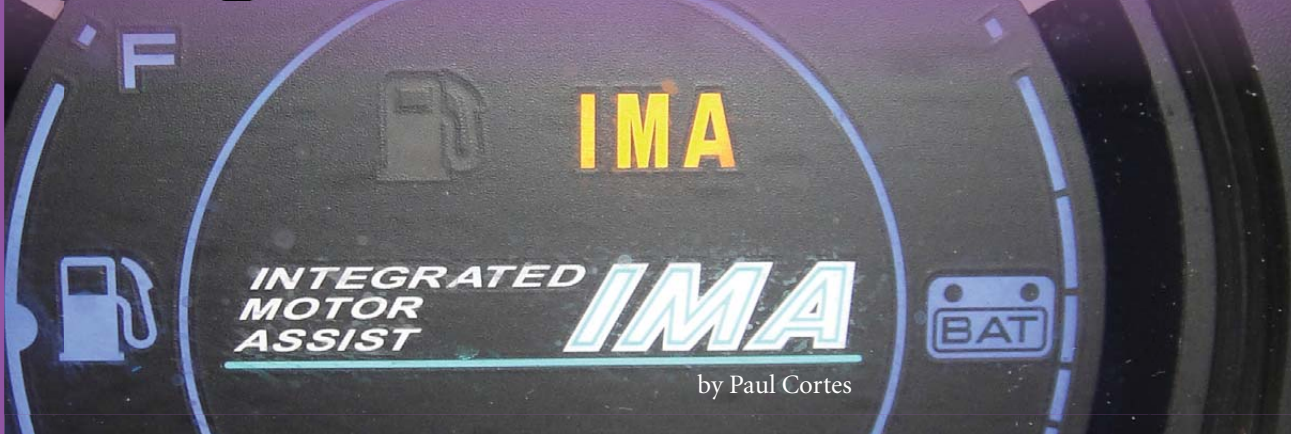


More Hands-On Hybrid Info: Civic HV Battery Replacement



by Paul Cortes

These days, quite a few techs have had experience with Toyota HV (Hybrid Vehicle) batteries, either during hands-on training, or while repairing customers' cars. Honda IMA battery packs, however, remain a mystery for many techs at independent shops. It's not due to lack of failures. In our shop, we've diagnosed several battery module failures, but most of them have been covered under the extended warranty on the Insight, or under the standard 8/80 warranty.

The first time we encountered a failed IMA battery module that was out of warranty, our dealership refused to sell us the battery citing training and safety concerns. After some back and forth, they finally admitted they had made a mistake, but by then it was too late and we had lost the sale.


We just recently replaced our first IMA battery on a 2003 Civic. It was a car referred to us from another shop because they weren't comfortable doing the job. After replacing the battery pack, I felt kind of bad for them. The job was very easy, much easier than replacing the battery pack in a Prius. The referring shop is good with talented techs. I know for a fact they would have had no trouble replacing the battery pack if they had tried. So, in my opinion the only thing that

held them back from taking on an easy and profitable job was fear of the unknown.

The purpose of this article is to demonstrate how easy IMA battery replacement really is, so that good shops won't give away good work just because they don't know what to expect, or because the flat rate time seems low.

Equipment

You will need the factory scan tool, the Honda HDS. The HDS used to come in three flavors: Tablet PC, Pocket PC, and Standard PC. Now, the HDS only comes in the PC version. The PC interface device – a box with two cables, one that connects to the laptop and the other to the OBD II connector – is currently the GNA600, which sells for about \$2000. You'll also need software for the laptop, which runs about \$840 per year. Finally, you'll need a subscription to Honda Service Express, Honda's information website. The website covers Honda and Acura products and is a bargain at only \$350 per year. If you have an LSID (locksmith license), you can subscribe to the Security Professional version for \$500 per year. If you work

