Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM1000000029A40
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [12/2022 -]
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM (for M20A-FXS): P0A9B11,...,P0C3315; Hybrid/EV Battery Temperature Sensor "A" Circuit Short to Ground; 2023 - 2024 MY Prius Prius Prime [12/2022 -]		

DTC	**P0A9B11**	**Hybrid/EV Battery Temperature Sensor "A" Circuit Short to Ground**

DTC	**P0A9B15**	**Hybrid/EV Battery Temperature Sensor "A" Circuit Short to Auxiliary Battery or Open**

DTC	**P0AC511**	**Hybrid/EV Battery Temperature Sensor "B" Circuit Short to Ground**

DTC	**P0AC515**	**Hybrid/EV Battery Temperature Sensor "B" Circuit Short to Auxiliary Battery or Open**

DTC	**P0ACA11**	**Hybrid/EV Battery Temperature Sensor "C" Circuit Short to Ground**

DTC	**P0ACA15**	**Hybrid/EV Battery Temperature Sensor "C" Circuit Short to Auxiliary Battery or Open**

DTC	**P0AE811**	**Hybrid/EV Battery Temperature Sensor "D" Circuit Short to Ground**

DTC	**P0AE815**	**Hybrid/EV Battery Temperature Sensor "D" Circuit Short to Auxiliary Battery or Open**

DTC	**P0BC211**	**Hybrid/EV Battery Temperature Sensor "E" Circuit Short to Ground**

DTC	**P0BC215**	**Hybrid/EV Battery Temperature Sensor "E" Circuit Short to Auxiliary Battery or Open**

DTC	**P0C3311**	**Hybrid/EV Battery Temperature Sensor "F" Circuit Short to Ground**

DTC	**P0C3315**	**Hybrid/EV Battery Temperature Sensor "F" Circuit Short to Auxiliary Battery or Open**

DESCRIPTION

The battery temperature sensors are provided at 6 locations of the HV battery. The resistance of the thermistor, which is built into each battery temperature sensor, varies in accordance with changes in the HV battery temperature. The lower the battery temperature, the higher the thermistor resistance. Conversely, the higher the temperature, the lower the resistance. The battery ECU assembly uses the battery temperature sensors to detect the HV battery temperature. Based on the results of this detection, the battery ECU assembly controls the blower fan. (The blower fan starts when the HV battery temperature rises above a predetermined level.)

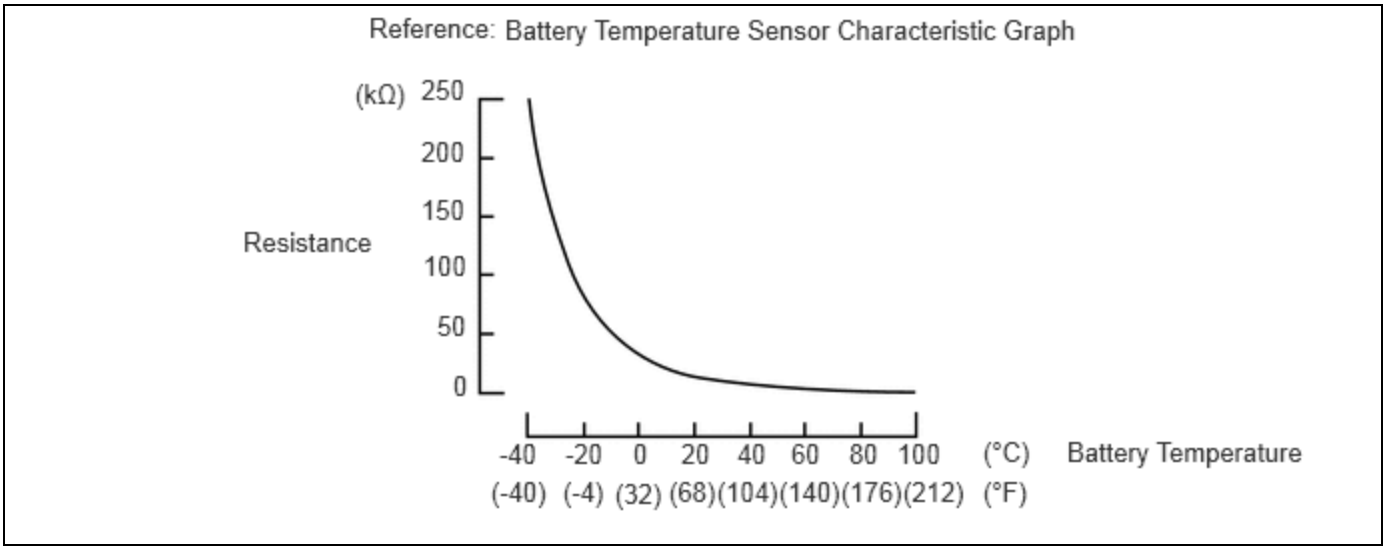
Temperature Sensor Identification Cross Reference Table:

