

Battery System, Hybrid Drive: Testing and Inspection

Hybrid Control System

HYBRID / BATTERY CONTROL: HYBRID BATTERY SYSTEM: UTILITY

CAUTION:

Before performing diagnosis and repair, do not perform "HV Batt Cell Low Volt READY ON Prevention Cancel".

NOTICE:

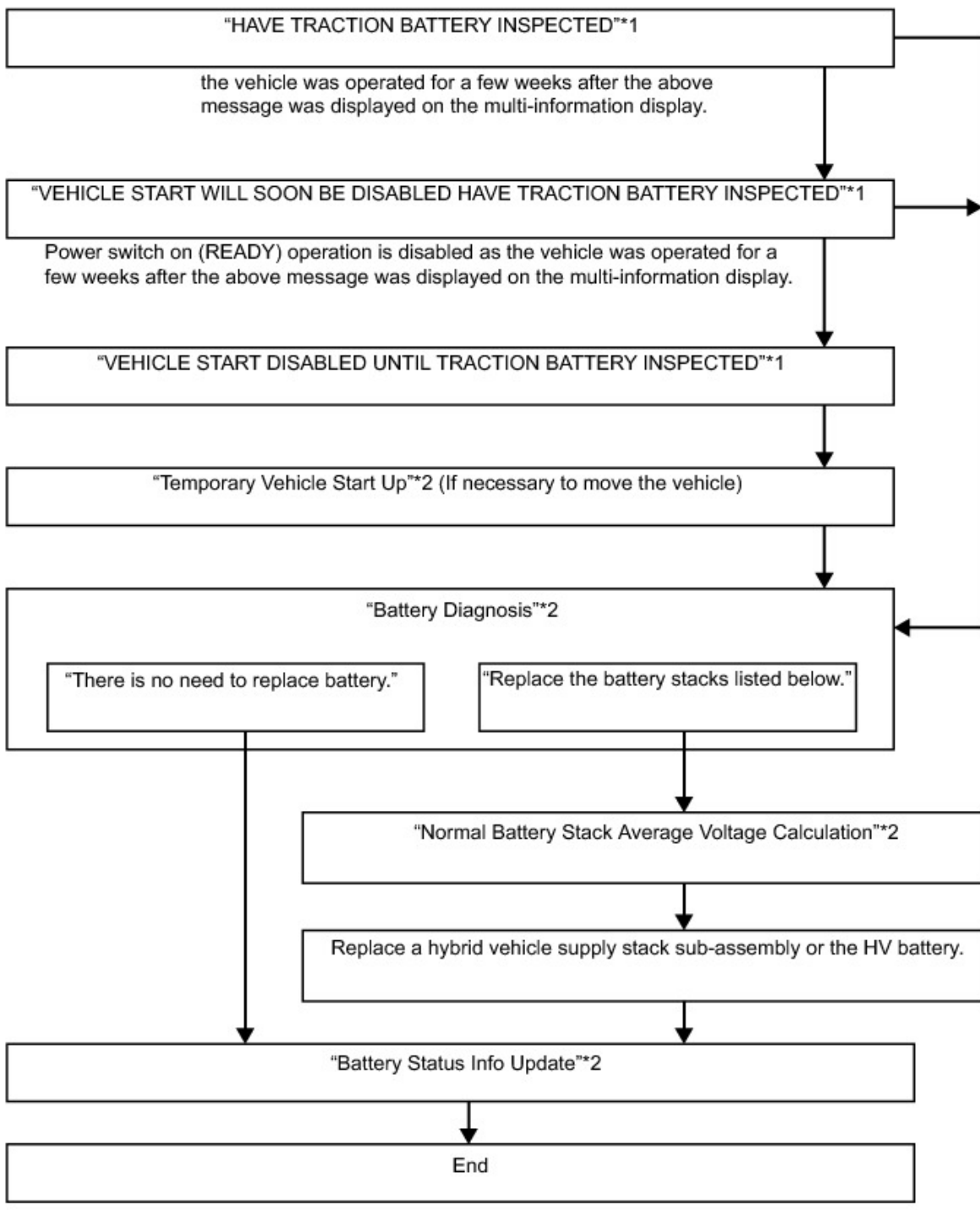
- * Make sure to perform "Normal Battery Stack Average Voltage Calculation" using the utility function before removing the hybrid vehicle supply stack sub-assembly.
- * If the traction battery is continually used for a few weeks* without performing "Battery Diagnosis", "VEHICLE START WILL SOON BE DISABLED" and "HAVE TRACTION BATTERY INSPECTED" will be displayed and the use of the HV battery will be limited. If use continues, the power switch on (READY) operation will be disabled.
- *: Timing may vary depending on vehicle usage.

