

February 2022
FL893A-G
NHTSA #21V-481
Transport Canada #2021-399

Subject: Aluminum Battery Cable Failure

Models Affected: Specific model years 2019-2022 Freightliner Cascadia vehicles; and Western Star 47X RHD, 48X RHD, and 49X vehicles manufactured April 28, 2018, through June 11, 2021.

General Information

Daimler Trucks North America LLC (DTNA), on behalf of its Freightliner Trucks Division, and its wholly owned subsidiary, Western Star Truck Sales, Inc., has decided that a defect that relates to motor vehicle safety exists on the vehicles mentioned above.

On certain vehicles, the battery cable terminal at the frame connecting point may break, resulting in the loss of electrical power and unintended engine shutdown without warning, increasing the risk of crash.

The affected battery cables will be replaced with copper battery cables.

There are approximately 141,000 vehicles involved in this campaign.

Additional Repairs

Dealers must complete all outstanding Recall and Field Service campaigns prior to the sale or delivery of a vehicle. A Dealer will be liable for any progressive damage that results from its failure to complete campaigns before sale or delivery of a vehicle.

Owners may be liable for any progressive damage that results from failure to complete campaigns within a reasonable time after receiving notification.

Work Instructions

Please refer to the attached work instructions. Prior to performing the campaign, check the vehicle for a completion sticker (Form WAR260).

Replacement Parts

Replacement parts are now available and can be obtained by ordering the kit and/or part number(s) listed below from your facing Parts Distribution Center.

If our records show your dealership has ordered any vehicle(s) involved in campaign number FL893, a list of the customers and vehicle identification numbers will be available on DTNAConnect. Please refer to this list when ordering parts for this recall.

Battery Cable Part Number Lookup Instructions (FL893A, B, C, F):The part numbers of the aluminum cables, that need to be replaced, can be identified using the PartsPro application. Follow the steps below to identify the VIN specific aluminum cable part number(s), and refer to [Table 2](#) in order to identify the correct copper cable(s) to be installed on each vehicle.

- Open PartsPro using your DTNAConnect credentials.

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- Enter the last 6 digits (serial number) of the vehicle identification number (VIN), then select the 'GO' button. See [Fig. 1](#).



Fig. 1, Entering Serial Number in PartsPro

- The 'Design Groups' page will be displayed. Locate the 'Search' button on the upper right side of the tool bar, then select the button. See [Fig. 2](#).

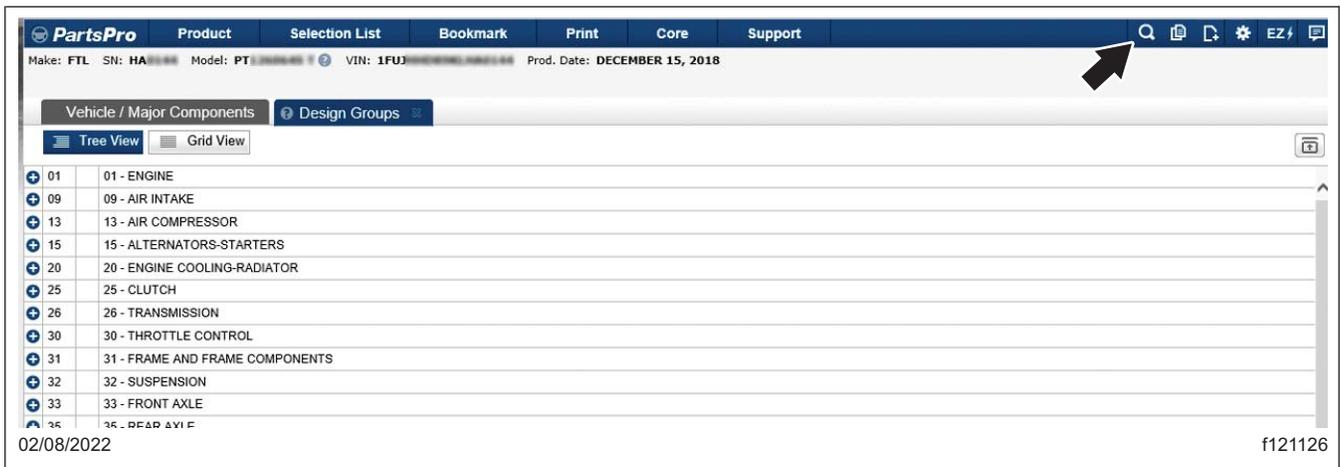


Fig. 2, Locating the Search Tool

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- The 'Search' window will be displayed. See **Fig. 3**. Select the 'Contains' radio button. Failure to select 'Contains' could result in non-consistent search results.

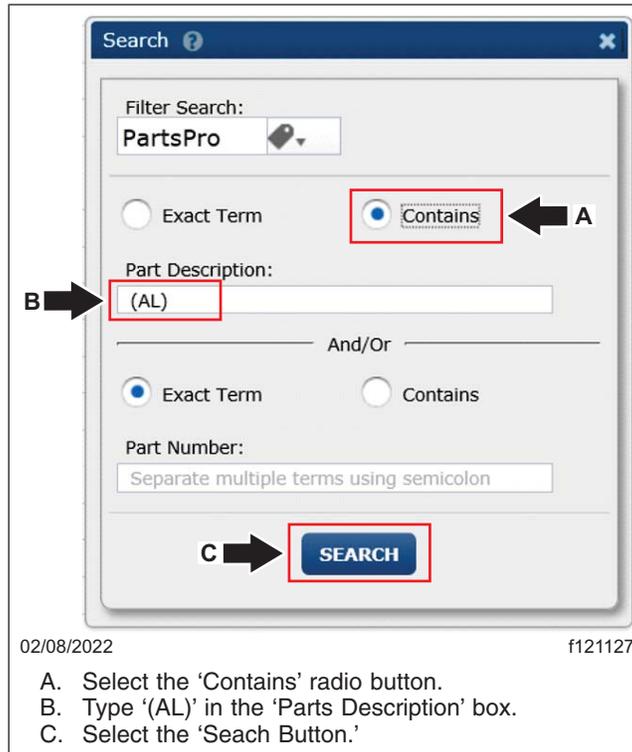


Fig. 3, Search Window

- Type '(AL)' in the 'Part Description:' box. Failure to type '(AL)' exactly could result in non-consistent search results. See **Fig. 3**.

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- Press the 'SEARCH' button. If multiple aluminum cable part numbers found, the results will be displayed in the 'Search Results' tab; see Fig. 4. If only one aluminum cable part number is found, PartsPro will open the parts list for the applicable bill of material (BOM), and highlight the aluminum cable part number for easy reference; see Fig. 5. Note the cable part number(s) being displayed.

Part Number	Part Description	Bill of Material	BOM Description	Subgroup#	Group# - Description
A66 19643-088	CABLE-POS (AL),4/0,	291-C44740	CABLE-BATTERY,POWER GROUND	291	54A - ELECTRICAL,CHASSIS
A66 19638-112	CABLE-POS (AL),4/0,	29A-C44796	POWER HARNESS-BATTERY	29A	54A - ELECTRICAL,CHASSIS
A66 19639-072	CABLE-NEG (AL),4/0,	49W-C86325	CABLE-CABIN, NEGATIVE	49W	54A - ELECTRICAL,CHASSIS
A66 11631-040	CABLE-NEG (AL),4/0,	49Y-C86401	CABLE-BATTERY,STARTER NEG	49Y	54A - ELECTRICAL,CHASSIS

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A. Note the part numbers listed in the 'Search Results' tab.

Fig. 4, Multiple Part Numbers Displayed in the Search Results Tab

Ref	SL	AD	Description	Part Number	QTY	UM	Alt Part Number
001			CABLE-POS (AL),4/0,	A66 19643-088	1	EA	
002			CABLE-POS,2GA,M8XM8	A06 19643-088	1	EA	
			.TERM-LUG,M8,(312IN),2 AWG	23-19643-088	2	EA	
003			CABLE-POS,2GA,5/16X5/16 FLAG	A06 19643-088	1	EA	
			.TERM-LUG,M8,(312IN),2 AWG	23-19643-088	1	EA	
			.TERM-FLAG,0.313IN,1.5L,2-1GA	23-19643-088	1	EA	
004			CABLE-POS,2GA,5/16 X 5/16 FLAG	A66 19643-088	1	EA	
			.TERM-LUG,M8,(312IN),2 AWG	23-19643-088	1	EA	
			.TERM-FLAG,0.313IN,1.5L,2-1GA	23-19643-088	1	EA	
005			CABLE-NEG,1GA,5/16X5/16	A06 19643-088	1	EA	
			.TERM-LUG,5/16,ID 1GA	23-19643-088	2	EA	
006			CBL-NEG,2GA,M8 X M8FLAG	A06 19643-088	1	EA	
			.TERM-LUG,M8,(312IN),2 AWG	23-19643-088	1	EA	
			.TERM-FLAG,0.313IN,2.0L,2-1GA	23-19643-088	1	EA	
007			BRKT-BCA PWR CBL RTG	A06 19643-088	1	EA	
008			MGJB ASSY,MOLDED,M8,2/0CBL BLK	A66 19643-088	1	EA	
009			BRKT-MGJB,FPT	A66 19643-088	1	EA	
010			BRKT-Z,CABLE RTG	66-19643-088	1	EA	
011			BOLT-HEX,PC10.9,PO,M16X1.5X40	23-19643-088	2	EA	
012			NUT-HEX,LKG,XL,BLK,M16X1.5	23-19643-088	2	EA	
013			SCRW HEX FLNG,M8X1.25X25	23-19643-088	4	EA	
014			STUD,PASS-THRU,ELEC,M8X1.25,BK	23-19643-088	1	EA	
015			STRAP-TIE ANTI-VIB,M6.3,FIR TR	23-19643-088	1	EA	

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A. Note the part number highlighted in the 'Bill Of Material' tab.

Fig. 5, Part Number Highlighted in the Bill Of Material Tab

- After the part number(s) are identified, refer to Table 2 to determine the correct replacement copper cable(s) for each vehicle. Vehicles will have up to a maximum of four cables replaced, depending on the population group.

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IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

Table 1 - Replacement Parts for FL893

NOTE: See the cross-reference **Table 2** below to determine the copper cable(s) part number

Campaign Number	Part Description	Part Number	Qty. Per VIN
FL893A	Four copper cables, refer to Battery Cable Part Number Lookup Instructions above for part numbers	See instructions	4 ea
	CLAMP 0000 BATT CA	23-13454-001	6 - 12 ea
FL893B	Three copper cables, refer to Battery Cable Part Number Lookup Instructions above for part numbers	See instructions	3 ea
	CLAMP 0000 BATT CA	23-13454-001	9 - 17 ea
FL893C	Two copper cables, refer to Battery Cable Part Number Lookup Instructions above for part numbers	See instructions	2 ea
	CLAMP 0000 BATT CA	23-13454-001	0 - 8 ea
FL893D	CABLE-POS,4/0,3/8 X M8 2 HOLE,112"	A66-02837-112	1 ea
	CLAMP 0000 BATT CA	23-13454-001	8 ea
FL893E	CA-BAT,NEG,4/0,3/8-3/8	A06-34490-072	1 ea
	CLAMP 0000 BATT CA	23-13454-001	5 - 10 ea
FL893F	One copper cable, refer to Battery Cable Part Number Lookup Instructions above for part numbers	See instructions	1 ea
	CLAMP 0000 BATT CA	23-13454-001	0 - 5 ea
FL893G	CABLE-NEG,4/0,3/8X3/8 SHORT90	A06-91586-070	1 ea
FL893A,B,D	STUD-THREADED TIE MOUNT,0.625 (For Cascadia 116 ONLY)	23-13805-062	2 ea
FL893A-G	BLANK COMPLETION STICKER	WAR260	1 ea

Table 1

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Table 2 - Existing Aluminum (Al) Battery Cable Part Number to Replacement Copper (Cu) Battery Cable Part Number Cross-Reference

