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Verizon PowerShift Training 2022

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Basic Theory of Operation

PowerShift® boosts the voltage supplied by the cell site DC rectifier (nominal -48V, typical -54V) in order to reduce the current flow and the voltage drop in the power conductors (trunk cable):

- When a circuit is first powered up, PowerShift® starts with a safe voltage to power on the RRU

- The OVP top box measures the voltage and transmits it to PowerShift® via a RS485 serial link

- PowerShift® computes the difference between its output voltage and the top voltage, it measures the load current, and then calculates the conductor loop resistance (which it stores in memory

- PowerShift® can optimize the output voltage boost to maintain a consistent -54VDC at the RRU, even as the load current changes due to user traffic or if there are changes in conductor resistance due to temperature

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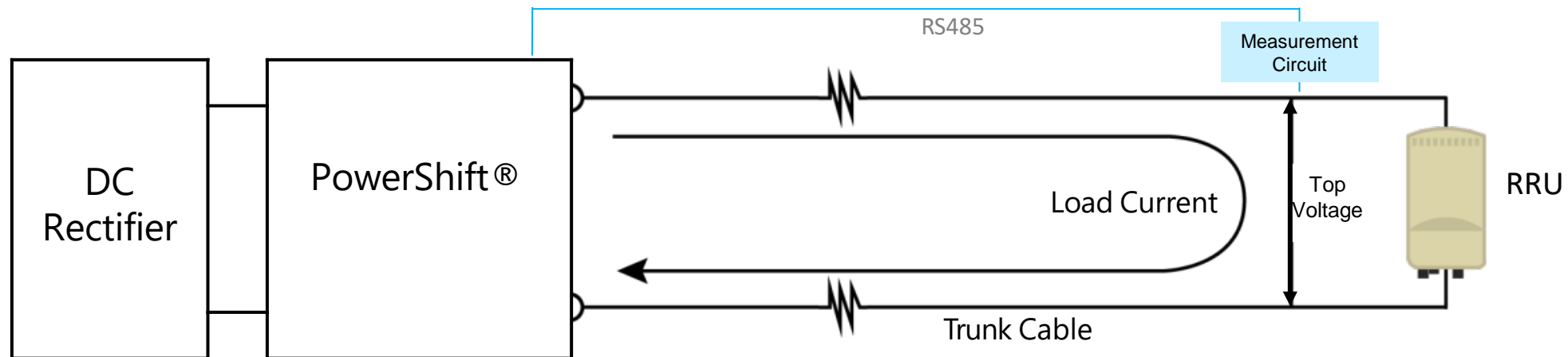
Why Use a DC Converter?
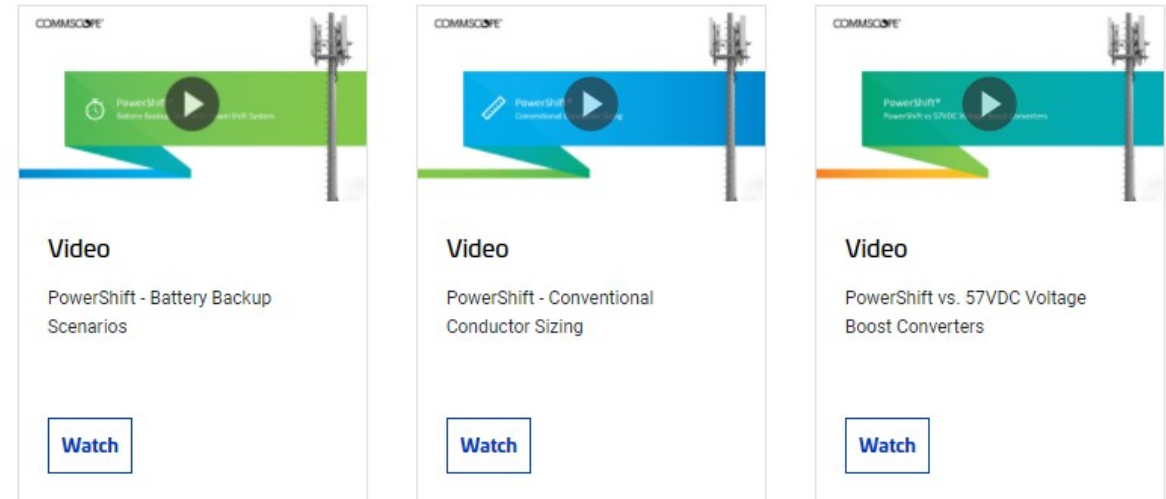
Prevent Cable Overheating
- Regulate a high voltage at the RRU input
- Reduction in current with higher regulated voltage.

Improve Battery Backup Time
- Up to 50% Improvement

Reduce (or recover) Trunk Conductors
- Saves Tower Rental Costs
- Lower Total Cost of Ownership
- Faster Deployment Time

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Video
PowerShift - Battery Backup Scenarios

Watch

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Video
PowerShift - Conventional Conductor Sizing

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Video
PowerShift vs. 57VDC Voltage Boost Converters

Watch

https://www.commscope.com/product-type/antennas/dc-power-supplies/

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MTCE Directive Change on Upconverter Usage

NETWORK DIRECTIVE

NUMBER	DATE ISSUED	LAST MODIFIED	COMPLY BY DATE	REVIEW DATE
ME-RFS-ST-14-0001	7/30/12	1/26/21	2/26/21	1/26/21

CLASSIFICATION	DOCUMENT CUSTODIAN
Company Confidential	James Giordano – MTCE RF Systems

STATUS	DOCUMENT TITLE
Active	RRH/RRU/AIR/AA – Hybrid Cable Plumbing Standard Diagrams

Why We Need Up-Converters on Our Sites (Per EOS)

The driver for the need of up-converters is due to the National Electric Code® (NEC®) ampacity limitations on a #6 wire after all the proper deratings are applied.
Since the hybrid cables contain multiple current carrying conductors within a common sheath and they are exposed to sunlight, the NEC® requires that we apply (2) deratings factors to the #6, one for the number of current carrying conductors in a common sheath or raceway and the other is due to the exposure of the cable to direct sunlight.

Per the NEC® ampacity tables, the 90 degree C rating of a #6 conductor is 75A, but that is for a maximum of (3) current carrying conductors in a common sheath. In a 6x12 hybrid, there are (12) current carrying conductors, which means per the NEC® we must derate the ampacity of the conductor by 50% and for a 12x24 hybrid we must derate to 45%. Since the cables are exposed to direct sunlight, we must further derate the ampacity to 82% of the previous value.

Based on the deratings described above, the following table was developed:

Hybrid Configuration	#6 90C Rating	Multiple Conductor Derating	Temperature Derating	Total Derated Ampacity	Largest Overcurrent
6x12	75A	50%	82%	30.75	35A
12x24	75A	45%	82%	27.67	30A

New Site Builds & Modifications (Hybrid Configuration):

Moving Forward MTCE and EOS guidance is that Up-converters are to be used on all new site builds and modifications for hybrid cables in order to meet high power requirements of new and future radios.

Please start planning on using up-converters on future sites. As of 1/26/21, MTCE is working with HQ planning on the funding to support the additional equipment costs.

Note: For any alternative solutions or any hybrid distance over 600 feet, please reach out to MTCE (James Giordano) or EOS (Mario Spina).

Note: The direction stated above on a wider adaptation of up-converters applies to radios that are 1000 Watts or higher.

Simplified Ordering Solutions: 3,6,9 and 12 RRU Kits

Kit Part number		PS-2-R3-V		
Description		Powershift 3 RRU Solution		
Line Item	Part Number	Description	Quantity	Unit of Measure
0001	PS-R-1600	RRH Drop Compensator Shelf	1	EA
0002	Pulsar-Edge-CNTRL	High Power Pulsar Edge CNTRL	1	EA
0003	RS485 Card	High Power RS485 Card	1	EA
0004	PS-1600-73	1600-Watt Module 73V	2	EA
0005	PS-BYPASS-1	PowerShift #2 Circuit Bypass	2	EA

Kit Part number		PS-2-R9-V		
Description		Powershift 9 RRU Solution		
Item	Part Number	Description	Quantity	Unit of Measure
0001	PS-R-1600	RRH Drop Compensator Shelf	1	EA
0002	Pulsar-Edge-CNTRL	High Power Pulsar Edge CNTRL	1	EA
0003	RS485 Card	High Power RS485 Card	1	EA
0004	PS-1600-73	1600-Watt Module 73V	5	EA
0005	PS-BYPASS-1	PowerShift #2 Circuit Bypass	5	EA

Kit Part number		PS-2-R6-V		
Description		Powershift 6 RRU Solution		
Item	Part Number	Description	Quantity	Unit of Measure
0001	PS-R-1600	RRH Drop Compensator Shelf	1	EA
0002	Pulsar-Edge-CNTRL	High Power Pulsar Edge CNTRL	1	EA
0003	RS485 Card	High Power RS485 Card	1	EA
0004	PS-1600-73	1600-Watt Module 73V	3	EA
0005	PS-BYPASS-1	PowerShift #2 Circuit Bypass	3	EA

Kit Part number		PS-2-R12-V		
Description		Powershift 12 RRU Solution		
Item	Part Number	Description	Quantity	Unit of Measure
0001	PS-R-1600	RRH Drop Compensator Shelf	1	EA
0002	Pulsar-Edge-CNTRL	High Power Pulsar Edge CNTRL	1	EA
0003	RS485 Card	High Power RS485 Card	1	EA
0004	PS-1600-73	1600-Watt Module 73V	6	EA
0005	PS-BYPASS-1	PowerShift #2 Circuit Bypass	6	EA

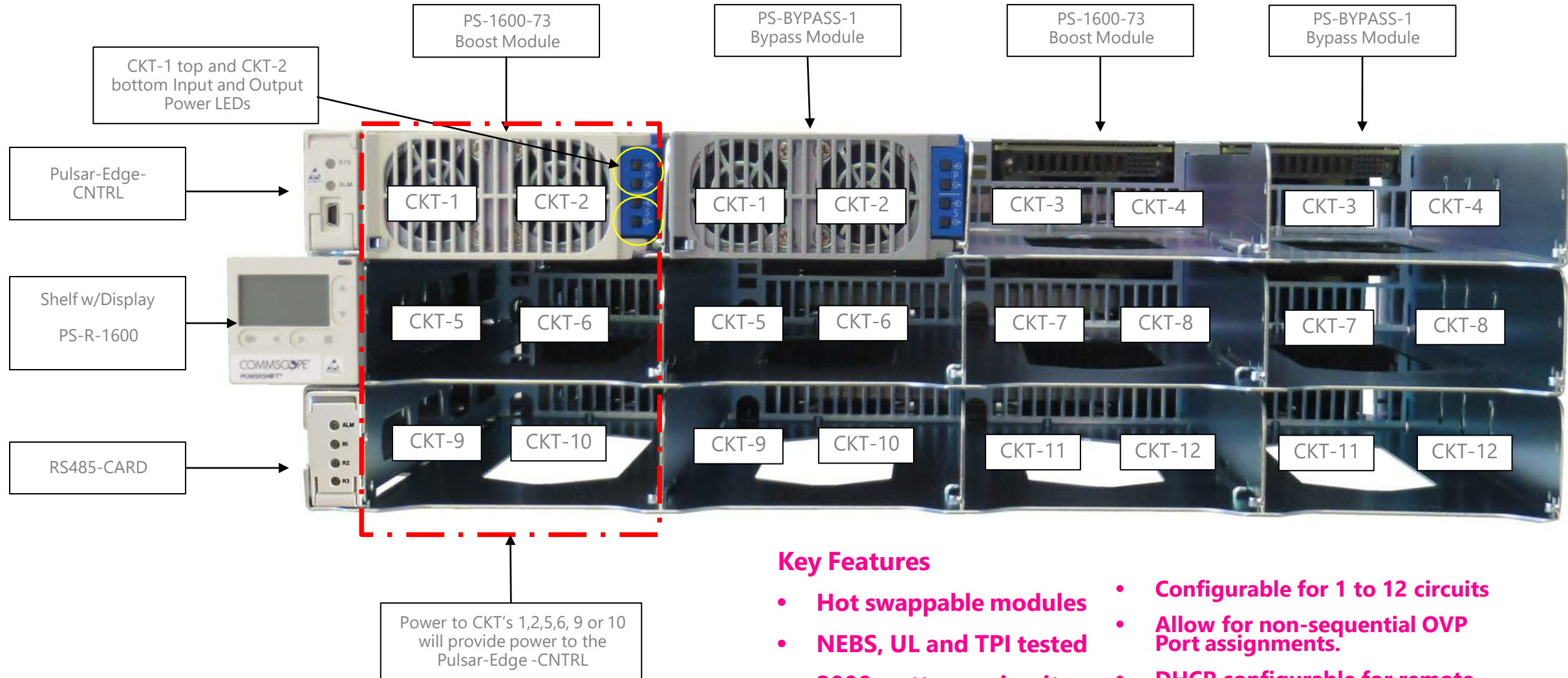COMMSCOPE

Features and Benefits

- Kits Include:
  - PowerShift Shelf
  - PowerShift Controller
  - RS485 Card
  - PS-1600- 73 Boost Modules
  - PS-Bypass Modules
- Simplified ordering processing with one part number for all kit components required for a PowerShift installation.
- All kit components bar coded and labeled on the one side of the containers for easy identification in the warehouse and in the field.
- Components consolidated into custom containers to eliminate excess waste.
- Light weight palatized kits can be easily loaded into pickup truck or small SUV without the use of a forklift.

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Turn-up Testing and Configuring PowerShift

PowerShift Front View

PS-1600-73
Boost Module

PS-BYPASS-1
Bypass Module

PS-1600-73
Boost Module

PS-BYPASS-1
Bypass Module

CKT-1 top and CKT-2 bottom Input and Output Power LEDs

Pulsar-Edge-CNTRL

Shelf w/Display
PS-R-1600

RS485-CARD

CKT-1   CKT-2   CKT-1   CKT-2   CKT-3   CKT-4   CKT-3   CKT-4

CKT-5   CKT-6   CKT-5   CKT-6   CKT-7   CKT-8   CKT-7   CKT-8

CKT-9   CKT-10   CKT-9   CKT-10   CKT-11 CKT-12   CKT-11 CKT-12

Power to CKT's 1,2,5,6, 9 or 10 will provide power to the Pulsar-Edge -CNTRL

Key Features

- **Hot swappable modules**
- **NEBS, UL and TPI tested**
- **2000 watts per circuit.**
- **Configurable for 1 to 12 circuits**
- **Allow for non-sequential OVP Port assignments.**
- **DHCP configurable for remote access.**

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PowerShift Rear View

Burndy or equivalent YAV6C-L2TC14-FX Standard Barrell lugs with ¼" stud size with 5/8" spacing for all input and output connections.

Output connections to Raycap OVP's. #6 AWG TelcoFlex IV or equivalent minimum 105C rated wire.

Input connections from DC Breaker. #6 AWG TelcoFlex IV or equivalent minimum 105C rated wire.

Dry Contact Alarms 2 pairs required Terminate in positions 3 and 4

8' Ethernet Cable. Terminate at LAN Port on Shelf and to Laptop Computer.

Data Port not used

Ethernet Cable from R1 Port on shelf to "V-Boost Out" on Raycap OVP

R2 and R3 Ports are not used

3 RU 5.25"

Ground Lug Connection Point. Burndy or equivalent Lugs YAZ6C-2TC14

19" rack width shelf. When installing in a 23" rack use Newton 40380330 3RUrack adaptors

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Boost Module Specification

PS-1600-73

PowerShift® Module, 2 separate 2020 watts circuits per module, Patent Pending

- Reduced capital/operating expenditures
- Engineering flexibility
- Future-ready design

Product Classification

Brand	PowerShift®
Product Series	V2
Product Type	Module

Dimensions

Depth	351.79 mm | 13.85 in
Height	41.40 mm | 1.63 in
Width	101.60 mm | 4.00 in
Length, maximum	1500.00 m | 4921.26 ft

Electrical Specifications

Electrical Safety Standard	CE | cUL | IEC 60950 | UL
Electromagnetic Compatibility/Interference (EMC/EMI)	EN 55022 Class A
Input Current Range	0-57 AMPS@ -38VDC
Input Voltage Range	-38 to -58 Vdc
Input Voltage, nominal	-48 Vdc
Output Current Range	0-30 A
Output Voltage Range	-48 to -73 Vdc
Output Voltage Ripple	400 mVpp
Output Voltage, nominal	-56 Vdc
Power Efficiency	93 %
Power Efficiency, nominal	97 %
Programmable RRU Voltage, nominal	56 Vdc
Total Output Power	2000 W, input voltage dependent

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Installation of RS485 Card and Controller Cards into PowerShift Shelf

Controller Card Installation

- Remove Controller Card from packaging

- Locate jumper on side of card, confirm controller bridging connector is set in Server (Local) setting.

- If the bridging connector is in the client location use needle nose plyers to move the connector.

- Client connector setting is used for remote access only.

- Slide controller card into slot with front latch open until you feel backplane connector fully seat, close latch
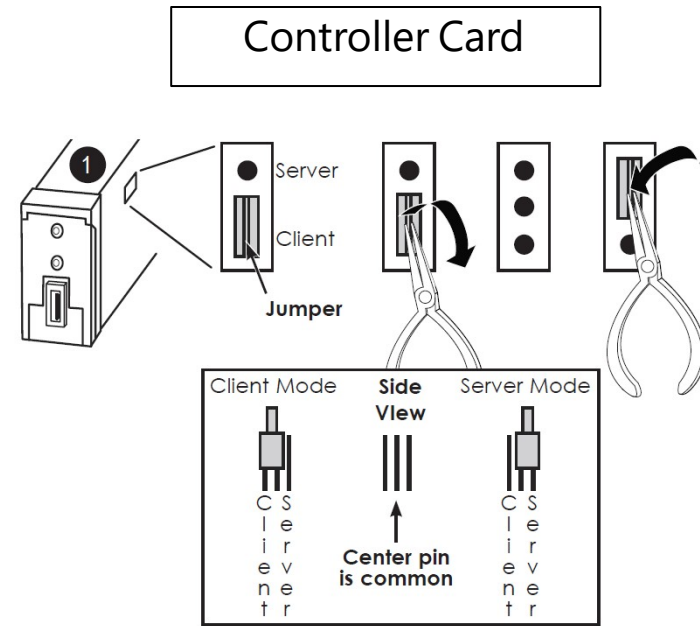
RS485 Card Installation

- Remove RS485 Converter Card from packaging, open latch, fully seat the card, and close the latch.

- RS485 Card and shelf are keyed to prevent it from being installed into the controller card slot.

Controller Card

RS485 Card

Use and ESD Protective wrist strap when installing the controller card to prevent static electricity from damaging controller.

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Pre-Power-Up Checklist

❑ Verify all PowerShift Circuits are terminated and securely connected to DC Power Plant, RayCap OVP(s), and PowerShift Backplane

❑ All equipment connected to and including PowerShift is properly grounded

❑ Verify Proper Installation of RS485 Retrofit Kits

❑ Alarm Pairs properly connected at Base OVP(s) and Top OVP(s) for functionality of RS485 link

❑ RS485 Link from Base OVP(s) to PowerShift Shelve(s) installed

❑ Set OVP configuration switch to appropriate position for Base Identification

❑ Properly sized Breakers in DC Power Plant installed

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Power-Up Procedure

1. Ensure no PowerShift Modules are seated into shelf.

2. Turn on DC plant circuit breaker for PowerShift Circuit 01, 02, 05, 06, 09, or 10

   Note: The Controller, Display and RS485 card obtain power from the Shelf input terminals of Circuits 01, 02, 05, 06, 09, or 10; at least one of these circuits must have input power applied, a Power Module does not need to be installed in the Shelf slot

3. The Controller and RS485 LEDs should cycle, and the LCD display will illuminate

4. The Controller Card SYS LED should illuminate solid green or Red

5. The Display should show the text "U" in the center/left of the screen

6. RS485 card ALM LED should illuminate green

7. R1 LED will not illuminate until output power from Shelf is applied to at least one circuit on the OVP base

Controller

RS485

Controller

RS485

Shelf Display

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GUI Login Procedure

1. Use Windows PC and web browser (Preferably Chrome)

2. Connect Ethernet Patch cable from PC to LAN port on back of PowerShift Shelf

3. PC must be configured for DHCP operation in its Network Settings

4. Open web browser (Chrome) on PC and enter **URL: 192.168.2.1**. GUI page should load.

5. **Note:** When the Controller is powered up it may take 1-2 minutes before the web browser can connect

6. Password: super-user (lower case, no spaces)

7. Click Submit, the GUI **Home Page** will load

Login Page

URL: 192.168.2.1

Enter Password

Password: ••••••••• Submit Reset

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Home Page

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Installation Report/Tab

- Set Site ID

- Set Site Name Description

- Set Date and Time

- Setting Date and Time will insure closeout documentation and alarm event history match site location and other site alarm reporting devices.

