Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BHVZ
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM (for PHEV Model): P1AC49E-P1AC69E; Hybrid/EV Battery Stack 1 Current Interrupt Device Stuck On; 2023 - 2024 MY Prius Prime [03/2023 -]		

DTC	**P1AC49E**	**Hybrid/EV Battery Stack 1 Current Interrupt Device Stuck On**

DTC	**P1AC59E**	**Hybrid/EV Battery Stack 2 Current Interrupt Device Stuck On**

DTC	**P1AC69E**	**Hybrid/EV Battery Stack 3 Current Interrupt Device Stuck On**

DESCRIPTION

Refer to the description for DTC P1AC413.

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DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P1AC49E	Hybrid/EV Battery Stack 1 Current Interrupt Device Stuck On	Conductivity returns after high voltage circuit disconnected by CID operation. (1 trip detection logic)	• No. 1 HV supply stack sub-assembly • Battery voltage sensor	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1AC4
P1AC59E	Hybrid/EV Battery Stack 2 Current Interrupt Device Stuck On	Conductivity returns after high voltage circuit disconnected by CID operation. (1 trip detection logic)	• No. 2 HV supply stack sub-assembly • Battery voltage sensor	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1AC5
P1AC69E	Hybrid/EV Battery Stack 3 Current Interrupt Device Stuck On	Conductivity returns after high voltage circuit disconnected by CID operation.	• No. 3 HV supply stack sub-assembly • Battery voltage sensor	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1AC6

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		(1 trip detection logic)						

MONITOR DESCRIPTION

If a current interrupt device (CID) located in a HV battery cell is shut off, the battery ECU assembly prohibits charging and discharging, illuminates the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P1AC4 (INF P1AC49E): Hybrid/EV Battery Cell Voltage Low Pack 1 Stack "A" at CID interception P1AC5 (INF P1AC59E): Hybrid/EV Battery Cell Voltage Low Pack 1 Stack "B" at CID interception P1AC6 (INF P1AC69E): Hybrid/EV Battery Cell Voltage Low Pack 1 Stack "C" at CID interception
Required sensors/components	Battery ECU assembly
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	1 driving cycle
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 P1AC4 (INF P1AC49E) is not detected DTC P1AC5 (INF P1AC59E) is not detected DTC P1AC6 (INF P1AC69E) 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.

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- 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. Turn the ignition switch to ON and wait for 10 seconds or more.[*1]
4. Turn the ignition switch off and wait for 2 minutes or more.[*2]
5. Turn the ignition switch to ON (READY) and wait for 30 seconds or more.[*3]

HINT:

[*1] to [*3]: Normal judgment procedure.

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

6. Enter the following menus: Powertrain / HV Battery / Utility / All Readiness.
7. 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 or N/A, perform the normal judgment procedure again.

WIRING DIAGRAM

Refer to the wiring diagram for DTC P1A001C.

Click here INFO

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 auxiliary negative (-) battery terminal.

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- 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
"P1AC49E, P1AC59E or P1AC69E" 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.	**CHECK DTC**

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

RESULT	PROCEED TO
"P1AC49E" is also output.	A
"P1AC59E" is also output.	B

RESULT	PROCEED TO
"P1AC69E" is also output.	C

B ▶ **GO TO STEP 6**

C ▶ **GO TO STEP 9**

A

3.	**CHECK CONNECTOR CONNECTION CONDITION (BATTERY VOLTAGE SENSOR CONNECTOR)**

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 connections of the battery voltage sensor connectors.

