Allison Transmission

Revisions to this document are noted by a stripe in the left-hand margin

SUBJECT: Replacing the DC Busbar Assembly, DC Terminal Block and HVIL Support in 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 4)
- Pick or Small Flat Blade Screwdriver
- Torx-Plus® T20 Bit
- Torx-Plus® T25 Bit
- 8mm Hex Socket
- 13mm Hex Socket
- Loctite® 242
- Loctite® 425

Parts Required

- P/N 29540714 – Cover Gasket
- P/N 29540614 – DPIM DC Access Lug Box Cover EMI Gasket
- Wire Ties (4 inch – Nylon 6/6 or approved equivalent)

Introduction:

This Service Information Letter (SIL) announces the availability of the DC (Direct Current) busbar, DC terminal block, HVIL support and related components, and includes the procedure to replace the DC busbar, DC terminal block and HVIL support. The availability of these part eliminates the need for a complete DPIM replacement under certain failure conditions.

NOTE: Replacement of the DC Busbar and DC Terminal block is not a warrantable repair by Allison Transmission, Inc. if damaged has been caused by arcing. Contact Allison TAC at (800) 252-5283 prior to initiating repairs on a DPIM that is under warranty.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

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.

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

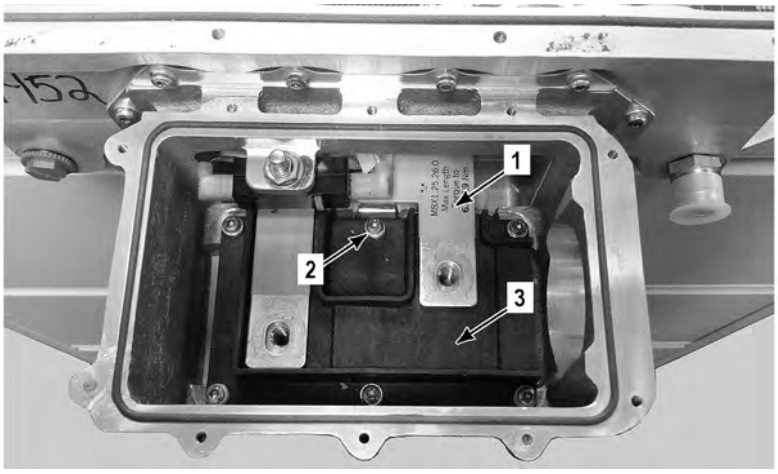
NOTE: Perform the necessary visual inspection prior to ordering parts. The parts are NOT available as a complete kit. All necessary components must be ordered individually.

NOTE: If the DC Lug Box has been damaged, refer to SIL 08-EP-14 for replacement parts and procedures.

Refer to Figure 1 for locations of the DC busbars, DC terminal block and related components. Refer to Table 1 for list of Service Parts.

Table 1. Service Parts (refer to Figure 1)

Item Number	Part Name	Part Number
1	Busbar – DC	29546732
2	Screw – M4x16mm	29557587
3	DC Terminal Block	29540604



2823420

Figure 1. Service Parts

Refer to Figure 2 for locations of the HVIL support and related components. Refer to Table 2 for list of Service Parts.

Table 2. Service Parts (refer to Table 2)

Item Number	Part Name	Part Number
1	HVIL Support	29549340
2	Screw M4x22mm	29549757

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

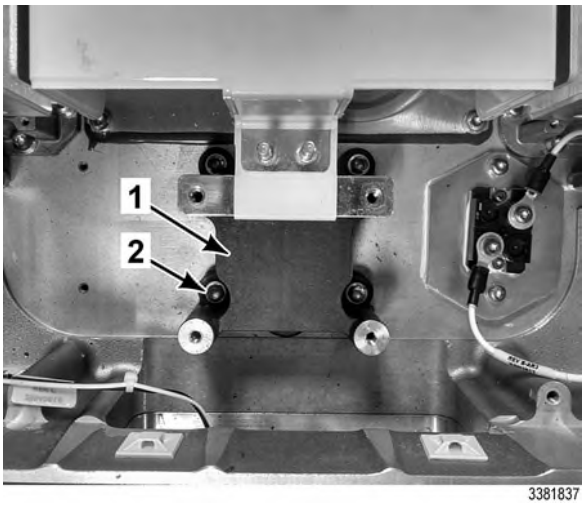


Figure 2. HVIL Support Service Parts

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 DC busbar assembly and DC terminal block may need to be replaced if the HV lug bolt has become loose and components are damaged by electrical arcing. Refer to Figure 3.

