

Altiostar Networks iRM2249nn00-1 intelligent Remote Radio Head

Product Description and Installation Guide



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Preface

About the document

This document covers the basic installation of the Altiostar Networks, Inc., iRM2249 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 iRM2249 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.

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 iRM2249 intelligent Remote Radio Head will often be referred to in the generic as the iRM2249 iRRH, iRM2249, or simply the iRRH.

The Altiostar Networks iRB7200 virtual Baseband Unit (vBBU) is a server-based companion unit to the iRM2249 in the Altiostar Networks LTE macro eNodeB solution.

The Operator or Owner of the facility and equipment where the iRM2249 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.



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

iRM2249 available models

Table P-1 iRM2249 iRRH part numbers on page P - ii provides top-level part numbers of available iRM2249*nn*00-*a* models.

Table P-1 iRM2249 iRRH part numbers

Model number	Part number	Description
iRM22490300-1	509-21-0002	iRM2249, Band 3, 45MHz IBW, 2T2R, 60W, MM SFP
iRM22490500-1	509-26-0001	iRM2249, Band 5, Macro, w/GPS, 20MHz IBW
iRM22490700-1	509-22-0002	iRM2249, Band 7, 45MHz IBW, 2T2R, 60W, MM SFP
iRM22491200-1	509-25-0001	iRM2249, Band 12 Macro, w/GPS, 20MHz IBW
iRM22492000-1	509-20-0001	iRM2249, Band 20, 20MHz IBW, 2T2R, 80W, MM SFP

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1 Introduction

1.1 Overview

The iRM2249 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 iRM2249 intelligent Remote Radio Head is based on a distributed architecture with the following two essential elements:

- iRM2249 iRRH
- iRB7200 vBBU, iRB1200 iBBU, or iRB2400 iBBU

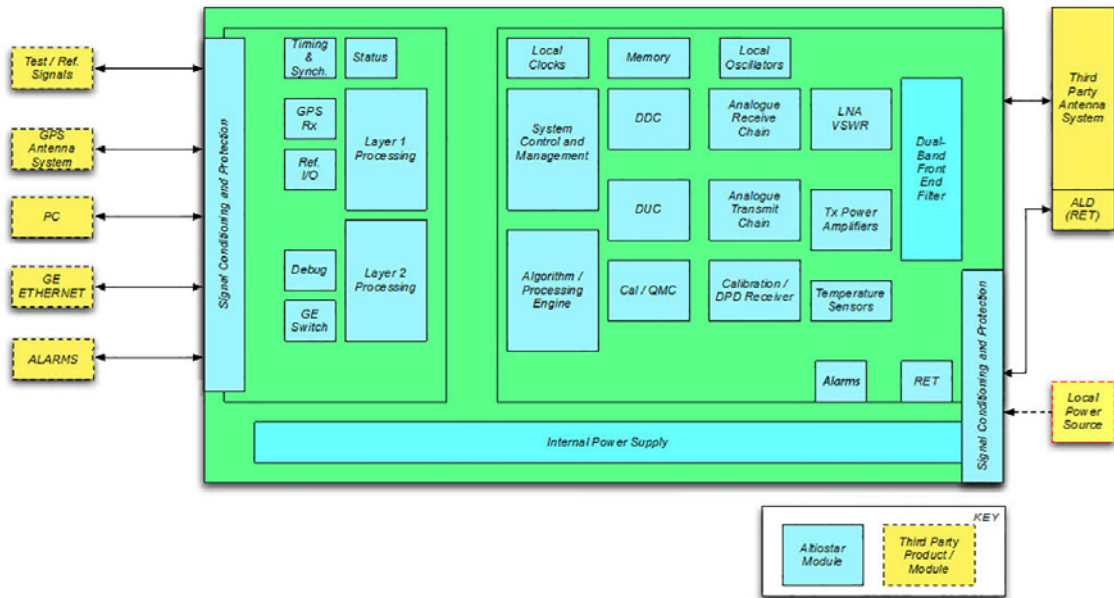
The iRM2249 iRRH is connected to the vBBU through a Gigabit Ethernet (GigE) connection. Connection to other compliant fronthaul devices can also be facilitated using the Ethernet fronthaul port.

The iRM2249 iRRH interconnects with the described Altiostar baseband units which operate within the RAN portion of the LTE wireless network.

The iRM2249 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 iRM2249 iRRH is shown in [Figure 1-1 iRM2249 iRRH functional block diagram](#) on page 1 - 2.

Figure 1-1 iRM2249 iRRH functional block diagram



1.2 Hardware components

The following major circuit cards and components comprise the iRM2249 iRRH. See [Figure 1-1 iRM2249 iRRH functional block diagram](#) on page 1 - 2.

- Signal Processing Module
- Radio Card
- Signal Conditioning and Protection
- Internal power supply
- Front-end Filter
- Fronthaul Interface
- GPS Receiver System
- RF Antenna System
- Local Power Source
- Alarms Interface

The iRM2249 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, dual-carrier, multi 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) and 45 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 bottom of the iRM2249 unit. There are four sets of 2-wire dry contacts that can be software-configured to be normally open or normally closed.

2 Safety requirements

2.1 Overview

This section provides safety precautions that apply to the iRM2249 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 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 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 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.



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.

Safety requirements

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.



HAZARDOUS VOLTAGES!

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



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.



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.*



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.*



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.*



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.*



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.

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



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.*



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 iRM2249 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. There are two independent RF outputs for a 2T2R configuration at 30 W or 40 W per RF path for a total of 60 W or 80 W maximum output power.

The iRM2249 iRRH has connections for -48 V DC power input and Gigabit Ethernet optical fronthaul.

[Figure 3-1 Altiostar Networks iRM2249 iRRH](#) on page 3-1 shows the iRM2249 iRRH.

Figure 3-1 Altiostar Networks iRM2249 iRRH



The Altiostar Networks iRM2249 iRRH can be mounted on a wall, mast or tower using the supplied mounting bracket assembly and mounting plate. [Table 3-1 Altiostar Networks iRM2249 iRRH technical specifications](#) on page 3-2 lists the specifications of the iRM2249 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 iRM2249 iRRH technical specifications

Item	Specification
Physical	
Dimensions (HxWxD) Radio Module SPM Radio+SPM	15.4 x 19.1 x 6.2 in (392 x 485 x 158 mm) 13.8 x 6.4 x 0.9 in (350 x 164 x 24 mm) 15.4x 19.1 x 7.2in (392 x 485x 182mm)
Weight - Excludes brackets	61.7 lb (28.0 kg)
Volume	32.8 L
Electrical	
Input power	-48 VDC (-58 ≤ -48 ≤ -40 VDC)
Typical power consumption	<350W
Maximum power consumption	<400W
BTU output – Typical BTU/hr	945 BTU/hr
BTU output – Maximum BTU/hr	1055 BTU/hr
TRx Configuration	2T2R
Normal RF output power	<ul style="list-style-type: none"> 80W (2 x 40W) for Aldebaran low band 60W (2 x 30W) for Aldebaran high band
Typical current drawn	~ 7A at -48VDC
Maximum current drawn	~ 10A at -40VDC
Power distribution breaker/fuse	15A <i>(At -40 VDC, maximum current is 10A. Per NEC guidelines, breaker should be sized for 125% of continuous load and 100% of non-continuous load. For this class of device as a primarily resistive load, circuit breaker should be a minimum of 15A.)</i>
<p>NOTE:</p> <ul style="list-style-type: none"> Typical conditions include 25 Deg C, 90% Data loading, and power input of -48VDC. Maximum conditions include 55 Deg C, +1dB over the rated power, and power input of -40VDC. Normal conditions include 25 Deg C, 100% Data loading, and power input of -48VDC. The specifications mentioned above are applicable for Aldebaran low band (unless otherwise specified) only. Upon completing the testing, the above specifications will be updated for Aldebaran high band. 	

Table 3-1 Altiostar Networks iRM2249 iRRH technical specifications *(continued)*

Item	Specification
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 iRM2249 iRRH boards and modules

The iRM2249 intelligent Remote Radio Head is an integral unit with no user-accessible boards or modules.

3.2 iRM2249 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–ANT2**), alarm connector, Fronthaul (**FH1/FH2**), Ground (**⊕**), and Remote Electrical Tilt (**RET**).

LEDs for Fronthaul 1 (**FH1**), Fronthaul 2 (**FH2**), **STATUS**, and **POWER** are located on the bottom of the unit.

Connector locations for RF input/output are shown in [Figure 3-2 iRM2249 iRRH RF connectors location](#) on page 3-4. Connector locations for −48 V DC Power and Remote Electrical Tilt are shown in [Figure 3-3 iRM2249 iRRH RET and −48VDC \(power\) connector location](#) on page 3-4. Connector locations for GPS antenna and

fronthaul are shown in [Figure 3-4 iRM2249 iRRH GPS and fronthaul connectors location](#) on page 3-5.

