

MULTIPLEX COMMUNICATION SYSTEM

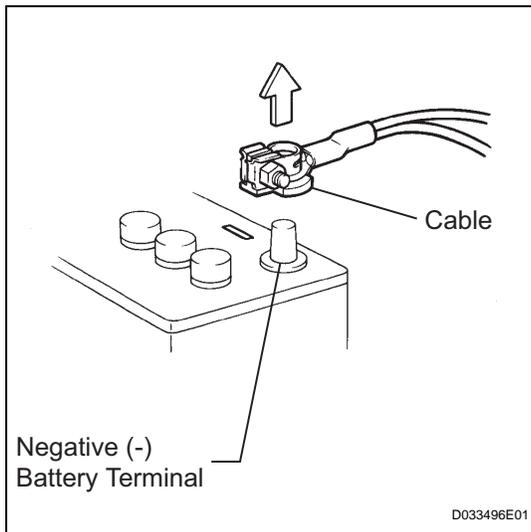
PRECAUTION

1. DISCONNECT AND RECONNECT CABLE OF NEGATIVE BATTERY TERMINAL

NOTICE:

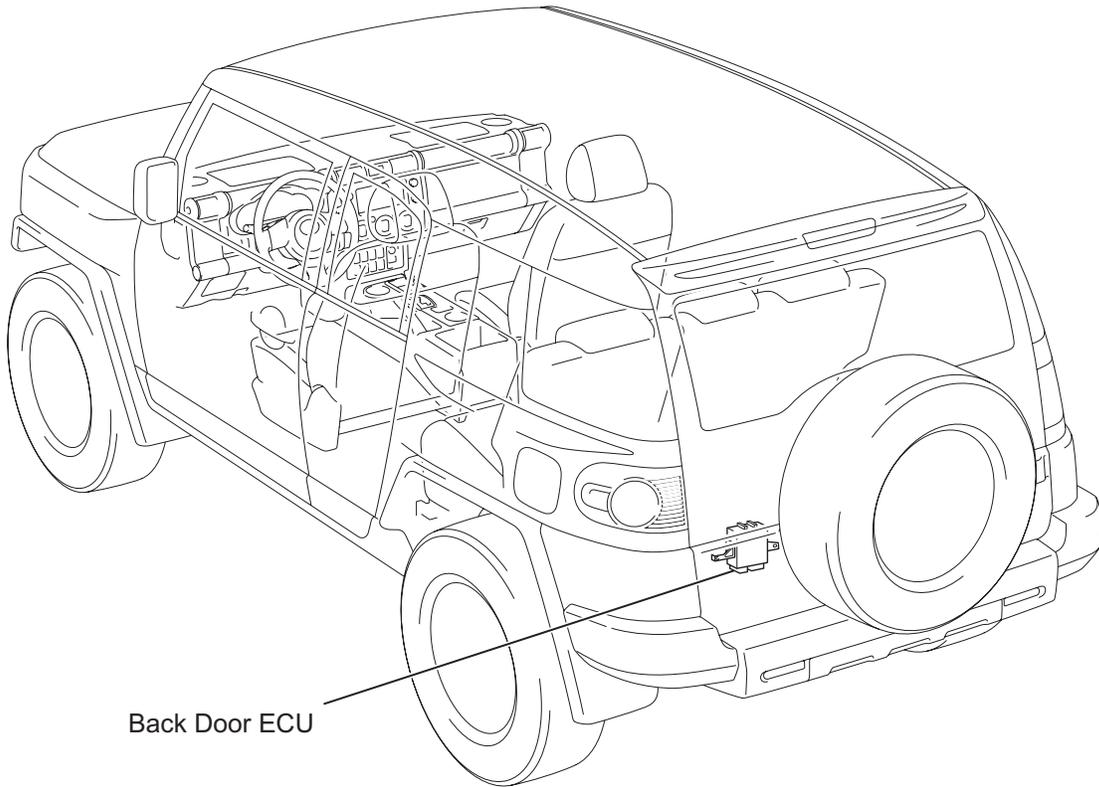
When disconnecting the cable from the negative (-) battery terminal, initialize the following systems after the cable is reconnected.

