mobileaccess

MobileAccess 1000 System

Installation and Configuration Guide

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Reporting Defects

THE UNITS WERE INSPECTED BEFORE SHIPMENT AND FOUND TO BE FREE OF MECHANICAL AND ELECTRICAL DEFECTS.

EXAMINE THE UNITS FOR ANY DAMAGE THAT MAY HAVE BEEN CAUSED IN TRANSIT. IF DAMAGE IS DISCOVERED, FILE A CLAIM WITH THE FREIGHT CARRIER IMMEDIATELY. NOTIFY MOBILEACCESS AS SOON AS POSSIBLE.

NOTE: KEEP ALL PACKING MATERIAL UNTIL YOU HAVE COMPLETED THE INSPECTION

WARNING: TO COMPLY WITH FCC RF EXPOSURE COMPLIANCE REQUIREMENTS, ANTENNAS USED FOR THIS PRODUCT MUST BE FIXED MOUNTED ON INDOOR PERMANENT STRUCTURES, PROVIDING A SEPARATION DISTANCE OF AT LEAST 20 CM FROM ALL PERSONS DURING NORMAL OPERATION.

WARNING: ANTENNA GAIN SHOULD NOT EXCEED 10 dBI.

WARNING: EACH INDIVIDUAL ANTENNA USED FOR THIS TRANSMITTER MUST BE INSTALLED TO PROVIDE A MINIMUM SEPARATION DISTANCE OF 20 CM OR MORE FROM ALL PERSONS AND MUST NOT BE CO-LOCATED WITH ANY OTHER ANTENNA FOR MEETING RF EXPOSURE REQUIREMENTS.

WARNING: THE DESIGN OF THE ANTENNA INSTALLATION NEEDS TO BE IMPLEMENTED IN SUCH A WAY SO AS TO ENSURE RF RADIATION SAFETY LEVELS AND NON-ENVIRONMENTAL POLLUTION DURING OPERATION.

ATTENTION:

COMPLIANCE WITH RF SAFETY REQUIREMENTS:

- MOBILEACCESS™ PRODUCTS HAVE NO INHERENT SIGNIFICANT RF RADIATION.

- THE RF LEVEL ON THE DOWN LINK IS VERY LOW AT THE REMOTE UNITS (RHUS) DOWNLINK PORTS. THEREFORE, THERE IS NO DANGEROUS RF RADIATION WHEN THE ANTENNA IS NOT CONNECTED.

Laser Safety

FIBER OPTIC PORTS OF THE MOBILEACCESS 1000/2000 EMIT INVISIBLE LASER RADIATION AT THE 1310 NM WAVELENGTH WINDOW.

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 THE MOBILEACCESS 1000/2000 MODULES AND THE ASSOCIATED CABLES.

THE MOBILEACCESS 1000/2000 COMPLIES WITH 21 CFR 1040.10 AND 1040.11 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE NO. 50 (JULY 26, 2001) & IEC 60825-1, AMENDMENT 2 (JAN. 2001).

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

Standards and Certification

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

Product Certifications

US   FCC 47 CFR part 15B, 22, 24, 90

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 communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does 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 Mobile Access Ltd. could void the user's authority to operate the equipment.

UL 60950-1

21CFR 1040.10 & 1040.11.

Europe   EN 301502, EN 300609, EN 301489, EN 60950-1, IEC 60825-1, IEC 60825-2

Company Certification

ISO ISO 9001: 2000 and ISO 13485: 2003

About this Guide and Other Relevant Documentation

This user guide describes how to perform the physical installation of the MA1000 systems. The installation procedures of other units (RIU, MA850/860) relevant to the system are detailed in their user manuals (see *Additional Relevant Documentation* below).

Revision History

The revision history for this document is shown in Table 1-1.

Table 1-1: Revision history

P/N	Date	Description
709C001502	05-SEPT-07	Updates up to current version.
	01-DEC-07	Update for 1000M products – Multi-mode fiber
709C001503	2008	Update for G-Block support

Additional Relevant Documents

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

Document Name
MA 850/860 Installation and Configuration Guide
RIU Installation and Configuration Guide
NMS MA 410/430 Installation and Configuration Guide
MA1000 MA2000 Commissioning Guide

List of Acronyms

AGC	Automatic Gain Control
BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
BTSC	Base Transceiver Station Conditioner
BU	Base Unit
DL	Downlink
RHU	Remote Hub Unit
RIU	Radio Interface Unit
SNR	Signal to Noise Ratio
UL	Uplink
VDC	Volts Direct Current

Table of Contents

1 Introduction to the MA 1000 System

1.1 About MobileAccess™ 1000

MobileAccess™ 1000 converged wireless networks solution provides scalable in-building coverage for multiple wireless data and voice services through a single coax and broadband antenna infrastructure.

The solution is based on combining a number of services, both voice and data, at each covered location and distributing them through a common antenna infrastructure.

NOTE: MobileAccess is in the process of transition to 1000M products that will support both singlemode fiber and multimode fiber. The new Base Unit is designated by WBM (Wide Band M) and the new RHUs will be indicated by 1000M RHUs, *where the suffix "M" indicates that the product will support both single mode and multimode fiber usage.* The new products have the same packaging and performance and are fully backward compatible. See 3.3.2, Fiber Optic Rules for details on multimode fiber use.

Voice services are transmitted between the BTS side and the locations via optic fiber after the appropriate conversion from RF to optic, and reconverted to RF at each end. The MA 1000 system provides entry level solutions that can be upgraded *using the same infrastructure* to support additional services as required.

Wireless 802.11/a/b/g coverage may be integrated into the MA 1000 system using the **MA 850/860** remote module (that supports wireless LAN service distribution).

To optimize system coverage under changing environmental conditions or load, as well as to enable remote monitoring of all system elements from a central location, MobileAccess provides the following MA 1000 system enhancement solutions:

- Manageable BTS interface devices that control the level of the BTS signal fed into the system (Radio Interface Unit)
- Network Management System (NMS) consisting of controllers, adjustment and management software

1.1.1 Features

- Support for all current and future technologies such as TDMA, CDMA, WCDMA and GSM, and services such as PCS/CELLULAR, Paging, iDEN and 802.11 (a/b/g) Wireless LAN
- All services are distributed through a *single* coax and antenna infrastructure
- All active components are located in the communication closet/room
- Modular, scalable and future-safe – additional remote units can *easily* be installed
- Support for remote monitoring through MA 410/430 controllers
- Eliminates RF interferences occurring where multiple antenna systems are used to serve multiple services

- Enables fast deployment for corporate enterprises, property owners and WSP's of new services

- Reduces tenant disruption

- Low power required by the system eliminates the need for high power BTS/RBS, reducing operator expenses

- Provides both local and remote monitoring and control capabilities

- Software programmable parameters including output power, AGC (on/off and levels), and system gain

- Real time component setting capabilities for optimal performance (aging, temperature, optical connectors, etc.,)

1.2   System Architecture

The MA 1000 solution is based on the following main elements:

- **MA Base Units (BUs) –** The BUs perform RF to optic conversion on the BTS side.

- **MA Remote Hub Units (RHUs) 1000 –** The MA 1000 performs the RF to optic signal conversion at the antenna side for up to two services corresponding to the RHU model. A third service can be added by connecting an add-on remote hub unit **(MA 1200)** to the RHU 1000.

- **MA 850** – The MA 850 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.

All services are combined and distributed through the same antenna broadband infrastructure.

