HONDA

Emergency Response Guide

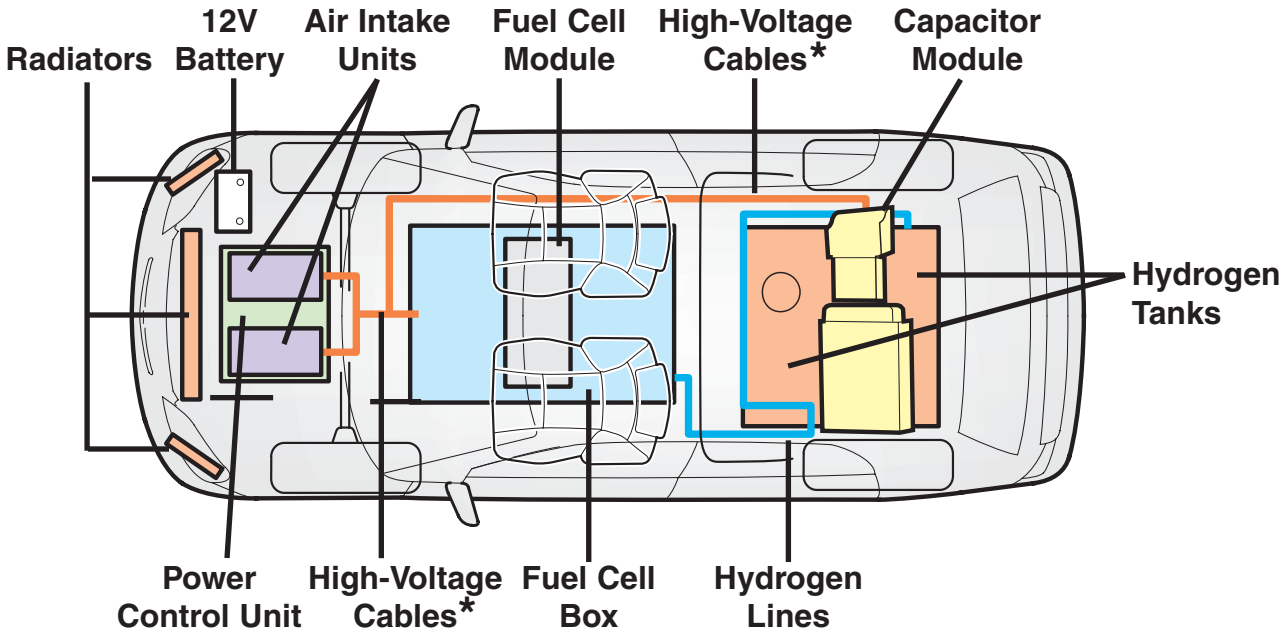
Honda Fuel Cell Vehicle

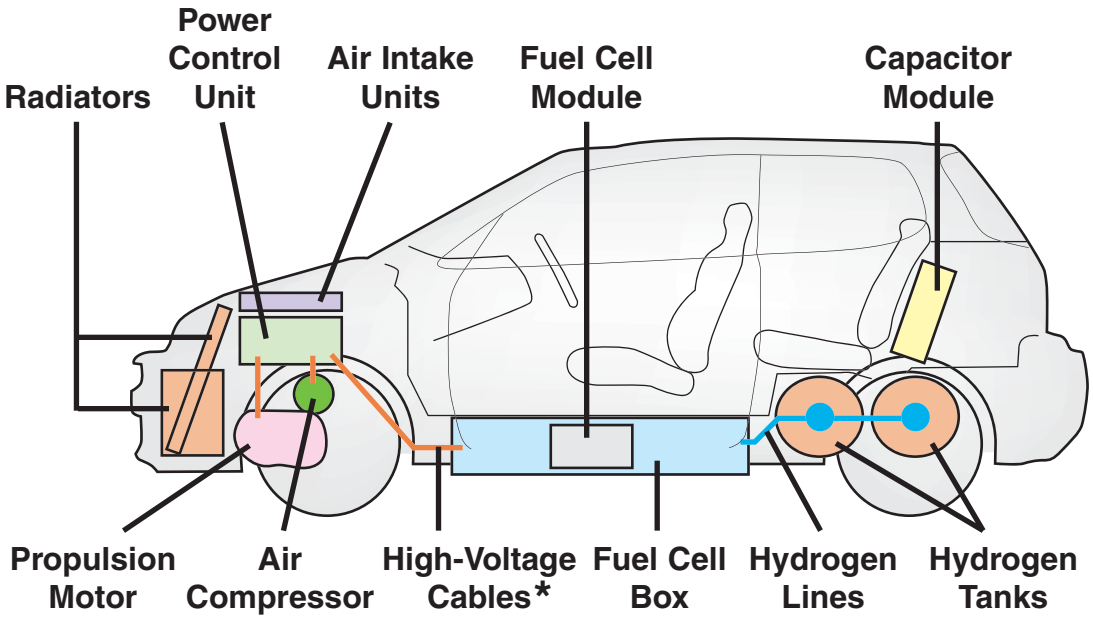
FCX

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

Contents

Key Components





*Locations of the high-voltage cables are approximate. See page 4 for information on how to identify these cables.

Vehicle Description

Fuel Cell Power
FCX

Compressed
Hydrogen Decal

Fuel Cell Module

Hydrogen Tanks

Type, Size, and Materials

The Honda FCX is a 2-door, 4-passenger hatchback electric vehicle that uses fuel cells to generate power. The FCX can be easily identified by the words “Fuel Cell Power” across the bottom of the rear window, a blue and white compressed hydrogen decal on the right side of the rear hatch, and the words “Fuel Cell Power” and the FCX logo on the driver’s and passenger’s doors. The chassis and most components are made of steel and aluminum. A few parts are made of plastic.

Curb Weight

The curb weight of the Honda FCX is 3,700 pounds (1,680 kg).

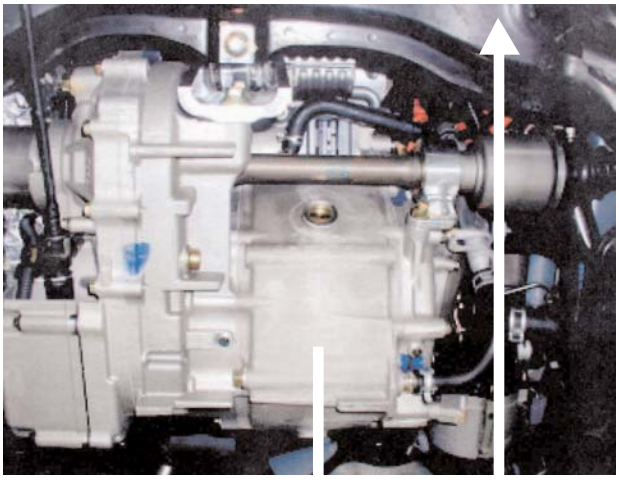
Fuel Cell Module

The main power source for the FCX is a fuel cell module, which is housed inside a strong steel box under the passenger compartment floor. This module contains many individual fuel cells that combine hydrogen from onboard tanks with oxygen from the air intake units to produce electricity. The only by-products of this process are heat and water; the water is released through the exhaust pipe.

Hydrogen Tanks

The hydrogen used by the fuel cell module is compressed to 5,000 psi and stored in two tanks. The tanks are under the rear floor of the vehicle. They are made of nonflammable materials and certified to have passed the same rigid impact tests as tanks in cars fueled by compressed natural gas (CNG).

At 5,000 psi, the total capacity of the tanks is 9.44 pounds (4.28 kg) of hydrogen.



