Corning

Mid-Power HX 2.5 GHz TDD Remote Unit
User Manual

Warranties

Hardware

Corning Optical Communications Wireless, Inc. (“Corning”) 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 (the “Hardware Warranty Period”), the Hardware furnished by Corning 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 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’s’ 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 and delivered to Customer which contain technical specifications or performance standards for the Products.

If Customer invokes this Hardware Warranty, it shall notify Corning promptly of the claimed defect. Customer will allow Corning to inspect the Hardware at Customer’s location, or to return the Hardware to Corning’ closest repair facility. For Hardware returned to Corning’s’ repair facility, Customer shall be responsible for payment of all transportation and freight costs (including insurance) to Corning’s’ repair facility, and Corning 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 and/or its return to Customer.

Notwithstanding the foregoing, in no event will Corning 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 personnel), alteration, accident, or for any other cause not attributable to defects in materials or workmanship on the part of Corning. Corning 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.

Software Warranty

Corning 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

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

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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 prior to returning any unit. Advise Corning of the model, Serial number, and discrepancy. The unit may then be forwarded to Corning, transportation prepaid. Devices returned collect or without authorization may not be accepted.
2. Prior to repair, Corning 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'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 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 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 as soon as possible in writing.

Note: Keep all packing material until you have completed the inspection

Warnings and Admonishments

There may be situations, particularly for workplace 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.

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 115 cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements.

WARNING! Antenna gain should not exceed 15 dBi.

WARNING! Each individual antenna used for this transmitter must be installed to provide a separation distance greater than 115 cm 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 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.

Power requirements for DC Inputs

WARNING! Only use a special DC supply cable with connector

WARNING! Always keep DC IN connectors connected during the product operation

WARNING! Disconnect all power from the equipment by means of an external circuit breaker before connecting or disconnecting the DC IN connectors.

Laser Safety

Fiber optic ports of the HX 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 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 HX devices and the associated cables.

HX has been tested and certified as a Class 1 Laser product to IEC 60825-1. It also meets the requirements for a Hazard Level 1 laser product to IEC 60825-2 +a2(2010) 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.

Regulatory Compliance Information

WARNINGS!

- This is **NOT** a **CONSUMER** device. It is designed for installation by **FCC LICENCEES** 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.
- **ANTENNAS**: Use only authorized and approved antennas, cables and/or coupling devices! The use of unapproved antennas, cables or coupling devices could cause damage and may be of violation of FCC regulations.
- It is prohibited to use unauthorized antennas, cables and/or coupling devices and the use of these devices, which is illegal under FCC regulations, may subject the user to fines.
- Use of unauthorized antennas, cables, and/or coupling devices not conforming with ERP/EIRP and/or indoor-only restrictions and the system shall not be used for outdoor.

Standards and Certifications

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

Category	Standards
Safety	UL 60950-1
Laser Safety	IEC 60825-1: 2007
Radio	FCC CFR47 Part 27
EMC	FCC CFR47 Part 15
RoHs	RoHs 6 compliant

Licensee Contact Information

Industrial Boosters may only be used by FCC licensees or those given express (individualized) consent of license. Corning certifies all of the VARs listed as licensed installers for Corning. For the list of licensed VARs, please contact the Corning Tech Support Hotline: (US) 410-553-2086 or 800-787-1266.

About this Guide

This Installation Guide describes how to perform the physical installation of the HX unit. The installation procedures of other units (e.g. RIU, OCH, 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
FT-350 User Manual (includes OCH information)
System Controller (SC-450) v7.3 User Manual
MA Software Version Update Tool

List of Acronyms

BTS	Base Transceiver Station
BTSC	Base Transceiver Station Conditioner
DL	Downlink
EPM	Expansion Passive Module
HX	High Power Remote
MUX	Multiplexer
OCH	Optical Central Hub
PA	Power Amplifier
PSU	Power Supply Unit
RCU	Remote Control Unit
RIU	Radio Interface Unit
RU	Remote Unit (module)
SC-450	System Controller
UL	Uplink

Table of Contents

1 Introduction

HX 2.5 GHz TDD is a mid-power, remote solution designed to be integrated into existing MobileAccess1000 (MA1000) and MobileAccess2000 (MA2000) Distributed Antenna Systems (DAS) already deployed in the field. It is a fiber fed, compact and scalable multi-service platform designed to complement the MA1000/MA2000 and other HX4 and HX WCS remotes while providing complete RF open space coverage for large-scale public venues such as campuses, stadiums, convention centers, hotels, airports and train stations.

Using low-loss fiber optic cabling, remote units can cover distances of up to 1.4 mi (2 km) from the BTS signal sources at the headend. HX 2.5 GHz TDD requires minimum addition of hardware to the headend (BTSC 2500) and utilizes existing fiber and antenna overlay. It also includes test ports, enabling to measure the signals at the remote without disconnecting the antenna cable and affecting services on the main stream. HX 2.5 GHz TDD MIMO takes full advantage of MIMO technology by using spatial multiplexing to deliver higher spectral efficiency and preventing the degradation of quality while significantly increasing throughput on the same spectrum.

HX 2.5 GHz TDD | Figure 1-1

1.1 Key Features and Capabilities

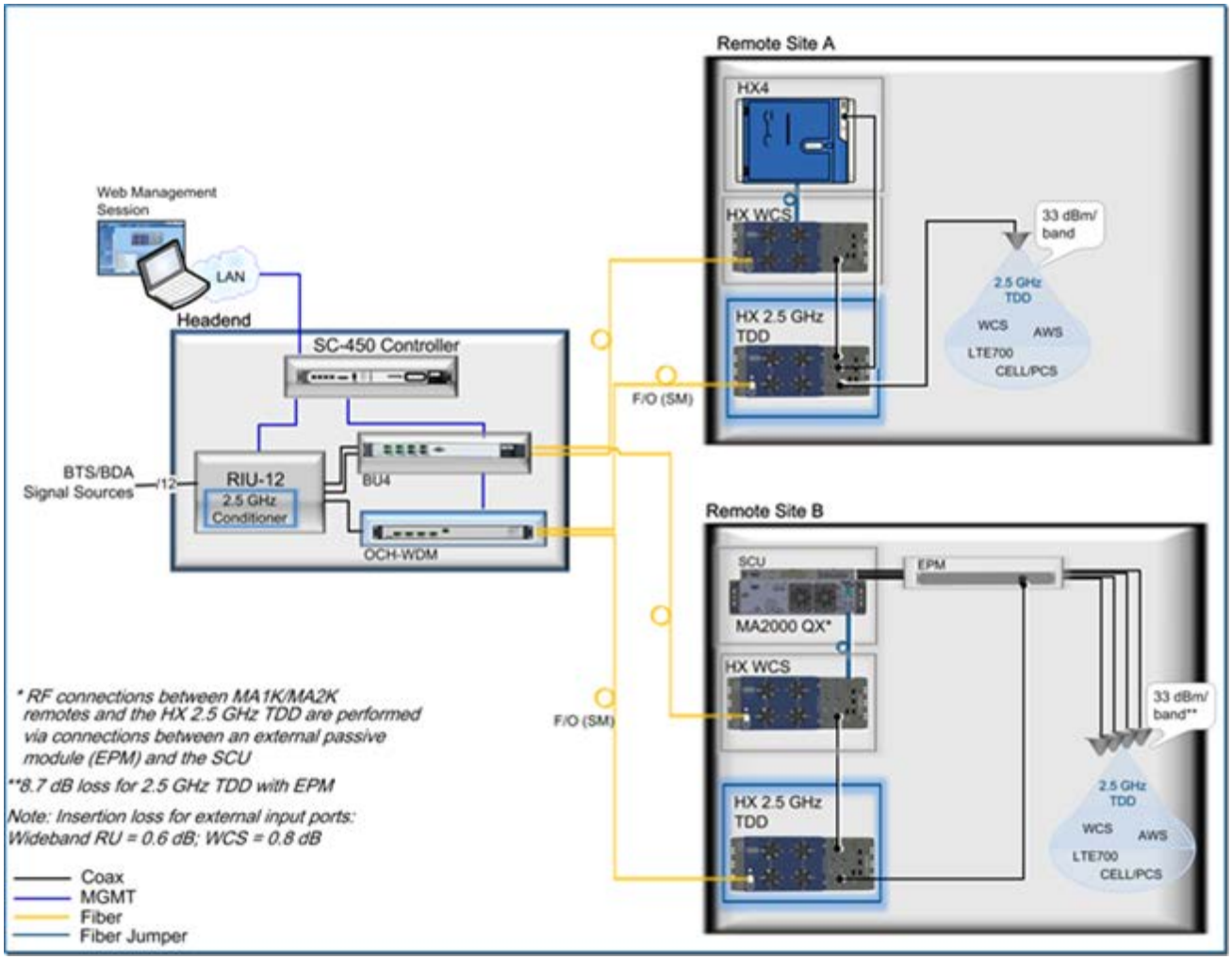
- **Service Platform:** Accommodates LTE TDD and provides SISO/MIMO configuration for the 2.5 GHz TDD band
- **Cost-Effective High Power**: Optimizes and reduces the number of antennas required to cover open areas by offering up to 33 dBm (2 W) composite power per frequency band.
- **Scalability:** Supports either SISO or MIMO service in a single compact enclosure.
- **Operator-Grade Operation**: Advanced signal handling and management ensures operator-grade performance in multi-operator deployments.
- **Design and Deployment Flexibility:** Antenna splitting schemes are possible due to the higher power output capability.
- **Compatibility:** Connects to existing MobileAccess1000, MobileAccess2000 and additional HX4 and HX WCS remote units to allow common antenna overlay; Shares a common headend and EMS in a single deployment)
- **Monitoring and Web Management:** All status LEDs are located on front panel; Web management via the SC-450 controller (v7.3 and higher)

1.2 System Architecture

Figure 1-2 shows an example of SISO scenarios in a system topology where the HX 2.5 GHz TDD is connected to existing HX4 and MA2000 QX remotes. The HX 2.5 GHz TDD remote is installed between the existing remote unit (e.g. HX, MA2000 QX) and the optical converter unit (i.e. OCH) and interfaces them both via fiber connections.

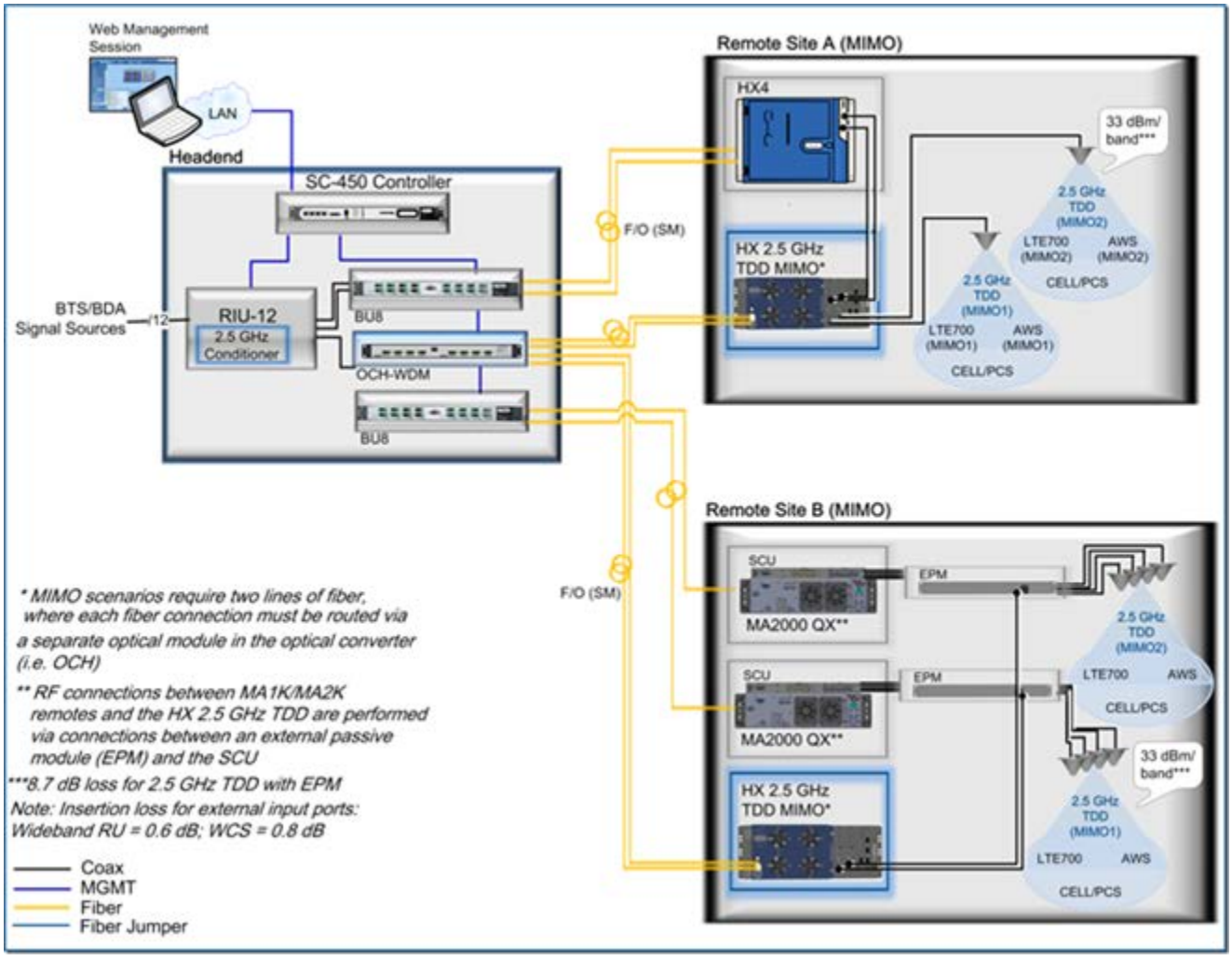
In the downlink, at the headend, the BTS or BDA signal is conditioned by the RIU, ensuring a constant RF level. The conditioned signal is then converted by the optical central hub (OCH) to an optical signal for transport over single mode fiber to the HX, located at the remote location. In the uplink, the process is reversed.

The system controller (SC-450 v7.3) enables local and remote management, as well as controls all MA1000, MA2000, and HX elements from a single, centralized location.



