Corning

Corning CORE System MA1000
User Manual

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CORNING

Warranties

Hardware

Corning Optical Communications warrants to the original purchaser ("Customer") that for the duration of the warranty period, one (1) year, commencing on the date of shipment of the Hardware, unless otherwise agreed in writing by Corning Optical Communications (the "Hardware Warranty Period"), the Hardware furnished by Corning Optical Communications shall be free in all material respects from defects in material and workmanship, and shall conform to the applicable portions of the Specifications, as defined below (the "Hardware Warranty"). If notified by Customer of any such defects in material or workmanship or nonconformity with applicable portions of the Specifications within the Hardware Warranty Period, Corning Optical Communications shall promptly, at its own election and expense, repair or replace any such Hardware proven to be defective under the terms of this Hardware Warranty. Such repair or replacement shall be Customer's sole remedy and Corning Optical Communications' sole obligation in the event this Hardware Warranty is invoked. If any components comprising a part of the Hardware are replaced or repaired during the Hardware Warranty Period, the Hardware Warranty Period for such repaired or replaced components shall extend to the longer of (i) the balance of the Hardware Warranty Period or (ii) three (3) months from the date of repair or replacement. For purposes of this Warranty, "Specifications" shall mean the specifications and performance standards of the Products as set forth in documents published by Corning Optical Communications s and delivered to Customer which contain technical specifications or performance standards for the Products.

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

Notwithstanding the foregoing, in no event will Corning Optical Communications be liable for damage to Products resulting from improper handling during or after shipment, misuse, neglect, improper installation, operation or repair (other than by authorized Corning Optical Communications personnel), alteration, accident, or for any other cause not attributable to defects in materials or workmanship on the part of Corning Optical Communications. Corning Optical Communications shall not reimburse or make any allowance to Customer for any labor charges incurred by Customer for replacement or repair of any goods unless such charges are authorized in advance in writing by Corning Optical Communications.

Software Warranty

Corning Optical Communications warrants to the original purchaser ("Customer") that for the duration of the warranty period, one (1) year, commencing on the date of shipment of the Software, unless otherwise agreed in writing by Corning Optical Communications (the "Software Warranty Period"), the Software shall conform with, and perform the functions set forth in the Specifications, and shall be free from defects in material or workmanship (the "Software Warranty"). In the event the Software is proven to be defective under the terms of this Software Warranty, Corning Optical Communications shall correct such defects or failure and ensure that the Software conforms with, and performs the functions set forth in, the Specifications. Customer will allow Corning Optical Communications to inspect the Software at Customer's location or to return it to Corning Optical Communications' closest repair facility.

Notwithstanding the foregoing, Corning Optical Communications shall have no obligation under the Software Warranty if the Software is modified or used with hardware or software not supplied or approved by Corning Optical Communications or if the Software is subject to abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

Third-party software distributed with the Software may carry certain warranties which, to the maximum extent allowed by law, Corning Optical Communications s hereby assigns, transfers and otherwise conveys to Customer, provided, however, that

Corning Optical Communications itself provides no warranty of any kind, express, implied, statutory or otherwise, for any third-party software provided hereunder.

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

THIS WARRANTY IS THE ONLY WARRANTY MADE BY CORNING OPTICAL COMMUNICATIONS AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. CORNING OPTICAL COMMUNICATIONSS SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE. CORNING OPTICAL COMMUNICATIONS SALES AGENTS OR REPRESENTATIVES ARE NOT AUTHORIZED TO MAKE COMMITMENTS ON WARRANTY RETURNS.

Returns

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

1. Return authorization is to be received from Corning Optical Communications prior to returning any unit. Advise Corning Optical Communications of the model, Serial number, and discrepancy. The unit may then be forwarded to Corning Optical Communications, transportation prepaid. Devices returned collect or without authorization may not be accepted.
2. Prior to repair, Corning Optical Communications will advise the customer of our test results and any charges for repairing customer-caused problems or out-of-warranty conditions etc.
3. Repaired products are warranted for the balance of the original warranty period, or at least 90 days from date of shipment.

Limitations of Liabilities

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

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

Reporting Defects

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

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

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 product must be fixed mounted in indoor permanent structures, providing a separation distance greater than 50 cm or more from all persons during normal operation and must not be co-located with any other antenna for meeting RF exposure requirements.

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

WARNING! Antenna gain should not exceed 12.5 dBi.

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

Compliance with RF safety requirements:

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

Power requirements for DC Inputs

WARNING! Only use a special DC supply cable with four connectors

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 MA1000 system elements 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 MA2K devices and the associated cables.

Corning CORE System MA1000 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.

Corning CORE System MA1000 system 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.

CAUTION! USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE

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. The use of unapproved antennas, cables and/or coupling devices is illegal under FCC regulations and may subject the user to fines.

Standards and Certifications

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

Company Certification

ISO 9001: 2000 and ISO 13485: 2003

Product Certification

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 LTE and AWS Frequency Bands
- FCC CFR part 15 Subpart B
- FCC CFR part 90

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference 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 Mobile Access could void the user's authority to operate the equipment.

Europe Radio Equipment and Systems

- EN 301502 – for GSM/EGSM Frequency Bands
- EN 300609 – for DCS Frequency Bands
- EN 301908 – for UMTS Frequency Band

EMC

EN 301 489

NTRL Safety UL 60950-1

Laser Safety IEC 60825-1, IEC 60825-2

TRA TRA type approval for UAE

Licensee Contact Information

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

About this User Manual

This user guide describes how to perform the physical installation of the Corning CORE System MA1000. The installation procedures of other units (e.g. RIU, MA860 WLAN solution) 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
MA2000 User Manual
RIU Product Line User Manual
330 User Manual
410/430User Manual
SC-450 User Manual

List of Acronyms

Acronym	Description
AGC	Automatic Gain Control
BDA	Bi-Directional Amplifier
BDAC	Bi-Directional Amplifier Conditioner
BTS	Base Transceiver Station
BTSC	Base Transceiver Station Conditioner
BU	Base Unit
DL	Downlink
PS	Power Supply
RHU	Remote Hub Unit
RU	Remote Unit
RIU	Radio Interface Unit
SC-450	System Controller
UL	Uplink

Table of Contents

1 Introduction

Corning CORE System MA1000 series provides enterprise level indoor coverage for a wide range of wireless services over a single broadband infrastructure.

The MA1000 is a single operator, multi-band system based on combining a number of services, voice and data, and distributing them to each remote location through a common antenna infrastructure. These include Cellular, Paging, Public Safety and LTE SISO signals.

Cellular services are bi-directionally transferred between the capacity source (BTS/BDA) and the remote locations using low loss fiber and broadband coax.

WLAN services from Wi-Fi Access Points (802.11 a/b/g/n) can be integrated with the MA1000 system at the remote sites for transport over a single cabling infrastructure to the antenna.

1.1 Features and Capabilities

- A multi-service platform that accommodates the combination of cellular and enterprise services (e.g. WLAN, WMTS Telemetry and 900MHz Building Automation), eliminating the need for separate overlay networks
- Carrier Class QoS – advanced signal handling and management ensures optimal performance for all services
- Local and remote end-to-end monitoring and control through an interface to 410, 430 or SC-450 system controller
- Low power system requirements eliminates the need for a high power capacity source's, reducing operator expenses
- Comprehensive conditioning and monitoring of RF signals at the head-end through an interface to the Radio Interface Unit (RIU)
- Reduce cost through the support of multimode fiber
- Software programmable parameters including output power, AGC (on/off and levels), and system gain
- Real time component setting capabilities for optimal performance

1.2 System Architecture

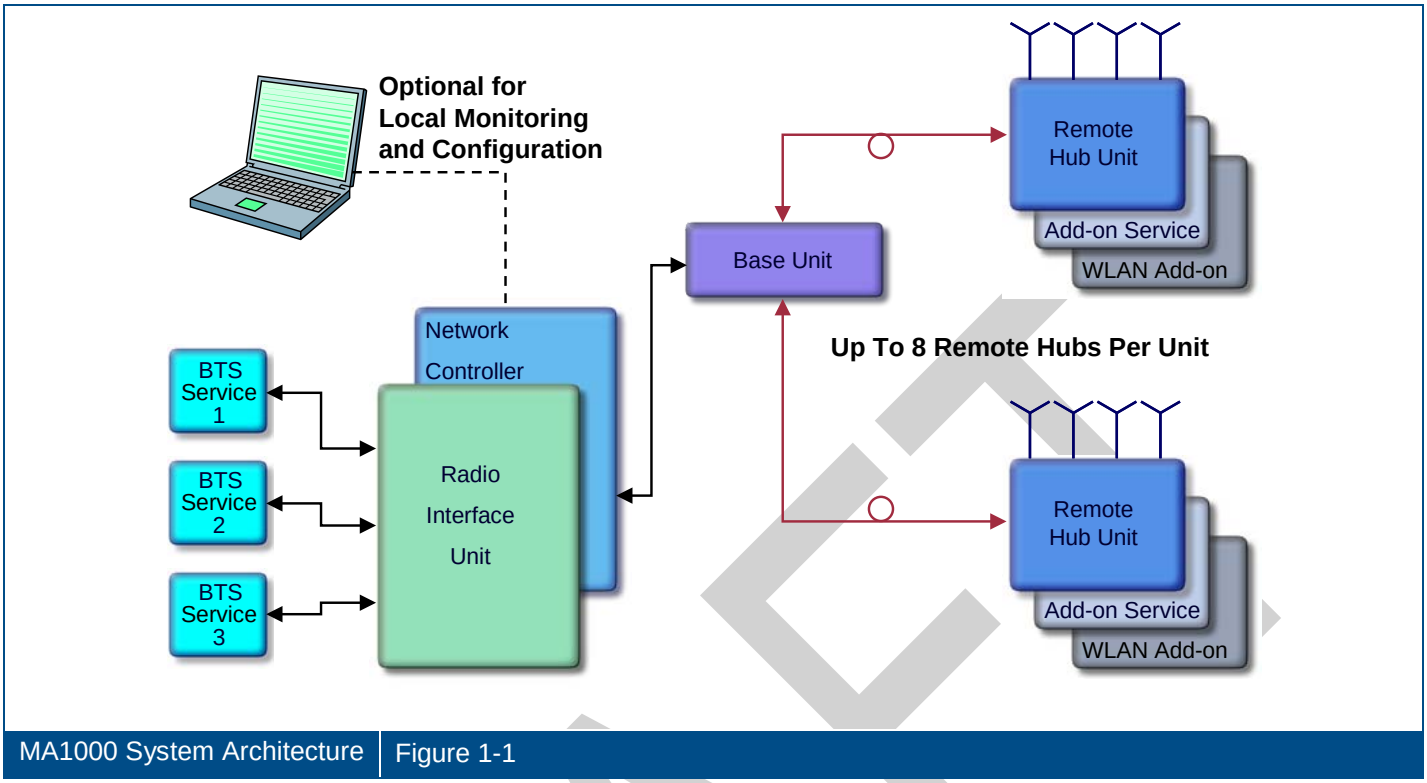
The MA1000 solution comprises both headend and remote end equipment providing an end-to-end comprehensive system solution.