To provide optimum coverage at all times and monitoring and control of all system elements from a central location MA provides the following devices:

- **MA Radio Interface Units** (RIUs) – The RIUs provide interfaces for up to three BTS/BDA signals, and automatically adjusts the output signal in response to input signal level in order to provide optimal coverage.

- **MA 410/430 controllers** – The controllers enable remote monitoring of the system elements from a *single location* via advanced intuitive GUI.
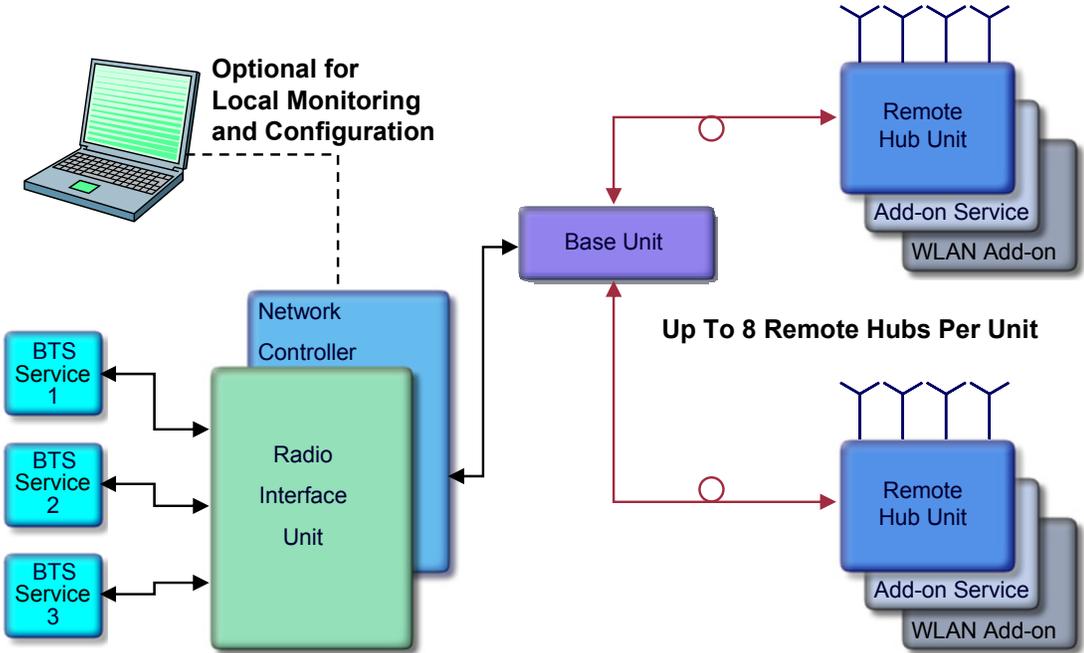
Figure 1. MA 1000 System Overview

1.3   Configuration Options

The MobileAccess™ 1000/1200 system includes three basic configuration options:

A) Basic configuration

The Base Unit drives a single or dual band, MobileAccess™ 1000 RHU. The dual band RHU consists of a low band service (cellular 800, iDEN, Paging, or GSM 900) and a high band service (PCS 1900 or DCS 1800).
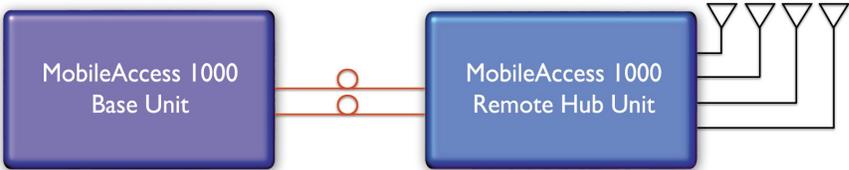
Figure 2. MobileAccess 1000 Basic BU – RHU Configuration

B) Using the MobileAccess 1200 add-on unit to provide an additional service

A MobileAccess™ 1200 add-on unit can be connected to a MA RHU 2000 unit to provide a third service. The add-on unit can be Cellular, PCS, UMTS, 3G, or any future service.
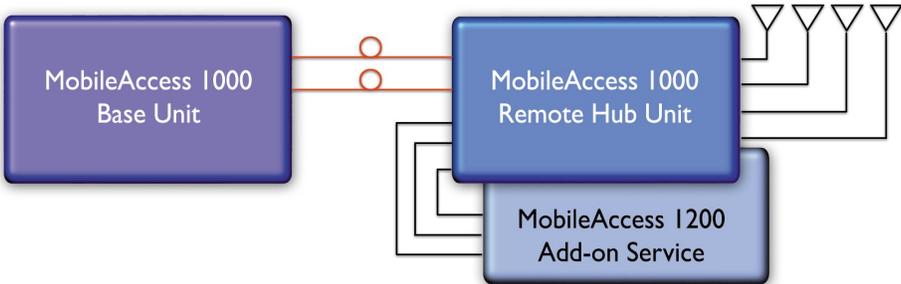
Figure 3. MobileAccess 1000/1200 BU – RHU Plus Add-On

C) Using the MobileAccess 850/860 WLAN module to provide access to high data-rate service

A WLAN module (MobileAccess™ 850/860) may also be added in a configuration that includes both RHU 1000 and RHU 1200 or only RHU 1000.
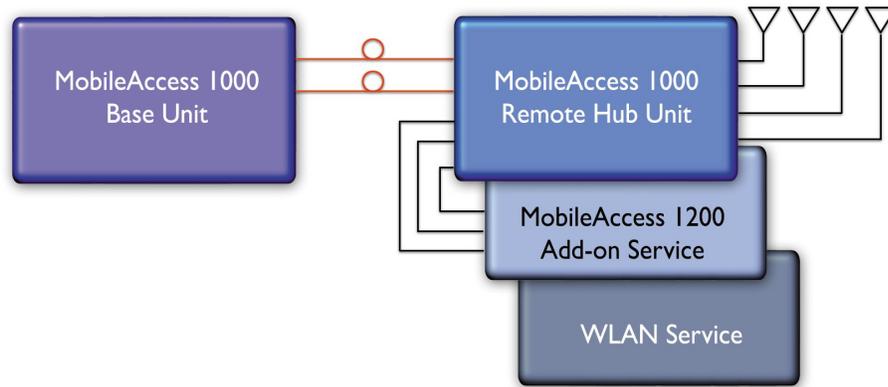
Figure 4. MobileAccess 1000/1200 BU – RHU Plus Add-on Plus WLAN Configuration

1.4   MA 410/430 Remote Management

The MobileAccess (MA) Network Management System (NMS) provides complete site coverage and network management. It can be used to provision coverage that can compensate for changing loads. It also provides real-time monitoring, control and diagnostics capabilities for *MobileAccess* devices from a single location.

NOTE: The MA NMS System is fully described in the MA NMS System Configuration and Operation Guide.

The MA NMS system consists of:

- **MA 410/430 Controller** – The controller provides the interface between the system elements and the management and control mechanism. Two controller models are available:

  - MobileAccess 410™ – enables management of the connected devices through a local or point-to-point dial-up connection. It can be remotely managed through a connection to the MobileAccess 430 controller.

  - MobileAccess 430™ – enables management of all connected elements and all connected MA 410 controllers and the corresponding elements. Supports SNMP (Simple Network Management Protocol) over TCP/IP connection.

  - MA 430 may be managed through the Network Operator Center (NOC) through Manager of Mangers element such as HP OpenView via SNMP.

- **MCT** – a Java based GUI application provided with both controllers. The MCT is used after the installation procedure to adjust MobileAccess devices according to the installation site characteristics in order to optimize coverage for the site.

  The application is installed and ran from a computer that is connected either locally or via remote dial-up modem to the controller site to be adjusted or monitored.