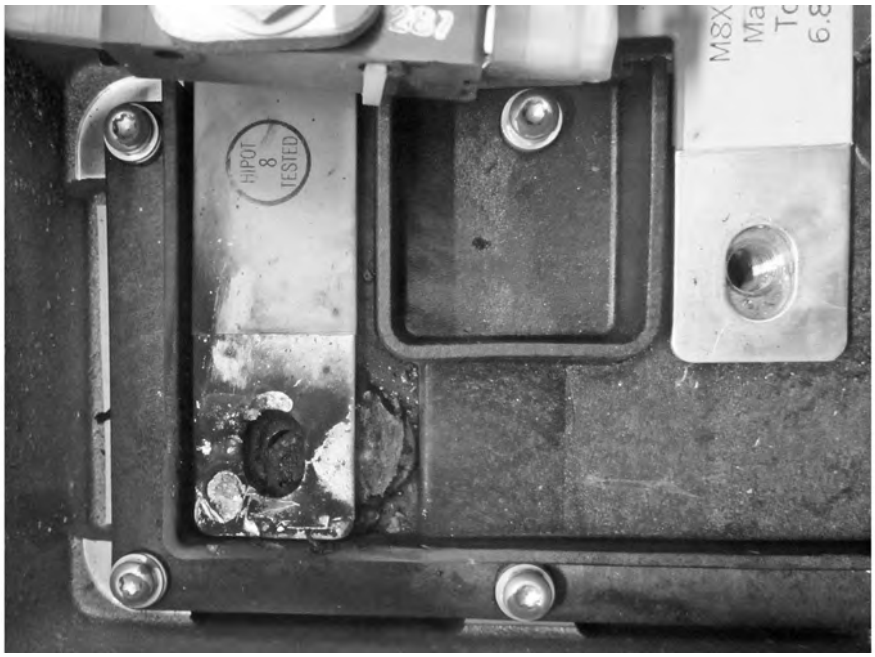


Figure 3. Damage to Busbar and Terminal Block Caused by Electrical Arcing

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

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.

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: Allison Transmission, Inc. requires the removal of the DPIM from the vehicle prior to performing internal repairs. 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: Internal DPIM repairs should NOT be performed if smoke and/or water damage are present. Photograph the smoke and/or water damage and contact Allison TAC at (800) 252-5283.

NOTE: Complete the DPIM Check List prior to replacing the DC busbar assembly and DC terminal block to ensure additional components have not been damaged. 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).

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

Section 1: Removal of Main Cover, HVIL Circuit Card, and DC Choke

Section 2: Replacement of the DC Busbar Assembly and HVIL Support

Section 3: Replacement of the DC Terminal Block

Section 4: Installation of DC Choke, HVIL Circuit Card and Main Cover

Section 1: Removal of Main Cover, HVIL Circuit Card, and DC Choke

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 4.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

426411

Figure 4. Electrostatic Discharge Wrist Strap (Tool Number 7744 Shown)

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 5). Set the screws aside for reassembly. Remove the Main Cover. Discard the cover gasket.

421911

Figure 5. DPIM Main Cover

2. Exercising care, cut one (1) wire tie at location shown in Figure 6. 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.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

Figure 6. HVIL Circuit Card – Wire Tie Location

3. Cut the two (2) wire ties at locations shown in Figure 7 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 7. 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 with a Pick or Small Flat Blade Screwdriver (refer to Figure 8).

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

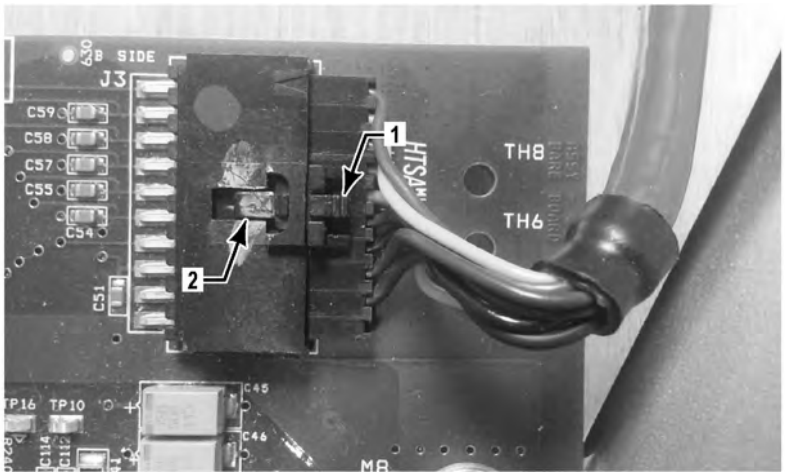


Figure 8. HVIL Circuit Card Connector Removal

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 9.

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

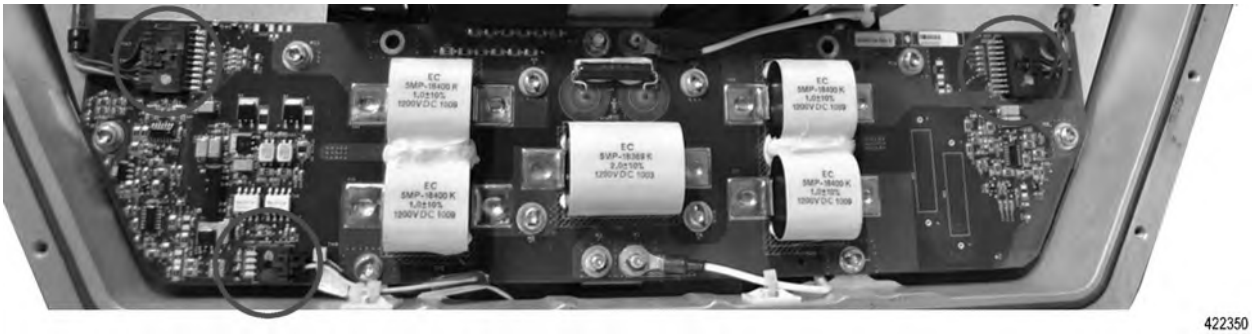


Figure 9. HVIL Circuit Card – Three (3) Harness Connector Locations

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 hex socket, remove the four (4) M5 nut/washer assemblies as shown in Figure 10. Disconnect the two (2) wire ring terminals from the studs.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

Figure 10. 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 11.