System Name	See procedure
METER / GAUGE SYSTEM	See page ME-10

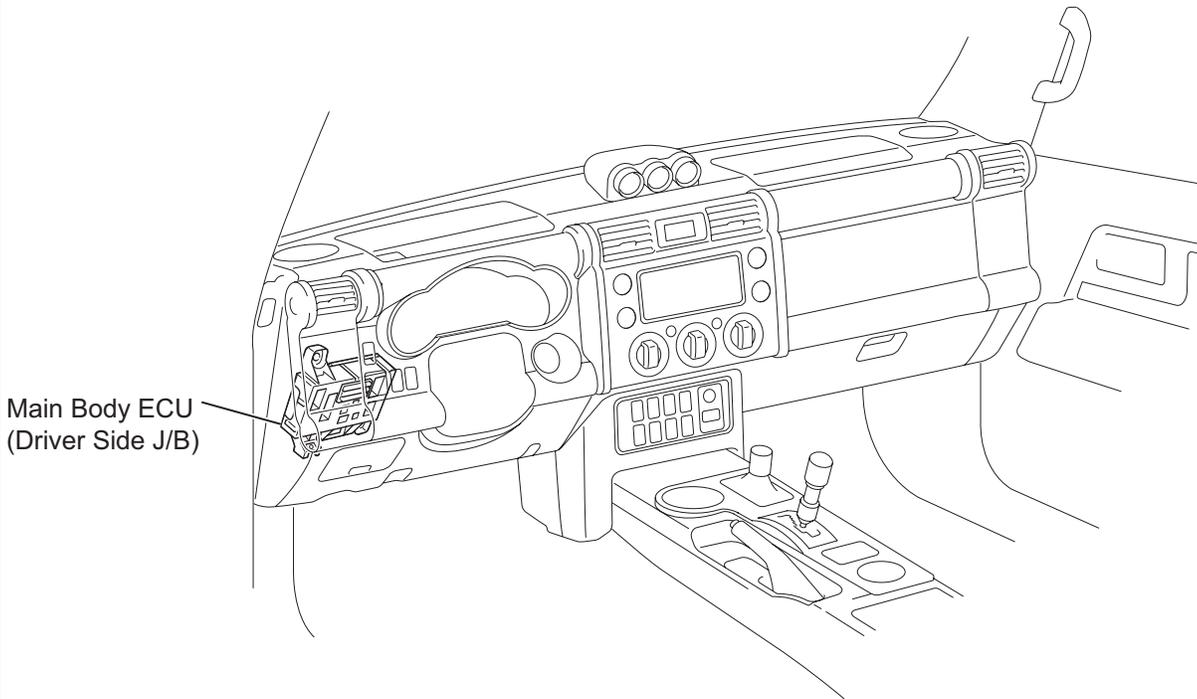


- (a) Before performing electronic work, disconnect the cable from the negative (-) battery terminal in order to prevent it from shorting and burning out.
- (b) Before disconnecting and reconnecting the battery cable, turn the ignition switch OFF and the headlight dimmer switch OFF. Then loosen the terminal nut completely. Do not damage the cable or terminal.
- (c) When the battery cable is disconnected, the clock and radio settings and stored DTCs are erased. Therefore, before disconnecting the battery cable, make a notes of them.

PARTS LOCATION

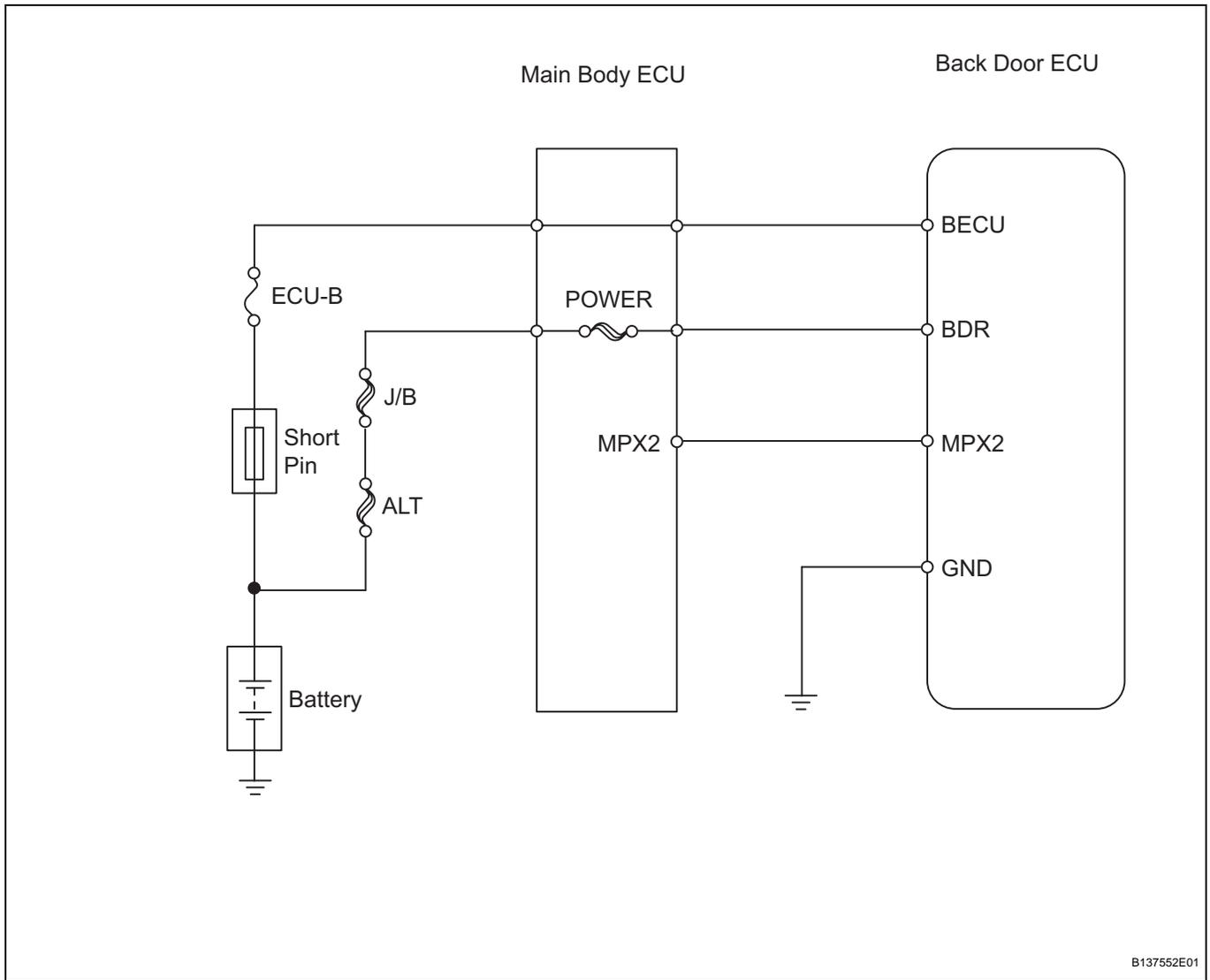


Back Door ECU



Main Body ECU
(Driver Side J/B)

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

1. MULTIPLEX COMMUNICATION SYSTEM (BEAN)

- (a) The BEAN communication line consists of 2 systems: One is a system with a loop-shaped line that links the back door ECU with the main body ECU, which is located in the center of the line. Since the line for the back door ECU is loop-shaped, communication can be maintained by the line that is not open even if part of the line becomes open for some reason. In the case that there is a short-circuit (bus-down) in the line, however, all the BEAN communication becomes impossible in the system and some DTCs are output.

