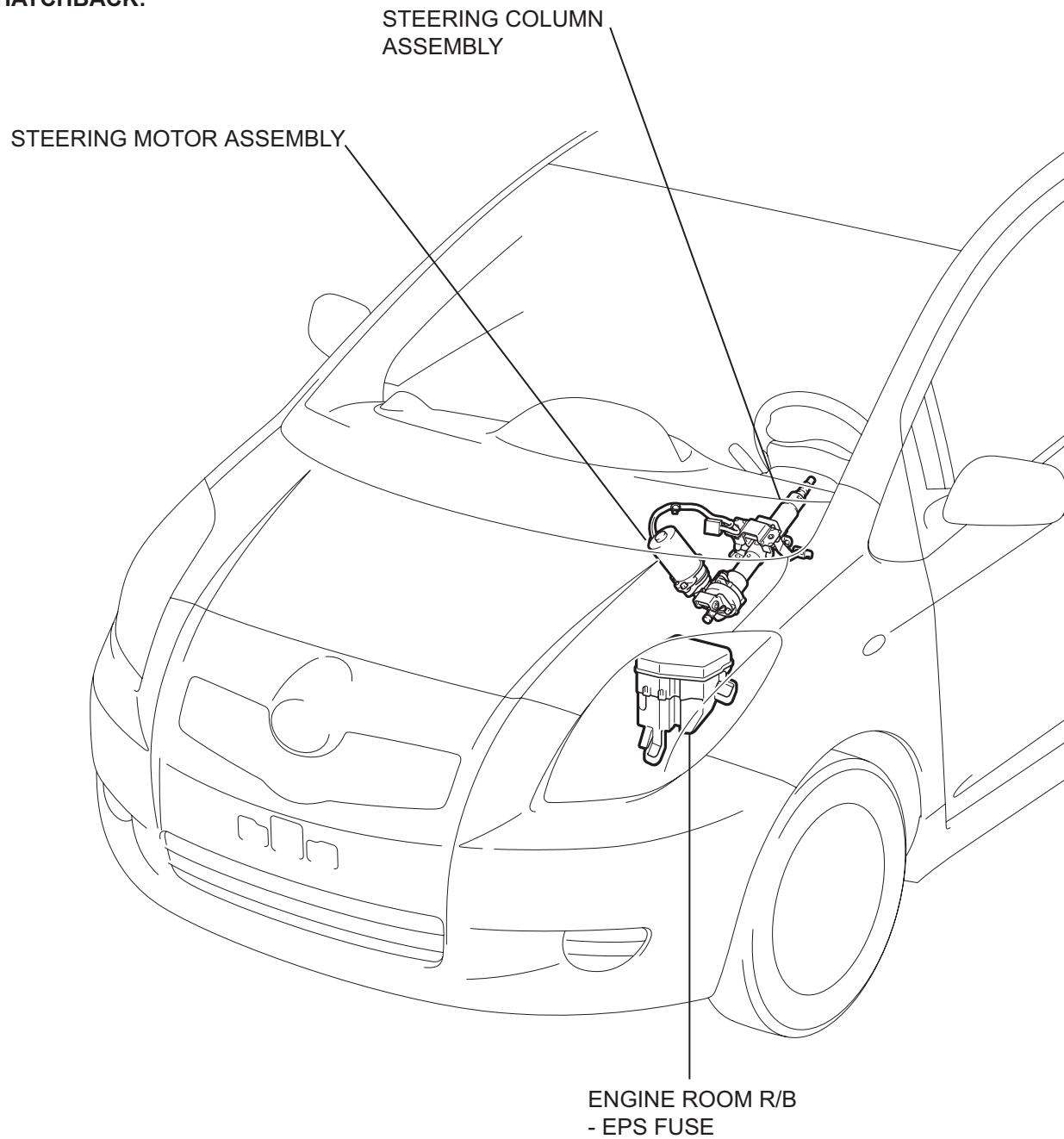
2. PRECAUTIONS FOR CAN COMMUNICATION

- (a) CAN communication lines are used to receive information from the skid control ECU (ABS 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 repaired temporarily with the bypass wire, etc.

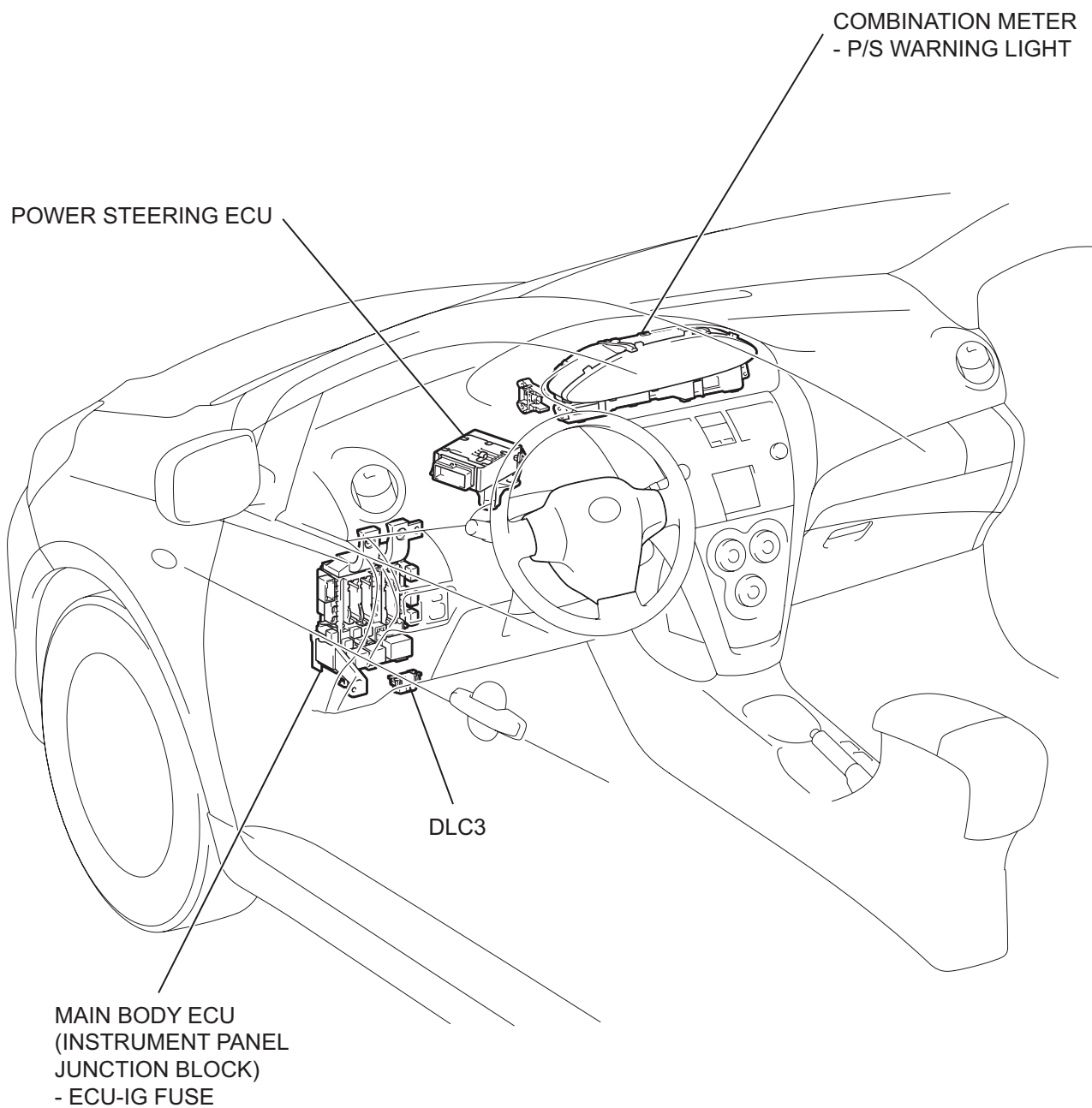
PARTS LOCATION

HATCHBACK:

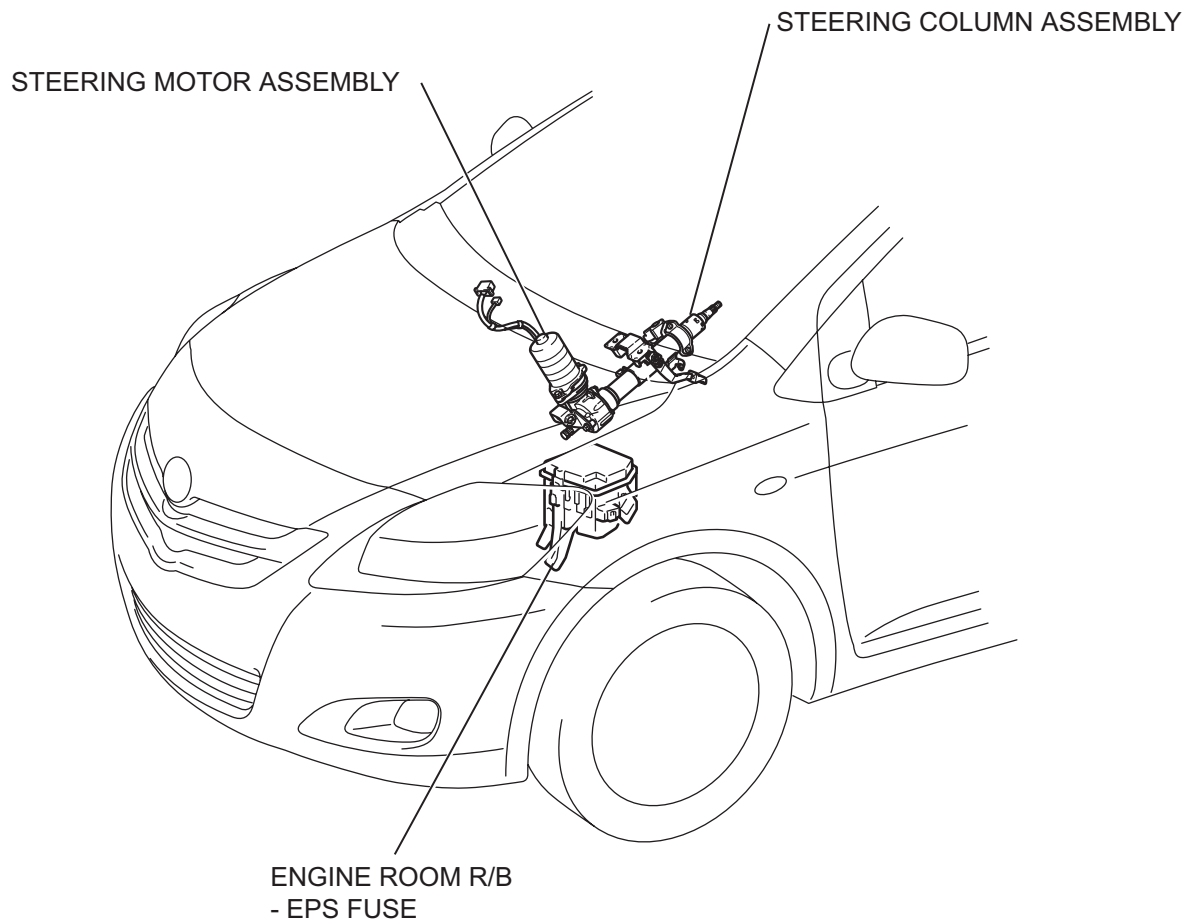


HATCHBACK:

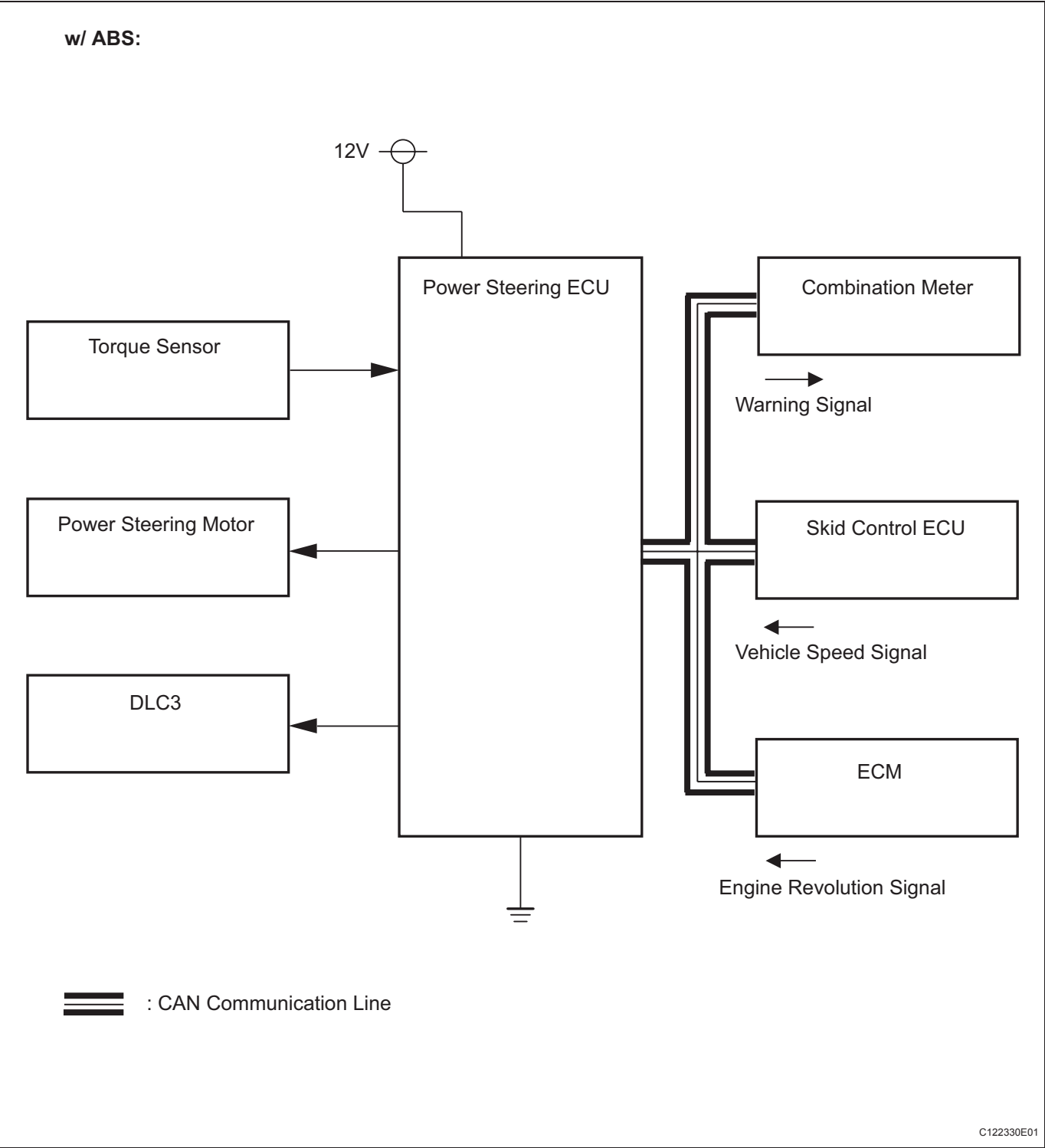
SEDAN:

