MobileAccess2000 TSX and QSX

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 TSX/QSX 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

MA2000 products have met the approvals of the following certifying organizations:

Company Certification

ISO 9001: 2000 and ISO 13485: 2003

Product Certifications

US

Radio Equipment and Systems:

- 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

EMC

- 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

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

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 and Other Relevant Documentation

This user guide is an addendum to the existing MA2000 User Manual focusing specifically on the physical installation of the MA2000 TSX / MA2000 QSX solutions. Refer to *MA2000 User Manual and Installation Guide* for detailed information on the head-end equipment, installation requirements, etc.

Other relevant documents:

Document Name
MA2000 System Installation and Configuration Guide
MA2000 TSX QSX Datasheet
MA2000 TSX Quick Installation Sheet
MA2000 QSX Quick Installation Sheet
MA2000 Upgrade Quick Installation Sheet
MA2000 TSX QSX Wallmount Quick Installation Sheet
MA2000 TSX QSX Vertical mount Quick Installation Sheet

1   Introduction

MA2000 Tri-Service Package (MA2000 TSX) and MA2000 Quad-Service Package (MA2000 QSX) series are compact, easily installable remote-end enclosures that provide carrier-grade indoor coverage for a number of services over a single, broadband architecture.

TSX supports three services, while QSX supports four services, where TSX units that are already installed in the field can be upgraded to support another service. A wide range of services are supported, including 2G, 3G, and 4G mobile voice and data services, where the combination of services supported by each unit is model dependent.

The TSX and QSX Units are displayed below.

Figure 1-1. MA2000 TSX (left side) and MA2000 QSX (right side)

TSX and QSX units are securely located in the telecommunication closets at each remote location. The units receive the head-end RF service signals via low-loss fiber, filter and reconvert the signals to RF. The RF services are combined and distributed via a passive combiner (SCU-4) to the broadband antennas.
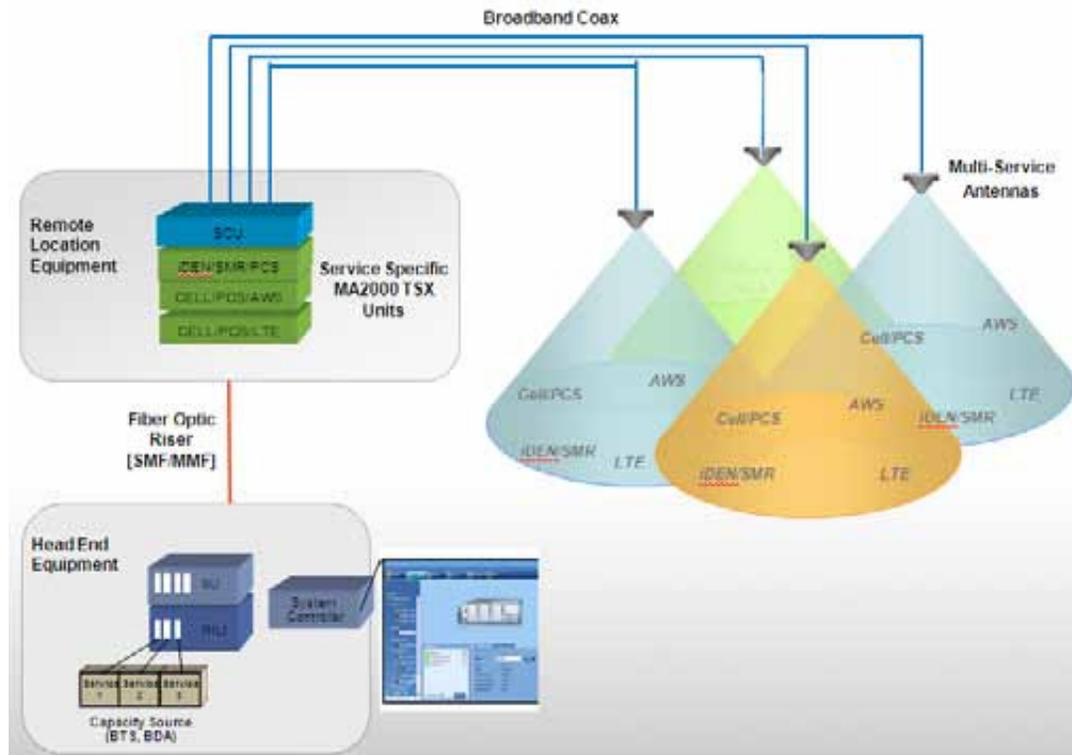

Figure 1-2. MobileAccesss2000 TSX/QSX System Architecture

1.1   Features and Capabilities

- Multi-operator platform - accommodates multiple operator requirements separately, yet cost-effectively across one common infrastructure. Pre-assembled modular service packs improve neutral host ROI for the 1st carrier in, as well as the 2nd and 3rd.

- Multi-service platform that accommodates virtually any mix of wireless services, eliminating the need for separate cabled networks for each. Services include: *GSM, CELL, PCS, iDEN, LMR, SMR, Public Safety, AWS1/3, 700 MHz LTE, Paging, UMTS, DCS, WMTS, and more.*

- Modular design – enables seamless service upgrades with the addition of a conditioning card in the head-end and self-contained service packs in IDF/Telco/IT closets at remote-ends.

- All active components are located in the communication closet/room

- Carrier grade management – Built-in signal grooming and an Element Management System (EMS) offer end-to-end visibility and proactive alarming, ideal for large scale, multi-operator environments.

- Local and remote end-to-end monitoring and control through interface to SC-450 controller

- Conditioning and monitoring of input RF signals at the head-end through interface to MA-RIU

- Scalable Media and MIMO Upgrades - Additional services leverage the existing coaxial cabling and antenna grid without disrupting work spaces or existing services. Fiber links extend a single capacity source across multiple buildings in campus environments. Multi-MIMO upgrades are simple with modular elements.

2   MA2000 TSX/QSX Solution Architecture

The MobileAccess**2000** TSX/QSX solution is comprised of the head-end and remote end elements described in this section.

Note: Third-party equipment is sold separately (i.e. cabling, antennas).
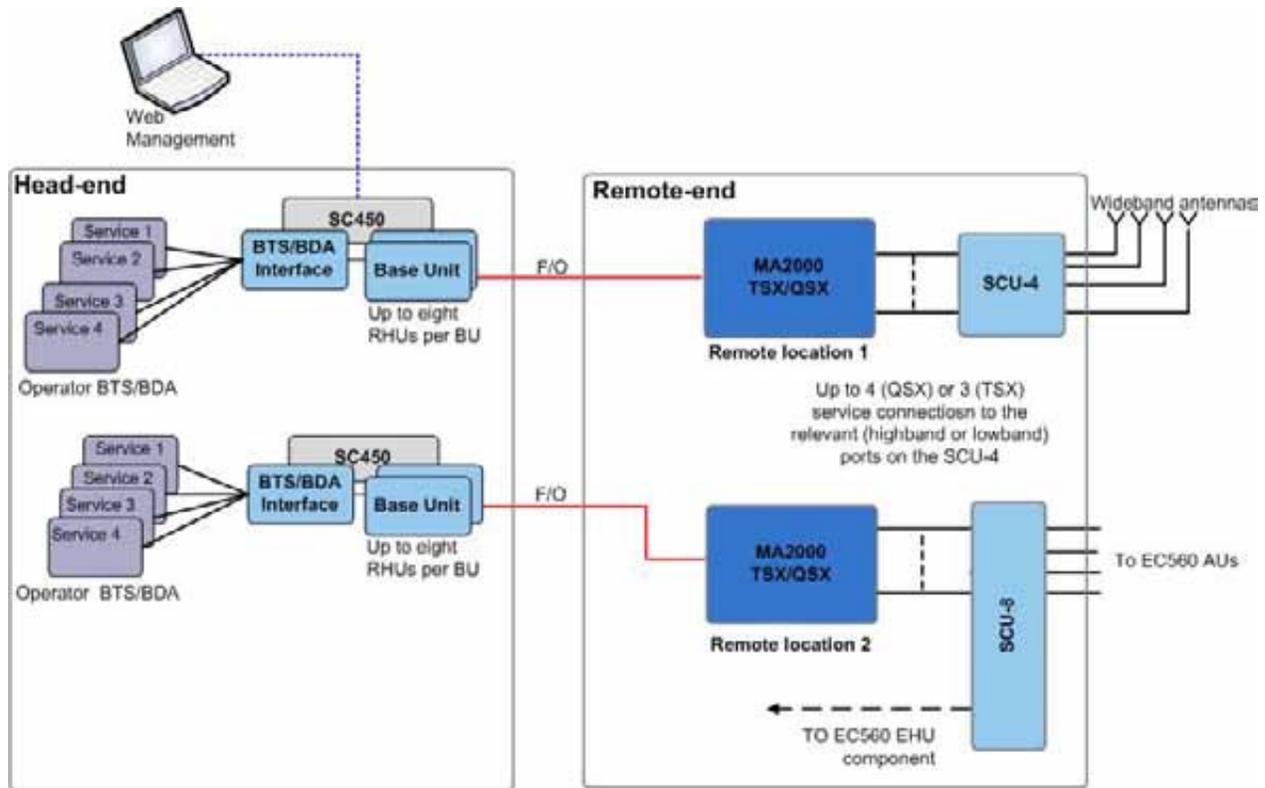
Figure 2-1. MA2000 TSX/QSX Architecture Diagram

2.1.1 Head-End Equipment

At the head-end MobileAccess elements provide interface to the wireless service provider's network, where the signals can be conditioned through an active interface and transported over optic fiber to the remote end.