- **MobileAccess Manager™** – a Java based GUI software application that provides enhanced monitoring and control capabilities for all your *MA 430™* sites from a single location; each site can consist of a standalone MA 430 controller, or a MA 430 controller in a Master topology with a number of MA 410 controllers connected as slaves. The **MobileAccess Manager** application is not supplied with the controller – it is *purchased separately.*

The MA NMS application is installed on a server and is accessed from any client by connecting to the server from any Web Browser with enhanced Java VM capabilities.

MA NMS manager provides the following features and capabilities:

- Remote SNMP management from a single location

- Client/server management capability over a TCP/IP network with enhanced monitoring and control capabilities

- Intuitive GUI that enables end-to-end fault sourcing from RIU to antennas. The GUI includes:

  - System status at a glance through multi-color tree with upward propagation of fault indications

  - Graphical view of system elements including LED status displays and auxiliary connections

  - Multi-color event monitoring display

  - RF Connections

2 System Elements

This chapter describes the MA1000 system basic elements: MA remote modules (MA 100 RHU and MA1200 Add-on) and the Base Units. Your system may include additional elements such as MA 410/430 controllers, MA RIUs and MA850 or MA860 units; these are described in the corresponding User Guides.

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 MA 1000 RHUs and in addition, may include MA 1200 add on modules and MA 850 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 4 - System Installation.

2.1.1 MA 1000 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 a MA 1200 Add-on module (see section 2.1.2).

Each RHU 1000 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 MA 410/430 controller (1.4).

The RHU 1000 services, MA 1200 add-on service and data services (provided by MA 860) at each location are combined and then transmitted over a common infrastructure to strategically placed antennas.

2.1.1.1   RHU 1000 Front Panel

The RHU 1000 front panel contains the fiber optic connections to the BU, four coax connections to the antennas, power connections and status indicators.

If RHU 1000 and MA 1200 add-on units are installed, then the combined services are fed to the coax infrastructure through the *RHU 1000 antenna ports*. However, if MA 850/860 is also installed, the combined *data and voice* services are fed to the coax infrastructure through the *MA 850/860 antenna ports*.

NOTE: To provide alarms, the antenna must supply a DC resistance of up to 5K ohms.
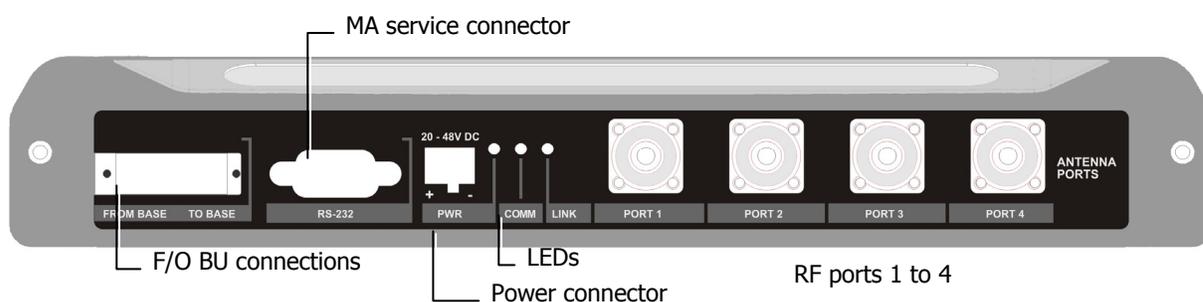
Figure 5. RHU 1000 Front Panel

Table 2-1. RHU 1000 Front Panel Indicators

LED	Description
COMM	Active communication detected
LINK	Optical link to BU detected
PWR	DC power connected

2.1.1.2 RHU 1000 Rear Panel

The RHU 1000 rear-panel provides the control, RF interface and optic interface ports that enable connecting an MA 1200 add-on unit to the RHU 1000 module.

Figure 6. RHU 1000 Rear

Table 2-2. RHU 1000 Rear Panel Connectors

Add-on control	Transmits the control signals from MA 1200 add-on module to the RHU 1000 module. Connected to the MA 1200 add-on **Control From** port.
High Band	Connects to the **1200 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.
DL, UL	Transmit the RF signals to- and from- the MA 1200 add-on module. These ports are connected to the corresponding ports on the MA 1200 rear panel: DL to DL, UL to UL.

2.1.2 MA 1200 Add-on

The MobileAccess 1200 Add-on module is a high power module, supporting a single frequency band (low or high). It is designed to be integrated with a host *RHU 1000* module. The RHU 1000 module provides the following functionality for both units:

• Optical interface (to the BU) and conversion

• RF interface (to antennas) and conversion

• Control signals

In addition, WLAN services can also be combined with MA 1200 add-on and RHU 1000 services. (However, in this type of configuration the combined services interface to the coax infrastructure through the MA 850/860 ports.)

NOTE: The units are integrated through simple external cable connections between corresponding ports.

2.1.2.1 MA 1200 Front Panel

The RHU 1200 front panel contains the power connection and status LEDs. (The RS-232 connector is reserved for MA service personnel).
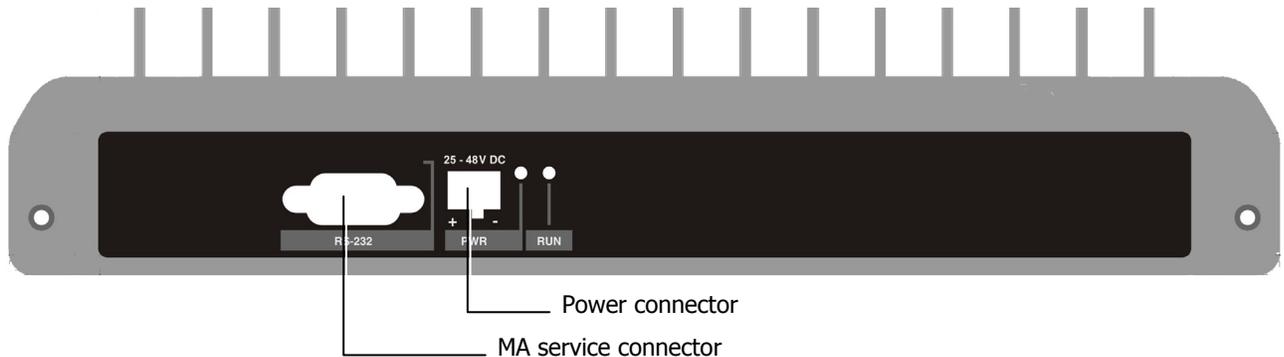
Figure 7. RHU 1200 Front panels

Table 2-3. MobileAccess 1200 Front Panel Indicators

LED	Description
RUN	When blinking, indicates that the RHU is in normal operating mode.
PWR	Power ON