- ENSURE DATE/TIME ARE PROPERLY SET BEFORE CONTINUTING WITH POWER UP PROCEDURE

Power Module Installation

1. Insert Power Module into Shelf Slot 01 until it stops

2. Close the front cover on the module to make connection and lock into place

3. Module input LED (P-In) illuminates green and output LED (P-out) blinks red

   - After 10-30 Seconds output LED turns solid green

4. Second Unpowered Circuit on module will illuminate yellow on the input LED (S-in) due to not having input power applied

5. RS485 card R1 LED should blink every 1-2 seconds and will blink indefinitely.

   - Indicates communication between PS Shelf and OVP base

6. Verify Circuit Voltage on RayCap Equipment

7. For Troubleshooting Please refer to Page 14 of PowerShift Installation Instruction Manual

ID	Normal State
P-In	Green
P-Out	Green
S-In	Green
S-Out	Green
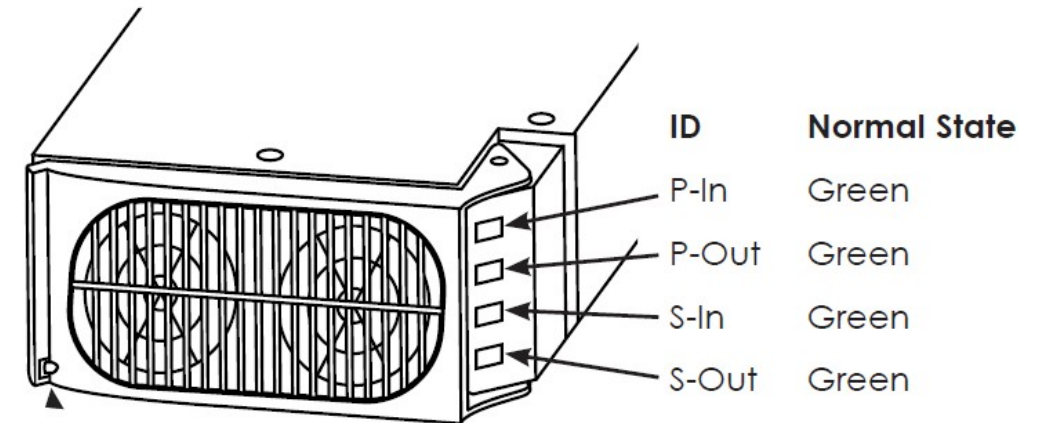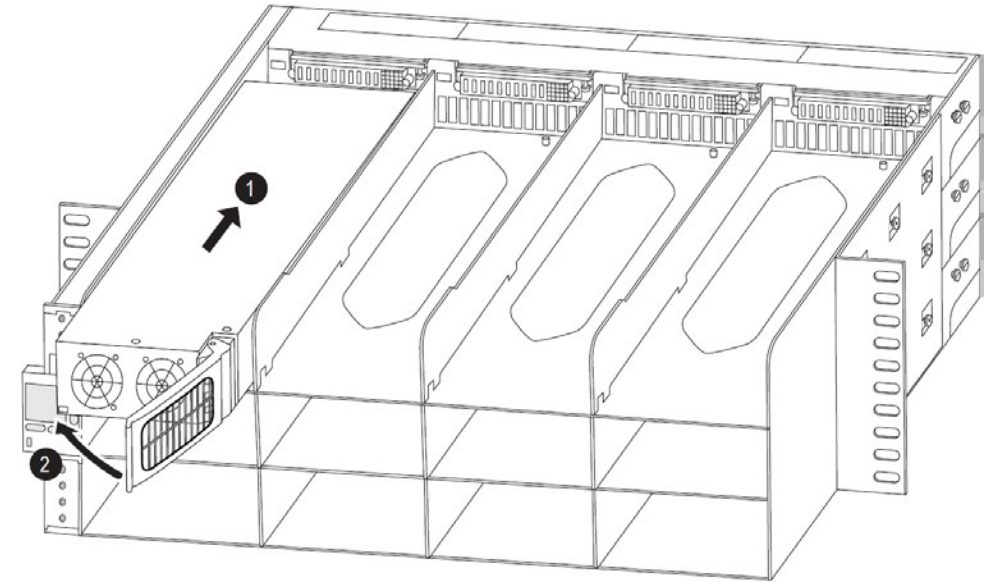
P = First Circuit

S = Second Circuit

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OVP Circuit Assignments

1. On GUI Home page, confirm circuit 01 inset box is green, indicating power has been applied

2. OVP Circuit Assignments are made by clicking anywhere inside the circuit box

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OVP Circuit Assignments Continued

The circuit information pop-up box will be displayed

Click on the OVP Assignment box to display the list of available OVP upper voltage measurements

- "Base: 0" is the address of the OVP base unit that receives the upper voltage measurement and sends it to the PowerShift shelf
- "Port: 1" identifies the port number of the OVP top unit that sends the upper voltage measurement to the OVP base unit
- Select the applicable OVP assignment from the list

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OVP Selection Table

- Select the Raycap Base Address and the Raycap Base Port assignment.

- Confirm upper and lower voltages on both the Raycap OVP and the PowerShift Display scree on the front of the shelf after the selection is made.

- Commscope recommends that one circuit is powered up at a time to confirm correct wiring from Powershift to Raycap OVP's

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OVP Circuit Assignments Continued

Note: The LCD main screen displays the upper voltage measurements for each circuit (01-12) after the upper voltage has been assigned to a Shelf circuit. The voltages are displayed in a 4x3 grid; example:
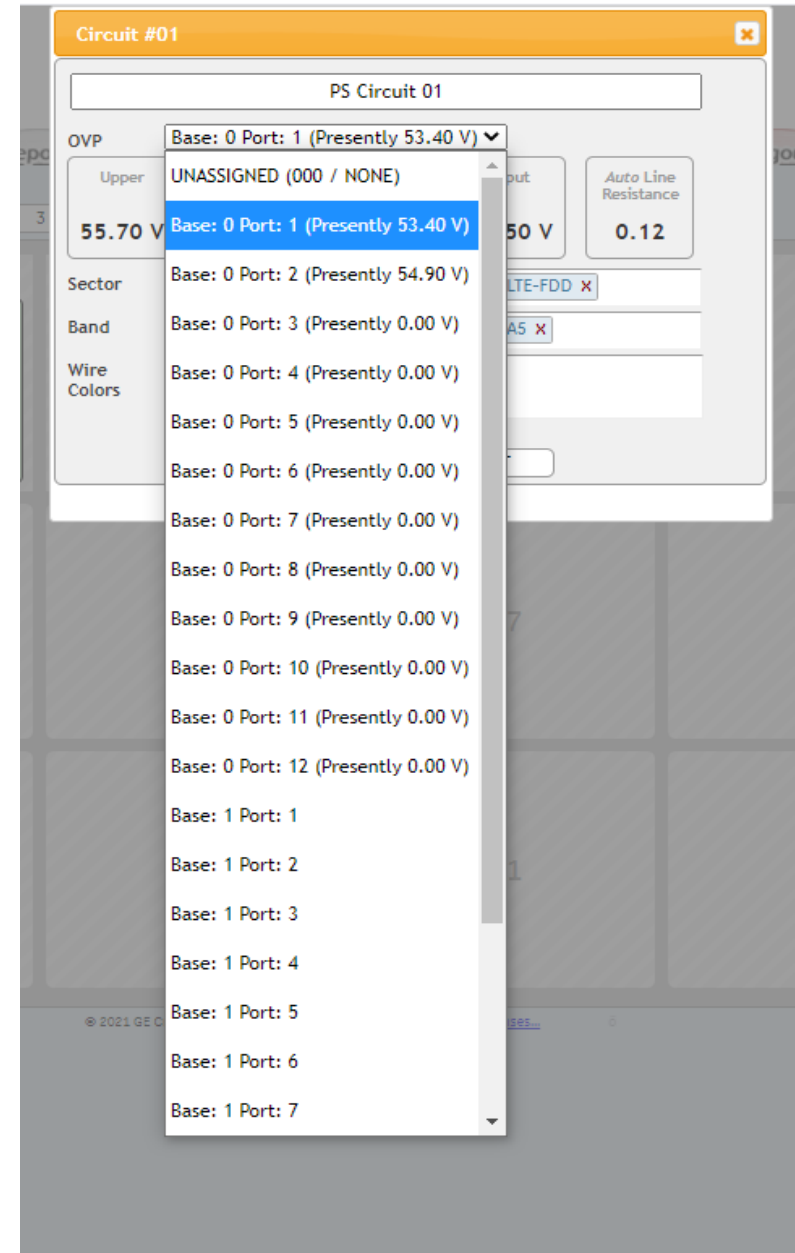
1. Check the LCD Display to confirm the Upper Voltage measurements are displayed.

Voltage Displays for Circuits 01 and 02

1. Using the LCD Display: Navigate the menu using up/down arrows to scroll, and the square button to select

- Select <u>Menu</u>

- Select <u>Status</u>

- Scroll down and select <u>LDC</u>

- The available Circuits (Channels) are displayed:

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OVP Circuit Assignments Continued

1. Scroll to highlight the desired Channel

2. Select Desired Channel

3. The First portion of detailed Circuit data is displayed

4. Scroll down to view the remaining Circuit data

5. Verify Correct Circuit Information using GUI or LCD Display
   - Input Voltage: Typically around 54.5V
   - Lower Voltage: Around 56V or higher
   - Upper Voltage: 54V-56V
   - Output Current: Greater than 0, exact value will vary
   - Auto Line Resistance: Varies depending on cable length and gauge

Installation and Testing of Bypass Module

1. Confirm Power Module Circuit 01 input LED (P-In) and output LED (P-Out) are solid green

2. Insert a Bypass Module into Slot 2 of Shelf
   - Bypass module input LED (P-In) and output LED (P-Out) illuminate solid green
   - Confirm Power Module input LED (P-In) and out LED (P-Out) remain solid green

3. Test Bypass Function is working properly
   - Press metal tab on lower left of Power Module front bezel, latch will flip outward
   - Pull the module outward until Power Module unseats and its LEDs go dark
   - On Bypass Module, confirm the input LED (P-In) remains solid green, and confirm the output LED (P-Out) changes to solid yellow, indicating circuit is in bypass
   - Confirm the OVP voltage display continues to show a non-zero voltage for L1 and U1

4. Insert Power Module back into slot
   - Power Module input LED (P-In) should illuminate solid green, output LED (P-Out) will blink red, and then turn to solid green
   - Bypass Module input LED (P-In) will remain solid green and the output LED (P-OUT) will change from solid yellow to solid green, indicating the circuit is no longer in bypass
   - Confirm U1 voltage is showing 54V-56V

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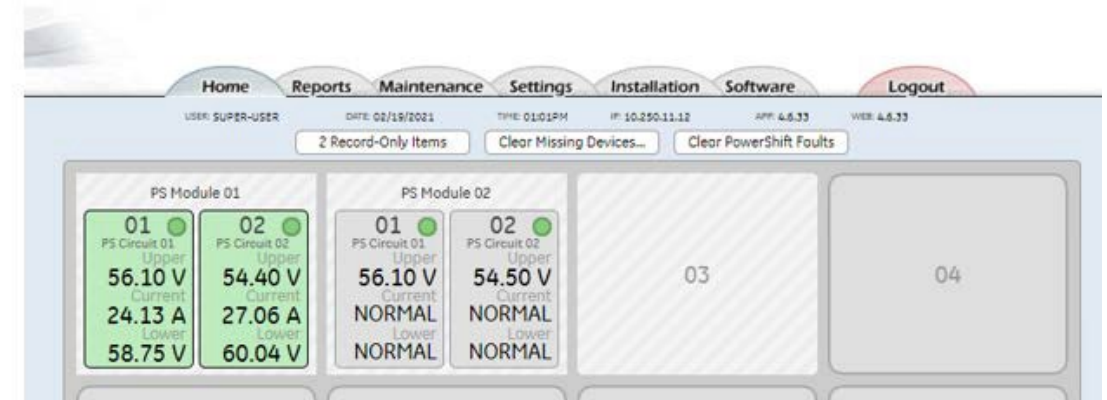
Power Up Remaining Circuits

1. Repeat previous steps for each circuit, one circuit at a time

   - Turn on circuit breaker

   - Insert Additional Power Module as needed

   - Confirm OVP base display lower and upper voltage measurements

   - Perform the OVP Circuit Assignments

   - Confirm LCD Display shows the circuit measurements

   - Perform check on circuit measurements

   - Insert additional Bypass Module as needed and test bypass circuits
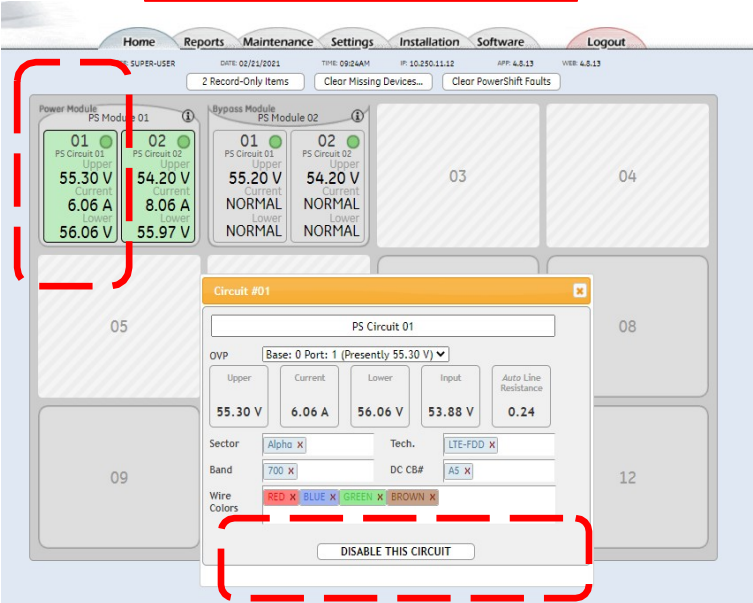
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Active Alarm Window

- Shows active alarms currently in the system.

- Modules are individual identified for ease of use.

- Remaining Alarms will generate above Module Alarms.

- Provides Date/Time/Severity/Description of Alarms

- Clear Missing Device

- Clear Faults

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Procedure to Disable an Unused Circuit

1. Select the Circuit to Disable

2. Click on the Disable window

3. Warning Confirmation

4. Disabled Circuit Shown in GUI

5. Reenable from GUI

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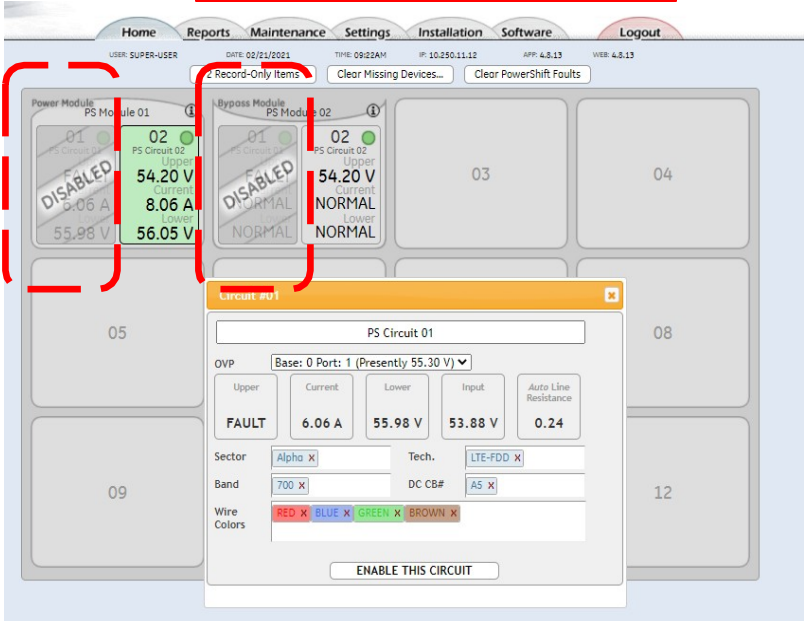
ALARM HISTORY REPORT
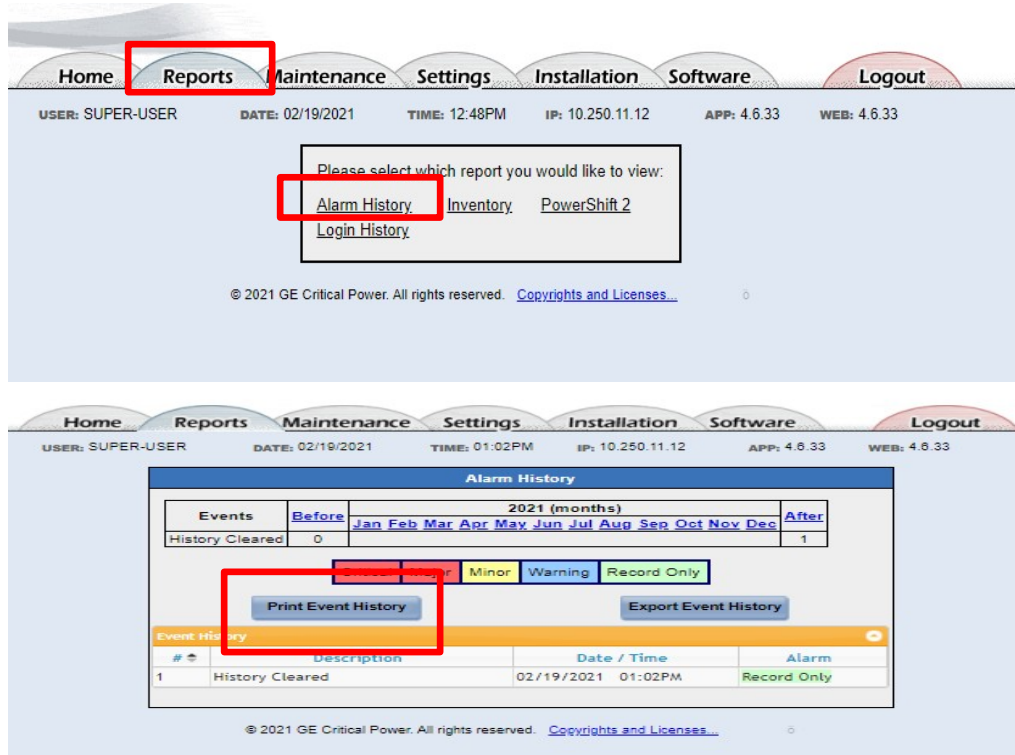
ALARM HISTORY REPORT-Records all Alarms including Login Date/Time, Configuration Changes, and Cleared History

- Ensure the system has no active alarms
- **Clear Alarm History from Maintenance Tab**
- Save Report and Submit with Closeout Documents

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Maintenance Tab

Alarm History

- From the Maintenance Tab at the Top of the Home page it is recommended to clear alarm history after all faults are cleared.

- This insures that prior to leaving the site the system is functioning correctly.

- Only alarms that have resolved can be cleared from the history.

Lamp Test

- Run a LED lamp test to cycle LED (Red, Amber, Green)

Clearing PS Faults and Latched Events

- Some critical events may require the use of the GUI to clear faults or latched events. Clears High Temp Alarm only.

Alarm Tests

- Closes dry contact relays for testing alarm. (20 seconds)

SNMP Trap Test

- Remote controller setup testing

Reboot

- Restarts controller, LEDS on output will flash red and restore back to green.

