

### 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 is also installed, the combined *data and voice* services are fed to the coax infrastructure through the *MA 850 antenna ports*.

**NOTE:** To provide alarms, the antenna must supply a DC resistance of up to 5K ohms.

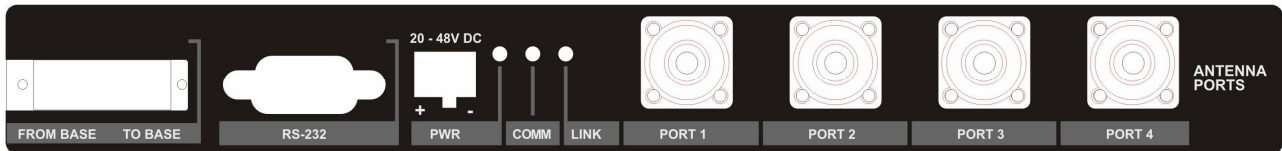


Figure 2-1. RHU 1000 Front Panel

Table 2-1. RHU 1000 Front Panel Ports

Port	Description
From Base To Base	Fiber Optic connections to- and from the Base Unit
RS232	Upgrade and service connection (MA service personnel)
PWR	DC power connection
Port 1-4	Coax connections to antennas

Table 2-2. 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 connections to an MA 1200 add-on unit.



Figure 2-2. RHU 1000 Rear

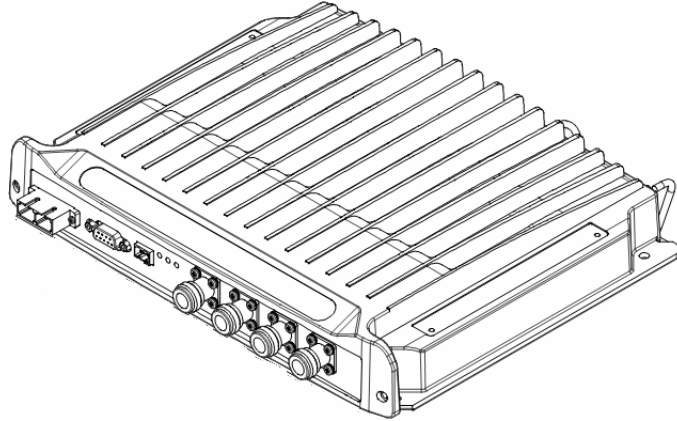
Table 2-3. RHU 1000 Rear Panel Connectors

<b>Add-on control</b>	Transmits the control signals from MA 1200 add-on module to the RHU 1000 module. Connected to the MA 1200 add-on <b>Control From</b> port.
<b>High Band</b>	Connects to the <b>1200 Add-on High Band</b> port. Provides the interface to the Add-on RF service which is combined with the RHU services and distributed through the common coax infrastructure.
<b>DL, UL</b>	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.

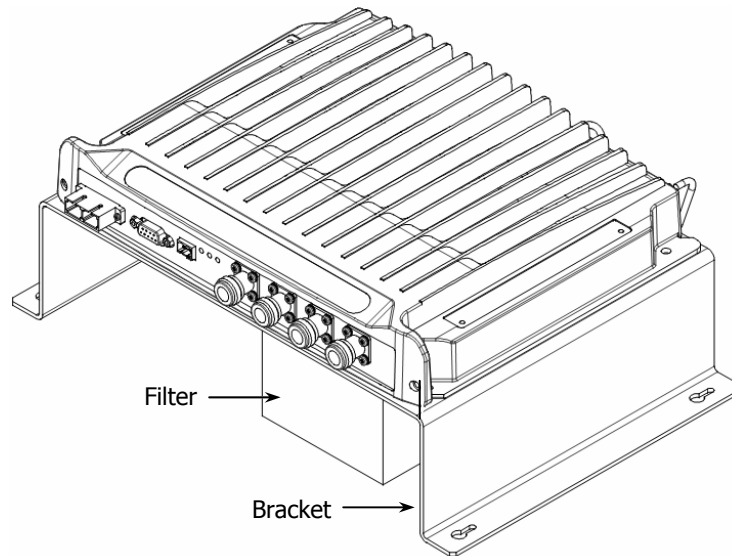
## 2.1.2 RHU 800/900

RHU 800/900 supports iDEN and SMR technologies. The module is available in the following configurations:

- A) As a *stand-alone module* similar in its physical description, ports, LEDs and installation procedure to RHU 1000 modules. The standalone module is illustrated below.



