Meter Board Replacement in a 60kW Bi-Directional Charger

Introduction

In order to replace a Meter Board in this 60 kW Bi-Directional Charger, several shelf-mounted parts in this charger must first be uninstalled.

To maintain the charger's listing, you must purchase replacement parts for this charger from Pii only and installers must be qualified and trained electricians who install the parts according to these instructions.

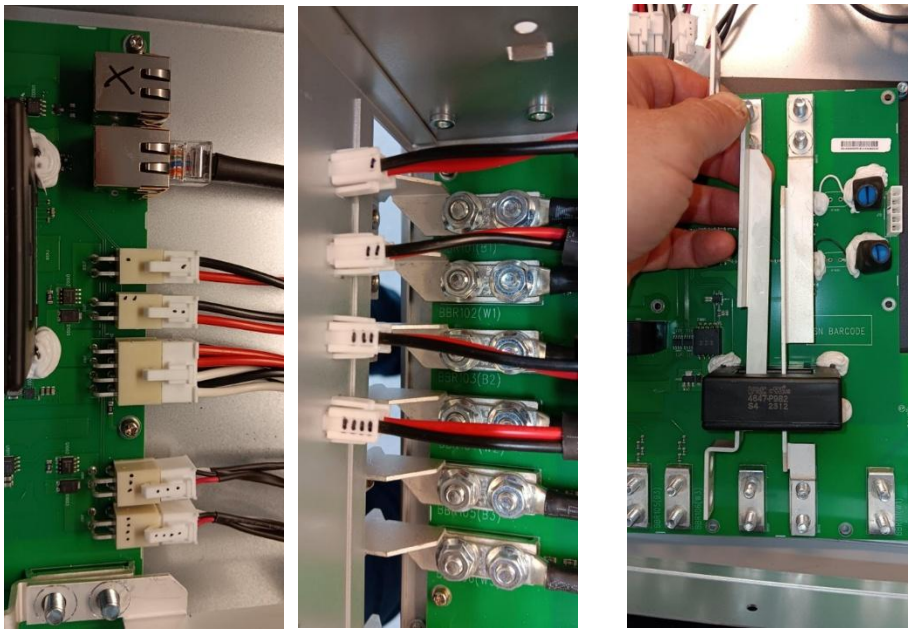


Figure 1: Meter Board with plug in connections and 2 straight DC busbars shown installed in this 60 kW Bi-Directional Charger

CAUTION! Replacement parts used must be purchased from Power Innovations International to maintain the charger's listing.

Replacement Meter Board Part Number

Meter Board Part #	Description	Supported Pii Charger Models
Contact Pii	Meter Board - 60kW Bi-Directional (Pii TBD)	EVBC6060 (60kW Bi-Direction)

Tools Needed

- PPE
- Diagonal cutters
- Fresh Sharpie
- Masking tape
- Headlamp
- Magnetic dish (for fasteners)
- Socket wrench and extension, 8 & 10 mm
- Phillips screwdriver, 0, 1 and 2 gauge
- Cable ties: min. length 6 in. (152.4 mm); max. width .14 in. (3.6 mm)
- Small ratcheting right-angle screwdriver

IMPORTANT SAFETY INSTRUCTIONS – SAVE THESE INSTRUCTIONS

ELECTRICAL WARNINGS – WARNING! RISK OF ELECTRIC SHOCK!

WARNING! RISK OF ELECTRIC SHOCK! ONLY QUALIFIED ELECTRICAL PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS TYPE OF EQUIPMENT AND THE HAZARDS INVOLVED SHOULD ADJUST, MODIFY, AND SERVICE THIS EQUIPMENT, WHICH IS REQUIRED TO MAINTAIN THE CHARGER'S INTERTEK LISTING. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING! RISK OF ELECTRIC SHOCK! SHUT OFF POWER SUPPLY BEFORE BEGINNING INSTALLATION ACTIVITIES OR MAINTENANCE WORK. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE INJURY OR DEATH.

WARNING! RISK OF ELECTRIC SHOCK! THIS EV QUICK CHARGER CONTAINS HIGH VOLTAGE POWER THAT IS POTENTIALLY DANGEROUS IF NOT HANDLED PROPERLY.