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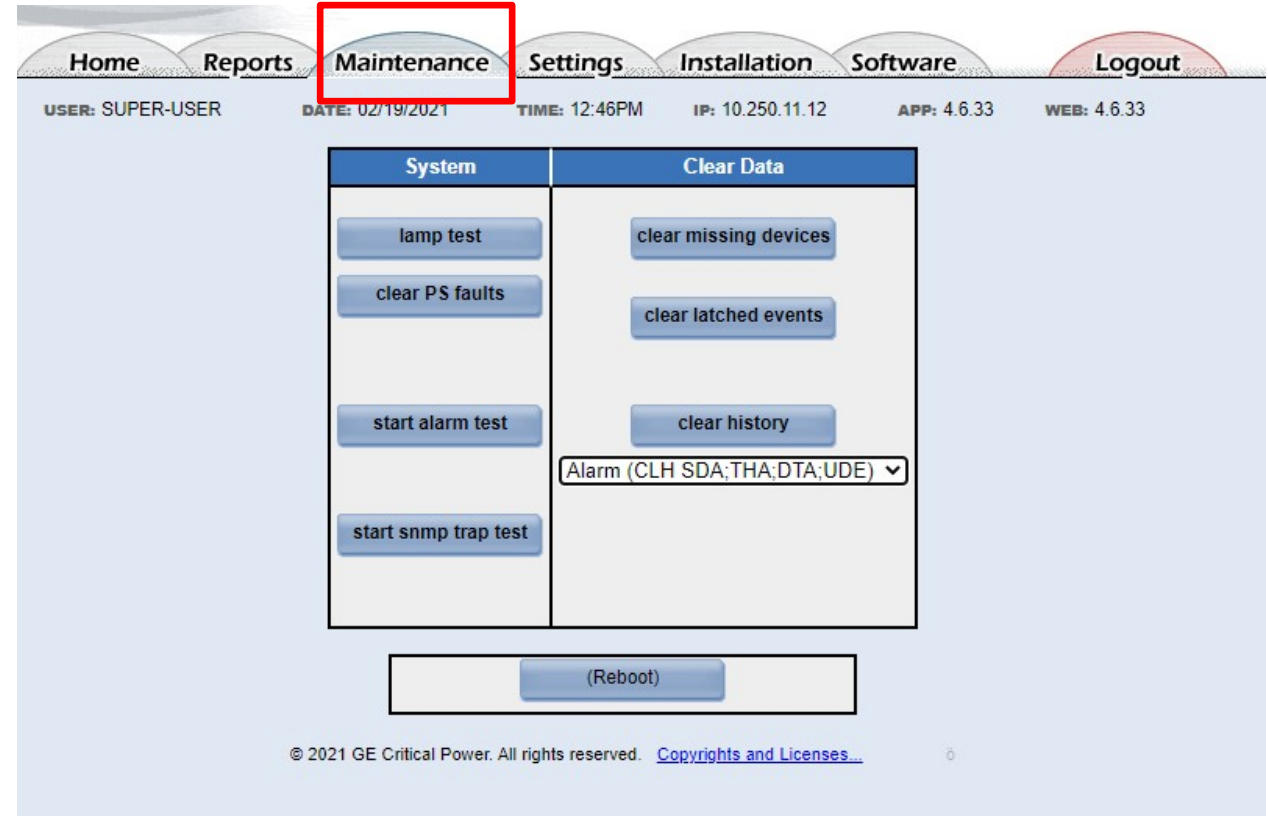
Inventory Report

1. Provides Hardware and Software information for PowerShift II Shelf and Associated Components;

   - Module Types

   - Module Serial Number, Hardware Version, and State of Module

   - Controller Card Serial Number and Version

Printer

| | Home | Reports | Maintenance | Settings | Installation | Software | Logout |

USER: SUPER USER(CRIT 1)   DATE: 02/15/2018   TIME: 12:05:43   IP: 192.168.2.1   APP: X4.0.67   WEB: X4.0.67

Currently Updating Board Table...

Inventory

Plant	Controller	Battery
Site ID: n/a	**Comcode:** 1600096527A	**Type:** 0 strings of VALVE-REG
Description: MOHEGAN SUN	**CLEI:** n/a	**Capacity:** 0 Ah installed, 0 Ah online
Plant Type: -48V	**Series:** 2:3	**Monitoring:** 0 thermal, 0 voltage
Volts: -52.80 V	**Board Code:** PS841A_0I6R_USB_VZW	**Reserve Time:** LOW CURRENT
Amps: 0.0 A	**Serial Number:** LBGEPE17KZ47022064	**Last Test Results:** NOT RUN
	Boot Block: 1.3.1	
	Application: X4.0.67	
	Web Pages: X4.0.67	
	Defaults: STD.1.4	
	Modbus: 1.0.2	

Line Drop Compensator

ID ▲	Description	Serial Number	Comcode	CLEI	Type	Version	State
RHT1	LDC Translator	LBGEPE17KZ46036180	1600096526A	CLEI CODE	1:1	1.7	PRESENT
RHM01	LDC Module 01	LBGEPE17KZ48071233	1600096524A	CLEI_CODE	PS1600DC73	1.20	PRESENT
RHM02	LDC Module 02	LBGEPE18KZ02016714	1600121677A	CLEI_CODE	PS1600BP	1.20	PRESENT
RHM03	LDC Module 03	LBGEPE17KZ48071227	1600096524A	CLEI_CODE	PS1600DC73	1.20	PRESENT
RHM04	LDC Module 04	LBGEPE18KZ02016702	1600121677A	CLEI_CODE	PS1600BP	1.20	PRESENT
RHM05	LDC Module 05	LBGEPE17KZ52001592	1600096524A	CLEI_CODE	PS1600DC73	1.20	PRESENT
RHM06	LDC Module 06	LBGEPE18KZ02016660	1600121677A	CLEI_CODE	PS1600BP	1.20	PRESENT
RHM07	LDC Module 07	LBGEPE17KZ48071236	1600096524A	CLEI_CODE	PS1600DC73	1.20	PRESENT
RHM08	LDC Module 08	LBGEPE18KZ02016675	1600121677A	CLEI_CODE	PS1600BP	1.20	PRESENT
RHM09	LDC Module 09	LBGEPE17KZ52001588	1600096524A	CLEI_CODE	PS1600DC73	1.20	PRESENT
RHM10	LDC Module 10	LBGEPE18KZ02016708	1600121677A	CLEI_CODE	PS1600BP	1.20	PRESENT
RHM11	LDC Module 11	LBGEPE17KZ48071134	1600096524A	CLEI_CODE	PS1600DC73	1.20	PRESENT
RHM12	LDC Module 12	LBGEPE18KZ03003079	1600121677A	CLEI_CODE	PS1600BP	1.20	PRESENT

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Clearing a Missing Device

- Missing Device alarms are caused when a module is relocated from one location to another, and the now empty slot location is not used.

- These alarms are easily cleared by using the Clear Missing Devices button on the GUI Home Page.
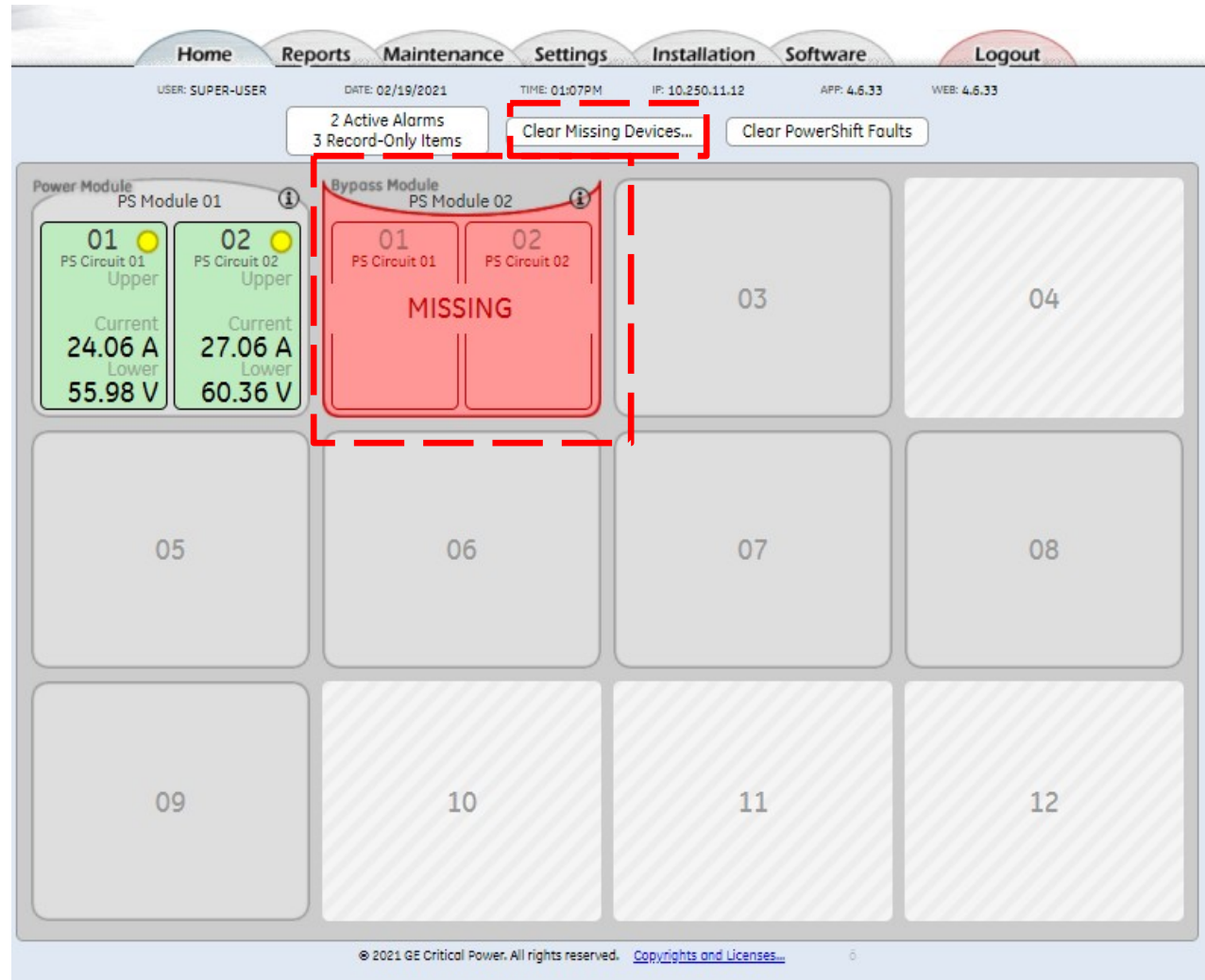
Software Tab

- Used when it requested to save the configuration as a backup file.

- Files are saved as a .gal file and can be renamed with a site name .gal.

- This tab can also be used when needing to perform a firmware upgrade on a controller.

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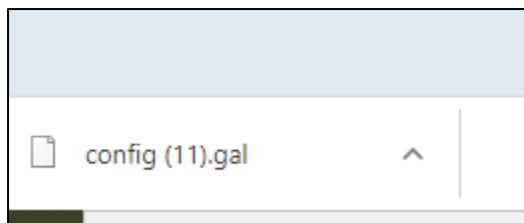
Setting Tab

- Optional location to set date at time using PC Date and time.

- Remote Controller setup and notification setting

- Changing Alarm Severity Table
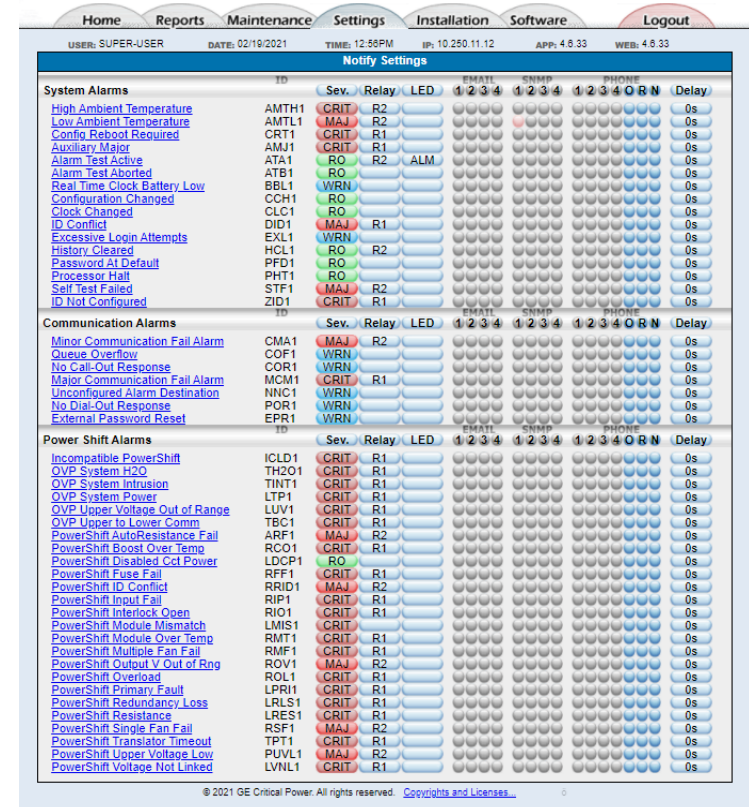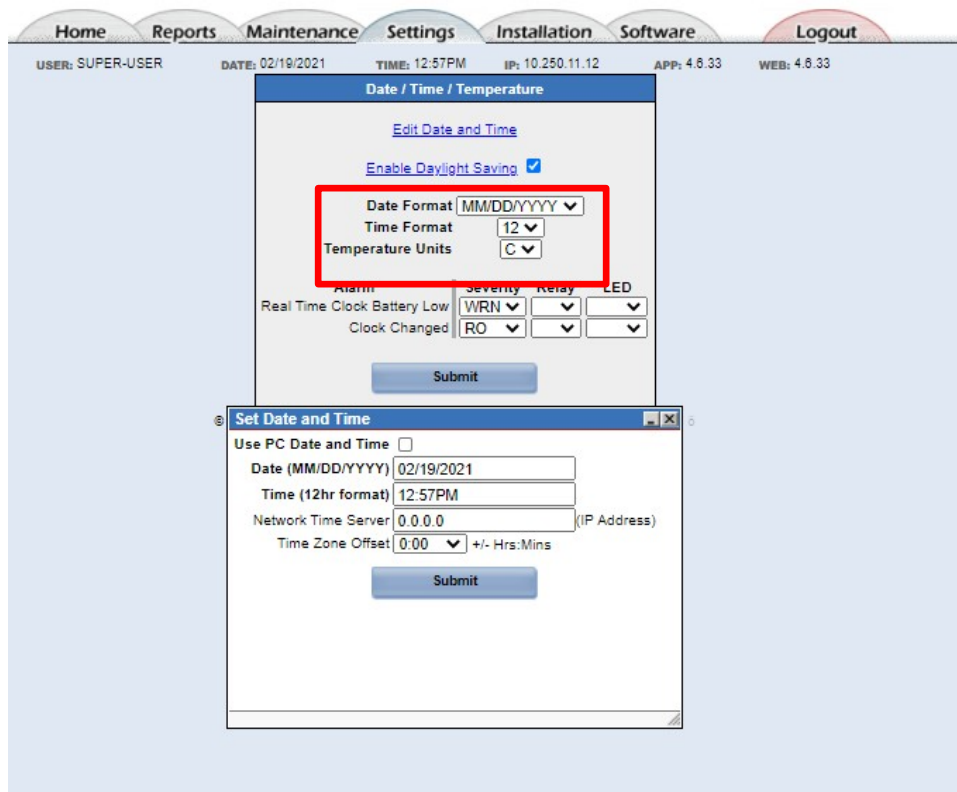
Dry Contact Alarm Connection

The PowerShift alarm relay terminal block is located on the back of the shelf. The relays are Open On Alarm (Normally Closed).

If required, integrate the PowerShift Critical and Major alarms into the cell site alarm system (e.g., to a 66-block) using the wiring positions shown below

ALARM DESCRIPTION

GUI Alarms

The following table lists all of the PowerShift alarms generated in the GUI; active alarms are viewable in the GUI Home page, and the Reports tab provides an Alarm History report.

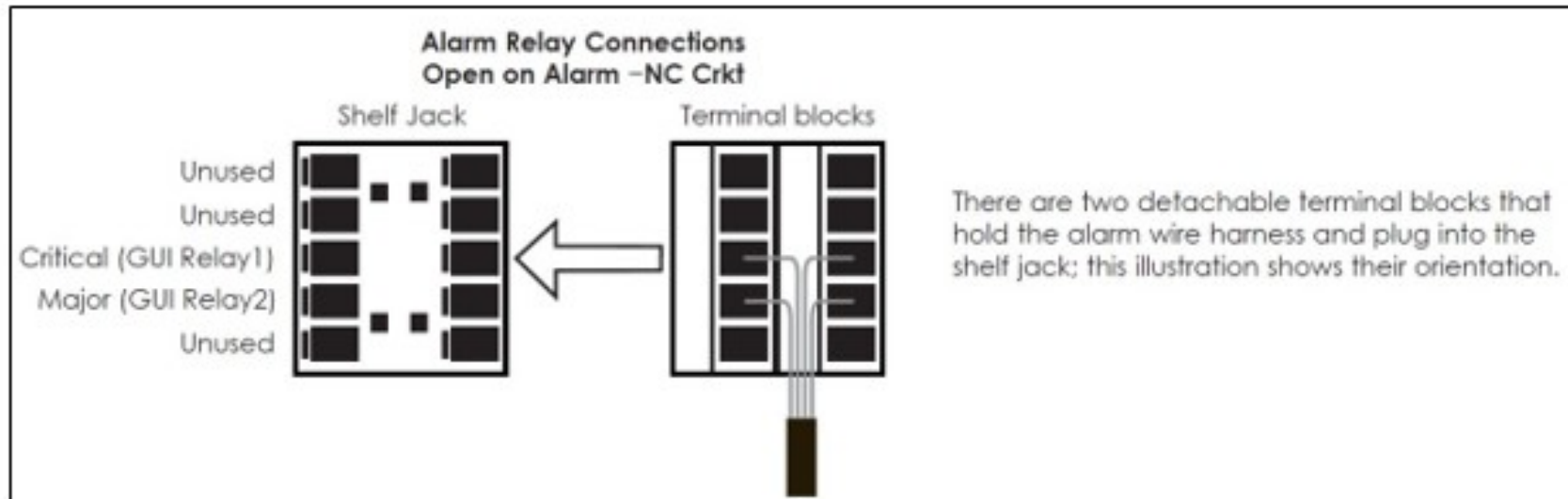| GUI Alarm Description	Alarm Type	Severity	Relay #	Description [Troubleshooting]
High Ambient Temperature	System	Major	2	Shelter/cabinet air temperature is above acceptable range
Low Ambient Temperature	System	Major	2	Shelter/cabinet air temperature is below acceptable range
Config Reboot Required	System	Critical	1	"Controller must be rebooted due to a configuration change [Reboost using GUI or reseat the controller to power cycle it]"
Auxiliary Major	System	Critical	1	N/A for PowerShift
Alarm Test Active	System	Read Only		Indicates user has initiated test of the alarm relays. True while test is active
Alarm Test Aborted	System	Read Only		User alarm test was aborted due to an actual alarm condition
Real Time Clock Battery Low	System	Warning		The lithium battery in the controller RTC should be replaced
Configuration Changed	System	Read Only		User has changed the system configuration
Clock Changed	System	Read Only		User has changed the system time/date
ID Conflict	System	Critical	1	Indicates a problem with one or more boost or bypass modules
Excessive Login Attempts	System	Warning		User has tried to login with an invalid password - three failed attempts
History Cleared	System	Read Only		User has cleared history logs for alarm history or other history logs
Password At Default	System	Read Only		The login passwords are at factory default
Processor Halt	System	Read Only		The controller processor has stopped; controller was unseated in the shelf or power is otherwise removed from the controller. Entry is written during boot up based on RTC flag
Self Test Failed	System	Major	2	N/A for PowerShift
ID Not Configured	System	Critical	1	Boost or bypass module has an ID that is outside valid range
Minor Communication Fail Alarm	Comms	Major	2	Controller has lost communication with one boost or one bypass module
Queue Overflow"	Comms	Warning		N/A for PowerShift; applies only when a modem is used
No Call-Out Response	Comms	Warning		N/A for PowerShift; applies only when a modem is used
Major Communication Fail Alarm	Comms	Critical	1	Controller has lost communication with multiple boost/bypass modules
Unconfigured Alarm Destination	Comms	Warning		Alarm is configured to alert via dial-out or SNMP, but no destination has been defined
No Dial-Out Response	Comms	Warning		N/A for PowerShift; applies only when a modem is used
External Password Reset	Comms	Warning		N/A for PowerShift
Incompatible PowerShift	PowerShift	Critical	1	The controller has detected PowerShift V1 boost modules installed in the shelf; only V2 modules may be used with PowerShift V2 shelf
OVP System H20	PowerShift	Critical	1	OVP alarm due to water ingress sensor activating on OVP dome unit
OVP System Intrusion	PowerShift	Critical	1	OVP alarm due to dome unit cover having been loosened or removed
OVP System Power	PowerShift	Critical	1	OVP alarm due to a power issue on one or more circuits
OVP Upper Voltage Out of Range	PowerShift	Critical	1	The reported radio input voltage is outside expected range (37V to 60V)
OVP Upper to Lower Comm	PowerShift	Critical	1	The OVP is reporting loss of communication between base unit and tower top unit(s)
PowerShift Auto Resistance Fail	PowerShift	Major	2	PowerShift was unable to complete a line resistance calculation for a circuit
PowerShift Boost Over Temp	PowerShift	Critical	1	"The PowerShift boost/bypass module has exceeded its operating temperature [Check for failed fan alarm on module; check the shelter or cabinet cooling system]"
PowerShift Fuse Fail	PowerShift	Critical	1	The PowerShift boost converter module has a failed internal fuse; replace the module
PowerShift ID Conflict	PowerShift	Major	2	Possible issue with the PowerShift shelf unit
PowerShift Input Fail	PowerShift	Critical	1	PowerShift has lost input power to a circuit; the circuit previously had input power applied and a boost/bypass module was installed for the circuit
PowerShift Interlock Open	PowerShift	Critical	1	"Boost or bypass module is improperly seated in the shelf, or the module backplane is damaged, or the shelf backplane is damaged [Reseat modules; inspect backplane of modules for any obvious damage]"

Cont.

