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SIL 4-EP-15, Rev. B
September, 2017
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SUBJECT: Replacing Passive Discharge Resistor Assembly Inside the Dual Power Inverter Module 2 (DPIM2)

MODELS AFFECTED: H 40/50 EP™ System Equipped With DPIM2

Tools Required

- J-46708 Multimeter (available at Allison.service-solutions.com) or equivalent
- Electrostatic Discharge Wrist Strap (Tool Number 7744 (available at Allison.service-solutions.com) or equivalent) (Refer to Figure 3)
- Pick or Small Flat Blade Screwdriver
- Torx Plus™ T10 Bit
- Torx Plus™ T20 Bit
- Torx Plus™ T25 Bit
- 8mm Hex Socket
- Loctite® 242
- Arctic Silver Ceramique™ 2 Thermal Compound
- Ty Wraps - 4 Inch and 6 Inch Lengths (nylon 6/6 or approved equivalent)

Introduction:

This Service Information Letter (SIL) announces the availability of the Passive Discharge Resistor (P/N 29549367 and related components) and includes the procedure to replace the Passive Discharge Resistor located inside the DPIM2. The availability of this part eliminates the need for a complete DPIM2 replacement under certain failure conditions.



NOTE: Perform the necessary diagnosis prior to ordering parts related to a Passive Discharge Resistor failure. Contact Allison TAC at (800) 252-5283 to confirm the Passive Discharge Resistor failure. This is NOT available as a kit. All necessary components must be ordered individually.

Refer to Figure 1 for location of Passive Discharge Resistor and related components. Refer to Table 1 for list of Passive Discharge Resistor Service Parts.

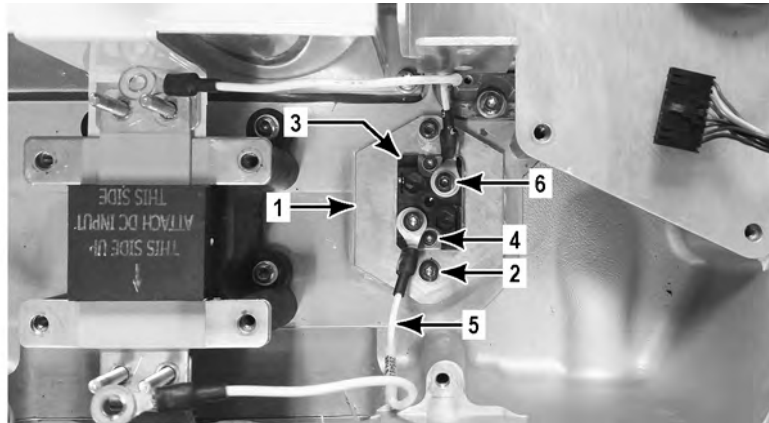
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Please Note: Allison Transmission Service Information Letters are intended for use by professional, trained technicians, not for the "do-it-yourselfer." They are written to inform those technicians of conditions that may occur on some transmission models (or serial numbers ranges) or to provide information that could assist in the proper servicing of a specific Allison transmission. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, do not assume that the Service Information Letter applies to your transmission, or that your transmission has the condition described. Product evolution and information updates are inevitable. Please see your authorized Allison Transmission service dealer or distributor to understand if your particular transmission may benefit from the information contained within the Service Information Letter.

Warranty Claim Information:



2634431

Figure 1. Passive Discharge Resistor and Related Components

Table 1. Passive Discharge Resistor Service Parts

Item Number	Part Name	Part Number	Quantity
1	Heatsink	29549368	1
2	Screw - M4x16mm	29557587	2
3	Discharge Resistor	29549367	1
4	Screw - M3x8mm	29540598	2
5	Harness	29549370	2
6	Screw - M4x6mm	29549371	2

1. When a Passive Discharge Resistor, P/N 29549367, is utilized to repair a failed DPIM under warranty, use P/N 29549367 as the PFP and claim the same part number in the Service Parts subsection of the AWAARE claim.
2. The replacement of Passive Discharge Resistor on a DPIM2 under Allison supplied warranty, must be approved by Allison H 40/50 EP™ Service Engineering prior to removing the DPIM Main Cover.

Diagnosis:



NOTE: The DPIM Main Cover EMI Gasket (P/N 29540714 - Qty. 1), the DPIM DC Access Lug Box Cover EMI Gasket (P/N 29540614 - Qty. 1), and the DPIM AC Access Lug Box Cover EMI Gaskets (P/N 29540715 - Qty. 2 Required) should be discarded and replaced with new gaskets whenever the covers are removed.