HINT:

- When bus-down occurs, communication from the related ECU stops. Therefore, DTCs cannot be output, so perform a DTC (SAE code) inspection using the intelligent tester.
- The back door ECU has a single communication line. Therefore, if the line has a short-circuit (bus-down), the BEAN communication will be impossible and DTCs will not be output, either.

2. CHECK COMMUNICATION FUNCTION

- (a) Check the battery voltage.

Standard voltage:

11 to 14 V

- (b) Inspect the DTC output.

- (1) Check for DTCs concerning the main body ECU by connecting the intelligent tester to the DLC3 and turning the ignition switch ON.
- (2) When the display shows DTCs concerning the ECU being unconnected and the communication bus defective, perform the inspection depending on the troubleshooting procedures.

HINT:

When other DTCs are output, refer to the DTC table and check the applicable section.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- Use this procedure to troubleshoot the multiplex communication system.
- The intelligent tester should be used in step 2.

1 VEHICLE BROUGHT TO WORKSHOP

NEXT

2 CHECK FOR DTC

- (a) Check for DTCs and note any codes that are output.
- (b) Delete the DTC.
- (c) Recheck for DTCs. Try to prompt the DTC by simulating the original activity that the DTC suggests.

Result

Result	Proceed to
DTC does not recur	A
DTC recurs	B

B GO TO DTC CHART

A

3 OVERALL ANALYSIS AND TROUBLESHOOTING

- (a) Terminals of ECU (See page [MP-6](#)).

NEXT

4 ADJUST, REPAIR OR REPLACE

NEXT

5 CONFIRMATION TEST

NEXT

END

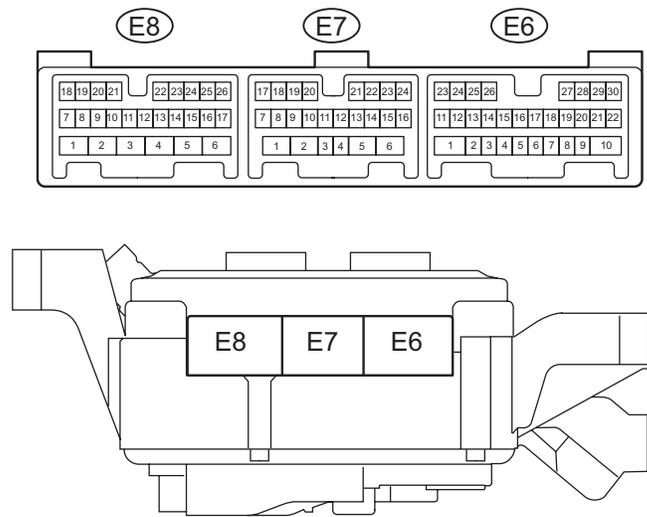
TERMINALS OF ECU

1. CHECK MAIN BODY ECU

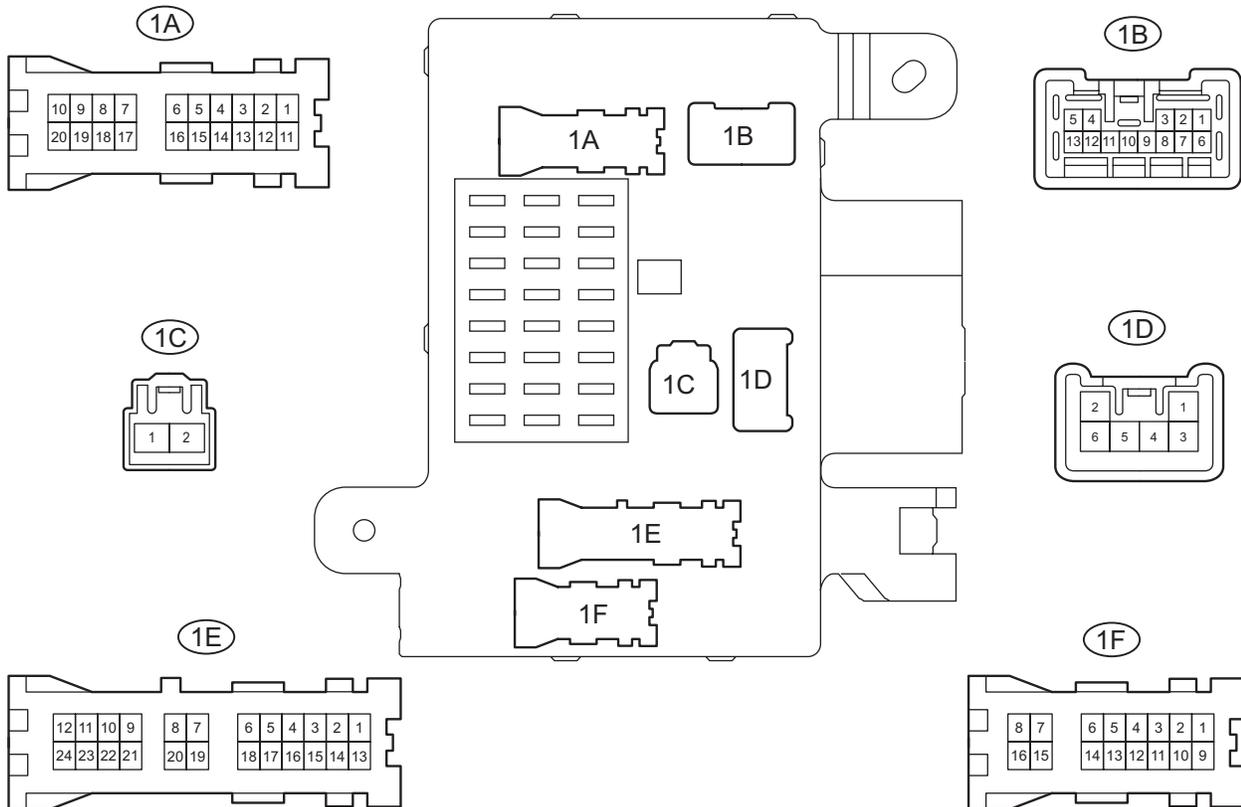
- (a) Disconnect the 1B, 1E, 1F, 1L and E6 main body ECU connectors.

