Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BHUW
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM (for PHEV Model): P1A8000,P1A8500,P1A8A00; Hybrid/EV Battery Stack 1 Delta SOC High; 2023 - 2024 MY Prius Prime [03/2023 -]		

DTC	**P1A8000**	**Hybrid/EV Battery Stack 1 Delta SOC High**

DTC	**P1A8500**	**Hybrid/EV Battery Stack 2 Delta SOC High**

DTC	**P1A8A00**	**Hybrid/EV Battery Stack 3 Delta SOC High**

DESCRIPTION

The HV battery is composed of 72 cells (3.7 V each) in series. The battery ECU assembly monitors the difference in capacity of each HV battery cell to detect malfunctions of the HV battery.

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P1A8000	Hybrid/EV Battery Stack 1 Delta SOC High	The difference in capacity of each cell of the No. 1 HV supply stack sub-assembly exceeds the specified value. (2 trip detection logic)	• No. 1 HV supply stack sub-assembly • Service plug grip • Battery voltage sensor	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1A80
P1A8500	Hybrid/EV Battery Stack 2 Delta SOC High	The difference in capacity of each cell of the No. 2 HV supply stack sub-assembly exceeds the specified value. (2 trip detection logic)	• No. 2 HV supply stack sub-assembly • Service plug grip • Battery voltage sensor	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1A85
P1A8A00	Hybrid/EV Battery Stack 3 Delta SOC High	The difference in capacity of each cell of the No. 3 HV supply stack sub-assembly	• No. 3 HV supply stack sub-assembly • Service plug grip	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1A8A

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
		exceeds the specified value. (2 trip detection logic)	• Battery voltage sensor					

HINT:

These DTCs can be stored after clearing the DTCs and driving the vehicle for approximately 12 minutes.

MONITOR DESCRIPTION

If the battery ECU assembly detects that the difference in capacity of each HV battery cell exceeds the specified value, the battery ECU assembly will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P1A80 (INF P1A8000), P1A85 (INF P1A8500), P1A8A (INF P1A8A00): Battery cell malfunction
Required sensors/components	Battery ECU assembly
Frequency of operation	Continuous
Duration	TMC's intellectual property
MIL operation	2 driving cycles
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 P1A80 (INF P1A8000) is not detected DTC P1A85 (INF P1A8500) is not detected DTC P1A8A (INF P1A8A00) 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. Drive the vehicle on urban roads for approximately 12 minutes 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 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.

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
"P1A8000, P1A8500 or P1A8A00" 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
	P0ABF28	Hybrid/EV Battery Current Sensor "A" Signal Bias Level Out of Range / Zero Adjustment Failure
	P0ABF2A	Hybrid/EV Battery Current Sensor "A" Signal Stuck In Range
	P1AC413	Hybrid/EV Battery Stack 1 Current Interrupt Device Circuit Open
	P1AC513	Hybrid/EV Battery Stack 2 Current Interrupt Device Circuit Open
	P1AC613	Hybrid/EV Battery Stack 3 Current Interrupt Device Circuit Open
	P1AC713	Hybrid/EV Battery Stack 4 Current Interrupt Device Circuit Open
	P1AC49E	Hybrid/EV Battery Stack 1 Current Interrupt Device Stuck On
	P1AC59E	Hybrid/EV Battery Stack 2 Current Interrupt Device Stuck On
	P1AC69E	Hybrid/EV Battery Stack 3 Current Interrupt Device Stuck On
	P1AC79E	Hybrid/EV Battery Stack 4 Current Interrupt Device Stuck On
	P1CBB12	Hybrid/EV Battery Current Sensor Power Supply Circuit Short to Auxiliary Battery
	P1CBB14	Hybrid/EV Battery Current Sensor Power Supply Circuit Short to Ground or Open
	P1CC81E	Hybrid/EV Battery Stack 1 Voltage Difference Out of Range
	P1CC91E	Hybrid/EV Battery Stack 2 Voltage Difference Out of Range
	P1CCA1E	Hybrid/EV Battery Stack 3 Voltage Difference Out of Range
	P1CCB1E	Hybrid/EV Battery Stack 4 Voltage Difference Out of Range
Hybrid control system	P0B231C	Hybrid/EV Battery "A" Voltage Sensor Voltage Out of Range
	P1C2D62	Hybrid/EV Battery "A" Voltage Sensor/ Boosting Converter Voltage Sensor "A" Signal Compare Failure

