

2021



F-150 Hybrid

BATTERY REMOVAL GUIDE



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High Voltage Battery Depowering

**WARNING:**

THE HIGH-VOLTAGE SYSTEM MAY RETAIN A DANGEROUS LEVEL OF VOLTAGE FOR A SHORT TIME AFTER THE SERVICE DISCONNECT HAS BEEN OPENED. WAIT 5 MINUTES FOR THE VOLTAGE TO DISSIPATE BEFORE BEGINNING SERVICE. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**WARNING:**

REMOVING THE BATTERY HIGH VOLTAGE SERVICE DISCONNECT DOES NOT DISSIPATE VOLTAGE INSIDE THE BATTERY PACK. THE BATTERY PACK REMAINS LIVE AND DANGEROUS. CONTACT WITH THE HIGH VOLTAGE BATTERY PACK INTERNALS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**WARNING:**

ELECTRIC VEHICLES DAMAGED BY A CRASH MAY HAVE COMPROMISED HIGH VOLTAGE SAFETY SYSTEMS AND PRESENT A POTENTIAL HIGH VOLTAGE ELECTRICAL SHOCK HAZARD. EXERCISE CAUTION AND WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT (PPE) INCLUDING HIGH VOLTAGE SAFETY GLOVES AND BOOTS. REMOVE ALL METALLIC JEWELRY, INCLUDING WATCHES AND RINGS. ISOLATE THE HIGH VOLTAGE SYSTEM AS DIRECTED BY THE FORD EMERGENCY RESPONSE GUIDE FOR THE VEHICLE. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**WARNING:**

TO PREVENT THE RISK OF HIGH-VOLTAGE SHOCK, ALWAYS FOLLOW PRECISELY ALL WARNINGS AND SERVICE INSTRUCTIONS INCLUDING INSTRUCTIONS TO DEPOWER THE SYSTEM. THE TOTAL VOLTAGE OF THE VEHICLE HV BATTERY PACK MAY BE UP TO APPROXIMATELY 450 VOLTS DC. THIS VOLTAGE IS PROVIDED THROUGH HIGH-VOLTAGE CABLES TO ITS COMPONENTS AND MODULES. THE HIGH-VOLTAGE CABLES AND WIRING ARE IDENTIFIED BY ORANGE HARNESS TAPE OR ORANGE WIRE COVERING. ALL HIGH-VOLTAGE COMPONENTS ARE MARKED WITH HIGH-VOLTAGE WARNING LABELS WITH A HIGH-VOLTAGE SYMBOL. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**WARNING:**

SERVICE OF THE HIGH VOLTAGE SYSTEM ON THIS VEHICLE IS RESTRICTED TO QUALIFIED PERSONNEL. THE REQUIRED QUALIFICATIONS VARY BY REGION. ALWAYS OBSERVE LOCAL LAWS AND LEGISLATIVE DIRECTIVES REGARDING ELECTRIC VEHICLE SERVICE. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**WARNING:**

NEVER CONNECT THE SERVICE DISCONNECT WHEN A HIGH-VOLTAGE COVER IS REMOVED. ALWAYS INSTALL THE COVER PRIOR TO CONNECTING THE SERVICE DISCONNECT. THE COVER PREVENTS INADVERTENT CONTACT WITH THE HIGH VOLTAGE WHICH IS PRESENT AT SEVERAL POINTS UNDER THE COVER. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

**WARNING:**

DISCONNECT THE 12V BATTERY BEFORE SERVICING THE DIRECT CURRENT TO ALTERNATING CURRENT (DC-AC) INVERTER OR ALTERNATING CURRENT (AC) POWERPOINT TO PREVENT THE RISK OF HIGH VOLTAGE SHOCK. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN SERIOUS PERSONAL INJURY.

NOTICE:

Do not backprobe, splice or repair the high voltage (orange) wiring. Voltage in the system is approximately 450 volts DC. Damage may occur to equipment added to the system.

NOTICE:

None of the High Voltage Traction Battery (HVTB) wiring should be tapped or spliced to check for battery voltage (power), ground or signals.

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NOTICE:

Modification of Low-Voltage (LV) power & control wires connecting to the High-Voltage (HV) battery system can damage or disable the HV Battery system. Do not open or modify High Voltage battery pack

High Voltage Battery Depowering using FDRS

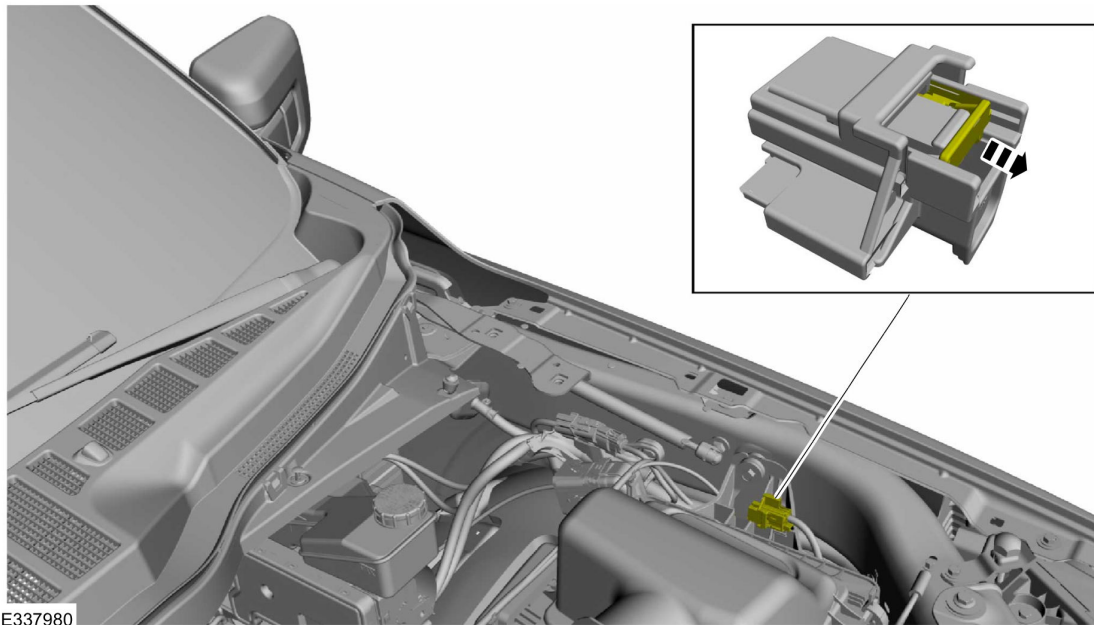
**WARNING:**

Before beginning any service procedure in this manual, refer to health and safety warnings. Failure to follow this instruction may result in serious personal injury.

**WARNING:**

To prevent the risk of high-voltage shock, always follow precisely all warnings and service instructions, including instructions to depower the system. The high-voltage system utilizes approximately 450 volts DC, provided through high-voltage cables to its components and modules. The high-voltage cables and wiring are identified by orange harness tape or orange wire covering. All high-voltage components are marked with high-voltage warning labels with a high-voltage symbol. Failure to follow these instructions may result in serious personal injury or death.

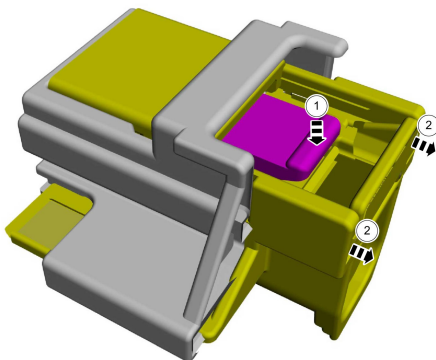
1. Using the FDRS CARRY OUT the Zero Voltage Confirmation routine and follow the on-screen instructions.
2. Release the Connector Position Assurance (CPA) clip.

**3. NOTE:**

The tab must be depressed prior to pushing the connector back in or damage to the connector may result.

Depress the tab while pulling the connector until the hole is completely visible on the top of the connector.

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4. Insert a suitable tool inside the connector hole to prevent the connector from closing.



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5. Using the FDRS COMPLETE the Zero Voltage Confirmation routine and verify the High Voltage System has been de-energized.

Manual De-Energizing

WARNING:

To prevent the risk of high-voltage shock, always follow precisely all warnings and service instructions, including instructions to depower the system. The high-voltage system utilizes approximately 450 volts DC, provided through high-voltage cables to its components and modules. The high-voltage cables and wiring are identified by orange harness tape or orange wire covering. All high-voltage components are marked with high-voltage warning labels with a high-voltage symbol. Failure to follow these instructions may result in serious personal injury or death.

WARNING:

Before beginning any service procedure in this manual, refer to health and safety warnings in WSM Section 100-00 General Information. Failure to follow this instruction may result in serious personal injury.

NOTICE:

Manual De-energization should only be performed when a Ford-specific diagnostic tool is not available.

NOTICE:

Excessive use of this method may cause damage to electrical connectors.

NOTICE:

To prevent the risk of high voltage shock, the high voltage battery cover must not be removed if any of the following condition exist:

- BECM DTC P0AA6:00 that has been diagnosed to be an internal fault with the high voltage Battery.
- BECM Diagnostic Trouble Codes (DTCs) P0AA1:00 AND P0AA4:00 are present.

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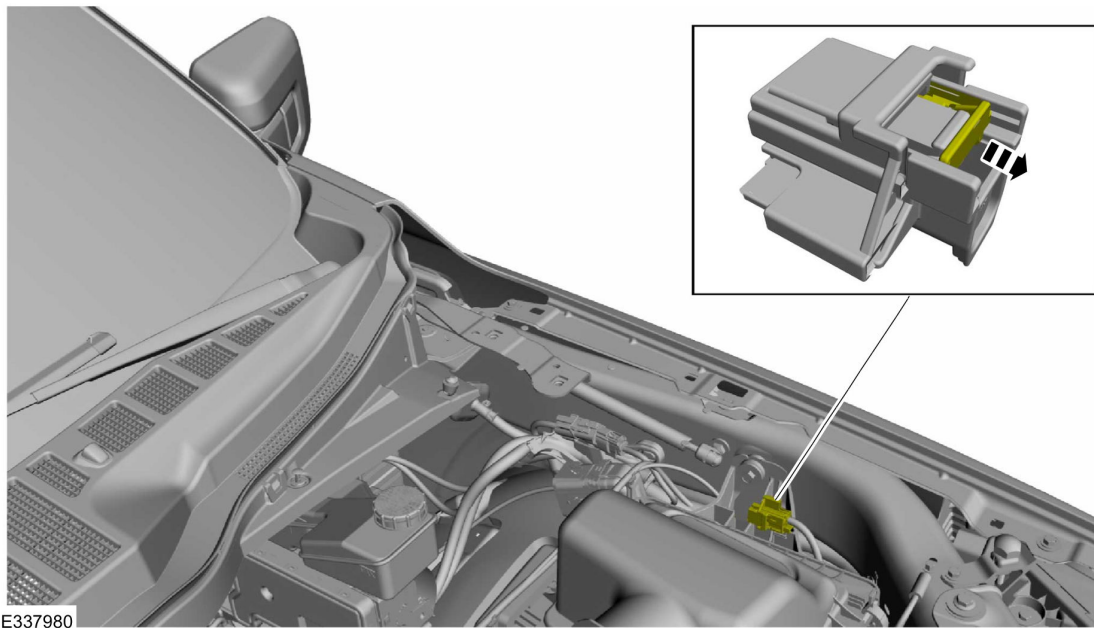
- **BECM Diagnostic Trouble Codes (DTCs) P0D0F:00 AND P0AA4:00 are present (PHEV only).**

1. Disconnect the Electric Vehicle Supply Equipment (EVSE) from the vehicle charge port. (PHEV only).
2. Turn the ignition ON without depressing the brake pedal (Accessory mode).
3. **NOTE:**
A scan tool that is capable of performing a self-test on the BECM is required.

Using a scan tool perform BECM self test and record the Diagnostic Trouble Codes (DTCs).

- If BECM Diagnostic Trouble Codes (DTCs) P0AA1:00 AND P0AA4:00 are present. Refer to WSM procedures in section 414-03 High Voltage Battery, Mounting and Cables, Diagnosis and Testing.
- If BECM Diagnostic Trouble Codes (DTCs) P0AA1:00 AND P0AA4:00 are present. Refer to WSM: High Voltage Battery, Mounting and Cables (414-03 High Voltage Battery, Mounting and Cables, Diagnosis and Testing).

