MA2000 QX Remote
User Manual

CORNING

Preface Material

RF Safety

To comply with FCC RF exposure compliance requirement, adhere to the following warnings:

Warning! Antennas used for this product must be fixed mounted on indoor permanent structures, providing a separation distance of at least 75 cm from all persons during normal operation.

Warning! Each individual antenna used for this transmitter must be installed to provide a minimum separation distance of 75 cm or more from all persons and must not be co-located with any other antenna for meeting RF exposure requirements.

Warning! Antenna gain should not exceed 12.5 dBi.

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.

ATTENTION!

Compliance with RF safety requirements:

Corning 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.

CAUTION!

Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Laser Safety

Fiber optic ports of the MA2000 QX 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.

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

To avoid eye injury never look directly into the optical ports, patchcords 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 MA2000 QX devices and the associated cables.

MA2000 QX 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.

MA2000 QX complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice NO. 50 (2007).

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 Certification

MobileAccess2000 products have met the approvals of the following certifying organizations:

Company Certification

ISO 9001: 2000 and ISO 13485: 2003

Product Certifications

US	<u>Radio Equipment and Systems</u>:
	· FCC 47 CFR Part 22 – for CELL Frequency Band
	· FCC 47 CFR Part 24 – for PCS Frequency Band
	· FCC 47 CFR Part 27 – for 700 LTE and AWS Frequency Bands
	<u>EMC</u>
	· FCC 47 CFR Part 15 Subpart B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

Warning! Changes or modifications to this equipment not expressly approved by Corning could void the user's authority to operate the equipment.

Europe	<u>Radio Equipment and Systems</u>
	EN 301 502 – for GSM / EGSM Frequency Bands
	EN 300 328 – for WLAN 802.11b/g 2.4GHz Frequency Band
	EN 301 893 – for WLAN 802.11a 5GHz Frequency Band
	EMC
	EN 301 489
Safety	EN 60950UL 60950
	CAN/CSA-C22.2 No.60950
	UL 2043
Laser Safety	CDRH 21 CFR 1040.10, 1040.11 (Except for deviations per notice No.50, July 26, 2001)
	IEC 60825-1, Amendment 2 (January 2001)
	EN 60825-1

About this Guide

This user guide describes how to perform the physical installation of the MA2000 systems. The installation procedures of other units (e.g. RIU, 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
Base Unit Quick Start Guide
System Controller (SC-450) User Manual
MA2000 QX Specification Sheet
MA Software Version Update Tool

List of Acronyms

AO	Add-On module
BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
BTSC	Base Transceiver Station Conditioner
BU	Base Unit
DL	Downlink
RHM	Remote Hub Module
RIU	Radio Interface Unit
UL	Uplink

Table of Contents

1 Introduction

MA200 QX Remote is a compact, modular, cellular indoor coverage remote solution for the MobileAccess2000 (MA2000) Distributed Antenna Systems (DAS).

It is a fiber fed, compact and scalable multi-service platform designed to complement the MA1000 and MA2000 supporting up to four services (CELL, PCS, 700LTE and AWS1/3).

All services are received from the headend, over an optic fiber pair, converted back to RF and distributed over a common DAS antenna infrastructure.

Service support can be quickly added as needed by inserting card like modules into the chassis without any downtime or additional cabling. In addition, two QX units can be cascaded to provide various combinations of SISO and MIMO services.

MA2000 QX remotes share a common equipment headend and element management system (EMS) with other remotes on the MA1000/MA2000 platform. Management and configuration options are provided for each QX service module (i.e. RHM and AO) and for the QX chassis fans via a Web session to the SC-450 Controller.

| MA2000 QX | Figure 1-1 |

1.1 Key Features and Capabilities

The following benefits are achieved with the QX platform:

- Multi-Service Platform - Supports up to four services: CELL850, PCS1900, LTE700 and AWS3 services in various configurations.
- Multi-Operator Optimized Platform - Services from a number of operators can be supported by the same chassis or by different units and distributed over a common DAS antenna infrastructure.
- Optic Fiber savings - All services routed to an QX unit are routed over a single optic fiber
- Modular Design - Seamless service upgrades – simply insert a module in the MA2000 QX and configure
- Scalable MIMO Upgrades - Upgrade any or all services from SISO to MIMO by cascading another QX unit
- Small Footprint - 3 U height rack; 4 U height rack including SCU-F unit
- Simple maintenance - All connections and status LEDs located on front panel; Modular, hot-swap, field replaceable service modules, including fan modules
- Web Management - Web management via the SC-450 controller

1.2   System Architecture

MA2000 QX compliments the MA2000 DAS solution and coexists alongside other MA1K and MA2K remotes, sharing a common headend. The QX remote unit provides coverage for up to four RF services over a common fiber/coax antenna infrastructure. The QX is installed at the remote end on floor level and operates in conjunction with an SCU-F (Service Combiner Unit) which combines the service signals and distributes them to up to four broadband antennas.

Headend:

At the headend CMA elements provide interface to the wireless service provider's network, condition the signals and convert them to optical signals for transportation over fiber optics towards the remote ends.

- **Radio Interface Unit (RIU)** - the RIU conditions and custom tunes the RF Downlink (DL) signals from an operator's signal source (BTS or BDA) to ensure a constant RF level. In the Uplink (UL), the signal (at the required level) is routed back to the operator's signal source.
- **Base Unit (BU) -** RF to Optic converter unit – The BU is a wideband unit that convert the RF Downlink (DL) signals from the RIU into optical signals for routing over single or multi-mode fiber optic cabling (SMF/MMF) to/from the QX units located at the remote locations up to 2 km away.
- **System Controller (SC-450)** - the system controller enables centralized remote management and control of MobileAccess elements. This unit connects directly to the RIU and BU and allows management of these as well as their hosted elements (e.g. QX) via a controller Web session.

Remote End:

At the remote end, the optical signal is reconverted to RF, filtered, amplified to the appropriate level, combined with other signals and distributed over the broadband antenna infrastructure. The QX unit is installed, along with the Four Port Service Combiner Unit (SCU-F). The QX system remote end consists of the following elements:

- **MA2000 QX -** each QX unit provides coverage for four RF services (e.g. CELL, PCS, 700LTE and AWS) via two types of service dedicated internal modules (RHU and AO). Each of these modules is monitored via the Controller as an independent unit:
  - **Remote Hub Module (RHM):** The RHM is a service-specific module, supporting two services, that performs optical to RF conversion of signals received from the BU. Signals are automatically filtered and amplified for transport over broadband coax cable to a passive antenna. Uplink (UL) signals from the antennas are then converted to optical signals before being transmitted back to the BU.
  - **Add-On Module (AO):** The AO is a single service module coupled with an RHM to deliver an additional service at a lower incremental cost. The AO receives RF signal from the RHM and amplifies it to transport across the broadband coax.
- **Service Combiner Unit (SCU-F):** The SCU-F is a passive unit that can combine service signals from up to two fully loaded QX units and distributes the combined signals over broadband antennas.

  Note: The QX can be used with any flavor of SCU (i.e. SCU-F, SCU-FT, SCU-4, SCU-8).

Figure 1-2 sows an example of an MA2000 QX deployment including two QX remote units (quad-band and tri-band). The QX receives RF over optic service signals from the head end, reconverts the signals to RF over copper, adjusts them to the required level and outputs each service to dedicated interfaces. The signals are combined by the SCU-F (along with services from other QX units) and distributed over a common DAS (Distributed Antenna System) infrastructure.

In the uplink, cellular service signals received at the DAS are separated by the SCU-F and routed to their dedicated QX ports. The signals are then converted to optic and forwarded to the head-end for reconversion to RF and distribution to the relevant BTS or BDA systems.

Note: 3rd party equipment is sold separately (i.e. cabling, antennas).
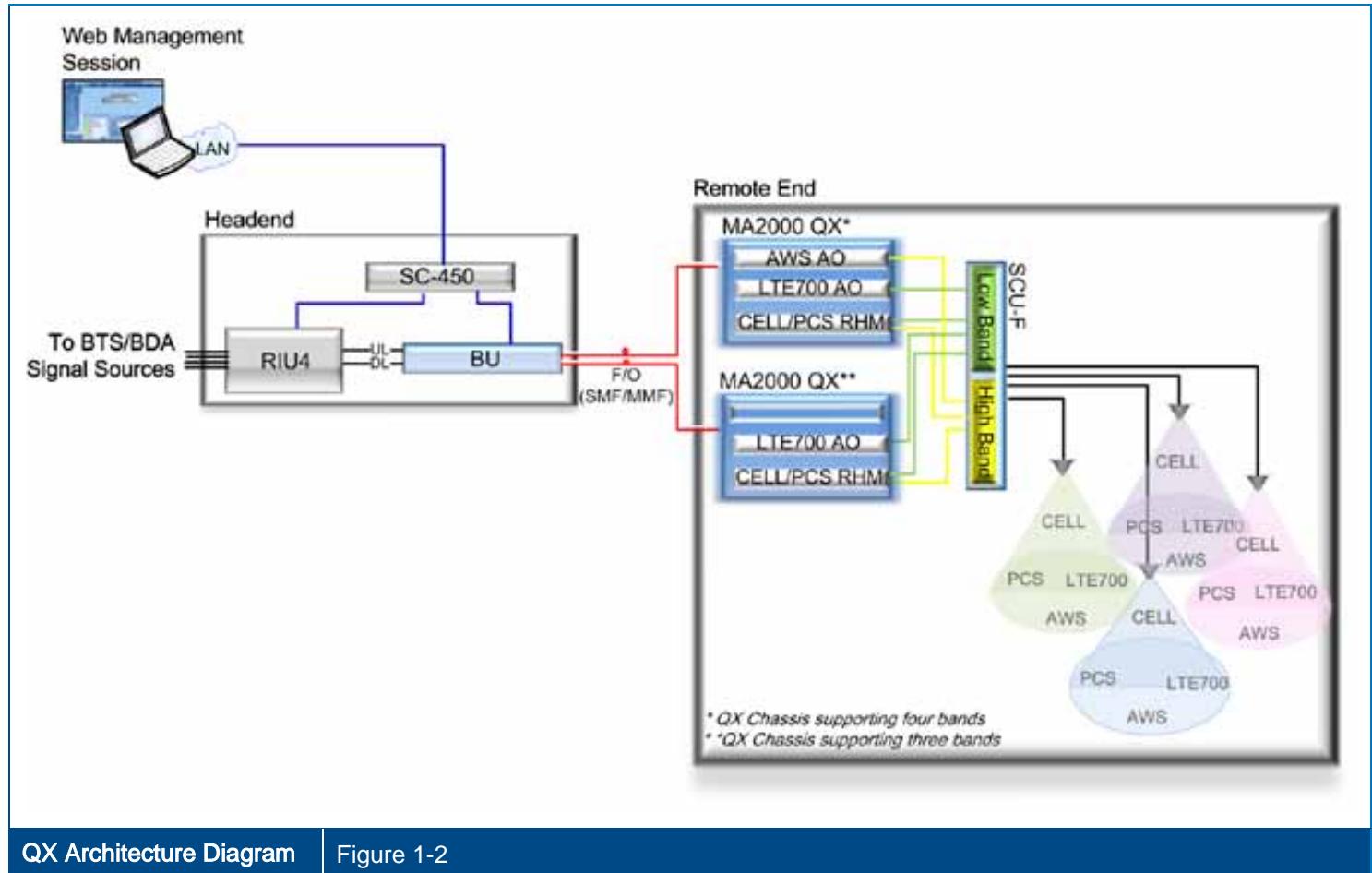
QX Architecture Diagram | Figure 1-2

1.3   QX Interfaces and Internal Modules

1.3.1   QX Interfaces

This section provides a full, detailed description of the QX unit and relevant interface connections (Table 1-1) and LED indicators (Table 1-2).

| MA2000 QX Front Panel | Figure 1-3 |
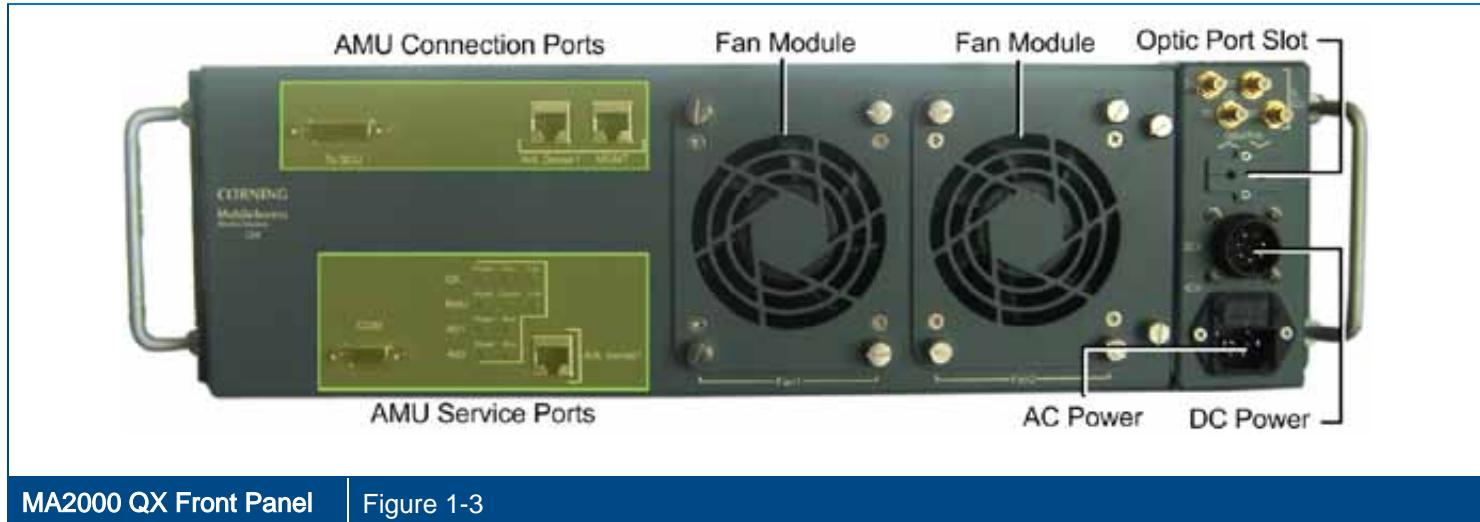
Table 1-1. QX Front Panel Interfaces

Interface	Description
DB-15	AMU (Antenna Monitoring Unit) port. Connect to parallel port on SCU-F. Note that only one QX unit port can be connected to the parallel SCU-F port. For installations with more than one QX, cascade QX AMU ports using IN/OUT ports.
IN/OUT	AMU cascading ports. Use in case there are more than one QX units connected to the SCU-F.
DB-9	RS232 serial connection (D-Type 9); Serves as AMU console port for service personnel
Console	Connect to network for AMU SW upgrade – for tech support personnel only
Service specific QMA connectors	Used for connecting to corresponding SCU-F High band and Low Band QMA connectors.
Optic Port Slot	Slot used to guide the optic fiber to the RHM module fiber optic SC/APC port inside the chassis.
AC In	Local AC power connection: 100 - 240 VAC (Integrated AC/DC converter)
DC In	Remote DC power connection: 25 to 48 VDC

The QX front panel supports three groups of LEDs: QX Chassis (system level), RHM and Add-On unit LEDs.

| MA2000 QX Front Panel | Figure 1-4 |

Table 1-2: LEDs Descriptions

Module	LED	Description	
QX Chassis (System Level)	Power	Steady Green:	Required power is supplied to AMU module of QX chassis
		Off:	No power supplied to AMU module of QX chassis
	Run	Steady Green:	AMU module SW initialized
		Blinking Green:	AMU module SW is initializing (blinks for the duration of approx. 1 minute)
	Fan	Steady Green:	Fan status normal
		Blinking Green:	Faulty fan, alarm triggered
RHM	Power	Steady Green:	Power input detected for RHM module
		Off:	No power detected for RHM module
	Comm	Blinking Green:	Active communication detected - connected and discovered by the BU
		Steady Slow Blink:	Faulty communication link - no external communication is received
	Link	Steady Green:	Normal optical link level from BU
		Blinking Green:	Low optical link level from BU
		Off:	No optical link is present
AO1/AO2	Power	Steady Green:	Power input detected for first/second Add-On unit
		Off:	No power detected for first/second Add-On unit
	Run	Blinking Green:	Indicates that the Add-On module is in normal operating mode.