HX 2.5 GHz TDD – SISO Architecture with an existing HX4 and MA2000 QX, Sharing a Common Headend | Figure 1-2

Figure 1-4 shows an example of MIMO scenarios in a system topology where the HX 2.5 GHz TDD is connected to existing HX4 and MA2000 QX remotes. The HX 2.5 GHz TDD remote is installed between the existing remote unit (e.g. HX, MA2000 QX) and the optical converter unit (i.e. OCH) and interfaces them both via fiber connections. MIMO configurations require one line of fiber for each MIMO stream and one EPM for each stream in installations with MA1000/MA2000 remotes.



HX 2.5 GHz TDD – MIMO Architecture with an existing HX4 and MA2000 QX, Sharing a Common Headend | Figure 1-3

1.3 System Monitoring and Management

The HX 2.5 GHz TDD remote unit is centrally managed via the SC-450 controller (v7.3 and higher). Note that HX is not directly connected to the controller but managed and configured via the OCH to which it is connected. Figure 1-4 shows the main configuration window for the selected HX 2.5 GHz TDD unit.

Note: Refer to the SC-450 controller user manual (v7.3 and higher) for information on how to configure and manage the HX 2.5 GHz TDD remote unit.

Example of HX 2.5GHz TDD Configuration Tab | Figure 1-4

1.4 HX Unit Description

The HX 2.5GHz TDD unit consists of the following main modules:

- **RCU** – Remote control unit; Includes status LEDs for each module and control ports
- **ANT (MUX)** – Multiplexer [ANT. 1 MUX (right) for SISO; ANT. 2 MUX (left) for MIMO] including interfaces to HX WCS, HX4 and RF antennas/MA1000/MA2000 units (via EPM); combines signal sources additional external RF signals (when connected to HX unit and MA1000/MA2000 remote) while providing the proper filtering into a single antenna port
- **Module –** [ANT. 1 (right) for SISO; ANT. 2 (left) for MIMO] Internal module that interfaces to the optical converter unit (OCH) connects via a single mode fiber pair and supports one service. The HX 2.5 GHz TDD module provides the additional amplification on the DL signals routed from the OCH towards the multiplexer.
- **Power Supply** - DC power; Internal module

The unit plot plan is provided on the left side of the enclosure door:

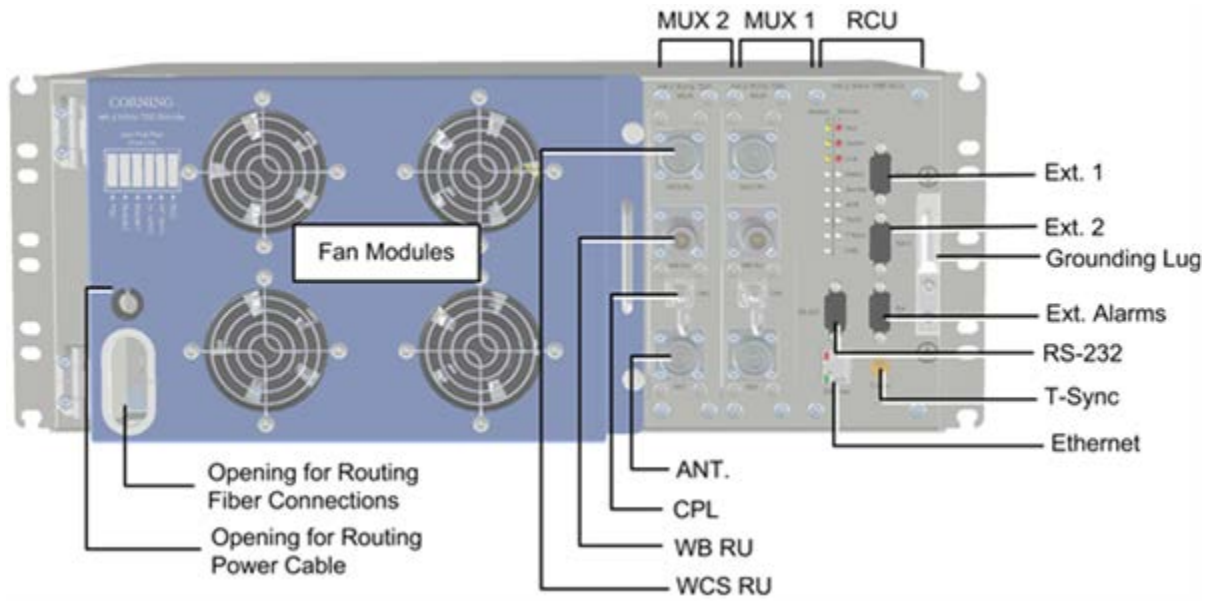
HX 2.5 GHz TDD Unit Plot Plan | Figure 1-5

The following sections provide details on the front panel and internal module interfaces.

1.4.1 HX 2.5 GHz TDD External Interfaces

The HX 2.5 GHz TDD front panel includes the multiplexer interfaces (e.g. antenna port, DL Test port, wideband RU port), system level status LEDs and service maintenance ports.

Note: Both SISO and MIMO models include two sets of multiplexer RF interfaces. For SISO models, the RF connections will be performed via the connectors corresponding to the installed HX remote unit module (inside chassis): Left MUX for Left HX 2.5 GHz Module and Right MUX for Right HX 2.5 GHz Module. See section 1.4.2 for internal modules.



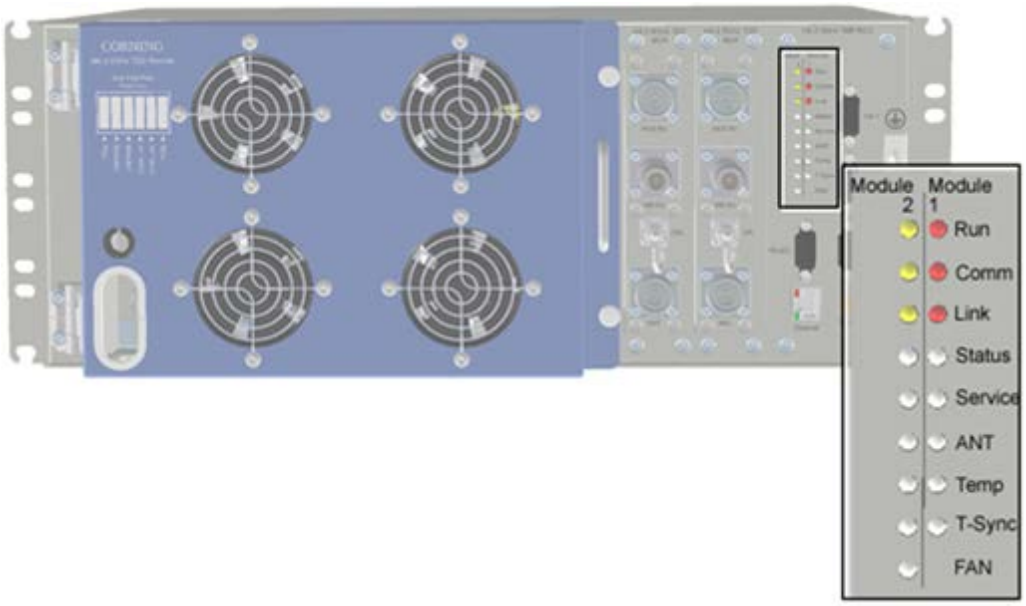
HX 2.5 GHz TDD Front Panel Interfaces | Figure 1-6

Table 1-1 provides a description of the front panel connectors.

Connector	Description
ANT.	Mini DIN 4.3-10 type duplexed antenna port (one per multiplexer)
CPL.	SMA-Type female 50Ω coupling port (-40 dB ± 1.0 dB) used for RF DL test (one per multiplexer)
WB RU	N-Type duplexed wideband remote unit expansion port for interfacing to HX4 remote (one per multiplexer) so that additional HX4 services are combined with those of the HX 2.5 GHz TDD and distributed from its antenna port
WCS RU	Mini DIN 4.3-10 Type duplexed port (one per multiplexer) for interfacing to HX WCS RF input so that additional WCS service is combined with those of the HX 2.5 GHz TDD and distributed from its antenna port
Ext. 1 / Ext. 2	N/A (Future option)
GND	Two-hole, standard barrel grounding lug
Ext. Alarms	DB-9 female external alarm connector for external dry contact alarm connections; Supports up to four external alarms (configurable via the Web GUI)
RS-232	D-Type 9 pin female console port used for connecting to engineering GUI
T-Sync	SMA type connector for TDD sync monitoring
Ethernet	Ethernet connection for local craft

Table 1-1. HX 2.5 GHz TDD Front Panel Connectors

Refer to Figure 1-7 and Table 1-2 for description of HX status LEDs.



HX 2.5GHz TDD RCU Module Status LEDs | Figure 1-7

Note: Module 1 and Module 2 LEDs correspond to installed modules [Module 1 for ANT. 1 (SISO); Module 2 for ANT. 2 (MIMO)].

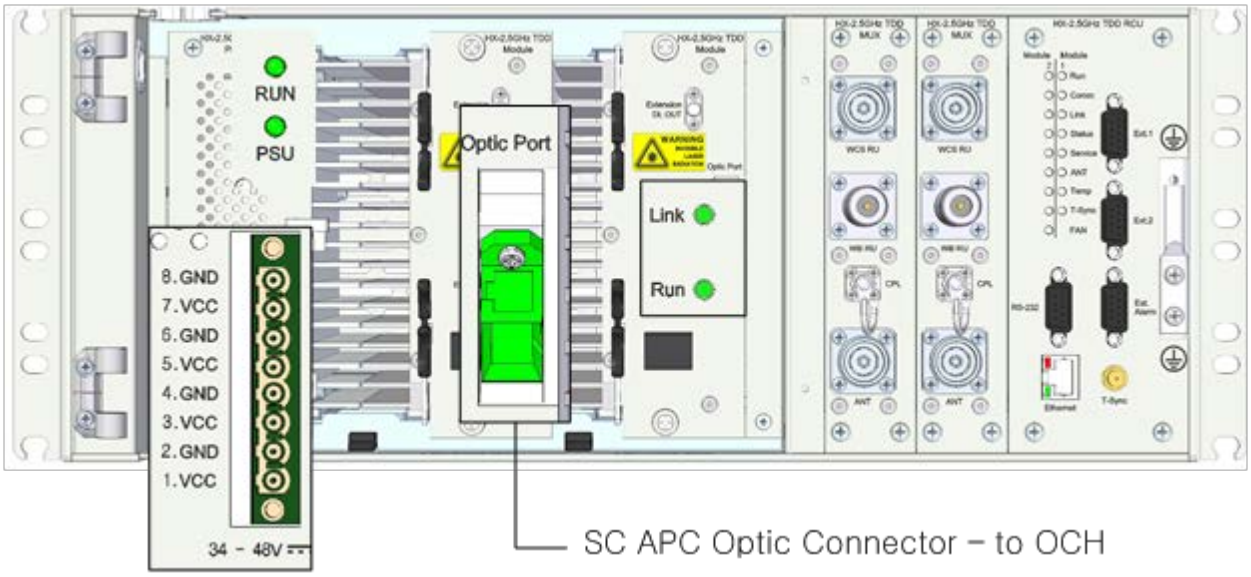
LED	State	Description
Run	Steady green Off	Power input detected Unit power is off
Comm	Green	Short blink upon receiving FSK message(Off at any other time)
Link	Steady green Blinking green Off	Optical link level is above normal threshold Optical link level is lower than normal threshold but above no-link threshold Optical link level is below No link threshold
Status	Green / Yellow / Red	Color according to device's overall status
Service	Green Red	Service status is ok Any service alarm is set
Ant.	Green Red	VSWR alarm is clear VSWR alarm is set
Temp.	Green Red	Over Temp and Temperature Protection alarms are clear Over Temp or Temperature Protection alarms is set
T-Sync	Green Red	TDD sync locked TDD sync error (unlocked)
Fan	Green	Fan alarm is clear
	Yellow Red	Fan alarm is set (minor) for first fan faulty Fan alarm is set (minor or major) for more than one faulty fan

Table 1-2. HX 2.5GHz TDD RCU Status LED Descriptions

1.4.2 Internal Module Interfaces

The HX internal modules include two main modules (see Figure 1-8):

- PSU – Power supply module; includes DC In connector and status LEDs
- HX Module – one for SISO cabinets and two for MIMO (the interfaces are the same for each module); comprises an optical module and power amplifier; interfaces to the base unit; Left HX Module 2 (MIMO) corresponds to left HX MUX and right HX Module 1 (SISO) corresponds to right MUX.



HX (MIMO) Internal Modules – PSU (Left) and HX 2.5 GHz TDD Modules (Middle and Right) | Figure 1-8

Module	Interface	Description
PSU	Power connector	34-48 V DC input; 8 pin DC terminal block connector (Dinkle 2EHDRM-08P)
HX Module	Optic Port	SC APC fiber-optic pair connector; SM fiber; connection towards OCH
	Extension UL/DL	SMA Type connector N/A (future option)

Table 1-3. HX 2.5 GHz TDD PSU and Module Connectors

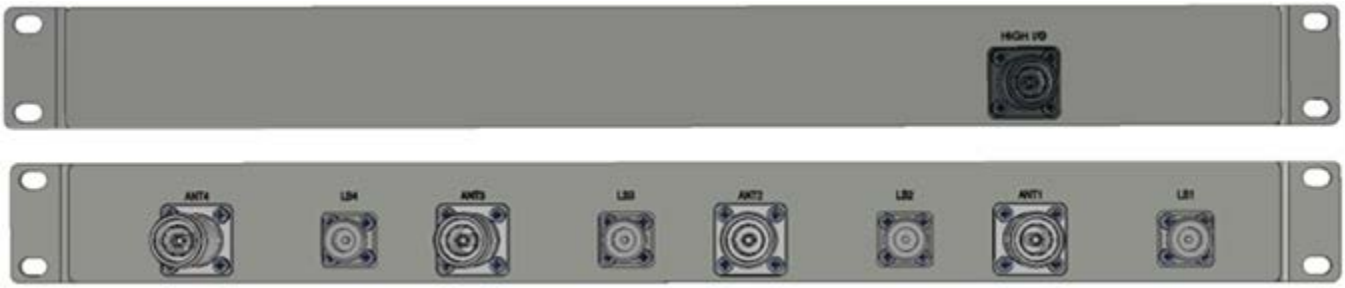
Module	LED	Description
PSU	Run PSU	Steady green – required power input detected Off – no power input Off – normal operation Steady red – faulty PSU module; In more than 10% difference than the rated DC output, the red LED occurs.
HX-2.5 GHz TDD Module	Link	Off – No optical link Blinking green – Low optical link level Steady green – Normal optical link level
	Run	Off – no power input Blinking green – power input detected

Table 1-4. HX 2.5 GHz TDD PSU and Module LEDs

1.5 External Passive Module (EPM)

The external passive module (EPM) is required when in installations with an existing MA1000/MA2000 remote unit (e.g. MA2000 QX). The EPM is used to combine up to four low band output wideband signals with the high band HX 2.5 GHz TDD output signal. The module includes a 1:4 splitter for the high band (i.e. 2.5 GHz TDD) and four internal diplexers that combine the 2.5 GHz TDD signal with the wideband signal received from the MA1000/MA2000 remote.

