
FIELD SERVICE CAMPAIGN – 22123

10 November 2022

SUBJECT:

High-Voltage Cable Retrofit

MODELS INVOLVED:

International® eMV™ Series and IC Bus® Electric CE Series

DEFECT DESCRIPTION:

Certain electric vehicles may have been built without the Level 2 Manual Service Disconnects (MSDs). This document will walk the user through installing the Level 2 MSDs and high-voltage circuits needed.

ELIGIBILITY:

This procedure applies ONLY to vehicles marked in the International® Service Portal™ with FSC 22123. Also complete any other open campaigns listed on the Service Portal at this time.

TOOLS REQUIRED:

Description	Tool Number
High-Voltage Battery Adapter Plate	08-529-04
Cooling System Adapter	09-040-03
High-Voltage Battery Mount Adapter Bracket	08-529-03
Drive Motor Adapter Plate	08-693-01
Lift Assembly	08-529-01
Coolant Management Tool	KL5007NAV

Table 1 Tools Information

PARTS REQUIRED:

2-String Short Wheelbase

Part Number	Description	Quantity
4302307C92	Cable, High-Voltage Battery A3 to MSD2+ IN	1
4264406C91	Cable, 1 String Battery A3- to Battery A2+	1
4282817C92	Cable, 1 String Battery A2- to Battery A1+	1
4270132C92	Cable, 1 String Battery A1- to S-Box-	1
4302305C92	Cable, High-Voltage Battery B6+ to MSD 1+	1
4214217C92	Cable, 2 String Battery B6- to Battery B5+	1
4214255C92	Cable, 2 String Battery B5- to Battery B4+	1
4270128C92	Cable, 2 String Battery B4- to S-Box-	1
4306655C92	Cable, High-Voltage Battery B6 MSD 1 OUT to S-Box+	1
4302308C92	Cable, High-Voltage Battery A3 MSD2 OUT to S-Box+	1
4305004C1	HDS Manual Service Disconnect	2
8765432X1	Jumper Harness Kit to VCU	1

Table 2 Parts Information – Short Wheelbase

2- String Long Wheelbase

Part Number	Description	Quantity
4302307C92	Cable, High-Voltage Battery A3 to MSD2+ IN	1
4264406C92	Cable, 1 String Battery A3- to Battery A2 +	1
4264407C92	Cable, 1 String Battery A2- to Battery A1 +	1
4282650C92	Cable, 1 String Battery A1- to S-Box -	1
4302305C92	Cable, High-Voltage Battery B6+ to MSD 1+	1
4214217C92	Cable, 2 String Battery B3- to Battery B2 +	1
4214255C92	Cable, 2 String Battery B2- to Battery B1 +	1
4304597C92	Cable, High-Voltage Battery B6 MSD1 OUT to S-Box	1
4304601C92	Cable, High-Voltage Battery A3 MSD2 OUT to S-Box	1
4264412C92	Cable, 2 String Battery B1- to S-Box -	1
4305004C1	HDS Manual Service Disconnect	2
8765432X1	Jumper Harness Kit to VCU	1

Table 3 Parts Information – Long Wheelbase

Front Master Service Disconnect (MSD) Mounting Kit

Part Number	Description	Quantity
4304591C2	Support, Left-Side Mounting Assembly	1
4304594C2	Support, Right-Side Mounting Assembly	1
4304971C3	Support, MSD Bracket Plate Assembly	1
4305098C1	Support, MSD Bracket Cable Retainer Assembly	2
40316R1	Bolt, Hexagon Flange Heavy M8 X 25mm	8
31045R1	Bolt, M6-1-6 X 16mm Hex Flange	8
30866R2	Bolt, M10 X 40mm Heavy Hex Flange	8
4039319C1	Guide, Brake Hose & Cable, 2-Way Lp	3
306132C1	Strap, Cable Lock	As needed
3570838C1	Guide, Brake Hose & Cable, Saddle Mount	1

Table 4 Parts Information – MSD Mounting Kit

WORK INSTRUCTIONS

GOVERNMENT REGULATION: Engine fluid (oil, fuel, and coolant) may be a hazard to human health and the environment. Handle all fluid and other contaminated materials (such as filters and rags) in accordance with applicable regulations. Recycle or dispose of engine fluids, filters, and other contaminated materials according to applicable regulations.

WARNING! To prevent personal injury and / or death, or damage to property, NEVER service a high-voltage vehicle without completing high-voltage safety training. Before working on vehicle, read and obey High-Voltage Safety, and Lock-Out Tag-Out safety procedures and information.

WARNING! To prevent personal injury and / or death, wear and use approved high-voltage Personal Protective Equipment (PPE) when near a high-voltage electric vehicle. Inspect PPE before use. Do not use gloves or other PPE with expired dates, holes, cracks, or damage. NEVER touch energized orange high-voltage cables or high-voltage components without wearing approved high voltage PPE.

WARNING! To prevent personal injury and / or death, or damage to property, park vehicle on hard flat surface, key OFF, set the parking brake, and install wheel chocks to prevent the vehicle from moving in both directions.

