Waymo autonomously driven Chrysler Pacifica

Emergency response guide and law enforcement interaction protocol

This document includes material from the **FCA 2017 Pacifica Hybrid Emergency Response Guide**



WAYMO

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Introduction

The Waymo fully autonomous driven Chrysler Pacifica is based on the Chrysler Pacifica Hybrid.

This document includes material from the FCA 2017 Pacifica Hybrid Emergency Response Guide and supplemental information related to the Waymo Driver, Waymo's autonomous driving technology.

This guide is intended to be used by trained first responders and assumes a professional-level background in safely responding to emergencies, including those involving damaged vehicles.

Chrysler Pacifica

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Waymo toll-free hotline for emergency responders

Waymo has established a toll-free 24-hour telephone hotline dedicated to allowing police, fire departments, and other first responders to communicate directly with Waymo's professionally-trained specialists at any time during our vehicle testing and operation on public roads.

1-877-503-0840

We ask that emergency responders calling this hotline identify the numerical identifier of the vehicle in question, license plate, and any location information available.

Identifying the Waymo fully autonomous driven vehicle

The Waymo fully autonomous driven Chrysler Pacifica Hybrid minivans can be easily identified by the white color with Waymo logos, roof assembly, front fender additions, or rear roof additions below.

During fully autonomous testing and operation, Waymo's vehicles are fully autonomous at all times, and will not have any person in the driver's seat either steering or otherwise controlling the vehicle.



Identifying the Waymo fully autonomous driven vehicle

Each Waymo vehicle is identified by license plate, in addition to required identifiers in the jurisdiction (e.g., vehicle-for-hire badges).



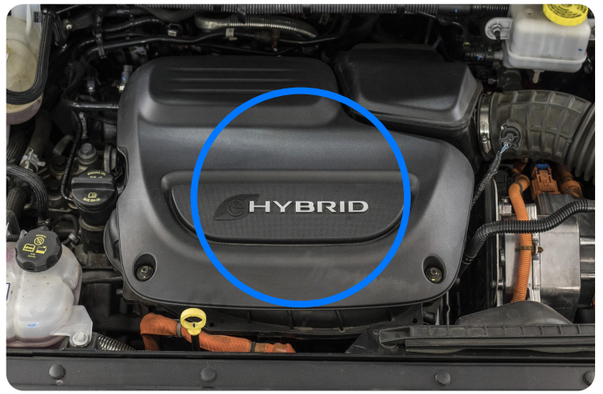


Identifying the Waymo fully autonomous driven vehicle

The Waymo vehicle is a plug-in hybrid electric vehicle and can be identified as such by the “eHYBRID” badge on the rear liftgate, the charge port door on the driver side featuring the same “e” leaf logo, and a unique engine cover as shown.







Location of in-vehicle documents

Two physical copies of vehicle owner information, vehicle registration, and proof of insurance are stored inside each driverless vehicle. Each of the following locations contains the same sets of documents, and either set of documents can be accessed in the event law enforcement requires this information.



In a container affixed to the front driver-side sun visor



In a container affixed to the front passenger -side sun visor

Level of automation

The Waymo vehicle is fully autonomous driven.

- It is validated for fully autonomous testing and operation.
- It is capable of performing the entire dynamic driving task within its operational design domain, as a Level 4 automated driving system under SAE International's Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles, **standard J3016.**
- It is capable of performing a safe stop, known as achieving a "minimal risk condition," without any expectation that a human will need to intervene.
- It is equipped with redundancies for critical systems, such as sensors, computing, steering and braking, and can automatically detect changes to the vehicle or the environment and determine an appropriate response to keep the vehicle, its passengers, and other road users safe.

Operational design domain

The Waymo vehicle is intended to operate in the following conditions:

- On roadways including freeways, highways, city streets, and rural roads with posted speed limits up to 65 mph
- In parking lots
- At all times day
- and night
- In light rain and fog

Conditions that limit driverless operations include:

- Inclement weather including heavy rain and snowy/icy conditions
- Flooded roadways
- Mountain roadways
- Offroad

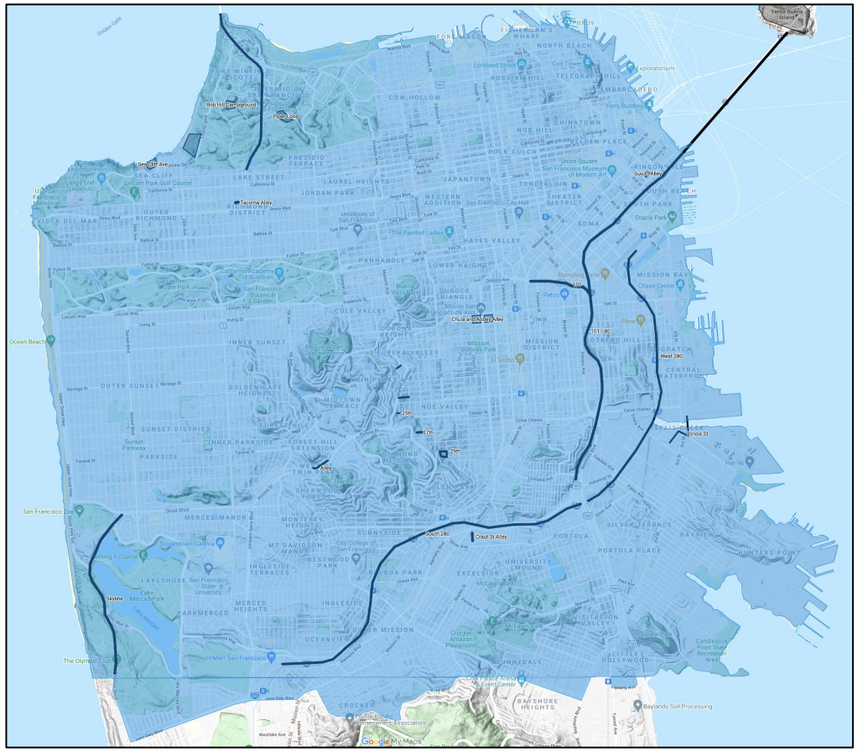
Operational design domain

Waymo vehicles can only be operated without a vehicle operator in specific geofenced areas, where they have been tested and validated to safely perform all the dynamic tasks of driving without human intervention.

- Testing and deployment territory will be expanded incrementally over time via our rigorous testing and validation process.
- Information relating to these areas is provided by Waymo directly to state and local authorities, prior to any driverless operation.

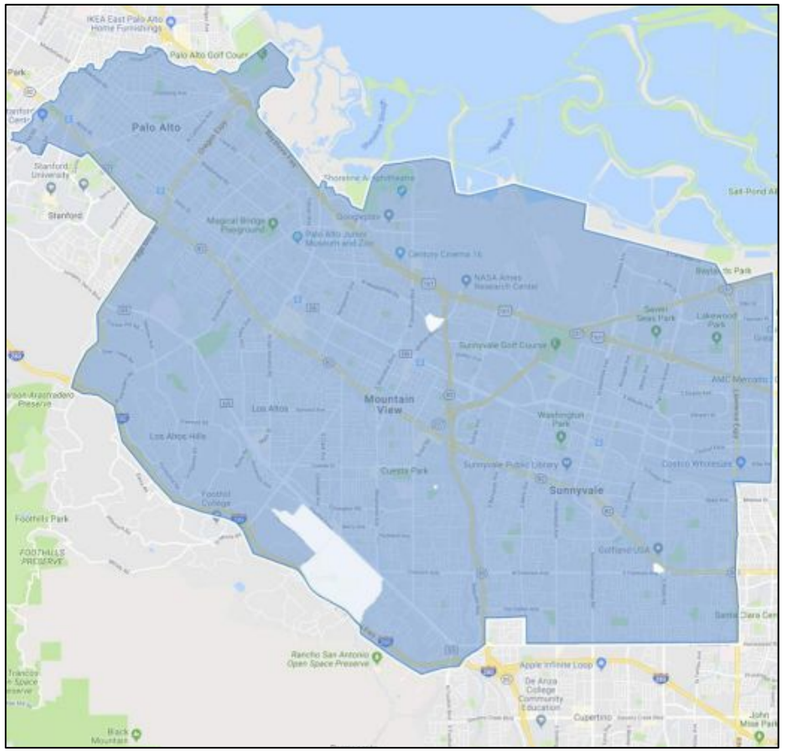
Operational design domain

San Francisco and Daly City Geofenced Area:



Initial testing without a vehicle operator within the San Francisco and Daly City geofenced area will exclude the areas marked in black. Waymo will notify state and local authorities prior to commencing driverless testing in these areas.