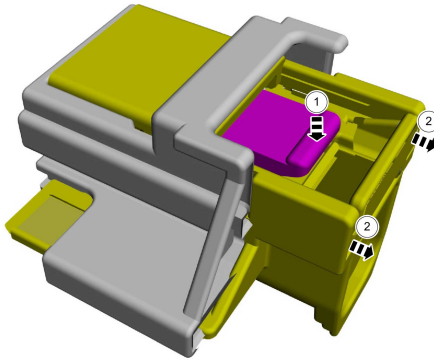
4. Turn the ignition OFF.
5. Release the Connector Position Assurance (CPA) clip.



6. **NOTE:**
The tab must be depressed prior to pushing the connector back in or damage to the connector may result.

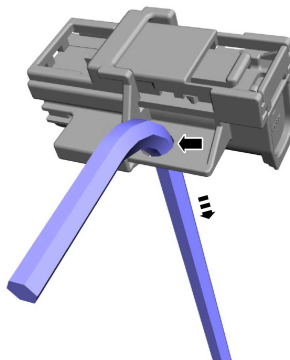
Depress the tab while pulling the connector until the hole is completely visible on the top of the connector.

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7. Insert a suitable tool inside the connector hole to prevent the connector from closing.



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8. Disconnect the low voltage electrical connector at the High Voltage Battery.
9. Disconnect the high voltage electrical connector at the High Voltage Battery.
10. Wait a minimum of 5 minutes.

Battery Removal

NOTE:

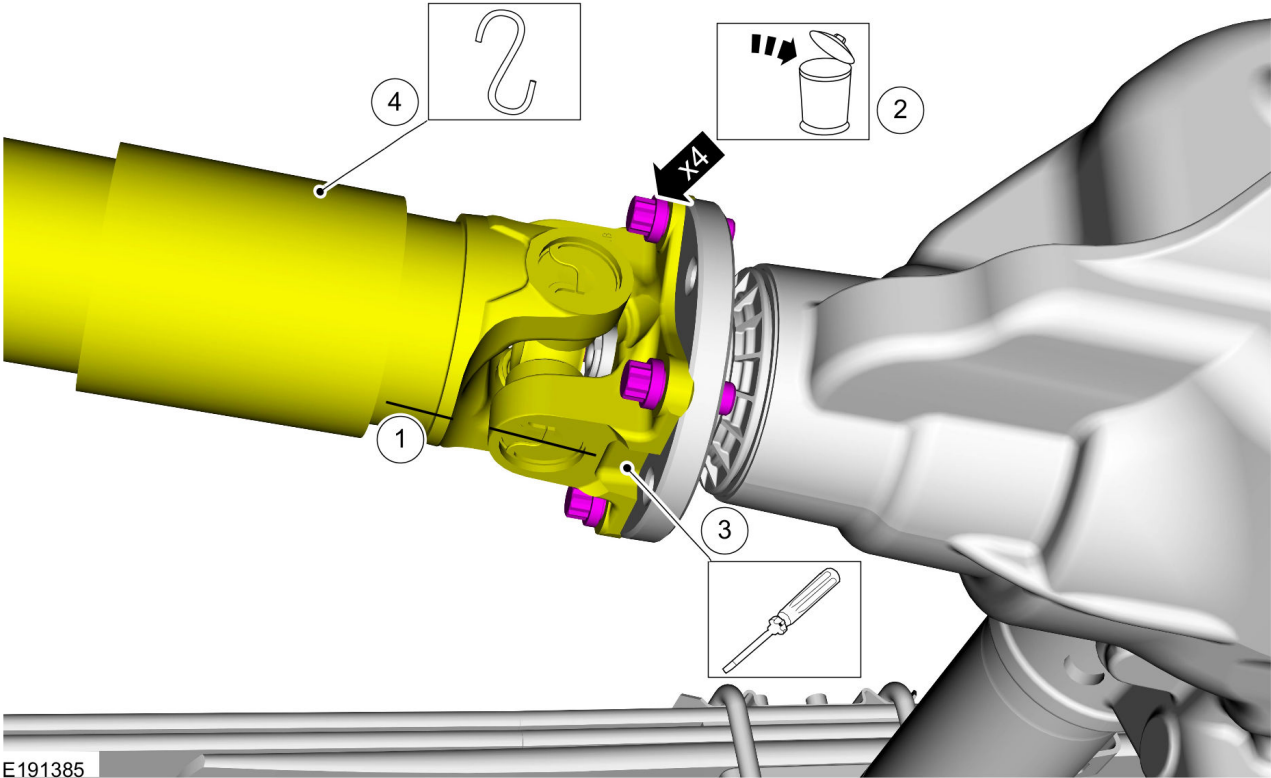
Before proceeding ensure the high voltage service disconnect procedure has been preformed.

1. With the vehicle in NEUTRAL, position it on a hoist. Refer to WSM procedures in 100-02 Jacking and Lifting, Description and Operation.

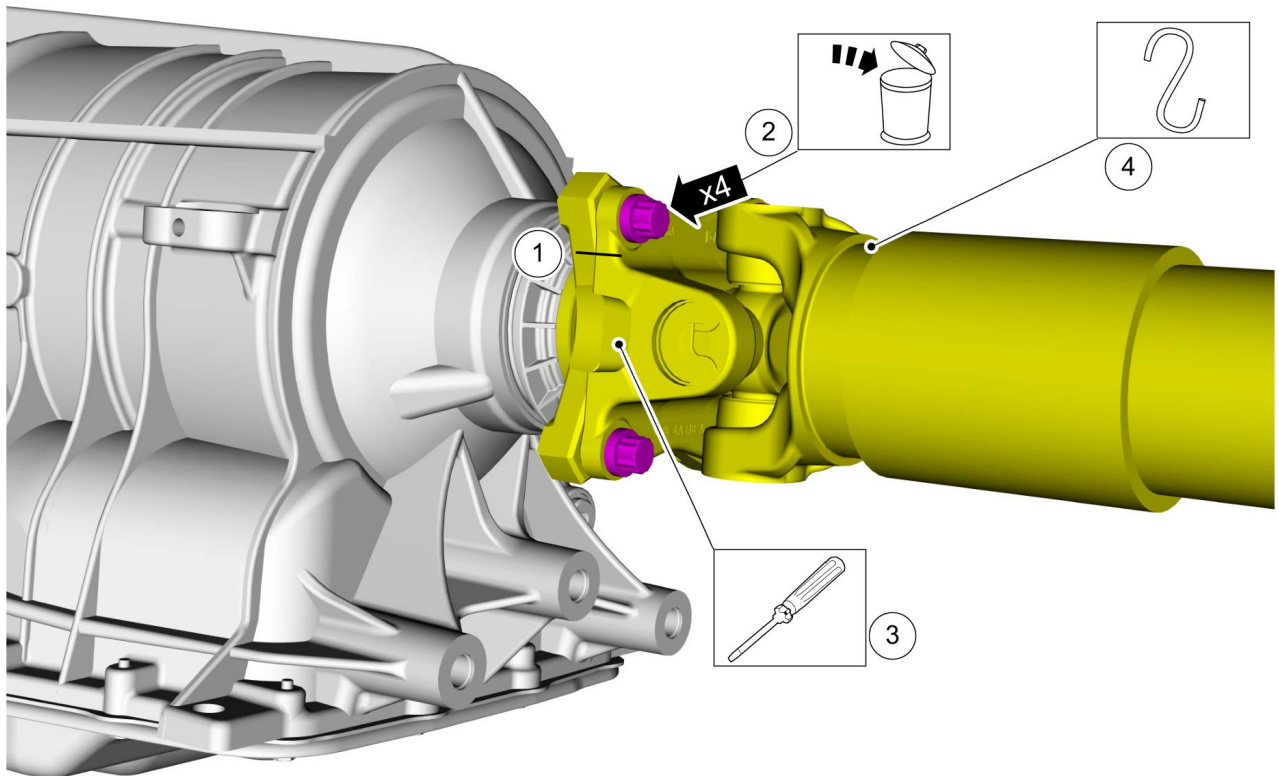
NOTE:

2. Remove the driveshaft. If equipped with transmission slip yoke slide the drive shaft outward and remove.
 - a. Support the driveshaft with suitable jackstands.
 - b. Remove and discard the driveshaft flange to pinion bolts.
 - c. If equipped, remove the driveshaft flange to transmission yoke bolts.
 - d. If equipped, remove the center bearing bolts.
 - e. If equipped, remove the slip yoke from the transmission.
 - f. Remove the driveshaft and jack stand supports.

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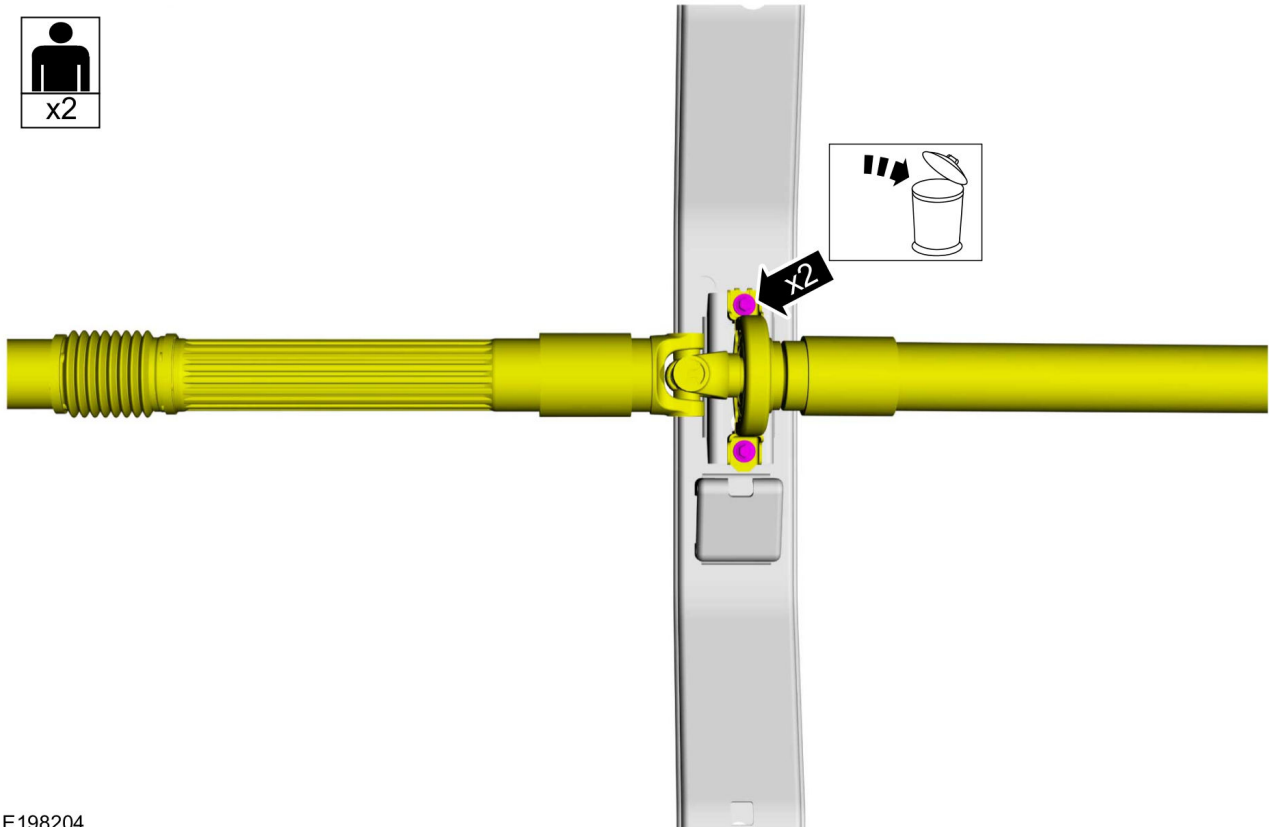


