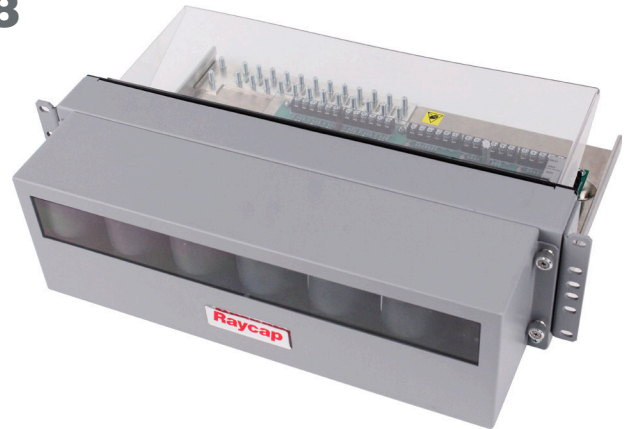


**Installation Instructions:**

**RRODC-2260-RM-48**





## Contents

1	Copyright	2
1.1	Disclaimer	2
1.2	Warnings	2
2	Introduction	3
3	OVP Package Contents	3
3.1	Prerequisites	3
3.2	Tools	3
3.3	Suggested Lugs	3
4	Installing the Rack	4
5	Alarm Cable and Remote Volt Meter Wiring	5
6	Power Cable Installation	23
7	Close up of Main PCB and LED indicators	27
8	Volt Meter Operation	28
9	Replacing PSM-48	29

## 1.0 Copyright

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## 1.1 Disclaimer

The information in this document is subject to change without notice and describes only the product defined in the introduction of this documentation. This documentation is intended for the use of Raycap customers only for the purposes of the agreement under which the document is submitted, and no part may be used, reproduced, modified or transmitted in any form or means without the prior written permission of Raycap. The documentation has been prepared to be used by professional and properly trained personnel, and the customer assumes full responsibility when using it. Raycap welcomes customer comments as part of the process of continuous development and improvement of the documentation.

This product must be installed in a secure location, accessible to craftpersons only.

Raycap has made all reasonable efforts to ensure that the instructions contained in this document are adequate and free of material errors and omissions. Raycap will, if deemed necessary explain issues which may not be covered by this document.

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. Raycap shall have no liability for any error damage of any kind resulting from the use of this document.

## 1.2 Warnings

Please read this manual prior to use to become familiar with the product's numerous features and operating procedures. To maintain the maximum degree of safety, follow the sequences as outlined.

Before using the product, read all instructions and cautionary markings on the product and on any equipment connected to the product.

**CAUTION** – Unless otherwise noted, product usage that is not recommended or sold by the product manufacturer can result in risk of fire, electric shock, or injury to persons.

**CAUTION** – Do not operate the product if it has been damaged in any way. Return damaged products to their manufacturer for repair or replacement.

**CAUTION** – Do not disassemble the product as incorrect reassembling can risk electrical shock or fire.

**WARNING** – Disconnect or disable the DC power source to the product prior to beginning its installation. Ensure that the DC power source to the product remains de-energized until the completion of the installation and after all connections have been verified to be correctly configured.

**WARNING** – Electrostatic sensitive devices. ESD mitigative procedures, such as wearing wriststraps are to be used during installation and maintenance.

For conditions other than those described above, please contact a Raycap Account Representative at (208) 777-1166, (800) 890-2569 or [www.raycap.com](http://www.raycap.com)

Thank you for choosing quality products from Raycap.

## 2.0 Introduction

In a split Radio Base Station (RBS) architecture the typical RBS consists of a Base Band Unit (BBU) and Remote Radio Heads (RRH) connected by cabling. Power to the RRH is provided through copper cables traveling from the base station to the top of the tower or roof top. This creates a conductive path, making the active equipment at the top and the base of the site vulnerable to damage by direct lightning strikes. Protection systems installed in front of both the BBU and the RRH must be able to withstand direct lightning currents in order to protect the sensitive equipment. Raycap's RRH solutions featuring Strikesorb® SPD technology significantly enhance the reliability & availability of the RRH site by providing superior electrical protection at the RRH and BBU, and also enable flexible fiber optic and power cable management solutions.

The RRODC-2260-RM-48 is suitable for installation for Network Telecommunications Facilities, (Central Office), Outside Plant (Remote Terminal Facilities), and locations where the NEC applies (Customer Prem Locations).

## 3.0 OVP Package Contents

1 each

- Rack Unit
- Extended Mounting Brackets & 23" Rack Adapter Plates
- (4) 12-24 screws (for use with rack mount brackets)
- Lexan Touch Guard and Screws
- 1/4-20 Nuts
- Dbl Lug, 1/4" Stud, 1" Pitch

**Note:** No fiber connection or cable management is included with this product. For information on available fiber connection or cable management approved product, contact a Raycap Account Representative at (208) 777-1166, (800) 890-2569

## 3.1 Prerequisites

This Document describes how to install the RRODC-2260-RM-48 on-site and how to mount, and connect it to external interfaces. Installers of Raycap's RRH surge protective and fiber/power management solutions must be industry professionals who have attended training on the proper installation of the equipment by Raycap and/or the mobile operator. Installers are required to read this installation guide thoroughly prior to installation of the Raycap RRH protection equipment.

## 3.2 Tools

- #2 Phillips screw driver
- 7/16" nutdriver
- Torque wrench
  - 7/16" socket
- Wire stripping tool
- Wire crimping tool

## 3.3 Suggested Lugs

#14-10 AWG, Copper, two hole, long barrel w/window, 1/4" holes, 5/8" pitch spacing

- Panduit P/N LCD10-14A-L
- Burndy P/N YAZV10-2TC14

#8 AWG, Copper, two hole, long barrel w/window, 1/4" holes, 5/8" pitch spacing

- Panduit P/N LCDX8-14A-L
- Burndy P/N YAZ8C-2TC14

#6 AWG, Copper, two hole, long barrel w/window, 1/4" holes, 5/8" pitch spacing

- Panduit P/N LCD6-14A-L
- Burndy P/N YAZ6C-2TC14

## Procedure

### Installing the Rack

- 4.1 Select a suitable position for the installation of the unit. You will need 3 U vertical space.



- 4.2 The unit ships with a set of standard mounting ears.

*Standard Option (A)*



- 4.3 19" mounting ears for mounting unit flush to front of rack.

*Standard Option (B)*



- 4.4 23" extender brackets that can be used with both sets of 19" brackets.

*Standard Option (C)*



- 4.5 Mount the unit on the rack.

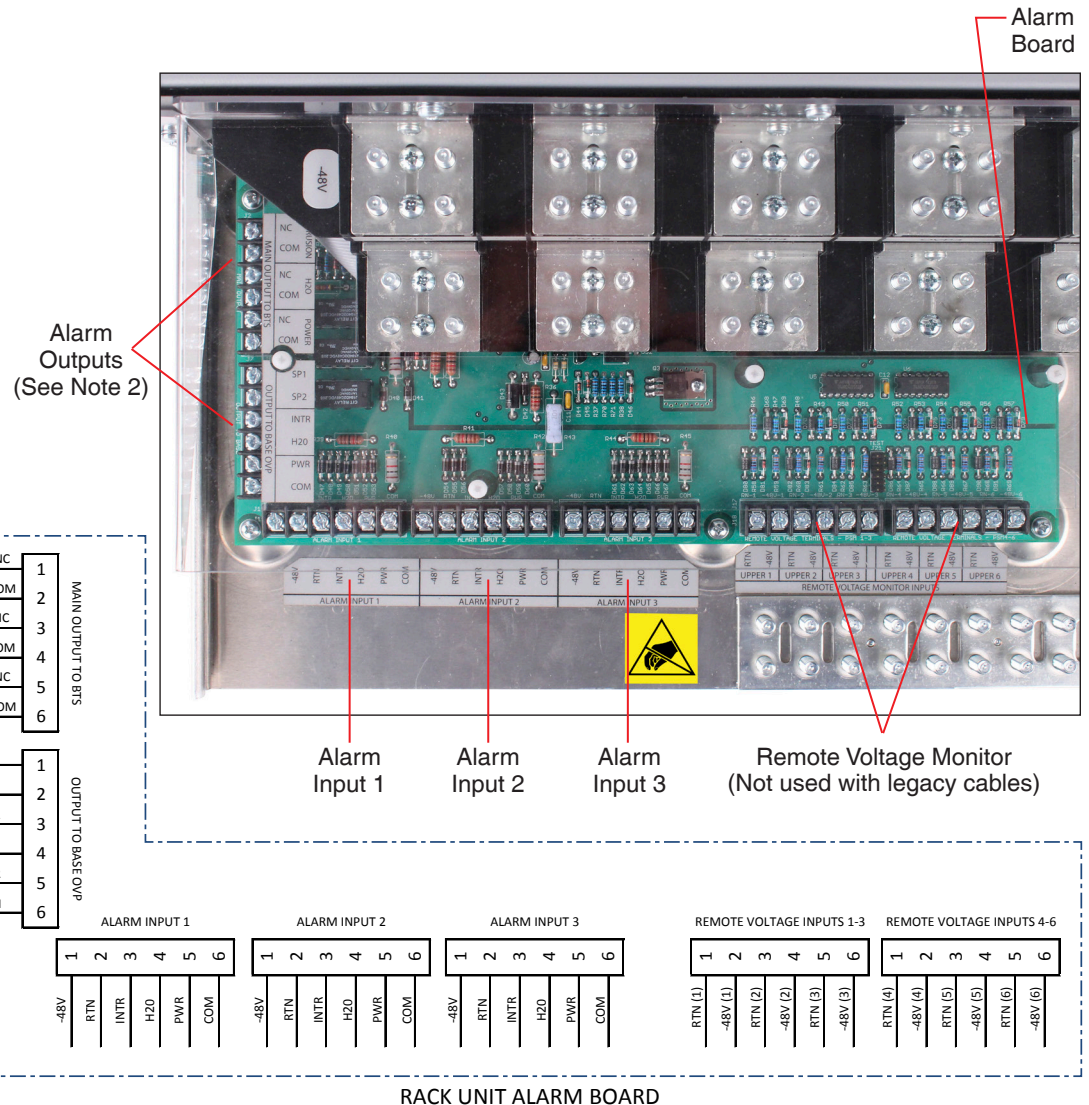
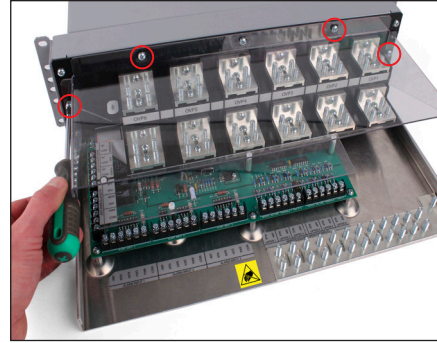


## Procedure

### Alarm Cable and Remote Volt Meter Wiring




- 5.1 If Required, remove the 4 screws securing the touch guard to the rack mount unit.
- 5.2 The alarm wires and remote voltage meter wires will be connected using a #2 phillips screwdriver via a series of terminal blocks.

**Note:** 1. If using a spade connector, use #6 18-22 AWG.  
2. Alarm outputs are rated at 2A, 24 VDC Max.



**Alarm cable**







- 5.3 The hybrid cable used in Verizon applications has been assigned three alarm wire pairs. This color code as it applies to the alarm wiring is the same for all hybrid cables. Wire the alarm contacts using the following Verizon approved color code for the 6/12 hybrid cable, 4/8 hybrid cable and the 2/4 hybrid cable.