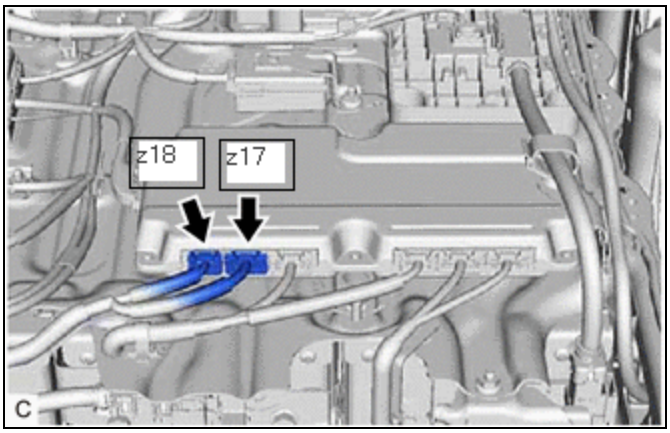
HINT:

Click here INFO

OK:

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

Result:



RESULT		PROCEED TO
OK		A
Not connected securely	The terminals are not damaged or corroded	B
Connector is not connected securely	The terminals are damaged or corroded	C

Post-procedure1

(c) None

B ▶ **CONNECT SECURELY**

C ▶ **REPLACE NO. 1 HV SUPPLY STACK SUB-ASSEMBLY**

A

4.	**CHECK BATTERY VOLTAGE SENSOR (VA1 - VA24)**

NOTICE:

Make sure to use tester probes with a diameter of approximately 0.5 mm (0.0197 in.) when measuring the voltage.

Pre-procedure1

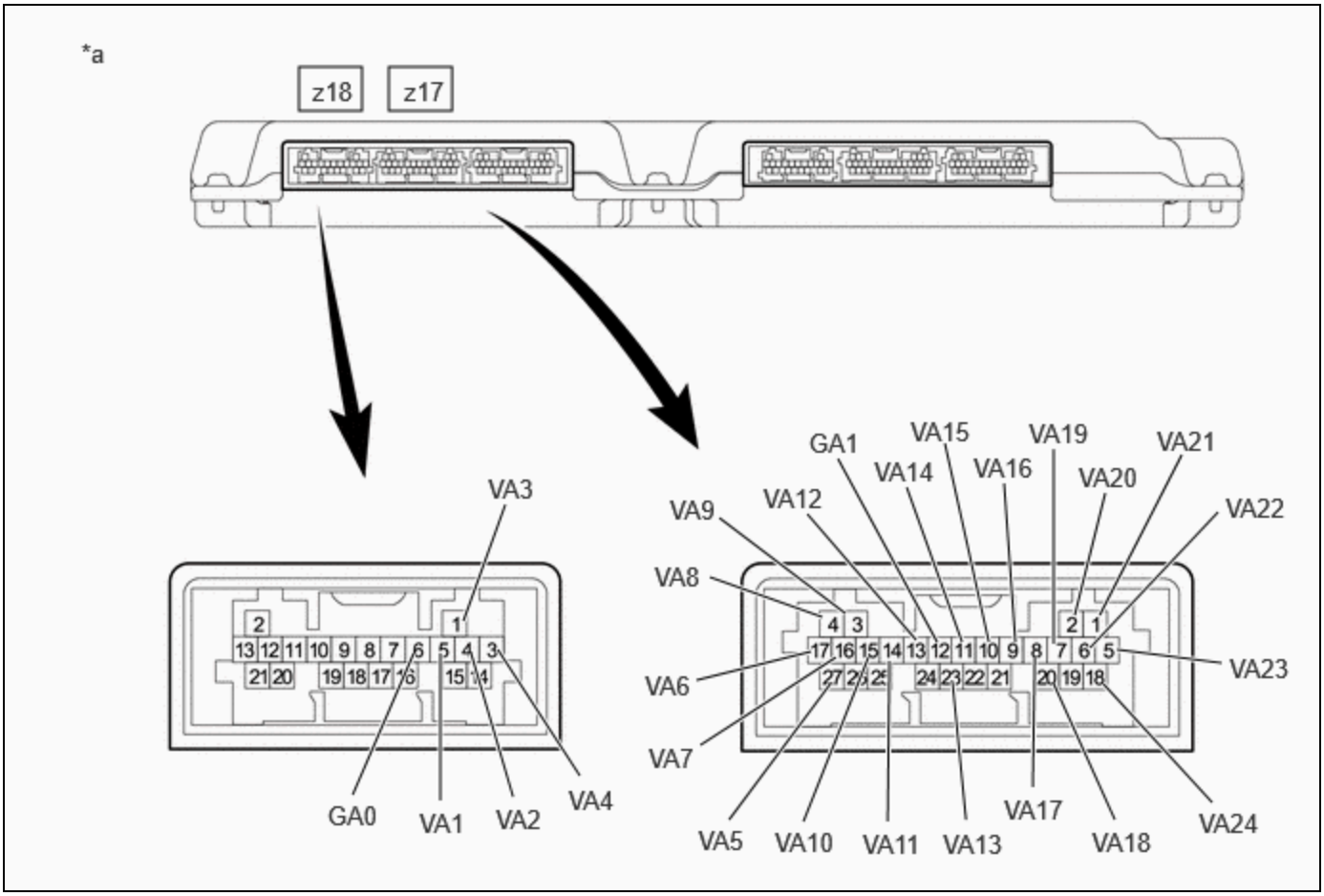
(a) Remove the battery voltage sensor.