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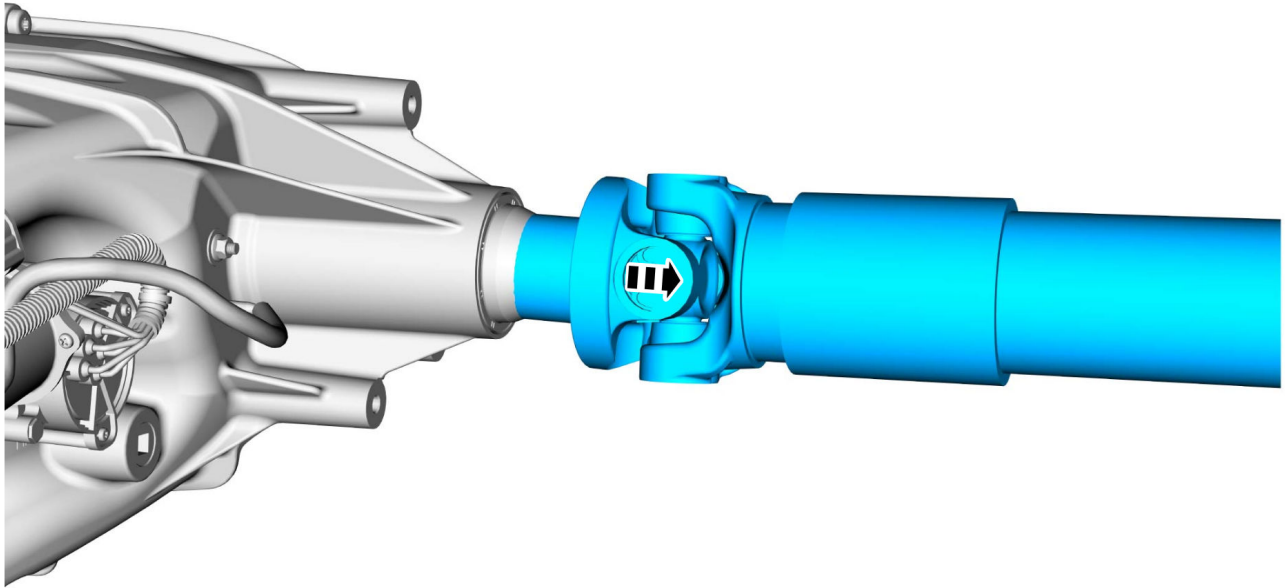
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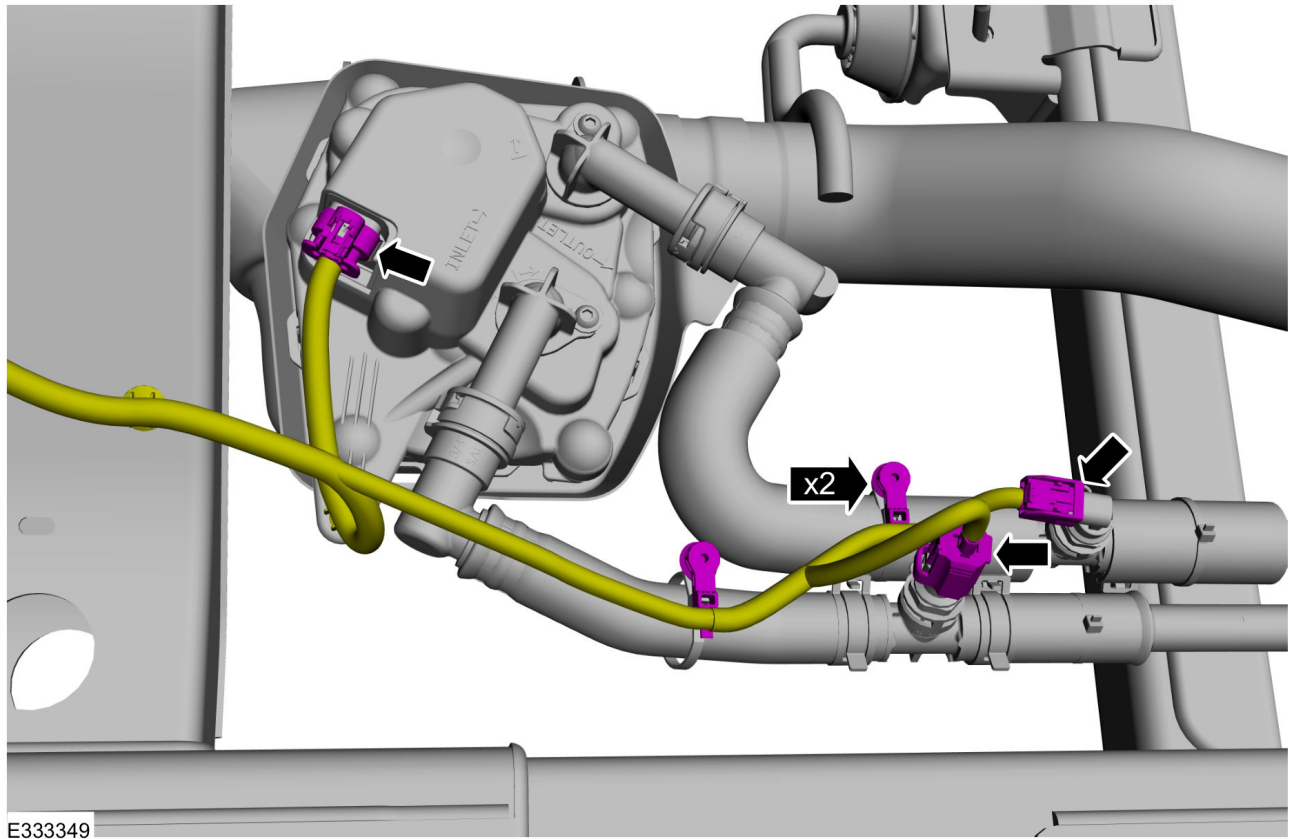
Battery Removal Guide



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3. Disconnect the electrical connectors and detach the wire clips.

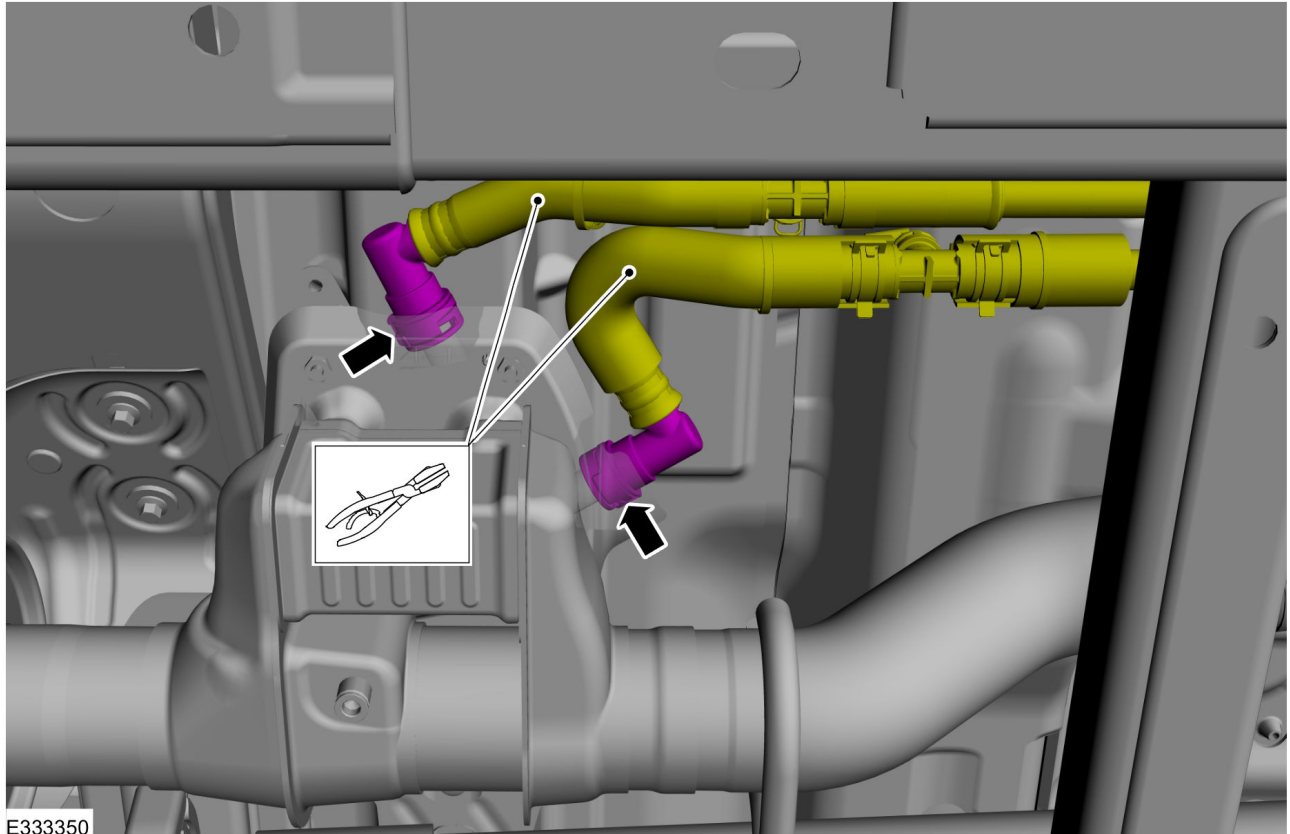
Battery Removal Guide

**NOTICE:**

Coolant spillage from the disconnected coolant hoses must be prevented using hose clamps.

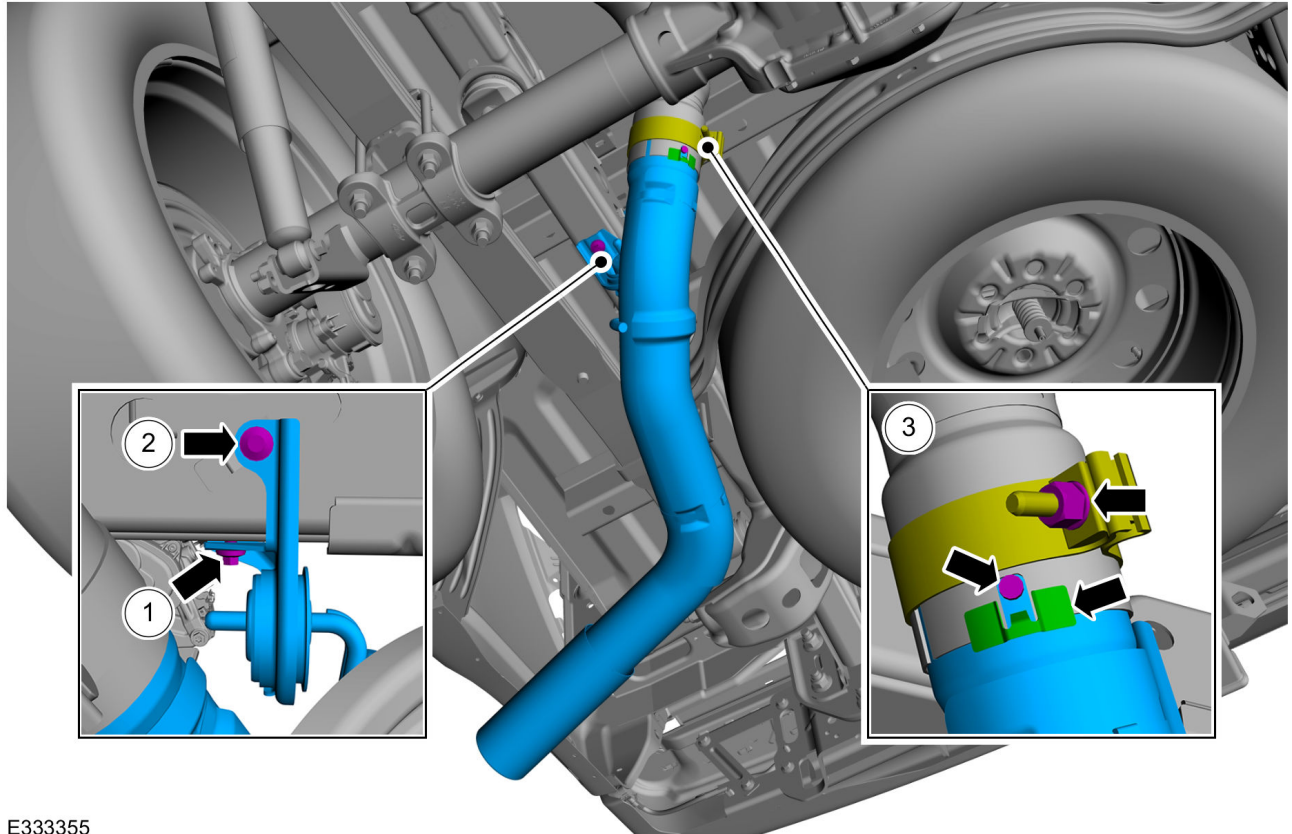
4. Release the coolant hoses from the heat exchanger.

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5. Remove the tailpipe.