The EPM interfaces to the HX 2.5 GHz TDD and to the service combiner unit (SCU) of the MA1000/MA2000 remote.



External Passive Module – Front (Top) and Rear (Bottom) Panels | Figure 1-9

Refer to Table 1-5 for a description of the EPM interfaces.

Panel	Connector	Description
Front	HIGH I/O	One Mini DIN 4.3-10 high-band input port interfaces to additional HX or MA1000/MA2000 remote
Rear	ANT	Four Mini DIN 4.3-10 combined output ports interface to wideband antennas
	LB	Four N-Type low-band input ports interface to service combiner unit (SCU) on MA1000/MA2000

Table 1-5. EPM Front and Rear Panel Interfaces

2 Installation Guidelines

This provides guidelines for installing the HX 2.5 GHz TDD remote unit.

2.1 Site Considerations

- The distance between the HX service antenna and the coverage area should correspond to LOS (Line of Sight) requirements for maximum coverage area.
- The maximum fiber path loss is 3 dB.
- The system delay of the optical system must be taken into consideration when there are neighboring BTS sites overlapping in coverage.

2.2 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 with a relative humidity of max. 90% and temperatures range of -20° to +60°C (-4° to 140°F).

2.3 Installation Requirements

- 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.
- 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 available of suitably terminated grade of RF and optical fiber.
- Observe handling of all cables to prevent damage.

2.4 Fiber Optic Requirements

2.4.1 Authorized Optic Cables

- Only single mode fiber can be used with HX 2.5 GHz TDD product
- 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 Corning specified patch cords listed below.

900 microns pathcord 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

2.4.2 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 10 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 30 mm.
- Use SC APC connectors (green color) 8 deg only.
- Pay special attention while connecting the SC APC connectors - ensure that you hear a “click”, indicating a secure connection
- 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 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.

- 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 RF Coaxial Cable Guidelines

2.5.1 General Cable Installation Procedures

Note: The installer should be familiar with the ANSI/TIA/EIS-568 Cabling Standard guidelines.

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 may need to be concealed above the ceiling.

The cable must be properly supported and maintained straight using velcro cable ties, 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 the supplied ½-in coax cable should be 7-in.
- 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.
- All cables shall be weather-resistant type.
- Cable length - determined by the system installation plan. When calculating the cable length, take into account excess cable slack so as not to limit the insertion paths.

2.5.2 RF Rules

- Use coax RG-223, 50 ohm, for RF connections between HX units and DAS antennas.
- When using the Corning 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 700 MHz to 2600 MHz
- Terminate all unused HX RF ports with a 50 ohm load
- Make sure that the VSWR measured at the coax cable meets the product specification The VSWR must be measured prior to terminating the HX RF ports in the remote communication rooms.

2.5.3 Coax Cable Lengths and Losses

Use the compatible jumper to connect the coax connector to the external antenna.

Note: The required distance between the antennas (installed in the ceiling) depends on the infrastructure and calculated path-loss.

Coax Length	Coax Loss (900 MHz)	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

Coax Length	Coax Loss (900 MHz)	Connector Loss	Total Loss
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

Table 2-1. Typical Coax Cable Lengths and Losses

2.5.4 Cable Routing

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

2.6 Antenna Specifications and Guidelines

Determine the antenna installation configuration, according to the transmission and coverage requirements and the installation site conditions.

2.6.1 Authorized Antennas and Couplers

- External antennas - No limitation on any vendor of available external antennas with respect to the following requirements:
  - Omni Directional or Directional
  - Supported frequency range: wideband antennas supporting a range of 700 MHz to 2600 MHz
  - Gain: up to 12.5 dBi
  - Impedance: 50 Ohm
  - Types of couplers/splitters – depends on number of splits

- Couplers – Use N-Male to N-Female broadband coupler separately ordered from Corning (P/N AK-1COUPLER-NM-NF) or the equivalent:
  - Broadband frequency: 698 – 2700 MHz
  - -40 dB coupling (QMA coupling port)
  - Max. VSWR/Return Loss: 5:1 / 16 dB
  - Max. Insertion Loss (dB): 0.2
  - Impedance: 50 ohms

2.6.2 General Antenna Installation Guidelines

- The wideband antenna should be installed at a convenient location, free of metallic obstruction (can also be installed in plenum spaces).
- Install the connected antenna at the designated height and tune it roughly toward the Service coverage area.
- Each individual antenna used for this transmitter must be installed to provide the separation distance as specified in the FCC grant from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements

2.7 Grounding Requirement

Verify that the equipment has been well grounded (refer to the grounding lug on the bottom right corner of the HX 2.5 GHz TDD front panel). This includes antennas and all cables connected to the system. Ensure lightning protection for the antennas is properly grounded. Also, see section 3.3.3.

2.8 Manual Handling

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

2.9 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 (Appendix A: System Specifications).
- Where appropriate, confirm available of suitably terminated grade of RF and optical fiber.
- Observe handling of all cables to prevent damage.

3 Physical Installation

This chapter describes the mounting procedure and physical connections for the HX 2.5 GHz TDD remote unit.

3.1 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. Verify that all of the item required for installing the HX 2.5GHz TDD have been received (refer to Table 3-1). If any of the listed items are missing, contact your Corning representative.
3. Check for signs of external damage. If there is any damage, call your Corning service representative.

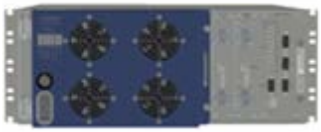
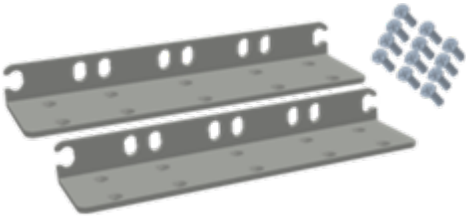
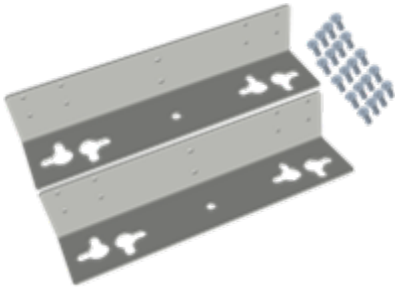
HX Kit Item	Quantity	
HX 2.5 GHz TDD remote unit: • HX-2500-SISO* HX-2500-MIMO** **SISO models include one HX-2.5 GHz TDD Module (internal) and one slot cover (blank panel for unoccupied HX-2.5 GHz TDD Module MIMO slot)* *** MIMO models include two HX-2.5 GHz TDD Modules*	1	
19-in rack brackets (factory assembled) – (default mounting option) for rack-mount installations Flat Head Screw UNC 6-32, 8mm; Stainless Steel	2 (RT/LT) 12	
Wall Mount Bracket (Belly-to-Wall) Assembly: Bracket Pan Head Screw Sems UNC 6-32, 12 mm; Stainless Steel; Used for securing bracket to HX sides	2 (RT/LT) 20	

Table 3-1. HX 2.5 GHz TDD Package Items List

3.2 Mounting

The HX 2.5 GHz TDD unit is installed in the communication room via one of the following options (each type of installation requires a different pair of brackets):

- Rack mount - rack ears preassembled
- Vertical wall mount (i.e. Belly-to-Wall; cabinet door faces side)
- (Optional) Horizontal - (i.e. Back-to-Wall; cabinet door faces front); separately ordered kit: AK-HX-ADDON-B2W-MNT

3.2.1 General Instructions

- HX 2.5 GHz TDD remotes should be installed in a communication room that provides access only to authorized personnel.
- The units are maintenance free. In the event of failure, only authorized personnel should handle the units.
- Only trained and qualified personnel should be allowed to install or replace this equipment.
- Verify that ambient temperature of the environment does not exceed 65°C (149°F)

3.2.2 Rack Mount Installation

3.2.2.1 Rack Installation General Safety Instructions

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

- 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.

3.2.2.2 Mounting HX 2.5 GHz TDD in 19-in Rack

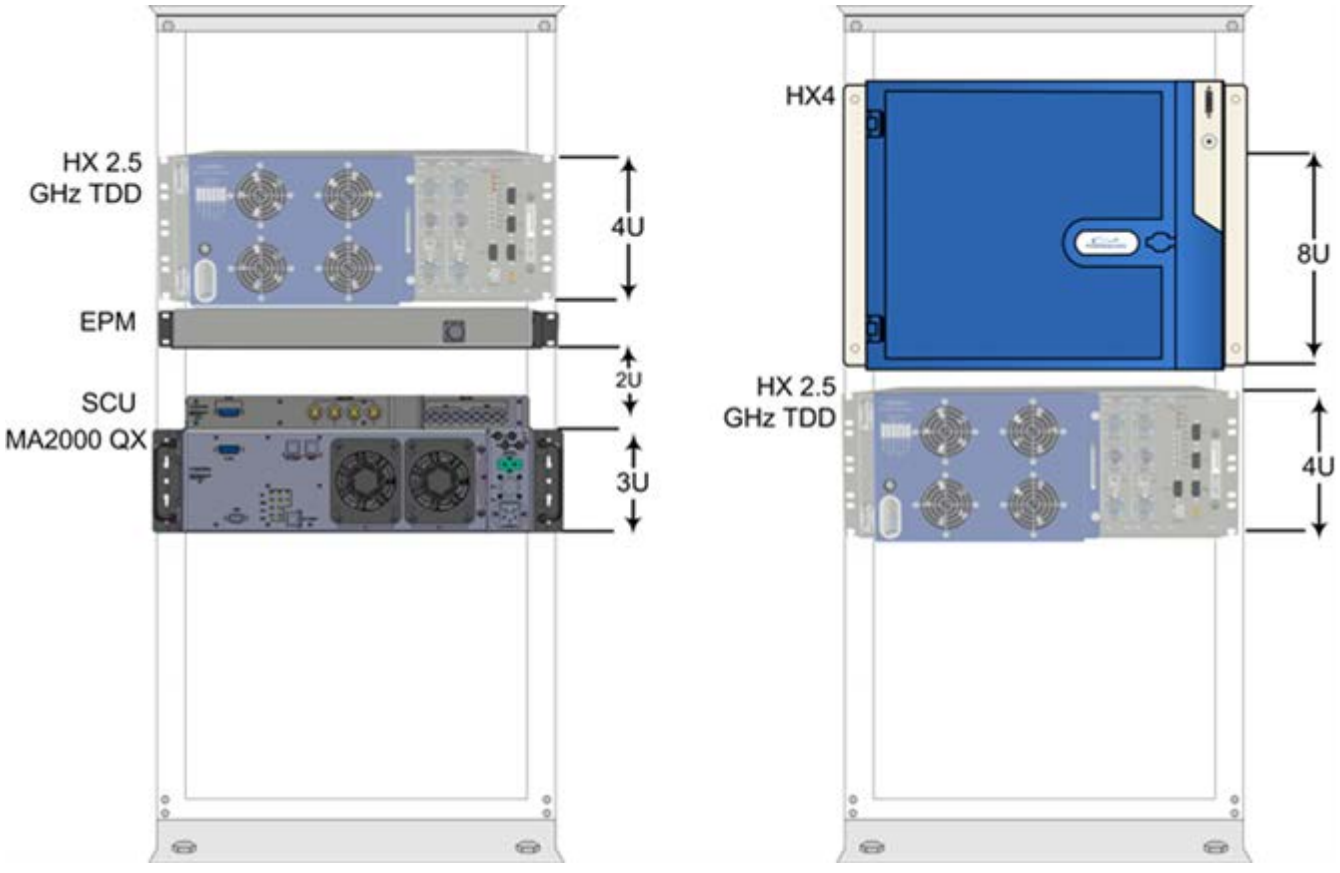
Note the following:

- The HX 2.5 GHz TDD requires 4U rack height availability
- For installations with MA1000/MA2000 remote:
  - EPM (1U) should be installed beneath the HX 2.5 GHz TDD unit in order to facilitate the connections
  - 2U separation distance between the EPM and the top of the MA1000/MA2000 remote unit is required
- Rack nuts and screws not provided (depend on rack type)

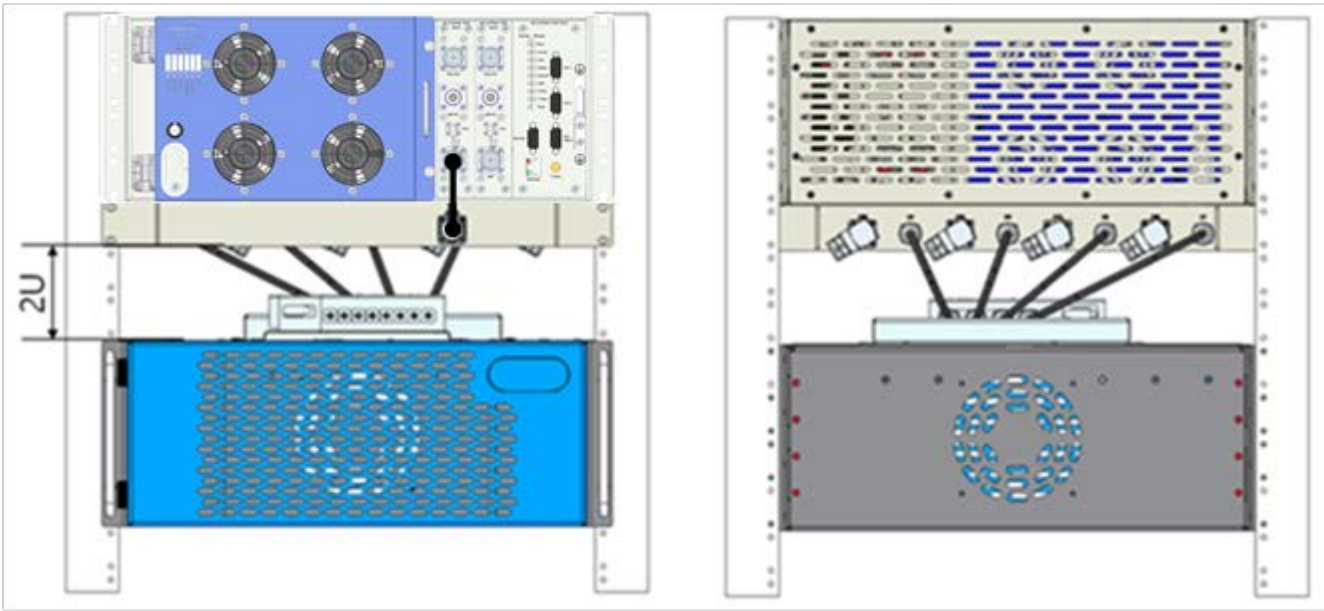
To mount the HX 2.5 GHz TDD in a 19-in rack:

1. Determine the location of the HX 2.5 GHz TDD in the rack.
2. Secure the unit to the communication racks' vertical uprights via at least two bracket holes on each side (one top and one middle) using the appropriate rack nuts and screws.