HINT:

Click here INFO

Procedure1

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



*a	Component without harness connected (Battery Voltage Sensor)	-	-

Standard Voltage:

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
1	z18-6 (GA0) (-) - z18-5 (VA1) (+)	Always	0.3 to 1.0 V
2	z18-5 (VA1) (-) - z18-4 (VA2) (+)	Always	0.3 to 1.0 V
3	z18-4 (VA2) (-) - z18-1 (VA3) (+)	Always	0.3 to 1.0 V
4	z18-1 (VA3) (-) - z18-3 (VA4) (+)	Always	0.3 to 1.0 V
5	z18-3 (VA4) (-) - z17-27 (VA5) (+)	Always	0.3 to 1.0 V
6	z17-27 (VA5) (-) - z17-17 (VA6) (+)	Always	0.3 to 1.0 V
7	z17-17 (VA6) (-) - z17-16 (VA7) (+)	Always	0.3 to 1.0 V
8	z17-16 (VA7) (-) - z17-4 (VA8) (+)	Always	0.3 to 1.0 V
9	z17-4 (VA8) (-) - z17-3 (VA9) (+)	Always	0.3 to 1.0 V
10	z17-3 (VA9) (-) - z17-15 (VA10) (+)	Always	0.3 to 1.0 V
11	z17-15 (VA10) (-) - z17-14 (VA11) (+)	Always	0.3 to 1.0 V
12	z17-14 (VA11) (-) - z17-13 (VA12) (+)	Always	0.3 to 1.0 V
13	z17-12 (GA1) (-) - z17-23 (VA13) (+)	Always	0.3 to 1.0 V

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
14	z17-23 (VA13) (-) - z17-11 (VA14) (+)	Always	0.3 to 1.0 V
15	z17-11 (VA14) (-) - z17-10 (VA15) (+)	Always	0.3 to 1.0 V
16	z17-10 (VA15) (-) - z17-9 (VA16) (+)	Always	0.3 to 1.0 V
17	z17-9 (VA16) (-) - z17-8 (VA17) (+)	Always	0.3 to 1.0 V
18	z17-8 (VA17) (-) - z17-20 (VA18) (+)	Always	0.3 to 1.0 V
19	z17-20 (VA18) (-) - z17-7 (VA19) (+)	Always	0.3 to 1.0 V
20	z17-7 (VA19) (-) - z17-2 (VA20) (+)	Always	0.3 to 1.0 V
21	z17-2 (VA20) (-) - z17-1 (VA21) (+)	Always	0.3 to 1.0 V
22	z17-1 (VA21) (-) - z17-6 (VA22) (+)	Always	0.3 to 1.0 V
23	z17-6 (VA22) (-) - z17-5 (VA23) (+)	Always	0.3 to 1.0 V
24	z17-5 (VA23) (-) - z17-18 (VA24) (+)	Always	0.3 to 1.0 V

NOTICE:

- Make sure to check the polarity of each terminal (positive (+) or negative (-)) before connecting a tester.
- Be sure to set the Toyota electrical tester to diode range when performing this test.
- Read the voltage after the value has stabilized.
- In order to avoid damaging the terminals of the battery voltage sensor, make sure to use tester probes with a diameter of approximately 0.5 mm (0.0197 in.) when measuring the voltage of the battery voltage sensor.

