MobileAccess 2000 System

Installation and Configuration Guide

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Preface Material

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.

EXCEPT AS EXPRESSLY PROVIDED HEREIN, MOBILEACCESS MAKES NO WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY GOODS, PARTS AND SERVICES PROVIDED IN CONNECTION WITH THIS AGREEMENT INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. MOBILEACCESS SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

Reporting Defects

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 DB.

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 DOWNLINK PORTS. THEREFORE, THERE IS NO DANGEROUS RF RADIATION WHEN THE ANTENNA IS NOT CONNECTED.

Laser Safety

FIBER OPTIC PORTS OF THE MOBILEACCESS 2000 EMIT INVISIBLE LASER RADIATION AT THE 1310/1550 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 2000 MODULES AND THE ASSOCIATED CABLES.

THE MOBILEACCESS 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.

Safety

⚠️ **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.

1. 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.

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

Compliance with RF safety requirements:

- MobileAccess™ products have no inherent significant RF radiation.

- The RF level on the downlink is very low at the downlink ports. Therefore, there is no dangerous RF radiation when the antenna is not connected.

Standards and 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....

FCC Certification

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.

About This Guide

This user guide provides all the information necessary to install and configure the MobileAccess 2000 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	September 2004	Initial version.
1.1	Oct-04	Text editing
1.2	JAN-05	2000 Lite, Configurations, 4x8
1.3	Jan-05	Max current consumption, laser warnings
1.4	FEB-05	Corrected 2000 configurations
1.5	MARCH-05	Modified Remote Cabinet wall-mount assembly to conform to UL requirements
1.6	APRIL-05	For upgrades, cables interconnecting RU 2000 and MA 1200 add-ons to filters are provided in separate kits. These differ for Cabinet and for 2000 Lite installations because of cable length requirements constraints.
1.7	FEB-2006	Digital module. Updates, reorganization and editing.
1.9	JUNE-06	Addition of section 3.3.4 – Coax Cable lengths and Losses
1.10	JUNE-06	Infrared references removed.
1.11	JULY-06	Laser safety and FCC Safety additions

List of Acronyms

BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
BTSC	Base Transceiver Station Conditioner
BU	Base Unit
DL	Downlink
RU	Remote Hub Unit
RIU	Radio Interface Unit
UL	Uplink
VDC	Volts Direct Current

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Introduction to the MA 2000 System

MobileAccess 2000 provides a cost effective solution that enables multi-operator indoor coverage of voice and data wireless services through a single coax antenna infrastructure. MA 2000 provides scalable indoor coverage for enterprises, where support for coverage from additional operators in any band range, for example CELLULAR 800MHz band and GSM 900MHz band, may be added as needed, without changing the infrastructure. Thus, subscribers of any operator (for whom coverage is provided) may have excellent wireless voice reception at any point in the building, as well as use of the network through 802.11a/b/g data services.

Two types of remote location systems are available:

- 2000 Lite – supports up to 8 services
- 2000 Cabinet – supports up to 20 multi-operator services

The MA 2000 system can be remotely controlled and managed from a single location through MA 410/430 Controllers.

Figure 1-1. MA 2000 Lite (left side) and MA 2000 Cabinet (right side)

Features and Capabilities

- 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

- Scalable and future-safe – can *easily* be upgraded to provide support for additional services

- Remote end-to-end monitoring through MA 410/430 controllers

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

- Simple installation and commissioning

1.1 System Architecture

At the head-end, MobileAccess elements provide the interface to the wireless service provider's network, condition the signals, convert them from RF to optical and transport them over the optic fiber infrastructure to the remote end.

At the remote end, MobileAccess elements receive the optical signal transmitted from the head end, convert the signal back to RF, amplify and filter the signals and then combine them for distribution over the broadband antenna infrastructure.

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

1.1.1 Head-End Elements

The following elements are installed at the BTS/BDA side:

- **MA Remote Interface Unit (RIU)** – Receives and combines RF inputs from one or more cellular networks via off-the-air repeaters or Base Transceiver Stations (BTS).

   NOTE: Interface to the BTS/BDA may also be passive (i.e. Interface Box).

- **Base Unit (BU) –** Receives the combined signal from the RIU and converts it to an optical signal for distribution over fiber optic cables to multiple MobileAccess Remote Hubs.

NOTE: These elements are not specific to the MA 2000 system. They are common to other MobileAccess systems.

1.1.2 Remote Locations Elements

The following elements are installed at each remote location:

- Service specific units that are either housed internally in an MA 2000 Cabinet or connected externally to an MA 2000 Lite device. Two types of units are available:

   - **Remote Units (RU) –** supports two voice services and performs the optic to RF (and vice versa) conversion, amplification and filtering at the remote locations. An third service can be added through connection to an MA 1200 Add-on unit.

- **MA 1200 Add-on** – supports a single voice service. It enables a host RU to which it is connected to provide an additional service.

- **MA 850** – flexible and maintainable wireless transport platform that enables large-scale Wi-Fi deployments and distribution of data services from 802.11a/b/g APs through the same antennas as the voice services.

- **MA 2000 Cabinet** – houses up to five units (RUs and MA 1200 add-on), converges the corresponding services (up to 20) and provides the interface to the coax antenna infrastructure. (MA 850 can also be added externally)

- **MA 2000 Lite** – provides connections to two RUs, where MA 1200 add-on units may be connected to the RUs to provide support for up to 8 services. (MA 850 can also be added).

- **Antennas –** wideband MobileAccess antennas

1.1.3   Management Elements

The following elements provide remote management for the MA 2000 system elements:

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

- **MCT** – a Java based GUI application provided with both controllers. MCT is used to setup the system elements and to provide basic management functions.

- **MA NMS Manager™** – SEPARATELY PURCHASED APPLICATION. A Java based GUI software application that provides enhanced monitoring and control capabilities for all your *MA 430™* sites from a single location.

1.1.4 System Operation

Figure 1-2 shows a basic block diagram of the system operation. On the downlink, the services from the BTS/BDA are transferred via interface to the Base Units. The interface, which may be passive (i.e. Interface Box) or active (RIU), is used to attenuate the RF signals to the required levels, converge them and distribute them to the BUs. *The BUs are wideband – they are not service specific.*

At the BUs, the RF signals are converted to optical signals and transmitted over the optic fiber to (service-specific) RUs at the remote locations. At the remote locations, the RUs, which are either housed in an MA 2000 Cabinet or externally connected to an MA 2000 Lite, reconvert the optical signal to RF. At the 2000 Cabinet/Lite, the services are converged and distributed over the coax antenna infrastructure. Data services from 802.11/a/b/g APs may be integrated into the MA 2000 system at the remote locations. MA 410/430 provide monitoring and control of all active system elements.
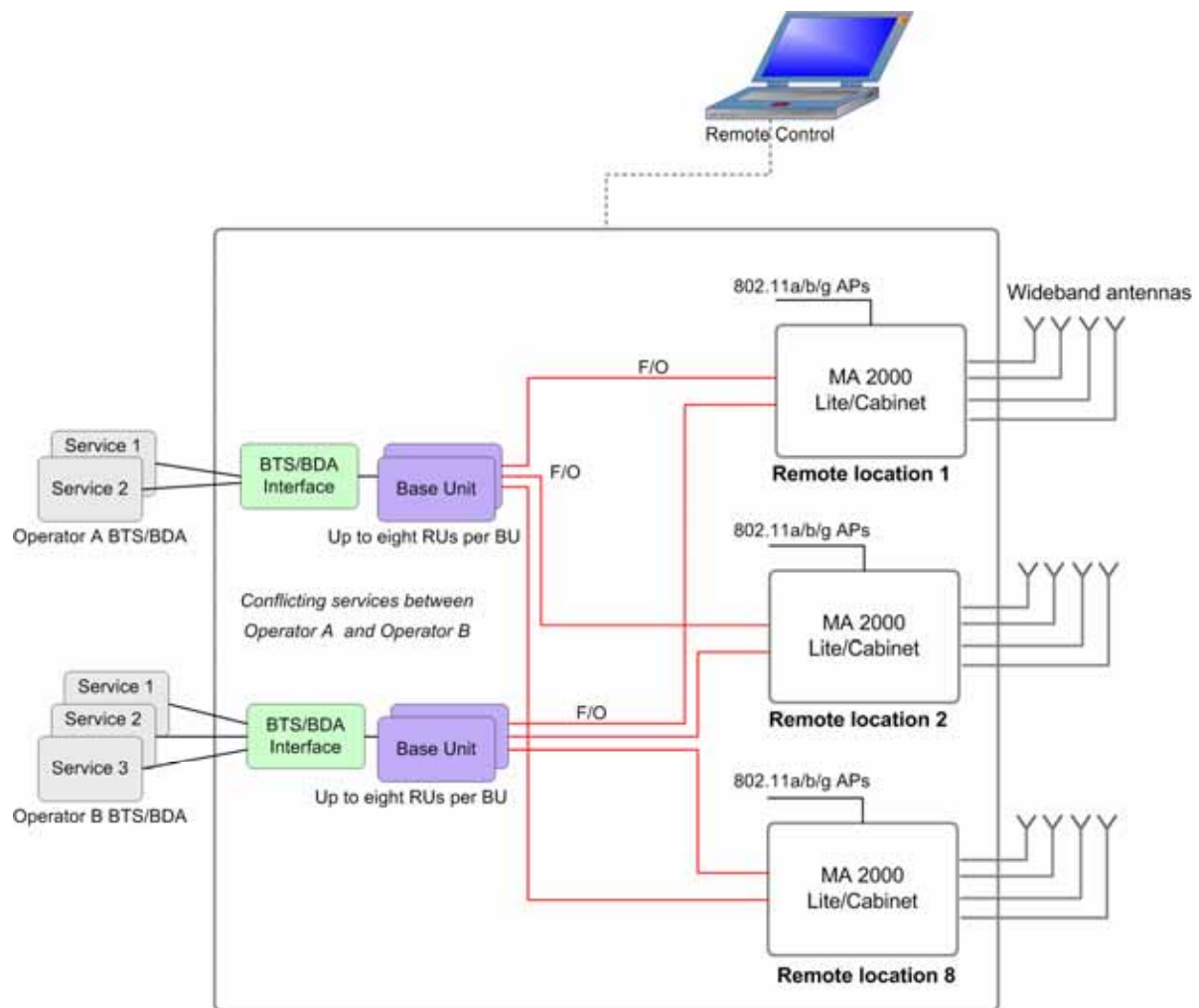
Figure 1-2. Basic Block Diagram of System Operation

1.2   Application Example

Figure 1-3 shows an example of an MA 2000 Cabinet based solution. Five services from two different operators are distributed, where services from Operator A conflict with those from Operator B.

The converted optical signal is routed from the BUs directly to the corresponding RUs in each Cabinet over optic fiber. Each BU supports connections to 8 RUs. Additional BUs are required for connection to more RUs.

Services 1 and 2 are distributed through the foremost RU in each Cabinet. Services 3, 4 and 5 are distributed through the second RU and the MA 1200 unit connected to that RU.

MA 850 converges 802.11a/b/g data services with the voice services to be distributed through a common infrastructure of coax and wideband antennas.
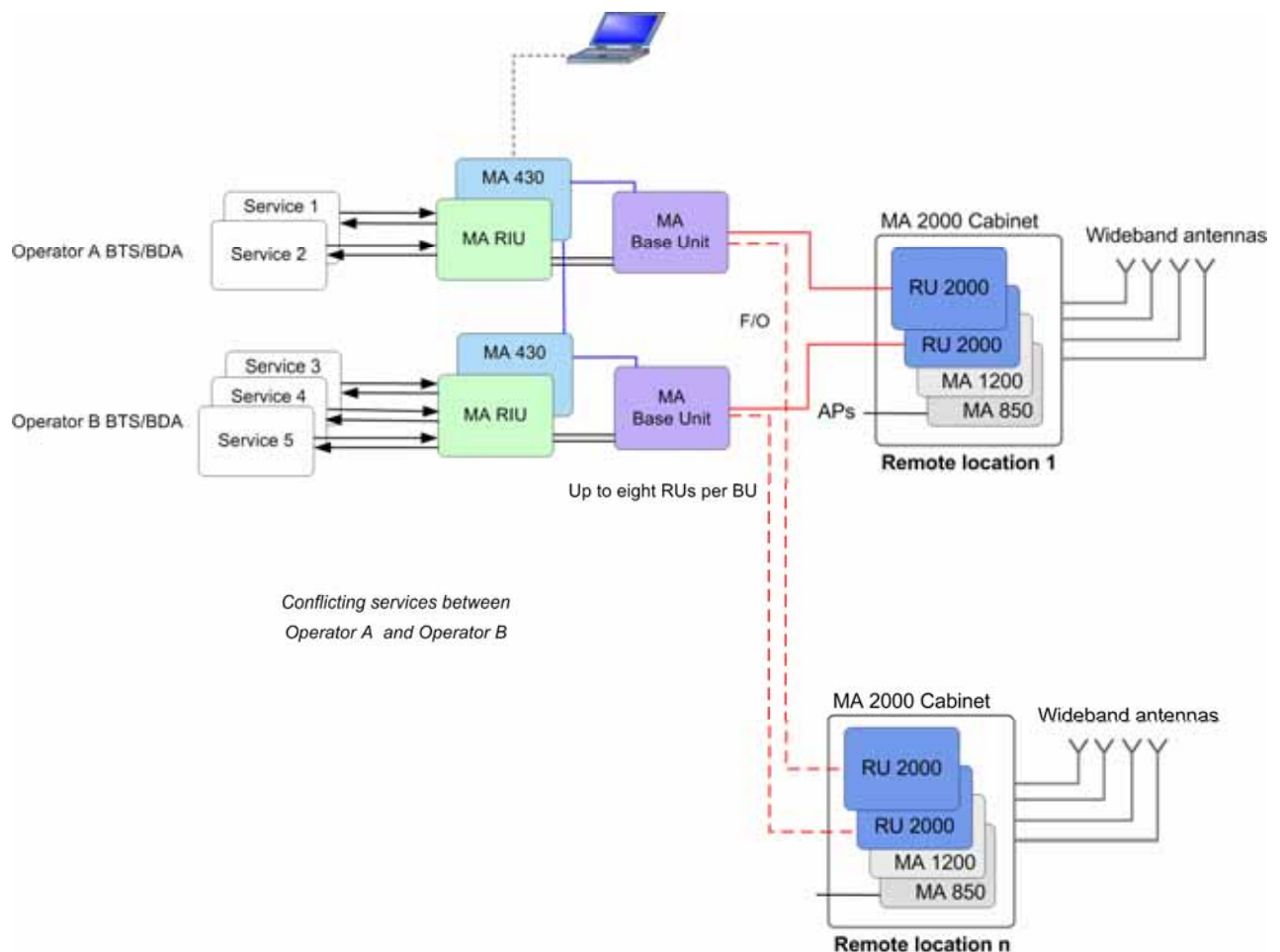
Figure 1-3. Example of MA 2000 Cabinet Architecture

1.3   MA 2000 Element Models

Table 1-1: MobileAccess™ Remote Cabinet Models

MobileAccess Remote Cabinet	
2000-RC-RP	Remote Cabinet, remote powering – integrated DC power supply
2000-RC-LP	Remote Cabinet, local powering
2000 - MINI-ENC (Lite)	2000 system supporting two modules (external to the system)