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
"P1A8000" is also output.	A
"P1A8500" is also output.	B
"P1A8A00" is also output.	C

B ▶ **GO TO STEP 7**

C ▶ **GO TO STEP 11**

A

3.	**CHECK FREEZE FRAME DATA**

Pre-procedure1

(a) None

Procedure1

(b) Read the value of freeze frame data items "Hybrid/EV Battery Cell 1 voltage" through "Hybrid/EV Battery Cell 24 voltage" for DTC P1A8000 and make a note if the value of any is the lowest voltage value.

Powertrain > HV Battery > Trouble Codes

Post-procedure1

(c) Turn the ignition switch off.

NEXT

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 resistance.

Pre-procedure1

(a) Remove the battery voltage sensor.

HINT:

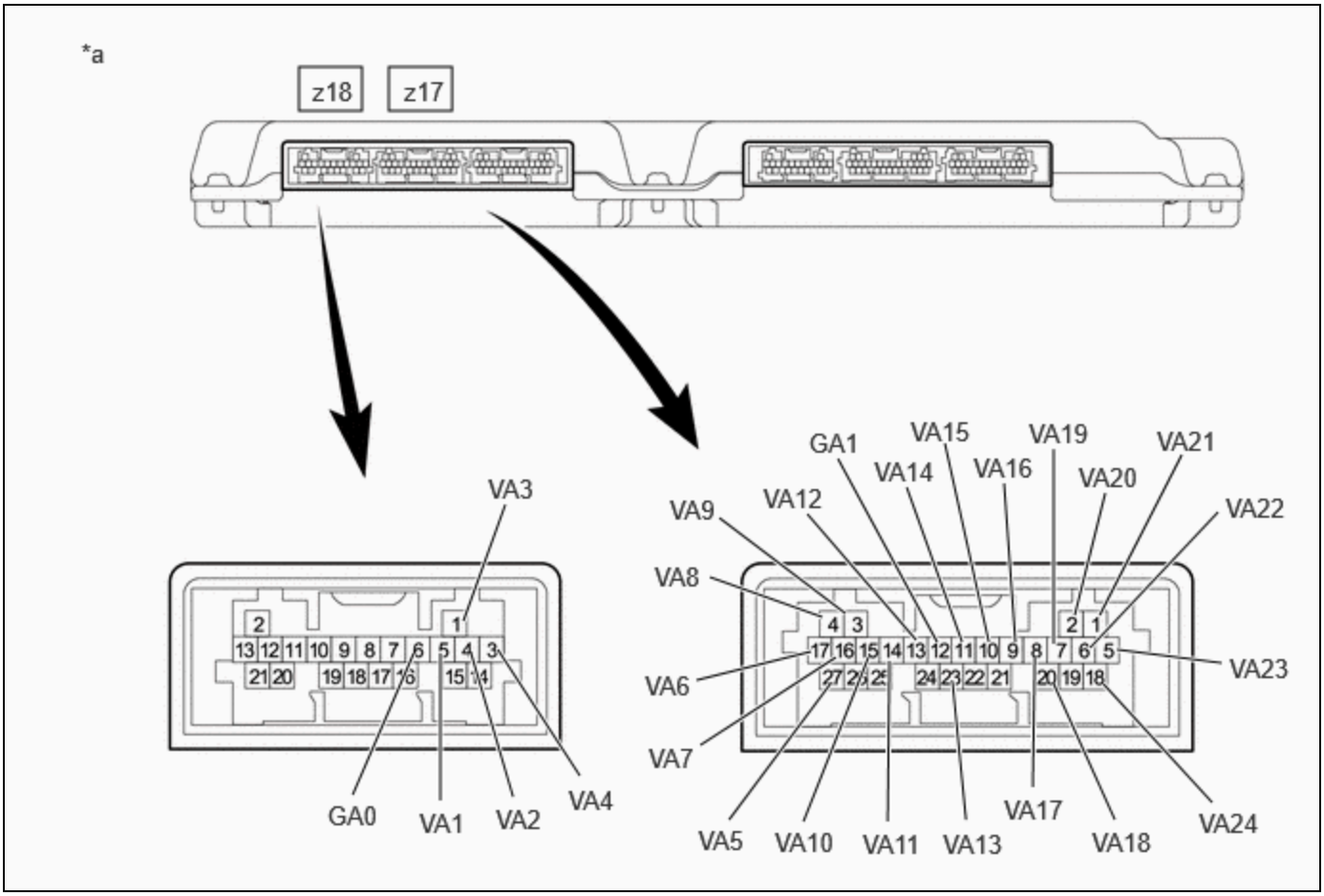
Click here INFO

Procedure1

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

HINT:

Only inspect the terminals of the battery voltage sensor which correspond to the HV battery cells which measured the lowest voltage value in the previous step.



*a	Component without harness connected	-	-

	(Battery Voltage Sensor)		

Standard Resistance:

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
1	z18-6 (GA0) (-) - z18-5 (VA1) (+)	Always	50 kΩ or more
2	z18-5 (VA1) (-) - z18-4 (VA2) (+)	Always	50 kΩ or more
3	z18-4 (VA2) (-) - z18-1 (VA3) (+)	Always	50 kΩ or more
4	z18-1 (VA3) (-) - z18-3 (VA4) (+)	Always	50 kΩ or more
5	z18-3 (VA4) (-) - z17-27 (VA5) (+)	Always	50 kΩ or more
6	z17-27 (VA5) (-) - z17-17 (VA6) (+)	Always	50 kΩ or more
7	z17-17 (VA6) (-) - z17-16 (VA7) (+)	Always	50 kΩ or more
8	z17-16 (VA7) (-) - z17-4 (VA8) (+)	Always	50 kΩ or more
9	z17-4 (VA8) (-) - z17-3 (VA9) (+)	Always	50 kΩ or more
10	z17-3 (VA9) (-) - z17-15 (VA10) (+)	Always	50 kΩ or more
11	z17-15 (VA10) (-) - z17-14 (VA11) (+)	Always	50 kΩ or more