 All DTC Test Certification		
Name _____		
Model <u>CIVIC HYBRID</u>		
VIN <u>JHMES96603S014553</u>		
System	DTC Code	Description
PGM-FI Permanent DTC	P1600	IMA SYSTEM MALFUNCTION
PGM-FI Permanent DTC	P1601	IMA SYSTEM MALFUNCTION
PGM-FI Temporary DTC	No DTC was found	
CVT Permanent DTC	No DTC was found	
CVT Temporary DTC	No DTC was found	
99SRS Permanent DTC	No DTC was found	
99SRS History DTC	07-2	Internal failure of SRS unit
HONDA ABS Permanent DTC	No DTC was found	
EPS Permanent DTC	No DTC was found	
IMA Permanent DTC	P1447	Battery Module Deterioration
IMA Permanent DTC	P1449	Battery Module Deterioration

The PGM-FI codes P1600 and P1601 indicate a problem with the IMA system and do not need to be investigated. The SRS code 07-2 was caused by a bad SRS control unit and is unrelated to the other codes.

on Honda or Acura, you're handicapping yourself by working without these resources, so regardless of whether or not you're interested in replacing IMA batteries, this equipment will quickly pay for itself.

level of the decrease in voltage, just like a load test on a 12V battery. When the IMA is acting as a generator, the MCM monitors the rate and level of the increase in voltage, just like a five-minute charging test on a 12V battery.

Diagnosis

Diagnosis is almost disappointingly simple. Pull the codes, in this case a P1447 and P1449. After a quick search on Service Express, you'll find a couple of surprisingly short flow charts. Both consist of only one line, "Replace battery module."

The 144-Volt IMA battery is made up of 20 7.2V cells tied together in series. Voltage is monitored at 12 points among the cells. The Motor Control Module (MCM) compares the lowest segment voltage to the highest segment voltage. If the difference is too great, a code P1447 will set.

Toyota requires a "manual" verification of excessive voltage spread under load using scan data. Honda says finding a code P1447 is enough to condemn the battery. It makes for a quick, if not intellectually satisfying, diagnosis.

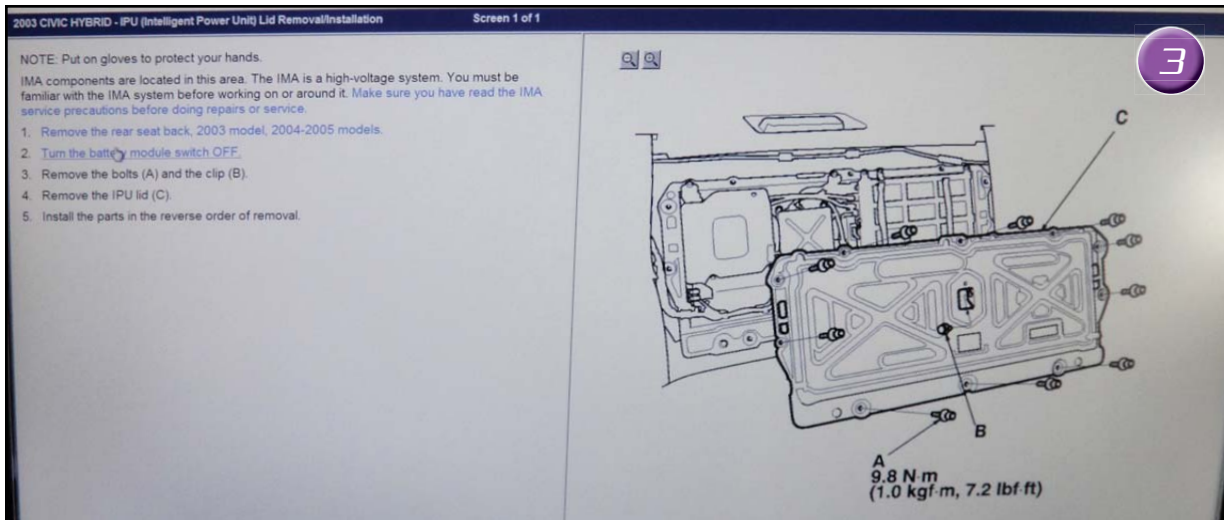
The code P1449 is an indicator of poor battery capacity. The MCM monitors the minimum and maximum battery voltage and computes the electrical current value during operation to calculate the battery capacity. Think of it like this: When the IMA motor is drawing current, the MCM monitors the rate and

Obtaining a battery

Battery modules can be purchased through any Honda dealer (don't let them tell you otherwise!). The old battery must be returned in the custom-built shipping box they provide (Image 2). Keeping the



Custom-built shipping box provided by the dealer.