Note: Third-party equipment is sold separately (i.e. cabling, antennas).

At the head-end Corning CORE System 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.

At the remote end, the optical signal is reconverted to RF, amplified, filtered and distributed over the broadband antenna infrastructure.

For end-to-end control, controllers installed at the head-end provide direct interface to the MA elements and through them, control over the remote end elements.



MA1000 System Architecture | Figure 1-1

Figure 1-1 shows a basic block diagram of the system operation. On the downlink, services from the BTS/BDA are transferred via interface to the Base Units (BUs). The interface, which may be passive (i.e. Interface Box) or active (RIU), is used to attenuate the RF signals to the required levels, converge them and distribute them to the BUs. The BUs are wideband – they are not service specific.

At the BUs, the RF signals are converted to optical signals and transmitted over the optic fiber to (service-specific) RUs at the remote locations. At the remote locations, the RUs supported by the hub reconvert the optical signal to RF. The hub elements converge the voice services together with 802.11 a/b/g data services (if MA850/MA860 units are installed) and distribute them over the coax antenna infrastructure. The MA SC-450 (in installations with remote management) provides monitoring and control of all active system elements.

1.2.1 Headend Equipment

At the headend Corning CORE System 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 conditions the RF Downlink (DL) signals from an operator's signal source (BTS: base-transceiver stations or BDA: bi-directional amplifiers) located inside the building. The RIU then custom tunes incoming signals in order to ensure a constant level of RF before signals are passed to/from the Base Unit (BU). RF Uplink (UL) signals from subscribers' phones are received from the BU and transported back to the operator's signal source (BTS or BDA) and to the operator's macro network outdoors.
- **Base Unit (BU):** The BU converts RF Downlink (DL) signals received from the RIU into an optical signal. This optical signal is then transported over single or multi-mode fiber optic cabling (SMF/MMF) to/from the MA1000 TSX units, which are housed inside of IDF/Telco/IT closets at the remote-end locations, for distribution throughout the facility. Uplink (UL) signals from subscribers' phones are received from the antennas and sent back to the TSX units through the fiber connection to the head-end, where they are converted back from RF optical to RF electrical before being passed on to the RIU.
- **System Controllers (SC-450,410, 430):** The system controller enables centralized remote management and control of all Corning CORE System MA1000 elements.

1.2.2 Remote-End Equipment

The remote end elements interface to the DAS infrastructure. At the remote end, the optical signal is reconverted to RF, amplified, filtered and distributed over the broadband antenna infrastructure.

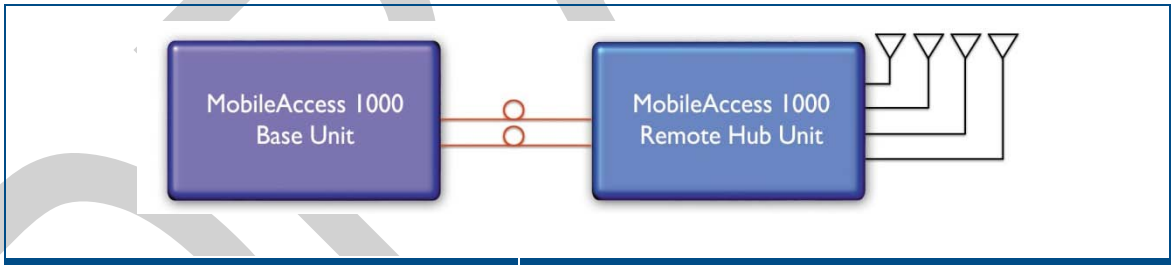
- **Remote Units (RUs)** – Pre-configured service specific modules that support up to two voice services and perform the optic to RF conversion on signals received from the BU at the remote locations. Signals are automatically filtered and amplified for transport over broadband coax cable to a passive antenna. Uplink (UL) signals from the antennas are then converted to optical signals before being transmitted back to the BU.
- **700 LTE SISO add-on –** Add-on module specifically designed to support LTE SISO in the 700 MHz lower A, B and C blocks and the upper C block. (The LTE add-on model varies depending on whether or not it is used in conjunction with the 700/800 Public Safety RHU).
- **860 WLAN Solution** – The 860 and WCE is a wireless LAN module that provides secure and centralized connections for 802.11a/b/g Access Points and distributes the wireless services over the same coax and broadband infrastructure as the voice services.
- **MA1200 Add-On** – Service specific module that provides support for an additional high band voice service. The AO is a single service module coupled with an RHU to deliver an additional, third service at a lower incremental cost. The AO receives RF signal from the RHU and amplifies it for transport across the broadband coax.
- **MA850/MA860** – Module that supports data services

1.3 Configuration Examples

The MA1000 system includes three basic configuration options:

1.3.1 Basic Configuration

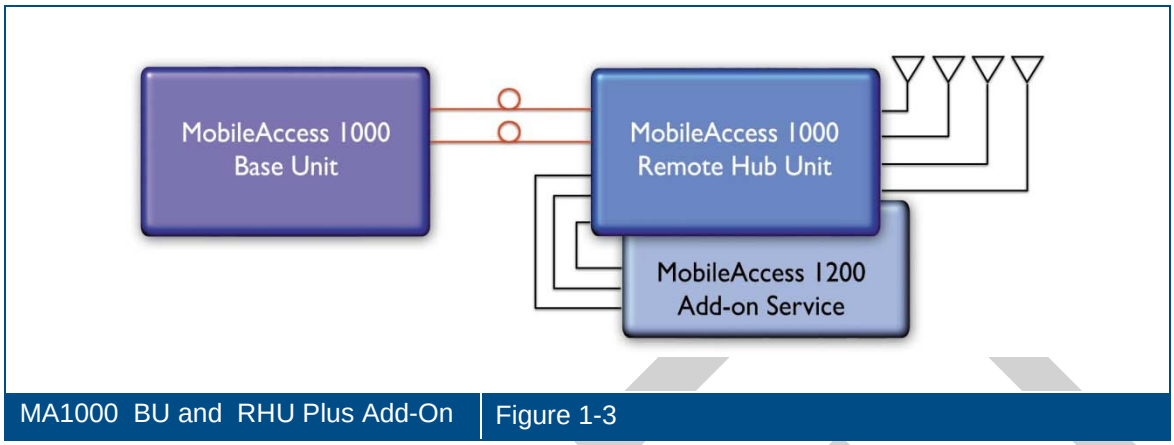
The Base Unit drives a single or dual band, MA1000 RHU. The dual band RHU consists of a low band service (CELL 800, iDEN, Paging, or GSM 900) and a high band service (PCS 1900 or DCS 1800).



MA1000 Basic BU – RHU Configuration | Figure 1-2

1.3.2 Configuration with Add-On for Providing Additional Service

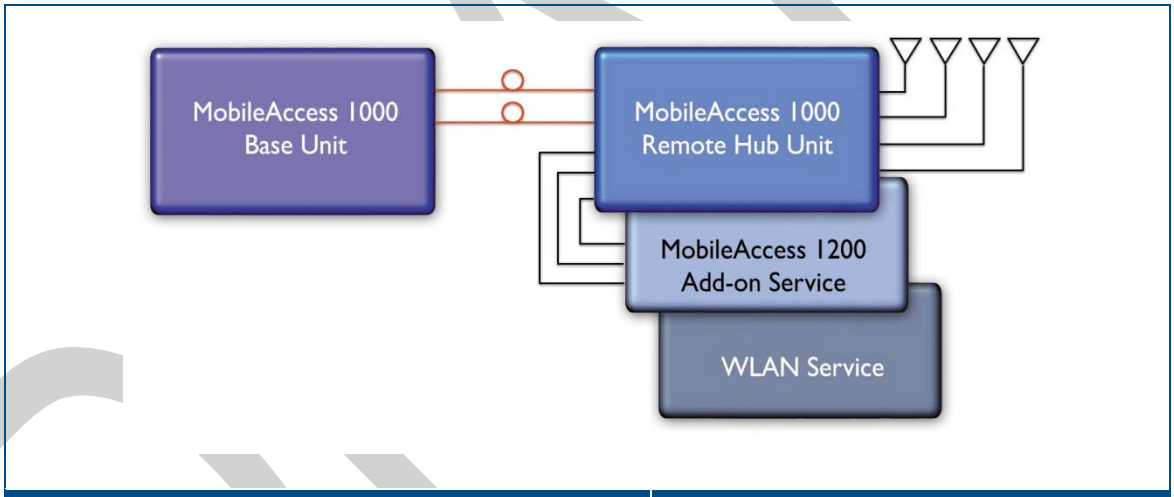
The Base Unit drives a single or dual band, MA1000 RHU. The dual band RHU consists of a low band service (CELL 800, iDEN, Paging, or GSM 900) and a high band service (PCS 1900 or DCS 1800).



MA1000 BU and RHU Plus Add-On | Figure 1-3

1.3.3 Configuration with 860 WLAN Solution for Access to High Data-Rate Service

An 860 WLAN solution may also be added in a configuration that includes both MA1000 RHU and Add-on RHU or only MA1000 RHU.



