

CorningOptical Communications

High Power GX™Tri DAS System User Manual

Warranties

Hardware

Corning Optical Communications warrants to the original purchaser (“Customer”) that for the duration of the warranty period,

One (1) year, commencing on the date of shipment of the Hardware, unless otherwise agreed in writing by Corning Optical Communications (the “Hardware Warranty Period”), the Hardware furnished by Corning Optical Communications shall be free in all material respects from defects in material and workmanship, and shall conform to the applicable portions of the Specifications, as defined below (the “Hardware Warranty”).

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

Such repair or replacement shall be Customer’s sole remedy and Corning Optical Communications’ sole obligation in the event this Hardware Warranty is invoked. If any components comprising a part of the Hardware are replaced or repaired during the Hardware Warranty Period, the Hardware Warranty Period for such repaired or replaced components shall extend to the longer of (i) the balance of the Hardware Warranty Period or (ii) three (3) months from the date of repair or replacement. For purposes of this Warranty, “Specifications” shall mean the specifications and performance standards of the Products as set forth in documents published by Corning Optical Communications and delivered to Customer which contain technical specifications or performance standards for the Products.

If Customer invokes this Hardware Warranty, it shall notify Corning Optical Communications promptly of the claimed defect.

Customer will allow Corning Optical Communications to inspect the Hardware at Customer’s location, or to return the Hardware to Corning Optical Communications’ closest repair facility. For Hardware returned to Corning Optical Communications’ repair facility, Customer shall be responsible for payment of all transportation and freight costs (including insurance) to Corning Optical Communications’ repair facility, and Corning Optical Communications shall be responsible for all transportation and freight costs (including insurance) incurred in connection with the shipment of such Hardware to other repair facilities of Corning Optical Communications and/or its return to Customer.

Notwithstanding the foregoing, in no event will Corning Optical Communications be liable for damage to Products resulting

From improper handling during or after shipment, misuse, neglect, improper installation, operation or repair (other than by authorized Corning Optical Communications personnel), alteration, accident, or for any other cause not attributable to defects in materials or workmanship on the part of Corning Optical Communications. Corning Optical Communications shall not

Reimburse or make any allowance to Customer for any labor charges incurred by Customer for replacement or repair of any goods unless such charges are authorized in advance in writing by Corning Optical Communications.

Software Warranty

Corning Optical Communications warrants to the original purchaser (“Customer”) that for the duration of the warranty period,

One (1) year, commencing on the date of shipment of the Software, unless otherwise agreed in writing by Corning Optical Communications (the “Software Warranty Period”), the Software shall conform with, and perform the functions set

Forth in the Specifications, and shall be free from defects in material or workmanship (the “Software Warranty”). In the event the Software is proven to be defective under the terms of this Software Warranty, Corning Optical Communications shall correct such defects or failure and ensure that the Software conforms with, and performs the functions set forth in, the Specifications. Customer will allow Corning Optical Communications to inspect the Software at Customer’s location or to return it to Corning Optical Communications’ closest repair facility.

Notwithstanding the foregoing, Corning Optical Communications shall have no obligation under the Software Warranty if the

Software is modified or used with hardware or software not supplied or approved by Corning Optical Communications, or if the Software is subject to abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

Third-party software distributed with the Software may carry certain warranties which, to the maximum extent allowed by law, Corning Optical Communications hereby assigns, transfers and otherwise conveys to Customer, provided, however, that Corning Optical Communications itself provides no warranty of any kind, express, implied, statutory or otherwise, for any third-party software provided hereunder.

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

THIS WARRANTY IS THE ONLY WARRANTY MADE BY CORNING OPTICAL COMMUNICATIONS AND IS IN

LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CORNING OPTICAL COMMUNICATIONS SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT

NOT LIMITED TO: INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE: GOODS, PARTS AND SERVICE.

CORNING OPTICAL COMMUNICATIONS SALES AGENTS OR REPRESENTATIVES ARE NOT AUTHORIZED TO

MAKE COMMITMENTS ON WARRANTY RETURNS.

Returns

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

1. Return authorization is to be received from Corning Optical Communications prior to returning any unit. Advise Corning Optical Communications of the model, Serial number, and discrepancy. The unit may then be forwarded to Corning Optical Communications, transportation prepaid. Devices returned collect or without authorization may not be accepted.

2. Prior to repair, Corning Optical Communications will advise the customer of our test results and any charges for repairing customer-caused problems or out-of-warranty conditions etc.
3. Repaired products are warranted for the balance of the original warranty period, or at least 90 days from date of shipment.

Limitations of Liabilities

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

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

Of or in connection with furnishing of goods, parts and service hereunder, or the performance, use of, or inability to use the: goods, parts and service.

Reporting Defects

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

Note: Keep all packing material until you have completed the inspection. The application antenna and RF cable are not provided.

Warnings and Admonishments

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

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

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

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

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

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

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.

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

This device complies with Part 15 B, FCC Part 90, FCC Part 24, FCC Part 27, FCC Part 2 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

RF Safety

 **WARNING!** To comply with FCC RF exposure compliance requirements, each individual antenna used for this transmitter must be installed to provide a separation distance greater than 144.97 cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements. The design of the antenna installation needs to be implemented in such a way so as to ensure RF radiation safety levels and non-environmental pollution during operation.

 **WARNING!** Antenna gain should not exceed 12.5 dBi.

 **WARNING!** Each individual antenna used for this transmitter must be installed to provide a separation distance greater than 400cm or more from all persons and must not be co-located with any other antenna for meeting RF exposure requirements.

 **WARNING!** The design of the antenna installation needs to be implemented in such a way so as to ensure RF radiation safety levels and non-environmental pollution during operation.

Compliance with RF safety requirements:

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

Laser Safety

Fiber optic ports of the GX system emit invisible laser radiation at the 1310/1550 nm wavelength window. The laser apertures /outputs are the green SC/APC Bulkhead adapters located on the front panel of the equipment. The product is Class 1/Hazard level 1

External optical power is less than 10mW, Internal optical power is less than 500mW.

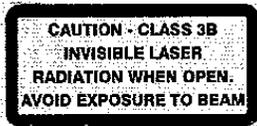
To avoid eye injury never look directly into the optical ports, patch cords or optical cables. Do not stare into beam or view directly with optical instruments. Always assume that optical outputs are on.

Only technicians familiar with fiber optic safety practices and procedures should perform optical fiber connections and disconnections of GX devices and the associated cables.

GX has been tested and certified as a “Class 1” Laser product to IEC/EN 60825-1(2007). It also meets the requirements for a Hazard Level 1 laser product to IEC/EN 60825-2: 2004 to the same degree.

GX complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice NO.50 (2007).

GX employs a Class 3B laser and therefore the following label is affixed inside the unit adjacent to the laser:



The product itself has been tested and certified as a Class 1 Laser product to IEC/EN 60825-1 (2007). It also meets the requirements for a Hazard Level 1 laser product to IEC/EN 60825-2: 2004 to the same degree.

Care of Fiber Optic Connectors

Do not remove the protective covers on the fiber optic connectors until a connection is ready to be made. Do not leave connectors uncovered when not connected.

The tip of the fiber optic connector should not come into contact with any object or dust.

Refer to the cleaning procedure for information on the cleaning of the fiber tip.

Standards and Certifications

Corning Optical Communications products have met the approvals of the following certifying organizations:

Category	Standards
Safety:	CB: IEC 60950; NRTL: UL 60950; CAN/CSA: C22.2 NO 60950
EMC:	ETSI: EN 301489; FCC: Part 15 subpart B
Radio:	ETSI: EN 301908; EN 301502; EN 300609 FCC: Part 22, 24, 27
ISO:	ISO 9001: 2000 and ISO 13485: 2003

About this Guide

This Installation Guide describes how to perform the physical installation of the GX unit. The installation procedures of other units (e.g. RIU, OCH-GX, SC-450) relevant to the system are detailed in their user manuals (see *Additional Relevant Documentation* below).

Additional Relevant Documents

The following documents are required if the corresponding units are included in your system.

Document Name
RIU Installation and Configuration Guide
FT350 Installation Guide (includes OCH-GX information)
System Controller User Manual (SC-450 v5.4 and higher)
MA Software Version Update Tool

List of Acronyms

BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
BTSC	Base Transceiver Station Conditioner
BU	Base Unit
DL	Downlink
OCH-GX	(Dedicated GX) Optical Central Hub
RU	Remote (Hub)Unit
RIU	Radio Interface Unit
UL	Uplink

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1 Introduction

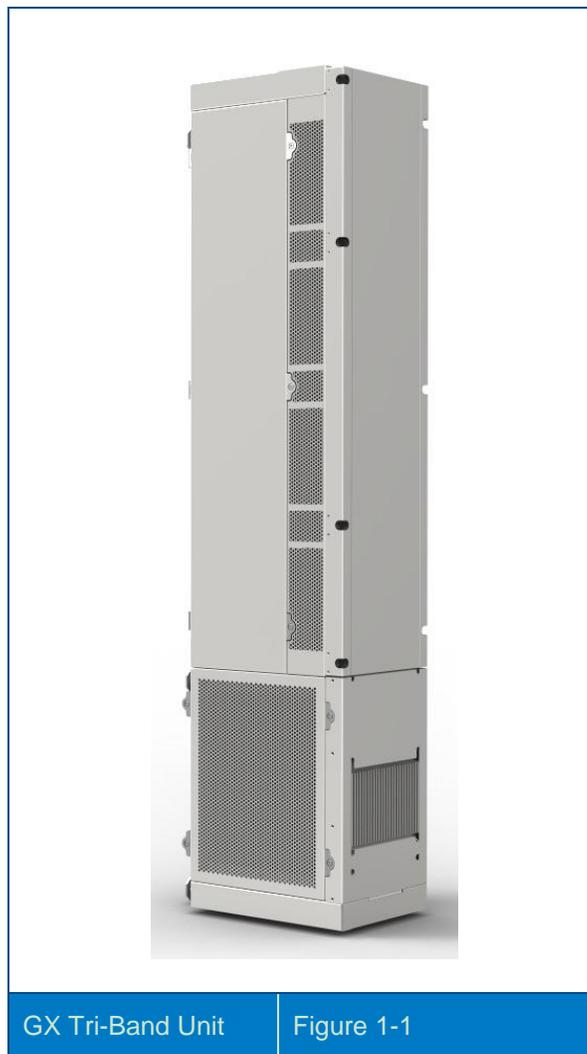
Corning Optical Communications GX-Tri offers a cost-effective 40W (46dBm) high power remote outdoor coverage solution for Corning Optical Communications Distributed Antenna Systems (DAS).

GX-Tri is a fiber-fed, multi-frequency, multi-operator remote designed to complement the MA1000 and MA2000 and MA2000 lower power, standard remotes. GX can also be installed as a dedicated solution for new sites, providing complete RF coverage options for open indoor, tunnel and adjacent outdoor spaces.

Using low loss fiber optic cabling, GX-Tri remote units can distribute multiple BTS signal sources for Spring 800, 1900MHz or AWS to multiple remote locations from 2 to 15 km from the head end to remotes. GX efficiently supports all operator modulations with linear MCPA (multi-carrier power amplifier) up to 40 W.

GX-Tri remotes share a common equipment head end and Element Management System (EMS) with other remotes on the MA1K/MA2K platform.

GX-Tri remotes offer high RF power coverage capabilities with compact design for added spaces savings and weather resistant enclosures to fit various site needs.



1.1 Key Features and Capabilities

- **Multi-Frequency/Multi-Service RF Transport Platform:** Accommodates CDMA, GSM, WCDMA, LTE, EDGE, EV-DO technologies and more. Four model-dependent bands per enclosure
- **Cost-Effective Higher Power:** Optimizes and reduces the number of antennas required to cover open and outdoor areas by offering 46dBm composite power per frequency band
- **Operator-Grade Operation:** Advanced signal handling and management ensures operator-grade performance.
- **Unique, space-saving non-obtrusive design:** Blends into the environment and avoids costly tower builds outdoors when covering campus scenarios, parking lots, tunnels and indoor-adjacent outdoor spaces.
- **Designed to withstand harsh environments** - Fully sealed Remote Unit (RU) enclosure ensures superior performance in harsh environments and worry-free electronics maintenance. Compliant to NEBS OSP Class 4 rated
- **Management and control**– alarm forward to NOC or standard EMS via SNMP, software controlled output power and Optical link auto gain control

1.2 System Architecture

GX-Tri provides a complete solution consisting of GX-Tri remote units at the remote locations, and head end elements, which are shared with any existing or new MA1000/MA2000 deployment.

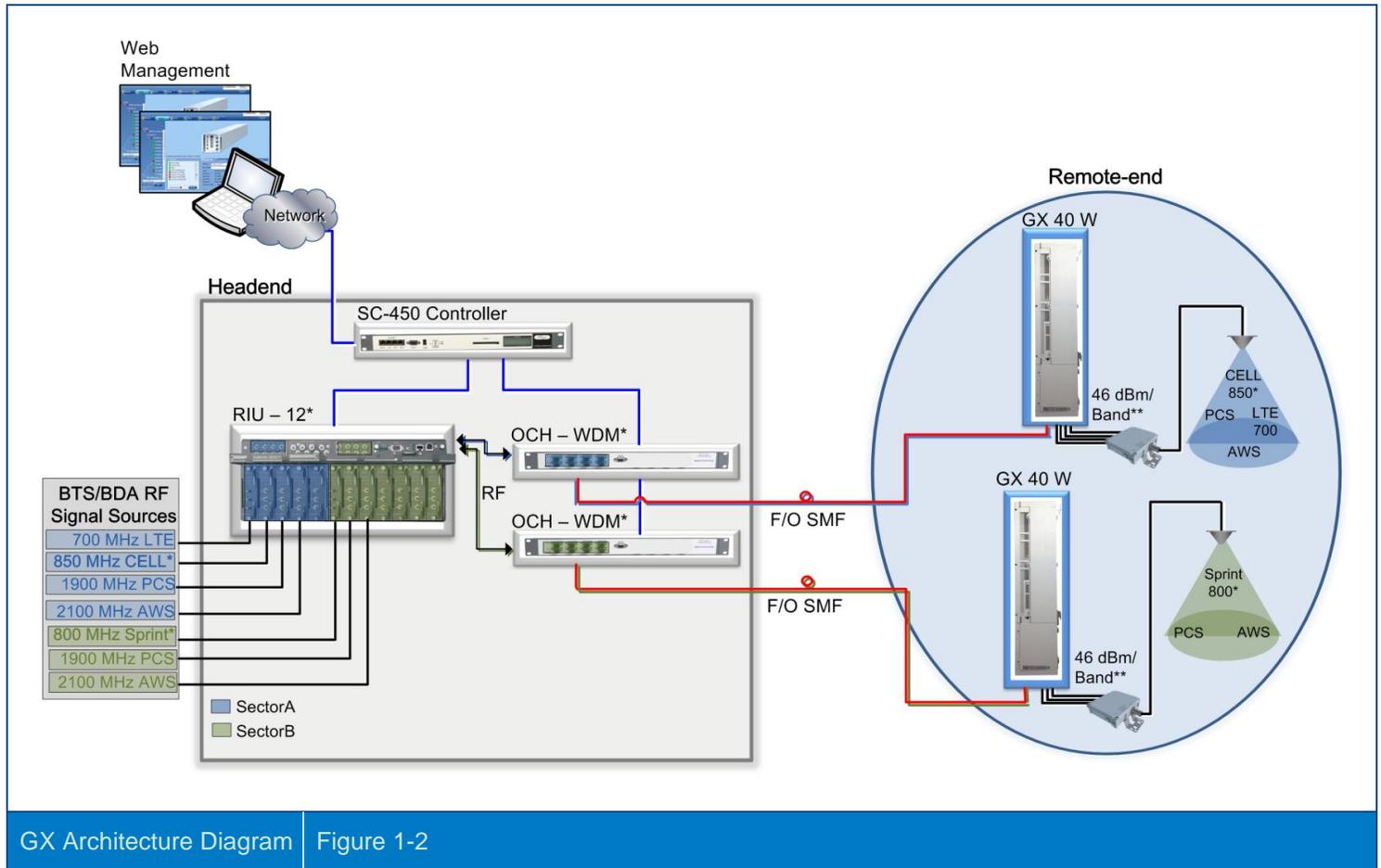
GX-Tri Remote Unit consists of a uniquely designed, non-obtrusive unit that includes all of the required RF, F/O and power interfaces. All mobile services are distributed through service/band dedicated RF connection ports over antennas installed at the remote locations.

