Installation Instructions:

RRODC-4750-PF-48

Contents

1.0 Copyright

1.1 Disclaimer

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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.

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

CAUTION – Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose. (See pg. 5 for typical bend radius')

CAUTION – Do not let fiber-optic cables hang free from the connector. All fiber must be secured against movement in wind while maintaining enough slack to prevent any tension along the run. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

WARNING – Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.
2. If the optical transceiver is covered by a rubber safety cap, remove the cap. Save the cap.
3. Prior to connecting the fiber to the device, clean it using proper industry accepted cleaning methods.
4. Insert the cable connector into the optical transceiver.
5. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

For conditions other than those described above, please contact a Raycap Account Representative at +1 (208) 777-1166, (800) 890-2569, info@raycap.com, or 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.

3.0 Overvoltage Protection Package Contents

- One (1) Enclosure including the SPDs, cable glands, the DC distribution and fiber management parts.
- Incorporated Mounting bracket and related accessories.
- Mounting hardware accessories (bolts, washers and nuts).

3.1 Prerequisites

This document describes how to install the RRODC-4750-PF-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.

Installers shall obey all general and regional installation and safety regulations related to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment. Use this equipment only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any parts that are not recommended by the manufacturer. This could cause electric shock or other injuries.

3.2 Required Tools & Supplies

Wire cutter
Wire strippers
Flat head screwdriver
Small flat head screwdriver
Cross head screwdriver
Adjustable wrench
5/32" Hex key/driver

Procedure

Mounting Procedures

4.1 A mounting base is delivered with the unit. The base allows either wall/ladder or pole mounted installation. See picture to identify the holes for each installation method.

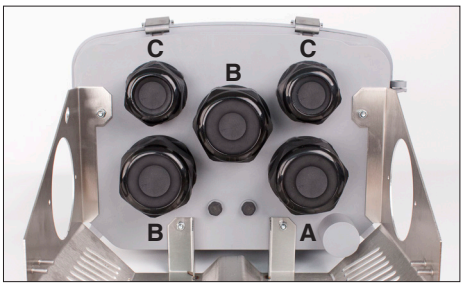
4.2 ***Option 1: Pole Mount***
Using supplied hardware, mount Bracket to 2" to 4" diameter pole.

4.3 ***Option 2: Unistrut***

4.4 ***Option 3: Monopole***
Use 1" stainless steel bands (not supplied) through slots on bracket to mount to Monopole.

Gland/Insert Definitions

5.1 See picture to identify Base Gland Assembly Definitions.



Assembled in unit as shipped:

Pos	Connector Size	Insert Qty	Insert P/N	Insert Range	Cable		Cable Type
					OD (in)	mm	
A	M75	1	190-0620	40mm	(1) 1.493"	37.9	#6 6/12 New
B	M75	2	190-0644	29mm	(1) .1.058"	26.9	#6 2/4 New
C	M63	2	190-0643	29mm	(1) .1.058"	26.9	#6 2/4 New

Included in kit shipped with unit:

Pos	Connector Size	Insert Qty	Insert P/N	Insert Range	Cable		Cable Type
					OD (in)	mm	
A	M75	1	190-0654	36mm	(1) 1.397"	35.48	#6 6/12
A	M75	1	190-0661	33mm	(1) 1.250"	31.75	#8 6/12
A	M75	1	190-0644	29mm	(1) 1.058"	26.9	#6 2/4 New
A&B	M75	3	190-0668	26mm	(1) .993"	25.22	#8 & #6 2/4
C	M63	2	190-0667	26mm	(1) .933"	25.22	#8 & #6 2/4

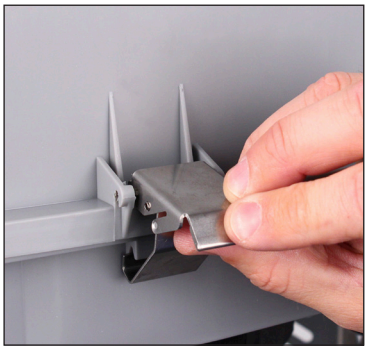
Pre-wiring Preparation Procedure

6.1 Ensure the lanyard from enclosure lid to enclosure base is secure.

Note: Use metal mounting frame to secure hoist when lifting to tower top.

Warning: Holes in lid for lanyard and padlock must NOT be used as hoist locations.

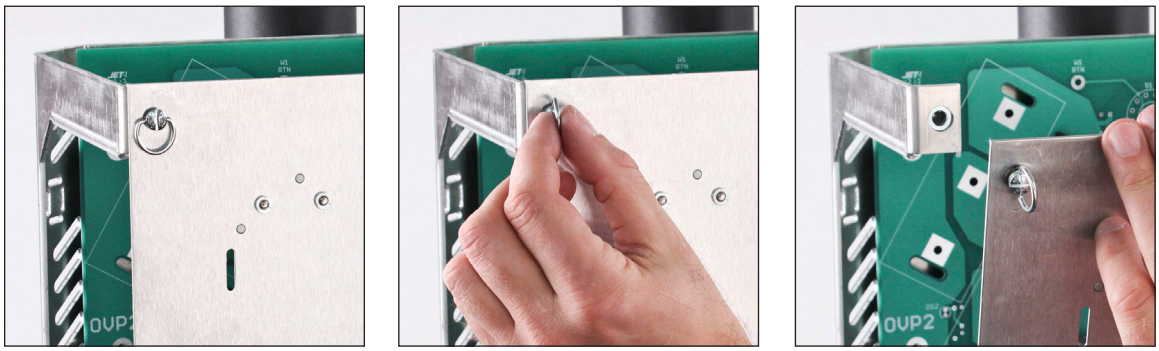
6.2 Open up clamps on all sides of the enclosure cabinet by lifting the hinged clamp tabs.



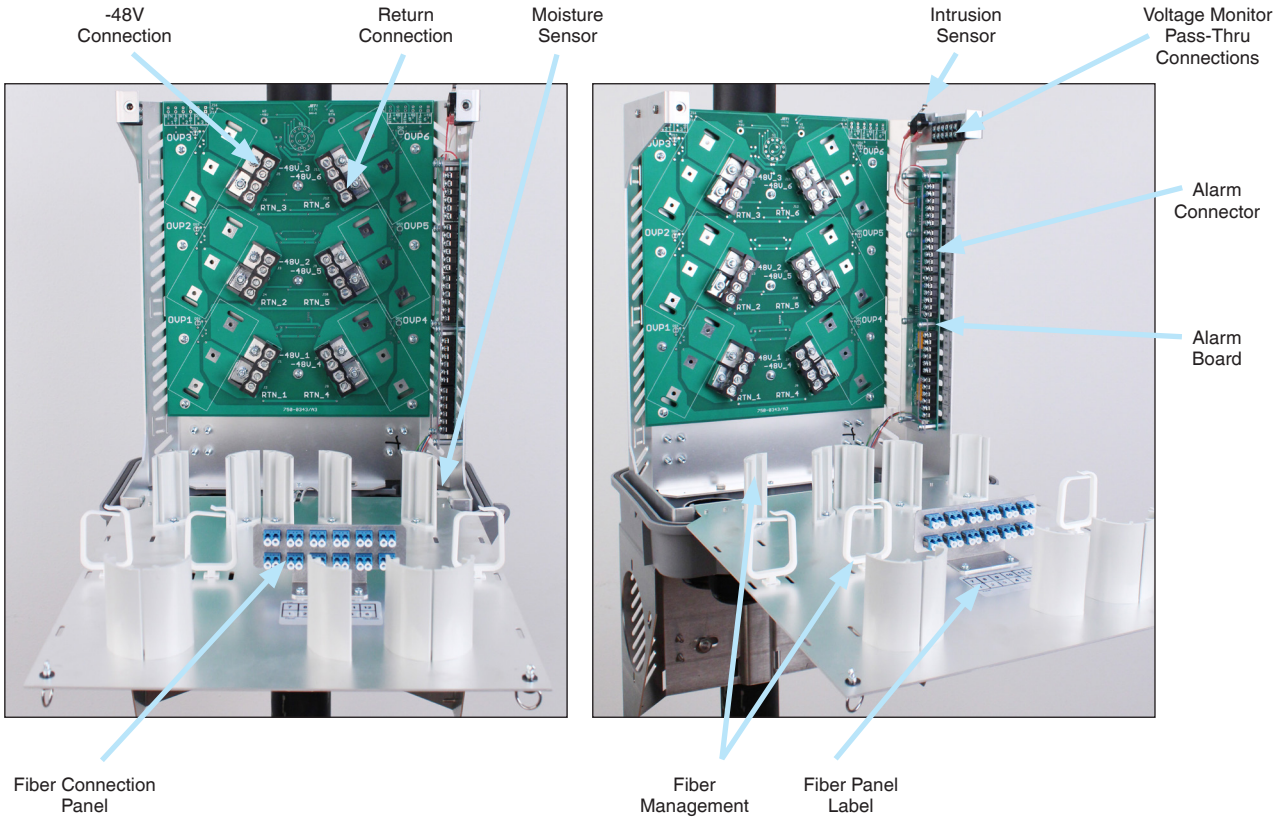
6.3 Remove enclosure lid.