RESULT	PROCEED TO
The voltage between the terminals is 0.3 to 1.0 V.	A
Other than above	B

Post-procedure1

(c) Install the battery voltage sensor.

A ▶ **REPLACE NO. 1 HV SUPPLY STACK SUB-ASSEMBLY**

B ▼

5.	**REPLACE NO. 1 HV SUPPLY STACK SUB-ASSEMBLY**

HINT:

Click here INFO

NEXT ▶ **REPLACE BATTERY VOLTAGE SENSOR**

6.	**CHECK CONNECTOR CONNECTION CONDITION (BATTERY VOLTAGE SENSOR CONNECTOR)**

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 connections of the battery voltage sensor connectors.

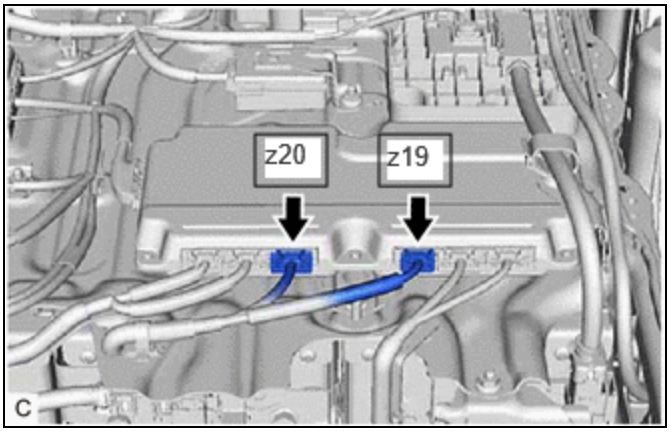
HINT:

Click here INFO

OK:

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

Result:



RESULT		PROCEED TO
OK		A
Not connected securely	The terminals are not damaged or corroded	B
Not connected securely	The terminals are damaged or corroded	C

Post-procedure1

(c) None

B ▶ **CONNECT SECURELY**

C ▶ **REPLACE NO. 2 HV SUPPLY STACK SUB-ASSEMBLY**

A ▼

7.	**CHECK BATTERY VOLTAGE SENSOR (VA25 - VA48)**

NOTICE:

Make sure to use tester probes with a diameter of approximately 0.5 mm (0.0197 in.) when measuring the voltage.