Existing Al Part Number	Replacement Cu Recall Part Number
A66-09638-106	A66-02837-106
A66-09638-108	A66-02837-108
A66-09638-112	A66-02837-112
A66-09638-114	A66-02837-114
A66-09638-126	A66-02837-126
A66-09638-128	A66-02837-128
A66-09638-132	A66-02837-132
A66-09638-154	A66-02837-154
A66-09639-072	A06-34490-072
A66-09639-114	A06-34490-114
A66-09640-080	A06-93715-080
A66-09640-084	A06-93715-084
A66-09640-088	A06-93715-088
A66-09640-092	A06-93715-092
A66-09640-096	A06-93715-096
A66-09640-130	A06-93715-130
A66-10443-068	A06-91586-068
A66-10443-070	A06-91586-070
A66-10443-076	A06-91586-076
A66-10444-084	A66-06414-084
A66-11631-036	A66-12313-036
A66-11631-040	A66-12313-040
A66-11631-044	A66-12313-044

Table 2

Existing Al Part Number	Replacement Cu Recall Part Number
A66-11631-048	A66-12313-048
A66-11631-052	A66-12313-052
A66-11631-056	A66-12313-056
A66-11631-060	A66-12313-060
A66-11631-064	A66-12313-064
A66-11631-068	A66-12313-068
A66-11631-072	A66-12313-072
A66-11631-082	A66-12313-084
A66-15575-108	A66-17600-108
A66-15575-110	A66-17600-110
A66-15575-112	A66-17600-112
A66-15575-116	A66-17600-116
A66-15575-124	A66-17600-124
A66-15575-128	A66-17600-128
A66-15575-130	A66-17600-130
A66-15575-132	A66-17600-132
A66-15575-136	A66-17600-136
A66-15575-138	A66-17600-138
A66-15611-080	A66-19605-080
A66-15611-084	A66-19605-084
A66-15611-088	A66-19605-088
A66-15611-096	A66-19605-096
A66-15611-100	A66-19605-100
A66-15611-104	A66-19605-104
A66-15611-108	A66-19605-108

Table 2

Removed Parts

U.S. and Canadian Dealers, please follow Warranty Failed Parts Tracking shipping instructions for the disposition of all removed parts. Export distributors, please destroy removed parts unless otherwise advised.

Labor Allowance

Table 3 - Labor Allowance

Campaign Number	Procedure	Time Allowed (hours)	SRT Code	Corrective Action
FL893A	Replace four aluminum battery cables with copper cables	2.8	996-R125A	12-Repair Recall/Campaign
FL893B	Replace three aluminum battery cables with copper cables	2.0	996-R125B	12-Repair Recall/Campaign
FL893C	Replace two aluminum battery cables with copper cables	1.8	996-R125C	12-Repair Recall/Campaign
FL893D,E	Replace one aluminum battery cable with a copper cable	1.2	996-R125E	12-Repair Recall/Campaign
FL893F,G	Replace one aluminum battery cable with a copper cable	1.0	996-R125F	12-Repair Recall/Campaign
FL893A-D	BCA spinning stud repair	0.8	996-R125D	12-Repair Recall/Campaign

Table 3

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IMPORTANT: When the Recall has been completed, locate the base completion label in the appropriate location on the vehicle, and attach the red completion sticker provided in the recall kit (Form WAR260). If the vehicle does not have a base completion label, clean a spot on the appropriate location of the vehicle and first attach the base completion label (Form WAR259). If a recall kit is not required or there is no completion sticker in the kit, write the recall number on a blank sticker and attach it to the base completion label.

Claims for Credit

You will be reimbursed for your parts, labor, and handling (landed cost for Export Distributors) by submitting your claim through the Warranty system within 30 days of completing this campaign. Please reference the following information in OWL:

- Claim type is **Recall Campaign**.
- In the Campaign field, enter the campaign number and appropriate condition code (e.g. **FL-893-A, FL893-B, etc.**).
- In the Primary Failed Part Number field, enter **25-FL893-000**.
- In the Parts field, enter the appropriate kit or part number(s) as shown in the Replacement Parts Table.
- In the Labor field, first enter the appropriate SRT from the Labor Allowance Table. Administrative time will be included automatically as SRT 939-6010A for 0.3 hours.
- The VMRS Component Code is **F99-999-005** and the Cause Code is **A1 - Campaign**.
- **U.S. and Canada -- Reimbursement for Prior Repairs.** When a customer asks about reimbursement, please do the following:
 - Accept the documentation of the previous repair.
 - Make a brief check of the customer's paperwork to see if the repair may be eligible for reimbursement. (See the "Copy of Owner Letter" section of this bulletin for reimbursement guidelines.)
 - Submit an OWL Recall Pre-Approval Request for a decision.
 - Include the approved amount on your claim in the Other Charges section.
 - Attach the documentation to the pre-approval request.
 - If approved, submit a based on claim for the pre-approval.
 - Reimburse the customer the appropriate amount.

IMPORTANT: OWL must be viewed prior to performing the recall to ensure the vehicle is involved and the campaign has not been previously completed. Also, check for a completion sticker prior to beginning work.

U.S. and Canadian dealers, contact the Warranty Campaigns Department via Web inquiry at DTNACONNECT.com/WSC, if you have any questions or need additional information. Export distributors, submit a Web inquiry or contact your International Service Manager.

U.S. and Canadian Dealers: To return excess kit inventory related to this campaign, U.S. dealers must submit a Parts Authorization Return (PAR) to the Memphis PDC. Canadian dealers must submit a PAR to their facing PDC. All kits must be in resalable condition. PAR requests must include the original purchase invoice number. Export Distributors: Excess inventory is not returnable.

The letter notifying U.S. and Canadian vehicle owners is included for your reference.

Please note that the National Traffic and Motor Vehicle Safety Act, as amended (Title 49, United States Code, Chapter 301), requires the owner's vehicle(s) be corrected within a reasonable time after parts are available to you. The Act states that failure to repair a vehicle within 60 days after tender for repair shall be prima facie evidence of an unreasonable time. However, circumstances of a particular situation may reduce the 60 day period. Failure to repair a vehicle within a reasonable time can result in either the obligation to (a) replace the vehicle with an identical or reasonably equivalent vehicle, without charge, or (b) refund the purchase price in

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full, less a reasonable allowance for depreciation. The Act further prohibits dealers from selling a vehicle unless all outstanding recalls are performed. Any lessor is required to send a copy of the recall notification to the lessee within 10 days. Any subsequent stage manufacturer is required to forward this notice to its distributors and retail outlets within five working days.

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Copy of Notice to Owners

Subject: Aluminum Battery Cable Failure

For the Notice to U.S. Customers: This notice is sent to you in accordance with the National Traffic and Motor Vehicle Safety Act. **For the Notice to Canadian Customers:** This notice is sent to you in accordance with the requirements of the Motor Vehicle Safety Act. This is to inform you that your vehicle may contain a defect that could affect the safety of a person.

Daimler Trucks North America LLC (DTNA), on behalf of its Freightliner Trucks Division, and its wholly owned subsidiary, Western Star Truck Sales, Inc., has decided that a defect that relates to motor vehicle safety exists on specific model years 2019-2022 Freightliner Cascadia vehicles; and Western Star 47X RHD, 48X RHD, and 49X vehicles manufactured April 28, 2018, through June 11, 2021.

On certain vehicles, the battery cable terminal at the frame connecting point may break, resulting in the loss of electrical power and unintended engine shutdown without warning, increasing the risk of crash.

The affected battery cables will be replaced with copper battery cables. Repairs will be performed by Daimler Trucks North America authorized service facilities.

Please contact an authorized Daimler Trucks North America dealer to arrange to have the Recall performed and to ensure that parts are available at the dealership. To locate an authorized dealer, go to Daimler-TrucksNorthAmerica.com/contact-us/. Scroll down to "Locate a Dealer," and select the appropriate brand. The Recall will take approximately two to three hours and will be performed at no charge to you. You may also confirm your vehicle's involvement in this recall at this URL: <https://dtna-dlrinfo.prd.freightliner.com:48518/VinLookup/vin-module/getVinLookupPage>.

You may be liable for any progressive damage that results from your failure to complete the Recall within a reasonable time after receiving notification.

If you do not own the vehicle that corresponds to the identification number(s) which appear on the Recall Notification, please return the notification to the Warranty Campaigns Department with any information you can furnish that will assist us in locating the present owner. If you have leased this vehicle, Federal law requires that you forward this notice to the lessee within 10 days. If you are a subsequent stage manufacturer, Federal law requires that you forward this notice to your distributors and retail outlets within five working days. If you have paid to have this recall condition corrected prior to this notice, you may be eligible to receive reimbursement. Please see the reverse side of this notice for details.

If you have questions about this Recall, please contact the Warranty Campaigns Department at (800) 547-0712, 7:00 a.m. to 4:00 p.m. Pacific Time, Monday through Friday, e-mail address DTNA.Warranty.Campaigns@Daimlertruck.com. **For the Notice to U.S. Customers:** If you are not able to have the defect remedied without charge and within a reasonable time, you may wish to submit a complaint to the Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590; or call the Vehicle Safety Hotline at (888) 327-4236 (TTY: 800-424-9153); or to <http://www.safercar.gov>. **For the Notice to Canadian Customers:** If you wish to submit a complaint about this recall, you can contact Transport Canada roads safety, 80 rue Noel, Gatineau, Quebec J8Z0A1 or call (800) 333-0510.

We regret any inconvenience this action may cause but feel certain you understand our interest in motor vehicle safety.

WARRANTY CAMPAIGNS DEPARTMENT

Enclosure

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Reimbursement to Customers for Repairs Performed Prior to Recall

If you have already **paid** to have this recall condition corrected you may be eligible to receive reimbursement.

Requests for reimbursement may include parts and labor. Reimbursement may be limited to the amount the repair would have cost if completed by an authorized Daimler Trucks North America LLC dealer. The following documentation must be presented to your dealer for consideration for reimbursement.

Please provide original or clear copies of all receipts, invoices, and repair orders that show:

- The name and address of the person who paid for the repair
- The Vehicle Identification Number (VIN) of the vehicle that was repaired
- What problem occurred, what repair was done, when the repair was done
- Who repaired the vehicle
- The total cost of the repair expense that is being claimed
- Proof of payment for the repair (such as the front and back of a cancelled check or a credit card receipt)

Reimbursement will be made by check from your Daimler Trucks North America LLC dealer.

Please speak with your Daimler Trucks North America LLC authorized dealer concerning this matter.

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Work Instructions

Subject: Aluminum Battery Cable Replacement

Models Affected: Specific model years 2019-2022 Freightliner Cascadia vehicles; and Western Star 47X RHD, 48X RHD, and 49X vehicles manufactured April 28, 2018, through June 11, 2021.

NOTE: Up to four of the main powernet battery cables, made of aluminum, will be replaced with cables made of copper. The four cables that may need to be replaced are:

- Positive 4/0 cable routed from batteries to starter.
- Positive 4/0 cable routed from batteries to battery cable access (BCA).
- Negative 4/0 cable routed from batteries to flywheel housing.
- Negative 4/0 cable routed from batteries to mega ground junction block (MGJB).

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

See [Table 4](#) for campaign group procedure page numbers.

Campaign Group	Battery Cables Replaced	Page Number
FL893A	4	11
FL893B	3	18
FL893C	2	22
FL893D	1	25
FL893E	1	29
FL893F	1	32
FL893G	1	34
FL893A-G, Spinning Stud Repair	BCA Spinning Stud	36

Table 4, Campaign Group Procedure Page Numbers

FL893A - Replace Four Aluminum Cables

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.

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3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, also remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 6](#).



Fig. 6, Negative Battery Cable Connection at the Battery Post

4. Inspect each of the four main powernet battery cables to identify those made of aluminum. Aluminum cables can be identified as follows:
 - The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 7](#).