WARNING! To prevent personal injury and / or death, or damage to property, **ALWAYS** follow existing cable-routing for all replacement cables. Kit-supplied replacement cables are designed to be installed with no slack present. **NEVER** deviate from existing routing when replacing a high-voltage cable.

WARNING! To prevent personal injury and / or death, always wear safe eye protection when performing vehicle maintenance.

WARNING! To prevent personal injury and / or death, or damage to property, keep flames or sparks away from vehicle and do not smoke while servicing the vehicle's batteries. Batteries expel explosive gases.

WARNING! To prevent personal injury and / or death, or damage to property, if the vehicle must be raised, do not work under the vehicle supported only by jacks. Jacks can slip or fall over.

WARNING! To prevent personal injury and / or death, read all information in the Safety Information and High-Voltage Safety sections of the service manual.

1. Bring vehicle into shop area and park vehicle on a dry level surface.
2. Set drive mode selector to Neutral, turn ignition to Key OFF position, and set parking brake.
3. Install wheel chocks.
4. Unlatch and open hood.
5. Using KL5007NAV Coolant Management Tool with 09-040-03 Cooling System Adapter and a clean receptacle, drain high-voltage battery coolant system.
6. Perform high-voltage isolation level 3. Refer to technician manual for detailed instructions.
7. Turn OFF 12V disconnect.
8. Lift vehicle.
9. From underneath vehicle, record and label all high-voltage harness connections at high-voltage battery and S-box locations.
10. Disconnect high-voltage cables from high-voltage batteries and S-box.
11. Remove high-voltage battery stacks and store on pallet or equivalent. Refer to technician manual for detailed instructions.

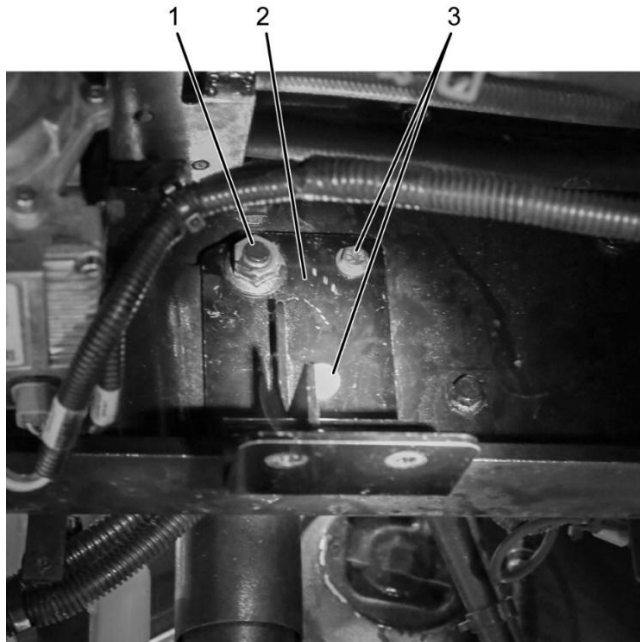
WARNING! To prevent personal injury and / or death, or damage to property, **ALWAYS** follow existing cable-routing for all replacement cables. Kit-supplied replacement cables are designed to be installed with no slack present. **NEVER** deviate from existing routing when replacing a high-voltage cable.

NOTE: Kit-supplied replacement cables will be labeled with specific battery location and connection.

NOTE: Kit-supplied replacement cables are designed to be installed with no slack present. Follow existing cable-routing for all replacement cables.

12. Replace each previously recorded high-voltage cable:

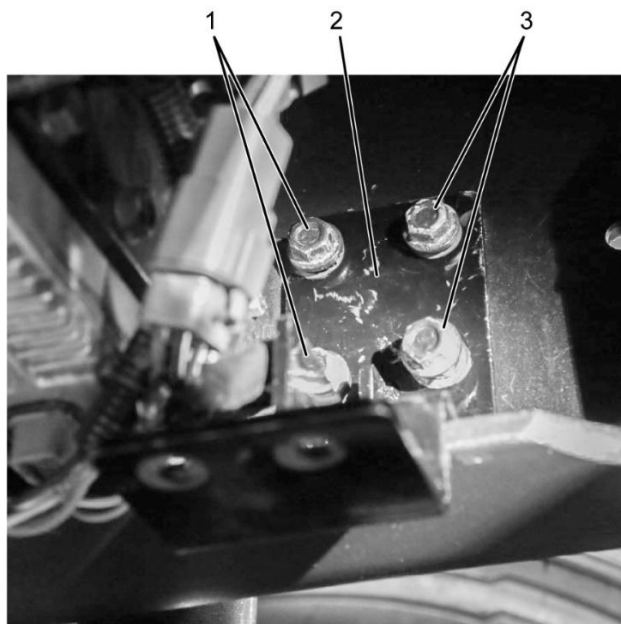
- a. Remove each cable one at a time and replace with appropriate kit-supplied replacement cable.
- b. Route and clip replacement harness.
- c. Repeat Steps a and b for remaining cables.