DTC TITLE SENSOR	BATTERY TEMPERATURE SENSOR	GTS DISPLAY
A	0	1
B	1	2
C	2	3
D	3	4
E	4	5
F	5	6

HINT:

Use the reference table above to determine which battery temperature sensor corresponds to each DTC. For example, sensor A in the DTC title column is battery temperature sensor 0. This sensor is displayed as Hybrid/EV Battery Temperature 1 in the Data List.

Reference: Battery Temperature Sensor Characteristic Graph



DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P0A9B11	Hybrid/EV Battery Temperature Sensor "A" Circuit Short to Ground	The battery temperature sensor is malfunctioning, its output voltage is lower than the specified value (short circuit) and the detected temperature is higher than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0A9D
P0A9B15	Hybrid/EV Battery Temperature Sensor "A" Circuit Short to Auxiliary Battery or Open	The battery temperature sensor is malfunctioning, its output voltage is higher than the specified value (short to +B or open) and the detected temperature is lower than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0A9E
P0AC511	Hybrid/EV Battery Temperature Sensor "B" Circuit Short to Ground	The battery temperature sensor is malfunctioning, its output voltage is lower than the specified value (short circuit) and the detected temperature is higher than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0AC7
P0AC515	Hybrid/EV Battery Temperature Sensor "B"	The battery temperature sensor is malfunctioning, its output voltage is	• HV battery • Battery ECU	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0AC8

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
	Circuit Short to Auxiliary Battery or Open	higher than the specified value (short to +B or open) and the detected temperature is lower than the specified value. (1 trip detection logic)	assembly • Wire harness or connector					
P0ACA11	Hybrid/EV Battery Temperature Sensor "C" Circuit Short to Ground	The battery temperature sensor is malfunctioning, its output voltage is lower than the specified value (short circuit) and the detected temperature is higher than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0ACC
P0ACA15	Hybrid/EV Battery Temperature Sensor "C" Circuit Short to Auxiliary Battery or Open	The battery temperature sensor is malfunctioning, its output voltage is higher than the specified value (short to +B or open) and the detected temperature is lower than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0ACD
P0AE811	Hybrid/EV Battery Temperature Sensor "D" Circuit Short to Ground	The battery temperature sensor is malfunctioning, its output voltage is lower than the specified value (short circuit) and the detected	• HV battery • Battery ECU assembly • Wire harness	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0AEA

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		temperature is higher than the specified value. (1 trip detection logic)	or connector					
P0AE815	Hybrid/EV Battery Temperature Sensor "D" Circuit Short to Auxiliary Battery or Open	The battery temperature sensor is malfunctioning, its output voltage is higher than the specified value (short to +B or open) and the detected temperature is lower than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0AEB
P0BC211	Hybrid/EV Battery Temperature Sensor "E" Circuit Short to Ground	The battery temperature sensor is malfunctioning, its output voltage is lower than the specified value (short circuit) and the detected temperature is higher than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0BC4
P0BC215	Hybrid/EV Battery Temperature Sensor "E" Circuit Short to Auxiliary Battery or Open	The battery temperature sensor is malfunctioning, its output voltage is higher than the specified value (short to +B or open) and the detected temperature is lower than the specified value.	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0BC5