1.3.2   QX Main Internal Modules

The QX main components consist of the following internal modules:

·   **Remote Hub Module (RHM)** – service specific module, supports two voice services, converts the optical signals received from the BU to RF signals (and vice versa) and routes them to the coax antenna infrastructure (via the Four Port Service Combiner Unit – SCU-F).

·   **Add-On (AO) –** adds an additional voice service to the host RHM (QX includes two AO modules hosted by the RHM)

   Note: The voice services are combined by the connected Service Combiner Unit (SCU).

·   **Antenna Monitoring Unit (AMU)** – digital unit that enables antenna monitoring and relay messaging of the following information:

   ·   Antenna status

   ·   Fans status

   ·   Fans control

   ·   AMU/QX alarms.

   The AMU is connected to the SCU. The AMU modules of a number of QX units can be daisy chained to a single SCU-F (see section 3.5.3.1).

·   **Fan Module** – two extractable fans, simple to maintain and replace (see section 4.2).
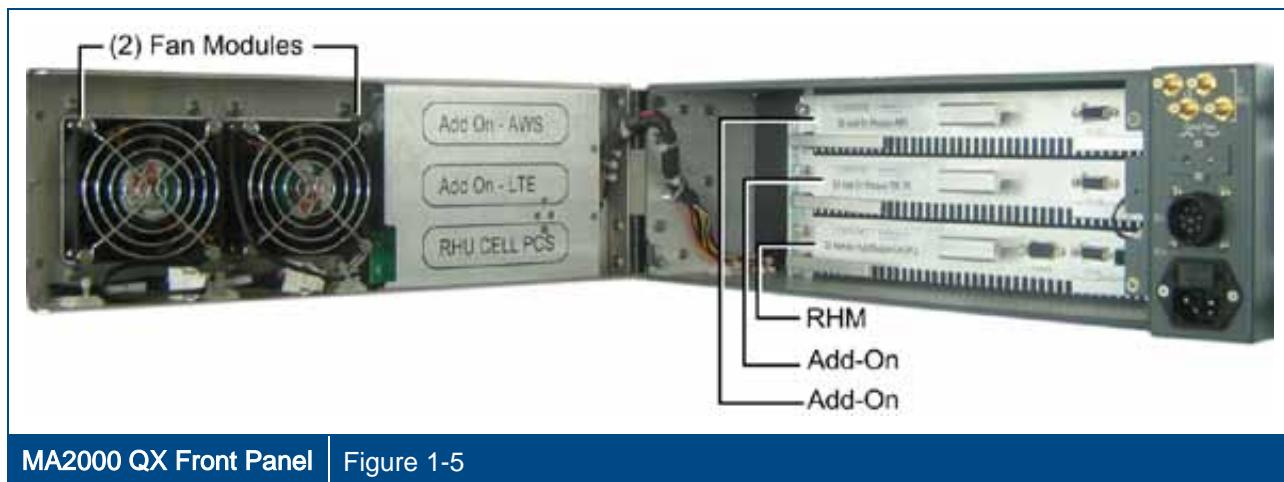
| MA2000 QX Front Panel | Figure 1-5 |

1.4 SCU-F Interfaces

The SCU-F is a passive unit which interfaces to the QX RF service ports and internal AMU module and to the DAS infrastructure. All of the interfaces are located on the front panel (shown in Figure 1-6).

| SCU-F Front Panel | Figure 1-6 |
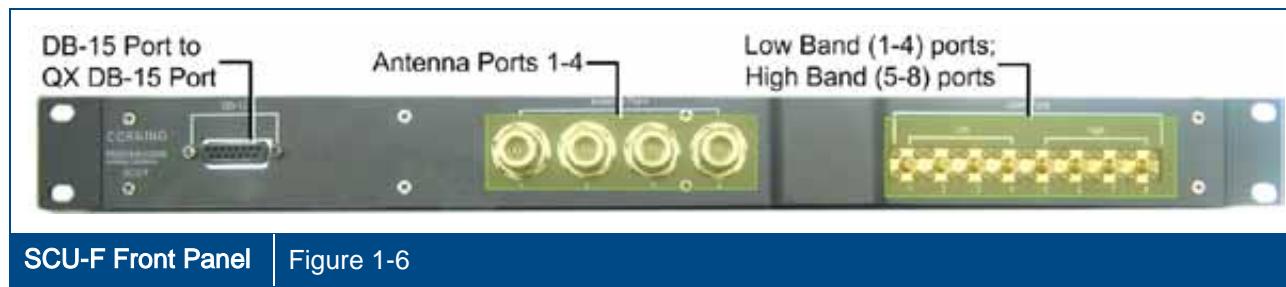
Table 1-3. SCU-F Front Panel Interfaces

Interface	Description
DB-15	DB-15 port used to connect the SCU-F to the QX DB-15 port (internal AMU module port)
Antenna Ports	N-Type RF antenna ports used to connect to the broadband antenna infrastructure
QMA Ports (Low/High)	QMA type RF ports used to connect to the QX service ports: Low: Ports 1-4 support low band service connections from the QX High: Ports 5-8 support high band service connections from the QX

2   Installation Guidelines

2.1   Infrastructure Preparation

This following installation rules are based on the assumption that site survey and installation planning (including power requirements) have been completed.

2.2   Installation Requirements

The infrastructure preparation consists of two main phases:

Floor Planning: Planning the distribution of the antennas on each floor to provide the required coverage.

Telecom Closet Planning: Planning the layout of the devices and cables in the telecom closet or shaft.

2.3   Coaxial Cable Connections

2.3.1   General Cable Installation Procedures

Observe the general cable installation procedures that meet with the building codes in your area. The building code requires that all cabling be installed above ceiling level (where applicable). The length of cable from the risers to each antenna must be concealed above the ceiling.

The cable must be properly supported and maintained straight using tie-wraps, cable trays and clamps or hangers every 10 feet (where practical above ceiling level). Where this is not practical, the following should be observed:

· The minimum bending radius of 7-in is required for the supplied ½-in coax cable.

· Cable that is kinked or has a bending radius smaller than 7-in must be replaced.

· Cable runs that span less than two floors should be secured to suitably located mechanical structures.

· The cables should be supported only from the building structure.

2.3.2 RF Rules

- When using the MA2000 system in an environment in which other indoor coverage systems are installed, it is recommended (where possible) that the antennas are placed at least two meters apart
- When bending coax cables, verify that the bending radius does not exceed the coax specifications.
- Use wideband antennas supporting a range of 800 MHz to 2500 MHz
- Use a VSWR meter (i.e. Site Master or equivalent) for checking coax cables, including the antennas. (< 2). The VSWR must be measured prior to terminating the RUs in the remote communication rooms
- Terminate all unused SCU ports with a 50 ohm load

2.3.3 Coax Cable Lengths and Losses

Use coax ½", 50 ohm, male-to-male QMA type, for connecting to SCU broadband antenna ports.

Note: The required distance between the antennas (installed in the ceiling) depends on the infrastructure and calculated path-loss. For example, if there is free space-loss between the antennas, a minimum distance of 100 ft is required; if there are partitions (loss) between the antennas, a distance of less than 100 ft between them is allowed.

Coax Length	Coax Loss (900Mhz)	Connector Loss	Total Loss
30	0.7	1.5	2.2
40	0.9	1.5	2.4
50	1.1	1.5	2.6
60	1.3	1.5	2.8
70	1.5	1.5	3
80	1.7	1.5	3.2
90	1.9	1.5	3.4
100	2.1	1.5	3.6
110	2.3	1.5	3.8
120	2.5	1.5	4
130	2.7	1.5	4.2
140	2.9	1.5	4.4
150	3.1	1.5	4.6
160	3.3	1.5	4.8
170	3.5	1.5	5
180	3.7	1.5	5.2
190	3.9	1.5	5.4
200	4.1	1.5	5.6

2.4 Fiber Optic Rules

- Either single mode or multimode fiber can be used with QX products.
- Only Multimode fiber, 50/125 or 62.5/125um complying with ANSI/TIA/EIA-568-B series, EN50173-1 or ISO/IEC 11801 can be used. The fiber length can be up to 300 meters assuming the following qualifications:
- All fiber in a given length of fiber must be of the same core diameter.
- All Bulkhead adapters must be Single mode SC APC (Green) adapters.
- All terminations cross connections or patches must be direct fusion splice or the specified patch cords listed below.

900 microns patchcord for splicing, 2 Meters, 2xSC/APC	
Diamond p/n ENC/1045341 Beige boots, 62.5/125/900	MA# 500001057
Diamond p/n ENC/1045340 Black boots, 50/125/900	MA# 500001058

Zipcord patchcord, 4xSC/APC, 50/125/900/2000/4500 micron	
Diamond p/n ENC/1045342 Black/Brown boots, 1 Meter	MA# 50000105
Diamond p/n ENC/1045343 Black/Brown boots, 3 Meter	MA# 500001060

Zipcord patchcord, 4xSC/APC, 62.5/125/900/2000/4500 micron	
Diamond p/n ENC/1045344 Beige/Brown boots, 1 Meter	MA# 500001061
Diamond p/n ENC/1045345 Beige/Brown boots, 3 Meter	MA# 500001062

- Use only 8-degree SC APC connectors (green color).
- Use only fusion splice for connecting two fibers.
- Use minimum splicing/connectors to achieve minimum losses on the fibers (<0.5 dB).
- Use precaution while installing, bending, or connecting fiber optic cables:
  - Fiber optic cable is sensitive to excessive pulling, bending and crushing forces. Consult the cable specification sheet for the cable you are installing.
  - Do not bend cable more sharply than the minimum recommended bend radius.
  - Do not apply more pulling force to the cable than specified.
  - Do not crush the cable or allow it to kink. Doing so may cause damage that can alter the transmission characteristics of the cable. The cable may have to be replaced.
- Use an optical power meter and light source for checking the fiber optic cables.
- Make sure the environment is clean while connecting/splicing fiber optic cables.
- All fiber optic connectors should be cleaned prior to connecting to the system
- Fiber connector protective caps should be installed on all non-terminated fibers and removed just before they are terminated.
- Check the Fiber Optic connections.
- Pay special attention while connecting the SC APC connectors - ensure that you hear a "click", indicating a secure connection
- Never look directly into the end of a fiber that may be carrying laser light. Laser light can be invisible and can damage your eyes.

2.5 Power Consumption, Connections and Power Supplies

2.5.1 Power Safety Instructions

⚠ SAFETY WARNINGS

When installing or selecting the power supplies:

· It is required to install a circuit breaker of 7.5 A for the DC supply circuit.

· Be sure to disconnect all power sources before servicing.

· Calculate the required power according to the requirements of the specific installation and then determine the configuration of the power supplies. The required DC cables will then be determined by the selected PS configuration.

· Use only UL approved power supplies

· AC and DC power supply cables – only use the power cords supplied with the units

2.5.2 Types of Power Supplies

CMA supplies various power supplies that can be installed in a rack or mounted on a wall, depending on your configuration.

2.6 Installation Conventions

Some of the basic installation conventions are listed below for the QX system:

· **QX** - usually placed in the communication shaft or closet of a corresponding floor so they can be easily located. Each QX unit can typically cover a floor of up to 30,000 sq ft.

· **Fiber optic cable** - bundled fibers are terminated into the Base Units in the main communication room. The fibers are then routed to each coverage locations where individual fibers terminate into splice boxes. The splice box couples the installed fiber into the remote units. Enough spare fibers should be installed to take into account future expansion of the system.

· **For remote power supply configuration -** cable bundles are routed from the main communication room and individual wire pairs are terminated into the power feed of individual units.

  By providing power from a single distribution point, maintenance can be reduced and UPS backup can be easily provided. The maximum distance from the source to the termination spot is 1000 feet using 18 gauge wires.

  In many locations local codes do not require power to be run through conduit if 100 watts or less is used. Please consult the regulations in your local jurisdiction prior to deploying remote power. When power cables require distances greater than 1000 feet 14 or 16 gauge wire may be used.

· **On each floor -** the antennas are connected to the Service Combiner Unit (SCU) using coax cables.

3 System Installation

The following sections provide an overview of the installation procedure for the QX and an SCU-F unit.

Note: The QX must be installed with the SCU (in rack installations - preferably below the SCU).

The QX can be mounted using one of the following options:

- 19-in Rack – pre-assembled rack ears
- Wall mount (interfaces facing front like in a rack installation) – supplied bracket
- Vertical wall mount –interfaces facing down - ordered separately (P/N AK-QX-ENC-WMT-V)

Note: Be sure to read the Installation Requirements (see section 2.2) and Power Consumption related instructions (see 2.3.3 section 2.5) before proceeding with the actual connections.

3.1 Overview of Physical Installation

Physical installation procedure steps

1. Unpacking and inspecting supplied items for QX and SCU-F units – see section 3.2.
2. Mounting SCU-F unit (not included – ordered separately)
3. Mounting QX unit

3.2 Unpacking and Inspection

This section provides instructions for opening the shipping box, verifying that all supplied items have been received, and verifying that no shipping damage has occurred.

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. Check for signs of external damage. If there is any damage, call your CMA service representative.
3. Verify that all supplied items have been received for the QX (see Table 3-1 and Table 3-2).

Table 3-1 and Table 3-2 list all of the items required for installing the QX.

Table 3-1: Package Contents

Kit	Item	P/N	Description	Quantity
QX	QX chassis	2000-QX-B-QC 2000-QX-B-QCF	Chassis (without RHU and Add-on modules)	1
	AC Power Cable	705900007	Black, Straight, USA 10A ,UL, Length=1.8-2.5m , 110V	1
	DC Power Cable	705A030821	DC, Power Cable with Open Edges. Length=5m	1
	Flat Cable	705900003	RJ45 to RJ45 communication cable. Length 2m-2.15m	1
RHM – Remote Hub Module (service specific)	QMA Cable	705A042102	QMA R/A to QMA R/A, 0.141", Length = 360 mm	2
	Flat Cable (pre-connected)	705A042601	RJ45 to RJ45 communication cable. Length=700mm	1
Add-On Module (service specific)	QMA Cable	705A042102	QMA R/A to QMA R/A, 0.141", Length = 360 mm	1

Table 3-2: SCU-F Package Contents

| Kit	Item	P/N	Description	Quantity
SCU-F	SCU-F	SCU-F	Four Port Service Combiner Unit with	1
	DB-15 to DB-15 Digital Cable	705A042301	Used for connecting the SCU-F DB-15 port to the QX DB-15 port (internal AMU module interface)	1

3.3   Inserting an RHM/AO Module in to QX Chassis

The QX chassis and Remote Hub Module (RHM) and Add-On (AO) modules are provided separately, whereas the modules must be inserted in to the chassis. This requires opening the QX chassis front panel door and inserting the modules into their dedicated slots.

The RHM/AO modules are hot swappable and can be inserted either before or after the system installation.

