balance™ hybrid electric vehicle

EMERGENCY RESPONSE GUIDE

2008-2011.5 E-450

Introduction

The emergency response procedures for the Balance Hybrid E450 vehicle are similar to those for traditional gasoline-powered vehicles with the addition of special considerations for the high-voltage electric system components.

The Balance Hybrid E450 vehicle uses a conventional gasoline engine in addition to an electric motor to power the vehicle. The energy used to power the vehicle comes from gasoline (used by the internal combustion engine) and electricity (used by the electric motor).

- Gasoline is stored in a traditional fuel tank.
- Electricity is stored in a high-voltage battery pack.

The combination of a gasoline engine and electric motor provides for reduced emissions and improved fuel economy. The high-voltage system is self contained, never needing to be plugged into an electrical outlet for recharging. The system incorporates a generator that recharges the batteries during cruising and braking.

The information in this guide will allow response to emergencies involving Balance Hybrid E450 vehicles.

The Balance E450 vehicles have been designed with many safety features for your protection. These features help provide safe access to the vehicle under various conditions. However, whenever approaching a high voltage vehicle in a fire, rescue or recovery situation, always follow one industry standard rule:

ALWAYS ASSUME THE VEHICLE'S

HIGH-VOLTAGE SYSTEM IS POWERED UP !

Hybrid Vehicle Identification

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Balance Hybrid vehicles may be identified by the Azure Dynamics “Balance Hybrid Electric” badges located near the front fenders.

Hybrid Nameplate with "Balance Hybrid Electric" badges located near the front fenders

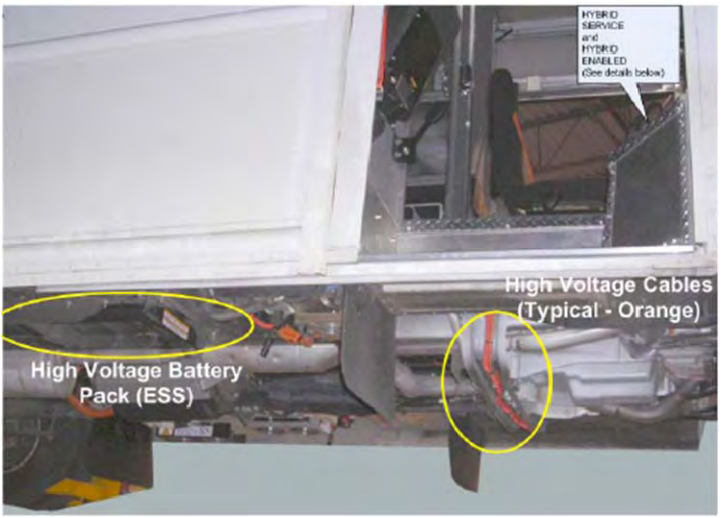
Hybrid Vehicle Identification

Balance Hybrid vehicles have unique hybrid indicators located to the right of the steering column.

Further verification of the Hybrid Electric Vehicle can be made by:

The orange colored cable and looming that are used for high voltage. They are visible under the vehicle and in the engine compartment.

- The presence of a high voltage battery pack mounted on the frame rail at the middle of the vehicle on the passenger side.



There are NO alphanumeric numbers in the vehicle identification number (VIN) that will classify this vehicle as a hybrid electric vehicle.

High Voltage & Fuel Disconnects

The following list indicates some of the safeguards incorporated in the design of the Hybrid vehicle to shut off the high voltage in the event of an accident.

WARNING

Various components in the hybrid system contain capacitors that can store high voltage charges for several minutes after High Voltage ESS is disconnected.

Ignition Key in OFF Position	Any time the ignition lock cylinder is in the OFF position, the high-voltage system is disabled.
Inertia Switch – High-Voltage Shut-Off	The high-voltage shut-off switch is located behind the passenger side kick panel. In the event of a collision or a substantial physical jolt, the switch is designed to open automatically, disabling the high-voltage system.
High-Voltage Fuse	In the event of a high-current short circuit, the high-voltage fuse will open, disabling the high-voltage system
High-Voltage Interlock Circuit	Whenever a high-voltage access point is disconnected, the high-voltage interlock circuit opens and disables the high-voltage system.
High-Voltage Service Disconnect Switch	Whenever the high-voltage service disconnect (located in the front of high-voltage battery) is removed, the high-voltage system is disabled. This step requires the use of tools
Thermal Sensors	If the vehicle's ignition key is left on, and the high voltage battery temperature exceeds 75°C (167°F), the thermal sensors will disconnect the high voltage battery. If key is off, the high voltage will already be off.
Fuel Pump Shut-Off	The fuel pump shut-off switch is normally closed to allow vehicle operation. In the event of a collision or a substantial physical jolt, the switch is designed to open automatically, shutting off electrical power to the fuel pump.

