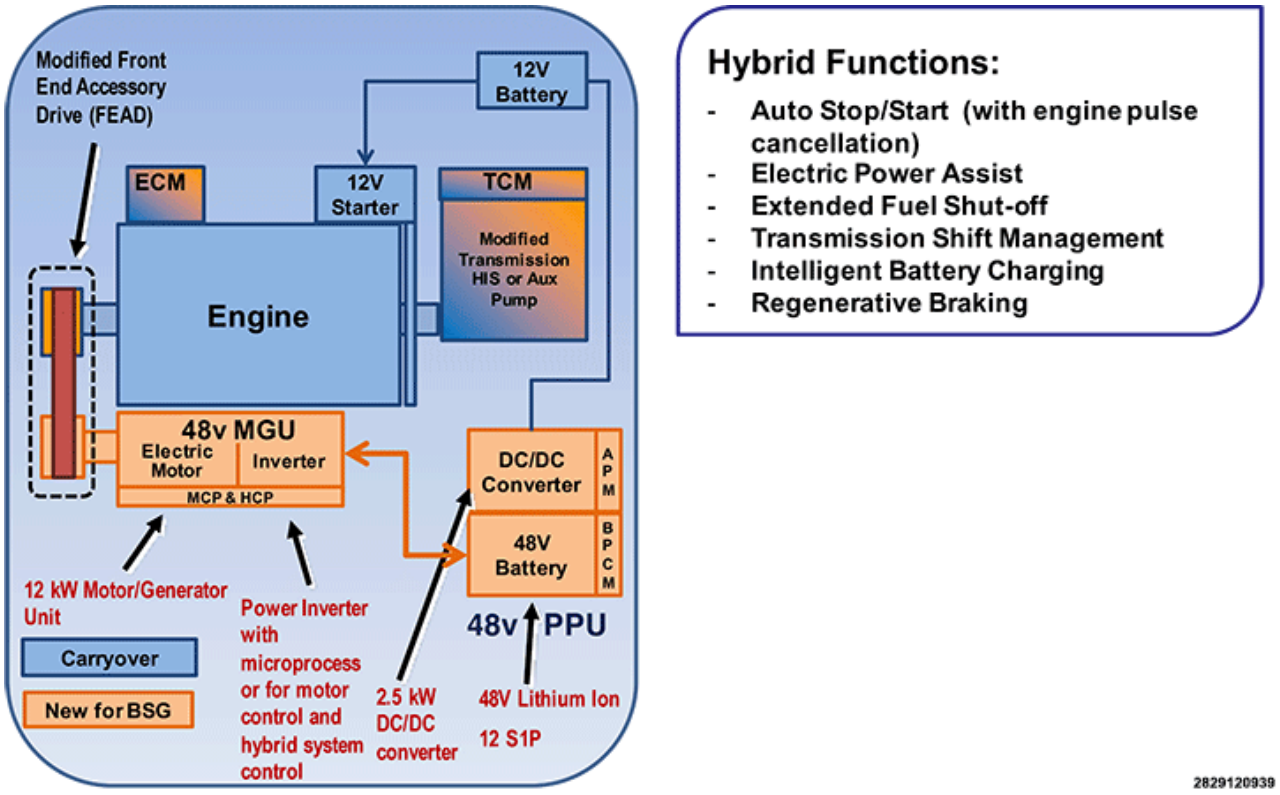
P0A94-00-DC/DC A CONVERTER PERFORMANCE

Theory of Operation

The Battery Pack Control Module (BPCM) is contained within the 48 volt Power Pack Unit (PPU). The BPCM provides battery management and system functionality in conjunction with Cell Supervision Circuits (CSCs) that monitor and balance the battery cells as well as the monitoring of related external support systems. The CSCs are also located within the Battery Pack. The BPCM communicates with the vehicle via CAN-C bus. The main functions of the BPCM are to manage battery voltage and maintain the 12 volt battery system using battery pack current, voltage and temperature sensing capabilities. CAN communication is used to monitor other vehicle systems and for fault detection reporting.



When Monitored and Set Conditions

When Monitored: This diagnostic runs continuously when the following conditions are met:

- Ignition on.
- When BPCM is powered on.
- Voltage between 9 and 18 volts.

