Corning Optical Network Evolution (ONE™)

User Manual

About This Manual

This user guide provides all the information necessary to understand the architecture and general installation procedures and requirements of Corning optical network evolution (ONE™) solutions system elements.

Note: The commissioning procedure, monitoring and management capabilities and configuration options of the Corning optical network evolution (ONE) solutions elements are described in the HCM and web management user manual (MRU is included in v1.6 and higher).

Warranties

Hardware

Corning Optical Communications Wireless, Inc. (“Corning”) warrants to the original purchaser (“Customer”) that for the duration of the warranty period, one (1) year, commencing on the date of shipment of the Hardware, unless otherwise agreed in writing by Corning (the “Hardware Warranty Period”), the Hardware furnished by Corning shall be free in all material respects from defects in material and workmanship, and shall conform to the applicable portions of the Specifications, as defined below (the “Hardware Warranty”).

If notified by Customer of any such defects in material or workmanship or nonconformity with applicable portions of the Specifications within the Hardware Warranty Period, Corning shall promptly, at its own election and expense, repair or replace any such Hardware proven to be defective under the terms of this Hardware Warranty.

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Notwithstanding the foregoing, Corning shall have no obligation under the Software Warranty if the Software is modified or used with hardware or software not supplied or approved by Corning or if the software is subject to abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

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Corning does not warrant any hardware, software or services not provided by Corning.

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IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

CORNING SALES AGENTS OR REPRESENTATIVES ARE NOT AUTHORIZED TO MAKE COMMITMENTS ON WARRANTY RETURNS.

Returns

In the event that it is necessary to return any product against above warranty, the following procedure shall be followed:

1. Return authorization is to be received from Corning prior to returning any unit. Advise Corning of the model, Serial number, and discrepancy. The unit may then be forwarded to Corning, transportation prepaid. Devices returned collect or without authorization may not be accepted.
2. Prior to repair, Corning will advise the customer of our test results and any charges for repairing customer-caused problems or out-of-warranty conditions etc.
3. Repaired products are warranted for the balance of the original warranty period, or at least 90 days from date of shipment.

Limitations of Liabilities

Corning's liability on any claim, of any kind, including negligence for any loss or damage arising from, connected with, or resulting from the purchase order, contract, quotation, or from the performance or breach thereof, or from the design, manufacture, sale, delivery, installation, inspection, operation or use of any equipment covered by or furnished under this contact, shall in no case exceed the purchase price of the device which gives rise to the claim.

Except as expressly provided herein, Corning makes no warranty, expressed or implied, with respect to any goods, parts and services provided in connection with this agreement including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Corning shall not be liable for any other damage including, but not limited to, indirect, special or consequential damages arising out of or in connection with furnishing of goods, parts and service hereunder, or the performance, use of, or inability to use the goods, parts and service.

Reporting Defects

The units were inspected before shipment and found to be free of mechanical and electrical defects. Examine the units for any damage that may have been caused in transit. If damage is discovered, file a claim with the freight carrier immediately. Notify Corning as soon as possible in writing.

Note: Keep all packing material until you have completed the inspection.

Warnings and Admonishments

There may be situations, particularly for workplace environments near high-powered RF sources, where recommended limits for safe exposure of human beings to RF energy could be exceeded. In such cases, restrictive measures or actions may be necessary to ensure the safe use of RF energy.

The equipment has been designed and constructed to prevent, as far as reasonably, practicable danger. Any work activity on or near equipment involving installation, operation or maintenance must be, as far as reasonably, free from danger.

Where there is a risk of damage to electrical systems involving adverse weather, extreme temperatures, wet, corrosive or dirty conditions, flammable or explosive atmospheres, the system must be suitably installed to prevent danger.

Equipment provided for the purpose of protecting individuals from electrical risk must be suitable for the purpose and properly maintained and used. This covers a range of activities including lifting, lowering, pushing, pulling, carrying, moving, holding or restraining an object, animal or person from the equipment. It also covers activities that require the use of force or effort, such as pulling a lever, or operating power tools.

Where some of the above mentioned activities are required, the equipment must be handled with care to avoid being damaged.

Observe standard precautions for handling ESD-sensitive devices. Assume that all solid-state electronic devices are ESD-sensitive. Ensure the use of a grounded wrist strap or equivalent while working with ESD-sensitive devices. Transport, store, and handle ESD-sensitive devices in static-safe environments.

Regulatory Compliance Information

WARNING!

- This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENCEES** and **QUALIFIED INSTALLERS**. You **MUST** have an **FCC LICENSE** or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation.
- **ANTENNAS**: Use only authorized and approved antennas, cables and/or coupling devices! The use of unapproved antennas, cables or coupling devices could cause damage and may be of violation of FCC regulations. The use of unapproved antennas, cables and/or coupling devices is illegal under FCC regulations and may subject the user to fines.

RF Safety

To comply with FCC RF exposure compliance requirement, adhere to the following warnings:

ATTENTION!

Compliance with RF safety requirements:

- Corning products have no inherent significant RF radiation
- The RF level on the downlink is very low at the downlink ports. Therefore, there is no dangerous RF radiation when the antenna is not connected.

CAUTION!

Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

NOTICE: The 2.5 GHz input connector port is currently not operational and is not to be used. It is intended for future applications.

Laser Safety

- Fiber optic ports of the Corning optical network evolution (ONE™) solutions emit invisible laser radiation at the 1310/1550 nm wavelength window.
- External optical power is less than 10 mW, Internal optical power is less than 500 mW.
- To avoid eye injury never look directly into the optical ports, patchcords or optical cables. Do not stare into beam or view directly with optical instruments. Always assume that optical outputs are on.
- Only technicians familiar with fiber optic safety practices and procedures should perform optical fiber connections and disconnections of the devices and the associated cables.
- Corning optical network evolution (ONE) solution components have been tested and certified as a Class 1 Laser product to IEC/EN 60825-1 (2007). It also meets the requirements for a Hazard Level 1 laser product to IEC/EN 60825-2: 2004 to the same degree.
- Corning optical network evolution (ONE) solutions complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice NO. 50 (2007).

Care of Fiber Optic Connectors

- Do not remove the protective covers on the fiber optic connectors until a connection is ready to be made. Do not leave connectors uncovered when not connected.
- The tip of the fiber optic connector should not come into contact with any object or dust.

Licensee Contact Information

Industrial Boosters may only be used by FCC licensees or those given express (individualized) consent of license. Corning optical communications wireless certifies all of the VARs listed as licensed installers for Corning. For the list of licensed VARs, please contact the Tech Support Hotline: (US) 410-553-2086 or 800-787-1266.

About This Manual

This user guide provides all the information necessary to understand the architecture and general installation procedures and requirements of Corning optical network evolution (ONE™) solutions headend and intermediate elements.

Note: The commissioning procedure, monitoring and management capabilities and configuration options of the Corning optical network evolution (ONE) solution elements are described in the HCM and web management user manual.

Additional Relevant Documents

The following documents are required if the corresponding units are included in your system (these can be downloaded from the Corning partner portal).

Document Name	CMA Lit Code
Headend control module (HCM) and web management GUI user manual	-
Campus connectivity fiber connectivity modules (FCM) Datasheet	CMA-421-AEN
Mid-Power Remote Unit (MRU) datasheet	CMA-422-AEN
Mid-Power Remote Unit (MRU) user manual	CMA-438-AEN
Five band remote access unit (RAU5) datasheet	CMA-377-AEN
Five band remote access unit with AWS3 (RAU5x) datasheet	CMA-487-AEN
Five band remote access unit (RAU5/RAU5x) user manual	CMA-482-AEN

Table of Contents

1 Introduction 11

1.1 About Corning Optical Network Evolution (ONE™) Solutions 11
1.2 Key Features and Capabilities 11
1.3 Basic System Architecture 12
1.4 User Controlled Service Group Distribution 13
1.4.1 Service Distribution via One Service Group 14

1.4.2 Service Distribution via Two Service Groups 15

1.4.3 Service Distribution via Three Service Groups 16

1.4.4 Service Distribution via Three Service Groups with Two IHUs 16

1.5 Web Management Application 17

2 Unit Descriptions 18

2.1 Integrated Headend Unit (IHU) Description 18
2.1.1 Control Module 19

2.1.1.1 Headend Control Module (HCM) 19

2.1.1.2 Auxiliary Control Module (ACM) 20

2.1.2 Radio Interface Module (RIM) 21

2.1.3 Radio Expander (RIX) Module 22

2.1.4 Optical Interface Module (OIM) 23

2.1.5 Optical Expander Module (OIX) 23

2.1.6 Power Supply Module (PSM) 24

2.2 24
2.3 Six Module DC Power Supply Unit (PSU6) Description 24
2.4 Mid-Power Remote Unit (MRU) 26

3 Installation Guidelines 29

3.1 General System Specifications and Requirements 29
3.1.1 Environmental and Regulatory Specifications 29

3.1.1.1 Temperature and Humidity 29

3.1.1.2 Safety and Regulatory Approvals 29

3.1.2 Power and Heat Specifications Summary 30

3.1.3 Dimensions, Weight and Rack Specifications of Units 30

3.2 Infrastructure Preparation 30
3.2.1 Site Considerations 30
3.2.2 Installation Location Requirements 31
3.2.3 Safety Guidelines 31
3.2.4 Rack Safety and Installation Guidelines 31
3.2.4.1 Rack Safety Instructions 31
3.2.4.2 Rack Installation Guidelines 31
3.2.5 Power Safety and Power Requirements 31
3.2.5.1 Power Safety Instructions 31
3.2.5.2 Types of Power Supplies 32
3.2.5.3 Circuit Breakers 32
3.2.6 RF Coaxial Cable Guidelines 33
3.2.6.1 Considerations for Cable Type and Installation Procedure Guidelines 33
3.2.6.2 RF Rules 33
3.2.7 Fiber Optic Requirements 33
3.2.7.1 Authorized Optic Cables 33
3.2.7.2 Fiber Optic Rules 33
3.3 Antenna Specifications and Guidelines 34
3.3.1 Authorized Antennas and Required Specifications 34

4 IHU Installation 35
4.1 General Installation Information 35
4.2 IHU Installation 36
4.2.1 Unpacking and Inspection 36
4.2.2 (IHU Only) Assembling Cable Management Tray and RF Expander Connection 38
4.2.3 Assembling the Cable Management Tray to the Chassis 38
4.2.4 Assembling the Door Sleeve 40
4.2.5 Mounting Chassis in 19-IN Rack 41
4.2.6 Installing Modules 43
4.2.6.1 Module Locations in Chassis 43
4.2.6.2 Installing the Chassis Modules 44

4.3 Grounding Chassis 44
4.4 RF Connections 44
4.4.1 RIM Connections to RF Source 44
4.4.2 RF Expander Connections 46
4.4.3 Pilot Clock Connections 47
4.5 IHU Fiber Connections 47
4.6 Management Connections 48
4.7 Power Connections and Power Up 48
4.7.1 AC Power Connection (PSM-AC) 48
4.7.2 DC Power Connection (PSM-DC) 49
4.8 Verifying Normal Operation 50
5 PSU6 Installation 52
5.1 PSU6 Installation 52
5.1.1 Items Required for PSU6 Installation 52
5.1.2 Installing the Power Supply Module 53
5.1.3 Mounting PSU6 54
5.1.3.1 Rackmount 54
5.1.3.2 Wall Mount 54
5.1.4 Grounding 55
5.1.5 DC Wiring Connections 56
5.1.6 Power-up 56
6 MRU Installation 58
6.1 MRU Indoor Installation 58
6.1.1 Unpacking and Inspection 58
6.1.2 Mounting the MRU 59
6.1.2.1 Rack Installation 59
6.1.2.2 Wall Mount Installation 60
6.1.3 Grounding MRU Chassis 64
6.1.4 Fiber Connections 65
6.1.5 RF Antenna Connections 65
6.1.6 Power Connections 66

6.1.6.1 AC Models 66
6.1.6.2 DC Models 67
6.1.7 Verifying Normal Operation 71
6.2 MRU Installation with Outdoor Enclosure 71
6.2.1 Items Required for Outdoor Installation 71
6.2.2 Pre-Installation Procedures 72
6.2.3 MRU Installation in Cabinet 74
6.2.4 MRU Connections 76
6.2.5 External Alarm Connections 78
7 Appendix A: Specifications 81
7.1 Supported Services 81
7.2 MRU Coupling Specifications 81
7.3 Optical 81
7.4 Power Specifications 82
7.4.1 IHU 82
7.4.1.1 PSM-AC 82
7.4.1.2 PSM-DC 82
7.4.2 MRU Power 82
7.5 Physical Specifications 83
7.6 Environmental 83
7.7 Standards and Approvals 83
7.8 PSU6 Specifications 84
7.9 Optical: Cabling, Unit/Modules Specifications 86
Cabling 86
Fiber Management 86
8 Appendix B: Ordering Information 87
8.1 IHU Assemblies, Modules, and Accessories 87
8.2 PSU6 88
8.3 Cable Ordering Information 89
Cable Configurations 89

1 INTRODUCTION

1.1 About Corning Optical Network Evolution (ONE™) Solutions

Corning optical network evolution (ONE™) provides an all optical converged solution which provides a flexible in-building cellular and network data coverage solution based on a fiber optic transport backbone. Fiber-to-the edge technology allows for virtually unlimited bandwidth to support today and tomorrow's growing demands of wireless users.

The fiber optic infrastructure is easily deployable via a wide range of preterminated composite cables and advanced end-to-end equipment. Easy to design, Plug & Play™ connectors significantly reduce installation cost and deployment time.

Dynamic service distribution group management allows precise service distribution control to meet changing density needs, and provides further savings by enabling sharing of equipment at various levels for service providers (detailed in Section 1.4).

The solution utilizes single-mode (SM) fiber to extend up to three user configured service groups from the main headend to the remote sites.

1.2 Key Features and Capabilities

- Comprehensive service support - SISO/MIMO services
- Supported services –LTE 2600 MHz, GSM, 800L, DCS and UMTS
- Flexible, configurable service distribution - advanced capacity and coverage management for better macro offload and enhanced user experience.
- Broadband enabled:
  - A range of ready-made fiber-optic (and power) composite cables simplify installation at all levels
  - Fiber backbone unleashes unlimited RF Spectrum
  - Easily scales to higher speeds requirements
- Scalable and customizable - infrastructure can be quickly expanded to support more services or increase coverage without downtime
- Carrier-grade network management:
  - Single-source, remote end-to-end field upgradable platform
  - Ready for SON, HetNet and future network requirements.
- Management and control – alarm forward to NOC or standard element management system (EMS) via SNMP, software-controlled output power and optical link auto gain control.
- Mid-power remote unit (MRU) provides the following:
  - Multioperator-optimized platform - services from a number of operators can be distributed by the same remote unit.
  - Cost effective higher power – optimizes and reduces the number of antennas required to cover open areas by offering up to 33 dBm (2 W) composite power per frequency band.
  - Operator grade performance – advanced signal handling, RF filtering and management ensures operator grade performance.
  - Optic fiber savings - all services routed to an MRU unit are routed over a single optic fiber pair
  - Design and deployment flexibility – MRU remote unit available in AC or DC power supply options. Antenna splitting schemes are possible due to the higher power output capability.
  - Modular and Scalable Design – modular design enables adding new wireless services easily and cost-effectively without disruption to workspaces or existing services. Supports external 2.5 GHz RF source.
  - Simple installation and maintenance – all connections and status LEDs located on the front panel. MRU is modular, hot swappable and field upgradable.

1.3 Basic System Architecture

Broadband RF distribution over fiber-optics infrastructure transfers converged wireless services from the IHU at the headend towards the MRUs deployed at the remote-end locations according to user defined configuration. The IHU is a compact unit designed to accommodate small/medium size deployments. The IHU interfaces up to eight RF sources, conditions the signals and performs the RF to optic conversion of the signals which are then routed towards the MRU at the remote site over single-mode fiber. Configuration and management of the system elements (i.e. IHU, and MRU) are performed via local/remote connection to the headend control module installed in the IHU.

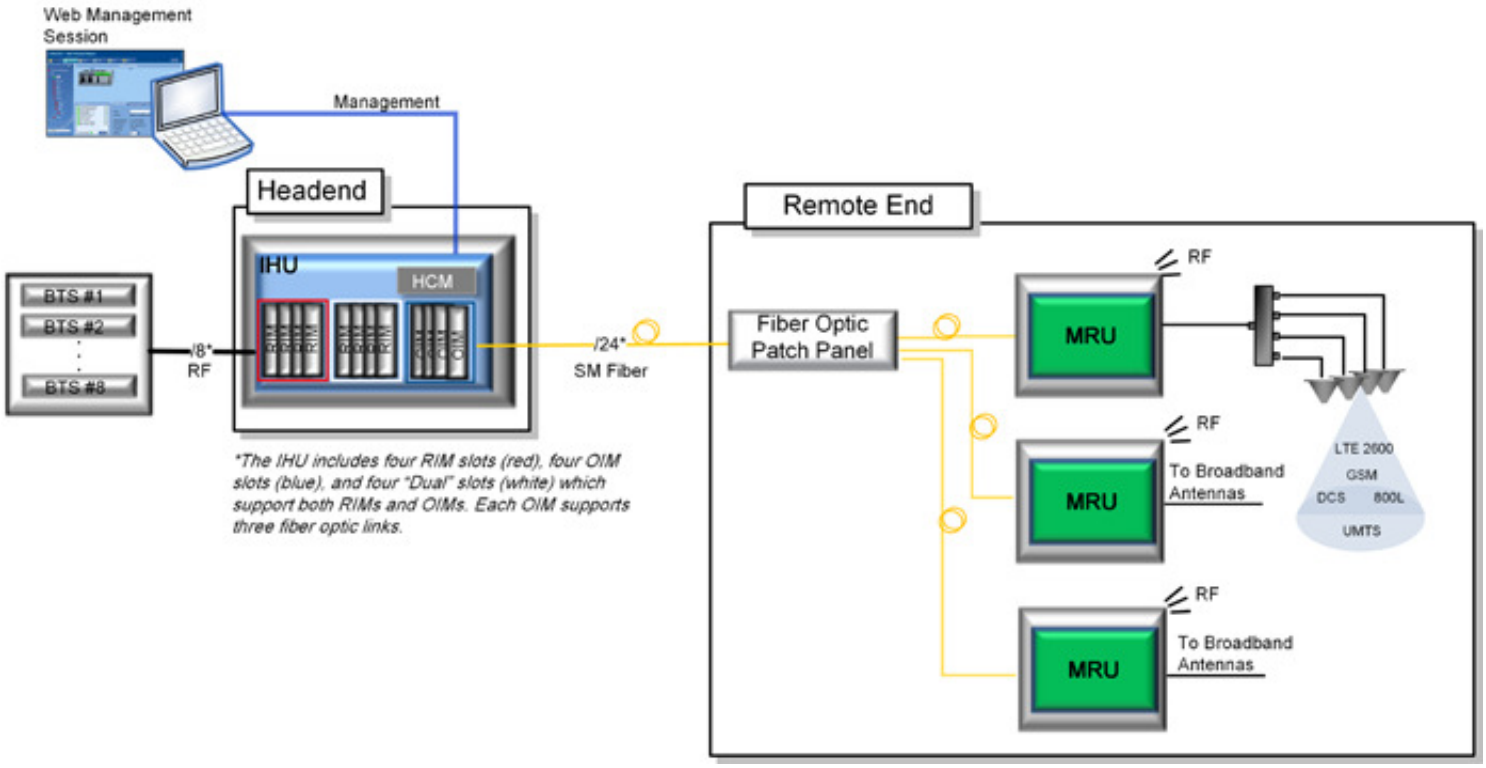

Figure 1-1. Corning Optical Network Evolution (ONE™) Solutions Basic Architecture

Acronyms	
BTS = base station	OIM = optic interface module
HCM = headend control module	RIM = radio interface module
IHU = integrated headend unit	SM = single mode
MRU = mid-power remote unit	

Table 1-1. Acronyms in System Architecture

1.4 User Controlled Service Group Distribution

Corning optical network evolution (ONE™) solutions fiber-optics infrastructure allows various combinations of wireless services to be routed from the headend to specified remote locations on each floor, according to user defined configurations. This allows optimizing service coverage and provides equipment savings. While the fiber-optics infrastructure is common, the services can be routed via service provider shared or dedicated equipment. By default, the system is configured to support a single service group: all services are transferred to all remote locations. This default configuration can be easily modified according to site requirements.

Figure 1-2 illustrates service distribution from the head-end to various locations on each remote floor. Each color represents a specific service, where different combinations of services are distributed at various locations on the same floor according to coverage requirements.

Figure 1-2. Illustration of Service Group Distribution

1.4.1 Service Distribution via One Service Group

In this example, all four services (A, B, C, and D) are routed to all remote units. In the illustrated topology, a single IHU conditions the services and performs the RF-to-optic conversion after which all the configured services are routed to the remote units for distribution over broadband antennas. Each IHU can support up to 24 remote-end units.

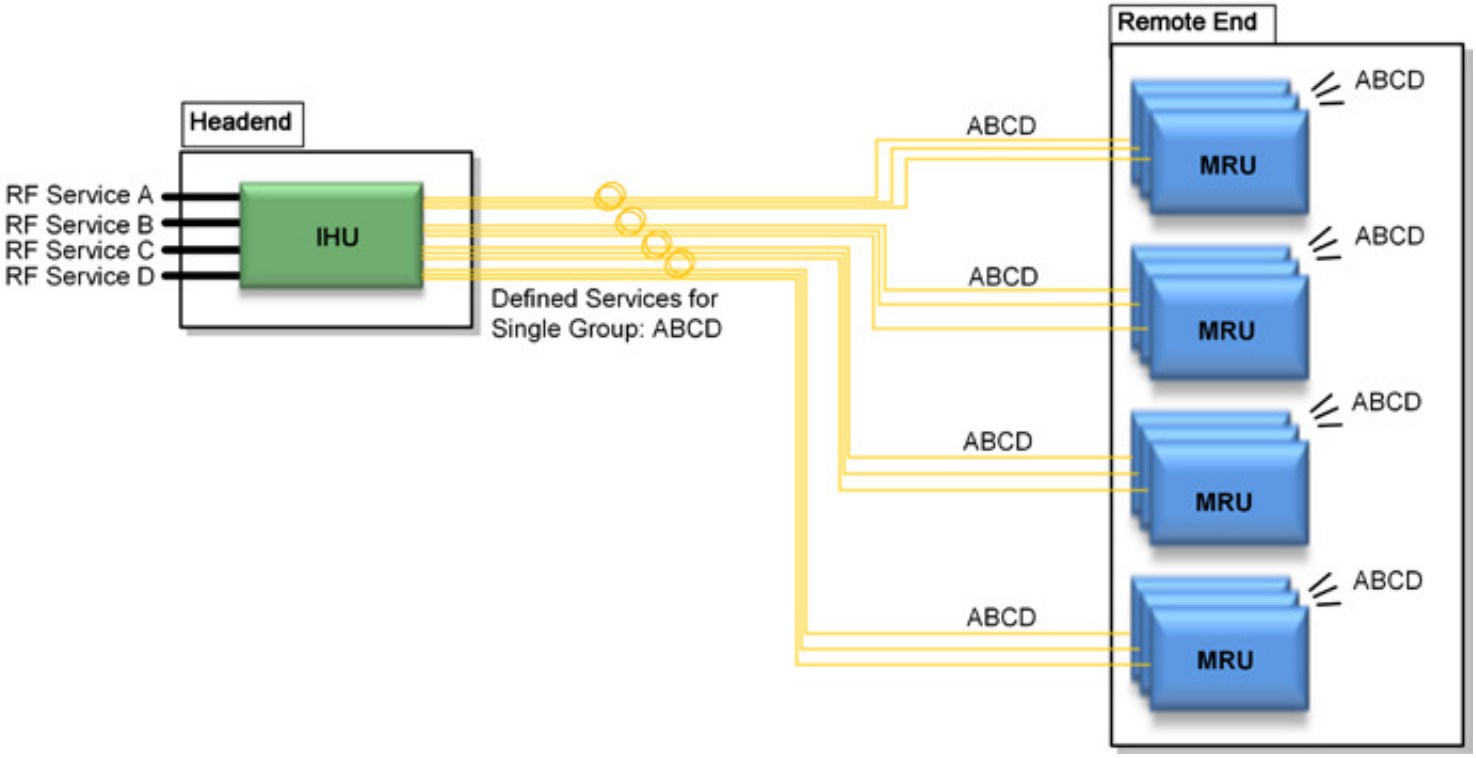

Figure 1-3. Distribution of a Single Service Group

1.4.2 Service Distribution via Two Service Groups

In this example, two service groups are defined: SG#1: A,B,C and SG#2: C,D. When configuring a service group, the user selects which services (according to RIMs) will be routed to which OIMs and then transferred over their optic links to their hosted remote units for distribution.