CAUTION! The installer is responsible for conforming to all local and national electrical codes and standards applicable in the jurisdiction this equipment is installed in, including providing suitable wire sizes per NEC for the input configuration.

Notice: Before Beginning Replacement

Note:

1. **Wire/cable count and placement vary, by model number**. Not all connections are specified here, so take note of positioning and be methodical when disassembling. Clear, lighted photographs, from varied angles, and labeling with tape and or Sharpie is recommended.
2. **Take care to keep track of fasteners**. If any fasteners are lost, they must be replaced--or else damage or liability may result.
3. **Avoid cross-threading.** Thread nuts and screws first by hand, then with power tools (if desired), to avoid cross-threading. This may seem minor, but it can have major ramifications if not observed.
4. **Recommissioning the unit is not necessary**, as that process will have been completed in the factory.

Replace Meter Board in a 60 kW Bi-Directional Charger

1. **Open door, left of screen**
    a. Remove padlock, turn key.
    b. Pull bottom of handle toward you, then turn toward center of door.
2. **Unfasten modem**
    a. Remove four black screws securing modem to rack controller using 0-gauge Phillips bit.
    b. Through one of the modem's open screw holes, cable-tie modem to a rectifier handle (Figure 3).

Figure 2: Inside left-side door of 60 kW Bi-Directional Charger with modem secured to installed rack

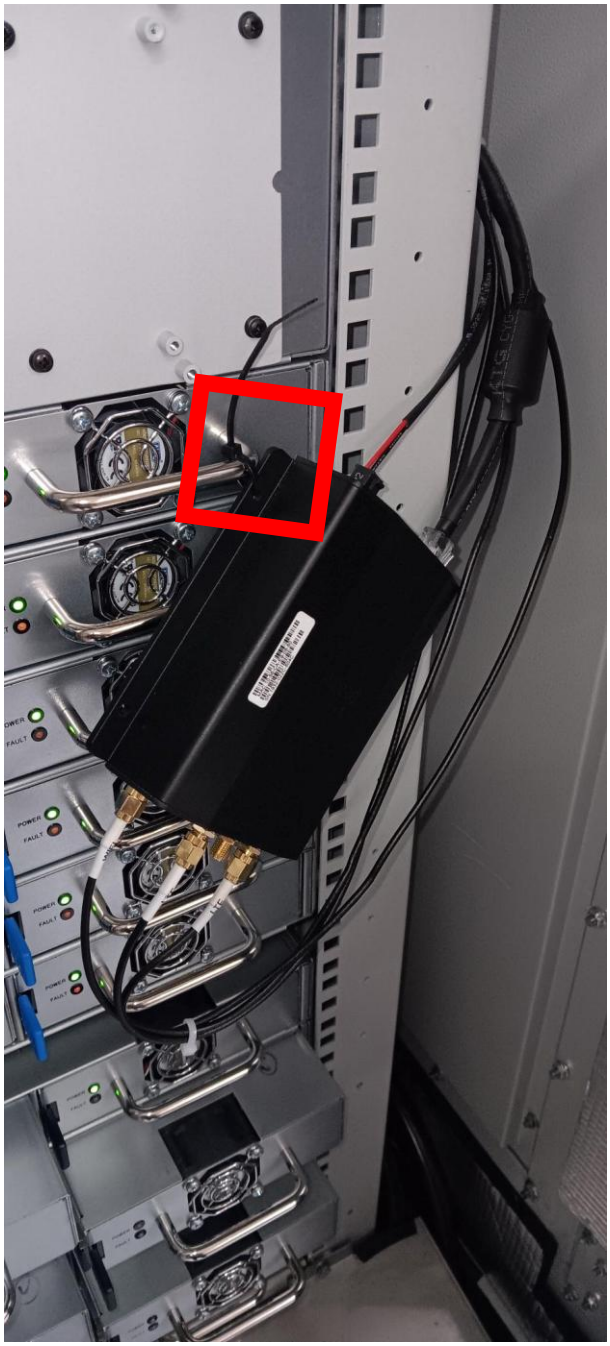


Figure 3: Inside left-side door of a 60 kW Bi-Directional Charger

3. De-energize charger:

a. Still inside the left-side door, flip Main Switch at bottom to “Off” position (use extension handle if needed).