Table 1-2: MobileAccess™ BU Models

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

Table 1-3: MobileAccess™ 2000 RU Models with Add-on Capabilities

Enclosures	
-2000RC-RP	Remote Cabinet, remote powering
-2000RC-LP	Remote Cabinet, local powering
-2000MINI-ENC	2000 enclosure supporting 2 modules

Dual Band RF Modules, add-on ready	
2000-CELL-PCSE	- Dual Band Cell/PCS for cabinet
2000-IDEN-SMR	- Dual Band iDEN/SMR for cabinet Nextel
2000-CELL-DCSE	- Dual Band Cell/DCS for cabinet
2000-GSM-DCSE	- Dual band GSM/DCS for cabinet
2000-GSMO-DCSE	- Dual band GSM Orange/DCS for cabinet
2000-GSM-DCSE-I	- Dual Band Cell/DCS for cabinet Indonesia
2000-CELL-PCSE-I	- Dual Band Cell/PCS for cabinet Indonesia
2000-CELL-PCSE-L	- Dual Band Cell/PCS for Lite
2000-IDEN-SMR -L	- Dual Band iDEN/SMR for Lite Nextel
2000-CELL-DCS-L	- Dual Band Cell/DCS for Lite for Lite
2000-GSMO-DCSE-L	- Dual Band GSM/DCS for Lite
2000-GSM-DCSE-L	- Dual Band GSM Orange/DCS for Lite
2000-GSM-DCSE-IL	- Dual Band Cell/DCS for Lite Indonesia
2000-CELL-PCS-IL	- Dual Band Cell/PCS for Lite Indonesia

MobileAccess 1200 RHUs	
1200-PCS-AO-CB	- Add-on RHU - PCS service for cabinet
1200-UMTS-AO-CB	- Add-on RHU - UMTS service for cabinet
1200-PCS-AO-LT	- Add-on RHU - PCS service for Lite
1200-UMTS-AO-LT	- Add-on RHU - UMTS service for Lite

* NOTE: An accessory kit must be ordered for **each new** RU 2000, where the number of accessory kits are equal the number of RUs (i.e. three accessory kits for three RUs). If the RU is to be installed in a Cabinet, the AK-2000-CABINET accessory kit is required. If the RU is to be installed in a 2000 Lite model, the AK-2000-LITE accessory kit is required.

Table 1-4: MobileAccess™ 1200 Add-on Models

MA 1200 Add-on	
1200-PCS-AO	Add-on RU - PCS service
1200-UMTS-AO	Add-on RU - UMTS service
AK-1200-LITE*	Accessory kit for 1200 RU installed in 2000 Lite
AK-1200-CABINET*	Accessory kit for 1200 RU installed in 2000 Cabinet

* NOTE: An accessory kit must be ordered for **each new** 1200 Add-on, where the number of accessory kits are equal the number of Add-ons (i.e. two accessory kits for two Add-ons). If the 1200 Add-on is to be installed in a Cabinet, the AK-1200-CABINET accessory kit is required. If the 1200 Add-on is to be installed in a 2000 Lite model, the AK-1200-LITE accessory kit is required.

Table 1-5: MobileAccess™ Controller Models

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

Table 1-6: 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 1-7: MobileAccess™ RIU

MobileAccess Radio Interface Unit (RIU)	
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
RIU-BDAC-CELL	BDA Conditioner for Cellular
RIU-BDAC-IDEN	BDA Conditioner for iDEN
RIU-BDAC-PCS	BDA Conditioner for PCS
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-ESMR-SMR1	RIU Lite ESMR 800,SMR 900
RIU-L-CELL-PCS1	RIU Lite Cellular 800,PCS 1900

2

MA 2000 System Elements

This chapter provides a full, detailed description of each of the system elements and their individual connections. The element descriptions are organized in three sections:

- Head end - BTS/BDA Side Elements
- Remote Location Elements
- Setup and Management Elements

2.1 BTS/BDA Side Elements

The following MobileAccess 2000 system elements are installed on the BTS/BDA side:

NOTE These elements are common to both MA 1000 and MA 2000 systems.

- MA RIU – provides active interface and control of the RF signal sources
- Base Units – perform the RF to optical (and vice versa) on the BTS/BDA side

2.1.1 MA RIU

NOTE: This section provides a brief description of the RIU devices, and the front and rear panel connections for each device. For full, detailed descriptions, refer to the RIU Product Line Installation and Configuration Guide.

The RIU is a service specific device that provides interface between the BTS/BDA systems and the Base Units. The RIU enables controlling and monitoring the signals level to provide optimum site coverage. RIU setup and adjustment is performed through a point-to-point connection and the MCT application supplied with the controller.

BTS/BDA Side Elements

RIUs provide interface to each BTS/BDA through internally installed sub-modules corresponding to the RF signal source (BTS or BDA) and the service band. Two main types of sub-modules are available:

- **BTSC (BTS Conditioner) -** BTS service specific modules
- **BDAC (BDA Conditioner)** – BDA service specific modules

Two types of RIUs are available:

- **RIU Chassis**
- **RIU Lite**

2.1.1.1 MA RIU Chassis

MA RIU Chassis is a *scalable* device with the following main capabilities:

- Support for up to three BTS and BDA services in any combination
- Duplex and simplex BTS/BDA interface for each service
- Support for up to four 8-port BUs, where the number of BUs can be doubled using an Extension
- Front panel indicators per service module
- Setup and monitoring using MCT via a local RS232 or a dial-up connection
- Setup and monitoring using the MCT software application and connection to the host MA 410/430 controller
- 3U 19″ rack-mountable device with an integrated power supply.

Figure 2-1. RIU Chassis with Three Sub-modules

RIU Chassis Front Panel

The RIU front panel contains the indicators for each of the sub-modules (BTSC/BDAC) installed in the device and for the power supply. In addition, the front panel contains Expansion connectors for interface to additional BUs (if interface to more than four 8-port BUs is required).
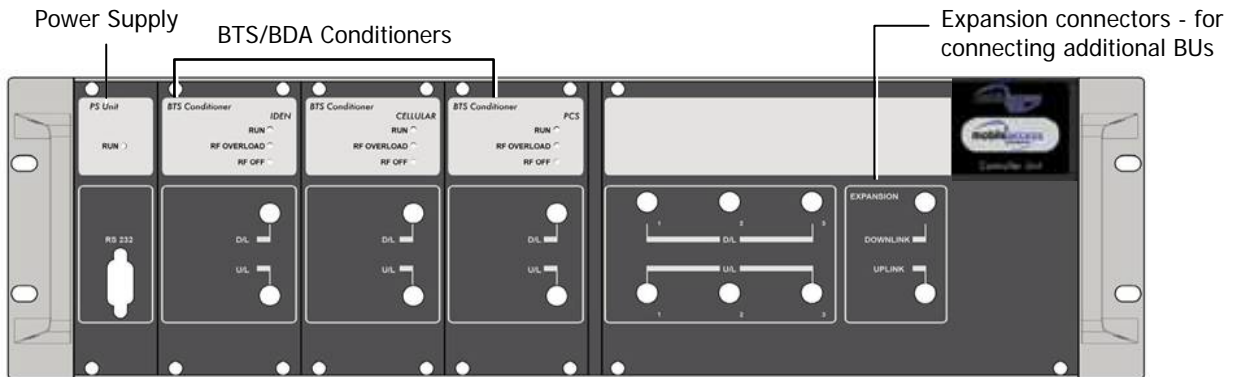
Figure 2-2. RIU Front Panel

Table 2-1. RIU Front Panel Indicators

LED	Description
P.S UNIT **PWR**	ON – input power is at the required level.
BTS CONDITIONER **RUN**	Flashing -- CPU is running and software loaded
BTS CONDITIONER **DL OVERLOAD**	Continuous Red – RF output towards BUs is disconnected to protect the system. This may be due to: o Unpredicted power rise for which the attenuation response was insufficient to compensate and reduce the power to the required level. o Software problem detected. Flashing: When the BTSC DL output power exceeds the calibrated value.
BTS CONDITIONER **DL LOW**	Continuous Red – if the RF outputs towards the BU is lower than the calibrated value. This condition also triggers an event.

RIU Rear Panel

The rear-panel contains connections to the BTS/BDA devices, BUs, Controller and Power.
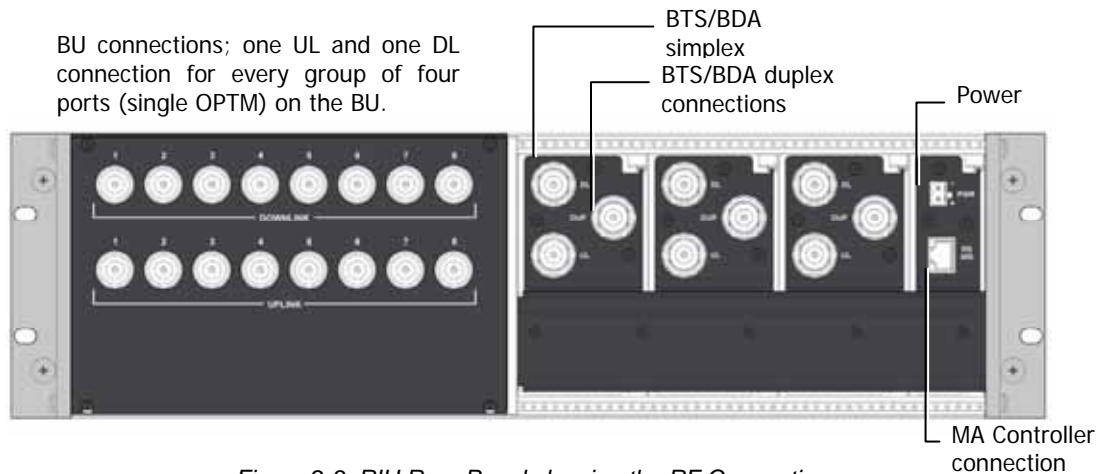
Figure 2-3. RIU Rear Panel showing the RF Connection

Table 2. RIU Rear Panel Connectors

Connector	Description
UL/DL and **DUPLEX**	BTS interface (via BTSC) - UL/DL and Duplex
	BDA interface (via BDAC) – Duplex interface only
BU UPLINK/DOWNLINK	BU UL/DL connections, where an 8-port BU consists of two modules and therefore would require two pairs UL and DL connections.
RS485	MA 410/430 controller connection. Connects to the controller rear panel RS485 connector (either port 1 or 5 on the controller).
PWR	DC power connection – 20 to 48 VDC

2.1.1.2   RIU Lite

Figure 2-4. RIU Lite – Support for Three Services

MA RIU Lite is factory defined with the required services. It provides the following main capabilities:

- Support for up to three BTS and BDA services in any combination
- Support for duplex and simplex BTS/BDA interface
- Support for up to four 8-port BUs, where the number of BUs can be doubled using an extension
- Front panel LEDs per BTSC/BDAC unit
- Setup and monitoring using the MCT software application and connection to the host MA 410/430 controller
- 3U 19″ rack-mountable device with an integrated power supply.

RIU Lite Front Panel

The RIU Lite front panel contains LED indicators for each service and an RS232 connection for MA service personnel.

NOTE: The RS232 service connector is for the use of MA Service Personnel.

Figure 2-5. RIU Lite Front Panel

Table 2-22. RIU Front Panel LEDs

LED	Description
PWR	ON – input power is within the required range
RUN	A set of LEDs is provided for each service supported by the RIU.
	Green Flashing – corresponding BDAC module is operational
DL Overload	Red – DL RF input is disconnected due to:
	Input power exceeding maximum allowed level
	Software setting
	Red Flashing: DL RF *output* exceeds the maximum allowed value.
DL Low Signal	DL power is under the minimum required level

RIU Lite Rear Panel

The RIU rear-panel contains the RF, control and power connections. The BDA side connections correspond to the number of installed modules. The following figure shows an example of an RIU model supporting two BDAs.

Figure 2. RIU Lite Rear Panel

Table 2. RIU Rear Panel Connectors

Connector	Description
CELLULAR/PCS DUP	Duplex connections to BDA services.
UPLINK/DOWNLINK	Base Unit connections. Each pair of UL/DL connections (i.e. Uplink 1 and Downlink 1) connects to the corresponding RF connections on a Base Unit module, where an 8-port BU consists of two modules and therefore would require two pairs of connections.
RS485	Connections to MA 410/430 controller rear panel RS485 connector (either port 1 or 5 on the controller)
PWR	DC power connection – 20 to 48 VDC

2.1.2   MA Base Unit

The BU (Base Unit) is a wideband device that performs RF to optical (and vice versa) conversion of the signal on the BTS/BDA side. The BU interfaces to the RIU (or to passive BTS/BDA interface) and the optic fiber.

Two models of MA BUs are available:

- Four-port unit – supports optic connections to four RUs
- Eight-port unit – supports optic connections to eight RUs

About OPTMs:

Each 4-port unit is referred to as OPTM. An 8-port unit consists of two 4-port modules or two OPTM, as they are referred to.

NOTE: Each 4-port module is referred to as **OPTM** and separately managed in the MCT and NMS management applications.

BU capabilities:

- Supports all services distributed by MobileAccess systems
- Fiber connection to up to 8 RUs
- Setup and monitoring through connection to the host MA 410/430 controller and MCT software application
- Dry contact alarms
- Front panel indicators providing status on optical link internal circuitry and signal level

MA BU Front Panel

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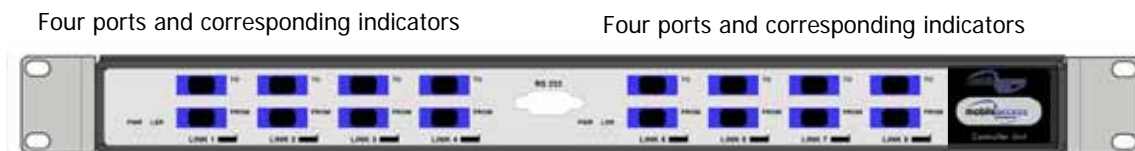
Four ports and corresponding indicators   Four ports and corresponding indicators

Figure 2-6. Eight-Port MA BU Front Panel

Figure 2-7. Four-Port BU Front Panel

Table 2-3. 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 required

BU Rear Panel

The BU rear panel contains the RF connections, Alarms, NMS and power connections.

NOTE: The following figure shows the rear panel of an 8-port BU. A 4-port BU contains a single UL and a single DL RF connector.
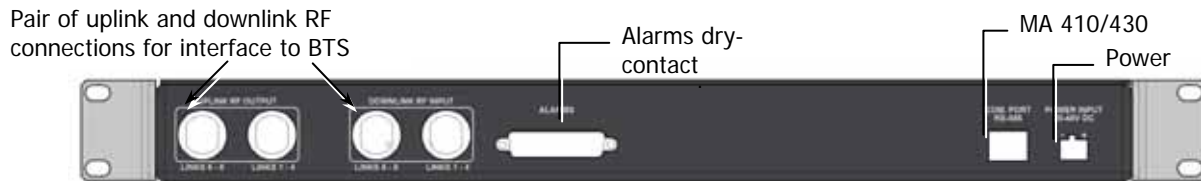
Figure 2-8. MA BU Rear Panel (RF Connections)

Table 2-4. MobileAccess 1000 Rear Panel Connections

Connector	Description
Uplink output	Uplink connectors to be connected on BTS/BDA side. For an 8-port BU, both UL connectors must be connected.
Downlink input	Downlink connectors to be connected on the BTS/BDA side. For an 8-port BU, both DL connectors must be connected.
Com Port RS485	Connection to MobileAccess 410/430 controller, rear panel RS485 port.
Alarms	Dry-contact connections to BTS/BDA (normally closed). Relevant only for system without MA 410/430 controllers.
PWR	Power connection: 20 to 48VDC

2.2   MA Remote Location Elements

Service specific units located at each remote location convert the RF signals to optics and route them to the coax antenna infrastructure. In addition, 802.11 data services may be added for distribution at each remote location. The units are either housed in, or externally connected to, a device or 'enclosure' that converges the data and voice services and provides the common interface to the antennas.