2.1.2.2 MA 1200 Rear Panel

The RHU 1200 rear panel contains the connections to the RHU 1000 and MA 850.
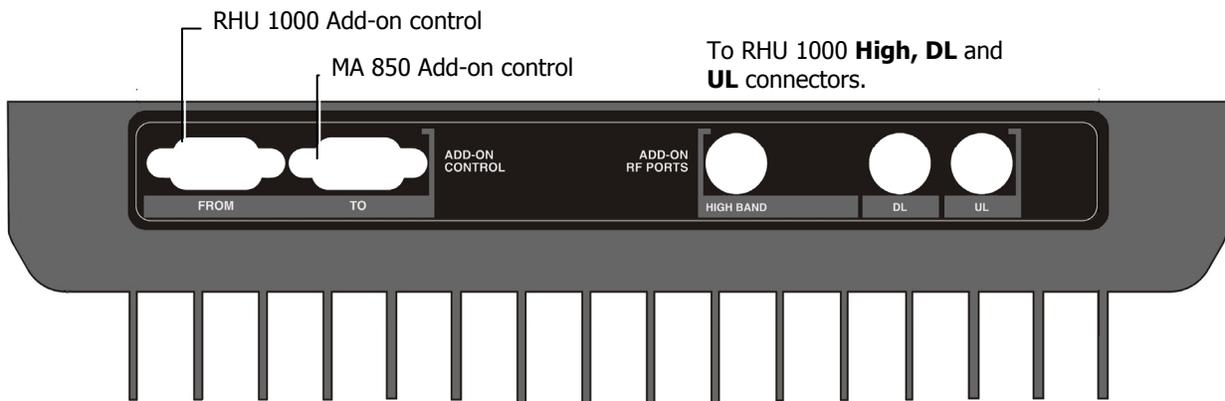
Figure 8. RHU 1200 Rear Panel

Table 2-4. RHU 1200 Rear Panel Connectors

Add-on Control	Transmits the control signals between the MA 1200 module and the MA 850 and RHU 1000 modules.
	From – receives control signals from the RHU 1000. Connected to the RHU 1000 Add-on Control connector.
	To – for configurations that include MA 850. Transmits control signals to MA 850. Connected to the MA 850 Add-on Control connector.
DL, UL	Transmit the RF signals to- and from- the MA 1200 add-on module. These ports are connected to the corresponding ports on the MA 1000 rear panel: DL to DL, UL to UL.
High	RF service output port connected to the RHU 1000 rear-panel High port.

2.2   MA Base Units

The BUs (Base Units) perform RF to optical conversion of the signal on the BTS/BDA side. Each can support up to two services (provided by the same operator). Two models of MA BUs are available: four-port unit – supporting four RHUs, and eight-port unit supporting up to eight RHUs. The RHU models correspond to the services supplied through the BUs.

The BU (and all the corresponding remote units) may be remotely monitored and managed via the MA NMS (Network Management System).

The BUs are usually installed in the telecom room adjacent to the BTS/BDA signal source. RF ports on the rear panel provide interface to the BTS side (through connection to RIU or passive interface), while optic ports on the front panel provide interface to the RHUs (Remote Units). This following sections describe the MA BU front and rear panels, including indicators and connectors.

2.2.1.1   MA BU Front Panel

The front panel contains the optical connections and indicators. The BU is available in two configurations: Four-port - and Eight-port BUs. The eight-port BU consists of two four-port elements where each four-port element has a dedicated set of indicators (PWR, LSR and Link 1 to Link 4 or Link 5 to Link 8).

Four ports and corresponding indicators   Four ports and corresponding indicators
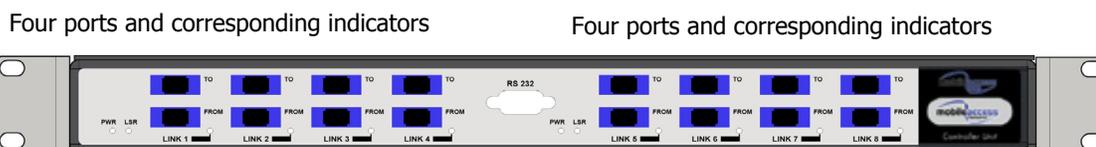
Figure 9. Eight-Port MA BU Front Panel

Figure 10. Four-Port BU Front Panel

Table 2-5. MA BU Front Panel Indicators

LED	Description
PWR	Power input detected for the corresponding unit.
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 expected by at least 2 dBm

2.2.1.2   BU Rear Panel

The BU rear panel contains the RF, NMS, and power connections. Note that there are two uplink and two downlink RF connections to the BTS side (to an Interface Box or RIU) - each individual uplink and downlink connection corresponds to a four-port BU element. For a four-port BU, one uplink and one downlink port is connected; for an eight-port BU, two uplink and two downlink ports are connected.

For systems that include MA 430 controllers, the **RS 485** port is connected to the MA 410/430 controller to enable remote monitoring and management of the BU from a central location..
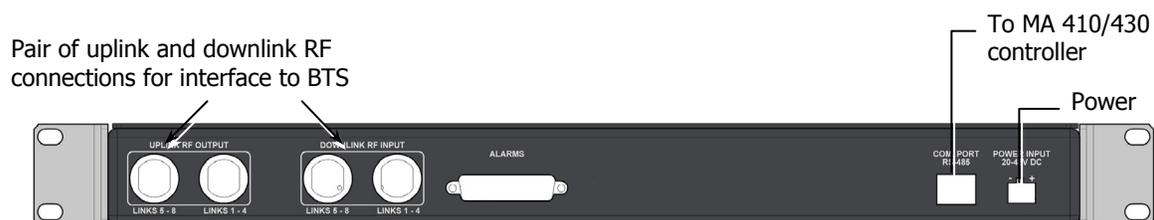
Figure 11. MA BU Rear Panel (RF Connections)

Table 2-6. MobileAccess 1000 Rear Panel Connections

Connector	Description
Uplink output	Uplink connectors to be connected on BTS side.
Downlink input	Downlink connectors to be connected on the BTS side.
Com Port RS485	Connection to MobileAccess 410/430 controller.
PWR	Power connection
Alarms	N/A

3 Site Preparation

3.1 Infrastructure Preparation

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

3.2 Installation Requirements

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 MA 850, 802.11 Access Points, cabling and other voice service distribution systems that are relevant to the specific installation.

3.3 Coaxial Cable Connections

3.3.1 General Cable Installation Procedures

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

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

- The minimum bending radius of 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.

3.3.2   Fiber Optic Rules

- Either single mode or multimode fiber can be used with MobileAccess 1000M products, while MobileAccess 1000 products can only be used with single mode fiber.

- 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 MobileAccess specified patch cords listed below.

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

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

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

- **Use only 8-degree SC/APC connectors (green color).**

- Use **only** fusion splice for connecting two fibers.

- Use minimum splicing/connectors to achieve minimum losses on the fibers (<0.5dB).

- Use precaution while installing, bending, or connecting fiber optic cables.

- Use an optical power meter and OTDR for checking the fiber optic cables.

- Make sure the environment is **clean** while connecting/splicing fiber optic cables.

- All fiber optic connections should be cleaned prior to attaching to termination points using a dry cleaning device (i.e. Cletop or equivalent).

- Fiber connector protective caps should be installed on all non-terminated fibers and removed just before they are terminated.

- Verify the Fiber Optic connections using a suitable fiber optic test procedure.

- Pay special attention while connecting the SC/APC connectors - you must hear the "click" when the connection is made.

3.3.3   RF Rules

- Use coax ½", 50ohm, male-to-male N-type, (6-7dB for 1Ghz, 11dB for 2Ghz) for connecting to RHU and RHU ports.

- 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 MobileAccess™ 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 800Mhz to 2500Mhz

- 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 RHUs in the remote communication rooms

- Terminate all unused **RHU** and **RIU** ports with a 50 ohm load

3.4   Power Consumption, Connections and Power Supplies

3.4.1   Power Safety Instructions

<div align="center">⚠ SAFETY WARNINGS</div>

- When installing or selecting the power supplies:

- Be sure to disconnect all power sources before servicing.

- **Battery replacement in units -** only the MA 410/430 controller has batteries. MA 410/430 Controller lithium type battery should only be replaced by MobileAccess service personnel. **Risk of exploding if battery is replaced by an incorrect type.** Dispose of used batteries according to the instructions.

- 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** – use only the power cords supplied with the units

- Install external over-current protective devices for the system according to the requirements described in section 3.4.3.