Honda's instructions include hyperlinks in blue.

old battery is not an option. There is an additional shipping charge on the battery, so be sure account for that when quoting the job.

There is also some paperwork that must be completed. The Honda IMA battery reman program requires a copy of the dealer invoice, a copy of the repair order, and a completed IMA Battery Module Return form, which asks for three pieces of information:

1. What was the customer complaint? (In this case, the IMA and Check Engine lights).
2. Did you duplicate the complaint and what codes were stored? (In this case, P1600, P1601, P1447, and P1449)
3. Were there any other symptoms or conditions? (In this case, no).

Failure to complete the paperwork results in a \$50 "diagnostic fee," so it makes sense to spend a couple of minutes jotting down some notes and photocopying.

Read the instructions

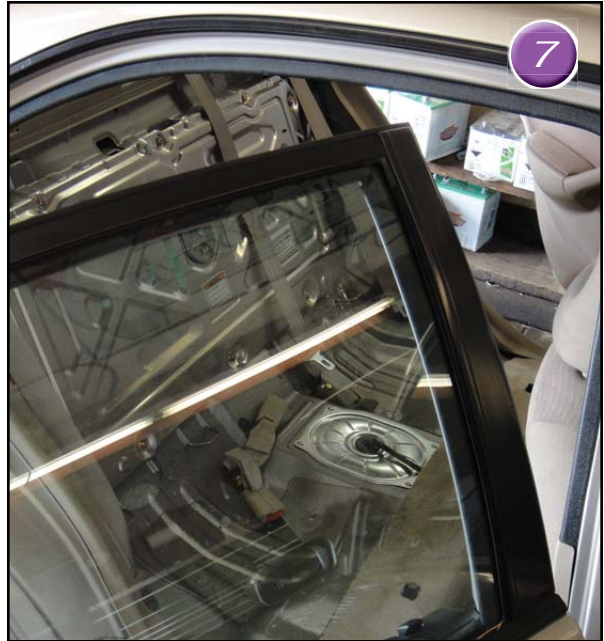
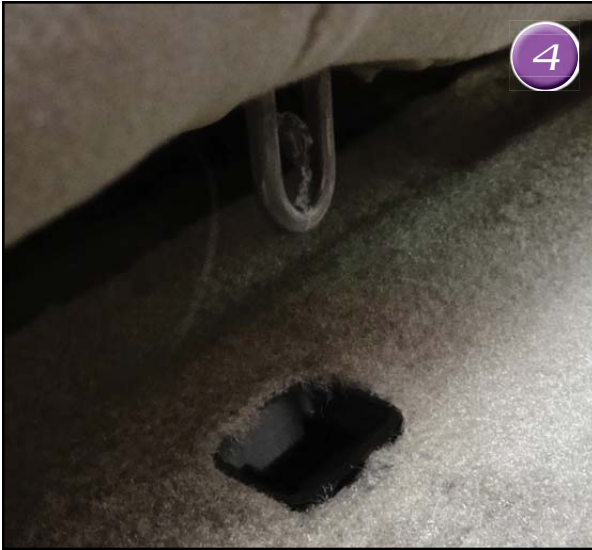
Replacing the IMA battery is some pretty basic R&R work. However, there are three good reasons to read the instructions. First, it is possible to electrocute yourself. Second, the two minutes you spend looking up and reading the procedure will save you time when you do the job. Third, you'll need to look up the torque specs anyway, so you may as well read the instructions before you start.

The IMA battery lives behind the rear seat back. Honda's instructions include hyperlinks in blue (**Image 3**). For instance, on this page it says, "Make sure you're familiar with IMA service precautions before doing repairs or service." So, if you're not sure that you are, you can click on the link to find out what you should know before you start.

Removing the IMA battery

The first step is to disconnect the 12V battery. This is necessary for safety and to prevent possible damage. Next, remove the seat bottom, then the seat back. Thankfully, most Japanese cars have more or less the same design, and the Civic hybrid is no different. The front of lower cushion is held in place with two clips. Just pull straight up and they will pop out (**Image 4**). The rear of the lower cushion is held in place with a single bolt near the center (**Image 5**). Once the bottom cushion is removed, you'll have access to the two bolts holding the back cushion in place (**Image 6**). With the seat out of the way, there's plenty of room to work, even for a tall guy (**Image 7**).