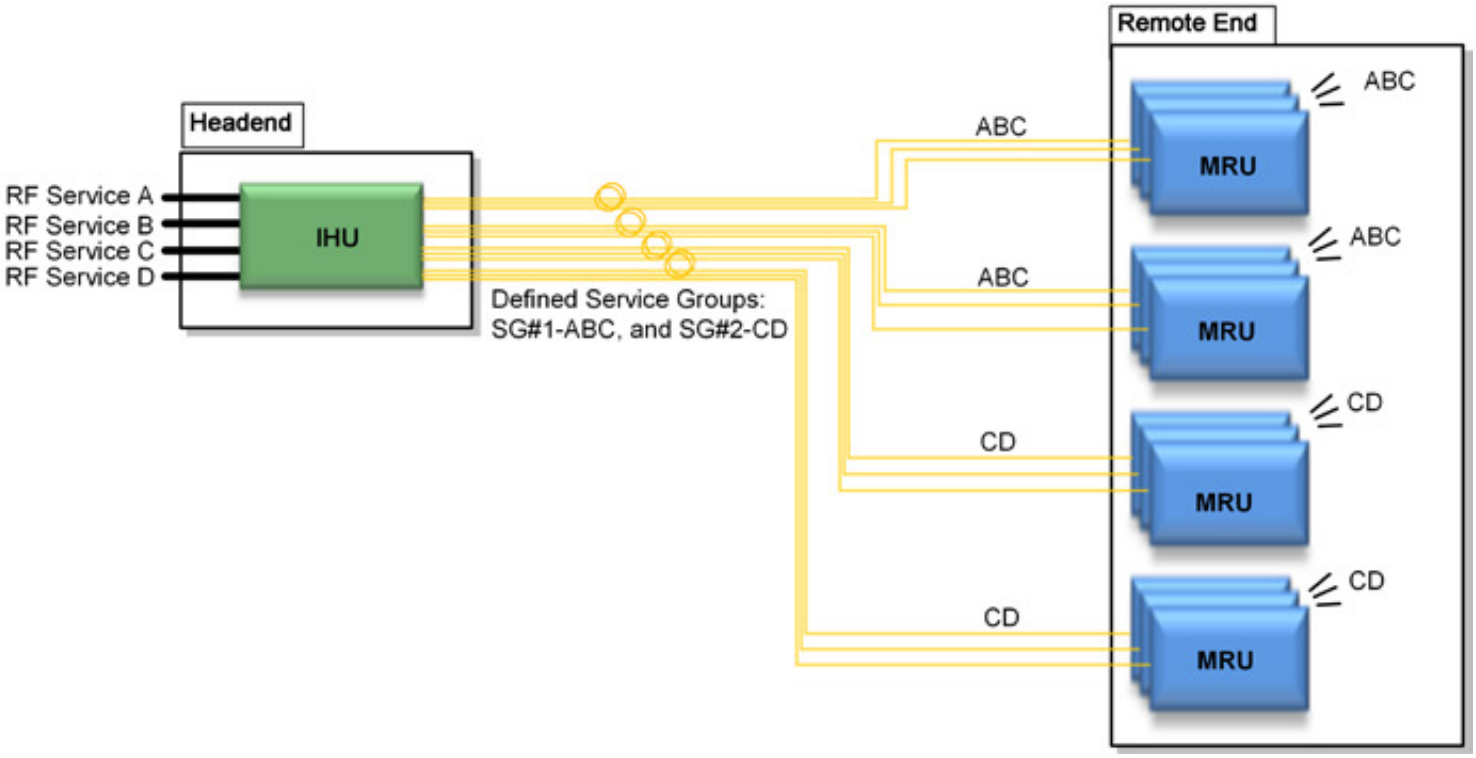

Figure 1-4. Example of Distribution of Two Service Groups

1.4.3 Service Distribution via Three Service Groups

In this example, three service groups are defined: SG#1: ABC, SG#2: AB, and SG#3: CD. Note that a service can be allocated to any of the service groups at the same time. For example, services C and B are allocated to two of the service groups. The services are routed to the OIMs for optic conversion. Each OIM can be configured to be included in any of the one, two or three service groups in any combination and the corresponding services are routed from the OIM to its hosted remote-end units.

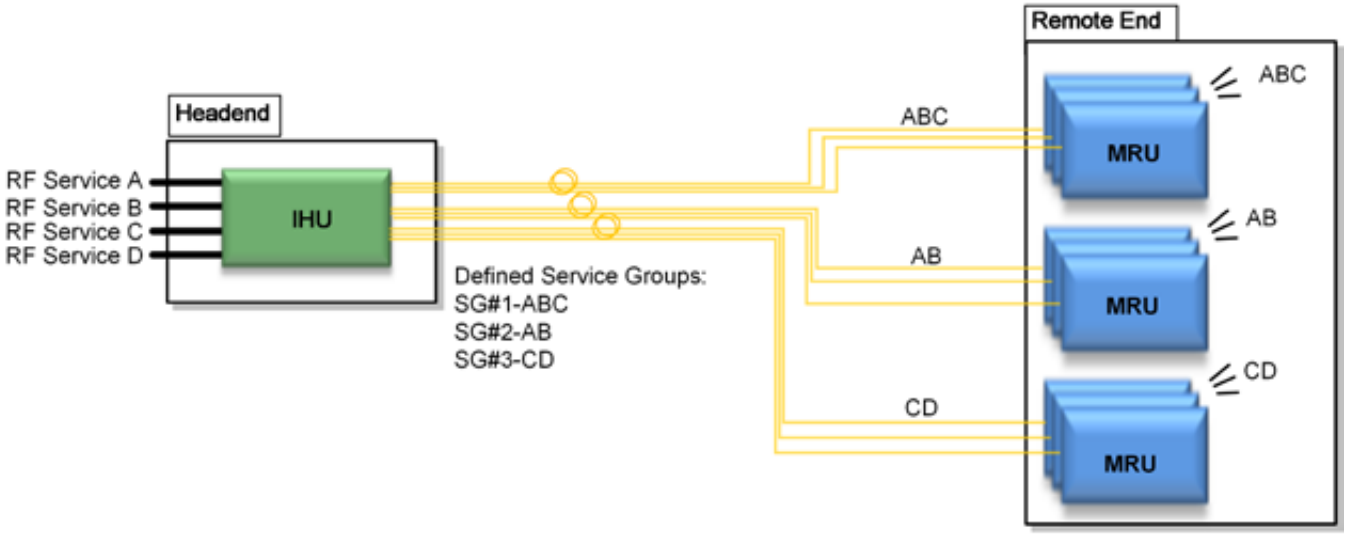

Figure 1-5. Example of Distribution of Three Service Groups

1.4.4 Service Distribution via Three Service Groups with Two IHUs

This example shows the distribution of three service groups with two IHUs. In this topology, the services routed via the two IHUs can be grouped in any combination between the two, providing up to three service groups. Each OIM in the IHUs can be configured to support any combination of service groups and the corresponding services are routed from to the hosted remote units.

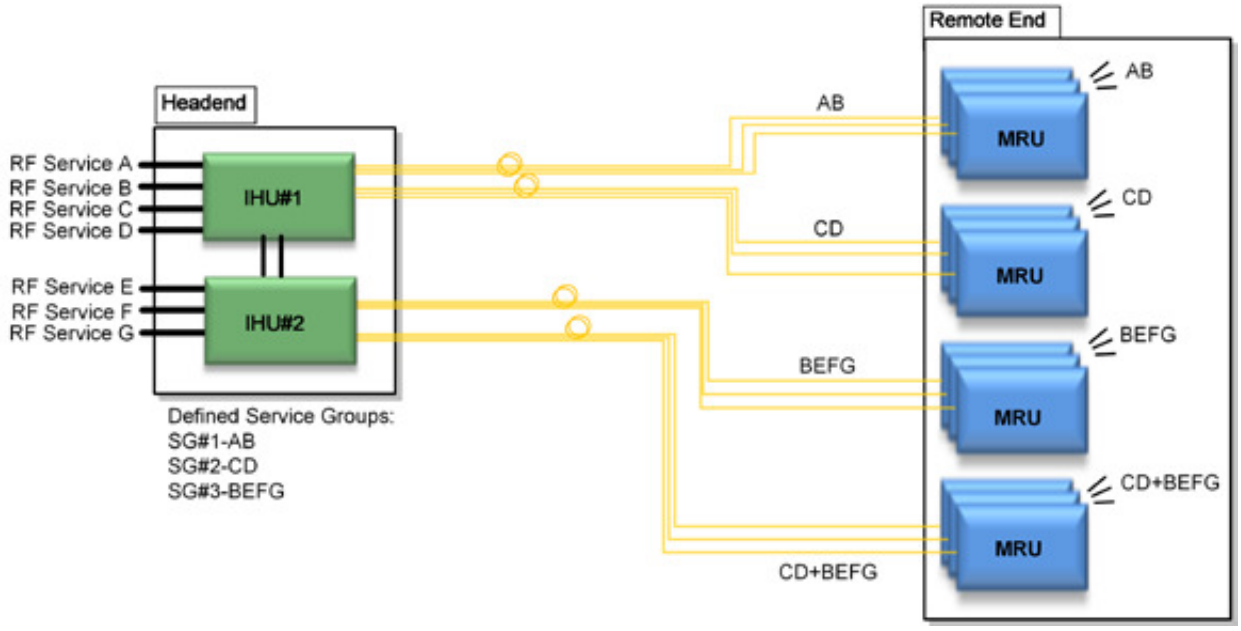

Figure 1-6. Example of Distribution of Three Service Groups with two IHUs

1.5 Web Management Application

The headend control module (HCM) enables centralized, system-level element management and provides comprehensive end-to-end, single source setup and management of the active RF components after their physical installation.

Note: Refer to the Corning optical network evolution (ONE™) solutions HCM and Management GUI user manual for a complete description of the Web management application.

Figure 1-7 shows the Management window, displayed by default upon login.

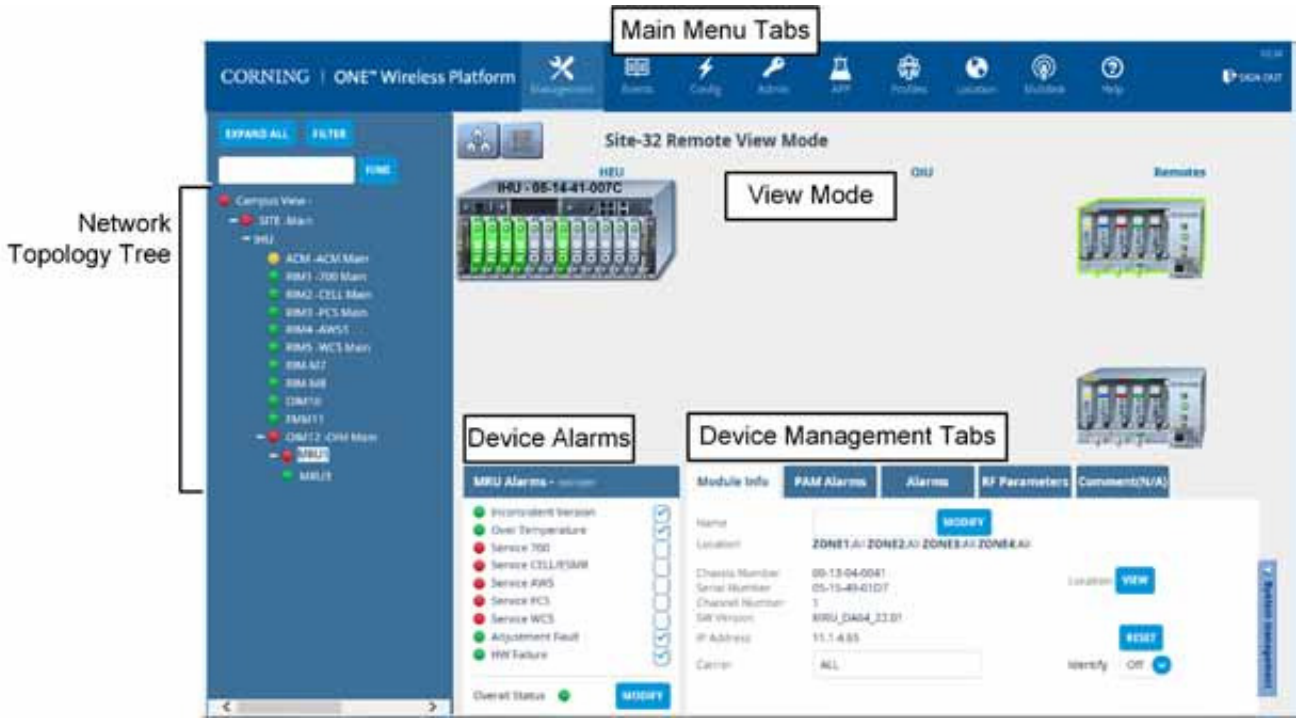

Figure 1-7. Example of Management Window (Software v2.2)

The main menu bar includes the following tabs:

Tab	Description
Management	Displayed upon login by default. Displays general module information and device alarms and provides the configuration options for the available selected site devices.
Events	Displays the events that occurred on the monitored devices and enables generating reports. Configuration changes that are initiated by the network manager are not considered events display.
Config	Set-up tool used for initial system set-up, commissioning of system devices and adjustment procedure.
Admin	Provides administration options such as firmware upgrade, user management options and IP settings required for receiving traps.
Profiles	Enables creating complete system configuration and setup profile offline and activating at a later time (software v1.8 and higher).
Location	Enables importing maps and icons to graphically display the geographical location and types of sites as well as the floor plans and map power settings for the system elements (software v1.8 and higher).
Multilink	Displays list of all of the setups configured in the same network and enables access to authorized users (software v2.0 and higher).
Help	Provides access to online help

Table 1-2. Main Menu Tabs

2 UNIT DESCRIPTIONS

2.1 Integrated Headend Unit (IHU) Description

The IHU is a compact unit which interfaces the RF sources (via RIMs), conditions the signals, performs the RF- to-optic conversion of the received signal (via OIMs), and distributes the wireless RF services to the remote units over the fiber optic infrastructure to the remote site. The IHU supports expansion connections to one additional IHU. Single source management is provided by the HCM installed in one of the IHUs.

Figure 2-1 provides an example of an IHU with four RIM modules (for RF interface and conditioning), five OIU modules for RF to optic conversion and routing to the fiber optic infrastructure, and three FMM modules (for topologies with campus connectivity).

The slots are color coded according to the type of modules that can be inserted in those slots:

- Red labeled slots – RIM slots
- Blue labeled slots – OIM slots
- White labeled slots – can host RIMs and OIMs

Note the following:

- *The IHU also includes a preassembled cable management tray with routed ERFC cable (shown in inset) used for connecting the RIX and OIX.*
- *The type and number of modules installed in an HEU chassis can vary according to the specific topology.*

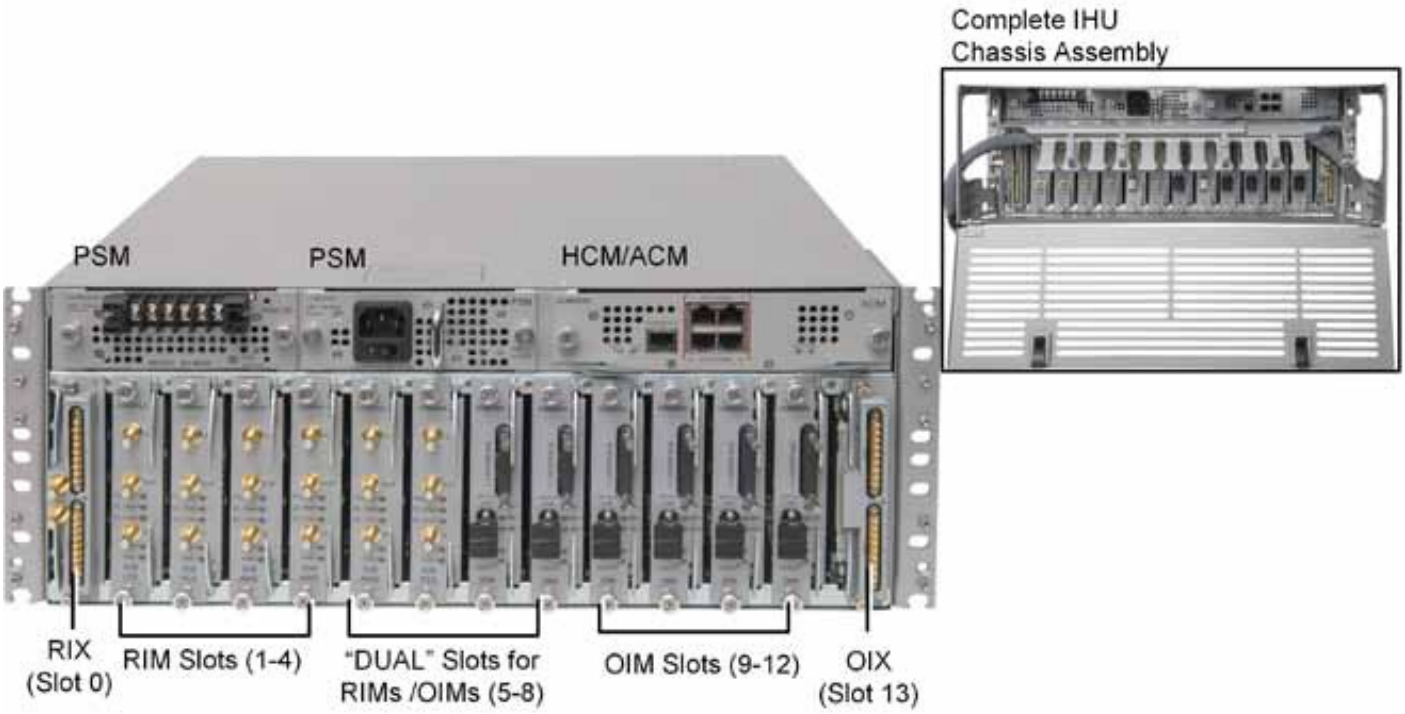

Figure 2-1. Example of IHU Front Panel with Installed Modules

The IHU performs the following main functions:

- Conditions (up to 8 including "Dual Slots") RF sources to a level required for feeding to the OIMs.
- Enables the configuration of up to three RF service groups.
- Performs the RF-to-optic conversion of the RF services and forwards the services over the fiber optic infrastructure to the remote site. Each OIU supports between 4-8 SM optic fibers.

For additional services or density, two IHU units can be cascaded, where both IHUs are managed from the headend control module (HCM) installed in one of the units. The IHU installation procedure is detailed in Chapter 4.

IHU hosts the following modules:

Module	Description
Control Module	One of the following control modules is installed in each IHU: • HCM (Headend Control Module) - one HCM per system. See section 2.1.1.1. • ACM (Auxiliary Control Module) - installed in second IHU if installed. See section 2.1.1.2.
RIM	Radio interface module – up to 12 per HEU. See section 2.1.2.
RIX	RF expander module – interface to OIX. See section 2.1.3.
PSM	Power supply module – AC and DC models can be ordered. Each IHU supports two PSMs for redundancy, where the same PSM type does not need to be installed in both slots. (Section 2.1.4). *Note: If one module is installed, it must be installed in the left slot. If two modules are installed, both must be powered on.*
OIM	Optical interface module - converts the RF to three optical links (see Section **2.1.4**)
OIX	Optical interface expander - interface to RIX (see Section **Error! Reference source not found.**).

Table 2-1. IHU Modules

2.1.1 Control Module

2.1.1.1 Headend Control Module (HCM)

This is a system control module that provides management and control capabilities for all headend and remote-end devices in a setup. One HCM is installed per setup in an IHU.

The HCM directly interfaces to the corporate LAN. It can be connected to (up to) four auxiliary control modules (ACMs) installed in additional headend units.

Figure 2-2. HCM Module

Table 2-2 and Table 2-3 provide a description of the HCM ports and LED status indicators.

Port	Description
INTERNAL (TO ACM)	Four RJ45, 100 Mb Ethernet ports - used for management of connected OIU systems (and/or Auxiliary HEUs).
LAN	RJ-45, 1 Gb Ethernet port - connects to the corporate LAN for remote management
LOCAL	RJ-45, 1 Gb Ethernet port - local configuration and management
CONSOLE	RJ-45, serial port - local configuration for service personnel
SD Card Slot	Supports micro SD cards up to 32 GB (used for saving and importing configuration files between different HEU chassis)

Table 2-2. HCM Interface Ports

LED	Description
PWR	Steady green - power input detected by HCM Off – no power is supplied to the unit
RUN	Blinking green – HCM Boot up sequence complete and module software up and running Off – no power supplied to the unit
SYS	Steady green – overall status of the managed system is ok
FAN	Steady green – normal operation status for all fans Red – fault indicated in at least one fan

Table 2-3. HCM LED Description

2.1.1.2 Auxiliary Control Module (ACM)

The ACM is installed in any additional IHU chassis (other than the one in which the HCM is installed).

The ACM provides the interfaces for remote management and control capabilities of the host chassis and connected remotes via a local connection to the HCM (see section 2.1.1.1).

Figure 2-3. ACM Module

Table 2-4 and Table 2-5 provide a description of the ACM ports and LED status indicators.

Port	Description
INTERNAL (TO HCM)	Four RJ-45, 100 Mb Ethernet management ports - interface to HCM and/or other ACMs
Console	One RJ-45, serial port used for basic IP configuration and local connection for service personnel

Table 2-4. ACM Ports Description

LED	Description
PWR	Steady green - power input detected by ACM Off – no power is supplied to the unit
RUN	Blinking green – ACM Boot up sequence complete and module SW up and running Off – no power supplied to the unit
SYS	Steady green – overall status of the managed system is ok
FAN	Steady green – normal operation status for all fans Red – fault indicated in at least one fan

Table 2-5. ACM LED Indicators Description

2.1.2 Radio Interface Module (RIM)

The RIM/RIM-M is a service specific RF conditioning module that interfaces to the RF signal source. An IHU chassis can support between 4-8 RIMs.

Each RIM supports both Simplex and Duplex RF connectors. LEDs provide status indications on signal level and module operation status.

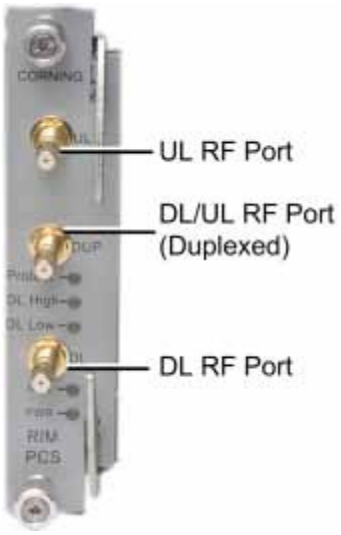

Figure 2-4. RIM

Table 2-6 and Table 2-7 provide a description of the RIM ports and LED status indicators.

Port	Description
DL/UL	UL and DL simplex connections to the RF signal source
DUP	Duplexed UL and DL connection to the RF signal source

Table 2-6. RIM Ports Description

LED	Description
Protect	N/A
DL High	Provides indication on DL RF level in conditioner module: • Off - DL RF input level in threshold range • Steady red – signal is 3 dB above max. expected power
DL Low	Provides indication on DL RF level in conditioner module: • Off - DL RF input level in threshold range • Steady red – no signal or 15 dB below max. expected power
RUN	• Blinking green - power on and module software has initialized and is up and running • Off - no power
PWR	On - input power is within required range

Table 2-7. RIM LED Descriptions

2.1.3 Radio Expander (RIX) Module

The RIX module provides the RF interface to the OIX module. Each IHU includes one RIX.