The Passive Discharge Resistor Assembly may need to be replaced if the following Diagnostic Trouble Codes are logged and DC(+) to DC(-) checks highlighted in Table 2 are out of specification.

- DTC 77-30
- DTC 80-01

Table 2. Inverter Circuit Test – IGBT Check (DPIM1 and DPIM2)

DPIM Checklist V2.0								
NOTE: To take these measurements, all cables (AC and DC) must be removed from the DPIM.								
NOTE: The specifications listed below are merely guidelines. All DPIM replacements must be approved by the Technical Assistance Center.								
Inverter Circuit Test – IGBT Check (DPIM1 and DPIM2)								
	DC(+)	DC(-)	A-Side			B-Side		
			Phase A	Phase B	Phase C	Phase A	Phase B	Phase C
Place Negative multimeter lead on DPIM Chassis	>400K Ohms	>400K Ohms	>200K Ohms	>200K Ohms	>200K Ohms	>200K Ohms	>200K Ohms	>200K Ohms
Results								
Place Positive multimeter lead on DC(+)	N/A	>7K Ohms	>5K Ohms	>5K Ohms	>5K Ohms	>5K Ohms	>5K Ohms	>5K Ohms
Results	—							
Place Negative multimeter lead on DC(-)	N/A	N/A	>5K Ohms	>5K Ohms	>5K Ohms	>5K Ohms	>5K Ohms	>5K Ohms
Results	—	—						
Set your multimeter to Resistance mode (Ohms).								
Make sure multimeter lead polarity is correct during Resistance Check.								
Resistance values will vary at first. Hold leads in position until the resistance value stabilizes and then record it.								



NOTE: When these pre-charge faults (DTC 77-30 and DTC 80-01) are logged, check the three (3) fuses inside the Energy Storage System (ESS) and replace as needed.



WARNING: DO NOT rely on the High Voltage Interlock Loop (HVIL) or control systems to de-energize the system. Always perform the Electrical Disconnect Verification Procedure to be sure the system is discharged before servicing components.

DO NOT attempt to bypass any High Voltage Interlock for any reason. Tampering with the HVIL may result in injury. Failure to follow proper safety procedures may result in serious personal injury or death.



NOTE: Allison Transmission, Inc. requires that the DPIM be removed from the vehicle prior to component replacement. Prior to removal of the DPIM, refer to the H 40/50 EP™ System Troubleshooting Manual (TS5812EN) and perform the Electrical Disconnect Verification Procedure.



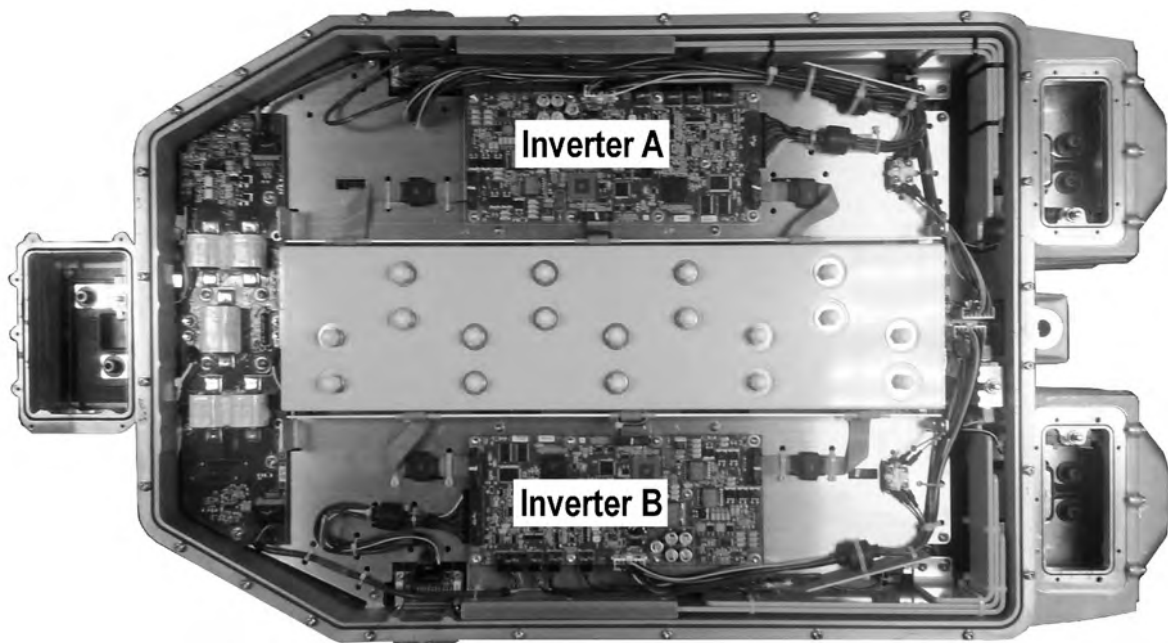
NOTE: The Passive Discharge Resistor replacement should NOT be performed if excessive smoke damage (refer to Figure 15) and/or water damage are present.