The "HIGH VOLTAGE, You will be killed or hurt" warning is a friendly indicator you are getting closer to the IMA battery (**Image 8**). Since it's an unconditional statement, we may as well proceed, since it apparently makes no difference what you do from this point on -- you're a goner regardless. Remove the two bolts on this cover and you'll find the IMA switch, which is just



With the seat out of the way, there's plenty of room to work.



Above: "HIGH VOLTAGE. You will be killed or hurt" warning.



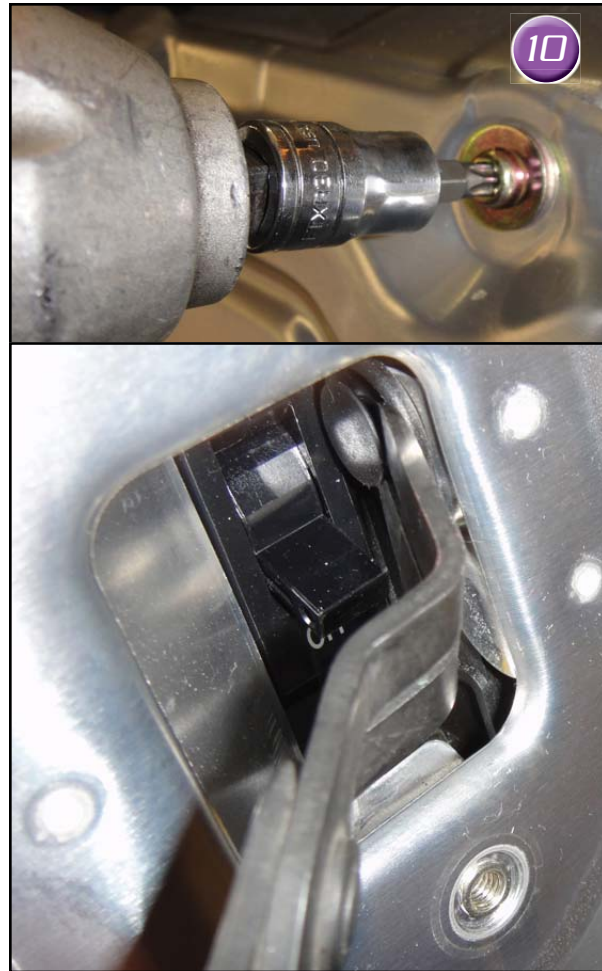
IMA switch: Remove the red locking clip, flip the switch to "off," and reinstall the red locking clip.

like a light switch. Remove the red locking clip, flip the switch to off, and reinstall the red locking clip (**Image 9**). This will prevent the switch from being turned on while you are working on the car. Honda says to wait five minutes after flipping switch before removing the Intelligent Power Unit (IPU) cover. This will give the capacitors time to discharge.

Next, remove the IPU cover. It's held in place by 10 T30 Torx bolts and one trim clip right next to the switch (**Image 10**). When the switch is in the "ON" position, it blocks the trim clip so you can't remove it. Honda does not have an interlock system like Toyota, so if the "clipinterlock" has been defeated because the last technician didn't put it back, it'll be up to you to remember to flip the switch before removing the cover.

The IMA battery is a black box with two straps on the right of **Image 11**. Before touching anything, you'll want to verify the power is off. Honda says there should be less than 30V, but there is no reason you shouldn't have 0V or pretty close to it (**Image 12**).

You'll need to disconnect a few things before unbolting and removing the IMA battery. Start with the MCM connector (**Image 13**), then remove the three other connectors as well (**Image 14**). Gently squeeze and remove the harness routing clips and remove the capacitor ground bolt (red arrow) (**Image 15**).



