COMMSCOPE®

Manual

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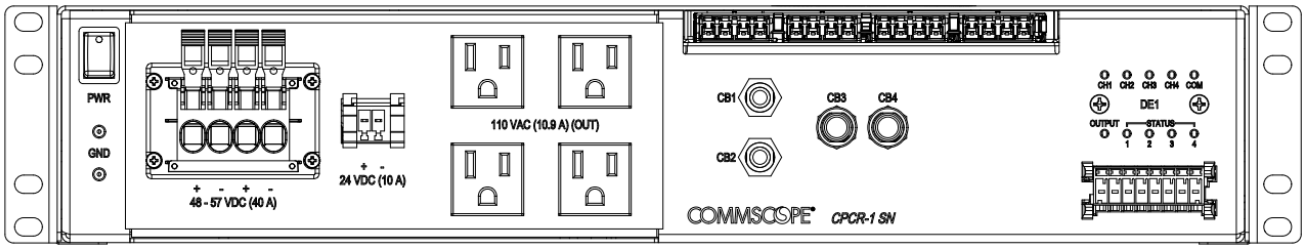
commscope.com

Constellation™ Power Conditioning Receiver (CPCR-1 SN and SI)



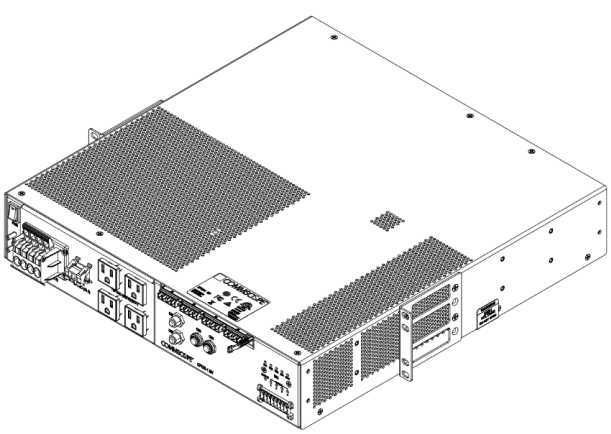
Constellation Power Conditioning Receiver

CONTENT PAGE

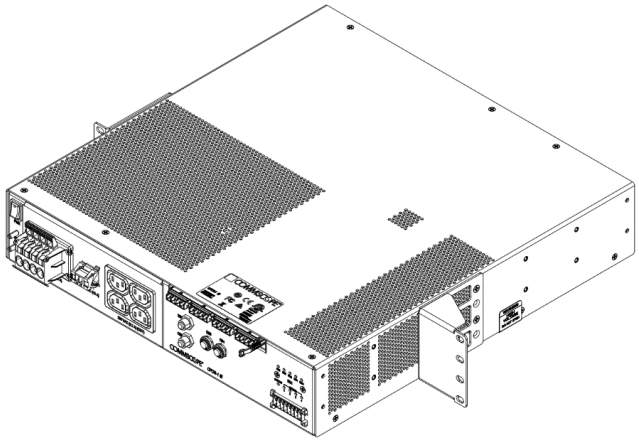
Electronic Only Document (EOD)

1 INTRODUCTION

Constellation™ provides a mechanism for the delivery of fault-managed power (FMP) and data over extended distances using a powered fiber cable (PFC). The power and data are delivered to the Constellation Powered Backplane (CPCB-1) for ceiling mounted environments (covered in TC-96350-IP) or to the Constellation Power Conditioning Receiver (CPCR-1 SN or SI) for 19" and ETSI equipment environments (covered in this document). Contents of this manual include a description of the products and procedures for unpacking, installing, and operating this portion of the Constellation system.



CPCR-1 SN



CPCR-1 SI

Figure 1 is a diagram of the typical intra-building Constellation system. For installations where the PFC will be exposed to outdoor environments, such as inter-building installations, please see TC-01001586-IP for information regarding over-voltage protection (OVP) that is recommended for these applications.

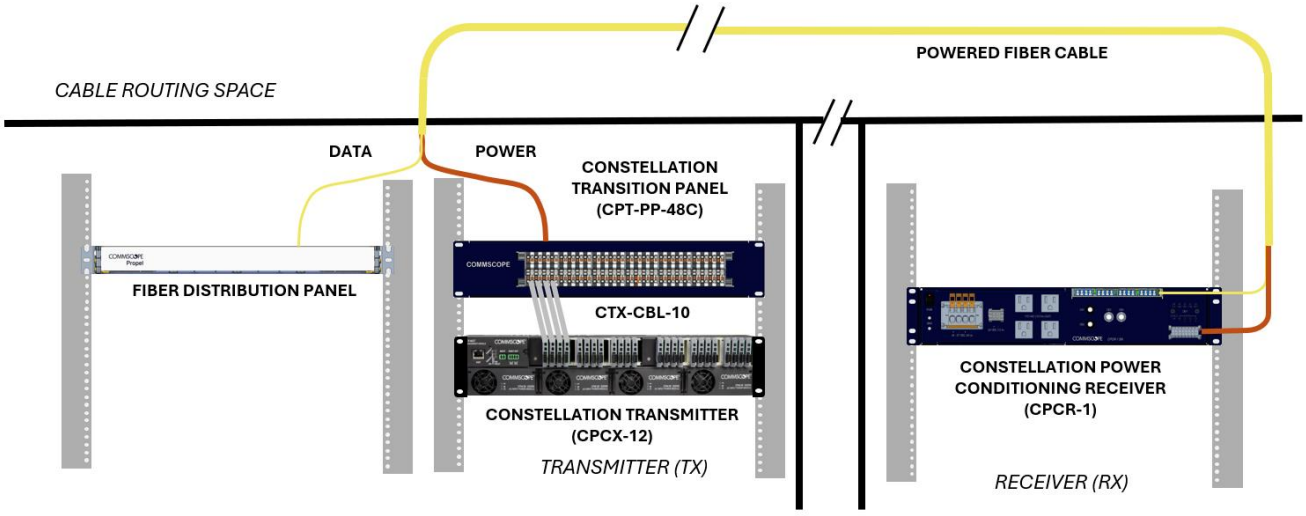


Figure 1. Constellation Rackmount System

1.1 Trademarks

CommScope (logo), **CommScope**, **Constellation**, and **Propel** are trademarks of CommScope

1.2 Important Safety Cautions

When installing or operating the Constellation Power Conditioning Receiver (CPCR-1 SN or SI), observe these safety cautions:

- To reduce the risk of fire, electric shock, and injury to persons, read, understand, and adhere to the following instructions as well as any warnings marked on the product.
- This product has a remote risk of electric shock. Never install the product in wet conditions or during lightning storms. Never touch uninsulated power wires or terminals.
- This product is intended for dry indoor or environmentally controlled spaces.
- Wearing safety glasses during installation is recommended.
- All wiring that connects to this equipment must meet applicable local and national building codes and network wiring standards.

1.3 Standards Certification

The CommScope Constellation CPCX-12 power source is a Limited Power Source per IEC/UL/CSA 62368-1 suitable for supplying a Class 2 circuit under NEC Art. 725 and CEC Rule 16-200.

Note: Always follow local codes.

1.4 Constellation Products

Table 1 lists currently available Constellation products with catalog numbers and Material IDs (MIDs).

Table 1. Constellation Products

PRODUCT	CATALOG #	MID
Power Transmitter	CPCX-12	760254285
Management Module	CTX-MGT	760254286
Power Supply	CPM-3K	760254287
Transmitter Card	CTX-6	760254288
Power Supply Bay Cover	PM500-COVER	760254642
Power Transition Panel	CPT-PP-48C	760254293
Power Patch Cable	CTX-CBL-10	760254294
Powered Backplane	CPCB-1	760252855
Powered Backplane (Black)	CPCB-1 BK	760256409
Edge Enclosure	CPCE-1	760252854
Edge Enclosure (Black)	CPCE-1 BK	760256408
Extended Side Cover	CPCE-1 EXT CVR	760256575
Extended Side Cover (Black)	CPCE-1 EXT CVR BK	760257727
Power Conditioning Receiver (single input; NAR)	CPCR-1 SN	760258034
Power Conditioning Receiver (single input; INT)	CPCR-1 SI	760258035
CPCR-1 Air Filter Kit	CPCR-1 FLTR KIT	760259809
Powered Fiber Cable	Configured to order	CTO
Propel Modules (up to 16-Fiber)	PROPEL-MODULES	Various

1.5 Constellation Publications

Table 2 lists technical publications available for the Constellation system. These manuals can be accessed online using the QR code on the product, its packaging, or by contacting the CommScope Support Center at https://www.commscope.com/SupportCenter.