Set Conditions:

- The Battery Pack Control Module (BPCM) detects a fault with internal or external components or circuitry.

Default Actions:

- Vehicle may be placed into limp-home mode.
- The Start/Stop feature will be disabled.

Possible Causes	
FUSED BATTERY CIRCUIT BELOW 12 VOLTS	REPORT RELATED DID-I
12 VOLT BATTERY SYSTEM FAILURE	REPORT RELATED DID-I
12 VOLT BATTERY TO BPCM HARNESS SHORT TO GROUND	REPORT RELATED DID-I
HIGH VOLTAGE HARNESS SHORT TO GROUND	REPORT RELATED DID-I
BATTERY PACK CONTROL MODULE (BPCM)	REPORT RELATED DID-I

Always perform the Pre-Diagnostic Troubleshooting procedure before proceeding. (Refer to 28 - DTC-Based Diagnostics/MODULE, Battery Pack Control (BPCM) /Standard Procedure) .

Diagnostic Test

1. CHECK FOR AN ACTIVE DTC

NOTE: Before performing this diagnostic test, low battery voltage or charging system faults should be corrected first. Make sure that the 12 volt battery passes a load test.

1. With the scan tool, read Battery Pack Control Module (BPCM) DTCs and record on the repair order.
2. Record the Freeze Frame Data (If available), Event Data (If available), and Environmental Data.
3. With the scan tool, erase DTCs.
4. Using the recorded data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
5. With the scan tool, read BPCM DTCs.

Is the DTC active?