Figure 3-2 iRM2249 iRRH RF connectors location



Figure 3-3 iRM2249 iRRH RET and -48VDC (power) connector location

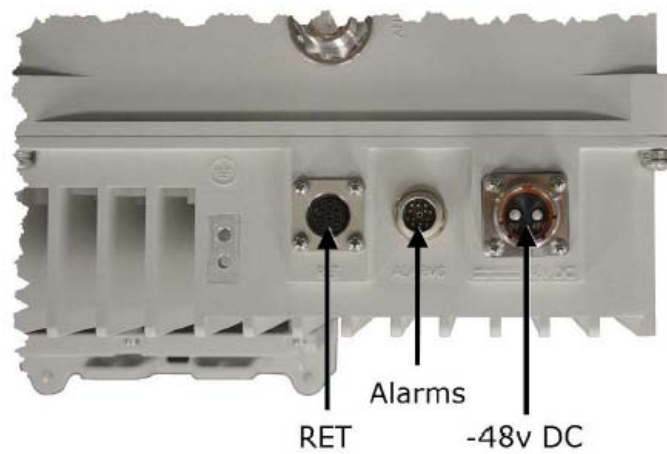


Figure 3-4 iRM2249 iRRH GPS and fronthaul connectors location

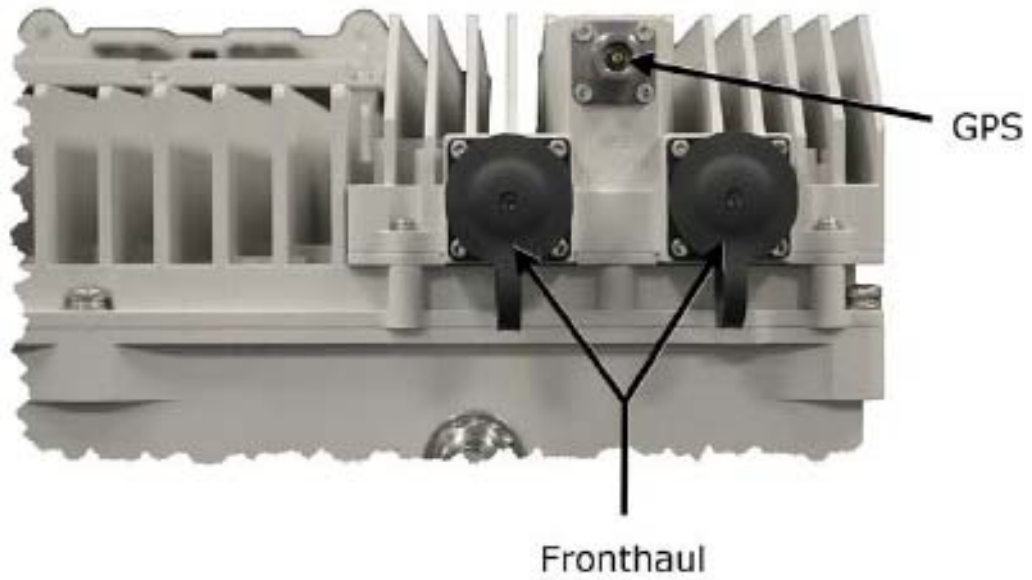



Figure 3-5 iRM2249 iRRH ground connector location



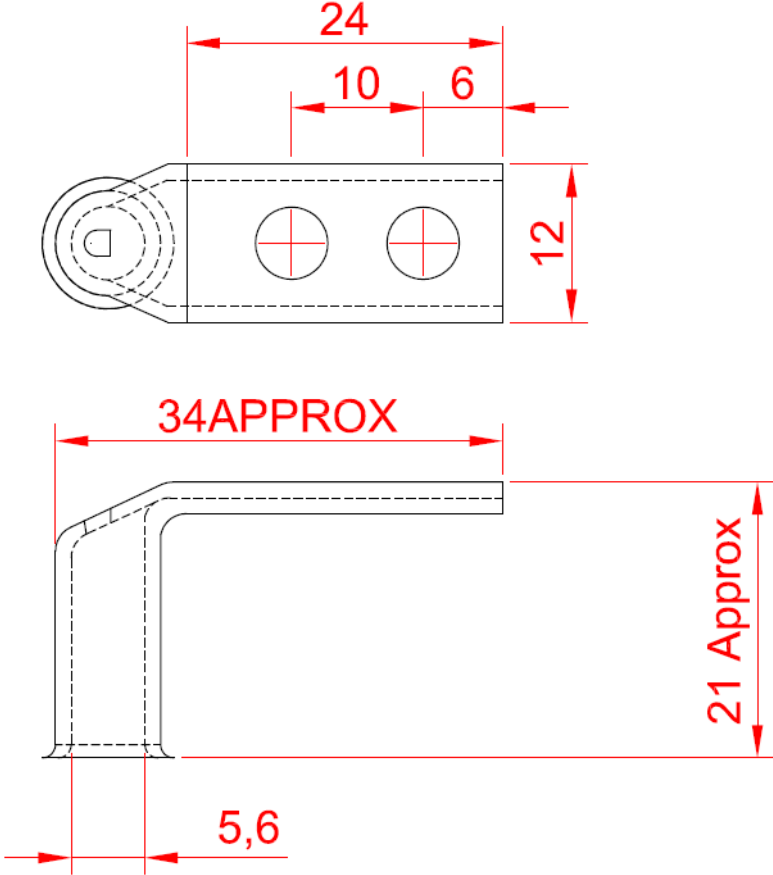
Table 3-2 iRM2249 iRRH connectors

Connection	Control/Connector Type	Quantity	Function
-48v DC	Rosenberger 2-pin connector (PN 99K73E-199N1)	1	Power input
 (GND)	Dual-hole lug terminal	1	Equipment grounding
GPS	N (female), 50 Ω	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 MM SFP modules (PN: FTLF8519P3BTL) or SM SFP module (PN: FTLF1318P3BTL), Rosenberger Fiber Enclosure (RFE) flange (PN: 98Z405-K00)	1	Fronthaul data
FH2		1	
ANT1-ANT2	4.3-10 conn (female) threaded coupling, 50 Ω	2	RF to directional antennas
ALARMS	Lumberg 03 series, 12-pin screw-lock circular DIN connector (Lumberg PN: 0315 12)	1	Alarms aggregation

3.2.1 Grounding terminal lug

The grounding cable and ground bonding hardware is supplied by the installer. The installer pre-assembles the grounding cable prior to routing to the iRM2249. However, the grounding terminal lug is supplied with the iRM2249. [Figure 3-5 iRM2249 iRRH ground connector location](#) on page 3-5 shows the details the grounding terminal lug. To install the grounding terminal lug refer to [Verify Installer-supplied grounding cable](#) on page 6-2.

Figure 3-6 Grounding terminal lug details



3.2.2 GPS connector

There is a 50 Ω GPS N-female connector located on the bottom of the iRM2249 iRRH as shown in [Figure 3-4 iRM2249 iRRH GPS and fronthaul connectors location](#) on page 3-5.

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).

3.2.3 RF connectors

There are four 50 Ω 4.3-10 female RF jacks that terminate on the bottom of the iRM2249 (see [Figure 3-2 iRM2249 iRRH RF connectors location](#) on page 3-4). They are marked, from left to right, **ANT1** through **ANT2**. 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.

3.2.4 Power connector

-48 V DC power to the iRM2249 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 input pins are isolated from the chassis. The power connector pin assignments, as viewed from the bottom of the iRM2249, are shown in [Figure 3-7 -48 V DC 2-pin Rosenberger bulkhead jack](#) on page 3-8.

Figure 3-7 -48 V DC 2-pin Rosenberger bulkhead jack



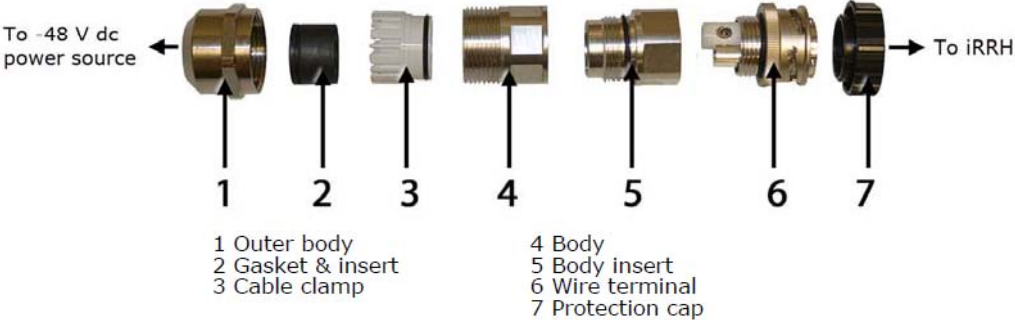
The isolated input allows the iRRH to be connected with a 2-wire or 3-wire supply. Altistar recommends a 2-wire connection with the +ve connection referenced to chassis ground at the power connector. This is indicated in [Figure 3-7 -48 V DC 2-pin Rosenberger bulkhead jack](#) on page 3-8. To facilitate the 2-wire connection, the supplied cable connector has the positive cable terminal connected to the connector body.

The Rosenberger 99S73B-199N1 cable connector supports the 2-wire connection. If an isolated supply (3-wire connection) is required, then an alternative Rosenberger 99S73J-199N1 cable connector is available.

The mating plug (Rosenberger 99S73B-199N1) 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.