BU and RHU Plus Add-on Plus WLAN Configuration | Figure 1-4

1.4 System Monitoring and Management

The Corning MobileAccess family of Element Management System (EMS) Controllers provide complete site coverage and management of the MA 1000 system. They can be used to provision coverage that can compensate for changing loads. They also provide real-time monitoring, control and diagnostics capabilities for *Corning MobileAccess* devices from a single location.

- 410 – enables management of the MA1000 system components through a local RS-232 or dial-up connection. It is also used as a slave controller to a 410, 430 or SC-450 controller to expand the management system on a site. Management access is provided through the MCT GUI application.
- 430 – enables management of the MA1000 system components through a local RS-232 or dial-up connection. Management access is provided through the MCT GUI application or via the NMS Server Software Application which communicates via SNMP over a Ethernet TCP/IP connection. The 430 may also be monitored via a 3rd party SNMP application for receipt of SNMP traps.
- SC-450 - enables management of the MA1000 system devices through local or remote Ethernet TCP/IP connection. Management access is provided through a local and remotely accessible web-GUI interface. The SC-450 may also be monitored via a third party SNMP application for receipt of SNMP traps.
- **MCT** – a Java based GUI application provided with both controllers. MCT is used with the 410 and 430 after the installation procedure to adjust Corning devices according to the installation site characteristics in order to optimize coverage for the site.

The application is installed and run from a computer that is connected either locally or via remote dial-up modem to the 410 or 430 at the site.

- **MobileAccess Manager™** – a Java based GUI software application that provides enhanced monitoring and control capabilities for all your MA1000 sites from a single location. The **MobileAccess Manager** application is not supplied with the controller – it is *purchased separately.*

2 MA1000 System Elements

This chapter describes the MA1000 system basic elements: remote modules (1000 RHU and Add-on) and the Base Units. Your system may include additional elements such as 410, 430 and SC-450 controllers, RIUs and 860 WLAN solution units; these are described in the corresponding User Guides.

Note: The following elements are fully described in their corresponding user guides: MA RIU, MA 850 /MA860, SC-450 Controller, MCT/NMS Management Application (described in MA410/MA430 Installation and Configuration Guide).

2.1 Remote Modules

The Optical to RF conversion of each service at the individual building floors is performed by remote units corresponding to the service types. These consist of 1000 RHUs and in addition, may include Add-on modules and 860 WLAN solution modules.

The configurations depend on the requirements of the site and the supported services. The following sections describe each of the system elements.

Note: The connections as they relate to the MA 1000 system are described in Chapter ***Error! Reference source not found.*** *-* ***Error! Reference source not found.****.*

2.1.1 MA1000 RHUs

Each RHU supports two different services (one high-band and one low-band). All RHUs are add-on ready, meaning that their optic interface and control functionality can support a third (high-power) service through the connections of an Add-on module (see section 4.2.2.1).

Each 1000 RHU is connected to the corresponding BU (located in the communication room) through a fiber optic connection. Remote monitoring is provided through the BU connections to the 410, 430 and SC-450 controller (**Error! Reference source not found.**).

The 1000 RHU services, add-on service and data services (provided by 860 WLAN system) at each location are combined and then transmitted over a common infrastructure to strategically placed antennas.

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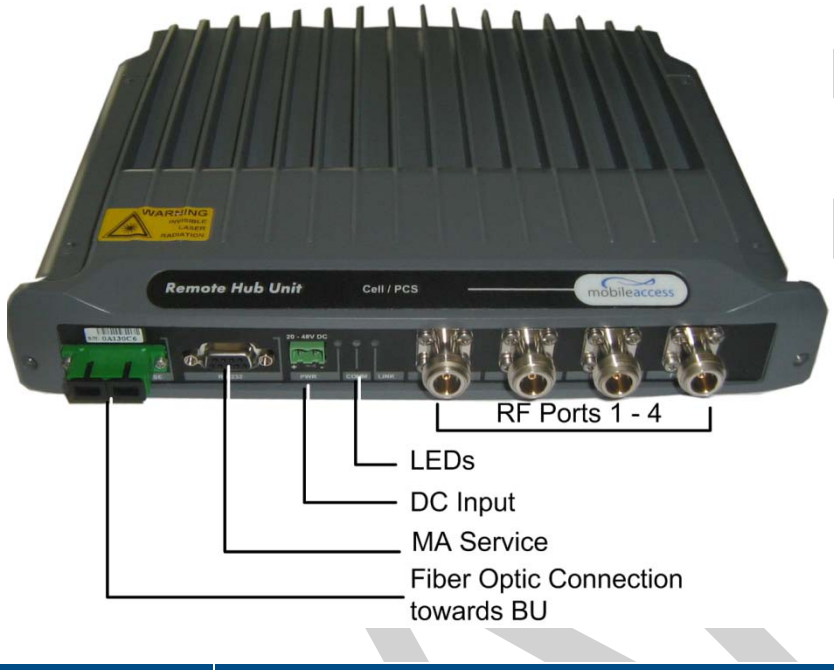
2.1.1.1 MA1000 RU Front Panel

The MA1000 RU front panel contains the fiber optic connections to the BU, four coax connections to the antennas, power connections and status indicators.



MA1000 RU Front Panel | Figure 2-1

LED	Description
COMM	Active communication detected
LINK	Optical link to BU detected
PWR	DC power connection. 20 to 48VDC

Table 2-1. 1000 RHU Front Panel Indicators

2.1.1.2 MA1000 RU Rear Panel

The MA1000 RU rear panel provides the control, RF interface and optic interface ports that enable connecting to an MA1200 Add-On unit.

MA1000 RHU Rear Panel | Figure 2-2

Add-on Control	Transmits the control signals from Add-on module to the 1000 RHU module. Connected to the Add-on **Control From** port.
High Band	Connects to the **Add-on High Band** port. Provides the interface to the Add-on RF service which is combined with the RHU services and distributed through the common coax infrastructure.
Low Band	Connects to the Add-on Low Band port. Provides the interface to the Add-on RF service which is combined with the RHU services and distributed through the common coax infrastructure.
DL, UL	Transmit the RF signals to- and from- the Add-on module. These ports are connected to the corresponding ports on the ADD-ON rear panel: DL to DL, UL to UL.

Table 2-2. MA1000 RHU Rear Panel Connectors

2.1.2 MA1200 Add-On

The MA1200 Add-On module is used to provide support for an additional service to an MA1000 RU. The host MA1000 RU and the MA1200 Add-On are interconnected and either housed in a MA1000 Cabinet or connected externally to a MA1000-Lite 'enclosure'.

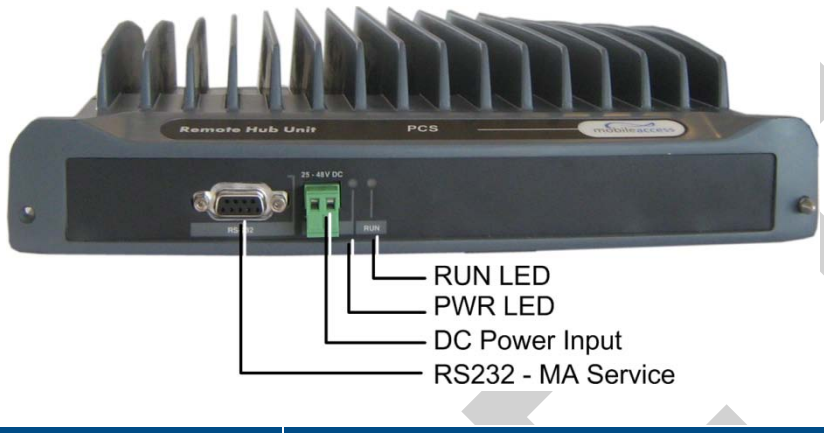
MA1200 Add-On provides the following functions:

- Single service – either low-band or high-band
- Installed only as an addition to a MA1000 RU

Note: MA1200 Add-on does NOT interface directly to the fiber optic infrastructure, does not perform the optic to RF conversion and does not interface to the antennas. All these functions are provided by the host MA1000 RU unit.

2.1.2.1 MA1200 Front Panel

The MA1200 front panel contains the power connection and status LEDs. (The RS-232 connector is reserved for MA service personnel). The figure below shows the MA 1200 front view. It is followed by a description of the connections and LEDs.



MA1000 1200 AO Front Panel | Figure 2-3

Interface	Description
RS232	Servicing connector to be used by MA service personnel for maintenance.
PWR	DC Power connection. 25 to 48VDC

Table 2-3. MA1200 Front Panel Connectors

LED	Description
RUN	Blinking Green: Indicates that the RU is in normal operating mode
PWR	Steady Green: Power on

Table 2-4. MA1200 Front Panel LED Indicators

2.1.2.2 MA1200 Rear Panel

The MA1200 rear panel contains the control connectors and the RF connections to the MA1000 RU and MA850/MA860.

MA1000 1200 AO Rear Panel | Figure 2-4

Interface	Description
Add-on Control:	Transmits the control signals between the MA1200 module and the MA850/MA860 and MA1000 RU modules. **From –** receives control signals from the MA1000 RU. Connected to the MA1000 RU **Add-on Control** connector. **To** – feeds control signals to MA850/MA860 (in configurations that include MA850/MA860)
DL, UL:	Transmit the RF signals to- and from- the MA1200 add-on module. These ports are connected to the corresponding ports on the MA1000 rear panel: DL to DL, UL to UL.
High:	Service RF output port. Connected to combiner/splitter to be combined with other services supported by the MA1000 system.

Table 2-5. MA1200 Rear Panel Connectors

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2.2 Base Unit

The BU (Base Unit) is a wideband device that performs the conversion between the BTS/BDA (passive or active) interface RF signal and the remote units' optic signal.