To insert an RHM/AO Module

1. Open the QX door, by unscrewing the two captive screws.

| QX Front Door Screws | Figure 3-1 |
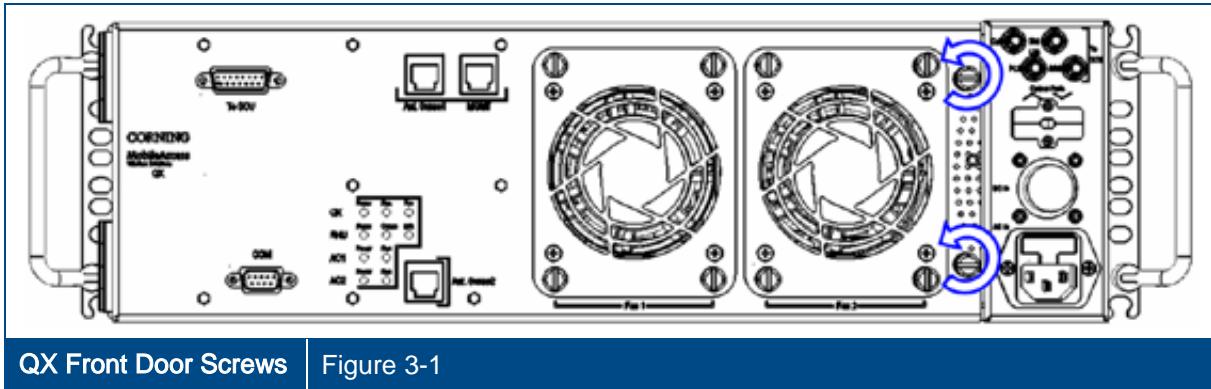
2. Referring to the slot allocation labels on the inside panel of the door, position the service modules in the relevant slotswith the handle facing front. See Figure 3-2.

IMPORTANT!
Termination modules (ordered separately) must be inserted in unoccupied slots for termination.

| Slot Allocations for Service Modules | Figure 3-2 |
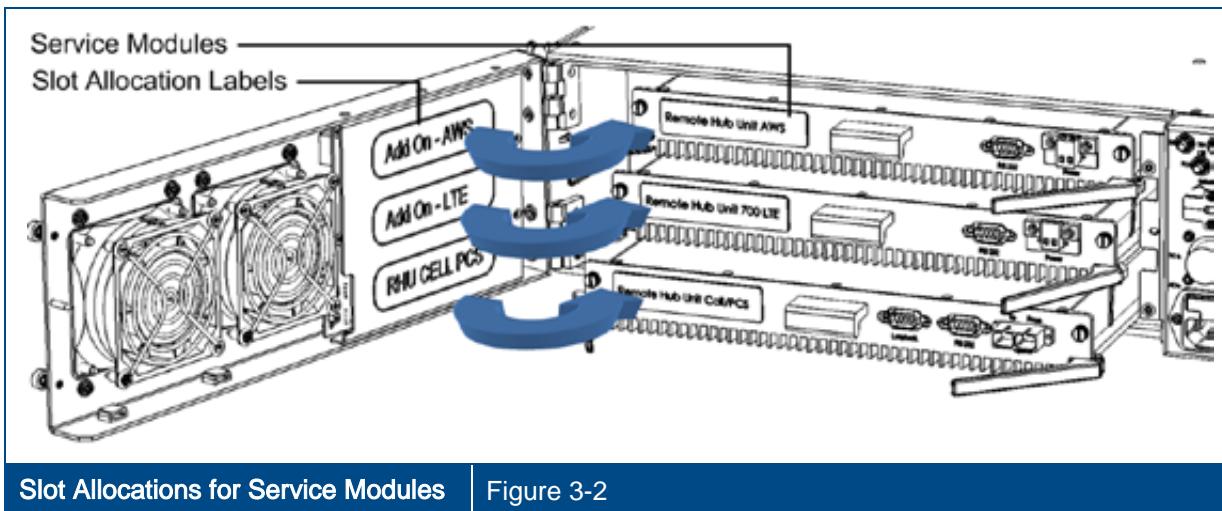
Note: When installing an LTE AO unit, an indication of the use of an internal or external filter must be selected – via the GUI.

3. Slide the module towards the back of the unit and fit the module ejectors in to the side notches of the slot (verify that the screws are unscrewed). Refer to Figure 3-3.
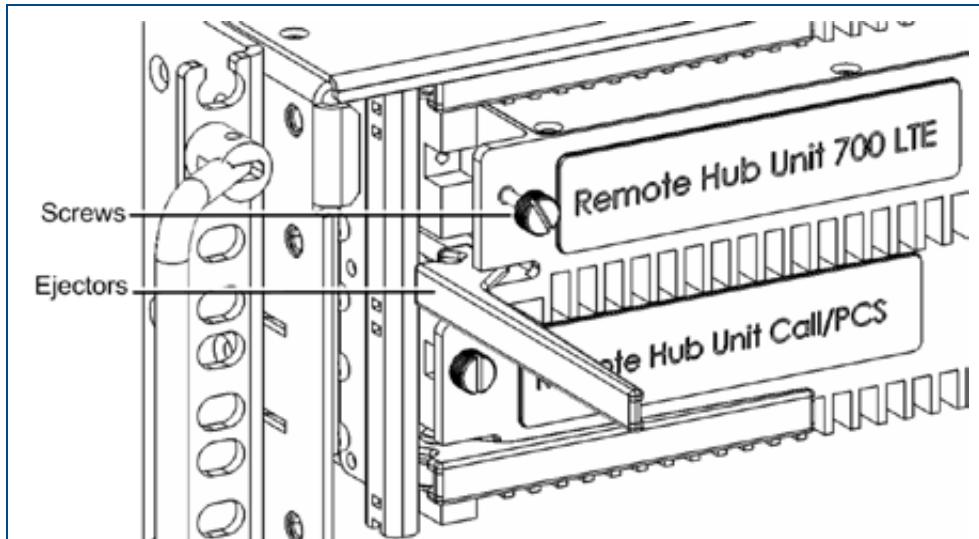
Positioning New Module in Designated Slot | Figure 3-3

4. Push the module all the way back until it "clicks" in to the chassis backplane.

5. Close ejectors and close both captive screws to secure the module in place. Refer to Figure 3-4.

6. For each Add-On module, connect the internal DC power feed to the module DC power connector. Refer to Figure 3-4.
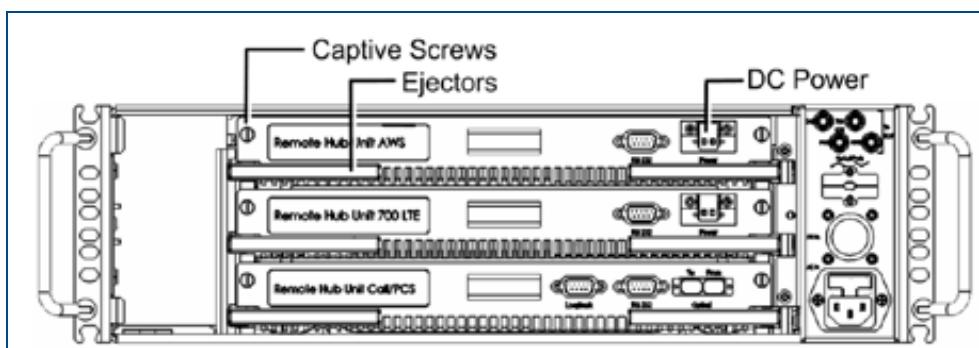
Securing Module in Slot and DC Connections | Figure 3-4

Note: The RHM does not have an internal power feed connection.

3.4 Mounting

3.4.1 Rack Mount Installations

3.4.1.1 Plan the rack installation

Note: The unit can also be wall mounted using dedicated brackets (ordered separately). For wall mounted units – it is recommended to install the service modules first.

When determining the QX installation location, consider the following:

· Verify that the height of the rack can support the QX unit(s) being installed, as well as additional equipment, SCU-F, AC or DC power, and space for the broadband coax connection. Also consider room for future expansions.

· If the SCU-F supports more than one QX chassis – install in between QX units. See Figure 3-5.

· Verify that the QX is accessible to the SCU cable routing:

  · For one QX unit - preferably below the SCU unit

  · For two QX units – the SCU should be in between the units

· To maintain low center gravity, ensure that heavier equipment is installed near the bottom of the rack, and that the rack is loaded from top to bottom.

| QX and SCU-F Locations in Rack | Figure 3-5 |
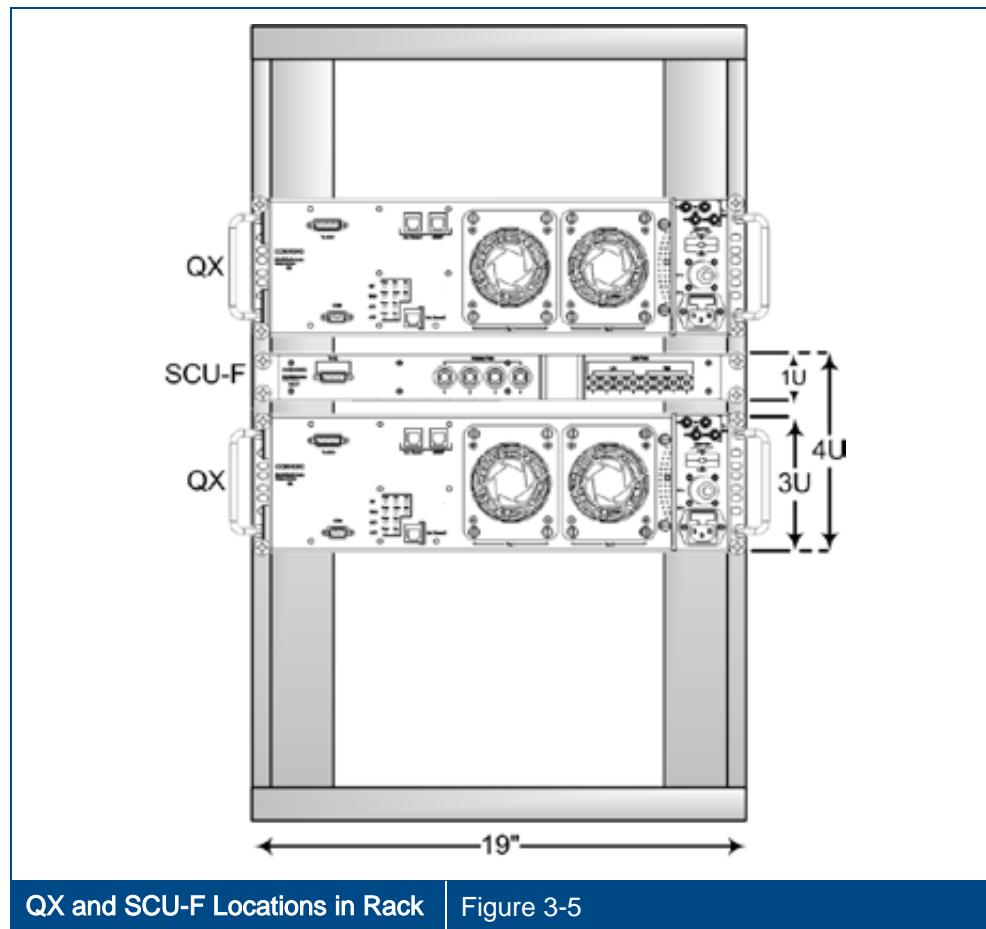
3.4.1.2 Rack Installation Safety Instructions

Review the following guidelines to help ensure your safety and protect the equipment from damage during the installation.

·   Only trained and qualified personnel should be allowed to install or replace this equipment.
·   Verify that ambient temperature of the environment does not exceed 50°C (122°F)
·   To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack and load the rack from the bottom to the top.
·   Ensure that adequate airflow and ventilation within the rack and around the installed components so that the safety of the equipment is not compromised. It is recommended to allow for at least about 2 cm of airspace between devices in the rack.

3.4.1.3 Mounting QX Unit in 19-in Rack

Note: The QX can also be mounted on wall – see section 3.4.2.

Referring to Figure 3-6, secure the unit's rack ears to the 19-in rack frame as follows:

1. Insert two screws half-way into the rack frame.
2. Position the QX on to the screws using the handles and the top and bottom half slots of the QX brackets.
3. Secure the unit in the rack via the remaining six bracket holes (between handle) using the appropriate rack nuts and screws.

   Note: Rack nuts and screws not provided (depend on rack type).

**SCU-F with Assembled Routing Bracket** | Figure 3-6
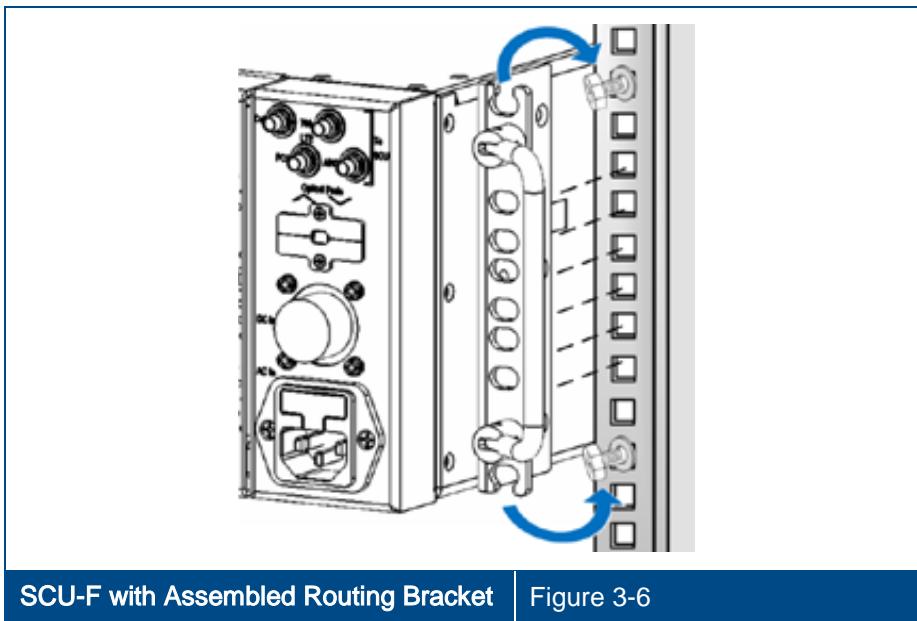
3.4.1.4 Mounting SCU-F Unit

1. Assemble the SCU-F Routing Bracket as follows:
    -   Unscrew the two screws located on the far right of the SCU-F front panel. Save the screws for next step.
    -   Assemble the supplied Routing Bracket on to the right side of the SCU-F front panel using the two screws previously removed. See Figure 3-7.


