Last Modified: 12-04-2024	6.11:8.1.0	**Doc ID:** RM100000002BHUT
Model Year Start: 2023	**Model:** Prius Prime	**Prod Date Range:** [03/2023 -]
Title: HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM (for PHEV Model): P1A001C,P1A051C,P301A1C; Hybrid Battery Stack 2 Cell Voltage Detection Voltage Out of Range; 2023 - 2024 MY Prius Prime [03/2023 -]		

DTC	**P1A001C**	**Hybrid Battery Stack 2 Cell Voltage Detection Voltage Out of Range**

DTC	**P1A051C**	**Hybrid Battery Stack 3 Cell Voltage Detection Voltage Out of Range**

DTC	**P301A1C**	**Hybrid Battery Stack 1 Cell Voltage Detection Voltage Out of Range**

DESCRIPTION

The HV battery is composed of 72 cells (3.7 V each) in series. The battery ECU assembly monitors the voltage 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
P1A001C	Hybrid Battery Stack 2 Cell Voltage Detection Voltage Out of Range	An open is detected in the HV battery cell voltage detection circuits of the No. 2 HV supply stack sub-assembly. (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: P1A00
P1A051C	Hybrid Battery Stack 3 Cell Voltage Detection Voltage Out of Range	An open is detected in the HV battery cell voltage detection circuits of the No. 3 HV supply stack sub-assembly. (1 trip detection logic)	• No. 3 HV supply stack sub-assembly • Battery voltage sensor	Comes on	Master Warning: Comes on	HV Battery	A	SAE Code: P1A05

DTC NO.	DETECTION ITEM	DTC DETECTION CONDITION	TROUBLE AREA	MIL	WARNING INDICATE	DTC OUTPUT FROM	PRIORITY	NOTE
P301A1C	Hybrid Battery Stack 1 Cell Voltage Detection Voltage Out of Range	An open is detected in the HV battery cell voltage detection circuits of the No. 1 HV supply stack sub-assembly. (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: P301A

MONITOR DESCRIPTION

If the voltage of an HV battery cell is abnormal, the battery ECU assembly will determine that a malfunction has occurred. When the malfunction detection condition is satisfied, the battery ECU assembly will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P1A00 (INF P1A001C), P1A05 (INF P1A051C), P301A (INF P301A1C): Battery voltage detection circuits malfunction
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 P1A00 (INF P1A001C) is not detected DTC P1A05 (INF P1A051C) is not detected DTC P301A (INF P301A1C) 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. Turn the ignition switch to ON and wait for 10 seconds or more.[*1]

HINT:

[*1]: Normal judgment procedure.