0000475162

Figure 1. Passenger-Side Master Service Disconnect (MSD) Support Bracket Assembly

1. Lower nut of passenger-side shock absorber mount
 2. MSD support bracket
 3. 30866R2 Flange Bolt and Nut M10 X 40mm (2)
-
13. Remove lower nut of passenger-side shock absorber mount (Figure 1, Item 1).
 14. Position passenger-side Master Service Disconnect (MSD) support bracket (Figure 1, Item 2) onto frame and slide onto the shock absorber lower bolt.
 15. Install two M10 x 40 flange bolts and nuts (Figure 1, Item 3) into the passenger-side MSD support bracket.
 16. Using torque wrench, tighten the loosened lower nut of the passenger-side shock absorber mount to 140 lb-ft (190 N·m). Tighten the two M10 x 40 flange bolts to 46 lb-ft (62 N·m).



0000475163

Figure 2. Driver-Side MSD Support Bracket Assembly

1. Rear 30866R2 Flange Bolt M10 X 40mm (2)
 2. MSD support bracket
 3. Front 30866R2 Flange Bolt M10 X 40mm (2)
-
17. Loosely install two rear flange bolts M10 X 40mm (Figure 2, Item 1) in driver-side frame rail.
 18. Slide driver-side MSD support bracket (Figure 2, Item 2) over rear-most M10 X 40mm bolts (Figure 2, Item 1) and secure onto frame rail with the two additional M10 X 40mm bolts (Figure 2, Item 3).
 19. Using torque wrench, tighten the four M10 X 40mm bolts and four nuts securing the driver-side MSD bracket to 46 lb-ft (62 N·m).