- B) As a *bracket assembly* that includes the module and the external filter elements as illustrated below.



**Figure 2-3. RHU 800/900 Front View**

The following sections provide descriptions of the RHU 800/900 front and rear panel. The installation of each type of module is described in section 4.3.3.

### 2.1.2.1 RHU 800/900 Front Panel

The RHU 800/900 front panel ports and LEDs is the same as the *RHU 1000 front panel*. Refer to section 2.1.1.1 for a detailed description of the LEDs and ports.

### 2.1.2.2 RHU 800/900 Rear Panel

The rear panel contains the 1200 add-on and the filter connections.



Figure 2-4. RHU 1000 Rear

Table 2-4. RHU 1000 Rear Panel Connectors

Port	Description
<b>EXT FILTER</b>	Connections to external filter (as illustrated in the following section). In installations without a filter, the two EXT FILTER ports are interconnected with a jumper.
<b>Add-on control</b>	Connection to MA 1200 Add-on module. Transmits the control signals from MA 1200 add-on module to the RHU 1000 module. Connected to the MA 1200 add-on <b>Control From</b> port.
<b>High Band</b>	Connection to MA 1200 add-on module. Connects to the <b>1200 Add-on High Band</b> port. Provides the interface to the Add-on RF service which is combined with the RHU services and distributed through the common coax infrastructure.
<b>DL, UL</b>	Connection to MA 1200 add-on module. 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.

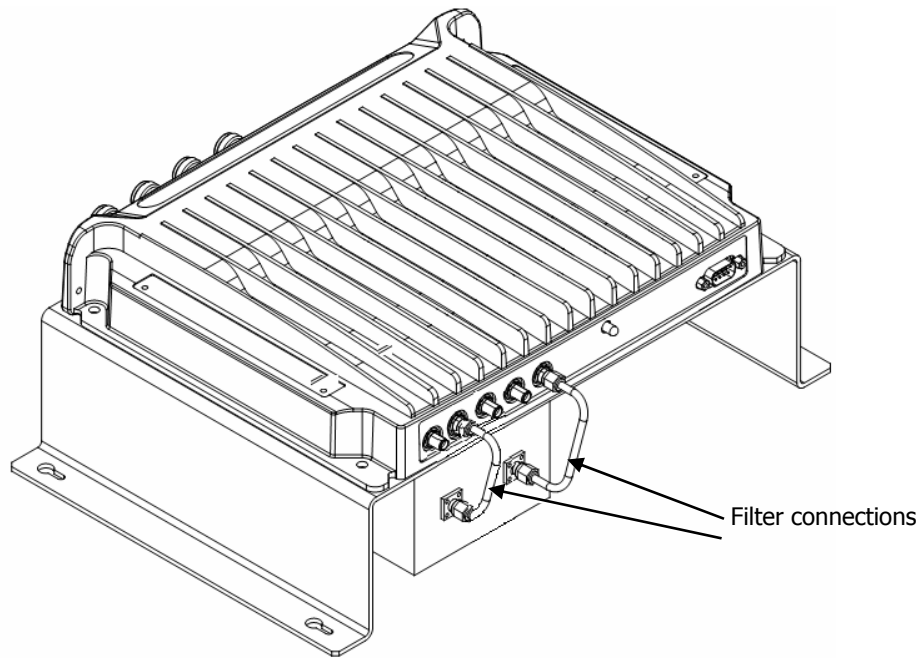
### 2.1.2.3 RHU 800/900 View of Filter Connection

The following figures illustrate the RHU 800/900 views with and without a filter.