Pre-wiring preparation procedure

6.4 To access power and fiber connections, unclasp 1/4 turn latches, then fold down fiber tray.



6.5

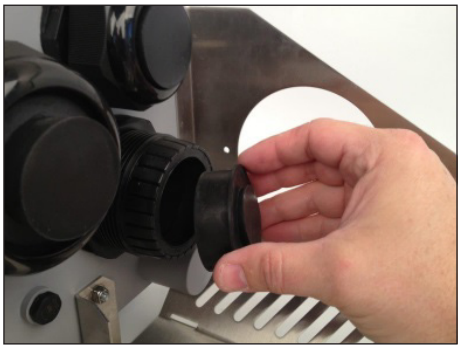


Cable installation instructions

7.1 At the base of the OVP boxes there are cable glands that provide weatherproofing for the enclosure. The following steps will show how to install the Hybrid cable properly.

7.2 Remove compression nut.

7.3 Remove center insert from cable gland.



7.4 Slide compression nut and insert over the cable breakout. Be careful not to damage the fiber connectors. Insert needs to be 1" behind heat shrink tube.

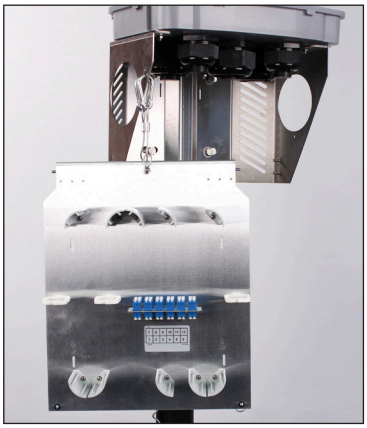
7.5 Carefully feed fiber and power conductors into the OVP box and tighten the compression nut.

Torque: 44 in-lbs

Note: Should the process of installing cables loosen the gland, then the inner nut needs to be retightened (66 in-lb [7.5 N-m]) to maintain the environmental seal of the enclosure.

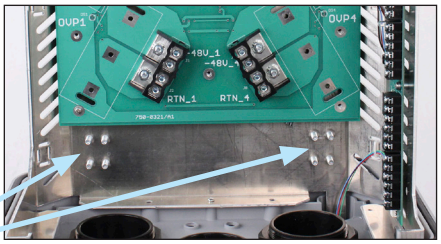
7.6 For more access to the printed circuit boards, the Fiber Panel can be temporarily removed. See illustrations below.

7.7 Attach lanyard to Mounting Bracket.

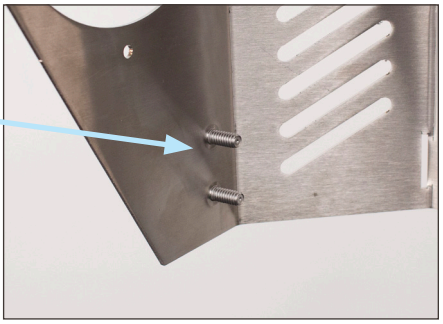


Installing Ground Cable

8.1 There are two grounding placement options available. See below.



Optional Cable Grounds



Main Ground

Hybrid cable

9.1 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		

Installing 6/12 Hybrid Cable

10.1 Feed Hybrid trunk through Insert.

10.2 Feed enough of the cable to strip and connect to power connectors.

10.3 Connect wires according to the guide below.

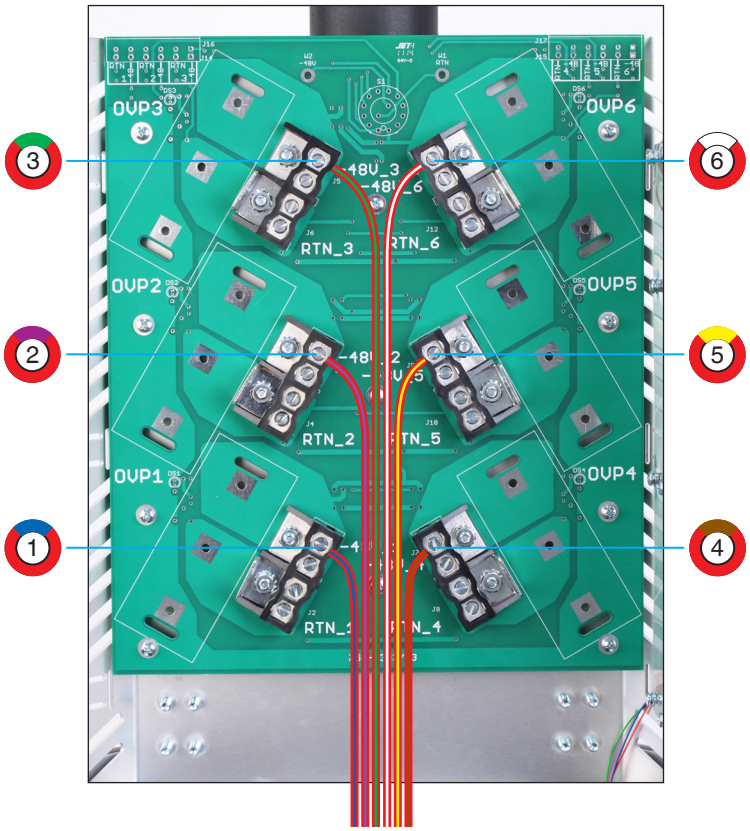
Note:
Bring all cables through cable glands.

Ensure all fiber is seperated and out of the way during copper wire installation.

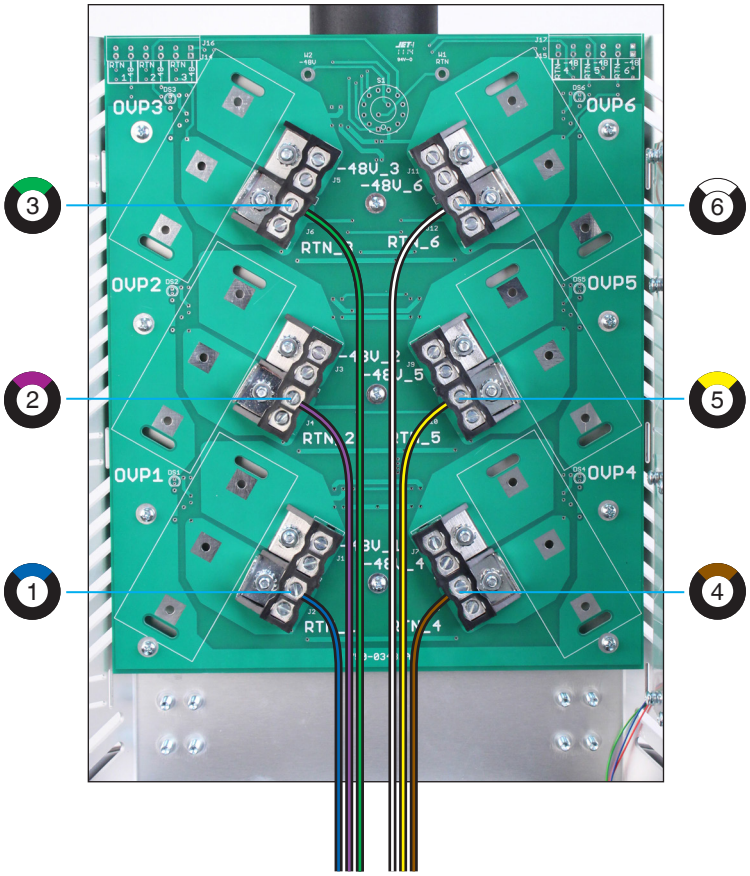
To assist in ease of wiring, proceed by wiring in the following order:

1st: OVP #1 and OVP #4
2nd: OVP #2 and OVP #5
3rd: OVP #3 and OVP #6

Torque: 40 in-lbs (10-6 AWG)