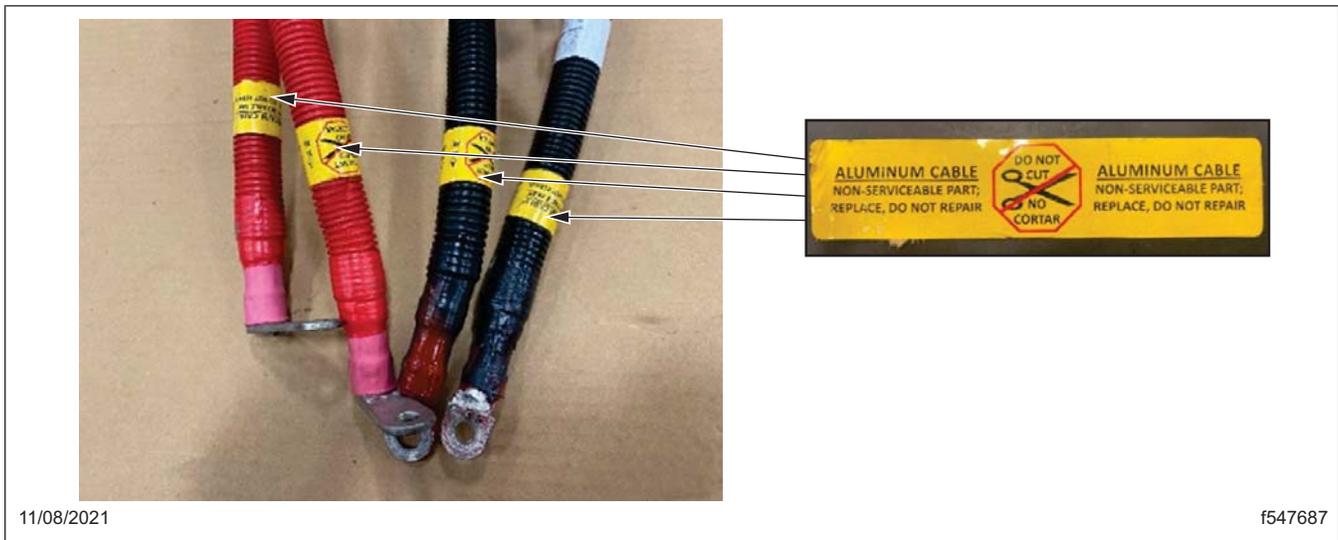


Fig. 7, Powernet Battery Cables Made of Aluminum

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IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
5. Remove the two nuts that attach the two positive aluminum battery cables to the positive battery jumper cable, then disconnect the two positive aluminum battery cables from the positive battery jumper cable. See [Fig. 8](#).

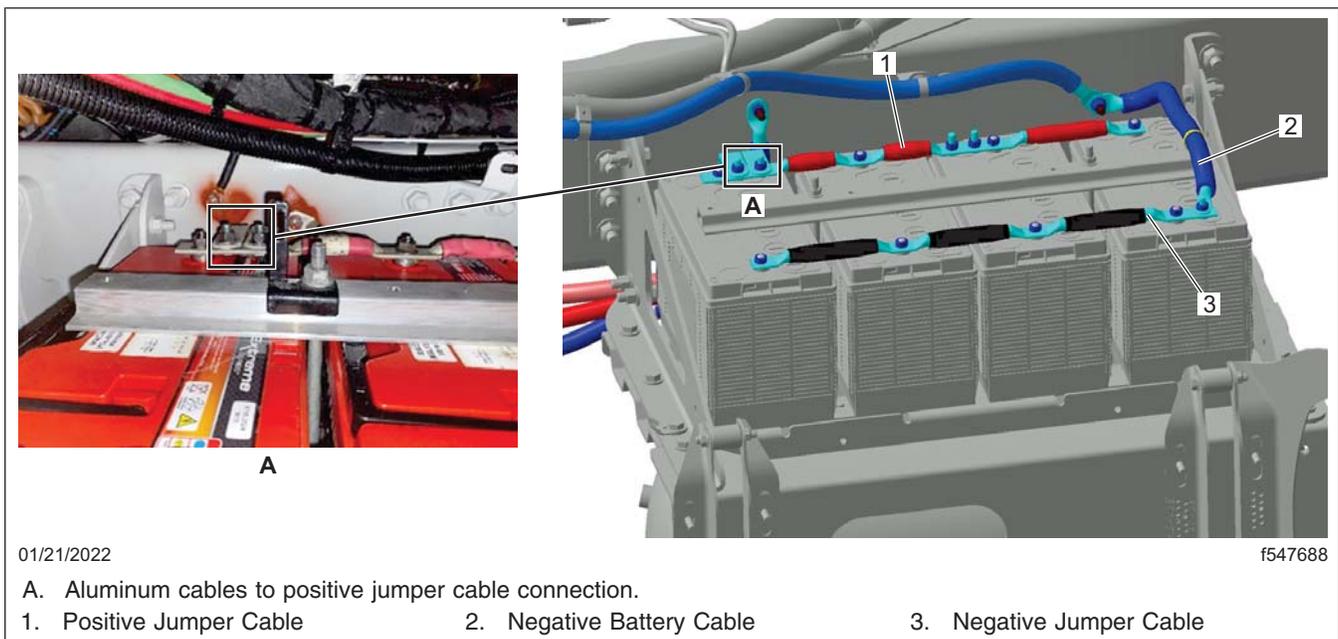


Fig. 8, Aluminum Cables to Positive Jumper Connection

6. Remove the two nuts, then disconnect the two negative aluminum battery cables from the ground studs on the frame rail near the batteries.

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IMPORTANT: Care must be taken to prevent the BCA studs from spinning within the BCA case, during the removal of nuts securing the battery cable. Do not use power tools when removing the nuts from the BCA studs. Hold the ends of the studs in the non-threaded area with vise grip pliers, or a similar tool, to avoid the stud from spinning within the BCA case during removal. Use a hand wrench to remove the nuts from BCA. If any of the BCA studs still spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36.

7. While holding the non-threaded tip of the BCA main power exterior stud with vise grip pliers, carefully remove the two nuts from the BCA studs using a hand wrench, then disconnect the positive aluminum battery connection at the BCA. See **Fig. 9** and **Fig. 10**. If any of the BCA studs spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36.

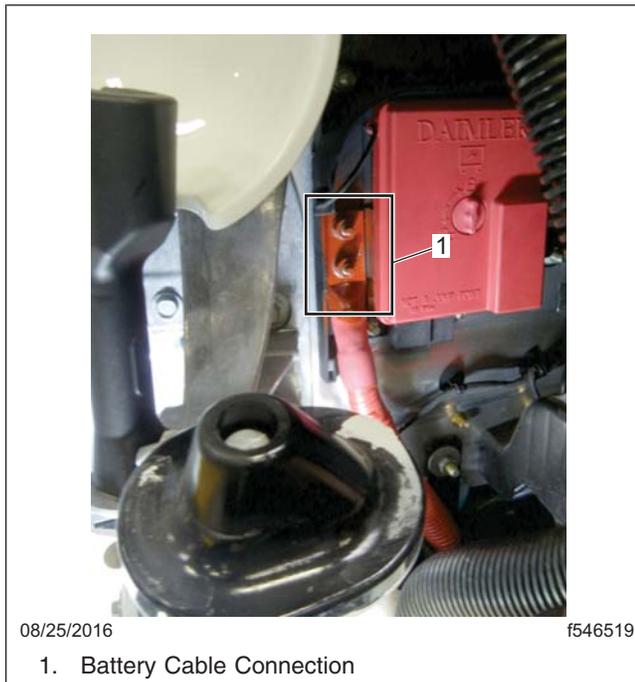


Fig. 9, BCA Battery Cable (Engine-Side Frontwall)

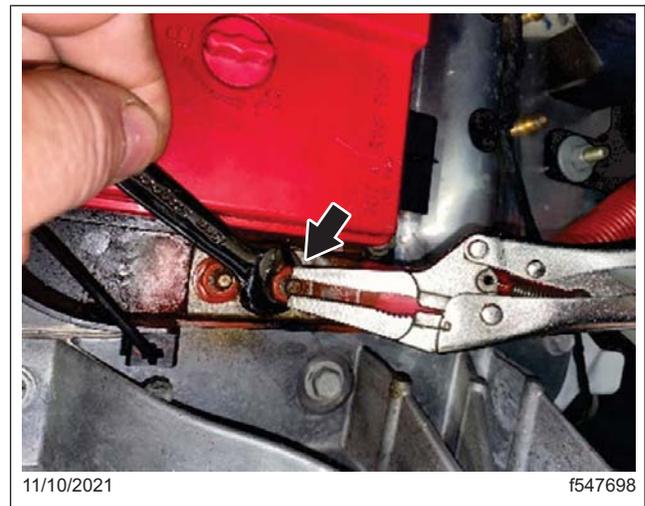


Fig. 10, Holding the BCA Stud

8. Remove the nut that attaches the positive aluminum battery cable to the positive terminal of the starter, then disconnect the positive aluminum battery cable from the starter.

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9. Remove the negative aluminum battery cable bolt at the flywheel housing, then disconnect the negative aluminum battery cable. See **Fig. 11**.

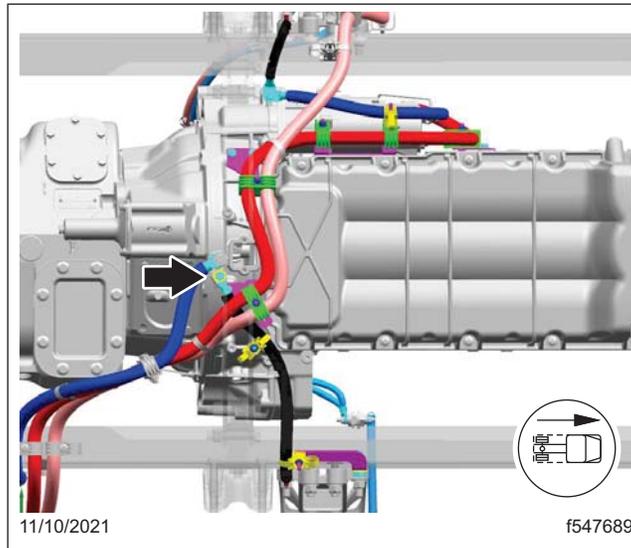


Fig. 11, Aluminum Battery Cable Bolt at the Flywheel Housing

10. Remove the bolt that attaches the negative aluminum battery cable to the mega ground junction block (MGJB), then disconnect the negative aluminum battery cable from the MGJB. See **Fig. 12**.



Fig. 12, Bolt at the MGJB

11. Remove the left-hand side cab-mounted splash shield as follows:
- 11.1 Open the hood.
 - 11.2 From underneath the splash shield, remove the screw that attaches the splash shield to the frontwall mounting bracket.
 - 11.3 From underneath the splash shield, remove the four nuts at the backing plates.

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IMPORTANT: Use care to avoid damaging the rocker panel on the lower edge of the cab side when removing the splash shield.

11.4 Remove the splash shield by pulling it forward until it clears the rocker panel, then pull it to the side.

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
- Routed the same way as the original cables,
- Using the same clipping points as the original battery cables.

12. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cables.

13. Remove all four aluminum battery cables from the vehicle.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

14. Install the new copper battery cable of the same length as that of the respective aluminum cable removed. Follow the routing of the original aluminum cables, then secure each cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm).

15. **For Cascadia 116 vehicles only:**

NOTE: The positive 4/0 cable from the batteries to BCA routing, near the right side cab mount frame bracket, needs to be secured to the exposed thread portion of the two right side cab mount frame bracket bolts using push-on tie mounts (23-13805-062). Only the two center upper bolts on the right side cab mount frame bracket can be used.

Some Cascadia 116 vehicles may already utilize the two push-on tie mounts, which can be used again, but only with the new tie straps (23-13476-000).

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- 15.1 Install the two push-on tie mounts (23-13805-062) on the exposed thread portion of the two right side cab mount frame bracket bolts. See **Fig. 13**.
- 15.2 Secure the new copper positive 4/0 cable to the push-on tie mount using tie straps (23-13476-000). See **Fig. 14**.

