POWERBOOST

DC Converter System 1.6:
User Manual

JMA

powered by **DELTA**

Date: September, 2023

Revision: B

Latest revision of this document is available online here:
https://jmawireless.com/17253-01/

A spreadsheet template is available for convenient capture and visual representation of system wiring: See this section in Appendix E for further information about the system template.
https://jmawireless.com/17186-01/

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Introduction

Document summary:

- Pre-Installation checklist
- Unbox
- Mount in rack
- Connect ground
- Input power-route, pre-check polarity, then connect.
- Output connections
- Data and alarm connections
- Startup

Notes:

- This information applies to product "PowerBoost 1.6," identifiable by Orion controller software version B9.20B29 or later.
  - o Firmware version label on circuit board at rear of chassis indicates FW 1.6.0.
- For information about product "PowerBoost 1.0," identifiable by Orion controller software version (circa) B8.30B32 and circuit board at rear indicating FW 1.0.2, see other documents 16089-01 and 15525-01.

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- For information about product "PowerBoost 1.5," identifiable by Orion controller software version (circa) B8.97B02 and circuit board at rear indicating FW 1.5.0, see document 16995-01.
- To identify the Orion controller's software via touchscreen:
  - Swipe right (or left) as needed to reach the main screen.
  - Touch the icon labeled **Controller** or **Device**.
  - Orion will reveal its installed software version, serial number, etc.
- Updated "PB 1.6" vs existing "PB 1.5":
  - Implements bullet-insertable circuit breakers (sold separately) in the OMM (output management module), allowing selection of different trip values (Amps) per specific system application. (Previous versions used fixed value circuit breakers, not user changeable.) Circuit breakers PB-BR-XX (PB-BR-30, etc.) purchased separately.
    - Associated - adds protective cover for circuit breaker trip levers.
    - **Important! Breaker position / channel number in the front panel is different for PB 1.6 as compared to previous versions.** See Page 13.
  - Implements detection of single channel telemetry loss to support legacy systems that do not have alarm module at upper OVP. (Use individual analog sense pair for each channel).
  - Supports mixed mode operation (automatic/manual) by boost brick.
  - Use model is the same, with minor menu addition.
  - Input power connections (from DC plant) are the same.
  - Output power connections (to lower OVP) are the same.
  - Note: consistent with prior variants of PowerBoost, the main flow of the user documentation is written assuming use of Raycap OVP telemetry (i.e., "automatic mode"). For operation in manual mode, see Appendix H.
- Updated "PB 1.5" vs existing "PB 1.0":
  - The use model of PB 1.5 is slightly different; users who are familiar with existing PB 1.0 please read PB 1.5 QSG document 16995-01 fully before working with PB 1.5.
  - Added channel mapping capability (increases flexibility to support greater variety of system wiring / OVP channel connections).
  - Supports interface to increased quantity of "daisy-chained" lower OVP units.
  - Supports manual mode operation (all channels).
  - Input power connections (from DC plant) are the same.
  - Output power connections (to lower OVP) are the same, now with greater flexibility.

1. Definitions

Boost channel: refers to an output channel within the PowerBoost unit.

- Governed by the Orion controller, has ability to add voltage to maintain a setpoint value at the upper OVP.
- Within PowerBoost, the boost channel outputs are internally (individually) wired to feed the circuit breaker inputs on the OMM unit Ch. 1-16.
- Each boost brick within PowerBoost contains 2 boost channels (up to 8 boost bricks).
- PowerBoost unit contains 4 bulk input power feeds; each bulk input feeds 2 boost bricks i.e., 4 output channels (Ch 1-4, 5-8, 9-12, 13-16).

GUI: Graphical User Interface. Refers to the controller interface environment accessed using a laptop computer, connected via the Orion controller's front Ethernet port.

OMM Output Management Module: uppermost 1U of PowerBoost, accommodates up to 16 output circuit breakers.

OMM Channel: refers to an output from one of the OMM circuit breakers on PowerBoost (numbered 1-16 and fed internally on PowerBoost from the boost channels). Provides the "-48V" nominal aka "hot" connection to a lower OVP unit. (Corresponding "return" conductor for the given OVP channel comes from the return output location on the PowerBoost shelf.)

Orion Controller: in PowerBoost upper shelf at left side; has touchscreen, has Ethernet GUI.

OVP – **Over Voltage Protection**: generally refers to the Raycap units upper and lower.
- OVP units are most commonly deployed in pairs (1 upper and 1 lower) and seen in 6-channel or 12-channel variants.
- The hybrid cable spans (connects) between lower and upper OVP and must connect to the same OVP channel number at bottom and top.
- Note: The Raycap OVP units also provide a telemetry function that communicates upper channel voltages. This is used by PowerBoost to regulate voltage at load.

OVP Channel: refers to a single channel on any set of OVP units; numbered 1-6 or 1-12 depending on the size of the OVP units deployed. (One OVP channel consists of 2 conductors: the "return" and the "-48V" nominal, aka "hot.")

PB: PowerBoost product

PB-COM: circuit board at rear of PowerBoost upper shelf; interface between Raycap RS485 data and Orion controller. Has heartbeat LED and other indicators.

RRH - Remote Radio Head: i.e., the load, typically connected near upper OVP unit.

SYS-16: Short-hand reference to PB-SYS-16-BB-01, i.e., the rack-mounted boost shelf, total 3U high, 16 channels. "Upper" 1U is the OMM unit (16 circuit breakers). Lower 2U are the boost units (channels 1-8 in the "middle" 1U, channels 9-16 in the "bottom" 1U).

2. General overview

JMA PowerBoost is a rack-mounted voltage boost unit that maintains acceptable voltage at the RRH by sensing system characteristics and adjusting its output voltage accordingly. PowerBoost makes use of telemetry data from suitably equipped Raycap OVP units as a reference point for maintaining RRH voltage. The PowerBoost unit is comprised of the following:

Product name: PB-SYS-16-BB-01 (total 3U high), consists of 1 OMM unit married with 2 boost racks (single Orion controller and 1 to 8 boost modules); supports up to 16 channels.
- Upper rack frame (19 inch, 1U high) holds 16 individual circuit breakers (PB-BR-XX purchased separately) for boost outputs; referred to as OMM output management module.
- Middle rack frame (19 inch, 1U high) holds an Orion controller and up to 4 boost modules (PB-PSU-162-BB purchased separately, 2 channels per module); referred to as "boost rack."
- Lower rack frame (19 inch, 1U high) holds up to 4 boost modules (PB-PSU-162-BB purchased separately, 2 channels per module); referred to as "boost rack."

General notes about information in this document:

The PowerBoost controller, known as "Orion," can be accessed 2 different ways:
- Via its front touchscreen
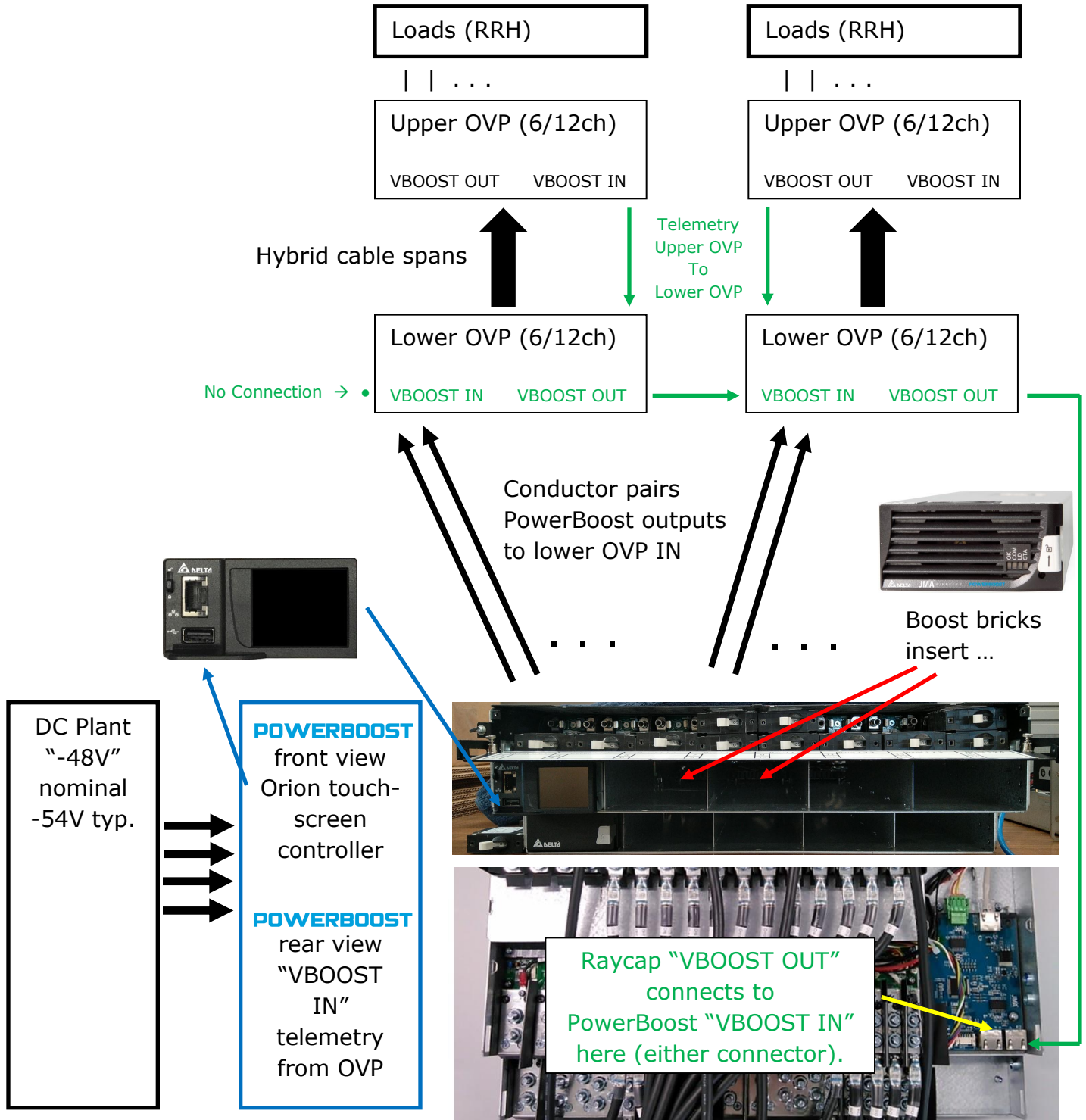- By connecting to its front Ethernet port using a laptop computer

For operations involving the Orion controller:
- Information is first presented assuming use of the touchscreen.
- After the touchscreen information, the operations are covered again assuming connection via front Ethernet port using laptop.

Touchscreen instructions include all necessary information to accomplish the needed tasks. In some cases, additional information may be included in the "Ethernet/laptop" section.

The user should read this entire document before beginning work with the unit.

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3. Typical System Diagram

Loads (RRH)

| | . . .

Upper OVP (6/12ch)

VBOOST OUT   VBOOST IN

Loads (RRH)

| | . . .

Upper OVP (6/12ch)

VBOOST OUT   VBOOST IN

Hybrid cable spans

Telemetry
Upper OVP
To
Lower OVP

Lower OVP (6/12ch)

VBOOST IN   VBOOST OUT

No Connection → •

Lower OVP (6/12ch)

VBOOST IN   VBOOST OUT

Conductor pairs
PowerBoost outputs
to lower OVP IN

Boost bricks
insert …

DC Plant
"-48V"
nominal
-54V typ.

POWERBOOST
front view
Orion touch-
screen
controller

POWERBOOST
rear view
"VBOOST
IN"
telemetry
from OVP

Raycap "VBOOST OUT"
connects to
PowerBoost "VBOOST IN"
here (either connector).

4. Pre-installation checklist

Space:

- ☐ System design performed; confirm equipment configuration.
- ☐ Documented wiring diagram with components and distances labeled.
- ☐ Rack space available for PowerBoost.
- ☐ DC plant has capacity and breaker space to feed PowerBoost inputs.
- ☐ Ground bus has sufficient location(s) available.
- ☐ Shelter/cabinet cooling system has capacity for added equipment.

Components:

- ☐ PowerBoost shelf and modules
- ☐ Circuit breakers and current lug adapters
- ☐ Compression lugs and heat shrink tubing
- ☐ Wire (typically Telcoflex II or Telcoflex IV, 6 AWG for PowerBoost outputs. Input AWG per code and system design.)

Tools:

- ☐ Standard hand tools
- ☐ 7/16 deep socket and driver capable of calibrated torque to 65 lbf·in.
- ☐ Compression tool(s) for wire/lugs
- ☐ Label maker

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5. Confirm OVP equipment and operation

☐ Verify that Raycap OVP network configuration is appropriate for use with PowerBoost (per system design). Lower Raycap OVP unit must have output port labeled "VBOOST OUTPUT." See table below:

Raycap Model	No. of circuits	RS485 board required	Description
RxxDC-2260-RM-48	6	Yes	6 Circuit rack
RxxDC-3315-PF-48	6	Yes	6 Circuit tower or base
RxxDC-4520-RM-48	12	No	12 Circuit rack
RxxDC-4520-RM-482	12	No	12 Circuit rack with (2) CPRI interface modules
RxxDC-6627-PF-48	12	No	12 Circuit tower or base

☐ Verify that Raycap OVP network telemetry is functioning correctly (lower OVP is reading voltage at upper OVP, from correct channels).

☐ OVP: Correct connection of conductors has been verified (no crossed channels or bridging/jumpering).

☐ Consult Raycap documents for troubleshooting OVP. See also general information later in this document.

Installation

6. Unbox, mount PowerBoost unit, connect ground

⚠️ **Caution!** Wear a grounded ESD wrist strap when handling equipment or working with electrical connections.

6.1. Unbox

Identify: Rear pre-installed cables.
Do not lift unit by cables.
Lift by grasping under sides & rear.

6.2. Mount securely in rack.

Mounting hardware supplied in box under unit.

6.3. Attach ground cable 6 AWG or larger

Compression lug for 6 AWG (1/4" x 5/8" spacing) and bolts provided in hardware kit. See photos below.
- Arrows show recommended point for ground lug. Typically, one ground cable per PowerBoost unit is acceptable, provided that the factory-supplied mounting brackets are present and secure.

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- Ground wiring must be installed in accordance with all local and national electric codes and requirements.
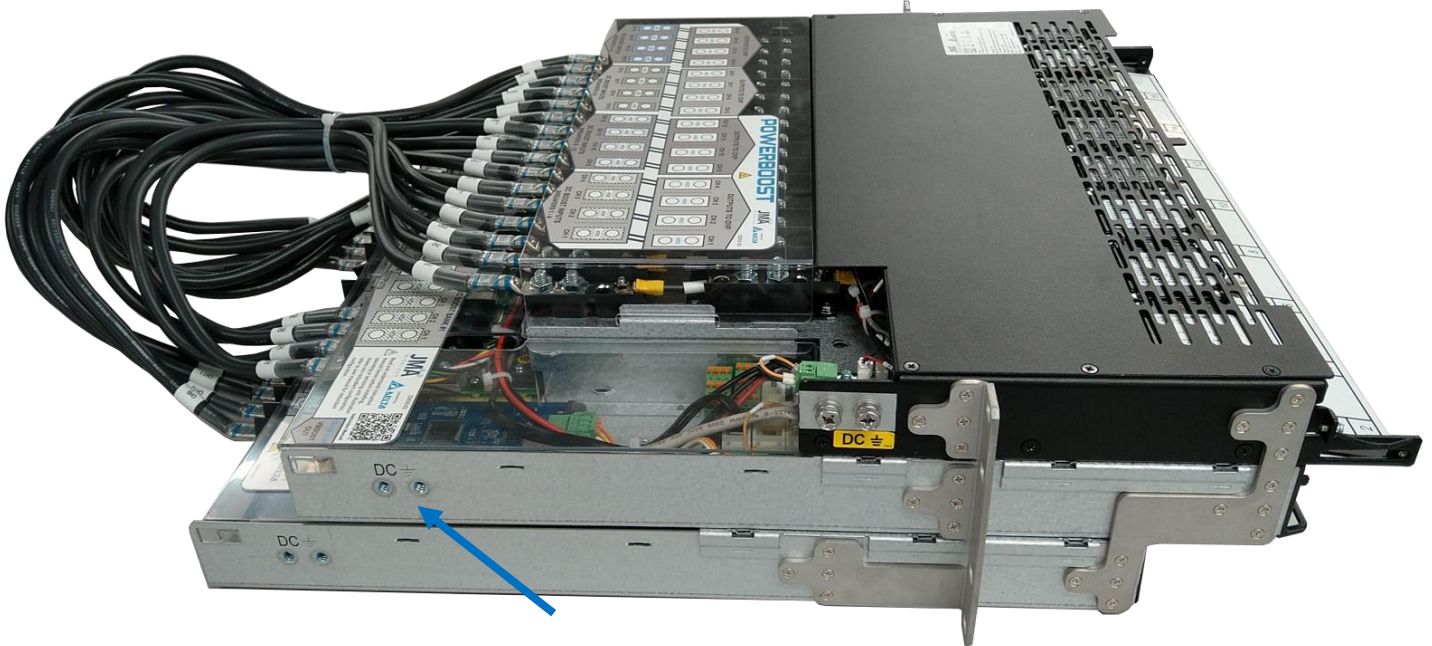
Arrow shows recommended earth connection point

6.4. How to insert and remove modules from boost rack

The following information explains how to insert and remove modules from the boost rack. The Orion controller comes pre-installed and is typically removed only for the purpose of re-setting the controller.

Insertion:

Simply slide the Orion controller and/or boost module into the appropriate bay and push it fully in. The module will automatically latch in place. For the Orion controller, push on the left side (not on the touchscreen).

Removal:

Orion controller: Locate the unlocking slide lever at the upper left corner. Hold the slide lever in the "up" position and pull on the protrusion at the bottom to remove the controller. The Orion controller is hot-swappable; loads will remain powered, but will not be regulated until a controller is installed.

Boost module: Locate the unlocking lever at the right side. Hold the lever in the "up" position and pull on it to remove the boost module. Use only boost modules specified for use in PowerBoost.

Lever

Lever

During the installation process for a new rack, the Orion controller should be (remain) installed.

Important! No boost modules should be present; they are installed at a later step.

## 6.5. How to insert and remove breakers from the OMM unit

The following information explains how to insert and remove circuit breakers from the OMM unit.

PB 1.6 uses field-changeable circuit breakers (purchased separately).
JMA part numbers for reference:
30A PB-BR-30, 35A PB-BR-35, 40A PB-BR-40, 50A PB-BR-50

To identify the current rating "Amps" of a circuit breaker, see the label on the breaker. The arrows shown below point to 30A.
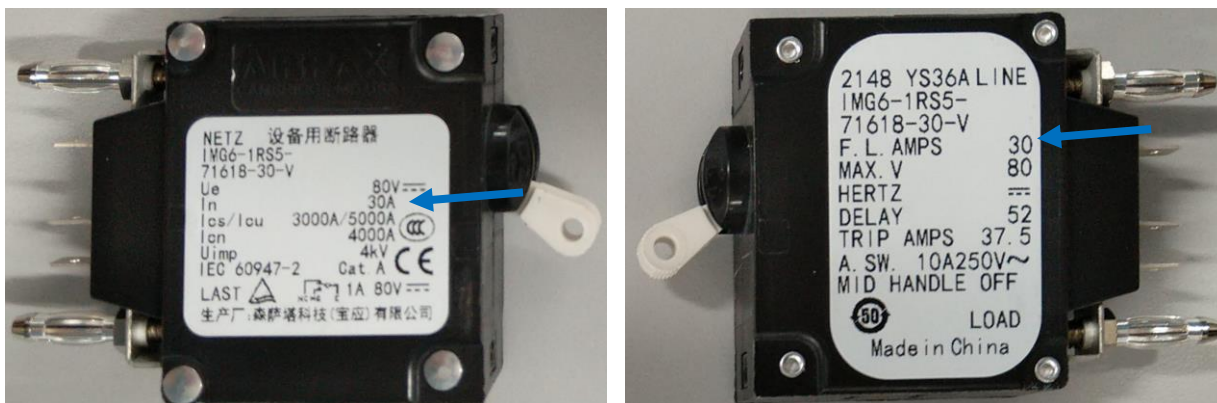
Insertion:

Identify the proper orientation for the circuit breaker. (See photo below.)

Note that the trip lever is off-center in the circuit breaker body. When properly oriented, the trip lever is right of center.

LEFT SIDE image: shows correct orientation   RIGHT SIDE image: breaker is upside down
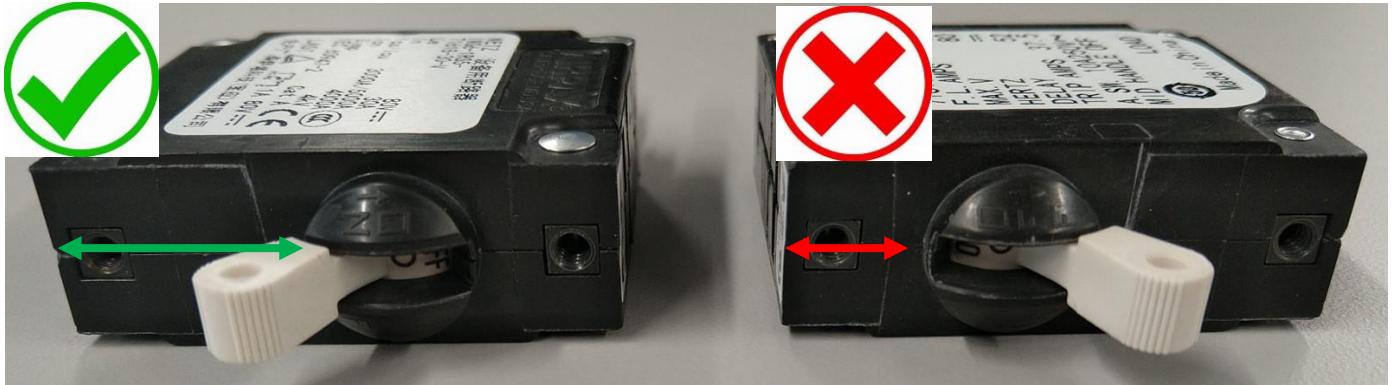
Breaker locations in OMM:

See illustration below for breaker location and associated boost channel number PB 1.6.

Note!! Boost channel number for given breaker location is different for PB 1.6 as compared to earlier variants of OMM that used fixed circuit breakers.

1	3	5	7	9	11	13	15
2	4	6	8	10	12	14	16

Insertion:

Orient the breaker correctly - trip lever right of center. See image above. Make sure the breaker is OFF. (Breaker oriented correctly; trip lever points toward the LEFT.)

For the given channel, identify the sockets inside OMM where the breaker "bullet" connectors will insert. See photos below, blue arrows.

Insert circuit breaker. Make sure that breaker "bullet" connectors align with the desired sockets in OMM. Gently and evenly push in - press with fingers in the area shown. See yellow arrows in the photo below. Make sure breaker is fully inserted.

Blue arrows show breaker socket openings in OMM.
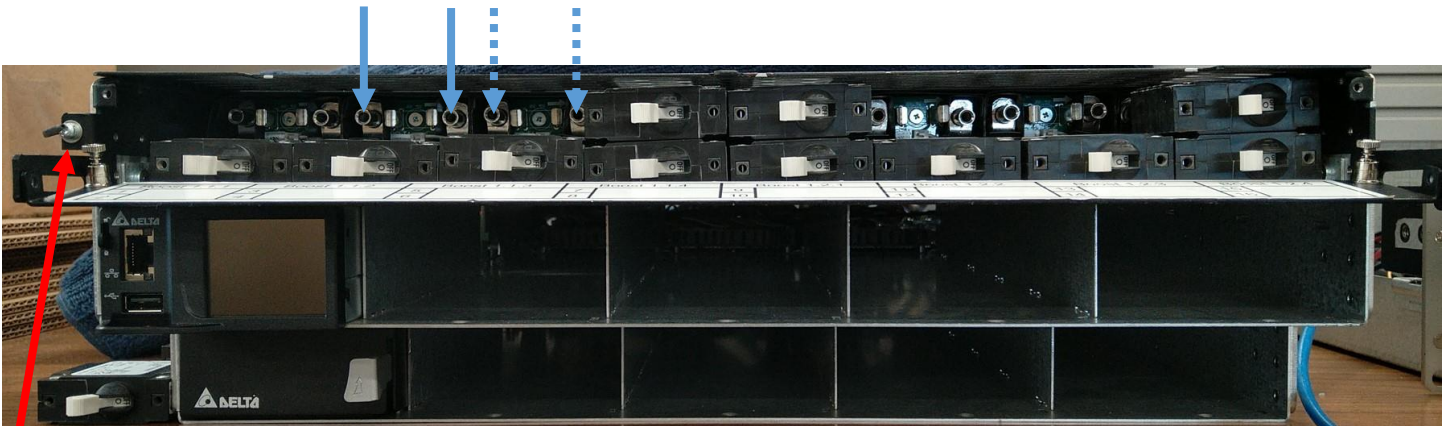
Arrow shows breaker removal tool storage location (see next pg)
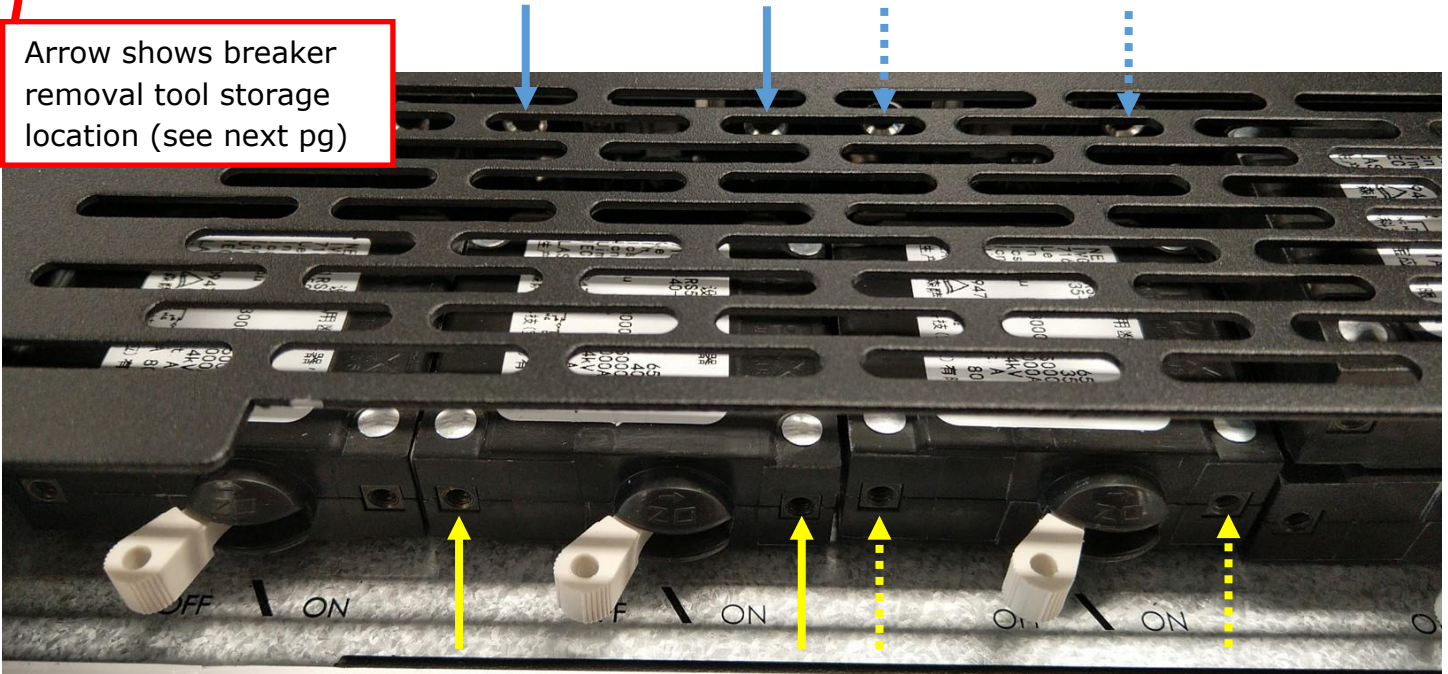
Yellow arrows show finger "push points" for inserting breaker.