Electric Vehicle Identification

WARNING	
	**Follow existing training & directions from personnel in charge at the scene (e.g. the Incident Commander)** **For maximum safety, do not approach or attempt to handle a damaged hybrid electric vehicle unless you have been properly trained.** **At a minimum, the Recommended Equipment and Safety Precautions sections below should be followed.**

Recommended Equipment

- Class ABC fire extinguisher
- High voltage gloves, face shield, insulated boots, protective raincoat or apron
- A non-conductive object that is about 1.5 metres (5 feet) long that can be used to safely push someone away from the vehicle in the event that they come in contact with high voltage.

Safety Precautions

- Always approach a hybrid vehicle as if there is high voltage present.
- Remove all jewelry, watches, necklaces, earrings etc. since metal objects conduct electricity.
- If the vehicle is on fire, use Class ABC powder type extinguisher to contain and smother the flames, or if water is being used, use large amounts (i.e. from a fire hydrant).
- Make sure you are wearing insulated high voltage gloves and other protective clothing.
- Do not touch any broken or damaged orange cables.
- Always treat severed or damaged cables as if they contain high voltage.
- If the vehicle is submerged in water – do not touch any high voltage components or cables while extricating the occupant.

Disconnecting High Voltage

WARNING

If the high voltage battery was damaged physically or electrically during an accident, there is a possibility that high voltage may still be present on the orange cables even after the 12 Volt batteries have been disconnected. Always follow high voltage training.

Engine Operation

Until the vehicle is shut down, the engine may start or accessory drive belt may operate without engine running. Secure the vehicle and disconnect the batteries to prevent engine start or accessory belt operation.

12V Battery

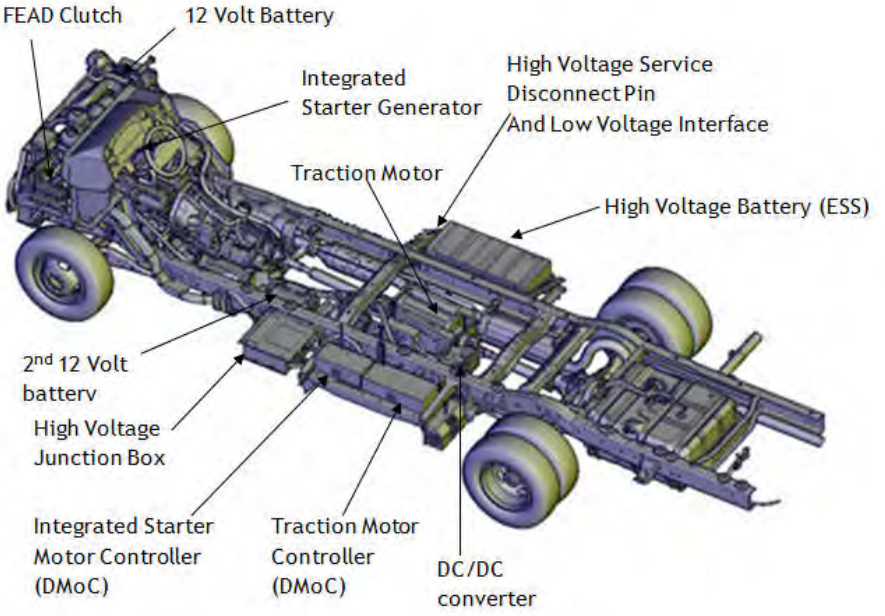
The 12 volt battery is located in the engine compartment on the passenger side. In the event of an accident, turn off the ignition and remove the ignition key. Then remove all of the negative cables from the 12 volt battery. This will disable the high voltage and low voltage systems (Single Battery option).

Azure also offers an option for a second 12 volt battery to accommodate increased 12 volt demands by some applications. This auxiliary battery will be mounted in-board of the frame rails. The second 12 volt battery is connected in parallel with the Ford original equipment battery and must also be disconnected to completely disable the 12 volt electrical system.

To disable the dual battery 12V system, first remove the negative battery terminal from the Ford original equipment battery located under the hood. Then remove the negative terminal of the second 12V battery located in-board of the frame rails.
Note that if the positive terminal of either of the 12 volt batteries is disconnected while the 2nd battery is still connected, the positive terminal must be electrically isolated from the chassis ground until the 2nd battery is disconnected. Failure to do so could result in vehicle damage.