South Bay Geofenced Area:



The South Bay geofenced area for testing without a vehicle operator includes all or portions of the cities of Mountain View, Palo Alto, Los Altos, Los Altos Hills, and Sunnyvale.

Response to police and emergency vehicles

The Waymo vehicle uses its sensors to identify police or emergency vehicles by detecting their appearance, their sirens, and their emergency lights.

- The Waymo vehicle is designed to yield as appropriate to these emergency vehicles no matter which direction they are headed.

If a Waymo fully autonomous driven vehicle detects that a police or emergency vehicle is behind it and flashing its lights, the Waymo vehicle is designed to pull over and stop when it finds a safe place to do so.

- The vehicle can unlock the doors and roll down the windows for Waymo's Rider Support team to communicate with law enforcement. Rider Support can also be reached by pressing the Help button in the interior console accessible from the second row passenger seating area.
- Waymo's Rider Support specialists have protocols for interacting with any vehicle passengers in the event of the vehicle being pulled over or involved in a collision, by providing information through in-vehicle speakers, on the in-vehicle displays, and communicating with passengers through in-vehicle telecommunications capabilities.
- A Waymo support team will be dispatched to provide on-scene support, when needed, for passengers and first responders.

Collision response

The Waymo vehicle is capable of detecting that it was involved in a collision. The vehicle will then brake until it reaches a full stop and immediately notify Waymo's Fleet Response specialists.

- Waymo's Fleet Response will call 911 if the circumstances warrant (e.g, where there is a significant collision in which police may be needed because of injuries, vehicles blocking traffic, etc).
- A Waymo support team will be dispatched to provide on-scene support for passengers and first responders.
- The Waymo fully autonomous driven vehicle will react differently depending on the collision severity.
  In the event an airbag is deployed, the base vehicle's engine and hybrid drive will be disabled.

Waymo Fully Autonomous Driven
Chrysler Pacifica

Approaching, disabling, and towing



Ensuring the vehicle will not drive autonomously

The vehicle will not drive autonomously while any of the following are true:

- Any airbags are deployed
- Any door is open
- The vehicle is in Park **(page 17)**
- The Parking Brake is applied **(page 17)**

Open a door of the vehicle to prevent the vehicle from autonomously driving:

- Break a window if doors are locked and immediate entry to vehicle or ventilation of passenger compartment is necessary.
- Call Waymo **(1-877-503-0840)** to unlock the doors remotely if there is time and there are no signs of battery heating, smoke, or fire.

Keep at least one door open until the base vehicle is turned off (page 19) or the 12 V cut loop under the hood is cut (page 24).

Vehicles can roll or move regardless of autonomous driving state. Always use standard precautions including wheel chocks.

Electronic shift control and parking brake

To determine if the vehicle is in Park or the Parking Brake is applied, approach the vehicle from the driver's side and check for:

- Blue "P" (Park) indicator on the Electronic Shift Control
- Red light on the Parking Brake

The Electronic Shift Control and Parking Brake cannot be manually controlled while the vehicle is in autonomous driving mode. See page 18 to disable autonomous driving mode.

NOTE: Base vehicle 12 V power must be functional to shift in or out of Park or apply or release the parking brake.

P (Park) indicator on the Electronic Shift Control



Red light on the Parking Brake

Disabling autonomous driving mode

Emergency responders needing to disable autonomous driving mode should contact Waymo using one of the following methods:

- **Call: 1-877-503-0840**
- **Or: Activate in-vehicle Rider Support by pushing the "Live Help" button on the ceiling in front of second row seats.**

Identify yourself and request that the Waymo representative authorize the vehicle for manual mode. If calling the toll-free hotline, you will need to identify the vehicle by license plate and/or location.

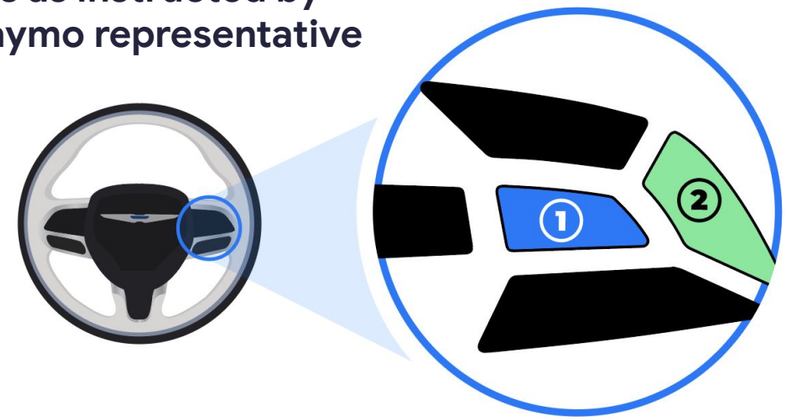
Follow the Waymo representative's instructions, which will include pressing buttons on the steering wheel.

NOTE: Successful transition to manual mode can be confirmed by attempting to turn the vehicle on or off or change gears. If gears can be changed or the vehicle can be manually turned on or off, the vehicle is not in autonomous driving mode.

Rider Support Button
(located above 2nd row seats)



Press two steering wheel buttons as instructed by the Waymo representative



Turning the vehicle off

Lights above the start-stop button indicate when the vehicle is running (RUN) or when it is off (OFF)

The Start-stop button will not turn the vehicle off while autonomous driving mode is enabled.

To turn off the vehicle:

1. Disable autonomous driving mode (page 18)
2. Push the start-stop button until "OFF" is illuminated in the button surround

If the button does not turn off engine:

- Ensure autonomous driving mode has been disabled
- Cut the 12 V cut loop to disable propulsion system (page 24).

NOTE: A faint buzzing may be heard from the 1st row center console when ignition is turned off or front 12 V power is cut.