Battery Removal Guide



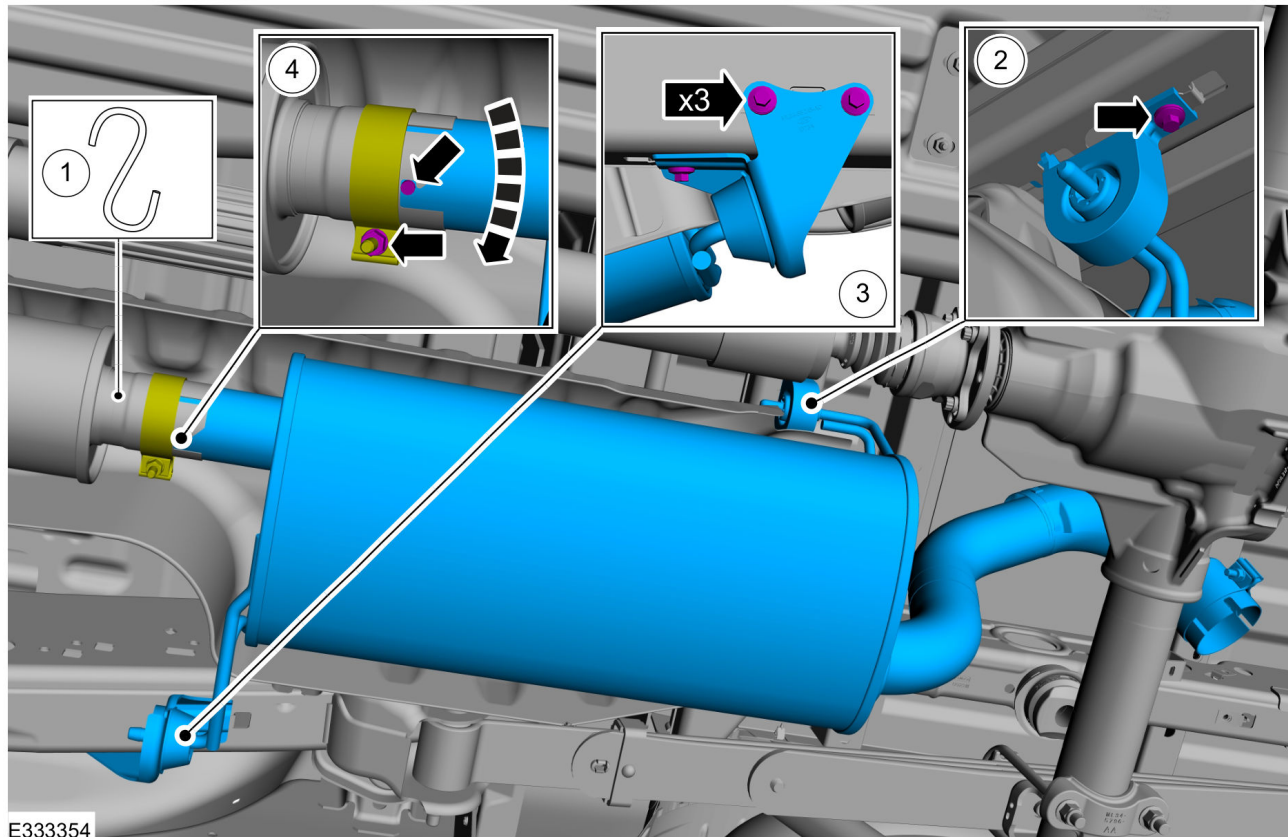
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NOTICE:

The muffler inlet pipe must be supported to prevent its free weight from damaging the exhaust heat exchanger during removal.

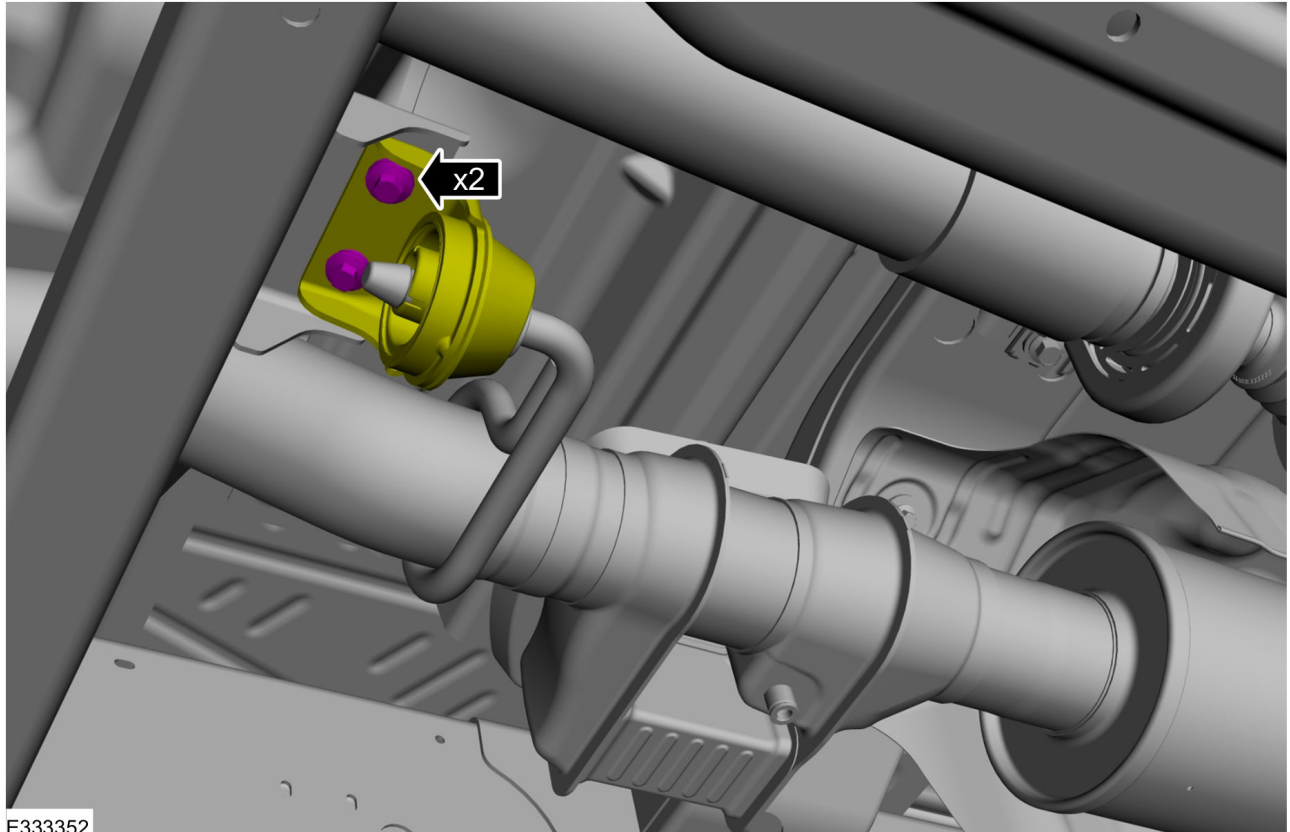
6. Remove the muffler assembly.
 - a. Secure the muffler inlet pipe using mechanics wire.
 - b. Remove the isolator bolt.
 - c. Remove the isolator bolts.
 - d. Loosen the clamp. Rotate the muffler assembly and remove it from the vehicle.

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7. Remove the isolator bolts.

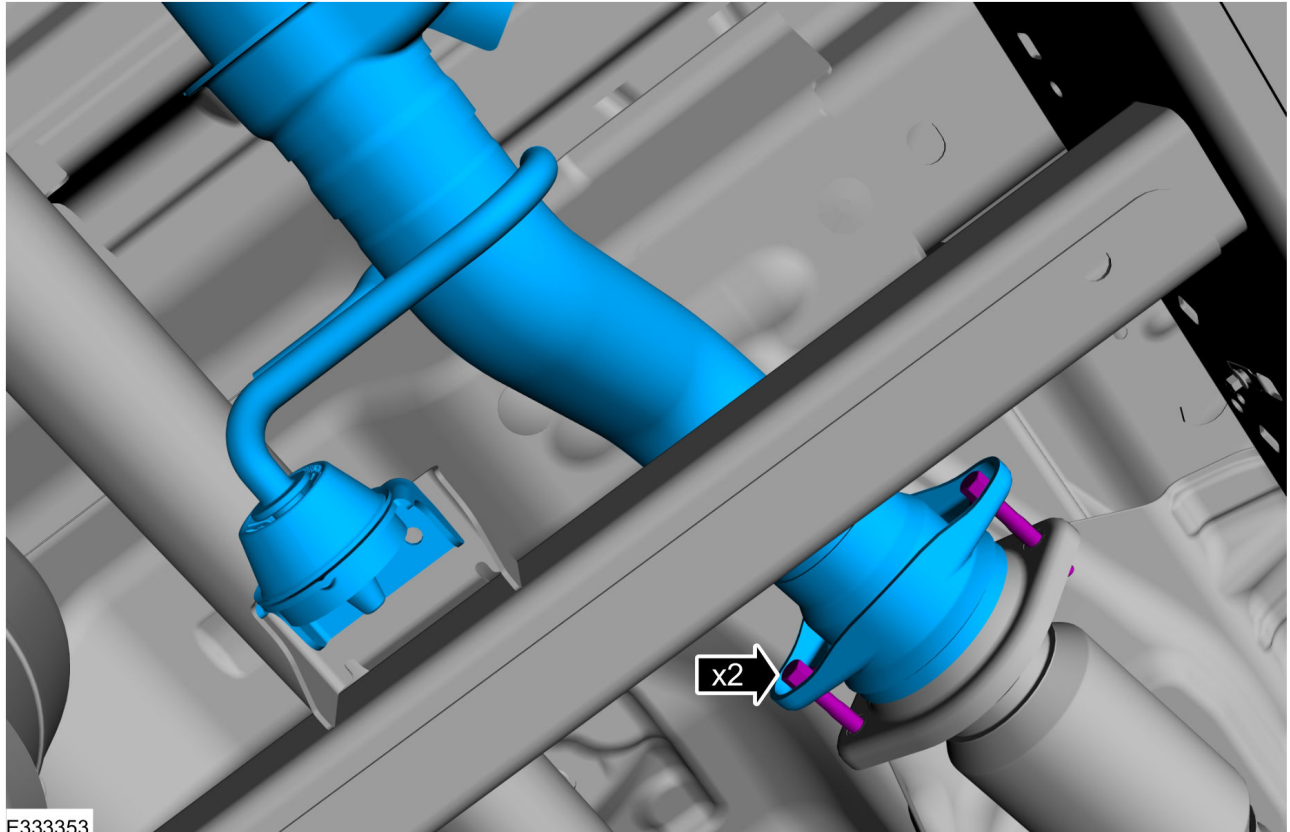
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8. Remove the bolts and the muffler inlet pipe.

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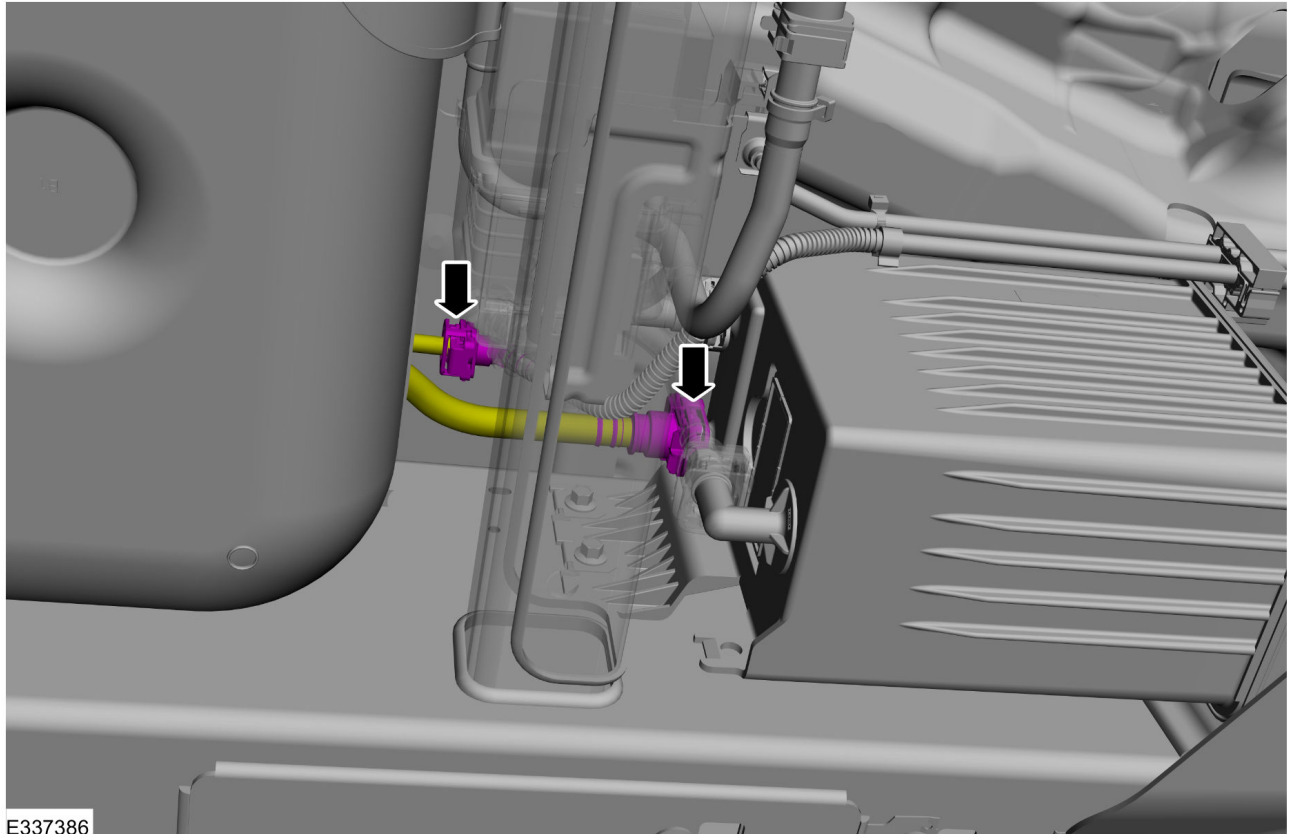


9. Release the fuel system pressure. For additional information refer to WSM section 310-00.
10. If equipped, remove the nuts and the skid plate.



