Discover Lithium Batteries Conversion Procedure for ICE Units (External)

Prerequisites/Tools/Prep:

1. Items to be shipped to the site: (by BrainCorp)

- a. Two Discover 14-24-2800 battery modules.
- b. DeltaQ IC1200 charger with Profile 261 and yellow SB50 plug.
- c. Yellow vehicle charge port connector with 6AWG cables.
- d. 10" 6AWG red battery cable.
- e. Battery/vehicle user instructions one page document (not ready yet)

2. Other site prep/requirements:

a. A 24 V compatible ARMOR data logger. (by USAC)

3. Tools needed (at a minimum):

- a. Torque wrench (3/8" prefered)
- b. Ratchet (%" prefered)
- c. 1/2" (or 13mm) socket
- d. 1/2" (or 13mm) open wrench
- e. 10mm socket
- f. 14mm socket
- g. Small Pliers (or needle nose)
- h. Philips screwdriver (#2 tip)
- i. Torque marker paint tube
- j. Cutter (to cut zip tie)
- k. Zip ties

Installation Procedure:

Step/Activity	Picture (if applicable)	Notes
Identify the ICE scrubber for the upgrade. Check the RIN number to confirm against the Work Order.		Move the vehicle to an area with at least 2 feet of clear space around the vehicle.
Turn off the key switch and lift the seat		
Disconnect the seat sensor switch		
Lift the seat to remove it from the robot	<image/>	Put the seat on the floor in front of or behind the robot. Leave room for the batteries on the sides of the vehicle.
Using a ¹ / ₂ " or 13mm socket, remove the two bolts securing the battery rotomold cover.		

Lift the battery cover away. You might have to pull the bottom away from the battery tray one side at a time.	Put it next to the seat on the floor
Slide, or lift back the terminal covers to access the terminal nuts	You might have to use a cutter to cut the zip tie
Using a ½" or 13mm socket, remove the terminal nuts from all 8 terminals. Remove the ARMOR device and save for later.	Keep one of the three short black cables for later. Move the main red and black vehicle power cables out of the way.
Remove the (AGM) batteries from the vehicle. Place them on the floor out of the way.	
Replacing the Charge port with a Lithium specific connector. Step-by-step instruction below	(Yellow connector)

Disconnect and remove the detergent tank to gain access to the charging connector screws.	(or, just lift and swing it out of the way if possible)
Use a 14mm socket to loosen the locking nut on the 5A circuit breaker.	Gently, those are delicate threads.
Remove the breaker from the assembly, leaving the wires connected.	Move the breaker out of the way
Mark the location of the screws in the bracket and then remove the microswitch using a Phillips screwdriver and small pliers (or 6mm socket?). This will provide better access to the charge port connector.	Also, pay attention to the position of the roller next to the charge port connector. Take a picture. It will be useful when reconnecting.

Remove the large terminal covers by cutting the zip-tie if present

Take a picture of the cables on each terminal. It will be useful when reconnecting.

use a 10 mm hex socket to remove the bolt that secures the charging cables.

Open one terminal at a time. Remove the cable that comes from the charge port, and put the bolt back in (finger tight).

Be aware that the cables that connect to those terminals are not all color coded...

When both charge port cables are free from their respective terminals, note that the Red cable is the top one.

Remove the two screws that secure the charging connector. Use pliers to hold the locking nut while unscrewing with a Phillips screwdriver.



Be sure to retain the correct order of components (cables, washers, etc.).

Mistakes here are very risky.

The charger port connector (+) is up.

Be careful not to drop the little washers. There are tiny flat washers under the screw head and under the nut on the other side.

See next row for pictures.

This should free the charge port connector. Note that the positive (red) cable on the charging port is connected to the higher, elevated terminal.	Screw assembly shown below.
To install the new Yellow connector charge port: Connect the cable ends to the terminals first, one at a time, finger tight only! Then, secure the yellow connector to the machine using the two small screws.	There are 3 cables on the Red. (The pictures taken in the previous steps might come in handy) (This picture was taken AFTER the microswitch was installed)
Fully tighten to 7 Nm (62 in-lb) while making sure there is no twisting, sheering, or lateral touching of eyelet connectors.	Use a torque wrench
Apply torque paint to the bolts of both terminals	Re-install the terminal covers. Use new zip-ties.

Reinstall the Microswitch The yellow arrow shows the location of the roller that will contact the charger connector.	Tighten the screws so the microswitch body is parallel with the edge of its mounting plate. The screws need to be at or near the end of their slots as seen in the photo.
Test fit of the charger power connector to ensure it seats correctly without over-stressing the microswitch moving parts/roller	It should make a clicking sound when the charger connector is plugged in.
Reinstall 5A circuit breaker using a 14mm socket. Tighten to 2 N-m torque	BE CAREFUL not to overtighten the breaker. They are very fragile and do not handle torque well.
Reinstall the cleaning solution tank.	
Bring the Lithium Batteries to the vehicle	
Remove the "Space bar" from the right side of the vehicle using a ¹ / ₂ " or 13mm wrench	No room for a socket in there.

Place the new Lithium batteries in the battery tray one at a time. Terminals facing each other in the middle.		It might be necessary to lift/tilt one battery to allow the other one to fit in (see pic below)
The carry handles will interfere in the middle as seen in the pic	LSB Biscoverbattery.com	Make sure the batteries sit flat in the middle of the tray
Make sure the I/O RESET buttons are not lit, (battery is off).	USB IVO discoverbattery.com	If it glows blue, press it, it will turn off. Test it now by pressing the button, before you connect the cables.

Prepare the cables for connecting the batteries: 1. Provided new Red cable from red to red 2. One of the original Black cables from black to black 3. Vehicle Red to front Red 4. Vehicle Black to front Black on the other battery.	Remove the original terminal covers from one of the black cables using the cutter if needed. The Lithium batteries come with their own terminal covers
Connect the cables as shown. Note: Orient the cables such that the terminal covers won't cover the metal I/O button or USB port. (see pic) Add the ARMOR unit and connect per USAC instructions	 Double check to make sure the cables are connected correctly. Very bad things will happen if mistakes are made during this step. Bad things include, but are not limited to: Big sparks, Melted cables, Smoke from the BCM, Dead Kinetek etc.
Tighten the terminal bolts to 9 Nm / 6.64 ft-lb / 80 in-lb	
Mark with Torque paint	
Double check to make sure the cables are connected correctly.	
Turn the batteries on by pressing the I/O RESET button one at a time	
Turn the key switch on	Wait for the machine boot up
Inform BrainCorp that the scrubber is ready for a SW upgrade.	Wait for SW to update

Check the SW version by clicking on "Settings" then "About".	Software BrainOS Versio : v2.8.0-lithium BrainOS SDK Version: 0.8.3 Software Hash: 337908d25 ROC Version: 1.38.5	Look for V2.8.0-lithium . If the Software version does not have a "-lithium", call BrainCorp for help
Plug in the charger.		Testing the charge port micro-switch: You should hear a click as the main contactor shuts down the power and the robot will turn off
The charger green LED should blink after a few seconds.		
Disconnect the charger from the vehicle.		
Install the terminal covers.		Make sure they don't cover the I/O RESET button and the USB port.
Re-install the battery rotomold cover and secure it with the two screws.		
Re-install the seat and re-connect the seat sensor plug.		Put the AGM batteries, "space bar" and extra cables in a safe storage place per the site supervisor.
Drive the scrubber to the nearest Home Marker.		
Teach a 5 minute route.		
Run the 5 minute route.		
Confirm normal scrubber operation.		
Put the scrubber back on the charger.		All done.