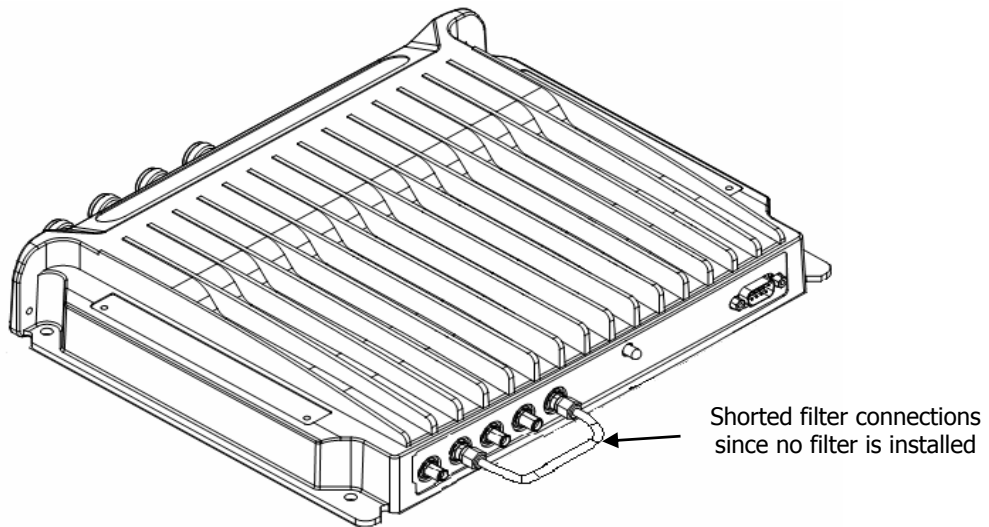
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**NOTE:** Note that the filter port connections are interconnected with a jumper in installations without a filter.

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**Figure 2-5. Rear View of RHU 800/900 with Filter**



**Figure 2-6. Rear View of RHU 800/900 without Filter**

### 2.1.3 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, MA 850 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 ports.)

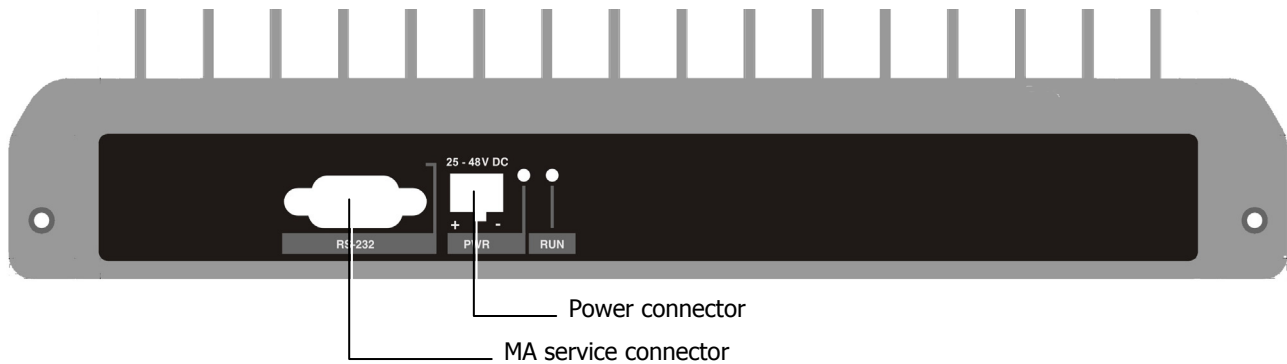
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**NOTE:** The units are integrated through simple external cable connections between corresponding ports.

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#### 2.1.3.1 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 2-7. RHU 1200 Front panels**

**Table 2-5. MobileAccess 1200 Front Panel Indicators**

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

### 2.1.3.2 MA 1200 Rear Panel

The RHU 1200 rear panel contains the connections to the RHU 1000 and MA 850.

