

COMMSCOPE®

DRAFT

ION[®]-U

H 17P2 Remote Unit



**User's Manual
MF0200A0A**

POWERED BY



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Andrew Wireless Systems GmbH, 19-July-2013

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1. General

1.1. Used Abbreviations

AC/DC	Alternating current / Direct Current
AIMOS	Andrew Integrated Management and Operating System
ALC	Automatic Level Control
BITE	Built-In Test Equipment
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CE	"Conformité Européenne" ("European Conformity")
CPD	Channel Power Detection
DL	Downlink
DoC	Declaration of Conformity
dSMR	Measurement Receiver
EP	Extension Port
ESD	Electrostatic Discharge
EU	Extension Unit
GSM	Global System for Mobile Communication
GND	Ground (Earth)
GUI	Graphical User Interface
ICP3	Intercept Point 3 rd order
ID No	Identification Number
IFC	Interface Card
ION	Intelligent Optical Network
LED	Light Emitting Diode
LMT	Local Maintenance Terminal
LTE	Long Term Evolution
MIMO	Multiple Input Multiple Output
MS	Mobile Station
MU	Main Unit
NF	Noise Figure
OMC	Operations and Maintenance Center
OTRx	Optical Transceiver = SRMU (Subrack Master Unit)
PDU	Power Distribution Unit
PIM	Passive Intermodulation
P_{in}	Input power
P_{out}	Output power
PSU	Power Supply Unit
Rev	Revision
RF	Radio Frequency
RU	Remote Unit
RX	Receiver
SISO	Single Input Single Output
SM	Site Manager
SMTX	Sector Matrix Module
SNMP	Simple Network Management Protocol
SRC	Subrack Controller
TX	Transmitter
UL	Uplink
UMTS	Universal Mobile Telecommunication System
UPS	Uninterruptible Power Supply
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access
WDM	Wavelength Division Multiplex
XML	Extensible Markup Language
ZCMB	Zone Combiner Module

1.2. Health and Safety Warnings



1. **Danger:** Obey all general and regional installation and safety regulations relating to work on high voltage installations, as well as regulations covering correct use of tools and personal protective equipment.



2. **Danger:** Laser radiation! Do not stare into the beam; do not view it directly or with optical instruments.

3. **Danger:** Before opening the unit, disconnect mains power.

4. **Danger:** Due to power dissipation, the remote unit may reach a very high temperature. Do not operate this equipment on or close to flammable materials. Use caution when servicing the unit.

5. **Warning:** Read and obey all the warning labels attached to the unit. Make sure that all warning labels are kept in a legible condition. Replace any missing or damaged labels.

6. **Warning:** It is the responsibility of the network provider to implement prevention measures to avoid health hazards associated with radiation from the antenna(s) connected to the unit.

7. **Warning:** Make sure, access is restricted to qualified personnel.

8. **Warning:** Only license holders for the respective frequency range are allowed to operate this unit.

9. **Warning:** Make sure the repeater settings are correct for the intended use (refer to the manufacturer product information) and regulatory requirements are met.

10. **Warning:** Use this equipment only for the purpose specified by the manufacturer. Do not carry out any modifications or fit any spare parts, which are not sold or recommended by the manufacturer. This could cause fires, electric shock, or other injuries.

11. **Warning:** For installations, which have to comply with FCC RF exposure requirements, the antenna selection and installation must be completed in a way to ensure compliance with those FCC requirements. Depending on the RF frequency, rated output power, antenna gain, and the loss between the repeater and antenna, the minimum distance D to be maintained between the antenna location and human beings is calculated according to this formula:

$$D_{[cm]} = \sqrt{\frac{P_{[mW]}}{4 * \pi * PD_{[mW/cm^2]}}}$$

where

- P (mW) is the radiated power at the antenna, i.e. the max. rated repeater output power in addition to the antenna gain minus the loss between the repeater and the antenna.

- PD (mW/cm²) is the allowed Power Density limit acc. to 47 CFR 1.1310 (B) for general population / uncontrolled exposures which is
 - F (MHz) / 1500 for frequencies from 300MHz to 1500MHz
 - 1 for frequencies from 1500MHz to 100.000MHz

RF exposure compliance may need to be addressed at the time of licensing, as required by the responsible FCC Bureau(s), including antenna co-location requirements of 1.1307(b)(3).


12. **Warning:** For installations which have to comply with Europe an EN50385 exposure compliance requirements, the following Power Density limits/guidelines (mW/cm²) according to ICNIRP are valid:

- 0.2 for frequencies from 10 MHz to 400 MHz
- F (MHz) / 2000 for frequencies from 400 MHz to 2 GHz
- 1 for frequencies from 2 GHz to 300 GHz

13. **Caution:** Keep operating instructions within easy reach and make them available to all users.

14. **Caution:** Corresponding local particularities and regulations must be observed. For national deviations, please refer to the respective documents included in the manual CD that is delivered with the unit.

15. **Caution:** Although the remote unit is internally protected against overvoltage, it is strongly recommended to ground (earth) the antenna cables close to the repeater's antenna connectors for protection against atmospheric discharge.

 16. **Caution:** ESD precautions must be observed! Before commencing maintenance work, use the available grounding (earthing) system to connect ESD protection measures.

17. **Caution:** Installation of this equipment is in full responsibility of the installer, who has also the responsibility, that cables and couplers are calculated into the maximum gain of the antennas, so that this value, which is filed in the FCC Grant and can be requested from the FCC data base, is not exceeded. The industrial boosters are shipped only as a naked booster without any installation devices or antennas as it needs for professional installation.


18. **Note:** For a Class A digital device or peripheral:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

19. **Note:** This unit complies with European standard EN60950.

Equipment Symbols Used

Please observe the meanings of the following symbols used in our equipment:

Symbol	Compliance	Meaning
---	FCC	WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC Licensee to operate this device. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of \$100,000 for each continuing violation.
	---	Alert sign to R&TTE To be sold exclusively to mobile operators or authorized installers – no harmonised frequency bands, operation requires license Intended use: EU and EFTA countries
CE 0700	Symbol	Indicates conformity with the R&TTE directive 1999/5/EC certified by the notified body no. 0700.

1.3. About CommScope

CommScope is the foremost supplier of one-stop, end-to-end radio frequency (RF) solutions. Part of the *CommScope* portfolio are complete solutions for wireless infrastructure from top-of-the-tower base station antennas to cable systems and cabinets, RF site solutions, signal distribution, and network optimization.

CommScope has global engineering and manufacturing facilities. In addition, it maintains field engineering offices throughout the world.

Andrew Wireless Systems GmbH based in Buchdorf/ Germany, which is part of *CommScope*, is a leading manufacturer of coverage equipment for mobile radio networks, specializing in high performance, RF and optical repeaters. Our optical distributed networks and RF repeater systems provide coverage and capacity solution for wireless networks in both indoor installations and outdoor environments, e.g. tunnels, subways, in-trains, airport buildings, stadiums, skyscrapers, shopping malls, hotels and conference rooms.

Andrew Wireless Systems GmbH operates a quality management system in compliance with the requirements of ISO 9001 and TL 9000. All equipment is manufactured using highly reliable material. To maintain highest quality of the products, comprehensive quality monitoring is conducted at all fabrication stages. Finished products leave the factory only after a thorough final acceptance test, accompanied by a test certificate guaranteeing optimal operation.

This product meets the requirements of the R&TTE directive and the Declaration of Conformity (DoC) itself. A current version of the CE DoC is included in this manual CD delivered *. Any updated version of the DoC is available upon request from the local sales offices or directly from *CommScope* via the local Customer Support at one of the addresses listed in the following chapter.

According to the DoC, our "CE"-marked equipment can be used in all member states of the European Union.

Note: **Exceptions of and national deviations from this intended use may be possible. To observe corresponding local particularities and regulations, please refer to the respective documents (also in national language) which are included in the manual CD delivered.**

* In case the Declaration of Conformity (DoC) for the product was not included in the manual CD delivered, it is available upon request from the local sales offices or directly from *CommScope* at one of the addresses listed in the following chapter.

To make the most of this product, we recommend you carefully read the instructions in this manual and commission the system only according to these instructions.

For technical assistance and support, please also contact the local office or *CommScope* directly at one of the addresses listed in the following chapter.

1.4. International Contact Addresses for Customer Support

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table 1-1 List of international contact addresses

2. Introduction

2.1. Purpose

Mobile telephone and public safety systems transmit signals in two directions between base transceiver station (BTS) and mobile stations (MS) within the signal coverage area to carry voice and data traffic.

If weak signal transmissions occur within the coverage area because of indoor applications, topological conditions or distance from the transmitter, extension of the transmission range can be achieved by means of an optical distributed antenna system (DAS).

Office buildings, sports arenas, college campuses, industrial parks, and other areas of high demand require the specialized capacity boost that an optical DAS can provide to meet increasing customer demands for voice and data.

An optical DAS contains optical Master Units and a sufficient number of Remote Units to provide the necessary coverage. The number of the Remote Units depends on the coverage requirements of the DAS. The Remote Units are connected to the Master Unit with optical links.

The Master Unit is the connection to the Base Transceiver Stations. The configuration of a Master Unit depends on the number of the Remote Units and the frequency range.

RF signals are transported to and from the remote units via optical fibers.

2.2. ION-U High Power Remote Units

The ION-U is an optical fiber based DAS system that efficiently takes the outputs of multiple Base Transceiver Stations (BTS) sectors and converts those RF signals to optical to send them over fiber optic cables to remote units to provide coverage in indoor and outdoor locations. The system supports both low power and high power remotes units and SISO and MIMO operation.

The ION-U H 17P2 is a multi-band, multi-operator high power remote unit optimized for CDMA2000, EV-DO, WCDMA, HSDPA, and OFDM modulation in the 1700 MHz band. It is provisioned for future modulation and frequency bands. These Remote Units feature independent downlink and uplink gain adjustments and an integrated channel power detector for in-band spectrum and PIM analysis and end-to-end auto leveling.

The unit utilizes a single fiber to support multiple bands in both the uplink and downlink directions. WDM (Wave Division Multiplex) filters are integrated in the optical modules. For the UL, a wavelength within 1546 nm – 1550 nm is used. For the DL, a wavelength of 1310 ±10 nm is used. The maximum output power for the UL and DL is 6.7 mW.

3. Functional Description

3.1.1. eCPD+ (Enhanced Channel Power Detector plus)

The enhanced Channel Power Detector plus (eCPD+) is a remote-controlled data acquisition system for monitoring the RF output power of the RU at the air interface. These measurements are monitored by the master unit.

3.1.2. Fan Protection Kit

In order to protect the fan unit in outdoor use (e.g. against rain), a protective cover is delivered with the unit that can be mounted over the fan unit. For indoor applications, mounting of the fan protection kit is not mandatory.

3.1.3. Accessories

A number of accessories are available for the Remote Unit such as shrouded housing, connecting boxes, and iso-trafo kits.

A short version of the Remote Unit designed to be mounted in a protective shroud is also available. The shroud provides protection for the Remote Unit, an Extension Unit, and an optional cross-band coupler. The short versions of the RU and EU are required when using the shroud.

