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SUBJECT: Using Amprobe Ohm Megger (Model AMB-45) for Troubleshooting

MODELS AFFECTED: H 40/50 EP System™ Transmissions

SERIAL NUMBERS AFFECTED: ALL

Tools Required

- Amprobe Ohm Megger (Model AMB-45) is available on the Allison Parts and Service website (Allison.service-solutions.com)

Introduction:

The purpose of this SIL is to explain how the Amprobe Ohm Megger (Model AMB-45) can be used to measure the insulation resistance of various hybrid components which includes AC and DC cables, stator assemblies and isolation faults in the Energy Storage System (ESS).

The Amprobe Ohm Megger is a digital tool that generates a high voltage signal of 250, 500 or 1000V.

It will show resistance to ground and provides a reading of 0 to 4000 megaohms.



NOTE: The Amprobe Ohm Megger (Model AMB-45) is a mandatory service tool that all authorized H 40/50 EP™ distributors and dealers should already have to troubleshoot isolation concerns.



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Figure 1. Amprobe Ohm Megger (AMB45) Insulation Resistance Meter with Built-in Voltmeter to Test Insulation of Wires, Cables, Transformers, and Electrical Motors

Features of Amprobe Ohm Megger (Model AMB-45):

- Digital meter with automatic range selection
- Internal memory stores up to 4000 test results for future download to a PC
- Measures voltage from 0 to 600V AC or DC and insulation resistance from 0 to 4000 megaohms with 250, 500, and 1000V DC test voltage
- Safety rated to European Standard EN 61010-1 Category III 600V and Category II 1000V
- Built-in voltmeter
- Internal memory to store measurements for future reference

AC and DC High Voltage Cable Testing:



WARNING: The ESS contains hazardous electrical energy. To help avoid serious bodily injury including death, electrocutions, and burns, follow approved electrical safety procedures. Refer to section 2 in SM4162EN for electrical Disconnect Verification Procedure.



NOTE: For all tests the ESS should be disconnected.

The AC high voltage cables will need to be disconnected from the DPIM. Make sure the cables ends are not touching.

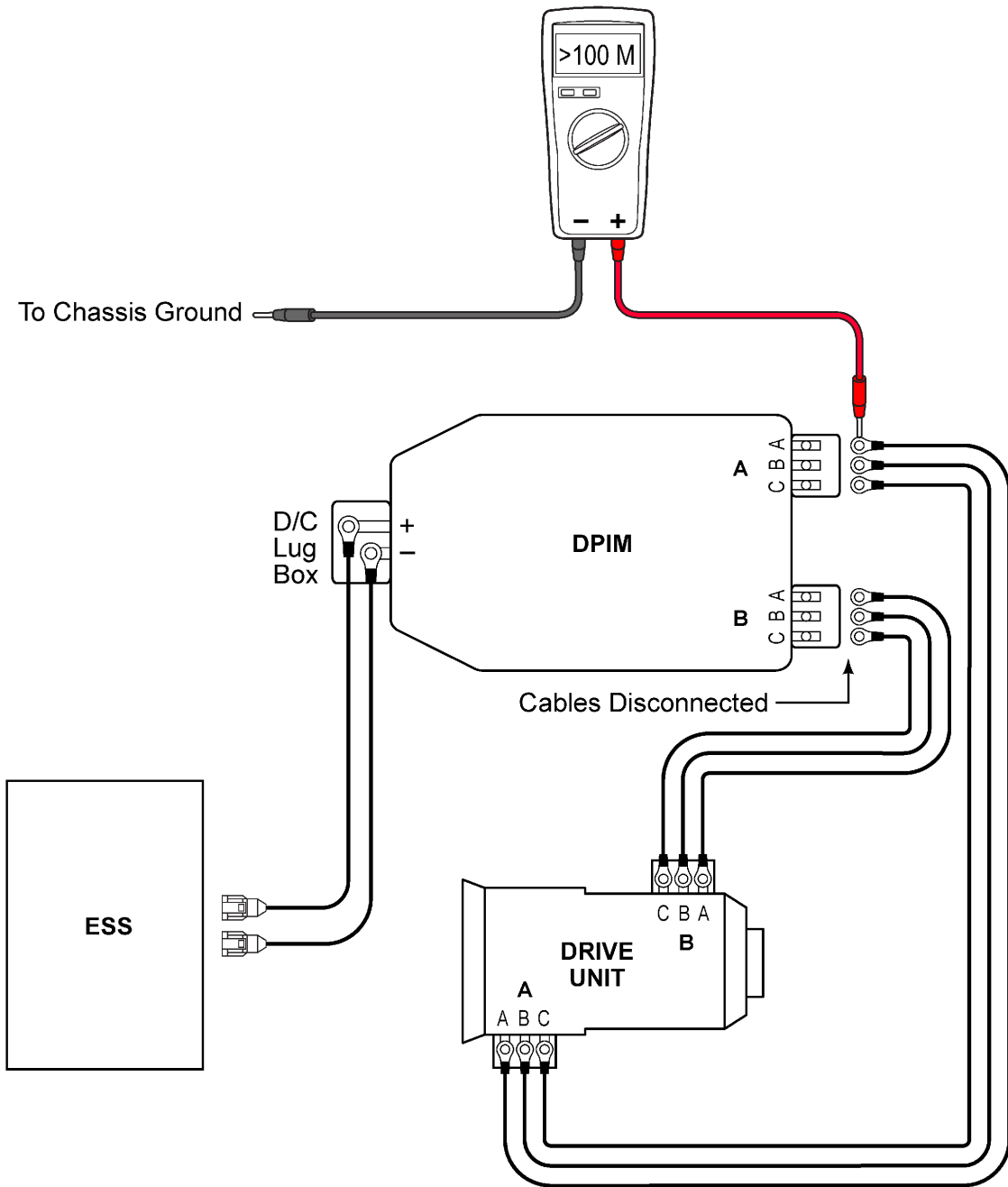
There are three tests that can be performed to verify that isolation is good.