Table 2. Constellation Technical Publications

PUBLICATION TITLE	PUBLICATION #
Constellation Power Transition Panel (CPT-PP-48C) User Manual	TC-96354-IP
Constellation Transmitter Card (CTX-6) Data Sheet	TC-96344-IP
Constellation Power Supply (CPM-3K) Data Sheet	TC-96345-IP
Constellation Multi-Chassis Synch Card (CMX-6) Quick Start Guide	TC-96346-IP
Constellation Power Supply Bay Cover (PM500-COVER) Data Sheet	TC-96347-IP
Constellation Management Software for Transmitters User Manual	TC-96348-IP
Constellation Edge Enclosure (CPCE-1) and Powered Backplane (CPCB-1) User Manual	TC-96350-IP
Constellation Best Practices Guide	TC-96352-IP
Constellation Power Transmitter (CPCX-12) Quick Start Guide	TC-96354-IP
Constellation Power Conversion Receiver (CPCR-1 SN and SI)	TC-01001508-IP
Constellation Over-Voltage Protection Guide	TC-01001586-IP

2 PRODUCT DESCRIPTION

2.1 General Description

The Constellation Power Conversion Receiver (CPCR-1 SN or SI) is a 2RU device that accepts a powered fiber cable feed. It is part of the Constellation Fault Managed Power System and can supply up to 1.8 kW of power across the AC and DC outputs.

Figure 2 shows the two receiver models, CPCR-1 SN and CPCR-1 SI. Table 3 highlights the configuration of each model.

This product is intended for indoor use, or to be installed in an environmentally controlled enclosure. The ambient environmental temperature range for full power output capability is -20C to 40C. Maximum environmental temperature is 60C with limited power output capability. (See section 5.2 for derating information.)

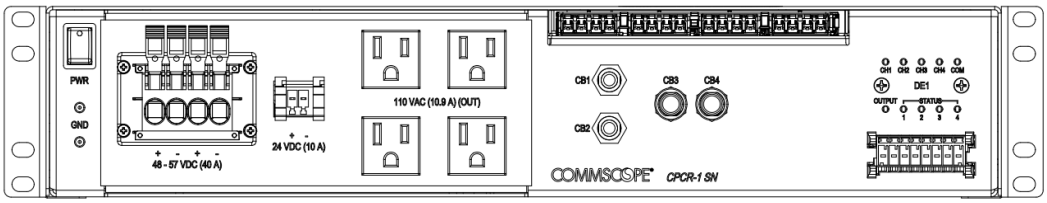


Figure 2a. CPCR-1 SN – Single input North American

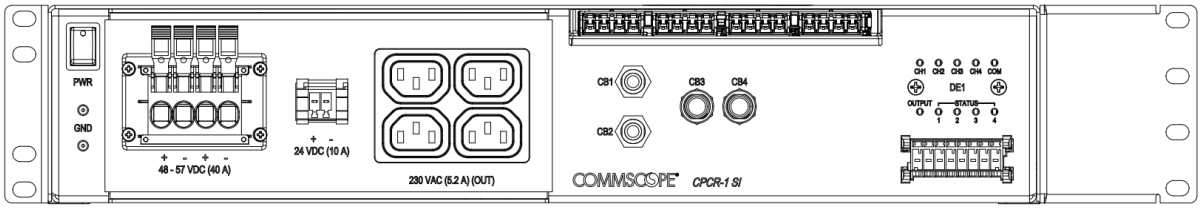


Figure 2b. CPCR-1 SI – Single input international

Table 3. CPCR-1 Model Configurations

Model	Pout	VAC/PWR	AC (front)	AC (rear)	Inputs	48 VDC	24 VDC
CPCR-1 SN	1.8 kW	110 / 1 kW	NEMA 5-15	IEC C13	1	1.8 kW	240 W
CPCR-1 SI		230 / 1 kW	IEC C13				

Both the CPCR-1 SN and SI are reversible allowing for the positioning of power outputs that align with the intended environment. A Propel compatible slot is provided on both the front and rear of the device that enables convenient fiber breakout. Diagrams that illustrate how to route fiber into the front or back of the receiver are provided later in this document.

The CPCR-1 SN is equipped with mounting ears that facilitate installation in a traditional 19” rack. The CPCR-1 SI is equipped with ETSI compatible mounting ears for 21” rack installations. (See section 4.2)

The mounting ears can be positioned at different locations on the side of the chassis so that the unit aligns with neighboring equipment. Four mounting ears (two sets) are provided for applications that require four points of support such as systems that employ the CPCR-1 and need to be shipped in final form for deployment.

CommScope recommends mounting the CPCR-1 such that the weight of the unit is balanced when mounting using a single set of ears.

Note: This user manual does not cover installation of non-CommScope equipment such as switches.

2.2 Physical Specifications

2.2.1 Main Features

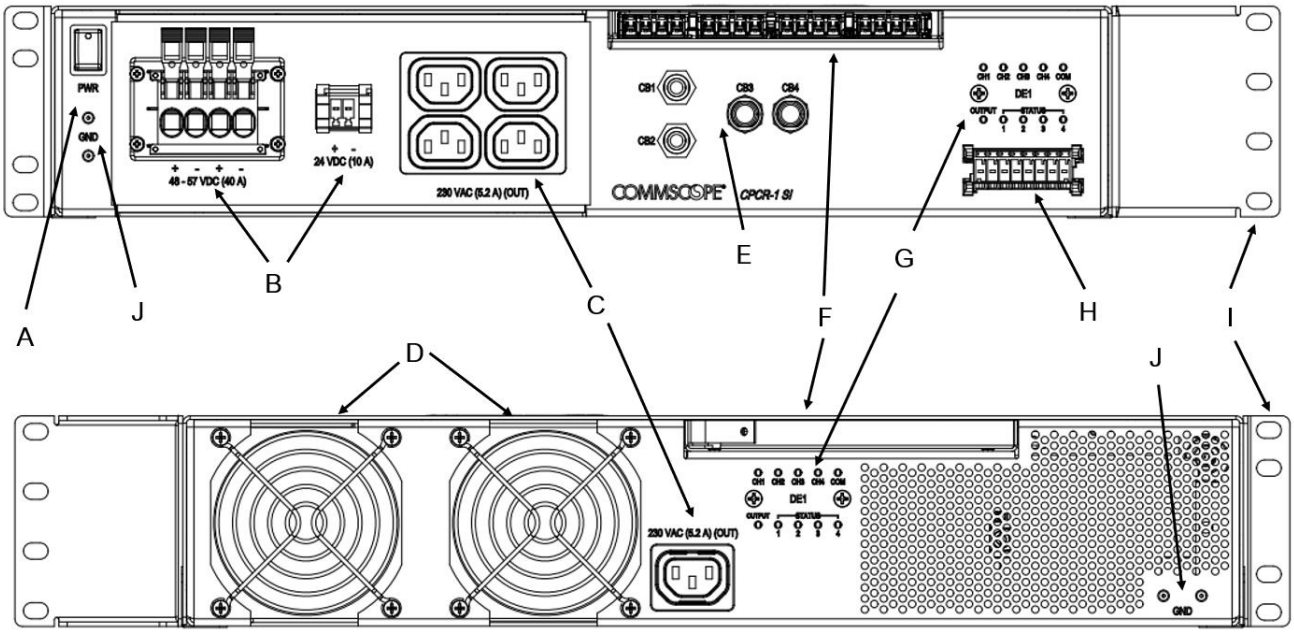


Figure 3. Main features (CPCR-1 SI shown)