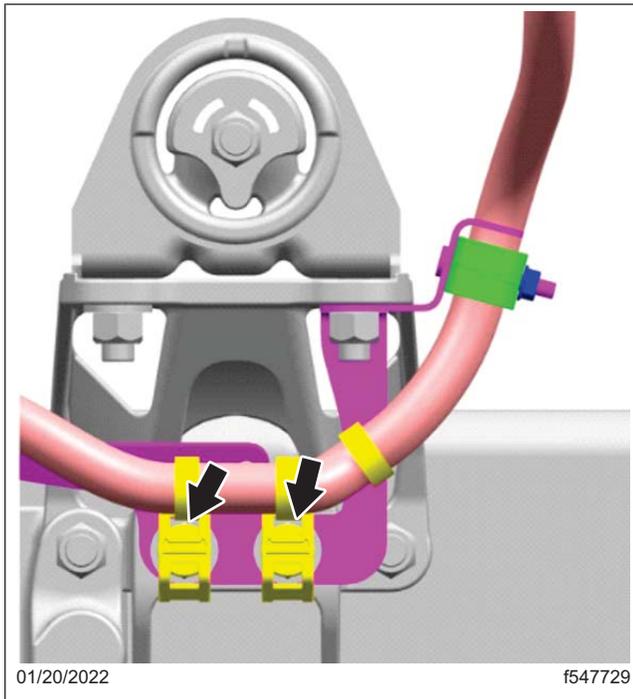


Fig. 13, Push-On Tie Mounts Installed

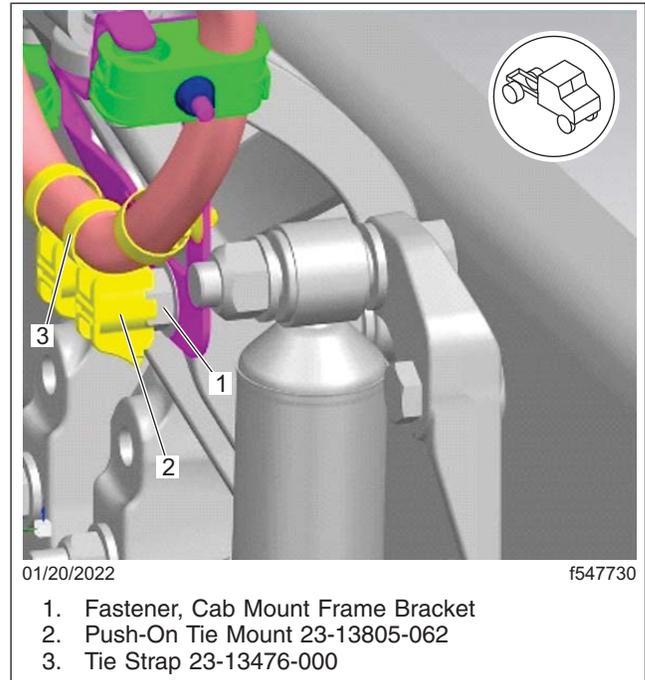


Fig. 14, Copper Cable Secured

16. Position the 29A battery cable on the BCA battery studs. Use two new stainless steel nuts (23-12612-008), apply a drop of LOCTITE® Blue 242 to the area of the studs where the tightened nuts will overlap. Install the washers and the new nuts. Hold the end of each stud with vise grip pliers, then tighten each nut with a 13 mm box end wrench to secure the newly installed copper cable to the BCA. Tighten the nuts 10 to 12 lbf·ft (14 to 16 N·m).
17. Connect each end of the new copper cables to the appropriate component using the original fasteners, then tighten the fasteners per the torque values listed in **Table 5**.

Fastener	Torque Value lbf·ft (N·m)
Positive cable at the starter main terminal	18 to 20 (24 to 27)
Positive cable at the BCA main input studs (use new stainless steel nuts)	10 to 12 (14 to 16)
Positive cables at the battery posts	10 to 15 (14 to 20)
Negative cable at the flywheel housing	59 (80)
Negative cable at the MGJB	14 (18)
Negative cables at the frame rail studs	14 (18)
DK cable clamp nuts	11 (15)

Table 5, Torque Values, Copper Cable Connections

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18. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
19. Install the left-hand side cab-mounted splash shield as follows:
 - 19.1 Position the splash shield so that the cab studs align with the splash shield holes. Install the two backing plates and the four nuts on the studs. Tighten the nuts 15 lbf-ft (20 N·m).
 - 19.2 Install the screw that attaches the splash shield to the frontwall mounting bracket.
20. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s).
21. Close the hood.
22. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

FL893B - Replace Three Aluminum Cables

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.
3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 15](#).



Fig. 15, Negative Battery Cable Connection at the Battery Post

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4. Inspect each of the four main powernet battery cables to identify those made of aluminum. Aluminum cables can be identified as follows.
- The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 16](#).



Fig. 16, Powernet Battery Cables Made of Aluminum

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
- Routed the same way as the original cables,
- Using the same clipping points as the original battery cables.

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5. Remove the two nuts that attach the two positive aluminum battery cables to the positive battery jumper cable, then disconnect the positive aluminum battery cables from the positive battery jumper cable. See [Fig. 17](#).

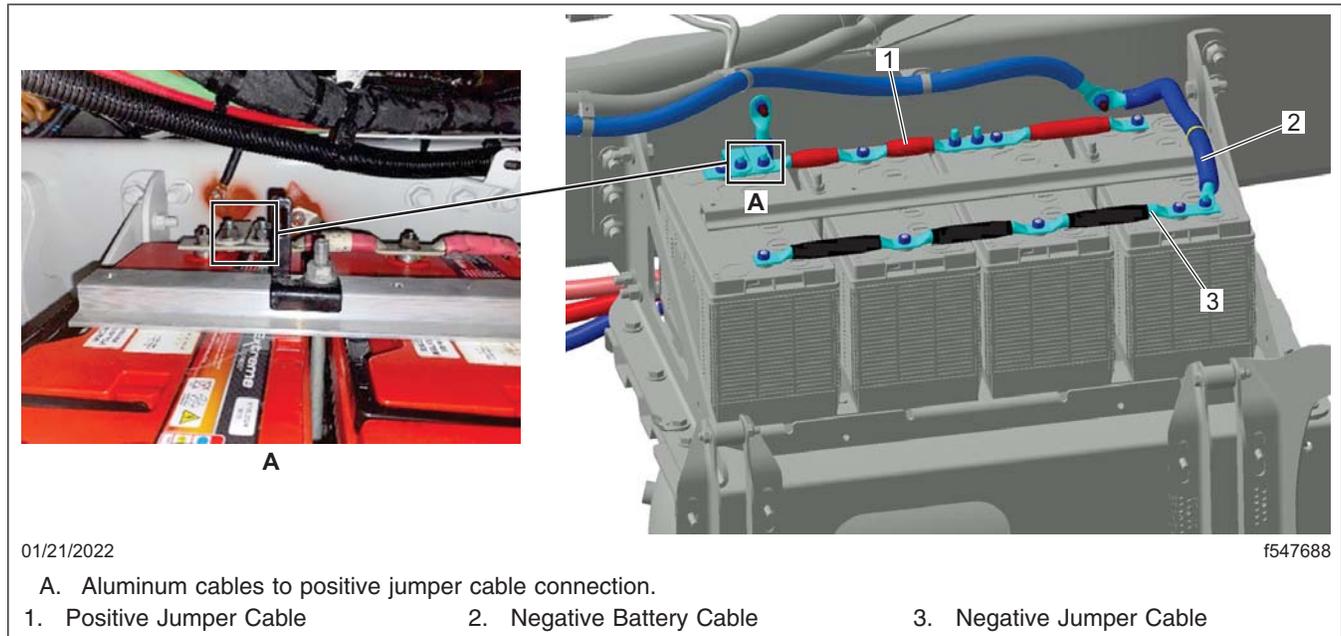


Fig. 17, Aluminum Cables to Positive Jumper Connection

6. Remove the nut that attaches the negative aluminum battery cable to the ground stud, on the frame rail near the batteries, then disconnect the negative aluminum battery cable from the ground stud.

IMPORTANT: Care must be taken to prevent the BCA studs from spinning within the BCA case, during the removal of nuts securing the battery cable. Do not use power tools when removing the nuts from the BCA studs. Hold the ends of the studs in the non-threaded area with vise grip pliers, or a similar tool, to avoid the stud from spinning within the BCA case during removal. Use a hand wrench to remove the nuts from the BCA. If any of the BCA studs still spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36.

7. While holding the non-threaded tip of the BCA main power exterior stud with vise grip pliers, carefully remove the two nuts from the BCA studs using a hand wrench, then disconnect the positive aluminum battery connection at the BCA. If any of the BCA studs spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36.
8. Remove the nut that attaches the positive aluminum battery to the positive terminal of the starter, then disconnect the positive aluminum battery connection at the starter.
9. Remove the bolt at flywheel housing and disconnect the negative aluminum battery cable.

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
10. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cables.

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11. Remove all three aluminum battery cables from the vehicle.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

12. Install the new copper battery cable of the same length as that of the respective aluminum cable removed. Follow the routing of the original aluminum cables, then secure each cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm).

13. **For Cascadia 116 vehicles only:**

NOTE: The positive 4/0 cable from the batteries to BCA routing, near the right side cab mount frame bracket, needs to be secured to the exposed thread portion of the two right side cab mount frame bracket bolts using push-on tie mounts (23-13805-062). Only the two center upper bolts on the right side cab mount frame bracket can be used.

Some Cascadia 116 vehicles may already utilize the two push-on tie mounts, which can be used again, but only with the new tie straps (23-13476-000).

13.1 Install the two push-on tie mounts (23-13805-062) on the exposed thread portion of the two right side cab mount frame bracket bolts. See [Fig. 18](#).

13.2 Secure the new copper positive 4/0 cable to the push-on tie mount using tie straps (23-13476-000). See [Fig. 19](#).

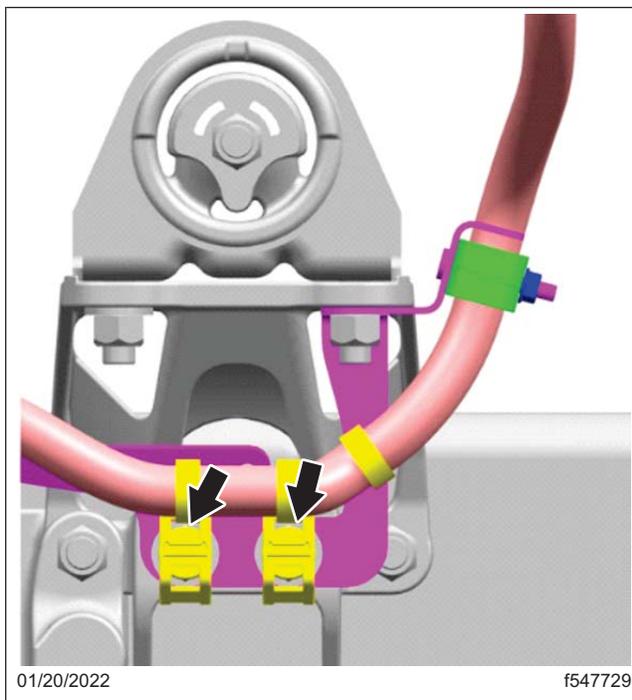


Fig. 18, Push-On Tie Mounts Installed

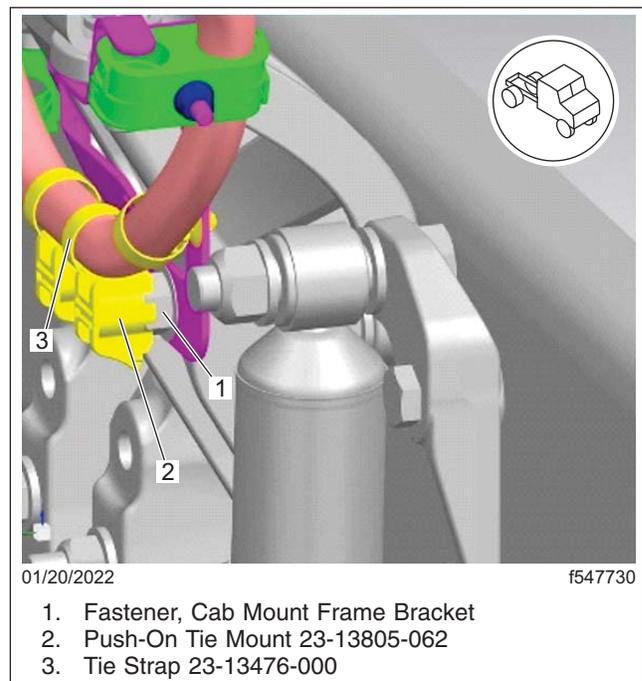


Fig. 19, Copper Cable Secured

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14. Position the 29A battery cable on the BCA battery studs. Use two new stainless steel nuts (23-12612-008), apply a drop of LOCTITE® Blue 242 to the area of the studs where the tightened nuts will overlap. Install the washers and the new nuts. Hold the end of each stud with vise grip pliers, then tighten each nut with a 13 mm box end wrench to secure the newly installed copper cable to the BCA. Tighten the nuts 10 to 12 lbf-ft (14 to 16 N·m).
15. Connect each end of the new copper cables to the appropriate component using the original fasteners, then tighten the fasteners per the torque values listed in [Table 6](#).