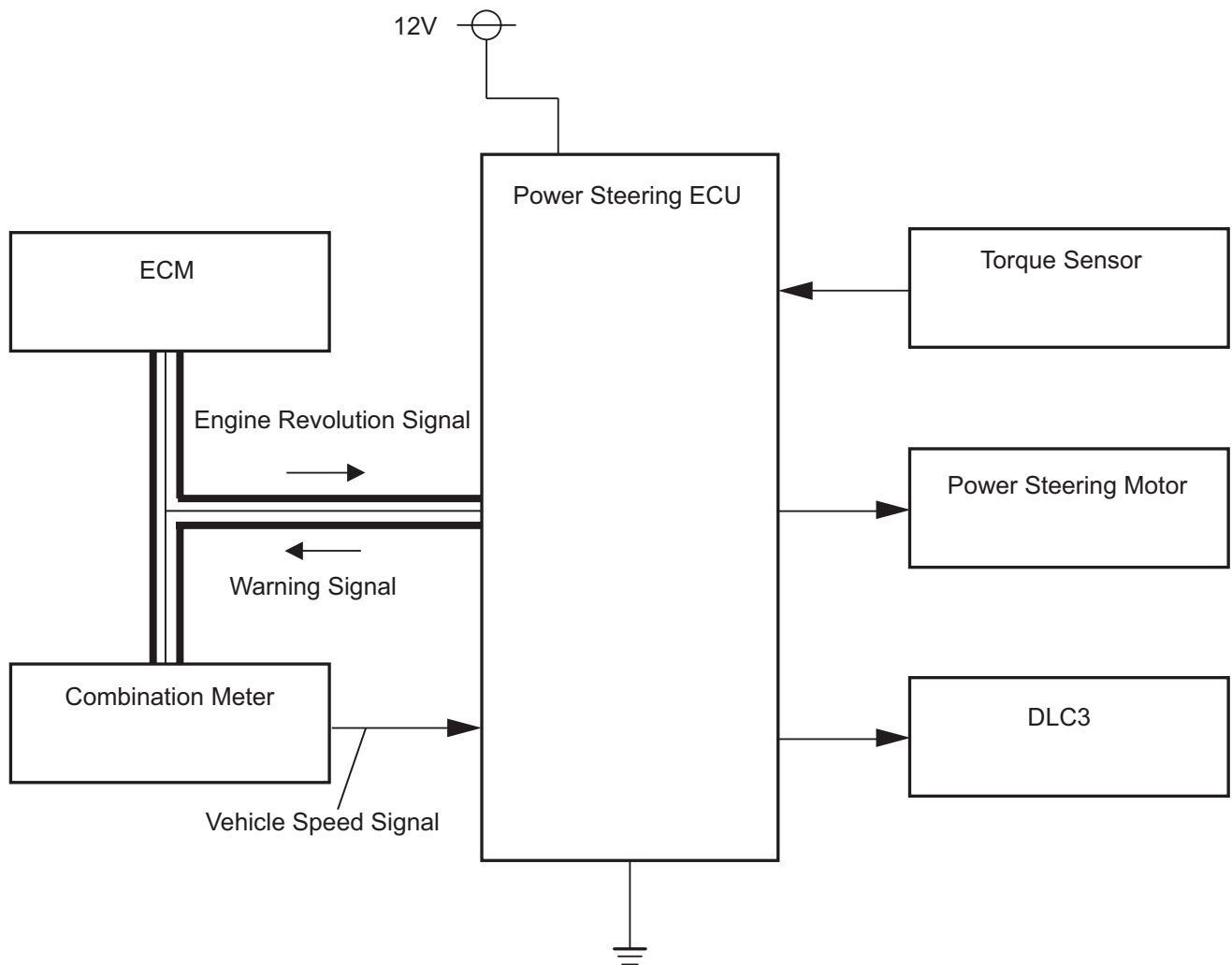


SEDAN:



SYSTEM DIAGRAM



w/o ABS: : CAN Communication Line

C122331E01

SYSTEM DESCRIPTION

1. DESCRIPTION

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

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

For vehicles without ABS, the power steering ECU receives vehicle speed signals from the speedometer.

(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) EPS motor:

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

HOW TO PROCEED WITH TROUBLESHOOTING

Perform troubleshooting according to the following flowchart.
HINT:

For further details, see the page given.

The intelligent tester can be used in steps 3, 4, 7, 10 and 13.

1 VEHICLE BROUGHT TO WORKSHOP

NEXT

2 CUSTOMER PROBLEM ANALYSIS

NEXT

3 CHECK DTC AND FREEZE FRAME DATA

(a) Record DTCs and freeze frame data. (See page [PS-25](#))

NEXT

4 CLEAR DTC AND FREEZE FRAME DATA

HINT:

Clear DTC and FREEZE FRAME DATA (See page [PS-25](#)).

NEXT

5 PROBLEM SYMPTOM CONFIRMATION

SYMPTOM DOES NOT OCCUR: GO TO STEP 6

SYMPTOM OCCURS: GO TO STEP 7

6 SYMPTOM SIMULATION

NEXT

7 CHECK DTC

(a) Recheck for DTCs (See page [PS-25](#)).

HINT:

- Refer to the diagnostic trouble code chart when any DTCs are output.

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



NORMAL SYSTEM CODE OUTPUT: GO TO STEP 8



DTC OUTPUT: GO TO STEP 9

| | |
|----------|-------------------------------|
| 8 | PROBLEM SYMPTOMS TABLE |
|----------|-------------------------------|

HINT:
Refer to PROBLEM SYMPTOMS TABLE (See page [PS-21](#)).

NEXT

| | |
|----------|------------------|
| 9 | DTC CHART |
|----------|------------------|

HINT:
Refer to DIAGNOSTIC TROUBLE CODE CHART (See page [PS-29](#)).

NEXT

| | |
|-----------|---------------------------|
| 10 | CIRCUIT INSPECTION |
|-----------|---------------------------|

NEXT

| | |
|-----------|-------------------------------|
| 11 | PROBLEM IDENTIFICATION |
|-----------|-------------------------------|

NEXT

| | |
|-----------|--------------------------|
| 12 | REPAIR OR REPLACE |
|-----------|--------------------------|

NEXT

| | |
|-----------|--------------------------|
| 13 | CONFIRMATION TEST |
|-----------|--------------------------|

NEXT

| |
|------------|
| END |
|------------|

CALIBRATION

1. TORQUE SENSOR ZERO POINT CALIBRATION (USING INTELLIGENT TESTER)

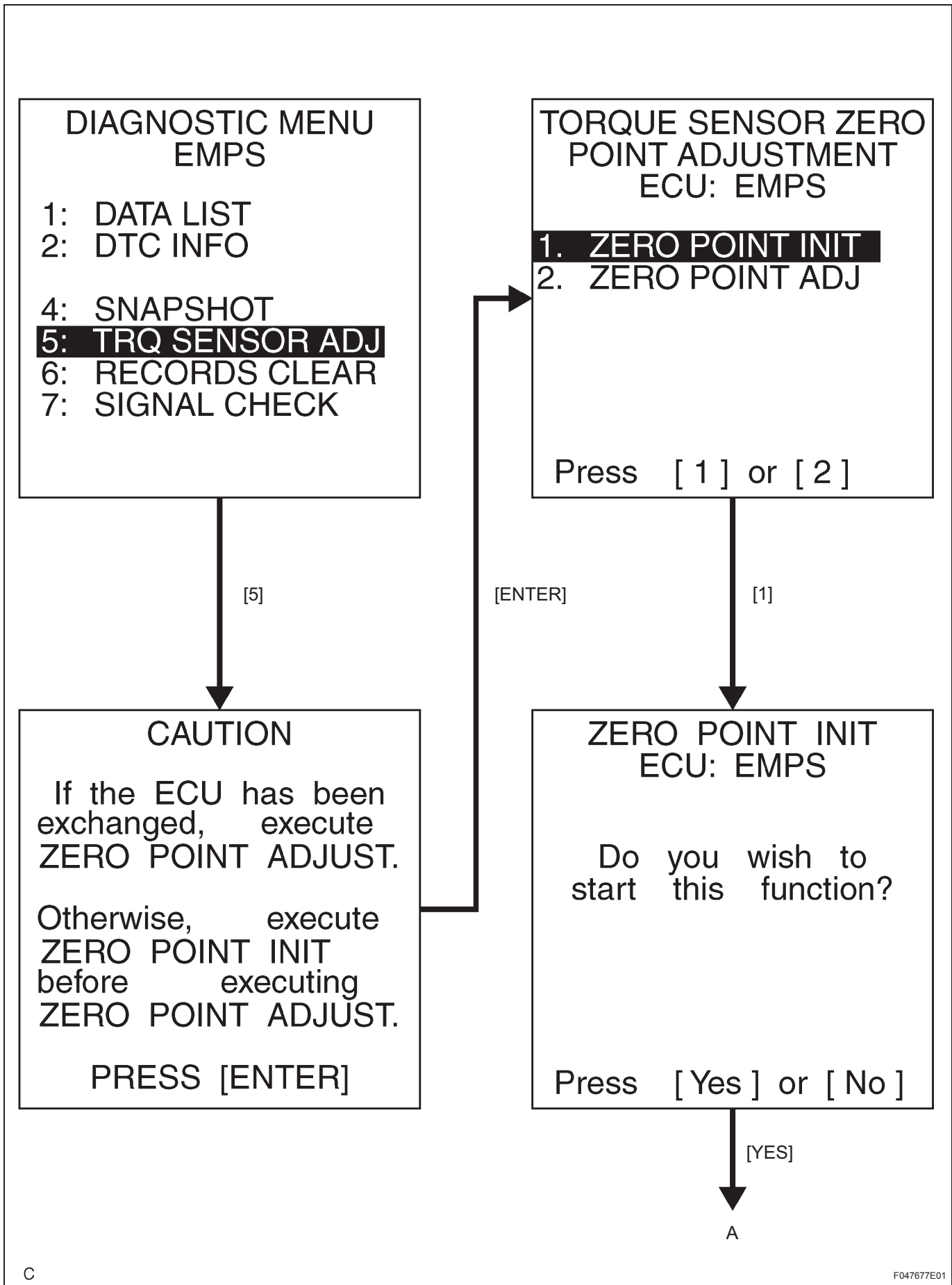
NOTICE:

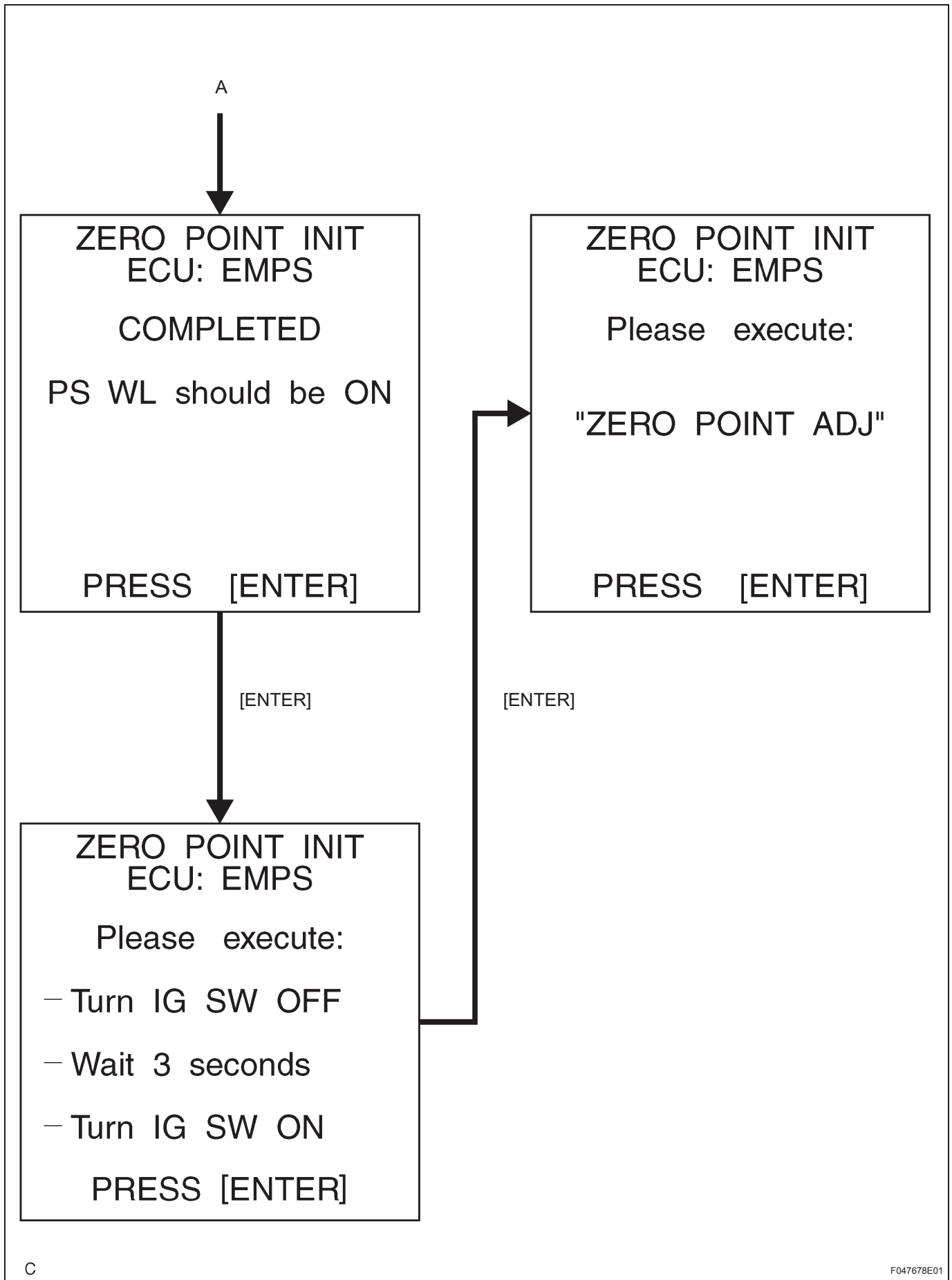
Perform the torque sensor zero point calibration when any of the following conditions occur.

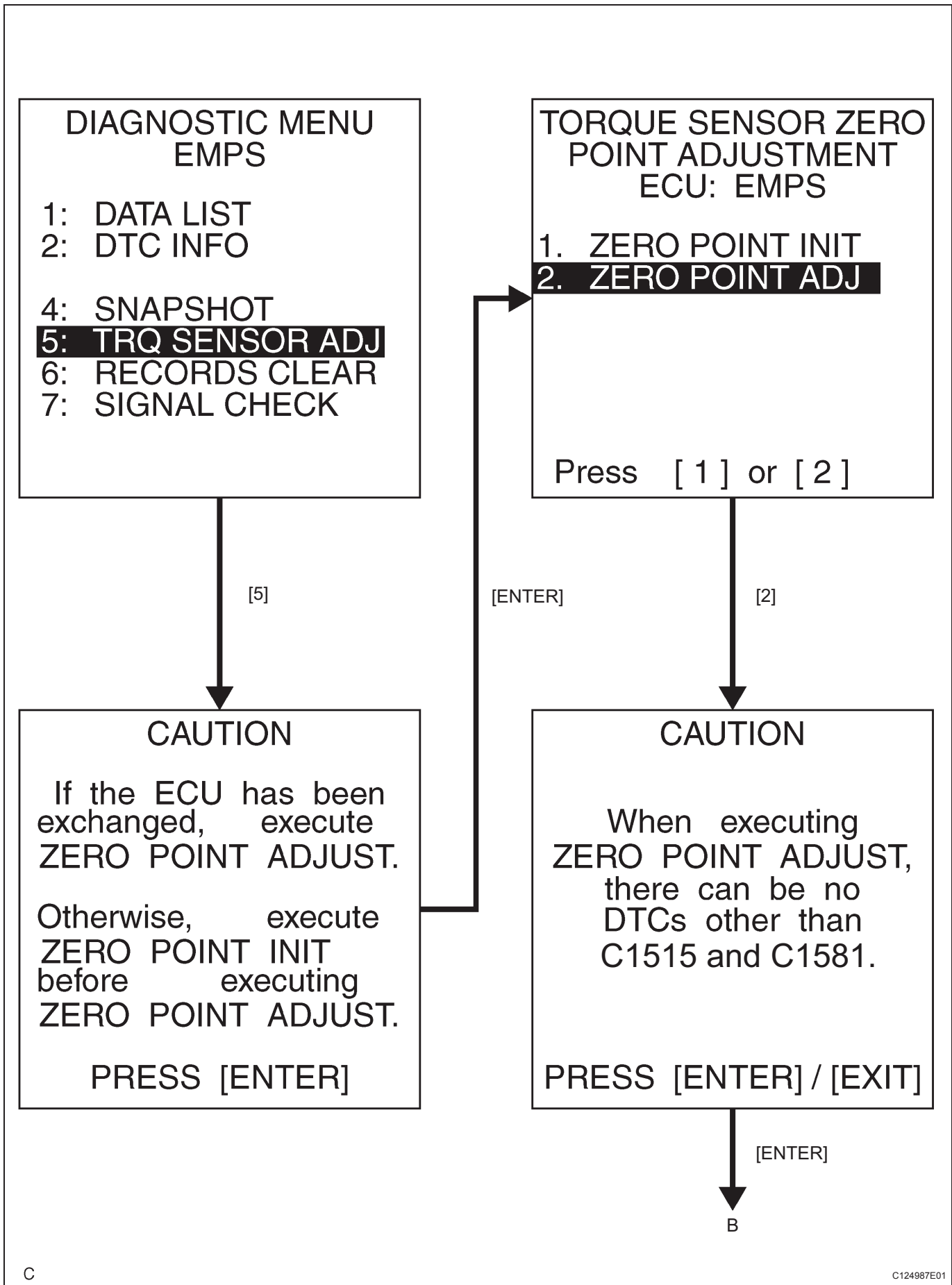
- The steering column assembly (containing the torque sensor) has been replaced.
 - The power steering ECU has been replaced.
 - The steering wheel has been replaced.
 - The steering gear assembly has been replaced.
 - There is a difference in steering effort between turning right and left.
- (a) Center the steering wheel and align the front wheels straight ahead.
 - (b) Connect the intelligent tester to the DLC3.
 - (c) Turn the ignition switch on and turn the tester on.
 - (d) Initialize the torque sensor zero point calibration signal and perform the zero point calibration by following the prompts on the tester screen.
 - (e) Confirm that no DTCs are output after the zero point calibration is completed.
 1. When DTC C1515/15 is output, see page [PS-35](#).
 2. When DTC C1516/16 is output, see page [PS-36](#).
 3. When DTC C1534/34 is output, see page [PS-40](#).