WARNING: Smoke inside the DPIM contains harmful Copper Oxide. Use proper protective equipment to protect your skin and eyes from contact. Avoid inhalation of smoke.



NOTE: All cables (AC and DC) must be removed from the DPIM prior to taking measurements shown on the DPIM Check List. For additional information, refer to H 40/50 EP System™ Troubleshooting Manual (TS5812EN).



454519

Figure 2. DPIM2 (Main Cover and Lug Box Covers Removed)



NOTE: Refer to the attachment at the end of this SIL for information regarding the name and location of components within the DPIM2.

The procedures contained in this SIL are organized into the following sections:

Section 1: Removal of Main Cover and HVIL Circuit Card

Section 2: Replacement of the Passive Discharge Resistor and Related Components

Section 3: Installation of HVIL Circuit Card and Main Cover

Section 1: Removal of Main Cover and HVIL Circuit Card



NOTE: All circuit cards in the DPIM2 are sensitive to electrostatic discharge (ESD). ESD damage can be caused by voltage levels that cannot be felt by humans. When working on the DPIM2, ALWAYS wear an ESD wrist strap to ground any possible electrostatic charge. The strap should be worn around the wrist with the alligator clip securely attached to the DPIM chassis. Refer to Figure 3.



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Figure 3. Electrostatic Discharge Wrist Strap (Typical)

1. Using a Torx Plus™ T25 bit, remove twenty-six (26) M5x18mm machine screws that secure the Main Cover to the DPIM Housing (refer to Figure 4). Set the screws aside for reassembly. Remove the Main Cover. Discard the cover gasket.



421911

Figure 4. DPIM Main Cover

2. Exercising care, cut one (1) wire tie at location shown in Figure 5. Do NOT remove any wire ties that pass through the HVIL Circuit Card. Leaving the severed wire ties in place will provide a visual aid for wire tie locations during installation of the replacement circuit card.



422298

Figure 5. HVIL Circuit Card – Wire Tie Location

3. Cut the two (2) wire ties at locations shown in Figure 6 and remove them from the mounts. The wire tie mounts do NOT have to be removed from the DPIM Housing unless they interfere with the removal or installation of the HVIL circuit card.



Figure 6. HVIL Circuit Card – Two (2) Wire Tie Locations



CAUTION: Do NOT pull on the wires when removing connectors; doing so may pull the pins out of the connector.

4. When removing connectors, push down on the tab at Location 1 and push the harness out of the connector at Location 2 (refer to Figure 7).

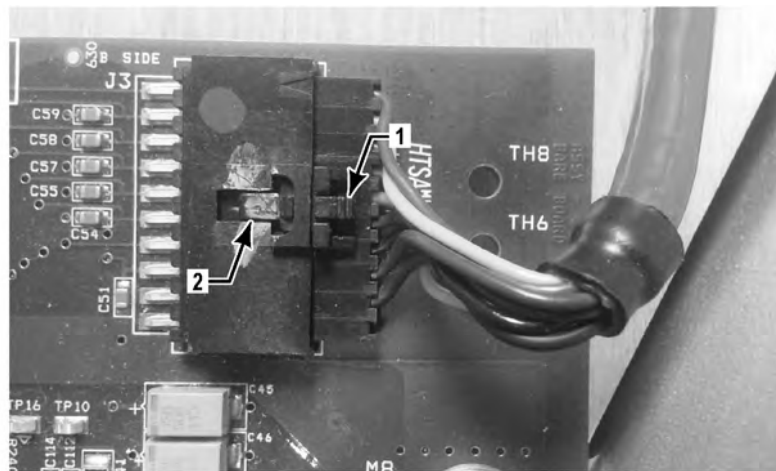
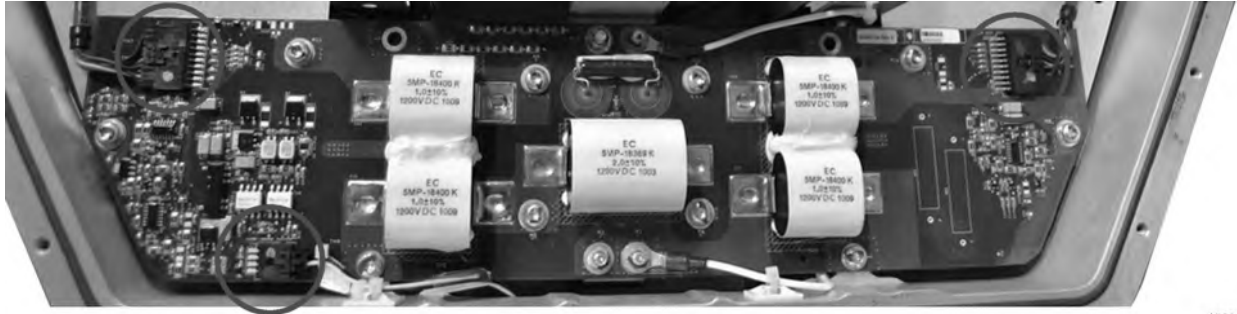