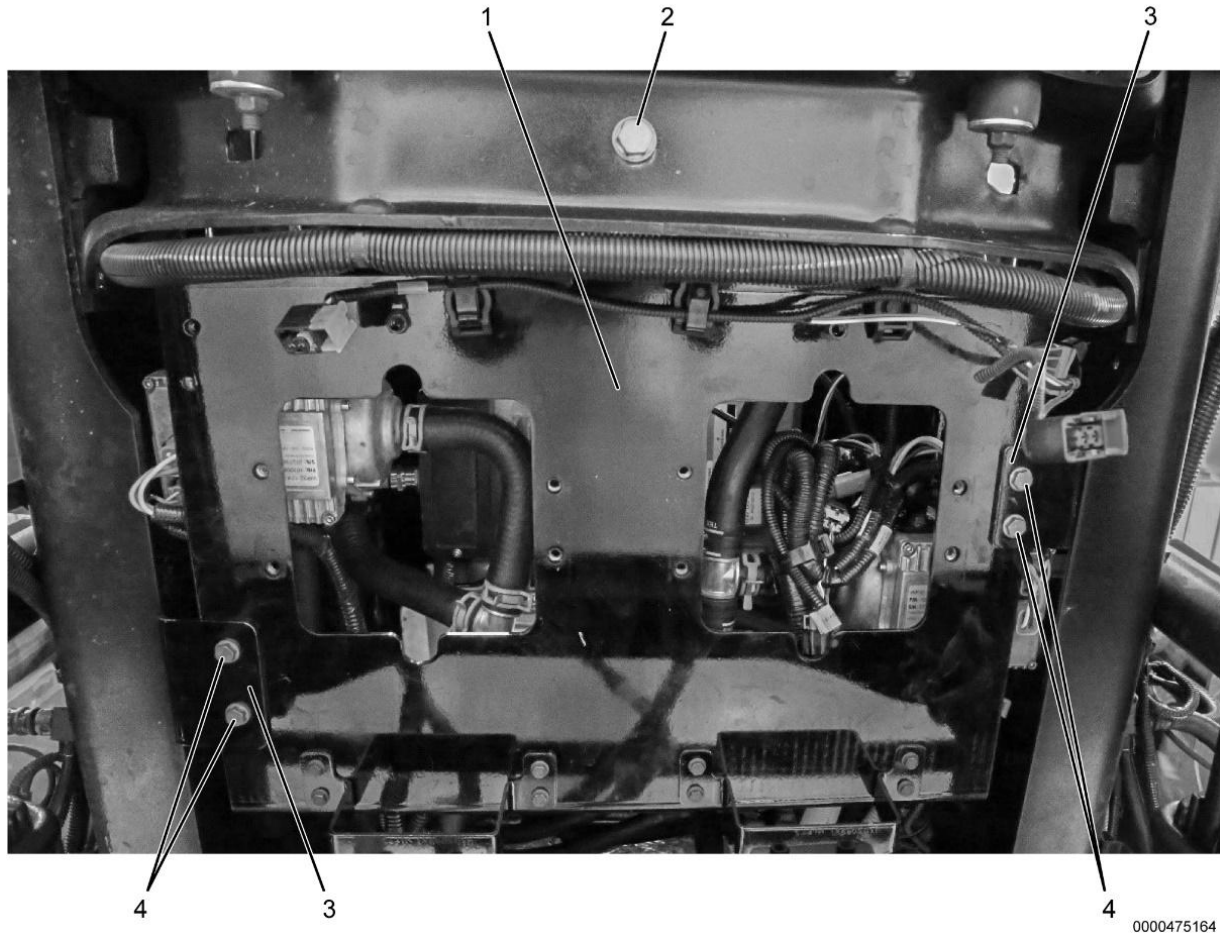
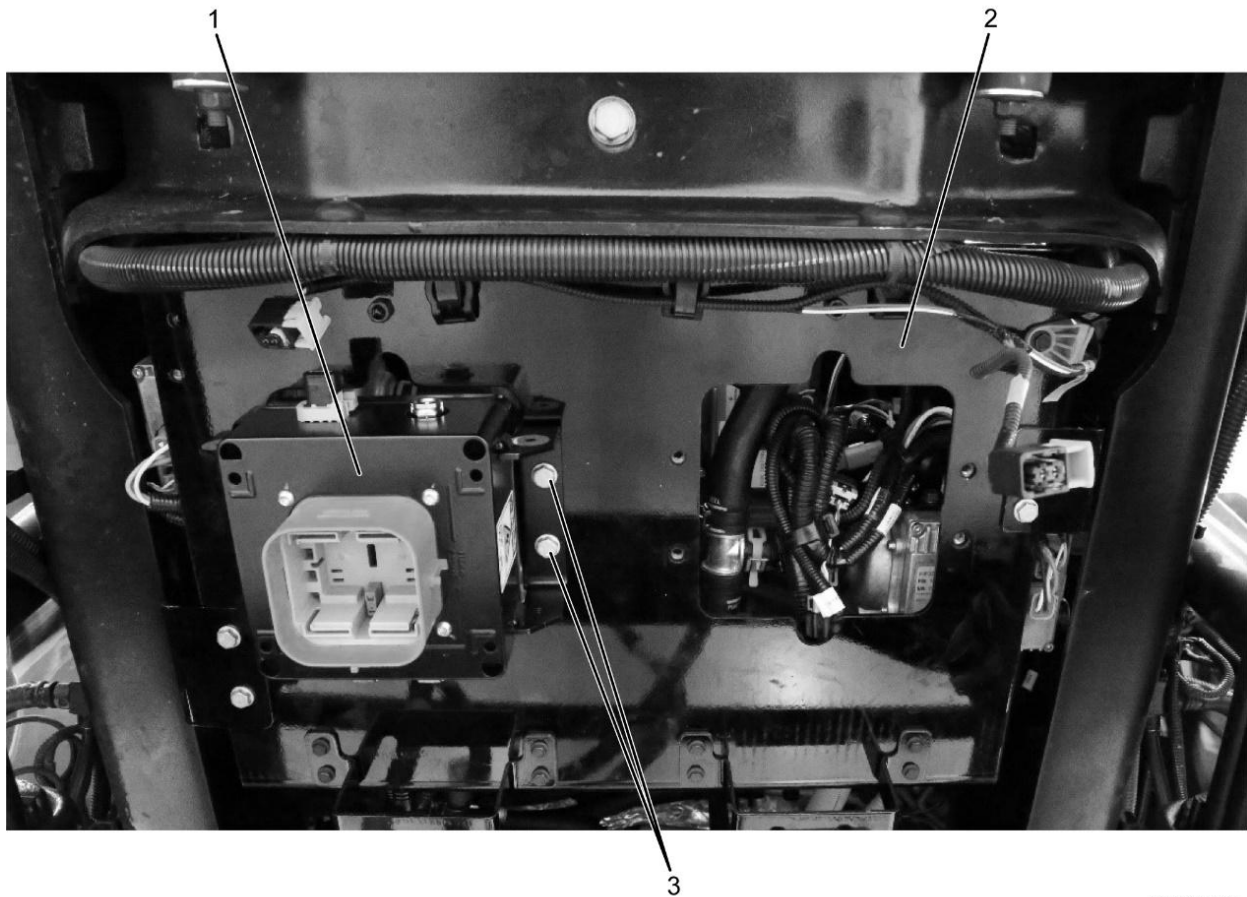


Figure 3. MSD Support Bracket Plate Assembly

1. MSD support bracket plate
2. Crossmember bottom support bolt
3. MSD support bracket (2)
4. 40316R1 M8 X 25 bolt (4)

20. Remove crossmember bottom support bolt (Figure 3, Item 2).
21. Position MSD support bracket plate (Figure 3, Item 1) on the MSD support brackets (Figure 3, Item 3).
22. Install four M8 X 25 bolts (Figure 3, Item 4) securing MSD bracket plate to MSD support brackets.
23. Using a torque wrench, tighten M8 X 25 bolts (Figure 3, Item 4) to 23 lb-ft (31 N·m).
24. Install crossmember bolt and nut (Figure 3, Item 2) onto crossmember.