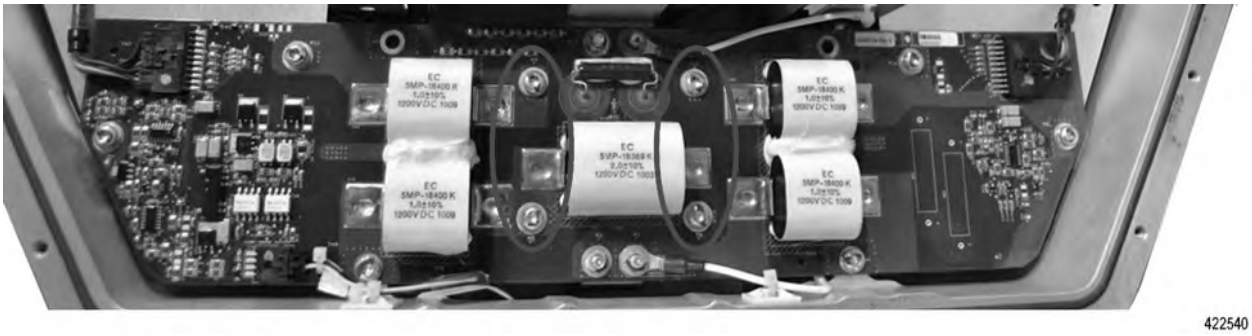


Figure 11. HVIL Circuit Card – Four (4) Mounting Screw Locations (M5x30mm)

8. Using a Torx-Plus® T25 bit, remove the two (2) M5x14mm screws securing the HVIL Circuit Card as shown in Figure 12.

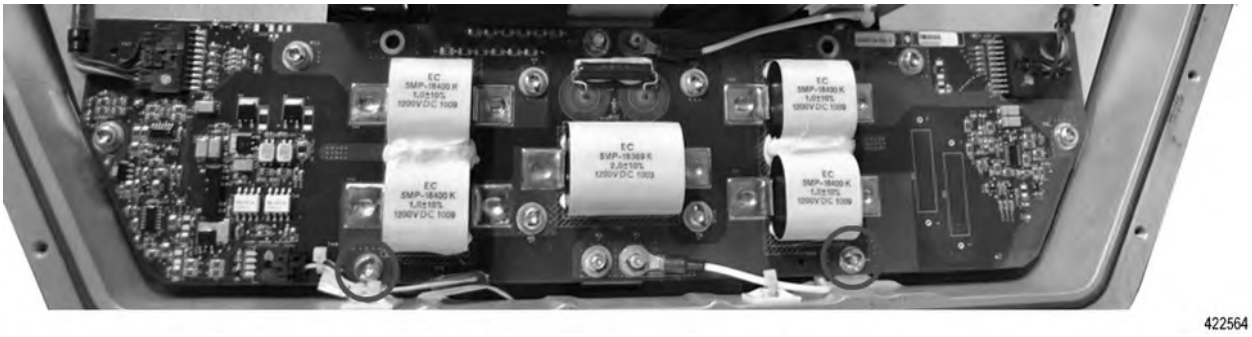


Figure 12. HVIL Circuit Card – Two (2) Mounting Screw Locations (M5x14mm)

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

9. Using a Torx-Plus® T25 bit, remove the four (4) M5x22mm screws securing the HVIL Circuit Card as shown in Figure 13.

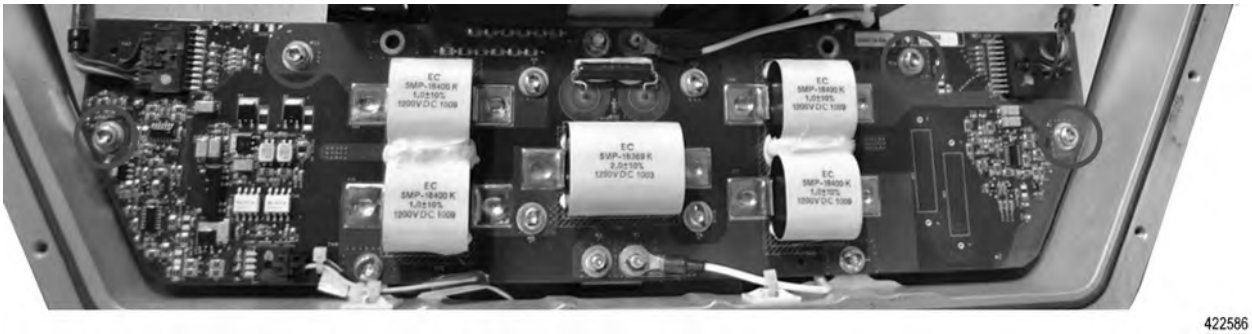
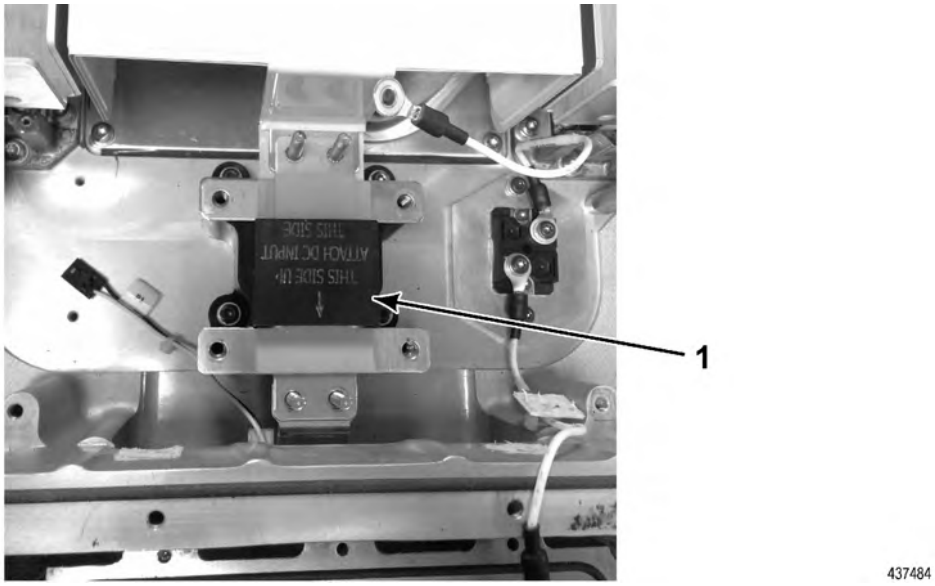