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



Installing 4/8 Hybrid Cable

11.1 Feed Hybrid trunk through Insert.

11.2 Feed enough of the cable to strip and connect to power connectors.

11.3 Connect wires according to the guide below.

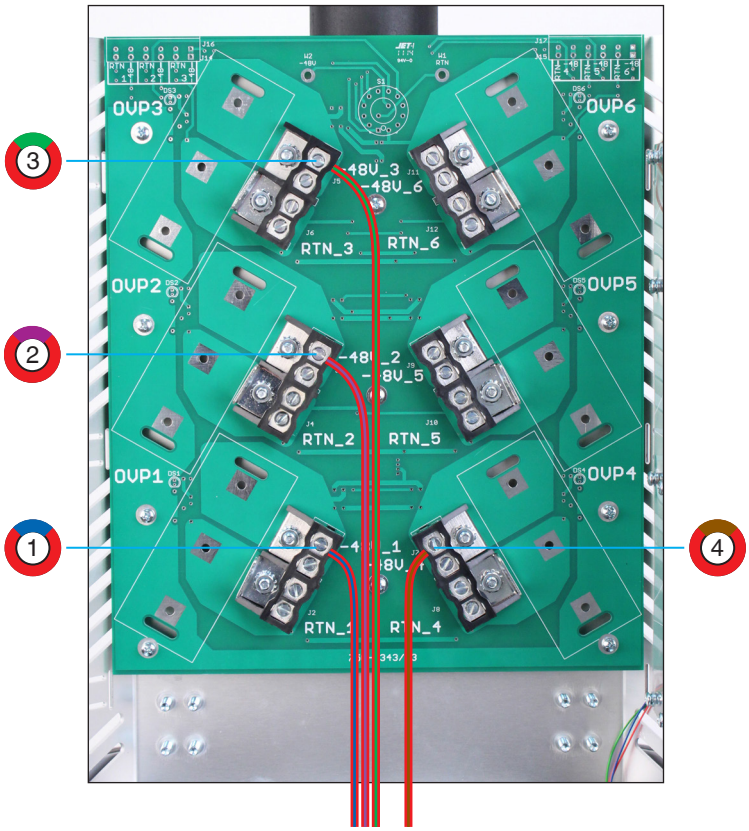
Note:
Bring all cables through cable glands.

Ensure all fiber is seperated and out of the way during copper wire installation.

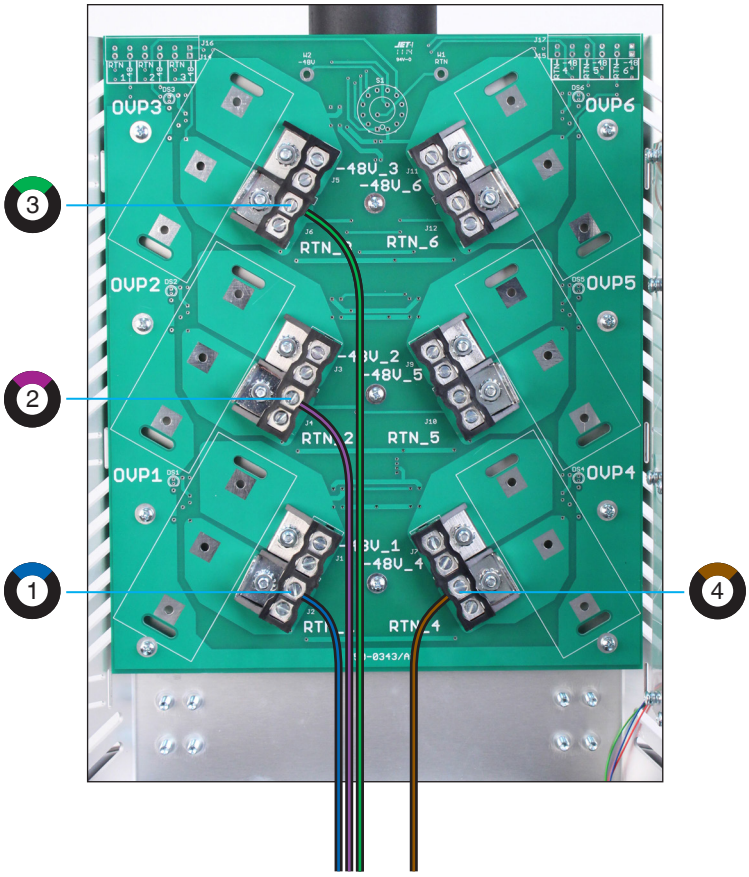
To assist in ease of wiring, proceed by wiring in the following order:

1st: OVP #1 and OVP #4
2nd: OVP #2
3rd: OVP #3

Torque: 40 in-lbs (10-6 AWG)



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



Installing 2/4 Hybrid Cable (X3)

12.1 Feed Hybrid trunk through Insert.

12.2 Feed enough of the cable to strip and connect to power connectors.

12.3 Connect wires according to the guide below.

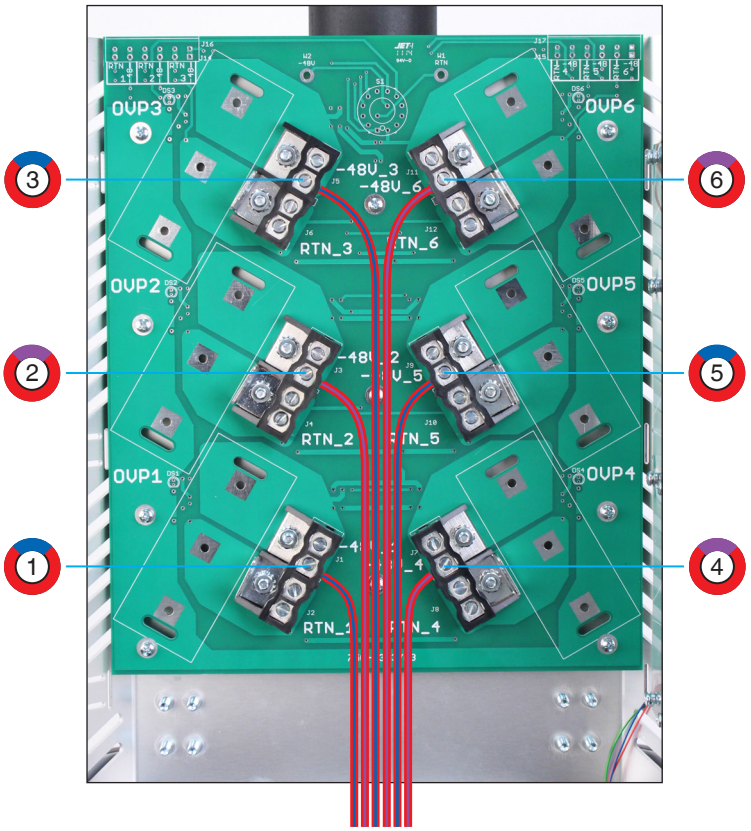
Note:
Bring all cables through cable glands.

Ensure all fiber is seperated and out of the way during copper wire installation.

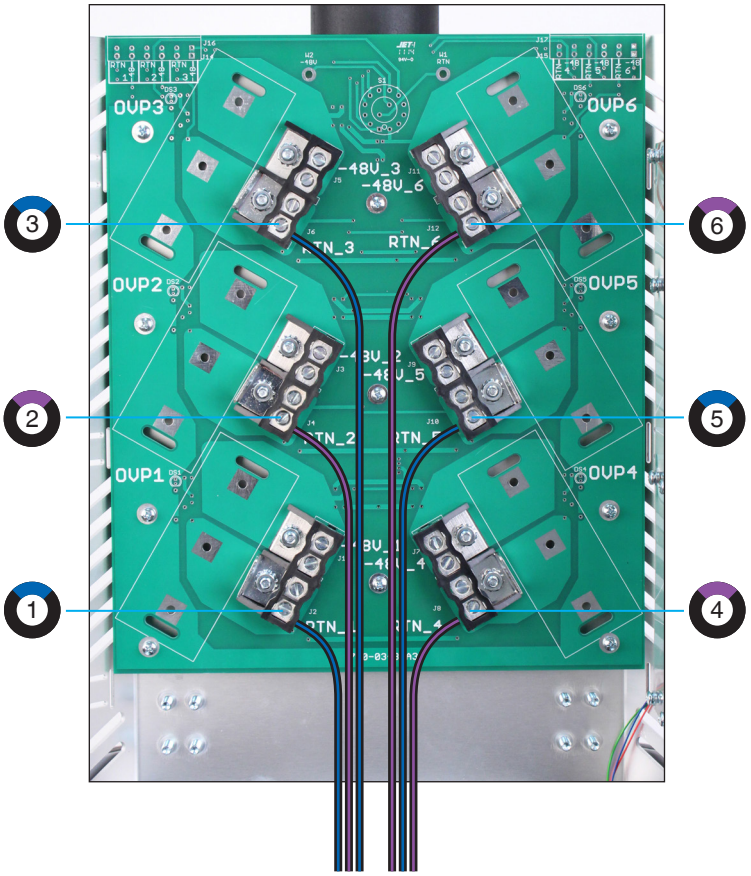
To assist in ease of wiring, proceed by wiring in the following order:

1st: OVP #1 and OVP #4
2nd: OVP #2 and OVP #5
3rd: OVP #3 and OVP #6

Torque: 40 in-lbs (10-6 AWG)

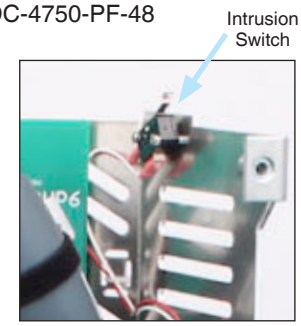


Power Pair	Identification Color	-48V	RTN
x1	Blue		
x2	Violet		



Installing Alarm for RRODC-4750-PF-48

13.1 Alarm connections for RRODC-4750-PF-48



Clear = OK
Red = Alarm

If alarm is indicated, then check Location LED.