11. Disconnect the fuel feed and vapor tube quick release couplings.

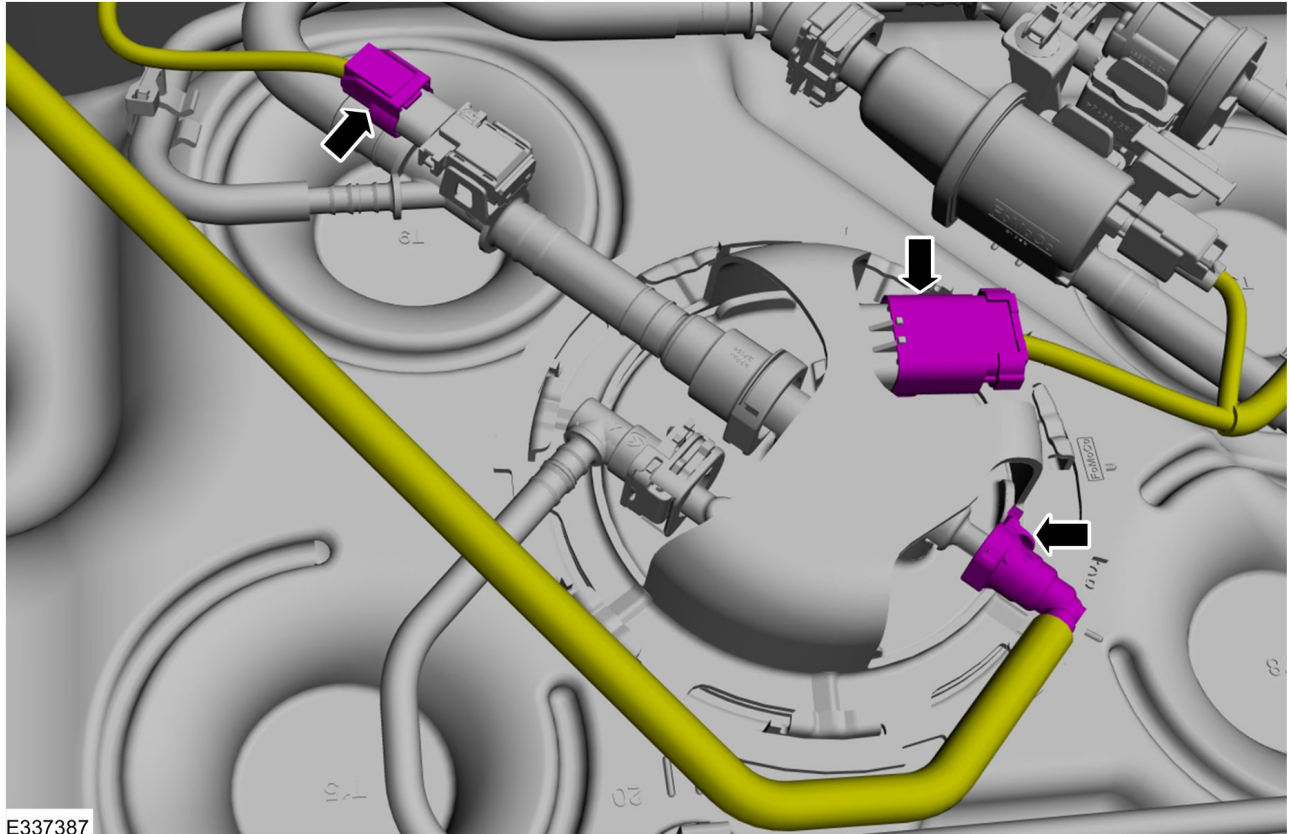
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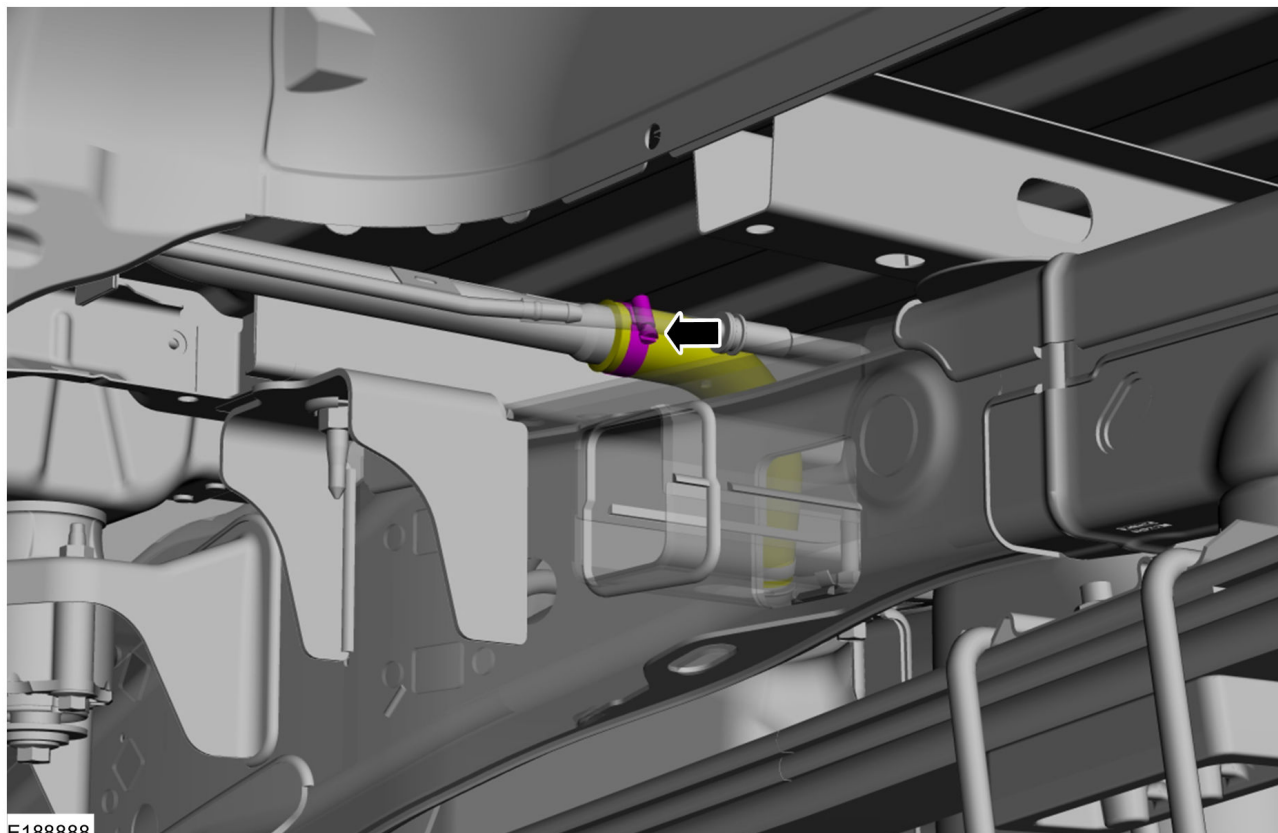
12. Disconnect the fuel tank filler pipe vent tube quick release coupling. Disconnect the electrical connectors and release the harness retainer clip.

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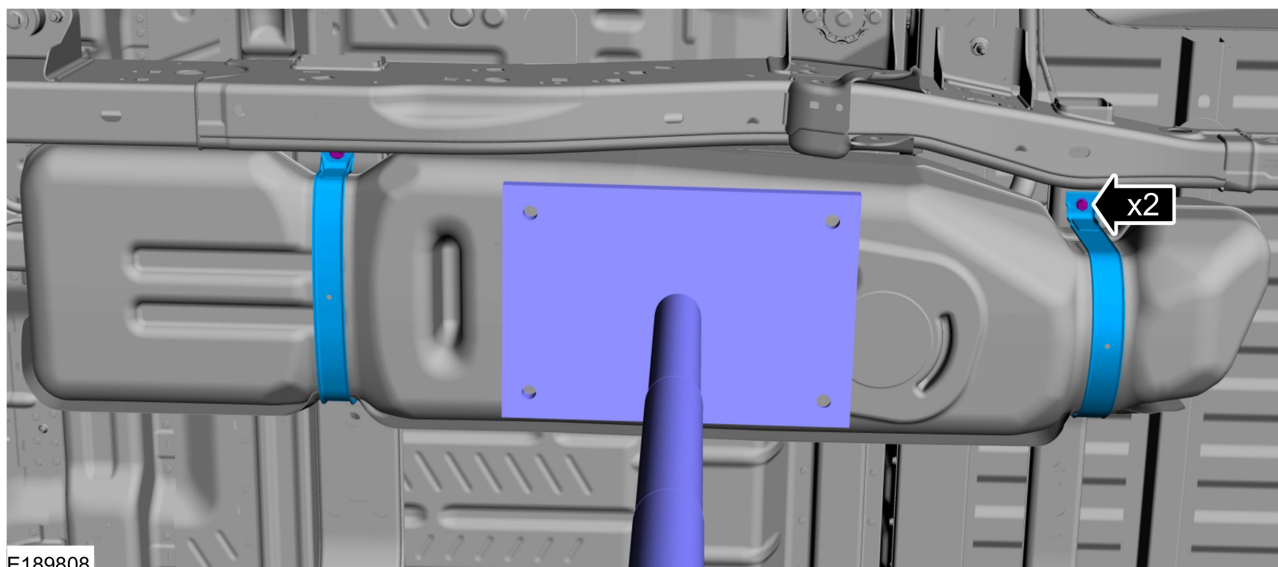


13. Remove the clamp and position aside the fuel filler pipe.

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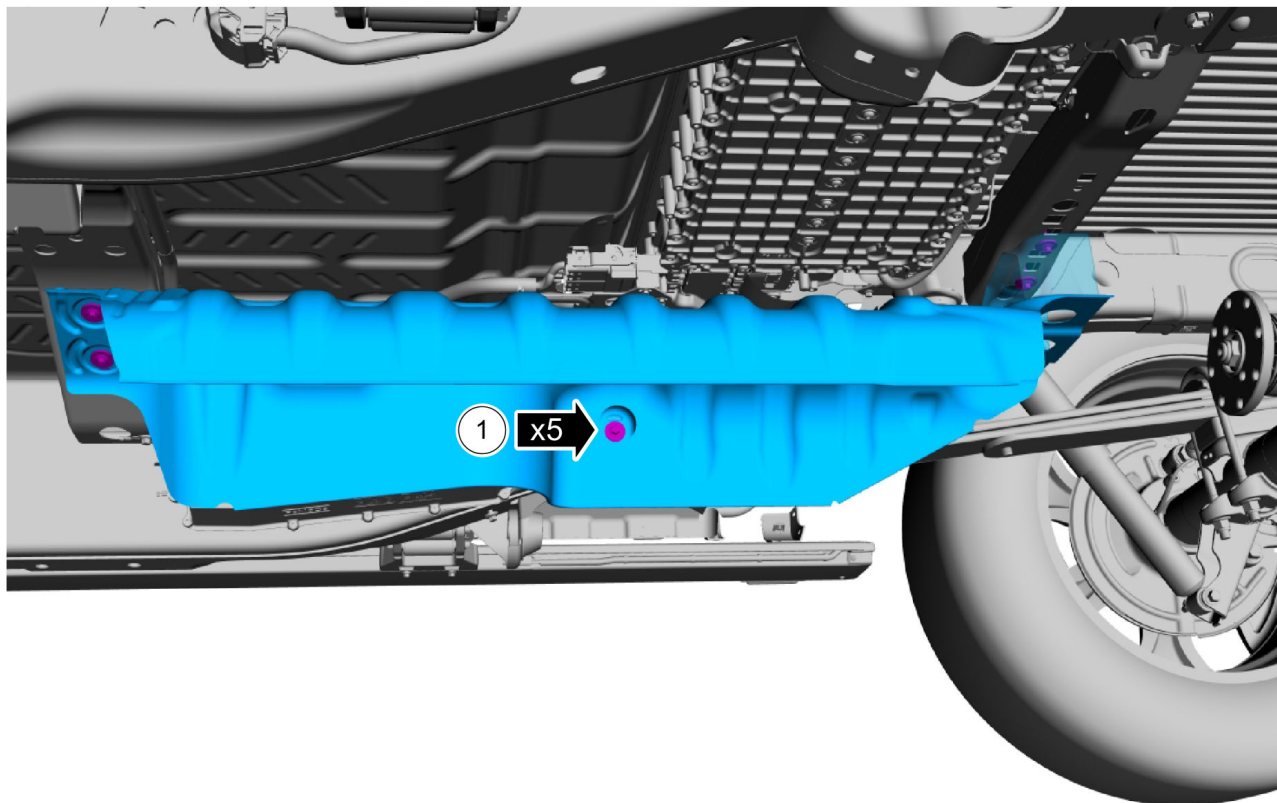


14. Using a powertrain lift, support the fuel tank.
15. Remove the bolts and position aside the fuel tanks straps and remove the fuel tank.