Propulsion Motor Front of Car

High-Voltage Electric Motors

Electricity generated by the fuel cell module powers these four high-voltage motors:

- The propulsion motor drives the front wheels
- An air compressor motor supplies air to the fuel cells
- A water pump motor cools the fuel cell module
- An air conditioning motor powers the air conditioning system

Turning the key switch to the Accessory (I) or Lock (0) position turns off all the motors. However, the air compressor motor may continue running for up to 10 seconds.

12V Battery Power Control Unit

Power Control Unit

The power control unit (PCU) is located under the hood directly under the two air intake units. The PCU controls the generation and use of high-voltage electrical power and contains high-voltage components.

12-Volt Battery

A conventional 12-volt battery is located under the hood, on the passenger side of the vehicle. This battery powers the lights, audio system, and other standard electrical components. It also supplies power to start the fuel cell system.

One of Two Assemblies in the Capacitor Module

Capacitor Module

Two integrated capacitor assemblies make up the capacitor module. Somewhat like a battery, the capacitor module provides long-term storage for electrical power generated by the fuel cells or regenerated by the propulsion motor. This power is available to provide extra current when needed, such as during acceleration. Each capacitor assembly has many individual cells. Specifications for the capacitor module are

Weight:	150 pounds (68.6 kg)
Total Voltage:	400 volts
Capacity:	8.0 farads

The capacitor module is housed inside a strong, sealed protective box, between the rear seat and the cargo area. The module contains high-voltage even when the fuel cell module and the key switch are turned off. The entire unit is electrically insulated from the vehicle body.

