Altiostar Networks
iRM4451*nn*00-2
intelligent Remote Radio Head

Product Description and Installation Guide

iRM4451*nn*00-2

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Preface

About the document

This document covers the basic installation of the Altiostar Networks, Inc., iRM4451*nn*00-2 intelligent Remote Radio Head (iRRH) on towers, walls, roof or other structures inaccessible to the general public.

Connections to external interfaces, including signaling, grounding, and power are described. Descriptions of the iRM4451*nn*00-2 macro-cellular intelligent Remote Radio Head indicators are also provided.

The iRB7200 virtual Baseband Unit (vBBU), the iRB1200 intelligent Baseband Unit and the iRB2400 intelligent Baseband Unit are companion products. Refer to the Altiostar Networks iRB1200 intelligent Baseband Unit Product Description and Installation Guide, document number 240-00-0007, for related information.

Intended Users

The target audience for this document is installation and engineering personnel. It assumes personnel have a basic understanding of wireless telecommunications terminology, and experience in installing wireless telecommunications equipment.

Overview

The iRM4451*nn*00-2 intelligent Remote Radio Head is an energy-efficient outdoor macrocell radio head with integrated baseband for use in several select frequency bands. Connection to a vBBU, or the optional iRB1200 iBBU or iRB2400 iBBU, is through a Gigabit Ethernet (GigE) connection. Connection to other compliant fronthaul devices can also be facilitated using the Ethernet fronthaul port.

The iRM4451*nn*00-2 intelligent Remote Radio Head is based on a distributed architecture with the following two essential elements:

- iRM4451*nn*00-2 iRRH

- iRB7200 vBBU, iRB1200 iBBU, or iRB2400 iBBU

The iRM4451*nn*00-2 iRRH is connected to the vBBU through a Gigabit Ethernet (GigE) connection. Connection to other compliant fronthaul devices can also be facilitated using the Ethernet fronthaul port.

The iRM4451*nn*00-2 iRRH interconnects with the described Altiostar baseband units which operate within the RAN portion of the LTE wireless network.

iRM4451*nn*00-2 available models

Table P-1 provides information on the available iRM4451iRRH models and associated part numbers. The model number for a specific model is in the form iRM4451*nn*00-2. For example, if you order a model iRM44510400-2, you would get an iRM4451 with GPS and Series-A connectors, operating in AWS Band 4 with Altiostar part number 509-03-0002.

Table P-1   iRM4451 iRRH models/configuration list

iRM4451 model naming				
Base model	**+**	**Band/Frequency extension**	**=**	**Band/Frequency**
iRM4451	+	*02*00-2	=	Band 2 (1.9 GHz) (Series-A connectors)
		*03*00-2		Band 3 (1.8 GHz) (Series-A connectors)
		*04*00-2		Band 4 (AWS) (Series-A connectors)
		*07*00-2		Band 7 (2.6 GHz) (Series-A connectors)
		*E4*00-2		Band 66A (AWS & AWS-3) (Series-A connectors)
		*07*00-3		Band 7 (2.6 GHz) (Series-A connectors) 70 MHz IBW, 40 MHz OBW
		*E4*00-3		Band 66A (AWS & AWS-3) (Series-A connectors) 70 MHz IBW, 40 MHz OBW
		*02*00-3		Band 2 (PCS) (Series-A connectors)
		*04*00-3		Band 4 (AWS) (Series-A connectors)
		*25*00-3		Band 2 EXT (PCS) (Series-A connectors)

Table P-2 provides top-level part numbers of available iRM4451*nn*00-*a* models.

Table P-2   iRM4451nn00-2 iRRH part numbers

Model number	Part number	Descripton
iRM44510700-2	509-02-0001	iRM4451 iRRH Band 7 (2.6 GHz), GPS and Series-A connectors
iRM44510400-2	509-03-0001	iRM4451 iRRH Band 4 (AWS), GPS and Series-A connectors
iRM4451E400-2	509-04-0001	iRM4451 iRRH Band 66A (AWS & AWS-3), GPS and Series-A connectors
iRM44510200-2	509-05-0001	iRM4451 iRRH Band 2 (1.9 GHz), GPS and Series-A connectors

Table P-2   iRM4451nn00-2 iRRH part numbers

Model number	Part number	Descripton
iRM44510300-2	509-06-0001	iRM4451 iRRH Band 3 (1.8 GHz), GPS and Series-A connectors
iRM44510700-3	509-02-0003	iRM4451 iRRH Band 7 (2.6 GHz), GPS and Series-A connectors 70 MHz IBW, 40 MHz OBW
iRM4451E400-3	509-04-0003	iRM4451 iRRH Band 66A (AWS & AWS-3), GPS and Series-A connectors 70 MHz IBW, 40 MHz OBW
iRM44510200-3	340-00-0085	iRM4451 iRRH Band 2 (PCS), GPS and Series-A connectors
iRM44510400-3	340-00-0TBD	iRM4451 iRRH Band 4 (AWS), GPS and Series-A connectors
iRM44512500-3	340-00-0086	iRM4451 iRRH Band 2 EXT (PCS), GPS and Series-A connectors

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1 Introduction

1.1 Conventions used

Illustrations and photos in this document are intended to show a basic installation. They show site and equipment configurations encountered during a typical installation. They do not show all details and exceptions, but highlight the main points of the installation.

Altiostar Networks, Inc. will often be referred to as Altiostar Networks, or simply Altiostar.

The Altiostar Networks iRM4451nn00-2 intelligent Remote Radio Head will often be referred to in the generic as the iRM4451nn00-2 iRRH, iRM4451nn00-2, or simply the iRRH. When referring to a specific model, the full model name will be used. For example, the iRM44510300-2 (Band 3, 1.8 GHz, with GPS external connector and Series A connectorization). Refer to "iRM4451nn00-2 available models" in the "Preface" to this document.

The Altiostar Networks iRB7200 virtual Baseband Unit (vBBU) is a server-based companion unit to the iRM4451nn00-2 in the Altiostar Networks LTE macro eNodeB solution.

The Operator or Owner of the facility and equipment where the iRM4451I00-2 iRRH is to be installed is referred to as the Operator in this document.

The Installer may be the Operator, or any other entity assigned and approved by the Operator, to perform the installation of the iRRH at specified Operator facilities.

NOTE

This is an example of a note used in this document that denotes important information about the text or procedure that follows it.

The iRM4451nn00-2 interconnects with compliant radio antennas and the associated baseband unit, i.e., vBBU (or the optional iRB1200/iRB2400 iBBUs) which operate within the RAN portion of the LTE wireless network.

A block diagram of the iRM4451nn00-2 iRRH is shown in Figure 1-1.
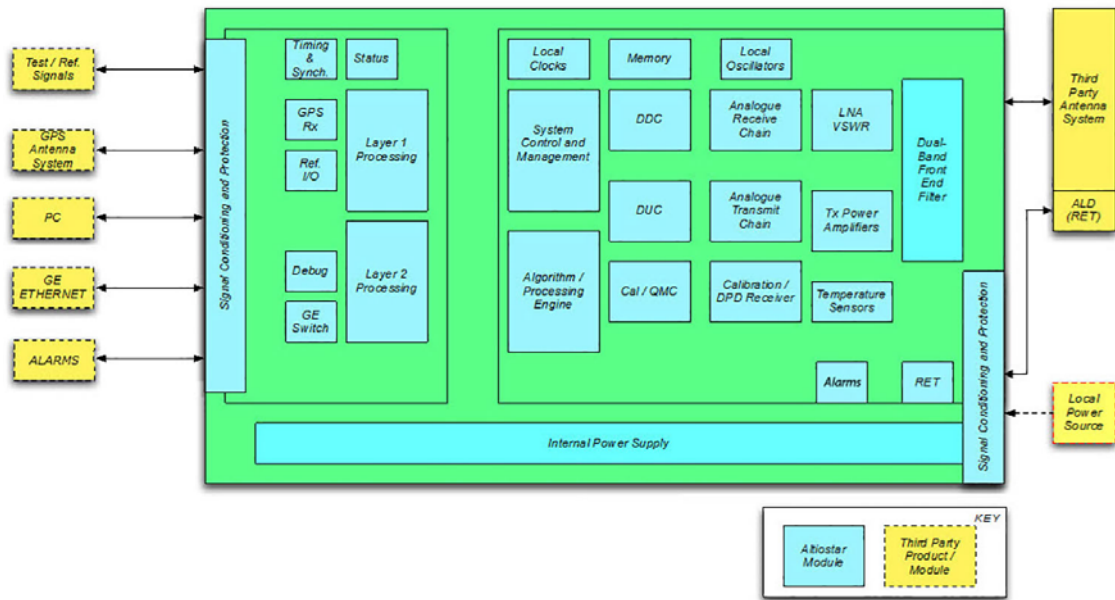
Figure 1-1   iRM4451*nn*00-2 iRRH functional block diagram

1.2 Hardware components

The following major circuit cards and components comprise the iRM4451*nn*00-2 iRRH. See Figure 1-1.

• Signal Processing Module

• Radio Card

• Signal Conditioning and Protection

• Internal power supply

• Front-end Filter

• Fronthaul Interface

• Local PC

• GPS Receiver System

• Test/Reference Signals

• RF Antenna System

• Local Power Source

• Alarms Interface

The iRM4451*nn*00-2 gets its power from an external –48 V DC source. Antennas, supplied by the Operator, are used for RF transmission and Global Positioning System (GPS) reception.

The Signal Processing Module (SPM) provides single carrier, single band, single sector LTE eNodeB operation; it is the Gigabit interface to the Altiostar base station unit (vBBU). It also provides for 20 MHz (max) instantaneous carrier bandwidth (IBW) support for 3GPP LTE Release 11 advanced features, L1/L2 signal conditioning, signal protection and signal processing of the fronthaul signal inputs, as well as eNodeB timing recovery and synchronization from either the external GPS antenna or 1588V2 extraction of timing from the Layer 2 stratum. It supports test and reference signal I/O for radio conformance testing (RCT), and Data and Control interface to the radio card.

An external alarms input is located on the side of the iRM4451 unit. There are four sets of 2-wire dry contacts that can be software-configured to be normally open or normally closed.

Test and Debug ports (both *factory use only*) are provided via a mini USB port and an HDMI port located behind an access panel on the front of the unit.

2 Safety requirements

2.1 Overview

This section provides safety precautions that apply to the iRM4451 iRRH. The precautions statements are required by national or regional standards institutes in the country or region where they apply. This document complies with these requirements.

2.2 Purpose

To protect installation personnel, equipment and operations, this document contains safety statements. Safety statements are provided at points in procedures where risks may exist to personnel, equipment and network operations. Failure to follow the directions in the safety statements may result in serious consequences.