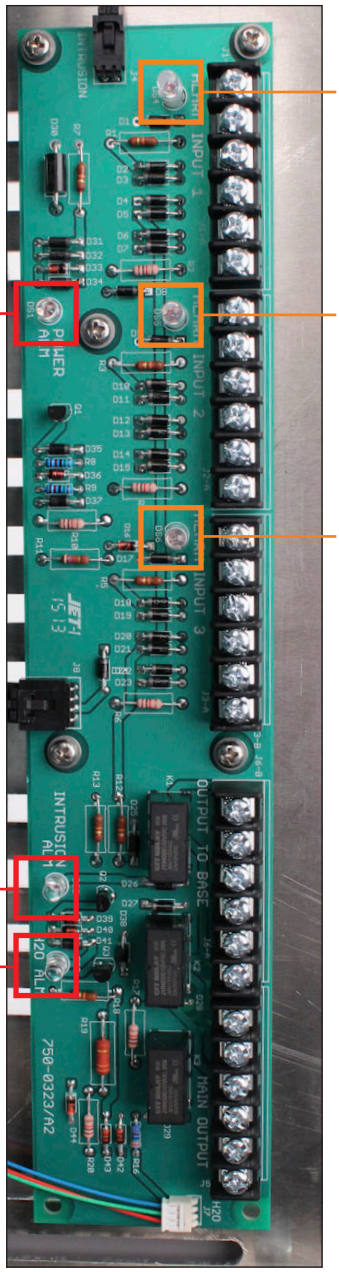
If no location is indicated, then Alarm is located inside this box.

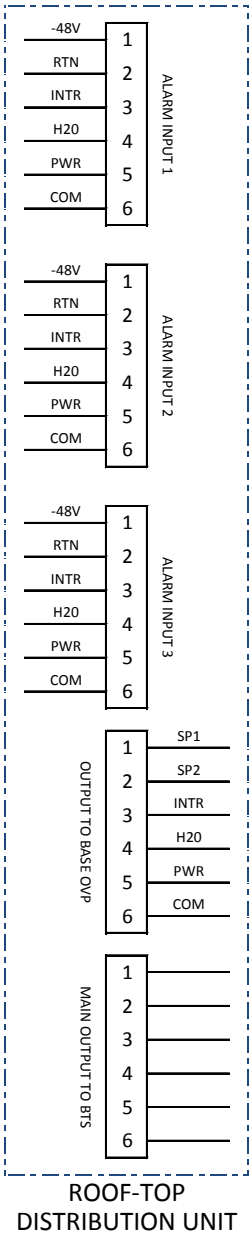
Note: Intrusion alarm will activate when lid is removed. Manually toggle the Intrusion Switch to verify function.

If using a spade connector, use #6 18-22 AWG.

Alarm Type:

Location of Alarm:



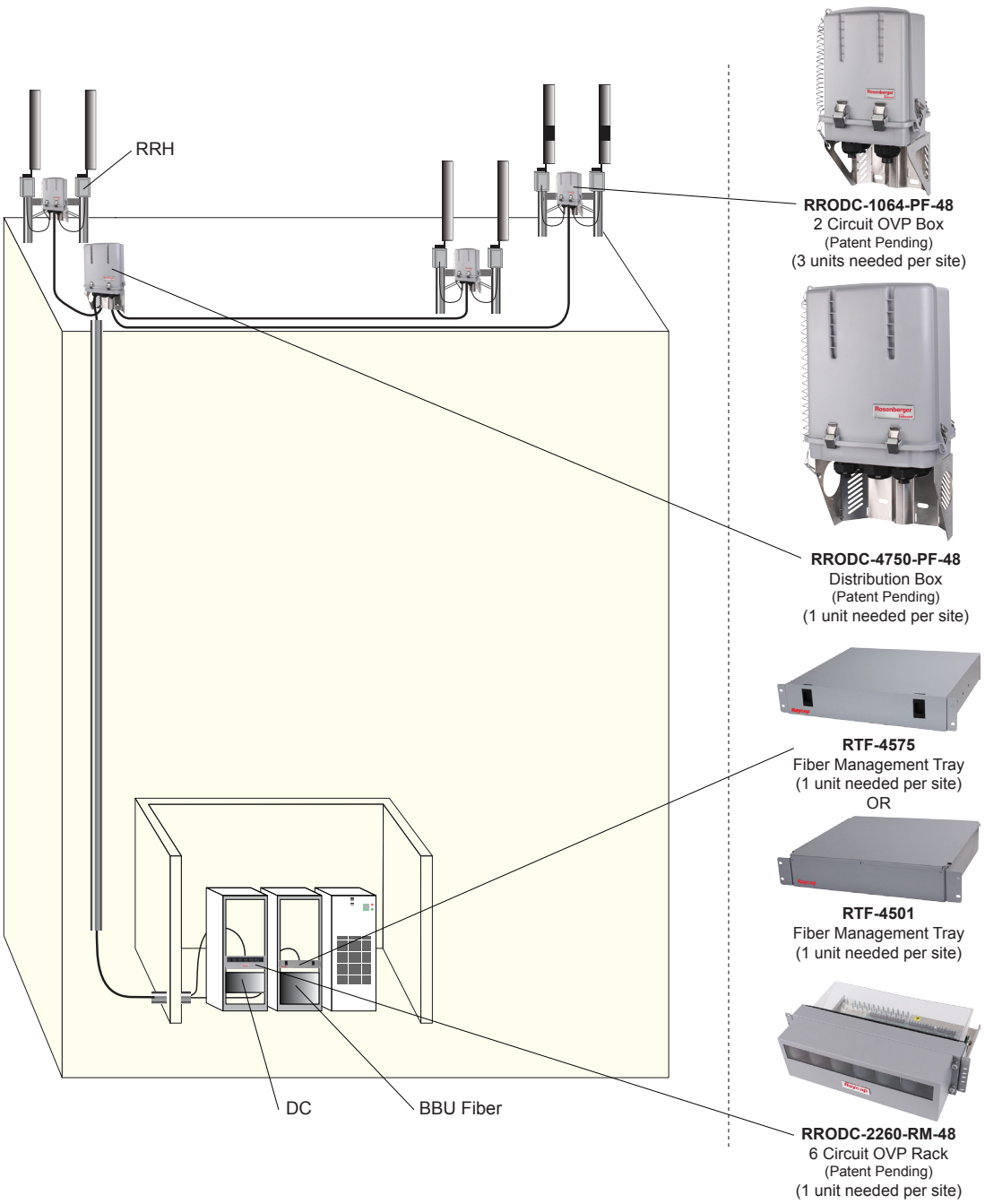


ROOF-TOP DISTRIBUTION UNIT

Installing Alarm for
Rooftop (Tenant Improvement)