GUI Alarm Description	Alarm Type	Severity	Relay #	Description [Troubleshooting]
PowerShift Module Over Temp	PowerShift	Critical	1	"The air inlet temperature to the module is above threshold temperature setpoint [Check shelter or cabinet cooling system]"
PowerShift Multiple Fan Fail	PowerShift	Critical	1	Both fans in a PowerShift boost or bypass module have failed; replace the module
PowerShift Output V Out of Rng	PowerShift	Major	2	"PowerShift boost module output voltage has exceeded the maximum output voltage of 73V [Should not occur unless module is faulted; replace the module]"
PowerShift Overload	PowerShift	Critical	1	"The output current on a PowerShift circuit has exceeded the specified maximum value of 30A, the module has turned off its output; if circuit over-current condition clears within 20 minutes, then module will re-enable output [Check for short-circuit on cable or radio; check for radio drawing excessive current]"
PowerShift Primary Fault	PowerShift	Critical	1	"A boost and bypass module pair are simultaneously trying to supply load current to a circuit [Unseat bypass module then reseat, if problem persists then swap in a different boost or bypass module to determine which module is faulted]"
PowerShift Redundancy Loss	PowerShift	Critical	1	One or more PowerShift circuits has lost redundant backup power on a circuit; this can be due failure of a boost or bypass module, removal of a boost or bypass module for maintenance purposes, etc.
PowerShift Resistance	PowerShift	Critical	1	The line resistance calculated by PowerShift has a value exceeding 1 Ohms; this indicates a problem condition with the line or misapplication of the product
PowerShift Single Fan Fail	PowerShift	Major	2	One fan in a PowerShift boost or bypass module has failed; replace the module
PowerShift Translator Timeout	PowerShift	Critical	1	"Communication failure between PowerShift shelf and OVP base unit [Check RS485 cable connection from OVP Boost Output port to PowerShift shelf R1 port]"
PowerShift Upper Voltage Low	PowerShift	Major	2	The reported radio input voltage is lower than the minimum expected voltage of 37V
PowerShift Voltage Not Linked	PowerShift	Critical	1	A PowerShift circuit has input power applied and its output power is enabled, but the GUI has not been configured to link an OVP voltage measurement to the circuit

Commscope Technical Support

Mobility Solutions Wireless Tech Support – CommScope

Phone: (800) 255-1479 or (888) 297-6433

Option 3 – AWP (All Wireless Products)

Normal Hours 8 AM – 5 PM CST

After Hours: Emergency Support Only (answering service will page engineer on duty)

Have an issue or a question?   Create a Tech Support Ticket at: www.commscope.com/wisupport

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Raycap OVP Types

6 OVP RM vs 12 OVP RM

Features (2260):
- 6-circuit OVP design
- 30-V1-HV Strikesorb Surge Protection
- Alarm Wire Connections: 36
- Voltage Monitoring of Tower Top voltages as well as alarms for intrusion, humidity & OVP Power

Features (4520):
- 12-circuit OVP design
- 30-V1-2CHV (same protection, 1/3 space)
- Alarm Wire Connections: 4 (simplified)
- Tower top Voltage reporting through RS485 link
- Alarms for intrusion, humidity and OVP power
- Ability to land power and fiber in a 3U space
- Modular, field upgradable CPRI addition
- Daisy chain readiness for additional units
- Vendor agnostic RS485 output to up-converter solutions.

Alternates

2260 + Retrofit Circuit
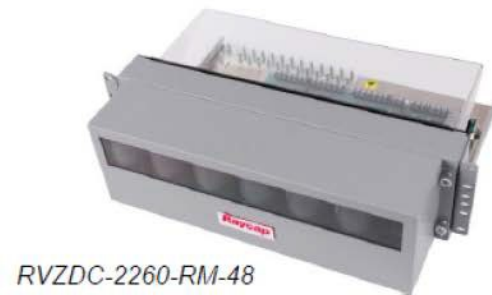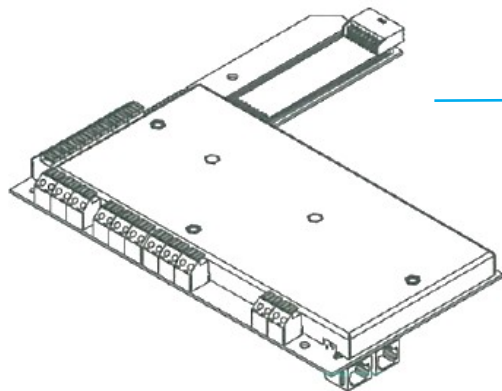
4520 Rack Mount

RVZDC-2260-RM-48

Evolution

RVZDC-4520-RM-48

COMMSCOPE
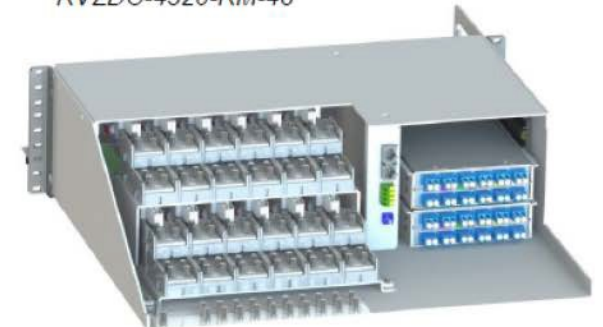
Rack Mount 12 RRU OVP – Front Panel

RCMDC-4520-RM-48
RCMDC-4520-RM-482

COMMSCOPE
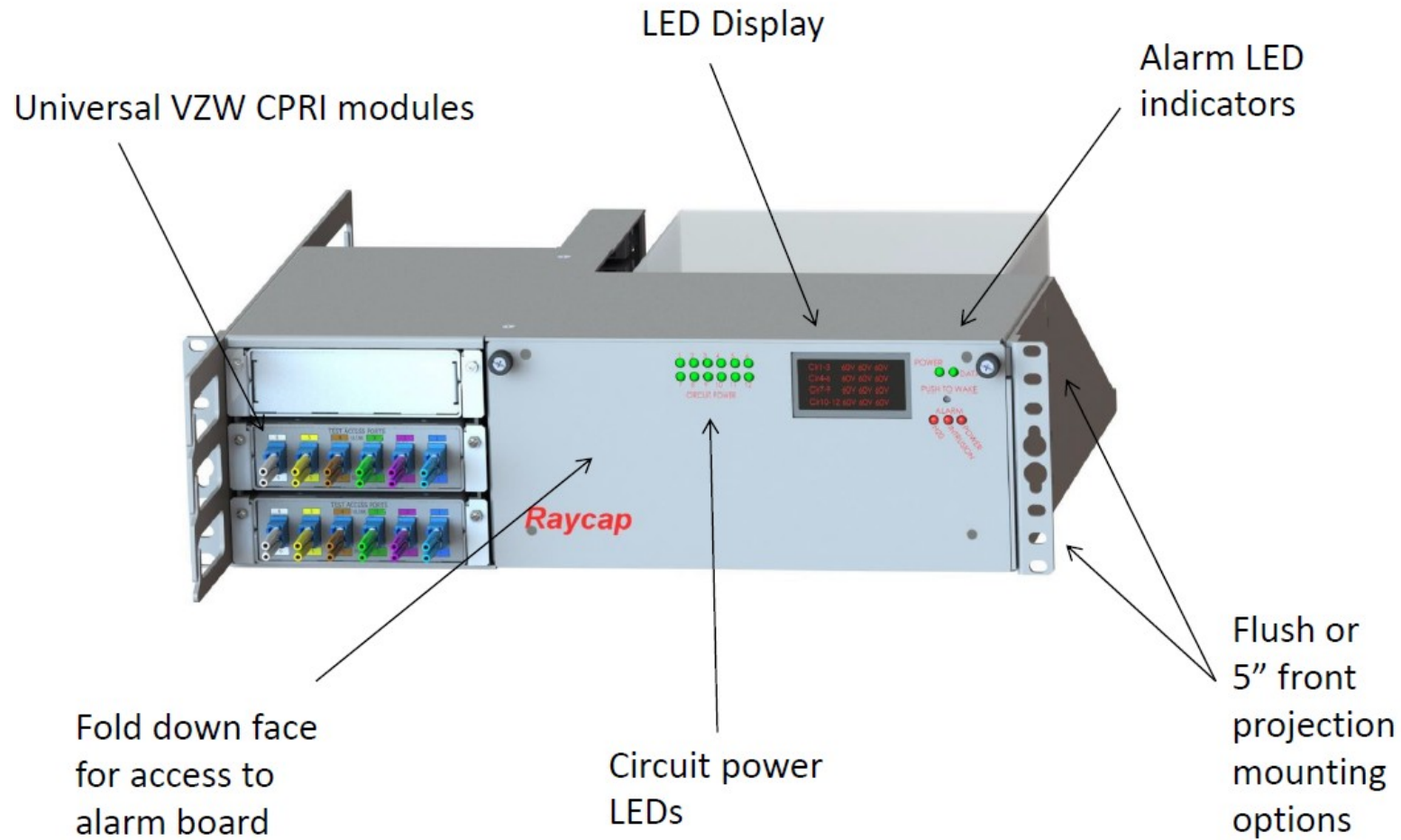
Rack Mount 12 RRU OVP – Power/Fiber Connections
RCMDC-4520-RM-48
RCMDC-4520-RM-482

Daisy chain and DC up-converter RJ45 connections

(2) RS-485 twisted pair connections from Tower top unit(s). Wires pass through to front PCB

Dual rows horizontally stacked Strikesorb

-48V bus 7-12

RTN bus 7-12

-48V bus 1-6

RTN bus 1-6

Main ground

COMMSCOPE
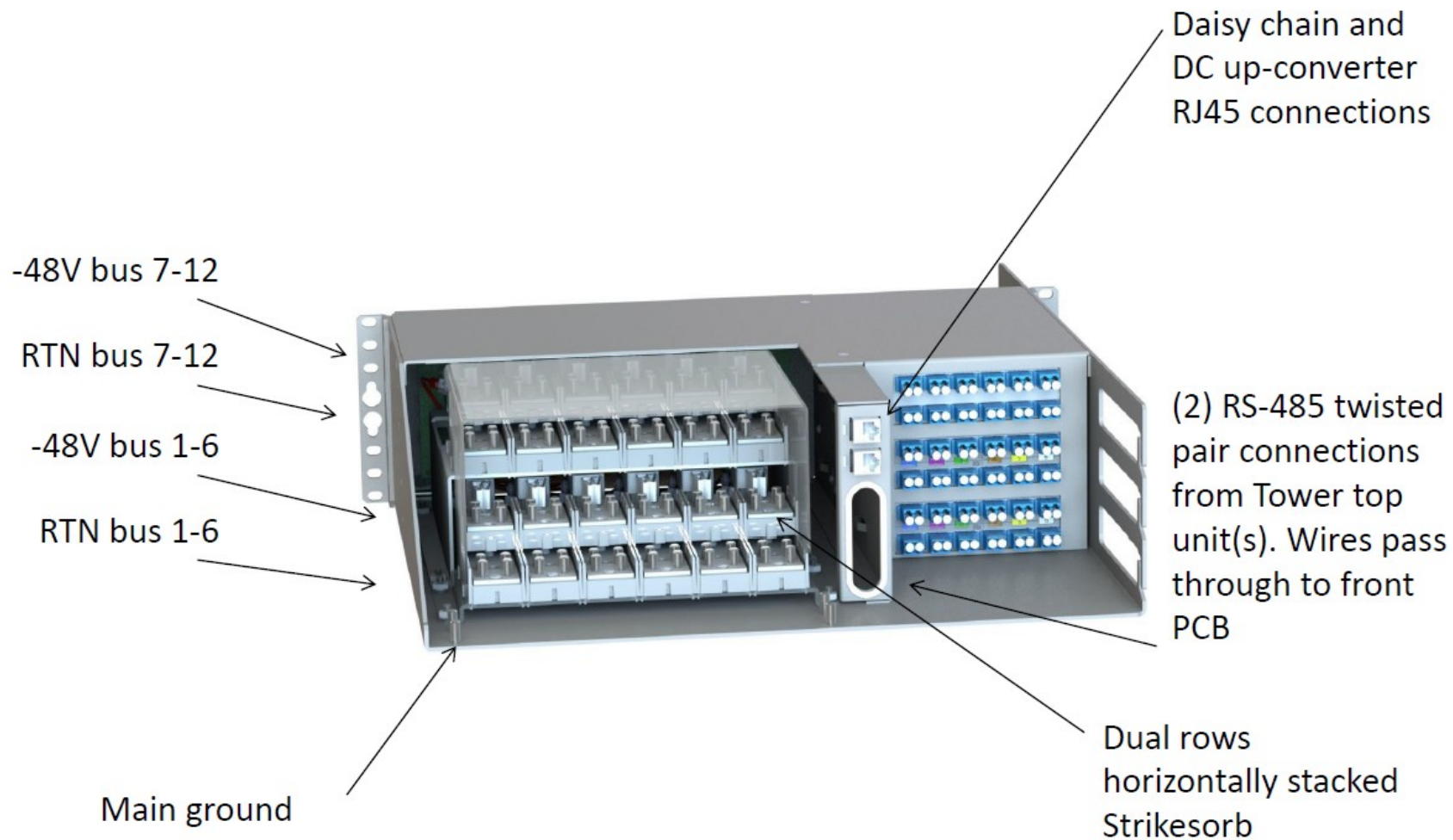
Raycap 2 Position OVP RC3DC-1064-PF-48

- Raycap 2 Position OVP manufactured from May of 2013 onward do have voltage monitoring capabilities.

- The same part number is used for the units that may not have voltage monitoring capabilities.

- Inspection of the installed units will be mandatory to assure that these units will work with PowerShift configurations and also to confirm that alarm pairs were terminated on the OVP.
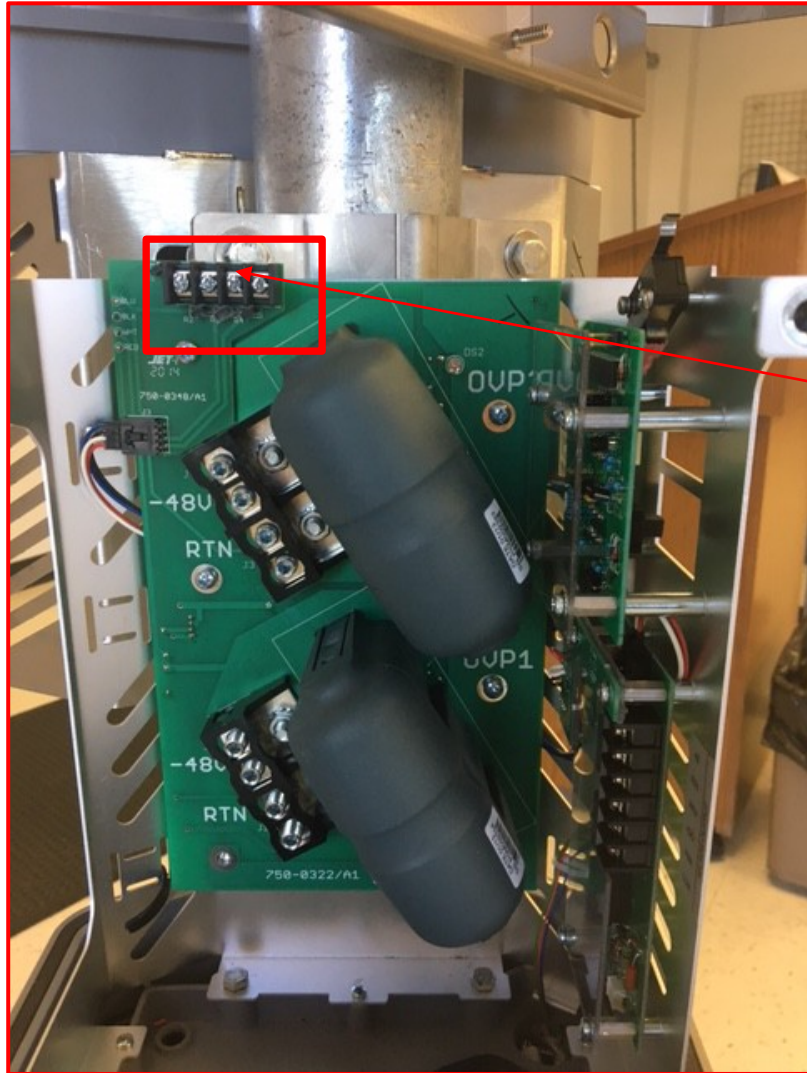
Voltage monitoring units will have a 4 position terminal strip at the top of the OVP board.

SURGE PROTECTION DEVICE TYPE 2	UL 1449
ENVIRONMENTAL TYPE 4	MFG DATE 00-00
CONTAINS NO SERVICEABLE PARTS	H1344

OPER TEMP   -35 TO +70C
In   20 kA   MODEL: RC3DC-1064-PF-48
OPER VOLTAGE   60 VDC
MCOV   75 VDC
VPR   800V DC+ to DC-, 1000V DC+ to GND, 800V DC- to GND

SUITABLE FOR USE ON A CIRCUIT CAPABLE OF
DELIVERING NOT MORE THAN 25,000 DC AMPERES, 60
VOLTS MAXIMUM, WHEN PROTECTED BY A 150 AMPERE
CIRCUIT BREAKER RATED 80 VOLTS MAXIMUM. REMOTE
ALARM WIRES TO BE CONNECTED TO CLASS 1   SN: 012345
CIRCUITS ONLY.

Raycap, Inc. USA 800 890-2569

This product is subject to one or more patents   150-2773A
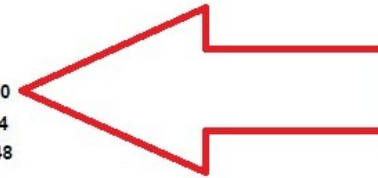
COMMSCOPE

Raycap   RCMDC-3300-PF-48 & RCMDC-3315-PF-48   6 Circuit OVP

Intrusion Sensor

Intrusion Sensor

Strikesorb Module

-48V Connection

Return Connection

Fiber Connection Panel

Fiber Panel Label
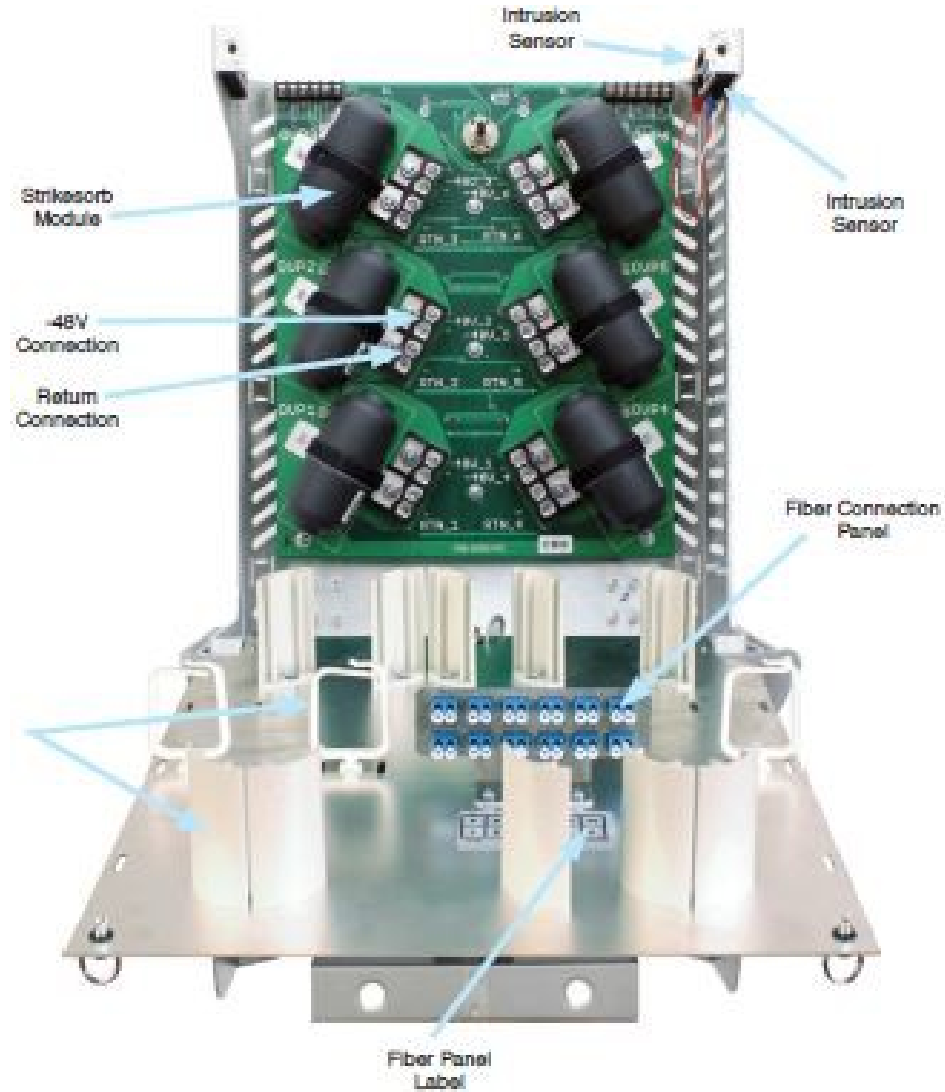
Raycap Design Progression for 3315 OVP

RCMDC-3315-PF-48
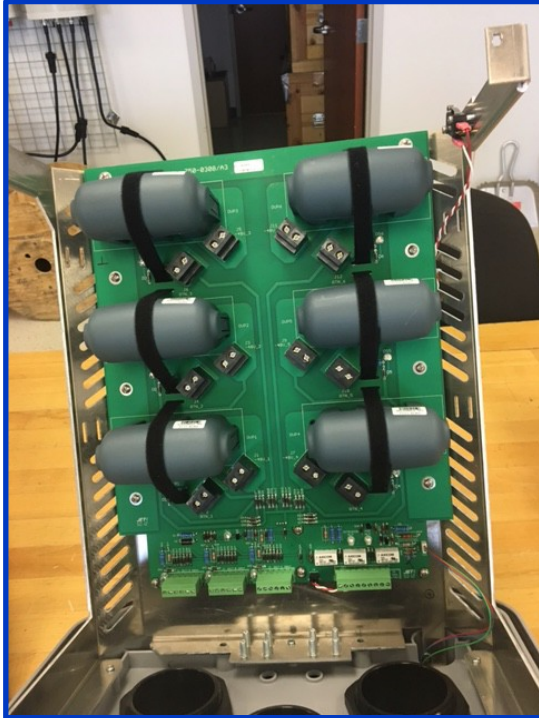
First Generation OVP

No Volt Meter. OVP box must be replaced for PowerShift

Note – **765** units sold through Commscope

RCMDC-3315V-PF-48

RC2DC-3315-PF-48 Rev A &B
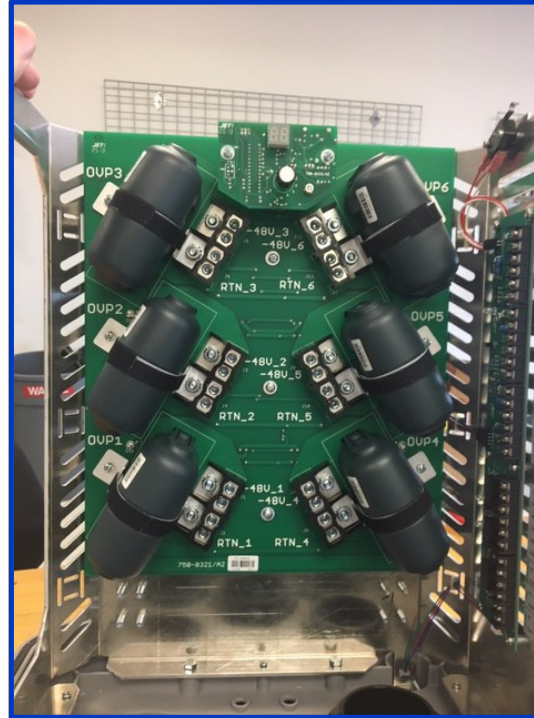
Second generation OVP

Has a volt meter but would require board upgrade and running conductors to each OVP. Needs to be replaced for PowerShift.