Figure 7. HVIL Circuit Card Connector Removal

5. Remove three (3) wire harness connectors from HVIL Circuit Card surface mount connectors by gently depressing the retaining tab with a pick or small flat blade screwdriver. Refer to Figure 8.



NOTE: Use care to avoid bending or damaging the circuit card connectors.



422350

Figure 8. HVIL Circuit Card – Three (3) Harness Connector Locations



WARNING: Any conductive material (i.e. screws, bolts, nuts, etc.) can cause a short inside the DPIM that will result in permanent and irreversible DPIM damage. All hardware must be accounted for throughout the service procedure.

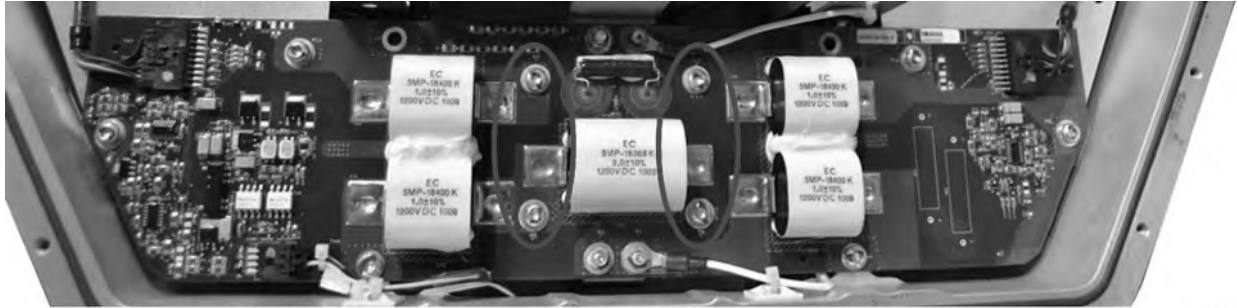
6. Using an 8mm socket, remove the four (4) M5 nut/washer assemblies as shown in Figure 9. Disconnect the two (2) wire ring terminals from the studs.



422390

Figure 9. HVIL Circuit Card – Four (4) Mounting Nut/Washer Locations (M5)

7. Using a Torx Plus™ T25 bit, remove the four (4) M5x30mm screws securing the HVIL Circuit Card as shown in Figure 10.



422540

Figure 10. HVIL Circuit Card – Four (4) Mounting Screw Locations (M5x30mm)

8. Using a Torx Plus™ T25 bit, remove the two (2) M5x14mm screws securing the HVIL Circuit Card as shown in Figure 11.



422564

Figure 11. HVIL Circuit Card – Two (2) Mounting Screw Locations (M5x14mm)

9. Using a Torx Plus™ T25 bit, remove the four (4) M5x22mm screws securing the HVIL Circuit Card as shown in Figure 12.



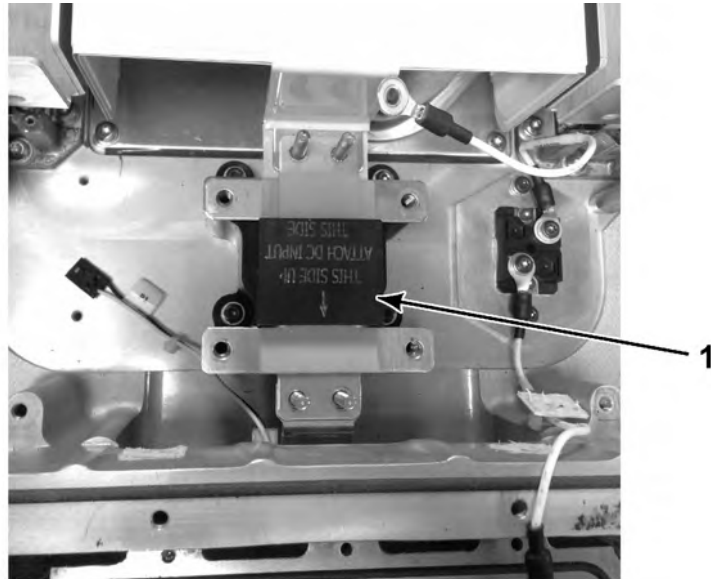
422586

Figure 12. HVIL Circuit Card – Four (4) Mounting Screw Locations (M5x22mm)