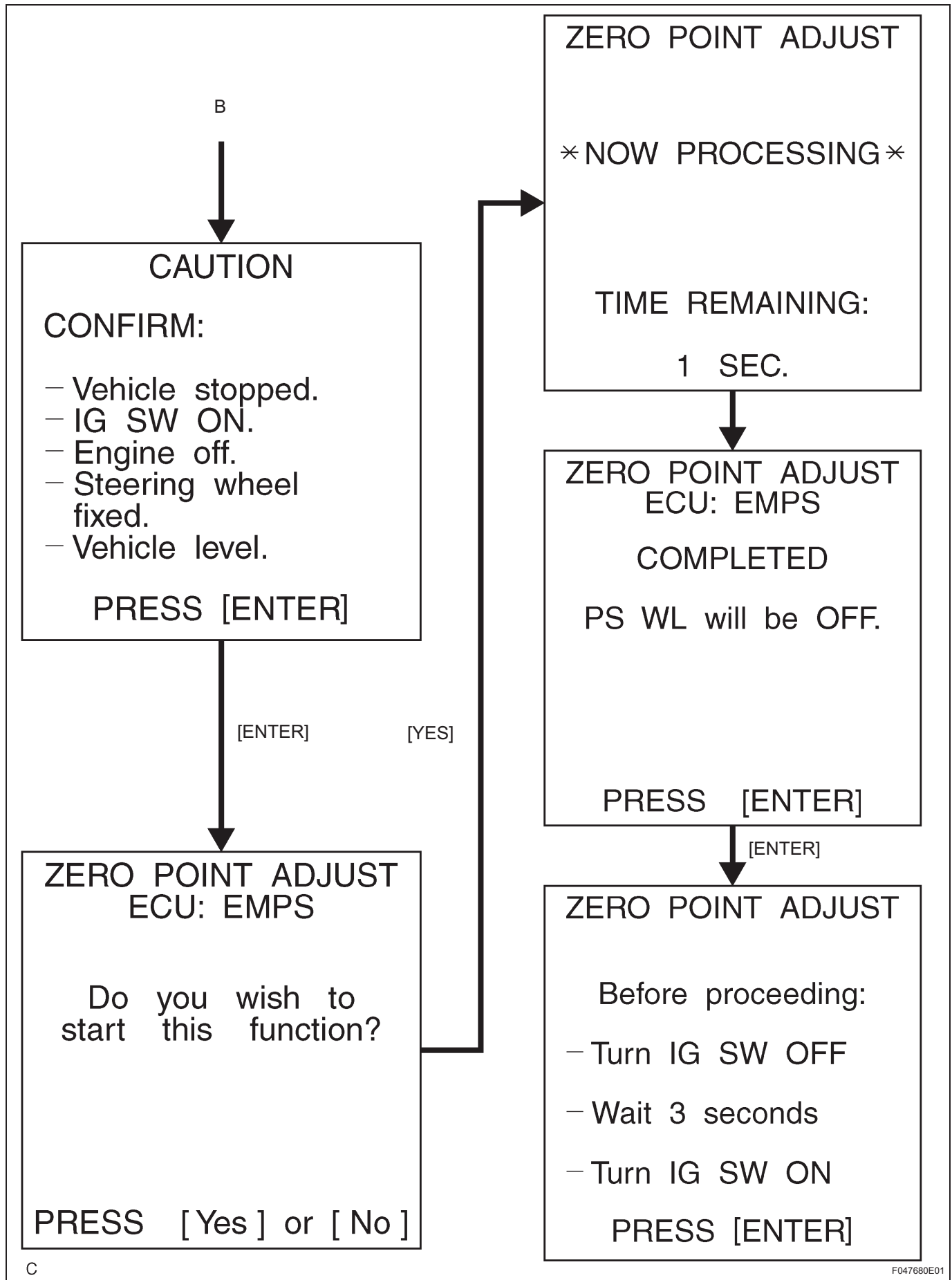
NOTICE:

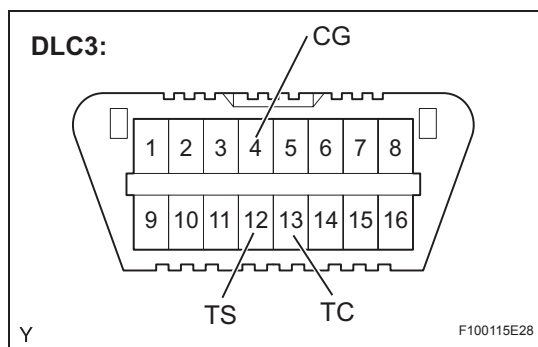
Do not touch the steering wheel during the calibration.











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

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

HINT:

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

- Stop the vehicle and turn the ignition switch off.
- Using SST, connect terminals TS and CG of the DLC3.

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

SST 09843-18040

- Turn the ignition switch on.
 - Disconnect and reconnect terminal TC of the DLC3 20 times or more within 20 seconds.
 - Check that DTC C1515/15 is output.
- Perform the torque sensor zero point calibration.

NOTICE:

Do not touch the steering wheel during the calibration.

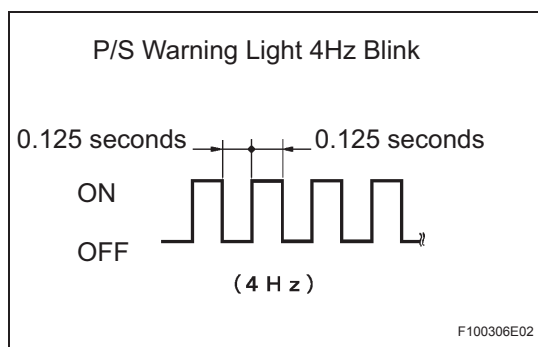
HINT:

Check whether any DTCs except C1515/15 are output.

- Stop the vehicle and turn the ignition switch off.
- Using SST, connect terminals TS and CG of the DLC3 and turn the ignition switch on.

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- Wait for 7 seconds after the P/S warning light comes on.
 - Confirm that the P/S warning light blinks at intervals of 0.125 seconds (4Hz blink).
 - Disconnect the SST.
- SST 09843-18040**
- Confirm that no DTCs are output.
 - When DTC C1515/15 is output, see page [PS-35](#).
 - When DTC C1516/16 is output, see page [PS-36](#).
 - When DTC C1534/34 is output, see page [PS-40](#).



TEST MODE PROCEDURE

NOTICE:

The torque sensor zero point calibration is performed automatically when the test mode inspection is conducted after the power steering ECU has been replaced with a new one.

HINT:

- Speed sensor signals can be checked easily in test mode.
- Test mode code C1571/71 is stored during the transition to test mode. This code does not indicate a malfunction since the code will be cleared when the ECU determines that the sensor is normal.
- The test mode code is cleared simultaneously when test mode is terminated.

1. TEST MODE START-UP

- When using an intelligent tester;
 - Connect the intelligent tester to the DLC3.
 - Turn the ignition switch on and enter test mode by following the instructions on the tester screen.
- When not using an intelligent tester;
 - Turn the ignition switch off and connect terminals 12 (TS) and 4 (CG) of the DLC3.
SST 09843-18040
 - Turn the ignition switch on.

NOTICE:

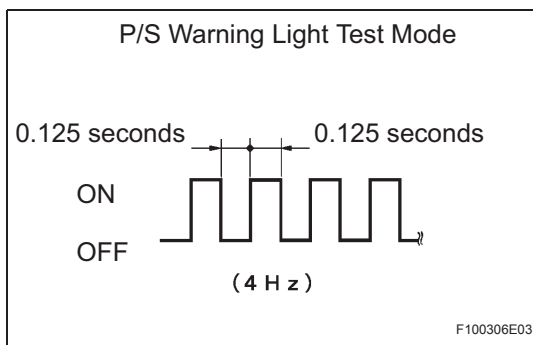
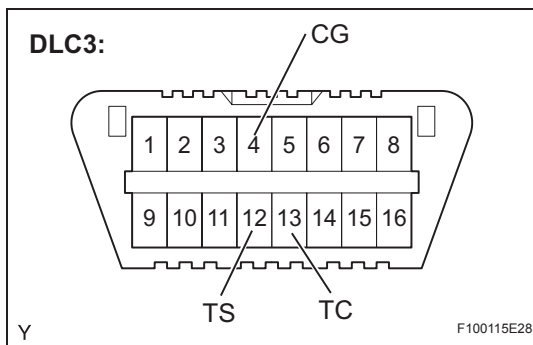
- Be sure to connect the correct terminals of the connector, otherwise a malfunction may occur.
- If the torque sensor zero point calibration has not been performed, the torque sensor zero point calibration is performed automatically when test mode is entered.

2. CHECK TEST MODE DISPLAY

- The P/S warning light blinks as shown on the left when test mode is entered.

NOTICE:

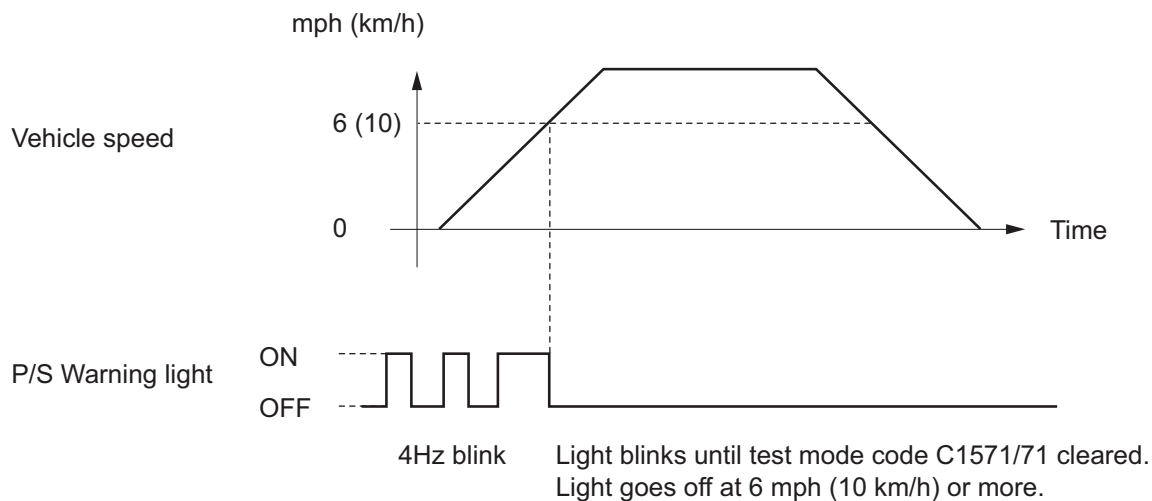
If the torque sensor zero point calibration has not been performed, the P/S warning comes on until the torque sensor zero point calibration is completed, and shows the test mode blink pattern after the torque sensor zero point calibration is completed.



3. CHECK VEHICLE SPEED SIGNAL (W/O ABS)

- (a) Drive the vehicle until the vehicle speed reaches 6 mph (10 Km/h) or more.

When system is normal:



C117900E01

4. READ TEST MODE CODE

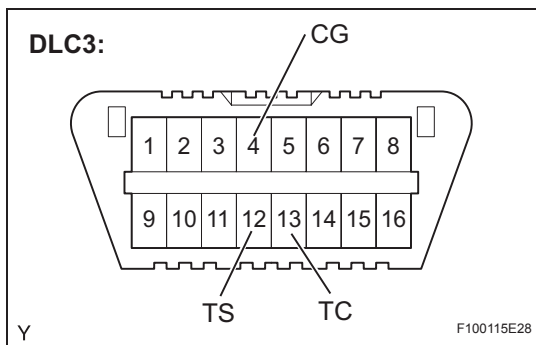
- (a) When using an intelligent tester;
 (1) Check the DTCs in test mode.

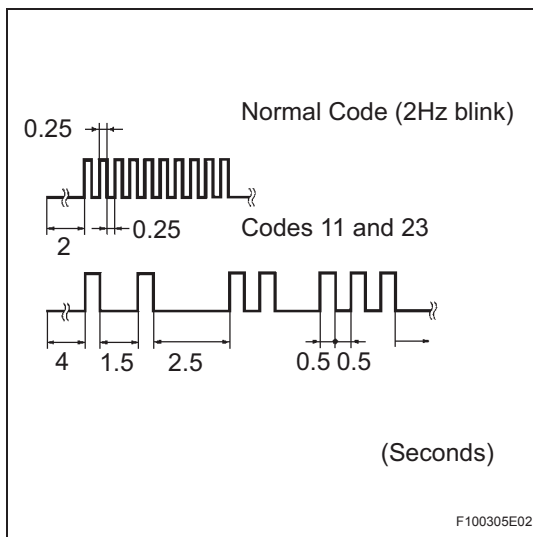
NOTICE:

Test mode code is cleared when test mode is terminated.

- (b) When not using an intelligent tester;
 (1) Turn the ignition switch off.
 (2) Connect terminals 12 (TS) and 4 (CG) of the DLC3, and also terminals 13 (TC) and 4 (CG) of the DLC3.

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- (3) Read the number of times that the P/S warning light on the combination meter blinks.
 - To indicate the normal code, the P/S warning light comes on for 0.25 seconds at intervals of 0.25 seconds (2Hz blink).
 - When outputting a DTC, the P/S warning light displays it at intervals of 4 seconds. When outputting two or more DTCs, the P/S warning light displays each DTC at intervals of 2.5 seconds, and repeats from the first one 4 seconds after indicating the last one.
 - If two or more malfunctions are detected at the same time, DTCs are displayed in ascending numerical order.

5. END OF TEST MODE

- (a) When using an intelligent tester;
 - (1) Return to normal mode by following the instructions on the tester screen.
 - (2) Turn the ignition switch off and disconnect the tester.
- (b) When not using an intelligent tester;
 - (1) Turn the ignition switch off and disconnect terminals 13 (TC) and 4 (CG), and terminals 12 (TS) and 4 (CG) of the DLC3.

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- (2) Turn the ignition switch on.