- **Radio Interface Unit (RIU):** The RIU adjusts the RF signal source from a number of host base-transceiver stations (BTS) or bi-directional amplifiers (BDA) and feeds the conditioned RF signals to the MobileAccess DAS coverage systems

- **Base Unit (BU):** The BU converts RF Downlink (DL) signals received from the RIU into an optical signal and transports them to/from the MobileAccess**2000** TSX/QSX units at the remote site.

- **SC-450 System Controller:** The system controller enables centralized remote management and control of all MobileAccess**2000** elements at the site.

2.1.2 Remote-End Equipment

At the remote end, the MA2000 TSX/QSX units reconvert the optical signal to RF signals which are amplified, filtered and distributed via a passive service combiner unit over the broadband antenna infrastructure. The output of multiple TSX/QSX units can be combined to provide a full multi-service solution over a common fiber/coax antenna infrastructure.

- **MA2000 TSX:** The MA2000 TSX delivers coverage for three RF services

- **MA2000 QSX:** The MA2000 QSX delivers coverage for four RF services (CELL, PCS, 700LTE and AWS). The sub-components of the QSX are equivalent to that of the TSX with an additional AO.

- **Service Combiner Unit (SCU):** A passive module that combines the services from the TSX or QSX and forwards the combined signals to a single broadband antenna infrastructure. Two models are available, depending on the site topology:

  - SCU-4 –supports four (4) Low Band and four (4) High Band connections, used in site topologies where only TSX/QSX services are distributed over the broadband antennas, mounted on top of the TSX/QSX enclosure.

  - SCU-8 - required for site topologies with EC560 solutions (interfaces between the TSX/QSX solution and the EC560 Antenna Units), includes eight (8) Low Band and eight (8) High Band connections, mounted in 19" rack. *The SCU-8 is an integral component of the EC560 solution and the installation procedure is described in the EC560 User Manual.*

2.2 MA2000 TSX Interfaces

This section provides a description of the MA2000 TSX unit internal views and relevant connection interfaces. Refer to the *MA2000 User Manual* for detailed description of internal components (RHU and Add-On).

You will be required to connect:

- Optic fiber to *internal RHU* optic port
- The filter outputs to the Service Combiner Unit (SCU).
- Either AC or DC power

The TSX internal view is given below.
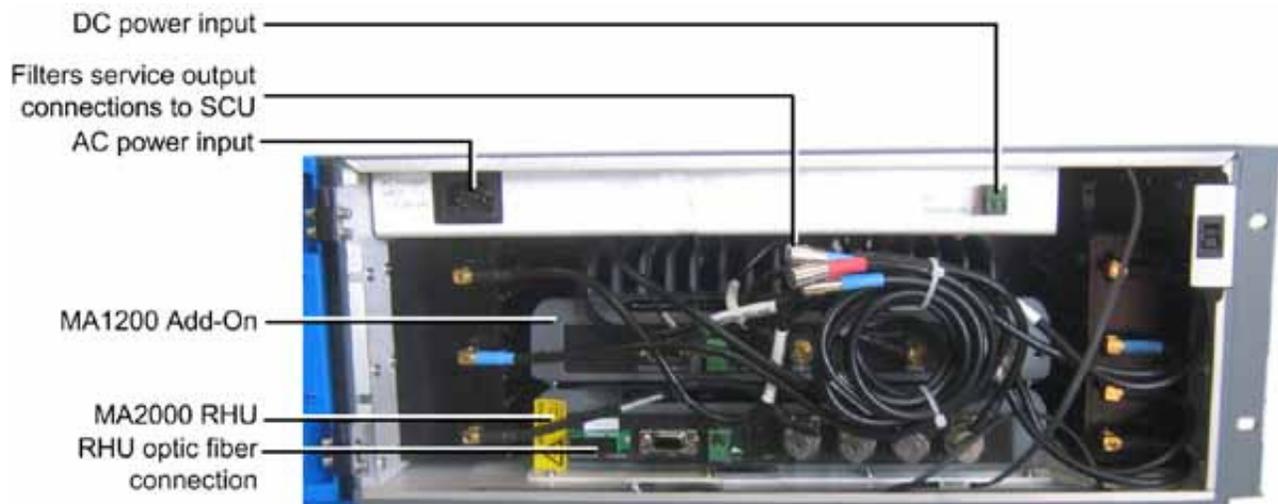
Figure 2-2. MA2000 TSX Open Cabinet View

3

2.3   MA2000 QSX Interfaces

This section provides a description of the MA2000 QSX unit internal views and relevant connection interfaces. Refer to the *MA2000 User Manual* for detailed description of internal components (RHU and Add-On).

You will be required to connect:

• Optic fiber to *internal RHU* optic ports

• The filter outputs to the Service Combiner Unit (SCU).

• Either AC or DC power
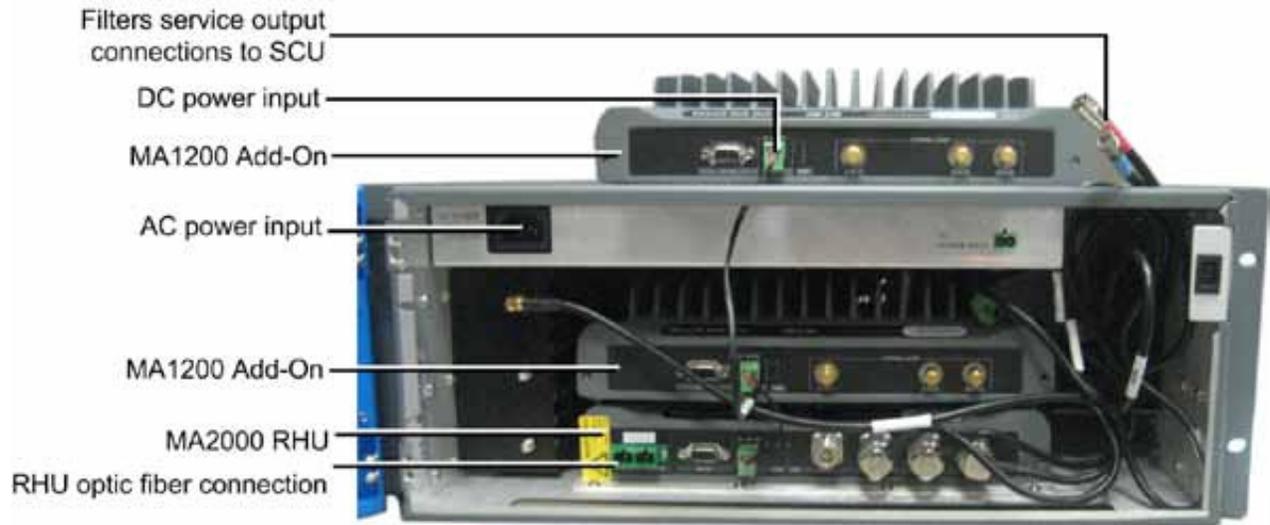
Figure 2-3. MA2000 QSX Open Cabinet View

2.4 SCU-4 Interfaces

This section describes the SCU-4 interfaces:

- Front Panel - consists of a total of eight QMA ports that support 4 low band (P1-P4) and 4 high band (P5-P8) connections to the TSX/QSX solution(s).

- Rear Panel (not shown) – includes the RF antenna connectors that interface to the broadband antennas.
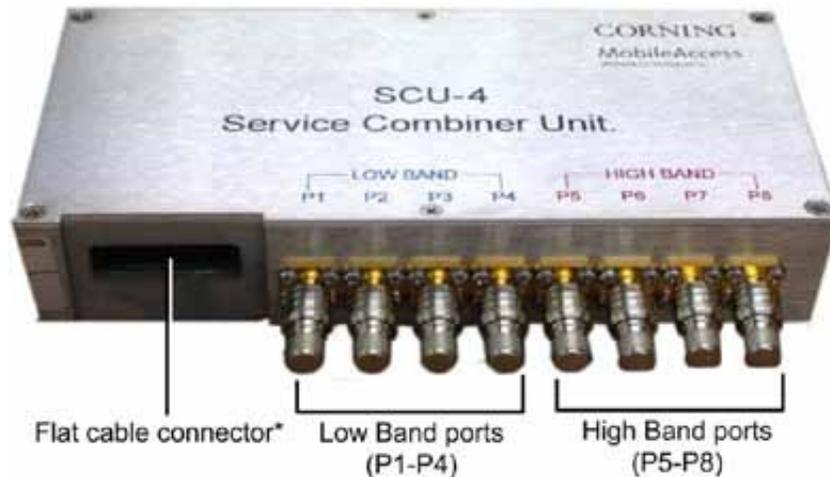

Figure 2-4. SCU-4 (Front Panel)

*Note: The flat cable connector is used for connecting the SCU-4 to an Antenna Monitoring Unit (AMU). See relevant AMU Quick Installation Sheet for details.

3   TSX and QSX Physical Installation and Configuration

This section describes the installation procedure for the MA2000 TSX/QSX solution (same for both enclosure types) with an SCU-4 unit.

Physical installation procedure steps:

1. Assemble SCU-4 on top of TSX/SCX enclosure. See section 0.
2. Connect between TSX/QSX filter outputs and SCU-4 High Band and Low Band ports. See section 3.2.
3. Mount the enclosure – three options:
   - Rack mount (see section 3.3.1)
   - Wall mount (brackets ordered separately). See section 3.3.2.
   - Vertical mount (brackets ordered separately). See section 3.3.3.
4. Perform the following connections:
   - Fiber optic cable to the MA2000 RHU optic port
   - Power to the TSX/QSX power interface
   - SCU RF antenna ports to the broadband antennas. See section 3.4.

3.1 Mounting SCU-4 on Top of TSX/QSX Enclosure

This section describes the SCU-4 mounting for TSX and QSX.

