



ION™-U

Optical Remote Unit

ION-U L 7/8/85/17/19



User's Manual
MF0147A0A

POWERED BY



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Andrew Wireless Systems GmbH, 04-February-2013

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1. General

1.1. Used Abbreviations

3GPP	3 rd Generation Partnership Project
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
CE	"Conformité Européenne" ("European Conformity")
CD	Compact Disk
CPD	Channel Power Detection
DL	Downlink
DoC	Declaration of Conformity
EDGE	Enhanced Data Rates for GSM Evolution
EN	European Norm
EP	Extension Port
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
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
ION	Intelligent Optical Network
IP	Ingress Protection
ISO	International Organization for Standardization
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
OTRx	Optical Transceiver = SRMU (Subrack Master Unit)
PDU	Power Distribution Unit
PG	Packing Gland
PIM	Passive Intermodulation
P _{in}	Input power
P _{out}	Output power
R&TTE	Radio & Telecommunications Terminal Equipment
Rev	Revision
RF	Radio Frequency
RU	Remote Unit
RX	Receiver
SNMP	Simple Network Management Protocol
TS	Technical Specification
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

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 licence 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. **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.

18. **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
	---	Alert sign to R&TTE
CE 0700	Symbol	Indicates conformity with the R&TTE directive 1999/5/EC certified by the notified body no. 0700.

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.

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table 1-1 List of international contact addresses

Introduction

1.4. Purpose

Cellular telephone systems transmit signals in two directions between base transceiver station (BTS) and mobile stations (MS) within the signal coverage area.

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 distribution system.

Such a system contains an optical Master Unit and several Remote Units. The number of the Remote Units depends on the hardware and software configuration. 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 the remote units via optical fibers.

1.5. The ION-U L 7/8/85/17/19 Remote Unit

The ION-U 7/8/85/17/19 is a low power remote unit for Cell700, LMR800, Cell850, AWS, and Extended PCS1900 Band Applications. The unit is compatible with analog, GSM, EDGE, IS-95, CDMA2000, EVDO, W-CDMA, HSDPA, and LTE modulation standards. It is used in conjunction with a Master Unit in the ION optical distribution system. This system transports multiple signals simultaneously, providing a cost-effective solution for distributing capacity from one or more base stations.

The ION-U 7/8/85/17/19 transports signals on the RF layer in a very inexpensive manner. This means that multiple operators and multiple technologies are moved simultaneously from a cluster of base stations to a remote location over the same fiber.

The ION optical distribution system is a cost-effective coverage solution for dense urban areas, tunnels, subway, airports, convention centers, high-rise buildings, and other locations where physical structures increase path loss. It has been specifically designed to reduce zoning problems and to provide homogeneous coverage and capacity.

The ION-U L 7/8/85/17/19 is capable of supporting both SISO and MIMO. RF signals are transported to the remote units via single mode fiber at 1310 nm. MIMO is achieved with the use of 4 fibers and the pairing of two interlinking RUs.

The system includes an Automatic Gain Control (AGC) that avoids field adjustments and reduces design, installation, and optimization time.

The ION is easily set-up and supervised via a graphical user interface (GUI). Remote Units can be commissioned using built-in test equipment. Optical Loss is compensated through the AGC. Autolevelling allows the output power to be levelled as specified in the system configuration. The entire system may be monitored remotely via an Andrew OMC. This platform uses SNMP protocol and is compliant to X.733 standard.

Should a sophisticated interface not be required, the Master Unit can be directly connected to the alarm interface of a base station via a LAN (local area network) or its contact relay.

Features at a glance:

- Full band, fully transparent operations
- Compatible with Analog, GSM, EDGE, IS-95, CDMA2000, EVDO, W-CDMA, HSDPA, and LTE modulation standards
- 5 dB optical budget compensated through AGC
- Enhanced communication channel for remote control/setting and SW download
- Independent uplink automatic level control (ALC) on each band
- 1 antenna port
- External alarm inputs
- Wideband auxiliary channel
- Internal swappable power supply adapter
- Centralized power supply optionally available

2. Functional Description

In the Downlink (DL) path, the remote unit provides:

- Optical to RF conversion of the input optical signal
- Automatic Gain Control (AGC) of each converted signal to compensate for optical losses
- RF amplification of the converted RF signal for transmission while maintaining a good signal-to-noise ratio
- RF filtering to reject spurious emissions

In the Uplink (UL) path, the remote unit provides:

- RF amplification to boost the signals received by the antennas to maintain a good signal-to-noise ratio
- RF filtering to reject spurious emissions
- Automatic Level Control (ALC) to adjust the RF signal level to meet blocking requirements
- RF-to-optical conversion of the signal, which is conveyed to the output optical port

2.1. SISO and MIMO Operation

The modular architecture of the ION-U 7/8/85/17/19 supports both SISO and MIMO operation. MIMO operation is achieved by pairing two RUs.

The following figures show views of a single ION-U 7/8/85/17/19 remote unit for SISO applications and two ION-U 7/8/85/17/19 remote units paired for MIMO applications.



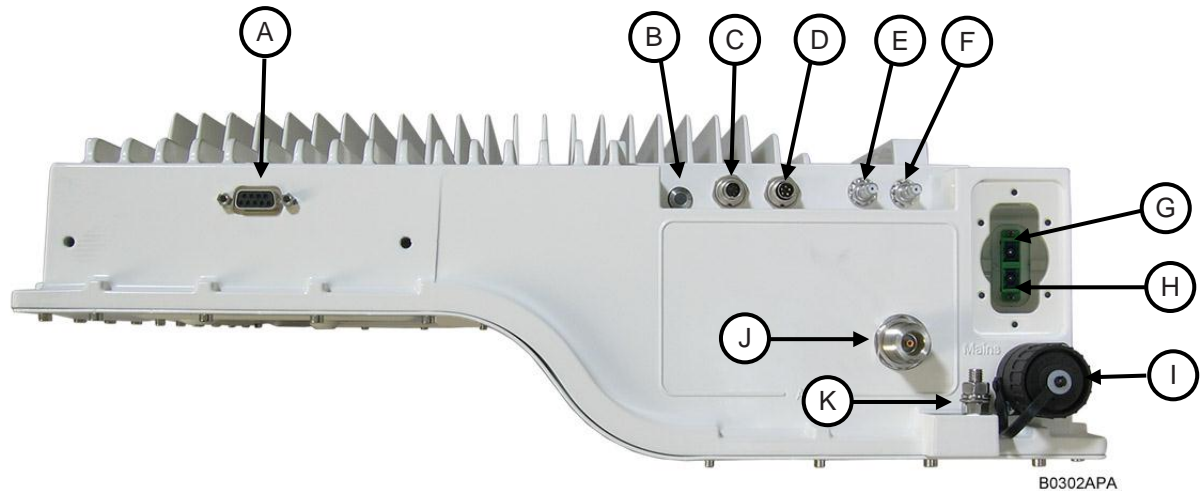
figure 2-1 Remote unit, SISO



figure 2-2 Remote unit, MIMO Two units paired

2.2. ION-U 7/8/85/17/19 Ports

The RF, optical, mains power, alarm, power control, and expansion ports are located on the bottom of the RU as shown in figure 2-3.



A	Local Port RS-232	G	DL optical port
B	Status LED	H	UL optical port
C	Pwr/Ctrl connector	I	Mains power connector
D	Alarm connector	J	RF antenna port
E	Expansion UL port	K	Grounding (earthing) bolt
F	Expansion DL port		

figure 2-3 RU Connectors and Status LED

Antenna Port

The RU has one duplex N-female antenna port (J) for transmitting and receiving signals to and from distributed antennas. This RF port can be connected directly to an antenna (i.e. using RF jumper cables) or through splitters, allowing additional antennas to be fed by the RU.

Status LED

The status LED provides a visual warning of an alarm condition. The color of the LED indicates the severity of the alarm.