Pair		Color	Alarm Input
1		Black	-48V
		Black/White	RTN
2		Orange	INTR
		Black	H <sub>2</sub> O
3		Violet	PWR
		Black	COM





**Remote Voltmeter Wiring**

- 5.4 Wire the voltage monitor contacts using the Verizon approved color code.



**6/12 Cable -  
6 Voltage monitor pairs**

Pair		Color	Alarm Input
1		Yellow	RTN (1)
		Black	-48V (1)
2		Red	RTN (2)
		Black	-48V (2)
3		Slate	RTN (3)
		Black	-48V (3)
4		Blue	RTN (4)
		Black	-48V (4)
5		Brown	RTN (5)
		Black	-48V (5)
6		White	RTN (6)
		White/Black	-48V (6)

**4/8 Cable-  
4 Voltage monitor pairs**

Pair		Color	Alarm Input
1		Yellow	RTN (1)
		Black	-48V (1)
2		Red	RTN (2)
		Black	-48V (2)
3		Slate	RTN (3)
		Black	-48V (3)
4		Blue	RTN (4)
		Black	-48V (4)

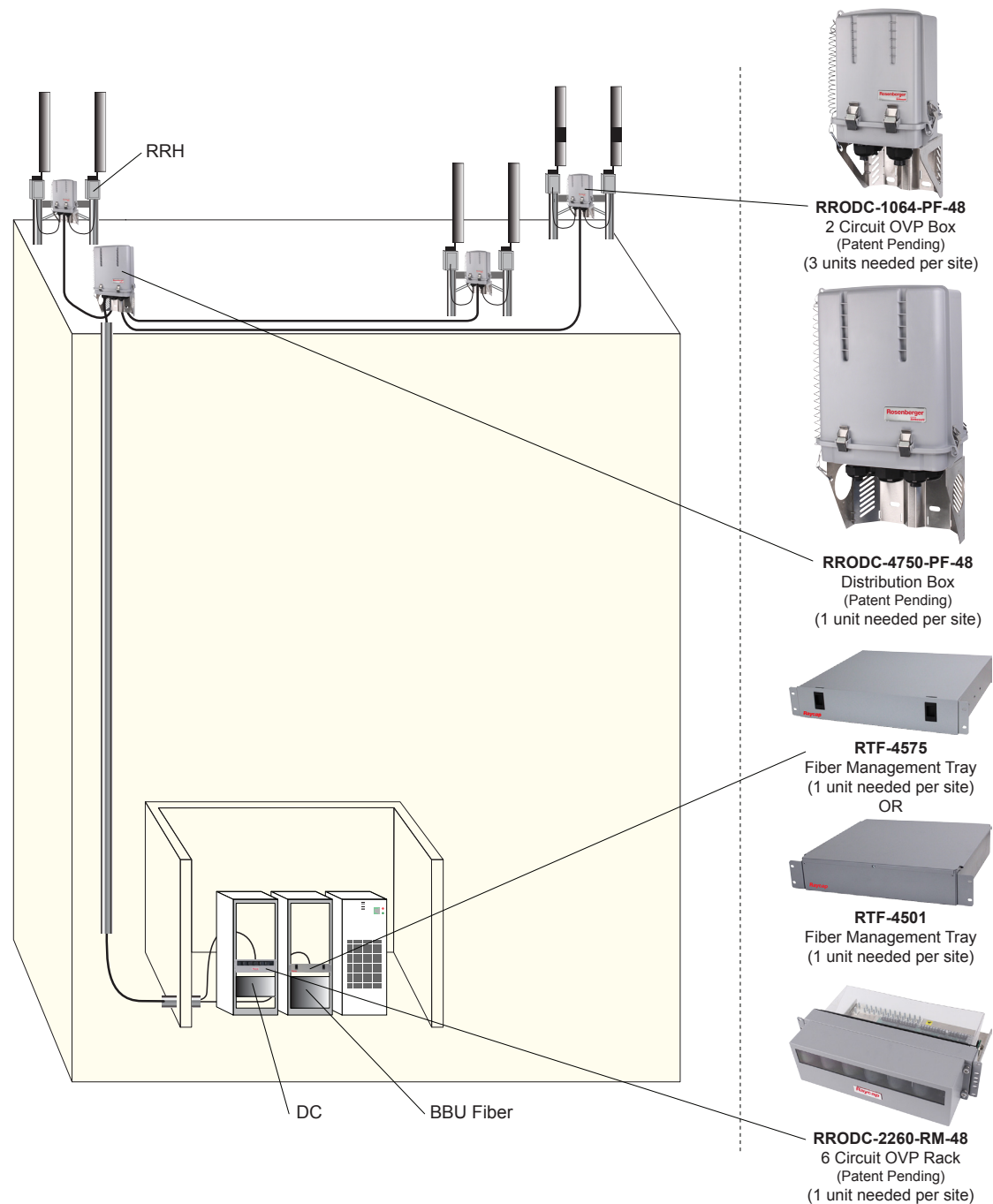
**2/4 Cable-  
2 Voltage monitor pairs**

Pair		Color	Alarm Input
1		Yellow	RTN (1)
		Black	-48V (1)
2		Red	RTN (2)
		Black	-48V (2)



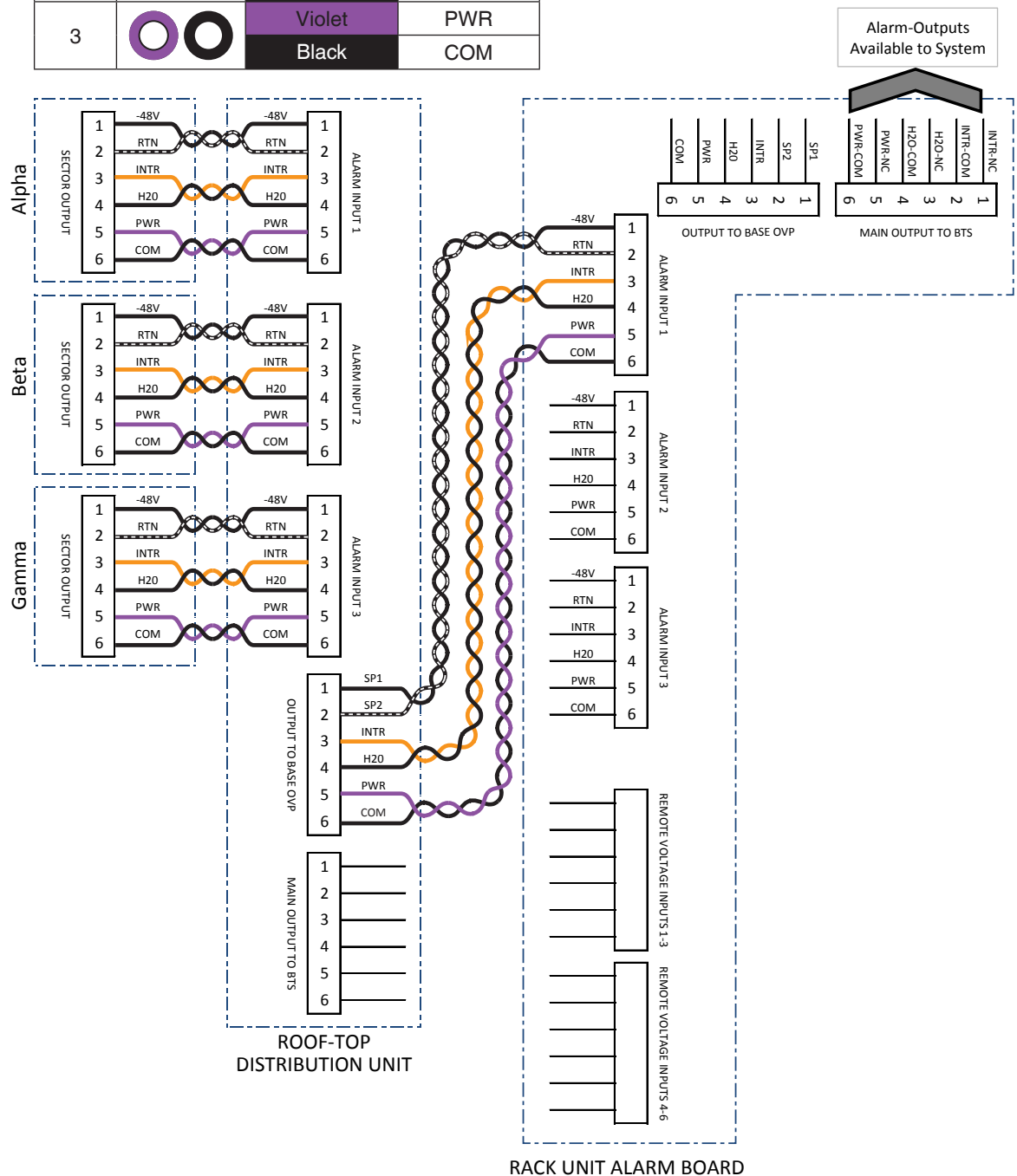
### Installing Alarm and Voltage Meter wires for Rooftop (Tenant Improvement)

- 5.5 Refer to diagram 5.7 for Alarm wiring connections.
- 5.6 Rooftop (Tenant Improvement) Application Guide.



- 5.7 Rooftop (Tenant Improvement) Wiring Diagram. These instructions are for interconnecting the alarms for the Raycap products. (Voltage monitoring circuit on separate page) Wire the alarms using the Verizon approved color code.

Pair	Color	Alarm Input
1	Black	-48V
	Black/White	RTN
2	Orange	INTR
	Black	H <sub>2</sub> O
3	Violet	PWR
	Black	COM



## Remote Volt Meter Wiring

- 5.8 The Remote Voltage Monitor signal wires connect to the tower-top domes at the radio jumper connection and allow the voltages at the tower-top to be measured with the voltmeter provided in the rack suppression unit.