Base Unit capabilities

- Supports all services distributed by Corning CORE Systems
- Fiber connection to up to 8 RUs
- Setup and monitoring through connection to the host SC-450 controller and NMS software application
- Dry contact alarms
- Front panel indicators providing status on optical link internal circuitry and signal level

2.2.1 Base Unit Models

Two models of MA BUs are available:

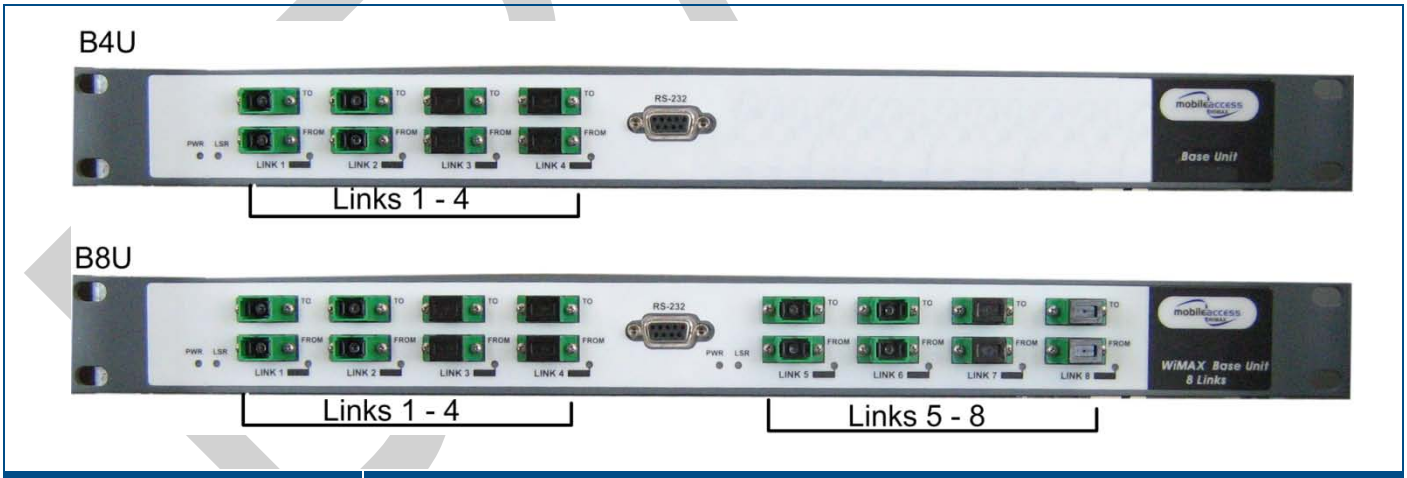
- B4U - four port unit comprising one optical module supporting optic connections to up to four RHUs
- B8U – eight port unit comprising two optical modules supporting optic connections to up to eight RHUs

Note: Each optical module is separately accessed and managed in the MCT and NMS management applications.

2.2.2 BU Panels

2.2.2.1 BU Front Panel

The front panel contains the optical connections and indicators. Each four-port element has a dedicated set of indicators (PWR, LSR and Link 1 to Link 4 or Link 5 to Link 8).



B4U and B8U Front Panels | Figure 2-5

LED	Description
PWR	Power input detected for the corresponding unit. 20 to 48 VDC
LSR	ON - laser circuitry for the corresponding element (group of four ports) is functioning correctly.
Link 1-4, 5-8	ON - the optical link to/from the connected remote functions within the specifications in both directions. Blinking - optical power from remote is lower than required

Table 2-6. BU Front Panel LED Indicators

2.2.2.2 BU Rear Panel

The BU rear panel contains the RF connections, Alarms, NMS and power connections. Figure 2-6 shows the rear panel of an 8-port BU. A 4-port BU contains a single UL and a single DL RF connector.

B8U Rear Panel | Figure 2-6

Connector	Description
Uplink output	Uplink connectors to be connected on BTS/BDA side. For an 8-port BU, both UL connectors must be connected.
Downlink input	Downlink connectors to be connected on the BTS/BDA side. For an 8-port BU, both DL connectors must be connected.
Com Port RS485	Connection to SC-450 controller, rear panel RS485 port.
Alarms	Dry-contact connections to BTS/BDA (normally closed). Relevant only for system without SC-450 controller.
PWR	Power connection: 20 to 48VDC

Table 2-7. BU Rear Panel Connections

3 Installation Guidelines

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

3.1 Site Considerations

- The distance between the service antenna and the coverage area should correspond to LOS requirements for maximum coverage area.
- The maximum fiber path loss is 6 dB.
- The system delay of the optical system must be taken into consideration when there are neighboring BTS sites overlapping in coverage.

3.2 Infrastructure Preparation

The infrastructure preparation consists of two main phases:

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

B. **Telecom Closet Planning:** Planning the layout of the devices and cables in the telecom closet or shaft. This includes the MA850/MA860, 802.11 Access Points, cabling and other voice service distribution systems that are relevant to the specific installation.

3.3 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 ranging as follows:

Operating: 0 to 50°C (-4° to 185°F)

Storage: -20°C to 85°C (-4°F to 185°F)

3.4 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.

3.5 Coaxial Cable Connections

3.5.1 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 must 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" coax cable should be 7".
- Cable that is kinked or has a bending radius smaller than 7" 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.

3.5.2 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.

3.6 Fiber Optic Requirements

3.6.1 Authorized Optic Cables

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

• 900 microns patchcord for splicing, 2 Meters, 2 x SC 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, 4 x SC APC, 50/125/900/2000/4500 micron	
• Diamond p/n ENC/1045342 Black/Brown boots, 1Meter	• MA# 50000105
• Diamond p/n ENC/1045343 Black/Brown boots, 3 Meter	• MA# 500001060

•

• Zipcord patchcord, 4 x SC 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

3.6.2 Fiber Optic Rules

ATTENTION!

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

- Use only 8-degree SC APC connectors (green color).
- Use only fusion splice for connecting two fibers.
- 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.
- 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.

3.7 RF Rules

- Use coax RG223, 50ohm, male-to-male N-type for RF connections from the BUs to the BTS/RBS and to the RIU.
- When using the Corning CORE System in an environment in which other indoor coverage systems are installed, it is recommended (where possible) that the antennas are placed at least two meters apart
- When bending coax cables, verify that the bending radius does not exceed the coax specifications.
- Use wideband antennas supporting a range of 800 MHz to 2500 MHz
- Use a VSWR meter (i.e. Site Master or equivalent) for checking coax cables, including the antennas. (<2). The VSWR must be measured prior to terminating the RUs in the remote communication rooms
- Terminate all unused RHU, AO and RIU 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 RHU RF ports in the remote communication rooms.

3.8 Coax Cable Lengths and Losses

Use coax ½", 50ohm, male-to-male N-type, for connecting to RHU and antenna ports.

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

Table 3-1. Typical Coax Cable Lengths and Losses

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
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

3.9 Antenna Specifications and Guidelines

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

3.9.1 Authorized Antennas and Required Specifications

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 2500 MHz
- Gain: up to 12.5 dBi
- Impedance: 50 Ohm
- Types of couplers/splitters – depends on number of splits

3.9.2 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

3.10 Grounding Requirement

Verify that the equipment has been well grounded (refer to the grounding lug located on the rear of the MRC cabinet). This includes antennas and all cables connected to the system. Ensure lightning protection for the antennas is properly grounded.

3.11 Manual Handling

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

3.12 Power Consumption, Connections and Power Supplies

3.12.1 Power Safety Instructions

SAFETY WARNINGS

- When installing or selecting the power supplies:
- Be sure to disconnect all power sources before servicing.
- Calculate the required power according to the requirements of the specific installation and then determine the configuration of the power supplies. The required DC cables will then be determined by the selected PS configuration.
- Use only UL approved power supplies
- AC and DC power supply cables – only use the power cords supplied with the units
- Install external over-current protective devices for the system according to the requirements described in section 3.12.2.

3.12.2 Power Consumption of Units

Table 3-2. Power Requirements

Unit Type	Voltage Input	Typical Power Consumption	Maximum Current Consumption
RHU 1000	20 to 48VDC	25W	1.25A
RHU 1000E	20 to 48 VDC	29W	1.45A
Add-on Unit 1200	25 to 48VDC	50W	2.0A
RIU – 3 BTSCs	20 to 48VDC	12W	0.6A
Base Unit	20 to 48VDC	14W	0.7A
MA410/MA430 Controller	20 to 48VDC	10W	0.5A
SC-450 Controller	36 to 60 VDC	10W	0.2A
MA850/MA860	20 to 48VDC	20W	1.0A

3.12.3 Circuit Breakers

Install fuse protections for the system according to the following criteria:

- The following system elements require external fuse protection: RIUs, BUs, and SC-450 Controllers.
- Referring to Table 3-2, calculate the required fuse protection.
- Example: a set of three elements consisting of a BU, RIU and SC-450 controller requires a 2A circuit breaker.

3.12.4 Types of Power Supplies

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

3.13 Installation Conventions

Some of the basic installation conventions are listed below for the MA1000 system:

- Base Units – are usually concentrated in the same location, most often in the main communication room.
- Remote Hub Units (RHUs) – usually placed in the communication shaft or closet of a corresponding floor so they can be easily located. Each RHU can typically cover a floor of up to 30,000 sq ft.
- Fiber optic cable - bundled fibers are terminated into the Base Units in the main communication room. The fibers are then routed to each coverage locations where individual fibers terminate into splice boxes. The splice box couples the installed fiber into the remote units. Enough spare fibers should be installed to take into account future expansion of the system.

  For example, for three remote units, six fibers are required. However, to allow for future expansion, it is recommended to install additional optic fibers to be connected to additional RHUs.

  Figure 3-1 illustrates fiber optic routing sufficient to cover 21 floors: each group of strands can cover three floors as illustrated below, with two strands to spare. The first group of strands coves floors 1, 2 and 3; the next group will cover floors 4, 5 and 6 through an additional splice box.