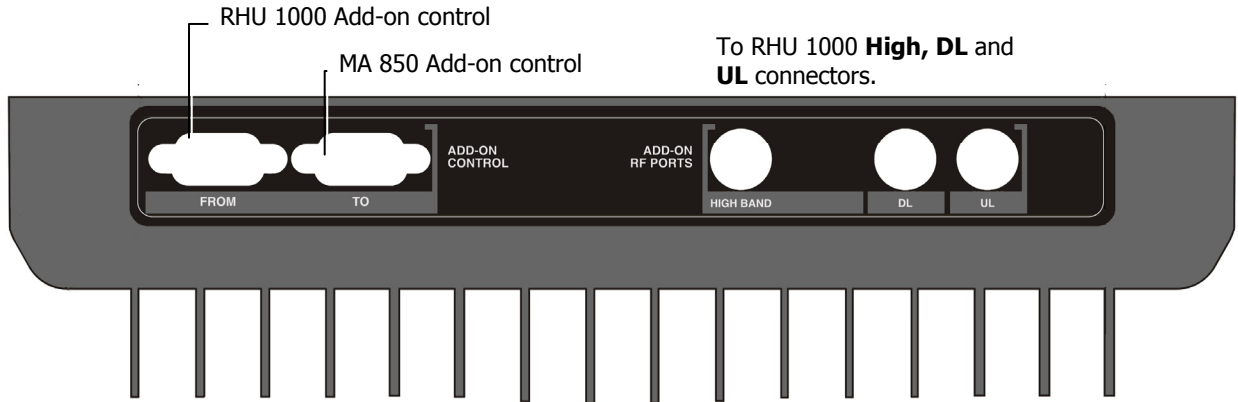


Figure 2-8. RHU 1200 Rear Panel

Table 2-6. RHU 1200 Rear Panel Connectors

<b>Add-on Control</b>	Transmits the control signals between the MA 1200 module and the MA 850 and RHU 1000 modules. <b>From</b> – receives control signals from the RHU 1000. Connected to the RHU 1000 <b>Add-on Control</b> connector. <b>To</b> – Future option.
<b>DL, UL</b>	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.
<b>High</b>	RF service output port connected to the RHU 1000 rear-panel <b>High</b> port.

### 2.1.4 MA-850 Module

**NOTE:** This section provides a brief overview of the MA 850 module. For detailed information on installation and connections, refer to the MA 850 Installation and Configuration Guide.

**MobileAccess 850** provides a *secure* and *centralized* connection for 802.11a/b/g Access Points. It significantly expands 802.11 coverage and enables distributing data and voice services over the same coax and antenna infrastructure used by MA 1000 system.

MA 850 may be assembled on top of the RHU 1000 or MA 1200 add-on. It is integrated into the MA 1000 system by interconnecting the appropriate connectors. The combined signals of the MA 1000 system input to the MA 850 module and then distributed through the same coax broadband antenna infrastructure *connected to the MA 850*.

MA 850 may be remotely monitored through the RHU 1000 system to which it is integrated, and remotely configured through a point-to-point Ethernet connection.

The MA 850 front and rear panels, connectors and connections are described in detail in the following sections.

### 2.1.4.1 MA 850 Front Panel

The MA 850 front panel contains the antenna ports interfaces, local configuration interface and power connection.

**NOTE:** Whether connected alone or integrated with RHU 1000 modules, the coax infrastructure is connected to the MA 850 coax ports.

The following figure shows the MA 850 front panel.



Figure 2-9. MobileAccess 850 Front View

Table 2-7. MA 850 Front Panel Connections

Front Panel	Description
Mobile Services	Four SMA female connections to which the antenna port of the MA 1000 system are connected. <b>To be terminated with 50 ohm terminations when not in use.</b>
Antenna Ports	Four n-type female antenna connections
Local	Local connection for setup
DC	Power connection: 20V to 48V from a standard power supply



### 2.1.4.2 MA 850 Rear Panel

The MA 850 rear panel contains the connections to the APs, the Ethernet port for remote configuration and the connection to the MA 1200 add-on control (if an MA 1200 add-on unit is installed)



**Figure 2-10. MobileAccess 850 Rear View**

**Table 2-8. MA 850 Rear Panel Connections**

Rear Panel	Description
802.11b,g APs	Connection to up to four 802.11 <b>b/g</b> APs, where associated LED Lite under the following conditions: <ul style="list-style-type: none"> <li>Green: indicates where AP should be connected after configuration</li> <li>Green flickering: Link with AP established but no data is received</li> <li>Red: AP transmitting data</li> </ul>
802.11a APs	Connection to up to four 802.11 <b>a</b> APs
Connection to control	Connection to MA 1200 <b>To</b> connector on the rear panel. Used for viewing antenna status
Ethernet port	Connection to network for Web configuration

## 2.2 Radio Interface Unit (RIU)

The RIU is an operator dedicated unit that interfaces to up to three BTS sources and automatically adjusts the signal output according to changing environmental conditions in order to provide optimal coverage for the site. The RIU is remotely monitored and managed.

Each RIU can support up to three **BTS Conditioner (BTSC)** sub-modules, where each sub-module provides interface to a BTS or BDA of *the same type of service*.

Each RIU can be connected to *four* 8-port Base Units (real panel connections) or to *eight* 4-port Base Units.

Additional BUs can be supported by using splitters and combiners connected to the front panel **Expansion** connectors.

The following figures shows an RIU with three BTSC sub-modules.



Figure 2-11. RIU

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**Note:** All connections are via RG223 coax cables with 1/2" N-type male connectors

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### ATTENTION

The RIU is factory set to 0dB gain on the uplink and downlink. In order to operate properly, an **ADJUSTMENT** process is required in the field.

