HONDA

Emergency Response Guide

Honda Fuel Cell Vehicle

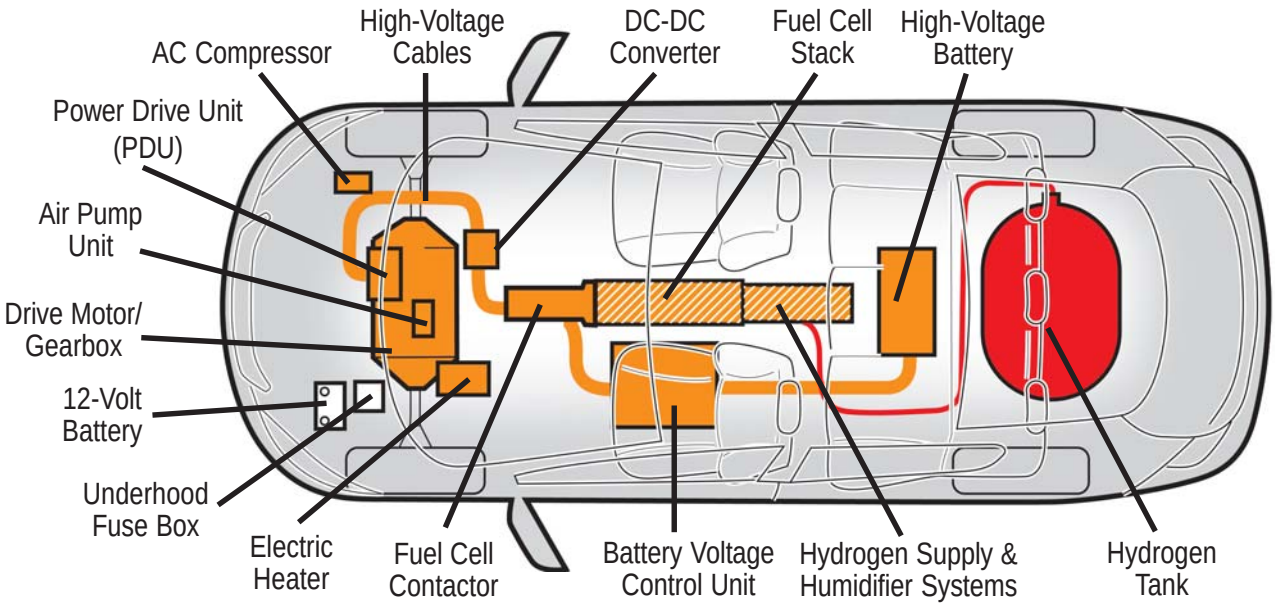
FCX CLARITY

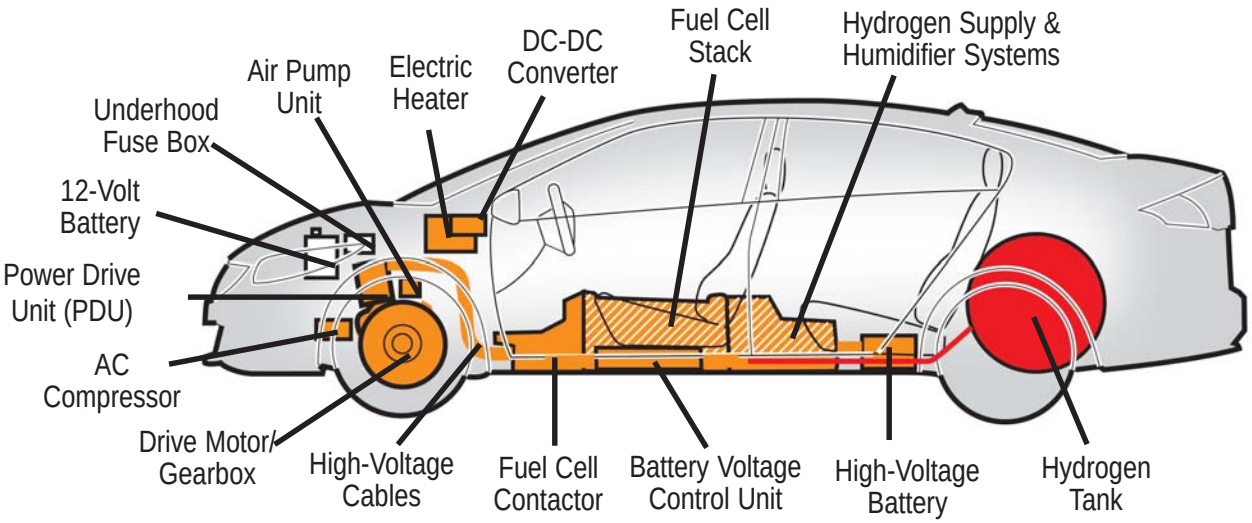
Prepared for Fire Service, Law Enforcement, Emergency Medical, and Professional Towing Personnel by American Honda Motor Co., Inc.