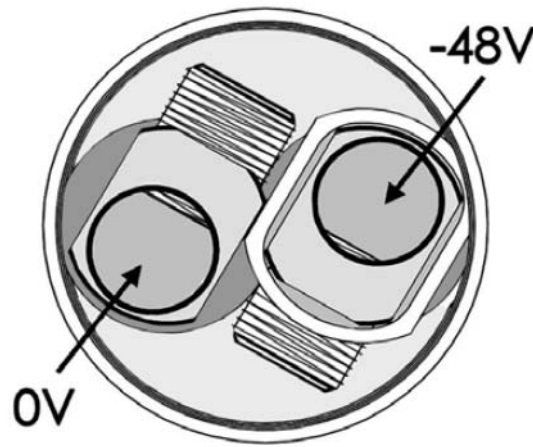
The iRM2249 comes supplied with an unconnectorized Rosenberger plug (99S73B-199N1) in a kit ([Figure 3-8 Rosenberger -48 V DC power plug \(exploded view\)](#) on page 3-9). The Installer assembles the cable onto the plug. Assembly instructions (MA_99A5) are found in the kit with the mating plug.

Figure 3-8 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 (an Installer supplied and assembled task) is shown in [Figure 3-9 Cable connection for supplied 2-pin Rosenberger plug](#) on page 3-10.

Figure 3-9 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.

Instructions for the connector assembly are included in the box. The Installer must assemble the cable on site in a length ordered according to the site requirement. Use the cable HUBER and SUHNER with part number 85013657 or equivalent.

The power cable length should be decided based on the position of the iRRH and the DC power supply. Ensure the voltage input at the iRRH power supply connector to be in the range of -40VDC to -58VDC. The maximum length of the power cable should not exceed 100m to minimize the voltage drop across the cable. The Rosenberger connector with part number 99S73B-199 or equivalent is used with the cable. Refer to the Altiostar cable assembly drawing 360-00-0272 for details.

For assembly instructions of the power connector and cable, refer to [Assembly instructions for 2-pin power connector and cable](#) on page A-1.

The following points list the power cable recommendations:

- Cable should be a 8 AWG minimum (to minimize any voltage drop in the DC feed), round, 2-wire, shielded (recommended) / unshielded /co-axial cable rated at 600 V minimum, or equivalent.
- The connector can support cables in the range AWG8-AWG16. Hence, smaller gauge cables could be used for short feed lengths.
- Cable should have Copper or Aluminum wire gauge of approximately 10mm² with 2 cores.

- Cable should support current per conductor >40A and resistance between 1.83 ohm/Km to 3.08 ohm/Km.
- Cable temperature range: -40degC to +90degC.
- Cable Standard: IEC 60228 class 2.
- Outer cable diameter should be in the range of 7mm to 17mm.
- Cable wires carry -48VDC and RTN.

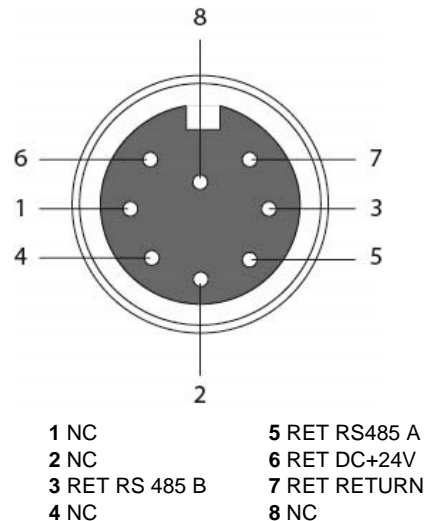
The following points list the power connector recommendations:

- Rosenberger type power connector (99S73B-199) is always used and comes pre-fitted to the iRRH from manufacturing.
- EMI shielded connector with a metallic body.
- 2 pins, -48VDC and RTN.
- The connector is designed so that the braided shield engages with the metallic connector assembly to provide continuous shielding.
- RTN terminal connected to the housing.
- Use common single point grounding.

3.2.5 RET connector

The **RET** (Remote Electrical Tilt) bulkhead connector provides the capability of electrical antenna control to all antennas connected to the iRM2249. Pin assignments for the **RET** standard 8-pin DIN connector is shown in [Figure 3-10 RET standard 8-pin DIN connector](#) on page 3-11. The connector is keyed to prevent mis-mating. The connector is fastened by turning the coupling nut clockwise until hand tight.

Figure 3-10 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 iRM42249 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.

3.2.6 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 ports, labeled **FH1** and **FH2**, are located on the bottom of the iRM2249 iRRH (see [Figure 3-4 iRM2249 iRRH GPS and fronthaul connectors location](#) on page 3-5). Connector **FH1** is intended for fronthaul support. **FH2** is used to daisy-chain sidehaul support to up to one other iRM2249.



NOTE

Altiostar recommends the use of MM SFP module from Finisar – PN: **FTLF8519P3BTL** or SM SFP module from Finisar – PN: **FTLF1318P3BTL** for the **FH1** and **FH2** GigE ports.

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 3-11 Rosenberger RFE fiber-optic enclosure](#) on page 3-13 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.

For assembly instructions of the Rosenberger Fiber Enclosure, refer to [Assembly instructions for Rosenberger Fiber Enclosure](#) on page A-4.

Figure 3-11 Rosenberger RFE fiber-optic enclosure



1	Threaded sealing nut	4	Plug body
2	Split grommet	5	LC-LC duplex fiber/connector
3	Clamping claw	6	Bulkhead connector

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, 10.0 m in length and is provided by L-Com (part no. FODLCMIL-10, or equivalent).



Remove the dust cap only when ready to connect the cable to the iRM2249.

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.

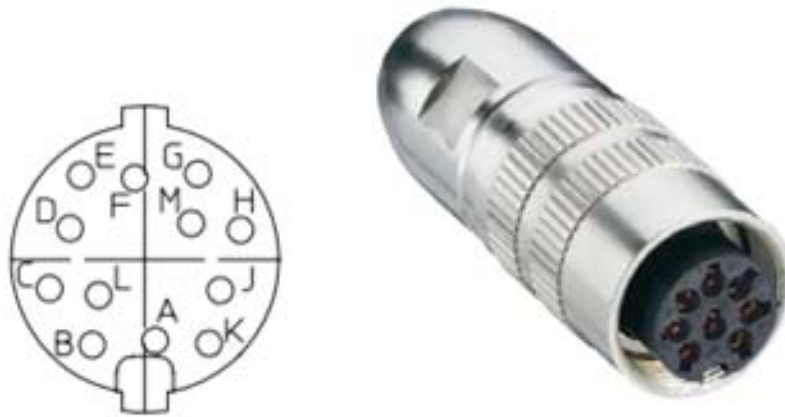
3.2.7 Alarms connector

The **ALARMS** connector in the iRM2249 iRRH comes pre-fitted with a Lumberg 03 series, 12-pin screw-lock circular DIN male type connector (LUMBERG PN: 0315 12). The **ALARMS** connector is located on the bottom of the iRM2249 and is used for aggregating alarms from equipment near the macro iRRH.

Alarm cables are assembled with a circular DIN female connector (refer to [Figure A-6 Alarms connector and cable assembly instructions](#) on page A-5) and then connected to an external alarm connector on the iRM2249 (as per guidelines given in [Connecting the alarms cable](#) on page 6-13). The external female type connector and alarms cable should be procured by the operator. AltioStar recommends to use IP68 and ROHS compliant female, 360 degree shielded connector; one compatible connector is Lumberg with part number 0322 12.

The Lumberg 0322 12 connector and pin assignment is shown in [Figure 3-12 Lumberg 0322 12 connector and pin assignment](#) on page 3-14.

Figure 3-12 Lumberg 0322 12 connector and pin assignment



For exploded view of the Lumberg 0322 12 connector, refer to [Figure 3-13 Lumberg 0322 12 connector exploded view](#) on page 3-14.

Figure 3-13 Lumberg 0322 12 connector exploded view



The compatible alarms cable must be a 4-pair, 23–24 AWG (0.26–0.20 mm²) with cable OD 4–8 mm, shielded, ruggedized, oil resistant, and outdoor rated at –40° to 131° F (–40° to 55° C), or equivalent.

Pin assignments of the pre-fitted connector on the iRRH are shown in [Table 3-3 Lumberg 0315 12 alarm connector details](#) on page 3-15.

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.

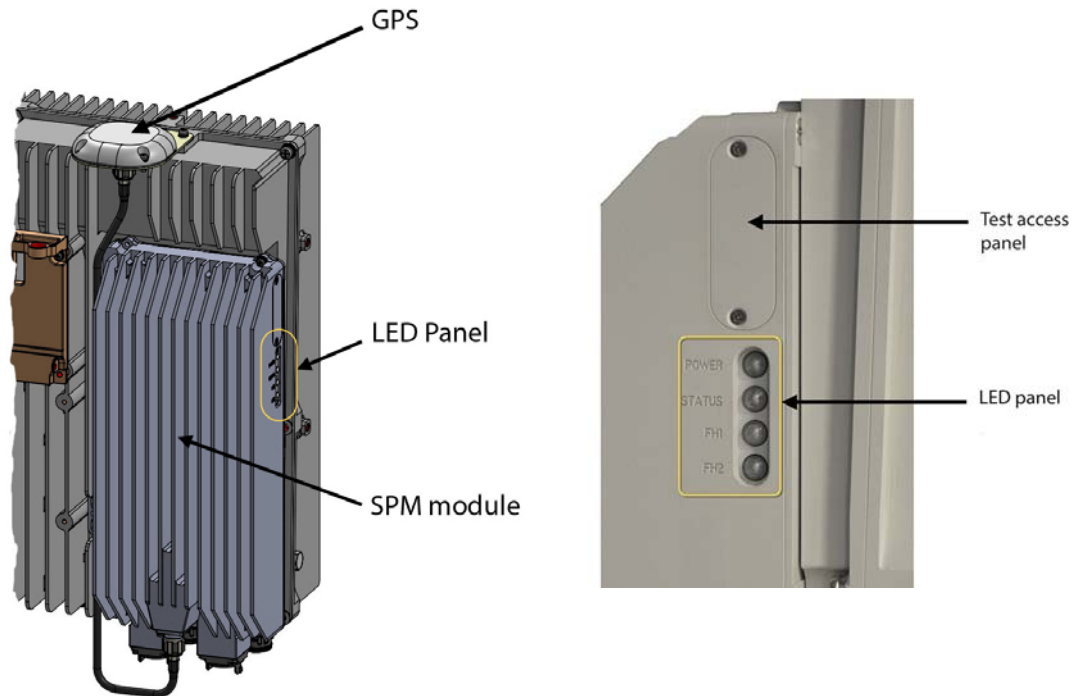
3.2.8 Access panel (*factory use only*)

An access panel ([Figure 3-14 iRM2249 SPM module, Test Access Panel and LED panel](#) on page 3-16) is located on the SPM module next to the LEDs. This panel is for factory use only.