High-Voltage Cables (driver's-side under-hood view)

High-Voltage Cables

Electrical energy comes from the fuel cell module and the capacitor module to the various electrical components through 21 high-voltage cables. Most of these cables are concealed behind or within various components. Any high voltage cable visible under the hood or from under the car can be easily identified by its orange protective cover.

Built-In Safety Features

Occupant Protection Features

The FCX has lap/shoulder belts in all four seating positions, dual front airbags, and pyrotechnic seat belt tensioners for the driver and a front passenger. To disable the airbags and tensioners, the key switch must be in the LOCK (0) position for at least 3 minutes, or the 12-volt battery must be disconnected for at least 3 minutes.

Crash Detection System

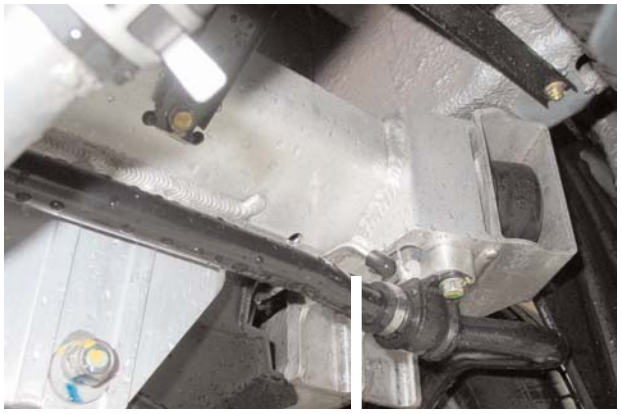
The FCX is equipped with sensors that can detect a serious impact to the front, rear, or either side of the vehicle. If the impact is severe enough, the control unit automatically shuts off the flow of electricity from the fuel cell module and the capacitor module. In less than 1 second, there is no electric current in the high-voltage cables.

Hydrogen Tank Safety Valves

Each hydrogen tank contains three internal safety valves. One prevents any backflow while the tank is being refilled, another shuts off the flow of hydrogen when signaled by the power control unit, and the third is a pressure relief device designed to release all hydrogen if the temperature in the tanks exceeds approximately 221°F (105°C).

When the pressure relief device is activated, hydrogen is routed through a line and out of the vehicle through the pressure relief tube under the right rear bumper.

Pressure Relief Tube (rear view of vehicle)



Pressure Relief Tube

The hydrogen will continue releasing into the atmosphere until the tanks are empty. This could take up to 5 minutes if both tanks are full.

Hydrogen Line Sensors

In addition to the in-tank safety valves, several sensors are located along the hydrogen lines to detect any possible leak. If a leak is detected, the power control unit automatically stops the flow of hydrogen from the tanks.

Manual Hydrogen Shut-Off Valve

Manual Hydrogen Shut-Off Valve

The FCX is equipped with a manual shut-off valve that can be used to stop the flow of hydrogen from the tanks. The valve is located inside the right rear wheelwell, in front of the tire. Its large, red handle easily identifies it.

See page 11, 13, or 15 for instructions on turning off the valve.

Potential Hazards

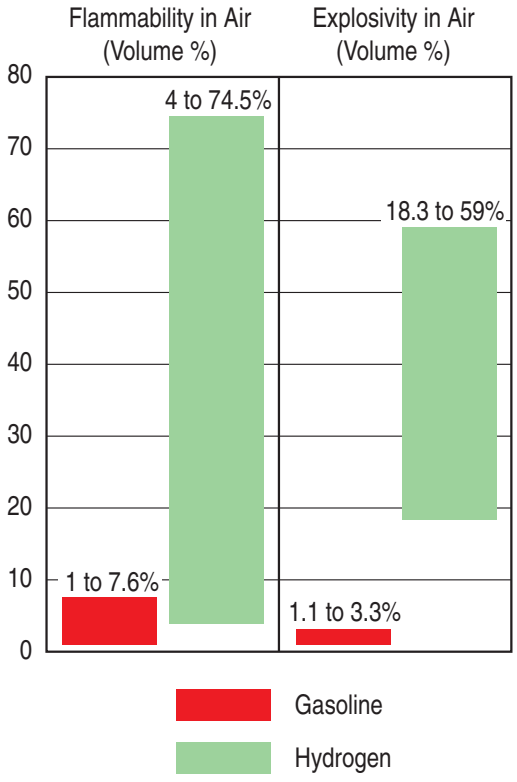
The FCX does not present any greater hazards than a conventional gasoline-powered passenger car or any other type of electric car. It performed well in front-, offset-frontal-, side-, and rear-impact tests, with no damage to any of the high-voltage or hydrogen components.

