mobileaccess
Networks

MobileAccess™ 1000/1200

Installation and Configuration Guide

UM-1000, Revision 2.2

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POLICY FOR WARRANTEE AND REPAIR

MobileAccess tests and inspects all its products to verify their quality and reliability. MobileAccess uses every reasonable precaution to ensure that each unit meets their declared specifications before shipment. Customers should advise their incoming inspection, assembly, and test personnel about the precautions required in handling and testing our products. Many of these precautions can be found in this manual.

The products are covered by the following warranties:

General Warranty

MobileAccess warrants to the original purchaser all standard products sold by MobileAccess to be free of defects in material and workmanship for one (1) year from date of shipment from MobileAccess. During the warranty period, MobileAccess will repair or replace any product that MobileAccess proves to be defective. This warranty does not apply to any product that has been subject to alteration, abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

Specific Product Warranty Instructions

All MobileAccess products are warranted against defects in workmanship, materials and construction, and to no further extent. Any claim for repair or replacement of units found to be defective on incoming inspection by a customer must be made within 30 days of receipt of shipment, or within 30 days of discovery of a defect within the warranty period.

This warranty is the only warranty made by MobileAccess and is in lieu of all other warranties, expressed or implied. MobileAccess 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 MobileAccess prior to returning any unit. Advise MobileAccess of the model, serial number, and discrepancy. The unit may then be forwarded to MobileAccess, transportation prepaid. Devices returned collect or without authorization may not be accepted.

2. Prior to repair, MobileAccess 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

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

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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

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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 10dB.

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 MobileAccess^{TM} system uses an optical laser for transmitting voice and data. The laser unit has the following output characteristics:

- Optical output power (mW): ≤ 3.0

- Wavelength (nM): 1310 ± 10

WARNING: Applying power to the MobileAccess™ creates a laser energy source operating in class I as defined by IEC 60825-1, 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice no. 50 (July 26, 2001). Use either an infrared viewer, optical power meter or fluorescent screen for optical output verification.

WARNING: The use of controls or adjustments or performance procedures other than those specified herein may result in hazardous radiation exposure.

WARNING:

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 hub unit downlink ports. Therefore, there is no dangerous RF radiation when the antenna is not connected.

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: To avoid damaging your product, please observe the following:

- Always keep the optical connector covered. Use the fiber optic cable or a protective cover. Do not allow any dirt and/or foreign material to get on the optical connector bulkheads.

- The optical fiber jumper cable bend radius is 3 cm. Smaller radii can cause excessive optical loss and/or fiber breakage.

- For proper system performance only use cables equipped with SC/APC connectors to connect to the MobileAccess system.

CERTIFICATION

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

ISO 9001

For US

> FCC 47 CFT part 22,24,90
> FDA-CDRH

> For Canada

> RSS-118, RSS-119, RSS-133….

SPECIFICATIONS

Maximum ambient operating temperature: 50° C

Maximum ambient temperature in a rack: 50° C

Preface

This user guide provides all the information necessary to install and configure the MobileAccess 1000/1200 system.

Revision History

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

Table 1-1: Revision history

Version	Date	Description
1.0	April 2003	Initial version.
2.0	October 2003	Updated version to MobileAccess.
2.1	November 2003	Review and editing
2.2	December 2003	Adding and updating RHU 1200

Table of Contents

Chapter 1.   Introduction

1.1   About MobileAccess 1000/1200™

MobileAccess™ 1000 family of products provides seamless coverage for voice and data wireless services in difficult indoor environments where steel, concrete and earth block RF signals, or in high-rise buildings where reception of multiple signals causes interference.

The MobileAccess™ converged wireless networks solution is designed to serve multiple wireless services through a single common cabling infrastructure. Homogeneous coverage is provided by antennas connected to Remote Hub Units (RHUs) distributed throughout the coverage area.

The MobileAccess™ infrastructure is protocol-independent and can simultaneously serve various services. Built-in alarm and control capabilities that enable remote monitoring and control of the system elements (including antennas).

Features

- Single cabling and antenna system for all services and frequency bands
- Support for all current and future voice and data wireless services such as PCS/CELLULAR, TDMA, CDMA, GSM, future 3G protocols, Paging, iDEN and 802.11 (a,b,g) Wireless LAN
- Upgradeable to include additional services
- 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.,)
- Modular design architecture

1.2   System Description

The MobileAccess™ system provides in-building coverage by routing RF signals from (up to three) BTS or BDA units, through optic fibers to remote areas where the signals are converted back to RF and interfaced to antennas covering the remote area. All system elements can be remotely controlled and monitored from a single location.

The MobileAccess™ coax and Fiber Optic hybrid solution consists of the following elements:

- **Radio Interface Unit (RIU) –** Provides direct, simple interface to up to three BTS or BDA units supporting up to three different services. Connections can be simplex or duplex.

  RIU output signal is automatically adjusted to respond to a range of BTS or BDA output power levels. This significantly reduces or eliminates the need for extensive manual site measurements and adjustments required to provide the optimal input to the Base Units.

  The RIU RF output signals are combined and fed via direct coax connection to MobileAccess Base Units.

- **Base Units (BUs) –** convert the RF signal received from the RIU (or passive interface) to an optic signal that is then split and routed via optic fiber to Remote Hub Units located in remote locations. Each BU can support up to eight RHUs.

- **Remote Hub Units (RHUs) –** converts the optic signal to an RF signal and feeds it to the antennas in the remote areas in order to provide the required coverage. Each RHU supports two different services (one high-band and one low-band) and provides coax connections to up to four antennas. The RHU filters and amplifies the optic signal received from the BU according to the service it supports.

  A third service can be added using a **MobileAccess 1200** add-on or independent module.

  Wireless LAN services can also be added to the MobileAccess 1000 RHU by connecting the **MobileAccess 840** add-on module. This provides wireless LAN signals to the antennas connected to the MobileAccess 1000 RHU.

- **System Controller –** provides monitoring and control to all MobileAccess system elements, from a single location.

A block diagram of the MobileAccess™ system is given below.
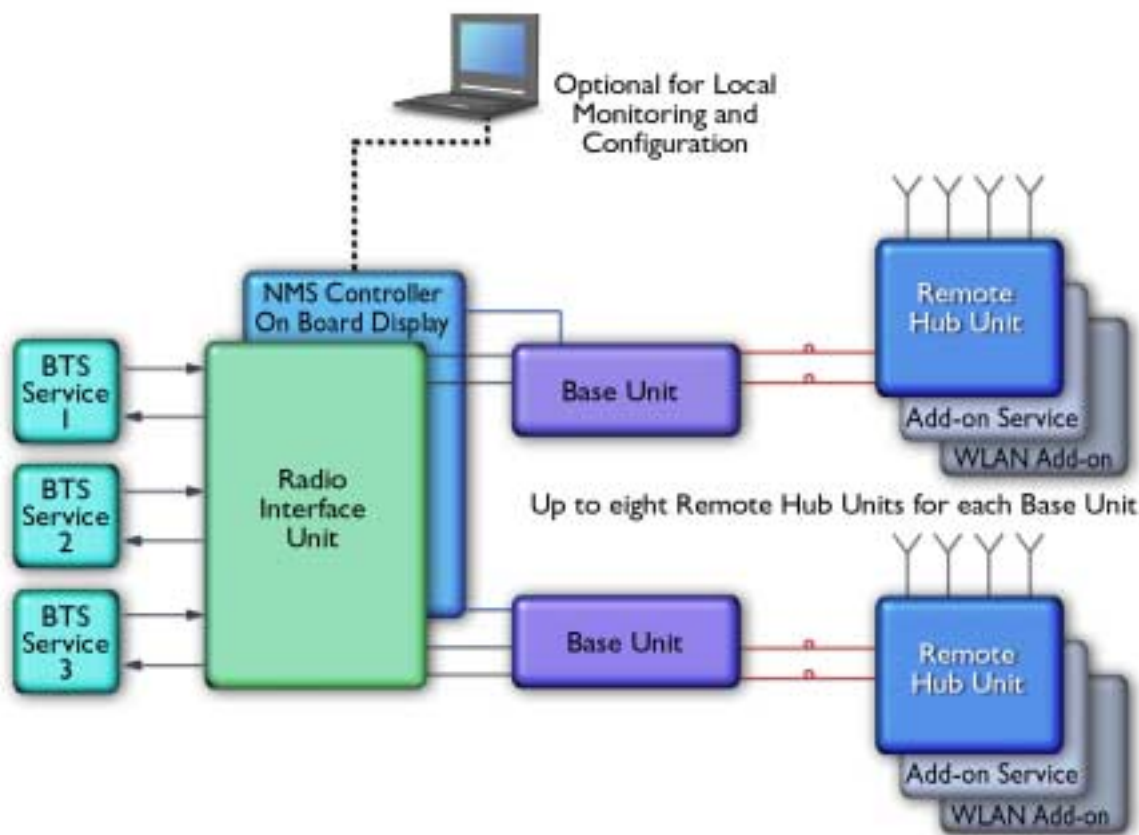
Figure 1-1. MobileAccess™ System Block Diagram

The Base Units and controller (along with the power supplies and other elements required for interface) are usually installed in the same rack in the communication room, while the RHUs are distributed throughout the locations to be covered. In the communication room located next to the BTS or BDA, the RIU is also installed in the rack.