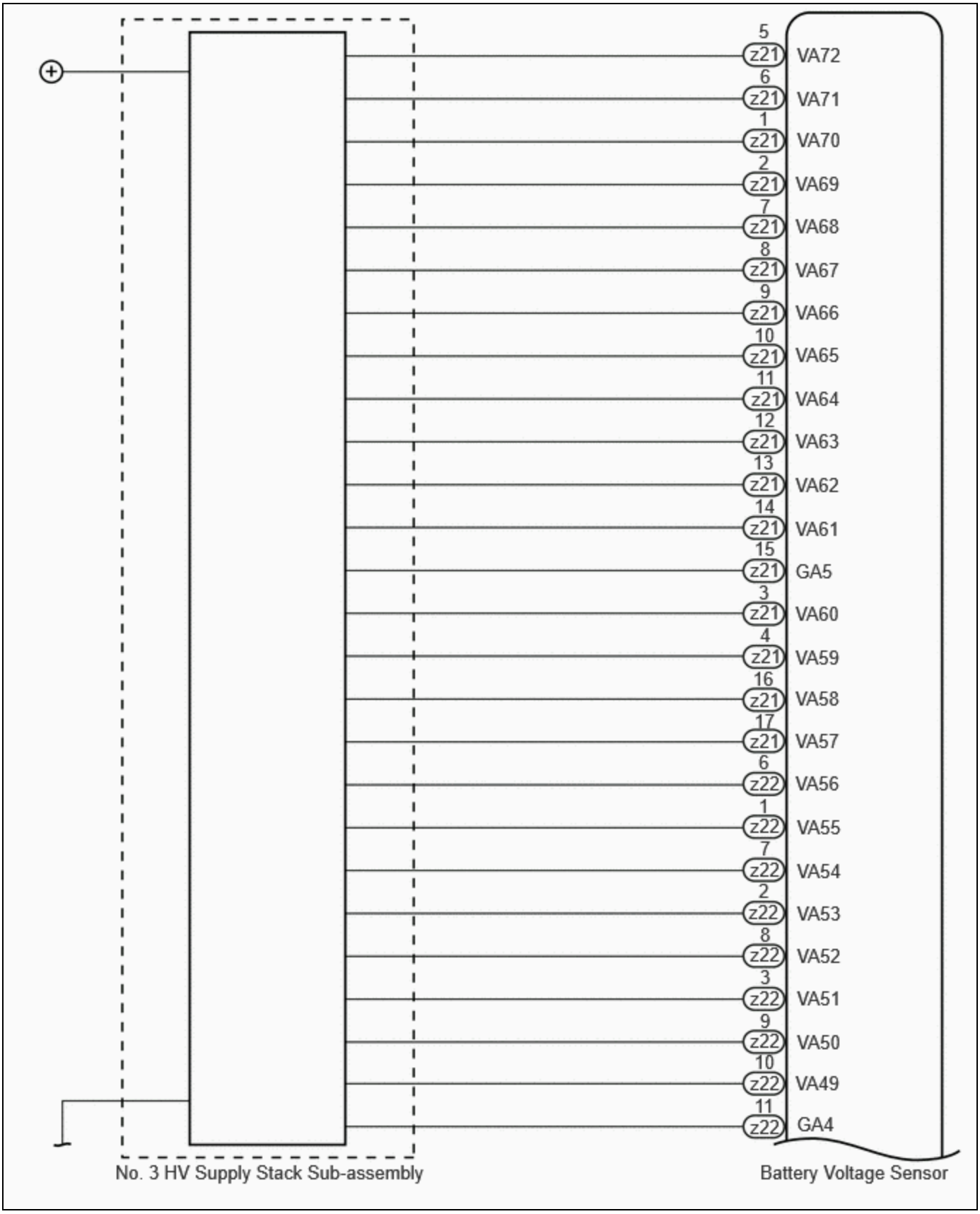
The normal judgment procedure is used to complete DTC judgment and also used when clearing permanent DTCs.

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 or N/A, perform the normal judgment procedure again.