2.3 Warning symbols

DANGER

Danger is used to indicate the presence of a hazard that will cause severe personal injury, death, or substantial property damage if the hazard is not avoided.

WARNING

Warning is used to indicate the presence of a hazard that can cause severe personal injury, death, or substantial property damage if the hazard is not avoided.

CAUTION

Caution is used to indicate the presence of a hazard that will or can cause minor personal injury or property damage if the hazard is not avoided.

2.4 General safety precautions

Safety precautions should be observed when performing these installation procedures.

NOTE

The safety precautions found in this section are only intended to supplement those safety precautions already proscribed by the Operator—who is responsible for communicating them clearly to the Installer.

The power system and RET cables will have hazardous energy and voltages present. Follow all safety warnings and practices when servicing this equipment.

This equipment must be installed, serviced, and operated only by authorized, qualified and trained personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment. Observe all local and national electrical, environmental and workplace codes.

DANGER

HAZARDOUS VOLTAGES!

Hazardous voltages can be present when the system is operating. Use caution when removing or installing equipment.

DANGER

FALL HAZARD!

A fall hazard is present when installation of this equipment requires working on towers, poles or at elevated work sites. All telecommunications personnel who perform tower work or work at elevation must be qualified to perform this type work.

Installation of this equipment may require working on towers, poles or at elevated work sites. All telecommunications personnel who perform tower work or work at elevation must be trained and qualified to perform this work, have the proper equipment to perform the work safely, and follow all requirements in accordance with 29 CFR 1910.268, 29 CFR 1926, and any other safety requirements in force by the Operator, or local and regional authorities. In addition, the tower or structure must be certified safe for climbing according to TIA/EIA 222 and 29 CFR 1910.66, Appendix C for anchorage devices.

WARNING

Read and understand all instructions before starting this procedure!

- *Follow all warnings and safety instructions in this procedure.*

- *Only trained personnel should install or operate this equipment.*

- *Observe all local and national electrical, environmental and workplace codes.*

- *Before working on equipment that is connected to power, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.*

- *The equipment must have a direct disconnect device in line with the power source.*

- *Grounding and circuit integrity is vital to a safe operating environment. Grounding conductors must be in place before installing the equipment. Never operate equipment when grounding or bonding conductor has been removed.*

- *Never install equipment not identified in this procedure. Fire or injury could result from improperly installed equipment.*

- *Caution should be exercised when installing or modifying telecommunications lines.*

- *Disconnect all power sources before servicing the equipment.*

- *Never touch uninsulated wiring or terminals unless power to the lines have been disconnected at the source. Always verify power has been removed using an approved voltage tester.*

- *To prevent electrical shock, never remove the cover or disassemble the equipment. There are no user serviceable components in the equipment.*

- *Never insert probes or objects of any kind into slots or openings to the equipment. Dangerous voltages may be present or the object may cause a short circuit and start a fire or damage the equipment.*

CAUTION

HOT SURFACES!

- *Under certain conditions, specifically during and immediately after prolonged operation, the unit can be hot. Wait for unit to cool before performing maintenance or use insulating gloves.*

CAUTION

HEAVY OBJECT!

- *Assisted carry ONLY! This object is heavy; over 75 lb. (34.0 kg). Follow instructions when lifting unit from shipping container and hoisting onto mounting bracket. Requires a minimum of two people to lift and hand carry the unit.*

WARNING

LIGHTNING STRIKE HAZARD!

- *Lightning strikes are possible during stormy weather. Do not install equipment if stormy conditions exist.*

- *Never work on telecommunications power supply lines or antenna feeders at the cell site during stormy conditions.*

WARNING

SHOCK HAZARD!

- *Some parts of all electrical systems are energized at all times. Exercise extreme caution at all times when working around telecommunications electrical systems. Short circuits can cause burns to the face or hands. Failure to observe this and other safety warnings may lead to bodily injury and property damage.*

- *Only trained and qualified personnel may install or service equipment as defined in IEC 215 and EN 60215.*

- *Turn off or disconnect equipment from its energy source(s) by switching off the load disconnect switch in the distribution panel before performing service or maintenance.*

CAUTION

LASER RADIATION AND FIBER OPTIC CABLE USE CAUTION!

- *Class 1 invisible laser radiation present. Avoid long-term viewing of laser. Never use a magnifying device to view optical fiber ends when fiber is connected to equipment.*

- *Fiber optic cables may be damaged if bent or curved to a radius that is less than the recommended minimum bend radius of two inches. Always observe the recommended bend radius limit when installing fiber optic cables and patch cords.*

CAUTION

SHORT CIRCUIT HAZARD!

Condensation on the equipment has a potential to cause short circuits!

Weather conditions may exist at the site where condensation may form on the equipment. Installing or operating the equipment when condensation is present may cause a short circuit and damage the equipment.

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Equipment showing signs of condensation should be allowed to dry before installation.

CAUTION

ELECTROSTATICALLY SENSITIVE EQUIPMENT!

Semiconductor components are sensitive to electrostatic electricity and may be damaged by static discharge.

When handling the equipment, the following rules must be followed:

- *Wear conductive or anti-static clothing.*
- *Wear grounded ESD wrist strap.*
- *Wear shoes with conductive straps or soles.*
- *Verify anti-static safety devices are operating properly by testing yourself at an approved test station.*
- *Leave equipment in their original anti-static wrapping until ready for installation.*
- *When handling equipment or modules, use handles provided to carry the device and do not touch electrical contacts, pins or components.*
- *Only place equipment or modules on conductive surfaces.*
- *Use tools on equipment or modules only when equipment is grounded.*
- *Handle defective equipment or modules similarly to new equipment to prevent additional damage.*

CAUTION

GROUNDING CAUTION!

- *This equipment's grounding connection is between the DC power circuit and the grounding conductor.*
- *This equipment must have a direct connection to the DC supply grounding point or to a bonding jumper from the grounding terminal bus bar to the DC supply ground electrode for the site.*
- *The grounding circuit must not have a disconnect device located in line with the DC circuit grounding conductor.*

3 Physical description

The Altiostar Networks iRM4451*nn*00-2 intelligent Remote Radio Head is an energy-efficient, modular, outdoor radio unit constructed of aluminum with integrated heat sink fins to facilitate fanless convection cooling. Four independent RF outputs for a 4T4R configuration at 30 W per RF path for a total of 120 W maximum output power.

The iRM4451*nn*00-2 iRRH has connections for −48 V DC power input and Gigabit Ethernet optical fronthaul. Figure 3-1 shows the iRM4451*nn*00-2 iRRH.

Figure 3-1   Altiostar networks iRM4451*nn*00-2 iRRH

The Altiostar Networks iRM4451*nn*00-2 iRRH can be mounted on a wall, mast or tower using the supplied mounting bracket assembly and mounting plate. Table 3-1 lists the model numbers for specific bands, and specifications of the iRM4451*nn*00-2 iRRH by characteristic type. The Installer is responsible for supplying and installing antennas and associated cables for the GPS and RF signals. For recommendations on the antenna type, the RET motor, and the RET cable assembly contact Altiostar Networks engineering prior to the site pre-installation visit.

Table 3-1   Altiostar Networks iRM4451*nn*00-2 iRRH technical specifications

Item	Specification
Physical	
Dimensions (H×W×D) - Excludes solar shield Radio Module SPM	 17.7 × 21.1 × 6.3 in (450 × 535 × 161 mm) 13.8 × 6.0 × 0.9 in (350 × 152 × 24 mm)
Weight - Excludes brackets	73.8 lb (33.5 kg)
Volume	< 40.0 L
Electrical	
Input power	−48 V DC
Current	18 A
Power distribution breaker/fuse	20 A (external)
Environmental	
Working temperature (non-condensing humidity	−40° to 131° F (−40° to 55° C)
Operating altitude	−197 to 9,843 ft (−60 to 3000 m)
Relative humidity	5 to 100%
Cooling	Convection (fanless)

3.1 iRM4451*nn*00-2 iRRH boards and modules

The iRM4451*nn*00-2 intelligent Remote Radio Head is an integral unit with no user-accessible boards or modules.

3.2 iRM4451*nn*00-2 iRRH controls, indicators connectors and components

There are no controls on the macro iRRH. The connectors are located on the bottom of the unit. They are for Global Positioning System antenna (**GPS)**, Power (**−48v DC)**, RF (**ANT1−ANT4**), Fronthaul (**FH1/FH2**), Ground (⏚), and Remote Electrical Tilt (**RET**).

LEDs for Fronthaul 1 (**FH1)**, Fronthaul 2 (**FH2)**, **STATUS**, and **POWER** are located on the side of the unit and are visible when the solar shield is installed.

Connector locations for RF input/output are shown in Figure 3-2. Connector locations for −48 V DC Power and Remote Electrical Tilt are shown in Figure 3-3. Connector locations for GPS antenna and fronthaul are shown in Figure 3-4.
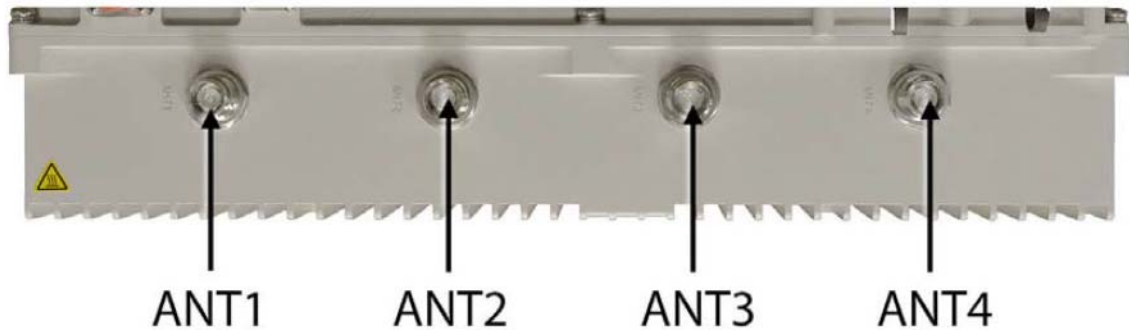
Figure 3-2 **iRM4451**nn**00-2 iRRH RF connectors location**
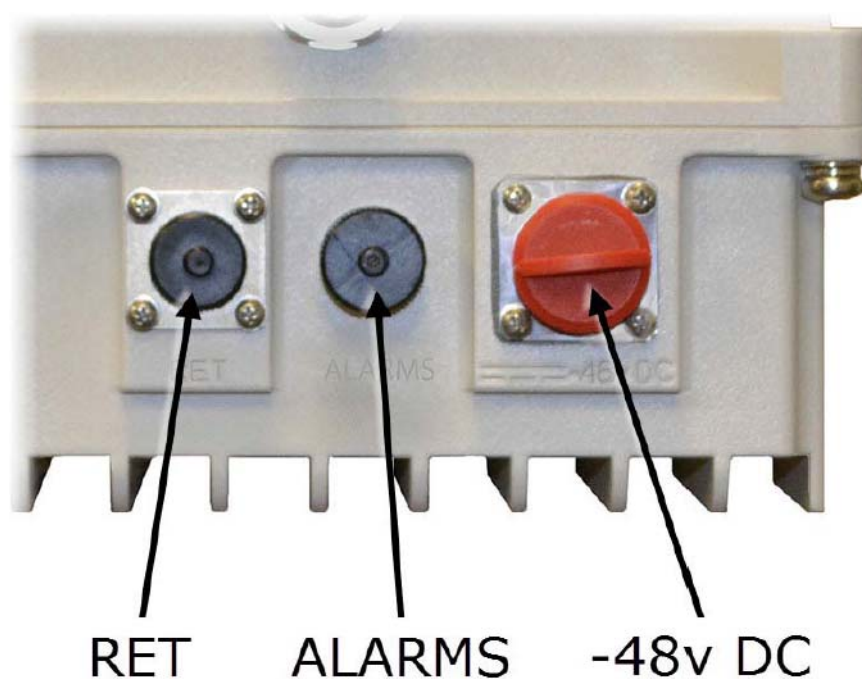