High Voltage Components

High Voltage Components—Strip Chassis or Step Van –2011 *



In the unlikely event that the battery pack is overcharged, or if it is exposed to extreme heat, the battery may vent corrosive gases (hydrofluoric acid and hydrogen fluoride) outside of the battery pack through a vent on the bottom of the battery pack. The battery pack is designed to be completely waterproof.

The high voltage battery pack is a liquid cooled single unit that is housed in a vented steel case. The 2008 to 2010 Balance Hybrid may have two different types of batteries installed.

A nickel-metal hydride (NiMH) high voltage battery pack consists of 24 sealed battery modules. Each module contains 10 nickel-metal hydride (NiMH) 1.2 Volt DC battery cells. The total battery pack voltage is approximately 288 Volts DC, however can be as high as 400 Volts DC depending on its state of charge.

The active material for the negative electrode in NiMH batteries is a metal hydride. In the unlikely event that the battery pack is overcharged, or if it is exposed to extreme heat, the modules can vent flammable and corrosive gases (hydrogen and potassium hydroxide) outside of the battery pack through a vent hose and a check valve at the rear of the battery pack.

High Voltage Components

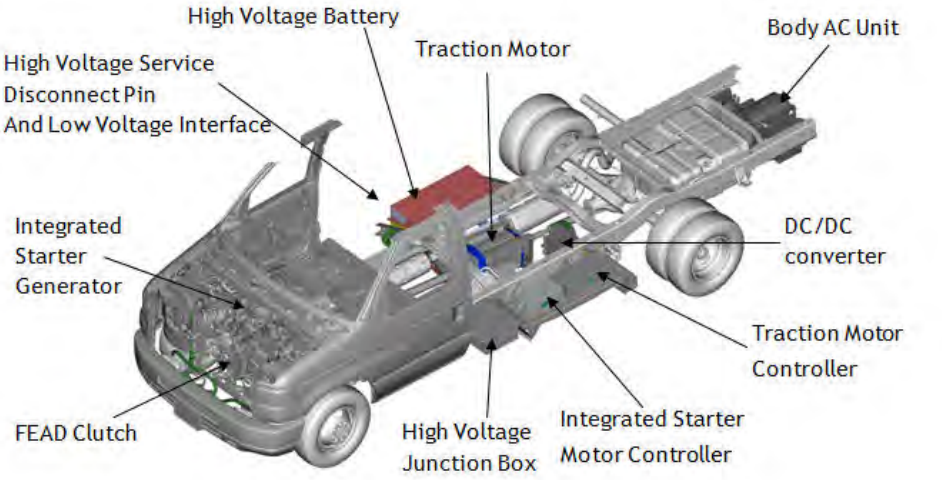
The battery pack is designed to be completely waterproof.

The liquid electrolyte (potassium hydroxide) in the battery pack is normally absorbed by the battery cell plates and will not leak under most conditions.

However, if the battery pack is crushed, it is possible for a small amount of electrolyte to leak.

The second type of battery is a lithium-ion battery which has 96 cells and the total battery pack voltage is approximately 345 volts DC, but can be as high as 394 volts DC.

High Voltage Components—Cutaway Chassis or Shuttle Bus—2011*

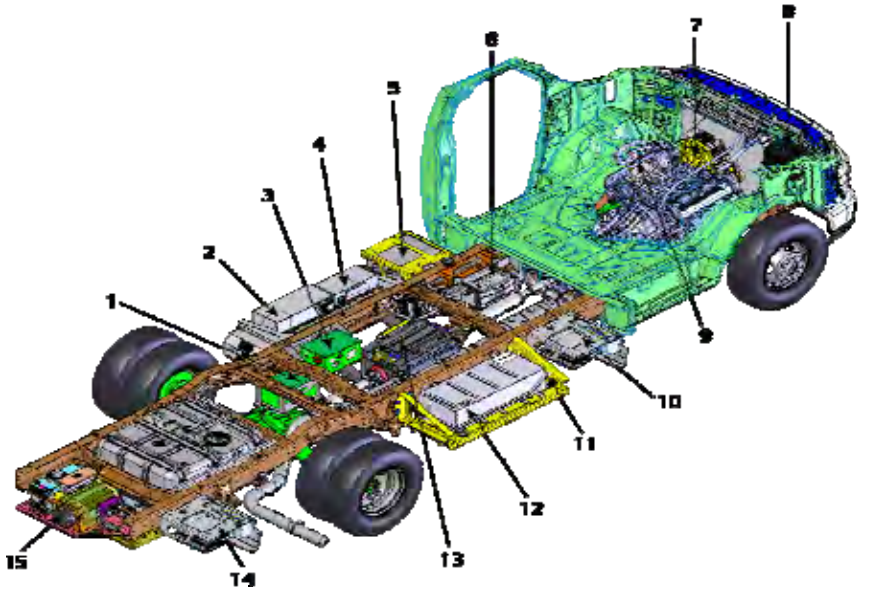


*** Prior model year High Voltage component configurations on pages 10 & 11.**

WARNING	
	**The electrical system in this vehicle is capable of producing lethal voltage levels. High Voltage Cabling is identified by orange cable or orange loom.**