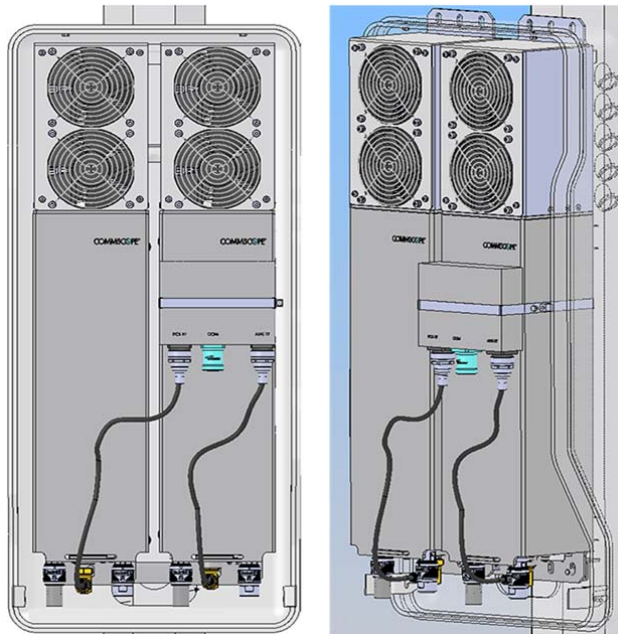


figure 3-1 Shroud with RU and EU


4. Commissioning

4.1. High Power RU Mechanical Installation

4.1.1. General


Read the health and safety warnings in chapter 1.2.

1. **Warning:** Do not install the unit in a way or at a place where the specifications outlined in the Environmental and Safety Specifications leaflet of the supplier are not met.

 2. **WARNING: IMPROPER INSTALLATION CAN LEAD TO EQUIPMENT FALLING CAUSING SERIOUS PERSONAL INJURY OR DAMAGE TO EQUIPMENT.** Installer must verify that the supporting surface will safely support the combined load of the electronic equipment and all attached hardware and components. The supporting wall should be solid wood or concrete using appropriate screws and dowels (wall anchors).

3. **Warning:** Use proper mounting hardware depending on the structure of e.g. the wall where the unit will be installed. It is recommended to only use the mounting hardware delivered by the manufacturer. If another type of mounting hardware is used, observe that the specifications for stationary use of the repeater must not be exceeded.

 **Note:** Exceeding the specified load limits may cause the loss of warranty!

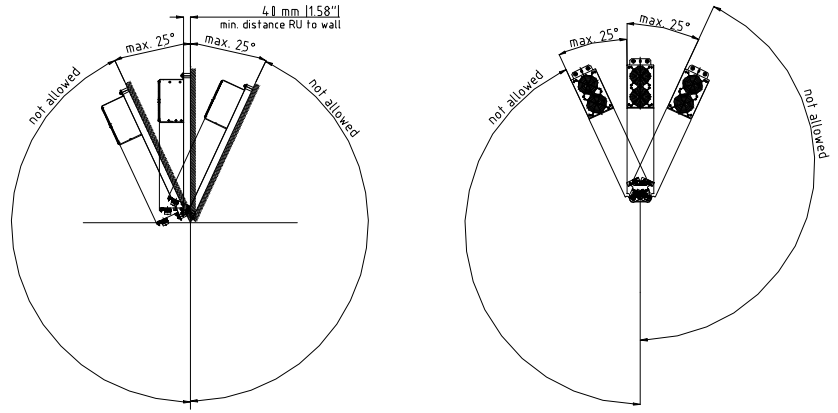
 4. **Warning:** The unit is considerably heavy. Make sure that a suitable mounting surface is used. Ensure there is adequate manpower to handle the weight of the system.

5. **Caution:** Due to power dissipation, the Remote Unit may reach a very high temperature. Ensure sufficient airflow for ventilation.

6. **Note:** When connecting and mounting the cables (RF, optical, mains, ...) ensure that no water can penetrate into the unit through these cables.

7. **Note:** Observe all additional rules or restrictions regarding mounting that apply to specific Remote Unit types.

8. **Note:** Observe all additional rules or restrictions regarding mounting that apply to specific Remote Unit types. For details refer to the mechanical specifications in the data sheet for the unit. Install the unit vertically with the fan unit at the top. A maximum tilt angle of 25° from a vertical position must be maintained, as shown in the following illustrations:



G1138M4

- 9. A spacing of **40 mm (1.66 inch)** around the unit is required.
- 10. To ensure sufficient airflow when mounting the unit in enclosed spaces, two lid openings (one for the air inlet and the other for the air outlet) must be provided. Do not block these air inlets and outlets when mounting the remote unit. The size of each opening must equal at least **12 x 12 cm (144 cm²)**. Ensure that there is no thermal short circuit between the air inlet and air outlet.

If any different or additional mounting material is used, ensure that the mounting remains as safe as the mounting designed by the manufacturer. Ensure that the static and dynamic strengths are adequate for the environmental conditions of the site. The mounting itself must not vibrate, swing or move in any way that might cause damage to the Remote Unit.

Specified torques must be observed for certain mounting procedures according to the following table:

Type	Tallow-drop screws	Hex nuts	Spacing bolts		PG (plastic)	PG (aluminium)
Thread	M 4	M 8	M 4	M 8	PG 13.5	PG 29
Specified torques	3.3 Nm	27 Nm	2.3 Nm	27 Nm	3.75 Nm	10 Nm

table 4-1 Specified torques

The mounting procedures for a stand-alone remote unit without optional accessories are described and illustrated in the following sections. For further information regarding special mounting procedures including mounting of accessory equipment, **please see the separate accessories manual.**

4.1.2. Wall-Mounting Procedure

- Check the suitability of the wall-mounting kit and the wall.

1. Mark the position of the drilling holes (for measurements refer to *(figure 4-1 Wall Mounting)*). Drill four holes at the marked positions and insert dowels*.

- Use a cap nut or lock nut to screw the four dowel screws into the dowels and put the distance tubes over the screws.
- Hang the mounting brackets of the remote unit into the screws, and fasten them immediately using the washers and nuts.
- Ensure that there is free access to the electrical connections as well as to the cabinet. The approved bending radius of the connected cables must not be exceeded.

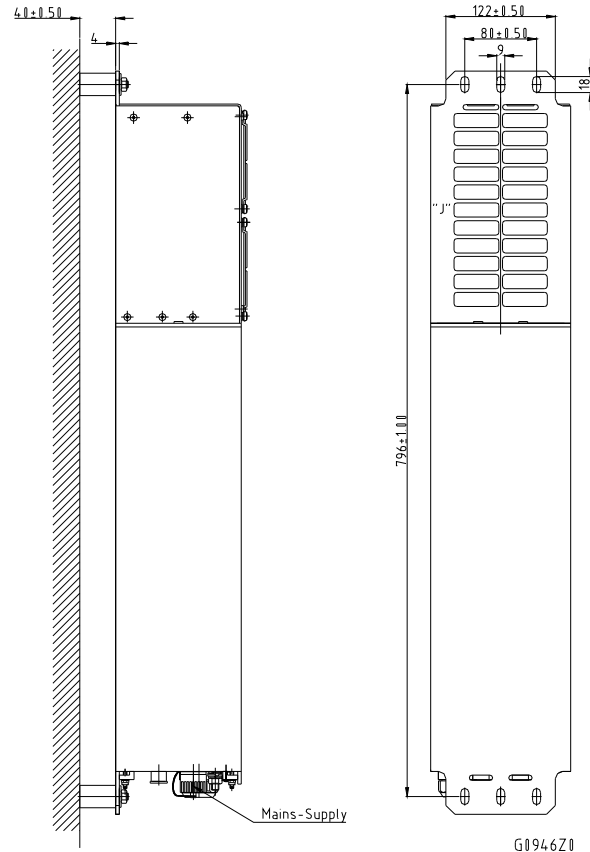


figure 4-1 Wall Mounting

* The dowels are not included with the delivery because the suitable type depends on the on-site conditions (material of wall). Use dowels or other fasteners that are the most appropriate for the mounting surface.

It is the responsibility of the installer to verify that the supporting surface will safely support the combined load of the electronic equipment and all attached hardware and components and to ensure that the RU is safely and securely mounted.

4.1.3. Pole Mounting Procedure

Standard mounting hardware cannot be used to mount the remote unit to a pole, a column, or other similar structures. Additional hardware must be used for this type of installation. The pole-mounting kit includes two mounting brackets with screw band (worm gear) clamps to mount the brackets to the pole and two nuts, flat washers, and lock washers per bracket to attach the remote unit to the bracket.

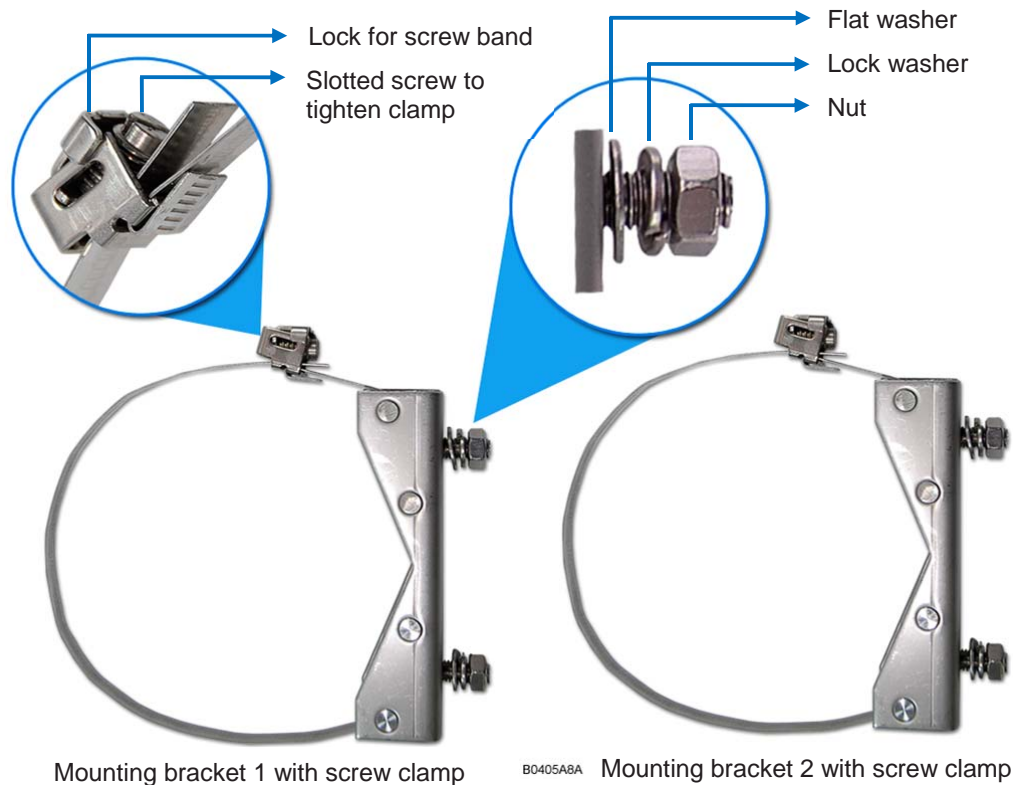


figure 4-2 Pole mounting kit

- Use the screw bands to fasten the two brackets to the pole as illustrated in *figure 4-3 Pole mounting drawing*.
- Place the bands around the pole or post and feed the loose end into the lock as shown and tighten the slotted screw securely. When the screw is turned clockwise, it acts as a worm drive pulling the threads of the band causing the band to tighten around the pole.