Fastener	Torque Value lbf-ft (N·m)
Positive cable at the starter main terminal	18 to 20 (24 to 27)
Positive cable at the BCA main input studs (use new stainless steel nuts)	10 to 12 (14 to 16)
Positive cables at the battery posts	10 to 15 (14 to 20)
Negative cable at the flywheel housing	59 (80)
Negative cables at the frame rail studs	14 (18)
DK cable clamp nuts	11 (15)

Table 6, Torque Values, Copper Cable Connections

16. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
17. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s).
18. Close the hood.
19. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

FL893C - Right-Hand Drive (RHD), Replace Two Aluminum Cables

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.

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3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 20](#).



Fig. 20, Negative Battery Cable Connection at the Battery Post

4. Inspect each of the four main powernet battery cables to identify those made of aluminum. Aluminum cables can be identified as follows.
 - The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 21](#).

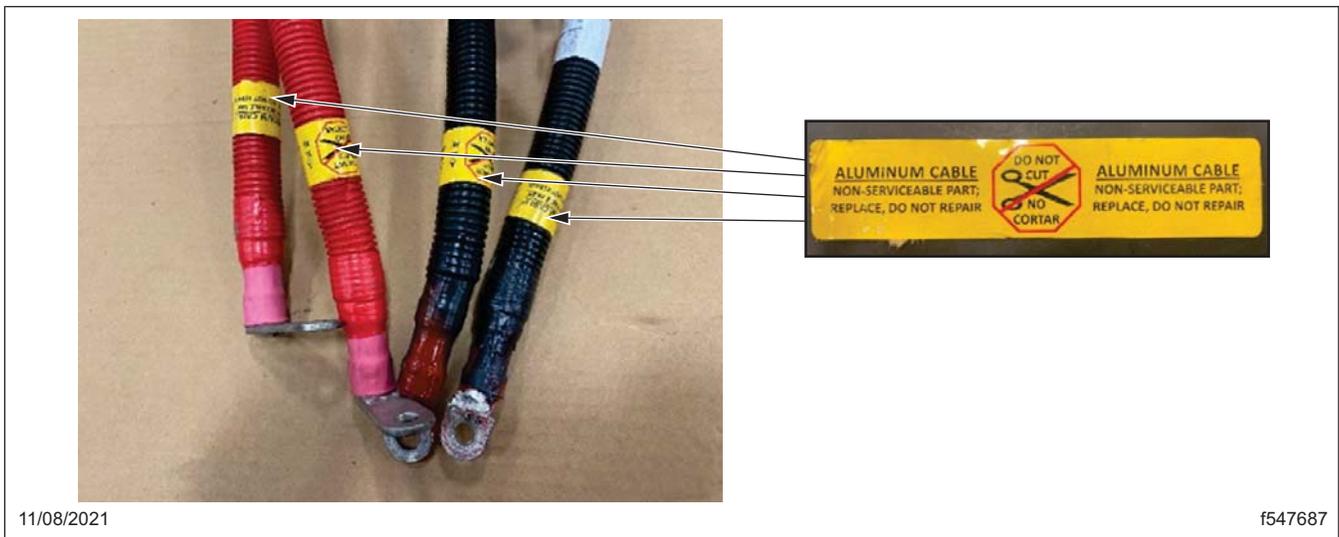


Fig. 21, Powernet Battery Cables Made of Aluminum

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IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
5. Remove the nut that attaches the positive starter aluminum battery cable to the positive battery jumper cable, then disconnect the positive starter aluminum battery cable from the positive battery jumper cable.
 6. Remove the nut that attaches the negative aluminum battery cable to the ground stud, on the frame rail near the batteries, then disconnect the negative aluminum battery cable from the ground stud. This cable routes to the flywheel housing ground.
 7. Remove the nut that attaches the positive aluminum battery connection to the positive terminal of the starter, then disconnect the positive aluminum battery connection from the starter.
 8. Remove the bolt that attaches the negative aluminum battery cable to the flywheel housing, then disconnect the negative aluminum battery cable from the flywheel housing.

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
9. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cables.
 10. Remove the two aluminum starter battery cables from the vehicle.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

11. Install the new copper battery cable of the same length as that of the respective aluminum cable removed. Follow the routing of the original aluminum cables, then secure each cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm).

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12. Connect each end of the new copper cables to the appropriate component using the original fasteners, then tighten the fasteners per the torque values listed in [Table 7](#).

Fastener	Torque Value lbf·ft (N·m)
Positive cable at the starter main terminal	18 to 20 (24 to 27)
Positive cables at the battery posts	10 to 15 (14 to 20)
Negative cable at the flywheel housing	59 (80)
Negative cables at the frame rail studs	14 (18)
DK cable clamp nuts	11 (15)

Table 7, Torque Values, Copper Cable Connections

13. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
14. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s).
15. Close the hood.
16. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

FL893D - Replace One Aluminum Positive 4/0 Cable Routed from Batteries to Battery Cable Access (BCA)

NOTE: Vehicles that belong to FL893D require only **ONE** main powernet battery cable, made of aluminum, to be replaced with a cable made of copper. The cable needing to be replaced is the positive 4/0 cable routed from the batteries to the battery cable access (BCA). Aluminum cables have a larger outer diameter compared to the copper cables, and will have a label installed indicating it is an aluminum cable.

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.

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3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 22](#).



Fig. 22, Negative Battery Cable Connection at the Battery Post

4. Inspect the positive 4/0 cable routed from the batteries to the BCA to identify those made of aluminum. Aluminum cables can be identified as follows.
 - The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 23](#).

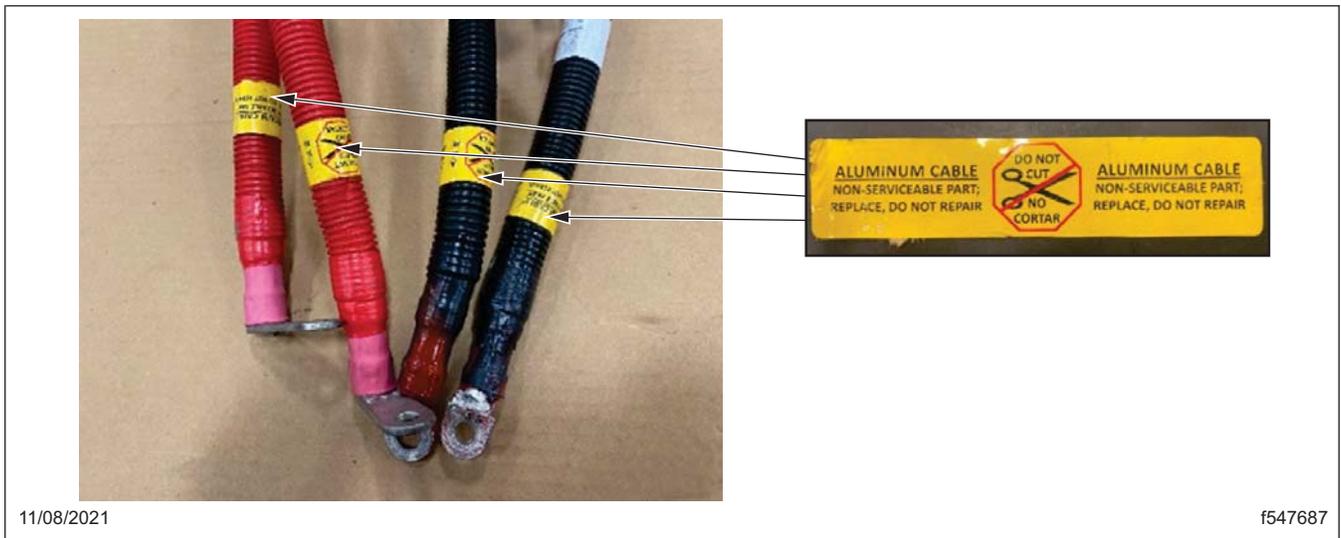


Fig. 23, Powernet Battery Cables Made of Aluminum

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IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
5. Remove the nut that attaches the BCA positive aluminum battery cable to the positive battery jumper cable connection at the batteries, then disconnect the BCA positive aluminum battery cable from the positive battery jumper cable.

IMPORTANT: Care must be taken to prevent the BCA studs from spinning within the BCA case, during the removal of nuts securing the battery cable. Do not use power tools when removing the nuts from the BCA studs. Hold the ends of the studs in the non-threaded area with vise grip pliers, or a similar tool, to avoid the stud from spinning within the BCA case during removal. Use a hand wrench to remove the nuts from BCA. If any of the BCA studs still spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36.

6. While holding the non-threaded tip of the BCA main power exterior stud with vise grip pliers, carefully remove the two nuts from the BCA studs using a hand wrench, then disconnect the positive aluminum battery connection at the BCA. If any of the BCA studs spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36. See [Fig. 24](#) and [Fig. 25](#).



Fig. 24, BCA Battery Cable (Engine-Side Frontwall)

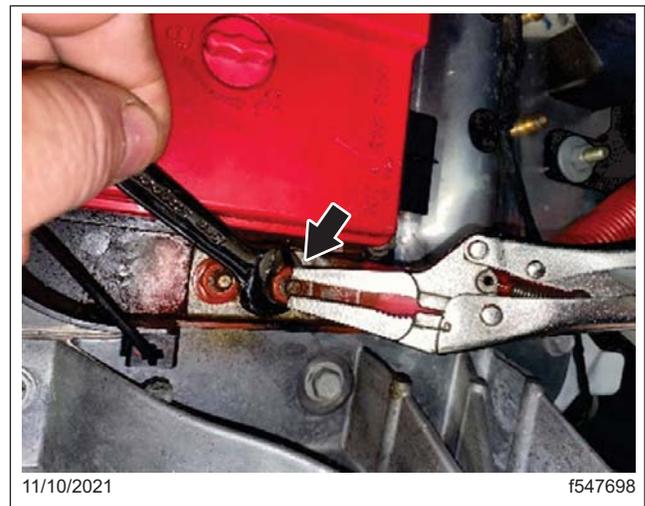


Fig. 25, Holding the BCA Stud

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7. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cable.
8. Remove the positive 4/0 cable, that is routed from the batteries to the BCA, from the vehicle.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

9. Install the new copper battery cable of the same length as that of the aluminum cable removed. Follow the routing of the original aluminum cable, then secure the cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm). Tighten DK cable clamp nuts 11 lbf-ft (15 N-m).

10. For Cascadia 116 vehicles only:

NOTE: The positive 4/0 cable from the batteries to BCA routing, near the right side cab mount frame bracket, needs to be secured to the exposed thread portion of the two right side cab mount frame bracket bolts using push-on tie mounts (23-13805-062). Only the two center upper bolts on the right side cab mount frame bracket can be used.

Some Cascadia 116 vehicles may already utilize the two push-on tie mounts, which can be used again, but only with the new tie straps (23-13476-000).

- 10.1 Install the two push-on tie mounts (23-13805-062) on the exposed thread portion of the two right side cab mount frame bracket bolts. See [Fig. 26](#).
- 10.2 Secure the new copper positive 4/0 cable to the push-on tie mount using tie straps (23-13476-000). See [Fig. 27](#).