TEST MODE CODE

| Code | Detection Item | Conditions to clear code | Trouble areas |
|----------|---------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C1571/71 | Vehicle speed check | Vehicle speed 6 mph (10 Km/h) or more | If code cannot be cleared, any of following areas may malfunction. <ul style="list-style-type: none"> • Speed sensor • Combination meter • Power steering ECU • Wire harness and connector |

PROBLEM SYMPTOMS TABLE

for Hatchback

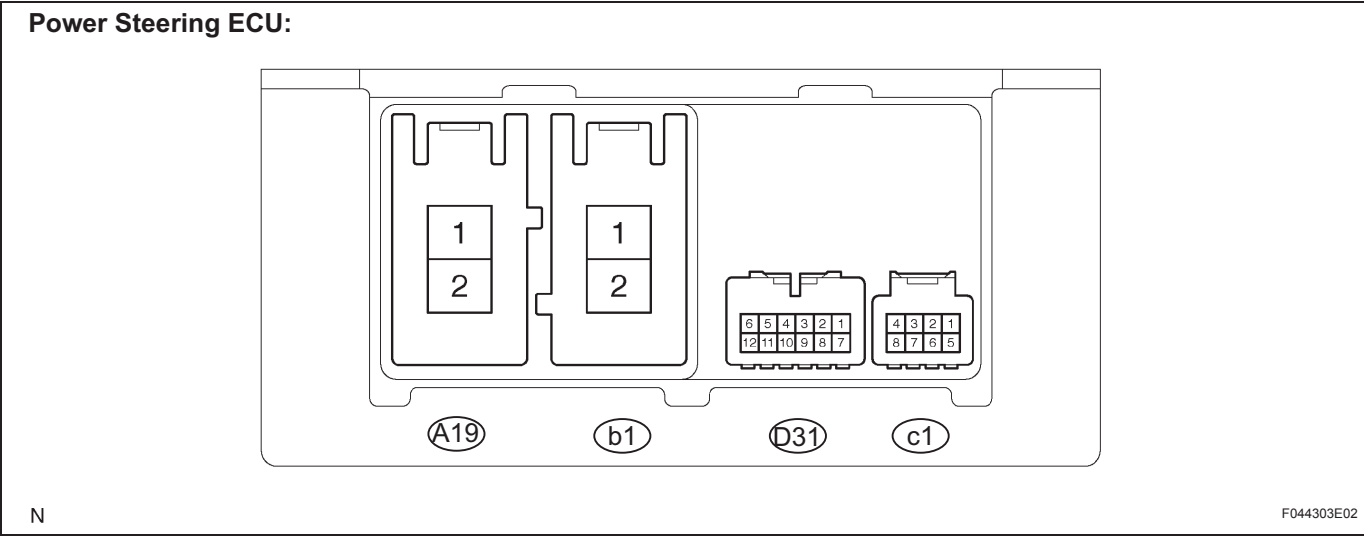
| Symptom | Suspected area | See page |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------|
| Heavy steering | Front tires (improperly inflated, unevenly worn) | TW-1 |
| | Front wheel alignment (incorrect) | SP-2 |
| | Front suspension (Lower ball joint) | SP-23 |
| | Steering gear assembly | PS-73 |
| | Power steering motor | SR-30 |
| | Battery and power source system | - |
| | Power source voltage of power steering ECU | IN-26 |
| | Power steering ECU | PS-89 |
| Steering effort differs between turning right and left or uneven | Steering center point (zero point) not recorded completely | PS-12 |
| | Front tires (improperly inflated, unevenly worn) | TW-1 |
| | Front wheel alignment (incorrect) | SP-2 |
| | Front suspension (Lower ball joint) | SP-23 |
| | Steering gear assembly | PS-73 |
| | Torque sensor (built into steering column) | SR-30 |
| | Steering column assembly | SR-30 |
| | Power steering motor | SR-30 |
| | Power steering ECU | PS-89 |
| While driving, steering effort does not change in accordance with vehicle speed or steering wheel does not return properly | Front suspension (Lower ball joint) | SP-23 |
| | Speed sensor (w/ ABS) | BC-14 |
| | Skid control ECU (ABS ECU) | BC-89 |
| | Combination meter (w/o ABS) | ME-145 |
| | Torque sensor (built into steering column) | SR-30 |
| | Power steering motor | SR-30 |
| | Power steering ECU | PS-89 |
| | Controlling CAN communication system | CA-9 |
| Friction occurs when turning steering wheel during low speed driving | Power steering motor | SR-30 |
| | Steering column assembly | SR-30 |
| High-pitched sound (squeaking) occurs when turning steering wheel slowly when vehicle stopped | Power steering motor | SR-30 |
| Steering wheel vibrates and noise occurs when turning steering wheel with vehicle stopped | Power steering motor | SR-30 |
| | Steering column assembly | SR-30 |
| P/S warning always indicated on combination meter | Power source voltage of power steering ECU | IN-26 |
| | Combination meter | ME-145 |
| | Power steering ECU | PS-89 |

for Sedan

| Symptom | Suspected area | See page |
|----------------|--------------------------------------------------|-----------------------|
| Heavy steering | Front tires (improperly inflated, unevenly worn) | TW-1 |
| | Front wheel alignment (incorrect) | SP-2 |
| | Front suspension (Lower ball joint) | SP-23 |
| | Steering gear assembly | PS-63 |
| | Power steering motor | SR-12 |
| | Battery and power source system | - |
| | Power source voltage of power steering ECU | IN-26 |
| | Power steering ECU | PS-83 |

| Symptom | Suspected area | See page |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------|
| Steering effort differs between turning right and left or uneven | Steering center point (zero point) not recorded completely | PS-12 |
| | Front tires (improperly inflated, unevenly worn) | TW-1 |
| | Front wheel alignment (incorrect) | SP-2 |
| | Front suspension (Lower ball joint) | SP-23 |
| | Steering gear assembly | PS-63 |
| | Torque sensor (built into steering column) | SR-12 |
| | Steering column assembly | SR-12 |
| | Power steering motor | SR-12 |
| | Power steering ECU | PS-83 |
| While driving, steering effort does not change in accordance with vehicle speed or steering wheel does not return properly | Front suspension (Lower ball joint) | SP-23 |
| | Speed sensor (w/ABS) | BC-14 |
| | Skid control ECU (ABS ECU) | BC-89 |
| | Combination meter (w/o ABS) | ME-138 |
| | Torque sensor (built into steering column) | SR-12 |
| | Power steering motor | SR-12 |
| | Power steering ECU | PS-83 |
| Friction occurs when turning steering wheel during low speed driving | Controlling CAN communication system | CA-9 |
| | Power steering motor | SR-12 |
| Steering wheel vibrates and noise occurs when turning steering wheel with vehicle stopped | Steering column assembly | SR-12 |
| | Power steering motor | SR-12 |
| P/S warning always indicated on combination meter | Power steering motor | SR-12 |
| | Power source voltage of power steering ECU | IN-26 |
| | Combination meter | ME-138 |
| | Power steering ECU | PS-83 |

TERMINALS OF ECU

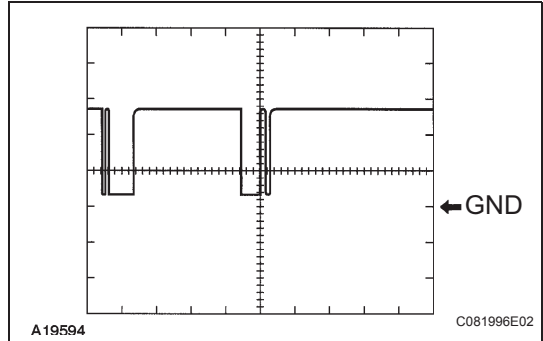


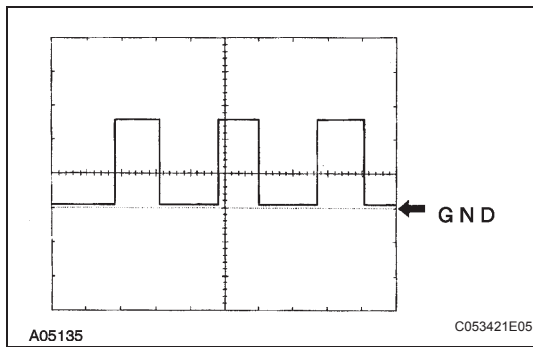
| Symbols (Terminals No.) | Terminal Description | Condition | Specified Condition |
|-----------------------------|----------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| PIG (A19-1) - PGND (A19-2) | EPS fuse | Always | 11 to 14 V |
| PGND (A19-2) - Body ground | Body ground | Always | Below 1 Ω |
| M1 (b1-1) - PGND (A19-2) | Power steering motor | 1. With ignition switch on, turn steering wheel to left 2. With ignition switch on, turn steering wheel to right | 1. 11 to 14 V 2. Below 1 V |
| M2 (b1-2) - PGND (A19-2) | Power steering motor | 1. With ignition switch on, turn steering wheel to left 2. With ignition switch on, turn steering wheel to right | 1. Below 1 V 2. 11 to 14 V |
| CANH (D31-1) - CANL (D31-7) | CAN BUS | Ignition switch off | 108 to 132 Ω |
| SIL (D31-2) - PGND (A19-2) | DLC3 | Communication established by connecting intelligent tester to DLC3 | Pulse generation (See waveform 1) |
| IG (D31-6) - PGND (A19-2) | ECU-IG fuse | Ignition switch on | 11 to 14 V |
| TS (D31-11) - PGND (A19-2) | DLC3 | Ignition switch on | 11 to 14 V |
| SPD* (D31-5) - PGND (A19-2) | Speed signal | Ignition switch on | Pulse generation (See waveform 2) |
| TRQ1 (c1 -5) - PGND (A19-2) | Torque sensor | With ignition switch on, turn steering wheel to left and right | 0.3 to 4.7 V |
| TRQV (c1-6) - PGND (A19-2) | Torque sensor | Ignition switch on | 7.5 to 8.5 V |
| TRQ2 (c1-7) - PGND (A19-2) | Torque sensor | With ignition switch on, turn steering wheel to left and right | 0.3 to 4.7 V |
| TRQG (c1-8) - PGND (A19-2) | Torque sensor | Always | Below 1 Ω |

* Only for vehicles without ABS

1. Waveform 1 Reference

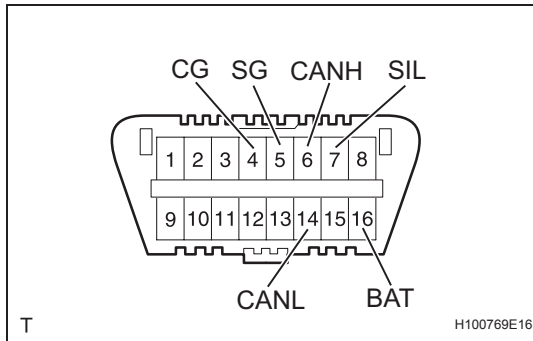
| Terminal | SIL - Body ground |
|--------------|--------------------------------------------------------------------|
| Tool setting | 5 V/DIV, 1 ms/DIV |
| Condition | Communication established by connecting intelligent tester to DLC3 |





2. Waveform 2 Reference

| Terminal | SPD - Body ground |
|--------------|------------------------------------------------|
| Tool setting | 5 V/DIV, 20 ms/DIV |
| Condition | Vehicle speed approximately 12.4 mph (20 km/h) |



DIAGNOSIS SYSTEM

1. CHECK DLC3

(a) Check the DLC3:

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.

| Symbols (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 k Ω or higher |
| CANL (14) - BAT (16) | LOW-level CAN bus line | Ignition switch OFF* | 6 k 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, any other switches or the doors.**

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

HINT:

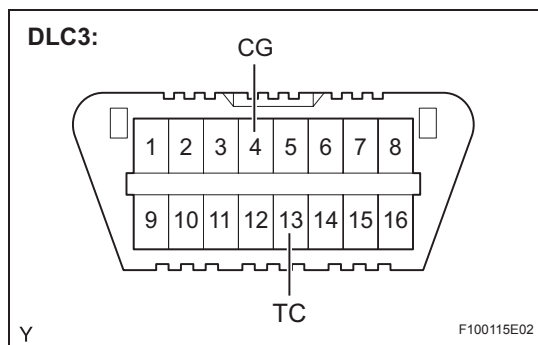
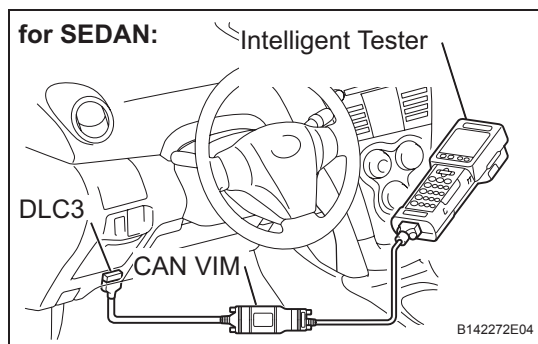
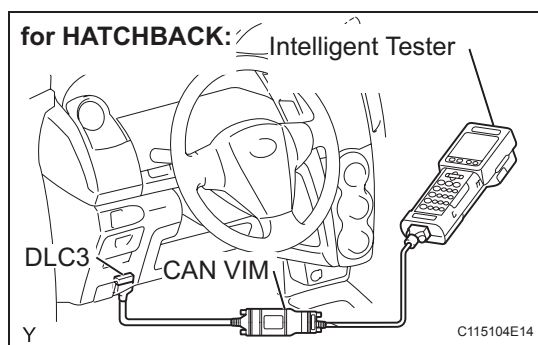
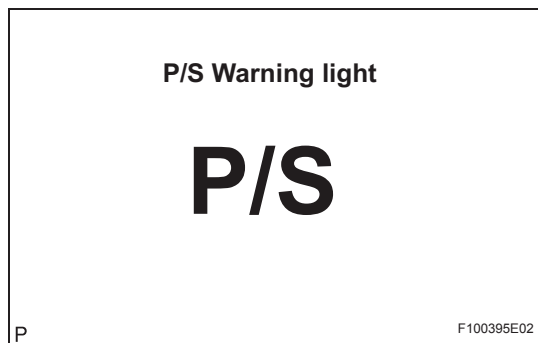
Connect the cable of the intelligent tester to the CAN VIM, connect the CAN VIM to the DLC3, turn the ignition switch ON and attempt to use the tester. If the display indicates that a communication error has occurred, there is a problem either with the vehicle or with the tester.

- If communication is normal when the tester is connected to another vehicle, inspect the DLC3 of the original vehicle.

- If communication is still not possible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

2. WARNING LIGHT

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



DTC CHECK / CLEAR

1. CHECK DTC

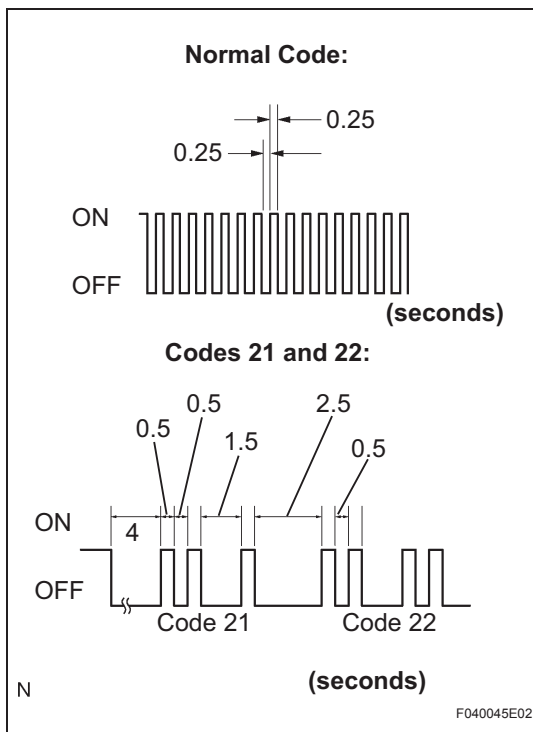
- When using an intelligent tester;

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch on and turn the tester on.
- Read the DTCs by following the prompts on the intelligent tester.

HINT:

Refer to the intelligent tester operator's manual for further details.

- When not using an intelligent tester;
 - Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.
SST 09843-18040
 - Turn the ignition switch on.



- (3) Read and write down any DTCs indicated by the P/S warning light on the combination meter. Refer to the chart on the left for examples of a normal code and DTCs 21 and 22.

HINT:

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

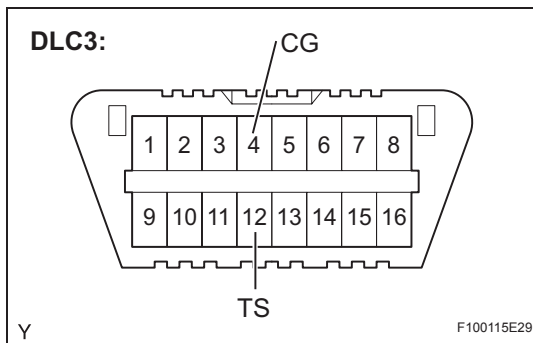
| Trouble Area | See Page |
|---------------------------|----------|
| EPS warning light circuit | PS-53 |

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

- (4) Refer to the Diagnostic Trouble Code Chart (See page [PS-29](#)) for DTC information.

2. CLEAR DTC

- (a) When using an intelligent tester;
- Connect the intelligent tester to the DLC3.
 - Turn the ignition switch on and turn the tester on.
 - Clear the DTCs by following the prompts on the intelligent tester.
 - Turn the ignition switch off.
 - Disconnect the intelligent tester from the DLC3.
- (b) When not using an intelligent tester;
- Using SST, connect terminals 12 (TS) and 4 (CG) of the DLC3.
SST 09843-18040
 - Turn the ignition switch on.
 - Disconnect the SST check wire from terminal 4 (CG) and reconnect it, and repeat this procedure 4 times or more within 8 seconds.
 - Check that the P/S warning light blinks a code to indicate normality.
 - Turn the ignition switch off.
 - Remove the SST from the DLC3.