Test One: Cables Connected at Drive Unit

Connect the Megger red lead to phase A and the black lead to the chassis. Do this for motor A and B. If readings are over >100 megaohms, this indicates good insulation resistance between the phase cable and chassis ground (refer to [Figure 2](#)).



NOTE: The specification for ALL isolation fault testing is greater than >100 megaohms is good.



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Figure 2. Test One

Test Two: Cables Disconnected at DPIM and Drive Unit



NOTE: This test requires the AC high voltage cables to be disconnected from both DPIM and the drive unit.

Cable lug end covers work well to protect the six AC cables ends from grounding to each other and to the drive unit lug box case. A good quality electrical tape may be also be used to wrap the cable ends.

Connect the Megger red lead to phase A cable end, then connect the black lead to phase B cable end. Push the yellow 1000 volt button. If the reading is over >100 megaohms, there is good insulation resistance between AC phase A and B cables. Check between phase A and C and for phase B and C. **Continue this test for B motor** (refer to [Figure 3](#)).



NOTE: The specification for ALL isolation fault testing is greater than >100 megaohms is good.

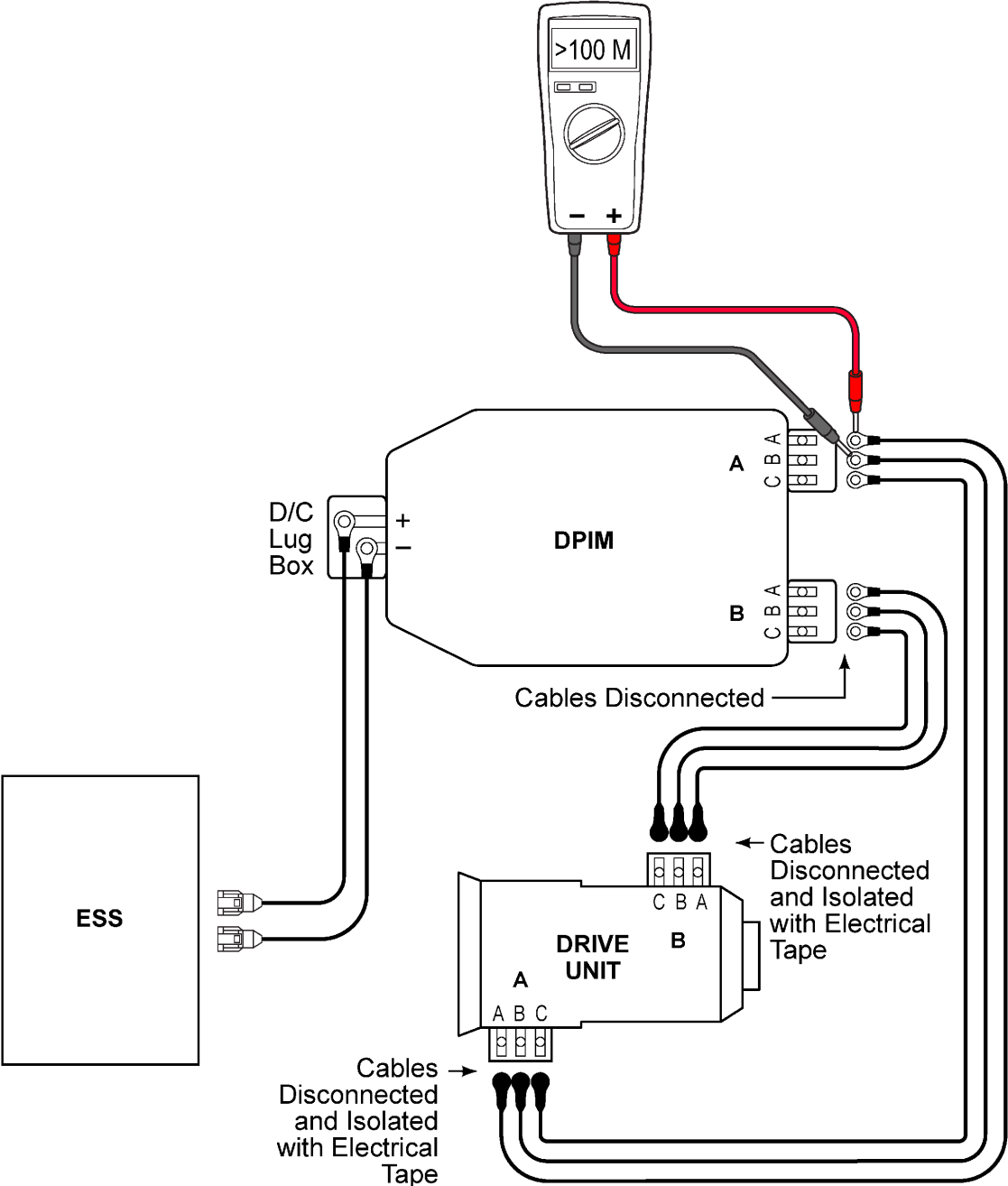


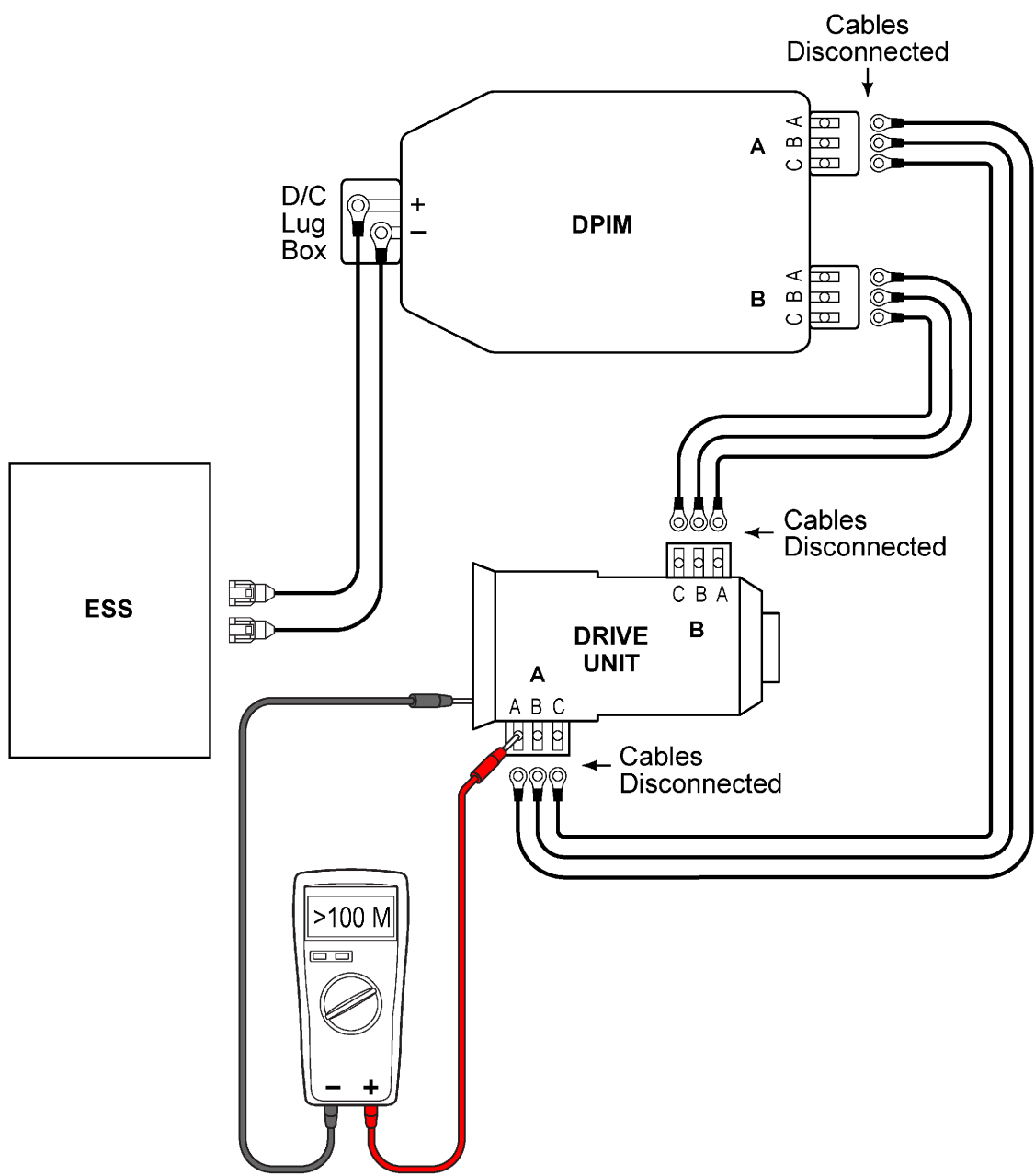
Figure 3. Test Two

Test Three: Motor Isolated

Connect the Megger red lead to phase A of motor A, then connect the black lead to the stator housing. Do the same tests between motor B phase A and the stator housing. A reading greater than >100 megaohms indicates good insulation resistance (refer to [Figure 4](#)).



NOTE: The specification for ALL isolation fault testing is greater than >100 megaohms is good.



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Figure 4. Test Three