1.2.1 SISO Scenario

Figure 1-2 illustrates a scenario including one GX Tri-Band and one GX Tri-Band remote unit remote. Note that all site elements are managed and controlled via a single SC-450 Controller* that enables local and remote management, and provides single-source, centralized 'common headend' controls of all installed elements.

For the GX path, at the Headend, the BTS or BDA signal is conditioned by the RIU, ensuring a constant RF level. The conditioned RF electrical signal is then converted by the Optical Central Unit (OCH) to an optical signal for transport to/from multiple GX remotes, over low-loss fiber cabling.

Note: GX Tri-Band is supported by SC-450 Controller v5.4 and higher.



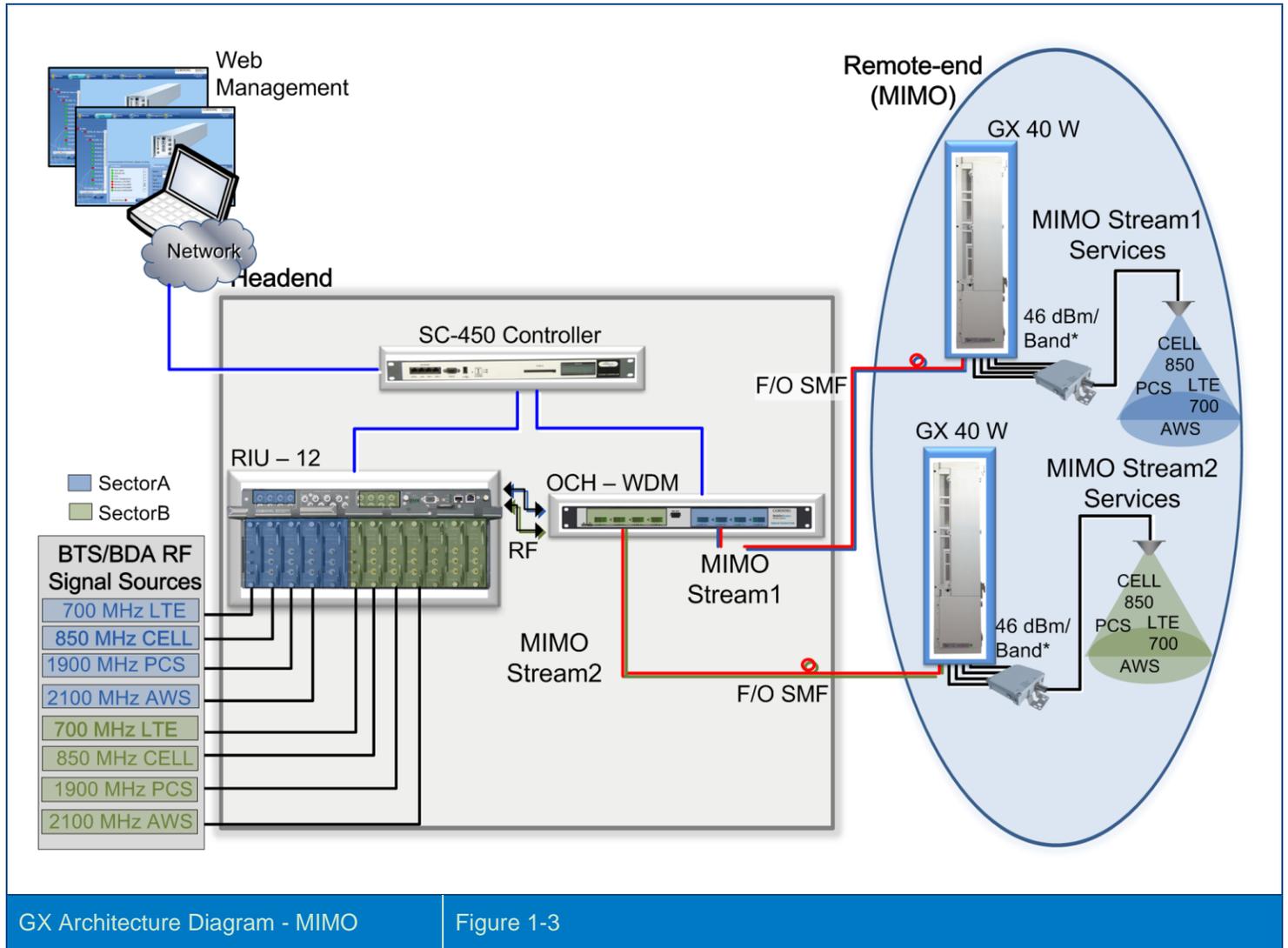
*In installations including a GX supporting the CELL band and a GX supporting the Sprint800 band, the CELL and Sprint service signals must be conditioned via two independent sectors in the RIU-12 (i.e. Sector A and Sector B in Figure 2) and routed through dedicated optical modules in the OCH. Note the following:

- Installations with RIU-4 units require a dedicated RIU-4 per GX model
- Either an OCH-4 unit per GX or an OCH-8 (supporting two separate optical modules) is used
- **External Combiner Insertion Loss of 1.0 dB

1.2.2 MIMO Scenario

Figure 1-3 illustrates a MIMO scenario supported by two GX Tri-Band units. In MIMO installations each MIMO stream is supported by a single GX unit. The MIMO1 and MIMO2 services are conditioned via two independent sectors in the RIU-12 (i.e. Sector A and Sector B) and routed through separate optical modules in the OCH. Note the following:

- Installations with RIU-4 units require a dedicated RIU-4 per GX model
- Either an OCH-8 (supporting two separate optical modules) or an OCH-4 unit per GX is used



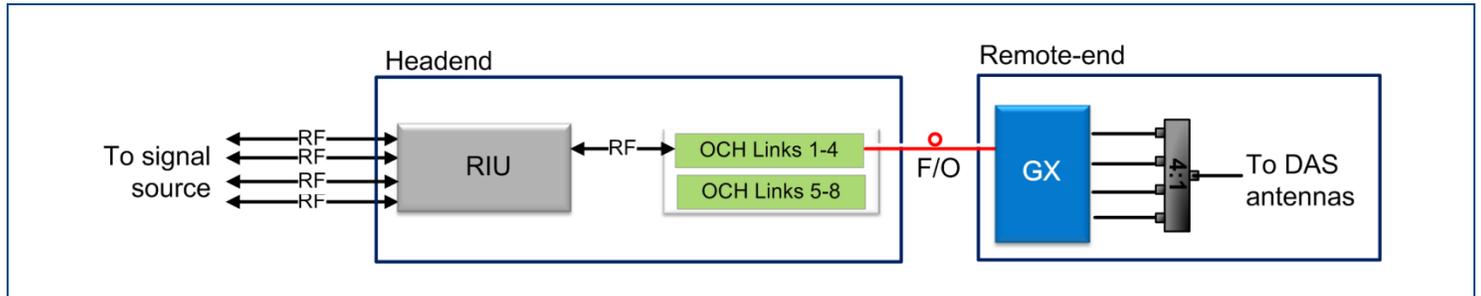
*External Combiner Insertion Loss of 1.0 dB

1.2.3 Signal Path

On the DL, combined RF signals (from up to four supported services) from the Radio Interface Unit (RIU) are converted into optical signals by the Optical Control Hub (OCH). The optical signals are then transmitted to the GX at the remote site via optical fiber. The signals are filtered and amplified at the GX and transmitted through the service specific output ports to the broadband antennas.

On the UL, GX converts the RF signals transmitted from the service antennas into optical signals. The signals are transmitted via optical fiber to the OCH-GX which then converts the optical signals back to RF signals.

The optical DL and UL signal are transmitted in a single optical fiber based on the WDM technology.



GX Functional Block Diagram | Figure 1-4

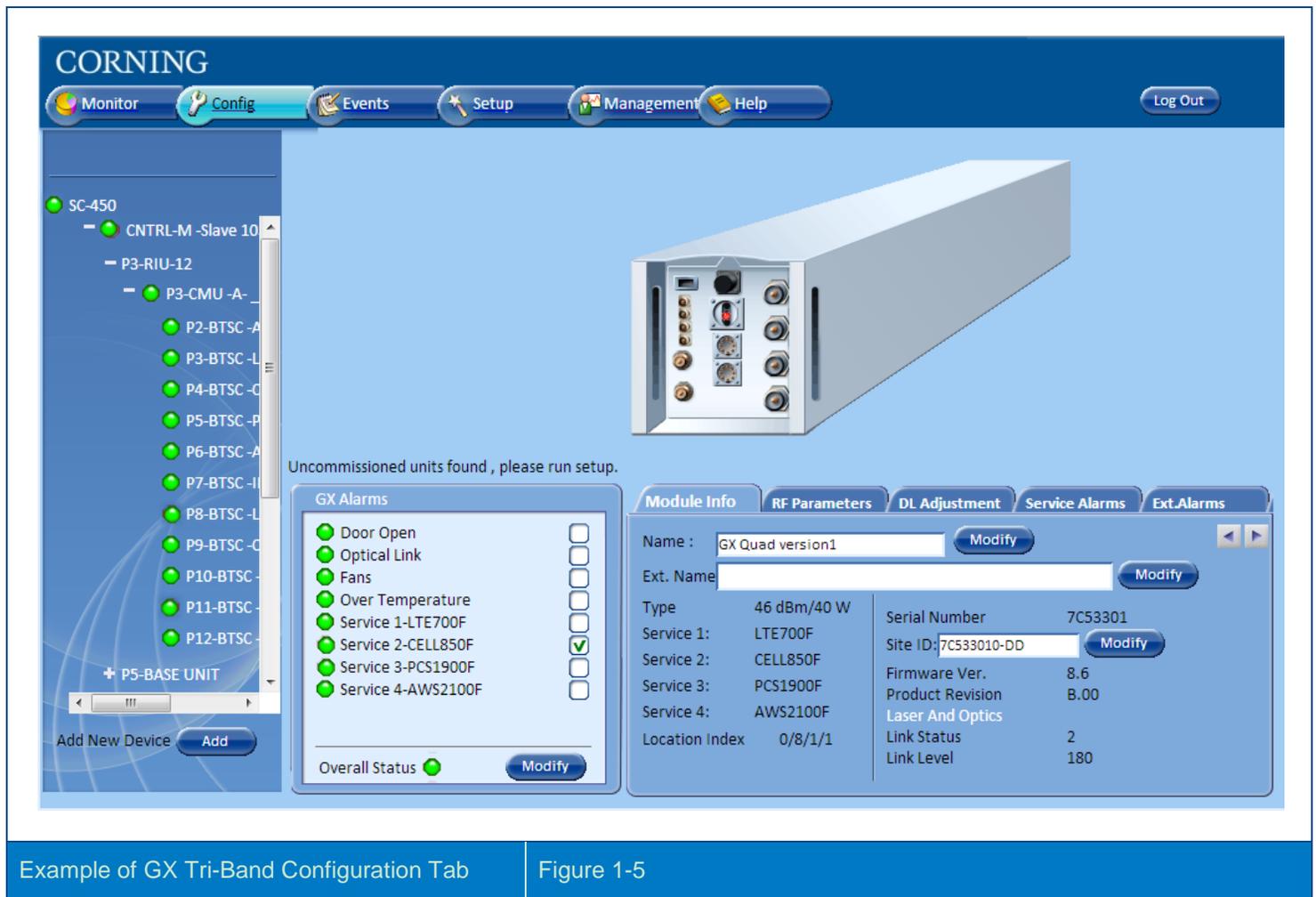
1.3 System Monitoring and Management

The GX-Tri Remote Unit is centrally managed via the MobileAccess SC-450 Controller.

Note: The GX Tri-Band solution is supported by SC-450 v5.4 and higher.

GX-Tri is not connected directly to the controller; it is connected to the OCH-GX element (that is connected to the controller). Thus, the controller monitors views and manages the GX-Tri via the OCH-GX, hosting the GX unit.

The following shows the Config [uration] tab of the selected GX unit. The system configuration and management is described in the SC-450 UM (v5.4 and higher).



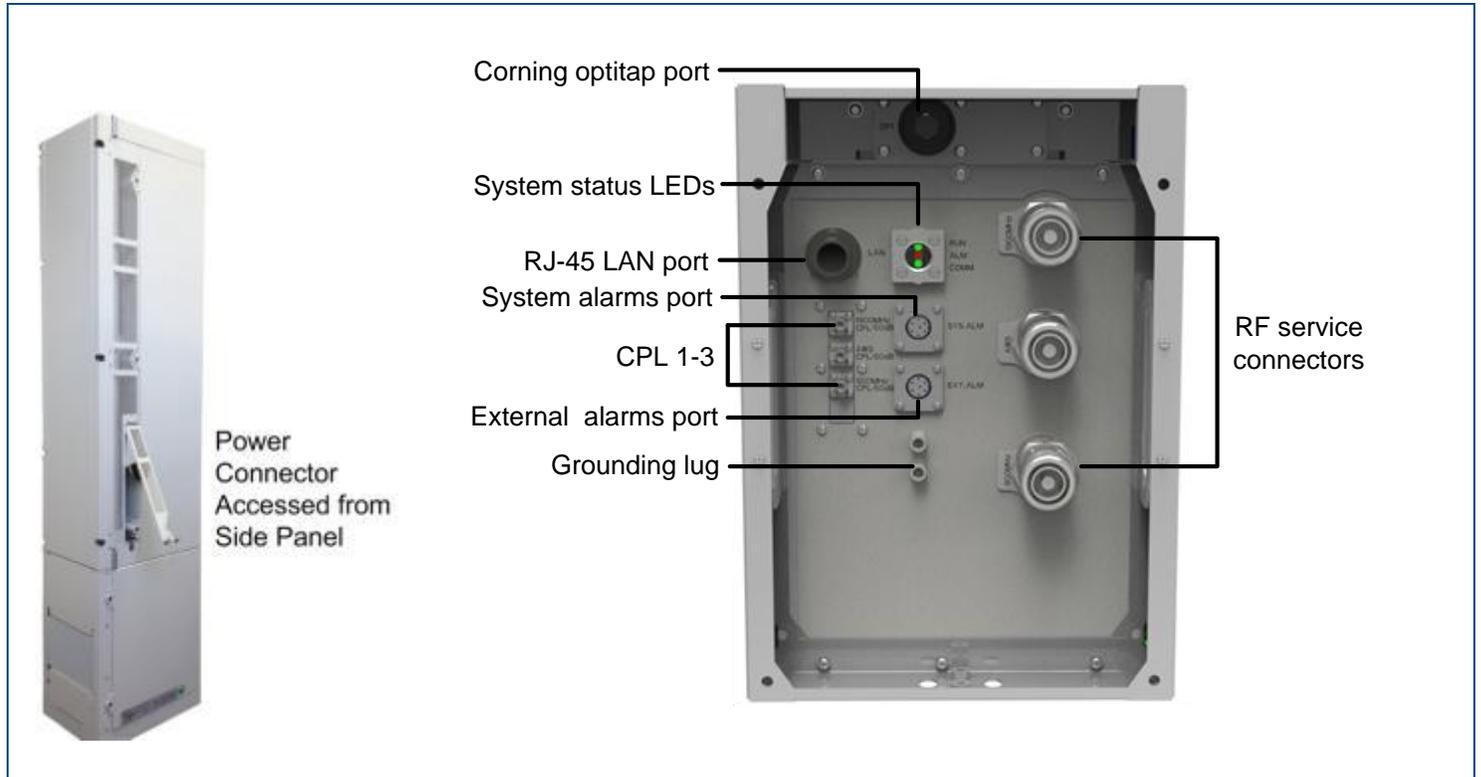
Example of GX Tri-Band Configuration Tab

Figure 1-5

1.4 GX-Tri Unit Interfaces

All of the GX interfaces (except for the power connector) are located externally on the underside of the unit (facing down when unit is mounted). The unit interfaces include the RF, power, optical link and external alarms connections.

The power connector is located in a separate side panel.



Example of GX Tri-Band(AC)Interfaces – Underside and Side Panels

Figure 1-6

Table 1-1 and Table 1-2 provide descriptions of the GX-Tri connectors and LEDs.