Expansion Ports

The Expansion UL and Expansion DL ports (E) (F) are QMA female connectors that are used to connect to a CommScope expansion unit to provide additional bands.

Optical Ports

The LC-APC optical connectors are used to send and receive the signals between the RU and the Master Unit's OTRx modules.

- The DL optical port **(G)** receives downlink signals from the MU OTRx.
- The UL optical port **(H)** transmits uplink signals to the MU OTRx.

Mains Connector

The RU receives its power through the Mains connector **(I)**. The type of connector is dependent on the RU model. A 4-pin Amphenol connector is used for AC models and standard DC models. A 7-pin Amphenol connector is used for DC models powered by a dual cable supply.

Pwr/Ctrl Connector

The Pwr/Ctrl connector **(C)** supports an optional fan unit. The RU provides power and fan speed control to the fan unit and receives alarms from it through this 7-pin Binder connector.

Alarm connector

The RU has two alarm relay inputs that can be used to monitor and report alarms from external devices. The Alarm connector **(D)** is a 5-pin Binder connector.

Local Port RS-232

The RS-232 port **(A)** is standard DB-9 female connector used for external modem communication with an optional extension unit and for local connection to a laptop PC.

3. Commissioning

3.1. Mechanical Installation

3.1.1. 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:** It is recommended to use the mounting hardware delivered by the manufacturer only. If different mounting hardware is used, the specifications for stationary use of the Remote Unit must not be exceeded.

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



3. **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.

4. **Caution:** Due to power dissipation, the Remote Unit may reach a very high temperature. Ensure sufficient airflow for ventilation.
5. **Note:** When connecting and mounting the cables (RF, optical, mains, ...) ensure that no water can penetrate into the unit through these cables.
6. **Note:** Observe all additional rules or restrictions regarding mounting that apply to specific Remote Unit types.

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:

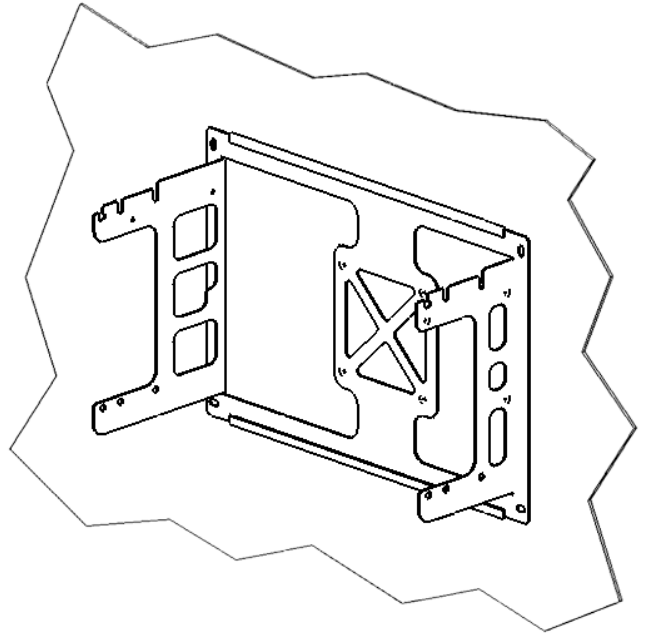
Type	Tallow-drop screws	Hex nuts	Spacing bolts		PG (plastic)	PG (aluminium)
Thread	M 4	M 8	M 4	M 8	PG 13.5	PG 29
Specified torques	3.3 Nm	27 Nm	2.3 Nm	27 Nm	3.75 Nm	10 Nm

table 3-1 Specified torques

3.1.2. Wall-Mounting Procedure

1. Check the suitability of the wall-mounting kit and the wall.
2. Install the wall-mounting bracket using 4 M6 screw anchors (not included*) according to the drilling layout. Confirm that the bracket is securely fastened to the wall.

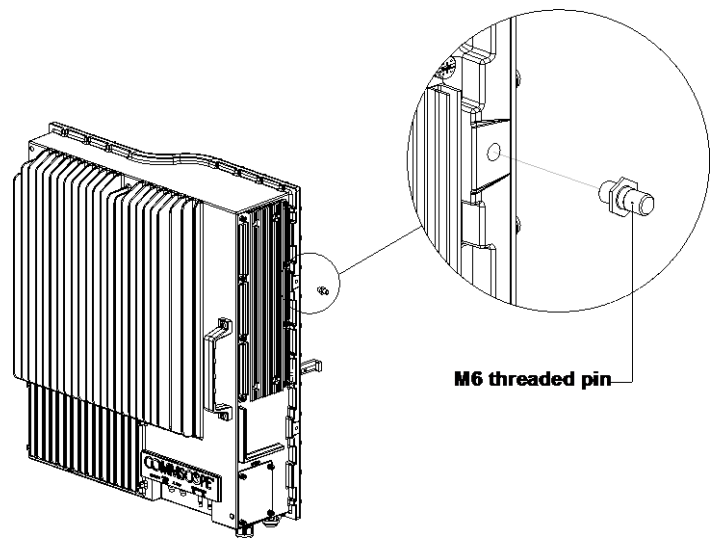
* The M6 screw anchors are not included as part of the RU delivery because the suitable type depends on the on-site conditions (wall structure and materials). Therefore, use screw anchors that are appropriate for the mounting surface.



B0303A6A

figure 3-1 Wall-mounting bracket

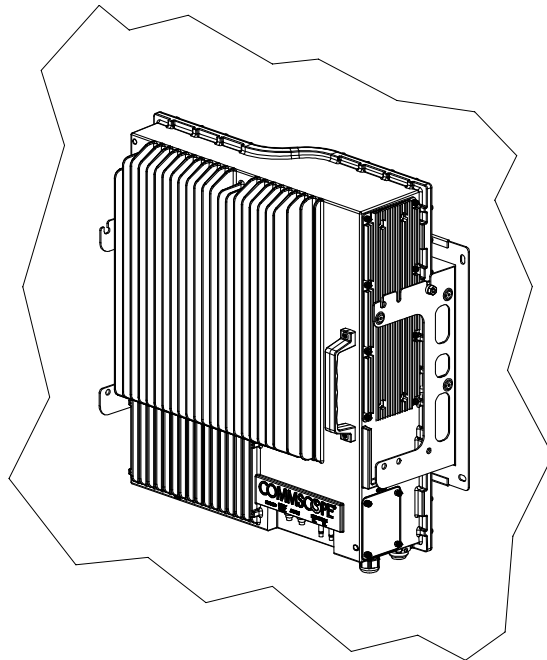
3. Attach the M6 threaded pins to the Remote Unit (on the both sides).



B0303A7A

figure 3-2 RU threaded pins

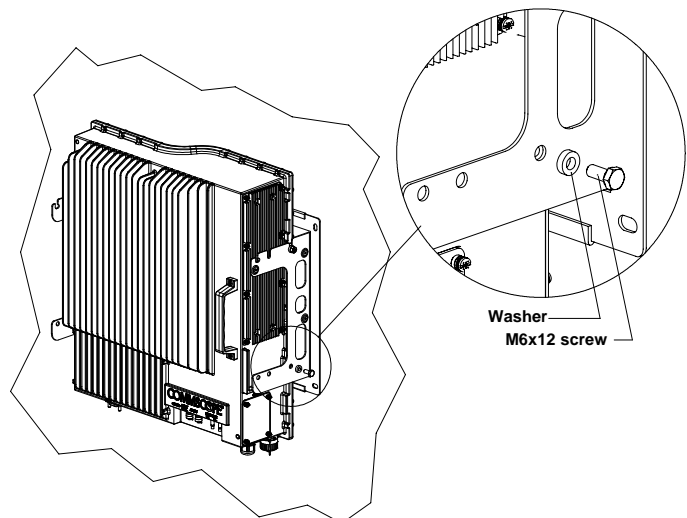
4. Install the Remote Unit on the wall-mounting bracket by lifting the RU into place and lowering it down onto the bracket. The M6 pins must align with the slots in the bracket to support the RU.