Note : **4452** Sold through Commscope

RC2DC-3315-PF-48 Rev C

RC3DC-3315-PF-48
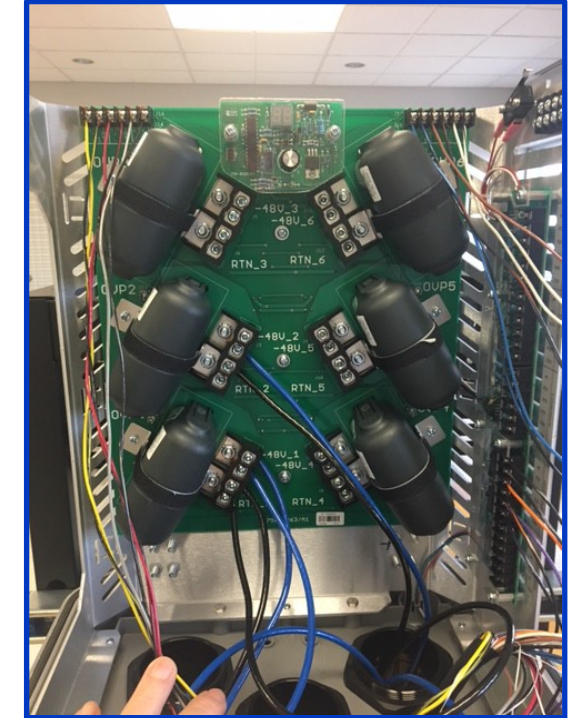
Third Generation OVP

RC2 and RC3 have different grommet kits but are essentially the same units.

RS485 Retrofit upgrade required if the 3315 is interfacing with a 6627 or 4520 OVP.

Note: **43,251** Sold through Commscope

COMMSCOPE

Raycap   RCMDC-6600-PF-48 & RCMDC-6627-PF-48   12 Circuit OVP

OVP Retrofit Kits

Kit for 3315 Box
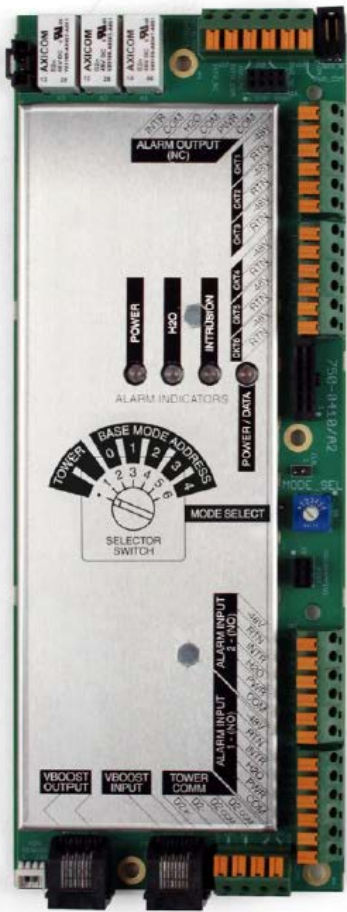
Kit for 2260 Rack Mount

Configure Manual Line Resistance

Determine Line Resistance

<u>IMPORTANT</u>:

- Take care to determine an accurate cable length between PowerShift shelf and remote radio unit; try to get within +/- 25 feet of actual cable length

- For a building rooftop site make sure to account for horizontal cable path; this increases the cable length in addition to the height of the building

- Double-check the resistance look-up table (Section 3) to ensure the correct cable gauge/length and corresponding resistance value have been selected

- When entering the resistance value into the PowerShift shelf GUI web page, double-check to ensure the correct resistance value has been entered

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Cable Gauge Resistance Lookup Table

Distance to RRU	Cable Gauge	Distance to RRU	Cable Gauge	Distance to RRU	Cable Gauge	Distance to RRU	Cable Gauge	Distance to RRU	Cable Gauge
Feet	6 AWG	Feet	6 AWG	Feet	6 AWG	Feet	8 AWG	Feet	8 AWG
150	0.13	600	0.53	1050	0.92	150	0.2	600	0.8
175	0.15	625	0.55	1075	0.95	175	0.23	625	0.84
200	0.18	650	0.57	1100	0.97	200	0.27	650	0.87
225	0.2	675	0.59	1125	0.99	225	0.3	675	0.9
250	0.22	700	0.62	1150	1.01	250	0.34	700	0.94
275	0.24	725	0.64			275	0.37	725	0.97
300	0.26	750	0.66			300	0.4	750	1.01
325	0.29	775	0.68			325	0.44		
350	0.31	800	0.7			350	0.47		
375	0.33	825	0.73			375	0.5		
400	0.35	850	0.75			400	0.54		
425	0.37	875	0.77			425	0.57		
450	0.4	900	0.79			450	0.6		
475	0.42	925	0.81			475	0.64		
500	0.44	950	0.84			500	0.67		
525	0.46	975	0.86			525	0.7		
550	0.48	1000	0.88			550	0.74		
575	0.51	1025	0.9			575	0.77		

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Configure Manual Resistance Mode Procedure

Click on the Home tab again and note at the top of the web browser where the URL address is displayed:

Note: If the URL address is not displayed the browser might be in full screen mode, try hitting the F11 keyboard button to exit the browser full screen mode

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At the end of the URL, add the text **&resist** as shown below, then hit the keyboard Enter key ("resist" must be lower case)
(use Shift+7 key to enter the "&" symbol)

After you hit the Enter key, the page should reload, and the Home page will appear again as normal

Click inside the circuit box, a pop-up box will display circuit details including the Resistance Mode and Manual Resistance value fields
(if these parameters are not visible then check that you entered **&resist** correctly; manually refresh the page if needed)

COMMSCOPE
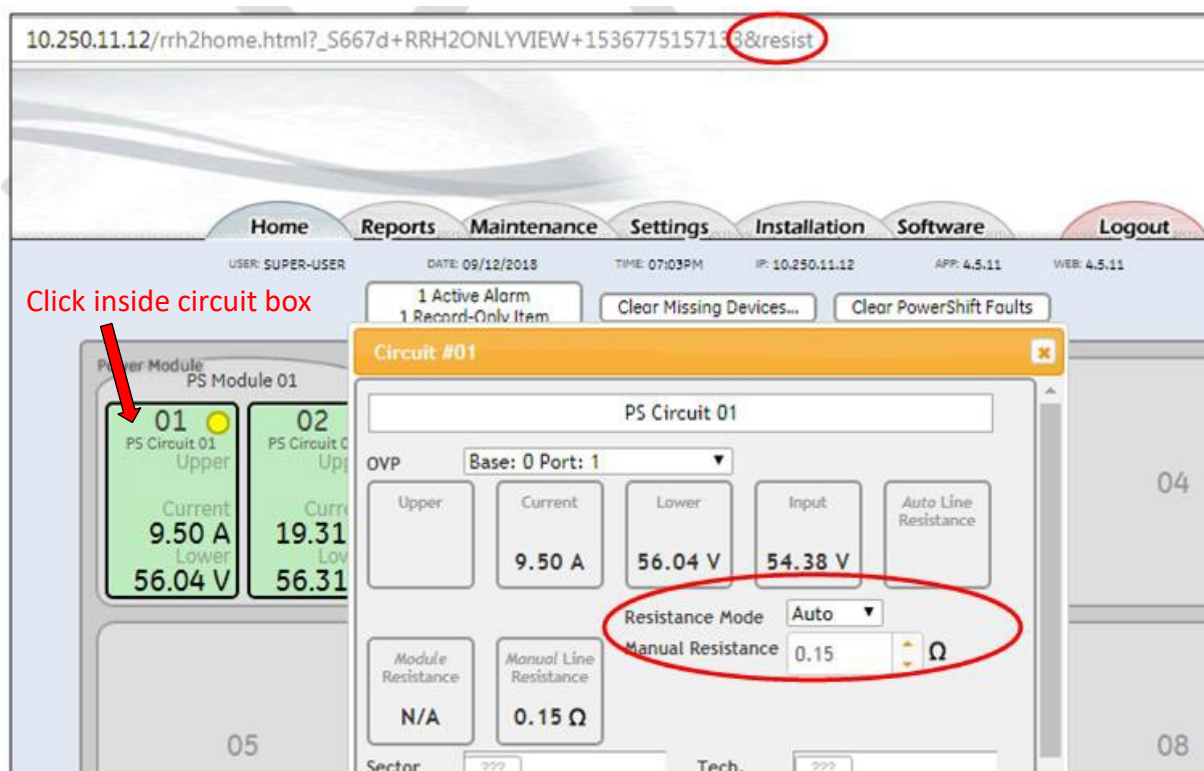
Set Manual Resistance Value

IMPORTANT: The following steps must be performed for each circuit

Click on the **Resistance Mode** drop-down list and select Manual

COMMSCOPE
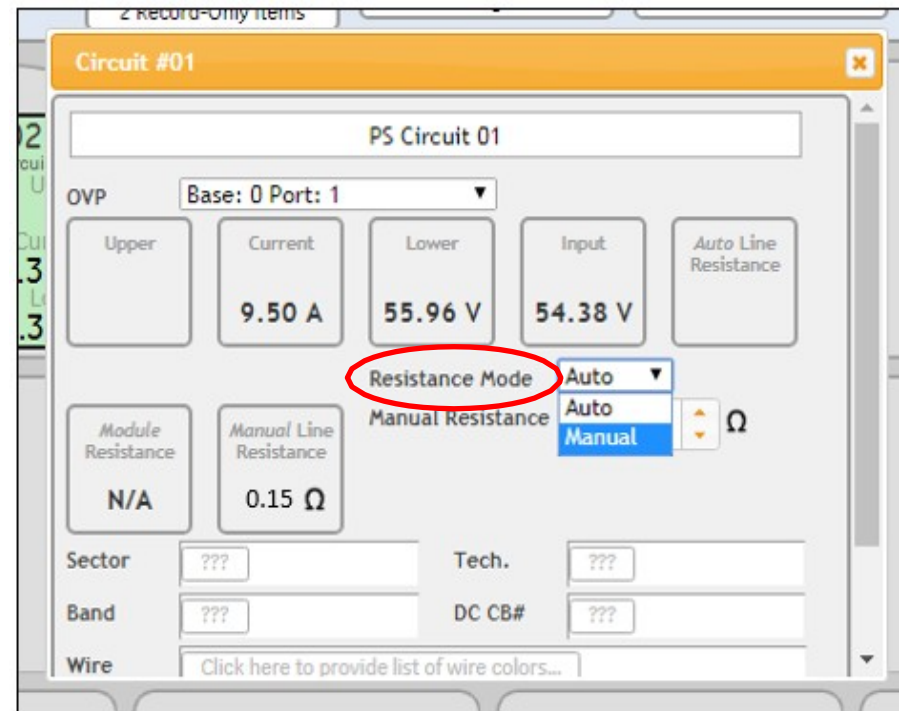
Set Manual Resistance Value

Click anywhere on the page to submit the change; the bottom of the page will show "Updated"
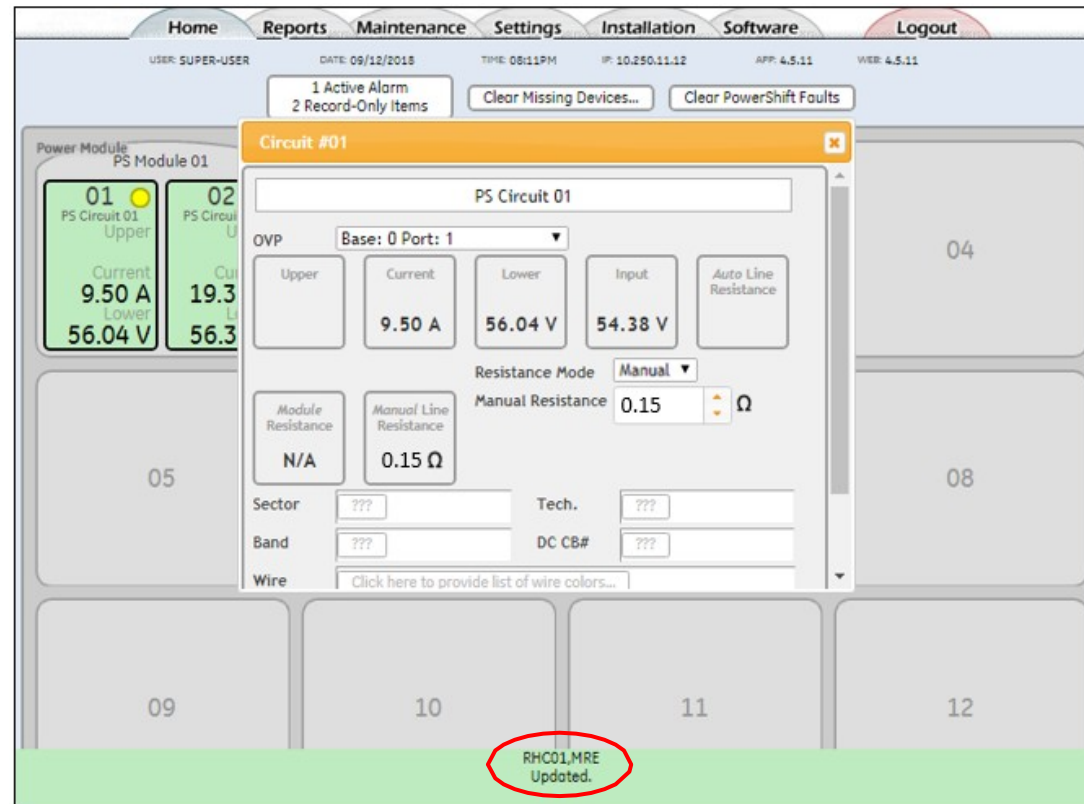
Set Manual Resistance Value

Use the lookup table in Section 3 to obtain the resistance value based on the cable length and the cable gauge (6-AWG for most Verizon sites); the example below is a 6-AWG cable with 375 feet length, which is 0.33 Ω (ohms)

Enter the desired resistance value into **Manual Resistance** field, then click anywhere on the page to cause the value to be submitted; the bottom of the page will show "Updated"

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Set Manual Resistance Value

As indicated below, confirm the circuit shows Manual Line Resistance and confirm the resistance value is correct as determined from the Section 3 lookup table
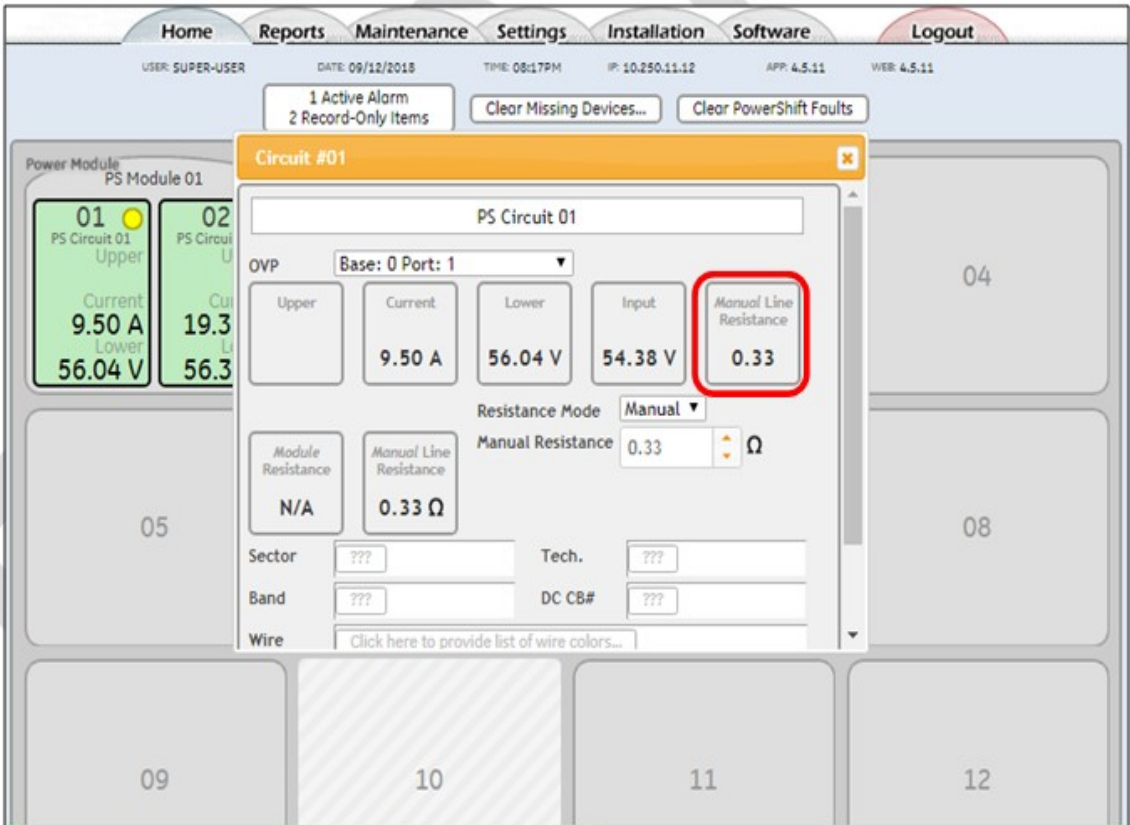
Repeat Manual Resistance for All Circuits