Removal: (Important! DO NOT pull on the trip lever to remove the circuit breaker !)

Identify the circuit breaker removal tool (one tool comes with each rack unit).
See photo below.
Note: If the breaker removal tool has been misplaced, a pair of long machine screws can be substituted from the local hardware store. Thread size is (SAE) #6-32.

Turn breaker OFF (trip lever pointing to left).

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Install breaker removal tool into threaded holes in the desired circuit breaker (same as push points identified by yellow arrows in the insertion section above).

Turn screws into breaker hand-tight. Pull gently and evenly to extract breaker.

Remove tool from breaker. (See previous page for tool storage location on chassis)
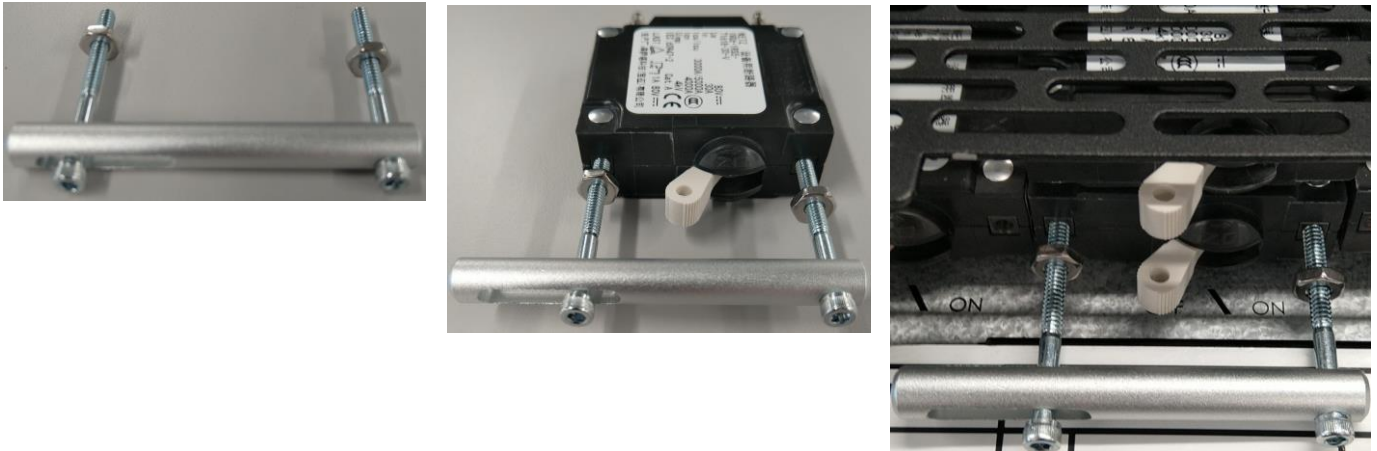
7. Connect -48VDC input power from DC plant

7.1. Circuit breakers and conductors – DC Plant

Input wiring and overcurrent protection must be installed in accordance with all local and national electric codes and requirements.

Note that PB-SYS-16-BB-01 utilizes up to 4 power inputs (ch 1-4, 5-8, 9-12, 13-16); a separate circuit breaker is needed for each input.

Install circuit breakers and associated current combiner plates in DC plant to feed each PowerBoost input. Circuit breaker size is determined during system design. Use manufacturer-recommended torque values. See Appendix A and Appendix B for reference information on lugs and circuit breakers.

7.2. Power input connections at PowerBoost rack

Notes-
- Not all PowerBoost installations utilize all 4 power input feeds when initially installed.
- It is recommended to design the system such that input feed "A" (ch 1-4) is utilized along with any combination of the remaining 3 input feeds.
- Typically, PowerBoost channels (and hence power input feeds) are utilized in ascending order, beginning with channel 1.

- ☐ Run conductors of appropriate AWG (per code and system design) to rear of the PowerBoost rack.
- ☐ Before connecting input power to PowerBoost rack, verify polarity of each power feed as follows:
- ☐ Begin with feed circuit breakers in DC plant OFF.
- ☐ **Caution! PowerBoost equipment will be damaged if energized with reversed polarity.**
- ☐ See images below.
- ☐ Insert probes into DMM as shown (black probe = COM).
- ☐ At PowerBoost rack, at least 1 power lug remains not landed and is insulated from connection.
- ☐ Orient the input power cables securely so they can be energized independent of the boost rack, for the purpose of measuring voltage polarity.
- ☐ Connect black lead from DMM to the "return" (RTN) feed.
- ☐ Connect red lead from DMM to the "-48V" feed.
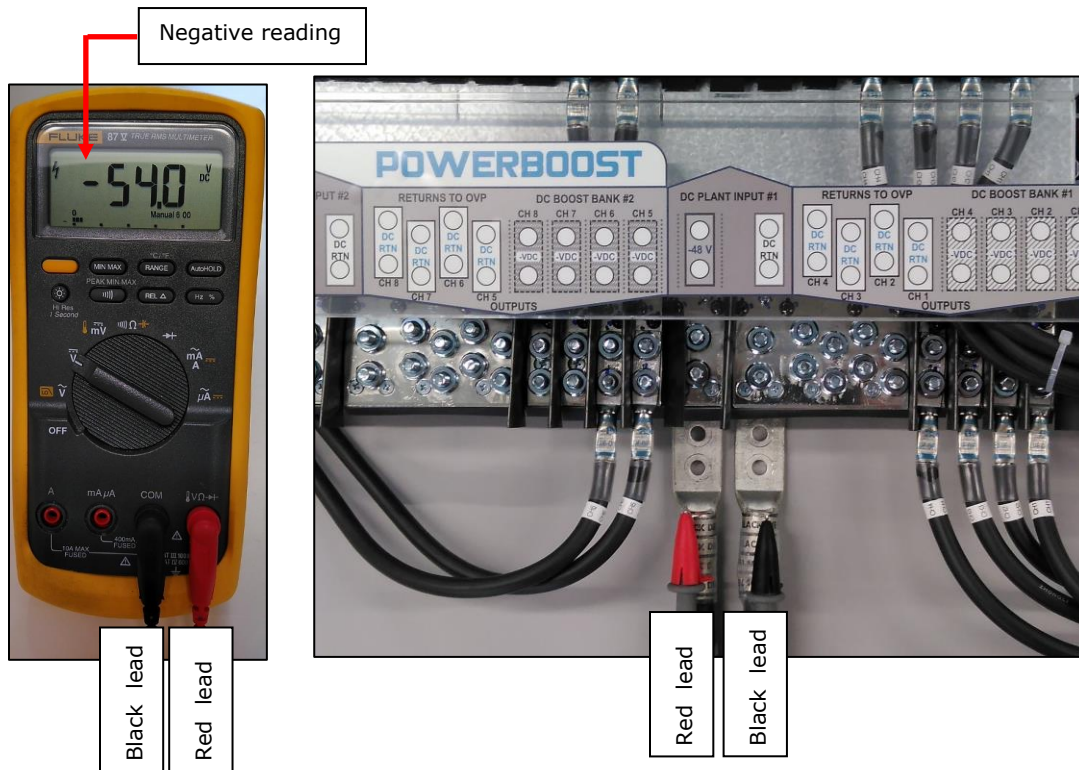
- ☐ Turn circuit breaker ON. Verify that meter indicates negative polarity voltage reading equal to DC plant voltage. Turn circuit breaker OFF.
- ☐ **If voltage reading is not negative, the feeds are not correctly arranged to provide correct polarity. Remedy the situation before connecting to PowerBoost inputs.**

Continued on the next page…

Images below show connection points for power feeds from DC plant to PowerBoost inputs. Torque value for all lugs on the PowerBoost unit is 65 lbf·in.

Photo below shows upper boost rack.
(power inputs #1 and #2 for channels 1-4 and 5-8)

Continued on the next page…

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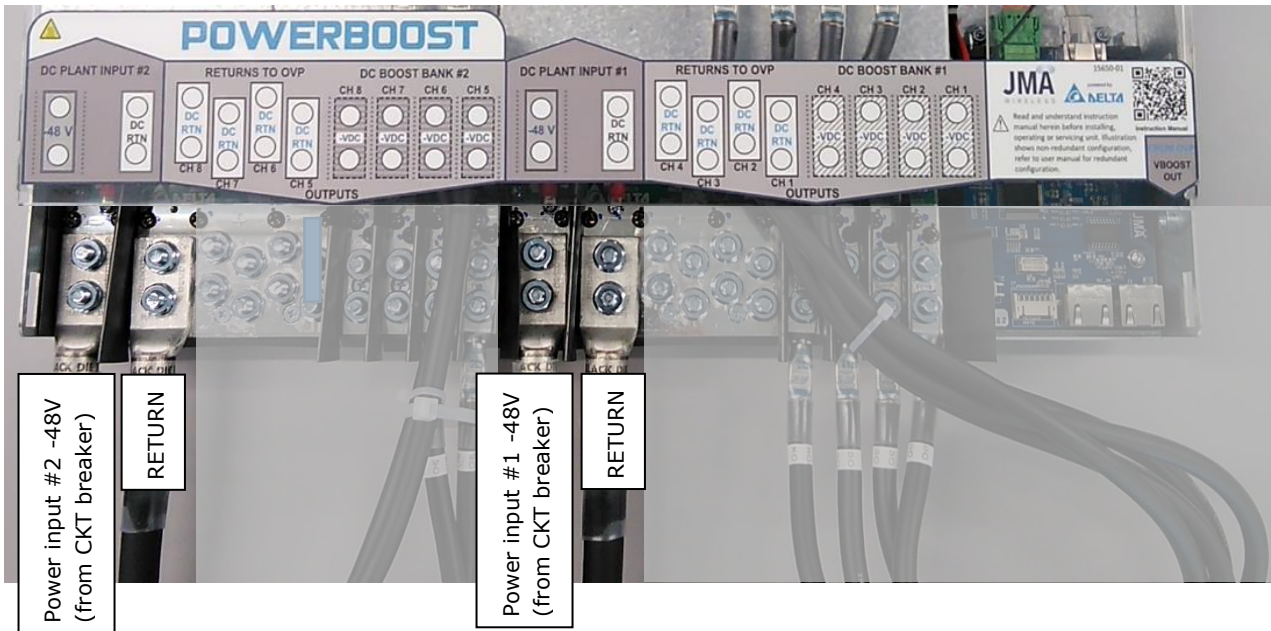
Photo below highlights lower boost rack
(power inputs #3 and #4 for channels 9-12 and 13-16)
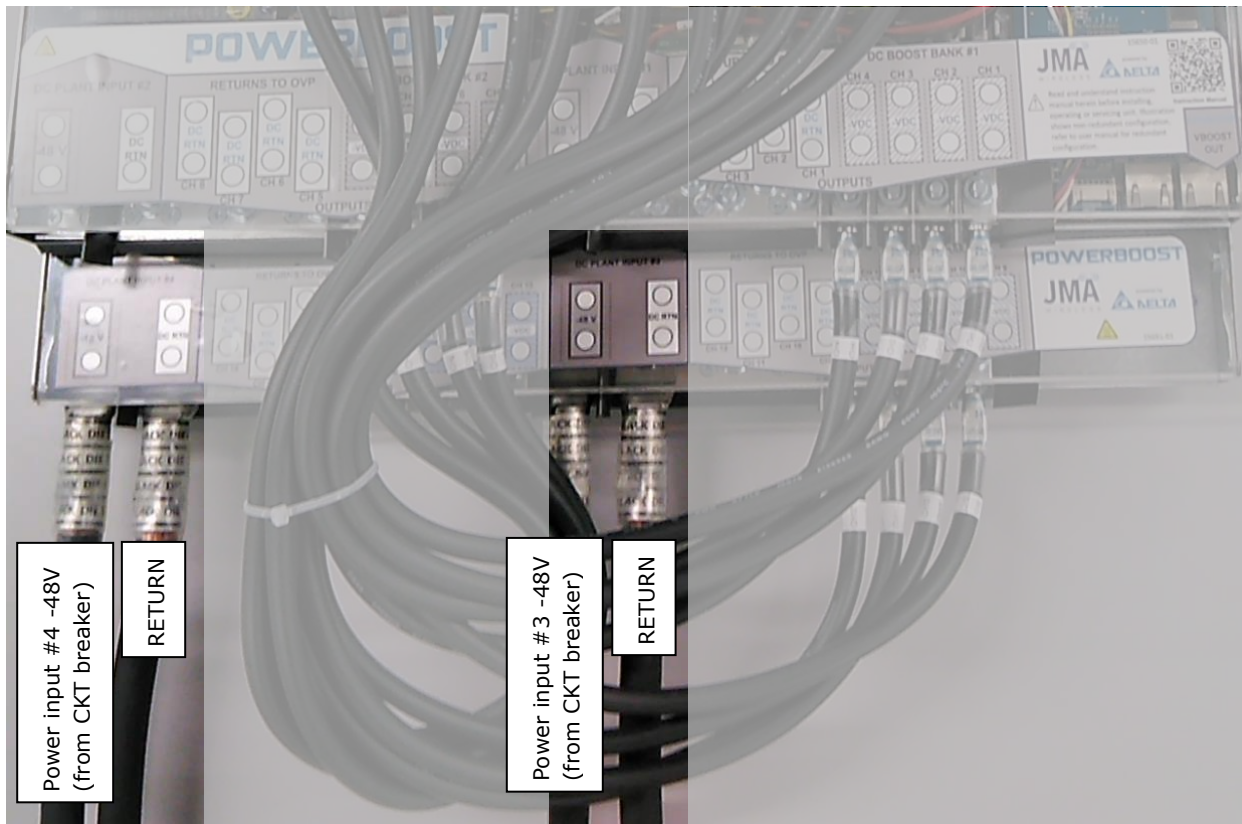
7.3. Connect PowerBoost (OMM) outputs to lower OVP

- Output wiring and overcurrent protection must be installed in accordance with all local and national electric codes and requirements.

Torque value for all lugs on the PowerBoost unit is 65 lbf·in. See labels on lug covers for further detail. See Appendix A for reference information on lugs. See Appendix C for reference information connections to lower OVP rack.

- -48V connection is made at the upper "OMM" shelf.
- Return connection is made at the middle (ch 1-8) or lower (ch 9-16) "boost" shelf.

See photo below (only boost returns ch 1-8 are highlighted for clarity).

Note that -48V lug channel numbers progress as follows:

| 8 7 6 5 | | 4 3 2 1 |
| 16 15 14 13 | | 12 11 10 9 |

Boost output #5 -48V to lower OVP CH5 -48V input

Boost output #1 -48V to lower OVP CH1 -48V input

Boost output #5 RETURN to lower OVP CH5 RETURN

Boost output #1 RETURN to lower OVP CH1 RETURN
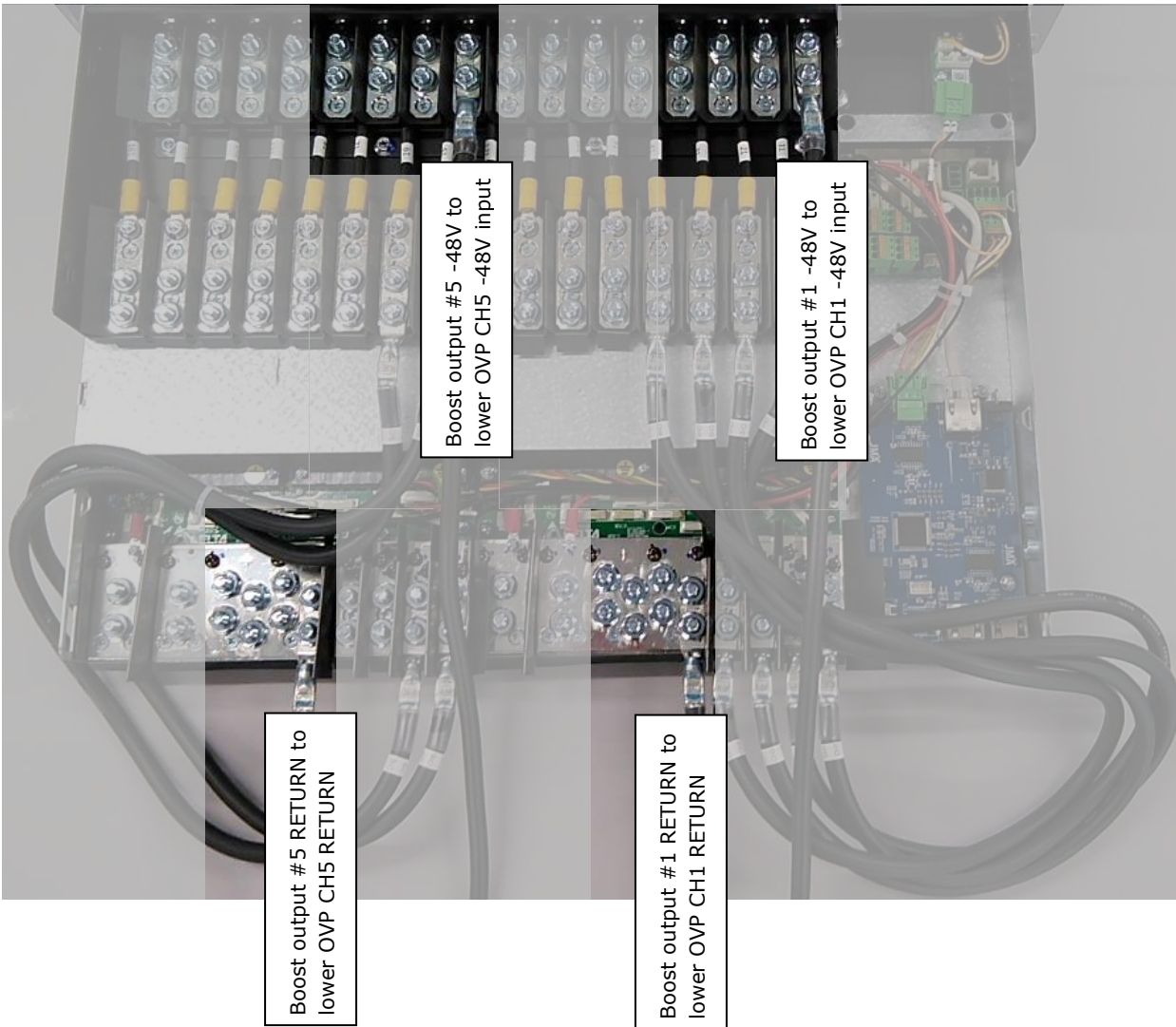
See photo below. Connections for ch 9-16 are illustrated.

- -48V connections are made at upper "OMM" shelf at the locations illustrated below.
- Return connections are made in similar fashion as ch 1-8, but connect to the lowest "boost" shelf (ch 9-16)

Note: During initial installation, tool access is often easier if the lower connections (CH9-16) are made first.

Note that -48V lug channel numbers progress as follows:

				8	7	6	5					4	3	2	1
16	15	14	13					12	11	10	9				

Boost output #13 -48V to lower OVP CH13 -48V input

Boost output #9 -48V to lower OVP CH9 -48V input

UPPER boost rack contains RETURNs for CH 1-8 to lower OVP.

LOWER boost rack contains RETURNs for CH 9-16.

Boost output #13 RETURN to lower OVP CH13 RETURN

Boost output #9 RETURN to lower OVP CH9 RETURN
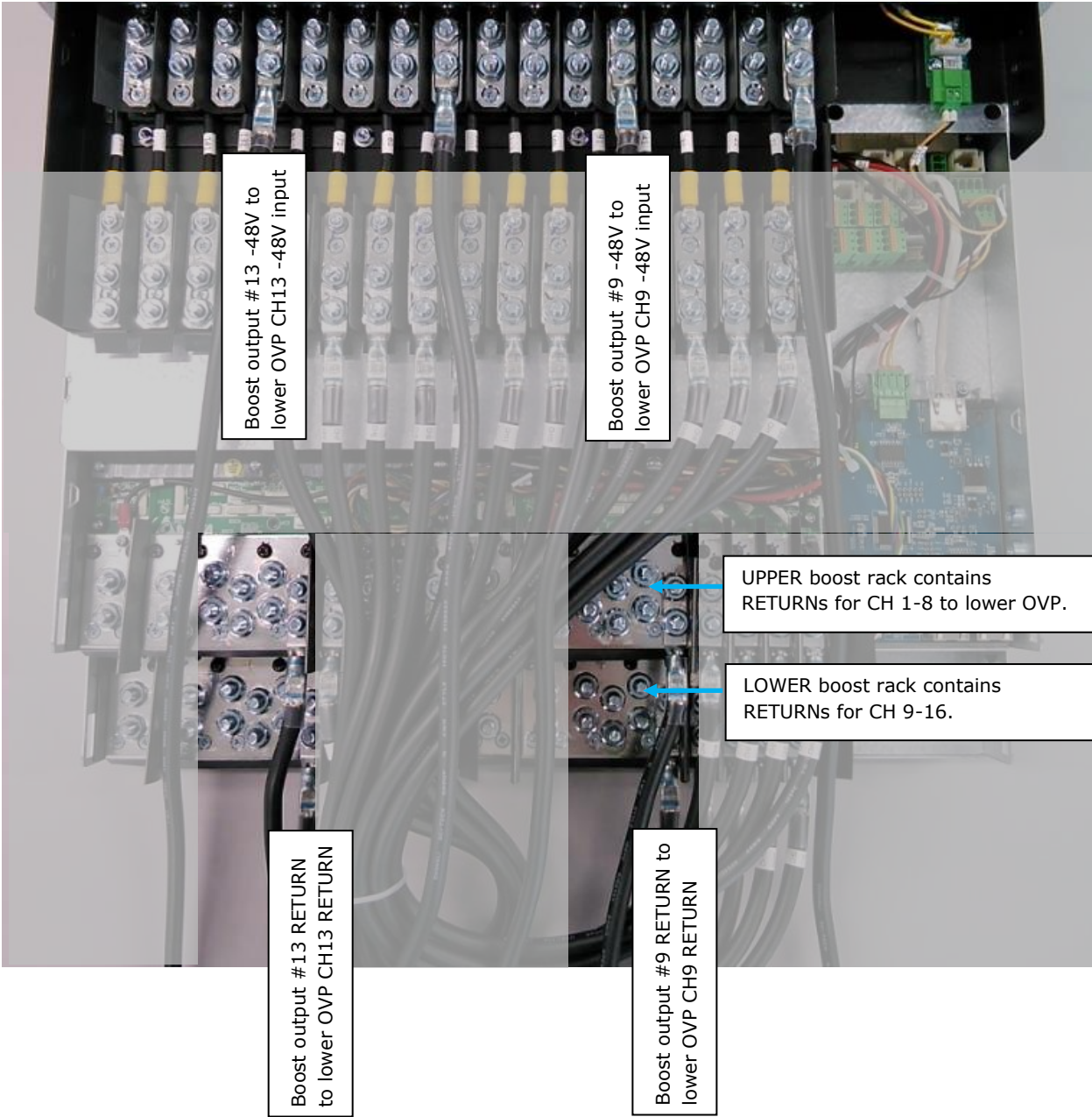
7.4. RS485 Data link and alarm connections

7.4.1. RS485 data

Alarm connections are made in the location shown. See further information below.

OVP data connection is made in the location shown. This is the PowerBoost
"VBOOST IN" connection.
The lower OVP "VBOOST OUT" connects here.

Note: if PowerBoost has 2 connectors (as shown in photo):
- Connection to either connector is acceptable.
- Only 1 cable connects to this location; both connectors are never used at the same time.

Alarm connection

OVP data connection "VBOOST"
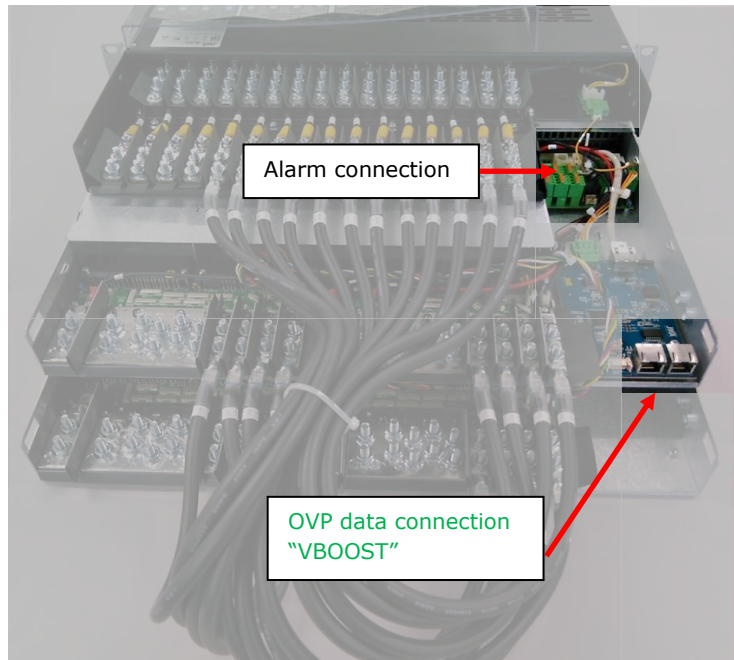
7.4.2. Alarm connections

Board is on the rear of the rack behind the Orion controller.

Photo view is standing at the front of the unit, looking over the top.

(Interface connectors are included with unit.)

For reference, summary information on alarm connections is shown below.
(See Appendix G for further information and alarm mapping.)