Open the Screws
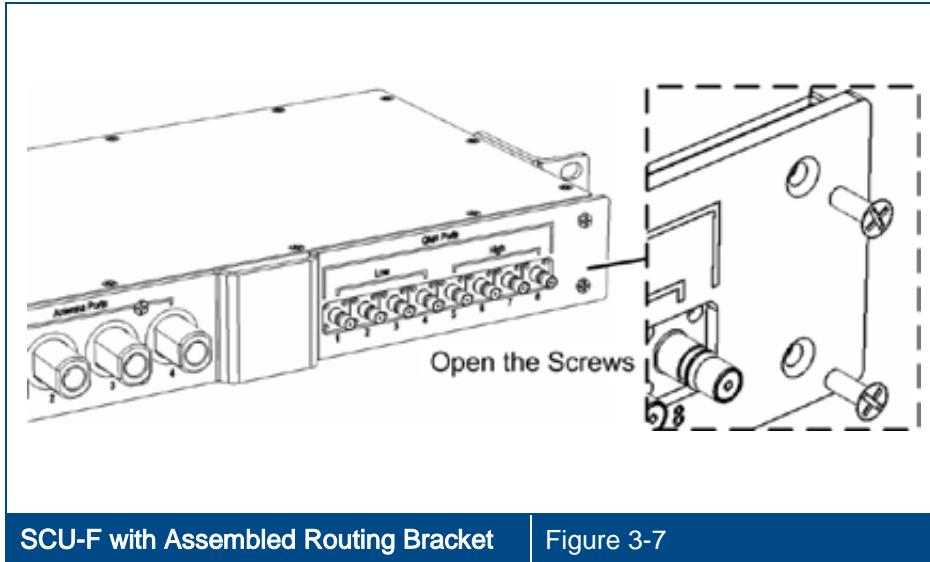
| SCU-F with Assembled Routing Bracket | Figure 3-7 |

2. Install the SCU-F unit in the 19-in rack and secure with the factory-assembled rack ears.
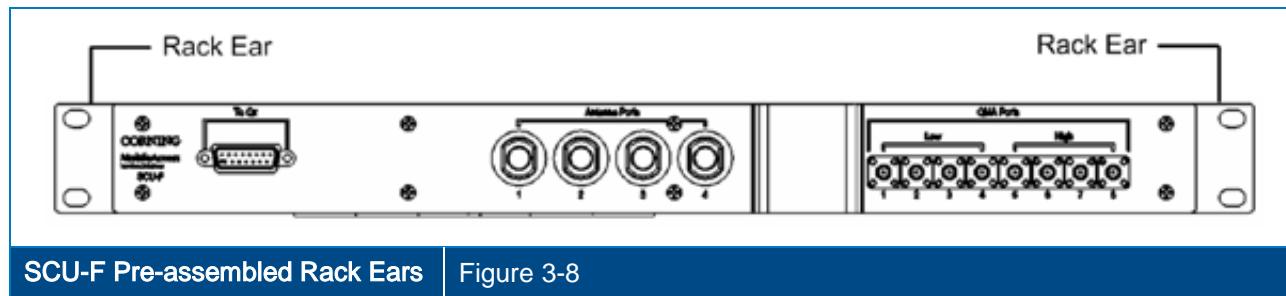
Rack Ear   Rack Ear

| SCU-F Pre-assembled Rack Ears | Figure 3-8 |

3.4.2 Wall Mount Installation

There are two wall mount installation options for the QX unit, whereas the SCU-F can also be mounted on top of the QX chassis so as to accommodate connections between the units:

a. **Horizontal Wall Mount** (provided with QX) - QX unit is mounted in a horizontal alignment so that the front panel interfaces face towards the front (as in rack installations). See 3.4.2.1.

b. **Vertical Wall Mount** (ordered separately: P/N AK-QX-ENC-WMT-V) – QX unit is mounted in a vertical alignment so that the front panel interfaces face towards the side. See Figure 3-9.
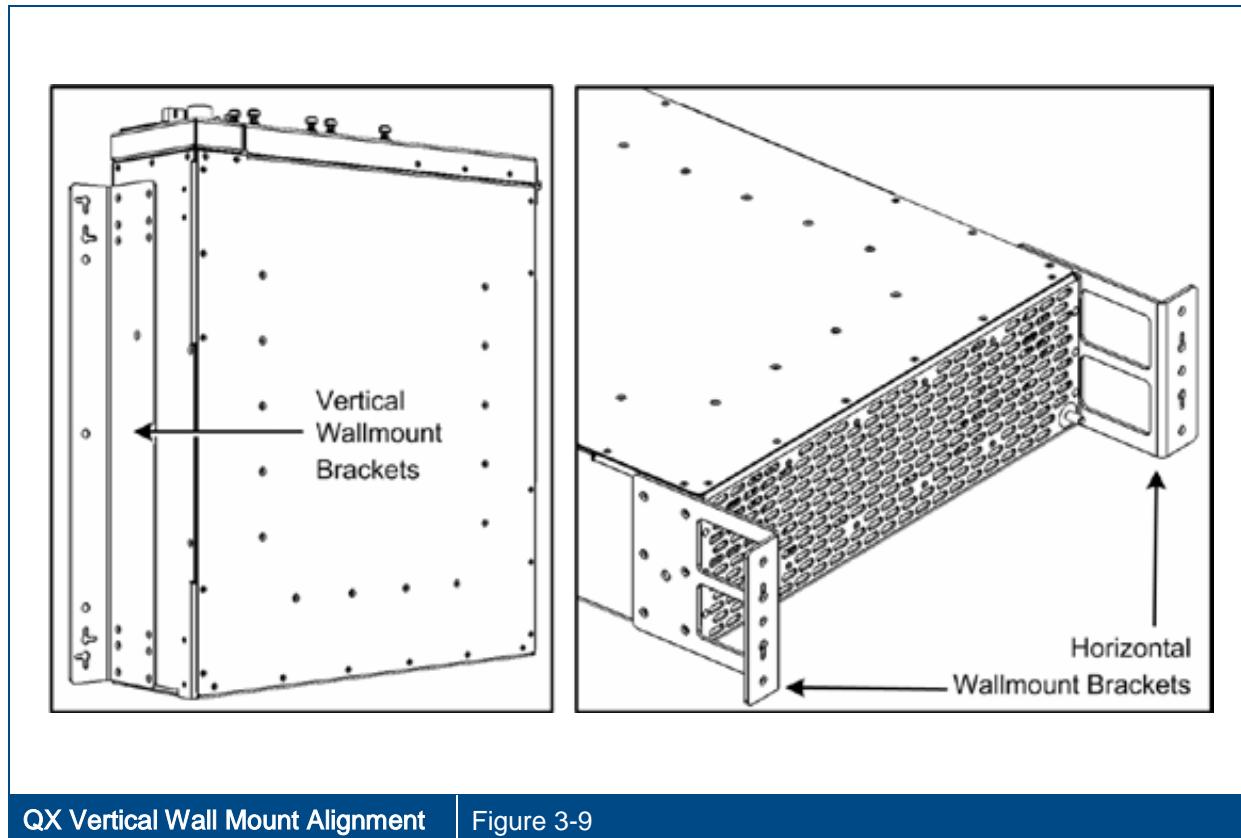

| QX Vertical Wall Mount Alignment | Figure 3-9 |

3.4.2.1 QX Horizontal Wall Mount Installation

To mount the QX horizontally on the wall

1. Mark and drill the installation holes in the wall, using the bracket as a guide. There are two options, as shown in Figure 3-10:

   · **A1** and **A2 keyholes** are used for hanging and positioning the unit on anchor bolts inserted in wall
   · **B1**, **B2** and **B3** holes - appropriate bolts are inserted through holes for additional support

| QX Horizontal Wall Mount Bracket Holes | Figure 3-10 |
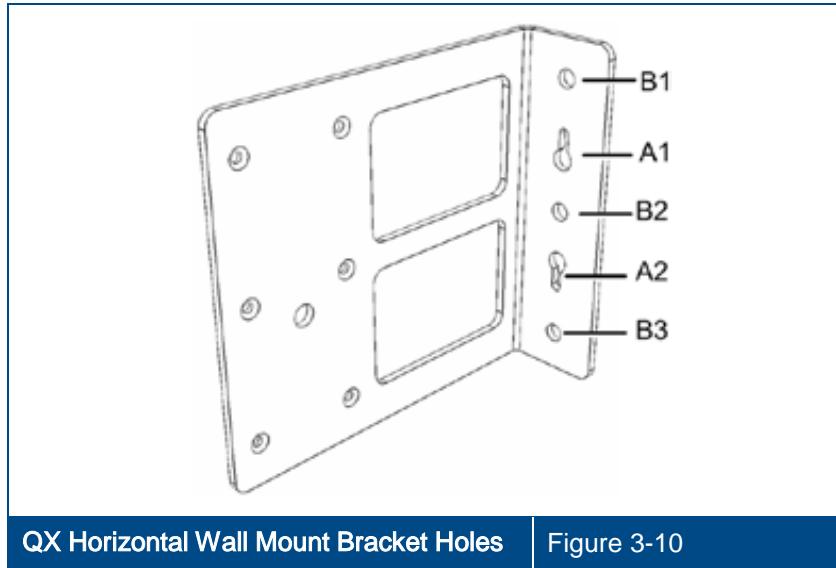
2. Assemble the brackets on to the QX unit by securing each bracket to the side of the QX chassis using (6) 6-32X5/16' Flat Head 100', Phillips screws (supplied) as shown in Figure 3-11.

| Horizontal Wall Mount Bracket Assembly | Figure 3-11 |
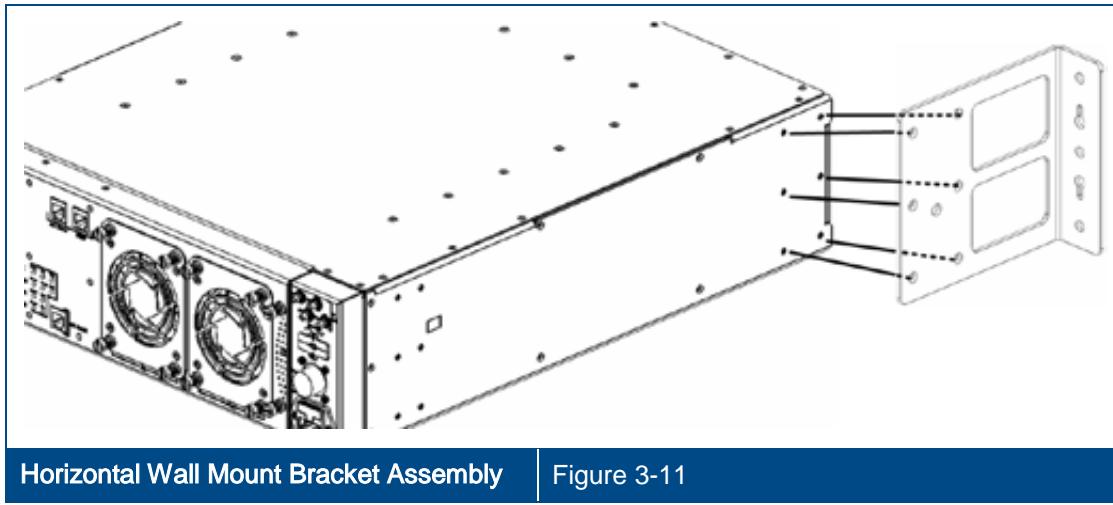
3. Optional – mount the SCU-F unit on to the QX chassis:
   - Remove the QX side rack ears (pre-assembled) to access the holes required for assembling SCU-F
   - Secure each SCU-F bracket to the side of the QX chassis using the six (6) supplied screws, as shown in Figure 3-12.
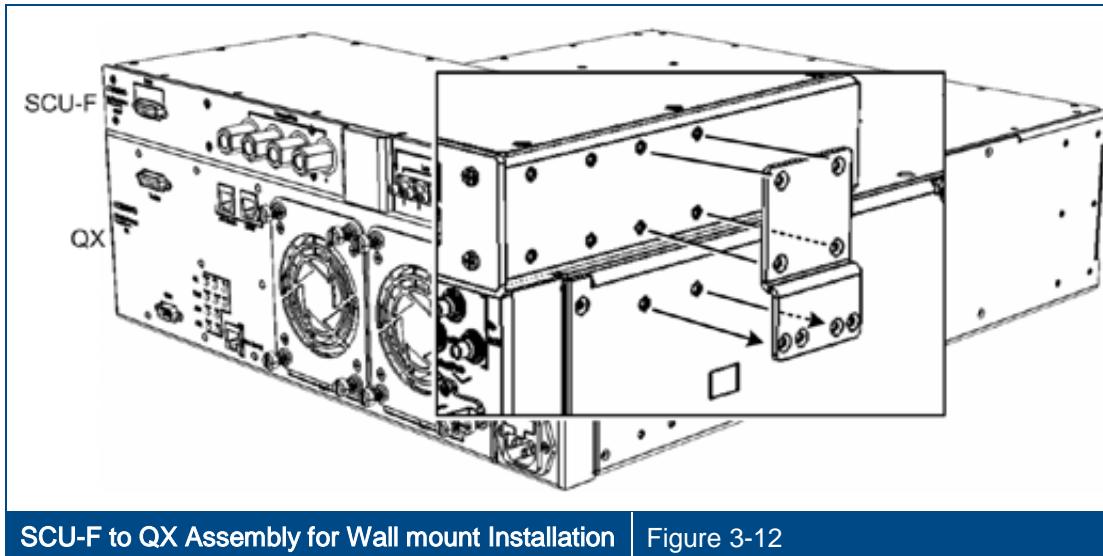
| SCU-F to QX Assembly for Wall mount Installation | Figure 3-12 |

4. Mount the assembly on the wall using one (or both) of the mounting options - hang the QX on the anchors (previously prepared in wall) and/or secure to wall using the three additional holes (screws not supplied).
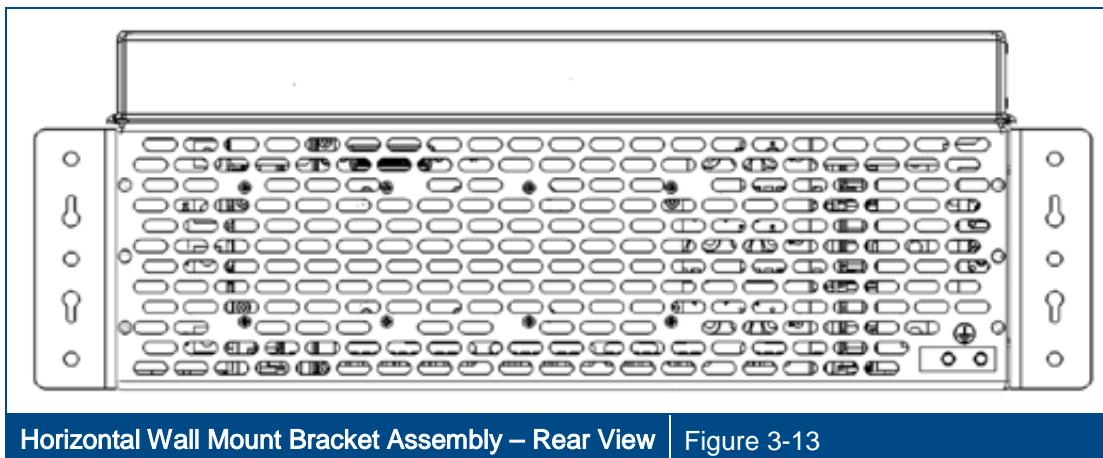
| Horizontal Wall Mount Bracket Assembly – Rear View | Figure 3-13 |

Note: When mounted on the wall, there will be approximately 60mm (2.36") of space between the wall and the back of the QX unit.

3.4.2.2 QX Vertical Wall Mount Installation

Note: Vertical Wall Mount brackets are ordered separately (P/N AK-QX-ENC-WMT-V).

To mount the QX vertically on the wall

1. Verify that the following items are included in the accessory kit:

Item	QTY.	Image
Vertical Wall Mount Bracket for QX chassis	2	
Screw,4-40X5/16',Flat-HD, 100', Philips, Nerosta	16	

2. Remove the factory assembled rack ears from the sides of the QX chassis so as to access the relevant screw holes for assembling the QX vertical wall mount brackets. See Figure 3-14.
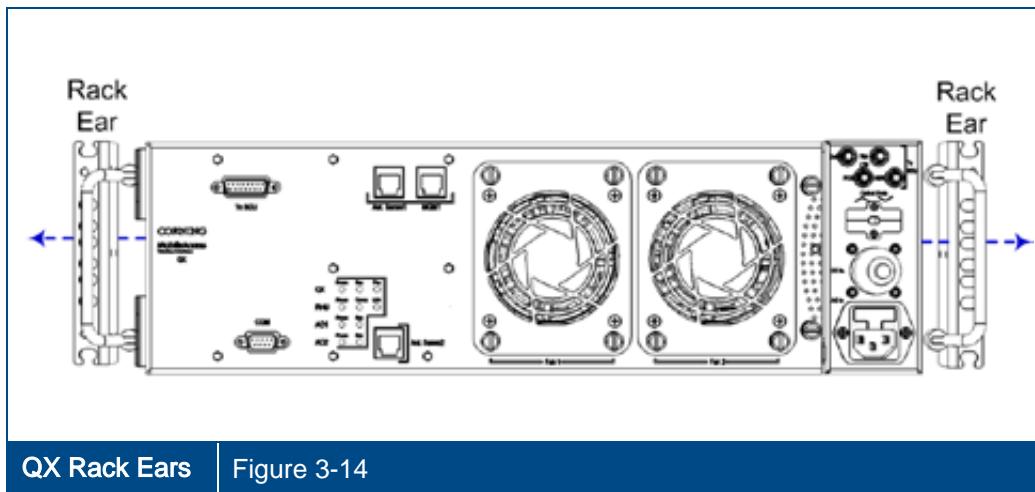
| QX Rack Ears | Figure 3-14 |

3. Assemble the vertical wall mount brackets on to the sides of the QX chassis using the eight (8) provided screws, as shown in Figure 3-15.