Pre-procedure1

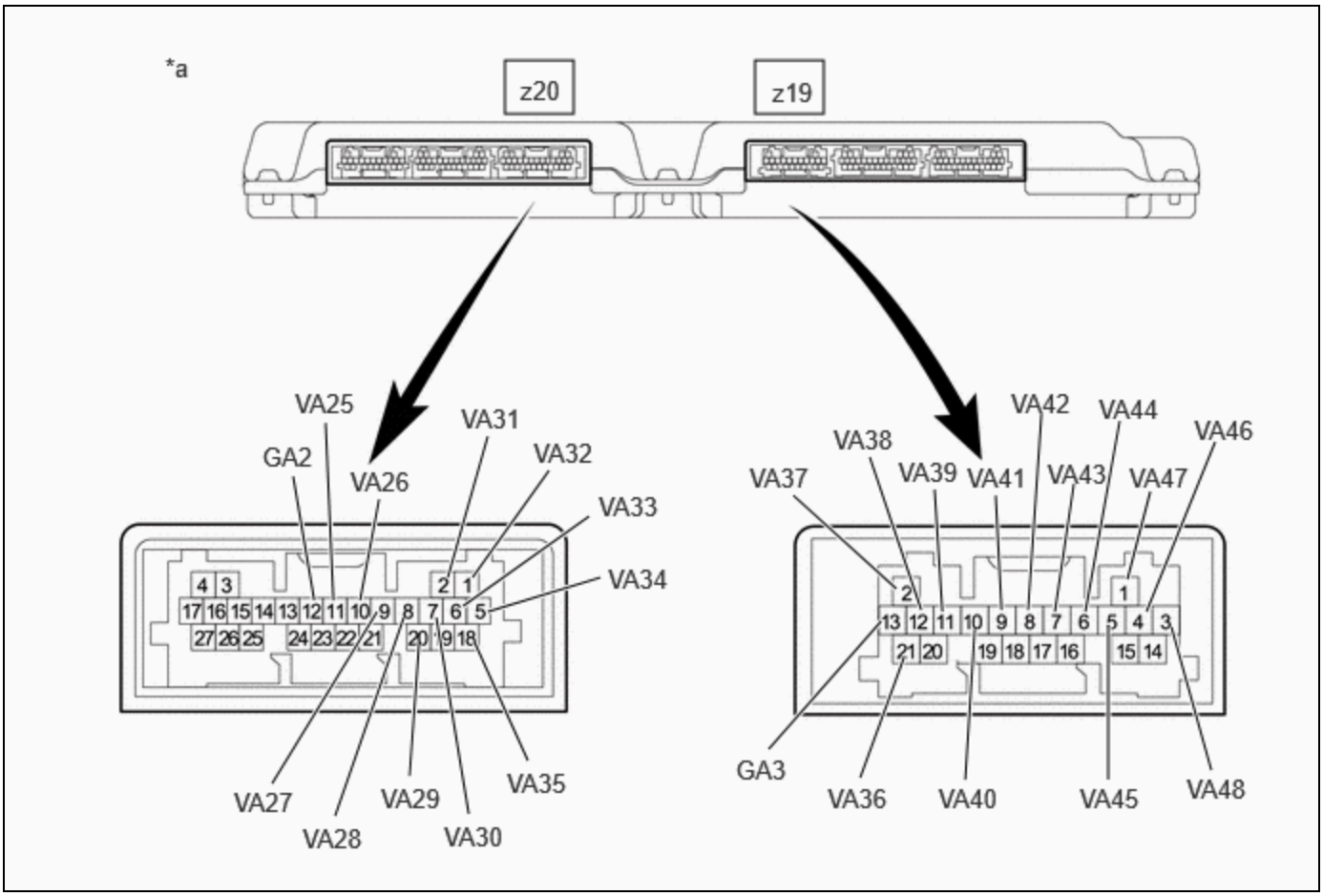
(a) Remove the battery voltage sensor.

HINT:

Click here INFO

Procedure1

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



*a	Component without harness connected (Battery Voltage Sensor)	-	-

Standard Voltage:

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
25	z20-12 (GA2) (-) - z20-11 (VA25) (+)	Always	0.3 to 1.0 V
26	z20-11 (VA25) (-) - z20-10 (VA26) (+)	Always	0.3 to 1.0 V