INTERFACE	DESCRIPTION
Service Connectors (e.g. Spring 800MHz, 1900MHz, AWS)	DIN female connectors to antennas (or external combiner – see section 3.2)
OP	Corning OptiTap™ Fiber-optic waterproof connector – connects to OCHGX-XR using Corning OptiTap™ to SC/APC cable (ordered separately) IMPORTANT! OptiTap™ pullout force ranges from a few lbs to 50+ lbs with the dust cap or connector installed. This prevents damages caused to the DAS unit.
Power Connector (side panel)	Power feed option is model dependent: <ul style="list-style-type: none"> Local power feed (AC) option: 100-240 V AC; 47-63 Hz; Remote power feed (DC) option: -40--57 V DC ; Max 32.5A Max Power Consumption: 1100 W
LAN	RJ-45 connector for local connection (i.e. debugging, troubleshooting)
EXT_ALM	External Alarm pin-out connectors supporting four external alarm connections
SYS_ALM	Pin-out connector supporting up to 3 relay alarms used for connecting the GX-TRI to a network or modem and relaying the status of the GX alarms
CPL_1	Coupler port - 1900MHz 50dB coupling
CPL_2	Coupler port - AWS 50dB coupling
CPL_3	Coupler port - 800MHz 50dB coupling
FILTER_OUT/ FILTER_IN*	Connections to external filter – only relevant if External Filter (ordered separately) is installed on GX-Quad

Table 1-1.LED Descriptions

LED	Description
RUN	Green – power on
ALM	Off – normal operation Red - fault
COMM.	Rapid flashing green - flashes (rate of flash per second) for the duration of 1 minute upon communication initialization Rapid/No Flash - indicates communication fault

Table 1-2.LED Descriptions

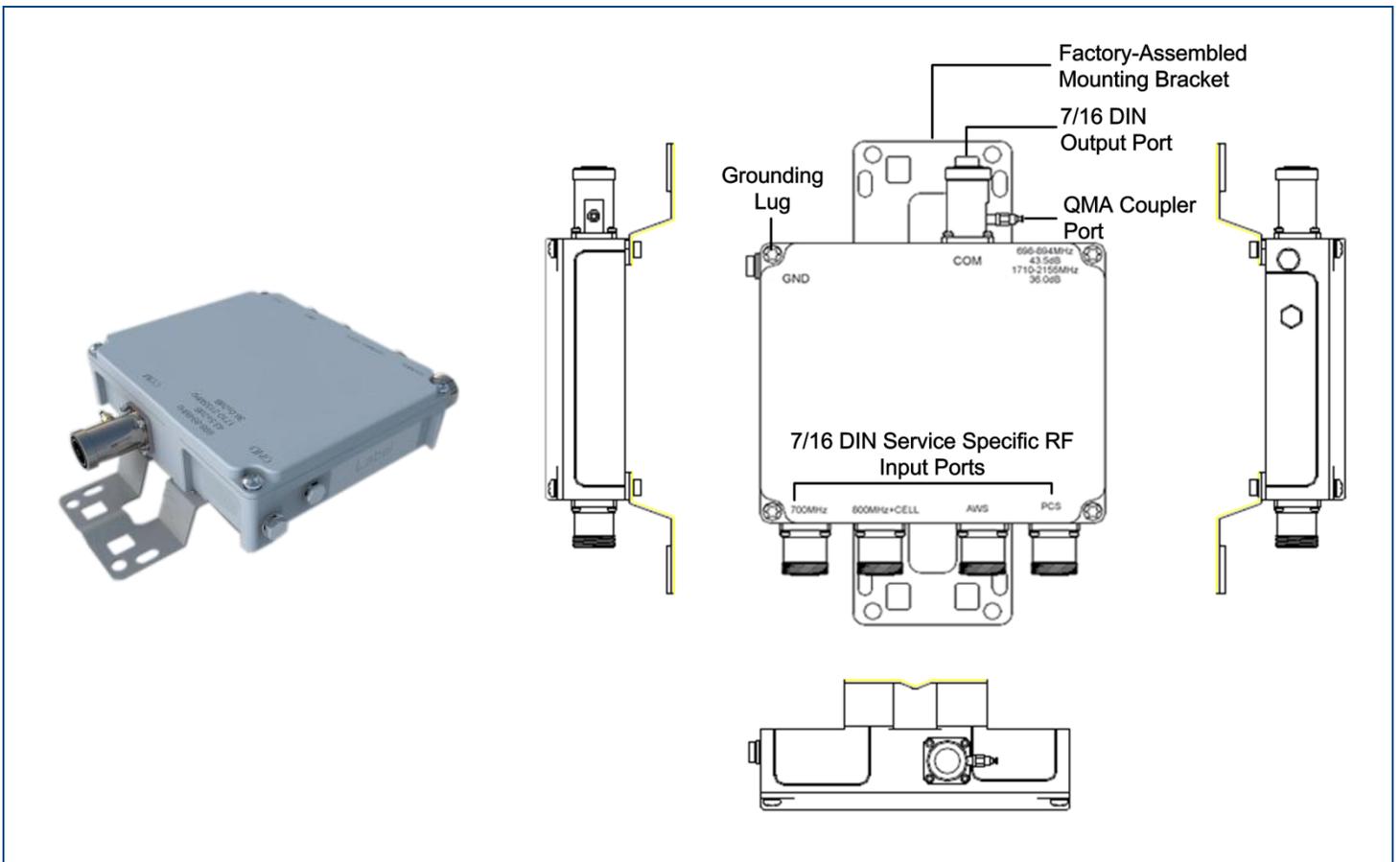
1.5 (Optional) External Multiplexer

Note: The External Combiner is optional and ordered separately (P/N: AK-GX-FILT-COMB).

The 4 x 1 external multiplexer filters and combines the service specific RF signals received from the GX and transmits the converged input signals through a single output port to the broadband service antenna.

The multiplexer includes the following interfaces:

- Four service specific RF input connectors (one is unused and should be terminated using the DIN terminator) – used for connecting to the GX service specific RF connectors
- One output connector – interfaces to the broadband DAS antenna
- One grounding lug
- One QMA coupler port – enables users/field engineers to measure and read signals without interrupting service due to service cable disconnections. The QMA coupling port serves as the coupling measurement port for reading the signal without affecting services on the main stream.



GX External Combiner

Figure 1-7

2 Installation Guidelines

This chapter provides the general guidelines for installing the GX Tri-band Remote Unit and includes information such as site considerations and installation requirements.

2.1 Site Considerations

- The distance between the GX Tri-Band service antenna and the coverage area should correspond to LOS (Line of Sight) requirements for maximum coverage area.
- The maximum fiber path loss is 6dB.
- The system delay of the optical system must be taken into consideration when there are neighboring BTS sites overlapping in coverage.
- In the MIMO scenario, two remote units shall use a pair of optic fiber for each one. This ensures to avoid the system delay difference between two units.

2.1.1 Installation Location

Mounting surface shall be capable of supporting the weight of the equipment.

In order to avoid electromagnetic interference, a proper mounting location must be selected to minimize interference from electromagnetic sources such as large electrical equipment.

2.1.2 Environmental

Humidity has an adverse effect on the reliability of the equipment. It is recommended to install the equipment in locations having stable temperature and unrestricted air-flow.

The installation location for the system should be well ventilated. The equipment has been designed to operate at the temperature range and humidity level as stated in the product specifications at temperatures ranging from $-40\sim 70^{\circ}\text{C}$ and a relative humidity of max. 85%.

2.1.3 Powering

The power supply unit provides power to all modules within the equipment. Depending on the product variant, it is recommended that the PSU operates on a dedicated AC circuit breaker or fused circuit.

2.1.4 Grounding Requirement

Verify that the equipment has been well grounded. This includes GX Tri-Band unit, external combiner, antennas and all cables connected to the system. Ensure lightning protection for the antennas is properly grounded.

2.1.5 Cable Routing

Ensure all cables, e.g. power cable, feeder cable, optic fiber, commissioning cable, connecting are properly routed (use drip-loops) and secured so that they are not damaged.

2.1.6 Manual Handling

During transportation and installation, take necessary handling precautions to avoid potential physical injury to the installation personnel and the equipment.

2.2 Installation Requirements

- Working space available for installation and maintenance for each mounting arrangement. Ensure unrestricted airflow.
- Ensure grounding connector is within reach of the ground wire.
- Ensure a power source is within reach of the power cord and the power source has sufficient capacity.
- Where appropriate, ensure unused RF connectors are terminated.
- Do not locate the equipment near large transformers or motors that may cause electromagnetic interference.
- Reduce signal loss in feeder cable by minimizing the length and number of RF connections.
- Ensure the equipment will be operated within the stated environment (refer to datasheet).
- Where appropriate, confirm availability of suitably terminated grade of RF and optical fiber.
- Observe handling of all cables to prevent damage.

2.3 Fiber Optic Rules

ATTENTION!

Please also refer to the Laser Safety section in the document Preface.

- Fiber optic cables require proper handling. Do not stretch, puncture, or crush the fiber cable(s) with staples, heavy equipment, doors, etc.
- Always maintain the minimum bending radius specified by the cable manufacturer. The minimum bend radius is usually ten times the cable's outer diameter. In the case of single optical fiber that is not in a cable, the minimum bending radius to be observed is 30mm.
- WDM, Wave Division Multiplexing, units require SMF
- Use minimum splicing/connectors to achieve minimum losses on the fibers.
- Use precaution while installing, bending, or connecting fiber optic cables.
- Use an optical power meter and OTDR for checking the fiber optic cables.
- Make sure the environment is clean while connecting/splicing fiber optic cables.
- All fiber optic connections should be cleaned prior to attaching to termination points using a dry cleaning device (i.e. Cletop or equivalent).
- Fiber connector protective caps should be installed on all non-terminated fibers and removed just before they are terminated.
- Check the fiber optic connections.

3 System Installation

This chapter describes the installation procedure for the GX Quad-bandRemote Units. The installation of the system components must be in the following order:

1. External Combiner installation (optional). See section 3.2.
2. GX-TriInstallation. See section **Error! Reference source not found.**

3.1 Installing the GX unit

3.1.1 Selecting Mounting Location

Select the mounting location (wall/pole):

- General surroundings
- Ventilated and easy-to-reach area
- Proximity to the antenna in order to minimize cable loss

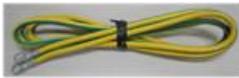
For installations with GX External Multiplexer - take into consideration that the unit must be mounted adjacent to the GX RF interfaces to facilitate the connections (DIN-DIN cables = 1.2 m).

3.1.2 Unpacking and Inspection

Unpack and inspect the cartons according to the following procedure

1. Open the shipping carton and carefully unpack each unit from the protective packing material.
2. Please verify that the items listed below are included in your package (image size is not proportional):

Item	Quantity	Image
GXTri-BandRemote Unit	1	
Mounting bracket (used for both pole and wall installations)	1	
M8 Nuts, spring washers $\Phi 8$, plain washers $\Phi 8$ (used for securing Remote Unit when hanged on bracket protrusions)	2 (per item)	
Masonry bolt (set) M10x110 – used for wall mount installations	6	
Power Supply Cable (AC) – for AC models	1	
Power cable tube gasket (DC) – for DC models	2	

Item	Quantity	Image
Copper Grounding Wire (2m)	1	
RJ-45 Ethernet communication cable	1	

3. Check for signs of external damage. If there is any damage, call your MobileAccess service representative.

3.1.3 Additional Required Tools

The following tools are the minimum required when installing the GX remote unit or performing routine maintenance:

- Electric Drill ($\Phi 12$ head for drilling holes for wall mount)
- Spanner (0.31 inch for tightening GXTri-BandM8 nuts)
- For pole mount installations – the GX bracket supports wooden pole mounting via the a dedicated GX Accessory Kit (ordered separately): AK-GX-QUAD-BRKT-WDPOLE

3.1.4 Mounting

CAUTION!

The GXQuad-bandunit weighs 147.7 lbs (67kg) take all necessary precautions when mounting. A minimum of two people is required for installing GX-Quad.

3.1.4.1 Wall Mount Installation

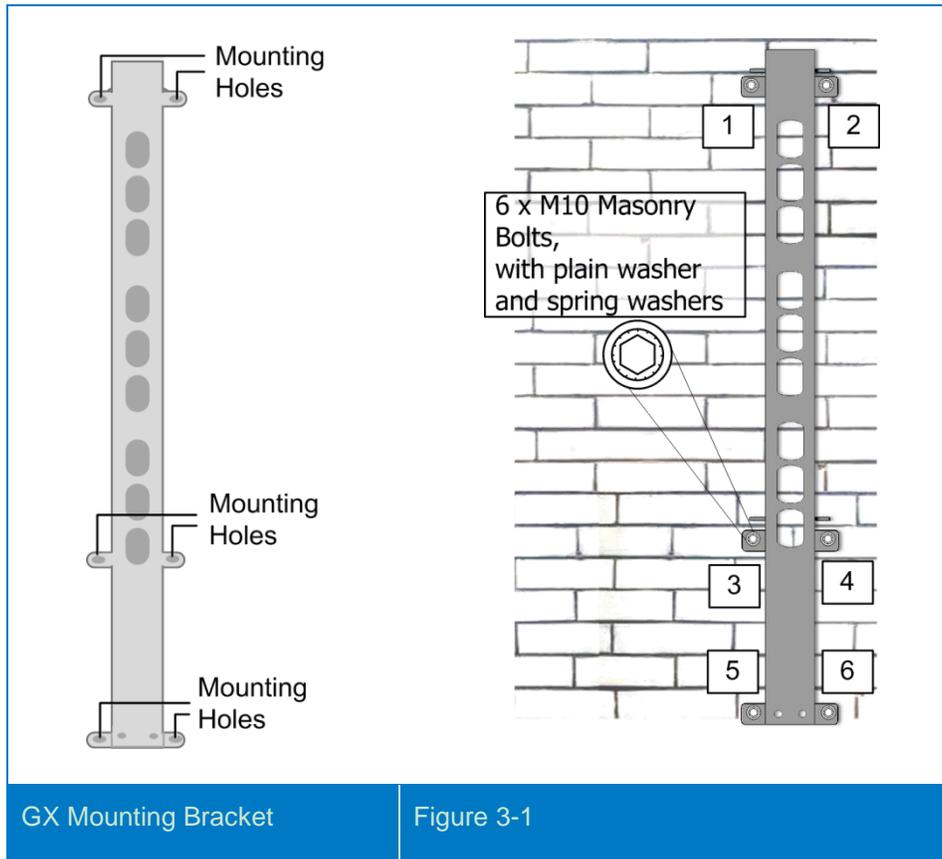
Note: The instructions provided in this section are for solid brick and concrete walls only.