Refer to Figure 3-1 and Figure 3-4 for examples of rack installations.



Examples of HX 2.5 GHz TDD Rack Installations with Additional HX4 and MA2000 QX Remotes | Figure 3-1



Examples of HX 2.5 GHz TDD Rack Installations with Additional MA2000 TSX Remote | Figure 3-2

3.2.3 Wall-Mount Installation

IMPORTANT! *The wall-mount installation procedures in this section are for concrete/brick walls. For other wall types, installer is responsible for following standard practices using the appropriate tools and materials.*

The following sections provide instructions for both vertical (“belly-to-wall”) and horizontal (optional “back-to wall”) wall-mount installation types.

Note the following:

- If the HX 2.5 GHz TDD is to be installed in conjunction with the EPM, the latter must be assembled to the HX 2.5 GHz TDD unit before mounting on the wall. Refer to 3.2.3.1.
- When selecting the installation location, make sure that there is enough clearance distance from the bottom to open the HX 2.5 GHz TDD chassis door.

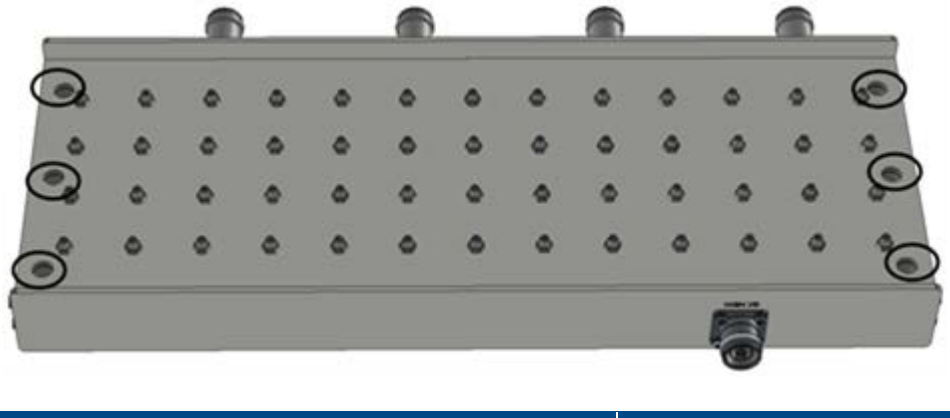
3.2.3.1 Assembling EPM to HX 2.5 GHz TDD (for Configurations with EPM)

Additional required items (not provided)

Six UNC 6-32, 11 mm screws for assembling EPM onto HX 2.5 GHz TDD unit.

To assemble EPM onto HX 2.5 GHz TDD

1. Remove the factory assembled rack ears from the sides of the unit.
2. Six fixed holes on top of the EPM are used for mounting the unit onto the HX 2.5 GHz TDD. See Figure 3-4.



Fixed Holes on EPM for Mounting on HX 2.5 GHz TDD | Figure 3-3

3. Place the EPM onto the top of the HX 2.5 GHz TDD unit and using six UNC 6-32, 11 mm screws (not provided), assemble the EPM onto the HX 2.5 GHz TDD unit. See Figure 3-4.

EPM and HX 2.5 GHz TDD Assembly | Figure 3-4

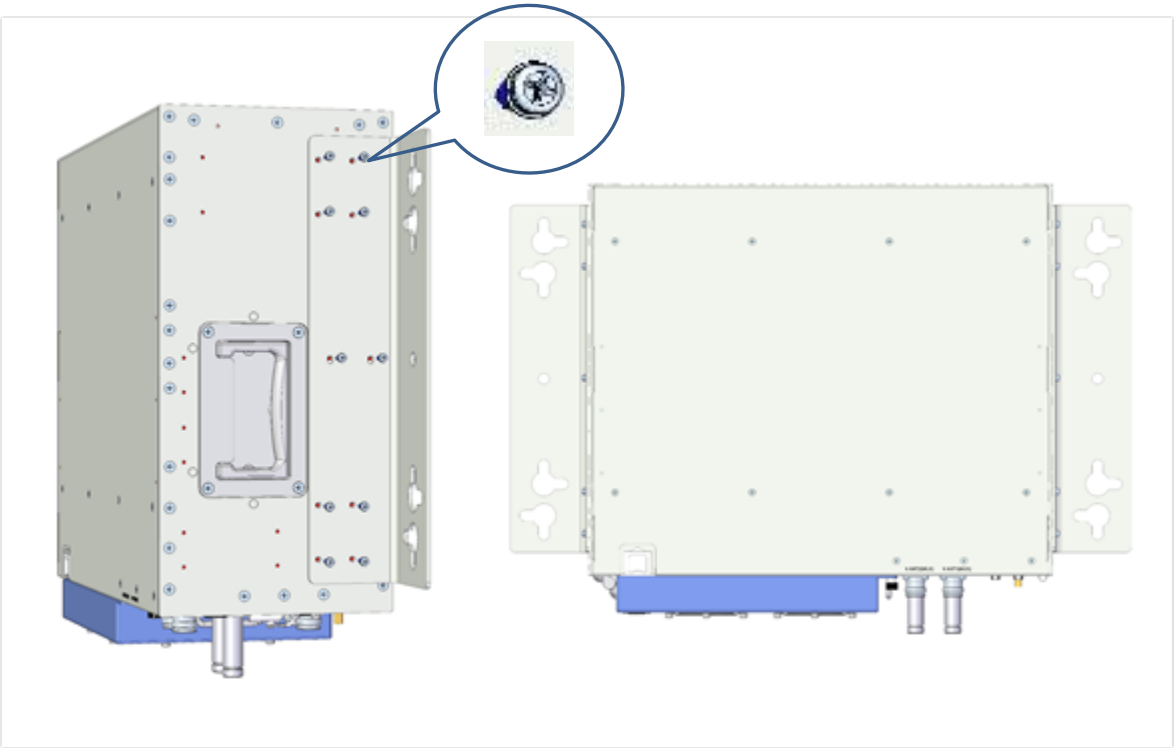
3.2.3.2 Horizontal Wall Mount Installation

Additional required tools and materials

- Philips/electric screwdriver
- Four anchors for mounting brackets on wall (anchor type depends on surface type)

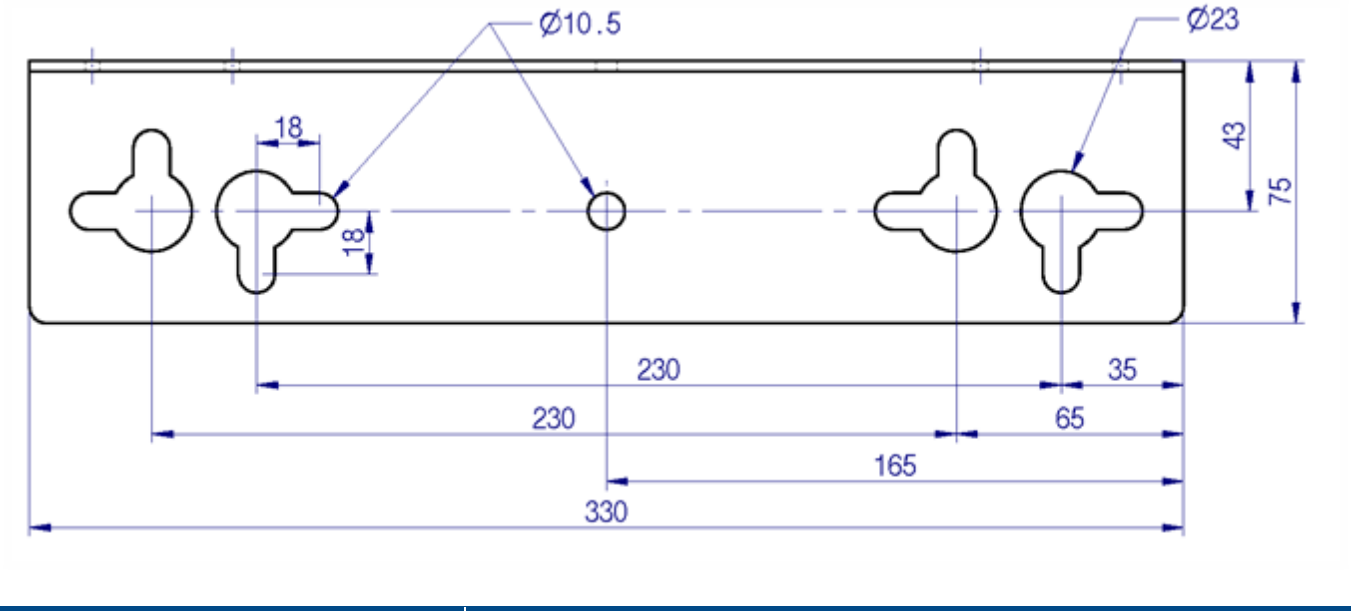
To mount the HX 2.5 GHz TDD unit on the wall:

1. Remove the factory assembled rack brackets from the sides of the HX 2.5 GHz TDD unit.
2. Using ten UNC 6-32, 12 mm screws for each bracket (provided in HX kit), assemble the wall-mount brackets to the sides of the HX 2.5 GHz TDD as shown in Figure 3-5.



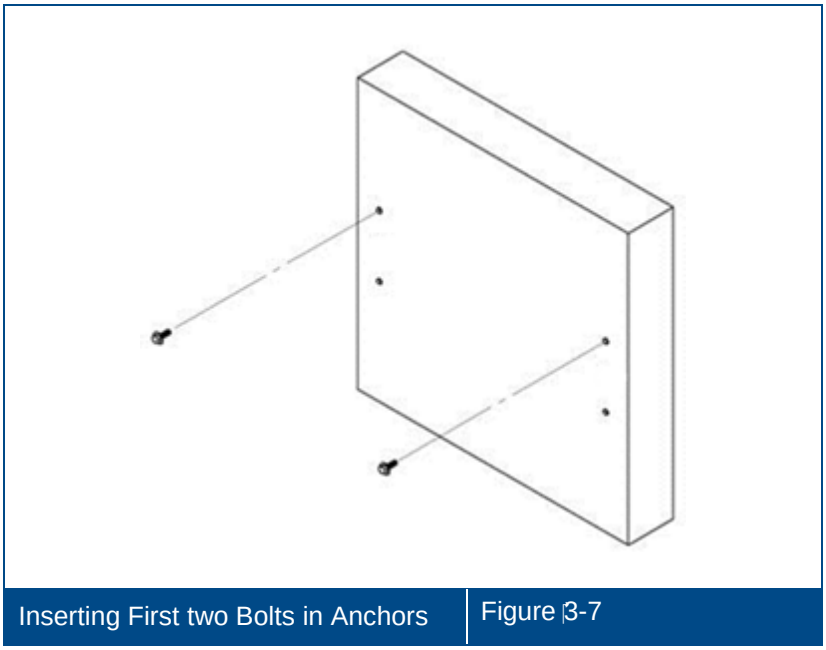
Wall-Mount Bracket Assembly | Figure 3-5

3. Referring to bracket hole dimensions in Figure 3-6 (units in mm), prepare the appropriate anchors and mount as follows:
   - Mark four holes (minimum of two on per bracket) on the wall for drilling the anchors
   - Drill four holes, using a hammer drill.
   - Fill the holes with silicon to help weather-proof the drilled holes and to prevent erosion.
   - Tap in expanding lead shield anchors



Wall-Mount Bracket Hole Dimensions | Figure 3-6

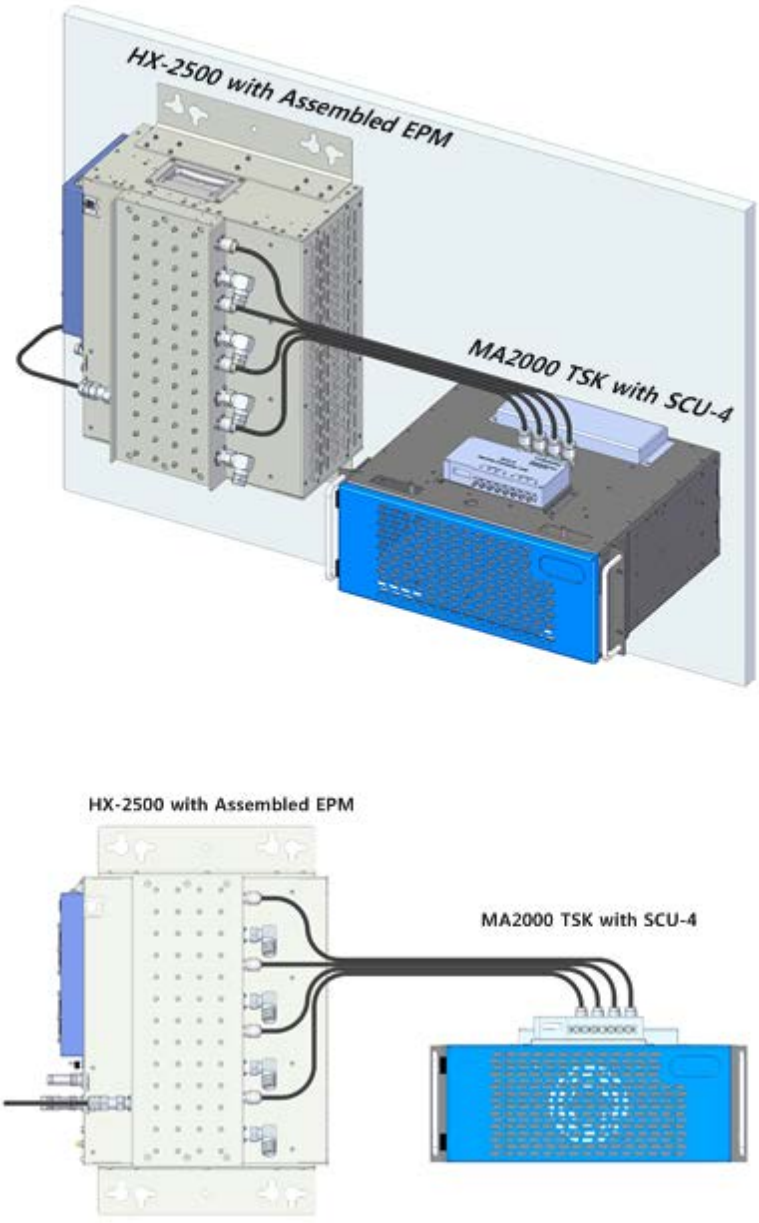
4. Insert two bolts in top anchors and tighten until bolt head is 0.5-in from surface of wall. See Figure 3-7.