High Voltage Components

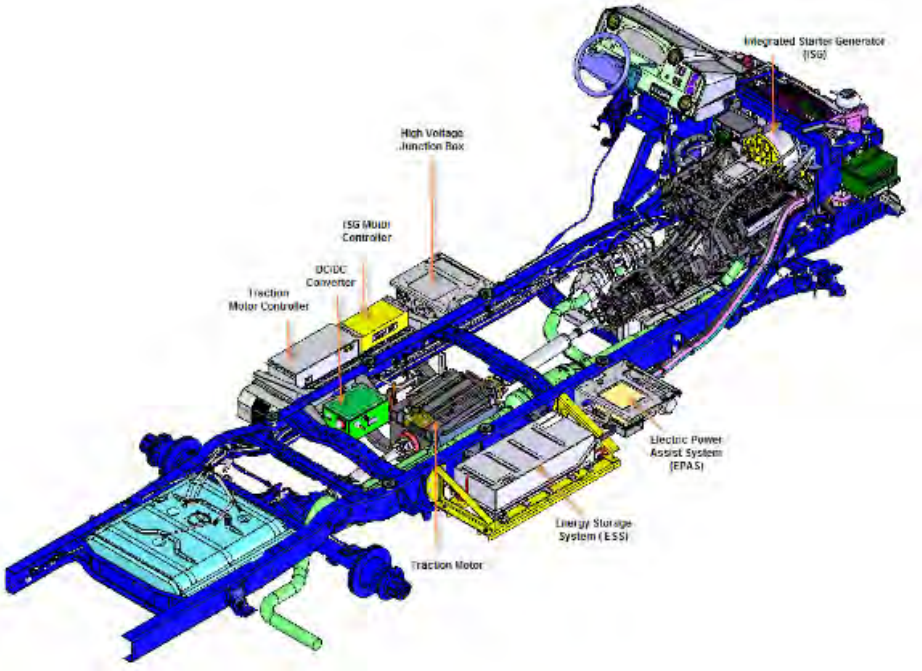
High Voltage Components—Shuttle Bus – 2008-2010.5



1. 2nd, DC/DC Converter (optional for all variants)
2. Traction Motor Controller
3. DC/DC Converter
4. Integrated Starter Generator Motor Controller
5. High Voltage Junction Box
6. 2nd, 12 Volt Battery (optional for all variants)
7. Integrated Starter Generator (ISG)
8. 12 Volt Battery
9. Vehicle Control Unit (VCU)
10. Electric Power Assist System Motor & Motor Controller (Non-Shuttle Bus Location)
11. High Voltage Service Disconnect Pin & Low Voltage Interface
12. Energy Storage System (ESS): High Voltage Battery Pack
13. Traction Motor
14. Electric Power Assist System Motor & Motor Controller (Shuttle Bus Location)
15. Electric Air Conditioning Unit (Shuttle Bus Only)

High Voltage Components

High Voltage Components—Strip Chassis or Step Van – 2008-2010.5



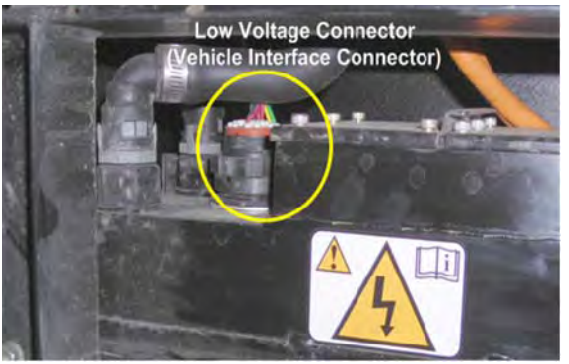
High Voltage Components

WARNING	
	**If the high voltage battery was damaged physically or electrically during an accident, there is a possibility that high voltage may still be present on the orange cables even after the 12 volt battery is disconnected. Always follow high voltage training.**

Securing A Damaged Vehicle

Disable the vehicle and its high voltage electrical system by performing as many of these steps as possible:

- Put the shift lever into Park.
- **Remove the ignition key. Removing the ignition key or turning it to the OFF position will disconnect the high voltage system unless the high voltage battery is damaged.**
- Block the wheels if necessary.
- Disconnect the negative cable (black) from the 12 Volt battery. It is located in the engine compartment on the passenger side. This will also disconnect the high voltage battery. The negative cable must be disconnected from the 2nd 12 volt battery, located inside the frame rails. (if installed)
- Disconnect the low voltage connector (also referred to as the Vehicle Interface Connector) from front of the battery pack. Turn counter -clockwise (¼ turn) and pull it out.