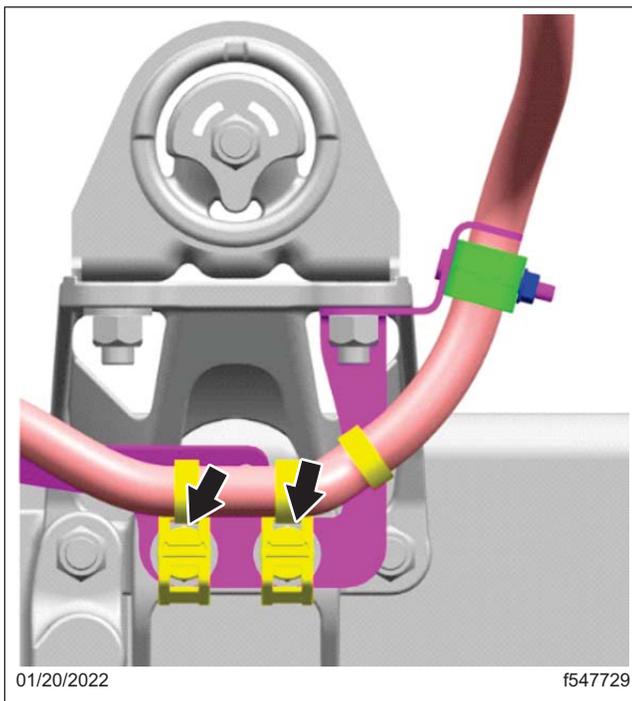


Fig. 26, Push-On Tie Mounts Installed

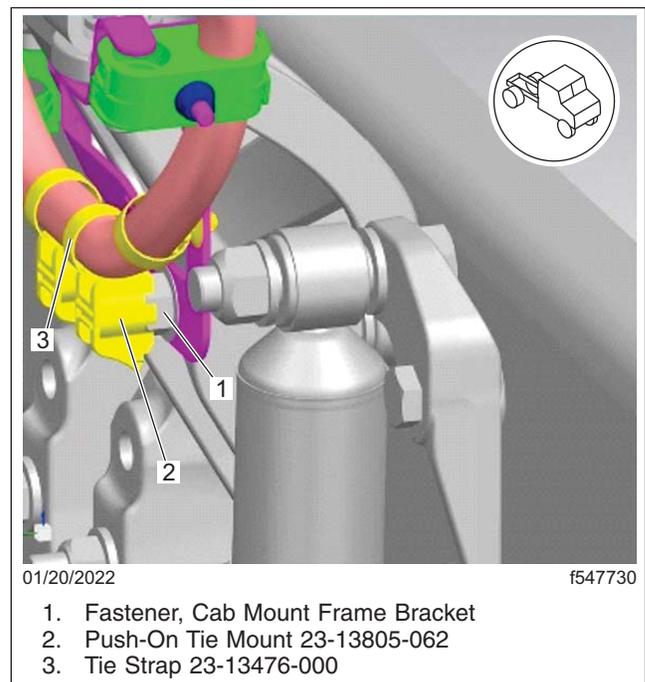


Fig. 27, Copper Cable Secured

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11. Position the battery cable on the BCA battery studs. Use two new stainless steel nuts (23-12612-008), apply a drop of LOCTITE® Blue 242 to the area of the studs the tightened nuts will overlap. Install the washers and the new nuts. Hold the end of each stud with vise grip pliers and tighten each nut with a 13 mm box end wrench to secure the newly installed copper cable to the BCA. Tighten the nuts 10 to 12 lbf-ft (14 to 16 N·m).
12. Connect the new positive cable at the battery post. Tighten the nut 10 to 15 lbf-ft (14 to 20 N·m).
13. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
14. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s). Tighten negative cable at the battery posts 10 to 15 lbf-ft (14 to 20 N·m).
15. Close the hood.
16. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

FL893E - Replace One Aluminum negative 4/0 Cable Routed from the Battery Frame Stud to the Mega Ground Junction Block (MGJB)

NOTE: Vehicles that belong to FL893E require only **ONE** main powernet battery cable, made of aluminum, to be replaced with a cable made of copper. The cable needing replaced is the negative 4/0 cable routed from the battery frame stud to the mega ground junction block (MGJB). Aluminum cables have a larger outer diameter compared to the copper cables, and will have a label installed indicating it is an aluminum cable.

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.
3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 28](#).



Fig. 28, Negative Battery Cable Connection at the Battery Post

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4. Inspect the negative 4/0 cable routed from the battery frame stud to the MGJB to identify those made of aluminum. Aluminum cables can be identified as follows.
 - The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 29](#).

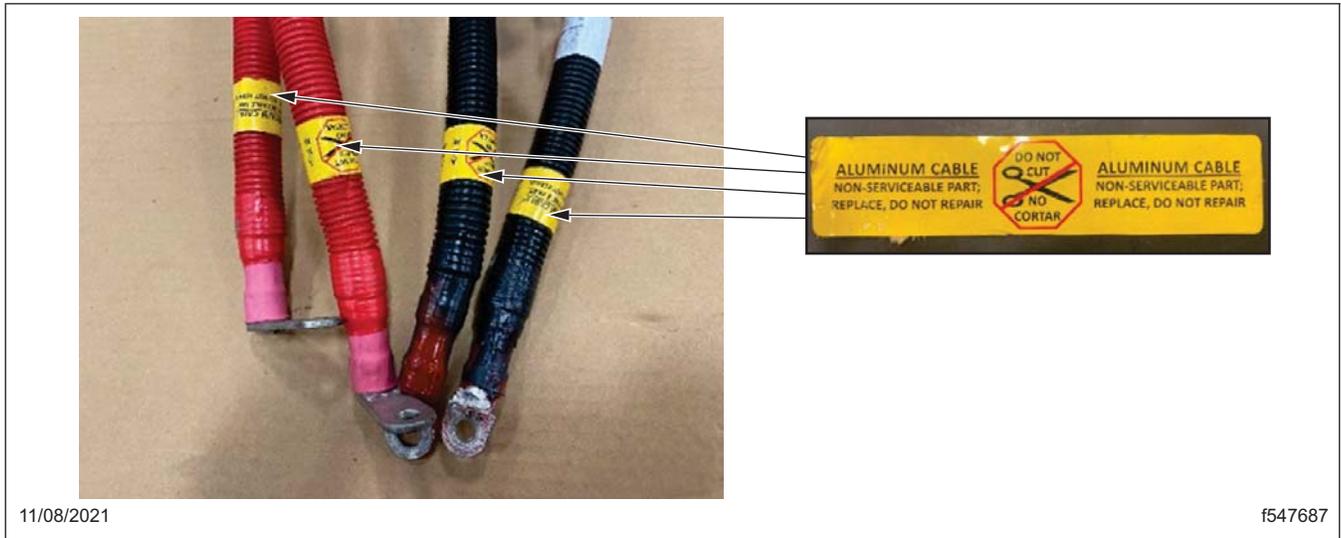


Fig. 29, Powernet Battery Cables Made of Aluminum

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
5. Remove the nut that attaches the negative 4/0 aluminum battery cable to the ground stud, on the frame rail near the batteries, then disconnect the negative 4/0 aluminum battery cable from the ground stud.

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6. Remove the fastener that attaches the negative aluminum battery cable to the MGJB, at the cab frontwall, then disconnect the negative aluminum battery cable from the MGJB. See [Fig. 30](#).



Fig. 30, Bolt at the MGJB

7. Remove the left-hand side cab-mounted splash shield as follows:
 - 7.1 Open the hood.
 - 7.2 From underneath the splash shield, remove the screw that attaches the splash shield to the frontwall mounting bracket.
 - 7.3 From underneath the splash shield, remove the four nuts at the backing plates.

IMPORTANT: Use care to avoid damaging the rocker panel on the lower edge of the cab side when removing the splash shield.

- 7.4 Remove the splash shield by pulling it forward until it clears the rocker panel, then pull it to the side.

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
8. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cable.
 9. Remove the negative 4/0 cable routed from the battery frame stud to the MGJB.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

10. Install the new copper battery cable of the same length as that of the aluminum cable removed. Follow the routing of the original aluminum cable, then secure the cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm).

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11. Install one end of the negative cable on the MGJB, then install the other end of the cable on the frame rail stud. Tighten the negative cable fasteners 14 lbf·ft (19 N·m).
12. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
13. Install the left-hand side cab-mounted splash shield as follows:
 - 13.1 Position the splash shield so that the cab studs align with the splash shield holes. Install the two backing plates and the four nuts on the studs. Tighten the nuts 15 lbf·ft (20 N·m).
 - 13.2 Install the screw that attaches the splash shield to the frontwall mounting bracket.
14. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s). Tighten negative cable at the battery posts 10 to 15 lbf·ft (14 to 20 N·m).
15. Close the hood.
16. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

FL893F - Replace One Aluminum Positive 4/0 Cable Routed from the Batteries to the Starter

NOTE: Vehicles that belong to FL893F require only **ONE** main powernet battery cable, made of aluminum, to be replaced with a cable made of copper. The cable needing to be replaced is the positive 4/0 cable routed from the batteries to the starter. Aluminum cables have a larger outer diameter compared to the copper cables, and will have a label installed indicating it is an aluminum cable.

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.
3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 31](#).



Fig. 31, Negative Battery Cable Connection at the Battery Post

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4. Inspect the positive 4/0 cable routed from the batteries to the starter to identify those made of aluminum. Aluminum cables can be identified as follows.
 - The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 32](#).

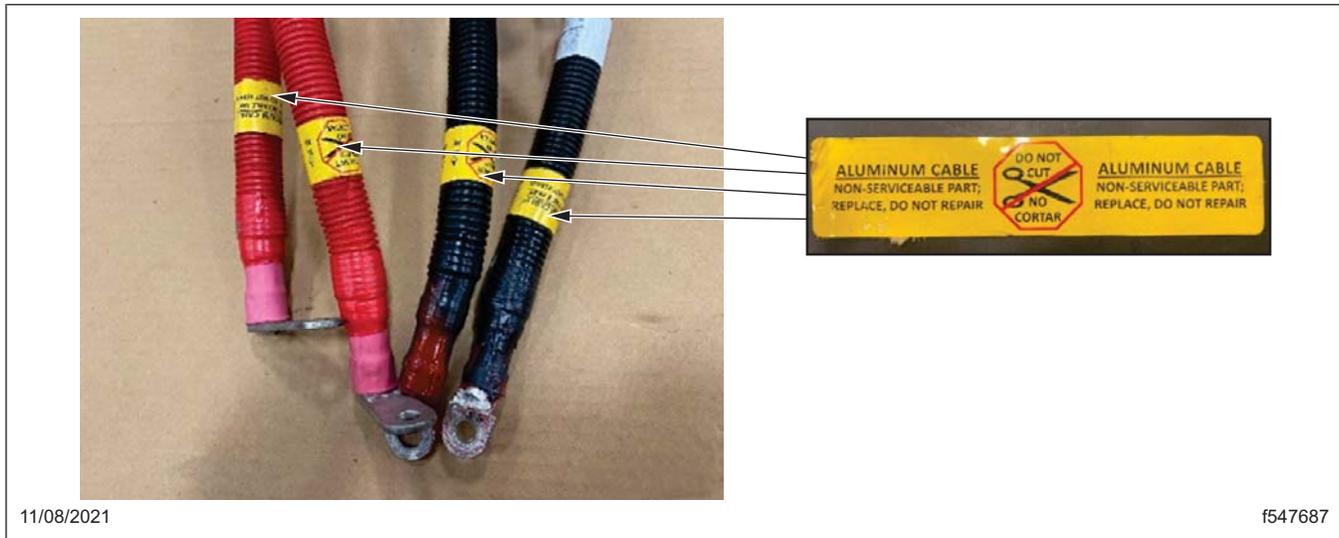


Fig. 32, Powernet Battery Cables Made of Aluminum

5. Remove the nut that attaches the positive 4/0 aluminum battery cable to the positive battery jumper cable connection at the batteries, then disconnect the positive 4/0 aluminum battery cable from the positive battery jumper cable.
6. Remove the nut that attaches the positive aluminum battery to the positive terminal of the starter, then disconnect the positive aluminum battery cable from the starter.

IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- of the same length as the original battery cables,
 - routed the same way as the original cables,
 - using the same clipping points as the original battery cables.
7. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cable.
 8. Remove the positive 4/0 cable, that is routed from the batteries to the starter, from the vehicle.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

9. Install the new copper battery cable of the same length as that of the aluminum cable removed. Follow the routing of the original aluminum cable, then secure the cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm).

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10. Install each end of the new copper cable. At the starter main terminal of the positive cable, tighten the fastener 18 to 20 lbf-ft (24 to 27 N·m). At the battery posts of the positive cable, tighten the fastener 10 to 15 lbf-ft (14 to 20 N·m).
11. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
12. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s). Tighten negative cable at the battery posts 10 to 15 lbf-ft (14 to 20 N·m).
13. Close the hood.
14. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

FL893G - Replace One Aluminum Negative 4/0 Cable Routed from the Battery Frame Stud to the Flywheel Housing

NOTE: Vehicles that belong to FL893G require only **ONE** main powernet battery cable, made of aluminum, to be replaced with a cable made of copper. The cable needing replaced is the negative 4/0 cable routed from the battery frame stud to the flywheel housing. Aluminum cables have a larger outer diameter compared to the copper cables, and will have a label installed indicating it is an aluminum cable.

1. Check the base label (Form WAR259) for a completion sticker for FL893 (Form WAR260) indicating this work has been done. The base label is usually located on the passenger door about 12 inches (30 cm) below the door latch. If a sticker is present, no work is needed. If there is no sticker, proceed with the next step.
2. Park the vehicle on a level surface, shut down the engine, and set the parking brake. Chock the tires.
3. Remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s). See [Fig. 33](#).



Fig. 33, Negative Battery Cable Connection at the Battery Post

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- Inspect the negative 4/0 cable routed from the battery frame stud to the flywheel housing to identify those made of aluminum. Aluminum cables can be identified as follows.
 - The aluminum 4/0 cables have a larger outer diameter than the copper 4/0 cables.
 - The aluminum 4/0 cables are attached with a yellow label on each end indicating they are made of aluminum. See [Fig. 34](#).

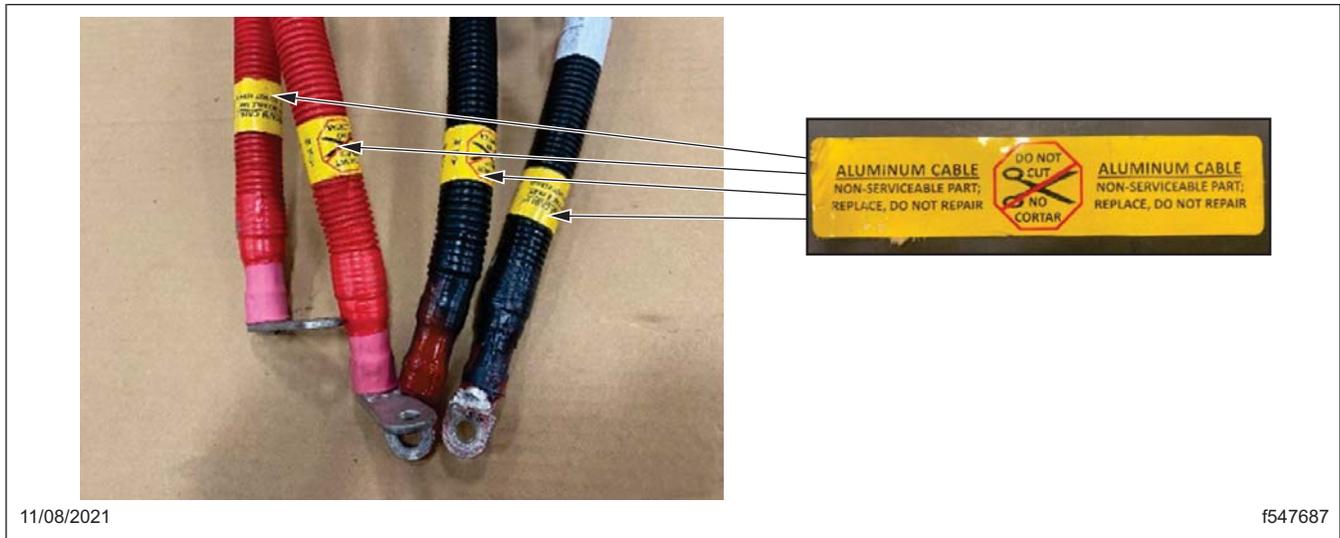


Fig. 34, Powernet Battery Cables Made of Aluminum

- Remove the nut that attaches the negative 4/0 aluminum battery cable to the ground stud, on the frame rail near the batteries, then disconnect the negative 4/0 aluminum battery cable from the ground stud.
- Remove the negative aluminum battery cable bolt at the flywheel housing, then disconnect the negative aluminum battery cable. See [Fig. 35](#).

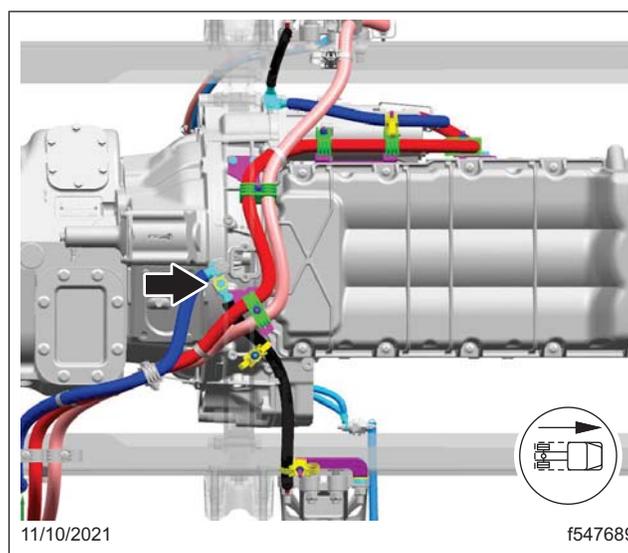


Fig. 35, Aluminum Battery Cable Bolt at the Flywheel Housing

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IMPORTANT: The battery cable length and routing may vary among vehicles. The replacement copper cables must be:

- Of the same length as the original battery cables,
 - Routed the same way as the original cables,
 - Using the same clipping points as the original battery cables.
7. Make notes, or take pictures of the original cable routing and clipping points. Remove and discard all the clamps, tie straps, tie blocks, and clipping hardware securing the aluminum cable.
 8. Remove the negative 4/0 cable, that is routed from the battery frame stud to the flywheel housing, from the vehicle.

IMPORTANT: As the new copper cables have a smaller outer diameter, the existing aluminum cable clamps must not be used on the copper cables. Discard the existing clamps used on the aluminum cables. Use the new copper cable clamp (23-13454-001) in order to properly secure copper battery cables, and prevent rubbing and chaffing.

9. Install the new copper battery cable of the same length as that of the aluminum cable removed. Follow the routing of the original aluminum cable, then secure the cable using new clamps (23-13454-001), new tie straps (23-13476-000), and new dual tie blocks (TYC DCT110HIR). Battery cable clipping points should be placed at minimum spacing of 2 inches (5.1 cm) and maximum spacing of 8 inches (20.3 cm).
10. Install the new copper negative cable at the flywheel housing. Tighten the bolt 59 lbf·ft (80 N·m).
11. Install the new copper negative cable at the frame rail stud. Tighten the bolt 14 lbf·ft (19 N·m).
12. As needed, lightly coat the cable end terminals with red enamel, and the battery terminals with dielectric grease.
13. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s). Tighten negative cable at the battery posts 10 to 15 lbf·ft (14 to 20 N·m).
14. Close the hood.
15. Clean a spot on the base label (Form WAR259), write the recall number, FL893, on a blank red completion sticker (Form WAR260), and attach it to the base label, indicating this work has been completed.

BCA Spinning Stud Repair

IMPORTANT: This procedure applies to the two main power exterior studs only, and should not be used for other repairs.

BCA Removal

1. If not previously done, remove the negative battery cable from the battery post. If equipped with auxiliary batteries, remove the negative battery cable(s) from the auxiliary battery post(s).
2. Remove the electronics bay cover and the passenger-side lower dash cover.

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3. Remove the four BCA electrical connectors located on the cab-side frontwall, below the central gateway.
See [Fig. 36](#).
4. Remove the three cab-side battery cable nuts and washers, then disconnect the battery cables.
See [Fig. 37](#).

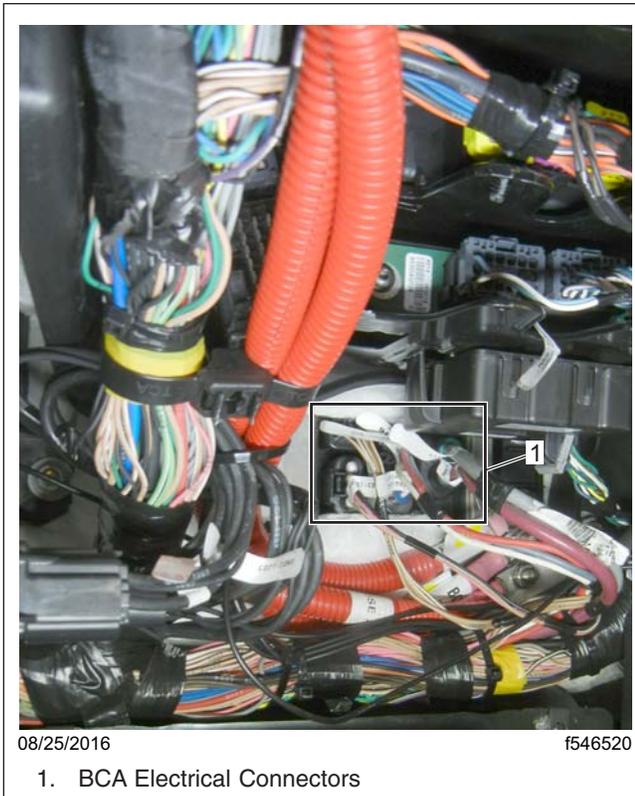


Fig. 36, BCA Electrical Connectors

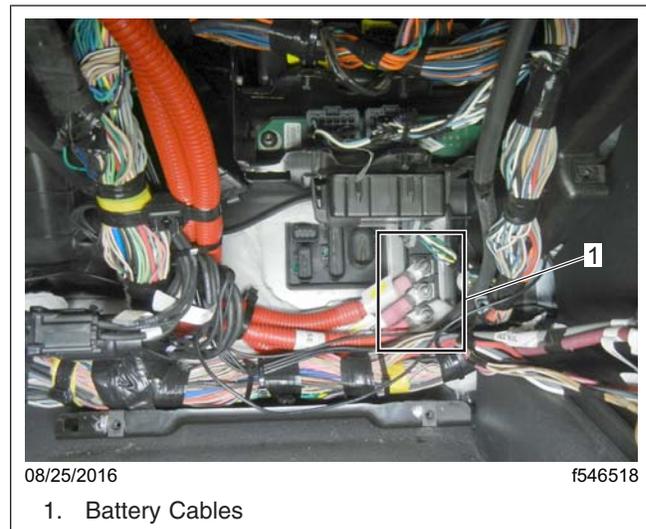


Fig. 37, Three BCA Battery Cables (Cab-Side Frontwall)

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IMPORTANT: Care must be taken to prevent the BCA studs from spinning within the BCA case, during the removal of nuts securing the battery cable. Do not use power tools when removing the nuts from the BCA studs. Hold the ends of the studs in the non-threaded area with vise grip pliers, or a similar tool, to avoid the stud from spinning within the BCA case during removal. Use a hand wrench to remove the nuts from BCA. If any of the BCA studs still spin, repair the spinning stud. For instructions, refer to **BCA Spinning Stud Repair** on page 36.

- From the engine-side frontwall, carefully hold the non-threaded portion of stud with pliers and use a hand wrench to remove the two nuts from the battery cable studs (if not previously removed), then disconnect the battery cable. Also remove any optional cables that also may be attached to the exterior of the BCA. See **Fig. 38** and **Fig. 39**.