Flammable Fluid

The only flammable fluid used by the FCX is transmission oil. The capacity is 1.2 quarts (1.1 liters).

Hydrogen Properties and Potential Hazards

The hydrogen used in the FCX 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 both flammable and explosive. Compared to gasoline, for example, when mixed with air, hydrogen has a much higher and wider range of flammability. Its explosive range is also much higher and wider, as illustrated in the graph.

To limit the chance of hydrogen leakage, the FCX has many built-in safety features to help contain hydrogen, detect a leak, and automatically shut off the flow of gas if a leak is detected (see pages 5-6).

Since hydrogen is 14 times lighter than air, a leak occurring in an open area would quickly rise and dissipate into the atmosphere. In an enclosed space, the hydrogen would collect in the uppermost areas.

Emergency personnel should also be aware that hydrogen flames are invisible. Also, hydrogen burns very quickly and radiates less heat than gasoline or other fuels.

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:

- Contact with high-voltage components inside the power control unit, the fuel cell box, or the capacitor module can occur only if these units are damaged and someone deliberately touches the contents, or if any of these units are opened without following the proper precautions.

- Contact with the propulsion motor or air compressor motor can occur only after one or more components are removed.

- Contact with “hot” high-voltage cables can occur only if the protective orange plastic covering is ripped open and someone deliberately contacts both the positive and negative wires.

- All high-voltage cables are clearly identifiable by their orange plastic covering.

Capacitor Electrolyte

Small quantities of organic electrolyte are used in the manufacture of the capacitor cells. Unlike the acid electrolyte used in the conventional 12-volt battery, capacitor electrolyte would cause only minor irritation. In addition, the only way someone could contact the electrolyte would be if the capacitor module were severely damaged and that person deliberately touched the cells without wearing protection.

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, we also recommend the procedures outlined in this section.

Incidents Involving Fire

If an FCX is involved in a fire, follow standard fire-fighting procedures, but ***keep away from the rear of the vehicle until the fire is completely out.*** Remember that high temperatures or pressures can cause all hydrogen in the tanks to be released through the pressure relief tubing at the right rear of the vehicle (see pages 5 and 6) and that hydrogen flames are invisible.

Submerged or Partially Submerged Vehicle

Pull the vehicle out of the water, and then use one of the procedures described on pages 10–15 for preventing current flow through the high voltage cables. There is no danger of electric shock from touching the car body or framework.

Damaged Vehicle

Before attempting to rescue occupants from a damaged FCX or to move a damaged vehicle, it's important to prevent electric current from flowing through the high voltage cables and to prevent hydrogen leakage.

You have three ways to do this, ranging from the best method to the least desirable.

Best method for preventing current flow and hydrogen leakage:
Turn the key switch off, remove the key, and turn off the manual hydrogen shut-off valve (see page 11).

Second-best method for preventing current flow and hydrogen leakage:
Disconnect the 12-volt battery negative cable and the negative DC-to-DC converter cable, then turn off the manual hydrogen shut-off valve (see page 12).

Least-desirable method for preventing current flow and hydrogen leakage:
Turn off the capacitor module main switch, then turn off the manual hydrogen shut-off valve (see page 14).

If you cannot perform any of these methods, use extreme care.

- Do not cut into any high-voltage components or high-voltage cables.
- Do not touch the cables, because they may be "hot."

Best Method for Preventing Current Flow and Hydrogen Leakage

Turn the key switch off, remove the key, and turn off the manual hydrogen shut-off valve.

Turning off the key switch turns off the fuel cell module and all the motors, preventing electric current from flowing into the high-voltage cables. It also turns off power to the airbags and the seat belt tensioners (although it will take 3 minutes for the airbags and seat belt tensioners to depower).

Turning off the manual hydrogen shut-off valve stops the hydrogen flow from the fuel tanks.

To use this method, do this:

Key in the Key Switch

1. Turn off the key switch, and remove the key. (Removing the key prevents the car from being accidentally or inadvertently powered up).
2. Locate the red handle of the manual hydrogen shut-off valve (it's in front of the tire in the right rear fenderwell).