Main Body ECU:

Left View:

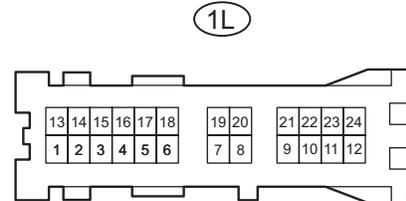
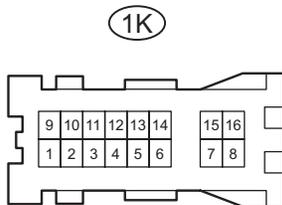
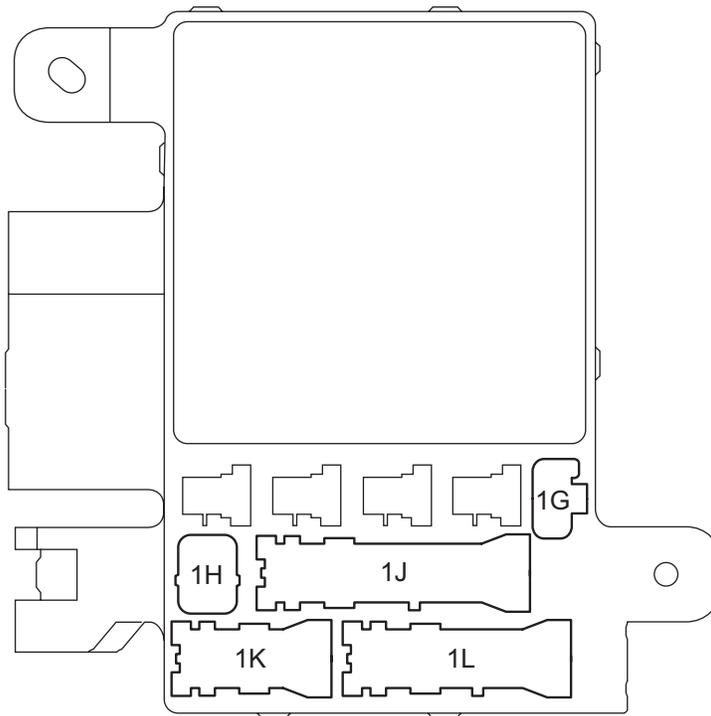
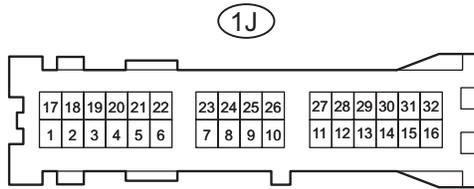
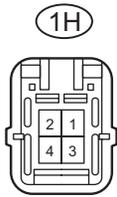


Rear View:



MP

Main Body ECU: Front View:



- (b) Measure the voltage of the wire harness side connectors.

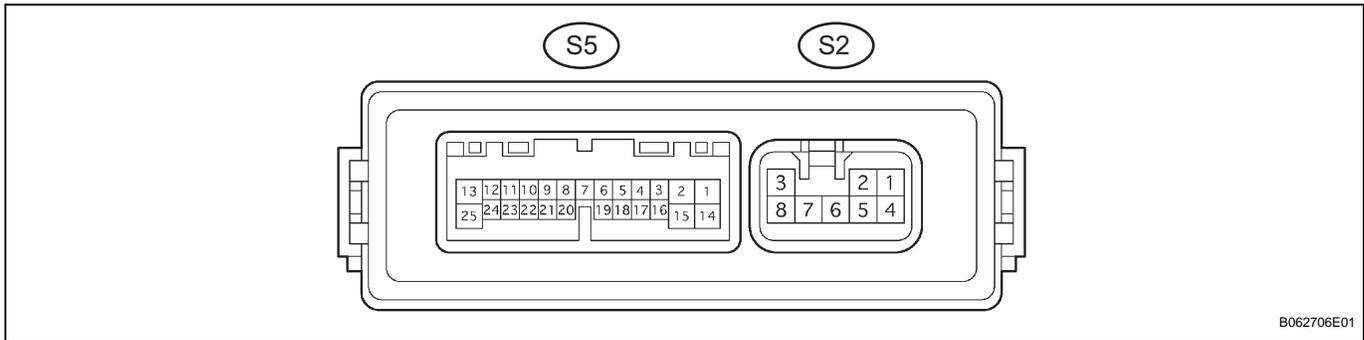
Standard voltage:

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
BECU (1B-4) - Body ground	W-R - Body ground	Power source (+B)	Always	11 to 14 V
BECU (1L-4) - Body ground	W-R - Body ground	Power source (+B)	Always	11 to 14 V
BECU (1F-12) - Body ground	W-R - Body ground	Power source (+B)	Always	11 to 14 V
BDR1 (1E-9) - Body ground	B-Y - Body ground	Power source (+B)	Always	11 to 14 V
MPX2 (E6-23) - Body ground	BR-R - Body ground	Multiplex communication signal	During communication	Signal waveform

If the result is not as specified, there may be a malfunction on the wire harness side.

2. CHECK BACK DOOR ECU

- (a) Disconnect the S2 ECU connector.



- (b) Measure the voltage of the wire harness side connector.

Standard voltage:

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
GND (S2-3) - Body ground	W-B - Body ground	Ground for main power supply	Ground for main power supply	Below 1 V
BECU (S2-5) - GND (S2-3)	W-R - W-B	Power source (+B)	Always	11 to 14 V
BDR (S2-4) - GND (S2-3)	L-O - W-B	Power source (+B)	Always	11 to 14 V
MPX2 (S2-1) - Body ground	BR-R - Body ground	Multiplex communication signal	During communication	Signal waveform
SIG (S2-6) - Body ground	B-R - Body ground	Power source (IG)	Ignition switch ON	11 to 14 V

If the result is not as specified, there may be a malfunction on the wire harness side.