Yes

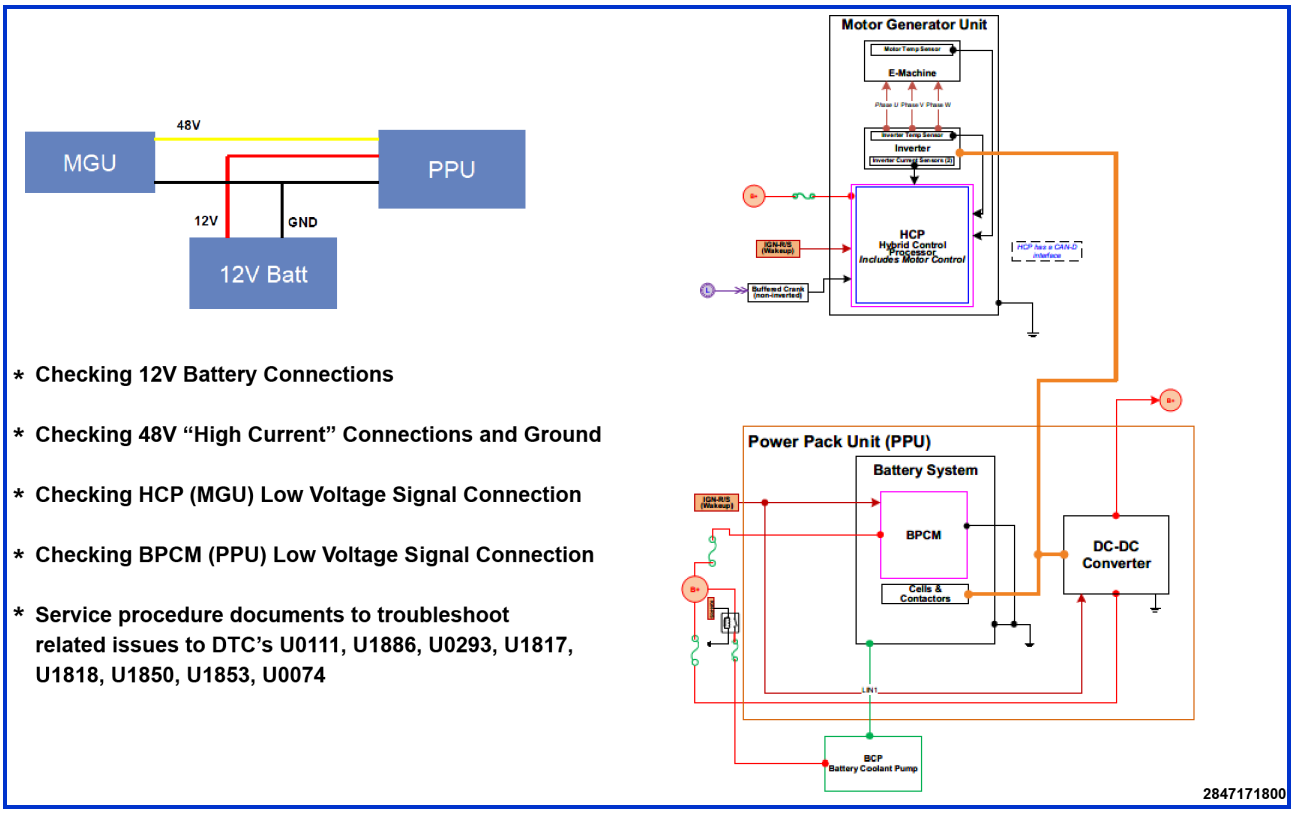
- Go To 2

No

- Perform the TESTING FOR AN INTERMITTENT CONDITION procedure. (Refer to 28 - DTC-Based Diagnostics/Standard Procedure) .

2. JL eTORQUE CONNECTION CHECK QUICK REFERENCE GUIDE

1.



Was the Quick Reference Guide reviewed?