ACI 47994

Contents

Key Components





Vehicle Description

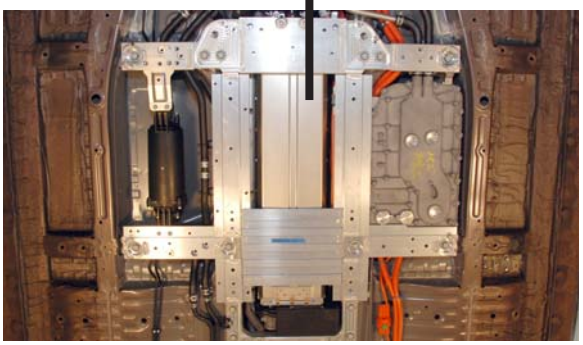
Vehicle Type, Size, and Materials

The Honda FCX Clarity is a 4-door, 4-passenger sedan that uses fuel cells to convert hydrogen and oxygen into electrical power. The chassis and most components are made of steel and aluminum. Some parts are made of plastic.

Identifying the FCX Clarity

The Clarity can be identified by the logo containing the words “FCX and “Clarity” located on the lower part of both rear passenger doors, and to the left of the license plate on the rear of the vehicle.

Fuel Cell Stack

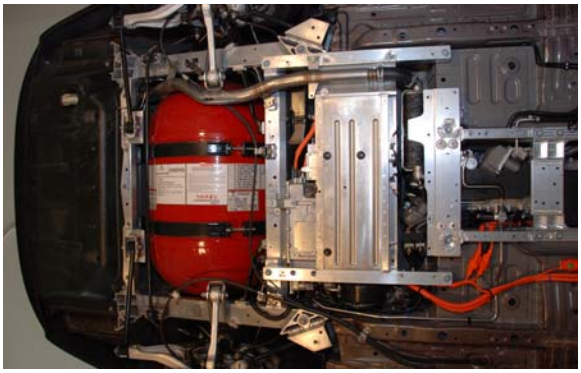


The fuel cell stack is well protected in the lower center of the vehicle, shown here with the underbody covers removed.

Fuel Cell Stack

The FCX Clarity’s main power source is a fuel cell stack housed in a metal box in the lower center of the vehicle. The stack contains layers of individual fuel cells that combine hydrogen from an onboard tank with oxygen brought into the vehicle from air intakes to produce electricity. The only by-products of this process are heat and water. Some of the water is used by the humidifier, and excess water is vented through the exhaust pipe.

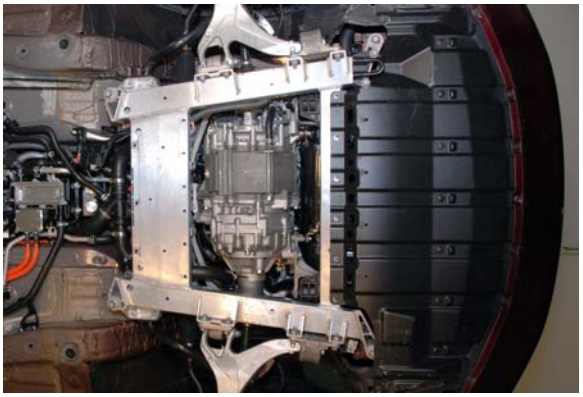
Vehicle Description



The hydrogen tank is securely strapped to the FCX Clarity's frame.