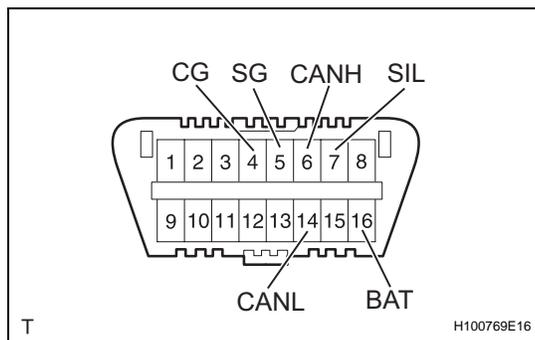
DIAGNOSIS SYSTEM

1. DESCRIPTION

- (a) The main body ECU controls the functions of the multiplex communication system on the vehicle. Data of the multiplex communication system and the Diagnostic Trouble Codes (DTC) can be read through the Data Link Connector 3 (DLC3) of the vehicle.

2. CHECK DLC3

- (a) The ECU uses ISO 15765-4 for communication. The terminal arrangement of the DLC3 complies with ISO 15031-3 and matches the ISO 15765-4 format.

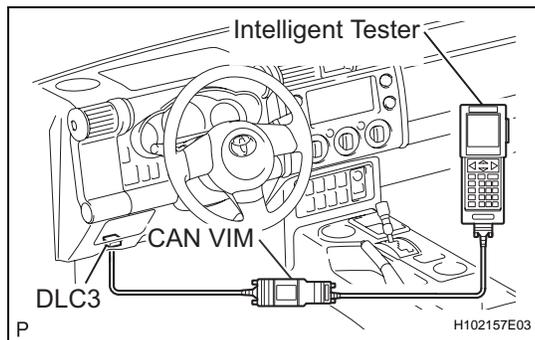


Symbols (Terminal No.)	Terminal Description	Condition	Specified Condition
SIL (7) - SG (5)	Bus "+" line	During transmission	Pulse generation
CG (4) - Body ground	Chassis ground	Always	Below 1 Ω
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	11 to 14 V
CANH (6) - CANL (14)	HIGH-level 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 more
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch OFF*	200 Ω or more
CANH (6) - BAT (16)	HIGH-level CAN bus line	Ignition switch OFF*	6 kΩ or more
CANL (14) - BAT (16)	LOW-level CAN bus line	Ignition switch OFF*	6 kΩ or more

CAUTION:

*: 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.



- (b) Intelligent tester

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 may be in the tester itself. Consult the Service Department listed in the tester's instruction manual.

3. INSPECT BATTERY VOLTAGE

Standard voltage:

11 to 14 V

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

DTC CHECK / CLEAR

1. CHECK DTC

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch ON.
- Enter the following menus: DIAGNOSIS/OBD/MOBD/BODY/DTC INFO.
- Check the DTCs on the tester screen.

HINT:

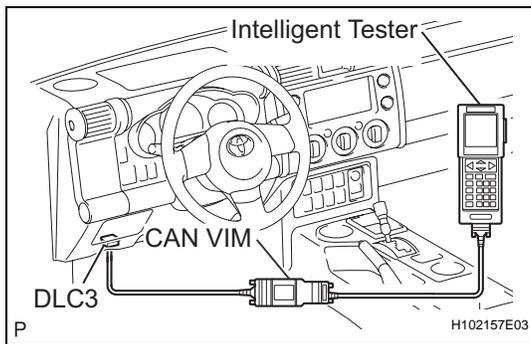
Refer to the intelligent tester operator's manual for further details.

2. CLEAR DTC

- Connect the intelligent tester to the DLC3.
- Turn the ignition switch ON.
- Erase the DTCs by following the prompts on the tester screen.
- Enter the following menus: DIAGNOSIS/OBD/MOBD/BODY/DTC INFO.

HINT:

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



DIAGNOSTIC TROUBLE CODE CHART

HINT:

If a malfunction code is displayed during the DTC check, check the circuit corresponding to the code in the table below. Proceed to the page given for the circuit.

MULTIPLEX COMMUNICATION SYSTEM

DTC No.	Detection Item	Trouble area	See page
B1214	Short to B+ in Door System Communication Bus Malfunction	1. Back door ECU 2. Main Body ECU 3. Wire Harness	MP-11
B1215	Short to GND in Door System Communication Bus Malfunction	1. Back door ECU 2. Main Body ECU 3. Wire Harness	MP-11
B1287	Back Door ECU Communication Stop	1. Back door ECU 2. Wire Harness	MP-14