Note: When using multiple 4 Port SCUs, a separate 1U rack shelf may need to be ordered separately to support a second unit.

3.1.1 Mounting SCU-4 on TSX

3.1.1.1 Unpack Package Contents

Check your package contents to verify that the items in the packing list are included:

Note: A Phillips Head Screwdriver is required but is NOT included in the package.

Description	Qty.	Comment
4 Port Service Combiner Unit	1	-
MA2000 TSX Bracket	1	Bracket and accessories for mounting the SCU directly on top of the MA2000 TSX unit.

3.1.1.2 Plan Rack Installation

Note: This section is ONLY relevant for 19" rack mount installations.

1. Verify that the height of the rack can support all of the MA2000 TSX units being installed, as well as additional equipment, SCU, AC or DC power, and space for the broadband coax connection. Also consider room for future expansions.

2. A max of three (3) MA2000 TSX units can be installed above or below the SCU or one (1) MA2000 QSX, depending on the service configuration. However, it is recommended that the MA2000 TSX units are installed below the SCU.

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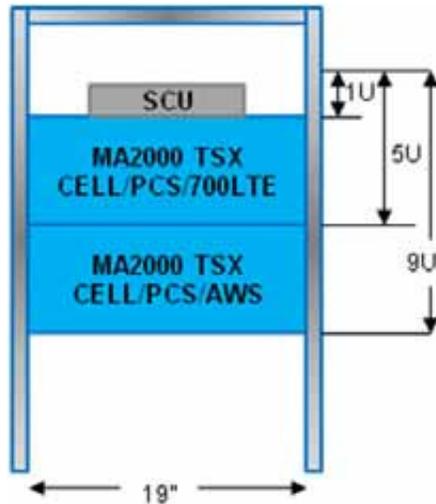

Figure 3-1. Basic MA2000 TSX with SCU-4 Rack Installation Diagram

3.1.1.3 Mount the SCU-4 on top of TSX Enclosure

NOTE: When mounting on SCU-4, be sure to mount on the top most MA2000 TSX unit.

1. Mount the SCU-4 unit on to the supplied bracket using the provided (4) screws.

2. Align the SCU-4 bracket holes (2 on each side of bracket) with the (4) top cover holes adjacent to the slot.

3. Mount the SCU-4 assembly with the SMA connectors facing the front of the Tri-Band Package (Facing the top cover slot).
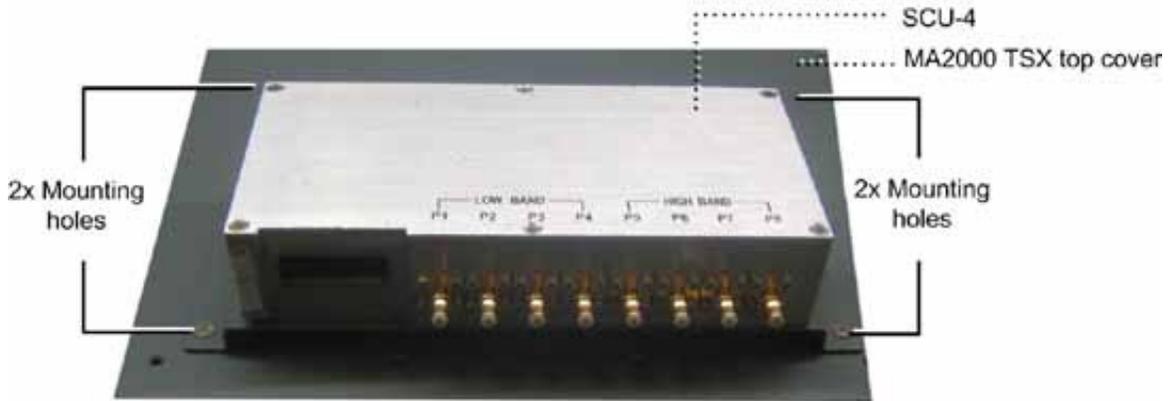

Figure 3-2. SCU-4 Mounted on TSX Unit

3.1.2 Mounting SCU-4 on QSX

3.1.2.1 Unpack Package Contents

Check your package contents to verify that the items in the packing list are included:

Note: A Phillips Head Screwdriver is required but is NOT included in the package.

Description	Qty.	Comment
MA2000 QSX Bracket	1	Bracket and accessories for mounting the SCU directly on top of the MA2000 QSX unit.
Screws	8	4 x Used for mounting SCU-4 on bracket 4 x Used for mounting SCU-4 and bracket assembly on QSX

3.1.2.2 Plan Rack Installation

Note: This section is only relevant for 19-in rack mount installations.

1. Verify that the height of the rack can support the MA2000 QSX unit being installed, as well as additional equipment, SCU, AC or DC power, and space for the broadband coax connection. Also consider room for future expansions.

2. One SCU-4 unit supports a single MA2000 QSX unit.

3. To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack and that the rack is loaded from the bottom to the top.
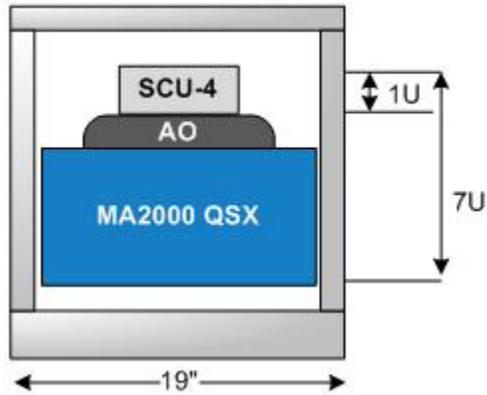
Figure 3-3. Basic MA2000 QSX with SCU-4 Rack Installation Diagram

3.1.2.3   Mount the SCU-4 on top of the QSX Enclosure

1. Mount the SCU-4 unit on to the supplied bracket using 4 appropriate screws (provided).
2. Align the SCU-4 bracket holes (2 on each side of bracket) with the (4) top cover holes adjacent to the slot.
3. Mount the SCU-4 assembly with the SMA connectors facing the front of the Quad-Band Package (facing the top cover slot).
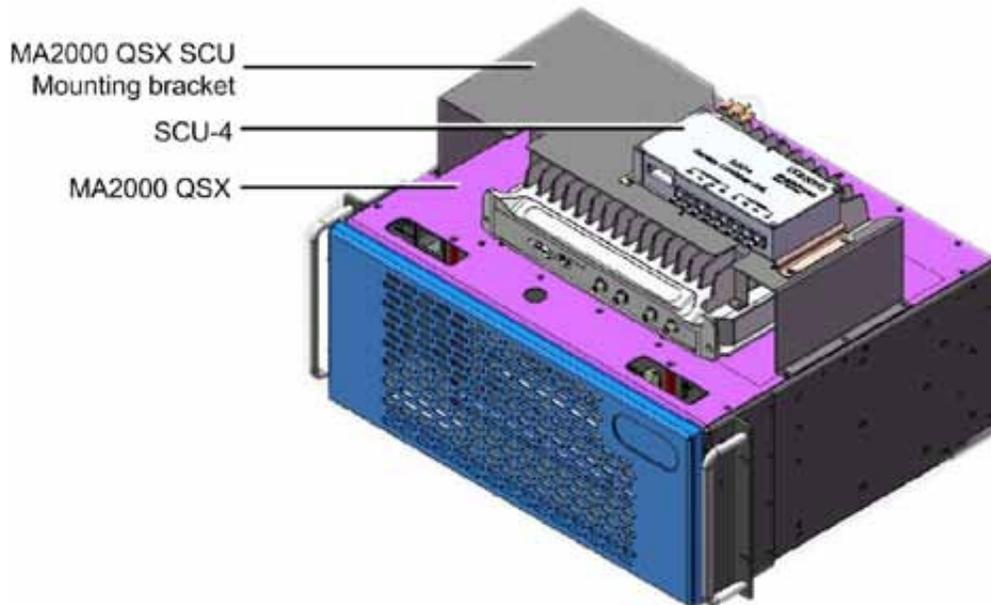

Figure 3-4. SCU-4 Mounted on QSX Unit

3.2   MA2000 TSX/QSX and SCU-4 Connections

The QMA cables on the MA2000 TSX/QSX units are color coded such that the RED cables connect to the High Band ports of the SCU and the BLUE cables connect to the Low Band ports of the SCU.

Below are recommendations on specific Low Band/High Band ports (#1-8) of the SCU to connect to based on the MA2000 TSX/QSX unit.

Service	Applicable MA2000 TSX Part Number	MA2000 TSX Cable	SCU-4 Port (In order of Preference)
700 MHz LTE	2000(M)-C85P19L70-x-TC-x	Low Band (BLUE)	Low Band Port 4
CELL	2000(M)-C85P19xx-x-TC	Low Band (BLUE)	Low Band Port 1, 4, or 2
700/800 MHz Public Safety	2000(M)-P71S80xx-x-TC	Low Band (BLUE)	Low Band Port 2 or 1
SMR 800 (iDEN 800)	2000(M)-S80S90xx-x-TC	Low Band (BLUE)	Low Band Port 3
SMR 900 (iDEN 900)	2000(M)-S80S90xx-x-TC	Low Band (BLUE)	Low Band Port 2
PCS	2000(M)-C85P19xxx-x-TC	High Band (RED)	High Band Port 5, 6, or 8
AWS	2000(M)-C85P19xxx-x-TC	High Band (RED)	High Band Port 7

3.3   Mounting the TSX/QSX Enclosure

There are three types of mounting options available for the MA2000 TSX/QSX solutions:

- Rack Mount – enclosures are pre-assembled with 19" rack ears. See section 3.3.1.
- Wall Mount – wall mount brackets enable mounting the TSX/QSX enclosure parallel to the wall (brackets ordered separately: AK-TC-ENC-WMT). See section 3.3.2.
- Vertical Mount – vertical mount brackets enable mounting the TSX/QSX enclosure in a vertical position on the wall (brackets ordered separately: AK-TC-ENC-WMT-V – TSX). See section 3.3.3.