Hydrogen Tank

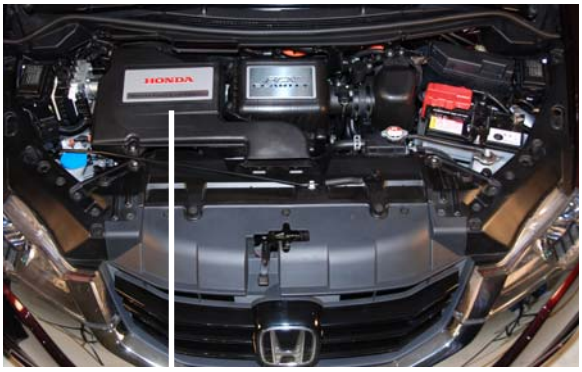
The hydrogen used to generate electricity is compressed to 5,000 psi and stored in a strong, refillable tank located behind the rear seats. The tank is made of nonflammable materials, and has passed the same rigid impact tests for tanks in cars fueled by compressed natural gas (CNG). Tank capacity is 171 liters.



Removing the underbody covers that protect components from dirt and damage reveals the drive motor, located between the front wheels.

High-Voltage Electric Motors

Electricity generated by the fuel cell stack powers the drive motor, an air pump motor, and an air conditioning motor—all located under the hood. Other high-voltage components include a fuel cell contactor, forward of the fuel cell stack; a battery voltage control unit, under the driver's seat; a DC-DC converter; a power drive unit; and an electric heater. (See page 2 for component locations.)

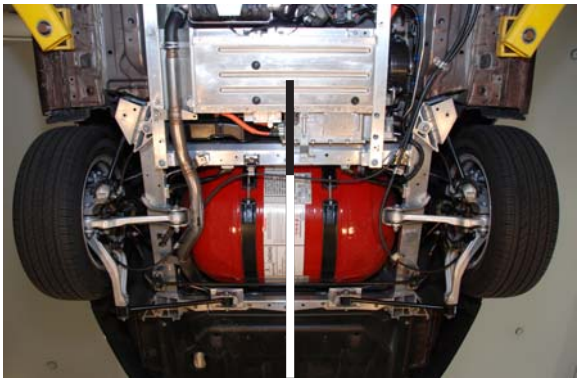


The Power Drive Unit (PDU) is located under other components and can be reached only by their removal.

Power Drive Unit

The power drive unit (PDU) controls the high-voltage electric motor power. While the PDU contains high-voltage components, it is located out of sight and reach, under other components.

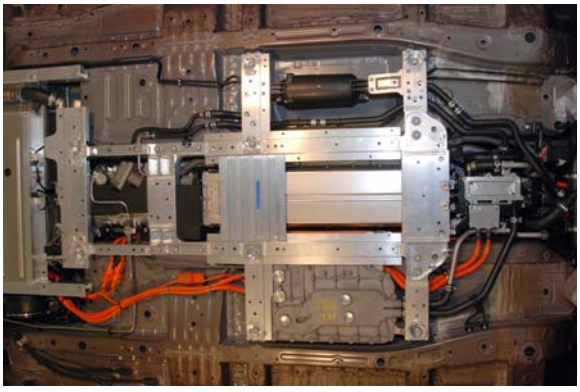
Vehicle Description



High-Voltage Battery Location

High-Voltage Battery

A lithium-ion battery stores power generated by the fuel cells and regenerated by the drive motor. It provides extra current when needed, such as during acceleration. The battery is housed under the rear seat and just forward of the hydrogen tank. Its voltage is nominally 288 volts.



The distinctive orange color makes it easy to identify the location of high-voltage cables, shown here with the underbody covers removed.

High-Voltage Cables

Electricity from the fuel cell stack and the high-voltage battery is delivered to the motors through a number of cables. Most are located inside or behind enclosed high-voltage components. Those located underneath the vehicle are protected by the underbody covers. Any that might be visible under the hood can be easily identified by distinctive orange protective covers.

12 Volt Battery

12-Volt Battery

A conventional 12-volt battery is located under the hood on the driver’s side. This battery powers the lights, the audio system, and other standard electrical components. It is also used to start the drive system.