DTC	B1214	Short to B+ in Door System Communication Bus Malfunction
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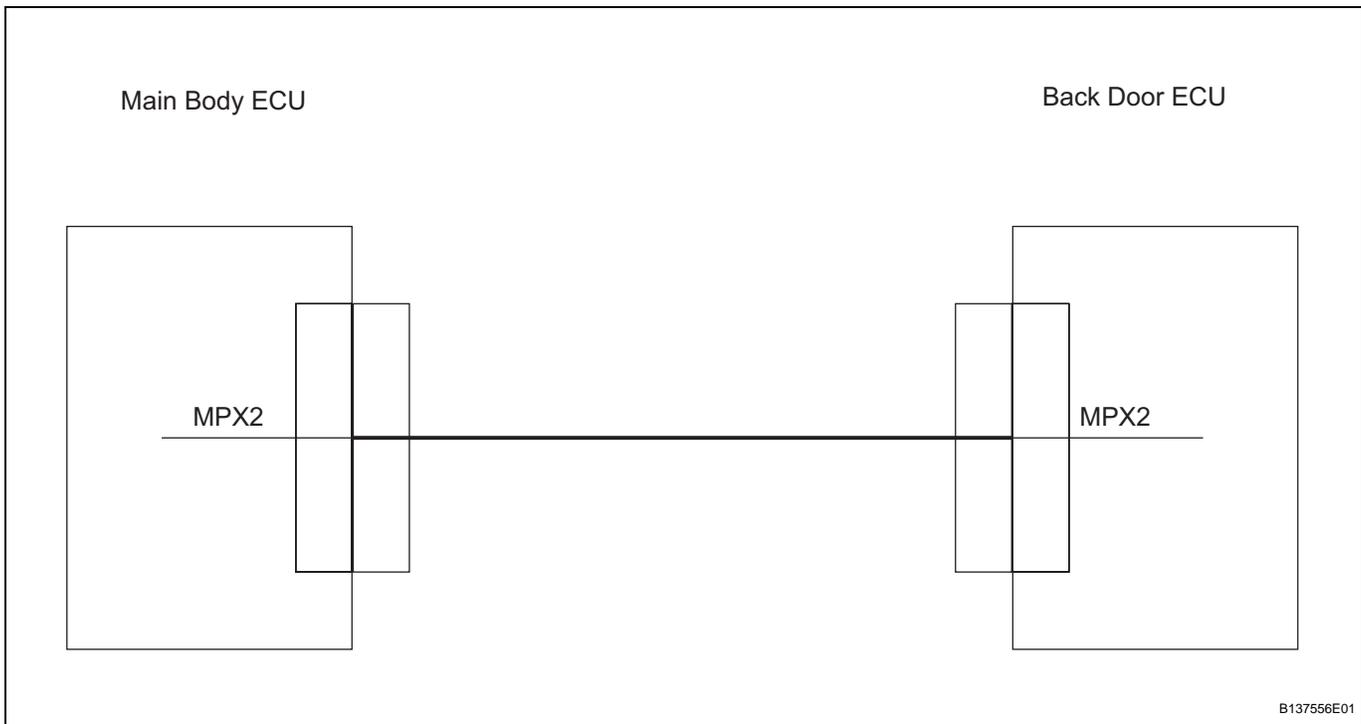
DTC	B1215	Short to GND in Door System Communication Bus Malfunction
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DESCRIPTION

When a +B short circuit or body ground short circuit is detected on the communication bus (BEAN), BEAN is disabled and a DTC is output.

DTC No.	DTC Detection Condition	Trouble Area
B1214	Communication circuit and +B battery system short	<ul style="list-style-type: none"> • Back door ECU • Main body ECU • Wire harness
B1215	Door system communication circuit and body ground short	<ul style="list-style-type: none"> • Back door ECU • Main body ECU • Wire harness

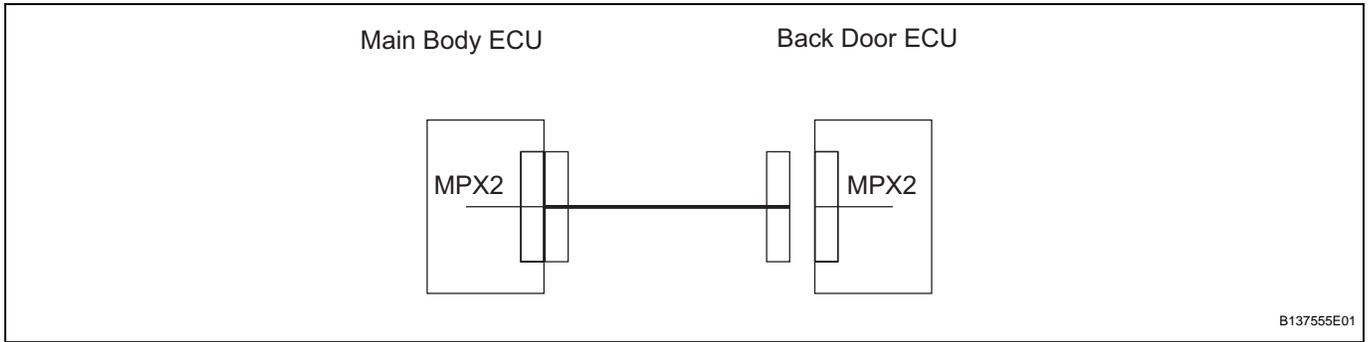
WIRING DIAGRAM



INSPECTION PROCEDURE

1	CHECK DIAGNOSTIC TROUBLE CODE (BACK DOOR ECU)
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- (a) Disconnect the back door ECU connector and check for DTCs B1214 and B1215.



OK:

Neither DTC B1214 nor DTC B1215 is output.

NOTICE:

Disconnect the connector in the operational sequence, and start the next step after the connector is reconnected.