Relay name	Pin out
Critical	OUT1.1 – Normally open OUT1.2 – Common OUT1.3 – Normally closed
Minor	OUT2.1 – Normally open OUT2.2 – Common OUT2.3 – Normally closed

3--NC
2--COM
1--NO
Alarm Connection OUT2 (Minor)

3--NC
2--COM
1--NO
Alarm Connection OUT1 (Critical)

Separate note:
Board contains 4 programming jumpers
Jumper positions are:
(Do not change)

Illustrated jumper Positions
UP   DOWN

4 UP
3 DOWN
2 UP
1 UP
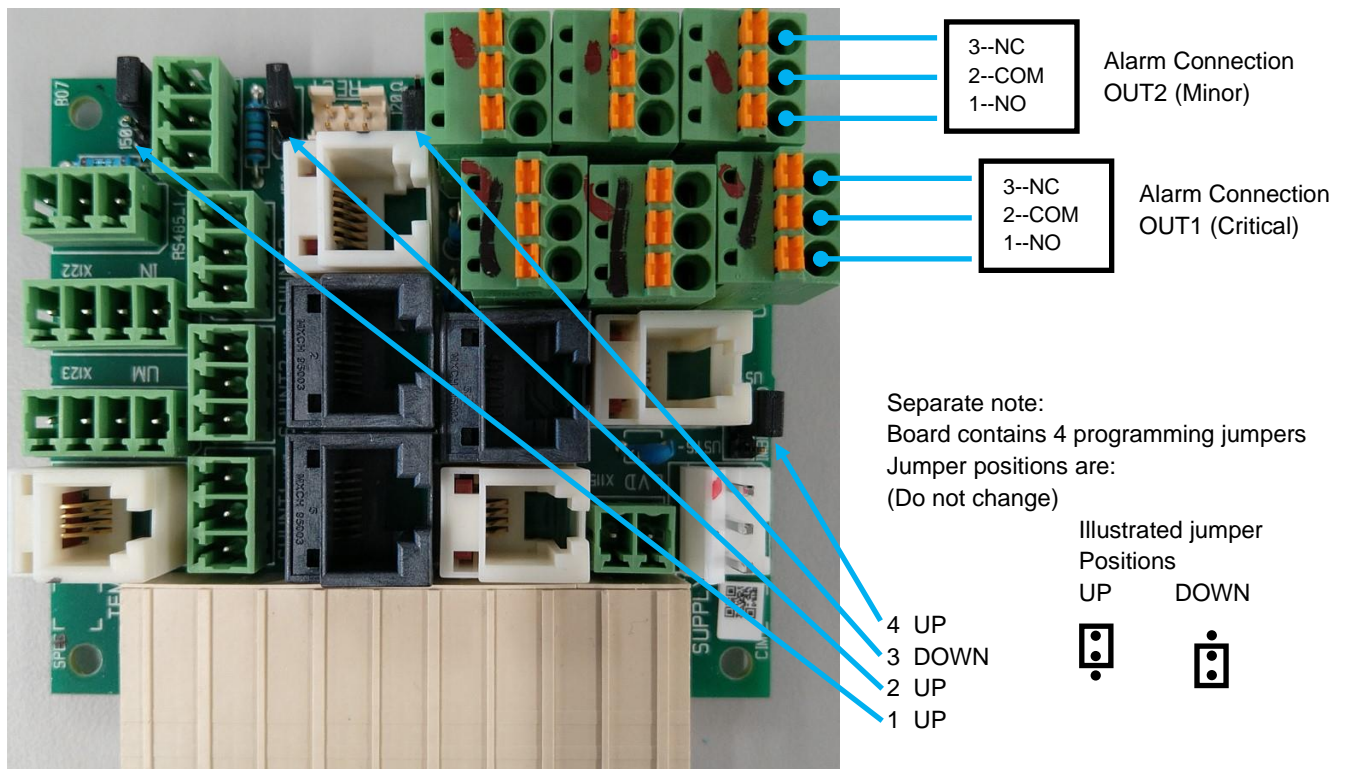
8. Startup

8.1. New system startup

Note: In order to select the proper configuration file later in this segment, it is necessary to have knowledge (and preferably a diagram) of the system wiring connections. The diagram should include:

- PowerBoost
- OVP lower and upper
- Cable spans (between lower and upper OVP)
- RRH units
- Which PowerBoost channels are connected to which OVP channels and RRH units.
- Circuit breaker values in each position of the OMM

Note: A spreadsheet template is available to aid in creating standardized system diagrams on Page 1.

Before applying power, ensure the following:

- The Orion controller is present and fully inserted.
- **No boost modules are inserted.**
- Power input feeds from DC plant have been checked for correct polarity before connecting to the lug lands. (See Section 7.2: Power input connections)

- **Note: Boost modules will be damaged if they are energized with reverse polarity.**
- Note: The Orion controller receives power from either of the power feeds on the same shelf (ch 1-4 or ch 5-8), and can withstand reverse polarity without damage.
    - Knowing this, the Orion controller can be used to confirm correct polarity of power input connection to input feeds (ch 1-4 or ch 5-8) as described below.

Turn on **only** the circuit breaker feeding power input for channels 1-4.

- Verify that the Orion controller touchscreen lights up. Typically, it lights up, then shows "ORION," then progresses to the default display screen. Allow up to 30 seconds.
    - Orion touchscreen that lights up is indication that input power is connected with correct polarity - ok to proceed.
    - If the Orion touchscreen remains dark when input power is turned on, this typically indicates that polarity is reversed. **Do not insert boost modules!** Troubleshoot before proceeding.

- Once the Orion controller has been properly confirmed to light up, turn OFF the circuit breaker for channels 1-4.
- If the system has a second power feed for channels 5-8, turn on the circuit breaker feeding those channels.
- Using same approach described in previous steps; verify that the Orion controller lights up as expected. Troubleshoot before proceeding.

If the system has 3rd and 4th power input feeds (ch 9-12 and 13-16): Note that the Orion controller does NOT draw power from these 2nd boost shelf inputs, so the Orion touchscreen will remain dark when only those power feeds are energized. Correct polarity of the 3rd and 4th power feeds can be confirmed by ensuring that the polarity connections are the same as the feed supplying ch 1-4, which has been previously verified.

Final step in performing the polarity checks — finish with all circuit breakers OFF.

- All power feed breakers from DC plant to PowerBoost OFF
- All 16 circuit breakers on PowerBoost OMM OFF
- No boost bricks are inserted

Once polarity of the individual power feeds has been verified, proceed with system power-up:

- Turn on all breakers in DC plant that feed the given PowerBoost rack.
- Allow 2-3 minutes for the Orion controller to boot.
- Proceed with configuration; see the following pages.

8.2. Orion controller access

General login information for reference:

- Orion touchscreen: Default password is 0000 (four zeros).
- Orion GUI (Ethernet): Default address from factory is set for static 192.168.100.100
    o Default username: Admin; Password: orion

Note: The Orion controller GUI contains many menus/sub-menus. Only the parameters needed for the PowerBoost functions are covered here. Leave all other settings at their default values.

A note about configuration files: Think of the config file in the same general manner as a website bookmark. The config file is a convenience item that sets many parameters within the Orion controller. Selecting and engaging a config file saves time that would otherwise be spent navigating to and entering the various menu parameters.

Refer to Appendix E to identify the configuration file appropriate for the given application. Consult JMA tech support with any questions.

8.2.1. Select a config file via touchscreen

Note: This section covers how to select and engage a configuration file. For information about configuration files, how to choose the appropriate file, and channel mapping, see Appendix E.

To select a config file via the Orion touchscreen
(without using a laptop / without logging into the Orion Ethernet GUI):

On the Orion touchscreen, think of horizontal swipes as flipping through pages in a book; swipes to the right return toward "front of the book"; in other words, toward the Orion main screen.

From the factory, the default display page for the Orion controller is the "meter panel" page, which shows parameters for each channel. Scroll up and down to scroll through the channels. Rather than one long (vertical) string of all channels, the meter panel page is divided into segments of approximately 5 channels. To advance forward through the meter panel page segments, scroll down to the bottom of a given segment and choose "Next." To return through the segments, swipe right in a given segment.

METER PANEL	
Vsys	54 V
CH1 BOTTOM V	****
CH1 TOP V	****
CH1 I	****

Orion touchscreen sequence is: (default display is "Meter Panel" page)

Main "Orion" page, "Menu" page, "Alarm" page, "Meter Panel" page.

To select a configuration file via the Orion touchscreen: Swipe right (2x) to reach the "Menu" screen, as shown below.
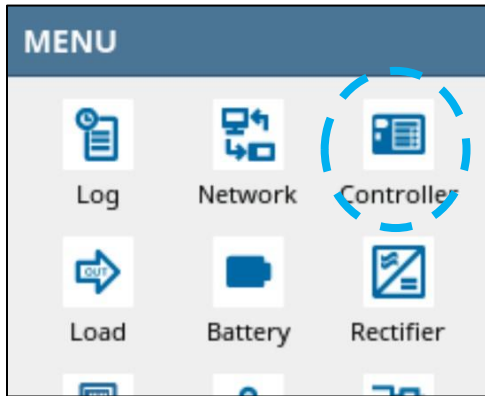
Touch the **Controller** icon.

This reveals the Orion controller serial number and installed software version. Scroll down (swipe up) to reach the configurations section.

Touch **Configurations** to enter the configs menu.
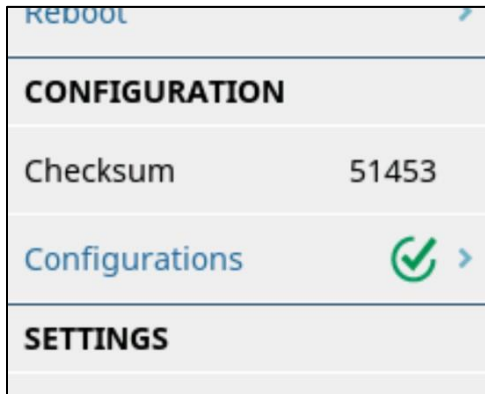
Touch on the desired configuration file (identified previously based on system design).
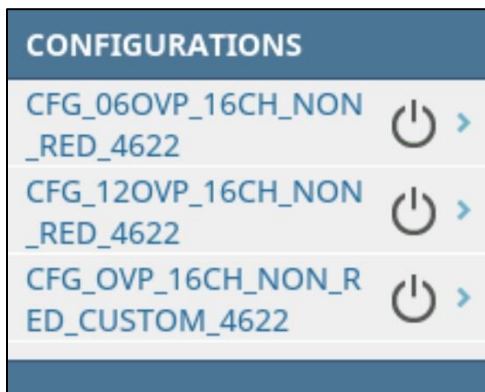
For the given config file, scroll down slightly to expose the "Activate" menu.

Touch **Activate**.

Created With	A9.20B09
At	09.26.2022 15:11:13
Activate	>
Deactivate	
Update	

If prompted for password:

Enter the default password 0000 and touch the **blue checkmark**.

Orion will present a confirmation screen; touch the blue **checkmark** at the bottom.

Activate?
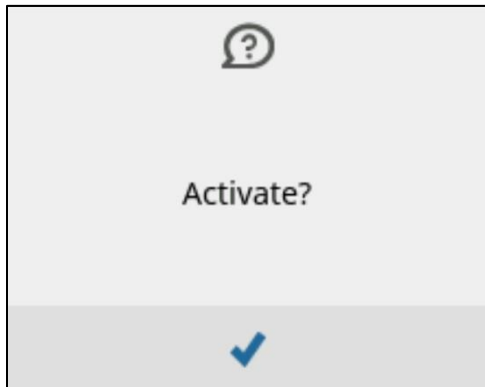
Note: Sometimes during the transition among config files, the controller will generate an alarm message which self-clears after a few seconds. This may change the TS display to a different screen. If necessary, swipe right to reach the menu screen, then touch the **Controller** icon, then scroll down (swipe up) and touch **Configurations** to view/confirm the active CUSTOM config file.

After selecting and activating the CUSTOM config file, the channels that will be used in the system must be mapped and enabled as follows:

Swipe the Orion touchscreen as needed to reach the "Menu" screen:
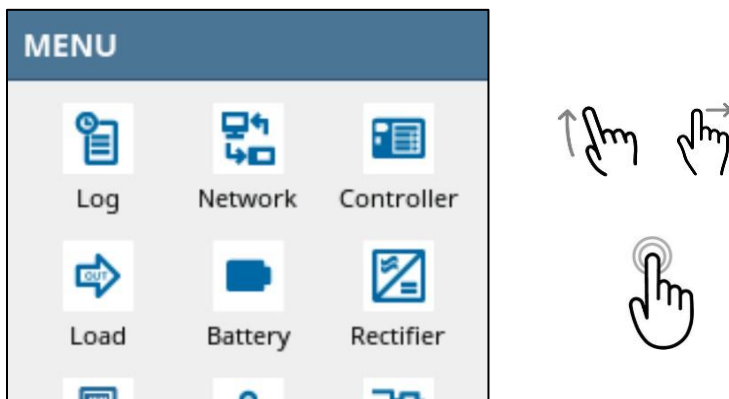
Once on the "Menu" screen, swipe up (scroll down) to reveal more icon tiles. Touch on the **Hybrid Ch.** tile.
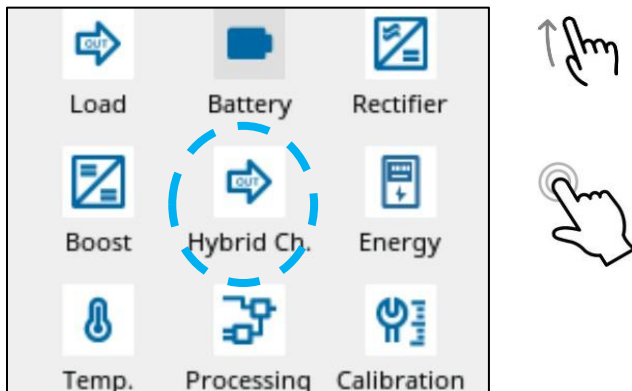
This brings the "HYBRID CHANNEL" menu.

Note: Only change entries for channel mapping and enable; do not change other existing entries in this menu.

The "HYBRID CHANNEL" menu is shown below. Note that the "Name" for each boost channel shown at left side is unmapped (contains default value 1, 2, etc., instead of mapping numbers such as 101, 102, 203, etc.)

Within the "HYBRID CHANNEL" menu, scroll down (swipe up) as appropriate and touch on the desired channel to set up.

This opens the channel menu.
(Note: The number at left shows that channel 1 has been selected)
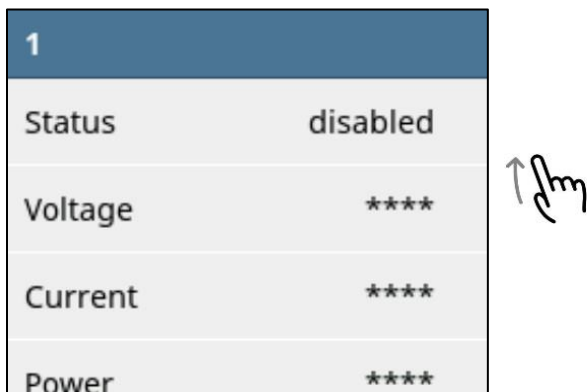
Scroll down to locate the "Name" variable. Touch the number entry box at right.

(Note: If prompted for a password, enter 0000 and touch the blue **checkmark** at lower right.)
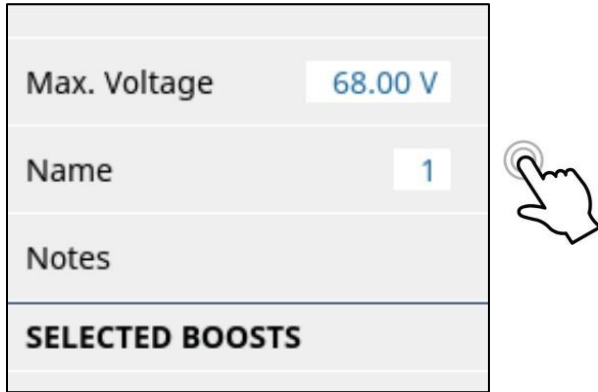
The touchscreen will show the entry line with the present default index number.

Touch the **X** icon at right of entry line to delete existing numbers.
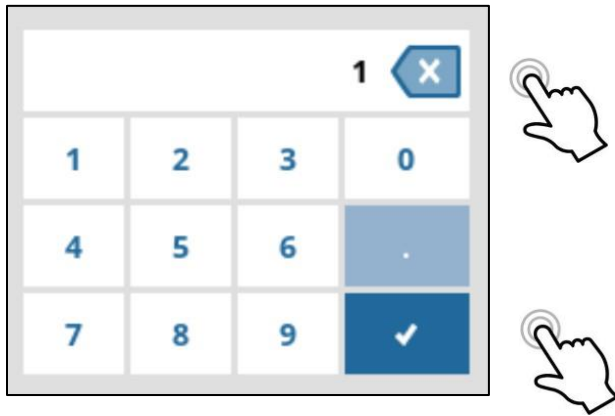
Enter the desired new mapping number, then touch the blue **checkmark** at lower right.

In the example image below, channel map number 101 was entered.

Max. Voltage   68.00 V

Name   101

Notes

SELECTED BOOSTS
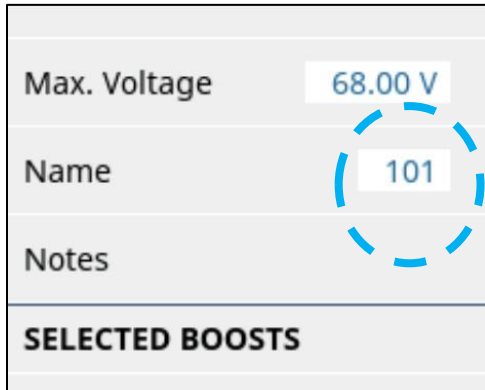
(Still within the same channel menu…)

Scroll upward (swipe down) in the menu to locate the "Enable" line.

Energy   23 kWh

Def. Supply Volt.   56.00 V

Enable

Man. Regulation
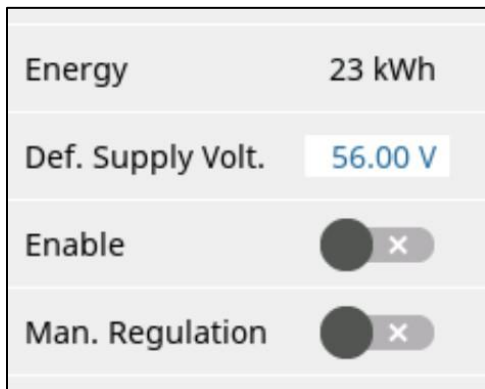
Touch on the **Enable** slider icon to toggle it to the "On" position.

Energy   23 kWh

Def. Supply Volt.   56.00 V

Enable

Man. Regulation
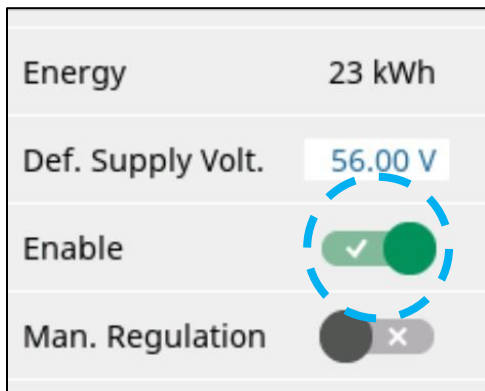
The above steps accomplish mapping and activation for the chosen channel.

Scroll up (swipe down) and swipe right as needed to access the channel list, then repeat the above steps to enter mapping number and toggle the "Enable" slider icon to map and enable the other needed channels.

To utilize channels in PowerBoost:

- Only enable the channels that will be used; leave the unused channels NOT enabled.
- For the given system design, if a boost brick has an unused channel, the unused channel must be assigned a valid mapping number (101, 102 etc.) but leave the channel NOT enabled. Typically, the mapping number for the landed OVP channel should be entered. If the channel is not landed, enter an unused but valid OVP mapping number.

Scroll up (swipe down) and swipe right as needed to reach the MENU screen.

Touch the **Controller** icon.

Scroll down (swipe up) to locate the "Configurations" line.

Note that it contains a flag indicating that the config file is not synchronized (because changes have been made to channel maps and enabling).

Touch the **Configurations** line to enter the config files list.
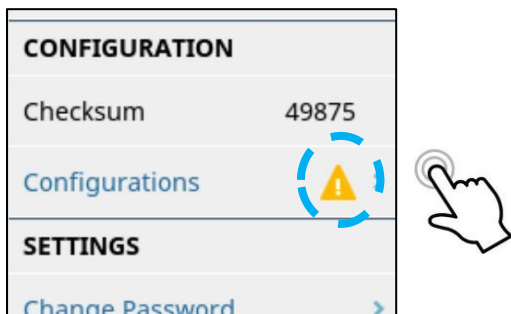
Touch the active config file line to open that config file, then scroll down (swipe up) to locate the "Update" line.
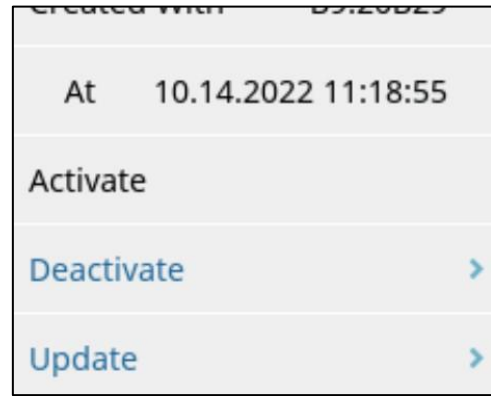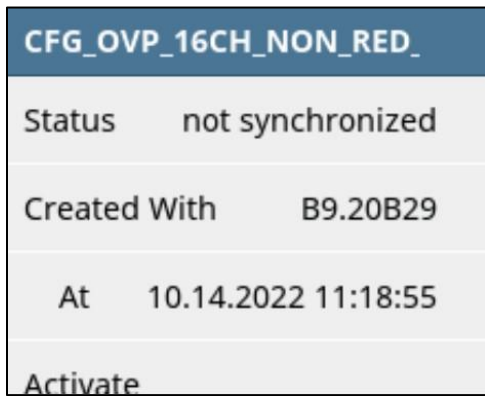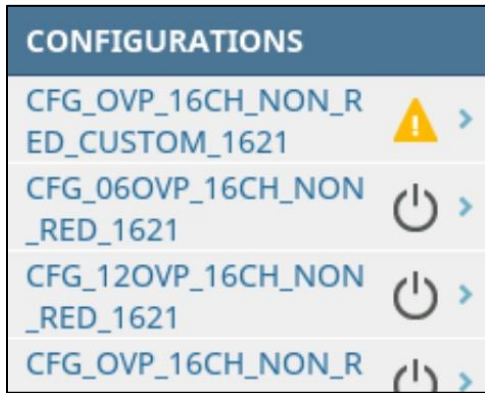
Touch **Update,** then on the next screen touch the blue **checkmark** at the bottom to confirm.
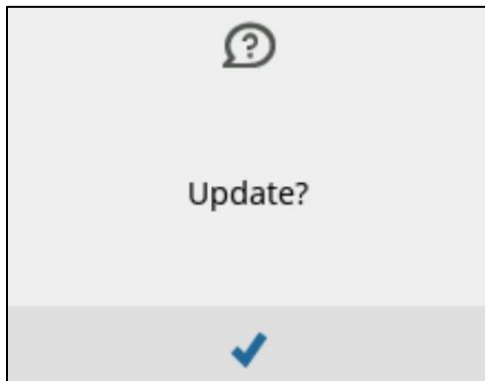
The config file status will change to "synchronized."
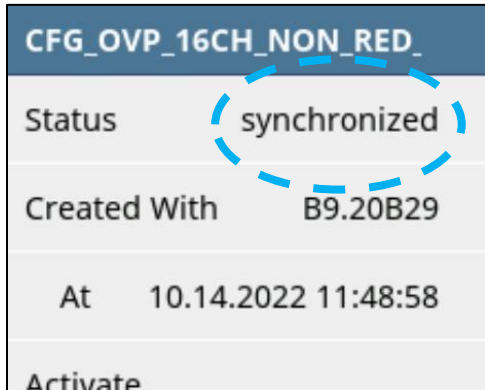
From this point, the screen could be manually swiped right to return to main screen or other menu display, or just leave as is and the screen will automatically revert to default display after approximately 30 seconds.

The example above discussed how to engage the "CUSTOM" config file, then map and enable the desired channels, then re-sync the config file. Also, there are two other config files included with PowerBoost. The other two files are pre-mapped to address common system constructions, and the user only needs to enable channels that are used:

- CFG_06OVP… represents two OVPs daisy-chained; a 6 OVP is connected to PowerBoost channels 1-6, followed by a 12 OVP connected to PowerBoost channels 7-onward. Note that this file can also be used for a single 6 OVP.
- CFG_12OVP… represents two OVPs daisy-chained; a 12 OVP is connected to PowerBoost channels 1-12, followed by a 6 OVP (or 12 OVP) connected to PowerBoost channels 13-onward. Note that this file can also be used for a single 12 OVP.

For detailed information about the mapping in these files, see Appendix E. To use the CFG_06OVP or CFG_12OVP file, follow the same process as for the CUSTOM file (info above), but omit the mapping steps; only need to enable the channels that will be used.

Once the configuration file is selected and implemented (<u>desired channels are mapped and enabled, then config file re-sync'd</u>):

- With all OMM circuit breakers OFF, insert boost modules only for the channels that are enabled.
- It is recommended to turn on the OMM circuit breakers one at a time, and verify that the expected Raycap channel energizes.
- Confirm/troubleshoot as appropriate.
- Optional: Once all channels are energized, see Appendix K for closeout checklist.

8.2.2. Selecting a config file via Ethernet GUI

Note: This section covers how to select and engage a configuration file. For information about configuration files, how to choose the appropriate file, and channel mapping, see Appendix E.

To select a config file via the Orion GUI (using laptop computer and login via Ethernet connection on front):

If the laptop computer has not previously been configured for direct connection to the Orion controller via (laptop's) local LAN port, refer to Appendix D for information to connect and log in.

Quick menu steps: (A memory aid for those familiar with the process. For more detailed information, continue reading.)

Configuration, System, Config Manager, Deactivate current config file, select new file, Activate, OK, Update.

See image below for reference. Once logged in, Orion main menu tree exists at the left side. Clicking on a main menu item toggles it open (sub-menus) / closed.

See image below for reference.

On the left side Menu, click **Configuration**.