Occupant Protection Equipment

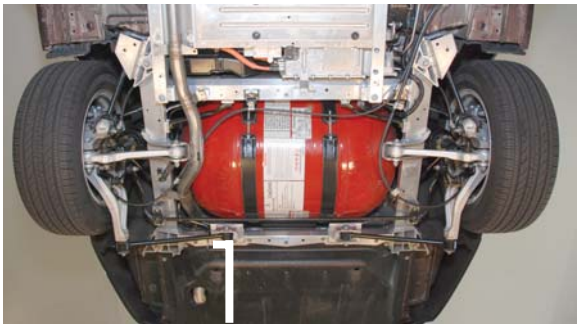
The FCX Clarity has lap/shoulder belts in all seating positions, dual front airbags, side airbags in front, and side curtain airbags. The front seats are equipped with pyrotechnically activated seat belt pretensioners. As with conventional automobiles, it takes about 3 minutes for the airbags and pretensioners to be disabled after the ignition switch is turned off or the 12-volt negative battery cable is cut.

Built-In Safety Features

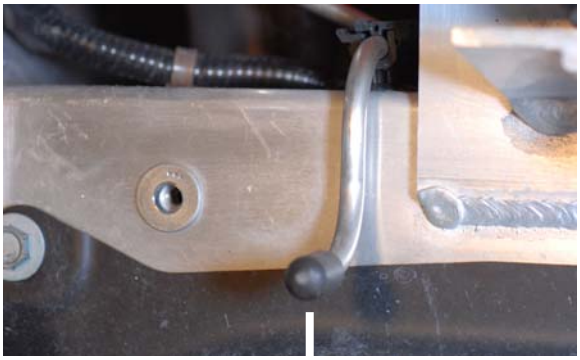
The FCX Clarity is designed with a number of built-in features to protect users, bystanders and emergency responders.

Crash Detection System

The vehicle is equipped with sensors that can detect a serious impact to the vehicle. ***If the impact is severe enough to deploy any airbag, the system controller will automatically shut off the flow of hydrogen and electric current***. While the hydrogen flow stops immediately, it takes about 3 minutes before the high-voltage system is completely shut down.



Hydrogen Pressure Relief Tube Location



Hydrogen Pressure Relief Outlet

Hydrogen Tank Safety Valves

The hydrogen tank contains an internal solenoid valve with three safety valves. One prevents backflow during refueling. Another stops the flow of hydrogen when signaled by the system controller. The third is a pressure relief valve that releases hydrogen if temperature inside the tank exceeds about 226°F (108°C).

If the pressure relief valve opens, hydrogen will be routed through a metal line and out a pressure relief tube under the trunk on the passenger side of the vehicle. The hydrogen will make a hissing noise as it escapes, and it will continue releasing and dissipating up into the atmosphere until the tank is empty. It could take up to 5 minutes if the tank is full.

Hydrogen Detectors

In addition to the safety valves, several hydrogen sensors are located throughout the vehicle. If a potentially hazardous leak is detected, the system controller will automatically stop the flow of hydrogen from the tank.

Potential Hazards

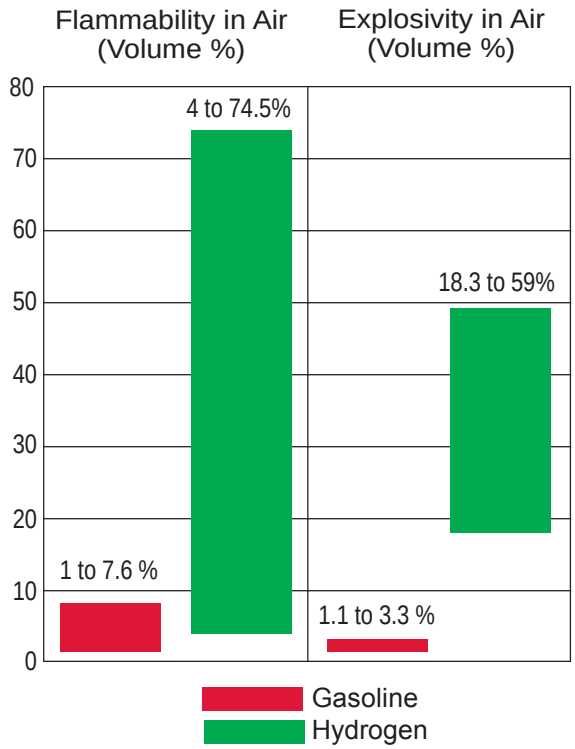
The FCX Clarity does not appear to present any greater hazards than a conventional gasoline-powered, hybrid, or electric car. The vehicle performed well in all standard crash tests, with no damage to the high-voltage or hydrogen components.