16. Remove the bolts and the exhaust heat shield.

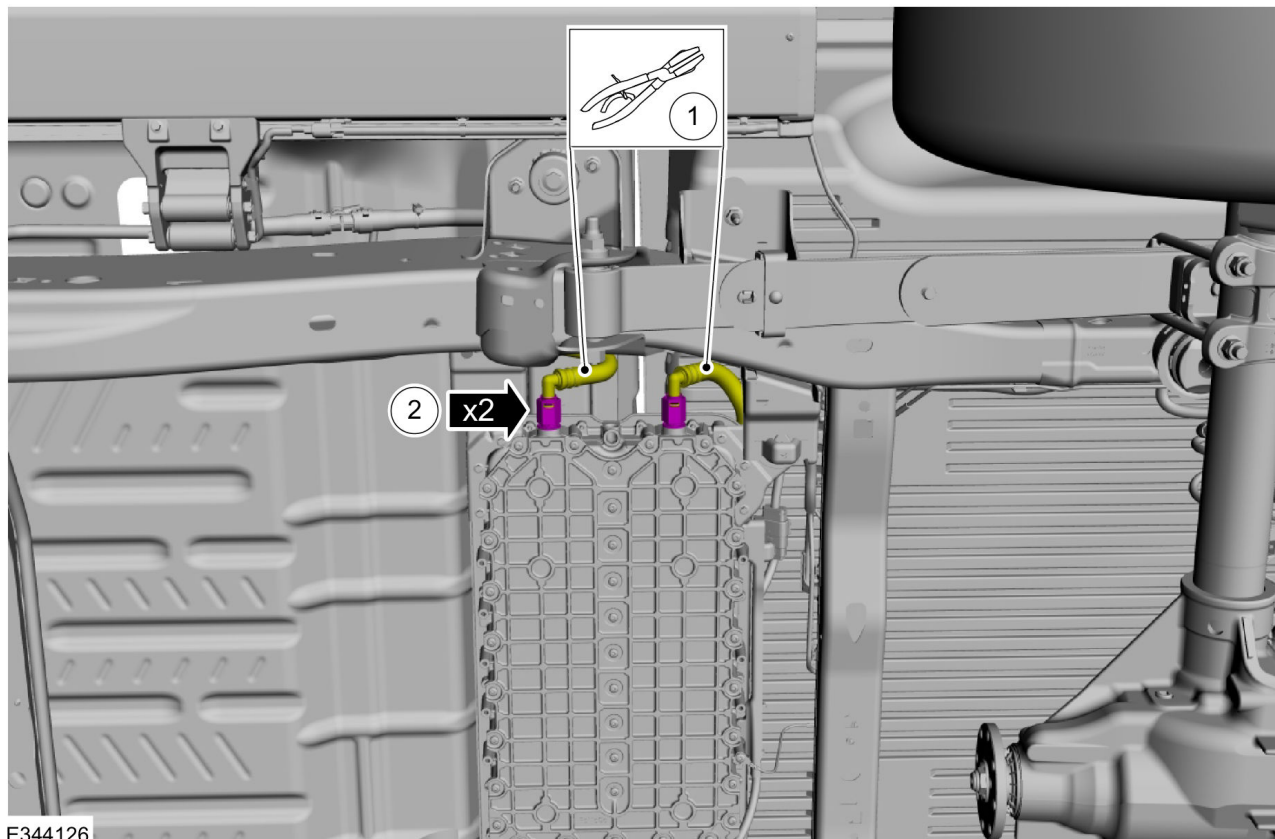
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17. Clamp the high voltage battery coolant hoses. Use the General Equipment: Hose Clamp(s) then disconnect the coolant hoses from the high voltage battery.

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**NOTICE:**

Before disconnecting the high voltage battery electrical connector, the electrical connector must be cleaned with and a nylon brush and free of debris. Blow any dirt or debris from the electrical connector with compressed air before disconnecting or component damage may occur.

NOTE:

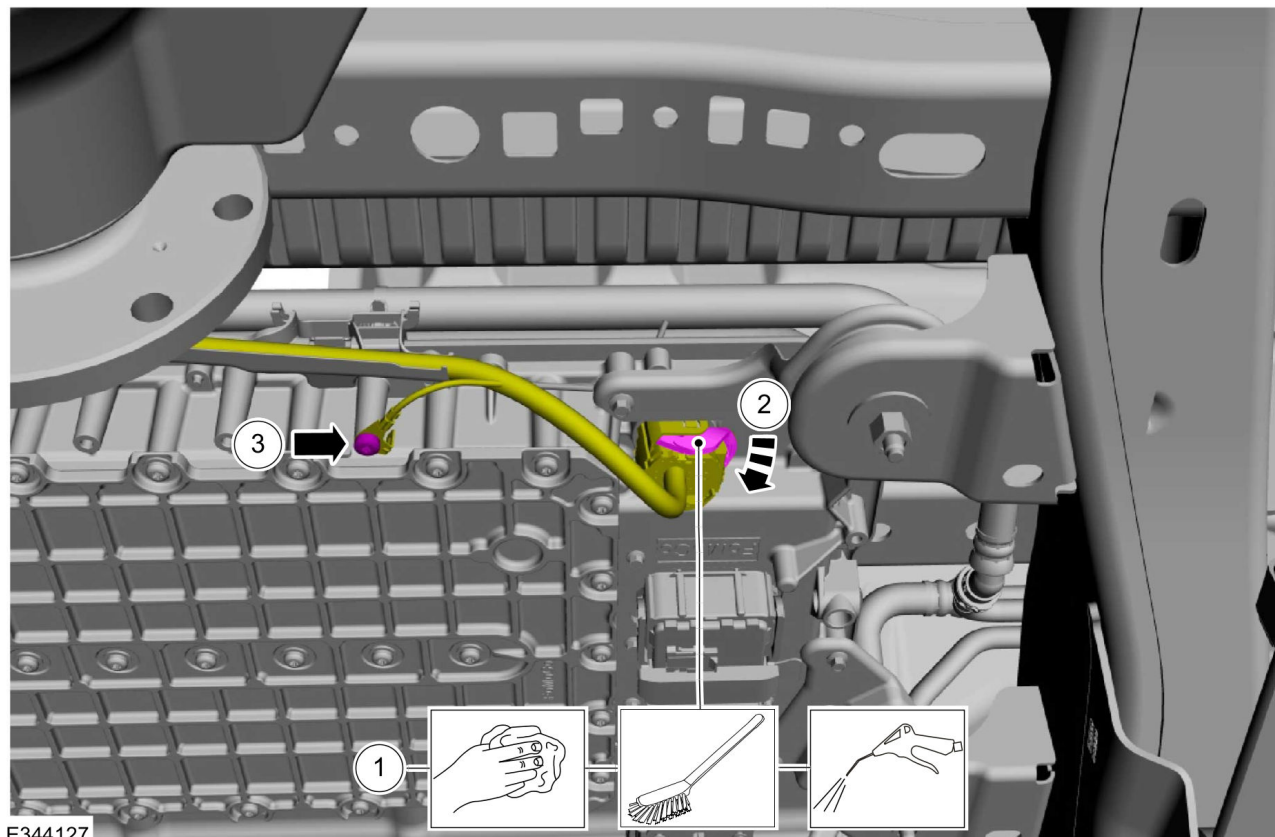
To aid in disconnecting the high voltage battery electrical connector, gently pull the base of the connector while releasing the lock lever.

NOTE:

To aid in disconnecting the high voltage battery electrical connector, gently pull the base of the connector while releasing the lock lever.

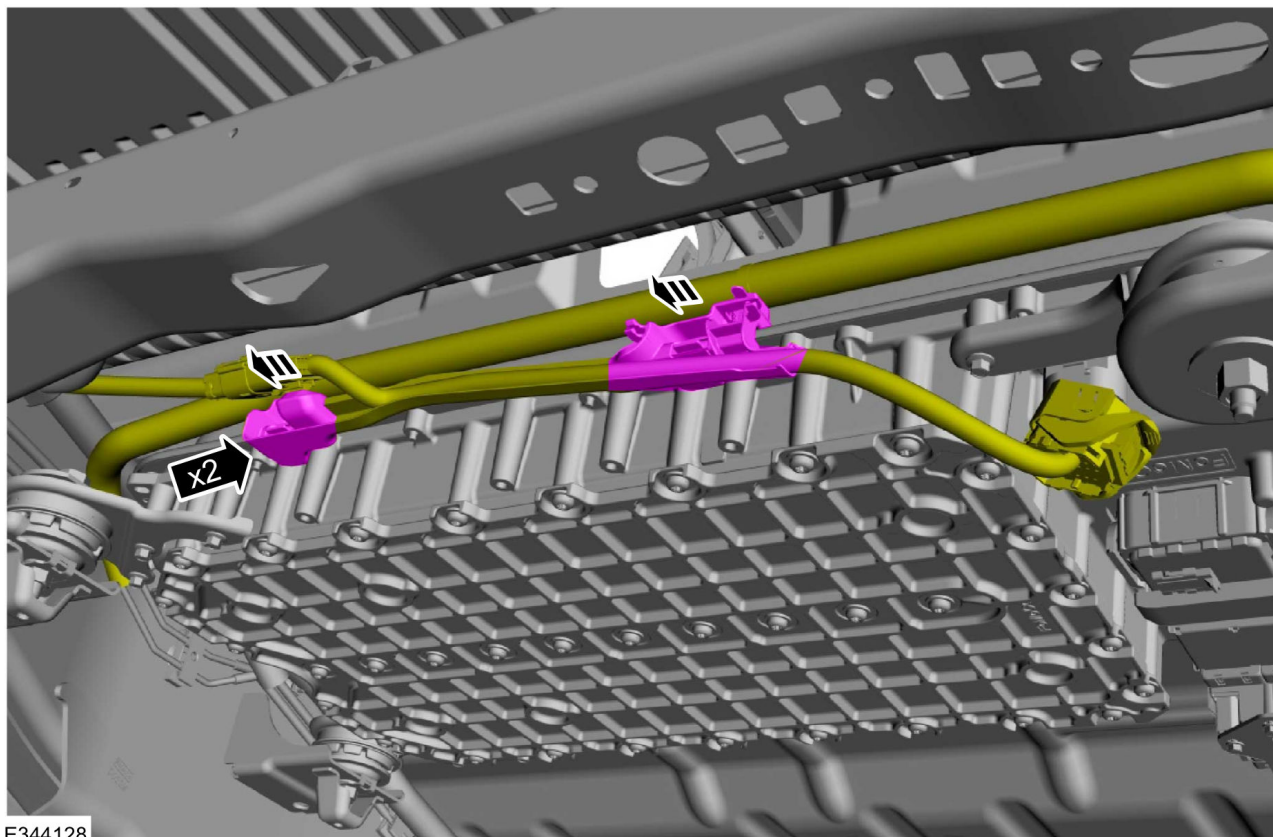
18. Clean the high voltage battery electrical connector with a nylon brush. Blow any dirt or debris from the electrical connector with compressed air. Release the lock lever and disconnect the high voltage battery electrical connector. Remove the ground terminal bolt from the high voltage battery.

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19. Release the retainers and position the wire harness and coolant hose aside.