B0303A8A

figure 3-3 RU placed on wall mounting bracket

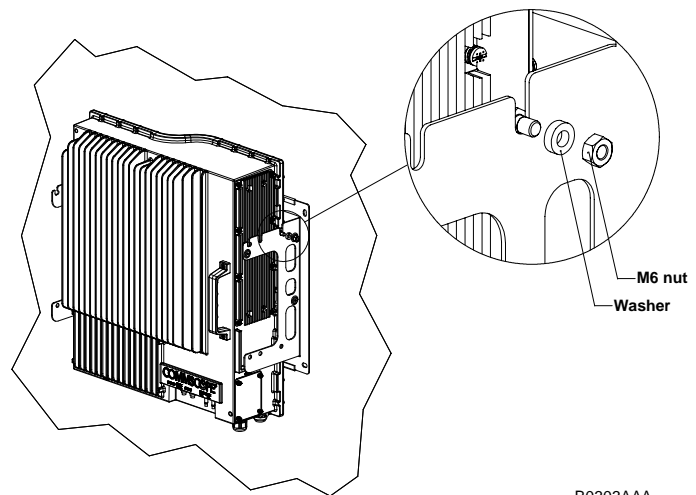
5. Fasten the lower section of the Remote Unit to the bracket using a washer and a M6x12 screw (on both sides). Slide a washer over each screw and then insert the screw and tighten it securely.



B0303A9A

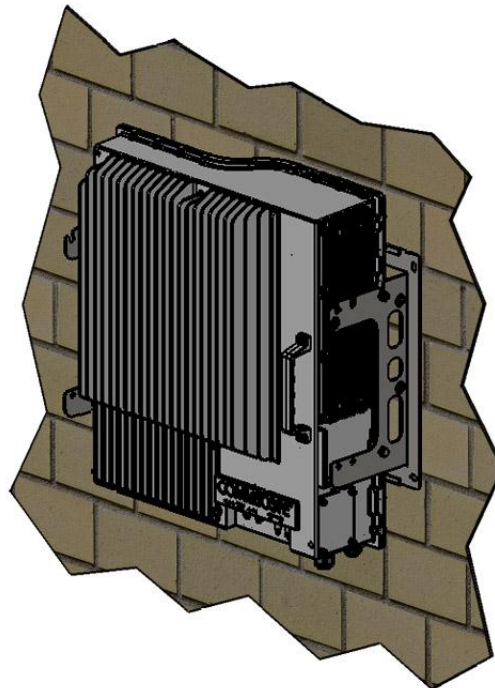
figure 3-4 Install M6x12 screws and washers

6. Fasten the Remote Unit to the bracket using a washer and M6 nut. Slide the washer over the threaded pins that were installed in step 3 and then screw the nut onto the pins (on both sides) and tighten securely.



B0303AAA
figure 3-5 Attach M6 nut to threaded pins

7. Confirm that all screws and nuts have been fastened and the unit is securely mounted to the wall.



B0303ABA
figure 3-6 Completed SISO RU Mount

MIMO mounting instructions

3.2. Electrical Installation

3.2.1. General

Read the health and safety warnings in chapter 1.2.

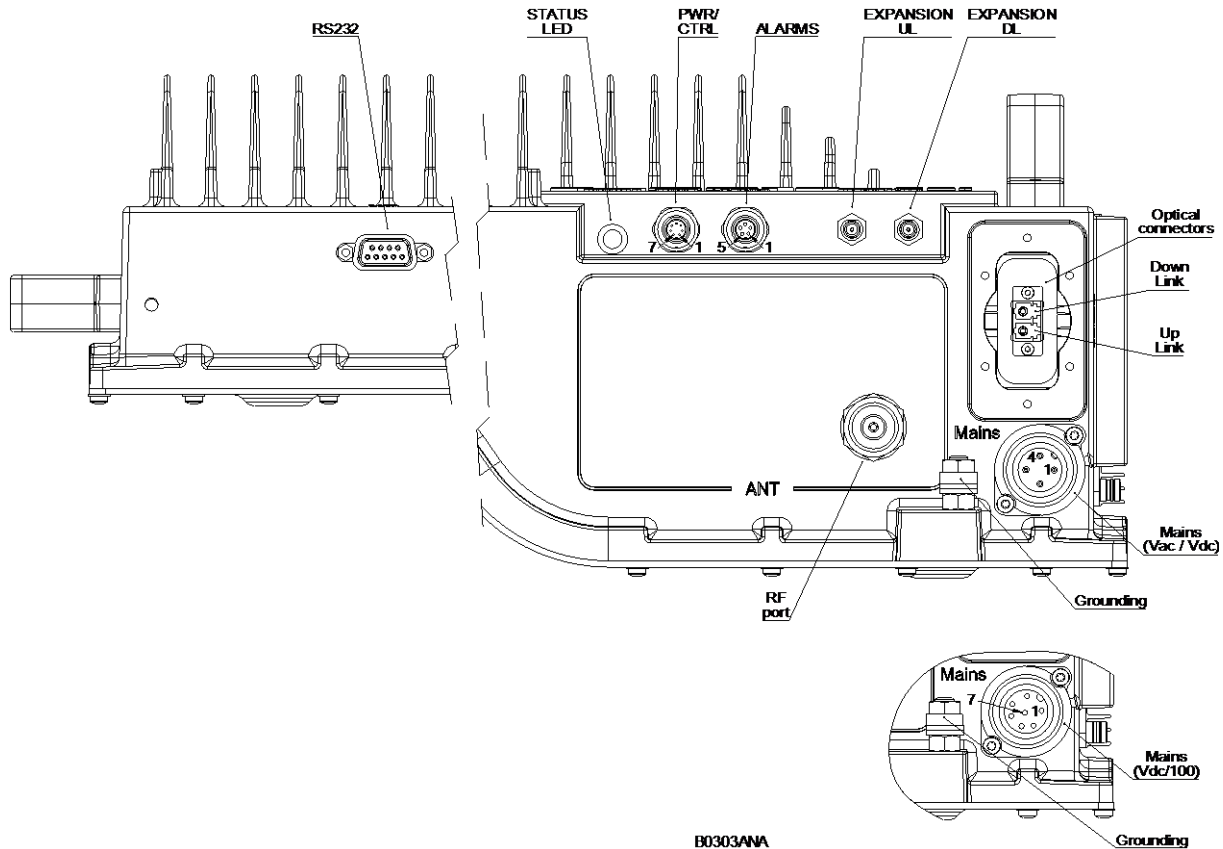


- Warning:** This unit contains dangerous voltages. Loss of life, severe personal injury, or property damage can be the result if the instructions contained in this manual are not followed.
- Caution:** It is compulsory to ground (earth) the unit before connecting the power supply. A grounding bolt is 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 for the coupling torque of N-type connectors (2 N-m / 20 in lb), with 13/16 in opening to tighten the N-type antenna connectors. For example, use torque wrench of item no. 244379 available from the *CommScope e-catalog*. 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.

11. **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.