FAIL-SAFE CHART

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

| DTC No. | Malfunction | Fail-safe |
|----------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------|
| C1511/11 C1512/12 C1513/13 C1514/14 | Torque sensor malfunction | Assist force restricted |
| C1517/17 | Torque sensor malfunction | Power assist stopped |
| C1524/24 | Motor malfunction | Power assist stopped |
| C1531/31 C1532/32 | Power steering ECU malfunction | Power assist stopped |
| C1533/33 | Temperature sensor malfunction in power steering ECU | Assist force restricted |
| C1534/34 | EEPROM abnormal | Assist force restricted |
| C1535/35 | Steering wheel location data error | Power assist stopped |
| C1541/41 C1542/42 | Speed sensor malfunction | Amount of power assist remains constant at speed of 43 mph (70 Km/h) |
| C1551/51 | IG power source voltage error | Assist force restricted |
| C1552/52 | PIG power source voltage error | Assist force restricted |
| C1553/53 | Overvoltage at IG and PIG terminals | Assist force restricted |
| C1554/54 | Power source relay malfunction | Power assist stopped |
| C1555/55 | Motor relay malfunction | Power assist stopped |
| U0073 | CAN bus malfunction | - |
| U0105 | ECM communication error | Amount of power assist remains constant at speed of 43 mph (70 Km/h) |
| U0121 | ABS ECU communication error | Amount of power assist remains constant at speed of 43 mph (70 Km/h) |
| - | Extremely high temperature in ECU | Assist force restricted until normal ECU temperature recovers |
| - | Power source voltage drop | Assist force suspended until voltage recovers |

HINT:

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

DATA LIST / ACTIVE TEST

1. DATA LIST

- Connect an intelligent tester to the DLC3.
- Turn the ignition switch on and turn the tester on.
- Operate the intelligent tester according to the prompts on the tester and select DATA LIST.

| Item | Item Description | Inspection Condition | Reference value |
|-------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| TRQ1 | Torque sensor 1 output value: Minimum: 0 V, Maximum: 5 V | <ol style="list-style-type: none"> Steering wheel not turned (without load) Steering wheel turned to right with vehicle stopped Steering wheel turned to left with vehicle stopped | <ol style="list-style-type: none"> 2.3 to 2.7 V 2.5 to 4.7 V 0.3 to 2.5 V |
| TRQ2 | Torque sensor 2 output value: Minimum: 0 V, Maximum: 5 V | <ol style="list-style-type: none"> Steering wheel not turned (without load) Steering wheel turned to right with vehicle stopped Steering wheel turned to left with vehicle stopped | <ol style="list-style-type: none"> 2.3 to 2.7 V 2.5 to 4.7 V 0.3 to 2.5 V |
| TRQ3 | Torque value for assist control: Minimum: 0 V, Maximum: 5 V | <ol style="list-style-type: none"> Steering wheel not turned (without load) Steering wheel turned to right with vehicle stopped Steering wheel turned to left with vehicle stopped | <ol style="list-style-type: none"> 2.3 to 2.7 V 2.5 to 4.7 V 0.3 to 2.5 V |
| SPD | Vehicle speed from meter: Minimum: 0 mph (km/h), Maximum: 158.5 mph (255 km/h) | <ol style="list-style-type: none"> Vehicle stopped Vehicle driven at constant speed | <ol style="list-style-type: none"> 0 mph (km/h) No significant fluctuation |
| MOTOR ACTUAL | Current to motor: Minimum: -128 A, Maximum: 127 A | - | - |
| COMMAND VALUE | Requested current to motor: Minimum: -128 A, Maximum: 127 A | - | - |
| THERMISTOR TEMP | ECU substrate temperature: Minimum: -50 °C, Maximum: 205 °C | Ignition switch on | - |
| PIG SUPPLY | Power source voltage to activate motor: Minimum: 0 V, Maximum: 25.5 V | Power steering in operation | 11 to 14 V |
| IG SUPPLY | ECU power source voltage: Minimum: 0 V, Maximum: 25.5 V | - | 11 to 14 V |
| TRQ1 ZERO VAL | Zero point value of torque sensor 1: Minimum: 0 V, Maximum: 5 V | Steering wheel not turned (without load) | 2.3 to 2.7 V |
| TRQ2 ZERO VAL | Zero point value of torque sensor 2: Minimum: 0 V, Maximum: 5 V | Steering wheel not turned (without load) | 2.3 to 2.7 V |
| TRQ3 ZERO VAL | Zero point value of torque sensor for assist control: Minimum: 0 V, Maximum: 5 V | Steering wheel not turned (without load) | 2.3 to 2.7 V |
| MOTOR TERMINAL(+) | Motor terminal M1 voltage: Minimum: 0 V, Maximum: 25.5 V | <ol style="list-style-type: none"> Steering wheel turned to right Steering wheel turned to left | <ol style="list-style-type: none"> Below 1 V 11 to 14 V |
| MOTOR TERMINAL(-) | Motor terminal M2 voltage: Minimum: 0 V, Maximum: 25.5 V | <ol style="list-style-type: none"> Steering wheel turned to right Steering wheel turned to left | <ol style="list-style-type: none"> 11 to 14 V Below 1 V |
| MTR OVERHEAT | Continuous overheat prevention control record: REC/UNREC | - | - |
| MTR LOW POWER | PIG power source voltage drop record: REC/UNREC | - | - |

| Item | Item Description | Inspection Condition | Reference value |
|-----------------|-------------------------------------------------------------------------------------------------------|----------------------|-----------------|
| CONTROL MODE | Codes indicating DTC detection timing during ECU control displayed in hexadecimal | - | - |
| IG ON/OFF TIMES | Number of times ignition switch turned on after DTC detection: Minimum: 0 time, Maximum: 255 times | - | - |
| # CODE | Number of detected DTCs when freeze frame data stored: Minimum: 0 time, Maximum: 255 times | - | - |
| ECU ID | ECU identification information | - | - |
| TEST MODE STAT | Selected mode: NORMAL MODE / TEST MODE | - | - |

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.
- Test mode code C1571/71 is stored during the transition to test mode. This code does not indicate a malfunction since the code will be cleared when the ECU determines that the sensor is normal. The test mode code is cleared simultaneously when test mode is terminated.
- The P/S warning light remains illuminated during test mode and starts blinking when the speed sensor is determined to be normal.

| DTC No. | Detection Item | Trouble Areas | Normal Return | P/S Warning Light | See page |
|----------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------------------|----------|
| C1511/11 | Torque Sensor 1 Malfunction | <ul style="list-style-type: none"> Steering column assembly (Torque sensor) Power steering ECU | Ignition switch on again | ○ | PS-32 |
| C1512/12 | Torque Sensor Circuit Malfunction | <ul style="list-style-type: none"> Steering column assembly (Torque sensor) Power steering ECU | Ignition switch on again | ○ | PS-32 |
| C1513/13 | Torque Sensor Circuit Malfunction | <ul style="list-style-type: none"> Steering column assembly (Torque sensor) Power steering ECU | Ignition switch on again | ○ | PS-32 |
| C1514/14 | Torque Sensor Power Source Circuit Malfunction | <ul style="list-style-type: none"> Steering column assembly (Torque sensor) Power steering ECU | Ignition switch on again | ○ | PS-32 |
| C1515/15 | Torque Sensor Zero Point Adjustment is not Initialized | <ul style="list-style-type: none"> Torque sensor zero point calibration not performed Steering column assembly | After calibrating torque sensor zero point | ○ | PS-35 |
| C1516/16 | Torque Sensor Zero Point Adjustment Incomplete | <ul style="list-style-type: none"> Torque sensor zero point calibration failure Steering column assembly | After calibrating torque sensor zero point normally | ○ | PS-36 |
| C1517/17 | Torque Sensor Hold Malfunction | <ul style="list-style-type: none"> Steering column assembly (Torque sensor) Power steering ECU | Ignition switch on again | ○ | PS-32 |
| C1524/24 | Motor Circuit Malfunction | <ul style="list-style-type: none"> Steering column assembly Power steering ECU | Ignition switch on again | ○ | PS-37 |
| C1531/31 | EPS ECU Circuit Malfunction | <ul style="list-style-type: none"> Power steering ECU | Ignition switch on again | ○ | PS-40 |
| C1532/32 | EPS ECU Circuit Malfunction | <ul style="list-style-type: none"> Power steering ECU | Ignition switch on again | ○ | PS-40 |
| C1533/33 | EPS ECU Circuit Malfunction | <ul style="list-style-type: none"> Power steering ECU | Ignition switch on again | ○ | PS-40 |

| DTC No. | Detection Item | Trouble Areas | Normal Return | P/S Warning Light | See page |
|-------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------|----------|
| C1534/34 | EPS ECU Circuit Malfunction | <ul style="list-style-type: none"> Power steering ECU | Ignition switch on again | - | PS-40 |
| C1535/35 | Steering Wheel Location Data Error | <ul style="list-style-type: none"> Power steering ECU | - | ○ | PS-40 |
| C1541/41 *1 | Speed Sensor Malfunction | <ul style="list-style-type: none"> Speed sensor Speed sensor circuit Combination meter Power steering ECU | Ignition switch on again | ○ | PS-41 |
| C1542/42 *1 | Speed Sensor Malfunction | <ul style="list-style-type: none"> Speed sensor Speed sensor circuit Combination meter Power steering ECU | Return to normal | X | PS-41 |
| C1551/51 | IG Power Source Circuit Malfunction | <ul style="list-style-type: none"> ECU-IG fuse IG power source circuit Power steering ECU | Ignition switch on again and after normal confirmation | ○ | PS-44 |
| C1552/52 | PIG Power Source Circuit | <ul style="list-style-type: none"> EPS fuse PIG power source circuit Power steering ECU | Ignition switch on again and after normal confirmation | ○ | PS-46 |
| C1553/53 | When Resetting Voltage, Vehicle is Being Driven | <ul style="list-style-type: none"> IG and PIG power source circuit Power steering ECU | Ignition switch on again and after normal confirmation | ○ | PS-46 |
| C1554/54 | EPS Relay Circuit | <ul style="list-style-type: none"> EPS fuse PIG power source circuit Power steering ECU | Ignition switch on again | ○ | PS-46 |
| C1555/55 | EPS Motor Relay Circuit | <ul style="list-style-type: none"> Power steering ECU | Ignition switch on again | ○ | PS-46 |
| C1571/71 *1 | Speed Sensor Malfunction (Test Mode DTC) | <ul style="list-style-type: none"> Speed sensor Speed sensor circuit Combination meter Power steering ECU | - | - | PS-41 |
| C1581/81 | Assist Map Un-Writing | <ul style="list-style-type: none"> Power steering ECU | - | ○ | PS-49 |
| U0073 | Control Module Communication Bus OFF | <ul style="list-style-type: none"> CAN communication system | Ignition switch on again and after normal confirmation | ○ | PS-50 |
| U0105 | Lost Communication with ECM | <ul style="list-style-type: none"> CAN communication system ECM | Ignition switch on again and after normal confirmation | ○ | PS-50 |
| U0121 *2 | Lost Communication with Anti-lock Brake System (ABS) Control Module | <ul style="list-style-type: none"> CAN communication system ABS ECU | Ignition switch on again and after normal confirmation | ○ | PS-50 |

(Warning light) ○---turn on, X---turn off (Normal reset)

*1---w/o ABS, *2---w/ ABS

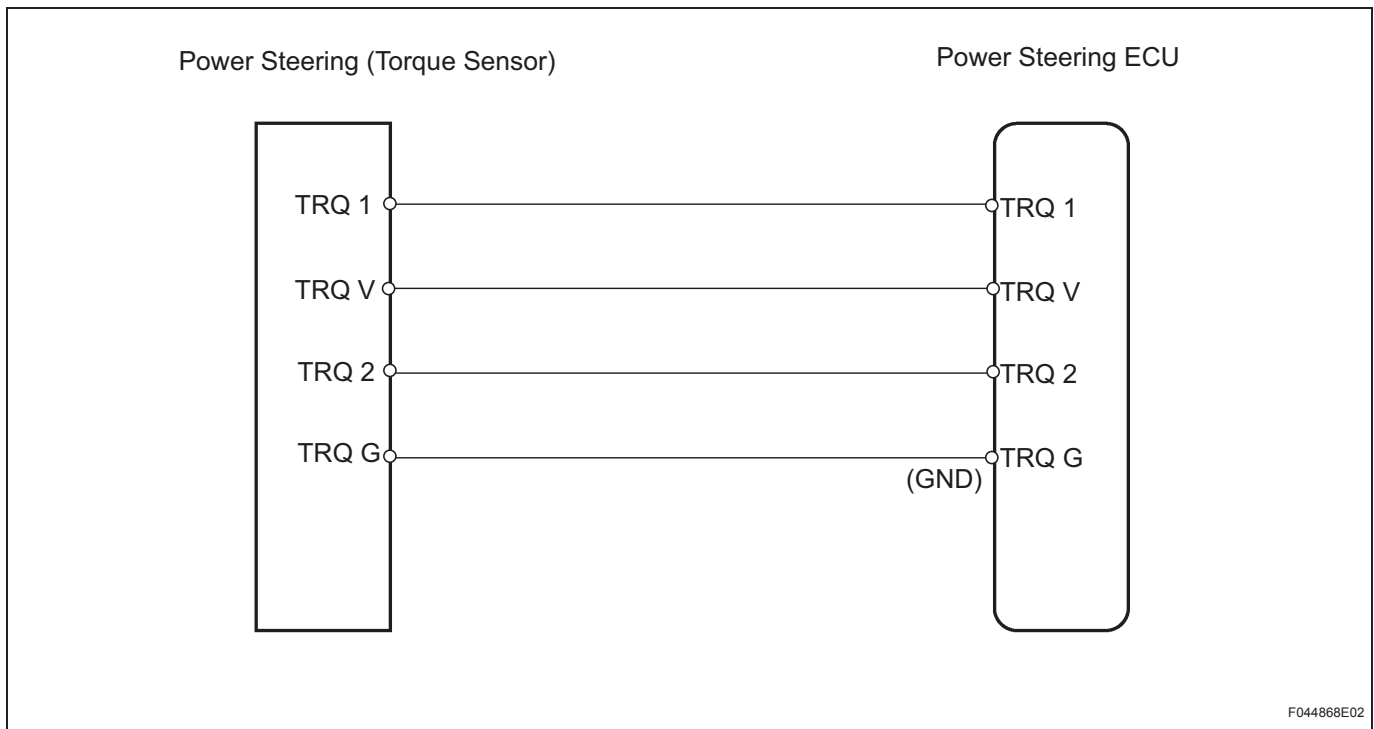
| | | |
|------------|-----------------|-------------------------------------------------------|
| DTC | C1511/11 | Torque Sensor 1 Malfunction |
| DTC | C1512/12 | Torque Sensor Circuit Malfunction |
| DTC | C1513/13 | Torque Sensor Circuit Malfunction |
| DTC | C1514/14 | Torque Sensor Power Source Circuit Malfunction |
| DTC | C1517/17 | Torque Sensor Hold Malfunction |

DESCRIPTION

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

| DTC No. | Detection Item | Trouble Area |
|----------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| C1511/11 | Torque sensor (TRQ1) signal error or stop | <ul style="list-style-type: none"> Torque sensor (built into steering column assembly) Power steering ECU |
| C1512/12 | Torque sensor (TRQ2) signal error or stop | |
| C1513/13 | Deviation between torque sensor TRQ1 and TRQ2 exceeds specified value | |
| C1514/14 | Torque sensor power source voltage error | |
| C1517/17 | Temporary control due to malfunction related to torque sensor continues for long time | |

WIRING DIAGRAM



INSPECTION PROCEDURE

1 READ VALUE OF DATA LIST (TRQ1, TRQ2)

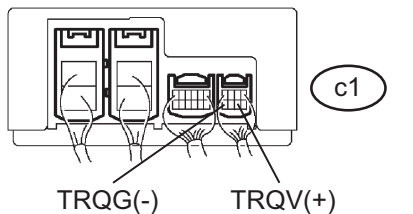
- Connect the intelligent tester to DLC3.
- Turn the ignition switch on and turn the tester on.
- Select the items [TRQ1] and [TRQ2] in the DATA LIST.
- Measure the voltage.

| Item | Item Description | Inspection Condition | Reference Value |
|------|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| TRQ1 | Torque sensor 1 output value Minimum: 0 V, Maximum: 5 V | <ol style="list-style-type: none"> Steering wheel not turned (without load) Turning steering wheel to right with vehicle stopped Turning steering wheel to left with vehicle stopped | <ol style="list-style-type: none"> 2.3 to 2.7 V 2.5 to 4.7 V 0.3 to 2.5 V |
| TRQ2 | Torque sensor 2 output value Minimum: 0 V, Maximum: 5 V | | |

- Check the difference in the values between [TRQ1] and [TRQ2].