The following types of service specific elements are available:

- **Remote Units (RUs) –** support two voice services
- **MA 1200 Add-on** – used to add an additional (third) service to the RU.
- **MA 850** – converges data services from 802.11a/b/g APs

Two types of enclosures are available for the service specific elements at each remote location:

- **2000 Lite** – supports up to 8 non-conflicting services
- **2000 Cabinet –** supports up to 20 services from the same or different operators

NOTE: The voice services are converged by an **8x4 Combiner** unit that is installed in each enclosure.

2.2.1   RU 2000

RU 2000 is a service specific module that is either housed in the MA 2000 Cabinet or connected externally to the MA 2000 Lite.

It provides the following functions:

- Performs the optic to RF (and vice versa) conversion at the remote locations
- Supports two services – high-band and low-band
- Interfaces to the optic fiber from the BU
- Add-on ready – MA 1200 can be added to support an additional services
- Remote management - requires connection of host BU connection to a MA 410/430 controller

RU 2000 Front Panel

The RU 2000 front panel contains the fiber optic connections to the BU, four coax connections to the antennas, power connections and status indicators.
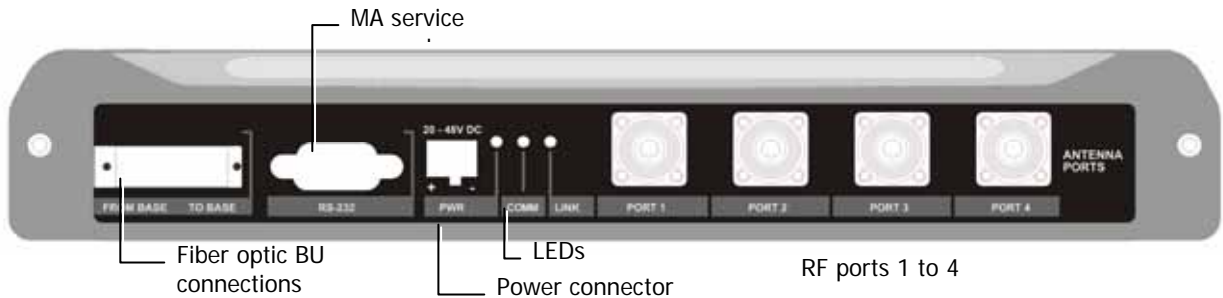
Figure 2-9. RU 2000 Front Panel

Table 2-5. RU 2000 Front Panel Indicators

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

RU 2000 Rear Panel

The RU 2000 rear-panel provides the control, RF interface and optic interface ports that enable connecting an MA 1200 add-on unit to the RU 2000 module.

Figure 2-10. RU 2000 Rear

Table 2-6. RU 2000 Rear Panel Connectors

Add-on control	Transmits the control signals from MA 1200 add-on module to the RU 2000 module. The **Add-on Control** port is connected to the MA 1200 add-on **From** port.
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.

2.2.2   MA 1200 Add-on

The MobileAccess 1200 Add-on module is used to provide support for an additional service to an MA 2000 RU. The host MA RU and the MA 1200 add-on are interconnected and either housed in a MA 2000 Cabinet or connected externally to a MA 2000 Lite 'enclosure'.

MA 1200 Add-on provides the following functions:

- Single service – either low-band or high-band
- Installed only as an addition to a MA 2000 RU

NOTE: The RU 2000 provides the interface to the optical, RF and control signals for both modules. In addition, the RU 2000 performs the optical to RF (and vice versa) conversion for both modules.

MA 1200 Front Panel

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

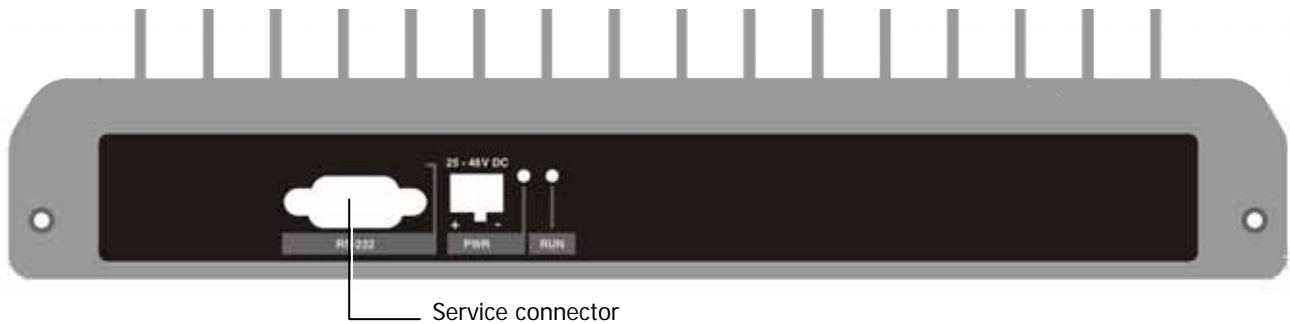Service connector

Figure 2-11. RU 1200 Front panels

Table 2-7. MobileAccess 1200 Front Panel Indicators

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

MA 1200 Rear Panel

The RU 1200 rear panel contains the control connectors and the RF connections to the RU 2000 and MA 850.
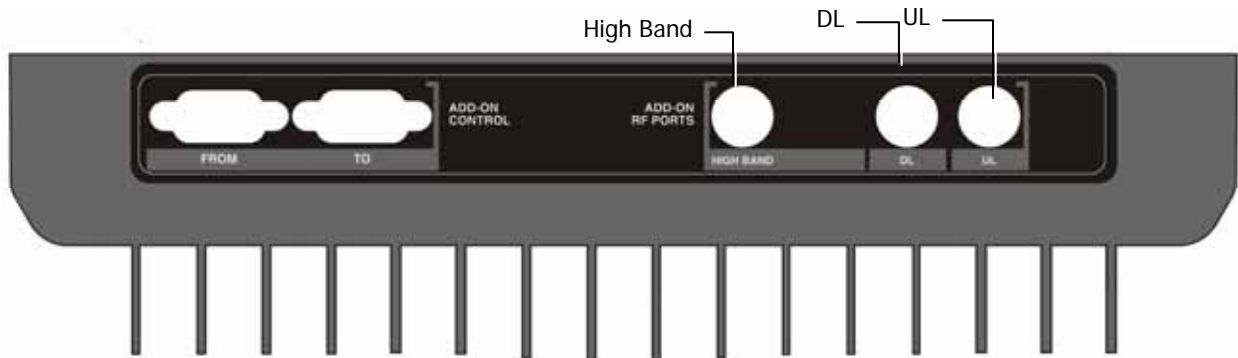
Figure 2-12. RU 1200 Rear Panel

Table 2-8. RU 1200 Rear Panel Connectors

Add-on Control	Transmits the control signals between the MA 1200 module and the MA 850 and RU 2000 modules.
	From – receives control signals from the RU 2000. Connected to the RU 2000 **Add-on Control** connector.
	To – feeds control signals to MA 850 (in configurations that include MA 850)
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 2000 rear panel: DL to DL, UL to UL.
High	Service RF output port. Connected to combiner/splitter to be combined with other services supported by the MA 2000 system.

2.2.3   MA-850 Module

Note: This section provides a brief description of the MA 850 module. For a full description of the module, refer to the MA 850 Installation and Configuration Guide

Figure 2-13. MA 850 Module

MobileAccess 850 provides a *secure* and *centralized* connection for 802.11a/b/g Access Points. It significantly expands 802.11a/b/g coverage and enables distributing data and voice services over the same coax and antenna infrastructure used by MA 2000 system.

MA 850 is installed externally to the MA 2000 Cabinet and the MA 2000 Lite 'enclosure'.

MA 850 provides the following functions:

- Converges services from 802.11a/b/g APs
- Connects to the antenna ports of the MA 2000 Cabinet/Lite and interfaces to the antenna infrastructure
- Local management through an RS232 connection and the MA 850 Management application
- Remote management monitoring through an Ethernet connection

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

MA 850 Front Panel

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

The following figure shows the MA 850 front panel.

Figure 2-14. MobileAccess 850 Front View

Table 2-9. MA 850 Front Panel Connections

Front Panel	Description
Mobile Services	Four SMA female connections to which the antenna port of the MA 2000 system are connected.
	To be terminated with 50 ohm terminations when not in use
Antenna Ports	Four n-type female antenna connections
Local	Local connection for setup
DC	Power connection: 20V to 48V from a standard power supply

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 2-15. MobileAccess 850 Rear View

Table 2-10. MA 850 Rear Panel Connections

Rear Panel	Description
802.11b,g APs	Connection to up to four 802.11**b/g** APs, where associated LED Lite under the following conditions: o Green: indicates where AP should be connected after configuration o Green flickering: Link with AP established but no data is received o Red: AP transmitting data
802.11a APs	Connection to up to four 802.11**a** APs
Connection to control	Connection to MA 2000 Chassis/Lite RS232 front panel antenna sensor.
Ethernet port	Connection to network for Web configuration

2.2.4   MA 2000 Remote Cabinet

Figure 2-16. RC 2000 Closed Cabinet View

The MA 2000 Remote Cabinet provides support for up to 20 **multi-operator** services through a single coax antenna infrastructure.

MA 2000 Cabinet provides the following functions:

- Compactly houses up to a total of five RU 2000 and MA 1200 modules and the required filters

---
NOTE: The number of modules depends on the models, required filtering, etc.

- MA 850 can be connected externally
- Converges all voice services and provides a single interface to the antennas through external connections
- Wall mounted or rack mounted
- Two MA 2000 Remote cabinet models:
  - Integrated power supply – fed from an external AC power source. The RU 2000 an MA 1200 Add-on modules are internally connected to the power supply. This model includes a battery connection as well.
  - External power supplies – power is routed to external connectors from which power is routed internally to each RU 2000 and MA 1200 Add-on module.

Open door views

The following figure shows an open RC 2000 cabinet, integrated power supply model, with four RU 2000 modules and four filters. (For clarity, the internal connections are not included).
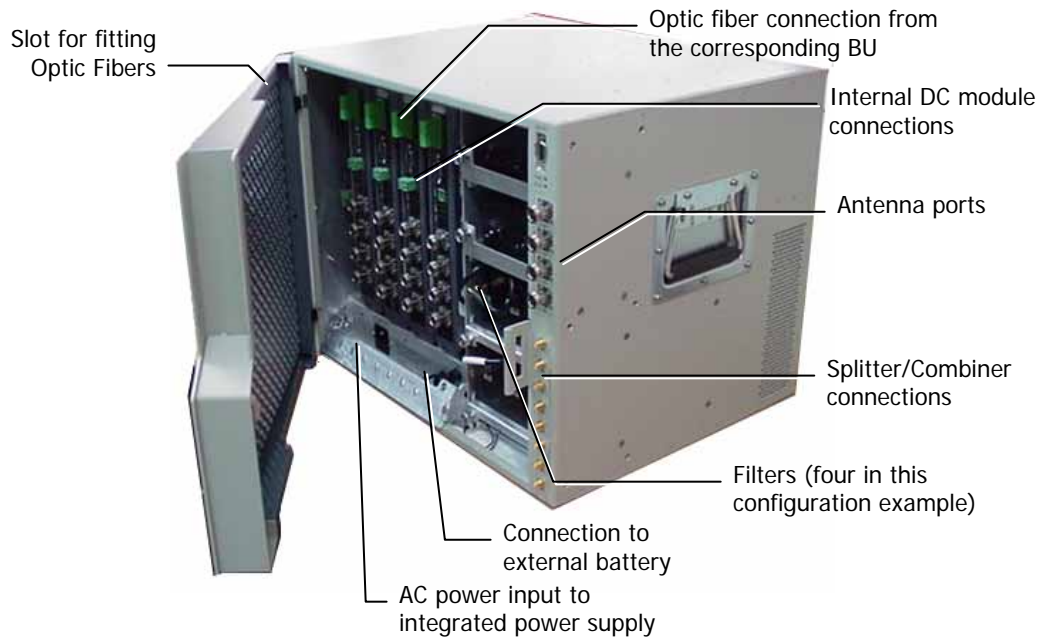
Figure 2-17. RC 2000 Open Cabinet View (without internal connections)

The following image shows the MA 2000 RC with the cabling. The antenna ports of the individual modules are connected to the internal RF connections and to the relevant filters. The PS connections of each module are also connected to cables that are internally routed to the integrated PS.

NOTE: The fiber optic connections are not displayed.

Figure 2-18. RC Open Cabinet with Internal Cabling

2.2.5   MA 2000 2000 Lite

Figure 2-19. 2000 Lite System

The 2000 Lite is designed to support up to 8 voice services, in addition to 802.11 data services.

MA 2000 Lite capabilities:

- External connections to two MA 2000 RUs (to which MA 1200 Add-on units can be added)
- Filters and combiner (converges all services) are installed in the enclosure
- Connection to MA 850 for support of 802.11a/b/g data services
- External power supplies

2.2.6   8 x 4 Combiner

NOTE: This unit is internal to the MA 2000 system – both Cabinet and Lite models.

This unit is installed in the MA 2000 system Cabinet and MA 2000 Lite and Lite enclosures. The 8x4 Combiner unit combines the antenna interface ports the RUs and provides a common interface to the coax antenna infrastructure.

The 8x4 Combiner provides the following capabilities:

- Supports up to eight inputs: four high-band and four low-band

- Provides low RF loss and high isolation for the input devices

- Antenna interface ports are located externally on the MA 2000 Cabinet and MA 2000 Lite.

The front panel of the unit contains the four antenna interface ports, LEDs and control port.
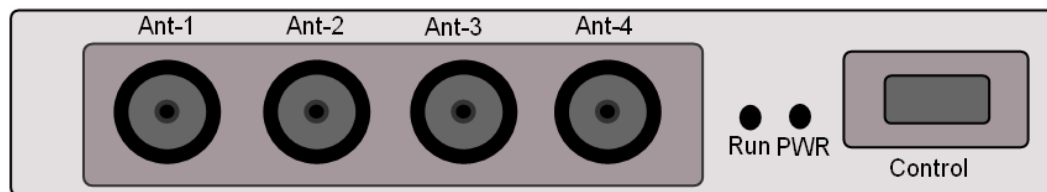
Figure 2-20. 8x4 Combiner Front Panel

The following table describes the front panel connectors.

Connector	Description
Ant-1 to Ant-4 (N-type)	Coax connections to corresponding antennas
Control	Relevant to Future Option

The following table describes the front panel LEDs.