WIRING DIAGRAM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12 z21 VA63
13 z21 VA62
14 z21 VA61
15 z21 GA5
3 z21 VA60
4 z21 VA59
16 z21 VA58
17 z21 VA57
6 z22 VA56
1 z22 VA55
7 z22 VA54
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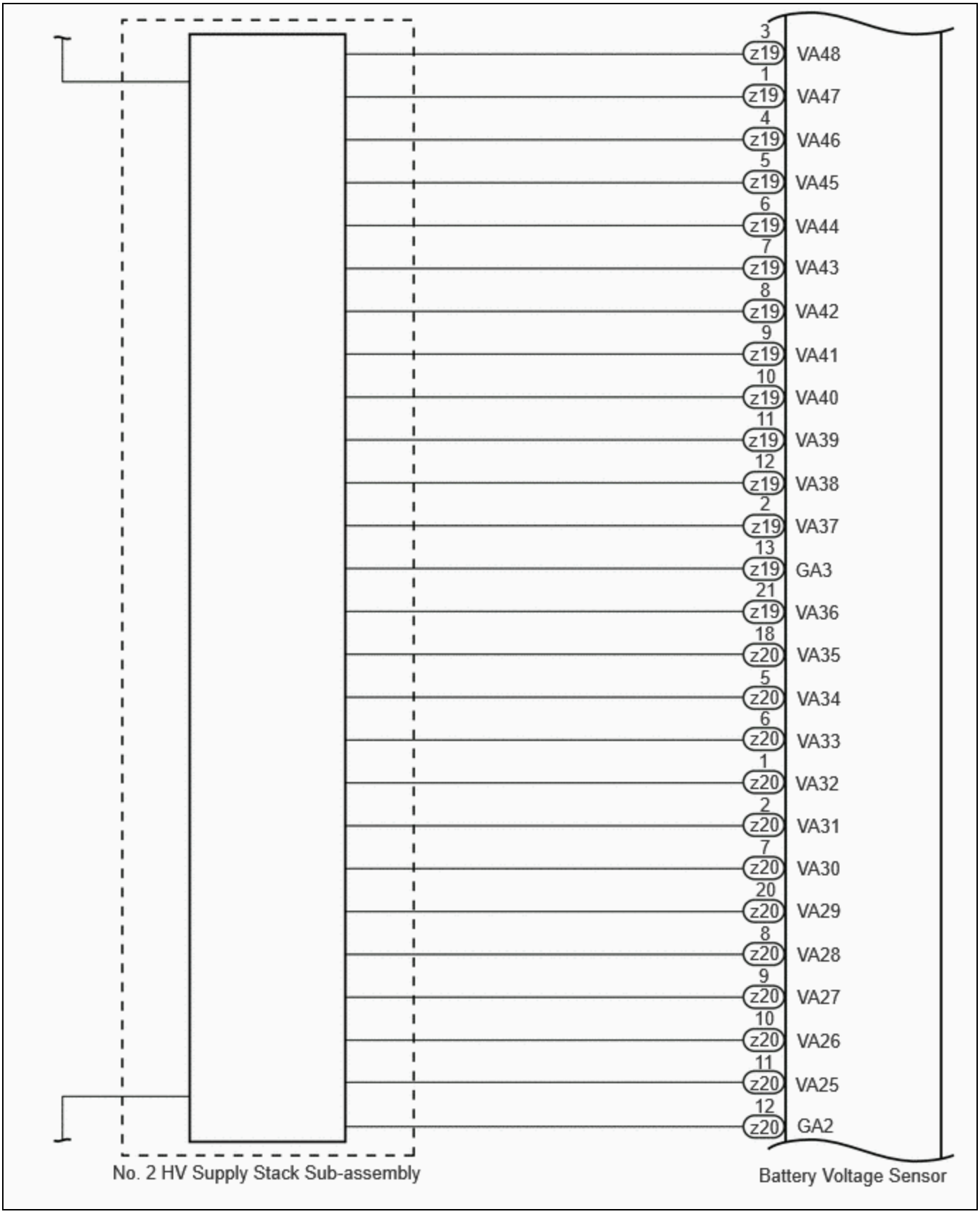
No. 3 HV Supply Stack Sub-assembly
Battery Voltage Sensor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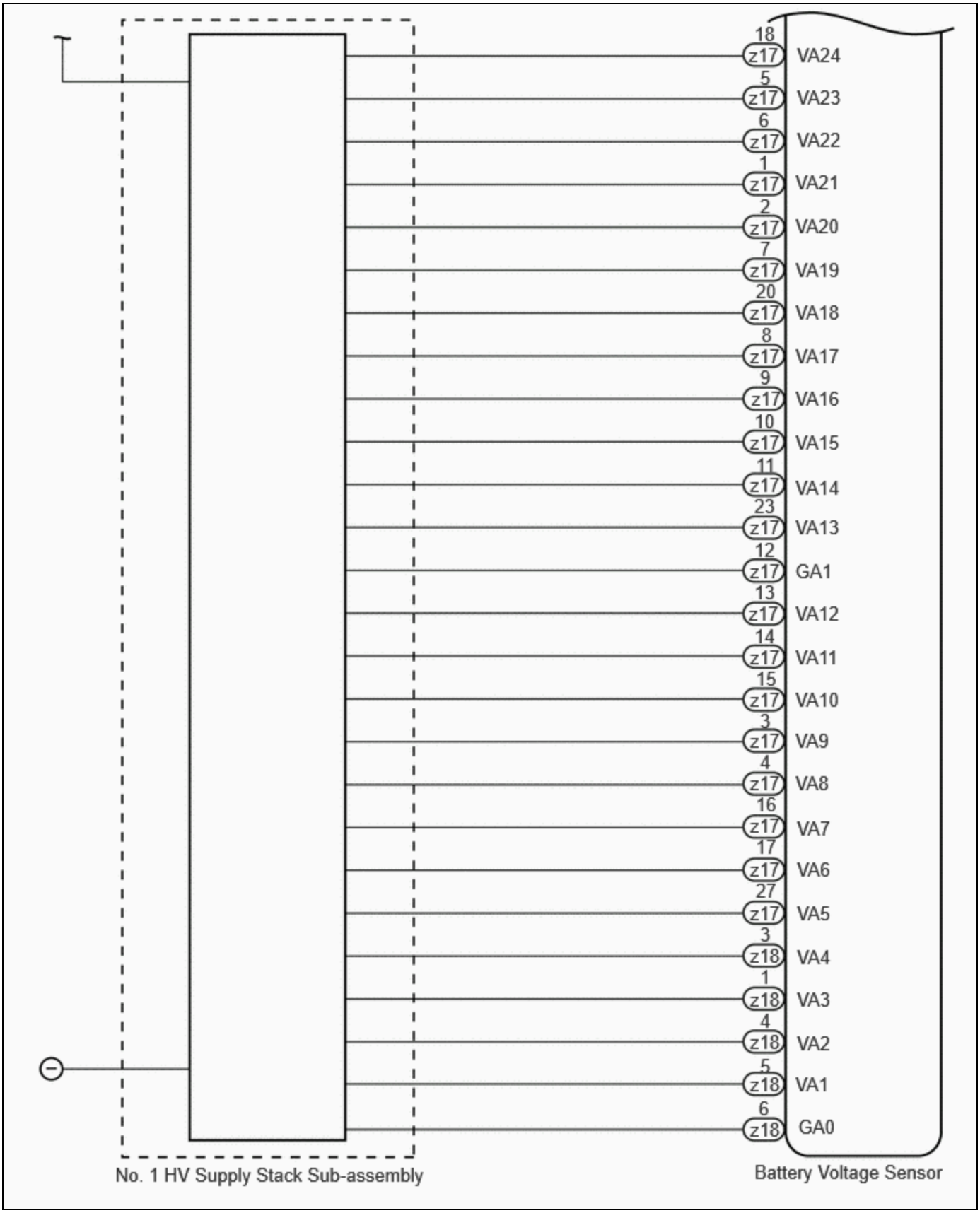
11 z19 VA39
12 z19 VA38
2 z19 VA37
13 z19 GA3
21 z19 VA36
18 z20 VA35
5 z20 VA34
6 z20 VA33
1 z20 VA32
2 z20 VA31
7 z20 VA30
20 z20 VA29
8 z20 VA28
9 z20 VA27
10 z20 VA26
11 z20 VA25
12 z20 GA2
No. 2 HV Supply Stack Sub-assembly
Battery Voltage Sensor