Figure 4 – Main Switch and its removeable handle shown in a fully loaded 60kW Bi-Directional Charger (inside left-side door)

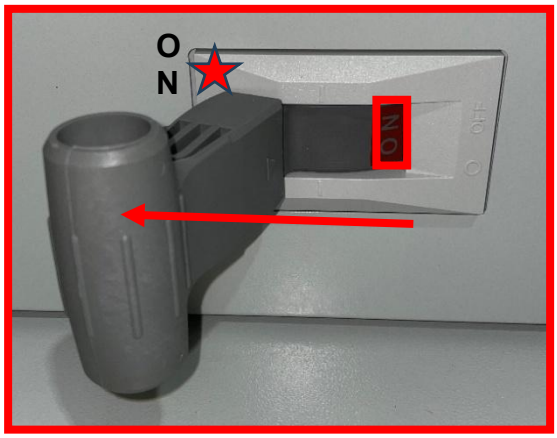


Figure 5 - Main Switch (shown with handle on) in the ON position

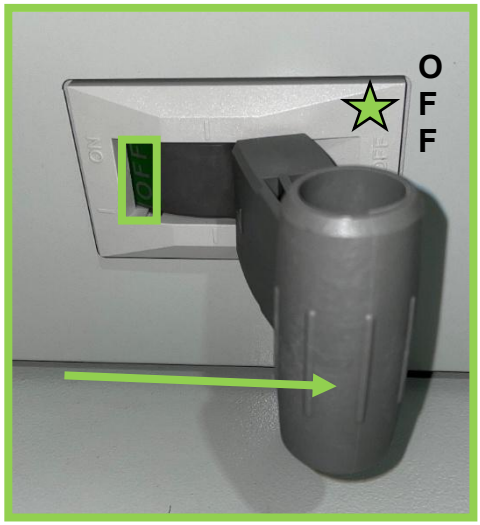


Figure 6 - Main Switch (shown with handle on) in the OFF position

WARNING! RISK OF ELECTRIC SHOCK!
THIS EV QUICK CHARGER CONTAINS HIGH VOLTAGE POWER THAT IS POTENTIALLY DANGEROUS IF NOT HANDLED PROPERLY.

b. Open upstream disconnect, if possible. Lock-out-tag-out.
   i. If not possible, the **input** wires inside the right door remain **live**—Do not touch!
      a. These are located behind the right door, coming up from the bottom.
      b. The remainder of the system is without power and can be handled safely.

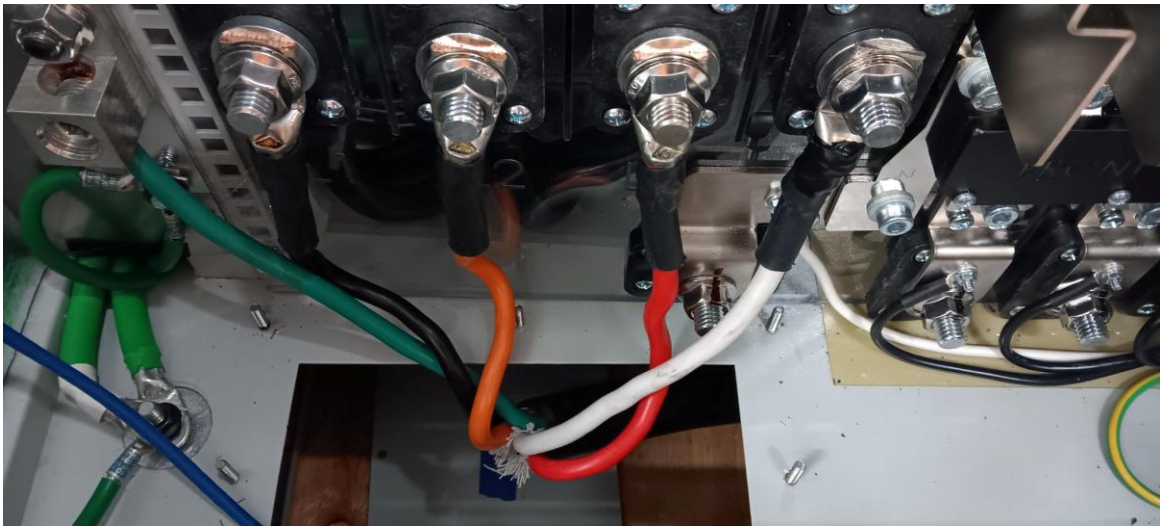


Figure 7 – WARNING! Don’t touch Input wires inside right-side door if they are live live