1.3   Base Unit to Remote Unit Configuration Options

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

A) Basic configuration

In the basic configuration, depicted below, 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 1-2. MobileAccess 1000 Basic BU – RHU Configuration

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

In the second option, a MobileAccess™ 1200 add-on unit can be added in order to provide an additional service. The add-on unit can be Cellular, PCS, UMTS, 3G, or any future service.
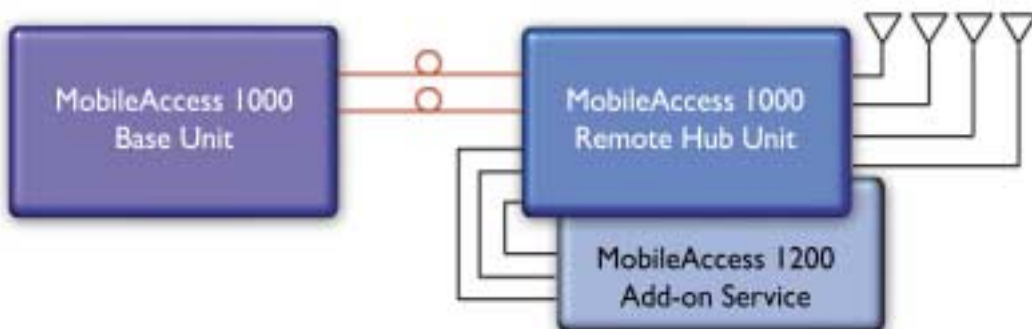
Figure 1-3. MobileAccess 1000/1200 BU – RHU Plus Add-On

C) Using the MobileAccess 800 WLAN module to provide access to high data-rate service

In the third configuration, depicted below, the WLAN module (MobileAccess™ 800) is added. The WLAN module may also be added without the MobileAccess™ 1200 unit.

Figure 1-4. MobileAccess 1000/1200 BU – RHU Plus Add-on Plus WLAN Configuration

1.4   MobileAccess Models

Table 1-1: MobileAccess™ BU Models

MobileAccess Universal Base Units (1000, 1200, 2000 support)	
WB-B8U	Wide Band Base 8 Unit supporting 8 RHUs
WB-B4U	Wide Band Base 4 Unit supporting 4 RHUs

Table 1-2: MobileAccess™ RHU Models with Add-on Capabilities

MobileAccess 1000 RHUs (ready for add-on units)	
1000S-CELL-4	Single band-Cellular, 4 ports
1000S-IDEN-4	Single band-iDEN, 4 ports
1000S-PCS-4	Single band-PCS 4 ports
1000D-IDEN-PCS4	Dual band-iDEN/PCS, 4 ports
1000D-SMR-PCS4	Dual band-SMR/PAGING/PCS, 4 ports
1000D-CELL-PCS4	Dual band-Cell/PCS, 4 ports
1000D-CELL-DCS4	Dual band Cell/DCS 4P ready for add-on units
1000D-CL-M-DCS4	Dual band Cell multi operator/DCS 4P ready for add-on units
1000D-GSM-DCS4	Dual band GSM/DCS 4P ready for add-on units
1000D-GSMO-DCS4	Dual band GSM orange/DCS 4P ready for add-on units

Table 1-3: MobileAccess™ RHU Models

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 opr/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

Table 1-4: MobileAccess™ 1200 RHU Models

MobileAccess 1200 RHU	
1200-PCS-SA-1	Stand Alone high power PCS , one port
1200-UMTS-SA-1	Stand Alone high power UMTS, one port RHU
1200-PCS-AO	Add-on RHU supporting a PCS service
1200-UMTS-AO	Add-on RHU supporting UMTS service

Table 1-5: MobileAccess™ UMTS Ready RHU Models

MobileAccess 1200 RHU(Litenna UMTS Ready compatible)	
12L-UMTS-AO	Add-on RHU supporting UMTS service LBC

Table 1-6: MobileAccess™ Controller Models

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

Table 1-7: MobileAccess™ Management System

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)

Table 1-8: MobileAccess™ RIU

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-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

Chapter 2.   Infrastructure Preparation

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

2.1   Basic Installation Rules

2.1.1   Fiber Optic Rules

- Use only single mode fiber for indoor applications.

- Use **only** 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, connecting fiber optic.

- 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.

- Verify the Fiber Optic connections. You may use the Optical Test Procedure described in *Appendix I: Optical Test Procedure.*

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

2.1.2   RF Rules

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

- Use coax RG223, 50ohm, male-to-male N-type for connecting RF side from the Base Unit to the BTS/RBS side.

- When using the MobileAccess™ system in an environment in which other indoor coverage systems are installed, pay special attention to the isolation between antennas (**distance must exceed 2 meter**).

- Use special attention while bending coax cables, according the coax specification.

- Use any antennas suitable to the desired frequency.

- Use VSWR meter (Site Master) for checking coax cables, including the antennas. (<2).

- Unused **RHU** and **RIU** ports should be terminated with a 50ohm load.

2.2   Power Consumption, Connections and Power Supplies

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.

2.2.1   Power Consumption of Units

Table 2-1. MobileAccess™ Power Requirements

Unit Type	Voltage Input	Power Consumption
RIU	20 to 48VDC	10W
Base Unit	20 to 48VDC	14W
Remote Hub Unit 1000	20 to 48VDC	25W
Add-on Unit 1200	20 to 48VDC	50W
410/430 Controller	20 to 48VDC	10W

2.2.2   Power Supply Configurations

Two Power Supply configurations are usually in use:

- **Individual connections** - each PS is located adjacent to the BU or RHU unit it will serve

- **Central connection** – a single power supply supplies the power for all BUs and RHUs

2.2.3   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. Four power supply options are available:

Table 2-2: MobileAccess™ Power Supplies

Power Supply	
LPS-48V-40W	Local AC/DC Converter 40W
LPS-48V-100W	Local AC/DC Converter 100W
RPS-200-N-48	Non-redundant 200W 110/220V Wall Mount
RPS-500-R-48	Redundant 500W 110/220V Chassis Mount
RPS-1000-R-48	Redundant 1000W 110/220V Chassis Mount
RPS-14-50W-48	Remote power supply,14 modules of 50W,48V
RPS-14-100W-48	Remote power supply,14 modules of 100W,48V
RPS-6M-220	Remote power supply enclosure,6 Modules,220v in-48VDC
RPS-600W-220	Remote power supply module 600W/48VDC,220V in
RPS-1200W-220	Remote power supply module 1200W/48VDC,220V in

2.3   Single-building Installation

Single building installation conventions:

- **Base Units** – placed in the same location (usually in the communication room).

- **RHUs** – usually placed in the communication shaft of the corresponding floor so they can be easily located. A single RHU can typically cover a floor of up to 30,000 sq ft.

- **Fiber optic cable** - Bundled fiber from the Patch Panel located in the communication room rack is also routed through the building shaft to splice boxes located every three floors where a Splice Box is used to split a tube of six fibers to three pairs of fibers. A pair of fibers is routed to the corresponding floor, to the floor above and to the floor below.

- **Single source power cable –** a single thick power cable runs from the communication room through the building shaft. The power is distributed to each floor using two thin cables that are connected to the thick power cable using DC clamps. The thin cables provide power to the individual RHUs on each floor.

- **On each floor**, connect F/O and power to the corresponding RHU. Connect antennas to RHU using via coax cables.