Inserting First two Bolts in Anchors | Figure 3-7

5. Hang the unit and bracket assembly onto the two bolts using the key holes.
6. Insert remaining bolts (two on each side) through remaining bracket holes into anchor.
7. Tighten all four bolts.
8. Verify that HX 2.5 GHz TDD unit is tightly secured and does not shake.

Refer to Figure 3-8 for HX 2.5 GHz TDD wall-mount examples with additional MA2000 remote.



Example of HX 2.5 GHz TDD with Assembled EPM Alongside MA2000 TSX Remote | Figure 3-8

3.2.3.3 Vertical Wall Mount Installation

The vertical wall-mount brackets are optional and ordered separately.

Unpack and inspect the carton as follows:

1. Open the shipping carton and carefully unpack each unit from the protective packing material.
2. Verify that all of the items required for wall mount installation have been received (refer to Table 3-2). If any of the listed items are missing, contact your Corning representative.
3. Check for signs of external damage. If there is any damage, call your Corning service representative.

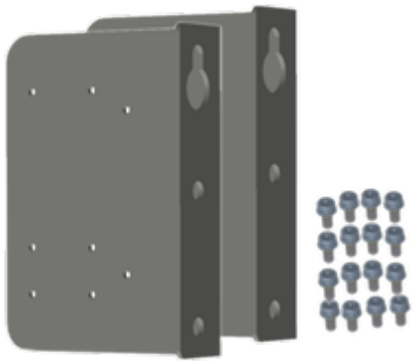
Wall Mount Bracket (Back-to-Wall) Assembly Kit	Quantity	
Bracket Pan Head Screw Sems UNC 6-32, 12 mm; Stainless Steel; Used for securing bracket to HX sides	2 (RT/LT) 16	

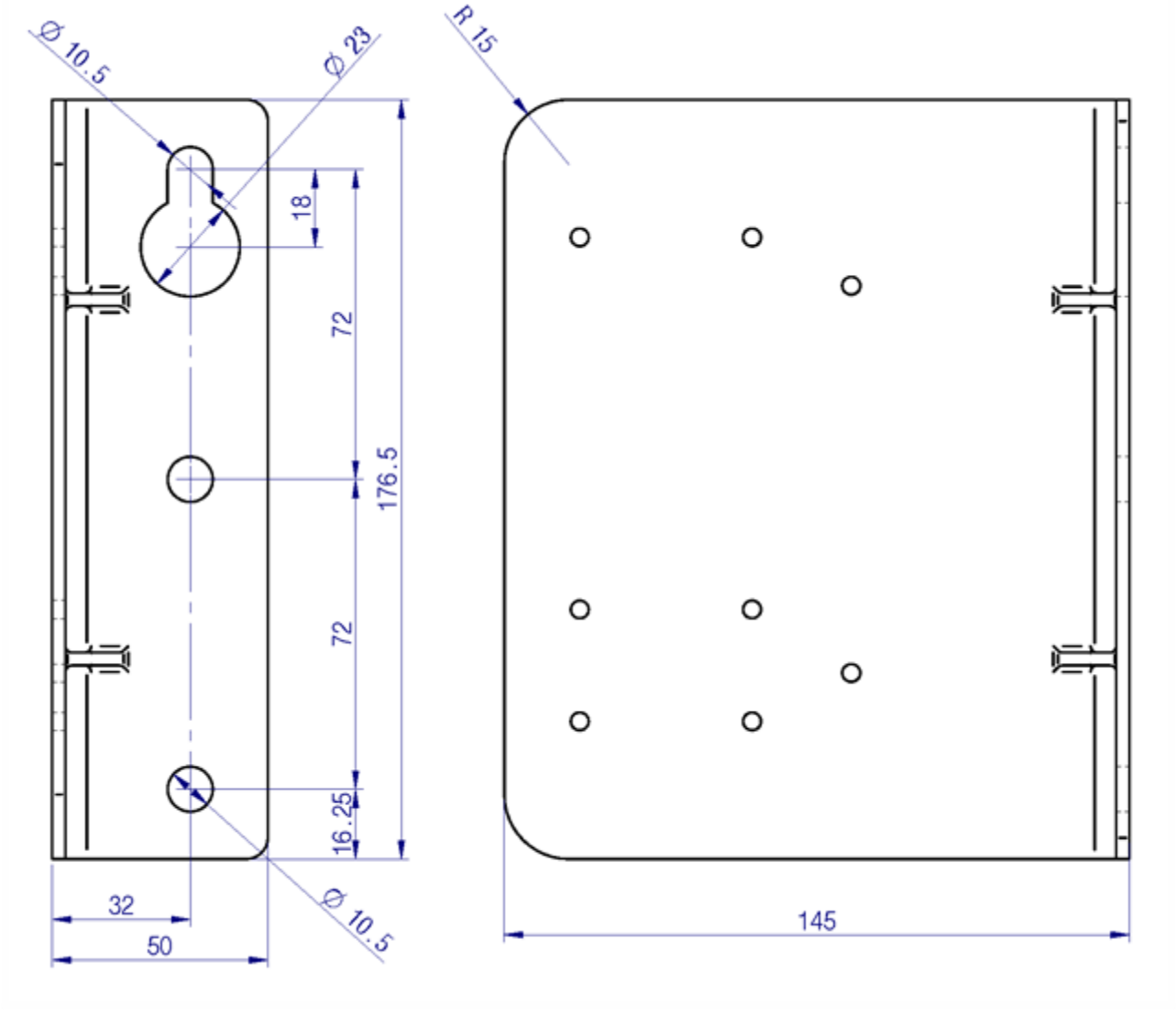
Table 3-2. HX 2.5 GHz TDD Wall-Mount Brackets Package Items List

Additional required tools and materials

- Philips/electric screwdriver
- Hammer drill
- Two anchors for hanging brackets on wall (anchor type depends on surface type) and four bolts for secure installation

To mount the HX 2.5GHz TDD unit on the wall:

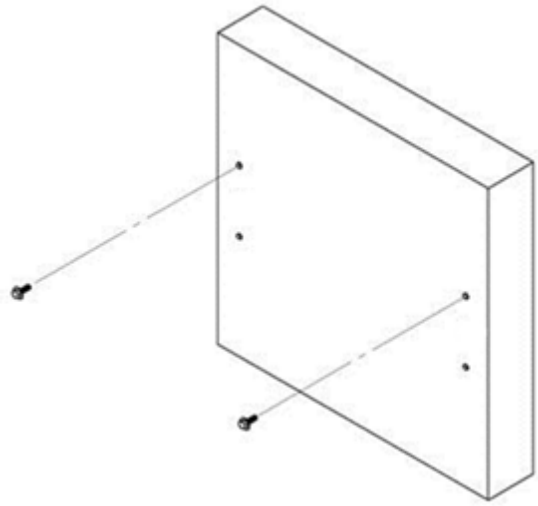
1. Remove the factory assembled rack brackets from the sides of the HX 2.5 GHz TDD unit.
2. Using eight UNC 6-32, 12 mm screws for each bracket (provided in HX 2.5 GHz TDD kit), assemble the wall-mount brackets to the rear of the HX 2.5 GHz TDD side panels.
3. Referring to Figure 3-9, prepare appropriate anchors and bolts for drilling.



Wall-Mount Bracket Dimensions | Figure 3-9

4. Using bracket holes as a template, mark holes for drilling in wall.

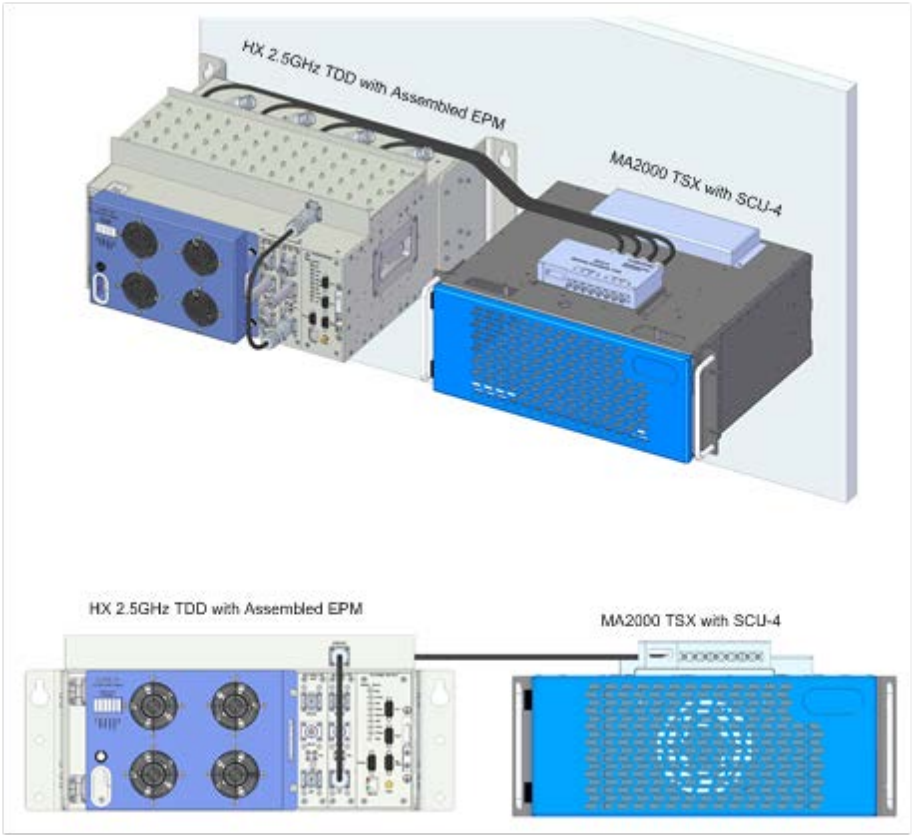
5. Insert two bolts in top anchors and tighten until bolt head is 0.5-in from surface of wall. See Figure 3-10.



Inserting First two Bolts in Anchors | Figure 3-10

6. Hang the unit and bracket assembly onto the two bolts using the key holes.
7. Insert remaining bolts (two on each side) through remaining bracket holes into anchor and tighten.
8. Verify that HX 2.5 GHz TDD unit is tightly secured and does not shake.

Refer to Figure 3-11 for HX 2.5 GHz TDD wall mount examples with additional MA2000 remote.



Example of HX 2.5 GHz TDD with Assembled EPM Alongside MA2000 TSX Remote | Figure 3-11

3.3 Connections

Note that the HX 2.5 GHz TDD is an upgrade unit and as such the RF and fiber connections also interface existing HX4, HX WCS and MA1000/MA2000 remote units.