Port	Description
(TO OIX)	Two 9 – pin connectors which serve as the RF interfaces to the OIX. RIX supports connections to two OIXs via an Expander cable (ERFC).
REF OUT/REF IN	Two QMA connectors used for reference clock signal connections between RIX modules. *Note: The reference clock passes from the Main HEU to all auxiliary chassis.*

Table 2-8. RIX Ports Description

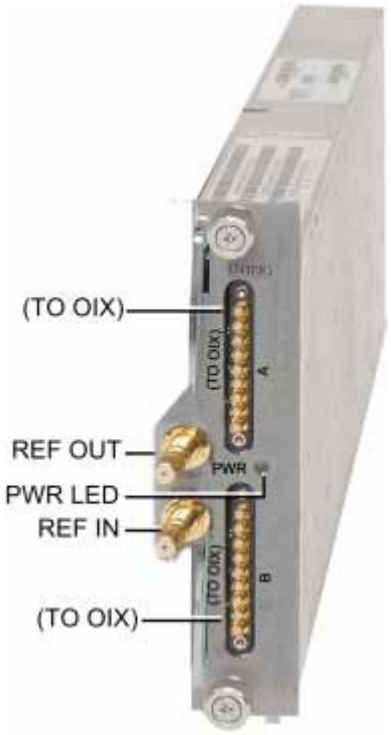

Figure 2-5. RIX Module Interfaces

2.1.4 Optical Interface Module (OIM)

The OIM is a wideband RF to F/O (and vice-versa) media conversion module. Up to 12 OIM units can be installed in each OIU, where each OIM can support connections up to three remote units connections.

Port	Description
OPTICAL LINK	Female MTP® Connector for optical interface connection; SM fiber
1:1 INTERFACE	Six pin SMP jack connector for 1:1 direct signal transportation, three UL and three for DL enables (DL and UL) broad band connection to each optical link

Table 2-9. OIM Ports Description

LED	Description
Link 1-3	Steady Green - optical link power to/from the connected remote is normal Off - no optical power from remote detected
RUN	Blinking Green – OIM module software has initialized and is up and running Off – Power off
PWR	Steady Green – Input power detected in OIM

Table 2-10. OIM LED Descriptions

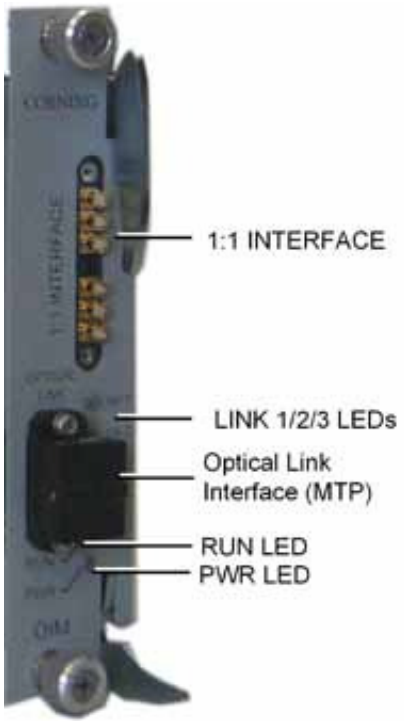

Figure 2-6. Optical Interface Module

2.1.5 Optical Expander Module (OIX)

The OIX provides the RF interface to two RIX modules via two 9-pin connectors.

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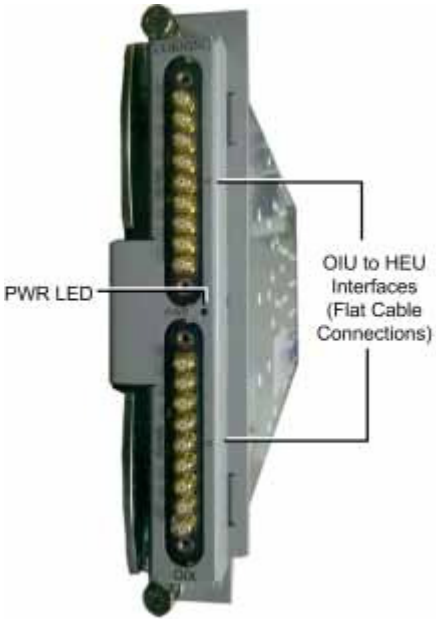


Figure 2-7. OIX Interfaces

2.1.6 Power Supply Module (PSM)

Two types of power supply modules are available:

- PSM-AC: 100 – 240 VAC (power rating 300 W);
- PSM-DC: 48 V DC; 9 A maximum (power rating 300 W).

Note the following:

- Each IHU can support two PSMs, where the second PSM provides redundancy in case one of the supplies fails.
- In cases that a single power supply module is installed, it must be installed in the LEFT slot.
- Both types of PSM modules (AC and DC) can be installed in the same chassis (at the same time).
- If two PSM modules are installed, both must be connected to their respective power source and turned on at all times.

PSM-AC

The PSM-AC includes an AC power connector, on/off switch and power status LED.

Figure 2-8. PSM-AC

PSM-DC

PSM-DC power source rating:

48 V DC; 9 A Max.; 300 W

The PSM-DC includes a six pin terminal block connector, supporting up to three DC wire pairs.

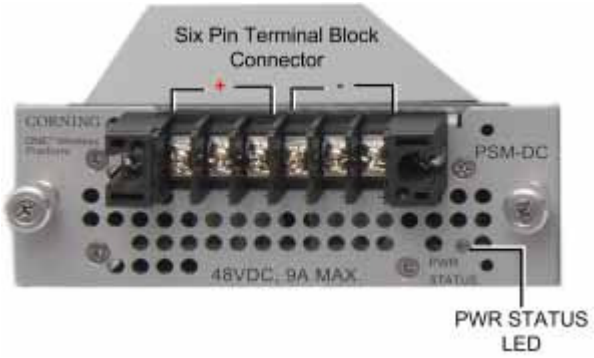


Figure 2-9. DC Power Supply Module

2.2 Six Module DC Power Supply Unit (PSU6) Description

PSU6 is a compact, scalable DC enclosed power supply used for feeding Corning optical network evolution (ONE™) solutions elements.

Power outputs:

- Up to 12 outputs of 57 VDC
- 100 W per output
- Total power of 1200 W

Refer to Section 7.8 for complete specifications.

Figure 2-10. PSU6 Front Panel

PSU6 supports up to six modules, where each module provides two DC outputs. All interfaces are located on the front panel. Modules are inserted and removed via the rear panel.

Figure 2-11. PSU6 Power Supply Module

The status of each module is indicated by a dedicated LED:

LED	Description
PSM LED	Green – power OK Red - indicates one (or more) of the following: • Insufficient input power • Problem with output load at one or both PSM output ports • PSM over temperature protection set • Fan failure Off in one PSM – PSM is off Off in all PSMs – no power input detected
Output LED 1/2	Off – normal operation Red – short circuit or overload detected

Table 2-11. PSU6 LED Description

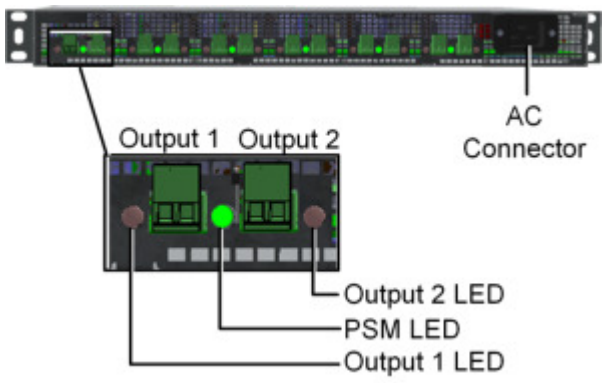


Figure 2-12. AC Input Power Connector and PSU6 LEDs

2.3 Mid-Power Remote Unit (MRU)

This section provides detailed descriptions of the MRU chassis and main modules and interfaces. This includes port and LED interface descriptions. The MRU comprises the following main modules:

- **Power amplifier modules (PAM)** – internal service specific power amplifier module that interfaces to an optical interface module (OIM) at the headend site via a single-mode fiber pair and supports one service. MRU supports up to seven bands. The PAM provides the additional amplification on the DL signals routed from the OIM towards the multiplexer; PAMs are pre-installed in designated slots according to supported band.
- **Multiplexer** – combines the UL and DL RF signals of the supported services in addition to external RF signal (future option for connecting to external 2.5 GHz signal source) while providing the proper filtering into a single duplexed antenna port.
- **Optical Module** – includes the fiber optic, RF expansion and external alarm interfaces
- **Power supply module (PSM)** - local AC or remote DC power feed (model dependent);
- **Fan module (FAM)** – integrated fan module comprised of four fans which are also monitored via the web GUI

The MRU includes front panel interfaces (e.g. antenna, fiber optic connection and LED status indicators) as well as status indicators per each internal module (which are accessed by opening the cabinet door. The following sections provide details on the front panel and internal module interfaces.

Figure 2-13 MRU Main Modules

The MRU front panel includes the RF and fiber optic interfaces in addition to the system level status LEDs and service maintenance ports. The internal PAM modules each include a PWR/STS LED.

Figure 2-14. MRU External Interfaces

Table 2-2 and Table 2-3 provide a description of the MRU interface ports and LED status indicators.

Port	Description
ANTENNA PORT	4.3-10 Type RF duplexed RF antenna port
TEST PORT	QMA coupling test port used for UL and DL measurements during system operation
2.5 GHz INPUT PORT	N/A (Future option); 4.3-10 Type RF port for 2.5 GHz external RF source
GND	Two-hole, standard barrel grounding lug
PSM Power Connector	Model dependant: AC models – AC connector connected to power source using provided AC power cable only DC models - two types of terminal block connectors: • CLASS2 (default) – two “DC In” 8-pin terminal block connectors for remote feed: one pair for each PAM (total of five pairs) and one pair for the FAM+OPTM; one RSV pair • CLASS1 – one “DC-In” 2-pin terminal block for local plant feed
Exp. UL/DL	SMA RF ports for UL and DL connections to add-on unit (supporting any band across the supported spectrum: 300 MHz to 3 GHz)

Port	Description
List. Mode	N/A
OPTIC	LC APC port for single-mode fiber optic connection
MGMT	RJ45 Ethernet connection for MRU local management connection
External Alarms	DB9 female external alarm connector for external dry contact alarm connections
Exp.	RJ45 Ethernet connection for Add-On local craft

Table 2-12. MRU Interface Ports

LED	Description	
PWR	Steady green:	Required power is supplied to MRU chassis
	Off:	No power input detected
RUN	Blinking green:	Unit is running and operational
	Rapid blinking green:	"Identify" feature has been enabled via the management GUI
	Off:	No power inpout detected
STS	Steady green:	Normal operation; overall status OK
	Steady red:	Indicates generated alarm in unit
	Blinking red:	"Over temperature" alarm active.; Indicates temperature has exceeded threshold (with door open) *Note: Temperature alarm is set as first priority and overrides any other alarm indicator.*
FAM	Steady green:	All four fans are operating at normal speed (fan alarms clear)
	Steady red:	Fault detected in at least one fan (fan alarm set)
LINK	Steady green:	Optical link level from optical module above normal threshold
	Steady red:	Optical link level is lower than normal threshold
(PAM)	Steady green:	Power and status of power amplifier module OK. No alarms active.
	Steady red:	One or more alarms are active.

Table 2-13. MRU LED Descriptions

3 INSTALLATION GUIDELINES

Note the following:

- It is assumed that the site survey and installation planning (including power requirements) have been completed.
- Specifications of remote units are described in the corresponding datasheets and installation manuals.

This chapter provides installation guidelines for the Corning optical network evolution (ONE™) IHU, PSU6, and MRU. The following installation rules are based on the assumption that the site survey and installation planning (including power requirements) have been completed. This includes planning the distribution of antennas to provide the required coverage, as well as planning the layout of the devices and cables in the telecom closet or shaft.

3.1 General System Specifications and Requirements

This section includes the environmental and physical specifications for the following units: HEU, OIU, IHU, CEU, ICU and PSU6.

3.1.1 Environmental and Regulatory Specifications

3.1.1.1 Temperature and Humidity

The environmental specifications listed below are relevant to all Corning optical network evolution (ONE™) solution devices.

	Operating	Storage
Temperature	0°C to +50°C (32°F to 122°F)	-20° C to 85° C (-4°F to 185°F)
Humidity	95% (non-condensing)	95% (non-condensing)

Table 3-1. Temperature and Humidity Specifications

3.1.1.2 Safety and Regulatory Approvals

The safety and regulatory specifications listed below are relevant to all Corning optical network evolution (ONE™) solution devices.

Regulation/Standard Category	Approval
Laser Safety	FDA/CE 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice no. 50 and IEC 60825-1
EMC	CE EN 301 489, EN55022, EN 61000 FCC 47 CFR Part 15, 22, 24, 27
Safety	UL 60950 IEC 60825-1:2007 IEC 60825-2:2010 CAN/CSA-C22.2 No.60950-1-03 Fire Safety UL 2043 (applicable for RAU5 only)

Table 3-2. Safety and Regulatory Approvals

3.1.2 Power and Heat Specifications Summary

Table 3-3 provides the power, heat and rack specifications for the equipment installed in the headend/telco rooms.

Unit	Description	Min-Max Voltage (VAC)	Max Power Draw (Watts)	No. of Units	Heat (BTU/hr)
IHU	Integrated headend unit	100 – 220	300	1	1020
PSU6	Six Unit DC power supply unit	85 to 265	1200 (100 W per port)	1	512 (typical at 100 V in)

Table 3-3. Power and Heat Specifications

3.1.3 Dimensions, Weight and Rack Specifications of Units

Table 3-4 describes the physical specifications of the Corning optical network evolution (ONE™) solution units described in this manual.

Unit	Dimensions (H x W x D)	Rack Space 19-in (RU)	Weight: lbs [kg]
IHU	7 x 17.3 x 15.5 in [177.8 x 440 x 394 mm]	4	Chassis: 30 lbs (14 kg) Per RIM: 1.9 lbs (0.9 kg) Per RIX: 1.54 lbs (0.7 kg) Per OIM: 1.5 lb (0.7 kg) Per OIX: 1.54 lb (0.7 kg) ACM: 2.2 lb (1.0 kg) PSM: 1.98 lb (0.9 kg)
PSU6	1.73 x 17.51 x 13.74 in [44 x 445 x 349 mm]	1	Enclosure: 6.22 lb (2.825 kg) Per PSM-I module: 0.8 lb (0.36 kg)
MRU	10.5 x 17.5* x 15.75 in (266.7 x 445 x 400 mm) **without rack brackets*	6	Chassis without PAMs: 48 lbs (21.8 kg) Each PAM: 4.7 lbs (2.15 kg)

Table 3-4. Dimensions, Weight and Rack Specifications of Headend/Intermediate Units

3.2 Infrastructure Preparation

The following installation rules are based on the assumption that the site survey and installation planning (including power requirements) have been completed.

3.2.1 Site Considerations

- The distance between the MRU service antenna and the coverage area should correspond to line of sight (LoS) requirements for maximum coverage area.
- The maximum fiber path loss is 5 dB.
- The system delay of the optical system must be taken into consideration when there are neighboring BTS sites overlapping in coverage.

3.2.2 Installation Location Requirements

- Mounting surface shall be capable of supporting the weight of the equipment.
- In order to avoid electromagnetic interference, a proper mounting location must be selected to minimize interference from electromagnetic sources such as large electrical equipment.
- Working space available for installation and maintenance for each mounting arrangement.
- Ensure unrestricted airflow.
- Ensure grounding connector is within reach of the ground wire.
- Ensure a power source is within reach of the power cord and the power source has sufficient capacity.
- Where appropriate, ensure unused RF connectors are terminated.
- Do not locate the equipment near large transformers or motors that may cause electromagnetic interference.
- Reduce signal loss in feeder cable by minimizing the length and number of RF connections.
- Ensure the equipment will be operated within the stated environment (refer to Appendix A: Specifications or unit datasheet).
- Where appropriate, confirm available of suitably terminated grade of RF and optical fiber.
- Observe handling of all cables to prevent damage.

3.2.3 Safety Guidelines

Before installing the equipment review the following safety information:

- Follow all local safety regulations when installing the equipment.
- Only qualified personnel are authorized to install and maintain the Repeater.
- Ground specified equipment with the provided grounding bolt
- Do not use the grounding bolt to connect external devices.
- Follow Electro-Static Discharge (ESD) precautions.
- Use low loss cables to connect the antennas

3.2.4 Rack Safety and Installation Guidelines

3.2.4.1 Rack Safety Instructions

The following guidelines are relevant to the rack installed units. Review the following guidelines to help ensure your safety and protect the equipment from damage during the installation.

- Only trained and qualified personnel should be allowed to install or replace this equipment.
- Verify that ambient temperature of the environment does not exceed 50°C (122° F)
- To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack and load the rack from the bottom to the top.
- Ensure that adequate airflow and ventilation within the rack and around the installed components so that the safety of the equipment is not compromised. It is recommended to allow for at least about 2 cm of airspace between devices in the rack.
- Verify that the equipment is grounded as required – especially the supply connections.

3.2.4.2 Rack Installation Guidelines

- To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack and load the rack from the bottom to the top.
- Verify that the rack height can support the unit to be installed, where you may also want to consider future installations.
  - IHU rack height = 4U
  - PSU6 rack height =1U
  - MRU rack height = 6U

3.2.5 Power Safety and Power Requirements

This section summarizes the power requirements of devices described in this manual.

3.2.5.1 Power Safety Instructions

SAFETY WARNINGS! When installing or selecting the power supplies:

- Use only the power cables (AC and DC) and any other relevant accessories provided with the unit to connect the power supply to the system components.
- For MRU AC models – only use the provided AC power cable (straight, U.S 10 A ,UL, L = 1.8-2.5 m ,black,110 V) to connect the power supply to the MRU.
- Be sure to disconnect all power sources before servicing.
- Calculate the required power according to the requirements of the specific installation and then determine the configuration of the power supplies. The required DC cables will then be determined by the selected PS configuration.
- Use only UL approved power supplies
- Install external over-current protective devices for the system according to the requirements described in section 3.1.2 - Power and Heat Specifications Summary..
- Types of Power Supplies - Corning supplies various power supplies that can be installed in a rack or mounted on a wall, depending on your configuration.

3.2.5.2 Types of Power Supplies

Corning supplies various power supplies that can be installed in a rack or mounted on a wall, depending on your configuration.

3.2.5.3 Circuit Breakers

Calculate the required fuse protection while referring to section 3.1.2 - Power and Heat Specifications Summary. Also, take into account when installing fuse protections for the system that there may be other Corning system elements that require external fuse protection.

3.2.6 RF Coaxial Cable Guidelines

3.2.6.1 Considerations for Cable Type and Installation Procedure Guidelines

Note: The installer should be familiar with the ANSI/TIA/EIS-568 Cabling Standard guidelines.

- Observe the general cable installation procedures that meet with the building codes in your area.
- The building code requires that all cabling be installed above ceiling level (where applicable). The length of cable from the risers to each antenna must be concealed above the ceiling.
- The cable must be properly supported and maintained straight using velcro cable ties, cable trays and clamps or hangers every 10 feet (where practical above ceiling level).

  Where this is not practical, the following should be observed:
  - The minimum bending radius of the supplied ½" coax cable should be 7".
  - Cable that is kinked or has a bending radius smaller than 7" must be replaced.
  - Cable runs that span less than two floors should be secured to suitably located mechanical structures.
  - The cables should be supported only from the building structure.
- All cables shall be weather-resistant type.
- The cable length is determined by the system installation plan. When calculating the cable length, take into account excess cable slack so as not to limit the insertion paths.

3.2.6.2 RF Rules

- Use coax RG-223, 50 ohm, male-to-male N-type to QMA for RF connections from the RIMs to the BTS/RBS and to the RAUs.
- When using the Corning system in an environment in which other indoor coverage systems are installed, it is recommended (where possible) that the antennas are placed at least two meters apart
- When bending coax cables, verify that the bending radius does not exceed the coax specifications.
- Use a VSWR meter (i.e. Site Master or equivalent) for checking coax cables, including the antennas. (<2). The VSWR must be measured prior to terminating the RAUs at the remote locations.

3.2.7 Fiber Optic Requirements

3.2.7.1 Authorized Optic Cables

The following specified optic cables are authorized for use with Corning optical network evolution (ONE™) products:

Vertical	Horizontal
Plug & Play™ Plenum Optical cables MTP Fiber Connectors 12 – 144 fibers 2-sided or 1-sided Armored, non-armored	Composite Plenum Tether Assemblies Fiber: LC APC, 2 – 24 fibers Cu: 16 AWG, 14 AWG, 12 AWG; 2 – 12 Conductors Armored, non-armored

3.2.7.2 Fiber Optic Rules

- Use only MTP® or LC APC connectors
- UniCam connectors can be used for field termination
- Use only fusion splice for connecting two fibers
- Use minimum splicing/connectors to achieve minimum losses on the fibers (< 0.5 dB)
- Use precaution while installing, bending, or connecting fiber optic cables:
  - Fiber optic cable is sensitive to excessive pulling, bending and crushing forces. Consult the cable specification sheet for the cable you are installing.
  - Do not bend cable more sharply than the minimum recommended bend radius.
  - Do not apply more pulling force to the cable than specified.

  - Do not crush the cable or allow it to kink. Doing so may cause damage that can alter the transmission characteristics of the cable. The cable may have to be replaced.
- Use an optical power meter and light source for checking the fiber optic cables
- Make sure the environment is clean while connecting/splicing fiber optic cables
- All fiber optic connectors should be cleaned prior to connecting to the system
- Fiber connector protective caps should be installed on all non-terminated fibers and removed just before they are terminated.
- Pay special attention while connecting the LC APC connectors – ensure that you hear a “click”, indicating a secure connection
- Never look directly into the end of a fiber that may be carrying laser light. Laser light can be invisible and can damage your eyes.

3.3 Antenna Specifications and Guidelines

Determine the antenna installation configuration, according to the transmission and coverage requirements and the installation site conditions.

3.3.1 Authorized Antennas and Required Specifications

- External antennas - no limitation on any vendor of available external antennas with respect to the following requirements:
  - Omni Directional or directional
  - Supported frequency range: wideband antennas supporting a range of 700 MHz to 2600 MHz
  - Gain: up to 12.5 dBi
  - Impedance: 50 Ohm
- Couplers – Use N-Male to N-Female broadband coupler separately ordered from Corning (P/N AK-1COUPLER-NM-NF) or the equivalent:
  - Broadband frequency: 300 – 3000 MHz
  - -20 dB coupling (SMA coupling port)
  - Maximum VSWR/return loss:12 dB
  - Maximum insertion loss (dB): 0.2
- Number of antennas that can be connected (with cables/splitters) – it is not recommended to connect more than one antenna per connector since 1:1 connectivity is reduced with each split.
- Types of couplers/splitters – depends on number of splits (not recommended)

4 IHU INSTALLATION

This chapter describes the installation for the IHU, PSU-6, and MRU equipment. A section is dedicated to general information relevant for the installation of the HEU, OIU and IHU, followed by dedicated installation sections for each type of equipment.

Note: For specific guidelines on infrastructure planning, design and installation, please consult with a Corning product line manager or Corning approved installer.

4.1 General Installation Information

Note the following information:

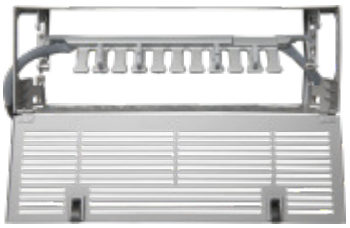
- The IHU chassis and modules are supplied separately and must be inserted by the user. Only the fan module is factory installed in the chassis rear.
- The IHU is installed at the intermediate distribution frame (IDF), adjacent (or as close as possible) to each other to facilitate the connections.
- The expander cable (ERFC) interconnecting the OIX and RIX modules are provided in lengths ranging from 16 to 59 in so as to accommodate a range of HEU-OIU rack installation configurations.
- HCMs and ACMs are not hot-swappable.
- Hot-swappable modules: RIMs, OIMs, PSMs, FAMs, RIXs and OIXs.
- If a redundant power supply is provided, both supplies must be installed, connected to respective AC or DC power and switched on.
- All components of a system installation are controlled and managed via a single HCM which is installed in the IHU chassis. *Note: The management connections for the Corning optical network evolution (ONE™) solution elements are detailed in the HCM and Web management GUI user manual.*

4.2 IHU Installation

4.2.1 Unpacking and Inspection

Unpack and inspect the cartons as follows:

1. Open the shipping cartons and carefully unpack each unit from the protective packing material.
2. Verify that all the items required for installing the chassis according to the items listed in the corresponding sections. If any of the listed items are missing, contact your Corning representative.
3. Check for signs of external damage. If there is any damage, call your Corning representative.