Figure 13. HVIL Circuit Card – Four (4) Mounting Screw Locations (M5x22mm)

10. Lift the HVIL Circuit Card straight up and remove it from the DPIM Housing.
11. Remove the DC Choke (refer to Figure 14).



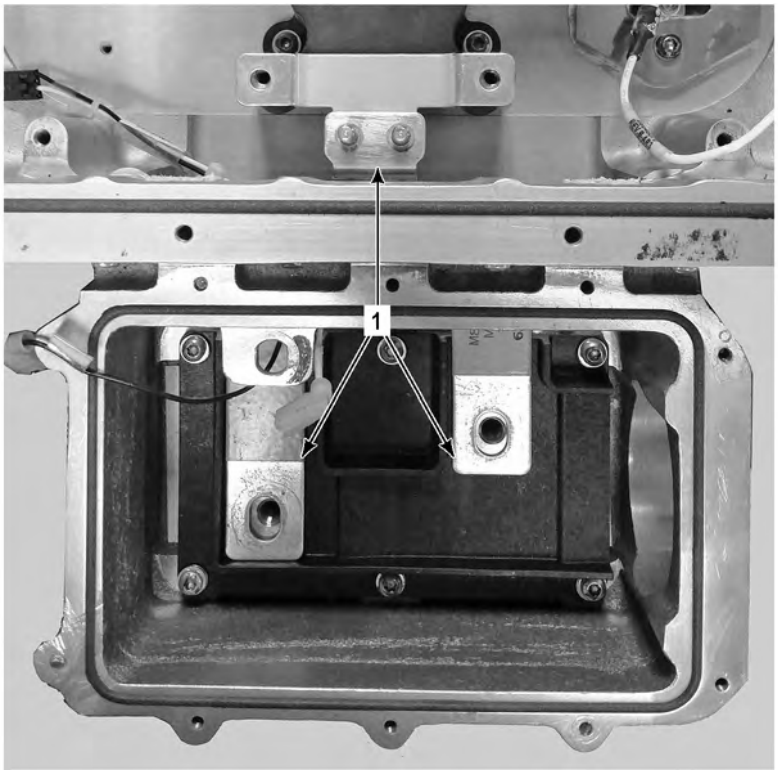
(1) – Choke

Figure 14. DC Choke Location

Section 2: Replacement of the DC Busbar Assembly and HVIL Support

1. Remove and, if damaged, discard the DC busbar through the main cover opening (refer to Figure 15).

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.



(1) – DC Busbar

Figure 15. DC Busbar Location

2. If the HVIL support is damaged, use a Torx-Plus® T20 bit to remove the four (4) M4x22mm screws that secure the HVIL support to the DPIM housing (refer to Figure 16). Discard the damaged HVIL support.

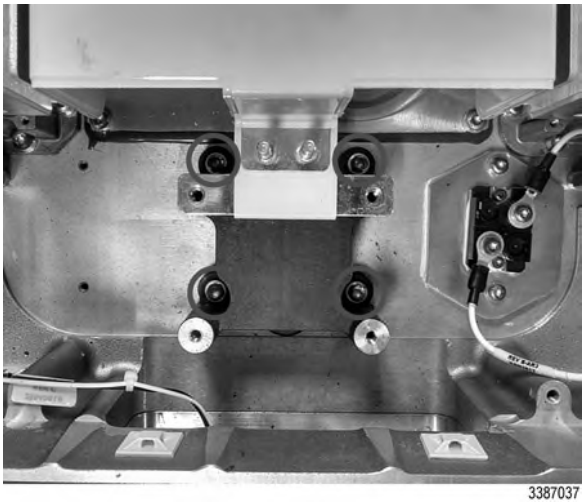


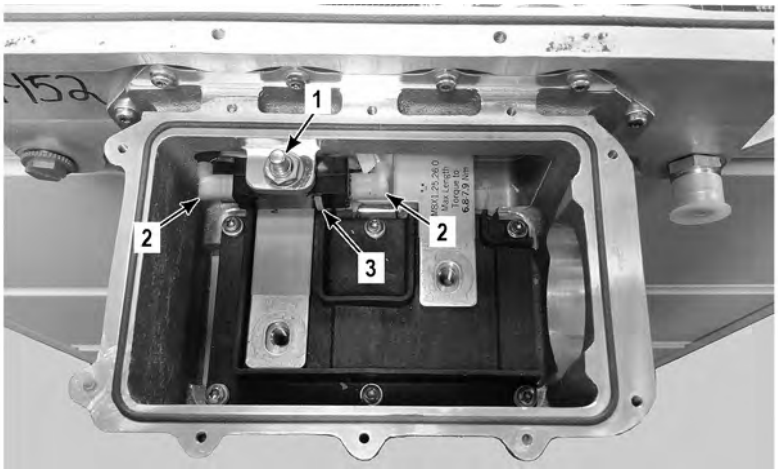
Figure 16. HVIL Support Screws

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

3. Install the new HVIL support in the proper orientation. Use a Torx-Plus® T20 bit to install and torque the four (4) M4x22mm screws (refer to Figure 16) to 1.2-1.5 N·m (10.6-13.3 lb in).