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		(1 trip detection logic)						
P0C3311	Hybrid/EV Battery Temperature Sensor "F" Circuit Short to Ground	The battery temperature sensor is malfunctioning, its output voltage is lower than the specified value (short circuit) and the detected temperature is higher than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0C35
P0C3315	Hybrid/EV Battery Temperature Sensor "F" Circuit Short to Auxiliary Battery or Open	The battery temperature sensor is malfunctioning, its output voltage is higher than the specified value (short to +B or open) and the detected temperature is lower than the specified value. (1 trip detection logic)	• HV battery • Battery ECU assembly • Wire harness or connector	Comes on	Master warning: Comes on	HV Battery	A	SAE Code: P0C36

HINT:

- After checking for the above DTCs, check the hybrid system Data List item "Hybrid/EV Battery Temperature" using the GTS.

TEMPERATURE DISPLAYED	MALFUNCTION
Below -45°C (-49°F)	Open or +B short circuit
95°C (203°F) or more	GND short circuit

- If the vehicle as is left as is for 24 hours, the value of "Hybrid/EV Battery Temperature" will be almost the same as the ambient temperature.

MONITOR DESCRIPTION

If the battery ECU assembly detects a malfunction in a HV battery temperature sensor, the battery ECU will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P0A9D (INF P0A9B11), P0AC7 (INF P0AC511), P0ACC (INF P0ACA11), P0AEA (INF P0AE811), P0BC4 (INF P0BC211), P0C35 (INF P0C3311): Battery temperature sensor circuit malfunction (GND short) P0A9E (INF P0A9B15), P0AC8 (INF P0AC515), P0ACD (INF P0ACA15), P0AEB (INF P0AE815), P0BC5 (INF P0BC215), P0C36 (INF P0C3315): Battery temperature sensor circuit malfunction (open)
Required sensors/components	Battery temperature sensor
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	Immediately
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not stored	TMC's intellectual property
Other conditions belong to TMC's intellectual property	-

TYPICAL MALFUNCTION THRESHOLDS

TMC's intellectual property	-

COMPONENT OPERATING RANGE

Battery ECU assembly	DTC P0A9D (INF P0A9B11) is not detected DTC P0AC7 (INF P0AC511) is not detected DTC P0ACC (INF P0ACA11) is not detected DTC P0BC4 (INF P0BC211) is not detected DTC P0C35 (INF P0C3311) is not detected DTC P0A9E (INF P0A9B15) is not detected DTC P0AC8 (INF P0AC515) is not detected DTC P0ACD (INF P0ACA15) is not detected DTC P0AEB (INF P0AE815) is not detected DTC P0BC5 (INF P0BC215) is not detected DTC P0C36 (INF P0C3315) is not detected

CONFIRMATION DRIVING PATTERN

HINT:

- After repair has been completed, clear the DTC and then check that the vehicle has returned to normal by performing the following All Readiness check procedure.

  Click here INFO
- When clearing the permanent DTCs, refer to the "CLEAR PERMANENT DTC" procedure.

  Click here INFO

1. Clear the DTCs (even if no DTCs are stored, perform the clear DTC procedure).
2. Turn the ignition switch off and wait for 2 minutes or more.

3. With ignition switch ON and wait for 10 seconds or more.[*1]

HINT:

[*1]: Normal judgment procedure.