Vertical Wall Mount Bracket Assembly | Figure 3-15
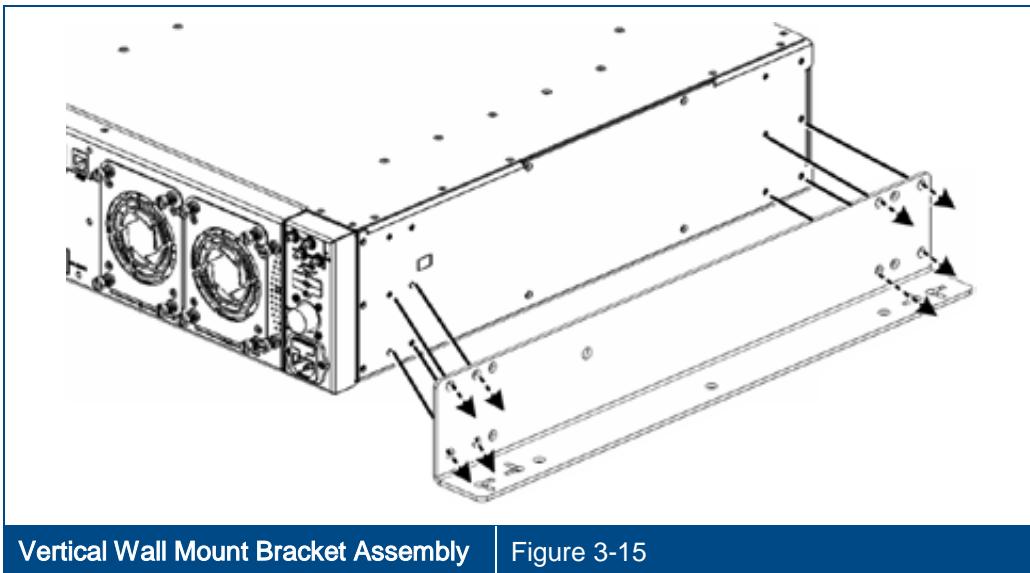
Note: You may want to mark the mounting holes on the wall (according to brackets) prior to mounting.

4. Select the appropriate location on wall for the QX unit. Verify that:
   · There is enough free space around the unit for ventilation
   · Location enables opening the enclosure door to the side
5. (If not already marked) Mark the mounting holes on the wall according to the bracket holes and drill appropriate holes.

6. Optional – mount the SCU-F unit on to the QX chassis by securing each SCU-F bracket to the side of the QX chassis with the six supplied screws, as shown in Figure 3-16.
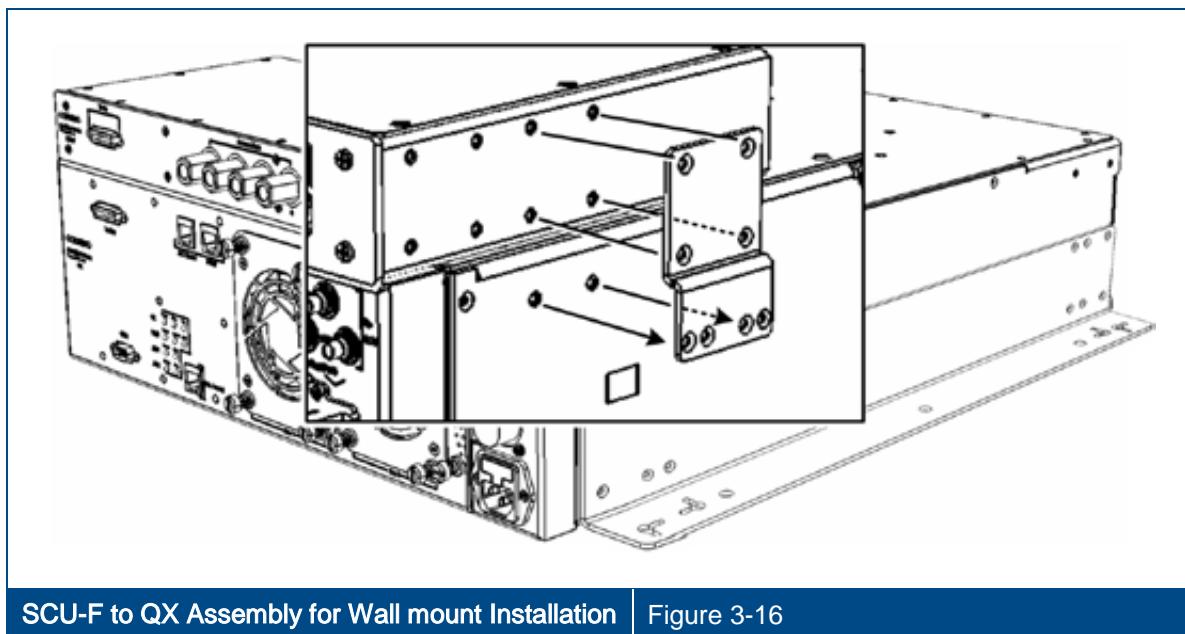
SCU-F to QX Assembly for Wall mount Installation | Figure 3-16

7. Mount the QX chassis on the wall with the panel interfaces facing towards the side, as shown in Figure 3-17.
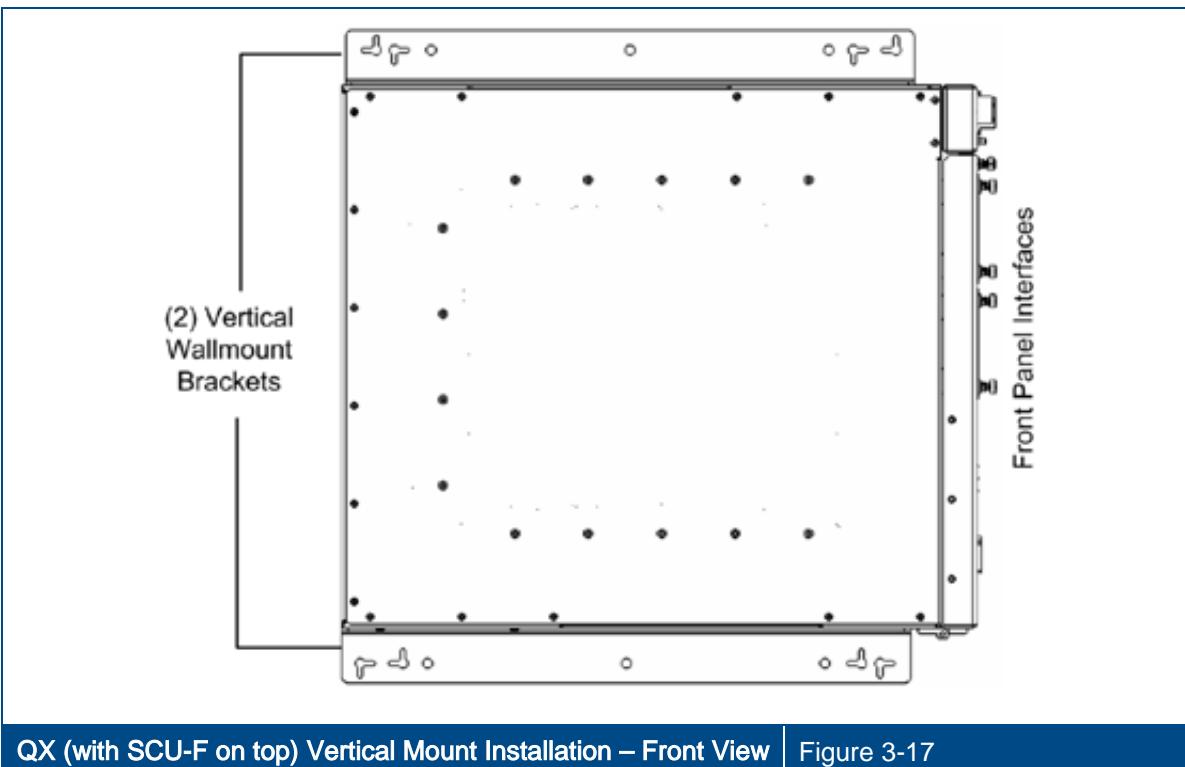
QX (with SCU-F on top) Vertical Mount Installation – Front View | Figure 3-17

3.5   Connections

The system connections required for the QX consist of the following:

· Fiber optic connections to the RF to fiber optic converter unit at the headend – BU

· RF and Antenna connections:

    · RF service connections to the four port Service Combiner Unit (SCU-F)

    · Antenna connections between the SCU and the broadband antennas

    · (QX) AMU module connections to SCU

· Power – Local (AC) or Remote (DC)

The connections are described in the following sections.

3.5.1   Internal Power Feed to AO Connections

For each Add-On module, connect one of the two available wire pairs to the AO power connector - "From AC PS" or "From DC CON" wire pair, depending on the AC or DC power source to be connected (see Figure 3-18).

The feed must be the same for both AO modules (AC or DC).

Note: The RHM does not require an internal power feed connection (powered from backplane).

| QX Internal AO Power Feed | Figure 3-18 |

3.5.2 QX Fiber Optic Connections

*Note: Keep in mind the rules for handling and connecting F/O cables. The F/O cables will be connected to the associated BU in the communication room at a later phase.*

To connect fiber optic cabling

1. (If not already installed) Install splice box near the QX chassis.

2. Referring to Figure 3-19, remove the tab (both parts) covering the fiber slot (located on port panel) and set aside. Route the fiber through the slot and connect to the RHM SC APC To/From ports, Refer to Figure 3-20 .

| Removing Fiber Slot Tab | Figure 3-19 |

| Routing Fiber to Connection Port | Figure 3-20 |
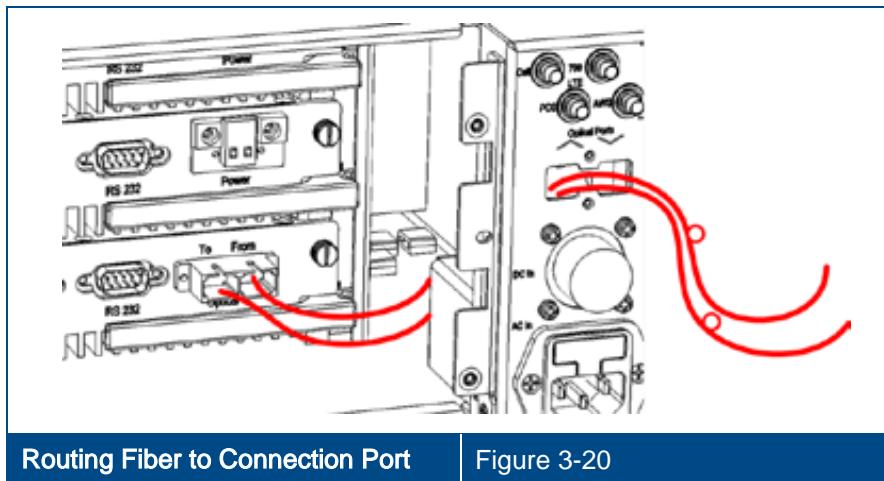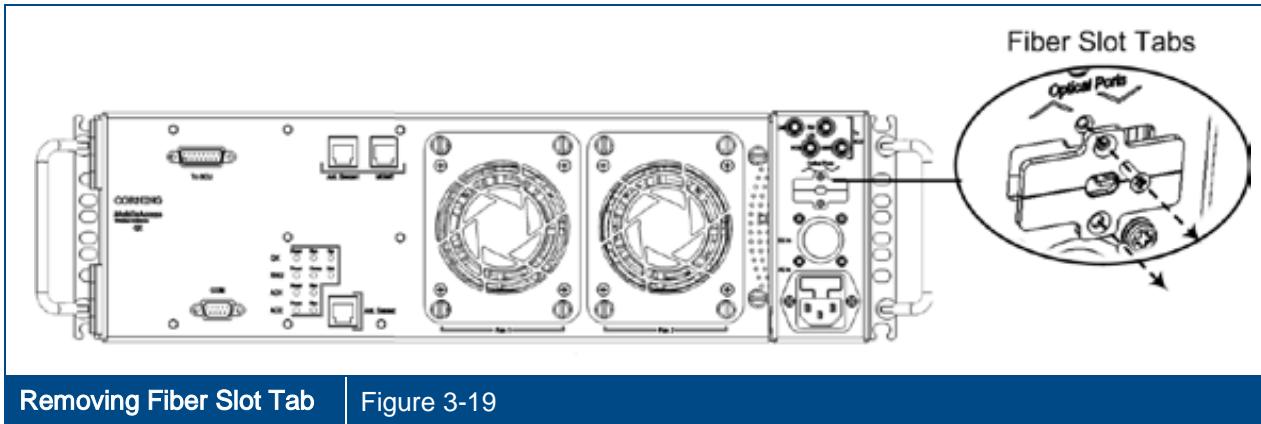
3. Replace the fiber slot tab (both parts).
4. Close the QX chassis door and close the captive screws.

Note: See section 3.5.2.1 for MIMO connections to RF to Fiber optic converter unit (BU).

3.5.2.1 MIMO Configurations

Two QX units supporting the LTE700 and AWS bands can provide MIMO service coverage.

For MIMO configurations

Connect the fiber optic port of each of the two QX units' supporting the LTE 700 and AWS (SISO) bands to a different BU optic module (see section 3.5.1 for description of connections). See Figure 3-21 for example of MIMO connections to BU.

| MA2000 QX to BU-8 MIMO Connections | Figure 3-21 |
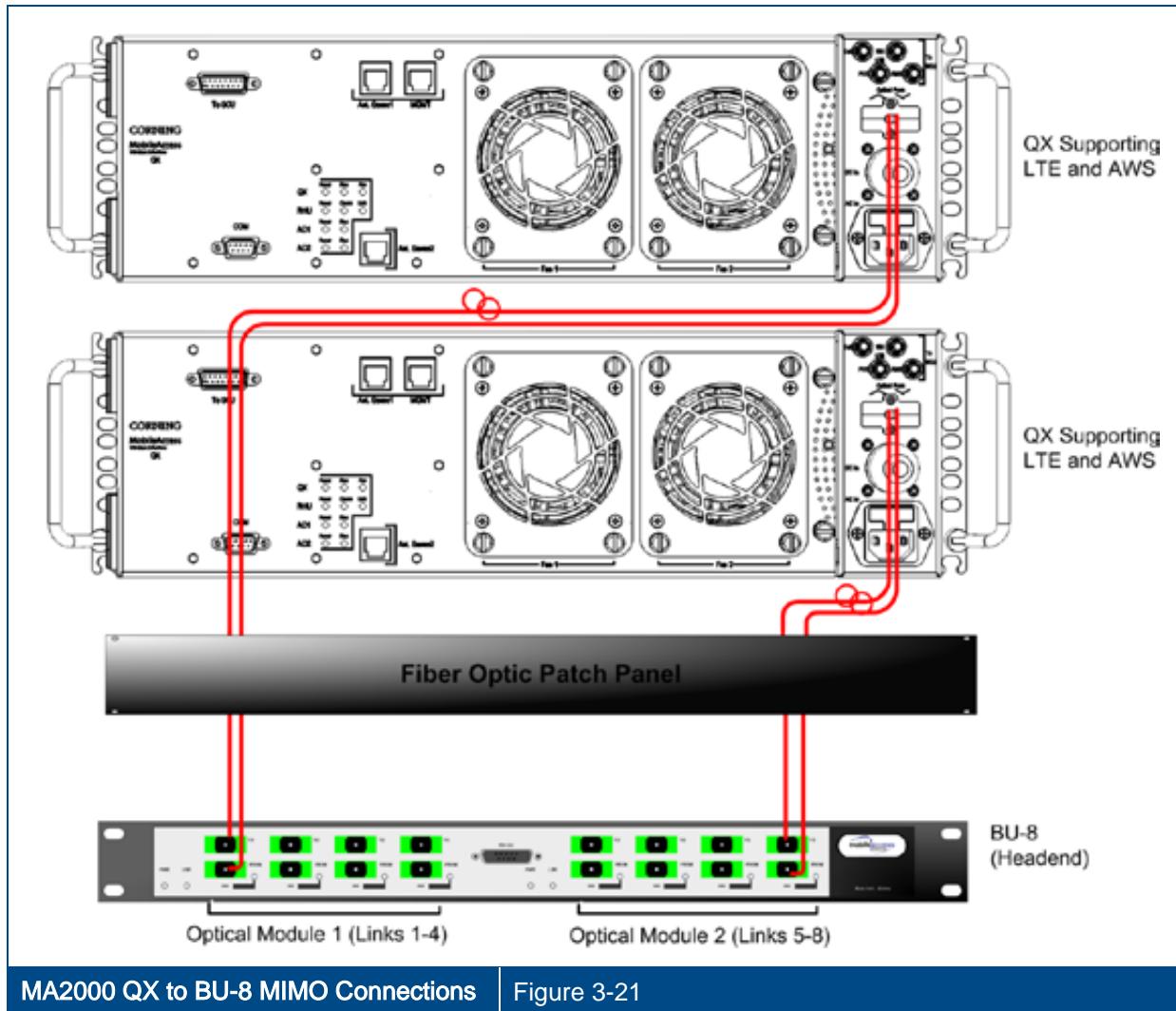
3.5.3 RF Connections

This section provides information describing the following connections:

· RF (SISO) and antenna monitoring connections between QX and SCU-F

· MIMO connections between QX and SCU-F

· SCU-F to broadband antenna infrastructure connections

3.5.3.1 QX RF Connections to SCU-F

To connect the RF service connection (refer to Figure 3-22)

1. Connect the QMA to QMA RF jumper cables (provided with each ordered service module) to the corresponding **To SCU** service specific RF port on the QX front panel. For example, the QMA jumper provided with the LTE module to the (To SCU) LTE RF.