Figure 3-3 **iRM4451**nn**00-2 iRRH RET and −48v DC (power) connector location**
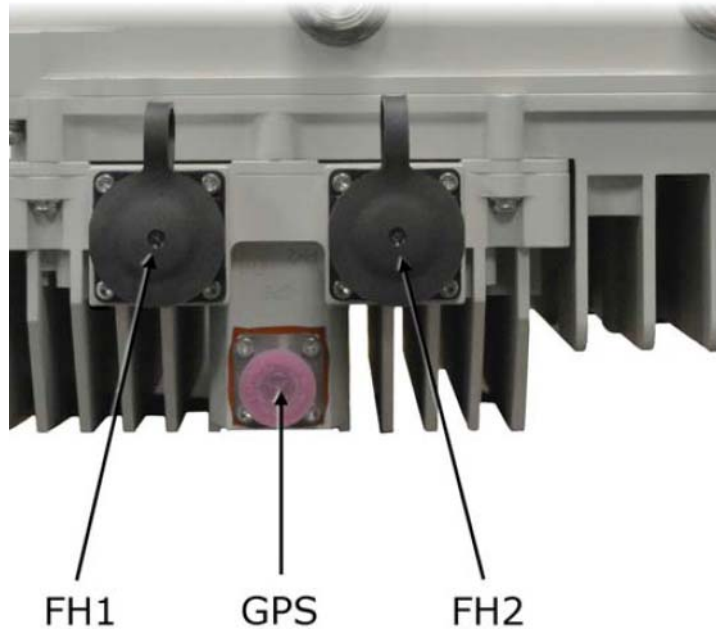
Figure 3-4 **iRM4451**_nn_**00-2 iRRH GPS and fronthaul connectors location**
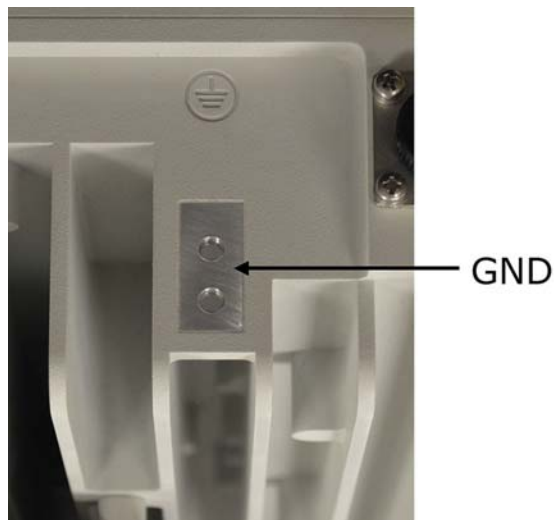
Figure 3-5 **iRM4451**_nn_**00-2 iRRH ground connector location**

Table 3-2   iRM4451*nn*00-2 iRRH connectors

Connection	Control/Connector Type	Quantity	Function
−48v DC	Rosenberger 2-pin connector (PN 99K73E-199N1)	1	−48 V DC power input
⏚ (GND)	Dual-hole lug terminal	1	Equipment grounding
GPS	N (female), 50 Ù	1	Timing source input
RET	8-pin circular DIN	1	Provides +24 V DC and RS5 control function for AISGv2.0-compliant antenna remote electrical tilt
FH1	Gigabit Ethernet optical SFP modules, Rosenberger Fiber Enclosure (RFE) flange (PN 98Z405-K00)	1	Fronthaul data
FH2		1	
ANT1−ANT4	4.3-10 conn (female) threaded coupling, 50 Ù	4	RF to directional antennas
ALARMS	Lumberg 03 series, 12-pin screw-lock circular DIN, 50 Ω	1	Alarms aggregation

3.2.1 GPS connector

There is a 50-Ω GPS SMA female connector located on the bottom of the iRM4451*nn*00-2 iRRH as shown in Figure 3-4.

A GPS mounting kit is provided which allows mounting the GPS antenna on the macro iRRH or, if required, in a remote location if it is necessary to obtain an unobstructed view of the sky. The kit will include a bracket with mounting fasteners, and a GPS antenna with integrated cable terminated with an N-male connector in a length specified in the Site Plan.

For installations where multiple equipment share a remote antenna, the Installer must supply any splitter/combiner/amplifier and other additional GPS cables, connectors or hardware as required in the Site Plan.

The GPS cable bend radius is .0.75 in (19 mm).

3.2.2 RF connectors

There are four 50-Ù, 4.3-10 female RF jacks that terminate on the bottom of the iRM4451nn00-2 (see Figure 3-2). They are marked, from left to right, **ANT4**

through **ANT1**. The RF cables are supplied and pre-installed by the Installer in lengths according to site requirements.

The 4.3-10 RF jack screw connector is secured by torquing the coupling nut to 44.25 in-lb (5 Nm) using a torque wrench.

NOTE

> The Installer is also responsible for determining the antenna type, and supplying and pre-installing the antennas at the site.

The recommended RF jumper cable is an IP-68 compliant, Amphenol 4.3-10, male to 7/16 DIN male, with super flex cable (Part No. AAS-12HF-43SMDM-xM). The variable x is the length of the jumper in meters, where x = 1.0, 2.5, or 5.0. The RF jumper cable minimum bend radius is 1.2 in (30 mm).

NOTE

> It is recommended that all RF cables be PIM-tested on site to ensure acceptable performance.

3.2.3 Power connector

−48 V DC power to the iRM4451nn00-2 iRRH is through a 2-pin, EMI shielded, circular twist-lock quick connect bulkhead jack, Rosenberger (99K73E-199N1). The connector is keyed to prevent mis-mating. The power connector pin assignments, as viewed from the bottom of the iRM4451nn00-2, are shown in Figure 3-6.

Figure 3-6   −48 V DC 2-pin Rosenberger bulkhead jack

The iRM4451nn00-2 comes supplied with an unconnectorized mating plug (Rosenberger 99S73B-199N1) in a kit (Figure 3-7). The Installer assembles the

cable onto the plug. Assembly instructions (MA_99A5) are found in the kit with the mating plug.
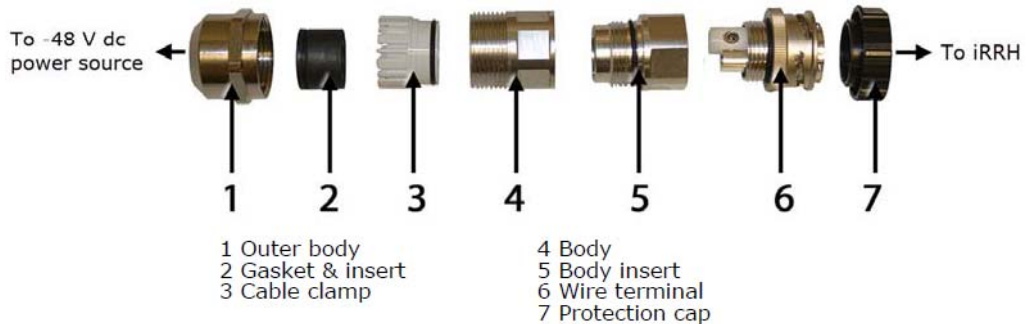
Figure 3-7   Rosenberger −48 V DC power plug (exploded view)

The power source end of the plug has screw terminals for connection to Installer-provided 8 AWG power cables. Power cable connection at the source end of the power cable is shown in Figure 3-8.
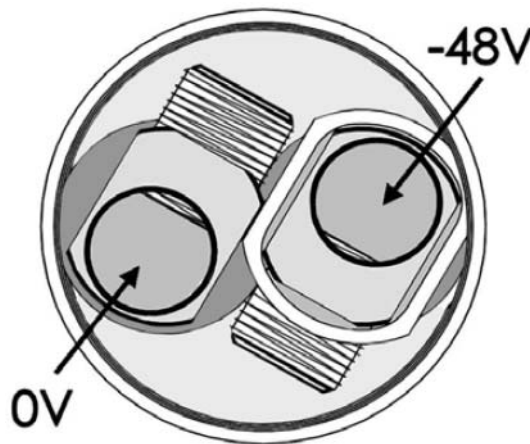
Figure 3-8   Cable connection for supplied 2-pin Rosenberger plug

The mating plug is fastened by turning the coupling nut clockwise 1/4 turn by hand until it 'clicks' into the locked position. To remove the power plug, twist the coupling nut counter-clockwise 1/4 turn.

The Installer must assemble the cable on site in a length ordered according to the site requirement. Use cable type SOOW, 8 AWG (min.), 2-conductor (8/2), shielded, stranded copper wires, indoor/outdoor, round cable, cable

OD 0.28–0.67 in (7–17 m), rated at 600 V, or equivalent. Cable can be a maximum of 328 ft (100 m) in length. The Installer is responsible for determining the power interface requirements at the supply-side of the cable and orders and installs the required connector, if any.

3.2.4 RET connector

The **RET** (Remote Electrical Tilt) bulkhead connector provides the capability of electrical antenna control to all antennas connected to the iRM4451*nn*00-2. Pin assignments for the **RET** standard 8-pin DIN connector is shown in Figure 3-9. The connector is keyed to prevent mis-mating. The connector is fastened by turning the coupling nut clockwise until hand tight..