Section 3: Replacement of the DC Terminal Block

1. Using a 13mm socket, remove the nut and washer that secure the HVIL switch to the DC lug box housing. Unplug the two (2) wiring terminals from the ends of the HVIL switch. Remove the wire tie. Remove the HVIL switch (refer to Figure 17). Make note of the wiring terminal and wire tie orientation for reinstallation.

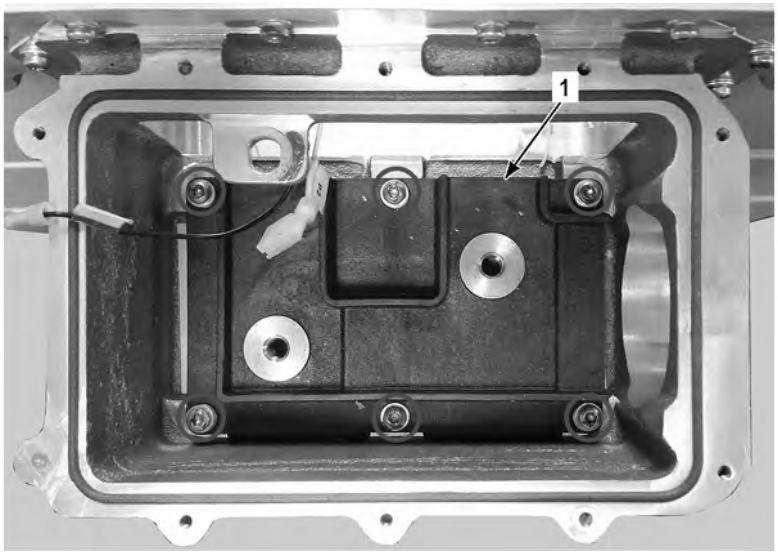


(1) – HVIL Switch Nut (2) – Wiring (3) – Wire Tie

Figure 17. DC Lug Box Components

2. Using a Torx-Plus® T20 bit, remove the six (6) M4x16mm screws that secure the DC terminal block to the DC lug box (refer to Figure 18). Remove and discard the DC terminal block from the DC lug box.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

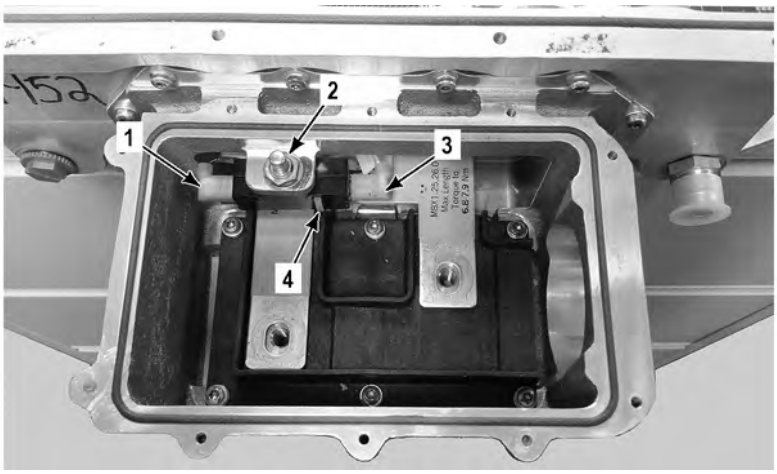


(1) – DC Terminal Block

Figure 18. DC Terminal Block and Fastener Locations

3. Place the DC terminal block into the DC lug box. Using a Torx-Plus® T20 bit, install the six (6) M4x16mm screws that secure the DC terminal block to the DC lug box (refer to Figure 18) and torque to 1.24-1.47 N·m (10.97-13.01 lb in).
4. Insert the new DC busbar into the DC Lug Box through the main cover opening (refer to Figure 18).
5. Place the HVIL switch in the DC lug box. Connect the two (2) wiring terminals to the ends of the HVIL switch (refer to Figure 19). Apply one drop of Loctite® 425 (or equivalent) to the external threads. Using a 13mm socket, install the nut and washer that secure the HVIL switch to the DC lug box. Torque the nut to 1.9-2.2 N·m (16.8-19.5 lb in). Install wire tie to secure the black wire to the HVIL switch and cut to length.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.