Connector	Description
Run	Relevant to Future Option
Power	Relevant to Future Option

MA 2000 Remote Management Elements

The rear panel of the unit contains four low-band and four high-band ports as well as the control port.

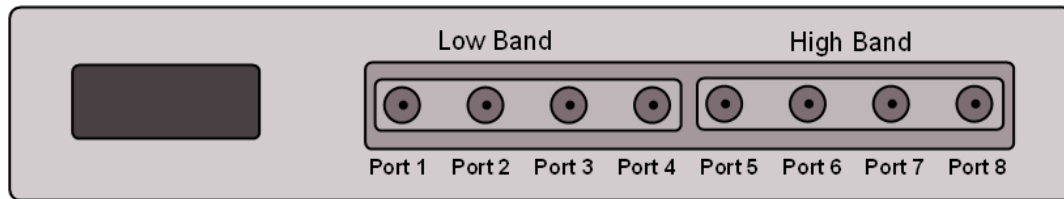*Figure 2-21. 8x4 Combiner Rear Panel*

The following table describes the rear panel connectors.

NOTE: Connector on rear panel is for future option.

SMA Connectors	Description
Low Band	Four connectors for the **low-band** outputs of the corresponding remote unit. Refer to *Chapter 6* for the exact connections relevant to each configuration.
High Band	Four connectors for the **high-band** outputs of the corresponding remote unit. Refer to *Chapter 6* for the exact connections relevant to each configuration.
Control	Interfaces to the Digital card (that enables antenna monitoring)

2.3   MA 2000 Remote Management Elements

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

The system elements can then be monitored via a connection to the host controller. The type of connection and monitoring depends on the type of controllers that are installed, the configuration and the available management applications:

- **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.

    NOTE: 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.

- **MA NMS 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 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.

NOTE: The **MobileAccess Manager** application is not supplied with the controller – it is **purchased separately.**

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

2.3.1   MA 410/430 Controller

MobileAccess provides two controller models: MA 410 and MA 430. The controllers enable monitoring all directly connected devices, such as BUs and RIUs, as well as all the RUs and antennas corresponding to each BU. In addition, MA 410 and 430 controllers may be interconnected in a Slave/Master configuration that can be monitored through a single connection. MA 410/430 controllers differ in the type of connections they support.

The controllers provide the following functions:

- Interface to up to eight BUs, where two of the BU ports can be used for connecting RIUs (six BUs and two RIUs)

- Front panel LCD display – provide status information on local and remote connections

- Auxiliary alarms – for connections to external devices

- Dry-contact alarms – for connections to BTS/BDA

- MA 410 – monitoring through RS232 and dial-up connection

- MA 430 – monitoring through SNMP (Simple Network Management Protocol) over TCP/IP connection (as well as RS232 and dial-up)

- Master/Slave connection for monitoring multi-controllers through a single connection - MA 410 controllers connected to MA 430 controllers as slaves

2.3.1.1   MA 410/430 Controller Front Panel

This section describes the front panels of MA 410 an MA 430 controllers. Note that the only difference is in the connection type; all indicators (LED and LCD display) are the same.
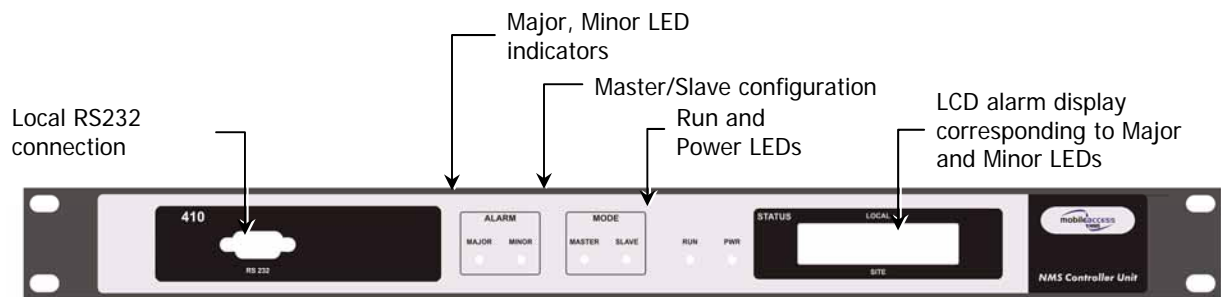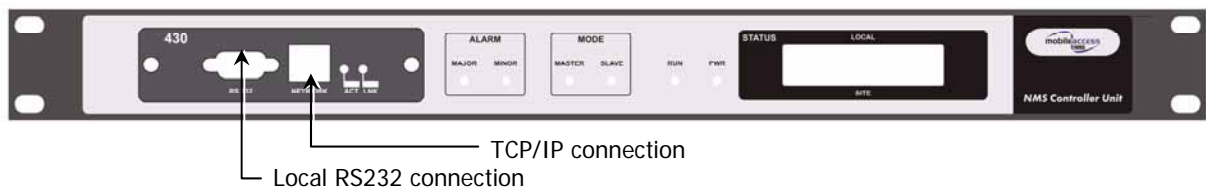

Figure 2-22. MobileAccess 410 Front Panel

Figure 2-23. MobileAccess 430 Front Panel

Table 2. MA 410/430 Front Panel Connectors

Connector	Description
RS232 Connector	Used for setup and RS232 monitoring.
	For MA 430 front panel, this connector is used for setting up the network parameters (IP Address, community names, etc.).
Network	MA 430 only - Ethernet TCP/IP connection to network.

Table 2. MA 410/430 LED Indicators

LED	Description
Network connection.	For MA 430 only
	Active LED – Blinks during TCP/IP communication.
	Link LED - ON as long as a TCP/IP network connection exists.
PWR	ON green - indicates correct power level
Run	ON green - flickers continuously indicating the controller is initialized and running.
Mode	Controller Master or Slave mode.
	Master green – lit if the controller is installed as a 'stand-alone' or is configured as a Master.
	Slave green – lit if the controller is configured as a Slave.
Failure	Indicates whether the alarm is 'Major' or 'Minor' type of alarms:
	Minor red – indicates a single faulty RHU in a building with more than one RHU
	Major red – indicates faulty RHU in a single RHU site, more than one faulty RHU in a site with multiple RHUs, fault on any of the auxiliary inputs, or other faults.

2.3.1.2   MA 410/430 Controller Rear Panel

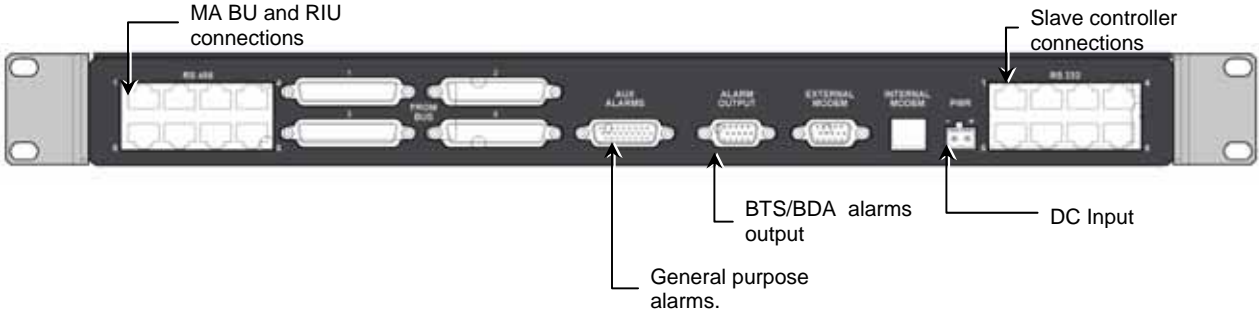**Note:** The rear panels for the MobileAccess 410 and MobileAccess 430 are the same.

Figure 2-24. MobileAccess 410/430 Rear Panel

Table 2. MA 410/430 Rear Panel Connectors

Connector	Description
RS485	MobileAccess Base Units and RIU connections. **NMS-RJ45** cables. Connection limitations: o Up to eight MA BUs on any of the ports o Up to two RIUs connected only to ports 1 and 5
From BU	Four Legacy BU connections using **NMS-BU/DB25** cables.
RS232	MA 430 only. Eight connections to Slave controllers.
Auxiliary Alarms	Eight inputs for alarms from auxiliary devices
Alarm Output	BTS/repeater dry-contact alarms. **NMS-BTS/DB15-open** cables.
External Modem	**Future option.** Connection to an external wireless or dial-up modem.
Internal Modem	Used for dial-up connection to the controller – MCT setup and monitoring
PWR	DC power input: 20 to 48VDC, 0.5A max

2.3.2   MCT

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.

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. Installation Requirements

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

- 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 RUs in the remote communication rooms

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

3.3.4   Coax Cable Lengths and Losses

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

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

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

3.4   Power Consumption, Connections and Power Supplies

3.4.1   Power Safety Instructions

⚠️ **SAFETY WARNINGS**

- When installing or selecting the power supplies:

- Be sure to disconnect all power sources before servicing.

- 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

- **Battery replacement in units -** only the MA 410/430 controller has batteries. These should be replaced (when necessary) only by MA Service Personnel.

- 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
2000 Remote Cabinet	20 to 48VDC	25W	1.25A
2000 Lite	20 to 48VDC	4W	0.2A
RU 2000	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

3.4.3   Circuit Breakers

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

Power Consumption, Connections and Power Supplies

- 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.

Table 3-2: MobileAccess™ Power Supplies

Power Supply	
LPS-48V-66W	Local AC/DC Converter 40W
LPS-48V-100W	Local AC/DC Converter 100W
RPS-200-N-48	Non-redundant 200W 110/220V Wall Mount. *Not to be used in North America*
RPS-500-R-48	Redundant 500W 110/220V Chassis Mount. *Not to be used in North America.*
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. *Not to be used in North America*
RPS-600W-220	Remote power supply module 600W/48VDC,220V in *Not to be used in North America*
RPS-1200W-220	Remote power supply module 1200W/48VDC,220V in *Not to be used in North America*

3.5   Installation Conventions

Some of the basic installation conventions are listed below for the MA 2000 system:

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

- **Remote Cabinet (or 2000 Lite)** – usually placed in the communication shaft or closet of a corresponding floor so they can be easily located. Each cabinet (or 2000 Lite) can typically cover a floor of up to 30,000 sq ft.

- **Fiber optic cable** - bundled fibers are terminated into the Base Units in the main communication room. The fibers are then routed to each coverage locations where individual fibers terminate into splice boxes. The splice box couples the installed fiber into the remote units. Enough spare fibers should be installed to take into account future expansion of the system.

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

The following figure illustrates fiber optic routing to Remote Cabinets.
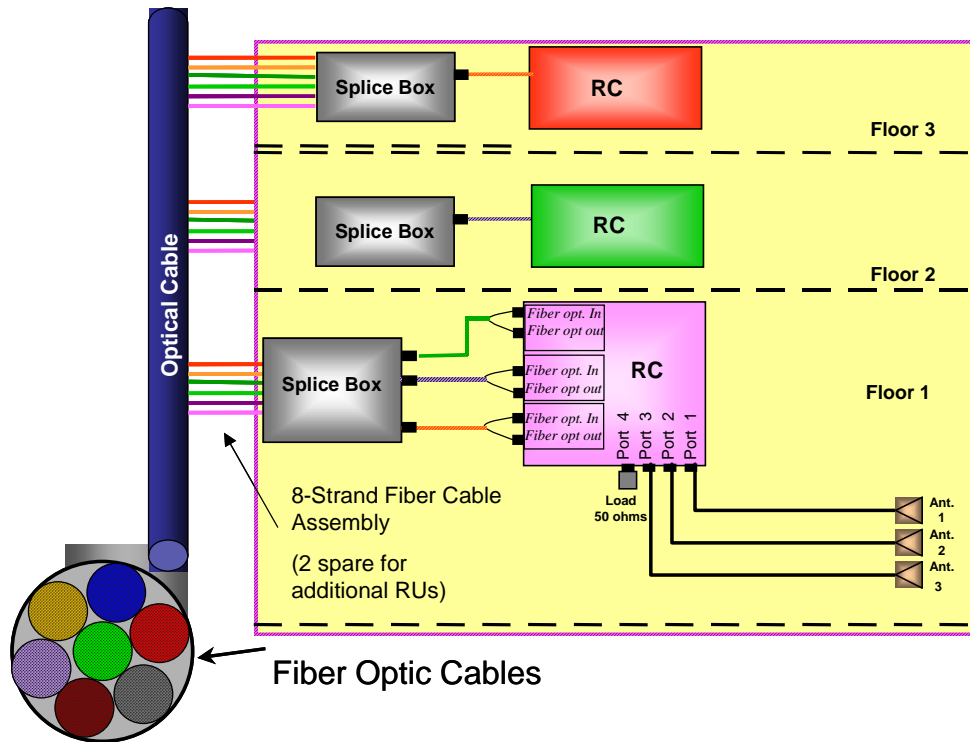

Figure 3-1. Illustration of Fiber Optic Routing

- **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 Remote Cabinet or 2000 Lite system using coax cables.

4

System Installation

This chapter describes how the communication room and cabinet are installed. The individual system elements and connections are described in the Chapter 2.

NOTE: Be sure to read the installation requirements (see 3.2) and Power Consumption related instructions (see 3.3.4) before proceeding with the actual connections.

4.1   Pre-installation Instructions

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** – two types of installations:

- MA 2000 Lite
- RC Cabinet

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).

4.1.1   Unpacking and Inspection

This section provides instructions for opening the shipping boxes, verifying that all parts have been received, and verifying that no shipping damage has occurred.

Unpack and inspect the cartons according to the following procedure

1. Open the shipping carton and carefully unpack each unit from the protective packing material.

2. Check for signs of external damage. If there is any damage, call your MobileAccess service representative.

4.2   Communication Room Installation

The Communication Room installation consists of the following basic steps:

1. Unpacking and inspecting the MA 2000 units (see 4.1.1)

2. Mounting the RIUs, BUs and 410/430 controllers in the mounting rack (see 4.2)

3   RF connections BTS/BDA connections.

4. RF connections to the Base Units.

5. Connecting the MA 410/430 control connections to the units

6. Connecting DC power to the units

4.2.1   Rack Installation General Instructions

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 Chassis 3U, RIU Lite 2U

- 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.

Figure 4-1 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 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.

The following figure shows a typical installation for a two field design.
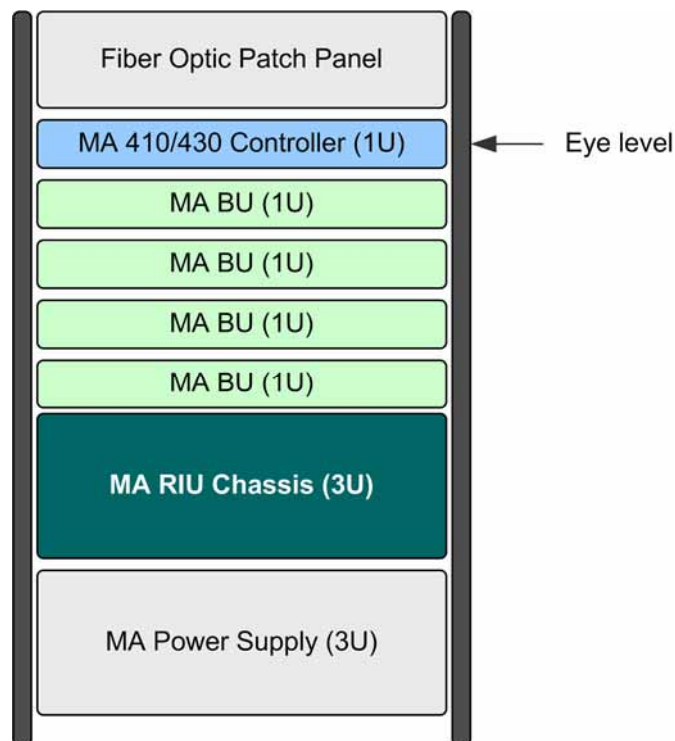
Figure 4-1: Recommended Order in the Communication Room Rack

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 RIU (Chassis) Connections

4.2.3.1 RIU Connections

1. RIU to BU connections: connect each **BU** to the corresponding RF **Uplink** and **Downlink** connectors on the **RIU** *rear panel*. For connections to more than four 8-port BUs, refer to section 4.2.3.2.