4. Remove Heat Exchanger (HX) power source

a. Open door, right of screen
b. Remove hex bolts from either side of top box using 8 mm socket
c. Disconnect HX wires (longer, 1 black, 1 white)
d. Disconnect opposite end of “CAN1” cable
e. Disconnect opposite end of remaining wires (N1, L1, N2, L2, N3, L3)
f. Pull box toward you and set aside
    i. Current iterations approach 40 lbs. in weight
    ii. Modules can first be removed from the opposite side, if desired. In that case, note release-tab colors (horizontal order is not important)

Figure 8 – Heat Exchanger installed above Rack Controller in charger shown

a. Remove underlying shelf (Figure 9) by removing 8 hex bolts and their washers careful of small parts falling).).

Figure 9 – Shelf installed beneath Heat Exchanger helps secure an installed Heat Exchanger

1. Remove rack controller (now the top box)

a. Disconnect wires and cables
   i. Label and/or photograph, to recall location.
   ii. Depress retaining latches and then pull cables.
      a. Gently wriggle-out connectors with multiple pins, if necessary.
   iii. Insert and lift a lever into quick-connect holes to release PE, L1, L2.

Figure 11 – Back of installed rack controller

Figure 10 – Front of installed rack controller with modem still attached

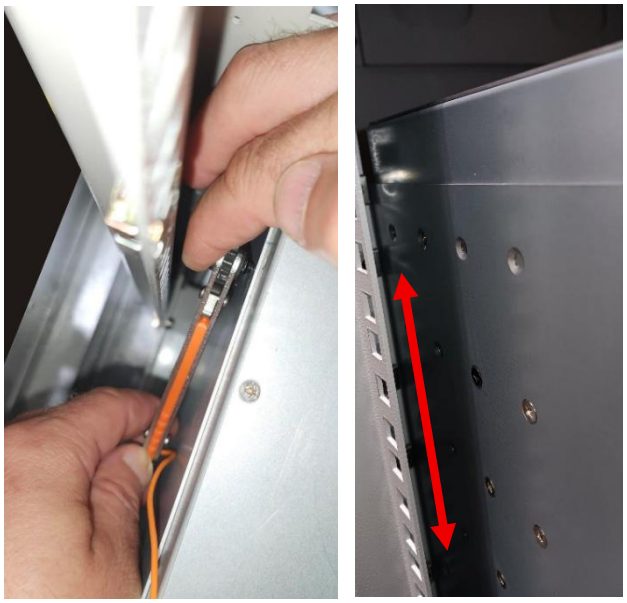
Figure 12 –Ratcheting right-angle screwdriver

b. Remove 28 bus screws.
   i. top 2 rows of 14, attached to bottom of controller.
   ii. use #2 Phillips bit.

c. Remove case screws (exterior, left and right sides). (Figure 13)

   i. Mark next to screws with Sharpie, to recall location (headlamp helpful).

   ii. Use a small ratcheting right-angle screwdriver with Phillips #1 bit
   .



The rack controller ends four and 3/8 inches from the top of the case. Ignore any screws below that depth. This is the most challenging aspect of the operation, but has been performed successfully and repeatedly, without losing screws.

Figure 13 – Removing bus screws securing Rack Controller inside charger

d. Remove rack controller (Figure 14), approximately 23 lbs) from enclosure.
    i. Slide out toward left door.
    ii. Place on a raised surface (e.g. table) for working ease.
    iii. Connector designators face you, reading upright and horizontally.

Figure 14 – Rack Controller, back view with Top Cover on

2. Remove Top Cover

a. 16 screws
b. #1 Phillips bit

3. Remove MCU shelf/board unit

a. Consists of larger + smaller PCB (Figure 15), attached to silver shelf.

b. Photograph (to recall positions) and disconnect cables.
c. Remove 4 side screws and 1 front screw (#1 bit).

d. Lift out, first through gap in enclosure lip (shown in Figure 16) and then set aside.