10. Lift the HVIL Circuit Card straight up and remove it from the DPIM Housing.
11. Verify that the choke is in place as shown in Figure 13.



NOTE: The choke may have adhered to the underside of the HVIL Circuit Card when it was removed. If this has occurred, reinstall choke to its proper location as shown in Figure 13. The choke must be installed with the arrow pointing toward the DC lug box.



437484

(1) – Choke

Figure 13. Verification of Choke Installation

Section 2: Replacement of the Passive Discharge Resistor and Related Components

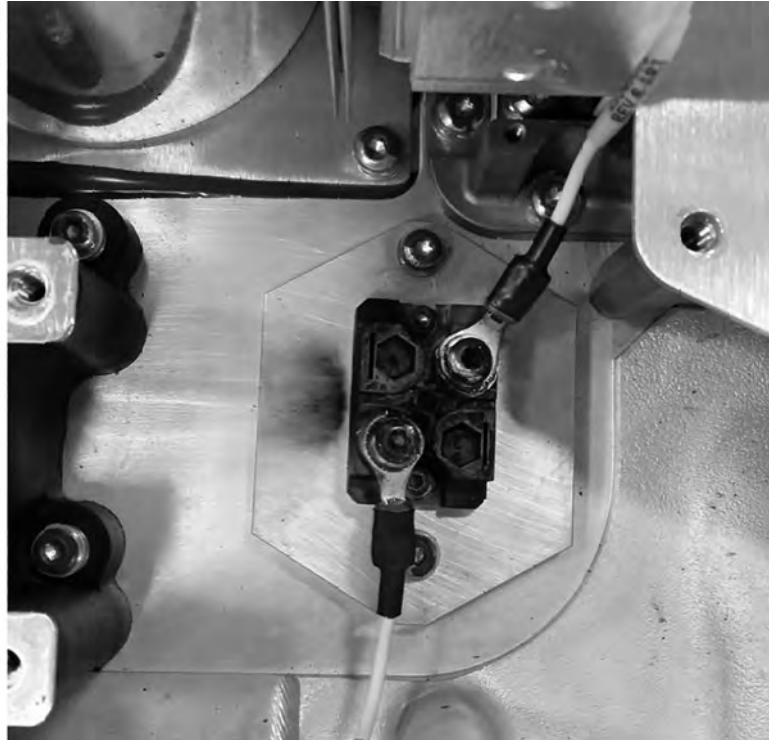


Figure 14. Smoke Damage Caused by Failed Passive Discharge Resistor – REPAIRABLE



Figure 15. Smoke Damage Caused by Failed Passive Discharge Resistor – NOT REPAIRABLE

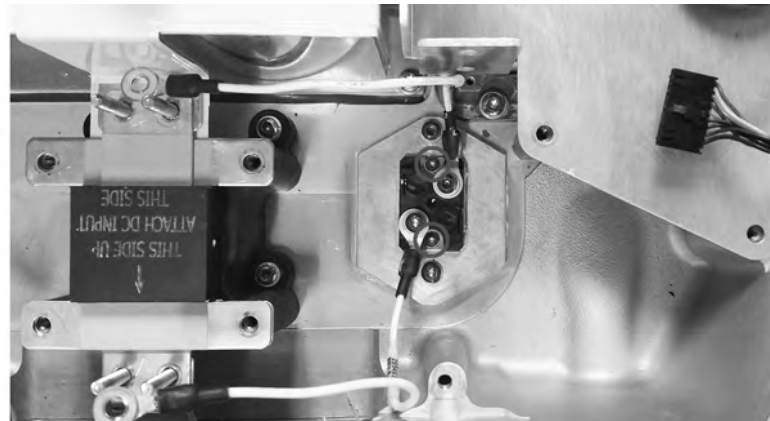
1. Confirm a Passive Discharge Resistor failure by checking the resistance through the resistor (refer to Figure 16). The measurement should read 9.8-10.2K ohms for a known good component.