A – **Outlet Power Switch** - can be toggled to enable or disable power to the VAC Outlets, 48 VDC Outputs, and 24 VDC Output. Toggling the switch does not affect the 12 VDC fans, which run continuously

B - **DC Output Terminals –** 24 VDC and 48 VDC outputs for powering local equipment. (See section 5.1)

C - AC Outlets—AC outlets for powering local equipment. (See section 5.1)

D - Cooling Fans – 12 VDC (See section 4.3)

E - Circuit Breakers – Overload protection (See section 5.3)

F - Fiber Distribution - Mounting locations for one 8- or 16-fiber Propel connection component. Mounting is accommodated on the front or rear of the chassis. (See section 5.4)

G - Input Power Status Indicator – Visual indication of Fault Managed Power (FMP) status (See section 4.5)

H – DE Power Input – FMP input for device (See section 4.5)

I - Equipment Rack Mounting Ears - (See section 4.2)

J – Chassis Ground Terminals – Located on front and rear. Designed to fit standard two-hole ground lug (included) for 6 AWG ground wire. (See section 4.4)

2.2.2 Dimensions

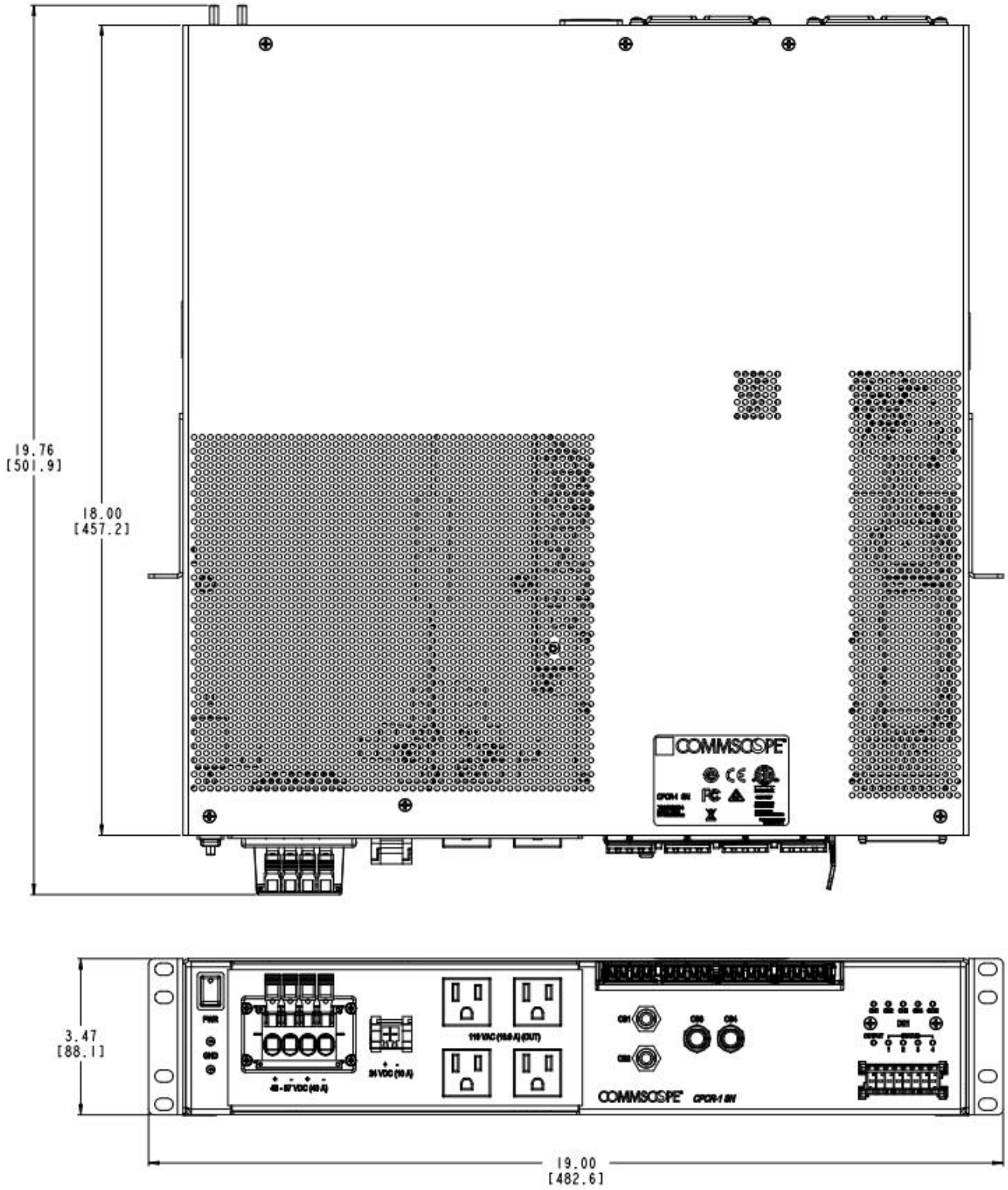


Figure 4. Dimensions of the CPCR-1 SN

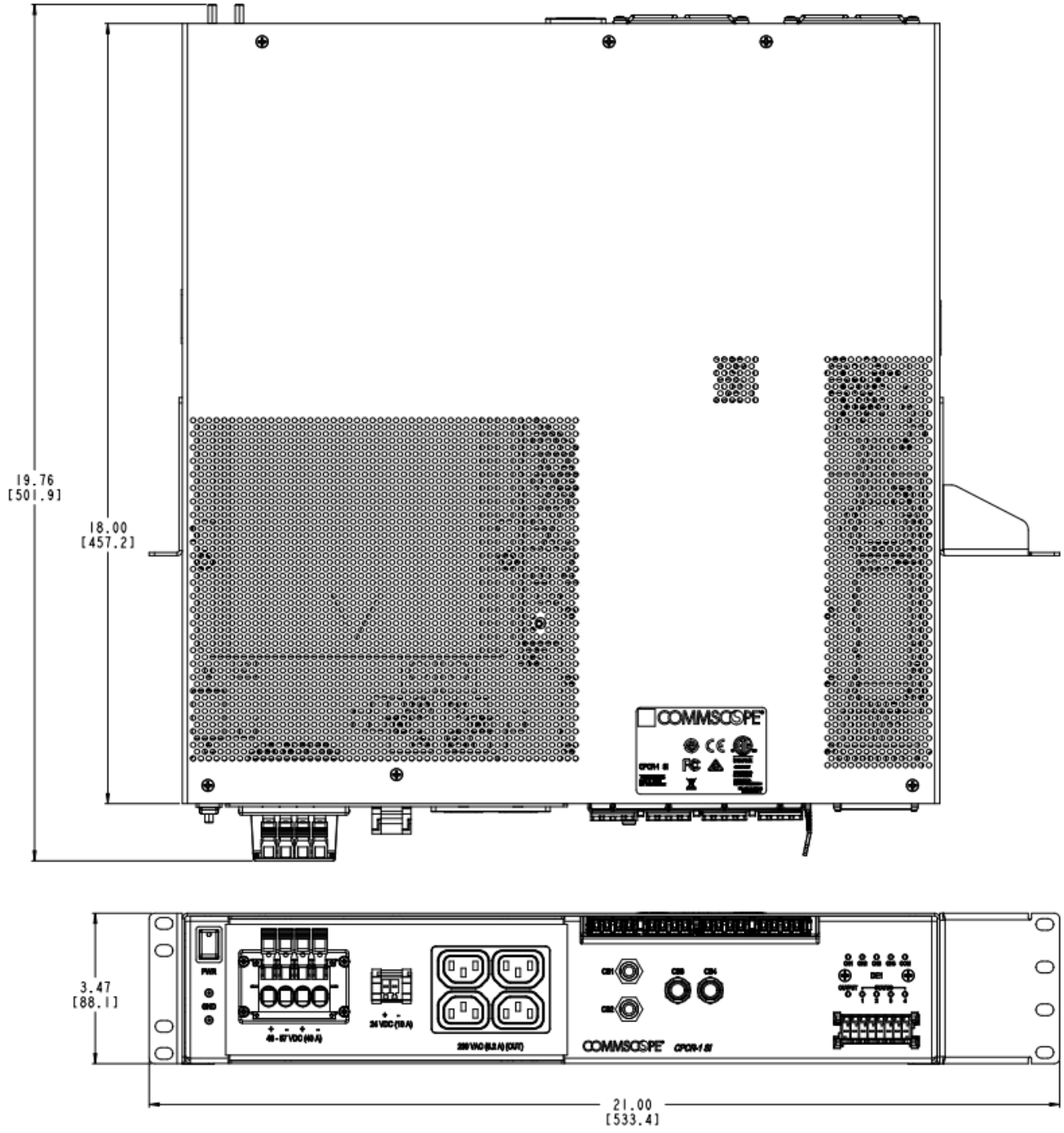


Figure 5. Dimensions of the CPCR-1 SI

2.2.3 Weight and Handling

Both the CPCR-1 SN and SI weigh 17.6 kg (38.8 lbs.) with mounting ears installed. Installation requires two people or mechanical aid to lift and position the unit for mounting. (See section 4.2)