12	z17-14 (VA11) (-) - z17-13 (VA12) (+)	Always	50 kΩ or more
13	z17-12 (GA1) (-) - z17-23 (VA13) (+)	Always	50 kΩ or more
14	z17-23 (VA13) (-) - z17-11 (VA14) (+)	Always	50 kΩ or more
15	z17-11 (VA14) (-) - z17-10 (VA15) (+)	Always	50 kΩ or more
16	z17-10 (VA15) (-) - z17-9 (VA16) (+)	Always	50 kΩ or more
17	z17-9 (VA16) (-) - z17-8 (VA17) (+)	Always	50 kΩ or more
18	z17-8 (VA17) (-) - z17-20 (VA18) (+)	Always	50 kΩ or more
19	z17-20 (VA18) (-) - z17-7 (VA19) (+)	Always	50 kΩ or more
20	z17-7 (VA19) (-) - z17-2 (VA20) (+)	Always	50 kΩ or more
21	z17-2 (VA20) (-) - z17-1 (VA21) (+)	Always	50 kΩ or more
22	z17-1 (VA21) (-) - z17-6 (VA22) (+)	Always	50 kΩ or more
23	z17-6 (VA22) (-) - z17-5 (VA23) (+)	Always	50 kΩ or more
24	z17-5 (VA23) (-) - z17-18 (VA24) (+)	Always	50 kΩ or more

NOTICE:

- Make sure to check the polarity of each terminal (positive (+) or negative (-)) before connecting a tester.
- Read the resistance 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 resistance of the battery voltage sensor.

RESULT	PROCEED TO
The resistance between the terminals is 50 kΩ or more.	A
Other than above	B

Post-procedure1

(c) Install the battery voltage sensor.

B ▶ **REPLACE BATTERY VOLTAGE SENSOR**

A

5.	**CHECK TOTAL DISTANCE DRIVEN**

(a) Read the odometer to check the total distance the vehicle has been driven.

RESULT		PROCEED TO
Total distance driven is less than 200000 km (124280 mile)		A
Total distance driven is 200000 km (124280 mile) or more	Current total distance driven - total distance driven when service plug grip replaced = less than 200000 km (124280 mile) *1	A
	Other than above	B

HINT:

*1: If the service plug grip has been replaced, use the total distance driven since it was replaced.