Base vehicle start-stop button

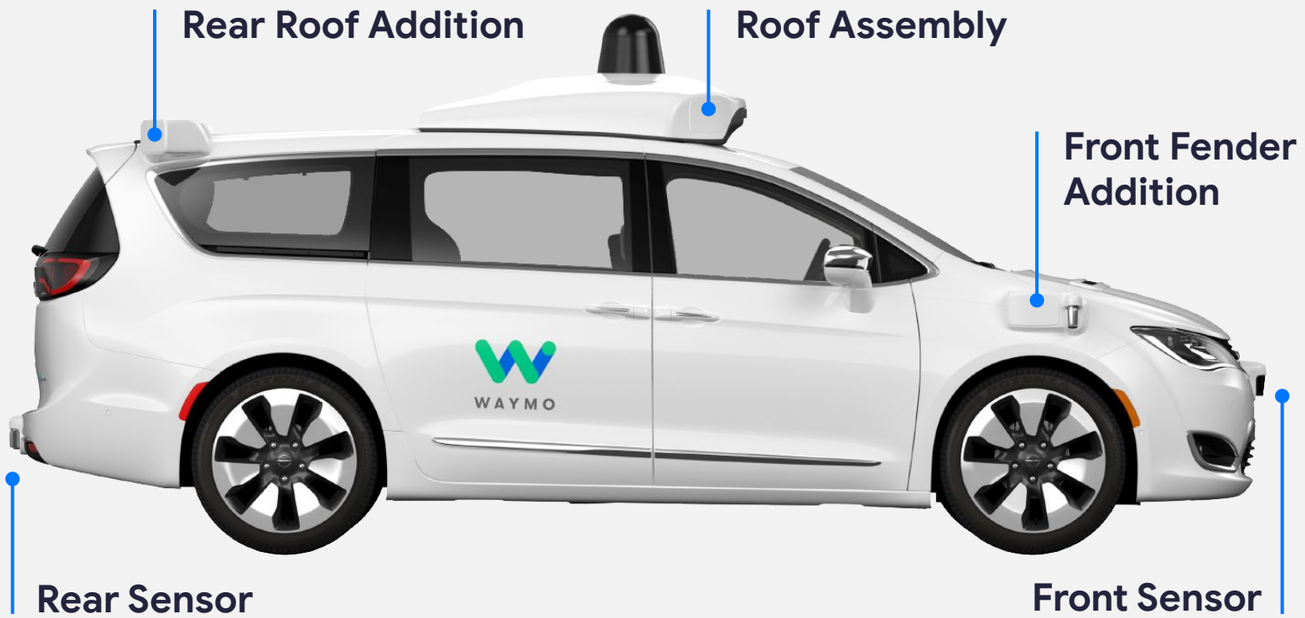
(RUN Shown)



Towing the vehicle

After disabling autonomous driving mode and shutting the vehicle off, the vehicle can be towed like any conventional front wheel drive vehicle (dolly tow with parking brake released and front wheels off the ground).

If the parking brake cannot be released or a dolly tow with front wheels off the ground is not available, the vehicle should be placed on a flatbed truck for removal. Please use caution to avoid damaging sensors. See page 38 for post-incident handling precautions.



NOTE: In emergency situations, push bumpers may be used to move the vehicle from the roadway, though sensor damage will likely occur.

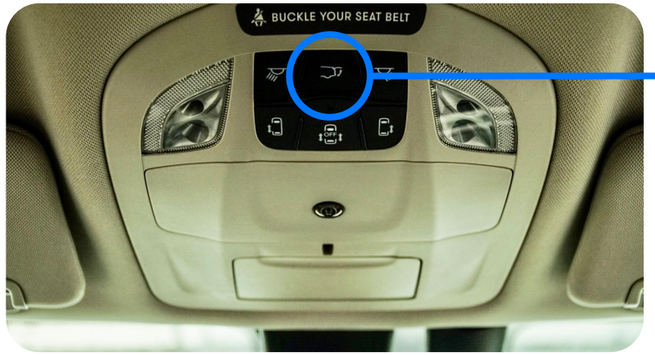
Opening the rear trunk

To access the trunk:

1. Disable autonomous driving mode (page 18)
2. Pull the exterior handle **or** press the liftgate button on the front row overhead console.

NOTE: The rear liftgate latch is electrical and will be inoperable when in autonomous driving mode or if base vehicle 12 V power is removed.





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Vehicle systems safety considerations



Emergency disabling electric power

The vehicle contains two 12 volt and one high voltage (HV) power source:

- 12 V power is supplied by the base vehicle's 12 V battery and a separate, isolated 12 V battery that powers components of the fully autonomous driven system. Both batteries are located in the vehicle's trunk.
- The vehicle's HV battery system powers the hybrid propulsion motor as well as the autonomous driving components located in the vehicle's trunk.

To disable electric power:

- See page 24 to disconnect the base vehicle's 12 V battery and disable the HV battery by cutting the cut loop located under the front hood.

NOTE: The rear liftgate latch is electrical and will be inoperable after the base vehicle's 12 V power is disconnected.

- If the vehicle is inverted or hood access is blocked, turn vehicle off (page 19) then cut the base vehicle negative battery cable located in the trunk (page 25)
- See page 26 to disconnect the isolated 12 V battery
- See page 27 to disable HV power using the Service Disconnect

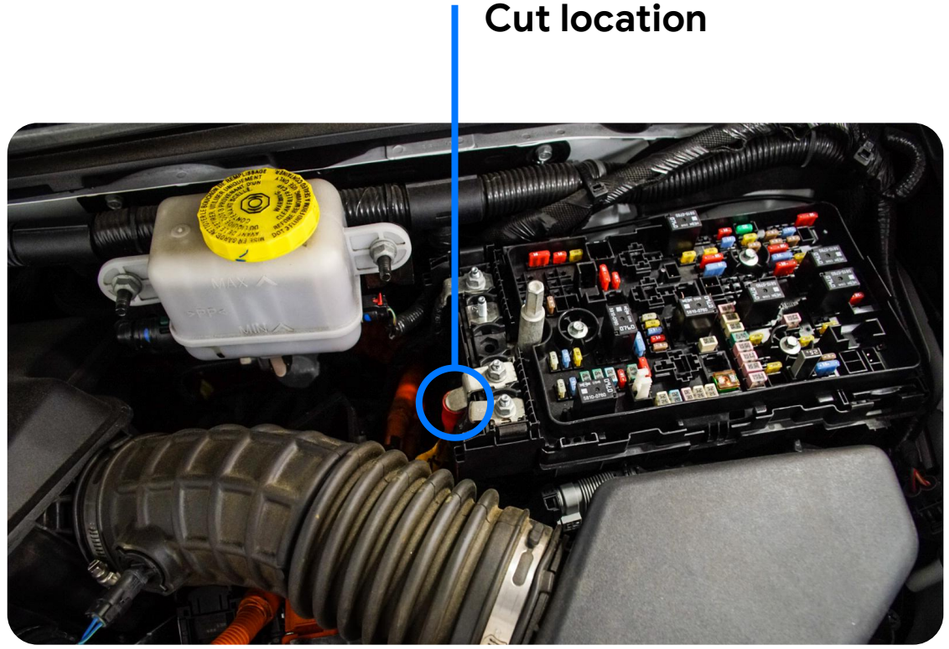
Cutting the 12V Cut Loop

Cutting the 12 V Cut Loop will shut down the base vehicle and will disable the HV Battery.

> ⚠ Keep at least one door open while in front of vehicle to prevent vehicle from driving autonomously. Also use standard precautions including wheel chocks

To cut the 12 V Cut Loop:

1. Open hood. Hood latch release is located to the left of the steering wheel at the base of the lower dash panel.
2. Remove fuse box cover.
3. Cut and remove a segment of the 12 V positive power supply cable. This cable is marked with a label designating the cut locations. Make a cut at each side of the cable label and remove the segment.
4. Protect the cut ends from arcing against metal parts.