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NOTICE:

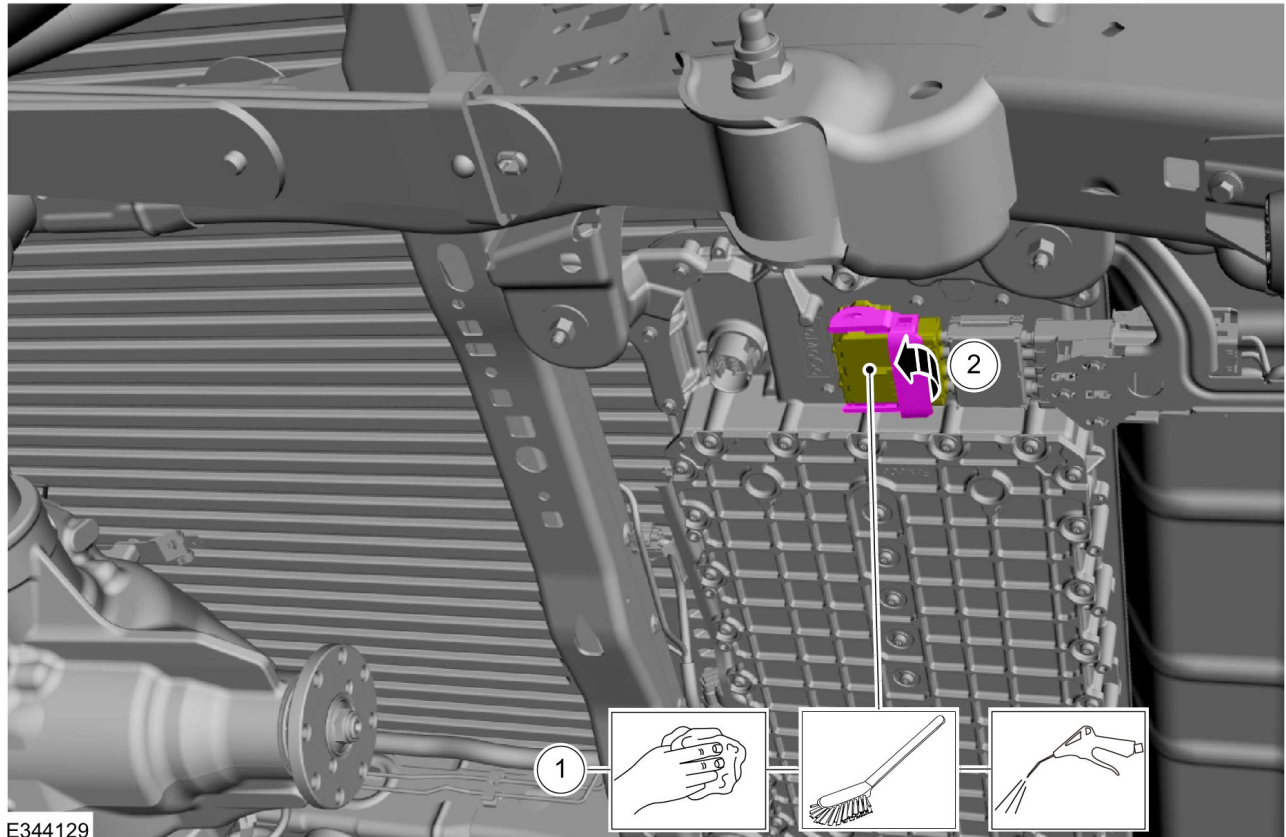
Before disconnecting the high voltage battery electrical connector, the electrical connector must be cleaned with and a nylon brush and free of debris. Blow any dirt or debris from the electrical connector with compressed air before disconnecting or component damage may occur.

NOTE:

To aid in disconnecting the high voltage battery electrical connector, gently pull the base of the connector while releasing the lock lever.

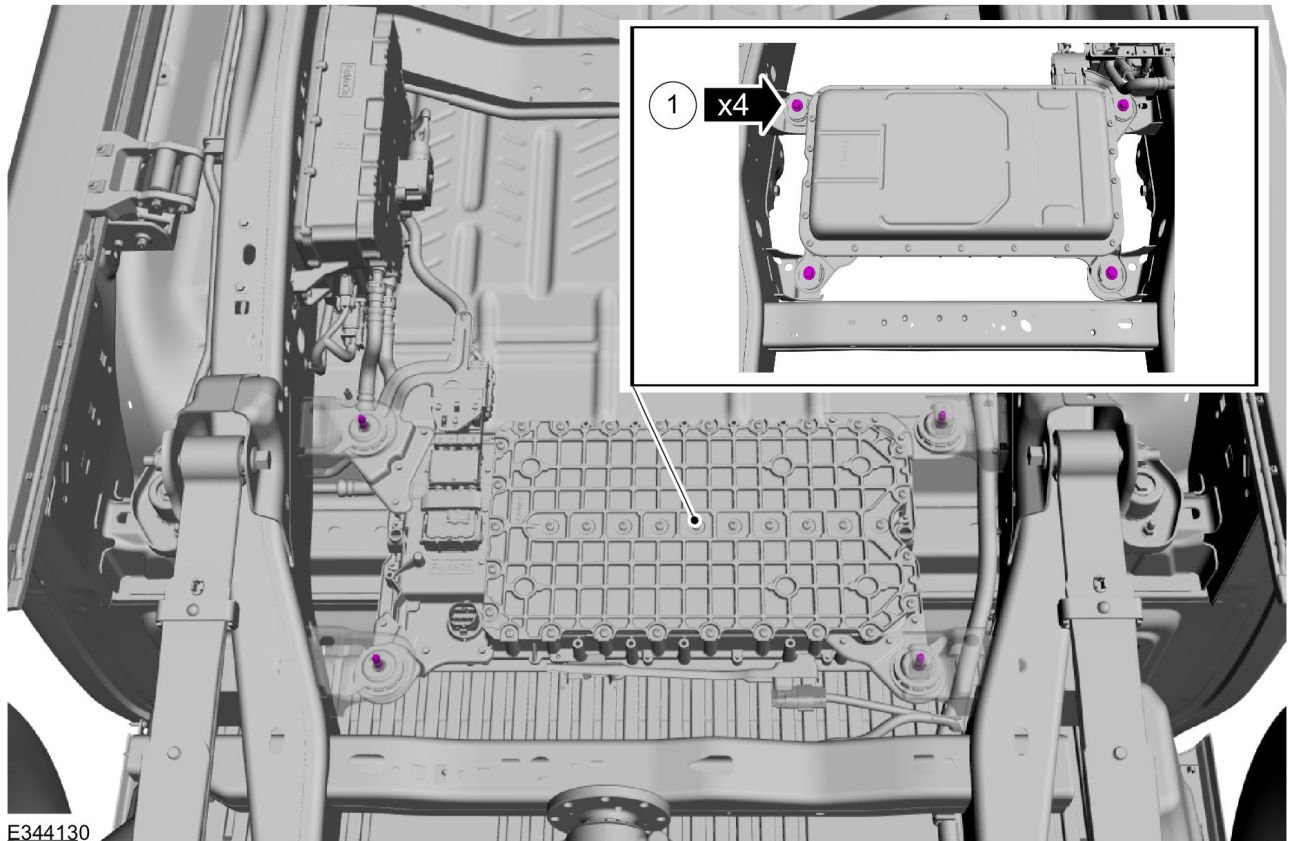
20. Clean the high voltage battery electrical connector with a nylon brush. Blow any dirt or debris from the electrical connector with compressed air. Release the lock lever and disconnect the high voltage battery electrical connector.

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21. Remove the high voltage battery mounting bolts.

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**NOTICE:**

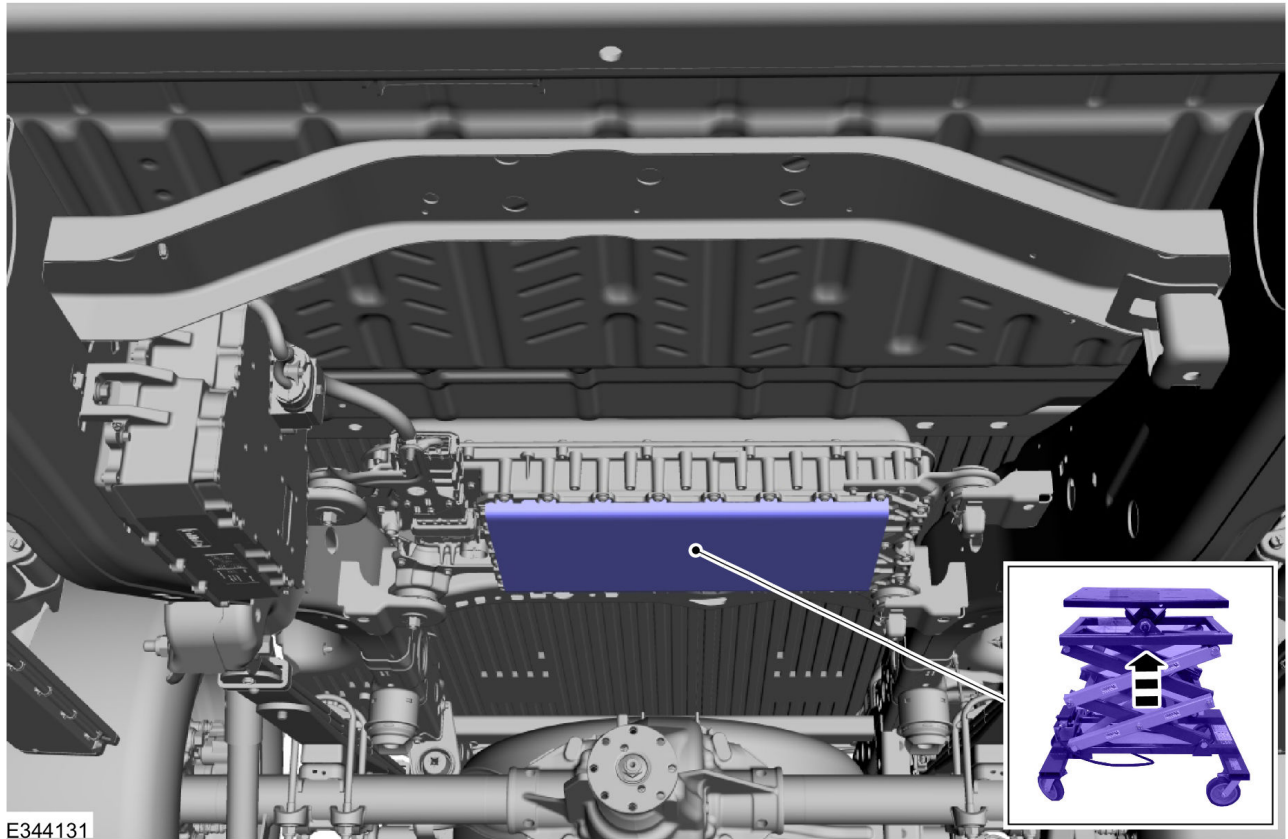
Only apply enough pressure from the powertrain jack to contact and support the high voltage battery during the removal. Excessive pressure placed under the high voltage battery may cause damage to the high voltage battery.

NOTE:

A powertrain jack with a nonslip mat must be used to prevent movement of the high voltage battery.