3.2.2. Connections

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



B0303ANA

figure 3-7 ION-U L 7/8/85/17/19 Connectors

ION-U L 7/8/85/17/19 Connectors/Indicators		
Port/Conn	Purpose	Type
LOCAL RS-232	This connector is used for external modem communication with an optional extension unit and for local connection to a laptop PC.	DB-9 Female
STATUS	This LED provides a visual warning of an alarm condition. The color of the LED indicates the severity of the alarm.	LED
PWR/CTRL	This connector supports an optional fan unit. The RU provides power and fan speed control to the fan unit and receives alarms from it.	Binder 712 series 7-pin
ALARM	This connector provides alarm contacts that are used to monitor and report alarms generated by other equipment.	Binder 712 series 5-pin
EXPANSION UL	This connector is used to connect to the UL port of an expansion unit to provide additional bands of coverage	QMA Female

ION-U L 7/8/85/17/19 Connectors/Indicators		
Port/Conn	Purpose	Type
EXPANSION DL	This connector is used to connect to the DL port of an expansion unit to provide additional bands of coverage	QMA Female
OPTICS UL	This connector is used to connect an optical fiber cable to send uplink signal back to the OTRx module of the ION-U master unit	LC-APC
OPTICS DL	This connector is used to connect an optical fiber cable to receive downlink signal from the OTRx module of the ION-U master unit	LC-APC
MAINS (Vac/Vdc)	This connector provides the power to RU models that use standard AC (85 to 265 Vac) or RU models that use standard DC (-60 to -38 Vdc) power.	Amphenol C016 Series, 4-Pin
MAINS (Vdc/100)	This connector provides the power to RU models used in locations where the power drawn on each cable must be limited to a maximum of 100 VA.	Amphenol C016 Series, 7-Pin
Grounding Bolt	Ground (earth) bolt for connecting the mandatory ground cable to the RU	M8 bolt, hex nut, & washers
ANT RF	This connector is used for transmitting and receiving signals to and from an antenna or antenna splitter.	N-type female

table 3-2: ION-U L 7/8/85/17/19 Connectors

3.2.3. Grounding (Earthing)

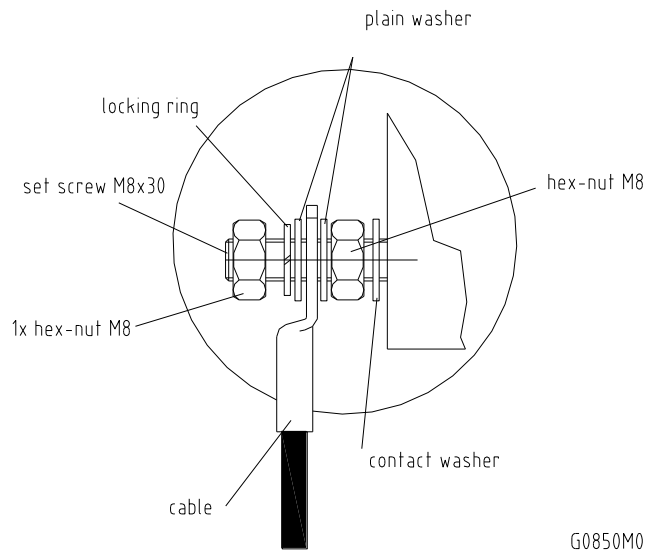
The RU must be grounded (earthed).

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 3-8. Do not use the grounding connection to connect external devices.



B0302ARA

figure 3-8 Grounding bolt



G0850M0

figure 3-9 Grounding bolt, schematic view

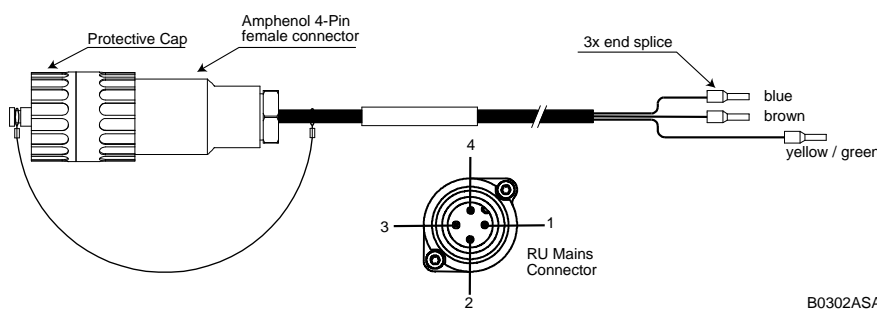
2. After loosening the hex nut, connect the earth-bonding cable between the two washers as illustrated in the figures above.
3. Then, fasten all parts again by tightening the the hex nut.
4. Connect the other end of the ground wire to a suitable permanent ground following local electrical code practices.

3.2.4. Mains Power Connection

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

The Mains power must be connected to the Mains connector of the unit for operation of the RU. A power cable is delivered with each RU. The type of power cable delivered is dependent on the type of power supply in the RU.

The AC power cable is a 3.2 m (10.5 ft) 16 AWG cable with a 4-pin Amphenol C016 series plug on one end to connect to the RU Mains connector. The other end of the cable is un-terminated with 3 end splices to connect to the AC power source. A 10 m (33.7 ft) AC power cable (part no. 7573605-00) is also available as an option. The AC power cable is shown in figure 3-10.

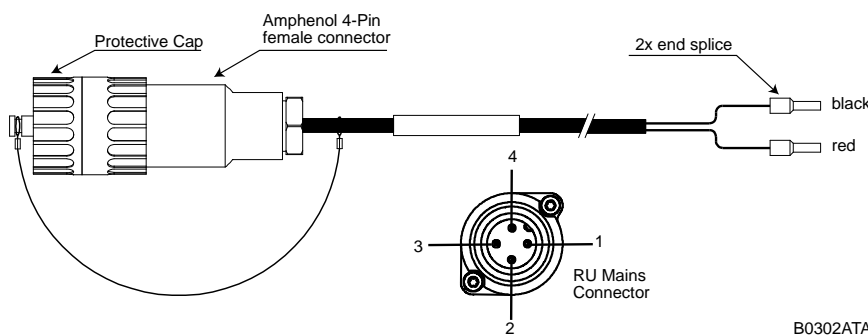


4-Pin Amphenol C016 Series		
Pin	Name	Color
1	Phase	Brown
2	Neutral	Blue
3	n.c.	n.c
4	Ground	Yellow / Green

figure 3-10 AC power cable

table 3-3 AC power cable

The standard DC power cable is a 3.2 m (10.5 ft) 13 AWG cable with a 4-pin Amphenol C016 series plug on one end to connect to the RU Mains connector. The other end of the cable is un-terminated with 2 end splices to connect to the -48 Vdc power source. The standard DC power cable is shown in figure 3-11.



4-Pin Amphenol C016 Series		
Pin	Name	Color
1	n.c.	n.c
2	-48V	Black
3	0V	Red
4	n.c.	n.c

figure 3-11 DC power cable

table 3-4 DC power cable

The Vdc/100 power cable is available for locations where the power drawn on each cable must be limited to a maximum of 100 VA. This cable is a 3.2 m (10.5 ft) 16 AWG cable with a 7-pin Amphenol C016 series plug on one end to connect to the RU Mains connector. The other end of the cable is un-terminated with 4 end splices to connect to the -48 vdc power source.

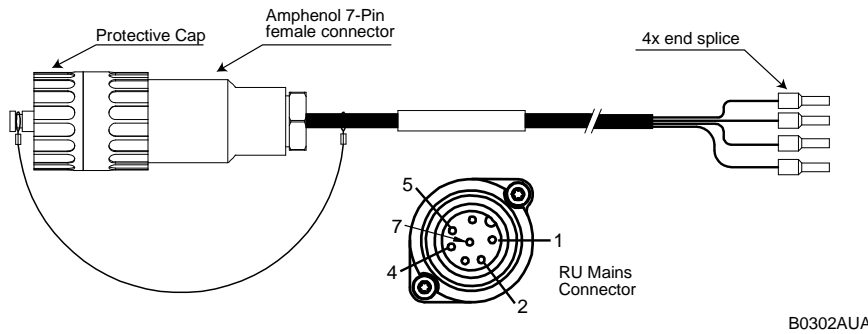


figure 3-12 Vdc/100 power cable

7-Pin Amphenol C016 Series		
Pin	Name	Color
1	0V	
2	-48V	
3	n.c.	
4	0V	
5	-48V	
6	n.c	
7	Ground	

table 3-5 Vdc/100 power cable



For the AC power supply connection, a minimum cross section of 1.5 mm² is required and for the DC power supply connection, a minimum cross section of 2.5 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 cable at the mains connector while power is on. Turn off mains* power before connecting the power cable at the remote unit, then, engage mains power again.