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

B

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

HINT:

Click here INFO

NEXT ▶ **REPLACE SERVICE PLUG GRIP**

7.	**CHECK FREEZE FRAME DATA**

Pre-procedure1

(a) None

Procedure1

(b) Read the value of freeze frame data items "Hybrid/EV Battery Cell 25 voltage" through "Hybrid/EV Battery Cell 48 voltage" for DTC P1A8500 and make a note if the value of any is the lowest voltage value.

Powertrain > HV Battery > Trouble Codes

Post-procedure1

(c) Turn the ignition switch off.

NEXT

8.	**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 resistance.

Pre-procedure1

(a) Remove the battery voltage sensor.

HINT:

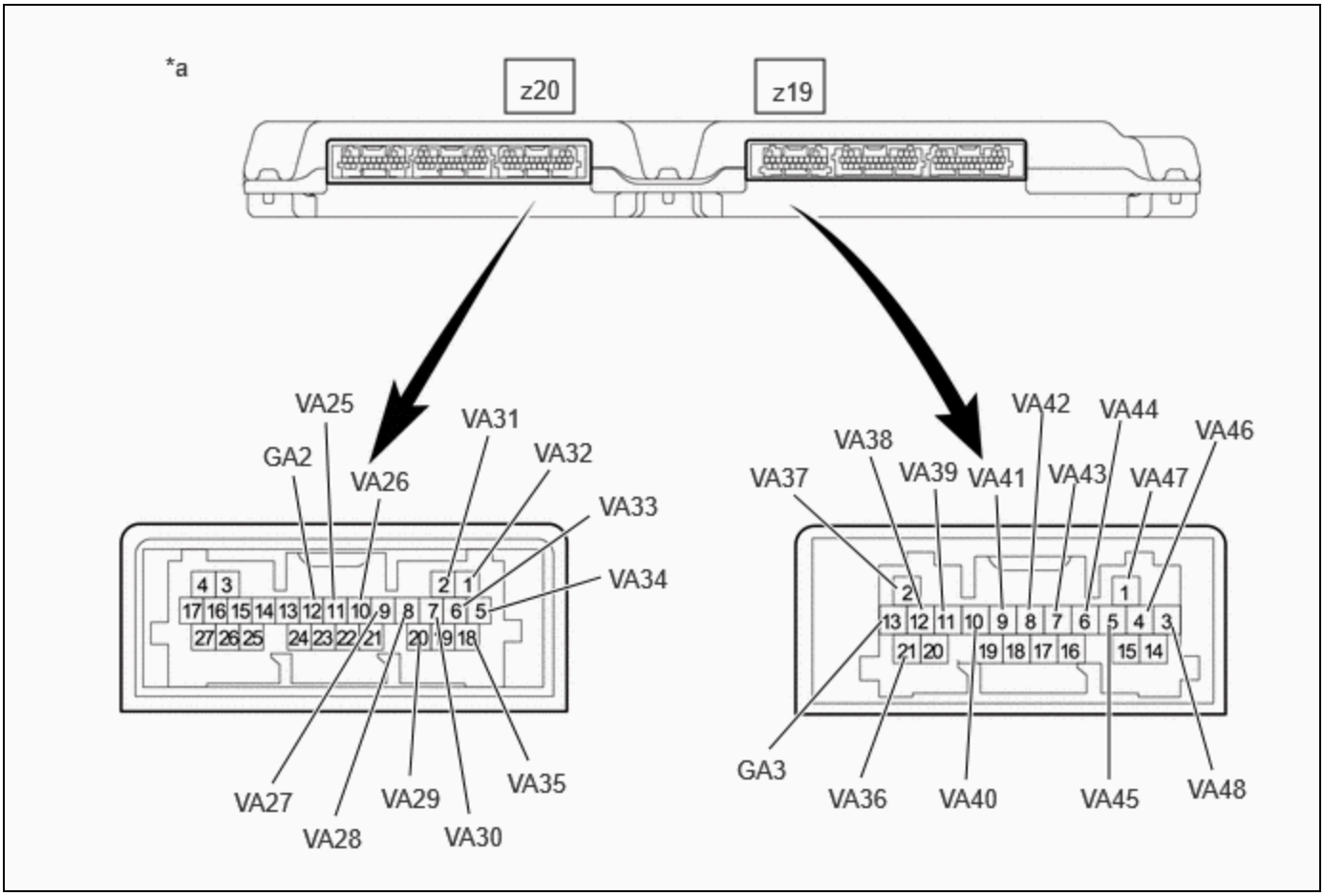
Click here INFO

Procedure1

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

HINT:

Only inspect the terminals of the battery voltage sensor which correspond to the HV battery cells which measured the lowest voltage value in the previous step.