3.3.1   Rack Mount Installation

To mount the unit in a 19" rack

1. Insert each MA2000 TSX/QSX unit in the 19" rack. It is recommended to install the bottom unit first working your way to the top, where the SCU mounted on top. Refer to Figure 1 in Step 1.
2. Open the doors of all the installed MA2000 TSX/QSX units. If needed, the doors can be removed from the enclosure by lifting it from the hinge on the left.

3.3.2 Wall Mount Installation

NOTE 1: The maximum weight that the MA2000 TSX/QSX wall mount bracket can hold is equivalent to a single MA2000 TSX unit + a single Add-On RF module (~48lbs).

NOTE 2: When mounted to the wall, there will be approximately 60mm (2.36") of space between the wall and the back of the MA2000 TSX unit.

3.3.2.1 Package Contents

Check your package contents to verify that the items in the packing list are included.

Note: A Phillips Head Screwdriver is required but is NOT included in the package.

Description	Qty.	Item
Wall Mount Brackets	2	
8-Port Service Combiner Unit (SCU-8) Brackets (Optional)	2	
Screw: 4-40x1/4', Flat Head Phillips	12	
Screws: 6-32X5/16' Flat Head 100', Phillips	16	

Below are the Front, Side and Top views of the Wall Mount Brackets. All dimensions are in millimeters (mm).
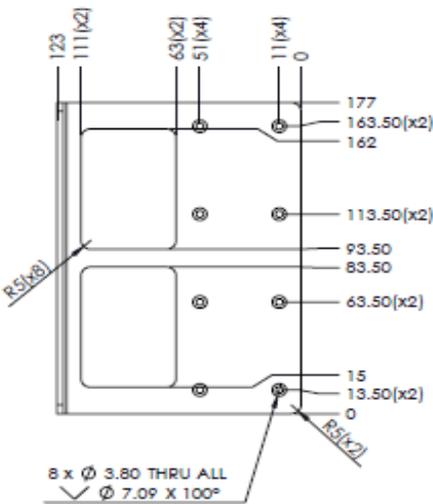

Figure 3-5. Top View of Brackets
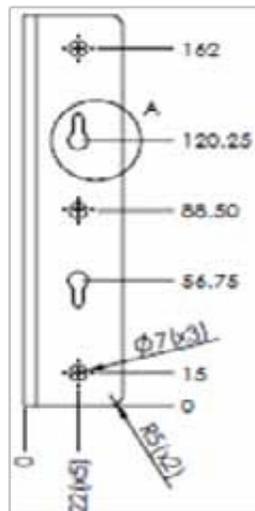

Figure 3-6. Front View of Brackets
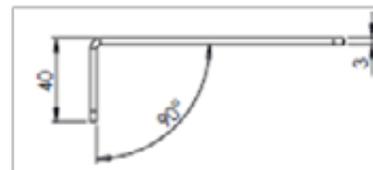
Figure 3-7. Side View of Brackets

3.3.2.2 Wall Mount Procedure

To mount the MA2000 TSX/QSX unit on the wall

1. Mark and drill the installation holes on the wall using the bracket as a guide:
   • Holes **B** & **D** are used for drilling 2 concrete anchors in to the wall.
   • Holes **A**, **C**, and **E** are used for securing the brackets to the wall after hanging the assembly on the anchors.
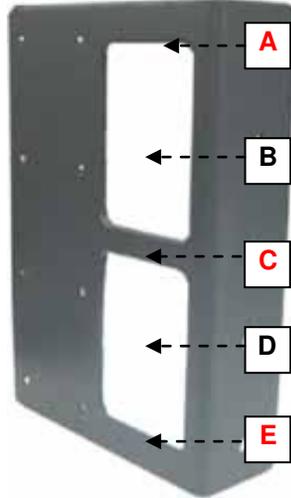
Figure 3-8. Holes for Securing Bracket to Wall

2. Assemble the brackets to the MA2000 TSX/QSX enclosure as follows:
   • Align the bracket installation holes with the eight (8) holes closest to the rear of the cabinet, as shown in Figure 3-9.
   • Secure bracket to side of TSX/QSX cabinet using eight (8) 6-32X5/16' Flat Head 100', Phillips screws (supplied), as shown in Figure 3-10.

Figure 3-9. Holes for Securing Wall Mount Bracket

Figure 3-10. Bracket Mounted on Side of TSX cabinet

3. Hang the assembly on the anchors and secure to wall using the (3) additional holes (screws not supplied).

Secure to wall using appropriate screws

Hang assembly on anchors with these holes

Figure 3-11. Bracket Mounted on Side of MA2000 TSX

3.3.3 Vertical Mount installation

3.3.3.1 Package Contents

Verify that the items listed below are included in your kit.

Description	Quantity	Item
Vertical Mount Bracket for MA2000 TSX/QSX units	2	
Screw,4-40X5/16',Flat-HD, 100', Philips, Nerosta	16	
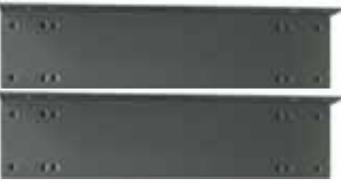
3.3.3.2 Vertical Mount Procedure

NOTE: The procedure is the same for both TSX and QSX enclosures. The QSX is shown here as an example.

To mount the MA2000 TSX/QSX unit vertically on the wall

1. Remove the pre-assembled rack ears from the sides of the MA2000 TSX/QSX cabinets.

NOTE: These can be saved for later use if required.

Rack ears (on each side)

Figure 3-12. MA2000 TSX/QSX Rack Ears

2. Assemble the vertical mount brackets:

NOTE: You may want to mark the mounting holes on the wall (according to brackets) prior to assembly.

Using the provided screws (8 per bracket) secure a bracket to each side of the cabinet as shown in the following figures.


Vertical Bracket

MA2000 QSX
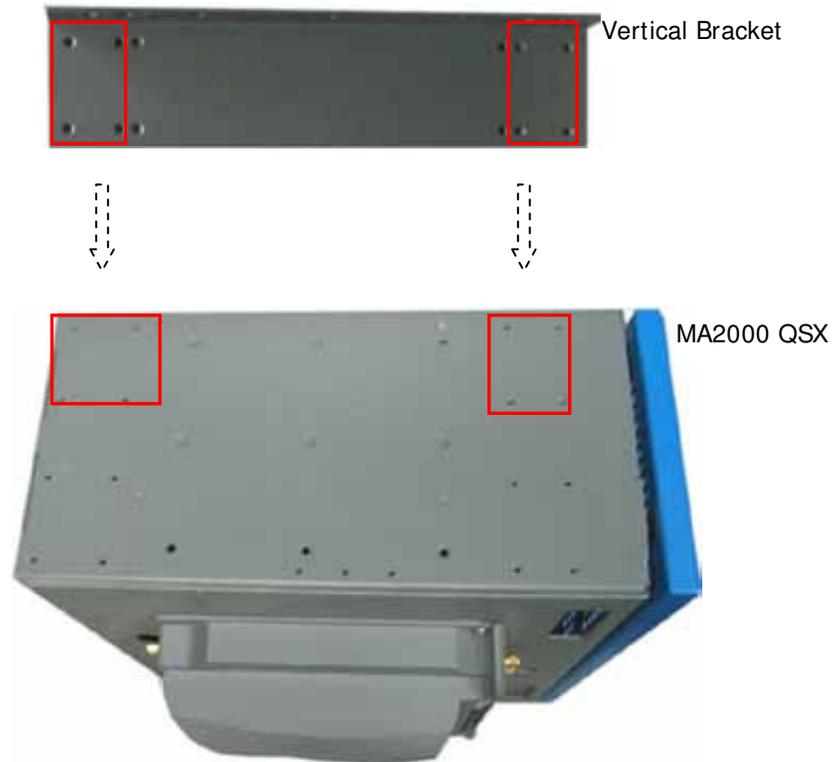
Figure 3-13. Location Assembly of Bracket on Enclosure

Figure 3-14. Both Vertical Brackets Assembled on Enclosure Sides (Underside View)

3. Select appropriate location on wall for the MA2000 TSX/QSX unit.

    NOTE: The vertical mount brackets include mounting holes for hanging on or screwing unit to wall.

    Verify that:

    - There is enough free space around the unit for ventilation
    - Location enables opening the enclosure door to the side. Refer to Figure 3-15.

4. (If not already marked) Mark the mounting holes on the wall according to the bracket holes and dill appropriate holes.

5. Mount the MA2000 TSX/QSX unit on the wall as shown in the following figure.
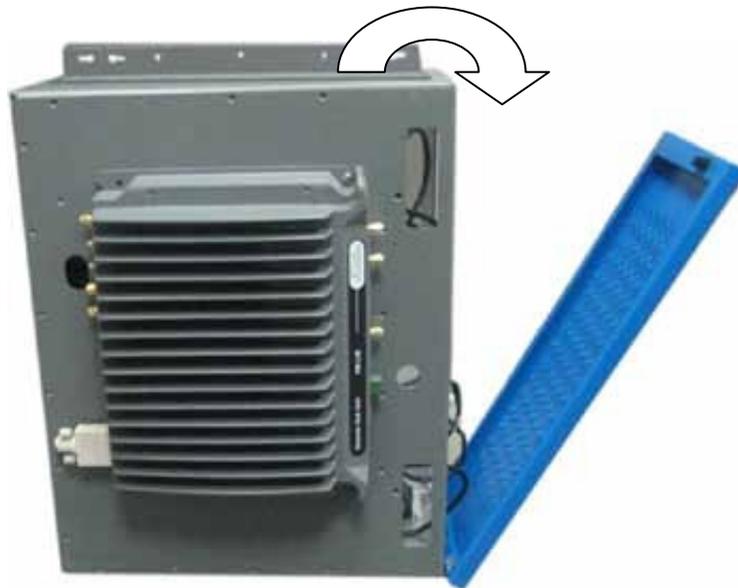
Figure 3-15. Front View of MA2000 QSX Mounted Vertically on Wall

3.4   MA2000 TSX/QSX Connections

After mounting the MA2000 TSX/QSX unit, perform the following connections:

1. Connect the fiber optic cable to the RHU subcomponent's SC/APC connector for each MA2000 TSX/QSX unit. See section 0 for Multimode Fiber (MMF) qualifications.