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 3-14 iRM2249 SPM module, Test Access Panel and LED panel



3.2.9 LED indicators

There are four LED indicators located on the right side of the iRM2249 iRRH as shown in [Figure 3-14 iRM2249 SPM module, Test Access Panel and LED panel](#) on page 3-16. Each LED can be either off, green, amber or red. The description and operating characteristics of each LED is described in [Table 3-4 LED indicators description and operating characteristics](#) on page 3-17. The blink rates for the LEDs are described in [Table 3-5 LED blink rates](#) on page 3-17. [Table 3-6 LED indicators boot-up sequence](#) on page 3-18 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	<ul style="list-style-type: none"> • 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 iRM2249	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<i>Future use</i>

*Refer to LED callouts in [Figure 3-14 iRM2249 SPM module, Test Access Panel and LED panel](#) on page 3-16.

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 (continued)

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.

3.2.10 Vent port

A gas permeable vent has been installed on the iRM2249 iRRH to help equalize air pressure inside the enclosure and prevent contaminants such as water, salt and dust from getting inside (see [Figure 3-15 Vent port](#) on page 3-19). 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 iRM2249.

Figure 3-15 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 iRM2249 installation. Additional required specialty tools and consumables are listed in [Table 4-1 Required tools](#) on page 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)	

Table 4-1 Required tools (continued)








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)	

Table 4-1 Required tools (continued)

Required Tools			
Insulating gloves (for lifting hot unit)		Hardhat, eye protection and other safety apparatus	
Eyebolts (McMaster Model 3040T13, or equivalent) M8 x1.25, 16mm, quantity 2 (lifting) and 1 (guiding) <i>minimum</i>		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 iRM2249. 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 iRM2249 iRRH connectors](#) on page 3-6 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 iRM2249 iRRH Installer-supplied parts list](#) on page 4-4 provides a list of the Installer-supplied interconnection equipment required to install the iRM2249.



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 iRM2249 iRRH Installer-supplied parts list

Qty	Part	Part number	Part description
Installer-acquired parts for pre-installation requirements			
1	Splitter/combiner/amp/cable	As specified per site requirement	Any splitter/combiner/amp/cable required for shared remote antenna.
1	Power cable	As specified per site requirement	Power cable, 8 AWG min., shielded, round cable. Refer to Power connector on page 3-8 (Installer orders to length according to site requirement.)
1	GigE duplex multi-/singlemode fiberoptic cable	L-Com (part no. FODLCMIL- <i>nn</i> , or equivalent)	GigE duplex multi-/single-mode fiber-optic cable, OM1 62.5/125, military fiber cable, with dual LC/dual LC terminations, length sized to site requirement (model number shown is for 10 m cable). For additional information. Refer to Fronthaul connectors on page 3-12.
1	AISG RET control cable	As specified per site requirement	AISG RET control cable with 8-pin DIN connector in required length. Refer to RET connector on page 3-11.
1 per 4 External alarms	Alarm cable	As specified per site requirement	4-pair, shielded, outdoor-rated, round alarm cable. For additional information, Refer to Alarms connector on page 3-14.
3 (min)	Eyebolt for lifting	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, Altistar Networks, and other required parties, must be performed. Tasks required

to be accomplished should include, at a minimum, those listed in [Table 4-3 Site pre-installation visit checklist](#) on page 4-5.

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 ($-58 \leq -48.0 \leq -40$ 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 Site installation checklist](#) on page 4-6.

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.	
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.	

Table 4-4 Site installation checklist (*continued*)

Item	Site installation checklist	Check
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 ($-58 \leq -48.0 \leq -40$ 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.	

5 Installation overview

This section provides an overview of the installation procedures and instructions for installing the Altiostar Networks iRM2249 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 iRM2249 installation procedures. You can instantly navigate to any procedure by clicking on the procedure with the mouse.

- [Unpacking the shipping container](#) on page 5-1
- [Verifying all parts received](#) on page 5-2
- [Assembling cables](#) on page 6-1
- [Verify Installer-supplied –48 V DC power cable](#) on page 6-1
- [Verify Installer-supplied GigE optical cable](#) on page 6-1
- [Verify Installer-supplied grounding cable](#) on page 6-2
- [Routing pre-assembled power/GigE optical fronthaul/grounding cables](#) on page 6-3
- [Mounting on a pole/mast](#) on page 6-4
- [Mounting on a wall](#) on page 6-5
- [Hoisting the iRM2249 on elevated structures](#) on page 6-6
- [Installing the iRM2249 on the mounting bracket](#) on page 6-7
- [Connecting the grounding cable](#) on page 6-10
- [Connecting the RET cables](#) on page 6-11
- [Connecting the GigE optical fronthaul cables](#) on page 6-12
- [Connecting the RF cables](#) on page 6-12
- [Connecting the alarms cable](#) on page 6-13
- [Connecting the –48 V DC power cable](#) on page 6-13
- [Weatherproofing cable connections](#) on page 6-14
- [Checking power](#) on page 6-15

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.

Procedure 5-1 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.



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 Verify all parts listed in the accessory list in are received.](#) on page 5-2 are received.

Table 5-1 iRM2249 iRRH parts list

Qty	Altiostar part number	Part description
1	509-20-0001 509-21-0002 509-22-0002 509-25-0001 509-26-0001	iRM2249, Band 20, 2T2R, 80W, MM SFP iRM2249, Band 3, 2T2R, 60W, MM SFP iRM2249, Band 7, 2T2R, 60W, MM SFP iRM2249, Band 12 Macro, w/GPS iRM2249, Band 5, Macro, w/GPS
1	340-00-0075 340-00-0074 340-00-0073 340-00-0094 340-00-0102	TOP LVL ASSY, ALDEBARAN, RADIO, 800 TOP LVL ASSY, ALDEBARAN, RADIO, BAND 3, 1800 TOP LVL ASSY, ALDEBARAN, RADIO, 2600 TOP LVL ASSY, ALDEBARAN, RADIO, Band 12 (700MHz) TOP LVL ASSY, ALDEBARAN, RADIO, Band 5 (850MHz)
1 per Radio module	350-00-0033	KIT,ACCESSORY, iRRH CHASSIS
1	100-00-0213	Conn, EMI Shielded 2 Way Cable Plug, 99S73B-199N1
2	100-00-0222	Conn, Fiber Enclosure, Fits 4.5-9.0mm Cable, UL94-V0, IP67, -40-70C

Table 5-1 iRM2249 iRRH parts list (continued)

Qty	Altiostar part number	Part description
1	350-00-0007	KIT,STANDARD KIT,MOUNT HARDWARE & SCREWS,OUTDOOR EQUIPMENT
1	402-00-0017	LBL, Part Number and Revision, 44.45mm X 19.05mm, White.Polyesther
4	445-00-0003	NUT,M12-1.75,18-8 STAINLESS STEEL
1	455-00-0022	PKG, RECLOSABLE CLEAR BAG 2x8IN 4 MIL THK
2	460-00-0014	SCREW,M4X0.7,12MM,PHILIPS PAN HEAD,SPLIT/PLAIN WASHER,SEMS,316 STAINLESS STEEL,PLAIN FINISH
2	460-00-0020	SCW,M12-1.75 x168MM STUD,18-8 STAINLESS STEEL
4	495-00-0001	WSH,PLAIN,M12,OD 24MM MAX,T=2.5MM MAX,18-8 STAINLESS STEEL
4	495-00-0002	WSH,SPLIT,M12,OD 21.1MM MAX,T=2.5MM MAX 18-8 STAINLESS STEEL
1	350-00-0009	KIT,ACCESSORY KIT,LUGS & NUTS,RRH
1	402-00-0017	LBL, Part Number and Revision, 44.45mm X 19.05mm, White. Polyesther
1	440-00-0033	LUG, #6 AWG, 2 HOLE, 10MM BOLT SP, 24MM L, 90 DEG, COPPER, ELECTRO TIN PL
1	455-00-0023	PKG, RECLOSABLE CLEAR BAG 2x2IN 4 MIL THK
3	460-00-0017	SCREW,M5-0.8 X10MM,PHILIPS PAN HEAD,SPLIT/PLAIN WASHER,SEMS,316 STAINLESS STEEL,PLAIN FINISH
1	402-00-0017	LBL, Part Number and Revision, 44.45mm X 19.05mm, White. Polyesther
1	455-00-0024	PKG, RECLOSABLE CLEAR BAG 6x10IN 4 MIL THK
2 per Radio module	402-00-0033	LBL, PACKAGING BOX, GENERIC
1 per Radio module	420-00-0030	FABM,PRESSED,AUXILLARY POLE BRACKET,4T4R,RRH,10W-PATH,2300MHZ
1 per Radio module	420-00-0109	FABM, CAST MACHINED, UNIVERSAL MOUNT BRACKET, OUTDOOR EQUIPMENT
1 per Radio module	456-00-0020	Pkg Set, Aldebaran Chassis and Shield, Skid,Top/Bottom pads,Corrugated box w/artwork

6 Installing the iRM2249

This section provides the procedure for installing the iRM2249 macro 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 iRM2249. 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 –48VDC power connection cable. Use an 8 AWG minimum, round, 2-wire shielded cable rated at 600 V minimum. The power cable length should be decided based on the position of the iRRH and the DC power supply. Ensure the voltage input at the iRRH power supply connector to be in the range of -40VDC to -58VDC. The maximum length of the power cable should not exceed 100m to minimize the voltage drop across the cable.