25. Using a torque wrench, tighten bolt to 72 lb-ft (98 N·m).



0000475172

Figure 4. Passenger-Side MSD Base and Support Bracket Plate Assembly

1. MSD base
2. MSD support bracket plate
3. 40316R1 M8 X 25 bolt (4 total 2 not shown)

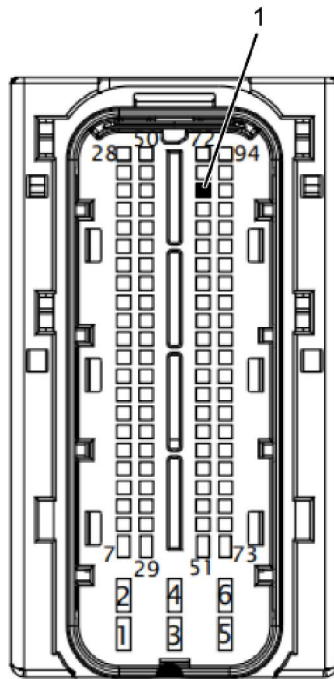
26. Position passenger-side MSD base (Figure 4, Item 1) onto the MSD support bracket plate (Figure 4, Item 2).

27. Install four M8 X 25 bolts securing MSD base to MSD support bracket plate, two on each side (Figure 4, Item 3).

28. Using a torque wrench, tighten bolts to 23 lb-ft (31 N·m).

29. Position driver-side MSD base onto the MSD support bracket plate.

30. Install four M8 X 25 bolts securing MSD base to MSD support bracket plate.
31. Using a torque wrench, tighten bolts to 23 lb-ft (31 N·m).



0000475173

Figure 5. Vehicle Control Unit (VCU) Connector R/D6025

1. Cavity 70
32. Access Vehicle Control Unit (VCU) connector R/D6025 located in driver-side hood compartment. Refer to technician manual for instruction.
33. Disconnect connector R/D6025 from VCU.
34. Identify Pin 70 (Figure 5, Item 1) on VCU connector R/D6025.
35. Unlock connector and depopulate wire located in cavity 70 (Figure 5, Item 1).

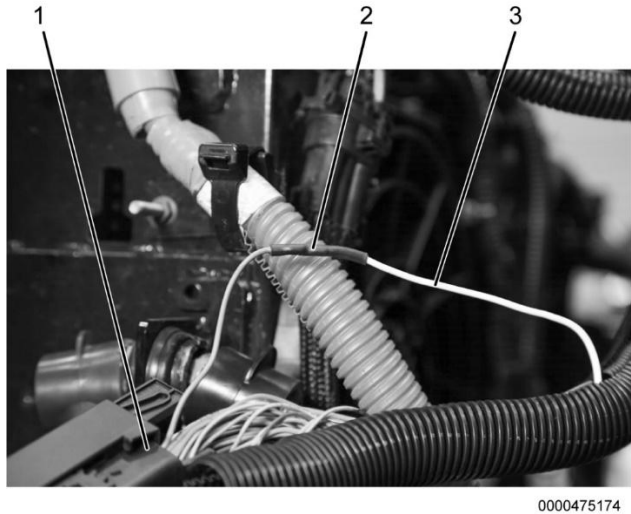
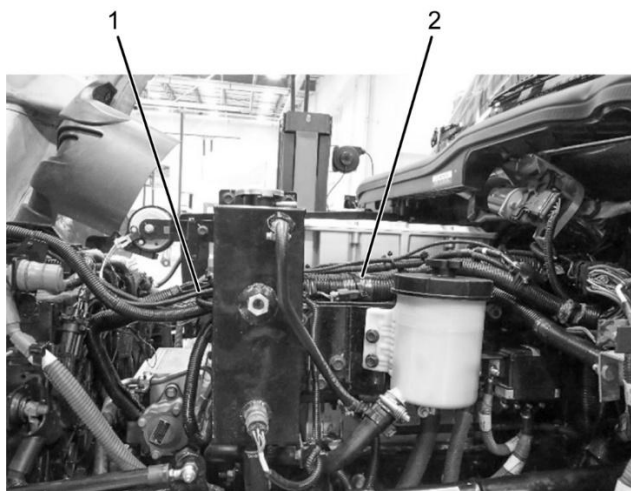


Figure 6. Vehicle Control Unit (VCU) Wire Splice Location

1. VCU Connector
 2. Splice
 3. Jumper Harness 1234567X91
-
36. Cut terminal from depopulated PIN 70 wire and discard.
 37. Splice (Figure 6, Item 2) into WHITE wire from jumper harness 1234567X91 (Figure 6, Item 3).
 38. Terminate end of RED wire of jumper harness.
 39. Insert terminal end of RED wire from jumper harness into PIN 70 of VCU connector (Figure 6, Item 1) to complete the circuit.
 40. Reinstall VCU connector.