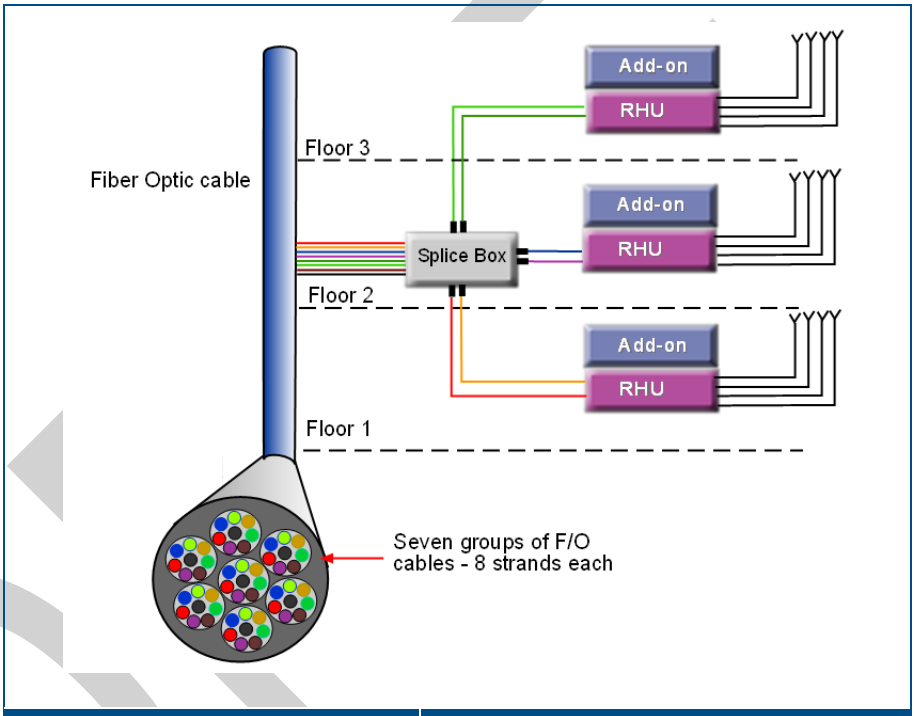


Illustration of Fiber Optic Routing | Figure 3-1

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

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

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

4 System Installation

This chapter describes how the communication room and remote locations are installed. The individual system elements are described in Chapter 2. In order to describe the installation process clearly, it will be described as consisting of two logical parts:

A. **Telecommunications room** – installing the **RIU**s, **BUs**, **410, 430 and SC-450 controllers**, and the required *passive equipment* in the telecommunication room close to the RF signal source. This installation may differ between single and multi-building topologies.
B. **Remote locations** – **RHU** and **Add-on** installations and connections. These are *usually* wall mounts.

The installations for two basic topologies are described in detail: for single building and for multi-building. By understanding the two generic installations you will be able to address any variations in system deployment.

4.1 Main Site - Communication Room Installation

It is recommended to install the following MA1000 system modules in a 19-in rack in the communication room

- RIU 3U
- BU 1U
- 410, 430 and SC-450 controller 1U
- Fiber Optic patch panel and splice tray

4.1.1 Rack Installation Instructions

4.1.1.1 General Instructions

Note: Usually, each operator installs the equipment that supports their services in a separate rack.

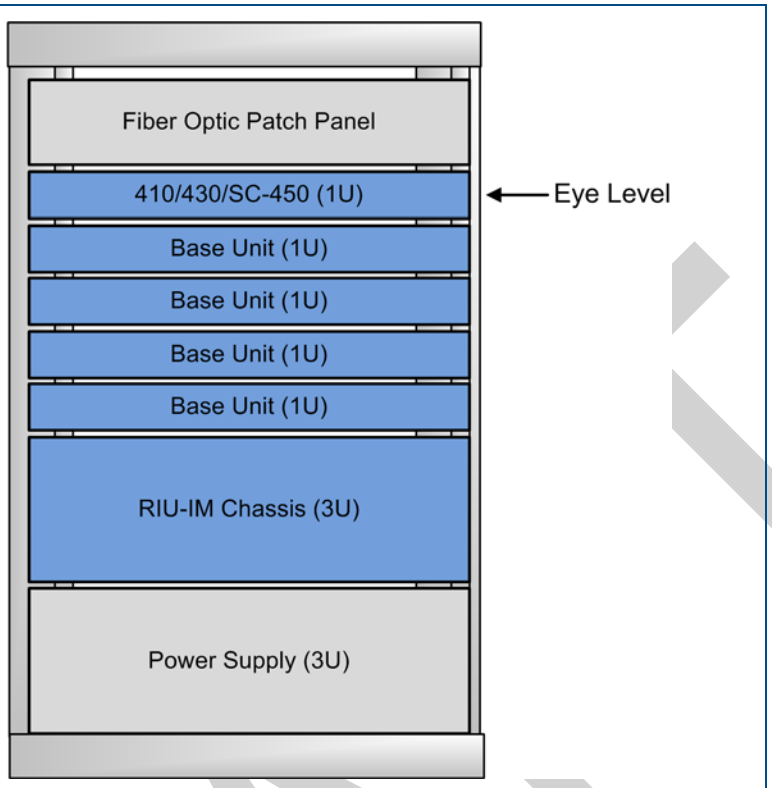
It is recommended to install the following Corning CORE system modules in a 19-in rack in the communication room

- RIU-IM Chassis 3U, RIU Lite 2U
- BU 1U
- SC-450/410/430 controller 1U
- Fiber Optic patch panel and splice tray
- Power supply/supplies (3U for each unit; units from other manufacturers may vary in size)

Verify that the rack height can support all the units to be installed, where you may also want to consider future expansions.

Figure 4-1 shows the recommended physical location of the MA1000 elements in the rack in order to facilitate and simplify the cabling connections. The configuration is for a single operator. If the site is serviced by more than one operator, each operator often installs their equipment in a separate rack.

Note: Note that the 430/SC-450 controller is at eye level to provide an easy view of the LED indicators and LCD display and easy access to the local and remote monitoring connections.



Recommended Order in the Communication Room Rack | Figure 4-1

4.1.1.2 Safety Instructions

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

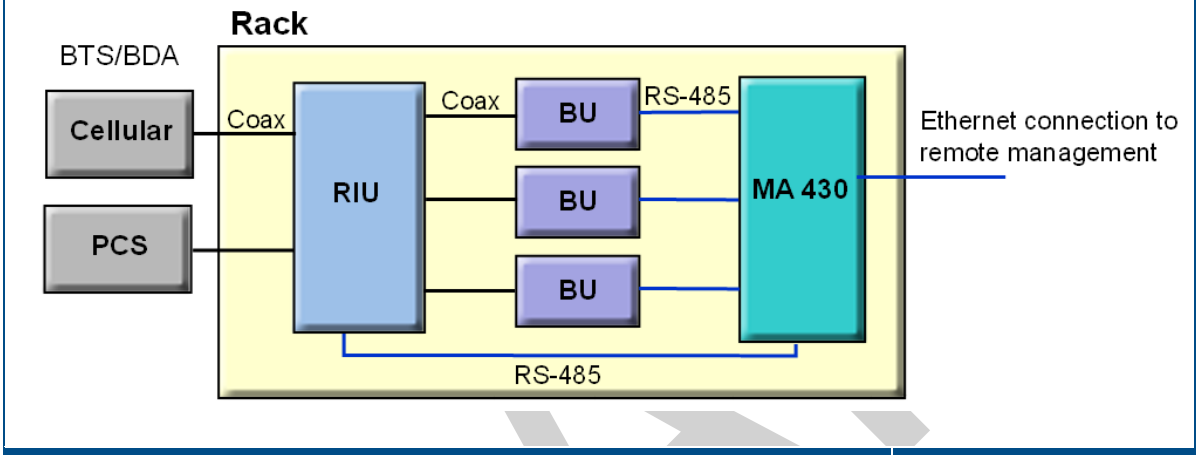
- Only trained and qualified personnel should be allowed to install or replace this equipment.
- Verify that ambient temperature of the environment does not exceed 50°C (122°F)
- To maintain a low center of gravity, ensure that heavier equipment is installed near the bottom of the rack and load the rack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

4.1.2 Single Building Rack Installation

This section provides an example of a single building **main communication room** installation for a 24-floor building with Cellular and PCS coverage.

Since there are 24 floors, then 24 RHUs are required – one for each floor. In addition, the following equipment will be installed in the main communication room:

- Three BUs – to support 24 RHUS
- One 430 controller for monitoring
- One RIU with Cellular and PCS BTSCs – to interface to the BTS/BDA



Example of Single-building Topology Communication Room Installation | Figure 4-2

4.1.3 Multi-Building Rack Installation

The figure below provides an example of a multi-building solution which distributes two bands from a main site over two remote sites up to 20Km away. **The 330** units extend the RF signal from the Main to the Remote buildings over a single strand of fiber. Uplink and downlink signal are placed on the single fiber at 1310 and 1550 respectively.

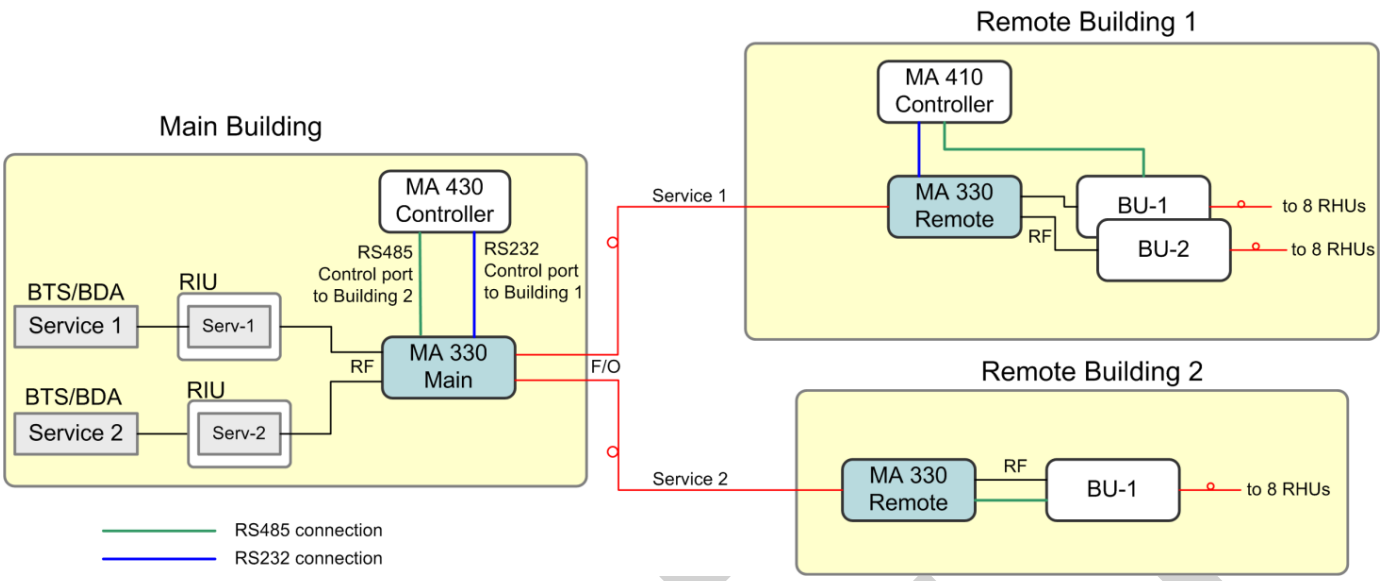
The 330 system provides flexible solutions for various site requirements. The figure below illustrates two types of installations:

- **Remote Building 1** – installation in a remote location with several Base Units. For clarity, the example shows two Base Units. However, the configuration applies to a maximum of four (8-port) Base Units that are supported using a 330 Expansion Box.