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

Standard Resistance:

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
25	z20-12 (GA2) (-) - z20-11 (VA25) (+)	Always	50 kΩ or more
26	z20-11 (VA25) (-) - z20-10 (VA26) (+)	Always	50 kΩ or more
27	z20-10 (VA26) (-) - z20-9 (VA27) (+)	Always	50 kΩ or more
28	z20-9 (VA27) (-) - z20-8 (VA28) (+)	Always	50 kΩ or more
29	z20-8 (VA28) (-) - z20-20 (VA29) (+)	Always	50 kΩ or more
30	z20-20 (VA29) (-) - z20-7 (VA30) (+)	Always	50 kΩ or more
31	z20-7 (VA30) (-) - z20-2 (VA31) (+)	Always	50 kΩ or more
32	z20-2 (VA31) (-) - z20-1 (VA32) (+)	Always	50 kΩ or more
33	z20-1 (VA32) (-) - z20-6 (VA33) (+)	Always	50 kΩ or more
34	z20-6 (VA33) (-) - z20-5 (VA34) (+)	Always	50 kΩ or more
35	z20-5 (VA34) (-) - z20-18 (VA35) (+)	Always	50 kΩ or more
36	z20-18 (VA35) (-) - z19-21 (VA36) (+)	Always	50 kΩ or more
37	z19-13 (GA3) (-) - z19-2 (VA37) (+)	Always	50 kΩ or more

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
38	z19-2 (VA37) (-) - z19-12 (VA38) (+)	Always	50 kΩ or more
39	z19-12 (VA38) (-) - z19-11 (VA39) (+)	Always	50 kΩ or more
40	z19-11 (VA39) (-) - z19-10 (VA40) (+)	Always	50 kΩ or more
41	z19-10 (VA40) (-) - z19-9 (VA41) (+)	Always	50 kΩ or more
42	z19-9 (VA41) (-) - z19-8 (VA42) (+)	Always	50 kΩ or more
43	z19-8 (VA42) (-) - z19-7 (VA43) (+)	Always	50 kΩ or more
44	z19-7 (VA43) (-) - z19-6 (VA44) (+)	Always	50 kΩ or more
45	z19-6 (VA44) (-) - z19-5 (VA45) (+)	Always	50 kΩ or more
46	z19-5 (VA45) (-) - z19-4 (VA46) (+)	Always	50 kΩ or more
47	z19-4 (VA46) (-) - z19-1 (VA47) (+)	Always	50 kΩ or more
48	z19-1 (VA47) (-) - z19-3 (VA48) (+)	Always	50 kΩ or more

NOTICE:

- Make sure to check the polarity of each terminal (positive (+) or negative (-)) before connecting a tester.
- Read the resistance 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 resistance of the battery voltage sensor.

RESULT	PROCEED TO
The resistance between the terminals is 50 kΩ or more.	A
Other than above	B

Post-procedure1

(c) Install the battery voltage sensor.

B ▶ **REPLACE BATTERY VOLTAGE SENSOR**

A ▼

9.	**CHECK TOTAL DISTANCE DRIVEN**

(a) Read the odometer to check the total distance the vehicle has been driven.

RESULT		PROCEED TO
Total distance driven is less than 200000 km (124280 mile)		A
Total distance driven is 200000 km (124280 mile) or more	Current total distance driven - total distance driven when service plug grip replaced = less than 200000 km (124280 mile) *1	A
	Other than above	B

HINT:

*1: If the service plug grip has been replaced, use the total distance driven since it was replaced.