0000475175

Figure 7. Jumper Harness Route (VCU Location)

1. Jumper harness
2. VCU harness

41. Route jumper harness (Figure 7, Item 1) towards bottom of vehicle following existing VCU harness (Figure 7, Item 2).

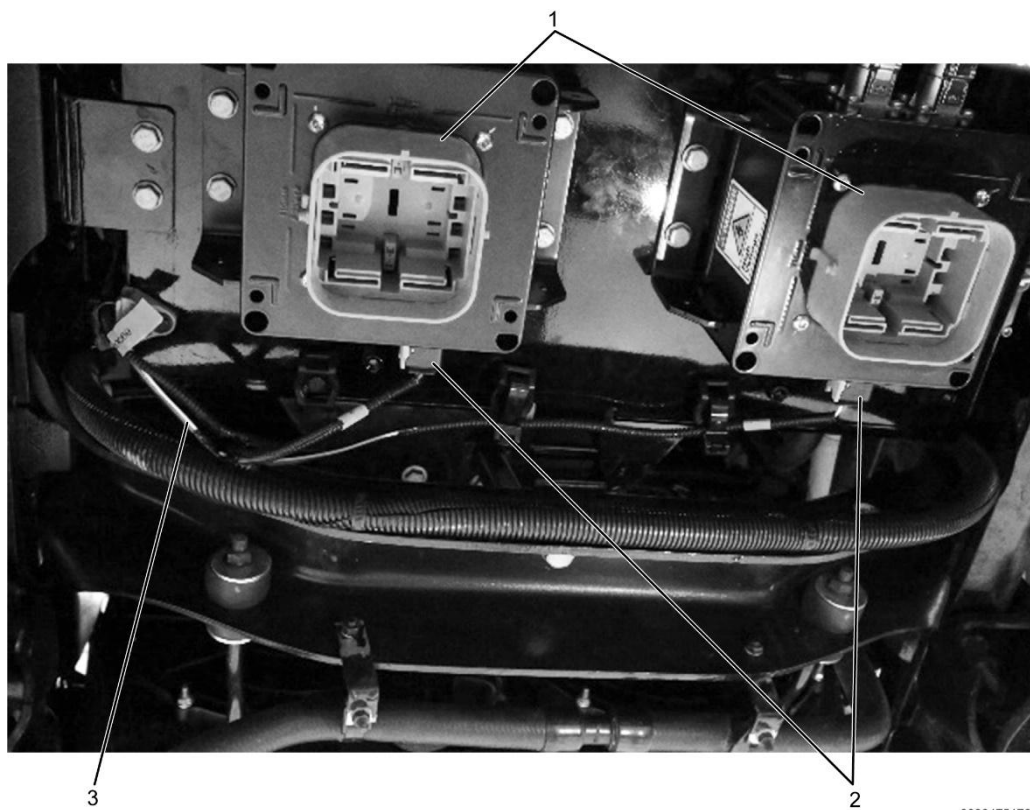


Figure 8. Jumper Harness Route (MSD Location)

1. MSD base (2)
 2. Connector (2)
 3. Jumper harness
-
42. Connect jumper harness connectors (Figure 8, Item 2) to MSD base (Figure 8, Item 1).
 43. Secure jumper harness (Figure 8, Item 3) to existing VCU harness and along edge of MSD bracket plate. Attach tie strap at 6-inch (150 mm) intervals.
 44. Install previously removed high-voltage battery stacks. Refer to technician manual for detailed instruction.