(1) – Black Terminal
(2) – HVIL Switch Nut and Washer
(3) – White Terminal
(4) – Wire Tie

Figure 19. DC Lug Box Components

Section 4: Installation of DC Choke, HVIL Circuit Card and Main Cover

1. Install the DC Choke, ensuring that the arrow is pointing towards the DC lug box (refer to Figure 20).

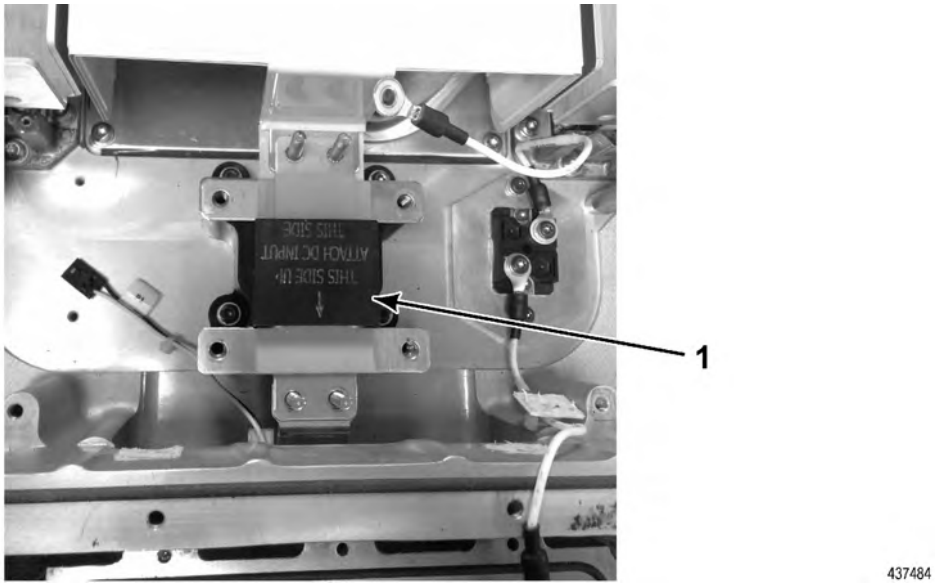


Figure 20. DC Choke Location

2. Insert one (1) new wire tie into the new HVIL Circuit Card at the same location as shown in Figure 21.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

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 21. HVIL Circuit Card – Wire Tie Location

3. 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.

4. Connect the three (3) wiring harness connectors at locations shown in Figure 22.

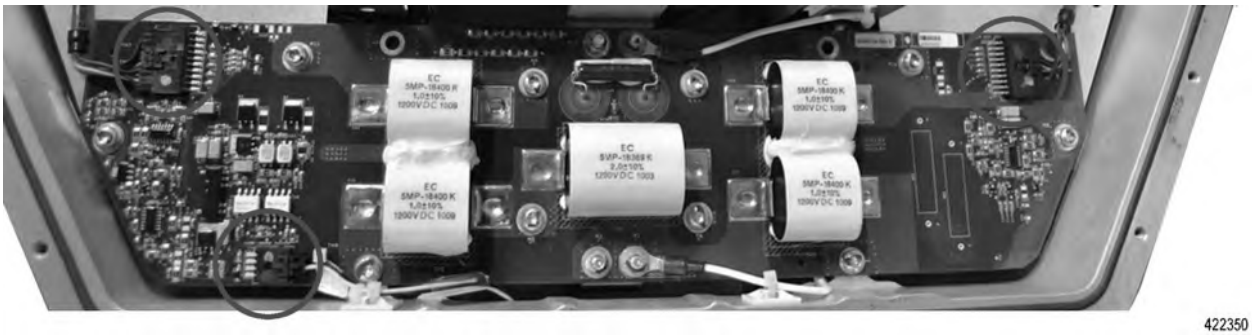


Figure 22. HVIL Circuit Card – Three (3) Harness Connector Locations

5. 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 23 for fastener sizes and locations.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

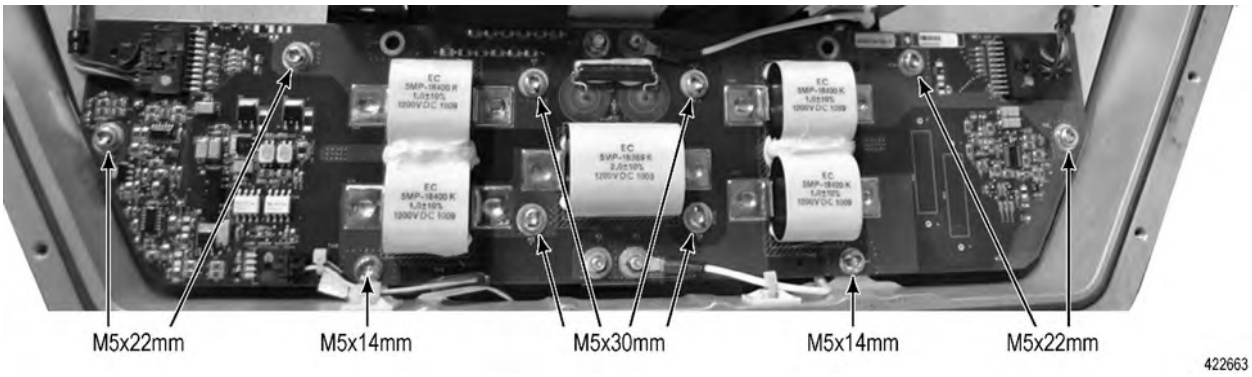


Figure 23. HVIL Circuit Card – Fastener Sizes/Locations

6. Install the two (2) wire ring terminals onto the studs at locations shown in Figure 24. 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).