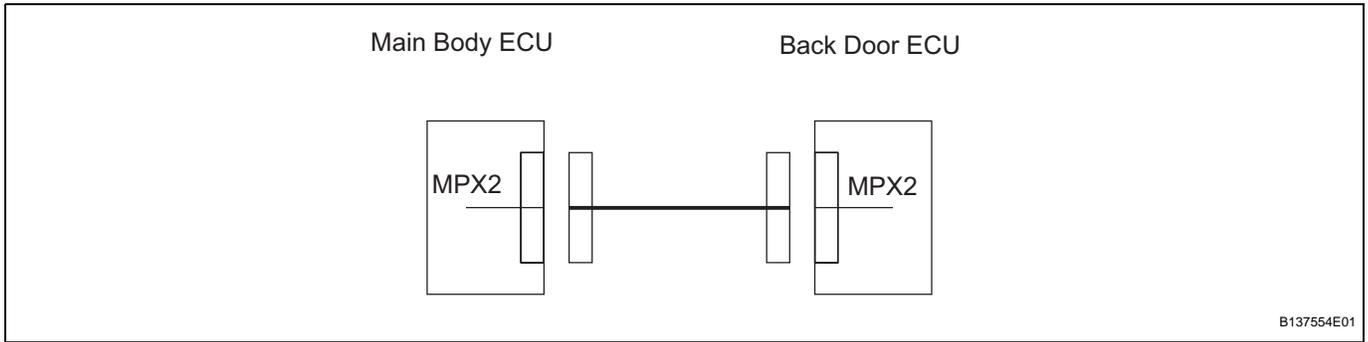
OK

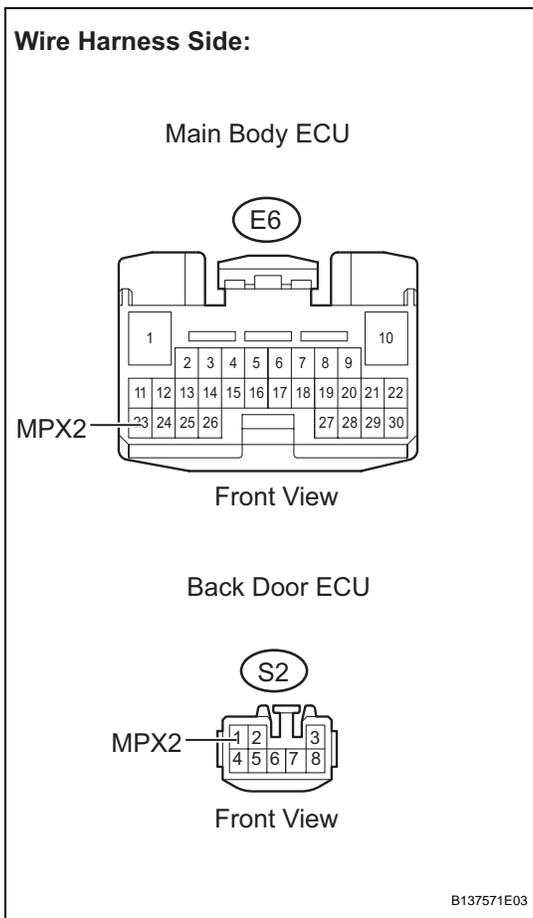
REPLACE BACK DOOR ECU

NG

2 CHECK HARNESS AND CONNECTOR (MAIN BODY ECU - BACK DOOR ECU)

(a) Check for a short-circuit in B+ or body ground.





- (b) Disconnect the S2 back door ECU connector and E6 main body ECU connector.
 - (1) Measure the voltage between the terminals of the S2 back door ECU or E6 main body ECU connector and body ground.

Standard voltage

Tester Connection	Condition	Specified Condition
E6-23 (MPX2) or S2-1 (MPX2) - Body ground	Ignition switch ON	Below 1 V

- (2) Check the resistance.

Standard resistance

Tester Connection	Specified Condition
E6-23 (MPX2) or S2-1 (MPX2) - Body ground	10 kΩ or higher

- (c) Reconnect the back door ECU connector and main body ECU connector.

NG → **REPAIR OR REPLACE WIRE HARNESS BETWEEN MAIN BODY ECU AND BACK DOOR ECU**

OK

REPLACE MAIN BODY ECU

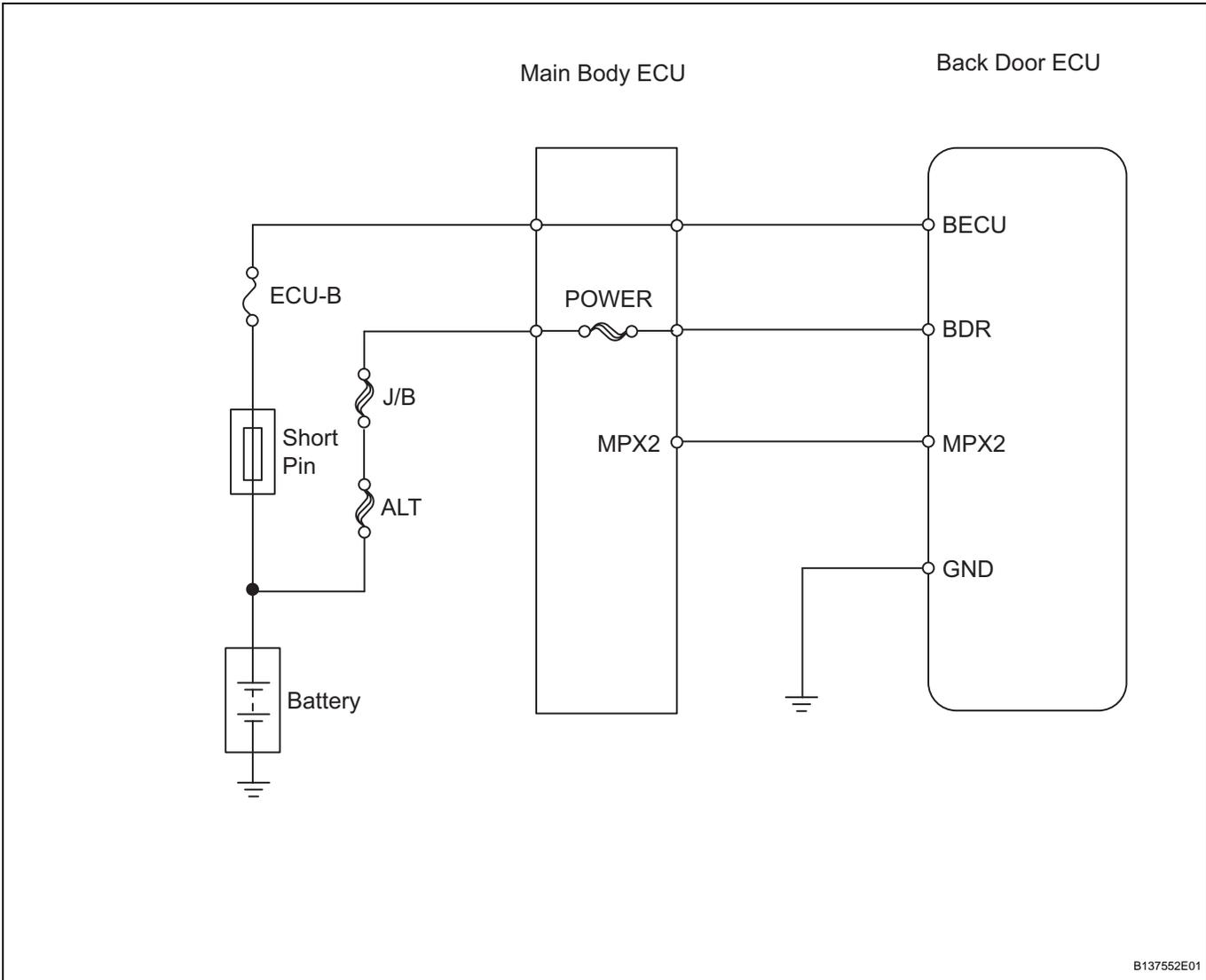
DTC	B1287	Back Door ECU Communication Stop
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DESCRIPTION