Positive supply cable with fuse box cover removed



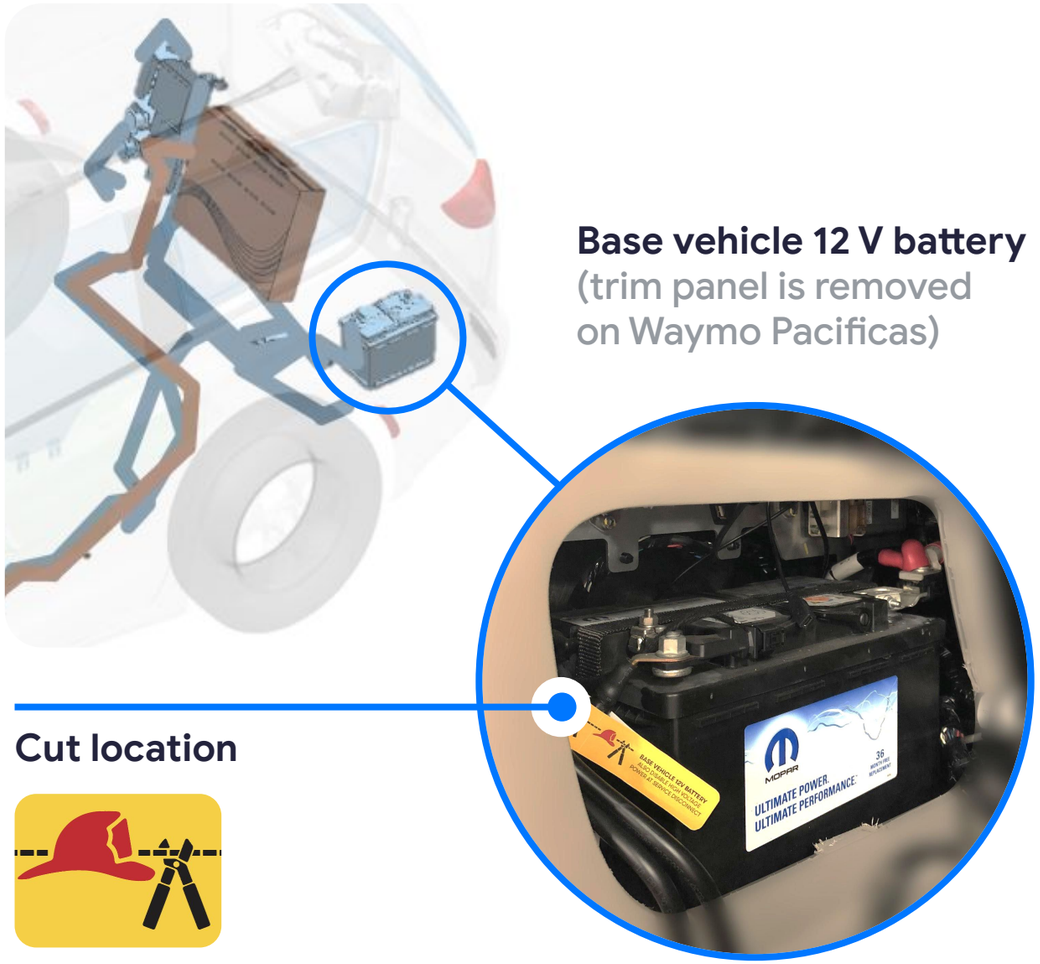
First responder cable cut loop tag in vehicle

Disconnecting base vehicle 12 V without hood access

If the vehicle is inverted or hood access is blocked, the base vehicle's 12 V battery can be disconnected at the battery, which is located in the trunk.

1. Turn vehicle off (page 19)
2. Open rear trunk (page 21)
3. Disconnect or cut and remove a segment of the base vehicle negative battery cable

NOTE: If base vehicle 12 V power is disconnected at the battery rather than under the front hood and HV contactors have experienced damage, the 12 V system may still be powered via the auxiliary power module (APM). To ensure power has been removed to 12 V systems including passive restraints, also disable HV power using the Service Disconnect (page 27).

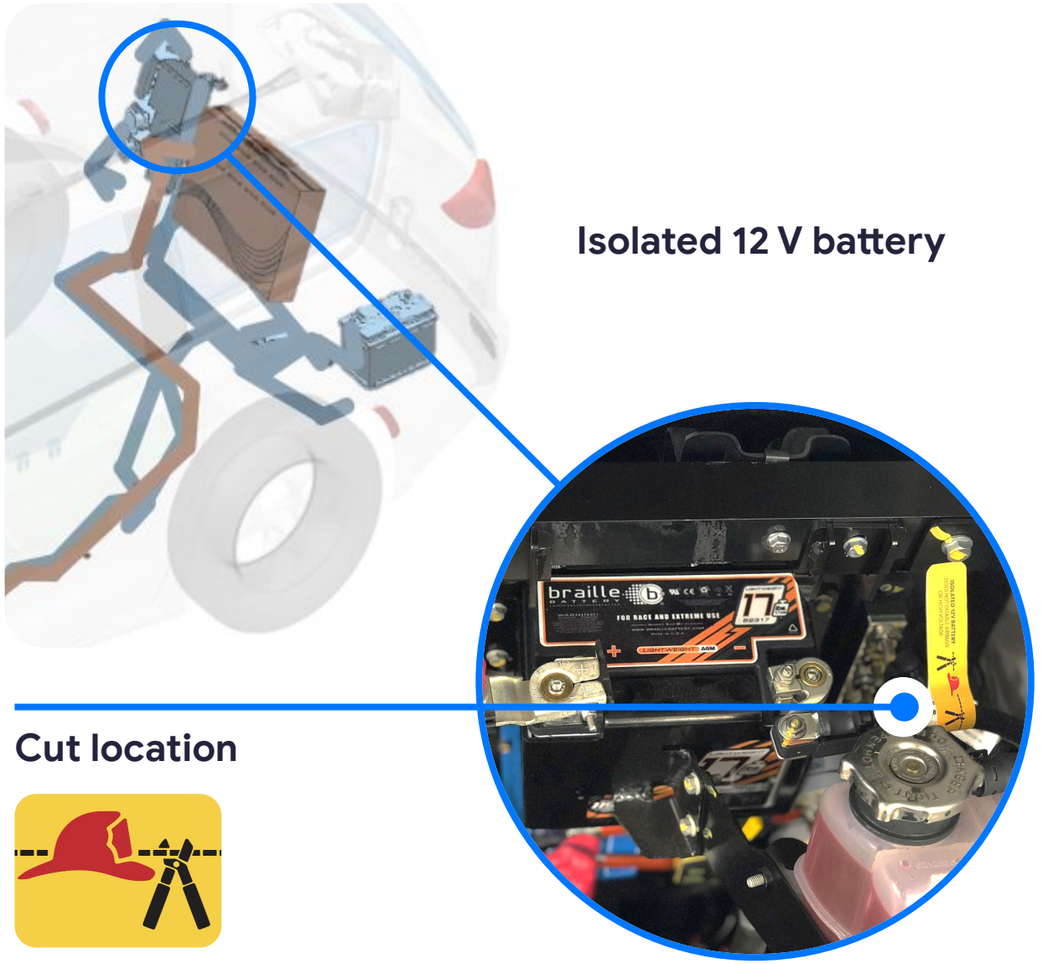


Disconnecting the isolated 12 V battery

An additional isolated 12 V battery located in the trunk powers the autonomous driving components. To disconnect this battery:

1. Open the rear trunk (page 21).
2. Disconnect or cut and remove a segment of the negative battery cable

NOTE: Disconnecting this battery does not disable HV power or 12 V power to airbags.



Disabling high voltage output from the HV battery

The Service Disconnect is under a cover located between the 1st and 2nd row seats. Removing the service disconnect will disable HV output from the HV battery system.

Emergency disabling of low and high voltage power

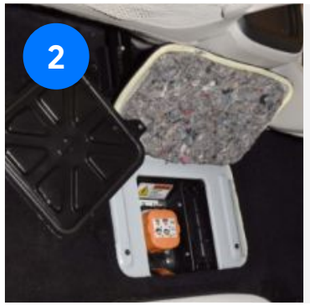
If possible safely remove the Service Disconnect

This will disable high voltage output from the battery.