Note: When fastening the brackets make sure that they are installed congruently and not at an angle to each other. To determine the distance between the clamps refer to *figure 4-1 Wall Mounting for measurements*.

- Hang the remote unit mounting brackets onto the threaded bolts of the bracket, and fasten them using the flat washers, spring (lock) washers and M8 nuts.

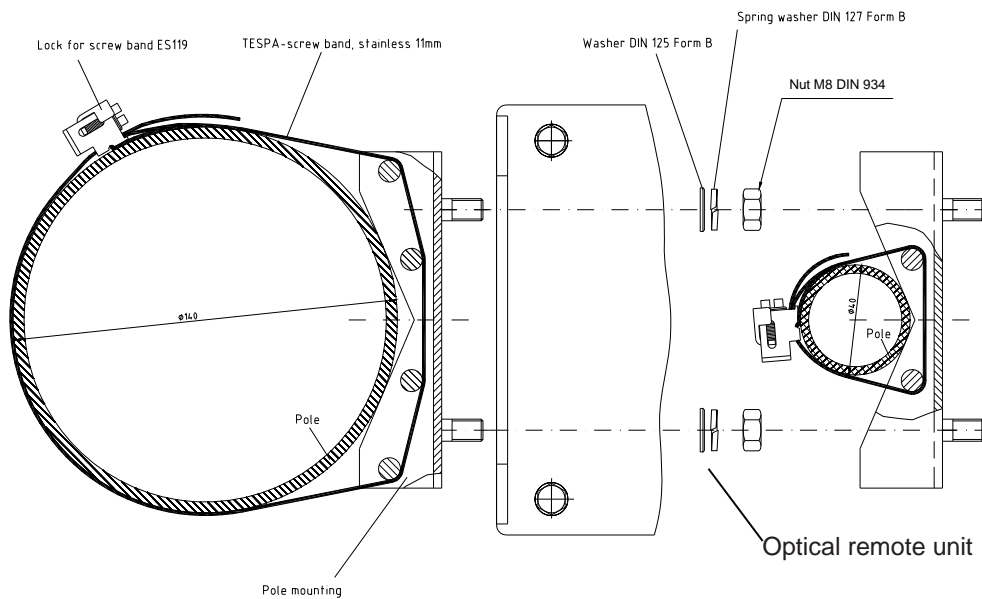


figure 4-3 Pole mounting drawing

Ensure that there is free access to the electrical connections as well as to the cabinet. The approved bending radius of the connected cables must not be exceeded.

4.1.4. Mounting of Fan Protection

Fan protection is required for the outdoor usage of a stand-alone remote unit. Mounting of the optional fan protection is described below.

- To install the protective cover of the fan protection kit, first remove the four screws with their respective lock washers from the cover of the air inlet of the remote unit, and replace them with four spacing bolts M4.0x30 with the four lock washers M4.0 DIN125 that are part of the fan protection kit.
- Place the protective cover into position by aligning its four bore holes over the spacing bolts and fasten it using the original lock washers and screws of the remote unit. (These lock washers and screws are also part of the fan protection kit and can be used as spare parts in case of loss.)

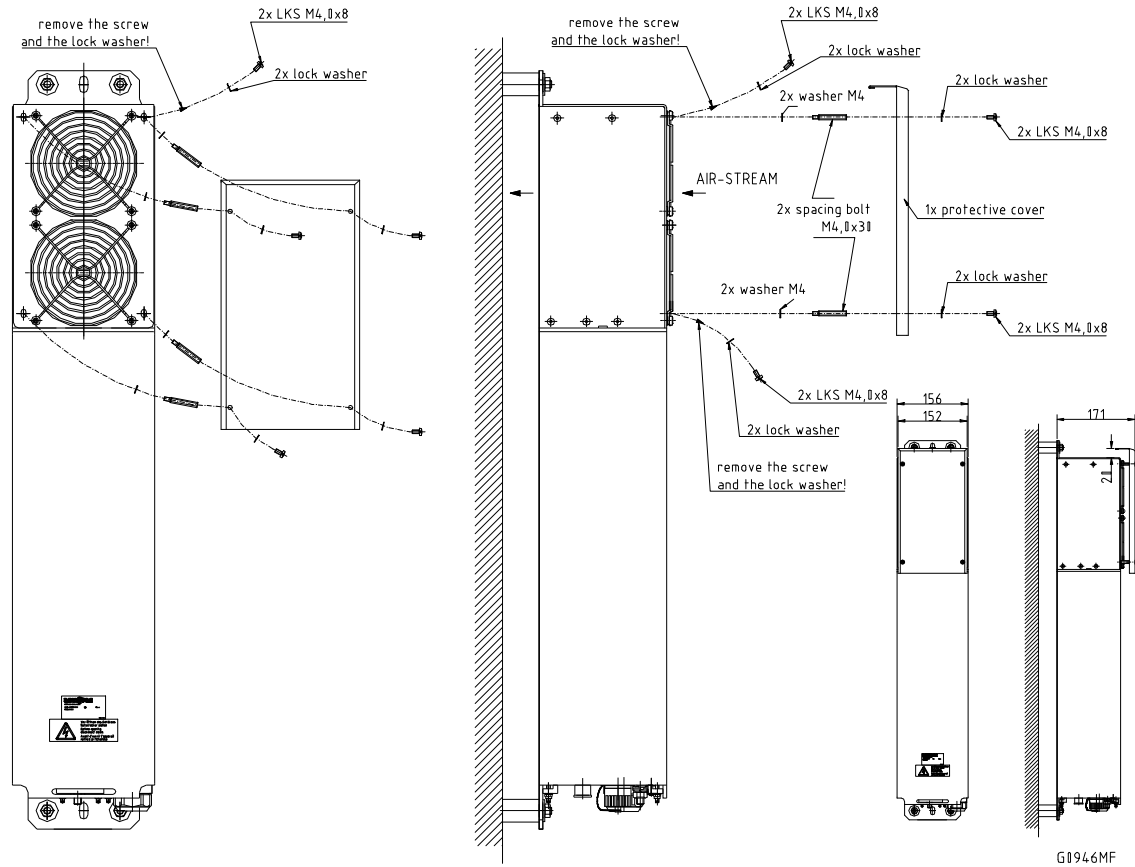


figure 4-4 Mounting procedure for fan protection

4.2. Electrical Installation

4.2.1. General

Read the health and safety warnings in chapter 1.2.



- Warning:** This unit contains dangerous voltages. Loss of life, severe personal injury, or property damage can be the result if the instructions contained in this manual are not followed.
- Caution:** It is compulsory to ground (earth) the unit before connecting the power supply. A grounding bolt is provided on the cabinet to connect the ground-bonding cable.
- Caution:** Although the remote unit is internally protected against overvoltage, it is strongly recommended to ground (earth) the antenna cables close to the antenna connectors of the remote unit for protection against atmospheric discharge. In areas with strong lightning, it is strongly recommended to install additional lightning protection.
- Caution:** If the mains connector of the remote unit is not easily accessible, a disconnect device in the mains power circuit must be provided within easy reach.
- Caution:** Before connecting or disconnecting the mains connector at the remote unit, ensure that mains power supply is disconnected.
- Caution:** Make sure that an appropriate circuit breaker acting as a disconnect device (as required by IEC/EN60950-1) and an overcurrent limiting device are connected between mains power and the Remote Unit.
- Caution:** A connection of the mains supply to a power socket requires the power socket to be nearby the remote unit.
- Caution:** Incorrectly wired connections can destroy electrical and electronic components.
- Caution:** To avoid corrosion at the connectors caused by electrochemical processes, the material of the cable connectors must not cause a higher potential difference than 0.6 V (see electrochemical contact series).
- Note:** Use an appropriate torque wrench to tighten the 7/16 DIN-type (1 ¼ -inch opening) antenna connectors to a coupling torque of 25 N-m / 19 ft lb. Torque wrench item no. 244377, available from the CommScope e-catalog, is recommended. Do NOT use your hands or any other tool (e. g. a pair of pliers)! This might cause damage to the connector and lead to a malfunction of the Remote Unit or increased PIM.
- Caution:** For unstabilized electric networks, which frequently generate spikes, the use of a voltage limiting device is advised.

12. **Caution:** The unit complies with the surge requirement according to EN 61000-4-5 (fine protection); however, installation of an additional medium (via local supply connection) and/or coarse protection (external surge protection) is recommended depending on the individual application in order to avoid damage caused by overcurrent.

13. **Caution:** Observe the labels on the front panels before connecting or disconnecting any cables.

4.2.2. Connections

The ION-U RU ports and connectors shown below are located at the base of the RU.