The following page shows an example of routing of Fiber Optic and power cables in a multi story building using the installation conventions previously described.
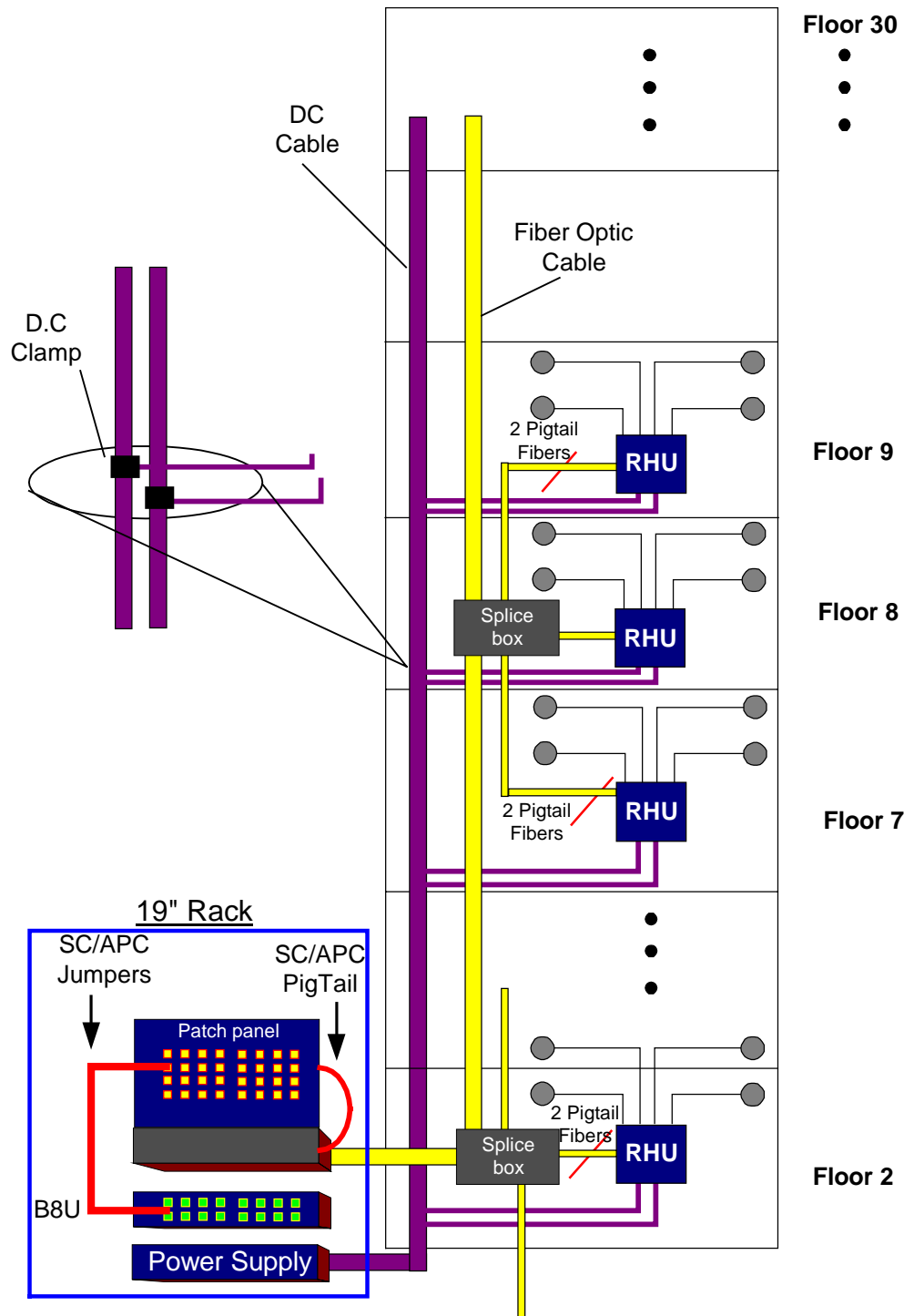

Figure 2-1- Fiber Optic and Power Cables Routing Example

2.4   Horizontal Layout Installation

Horizontal layout installation conventions:

- Connect a separate optic fiber to every site location, where a site may include more than one RHU.

- The connection may be to a splice box or directly to the RHU (depending on the site configuration).

The following figure shows a horizontal layout installation with three RHUs connected to a number of antennas.
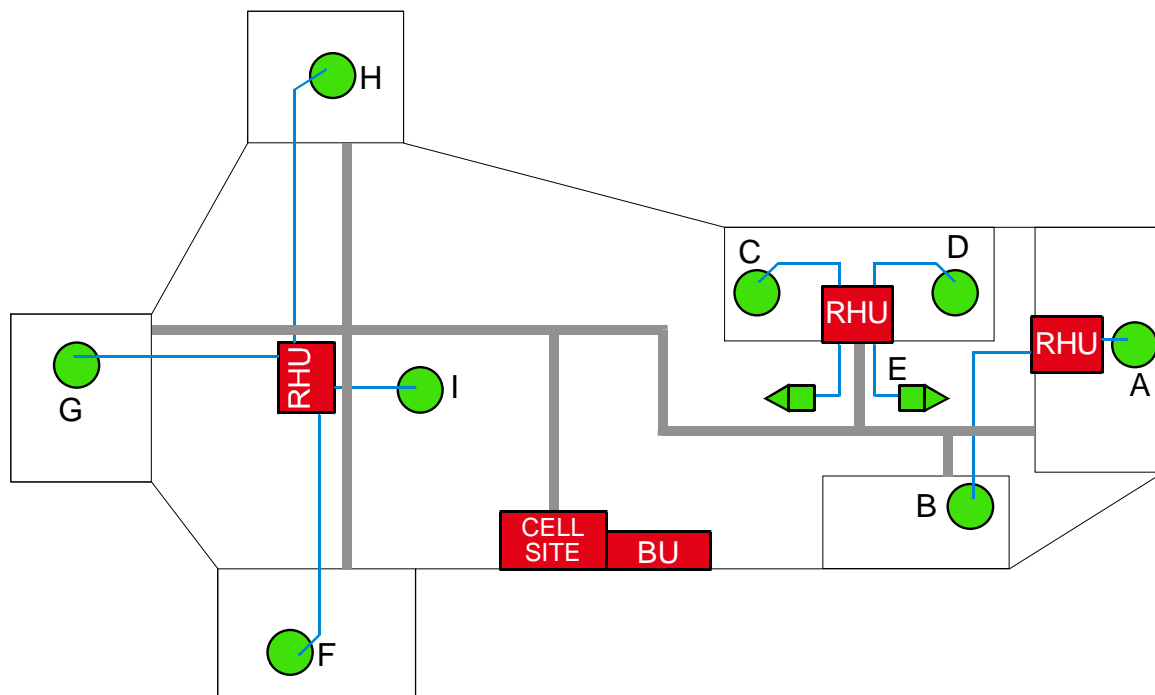

Figure 2-2: Horizontal Layout Installation

Chapter 3.   Connections

3.1   Rack Installation

It is recommended to install the following MobileAccess system modules in a 19" rack (usually 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)

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

The following image describes shows the recommended locations of the MobileAccess elements in the rack in order to facilitate and simplify the cabling *connections.*   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.
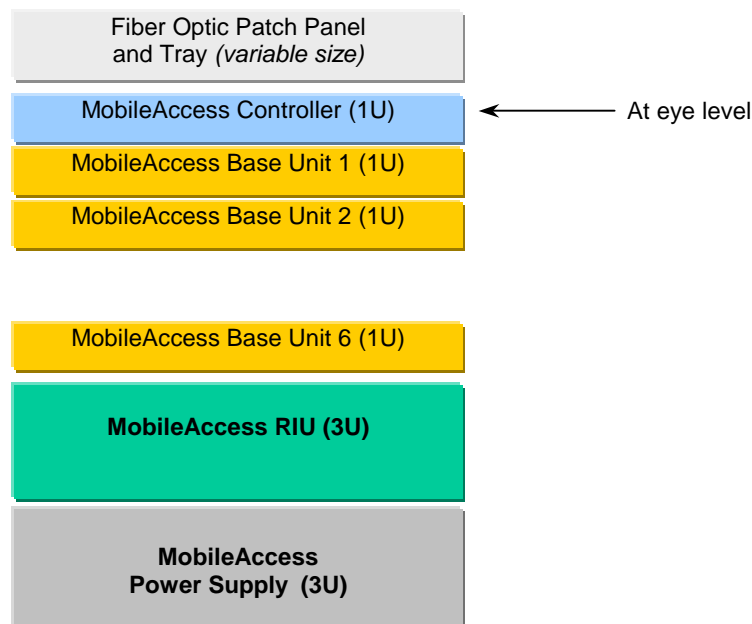

Figure 3-1: Recommended Order In Rack

3.2   Module Descriptions and Connections

3.2.1   Radio Interface Unit (RIU)

Each RIU can support up to three BTS Conditioner (BTSC) sub-modules, where each sub-module provides interface to a BTS or BDA. The BTS or BDA service must correspond to the type of BTSC to which it is connected.