Repeat the previous steps for each circuit

When all the circuits have been configured for Manual Resistance operation, there should be no remaining alarms; note that any unused circuits must be disabled (as shown in the example below for circuit 4):
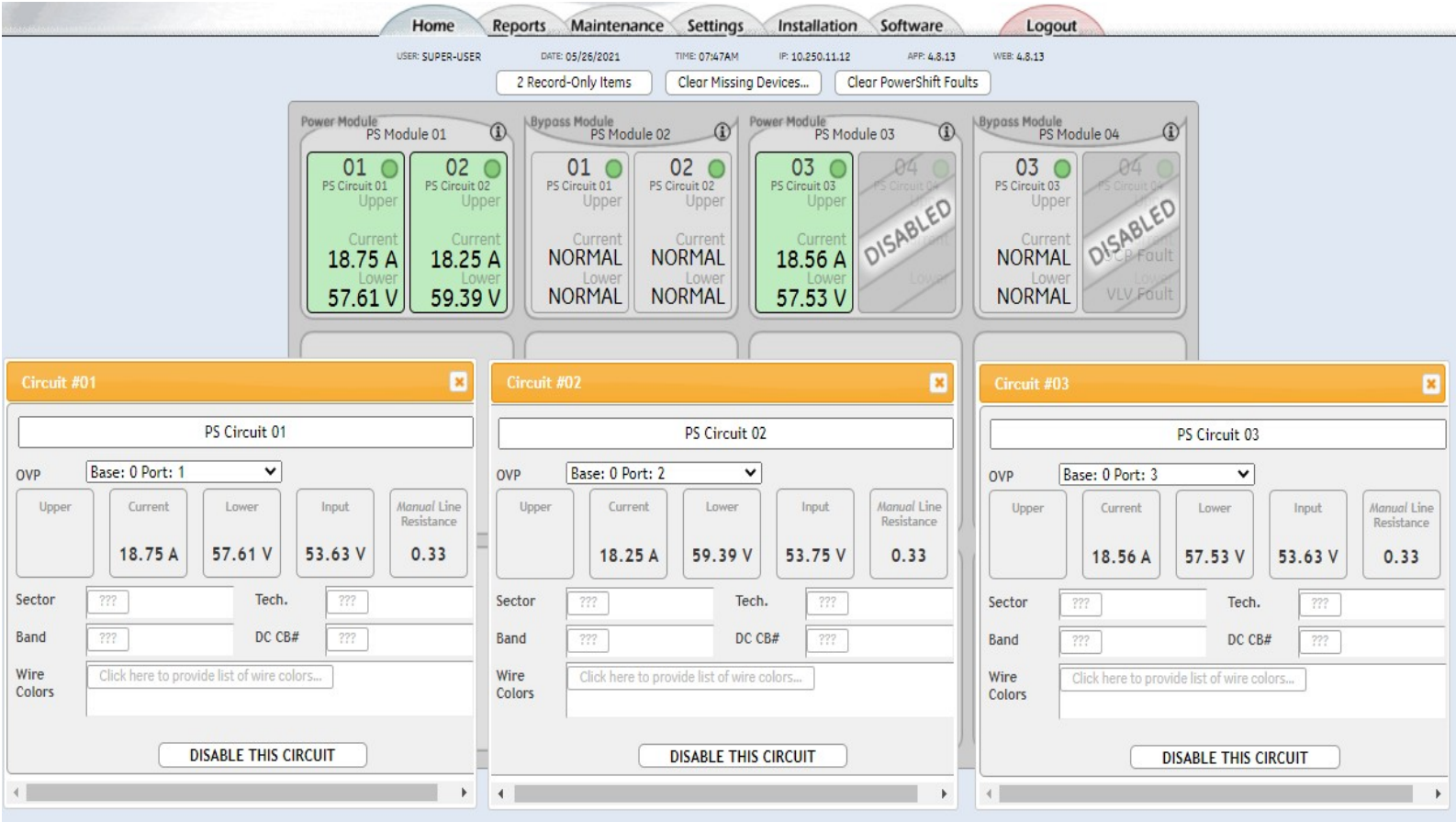
Confirm Radio Input Voltage

1) If practical, the remote radio input voltage can be measured at the tower/roof top mounted OVP by observing the digital LED display that is built into the OVP (or by using a hand-held voltage meter)

2) The RRU input voltage should measure roughly around 52VDC to 56VDC, depending on the amount of RRU load current

3) Using the PowerShift LCD display or the GUI to observe the RRU current for each circuit, following are rough guidelines on the expected RRU input voltage:

   a. A load current of 0A-3A (when RRU is idle) will result in an RRU input voltage of around 54VDC to 56VDC

   b. A load current around 10A or higher will result in an RRU input voltage of 52VDC to 54VDC

4) A RRU input voltage measurement <50VDC or >56VDC most likely indicates an issue:

   a. <50VDC RRU input voltage indicates the actual line resistance is higher than the manual resistance value you entered in the GUI

   b. >56A RRU input voltage indicates the actual line resistance is less than the manual resistance value you entered in the GUI

   c. Re-check the resistance value entered in the GUI; confirm the correct cable gauge and length was chosen from the lookup table in Section 3

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Raycap OVP Configuration Examples

12 RRU Capacity

Top: 6627

Please refer to Raycap RCMDC-6627-PF-48 Install instructions for alarm wiring instructions and selector switch settings.

Trunk Cables

V-Boost Out

Base ID 0

Bottom: 6627

RS485

24 - #6 AWG

R1

PowerShift

Alarms

24 - #6 AWG

DC Breaker
12 circuits

COMMSCOPE
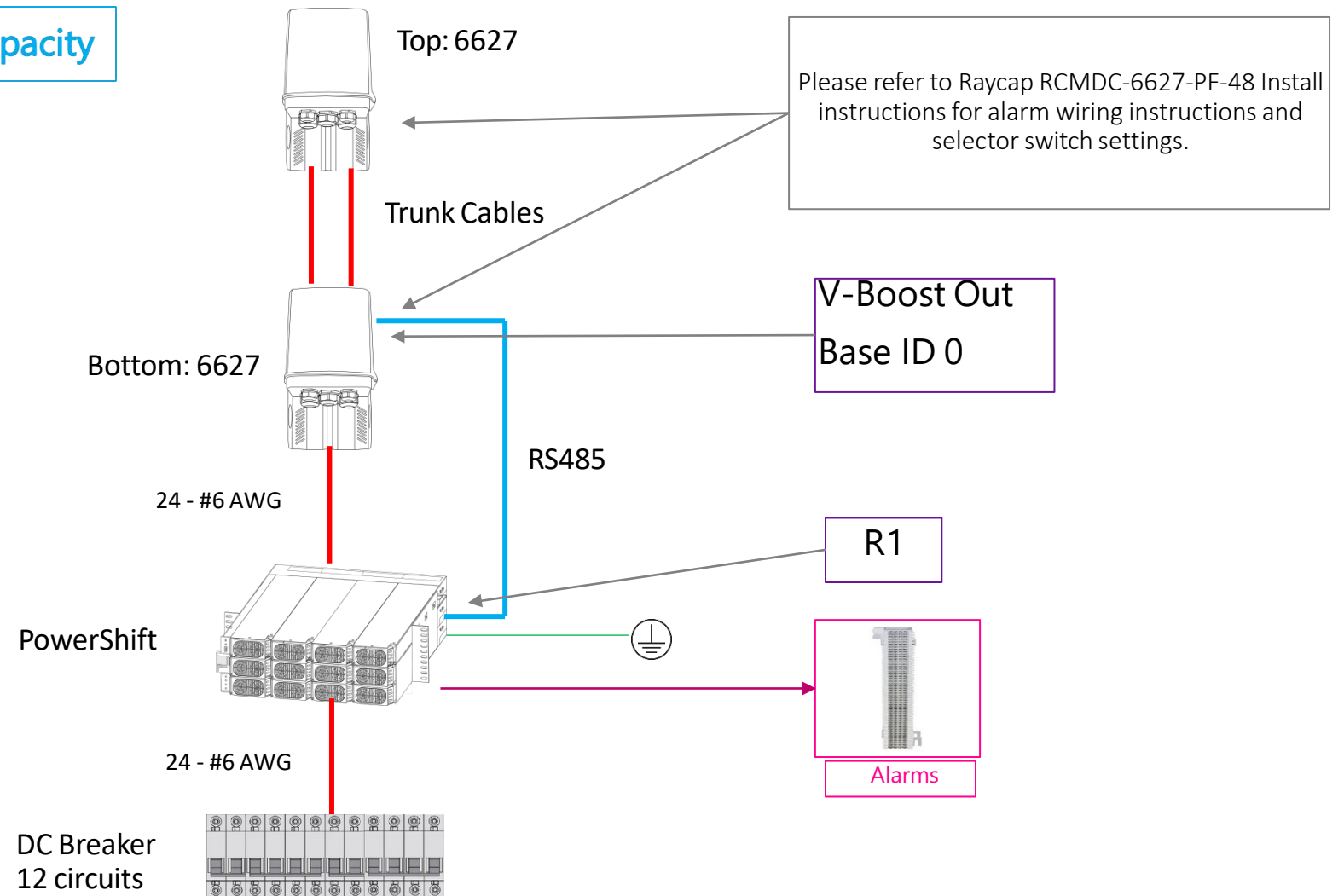
Alarm Wiring 12 RRU OVP – RS485 Feedback

12 RRU Capacity

Top: 6627

Please refer to Raycap RCMDC-6627-PF-48 Install instructions for alarm wiring instructions and selector switch settings.

Trunk Cables

Cabinet or shelter

Please refer to Raycap RVZDC-4520-RM-48 Install instructions for alarm wiring instructions and selector switch settings.

Bottom: 4520

V-Boost Out

Base ID 0

24 - #6 AWG

RS485

R1

PowerShift

Alarms

24 - #6 AWG

DC Breaker
12 circuits

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Raycap 6627 Tower Top and Raycap 4520 at Base

6627 Top

4520 Bottom

COMMSCOPE
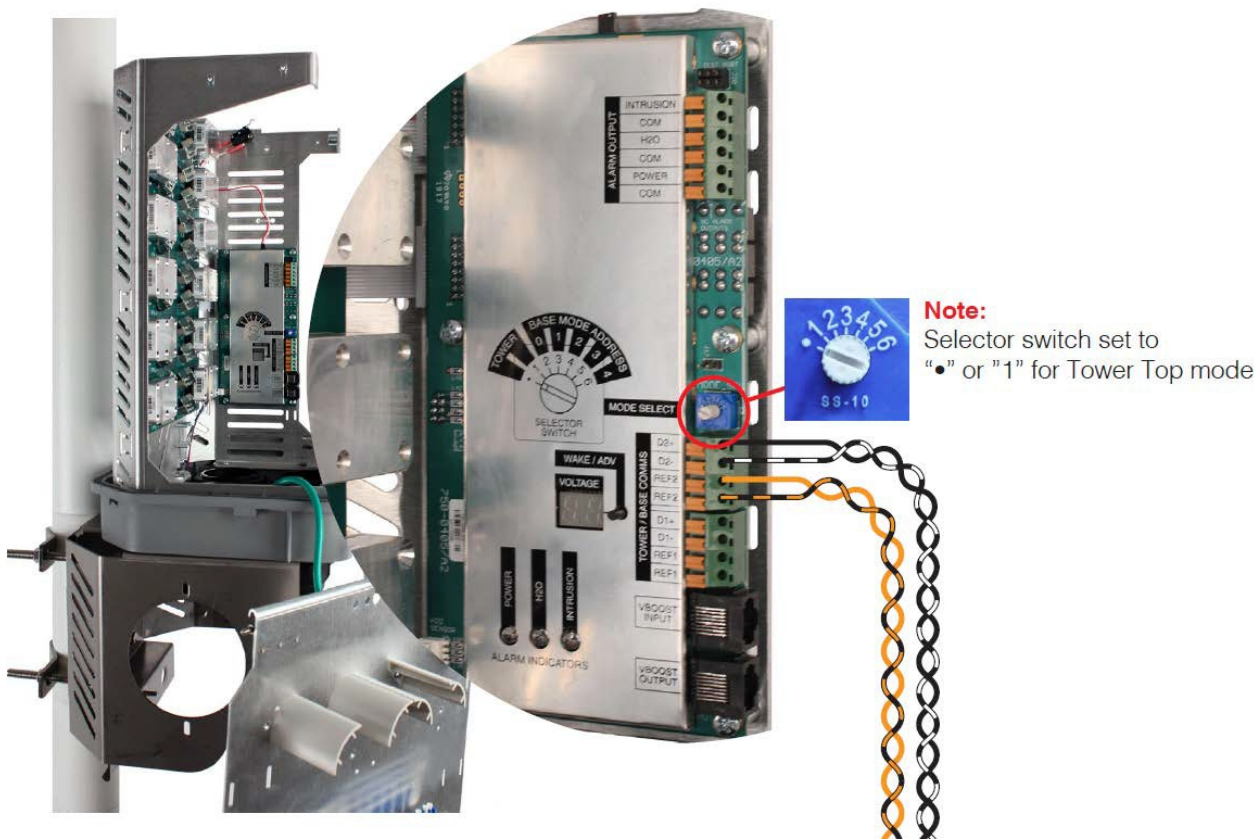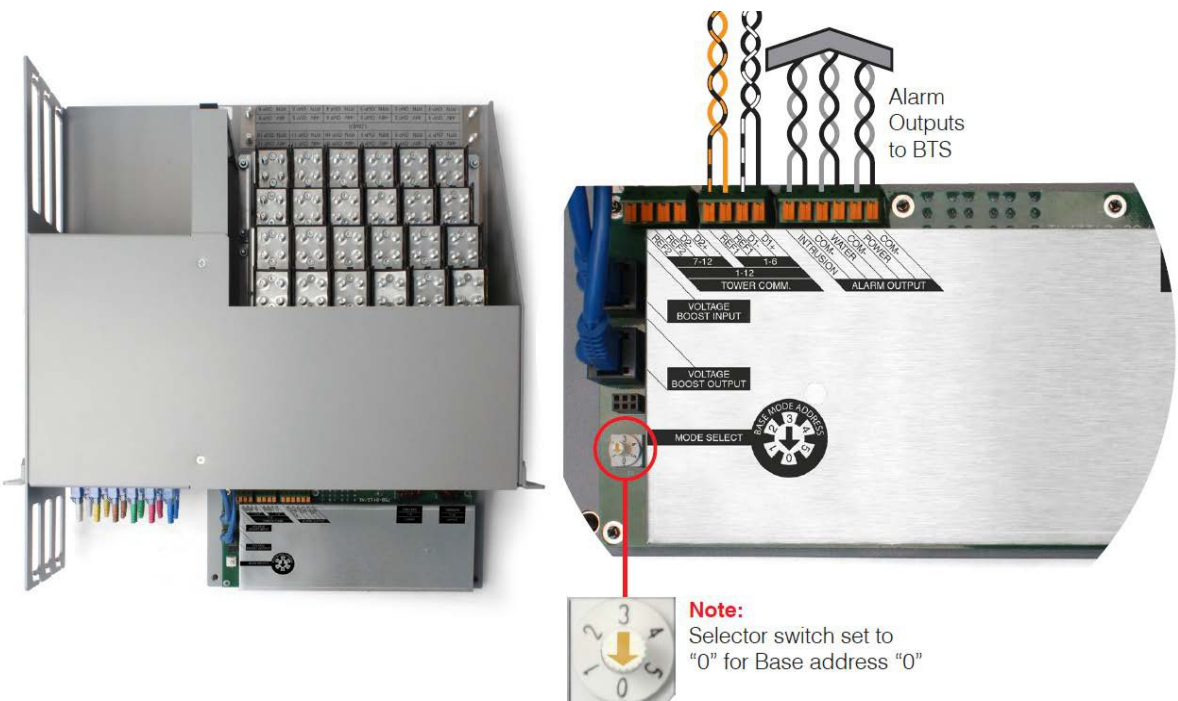
New Site - 12 OVP Raycap 6627 Top and Raycap 6627 Bottom

18 RRU Capacity

Top: 6627

Top: 6627

Please refer to Raycap RCMDC-6627-PF-48 Install instructions for alarm wiring instructions and selector switch settings.

Please refer to Raycap RCMDC-6627-PF-48 Install instructions for alarm wiring instructions and selector switch settings.

Trunk Cables

V-Boost Out
Base ID 0

Trunk Cables

Bottom: 6627

Bottom: 6627

RS485

RS485

24 - #6 AWG

12 - #6 AWG

R1

R1

PowerShift

PowerShift

24 - #6 AWG

Alarms

12 - #6 AWG

DC Breaker
12 circuits

DC Breaker
6 circuits

COMMSCOPE

New Site - 18 OVP Raycap 6627 top and Raycap 4520 Rack Mount bottom
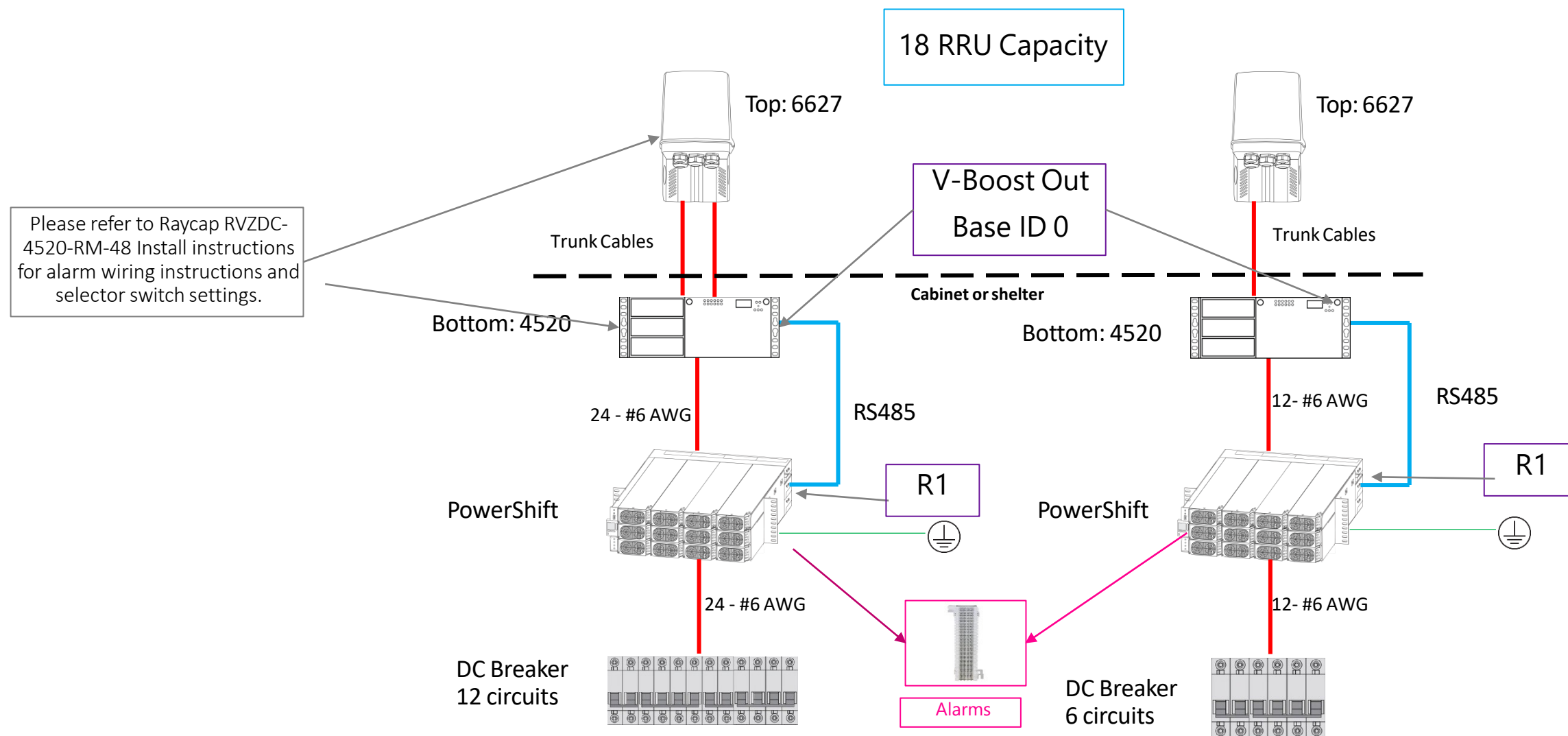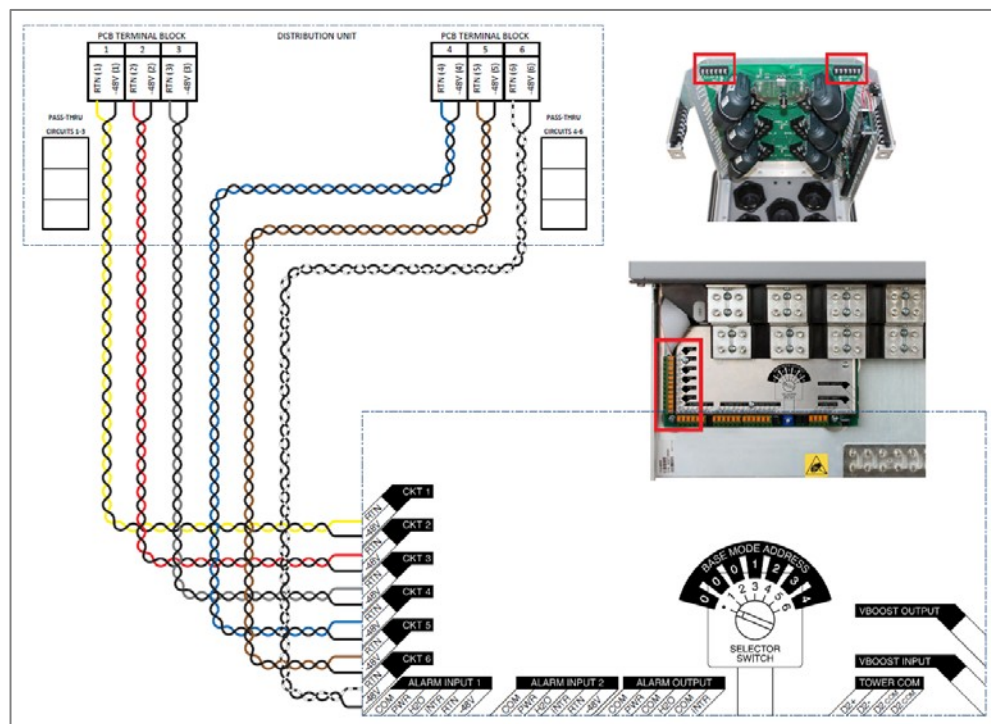
18 RRU Capacity

Top: 6627

Top: 6627

V-Boost Out
Base ID 0

Please refer to Raycap RVZDC-4520-RM-48 Install instructions for alarm wiring instructions and selector switch settings.