Any unused input and output connectors **MUST** be terminated with **50 ohms** – otherwise the ADJUSTMENT procedure results may be affected.

### 2.2.1.1 RIU Front Panel

The RIU front panel contains the indicators and expansion connectors for the connection of additional BUs.

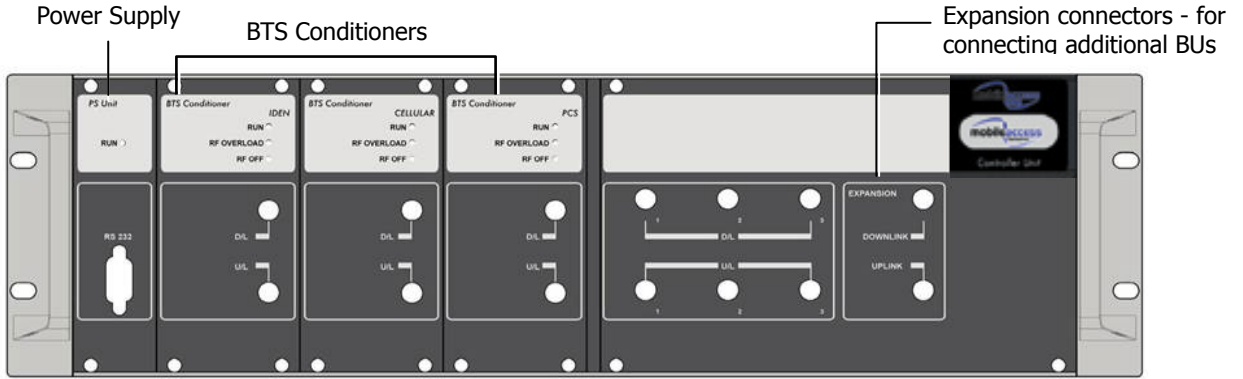


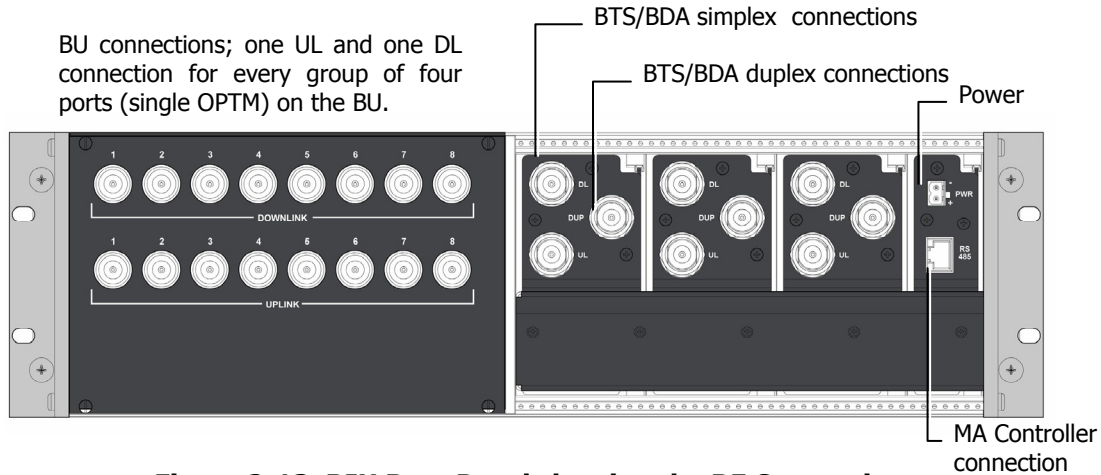
Figure 2-12. RIU Front Panel

Table 2-9. RIU Front Panel Indicators

LED	Description
P.S UNIT <b>PWR</b>	ON – input signal is at the required level.
BTS CONDITIONER <b>RUN</b>	Flashing -- CPU is running and software loaded
BTS CONDITIONER <b>DL OVERLOAD</b>	<p>Continuous Red – RF switch is disconnected to protect the system. This may be due to:</p> <ul style="list-style-type: none"> <li>• Unpredicted power rise for which the attenuation response was insufficient to compensate and reduce the power to the required level.</li> <li>• Software problem detected.</li> </ul> <p>Flashing: When the BTSC DL output power is more than 3dB of the calibrated value.</p>
BTS CONDITIONER <b>DL LOW</b>	Continuous Red – if the BTSC DL power is at least 15dB lower than the calibrated BTSC max power level. This condition also triggers an event.