OK:

The voltage difference is below 0.3 V.

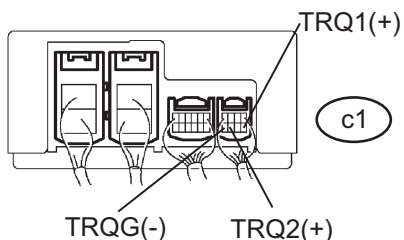
OK**CHECK INTERMITTENT PROBLEMS****NG****2 INSPECT POWER STEERING ECU (OUTPUT)****Power Steering ECU:**

G21778

F046432E01

- Turn the ignition switch on.
 - Measure the voltage.
- Standard voltage**

| Tester Connection | Condition | Specified condition |
|---------------------------|--------------------|---------------------|
| TRQV (c1-6) - TRQG (c1-8) | Ignition switch on | 7.5 to 8.5 V |

NG**REPLACE POWER STEERING ECU****OK****3 INSPECT STEERING COLUMN ASSEMBLY (TORQUE SENSOR)****Power Steering ECU:**

G21778

F046432E02

- Turn the ignition switch on.
 - Measure the voltage.
- Standard voltage**

| Tester Connection | Condition (Steering Position) | Specified Condition |
|---------------------------|-------------------------------|---------------------|
| TRQ1 (c1-5) - TRQG (c1-8) | Center position | 2.3 to 2.7 V |
| TRQ2 (c1-7) - TRQG (c1-8) | Center position | 2.3 to 2.7 V |
| TRQ1 (c1-5) - TRQG (c1-8) | Turned to right | 2.5 to 4.7 V |

| Tester Connection | Condition (Steering Position) | Specified Condition |
|---------------------------|-------------------------------|---------------------|
| TRQ2 (c1-7) - TRQG (c1-8) | Turned to right | 2.5 to 4.7 V |
| TRQ1 (c1-5) - TRQG (c1-8) | Turned to left | 0.3 to 2.5 V |
| TRQ2 (c1-7) - TRQG (c1-8) | Turned to left | 0.3 to 2.5 V |

NG

REPLACE STEERING COLUMN ASSEMBLY

OK

REPLACE POWER STEERING ECU

| | | |
|------------|-----------------|---------------------------------------------------------------|
| DTC | C1515/15 | Torque Sensor Zero Point Adjustment is not Initialized |
|------------|-----------------|---------------------------------------------------------------|

DESCRIPTION

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

| DTC No. | DTC Detection Condition | Trouble Area |
|----------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| C1515/15 | Torque sensor zero point calibration not performed. | <ul style="list-style-type: none"> Torque sensor zero point calibration Steering column assembly |

INSPECTION PROCEDURE

| | |
|----------|-------------------------------------------------------|
| 1 | PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR) |
|----------|-------------------------------------------------------|

NEXT

| | |
|----------|--------------------|
| 2 | CONFIRM DTC |
|----------|--------------------|

(a) Check for DTCs (See page [PS-25](#)).

Result

| | |
|--------------------------------------------------------------------------------------------|----------|
| DTC still output even after performing torque sensor zero point calibration 3 times. | A |
| DTC still output even after performing torque sensor zero point calibration once or twice. | B |
| Normal system code output. | C |

HINT:

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

B

Go to step 1

C

END

A

REPLACE STEERING COLUMN ASSEMBLY

| | | |
|------------|-----------------|-------------------------------------------------------|
| DTC | C1516/16 | Torque Sensor Zero Point Adjustment Incomplete |
|------------|-----------------|-------------------------------------------------------|

DESCRIPTION

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

| DTC No. | DTC Detection Condition | Trouble area |
|----------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| C1516/16 | Torque sensor zero point calibration not completed successfully. | <ul style="list-style-type: none"> Torque sensor zero point calibration failure Steering column assembly |

INSPECTION PROCEDURE

| | |
|----------|------------------|
| 1 | CLEAR DTC |
|----------|------------------|

NEXT

| | |
|----------|----------------------------------------------------------|
| 2 | PERFORM INITIALIZATION (TORQUE SENSOR ZERO POINT) |
|----------|----------------------------------------------------------|

NEXT

| | |
|----------|-------------------------------------------------------|
| 3 | PERFORM ZERO POINT CALIBRATION (TORQUE SENSOR) |
|----------|-------------------------------------------------------|

NEXT

| | |
|----------|--------------------|
| 4 | CONFIRM DTC |
|----------|--------------------|

(a) Check for DTCs (See page [PS-25](#)).

Result

| | |
|--------------------------------------------------------------------------------------------|----------|
| DTC still output even after performing torque sensor zero point calibration 3 times. | A |
| DTC still output even after performing torque sensor zero point calibration once or twice. | B |
| Normal system code output. | C |

HINT:

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

B

Go to step 1

C

END

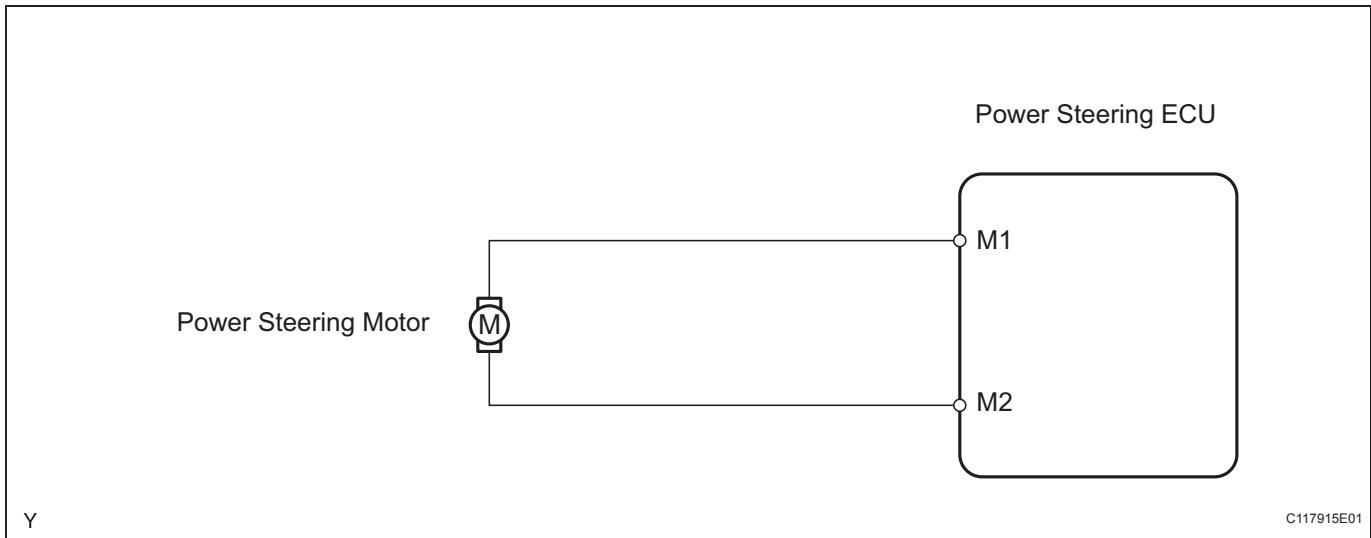
A

REPLACE STEERING COLUMN ASSEMBLY

DTC**C1524/24****Motor Circuit Malfunction****DESCRIPTION**

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

| DTC No. | DTC Detection Condition | Trouble Area |
|----------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| C1524/24 | Short (or open) in motor circuit or abnormal voltage or current in motor circuit. | <ul style="list-style-type: none"> Steering column assembly Power steering ECU |

WIRING DIAGRAM**INSPECTION PROCEDURE****1****READ VALUE OF DATA LIST (MOTOR ACTUAL CURRENT)**

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch on and turn the tester on.
- Select the items [MOTOR ACTUAL CURRENT] and [COMMAND VALUE] in the DATA LIST and read the value displayed on the intelligent tester.

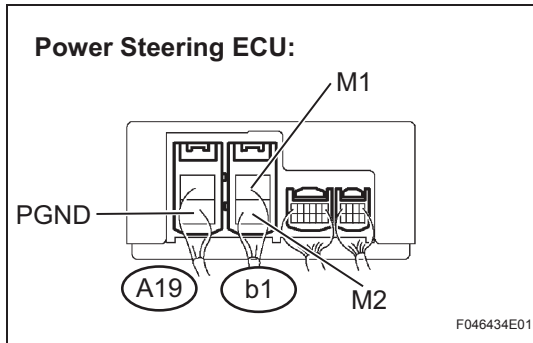
Standard current

| Data List Item | Steering Position (Left Turned) | Steering Position (Center) | Steering Position (Right Turned) |
|----------------|------------------------------------|-------------------------------|-------------------------------------|
| MOTOR ACTUAL | 10 A to 55 A | -1 A to +1 A | -55 A to -10 A |
| COMMAND VALUE | 55 A | 0 A | -55 A |

HINT:

The current changes when steering wheel is turned.

OK**CHECK INTERMITTENT PROBLEMS****NG****PS**

2 INSPECT POWER STEERING ECU

- (a) Turn the ignition switch on.
 (b) Measure the voltage.

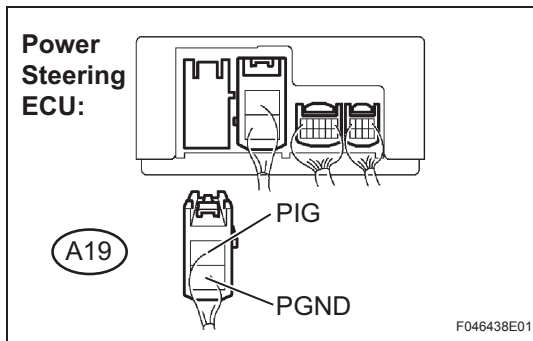
Standard voltage

| Tester Connection | Condition (Steering Position) | Specified Condition |
|--------------------------|-------------------------------|---------------------|
| M1 (b1-1) - PGND (A19-2) | Turned to right | Below 1 V |
| M1 (b1-1) - PGND (A19-2) | Turned to left | 11 to 14 V |
| M2 (b1-2) - PGND (A19-2) | Turned to right | 11 to 14 V |
| M2 (b1-2) - PGND (A19-2) | Turned to left | Below 1 V |

OK

Go to step 4

NG

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

- (a) Disconnect the connector from the power steering ECU.
 (b) Measure the resistance and the voltage.

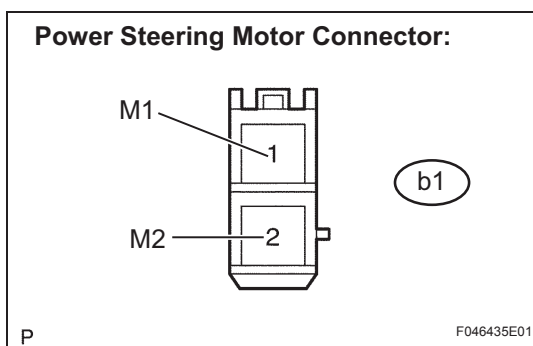
Standard

| Tester Connection | Condition | Specified Condition |
|----------------------------|---------------------|---------------------|
| PGND (A19-2) - Body ground | Always | Below 1 Ω |
| PIG (A19-1) - Body ground | Ignition switch on. | 11 to 14 V |

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4 INSPECT STEERING COLUMN ASSEMBLY (POWER STEERING MOTOR)

- (a) Disconnect the connector from the power steering ECU.
 (b) Measure the resistance.

Standard resistance

| Tester Connection | Condition | Specified Condition |
|-------------------------|-----------|------------------------|
| M1 (b1-1) - M2 (b1-2) | Always | 0.08 to 0.15 Ω |
| M1 (b1-1) - Body ground | Always | 1 M Ω or higher |
| M2 (b1-2) - Body ground | Always | 1 M Ω or higher |

NG

REPLACE STEERING COLUMN ASSEMBLY

PS

OK

REPLACE POWER STEERING ECU

| | | |
|------------|-----------------|-------------------------------------------|
| DTC | C1531/31 | EPS ECU Circuit Malfunction |
| DTC | C1532/32 | EPS ECU Circuit Malfunction |
| DTC | C1533/33 | EPS ECU Circuit Malfunction |
| DTC | C1534/34 | EPS ECU Circuit Malfunction |
| DTC | C1535/35 | Steering Wheel Location Data Error |

DESCRIPTION

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

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

INSPECTION PROCEDURE

| | |
|----------|--------------------|
| 1 | CONFIRM DTC |
|----------|--------------------|

(a) Check for DTCs.

OK:

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

NG

REPAIR CIRCUITS INDICATED BY OUTPUT DTCs

OK

REPLACE POWER STEERING ECU

| | | |
|------------|-----------------|-------------------------------------------------|
| DTC | C1541/41 | Speed Sensor Malfunction |
| DTC | C1542/42 | Speed Sensor Malfunction |
| DTC | C1571/71 | Speed Sensor Malfunction (Test Mode DTC) |

DESCRIPTION

The power steering ECU controls the assisting power in accordance with the vehicle speed signals from the combination meter.

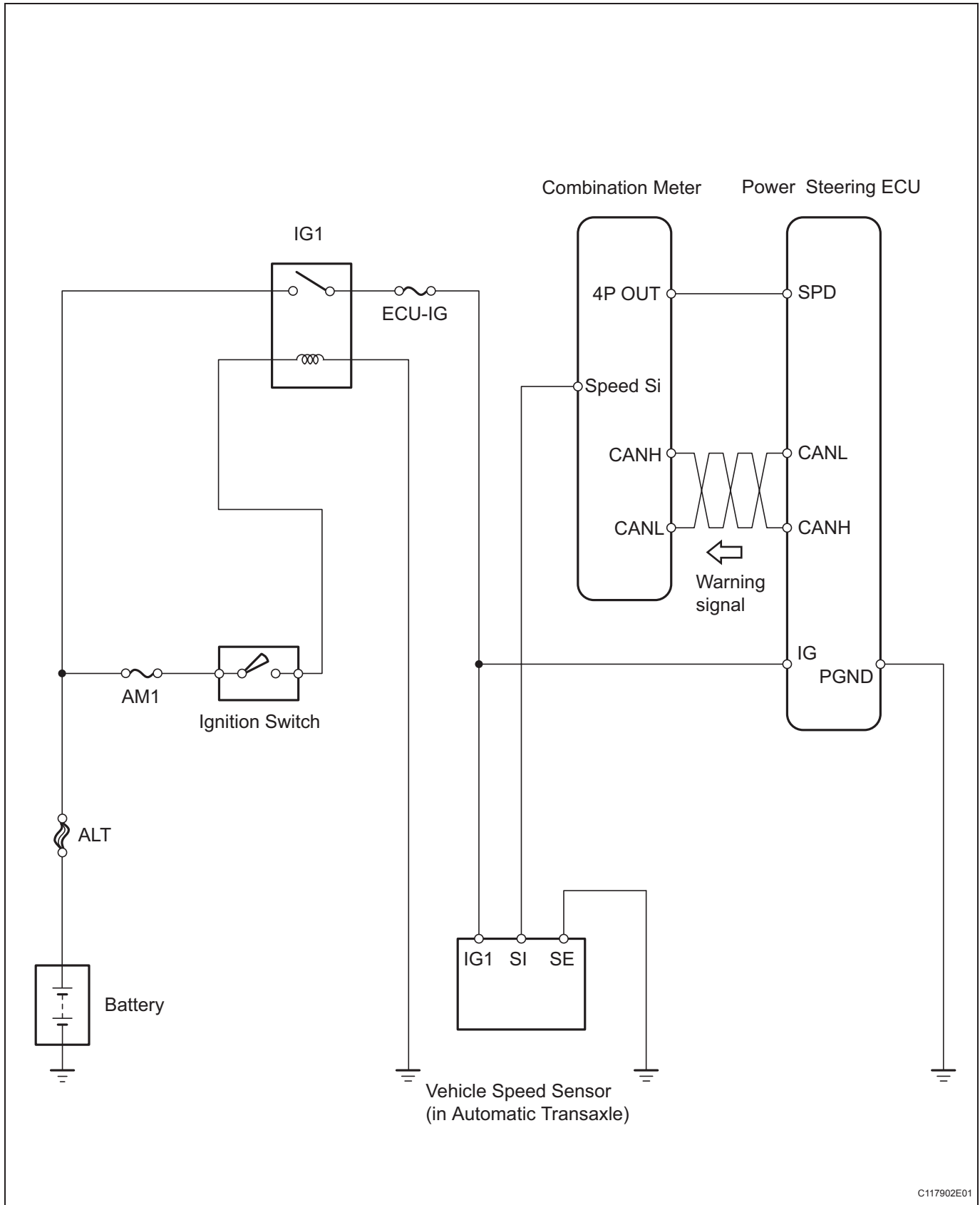
HINT:

These DTCs are only for vehicles without a skid control ECU (ABS ECU).