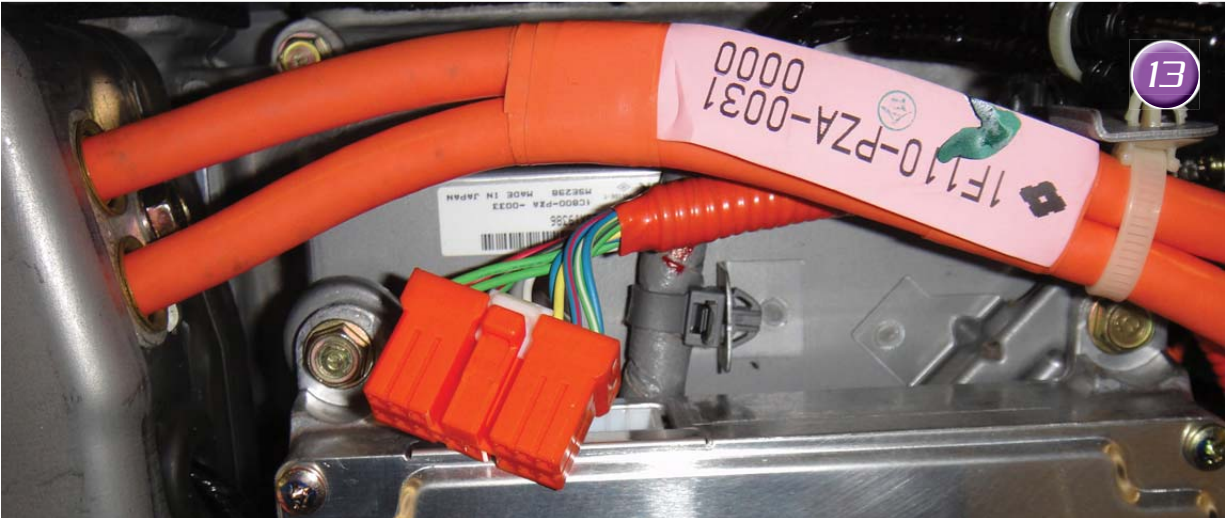
The IPU cover is held in place by 10 T30 Torx bolts and one trim clip right next to the switch.



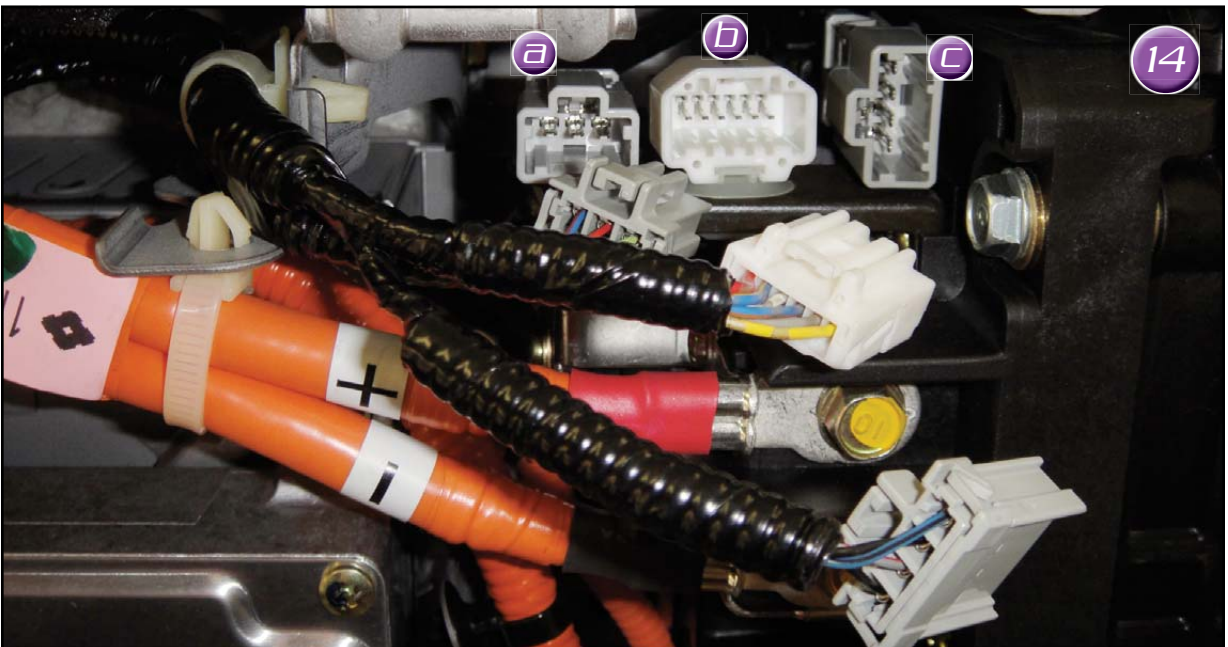
IMA battery is a black box with two straps on the right.