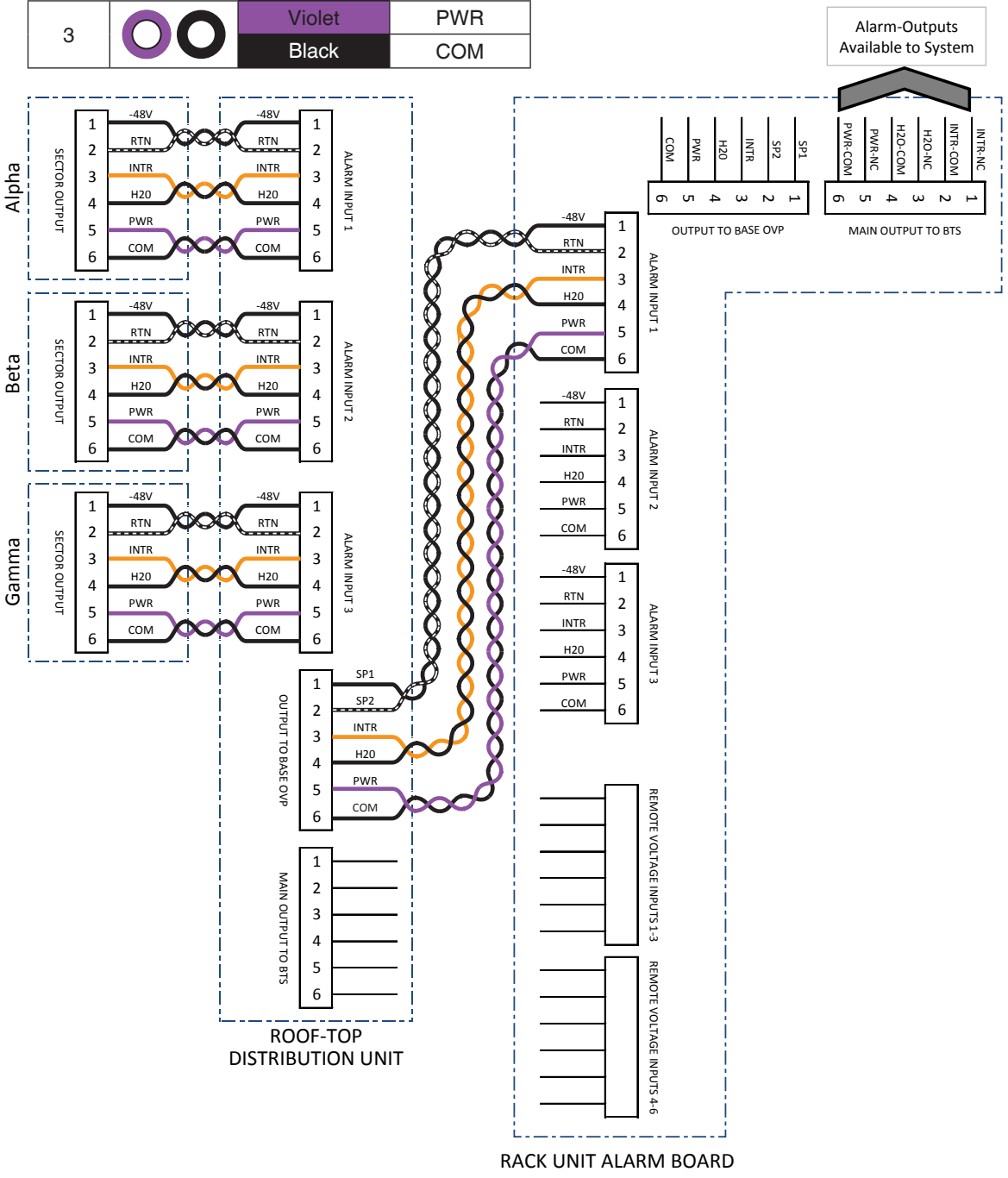
13.2 Refer to diagram 13.4 and for Alarm wiring connections.

13.3 Rooftop (Tenant Improvement) Application Guide.



13.4 Rooftop (Tenant Improvement) Wiring Diagram. These instructions are for interconnecting the alarms for the 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	H_2O
3	Violet	PWR
	Black	COM



Remote Volt Meter Wiring (when employing rack unit)

13.5 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 13.6).

Connect the Voltage signal wires to the terminal blocks by stripping the wires back 3/8" and connect the Return and -48V for each radio in the correct input terminal using a standard 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”.

The approved Verizon color code within each hybrid cable is as follows:

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)

Volt Meter Wiring Diagram (Rooftop Distribution)

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

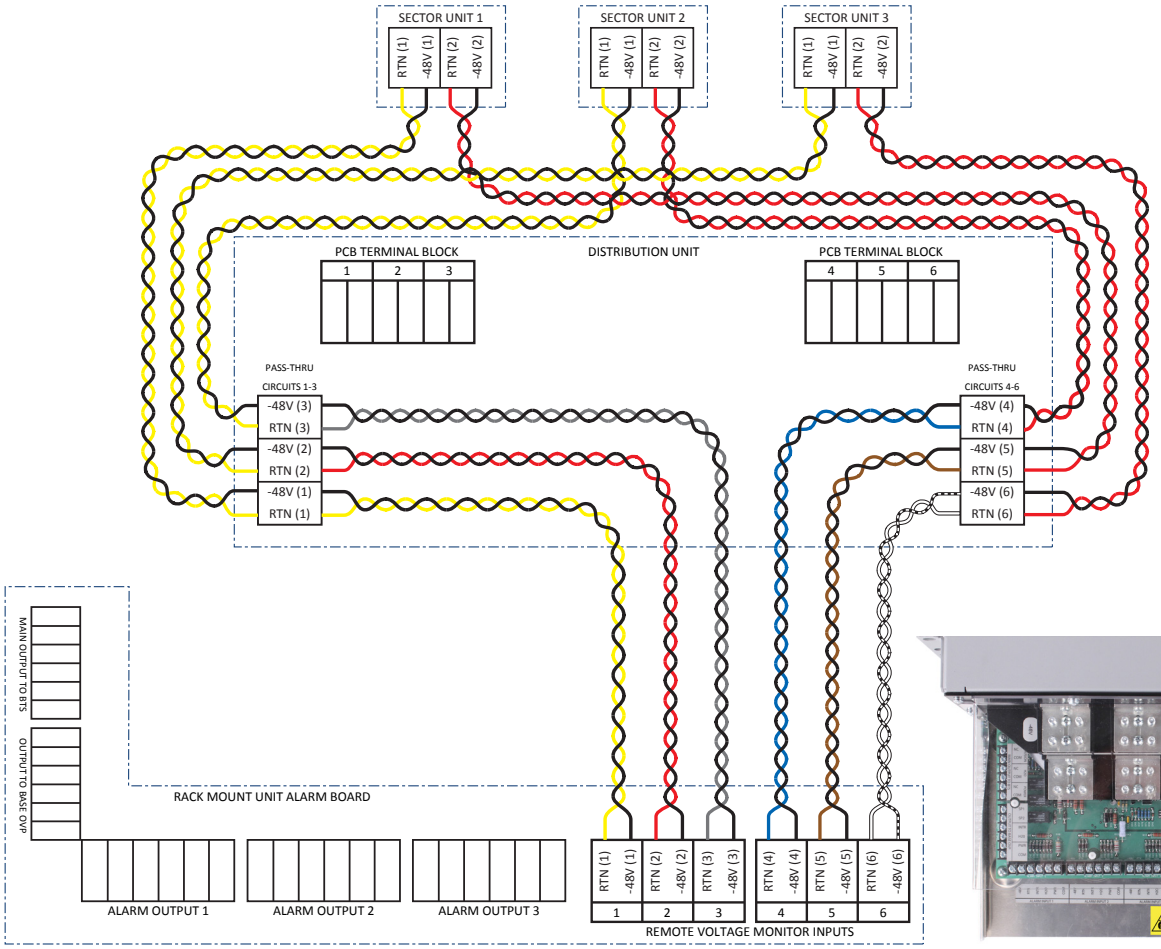
Note: The diagram shows the color code for the 2/4 hybrid cable used between the sector units and the distribution unit and the 6/12 hybrid cable used between the distribution unit and the rack mount unit.

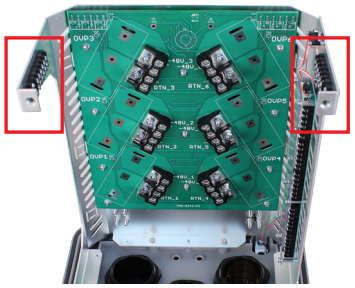
2/4 Cable - 2 Voltage monitor pairs

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

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)

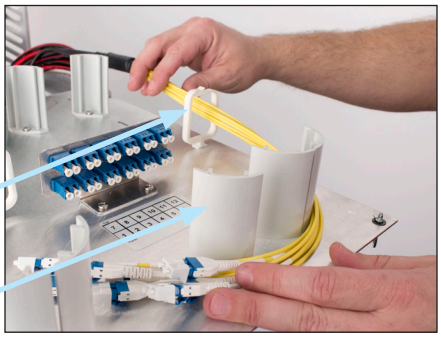




Installing Hybrid Cable-Fiber (In)

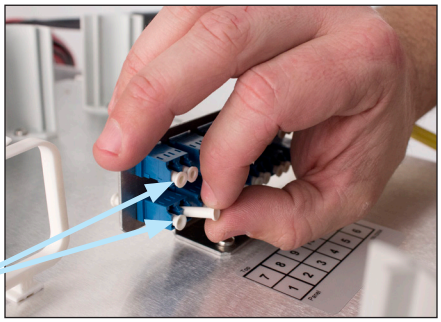
14.1 Loosely route fiber cables around the cable guides.