IHU Kit	Quantity	Item
Integrated headend unit chassis	1	
Fan Module (S-FAM) – single unit hosting 4 fans (installed in the chassis rear)	1	
RJ45/RJ45 communication cable L=2m-2.15m (P/N 705900003) – HCM management cable	1	
Cable Management Tray - includes management tray with routed ERFC cable and door sleeve ERFC (Expander Cable) - RF interface cable between RIX and OIX modules; 9 pin SMP to SMP connector; L=34 in	1	
RIM Kit (up to 8 according to order)	**Quantity**	**Item**
radio interface module (service specific)	1	
OIM Kit (up to 8 according to order)	**Quantity**	**Item**
Optical Interface Module (OIM)	1	
MTP-LC APC Harness Cable (P/N 37HP900162-006F) - connector for splitting fibers (6) leading from OIM to (FMU) Edge module	1	
RIX Module Kit	**Quantity**	**Item**
Radio Expander Module – expands the RF sources to the OIM modules via the OIX	1	
Pilot Transport Cable (P/N: PCKC47*) – Single QMA to QMA cable; L = 47 in; used for passing reference clock signal connections between RIX modules. *Additional various lengths are available: • PCKC20: L=20 in • PCKC63: L=63 in	1	

• PCKC79: L=79 in		
OIX Kit	**Quantity**	**Item**
OIU Expander Module - connects to the RIX Expander module; provides RF interface between RIM and OIMs	1	
PSM Kit (AC or DC modules - 1 or 2 kits according to order)	**Quantity**	**Item**
PSM-AC: 100-240 VAC Power Supply Module including standard IEC 60320-1 C13 cable	1	
PSM-DC: 48 V DC Power Supply Module; 9 A Max.; Includes six pin terminal block connector	1	
Controller Module Kit (HCM or ACM - according to order)	**Quantity**	**Item**
HCM Kit (headend control module) – installed in IHU unit; enables remote/local management of all hosted units	1	
ACM Kit (auxiliary control module) – for system setups with two IHUs; installed in second IHU unit; provides management connections for the second IHU.	1	

Table 4-1. Items Required for IHU Installation

4.2.2 (IHU Only) Assembling Cable Management Tray and RF Expander Connection

Note the following:

- The IHU cable management tray should be assembled before the unit is mounted onto the rack.
- The IHU modules can be inserted anytime before or after the management tray is assembled.
- The cable management tray consists of two items:
  - Cable management tray with routed ERFC (RIX- to-OIX) cable
  - Door sleeve
- A Phillips screwdriver is required.

4.2.3 Assembling the Cable Management Tray to the Chassis

Assemble the provided cable management tray to the chassis and connect ERFC Cable (routed through tray) as follows:

1. Assemble cable management tray to IHU chassis:

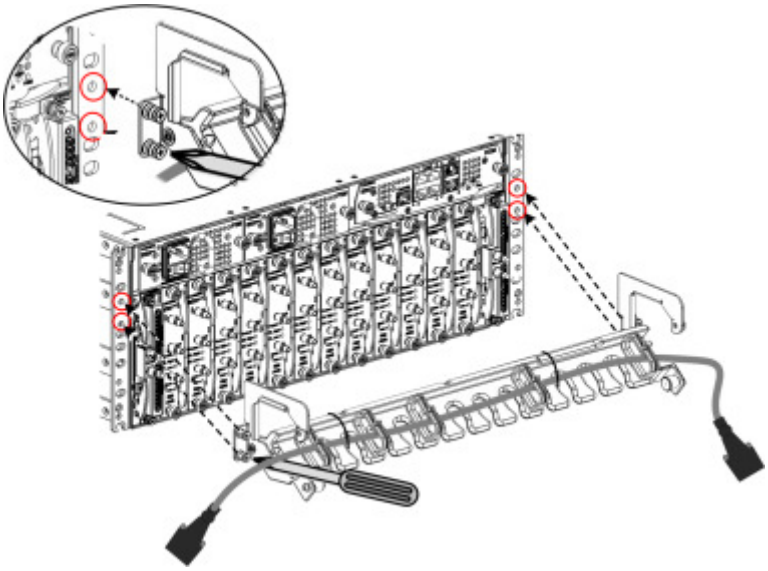
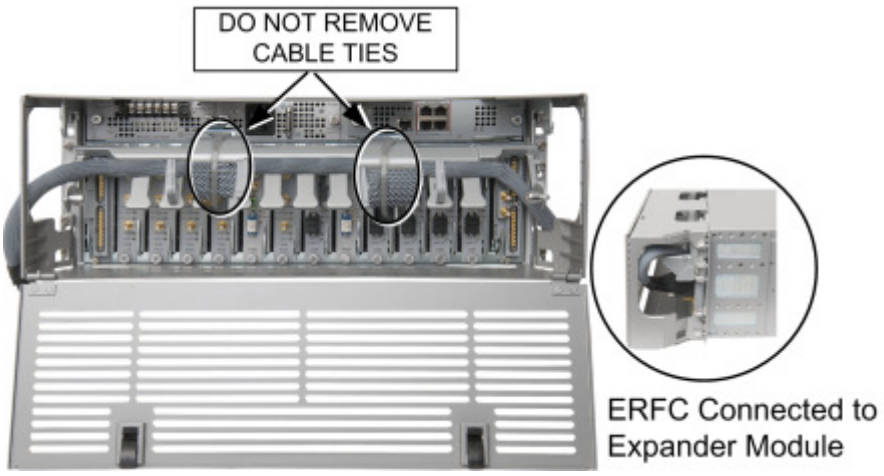


Figure 4-1. Assembling the Cable Management Tray

2. Connect ERFC Cable to RIX (Slot 1) 9-Pin connector and OIX (Slot 14) connector

ATTENTION! Manipulate the ERFC cable as shown on left in Figure 4-2 in order to properly connect the 9-pin connectors to the RIX and OIX modules and so that the cable does not obstruct the module slots. Do not remove the cable ties holding the cable in place!



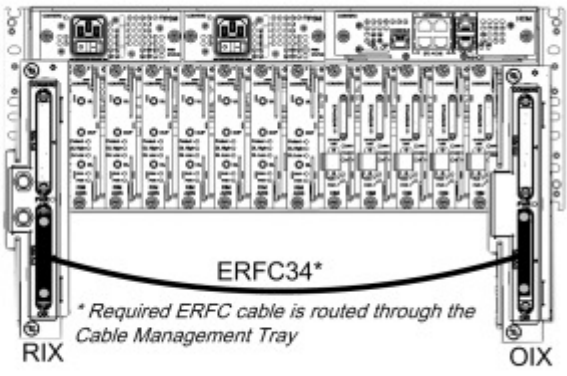


Figure 4-2. Overview of ERFC Cable Connection to RIX and OIX Modules

3. Route connected cables and lock tray.

Note: The tray pin must first be pulled towards the left and then released into the hole.

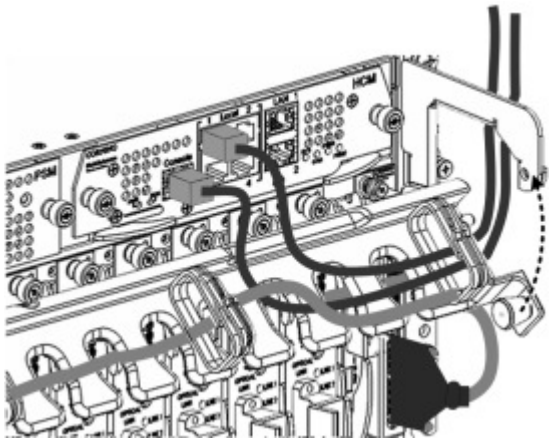


Figure 4-3. Routing Connection Cables

Example of Routed Cables and Locked Tray

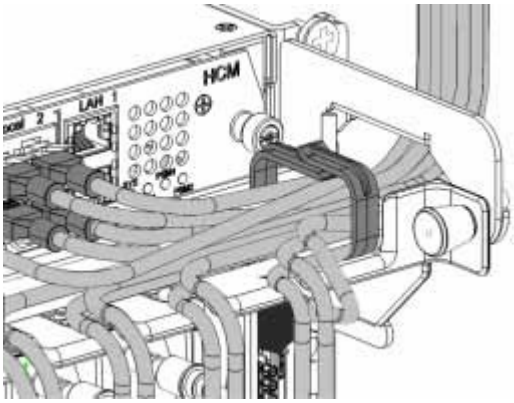


Figure 4-4. Example of Routed Connection Cables and Locked Tray

4.2.4 Assembling the Door Sleeve

Assemble the Door Sleeve as follows:

1. Pull down door cover.

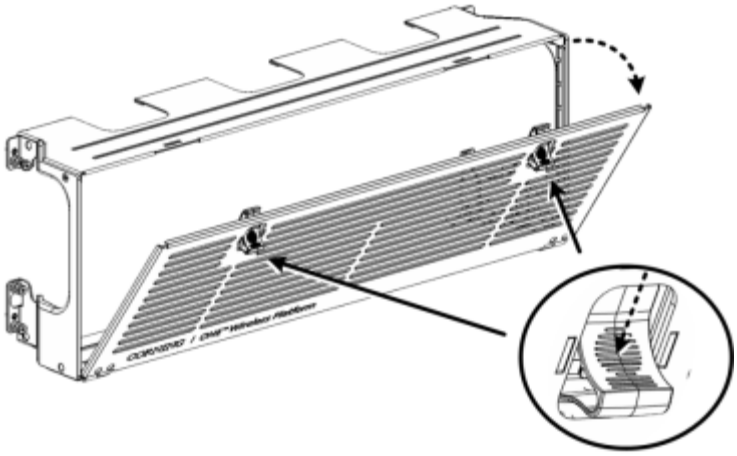


Figure 4-5. Pulling Down Door Cover

2. Attach door to IHU chassis

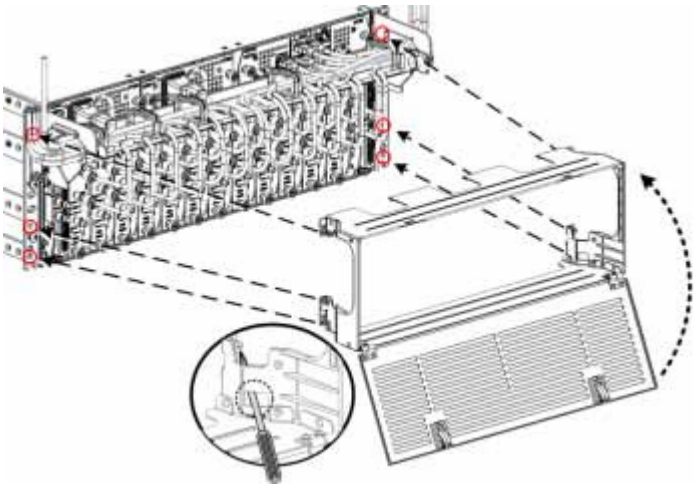


Figure 4-6.Attaching Door to Chassis

Figure 4-7 and Figure 4-8 show open and closed views of the tray with assembled door sleeve.

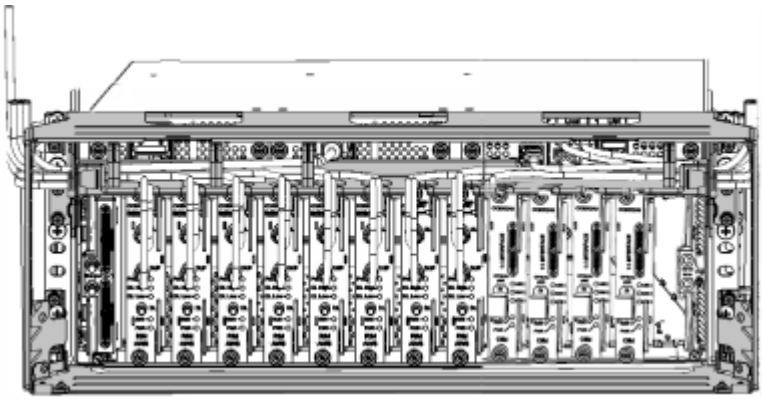


Figure 4-7. Open View of IHU with Assembled Door

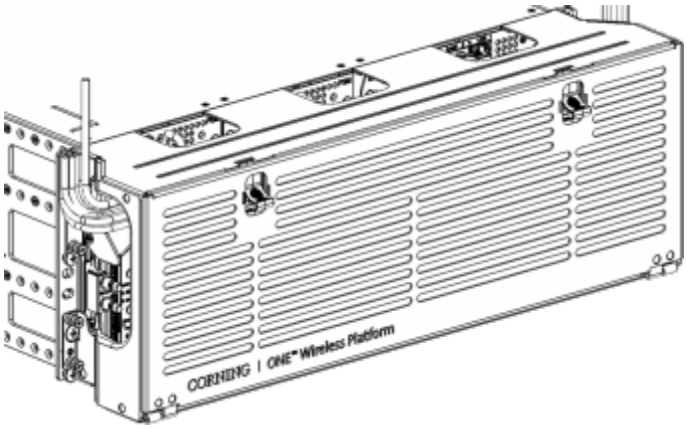


Figure 4-8. Closed View of IHU with Assembled Door

4.2.5 Mounting Chassis in 19-IN Rack

Note the following:

- The mounting procedure is the same for all chassis types (i.e. HEU, OIU and IHU).
- For IHUs – the IHU cable management tray, consisting of tray with routed ERFC cable and door sleeve, should be assembled before the unit is mounted onto the rack. See Section 4.2.2.
- For HEU/OIU – the cable management tray can be assembled before after the chassis installation. See Section **Error! Reference source not found.** for details on how to assemble.
- Each chassis requires 4U rack height availability.
- Rack nuts and screws not provided (since that depends on the rack type).

To mount the chassis

1. Determine the location of the chassis in the rack while considering additional headend units and the lengths of the available ERFC cables to be connected between the HEUs, OIUs and IHUs (provided with each HEU).

   Note: In the IHU chassis, the ERFC cable is pre-routed through its' cable tray

   Figure 4-9 and Figure 4-10 illustrate the optimal rack installations for a maximum 4x4 HEU-OIU configuration in shared and dedicated equipment scenarios.

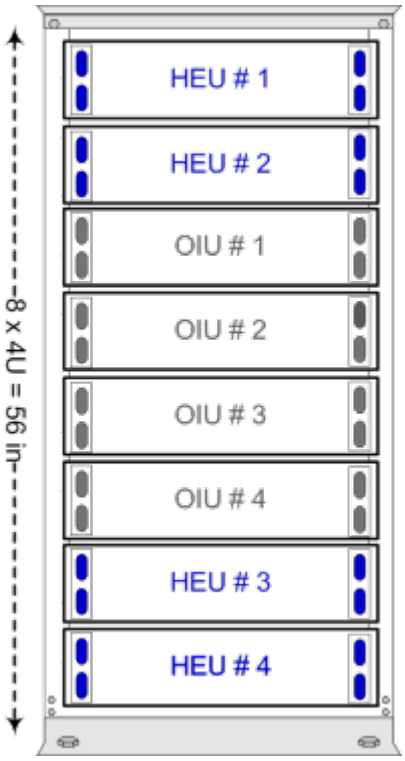


Figure 4-9. HEU/OIU 4x4 Installation Diagram – Dedicated

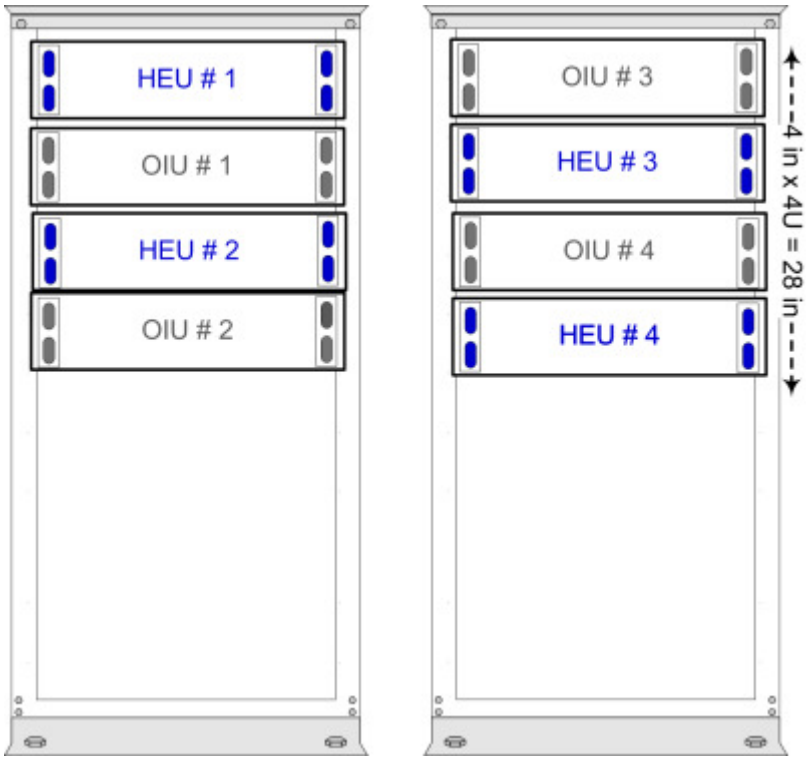


Figure 4-10. HEU/OIU 4x4 Installation Diagram – Shared

2. Referring to Figure 4-11 secure the units' rack ears to the rack frame as follows:
   - Insert two screws half-way into the rack frame.
   - Position the chassis on to the screws using the handles and the bottom half slots of the rack ears.
   - Secure the unit in the rack via all applicable bracket holes using the appropriate rack nuts and screws.

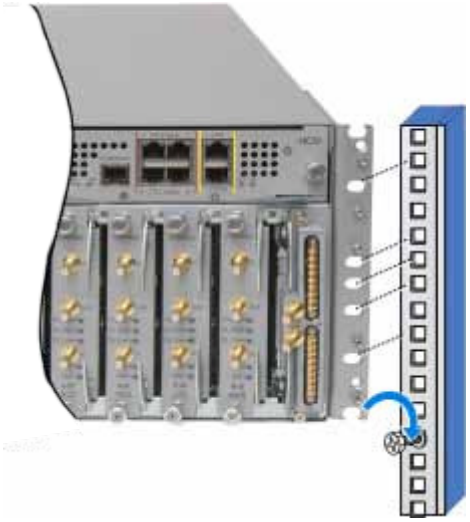


Figure 4-11. Installing Chassis in Rack (shows HEU as example)

4.2.6 Installing Modules

Note: The HEU, OIU and IHU chassis are similar, whereas the managed modules vary depending on chassis type. The slot locations for the control module, PSMs and expanders are the same for all chassis. Chassis slots are 100% mistake proof.

4.2.6.1 Module Locations in Chassis

Module	Quantity	Comment
Control Module	1	• Headend control module (HCM) – one per system; installed in an HEU or IHU. • Auxiliary control module (ACM) – installed in OIUs and in any additional HEU or IHU.
PSM	1 - 2	• For installations with one PSM module – install module in left most slot. • For installations with two PSM modules (redundancy) – remove blank panel from middle slot and insert additional PSM module.
Expander	1 - 2	• For HEU – RF expander modules (RIX) are installed in Slot 1* and Slot 14* • For OIU – optical expander modules (OIX) are installed in Slot 1* and Slot 14* • For IHU – RIX module installed in Slot 1* and OIX module installed in Slot 14* • In installations with only one expander, the unoccupied expander slot must be terminated with an ETM. ***IMPORTANT!*** *The RIX and OIX) are similar in appearance but are NOT INTERCHANGEABLE. Each expander module is indicated as RIX or OIX on the bottom of the module.*
ETM	1	• Relevant if only one RIX module is installed in the chassis. • It is required to install the ETM in the empty RIX slot.
RIM	For HEU: 1 – 12 For IHU: 8	• In HEU - installed in Slots 2 – 12* • In IHU – installed in RIM Slots 2-5 and can be installed in Dual Slots 6-9. • No need to terminate unoccupied RIM slot (leave blank panel). • A RIM slot can be occupied by an FRM module (see Section **Error! Reference source not found.** for details on FCM solution).
OIM	For OIU: 1 – 12 For IHU: 8	• In OIU - installed in OIU Slots 2 – 12*. • In IHU – installed in OIU Slots 10-13 and can be installed in Dual Slots 6-9 • It is not necessary to terminate unoccupied OIM slot (leave blank panel). • An RIM slot can also be occupied by an FMM module (see Section **Error! Reference source not found.** for details on FCM solution).
**Future chassis may be numbered from 0-13, so that expander modules are in Slots "0" and "13" and RIMs/OIMs in Slots 1-12. Version 2.0 and higher of management GUI display chassis numbering as "0-13".*		

Examples of Occupied Chassis

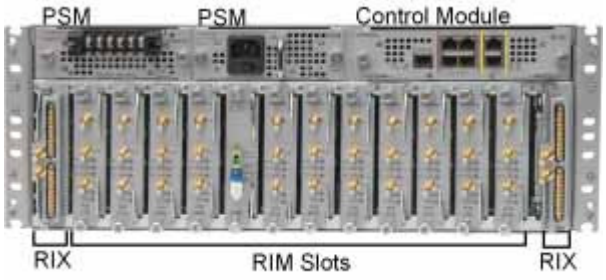


Figure 4-12. Example of Occupied HEU

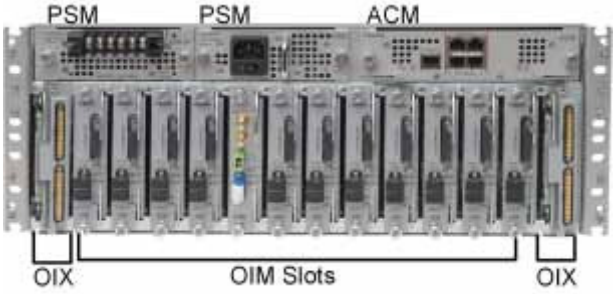


Figure 4-13. Example of Occupied OIU

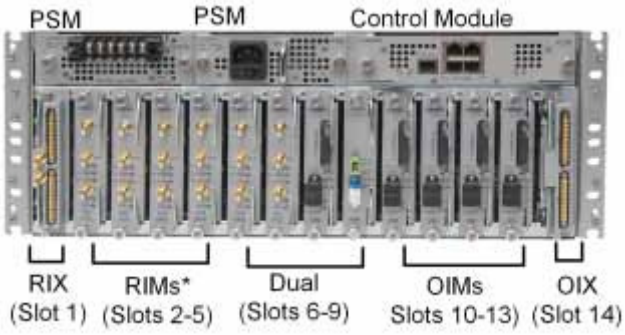


Figure 4-14. Example of Occupied IHU

Table 4-2. Module Locations in Chassis and Installation Comments

4.2.6.2 Installing the Chassis Modules

To install modules

1. Remove blank panels of relevant slots
2. For modules with ejectors (i.e. RIM, OIM, expander modules, FMM/FRM and control module) - ejectors should be completely open when inserting in dedicated slot. Figure 4-15 and Figure 4-16 show examples of module type captive screws and ejectors.
3. Slide modules in the relevant slots (refer to module locations described in Table 4-2 and then push in until it clicks into the backplane.
4. (Where relevant) close ejectors and on all modules, tighten captive screws. Figure 4-15 and Figure 4-16 show examples of module type captive screws and ejectors.

Figure 4-15. Control Module Ejectors and Captive Screws

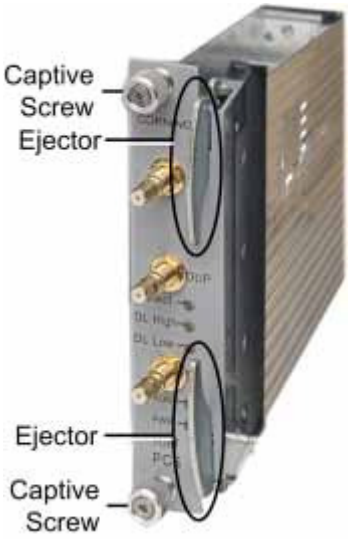


Figure 4-16. RIM Ejectors and Captive Screws

4.3 Grounding Chassis

Grounding connections are the same foe all chassis types.

Connect the ground via the two-hole, standard barrel grounding lug located on the chassis rear panel (see Figure 4-17):

- Use stranded copper wire conductors
- 10-14 AWG
- Holes - 1/4 inch

Figure 4-17. Grounding Lug (Chassis Rear)

4.4 RF Connections

4.4.1 RIM Connections to RF Source

For each service specific RIM - connect (simplex or duplex) RF QMA connectors to the service providers' external RF source. See Figure 4-18.