Each RIU can be connected to *four* 8-port Base Units (real panel connections) or *eight* 4-port Base Units. **The RIU can be expanded to support additional BU by using splitters and combiners connected to the front panel connectors.**

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

3.2.1.1   RIU Front Panel

The RIU front panel contains all the indicators and LEDs. The wiring connections on the front panel are used to combine the RF signals into a single signal that is applied to all BUs.
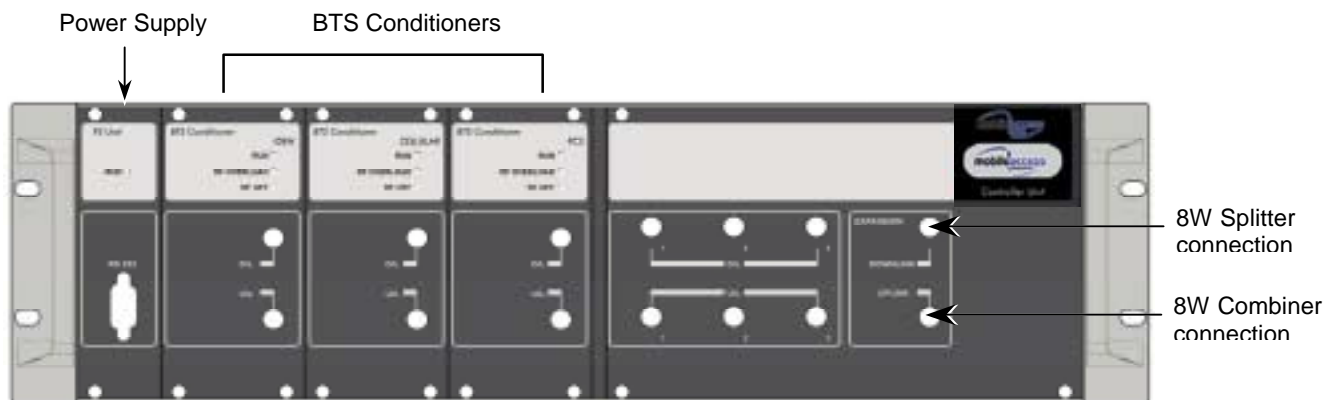

Figure 3-2. RIU Front Panel

Table 3-1. RIU Front Panel Indicators

LED	Description
P.S UNIT **PWR**	ON – input signal is at the required level.
BTS CONDITIONER **RUN**	Flashing -- CPU is running and software loaded
BTS CONDITIONER **DL OVERLOAD**	Continuous Red – RF switch is disconnected to protect the system. This may be due to: • Unpredicted power rise for which the attenuation response was insufficient to compensate and reduce the power to the required level. • Software problem detected. Flashing: When the BTSC DL output power is more than 3dB of the calibrated value.
BTS CONDITIONER **DL LOW**	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.

3.2.1.2 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.

ATTENTION

1. **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.**

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

3.2.1.3 RIU Connections

1. Connect each Base Unit to the corresponding pair of RF outputs on the RIU rear panel. Note that one uplink and one downlink RIU rear-panel connector is used to connect one OPTM (four ports from the BU). To connect additional BUs, refer to Connections to Additional BUs.

2. Connect the BTS/BDA connections (either simplex or duplex), the controller, and the power connections.
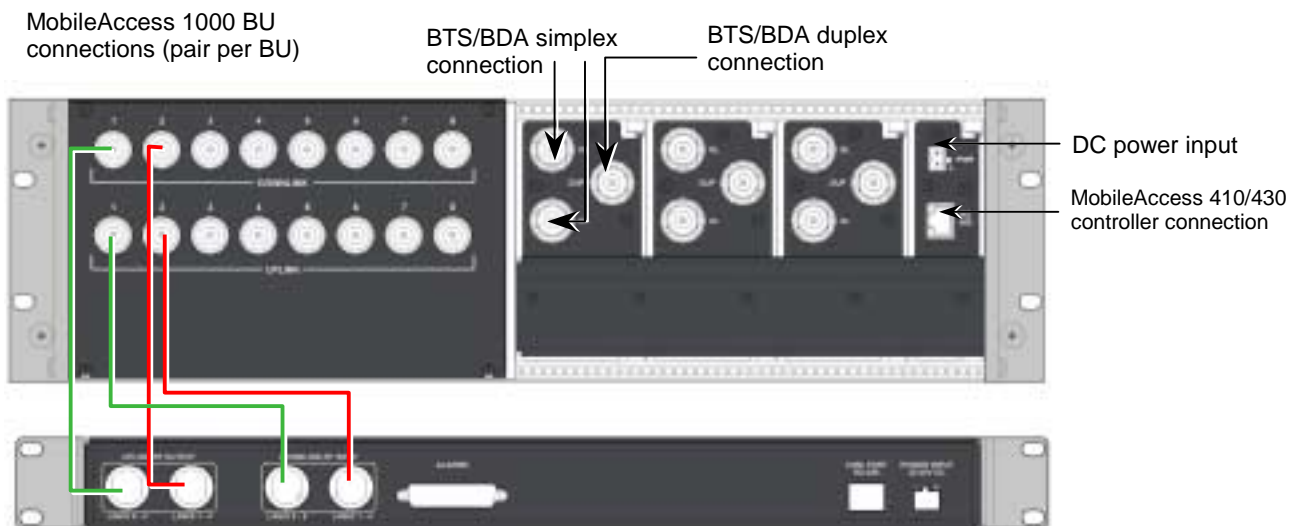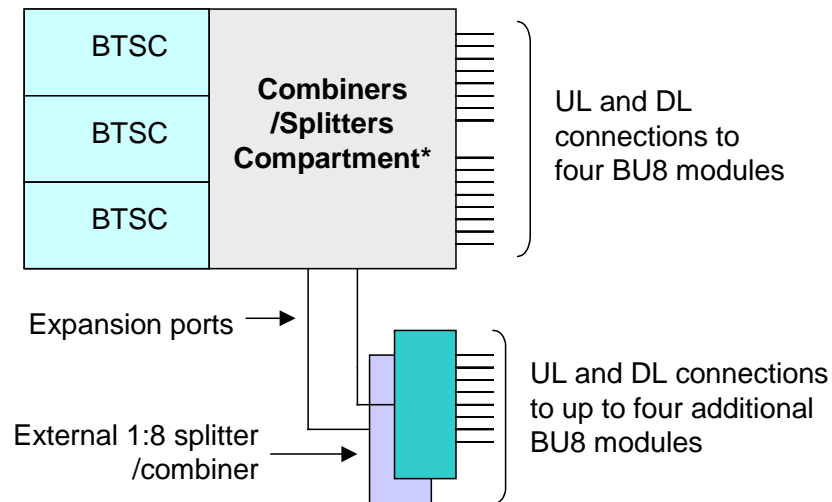

Figure 3-3. RIU Rear Panel showing the RF Connection

3.2.1.4 Connections to Additional BUs

To connect more than four 8-port BUs or more than eight 4-port BUs to the RIU, Connect an 8W splitter to the **Downlink** connector on the RIU front panel and an 8W combiner to the **Uplink** connector on the RIU front panel and connect additional BUs to the uplink and downlink connections.

3.2.2   Base Units

Depending on the Base Unit model, each Base Unit drives up to four or eight remotes via duplex F/O connection, where each remote can be as far as 2 kilometers (1¼ miles) from the BU. Eight port BU consist of two four port BU that are integrated.

During power-up, the Base Unit identifies the active connected RHUs that are connected to that Base Unit and each of the corresponding link LEDs is lit according.

3.2.2.1   BU Front Panel

The front panel contains all the optical connections. The following figures show the two configurations in which the BU is available.
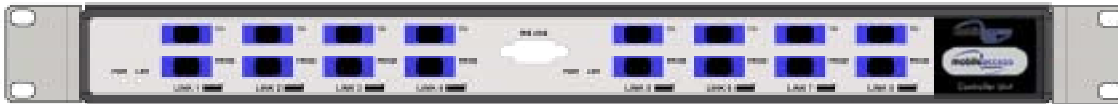
Figure 3-4. Eight Port MobileAccess 1000 Base Unit Front Panel

Figure 3-5. Four Port MobileAccess 1000 Base Unit Front Panel

Table 3-2. MobileAccess BU 1000 Front Panel Indicators

LED	Description
Link 1-8	ON - the optical link between the BU and RHU functions within the specifications in both directions.
	Blinking - optical power from RHU exceeds 2dBm.
LSR	ON - laser circuitry for the corresponding RHUs (1-4 or 5-8) is functioning correctly.
PWR	Power ON

3.2.2.2   BU Rear Panel

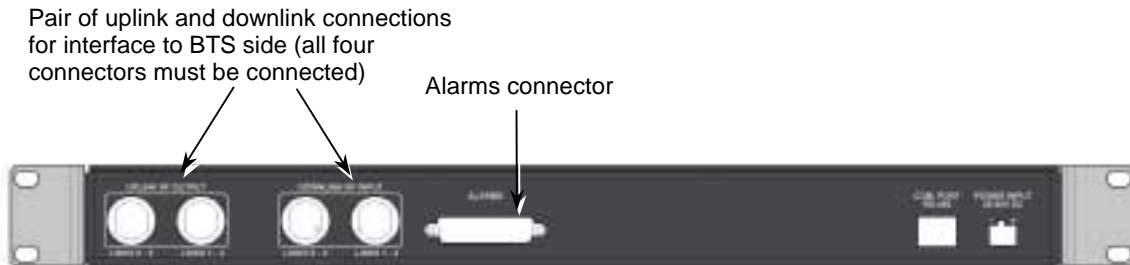The BU rear panel contains all the RF connections.