* Mains power must be interruptible 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.

For the DC power supply, observe the local regulations of the DC service provider.

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 3-10 (AC cable), figure 3-11 (DC cable), or figure 3-12 (Vdc/100 cable) depending on the type of power supply used by the RU.
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.
8. Insert the plug into the Mains connector (figure 3-13) and tighten the clamping ring until it is hand tight. Do not over-tighten the clamping ring.

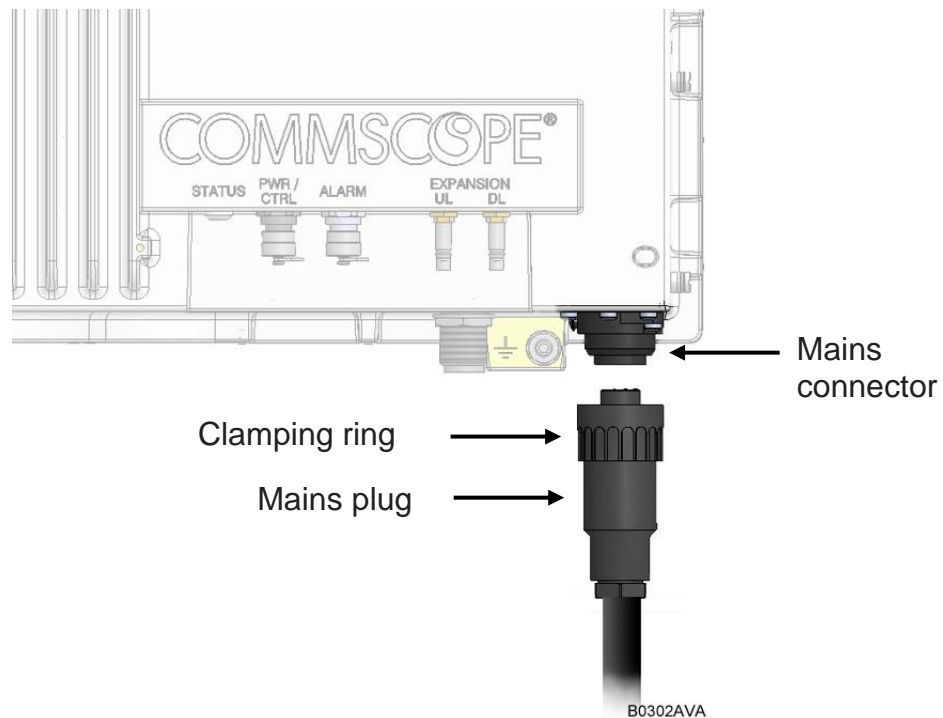


figure 3-13 Connect Mains plug

3.2.5. Antenna Connection

The Remote Unit has one N-type antenna connector (figure 3-14). For mounting the cable connector, it is recommended to refer to the corresponding documentation of the connector manufacturer. The bending radius of the antenna cables must remain within the given specifications.

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 for the coupling torque of N-type connectors (2 N-m / 20 in lb), with 13/16 in opening to tighten the N-type antenna connectors. For example, use torque wrench of item no. 244379 available from the *CommScope e-catalog*. 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.



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.

1. Route the antenna cable from the antenna or splitter to the base of the RU.
2. Cut the cable to length and terminate the cable with an N-type male connector.
3. Remove the red plastic protective cover from the N-type female connector.
4. Using an appropriate torque wrench, connect the cable to the antenna port of the RU.

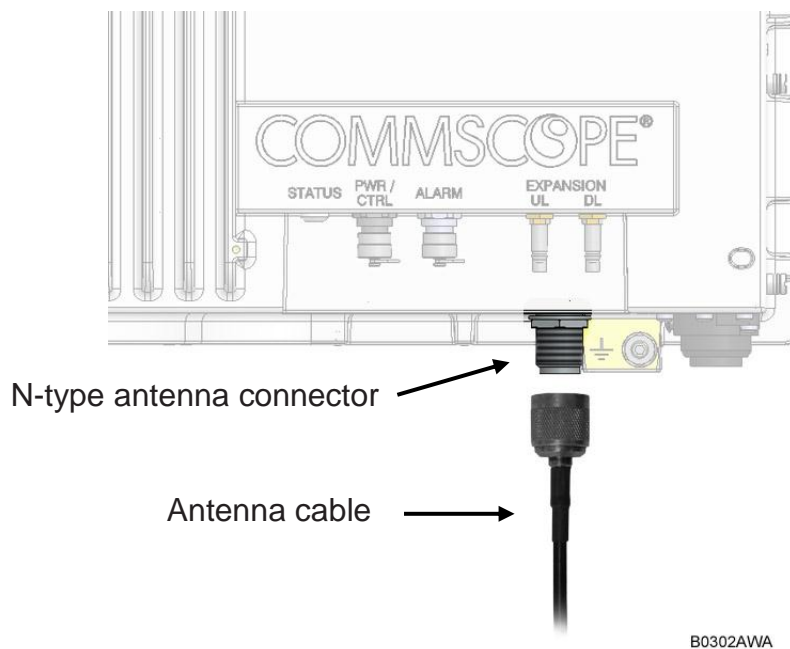


figure 3-14 N-type antenna connection

3.2.6. Expansion Ports Connections

The Expansion ports are QMA-F connectors that are used to connect to an expansion unit to provide additional bands of coverage.

1. Connect an RF cable with QMA male connectors between the UL Expansion port connector of the RU to the UL port of the expansion unit. Press the QMA connector of the cable onto the UL port of the RU until it clicks into place to connect the cable.
2. Connect an RF cable with QMA male connectors between the DL Expansion port connector of the RU to the DL port of the expansion unit. Press the QMA connector of the cable onto the DL port of the RU until it clicks into place to connect the cable.

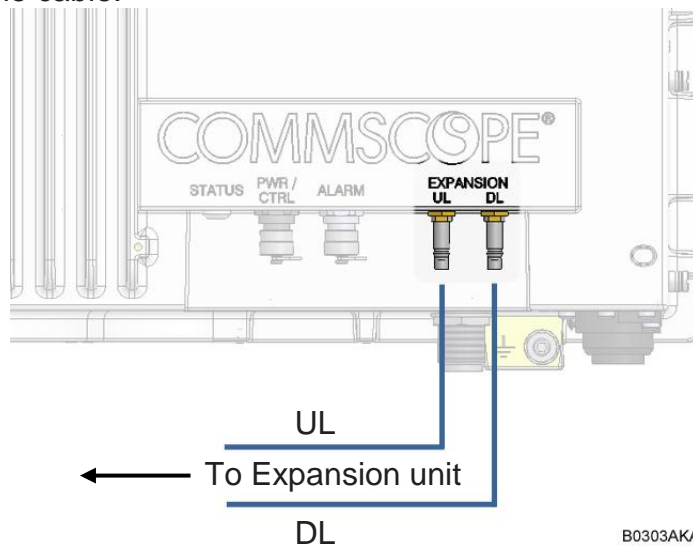
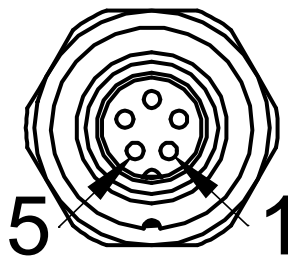


figure 3-15 Expansion ports

3.2.7. Alarm Port

The Alarm port provides alarm contacts that are used to monitor and report alarms generated by other equipment. The connector is a 5-pin Binder 712 series connector.