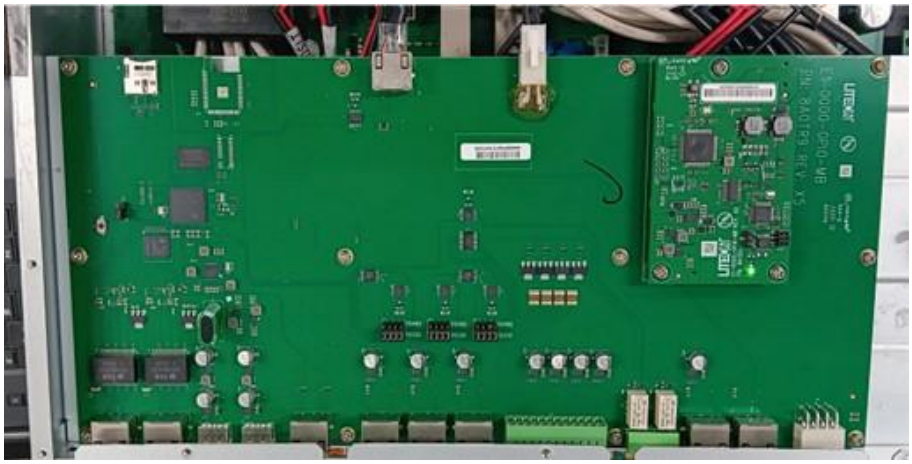


Figure 15 – Larger and Smaller PCB Board

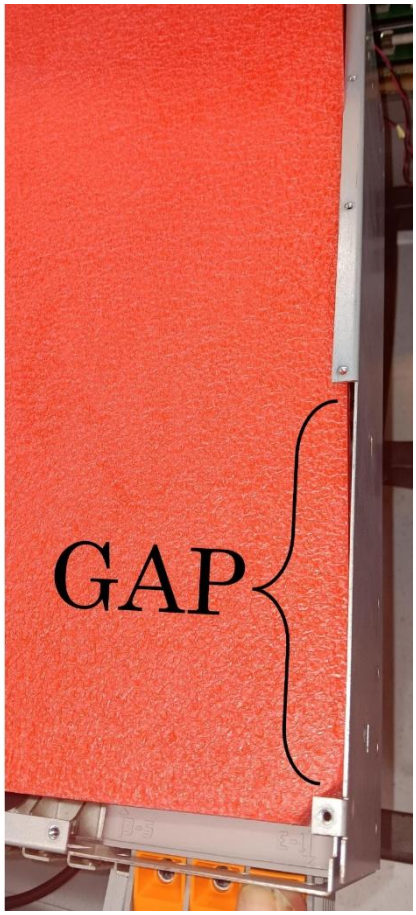


Figure 16 –Gap in enclosure lip allows for uninstalling and reinstalling MCU shelf/board unit

4. Remove Meter Board

a. This is the larger PCB, of two mounted in bottom of rack controller.
b. Remove cable ties with diagonal cutters, careful not to harm wires
c. Mark “X” on empty receptacle(s) (see Figure 17, red highlight)

d. Mark with Sharpie to distinguish identical connectors, such as blue highlights in Figure 17: See two different dot sequences marked on two identical receptacles and their connectors.

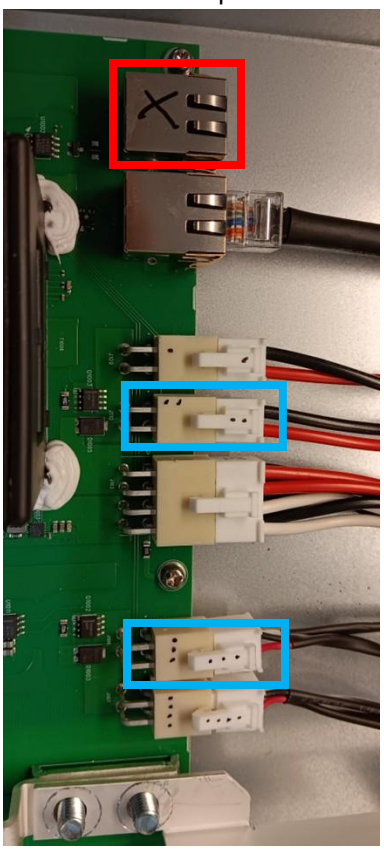


Figure 17 – Empty receptable marked with red highlight and dot sequences displayed inside blue highlights