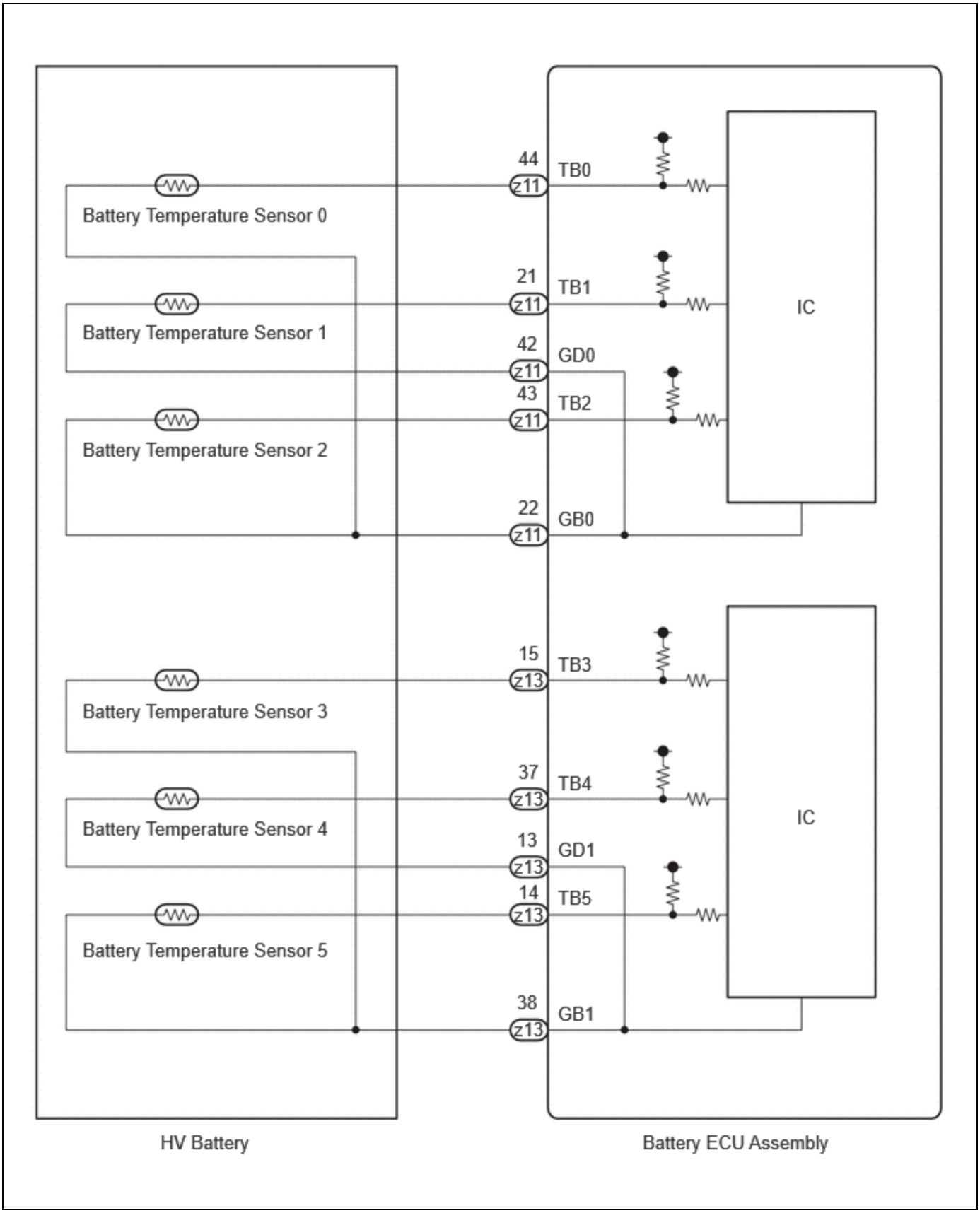
The normal judgment procedure is used to complete DTC judgment and also used when clearing permanent DTCs.

4. Enter the following menus: Powertrain / HV Battery / Utility / All Readiness.
5. Check the DTC judgment result.

HINT:

- If the judgment result shows NORMAL, the system is normal.
- If the judgment result shows ABNORMAL, the system has a malfunction.
- If the judgment result shows INCOMPLETE, perform the normal judgment procedure again.