NOTE: The two DC cables can be tested using the same techniques as the six AC cables.

The specification for ALL isolation fault testing is greater than >100 megaohms is good.

ESS Isolation Fault Testing:

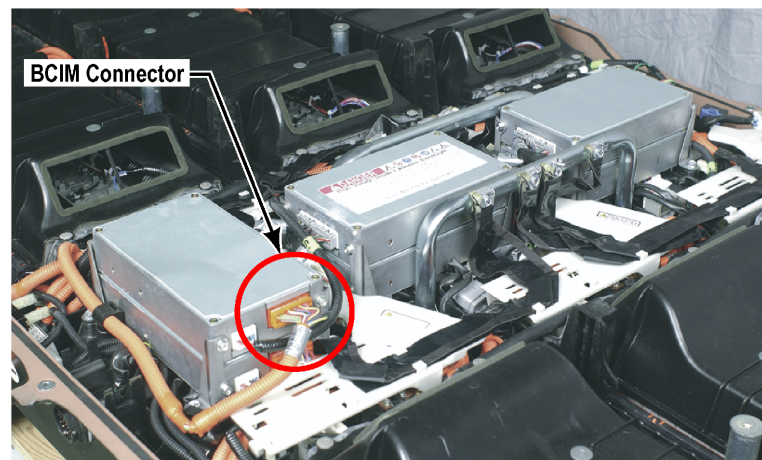
DTC 77-27 Battery Substring High Voltage Isolation fault.

When this DTC sets, there is an isolation condition inside the ESS. The isolation condition will be active when there is less than 0.780 megaohms between the ESS and chassis ground for more than 4 seconds.



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Figure 5. Disconnect all Service Connectors.



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Figure 6. Location of BCIM Power Plugs.

Remove all six orange plugs from BCIM's while performing the Megger test on ESS.

To perform a Megger test on the ESS, connect the black lead to a chassis ground.