This view is from underneath the front edge of the high voltage battery pack.

High Voltage Battery

For the 2011 Balance the harness may be cut at the label located at the front of the High Voltage Battery.

Damaged Battery

The batteries contain chemicals which can cause burns and other serious injuries. If contact with battery electrolyte occurs, follow the suggestions below, to minimize the chance of injury:

- Flush eyes immediately with cold running water for at least 15 minutes if contact occurs.
- Rinse skin immediately with water for at least 15 minutes.
- Remove and dispose clothing if soiled.
- Seek medical attention immediately.

Personal protective equipment (PPE) such as a splash shield or safety goggles, gloves (latex, rubber or Nitrile), an apron or overcoat and rubber boots are required when handling damaged batteries.

Fold-down helmet shields are not acceptable for acid or alkaline spills.

The liquid electrolyte in the battery pack is normally absorbed by the battery cell plates and will not leak under most conditions. However, if the battery pack is crushed, it is possible for a small amount (drops/mist) of electrolyte to leak.

Potential Hazards / Public Safety

Towing

Follow the towing procedure for a conventional gasoline-powered vehicle.

WARNING	
	**Never chain or strap vehicle to or across any high voltage components or orange cables.**

Battery Pack Disposal

The high voltage battery pack is recyclable. Dispose the battery according to the applicable federal, provincial, state, and local regulations.

WARNING	
	**Do not disassemble or incinerate the high voltage battery pack. Improper disposal methods can lead to injury.**

Special Post Crash Safety Considerations

- **Emergency responders should check a vehicle for markings or other indications that it is electric-powered. If it is, they should exercise caution, per published guidelines, to avoid any possible electrical shock and should disconnect the battery from the vehicle circuits if possible.**
- **Emergency responders should also use copious amounts of water if fire is present or suspected and, keeping in mind that fire can occur for a considerable period after a crash, should proceed accordingly.**
- **Operators of tow trucks and vehicle storage facilities should ensure the damaged vehicle is kept in an open area instead of inside a garage or other enclosed building.**
- **Rather than attempt to discharge a propulsion battery, an emergency responder, tow truck operator, or storage facility manager should contact experts at the vehicle's manufacturer on that subject.**
- **Vehicle owners should not store a severely damaged vehicle in a garage or near other vehicles.**

transit /tourneo connect electric

EMERGENCY RESPONSE GUIDE

Introduction

The emergency response procedures for the Transit / Tourneo Connect Electric vehicles are similar to those for traditional gasoline or diesel-powered vehicles with the addition of special considerations for the high-voltage electric system components.

The vehicle uses a high voltage electric motor to power the vehicle. The energy used to power the vehicle comes from an on-board high voltage battery pack. There is no internal combustion engine or fuel tank.

The high-voltage system is charged by plugging the vehicle into the electrical grid to obtain either 110V or 220-240V AC current.

The information in this guide will allow response to emergencies involving these vehicles to be as safe as with conventional vehicles.

These vehicles have been designed with many safety features for your protection.

These features help provide safe access to the vehicle under various conditions. However, when approaching a high-voltage vehicle in a fire, rescue or recovery situation, always follow one industry standard rule:

ALWAYS ASSUME THE VEHICLE'S

HIGH-VOLTAGE SYSTEM IS POWERED UP !

Electric Vehicle Identification

A unique badge is installed on the right, rear door to distinguish the Transit Connect Electric from the non-electric models.

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Identification can also be quickly made with reference to the additional items on this and following pages.

Under the hood there are high voltage components instead of an internal combustion engine.

Electric Vehicle Identification

Orange cabling is found under the hood and underneath the vehicle to identify those wires carrying high voltage.

On the Right side of the vehicle – in the area normally occupied by the fuel cap – is the charge port.