Under "Configuration," click **System.**

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Under "System," click **Configuration Manager.**

Deactivate the existing configuration file (if applicable).
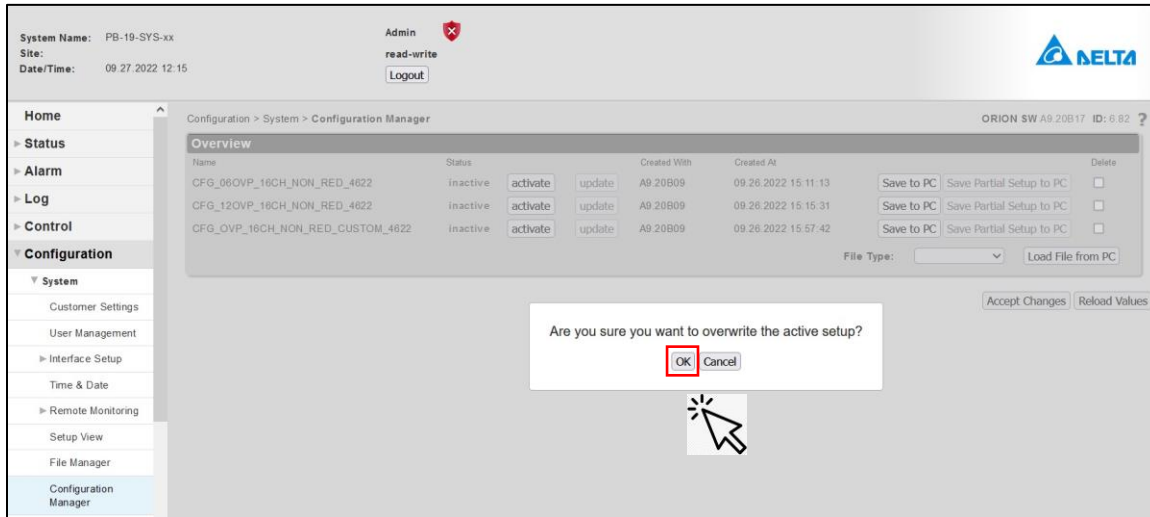(For this example, the CUSTOM config file will be loaded…)
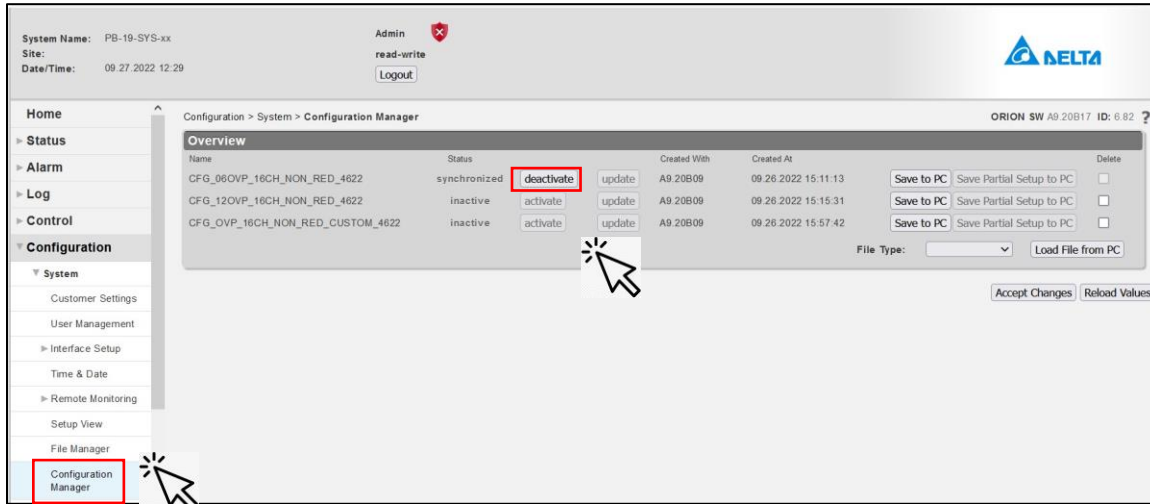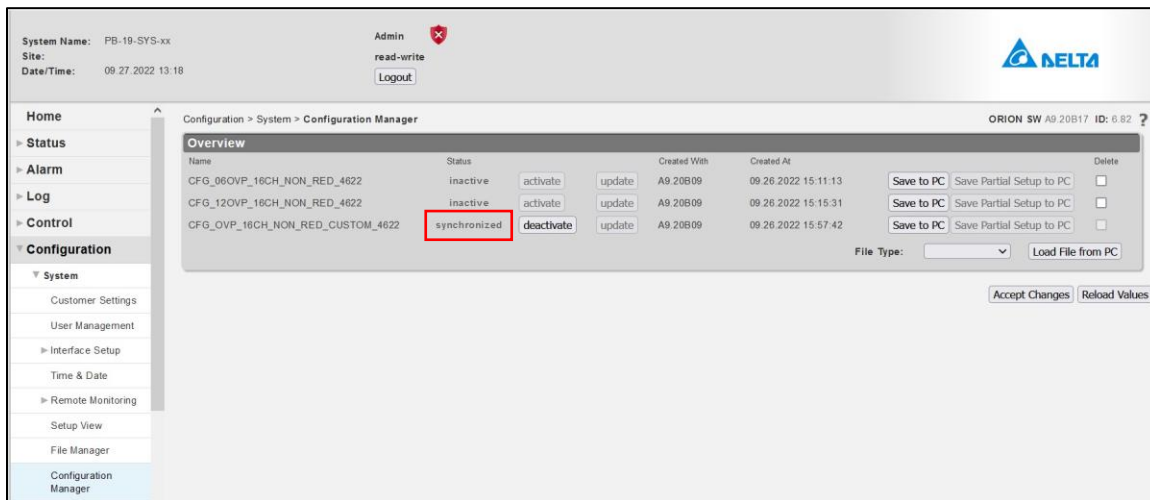

Click **activate** for the CUSTOM config file.
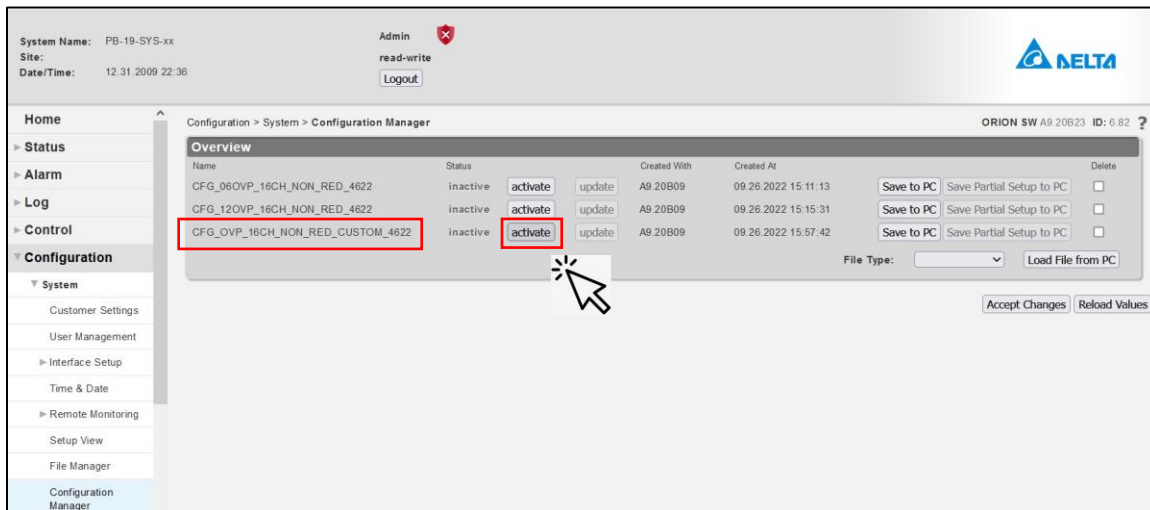
This will bring a confirmation dialogue box; click **OK**.

Allow a few seconds; Orion will activate the file, and the status will indicate synchronized.

Next step is to map and enable each of the channels that will be used in the system.

Note: See <u>Appendix E</u> for detailed discussion on channel mapping.

Navigate menu path: **Configuration, System, Hybrid channel**. See image below. The purpose of navigating to this menu is to do two things:

- Enter the desired channel mapping numbers (example 101, 102, 201 etc.) in the "Name" column for each boost channel.

- o Note: See Appendix E for detailed discussion on channel mapping.
- Enable (only) the desired channels by clicking the checkbox in the "Enable" column.
  - o Note: Enabled channels must have a valid mapping number in their "Name" entry (i.e., 101, 102, etc. – this is the OVP channel reference). Enabling a channel that doesn't have a valid "Name (OVP CH)" mapping entry will result in system not boosting or other incorrect operation.

Note: Do not change other existing entries in this menu; the focus is only on the "Name" and "Enable" columns.
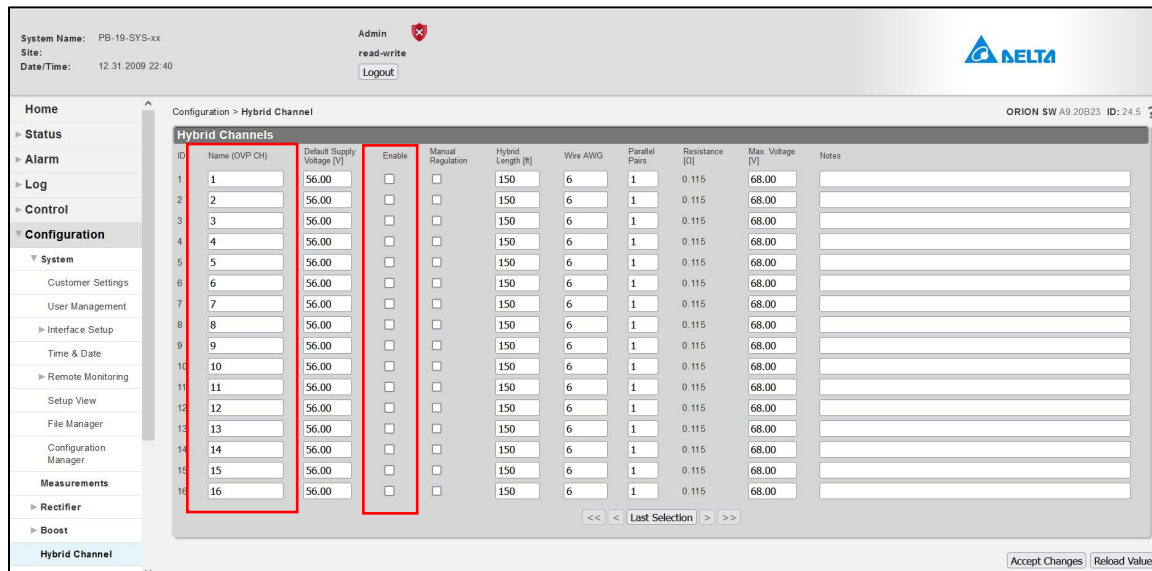
When finished making the "Name" and "Enable" entries, click **Accept Changes** at the bottom.

Important! After clicking **Accept changes**, the config file must be synchronized.

(Return to the menu **Configuration, System, Configuration Manager**, and click the **Update** button to synchronize the config file.)

The information above discussed how to engage the "CUSTOM" config file, then map and enable the desired channels, then re-sync the config file. Also, there are two other config files included with PowerBoost. The other two files are pre-mapped to address common system constructions, and the user only needs to enable channels that are used:
- CFG_06OVP… represents two OVPs daisy-chained; a 6 OVP is connected to PowerBoost channels 1-6, followed by a 12 OVP (or 6 OVP) connected to

PowerBoost channels 7-onward. Note that this file can also be used for a single 6 OVP.

- CFG_12OVP… represents two OVPs daisy-chained; a 12 OVP is connected to PowerBoost channels 1-12, followed by a 6 OVP connected to PowerBoost channels 13-onward. Note that this file can also be used for a single 12 OVP.

For detailed information about the mapping in these files, see Appendix E.

Once the configuration file is selected and implemented:

- With all OMM circuit breakers OFF, insert boost modules only for the channels that are enabled.
- It is recommended to turn OMM circuit breakers on one at a time, and verify that the expected Raycap channel energizes.
- Confirm/troubleshoot as appropriate.
- Optional: Once all channels are energized, proceed to Appendix K for closeout checklist.

Appendix A: Compression Lug Information for Reference

Note: All input and output lug locations on the PowerBoost chassis, including ground bonding locations on the side, utilize 1/4" stud x 5/8" spacing. Torque value for all lugs is 65 lbf·in.

For PowerBoost inputs:

Note: PowerBoost has 4 inputs. Each input feeds up to 4 output channels. Selected circuit breaker, cable, and lug size must satisfy national and local requirements, and support maximum anticipated total load per system design. Often, PowerBoost inputs are fed with 4/0 AWG to support future buildout to full load.

Wire size (AWG)	Recommended Burndy part number	Recommended Panduit part number
#4	YAZV4C2TC14FX	LCCX4-14A-L
#2	YAZV2C2TC14FX	LCCX2-14A-E
#1	YAZV1C2TC14FX	LCCX1-14A-X
1/0	YAZV252TC14FX	LCCX1/0-14A-X
2/0	YAZV262TC14FX	LCCX2/0-14A-X
4/0	YAZV282NT14FX	PennUnion BBLU4/0D2TC14 w/o inspection window via elecdirect.com

For PowerBoost outputs:

Note: Narrow tongue lugs indicated for PowerBoost outputs can also be used on inputs.

Wire size (AWG)	Recommended Burndy part number	Recommended Panduit part number
#8	YAZ8C2TC14FX	LCCX8-14A-L
#6	YAZV6C2TC14FX	LCCX6-14A-L
#4	YAZV4C2NT14FX	
#2	YAZV2C2NT14FX	

Appendix B: Power feed circuit breakers for reference

Summary of circuit breakers and lug adapter kits for DC plant manufacturers Delta, GE, and Vertiv/Emerson.

	Delta	GE	Vertiv/ Emerson		
Circuit breaker 75A 1 pole	830692008	N/A	101609		
Circuit breaker 80A 1 pole	830692108	407998251	121995		
Circuit breaker 150A 2 pole	830734408	408185346	516839		
Circuit breaker 200A 2 pole	830746508	408544076 (See Note 1)	121832		
Circuit breaker 200A 3 pole	xx	408564941	xx		
Circuit breaker 225A 3 pole	N/A	408573975	144886		
Circuit breaker 250A 3 pole	830730008	408535752	121836		
Note: 2-pole and 3-pole breakers require lug adapters. Info below:					
Lug adapter kit 2 pole (conn posts 3/8 x 1.0)	3799235700-S	850021775	534449		
Lug adapter kit 2 pole (conn posts 1/4 x 5/8)		CC848756916			
Lug adapter kit 3 pole (conn posts 3/8 x 1.0)	3799236400-S	850021955	514714		
Lug adapter kit 3 pole offset (conn posts 3/8 x 1.0)		CC848756924			

# of CH	Typ. Breaker (A) *
1	75 or 80
2	150
3	200 or 225
4	250
* For reference only. Consult local system design standards/requirements.	

Note 1: for GE/ABB plant:
- 100A/pole buss to use 2-pole 200A breaker, and requires no spacing (modern 600A & 900A plants).
- 70A/pole buss requires a space between the next breaker when using a 2 pole; pre 2015.

Appendix C: Connections from PowerBoost output to rack mount "near" OVP input

Data cable connects here to VBOOST OUT. Other end to PowerBoost TM communication board J1.

Illustration shows connections from OMM CH. 1 and 2 to corresponding landings on rack OVP CH. 1 and 2.

-48 V bus, circuits 7–12

Return bus, circuits 7–12

-48 V bus, circuits 1–6

Return bus, circuits 1–6

VBOOST IN port is not used. See OVP documentation for additional information.

CH1, CH2, etc., From OMM outputs (forward lands) connect to OVP "-VDC" inputs. Other stud land to cable to upper OVP "-VDC."

CH1 CH2 etc.
From PowerBoost DC return outputs connect to OVP inputs. Other stud land to cable to upper OVP "Return."

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Appendix D: Orion GUI login

☐ Swipe through the menu options on the Orion controller screen and find the network option. Identify and remember the IP address on the controller.
(Default IP address programmed at factory is 192.168.100.100)
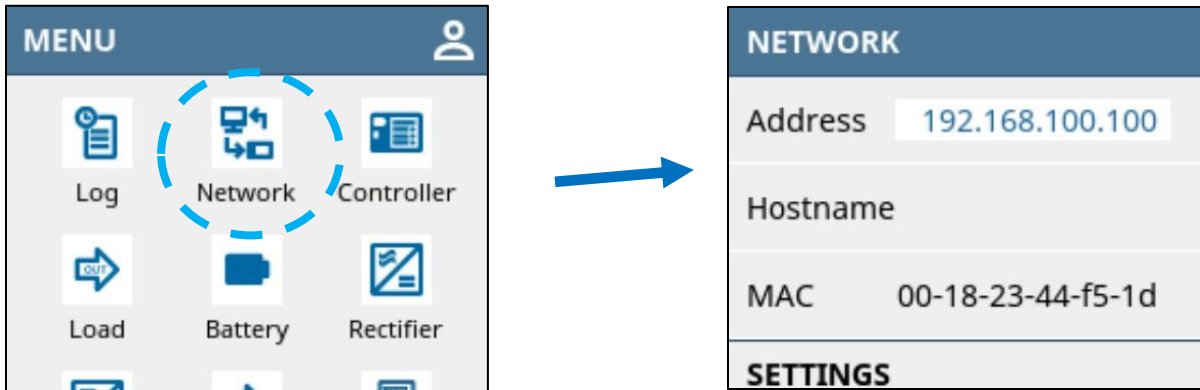
☐ Connect the Ethernet cable to the Orion controller and the other end of the cable to your laptop/PC.

For Windows 10 and earlier:

☐ Go to **Control Panel** on your laptop → **Network Sharing center** → **Local Area connection**.

For Windows 11:

Go to **Start**, **Settings**, **Network and Internet settings.**

Then scroll down to **Advanced Network Settings**, **More Network Adapter Options.**

- Go to **Properties → Internet Protocol Version 4 (TCP/IPv4).**
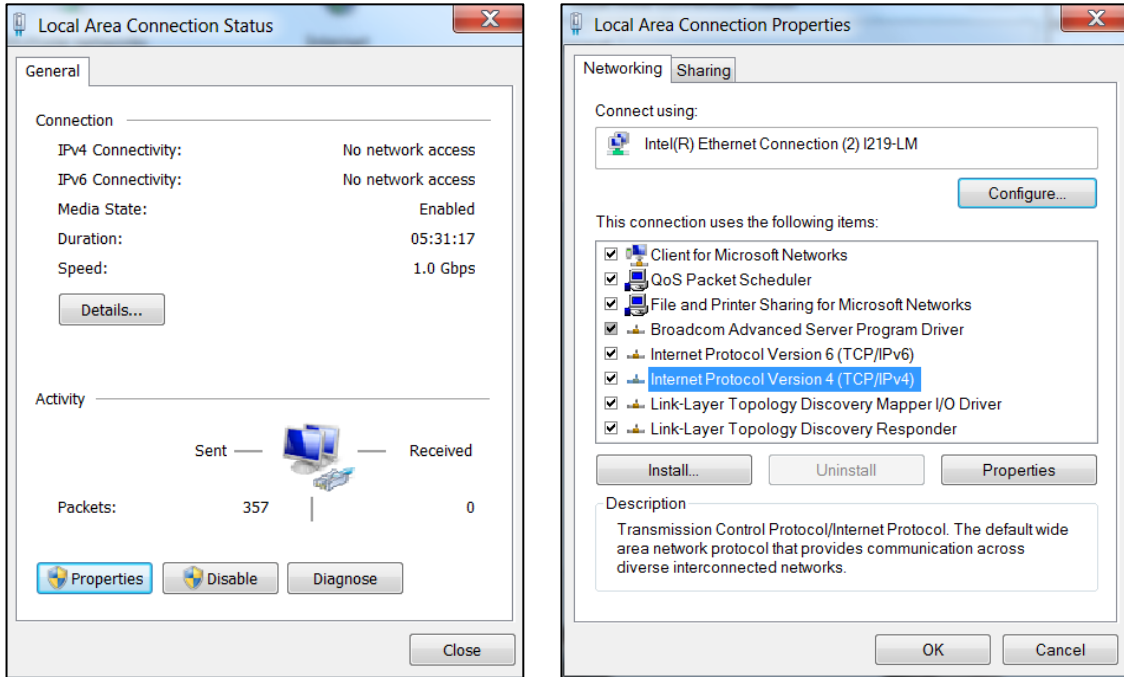
- Change the properties to match the IP address identified in the first bullet and click **OK**.
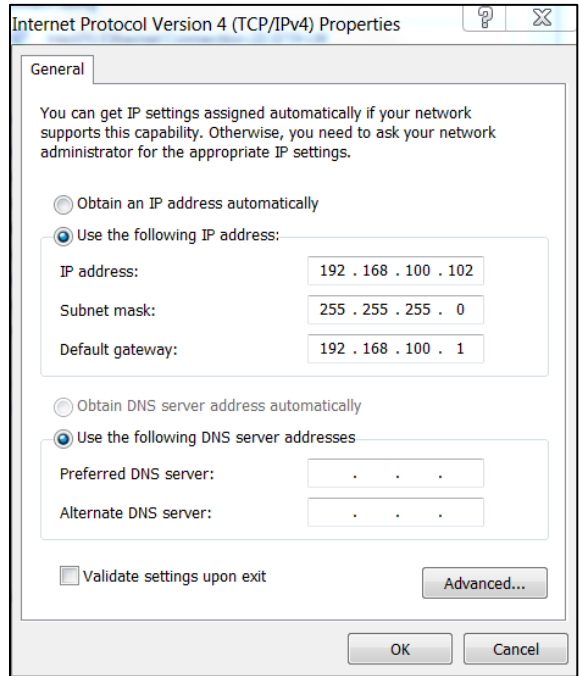
Note: The above steps only need to be performed when a laptop is connected for the first time, or if the Orion IP address has been changed since the last time the laptop was connected.
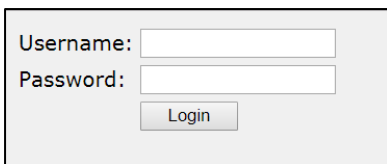
Logging into the Orion:

- Launch a web browser on the laptop/PC and enter the following URL address into the address bar at top of the web browser:
  https://192.168.100.100

Note: The full text shown above (including https://...) is entered into the address bar at top of web browser (not into a search engine).

When the Orion controller responds, a login window will appear as shown below.
Enter the Username & Password shown:

Username:	
Password:	
	Login

Username: Admin
Password: orion

Appendix E: OVP Configurations and channel mapping

General overview of Raycap OVP telemetry connections for reference

This information is provided for general reference only; consult Raycap information for setup and troubleshooting. In the event of conflicting information, information from Raycap company or documentation should take precedence.

See diagram below. (Diagram shows only the RS485 "OVP telemetry" wiring, not the radio power cables.)

- OVP units are generally organized in pairs containing 1 upper and 1 lower OVP.
- Each upper OVP unit has data wires that connect to its corresponding lower OVP unit. (Typically 4 wires connected at green & orange terminal blocks "TOWER COMM" ports.)
- Each OVP unit has a rotary mode switch selector that must be set correctly. (read on…)
- Upper OVP units typically have their mode switches set same = "Tower Dot" (fully CCW).
- Lower OVP units have their mode switch set to BASEx (where "x" is a number 0, 1, 2...)
    - If using just 1 pair of upper and lower OVPs, the lower OVP mode switch is set to BASE0.
        - VBOOST OUT from the lower OVP connects to VBOOST IN at PowerBoost.
    - If using 2 or more OVP pairs, the lower OVP mode switches are set in sequence BASE0, BASE1, BASE2, etc., and the units are connected in "daisy chain."
        - Lower OVP BASE0 VBOOST OUT connects to PowerBoost VBOOST IN.
        - Lower OVP BASE0 VBOOST IN comes from BASE1 VBOOST OUT.
        - Lower OVP BASE1 VBOOST IN comes from BASE2 VBOOST OUT and so on.
        - Note that only one OVP base unit connects to PowerBoost "VBOOST IN."
- Important! The power wiring conductors must connect to SAME channel number at upper and lower OVP. (Not shown in diagram)
- Diagram below shows general OVP configuration for introduction.

Note: Other configurations are supported; contact JMA technical support (888-201-6073) with any questions.

| Upper xOVP

Mode switch "Tower Dot"

4-wire "D" comm | Upper xOVP

Mode switch "Tower Dot"

4-wire "D" comm | Upper xOVP

Mode switch "Tower Dot"

4-wire "D" comm |

All Upper OVP mode switches typically set full CCW "Tower Dot"

Lower OVP mode switches sequence BASE0, BASE1, BASE2…

| Lower xOVP

Mode switch Base2

VBOOST
IN   OUT | Lower xOVP

Mode switch Base1

VBOOST
IN   OUT | Lower xOVP

Mode switch Base0

VBOOST
IN   OUT | **PowerBoost**

VBOOST
IN |

| Channel mapping:

When mode switch is set to "BASE2", the RS485 telemetry tags channels as:

CH1 = 301
CH2 = 302
CH10 = 310
…and so on | Channel mapping:

When mode switch is set to "BASE1", the RS485 telemetry tags channels as:

CH1 = 201
CH2 = 202
CH10 = 210
…and so on | Channel mapping:

When mode switch is set to "BASE0", the RS485 telemetry tags channels as:

CH1 = 101
CH2 = 102
CH10 = 110
…and so on |

These channel tags are used within Orion to identify the channels for mapping.

Explanation of channel mapping:

PowerBoost has 16 channels, numbered 1 thru 16.

Within the PowerBoost Orion GUI, OVP channels are mapped to the PowerBoost channels as described below.

As described in the diagram above, Raycap OVP channels are identified by the mode select switch on the lower OVP unit(s):

- For a single lower OVP unit, mode select is set to BASE0.
    o In that setting, the OVP channels are identified as 101 (OVP CH1), 102 (OVP CH2), etc., up through 106 or 112.
- When two lower OVP units are daisy-chained together, the first lower OVP unit mode select is set to BASE0, and the second lower OVP unit is set to BASE1. Then…
    o Channels of the BASE0 OVP are identified as 101, 102, etc.
    o Channels of the BASE1 OVP are identified as 201, 202, etc.

The approach remains the same for daisy-chaining more lower OVP together:
- The third lower OVP mode select is set to BASE2, and its channels would be identified as 301, 302, etc.
- A fourth lower OVP in daisy-chain would have its mode select set to BASE3, and its channels would be identified as 401, 402, etc.

These numbers 101, 102… 201, 202… are used by PowerBoost to map the given OVP channels to the PowerBoost channels 1-16. (The mapping numbers are entered at menu path: **Configuration, Hybrid Channel** in the "Name" column - see information later in this section.)

As an aid for documenting system wiring easily and consistently, a downloadable spreadsheet file is available on Page 1 which depicts a generic system including PowerBoost and 4 sets of OVP. Users can save in software form or print a hard copy and draw the system connections with pen.

Image of the diagram is shown below (with annotations added for this example):
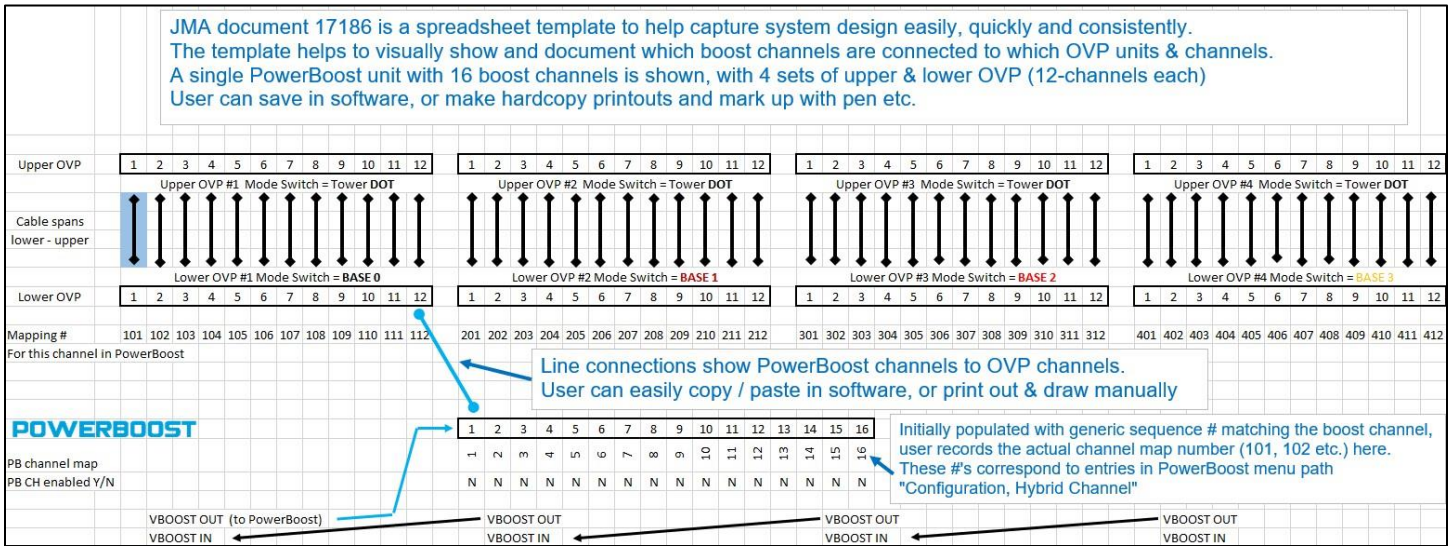
JMA document 17186 is a spreadsheet template to help capture system design easily, quickly and consistently.
The template helps to visually show and document which boost channels are connected to which OVP units & channels.
A single PowerBoost unit with 16 boost channels is shown, with 4 sets of upper & lower OVP (12-channels each)
User can save in software, or make hardcopy printouts and mark up with pen etc.

A note about configuration files: Think of the config file in the same general manner as a website bookmark. The config file is a convenience item that sets many parameters within the Orion controller. Selecting and engaging a config file saves time that would otherwise be spent navigating to and entering the various parameters.