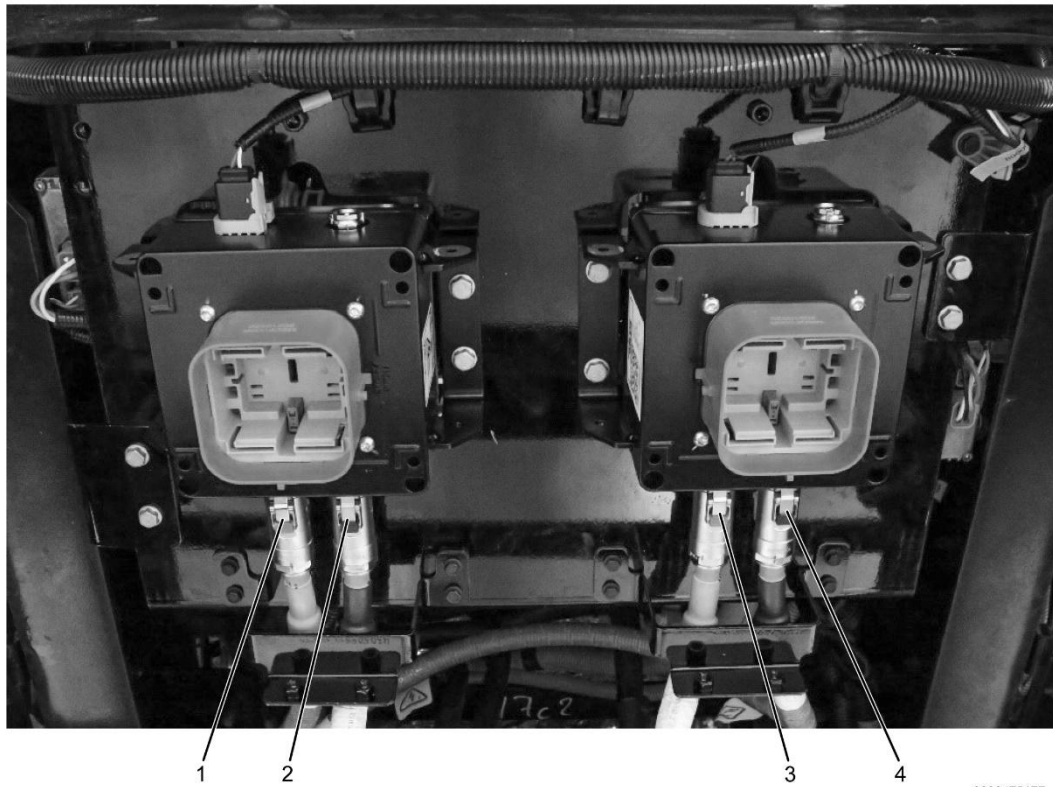


Figure 9. Front MSD High-Voltage Connections

1. Positive high-voltage cable routed from battery 6 (bottom) to passenger-side MSD
2. Negative high-voltage cable routed from S-box to passenger-side MSD
3. Positive high-voltage cable routed from battery 3 (top) to driver-side MSD
4. Negative high-voltage cable routed from S-box to driver-side MSD

WARNING! To prevent personal injury and / or death, or damage to property, ensure MSD high-voltage cables are connected securely to avoid potential high-voltage isolation faults.

NOTE: New replacement cables route from S-box to battery 3 and S-box to battery 6 and from battery 3 to MSD and battery 6 to MSD. Refer to Figures 10 and 11.

45. Connect replacement positive cables:

- a. Connect positive high-voltage cables (Figure 9, Items 1 & 3) to passenger and driver-side MSD.
- b. Connect negative high-voltage cables (Figure 9, Items 2 & 4) to passenger and driver-side MSD.

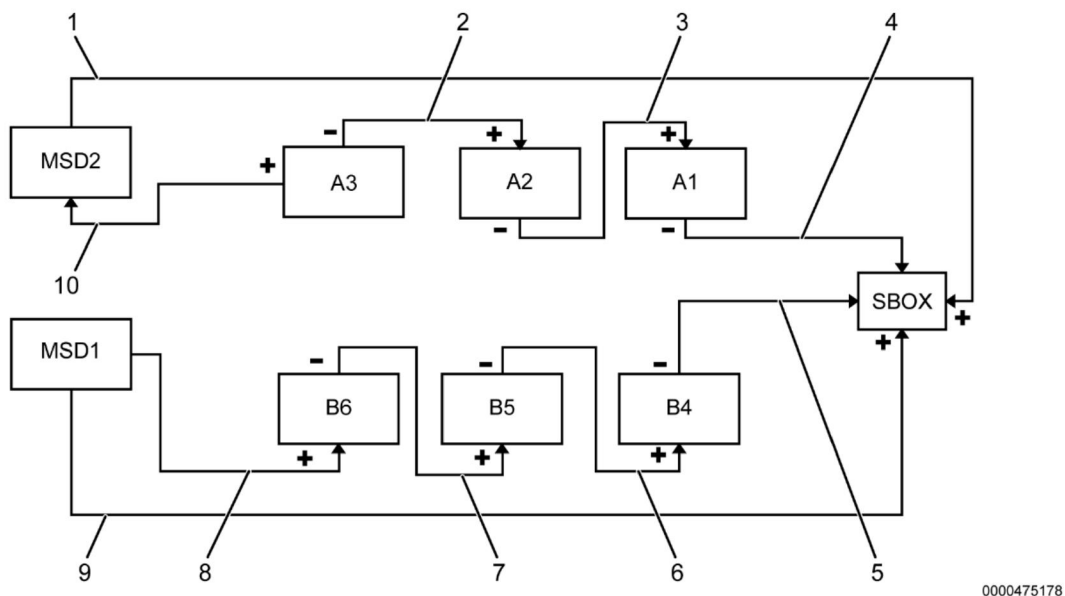


Figure 10. 2-String Short Wheelbase High-Voltage Cable Routing

1. 4302308C92 Cable, High-Voltage Battery A3 MSD2 OUT to S-box +
2. 4264406C92 Cable, 1 String Battery A3- to Battery A2+
3. 4282817C92 Cable, 1 String Battery A2- to Battery A1+
4. 4270132C92 Cable, 1 String Battery A1- to S-box -
5. 4270128C92 Cable, 2 String Battery B4- to S-box-
6. 4214255C92 Cable, 2 String Battery B5- to Battery B4+
7. 4214217C92 Cable, High-Voltage Battery B6 MSD 1 OUT to S-box+
8. 4302305C91 Cable, High-Voltage Battery B6+ to MSD 1+
9. 4306655C92 Cable, High-Voltage Battery B6 MSD 1 OUT to S-box+
10. 4302307C92 Cable, High-Voltage Battery A3 to MSD 2+ IN