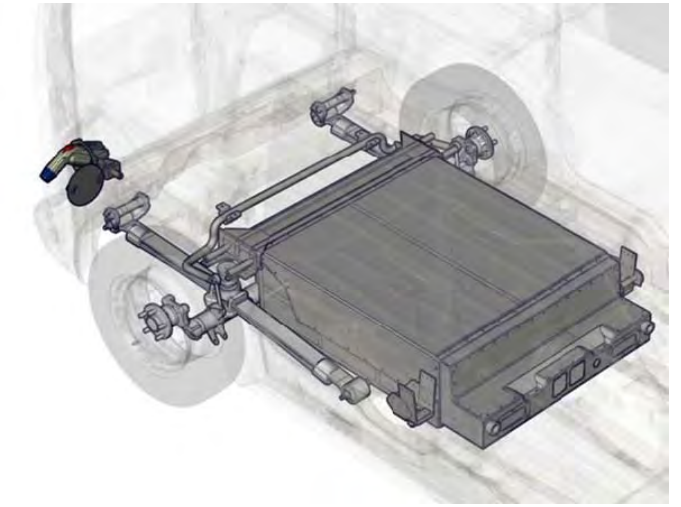
Electric Vehicle Identification

The instrument cluster in the dash has unique markings.

A Vehicle Range Meter is found on the left side – in place of the tachometer. This indicates approximate vehicle range remaining from the high voltage charge.

A Vehicle State Of Charge Meter is to the left of and slightly above the speedometer and shows approximate charge. A battery icon is found here.

Electric Vehicle Identification



The sealed, liquid-cooled, high voltage battery pack is found under the vehicle – below the cargo area.

Mounted along the vehicle centerline, it fills the space forward of the rear wheels.

Orange cables run from the high voltage connections to the junction box mid-vehicle behind the front wheels.

Disconnecting High Voltage

The following list describes certain features that have been incorporated into the Transit / Tourneo Connect Electric vehicles that allow for either simple or automatic shutoff of the high-voltage electrical systems.

High-Voltage Fuse — In the event of a high-current short circuit, the high-voltage fuse will open, disabling the high-voltage system.

High-Voltage Interlock Circuit — Whenever a high-voltage connector is disconnected, the high-voltage interlock circuit opens and disables the high-voltage system.

Ignition Key in OFF Position — When the ignition lock cylinder is moved to the OFF position, the high-voltage system is disabled after a one-minute delay.

12V Battery Disconnected - Whenever the 12V battery is disconnected from the vehicle, the high voltage system is disabled.

High-Voltage Service Disconnect — Whenever the high-voltage service disconnect (located behind panels retained by screws at the front of the high voltage battery pack) is removed, the high-voltage system is disabled.

Thermal Sensors — In the event that the high-voltage battery temperature exceeds a given temperature limit, thermal sensors located inside the high voltage battery pack disable the high-voltage battery system.

Inertia Switch – In the event of a collision or severe jarring of the vehicle, an inertia switch – located behind the passenger (right) side kick panel – opens and disables the high voltage battery system.