2. Connect the power source to the corresponding MA2000 TSX/QSX AC or DC connector.

    MA2000 TSX and QSX power requirements:

Local Power	MA2000 TSX	MA2000 QSX
Local Power	100-240VAC (Integrated AC/DC converter)	100-240VAC (Integrated AC/DC converter)
Remote Power	25 to 48VDC	25 to 48VDC
Max. Power Consumption	77W	118W

Note: The TSX/QSX is powered by an AC adaptor power supply (AC voltage is provided directly to the adaptor), so separate grounding is not required for this installation. In compliance with UL and TUV safety (Standard: UL60950-1:2003).

3. If previously removed – replace enclosure door.

4. (Optional) - Place a label on the outside of each door identifying the supported services.

5. Connect the broadband coax to the rear N-Type connectors of the connected SCU via a jumper cable.

4   Upgrading MA2000 TSX with AWS Add-On

This section provides information on how to upgrade an existing MA2000 Tri-Service package (TSX) with an AWS AO (Add-On) unit, making it a QSX unit.

Note: This information can also be found in the MA TSX Upgrade Quick Installation Sheet provided with the upgrade kit.

Please note the following:

- This procedure requires *removing the current TSX cabinet from the rack,* reconnecting the CELL-PCSH and LTE700 AO RF connections and replacing the cabinet top cover.
- SCU-4 cannot be assembled together with an AWS AO – on the same TSX unit. (If relevant, re-mount the SCU-4 on another TSX unit or on the wall).
- The rack installation may need to be re-planned when mounting an AO unit on the TSX cabinet.

Upgrade procedure steps:

1. For rack installations – re-plan the rack installation if necessary.
2. Prepare the unit for upgrade – remove top cover and tray.
3. Change CELL-PCSH and LTE700 AO Unit Connections for Quad-Band.
4. Re-assemble top tray.
5. Assemble new top cover.
6. Mount AWS Add-On unit on enclosure.
7. Perform AWS Add-On RF connections.
8. Perform power connections
9. Tie and secure cables.
10. Mount the assembly.
11. Connect High-Band and Low-Band QMA cables to SCU.
12. Replace and/or close door of the unit.

4.1 Package Contents

Please verify that the kit includes the following items:

Note: A Phillips Head Screwdriver is required but is NOT included in the package.

| Kit	Item	Qty	Description	Item Image
AWS Add-On	AWS Add-On Unit	1	Installed on the new top cover.	
MA2000 accessory kit to upgrade TSX tri-band to quad band	Top Cover Case for quad-band	1	Replaces the existing top cover.	
	Screws, 6/32 x 5/16', FLAT HD, Philips	16	Used for securing top cover to cabinet	
	Screw, 8/32 X 1/2, PAN HD, Philips	4	Used for securing AWS Add-on unit to top cover	
	SPI D-TYPE/F 9 PIN Cable for quad-band with diodes	1	Used for AWS Add-On Control connection	
	Coax Cable CON. SMA-R.A to CON.SMA-R.A L=60mm	2	Used for LTE AO UL and DL connections	
	Cable QMA to SMA R/A , RG233, L=1100MM-Low Band	1	Used for connecting LTE700 AO Low Band port	

4.2 Plan Rack Installation

Verify that the height of the rack can support the MA2000 TSX with mounted Add-On unit on top.

Notes:

- *Each SCU-4 unit supports a single QSX.*

- *If the TSX cabinet includes a 4 Port Service Combiner Unit (SCU-4), relocate the SCU-4 and mount it on either a different TSX cabinet or on the wall.*

4.3   Prepare TSX Unit for Upgrade

1. Remove the TSX cabinet from the rack.

2. Remove top cover of the TSX cabinet. The tray with the power supply connections to the internal modules will be uncovered.

3. Refer to Figure 4-1 - (temporarily) remove the tray:

    - Cut cable ties
    - Disconnect all power supply connectors
    - Unscrew the top tray screws (9) securing the tray to the left (Figure 4-2) and rear Figure 4-3) cabinet walls and remove the top tray from the housing.

Cut ALL cable ties and disconnect ALL connectors.
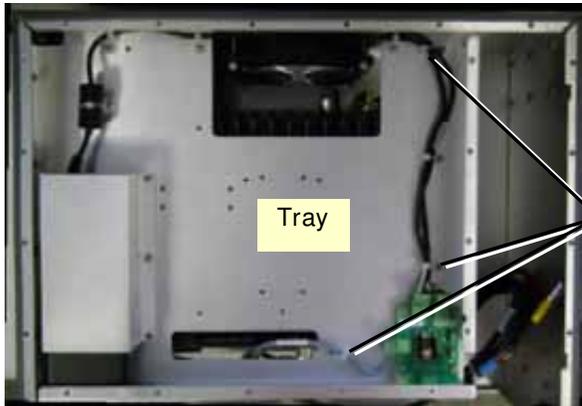
Figure 4-1. Top View of Tray Connections

Figure 4-2. Side View of cabinet – remove screws

Figure 4-3. Rear View of cabinet – remove screws

4.4 Modify CELL-PCSH and LTE700 AO Unit Connections for Quad-Band

The following shows a block diagram of the CELL-PCSH/LTE700 AO/AWS AO connections.
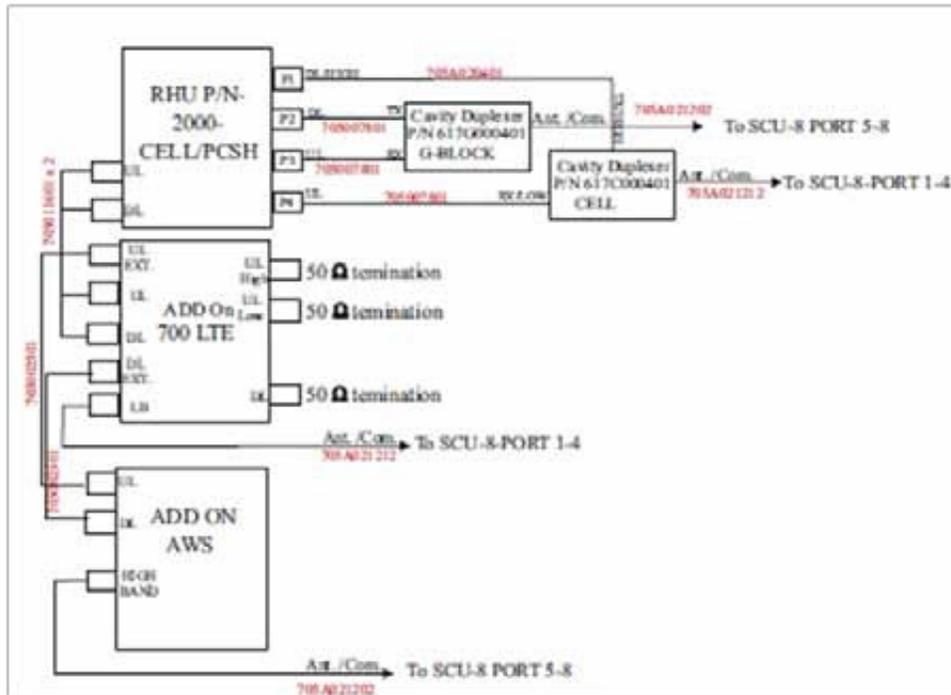
1. Disconnect the UL and DL RF and SPI cables interconnecting the CELL-PCSH RHU and LTE700 AO units.

2. Refer to Figure 4-4 and perform the following connections:

• Connect the supplied QMA to SMA RF Low Band cable to the LTE700 rear panel **Low Band** port.

• Connect the supplied UL and DL RF cables to the corresponding LTE700 AO UL and DL Expansion ports (on rear panel).

   Note: The UL and DL RF cables should be connected so that the labels face the top of the cabinet (towards the AWS AO).
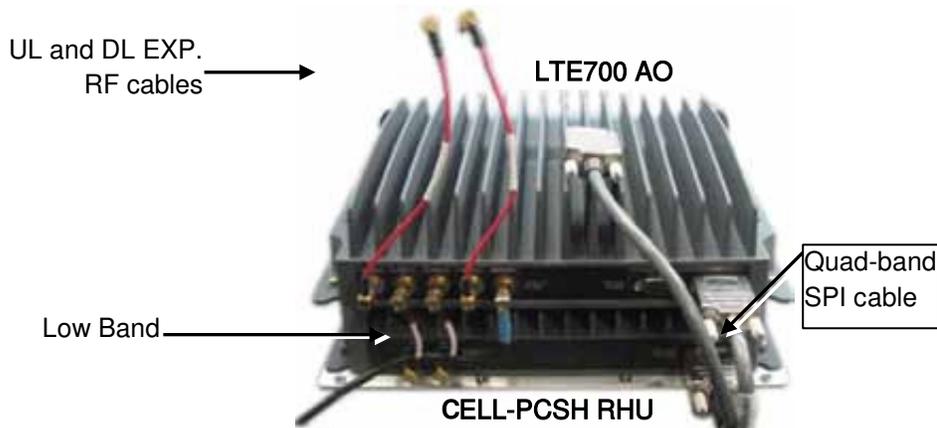
Figure 4-4. RHU and AO Units

4.5 Re-assemble Top Tray

1. Position top tray (with fan and power supply) above the tri-band assembly and secure with the (9) screws previously removed in section 0 -

Prepare TSX Unit for Upgrade.