1 NC		**5** RS5 A	
2 NC		**6** +24 V DC	
3 RS5		**7** Dc return	
4 NC		**8** NC	
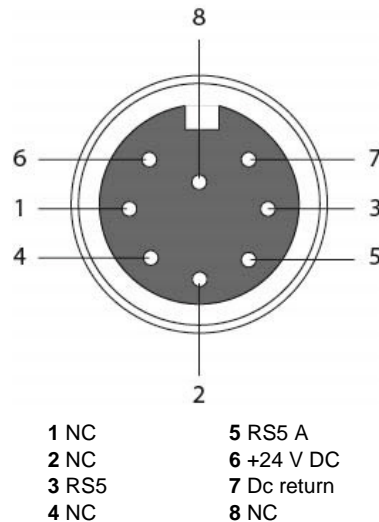
Figure 3-9   RET standard 8-pin DIN connector

The RET cable and connectors is a standardized AISG RET Control Cable available from many vendors. Installer supplies and installs RET cables in lengths according to site requirements.

The RET cable can be daisy-chained to other antennas served by the iRM4451*nn*00-2 iRRH if the option is provided by the RET motor manufacturer. Antenna RET control is facilitated within the EMS user interface.

The Installer is responsible for providing and pre-assembly of the standardized RET cable and connector in a length according to site requirements.

3.2.5 Fronthaul connectors

Two Gigabit Ethernet (GigE) optical SFP fronthaul ports provide connection for up to two duplex multi-/single-mode optical GigE cables. The GigE entry ports, labeled FH1 and FH2, are located on the bottom of the iRM4451*nn*00-2 iRRH (see Figure 3-4). Connector FH1 is intended for fronthaul support. FH2 is used to daisy-chain sidehaul support to up to one other iRM4451*nn*00-2.

The macro iRRH is shipped with Rosenberger Fiber Enclosure (RFE) flange (PN 98Z405-K00)—a bulkhead connector with captive dust cover—installed. The mate to the flange is the RFE 'plug' (Rosenberger PN 98Z105-S00) which contain the two duplex optical GigE fiber cables and protects the fiber connections. One (1) RFE plug is provided with the macro iRRH. They are UL94-V0 and IP67 compliant at–40° to 158° F (–40° to 70° C).

To assemble the Rosenberger RFE plug, the threaded sealing nut is first routed onto the fiber cable, followed by installation of a split grommet and clamping claw onto the fiber itself (see Figure 3-10 for the order of RFE assembly). The fiber cable/split grommet/clamping claw assembly is then pressed and seated into the plug body. Approximately 3–5 in (76–127 mm) of fiber cable, including the duplex fiber plug, should extend beyond the outside after the RFE 'plug' assembly is assembled.

The RFE plug is assembled by screwing the threaded sealing nut clockwise until it seats into position, hand tight, on the plug body. This completes the assembly of the RFE plug. The fiber connector is then inserted into the SFP fiber module, which is recessed in the iRRH fronthaul port, until it 'clicks' into position. Any slack fiber cable is stored inside the RFE plug. The RFE alignment rails on the RFE plug are engaged now with the bulkhead connector. When pushed in firmly, it 'clicks' into place and is locked onto the bulkhead connector completing the installation. The RFE cannot be removed because the latch function has been disabled by the obstruction at the latch pivot when seating the threaded sealing nut.

To remove the RFE plug from the bulkhead connector, the plug housing must be turned counter-clockwise until obstruction of the release latches on either side of the plug body, has been cleared. Finally, pressing on both latches at the same time and pulling the plug body removes the RFE from the bulkhead connector.

1 Threaded sealing nut	4 Plug body
2 Split grommet	5 LC-LC duplex fiber/connector
3 Clamping claw	6 Bulkhead connector
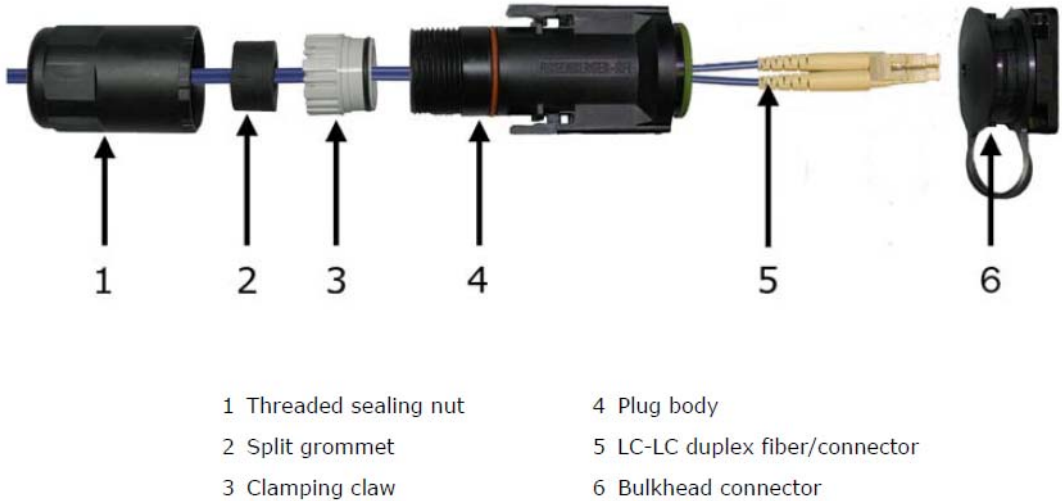
Figure 3-10   Rosenberger RFE fiber-optic enclosure

The dust covers over the **FH1** and **FH2** flanges should remain in place until the GigE optical Ethernet cables are connected and on any unused port. The dust covers are keyed to ensure proper installation. To remove the dust cover, just pull it off. The dust covers are re-installed in the opposite manner.

The recommended GigE fiber optic cable (x2) is OM1 62.5/125, military fiber cable, with dual LC/dual LC termination and is provided by L-Com (FODLCMIL-*nn*, or equivalent, where *nn* = length in meters). The Installer is responsible for ordering this cable in the appropriate length according to site requirements.

NOTE

Remove the dust cap only when ready to connect the cable to the iRM4451nn00-2.

The GigE optical fronthaul cables are supplied and pre-installed at the site by the Installer. Detailed assembly instructions (Rosenberger PN MA_98A1) are supplied with each Rosenberger RFE in its packing box.

3.2.6 Alarms connector

There is a panel-mount plug connector (**ALARMS**) located on the side of the iRM4451nn00-2 for aggregating alarms from equipment near the macro iRRH. It is a Lumberg 03 series 12-pin screw-lock circular DIN connector.

The alarms cable receptacle (plug) is provided as a kit. It includes a Lumberg circular DIN connector (part no. 0322 12) with 12-contacts, and is iP68 and RoHS compliant. It is keyed to prevent mis-mating.

The compatible alarms cable must be a 4-pair, 23–24 AWG (0.26–0.20 mm^2) with cable OD 4–8 mm, shielded, ruggedized, oil resistant, and outdoor rated at −40° to 131° F (−40° to 55° C), or equivalent. Connector pin assignments are shown in Table 3-3.

Table 3-3   Lumberg 0315 12 alarm connector details

Pin number	Pin assignment	Function
1	Pin A	NA
2	Pin B	NA
3	Pin C	NA
4	Pin D	NA
5	Pin E	Alarm1-A
6	Pin F	Alarm1-B
7	Pin G	Alarm2-A
8	Pin H	Alarm2-B
9	Pin J	Alarm3-A
10	Pin K	Alarm3-B
11	Pin L	Alarm4-A
12	Pin M	Alarm4-B

The Installer is responsible for supplying the cable and cable pre-assembly, including defining the wire-color matched to pin assignments for the plug assembly. The final wire-color pin assignments are recorded into the site log.

3.2.7 Access panel *(factory use only)*

An access panel (Figure 3-11)is located on the SPM module next to the LEDs. This panel is for factory use only.

⚠️
WARNING

DO NOT OPEN THE ACCESS PANEL. The access panel is for factory use only. Opening the access panel will compromise the integrity of the weather-tight seal and void the warranty.
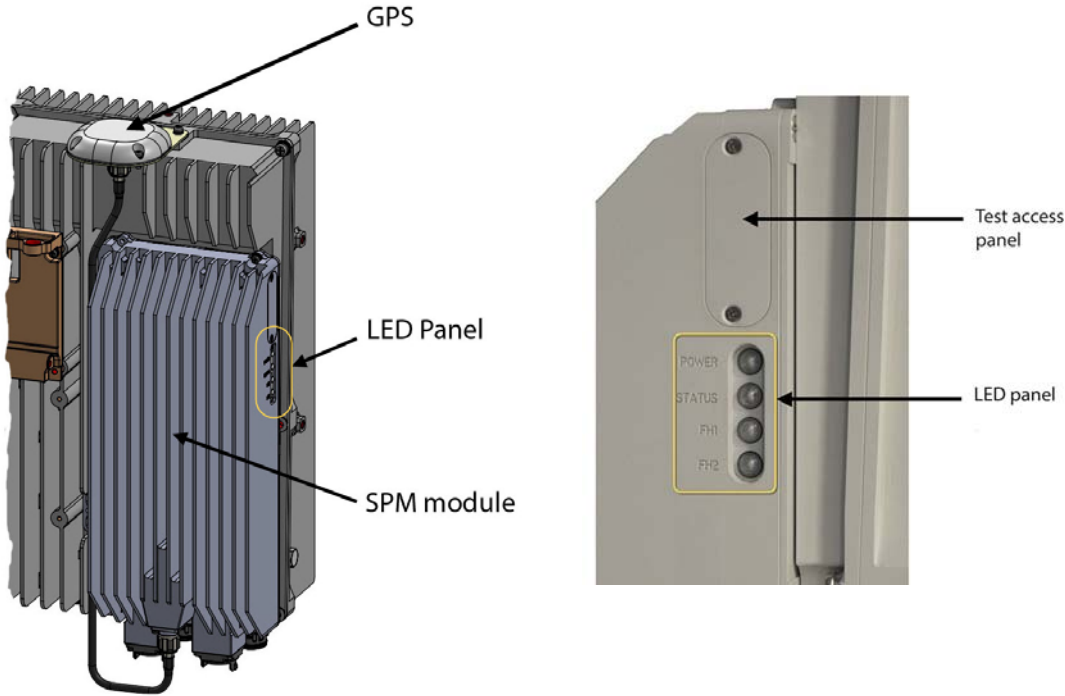
Figure 3-11   iRM4451*nn*00-2 SPM module, Test Access Panel and LED panel

3.2.8 LED indicators

There are four LED indicators located on the right side of the iRM4451*nn*00-2 iRRH as shown in Figure 3-11. Each LED can be either off, green, amber or red. The description and operating characteristics of each LED is described in Table 3-4. The blink rates for the LEDs are described in Table 3-5. Table 3-6 describes the LED lighting sequence during boot-up.