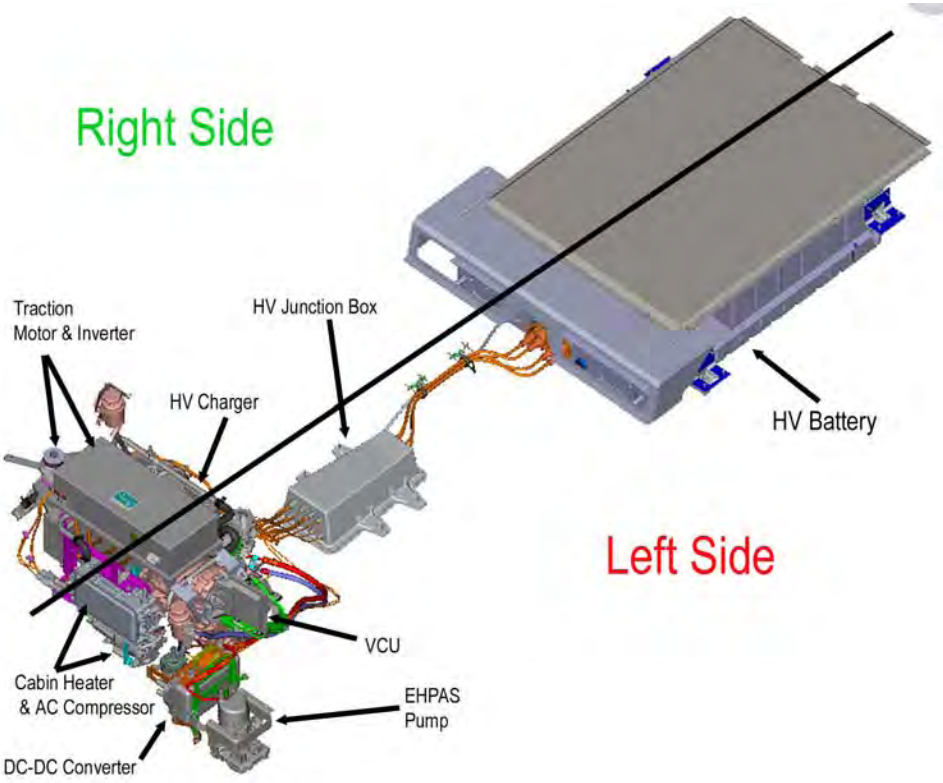
High Voltage Labels

High Voltage Components

COMPONENT	LOCATION/DESCRIPTION	FUNCTION
Charge Port	Right side of vehicle behind the fuel filler door.	Provides connection point to external power for activation of on-board battery charging system.
High Voltage Battery Pack (290-384V)	Underneath cargo area along centerline of vehicle.	Provides high voltage for all system requirements.
High Voltage Junction Box	Mid-vehicle behind the front wheels.	Provides connections and fusing for cabling to high voltage components. High voltage orange cabling connections to DMoC, DC/DC Converter, HV Charger, AC Compressor, and cabin heater.
HV Charger	Behind traction motor under hood.	Converts 110V/220V AC voltage to 384V DC to charge high voltage battery.
Motor Controller (DMoC)	On top of traction motor under hood.	Translates signals from Control Unit and converts high voltage battery pack DC to 3-phase AC outputs to traction motor.
Traction Motor	Under hood coupled to the gearbox.	Provides power to move the vehicle and serves as generator for regenerative braking.
AC Compressor	Front right of traction motor.	HV electric motor driven compressor
Vacuum Pump	Back left of traction motor.	Provides vacuum for operation of power brake booster.
DC/DC Converter	Left frame rail underhood.	Converts high voltage DC to low voltage DC for operation of 12V vehicle components.
Electro-Hydraulic Power Assist System	Behind inner fenderwell forward of left front wheel.	Provides high pressure hydraulic fluid flow for power steering rack.
Gearbox	Under hood – coupled to traction motor.	Provides gear reduction output from traction motor and method of differentiation of front drive wheel speed.
Vehicle Control Unit (VCU)	On left side under hood beside 12V battery.	Controls operation of and communications with all vehicle systems.

NOTE: All high voltage wires and harnesses are wrapped in orange-colored insulation or have orange banding identification.

High Voltage Components



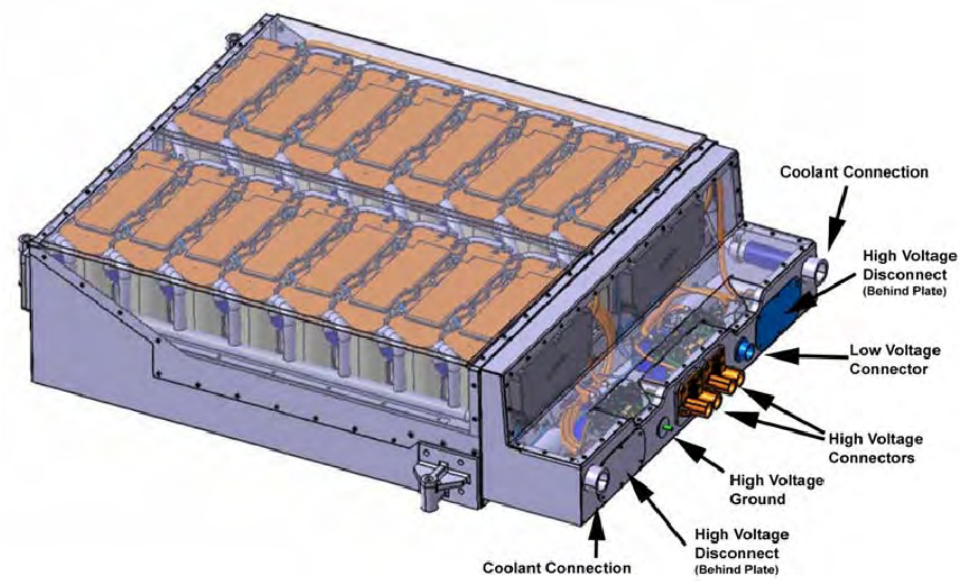
Note: All vehicle component location references refer to either Right or Left side as noted.

Vehicles may be RH or LH drive.

High Voltage Battery

WARNING

- Removing the high-voltage service disconnect will disconnect the high -voltage from the vehicle.
- The individual cells inside the battery pack will still be charged.
- Do not cut, weld or screw into the high-voltage battery case or penetrate the batteries in any way.



Potential Hazards / Public Safety

The high voltage battery pack consists of two strings of 8 battery modules in parallel.

Each module is comprised of 12 lithium ion, 4V batteries in series.

The total voltage of the battery pack is 384VDC when fully charged, 290VDC when discharged (345.0 VDC nominal).

The battery case is designed to be water resistant.

The high-voltage battery pack is located under the cargo area along the vehicle centerline.