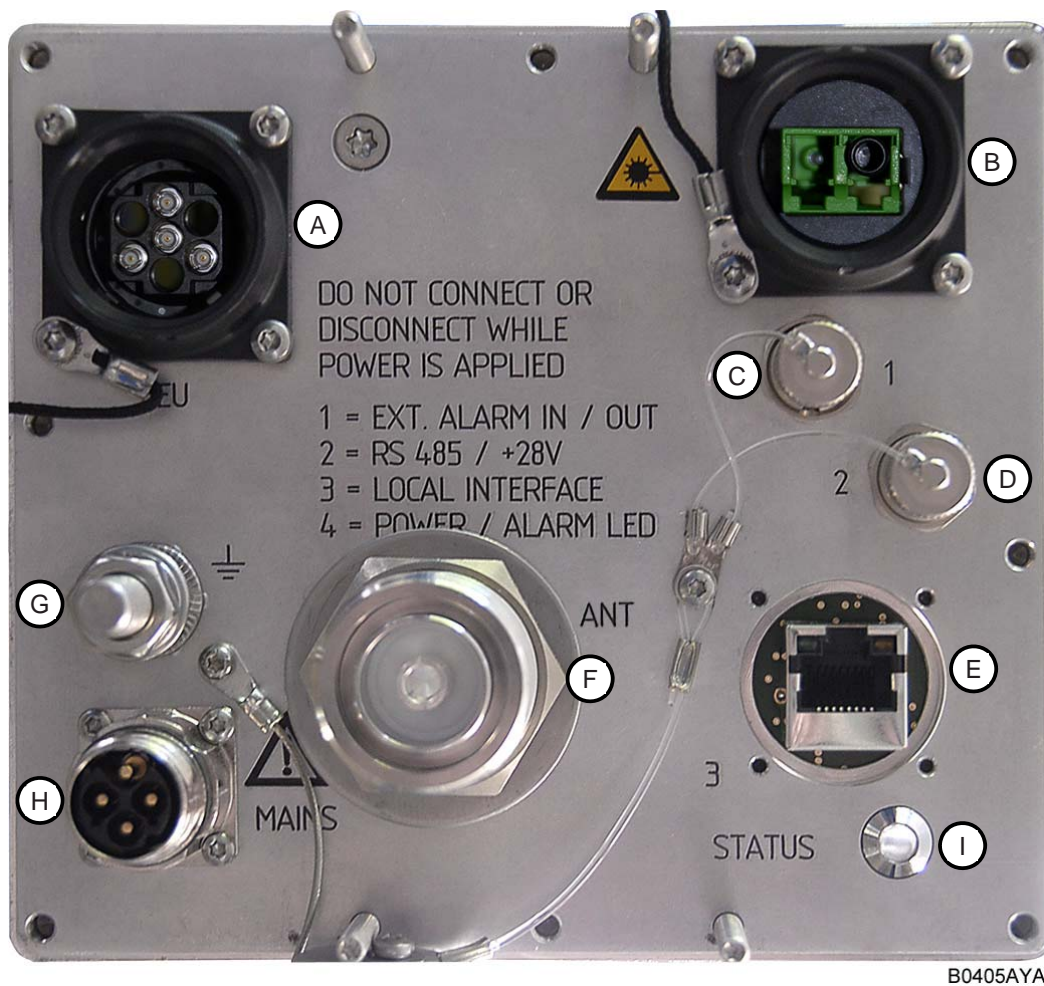


figure 4-5 ION-U H 17P2 Connectors

ION-U High Power RU Connectors/Indicators			
	Port/Conn	Purpose	Type
(A)	EU	This connector is used to interconnect to an extension unit to provide additional bands of coverage.	Radiall Opus M424400-003
(B)	OPTICAL	This connector is used to connect an optical fiber cable to receive downlink signals from and to send uplink signals back to the OTRx module of the ION-U master unit.	Radial Opus LC-APC 8°
(C)	EXTERNAL ALARM IN/OUT	This connector provides two alarm contact inputs and two alarm contact outputs.	Binder 712 series 8-pin
(D)	RS 485 / +28V	This connector provides RS 485 communications and +28 VDC power (500 mA)	Binder 712 series 5-pin
(E)	LOCAL INTERFACE	This port is used for a local connection to a laptop PC.	RJ45
(F)	ANT	This connector is used for transmitting and receiving signals to and from an antenna, antenna splitter, or cross-band coupler.	7/16 DIN type female
(G)	Grounding Bolt	Ground (earth) bolt for connecting the mandatory ground cable to the RU	M8 bolt, hex nut, & washers
(H)	MAINS	This connector provides the power to RU models that use standard AC (100 to 240 Vac) power.	Coninvers M17 –Series P20, 4-Pin
(I)	STATUS	This LED provides a visual warning of an alarm condition. The color of the LED indicates the severity of the alarm.	LED

table 4-2: ION-U High Power RU Connectors

4.2.3. Grounding (Earthing)

The RU must be grounded (earthed).

1. Connect an earth-bonding cable to the grounding bolt connection provided on the outside of the remote unit (near the Mains connector) as shown in figure 4-6. Do not use the grounding connection to connect external devices.



figure 4-6 Grounding bolt

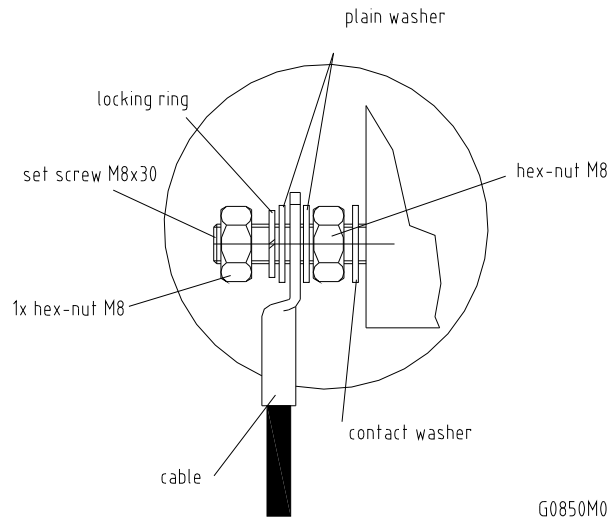


figure 4-7 Grounding bolt, schematic view

2. After loosening the hex nut, connect the earth-bonding cable between the two washers as illustrated in the figures above.
3. Then, fasten all parts again by tightening the hex nut.
4. Connect the other end of the ground wire to a suitable permanent ground following local electrical code practices.

4.2.4. Connection of the Antenna Cable

The remote unit has one 7/16 DIN type antenna connector labelled “ANT”. For its location please refer to chapter 4.2.2 *Connections*. When attaching the antenna cable connector, it is recommended to refer to the corresponding documentation of the connector manufacturer. The bending radius of the antenna cable must remain within the given specifications.

When pairing this RU with an EU such as the ION-U H 19P2, the antenna ports of both units can be connected to separate antennas or to an external crossband coupler (CBC) to combine the multiple frequency bands of the two units to a single antenna or antenna splitter.

The selection of cable and antenna is an important consideration. On the one hand, a cable with higher loss is less expensive but, on the other hand, it impairs performance.

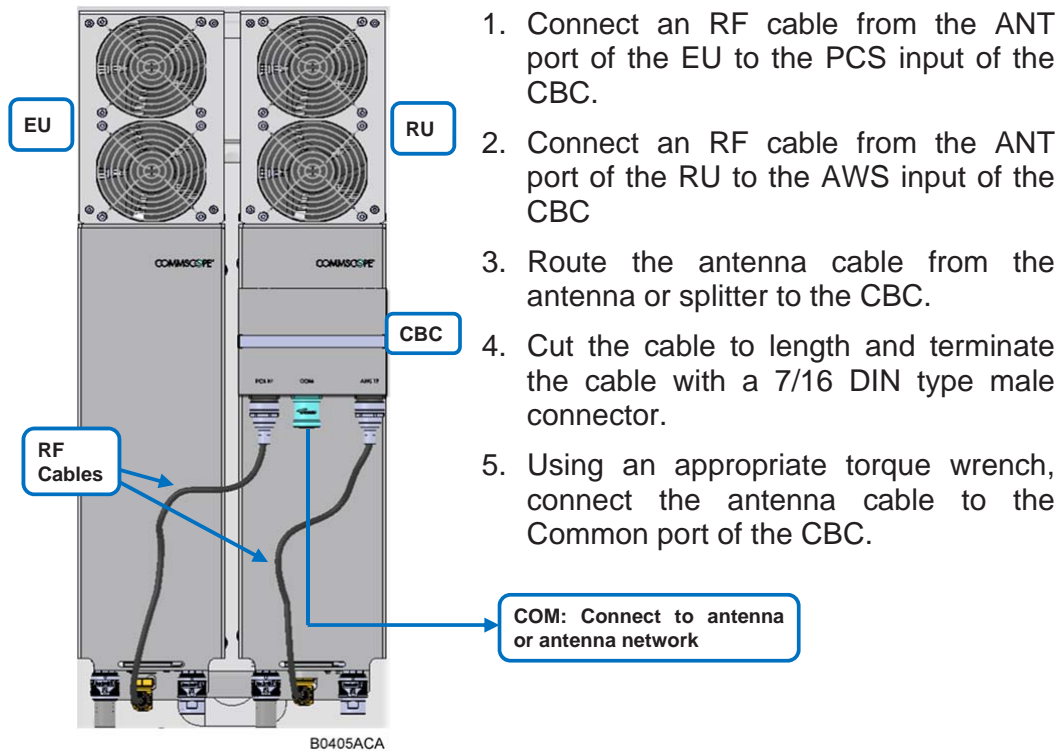


Use an appropriate torque wrench to tighten the 7/16 DIN-type (1 ¼ -inch opening) antenna connectors to a coupling torque of 25 N-m / 19 ft lb. Torque wrench item no. 244377, available from the *CommScope e-catalog*, is recommended. Do NOT use your hands or any other tool (e. g. a pair of pliers)! This might cause damage to the connector and lead to a malfunction of the Remote Unit or increased PIM.



To minimize passive inter-modulation (PIM) distortion, attention must be paid to the physical condition of the connector junctions. Do not use connectors that show signs of corrosion on the metal surface. Prevent the ingress of water into the connector. Attach and torque the connectors properly.

An example of the antenna port connections for a Remote Unit paired with an Extension Unit using an optional crossband coupler is shown below.



1. Connect an RF cable from the ANT port of the EU to the PCS input of the CBC.
2. Connect an RF cable from the ANT port of the RU to the AWS input of the CBC
3. Route the antenna cable from the antenna or splitter to the CBC.
4. Cut the cable to length and terminate the cable with a 7/16 DIN type male connector.
5. Using an appropriate torque wrench, connect the antenna cable to the Common port of the CBC.

figure 4-8 Antenna port to CBC wiring

4.2.5. Mains Power Connection

Before connecting electrical power to the units, the system must be grounded as described in the previous chapter.

Mains power must be connected at the mains connector of the unit (see chapter 4.2.2 *Connections*).

Use the following method to install and connect the Mains power to the RU:

1. Locate the Mains power cable that was delivered with the RU.
2. Locate or install a suitable power junction box or receptacle near the RU and route the power cable from the power source to the RU. Do not connect the cable to the RU's Mains connector at this time. The power source must be interruptible.
3. The Mains cable must be properly secured observing local regulations and electrical codes. Be sure to allow enough slack in the cable at the RU to plug or unplug the cable into the Mains connector of the RU.
4. Wire the power cable to the junction box or receptacle. Refer to the color code and pin numbers shown in *figure 4-10* (AC cable), and *table 4-3*.
5. With the cable's Mains plug disconnected from the RU, turn the circuit breaker on, unscrew the plug's protective cover, and carefully test the plug with a voltmeter to ensure that the voltage and polarity are correct.
6. Once the testing has been completed, turn off the circuit breaker.
7. Unscrew the protective cover from the Mains connector of the RU (*figure 4-9*).
8. Insert the plug into the Mains connector and tighten the clamping ring until it is hand tight. Do not over-tighten the clamping ring.



figure 4-9 Mains power connector

The Mains cable is part of the delivery. The wiring of the mains cable is as follows:

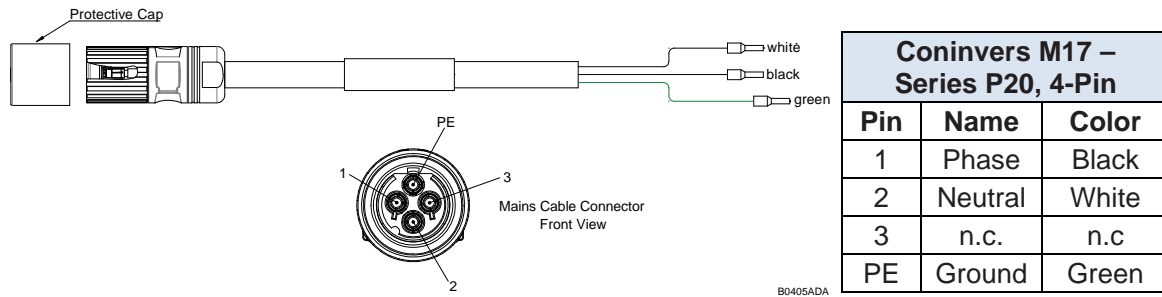


figure 4-10 Mains power cable - AC

table 4-3 AC power cable



For the AC power supply connection, a minimum cross section of 1.5 mm² is required. Each wire must observe the applicable national regulations regarding loop impedance, voltage drop, and methods of installation. Make sure to connect the correct voltage to the unit.

Note: Do not connect or disconnect the power cord at the mains connector while power is on. Turn off mains* power before connecting the power cord at the remote unit, then, engage mains again.