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

B ▼

10.	**REPLACE NO. 2 HV SUPPLY STACK SUB-ASSEMBLY**

HINT:

Click here INFO

NEXT ▶ **REPLACE SERVICE PLUG GRIP**

11.	**CHECK FREEZE FRAME DATA**

Pre-procedure1

(a) None

Procedure1

(b) Read the value of freeze frame data items "Hybrid/EV Battery Cell 49 voltage" through "Hybrid/EV Battery Cell 72 voltage" for DTC P1A8A00 and make a note if the value of any is the lowest voltage value.

Powertrain > HV Battery > Trouble Codes

Post-procedure1

(c) Turn the ignition switch off.

NEXT ▼

12.	**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 resistance.

Pre-procedure1

(a) Remove the battery voltage sensor.

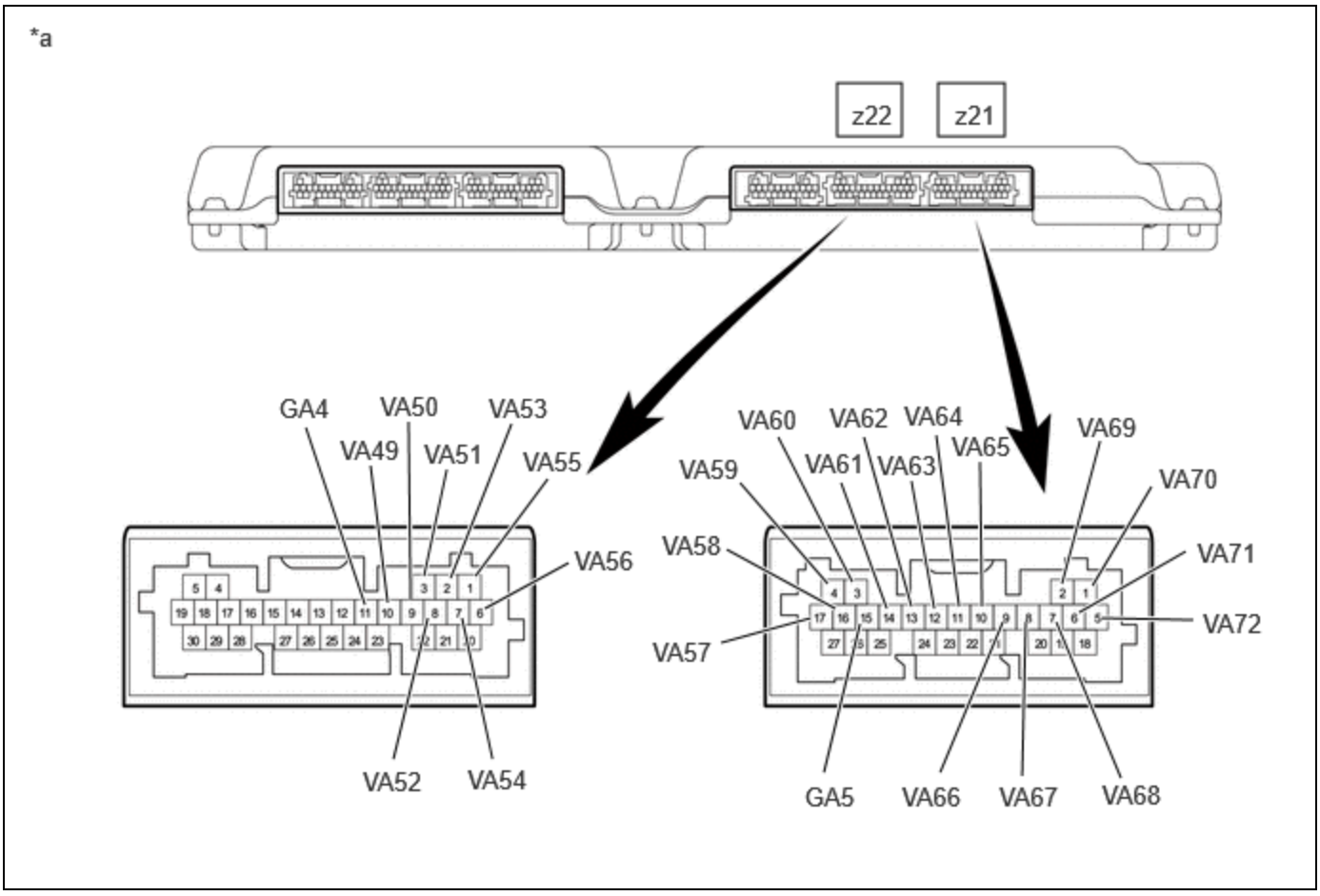
Click here INFO

Procedure1

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

HINT:

Only inspect the terminals of the battery voltage sensor which correspond to the HV battery cells which measured the lowest voltage value in the previous step.