High-Voltage Battery Contents
The lithium-ion battery is contained in a strong metal box and should present no hazard in normal circumstances.

However, the contents of the battery are flammable and can burn if the box is broken open, giving off gases that can cause irritation if inhaled. To extinguish a burning battery, the manufacturer recommends CO2 or an abundance of water.

Potential Hazards / Public Safety

APPROACHING A DAMAGED HIGH-VOLTAGE VEHICLE

1. FOLLOW EXISTING TRAINING AND INCIDENT COMMANDER DIRECTION.

This guide provides only supplemental information as it pertains to the Transit / Tourneo Connect Electric vehicles.

The same rules apply when approaching any potential high-voltage situation. Always follow your high-voltage safety training. Some precautions to be taken in any high-voltage situation include:

- Remove all jewelry (watches, necklaces and earrings). Metal objects are conductors of electricity.
- Wear the necessary PPEs (high-voltage rubber gloves, face shield, insulated boots, protective raincoat or apron).
- Bring the following equipment:
- Class ABC powder-type fire extinguisher

A non-conductive object – about 1.5 m (5 ft) long – used to safely push someone away from the vehicle if they accidentally come in contact with high-voltage.

2. APPROACHING A DAMAGED VEHICLE.

Disable the high-voltage electrical system using the following steps::

- Secure the vehicle — place the shift lever into the PARK position.
- Remove the key—if possible.
- Block the wheels if necessary.
- Remove the ignition key. Block the wheels,
- Removing the ignition key or turning the key to the OFF position will disconnect the high-voltage system after a one-minute delay.
- Disconnect the negative cable from the 12-volt battery – this will also disable the high-voltage system.

In an emergency where access to the inside of the vehicle is not readily available, disconnect the 12V battery under hood by using bolt cutters to cut both negative and positive cables.

Potential Hazards / Public Safety

SPECIAL NOTES

If the vehicle is on fire, use a Class ABC powder-type extinguisher to contain and smother the flames. If water is being used, large amounts of water will be required (e.g., from a fire hydrant) to extinguish the flames.

If the vehicle has any exposed cables, make sure to wear high-voltage rubber gloves and other protective clothing. Do not touch any broken or damaged high-voltage orange cables. Treat severed cables as if they contain high voltage.

If the vehicle is submerged in water, do not touch any high-voltage components or orange cables while extricating the occupant(s). Do not remove the vehicle until you are sure the high-voltage battery is completely discharged. A submerged high-voltage battery may produce a fizzing or bubbling reaction. The high-voltage battery will be discharged when the fizzing or bubbling has completely stopped.

3. IF THE HIGH-VOLTAGE BATTERY CASE HAS BEEN RUPTURED.
• Just like any other battery, hose the area down with large amounts of water.

4. MOVING DAMAGED VEHICLES — RECOVERY VEHICLE DRIVERS.

- Turn the vehicle ignition key to the ACCESSORY position to release the locking steering wheel, release the emergency brake, place gear selector in Neutral.
- If possible, remove the high-voltage service disconnect
- Follow the guidelines in the Wrecker Towing Manual.
- Tow from front or rear with wheel lift. **Slings are prohibited!**
- Flat bed: Front and Rear

5. SPECIAL NOTE TO 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 or federal guidelines.

Potential Hazards / Public Safety

FIRE OR EXPLOSION

- Lithium ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C (302 °F)), when damaged or abused (e.g., mechanical damage or electrical overcharging).
- May burn rapidly with flare-burning effect.
- May ignite other batteries in close proximity.

HEALTH

- Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes.
- Fire will produce irritating, corrosive and/or toxic gases.
- Burning batteries may produce toxic hydrogen fluoride gas.
- Fumes may cause dizziness or suffocation.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.

EVACUATION

- **Large Spill -**Consider initial downwind evacuation for at least 100 meters (330 feet).
- **Fire -** If rail car or trailer is involved in a fire, ISOLATE for 500 meters (1/3 mile) in all directions; also initiate evacuation including emergency responders for 500 meters (1/3 mile) in all directions.

Potential Hazards / Public Safety

FIRE

Small Fire

- Dry chemical, CO_2, water spray or regular foam.

Large Fire

- Water spray, fog or regular foam.
- Move containers from fire area if you can do it without risk.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch or walk through spilled material.
- Absorb with earth, sand or other non-combustible material.
- Leaking batteries and contaminated absorbent material should be placed in metal containers.

FIRST AID

- Move victim to fresh air.
- Call emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with electrolyte, immediately flush skin or eyes with running water for at least 20 minutes.
- Ensure that medical personnel are aware of the materials involved and take precautions to protect themselves.