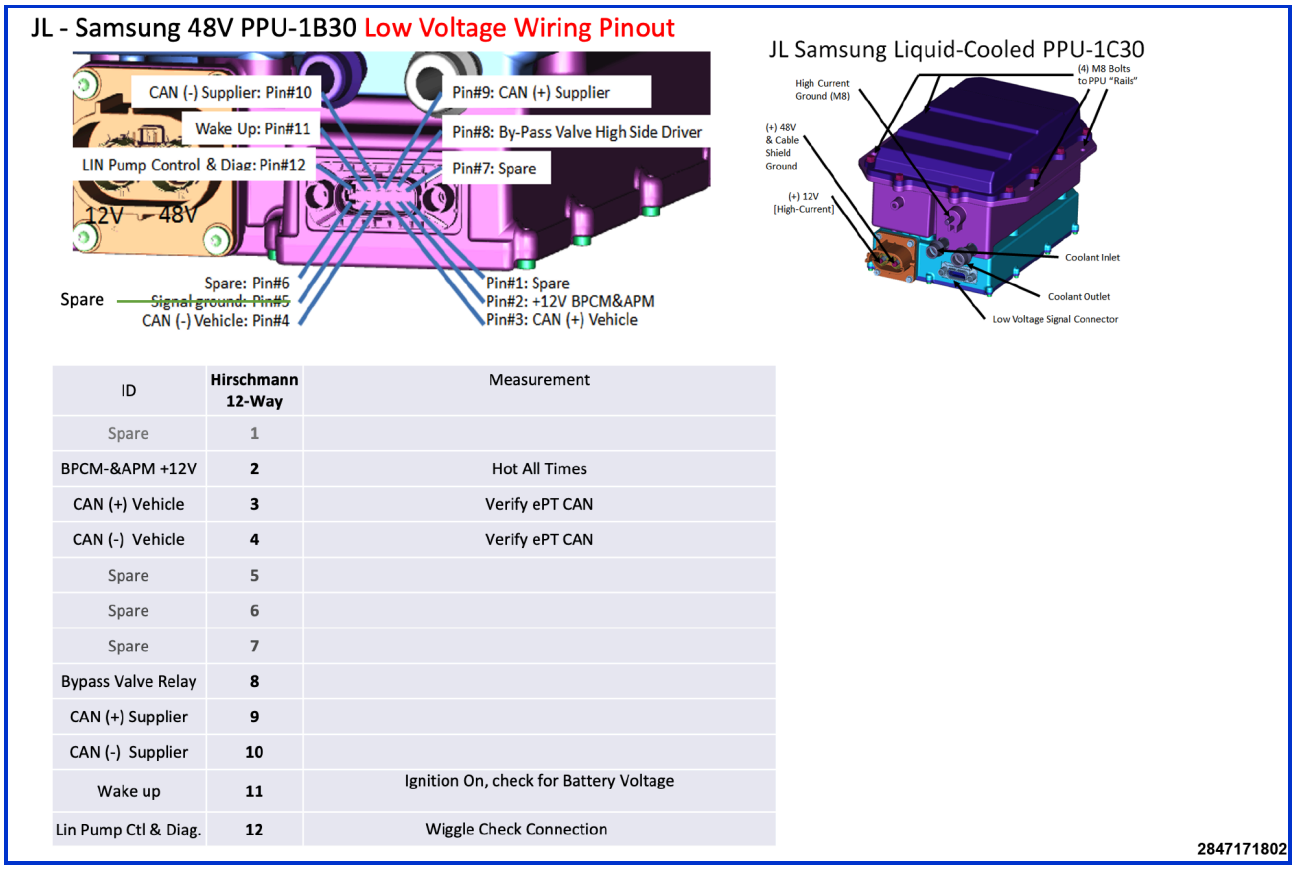
Yes

- Go To **3**

3. JL eTORQUE LOW VOLTAGE WIRING PINOUT TEST

1. Inspect and test the following connections:
    - Pin 2 harness side should be battery voltage at all times.

- Pin 3 harness side, verify CAN EPT voltage.



ID	Hirschmann 12-Way	Measurement
Spare	1	
BPCM-&APM +12V	2	Hot All Times
CAN (+) Vehicle	3	Verify ePT CAN
CAN (-) Vehicle	4	Verify ePT CAN
Spare	5	
Spare	6	
Spare	7	
Bypass Valve Relay	8	
CAN (+) Supplier	9	
CAN (-) Supplier	10	
Wake up	11	Ignition On, check for Battery Voltage
Lin Pump Ctl & Diag.	12	Wiggle Check Connection