When the sensor is normal, a pulse signal (43 Hz at 37 mph [60 km/h]) that alternates between 0 V and 5 V is transmitted to the ECU.

| DTC No. | Detection Item | Trouble Area |
|----------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C1541/41 | Speed sensor malfunction. | <ul style="list-style-type: none"> • Speed sensor • Speed sensor circuit • Combination meter • Power steering ECU |
| C1542/42 | | |
| C1571/71 | Speed sensor malfunction (Test mode). | |

WIRING DIAGRAM



C117902E01

PS

INSPECTION PROCEDURE

HINT:

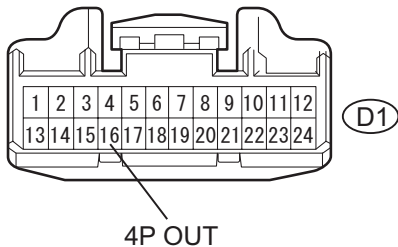
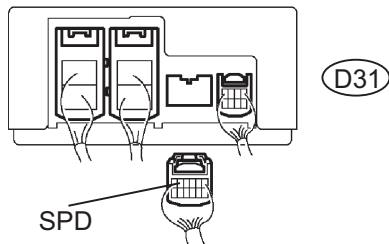
Confirm that DTC C1571/71 has been cleared by activating test mode after the repair is completed.

1 READ VALUE OF DATA LIST (SPD)

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch on and turn the tester on.
- Select the item [SPD] in the DATA LIST and read the value displayed on the intelligent tester.
- Drive the vehicle and check that there is no significant difference between the speed value displayed by the intelligent tester and the speed value displayed by the speedometer.

OK:**Speed values are same.****HINT:**

There is tolerance of + - 10 % in the speedometer indication.

OK**CHECK INTERMITTENT PROBLEMS****NG****2 CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - COMBINATION METER)****Combination Meter (harness side):****Power steering ECU:**

C122913E01

- Disconnect the connectors from the power steering ECU and the combination meter.
- Measure the resistance.

Standard resistance

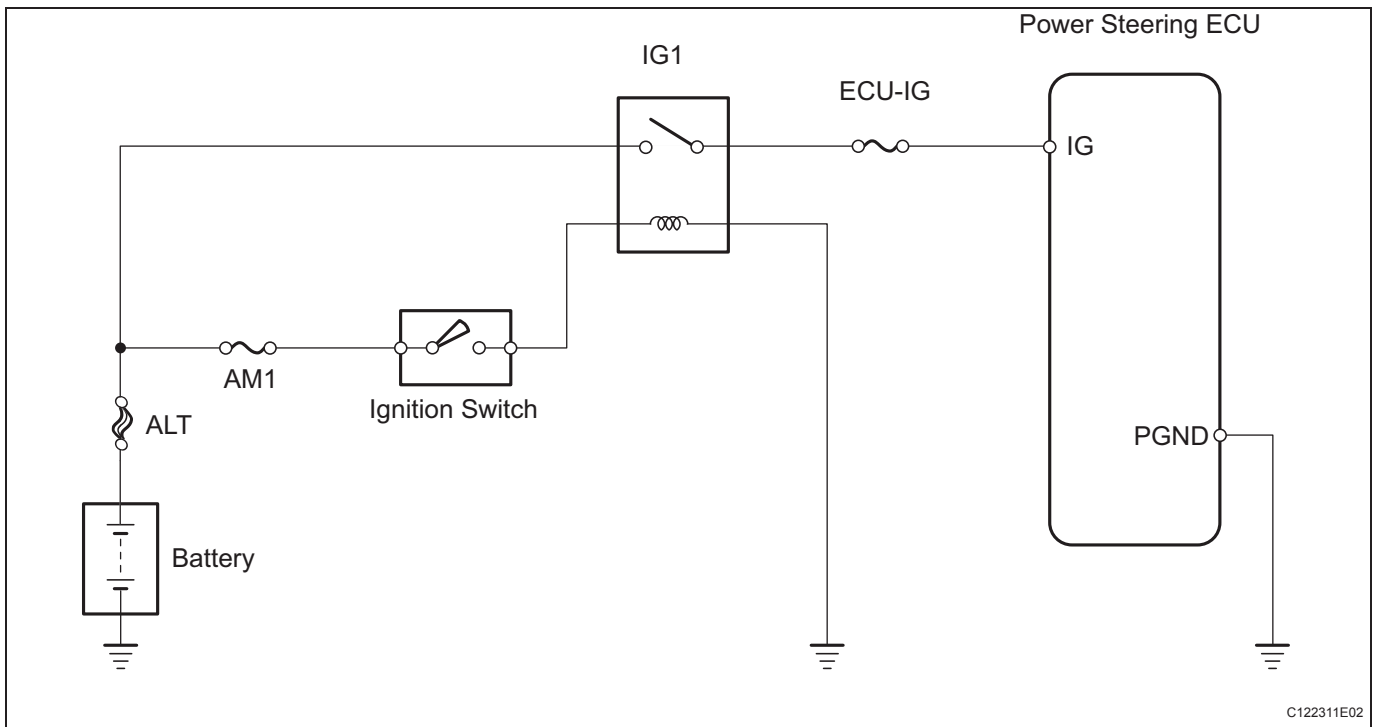
| Tester Connection | Condition | Specified Condition |
|------------------------------|-----------|-------------------------|
| SPD (D31-5) - 4P OUT (D1-16) | Always | Below 1 Ω |
| SPD (D31-5) - Body ground | Always | 10 k Ω or higher |

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****GO TO COMBINATION METER SYSTEM**

DTC**C1551/51****IG Power Source Circuit Malfunction****DESCRIPTION**

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

| DTC No. | DTC Detection Condition | Trouble Area |
|----------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| C1551/51 | Open or short in IG power source circuit with ignition switch on. | <ul style="list-style-type: none"> ECU-IG fuse IG power source circuit Power steering ECU |

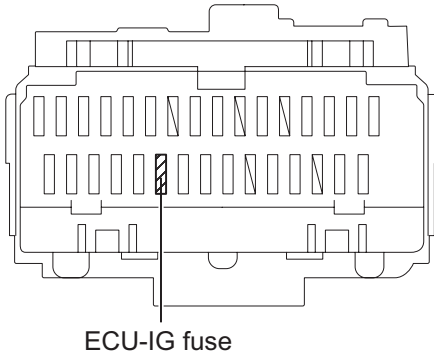
WIRING DIAGRAM**INSPECTION PROCEDURE****1****READ VALUE OF DATA LIST (IG SUPPLY)**

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch on and turn the tester on.
- Select the item [IG SUPPLY] in the DATA LIST and read the value displayed on the intelligent tester.

Standard voltage:**11 to 14 V****OK****CHECK INTERMITTENT PROBLEMS****NG****PS**

2 INSPECT FUSE (ECU-IG)

**Main Body ECU
(Instrument Panel Junction Block):**



Y

C120678E01

- (a) Remove the ECU-IG fuse from the instrument panel J/B.
- (b) Check the resistance of the fuse.

Standard resistance:

Below 1 Ω

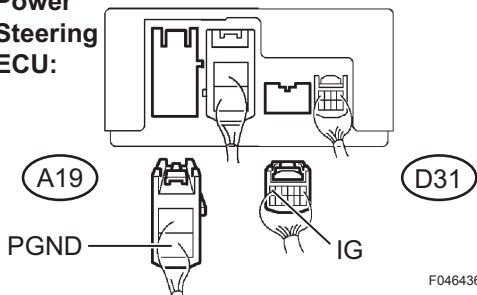
NG

**INSPECT SHORT CIRCUIT IN COMPONENTS
AND WIRES CONNECTED TO FUSE**

OK

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

**Power
Steering
ECU:**



F046436E01

- (a) Disconnect the connectors from the power steering ECU.
- (b) Measure the voltage and the resistance.

Standard

| Tester Connection | Condition | Specified Condition |
|----------------------------|--------------------|---------------------|
| IG (D31-6) - Body ground | Ignition switch on | 11 to 14 V |
| PGND (A19-2) - Body ground | Always | Below 1 Ω |

NG

**REPAIR OR REPLACE HARNESS OR
CONNECTOR**

OK

REPLACE POWER STEERING ECU

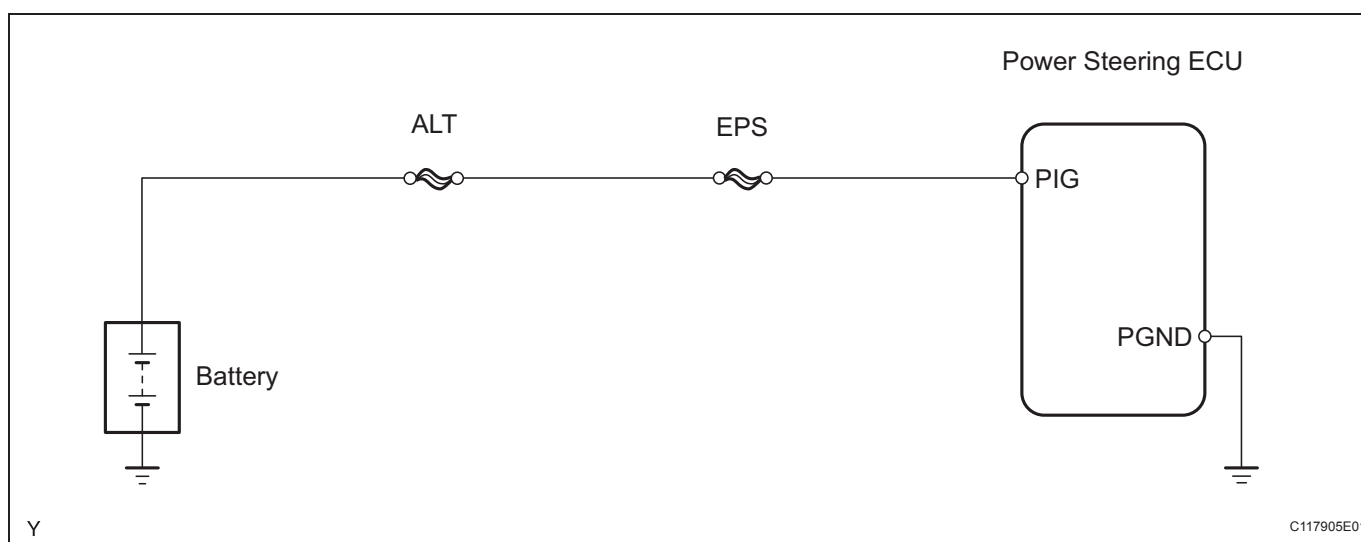
| | | |
|------------|-----------------|--------------------------------------------------------|
| DTC | C1552/52 | PIG Power Source Circuit |
| DTC | C1553/53 | When Resetting Voltage, Vehicle is Being Driven |
| DTC | C1554/54 | EPS Relay Circuit |
| DTC | C1555/55 | EPS Motor Relay Circuit |

DESCRIPTION

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

| DTC No. | DTC Detection Condition | Trouble Area |
|----------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| C1552/52 | PIG power source circuit malfunction | <ul style="list-style-type: none"> • EPS fuse • PIG power source circuit • Power steering ECU |
| C1553/53 | Abnormal overvoltage | <ul style="list-style-type: none"> • IG and PIG power source circuit • Power steering ECU |
| C1554/54 | Power source relay circuit malfunction | <ul style="list-style-type: none"> • EPS fuse • PIG power source circuit • Power steering ECU |
| C1555/55 | Motor relay circuit malfunction | <ul style="list-style-type: none"> • Power steering ECU |

WIRING DIAGRAM



INSPECTION PROCEDURE

| | |
|----------|---------------------------------------------|
| 1 | READ VALUE OF DATA LIST (PIG SUPPLY) |
|----------|---------------------------------------------|

- Connect the intelligent tester to the DLC3.
- Select the item [PIG SUPPLY] in the DATA LIST and read the value displayed on the intelligent tester.

Standard voltage:
Always 11 to 14 V

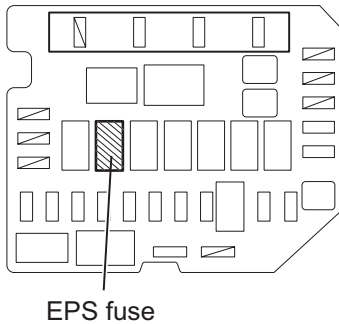
OK

CHECK INTERMITTENT PROBLEMS

NG

2 INSPECT FUSE (EPS FUSE)

Engine Room R/B:



C117909E01

- (a) Remove the EPS fuse from the engine room R/B.
- (b) Measure the resistance of the fuse.

Standard resistance:
Below 1 Ω

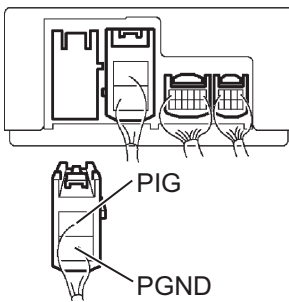
NG

INSPECT SHORT CIRCUIT IN COMPONENTS AND WIRES CONNECTED TO FUSE

OK

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

Power Steering ECU:



F046438E02

- (a) Disconnect the connector from the power steering ECU.
- (b) Measure the voltage and the resistance.

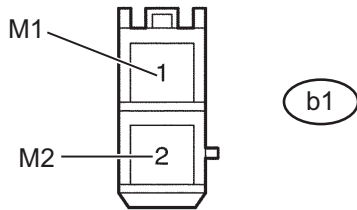
Standard

| Tester Connection | Condition | Specified Condition |
|----------------------------|-----------|---------------------|
| PIG (A19-1) - Body ground | Always | 11 to 14 V |
| PGND (A19-2) - Body ground | Always | Below 1 Ω |

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4 INSPECT STEERING COLUMN ASSEMBLY (POWER STEERING MOTOR)**Power Steering Motor Connector:**

- (a) Disconnect the connector from the power steering ECU.
(b) Measure the resistance.

Standard resistance

| Tester Connection | Condition | Specified Condition |
|-------------------------|-----------|------------------------|
| M1 (b1-1) - M2 (b1-2) | Always | 0.08 to 0.15 Ω |
| M1 (b1-1) - Body ground | Always | 1 M Ω or higher |
| M2 (b1-2) - Body ground | Always | 1 M Ω or higher |

NG**REPLACE STEERING COLUMN ASSEMBLY****OK****REPLACE POWER STEERING ECU**

DTC**C1581/81****Assist Map Un-Writing****DESCRIPTION**

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

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

HINT:

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

| DTC No. | DTC Detection Condition | Trouble Area |
|----------|----------------------------------------------|--------------------|
| C1581/81 | Assist map not written in power steering ECU | Power steering ECU |

INSPECTION PROCEDURE**1****CONFIRM DTC**

(a) Check for DTCs (See page [PS-25](#)).

OK:

DTCs other than C1581/81 are not output.