WIRING DIAGRAM



CAUTION / NOTICE / HINT

CAUTION:

Refer to the precautions before inspecting high voltage circuit.

Click here INFO

NOTICE:

- After the ignition switch is turned off, there may be a waiting time before disconnecting the negative (-) auxiliary battery terminal.

  Click here INFO
- When disconnecting and reconnecting the auxiliary battery

HINT:

When disconnecting and reconnecting the auxiliary battery, there is an automatic learning function that completes learning when the respective system is used.

Click here INFO

PROCEDURE

1.	**CHECK DTC OUTPUT (HV BATTERY, HYBRID CONTROL)**

Pre-procedure1

(a) None

Procedure1

(b) Check for DTCs.

Powertrain > HV Battery > Trouble Codes
Powertrain > Hybrid Control > Trouble Codes

RESULT	PROCEED TO
"P0A9B11, P0A9B15, P0AC511, P0AC515, P0ACA11, P0ACA15, P0AE811, P0AE815, P0BC211, P0BC215, P0C3311 or P0C3315" only is output, or DTCs except the ones in the table below are also output.	A
DTCs of hybrid battery system in the table below are output.	B
DTCs of hybrid control system in the table below are output.	C

SYSTEM	RELEVANT DTC	
Hybrid battery system	P060A47	Hybrid/EV Battery Energy Control Module Monitoring Processor Watchdog / Safety MCU Failure
	P060B49	Hybrid/EV Battery Energy Control Module A/D Processing Internal Electronic Failure
	P060687	Hybrid/EV Battery Energy Control Module Processor to Monitoring Processor Missing Message
Hybrid control system	P0A1F94	Hybrid/EV Battery Energy Control Module Unexpected Operation

Post-procedure1

(c) Turn the ignition switch off.

B ▶ **GO TO DTC CHART (HYBRID BATTERY SYSTEM)**

C ▶ **GO TO DTC CHART (HYBRID CONTROL SYSTEM)**

A

2.	READ VALUE USING GTS (HYBRID/EV BATTERY TEMPERATURE)

Pre-procedure1

(a) None

Procedure1

(b) Read the Data List.

Powertrain > HV Battery > Data List

TESTER DISPLAY
Hybrid/EV Battery Temperature 1
Hybrid/EV Battery Temperature 2
Hybrid/EV Battery Temperature 3
Hybrid/EV Battery Temperature 4
Hybrid/EV Battery Temperature 5
Hybrid/EV Battery Temperature 6

HINT:

A malfunctioning sensor (battery temperature sensor 0, 1, 2, 3, or 5) can be determined by comparing the output temperature of the 6 battery temperature sensors.

Post-procedure1

(c) Turn the ignition switch off.

NEXT

3.	CHECK CONNECTOR CONNECTION CONDITION (BATTERY ECU ASSEMBLY)

CAUTION:

Be sure to wear insulated gloves and protective goggles.

Pre-procedure1

(a) Check that the service plug grip is not installed.

NOTICE:

After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

Procedure1

(b) Check the connector connections and contact pressure of the relevant terminals for the battery ECU assembly.

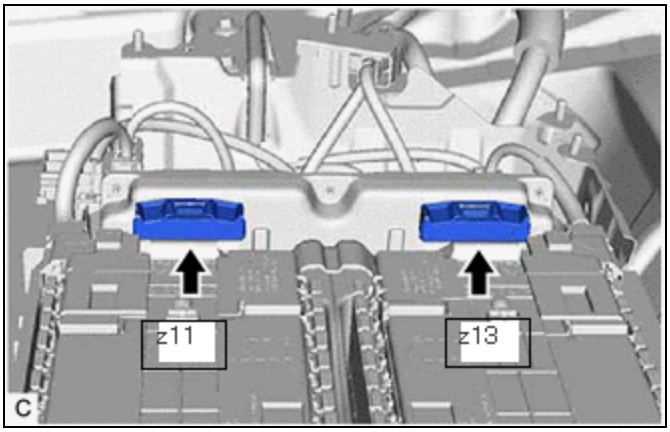
HINT:

Click here INFO

OK:

The connector is connected securely and there are no contact pressure problems.