B303ALA

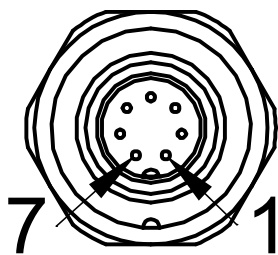
figure 3-16 Alarm Connector

5-Pin Binder 712 Series	
Pin	Assignment
1	EXT1_Alarm
2	EXT1_GND
3	n.c.
4	EXT2_Alarm
5	EXT_GND

table 3-6 Alarm Connector

3.2.8. Pwr/Ctrl Port

The Pwr/Ctrl port is used to handle an optional fan unit. The connector will provide power to the fan unit and will allow the RU to control the fan speed. The connector is a 7-pin Binder 712 series connector.



B303AMA

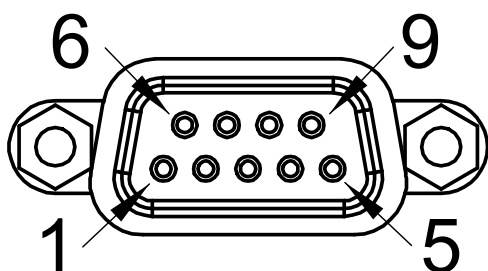
figure 3-17 Pwr/Ctrl Connector

7-Pin Binder 712 Series	
Pin	Assignment
1	+V_FAN
2	Fan1 Alarm In
3	Fan1 (PWM) Out
4	GND_FAN
5	Fan2 Alarm In
6	Fan2 (PWM) Out
7	n.c

table 3-7 Pwr/Ctrl Connector

3.2.9. Control Connector RS-232 - Local Interface

This DB-9 female connector is used for external modem communication with a possible extension unit and for local connection with a laptop.



B303APA

figure 3-18 RS-232 connector

DB-9 Female	
PIN	Assignment
1	Not connected (n.c.)
2	RS232 Rx
3	RS232 Tx
4	n.c.
5	GND (RS232)
6	n.c.
7	n.c.
8	n.c.

table 3-8 RS-232 connector, pin assignment

3.3. Optical-Fiber-Cable Connection - Rules

Main optical system parameters:

Fiber:

- Single mode fiber, type is 9.5/125 μm
- Fiber-cable connectors LC/APC

ION-U system:

- The pigtails for the connection between Master Unit and Remote Unit must have a sufficient length. Protection for the optical fibers must be provided where the fibers feed into the units.
- The system attenuation of the optical fibers, including the connectors, must not exceed 5 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-System Installation:

Fiber-cable connectors have to be of the same type (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 just before making the fiber connections. Do not leave any LC/APC connectors open as they may attract dirt. Unused optical connectors must always be covered by their caps.
- Do not bend the fiber-optic cable in a tight radius (< 5 cm) as this may cause damage to the cable 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. Use a fiber end-face inspection tool to scan both, the class fiber and its surrounding area.
- Check for dirt on the cladding, chips/pits, dirt on the ferrule, and scratches.

- Connect the fiber-optic cables by inserting the cable end into the laser receptacle.
- 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.

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

Cleaning Procedure for Fiber-Optical Components:

Any contamination in the fiber connection results in additional optical transmission loss which could cause whole system failure. It is thus recommended that every fiber connector be inspected and cleaned prior to mating.

The goal is to eliminate any dust or contamination and to provide a clean environment for the fiber-optic connection.

When you clean fiber components, always complete the following steps carefully:

1. Turn off the ION-U system (laser sources) before you inspect fiber connectors.



Never look into a fiber while the system lasers are on!

2. Check the connectors or adapters with a fiberscope before cleaning.
3. If the connector is dirty, clean it with a lint-free wipe (dry cleaning).
4. Inspect the connector.
5. If the connector is still dirty, repeat the dry cleaning technique.
6. Inspect the connector.
7. If the connector is still dirty, clean it with 99% isopropyl alcohol (wet cleaning) followed immediately with a dry clean in order to ensure no residue is left on the endface.
8. Repeat steps 5 through 7 until endface is clean.

Note: For a more detailed description, please refer to:

http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

3.3.1. Optical cable installation

1. Locate the Optics connector cover on the lower right side of the RU. Loosen the four cover screws, remove the cover, and set it aside. Removing this cover allows access to the UP and DL optical connectors.

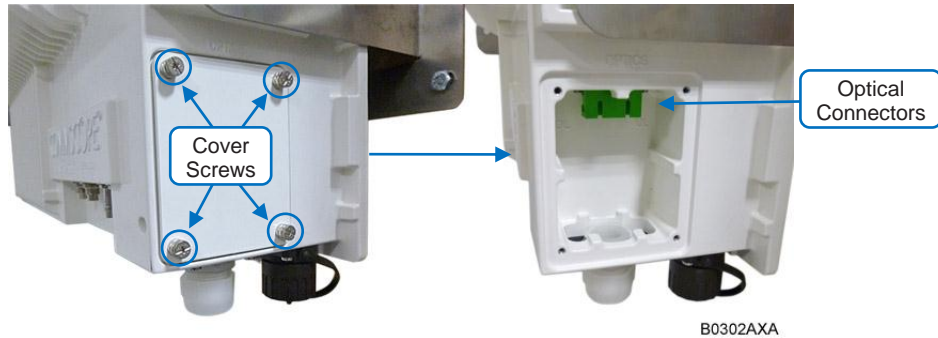


figure 3-19 Remove optics cover

2. Remove the sealing nut from the optical cable gland at the bottom of the RU.

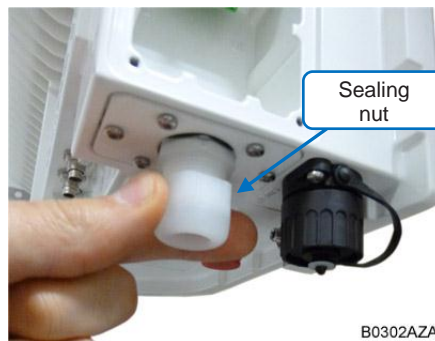


figure 3-20 Remove sealing nut

3. Remove the split-seal by pulling it downward and out of the clamp ring.



figure 3-21 Remove split-seal

4. Insert the UL and DL optical cables through the sealing nut as shown in figure 3-22.

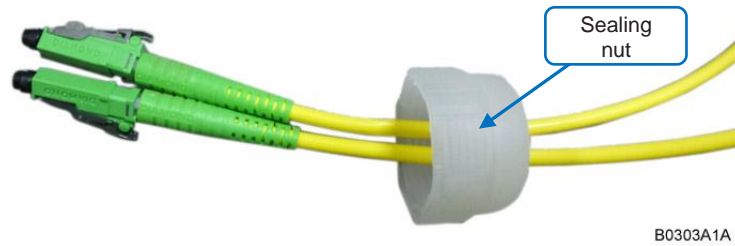


figure 3-22 Insert fiber optic cables through sealing nut

5. Then insert the optical cables through the opening in the cable gland clamp ring
6. Connect the optical cables to the proper UL and DL LC/APC connectors.



figure 3-23 Insert cables through clamp ring

7. Separate the two halves of the split-seal. Place each cable into one of the grooves in the lower half of the split-seal. Place the other half of the split-seal over the fiber optic cables.