Trunk Cables

Trunk Cables

Cabinet or shelter

Bottom: 4520

Bottom: 4520

24 - #6 AWG

RS485

12- #6 AWG

RS485

R1

R1

PowerShift

PowerShift

24 - #6 AWG

12- #6 AWG

DC Breaker
12 circuits

Alarms

DC Breaker
6 circuits

COMMSCOPE

Retrofit Site Raycap 3315 Top and Raycap 2260 Bottom

6 RRU Capacity

Top: 3315

Trunk Cables
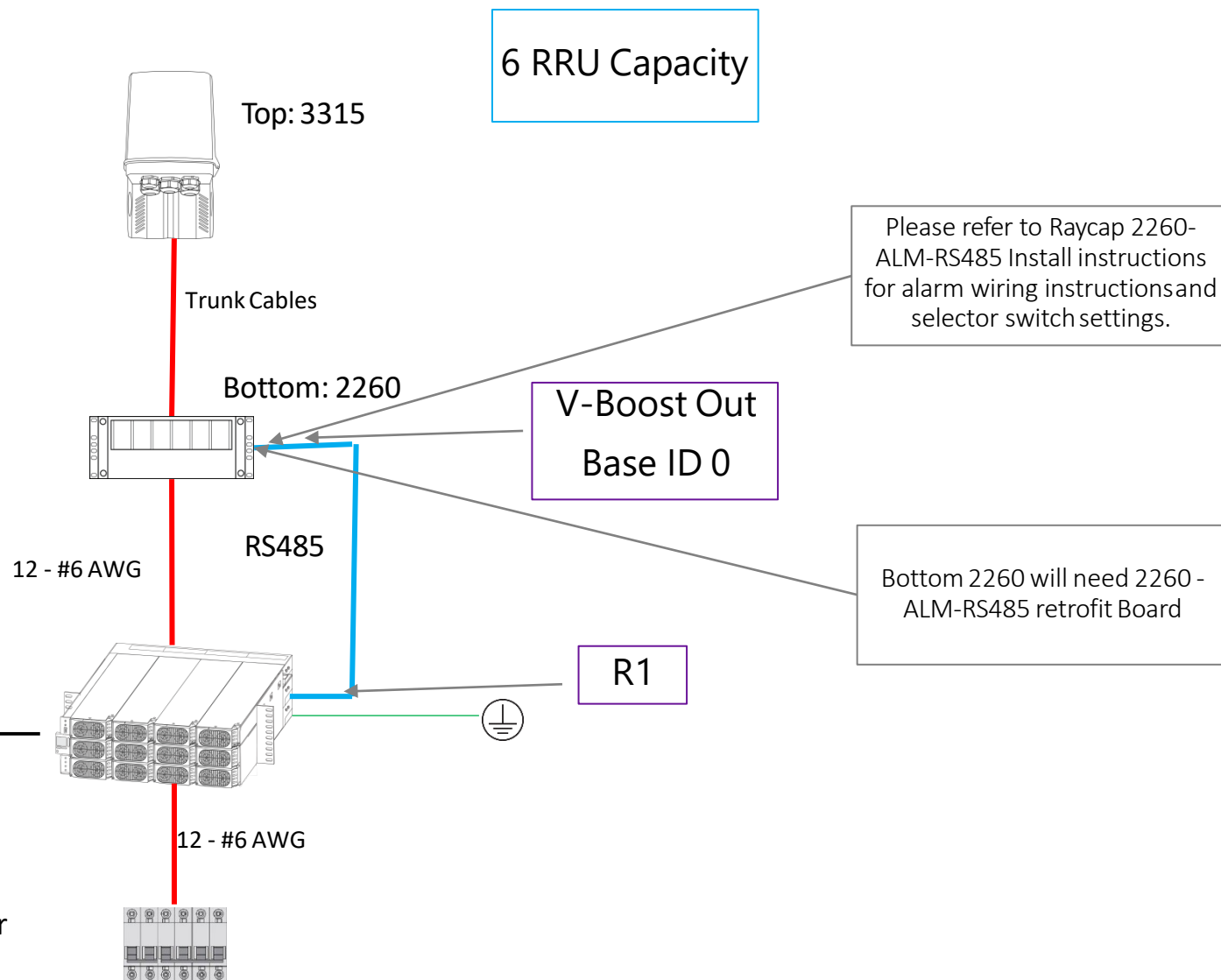
Please refer to Raycap 2260-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

Bottom: 2260

V-Boost Out

Base ID 0

RS485

Bottom 2260 will need 2260 - ALM-RS485 retrofit Board

12 - #6 AWG

R1

PowerShift

Alarms

DC Breaker
6 circuits

12 - #6 AWG

COMMSCOPE

Analog Wiring Method – Existing Sites

Top
Box

Existing
Trunk
Wiring

Retrofit
Board

6 RRU Capacity

Top: 3315

Trunk Cables

V-Boost Out

Base ID 0

Bottom: 3315

Bottom 3315 will need 3315-ALM-RS485 retrofit Board

RS485

12 - #6 AWG

R1

PowerShift

Alarms

12 - #6 AWG

DC Breaker
6 circuits

COMMSCOPE
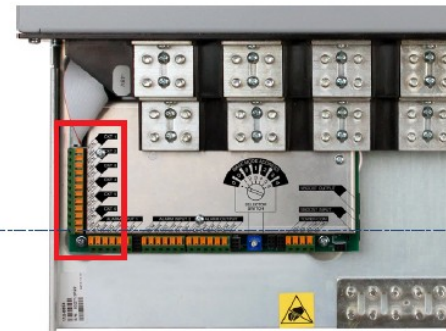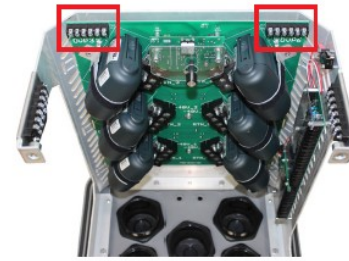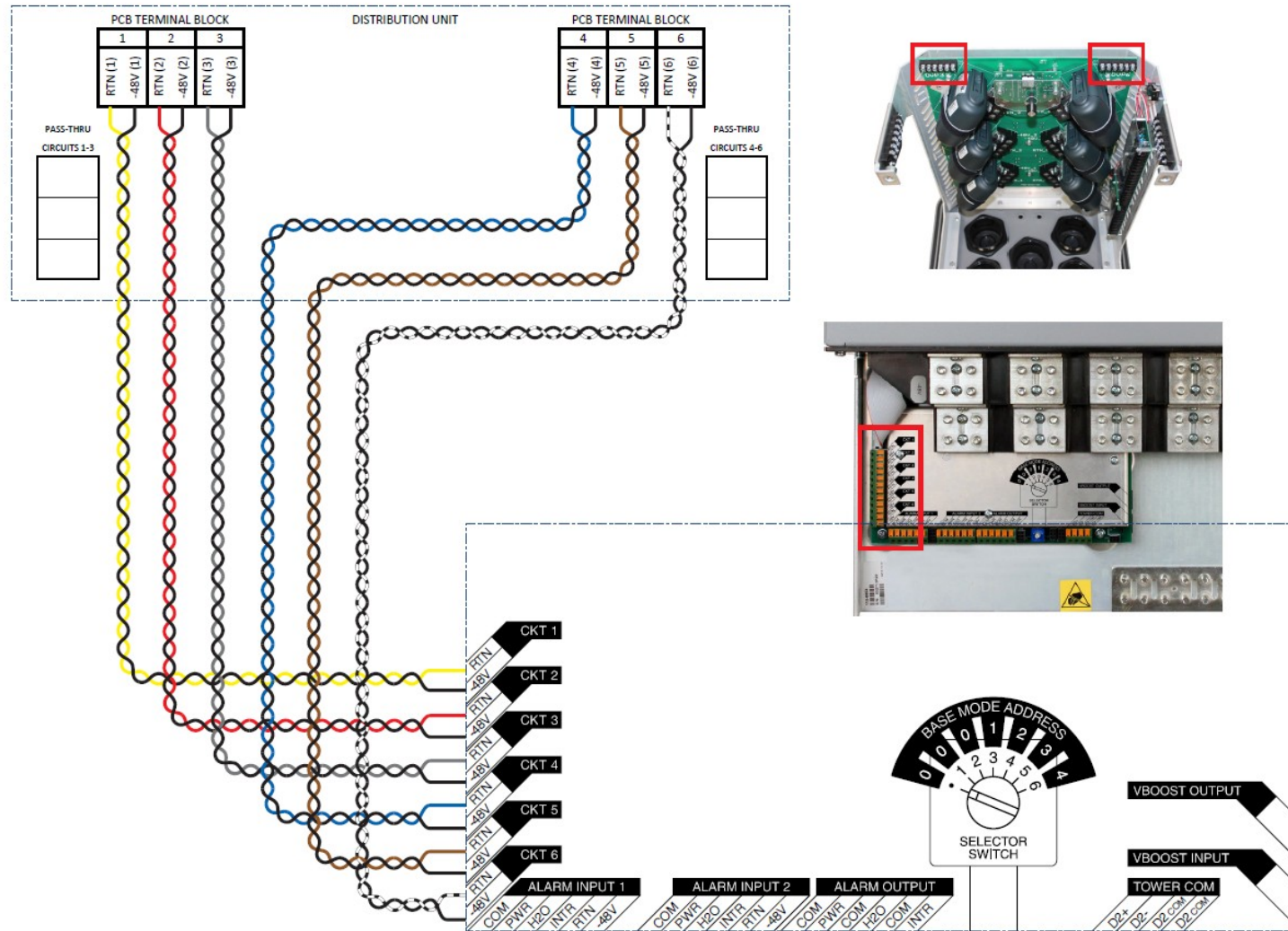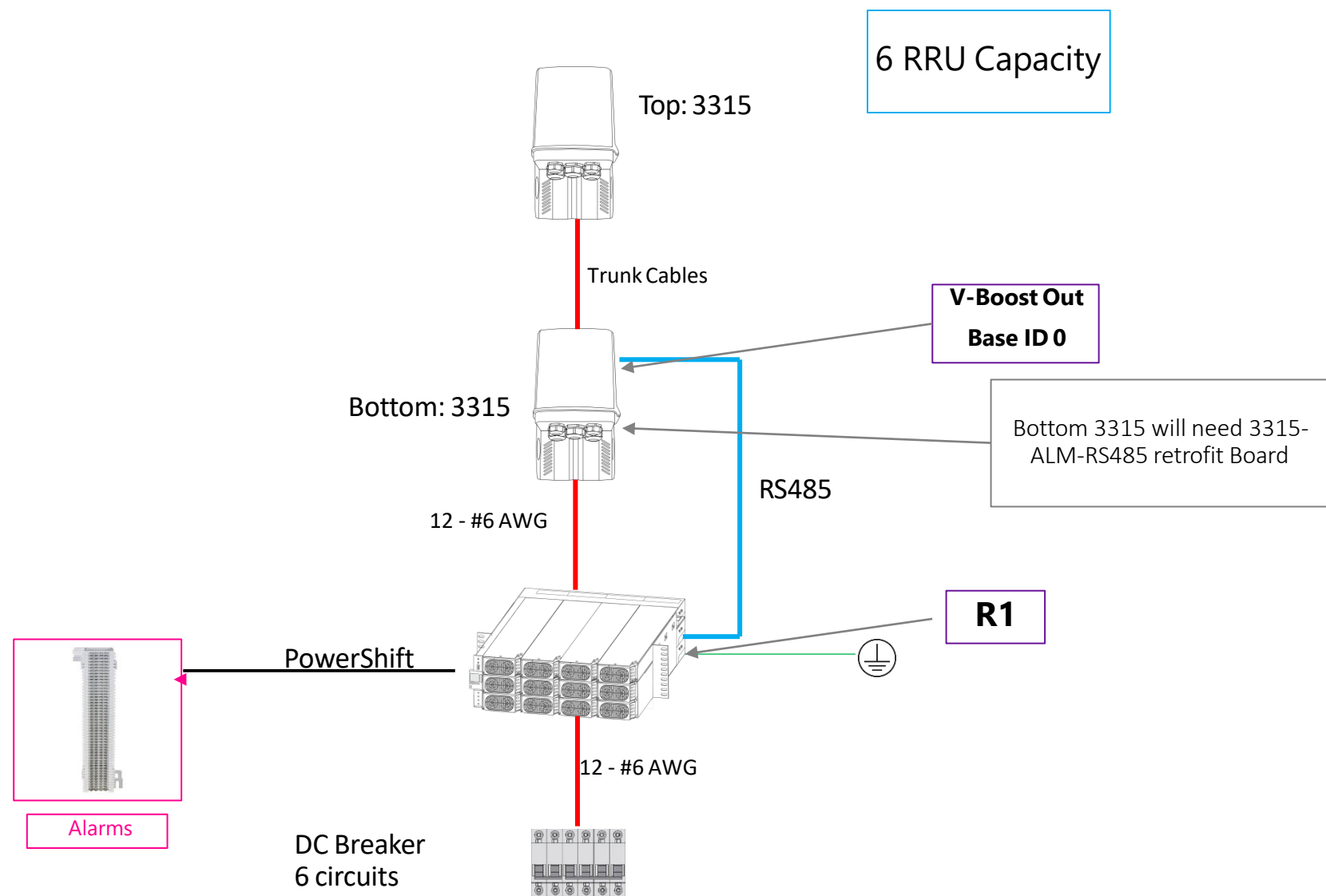
3315 Top and 3315 Retrofit Bottom

Retrofit Site Raycap 3315 top and Raycap 2260 Bottom

12 RRU Capacity

Bottom 2260 will need 2260-ALM-RS485 retrofit Board

Please refer to Raycap 2260-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

Top: 3315

Trunk Cables

Trunk Cables

RS485

V-Boost Out - Base ID 1

to V-Boost IN on Base ID 0

V-Boost Out

Base ID 0

Bottom: 2260

RS485

12 - #6 AWG

12 - #6 AWG

R1

PowerShift

Alarms

24 - #6 AWG

DC Breaker
12 circuits

COMMSCOPE

Retrofit Site Raycap 3315 top and Raycap 3315 Bottom

12 RRU Capacity

Top: 3315

Trunk Cables

Trunk Cables

V-Boost Out - Base ID 1

to V-Boost In on Base ID 0

Bottom: 3315

V-Boost Out

Base ID 0

RS485

Bottom 3315 will need 3315-ALM-RS485 retrofit Board

12 - #6 AWG

RS485

12 - #6 AWG

R1

PowerShift

Alarms

24 - #6 AWG

DC Breaker
12 circuits

COMMSCOPE

Retrofit Site Raycap 3315 Top and Raycap 2260 Bottom

Top: 3315

Top: 3315

Top: 3315

12 RRU / 3 Sectors

12 RRU Capacity

Base ID 2

Base ID 1

Base ID 0

Please refer to Raycap 2260-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings. No upgrade required on top 3315s

Bottom: 2260

RS485

RS485

8 #6 AWG

8 #6 AWG

8 #6 AWG

All bottom 2260 will need 2260-ALM-RS485 retrofit Board upgrades.

R1

RS485

RS485

Alarms

24 #6 AWG

DC Breaker
12 circuits

COMMSCOPE

Retrofit Site Raycap 3315 Top and Raycap 3315 Bottom

Top: 3315

Top: 3315

Top: 3315

12 RRU / 3 Sectors

12 RRU Capacity

Base ID 2

Base ID 1

Base ID 0

Bottom: 3315

RS485

RS485

Please refer to Raycap 3315-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings. No upgrade required on top 3315s

8 #6 AWG

8 #6 AWG

8 #6 AWG

R1

RS485

All bottom 3115 will need 3315-ALM-RS485 retrofit Board upgrades.

RS485

Alarms

24 #6 AWG

DC Breaker
12 circuits

COMMSCOPE

Raycap 6627 Top and Raycap 6627 Bottom

Top: 6627

Top: 6627

Top:6627

12 RRU Capacity

4 RRU's Per Sector

Base ID 2

Base ID 1

Base ID 0

Bottom: 6627

Bottom: 6627

Bottom: 6627

RS485

RS485

8 #6 AWG

8 #6 AWG

8 #6 AWG

RS485

R1

Alarms

24 #6 AWG

DC Breaker
12 circuits

COMMSCOPE

Retrofit Site Raycap 3315 top Raycap 3315 bottom

18 RRU Capacity

Top: 3315

Top: 3315

Trunk Cables

Trunk Cable

X 6 RRU
2 per sector

X 6 RRU
2 per sector

Base ID 1

Base ID 0

Base ID 0

Bottom: 3315

RS485

Bottom: 3315

RS485

RS485

12- #6 AWG

12- #6 AWG

12- #6 AWG

Bottom 3315 will need 3315-ALM-RS485 retrofit Board

R1

R1

PowerShift

PowerShift

Please refer to Raycap 3315-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

24 #6 AWG

Alarms

24 #6 AWG

DC Breaker
12 circuits

DC Breaker
6 circuits

COMMSCOPE

Hybrid 6627 Solution

12 RRU Capacity

Top: 6627

Please refer to Raycap RCMDC-6627-PF-48 Install instructions for alarm wiring instructions and selector switch settings.

Trunk Cables

RS485

Cabinet or shelter

Bottom: 2260

Base ID 1

Base ID 0

Bottom 2260 will need 2260-ALM-RS485 retrofit Board upgrades.

12- #6 AWG

12- #6 AWG

RS485

R1

PowerShift

Alarms

24- #6 AWG

DC Breaker
12 circuits

COMMSCOPE

Hybrid 3 Sector Solution

12 RRU / 3 Sectors

Top: 3315

Top: 3315

Top: 3315

All Raycap 3315s will need retrofit cards. Please refer to Raycap 3315-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

6 AWG Hybrid Trunk

Base ID 1

Base ID 0

Bottom: 4520

RS485

16 #6 AWG

8 #6 AWG

Alarms

24 #6 AWG

DC Breakers 12 circuits

COMMSCOPE

Hybrid 3 Sector Solution

12 RRU / 3 Sectors

Top: 3315

Top: 3315

Top: 3315

Raycap 3315s will need retrofit cards. Please refer to Raycap 3315-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

6 AWG Hybrid Trunk

Raycap 3315 will need retrofit card. Please refer to Raycap 3315-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

Base ID 1

Base ID 0

Bottom: 3315 and 4520

RS485

8 #6 AWG

16 #6 AWG

Alarms

24 #6 AWG

DC Breakers 12 circuits

COMMSCOPE

Hybrid 3 Sector Solution

12 RRU / 3 Sectors

Top: 3315

Top: 3315

Top: 3315

Raycap 3315s will need retrofit cards. Please refer to Raycap 3315-ALM-RS485 Install instructions for alarm wiring instructions and selector switch settings.

6 AWG Hybrid Trunk

6627

3315

Base ID 1

Base ID 0

Contact Raycap for 6627 RS485 board upgrade

RS485

16 #6 AWG

8 #6 AWG

Alarms

24 #6 AWG

DC Breakers 12 circuits

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Base/Tower Configuration.
(2) RCMDC-3315-PF-48 units with RS485 Retrofit Kits installed at tower top and
(1) RCMDC-4520-RM-48x unit at the base.