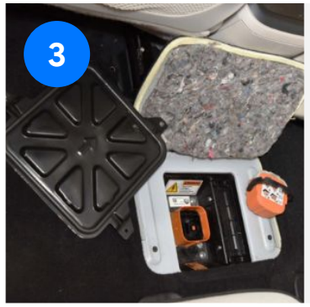


Uncover the Service Disconnect access cover

Located between the 1st and 2nd row seat



Unbolt the cover panel over the Service Disconnect



Remove the Service Disconnect



Reinstall the cover over the empty socket and replace the carpet

Wait 5 minutes

This will allow the HV capacitors to discharge under most circumstances. However, under some circumstances the HV Battery System HV Contactors may not open. Consequently, HV may not be contained to within the HV Battery System.

Personal Protective Equipment (HV qualified Gloves, Boots and Coat) provides protection against Live HV.

Personal Protective Equipment must be used by First Responders when addressing a damaged Chrysler Pacifica Hybrid.

Wet location considerations

A vehicle submerged or flooded with water can result in protective system failures.

Excessive heat and electrolysis may take place resulting in byproducts of hydrogen and oxygen. In salt water chlorine is also a byproduct. These byproducts, trapped and concentrated by the passenger compartment, a garage, or other containment, may be in concentrations that could be explosive or corrosive and could have adverse effects on human health. Action should be taken to assure ventilation of a partially submerged vehicle and any space in which it is contained.

A vehicle without impact damage

Has HV contained to within enclosures or insulation and has HV isolated from the chassis, therefore electrical shock hazard risk is minimal. A submerged or flooded undamaged vehicle has a low electrical shock hazard risk.

A vehicle with impact damage

Presents an increased electrical shock hazard risk. If HV is open to the environment you must stay away from damaged HV components.



First Responders must use proper Personal Protective Equipment when addressing a damaged Chrysler Pacifica Hybrid vehicle.

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Firefighting considerations

Fighting electrified driveline vehicle fires poses unique challenges:

Chemical extinguishers and oxygen denial are not effective in these fires.

Damage, abuse, flooding or exposure to heat (such as from a vehicle fire) can initiate thermal reactions which will advance to a significant fire in lithium ion power systems.

Deluge with water delivered via fire hose at the maximum possible distance is the recommended practice to contain the fire and cool the reagents, minimizing risk of spread and risk of toxic emissions. This should co

Continue after extinguishment until the pack is cool.The Battery thermal reactions become self-sustaining at higher temperatures due to the emission of oxygen from certain constituents.

Lithium-ion automotive batteries can reignite due to ongoing reactions from internal heat.

Application of large amounts of water should begin at the first signs of battery smoke as water may absorb some harmful toxic emissions in the smoke.

Ventilation of the passenger compartment, if occupied, is essential at the first sign of battery heating, smoke or fire. Batteries should be thermally assessed during initial operations and throughout rescue and remediation efforts.

Ongoing battery fire or heat production can facilitate the re-ignition of combustible automotive components above and adjacent to the pack.

Rescue of persons at risk and containment of the fire with prevention of toxic gas emissions should be the goals of fire-fighting efforts.

⚠ Never cut, pierce or damage any high voltage component as serious injury may result.

⚠ For any battery thermal event, NFPA recommends SCBA be required within fifty feet.

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Extrication considerations

Impact event emergencies can require the extrication of victims from damaged vehicles. Determination of the need to extricate and timing must be made by incident command based on standard response practices and procedures.

When victims can be removed safely from an electrified driveline vehicle, it may be prudent as consequences of damage to high voltage components may evolve over time.

Potential related hazards to vehicle occupants, beyond medical condition and typical automotive impact event hazards will include:

- Fire, which is sustained by heat from a damaged battery or shorted wiring
- Exposure of high voltage potentials from damage to the isolated HV system
- Toxic gaseous emissions from a thermally active damaged battery
- Vehicle stability, or the lack thereof. Lift points indicated on page 35 should be used to immobilize the vehicle when possible before extrication activities.

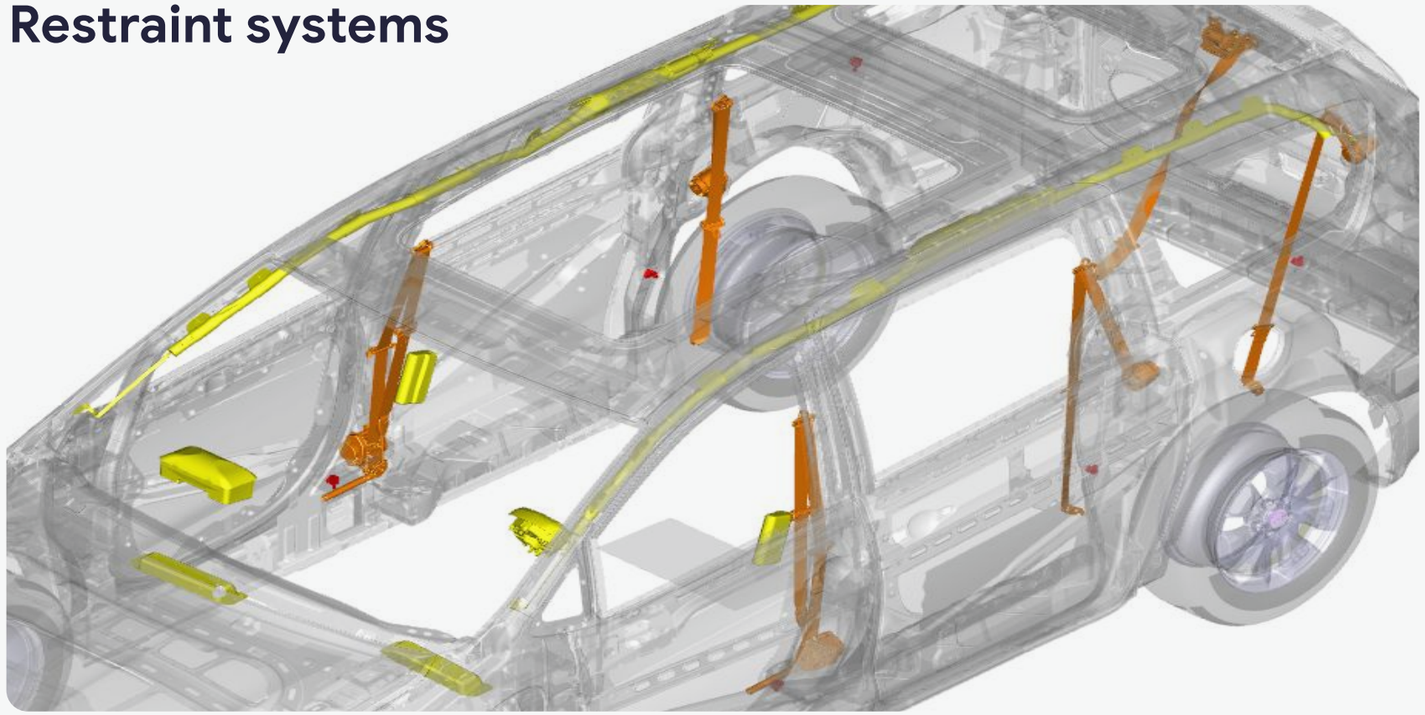
⚠ **Decisions to extricate must take into account the balance between medical condition and hazard from the state of the vehicle.**

Damage to fuel systems, potential hot coolant lines, all high voltage electrical components and cables, the batteries, and potentially active restraint systems must be avoided at all times. See the following pages for location information. (The “do not cut” and “recommended lift and cut zones” illustrations)

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Passive restraint device considerations

Restraint systems



Front seat belts with pretensioning devices (horizontal cylinder below the belt spool)