2. Assemble the following components (shown in Figure 4-5):

    • Power supply adapter and supporting bracket
    • DC distribution card
    • Base strip and hardware and filters

3. Reconnect power cable to DC board J3 connector.

4. Route the cables and tie them with the supplied nylon ties.

5. Screw the top tray screws (9) securing the tray to the left (Figure 4-2 and rear (Figure 4-3) cabinet walls.

Location of 9 screws securing
tray and cable ties

Top tray

PS adapter
and bracket

Filter

DC card

Figure 4-5. Re-assembled Top Tray

Power cable connection
to DC board
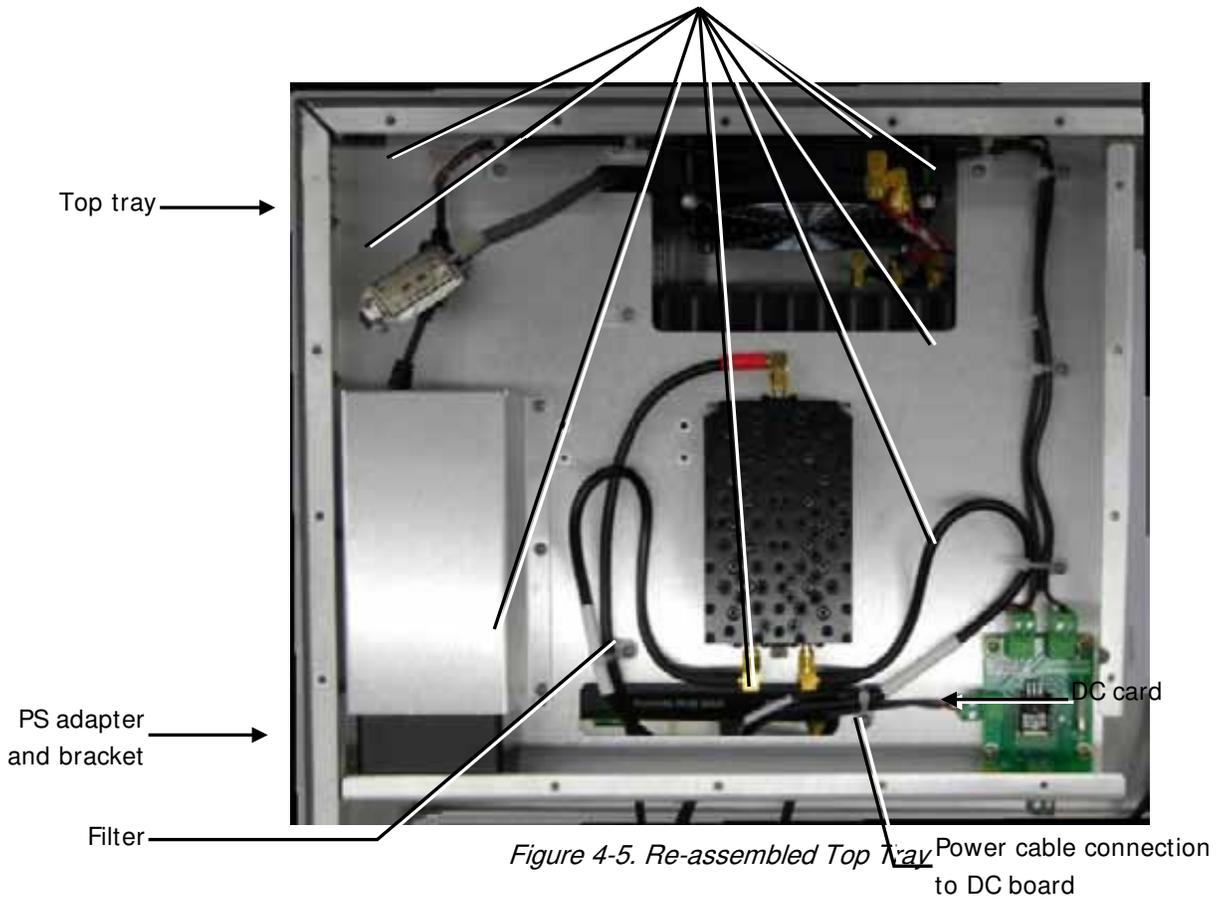
4.6   Assemble New Top Cover

1. Place the new top cover on the cabinet with the *two rectangular openings facing the front*.
2. Make sure that the DB-9 SPI cable, DC and coax cables are routed out through the corresponding openings in the top cover.
3. Assemble the top cover using 16 6/32 x 5/16', FLAT HD, Philips screws (supplied).
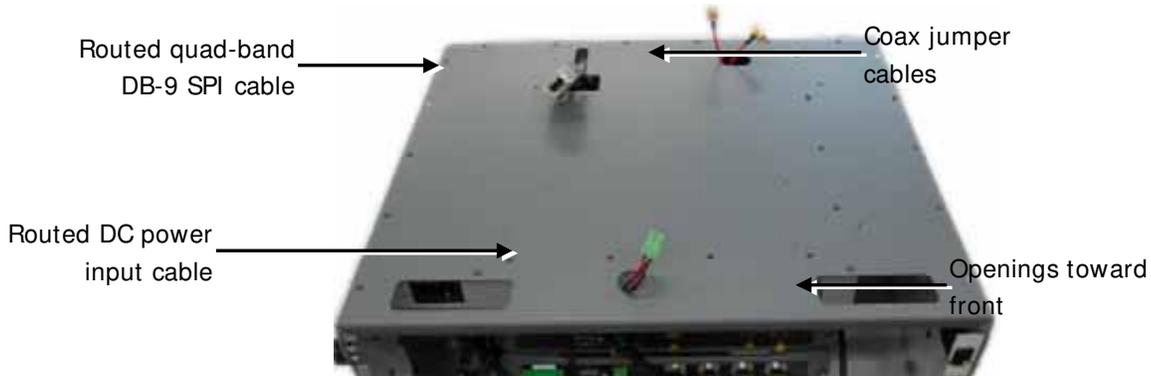
Figure 4-6. TSX Top Cover Openings

4.7   Mount AWS Add-On Unit

1. Align the AO unit with the appropriate 4 holes on the top cover (circled in Figure 4-7).
2. Assemble AWS Add-On unit on to top cover using the four (4) 8/32 X 1/2, PAN HD, Philips screws (supplied) – two on each side. See Figure 4-8.
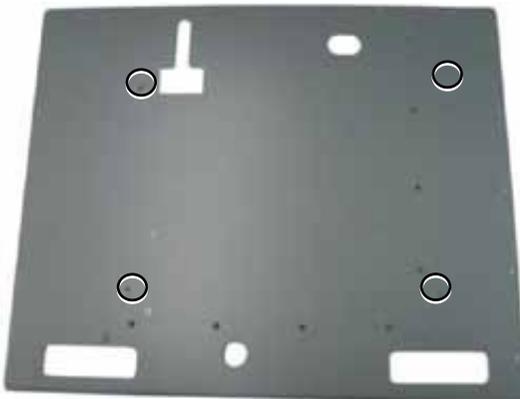
Figure 4-7. AO Unit Mounting Holes –
General Location
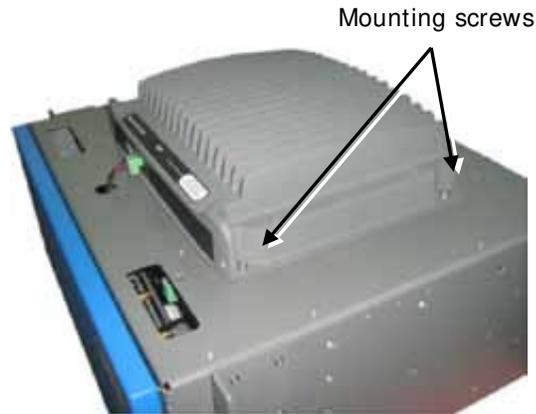
Figure 4-8. AO Unit Mounting Holes –
General Location

4.8   AWS Add-On RF Connections

Connect the routed cables from the CELL/PCS RHU inside the cabinet:

1. Interconnect DB-9 SPI cable between the RHU and the AO rear panel **From** connector. Refer to Figure 4-9.
2. Perform the following RF connections (Refer to Figure 4-9):

    *   Interconnect the UL and DL SMA connections to the corresponding AO rear panel **UL** and **DL** ports.
    *   Connect the RF cable to the Add-On High Band port
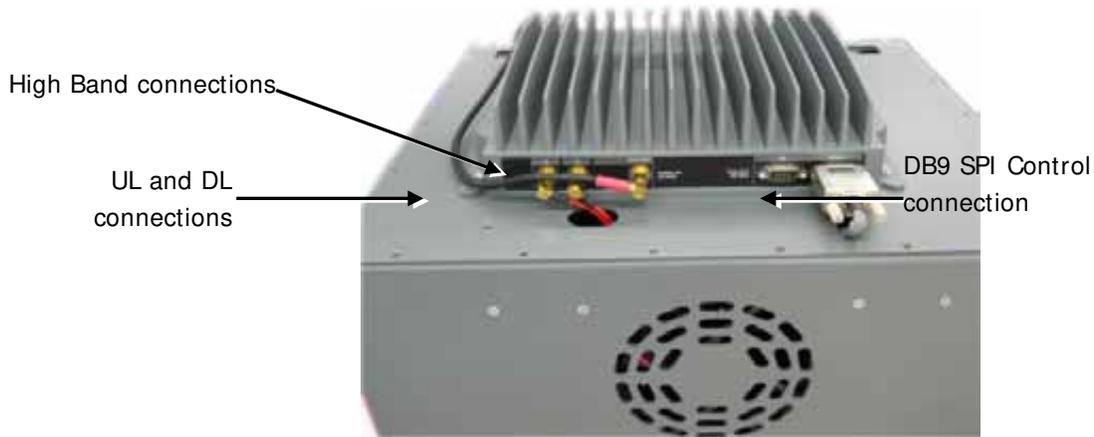
Figure 4-9: AWS AO Rear Panel Cable Connections

4.9   DC Power Connections

Refer to Figure 4-10 and perform the following connections:

• Connect the DC power cable to the AWS AO front panel DC connector.