PowerBoost includes 3 pre-made configuration files.
The image below shows the list of configuration files as seen in the Orion graphical user interface.
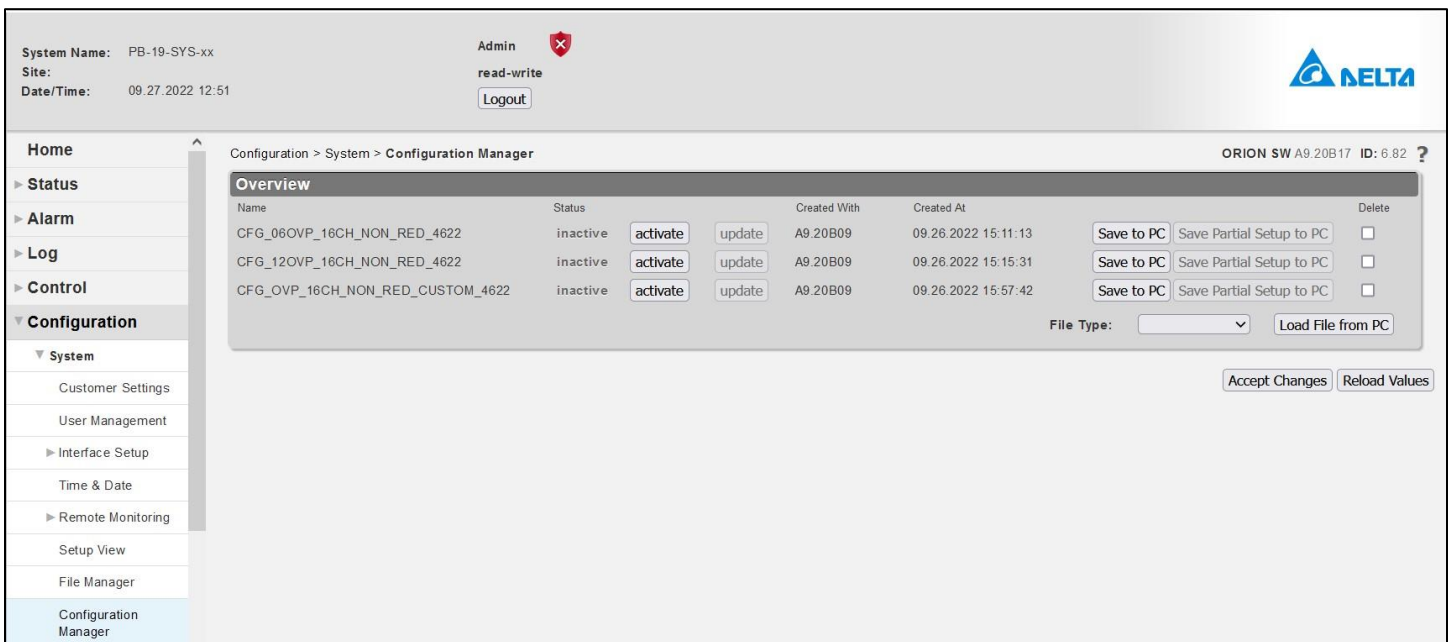
Summary information is given here. Any new user-made configuration can be saved as a config file for future re-use. Further detail is included later in this section. Of the three pre-made config files included with PowerBoost:

- The "CUSTOM" config file is unmapped; the user enters channel mapping information (101, 102, etc.) and enables the desired channels. Many users prefer to use the CUSTOM file and enter their own mapping because the effort is low, and the setup process is consistent every time.
- The other two files are pre-mapped to address common system constructions, and the user only needs to enable channels that are used:
    - CFG_06OVP… represents two OVPs daisy-chained; a 6 OVP is connected to PowerBoost channels 1-6, followed by a 12 OVP connected to PowerBoost channels 7-onward.
    - CFG_12OVP… represents two OVPs daisy-chained; a 12 OVP is connected to PowerBoost channels 1-12, followed by a 6 OVP (or 12 OVP) connected to PowerBoost channels 13-onward.

For each configuration file, a basic diagram and notes are provided:

CFG_OVP_16CH_NON_RED_CUSTOM_4622

This configuration file is constructed with placeholders for the channel map numbers, and none of the channels are enabled. After activating this configuration file:
- The desired channel mapping entries are made.
- The mapped channels must be enabled and config file re-synchronized.

Many users prefer to use the CUSTOM file and enter their own mapping because the effort is low, and the setup process is consistent every time.
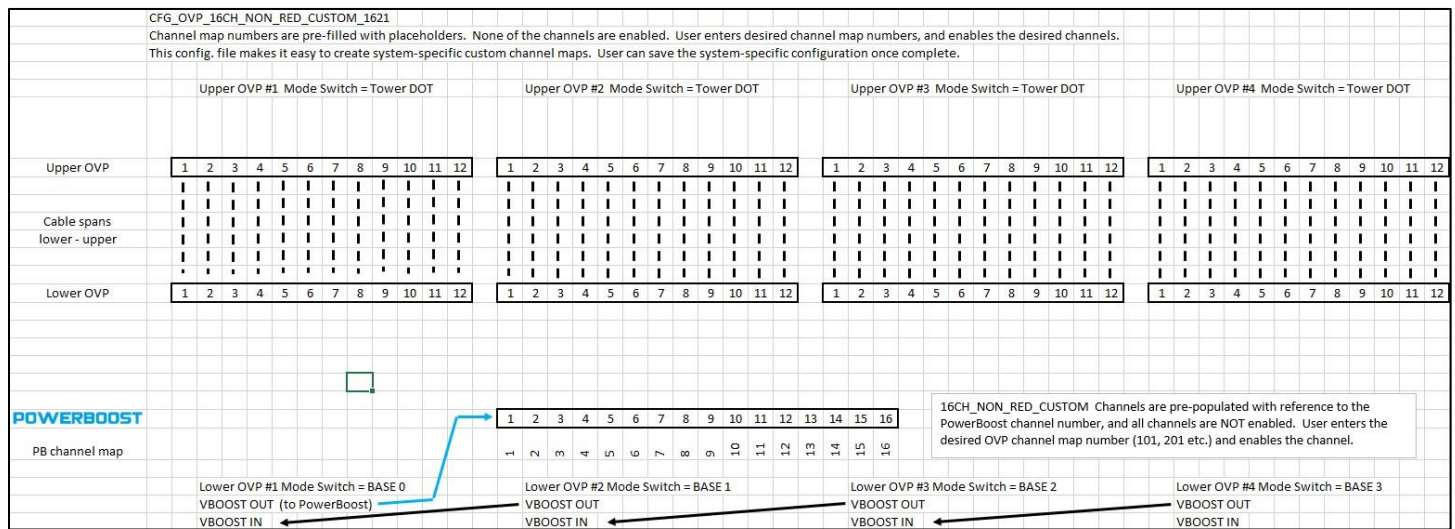
Image below shows the hybrid channel menu for config file "CUSTOM."
Channel mapping entries (101, 102, etc.) must be entered in the "Name" column.

Continued on the next page…

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The example below shows the CUSTOM file configured such that:

- PB CH1 is mapped to OVP 101 (i.e., first OVP set, lower OVP BASE0, CH1).
- PB CH2 is mapped to OVP 102 (i.e., first OVP set, lower OVP BASE0, CH2).
- PB CH3 is mapped to OVP 203 (i.e., second OVP set, lower OVP BASE1, CH3)
  (i.e., skipped OVP ch 1&2).
- PB CH4 is mapped to OVP 204 (i.e., second OVP set, lower OVP BASE1, CH4).
- PB CH7 is mapped to OVP 301 (i.e., third OVP set, lower OVP BASE2, CH1)
  (i.e., skipped PB ch 5&6).
- PB CH8 is mapped to OVP 302 (i.e., third OVP set, lower OVP BASE2, CH2).

When finished making the "Name" and "Enable" entries, click **Accept Changes** at the bottom.

Side note:

The hybrid channel menu (menu path: **Configuration, Hybrid Channel**) contains a "Notes" field for each channel, visible in the image above at right side. This field allows the user to enter note information as desired for each channel, up to 64 characters.

Important! After clicking **Accept changes**, the config file must be synchronized.

(Return to the menu **Configuration, System, Configuration Manager**, and click the **Update** button to synchronize the config file.)

Side note:

Using the system diagram template 17186-01 mentioned on of this document, a diagram was created to visually show the wiring connections described in the example on the previous page:
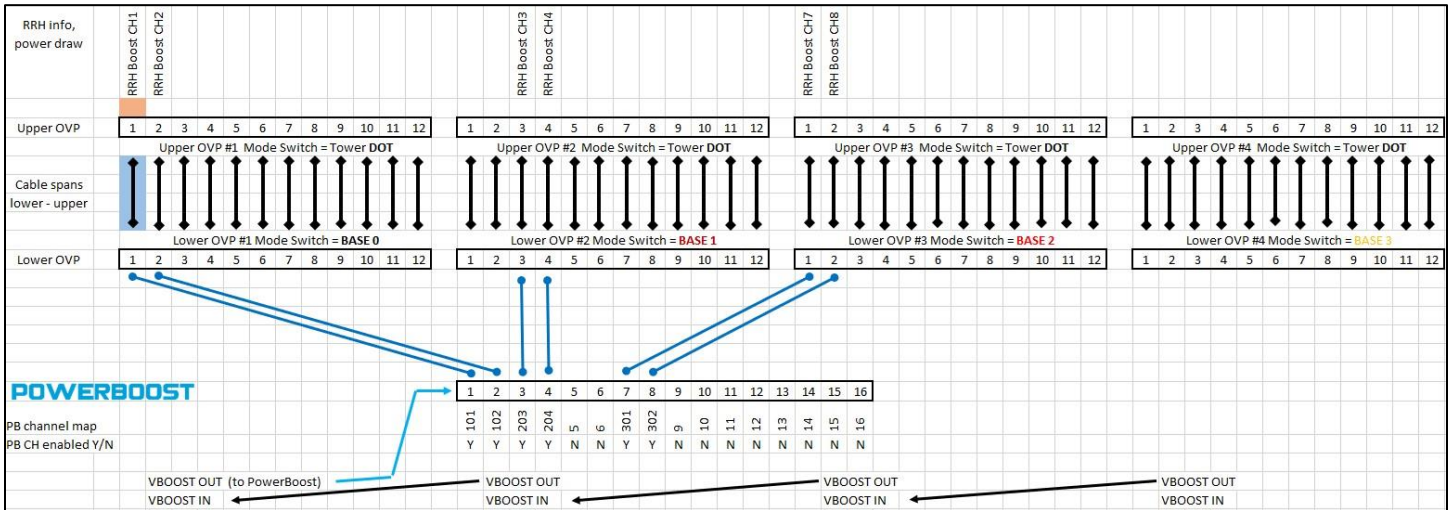
Important- When using the CUSTOM config file-

- Only enable the channels that will be used; leave the unused channels NOT enabled.
- For the given system design, if a boost brick has an unused channel, the unused channel must be assigned a valid mapping number (101, 102 etc.) but leave the channel not enabled. Typically, the mapping number for the landed OVP channel should be entered. If the channel is not landed, enter an unused but valid OVP mapping number.

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CFG_06OVP_16CH_NON_RED_4622

This configuration file supports a set of OVP6 connected to boost channels 1-6, and a set of OVP12 connected to boost channels 7-16. The channels are pre-mapped as shown below, but none of the channels are enabled. Note that this file can also be used for a single 6 OVP.

After activating this configuration file, the desired channels must be enabled, then re-synchronize the file. (See the information in Section 8.2.1 to enable the desired channels and synchronize the file. Skip the information about channel mapping because the channels in this file have been pre-mapped.)
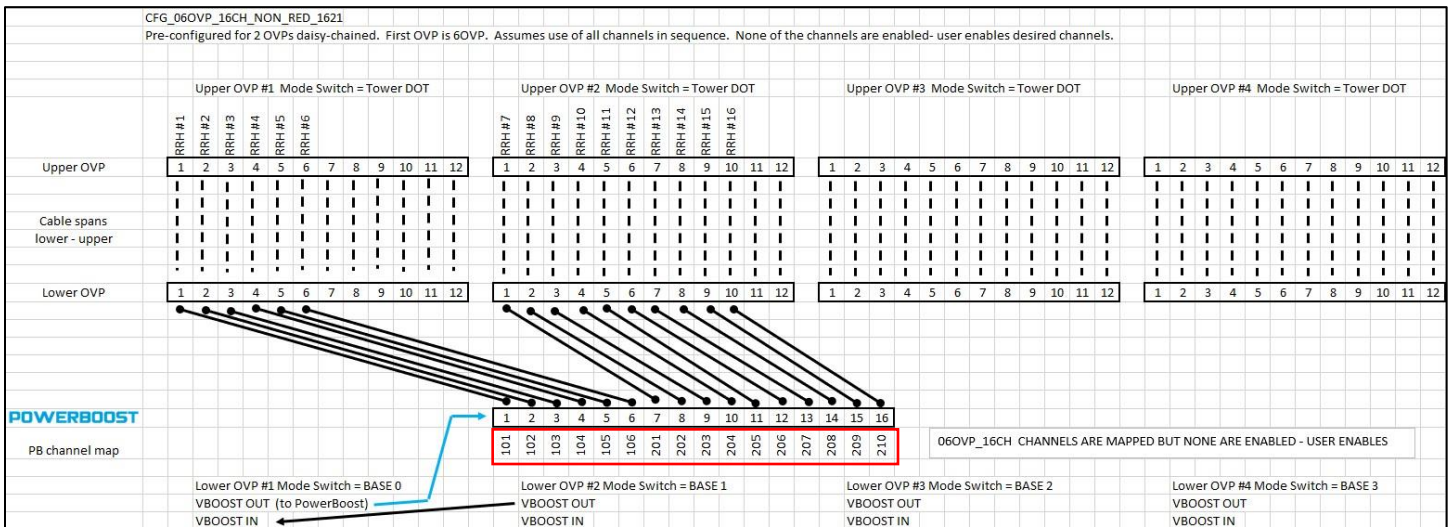
Continued on the next page…

The image below shows the hybrid channel menu for config file 06OVP.
Note that the entries in the "PB channel map" line match those in the "Name" column.

Continued on the next page…

CFG_12OVP_16CH_NON_RED_4622

This configuration file supports a set of OVP12 connected to boost channels 1-12, and a set of OVP6 connected to boost channels 13-16. The channels are pre-mapped as shown below, but none of the channels are enabled. Note that this file can also be used for a single 12 OVP.

After activating this configuration file, the desired channels must be enabled, then re-synchronize the file. (See the information in Section 8.2.1 to enable the desired channels and synchronize the file. Skip the information about channel mapping because the channels in this file have been pre-mapped.)

CFG_12OVP_16CH_NON_RED_1621
Pre-configured for 2 OVPs daisy-chained. First OVP is 12OVP. Assumes use of all channels in sequence. None of the channels are enabled- user enables desired channels.

	Upper OVP #1 Mode Switch = Tower DOT	Upper OVP #2 Mode Switch = Tower DOT	Upper OVP #3 Mode Switch = Tower DOT	Upper OVP #4 Mode Switch = Tower DOT
Upper OVP	RRH #1–#12 (1–12)	RRH #13–#16 (1–12)	1–12	1–12
Cable spans lower - upper				
Lower OVP	1–12	1–12	1–12	1–12

POWERBOOST
PB channel map: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
101 102 103 104 105 106 107 108 109 110 111 112 201 202 203 204
12OVP_16CH CHANNELS ARE MAPPED BUT NONE ARE ENABLED - USER ENABLES

Lower OVP #1 Mode Switch = BASE 0 — VBOOST OUT (to PowerBoost) — VBOOST IN
Lower OVP #2 Mode Switch = BASE 1 — VBOOST OUT — VBOOST IN
Lower OVP #3 Mode Switch = BASE 2 — VBOOST OUT — VBOOST IN
Lower OVP #4 Mode Switch = BASE 3 — VBOOST OUT — VBOOST IN

Continued on the next page…

The image below shows the hybrid channel menu for config file 12 OVP.
Note that the entries in the "PB channel map" line match those in the "Name" column.

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Appendix F: Converter status LEDs

LED	LED behavior	Description
OK COM LD STA	OK LED is solid green	• The converter is operating normally **Action** • N/A
OK COM LD STA	OK LED is solid red	• The converter is not operating due to input being out of the operating range (under-voltage or over-voltage) • The converter is not operating due to over-temperature protection (OTP) • The converter is not operating due to a fan failure • The converter is not operating due to a DC overvoltage protection (OVP) • The converter is not operating due to improper installation **Action** • View converter status on controller • Reseat converter • Test status of converter by inserting converter into different slot • Replace converter
OK COM LD STA	OK LED is off	• The converter is not working due to a loss of input power • The converter is not working due to a converter failure **Action** • View converter status on controller • Reseat converter • Test status of converter by inserting converter into different slot • Replace converter
OK COM LD STA	COM LED is solid green	• The converter is communicating with the controller (if applicable) **Action** • N/A

LED	LED behavior	Description
OK COM LD STA	COM LED is off	• The converter is not communicating with the controller (if applicable) **Action** • View converter status on controller • Reseat converter • Test status of converter by inserting converter into different slot • Replace converter
OK COM LD STA	LD LED is solid yellow	• The converter is operating at less than 5 percent load **Action** • N/A
OK COM LD STA	LD LED is blinking yellow	• The converter is operating in current limit mode • The DC output of the converter is short circuited **Action** • View converter status on controller • Reseat converter • Test status of converter by inserting converter into different slot • Replace converter
OK COM LD STA	STA LED is solid red	• The converter is shut down permanently (latched protection) due to an over-temperature or a DC over-voltage condition **Action** • [1] Note: The presence of the red "STA" LED on boost converter is almost always an indication of incorrect system wiring or configuration: ○ Crossed channel wiring connections between PowerBoost outputs and lower Raycap ○ Crossed channel wiring connections between the upper and lower Raycaps ○ Incorrect mapping of Raycap channels in the Orion controller Hybrid Channel menu. ○ Thoroughly check channel mapping and system wiring; turn on one OMM breaker at a time, verify that the expected channel energizes on both lower and upper Raycap.

LED	LED behavior	Description
		• [2] Re-seat converter. (Turn associated OMM breakers OFF. Once a boost converter displays the red STA LED, it must be pulled out for a few seconds then re-inserted to re-set the red STA LED. Then turn on associated OMM breakers.) • Replace converter (Note: The presence of the red STA LED is rarely an indication of defective boost converter).

Continued on the next page…

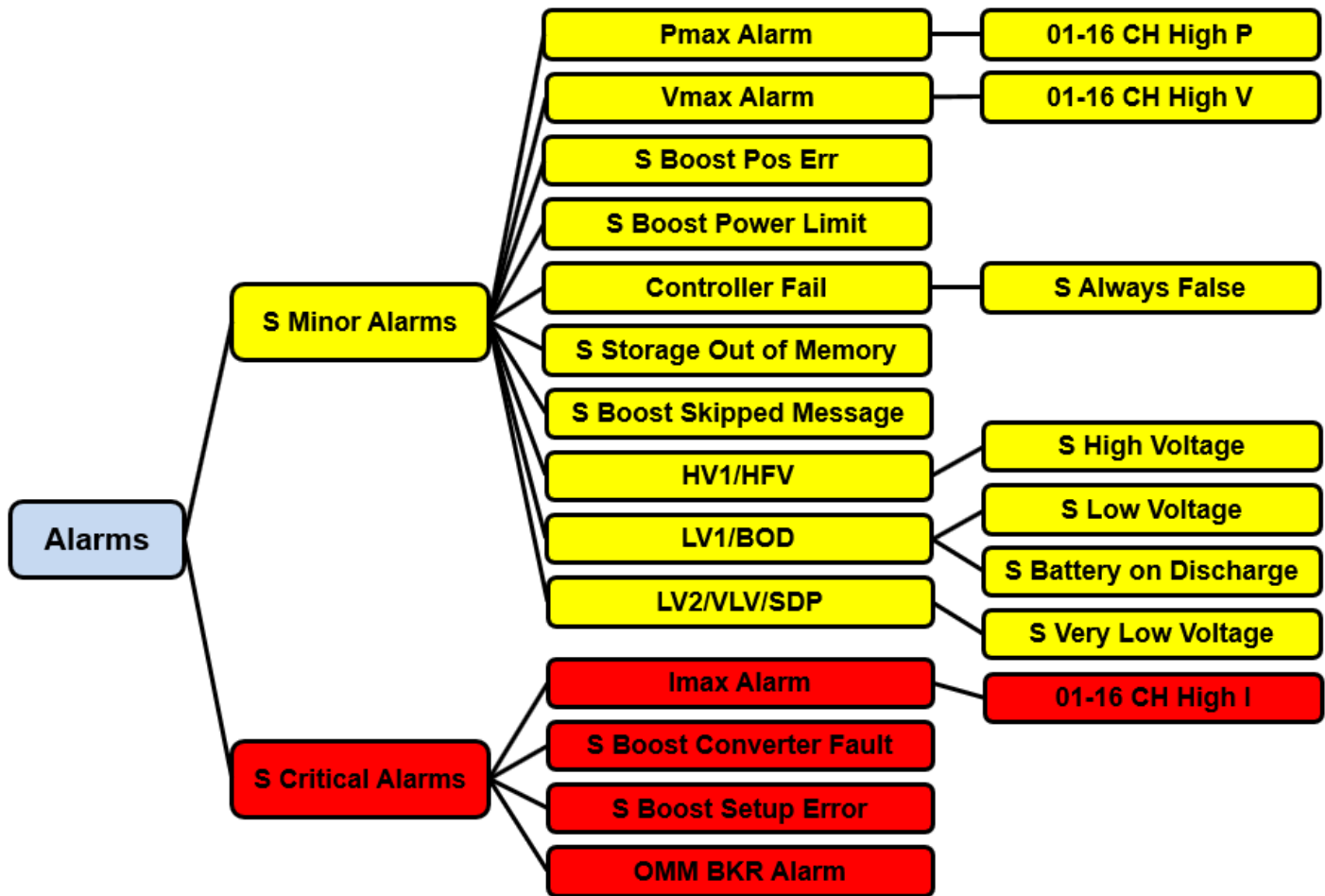# Appendix G: Alarm information

The Orion controller provides output alarm relays (see table below), local LCD display, and web access to alarm statuses. Alarms can be found on the controller display at **Main Menu > Alarm > Alarm List**.

- From the home screen, press the **Enter** button to enter the **Main Menu.**
- Highlight the **Alarm** menu and press **Enter.**
- Highlight the **Alarm List** menu and press **Enter.**

PowerBoost alarm matrix:

Alarm name	Critical	Minor	Alarm Description
Relay output:	O/P#1	O/P#2	
HV1/HFV		x	sys high voltage
LV1/BOD		x	sys low voltage or sys battery on discharge
LV2/VLV/SDP		x	sys very low voltage
S BOOST CONVERTOR FAULT	x		Event indicating that at least one of the configured boost converters is not running
S BOOST SETUP ERROR	x		The controller is not able to send a correct configuration to the convertor
OMM BKR Alarm	x		Results when a 50A breaker is tripped
CONTROLLER FAIL		x	This is the result of a failed controller
STORAGE OUT OF MEMORY		x	This is the result of not clearing device history
S BOOST SKIPPED MESSAGE		x	Event received by the JMA Modbus protocol. Indicates that there is an issue with OVP telemetry communication.
Imax ALARM	x		Over current threshold alarm above 33A
Pmax ALARM		x	Overpower threshold alarm above 2200W
Vmax ALARM		x	Over voltage threshold alarm above 70V
S BOOST POS ERR		x	A positioning error occurred
S BOOST POWER LIMIT		x	Event indicating that at least one of the configured boost convertors is in power limit
S HIGH VOLTAGE			sys output voltage above 55.50 +/- 0.5
S LOW VOLTAGE			sys output voltage below 53 +/- 0.5

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Alarm name	Critical	Minor	Alarm Description
S BATTERY ON DISCHARGE			sys battery on discharge below 53 +/- 0.5
S VERY LOW VOLTAGE			sys output voltage below 46 +/- 0.5

Alarm details:

Converter fail

Converter fail alarms are due to the failure of one or more converters.

1. Identify the failed converter(s). See the Converter status LEDs table (Appendix F) for information on the converter LED status indicators.
2. Remove and reinsert the converter per the instructions in Section 6.4.
3. If the converter continues to shut down, replace the faulty converter.

LV1/BOD

PB input low voltage (below 48 +/- 0.5) /system battery on discharge alarm (PB input voltage below 48 +/- 0.5) (i.e., the DC plant voltage is low). Increase in voltage clears the alarm.

LV2/VLV/SDP

PB input very low voltage alarm (below 46V +/-0.5) (i.e., the DC plant voltage is low). Increase in voltage clears the alarm.

HV1/HFV/HVSD

This alarm is the result of an input voltage being above the high voltage set point (58.50 +/-0.5). Check the DC plant voltage.

"SBoost" Convertor Fault error

Event indicating that at least one of the configured boost converters is not running.

This error message can result in rare situations where operational channels are taken out of service and one or more boost modules are removed. To reset this, follow the steps below.
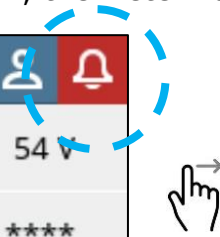
In the example below, the configuration file for 06OVP_16CH is active.

On withdrawal of brick 1, the Orion touchscreen will display a red "alarm" icon in upper right. In the example image below, the Meter Panel screen is shown indicating alarm(s).


Swipe right to reach the Alarm screen. See image below.

Note in this example, a minor alarm has also resulted because withdrawal of the boost brick has de-powered the Raycap OVP. Telemetry has ceased and so the S BOOST SKIPPED alarm is also active. For the purpose of this example, the focus will remain on the boost brick.

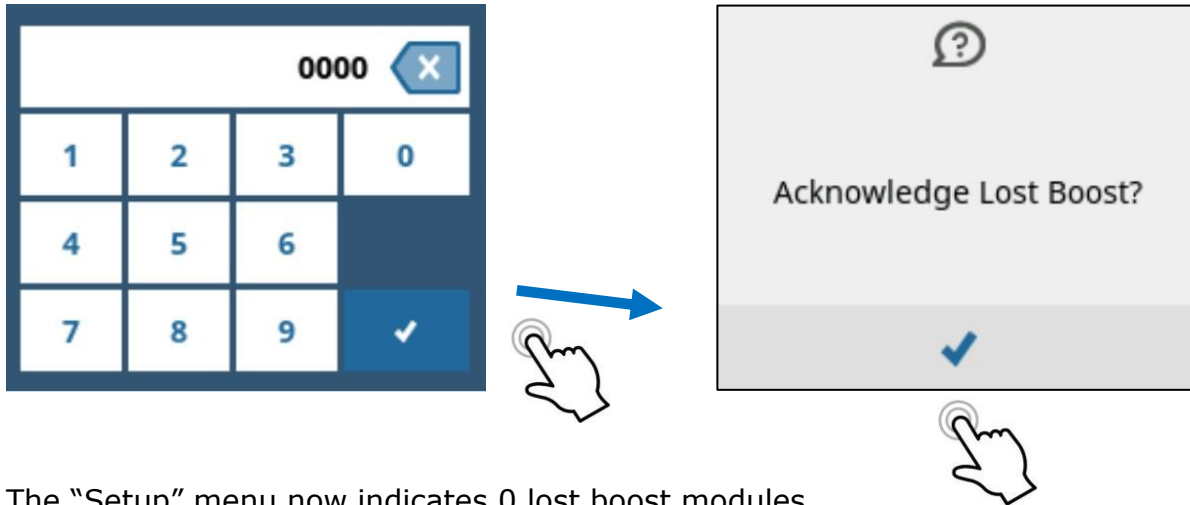Touch on **Boost**. Then within the Boost menu, touch on **Setup.**
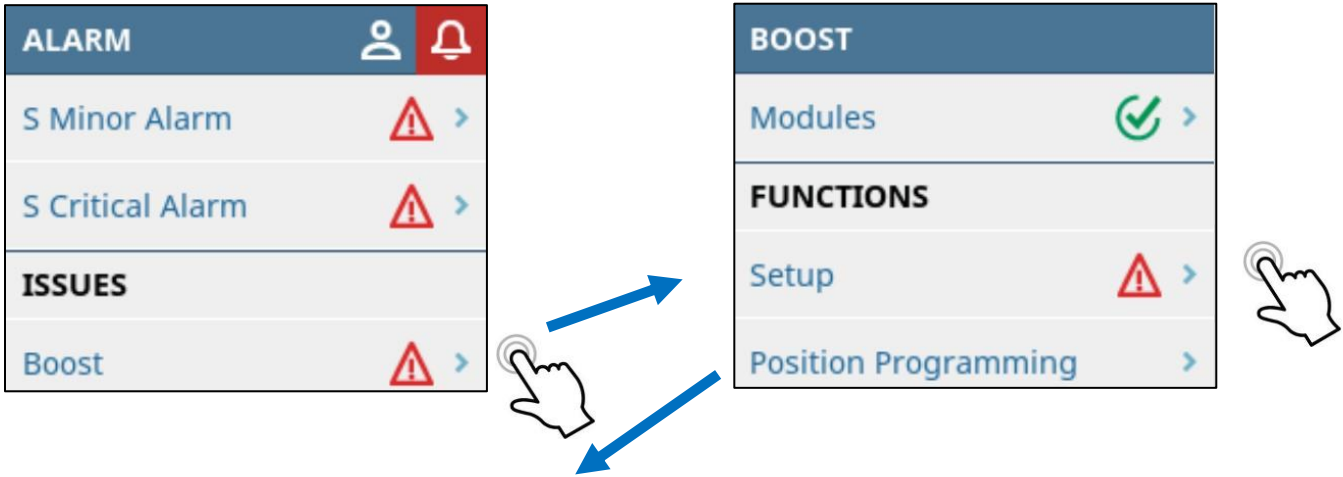
Within the "Setup" menu, scroll down (swipe up) to find "Lost."