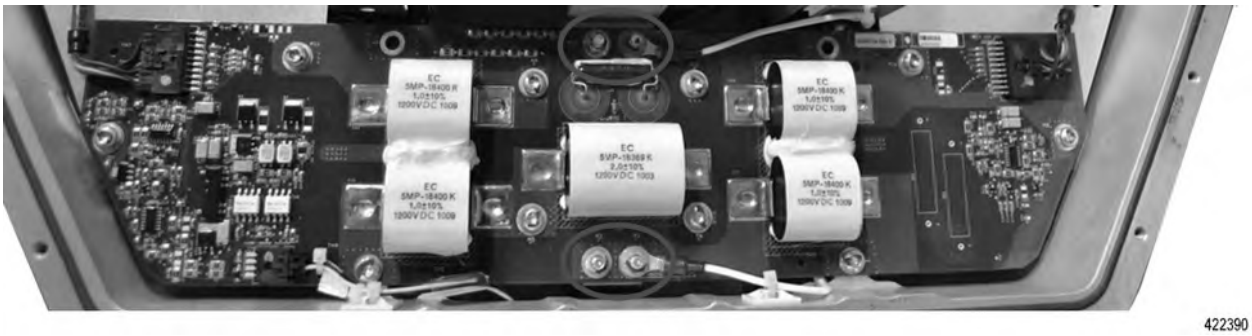


Figure 24. HVIL Circuit Card – Four (4) Mounting Nut/Washer Locations (M5)

7. Secure wiring with new wire ties and clip excess length as required. Refer to Figure 21 and Figure 25 for wire tie locations.

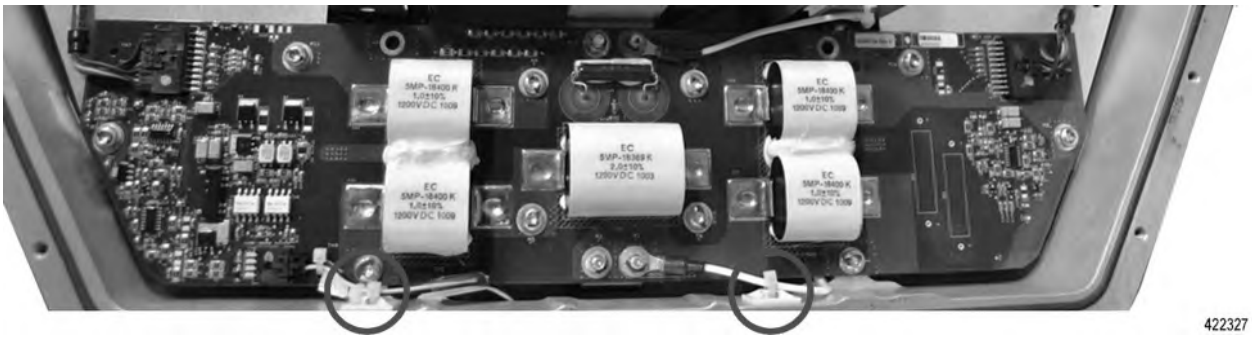


Figure 25. HVIL Circuit Card – Two (2) Wire Tie Locations

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

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.

8. Install new Cover Gasket P/N 29540714. 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 26. Torque the screws to 3.1-3.5 N·m (27-31 lb in).

Figure 26. DPIM Main Cover

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

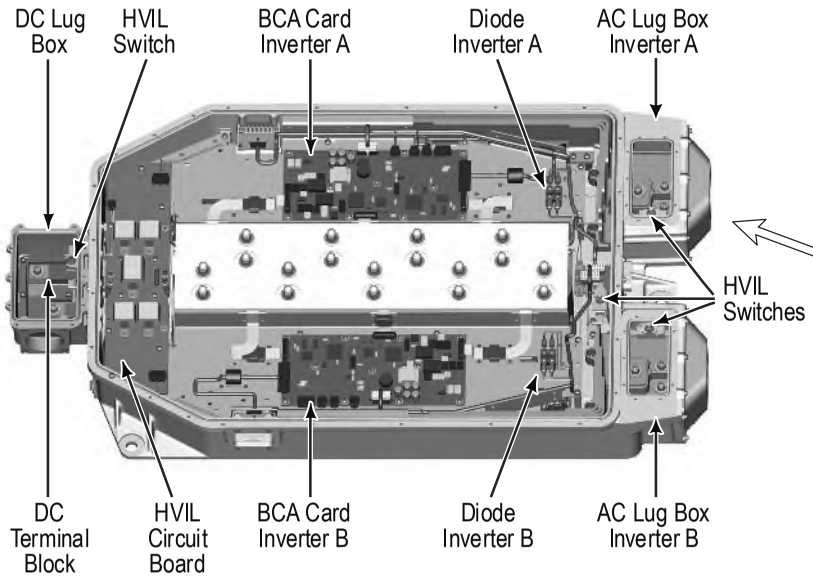
9. Complete the DPIM check sheet again to verify the repair before installing the DPIM on the bus.

Copyright © 2017 Allison Transmission, Inc. All Rights Reserved.

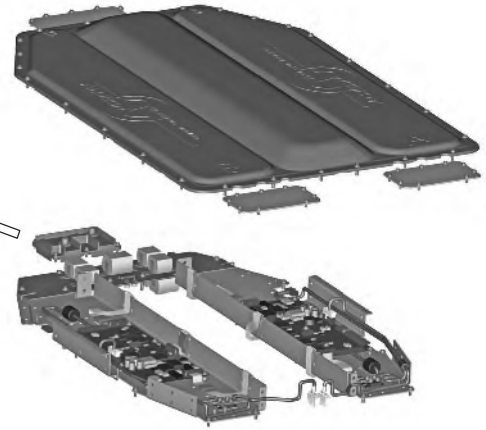
NOTE: This illustration is to be used for identifying the name and location of components within the Dual Power Inverter Module 2 (DPIM2). It is not intended to be used for disassembly and assembly procedures.