To mount the unit on the wall

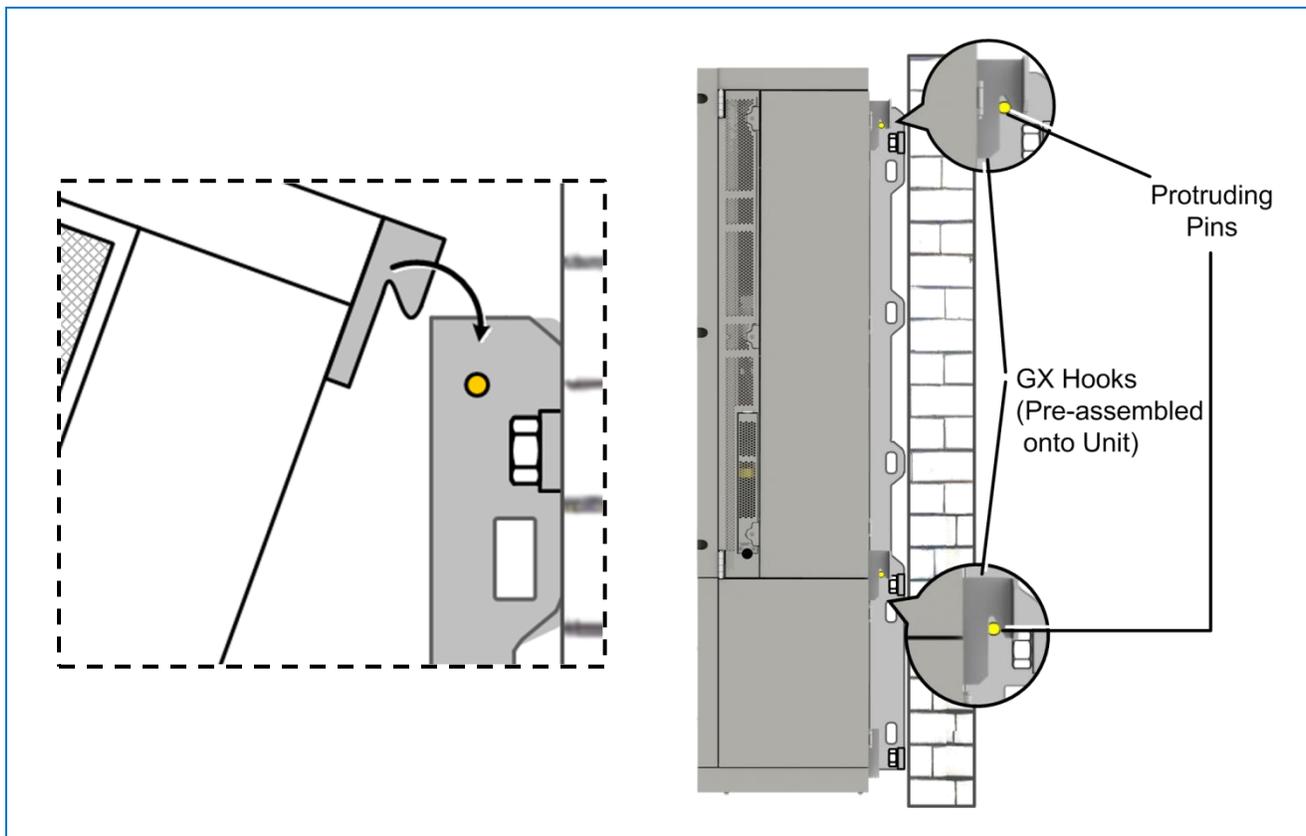
1. Select the wall mount location according to the following criteria:
 - General surroundings
 - Ventilated and easy-to-reach area (for maintenance and on-site inspection)
 - Proximity to the antenna in order to minimize cable loss
 - For installations with GX External Multiplexer - take into consideration that the unit must be mounted adjacent to the GX RF interfaces to facilitate the connections (DIN-DIN cables = 1.2 m).
2. Using the mounting bracket top and bottom mounting holes as a guide (refer to Figure 3-1):
 - Measure and mark the location for drilling the (supplied) M10 Masonry bolts ($\Phi 12$) in the wall (six per bracket and drill the holes).

Note: The GXTri-Bandunit is mounted vertically with the connectors facing downwards.

- Using an electric drill with a $\Phi 12$ head, drill the holes for the Masonry bolts

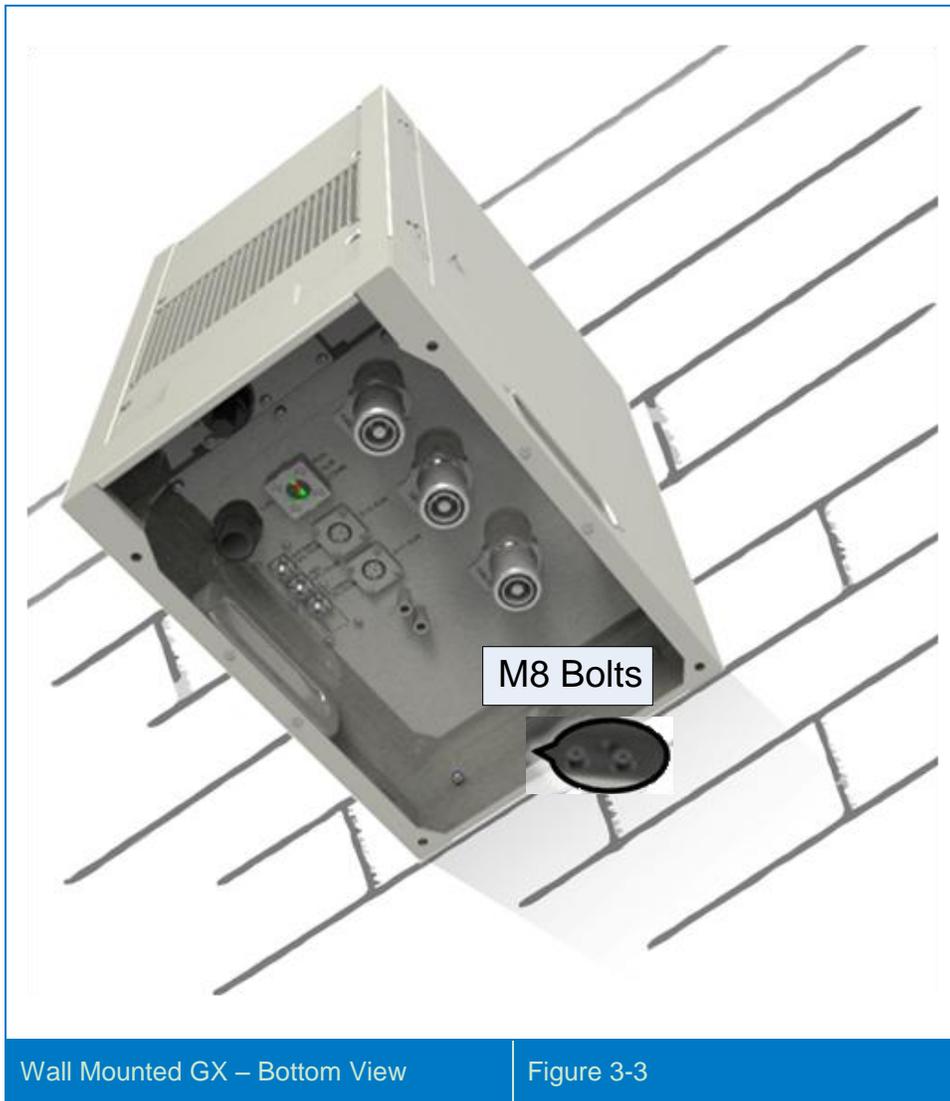


3. Using six(M10x110) Masonry bolts per bracket – secure the Mounting Brackets to the wall with the protruding pins facing towards you. The GXTri-Band will be hung on these. See Figure 3-1.



- Connectors facing down, carefully fit and hang the GX unit on the Pins(SeeFigure 3-2) protruding from the top, and middle-bottom parts of the mounting bracket.
- Using a spanner or wrench, tighten the two M8 nuts on the top and bottom of the mounting bracket as shown in Figure 3-3.

Note: It is recommended to use a threadlocker to tightly seal the nuts.



Wall Mounted GX – Bottom View

Figure 3-3

- Check enclosure position and verify that unit is mounted securely to the wall.

3.1.4.2 Indoor Wall Mount Installation

This section provides instructions on how to mount the GX Tri-Bandunit on indoor concrete walls using the AK- AK-GX-QUAD-BRKT-INDOOR accessory kit (ordered separately).

Note the following:

- The AK-GX-QUAD-BRKT-INDOOR accessory kit is designed for installations on concrete walls only.
- The GX unit is mounted with the connectors facing UPWARDS (as opposed to all other installation types).

The accessory kit includes the following items:

Item	Quantity	Image
Top Wall Rack (6 holes)	1	
Bottom Wall Rack (8 holes)	1	
Mounting Ground Support	1	
Sideboard	2	
Spring Washer	8	
Plain Washer	8	
M5x12 Hex socket head cap screws – required for rack assembly	14 (six for top rack; eight for bottom rack)	
M6x16 Hex socket head cap screws – required for sideboard assembly	8	-

Table 3-1. Kit Items for GX Quad Indoor Bracket

Additional required tools:

- Electric Screwdriver with Hexbits
- Electric Drill with aΦ12 head
- Spanner (0.31 inch for tightening GX M8 nuts)

To mount GX Tri-Bandunit in indoor installation

1. Determine the installation location so that there is enough free space for proper ventilation and technical support access.
2. Referring to Figure 3-4, perform the following before mounting:
 - Disassemble the mounting hooks from the GX by unscrewing the relevant bolts.
 - Assemble the top wall rack on the GX using six M5×12 hex socket head cap screws.
 - Assemble the bottom wall rack on the GX using eight M5×12 hex socket head cap screws.
 - Place the GX unit on the Mounting Ground Support facing with the connectors upwards.
 - Place the GX unit on the Mounting Ground Support facing with the connectors upwards.
 - Secure the GX to the mounting ground support with the two sideboards using eight M6×16 hex socket head cap screws.

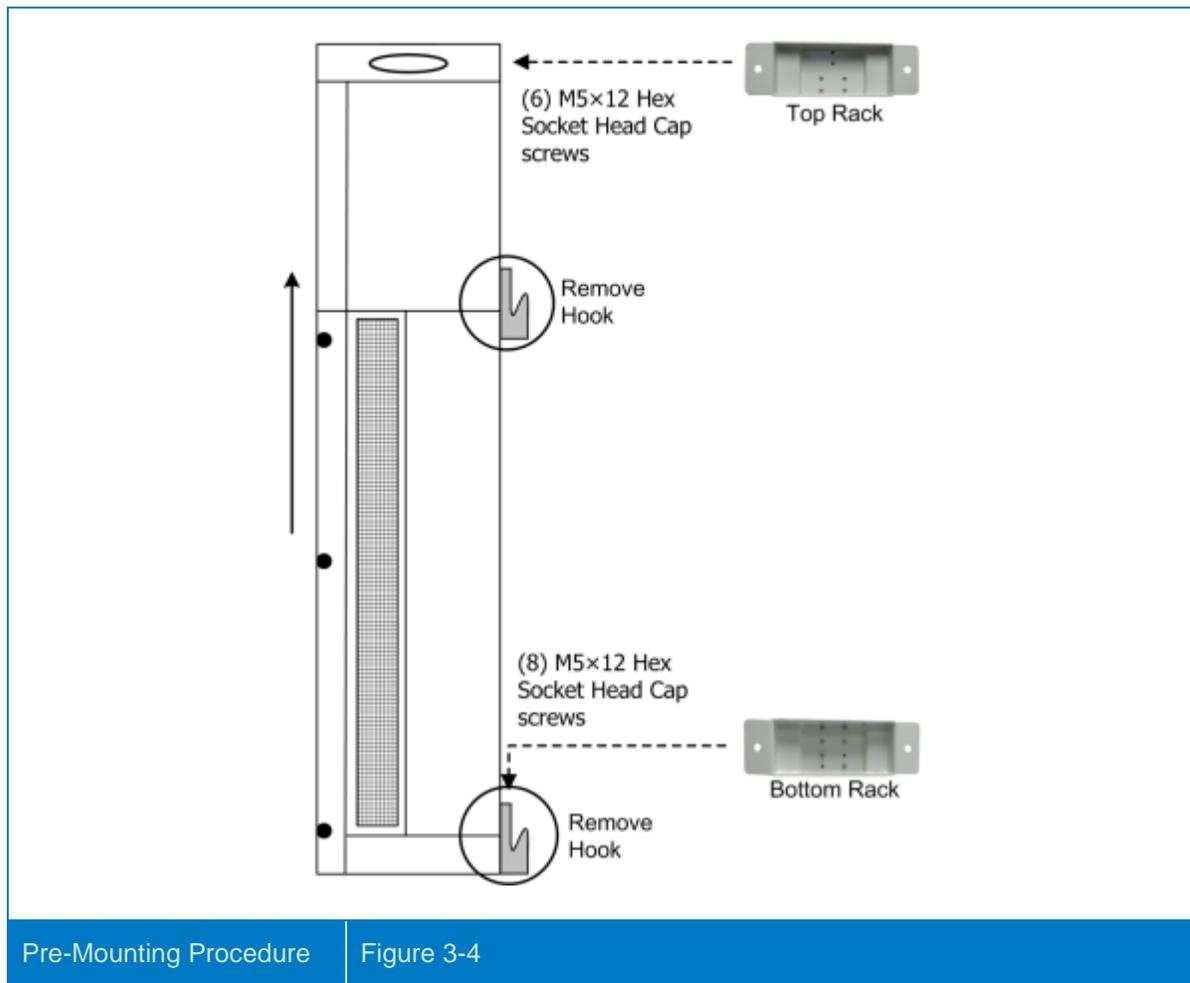
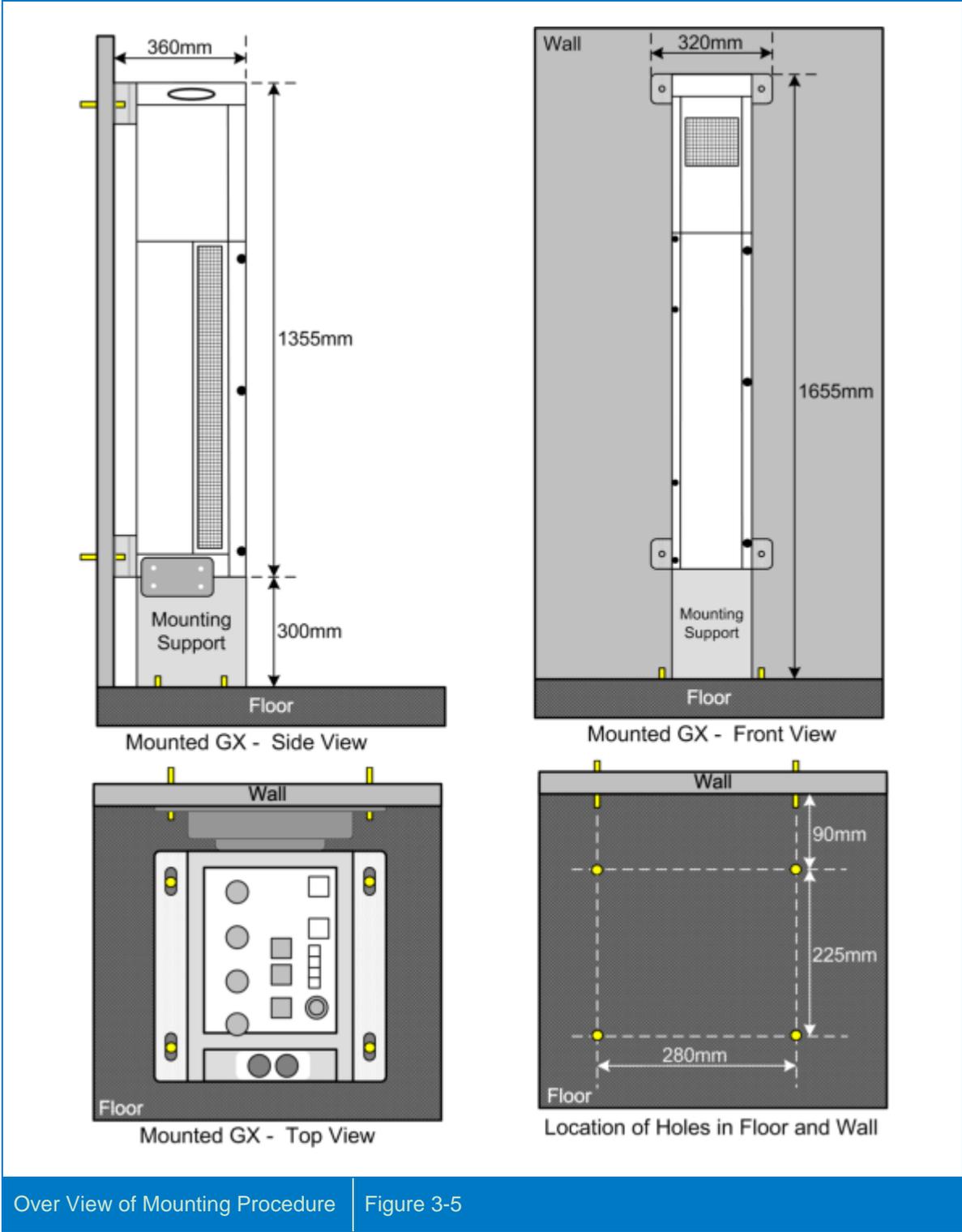