### 2.2.1.2 RIU Rear Panel

The rear-panel provides all the connections on the BTS side and on the BU side as well as connections to the MobileAccess 410/430 controller and the power connection. Two types of BTS side connections are available for each BTS conditioner: simplex and duplex.



**Figure 2-13. RIU Rear Panel showing the RF Connection**

## 2.3 MA Base Units

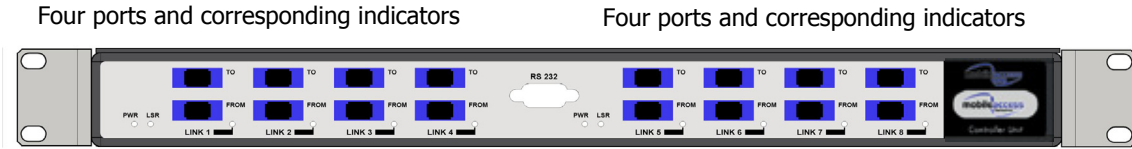
The BUs (Base Units) perform RF to optical conversion of the signal on the BTS/BDA side. Each can support up to two services (provided by the same operator). Two models of MA BUs are available: four-port unit – supporting four RHUs, and eight-port unit supporting up to eight RHUs. The RHU models correspond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

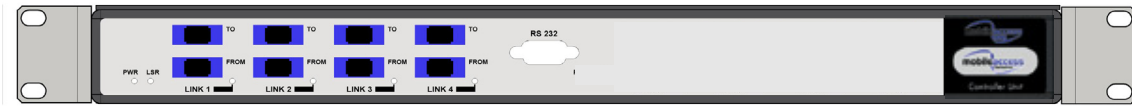
The BUs are usually installed in the telecom room adjacent to the BTS/BDA signal source. RF ports on the rear panel provide interface to the BTS side (through connection to RIU or passive interface), while optic ports on the front panel provide interface to the RHUs (Remote Units). This following sections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

### 2.3.1.1 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).



**Figure 2-14. Eight-Port MA BU Front Panel**



**Figure 2-15. Four-Port BU Front Panel**

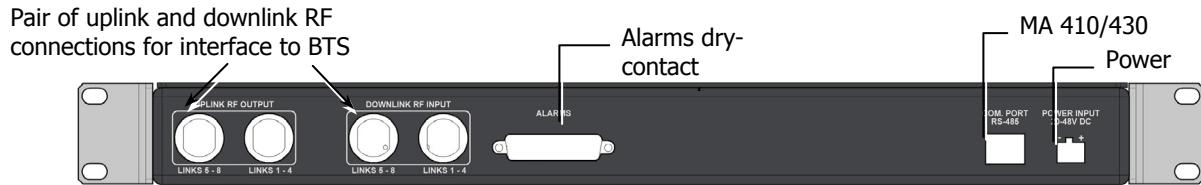
**Table 2-10. MA BU Front Panel Indicators**

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

### 2.3.1.2 BU Rear Panel

The BU rear panel contains the RF, Alarms, 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. For systems without remote management, the **Alarms** dry-contact connector pins can be connected to the BTS to provide alarms functionality.



**Figure 2-16. MA BU Rear Panel (RF Connections)**

**Table 2-11. 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	Dry-contact connections to BTS/BDA (normally closed). Relevant only for system without MA 410/430 controllers.

## 2.4 MobileAccess NMS System

**NOTE:** This section provides general information on the MobileAccess 410/430 Controller. For detailed information on the controller, configuration and connections refer to the Mobile Access NMS User's Guide.

The MobileAccess controllers enable managing and controlling the MobileAccess system elements. All the monitoring and control operations can be performed from the Master's location.

Two MobileAccess controller configurations are provided: MobileAccess 410 and MobileAccess 430. The models differ in their remote access capabilities:

- MobileAccess 410 provides point-to-point connectivity implemented via either direct RS232 connection or via connection to a DSPN phone line
- MobileAccess 430 provides client/server management capability over TCP/IP network with enhanced monitoring and control capabilities (in addition to the connectivity options provided by MobileAccess 410).

**NOTE:** The MobileAccess 430 front panel is differentiated from the MobileAccess 410 front panel by the SNMP Agent Card that provides TCP/IP management capabilities.