3.3.1 RF Connections

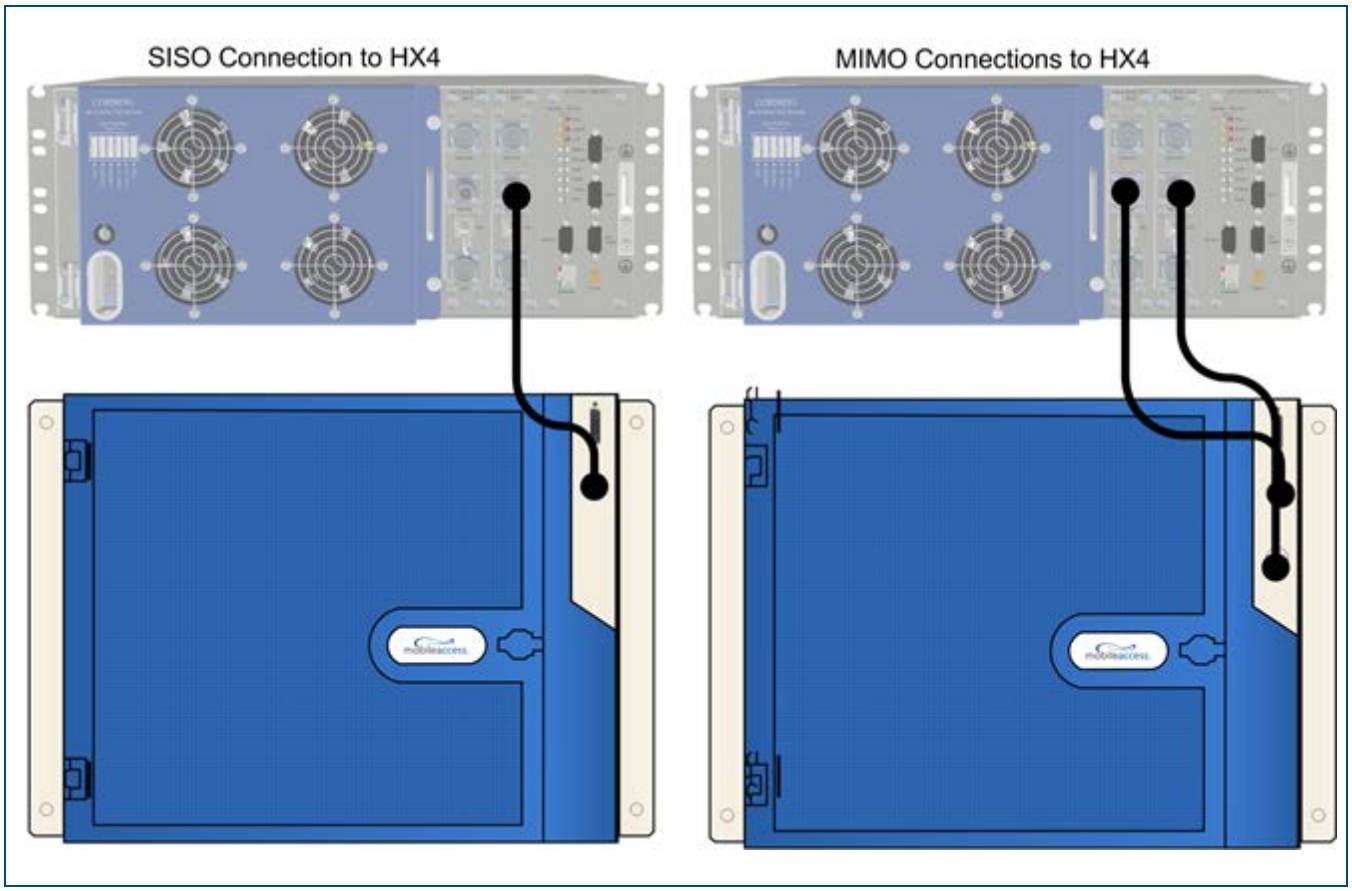
3.3.1.1 RF Connections to HX4 Remote

1. Perform the HX4 service connection as follows:

Connect From Port…		To Port…	
Unit:	HX 2.5 GHz TDD	Unit:	HX4
Port Name:	WB RU	Port Name:	(ANTENNA PORT) Port 1
Port Type:	N-Type duplexed	Port Type:	N-Type duplexed

Table 3-3. HX4 Services Connection

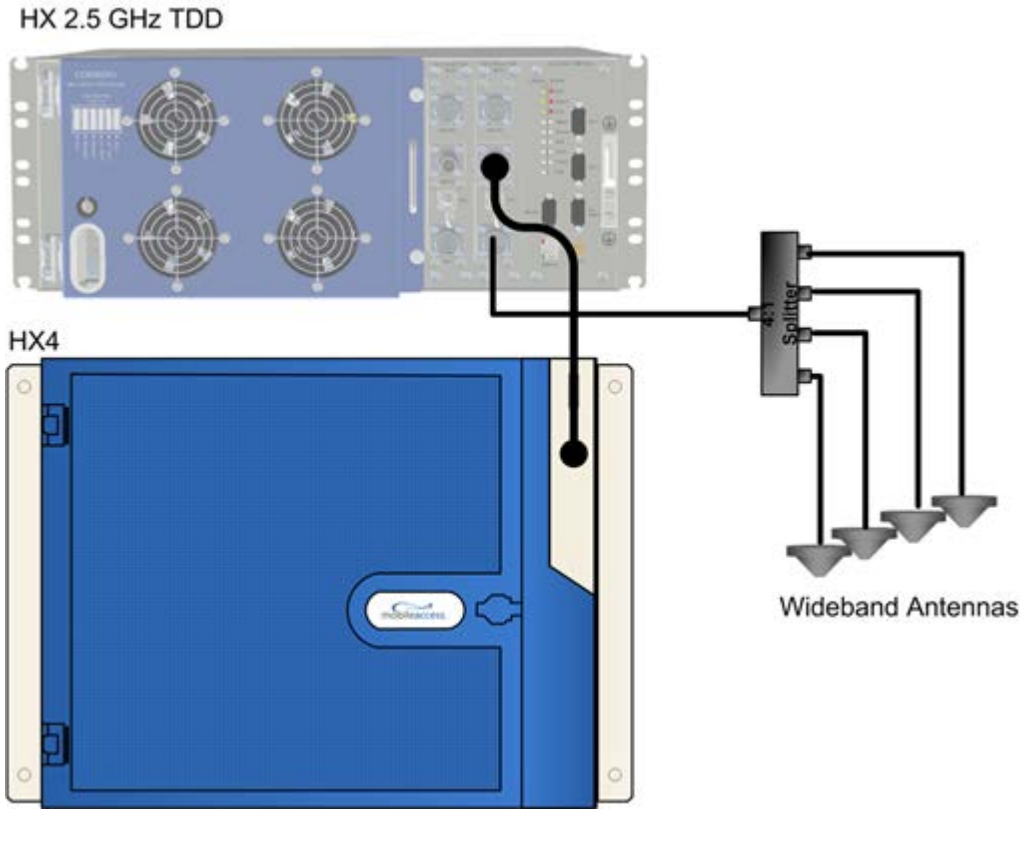
Note: For SISO installations the connections are from HX 2.5 GHz TDD ANT 1 (MUX) "WB RU" port to the HX4 'ANTENNA PORT 1"; For MIMO installations the MIMO 2 Stream connections are performed between the HX 2.5 GHz TDD ANT 2 (MUX) "WB RU" port and the HX4 "'ANTENNA PORT 2".



RF Connections Between HX 2.5 GHz and Existing HX4 (Right-SISO; Left – MIMO) | Figure 3-12

2. Connect broadband antenna coax to the HX-2.5 GHz TDD MUX module “ANT” port (two for MIMO models) and to broadband DAS antennas. Refer to Figure 3-13 for example.

ATTENTION! *Terminate any unused RF ports with a 50 ohm termination load.*



Example of HX 2.5 GHz TDD Antenna Connections (SISO) | Figure 3-13

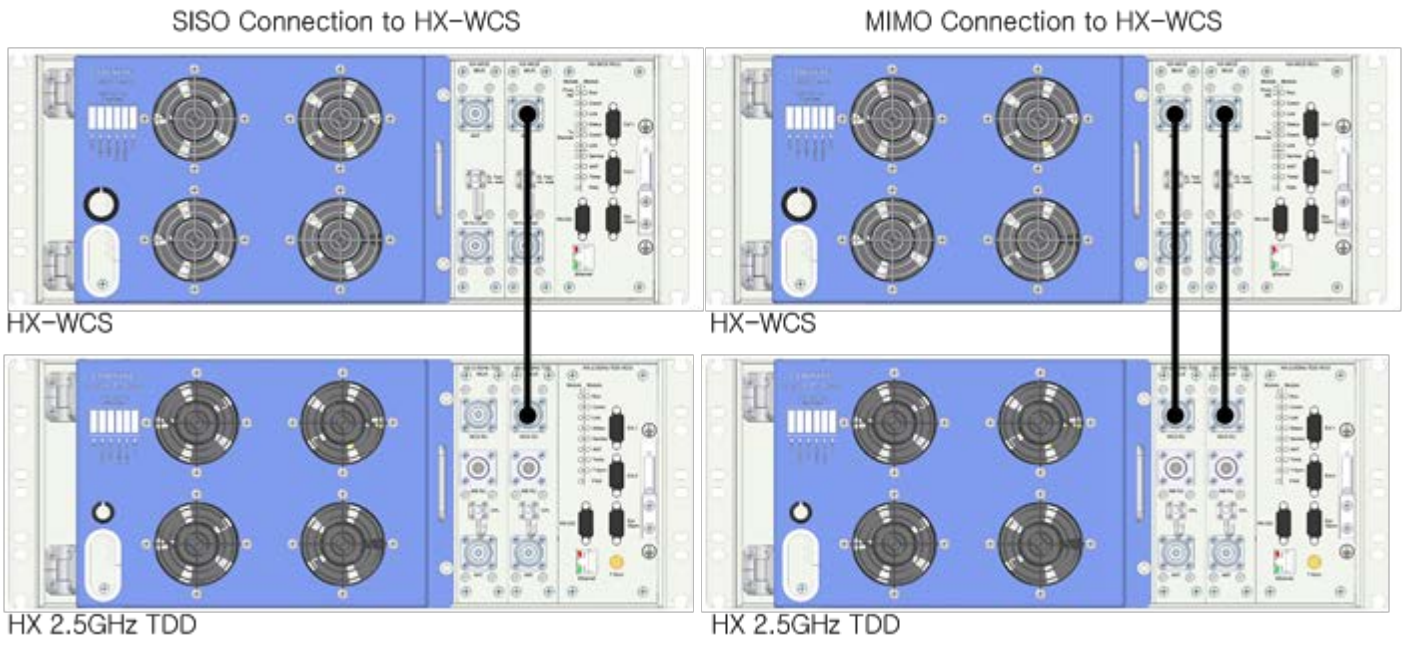
3.3.1.2 RF Connections to HX WCS

1. Perform the WCS service connections as follows:

Connect From Port…		To Port…	
Unit:	HX 2.5 GHz TDD	Unit:	HX WCS
Port Name:	WCS RU	Port Name:	ANT
Port Type:	Mini DIN 4.3-10 Type duplexed	Port Type:	Mini DIN 4.3-10 Type duplexed

Table 3-4. WCS Service Connection

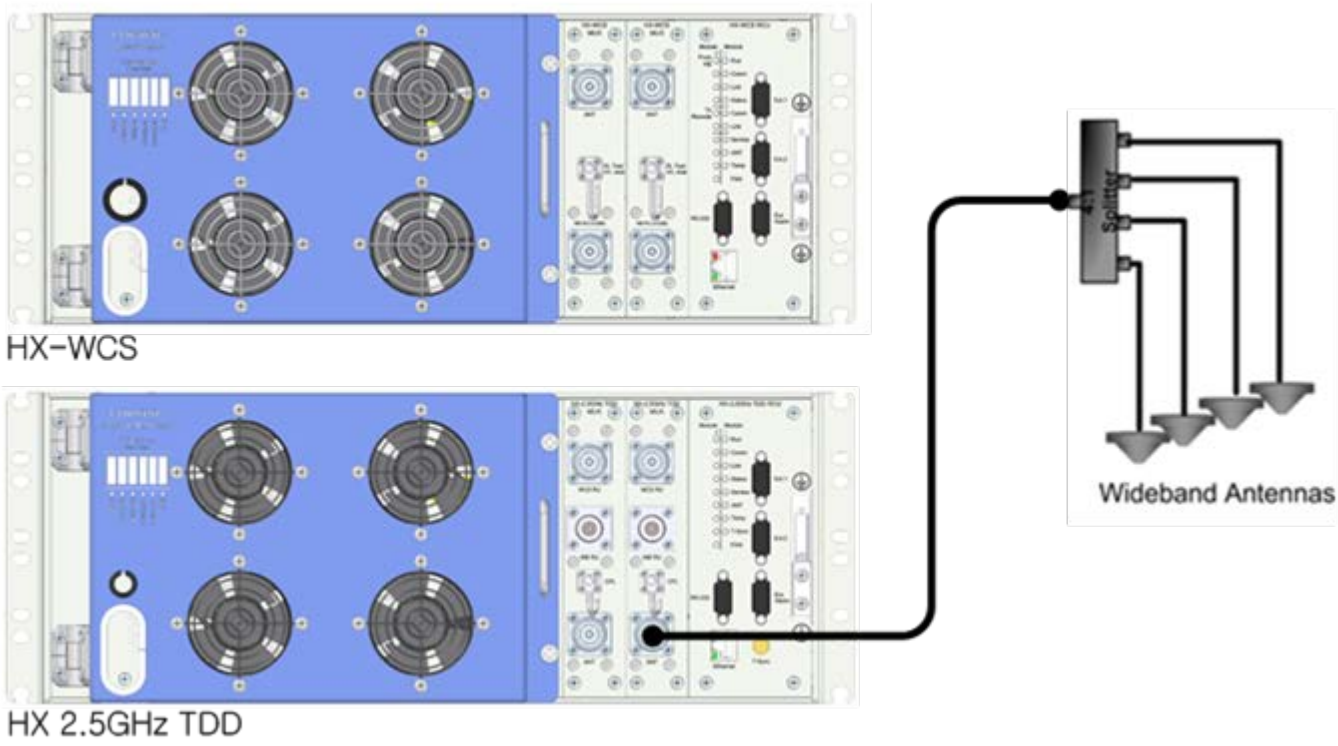
Note: For SISO installations the connections are from HX 2.5 GHz TDD ANT 1 (MUX) "WCS RU" port to the HX WCS ANT 1 (MUX) "ANT" port; For MIMO installations the MIMO 2 Stream connections are performed between the HX 2.5 GHz TDD ANT 2 (MUX) "WCS RU" port and the HX WCS ANT 2 (MUX) "ANT" port.



RF Connections Between HX 2.5 GHz and Existing HX-WCS (Right-SISO;Left – MIMO) | Figure 3-14

2. Connect broadband antenna coax to HX-2.5 GHz TDD MUX module “ANT” port of (two for MIMO models) and to broadband DAS antennas.

ATTENTION! *Terminate any unused RF ports with a 50 ohm termination load.*



Example of HX 2.5 GHz TDD Antenna Connections (SISO) | Figure 3-15

3.3.1.3 RF Connections to MA1000/MA2000 Remote

This section provides instructions on how to perform expansion connections between the HX 2.5GHz TDD unit and an MA1000/MA2000 remote unit. The RF connections between the HX 2.5 GHz TDD unit and an MA1000/MA2000 remote require an EPM unit which interfaces between the HX 2.5 GHz TDD and the service combiner unit (SCU) required for the MA1000/MA2000 remote.

IMPORTANT! Two EPM units are required for MIMO installations – each one connects to one HX 2.5 GHz TDD "ANT." port.