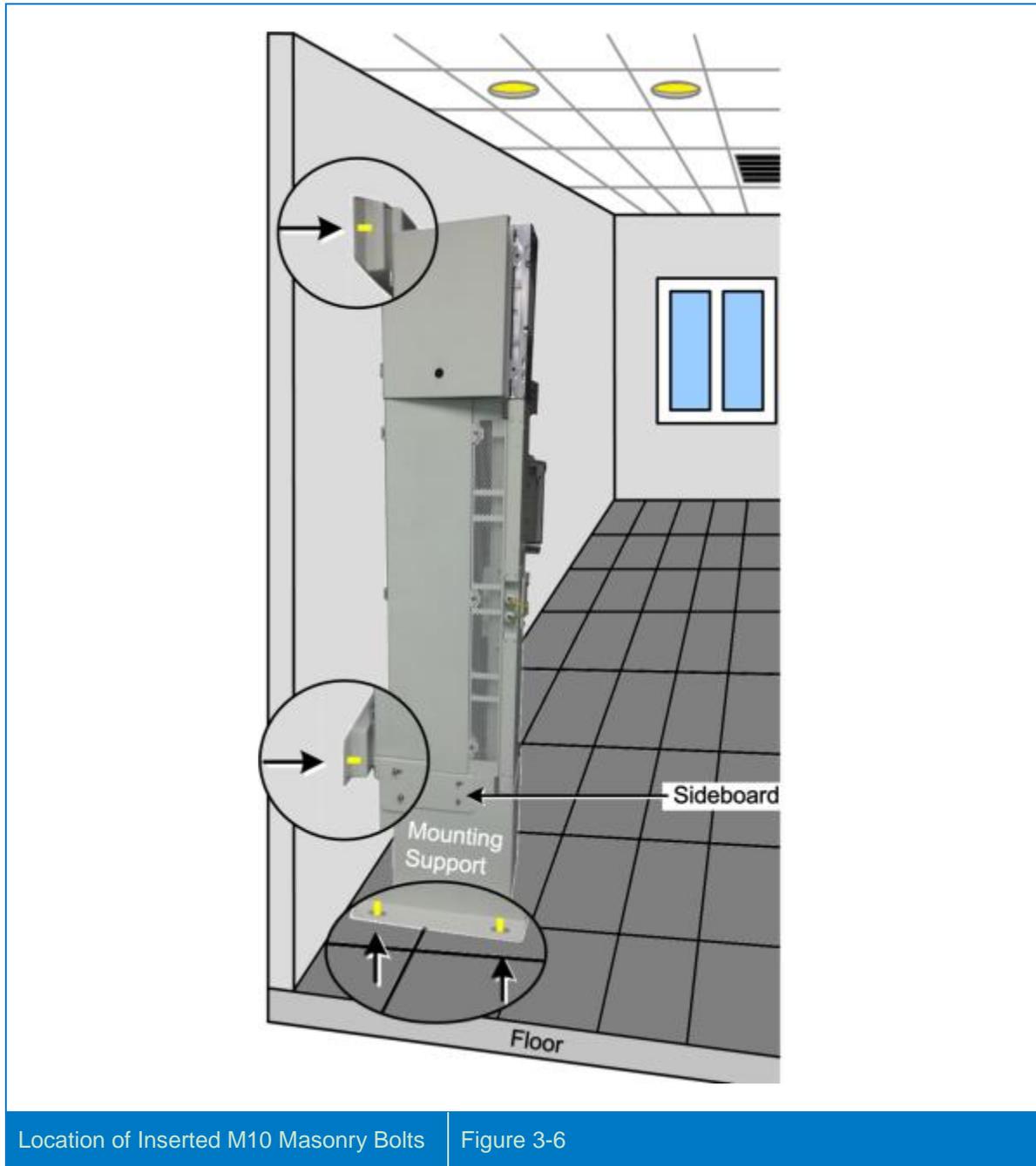
Figure 3-5 provides an overview of the mounted GX unit.



Over View of Mounting Procedure | Figure 3-5

Note: Eight M10 masonry bolts are required (not provided).

3. Position the GX and Bracket assembly so that the mounting brackets face the wall. Refer to “Side View” (top-left image) and “Front View” (top-right image) shown in Figure 3-5.
4. Using the screw holes as a template, drill the required holes in the floor and wall (drill directly through the screw holes). Refer to “Front View” (top-right image) and “Top View” (bottom-left image) shown in Figure 3-5.
5. Insert masonry M10 bolts into drilled holes and tighten. Refer to Figure 3-6.

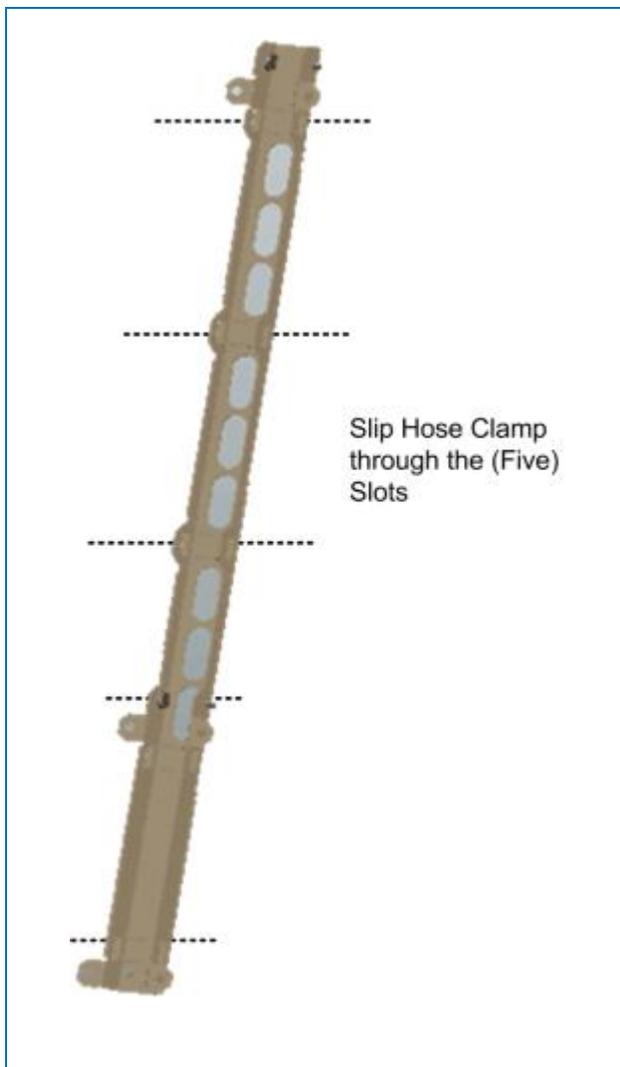


3.1.4.3 Pole Mount Installation

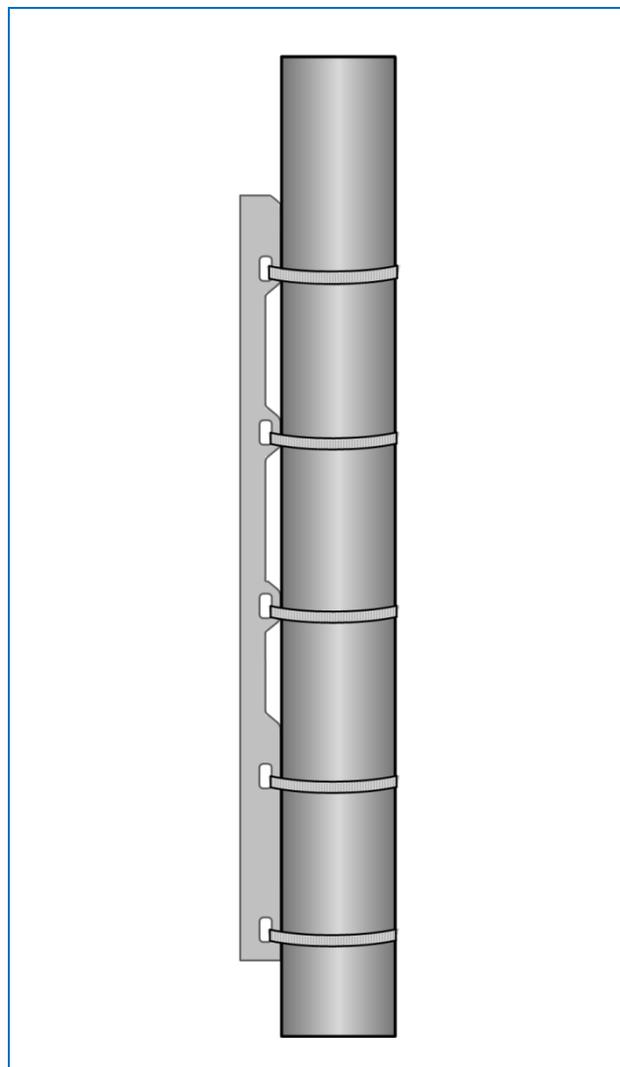
Note: Refer to section 3.1.4.4 for wooden pole mount installations.

To mount the unit on a pole (not wooden)

1. Select the appropriate location according to the following criteria:
 - Accessibility
 - Antenna location and distance
 - Proximity to the antenna in order to minimize cable loss
2. Secure the mounting bracket by slipping the 5 hose clamps (provided) through the mounting bracket and tighten securely. Refer to Figure 3-7 and Figure 3-8.



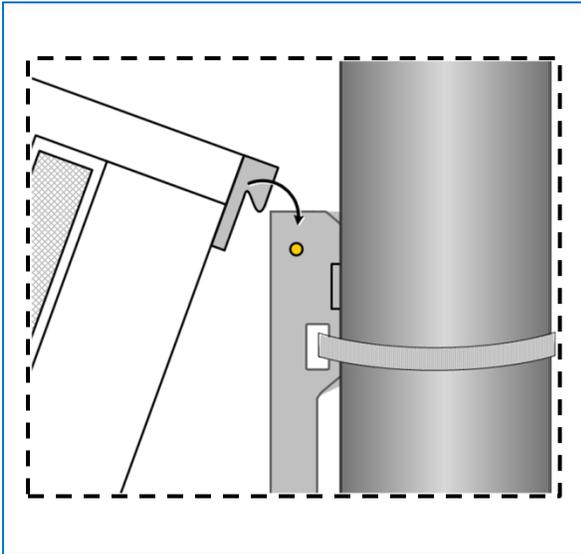
Bracket Slots for Hose Clamps | Figure 3-7



Bracket Mounted on Pole | Figure 3-8

3. Connectors facing downwards, hook the GXTri-Bandon to the top part of the bracket and then to the bottom. Refer to Figure 3-9.
4. Using a spanner or wrench, tighten the two M8 nuts on the top and bottom of the mounting bracket as shown in Figure 3-9 and Figure 3-10.

Note: It is recommended to use a threadlocker to tightly seal the nuts.



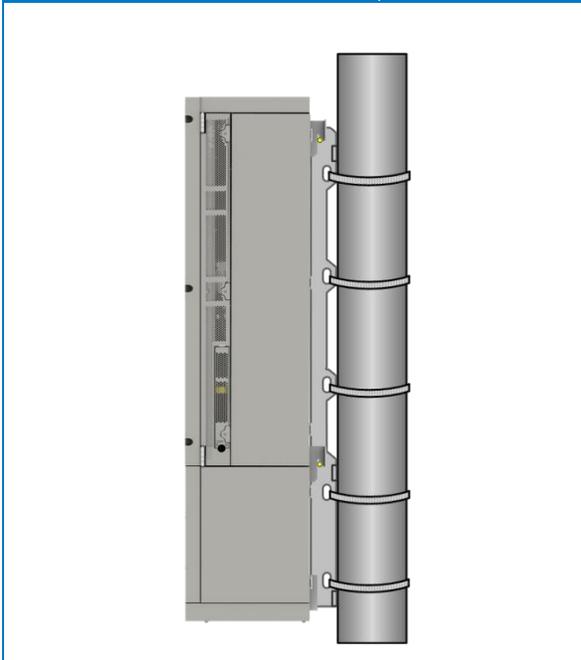
Hooking GX-Trito Bracket

Figure 3-9



Pole Mounted GX – Bottom View

Figure 3-10



Pole Mounted GXQuad

Figure 3-11

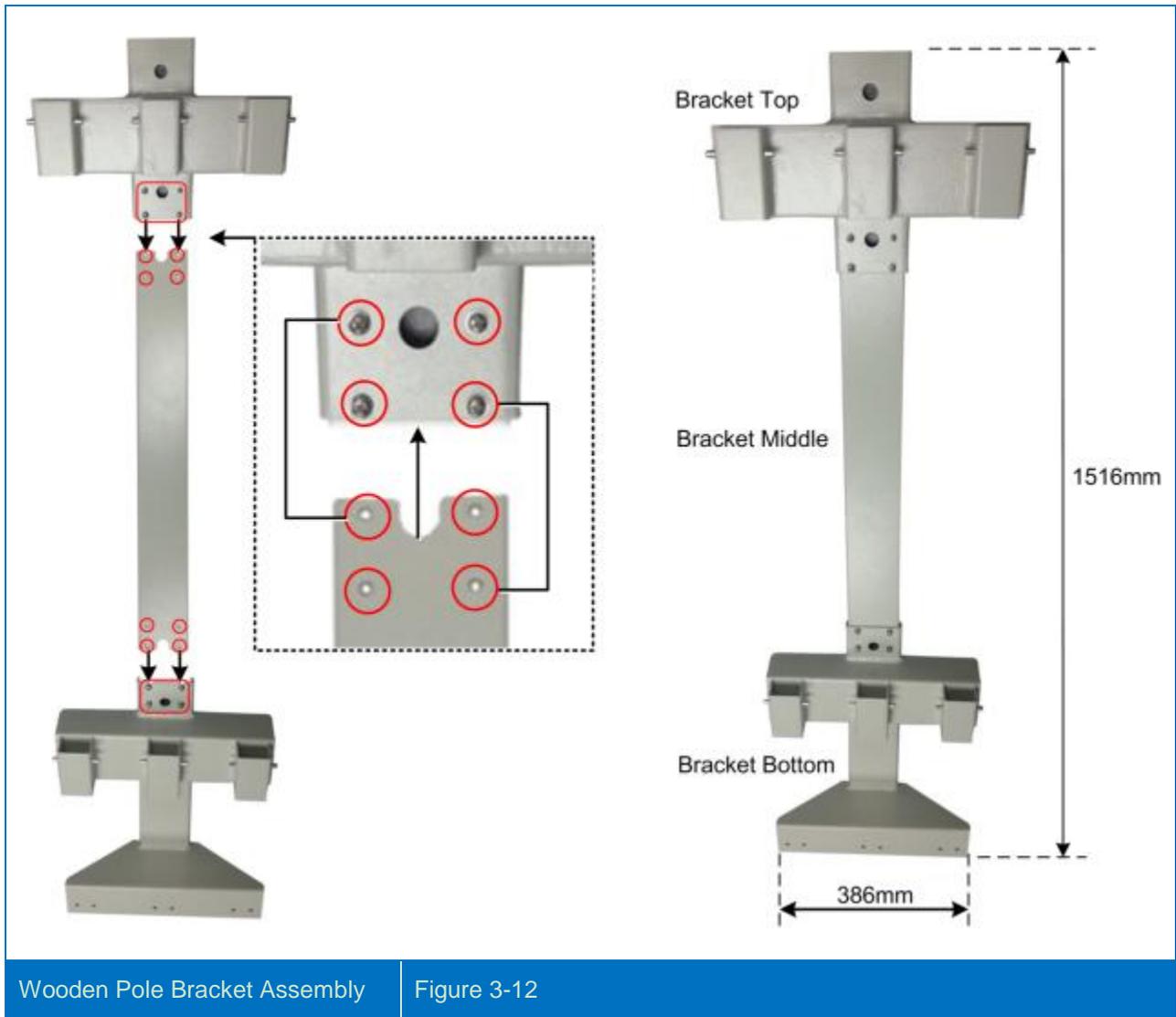
3.1.4.4 Wooden Pole Mount Installation

This section provides instructions on how to mount the GX Tri-Bandunit on wooden poles using the AK-GX-QUAD-BRKT-WDPOLE accessory kit (ordered separately).

To mount a GX unit on a wooden pole

1. Assemble the wooden pole bracket, Using the 8 M6×16 hex socket screws and the relevant washers:

- Insert the bracket middle part into the bottom part and tighten the four M6x16 hex socket screws.
- Insert the assembled parts into the top part and tighten the four M6x16 hex socket screws. Refer to Figure 3-12.