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- Pin 4 harness side, verify CAN EPT voltage.
- Pin 11 harness side should be battery voltage with ignition on.
- Pin 12 harness side. Wiggle test and check connection.

Was the Low Wiring Pinout Test completed?

Yes

- Go To **4**

4. JL eTORQUE 12 VOLT BATTERY CABLE CONNECTION CHECK

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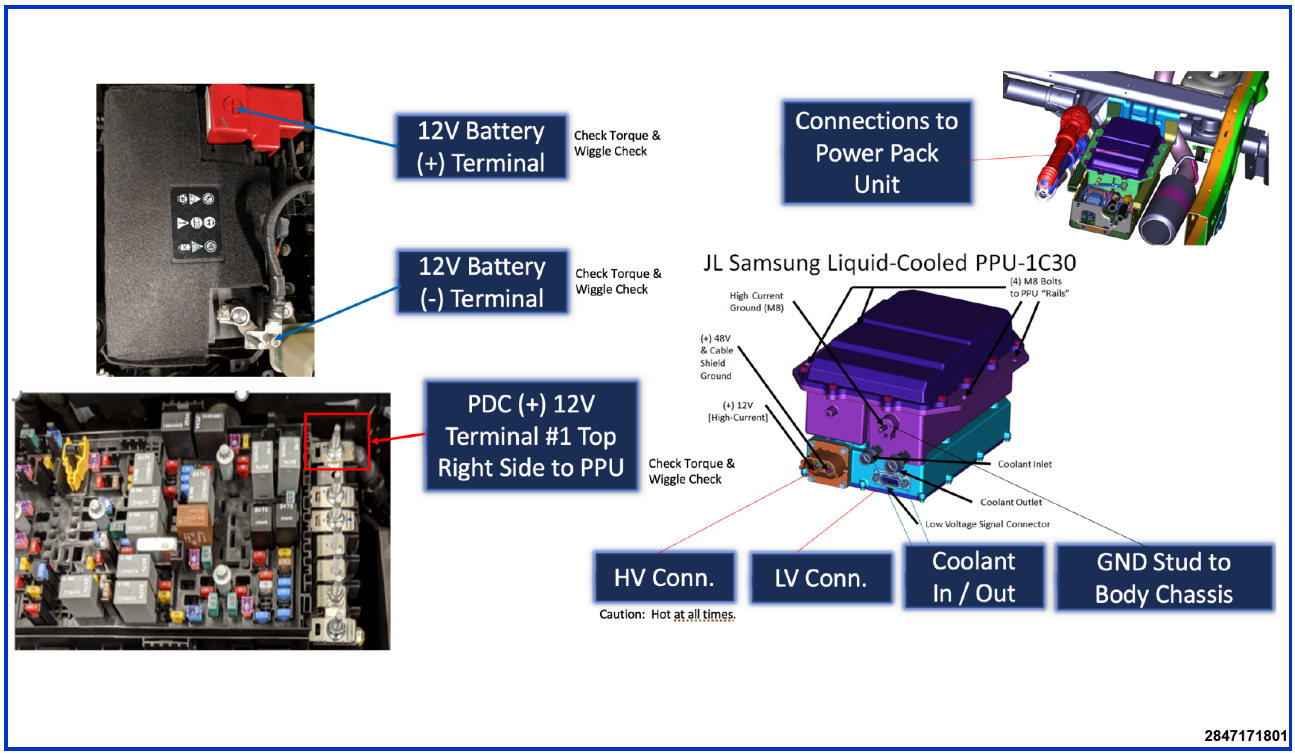
1. Inspect and test the following connections:
    - Check 12 volt battery, clamp connections and torque to specs.