To connect expansion connections

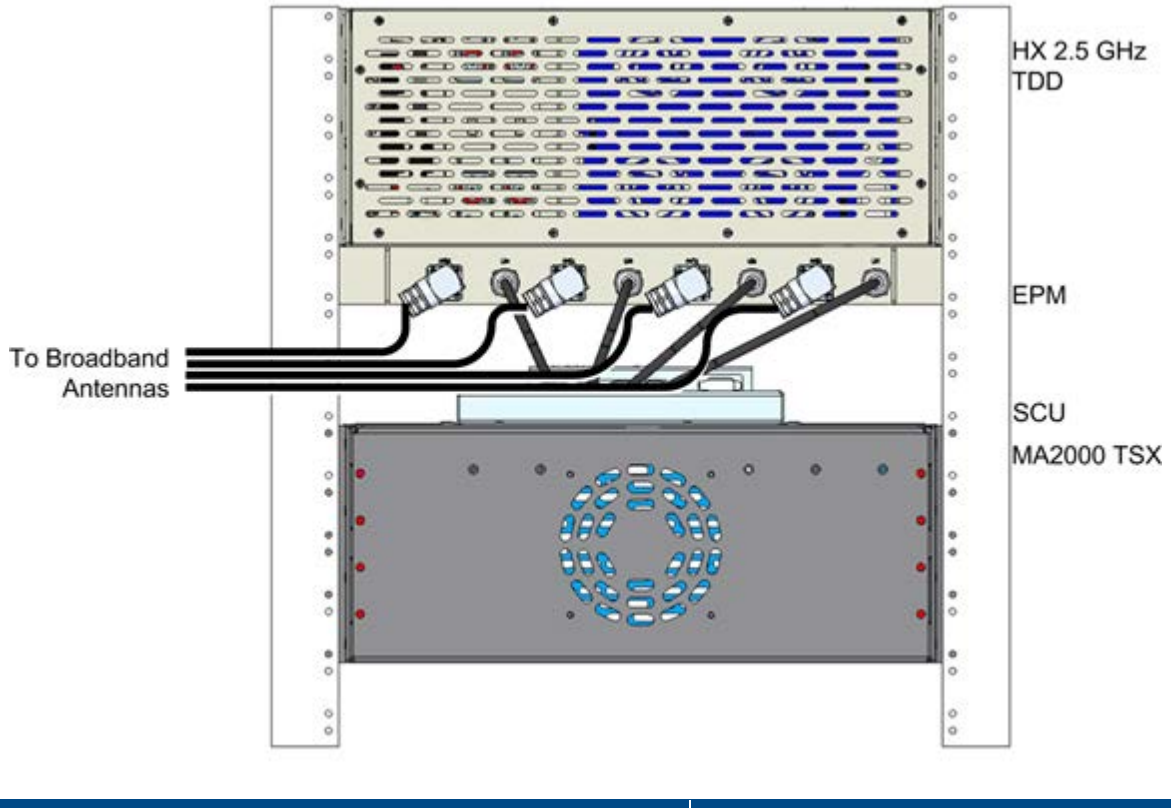
1. Connect the HX 2.5 GHz TDD MUX "ANT" mini 4.3-10 Type duplexed RF port to the EPM front panel high band mini DIN 4.3-10 input port, as shown in Figure 3-16.

Example of Connection between HX 2.5 GHz TDD and EPM | Figure 3-16

2. Connect the four rear panel EPM low-band N-Type input ports to the corresponding SCU N-Type ANTENNA PORTS".

   Note: The location of the SCU "ANTENNA PORTS" differ depending on model:

   - SCU-4/SCU-8 units - antenna ports located on rear panel
   - SCU-F/SCU-FT - antenna ports located on front panel

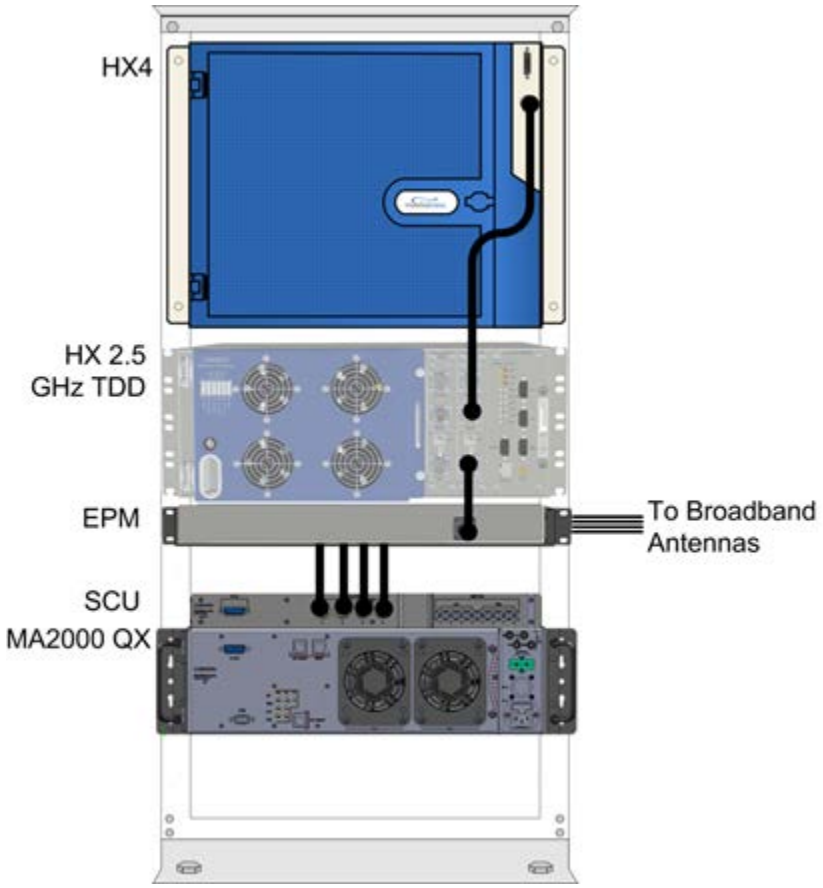


Example of Connections between EPM and MA2000 TSX | Figure 3-17

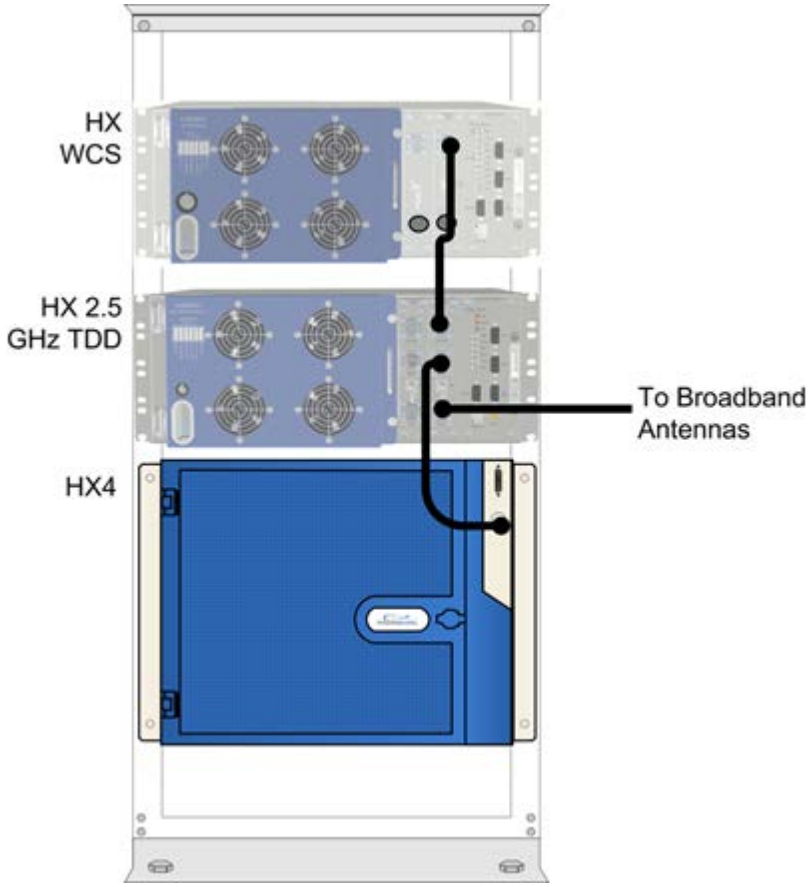
3. Connect the four EPM rear panel Mini DIN 4.3-10 "ANT" output ports to the wideband antennas.

3.3.1.4 Example of Multiple RF Expansion Connections

Figure 3-17 and Figure 3-18 provide examples of connections between an HX 2.5 GHz TDD unit and multiple expansion units.



Example of Connections between HX 2.5 GHz TDD, HX4, EPM and MA2000 QX | Figure 3-18



Example of Connections between HX 2.5 GHz TDD, HX WCS and HX4 | Figure 3-19

3.3.2 Fiber Connections

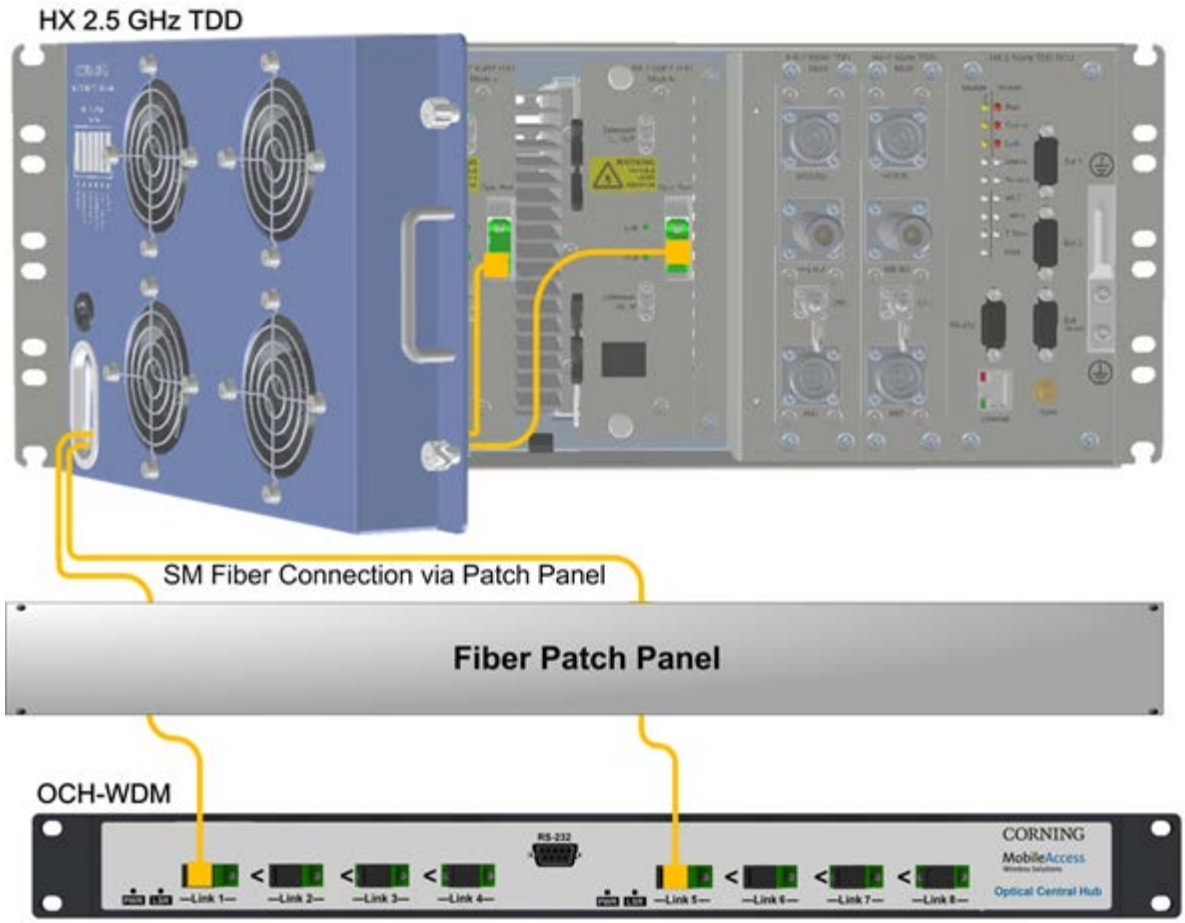
HX 2.5 GHz TDD support single mode fiber connections and interfaces to the OCH-WDM located at the headend via the fiber patch panel.

Note: HX 2.5 GHz TDD supports connections to OCH-WDM, whereas the HX4 and HX WCS support connections to BUs.

To perform fiber connections

Open cabinet door to access HX 2.5 GHz TDD module(s) with the fiber optic interface, route the DL and UL fibers through the front door slot and (see Figure 3-20) and connect the fiber optic cable pigtails from splice box, leading from the OCH port, to the corresponding HX 2.5 GHz TDD module SC APC “Optic Port” (MIMO models include two service modules with fiber connections).

IMPORTANT! *Keep in mind the rules for handling and connecting F/O cables.*



Example of HX 2.5 GHz TDD Fiber Connections to OCH (MIMO) | Figure 3-20

3.3.3 Ground Connection

Required tools and components

The following additional (not supplied) tools and components are required for connecting the system ground:

- Grounding wire - grounding wire should be sized according to local and national installation requirements. The provided grounding lug supports 14 AWG to 10 AWG stranded copper (or 12 AWG to 10 AWG solid) wire conductors.

Note: The length of the grounding wire depends on the proximity to proper grounding facilities.

- Phillips-head screwdriver
- Crimping tool to crimp the grounding wire to the grounding lug.
- Wire-stripping tool to remove the insulation from the grounding wire

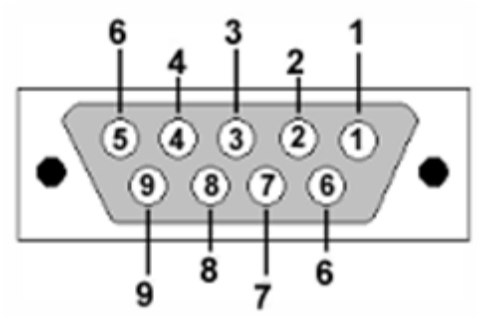
To ground the HX 2.5 GHz TDD remote

1. Use a wire-stripping tool to remove approximately 0.4 inch (10.9 mm) of the covering from the end of the grounding wire.
2. Insert the stripped end of the grounding wire into the open end of the grounding lug.
3. Crimp the grounding wire in the barrel of the grounding lug. Verify that the ground wire is securely attached to the ground lug by holding the ground lug and gently pulling on the ground wire.
4. Prepare the other end of the grounding wire and connect it to an appropriate grounding point at the site to ensure adequate earth ground.