Verify the power is off. Honda says there should be less than 30V, but there is no reason you shouldn't have 0V or pretty close to it.



Start disconnecting the MCM connector first.



Remove the other three connectors as well.

Remove the battery cables and tape the ends (**Image 16**). Honestly, I'm not sure why. There will be no power at these cables while the car is sitting motionless in the bay with the key off and the battery disconnected. However, the instructions are there to keep you safe and prevent damage, so it's best just to follow them.


One connector must be removed from its mount before it can be separated (**Image 17**), similar to many Honda O2 sensor connectors. The IMA battery module is held in place with four bolts and one retaining bracket (**Image 18**).

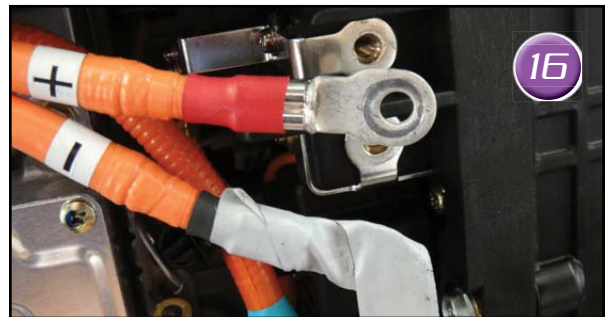
It seems like Honda always considers ease of repair when they are designing a car. I doubt these straps are used during manufacture, but they sure are handy when removing the battery (**Image 19**). The battery is a little heavy, but I was able to remove it by myself fairly easily. The Gen 1 Prius is about twice as heavy and I always get some help to remove it from the car.

Unlike the Prius, there is no need to transfer any components other than the switch lock clip. Just grab the new battery and put it in the car, then put the old battery in the box to send back to Honda (**Image 20**).

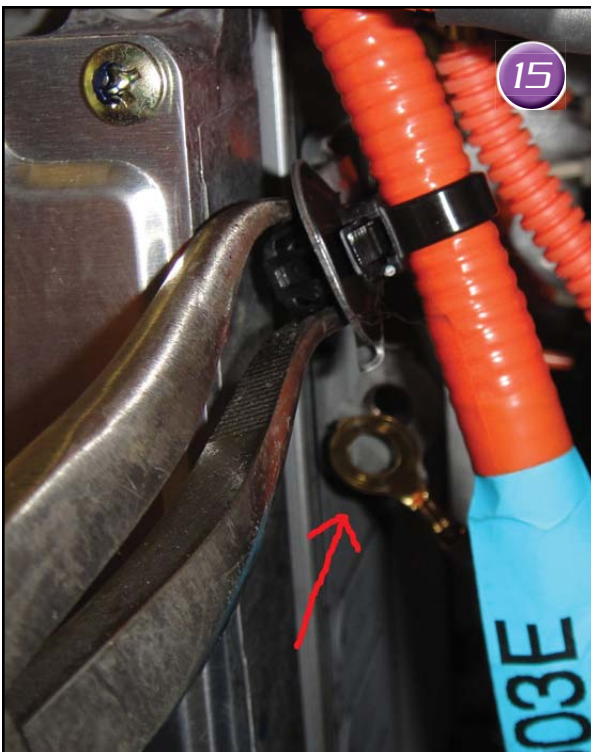
I would strongly recommend using a torque wrench for the battery cables (**Image 21**). The spec is 7.2 ft.lbs, which is lower than most torque wrenches will read accurately. So, use an in.lb. wrench instead. $12 \times 7.2 \text{ ft.lbs.} = 86.4 \text{ in. lbs.}$ I used common sense and a 3/8 in. electric impact wrench for everything else.