Pair of uplink and downlink connections for interface to BTS side (all four connectors must be connected)

Alarms connector

Figure 3-6. Base Hub Unit Rear Panel (RF Connections)

Table 3-3. MobileAccess 1000 Front Panel Indicators

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

3.2.2.3   Base Unit to RHU connections

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

2. Connect (3/125/900) pigtail with SC/APC connectors between splice tray and patch panel cabinet.

3. Connect (3/125/3000) SC/APC jumpers between the corresponding Base Unit and patch panel.

4. Connect the fiber optic cables from the Base Unit to the RHU's through the patch panel cabinet.

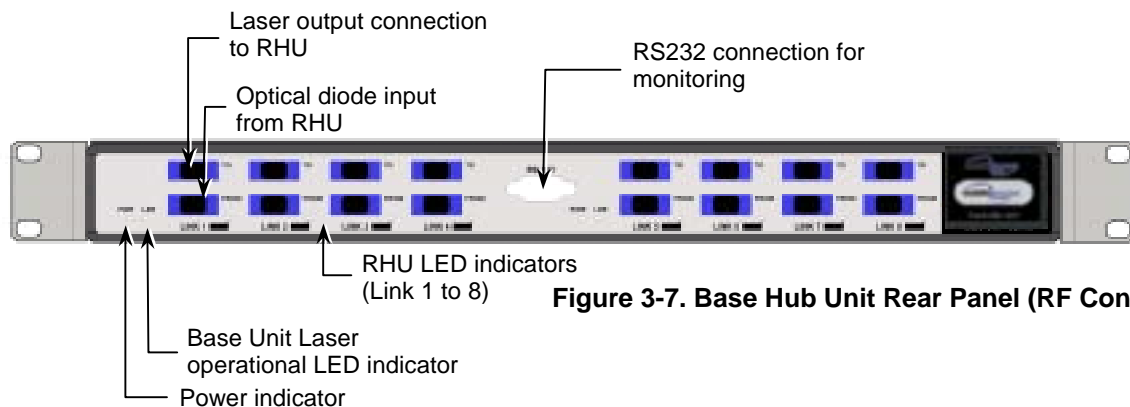
Laser output connection to RHU

Optical diode input from RHU

RS232 connection for monitoring

RHU LED indicators (Link 1 to 8)

Base Unit Laser operational LED indicator

Power indicator

Figure 3-7. Base Hub Unit Rear Panel (RF Connections)

3.2.3   Remote Hub Unit (RHU) 1000

Supports two different frequency bands depending on the RHU 1000 model.

Output composite power per antenna port is in the range of 14 to 20 dBm (depending on the served protocol). **In order to supply antenna alarms, the antenna must provide a DC resistance of up to 5K ohms.**
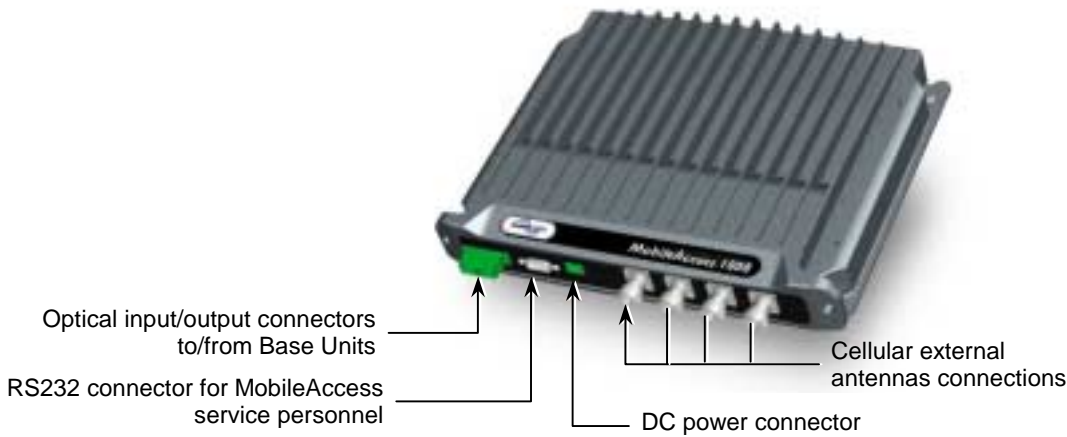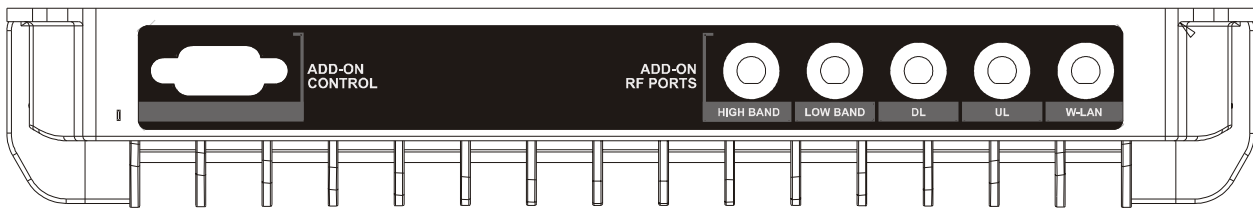
Optical input/output connectors to/from Base Units

RS232 connector for MobileAccess service personnel

DC power connector

Cellular external antennas connections

Figure 3-8. RHU 1000

ADD-ON CONTROL

ADD-ON RF PORTS

HIGH BAND   LOW BAND   DL   UL   W-LAN

Figure 3-9. RHU 1000 Rear Panel

Table 3-4. MobileAccess 1000 Front Panel Indicators

LED	Description
Link	When on constantly, the LED indicates that the received optical power from BU functions within the specifications.
	When it blinking, it indicates that the optical power from BU is higher than 2dBo.
RUN	When blinking, indicates that the CPU in the RHU is in normal operating mode.
DC	Power ON

3.2.3.1 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.
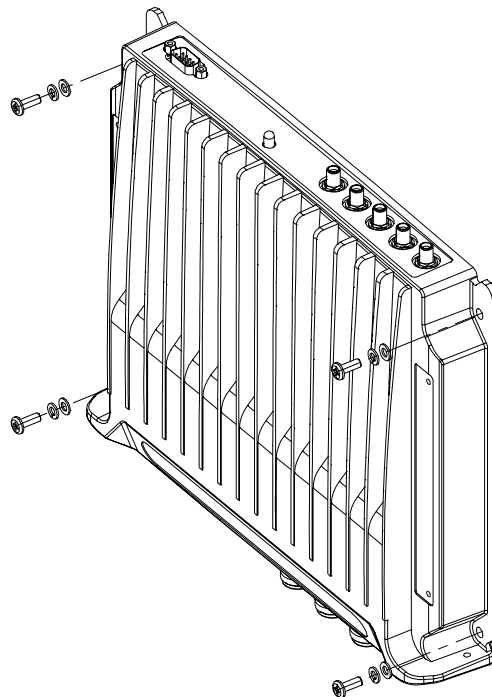

Figure 3-10. RHU 1000 Wall Mount

3.2.3.2 Connections

1. Install splice box near RHU (refer to Figure 2-1).
2. Connect fiber optic cable to splice box and to SC/APC pigtails to RHU
3. For the downlink, connect the fiber optic cable pigtails from splice box coming from the Base Unit port to the corresponding Remote Hub Unit port.
4. Connect the Remote Hub Unit to antennas according to the RF engineers design. (up to 4 antennas per RHU).
5. For the uplink, connect the fiber optic cable pigtails from splice box from the Remote Hub Unit to the uplink port that connects to the Base Unit.

6. Connect the **power** to each RHU according to power design planning (local or remote power supply).

7. Verify that 50ohm terminators are placed on the unused uplink and downlink connectors.

3.2.4 RHU 1200

High power module, supporting a single frequency band (low or high). The frequency band depends on the model. RHU 1200 is supplied in two configurations: add-on and standalone.