3.4.2 Power Consumption of Units

Table 3-1. MobileAccess™ Power Requirements

Unit Type	Voltage Input	Typical Power Consumption	Maximum Current Consumption
Remote Unit 1000	20 to 48VDC	25W	1.25A
Remote Unit 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
410/430 Controller	20 to 48VDC	10W	0.5A
MA 850/860	20 to 48VDC	20W	1.0A

3.4.3 Circuit Breakers

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

- The following system elements require external fuse protection: **RIUs, BUs, and 410/430 Controllers**.

- Referring to Table 3-1, calculate the required fuse protection.

- **Example**: a set of three elements consisting of a BU, RIU and MA 410/430 controller requires a 2A circuit breaker.

3.4.4 Types of Power Supplies

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

3.5 Installation Conventions

Some of the basic installation conventions are listed below for the MA 1000 system:

- **Base Units** – are usually concentrated in the same location, most often in the main communication room.

- **Remote Hub Units** 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 location 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 upgrades, it is recommended to install additional optic fibers to be connected to additional RHUs.

The following figure 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.
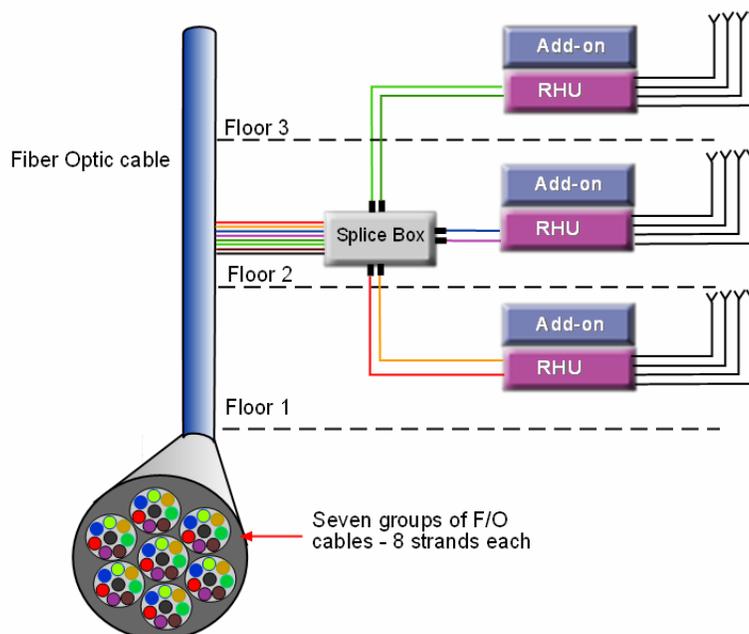
Figure 12. Illustration of Fiber Optic Routing

- **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

4.1   Overview

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**, **MA 410/430 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.

NOTE: For installations that include the MA NMS: Once the installation has been completed, it can be verified using the **MCT** application (NMS User's Guide) and the devices monitored using the **NMS Manager** (NMS User's Guide).

4.2   Communication Room Installation

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

It is recommended to install the following MobileAccess system modules in a 19" rack in the communication room

- RIU 3U

- BU 1U

- MobileAccess 410/430 controller 1U

- Fiber Optic patch panel and splice tray

- Power supply/supplies (MobileAccess – 3U for each unit; units from other manufacturers may vary in size)

4.2.1   Rack Installation General Instructions

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

Figure 13 shows the recommended physical location of the MobileAccess 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 **MobileAccess 410/430 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.
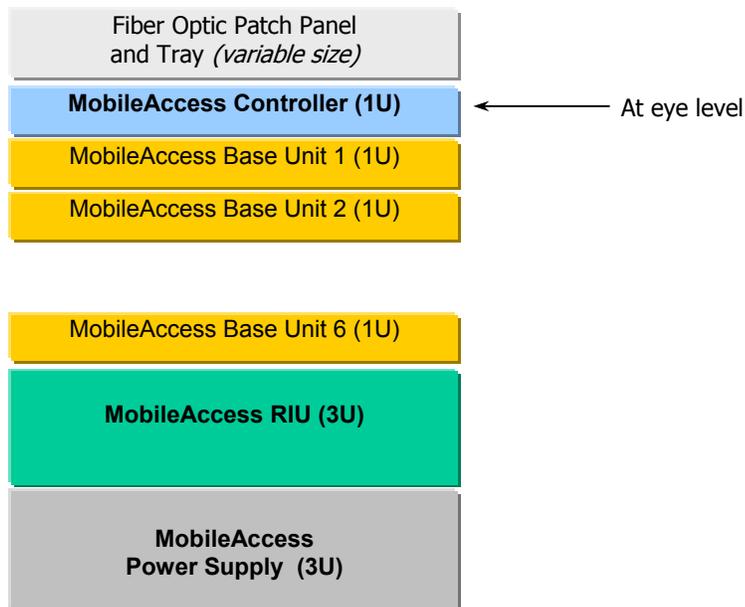
Figure 13: Recommended Order in the Communication Room Rack

4.2.2 Rack Installation Safety Instructions

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

- Only trained and qualified personnel should be allowed to install or replace this equipment.

- Verify that ambient temperature of the environment does not exceed 50°C (122°F)

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

- Ensure that adequate airflow and ventilation within the rack and around the installed components so that the safety of the equipment is not compromised. It is recommended to allow for at least about 2 cm of airspace between devices in the rack.

- Verify that the equipment is grounded as required – especially the supply connections.

4.2.3 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 MA 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 MA 430 controller for monitoring

- One RIU with Cellular and PCS BTSCs – to interface to the BTS/BDA
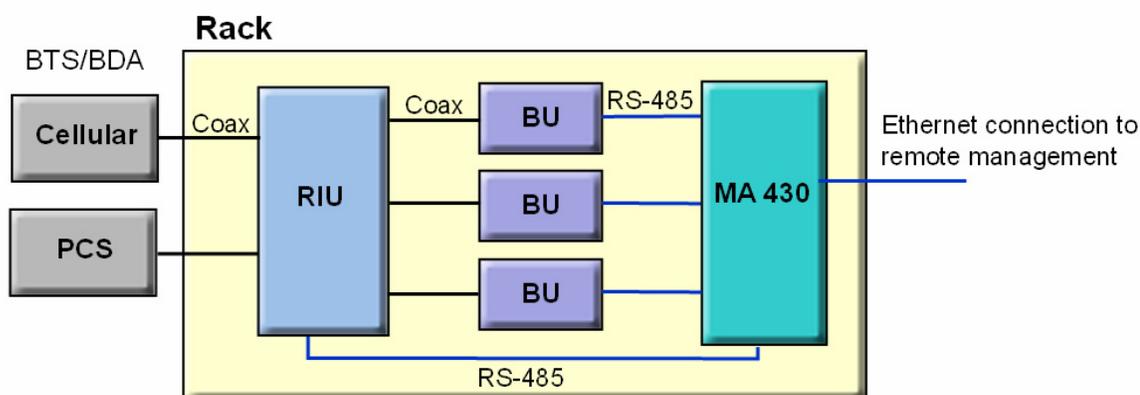
Figure 14. Example of Single-building Topology Communication Room Installation

4.2.4   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 MA 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 MA 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 an MA 330 Expansion Box.

   The MA 330 Remote unit forwards the signals as follows:

   - Service signals to the Base Units

   - Control signals from MA 430 Master controller at the main site to the MA 410 Slave controller at the remote site. The Base Units are controlled through the MA 410 controller.