Flammable Fluid

The only flammable fluid used by the FCX Clarity is transmission oil. The capacity is 1.2 liters.

Hydrogen Properties and Potential Hazards

The hydrogen used in the FCX Clarity is a nontoxic and odorless gas. Unlike gasoline and oil, it cannot spill and it cannot harm humans, wildlife, or the environment.



However, like other fuels, ***hydrogen is flammable and explosive***. Compared to gasoline, for example, when mixed with air, hydrogen has a much larger range of flammability, and its explosive range is also much larger.

Emergency responders should also know that ***hydrogen flames are invisible.*** In addition, hydrogen burns very quickly and radiates less heat than gasoline or other fuels.

To limit the chance of a hydrogen leak, the FCX Clarity has many built-in safety features (see pages 7-8). And, since hydrogen is 14 times lighter than air, a leak occurring outdoors would quickly dissipate into the atmosphere.

Potential Hazards

Electric Shock Potential

Unprotected contact with any electrically charged or “hot” high-voltage component can cause serious injury or death. However, ***receiving an electric shock is highly unlikely*** due to these facts:

- Following the instructions on pages 13-15 after an incident will shut down the high-voltage system (in about 3 minutes).
- All high-voltage components are insulated from the rest of the vehicle, so touching the body or other vehicle parts cannot result in an electric shock.
- Contact with high-voltage components (shown in orange in the illustrations on page 2) can occur only if these items are damaged and someone deliberately touches the contents.
- Contact with any of the high-voltage motors or other components can occur only after one or more components are removed, or the vehicle is cut outside the cut zone shown on page 16.

High-Voltage Battery Contents

The lithium-ion battery is contained in a strong metal box and should present no hazard in normal circumstances. Also, if the box is engulfed in flames or temperatures above 212°F (100°C), a pressure relief valve will open and release pressure, so the battery should not explode.

However, the contents of the battery are flammable and will burn if the box is broken open, giving off gases that can cause irritation if inhaled. To extinguish a burning battery, the manufacturer recommends CO_2 or an abundance of water.

The electrolyte in the battery is a non-aqueous liquid which is less hazardous than the electrolyte in the 12-volt battery. If the battery box is broken and the electrolyte leaks out, appropriate skin and eye protection are recommended.

Emergency Procedures

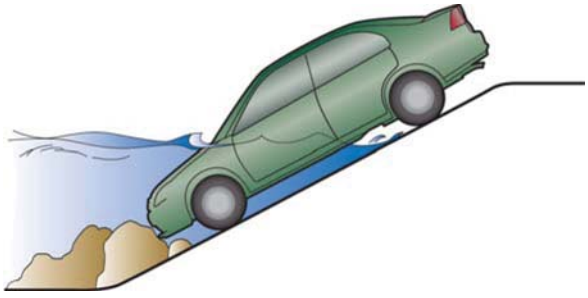
Based on discussions with rescue professionals, we recommend that emergency response personnel follow standard procedures developed by their own organization for assessing situations and dealing with potential hazards. Given our knowledge of the FCX Clarity, we also recommend the procedures outlined in this section.

Incidents Involving Fire

If an FCX Clarity is involved in a fire, follow standard fire-fighting procedures, but with this reminder:

Keep away from the rear of the vehicle until the fire is completely out. If the temperature inside the hydrogen tank exceeds about 226°F (108°C), the gas in the tank will be released through a pressure relief tube at the right rear of the vehicle. You may hear a hissing sound as the hydrogen escapes, and it can take up to 5 minutes for a full tank to empty. Although pure hydrogen flames are invisible, you will see colored flames if other parts of the vehicle are burning.

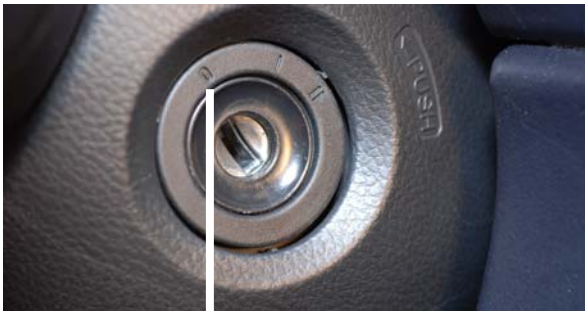
Submerged or Partly Submerged Vehicle



Pull the vehicle out of the water, then proceed with the emergency procedures on the following pages.