2.2.4 Operational Environment

This product is intended for indoor use or to be installed in an environmentally controlled enclosure. The ambient environmental temperature range for full output power capability is -20C to 35C. Maximum environmental temperature is 60C with limited output power capability. (See section 5.2 for derating information and section 4.3 for airflow requirements)

3 UNPACKING AND INSPECTION

3.1 Unpacking

Use the following procedure to unpack and inspect the product. Verify parts against Table 4 below.

Table 4. Parts List for Power Conditioning Receiver

DESCRIPTION	QTY
Receiver (SN or SI)	1
Mounting ears w/ attachment screws	4/16
Grounding lug w/ securing nuts	1/2
DE input connectors (4 pos.)	2
24 VDC output connector (2 pos.)	1
12-24 Rack mounting screw	8
M6 x 1mm Cage nuts w/ M6 x 12mm screws	8/8

3.2 Inspection

1. Inspect the exterior of the shipping boxes for evidence of rough handling that may have damaged the components in the container.
2. Open the boxes and remove the items listed in Table 4 while carefully checking the contents for damage.
3. If damage is found or items are missing, save the damaged components for inspection by the carrier and contact the CommScope Support Center using the URL: http://www.commscope.com/SupportCenter

4 INSTALLATION

4.1 General

The CPCR-1 SN and SI are designed to safely power information technology and operational technology equipment. Each receiver is equipped with sensors that monitor key elements of the device. The receivers are equipped with a local outlet power switch so that equipment supported by the receiver can be powered down and removed or added without having to power down the unit remotely.

Note: Power up includes a short delay before power is established. This will be evident if the power to the receiver is toggled off and on using the local outlet power switch.

4.2 Mounting

The CPCR-1 SN and SI are supplied with mounting tabs or ears that are intended to support the unit when installed in a 19” or 21” rack. When supporting the unit at its midpoint, one set of mounting tabs is sufficient. When supporting the unit at a point away from its midpoint, CommScope recommends employing four points of support (four mounting ears). If the CPCR-1 SN or SI is to be employed in a dynamic application (mounted in a rack and shipped to its final destination), CommScope recommends the use of four points of support. Figures 6 and 7 illustrate the method of supporting the chassis from the midpoint and using four points of support respectively.

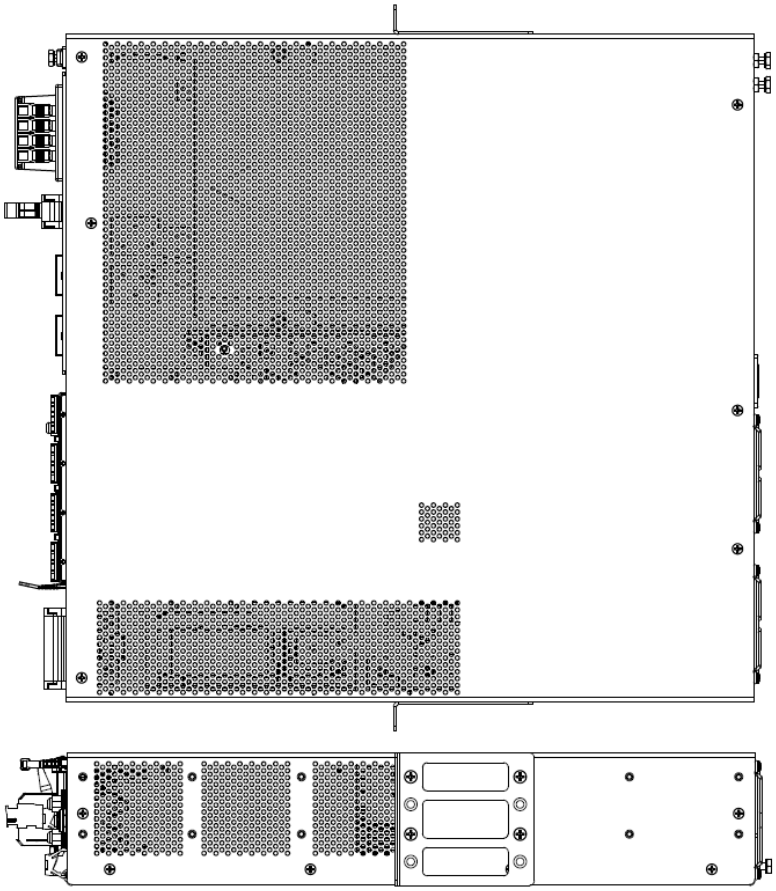


Figure 6. Support at midpoint using two mounting ears

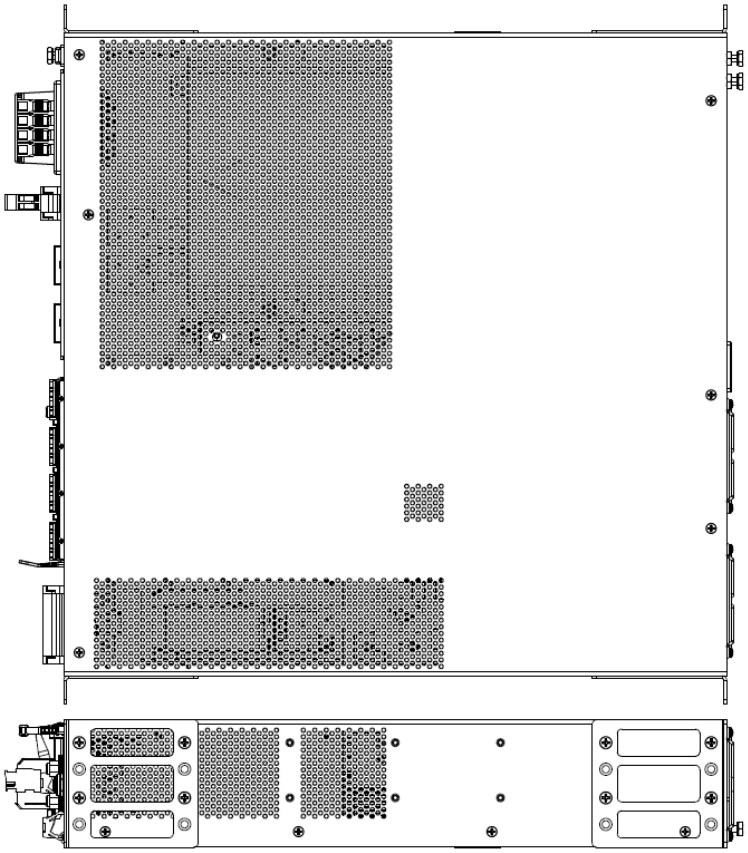


Figure 7. Four-point support for dynamic/off-center mounting

4.3 Airflow Requirements

The CPCR-1 SN and SI require sufficient airflow to function as specified. The two 12 VDC fans in the rear of the chassis draw air in and force it through the unit to air vents on the sides and top. Additionally, one of the internal power components is equipped with its own cooling fan. This fan draws air from inside the chassis and forces it out the rear. As such, open space of at least two inches should be maintained around the unit. Space above and below the unit should be at least 1 ¾" (1 RU). See section 2.1 and 5.2 for ambient temperature requirements.