* Mains power must be interrupted with an external mains breaker. For the mains breaker, observe the following recommendation:

120 Volt / 20 Amp max. or 240 Volt / 16 Amp, single-phase, 50 / 60 Hz AC service is needed, i.e. the external AC breaker should be 20 Amps max. for 120-Volt service or 16 Amps for 240-Volt service.

4.2.6. Extension Unit Port Connection

The EU connector is used to connect a cable bridge to an optional Extension Unit to provide additional bands of coverage. This port provides control and RF signaling to and from the extension unit.

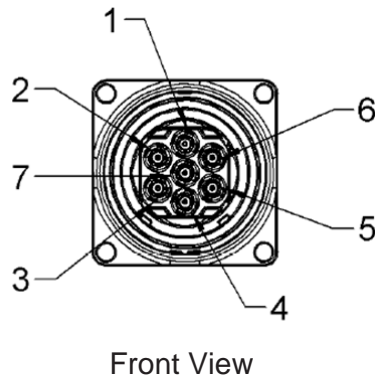


figure 4-11 EU (Extension Unit) connector

7-Pin	
Pin	Assignment
1	RF
2	n.c.
3	System Bus
4	RF (if Pin installed)
5	System Bus
6	n.c.
7	RF

table 4-4 EU Connector

Connect the cable bridge (corrugated flexible cable) between the EU port connector of the RU and the EU port of the Extension unit.



figure 4-12 Extension unit cable bridge

4.2.7. Ext. Alarm In / Out Port

The Alarm port provides external alarm contacts (two input and two output) that are used to monitor and report alarms generated by other equipment or to provide contact closures for RU alarms. The connector is an 8-pin Binder 712 series connector.

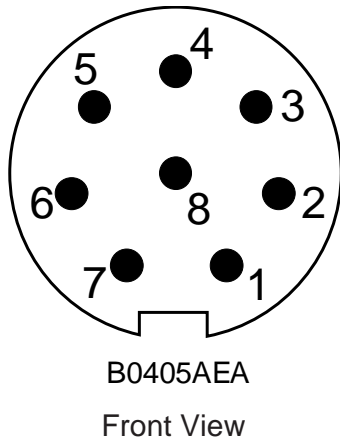


figure 4-13 Alarm Connector

8-Pin Binder 712 Series	
Pin	Assignment
1	EXT_IN_1
2	GND_Isolated
3	EXT_IN_2
4	EXT_Out_1_normally closed
5	EXT_Out_1_common
6	EXT_Out_2_normally open
7	EXT_Out_2_common
8	EXT_Out_2_normally closed

table 4-5 Alarm Connector

4.2.8. RS 485 /+28 V Port

This 5 pin connector provides RS 485 communications and +28 VDC power.

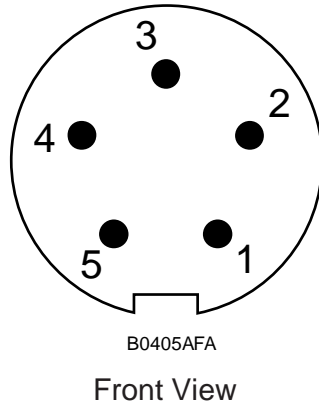


figure 4-14 RS485 /+28 VDC Connector

5-Pin Binder 712 Series	
Pin	Assignment
1	+28V/1A
2	GND
3	RS485_RD-
4	RS485_RD+
5	GND

table 4-6 RS485/+28V

4.2.9. Local Interface Port

The Local Interface port is a RJ45 network port, which can be used for a local connection to a laptop PC.

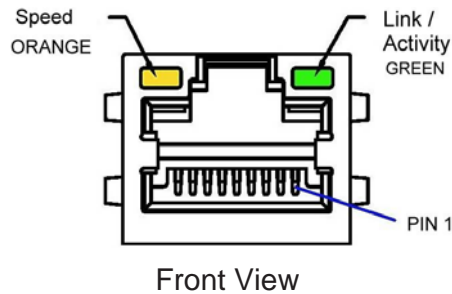


figure 4-15 Local Interface Connector


8-Pin Binder 712 Series	
Pin	Assignment
1	TXD+
2	TXD-
3	RXD+
4	
5	
6	RXD-
7	
8	

table 4-7 Local Interface Connector

4.2.10. Optical-Fiber Cable Connection

Rules for Optical-Fiber Connection

Optical signals are transmitted by use of optical fibers. When connecting these fibers observe the following instructions.

 **Note:** Care should be taken when connecting and disconnecting fiber-optic cables. Scratches and dust significantly affect system performance and may permanently damage the connector. Always use protective caps on fiber-optic connectors not in use.

In general, optical fibres do not need special protective measures. However, protection against environmental influences e.g. rodents and humidity must be considered.

The optical fibre is a single mode fiber. Type is E9/125 µm with the following minimum requirements:

Attenuation:	<0.36 dB / km @ 1310 nm	/	<0.26 dB / km @ 1550 nm
Dispersion:	<3.5 ps / nm km @ 1310 nm	/	<18.0 ps / nm km @ 1550 nm

The specified bending radius of the optical fibers must not be exceeded. The pigtails for the connection between master unit and remote unit must have a sufficient length. The fibers must be protected where they enter the units. The system attenuation of the optical fibers, including the connectors, must not exceed 10 dB.

System attenuation and attenuation of optical components must be determined. This can be achieved by measuring attenuation and reflection with an appropriate measuring instrument. For pigtails, a total value of < 0.4 dB (measured to a reference plug) can be assumed due to the dead zone of the reflectometer. These measurements must be made with a sufficient length of optical fiber, at the input and output of the device which has to be measured.

Fiber-cable connectors have to be of the same type (Radiall Opus LC-APC) as the connectors used for the unit. The fiber-optic cables are connected to the optical transceiver.



Angled connectors are not compatible with straight optical connectors; non-compatibility of connectors will result in permanent damage to both connectors.

Before connecting the fiber cables, follow the procedure below to ensure optimized performance. It is important for these procedures to be carried out with care:

- Remove fiber-optic protective caps.
- Do not bend the fiber-optic cable in a tight radius (< 4 cm) as this may cause cable damage and interrupt transmission.
- Using high-grade alcohol and lint-free cotton cleaning swabs, clean the end of the fiber-optic cable that will be inserted in the optical connectors on the donor interface box.
- Blow out the laser receptacle with clean and dry compressed air to remove any particulate matter.
- Do not use any index-matching gels or fluids of any kind in these connectors. Gels are intended for laboratory use and attract dirt in the field.
- Connect the fiber-optic cables by following the instructions in the next chapter.

4.2.11. Assembly Instructions for Optical LC Patch Cables

The RU optical connector (Opus Short Plug kit) supports both simplex (one fiber cable) and duplex (two fiber cables) operation. The ION-U H 17P2 utilizes a single fiber cable for both uplink and downlink. The following instructions cover both simplex and duplex installation.

The Opus Short Plug kit, which is included with the delivery of the RU has the following components.

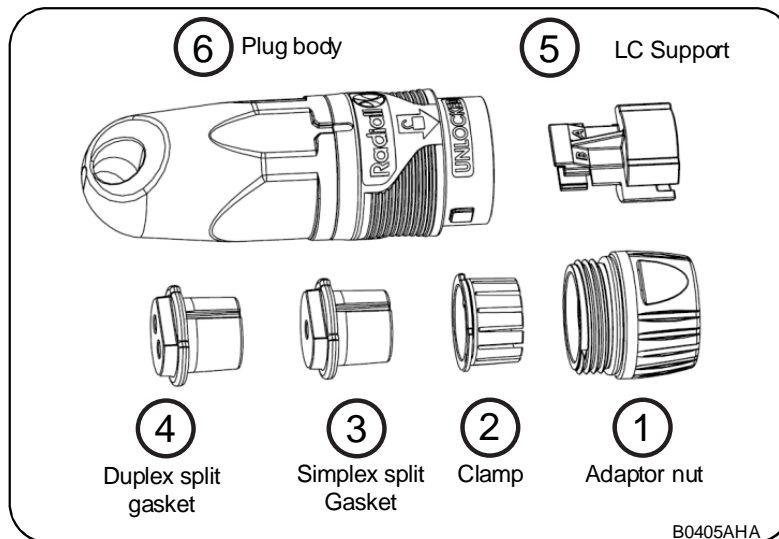


figure 4-16 Contents of the Opus Short Plug kit

The LC/APC patch cables must meet the following requirements shown in *figure 4-17* for use with the RU and the Opus short plug kit.

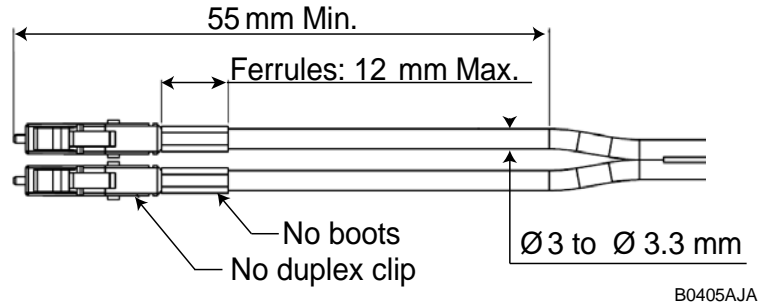


figure 4-17 LC/APC patch cable requirements

Note: You must pay close attention to the integrity of the fiber during the assembly process!

4.2.11.1. Assemble Optical Opus Short Plug Components

The following instructions cover both simplex and duplex fiber cables. Steps that apply only to duplex cables have “b” following the step number.

- 1 Slide the adaptor nut ① and the clamp ② onto and along the fiber patch cable as shown.

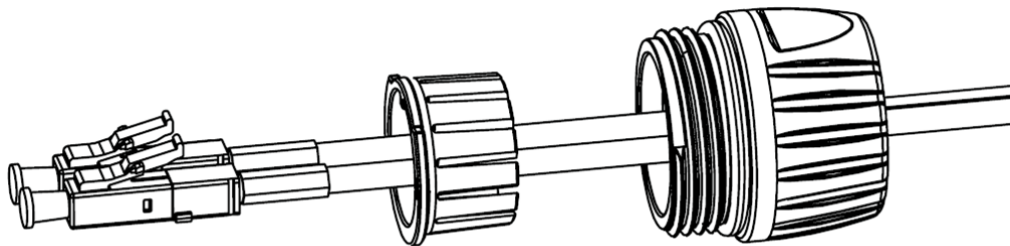


figure 4-18 Opus short plug gasket and nut

Simplex Cable

- 2** Place the simplex split gasket **3** on the cable using the split on the side of the gasket with the larger diameter of the gasket toward the front.

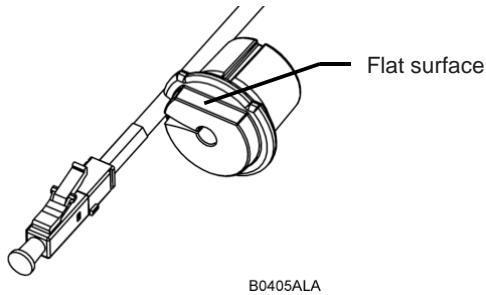


figure 4-19 Simplex split gasket

- 3** Insert the LC connector by its side into Cavity A of LC support **5** until it clicks into place.