HINT

If "HAVE TRACTION BATTERY INSPECTED" is displayed, See: Testing and Inspection/Symptom Related Diagnostic Procedures/Hybrid Battery System/"Have Traction Battery Inspected" Is Displayed.

1. Purpose

Utility Items (Techstream Display)	Main Purpose	Control Description
Battery Diagnosis	-	Performs diagnosis of the extent of deterioration of the HV battery by measuring the SOC (state of charge) of each HV battery stack sub-assembly.
Battery Status Info Update	Clears the "HAVE TRACTION BATTERY INSPECTED" screen on the multi-information display after performing "Battery Diagnosis".	Updates the SOC (state of charge) record to the normal value.
Temporary Vehicle Start Up	-	Temporarily enable the power switch on (Ready) operation which has been disabled due to continual usage of the vehicle without performing battery diagnosis.
HV Batt Cell Low Volt READY ON Prevention Cancel	Used to cancel the READY On Prevention, which is enabled when the vehicle is repaired after DTC P31AB-123, P1A61-123, P1A64-123 or P1A67-123 was output.	Cancels the power switch on (READY) prevention after repairing the Hybrid battery cell low voltage malfunction.
Normal Battery Stack Average Voltage Calculation	To calculate the average battery stack voltage of the known good HV battery stack sub-assemblies to adjust the voltage of a new HV supply stack sub-assembly correctly before replacement.	Measures the HV battery temperature and average voltage of known good hybrid vehicle supply stack sub-assemblies.



*1: Message displayed on the multi-information display.

*2: Utility items (Techstream display)

2. Battery Diagnosis

NOTICE:

- * Do not perform battery diagnosis while the hybrid system light is illuminated.
- * Perform battery diagnosis with the HV battery installed correctly.
- * Do not perform battery diagnosis while changing from inspection mode to another mode.
- * Make sure to turn the power switch off after battery diagnosis to prevent the auxiliary battery from being discharged.
- * If the learning of SOC (state of charge) has not been performed, perform battery diagnosis after plug-in charging the vehicle as specified.

(a) Connect the Techstream to the DLC3.

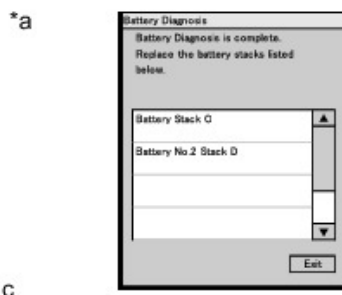
(b) Turn the power switch on (IG).

- (c) Enter the following menus: Powertrain / Hybrid Control / Utility / Battery Diagnosis.
- (d) Check items on the display and press "Next".
- (e) The screen transitions to the next screen and "Now diagnosing" is displayed.

HINT

- * "Progress" is displayed as a reference to the estimated time to complete the diagnosis.
- * To suspend battery diagnosis, press "Exit" and turn the power switch off.

- (f) When battery diagnosis is complete, the result will be displayed.

**Text in Illustration**

*a Example of a diagnosis result

- (g) Check the diagnosis result.

Techstream Display	Diagnosis Result	After performing diagnosis
"There is no need to replace the battery. Be sure to refer to the repair manual for procedures to take after this."	There is no need to replace battery.	Perform "Battery Status Info Update".
Replace the hybrid vehicle supply stack sub-assemblies listed below.	Replace the battery stacks listed below.	Replace the listed hybrid vehicle supply stack sub-assemblies.