It's pretty basic, but often overlooked: I like to connect all of the seat belts to make sure none are still stuck under the seat or twisted any time I remove a seat (**Image 22**).

And that's it. Replacing the IMA battery is easier than most brake jobs, radiator or CV boot replacement, and a whole lot cleaner! 



Remove the battery cables and tape the ends.



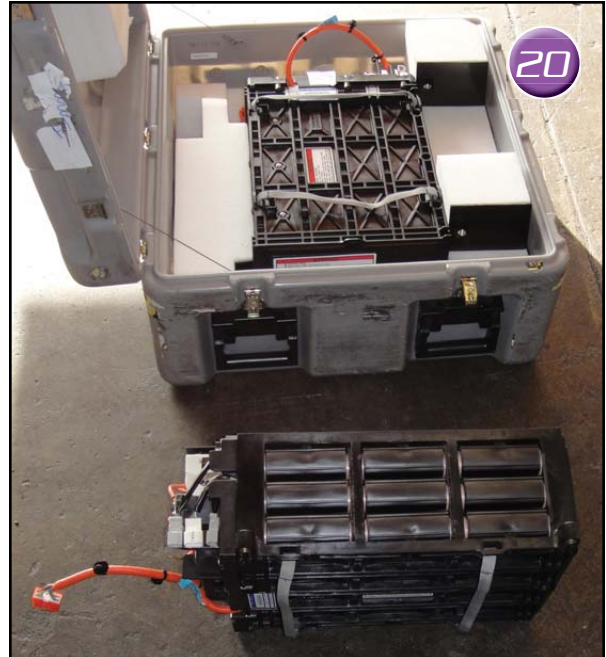
Remove the capacitor ground bolt (red arrow)



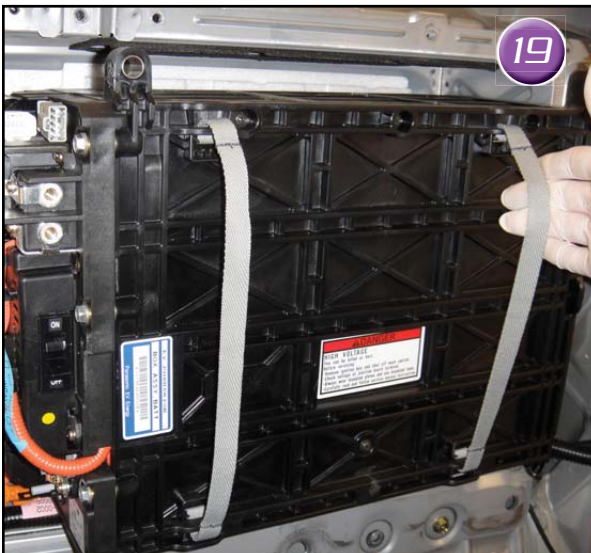
This connector must be removed from its mount before it can be separated



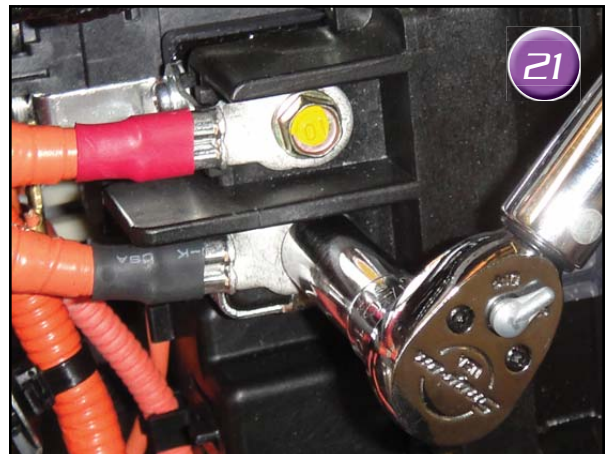
The IMA battery module is held in place with four bolts and one retaining bracket.



No need to transfer components. Simply replace the old battery with the new, and ship back to Honda.



Straps make for easy battery removal.



Strongly recommended to use a torque wrench for the battery cables.



Often overlooked- Connect all of the seat belts to make sure none are still stuck under the seat or twisted any time the seat was removed.