RHU 1200 add-on model is assembled onto the RHU 1000 model using the supplied bracket. RHU 1200 does not require any additional RF or optic infrastructure since all signals are received through the RHU 1000 unit to which RHU 1200 is assembled.
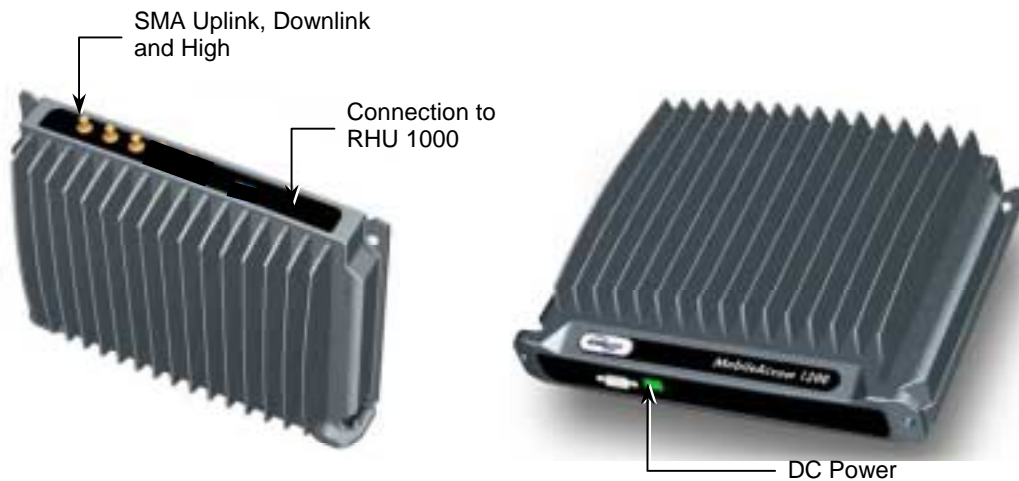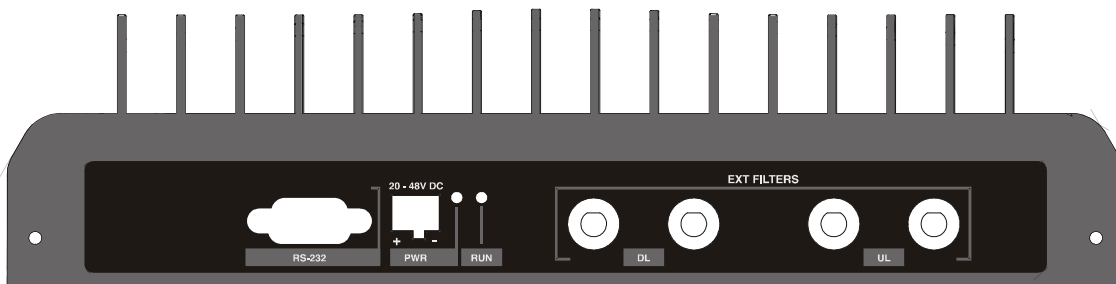

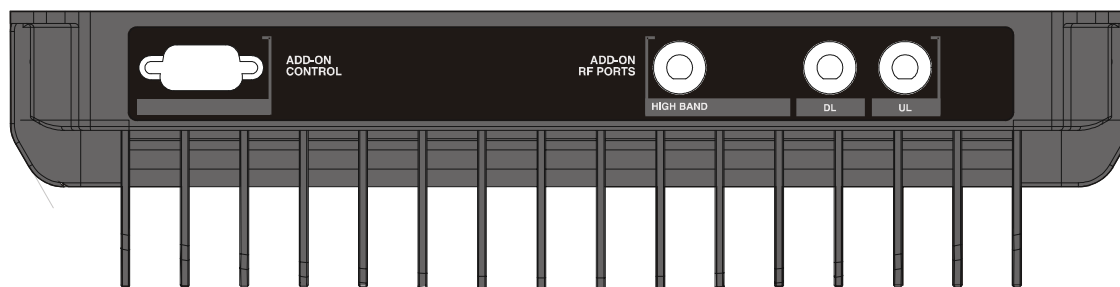**Figure 3-11. RHU 1200 Front and Rear panels**

Figure 3-12. RHU 1200 Rear Panel

Figure 3-13. RHU 1200 Front Panels

Table 3-5. MobileAccess 1000 Front Panel Indicators

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

3.2.4.1   Assembly and Connections

Refer to Figure 3-14.

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

1. On the RHU 1200 front panel, **short (interconnect)** the pair of **SMA Downlink** connectors to each other using the '**U-shaped'** jumpers, and the pair of **SMA Uplink** connectors to each other. Using the second **U-shaped** jumper.

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

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

4. **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.

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

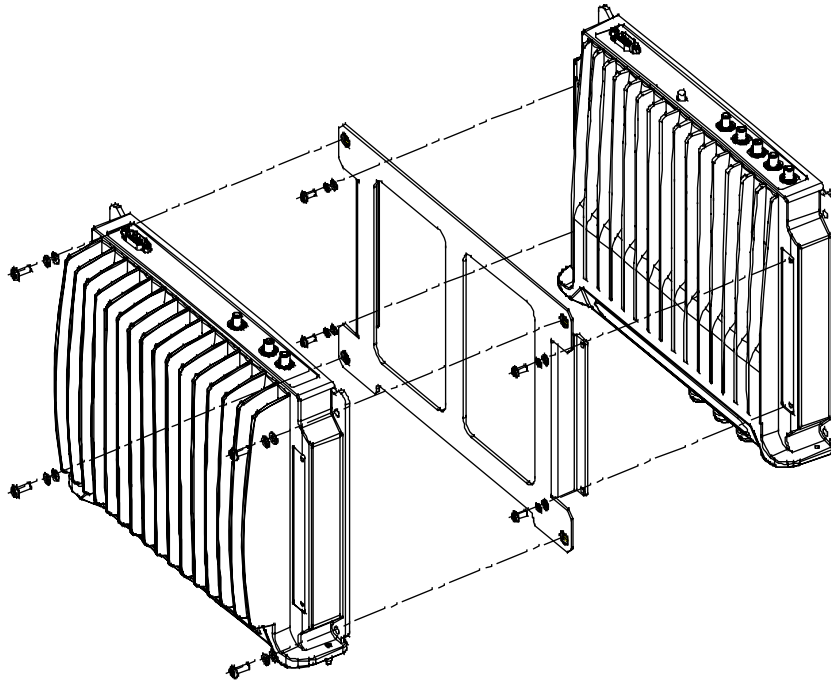6. Connect the power to the RHU 1200 front-panel **DC** connector.

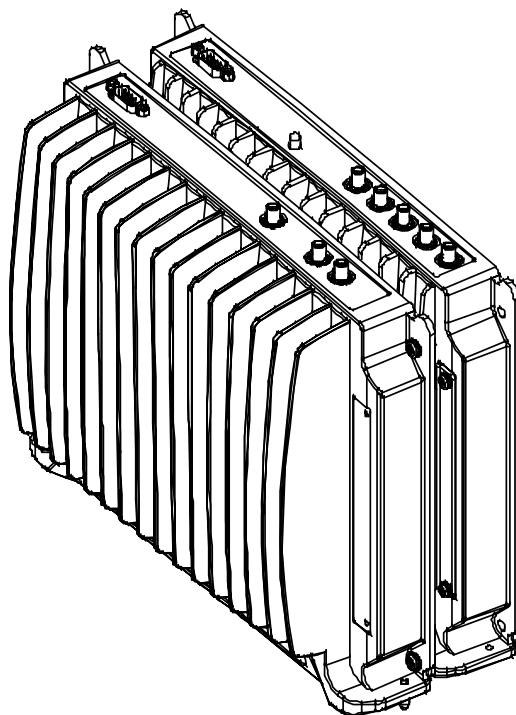**Figure 3-14. RHU 1200 to RHU 1000 Assembly**

Figure 3-15. RHU 1200 to RHU 1000 Completed Assembly

3.2.5   MobileAccess 410/430 Controller

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.