Table 3-4   LED indicators description and operating characteristics

Indicator	Description	Operation
POWER	Indicated power ON/OFF status	• OFF when no power is applied to the unit • Steady GREEN when power to the unit is normal/in service • Steady RED when a power fault is present
STATUS	Indicates the status of the iRM4451*nn*00-2	• OFF when no power is applied to the unit • Steady GREEN when GPS or 1588V2 timing synchronization lock is achieved • Slow GREEN blink when booting up or shutting down • Steady AMBER when minor fault occurs (hardware or software) • Steady RED when a critical or major fault occurs (hardware or software)
FH1	Indicates the status of the Ethernet fronthaul data Port 1 throughput	• OFF when no power is applied to the unit or when booting • Steady GREEN when port has link and operating at Gigabit Ethernet rate, but there is no Ethernet activity • Slow GREEN when port is operating at Gigabit Ethernet rate and has Ethernet activity • Steady AMBER when less than Gigabit Ethernet mode • RED when a critical fault occurs
FH2	Indicates the status of the Ethernet fronthaul data Port 2 throughput	*Future use*
*Refer to LED callouts in Figure 3-11.		

Table 3-5   LED blink rates

Indicator state	Description
Steady OFF	LED OFF
Steady ON	LED is continuously ON, no interruption
Slow blink	LED ON for about 0.5 s and OFF for about 0.5 s

Table 3-5   LED blink rates

Indicator state	Description
Fast blink	Varying blink rate, noticeably faster than a slow blink rate (used only as a location aid/unit ID)

Table 3-6   LED indicators boot-up sequence

Time (mm:ss)	Indicator name			
	POWER	STATUS	FH1	FH2
—	OFF	OFF	OFF	OFF
00:01	Fast blink	OFF	OFF	OFF
00:02	Steady ON Green	OFF	OFF	OFF
00:03	Steady ON Red	OFF	OFF	OFF
00:04	OFF	OFF	OFF	OFF
00:10	Fast blink	OFF	OFF	OFF
00:11	Steady ON green	OFF	OFF	OFF
00:16	*	OFF	Slow/Fast flash green	OFF
00:60	*	Slow flash green	Slow/Fast flash green	OFF
02:30	Steady ON green	Steady ON green	Slow/Fast flash green	OFF

NOTE: Assumes FH1 is connected and FH2 is not connected. Initial state (—) is power OFF. * means state remains as previously indicated. GPS lock is achieved at 02:30 as indicated by STATUS LED being Steady On green.

3.2.9 Vent port

A gas permeable vent has been installed on the iRM4451*nn*00-2 iRRH to help equalize air pressure inside the enclosure and prevent contaminants such as water, salt and dust from getting inside (see Figure 3-12). The vent fitting has a gas-permeable membrane integrated into a screw-in fitting. It meets the IEC 60529 standard for enclosure ingress protection against particulates and liquids. The vent should function maintenance-free over the lifetime of the iRM4451*nn*00-2.

Figure 3-12   Vent port

4 Installation prerequisites

This section contains information on the documentation, tools, equipment, and conditions required for performing the installation procedure. The document assumes that the target audience has reasonable industry experience, is qualified, and has installed wireless base stations in the past.

4.1 Required tools

A typical telecommunications technician's toolkit is required to complete the iRM4451*nn*00-2 installation. Additional required specialty tools and consumables are listed in Table 4-1.

Table 4-1   Required tools

Required Tools			
ESD wrist grounding strap		Torque screwdriver and assorted bits	
Box cutter		Digital voltmeter	
Torque wrench, open-end, 8 mm		Crimp tool (2 to 8 AWG)	
Socket set, plus additional socket wrench		Wrench, 3/4 in (19 mm)	

Required Tools			
Cordless electric screwdriver		Cable tie tool	
Nylon bridle sling, 2-leg, 2 in (5.1 mm) straps, 6×19 EIPS, or equivalent		Pulley-minimum load-bearing capacity 880 lb (400 kg)	
Punch		Wire stripper	
Rope - minimum breaking strength 600 lb (272 kg)		Self-amalgamating waterproofing tape (e.g., Commscope Miracle Tape, Huber+Suhner Fast-Wrap, RFS CELL-Tape, EasyWrap® tape, etc.)	
Spirit level		Tape measure	
Assorted hook & loop fasteners (for fiber optic cables) and cable ties (for all other applications)		Torque wrench for 7/16 conn, 32 mm, 211 in-lb (25 Nm)	

Required Tools			
Insulating gloves (for lifting hot unit)		Hardhat, eye protection and other safety apparatus	
Eyebolts (McMaster Model 3040T13, or equivalent) M8 ×1.25, 16mm, quantity 2 (lifting) and 1 (guiding) **minimum**		1/2-in drive, 3/4 in (19 mm) extra deep well sockets, 5 in (127 mm) min internal depth. Quantity 2, for accessing mounting bracket M12 bolts.	

4.2 Required site equipment

This section describes the additional interconnecting equipment required for the installation of the Altiostar Networks iRM4451*nn*00-2. These are essentially cables, connectors and fixing arrangements. The specification of these items may need to be customized on site by the Installer (specifically the type and length of cables). Refer to Table 3-2 when ordering and customizing the following items:

• Grounding cable between the iRRH and the local grounding point. Altiostar Networks provides the two-hole lug for crimping onto the cable.

• Power cable between the iRRH and local DC supply. Installer must provide suitable lightning and surge suppression devices on the power line to the unit (minimum 20 kA-rated device recommended). We recommend one lightning and surge suppressor be installed close to the iRRH on the tower/pole/wall and one on the cable entrance just before it enters the facility.

• Optical fiber cables between iRRH and transport network.

Other than lightning and surge suppression devices, Table 4-2 provides a list of the

Installer-supplied interconnection equipment required to install the iRM4451*nn*00-2.

NOTE

Some parts have an order lead-time of up to 10 weeks. It is important that these items be ordered as soon as possible in the planning phases of the iRRH installation so that they are available on-site at the time of installation.

Table 4-2   iRM4451*nn*00-2 iRRH Installer-supplied parts list

Qty	Part number	Part description
Installer-acquired parts for pre-installation requirements		
1	As specified per site requirement	Any splitter/combiner/amp/cable required for shared remote antenna.
1	As specified per site requirement	Power cable, 8 AWG min., shielded, round cable. Refer to Power connector on page 3-6 (Installer orders to length according to site requirement.)
1	L-Com (part no. FODLCMIL-*nn,* or equivalent)	GigE duplex multi-/single-mode fiber-optic cable, OM1 62.5/125, military fiber cable, with dual LC/dual LC terminations, *nn* = length in meters. For additional information. Refer to Fronthaul connectors on page 3-8.
1	As specified per site requirement	AISG RET control cable with 8-pin DIN connector in required length. Refer to RET connector on page 3-8.
1 to 2	As specified per site requirement	4-pr, shielded, outdoor-rated, round alarm cable. For additional information, Refer to Alarms connector on page 3-10.
3 (minimum)	McMaster 3040T13T (or equiv)	Eyebolt, M8x1.25, 16 mm, SS (third eyebolt to be used for control line [guide] attachment).

4.3 Site preparation

It is a *critical* that the conditions in this section must be fulfilled before starting work at the site.

4.4 Site pre-installation visit checklist

To verify site conditions required for the installation of the iRRH are known, a **pre-installation visit**, attended by the Operator's representative, the Installer, Altiostar Networks, and other required parties, must be performed. Tasks required to be accomplished should include, at a minimum, those listed in Table 4-3.

Table 4-3   Site pre-installation visit checklist

Item	Site pre-installation visit checklist	Check
1	Verify Site Installation Plan and installation documentation is available.	
2	Verify health and safety documentation specified by the Operator and Altiostar Networks are understood and installation personnel are trained accordingly.	
3	Know locations of fire equipment, eyewash stations, and evacuation procedures posted for fire/halon discharge.	
4	Know locations of first aid and emergency equipment and installation personnel are familiar with their operation and use.	
5	Verify site authorizations, clearances, and releases from Operator and local authorities are complete.	
6	Verify emergency telephone numbers are posted for fire, police, and ambulance/medical aid.	
7	Verify contact information for the Operator or his representative(s), the Installer, and local authorities are posted.	
8	Verify installation schedule is approved.	
9	Wear approved protective equipment such as hard hats, safety glasses, gloves, etc. when needed.	
10	Verify the installation location of the iRRH meets the mounting requirements indicated in this document.	
11	Verify main power supply is properly installed and tested and capable of supplying the required voltage (−55.2 £ −48.0 £ −43.2 V DC) and current for proper operation of the iRRH.	
12	Verify −48 V DC power cable to the iRRH is labeled and tested as specified in the Site Installation Plan.	
13	Verify recommended size breakers/fuses for the external power source is properly installed and capable of protecting the −48 V DC power to the unit.	
14	Verify earth ground bonding point, for connection of the grounding cable to the iRRH is correctly installed, labeled and tested as specified in the Site Installation Plan.	
15	Determine a safe method to hoist and secure iRRH into position on selected structure and enter into Site Installation Plan.	
16	Verify proper in-line surge protectors are installed, where required, on power and RET cables as specified in the Site Installation Plan.	
17	Verify that the Operator, Installer, Altiostar Networks and all other affected parties are in agreement with the equipment installation location, power source, and grounding location, to meet the installation checklist requirements.	

4.5 Site installation checklist

Verify site conditions required for the installation of the iRRH are known. In addition, the site must be prepared by the Installer in accordance with the Site Installation Guide provided by the Operator which must include, at a minimum, the required tasks in Table 4-4. The Installer or his representative should initial and date the Check box as each item is completed.

Table 4-4   Site installation checklist

Item	Site installation checklist	Check
1	Verify Site Installation Plan and installation documentation is available.	
2	Verify health and safety documentation specified by the Operator and Altiostar Networks are understood and installation personnel are trained accordingly.	
3	Know locations of fire equipment, eyewash stations, and evacuation procedures posted for fire/halon discharge.	
4	Know locations of first aid and emergency equipment and installation personnel are familiar with their operation and use.	
5	Verify site authorizations, clearances, and releases from Operator and local authorities are complete.	
6	Verify emergency telephone numbers are posted for fire, police, and ambulance/medical aid.	
7	Verify Operator or his representative(s), the Installer, and local authorities contact and phone numbers are posted.	
8	Verify installation schedule is approved.	
9	Wear approved protective equipment such as hard hats, safety glasses, gloves, etc. when needed.	
10	Verify pre-installation work specified in the Site Installation Plan is complete.	
11	Verify the installation location of the iRRH meets the mounting requirements indicated in this document.	
12	Verify all required tools required for lifting the iRRH onto structure, and for installation, are available.	
13	Verify all ordered hardware, including that not provided as part of the Altiostar Networks intelligent eNodeB solution, is available and on site.	
14	Verify that the Operator or his representative(s), the Installer, Altiostar Networks, and all other affected parties are in agreement with the equipment installation location, power source, and grounding location, to meet the installation checklist requirements.	