• Connect the TSX cabinet terminal block (green connector) to j2 DC card.

DC power

Terminal block
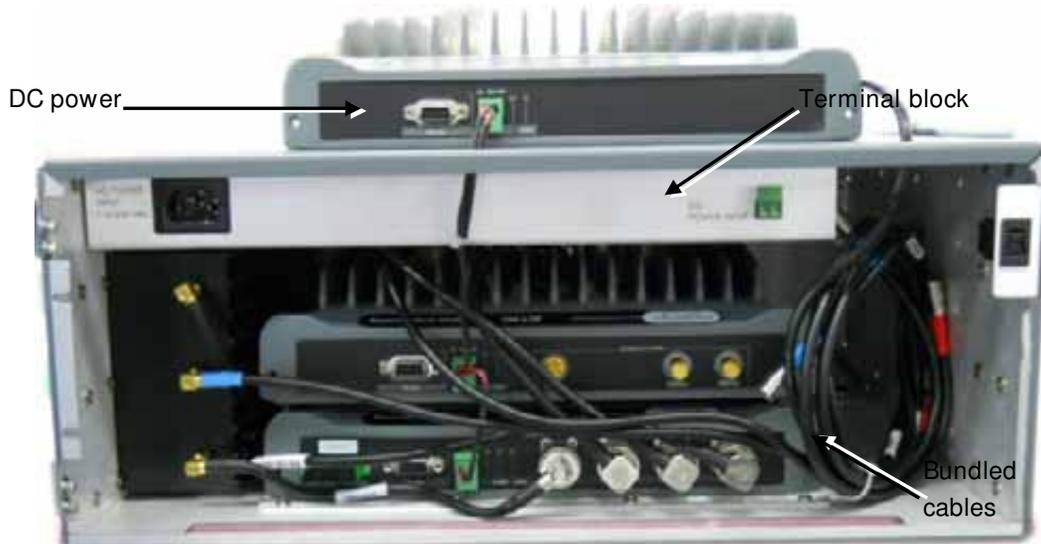
Bundled cables

Figure 4-10. Power Connections

4.10   Tie and Secure Cables

1. Referring to Figure 4-10 (previous page) - using a nylon cable, bundle and tie the RHU and Add-On cables (3) leading to the SCU-4 unit and route them through the upper slot.

2. Referring to figure Figure 4-11 - using the Adhesive Cable Tie Mounts, secure the RF High Band connection cable to the cover.

3. Close the TSX cabinet front door.

Adhesive cable tie mounts

Figure 4-11. Secured High-Band connection

4.11   Install the Assembled MA2000 TSX with AWS AO in Communication Rack

1.   Mount the assembled MA2000 TSX unit with AO in the 19" rack.
2.   Open the door of the installed MA2000 TSX unit.

4.12   Connect QMA Cables to SCU

1.   Route the QMA terminated cables through the cable routing slots. The tie-wraps can be disconnected to allow more cable length. Leave room to route the fiber cable and power cable to the units. *Note: All cables from RF service modules to filters are pre-connected as required for each service. Do not disconnect these cables.*
2.   Connect the BLUE QMA cables to the Low-band ports of the SCU.
3.   Connect the RED QMA cables to the High-band ports of the SCU.

NOTE: Refer to section 3.2 for SCU-4 t MA2000 TSX/QSX connections.

4.13   Connect the Power Source

Connect the power source to the MA2000 TSX AC/DC connector.

4.14   Replace and/or Close Door of the MA2000 TSX Unit

Recommended: Add a label on the outside of the door identifying the additional service being supported.

4.15   Configure Services

Refer to the System Controller User Manual and configure the services as required. (*System Controller v2.0 or above is required.*)

5 Appendix A: Specifications

5.1 RF Parameters

5.1.1 RF Frequency Range

Services	Frequency Range Uplink	Frequency Range Downlink
CELL	824-849	869-894
iDEN	806-824	851-869
GSM	890-915	935-960
E-GSM	880-915	925-960
Telstra 850M	824-849	869-890
SMR	896-902	929-941
AWS3	1710-1778	2110-2180
DCS	1710-1785	1805-1880
PCS	1850-1910	1930-1990
G-PCS	1850-1915	1930-1995
UMTS 2100	1920-1980	2110-2170

5.1.2 Low Band

RF Parameters Low Band

RU 2000	CELL TDMA/CDMA/WCDMA DL	UL	SMR 800 DL	UL	iDEN 800 Sprint DL	UL	GSM/ E-GSM DL	UL	SMR 900 DL	UL	iDEN 900 Sprint DL	UL
Max output PWR per antenna port												
1 (comp)	16		14		10		12		14		10	
2 carriers	13		11		7		9		11		7	
4 carriers	10		8		4		6		8		4	
8 carriers	7		5		1		3		5		1	
12 carriers	5		3		-1		1		3		-1	
Mean Gain(dB)*	16	7	14	7	10	7	12	7	14	7	10	7
Pin (dBm)*	0		0		0		0		0		0	
Input IP3 (dBm) AGC OFF Min	-5		-5		-5		-5		-5		-5	
Input IP3 (dBm) AGC ON Min	5		5		5		5		5		5	
SFDR** (dB)	71		72		72		64		71		71	
Max Intermod Distortion (dBm)	-13		-13		-13		-36		-13		-13	
Max Nf (dB)	20		20		20		20		20		20	
Gain Flatn. (dB)	±2.0											

5.1.3 High Band

RF Parameters High Band						
	DCS		PCS CDMA/ WCDMA		PCS GSM/ TDMA	
RU 2000	DL	UL	DL	UL	DL	UL
Max output PWR per Antenna Port 1 (comp)	14		14		16	
2 carriers	11		11		13	
4 carriers	8		9		10	
8 carriers	5		6		7	
12 carriers	3		4		5	
Mean Gain(dB)*	14	3	14	3	14	3
Pin (dBm)*	0		0		2	
Input IP3 (dBm) AGC OFF Min		-6		-6		-6
Input IP3 (dBm) AGC ON Min		3		3		3
SFDR** (dB)		64		66		64
Max Intermod Distortion (dBm)	-30		-13		-13	
Max Nf (dB)		20		20		20
Gain Flatn. (dB)	± 2.0					

*Factory set mean gain BU-RHU without RIU. May be field adjusted using system controller.

** SFDR for CDMA services is calculated in 100Kb/sec

5.1.4 RF Parameters MA1200 Add-on

MA1200 Add-on	LTE 700 MHz		G-PCS CDMA/WCDMA		G-PCS GSM/TDMA		UMTS*** and AWS3 CDMA/WCDMA	
	DL	UL	DL	UL	DL	UL	DL	UL
Max output PWR per Antenna Port								
1 (comp)	21		20		21		21	
2 carriers	18		17		18		18	
4 carriers	15		14		15		15	
8 carriers			11		12		12	
12 carriers			9		10		10	
Mean Gain(dB)*	21		20	3	20	3	21	3
Pin (dBm)*	0		0		1		0	
Input IP3 (dBm) AGC OFF Min				-7		-7		-7
Input IP3 (dBm) AGC ON Min		-10		3				3
SFDR** (dB)		55	66		64		66	70
Max Intermod Distortion (dBm)			-13		-13		***	
Max NF (dB)		20		20		20		20
Gain Flatn. (dB)	+/-1.0^4				±2.0			

*Factory set mean gain BU-RHU without RIU. May be field adjusted using system controller.

** SFDR for CDMA services is calculated in 100Kb/sec

*** UMTS Compiles with 3GPP TS 25.106 V5.0.0 (2002-03) Table 9.4 spectrum emission mask

5.2   Fiber Optic Specifications

Optical output power	<3.0mW
Max. Optical budget	2 dB for fiber + 1 dB for connectors (assumed) = 3 dB total
Optical loss per mated-pair connectors	0.5dB (max)
Optical Connector	SC/APC
Fiber type	9/125 SM
Wavelength	1310±10nm
Maximum distance between Base Unit and Remote Cabinet	2Km

5.3   Absolute Maximum Rating

Total Input RF Power to BU	10dBm
Total Input RF Power to RU	20dBm out-of-band -10dBm in-band
Power Supply VDC	60VDC

5.4   Temperature Specifications

Operating	0°C to +50°C (32°F to 122°F)
Storage	-20°C to 85°C (-4°F to 185°F)

5.5   Components Specifications

5.5.1 Tri-Service Package (TSX)

The TSX comes fully assembled with the RF service modules, applicable filters, and accessories. The specifications below reflect this.