Result:



PROCEED TO
OK
NG

Post-procedure1

(c) None

NG ▶ **CONNECT SECURELY**

OK ▼

4.	CHECK DTC

(a) Check the DTCs that were output when the vehicle was brought to the workshop.

RESULT	PROCEED TO
"P0A9B11, P0A9B15, P0AC511, P0AC515, P0ACA11 or P0ACA15" is also output.	A
"P0AE811, P0AE815, P0BC211, P0BC215, P0C3311 or P0C3315" is also output.	B

B ▶ **GO TO STEP 6**

A ▼

5.	**CHECK HV BATTERY (BATTERY TEMPERATURE SENSOR 0 to 2)**

CAUTION:

Be sure to wear insulated gloves and protective goggles.

Pre-procedure1

(a) Check that the service plug grip is not installed.

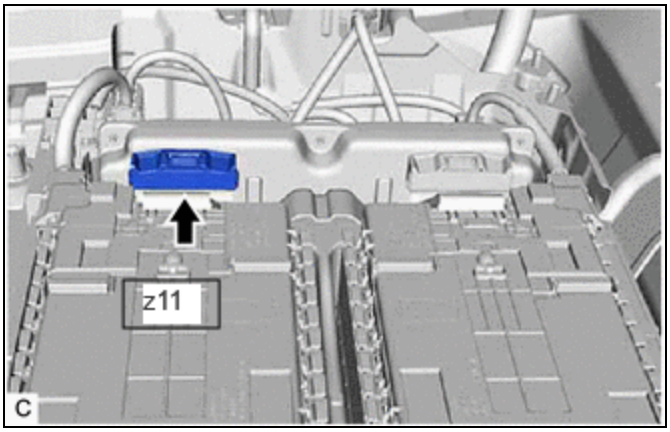
NOTICE:

After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

(b) Disconnect the battery ECU assembly connector.

NOTICE:

Before disconnecting the connector, check that it is not loose or disconnected.



Pre-procedure1

(c) Measure the resistance of the circuit for the malfunctioning sensor (battery temperature sensor 0 to 2).

Tester Connection:

EWD INFO

Click Location & Routing(z11)
Click Connector(z11)

TESTER CONNECTION	BATTERY TEMPERATURE SENSOR
z11-44 (TB0) - z11-22 (GB0)	0
z11-21 (TB1) - z11-42 (GD0)	1
z11-43 (TB2) - z11-22 (GB0)	2

Standard Resistance:

THERMISTOR TEMPERATURE	CONDITION	SPECIFIED CONDITION
0 to 10°C (32 to 50°F)	Ignition switch off	17.68 to 27.83 kΩ
10 to 20°C (50 to 68°F)	Ignition switch off	11.94 to 18.25 kΩ
20 to 30°C (68 to 86°F)	Ignition switch off	8.21 to 12.24 kΩ
30 to 40°C (86 to 104°F)	Ignition switch off	5.73 to 8.41 kΩ
40 to 50°C (104 to 122°F)	Ignition switch off	4.08 to 5.91 kΩ

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

Standard Resistance:

EWD INFO

Click Location & Routing(z11)
Click Connector(z11)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
z11-44 (TB0) - Body ground and other terminals (except z11-22 (GB0) and z11-43 (TB2))	Ignition switch off	10 kΩ or higher
z11-22 (GB0) - Body ground and other terminals (except z11-44 (TB0) and z11-43 (TB2))	Ignition switch off	10 kΩ or higher
z11-21 (TB1) - Body ground and other terminals (except z11-42 (GD0))	Ignition switch off	10 kΩ or higher
z11-42 (GD0) - Body ground and other terminals (except z11-21 (TB1))	Ignition switch off	10 kΩ or higher
z11-43 (TB2) - Body ground and other terminals (except z11-44 (TB0) and z11-22 (GB0))	Ignition switch off	10 kΩ or higher

Post-procedure1

(e) Reconnect the battery ECU assembly connector.