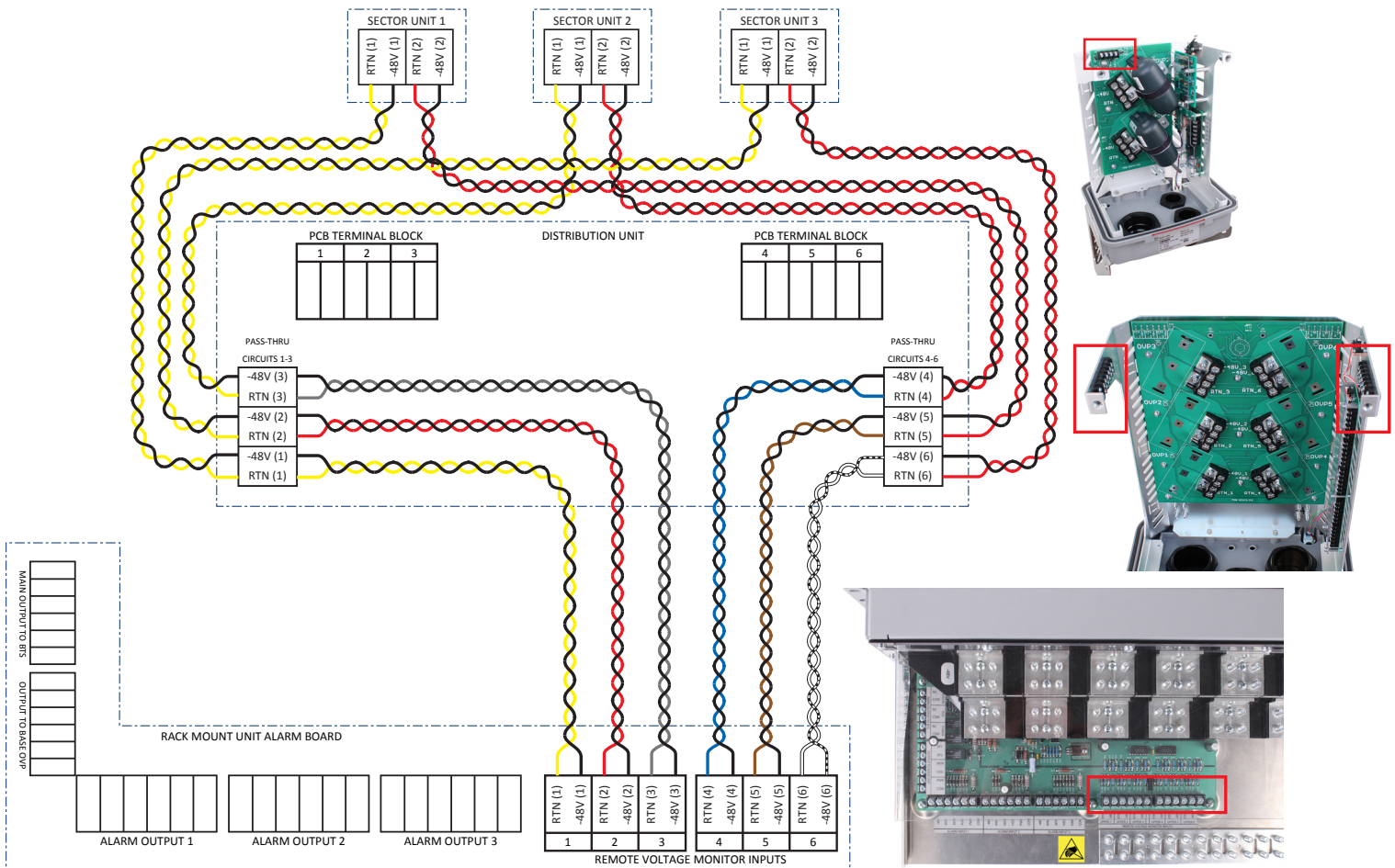
There are two six contact terminal blocks provided on the rack to connect the wires from the tower top (refer to 5.9 below).

Connect the Voltage signal wires to the terminal blocks by stripping the wires back  $\frac{3}{8}$ " and connect the Return and -48V for each radio in the correct input terminal using a standard  $\frac{1}{4}$ " or a #1 Phillips screwdriver. When power is applied, the voltmeter should display the voltage between each -48V and Return pair. If the circuit is connected backwards, the voltmeter will display "PL" for "PoLarity".

## Volt Meter Wiring Diagram (Rooftop Distribution)

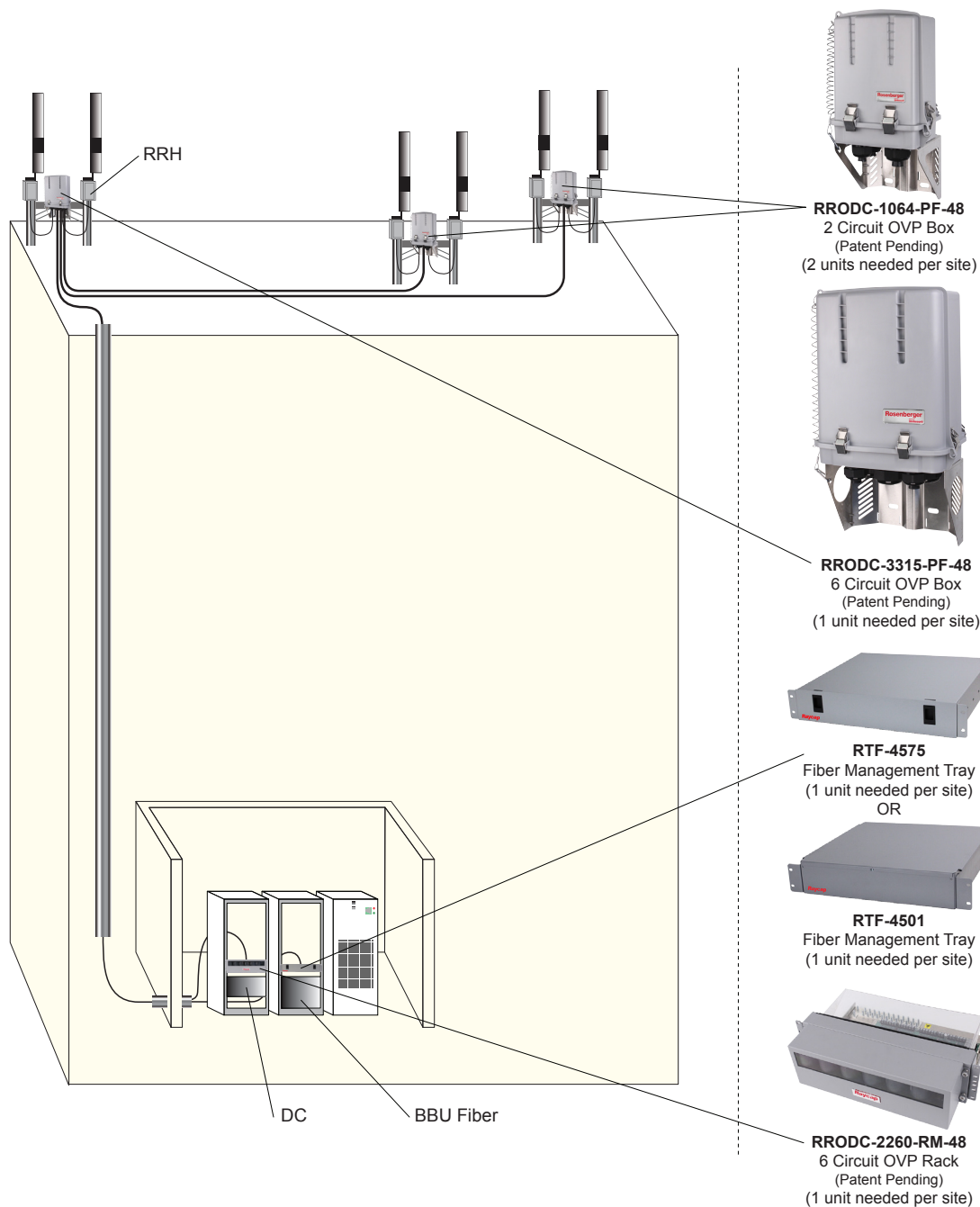
- 5.9 Refer to diagram below for wiring the Volt Meter System.

**Note:** The diagram shows the color code for the 2/4 hybrid cable used between the sector units and the distribution unit and the 6/12 hybrid cable used between the distribution unit and the rack mount unit.



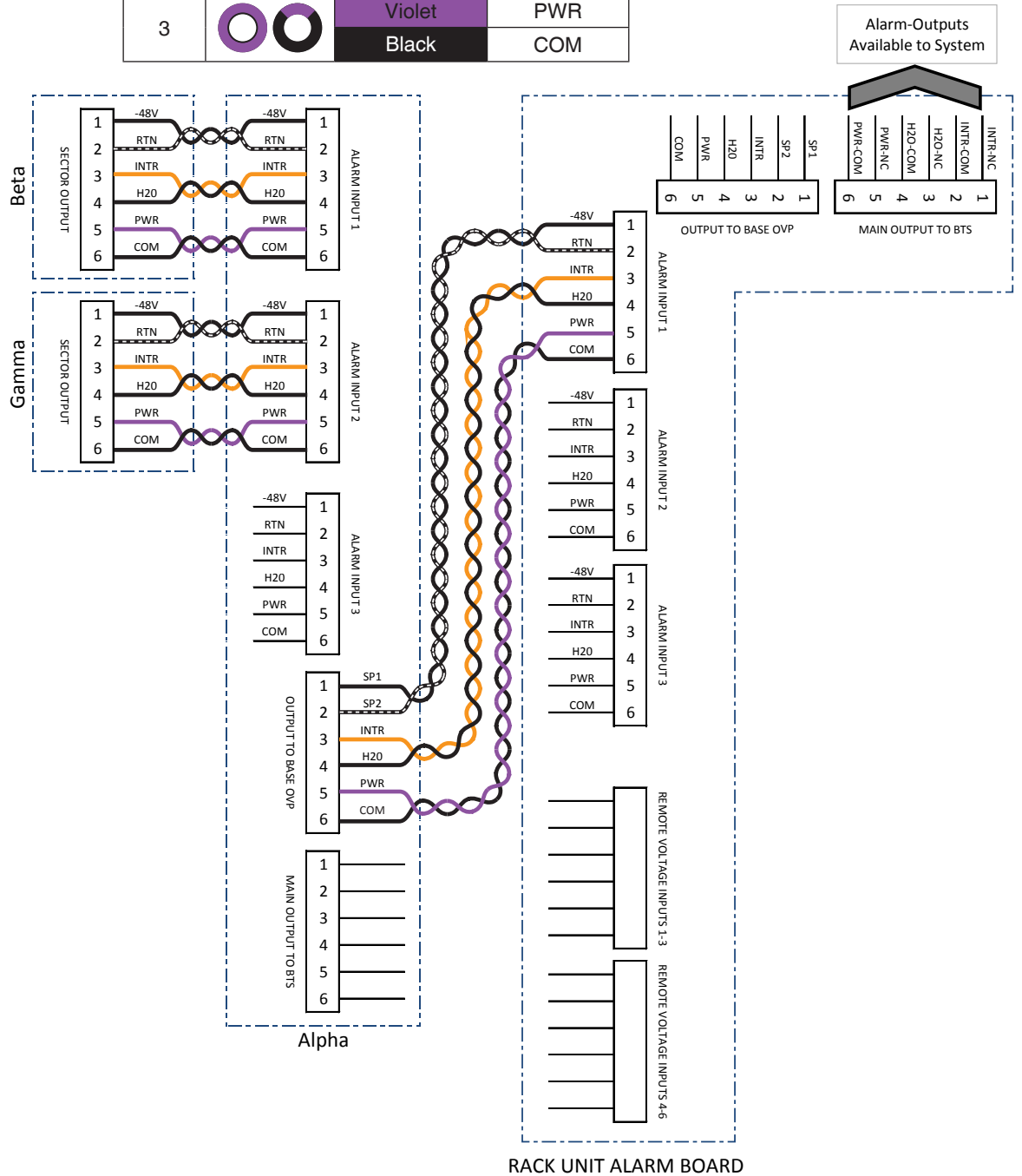
### Installing Alarm for Rooftop (Tenant Improvement)

- 5.10 Refer to diagram 5.12 for Alarm wiring connections.
- 5.11 Rooftop (Tenant Improvement) Application Guide.



- 5.12 Rooftop (Tenant Improvement) Wiring Diagram. These instructions are for interconnecting the alarms for the Raycap products. (Voltage monitoring circuit on separate page) Wire the alarms using the Verizon approved color code.