DTC B1287 is output when communication between the back door ECU and the main body ECU stops for more than 10 seconds.

DTC No.	DTC Detection Condition	Trouble Area
B1287	Back door ECU communication stops	<ul style="list-style-type: none"> • Back door ECU • Wire harness

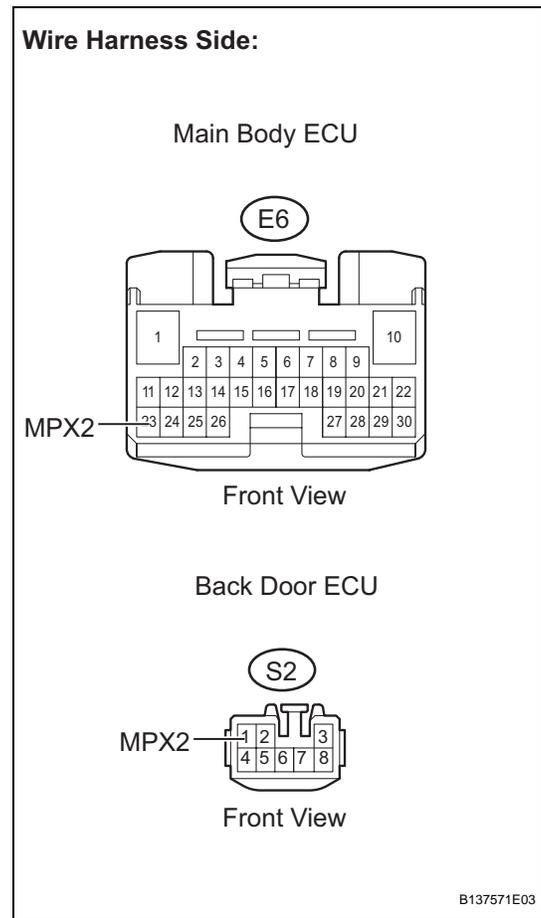
WIRING DIAGRAM



B137552E01

INSPECTION PROCEDURE

1 CHECK COMMUNICATION LINE



(a) Disconnect the E6 main body ECU and S2 back door ECU connectors.

(b) Check the resistance.

Standard resistance

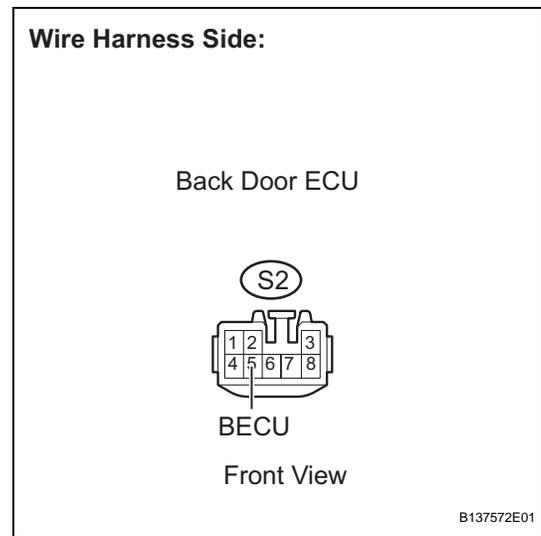
Tester Connection	Specified Condition
E6-23 (MPX2) - S2-1 (MPX2)	Below 1 Ω

(c) Reconnect the main body ECU and back door ECU connectors.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

2 CHECK BACK DOOR ECU (POWER SOURCE)



(a) Disconnect the S2 back door ECU connector.

(b) Measure the voltage between the terminals of the S2 back door ECU connector and body ground.

Standard voltage

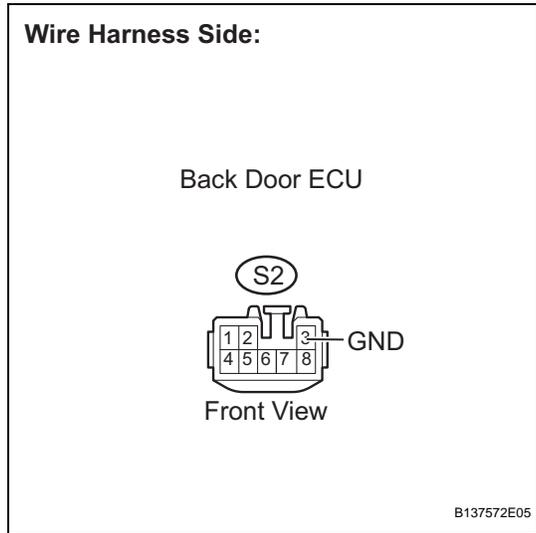
Tester Connection	Specified Condition
S2-5 (BECU) - Body ground	11 to 14 V

(c) Reconnect the ECU connector.

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

3 CHECK BACK DOOR ECU (GROUND)



- (a) Disconnect the S2 back door ECU connector.
- (b) Check the resistance.

Standard resistance

Tester Connection	Specified Condition
S2-3 (GND) - Body ground	Below 1 Ω

- (c) Reconnect the ECU connector.

NG REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE BACK DOOR ECU