Note: Secure fiber cables using either the supplied fiber clips or Velcro. (Velcro not pictured)

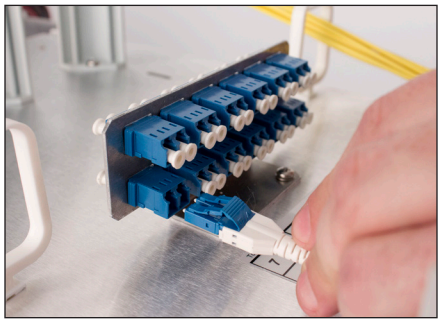


14.2 Remove the plugs in the fiber connectors to be used – To avoid contamination, do not remove any plugs until fiber is immediately ready to be installed.

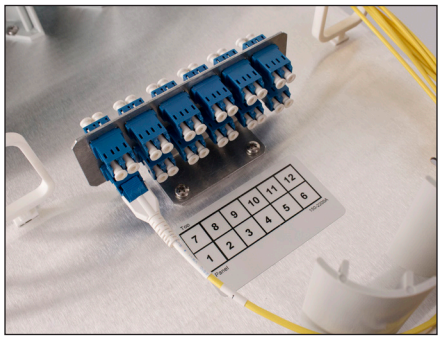
Example: pull one plug, plug in fiber, repeat.



14.3 Connect the cables into the fiber connection panel starting with the row closest to the back plate, and feed through the cable guides.



14.4 Connect fiber according to the *Verizon Wireless established guide.*



Installing Hybrid Cable-Fiber (Out)

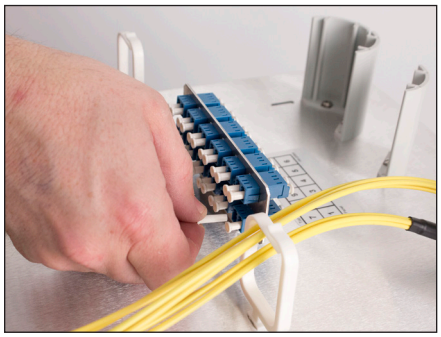
15.1 Feed cables through gland assembly.

Note: Secure fiber cables using either the supplied fiber clips or Velcro. (Velcro not pictured)

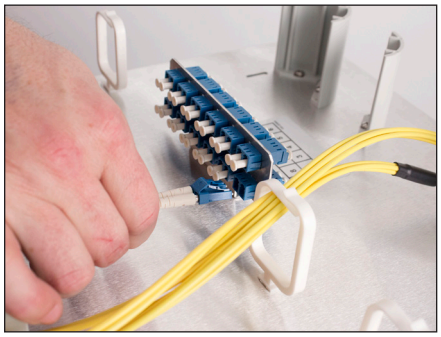
15.2 Remove plugs in fiber connectors that will be used – To avoid contamination, do not remove any plugs until fiber is immediately ready to be installed.

Example: pull one plug, plug in fiber, then do the next one, repeat.

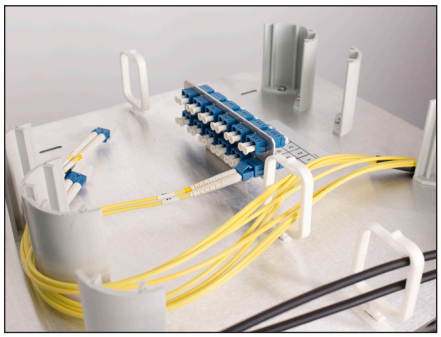
Note: Always keep un-used connectors plugged.



15.3 Connect the cables into the fiber connection bar starting with the row closest to the back plate, and feed through the cable guides as shown.



15.4 Connect fiber according to the *Verizon Wireless established guide.*



Optional 90˚ Elbow Installation

16.1 Place included gasket onto elbow as shown.

16.2 **Note:** 90˚ Elbow can be installed on left or right side of unit.

Remove the gland which is being replaced from unit by loosening gland nut. Set both nut and gland aside.

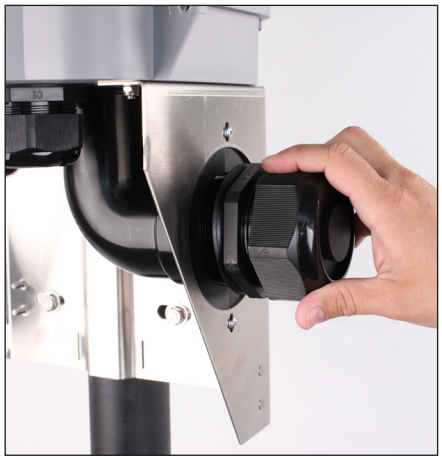
16.3 Place elbow into position through gland hole, lining up the 2 mounting holes to the units metal frame. Secure elbow to unit with gland nut.

Torque: 66 in-lbs

16.4 Secure elbow to frame with the 2 supplied mounting screws.

16.5 Secure gland to elbow.

Torque: 66 in-lbs



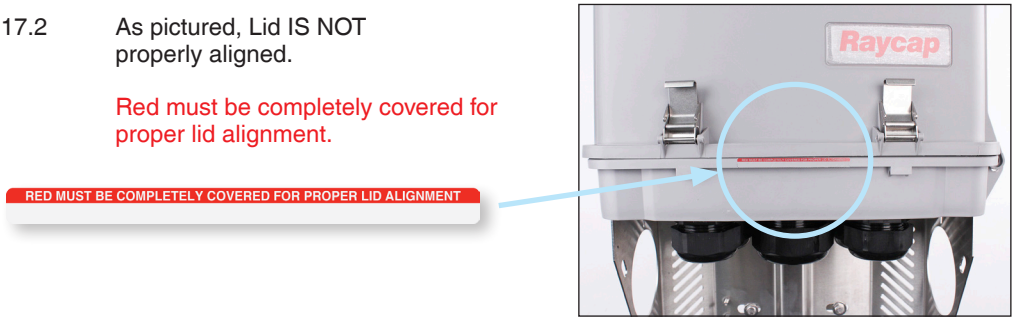
16.6 90˚ Elbow installation complete.

Installation Complete.
Closing and Securing Unit.

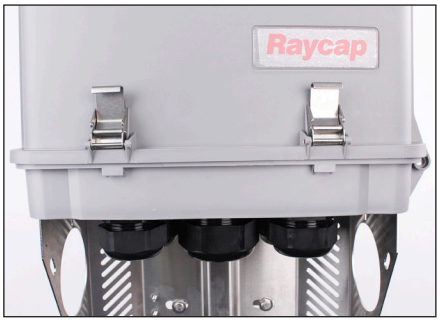
17.1 Slide enclosure lid into place.

17.2 As pictured, Lid IS NOT properly aligned.

Red must be completely covered for proper lid alignment.



17.3 As pictured, Lid IS properly aligned.



17.4 If installation requires padlocks, (not provided) secure “bottom right” of enclosure.

Note: If padlock holes are NOT aligned, the lid is NOT properly aligned.

17.5 When alignment of lid is comfirmed, close and secure all clamps.

Installation complete.

Appendix

Instructions for using legacy cables prior to Verizon standardized cable color code.