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
"P1A001C, P1A051C or P301A1C" 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
	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

SYSTEM	RELEVANT DTC	
	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
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
"P1A001C" is also output.	A
"P1A051C" is also output.	B
"P301A1C" 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.

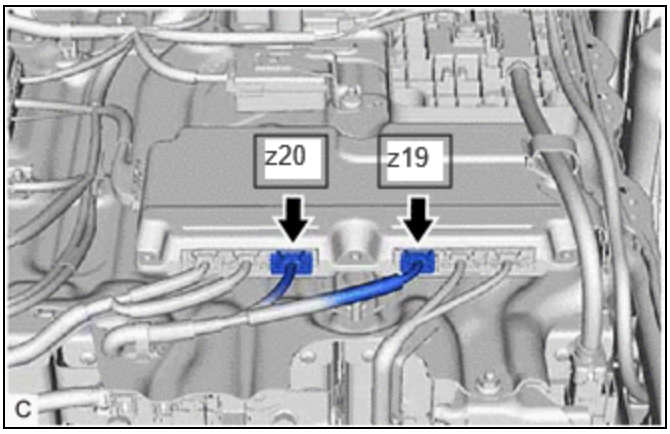
HINT:

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
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 ▼

4.	**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 P1A001C and make a note if the value of any is 1.6 V or less.