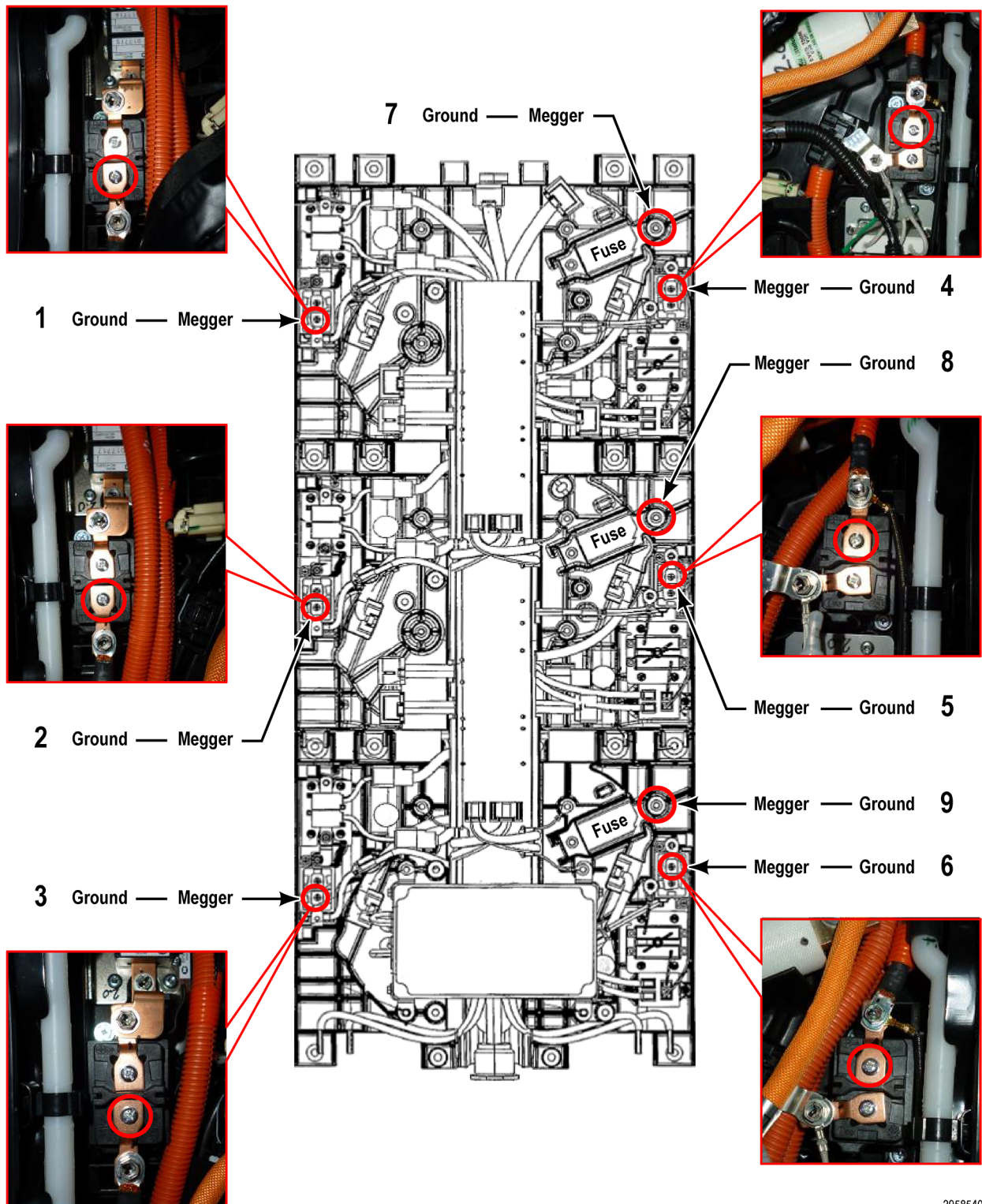
The red lead needs to be connected at each of the nine different check points listed on the ESS illustration (refer to [Figure 7](#))

These test points are referenced in list below for the (3) fuses (3) low relays and (3) high relays.

1. Attach red lead at each of the low side relays at the copper terminal labeled 1+
2. Attach red lead at each of the high side relays again at the terminal labeled 1+
3. Attach red lead at each of the three fuses.



NOTE: The specification for ALL isolation fault testing is greater than >100 megaohms is good.



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Figure 7. PEVE Recommended Test.