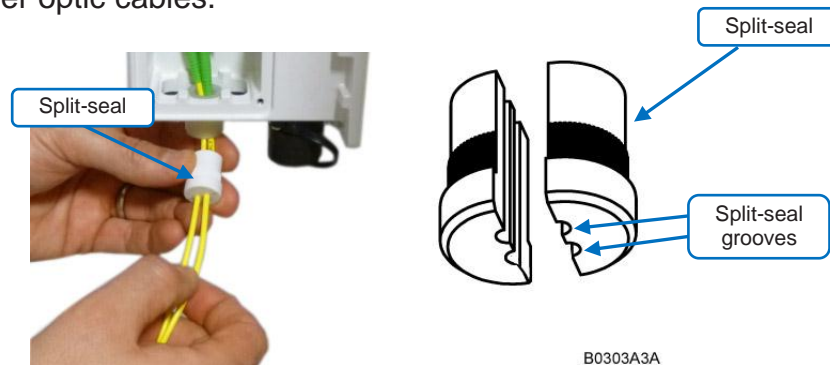


figure 3-24 Place cables into split-seal

8. Press the split-seal up into the clamp ring opening.

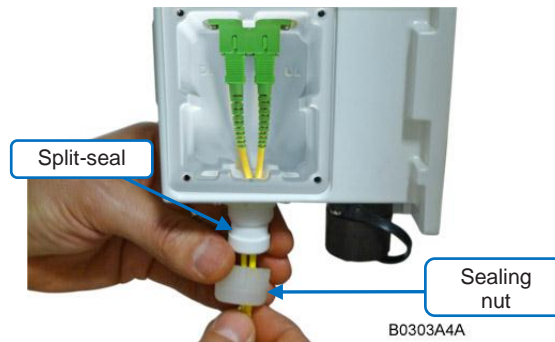


figure 3-25 Press split-seal into opening

9. Tighten the sealing nut securely.

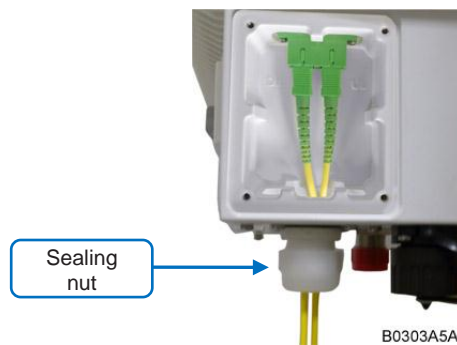


figure 3-26 Tighten sealing nut

10. Replace the optics metal cover and tighten the four screws that were loosened in step 1.

3.3.2. Commissioning

Read the health and safety warnings in chapter 3.3.2 *Commissioning* 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 3.2.2 *Connections*.

4. Alarms

4.1. Bite and Alarms

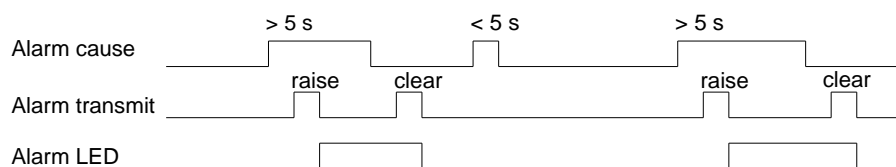
The Built-In Test concept comprises the monitoring of the power supplies, the power amplifiers, and the optical interface.

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

4.2. 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 is an interruption of at least five seconds after acknowledgement, a new alarm message will be generated.



V1651A2

figure 4-1 Alarm triggering

4.3. Status LED Alarms

For local supervision, a status LED on the connector panel of the remote unit adjacent to the Expansion ports 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.

Alarm Name	Description	Remedy	Default Severity	LED
Fan Failure		check ventilation and environment	critical	Red
DL optical power fail	Received optical power below minimum threshold	check fiber connections and transmitted optical power	major	Red
Temperature Alarm	temperature too high	check ventilation and environment	warning	Green
VSWR Alarm	bad RF cabling / mismatched antenna	check cable / antenna	critical	Yellow
RF Low Output CELL700	RF signal too low	check BTS output level/attenuator configuration/RF cabling	minor	Green
RF Low Output CELL 850	RF signal too low	check BTS output level/attenuator configuration/RF cabling	minor	Green
RF Low Output LMR 800	RF signal too low	check BTS output level/attenuator configuration/RF cabling	minor	Green
RF Low Output PCS 1900E	RF signal too low	check BTS output level/attenuator configuration/RF cabling	minor	Green
RF Low Output AWS	RF signal too low	check BTS output level/attenuator configuration/RF cabling	minor	Green
DL CELL 700 band alarm	hw failure in RF section	change unit	critical	Red
DL LMR800+CELL850 alarm	hw failure in RF section	change unit	critical	Red
DL PCS 1900E band alarm	hw failure in RF section	change unit	critical	Red
DL AWS band alarm	hw failure in RF section	change unit	critical	Red
UL CELL 700 band alarm	hw failure in RF section	change unit	critical	Red
UL LMR800+CELL850 band alarm	hw failure in RF section	change unit	critical	Red
UL PCS 1900E band alarm	hw failure in RF section	change unit	critical	Red
UL AWS band alarm	hw failure on RF section	change unit	critical	Red
UL Overdrive/ALC Limiting CELL 700	too high RF signal feeding device	check unit/attenuator configuration	minor	Green
UL Overdrive/ALC Limiting LMR800+CELL850	too high RF signal feeding device	check unit/attenuator configuration	minor	Green
UL Overdrive/ALC Limiting PCS 1900E	RF signal feeding device too high	check unit/attenuator configuration	minor	Green
UL Overdrive/ALC Limiting AWS	RF signal feeding device too high	check unit/attenuator configuration	minor	Green
Internal bus alarm	internal I2CBUS communication malfunction	change unit	critical	Red
UL Laser Alarm	Uplink laser fail (cooling or current failure)	change unit	major	Red
External 1 Alarm	external input alarm	check external device/ check alarm connection	major	Yellow

Alarm Name	Description	Remedy	Default Severity	LED
External 2 Alarm	external input alarm	check external device/ check alarm connection	major	Yellow
RF High Output CELL700	RF signal too high	check BTS output level/attenuator configuration/RF cabling	major	Green
RF High Output CELL 850	RF signal too high	check BTS output level/attenuator configuration/RF cabling	major	Green
RF High Output LMR 800	RF signal too high	check BTS output level/attenuator configuration/RF cabling	major	Green
RF High Output PCS 1900E	RF signal too high	check BTS output level/attenuator configuration/RF cabling	major	Green
RF High Output AWS	RF signal too high	check BTS output level/attenuator configuration/RF cabling	major	Green
Power Supply 1 Alarm	internal power supply alarm	change/verify unit	major	Red
Power Supply 2 Alarm	internal power supply alarm	change/verify unit	major	Red
Power Supply 1 exceeded load threshold	power supply load too high	change/verify unit	minor	Green
Power Supply 2 exceeded load threshold	power supply load too high	change/verify unit	minor	Green
Power Supply 1 partial availability	internal power supply alarm / partial power available	change/verify unit	major	Green
Power Supply 2 partial availability	internal power supply alarm / partial power available	change/verify unit	major	Green
High Power Consumption	power supply load too high	change/verify unit	minor	Green
Low Power Consumption	power supply load too low	change/verify unit	minor	Green

table 4-1 Status LED alarms

4.4. External Alarm Inputs

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 five contacts, which are contained in the alarm kit, can be ordered directly from the Binder Connector Group, the manufacturer, or indirectly from CommScope. For the designation of the alarm kit see chapter 6.5 *Spare Parts*.

4.5. Troubleshooting

The status of the remote unit can be checked via the master unit (for details please refer to the ION-U software manual). Locally, the status can be checked at the LED, see chapter *4.3 Status LED Alarms*.

5. Maintenance

5.1. General

Read the health and safety warnings in chapter 1.2.

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

Maintenance of the ION-U L 7/8/85/17/19 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, 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 power supply is the only component that should be replaced in the field. Please contact the supplier for replacement of any other components.

5.2. RU Power Supply Replacement

The power supply for the RU is a field replaceable module. The type of power supply used by the RU (AC, DC, or Vdc/100) is dependent on the model number of the RU.



Before starting any maintenance on the RU, read the health and safety warnings in *chapter 1.2* and the electrical installation general information in *chapter 4.2.1*.

1. Switch off the circuit breaker supplying power to the RU.
2. Once you have confirmed that the power has been shutdown, remove Mains power connector from the RU.