2 Raycap 3315 with Retrofit at Tower Top

Raycap 4520 at Tower Base

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PowerShift Maximum Cable Lengths Tables for Ericsson, Samsung, and Nokia

Sizing DC Breakers

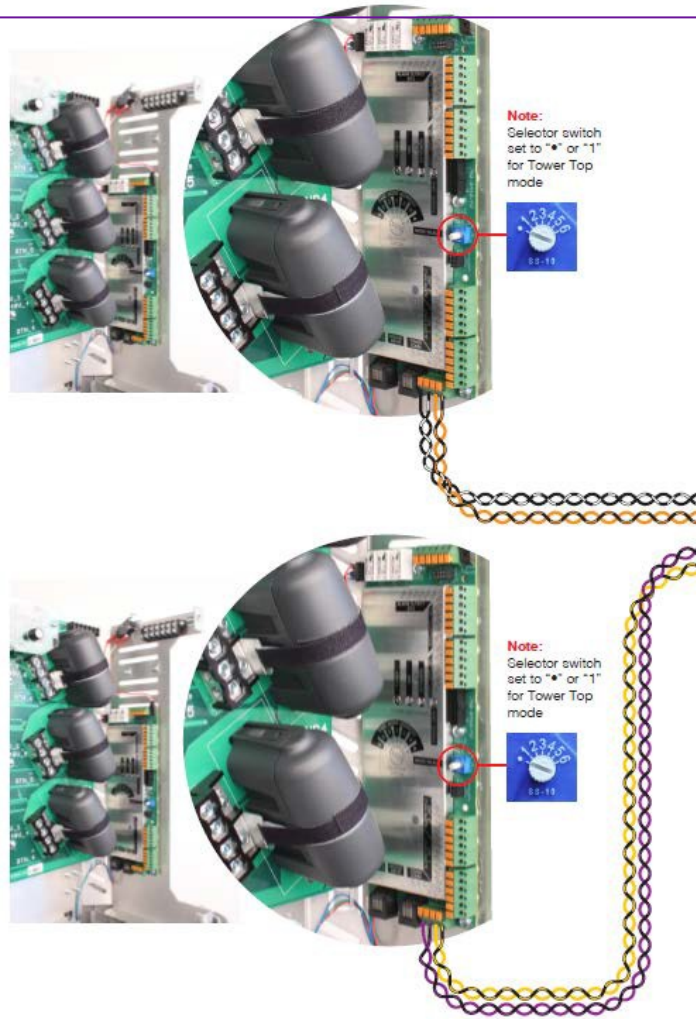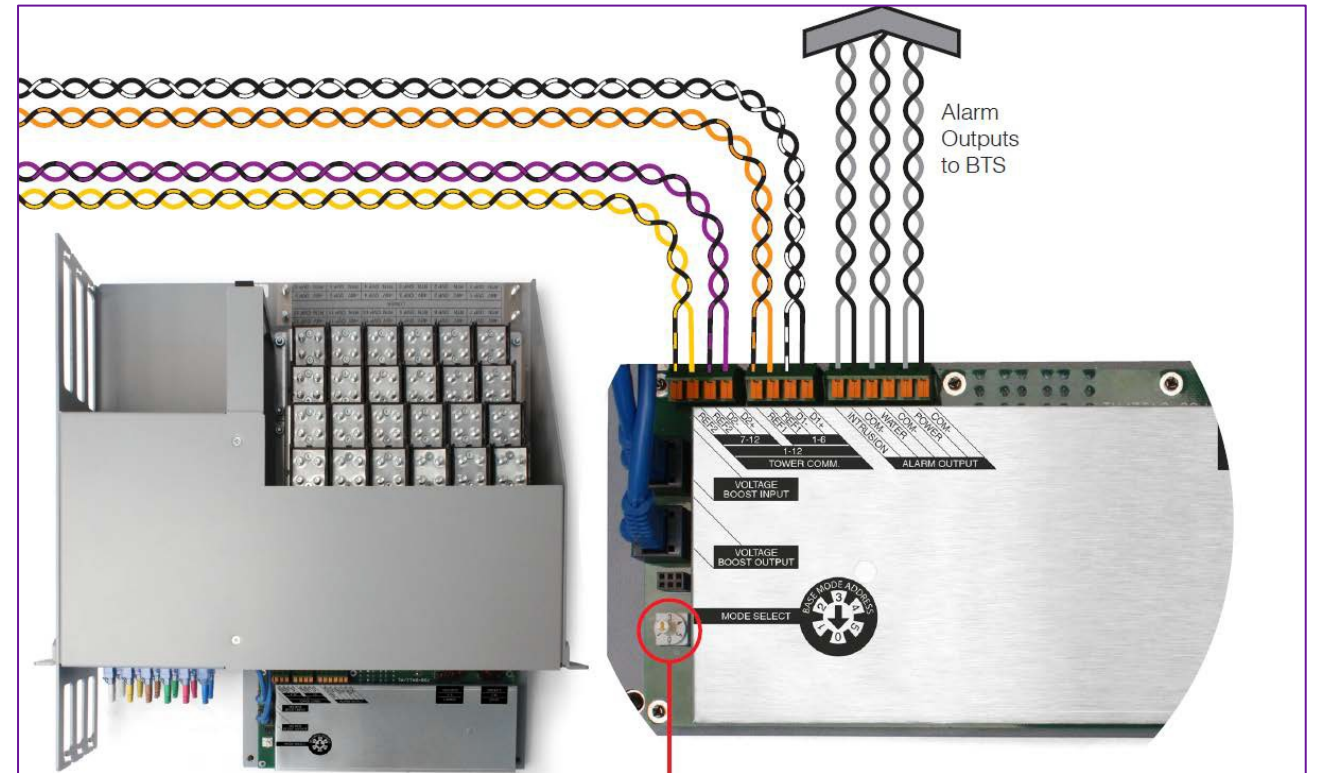| RRU Max Power W	DC Breaker Size	DC Input Wire Size	PowerShift Module
1440 W	50 AMP	6 AWG	PS-1600-73
1550 W	60 AMP	6 AWG	PS-1600-73
1870 W	70 AMP	4 AWG	PS-1800-73

Max power level of RRU/AAU	**1870 Watts**
Lowest Battery Voltage	**38 Volts**
PowerShift Efficiency	**97%**
Max Cable Run	**500 Feet of 6 AWG**

Calculation

Max Cable loss @ 500'	0.4 Ohms
Max Current @ 1870 Watts	1870W/56V = 33.4 Amps
Cable Loss @ 500'	33.4^2Amps*0.4 Ohms = 446 Watts
PowerShift Total Power Output	1870W + 446W = 2,316 Watts
Total Power Input to PowerShift	2,316 Watts/.97 = 2,388 Watts
Worst Case Current of Input	2,388W/38V = 62 Amps
Circuit Breaker Recommendation	70 Amps
Telco Flex Cable Recommendation	90C or 105C Telco Flex 4 AWG (in case of bundling)

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High Power Jumper(s)

Ericsson

Nokia/Samsung or Single Input

End 1 RRU • Cable Assembly Length • End 2 Enclosure

Figure 1

End 1 RRU • Cable Assembly Length • End 2 Enclosure
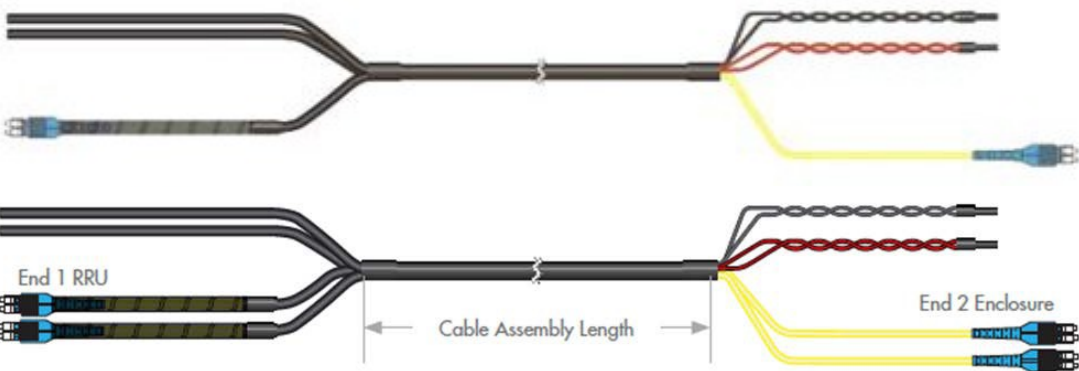
Figure 2

HFT410-2SVHY-3, 6, 9, 12, 15, 20, 25 or 30 Single Fiber Pair

HFT410-4SVHY-3, 6, 9, 12, 15, 20, 25 or 30 Two Fiber Pair
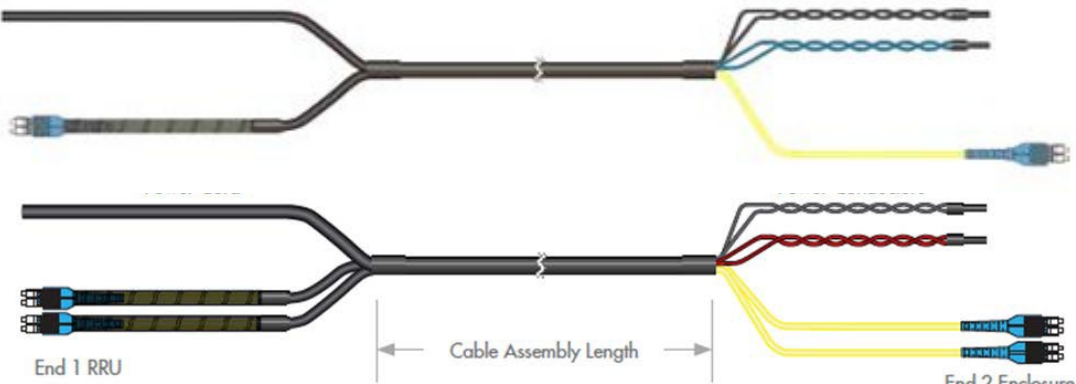
HFT410-2SVHE-3, 6, 9, 12, 15, 20, 25 or 30 Single Fiber Pair

HFT410-4SVHE-3, 6, 9, 12, 15, 20, 25 or 30 Two Fiber Pair

Bi-Di Version

Bi-Di Version

HFT410-1SBVY-3, 6, 9, 12, 15, 20, 25 or 30 Single Fiber

HFT410-2SBVY-3, 6, 9, 12, 15, 20, 25 or 30 Two Fiber

HFT410-1SBVE-3, 6, 9, 12, 15, 20, 25 or 30 Single Fiber

HFT410-2SBVE-3, 6, 9, 12, 15, 20, 25 or 30 Two Fiber

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Space Considerations
Installation Tools
DC Conductors
Site Survey
Wire Management

Standard PowerShift II BOM Installation Material

Sample Bill of Material			12 RRU	6 RRU	Notes
	Part Number	Vendor	Quantity	Quantity	
TelcoFlex 65 Strand	3BALI-0601-09	SOUTHWIRE	384	192	8' per run
#6 Ground Wire	6G-0601-04	SOUTHWIRE	50	50	1 run<50'
Burndy Lugs #6 Standard Barrell Lugs	YAV6CL2TC14FX	BURNDY	100	50	2 spare
Burndy #6 Long Barrell Lugs	YAZ6C2TC14	BURNDY	2	2	each
Heat Shrink	HSC12FR250	BURNDY	18	9	feet
Fiber Tags	145PTAGS	BURNDY	100	50	each
Wax String	44800NAT	COAT AMERICA	1	1	1 roll
Ethernet Cable (no connectors)	CS24R GRAY	COMMSCOPE	50	50	Alarm Wire
Ethernet Cable with connectors	TBD	TBD	8'	8'	1 each
8" Stand Off Brackets	0040410730	NEWTON	8	4	each
19" to 23" Rack Adaptors	40320330	NEWTON	1	1	each

TALLEY   COMMSCOPE®
PowerShift™ & Ancillary Needs

PowerShift™ Accesories

Part Number	3 RRU QTY	6 RRU QTY	9 RRU QTY	12 RRU QTY	Description
TFX39771	130	200	320	400	#6 TelcoFlex Gray L4
BRNYAV6CL2TC14FX	50	50	100	100	#6 Flex 2 Hole Lug, 1/4" Stud, 5/8" Spcg, Short Barrel, IW=Y
TFX40004	50	50	50	50	#6 TelcoFlex Green L4 Class I, Cloth Braid
BRNYAZV6C2TC14FX	2	2	2	2	#6 Lug Two 1/4" Holes 5/8" OC Long Barrel, Windowed
MIS407998228	3	6	9	12	50A Bullet Breaker Mid Trip 1 Pin Alarm

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Recommended Tool list

Type	Manufacture	Part Number
Lug Crimper	Burndy	Y122CMR or Y1MRTC
Wire Strippers	Klein	11053 for 6 AWG to 12 AWG
Wire Strippers	Southwire	S612STR for 6 AWG to 12 AWG
Screw Driver	Klein Insulated #2 Phillips	33532-INS
Nut Driver	Klein Insulated 7/16	646-7/16-INS
9" Cable Cutter	Southwire	CCP9
Scissors	Southwire	ES0001
Label Maker	Dymo	Dymo 160
Heat Gun	Dewalt	26950
Jeweler's Screwdriver	Generic	Generic
Wire Strippers 16-22 AWG	Generic	Generic
4 Ton Crimper, Li-Ion, standard, 120V AC (OPTIONAL)	Greenlee	EK410LX120

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Shelter Recommended Power Cable

TelcoFlex ® III

CENTRAL OFFICE/TELECOM POWER CABLE

600 Volts, Copper Conductor
Central Office/Telecom Power Cable
Class B Strand With Braid
CSA approved, Non-Halogen Insulation
14 AWG - 750 KCMIL - Single Conductor

TelcoFlex®

APPLICATIONS

TelcoFlex® III Central Office Power Wire and Cable Class B Strand With Braid. The Cable has low-smoke, lead-free and silicone-free non-halogenated insulation. UL Central Office Power Cable 105°C dry, 60°C wet. UL Listed RHH/LS FT4 and VW-1, 90°C dry, 60°C wet, 600 volts. Sizes 1/0 and larger are UL, CT USE rated. CSA AWM I B 105°C, 600 Volts, FT4-ST1.

SPECIFICATIONS

Southwire's TelcoFlex® III meets or exceeds the following:

- UL Listed RHH/LS
- FT4- Flame Test
- VW-1
- ASTM B-33
- Physical and Electrical tests in accordance with UL standard 44 requirements
- CSA AWM I B 105°C
- IEC 60674 and 60332
- RoHS / Reach Compliant

CONSTRUCTION

Southwire's TelcoFlex® III cable is single conductor with a class B stranded tinned copper conforming to ASTM B-33 and Underwriters' laboratories requirements. An opaque mylar tape shall be applied over the conductor to facilitate stripping. Insulation is 90°C rated low smoke, non-halogen, TelcoHyde™ 5221 conforming to Underwriters' Laboratories standard 44 and Telcordia Specification GR-347-CORE, also UL and CSA 105°C AWM rated.
The insulation has a limiting oxygen index of 35%.

- For Shelter installations not inside an enclosed cabinet TelcoFlex III 6AWG Grey is the recommended Power Cable

- It is a braided 7-Strand Cable

- The 7-Strands provide a firm cable that holds its form when routed providing a clean professional installation

COMMSCOPE

Cabinet Recommended Power Cable

TelcoFlex® IV

CENTRAL OFFICE/TELECOM POWER CABLE

600 Volts, Copper Conductor
Class I Flexible Strand With Braid
CSA approved, Non-Halogen Insulation
8 AWG - 750 KCMIL - Single Conductor

APPLICATIONS

TelcoFlex® IV Central Office Power Wire and Cable Class I Flexible Strand With Braid. The Cable has low-smoke, lead-free and silicone-free non-halogenated insulation. UL Central Office Power Cable 105°C dry, 60°C wet. UL Listed RHH/LS FT4 and VW-1, 90°C dry, 60°C wet. 600 volts. Sizes 1/0 and larger are UL, CT USE rated. CSA AWM I B 105°C, 600 Volts, FT4-ST1.

SPECIFICATIONS

Southwire's TelcoFlex® IV meets or exceeds the following:

- UL Listed RHH/LS
- FT4- Flame Test
- VW-1
- ASTM B-33
- Physical and Electrical tests in accordance with UL standard 44 requirements
- CSA AWM I B 105°C
- IEC 60674 and 60332
- RoHS / Reach Compliant

CONSTRUCTION

Southwire's TelcoFlex® IV cable is single conductor with a class I(modified) bunched (8 and 6 AWG) and rope-bunched (4 AWG and larger) stranded tinned copper conforming to ASTM B-33 and Underwriters' laboratories requirements. An opaque mylar tape shall be applied over the conductor to facilitate stripping. Insulation is 90°C rated limited smoke, non-halogen, TelcoHyde™ 5221 conforming to Underwriters' Laboratories standard 44 and Telcordia Specification GR-347-CORE, also UL and CSA 105°C AWM rated. The insulation has a limiting oxygen index of 35%.

- For Cabinet installations not inside an enclosed cabinet TelcoFlex IV 6AWG Grey is the recommended Power Cable

- It is a braided 65-Strand Cable

- The 65-Strands provide more flexibility for ease of installation inside of the cabinets.
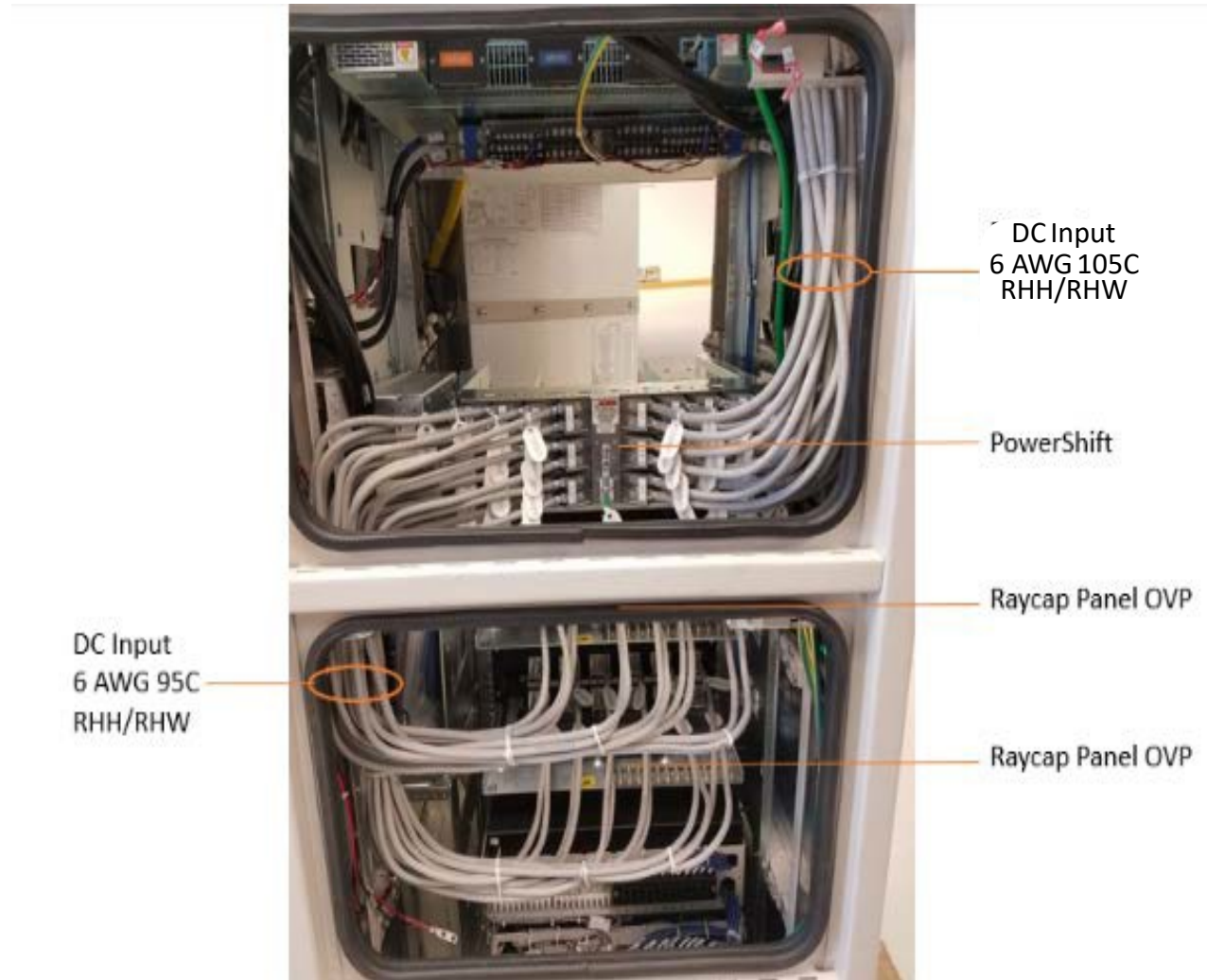
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Wire Management Techniques

MAINTAING PROPER HEAT DISSIPATION

- Limit groups/bundles to a quantity of 12 cables

- Maintain at least half of an inch of space between cable bundles

- Avoid running cable bundles near equipment that emits heat

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Typical Cabinet Layout

DC Input
6 AWG 105C
RHH/RHW

PowerShift

Raycap Panel OVP

DC Input
6 AWG 95C
RHH/RHW

Raycap Panel OVP

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