Pair	Color	Alarm Input
1	Black	-48V
	Black/White	RTN
2	Orange	INTR
	Black	H <sub>2</sub> O
3	Violet	PWR
	Black	COM



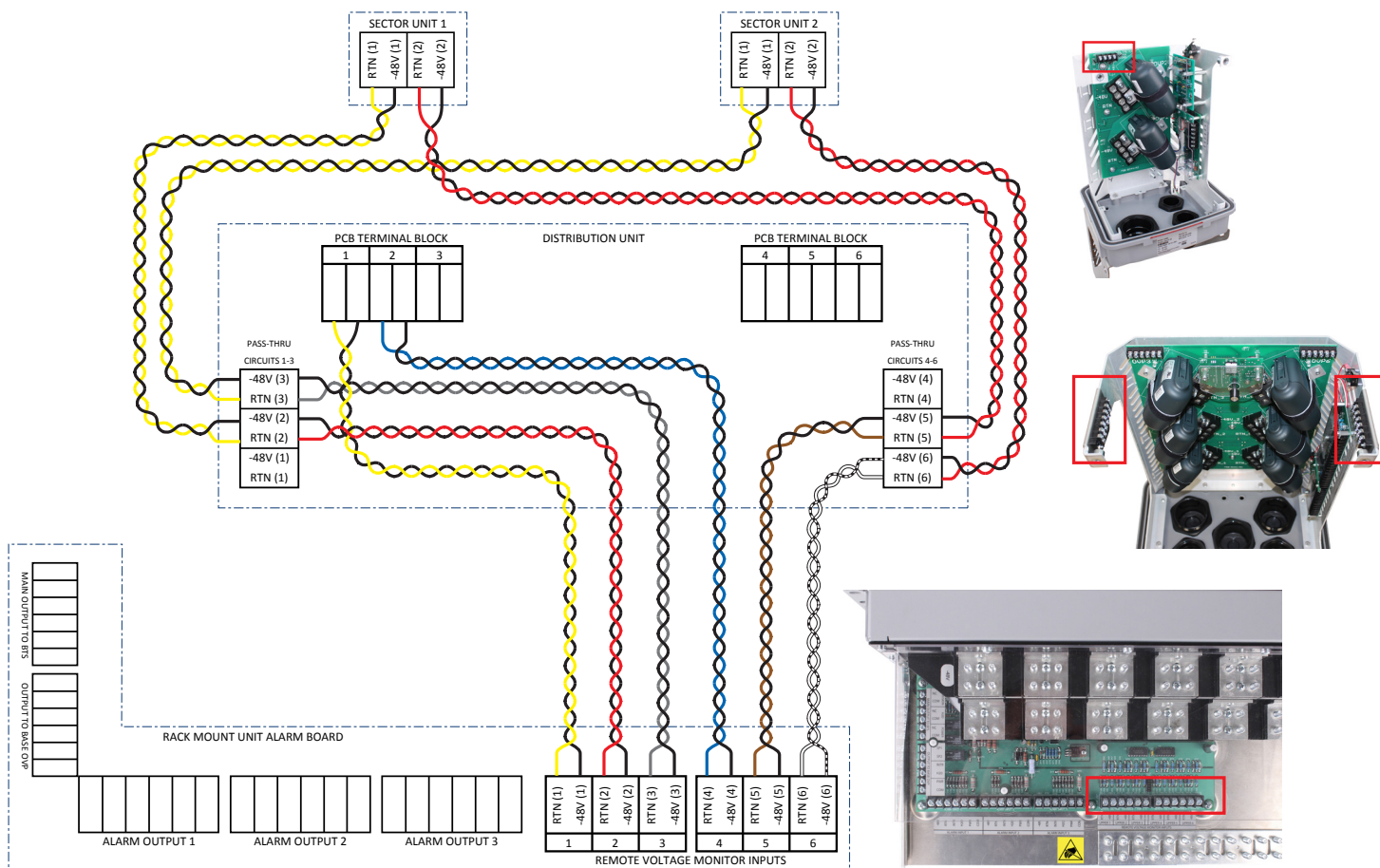
### Volt Meter Wiring Diagram (Rooftop Distribution)

5.13 Refer to diagram below for wiring the Volt Meter System.

**Note:** The diagram shows the color code for the 2/4 hybrid cable used between the sector units and the distribution unit and the 6/12 hybrid cable used between the distribution unit and the rack mount unit.

#### 6/12 Cable - 6 Voltage monitor pairs

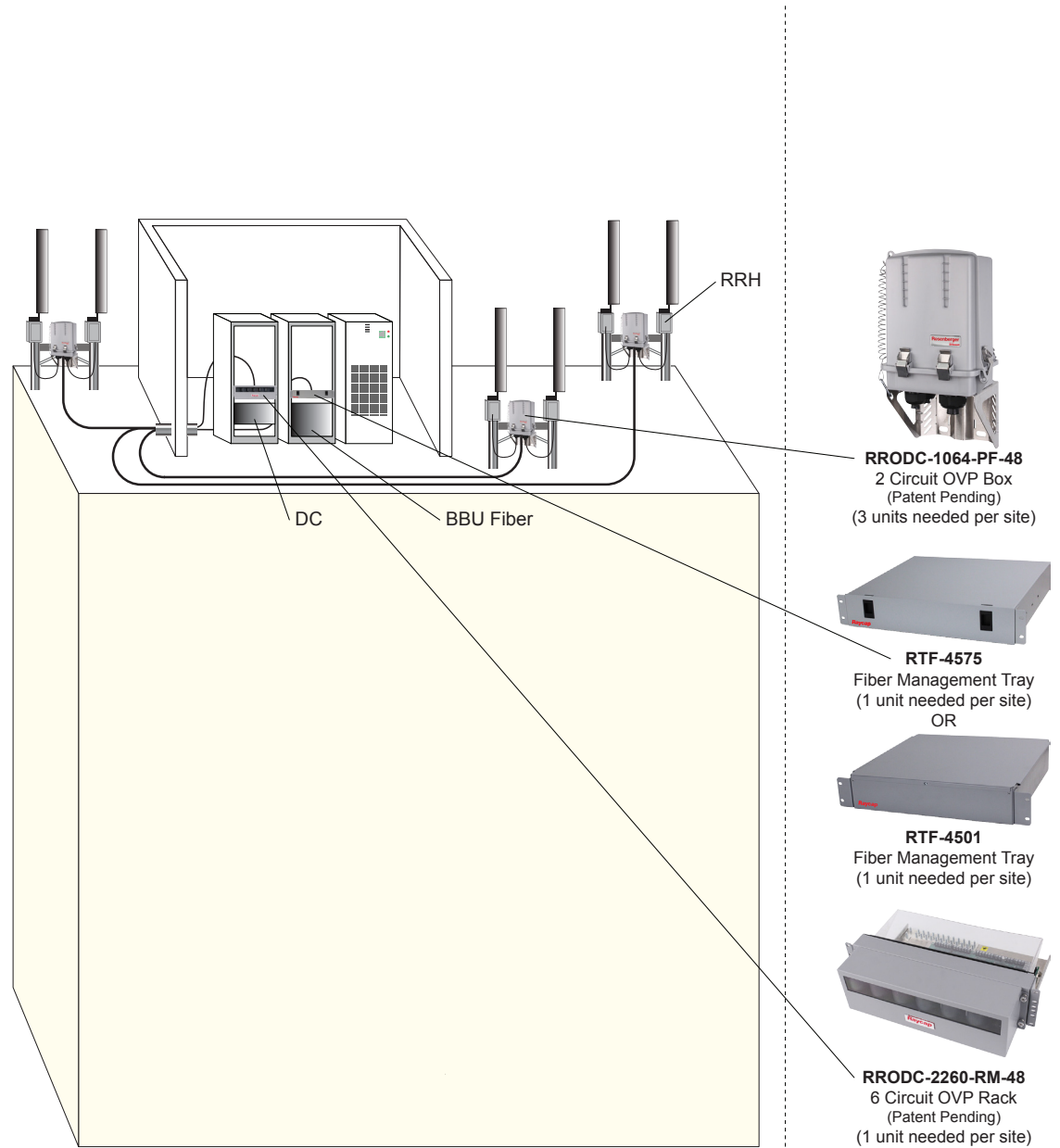
Pair	Color	Alarm Input
1	Yellow	RTN (1)
	Black	-48V (1)
2	Red	RTN (2)
	Black	-48V (2)
3	Slate	RTN (3)
	Black	-48V (3)
4	Blue	RTN (4)
	Black	-48V (4)
5	Brown	RTN (5)
	Black	-48V (5)
6	White	RTN (6)
	White/Black	-48V (6)



### Installing Alarm and Voltage Meter Wires for Rooftop (Penthouse)

5.14 Refer to diagram 5.16 for Alarm wiring connections.

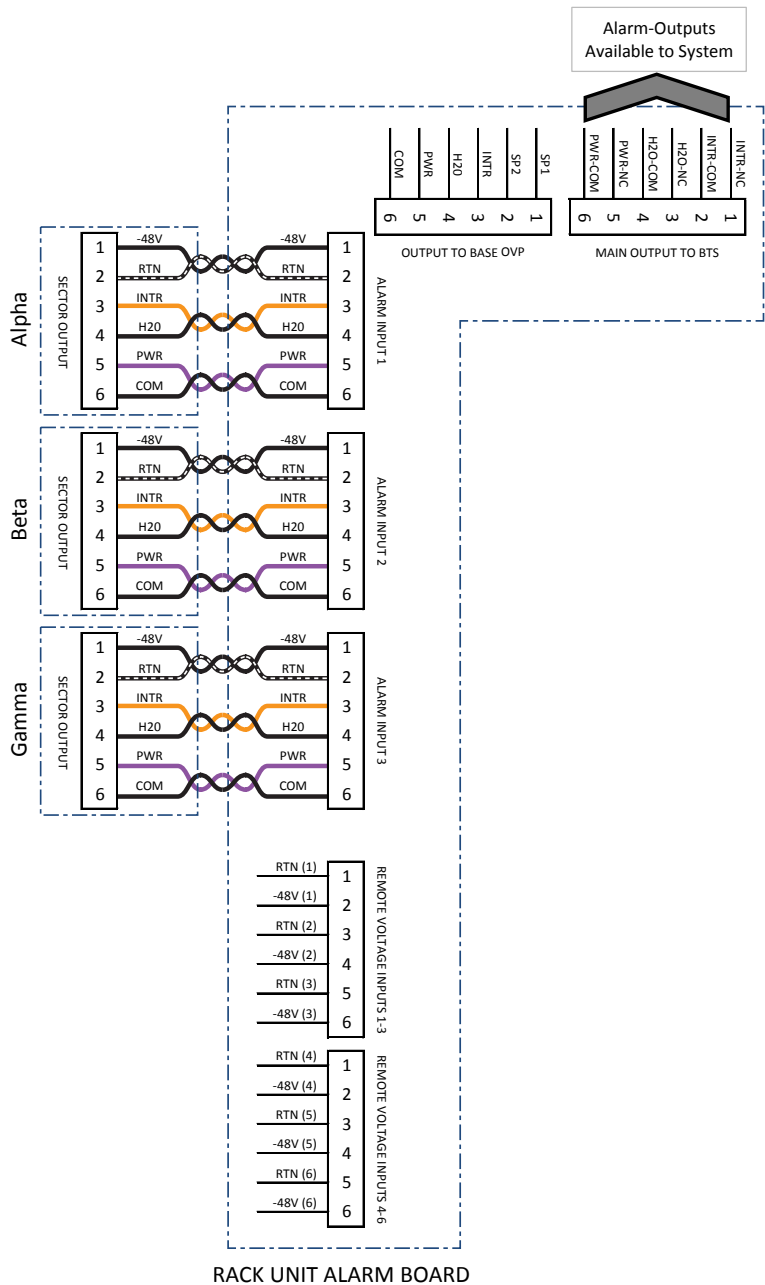
5.15 Rooftop (Penthouse)  
Application Guide.