Figure 18– Connectors removed after photographing them installed

e. Photograph and disconnect all click-in cables (Figure 18)
f. Remove the thirty-two 10mm nuts
g. Remove all terminals from their studs
h. Pull all twelve 10AWG wires together through square & arched sensors
i. Remove two L-shaped relay busbars (Figure 19)
j. Remove two straight DC busbars passing through other square sensor (Figure 19): Roll each on its axis, to maneuver out.
k. Remove the 14 bus brackets
l. Remove the 11 PCB mounting screws

m. Lift PCB out of enclosure and set aside, careful not confuse with new one

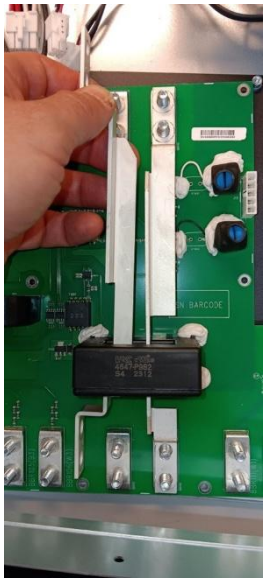


Figure 19 – L-shaped Relay busbars and DC busbars being removed

5. Install New Meter Board

a. Mount PCB to bottom of enclosure with 11 screws (tighten, not overly)
b. Connect all cables. Refer to photos and Sharpie marks for aid
c. Guide straight DC busbars through square GFCI sensor and onto studs.
    i. Tilt both on axis, to maneuver the second into place

    ii. Tighten 4 nuts onto front studs. Interior studs, leave nuts off two straight DC busbars (Figure 20).

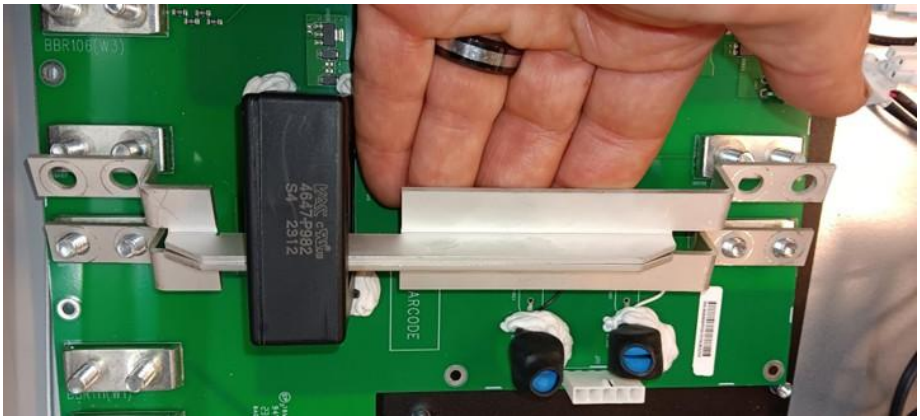


Figure 20 – Two straight DC busbars and L-shaped relay busbars installed

d. Attach L-shaped DC busbars to relays with 2 screws and tighten (Figure 19).
    i. Atop previously placed cables.
    ii. Attach & tighten 4 nuts on meter board side.

e. Place the 14 bus brackets onto their double studs (no nuts, yet)
f. Guide twelve 10AWG wires together, through the square sensor
    i. Then the black bundled wires through arched sensors
        a. B1, through arch closest to enclosure
        b. B2, though center arch
        c. B3, through innermost arch

g. Attach 10AWG terminals
    i. Atop bus brackets and their double studs
    ii. Number placement is printed on circuit board
        a. B1,W1,B2,W2,B3,W3 (side nearest enclosure)
        b. W1,B1,W2,B2,W3,B3 (other side)
    iii. Angled portion of terminal positioned upward
    iv. Push bus bracket laterally against both studs, to keep straight
        a. (Crooked brackets will not align with external busbars)

h. Install the four Molex 2-pin cables (distinguished by Sharpie markings)
    i. +48V SW, +48V SW, +24V Modem, +24V Aux

i. Cable-tie all loose wires (except 2 MCU board cables)