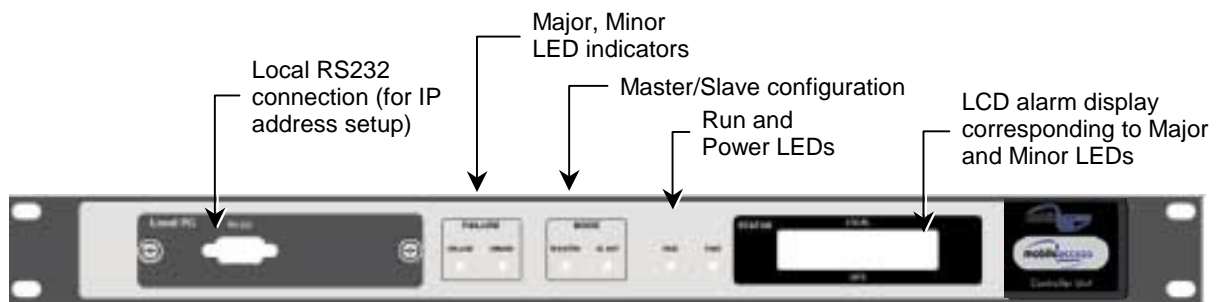## 3.2.5.1   Controller Front Panel

Figure 3-16. MobileAccess 410 Front Panel
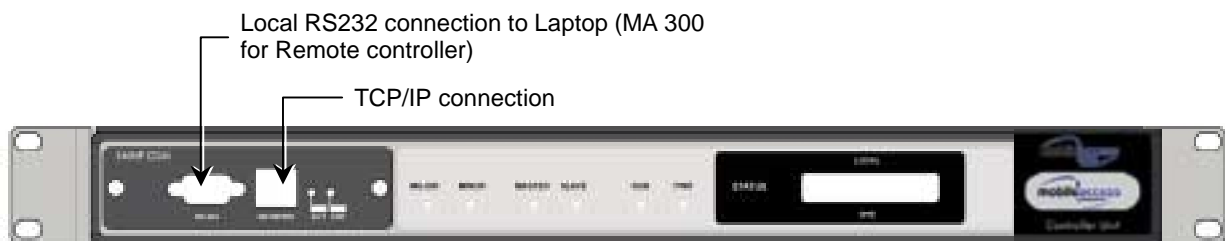

Figure 3-17. MobileAccess 430 Front Panel

3.2.5.2   Controller Rear Panel

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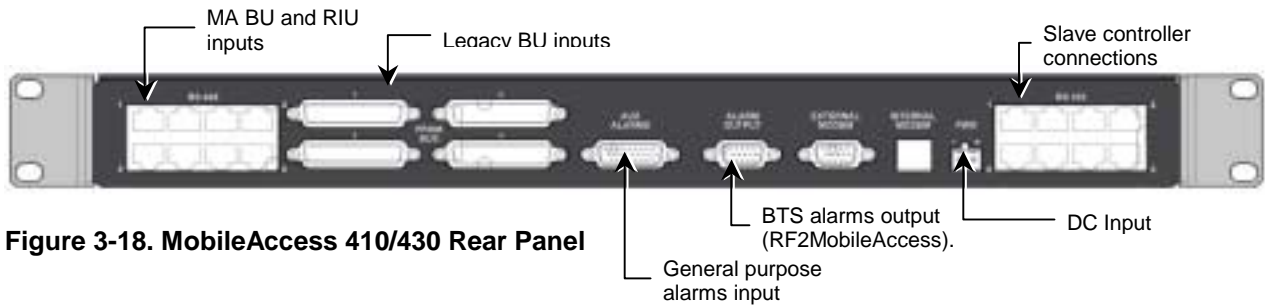

Figure 3-18. MobileAccess 410/430 Rear Panel

Chapter 4.   Appendices

4.1   Appendix I: Optical Test Procedure

This section describes the methods applied to test fiber optic cable's optical insertion loss and return loss.

4.1.1   Fiber Optic Cable Test

Due to the extended distances that analog signal transmissions travel on cable, the major challenge is to determine the status of the cable.

In order to determine that the cables are functioning, technical personnel need to perform optical power tests.

The optical power tests covered in this document are:

- Optical insertion loss measurement test
- Optical return loss measurement test

4.1.2   MobileAccess System Characteristics

The MobileAccess™ system consists of the following characteristics:

- Singlemode fiber
- Wavelength 1310nm
- Fiber Optic Cable Measurement Tests

Cable can be measured through several procedures. This document describes the following tests:

- Optical insertion loss measurement test
- Optical return loss measurement test

These tests are intended to be performed by technical personnel that deal with MobileAccess systems. Other equipment can be used to perform these tests, however the results have to be the same as will appear in the fiber optic cable test results table (Table 4-1), at the end of this document.

The insertion loss measurement determines whether the optical signal power traveling the cable length is strong enough to be received by the photo diode, in the receiver.

Following the completion of the insertion loss test, the return loss test determines the optical signal power that returns to the laser. The return power affects the laser, changing the laser's base current.

4.1.3 Test Equipment

In order to perform these tests, the following equipment is necessary:

- Light source (for wavelength 1310nm , 0dbm)
- Optical power meter
- Optical coupler (hosed and connectorized)
- Fiber optic jumper
- Adapter parts for the cable connectors

For information about equipment suppliers, contact MobileAccess.

4.1.4 Optical Insertion Loss Measurement Test

The optical insertion loss measurement tests the attenuation of the cable. The insertion loss' value should be minimal and remain in scale to 0.4dB/Km.

The insertion loss measurement can be performed in two methods:

- Two point test
- Single point test

4.1.4.1 Method #1: Two Point Test

Connection description: Light source connected at one end of the cable and an optical power meter at the other end.
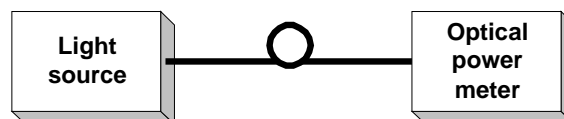
Figure 4-1: Two Point Test

1. Connect light source directly to the optical power meter.
2. Measure light source signal power, verifying power of 0dBm.
3. Connect light source to cable end.
4. Connect optical power meter to cable at other end.
5. Measure light source signal power using the optical power meter.
6. Calculate the difference between two signals (dB):

(Insertion loss)dB = (Light source signal at one end)dBm – (Measured signal at other end)dBm

4.1.4.2   Method #2: Single Point Test

Connection description: This method assumes that there are two parallel fibers on the path to be tested. Connect fiber jumper at end of the cable being tested to another parallel cable. Connect the light source, optical power meter and optical jumper as shown in Figure 4-2. This measurement can test two cables simultaneously.
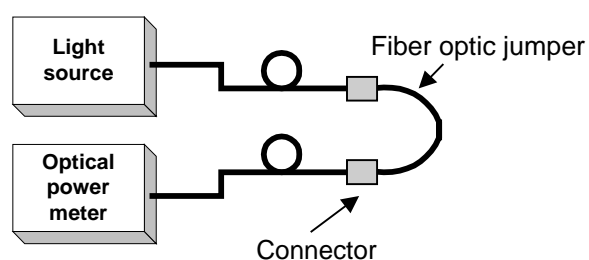
Figure 4-2: Single Point Test

1. Use optic jumper to connect the two cables.
2. Connect light source directly to the optical power meter.
3. Measure the power of light source signal , verify power of 0dBm.
4. Connect a light source and optical power meter to one end of each cable.
5. Measure the power of the signal.
6. Calculate the difference between the two signals in dB

(Insertion loss)dB =(Light source signal)dBm– (Measure signal)dBm

4.1.5   Other Test Equipment

The optical insertion loss measurement test can be performed with more sophisticated measurement equipment.

For information on other types of test equipment contact MobileAccess.

4.1.6   Optical Return Loss Measurement Test

Connection description: Connect a light source and optical power to the inputs. If the coupler has one output, connect the tested cable to this output. If the coupler has two outputs make a pigtail at the second output.
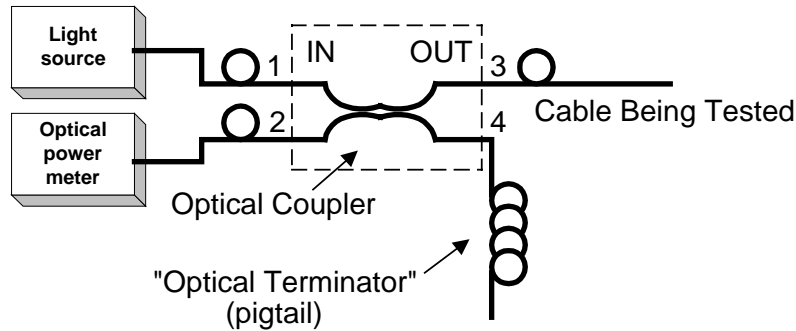
Figure 4-3: Optical Return Loss Measurement

4.1.7   Measurement Procedure

4.1.7.1   Measuring Power Input To Cable Being Tested

- Verify that light source power is at 0dBm.
- Connect a light source to connector #1.
- Connect optical power meter to connector #3.
- Measure signal power (P3), power should be approximately –4dBm.