NG

REPAIR CIRCUITS INDICATED BY OUTPUT DTCs

OK

REPLACE POWER STEERING ECU

| | | |
|------------|--------------|----------------------------------------------------------------------------|
| DTC | U0073 | Control Module Communication Bus OFF |
| DTC | U0105 | Lost Communication with ECM |
| DTC | U0121 | Lost Communication with Anti-lock Brake System (ABS) Control Module |

DESCRIPTION

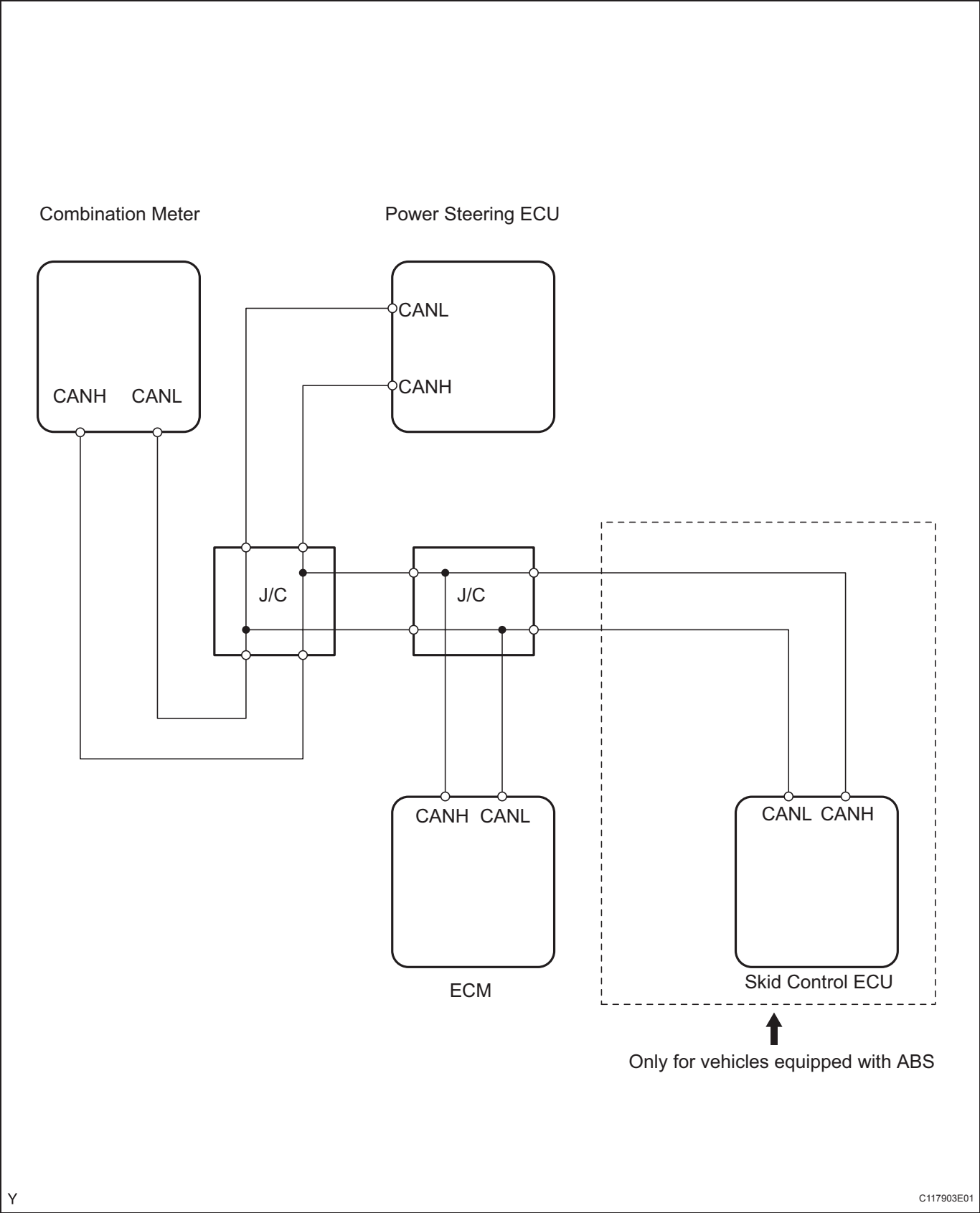
The power steering ECU receives signals from the ECM and the skid control ECU (ABS ECU) via the CAN communication system.

| DTC No. | DTC Detection Condition | Trouble Area |
|----------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| U0073 | CAN communication error (CAN bus off) | <ul style="list-style-type: none"> • CAN communication system |
| U0105 | ECM communication error | <ul style="list-style-type: none"> • CAN communication system • ECM |
| U0121 | Skid control ECU (ABS ECU) communication error | <ul style="list-style-type: none"> • CAN communication system • Skid control ECU (ABS ECU) |

HINT:

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

WIRING DIAGRAM



INSPECTION PROCEDURE**1 CONFIRM DTC**

(a) Check for DTCs (See page [PS-25](#)).

OK:

DTCs other than U0073, U0105 and U0121 are not output.

NG

REPAIR CIRCUITS INDICATED BY OUTPUT DTCS

OK

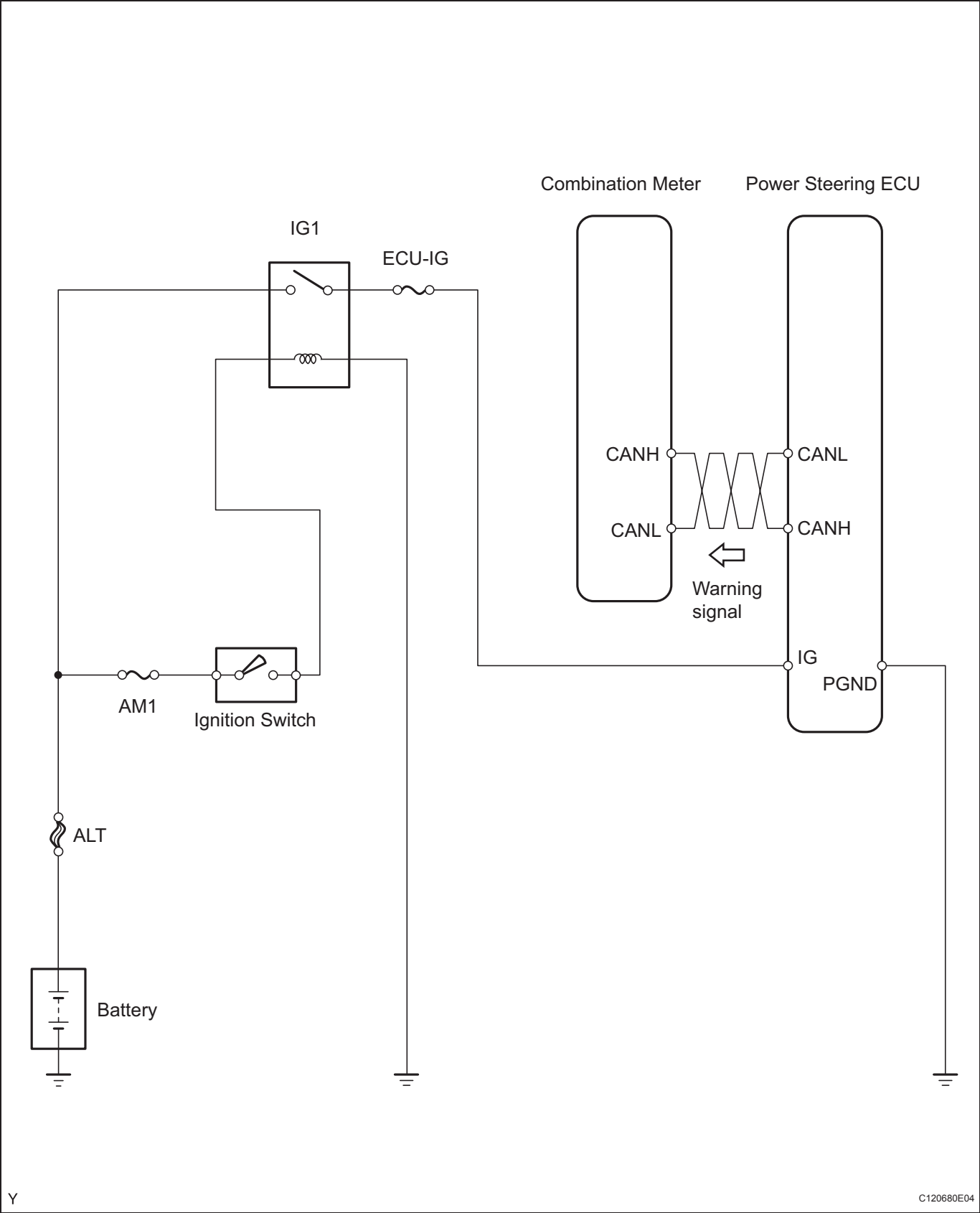
GO TO CAN COMMUNICATION SYSTEM

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



INSPECTION PROCEDURE

1 INSPECT CAN COMMUNICATION SYSTEM

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

OK:

DTCs are not output.

NG

GO TO CAN COMMUNICATION SYSTEM

OK

2 READ VALUE OF DATA LIST (IG SUPPLY)

- (a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch on and turn the tester on.
(c) Select the item [IG SUPPLY] in the DATA LIST and read value displayed on the intelligent tester.

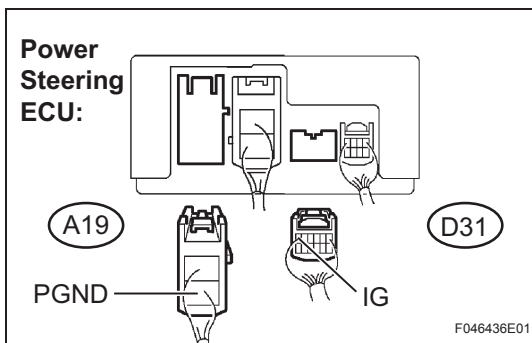
Standard voltage:

11 to 14 V

NG

**INSPECT POWER SOURCE CIRCUIT (IG)
(See page PS-45)**

OK

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

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

- (b) Measure the voltage and the resistance.

Standard

| Tester Connection | Condition | Specified Condition |
|----------------------------|--------------------|---------------------|
| IG (D31-6) - Body ground | Ignition switch on | 11 to 14 V |
| PGND (A19-2) - Body ground | Always | Below 1 Ω |

NG

REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4 REPLACE POWER STEERING ECU

NOTICE:

After replacing the power steering ECU, perform the torque sensor zero point calibration.

PS

NEXT

5 CHECK PS WARNING LIGHT (COMBINATION METER)

- (a) Check that the P/S warning light on the combination meter does not come on.

OK:

The P/S warning light does not come on.

NG

REPLACE COMBINATION METER

OK

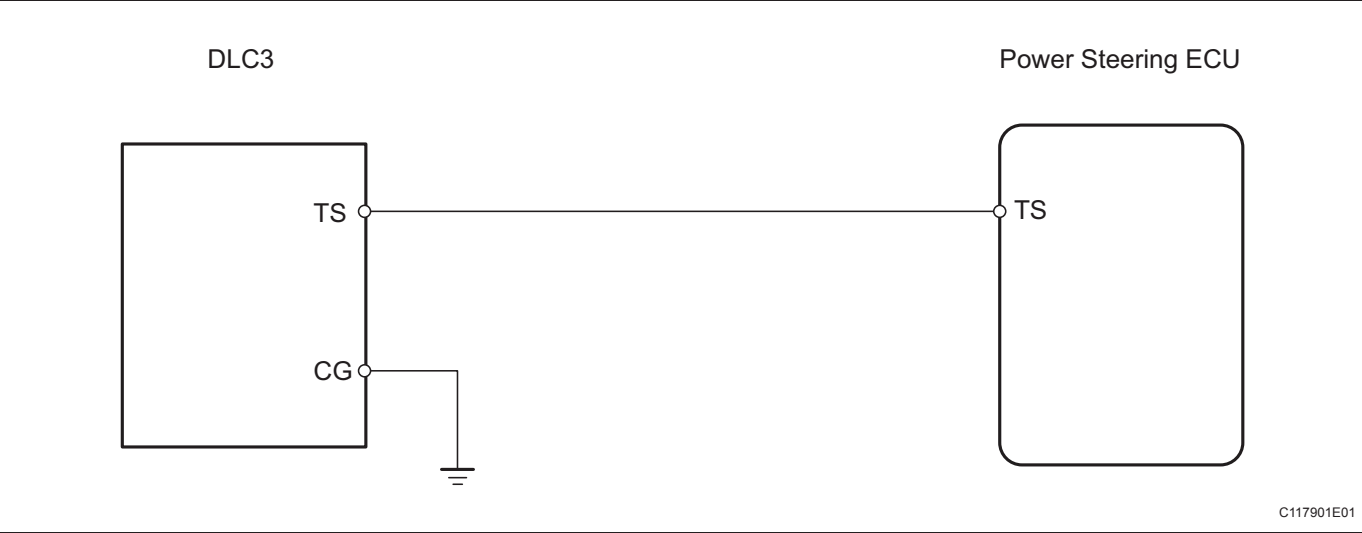
END

TS and CG Terminal Circuit

DESCRIPTION

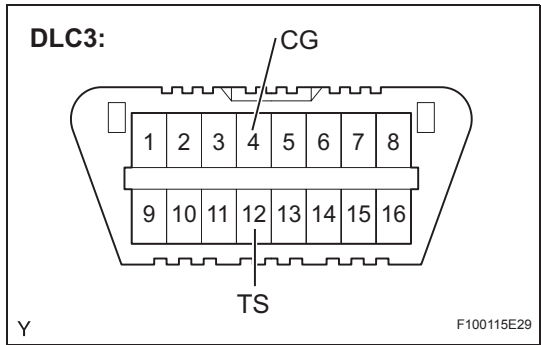
The power steering ECU can be changed from normal mode to the mode for the torque sensor zero point calibration by turning the ignition switch on after the DLC3 TS and CG terminals have been connected.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT DLC3 TERMINAL VOLTAGE

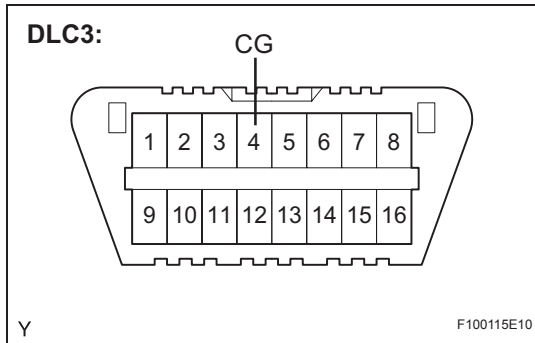


- (a) Turn the ignition switch on.
- (b) Measure the voltage.

Standard voltage

| Tester Connection | Specified Condition |
|-------------------|---------------------|
| TS (12) - CG (4) | 11 to 14 V |

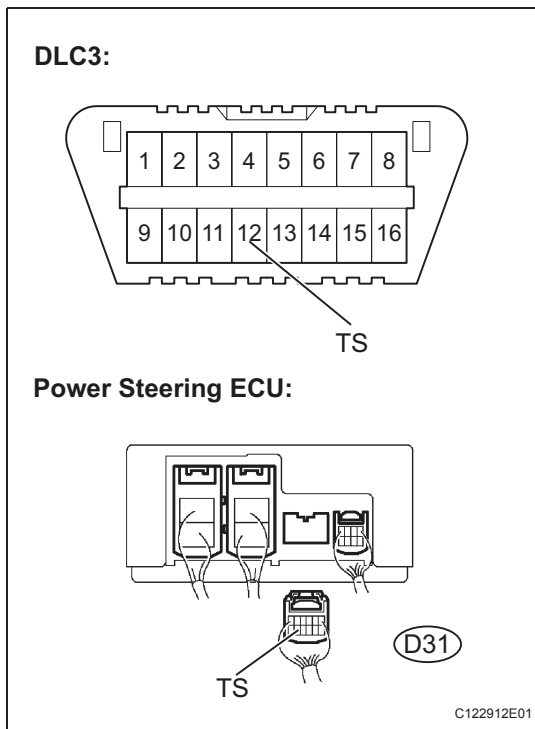


2 CHECK HARNESS AND CONNECTOR (DLC3 - BODY GROUND)

(a) Measure the resistance.

Standard resistance

| Tester Connection | Specified Condition |
|----------------------|---------------------|
| CG (4) - Body ground | Below 1 Ω |

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****3 CHECK HARNESS AND CONNECTOR (POWER STEERING ECU - DLC3)**

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

(b) Measure the resistance.

Standard resistance

| Tester Connection | Specified Condition |
|---------------------------|-------------------------|
| TS (D31-11) - TS (12) | Below 1 Ω |
| TS (D31-11) - Body ground | 10 k Ω or higher |

NG**REPAIR OR REPLACE HARNESS OR CONNECTOR****OK****REPLACE POWER STEERING ECU**