- Check 12 volt PDC connection for battery voltage and torque to specs.



- Check High Voltage connector to be sure it is seated and locked.
- Check Low Voltage connector to be sure it is seated and locked.
- Check PPU ground stud to body connection and torque to specs.

Was the 12 volt battery and connection check completed?

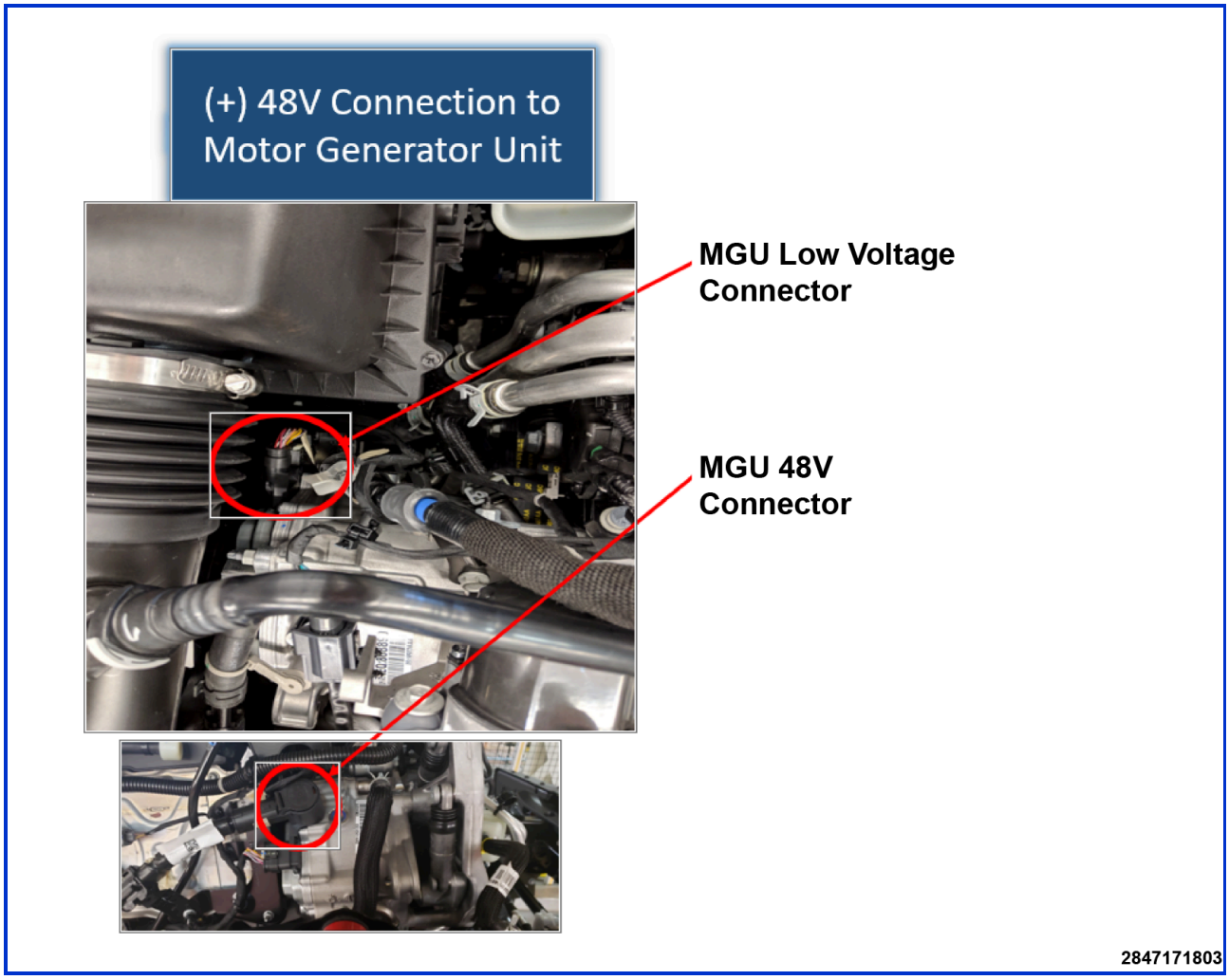
Yes

- Go To **5**

5. JL eTORQUE MOTOR GENERATOR UNIT (MGU) CONNECTION CHECK

1. Inspect and test the following connections:

    - Inspect MGU low voltage connector to be sure it is seated and connected correctly.
    - Remove MGU low voltage connector and check MGU pins 5 to 11 terminal resistance. Should be around 60 ohms.



- Check MGU 48 volt connection to be sure it is tight and the locking tab is secured. An audible click is heard when locking is correct.

Was the MGU connection check completed?