- **Building 2 –** special installations in a remote location with *a single* Base Unit. The MA 330 Remote unit forwards both the service and the control signals from the main building *directly* to the Base Units. Note that a *MA 410 Controller is not required in this type of installation.*
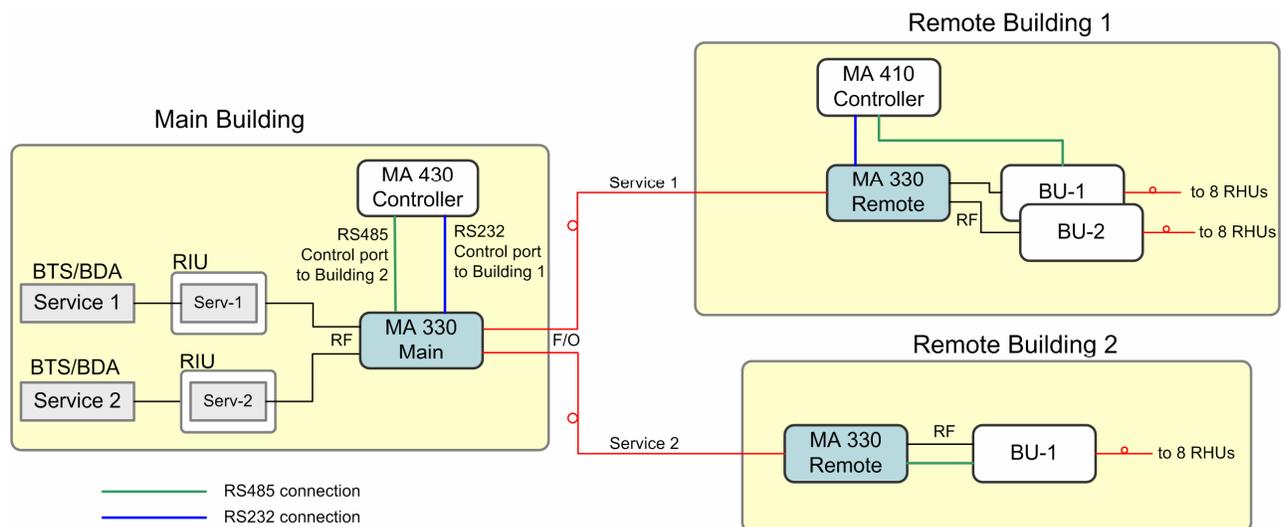
Figure 15: MA 330 System Installation Examples

4.2.5   RIU Connections

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

4.2.6   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.

4.2.7   Controller Connections

Refer to the MobileAccess *NMS 410/430 Installation and Configuration Guide* for connections.

4.3   Remote Site Installation

4.3.1   RHU 1000 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.
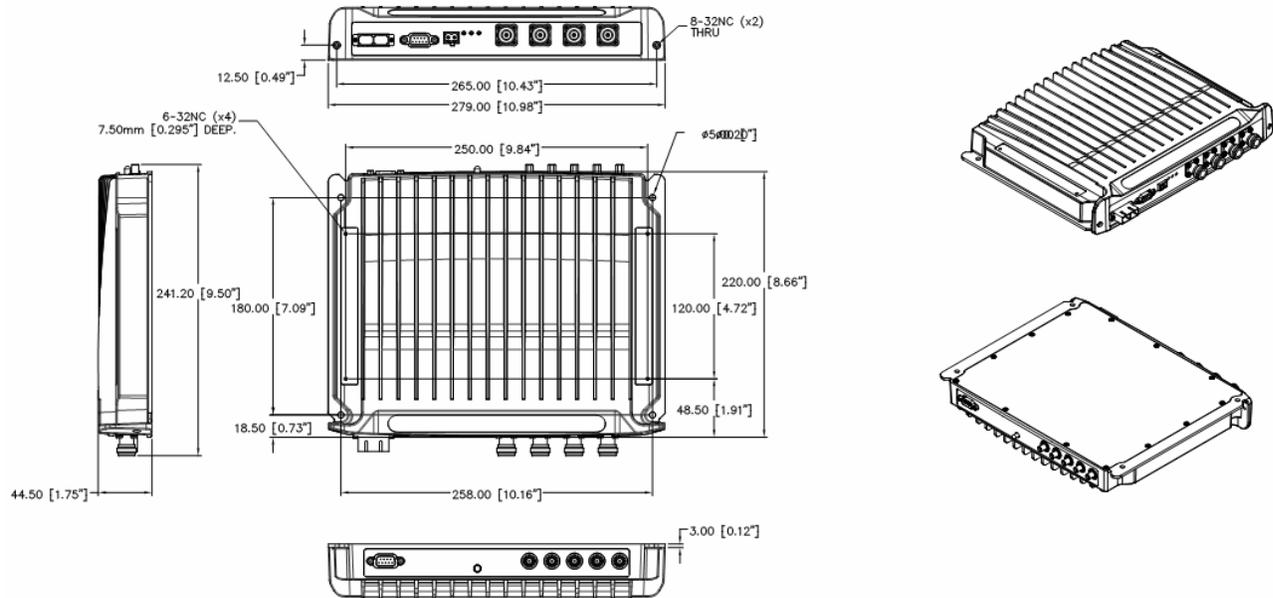
Figure 16: RHU 1000 Dimensions

4.3.1.1 Wall Mount

RHU 1000 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 8mm in diameter and insert the appropriate sized plastic plugs in each hole.

3. Secure the RHU 1000 to the wall using four screws, 4.5mm diameter, 40mm long.
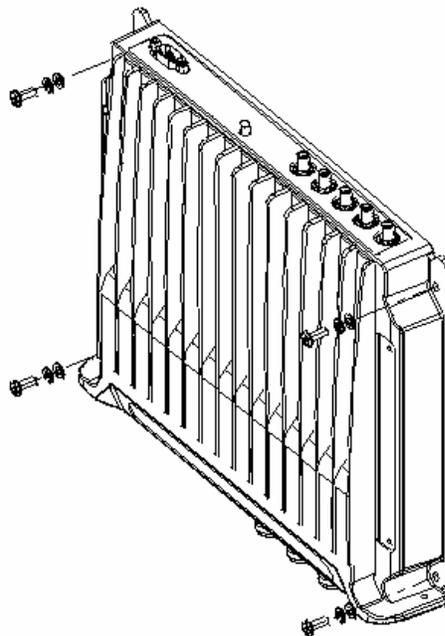
Figure 17. RHU 1000 Wall Mount

4.3.1.2 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.