Manual Hydrogen Shut-Off Valve (Turn 1/4 turn clockwise to stop the flow of hydrogen.)

3. Turn the handle one-quarter turn clockwise to stop the flow of hydrogen.

Second-Best Method for Preventing Current Flow and Hydrogen Leakage

Disconnect the 12-volt battery negative cable and the negative DC-to-DC converter cable, then turn off the manual hydrogen shut-off valve.

This method should be used only if the key switch is in the ON (II) position, and you cannot reach the key but you can reach under the hood.

Disconnecting the 12-volt battery negative cable and the negative DC-to-DC converter cable turns off the fuel cell system and all the motors, preventing high voltage from flowing into the cables. It also cuts power to the airbags and the seat belt tensioners within 3 minutes, and prevents the propulsion motor from being restarted.

Turning off the manual hydrogen shut-off valve stops the hydrogen flow from the fuel tanks.

To use this method, do this:

1. Open the hood, and locate the 12-volt battery on the passenger's side.

2. Using a 10 mm wrench or pliers, disconnect the 12-volt battery negative ground bolt.

3. Using the wrench or pliers, disconnect the negative DC-to-DC converter cable ground bolt.

Manual Hydrogen Shut-Off Valve (Turn 1/4 turn clockwise to stop the flow of hydrogen.)

4. Locate the red handle of the manual hydrogen shut-off valve (it's in front of the tire in the right rear fenderwell).

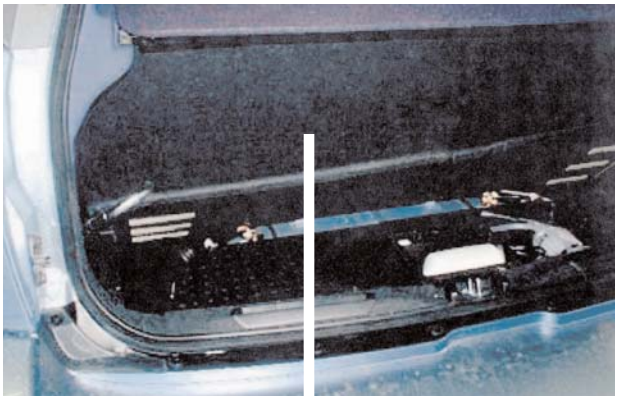
5. Turn the handle one-quarter turn clockwise to stop the flow of hydrogen.

Least-Desirable Method for Preventing Current Flow and Hydrogen Leakage

Turn off the capacitor module main switch, then turn off the manual hydrogen shut-off valve.

This method does not disable the airbags or the seat belt tensioners.

It should be used only if the key switch is in the ON (II) position, you cannot reach the key, and you cannot reach under the hood.



Cargo Area Carpet

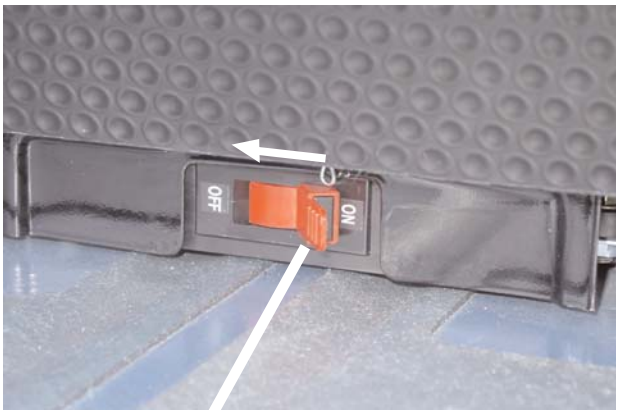
Turning off the capacitor module main switch prevents electric current from flowing into the high-voltage cables from the capacitor module. Turning off the manual hydrogen shut-off valve stops the hydrogen flow from the fuel tanks. Within 90 seconds, the fuel cells will stop generating electricity, and electric current will stop flowing into the high-voltage cables.