Driver and front passenger airbags, seat-mounted side bolsters and leg bolsters

Side curtain airbags

Impact sensors

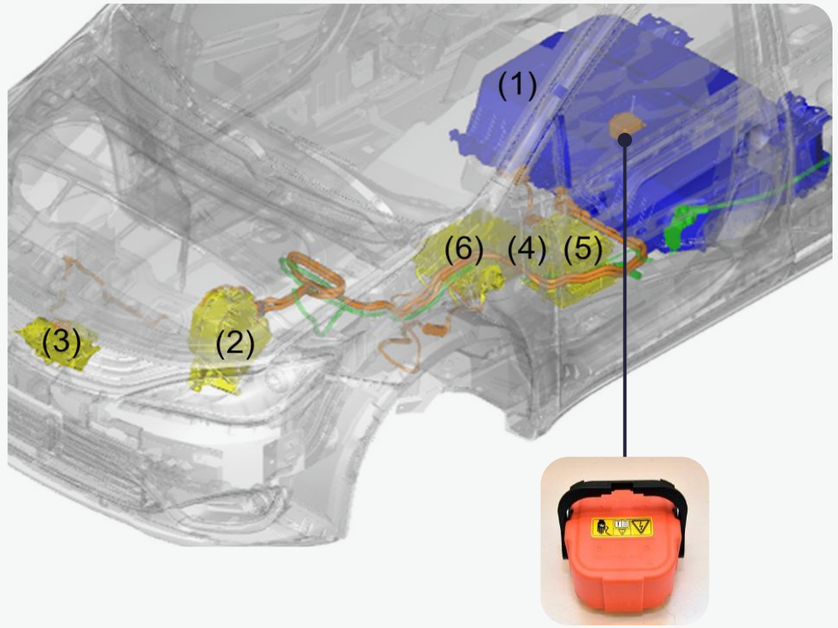
See page 32 for additional high voltage devices specific to the Waymo fully autonomous driven system

High voltage devices

Stored HV energy in the HV Battery System (1) is provided to the 'PIM' Power Electronics (2) and delivered as three phase AC power to the Electric Motors for propulsion. The stored HV energy is used by other vehicle components including:

- The 'EAC' HV Air Conditioning Compressor **(3)**
- The 'BCH' Battery Coolant Heater **(4)** which maintains battery temperature
- The 'APM' auxiliary Power Module **(5)** that charges the 12 volt low voltage system & battery

When plugged in, the HV power is supplied by the 'OBCM' On Board Charging Module (6)



Highvoltage Disconnect



PIM

EAC

BCH

APM

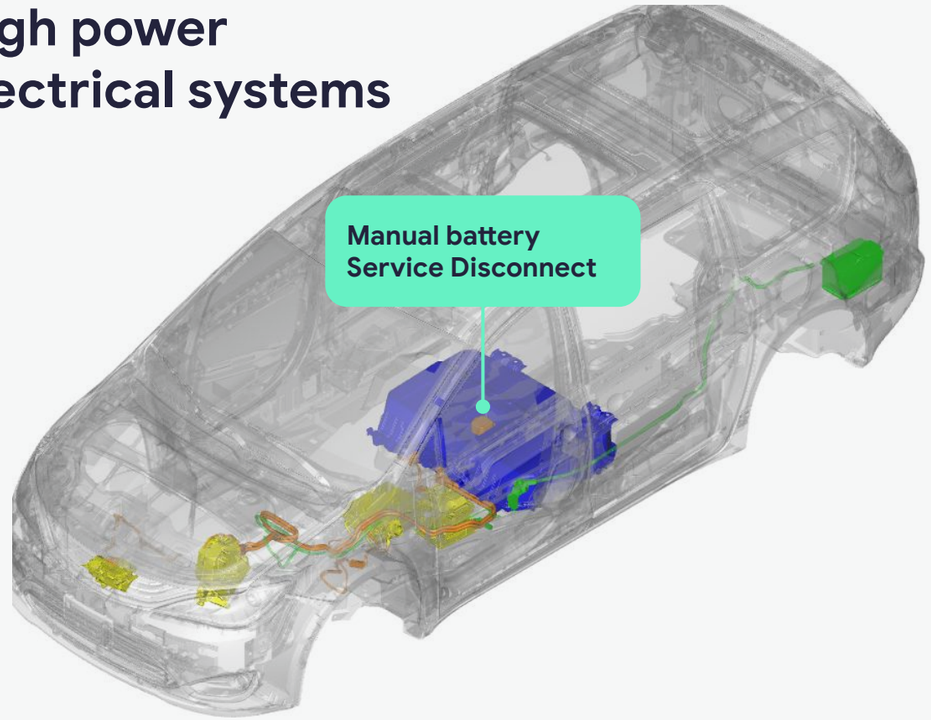
OBCM

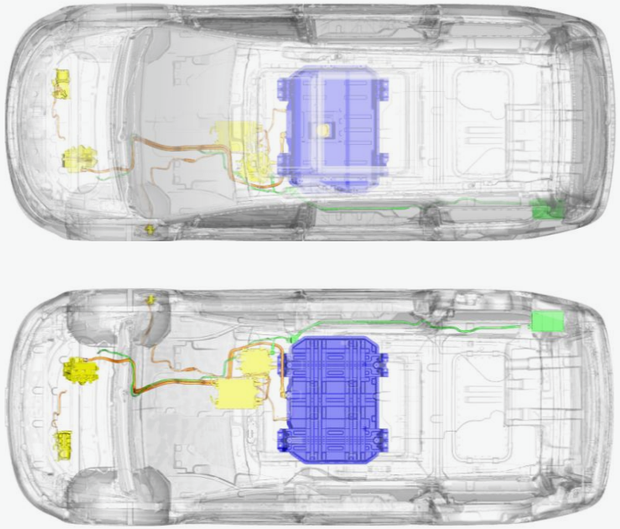
See page 32 for additional high voltage devices specific to the Waymo fully autonomous driven system

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Base vehicle electrical considerations

High power electrical systems





- High voltage cables
- High voltage components
- High voltage battery
- Low Voltage (12V) Battery and Cables