The 330 Remote unit forwards the signals as follows:

- Service signals to the Base Units
- Control signals from Master Controller at the main site to the 410 Slave Controller at the remote site. The Base Units are controlled through the 410 controller.

- **Building 2 –** special installations in a remote location with *a single* Base Unit. The 330 Remote unit forwards both the service and the control signals from the main building *directly* to the Base Units. Note that a *410 Controller is not required in this type of installation.*



330 System Installation Examples | Figure 4-3

4.1.4 RIU Connections

Refer to the RIU Products Installation and Configuration Guide for detailed instructions on connecting the RIU model in your installation.

4.1.5 BU Connections

Note:It is assumed that the patch panel cabinet (SC/APC adaptors) for fiber optic cable connections is installed in the rack near the BUs.

1. Connect (3/125/900) pigtail with SC/APC connectors between **splice tray** and **patch panel** cabinet.
2. Connect (3/125/3000) SC/APC jumpers between the corresponding **BU** and **patch panel**.
3. Connect the fiber optic cables from the **BU** to the **RHUs** through the patch panel cabinet.
4. Connect the **UL RF** Output and **DL RF** Input connectors to the RIU or UL and DL connectors or to the passive interface (such as Interface Box) in topologies that do not include RIUs.

4.1.6 Controller Connections

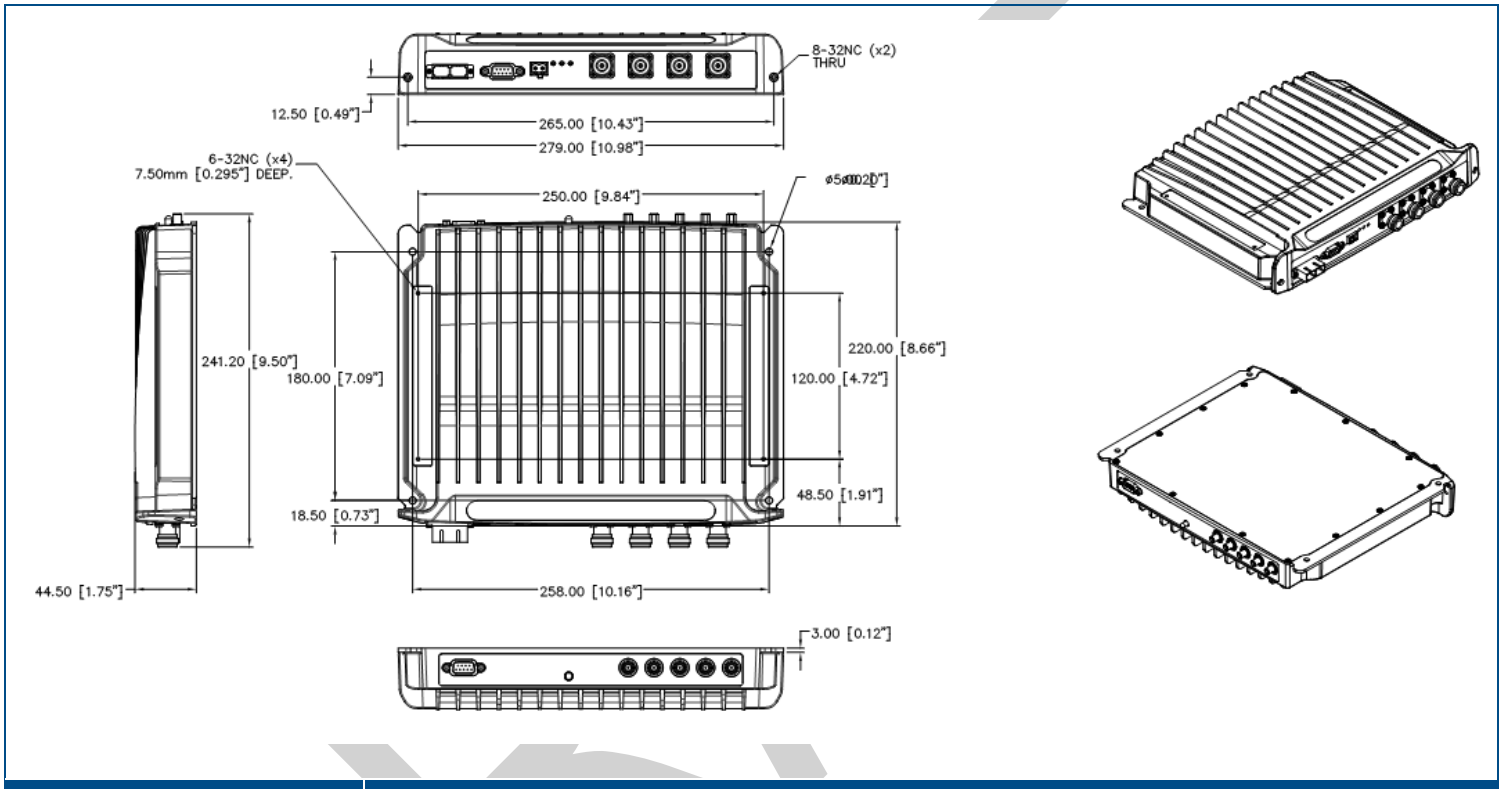
Refer to the *NMS 410/430 or SC-450 Installation and Configuration Guide* for connections.

4.2 Remote Site Installation

4.2.1 MA1000 RHU Installation

Mount and install each RHU on the wall in the communication shaft or communication room.

The following provides the dimensions for the RHU unit.



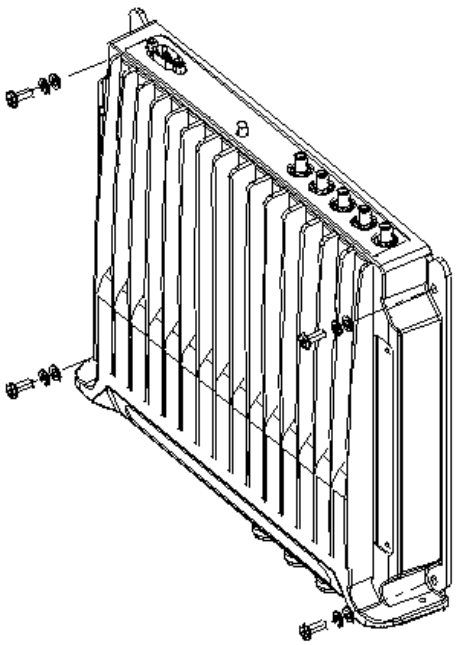
MA1000 RHU Dimensions | Figure 4-4

4.2.1.1 Wall Mount

MA1000 RHU is usually mounted on a wall in a clean indoor environment – RF ports facing down.

Assembly instructions

1. Place the unit against the wall and mark the four holes to be drilled in the wall.
2. Drill four holes 8 mm in diameter and insert the appropriate sized plastic plugs in each hole.
3. Secure the MA1000 RHU to the wall using four screws, 4.5mm diameter, 40 mm long.