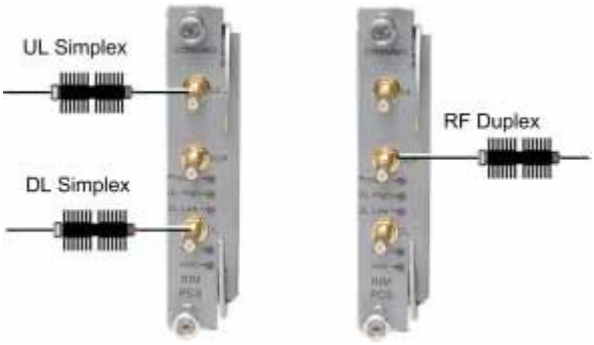


Figure 4-18. RIM RF Source Interfaces

4.4.2 RF Expander Connections

Note the following:

A single IHU supports expansion connections as follows:

- To one additional IHU unit
- To one HEU and one OIU

To connect to an additional IHU

Note: Only the bottom OIX and RIX connectors of each IHU are free; the top OIX and RIX connectors should have already been connected to the ERFC connector from the cable management tray (Section 4.2.2).

Referring to Figure 4-19 and using the appropriate length ERFC cable length, interconnect the OIX and RIX (bottom) connectors of both IHUs:

- From RIX of IHU #1 to OIX of IHU #2 ;
  Main IHU OIX to Auxiliary IHU RIX;

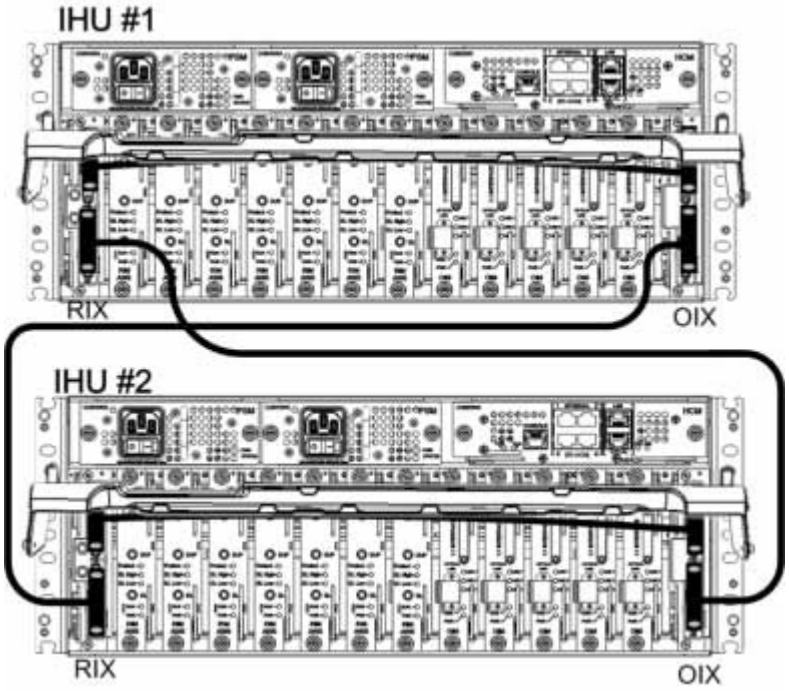


Figure 4-19. RIX to OIX Connections - Two IHUs

4.4.3 Pilot Clock Connections

Pilot clock connections are required in installations with two IHUs. It is required to interconnect the REF IN and REF OUT of the RIX modules installed in both IHUs.

- Referring to Figure 4-20, use the QMA/QMA jumper cables (PCKC47 provided with each RIX) to connect the **REF OUT** and **REF IN** ports of the RIX modules in the IHU chassis.

Note: The REF IN and REF OUT pilot clock ports must be connected in a closed loop.

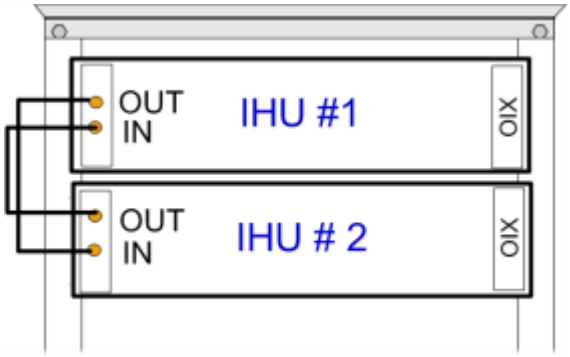


Figure 4-20. Example of Pilot Clock Connections between Two IHU Units

4.5 IHU Fiber Connections

The fiber connections are performed for the OIMs using the provided Corning MTP-LC APC Harness Cable:

- Connect the cable MTP® connector to the OIM MTP connector
- Remove the protective plastic covers and (noting the numbering 1/2/3), connect the three LC APC connection fibers to the FMU Edge module LC APC connections. See Figure 4-21.

Figure 4-21. OIM Fiber Connections

4.6 Management Connections

Note: RJ-45/RJ-45 management cable is provided with each IHU.

To connect the management connections

1. Connect the HCM module LAN port to the corporate LAN using the provided RJ45/RJ45 communication cable. See Figure 4-22.
2. For system setups with two IHUs:
   From HCM INTERNAL port to the ACM INTERNAL port (any of the four ports can be interconnected). Refer to Figure 4-22.

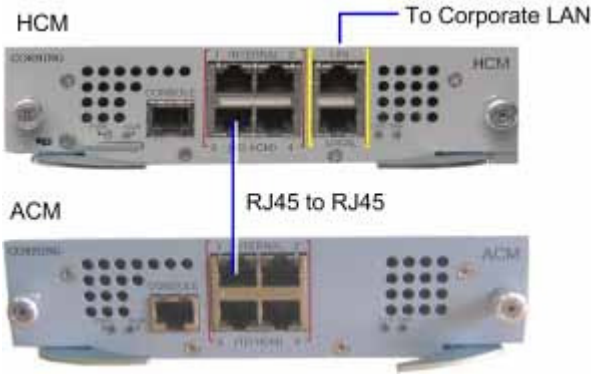


Figure 4-22. HCM LOCAL Port to ACM Port LOCAL Management Connection

4.7 Power Connections and Power Up

Note the following:

- PSM-DC can be installed and activated simultaneously in the same chassis along with a PSM-AC module.
- For installations with two PSMs, both modules must be:
  - Connected to their respective power source (AC or DC)
  - Switched on to begin system operation
  - Turned on at all times after installation

4.7.1 AC Power Connection (PSM-AC)

To connect the AC Power to the PSM-AC

1. Connect power cable (100-240 VAC) supplied with module to the PSM-AC input connector and to the AC outlet and switch on. See Figure 4-23
2. Verify that the Power Status LED on each PSM is GREEN.

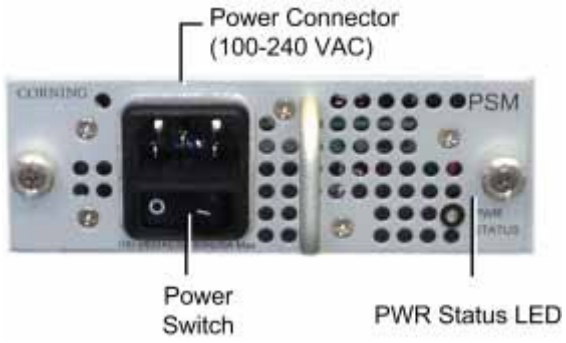


Figure 4-23. PSM-AC LEDs

4.7.2 DC Power Connection (PSM-DC)

IMPORTANT! Verify that the DC power source is off before connecting the wire pairs!

Note the following:

- PSM-DC power source rating: 48 V DC; 9A max.
- The PSM-DC (see Figure 4-24) is provided with six terminal rings (PN: 708A043001), type PMNF2-3R-C or PMV2-3RB-3K (depending on availability)
- Type of terminal ring crimped onto DC wires – PANDUIT ring terminal:
  - Compatible wire size: 1.5 – 2.5mm² wire
  - Range 14 AWG to 16 AWG
  - M3 stud size
- No. of required wire pairs:
  - Remote feed - three pairs; maximum 100 W per pair
  - Local Plant feed - two pairs; maximum 100 W per pair
- Max. current consumption per pair:
  - Remote feed = 1.55 A
  - Plant feed = 4.65 A

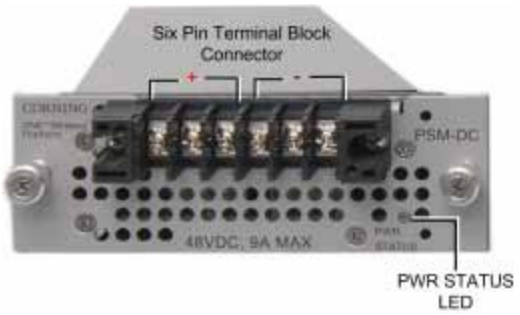


Figure 4-24. DC Power Supply Module

Figure 4-25. Crimping the Terminal Rings onto the DC Wire

To wire and connect the DC power

1. Referring to Figure 4-25, crimp the provided terminal rings onto the DC wire pairs.

   IMPORTANT! Make sure to use an appropriate crimper. Do NOT use a pair of pliers!

2. Referring to Figure 4-26, connect crimped terminal rings to DC connectors.

   IMPORTANT! Verify that the DC power source is off before connecting the wire pairs!

3. For optimal cable management, route all wire pairs to the left side of the rack
4. Turn on DC source and verify that power status LED is green.

Figure 4-26. Connecting PSM-DC Wire Pairs

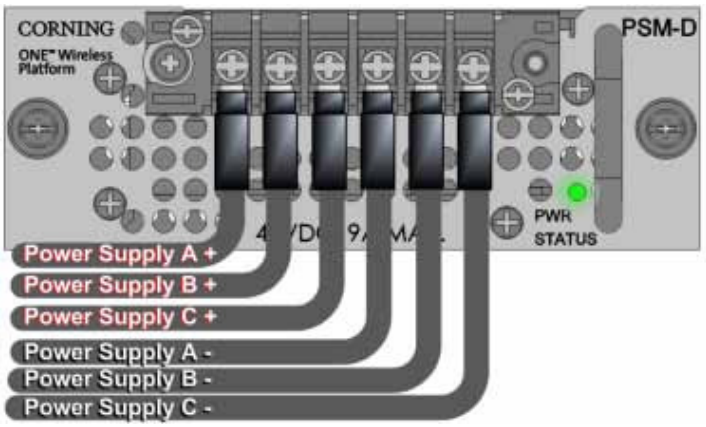


Figure 4-27. Connected DC Wire Pairs and Green Power LED

4.8 Verifying Normal Operation

After powering up, verify that the HCM/ACM LEDs (see Figure 4-28) indicate normal operation. If the RF source is operational, also verify that the RIM LEDs (see Figure 4-30) indicate normal operation.

Note: The LEDs are the same for HCM and ACM modules.

HCM LED	Description
PWR	Steady green - power input detected by module.
RUN	Blinking green – module software up and running
SYS	Steady green - overall status of the managed system is OK
FAN	Steady green – normal operation status for all fans

Table 4-3. HCM/ACM LED Descriptions

Figure 4-28. HCM/ACM LEDs

LED	Description
PWR	Steady green - power input detected by module.
RUN	Blinking green – module software up and running
SYS	Steady green - overall status of the managed system is OK
FAN	Steady green – normal operation status for all fans

Table 4-4. ACM LED Descriptions

Figure 4-29. HCM/ACM LEDs

RIM LED	Description
Protect	N/A
DL High	Off - DL RF input level in threshold range Steady red – DL RF input level is 3 dB above maximum expected power
DL Low	Off - DL RF input level in threshold range Steady Red - DL RF input level is 15 dB below maximum expected power
RUN	Blinking green - RIM module software has initialized and is up and running Off – power off
PWR	Steady green - input power is within required range

Table 4-5. RIM LED Descriptions

Figure 4-30. RIM LEDs

OIM LED	Description
LINK 1/2/3	Steady green - optical link power to/from the connected remote is normal
	Blinking green - optical power from remote is lower than required
RUN	Blinking green - module software has initialized and is up and running
	Off – power off
PWR	Steady green - power input detected in OIM

Table 4-6. OIM LED Descriptions

Figure 4-31. OIM LEDs

5 PSU6 INSTALLATION

This chapter describes the installation procedures for the PSU6.

5.1 PSU6 Installation

The PSU6 enclosure includes the DC connectors and power LEDs, and supports up to six power supply modules (PSMs). The PSU6 supports Corning optical network evolution (ONE™) solutions remotes and can also power the following specified network interface devices (NIDs):

- Tellabs™ - P/N Tellabs® 709GP ONT
- Zhone® - P/N ZNID-GPON-2624P-00
- Antaira® - P/N LMP-0601G-SFP-T

5.1.1 Items Required for PSU6 Installation

The following kits and included items are required for installing the PSU6. If any of the listed items are missing, contact your Corning representative.

PSU6 Kit	Quantity	Item
PSU6	1	
AC power cable US plug, 90 degree, length 1.8 m-2.5 m	1	
Wall mount bracket	2	
DC terminal block; two pole with screw for wire (Manufacturing PN: Dinkle MP/N 2ESDV-02P) *Note: The DC terminal blocks are pre-inserted into the units' DC connectors.*	12	
Power Supply Module Kit (1 to 6 according to order)	**Quantity**	**Item**
Power supply module	1	

Table 5-1. Required Kits for PSU6 Installation

5.1.2 Installing the Power Supply Module

Note the following:

- Modules can be inserted either before or after enclosure is mounted.
- The power supply modules are hot-swappable and can be installed/extracted either before or after power-up.

To install the power modules

1. With the lever up, slide the power supply module into one of the six slots on the PSU6 enclosure rear (Figure 5-1).

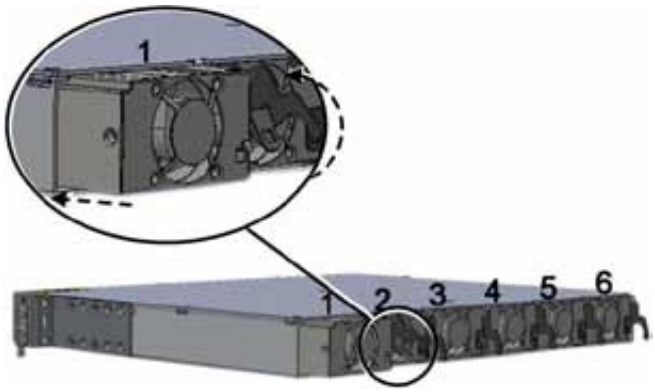


Figure 5-1. Inserting Power Supply Module

2. Push in the module until it is flush with the chassis.
3. Secure by pulling the lever downward until it “clicks" and the module is flush with chassis rear. See Figure 5-2

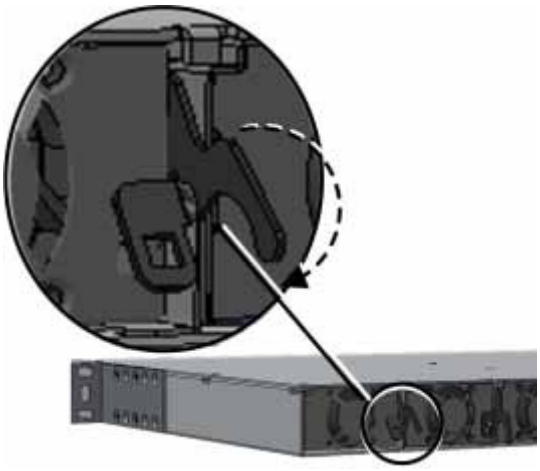


Figure 5-2. Securing PSM in Slot

5.1.3 Mounting PSU6

The PSU6 can be mounted in 19-in communication rack or on a wall – appropriate brackets provided for both mounting options.

5.1.3.1 Rackmount

Mount the PSU6 in the 19-in communication rack and secure the rack brackets to the rack uprights using appropriate rack screws.

5.1.3.2 Wall Mount

To mount the PSU6 on a wall

1. Remove the rack mounting brackets and set the screws aside.

Figure 5-3. PSU6 Rack Bracket(s) for Removal

2. Using the four screws (previously set aside), assemble the wall mount brackets onto the sides of the PSU6 so that the unit can be mounted belly-to-wall. See Figure 5-4.

Figure 5-4. DC Assembling Wall Mount Brackets

Note the following

- The unit should be mounted on the wall with the DC connectors facing sideways. See Figure 5-5.

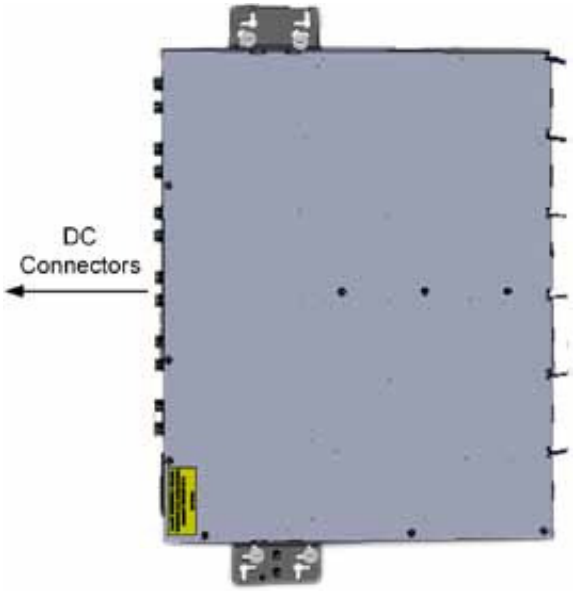


Figure 5-5. Mounting Direction on Wall

- Make sure that there is enough space at the rear to insert/extract the PSMs.

3. Using the wall mount bracket keyholes as a guide, mark the holes to be drilled on the wall.
4. Insert appropriate bolts and mount unit.

5.1.4 Grounding

Note: For wall-mount installations – use grounding lug from previously removed right rack bracket.

The grounding connection is performed via a two-hole, standard barrel grounding lug located on the PSU6 front-left panel.

Required tools and components

The following additional (not supplied) tools and components are required for connecting the system ground:

- Grounding wire - grounding wire should be sized according to local and national installation requirements. The provided grounding lug supports 14 AWG to 10 AWG stranded copper (or 12 AWG to 10 AWG solid) wire conductors.

Note: The length of the grounding wire depends on the proximity of the switch to proper grounding facilities.

- Phillips-head screwdriver
- Crimping tool to crimp the grounding wire to the grounding lug
- Wire-stripping tool to remove the insulation from the grounding wire

To ground PSU6

1. Use a wire-stripping tool to remove approximately 0.4 inch (10.9 mm) of the covering from the end of the grounding wire.
2. Insert the stripped end of the grounding wire into the open end of the grounding lug.

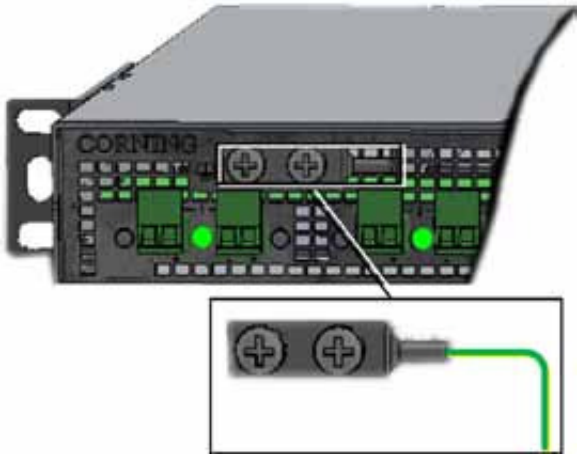


Figure 5-6. PSU6 Grounding Connection

3. Crimp the grounding wire in the barrel of the grounding lug. Verify that the ground wire is securely attached to the ground lug by holding the ground lug and gently pulling on the ground wire.
4. Prepare the other end of the grounding wire and connect it to an appropriate grounding point at the site to ensure adequate earth ground.

5.1.5 DC Wiring Connections

Each installed PSM supports two DC outputs (terminal block pre-inserted) with the following specifications:

- Voltage: 57 v constant
- Maximum current: 1.7 A
- Power: 100 W

To wire the DC

1. Identify the positive and negative terminals on the feed positions as indicated on the PSU6. The wiring sequence is positive to positive and negative to negative as shown in Figure 5-7.
2. Open the terminal block screw above the negative feed position and then insert the exposed black wire (negative feed) into the terminal block.
3. Torque the terminal block captive screw (above the installed wire lead), using a ratcheting torque screwdriver. Recommended torque is 0.51N•m.
4. Repeat for remaining positive feed (exposed red wire).

CAUTION! Secure the wires coming in from the terminal block so that they cannot be disturbed by casual contact. For example, use tie wraps to secure the wires to the rack.

5. Connect the DC wiring to the remote-end units (DC connections on the remote-end side are described in the quick installation sheet provided with each unit).

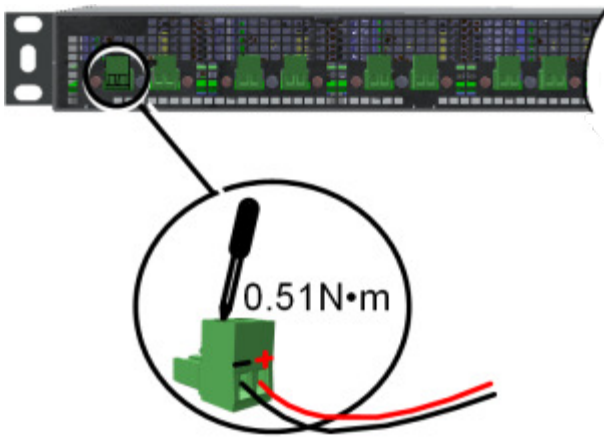


Figure 5-7. DC Wiring Connections

5.1.6 Power-up

1. Connect the PSU6 AC power connector (front panel) to the AC power outlet using the provided power cable.

   The AC Input power specifications are as follows:

   - Voltage range: 85 to 265 VAC; 47 – 63 Hz. via IEC socket; Rated voltage (for safety approval): 100-240 VAC, 50-60 Hz.
   - Current: Maximum input current at 85 VAC is 16.8 amp for six PSMs
   - Power factor: >0.925 at maximum load
   - Efficiency: For 100 VAC input voltage: 86% minimum at 25°C and 85% minimum at 55°C

     For 220 VAC input voltage: 88% minimum at 25°C and 86% minimum at 55°C

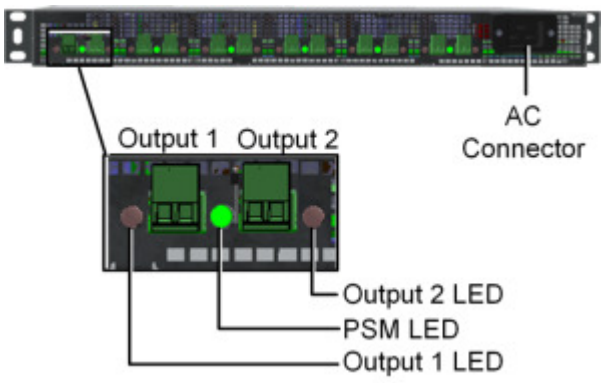


Figure 5-8. AC Input Power Connector and PSU6 LEDs

2. Verify normal operation for each PSM by monitoring the PSM LEDs.

   Each PSM has three LEDs – one power LED (per PSM) and two output LEDs.

LED	Description	Recommended Action
PSM LED	Green – power OK	-
	Red - indicates one (or more) of the following: • Insufficient input power • Problem with output load at one or both PSM output ports • PSM over temperature protection set • Fan failure	-
	Off in one PSM – PSM is off	-
	Off in all PSMs – no power input detected	Check power source
Output LED 1/2	Off – normal operation	-
	Red – short circuit or overload detected.	Disconnect the load and then re-connect. If the problem continues the load may be faulty and may need to be replaced.

Table 5-2. PSU6 LED Descriptions

6 MRU INSTALLATION

6.1 MRU Indoor Installation

6.1.1 Unpacking and Inspection

Unpack and inspect the cartons as follows:

1. Open the shipping cartons and carefully unpack each unit from the protective packing material.
2. Verify that all the items listed in Table 6-1 are included in the MRU package. If any of the listed items are missing, contact your Corning representative.
3. Check for signs of external damage. If there is any damage, call your Corning representative.