Shutting Down the High-Voltage, Hydrogen & Airbag Systems

If it becomes necessary to shut down the high-voltage, hydrogen and airbag systems (such as after the vehicle has been involved in a collision), follow one of the two procedures described below and on the following pages.



Ignition Switch Off (O) Position

Preferred Method

This method is recommended for situations where the responder can safely reach the ignition key.

> ***Turn the ignition key to the off (O) position and remove the key.***

Turning the ignition switch off immediately shuts down the flow of hydrogen. In about three minutes, the high-voltage system and any undeployed airbags and front seat-belt pretensioners will also be shut down.

Removing the key prevents the high-voltage and occupant protection systems from restarting while you assist the vehicle's occupants.

Alternate Method

This method is recommended for situations in which responders cannot reach the ignition key but can reach under the hood and have access to a Phillips screwdriver.

> ***Remove the 120 amp main fuse from the underhood fuse box, THEN cut the negative 12-volt battery cable.***

Removing the main fuse shuts down the high-voltage and hydrogen systems, and cutting the negative 12-volt battery cable shuts down power to the airbags and pretensioners. (Remember, it will take about 3 minutes for these systems to shut down.)

To use this method:

1. Raise the hood and locate the underhood fuse box and the 12-volt battery.

Underhood Fuse Box

12-Volt Battery

120 Main Fuse Screws

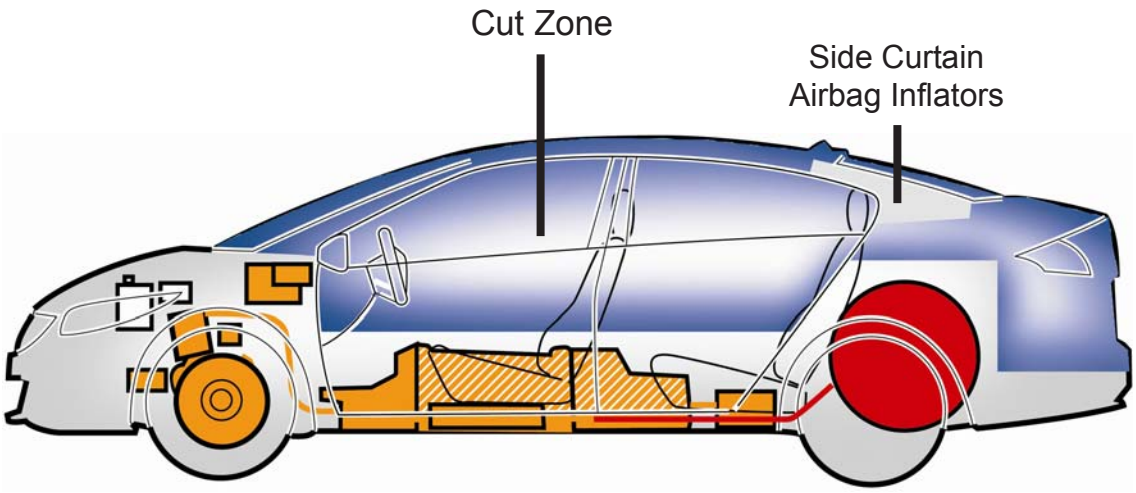
2. Remove the underhood fuse box lid and locate the 120 amp main fuse.
3. Using a Phillips screwdriver, unscrew and remove the main fuse assembly.

Negative 12-Volt Battery Cable

4. Cut the negative 12-volt battery cable.

Extricating Occupants

If you need to cut into the body, or use other Jaws of Life type of equipment to remove occupants, be sure to stay within the cut zone indicated in the illustration below.



Cutting into these components can result in high-voltage electric shock

Cutting into these components should not result in electric shock

Emergency Towing

If a damaged or disabled FCX Clarity needs to be moved a short distance, such as to the side of the road, and the car can still roll on the ground, shift the transmission to neutral, then manually push the car. If the vehicle needs to be towed away from the area, the preferred method is by flatbed truck.

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