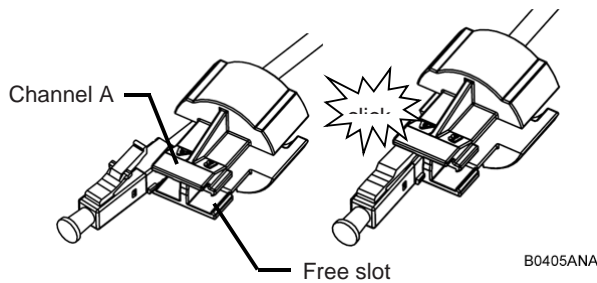


figure 4-21 Simplex Cavity A

Duplex Cable

- 2b** Place the duplex split gasket **4** on the cables using the split on both sides of the gasket with the larger diameter of the gasket toward the front. Ensure that the channel positioning is correct as shown.

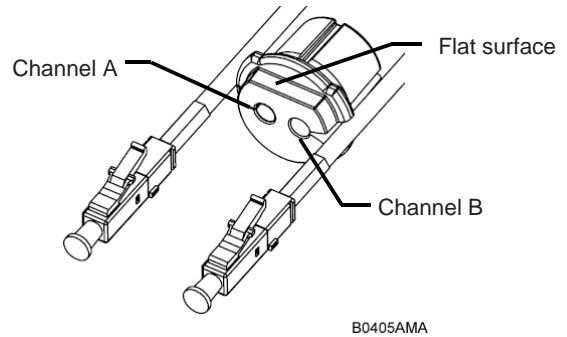


figure 4-20 Duplex split gasket

- 3b** Insert the LC connectors by their sides into the LC support **5** until they click into place. Ensure that the channel positioning is correct as shown.

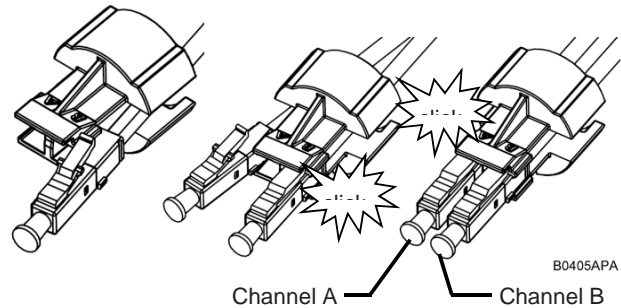
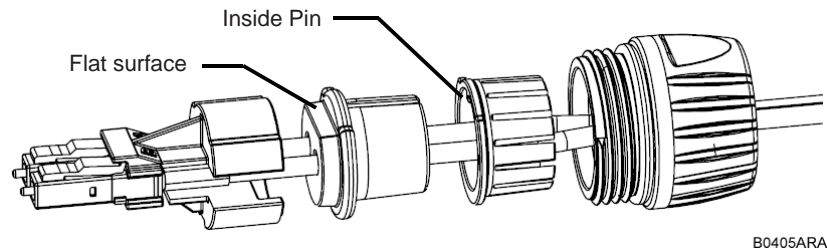


figure 4-22 Duplex Cavity A & B

Note: The LC latch must be pressed down in order to slide it into the cavity of the LC support.

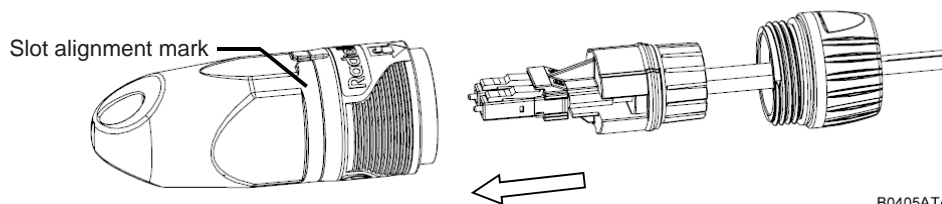
Note: Remove the LC protection cap after completing step 3 (or 3b).

- 4** Align and assemble LC support **5** with split gasket **3** or **4** and clamp **2**. Insert this assembly into the plug body **6** as shown. The inside pin of the clamp must be aligned with the groove in the split gasket.



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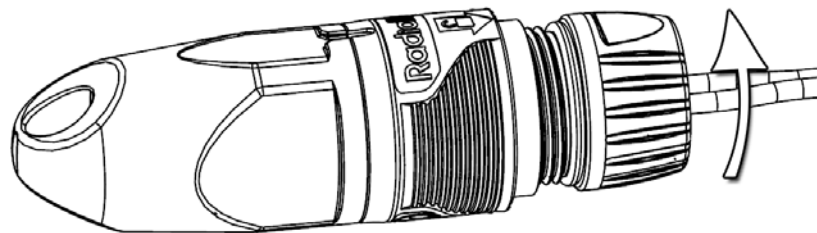
figure 4-23 Assemble Opus short plug



B0405ATA

figure 4-24 Insert LC connector plug into plug body

- 5** Screw the adapter nut **1** onto the body (2 N.m maximum torque).

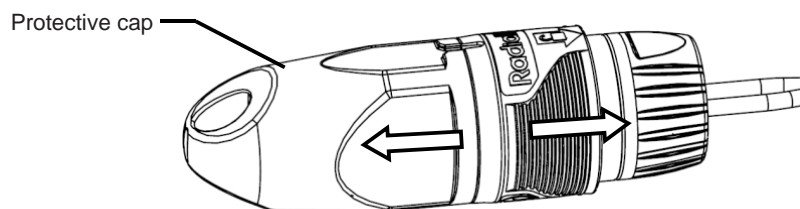


B0405AUA

figure 4-25 Tighten Opus short plug adapter nut

4.2.11.2. Connect Opus short plug to RU

- 1** Pull on the plug's collar to remove the protection cap.



B0405AVA

figure 4-26 Remove Opus short plug protective cap

- 2 Push the plug body into the receptacle until the collar is in the locked position. The “UNLOCKED” label on the connector body will no longer be visible when the connector is properly locked into the receptacle on the RU.

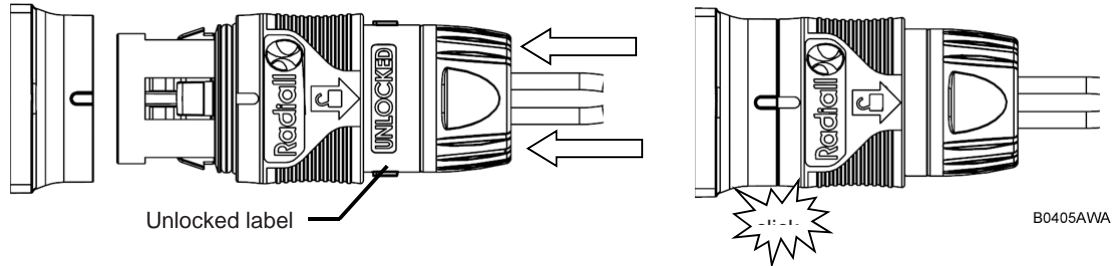


figure 4-27 Insert Opus short plug into RU receptacle

4.2.11.3. Disconnect Opus Short Plug from RU

- 1 To disconnect the Opus short plug, pull on the collar to release the plug.

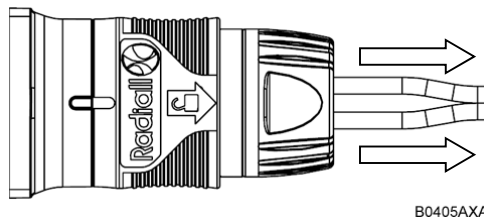


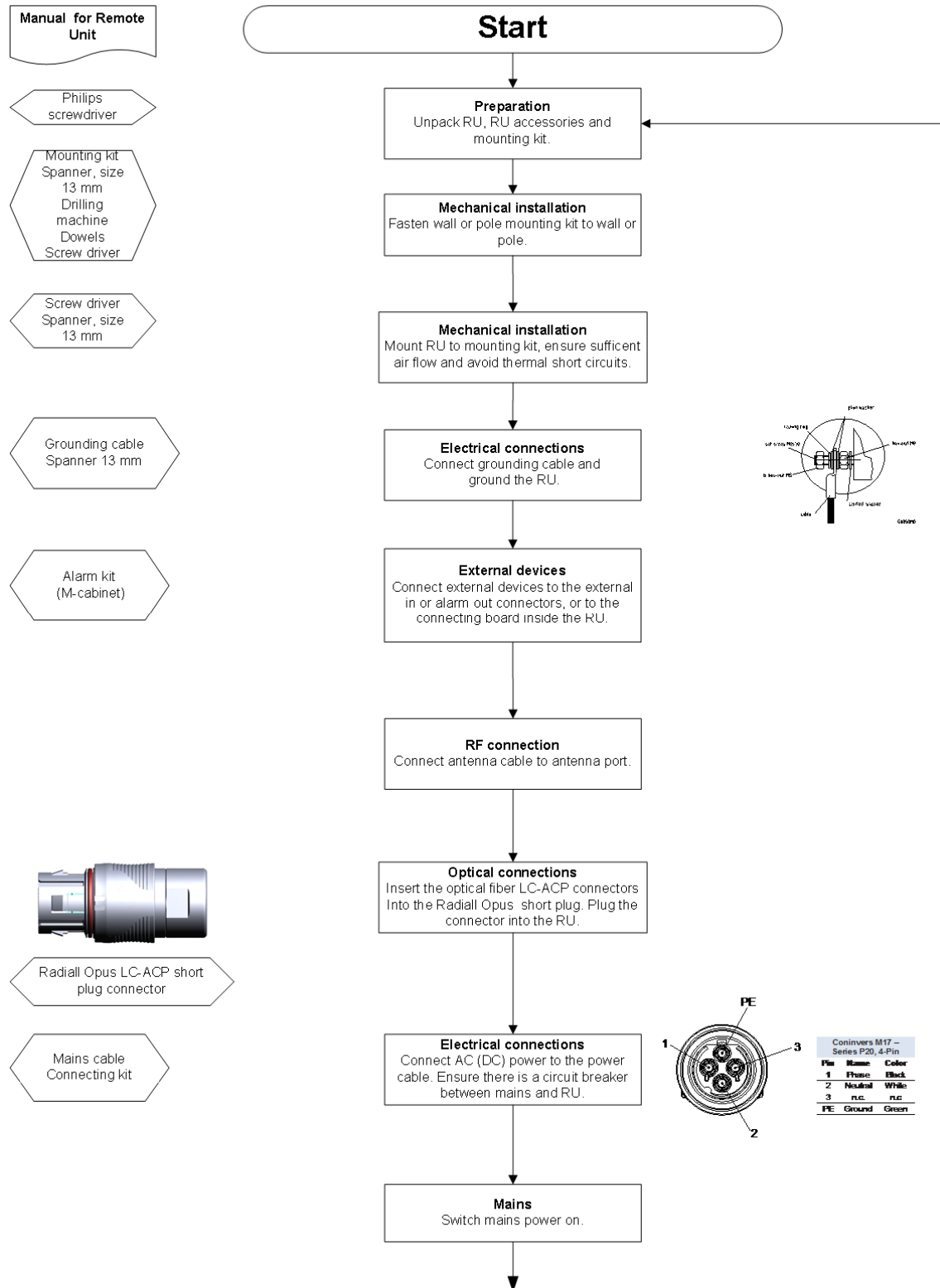
figure 4-28 Disconnect Opus short plug from RU