The receiver can be equipped with an air filter to limit the amount of debris pulled in by the cooling fans. CPCR-1 Air Filter Kit 760259809 can be purchased separately and installed prior to or after the unit is mounted in the rack when rear access is available. To install, ensure the filter foam is inside the frame, align the tabs on the frame with the slots above and below each fan housing and seat frame against the chassis (Figure 8). The frame and filter foam can be removed for periodic cleaning or replacement of the foam.

To clean the filter foam, rinse under running water and dry thoroughly or use compressed air. Replacement filter foam can be ordered from McMaster Carr (9803K302) and cut to 3.13 in X 7.25 in.

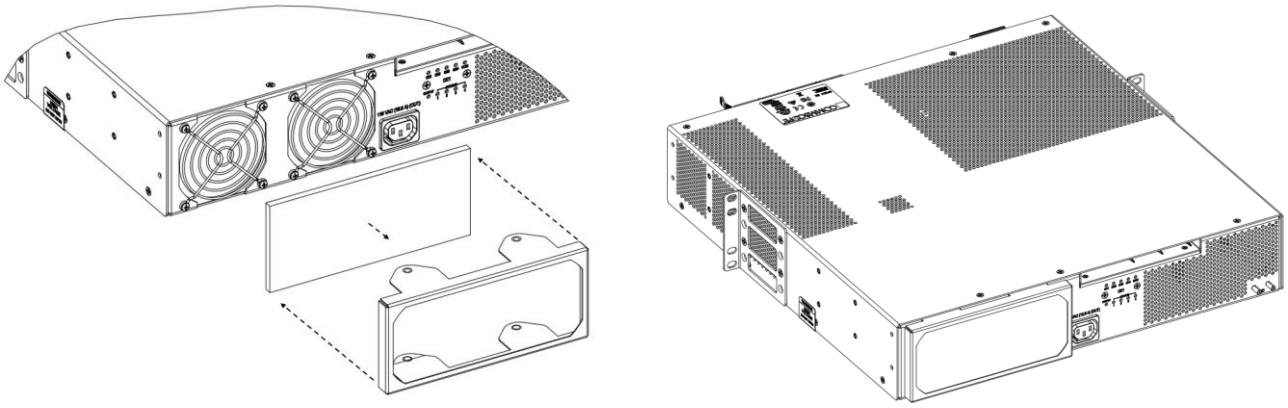


Figure 8. CPCR-1 Air Filter Kit installation

The health and operation of the 12 VDC fans and the internal temperature of the CPCR-1 are monitored by the system and any faults are indicated by an on-board buzzer. In the event of a fan failure, the buzzer will sound for 1.5 sec. and repeat every 1.5 sec. The CPCR-1 will continue to function. If the temperature of the ambient air surrounding the CPCR-1 exceeds 60 C, the receiver will shut down and the buzzer will sound for 0.5 sec. and repeat every 0.5 sec. If the ambient temperature drops below 55 C, the receiver will automatically restart and the buzzer will stop.

4.4 Grounding

The CPCR-1 SN and SI include a double lug ground point on the front and rear of the chassis (Figure 9a.) A 6 AWG two-hole crimp style grounding lug and appropriate nuts are included (Figure 9b.) The front and rear ground locations are electrically equivalent. One of these two points shall be connected to the same ground/building steel as the transmitter. Nuts should be tightened to 24 - 30 in-lbs. Grounding should be carried out in accordance with all local and national electric codes.

The Chatsworth Products Rack Bonding Busbar (PN: 10610-019) is recommended for customers requiring a localized telecom ground.

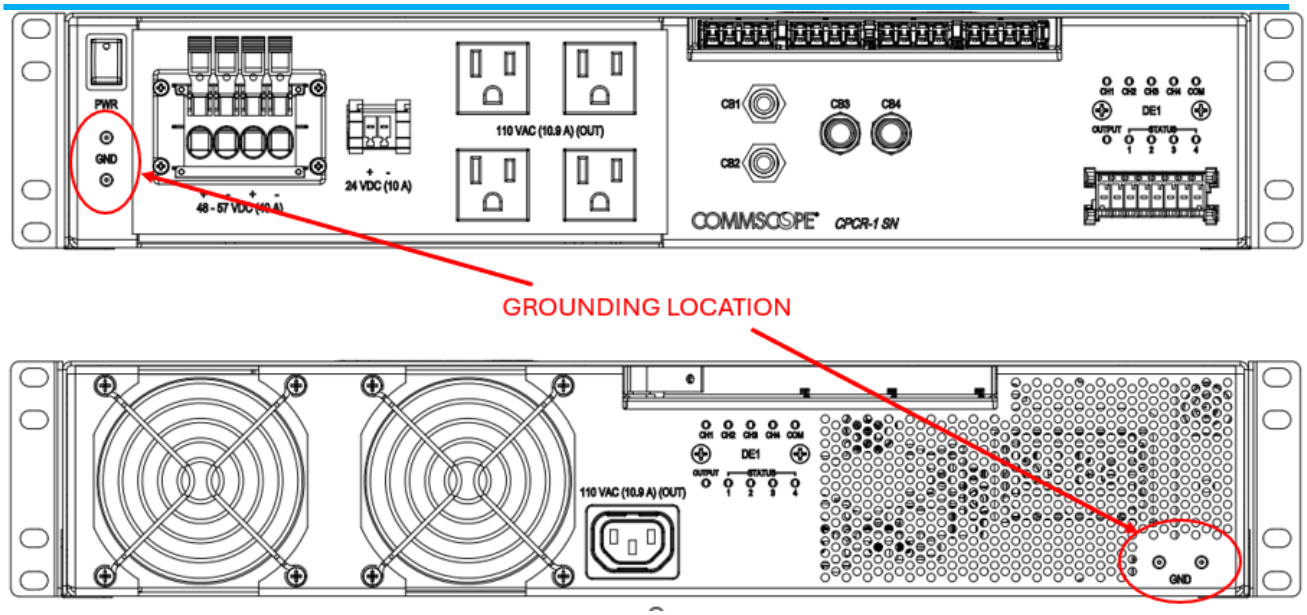


Figure 9a. Grounding locations on the CPCR-1

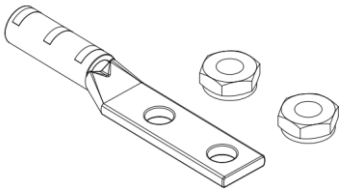


Figure 9b. Included Ground Lug Kit

4.5 DE Power Input

The copper conductors of the Powered Fiber Cable that will deliver the DE power to the receiver must be terminated to the DE input connectors (4 pos.) as shown in Figure 10. A simple tool (WAGO 769-434) available from several third distributors facilitates the insertion of the stripped conductors into the connector. The figure also shows the proper order of termination for the DE conductors.

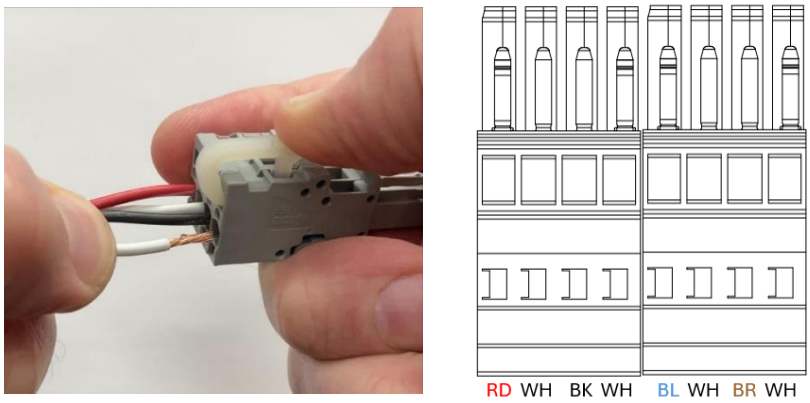


Figure 10. DE Power Connector Termination

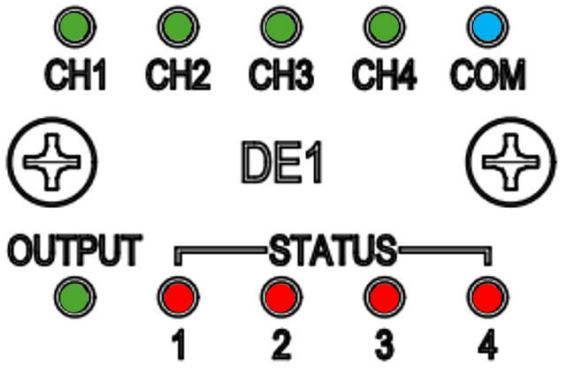


Figure 11. DE Power Status Indicator

The DE Power Status LEDs provide information on the status of the DE power link between the transmitter and the receiver (CPCR-1 SN or SI.)