2494808

Figure 16. Measuring Resistance Across Passive Discharge Resistor

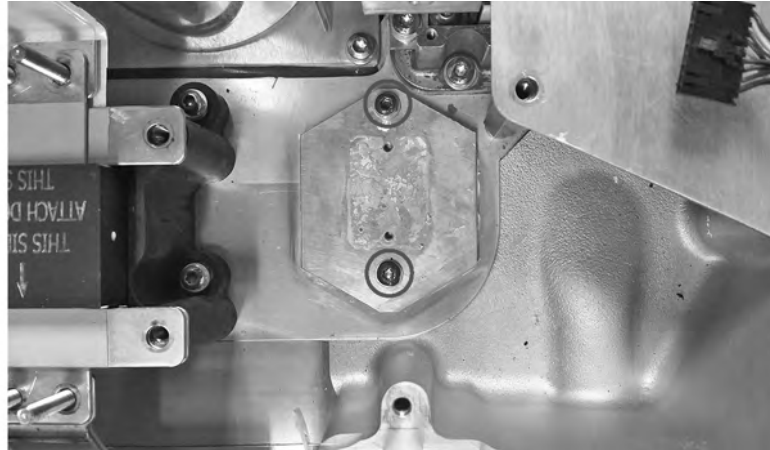
2. Using a Torx Plus™ T10 bit, remove the two (2) M3x8mm screws securing the Passive Discharge Resistor and Harness Assembly as shown in Figure 17. Remove and discard the assembly.



2494918

Figure 17. Passive Discharge Resistor Removal

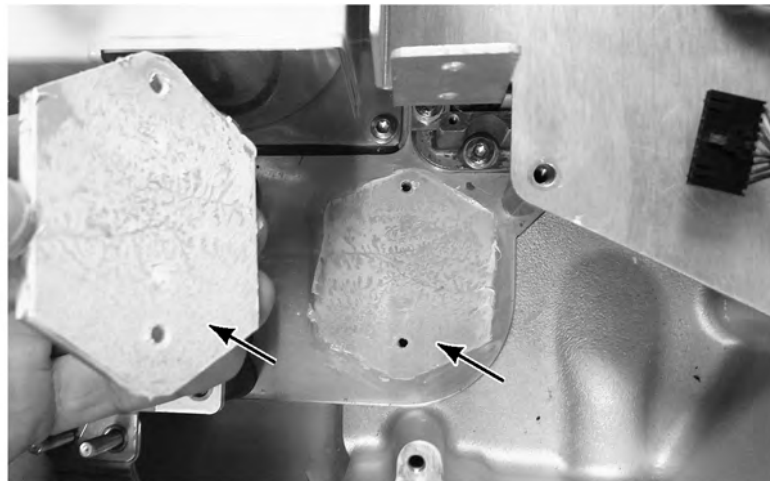
3. Using a Torx Plus™ T20 bit, remove the two (2) M4x16mm screws securing the Heatsink as shown in Figure 18. Remove the Heatsink.



2633791

Figure 18. Passive Discharge Heatsink Removal

4. Clean the chassis surface and both sides of the Passive Discharge Resistor Heatsink to remove any thermal compound or smoke residue that remained after removing the original Passive Discharge Resistor (refer to Figure 19).



2633881

Figure 19. Cleaning of DPIM Chassis and Passive Discharge Resistor Heatsink Surfaces

5. Apply a thin layer of Arctic Silver Ceramique™ 2 Thermal Compound to the bottom of the Passive Discharge Resistor Heatsink (refer to Figure 20).



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Figure 20. Application of Thermal Compound

6. Spread the thermal compound evenly over the entire surface of the Passive Discharge Resistor Heatsink using a silicone non-stick spatula (recommended) (refer to Figure 21).



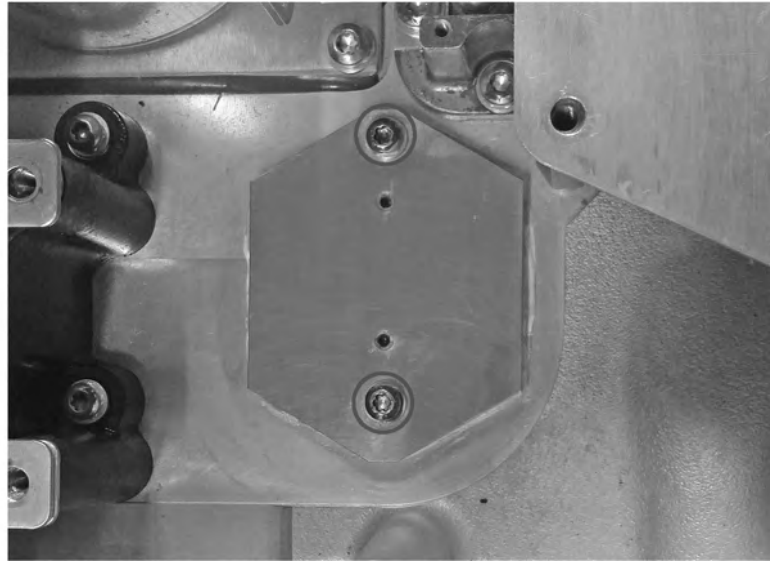
NOTE: Remove the thermal compound from the four (4) holes to avoid transfer to the mounting screws (refer to Figure 21).