Kit	Item Description		Quantity	
MRU	Mid-power remote unit *Note: See 'Appendix B: Ordering Information for MRU part numbers.*		1	
	Hosted Modules (pre-installed)*:	Service specific power amplifier modules (PAMs) – pre-installed according to ordered configuration	1 - 5	
		Fan module (FAM)	1	
		AC or DC (model dependent) power supply module (PSM)	1	
	AC power cable (AC models only)	Cable, power, straight, USA 10A ,UL, L=1.8-2.5m ,black,110V	1	
	Rack ears for 19-in rack (factory assembled onto sides of MRU)		2	

Table 6-1. MRU Kit

⚠ATTENTION!** *In the event that a PAM or the OPTM needs to be removed from the chassis, make sure to first press the release button on the module and then pull out using the handle. Any attempt to pull out the module without first releasing may cause damage. Refer to Section* ***Error! Reference source not found. *for more details.*

Corning will not be liable for damage of products resulting from improper handling during installation or repair.

6.1.2 Mounting the MRU

The MRU supports two types of mounting installations:

- 19 – in rack installation (see Section 6.1.2.1)
- Wall mount installation (see Section 6.1.2.2)
- Outdoor installation – the MRU can be installed in a separately ordered outdoor enclosure; Refer to Section 0 for instructions on how to install the MRU in a Purcell cabinet (Flexsure®12-2420).

6.1.2.1 Rack Installation

Note the following:

- MRU chassis requires 6U rack height availability
- Rack nuts and screws not provided

To install MRU in rack

Determine the location of the MRU in the rack while considering additional units (e.g. power supply).

1. Referring to Figure 6-1, secure the units' rack ears to the rack frame as follows:
   - Insert two screws half-way into the rack frame (one on each side)
   - Position the bottom half slots of the chassis rack ears on to the screws
   - Secure the unit in the rack via the remaining applicable bracket holes using the appropriate rack nuts and screws

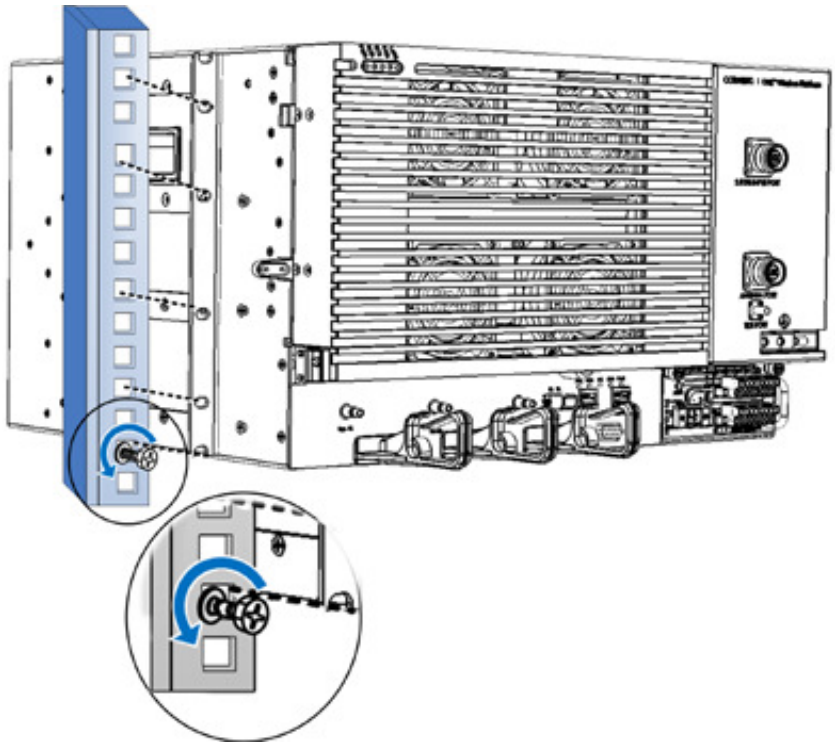


Figure 6-1 Example of MRU Chassis Rack Installation

6.1.2.2 Wall Mount Installation

Note the following:

- MRU wall-mount brackets are not included with the MRU package and are ordered separately (MKT P/N: BR-MRU-W).
- The mounting surface shall be capable of supporting the weight of the equipment. The weight of a fully populated MRU chassis is 70.55 lbs (32 kg).
- The installer is responsible for accommodating the installation to the surface type.

Unpack and inspect the carton as follows:

Open the shipping carton and carefully unpack each unit from the protective packing material.

1. Verify that all the items listed in Table 6-2 are included in the wall-mount bracket package. If any of the listed items are missing, contact your Corning representative.
2. Check for signs of external damage. If there is any damage, call your Corning representative.

Item	Quantity	
Wall Mount Bracket	1	
Screws, flathead,8-32X3/8	11	

Table 6-2. MRU Wall-Mount Bracket Package Items

Mounting MRU on Wall

1. Assemble wall-mount bracket to MRU underside.

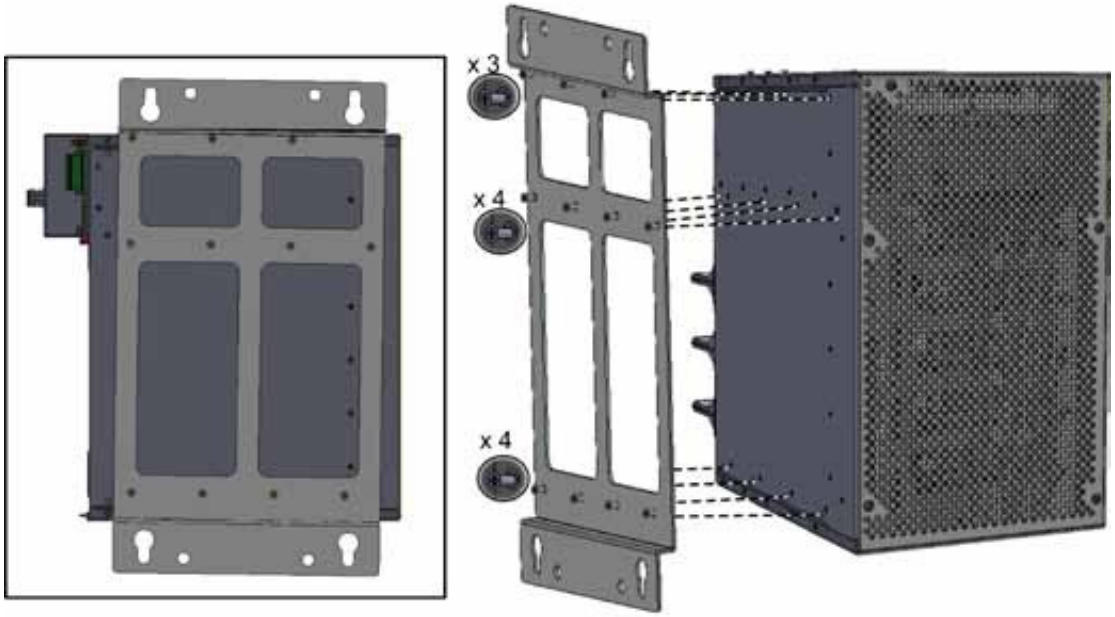


Figure 6-2. Assembling Bracket onto MRU

2. Select location and mark and drill appropriate holes in wall.

IMPORTANT! MRU is installed belly-to-the-wall with door opening rightward. If installed near a right facing wall, make sure that there is at least 16 inches of clearance to open the door to the right and to successfully remove and replace all modules.

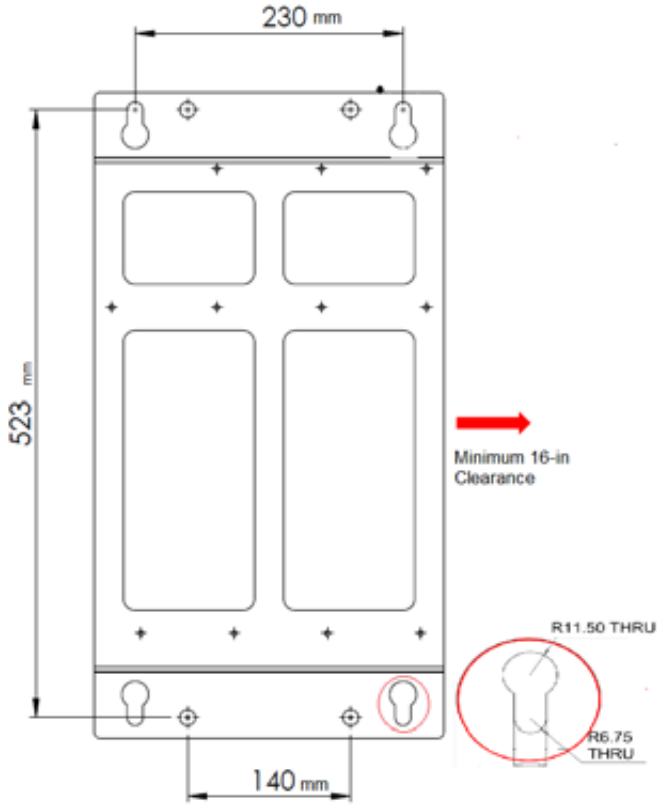


Figure 6-3. Wall-Mount Bracket Dimensions

3. Insert anchors in wall, hang unit and tighten to secure.

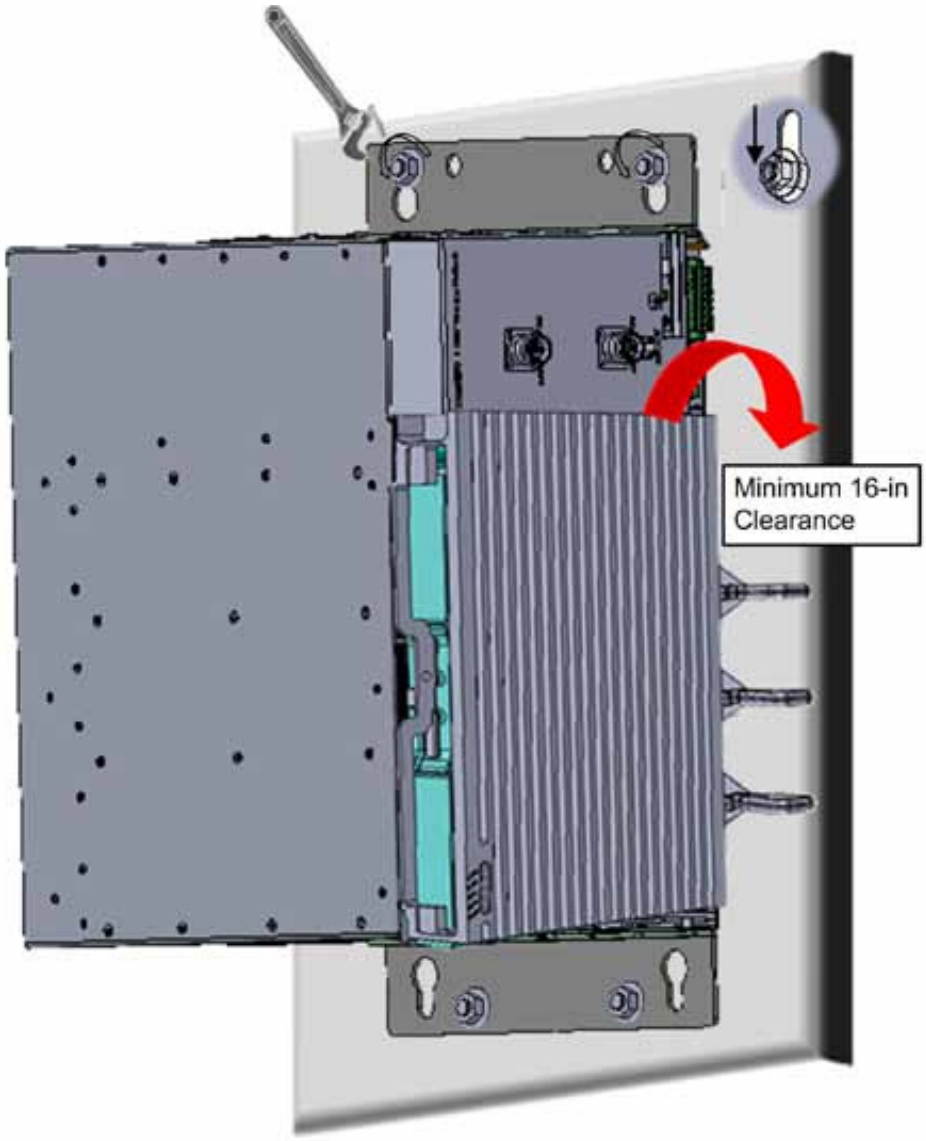


Figure 6-4. Mounting MRU on Wall

6.1.3 Grounding MRU Chassis

The grounding connection is performed via a two-hole, standard barrel grounding lug located on the front of the MRU chassis (see Figure 6-5).

Required tools and components

The following additional (not supplied) tools and components are required for connecting the system ground:

- Grounding wire - The grounding wire should be sized according to local and national installation requirements. The provided grounding lug supports 14 AWG to 10AWG stranded copper (or 12 AWG to 10 AWG solid) wire conductors.
  Note: The length of the grounding wire depends on the proximity of the switch to proper grounding facilities.
- Phillips-head screwdriver
- Crimping tool to crimp the grounding wire to the grounding lug.
- Wire-stripping tool to remove the insulation from the grounding wire.

Connecting system ground

Use a wire-stripping tool to remove approximately 0.4 inch (10.9 mm) of the covering from the end of the grounding wire.

1. Insert the stripped end of the grounding wire into the open end of the grounding lug.
2. Crimp the grounding wire in the barrel of the grounding lug. Verify that the ground wire is securely attached to the ground lug by holding the ground lug and gently pulling on the ground wire.
3. Prepare the other end of the grounding wire and connect it to an appropriate grounding point at the site to ensure adequate earth ground.

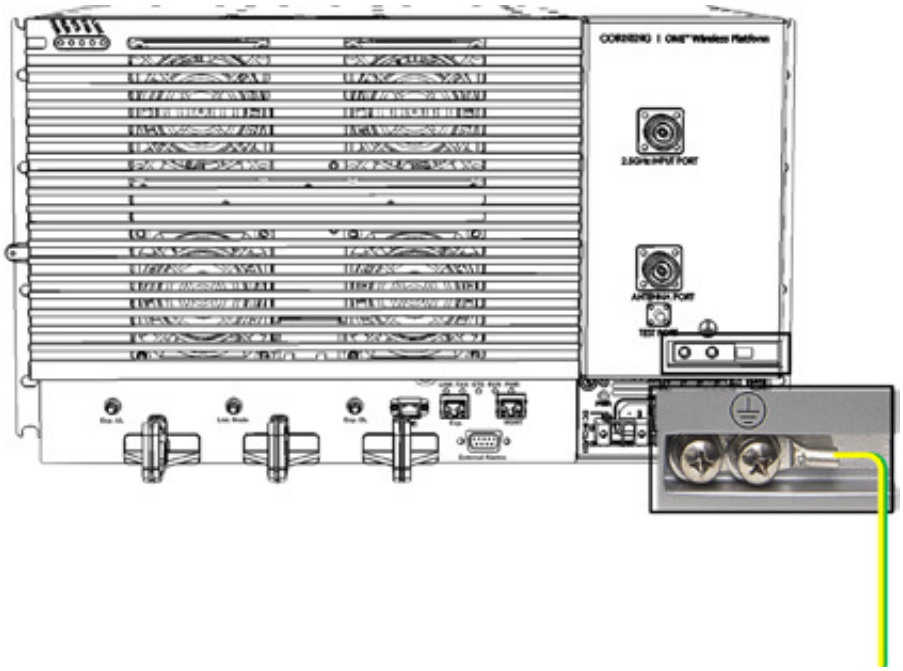


Figure 6-5. MRU Grounding Lug Connection

6.1.4 Fiber Connections

To connect optic fiber

Remove the LC APC connector plugs.

1. Using Corning® SMF-28® fiber (or compatible), connect the MRU LC APC fiber connector fiber patch panel. See Figure 6-6.

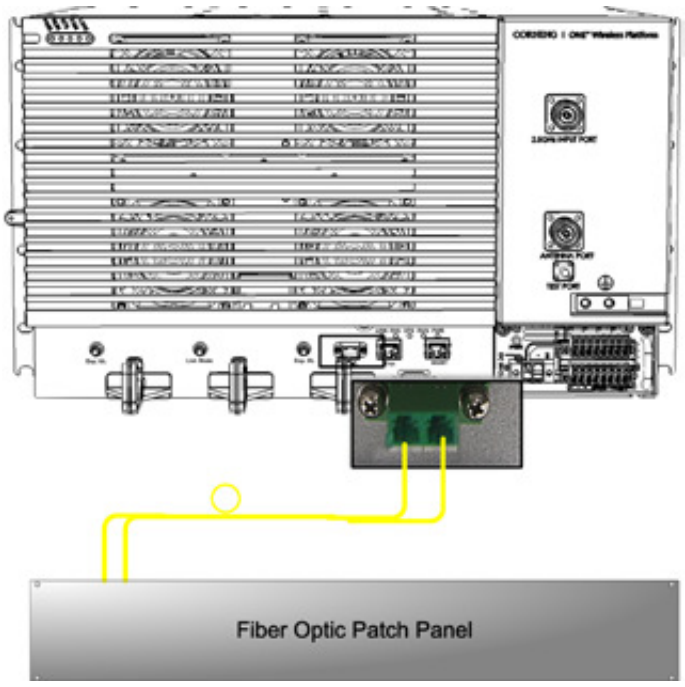


Figure 6-6 Fiber Connections toward Fiber Patch Panel

6.1.5 RF Antenna Connections

Connect the MRU male DIN type 4.3-10 duplexed RF “ANTENNA” port to the broadband antenna(s) using appropriate coax cables. See Figure 6-7.

The MRU includes one 4.3-10 Type RF port used for connecting to a 2.5 GHz external RF source (e.g. picocell).

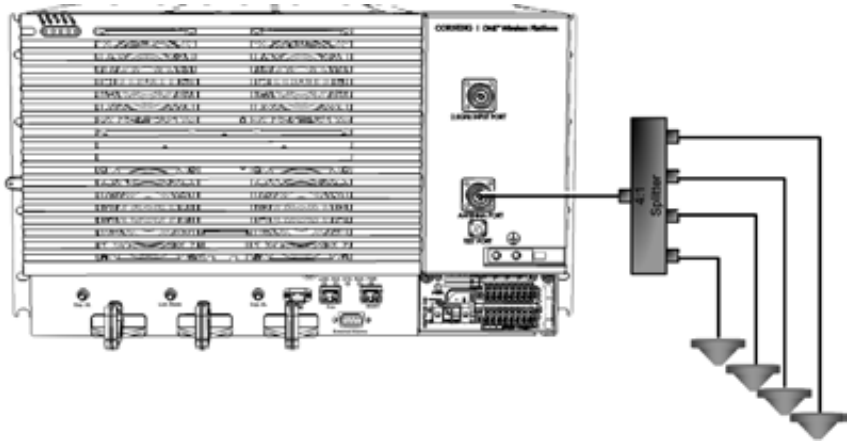


Figure 6-7 Example of MRU Connections to Broadband Antennas (Via Splitter)

6.1.6 Power Connections

The MRU power connections depend on the type of power module (AC or DC). The power supply module (PSM) is located on the bottom right of the chassis front.

- Refer to Section 6.1.6.1 for AC model power connections
- Refer to Section 4.6.2 for DC model power connections

6.1.6.1 AC Models

Using the provided AC power cable only, simply connect the MRU AC power connector to the AC power source.

Note the following:

- Power input: 100-240 VAC / 50-60 Hz
- Power consumption: 360 W (max.)
- Maximum AC current consumption: 5A

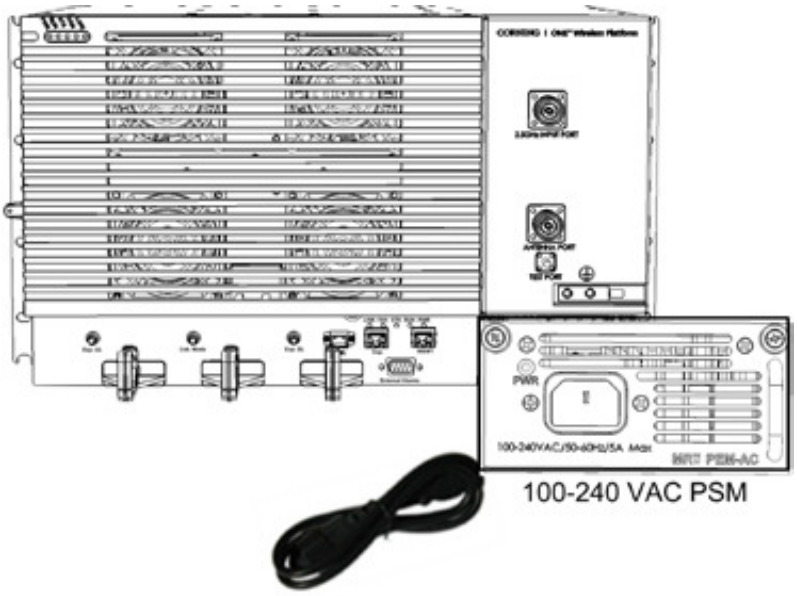


Figure 6-8. MRU AC Model Power Connector

6.1.6.2 DC Models

DC models include two types of terminal block connectors:

- CLASS 2 (default) – two eight pin terminal block connectors for remote feed (see Section 0).
- CLASS 1 – one two pin terminal block for local plant feed. To use CLASS1 user must change default connector mode from CLASS 2 to CLASS 1 (see Section 0).

CLASS2 Connector (Remote Feed)

Note the following:

- The CLASS2 DC connector supports the following wire pairs (refer to Figure 6-9):
  - One pair for each installed PAM (up to five pairs)
  - One pair for OPTM + FAM
  - One reserved pair (RSV) for future use
- DC CLASS2 connector specs:
  - Supported wire AWG:
    - Conductor cross-section, solid (AWG/mm²): 30~12 / 0.2~2.5
    - Conductor cross-section, flexible (AWG/ mm²): 30~12 / 0.2~2.5
  - Wire strip length: 9~10 mm
- DC Power input:
  - DC class 1: 48 VDC (40-60 VDC) 9 A max
  - DC class 2: 24 VDC / 48 VDC (20-60 VDC)1.75 A maximum per pair
  - Power amplifier consumption per pair: 50 W
- Maximum power consumption: 330 W
- Maximum current consumption: 1.75 A per pair

To perform CLASS2 DC connector wiring – for each DC pair:

1. Identify the positive and negative terminals for the DC pair to be wired on the CLASS2 connector feed positions. The wiring sequence is positive to positive and negative to negative as shown in Figure 6-9.
2. Use a wire-stripping tool to remove the covering from the end of the DC wire pairs.
3. Open the terminal block screw above the negative feed position and then insert the exposed black wire (negative feed) into the terminal block.

   Note: Ensure that no exposed portion of the DC wires extends from the terminal block plug.
4. Torque the terminal block captive screw (above the installed wire lead), using a ratcheting torque screwdriver. Recommended torque is 0.49N•m.
5. Repeat the same process as in Step 3 and Step 4 for remaining positive feed (exposed red wire).