HINT

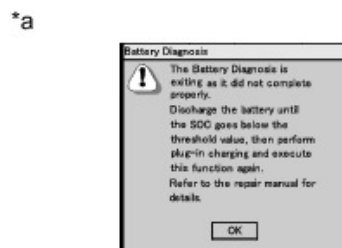
- * If "HAVE TRACTION BATTERY INSPECTED" is displayed on the multi-information display, the message will not be cleared even after it is determined that "There is no need to replace battery". It can be cleared only after performing "Battery Status Info Update".
- * If the listed hybrid vehicle supply stack sub-assemblies are replaced, perform "Battery Status Info Update" after replacing them.

- (h) Turn the power switch off.

NOTICE:

Make sure to turn the power switch off after battery diagnosis to prevent the auxiliary battery from being discharged.

- (i) When the battery diagnosis is suspended because the diagnosis conditions are not met anymore, the reasons of suspension are displayed on the Techstream. Perform "Battery Status Info Update" after checking the causes and troubleshoot the suspected area in accordance with instructions in the "Procedure when battery diagnosis is suspended" table.

**Text in Illustration**

*a Example of a suspended battery diagnosis.
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Procedure when battery diagnosis is suspended.:

Techstream Display	Reason of Diagnosis Suspension (Related Condition)	Procedure
The Battery Diagnosis is exiting as it did not complete properly. Discharge the battery until the SOC goes below the threshold value, then perform plug-in charging and execute this function again. Refer to the repair manual for details.	SOC (state of charge) learning has not completed.	<ol style="list-style-type: none"> 1. Lower the SOC (state of charge) of the HV battery by driving in EV mode until it enters HV mode. 2. Record all data from "Temp of Batt TB1" to "Temp of Batt TB6". 3. If the lowest measured battery temperature is 10oC or lower, drive the vehicle until the temperature exceeds 15oC. If "HAVE TRACTION BATTERY INSPECTED" is displayed on the multi-information display and the hybrid vehicle system cannot be started, perform "Temporary Vehicle Start Up" and drive the vehicle. 4. Perform plug-in charging. 5. Before turning the power switch on (IG) or on (READY), wait for 35 minutes or more after plug-in charging has completed. 6. Leave the vehicle with the power switch on (IG) or on (READY) for 10 minutes or more, turn the power switch off, and then perform battery diagnosis.
Communication error	The power switch was turned off or a communication error occurred.	<ol style="list-style-type: none"> 1. Turn the power switch on (IG), and then perform battery diagnosis again. 2. Check that the connector of the Techstream is not disconnected from the DLC3, perform battery diagnosis again.

3. Battery Status Info Update

NOTICE:

- * **Do not perform battery status info update while the hybrid system light is illuminated.**
- * **Perform battery status info update with the HV battery installed correctly.**
- * **Make sure to turn the power switch off after battery status info update to prevent the auxiliary battery from being discharged.**
- * **If "Battery Status Info Update" is performed more than necessary, it may deteriorate the HV battery.**
- * **Make sure to perform "Battery Status Info Update" if the hybrid vehicle supply stack sub-assembly or HV battery is replaced.**

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Enter the following menus: Powertrain / Hybrid Control / Utility / Battery Status Info Update.
- (d) Check items on the display and press "Next".
- (e) The screen transitions to the next screen and "Now diagnosing" is displayed.

HINT

- * **"Progress" is displayed as a reference to the "Battery Status Info Update" status.**
- * **To suspend "Battery Status Info Update", press "Exit" and turn the power switch off.**

- (f) If "Battery Status Info Update" has completed properly, "Now ready to update" will be displayed.

NOTICE:

If "HAVE TRACTION BATTERY INSPECTED" is displayed on the multi-information display, the message will not be cleared even after "Battery Status Info Update" has completed. The message will be cleared by turning the power switch from off to on (IG) or on (READY) after "Battery Status Info Update" has completed.

- (g) Turn the power switch off.

NOTICE:

Make sure to turn the power switch off after battery status info update to prevent the auxiliary battery from being discharged.

- (h) When the battery status info update is suspended because the diagnosis condition is not met anymore, the reasons for the suspension are displayed on the Techstream. Perform "Battery Status Info Update" after checking the causes and troubleshoot the suspected area in accordance with instructions in the "Procedure when battery status info update is suspended" table.