2495848

Figure 21. Even Layer of Thermal Paste on Heatsink and Screw Hole Locations

7. Apply one drop of Loctite® 242 thread locking compound to the end of the external threads of the two (2) M4x16mm screws. Using a Torx Plus™ T20 bit, install the two (2) M4x16mm screws (refer to Figure 22) to secure the Heatsink to the DPIM chassis. Torque the two (2) M4x16mm screws to 1.2-1.5 N·m (11-13 lb in).



2634011

Figure 22. Passive Discharge Resistor Heatsink Installation

8. Apply a thin layer of Arctic Silver Ceramique™ 2 Thermal Compound to the entire bottom surface of the Passive Discharge Resistor and spread evenly using a silicone non-stick spatula (recommended) (refer to Figure 23).



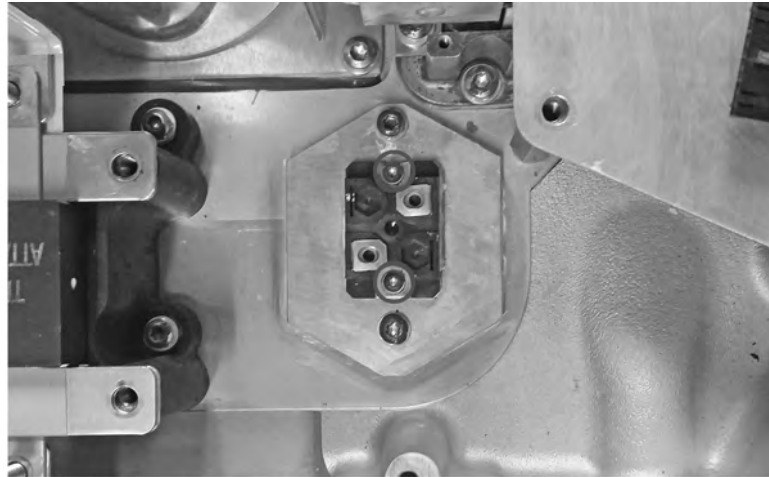
NOTE: Remove the thermal compound from the two (2) holes to avoid transfer to the mounting screws (refer to Figure 23).



2633701

Figure 23. Even Layer of Thermal Compound on Passive Discharge Resistor and Screw Hole Locations

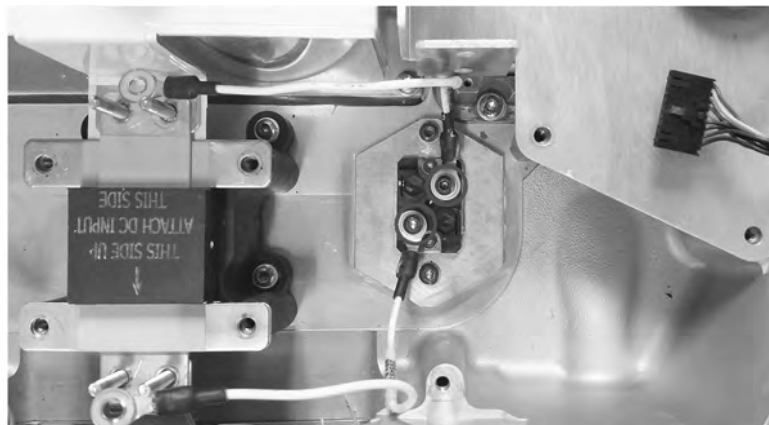
9. Apply the new Passive Discharge Resistor to the Heatsink. Apply one drop of Loctite® 242 thread locking compound to the end of the external threads of the two (2) M3x8mm screws. Using a Torx Plus™ T10 bit, install the two (2) M3x8mm screws to secure it to the Heatsink (refer to Figure 24). Torque the two (2) M3x8mm screws to 0.6-0.8 N·m (5-7 lb in).