   > **NOTE:** Each pair of *uplink* and *one downlink* RIU rear-panel ports are used to connect one *OPTM*. See section 2.1.2. Two pairs are used to connect an 8-port BU (two OPTMs)
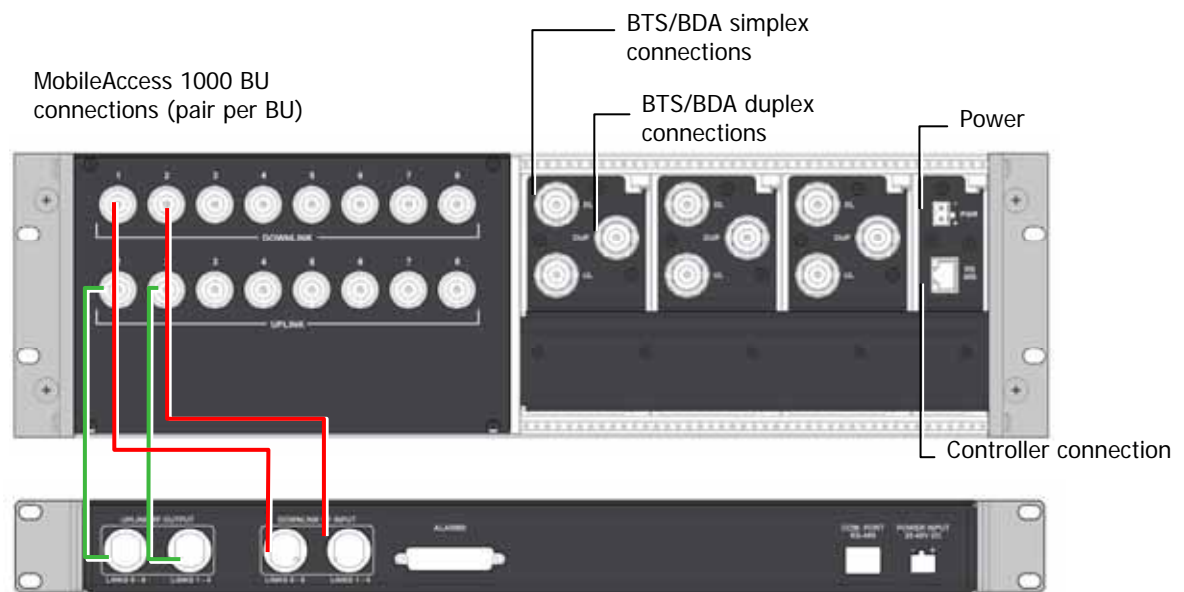

Figure 4-2. RIU Rear Panel showing the RF Connection

> **NOTE:** Up to four 8-port BU may be connected. Additional BUs may be connected through the **Extension** connector on the front panel. Refer to **Connecting to Additional BUs**, page 44.

2. BTS/BDA connections: Connect each BTS/BDA to the corresponding rear panel **BTSC/BDAC)** connectors (BTSC and BDAC are service specific).

   Both simplex and duplex connections are available for each connection:

   • For a duplex connection, connect to the BTSC **DUP** port;

   • For a simplex connection, connect to the BTSC **UL** and **DL** ports;

3. MA 410/430 controller connection: connect the **RS485** port on the RIU rear panel to the MA 410/430 rear panel RS232 connector: port-1 or port-5.

4. Connect the **Power** connections to the RIU rear panel **PWR** port.

4.2.3.2   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.
- Connect an 8W combiner to the **Uplink** connector on the RIU front panel.
- Connect additional BUs to the uplink and downlink connections.
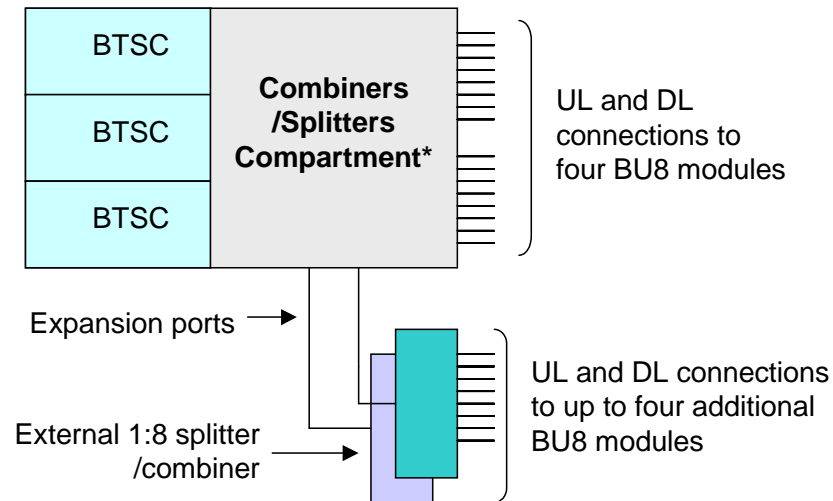
4.2.4   BU Connections

> **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 fiber jumper between **splice tray** and **patch panel** cabinet.

2. Connect fiber jumpers between the corresponding **BU** optical ports and the **patch panel**.

Figure 4-3. BU Front Panel Connections

3. Connect the BU rear panel **Uplink** and **Downlink** ports to the corresponding ports on the RIU rear panel.

The following figure shows the BU connections to an RIU Chassis and MA 410/430 controller.
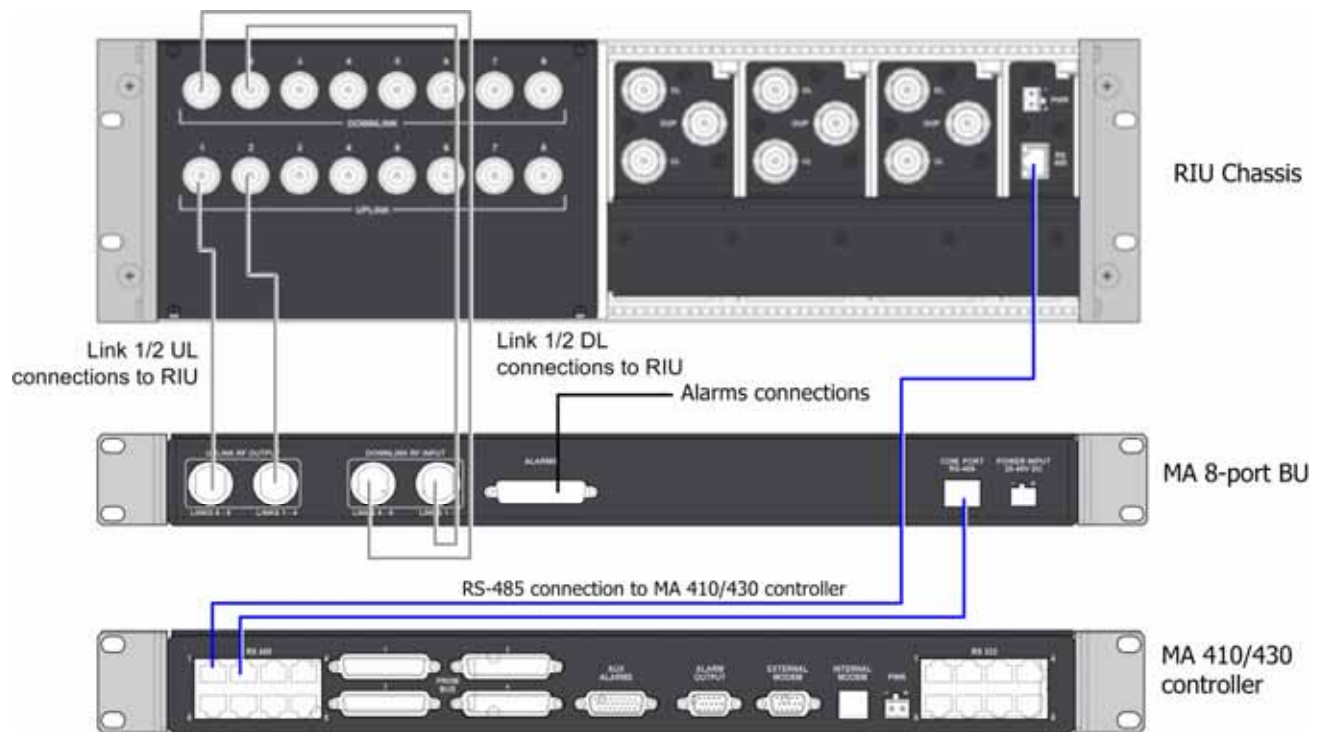
Figure 4-4. BU Rear Panel Connections

4. Connect the BU rear panel **COM** to the MA 430 rear panel RS485 connector.

5. Connect the **Power** connection on the BU rear panel.

4.2.5   BU and RIU Lite Connections

1. Connect the BU to the corresponding RF Uplink and Downlink connectors on the RIU Lite rear panel. Note that one uplink and one downlink RIU rear-panel ports are used to connect one OPTM (four ports from the BU).

NOTE: Only a single four 4-port BU may be connected.

---

2. Connect each BDA to the corresponding rear panel Duplex connectors.

3. Connect the **Power** connections on the RIU rear panel.

4. If your system includes a MA 410/430 controller, connect the **RS485** port on the RIU rear panel to the controller rear panel RS485 ports (either Port-1 or Port-5).
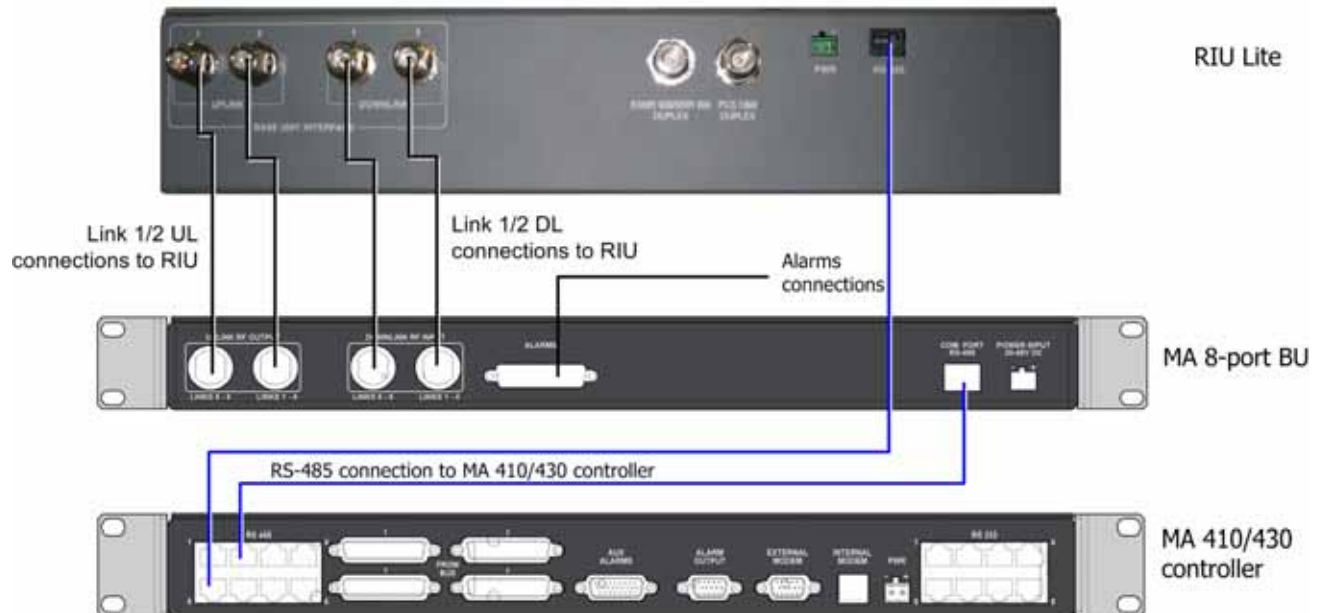
Figure 4. MobileAccess RIU Lite-Controller connection

4.3   Remote Cabinet Installation

Mount and install the Remote Cabinet (RC) in one of the following configurations:

- Wallmount - on the wall in the communication room
- Rackmount – in a 19″ rack in the *communication room* allocated to that area (sometimes referred to as a **secondary** communication room).

The procedure varies slightly according to the MA 2000 Cabinet mocel:

- Integrate power supply
- External power supply

The following sections describe both procedures.

NOTE: For installations that include MA 850 units, refer to the MA 850 Installation and Configuration Guide for instructions on various installation options with the MA 2000.

4.3.1   RC 2000 Wall Mount Installation

General Installation Instructions

- The MA 2000 Remote Cabinet units should be installed in a communication room that provides access to authorized personnel only. The units are maintenance free. In the event of failure, only authorized personnel should handle the units.