Supported Services	Three services per TSX (1 RHU + 1 AO). Refer to the TSX model for specific services support.
Ports	To Service Combiner Unit: 50Ω QMA cables
Power	Local Power: 100-240VAC (Integrated AC/DC converter Remote Power: 25 to 48VDC Max Power Consumption: 77W
Physical Characteristics	Mounting: 19" Rack Mount brackets pre-connected; Wall Mount brackets to be ordered separately Dimensions: 43.4cm x 36.9cm x 17.7cm (17.09" x 14.53" x 6.97") Weight: 19Kg (42 lbs)

5.5.2 Quad-Service Package (QSX)

The QSX comes fully assembled with the RF service modules, applicable filters and accessories. The specifications below reflect this.

Supported Services	CELL, PCS, 700LTE, and AWS1/3 (1 RHU + 2 AO).
Ports	To Service Combiner Unit: 50Ω QMA cables
Power	Local Power: 100-240VAC (Integrated AC/DC converter) Remote Power: 25 to 48VDC Max Power Consumption: 118W
Physical Characteristics	Mounting: 19" Rack Mount brackets pre-connected; Wall Mount brackets to be ordered separately Dimensions: Dimensions: 43.4cm x 36.9cm x 26.6cm (17.09" x 14.53" x 10.47") Weight: 22Kg (49 lbs)

5.5.3 4-Port Service Combiner Unit (SCU-4)

Supported Services	High band (1710 MHz - 2170 MHz) and low band (698 MHz – 960 MHz) RF services
Ports	To MA2000 TSX: 8 QMA 50Ω connectors *(Terminate if unused; 6* QMA 50Ω terminations provided*)* To Antennas: 4 N-Type 50Ω connectors *(Terminate if unused)*
Physical Characteristics	Dimensions: 16.6cm x 8.0cm x 3.5cm (6.5" x 3.15" x 1.38") Comes with bracket that allows it to be mounted directly on top of a MA2000 TSX

5.5.4 8-Port Service Combiner Unit (SCU-8)

Supported Services	High band (1710 MHz - 2170 MHz) and low band (698 MHz – 960 MHz) RF services Required supporting element of the EC560 Solution
Ports	To MA2000 TSX: 16 QMA 50Ω connectors *(Terminate if unused; 14* QMA 50Ω *terminations provided.)* To Antennas: 8 N-Type 50Ω connectors (*Terminate if unused)* To EHU: 8 QMA 50Ω connectors *(Terminations not required)*
Physical Characteristics	Dimensions: 43.3cm x 4.4cm x 27.00cm (17.04" x 1.72" x 10.63") Weight: 3Kg (6.6 lbs) Comes with brackets that allow it to be mounted on 19" rack as well as on the wall

5.6 Multimode Fiber Qualifications

50/125 or 62.5/125um complying with ANSI/TIA/EIA-568-B series, EN50173-1 or ISO/IEC 11801, may be used up to 300 meters in length assuming the following qualifications:

- Both the Base Unit and MobileAccess2000 TSX/QSX must be multimode capable.

- 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 MobileAccess specified patchcords listed below.

900 Micron Patchcord for Splicing, 2 Meters, 2xSC/APC

62.5/125/900	Diamond p/n ENC/1045341	FiberNext p/n OEM-629002-MAN
50/125/900	Diamond p/n ENC/1045340	FiberNext p/n OEM-509002-MAN

Zipcord Patchcord, 4xSC/APC, 50/125/900/2000/4500 Micron

1Meter	Diamond p/n ENC/1045342	FiberNext p/n OEM-50ZIP1-MAN
3 Meter	Diamond p/n ENC/1045343	FiberNext p/n OEM-50ZIP3-MAN

Zipcord Patchcord, 4xSC/APC, 62.5/125/900/2000/4500 Micron

1Meter	Diamond p/n ENC/1045344	FiberNext p/n OEM-62ZIP1-MAN
3 Meter	Diamond p/n ENC/1045345	FiberNext p/n OEM-62ZIP3-MAN

5.7 Software Management

Each RHU and Add-On module are configured and managed individually. Refer to the System Controller User Manual and configure the services as required. (*System Controller v2.0 or above is required.*)

6 Appendix B: Ordering Information

6.1 MA2000 TSX

Service Supported	Part Number	Description
700/800 MHz Public Safety	2000-P71S80-A-TC	MA2000 TSX dual-service 700/800 MHz Public Safety.
	2000M-P71S80-A-TC	MA2000 TSX dual-service 700/800 MHz Public Safety with MM fiber.
700/800 MHz Public Safety/AWS	2000-P71S80A17-A-TC	MA2000 TSX tri-service 700/800 MHz Public Safety and AWS.
	2000M-P71S80A17-A-TC	MA2000 TSX tri-service 700/800 MHz Public Safety and AWS with MMF.
CELL/PCS	2000-C85P19-A-TC	MA2000 TSX dual-service CELL/PCS.
	2000M-C85P19-A-TC	MA2000 TSX tri-service CELL/PCS with MMF.
CELL/PCS/700LTE	2000-C85P19L70-A-TC	MA2000 TSX tri-service CELL/PCS and 700 MHz LTE. - Additional filter (P/N 700LTE-PS-FILTER) ordered separately. Required if 700/800 MHz Public Safety coexists across same infrastructure.
	2000-C85P19L70-A-TC-F	MA2000 TSX tri-service CELL/PCS and 700 MHz LTE with filter to support 700/800 MHz Public Safety coexistence.
	2000M-C85P19L70-A-TC	MA2000 TSX tri-service CELL/PCS and 700 MHz LTE with filter to support 700/800 MHz Public Safety coexistence with MMF. - Additional filter (P/N 700LTE-PS-FILTER) ordered separately. Required if 700/800 MHz Public Safety coexists across same infrastructure.
	2000M-C85P19L70-A-TC-F	MA2000 TSX tri-service CELL/PCS and 700 MHz LTE with filter to support 700/800 MHz Public Safety coexistence with filter to support 700/800 MHz Public Safety coexistence and MMF.
CELL/PCS/AWS	2000-C85P19A17-A-TC	MA2000 TSX tri-service CELL/PCS and AWS.
	2000M-C85P19A17-A-TC	MA2000 TSX tri-service CELL/PCS and AWS with MMF.
iDEN/SMR	2000-S80S90-A-TC	MA2000 TSX dual-service 800/900 MHz SMR. Supports 700 MHz LTE and 700/800 MHz Public Safety coexistence.
	2000M-S80S90-A-TC	MA2000 TSX dual-service 800/900 MHz SMR with MMF. Supports 700 MHz LTE and 700/800 MHz Public Safety coexistence.
iDEN/SMR/PCS	2000-S80S90P19-A-TC	MA2000 TSX tri-service 800/900 MHz SMR and PCS.

		Supports 700 MHz LTE and 700/800 MHz Public Safety coexistence.
	2000M-S80S90P19-A-TC	MA2000 TSX tri-service 800/900 MHz SMR and PCS with MMF. Supports 700 MHz LTE and 700/800 MHz Public Safety coexistence.
iDEN/SMR/AWS	2000-S80S90A17-A-TC	MA2000 TSX tri-service 800/900 MHz SMR and AWS. Supports 700 MHz LTE and 700/800 MHz Public Safety coexistence.
	2000M-S80S90A17-A-TC	MA2000 TSX tri-service 800/900 MHz SMR and PCS with MMF. Supports 700 MHz LTE and 700/800 MHz Public Safety coexistence.

6.2   MA2000 TSX – International

Service Supported	Part Number	Description
GSM/DCS/UMTS 2100	2000-G92D18U21-A-TC	MA2000 TSX tri-service GSM/DCS and UMTS 2100.
E-GSM/DCS/UMTS 2100	2000-G90D18U21-A-TC	MA2000 TSX tri-service E-GSM/DCS and UMTS 2100.

6.3   MA2000 QSX

Service Supported	Part Number	Description
CELL/PCS/700LTE/AWS	2000-C85P19L70A17-A-TC	MA2000 QSX quad-service CELL/PCS, 700 MHz LTE and AWS. - Additional filter (P/N 700LTE-PS-FILTER) ordered separately. Required if 700/800 MHz Public Safety coexists across same infrastructure.
	2000-C85P19L70A17-A-TCF	MA2000 QSX quad-service CELL/PCS, 700 MHz LTE and AWS with filter to support 700/800 MHz Public Safety coexistence.
	2000M-C85P19L70A17-A-TC	MA2000 TSX tri-service CELL/PCS and 700 MHz LTE with filter to support 700/800 MHz Public Safety coexistence with MMF. - Additional filter (P/N 700LTE-PS-FILTER) ordered separately. Required if 700/800 MHz Public Safety coexists across same infrastructure.
	2000M-C85P19L70A17-ATCF	MA2000 TSX tri-service CELL/PCS and 700 MHz LTE with filter to support 700/800 MHz Public Safety coexistence with filter to support 700/800 MHz Public Safety coexistence and MMF.

6.4 Service Combiner Unit

Part Number	Description
SCU-4	Service Combiner Unit supporting 4 Antenna output ports, 4 Low Band services input ports and 4 High Band services input ports. To be used with the MA2000 TSX solution.
SCU-8	Service Combiner Unit supporting 8 Antenna output ports, 8 Low Band services input ports and 8 High Band services input ports. To be used with the MA2000 TSX solution.

6.5 Accessories

6.5.1 Brackets

Part Number	Description
AK-TC-ENC-WMT	Accessory kit containing contents to mount the MA2000 TSX and QSX onto the wall.

6.5.2 Filters

Part Number	Description
700LTE-PS-FILTER	Cavity filter for the 700LTE Add-On when 700LTE service coexists with 700/800 Public Safety service across the same set of coax. This filter is already included with the MA2000 TSX CELL/PCS/700LTE part numbers with a "-F" suffix.