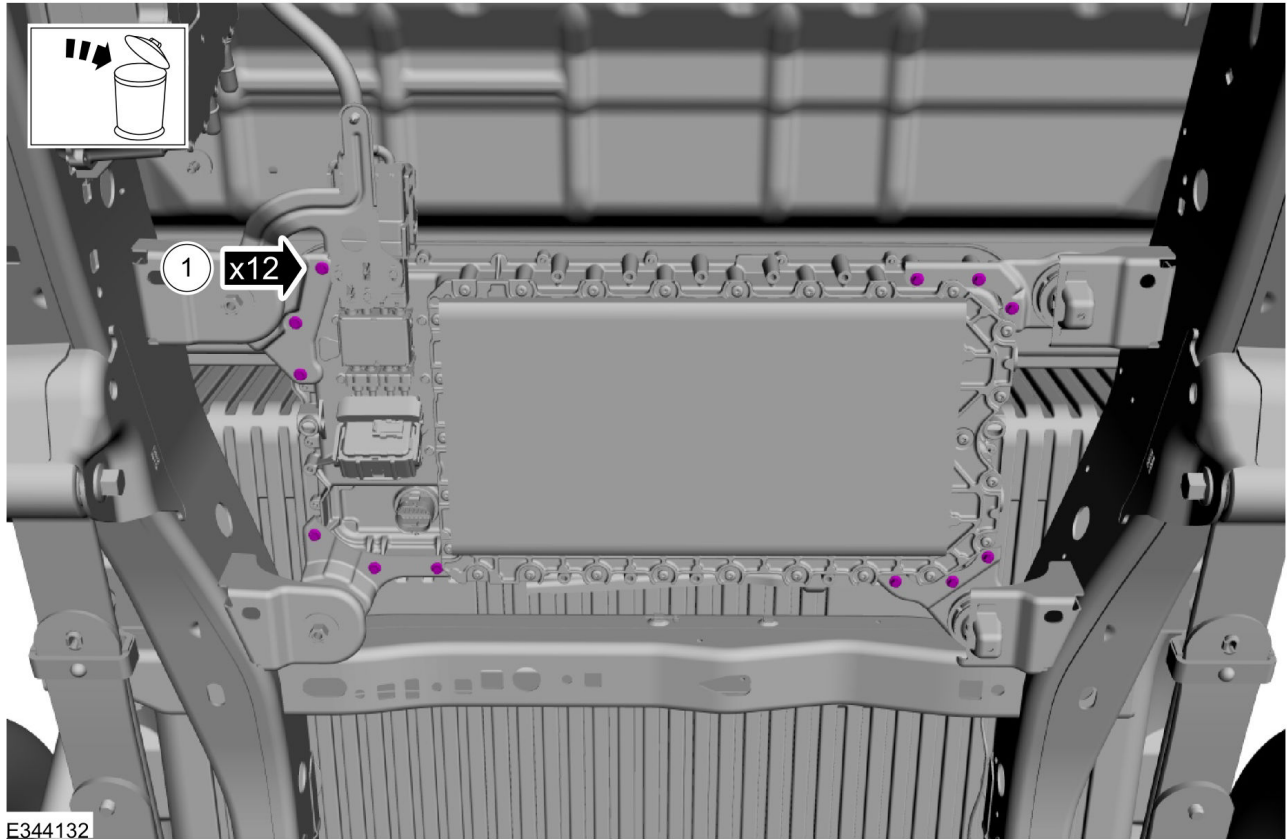
22. Position a powertrain jack with a nonslip mat below the high voltage battery. Use the General Equipment: Powertrain Jack.

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23. Remove and discard the high voltage battery mounting bracket bolts.

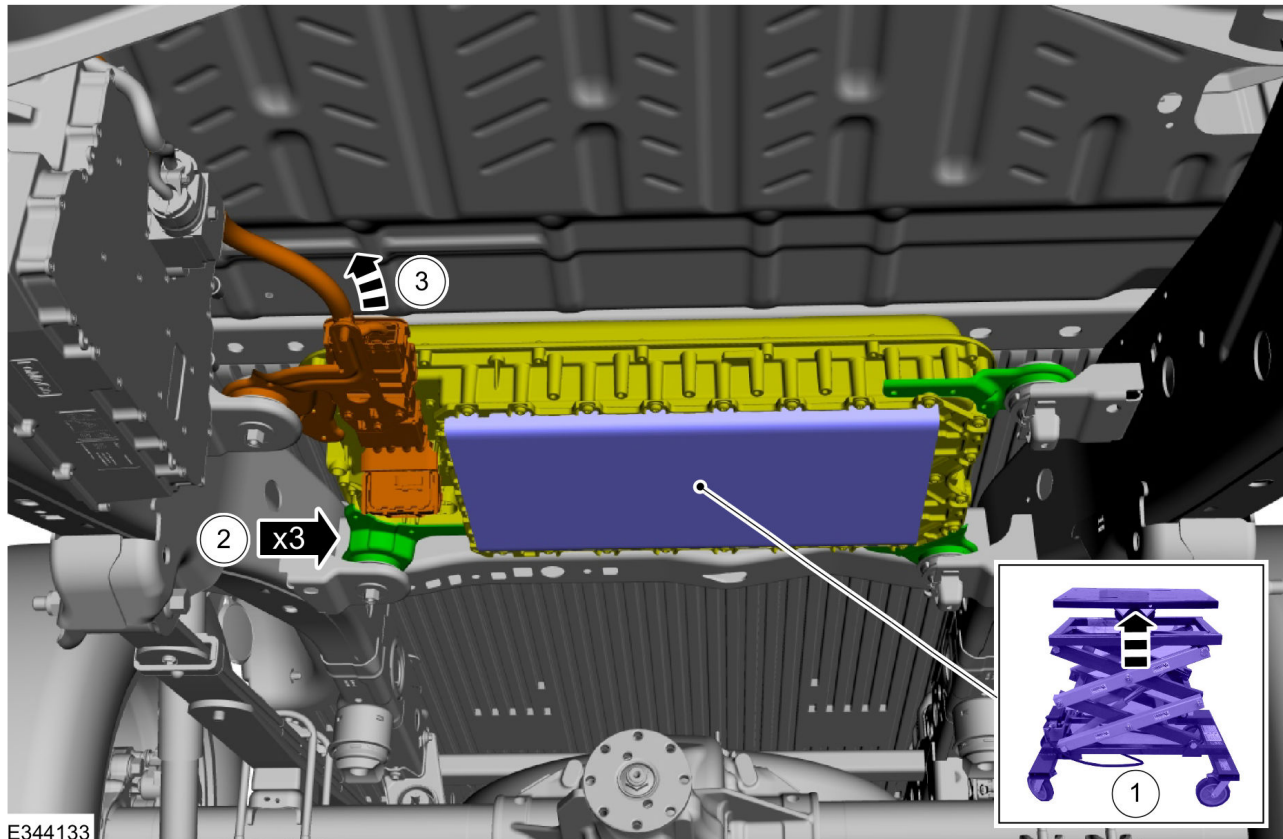
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**NOTICE:**

Only raise the powertrain jack enough to remove the high voltage battery mounting brackets. Excessive lifting of the high voltage battery may cause damage to the high voltage battery.

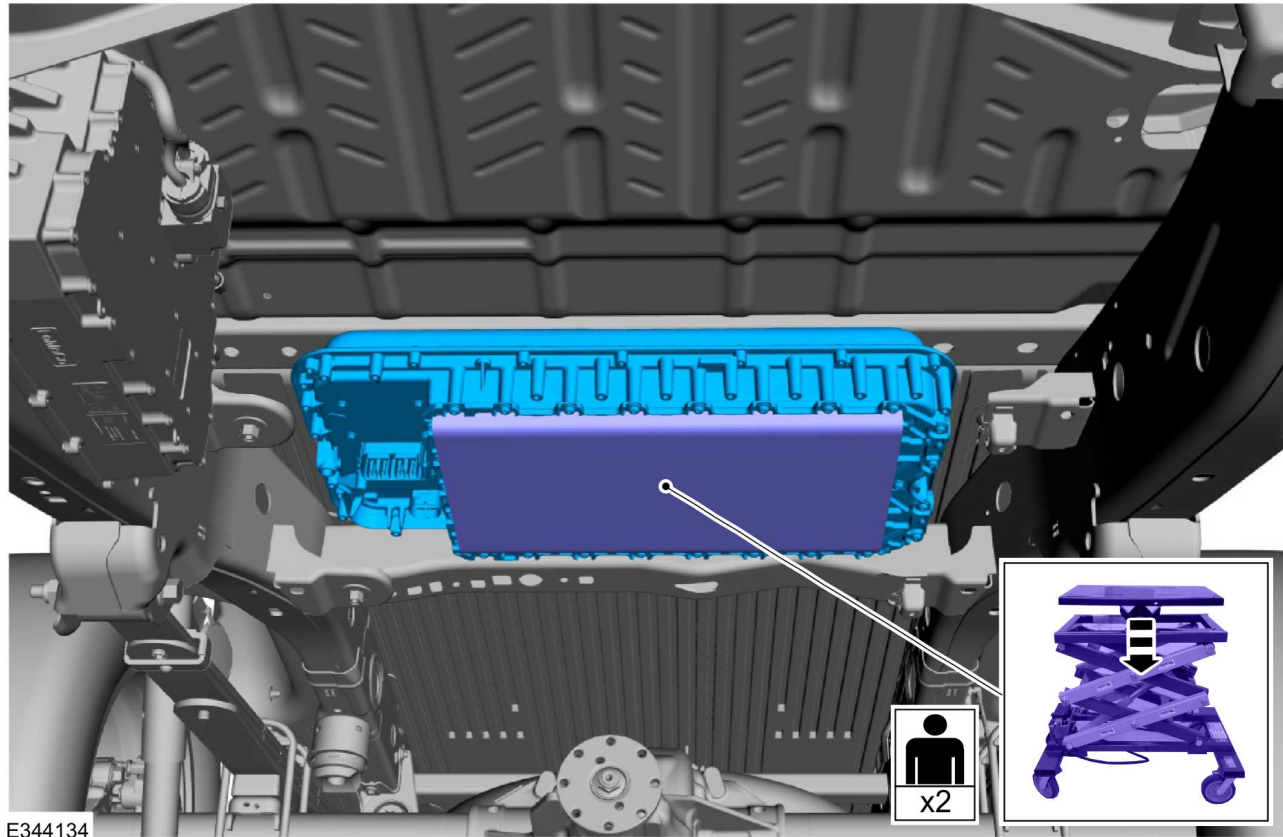
24. Using the powertrain jack, raise the high voltage battery. Remove the high voltage battery mounting brackets. Position the high voltage battery mounting bracket and wire harness aside.

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25. With the aid of an assistant, remove the high voltage battery.

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SPECIAL NOTE TO DISMANTLERS AND SALVAGE YARDS

If a vehicle with a high voltage battery is to be scrapped, the high voltage battery must be disposed of following all local, state/provincial and federal guidelines.

The vehicle's Lithium-Ion High Voltage Battery pack (Li-Ion HVB) is fully recyclable and should be shipped to a permitted recycling facility. The guidelines below are for Li-Ion HVBs which have been removed from the vehicle and discharged.

General Packaging, Transport, and Recycling Guidelines

Once the battery has been removed from the vehicle and discharged:

- Store the battery components in a building or under shelter so that batteries are kept dry and not exposed to high temperatures.
- Protect battery components from damage (e.g. crushed or punctured).
- It is recommended to ask about the specific packaging requirements for battery shipments to the recycler who will be receiving the battery components in order to avoid inappropriate repacking/stacking of the batteries.
- Batteries should be sorted by type. Keep lead acid batteries, NiMH batteries, and Li-Ion batteries separated from each other (e.g. separate pallets or storage locations).
- Make sure the battery recycler is aware of the battery type. Li-ion batteries cannot be recycled in the same manner as lead acid or NiMH batteries.

Though Ford Motor Company makes no representations or endorsements, there are companies that have the capability to accept, consolidate and recycle undamaged Li-Ion HVBs, and a few are listed below. Contact the appropriate battery manufacturer for additional information.

North America Battery Recyclers

Once the battery has been removed from the vehicle and discharged:

Kinsbury Brothers, Inc. 1125 Beacon Street Brea, CA 92801: Phone: (800) 502-9258

Retriev Technologies, Inc. 265 Quarry Rd SE Lancaster, OH 43130: Phone: (740) 653-6290

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Applicable Laws/Regulations

The following is a general explanation of certain applicable laws; however, these laws change from time to time, additional regulations are under development and Ford Motor Company makes no representation that this is a complete summary.

Packaging and Transport

Packaging and Transport The U.S. Department of Transportation (DOT) outlines packaging and shipping requirements for Li-Ion batteries. Certain exceptions on packaging and transportation regulations for large format Li-Ion batteries may be found in 49CFR 173.185 (d) and (f). Make sure that the shipping paperwork is filled out correctly and that the shipment is properly labeled per federal, state, and local laws and regulations. Ensure that you are complying with any record keeping requirements. Generally, under U.S. DOT regulations, Li-Ion batteries are considered a dangerous good and regulated as hazardous materials when transported. Li-Ion batteries are classified as Class 9 hazardous material. Only certified hazardous material shippers should offer transport of a hazardous material. Batteries for recycling should be shipped by ground or vessel only. Do not ship batteries for recycling by air.

NOTE:

A damaged battery (one that is leaking electrolyte from the battery pack) might need to be shipped as a hazardous waste. If you are transporting a damaged battery, utilize a company that specializes in hazardous waste transport and management. Ensure that you comply with all applicable hazardous waste management laws and regulations.

Recycling

40 CFR 261 states that manufactured articles that yield extracts which exceed one or more of the concentration limits of regulated listed constituents, or meets the definition of ignitability, corrosivity or reactivity are defined as hazardous wastes and must be disposed of in accordance with federal and state regulations. Since there are many variations in the specific chemistry of Li-Ion batteries, additional classifications may be necessary to determine if the battery is a hazardous waste. It is the responsibility of the generator to make this determination. Generally, under federal and state law, sealed, Li-Ion batteries may be considered dry cell batteries and therefore may be managed as a universal waste; damaged or leaking Li-Ion batteries may be regulated as hazardous waste under federal and state regulations.