MA1000 RHU Wall Mount | Figure 4-5

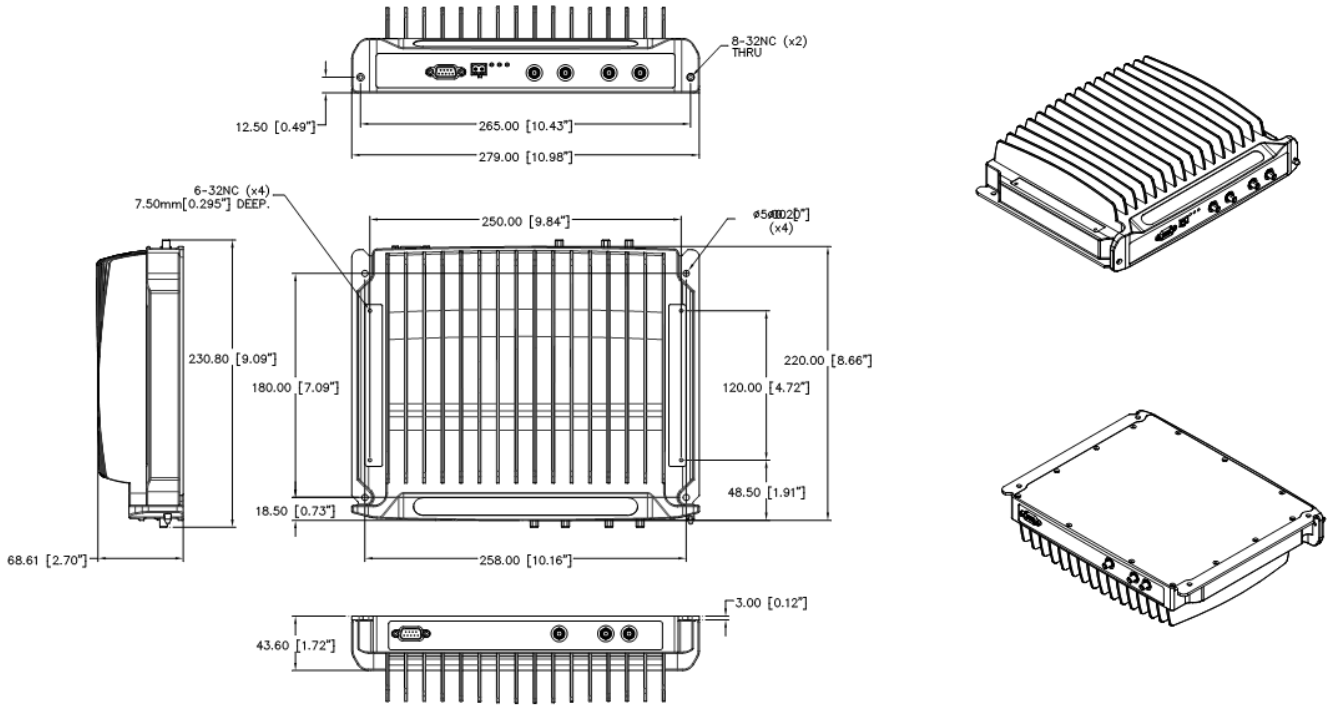
4.2.1.2 Connections

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

1. Connect fiber optic cable to splice box and to SC APC pigtails to RHU.
2. For the downlink, connect the fiber optic cable pigtails from splice box coming from the **BU** port to the corresponding **RHU** port.
3. Connect the RHU to antennas according to the RF engineers design (up to 4 antennas per RHU).
4. For the uplink, connect the fiber optic cable pigtails from splice box from the RHU to the uplink port that connects to the BU.
5. Connect the power to each RHU according to power design planning.
6. Verify that 50 ohm terminators are placed on the unused uplink and downlink connectors.

4.2.2 Add-on Installation

The following figure provides the dimensions for the Add-On unit.



Add-On Dimensions | Figure 4-6

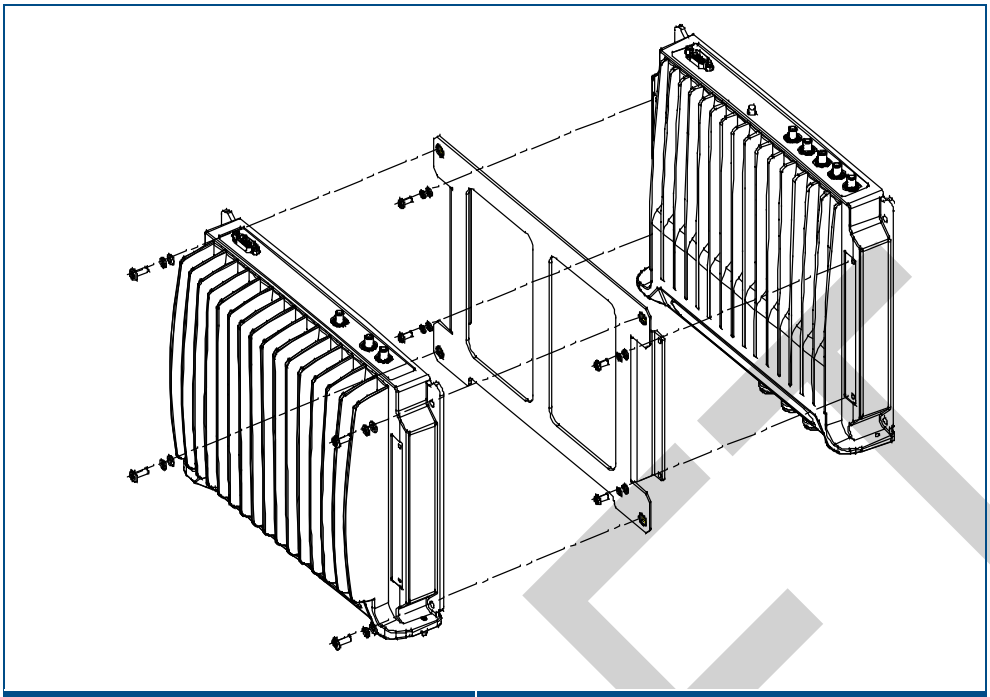
4.2.2.1 Assembly and Connections

Refer to **Error! Reference source not found.**.

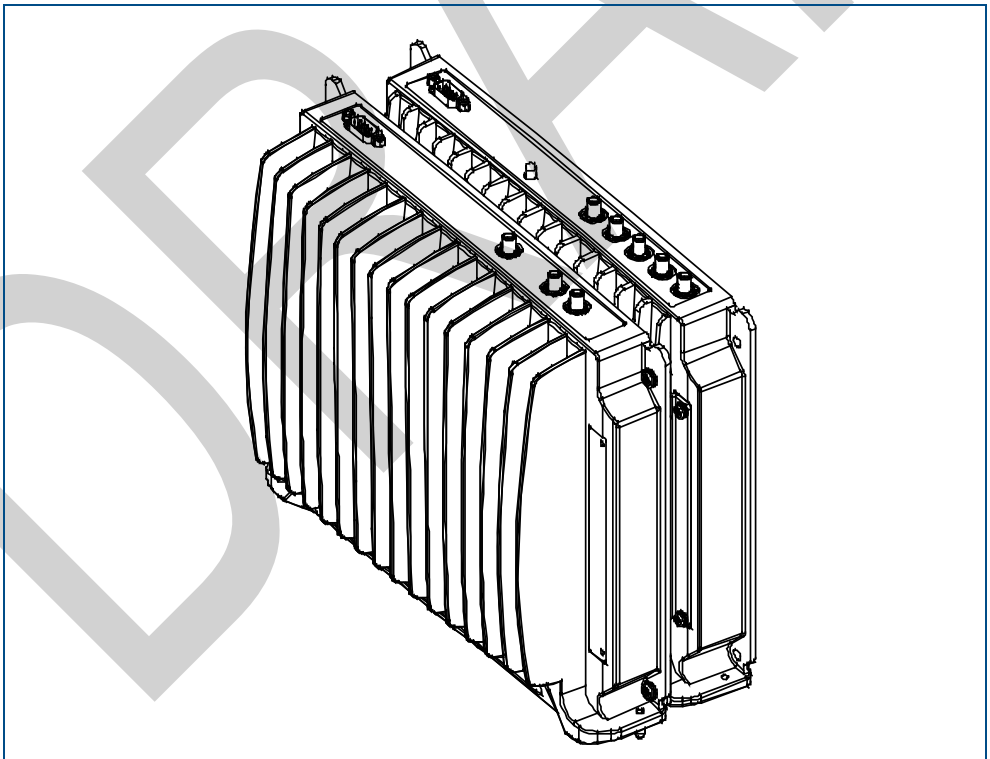
ATTENTION!

To prevent damaging the SMA connectors,
be sure to tighten using a torque of 8 lb.

1. Position the supplied bracket on the 1000 RHU and secure the **bracket** to the **1000 RHU** using the four supplied **6-32 NC** screws.
2. Position the RHU Add-on unit on the bracket and secure the **Add-on** to the **bracket** using the four supplied **8-32** screws.
3. **Interconnect** the 1000 RHU and RHU Add-on SMA **Uplink**, **Downlink** and **High** connectors on the rear panels of both units using the **three straight** jumpers.
4. **Interconnect** the 1000 RHU and RHU Add-on **D-type 9-pin** connectors on the rear panels of both units using the supplied flat-cable.
5. Connect the power to the RHU Add-on front-panel **DC** connector.6.



RHU Add-on to 1000 RHU Assembly | Figure 4-7



RHU Add-on to 1000 RHU Completed Assembly | Figure 4-8

4.2.3 860 WLAN Solution Installations

Refer to the corresponding User Manual for detailed instructions on installing the unit.

4.2.4 Antenna Connections

- For systems without the 860 WLAN solution modules - connect the antenna connections to the RHU antenna ports;
- For systems with the 860 WLAN solution - refer to the 860 Installation and Configuration Guide and connect the antenna ports to the 860.

Appendix A: System Specifications

RF Parameters

RF Frequency Range

Services	Frequency Range (MHz)	
	Uplink	Downlink
LTE SISO*	698-716 778-787	728-757
CELL	824-849	869-894
Telstra 850M	824-849	869-890
iDEN (SMR800)	806-824	851-869
GSM	890-915	935-960
E-GSM	880-915	925-960
iDEN (SMR900 Paging)	896-902	929-941
AWS	1710 - 1755	2110 - 2155
DCS	1710-1785	1805-1880
PCS	1850-1910	1930-1990
G-PCS	1850-1915	1930-1995
UMTS 2100	1920-1980	2110-2170

*700 LTE Lower A, B, C blocks 3GPP Band 13 and Upper C blocks

Low Band

RHU 1000	LTE 700 MHz		CELL/TDMA/ CDMA/WCDMA/ GSM800		SMR 800[6]		GSM/EGSM		SMR 900[6]	
	DL	UL	DL	UL	DL	UL	DL	UL	DL	UL
Maximum Output Power per Antenna Port										
1 (Composite)	21		20		20		14		20	
2 Carriers	18		17		17		11		17	
4 Carriers	15		14		14		8		14	
8 Carriers			11		11		5		11	
12 Carriers			9		9		3		9	
Mean Gain (dB)[1]	21		20	7	20	7	14	7	20	7
Pin (dBm)[1]	0		0		0		0		0	
Input IP3 (dBm) AGC OFF Minimum		-10		-5		-5		-5		-5
Input IP3 (dBm) AGC ON Minimum				5		5		5		5
SFDR[2] (dB)		55		68/69/73		72		68		74
Max Intermod Distortion (dBm)	**		-13*		-13		-36		-13	
Max Nf (dB)		20		20		20		16		16
Gain Flatness/Ripple[3] (dB)	± 1.0[5]		± 1.5		± 1.5		± 1.5		± 1.5	

* WCDMA compiles with 3GPP TS 25.106 V5.0.0 (2002-03) table 9.4 spectrum emission mask.
**Out of band and spurious emissions compliant with FCC standards.
1 Factory set mean gain BU-RHU without RIU. May be field adjusted using controller system.
2 SFDR for CDMA services is calculated in 100KB/sec.
3 Gain Flatness/Ripple is specified for the non-duplexed port of the system.
4 Specifications include the 900 MHz UL filter. The output power is limited on the downlink.
5 Gain Flatness/Ripple at any block of the spectrum.
6 The SMR 800/900 for Sprint are to be designed, per Sprint guidelines, with composite power levels per antenna port and mean gain values 3dB less than stated