The female plug (Rosenberger PN 99S73B-199N1), for assembly of the DC power cable, is provided with the iRM2249 iRRH. The connection configuration for the supply side of the power cable is determined by site specific requirements.

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-xx, or equivalent, where xx=length of cable 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 iRM2249 to conform to an IP67 standard, completing the weatherproof seal.

The RFE plug is pushed firmly into the fronthaul port flange on the bottom of the iRM2249 until it clicks into the locked 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 iRM2249. However, the grounding terminal lug is supplied with the iRM2249.



NOTE

The grounding cable to the iRM2249 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.

Procedure 6-1 To install ground terminal lug

1. Cut a 6 AWG (4.11 mm) stranded grounding cable the appropriate length for the iRM2249 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 a typical telecommunications technician's toolkit. Additional required specialty tools and consumables are listed in [Table 4-1 Required tools](#) on page 4 - 1. [Table 6-1 Grounding terminal lug assembled on grounding cable](#) on page 6 - 2 shows an assembled cable/lug assembly.

Figure 6-1 Grounding terminal lug assembled on grounding cable



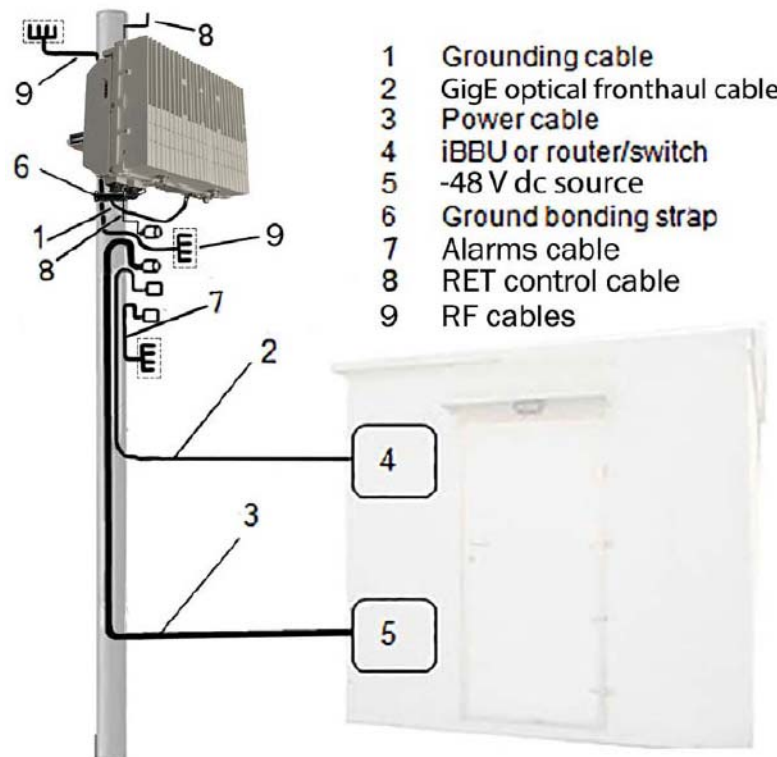
6.2 Routing pre-assembled power/GigE optical fronthaul/grounding cables

This procedure provides instructions for routing the pre-assembled -48 V DC power cable, the GigE optical fronthaul cable, and the grounding cable to the iRM2249 mounting location before assembling components.

Procedure 6-2 To route cables

1. Route the cables from the iRM2249 installation location to cable sources as shown in [Figure 6-2 iRM2249 cable routing](#) on page 6-3.

Figure 6-2 iRM2249 cable routing

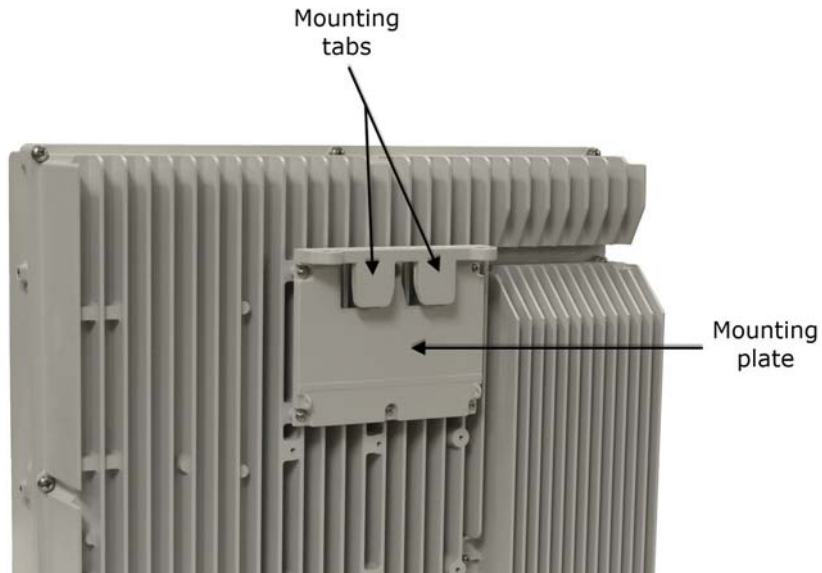


2. Secure and dress all cables according to local practice.

6.3 Installing the mounting bracket

The iRM2249 is shipped from the factory with the mounting plate pre-installed on the chassis as shown in [Figure 6-3 iRM2249 mounting plate](#) on page 6-4.

Figure 6-3 iRM2249 mounting plate

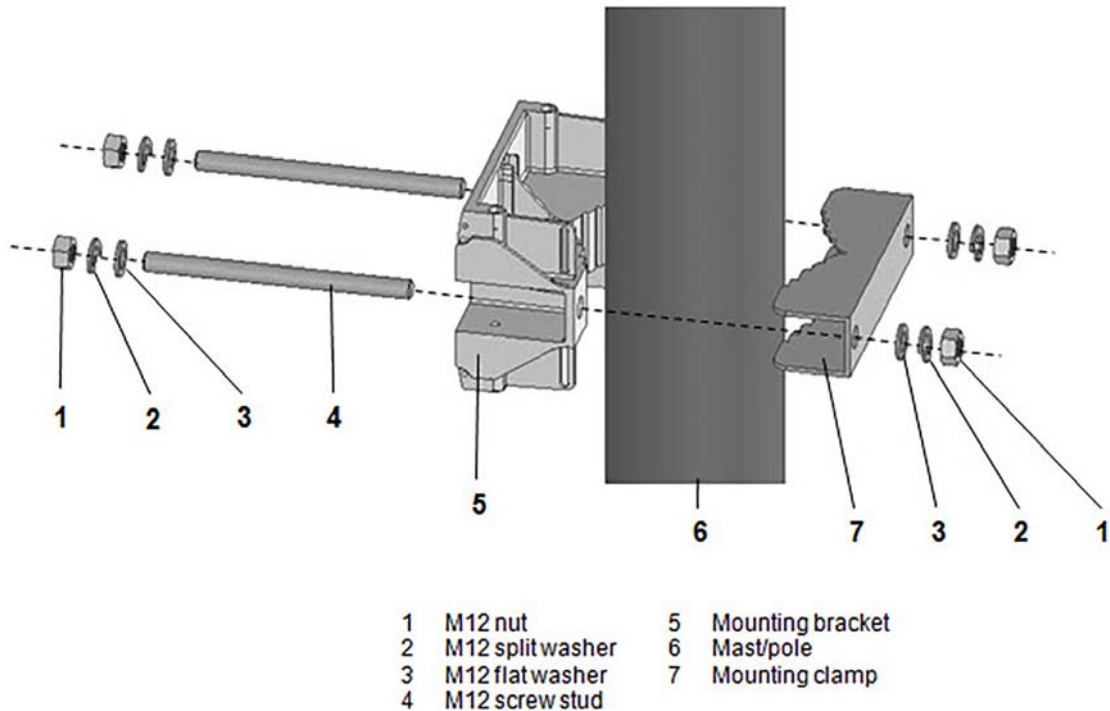


6.3.1 Mounting on a pole/mast

The following procedure provided instructions for mounting the iRM2249 on a pole/mast using the supplied mounting bracket assembly.