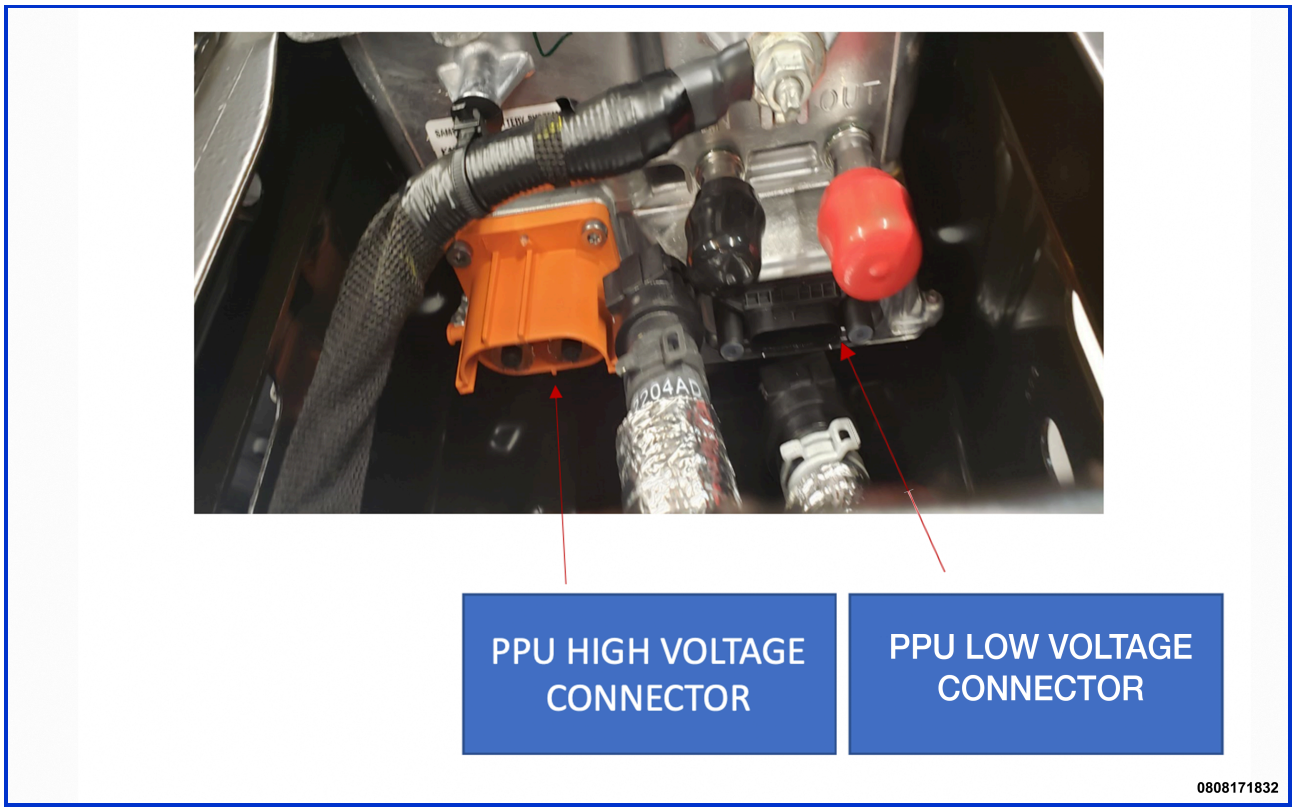
Yes

- Go To **6**

6. JL eTORQUE POWER PACK UNIT (PPU) CONNECTOR CHECK

1. Inspect and test the following connections:
    - Remove the PPU low voltage connector and inspect for bent pins and connector problems.

- Reconnect the PPU low voltage connector and be sure it is seated and connected correctly.



- Check the PPU 48 volt connection to be sure it is tight and the locking tab is secured. An audible click is heard when locking is correct.

Was the PPU connector check completed?

Yes

- Go To 7

7. CHECK PPU GROUND CABLE

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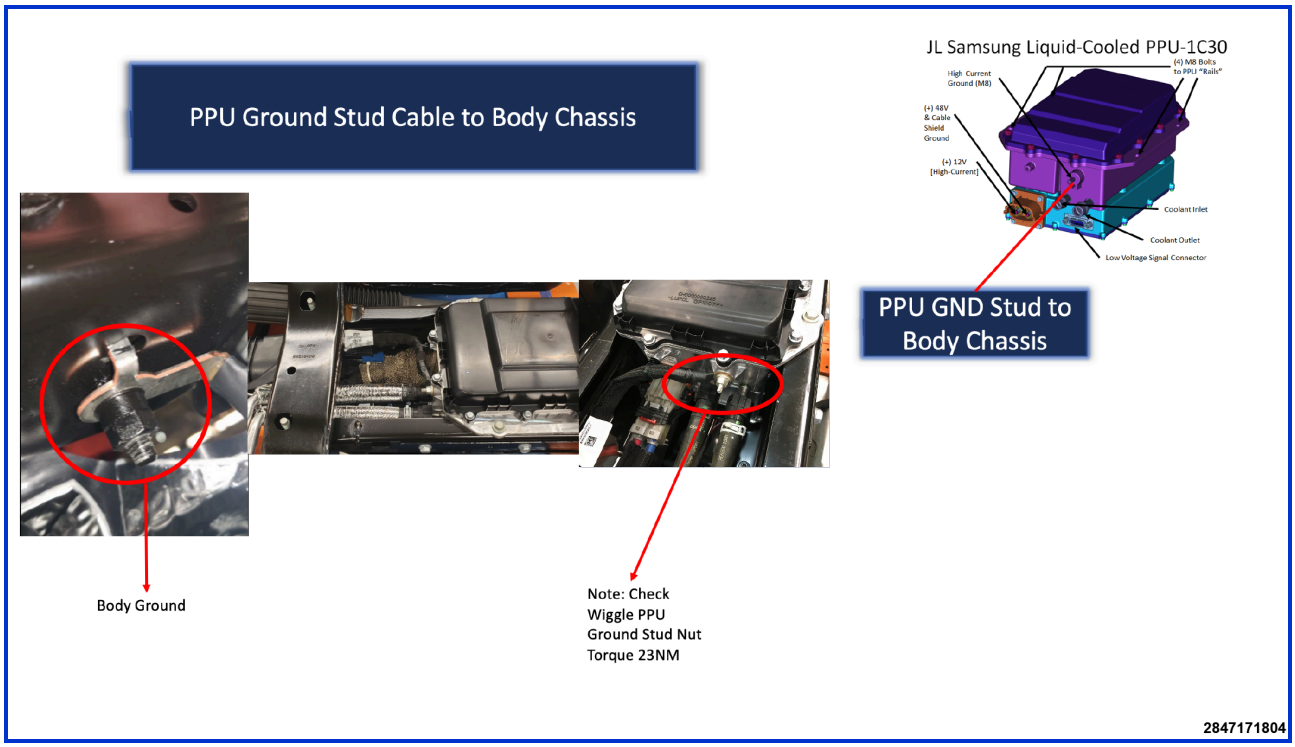
1. Inspect and test the following connections:
    - Clean and tighten PPU ground stud at body connection to 20.2NM.