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

Standard Resistance:

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
49	z22-11 (GA4) (-) - z22-10 (VA49) (+)	Always	50 kΩ or more
50	z22-10 (VA49) (-) - z22-9 (VA50) (+)	Always	50 kΩ or more
51	z22-9 (VA50) (-) - z22-3 (VA51) (+)	Always	50 kΩ or more

HYBRID BATTERY CELL	TESTER CONNECTION (TESTER PROBE POLARITY)	CONDITION	SPECIFIED CONDITION
52	z22-3 (VA51) (-) - z22-8 (VA52) (+)	Always	50 kΩ or more
53	z22-8 (VA52) (-) - z22-2 (VA53) (+)	Always	50 kΩ or more
54	z22-2 (VA53) (-) - z22-7 (VA54) (+)	Always	50 kΩ or more
55	z22-7 (VA54) (-) - z22-1 (VA55) (+)	Always	50 kΩ or more
56	z22-1 (VA55) (-) - z22-6 (VA56) (+)	Always	50 kΩ or more
57	z22-6 (VA56) (-) - z21-17 (VA57) (+)	Always	50 kΩ or more
58	z21-17 (VA57) (-) - z21-16 (VA58) (+)	Always	50 kΩ or more
59	z21-16 (VA58) (-) - z21-4 (VA59) (+)	Always	50 kΩ or more
60	z21-4 (VA59) (-) - z21-3 (VA60) (+)	Always	50 kΩ or more
61	z21-15 (GA5) (-) - z21-14 (VA61) (+)	Always	50 kΩ or more
62	z21-14 (VA61) (-) - z21-13 (VA62) (+)	Always	50 kΩ or more
63	z21-13 (VA62) (-) - z21-12 (VA63) (+)	Always	50 kΩ or more
64	z21-12 (VA63) (-) - z21-11 (VA64) (+)	Always	50 kΩ or more
65	z21-11 (VA64) (-) - z21-10 (VA65) (+)	Always	50 kΩ or more
66	z21-10 (VA65) (-) - z21-9 (VA66) (+)	Always	50 kΩ or more
67	z21-9 (VA66) (-) - z21-8 (VA67) (+)	Always	50 kΩ or more
68	z21-8 (VA67) (-) - z21-7 (VA68) (+)	Always	50 kΩ or more
69	z21-7 (VA68) (-) - z21-2 (VA69) (+)	Always	50 kΩ or more
70	z21-2 (VA69) (-) - z21-1 (VA70) (+)	Always	50 kΩ or more
71	z21-1 (VA70) (-) - z21-6 (VA71) (+)	Always	50 kΩ or more
72	z21-6 (VA71) (-) - z21-5 (VA72) (+)	Always	50 kΩ or more

NOTICE:

- Make sure to check the polarity of each terminal (positive (+) or negative (-)) before connecting a tester.
- Read the resistance 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 resistance of the battery voltage sensor.

RESULT	PROCEED TO
The resistance between the terminals is 50 kΩ or more.	A
Other than above	B

Post-procedure1

(c) Install the battery voltage sensor.

B ▶ **REPLACE BATTERY VOLTAGE SENSOR**

A

13.	**CHECK TOTAL DISTANCE DRIVEN**

(a) Read the odometer to check the total distance the vehicle has been driven.

RESULT		PROCEED TO
Total distance driven is less than 200000 km (124280 mile)		A
Total distance driven is 200000 km (124280 mile) or more	Current total distance driven - total distance driven when service plug grip replaced = less than 200000 km (124280 mile) *1	A
	Other than above	B

HINT:

*1: If the service plug grip has been replaced, use the total distance driven since it was replaced.

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

B

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

HINT:

Click here INFO

NEXT ▶ **REPLACE SERVICE PLUG GRIP**