Table 4-4   Site installation checklist

Item	Site installation checklist	Check
15	Verify proper in-line surge protectors are installed, where required, on −48 V DC power and RET cables as specified in the Site Installation Plan.	
16	Verify recommended size wire is installed in the external power source supplying −48 V DC power to the unit.	
17	Verify custom pre-assembled cables, custom cables, wires and other material are properly labeled, installed and tested according to system and site requirements as specified in the Site Installation Plan.	
18	Verify earth grounding of the chassis/rack hosting the iRRH is correctly installed, using the correct size/type wire, and is tested.	
19	Verify main power supply is properly installed and tested and capable of supplying the required voltage (−55.2 £ −48.0 £ −43.2 V DC), and current for proper operation of the iRRH.	
20	Verify all cables are neatly routed through cable ladders, cable trays and ducts, are secured with cable ties/wraps, and dressed according to local practice.	

iRM4451*nn*00-2 iRRH Product Description and Installation Guide

5 Installation overview

This section provides an overview of the installation procedures and instructions for installing the Altiostar Networks iRM4451*nn*00-2 intelligent Remote Radio Head.

All required cabling for grounding, power, fronthaul, RF and optional GPS, are supplied by the Installer, as provided in the Site Installation Plan, and should already be pre-installed with drops to the iRRH location, or according to local practice.

5.1 Installation procedures

The following list describes the top-level iRM4451*nn*00-2 installation procedures. You can instantly navigate to any procedure by clicking on the procedure with the mouse.

5.2 Unpacking the shipping container

The following procedure describes removing the iRRH from the shipping container, inspecting the contents for damage, and what to do if damage is found.

To unpack the shipping container:

1. Verify no shipping damage to box.

   NOTE

   It is important to report damage or material shortages to the shipping carrier while a representative is on site. If concealed damage or material shortages are found at a later time, contact the shipper to make arrangements for inspection and claim filing.

2. Remove packing materials.

   NOTE

   The shipping materials can be recycled. In some regions or countries it is mandatory that packing materials be recycled or re-purposed. Please dispose of shipping material accordingly.

3. Remove equipment from packing material and inspect equipment for shipping damage or missing items.

   ⚠ CAUTION Two person handling required **Assisted carry ONLY!** This object is heavy; over 75 lb. (34.0 kg). Follow instructions when lifting unit from shipping container and hoisting onto mounting bracket. Requires a minimum of two people to lift and hand carry the unit.

   NOTE

   If concealed damage or material shortages are found at a later time, contact the shipper to make arrangements for inspection and claim filing.

5.3 Verifying all parts received

Verify all parts listed in the accessory list in Table 5-5 were received.

Table 5-5   iRM4451*nn*00-2 iRRH parts list

Qty	Altiostar part number	Part description		
1	509-0*n*-0002 (top level)	$n = 2$ Band 7 (2.6 GHz) $n = 3$ Band 4 (AWS) $n = 4$ 66A (AWS & AWS-3) $n = 5$ Band 2 (1.9 GHz) $n = 6$ Band 3 (1.8 GHz)		
1	*n*=2 340-00-0068 *n*=3 340-00-0067 *n*=4 340-00-0066 *n*=5 340-00-0070 *n*=6 340-00-0069	iRM4451*nn*00-2 macrocell (main unit) assy., 4T4R		
1	350-00-0033	**Kit**, accessory, iRRH chassis—2 sub-kits		
	350-00-0007	**Sub-kit #1**: Standard mounting bracket hardware, outdoor		
2	460-00-0014		*Screw, M4-0.7 × 12 mm, cross-head pan, SEMS, SS*	
2	460-00-0020		*Screw stud, M12-1.75 × 168 mm, SS*	
4	495-00-0001		*Washer, flat, M12, max. 24 mm OD, SS*	
4	495-00-0002		*Washer, split, M12, max. 21.1 mm OD, SS*	
4	445-00-0003		*Nut, M12-1.75, SS*	
	350-00-0009	**Sub-kit #2**: Accessory, grounding cable lug		
1	440-00-0033		*Dual-hole grounding lug, 6 AWG, CAT10-5POI*	
3	460-00-0017		*Screw, crosshead pan, M5-0.8 × 10 mm, split/plain washer, SEMS, SS*	
1	100-00-0213		DC power connector, EMI shielded 2-way cable plug, Rosenberger 99S73B-199N1	
1	100-00-0222		Connector, fiber enclosure for fronthaul, fits 4.5–9.0 mm cable, Rosenberger 98Z105-S00	
1	350-00-0037	Kit, GPS antenna		
3	460-00-0012	Fasteners, mounting bracket		
1	195-00-0087	Antenna, GPS, w/ 2 ft (0.6 m) pigtail terminating in Type N-male connector (to SPM GPS connector)		
1	430-00-0032	Mounting bracket, GPS		
1	420-00-0030	Mounting clamp, universal (metal, powder-coated)		
1	420-00-0109	Mounting bracket, universal (metal, powder-coated)		

6 Installing the iRM4451*nn*00-2

This section provides the procedure for installing the iRM4451*nn*00-2 iRRH in remote locations such as on towers, poles, masts, walls, roofs, or other structures utilizing a universal mounting assembly.

Instructions for making connections to external interfaces, cabling, grounding and power are also provided.

6.1 Assembling cables

The Installer will need to order, pre-assemble, and pre-install various cables to the iRM4451*nn*00-2. Refer to Required site equipment on page 4-3.

6.1.1 Verify Installer-supplied −48 V dc power cable

The Installer supplies and pre-assembles the −48 V dc power connection cable according to site requirement. Use an 8 AWG minimum, round, 2-wire with ground, shielded cable rated at 600 V minimum, or equivalent. The maximum recommended power cable length is 328 ft (100 m).

The female plug (Rosenberger PN 99S73B-199N1) for assembly of the dc power cable, is provided with the macro iRRH (see Figure 3-7). The connection configuration for the supply side of the power cable is determined by site specific requirements. Assembly instructions are in the packing box with the plug.

6.1.2 Verify Installer-supplied GigE optical cable

The recommended GigE fiber optic cable is OM1 62.5/125, military fiber cable, with dual LC/dual LC termination (L-Com PN FODLCMIL-*nn*, or equivalent, where *nn* = length in meters). The Installer is responsible for ordering this cable in the appropriate length according to site requirements.

One (1) RFE plug (Rosenberger PN 98Z105-S00) is provided with the macro iRRH. The fiber-optic cable and dual mode fiber connector is housed inside the RFE plug. The RFE plug is essentially a shroud covering the connected fiber-optic connector and SFP optical module inside the bulkhead on the bottom of the iRM4451*nn*00-2 to conform to an IP67 standard, completing the weatherproof seal.

Once assembled, the duplex optical fiber connector is plugged into the optical connector, then the RFE plug is pushed firmly into the fronthaul port flange on the bottom of the iRM4451*nn*00-2 until an audible 'click' is heard indicating the plug is locked into position.

6.1.3 Verify Installer-supplied grounding cable

The grounding cable and ground bonding hardware is supplied by the Installer. The Installer pre-assembles the grounding cable prior to routing to the iRM4451*nn*00-2. However, the grounding terminal lug is supplied with the iRM4451*nn*00-2.

NOTE

The grounding cable to the iRM4451*nn*00-2 should be 3.9 in (10 cm) longer than other cables to the unit. This will maintain ground connection should the cables be pulled off when the unit is extended beyond the length of the cables.

To install ground terminal lug:

1. Cut a 6 AWG (4.11 mm) stranded grounding cable the appropriate length for the iRM4451*nn*00-2 installation.

2. Strip away insulation from one end to expose 3/4 in (19 mm) of bare wire.

3. Crimp the dual-lug grounding terminal (supplied) to the cable using the special-purpose crimp tool specified in Required tools on page 4-1as directed by tool manufacturer instruction manual. Figure 6-1 shows an assembled cable/lug assembly.

Figure 6-1   Grounding terminal lug assembled on grounding cable

6.2 Routing pre-assembled power/GigE optical fronthaul/grounding cables

This procedures provides instructions for routing the pre-assembled −48 V dc power cable, the GigE optical fronthaul cable, and the grounding cable to the iRM4451nn00-2 mounting location before assembling components.

To route cables:

1. Route the cables from the iRM4451*nn*00-2 installation location to cable sources as shown in Figure 6-2.

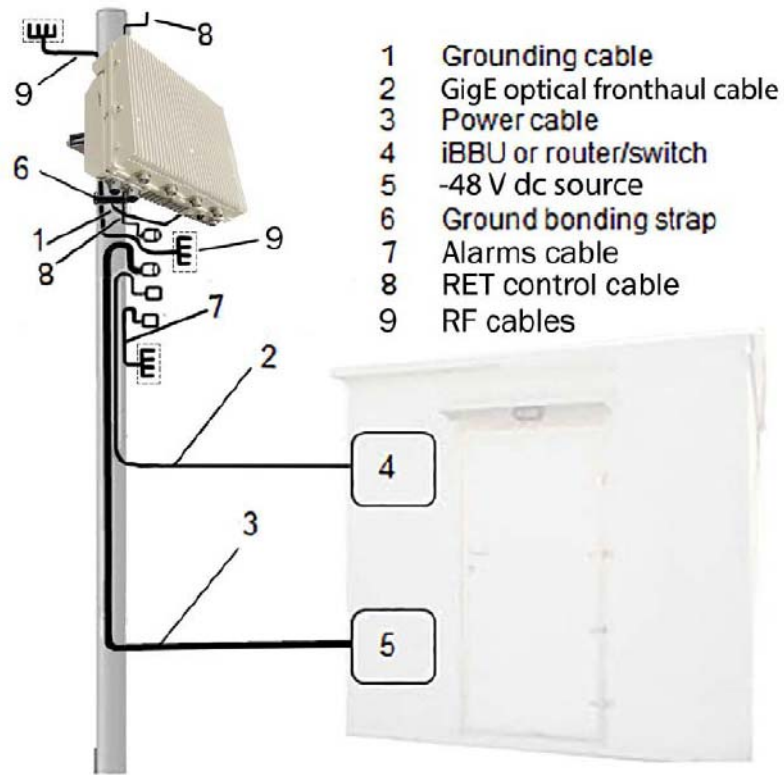|	
1	Grounding cable
2	GigE optical fronthaul cable
3	Power cable
4	iBBU or router/switch
5	-48 V dc source
6	Ground bonding strap
7	Alarms cable
8	RET control cable
9	RF cables

Figure 6-2   iRM4451nn00-2 cable routing

2. Secure and dress all cables according to local practice.

6.3 Installing the mounting bracket

The iRM4451*nn*00-2 is shipped from the factory with the mounting plate pre-installed on the chassis as shown in Figure 6-3.