Procedure 6-3 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 Installing mounting bracket on a pole](#) on page 6-5.

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 M12-1.75 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 iRM2249 to a wall or other flat, vertical surface.

**NOTE**

The wall where the iRM2249 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 $\leq 3^\circ$.



NOTE

The mounting clamp is not used when mounting the iRM2249 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 iRM2249 is to be installed.

Procedure 6-4 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 iRM2249 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 iRM2249 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 iRM2249 using the side screw inserts is shown in [Figure 6-5 Hoist line carabiner attachment points](#) on page 6-7. 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 iRM2249 into position on elevated structures.

An Installer-supplied 2-leg nylon lift sling is attached to the eye bolts and the iRM2249 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 iRM2249 into position onto elevated structures.

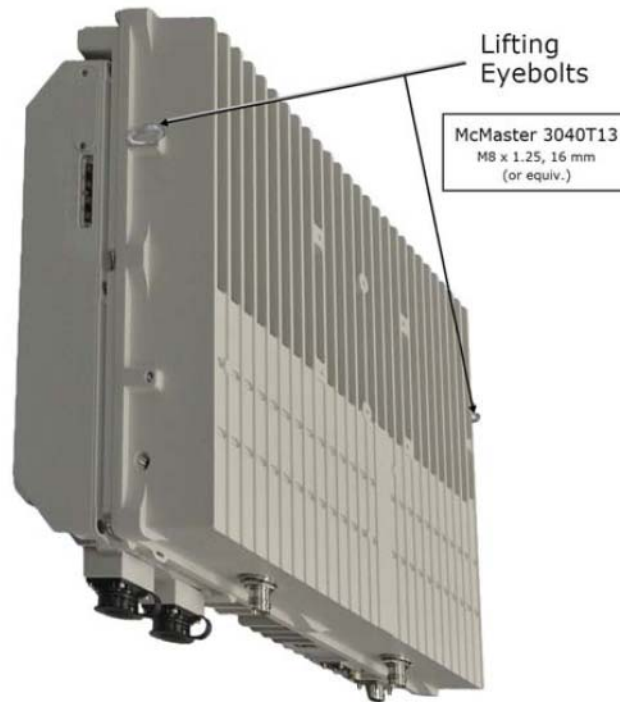
**NOTE**

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.

Figure 6-5 Hoist line carabiner attachment points



6.5 Installing the iRM2249 on the mounting bracket

This section provides the procedure for installing the iRM2249 main unit on the installed mounting bracket.

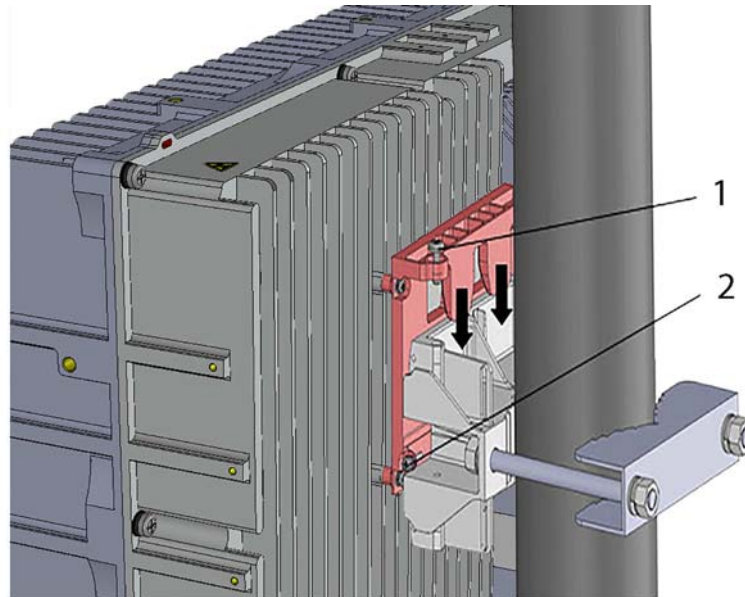
**NOTE**

While installing the iRM2249 iRRH, care must be taken to ensure that the unit is vertically mounted with sufficient gap around the unit to allow for convection cooling. Also, ensure that the GPS antenna has a clear view of the sky for maximum signal reception.

Procedure 6-5 To install iRM2249 on the mounting bracket

1. Hang the iRM2249 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 Aligning mounting plate tabs to mounting bracket](#) on page 6-8).

Figure 6-6 Aligning mounting plate tabs to mounting bracket



1 M6×20 mm SEMS
2 M4×20 mm screw

2. Lower iRM2249 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 Aligning mounting plate tabs to mounting bracket](#) on page 6-8). 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.

6.5.1 General instructions and clearances upon installing the iRM2249 on the mounting bracket

Refer to the following points for general instructions and clearances upon installing the iRM2249 on the mounting bracket:

- The mounting bracket supports mounting on poles between 60mm and 120mm diameter.
- Ensure that the GPS antenna has a clear view of the sky for maximum signal reception.
- The unit can operate in accordance within stated ambient temperature range as long as it is mounted correctly (vertically) and air flow across fins due to natural convection is not impeded. Specific configurations where this may be an issue can be evaluated and or simulated by Altistar.
- For mounting clearances on pole or mast refer to [Figure 6-7 iRM2249 mounting clearances on pole or mast](#) on page 6-9 and for mounting clearances on wall refer to [Figure 6-8 iRM2249 mounting clearances on wall](#) on page 6-10.

Figure 6-7 iRM2249 mounting clearances on pole or mast

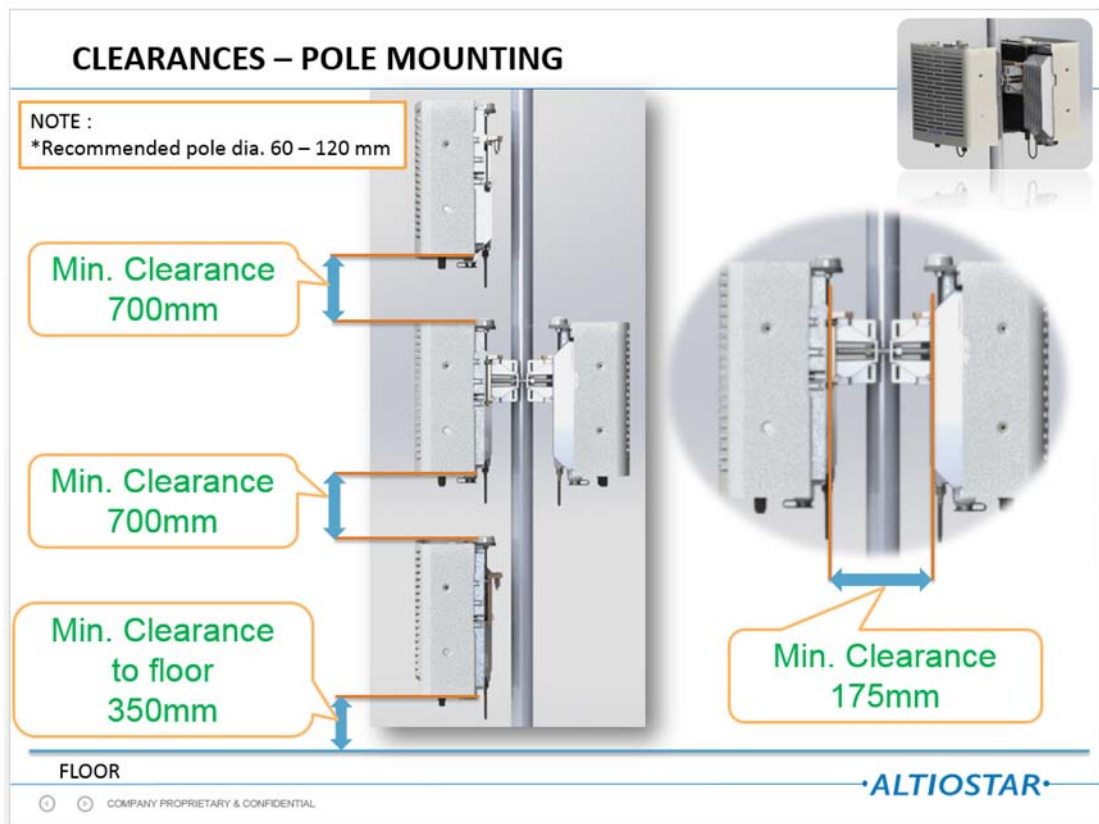
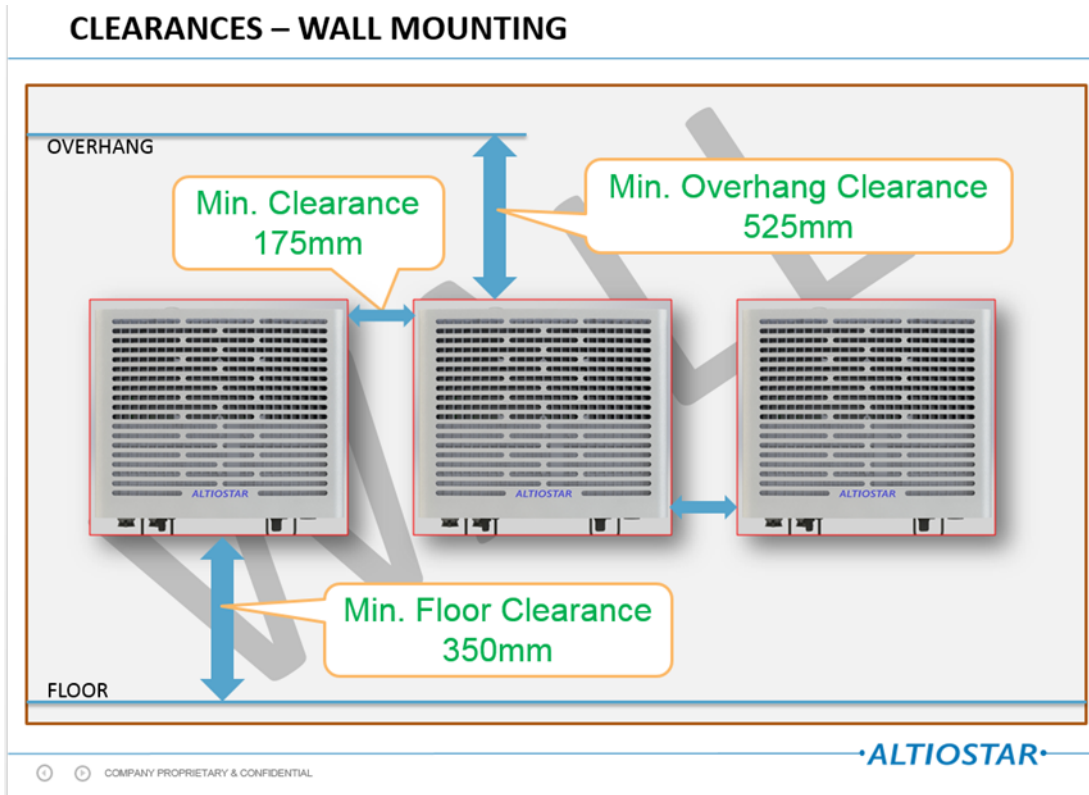