Note in the image below at right, the system indicates 1 lost boost module.

Touch **Lost**.

If the touchscreen requests a password, enter 0000, then touch **checkmark** at lower right.

Then touch **checkmark** at bottom center to "Acknowledge Lost Boost."

The "Setup" menu now indicates 0 lost boost modules.

OK	0
Fault	0
New	0
Lost	0

S Boost Setup Err

The controller is not able to send a correct configuration to the convertor. This alarm is triggered if you plug in a boost convertor that does not match the profile. Plug in the correct boost convertor (PB-PSU-162) to clear the alarm.

OMM BKR Alarm

When any of the Output management module 50A breakers trips, system will generate this alarm. Reset the breaker that was tripped to clear the alarm. There might be subsequent channel errors to investigate which channel triggered the alarm.

Imax Alarm

This alarm is raised when there is a current draw above 33A per channel. When operating under parallel or redundant mode, the alarm is raised when the current draw is above 66A per boost brick. Reduce the current to clear the alarm.

Pmax Alarm

This alarm is raised when there is power output over 2200W per channel. When operating under parallel or redundant mode, the alarm is raised when the power output is above 4400W per boost brick. Reduce the power load to clear the alarm.

Vmax Alarm

This alarm is raised when the output voltage is above 70V per module. Reduce the voltage to clear the alarm.

S Boost Pos Error

A positioning error occurred. If the configuration file uses less number of channels and an additional module is plugged in without updating the configuration, the system will flag this alarm. To reset the alarm, select the correct configuration file and reset the Orion controller by withdrawing it for a few seconds, then re-insterting.

S Boost Power Limit

Event indicating that at least one of the configured boost convertors is in power limit.

Orion controller fail (failure message or blank screen)

This is the result of a failed controller.

1. Remove the controller according to the steps in Section 6.4.
2. Reinsert the controller.
3. If the controller is still faulty, replace the controller.

Storage out of memory

Currently the device logs 10000 events per file up to 90 different files. If the device history is not cleared, the system will generate this alarm.

S Boost Skipped Message

- Indicates that there is an issue with the Raycap OVP telemetry (RS485) data reaching (or not reaching) the PB "VBOOST IN" port.
- PB-COM LED steady red indicates a fault or error in the message from the Raycap OVP or a bad connection to communication board.

- Possible causes include issue with connection between the Raycap OVP and PowerBoost "VBOOST IN", or issue with telemetry connection between the upper and lower Raycap.
  - o Check the RS485 cable on Raycap and to the PB-COM.
  - o Check telemetry wiring connection between Raycap base and the top.
  - o Reset PB-COM or power cycle the Orion controller.
  - o Check the lower Raycap: Is it correctly reporting the upper Raycap Voltages?
- PB-COM LED green flashing at approximate one second interval indicates that it is receiving valid data from Raycap OVP telemetry.

Appendix H: Manual / Mixed regulation mode

Note: The information in this section covers the use of PowerBoost (PB) in manual regulation mode. This information does not replace other information in this document. With the exception of Section 7.4.1, it is still necessary to follow the steps outlined from the beginning of the guide, up to and including Section 8.1. It is necessary to have information regarding the conductor length and AWG for each channel to properly configure PowerBoost for operation in manual regulation mode. It is recommended to familiarize with the information by reading the entire section through once, then commence with making configuration changes.

First step: Make sure that PowerBoost unit is installed per installation instructions earlier in this document.

Aspects of manual regulation mode:

- Does not use OVP telemetry (voltage data from upper OVP).
- Accordingly, PB does not monitor voltage at RRH.
- Does not produce alarms if OVP telemetry wires are disconnected.
- User enters wire AWG and distance (increments of 25 ft), from which PB derives an internal equivalent loop resistance value. PB uses internal current flow measurement for each channel and calculates a boost change to keep the load at ~constant V setpoint.
- Mixed: PowerBoost supports using all channels in manual mode or all channels in automatic (OVP telemetry) mode or a mixture of the two. Both channels on a given boost brick must be in same mode, i.e., ch 1&2, ch 3&4. etc.)
- Caution: If user enters incorrect settings, it is possible to experience high or low voltage at the load (RRH).

To configure for manual regulation mode via the Orion touchscreen

Note: When using the Orion touchscreen, if a password is requested, the default password is 0000, then touch the blue checkmark at lower right.

Note: If a different configuration file is loaded <u>after</u> making the changes described below, the newly loaded configuration file re-sets the changes. (Recommend do not load a new configuration file after implementing these changes, or re-load the saved variant of the CUSTOM config file mentioned later.)

Make only the indicated menu changes; do not make changes unless instructed to do so.

These instructions cover how to:

- Establish baseline settings (accomplished by simply loading the existing CUSTOM file).

- Enter channel parameters for cable length and AWG.
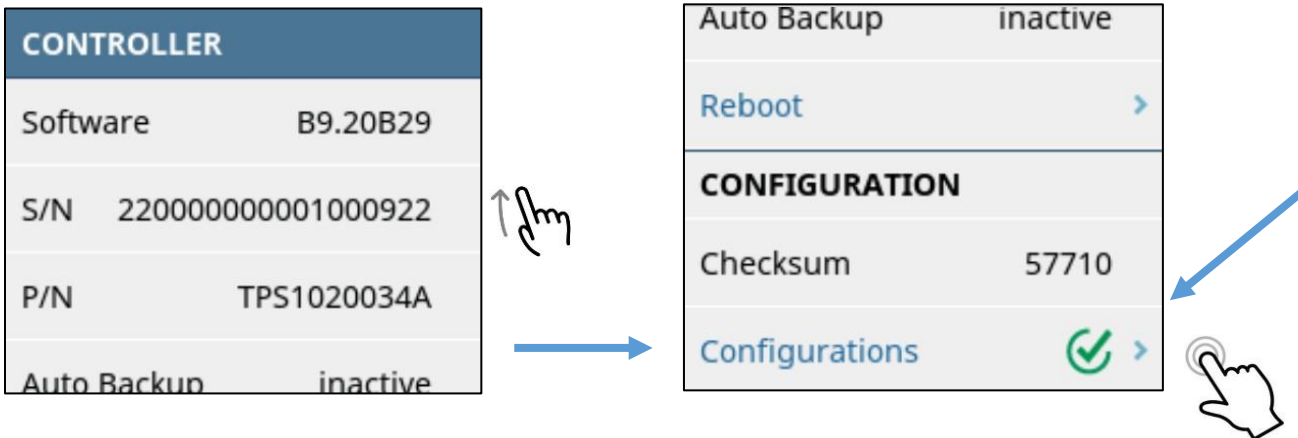- Place the system into "Manual Regulation" mode.

To de-activate the existing config file and activate the "CUSTOM" config file:

Default main menu on the touchscreen is Meter Panel. Swipe right 2X to reach the main MENU screen.

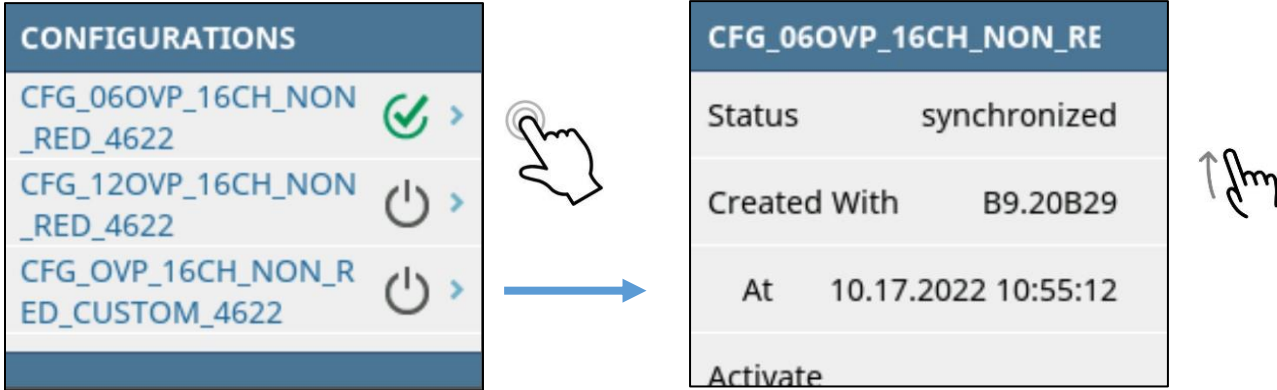Touch the **Controller** icon.
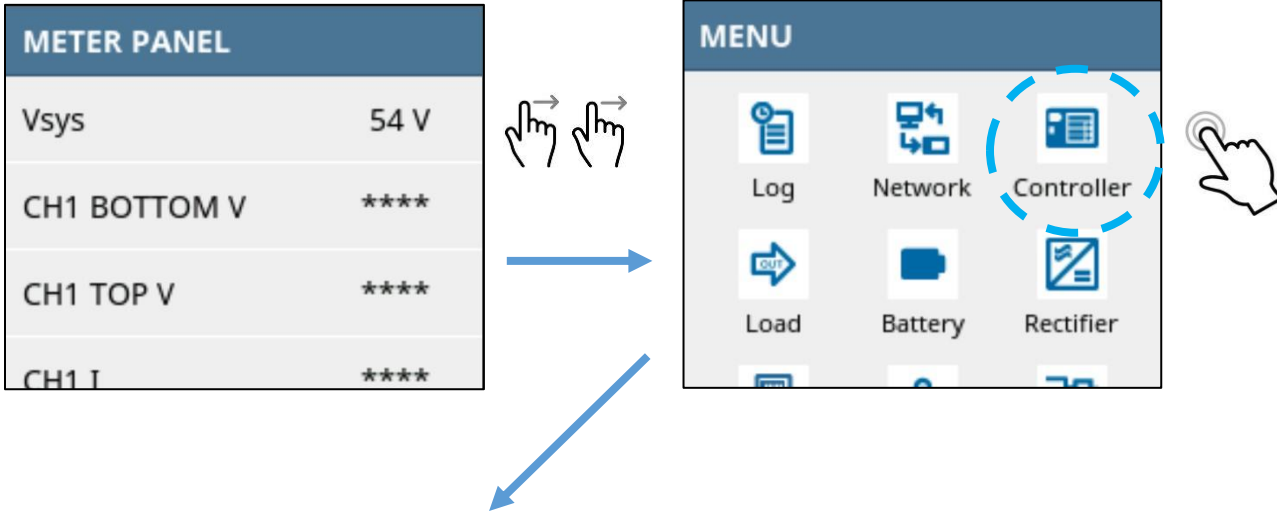
Within "Controller" menu, scroll down (swipe up) and touch **Configurations.**

The image below shows the Configurations menu. To see more line items in the list, scroll down. In this example, the first config file "CFG_06OVP_16CH_NON_RED_4622" is active.

Touch the active config file to open it. Once in the config file, scroll down and touch **Deactivate**.

Touch the **checkmark** to confirm.
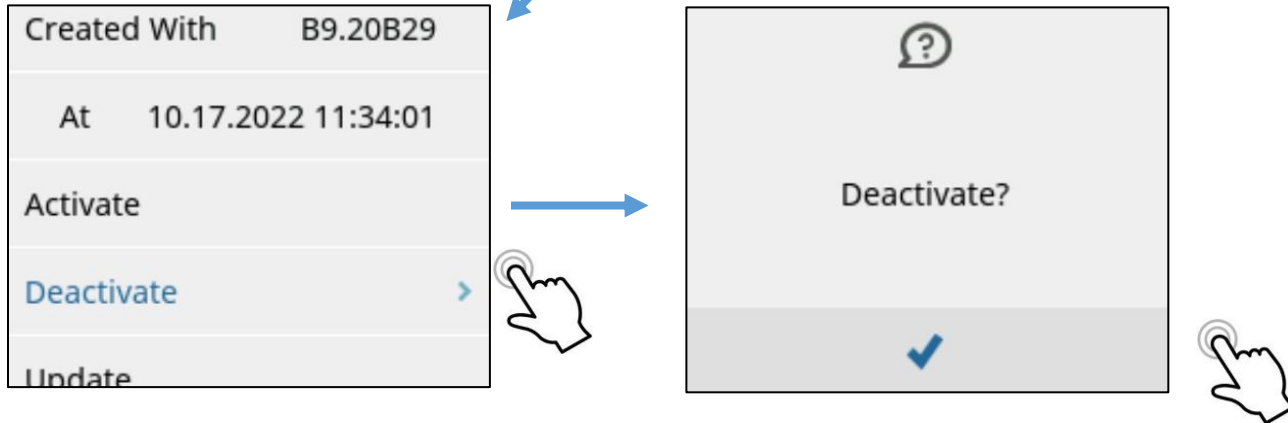
The touchscreen indicates that the config file is deactivated. Swipe right to exit this config file, back to the list of config files.
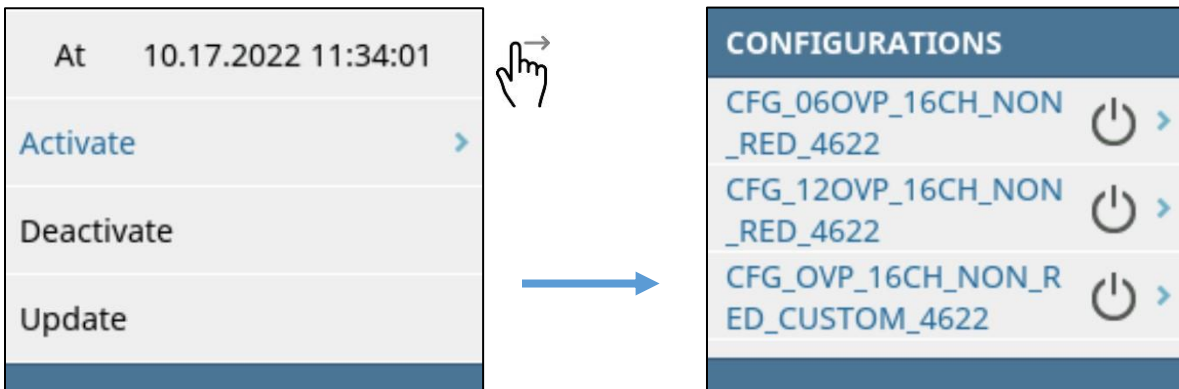
Next, activate the CUSTOM config file. Locate the CUSTOM config file (scroll up/down as appropriate) "CFG_OVP_16CH_NON_RED_CUSTOM_4622."

Touch the CUSTOM config file to select it. Then touch **Activate.**
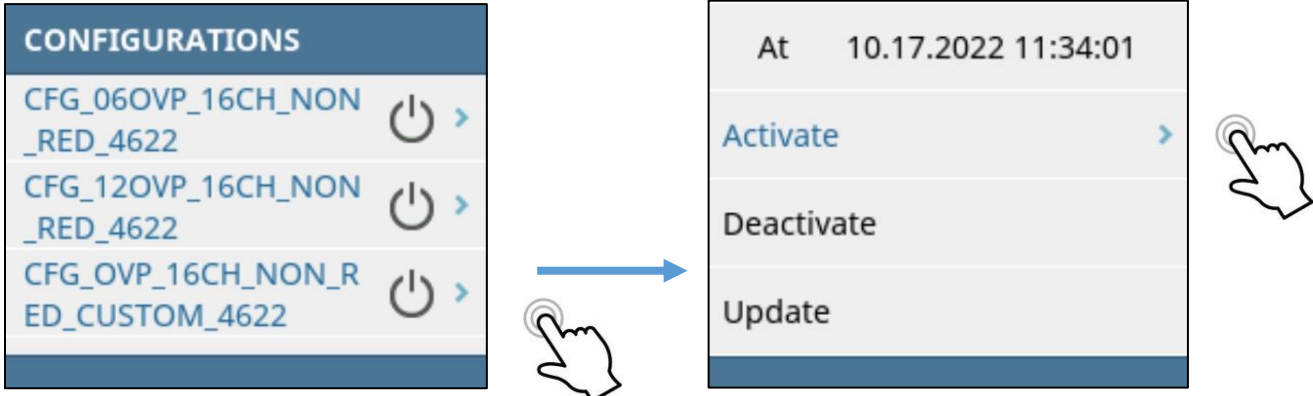
Touch the **checkmark** to confirm.
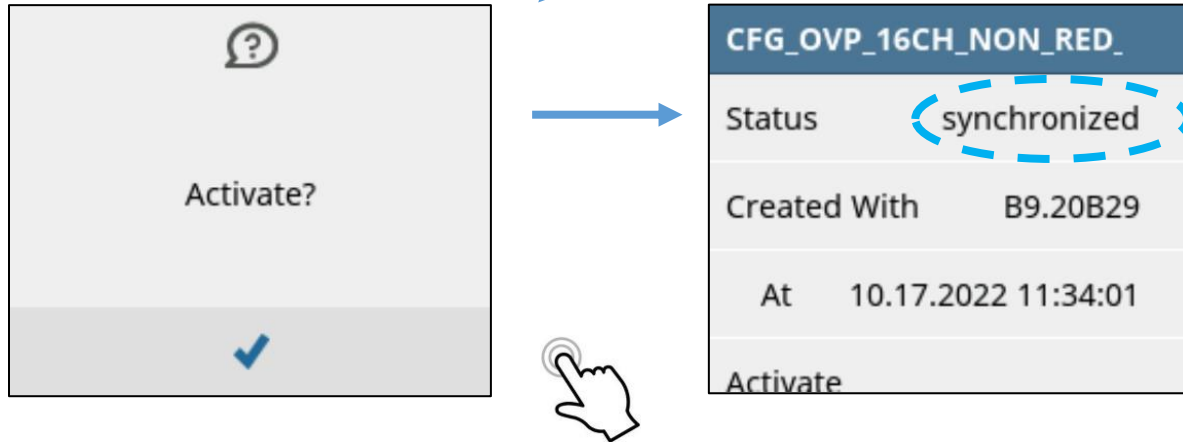
Note: In some cases, if ancillary alarms are present, one or more alarm screens may display before the config file "synchronized" screen appears. Once the alarm screens are acknowledged (touch **X**), the config file screen will display.

Note: The purpose of loading the CUSTOM config file is merely a shortcut for a future step; this initializes all 16 boost channels to known initial conditions. In the steps that follow, desired boost channels will be configured and placed in manual mode. (Boost channels in manual mode do not use voltage information from the OVP network.)

Note: If a different configuration file is loaded <u>after</u> making the changes described below, the newly loaded configuration file re-sets the changes. (Recommend do not load a new configuration file after implementing these changes, or re-load the saved variant of the CUSTOM config file mentioned later.)

Next, for each channel that will be used, configure its manual regulation parameters:

Swipe right through screens as needed to return to the main MENU page. On the MENU page, scroll down to find the tile for "Hybrid Ch."

Touch **Hybrid Ch**
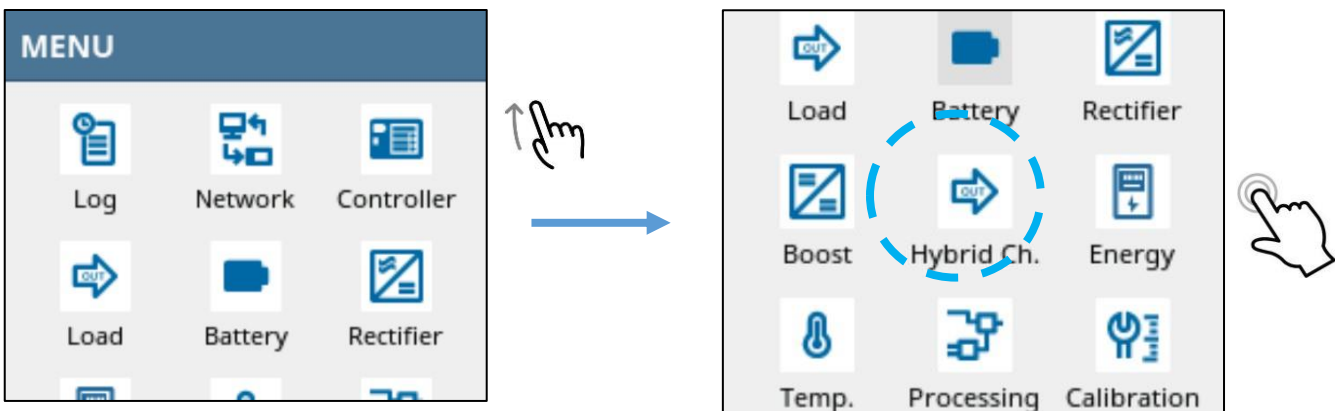
Note: When using the touchscreen, if prompted for a password, enter 0000 then touch the blue checkmark at lower right.

This enters the top of the HYBRID CHANNEL menu. The Orion touchscreen will show rows for channels 1, 2, 3.

Note: We could swipe up to scroll down, revealing channels 4 – onward. For this example, we will explore the menu items within CH1. Other channels are the same.

Touch on the line showing "1" to enter the hybrid channel configuration menu for channel 1.
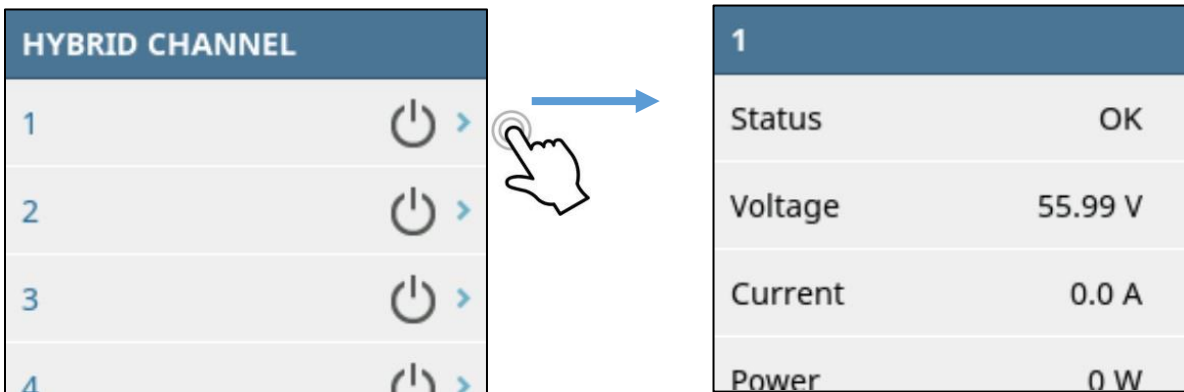
Once in the parameters for channel 1, scroll down (swipe up) within the menu.

Text below covers the various parameters in the Hybrid Channel menu:

- **Def. Supply Volt:** This is the target voltage to be maintained at the load, entered as a positive number. The default entry is 56.00 which results in a load voltage target of -56 V. Recommendation: Leave the default setting unchanged unless instructed to use a different value.
- **Enable:** Touch the slider icon to enable/disable the channel.
- **Man. Regulation:** Touch the slider to toggle manual regulation mode on/off.
  Note: In "manual" mode, Raycap telemetry data for the given channel is not used, and correspondingly the meter panel upper voltage for the channel displays *****. In manual mode, the parameters "Hybrid Length," "Wire AWG," and "Parallel pairs" (along with internally measured channel current) are used to determine boost voltage.
- **Hybrid Length:** Touch the number entry box; a numeric touchpad will appear. Touch the "delete" **X** button in upper right as needed to delete existing numbers. Enter the hybrid cable length. This is the one-way cable length from the boost shelf output to the load (assumes copper). (PB doubles this internally to account for both conductors in the pair.) Enter length in multiples of 25 ft. Recommendation: Enter the closest multiple of 25 ft that is greater than the actual system distance. The entry must be a multiple of 25 within

the range of 0 – 650. (Must be within system design limits. Longer distances may be possible - consult JMA).

- o Touch the blue **checkmark** at lower right to confirm.
- Swipe right to exit the "Hybrid Length" field and return to channel 1 parameters list.

For example, the images below show scrolling down within the hybrid channel and changing the default Hybrid Length to 225 ft, then enabling the channel and placing it into Manual Regulation mode.