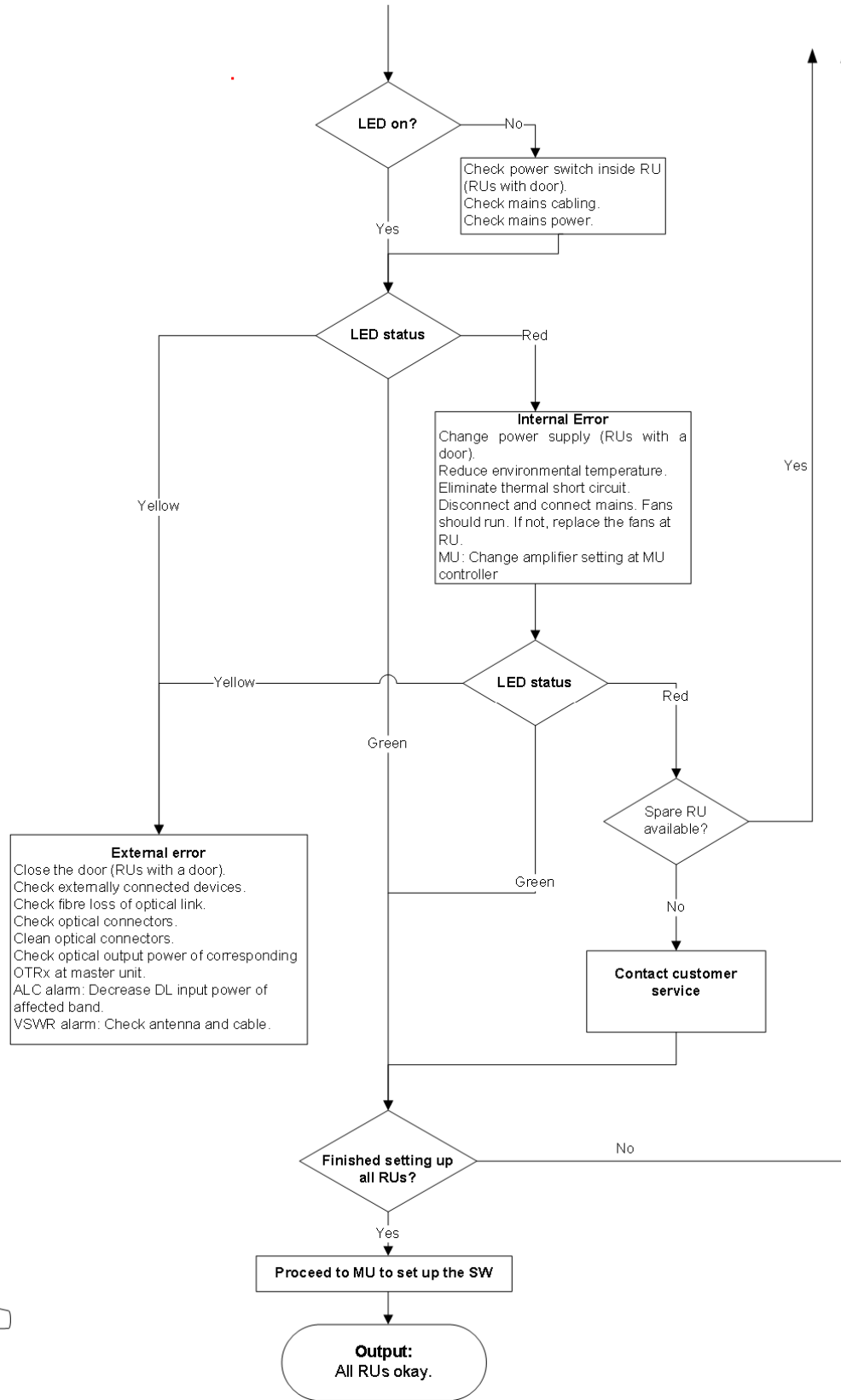
4.3. Commissioning

Read the health and safety warnings in chapter *1.2 Health and Safety Warnings* as well as the description carefully to avoid mistakes and proceed step by step as described!

- Do not operate the remote unit without terminating the antenna connectors. The antenna connectors may be terminated by connecting them to their respective antennas or to a dummy load.
- Only qualified personnel should carry out the electrical, mechanical, commissioning and maintenance activities that require the unit to be powered on when open.
- When opening the remote unit do not damage the warranty labels on the internal devices. The warranty is void if the seals are broken.
- Ensure that all connections have been performed according to chapter *4.2.2 Connections*.

Commissioning an ION-U Remote Unit





5. Alarms

5.1. Bite and Alarms

The Built-In Test concept comprises the monitoring of the power supplies, the power amplifiers and the optical interface.

All occurring alarms can be checked via software at the master unit.

5.2. Handling of Alarms

As soon as the software acknowledges a valid alarm, a message is transmitted to the master unit.

If the reason for the alarm has been cleared or if the alarm should continue, a new alarm message will not be repeated. If there was an interruption of at least five seconds after acknowledgement, a new alarm message will be generated.

5.3. Alarm Status

For details refer to the corresponding software documentation of the master unit.

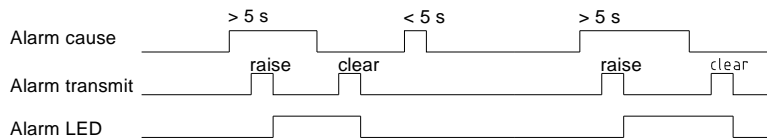
5.4. Status LED Alarms

For local supervision, a status LED on the connector flange of the remote unit provides a visual indication of possible reasons for alarms. This table shows possible on-site measures that could be checked before referring to the master unit alarm list.

For local supervision, a status LED on the connector panel of the remote unit provides a visual warning of an alarm condition. The color of the LED indicates the severity of the alarm. Detailed alarm information is available through the ION-U software interface. This table lists the alarm conditions and possible on-site measures that could be performed to resolve the issues responsible for triggering the alarms.

Status LED Indication	Alarms	Possible on-site measures
Green	No alarm → Status ok	
Orange	Door alarm	Close the door (RUs with door).
	<i>Alarms not directly related to RU:</i>	
	External alarms	Check externally connected devices.
	Optical alarm Rx	Check fiber loss of optical link. Check optical connectors. Clean optical connectors. <i>(MU: Check optical output power of corresponding OTRx at master unit).</i>
	ALC alarm	<i>(MU: Decrease DL input power of affected band).</i>
Red	<i>Alarms directly related to RU:</i>	
	Power 28 V	Change power supply (RUs with door). Replace the affected remote unit.
	Temperature	Reduce environmental temperature. Eliminate thermal short circuit.
	Fan	Disconnect and connect mains. Fans should run briefly (SW version > 2.4). If not, replace the fans at RU.
	I ² C	Disconnect and connect mains.
	Optical alarm Tx	-
	Amplifier “Power Down”	<i>(MU: Change amplifier setting at MU controller).</i>
Status LED off	Mains	Check power switch inside of RU (RUs with door). Check mains cabling. Check mains power.

table 5-1 Status LED alarms



V1651A2

figure 5-1 Alarm triggering

For the position of the status LED see chapter 4.2.2 Connections.

Explicit troubleshooting is available in the MU software, (software manual or WEB Interface).

5.5. External Alarm Inputs and Outputs

The eight-pin EXT ALARM IN/OUT connector supports two external alarm inputs and two external alarm outputs. Chapter 4.2.7 *Ext. Alarm In / Out Port* includes the connector’s pin-out information and chapter 4.2.2 *Connections* identifies the connector’s location.

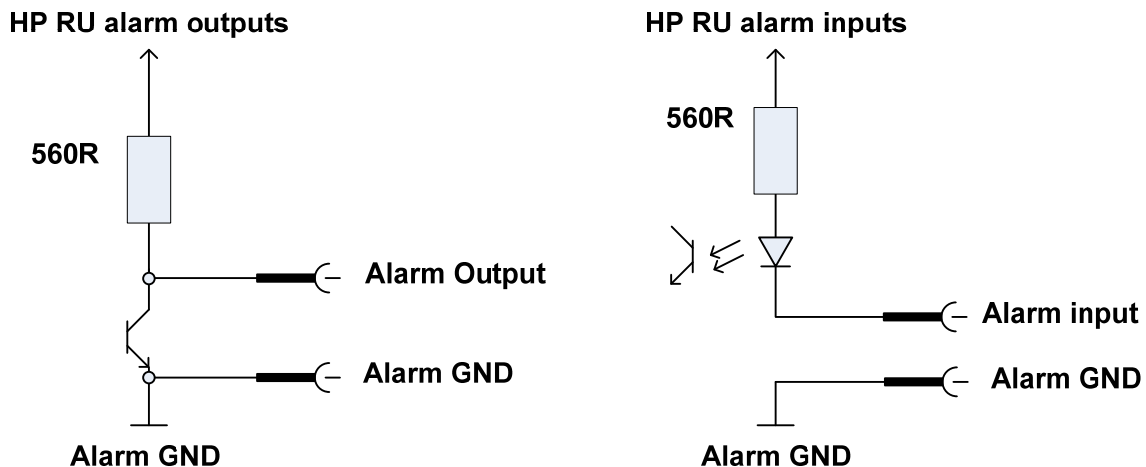
The alarm outputs (open collector output 5 V / 1 mA) are normally low. In case of an alarm they are high active (5 V). They can be used to monitor alarms with an external alarm indicator.

Note: The manufacturer / supplier of this system accepts no liability for damage caused by equipment connected to external outputs or by effects from such equipment.

With the external alarm inputs, it is possible to monitor the status of connected devices, e.g. a UPS, via software. All alarm inputs are normally high (5 V) without connection. The polarity (high/ low) can be set via the software at the Master Unit (for details please see the appropriate ION-U software manual).

The device to be monitored must be connected so that the alarm contacts will be closed in case of an alarm (I max = 8 mA). The alarm inputs are potential-free with common ground (earth).

Subminiature circular connectors series 712 with eight contacts, which are included in the alarm kit, can be ordered directly from the Binder Connector Group, the manufacturer, or indirectly from CommScope.



B0405AGA

figure 5-2 Alarm inputs and outputs, standard

5.6. Troubleshooting

The status of the remote unit can be checked via the master unit (for details please refer to the ION-U Site Manager software manual). Locally, the status can be checked at the LED, see chapter *5.4 Status LED Alarms*.

6. Maintenance

6.1. General

Read the health and safety warnings in chapter 1.2.

Note: The remote unit does not require preventative maintenance measures.

Note: To prevent malfunctions of the cooling system due to dirt or pollution, it is recommended to clean the heat sink at regular intervals. These cleaning intervals depend mainly on the location of the remote unit and the corresponding degree of pollution.

Maintenance of the ION-U High Power RUs should be performed by replacing only components that are described in this chapter. In order to maintain the warranty, avoid unintentional damage to the seals on the modules.

The spare parts list, (see chapter 7.3) includes only units that can be replaced in the field without tuning or soldering work.

Note: When sending back the unit, use appropriate packaging. Use of the original packaging for shipping the unit is strongly recommended!