Wooden Pole Bracket Assembly

Figure 3-12

2. Select the appropriate location for the bracket according to the following criteria:

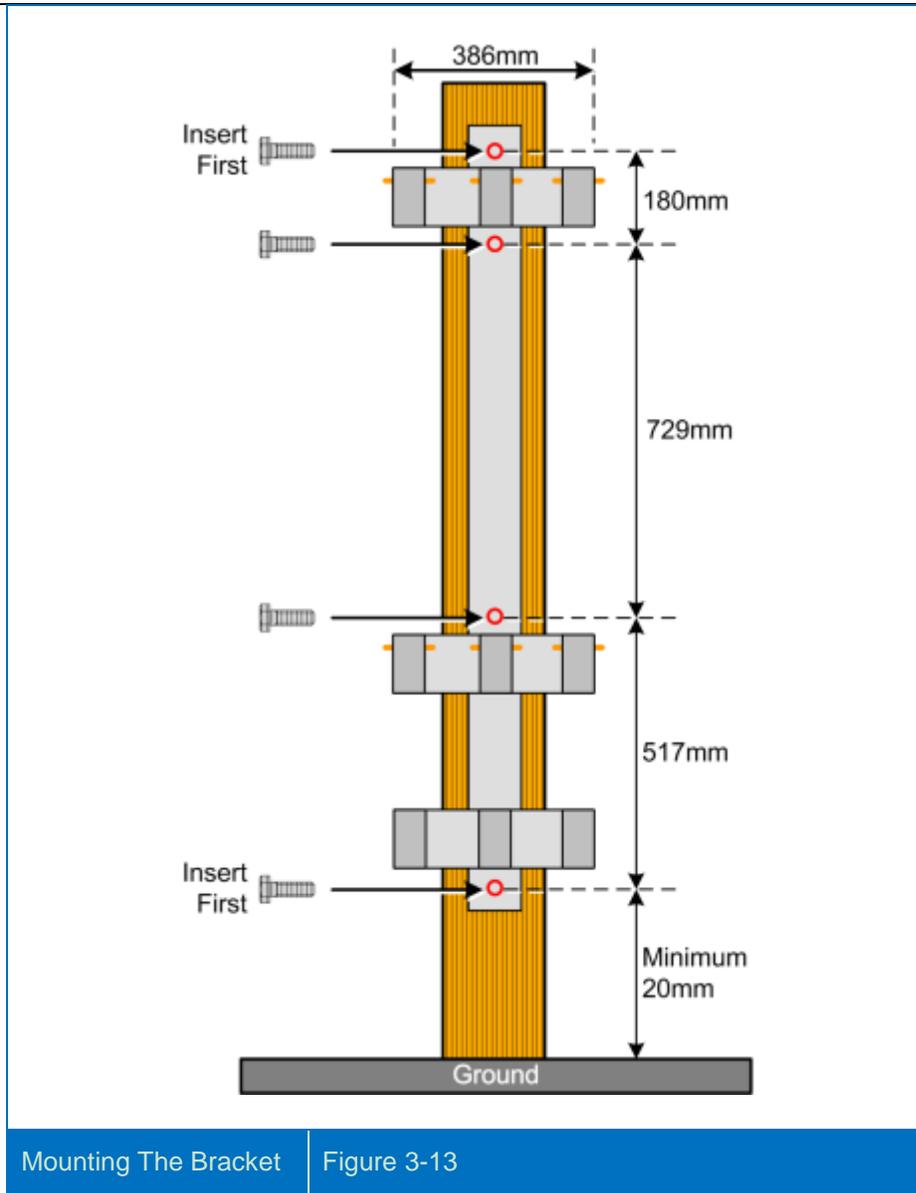
- General surroundings
- Make sure that the bracket is installed high enough to ensure convenient access to the GX connectors located on the underside of the unit when mounted.
- Ventilated and easy-to-reach area
- Proximity to the antenna in order to minimize cable loss

3. Referring to Figure 3-13, mount the wooden pole bracket according to the following steps:

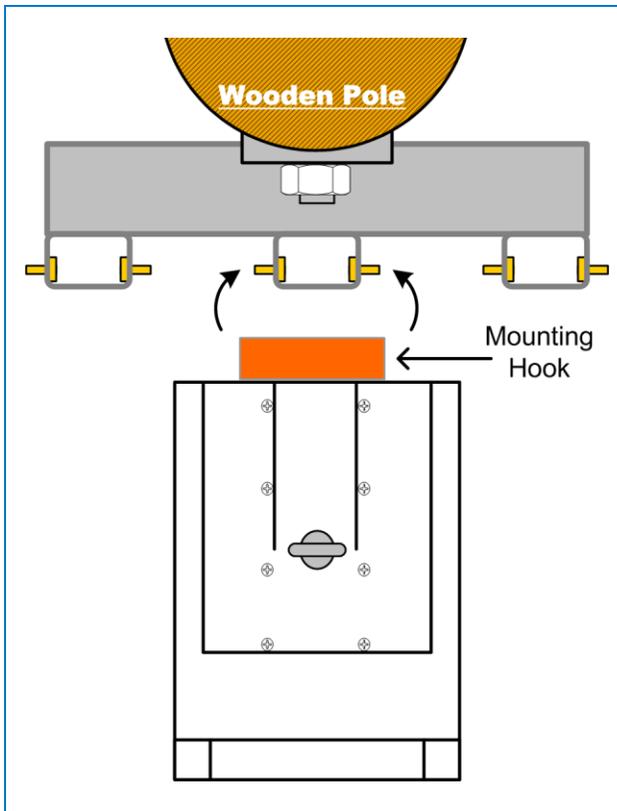
- Drill four holes in the pole according to the distances shown in Figure 3-13.
- Position the bracket onto the wooden pole and screw in the 5/8" screws (provided) into the top and bottom mounting holes.

- Screw in the two additional screws into the remaining middle mounting holes and tighten.

Note: The distance between the bracket bottom screw and the ground must be at least 20mm. See Figure 3-13

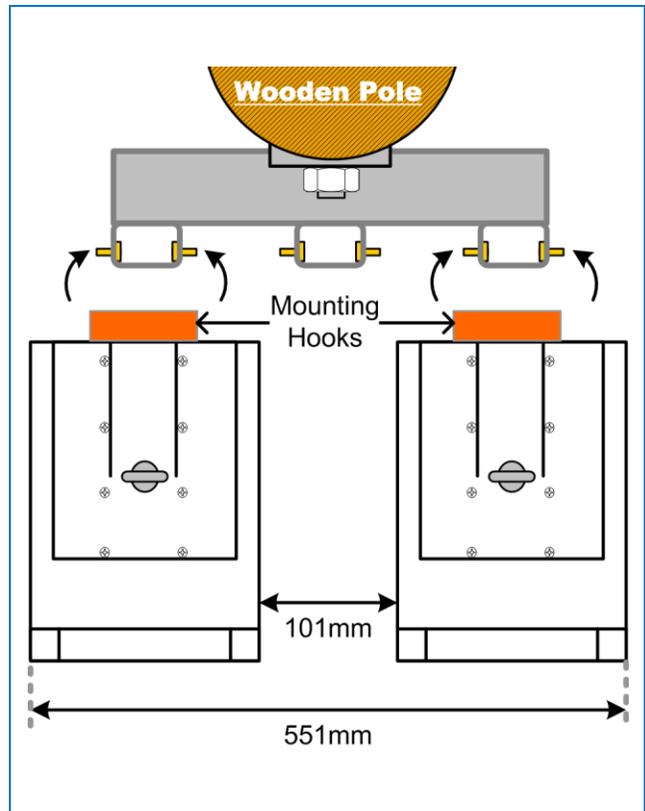


Note: For Single GX unit installations – unit is mounted onto middle of bracket (Figure 3-14);
 For Dual GX unit installations – units are mounted on the sides of the bracket (Figure 3-15).



Single GX Unit Installation (Mounted in Middle of Bracket) – Top View

Figure 3-14



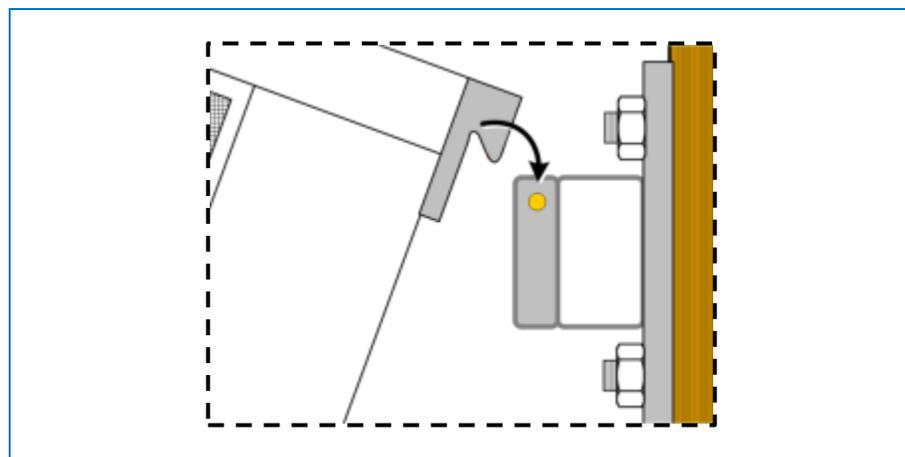
Dual GX Unit Installation (One on each Bracket Side) – Top View

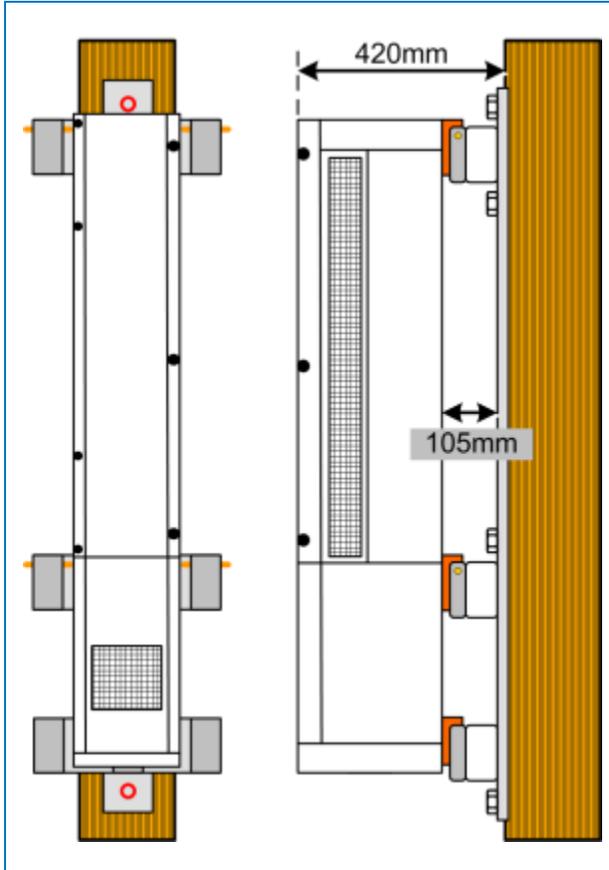
Figure 3-15

4. Mount the GX unit onto the bracket:

- Referring Figure 3-16, Hang the GX on the pins protruding from the relevant (see above note) top and center parts of the bracket. See and Figure 3-17 and Figure 3-22 for final Assembly.
- Insert the two M8 nuts on the bottom of the GX unit (provided with GX) into the appropriate bracket holes and tighten using a spanner or wrench.

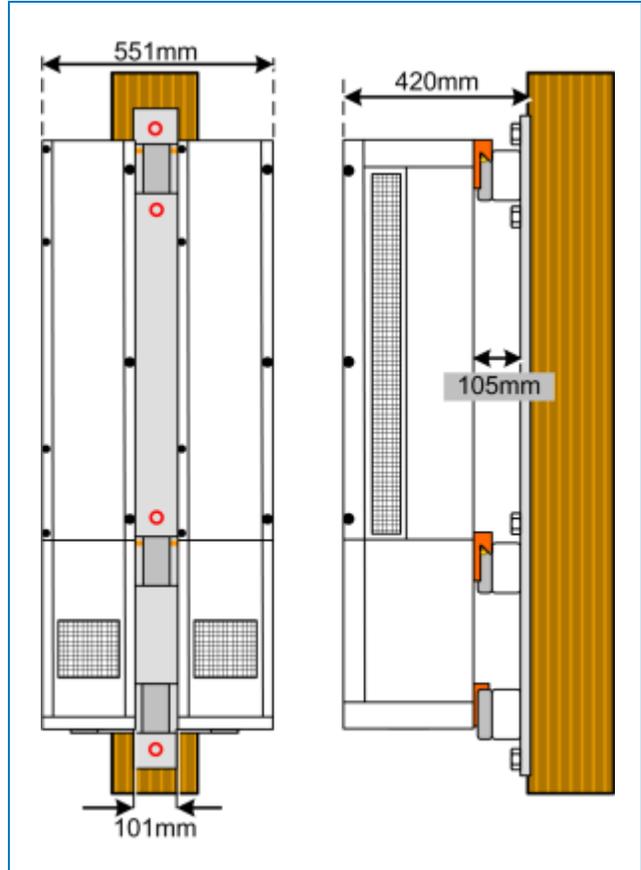
It is recommended to use a thread locker to tightly seal the nuts.





Pole Mounted GX – Single Mount

Figure 3-17



Pole Mounted GX – Dual Mount

Figure 3-18

3.2 Installing External Combiner

Note: The external combiner is ordered separately and supports up to 4 service inputs. The GX remote unit supports 3 services, requiring that the unused combiner input be terminated.

The 4x1 external combiner (AK-GX-FILT-COMB) combines the input signals of the four GX supported bands (e.g. CELL, PCS, LTE700 and AWS) and transmits them through a single output port to the broadband service antenna.

3.2.1 Unpacking and Inspection

1. Open the shipping carton and carefully unpack each unit from the protective packing material.
2. Check your package contents to verify that the items in the packing list are included and that there are no signs of external damage. If there is any damage, call your Corning Optical Communications service representative.

The External Combiner kit includes the following items:

Item	Description	Quantity
External Combiner (Multiplexer)	4 x 1 service specific Tri-Bandcombiner	1
Grounding Cable; 3 ft. (~ 1m)	Used for connecting combiner to earth ground	1
Hose Clamps	Used for pole mount installations	2
M6 x 16 anchor Bolts; Spring washers; Flat washers	Used for wall mount installations	4 (per item)
DIN to DIN cables – super flex; 3 ft. (1.2 m)	Used to connect the GX RF service ports to the external combiner input ports	4
DIN terminator	Used to terminate unused input port (e.g. for installations with GX tri-band units)	1

Table 3-2. External Combiner Kit

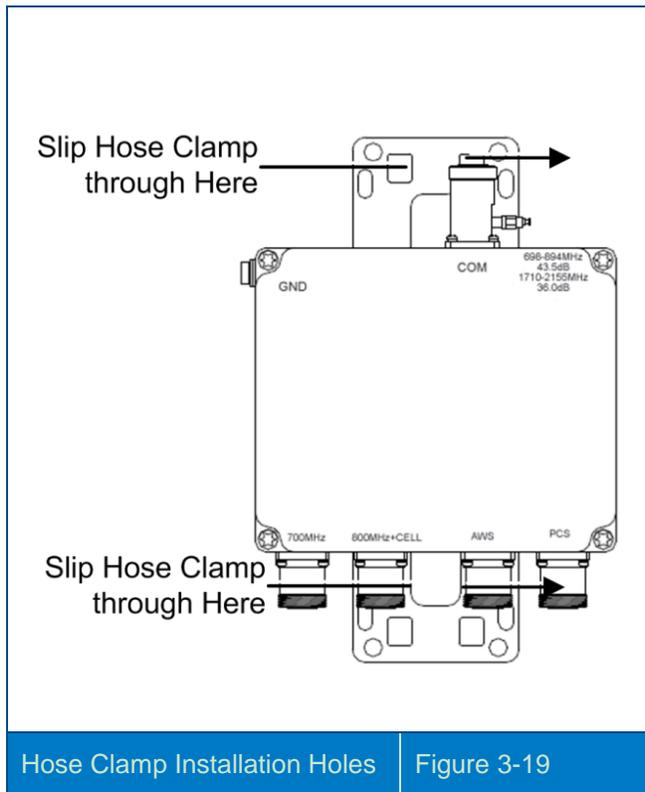
3.2.2 Mounting the External Combiner

3.2.2.1 Wallmount

1. Using the combiner bracket mounting holes as a guide mark and drill four holes for the provided M6 bolts
2. Mount combiner on wall using the M6 bolts, spring and flat washers (four of each) provided in the External Combiner Kit.

3.2.2.2 Pole mount

Slip a hose clamp through each end of the factory assembled mounting bracket (see Figure 3-19 and Figure 3-20) and secure to pole by tightening.



3.3 GX Connections

IMPORTANT – CABLE DRIP LOOPS!

It is highly recommended that every horizontal cable entry to the equipment forms a 'U' before its entry to the equipment. Water on the cable will drip down at the bottom of the loop and will not accumulate at the equipment connectors.