⚠ Do not cut or pierce high voltage devices

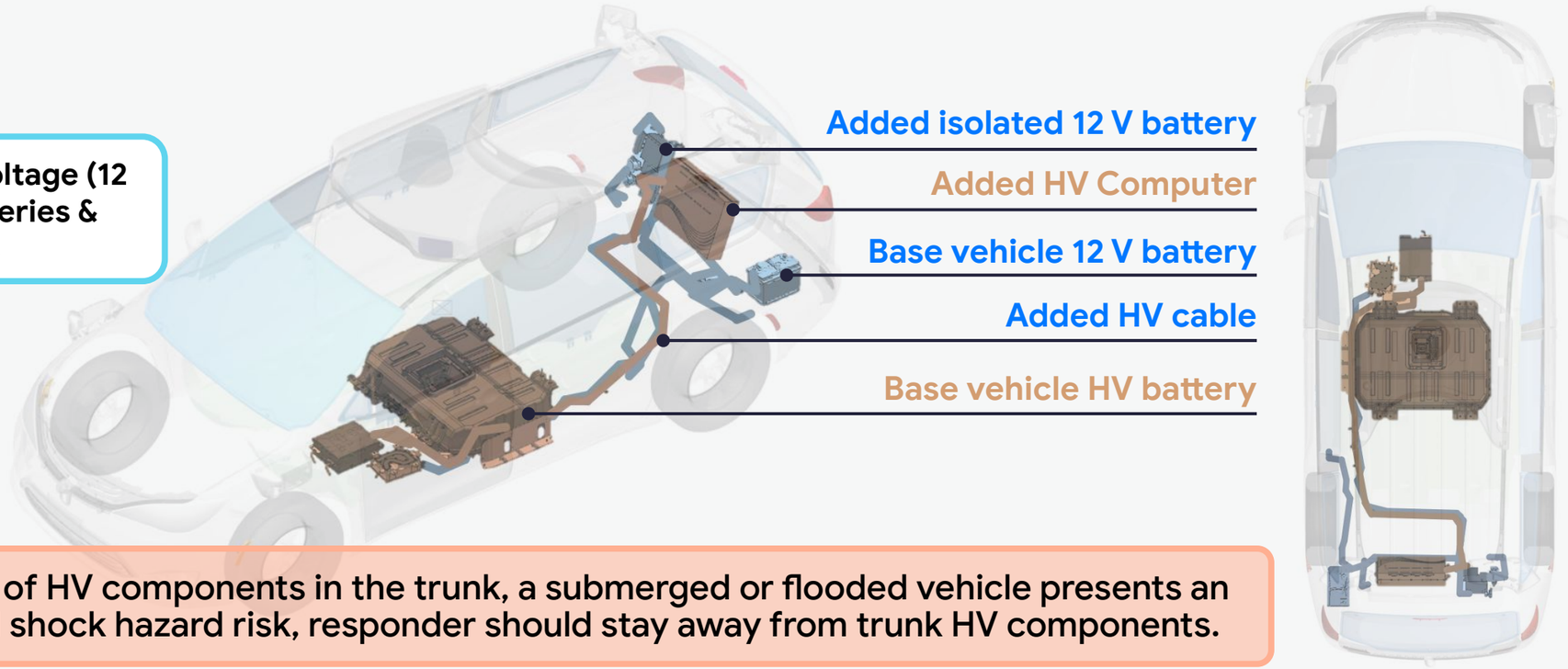
Additional fully autonomous driven system electrical considerations

There are no changes to procedures to disable HV power (page 25)

High power electrical

High Voltage Components & Cables

Low Voltage (12 V) Batteries & Cables



⚠ Do not cut or pierce high voltage devices

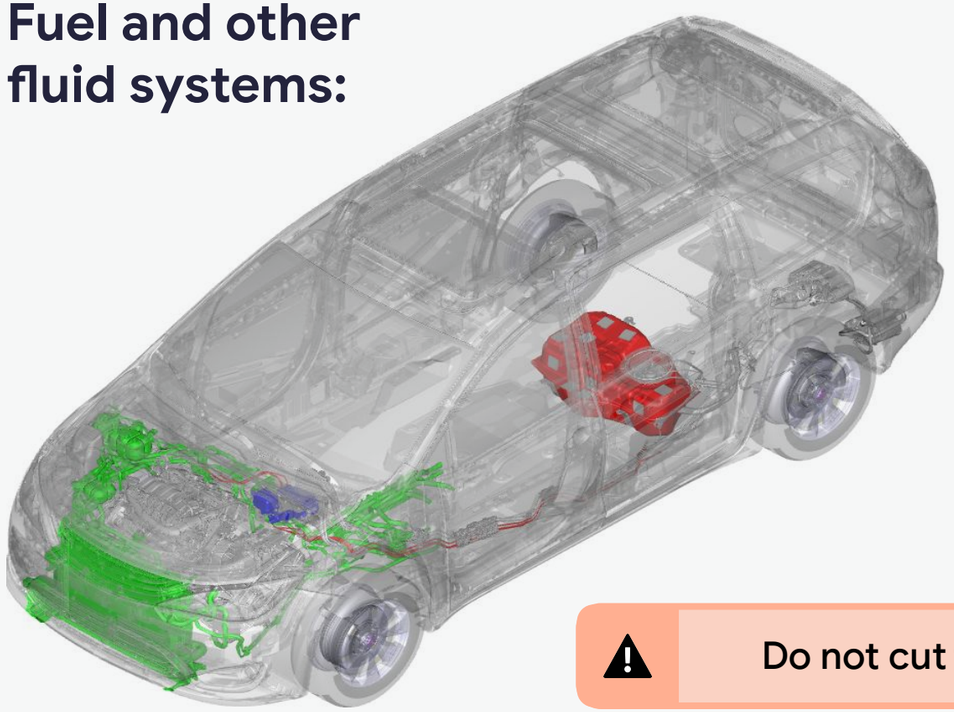
⚠ Due to the addition of HV components in the trunk, a submerged or flooded vehicle presents an increased electrical shock hazard risk, responder should stay away from trunk HV components.

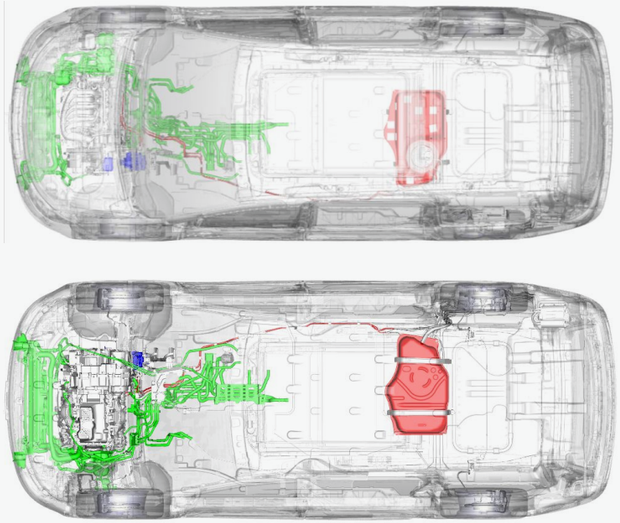
See page 34 for additional fluid considerations specific to the Waymo fully autonomous driven system

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Base vehicle fuel and fluid systems considerations

Fuel and other fluid systems:





- Gasoline fuel tank and fuel lines
- Brake and power steering reservoirs
- Low voltage (12V) battery and cables

⚠ Do not cut fuel tank, fuel or coolant lines

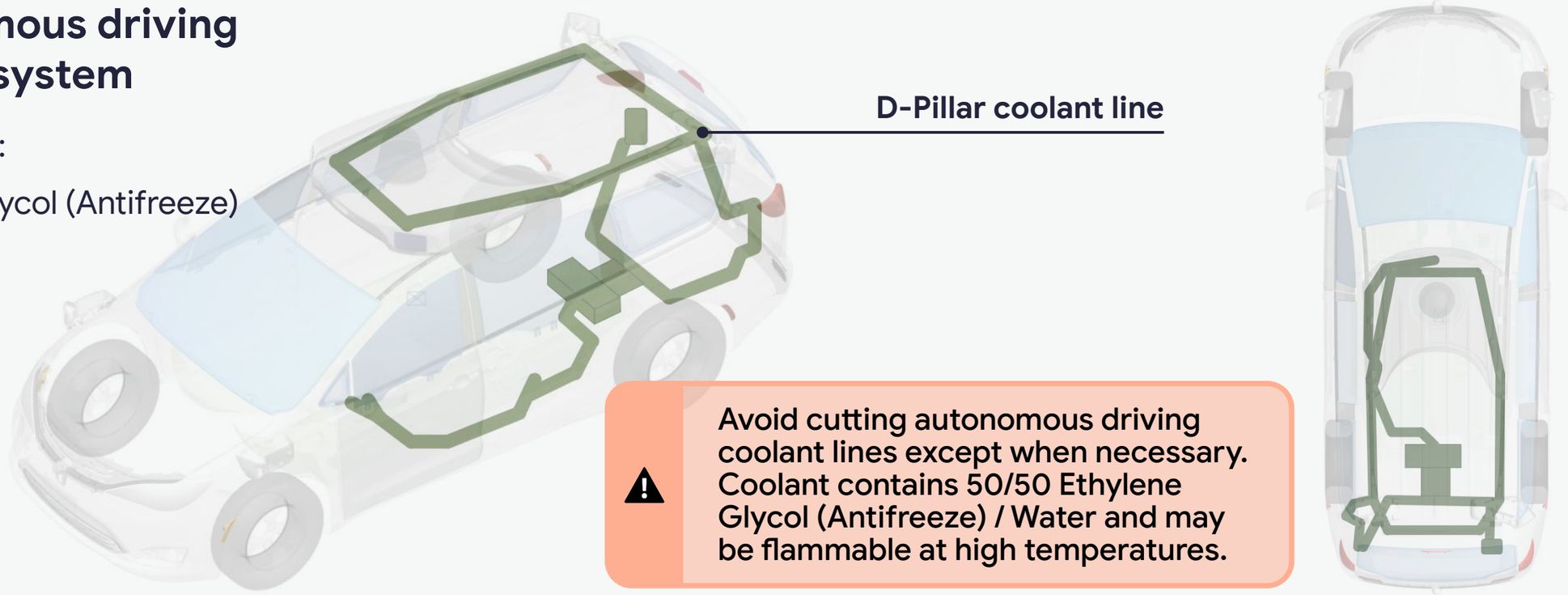
Additional fluid considerations to base vehicle