6. Reinstall MCU Shelf/Board

a. Narrow end last (through side gap in enclosure lip)
b. Edge with connectors goes into front enclosure slot
c. Fasten with 5 screws (2 on ea. side, one in front)

7. Reinstall Top Cover (Figure 21)

a. 16 screws
b. #1 Phillips bit

Figure 21 – Back view of Rack Controller with Top Cover on

8. Reinstall Rack Controller

a. Slide into position
    i. through left door
    ii. atop rectifier stack
    iii. fan facing you
b. Fasten side screws
    i. Look for Sharpie marks, to recall location (headlamp helpful).
    ii. Use a small ratcheting right-angle screwdriver with Phillips #1 bit.
c. Attach Modem, with 4 black screws and 0-gauge screwdriver.
d. Fasten and terminate nothing on right door side, as of yet.

9. Reinstall Shelf for HX power source (Figure 22).

a. Position the alignment tabs side of shelf toward the left door.
b. Attach 8 hex bolts (2 in each corner) using 8mm socket.

Figure 22 – Shelf for HX power source installed

10. Reinstall HX power controller

a. Slide in through right door, atop shelf.
    i. Guiding between tabs may require work from opposite side.
b. Fasten 4 hex bolts (2 on each side) with 8mm socket.
    i. Ensure ground wire is included, on lower left side.

c. Connect HX wires (longer, 1 black and 1 white shown in Figure 23). These come from the Heat Exchanger, on the right.

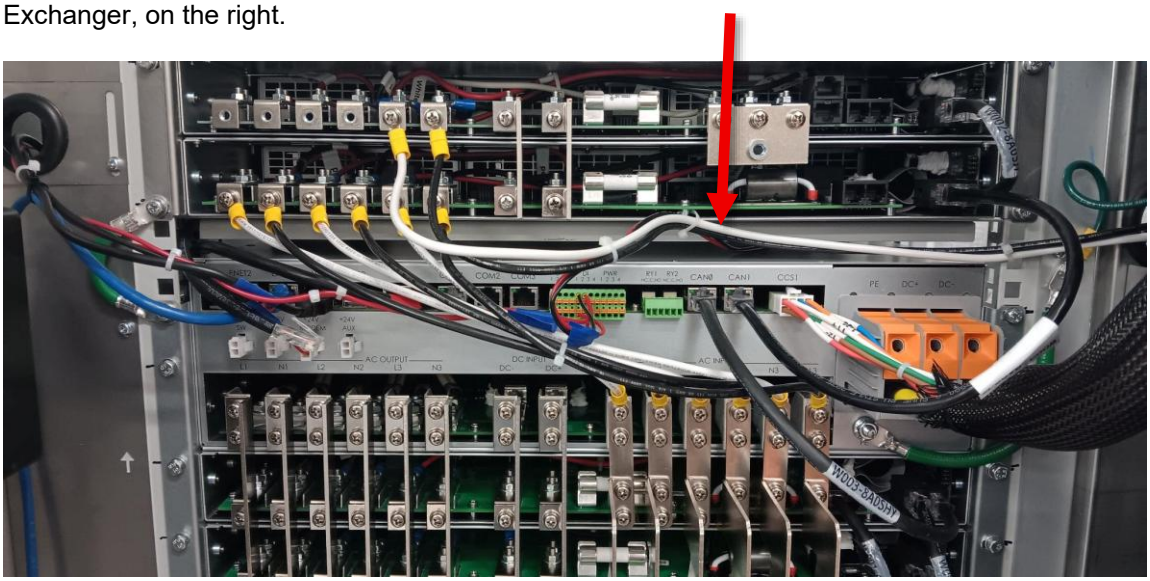


Figure 23 – HX power controller wires connected

d. Insert modules into opposite side (if absent), until they “click.”

11. Terminate remaining connections.

a. Ensure retaining latches are engaged.
b. Include B/W wires from HX power source in bus bar terminations.
    i. Placement mirrors order of AC INPUT on rack controller.
c. Terminating PE, L1, L2 at Quick Connect:
    i. Take care that these are each inserted fully.
    ii. Insert a lever into hole above each wire and lower to horizontal position.

12. Energize Charger

a. Restore upstream power (if applicable).
b. Switch breaker to “On” position.
c. Close and lock doors.