HX 2.5 GHz TDD Grounding Lug | Figure 3-21

3.3.4 External Alarm Connections

The HX 2.5GHz TDD DB-9 “Ext. Alarm” connector supports up to four dry contact alarms for which the polarity field (normally open/normally close circuit) and severity are configured via the Web management GUI (SC-450 v7.2 and higher). Refer to Figure 3-21 and Table 3-5 for connector pin out and description.



HX 2.5GHz TDD External Alarm Connector Pin Out | Figure 3-22

Pin	Description	Wire Color
1	+48v Common	Red
2	Not connected	
3	Not connected	
4	Not connected	
5	Not connected	
6	-48v_Alarm Door	Black
7	-48v_Alarm HEX	Black
8	-48v_Alarm Future	Black
9	-48v_Exist Indication	Black

Table 3-5. External Alarm Connector Pin Out Description

3.3.5 Power Connections

WARNING! *Before connecting or disconnecting ground or power wires to the chassis, ensure that power is disconnected from the DC circuit. To disconnect power, locate the circuit breaker on the panel board that services the DC circuit, and switch the circuit breaker to the OFF position. Verify zero voltage at the power terminals on the chassis before proceeding.*

DC power specifications

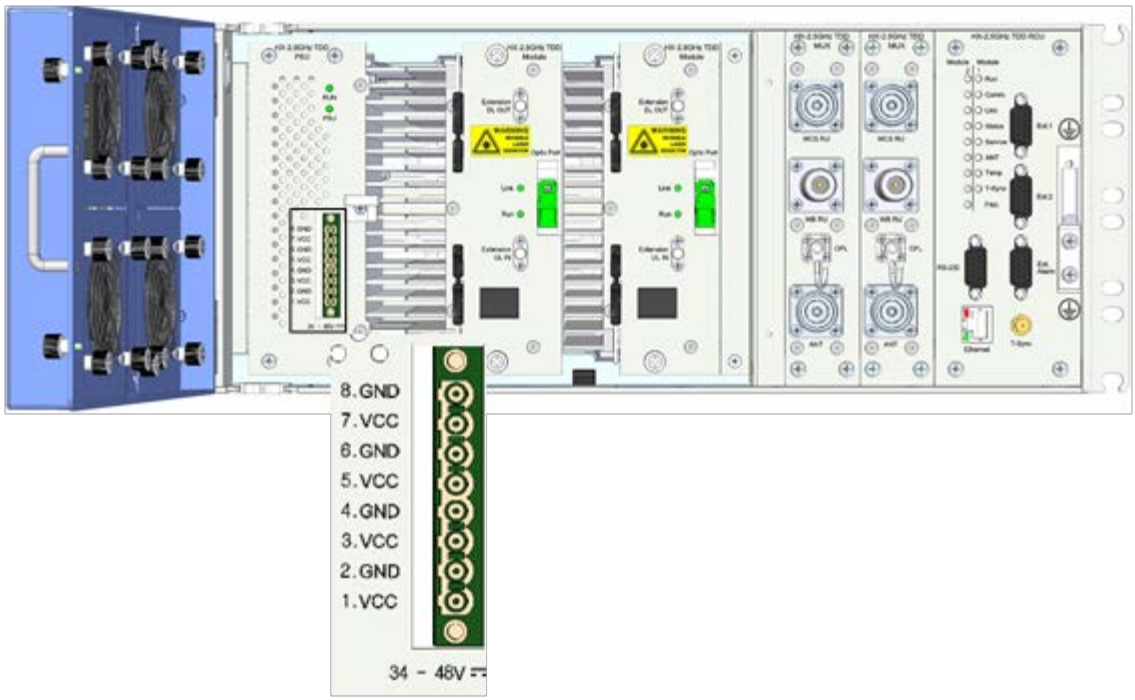
- Power source rating: 34-48 V DC
- Tolerance Voltage : 28-60 V DC
- Max Consumption: SISO = 90 W(3A); MIMO = 150 W(5A)
- Compatible wire size for plug: 30~12 AWG

- No. of required pairs: Minimum of one pair (up to three)
- Max. current consumption for connector: for 20 AWG = 4.5 A; (max. 5A)

To connect DC power:

Note: The internal power connections and other connections should already be connected.

1. Open cabinet door, if not already open, to access Power Supply Unit (PSU).



HX 2.5GHz TDD PSU DC Connector | Figure 3-23

2. Connect the DC wires leading from the power source to the Dinkle 2ESDFM terminal block plug according to indicated pin out on the PSU DC terminal block:
   - Identify the positive and negative terminals on power source feed positions. The wiring sequence is positive to positive and negative to negative.
   - Open the terminal block screw and insert appropriate feed into the terminal block plug
   - Torque the terminal block captive screw (above the installed wire lead), using a ratcheting torque screwdriver. Recommended torque is 0.49N•m.
   - Repeat above steps for all feeds
   - Insert the plug into HX 2.5GHz TDD PSU DC terminal block.

3.4 Verifying Normal Operation

1. Verify that the fans are operational.
2. Verify system normal operation via the system and service LEDs – refer to section 1.4.1 (Table 1-2) and section 1.4.2 (Table 1-4) for LED descriptions.

Note: The HX 2.5GHz TDD monitoring and management capabilities are performed via the host OCH unit. Refer to the SC-450 (v7.2 and higher) User Manual for the configuration and management options.

Appendix A: System Specifications

RF Parameters

Supported Services

Technologies	Frequency Range	
	Band	Uplink and Downlink (Combined)
LTE* 2500	2.5 GHz	2496-2690 MHz

* LTE compiles with 3GPP TS 36.106 V10.6.0 (2012-12) table 9.1 unwanted emission.

RF Parameters per Service Antenna Port

RF Parameters	LTE2500 TDD	
	DL	UL
Max Output Power Per Antenna Port 1 Operator (Composite)[3] (dBm)	33	
2 Operators(dBm)	30	
4 Operators(dBm)	27	
8 Operators(dBm)	24	
Mean Gain (dB)[1]	33	31
Pin[1] (dBm)	0	
Input IP3 (dBm) AGC OFF Typical		-13
Max. Intermod Distortion (dBm)	-13	
NF (dB) Typical		6
RF Output Port Impedance	50 ohm	
Gain Flatness/Ripple (dB)[2]	+/- 1.5	
Output Power Controll range	19 ~ 34dBm	

[1] *Factory set mean gain OCH without RIU. May be field adjusted using controller system.*

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

RF Adjustment

HX 2.5GHz TDD UNIT shall be capable of performing DL RF adjustment upon user request.

Adjustment targets shall be user-configurable within valid working range according to MRD (19 to 34dBm)

A change in adjustment target value shall set "Adjustment Result" to "N/A" (regardless previous adjustment result was "Success" or "Fail")

HX2500-TDD UNIT shall be able to perform successful DL RF adjustment upon the following conditions:

- input power to OCH unit shall be -20dBm on OPTM DL port during calibration
- Optical loss on optical connection is within valid loss range defined
- Successful adjustment shall comply with target RF output power set by user
- Successful adjustment shall update time and date for adjusted device
- Upon failure in adjustment process DCA value shall revert to default state or last good known configuration if available, adjustment date shall be N/A
- Failure in adjustment shall include the information:
- For failure due to overpower : “Adjustment failed due to over power, power exceed max value by (calculate gap between desired value and achieved value)
- For failure due to under power : “Adjustment failed due to under power, power exceed max value by (calculate gap between desired value and achieved value)

Units that was never adjusted shall display N/A in adjustment information fields

#	Alarm name	Severity	Raise	Clear	Event	SNMP	LED
1	DL RF Under Power	Major	(RF Power reading) < (Max output power -20)	(Max output power -18) < (RF Power reading) < (Max output)	yes	yes	service
2	DL RF Over power	Major	(RF Power reading) > (Max output power +2)	(RF Power reading) < (Max output)	yes	yes	service
3	DL RF Over power protection	Major	(RF Power reading) > (Max output power +3)	(RF Power reading) < (Max output)	yes	yes	service
4	DL RF Adjustment	Minor	DL RF Adjustment = Fail	DL RF Adjustment = Success / NA	yes	yes	service

OverPower Protection Mechanism

HX 2.5GHz-TDD have limiter mechanism in order to limit and maintain the output level to level.

DL limiter threshold shall be the same as “Max output target” value and the range shall be at least 6dB.

To prevent HX 2.5GHz-TDD UNIT system from damage due to output over power, an automatic shutdown mechanism shall be implemented into the HX 2.5GHz-TDD UNIT and it shall continuously monitor its output power.

Overpower criteria - In case DL output power is higher than Max output power by more than 3dB for more than 5 seconds or HX 2.5GHz-TDD UNIT Overpower state identified - unit shall turn off service in order to prevent damage.

Recovery from overpower protection shall occur by estimating Output RF power by measuring input power and taking attenuation status into account. If estimated output power is < (Max output power -3) than service shall be recovered.

Power Down Mechanism

- Over Current Protection (OCP)

In order to avoid danger from overcurrent due to output load failure or short-circuit, over current protection is triggered at the range above 110% of maximum output current in which turns the power to output current down. It will automatically recover the current at normal current range (below 100% current load). (RCU + 12V)

In case of SLOT1 and SLOT2, E-FUSE mechanism blocks the current. (3.3A~3.6A/Each mechanism works independently.) and must be recovered by actuating signal of RCU.

- Over Voltage Protection (OVP)

When output current are being operated above the rated voltage within the range of input current, over voltage protection are triggered at 110% ~ 140% of rated output voltage and the device is shut down.

- Input Terminal Circuit Protection

This circuit protects the PSU from being damaged by the over current when inverse polarity are connected to the input terminal.

- Short Circuit Protection(SCP)

Even if circuits are shorted while in operation, short circuit protection protects semiconductor devices within and in case of SLOT1, SLOT2, E-FUSE mechanism blocks the current(3.3A~3.6A/Each mechanism works independently.) and must be recovered by actuating signal of RCU.

RF Parameters for External Wideband and WCS Input Ports

RF Parameters	Wideband RU Inport Port	WCS Input Port
Frequency Range	698 – 2170 MHz	2305 – 2360 MHz
Insertion Loss	0.6 dB	0.8 dB
Isolation	50 dB Min.@ 2496-2690 MHz	50 dB Min.@ 2496~2690 MHz
Return Loss	15 dB Min.	16 dB Min.
Power Rating	Avg.100 W	Avg.100 W

Optical Specifications

Max. Optical Budget	3 dB
Optical Connector	SC APC
Fiber Type	Single-mode: 9/125µm (Minimum qualifications with ANSI/TIA/EIA-568-B series, EN50173-1 or ISO/IEC 11801)
Wavelength	DL: 1310 ± 10 nm (@ 25° C) UL: 1550 ± 10 nm (@ 25° C)
Maximum Distance Between OCH and Remote Cabinet	2 km

Physical Specifications

Interfaces	Chassis: • One mini DIN 4.3-10 Type duplexed antenna ('ANT') port per multiplexer • One mini DIN 4.3-10 Type duplexed ('WCS RU') port per multiplexer (one for SISO and two for MIMO configurations) for interfacing to HX WCS RF input • One N-Type duplexed wideband ("WB RU") port per multiplexer for interfacing to HX4 remote unit • One SMA-Type female 50Ω port for DL test port per multiplexer (one for SISO and two for MIMO configurations) • One female RJ45 Ethernet port for local craft • One DB-9 pin female RS232 console port (engineering GUI) • One DB-9 female external alarm connector for external dry contact alarm connections • Two DB-9 female RS232 console ports (engineering GUI) for connected external RF modules • One SMA type connector for TDD sync monitoring • One two-hole grounding lug compatible with 6 AWG wire • One 8-pin pluggable terminal block DC connector; three VCC and GND pairs Module: • One SC APC optical connector • Two SMA UL/DL Extension Port connectors (future option)
Power	• Power Input: 34-48 V DC • Maximum operating voltage : 28-60 V DC • Max Power Consumption: 90 W (3A)(SISO models); 150 W(5A) (MIMO models)
Physical	Mounting: Wall or 19-in Rack Dimensions (H x W x D): 7.0 x 19 x 15.4 in (176.5 x 492 x 392 mm) Weight: SISO Services configuration: 48 lbs (21.77 kg) MIMO Services configuration: 55.11 lbs (25 kg)
Cooling Feature	Active heat dissipation (Fan)

Environmental Specifications

Operating Temperature	-20° to +60°C (-4° to 140°F)
Storage Temperature	-40° to 85°C (-40 to 185°F)
Humidity	10% to 95%, non-condensing
Ingress protection	IP20; with outdoor enclosure: GR487

Standards and Approvals

Laser Safety	• IEC 60825-1: 2007
Safety	• UL 60950-1
Radio	• FCC CFR47 Part 27
EMC	• FCC CFR47 Part 15
RoHS	• RoHS 6 compliant

Appendix B: Ordering Information

Note: The information listed below is updated up to the document publishing date. Refer to the HX 2.5 GHz TDD datasheet (CMA-461-AEN), which can be downloaded from the Corning Partner Portal, for the most updated ordering information.

HX 2.5 GHz TDD Remote Units

Service Supported	Part Number	Description
2.5 GHz TDD SISO	HX-2500-SISO	MobileAccessHX SISO remote with support for 2500 Spark band
2.5 GHz TDD MIMO	HX-2500-MIMO	MobileAccessHX MIMO remote with support for 2500 Spark band

RIU Conditioner Modules

Part Number	Description
RIU-BTSC-2500	RIU-4 conditioner for 2500 Spark Band; -10 to + 36 dBm input range
RIU-12-CNDTR-2500	RIU-12 Conditioner for 2500 Spark Band; -10 to +36 dBm input range

Upgrade kits

Kit	Part Number	Description
2.5 GHz TDD Module	HX-2500-MODULE	MobileAccess HX 2.5GHz TDD band module for upgrade from SISO to MIMO

Accessory Kits

Part Number	Description
AK-HX-1K2K-HXN-COMB	MobileAccessHX accessory kit combining 1K/2K and HX; External passive module

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