4.3.2   MA 1200 Add-on Installation

The following figure provides the dimensions for the 1200 Add-On unit.
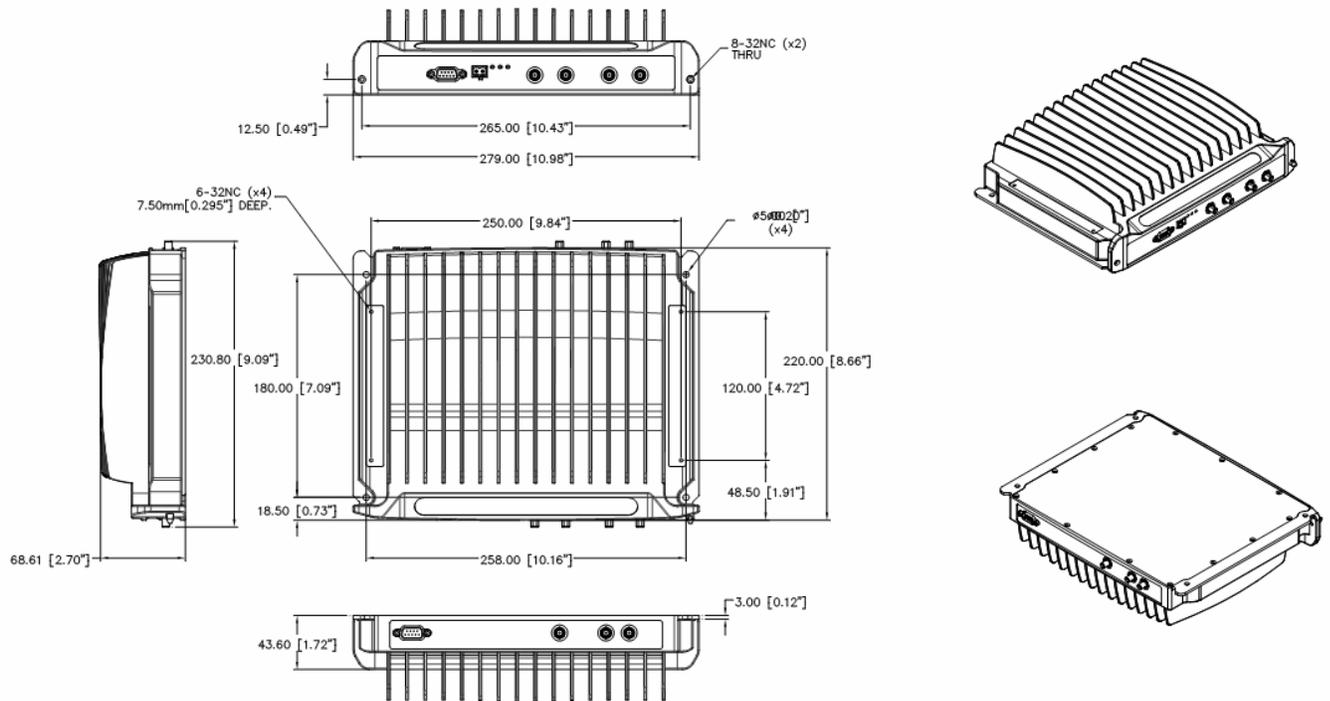
Figure 18. 1200 Add-On Dimensions

4.3.2.1   Assembly and Connections

Refer to Figure 19.

ATTENTION

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

---

1. Position the supplied bracket on the RHU 1000 and secure the **bracket** to the **RHU 1000** using the four supplied **6-32 NC** screws.

2. Position the RHU 1200 unit on the bracket and secure the **RHU 1200** to the **bracket** using the four supplied **8-32** screws.

3. **Interconnect** the RHU 1000 and RHU 1200 SMA **Uplink**, **Downlink** and **High** connectors on the rear panels of both units using the **three straight** jumpers.

4. **Interconnect** the RHU 1000 and RHU 1200 **D-type 9-pin** connectors on the rear panels of both units using the supplied flat-cable.

5. Connect the power to the RHU 1200 front-panel **DC** connector.6.
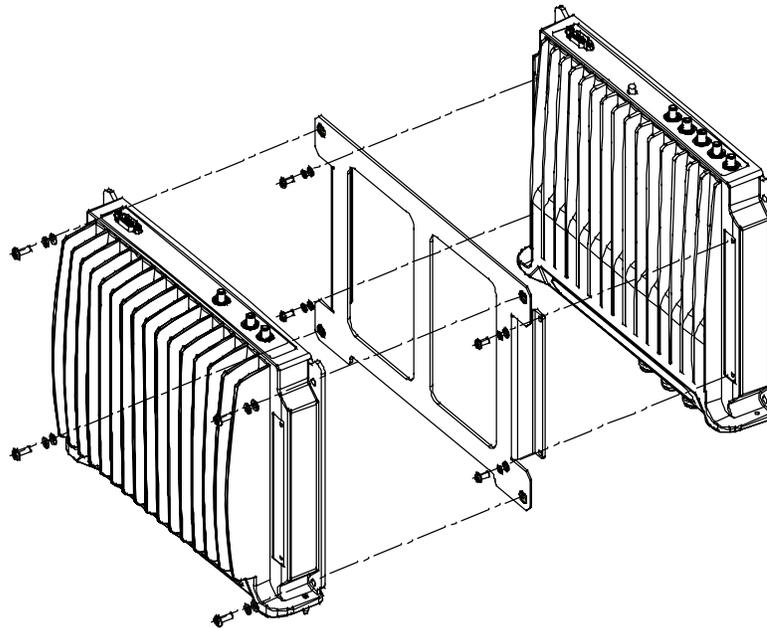
Figure 19. RHU 1200 to RHU 1000 Assembly
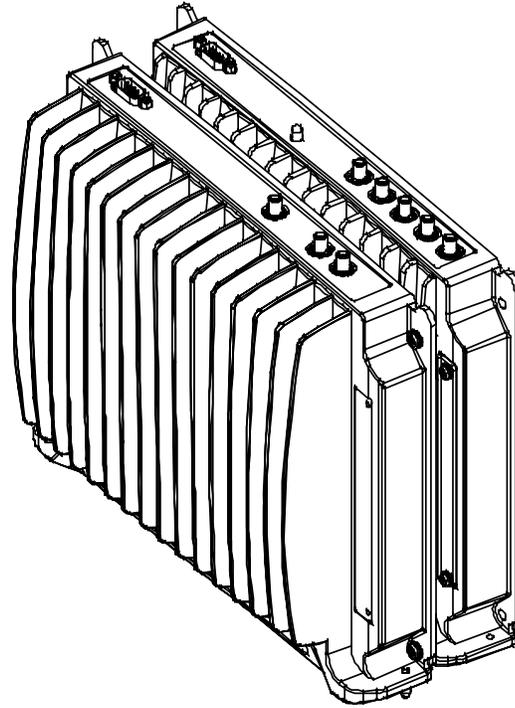
Figure 20. RHU 1200 to RHU 1000 Completed Assembly

4.3.3   MA 850/860 Installations

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

4.3.4   Antenna Connections

- For systems *without* MA 850 modules - connect the antenna connections to the RHU antenna ports;

- For systems with MA 850 or 860 modules - refer to the *MA 850 or 860 Installation and Configuration Guide* and connect the antenna ports to the MA 850/860.

5   Appendix: System Specifications

RF Parameters

RF Frequency Range

Services	Frequency range	
	Uplink	**Downlink**
CELL	824-849	869-894
iDEN	806-824	851-869
GSM	890-915	935-960
SMR	896-902	929-941
DCS	1710-1785	1805-1880
PCS	1850-1910	1930-1990
G-PCS	1850-1915	1930-1995
UMTS	1920-1980	2110-2170

Low Band

RHU 1000	CELL CDMA/ WCDMA/TDMA /GSM800		iDEN NEXTEL		IDEN		GSM900		SMR		SMR NEXTEL*** *	
	D	**U**	**D**	**U**	**D**	**U**	**D**	**U**	**D**	**U**	**D**	**U**
Max output power per antenna port												
1 (comp)	20		10		20		14		20		10	
2 carriers	17		7		17		11		17		7	
4 carriers	14		4		14		8		14		4	
8 carriers	11		1		11		5		11		1	
12 carriers	9		-1		9		3		9		-1	
Mean Gain(dB) *	20	7	10	7	20	7	14	7	20	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)		69/ 73/68		74		74		68		74		73
Max Intermod Distortion (dBm)	-13				-13		-36		-13			
Max NF (dB)		16		16		16		16		16		18
Max Intermod. Distortion (dBc)	***		-45								-45	
Gain Flatness (dB)	±1.5										±2.0	

* Factory set mean gain BU-RHU when RIU is not used. May be field adjusted using system controller.