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
27	z20-10 (VA26) (-) - z20-9 (VA27) (+)	Always	0.3 to 1.0 V
28	z20-9 (VA27) (-) - z20-8 (VA28) (+)	Always	0.3 to 1.0 V
29	z20-8 (VA28) (-) - z20-20 (VA29) (+)	Always	0.3 to 1.0 V
30	z20-20 (VA29) (-) - z20-7 (VA30) (+)	Always	0.3 to 1.0 V
31	z20-7 (VA30) (-) - z20-2 (VA31) (+)	Always	0.3 to 1.0 V
32	z20-2 (VA31) (-) - z20-1 (VA32) (+)	Always	0.3 to 1.0 V
33	z20-1 (VA32) (-) - z20-6 (VA33) (+)	Always	0.3 to 1.0 V
34	z20-6 (VA33) (-) - z20-5 (VA34) (+)	Always	0.3 to 1.0 V
35	z20-5 (VA34) (-) - z20-18 (VA35) (+)	Always	0.3 to 1.0 V
36	z20-18 (VA35) (-) - z19-21 (VA36) (+)	Always	0.3 to 1.0 V
37	z19-13 (GA3) (-) - z19-2 (VA37) (+)	Always	0.3 to 1.0 V
38	z19-2 (VA37) (-) - z19-12 (VA38) (+)	Always	0.3 to 1.0 V
39	z19-12 (VA38) (-) - z19-11 (VA39) (+)	Always	0.3 to 1.0 V
40	z19-11 (VA39) (-) - z19-10 (VA40) (+)	Always	0.3 to 1.0 V
41	z19-10 (VA40) (-) - z19-9 (VA41) (+)	Always	0.3 to 1.0 V
42	z19-9 (VA41) (-) - z19-8 (VA42) (+)	Always	0.3 to 1.0 V
43	z19-8 (VA42) (-) - z19-7 (VA43) (+)	Always	0.3 to 1.0 V
44	z19-7 (VA43) (-) - z19-6 (VA44) (+)	Always	0.3 to 1.0 V
45	z19-6 (VA44) (-) - z19-5 (VA45) (+)	Always	0.3 to 1.0 V
46	z19-5 (VA45) (-) - z19-4 (VA46) (+)	Always	0.3 to 1.0 V
47	z19-4 (VA46) (-) - z19-1 (VA47) (+)	Always	0.3 to 1.0 V
48	z19-1 (VA47) (-) - z19-3 (VA48) (+)	Always	0.3 to 1.0 V

NOTICE:

- Make sure to check the polarity of each terminal (positive (+) or negative (-)) before connecting a tester.
- Be sure to set the Toyota electrical tester to diode range when performing this test.
- Read the voltage after the value has stabilized.
- In order to avoid damaging the terminals of the battery voltage sensor, make sure to use tester probes with a diameter of approximately 0.5 mm (0.0197 in.) when measuring the voltage of the battery voltage sensor.

RESULT	PROCEED TO
The voltage between the terminals is 0.3 to 1.0 V.	A
Other than above	B

Post-procedure1

(c) Install the battery voltage sensor.

A REPLACE NO. 2 HV SUPPLY STACK SUB-ASSEMBLY

B

8.	REPLACE NO. 2 HV SUPPLY STACK SUB-ASSEMBLY

HINT:

Click here INFO

NEXT REPLACE BATTERY VOLTAGE SENSOR

9.	CHECK CONNECTOR CONNECTION CONDITION (BATTERY VOLTAGE SENSOR CONNECTOR)

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 connections of the battery voltage sensor connectors.

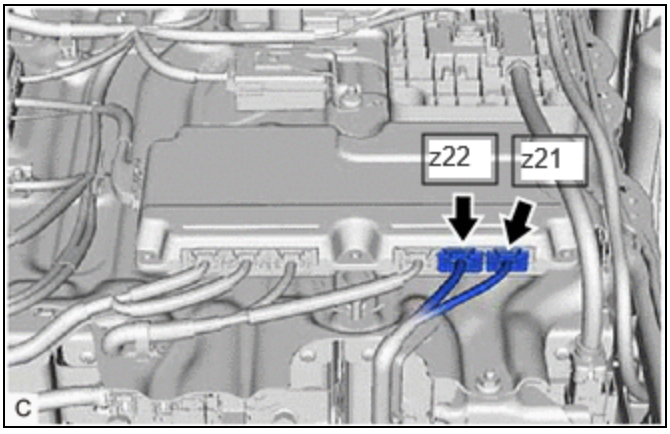
HINT:

Click here INFO

OK:

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

Result:



RESULT		PROCEED TO
OK		A
Not connected securely	The terminals are not damaged or corroded	B

RESULT		PROCEED TO
Not connected securely	The terminals are damaged or corroded	C

Post-procedure1

(c) None

B ▶ **CONNECT SECURELY**

C ▶ **REPLACE NO. 3 HV SUPPLY STACK SUB-ASSEMBLY**

A

10.	CHECK BATTERY VOLTAGE SENSOR (VA49 - VA72)

NOTICE:

Make sure to use tester probes with a diameter of approximately 0.5 mm (0.0197 in.) when measuring the voltage.