Figure 6-8 iRM2249 mounting clearances on wall

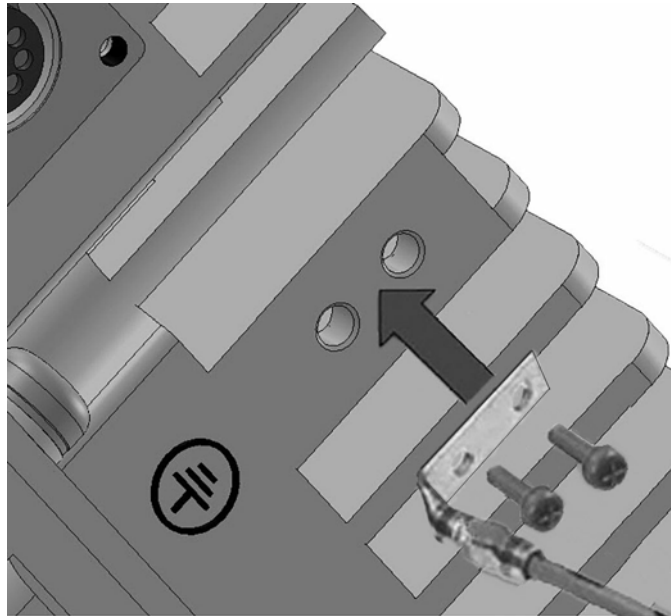


6.6 Connecting the grounding cable

This section provides the procedure for properly grounding the iRM2249 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.

Procedure 6-6 To connect grounding cable

1. Fasten the dual-hole grounding lug and cable assembly to the iRM2249 chassis grounding posts using two (2) M5-0.8 screws and washers (included in the kit). See [Figure 6-9 Connecting the grounding cable](#) on page 6-11.

Figure 6-9 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.

Procedure 6-7 To connect RET cable

1. Insert RET cable into keyed 8-pin RET socket on iRM2249.
2. Twist the ferrule of the RET connector clockwise until it audibly 'clicks' into the locked position.



The RET connection must be waterproofed using a self-fusing tape made for that purpose. A recommended method of wrapping the connections is provided in section 6.12.

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.

Procedure 6-8 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 indicating the fiber is locked into the module.
4. Store any slack of the fiber-optic cable inside the Rosenberger RFE plug to clear it 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 duplex fiber optic cables are used to daisy-chain or sidehaul to another iRM2249.



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 iRM2249 iRRH.

Procedure 6-9 To connect the RF cables

1. Remove the dust covers from the **ANT1** RF connector 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 to 44.25 in-lb (5 Nm).
4. Repeat for **ANT2** connector.

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-contacts female type DIN connector, to the iRM2249 iRRH.

Procedure 6-10 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.



NOTE

The alarms cable 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.

6.11 Connecting the –48 V DC power cable

This section provides the procedure for connecting the –48 V DC power cable to the iRM2249 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 iRM2249 power input connector.

Procedure 6-11 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.

Procedure 6-12 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 6-10 Weatherproofing connections using self-fusing tape](#) on page 6-14, or according to local practice.

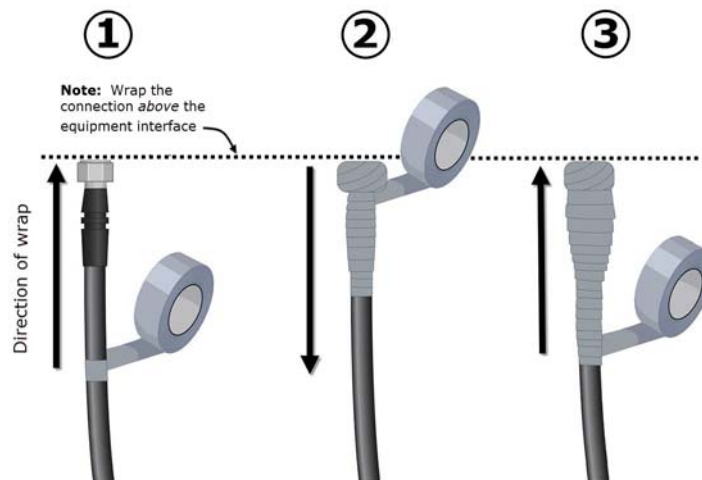


NOTE

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. To make it easier to remove the self-fusing tape, first wrap the connection with electrical tape, such as Scotch Super 33+ (or equivalent) before wrapping the first layer of self-fusing tape.*

Figure 6-10 Weatherproofing connections using self-fusing tape



6.13 Checking power

This section provides the procedure for verifying power to the iRM2249 is connected correctly and operating normally.

**NOTE**

After applying -48 V dc power and verifying that the iRM2249 is functioning properly, leave power to the unit ON.

Procedure 6-13 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 iRM2249 iRRH.
2. Verify that the iRM2249 powers up as indicated by the LEDs on the side of the iRM2249 lighting in the boot sequence provided in [Table 3-6 LED indicators boot-up sequence](#) on page 3 - 18.
3. Leave power to the iRM2249 iRRH 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
NA	Not Applicable
NC	No Connection

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
v DC or V dc	Voltage direct current

Appendix A

Assembly instructions

1 Assembly instructions for 2-pin power connector and cable

For assembly instructions of the Rosenberger 2-pin power connector, please refer to [Figure A-1 Rosenberger 2-pin power connector and cable](#) on page A-1 through [Figure A-3 Connecting the cable with the connector](#) on page A-3.

Figure A-1 Rosenberger 2-pin power connector and cable



A: connector head

B: connector body

C: extra gasket

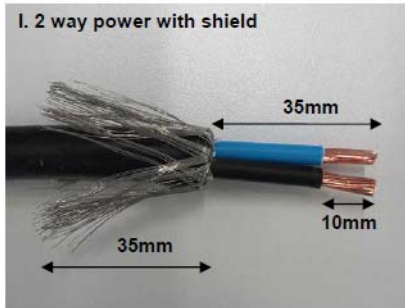


If your cable diameter is smaller than 9mm, add the extra gasket into the cable gland.

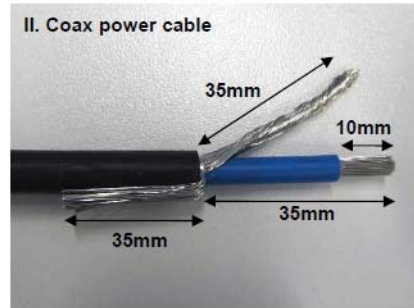


Slide the connector body in the correct position onto the cable.

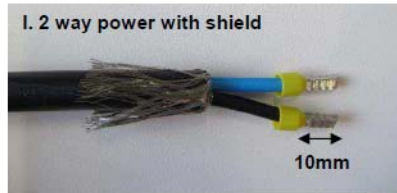
Figure A-2 Preparing the cable



Prepare the cable according to the picture above.



Prepare the cable according to the picture above: Divide the shield in half, fold back half of it, twist half of it.



Rosenberger recommends to use wire ferrules with stranded wires. Make sure the wire ferrules have the adequate size. If they are longer than 10mm, shorten them.