High Band

RF Parameters High Band RHU 1000	DCS		PCS5/[5] CDMA/WCDMA		PCS[5] GSM/TDMA	
	DL	UL	DL	UL	DL	UL
Max Output Power per Antenna Port 1 (Composite)	16		20		20	
2 Carriers	13		17		17	
4 Carriers	10		14		14	
8 Carriers	7		11		11	
12 Carriers	5		9		9	
Mean Gain (dB) [1]	16	3	20	3	20	3
Pin (dBm) [1]	0		0		0	
Input IP3 (dBm) AGC OFF Minimum		-6		-6		-6
Input IP3 (dBm) AGC ON Minimum		3		3		3
SFDR[2] (dB)		65		67		70/65
Max Intermod Distortion (dBm)	-30		-13*		-13*	
Max Nf (dB)		18		18		18
Gain Flatn. (dB)	± 2.0					

* WCDMA compiles with 3GPP TS 25.106 V5.0.0 (2002-03) table 9.4 spectrum emission mask.
[1]Factory set mean gain BU-RHU without RIU. May be field adjusted using controller system.
[2]SFDR for CDMA services is calculated in 100KB/sec.
[3]Gain Flatness/Ripple is specified for the non-duplexed port of the system.
5The PCS service RF specifications outlined is relevant only for the MA1000 CELL/PCS RHU, CELL/PCS/700LTE TSX, CELL/PCS/AWS TSX and CELL/PCS/700LTE/AWS QSX
[6]The PCS service RF specifications outlined is relevant only for the MA1000 PCS AO and IDEN/SMR/PCS TSX c

RF Parameters MA1200 Add-on

MA1200 Add-on	G-PCS[6] CDMA/WCDMA		G-PCS[6] GSM/TDMA		UMTS and AWS CDMA/WCDMA	
	DL	UL	DL	UL	DL	UL
Max output PWR per Antenna Port						
1 (comp)	20		21		21	
2 carriers	17		18		18	
4 carriers	14		15		15	
8 carriers	11		12		12	
12 carriers	9		10		10	
Mean Gain(dB)*	20	3	20	3	21	3
Pin (dBm)*	0		1		0	
Input IP3 (dBm) AGC OFF Min		-7		-7		-7
Input IP3 (dBm) AGC ON Min		3				
SFDR** (dB)	66		66		64	66
Max Intermod Distortion (dBm)	-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

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

System Specs

Fiber Optic Specifications

Optical output power	<3.0mW
Max. Optical budget	2 dB for fiber + 1 dB for connectors (assumed) = 3 dB total 300 m Multi-mode
Optical loss per mated-pair connectors	0.5 dB (max)
Optical Connector	SC APC
Fiber type	9/125 SM Multi-mode: 50/125 um or 62.5/125um (Minimum qualifications with ANSI/TIA/EIA-568-B series, EN50173-1 or ISO/IEC 11801)
Wavelength	1310 ±10 nm
Maximum Distance between Base Unit and Remote Cabinet	2 km

Absolute Maximum Rating

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

Temperature Specifications

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

Specifications of Units

MA 1000 Remote Hub Unit

Supported Services:	Two services corresponding to the model
Power:	
Input Power	20 to 48V DC
Power Consumption	29 W
RF Connections:	To Antennas (via hub) - N-type Female, 50 ohm
	To MA 1200 add-on - SMA 50 ohm
Optic Connections:	SC APC optic connections
Remote Management:	SNMP, NMS via Base Unit connection to SC-450 controller
Physical Characteristics:	
Dimensions (W x D x H):	10.98 x 9.5 x 1.74 in (278.9 x 241.3 x 44.2 mm)
Weight:	6.2 lb (2.8 kg)

MA 1200 Add-On Specifications

Supported Services:	Single service corresponding to the model
Power:	
Input Power	25 to 48V DC
Power Consumption	50 W
RF Connections:	To RHU - SMA 50 ohm
Remote Management:	SNMP, NMS via RHU connection
Physical Characteristics:	
Dimensions:	10.98 x 8.66 x 2.71 in (278.9 x 219.96 x 68.83 mm)
Weight:	6.2 lb (2.8 kg)

Base Unit Specifications

Supported Services:	Wideband device supporting all services supported by MA1000 systems
Power:	
Input Power	20 to 48V DC
Power Consumption	14 W (BU8)
RF Connections:	N-Type Female, 50 ohm – interface to RIU or to passive
Optic Connections:	Four or eight (depending on the model) SC APC optic connections
Remote Management:	SNMP, NMS via connection to SC-450 controller
Physical Characteristics:	
Dimensions (H x W x D)	(1U x 19 x 11.8 in) (1U x 482.6 x 299.72 mm)
Weight:	6.2 lb (2.8 kg)

Appendix B: Ordering Information

Note: The information listed below is updated up to the document publishing date. Refer to the MA1000 datasheet for the most updated ordering information.

MA1000 QSX

Supported Services	Part Number	Description
CELL/PCS/700 LTE/AWS	1000-C85P19L70A17-A	MA1000 Quad-service package supporting CELL, PCS, 700 MHz LTE and AWS.
	1000M-C85P19L70A17-A	MA1000 Quad-service package supporting CELL, PCS, 700 MHz LTE and AWS with MMF.

MA1000 TSX

Supported Services	Part Number	Description
CELL/PCS/700 LTE	1000-C85P19L70-A	MA1000 TSX tri-service CELL/PCS and 700 MHz LTE.
	1000M-C85P19L70-A	MA1000 TSX tri-service CELL/PCS and 700 MHz LTE with MMF.
CELL/PCS/AWS	1000-C85P19A17-A	MA1000 TSX tri-service CELL/PCS and AWS.
	1000M-C85P19A17-A	MA1000 TSX tri-service CELL/PCS and AWS with MMF.
IDEN/SMR/PCS	1000-IDEN-SMR-G-PCS	MA1000 TSX tri-service iDEN/SMR and PCS with G-Block support.
	1000M-IDEN-SMR-G-PCS	MA1000 TSX tri-service iDEN/SMR and PCS with G-Block support with MMF.
	1000-IDEN-SMR-G-PCSF	MA1000 TSX tri-service iDEN/SMR and PCS with G-Block support and filter to provide additional guard band between iDEN DL and SMR UL.
	1000M-IDEN-SMR-G-PCSF	MA1000 TSX tri-service iDEN/SMR and PCS with G-Block support and filter to provide additional guard band between iDEN DL and SMR UL with MMF.

Base Units

Part Number	Description
WB-B8U	Wide Band Base 8 Unit supporting 8 RHUs
WBM-B8U	Wide Band Base 8 Unit supporting 8 RHUs over MMF
WB-B4U	Wide Band Base 4 Unit supporting 4 RHUs
WBM-B4U	Wide Band Base 4 Unit supporting 4 RHUs over MMF

Remote Hub Unit Modules

Part Number	Description
1000-CELL-4E	Single band CELL, 4 ports, PCS Add-on support
1000-PCS-4E	Single band PCS, 4 ports, AWS Add-on support
1000-DCS-4E	Single band DCS, 4 ports, UMTS Add-on support
1000M-DCS	MMF Single band DCS, 4 ports, UMTS Add-on support
1000-CELL-PCS4E-HL	Dual band CELL/PCS, 4 ports, AWS Add-on support
1000M-CELL-PCS4E-HL	MMF dual band CELL/PCS, 4 ports, AWS Add-on support
1000-CELL-DCS4E	Dual band CELL/DCS, 4 ports, UMTS Add-on support
1000M-GSM-DCS	MMF dual band GSM/DCS 4 ports, UMTS Add-on support
1000-GSM-DCS4E	Dual band GSM/DCS, 4 ports, UMTS Add-on support
1000-GSMO-DCS4E	Dual band GSM orange/DCS, 4 ports, UMTS Add-on support
1000M-iDEN-SMR	MMF dual band iDEN(SMR800)/SMR900 Paging,4 ports, PCS Add-on support
1000-iDEN-SMR4	Dual band iDEN(SMR800)/SMR900, 4 ports, PCS Add-on support
1000-IDEN-SMR4F	Dual band iDEN(SMR800)/SMR900, 4 ports with filter kit, PCS Add-on support
1000-SMR-FILTER	Filter kit for SMR 900

Add-On Modules

Part Number	Description
700LTE-AO-A-SCU	Add-On kit for LTE 700 MHz service for use in upgrade situations with older MA1000 Cell/PCS RHUs (P/N 1000-CELL-PCS4E and 1000M-CELL-PCS). Includes 700 MHz service combiner unit (SCU-700) and applicable accessories for connecting to the Cell/PCS RHU.
700LTE-AO-B-HL	Add-On for LTE 700 MHz service with MA1000 Cell/PCS RHUs (P/N 1000(M)-CELL-PCS4E-HL)
1200-G-PCS-AO	Add-On RHU Supporting a PCS w/G-Block
1200-UMTSE-AO	Add-On RHU - UMTS Service
1200-AWS-AO	Add-On RHU Supporting AWS Service

Power Supply Accessories

Part Number	Description
LPS-48V-66W	Local AC/DC Converter 66W
LPS-48V-100W	Local AC/DC Converter 100W
AK-PWR-CORD-EU	AC Power Cord for 66W and 100W Power Supplies, European Connector
AK-PWR-CORD-UK	AC Power Cord for 66W and 100W Power Supplies, UK Connector

Mounting Bracket Accessories

Part Number	Description
BRKT-1200-STK	Bracket for stacking RHU/Add-On/860 module on top of an Add-On module
BRKT-1RU-SHELF-2K	Shelf for RHU/Add-On/860 or bracket for stacking on MA2000 MRC
BRKT-RHU-800-STK	Bracket for stacking RHU/Add-On/860 module on top of a RHU/860 module *Note: Not on top of an Add-On*

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