The connections are performed from the underside of the GX unit after it has been mounted.

3.3.1 Grounding Connections



WARNING!

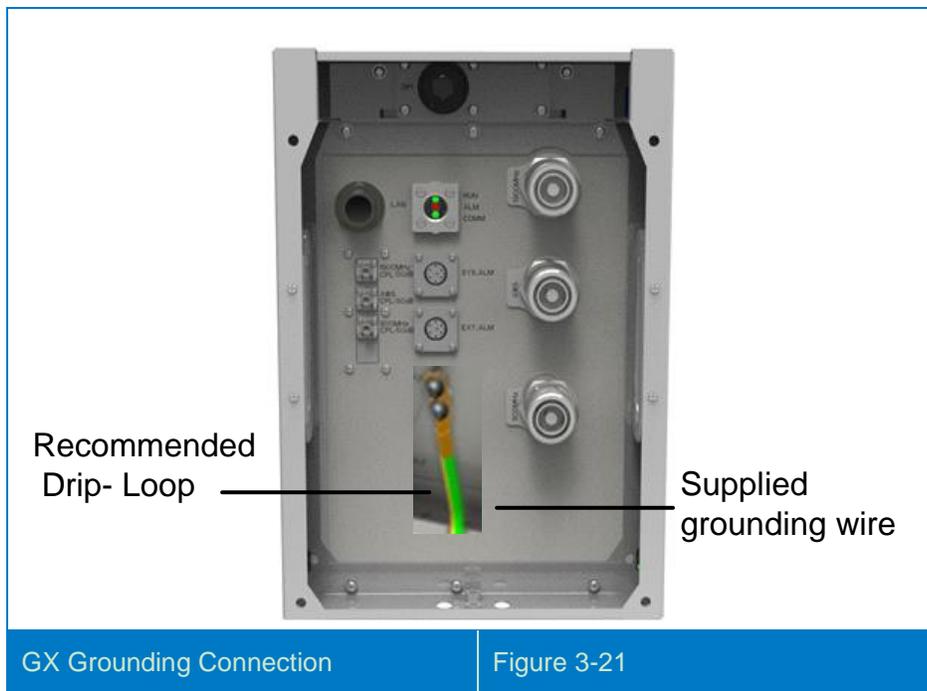
This unit must always be grounded. Consult an appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.

DO NOT CONNECT POWER BEFORE GROUNDING!

Note: An internationally acceptable color code of the ground connection wire is green/yellow.

To ground the GX unit:

1. Connect the supplied copper wire (AWG #6) GND cable to the GND connector and the equipment rack or building EARTH.
2. Ground the GX unit by connecting the provided “earth wire” of the power cord to the ground terminal of the AC supply.

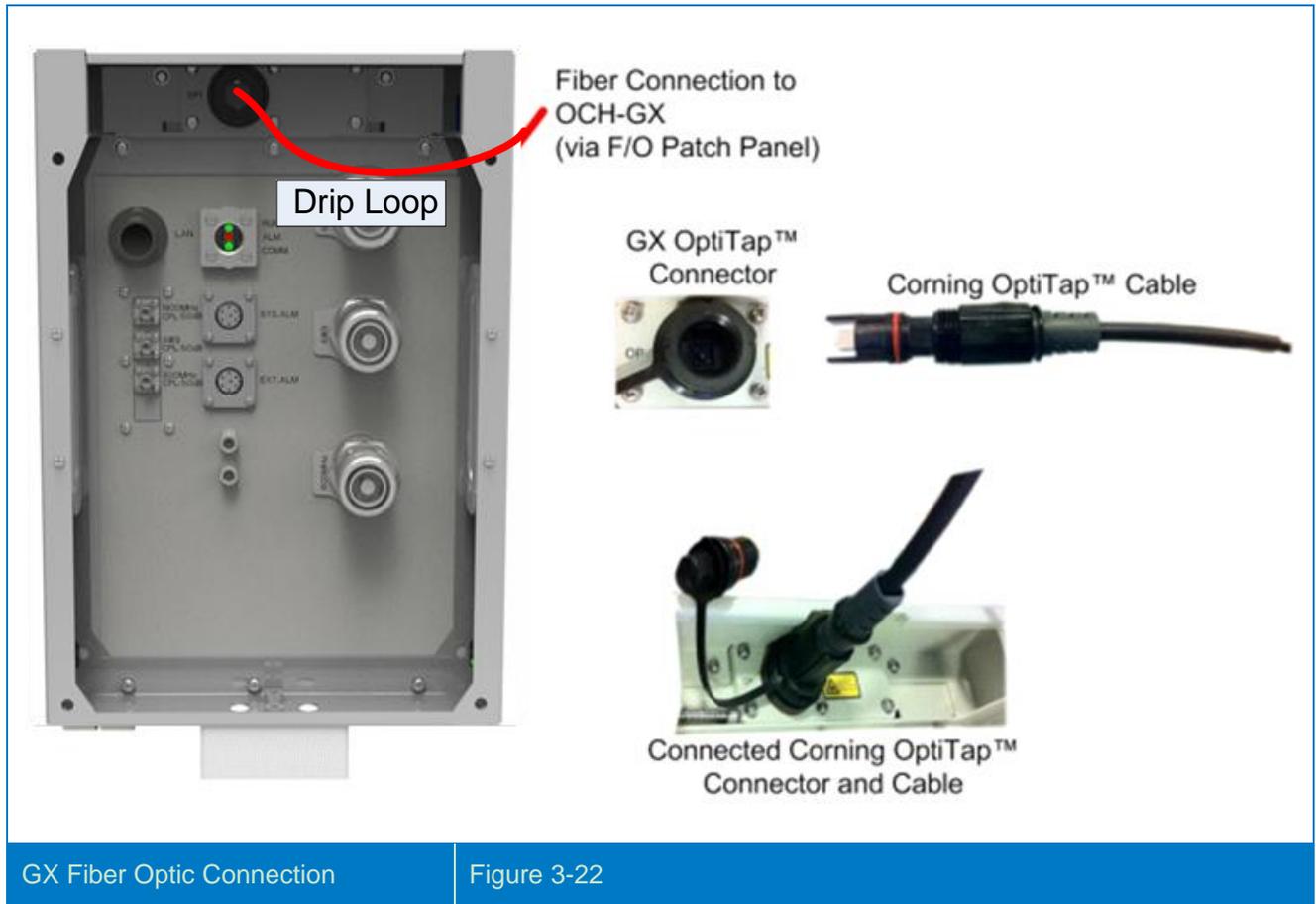


For installations with external combiner (AK-GX-FILT-COMB) – connect external combiner ground to building ground. See Figure 3-20 for grounding bolt location.

3.3.2 F/O Connections

IMPORTANT! OptiTap™ pullout force ranges from a few lbs to 50+ lbs with the dust cap or connector installed. This prevents damages caused to the DAS unit.

Connect the GX-TriOPOptiTap™ port to one of the OCH-GX front panel Link ports (via F/O patch panel), using a Corning OptiTap™ cable (ordered separately).



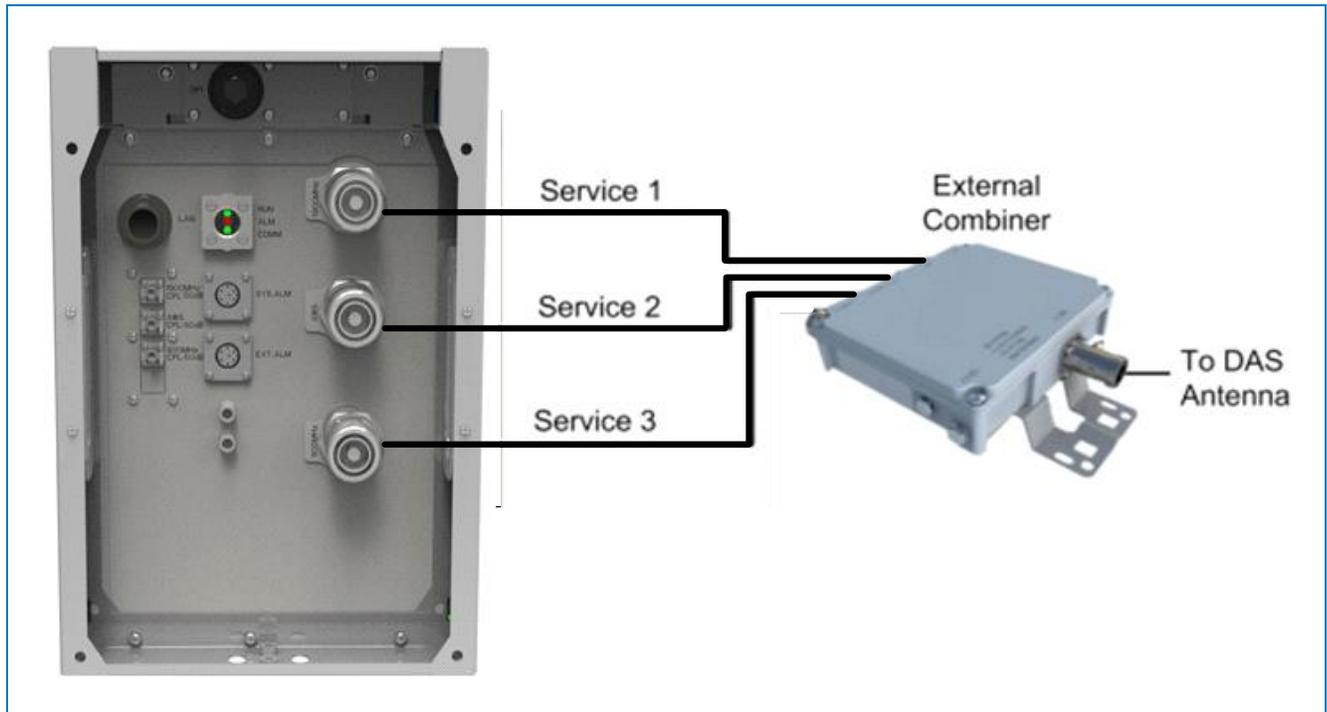
GX Fiber Optic Connection

Figure 3-22

3.3.3 RF Connections

To connect GX-TriRF connections

1. Connect each relevant RF output (e.g. 1900MHz, 700MHz, AWS, CELL) to the corresponding service specific port of the combiner (e.g. GX AWS RF port to Combiner AWS port) using the provided DIN-M to DIN-M cable.



GX RF Connections with External Combiner

Figure 3-23

2. Ensure lightning protection for each antenna.
3. Waterproof all RF ports.

3.3.4 Power Connections

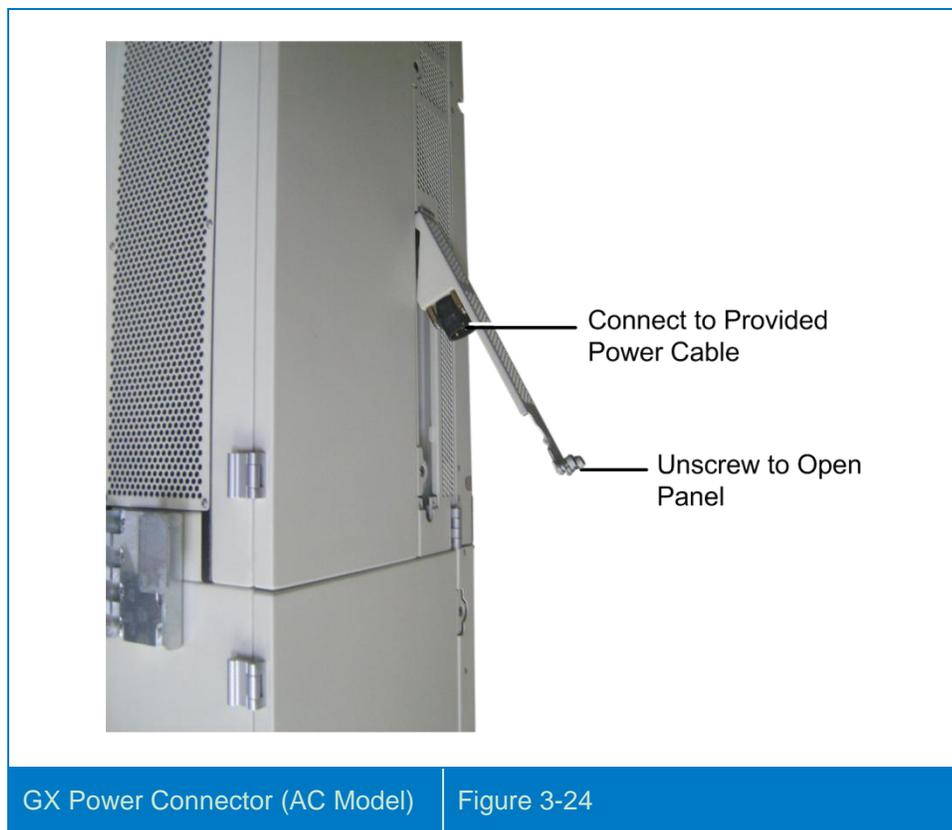
CAUTION!

Any open RF port on GX or improper connection between GX RF ports and filter input ports will damage GX internal power amplifier after the equipment is powered on. Make sure all connections are performed correctly before powering.

3.3.4.1 AC Models

To connect GX power

1. Unscrew the two screws of the side panel (shown in Figure 3-24) and open to access the power connector.

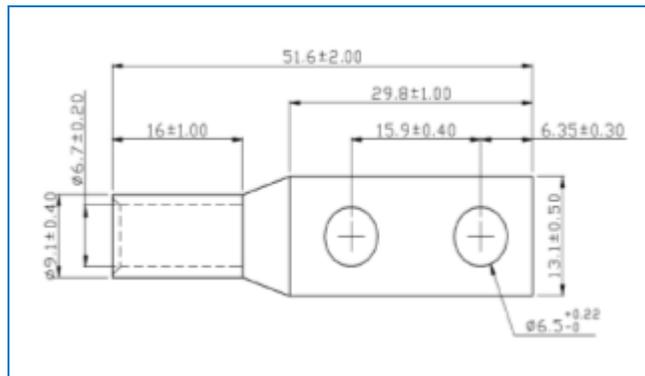


2. Connect the supplied power cable to the power supply port (100-240VAC, 20A maximum).

3.3.4.2 DC Models

Verify the following before connecting DC power:

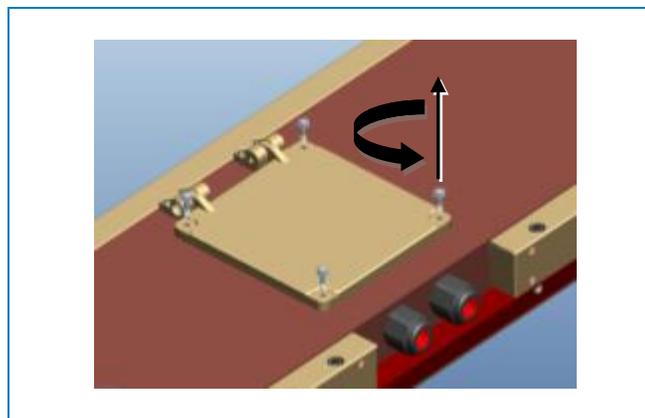
- DC power supplier is turned off
- DC cable (not provided) meets the following requirements:
 - Supports required voltage and current specifications: 40-57 V DC; Max 37.5A.
 - Cable diameter ranges between 7 and 14mm
 - Cable lug specs (refer to Figure 3-25 for example of compliant lug) :
 - Hole Size: ¼ in
 - Hole Spacing: 5/8 in