Pre-procedure1

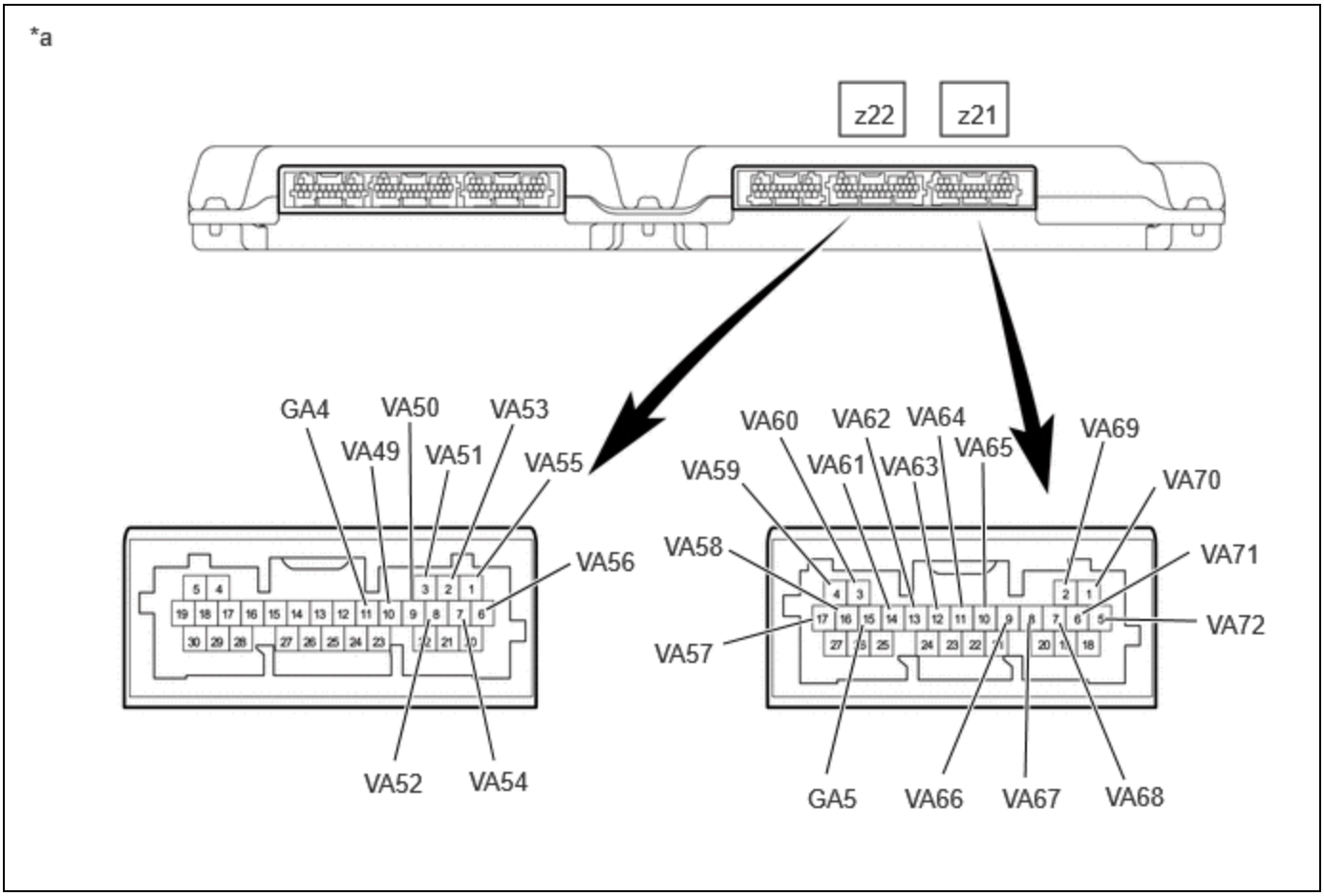
(a) Remove the battery voltage sensor.