2. Route the cables through the assembled SCU-F Routing Bracket.

3. Connect the other side of the jumper cables to the relevant SCU-F low band (ports 1-4) and/or high band (ports 5-8) QMA ports.

   The connections shown in Figure 3-22 show an example of connections performed for the CELL/PCS/700LTE/AWS services:

   · QX High-frequency band mobile service to SCU-F High Ports (1 - 4) (e.g. AWS and PCS) (shown in blue)

   · QX Low-frequency band mobile service to SCU-F Low Ports (5 - 8) (e.g. CELL and LTE700) (shown in red)

IMPORTANT!
Terminate any unused ports.

Note: Refer to section 3.5.3.2 for connections required for MIMO configurations.

| QX RF and Antenna Connections | Figure 3-22 |
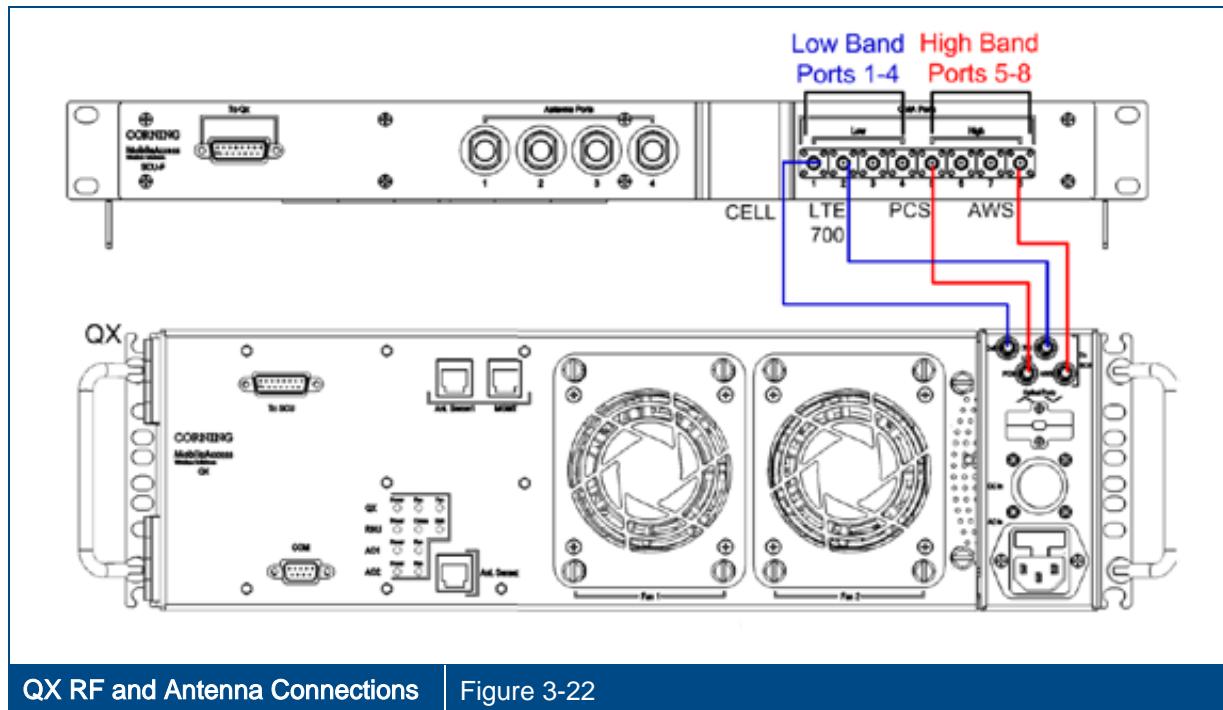
Note: The SCU-F and QX units do not appear adjacent in Figure 3-22 for connection clarity purposes.

3.5.3.2 RF MIMO Connections to SCU-F

Two QX units supporting the LTE700 and AWS bands can be deployed in a MIMO configuration. The LTE700 and AWS RF service ports of both QX units are connected to the corresponding low band and high band SCU-F ports. See Figure 3-23.

| QX RF and Antenna Connections | Figure 3-23 |
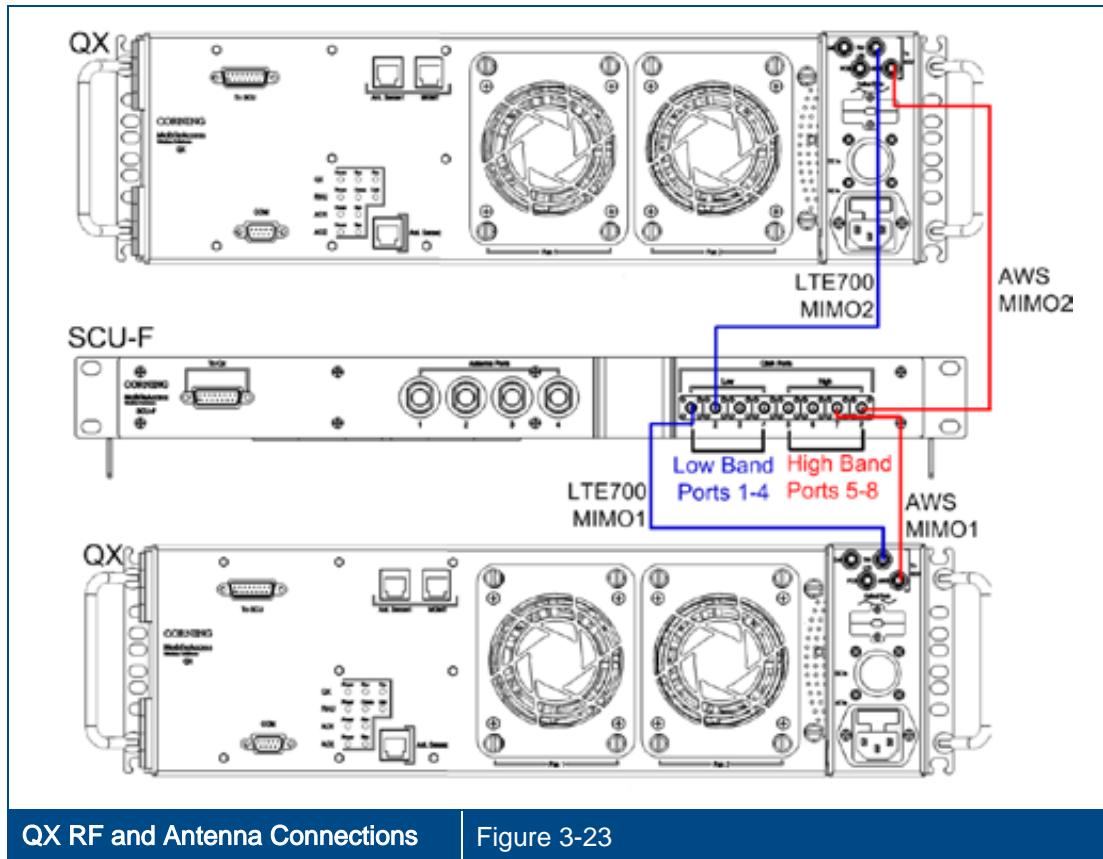
3.5.3.3 QX Antenna Monitoring Unit (AMU) Connections

Note 1: The QX unit includes an integrated AMU – no need for external AMU.
Note 2: In installations where one SCU is supporting two QX units, the QX units can be cascaded via an RJ45 connection so that the antenna sense function is performed by the AMU of the QX with the physical AMU connection to the SCU.

· For Single QX Unit - Connect the QX internal AMU module (for antenna sensing) to the SCU by connecting the **DB15 female connector** to the corresponding **SCU DB15 female connector**, using corresponding cable provided with the SCU-F (P/N 705A042301). See Figure 3-24.

· For Multiple QX Units - Connect one of the two front panel **ANT. Sense1** RJ45 connectors of the QX unit directly connected to the SCU-F DB-15 port to the **ANT. Sense1** port of the additional QX unit using the RJ45 to RJ45 cable provided with the QX (P/N 705900003). It is recommended to connect the ports closest to each other. See Figure 3-24.

| Daisy Chaining AMU to SCU-F Connections | Figure 3-24 |
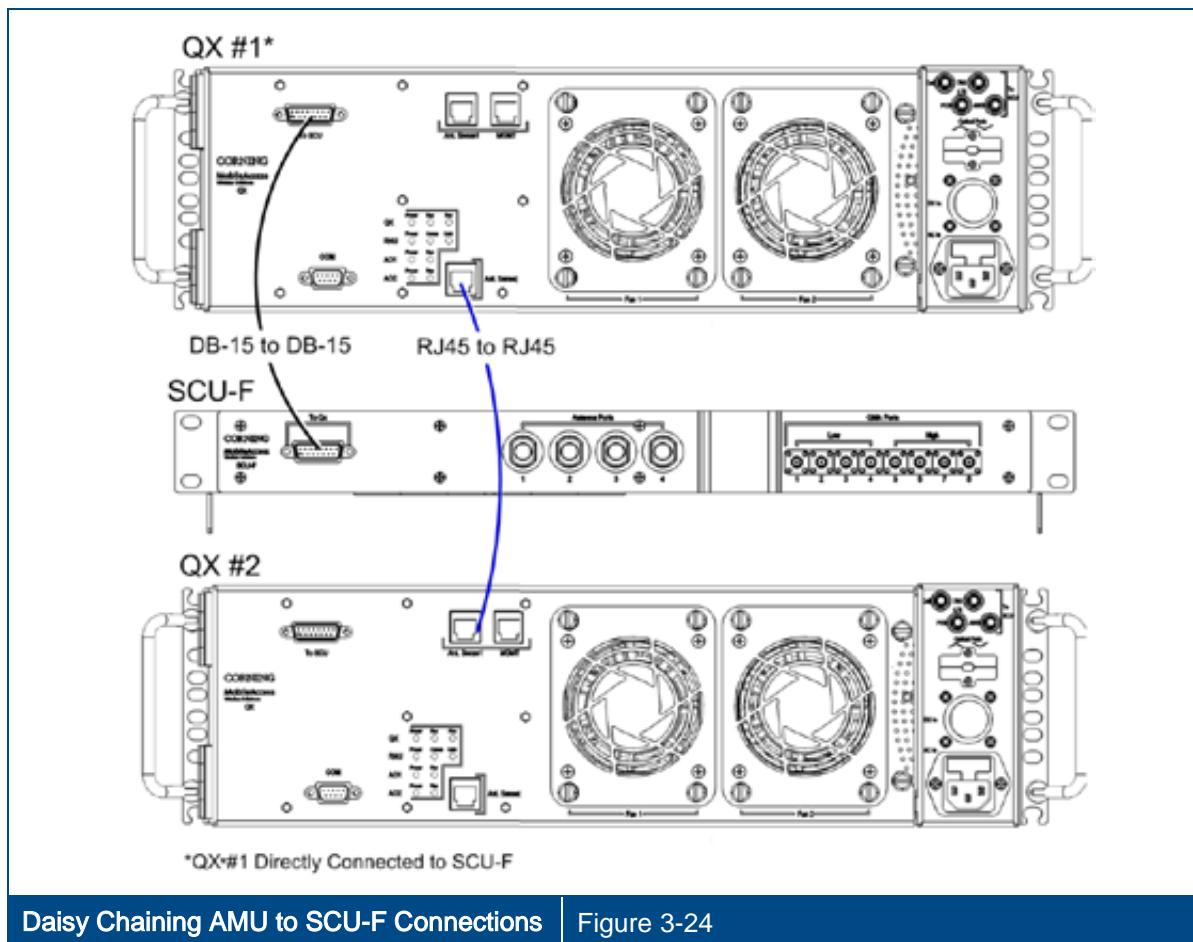
3.5.3.4 SCU-F to Broadband Antenna Connections

To connect the broadband antennas

The QX is connected to the antenna infrastructure via the Service Combiner Unit (SCU-F). Connect the SCU-F front panel N-Type RF Antenna Ports to the broadband antennas. See Figure 3-25.