4.1.7.2   Measuring Coupler Power Loss

- Move power meter from connector #3 to connector #2.
- Move light source from connector #1 to connector #3.
- Measure power loss of coupler (Lc).

4.1.7.3   Measuring Return Power

To measure return power:

- Move light source from connector #3 to connector #1.
- Connect cable being tested to output connector #3.
- If coupler has two outputs, then make a pigtail at second output.
- If cable is longer than 100 meter, then cable needs to be isolated.

To isolate cable:

1. Find place near test point where winding the cable into a pigtail is possible.
1. Make pigtail.
2. If cable is shorter than 100 meter, then verify that cable is disconnected at end.
3. Measure the return light power (P2), connector #2.

Calculating Return Loss

Calculate the difference between the signals in dB.

(Return loss)dB = (P2)dBm – (P3)dBm + (Lc)dB

4.1.8   Results

The following table is to be filled in by technical personnel testing the fiber optic cables.

Table 4-1: Fiber optic Cable Test Results

Test	Measurement	Pass Range	Pass/Fail
Optical insertion loss		<0.5 dB/Km	
Optical return loss		< -50 dB	

4.1.9   Summary

If the fiber fails in the optical insertion loss or optical return loss tests, then the connector needs to be cleaned. Connector cleaning is carried out according to a standard cleaning procedure. Following cleaning, the fiber needs to be tested again. If the failure continues in the fiber following cleaning, then the technical personnel need to refer to the fiber optic cable manufacturer's troubleshooting guide.If the fiber passes the optical insertion loss and optical return loss tests, then the tested fiber optic cable is considered suitable for use with MobileAccess equipment

4.2 Appendix II: Link Measurements Form

To smoothly carry out link measurements, refer to table *Table 4-1: Fiber optic Cable Test Results*. This table aids system evaluation and provides necessary feedback to MobileAccess.

The following issues should be taken into account:

- Measure the optical power for every link with an optical meter and light source, according to the number of links or RHU's.

- Measure the typical signal strength (RSSI) for every installed antenna.

- Check coax cable connection between RHU and every installed antenna.

Table 4-2: Link Measurement Table

System Link	Power Meter (mW)	RSSI (dBm)				Coax Cable (OK/Fail)			
		Ant1	Ant2	Ant3	Ant4	Ant1	Ant2	Ant3	Ant4
RHU1									
RHU2									
RHU3									
RHU4									
•									
•									
•									
•									
•									
•									

4.3 Frequently Asked Questions

1.	**What optical parameters are recommended in order for the MobileAccess network to operate with the highest performance?**
	Answer. Three parameters are specified for every installation: • Single-mode Fiber: Corning SMF 28 or equivalent • Back Reflection: Less than 45 dB of back reflection @1310 nm • Loss: Total end to end optical loss should be less than 1.5 dB @1310 nm
2.	**What does MobileAccess recommend as the best method to achieve these parameters for a reliable system?**
	Answer. The end to end fiber backbone should include only fusion splicing or APC polished connectors for all fiber interconnections.
3.	**Which optical connector type does MobileAccess recommend for the highest performance network with long term reliability?**
	Answer. We use the SC/APC connector for MobileAccess products and this is the connector that we would recommend in the building infrastructure as well. We have found that this connector is the optimal connector from a cost versus performance perspective for use with our products. It offers a consistently low back reflection and low loss. It is currently the lowest cost connector in its performance class
	In green field turnkey installations, MobileAccess will use only SC/APC connectors in the network in order to warrant system performance
4.	**Are connectors other than SC/APC recommended or allowed as long as they are APC?**
	Answer. Any connector with an APC polish may be used in the fiber link. The APC polish is available as an option on most fiber optic connectors. There is a list of popular connectors that are available with an APC polish at the end of this FAQ. APC is an abbreviation for Angle Polished Connector. The APC polish consistently provides the lowest back reflection. The high performance analog nature of the MobileAccess products makes this low back reflection for required for optimum performance. It should be noted, however, that the SC/APC connector is the only connector type that directly connects to the MobileAccess antenna system products.
5.	**My installer says that he has a connector with very low back reflection and loss but it does not have an APC polish. Is this non-APC connector acceptable?**

	Answer. We have found that only the APC polish can offer consistently low levels of back reflection with a high level of reliability.
	There are connectors on the market with UPC, SPC and PC polishes that specify low back reflection. The problem with these various polishes is that they are very fragile. A small particle or even environmental changes can cause dramatic changes in the optical performance. As a result performance degrading back reflection may suddenly appear some time after the initial installation.
	The APC, however, is much more robust and resistant to back reflections due to the superior method used to eliminate back reflections. APC connectors are trouble free and maintenance free. Once installed, there is no physical or environmental mechanism by which the back reflection performance can be significantly changed.
	If non-APC connectors are installed by the customer and provided for use with the MobileAccess System, future system performance may be impacted and issues resulting from a degradation of the fiber backbone performance are not warranted by MobileAccess.
6.	**What skills and experience should I look for when choosing a fiber cable installer?**
	Answer. Choose an installer who has experience with fusion splicing and APC connectors. Only factory polished APC pigtails should be used and they should be fusion spliced to the backbone cable.
	Many installers lack experience with low back reflection singlemode links. This is because the lower optical performance LAN data links which are more commonly installed in the premises environment do not have stringent back reflection requirements. Installers who have worked with the Telephone carriers or CATV installations, on the other hand, are much more aware of low back reflection requirements.
7.	**What test documentation should I require from my fiber cable installer? Should I require OTDR traces?**
	Answer. When using APC connectors, documentation of the fiber loss measurements of each end to end fiber link is sufficient. A 1310nm light source and optical power meter are the only instrumentation required to perform this testing. Back reflection from APC connectors and splices are so consistently low, that back reflection measurements are not required.
	If, however, a non-APC connector is used, the back reflection measurements of each link should also be documented. An optical back reflection meter should be used for these tests. Unfortunately, most installers are not equipped with a back reflection meter. This is another reason that use of the non-APC connector is strongly discouraged.
	An OTDR trace lacks the resolution required to evaluate the closely spaced splice junctures and connection pairings that are typical of In-building installations. OTDR traces are only useful on long fiber spans where the fiber events are spaced at long intervals from one another.
8.	**What are the maximum acceptable optical loss limits that are recommended for the connectors, splices and optical fiber?**
	Mated connector pair: <0.5 dB
	Fusion splice: <0.04 dB
	Optical fiber cable: <0.4 dB/Km
	Total end to end link: <1.5 dB
9.	**I have a non-APC Singlemode fiber infrastructure already installed. Do I have to install a totally new infrastructure for MobileAccess equipment?**

	Answer. As stated above, the APC polished connector is the most robust and reliable solution and is the only recommendation of MobileAccess.
	However existing backbone with UPC polished connectors could be used if they were tested and found to have less than -45 dB back reflection and less than 0.5 dB loss per mated pair connection.
	Again, the end to end performance of each fiber link should meet or exceed the MobileAccess specifications. As long as this occurs, MobileAccess will warrant system performance. However, fiber backbone performance degradation will be a principle suspect if system performance issues arise in the future. Issues resulting from a degradation of the fiber backbone performance are not warranted by MobileAccess.
10.	**I have heard that there is an 8 degree APC and a 12 degree APC polish. Which of these is compatible with Mobile Access Equipment?**
	Answer. The 8-degree angled APC polish is compatible with our equipment. This is by far the most popular APC polish available on the market. So much so, that it is usually referred to as simply "APC".
	There is a 12 degree angled APC polish available as well, but it is rare. This 12 degree angled polish is not compatible to MobileAccess equipment and should not be mated to an 8 degree APC. It is however acceptable for use in the fiber backbone.
11.	**What are the various connectors that MobileAccess would recommend?**
	Answer.
	1. SC/APC (Most popular connector, Quick push-pull mating)
	2. LC/APC (Small form factor (SFF), there is a good chance that this will replace the SC/APC as the most popular connector in the U.S. but there are competitors shown below)
	3. LX.5/APC (SFF, Not extremely popular yet, Has backing of some vendors)
	4. Diamond E2000/APC (Excellent but expensive and not extremely popular outside of Europe. Especially popular in Germany.)
	5. FC/APC (Generally replaced by the SC/APC - Uses a threaded coupling nut, secure even in high vibration environments but does not permit quick connection)
	6. MU/APC (SFF, half the size of the SC/APC, more popular in Japan)
	7. Diamond F3000/APC (SFF, new, not popular, could be compatible to the LC)
	Once again, it must be noted that the SC/APC is the only connector type that may be directly connected to the MobileAccess antenna system products.