- Environmental Data - Maximum ambient operating temperature: 45° C

      Maximum ambient temperature in a rack: 45° C

Remote Cabinet Installation

The wall installation 2000 Remote Cabinet is supplied with a plate that is to be mounted on the wall and a bracket that is assembled on the rear of the MA 2000 system.
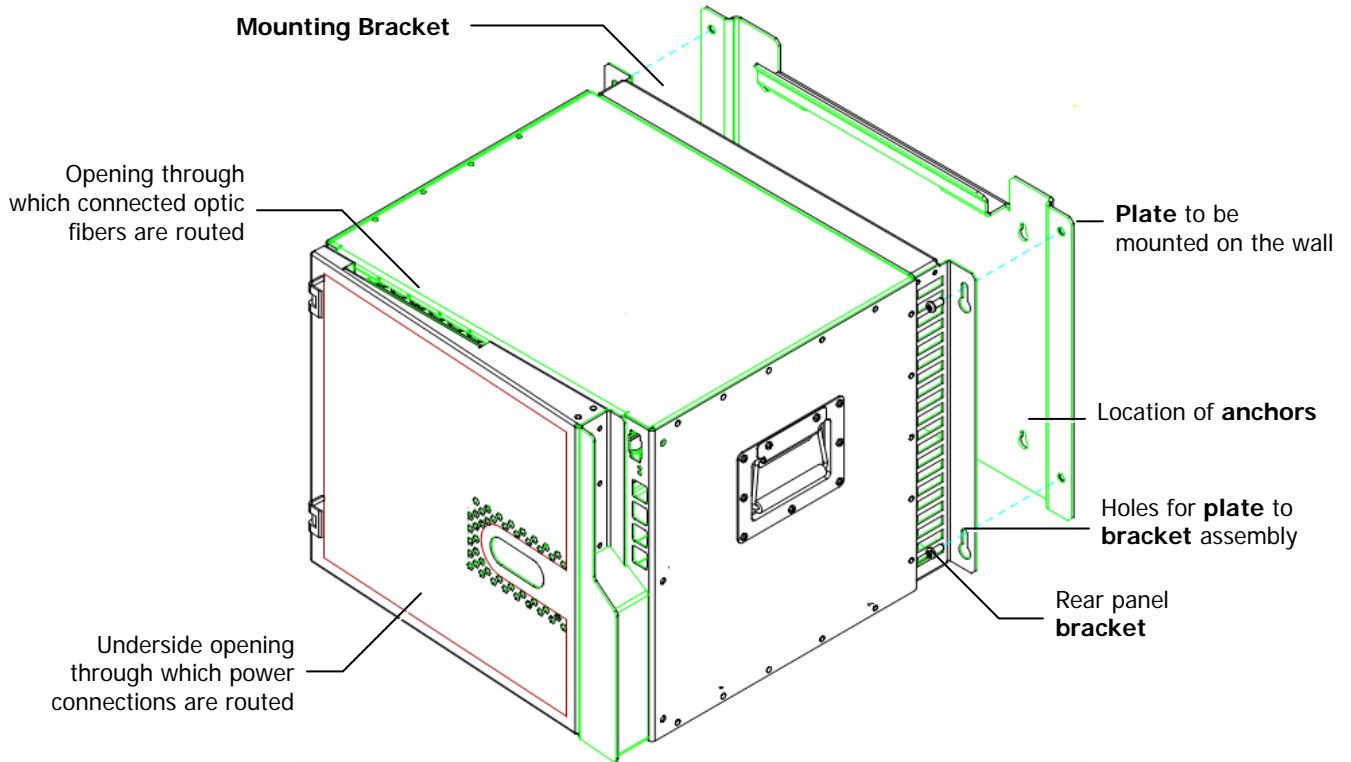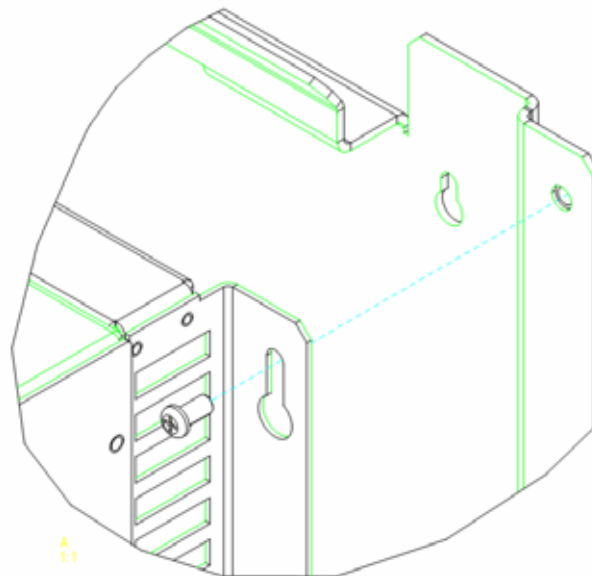

Figure 4-5. MA 2000 System Wall Mount

Figure 4-6. Zoom of Mounting Holes

Mount the RC on the wall as follows:

> **ATTENTION: The following instructions apply to an installation on a concrete wall. For any other type of wall, contact MobileAccess.**

NOTE: For installations that include an MA 850 system, refer to the **MobileAccess 850 Installation and Configuration Guide**.

1. For **integrated power supply** configurations only (for other configuration grounding is optional), connect the cabinet GND according to section 4.3.2.

2. Using the **plate** as a guide, drill four holes for concrete anchors. Insert four concrete anchors (McMaster-Carr catalogue number 92403A200, or equivalent).

3. Mount the **Plate** on the wall. Carefully and thoroughly fasten the anchors to the wall.

4. Assemble the **Bracket** onto the rear of the Remote Cabinet using the supplied screws.

5. Lift the MA 2000 RC and guide the rear ledge of the assembled bracket onto the **plate bracket**.

6. Using the four screws, secure the RC **Bracket** to the **Plate** on the wall.

NOTE: Tighten the screws only as much as needed to secure the Bracket to the Plate. One should be able to loosen the screws quickly if needed.

4.3.2   RC Grounding - Integrated PS Wall Mount Model

NOTE: This procedure is only necessary for wall mount integrated power supply configuration (for other configurations this procedure is optional).

The Ground screw is located at the rear of the unit.

Figure 4-7: Grounding Located at the Rear of the Unit

SIDE VIEW
GND STANDOFF

WING NUT
TERMINAL LUG   TOOTH WASHER
GND WIRE   FLAT WASHER
16 AWG

HOUSING WALL
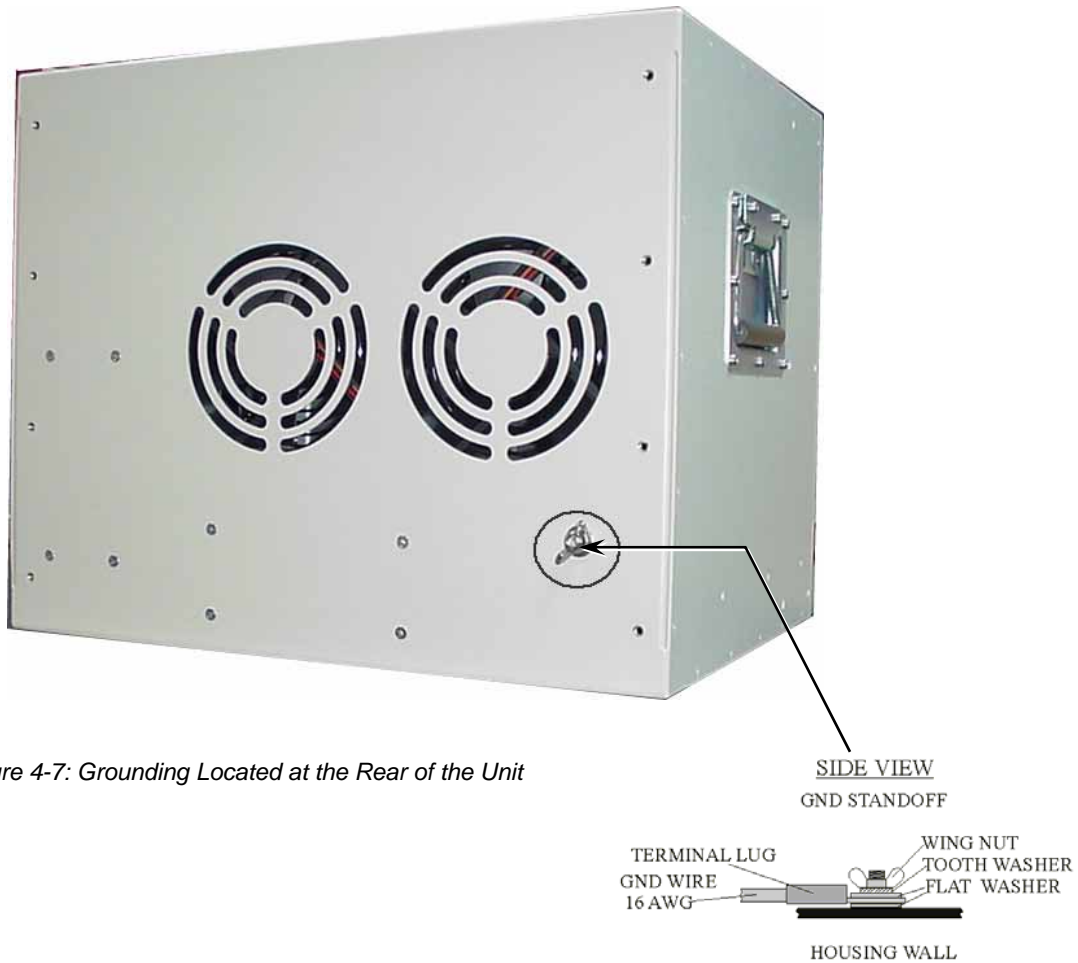
4.3.3   RC 2000 Rack Mount Installation

NOTE: The cabinet requires a clearance of 10 cm above the unit. If a heating source is installed beneath the MRC, a buffer must be placed between the cabinet and the surface.

The MA 2000 RC Rack Mount model is supplied with the required brackets already assembled to the sides of the cabinet as illustrated in the following figure.

Simply, mount the MA 2000 RC in the rack and secure with the supplied screws.

Rack brackets
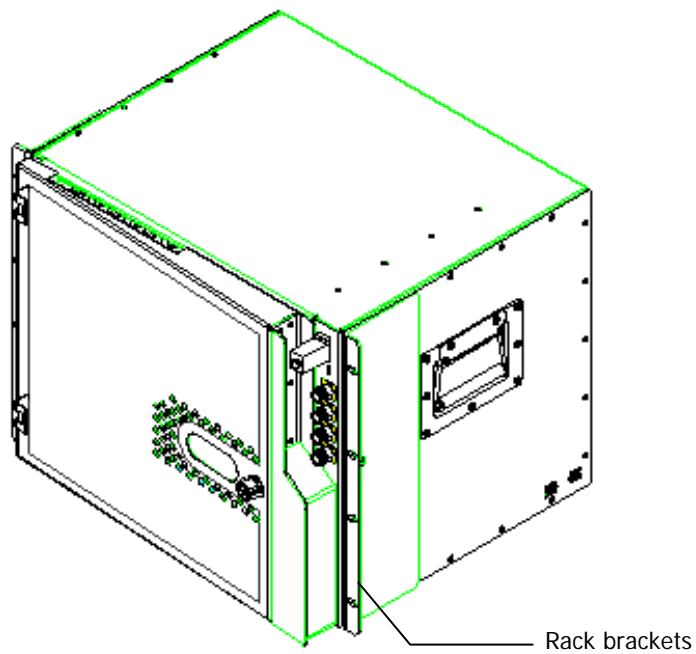
Figure 4-8 . MA 2000 RC Rack Model

4.3.4   Fiber Optic 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. Install splice box near Remote Cabinet.

2. Connect fiber optic cable to splice box and the SC/APC pigtails to each RU 2000 module.

3. For the downlink, connect the fiber optic cable pigtails from splice box coming from the BU port to the corresponding RU port (routing the optic fibers so they will fit through the top opening in the door.)

4. For the uplink, connect the fiber optic cable pigtails from splice box from the RU (routing the optic fibers so they will fit through the top opening in the door), to the uplink port that connects to the BU.

The internal power connections and other connections should already be connected.
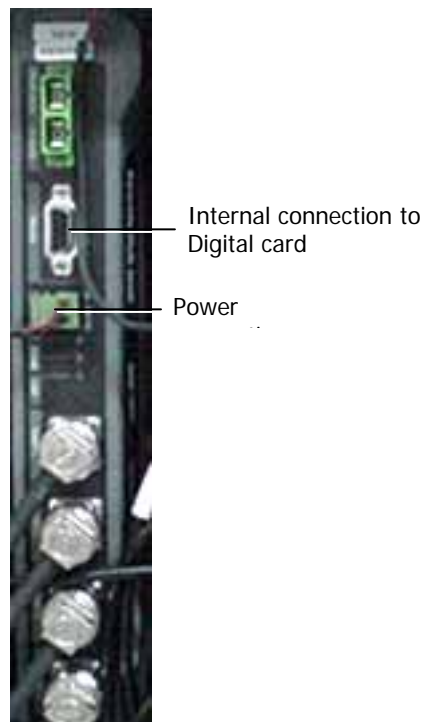
Figure 4-9. RU 2000 Fiber Optic and internal power connections

4.3.5   Power Connections

The power connections vary depending on whether the configuration is for an integrated power supply or for external power supplies.

4.3.5.1   Integrated Power Supply model

- Connect the AC power connector to the connector on the internal plate as illustrated below. The power source may be: 230 VAC, 115 VAC (an AC/DC converter is built into the chassis).

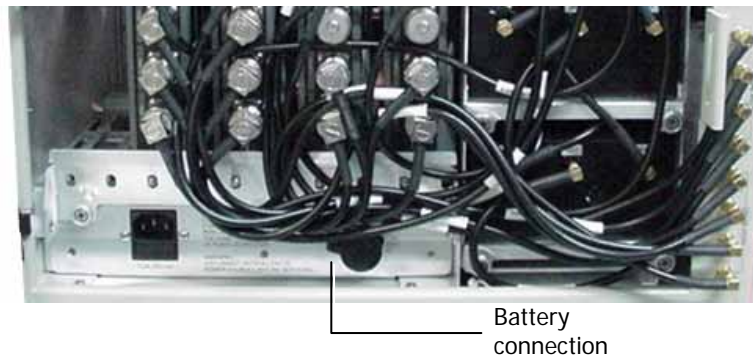- You may also connect a **backup battery of 48V** to the battery connector. This is an optional connection.

Battery
connection

Figure 4-10. Partial View of system illustrating location of power connections

4.3.5.2   External Power Supplies Model

The external power source may be a central source with cables routed to each RU, or RU dedicated power supplies locally installed.

- PS = 24 VDC to 48 VDC.

- Connect each power connection to the appropriate connector on the remote cabinet.

4.3.6   Antenna Connections

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

- For systems with MA 850 modules - refer to *MA 850 Installation Manual.*

4.4   2000 Lite Installation and Connections

MA 2000 is designed as a wall-mount installation – usually located in the communication shaft of the corresponding floor. The remote units are mounted externally to the 2000 Lite device and their antenna outputs are connected to either side of the 2000 Lite device. The combined outputs are then connected to the antennas in the covered area.

The following figure illustrates MA 2000 connections to two RUs.

Figure 4-11. 2000 Lite System coax connections

4.4.1   Mounting MA 2000 Lite

In order to mount MA 2000 Lite on the wall, the cover is first removed, the tray and all installed elements are secured to the wall and the top cover assembled again.