To use this method, do this:

1. Lift up the carpet covering the floor of the cargo area.

2. Locate the capacitor module main switch at the center of the cargo area floor.

Capacitor Module Main Switch



Red Locking Cover

3. Remove the red locking cover, then flip the switch from ON to OFF.

4. Reattach the locking cover to prevent the switch from inadvertently being flipped on.

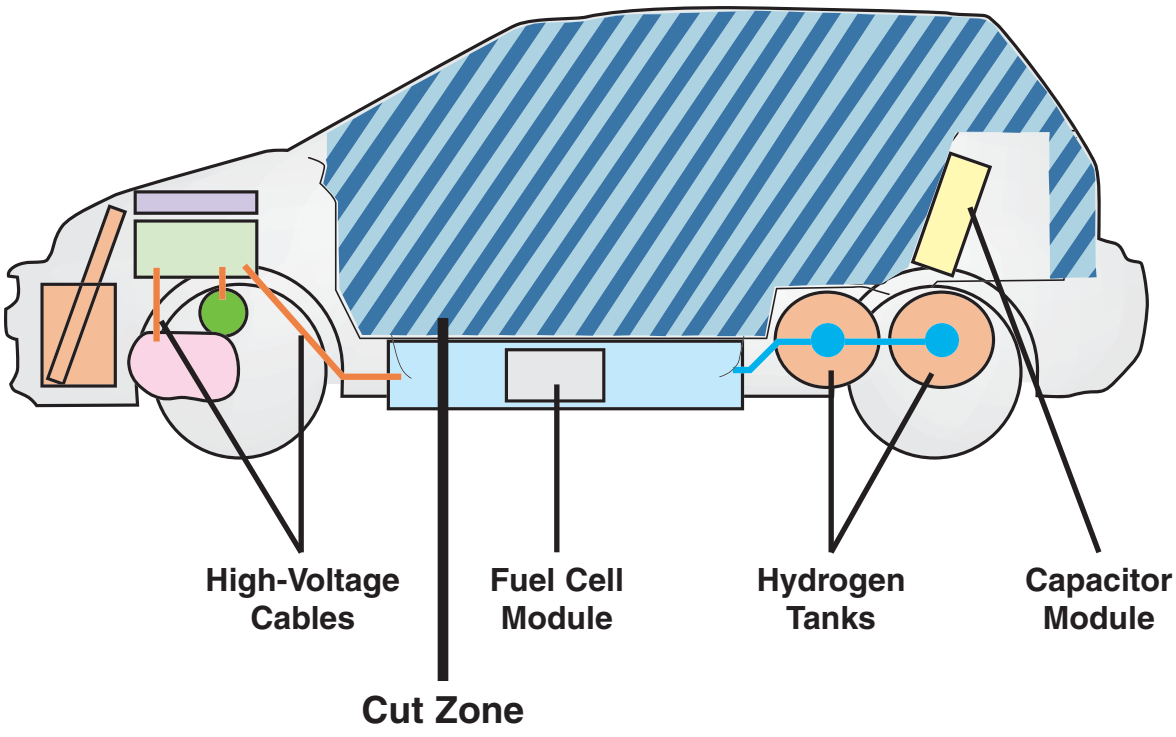
Manual Hydrogen Shut-Off Valve (Turn 1/4 turn clockwise to stop the flow of hydrogen.)

5. Locate the red handle of the manual hydrogen shut-off valve (it's in front of the tire in the right rear fenderwell).

6. Turn the handle one-quarter turn clockwise to stop the flow of hydrogen.

Extricating Occupants

If you need to break windows, cut into the body, or use “Jaws of Life”-type equipment to remove occupants from a damaged vehicle, be sure to stay within the cut zone (as indicated on the illustration by the light blue and dark blue diagonal lines). Do not cut into the undercarriage or into the area containing the capacitor module.



Emergency Towing Continued

If you need to move the FCX only a short distance, such as to the side of the road, and the car can still roll on the ground, the easiest way is to shift to neutral, then push the car manually.

To move the FCX a longer distance, the preferred method is to use a flat-bed truck. To prevent damage to the bodywork, use the towing hook to pull the car onto the truck, and then use the tie-down points to secure it to the flat-bed.

If a flat-bed is not available, wheel lift equipment may be used, preferably with the front wheels lifted. If the rear wheels must be raised, be sure to first set the parking brake and shift the transmission to neutral. With the front wheels rotating, the propulsion motor generates electrical power. To prevent over-voltage problems, the towing speed should be limited to less than 25 mph.

Using the Towing Hook

1. Lift up the carpet from the cargo area floor, and remove the towing hook from the pocket on the left.

Towing Hook

Towing Hook Hole

2. Remove the round grommet that covers the towing hook hole (on the driver's side of the front grille).

3. Screw the towing hook firmly into the hole.

Tie-Down Points

Using the Tie-Downs

Tie-down points are provided on the inside of the side sills. Remove the grommets before using these points.

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