CH1 – CH4 - Indicates a DE link between the transmitter and receiver

COM - Blinks blue- indicates an active communication link between the transmitter and receiver

OUTPUT - The OUTPUT LED will blink while the DE link is being established
The OUTPUT LED turning solid green indicates that the DE link has been established

Status codes and troubleshooting

STATUS 1 - Solid red – Indicates an issue delivering power from the receiver to the end device – *(Check wiring between receiver and end device / Reduce power usage)*

STATUS 2 - Solid red – Indicates receiver over temperature – *(Reduce ambient air temperature / Reduce power usage / Ensure adequate airflow to fans)*

STATUS 3 - Solid red – Indicates an internal receiver failure – *(Contact customer support)*

STATUS 4 - Solid red – Indicates an issue delivering power from transmitter to receiver – *(Check wiring between TX and RX / Consider adding additional input connections)*

5 OPERATION

5.1 Power Usage

Figure 12 provides detail on the power output ports including amperage and outlet style.

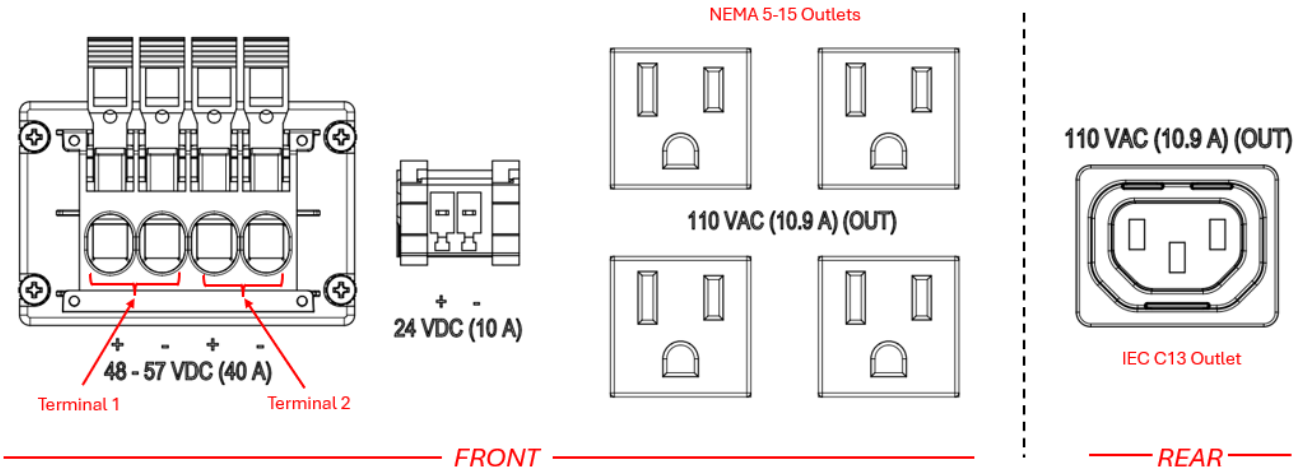


Figure 12a. CPCR-1 SN – Output Power Detail

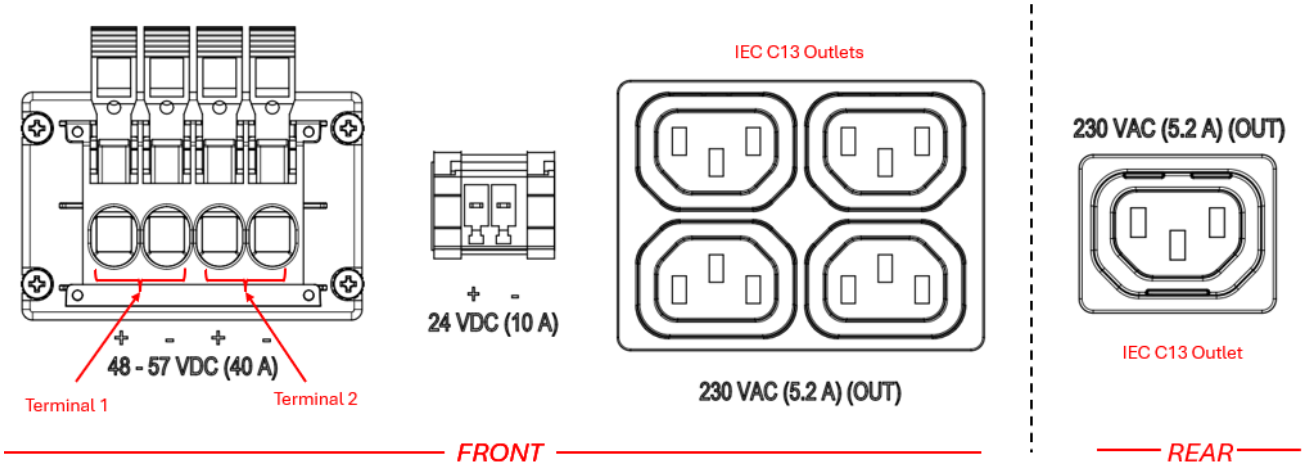


Figure 12b. CPCR-1 SI – Output Power Detail

Caution! The enclosure is equipped with an outlet power switch. (See section 2.2.1) When the switch is activated, the AC and DC outputs are live. To disable these outlets, toggle the outlet power switch. Toggling this switch does not affect the 12 VDC fans, which run continuously.

Note: The CPCR-1 can supply a total of 1.8 kW of power divided between the five VAC outlets, two 48 VDC outputs, and one 24 VDC output.

48 VDC Power Output—Maximum power draw is 1.8 kW (40 A).

24 VDC Power Output—Maximum power draw is 240 W (10 A).

110 / 230 VAC Power Output—Maximum power draw is 1 kW (10.9 A / 5.2 A).

5.2 Power Distance Curves

The Constellation CPCR-1 SN and SI are designed to be powered via a Constellation powered fiber cable having two or four 16AWG pairs. The amount of customer accessible (output) power that the unit can provide is dependent on several factors - the length of the powered fiber cable, the number of pairs used to deliver power, temperature of the cabling and the CPCR-1 ambient temperature.

CommScope has developed a modelling tool in spreadsheet form that can be used to determine the amount of power that can be sourced over a length of powered fiber cable. The model accounts for the environment that the hybrid fiber cable exists in as well as the ambient temperature in which the CPCR-1 exists. The model is shown in Figure 13. Details on how to use the model are included after Figure 13.