Note: Defective parts should only be replaced by original parts from the supplier. All service work performed inside the housing is performed at the users own risk.

Note: Ensure the Remote Unit has been disconnected from mains power during maintenance.

Note: Label any unlabelled cables before disconnecting them to ensure correct reconnection.

For most maintenance procedures, appropriate tools are required to ensure correct handling. All of these tools can be ordered from the supplier.

Note: All Remote Unit screws have a right-hand thread, and are tightened by turning the screws clockwise and loosened by turning them counter-clockwise with an appropriate tool.

Due to the design of the remote unit, the fan unit is the only component that should be replaced in the field. Please contact the supplier for replacement of any other components.

6.2. Replacing the Fan Unit

Replacement of the fan unit is not required as a preventative measure. Only when an alarm indicates a malfunctioning of a fan, must the unit be exchanged.

Note: Please observe that the fan unit can only be replaced as a whole. Do not remove the fans separately.

Read the health and safety warnings in chapter 1.2 *Health and Safety Warnings* as well as the instructions in chapter 6.1 *General* before starting with the replacement.

1. **Switch off the remote unit. Make sure that mains power is disconnected for the following replacement procedure.** Then, proceed as follows:

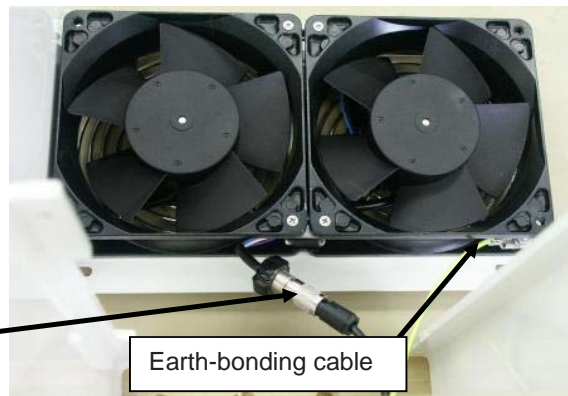
2. Loosen the four tallow-drop screws M4x8 by which the fan plate is attached to the cabinet. Remove the four screws and the corresponding washers.



B0092ALA

3. Remove the fan unit – by putting slight pressure on the fan plate cover – moving it to a position that allows access to the fan connector and the earth-bonding cable.

4. Unscrew the fan connector and then disconnect the earth-bonding cable.



B0092A5A

Note: To observe the specified torque of 650 Ncm for an M5 thread, use an appropriate tool for the following procedures.

5. To mount the new fan unit, reconnect the earth-bonding cable and the fan connector (see *step 4*). Then, place the fan unit back into its original position and press it back into position as shown below:



B0092AJA



B0097AKA

6. Fasten the complete fan unit to the cabinet with the four tallow-drop screws M4x8 (see *step 2*). To prevent exceeding the specified torque of 330 Ncm, use an appropriate tool.

6.3. Cleaning the Heat Sink

👉 **Note:** Read the health and safety warnings in chapter *1.2 Health and Safety Warnings* as well as the instructions in chapter *6.1 General* before starting with the replacement procedure. Then, proceed as follows:

1. Switch off the remote unit. Make sure that mains power is disconnected for the following procedure.
2. Remove the fan plate with the fan unit from the remote unit as described in chapter *6.2 Replacing the Fan Unit*, steps 2 and 3.
3. Use compressed air (max. 5 bar) to dust, dirt, or other debris the heat sink from back to front.
4. If the dirt cannot be blown out completely and parts of it stick to the ribs of the heat sink, clean the parts concerned carefully from the front using e.g. a brush. Take care that the heat sink material is not scratched or damaged.
5. After cleaning the heat sink, remount the fan unit according to chapter *6.2 Replacing the Fan Unit*, steps 5 and 6. Then, switch the remote unit back on.

7. Appendix

7.1. Illustrations

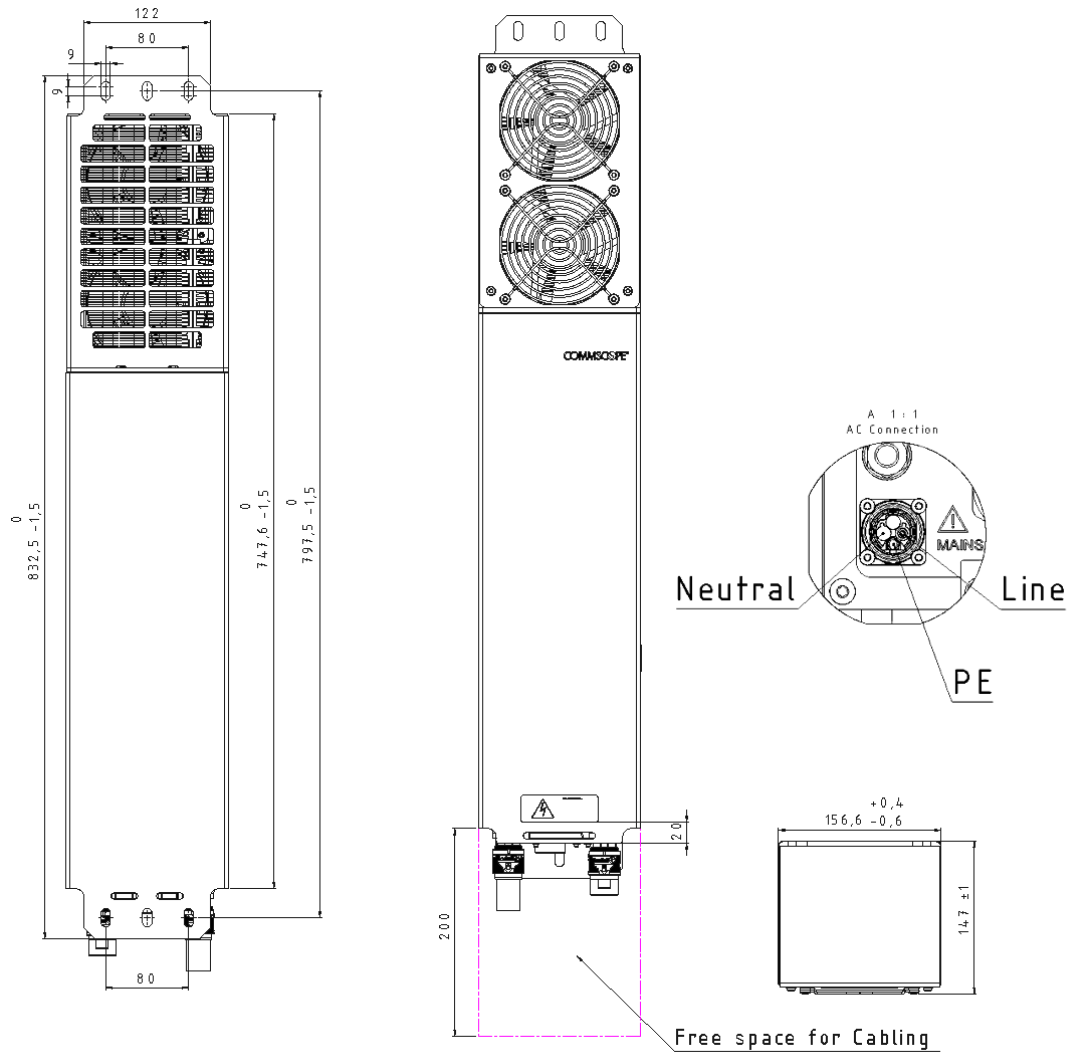


figure 7-1 Installation drawing-front and rear views

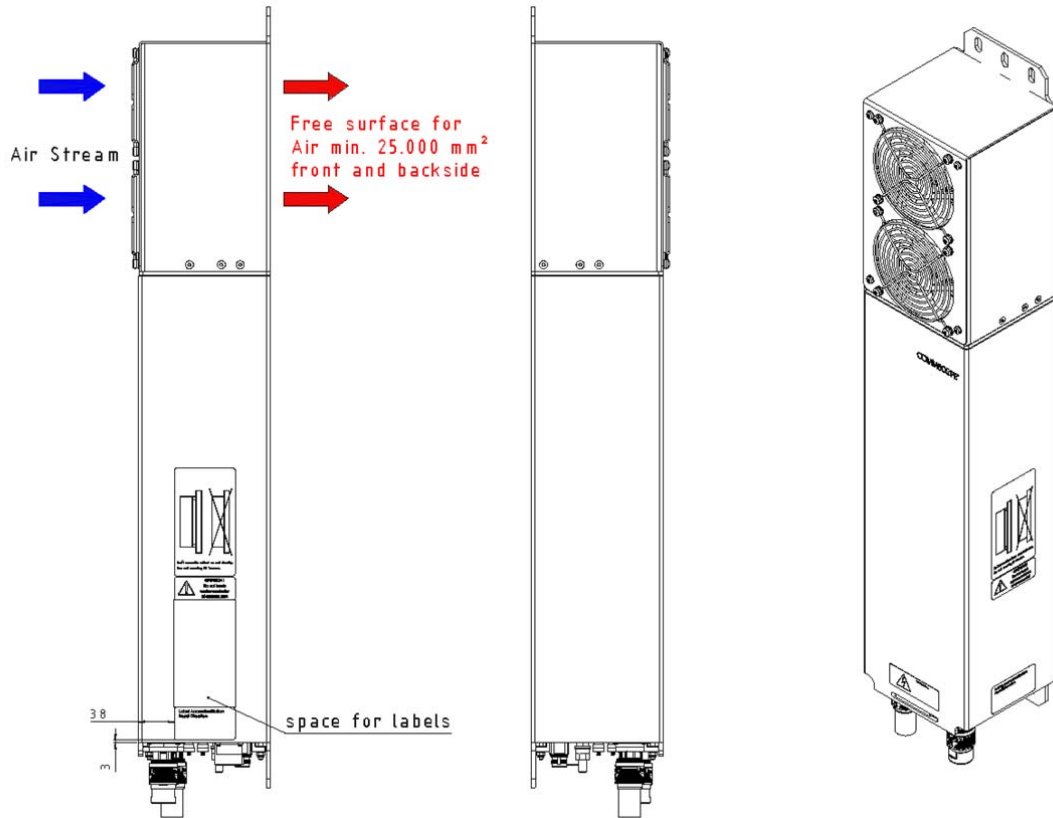


figure 7-2 Installation drawing-side views

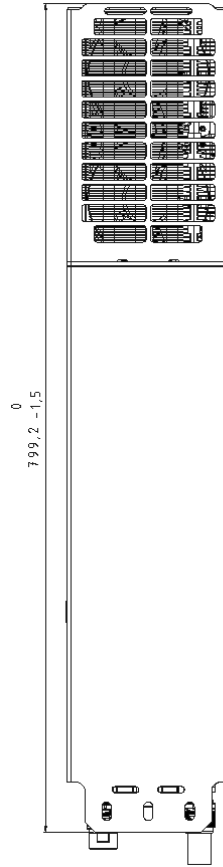


figure 7-3 Installation drawing-short version

7.2. Specifications

Please refer to the *ION-U_H_17P2_PA-106766.x-EN.GB* data sheet for the ION-U HP RU specifications.

7.3. Spare Parts

Please contact your CommScope sales representative or DCCS Technical Support for a current ION-U HP RU parts list.

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