Installing 6/12 Hybrid Feeder Cable

18.1 For more access to the printed circuit boards, the Fiber Panel can be temporarily removed. See illustrations below.

18.2 Attach lanyard to Mounting Bracket.

18.3 Feed Hybrid trunk through Insert.

18.4 Feed enough of the cable to strip and connect to power connectors.

18.5 Connect wires according to the *Verizon Wireless established color guide.*

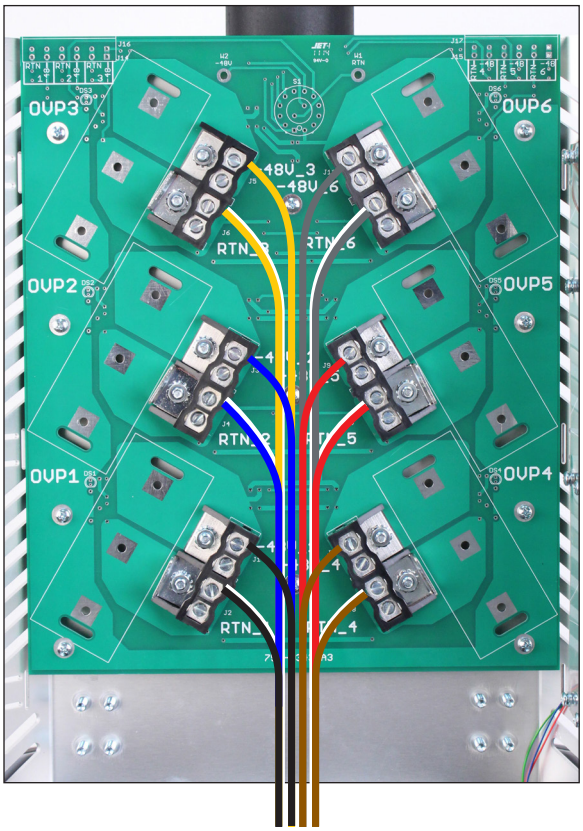
Note:
Bring all cables through cable glands.

Ensure all fiber is seperated and out of the way during copper wire installation.

To assist in ease of wiring, proceed by wiring in the following order:

1st: OVP #1 and OVP #4
2nd: OVP #2 and OVP #5
3rd: OVP #3 and OVP #6

Torque: 40 in-lbs (10-6 AWG)



Circuit Number	Color	
	-48V	Return
1	Black	Black/White
2	Blue	Blue/White
3	Yellow	Yellow/White
4	Brown	Brown/White
5	Red	Red/White
6	Gray	Gray/White

Installing 2/4 Hybrid Branch Cables

18.6 Feed Cables through Inserts.

18.7 Feed enough of the cable to strip and connect to power connectors.

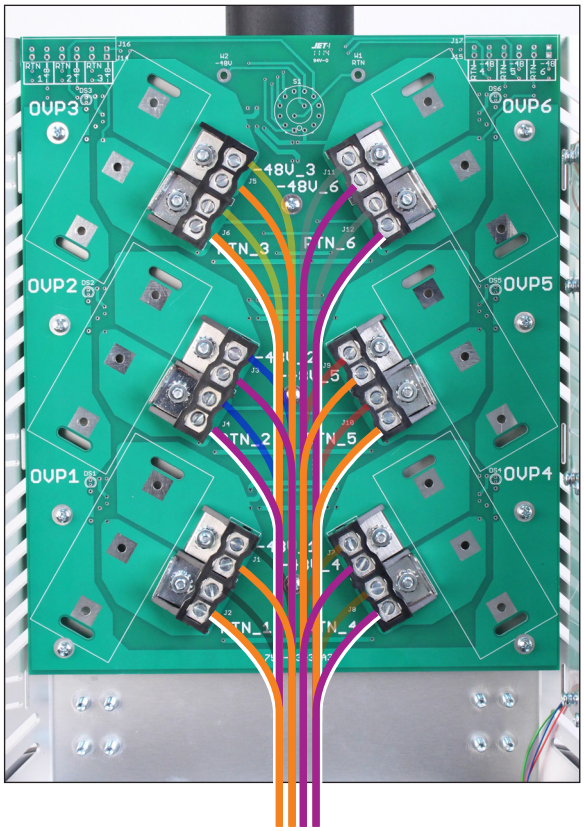
18.8 Connect wires according to the color guide below:

Note:
To assist in ease of wiring, proceed by wiring in the following order:

1st: OVP #1 and OVP #4
2nd: OVP #2 and OVP #5
3rd: OVP #3 and OVP #6

Torque: 40 in-lbs (10-6 AWG)

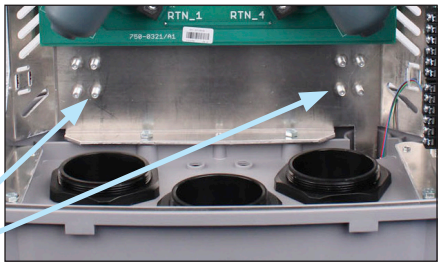
Individual 2/4 Hybrid Branch Cables must be designated per Verizon Wireless standards.



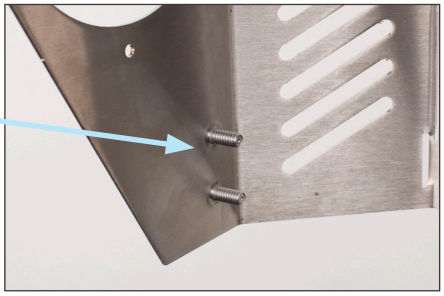
Sector	Circuit Number	Color	
		-48V	Return
Alpha	1	Orange	Orange/White
	2	Violet	Violet/White
Beta	3	Orange	Orange/White
	4	Violet	Violet/White
Gam-ma	5	Orange	Orange/White
	6	Violet	Violet/White

Installing Ground Cable

18.9 There are two grounding placement options available. See below.



Optional Cable Grounds

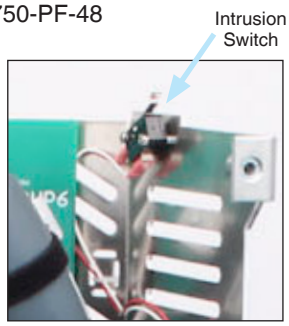


Main Ground

Installing Alarm for RRODC-4750-PF-48

18.10 Alarm connections for RRODC-4750-PF-48

Clear = OK
Red = Alarm



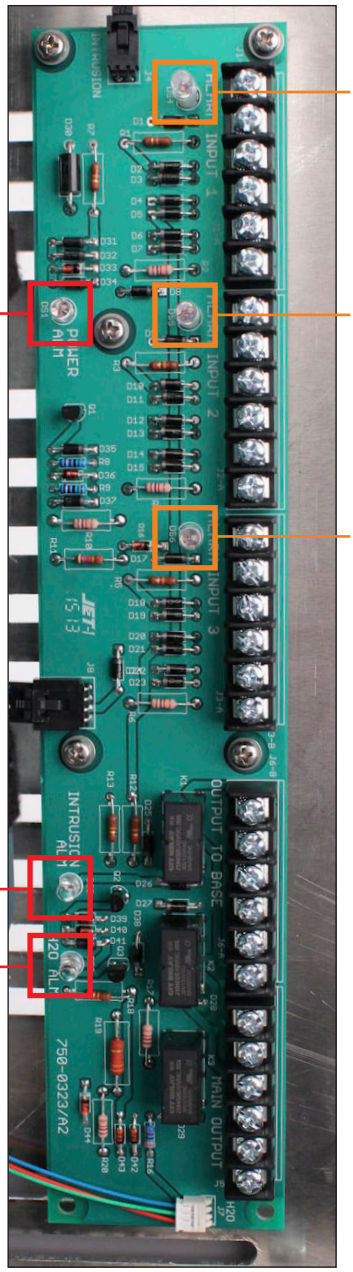
If alarm is indicated, then check Location LED.

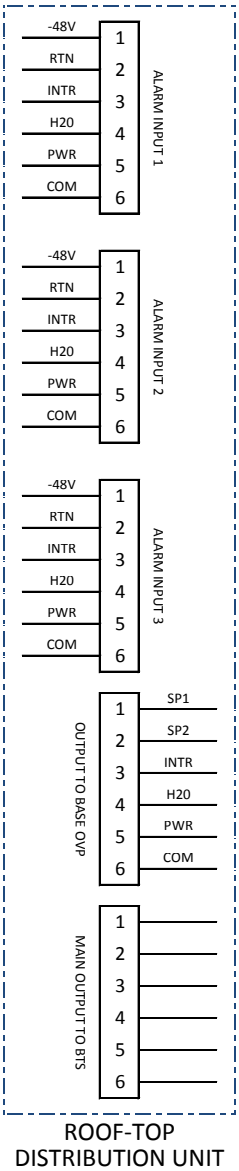
If no location is indicated, then Alarm is located inside this box.

Note: Intrusion alarm will activate when lid is removed. Manually toggle the Intrusion Switch to verify function.