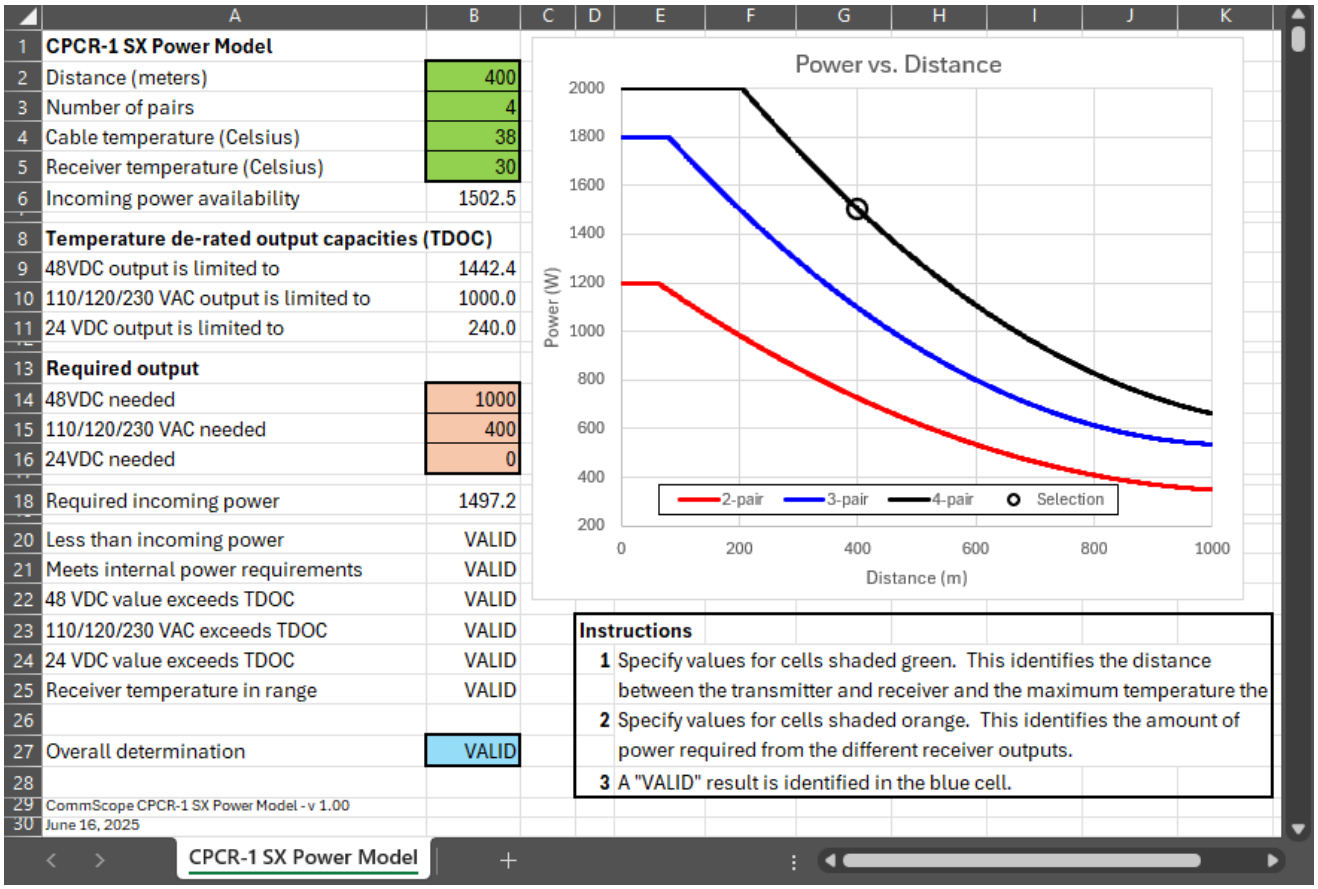


Figure 13. CPCR-1 Power deliver modelling tool (example 1)

Figure 13 shows and example (example 1) how the tool is used to establish a particular power scenario in a specific environment. Example 1 and the use of the modelling tool are described in detail below.

A customer would like to position a CPCR-1 SN in a parking garage. The customer knows that the cabling between the 4-pair enabled transmitter and the CPCR-1 will be 400 meters in length and will reach temperatures as high as 38 C (cells B2 through B4). The customer intends to locate the CPCR-1 in an enclosure that will be environmentally controlled such that the ambient temperature in the enclosure never exceeds 30 C (cell B5). Specifying those parameters helps to identify the power output limits of the CPCR-1 (cells B14 through B16). The customer also knows that their power requirements are 1 kW to be drawn from the 48 VDC ports (cell B14) and 400 Watts to be drawn from the AC output (cell B15). The customer does not foresee the need for 24 VDC power (cell B16). The model determines that a total of 1497.2 Watts of power will be required at the input to the unit and that all internal components (cells B20 through B25 and B27) are capable of delivering the required output power (VALID).

The same customer wanted to adjust the model in Figure 13 to determine if the configuration would support an additional 100 Watts of power drawn from the 24 VDC output (B16). When the model is adjusted for this scenario, shown in Figure 14, the model predicts that this condition may exceed the maximum power available and results in an INVALID scenario (B27).

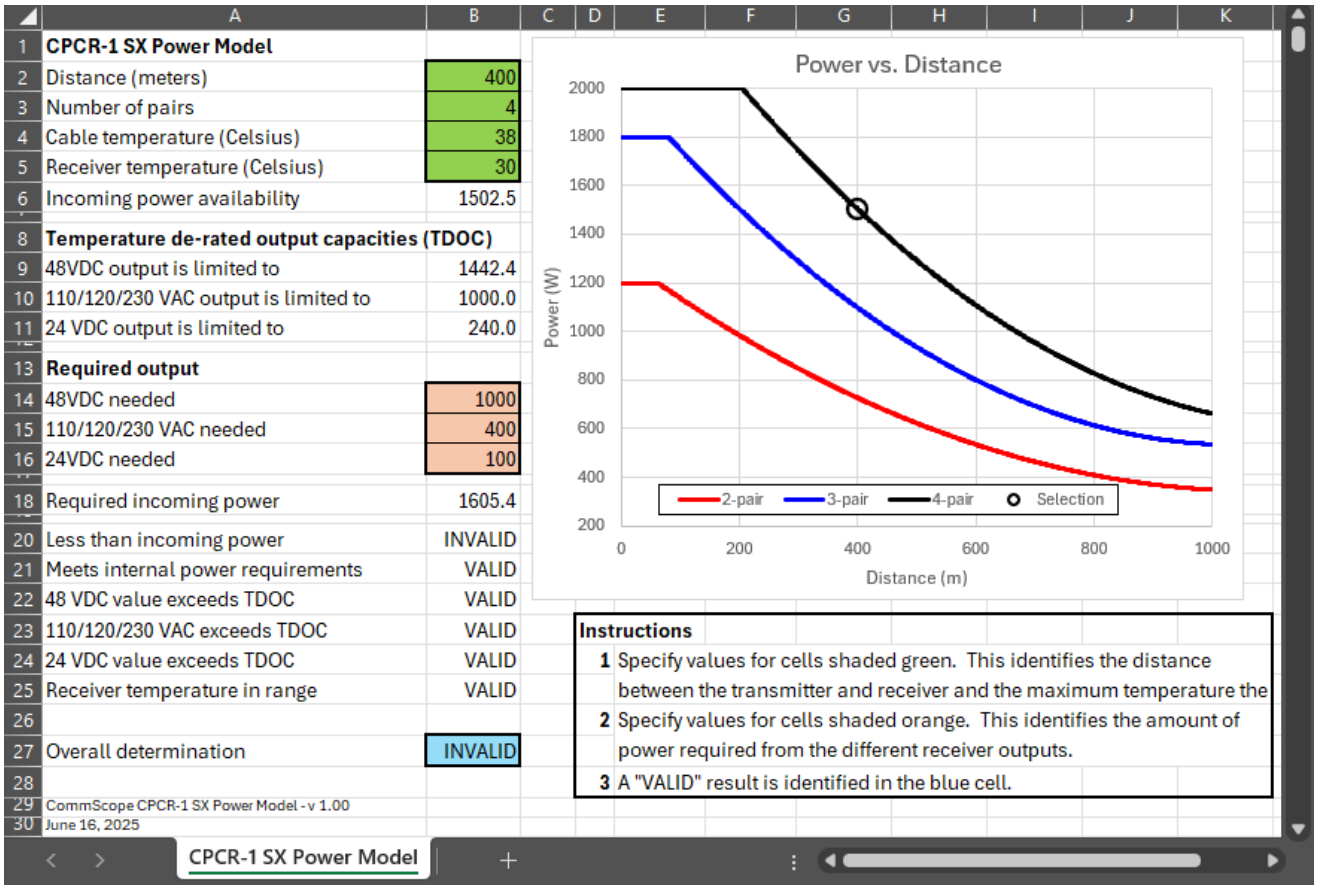


Figure 14. CPCR-1 Power deliver modelling tool (example 2)

The device is designed to operate in environmental temperatures up to 60C. In such environments, the amount of power that can be drawn is limited once ambient temperatures exceed 35C.