CAUTION! *Secure the wires coming in from the terminal block so that they cannot be disturbed by casual contact. For example, use tie wraps to secure the wires to the rack.*

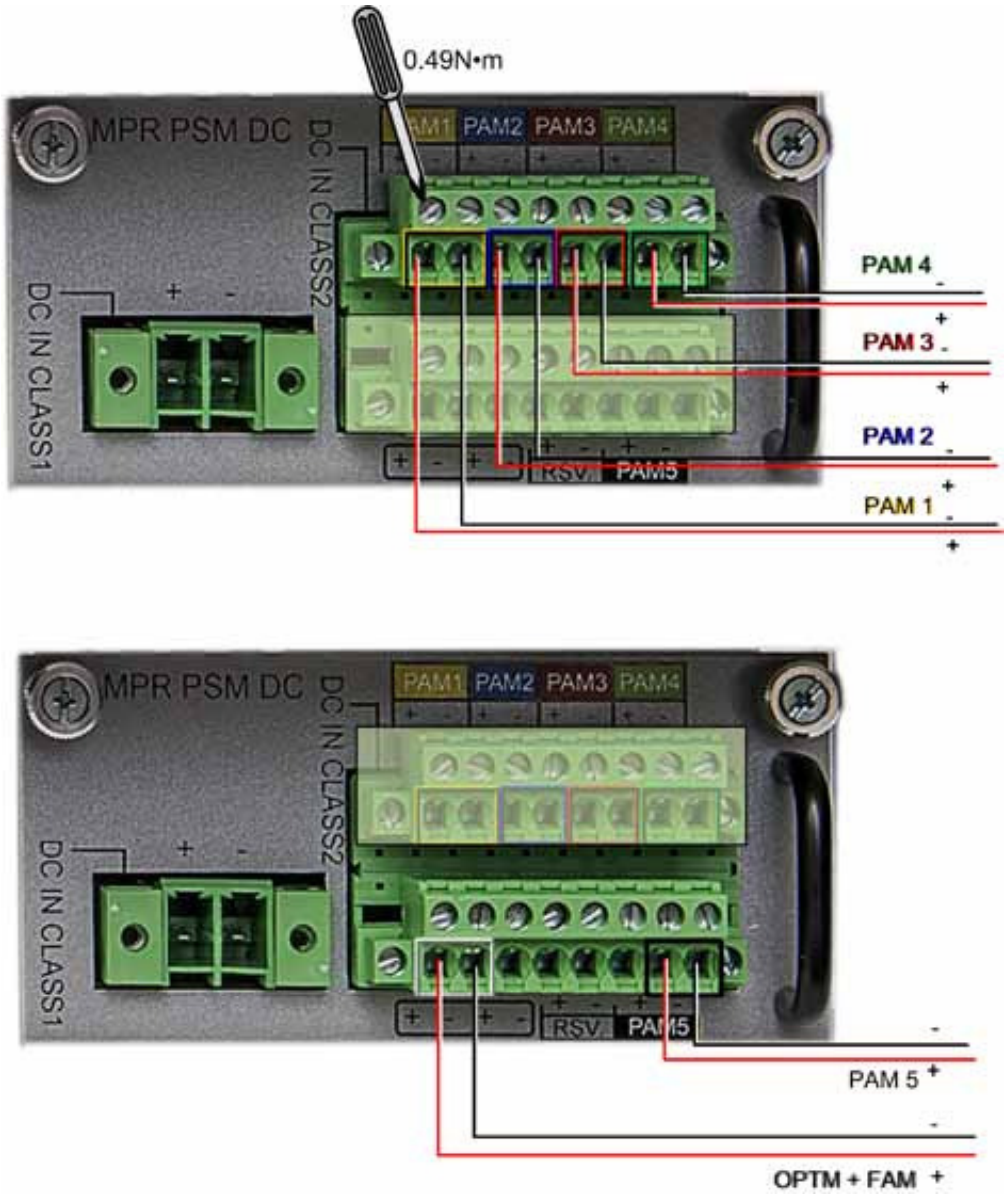


Figure 6-9. Example of CLASS2 DC Wiring Connections

CLASS1 Connector (Local Plant Feed)

Note: In order to power the MRU via the CLASS1 connector (2 pole terminal plug), the DC bridge must be moved from the default CLASS2 mode position to CLASS1.

DC CLASS1 power specs:

- Power input: 48 VDC (40-60VDC)
- Max. current consumption: 9 A

To perform CLASS1 DC connector wiring

1. Loosen PSM captive screws and pull out module from chassis. See Figure 6-10.

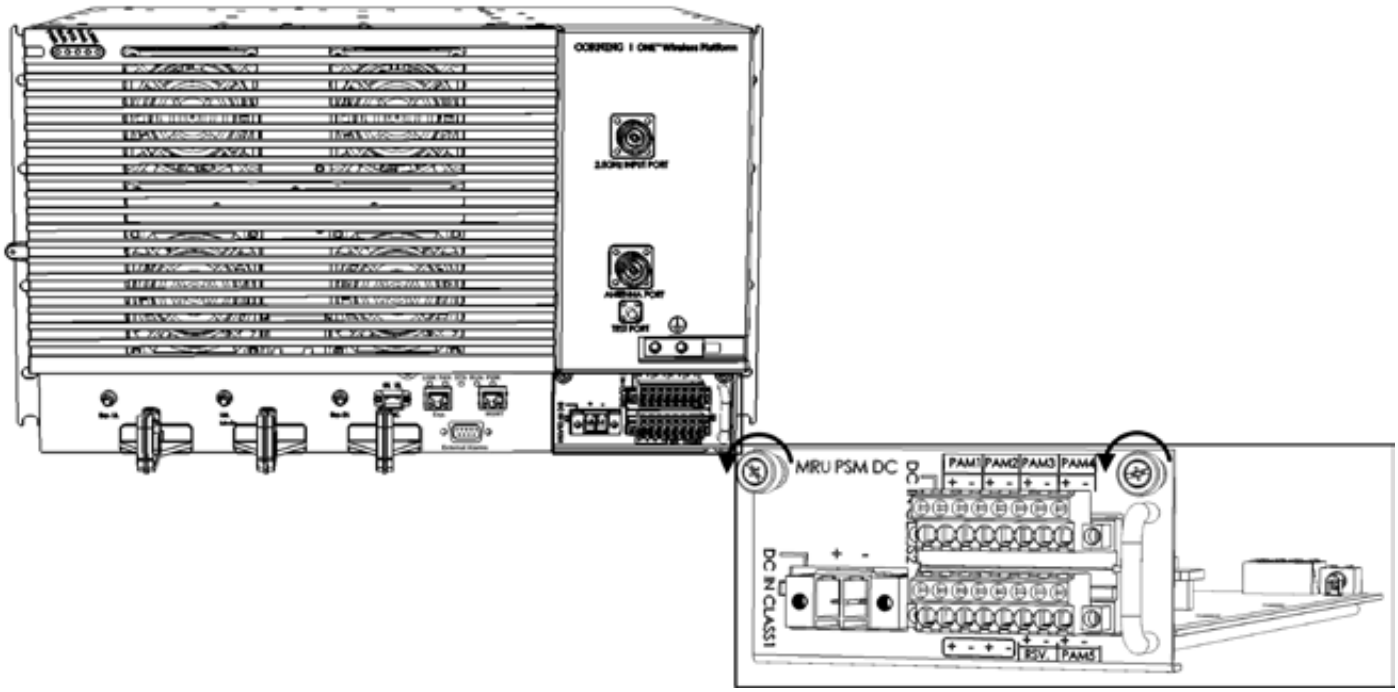


Figure 6-10. Extracting PSM from Chassis

2. Move DC bridge from CLASS2 position to CLASS1 to set DC input source type to 'CLASS1' connector. Refer to Figure 6-11.

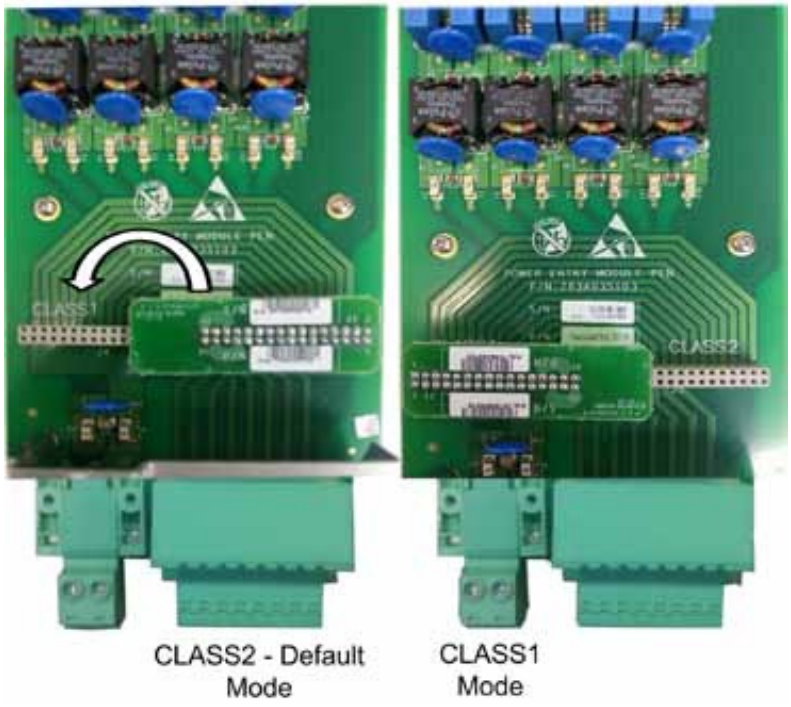


Figure 6-11. Setting CLASS1 Mode

3. Push PSM back in slot and close captive screws.
4. Identify the positive and negative terminals for the DC pair to be wired on the CLASS1 connector feed positions. The wiring sequence is positive to positive and negative to negative.
5. Use a wire-stripping tool to remove the covering from the end of the DC wire pairs.
6. Open the terminal block screw above the negative feed position and then insert the exposed black wire (negative feed) into the terminal block.

   Note: Ensure that no exposed portion of the DC wires extends from the terminal block plug.

7. Torque the terminal block captive screw (above the installed wire lead), using a ratcheting torque screwdriver. Recommended torque is 0.49N•m.
8. Repeat the same process as in Step 6 and Step 7 for remaining positive feed (exposed red wire).

CAUTION! *Secure the wires coming in from the terminal block so that they cannot be disturbed by casual contact. For example, use tie wraps to secure the wires to the rack.*

6.1.7 Verifying Normal Operation

Verify that all the fans are operational and that all the LEDs on the top-left of the chassis door and on each PAM indicate normal system operation (see Section 2.4 for LED description).

6.2 MRU Installation with Outdoor Enclosure

This section provides instructions on how to install the MRU in a Purcell Systems cabinet (Flexsure® 12-2420) and perform external alarm connections between the unit and the enclosure.

Note the following:

- The MRU, outdoor enclosure and required dry contact alarms cable are each ordered separately
- Additional relevant documentation - Purcell Flexsure 12-2420 installation manual provided with the cabinet
- Only trained and qualified personnel should be allowed to install, replace, or service this equipment
- The MRU connections are performed after the chassis is installed in cabinet

6.2.1 Items Required for Outdoor Installation

Refer to Table 6-3 for the items required for installing the MRU in the outdoor enclosure.

Kit	Item	Quantity
FLX12-2420 Enclosure	Purcell Systems Flexsure® 12RU Outdoor GR-487 Enclosure for single MRU installations SISO cabinets: • PURCELL P/N: 2000003905 FLX12-2420, 39W/C HEX, Right Hinge Door • PURCELLP/N: 2000003974 FLX12-2420, 39W/C HEX, Left Hinge Door	1
FLX12-2420 Pole Mounting Kit (optional)	P/N 2000003986 platform pole mount kit for FLX12-2420 SISO and FLX16-2520 MIMO	1
FLX12-2420 Wall Mounting Kit (optional)	P/N 2000003985 wall mount kit for FLX12-2420 SISO	1
MRU	Mid-Power remote unit	1
External Alarms Cable (AK-MRU-DCA-CBL)	DB9 male open wire cable for external alarm connections	1

Table 6-3. Items Required for Outdoor Installation

Additional required items (not provided):

- Standard electrician tools (including ratchet wrench with extension bar and 8 mm socket) for tightening self-drilling screws securing MRU chassis to cabinet rails)
- Assorted cable ties
- 90° right angle 4.3-10 type male connector coax cables – one for antenna connection and one for external 2.5 GHz RF source connection (if relevant)

- Recommended - flexible cable conduits for routing connections cables through cabinet knockouts; refer to Figure 6-13 for relevant knockouts; Following are recommended Heyco part numbers for flexible conduits:

Manufacturer PN	Description
8406	HFC 1 BLACKw/8467 Nut, conduit fitting 1 in thread
8453	HF2 1 Tubing 100’ Coil Black
8456	HFC 2 Tubing 50’ Coil Black
8642	HFC 2 Black; conduit fitting 2 in thread

Table 6-4. Recommended Conduits

- Sealing material for knockouts – if not using conduits

6.2.2 Pre-Installation Procedures

1. Remove each rack ear and reassemble according to position shown in Figure 6-12.

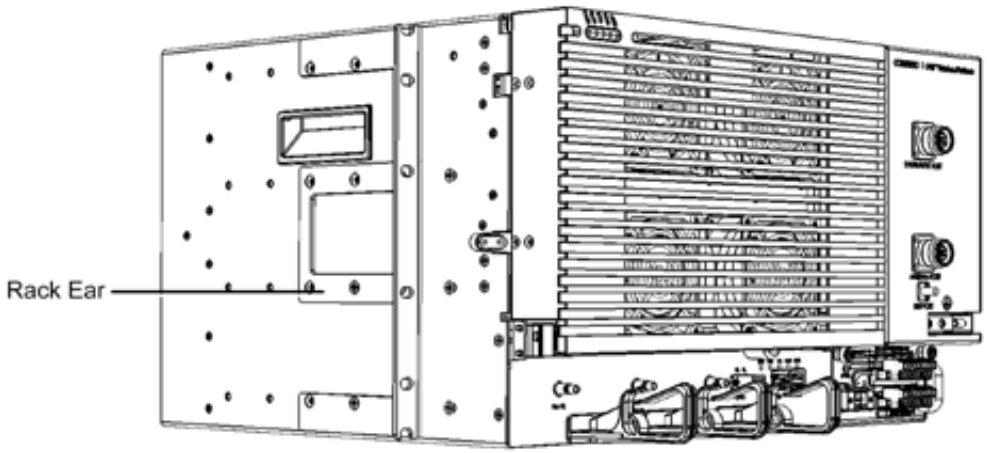


Figure 6-12. Required Position of MRU Rack Ears

2. Referring to Figure 6-13 for relevant knockouts, use appropriate knockout tools to punch out knockouts for routing connection cables.

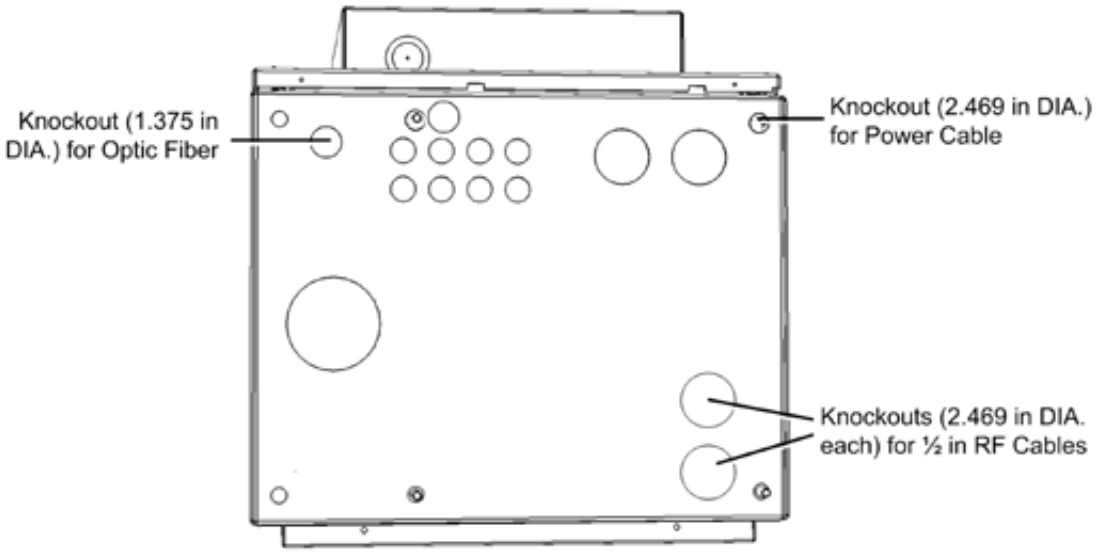


Figure 6-13. Required Knockouts Positions

6.2.3 MRU Installation in Cabinet

1. Carefully lay cabinet on backside (so door faces upwards) and open door.

ATTENTION! Make sure that the door hatch locks into the door rail in order to avoid closing of door while installing the chassis. See Figure 6-14.

Note: Push hatch inwards towards the door to release and close the cabinet.

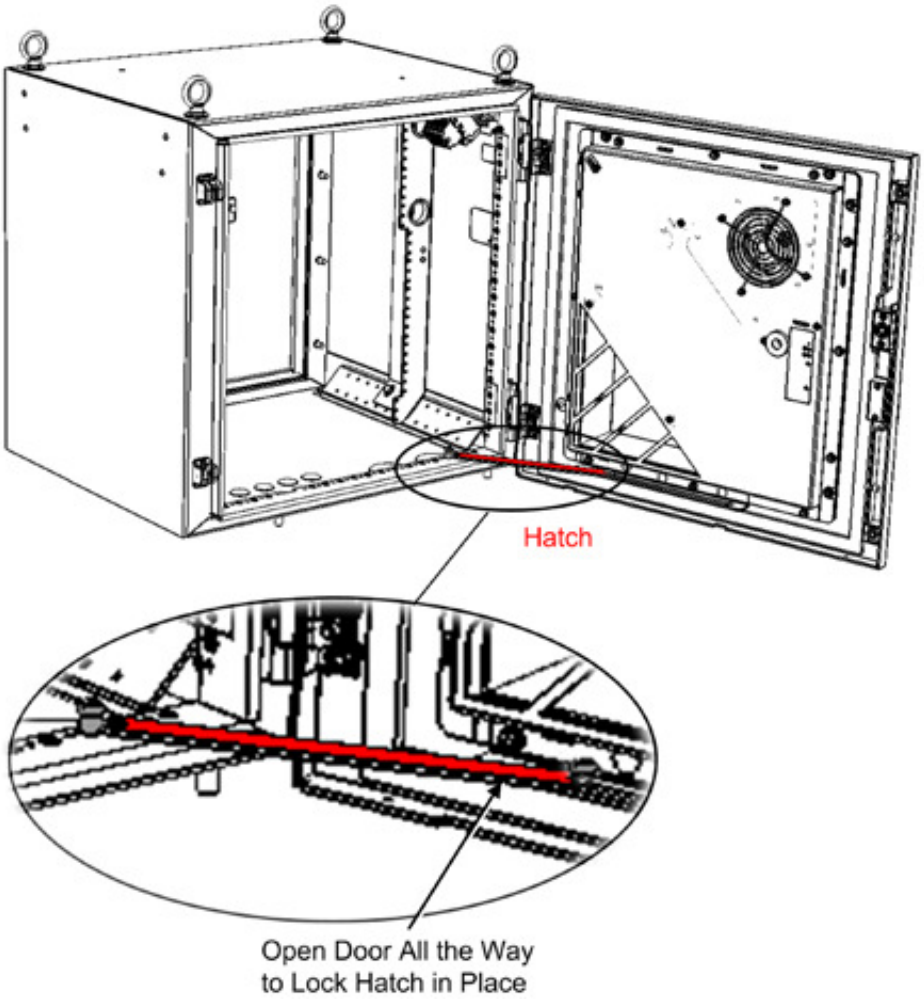


Figure 6-14. Opening Cabinet Door and Locking in Place

2. Insert one 8 mm self-tapping screw (provided with the cabinet) half way into the bottom hole of each rail. Refer to Figure 6-15.

Note: An extension bar may be required to access the screws due to narrow space between chassis and cabinet rails.

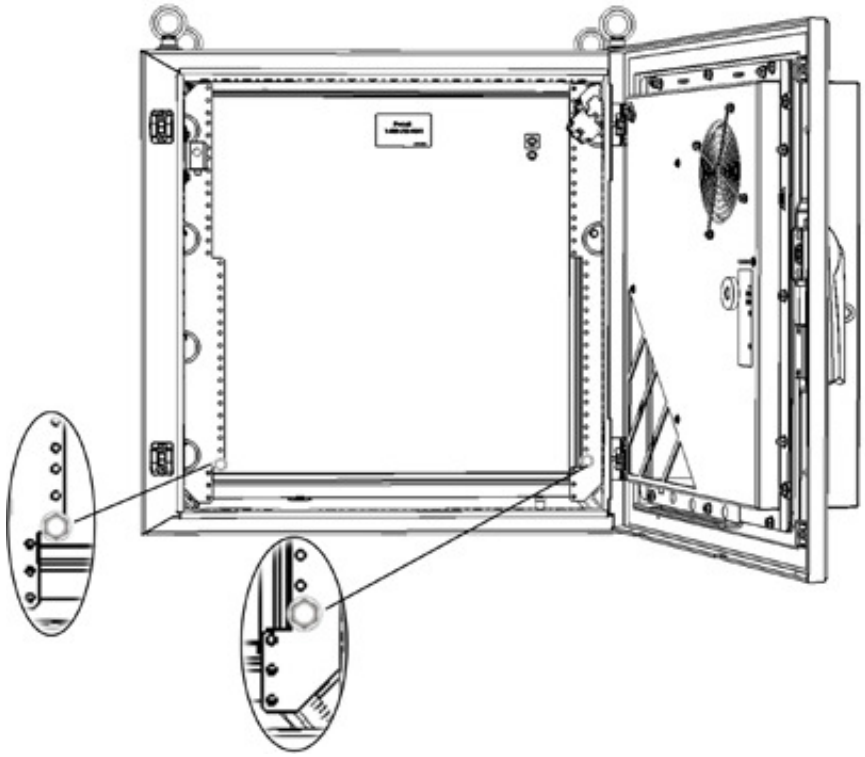


Figure 6-15. Self-Tapping Screw Inserted in each Rail

3. Position the bottom half slots of the MRU rack ears onto the protruding screws and tighten the screws using a ratchet wrench. Refer to Figure 6-16.

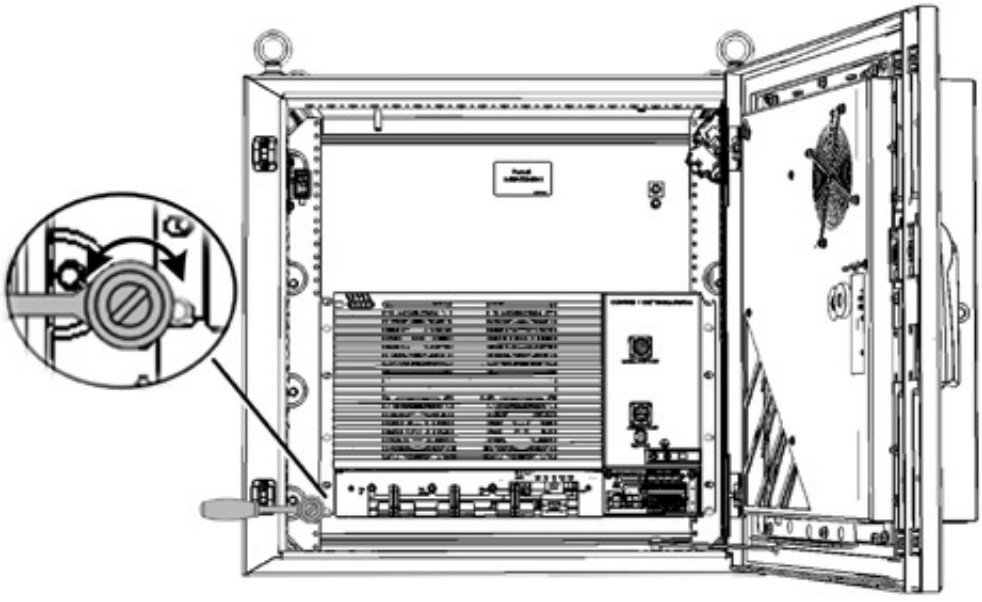


Figure 6-16. Securing MRU to Cabinet Rails

4. Insert at least two additional screws into each of the cabinet rails to safely secure MRU and tighten.
5. (Optional) Insert the appropriate conduits (refer to Table 6-4 in Section 6.2.1 for recommended part numbers) in each of the punched out knockouts.

6.2.4 MRU Connections

1. Ground the cabinet and MRU:

- For cabinet grounding instructions - refer to the manufacturers installation guide for instructions on cabinet grounding
- Using one of the grounding cables provided with the cabinet, ground the MRU chassis via the two-hole, standard barrel grounding lug located on the front panel to one of the cabinet grounding bolts. Refer to Figure 6-17.