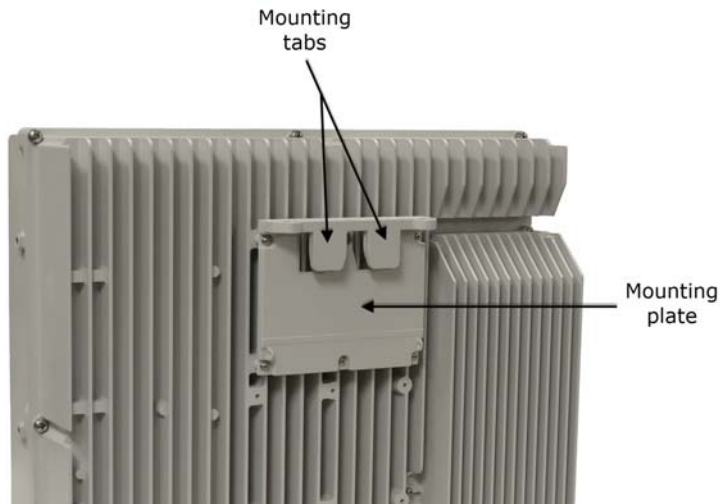**Figure 6-3   iRM4451*nn*00-2 mounting plate**

6.3.1 Mounting on a pole/mast

The following procedure provided instructions for mounting the iRM4451*nn*00-2 on a pole/mast using the supplied mounting bracket assembly.

To install mounting plate on a pole or mast:

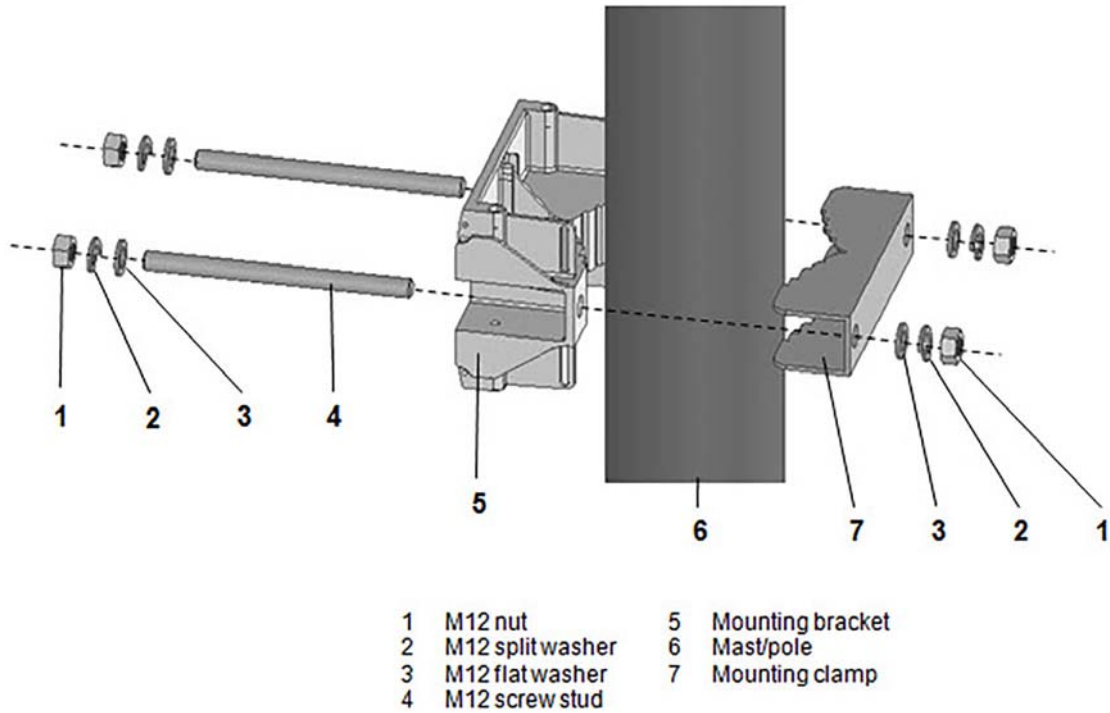1. Install the mounting bracket and mounting clamp onto the pole/mast with mounting hardware as shown in Figure 6-4.

1	M12 nut	5	Mounting bracket
2	M12 split washer	6	Mast/pole
3	M12 flat washer	7	Mounting clamp
4	M12 screw stud		

Figure 6-4   Installing mounting bracket on a pole

NOTE

IMPORTANT! Maintain the parallel orientation of the clamp and bracket while tightening the nuts. This will require alternating tightening the M12-175 nuts on each screw stud until the final torque, 29.5 ft-lb (40 Nm) is achieved.

6.3.2 Mounting on a wall

The following procedure provides instructions for mounting the iRM4451*nn*00-2 to a wall or other flat, vertical surface.

NOTE

The wall where the iRM4451*nn*00-2 is to be mounted must be able to support four times the weight of the unit. The unit can be mounted at a deviation from vertical of ≤3°.

NOTE

The mounting clamp is not used when mounting the iRM4451*nn*00-2 to a wall or other flat surface. In addition, the M12 bolts supplied in the hardware kit are not used for wall-mount applications.

NOTE

The Installer must provide two (2) M12 anchors, designed for outdoor use, that are compatible with the type structure on which the iRM4451*nn*00-2 is to be installed.

To install mounting plate on a wall:

1. Determine the location where the mounting bracket is to be installed.

NOTE

The center-to-center distance for drilling holes to install the selected anchor is 5.5 in (140 mm).

2. Using a tape measure and spirit level, mark where the anchor will be installed using a center punch.
3. Drill the holes where the anchor or fastener will be installed on the wall using a drill bit sized for the anchor or fastener, and insert anchor or fastener.
4. Install the iRM4451*nn*00-2 mounting bracket to the wall using the two (2) selected fasteners and supplied by the Installer.
5. Tighten the fastener to torque specified by the fastener/anchor manufacturer using a torque wrench.

6.4 Hoisting the iRM4451*nn*00-2 on elevated structures

Hoist line eye bolt screw inserts are located on both sides and on top of the unit. The recommended hoist line lift points for the iRM4451*nn*00-2 using the side screw inserts is shown in Figure 6-5. Installing the hoist line lift eyebolts in the screw inserts on the top of the unit (not shown) are also recommended. These are the ONLY recommended points of attachment when hoisting the iRM4451*nn*00-2 into position on elevated structures.

An Installer-supplied 2-leg nylon lift sling is attached to the eye bolts and the iRM4451*nn*00-2 is lifted directly from the packing container to the mounting location.

WARNING

Because of the variation that may exist among mounting environments, the Installer is solely responsible for determining an industry-approved, safe method of hoisting the iRM4451nn00-2 into position onto elevated structures.

NOTE

A tag line, to control sway during the lift, can be attached to either eye bolt, or a third eyebolt can be installed in one of the unused screw inserts located on the sides of the unit.

⚠️ **WARNING**

Be sure to follow all established local practice and safety precautions when hoisting the equipment on elevated structures.

Lifting Eyebolts

McMaster 3040T13
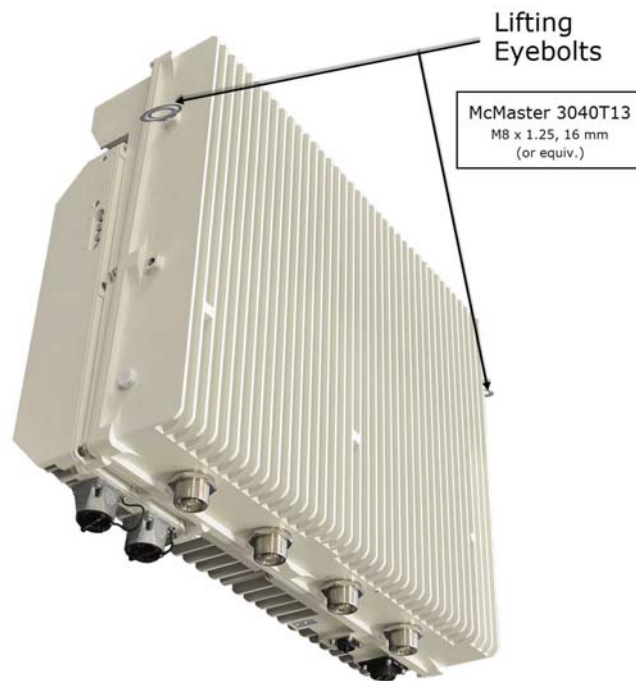M8 x 1.25, 16 mm
(or equiv.)

Figure 6-5   Hoist line carabiner attachment points

6.5 Installing the iRM4451*nn*00-2 on the mounting bracket

This section provides the procedure for installing the iRM4451*nn*00-2 main unit on the installed mounting bracket.

To install iRM4451*nn*00-2 on the mounting bracket:

1. Hang the iRM4451*nn*00-2 chassis on the mounting bracket by aligning the mounting plate tabs on the rear of the chassis to the mounting bracket slots (see Figure 6-6).

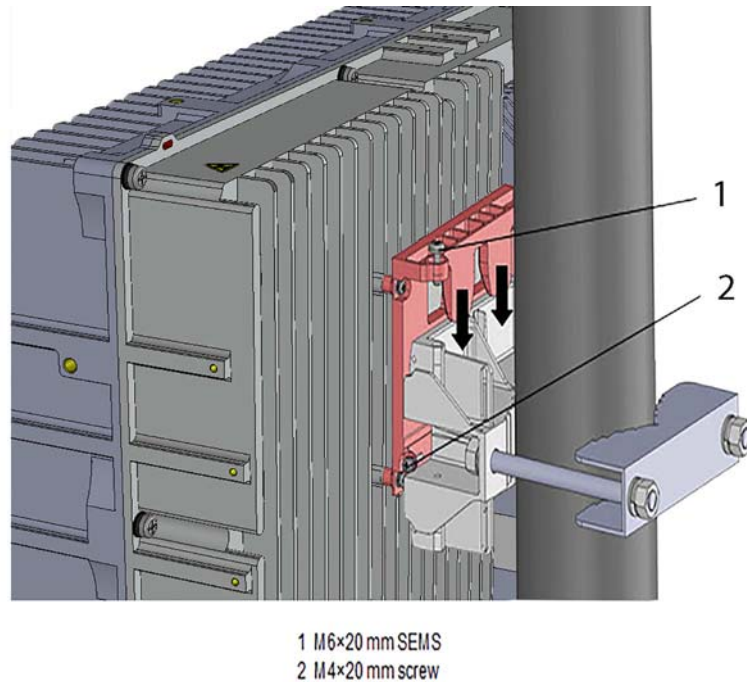1 M6×20 mm SEMS
2 M4×20 mm screw

Figure 6-6   Aligning mounting plate tabs to mounting bracket

2. Lower iRM4451*nn*00-2 onto the mounting bracket and align the tapped screw hole on top of the mounting plate with the tapped screw hole on the mounting bracket.
3. There are two (2) M6 × 20 mm SEMS captive screws on the top of the mounting plate. See Figure 6-6. Start threading the M6 screws into the mounting bracket screws. Do NOT fully tighten.
4. Insert two (2) M4 × 20 mm SEMS screws into the screw holes on either side of the mounting plate.
5. Tighten the M4 screws on the side 13.3 in-lb (1.5 Nm) using a torque wrench.
6. Tighten the M6 screws to 9 in-lb (1 Nm) using a torque wrench.