- Clean and tighten PPU ground stud at PPU connection to 23NM.



Was the PPU ground stud cable to body ground check completed?

Yes

- Go To **8**

8. CHECK THE MOTOR GENERATOR UNIT (MGU) CAPACITANCE

1. Disconnect the +48 volt cable from the Motor Generator Unit (MGU).
2. Disconnect the +48 volt cable from the Power Pack Unit (PPU).
3. Measure the Capacitance of the MGU +48 volt stud to MGU case ground with the Fluke 1587 Meter. **NOTE: Wait for the reading to stabilize on the meter.**

Is the capacitance reading within the specs in the table below?

2.0L/3.6L Low 1500 uF, Typical 1750 uF, High 2340.5 uF
5.7L 8,000 uF (+/- 10%)

Yes

- Go To **9**

No

- Replace the Motor Generator Unit (MGU) in accordance with the service information. (Refer to 12 - Electrified Powertrain System/Electric Powertrain Control/MOTORS, Electric Drive/Removal and Installation) .
- Perform the BATTERY PACK CONTROL MODULE (BPCM) VERIFICATION TEST. (Refer to 28 - DTC-Based Diagnostics/MODULE, Battery Pack Control (BPCM) /Standard Procedure) .

9. CHECK RELATED HARNESS CONNECTIONS

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1. Disconnect all BPCM harness connectors.
2. Disconnect all related in-line harness connections (if equipped).
3. Disconnect the related component harness connectors.
4. Inspect harness connectors, component connectors, and all male and female terminals for the following conditions:

    - Proper connector installation.
    - Damaged connector locks.
    - Corrosion.
    - Other signs of water intrusion.
    - Weather seal damage (if equipped).
    - Bent terminals.
    - Overheating due to a poor connection (terminal may be discolored due to excessive current draw).
    - Terminals that have been pushed back into the connector cavity.
    - Perform a terminal drag test on each connector terminal to verify proper terminal tension.

    Repair any conditions that are found.

5. Reconnect all BPCM harness connectors. Be certain that all harness connectors are fully seated and the connector locks are fully engaged.
6. Reconnect all in-line harness connectors (if equipped). Be certain that all connectors are fully seated and the connector locks are fully engaged.
7. Load test **ALL** B+, Switched Ignition, and Ground supplies to the BPCM. Repair as necessary and retest.
8. Reconnect all related component harness connectors. Be certain that all connectors are fully seated and the connector locks are fully engaged.
9. With the scan tool, erase DTCs.
10. Using the recorded Environmental Data, along with the When Monitored and Set Conditions above, operate the vehicle in the conditions that set the DTC.
11. With the scan tool, read BPCM DTCs.

Did the DTC return?

Yes

- Replace the Power Pack Unit in accordance with the Service Information. (Refer to 12 - Electrified Powertrain System/Electric Powertrain Control/MODULES, High Voltage System/Removal and Installation) .
- Perform the BATTERY PACK CONTROL MODULE (BPCM) VERIFICATION TEST. (Refer to 28 - DTC-Based Diagnostics/MODULE, Battery Pack Control (BPCM) /Standard Procedure) .

No

- Perform the BATTERY PACK CONTROL MODULE (BPCM) VERIFICATION TEST. (Refer to 28 - DTC-Based Diagnostics/MODULE, Battery Pack Control (BPCM) /Standard Procedure) .
- Test complete.