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Text in Illustration

*a An example of suspended "Battery Status Info Update"

Procedure when "Battery Status Info Update" is suspended.:

Techstream Display	Reason of Diagnosis Suspension (Related Condition)	Procedure
Battery Status Info Update has failed. Confirm the following condition. - No HV related DTC stored	Hybrid related DTC is stored.	<ol style="list-style-type: none"> 1. Check for HV battery system related DTCs and perform troubleshooting. 2. After confirming that the master warning light turned off, perform "Battery Status Info Update" again.
Now preparing for the update The screen will change when the preparation is complete.	"Battery Status Info Update" is ongoing or has completed.	The screen transitions from "Now preparing for the update" to "Now ready to update" when "Battery Status Info Update" has completed. <ol style="list-style-type: none"> 1. Turn the power switch off and on (IG), and perform "Battery Status Info Update" again as shown on the display.
Now ready to update. Perform the following operations, then press Next. <ol style="list-style-type: none"> 1. Turn the IG OFF. 2. Wait for 10 seconds. 3. Turn the IG ON again. 		
Battery Status Info Update has failed. Refer to the repair manual for details.	Techstream communication error	After checking that the connector of the Techstream is not disconnected from the DLC3 and checking for HV battery system related DTCs, perform "Battery Status Info Update" again.
Communication error	The power switch was turned off or a communication error occurred.	<ol style="list-style-type: none"> 1. If suspended due to an ST button operation, perform "Battery Status Info Update" again. 2. After checking that the connector of the Techstream is not disconnected from the DLC3, perform "Battery Status Info Update" again.

4. Temporary Vehicle Start Up

NOTICE:

- * Do not perform temporary vehicle start up while the hybrid system light is illuminated.
- * Perform only when "VEHICLE START DISABLED UNTIL TRACTION BATTERY INSPECTED" is displayed on the multi-information display and the vehicle cannot be started.
- * "VEHICLE START DISABLED UNTIL TRACTION BATTERY INSPECTED" will not be cleared after "Temporary Vehicle Start Up" is performed.

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Enter the following menus: Powertrain / Hybrid Control / Utility / Temporary Vehicle Start Up.

NOTICE:

If the power switch is turned on (READY) while depressing the brake pedal, "Temporary Vehicle Start Up" is not possible. Retry

after turning the power switch off.

- (d) Check items on the display and press "Next".
- (e) The screen transitions to the next screen and "Please wait" is displayed.
- (f) The screen transitions to the next screen and "Now the vehicle is ready to start." is displayed.

HINT

- * **If the power switch is turned off after "Temporary Start Up", the vehicle will not be able to start again.**
- * **The Techstream can be disconnected after turning the power switch on (READY).**

- (g) Turn the power switch on (READY).
- (h) When the condition to perform "Temporary Vehicle Start Up" is not met, the reasons for suspension are displayed on the Techstream. Perform "Temporary Vehicle Start Up" again after checking the causes and troubleshoot the suspected area in accordance with instructions in the "Procedure when temporary vehicle start up is suspended" table.



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Procedure when "Temporary Vehicle Start Up" is suspended.:

Techstream Display	Reason of Diagnosis Suspension (Related Condition)	Procedure
Temporary Vehicle Start Up has failed. Confirm the following condition.	Techstream communication error	After checking that the connector of the Techstream is not disconnected and the power switch is on (IG), perform "Temporary Vehicle Start Up" again.

5. HV Batt Cell Low Volt READY ON Prevention Cancel

CAUTION:

Before performing diagnosis and repair, do not use this function.

NOTICE:

- * **Use this function only when the power switch cannot be turned on (READY) after repair.**
- * **Hybrid battery cell low voltage DTCs will not be cleared even after "HV Batt Cell Low Volt READY ON Prevention Cancel" is performed.**
- * **The master warning light does not turn off even after "HV Batt Cell Low Volt READY ON Prevention Cancel" is performed.**

- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Enter the following menus: Powertrain / Hybrid Control / Utility / HV Batt Cell Low Volt READY ON Prevention Cancel.