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

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

**** Specs include the 900 UL Filter Kit. The output power is limited on the downlink.

High Band

RHU 1000	DCS		PCS CDMA/WCDMA		PCS GSM/TDMA	
Max output PWR / ANT Port	**D**	**U**	**D**	**U**	**D**	**U**
1 (comp)	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) *	16	3	20	3	20	3
Pin (dBm) *	0		0		0	
Input IP3 (dBm) AGC OFF Min		-6		-6		-6
Input IP3 (dBm) AGC ON Min		3		3		3
SFDR**(dB)		65		67		70/65
Max Intermod. Distortion (dBm)	-30		-13		-13	
Max NF(dB)		18		18		18
Gain Flatness (dB)	$\pm$2.0					

* Factory set mean gain BU-RHU when RIU is not used. May be field adjusted using system controller.

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

RF Parameters 1200 Add-on

1200 Add-on	PCS CDMA/WCDMA		PCS GSM/TDMA		UMTS	
Max output power per antenna port	D	U	D	U	D	U
1(composite)	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	
Max. Intermodulation Distortion [dBm]	-13/***		-13		***	
Input IP3 (dBm)		-7		-7		-7
SFDR (dBm)**		66		64		66
Max NF (dB)		18		18		18
Gain Flatness (dB) ****	$\pm$2.0					

*Factory set mean gain BU-RHU when RIU is not used. May be field adjusted using system controller.

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

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

**** Gain Ripple is specified for unduplexed port of the system

System Specs

Fiber Optic Specifications	
Optical output power	<3mW
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

Absolute Maximum Rating	
Total Input RF Power to BU:	10 dBm
Power Supply:	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)

Standards and Approvals	
FCC-47 CFR, parts 15, 22, 24, 90	iDEN SMR (90, 15,) CELL DCS (22, 24, 15)
ISO	ISO 9001: 2000 and ISO 13485: 2003

Specifications of Units

Base Unit Specifications

Models:	4-port model, 8-port model (illustrated above)
Supported services:	Wideband device supporting all services supported by MA systems
RF (total Input):	10 dBm max
Power:	
Input power	20 to 48V DC
Power consumption	14W (8-port BU)
RF connections	N-type Female, 50 ohm – interface to RIU or to passive BTS interface
Optic connections	Four or eight (depending on the model) SC/APC optic connections
Remote management	SNMP, NMS via connection to MA 410/430 controller.
Physical	
Dimensions	48.26x4.44x29.97cm (19"x1Ux11.8")
Weight	3Kg (6.6 lb)

RHU Specifications

Supported services:	Two services corresponding to the model
Power:	
Input power	20 to 48V DC
Power consumption	29W
RF connections	To antennas: 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 MA 410/430 controller.
Physical	
Dimensions	27.9x24.1x4.5cm (10.98"x9.5x1.75")
Weight	2.8Kg (6.2 lb)

MA 1200 Add-on Specifications

Supported services:	Single service corresponding to the model
RF Connections:	To RHU: SMA 50 ohm
Power:	
Input power	25-48VDC
Power consumption	50W
Remote management	SNMP, NMS via RHU connection
Physical	
Dimensions	27.9x24.1x4.5cm (10.98"x9.5x1.75")
Weight	2.8Kg (6.2 lb)

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.

MobileAccess Universal Base Units

WB-B8U	Wide Band Base 8 Unit supporting 8 RHUs
WB-B4U	Wide Band Base 4 Unit supporting 4 RHUs

MobileAccess 1000 RHUs

1000-CELL-4E	Single band-Cellular, 4 ports enhanced out power
1000-PCS-4E	Single band-PCS 4 ports enhanced out power
1000-DCS-4E	Single band-DCS 4 ports, enhanced out power
1000-CELL-PCS4E	Dual band-Cell/PCS, 4 ports, enhanced out power
1000-CELL-DCS4E	Dual band Cell/DCS 4P,enhanced out power
1000-GSM-DCS4E	Dual band GSM/DCS 4P ,enhanced out power
1000-GSMO-DCS4E	Dual band GSM orange/DCS 4P ,enhanced out power
1000-iDEN-SMR4	Dual-band-iDEN/SMR Paging 4-Ports ready for add-on unit
1000-IDEN-SMR4F	Dual band-iDEN/SMR, 4 ports with filter kit
1000-SMR-FILTER	Filter kit for SMR 900

MobileAccess 1000 RHUs (Litenna compatible)

10L-D-IDEN-PCS4	Dual band-iDEN/PCS, 4 ports, LBC
10L-D-SMR-PCS4	Dual band-SMR/PAGING/PCS, 4 ports, LBC
10L-D-CELL-PCS4	Dual band-Cell/PCS, 4 ports, LBC
10L-D-CELL-DCS4	DB Cell/DCS 4P ready for add-on units-LBC
10L-D-CL-M-DCS4	DB Cell multi-operator/DCS 4P ready for add-on units-LBC
10L-D-GSM-DCS4	DB GSM/DCS 4P ready for add-on units-LBC
10L-D-GSMO-DCS4	DB GSM orange/DCS 4P ready for add-on units-LBC

MobileAccess 1200 RHU

1200-PCS-AO	Add-on RHU supporting a PCS service
1200-G-PCS-AO	Add-on RHU supporting a PCS service including G-Block
1200-UMTS-AO	Add-on RHU supporting UMTS service

MobileAccess 1200 RHU (Litenna UMTS Ready compatible)

12L-UMTS-AO	Add-on RHU supporting UMTS service LBC

Network Controller

410	Network Controller – Serial Interface (dial-up)
430	Network Controller –Ethernet/IP Interface

Network Management System

NMS-SW-SERVER	GUI and server S/W package (one per site)
NMS-SW-MFEE	NMS annual S/W maintenance fee (per 430-CTLR)

Radio Interface Unit

RIU-IM	Radio Interface Unit
RIU-BTSC-CELL	BTS Conditioner for Cellular
RIU-BTSC-IDEN	BTS Conditioner for iDEN
RIU-BTSC-PCS	BTS Conditioner for PCS
RIU -BTSC-G -PCS	BTS Conditioner for PCS w/ G-Block support
RIU-BTSC-SMR	BTS Conditioner for SMR-Paging
RIU-BTSC-GSM	BTS Conditioner for GSM 900MHz
RIU-BTSC-GSM-O	BTS Conditioner for GSM 900MHz for Orange
RIU-BTSC-DCS	BTS Conditioner for DCS 1800MHz
RIU-BTSC-UMTS	BTS Conditioner for UMTS 2100MHz
RIU-BDAC-CELL	BDA Conditioner for Cellular
RIU-BDAC-IDEN	BDA Conditioner for iDEN
RIU-BDAC-PCS	BDA Conditioner for PCS
RIU-BDAC-G-PCS	BDA Conditioner for PCS w/ G-Block support
RIU-BDAC-SMR	BDA Conditioner for SMR-Paging
RIU-BDAC-GSM	BDA Conditioner for GSM 900MHz
RIU-BDAC-GSM-O	BDA Conditioner for GSM 900MHz for Orange
RIU-BDAC-DCS	BDA Conditioner for DCS 1800MHz
RIU-L-IDEN-SMR-G-PCS1	RIU Lite for iDEN800,SMR 900,PCS1900 w/G-Block, support 1BU8
RIU-L-CELL-PCS1	RIU Lite Cellular 800,PCS 1900

Power Supply

LPS-48V-66W	Local AC/DC Converter 66W
LPS-48V-100W	Local AC/DC Converter 100W