6.6 Connecting the grounding cable

This section provides the procedure for properly grounding the iRM4451*nn*00-2 to an earth grounding point. Verify that grounding cable/lug assembly is terminated at the other end to a tested earth grounding point according to local practice.

To connect grounding cable:

1. Fasten the dual-hole grounding lug and cable assembly to the iRM4451*nn*00-2 chassis grounding posts using two (2) M5-0.8 screws and washers (supplied by Installer). See Figure 6-7.
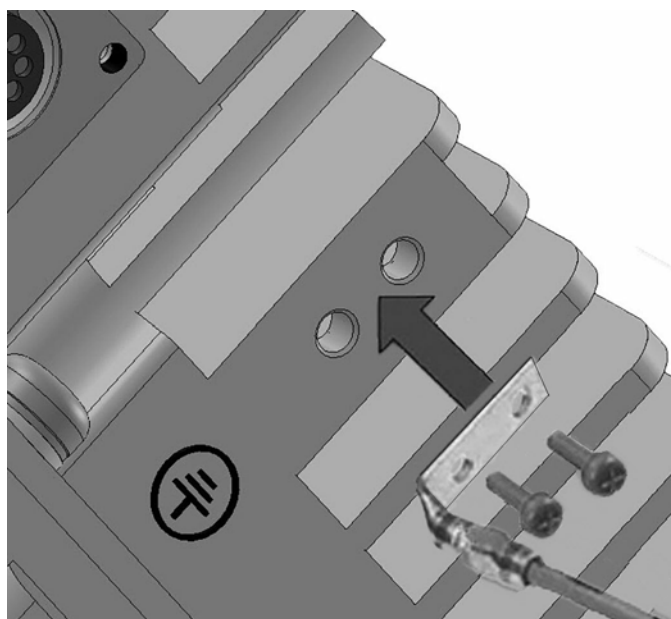

Figure 6-7   Connecting the grounding cable

2. Tighten the bolts to 2.4 ft-lb (3.2 Nm) using a torque screwdriver.

6.7 Connecting the RET cables

This section provides the procedure for connecting the RET cable to the **RET** connector socket.

To connect RET cable:

1. Insert RET cable into keyed 8-pin RET socket on iRM4451*nn*00-2.
2. Twist the ferrule of the RET connector clockwise until it audibly 'clicks' into the locked position.

NOTE

It is recommended that the RET connection be waterproofed using a self-fusing tape made for that purpose. The application of the tape will vary by Installer, so local practice will determine how the tape is applied.

6.8 Connecting the GigE optical fronthaul cables

This section provides the procedure for connecting the GigE optical fronthaul cable to the **FH1** or **FH2** SFP connector sockets. A set of detailed assembly instructions are provided with each Rosenberger Fiber Enclosure. The instructions detail the assembly of the enclosure over duplex fiber-optic cables..

To connect GigE optical fronthaul cables:

1. Remove the captive dust cover of the **FH1** fiber optic cable entry port.
2. Remove the four (4) dust plugs on each of the duplex fiber ends and retain for future use.
3. Insert the duplex into the SFP module recessed inside the **FH1** bulkhead connector until an audible 'click' is heard indicting the fiber is locked into the module.
4. Store any slack of the fiber-optic cable inside the Rosenberger RFE plug to clear if from getting pinched in the process of connecting the RFE plug to the bulkhead connector.
5. Align the rails on the side of the Rosenberger RFE plug and push firmly until an audible 'click' is heard indicating the RFE plug is locked into the bulkhead connector completing the weatherproof seal..
6. If required, repeat step 1 through step 5 for the **FH2** fiber optic cable entry port if two Q-XCO fiber optic cables are used to daisy-chain or sidehaul to another iRM4451nn00-2.

NOTE

The fronthaul Ethernet connections must be waterproofed using a self-fusing tape made for that purpose. Refer to Required tools on page 4-1. Refer to the recommended taping procedure in Section 6.12. The application of the tape may vary by Installer local practice.

6.9 Connecting the RF cables

This section provides the procedure for connecting the 4.3-10 connectorized RF cables to the iRM4451nn00-2 iRRH.

To connect the RF cables:

1. Remove the dust covers from the **ANT1**–**ANT4** RF connectors located on the bottom of the iRRH and retain for future use.
2. Screw the 4.3-10 RF cable coupling nut onto the ANT1 4.3-10 cable connector.
3. Secure the connection by torquing the coupling nut hand tight.
4. Repeat for connectors **ANT2**–**ANT4**.

6.10 Connecting the alarms cable

This section provides the procedure for connecting the alarms cable, terminated at the macro iRRH with a Lumberg 0322 12 circular 12-pin DIN connector, to the iRM4451*nn*00-2 iRRH.

To connect the alarms cable:

1. Remove the captive dust cover from the **ALARMS** connector located on the side of the macro iRRH.
2. Screw the DIN connector coupling nut onto the **ALARMS** connector.
3. Secure the connection by torquing the coupling nut hand tight.

6.11 Connecting the −48 V dc power cable

This section provides the procedure for connecting the −48 V dc power cable to the iRM4451*nn*00-2 power input connector. Detailed instructions on how to assemble the power cable to the Rosenberger power connector are provided with the each plug. Refer to them to install the power connector to the power cable.

NOTE

Power to the −48 V dc power supply cable should be switched off at the breaker before connecting to the iRM4451*nn*00-2 power input connector.

To connect the dc power cable:

1. Plug the Rosenberger quick-disconnect power plug into the power input receptacle labeled **POWER** located on the bottom of the unit by aligning the two bayonet lugs into the slots of the coupling nut.
2. Secure the connection by twisting the coupling nut firmly clockwise by hand until you feel and hear it 'click' into the locked position.

NOTE

It is recommended that the −48 V dc power connection be waterproofed using a self-fusing tape made for that purpose. The application of the tape will vary by Installer, so local practice will determine how the tape is applied.

6.12 Weatherproofing cable connections

This section provides the procedure for additional weatherproofing of all cable connections (power, RET, RF, fronthaul, and alarms) to ensure a weather-tight cable connection is maintained.

To weatherproof cable connections:

1. Weatherproof all cable connections by completely wrapping the cable, the connector on the cable, *and* the connector threads on the equipment itself with

self-fusing tape (refer to Required tools on page 4-1) as shown in Figure 6-8, or according to local practice.

NOTE

To ensure a weather-tight connection, be sure to wrap the entire connection with self-fusing tape. Refer to the recommended taping procedure in Section 6.12.

TIP: It can be hard to remove the self-fusing tape from the connection after it has weathered over time. So as an alternative, some Installers prefer to use electrical tape, such as Scotch Super 33+ (or equivalent), when wrapping the first layer around the cable and connection.
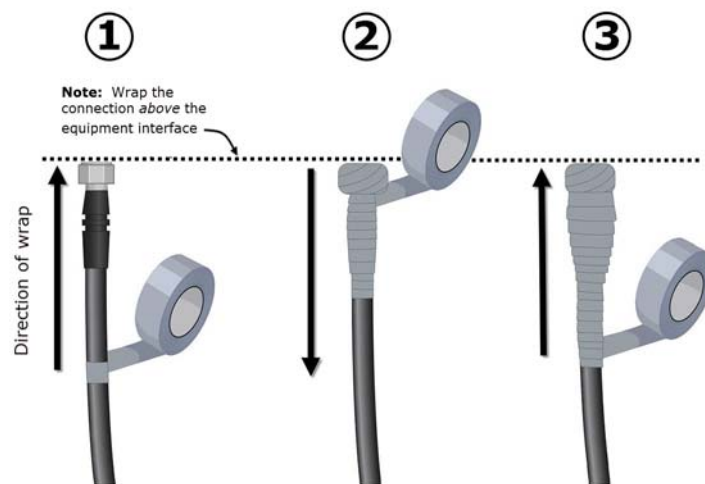

Figure 6-8   Weatherproofing connections using self-fusing tape

6.13 Checking power

This section provides the procedure for verifying power to the iRM4451nn00-2 is connected correctly and operating normally.

NOTE

After applying −48 V dc power and verifying that the iRM4451nn00-2 is functioning properly, leave power to the unit ON.

To check power to the macro iRRU:

1. Switch ON the breaker (or insert the appropriate size and type of fuse) to provide power to the iRM4451nn00-2 iRRH.

2. Verify that the iRM4451nn00-2 powers up as indicated by the LEDs on the side of the iRM4451nn00-2 lighting in the boot sequence provided in Table 3-6.

3. Leave power to the iRM4451nn00-2 ON.

7 Terms, Acronyms and Abbreviations

Term	Description
AWG	American Wire Gauge
AWS	Advanced Wireless Services
BBU	Baseband Unit
BOM	Bill of Materials
CBN	Common Bonding Network
CFR	Code of federal regulations
C-RAN	Cloud-Radio Access Network
DIN	Digital Input
EIPS	Electronics Industry Pallet Specification
EMS	Enterprise Management System
EN	Engineering Note
FO	Fiber Optic
FTTA	Fiber-To-The-Antenna
GigE	Gigabit Ethernet
GPS	Global Positioning System
iBBU	intelligent Baseband Unit
IEC	International Electrical Code
iRRH	intelligent Remote Radio Head
LED	Light Emitting Diode
PN	Part Number
NA	Not Applicable

Term	Description
RET	Remote Antenna Tilt
RF	Radio Frequency
RFE	Rosenberger Fiber Enclosure
RX	Receive
SEMS	Screw and Washer Assemblies
SS	Stainless Steel
TX	Transmit
vBBU	virtual Baseband Unit
VDC or V dc	Voltage direct current

ALTIOSTAR

iRM4451*nn*00-2 iRRH Product Description and Installation Guide

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