1. Remove the top cover by pulling it towards the rear bracket and lifting it over the front brackets. The tray and all its assembled components is displayed. The installed filters vary depending on the RU models in the installation.
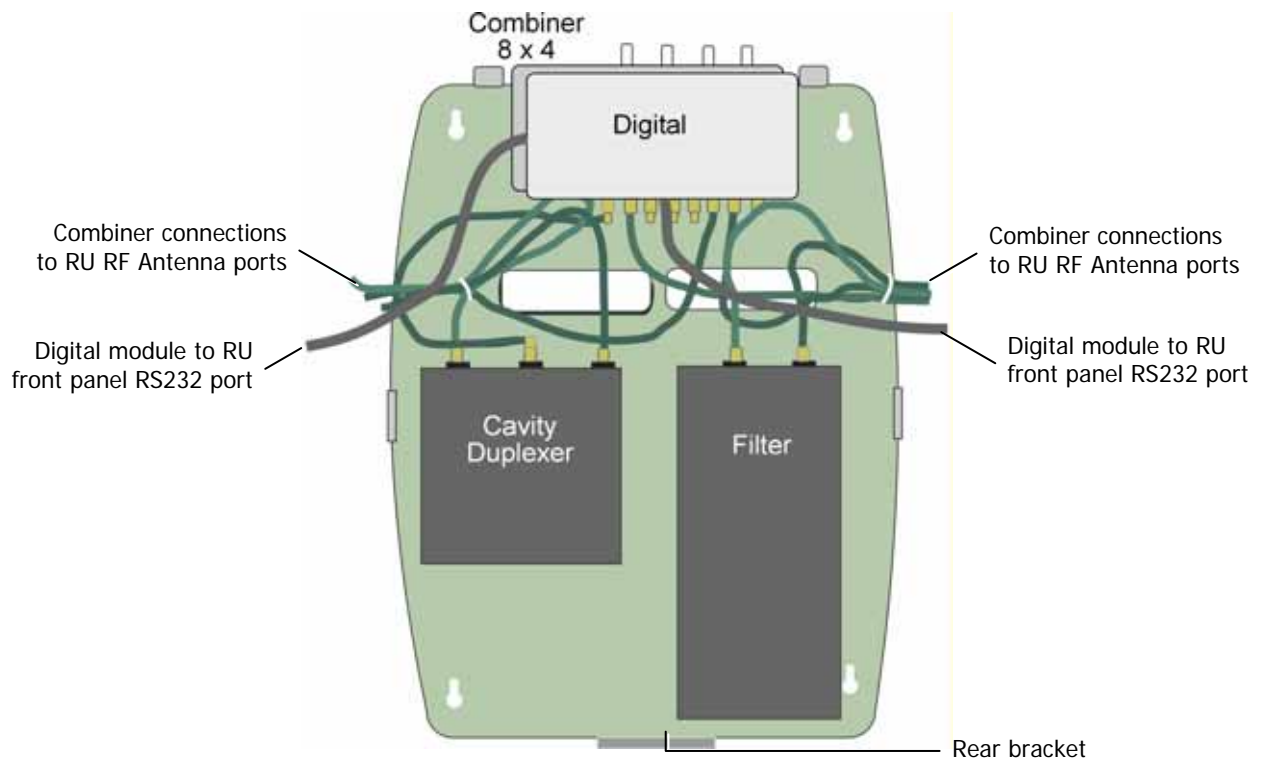
Figure 4-12. MA 2000 Lite Prepared for Mounting

2. Depending on the tools you use:

   - Either measure the distance between the four wall mount holes and drill the required holes in the wall and insert the screws, or

   - Hold the tray up against the wall and simply drill the screws in the holes.

3. Re-assemble the 2000 Lite top cover.

4. Mount each RU 2000 on the wall, on the corresponding side of the MA 2000 Lite unit.

4.4.2   Antenna Connections

Referring to Figure 4-12:

- Connect the four cables that are routed from the 8x4 Combiner to either side of the 2000 Lite, to the antenna ports of each RU.
- Connect the two cables that are routed from the Digital unit to either side of the 2000 Lite, to the RS232 front panel connector of each RU.

The following figure shows the internal connections ports.

Figure 4-13. Side View of the Open MA 2000 without the Cables

NOTE: All the required RU 2000 connections are described in section 2.2.1.

- Connect the antennas to the **MA 2000 Lite** antenna ports.

5

Setup and Adjustment Procedure

NOTE: This chapter provides only the basic instructions necessary for setting up and configuring the MA 2000 System. A complete description of the NMS System is given in the *MA NMS Installation and Configuration Guide.*

5.1 Overview

After completing the required physical connections, it is required to perform some basic setup and adjustment procedures to the MA 2000 system elements. The setup procedures are performed through:

- A local connection to each MA 410/430 controller to which the MA 2000 head-end system devices (BUs and RIUs) are connected

- MCT application

NOTE: The setup and adjustment procedures may also be performed through a remote connection to the MA 430 controller using the *MA NMS* application.

The following steps are required to setup and adjust MA 2000 system devices

1. Assign an IP address (if it has not already been configured) to each MA 430 controller in your installation (section 5.2).

2. Install the MCT application on a laptop.

3. Connect the laptop to the MA 410/430 front panel through the RS232 port.

4. Open a local session to the MA 410/430 controller.

5. Verify that MA 2000 system modules are displayed in the "Network Topology" tree.

6. If RIUs are installed, verify that the interface between the Base Units and the RIUs is defined as 'RIU' and perform the adjustment procedure described in the ***RIU Products Line Installation and Configuration Guide***.

7. If RIUs are not installed, perform the adjustment procedure described in section 0.

5.2 Configuring MA 430 Controller Network Parameters

In order to monitor the MA 430 controller and all the devices it hosts, it is required to assign a static IP address to each MA 430 controller. This is achieved through a local connection and configuration using a terminal emulation application such as HyperTerminal.

To configuring the MA 430 IP communication parameters

1. Connect the Laptop (or any computer) on which a terminal application (such as HyperTerminal) is installed, to the MA 430 controller RS232 front panel connector using cable **NMS-PC-DB9**.

2. Launch the terminal emulation application and set the communication settings as follows: 9600 bps, 8 data bits, no parity, 1 stop bit, no flow control. The following figure shows the HyperTerminal Port Settings dialog.

.
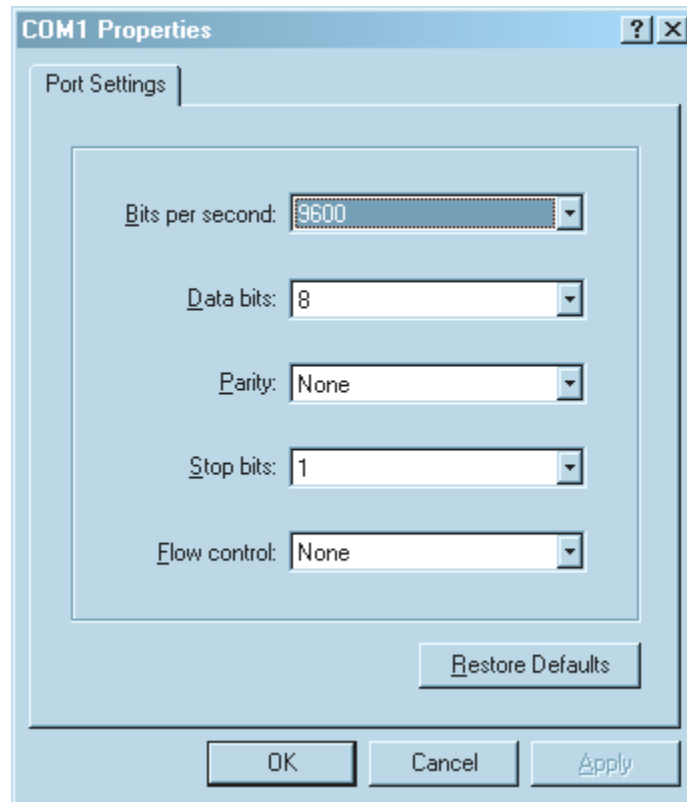
Figure 5-1. Terminal Emulation Application Settings

3. Reset the MA 430 controller by removing and reinserting the power connector on the controller rear panel. The terminal application will be initialized.

4. Press any key within 5 sec in order to access the CLI command prompt.

5. At the password prompt, enter the default password "MA" and change the password if desired.

6. Respond to the IP Address prompts by entering the IP Address, Subnet mask and Default Gateway address for the MA 430 to which you are connected.

7. Respond to the Community name prompts, make any necessary changes (default Get = Public, default Set = Private).

8. Respond to the Boot Operation prompt by selecting **2: RUN**.

9. Remove the RS232 connection.

10. Connect the MA 430 rear panel COM connector to the network.

```
MAC address        - 0:88:44:c1:c1:46
FTP server address - 192.168.10.28
FTP user           - mira
FTP password       -
FTP file           - /ftp/ma122.bin
Image:   Filename  - /ftp/ma122.bin
         File size - 1034440
         Status    - Update

Storing updated bootrecord...done
Erasing Flash...done
Starting ftp transfer...done
Loading...............................done
Storing updated bootrecord...done
Please enter new boot parameters
  SNMP Get community [public] -
  SNMP Set community [private] -
  FTP server address [192.168.10.28] -
  FTP user [mira] -
  FTP password [    ] -
  FTP filename [/ftp/ma122.bin] -
  Boot operation [1:Download, 2:Run] - 2

  Modify the above or continue? [M/C] -
```

*Figure 5-2. Defining IP Address Parameters*

5.3   Opening a Controller Session

The configuration procedure is performed through a computer that is serially connected to the MA 430 controller.

Install MCT on a computer (or laptop) meeting the requirements specified in the datasheet and create a shortcut to the application on your desktop.

To connect to the controller locally

1. Connect the computer on which the MCT application is installed to controller RS232 front panel connector, as illustrated below.

Laptop with MCT application
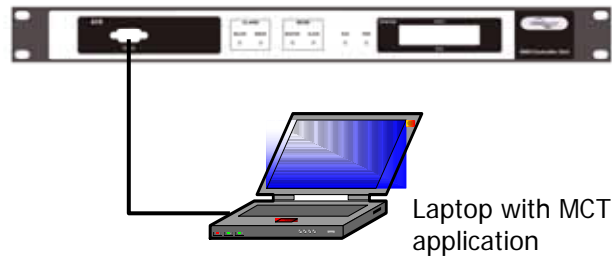
2. Launch the MCT application by double-clicking on the MCT icon on the desktop. The Login dialog appears.
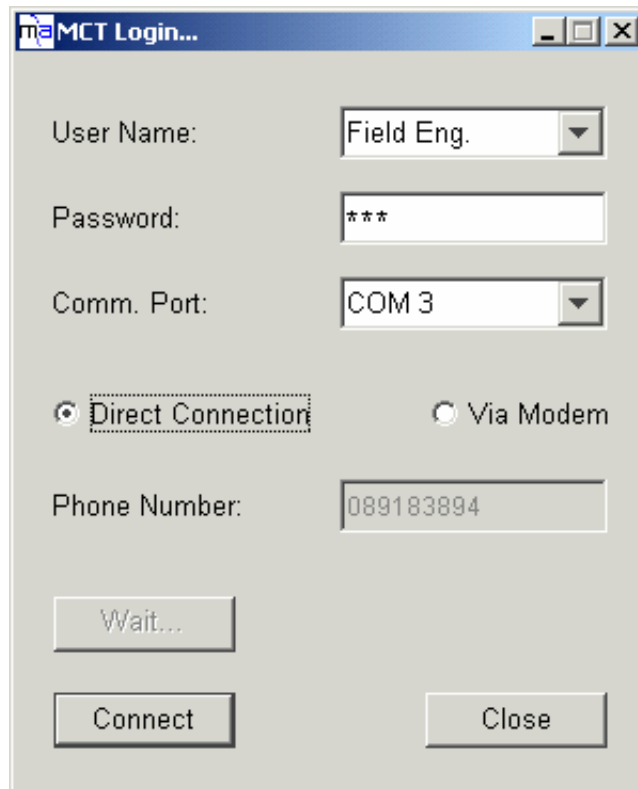
Figure 5-3. MCT Login dialog

Opening a Controller Session

3. To open a session at a level that provides access to configuration options, select the **User Name** '**Field Eng**' and enter the default Engineering password '**Eng'.**

> **NOTE:** The User Names determine the access levels. For more information on the User Names, Passwords and Password change, refer to the NMS manual.

4. Select the **Comm Port** according to the communication port to which your computer is connected.

> **NOTE:** To determine the communication port on your computer, right-click on the **My Computer** icon, select the **Hardware** tab, click **Device Manager** and under **Ports**, the communication port identification will be displayed.

5. Click **Connect**. The MCT main window appears. The window contains the Topology Tree that displays the currently installed and defined modules, and the Display Area showing graphical displays of the units.

   Each element has a separate configuration dialog that is accessed by double-clicking either on the corresponding node in the Network Topology tree or on the element view in the Display Area.
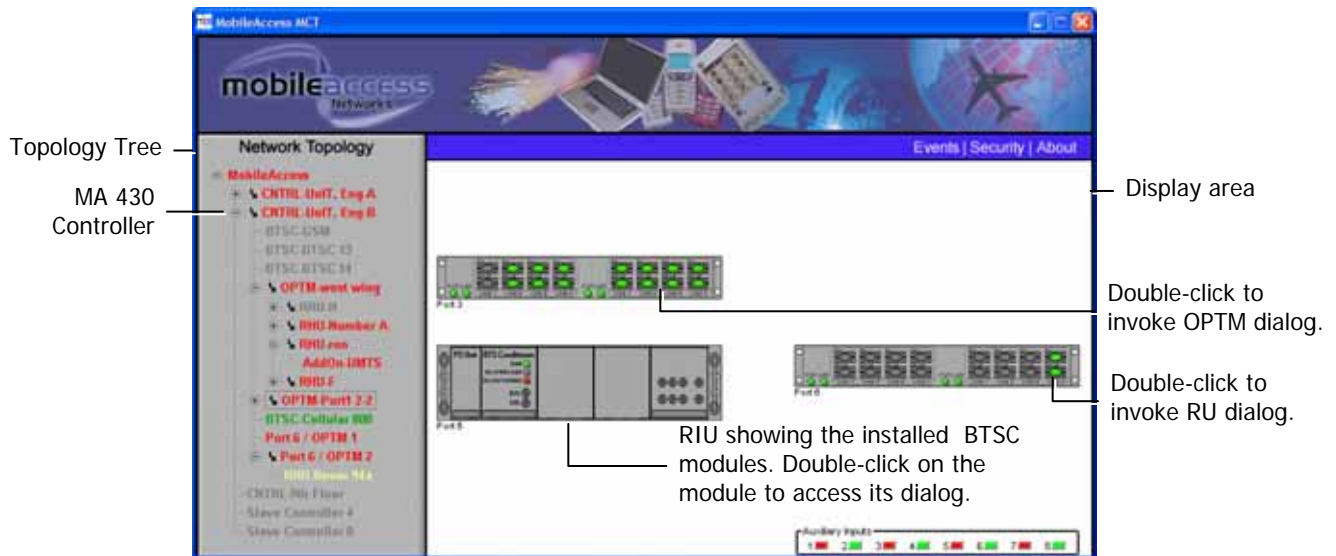

Figure 5-4. MCT Main window

6. Verify that the modules are identified in the Network Topology tree.

> **NOTE:** The nodes may be displayed in, green, red or yellow since the adjustment procedure has not yet been preformed.

5.4   Base Units Interface Definition

By default, the Base Units are factory configured to connect to a passive BTS/BDA interface type. If an RIU is included in the installation, the BTS/BDA interface for each BU must be defined accordingly.

NOTE: The relevant Base Units are displayed under the group of host BTSC module(s) In the Topology Tree. Each Base Unit is displayed according to its 4-port modules, where each 4-port module is referred to as OPTM.

To verify and modify the Base Unit interface configuration

1. To invoke the BU configuration dialog, do one of the following:

    -   Double-click on the first OPTM node in the tree, or
    -   Double-click the *empty space* in the OPTM in the Base Unit view. *Do not click on the LEDs in the OPTM* – this will invoke the RU configuration dialog.