5.16 Rooftop (Penthouse) Wiring Diagram. These instructions are for interconnecting the alarms for the current Raycap products. (Voltage monitoring circuit on seperate page) Wire the alarms using the Verizon approved color code.

Pair		Color	Alarm Input
1		Black	-48V
		Black/White	RTN
2		Orange	INTR
		Black	H2O
3		Violet	PWR
		Black	COM







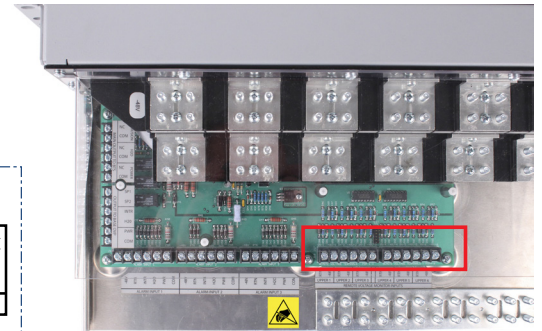
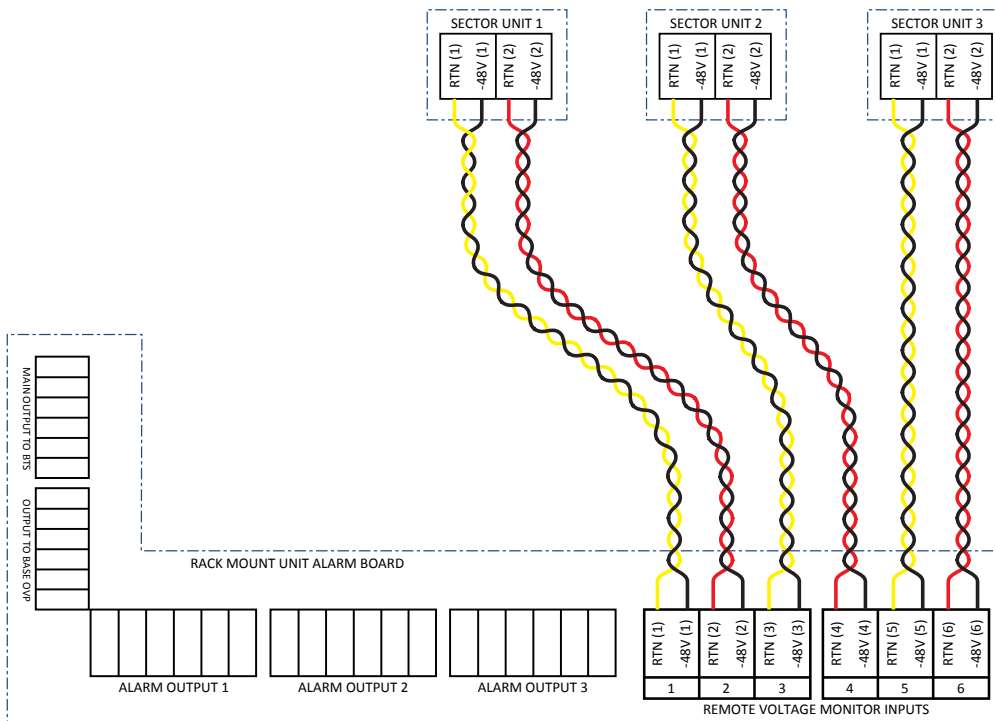
### Volt Meter Wiring Diagram (Rooftop Penthouse)

- 5.17 Refer to diagram below for wiring the Volt Meter System.

**Note:** The diagram shows the color code for the 2/4 hybrid cable used between the sector units and the rack mount unit.

#### 2/4 Cable - 2 Voltage monitor Pairs

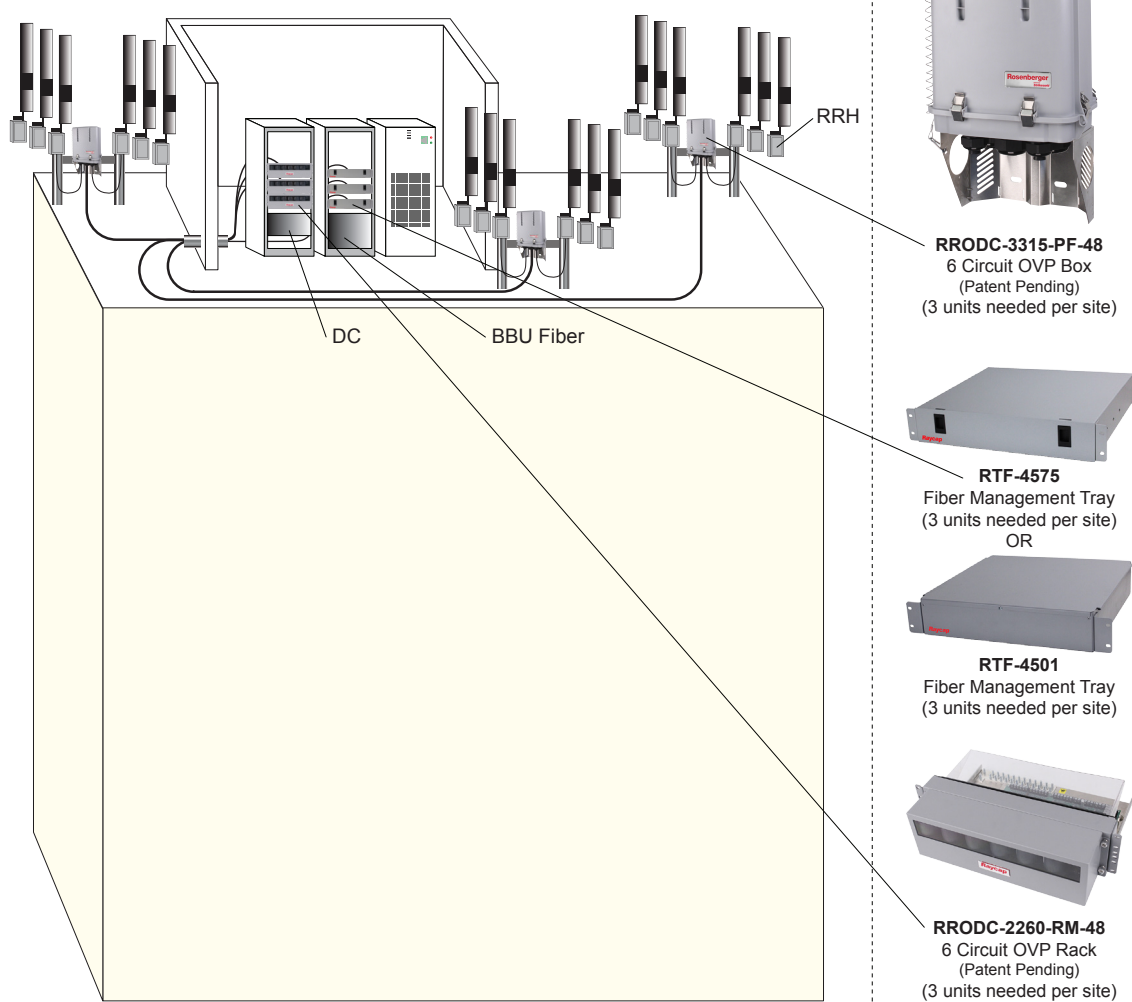
Pair		Color	Alarm Input
1		Yellow	RTN (1)
		Black	-48V (1)
2		Red	RTN (2)
		Black	-48V (2)



### Installing Alarm for Rooftop (Penthouse) -Alternate configuration for high radio count

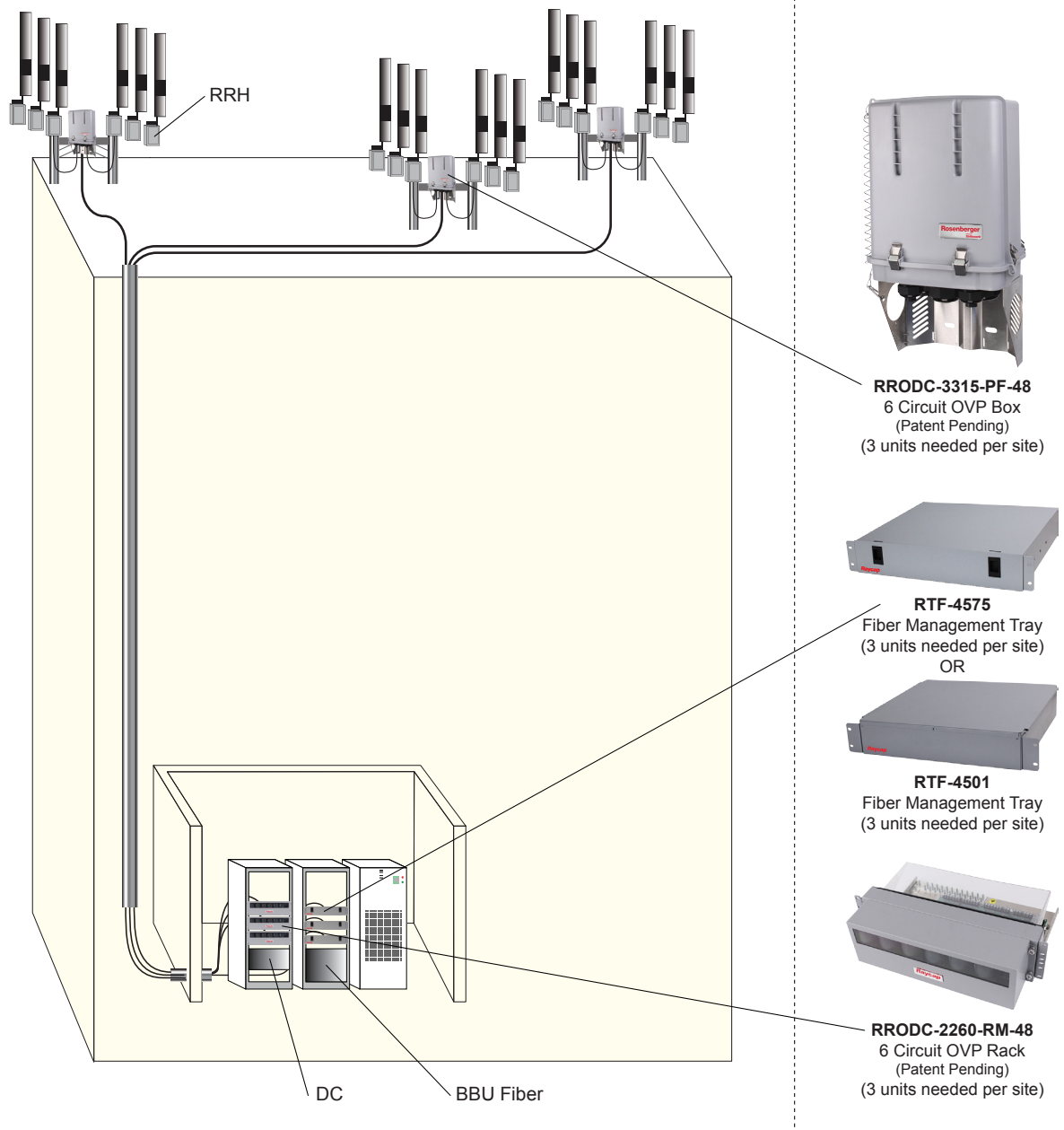
5.18 Refer to diagram 5.26 for  
Alarm wiring connections.