### Controller Front Panel

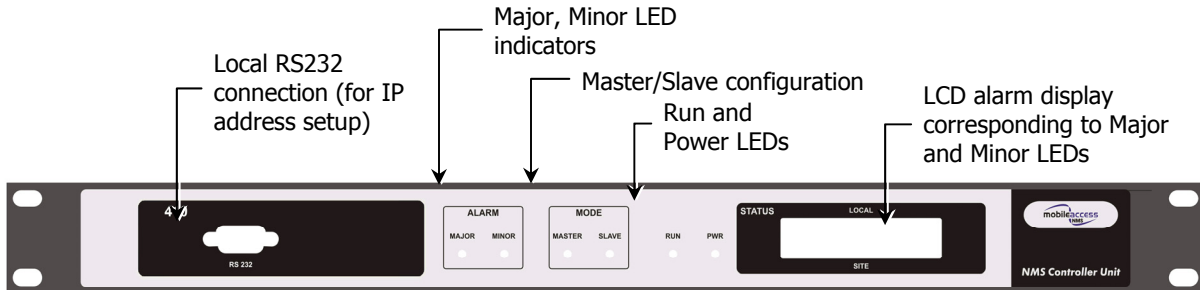


Figure 2-17. MobileAccess 410 Front Panel

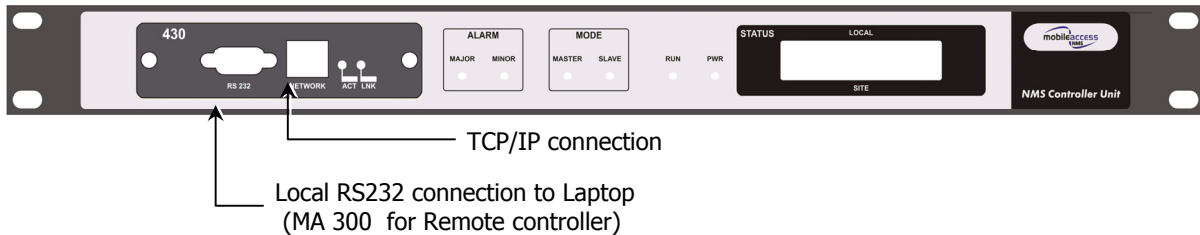
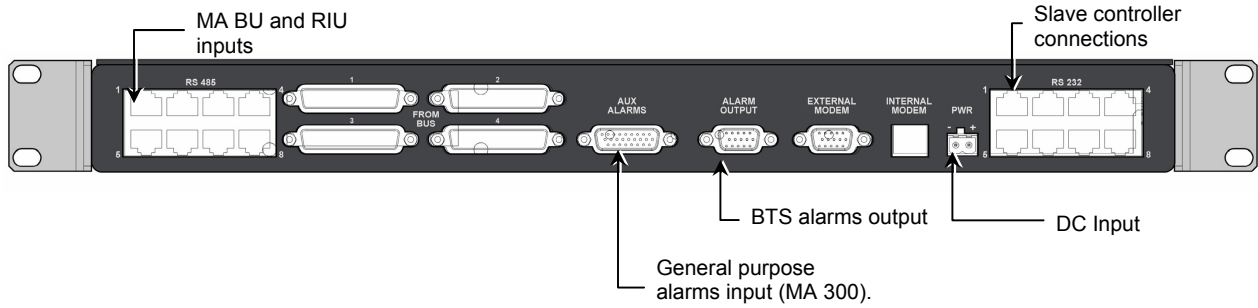


Figure 2-18. MobileAccess 430 Front Panel

## Controller Rear Panel

**Note:** The rear panels for the MobileAccess 410 and MobileAccess 430 are the same.



**Figure 2-19. MobileAccess 410/430 Rear Panel**



# 3 Site Preparation

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## 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 1/2" 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

- Use only single mode fiber for indoor applications.
- **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. You may use the Optical Test Procedure described at the end of this manual.
- 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 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

### 3.3.4 Coax Cable Lengths and Losses

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

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

### 3.3.5 Power Consumption, Connections and Power Supplies

### 3.3.6 Power Safety Instructions



#### SAFETY WARNINGS

- 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 3.3.9.

### 3.3.7 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
Add-on Unit 1200	25 to 48VDC	50W	2.0A
RIU	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	20 to 48VDC	20W	1.0A