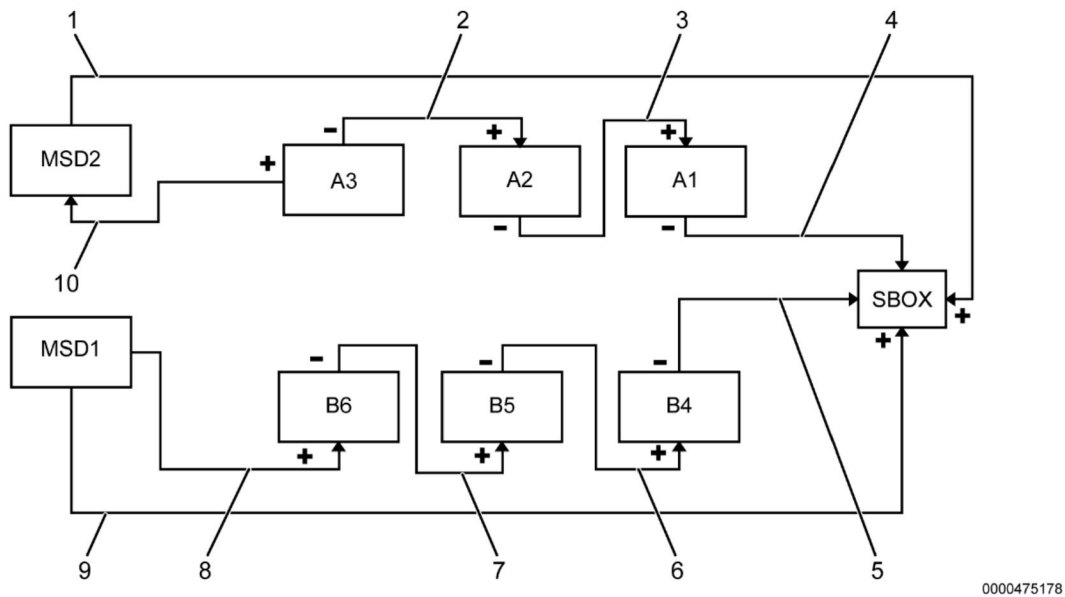


Figure 11. 2-String Long Wheelbase High-Voltage Cable Routing

1. 4304601C91 Cable, High-Voltage Battery A3 MSD 2 OUT to S-box
2. 4264406C92 Cable, 1 String Battery A3- to Battery A2+
3. 4264407C92 Cable, 1 String Battery A2- to Battery A1+
4. 4282650C91 Cable, 1 String Battery A1- to S-box-
5. 4264412C91 Cable, 2 String Battery B4- to S-box-
6. 4214255C92 Cable, 2 String Battery B5- to Battery B4+
7. 4214217C92 Cable, 2 String Battery B6- to Battery B5+
8. 4302305C91 Cable, High-Voltage Battery B6+ to MSD 1+
9. 4304597C91 Cable, High-Voltage Battery B6 MSD 1 OUT to S-box
10. 4302307C92 Cable, High-Voltage Battery A3+ to MSD 2+ IN

46. Connect positive high-voltage cables at battery pack and S-box.
47. Connect negative high-voltage cables at battery pack and S-box.
48. Install battery fuses for each battery pack.
49. Install front and rear MSD.
50. Lower vehicle.
51. Using KL5007NAV Coolant Management Tool with 09-040-03 Cooling System Adapter, refill high-voltage battery coolant system. Refer to technician manual for detailed instructions.

52. Close and latch hood.
53. Turn ON 12V and high-voltage disconnect switches. Inspect replacement cable connections. Inspect high-voltage battery coolant system for leaks.
54. Remove wheel chocks.

LABOR INFORMATION

Operation number must appear on all claims.

Operation Number	Description	Time
A40-22123-01	Replace High-Voltage Cables; Including Coolant Drain / Fill, and Lift Set Up	5.6 hrs
A40-22123-02	R&R Battery Stack; Single Stack, Including BTMS	3.4 hrs
A40-22123-03	R&R Battery Stack; Two or Three Stack, Incl BTMS	6.7 hrs
A40-22123-04	High-Voltage Isolation Level 3 / Zone 3	1.3 hrs

Table 5 Labor Information

WARRANTY CLAIMS

Warranty claim expense is to be charged to Warranty. Claims are to be submitted in the normal manner, making reference to Field Service Campaign 22123.

Section 7 of the Warranty Policy and Procedures Manual contains further information related to the submission and processing of AFC / Recall claims.

As with all claim submissions, items acquired locally must be submitted in the “Other Charges” tab. The cost of any bulk items (such as a bag of cable tie straps, roll of wire, barrel of oil, or tube of silicone) should be prorated for the cost of the individual pieces / amount used during each repair.

To make sure this important improvement is made in a timely manner, all claims for 22123 activity must be submitted by 10 November 2023 or within the normal warranty period for the component repaired, if after 10 November 2023.

GROUP	NOUN	C	WARR.	TP	PAD

GROUP — Enter number

NOUN — Leave blank

C (CAUSE) — Enter either 1, 2, 3. (See below)

1. Inspected (No repair required).
2. Inspected and repaired.
3. Defective part from parts stock.

WARRANTY — (Warranty Code) Enter 40.

TYPE PART — Enter P for type part causing failure.

PAD — Enter 100

0000047910