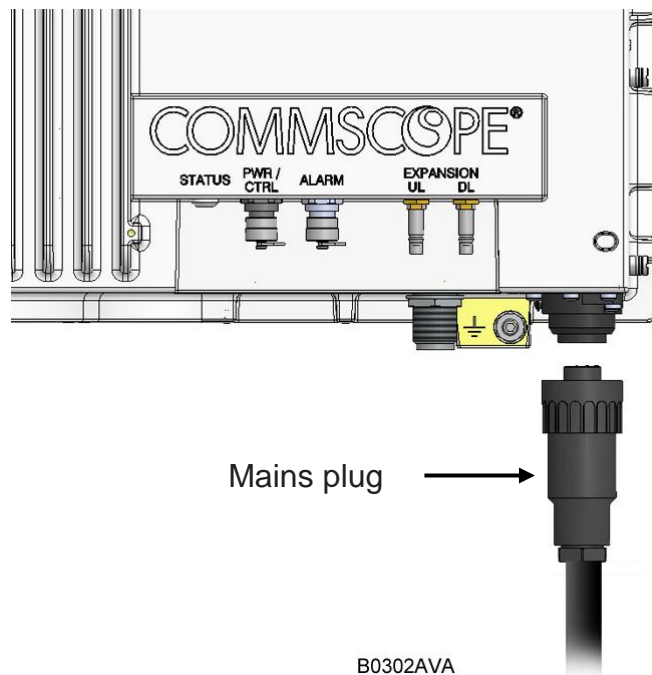


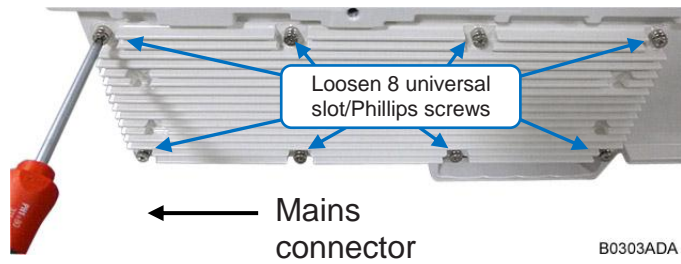
figure 5-1 Disconnect Mains power

3. Locate the power supply on the right side of the Remote Unit.



figure 5-2 RU power supply location

4. Use a #2 Phillips head or slotted screwdriver to loosen the 8 universal slot/Phillips captive power supply screws and carefully remove the supply. The weight of the power supply must be supported as you loosen the screws to prevent damage to the supply.



B0303ADA

figure 5-3 8 RU power supply screws

5. Carefully remove the power supply from the unit. Do not attempt to support the weight of the supply with the attached input and output cables.



B0303AEA

figure 5-4 RU power supply with cables

6. Locate the input cable connector for the power supply on the right side of the supply.
7. Loosen the 3 Phillips head terminal screws and remove the connector.



B0303AFA

figure 5-5 RU power supply input cable

8. Locate the output connector for the power supply on the left side of the supply.
9. Loosen the 2 Phillips head screws and remove the output connector.



B0303AGA

figure 5-6 RU power supply output cable

10. Remove the defective supply.



B0303AHA

figure 5-7 Ru with power supply removed

11. Replace the defective power supply with the new power supply.
It is very important to confirm that the replacement supply is the same type as the original supply. The AC, DC, and Vdc/100 supplies are not interchangeable.

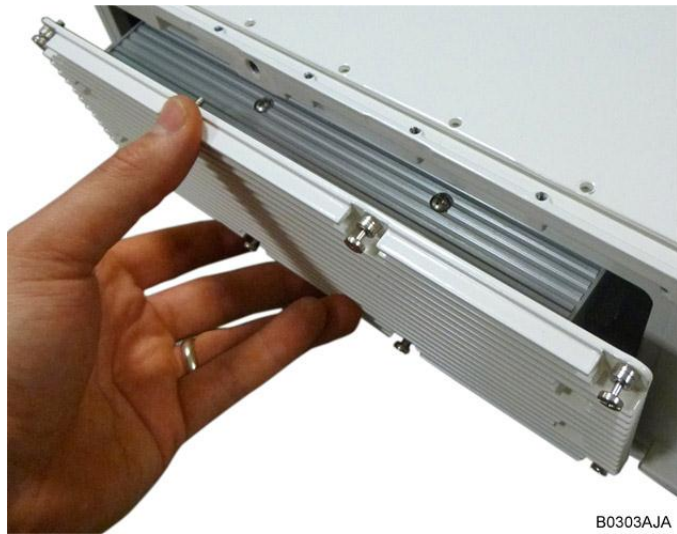
12. Reconnect the input and output connectors, and tighten the associated terminal screws.



B0303AEA

figure 5-8 Ru with replacement power supply

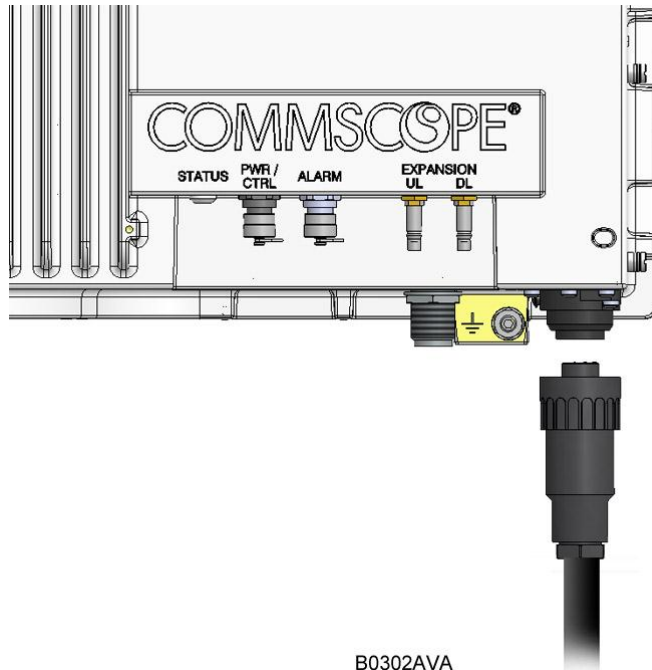
13. Insert the power supply into the RU carefully to avoid damaging any cables. The supply must be supported until the 8 universal slot/Phillips captive power supply screws have been tightened.
14. Tighten the 8 universal slot/Phillips captive power supply screws.



B0303AJA

figure 5-9 Ru insert power supply

15. Reconnect the Mains power plug.
16. Switch on the breaker and check the RU for proper operation.



B0302AVA

figure 5-10 Reconnect Mains power

6. Appendix

6.1. Illustrations

Need drawings with dimensions here

figure 6-1 Installation drawing

6.2. Electrical Specifications

Please refer to the “ION-U_LP_RU_US_PA-106156-EN.GB.pdf” data sheet for the Remote Unit’s electrical specifications.

6.3. Environmental and Safety Specifications

Please refer to the “ION-U_LP_RU_US_PA-106156-EN.GB.pdf” data sheet for the Remote Unit’s environmental and safety specifications.

6.4. Mechanical Specifications

Please refer to the “ION-U_LP_RU_US_PA-106156-EN.GB.pdf” data sheet for the Remote Unit’s mechanical specifications.

6.5. Spare Parts

The following table lists the spare parts available for the Remote Unit. The configuration of the delivered unit meets the requirements of the customer and can differ depending on the state of the delivery.

Maintenance of the ION-U L 7/8/85/17/19 should be performed on an FRU (Field Replaceable Unit) basis only. Do not damage the warranty labels on the components, as this voids the warranty.

If a FRU which is not included in the following list needs to be replaced, please contact customer service for additional instructions.

ION-U L 7/8/85/17/19 Spare Parts List

Designation:	ID No:
Need Spare Parts	Need ID Numbers

Accessories	
Need Accessories and part numbers	

The manufacturer reserves the right to replace the spare parts listed above by equivalent substitutes!

☞ **Note:** Only the spare parts listed above are FRUs (= Field Replaceable Units) and can be replaced by the user. For replacement of any other parts, please send the entire Remote Unit back to the manufacturer.

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