HINT:

Click here INFO

Procedure1

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



*a	Component without harness connected (Battery Voltage Sensor)	-	-

Standard Voltage:

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
49	z22-11 (GA4) (-) - z22-10 (VA49) (+)	Always	0.3 to 1.0 V
50	z22-10 (VA49) (-) - z22-9 (VA50) (+)	Always	0.3 to 1.0 V
51	z22-9 (VA50) (-) - z22-3 (VA51) (+)	Always	0.3 to 1.0 V
52	z22-3 (VA51) (-) - z22-8 (VA52) (+)	Always	0.3 to 1.0 V
53	z22-8 (VA52) (-) - z22-2 (VA53) (+)	Always	0.3 to 1.0 V
54	z22-2 (VA53) (-) - z22-7 (VA54) (+)	Always	0.3 to 1.0 V
55	z22-7 (VA54) (-) - z22-1 (VA55) (+)	Always	0.3 to 1.0 V
56	z22-1 (VA55) (-) - z22-6 (VA56) (+)	Always	0.3 to 1.0 V
57	z22-6 (VA56) (-) - z21-17 (VA57) (+)	Always	0.3 to 1.0 V
58	z21-17 (VA57) (-) - z21-16 (VA58) (+)	Always	0.3 to 1.0 V
59	z21-16 (VA58) (-) - z21-4 (VA59) (+)	Always	0.3 to 1.0 V
60	z21-4 (VA59) (-) - z21-3 (VA60) (+)	Always	0.3 to 1.0 V
61	z21-15 (GA5) (-) - z21-14 (VA61) (+)	Always	0.3 to 1.0 V

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
62	z21-14 (VA61) (-) - z21-13 (VA62) (+)	Always	0.3 to 1.0 V
63	z21-13 (VA62) (-) - z21-12 (VA63) (+)	Always	0.3 to 1.0 V
64	z21-12 (VA63) (-) - z21-11 (VA64) (+)	Always	0.3 to 1.0 V
65	z21-11 (VA64) (-) - z21-10 (VA65) (+)	Always	0.3 to 1.0 V
66	z21-10 (VA65) (-) - z21-9 (VA66) (+)	Always	0.3 to 1.0 V
67	z21-9 (VA66) (-) - z21-8 (VA67) (+)	Always	0.3 to 1.0 V
68	z21-8 (VA67) (-) - z21-7 (VA68) (+)	Always	0.3 to 1.0 V
69	z21-7 (VA68) (-) - z21-2 (VA69) (+)	Always	0.3 to 1.0 V
70	z21-2 (VA69) (-) - z21-1 (VA70) (+)	Always	0.3 to 1.0 V
71	z21-1 (VA70) (-) - z21-6 (VA71) (+)	Always	0.3 to 1.0 V
72	z21-6 (VA71) (-) - z21-5 (VA72) (+)	Always	0.3 to 1.0 V

NOTICE:

- Make sure to check the polarity of each terminal (positive (+) or negative (-)) before connecting a tester.
- Be sure to set the Toyota electrical tester to diode range when performing this test.
- Read the voltage after the value has stabilized.
- In order to avoid damaging the terminals of the battery voltage sensor, make sure to use tester probes with a diameter of approximately 0.5 mm (0.0197 in.) when measuring the voltage of the battery voltage sensor.

RESULT	PROCEED TO
The voltage between the terminals is 0.3 to 1.0 V.	A
Other than above	B

Post-procedure1

(c) Install the battery voltage sensor.

A ▶ **REPLACE NO. 3 HV SUPPLY STACK SUB-ASSEMBLY**

B ▼

11.	**REPLACE NO. 3 HV SUPPLY STACK SUB-ASSEMBLY**

HINT:

Click here INFO

NEXT ▶ **REPLACE BATTERY VOLTAGE SENSOR**