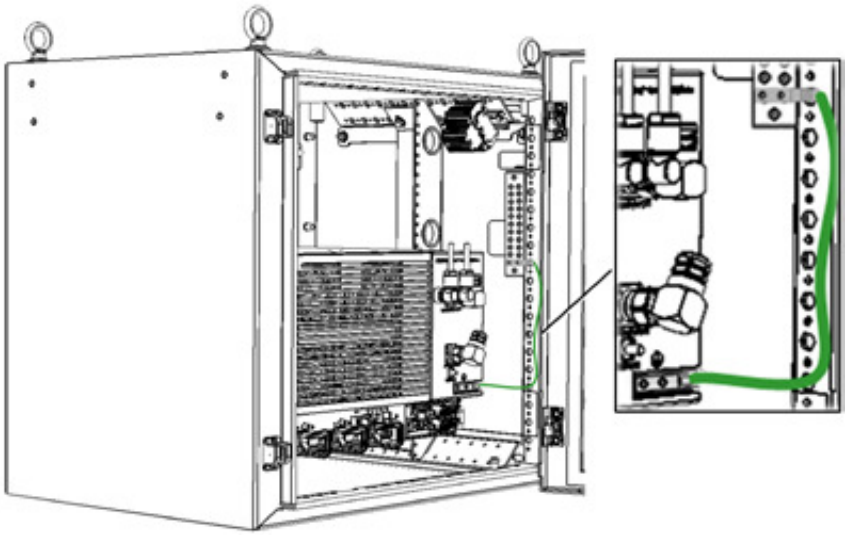


Figure 6-17. Grounding MRU to Cabinet

2. Connect RF antenna coax - (for both 4.3-10 Type “ANTENNA PORT” and “2.5GHz INPUT PORT”) route coax cable with 90° right angle connector through its’ designated knockout (see Figure 6-13) behind and above the MRU chassis and connect to the corresponding RF port. Refer to Figure 6-18.
3. Terminate unused RF ports with 50 ohm loads.
4. Route optical fiber from ICU and power cable through designated knockouts (see Figure 6-13) and connect according to instructions in Section 4.4. Refer to Figure 6-18.

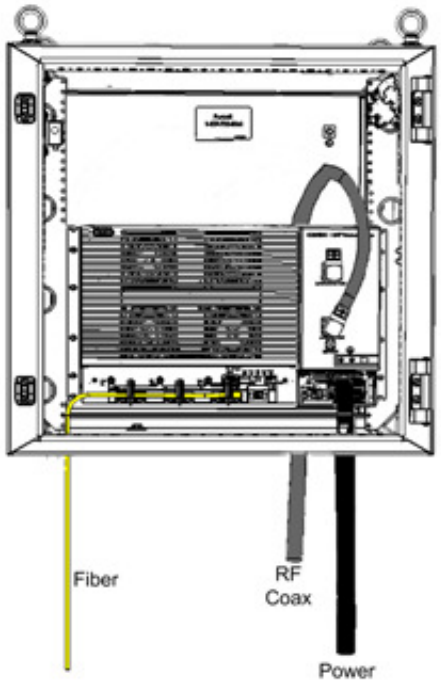


Figure 6-18. Example of Routed Connection Cables

Note: For DC power connections – route DC power cable with open wires (without connector) and then wire according to instructions in Section 4.6.2.

6.2.5 External Alarm Connections

Note: Also refer to relevant section of the Purcell Systems cabinet installation manual (i.e. "Connecting Optional Custom Alarms").

A DB-9 female pin "External Alarms" connector (located on optical module below RJ45 ports) provides support for up to three external dry contact alarm connections from external sources (incoming outputs). See Figure 6-19. The connector provides indications for door opening, heat exchanger (HEX) and one additional input for future use.

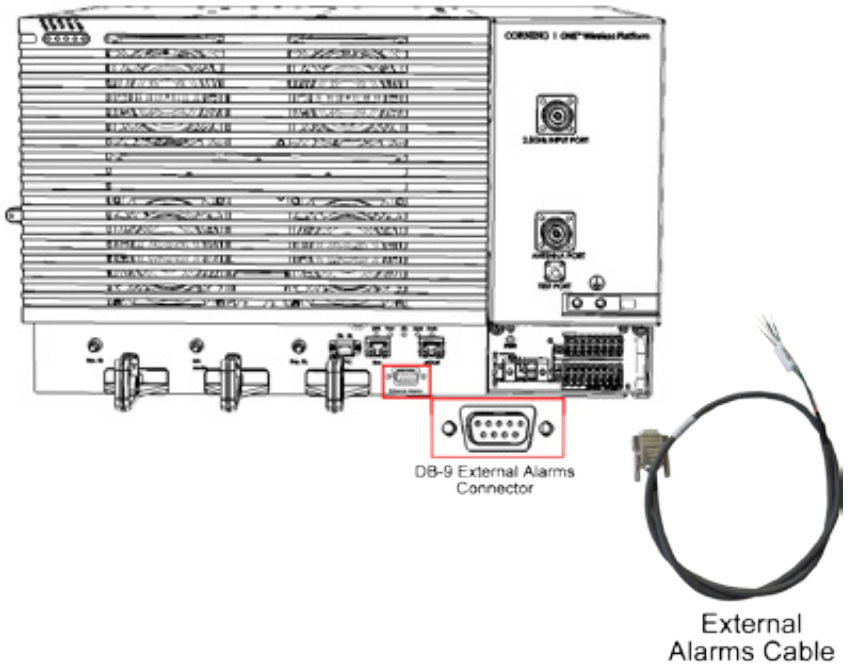


Figure 6-19. MRU External Alarms Connector and Cable

To perform external alarm connections

1. Connect the external alarms cable (ordered separately) to the chassis's DB9 "External Alarms" connector. Refer to Table 6-5 and to Figure 6-20 for pin out information.

Pin	Description
1	Common
2	Not connected
3	Not connected
4	Not connected
5	Not connected
6	Door alarm
7	HEX (heat exchange) alarm
8	Future alarm
9	Exist indication (indicates existing connection of alarm cable)

Table 6-5. MRU External Alarm Connector Pin Out Description

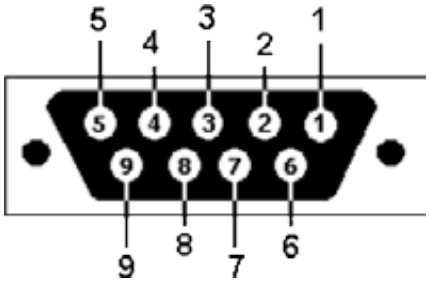


Figure 6-20. MRU External Alarms Connector Pin Out

2. Route the cable alarm wires to the alarm block, located on the upper right corner of the cabinet. See Figure 6-21.

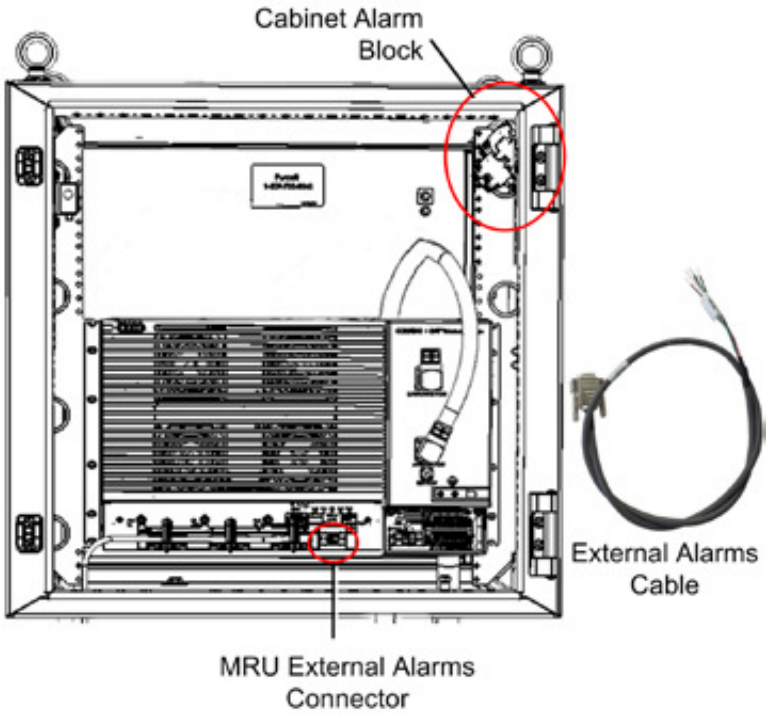


Figure 6-21. Location of External Alarms Connector and Cabinet Alarms Block

3. Connect the external alarm connections to the cabinet.

Table 6-6 provides the dry contact alarms cable wiring description.

Color	Description
Red	+48 V_COMMON
Green	N48 V_EXIST INDICATION
Brown	N48 V_DOOR ALARM
Black	N48 V_HEX ALARM
White	N48 V_FUTURE ALARM

Table 6-6. Dry Contact Alarm Cable Wiring Info

Refer to Table 6-7 for wiring description of MRU External Alarms connector and to Figure 6-22 for examples of the upper and lower cabinet block wiring connections.

External Alarms Connector Pin No.	
1	Common
6	Door Alarm
2	NC
7	HEX Alarm
3	NC
8	Future Alarm
4	NC
9	Exist Indication

5	NC (not connected)

Table 6-7. External Alarms to Cabinet Block Wiring

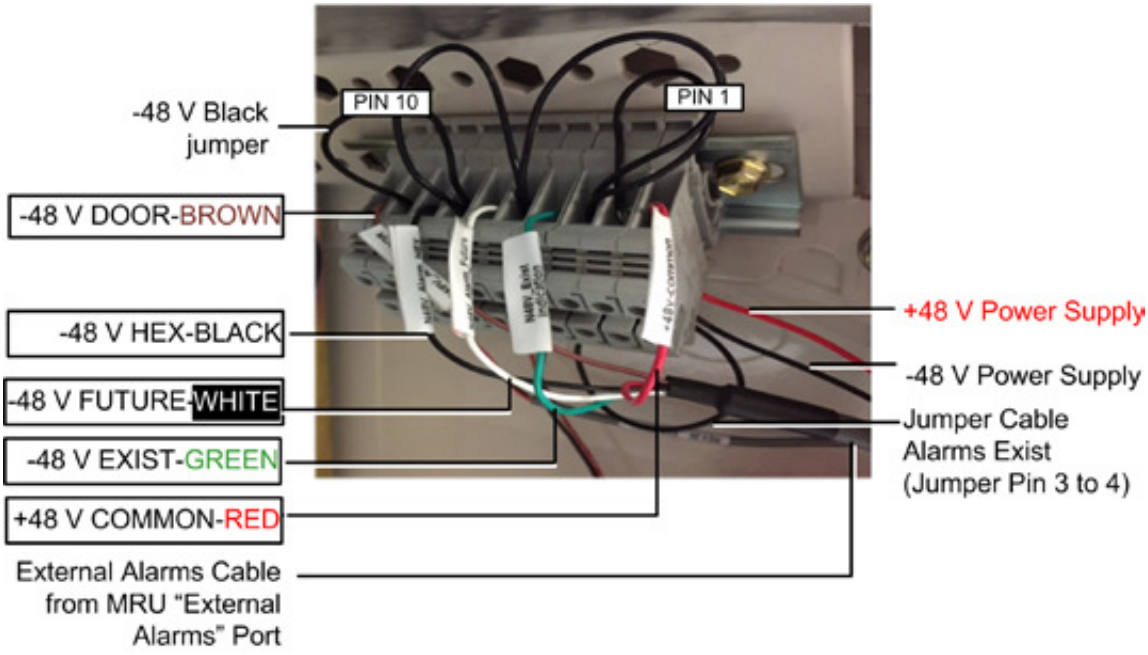


Figure 6-22. Example of External Alarm Wiring Connections

4. Verify that fans are operational and refer to status LEDs on the inside of the cabinet door and verify that all show green.

7 APPENDIX A: SPECIFICATIONS

7.1 Supported Services

Technology	Frequency Range (MHz)		
	Service/Band	Uplink (UL)	Downlink (DL)
LTE	2600	2500-2570	2620-2690
GSM/UMTS/LTE	GSM	880-915	925-960
LTE	800L	791-821	832-862
GSM/UMTS/LTE	DCS	1710-1785	1805-1880
UMTS/LTE	UMTS	1920-1980	2110-2170

7.2 MRU Coupling Specifications

DL Center Frequency of Supported Bands (MHz)	Typical Coupling* (dB)
942.5	26.0
847	26.0
1842.5	26.0
2140	26.0
2655	26.0

**The typical coupling value for the supported bands is -26 dB however a delta of +/- 3 dB can be expected. As such, the actual coupling value for each unit (measured for the DL center frequency of supported bands) is specified on a label on the unit. Note that the test port is bi-directional, so that an UL signal can also be injected and measured with a -26 dB loss.*

7.3 Optical

Optical Output Power	< 9 dBm
Max. Optical Budget	7 dB (5 dB over any temp, and optical variations)
Back Reflectance	- 60 dB
Optical Connector	OIM: Female MTP® connector MRU: LC APC SM
Fiber Type	Corning® SMF-28® fiber or compatible
Wavelength	1310 ± 10nm (@ 25° C)

7.4 Power Specifications

7.4.1 IHU

IHU chassis are powered via two power supply modules (one for redundancy). Both AC and DC power supply modules are available.

7.4.1.1 PSM-AC

Power rating	300 W
Power input	110-220 VAC
Power consumption	(Full chassis): 200 W
On/Off switch	

7.4.1.2 PSM-DC

Power rating	300 W
Power input	48 V DC; 9 A maximum
Power consumption	(Full chassis): 200 W
DC Connector	Six terminal rings; Type: PMNF2-3R-C or PMV2-3RB-3K Type of terminal ring crimped onto DC wires – PANDUIT ring terminal: • Compatible wire size: 1.5 – 2.5mm² wire • Range 14 AWG to 16 AWG • M3 stud size • No. of required wire pairs: – Remote feed - three pairs; 100 W max. per pair – Local Plant feed - two pairs; 100 W max. per pair • Max. current consumption per pair: • Remote feed = 1.55 A • Plant feed = 4.65 A

7.4.2 MRU Power

Power Consumption:	DC Version: 330 W (maximum)	AC Version: 360 W (maximum)
AC:	Power Input: Maximum AC Current Consumption	100-240 VAC/50-60 Hz; 5 A
DC:	Power Input	DC class 1: 48 VDC (40-60 VDC) 9 A max DC class 2: 24 VDC / 48 VDC (20-60 VDC) Power amplifier consumption per pair: 50 W Maximum power consumption: 330 W Maximum current consumption: 1.75 A per pair Maximum current draw per pair: 64 W

7.5 Physical Specifications

	IHU	MRU
Mounting	Rack-mount – 19 in and 4U	19-in rack; (6U rack height) Wall mount (separately ordered accessory kit)
Dimensions (H x W x D)	IHU: 7 x 17.3 x 15.5 in (177.8 x 440 x 394 mm)	10.5 x 17.5* x 15.75 in (266.7 x 445 x 400 mm) **without rack brackets*
Weight	Chassis: IHU chassis: 30 lbs (14 kg) Modules: • Per RIM: 1.9 lbs (0.9 kg); • Per RIX: 1.54 lbs (0.7 kg) • Per OIM: 1.54 lbs (0.7kg) • Per OIX: 1.54 lbs (0.7 kg) • HCM/ACM: 2.2 lbs (1.0 kg); • PSM-AC: 2.09 lbs (0.95 kg) • PSM-DC: 1.76 lb (0.8 kg)	Chassis without PAMs: 48 lbs (21.8 kg) Each PAM: 4.7 lbs (2.15 kg)

7.6 Environmental

	IHU	MRU
Operating Temperature		

7.8 PSU6 Specifications

AC Input	
Voltage range:	85 to 265 VAC; 47 – 63 Hz via IEC socket Rated voltage (for safety approval): 100-240 VAC, 50-60 Hz
Current:	Maximum input current at 85 VAC is 2.8 amp
Power Factor:	>0.925 at maximum load
Efficiency	For 100 VAC input voltage: 86% minimum at 25°C and 85% minimum at 55°C For 220 VAC input voltage: 88% minimum at 25°C and 86% minimum at 55°C
DC Output Per Port	
Voltage	57 V constant output power
Maximum current	1.7 amp
Power	100 W

Power

Maximum system output power	1200 W @ 57 VDC
Polarity	Positive earth; 57 V
Individual module power	200 W
Noise	Ripple <100 Hz at maximum load @20 MHz BW
Monitoring	
Single Status LED per module	Green – normal operation Red – fault detected
Identified faults	Low input voltage Fan failure detection Output voltage out of range Internal fault

Protection

Output Current Limit	Output current limit >94 W and <100 W Auto-recovery when current is back within range
Output Inrush	Current limiter supports startup with 500uF ± 20% load capacitance and 200 mA load
Over Voltage	Limit of 61 V ± 4%
Input protection	Auto shutdown and auto restart when correct voltage is restored
Input Fuses	Short circuit on main lines is protected by replaceable fuse

Temperature

Operating Temperature	0 to +55◦C (32 to +131◦F)
Storage Temperature	-20° to 85°C (-4° to 185°F)
Operating Humidity	Non-condensing relative humidity range: 5% to 95%
MTBF	262,800 hours

Physical

Dimensions (enclosure) (HxWxD)	1.73 x 17.51 x 13.74 in (44 x 445 x 349 mm)
Weight	Enclosure without PSM-I modules: 6.22 lb (2.825 kg) Per PSM-I module: 0.8 lb (0.36 kg)
Connectors	Input connector: TU-320-B-MB TECX or equivalent Output connector: PCIC16W7M400A1/AA POSITRONIC part number or equivalent
Mounting	19-in rackmount (1U)

Safety compliance

UL 60950, Third Edition
UL to CAN/CSA 22.2 No.60950, Third Edition
CB to IEC 60950 with all country deviations
CE Marking

7.9 Optical: Cabling, Unit/Modules Specifications

Cabling

Vertical	Plug & Play™ Plenum Optical cables MTP® Fiber Connectors 12 – 144 fibers Two-sided or one-sided Armored, non-armored	
Horizontal	Composite Plenum tether assemblies Fiber: LC APC, 2 – 24 fibers Cu: 16AWG, 14AWG, 12AWG; 2 – 12 Conductors Armored, non-armored	

Fiber Management

FMU	1U: 144 Fibers 2U: 288 Fibers 4U: 576 Fibers Plug & Play™ Modules or Splice Cassettes	

8 APPENDIX B: ORDERING INFORMATION

8.1 IHU Assemblies, Modules, and Accessories

Part Number	Description
IHU	Integrated headend unit assembly (without RIMs and OIMs); support for four RIMs, four OIMs and four additional RIMs/OIMs in dual slots
MRU-EU-89182126-AC	MRU AC Assembly supporting 5 amps: 800, 900, 1800, 2100, 2600
MRU-EU-89182126-DC	MRU DC Assembly supporting 5 amps: 800, 900, 1800, 2100, 2600
MRU-EU-9182126-AC	MRU AC Assembly supporting 4 amps: 900, 1800, 2100, 2600
MRU-EU-9182126-DC	MRU DC Assembly supporting 4 amps: 900, 1800, 2100, 2600
MRU-EU-8182126-AC	MRU AC Assembly supporting 4 amps: 800, 1800, 2100, 2600
MRU-EU-8182126-DC	MRU DC Assembly supporting 4 amps: 800, 1800, 2100, 2600
MRU-EU-891821-AC	MRU AC Assembly supporting 4 amps: 800, 900,1800, 2100
MRU-EU-891821-DC	MRU DC Assembly supporting 4 amps: 800, 900, 1800, 2100
MRU-EU-91821-AC	MRU AC Assembly supporting 3 amps: 900, 1800, 2100
MRU-EU-91821-DC	MRU DC Assembly supporting 3 amps: 900, 1800, 2100
MRU-EU-182126-AC	MRU AC Assembly supporting 3 amps: 1800, 2100, 2600
MRU-EU-182126-DC	MRU DC Assembly supporting 3 amps: 1800, 2100, 2600
MRU-EU-92126-AC	MRU AC Assembly supporting 3 amps: 900, 2100, 2600
MRU-EU-92126-DC	MRU DC Assembly supporting 3 amps: 900, 2100, 2600

Part Number	Description
IHU Modules	
MRU-PAM-A70	ONE MRU Power Amplifier Module supporting 700APT
MRU-PAM-L26	ONE MRU Power Amplifier Module supporting 2600 Mhz FDD
MRU-PAM-G90	ONE MRU Power Amplifier Module supporting 900 MHz GSM
MRU-PAM-D18	ONE MRU Power Amplifier Module supporting 1800 MHz DCS
MRU-PAM-U21	ONE MRU Power Amplifier Module supporting 2100 MHz UMTS
MRU-PAM-L80	ONE MRU Power Amplifier Module supporting 800 MHz LTE
ACM	Auxiliary Control Module; Includes two RJ-45 cables (2 m)
PSM-AC	AC Power Supply – installed in HEU and OIU chassis; includes US plug power cords
PSM-DC	DC Power Supply - installed in HEU and OIU chassis; includes 48 V DC six pin terminal block connector

Accessories

Part Number	Description
ERFC:	Expander RF Cable; SMP to SMP connector
ERFC16	L= 16 in; 9 pin
ERFC24	L= 24 in; 9 pin

ERFC34	L= 34 in; 9 pin
ERFC40	L= 40 in; 9 pin
ERFC59	L= 59 in; 9 pin
PCKC:	Pilot Transport Cable; Single QMA to QMA
PCKC20	L=20 in
PCKC47	L=47 in
PCKC63	L=63 in
PCKC79	L=79 in

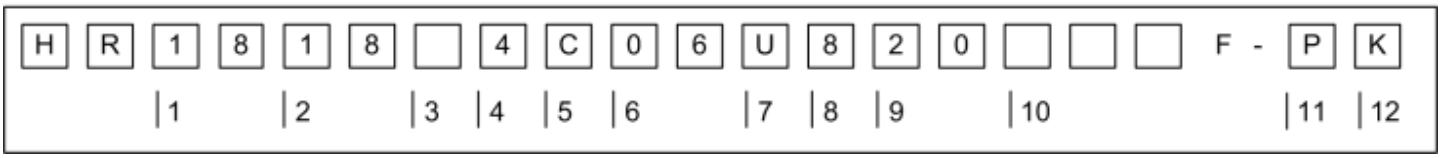
8.2 PSU6

Part Number	Product Description
PSM-I	Power supply module (up to six modules per PSU6)
PSU6-1U	Power supply unit with no PSM-I
PSU6-1PS	Power supply unit with one PSM-I
PSU6-2PS	Power supply unit with two PSM-I modules
PSU6-3PS	Power supply unit with three PSM-I modules
PSU6-4PS	Power supply unit with four PSM-I modules
PSU6-5PS	Power supply unit with five PSM-I modules
PSU6-6PS	Power supply unit with six PSM-I modules

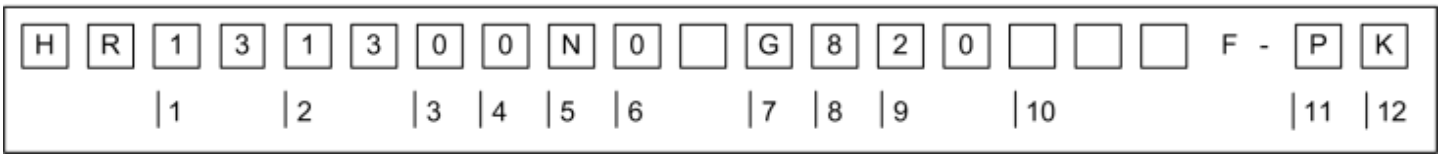
8.3 Cable Ordering Information

Cable Configurations

Composite Cable Ordering Configuration



Trunk Cable Ordering Configuration



1
Connector.

13 = MTP® Connector, SM Elite

18 = LC/APC Duplex

2
Connector.

13 = MTP® Connector, SM Elite
18 = LC/APC Duplex

3
Select cu wire gauge

0 = No Cu Wire

F = 12AWG

G = 14AWG

H = 16AWG

K = 20AWG

4
Cu conductor count.

0 = 0 conductors

4 = 4 conductors

5
Cu connectors.

Cu = With connectors

N = No connectors

6
Fiber count.

06 = 6 fibers

24 = 24 fibers

48 = 48 fibers

72 = 72 fibers

96 = 96 fibers

E4 = 144 fibers

7
Fiber type.

U = ZBL Fiber

G = XB fiber

8
Jacket type.

8 = Plenum Indoor

9
Armored/non-armored

20 = Non-armored

10
Select cable length.
004 – 999 ft.

11
Pulling grip type.

P = One-sided pulling grip

12
Kit type

K = 2 Strain relief trunk holders

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