5.19 Rooftop (Penthouse)  
Application Guide.



**Installing Alarm for  
Rooftop (Tenant Improvement)  
-Alternate configuration for high radio count**

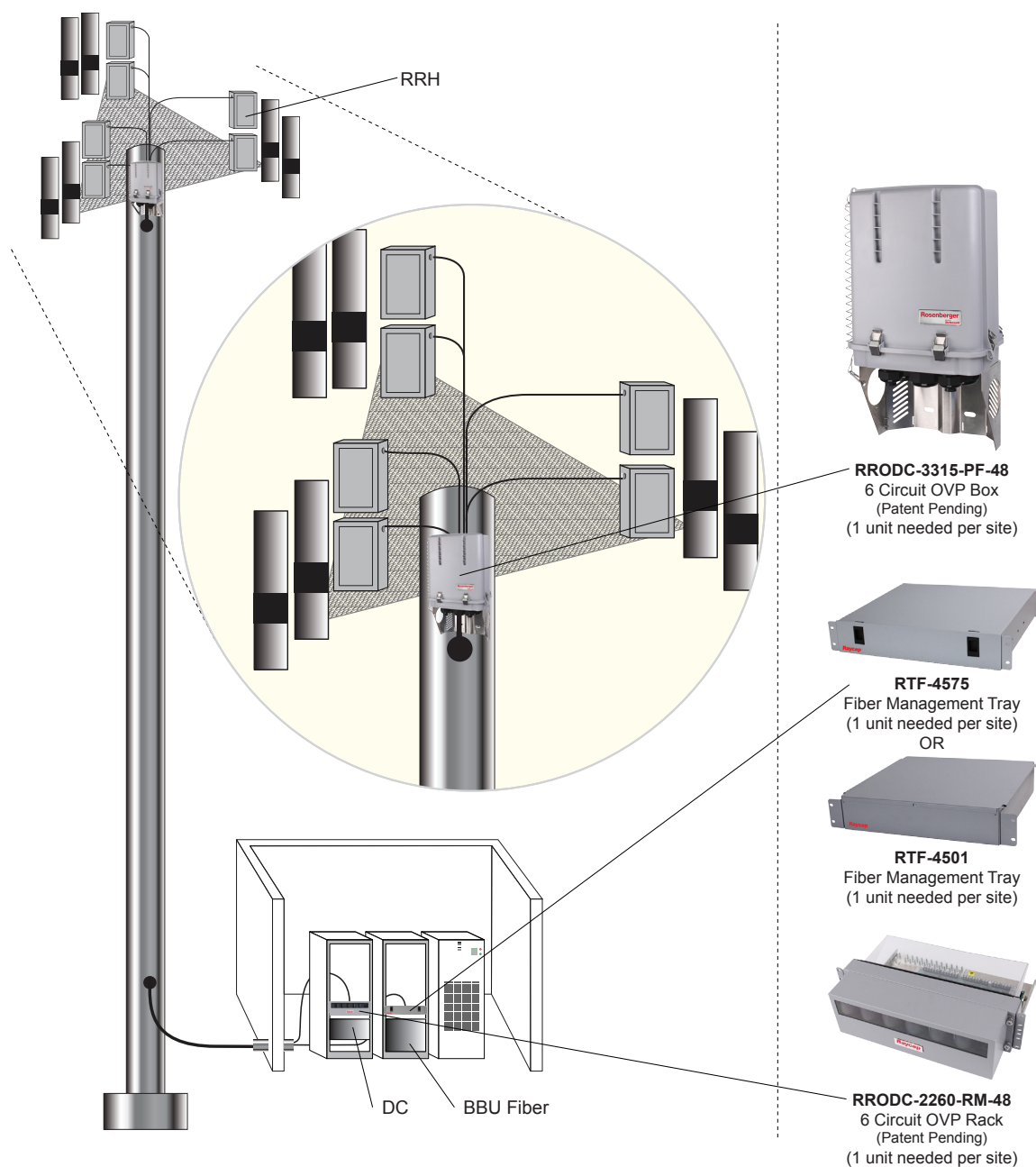
- 5.20 Refer to diagram 5.26 for  
Alarm wiring connections.
- 5.21 Rooftop (Tenant Improvement)  
Application Guide.



### Installing Alarm and Voltage Meter Wires for Tower Top

5.22 Refer to diagram 5.26 for Alarm wiring connections.

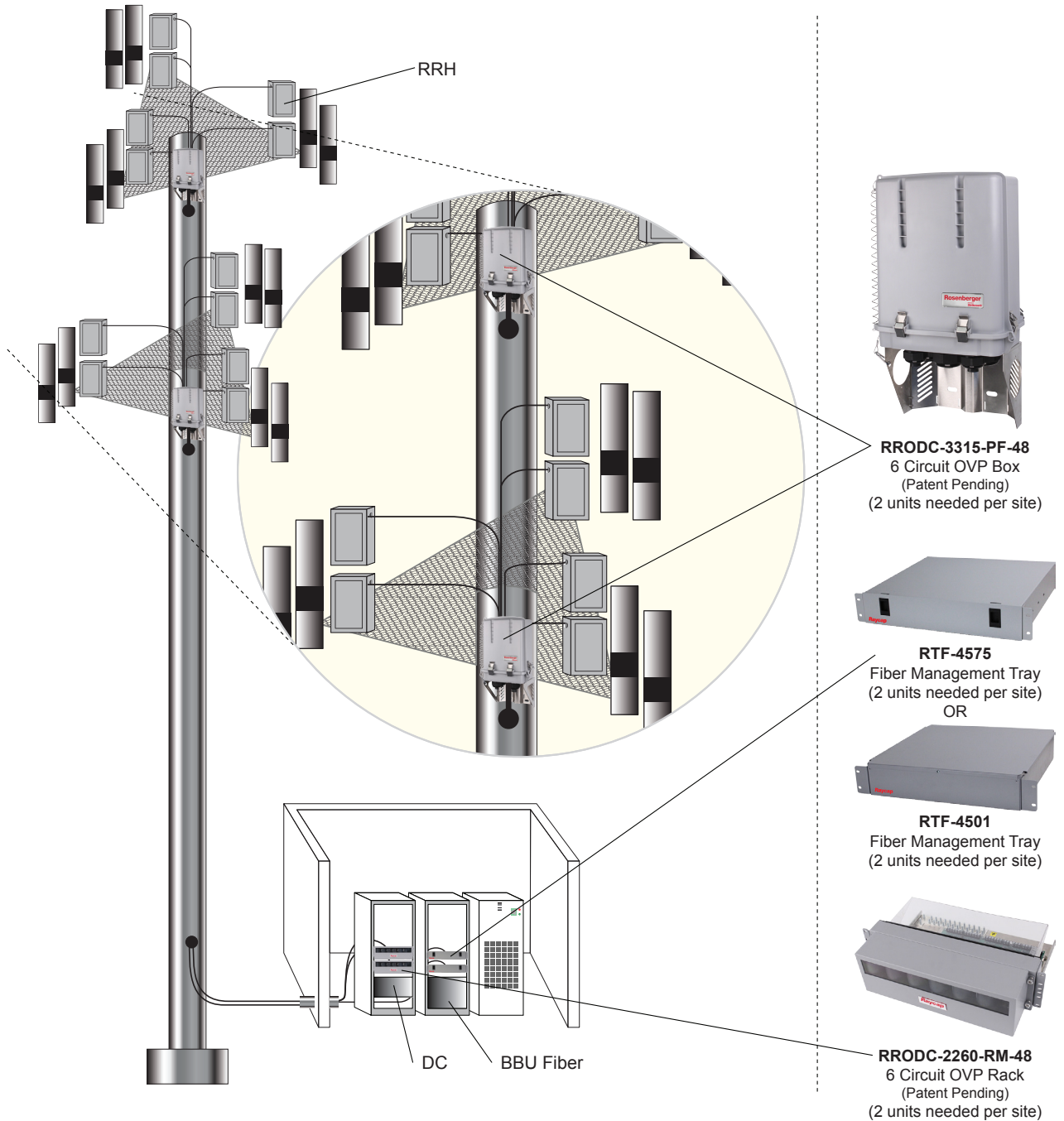
5.23 Tower Top Application Guide.






### Installing Alarm for Tower Top

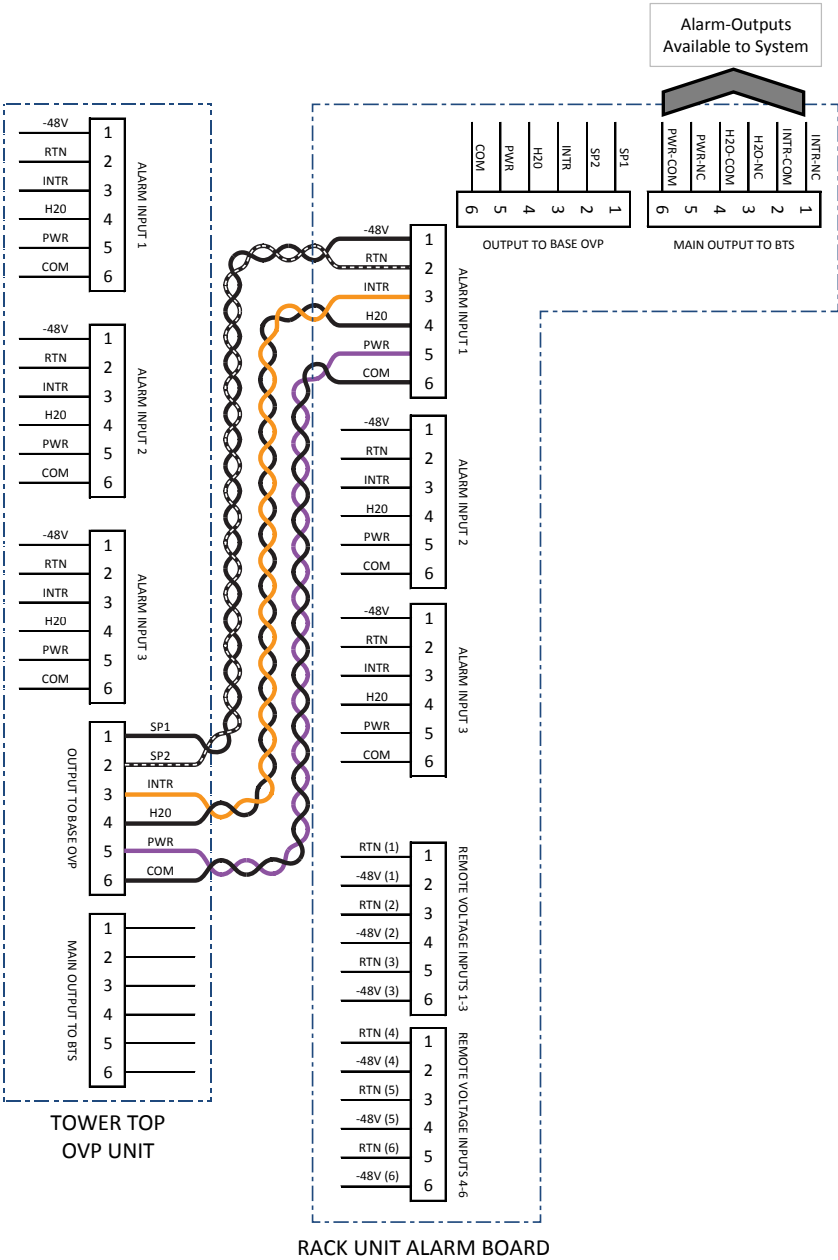
5.24 Refer to diagram 5.26 for Alarm wiring connections.