Power at Temp.	T = 20C	30C	40C	50C	60C
Total	1.8kW	1.8kW	1.8kW	1.6kW	1.2kW
48 VDC	1.8kW	1.8kW	1.8kW	1.6kW	1.2kW
24 VDC	240W	240W	240W	225W	165W
110/230 VAC	1kW	1kW	900W	840W	600W

Over-temperature events – The device is equipped with temperature sensors that limit operation when certain operating points are exceeded. When the temperature of the surrounding ambient air exceeds 60C, the outputs are de-energized, but the cooling fans continue to operate. The outputs are automatically re-energized when the temperature drops below 55C.

5.3 Circuit Protection

5.3.1 Circuit Breakers

There are four circuit breakers included on the exterior of the CPCR-1 SN and SI. These are intended to limit over- current events. If the maximum recommended output current drawn from the 24 VDC or 48 VDC outlets is exceeded, the circuit breakers will trip effectively shutting down those power ports. The circuit breakers are labeled with the amperage they support and can be reset by pressing the button that has tripped. Customers should be aware that a tripped breaker represents an operating condition that exceeded recommended current draw and should take steps to limit the current draw to less than the maximum. The maximum current draw from the 48 VDC output ports is 40 A. The maximum current draw from the 24 VDC output ports is 10 A.

It is possible to overload internal components that do not trip the breakers such as the AC inversion stage. Internal safeguards (in addition to the breakers) are present. If those safeguards are activated, the CPCR-1 SN or SI may need to be restarted before full functionality is realized. Restarting involves de-energizing the DE input for 15 seconds.

5.3.2 Inrush Current

As with any circuit, there exists the possibility to activate the safety features of the CPCR-1 when connecting loads that draw a high startup or inrush current. The CPCR-1 has been designed with inrush currents in mind and is capable of handling inrush introduced by loads such as enclosure air conditioning units.

Introducing significant inrush current under load may activate the CPCR-1 over current protection circuit and force the unit into a safe-shutdown state. To restore the system to its normal operating state, de-energize the enclosure completely using the CPCX-12 management GUI, wait two minutes, and re-energize the enclosure using the same GUI.

5.4 Fiber Connectivity

Network connectivity for the CPCR-1 SN and SI is established via the optical fibers that are integrated into the powered fiber cable. These fibers can be customer spliced for direct connection to local equipment or factory terminated to an MPO connector. The CPCR-1 is equipped with a front to rear fiber pass through channel that is also compatible with various Propel fiber modules that can be installed from either the front (Figure 15a) or the rear (Figure 15b) of the chassis. When connected via the MPO connector, the Propel module can provide up to 16 single LC (8 dual LC) ports for equipment connectivity.

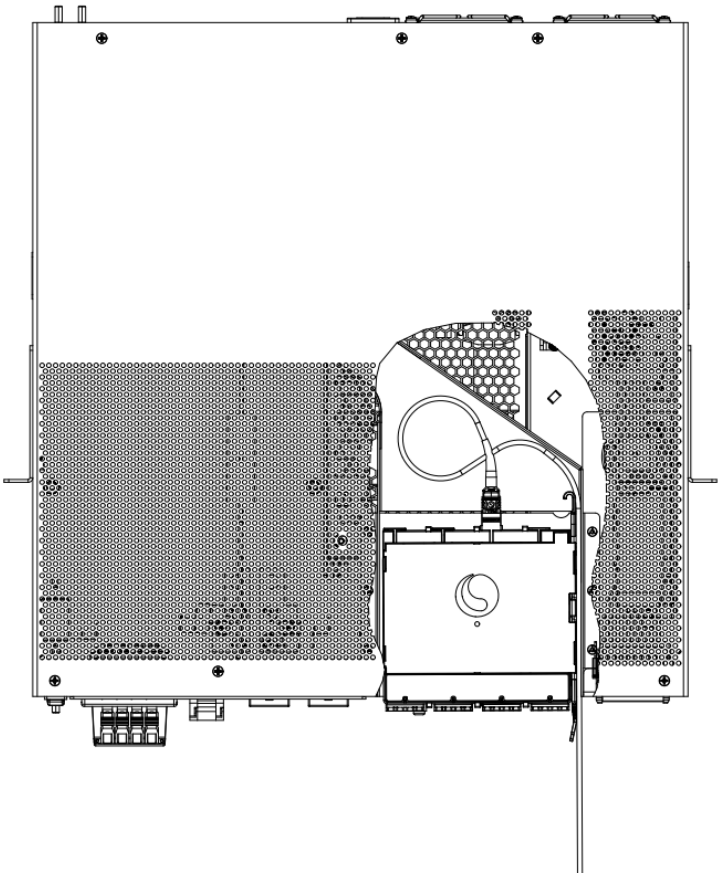


Figure 15a. Fiber Connectivity and Distribution

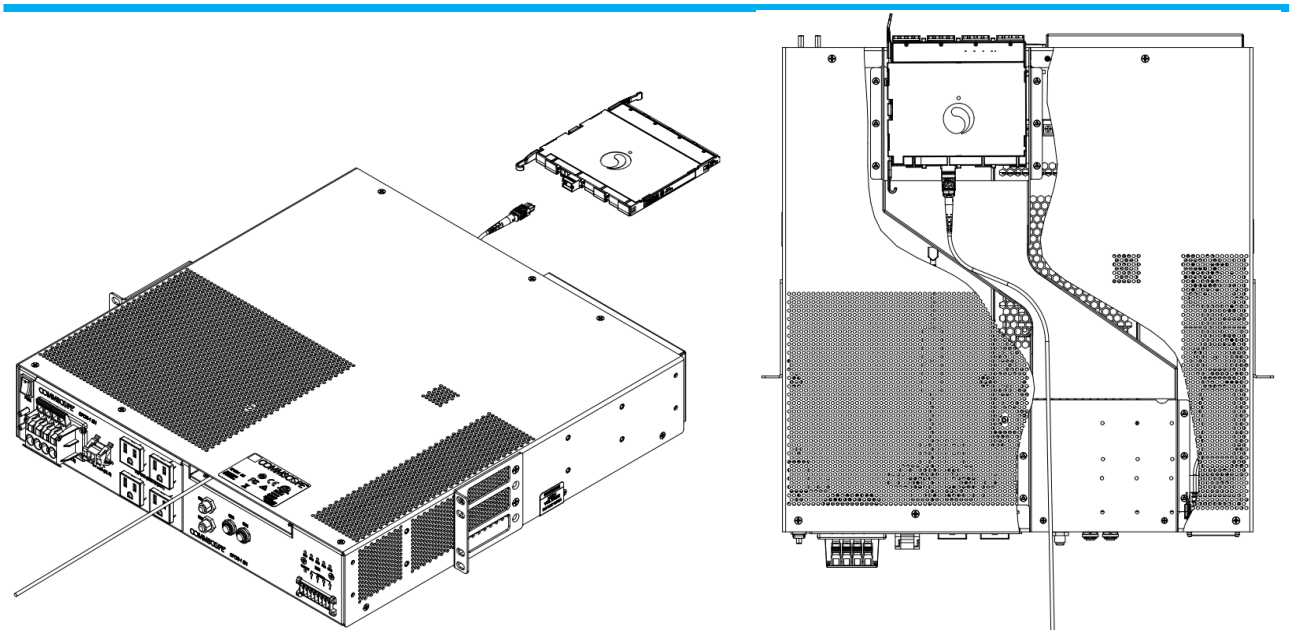


Figure 15b. Fiber Connectivity and Distribution

6 CONTACT INFORMATION

- To find out more about CommScope® products, visit us on the web at www.commscope.com
- For technical assistance, customer service, or to report any missing/damaged parts, visit us at http://www.commscope.com/SupportCenter