Powertrain > HV Battery > Trouble Codes

Post-procedure1

(c) Turn the ignition switch off.

NEXT

5.	**CHECK NO. 2 HV SUPPLY STACK SUB-ASSEMBLY (HYBRID BATTERY CELL 25 TO 48 VOLTAGE)**

Click here INFO

RESULT	PROCEED TO
The voltage between the terminals is 1.6 V or less.	A
Other than above	B

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

B ▶ **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.

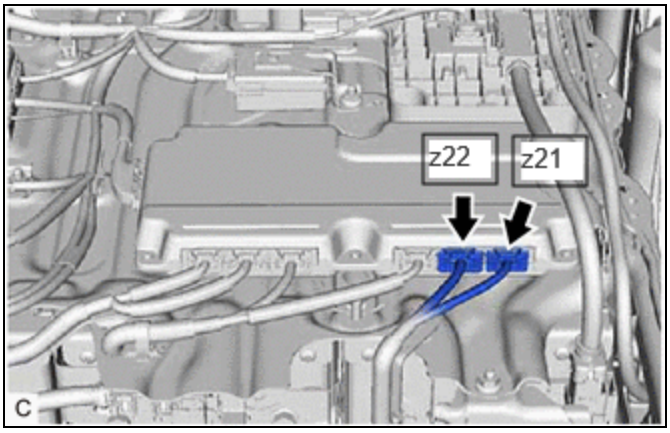
HINT:

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. 3 HV SUPPLY STACK SUB-ASSEMBLY**

A ▼

7.	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 P1A051C and make a note if the value of any is 1.6 V or less.

Powertrain > HV Battery > Trouble Codes

Post-procedure1

(c) Turn the ignition switch off.

NEXT

8.	**CHECK NO. 3 HV SUPPLY STACK SUB-ASSEMBLY (HYBRID BATTERY CELL 49 TO 72 VOLTAGE)**

Click here INFO

RESULT	PROCEED TO
The voltage between the terminals is 1.6 V or less.	A
Other than above	B

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

B ▶ **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.

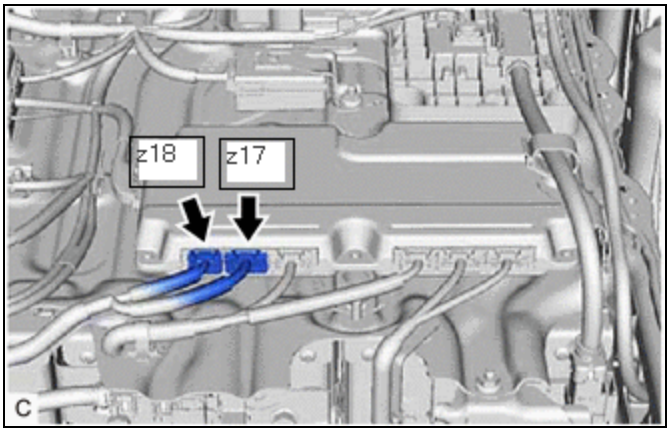
Click here INFO

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

10.	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 P301A1C and make a note if the value of any is 1.6 V or less.

Powertrain > HV Battery > Trouble Codes

Post-procedure1

(c) Turn the ignition switch off.

NEXT

11.	CHECK NO. 1 HV SUPPLY STACK SUB-ASSEMBLY (HYBRID BATTERY CELL 1 TO 24 VOLTAGE)

Click here INFO

RESULT	PROCEED TO
The voltage between the terminals is 1.6 V or less.	A
Other than above	B

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

B ▶ **REPLACE BATTERY VOLTAGE SENSOR**