Image shows entry of 225 feet
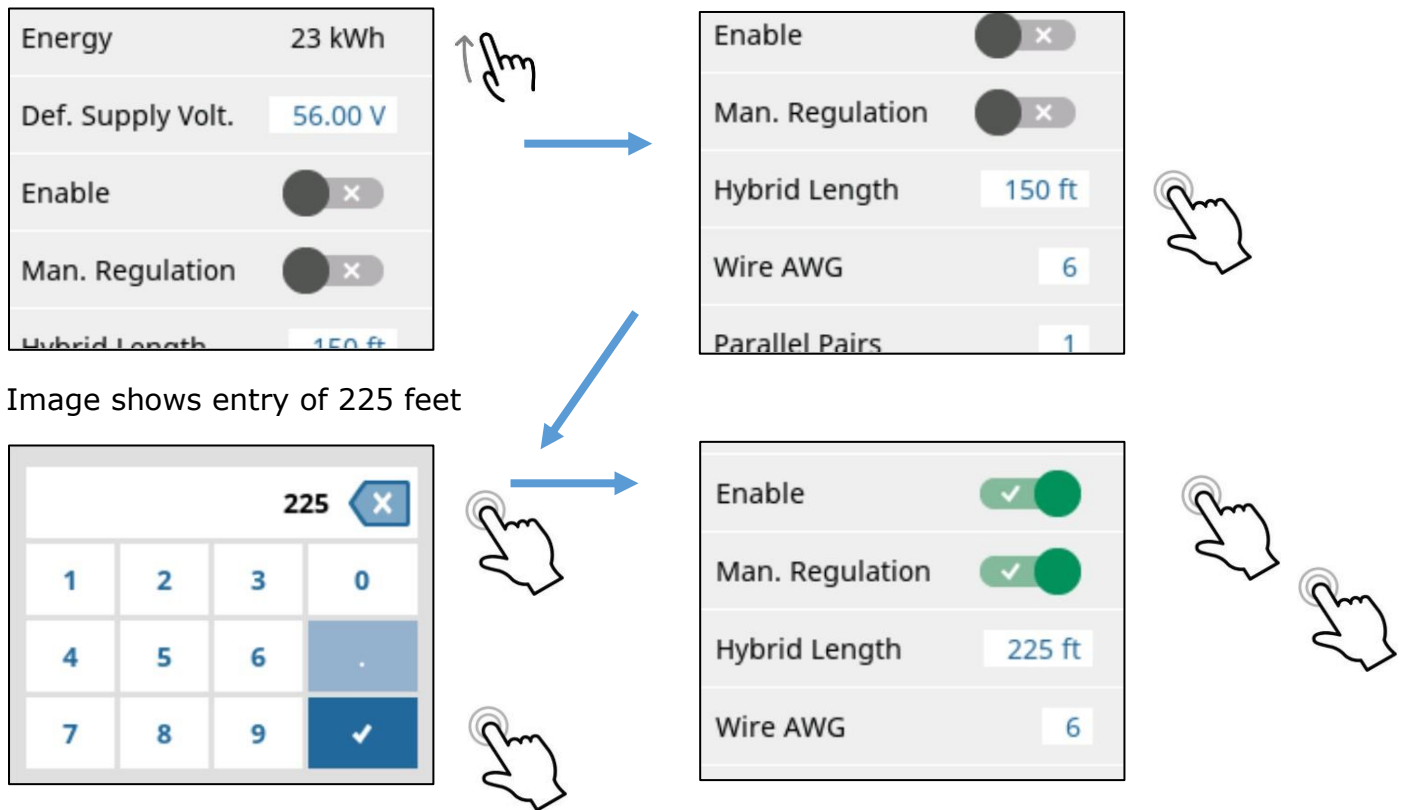
- **Wire AWG:** The default is set to 6 AWG. Change as needed (touch on the number box): enter the appropriate wire AWG that matches the system wiring used (entry must be 2, 3, 4, 6, 8). Touch the **checkmark** at bottom right to confirm.
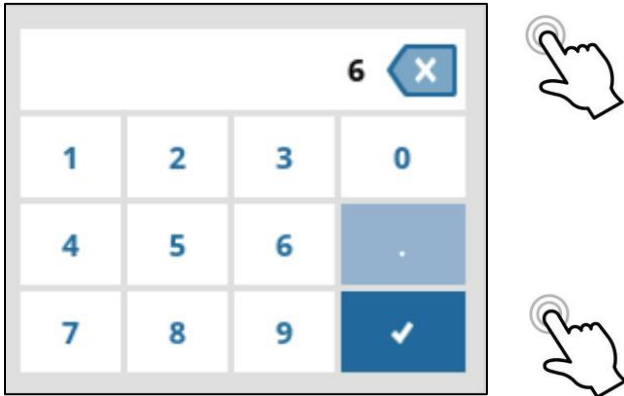
- **Parallel Pairs:** This entry facilitates the automatic calculation of parallel sets of conductors. The default entry is 1. Recommendation: Leave the default setting unchanged unless instructed to use a different value.
- **Max Voltage:** This entry sets the maximum output voltage for the channel at the boost rack, regardless of the target value derived mathematically from the default supply voltage, cable length, wire AWG, and channel current. The default entry is 68.00 (corresponds to output voltage of -68.00). Recommendation: Leave the default setting unchanged unless instructed to use a different value.

See image below. Note that each channel within the HYBRIDE CHANNEL menu displays the resulting total loop resistance derived from the user inputs for Hybrid Length, Wire AWG, and number of Parallel Pairs. This is provided so the user can make a "reality check" to ensure that system settings are correct. Typically, resistance values fall in the range of approximately 0.1 Ω to 0.3 Ω.

Swipe right to exit the channel 1 parameters and return to the HYBRID CHANNEL menu.

Note: The image below shows HYBRID CHANNEL menu with Ch 1-4 visible.
- Only Ch1 is enabled
- Scroll down (swipe up) and click as needed to view channels 5-onward.
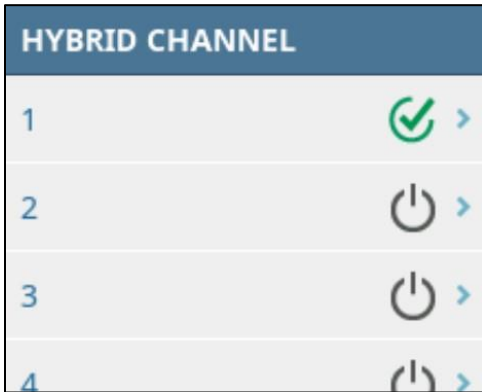
Scroll down as necessary and repeat the process for subsequent channels.

Note: For each channel, the typical operation only involves changing 2 or 3 parameters:

1. Touch **Man. Regulation** to place the channel in manual mode.
2. Enter the cable length.
3. Change the wire AWG if it is different from the default value of 6.
4. Touch the **Enable** line to toggle the channel "ON."

Note: It is not necessary to enable channels in sequence, or to use all of the channels (can skip channels and leave some channels not enabled). Do not enable channels that are not being used.

Continued on the next page…

Lastly, to re-synchronize (update) the configuration file:

Swipe right as needed to return to the MENU screen, then touch the **Controller** icon. Scroll down to "Configurations." Note the orange triangle; Orion is indicating an issue with the configuration file.

Touch **Configurations** to enter the list of config files:
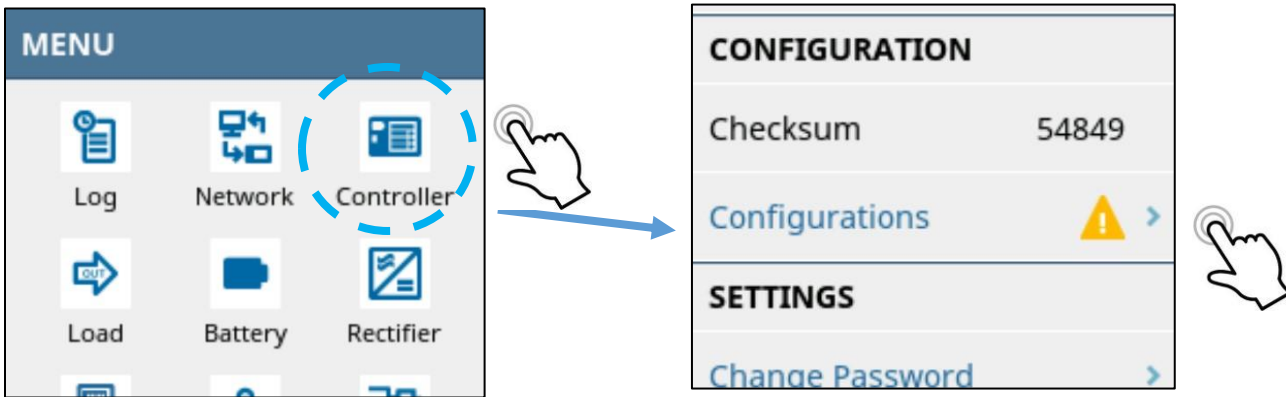
Scroll as necessary to find the active configuration file. It's typically shown at the top of the list for convenience. Similarly, note that the active config file is displaying an orange triangle.

Touch on the CUSTOM config file to enter it. Note that its status indicates "not synchronized."
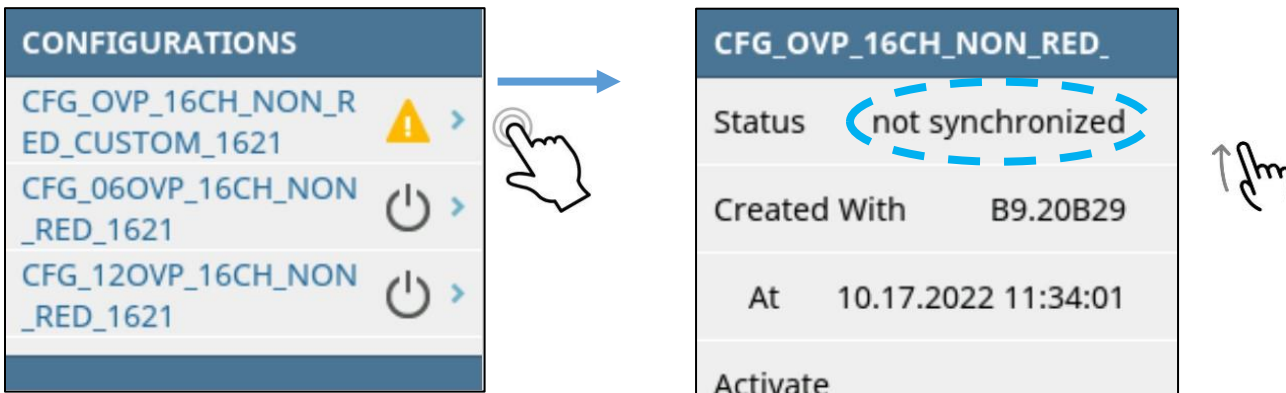
Scroll down within the CUSTOM config file and touch **Update**, then touch the blue **checkmark** to acknowledge. Allow a few seconds for the update process.
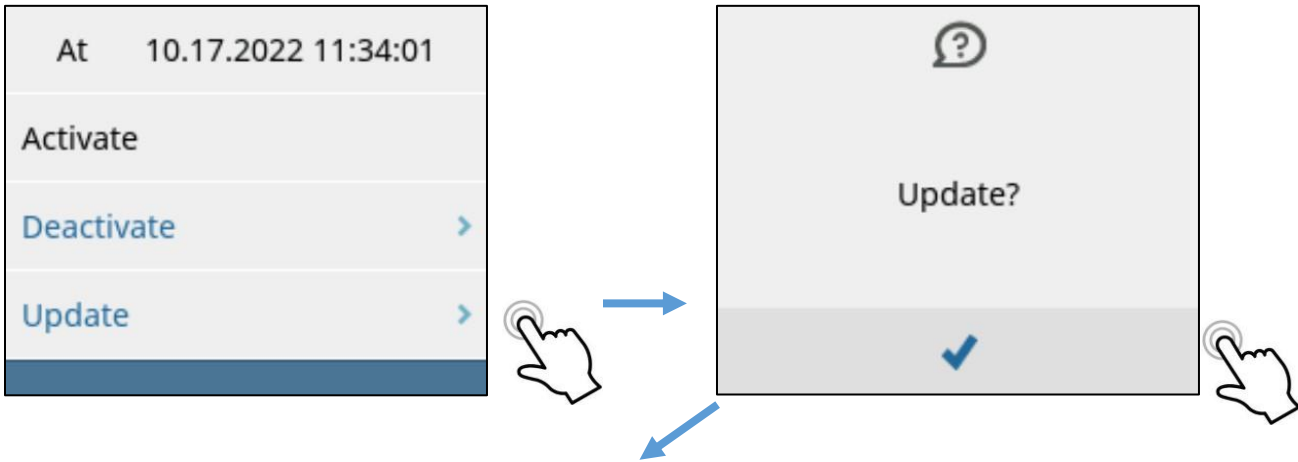
Swipe right to return to the list of configuration files. Note that the CUSTOM file now shows a green checkmark, indicating that it is active and synchronized.

Done.

Optional: Swipe right as needed to return to the MENU screen or Meter Panel, or just leave it alone, and Orion will automatically revert after some time.

Note: The Orion controller will display the hybrid channel alert until boost modules are inserted; this is expected.

Note: It is possible to change units of measurement to metric. This is accomplished via login to the GUI (not via touchscreen). See the metric information on .

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Next, (for initial deployment) verify that all OMM circuit breakers are OFF. Insert boost modules (PB-PSU-162-BB) that correspond to all enabled channels. It is recommended to turn on OMM breakers one at a time, and verify that the expected load (RRH) is powered.

To configure for manual regulation mode via the Ethernet GUI login:

A laptop computer with web browser and ability to connect using its local LAN port is needed for this operation. See Appendix D for instructions to connect laptop local LAN port to the Orion controller.

Note: Further information about manual regulation mode is available in Appendix H. If a configuration file is active, disengage it and load the custom configuration file per the following instructions:

Once connected and logged in to the Orion controller, navigate the menu path.

Main menu: **Configuration, System, Configuration manager**.
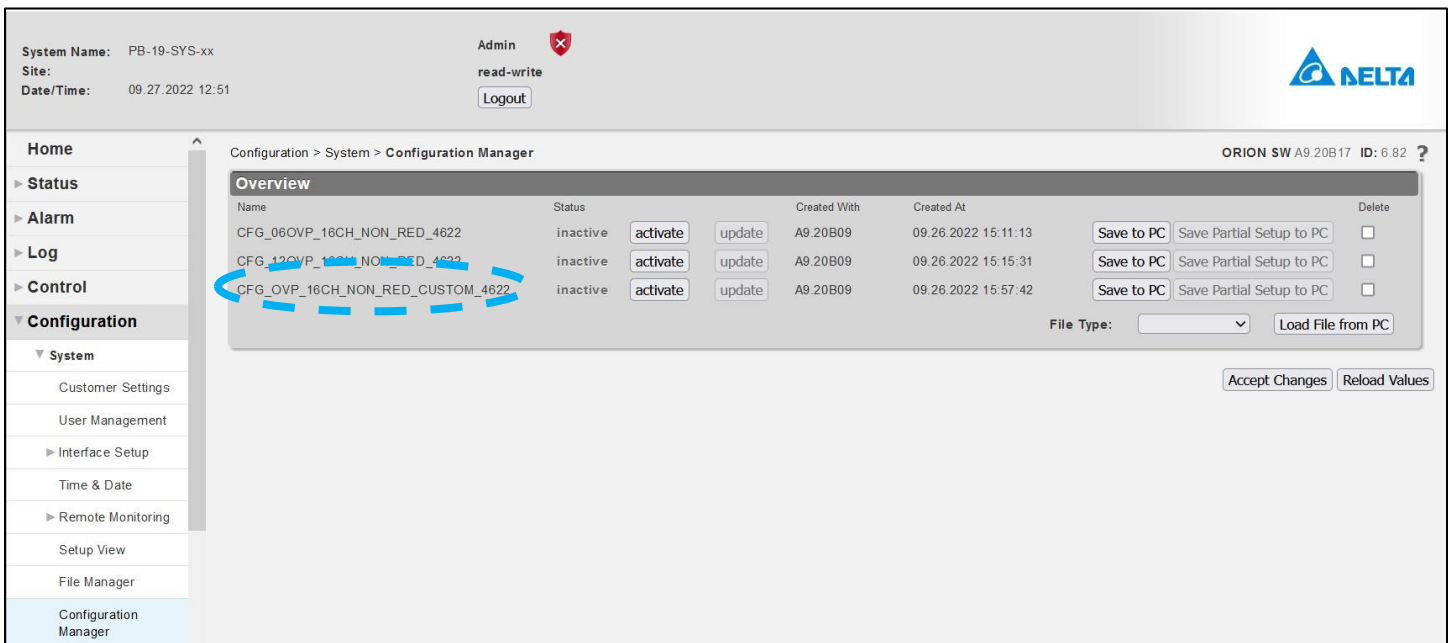
If one of the config files in the list offers a "deactivate" button, click **deactivate** then click **Accept Changes** at lower right.

Next, activate the CUSTOM config file. Typically, the file is at the bottom of the list; see CFG_OVP_16CH_NON_RED_CUSTOM_4622. Click the **Activate** button for that file. At the dialogue box "Are you sure you want to overwrite the active setup?" click **OK**. Allow several

seconds as the file status changes to "Synchronized." Then at the bottom right, click **Accept Changes**.

Note: The purpose of loading the CUSTOM config file is merely a shortcut for a future step; this initializes all 16 boost channels to known initial conditions. In the steps that follow, desired boost channels will be configured and placed in manual mode. (Boost channels in manual mode do not use voltage information from the OVP network).

Note: If a different configuration file is loaded <u>after</u> making the changes described below, the newly loaded configuration file re-sets the changes. (Recommend do not load a new configuration file after implementing these changes, or re-load the saved variant of the CUSTOM config file mentioned later.)

Next, access the list of available channels to configure for manual regulation: **Main menu, Configuration, Hybrid channel.**

Typically, Orion will display the first 10 boost channels. If the need exists to configure and enable any of channels 11 onward, click **All 16** at center bottom to reveal the entire list of available boost channels.

Arrows highlight the fields used for setting up manual regulation.

Note: When using manual regulation mode, channel ID (far left column) indicates the PowerBoost channel and associated OMM breaker. Channel "Name" is initially populated with the same value for easy reference.

Next, make appropriate entries for each desired channel. Note: The sequence of steps that follows does not take effect until **Accept Changes** is clicked at the end.

- **"Default Supply Voltage":** For each channel ID, make sure the correct "Default Supply Voltage" is entered. This is the target voltage to be maintained at the load, entered as a positive number. The default entry is 56.00 which results in a load voltage target of -56 V. Recommendation: Leave the default setting unchanged unless instructed to use a different value.
- **"Enable"**: Click the box to enable the channel. A checkmark will appear to identify that the channel is enabled. Channels that will be used in manual mode must be enabled. Only enable channels that are in use. Leave unused channels unchecked (disabled).
- **"Manual Regulation"**: Click the box to place the channel in manual mode. A checkmark will appear to identify that the channel is in manual mode.
  - Note: The "manual regulation" checkboxes operate in pairs (Ch. 1&2, 3&4, etc.) Clicking one of the checkboxes will change both associated channels in/out of manual mode.
  - Note: For a given channel, if the box is <u>not</u> checked, the channel operates in automatic mode and uses voltage information from the Raycap OVP telemetry according to a mapping number that is (must be) entered in the "Name" column. This is the factory configuration for PowerBoost. In automatic mode, the fields for "Hybrid Length," "Wire AWG," and "Parallel pairs" are ignored.
  - Note: For a given channel, if the box is checked, the channel operates in manual mode. Mapping information in the "Name" column is ignored, and entries in the fields for "Hybrid Length," "Wire AWG," and "Parallel pairs" are used to calculate boost parameters.
  - Note: Some channels can be used in automatic mode and other channels can be used in manual mode. Allocation among automatic/manual mode is made by channel pairs on a given boost brick (i.e., Ch 1&2, 3&4, etc.)
    - Channels in automatic mode must have a corresponding valid Raycap channel tag (101, 102, 201, 202, etc.) entered in the "Name" column.
    - Channels in manual mode must have corresponding valid information entered in entries in the fields for "Hybrid Length," "Wire AWG," and "Parallel pairs."
- **"Hybrid Length"**: This is the one-way cable length from boost shelf output to the upper OVP (assumes copper). (PB doubles this internally to account for both conductors in the pair.) Enter length in multiples of 25 ft. Recommendation: Enter the closest multiple of 25

ft that is less than the actual system distance. The entry must be a multiple of 25 within the range of 0 – 1000. (Consult JMA before implementing length greater than 500 ft.)

- **"Wire AWG"**: Enter the wire AWG being used. The default value is 6. The entry must be one of the following integer numbers: 2, 3, 4, 6, 8.
- **"Parallel Pairs"**: This entry facilitates automatic calculation of parallel sets of conductors. The default entry is 1. <u>Recommendation: Leave the default setting unchanged unless instructed to use a different value.</u>
  - Note: Visible in the screen captures, the GUI contains a "Resistance" column. This shows the internally calculated resistance (full loop, round trip), derived from the user-entered values for "Hybrid Length," "Wire AWG," and "Parallel pairs." This value is shown as an aid so the operator can confirm reasonable figures before engaging the system in manual mode.
- **"Max Voltage"**: This entry sets the maximum output voltage for the channel at the boost rack, regardless of the target value derived mathematically from the default supply voltage, cable length, wire AWG, and channel current. The default entry is 68.00 (corresponds to output voltage of -68.00). <u>Recommendation: Leave the default setting unchanged unless instructed to use a different value.</u>

Each line item corresponds to a channel in PowerBoost. Make sure that each entry has been made as desired for each PowerBoost channel that will be used. Make sure that any <u>unused</u> PowerBoost channels do <u>not</u> have their "Enable" box checked.

Note: It is not necessary to enable channels in sequence, or to use all of the channels. It's permissible to skip channels and leave some channels not enabled.

Do not enable channels that are not being used.

Click **Accept Changes** at the bottom right, then click **OK** to confirm.

In the example image below:

- Channels 1 and 2 have been configured in manual mode with 6 AWG cable and distance to the upper OVP 300 ft. (Default values are 6 AWG and 150 ft for all channels.)
- Channels 3 and higher are not enabled.
- Note: To configure any other channels in automatic mode, it would be necessary to enter valid OVP mapping information in the "Name" column (ex. 203, 204, etc.) and click the "Enable" box for the given channels.
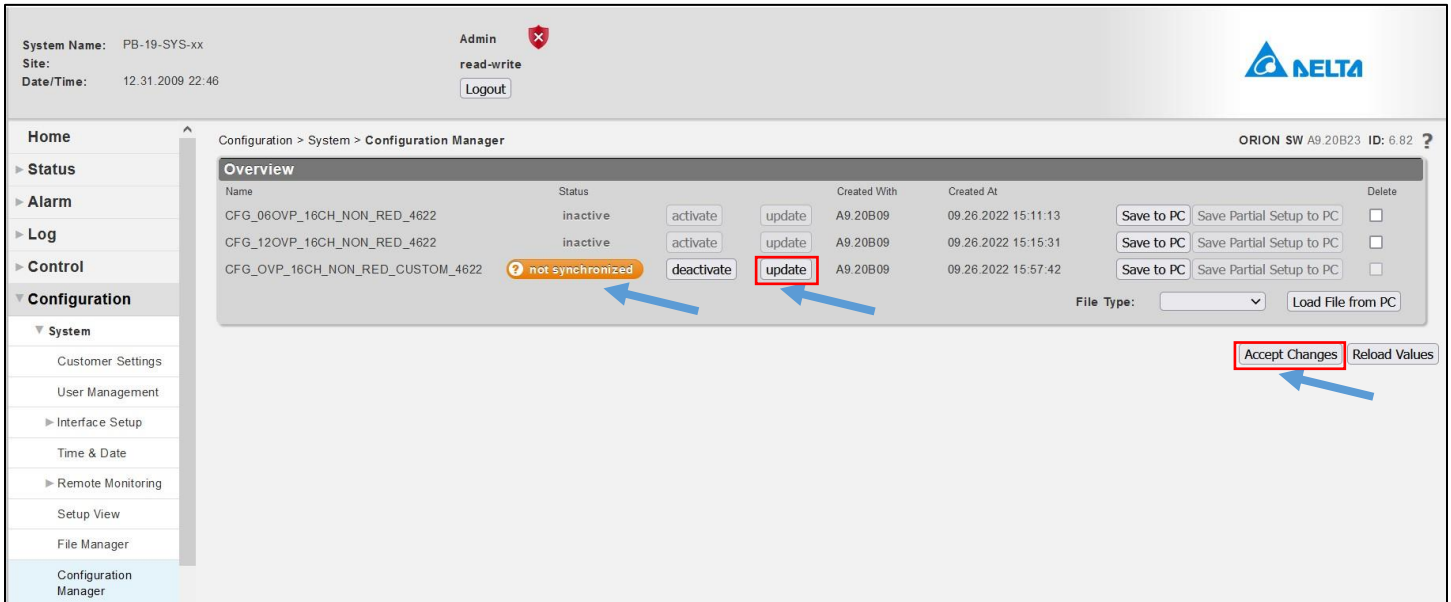

As a final step, the configuration file must be synchronized…

Continued on the next page…

Navigate to: **Main menu, Configuration, System, Configuration manager.**

Note that the CUSTOM config file now shows "not synchronized" because changes have been made to its parameters.

Click **update**. Allow several seconds until the status changes to "synchronized."

Continued on the next page…

See image below…

As a side note, observe that a new configuration file has appeared in the list (…CUSTOM_4622_1).

- When an existing configuration file is modified, the original/previous version is saved with an index number added to end of filename (_1, _2, etc.).
- In this fashion, config files with filenames ending in _1 are often copies of the original config file that shipped from the factory. It is generally good practice to retain config files with filename ending in _1.
- The extra config file(s) can remain without consequence. Alternatively, the extra file can be deleted if desired; simply click in the corresponding checkbox in the "Delete" column on the right, then click **Accept Changes** at the bottom. Use care to click only the desired boxes for deletion, so as not to unintentionally remove desired files.
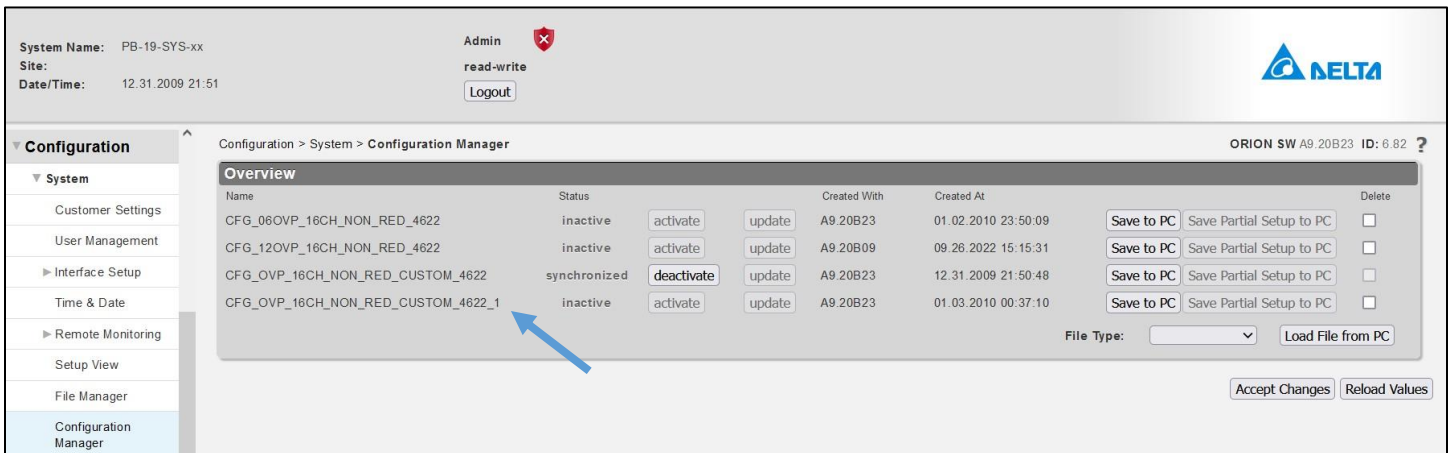
Next, (for initial deployment) verify that all OMM circuit breakers are OFF. Insert boost modules (PB-PSU-162-BB) that correspond to all enabled channels.

It is recommended to turn on OMM breakers one at a time, and verify that the expected load (RRH) is powered. This confirms system wiring has been accomplished as intended.

Note: System units can be set to metric.

To do this: Navigate to **Main Menu, Configuration, System Architecture, Hybrid channel.**

At bottom of the menu there exists a "Parameter" entry window. Units for "Cable Length" and "Cross Section" can be set via dropdowns there.

Once the dropdown selections have been made, be sure to click **Accept Changes**.

Input boundaries for metric parameters are as follows:

- Length (meters) accepts 0 – 300 (must be an integer number).
- Cross section (mm^2 i.e., square millimeters) accepts 1 – 120 (must be an integer number).

Appendix I: How to Set Time and Date in the Orion Controller

Note: Setting time and date in the Orion controller is optional. This is typically of interest if the unit will be connected to a network, or if the desire exists to have accurate time stamps on logged events, etc.

To set time and date via touchscreen:

Note: If a password is requested, enter the default value 0000, then touch blue checkmark at lower right.
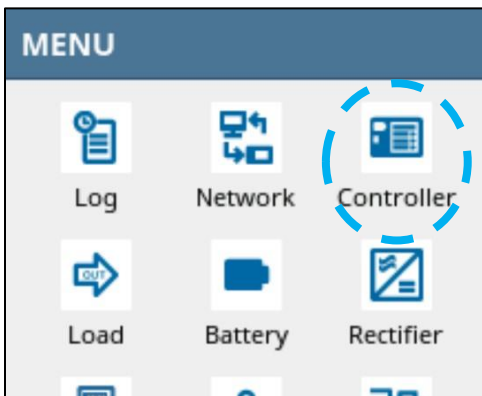
Orion touchscreen sequence is: (default display is "Meter Panel" page)

Main "Orion" page, "Menu" page, "Alarm" page, "Meter Panel" page.