5.25 Tower Top Application Guide.



5.26 Tower Top Wiring Diagram. These instructions are for interconnecting the alarms for the Raycap products. (Voltage monitoring circuit on separate page) Wire the alarms using the Verizon approved color code.

Pair	Color		Alarm Input
1		Black	-48V
		Black/White	RTN
2		Orange	INTR
		Black	H2O
3		Violet	PWR
		Black	COM



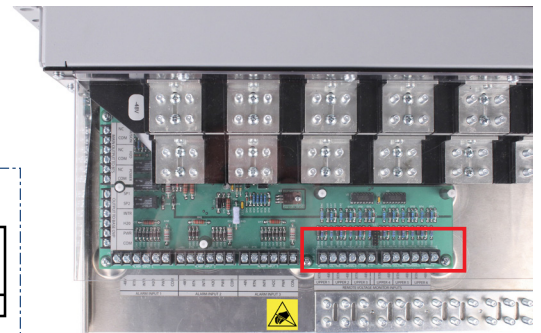
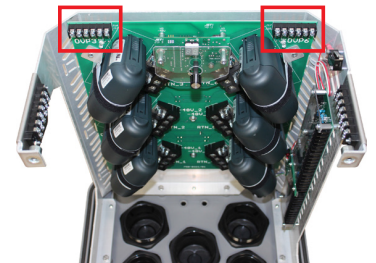
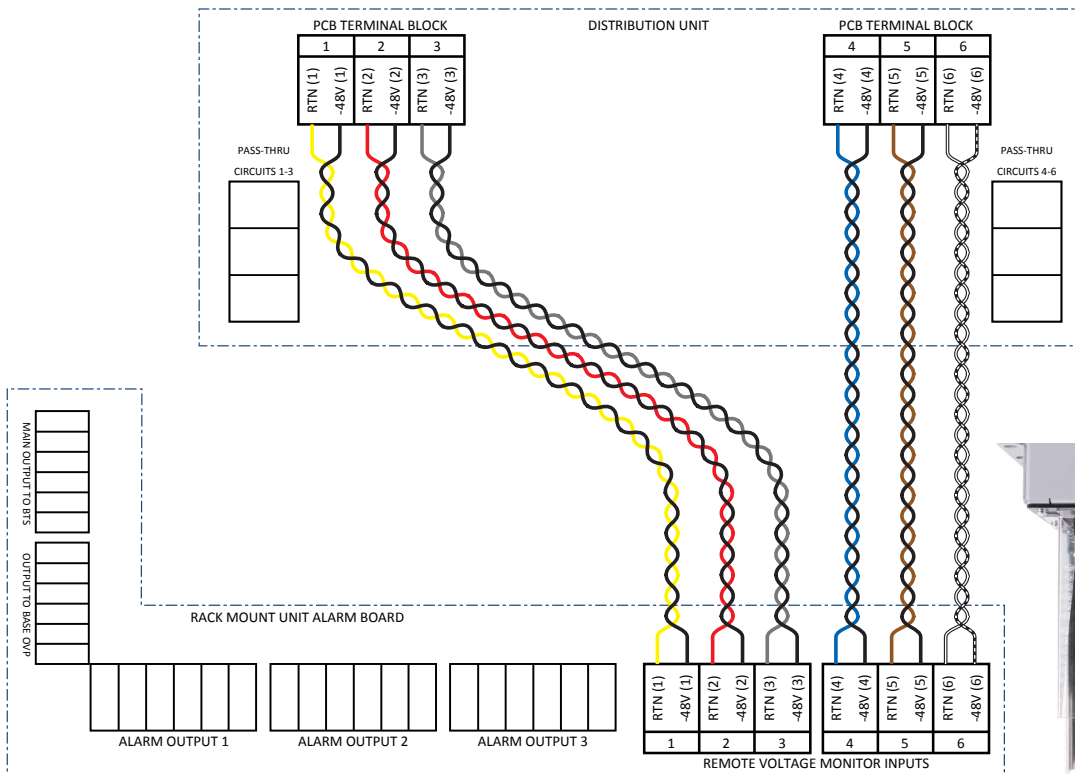
# Volt Meter Wiring Diagram (Towertop)

5.27 Refer to diagram for wiring the Volt Meter System.

**Note:** The diagram shows the color code for the 6/12 hybrid cable used between the tower top unit and the rack mount unit.

## 6/12 Cable - 6 Voltage monitor Pairs

Pair	Color	Alarm Input
1	Yellow	RTN (1)
	Black	-48V (1)
2	Red	RTN (2)
	Black	-48V (2)
3	Slate	RTN (3)
	Black	-48V (3)
4	Blue	RTN (4)
	Black	-48V (4)
5	Brown	RTN (5)
	Black	-48V (5)
6	White	RTN (6)
	White/Black	-48V (6)









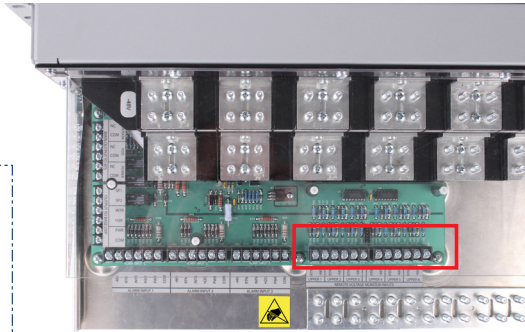
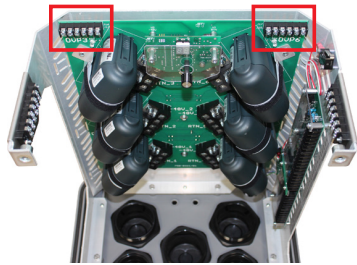
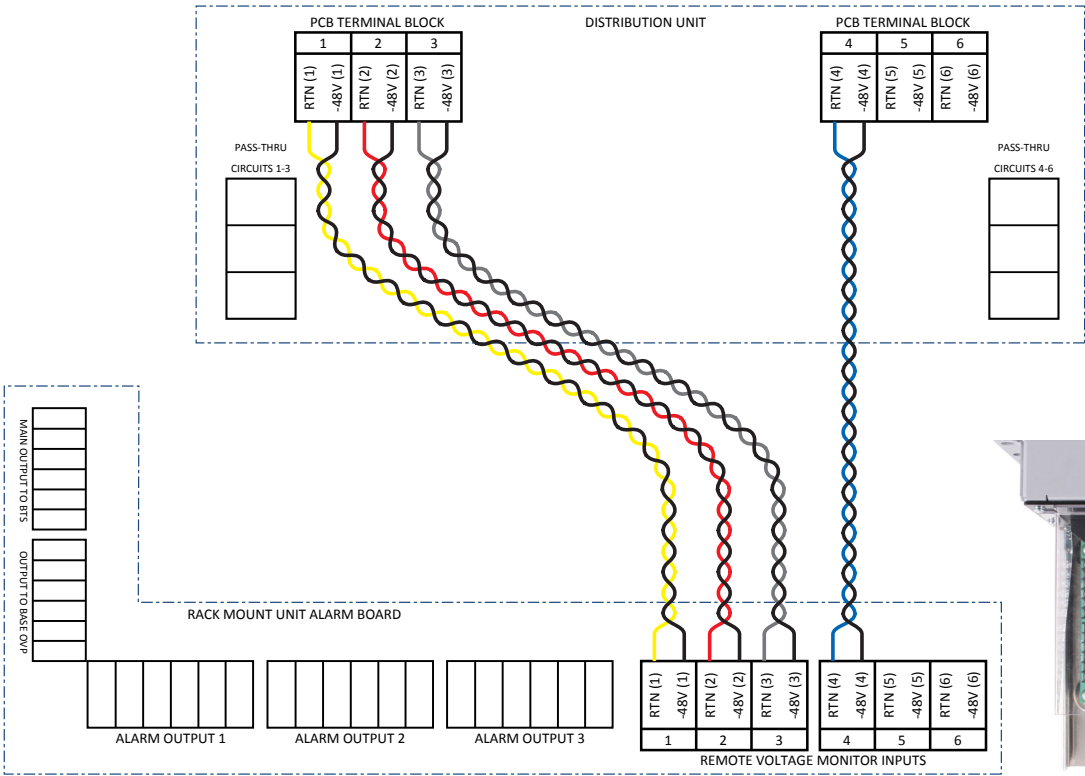
Volt Meter Wiring Diagram  
(Towertop)

5.28 Refer to diagram for wiring the Volt Meter System.

**Note:** The diagram shows the color code for the 4/8 hybrid cable used between the tower top unit and the rack mount unit.

4/8 Cable - 4 Voltage monitor Pairs

Pair	Color		Alarm Input
1		Yellow	RTN (1)
		Black	-48V (1)
2		Red	RTN (2)
		Black	-48V (2)
3		Slate	RTN (3)
		Black	-48V (3)
4		Blue	RTN (4)
		Black	-48V (4)

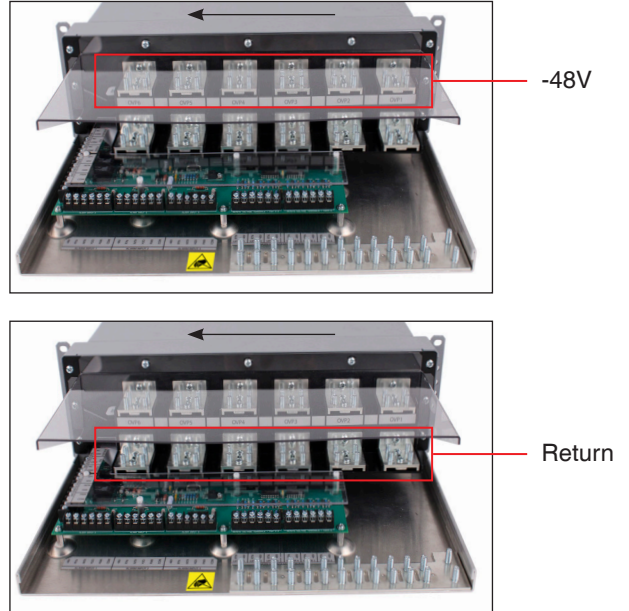




## Procedure

### Power Cable Installation

- 6.1 Top row is used for -48V supply.  
Bottom row is used for return.



### -48VDC (Shield/Ground)

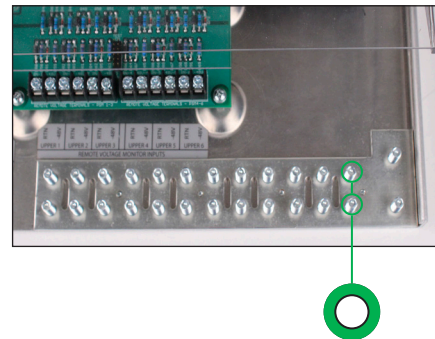
- 6.2 Coat bare conductors with antioxidant.

*The RRODC-2260-RM-48 is to be grounded to a Common Bonding Network.*

*Only copper conductors shall be used for grounding purposes.*

Attach ground cable to ground lug as shown. Tighten nuts using a 7/16" nutdriver.

**Torque:** 65 in-lbs



- 6.3 Ground cable installation complete.