OK ▶ **REPLACE BATTERY ECU ASSEMBLY**

NG ▶ **REPLACE HV BATTERY**

6.	**CHECK HV BATTERY (BATTERY TEMPERATURE SENSOR 3 to 5)**

CAUTION:

Be sure to wear insulated gloves and protective goggles.

Pre-procedure1

(a) Check that the service plug grip is not installed.

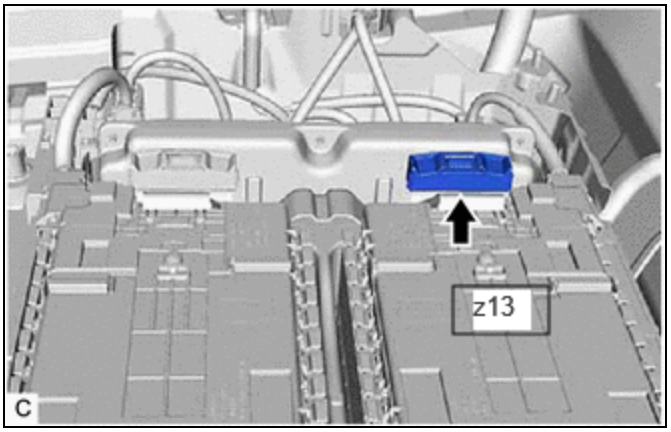
NOTICE:

After removing the service plug grip, do not turn the ignition switch to ON (READY), unless instructed by the repair manual because this may cause a malfunction.

(b) Disconnect the battery ECU assembly connector.

NOTICE:

Before disconnecting the connector, check that it is not loose or disconnected.



Procedure1

(c) Measure the resistance of the circuit for the malfunctioning sensor (battery temperature sensor 3 to 5).

Tester Connection:

EWD INFO

Click Location & Routing(z13)
Click Connector(z13)

TESTER CONNECTION	BATTERY TEMPERATURE SENSOR
z13-15 (TB3) - z13-38 (GB1)	3
z13-37 (TB4) - z13-13 (GD1)	4
z13-14 (TB5) - z13-38 (GB1)	5

Standard Resistance:

THERMISTOR TEMPERATURE	CONDITION	SPECIFIED CONDITION
0 to 10°C (32 to 50°F)	Ignition switch off	17.68 to 27.83 kΩ
10 to 20°C (50 to 68°F)	Ignition switch off	11.94 to 18.25 kΩ
20 to 30°C (68 to 86°F)	Ignition switch off	8.21 to 12.24 kΩ
30 to 40°C (86 to 104°F)	Ignition switch off	5.73 to 8.41 kΩ
40 to 50°C (104 to 122°F)	Ignition switch off	4.08 to 5.91 kΩ

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

Standard Resistance:

EWD INFO

Click Location & Routing(z13)
Click Connector(z13)

TESTER CONNECTION	CONDITION	SPECIFIED CONDITION
z13-15 (TB3) - Body ground and other terminals (except z13-38 (GB1) and z13-14 (TB5))	Ignition switch off	10 kΩ or higher
z13-38 (GB1) - Body ground and other terminals (except z13-15 (TB3) and z13-14 (TB5))	Ignition switch off	10 kΩ or higher
z13-37 (TB4) - Body ground and other terminals (except z13-13 (GD1))	Ignition switch off	10 kΩ or higher
z13-13 (GD1) - Body ground and other terminals (except z13-37 (TB4))	Ignition switch off	10 kΩ or higher
z13-14 (TB5) - Body ground and other terminals (except z13-15 (TB3) and z13-38 (GB1))	Ignition switch off	10 kΩ or higher

Post-procedure1

(e) Reconnect the battery ECU assembly connector.

OK ▶ **REPLACE BATTERY ECU ASSEMBLY**

NG ▶ **REPLACE HV BATTERY**