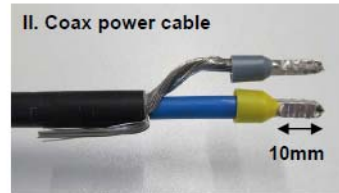
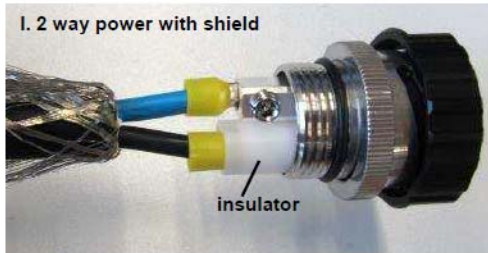
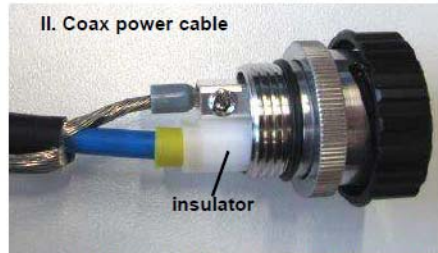


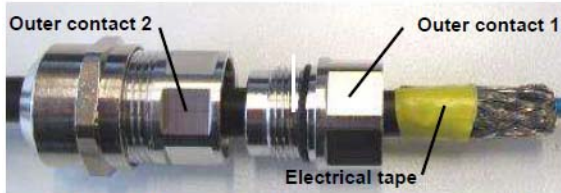
Figure A-3 Connecting the cable with the connector



Screw the hot wire into the centre contact with insulator.
Screw the ground wire into the centre contact without insulator.



Screw the hot wire into the centre contact with insulator
Screw half of the shield into the centre contact without insulator.



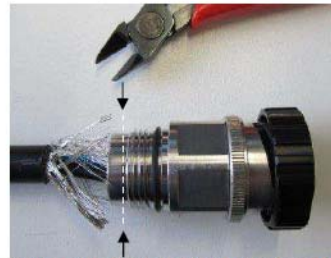
Disassemble the connector body according above picture.
Electrical tape may help to keep the shield in position.



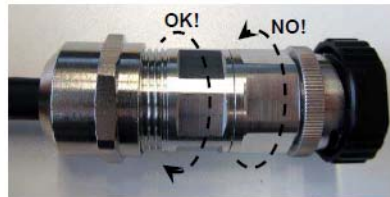
Screw the outer contact 1 on the connector head.
until stop. Caution: DO NOT turn the connector head !



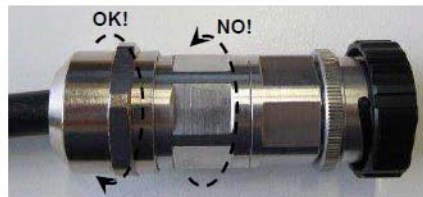
Fold back the shield on outer contact 1.



Cut the shield wires which are overcoming
the thread of outer contact 1.



Screw the outer contact 2 on the outer contact 1 until
stop. Caution: DO NOT turn the outer contact 1 !



Screw the nut on the outer contact 2 until stop.
Caution: DO NOT turn the outer contact 2 !

2 Assembly instructions for Rosenberger Fiber Enclosure

For assembly instructions of the Rosenberger Fiber Enclosure, please refer to [Figure A-4 Rosenberger Fiber Enclosure exploded view](#) on page A-4 and [Figure A-5 Rosenberger Fiber Enclosure assembly instructions](#) on page A-4.

Figure A-4 Rosenberger Fiber Enclosure exploded view

Parts

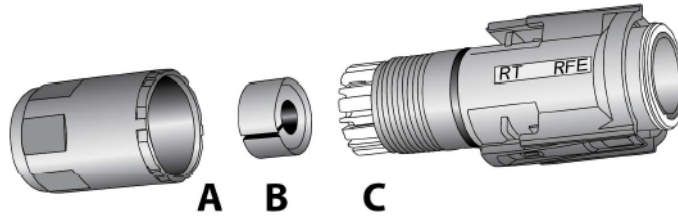
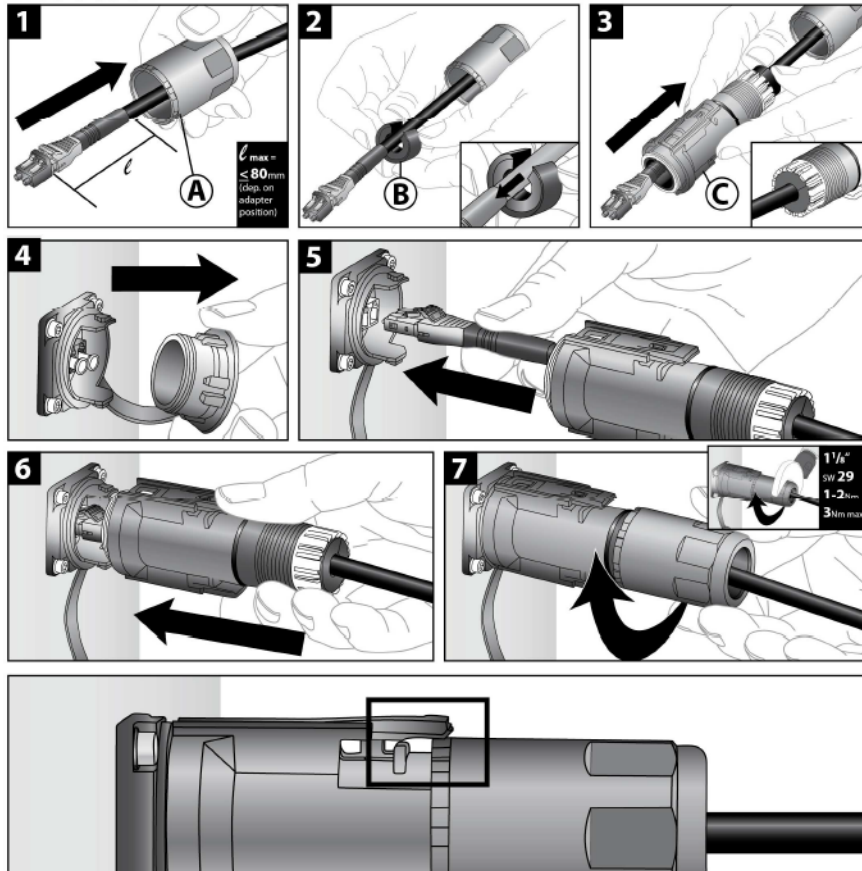


Figure A-5 Rosenberger Fiber Enclosure assembly instructions

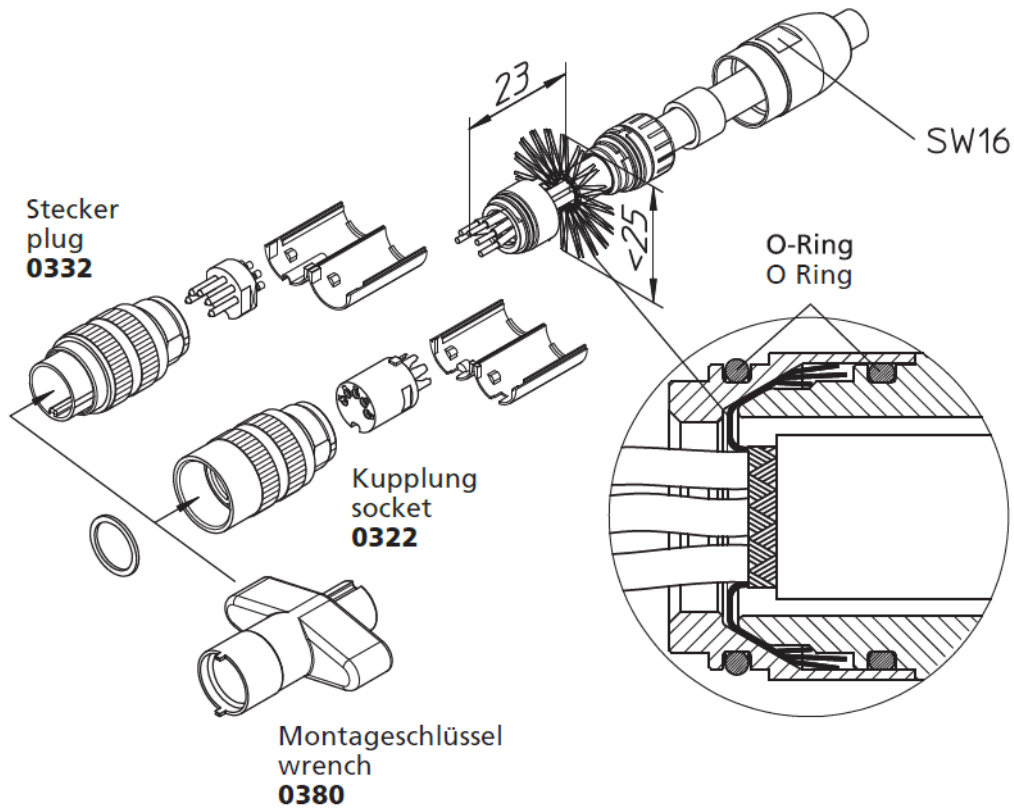
Instruction



3 Assembly instructions for circular DIN female connector and cable

For assembly instructions of the circular DIN female connector and alarms cable, refer to [Figure A-6 Alarms connector and cable assembly instructions](#) on page A-5.

Figure A-6 Alarms connector and cable assembly instructions



For assembling the Lumberg 0322 12 female connector, the WRENCH (PN: 0380) shown in [Figure A-6 Alarms connector and cable assembly instructions](#) on page A-5, should be procured by the operator.

ALTIOSTAR

iRM2249nn00-1 iRRH Product Description and Installation Guide

Issue 1

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