Example of Compliant DC Cable Lug | Figure 3-25

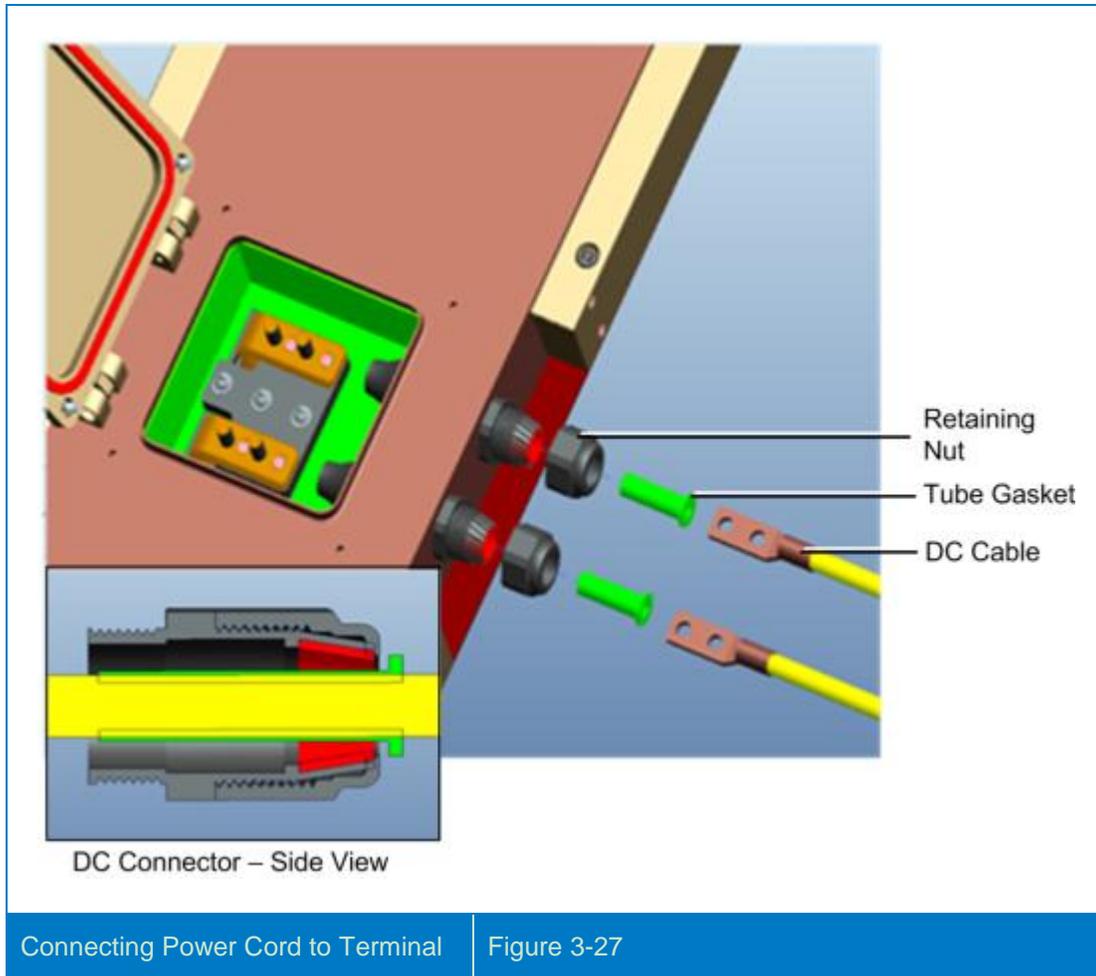
To connect DC power

1. Open DC power chamber panel by loosening four M3 screws, as shown in Figure 3-26.

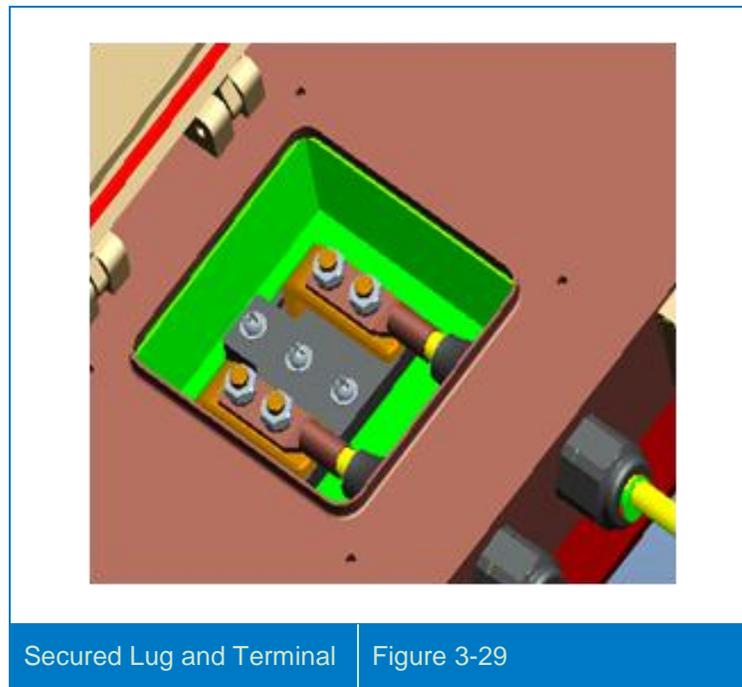
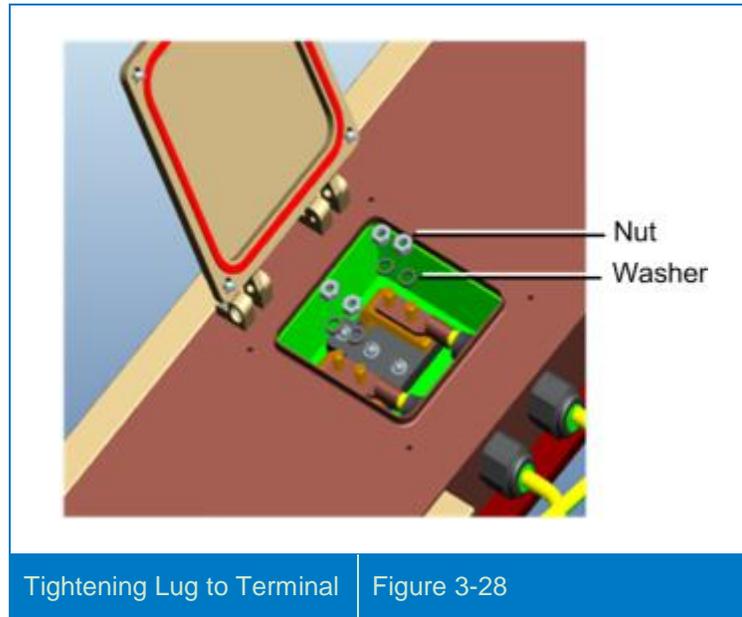


Opening DC Chamber Panel | Figure 3-26

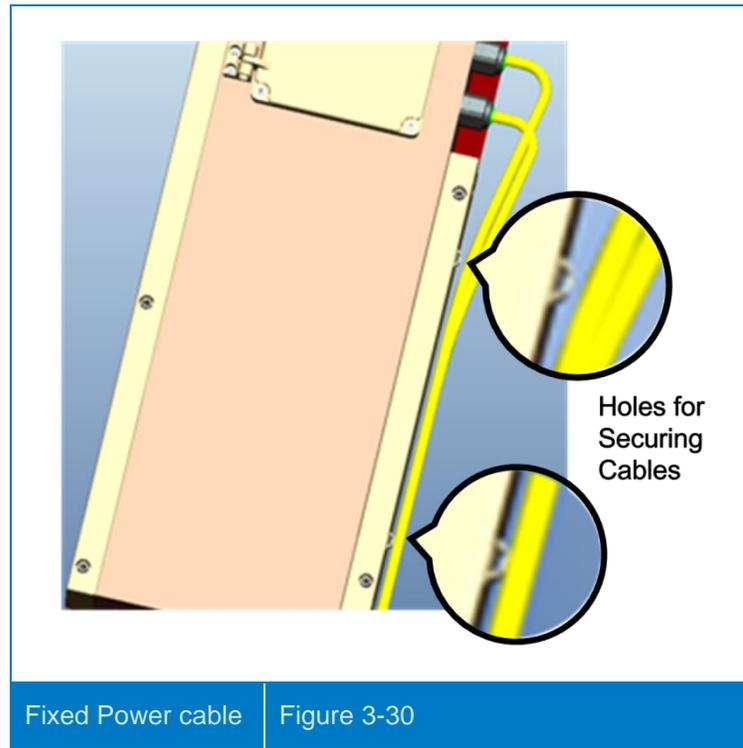
2. Referring to Figure 3-27, remove retaining nut, insert DC power cable through tubing gasket (provided), then carefully route the power cable into the chamber (through hole) and connect the lug to terminal (make sure right DC polar is connected).
3. Tighten retaining nuts.



4. Referring to Figure 3-28, use nut to tighten lug to terminal.



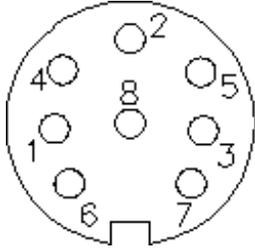
5. It is highly recommended to have power cords fixed or tighten with an enclosure type element. Additional holes are left for that purpose. See Figure 3-30.



3.3.5 External Alarm Connections

The GX-Tri EXT_ALM port supports up to four dry-contact alarm connections from external sources (incoming outputs). The alarms can be connected any time, before or after the system is powered-on.

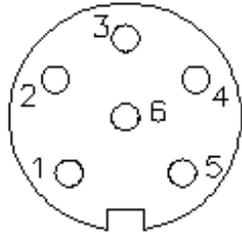
NOTE: After being connected, the External Alarms must be enabled from the Web Management application (see SC-450 v4.5 UM).



Pin No.	Description
1	EXT_ALM1
2	EXT_COM1
3	EXT_ALM2
4	EXT_COM2
5	EXT ALM3
6	EXT_COM3
7	EXT ALM4
8	EXT_COM4

3.3.6 System Alarm Pin-Out Description

The GX-Tri System Alarm pin-out connector supports 3 relay alarm connections. GX-Tristatus alarms can be relayed via a network or modem connection.



Pin No.	Description
1	EXT_OPEN
2	EXT_COM
3	EXT_CLOSE

3.4 Verifying Normal Operation

Upon powering up the GX-Tri remote unit:

- Confirm the fans are working after powering.
- Verify normal operation:

LED	Description	
RUN	Flashing Green -	Flashes green for the duration of a minute upon system initialization
	Off -	System initialized
COMM.	Flashing Green -	Flashes (rate of flash per second) for the duration of 1 minute upon communication initialization
	Rapid/No Flash -	Indicates communication fault
ALM	Steady Red -	Fault
	Off -	Normal operation



Appendix A: System Specifications

RF Parameters

Supported Services

Technologies	Band	Frequency Range	
		Uplink	Downlink
CDMA / WCDMA* / GSM /LTE	CELL850	824-849	869-894
CDMA / WCDMA* / GSM /LTE	PCS1900	1850-1915	1930-1995
WCDMA* / HSPA / LTE	AWS2100	1710-1755	2110-2155
LTE	700MHz	698-716 and 776-787	728-757
CDMA/LTE	S-800	817-824	862-869

(*)WCDMA service is based on 3GPP standards, LTE service may be deployed in the future due to Frequencies re-farming planned by the operators as well

RF Parameters per Service (40 W)

RF Parameters	LTE 700MHz		CELL GSM / CDMA / WCDMA/ LTE 850MHz		PCS GSM / CDMA / WCDMA / LTE 1900MHz		AWS CDMA / WCDMA / LTE 2100MHz		CDMA / LTE S-800 MHz	
	DL	UL	DL	UL	DL	UL	DL	UL	DL	UL
Max Output Power 1 Carrier (Composite)	46		46		46		46		46	
2 Carriers	43		43		43		43		43	
4 Carriers	40		40		40		40		40	
8 Carriers	-		37		37		37		37	
12 Carriers	-		35		35		35		35	
24 Carriers	-		32		32		32		32	
Mean Gain (dB)¹	46	50	46	50	46	50	46	50	46	50
Gain Range (dB)	30	30	30	30	30	30	30	30	30	30
Max Pin (dBm)¹ at AGC Threshold	0	-54	0	-54	0	-54	0	-54	0	-54
Max Intermod Distortion (dBm)	-13**		-13**		-13**		-13**		-13**	
NF (dB) Typical		5		5		5		5		5
VSWR	1.5:1									
Gain Flatness/Ripple (dB)²	+/- 2.0									

* WCDMA complies with 3GPP TS 25.106 V5.0.0 (2002-03) table 9.4 spectrum emission mask.

** Out of band and spurious emissions compliant to FCC.

***Default Conditioner (BTSC) UL Gain=+3dB

¹ Factory set mean gain OCH-WDM without RIU (OCH GUI set in "Active Mode"). May be field adjusted using controller system.

² Gain Flatness/Ripple is specified for the non-duplexed port of the system.

Optical Specifications

Max. Optical Budget	6.0dBo
Optical Return Loss	> 50dB
Optical Loss per Mated-pair Connectors	0.5dB (maximum)
Optical Connector	Corning OptiTap® Fiber-optic waterproof connector
Optical Automatic Gain Control Range	-2~-10dBm
Fiber Type	Single-mode: 9/125um
Wavelength	1310nm, 1550nm + WDM

Physical Specifications

Ports	Corning OptiTap™ Fiber-optic waterproof connectors RF DIN Female connectors		
Power	AC: VAC 100-240/47-63 Hz Max Power consumption	Tri-Band Remote 1450W	S800 Remote 1100W
	DC: VDC (-40) to (-57) Max Power consumption	1450W	1150W
Physical Characteristics	Weight kg (lbs)	147.7 lb. (67kg)	146.16 lb. (66.3 kg)
	Mounting	Wall or Pole	
	Dimensions (H x W x D)	53 x 12.4 x 8.9 in (1350 x 315 x 225 mm)	
Cooling Feature	Active heat dissipation (Fan)		

Environmental Specifications

Operating Temperature	-40 to +70°C (-40 to +158°F)
Humidity	≤95 %
Enclosure	NEBS OSP Class 4 rated(Enclosure protected from elements and waterproofing)

Appendix B: Ordering Information

Note: The information listed below is updated up to the document publishing date. Refer to the GX-Quaddatasheet for the most updated ordering information.

GX-TriRemote Units

Service Supported	Part Number	Description
CELL/PCS/700LTE/AWS 40W	GX-C85P19L70A17-40	GX Quad-Hardware with service CELL, PCS, AWS and 700 MHz LTE solution supporting 40W output power.
	GX-C85P19L70A17-40-DC	GX Quad-Hardware with service CELL, PCS, AWS and 700 MHz LTE solution supporting 40W output power, for DC powering.
CELL/PCS/700LTE 40W	GX-LIC-C85P19L70-40	GX Quad-Hardware with licensed service CELL, PCS and 700 MHz LTE solution supporting 40W output power.
	GX-LIC-C85P19L70-40-DC	GX Quad-Hardware with licensed service CELL, PCS and 700 MHz LTE solution supporting 40 W output power, for DC powering
AWS 40W	GX-LIC-AO-A17-40	GX licensed service Add on for AWS solution supporting 40 W output power.
S800/PCS/AWS	GX-P19S80A17-40	GX Tri-service PCS, S800 and AWS solution supporting 40W output power for AC powering.
	GX-P19S80A17-40-DC	GX Tri-service PCS, S800 and AWS solution supporting 40W output power for DC powering.

Optical Central Hub (OCH) - GX International products

Part Number	Description
OCH-4-WDM	Optical Central Hub for SISO services, supporting (4) SISO Remote units, SMF (WDM)
OCH-8-WDM	Optical Central Hub for SISO or MIMO services, supporting (8) SISO or (4) MIMO Remote units, SMF (WDM)

Accessories

Part Number	Description
AK-GX-FILT-COMB	GX Accessorized 4 to 1 external multiplexer
AK-GX-QUAD-PWR-CABLE	GX AC electrical power cable for US GX Quadband
AK-3COUPLER-DINM-DINF	Male DIN-Type to Female DIN-Type Coupler with QMA port, Qty of three
AK-RIU4-OCH-CABLES	Accessory Kit Cables for RIU4 to OCH, four QMA to QMA R/A cables 1 m
AK-GX-FILT-850	GX Accessories CELL Cavity External filter
AK-GX-QUAD-BRKT-INDOOR	GX Accessory Kit including bracket for wooden pole mounting option
AK-GX-QUAD-BRKT-WDPOLE	GX Accessory Kit including bracket with ground support for indoor concrete wall mounting option

Corning OptiTap® Cables

Part Number	Description
434401EB4R2005M-P	OptiTap® to SC APC 5 meters
434401EB4R2030M-P	OptiTap® to SCAPC 30 meters
434401EB4R2100M-P	OptiTap® to SC APC 100 meters

Corning Optical Communications, Inc. • 13221 Woodland Park Road, Suite 400 • Herndon, Virginia 20171 USA866-436-9266 • FAX: 703-848-0280 • Tech Support Hotline: 410-553-2086 or 800-787-1266 • www.corning.com/mobileaccess

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