2634111

Figure 24. Passive Discharge Resistor Installation

10. Install the two new wiring harnesses in the orientation shown in Figure 25. Using a Torx Plus™ T20 bit, install the two (2) M4x6mm screws to secure the new wiring harnesses to the new Passive Discharge Resistor. Torque the two (2) M4x6mm screws to 0.6-0.8 N·m (5-7 lb in).



2634341

Figure 25. Passive Discharge Resistor Wiring Harness Installation

Section 3: Installation of HVIL Circuit Card and Main Cover

1. Insert one (1) new wire tie into the new HVIL Circuit Card at the same location as shown in Figure 26.



NOTE: To ease assembly, the new wire tie must be inserted through the hole in the circuit card prior to installation in the DPIM Housing.



Figure 26. HVIL Circuit Card – Wire Tie Location

2. Install HVIL Circuit Card into the DPIM Housing.



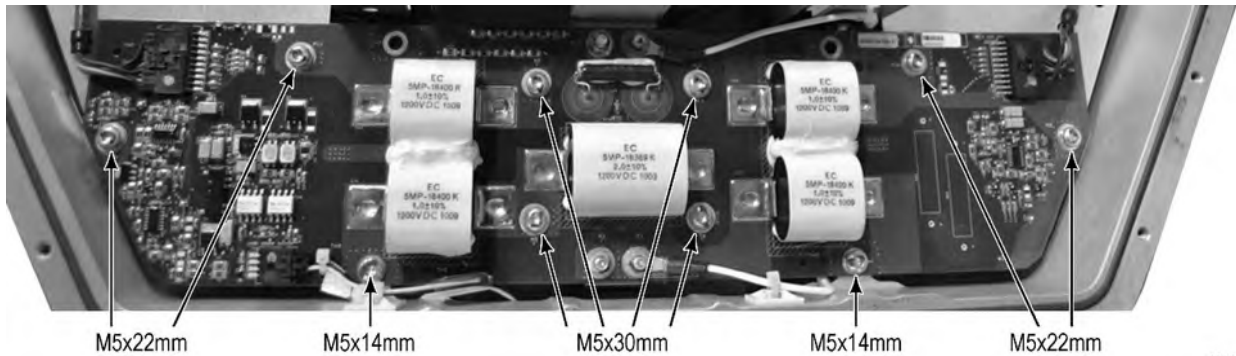
NOTE: Ensure that the wire harnesses and individual wires are NOT pinched under the circuit card during installation.

3. Connect the three (3) wiring harness connectors at locations shown in Figure 27.



Figure 27. HVIL Circuit Card – Three (3) Harness Connector Locations

4. Using a Torx Plus™ T25 bit, install and finger tighten the ten (10) M5 screws that secure the HVIL Circuit Card to the DPIM Housing. Torque all M5 screws to 3.1-3.5 N·m (27-31 lb in). Refer to Figure 28 for fastener sizes and locations.



422663

Figure 28. HVIL Circuit Card – Fastener Sizes/Locations

5. Install the two (2) wire ring terminals onto the studs at locations shown in Figure 29. Using an 8mm socket, install four (4) M5 nut/washer assemblies onto the studs as shown in the same figure. Torque the nuts to 3.1-3.5 N·m (27-31 lb in).



422390

Figure 29. HVIL Circuit Card – Four (4) Mounting Nut/Washer Locations (M5)

6. Secure wiring with new wire ties and clip excess length as required. Refer to Figure 26 and Figure 30 for wire tie locations.



422327

Figure 30. HVIL Circuit Card – Two (2) Wire Tie Locations



NOTE: Verify that all eighteen (18) white protective caps are installed over the capacitor studs in the center of the DPIM. Reinstall or replace any missing caps as necessary.

7. Install new Cover Gasket P/N 29540714, included in Electronic Service Kit P/N 29556119. Using a Torx Plus™ T25 bit, install and finger tighten the twenty-six (26) M5x18mm machine screws that secure the Main Cover to the DPIM Housing as shown in Figure 31. Torque the screws to 3.1-3.5 N·m (27-31 lb in).



421911

Figure 31. DPIM Main Cover



NOTE: For additional information refer to H 40/50 EP™ System Service Manual SM3602EN Appendix E.

8. Complete the DPIM check sheet again to verify the repair before installing the DPIM on the bus.

NOTE: This illustration is to be used for identifying the name and location of components within the Dual Power Inverter Module 2 (DPIM2). It is not intended to be used for disassembly and assembly procedures.



DPIM2

Levels of Assembly