Note: Terminate any unused antenna ports with 50 ohm terminators.

| SCU-F to Antennas Connections | Figure 3-25 |
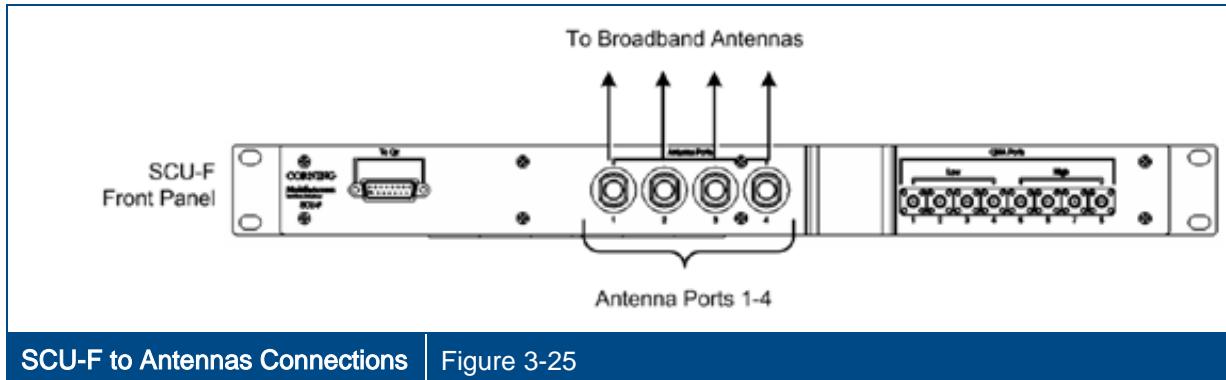
3.5.4 Grounding the QX Unit

The grounding connection is performed via a two-hole, standard barrel grounding lug located on the QX rear panel (see Figure 3-26):

· For use with stranded copper wire conductors

· 10-14 AWG

· Holes - 1/4 inch

| QX Grounding Lug | Figure 3-26 |
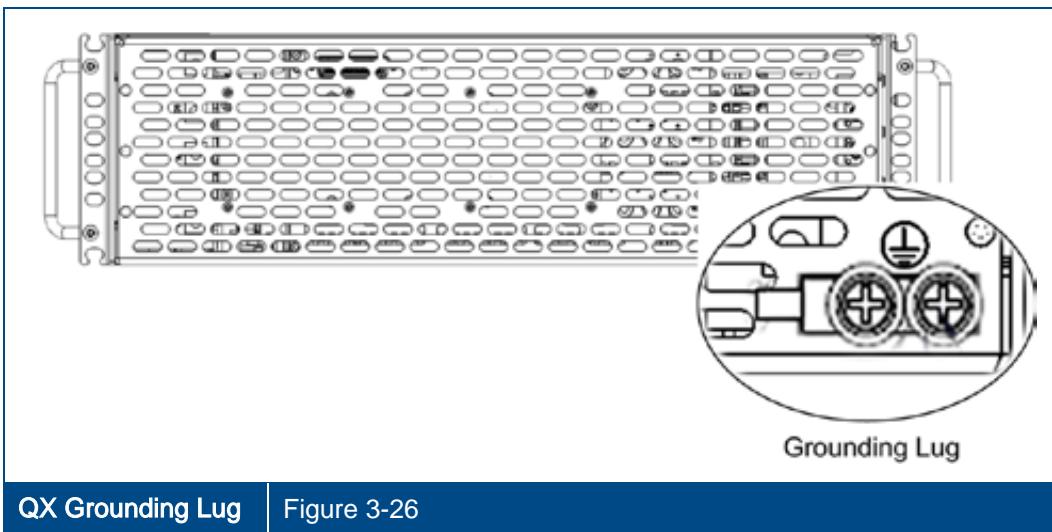
3.5.5 External Power Connections

The QX supports both local and remote powering options. Both types of power cables are provided with the unit (see section 3.2).

Connect the power source to the QX using either local or remote power. Refer to Figure 3-27 for location of power connectors.

AC Power Connector
DC Power Connector
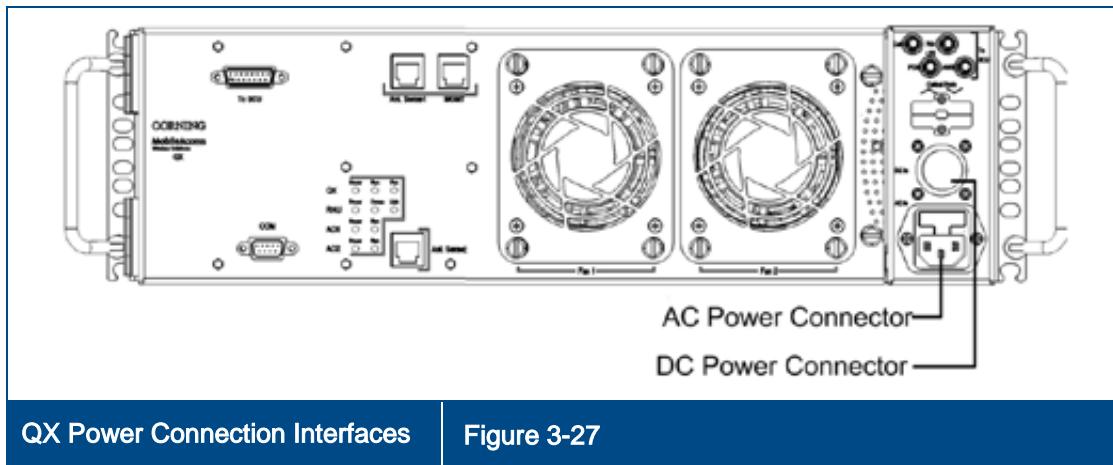
QX Power Connection Interfaces	Figure 3-27

- **AC In** - Local Power: 100 – 240 VAC (Integrated AC/DC converter)
- **DC In** - Remote Power: 25 to 48 VDC (QX chassis provided with DC male connector and pig tail – see Figure 3-28)

Referring to Table 3-3 and Figure 3-28, connect the exposed DC wires to the DC power source, while noting the following:

- DC wire length (meter) = 5 ; Tolerance (meter) = $\pm$ 0.1
- No. of DC connector conductors: 8
- DC Conductor size: 20 AWG

	Pin	Wire Color	
First Couple	A	Red	Pin 13 in AMU- feeds RHU + AMU
	B	Black	Pin 1 in AMU - feeds RHU + AMU
Second Couple	C	Red	Goes to 2-pin green connector for AO1
	D	Black	Goes to 2-pin green connector for AO1
Third Couple	E	Red	Goes to 2-pin green connector for AO2
	F	Black	Goes to 2-pin green connector for AO2
Fourth Couple	G	Red	Not connected
	H	Black	Not Connected

Table 3-3. Pin-Out Description Table
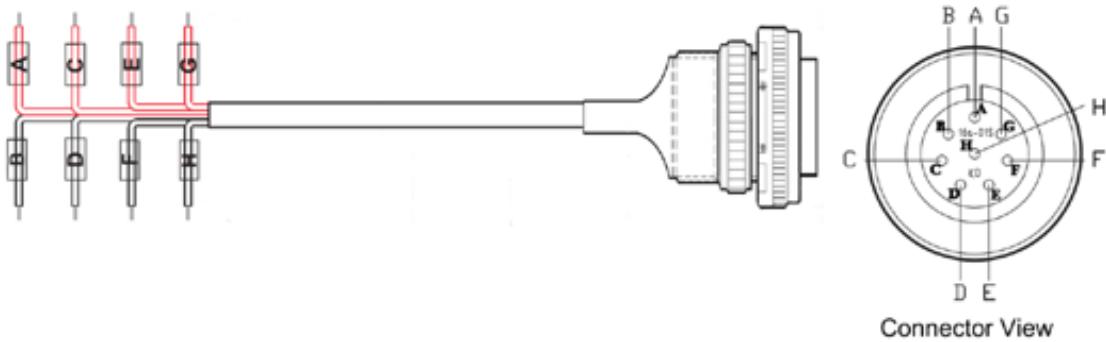
| Connector Pin-out Diagram | Figure 3-28 |

3.6   Verifying Normal Operation

Upon powering up the QX remote unit:

·   Confirm the fans are working after powering

·   Verify that all of the QX LED indicators, located on the front door, appear green (see Figure 3-29, indicating normal operation. Refer to Table 3-4 for LED status information.
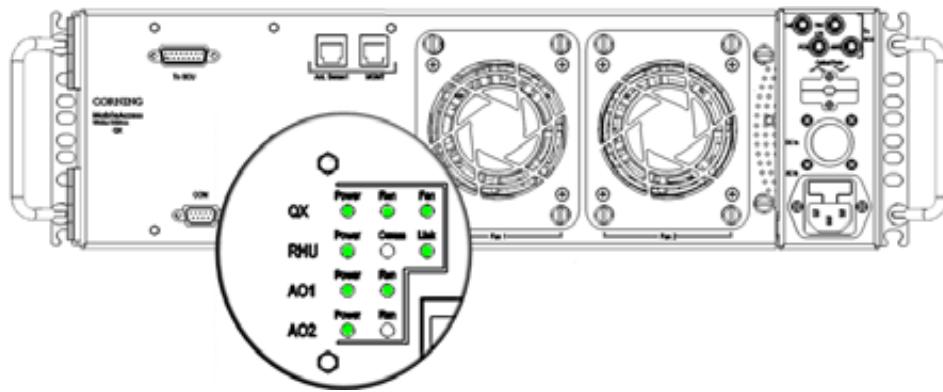

| LED Status Indicators | Figure 3-29 |

Module	LED	Description	
QX	Power	Steady Green:	Required power is supplied to AMU module of QX chassis
		Off:	No power supplied to AMU module of QX chassis
	Run	Steady Green:	AMU module SW initialized
		Blinking Green:	AMU module SW is initializing (blinks for the duration of approx. 1 minute)
	Fan	Steady Green:	Fan status normal
		Red:	Faulty fan, alarm triggered
RHM	Power	Steady Green:	Power input detected for RHM module
		Off:	No power detected for RHM module
	Comm	Blinking Green:	Active communication detected
		Red:	Faulty communication link
	Link	Steady Green:	Normal optical link level from BU
		Blinking Green:	Low optical link level from BU
		Off:	No optical link is detected from BU
AO1/AO2	Power	Steady Green:	Power input detected for first/second Add-On unit
		Off:	No power detected for first/second Add-On unit
	Run	Steady Green:	Boot up sequence for first/second Add-On unit complete and functioning
		Blinking Green:	Boot up sequence for first/second Add-On unit in process

Table 3-4. Pin-Out Description Table

4   Maintenance

This section provides maintenance information on the following:

· Replacing existing RHM/AO modules currently in QX chassis
· Replacing the QX chassis fan modules (in case of faulty fans)

4.1   Replacing an RHM/AO Module

This section describes how to replace an existing RHM and/or RHM/AO module. The RHM and AO modules are easily removed from/added to the QX chassis, while the procedure does not require powering off the unit (hot-swap).

To Replace an RHM/AO Module

1. Open the QX door, by unscrewing the two screws.

| QX Front Door Screws | Figure 4-1 |
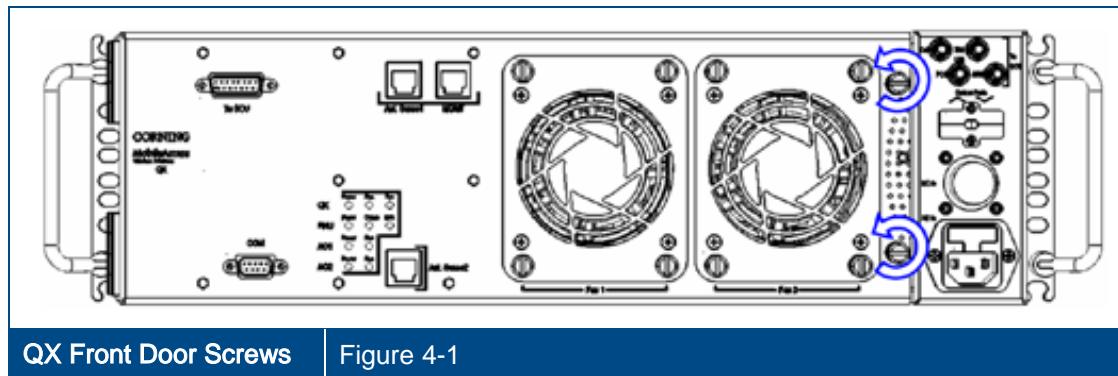
2. To remove a module:

Note: For partial configurations, a Termination module is inserted in the unused service module slot. Does not include connections.

· Disconnect F/O (RHM) or DC power connection (Add-On) – where relevant
· Open the captive screws securing the module in place
· Open the ejectors and pull the module out (using the handle)
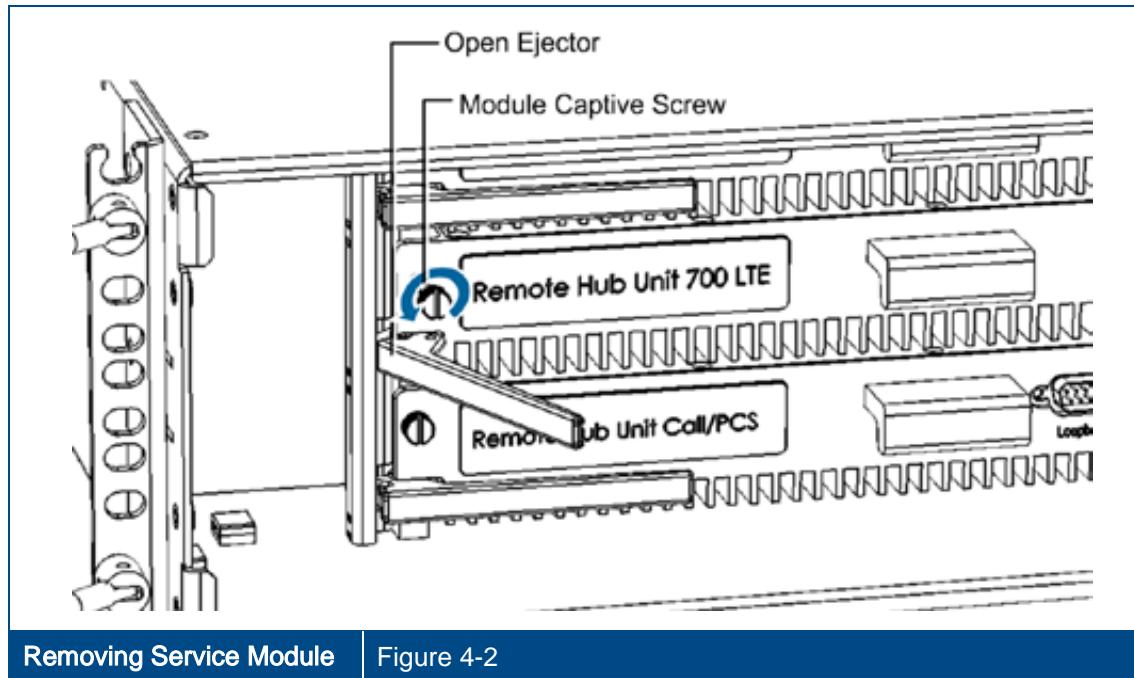
| Removing Service Module | Figure 4-2 |

3. To insert a module – refer to section 3.3.

4. Connect the F/O and power connections to the corresponding ports on the module front panel.

5. Close the QX chassis door and secure the screws.

6. Connect the relevant RF SMA connector, located on the QX front panel (door), to the SCU.

7. Configure new service via the SC-450 Controller (refer to SC-450 User Manual).

4.2 Replacing Fan Module

In case of faulty fans, they are easily replaced while the procedure does not require powering off the unit (hot-swap).

To replace faulty fan(s)

1. Unscrew the four screws securing the fan to the chassis door. See Figure 4-3.

| Unscrewing Fan Module Screws | Figure 4-3 |
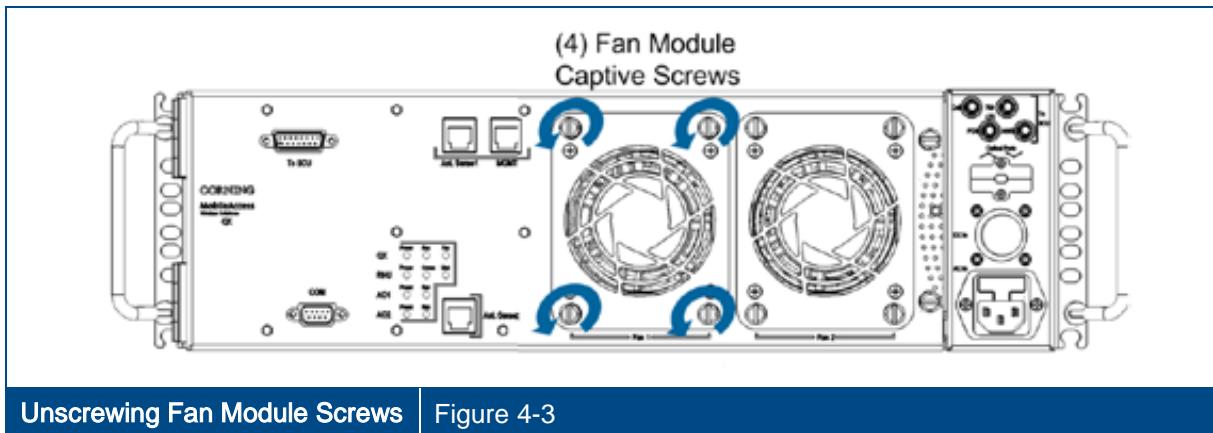
2. Pull out the fan module and disconnect the cable. See Figure 4-4.