Alarm Type:

Location of Alarm:





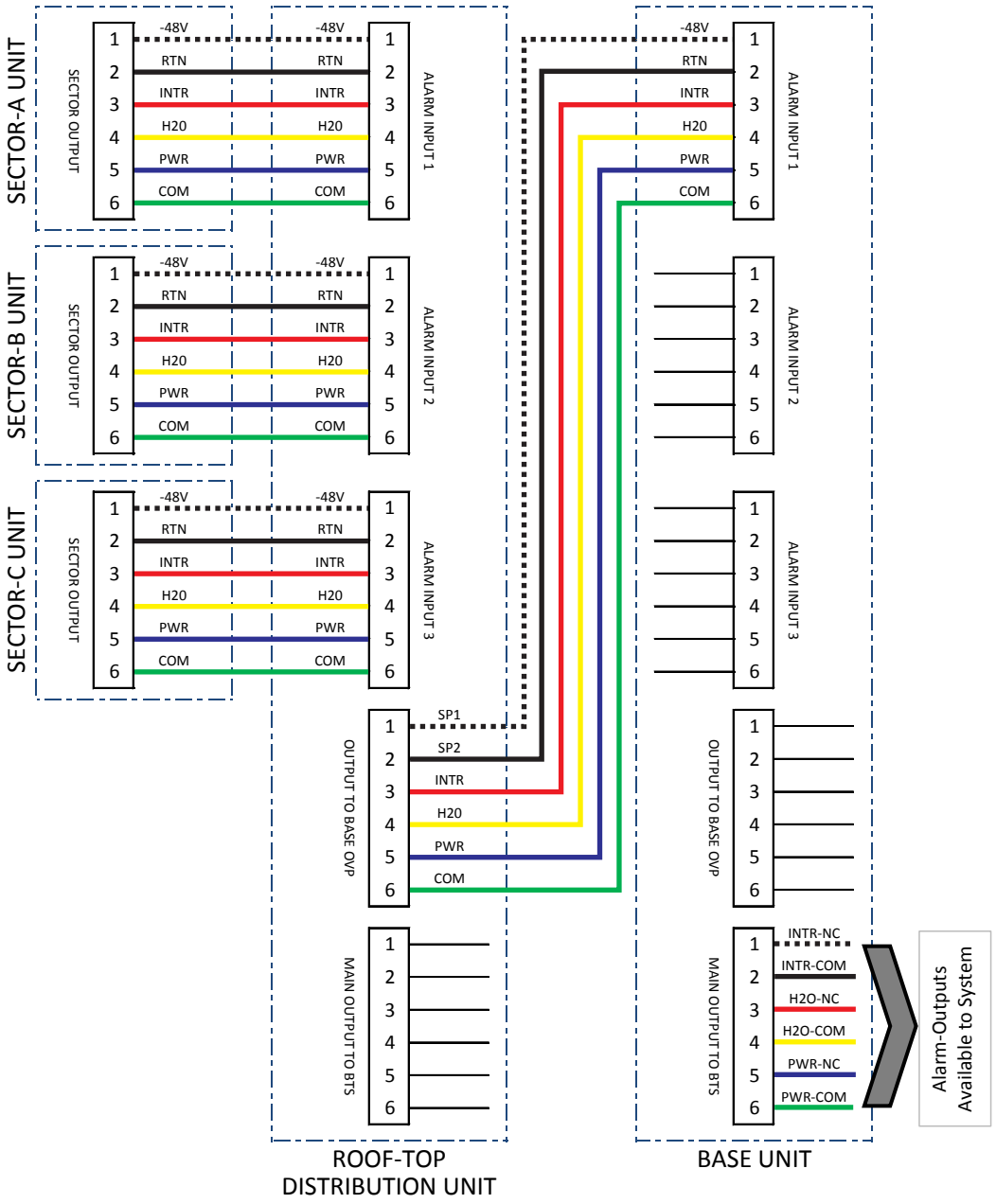
ROOF-TOP DISTRIBUTION UNIT

18.11 Rooftop (Tenant Improvement) Wiring Diagram. These instructions are for interconnecting the alarms for the current Raycap products.

Input	Color
1	White
2	Black
3	Red
4	Yellow
5	Blue
6	Green

Instructions for connecting this unit to the following legacy units are found in the appendix:

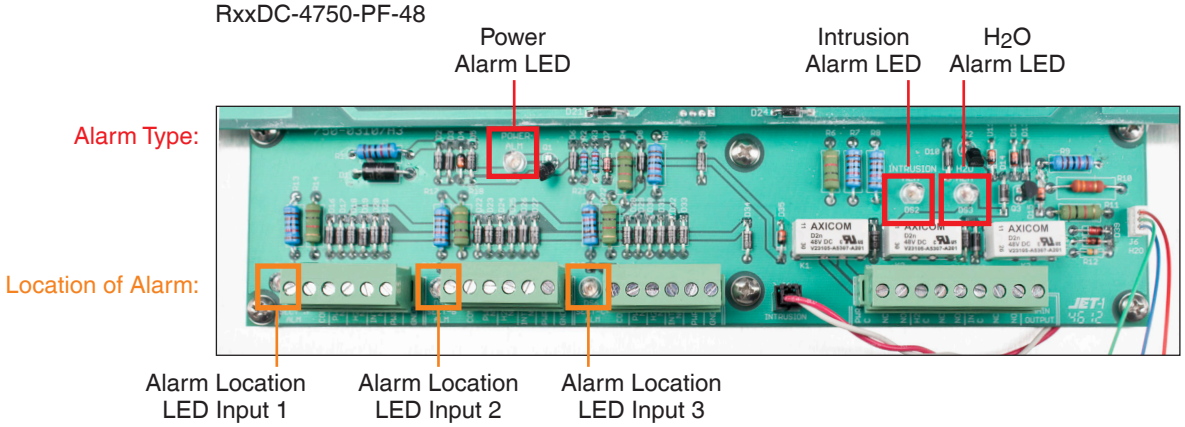
RRODC-4750-PF-48

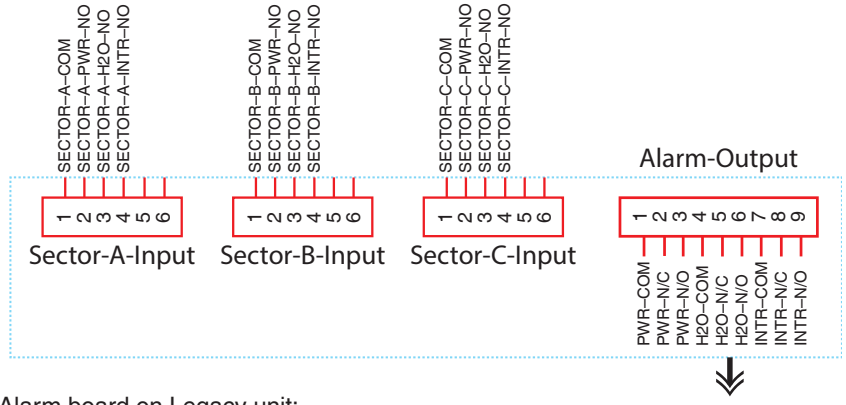


Alarm board on Legacy products

18.12 Alarm board on Legacy units:

RxxDC-3315-PF-48
RxxDC-4750-PF-48

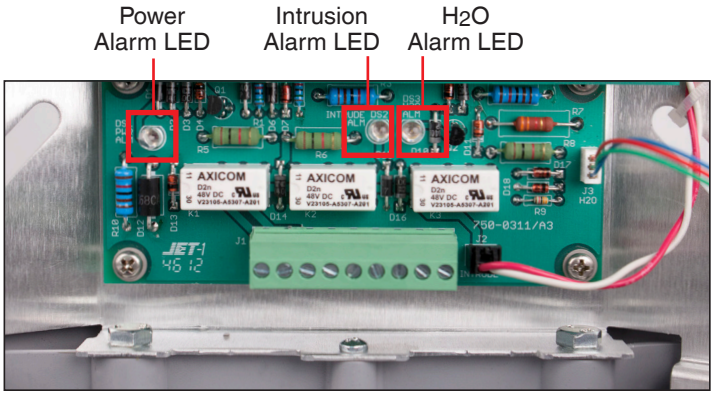


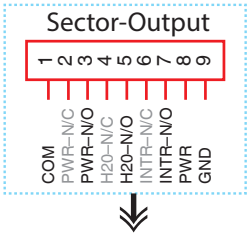


Alarm-Outputs Available to System
Common, Normally Closed and Normally Open
for PWR, H2O and Intrusion

18.13 Alarm board on Legacy unit:

RxxDC-1064-PF-48





Alarm-Outputs Available to System
Common, Normally Closed and Normally Open
for PWR, H2O and Intrusion

18.14 Connecting the RRODC-4750-PF-48 to Raycap Legacy Products.

The following diagram illustrates connection between a current RRODC-4750-PF-48 to the following legacy Tower Base and Sector products:

RRODC-3315-PF-48
RRODC-1064-PF-48