**Hybrid cable**

- 6.4 The approved Verizon color codes for the power cable within each hybrid cable is as follows:





**6/12 Hybrid Cable**

Power Pair	Identification Color	-48V	RTN
x1	Blue		
x2	Violet		
x3	Green		
x4	Brown		
x5	Yellow		
x6	White		

**4/8 Hybrid Cable**

Power Pair	Identification Color	-48V	RTN
x1	Blue		
x2	Violet		
x3	Green		
x4	Brown		

**2/4 Hybrid Cable**

Power Pair	Identification Color	-48V	RTN
x1	Blue		
x2	Violet		

## Procedure

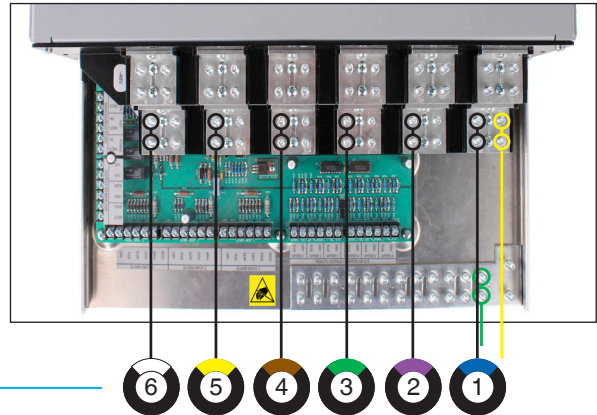
### -48VDC Return

- 6.5 Cut return wires to desired length. Coat bare conductors with antioxidant. Insert cable into lug and crimp to lug according to lug manufacturer's recommendations. *(The battery return cables are in the configuration of an Isolated DC Return.)*

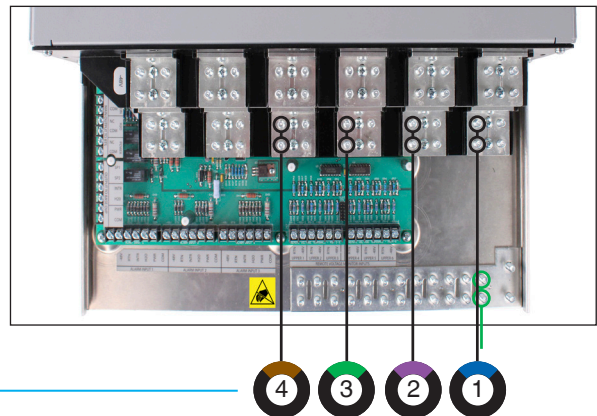
**Note:** Return power from power distribution unit will land on adjacent lug shown here in yellow for circuit #1.

- 6.6 Remove nuts and washers where installation of cables will occur.

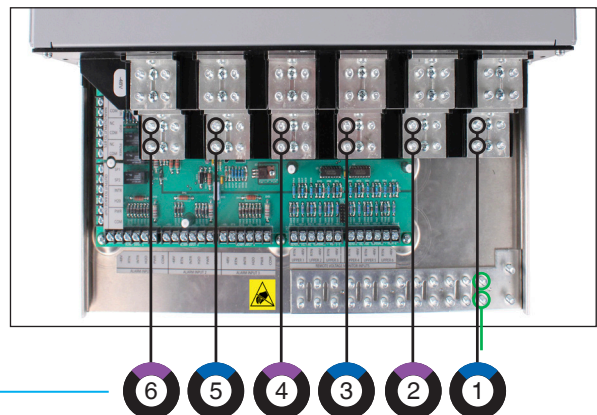
- 6.7 Insert return wires into return bar. Tighten lugs using a 7/16" nutdriver as shown.  
**Torque:** 65 in-lbs



**6/12 Hybrid Cable**  
as used in the Rooftop  
(Tenant Improvement) and  
Tower Top Applications



**4/8 Hybrid Cable**  
as used in Tower Top  
Applications



**2/4 Hybrid Cable (X3)**  
as used in Roof Top  
Applications

## Procedure

### -48VDC Supply

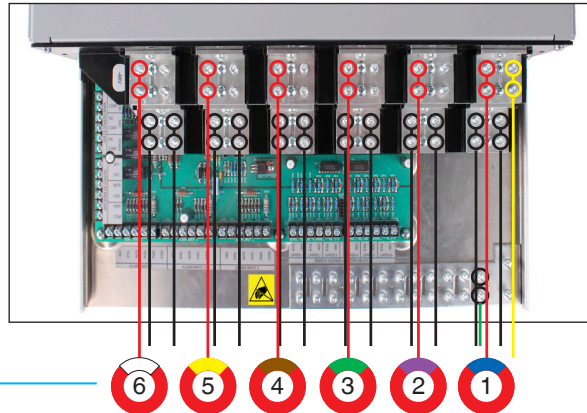
- 6.8 Cut -48 supply wires to desired length. Coat bare conductors with antioxidant. Insert cable into lug and crimp to lug according to lug manufacturer's recommendations.

**Note:** -48V power from power distribution unit will land on adjacent lug shown here in yellow for circuit #1.

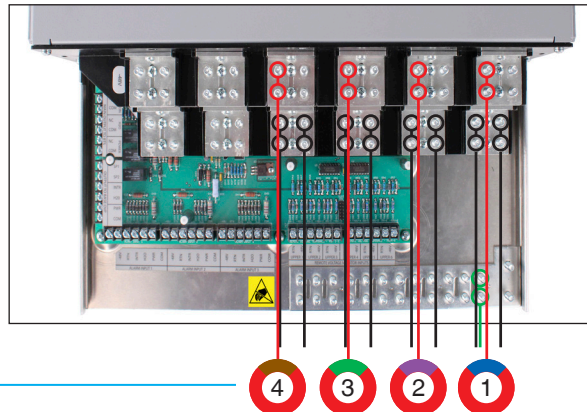
- 6.9 Remove nuts and washers where installation of cables will occur.

- 6.10 Insert -48 supply wires into -48 supply bar. Tighten lugs using a 7/16" nutdriver as shown.  
**Torque:** 65 in-lbs

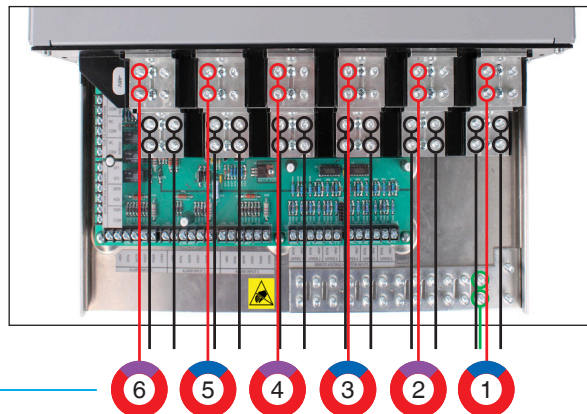
- 6.11 DC cable installation complete.



**6/12 Hybrid Cable**  
as used in the Rooftop  
(Tenant Improvement) and  
Tower Top Applications



**4/8 Hybrid Cable**  
as used in Tower Top  
Applications

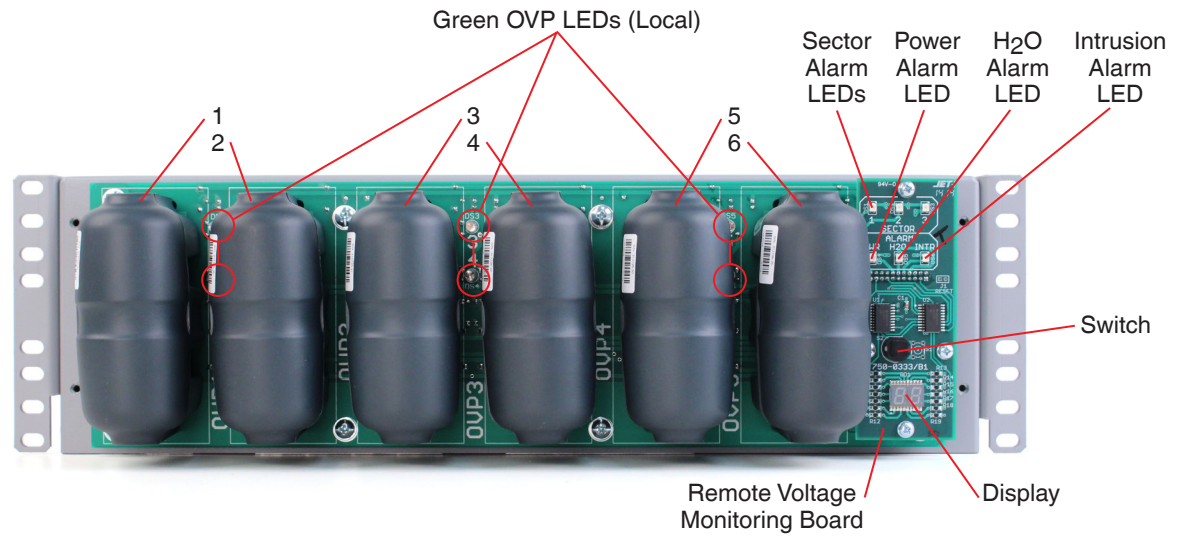


**2/4 Hybrid Cable (X3)**  
as used in Roof Top  
Applications

## Verizon Rack

Close up of Main PCB and LED indicators  
(Shown with cover removed)

7.1





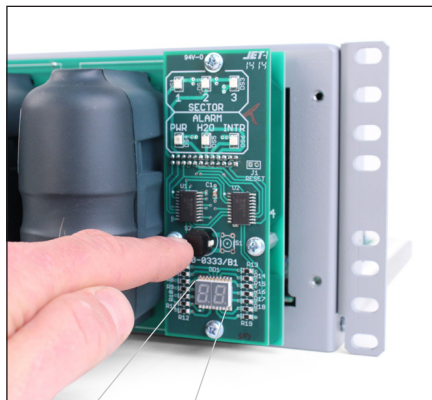
### Volt Meter Operation

- 8.1 Remove cover with a #2 Phillips screw driver.



- 8.2 Once cabling is complete and power is supplied to the unit, voltages can be measured (both local and remote).

- 8.3 To measure a voltage, press the button above the 2-digit display.



- 8.4 Voltages for circuit 1 will be displayed as shown at right:

**Note:**

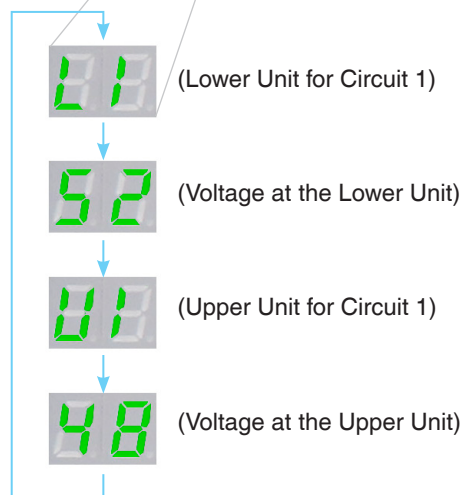
If an alarm circuit is mis-wired, the display will show "PL" (for Polarity)

- 8.5 Pressing the button again shows circuit #2 and so on.

**Note:**

Voltage display will time out after 1 minute of inactivity.

- 8.6 Replace cover.



## Procedure

### Replacing PSM-48

9.1 If required, a PSM-48 module can be replaced.

9.2 Turn off system power.

9.3 Remove front cover.



9.4 Pinch retaining snaps top and bottom and loose PSM-48 module. Remove completely and set aside.



9.5 Install new PSM-48 module.

**Note:**

Fit may be tight. Insure a solid connection.



9.6 Replace cover.