NOTICE:

- * **This procedure can be performed only once per trip.**
- * **If the procedure fails or has been suspended, turn the power switch off and on (IG) and perform the procedure again.**

- (d) Check items on the display and press "Next".
- (e) The screen transitions to the next screen and "Now Canceling" is displayed.
- (f) The screen transitions to the next screen and "HV Batt Cell Low Volt READY ON Prevention Cancel is complete" is displayed.

HINT

- * Hybrid battery cell low voltage DTCs will not be cleared.
- * The master warning light does not turn off.

- (g) Clear the DTCs. See: Testing and Inspection/Reading and Clearing Diagnostic Trouble Codes/Hybrid Battery System.
- (h) Turn the power switch off.
- (i) When the condition to perform "HV Batt Cell Low Volt READY ON Prevention Cancel" is not met, the reasons for suspension are displayed on the Techstream. Perform "HV Batt Cell Low Volt READY ON Prevention Cancel" after checking the causes and troubleshooting the suspected area in accordance with instructions listed in the "Procedure when HV batt cell low volt READY ON is suspended" table.



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Procedure when "HV Batt Cell Low Volt READY ON Prevention Cancel" is suspended.:

Techstream Display	Reason of Diagnosis Suspension (Related Condition)	Procedure
HV Batt Cell Low Volt READY ON Prevention Cancel has failed.	Techstream communication error	After checking that the connector of the Techstream is not disconnected and checking for HV battery system related DTCs, turn the power switch off and on (IG). Then perform "HV Batt Cell Low Volt READY ON Prevention Cancel" again.

6. Normal Battery Stack Average Voltage Calculation

NOTICE:

Perform the following procedure before removing a hybrid vehicle supply stack sub-assembly.

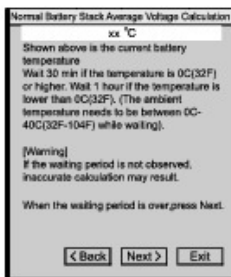
- (a) Connect the Techstream to the DLC3.
- (b) Turn the power switch on (IG).
- (c) Enter the following menus: Powertrain / Hybrid Control / Utility / Normal Battery Stack Average Voltage Calculation.

NOTICE:

If the procedure fails or is suspended, turn off and on (IG) the power switch and perform the procedure again.

- (d) Check items on the display and press "Next".
- (e) The screen transitions to the next screen and "Shown above is the current battery temperature" is displayed.

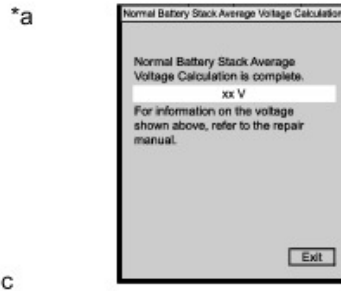
* a



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*a HV battery temperature display example

- (f) Select the stack to be replaced and press "Next".
- (g) The screen transitions to the next screen and "Now Calculating" is displayed.
- (h) The screen transitions to the next screen and "Normal Battery Stack Average Voltage Calculation is complete" is displayed.



Text in Illustration

*a Example of a "Normal Battery Stack Average Voltage Calculation" result

HINT

Make a note of the calculated voltage.

- (i) When the condition to perform "Normal Battery Stack Average Voltage Calculation" is not met, the reasons for suspension are displayed on the Techstream. Perform "Battery Status Info Update" after checking the causes and troubleshooting the suspected area in accordance with instructions listed in the "Procedure when normal battery stack average calculation is suspended" table and perform "Normal Battery Stack Average Voltage Calculation" again.



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Procedure when "Normal Battery Stack Average Voltage Calculation" is suspended.:

Techstream Display	Reason of Diagnosis Suspension (Related Condition)	Procedure
Normal Battery Stack Average Voltage Calculation has failed. Verify the following condition.	Techstream communication error	After checking that the connector of the Techstream is not disconnected and checking for HV battery system related DTCs, turn the power switch off and on (IG), and then perform "Normal Battery Stack Average Voltage Calculation" again.