Beginning at the default Orion screen (which is "Meter Panel"): Swipe right (2x) to reach the "Menu" screen, as shown below.

Touch the **Controller** icon.

Continued on the next page…

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This reveals the Orion controller serial number and installed software version. Scroll down (swipe up) to reach the bottom of the menu.

Touch **Time & Date**. This reveals the entry fields.
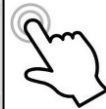
Touch the entry field for "Date." This presents the entry dialogue with existing date in the form of mm.dd.yyyy (two digit month, two digit day, four digit year, separated by periods).

- Touch blue **X** in upper right as needed to delete existing text.
- Touch number keypad as needed to enter new date in the form mm.dd.yyyy
- To finish, touch blue **checkmark** at lower right.

Swipe right as needed, to back up and return to the "TIME & DATE" entry screen.

Touch the entry field for "Time." This presents the entry dialogue with existing time in the form of hh.mm.ss (two digit hour, two digit minute, two digit second, separated by periods).

Note that the time entry is in 24-hour format: hour for 1AM, 2AM is 01, 02, etc.; hour for 1PM, 2PM is 13, 14, etc.

- Touch blue **X** in upper right as needed to delete existing text.
- Touch number keypad as needed to enter new time in 24-hour format hh.mm.ss
- To finish, touch blue **checkmark** at lower right.

For reference: image at the right shows the time entry dialogue at 11 minutes after 10AM.

For reference: image at the right shows the "TIME & DATE" menu, displaying:

Date: October 24th, 2022

Time: 9 minutes after 1PM

To set time and date via GUI (log in using laptop via front Ethernet port):

If the laptop computer has not previously been configured for direct connection to the Orion controller via (laptop's) local LAN port, refer to Appendix D for information to connect and log in.

Once logged in, navigate menu path: **Configuration, System, Time & Date.**

See image below. For convenience, a button exists that will automatically read the existing time and date from the connected laptop computer and install the same information in the Orion controller. If this is acceptable, click **Set Clock Equal to PC**.

Note: In some instances when using the "Set Clock Equal to PC" function, the process can take up to one minute to complete.
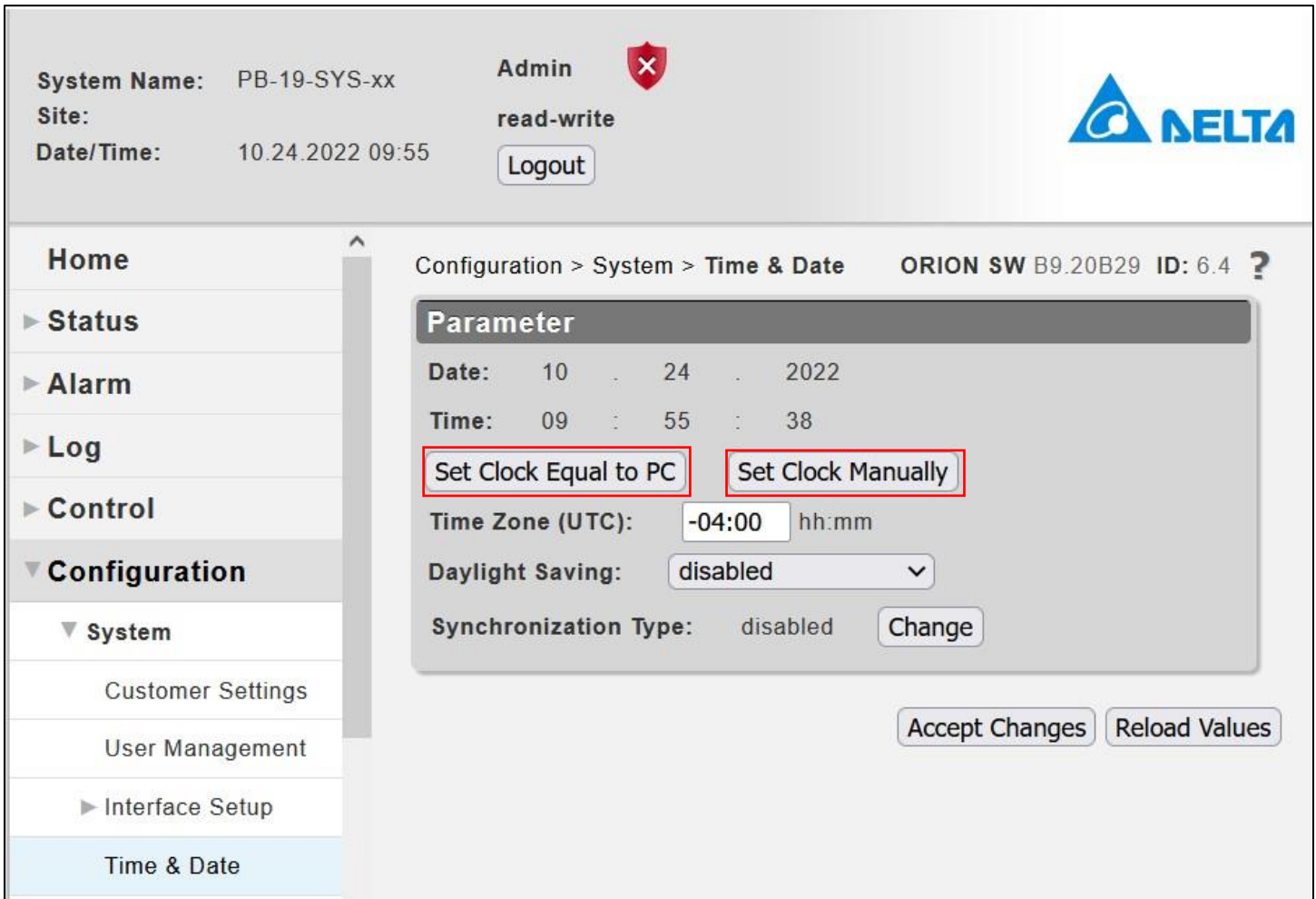
To make manual entries for Time & Date, click the button **Set Clock Manually.**

Continued on the next page…

Note that time entry is in 24-hour format: hour for 1AM, 2AM is 01, 02, etc.; hour for 1PM, 2PM is 13, 14, etc.

See image below.

Use the dropdowns to set time in the form of hh.mm.ss (two digit hour, two digit minute, two digit second, separated by periods).

Use the dropdowns to set date in the form of mm.dd.yyyy (two digit month, two digit day, four digit year, separated by periods).
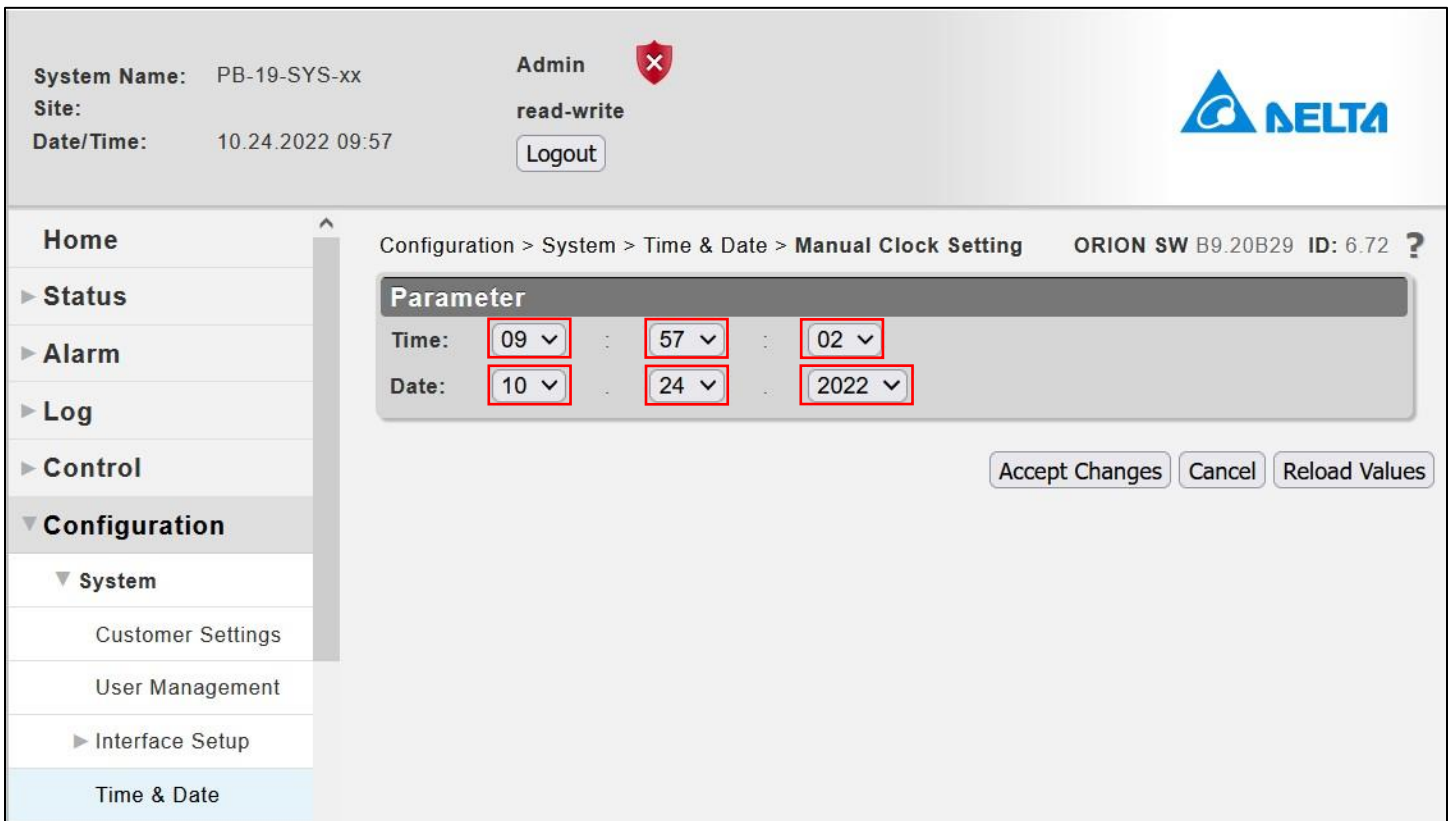
When finished making the entries, click **Accept Changes** at the bottom.

Important! After clicking **Accept changes**, the config file must be synchronized.

Return to the menu **Configuration, System, Configuration Manager**, and click the **Update** button to synchronize the config file.

Appendix J: Ordering guide

Part number	Details
PB-SYS-16-BB-01	19IN 3RU DC BOOST SYSTEM 16CH WOMM JUMPERS, BOOST MODULES ORDERED SEPARATELY
PB-PSU-162-BB	CPC1700B-24 DC Boost Module
PB-PSU-COV-BB	Slot Blank Cover, PSU
OMM circuit breakers listed below - purchased separately	
PB-BR-30	Circuit breaker for OMM, single pole, 30A
PB-BR-35	Circuit breaker for OMM, single pole, 35A
PB-BR-40	Circuit breaker for OMM, single pole, 40A
PB-BR-50	Circuit breaker for OMM, single pole, 50A
PB-BR-60	Circuit breaker for OMM, 2 pole, 60A
PB-OMM-CBL-KIT-2	OMM jumper cable kit, contains 2 cables 26in ea

Appendix K: Commissioning and closeout checklist

Definitions:

PB: PowerBoost

OVP: Raycap OVP equipment

OMM: PowerBoost Output Management Module, i.e., circuit breakers on PB unit

PowerBoost installation/commissioning

☐ Note: Commissioning of PowerBoost system assumes that the Raycap OVP system to which PowerBoost will be connected has previously been installed and verified for correct wiring connections and correct data communication upper to lower (i.e., the display on lower OVP correctly reports the upper OVP channel voltages).

☐ Prior to energizing PB, complete the next three steps:

  o System wiring must be complete.

  o Based on system design information (OVP configuration), identify the associated PB configuration file that will be selected during setup.

  o Verify correct polarity of all power feeds from the DC plant to the PB rack. Note that PB-19-SYS-8 contains two (2) input power feeds, and PB-19-SYS-16 contains four (4) input power feeds. Correct polarity of all power feeds must be verified before energizing. See information in Section 7.2.

☐ Energize the system.

☐ Select and implement the PB config file for the given system configuration.

☐ With at least one PB channel energized, after at least 1 minute of operation, observe the PB-COM circuit board and verify the presence of a green LED flashing at approximately 1 second intervals. This indicates the receipt of communication from the lower OVP to PB.

☐ For all PB channels used in the given system, sequentially energize channels at the PB OMM, turning on 1 more channel at a time, and verify that the expected channel indicates voltage at the upper OVP (as read on the lower OVP display). Allow at least 30 seconds for a recently energized channel to indicate voltage on the OVP.

☐ Check for the absence of system alarms after PB has been operating for at least 3 minutes beyond the most recent change.

Option 1: Using Orion GUI

- After the installation is complete and verified, log into Orion GUI (refer to Appendix D: Orion GUI Login).
- Go to **Alarm → Status**
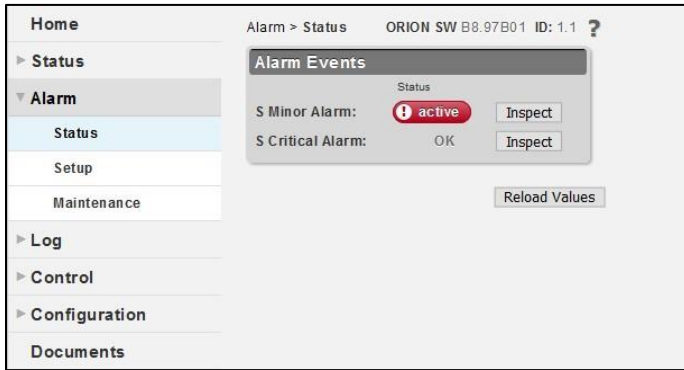
- The status "OK" on all the alarm events is a clear indication that there are no system alarms.

Option 2: Using Orion GUI (High Level Screen Capture)

- After the installation is complete and verified, log into the Orion GUI (refer to Appendix D: Orion GUI Login).
- Go to **Home**; the status in the highlighted screen capture that there are no alarms is an indication that there are no system alarms.
- Note: The screen shot below is showing an active alarm for illustrative purposes.
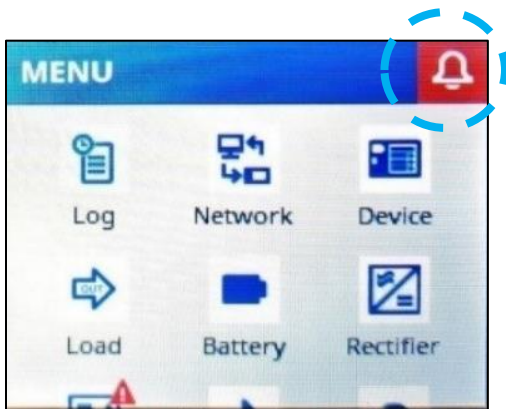
Option 3: Using Orion touchscreen

- The clear screen with no alarm symbol is an indication that there are no system alarms.
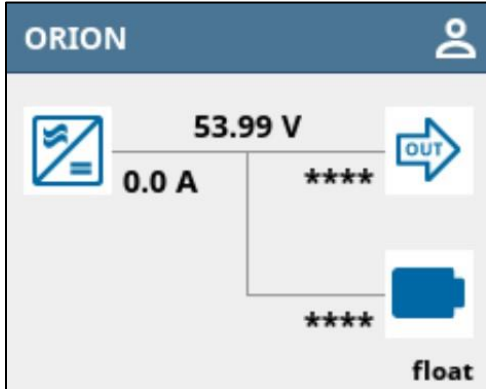
(or) Swipe right twice on the Orion touchscreen:

- Below is a screenshot of the Orion touchscreen with active alarms. Refer to the alarms section if there are any active alarms.
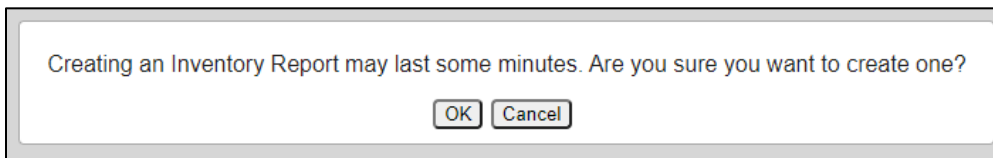
Capture the inventory report
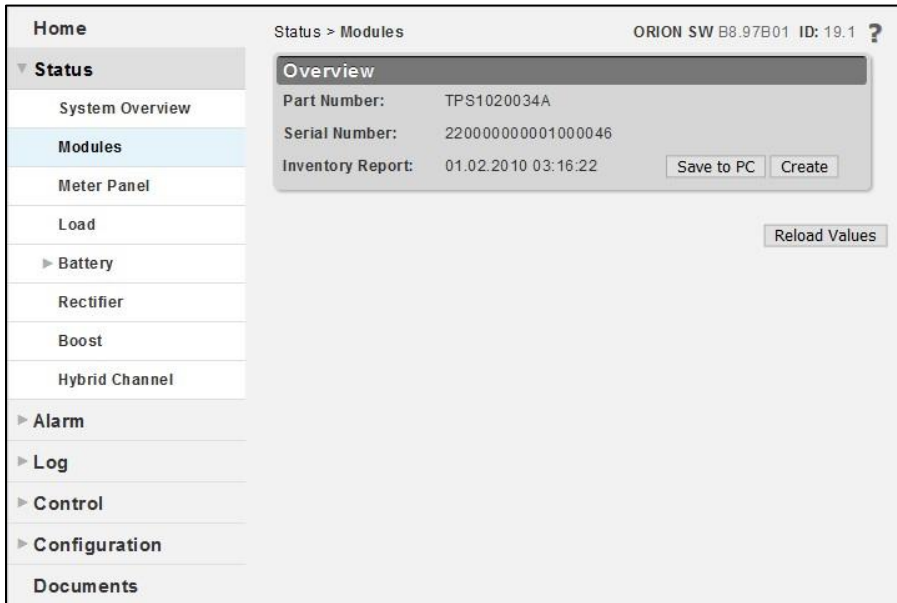
Log into the PB GUI and record the following:
- After the installation is complete and verified, log into Orion GUI (refer to Appendix D: Orion GUI Login).
- Go to **Status → Modules**.
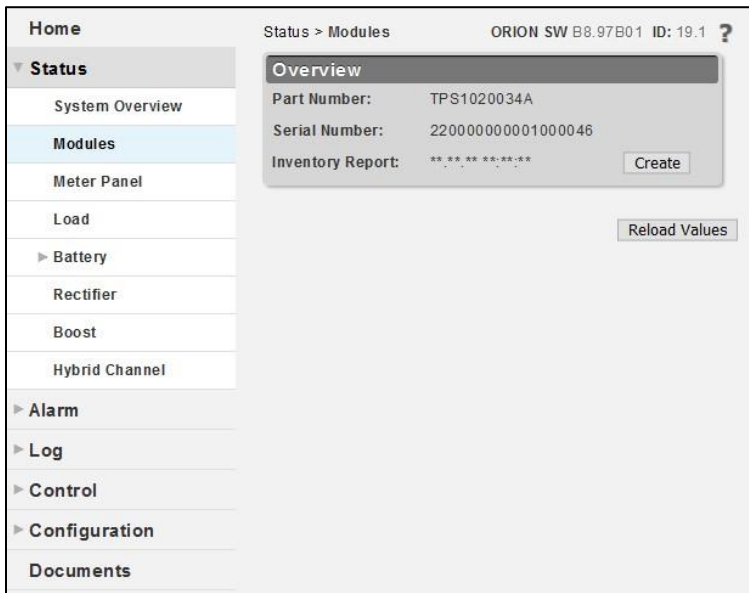
- Click on **Create**. You will see a pop-up window. Click **OK**. Do not log off or disconnect until the process is finished.
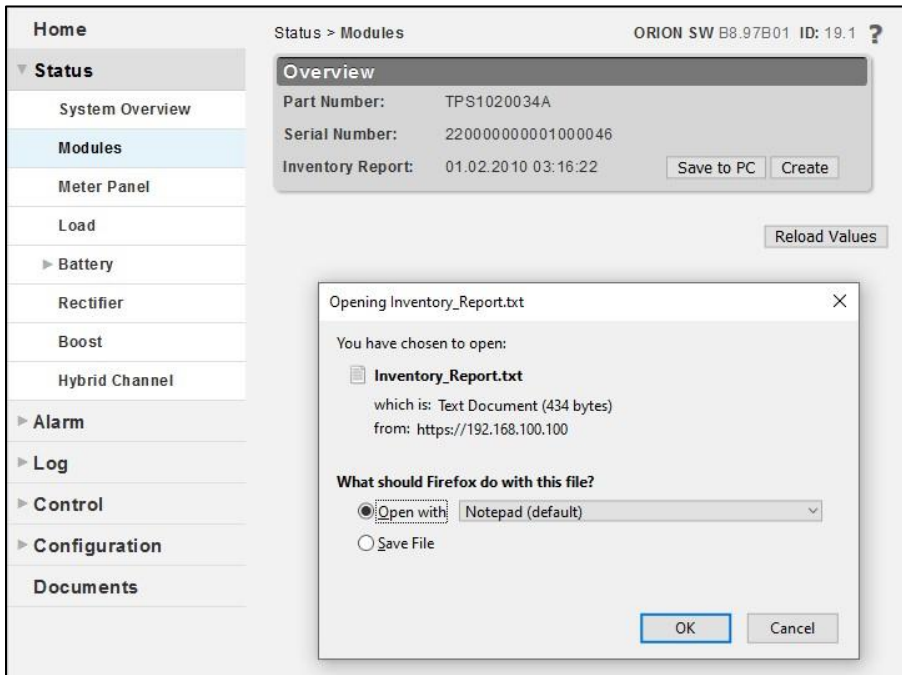
- Once the process is complete, you will see that an inventory report is generated and gives an option to save it to your PC. Click on **Save to PC** to download the file to your PC.
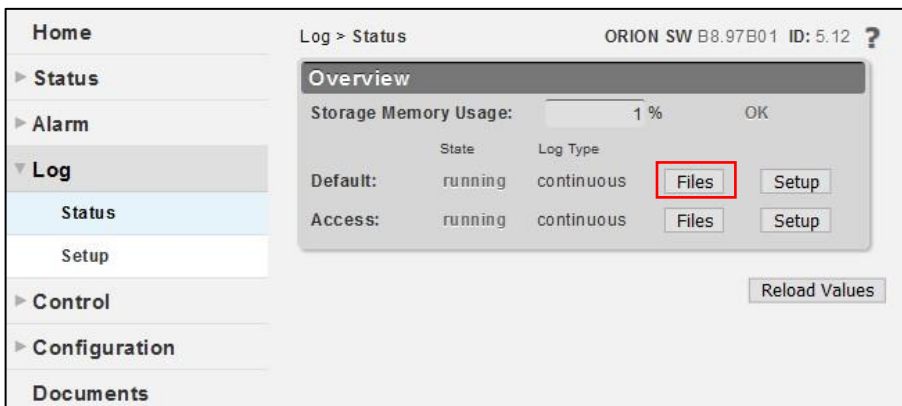

Continued on the next page…

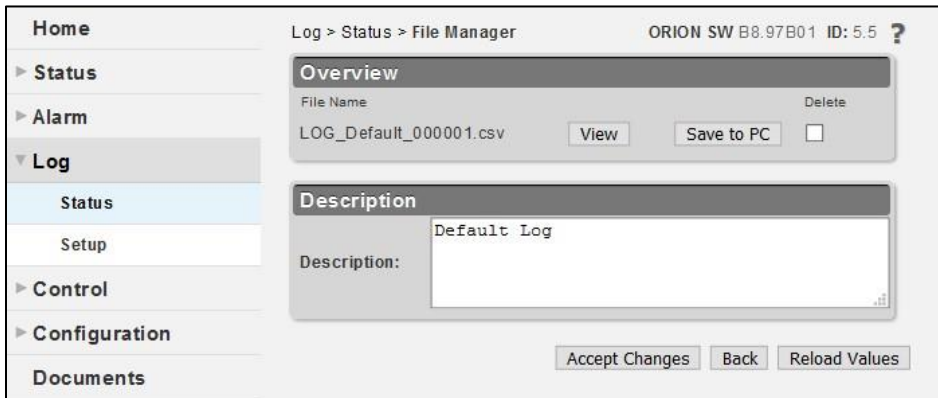- An inventory report is generated/downloaded, as shown in the screenshot below.

Capture the alarm history report

- After the installation process is complete and verified, log into the Orion GUI (refer to Appendix D: Orion GUI Login).
- Go to **Log → Status**
- For the "Default" log (see image below, upper line) Click on **Files**.

- Click on **Save to PC**; do not log off or disconnect until the process is finished.

☐ Once the process is complete, you will see that an event/alarm spreadsheet is generated/downloaded to your PC. An alarm report is generated at the bottom of the page in the screenshot below.
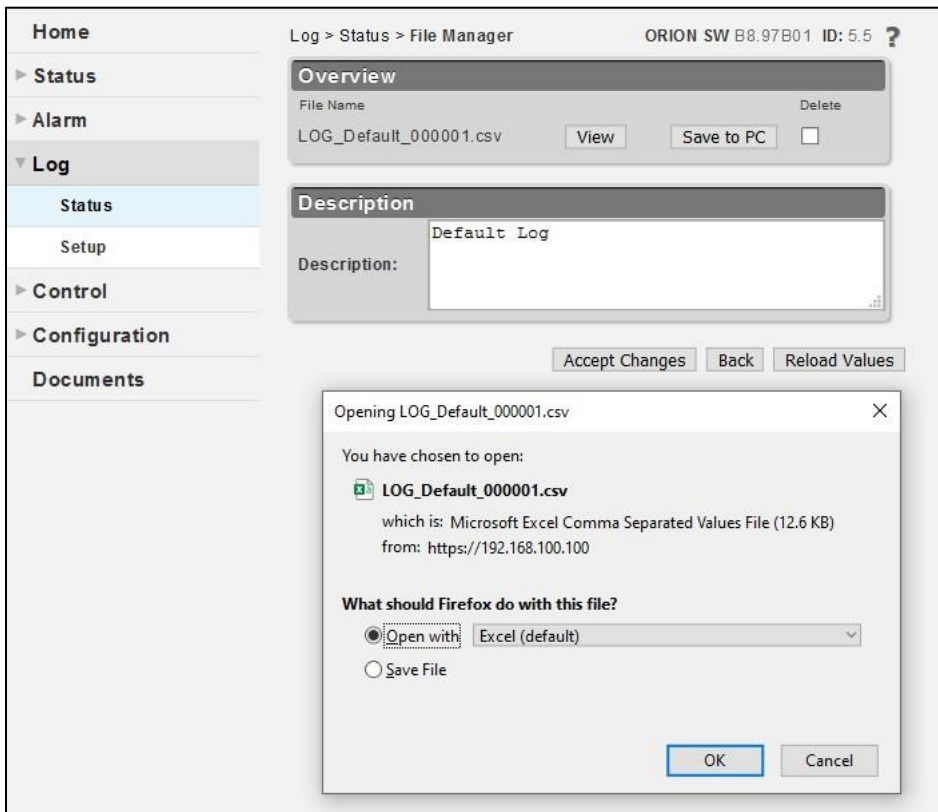
Capture the system map worksheet

PB CH #	RRU #	RRU Sector	Notes info	PB input breaker #	OVP base ID #	OVP base port #
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

PowerBoost closeout

☐ Verify that the system map table is completely and correctly captured.
  Use table above or system capture spreadsheet linked on Page 1.

☐ Verify that the system inventory report is captured and accurate.

☐ Verify that the system alarm history report is captured.

Document History

Version	Date	Description	EC
A	11/28/2022	Release	78479
B	1/11/2023	Typo corrected in Introduction Notes, pg 4: PB-BK-XX should read PB-BR-XX.	ECO-00406