Disconnect cable

| Removing Existing Fan Module | Figure 4-4 |
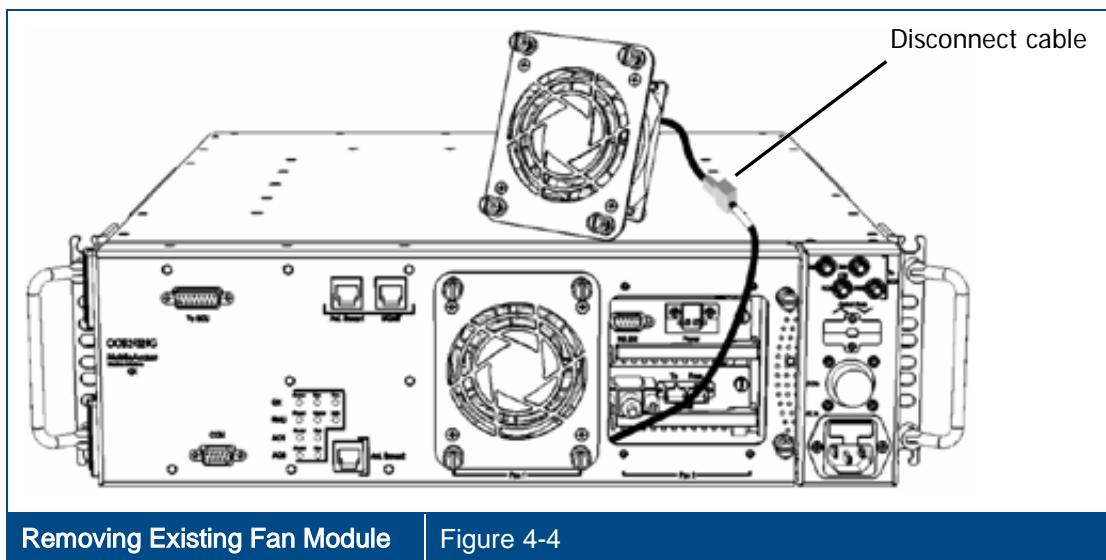
3. Connect new fan module.

4. Fit the new fan module into place in the chassis door, as shown in Figure 4-5.
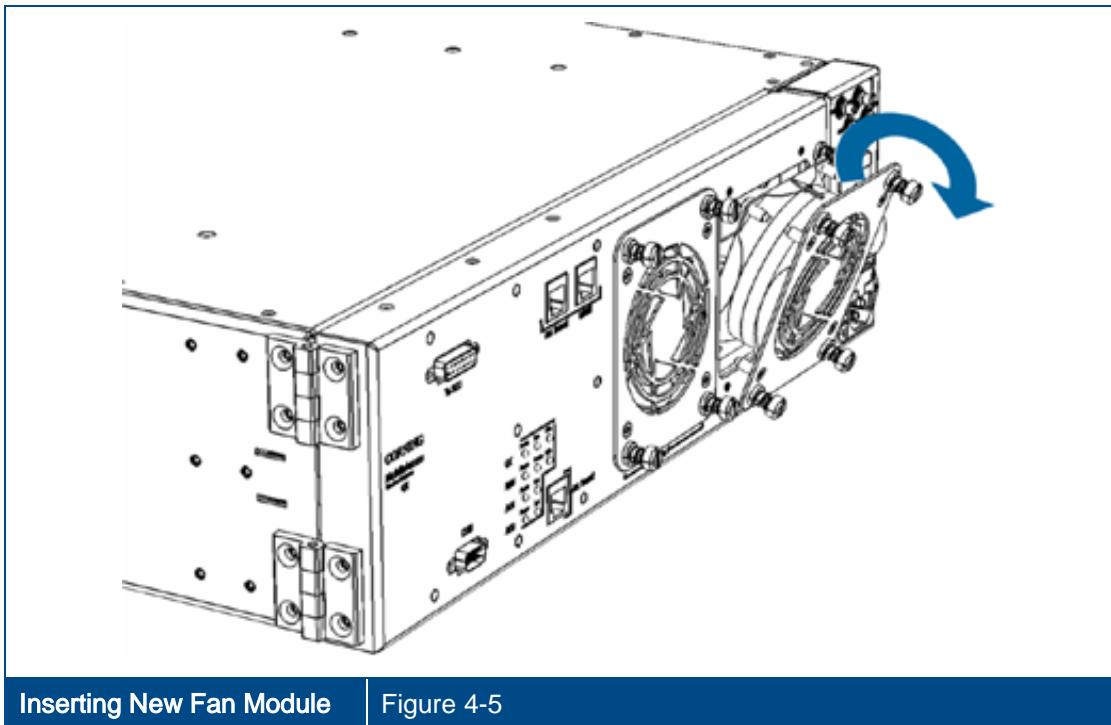
Inserting New Fan Module | Figure 4-5

5. Tighten the four fan module screws so it is secured to the QX front door panel.

5 Appendix A: System Specifications

5.1 Supported Services

Technology	Service/ Band	Frequency Range	
		Uplink (UL)	Downlink (DL)
CDMA/WCDMA**/TDMA/GSM/LTE*	CELL850	824-849	869-894
CDMA/WCDMA**/TDMA/GSM/LTE*	PCS1900	1850-1915	1930-1995
WCDMA**/LTE*	AWS3	1710-1778	2110-2180
LTE	700 MHz	698-716 776-787	728-746 746-757

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

(**)WCDMA service is based on 3GPP2 CDMA2000 standards.

5.2   RF Parameters

RF Parameters per Service at Antenna Port of Service Combiner Unit (SCU-F)

The RF Parameters listed in the tables in this section reflect the specifications at each of the four antenna ports of the SCU-F/SCU-FT when combined with the QX.

RF Parameters								
QX RF Parameters at Antenna Port of SCU-F	CELL TDMA/CDMA/ WCDMA		PCS CDMA/WCDMA/ TDMA/GSM		AWS1/3 WCDMA		700 MHz LTE	
	DL	UL	DL	UL	DL	UL	DL	UL
Max Output Power per Antenna Port 1 Operator (Composite)	16	-	20	-	21	-	21	-
2 Operators	13	-	17	-	18	-	18	-
4 Operators	10	-	14	-	15	-	15	-
8 Operators	7	-	11	-	12	-	-	-
12 Operators	5	-	9	-	10	-	-	-
Mean Gain (dB) [1]	16	-	20	3	21	3	21	4***
Pin (dBm)	0	-	0	-	0	-	0	-
Input IP3 (dBm) AGC OFF Min	-	-5	-	-	-		-	-
Input IP3 (dBm) AGC ON Min	-	5	-	-6	-	-	-	-
Input IP3 (dBm)	-	-	-	-	-	-7	-	-10
SFDR[2] (dB)	-	71	-	3	-	66	-	55
Max Intermod Distortion (dBm)	-13*	-	-13*	64	*	-	**	-
Max NF (dB)	-	20	-	20	-	20	-	20
Gain Flatness/Ripple (dB) [3]	±2.0							

* WCDMA compiles 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 BU-RHU without RIU. May be field adjusted using controller system.

[2]SFDR for CDMA services is calculated in 100KB/sec.

3Gain Flatness/Ripple is specified for the non-duplexed port of the system. Overall system typical values.

5.3 Absolute Maximum Rating

Total Input RF Power to BU	10 dBm
Total Input RF Power to RHU	20 dBm out-of-band; -10 dBm in-band
Power Supply	48V (DC) max; 240V (AC)

5.4 Optical Specifications

Optical Output Power	< 3.0 mW
Max. Optical Budget	2 dB for fiber + 1 dBo for connectors (assumed) = 3 dBo total.
Optical Loss per Mated-pair Connectors	0.5 dB (max)
Optical Connectors	SC APC
Fiber Type	· Single Mode Fiber (SMF): 9/125 µm · Multi-Mode Fiber (MMF): 50/125 µm or 62.5/125 µm (Minimum qualifications with ANSI/TIA/EIA-568-B series, EN50173-1 or ISO/IEC 11801
Wavelength	1310 ± 10 nm

5.5　Environmental Specifications

Operating Temperature	-5°C to +55°C (23°F to 131°F)
Storage	-20°C to 85°C (-4°F to 185°F)
Humidity	10% to 90%, non-condensing

5.6　Standards and Approvals

Laser Safety	· CDRH 21 CFR 1040.10, 1040.11 (Except for deviations per notice No.50, July 26, 2001) · IEC 60825-1, Amendment 2 (January 2001) · EN 60825-1
CE	Radio Equipment and Systems · EN 301 502 – for GSM / EGSM Frequency Bands · EN 300 328 – for WLAN 802.11b/g 2.4GHz Frequency Band · EN 301 893 – for WLAN 802.11a 5GHz Frequency Band · EMC · EN 301 489
FCC	· Radio Equipment and Systems: FCC 47 CFR Part 22, 24, 27, 90 · EMC: FCC 47 CFR Part 15 Subpart B
Safety	· EN 60950UL 60950 · CAN/CSA-C22.2 No.60950 · UL 2043 · NEBS OSP Class 1 compliance

5.7   System Component Specifications

5.7.1   Quad-Service Package (QX)

Supported Services	CELL, PCS, LTE 700 and AWS1/3

Ports

·	To Service Combiner Unit (SCU-F):	(4) 50Ω QMA ports
·	Cascading a number of QX units to AMU	(2) RJ45 ports
·	Local connection to AMU module for SW DL (for service personnel):	(1) RJ45 port
·	To SCU-F:	(1) DB15 connector
·	RS232 local connection to AMU module (for service personnel):	(1) DB9 connector

MA2000 QX Chassis

Power

- · Local Power: 100 - 240 VAC (Integrated AC/DC converter)
- · Remote Power: 25 to 48 VDC
- · Power Consumption (modules):
  - · RHM + AMU = 50 W
  - · Add-On = 50 W each
- · Max. power consumption of fully loaded chassis: AC models: 200 W; DC models: 150 W

Physical Dimensions

- · Mounting: 19-in Rack or Wall (pre-assembled brackets)
- · (H x W x D): 5.1 x 17.4 x 19.8 in (129.5 x 442 x 503 mm) – width not including pre-assembled rack brackets
- · Weight (fully occupied chassis): 46.8 lbs (21.2 kg)

Cooling Feature   Active heat dissipation (Fan)

5.7.2 Remote Hub Module (RHM)

Supported Services	Dual-band module supporting the CELL and PCS bands.
Remote Hub Module (RHM) |

Ports	RS232 local connections to RU module	DB9 Female connector
	RS232 connection for loopback test	DB9 Male connector
	Fiber optic connection to BU/OCH	SC APC fiber-optic pair Connector

Physical Dimensions	(H x W x D): 1.7 x 17 x 10.6 in (43.1 x 431.7 x 269.2 mm)
Weight: 7.7 lbs (3.5 kg)

5.7.3 Add-On (AO) Module

Supported Services	Single service per Add-On module. Refer to AO model number for specific service support
Remote Hub Module |

Ports	To DC power feed:	DC two pin terminal block power connector
	For local maintenance:	(1) RS232 connector

Physical Dimensions	(H x W x D): 1.7 x 17 x 10.6 in (43.1 x 431.7 x 269.2 mm)
Weight: 6.6 lbs (3 kg)

5.7.4 Termination Module

Physical Dimensions	(H x W x D): 1.7 x 17 x 10.6 in (43.1 x 431.7 x 269.2 mm)
Weight: 6.6 lbs (3 kg)

5.7.5 Antenna Monitoring Unit (AMU)

The AMU is an internal module which monitors the status of the antennas connected to the SCU-F (Four port Service Combiner Unit); Operates in conjunction with the SCU-F.

Note the following:

·   The DC resistance of the antenna together with the cable connected to the SCU-F should be less than or equal to 1 kilo ohm for the AMU to sense the antennas successfully.
·   AMU may not sense antenna if splitters are used between the connected antenna and the SCU-F

5.7.6 Service Combiner Unit (SCU-F)

Supported Services	High band (1710 MHz - 2170 MHz) and low band (698 MHz – 960 MHz) RF services	SCU-F | Figure	
Ports	· To QX:	(8) 50Ω QMA connectors	
	· To Wideband antennas:	(4) N-Type 50Ω connectors	
	· For local maintenance:	(1) DB15 connector	
Physical Dimensions	· Mounting: 19" Rack (pre-assembled brackets) (H x W x D): 1.72 x 17.04 x 10.63 in (44.0 x 434 x 270 mm)		
	· Weight: 5.40 lbs (1.75 kg)		

6 Appendix B: Ordering information

6.1 QX Chassis and Modules

Part Number	Description
2000-C85P19L70A17-BQC	CELL, PCS, LTE700, AWS services in a QX chassis; SM fiber support
2000M-C85P19L70A17-BQC	CELL, PCS, LTE700, AWS services in a QX chassis; MM fiber support
2000-C85P19L70-BQC	CELL, PCS, LTE700 services in a QX chassis; SM fiber support; Supplied with required termination modules
2000M-C85P19L70-BQC	CELL, PCS, LTE700 services in a QX chassis; MM fiber support; Supplied with required termination modules
2000-C85P19A17-BQC	CELL, PCS, AWS services in a QX chassis; SM fiber support; Supplied with required termination modules
2000M-C85P19A17-BQC	CELL, PCS, AWS services in a QX chassis; MM fiber support; Supplied with required termination modules
2000-C85P19-BQC	CELL, PCS services in a QX chassis; SM fiber support; Supplied with required termination modules
2000M-C85P19-BQC	CELL, PCS services in a QX chassis; MM fiber support; Supplied with required termination modules
2000-C85P19L70A17-BQCF	CELL, PCS, LTE700, AWS services in a QX chassis; SM fiber support; Public Safety coexistence compatible
2000M-C85P19L70A17-BQCF	CELL, PCS, LTE700, AWS services in a QX chassis; MM fiber support; Public Safety coexistence compatible
2000-C85P19L70-BQCF	CELL, PCS, LTE700 services in a QX chassis; SM fiber support; Public Safety coexistence compatible; Supplied with required termination modules
2000M-C85P19L70-BQCF	CELL, PCS, LTE700 services in a QX chassis; MM fiber support; Public Safety coexistence compatible; Supplied with required termination modules
2000-C85P19A17-BQCF	CELL, PCS, AWS services in a QX chassis; SM fiber support; Public Safety coexistence compatible; Supplied with required termination modules
2000M-C85P19A17-BQCF	CELL, PCS, AWS services in a QX chassis; MM fiber support; Public Safety coexistence compatible; Supplied with required termination modules
2000-C85P19-BQCF	CELL, PCS services in a QX chassis; SM fiber support; Public Safety coexistence compatible; Comes with required termination modules
2000M-C85P19-BQCF	CELL, PCS, AWS services in a QX chassis; MM fiber support; Supplied with required termination modules

Part Number	Description
2000-QX-B-QC	QX Chassis without Public Safety Support (termination modules not included; no coexistence with Public Safety)
2000-QX-B-QCF	QX Chassis without Public Safety Support (termination modules not included; supports coexistence with Public Safety)
2000-C85P19-B-RHM	QX Cell & PCS SISO Remote Hub Module (with Single-Mode Fiber Support)
2000M-C85P19-B-RHM	QX Cell & PCS SISO Remote Hub Module (with Multi-mode Mode Fiber Support)
2000-L70-B-AM	QX LTE SISO Add-on module;
2000-L70-B-AMF	QX LTE SISO Add-on module; with Public Safety coexistence compatibility
2000-A17-B-AM	QX AWS SISO Add-on module

6.2   QX Accessory Kits

Part Number	Description
2000-QX-B-FAM	QX field replaceable Fan
2000-SCU-8-4-F	8 x 4 Service Combiner Unit with all connectors in the front
2000-L70-B-TM	QX LTE SISO Add-on port termination module;
2000-A17-B-TM	QX AWS SISO Add-on port termination module;
AK-QX-ENC-WMT-V	QX mounting brackets and screws to mount the chassis flush to the wall