Autonomous driving cooling system

Uses 50/50:

Ethylene Glycol (Antifreeze)

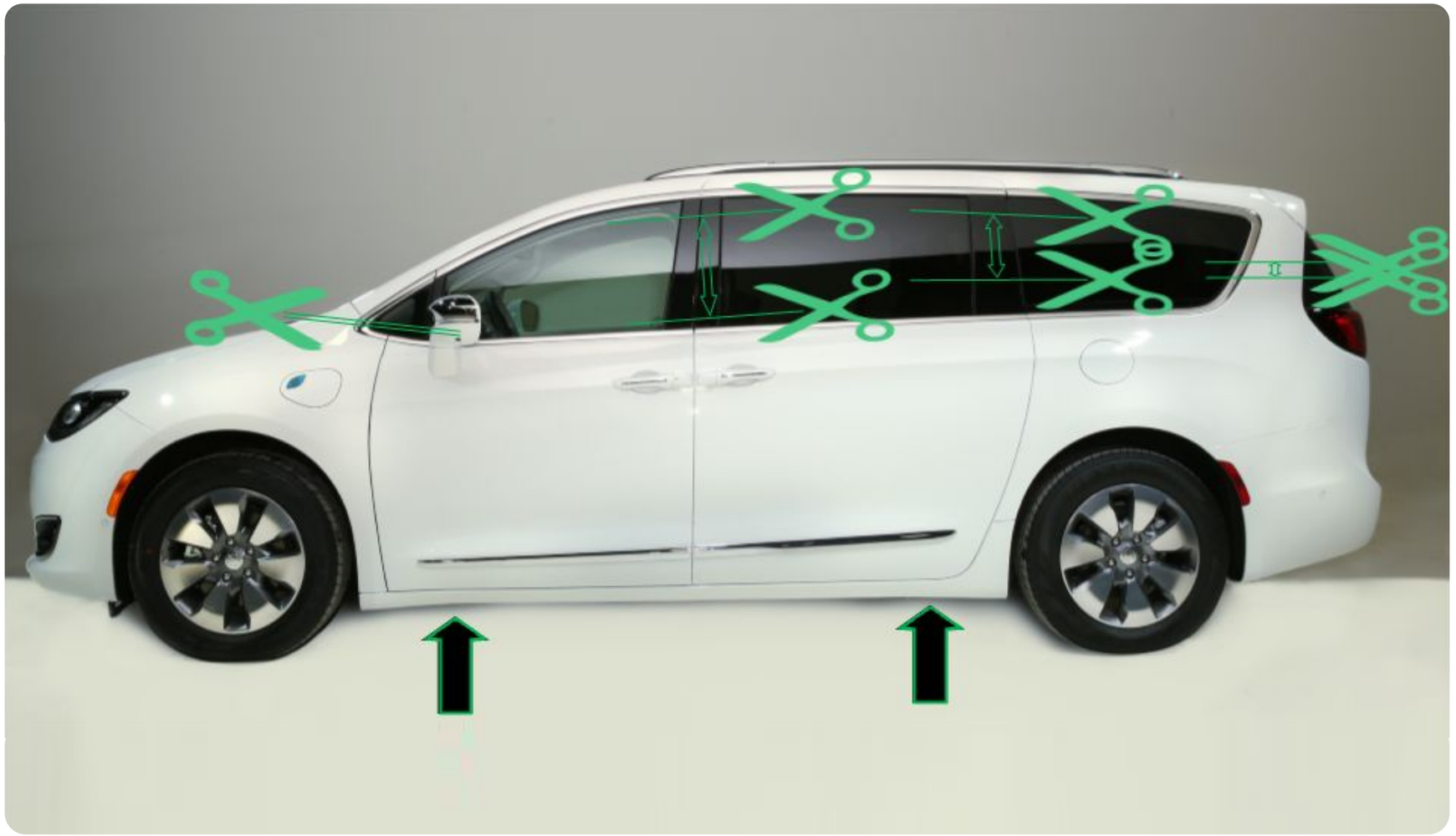
Water



⚠ Avoid cutting autonomous driving coolant lines except when necessary. Coolant contains 50/50 Ethylene Glycol (Antifreeze) / Water and may be flammable at high temperatures.

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Recommended lift and cut zones



Lift Points

Cut zones

⚠

The areas illustrated are recommended lift and cut zones on the vehicle.

Determination of actual lift and cut points must be made by incident command based on the unique situational factors such as possible relocation of the hazards illustrated on the preceding pages as a result of impact events. These are only recommendations.

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Post-incident handling (page 1 of 2)

Following initial response, certain actions and precautions are necessary. If airbags have deployed, the vehicle cannot be driven again until repaired, as air bag protection will not be available to occupants in the event of a collision. After any collision, the vehicle should be taken to an authorized dealer immediately.

While the Pacifica HV battery is designed for safety, industry-wide experience has demonstrated that the unlikely possibility of delayed ignition or re-ignition of a damaged battery must be considered in post-incident handling. Any battery exposed to accident forces sufficient to deploy airbags or to a vehicle fire requires special precautions until verified as undamaged.

- The vehicle or battery pack must not be stored inside an occupied structure.
- Adequate ventilation must be present at the storage location to prevent buildup of any outgassing.
- Batteries to be recycled must be shipped in accordance with regulations governing the transport of damaged lithium-ion batteries (and never by air).
- Thermal monitoring of any damaged, flooded or burned battery should be performed during storage.
- The manual battery Service Disconnect must not be reinstalled by other than an authorized technician.
- The Service Disconnect socket must be covered / sealed to prevent water or debris entering the battery.

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Post-incident handling (page 2 of 2)

The battery pack in this vehicle uses non-spillable lithium-ion cells, and it is unlikely that electrolyte, which is clear, will escape from the pack in the event of damage.

Liquid emissions from damaged packs are typically colored battery coolant, which should be addressed in the same manner as spilled engine coolant.

Do not ingest, inhale, or make bare skin contact with any internal material from the battery cells.

In the event of accidental contact of this nature, wash exposed skin thoroughly with soap and water for at least 5 minutes and seek medical attention. In the event of ingestion, seek emergency medical care immediately.

Do not apply chemical neutralizers used for other battery types or take any other action which could result in battery cell contents being aerosolized.