Fig. 38, BCA Battery Cable (Engine-Side Frontwall)

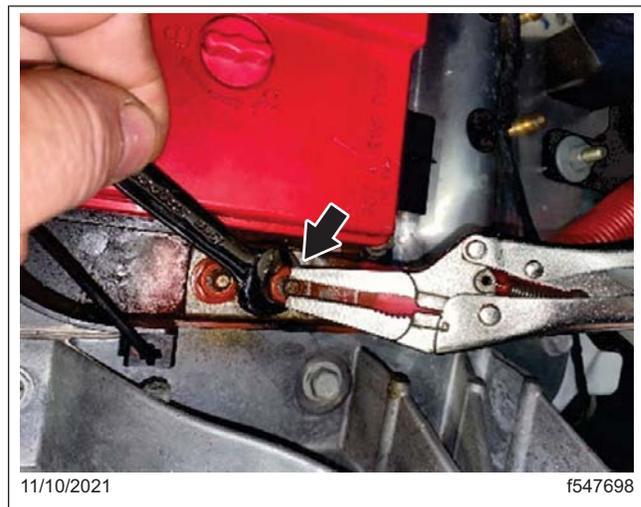


Fig. 39, Holding the BCA Stud

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NOTE: One of the BCA assembly mounting nuts is located behind the battery contactor solenoid. A short-handled wrench with a ½ inch socket may be required to remove the nut.

6. Remove the four stud nuts and washers attaching the BCA assembly to the engine-side frontwall. See **Fig. 40**.

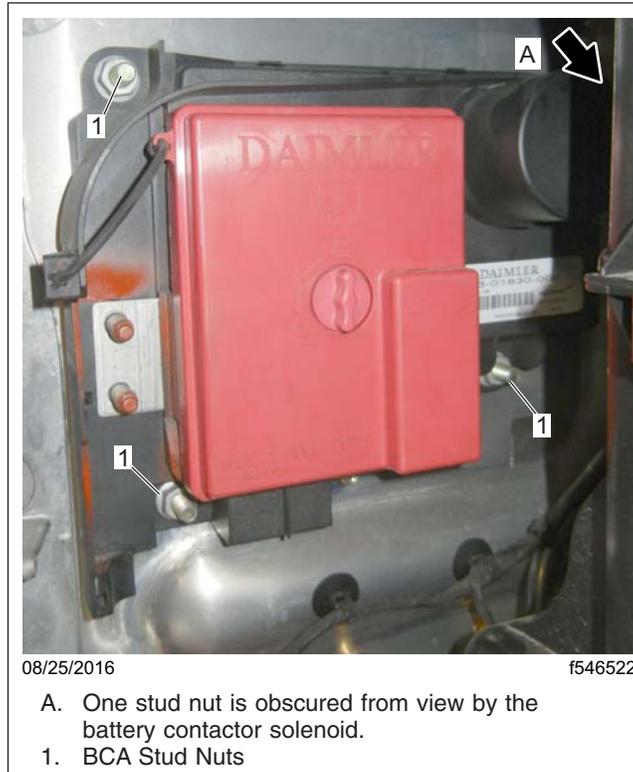


Fig. 40, BCA Mounting Stud Nuts

7. Remove the BCA assembly from the frontwall.
8. To secure the studs during the spinning stud repair procedure, install a washer and a nut onto each of the BCA main power exterior studs, torque nuts to 10 to 12 lbf-ft (14 to 16 N·m).

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NOTE: Two holes will be drilled in the BCA back cover directly behind the two main power exterior studs. Care must be taken to ensure holes are drilled in the correct location.

- Layout and drill two holes in the plastic BCA back cover as follows: Starting at the left lower corner of the back cover, mark locations at 2-½ inches and 3-½ inches. Place an intersecting mark at 3/8 inch from the outer edge. These two intersecting marks should line up with the two main power exterior studs. Using a 3/16 inch drill bit, drill the outer plastic cover at the two intersecting marks. The plastic cover is approximately 1/16 inches thick and is easily drilled. Do not drill into the metal studs that are approximately 3/8 inch below the plastic cover. See [Fig. 41](#) and [Fig. 42](#).

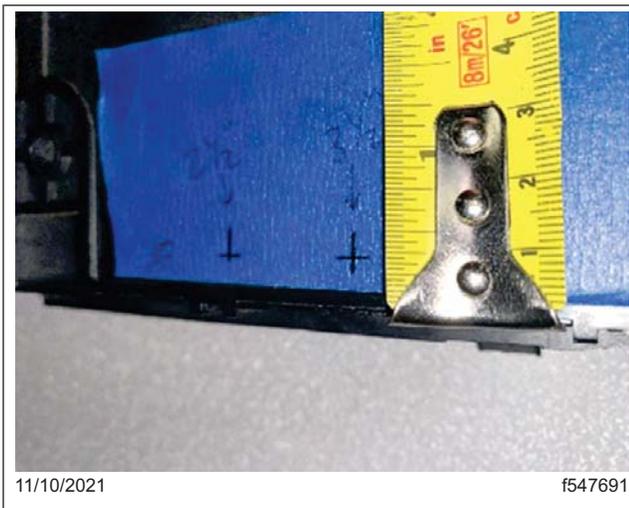


Fig. 41, Marking 2-½ inches and 3-½ inches from the Lower Corner

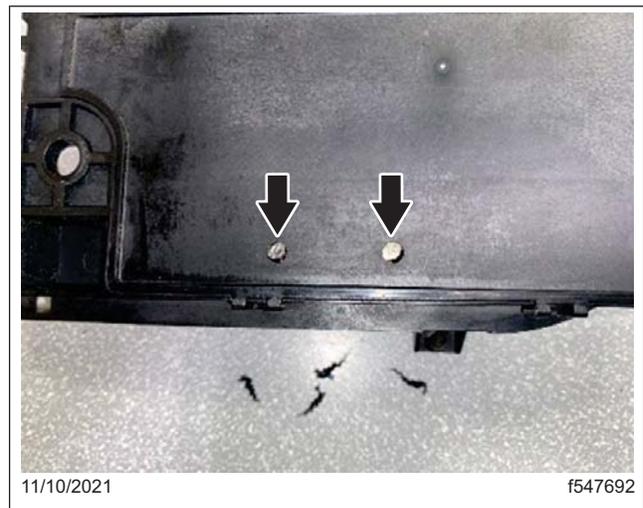


Fig. 42, Drilled Holes

- Using fast dry two-part epoxy with mixing tube applicator such as JB Weld Clearweld™, or Loctite Instant Mix Epoxy™, create an epoxy test patch on a flat/level piece of scrap material in order to gauge the amount of pressure (or effort)/time is required to apply enough epoxy to fill a space 3/4 x 3/4 x 3/8 inches high. See [Fig. 43](#) and [Fig. 44](#).



Fig. 43, JB Weld Clearweld™



Fig. 44, Loctite Instant Mix Epoxy™

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11. Place the BCA on a level surface in preparation for applying epoxy. Apply the epoxy into each hole and fill with enough epoxy to fill a space $3/4 \times 3/4 \times 3/8$ inches similar to the test patch on step 10. Wipe excess glue from the BCA case and cover the two holes with electrical tape. Leave the BCA on a level surface and allow time for epoxy to set before installing the BCA, typically minimum of 5 minutes, use test patch to determine when epoxy has set firm. See [Fig. 45](#), [Fig. 46](#) and [Fig. 47](#).

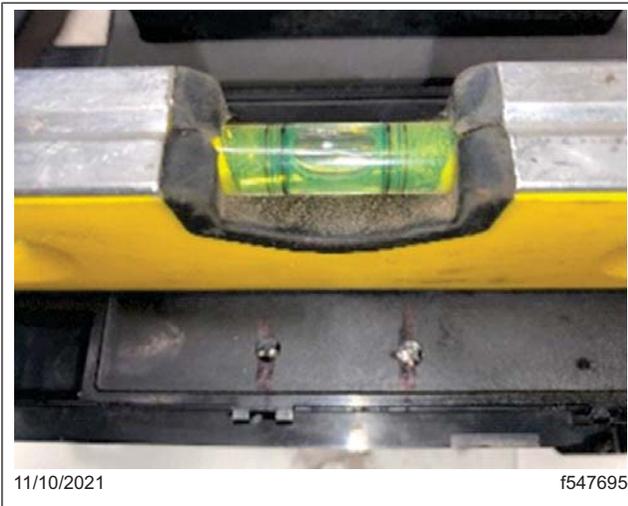


Fig. 45, Setting the BCA on a Level Surface



Fig. 46, Epoxy Application

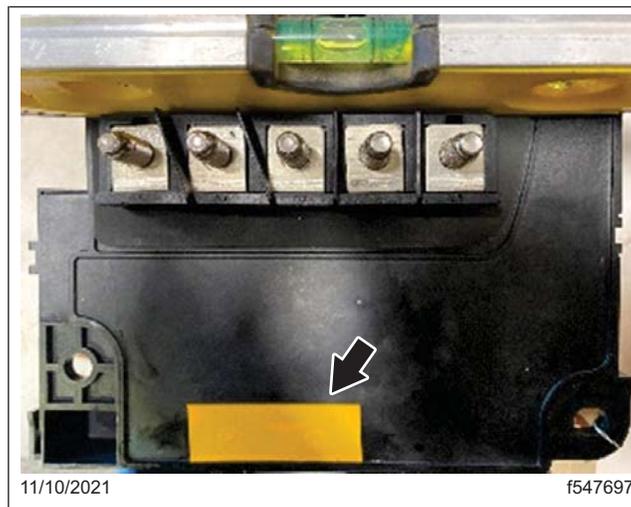


Fig. 47, Covering the Two Holes With Electric Tape

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BCA Installation

NOTE: The BCA mounting studs on the frontwall are designed to allow for slight movement.

1. Position the BCA on the four mounting studs on the engine-side frontwall. Install four mounting nuts and washers, and tighten the nuts to 10 to 12 lbf·ft (14 to 16 N·m).
2. Remove the two nuts and washers installed for the spinning stud repair, then position the 29A battery cable on the BCA battery studs. Use two new stainless steel nuts (23-12612-008), apply a drop of LOCTITE® Blue 242 to the area of the studs where the tightened nuts will overlap. Install the washers and the new nuts. Hold the end of each stud with vise grip pliers, then tighten each nut with a 13 mm box end wrench to secure the newly installed copper cable to the BCA. Tighten the nuts 10 to 12 lbf·ft (14 to 16 N·m). See [Fig. 48](#).

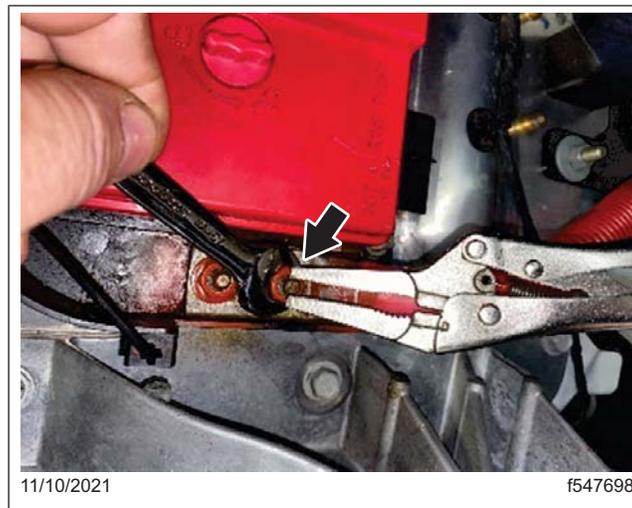


Fig. 48, Holding Stud and Tightening with Wrench

3. Install any optional cables previously removed from the BCA and torque the nuts to 10 to 12 lbf·ft (14 to 16 N·m).
4. From the cab-side frontwall, position the three battery cables on the battery studs, then install the washers and nuts. Tighten the nuts to 10 to 12 lbf·ft (14 to 16 N·m).
5. Connect the four BCA electrical connectors.
6. Install the dash panels.
7. Install the negative battery cable on the battery post. If equipped with auxiliary batteries, install the negative battery cable(s) on the auxiliary battery post(s).
8. Continue with the respective aluminum cable repair procedure above.