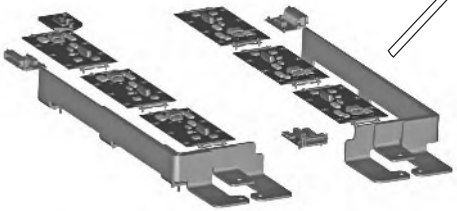
DPIM2
Levels of Assembly

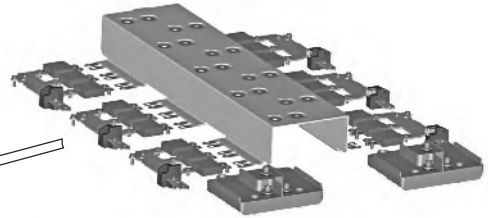
Allison Transmission

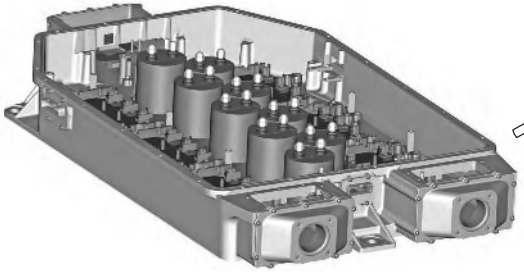


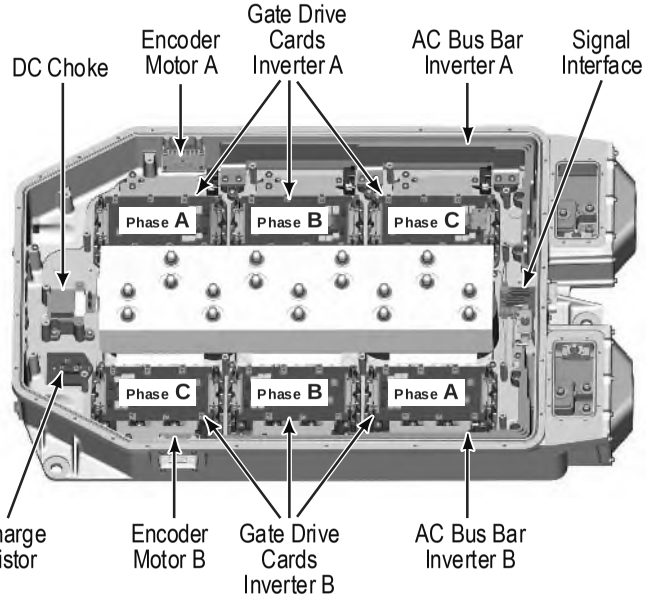
Level 1



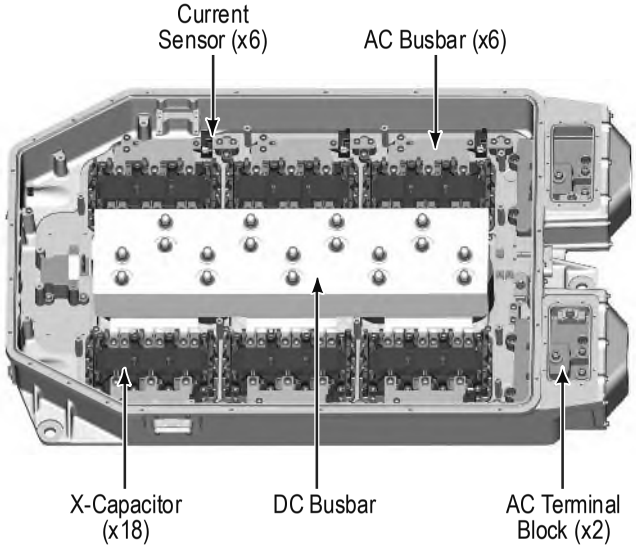




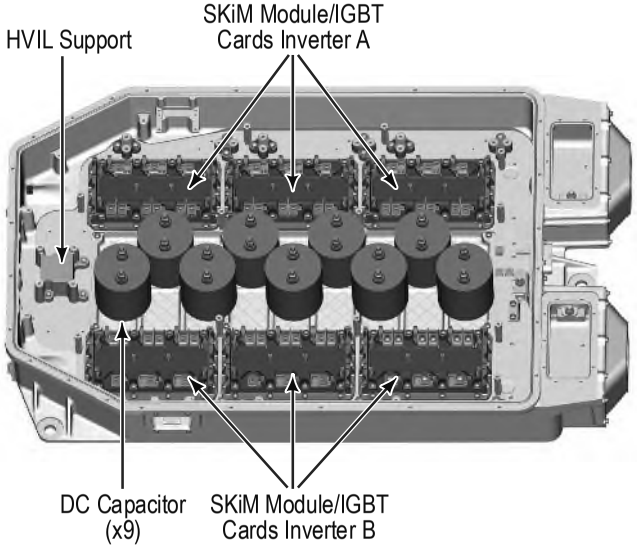




Level 2



Level 3



Level 4

Copyright 2014 Allison Transmission, Inc. All Rights Reserved.

GN7499EN
201405