2. Click the **Advanced** tab. In the **BTS Interface Type** field, verify that the correct option is selected: **RIU** or **Passive**, according to the BTS/BDA interface.
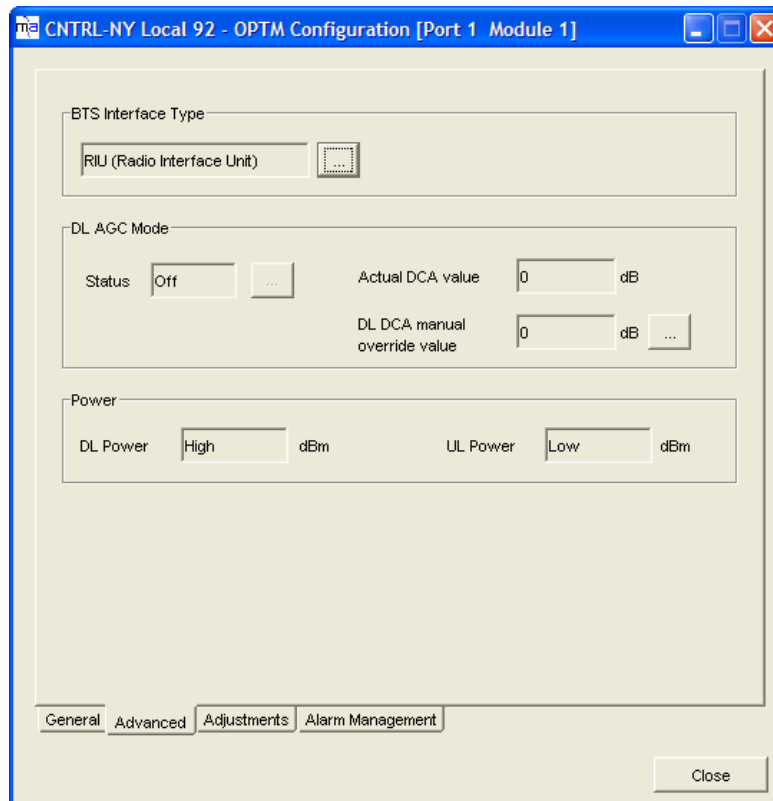
Figure 5-5: OPTM Configuration Dialog

5.5   Adjustment Procedure

> **NOTE:** If your system includes RIU Chassis/Lite systems, refer to the RIU Product Line Installation and Configuration Guide for detailed instructions on commissioning, configuring and monitoring RIUs.

This procedure may be performed for systems without RIUs. Although the adjustment procedure is optional and the system will operate without it, the procedure contributes to optimal site coverage.

The adjustments are performed at each band, where the **OPTM** and relevant remotes **RUs** are adjusted at the low band, and only the **RUs** and **add-on** units are adjusted for each additional band.

To adjusts sites without RIUs

1.   Referring to the DS (1000/2000) for the required composite signal input to the BU for the number of carriers and the bands, inject the **low band** signal at the appropriate power directly to the OPTM.
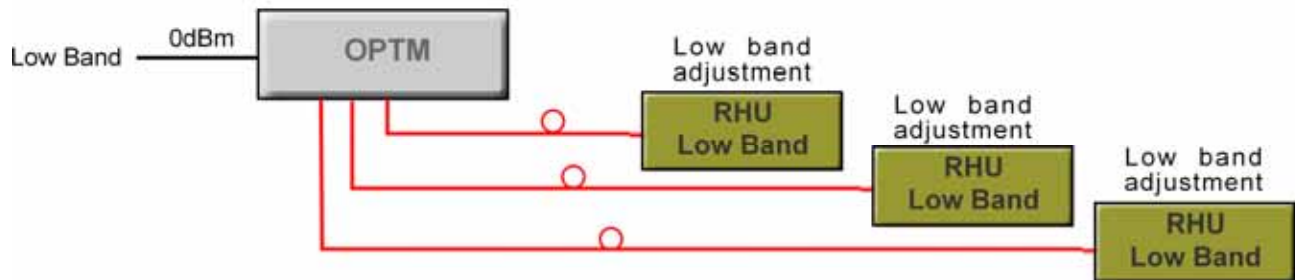
2.   Adjust the RU as follows:

   • Invoke the RU configuration dialog by double-clicking on the **RU** in the **Topology Tree** or **Display View**.

   • Click the **Adjustment** tab, and click **Adjust.**

3.   Referring to the DS (1000/2000) for the required composite signal input to the BU for the number of carriers and the bands, inject the **high band** signal at the appropriate power directly to the OPTM.
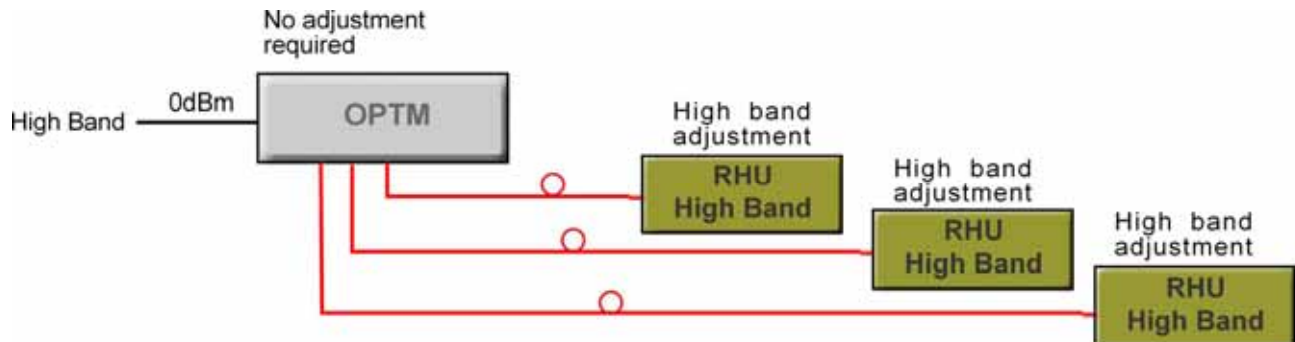
4.   Adjust the OPTM as follows:

   • Invoke the OPTM configuration dialog by double-clicking on the **OPTM** in the **Topology Tree** or **Display View**.

Adjustment Procedure

- Click the **Adjustment** tab, verify that **Live Signal** is selected and click **Adjust.**

5. Adjust the RU as follows:

    - Invoke the RU configuration dialog by double-clicking on the **RU** in the **Topology Tree** or **Display View**.

6. Click the **Adjustment** tab, and click **Adjust**

7. Repeat steps 5 to 7 for any additional bands.

6

Upgrading and Configuration Examples

MA 2000 provides an entry level cost effective solution for current services and support for future services from the same or different operators. Support for additional bands is implemented by an RU module and RU specific hardware designed to prevent interference with other existing bands in the coverage area.

For support for additional services, connect the corresponding RU and hardware (Cavity Filter, Duplexer, etc.) to the **8x4 Module** and to the external coax infrastructure.

NOTE: It is required to order an Accessory Kit for each new unit to be added to the installation. The kit includes cables for connecting the RU 2000 or MA 1200 add on units to the required filters. Because of the differences in cable length requirements, the accessory kit differs for units designated to be installed in 2000 Cabinets and for those designated to be installed with MA 2000 Lite systems. **Be sure to order the appropriate kit as detailed in section 1.3 -** MA 2000 Element Models under the appropriate section.

This chapter provides several examples of the most common configurations and their connections. As systems are upgraded, refer to the provided diagrams for a description of the connections between the **Remote Units** (referred to as RU or RU 2000), the **interface devices** (Filters, etc.) and the **4x8 Combiner.**

6.1   Common USA Configurations

6.1.1   iDEN/SMR with PCS Add-on

iDEN and SMR coverage is implemented by one remote unit. This type of configuration was designed to meet Nextel's existing needs. MA 1200 add-on module for PCS support can be integrated into the solution at any time in order to meet future needs.

The following figure describes the port connections between the remote units, add-on, and 8x4 Combiner.
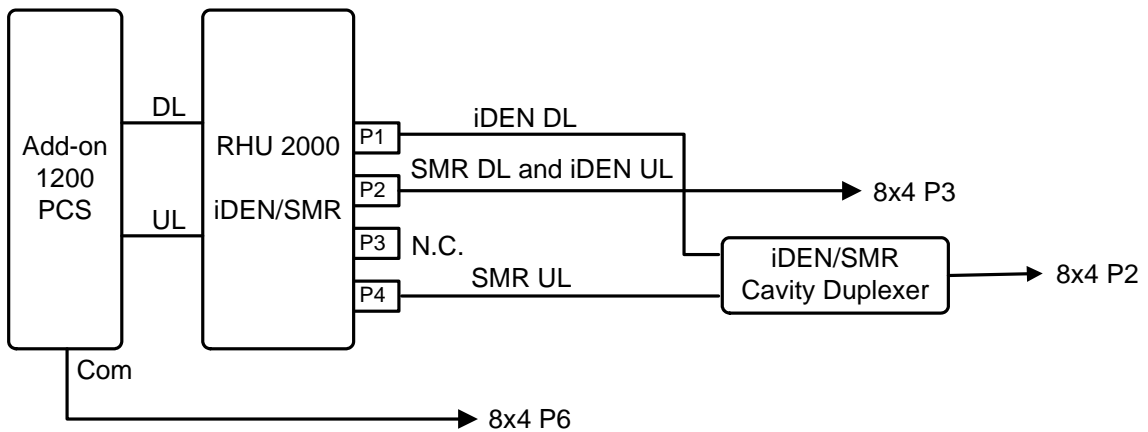

Figure 6-1. iDEN/SMR and PCS Connections

6.1.2   Cell/PCS

For infrastructures supporting a single Cell band and PCS, connect the RU according to the following figure.
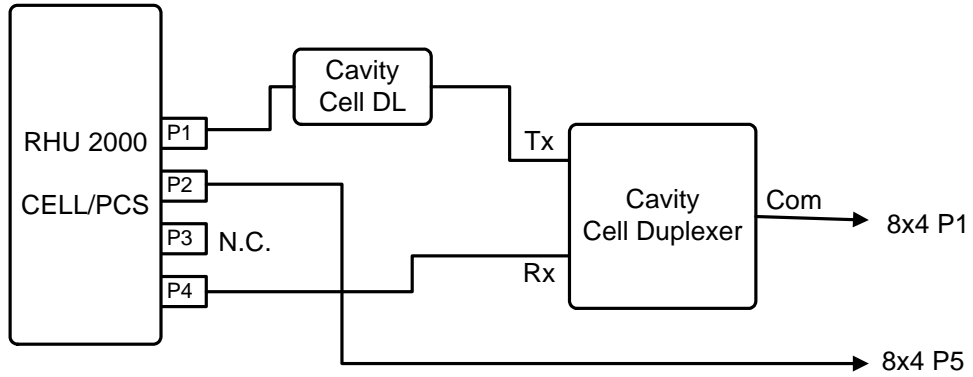
Figure 6-2. Single Cell/PCS Connections

For infrastructures supporting two Cell bands and a PCS band, connect the second Cell/PCS services RU according to the following figure.
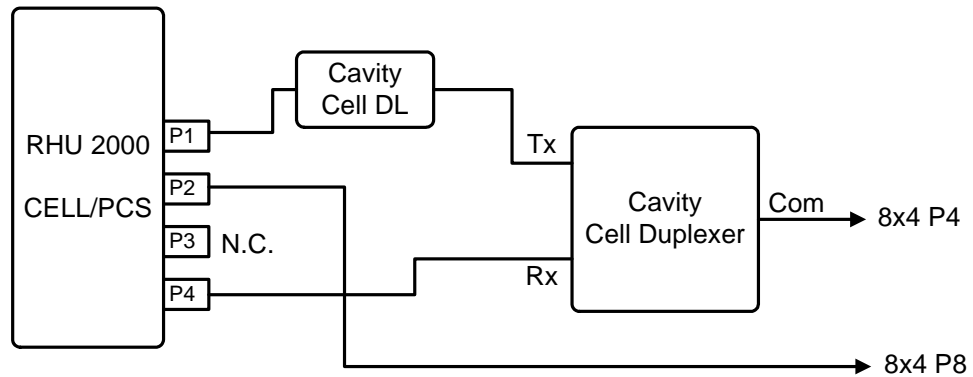

Figure 6-3. Additional Cell/PCS Connections

6.2   Common Israeli Configurations

MA 2000 Lite supports Cell/DCS and Orange/DCS. UMTS support can be added through MA 1200 Add-on.

6.2.1   Cell/DCS
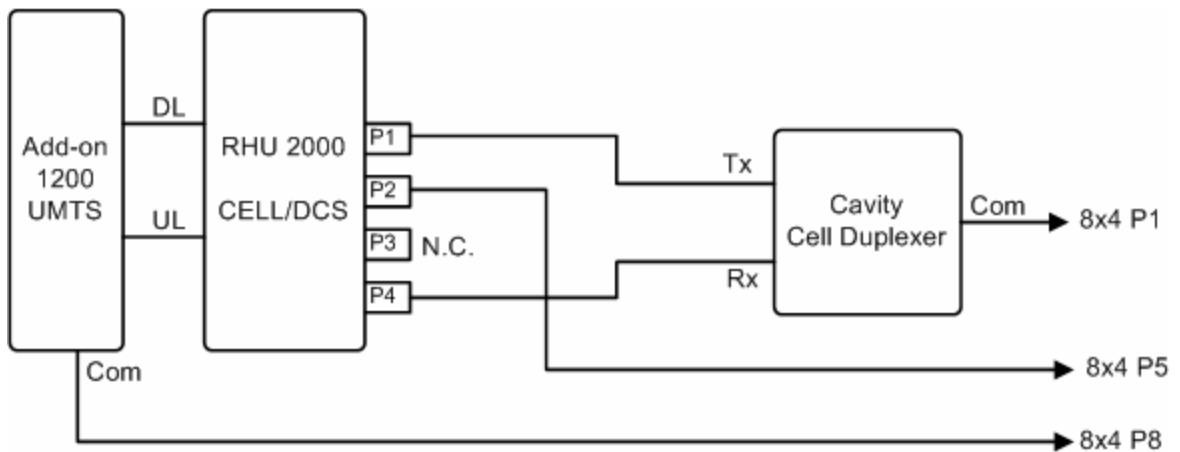
Figure 6-4. Cell/DCS and UMTS Configuration

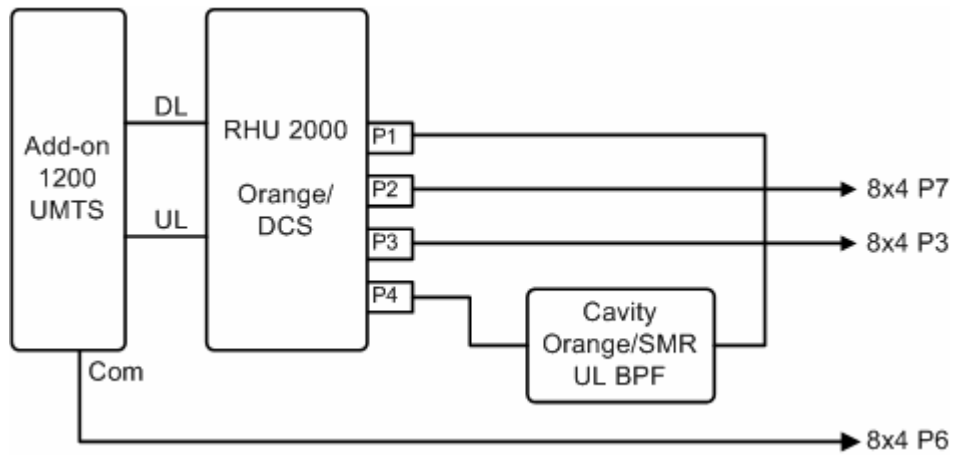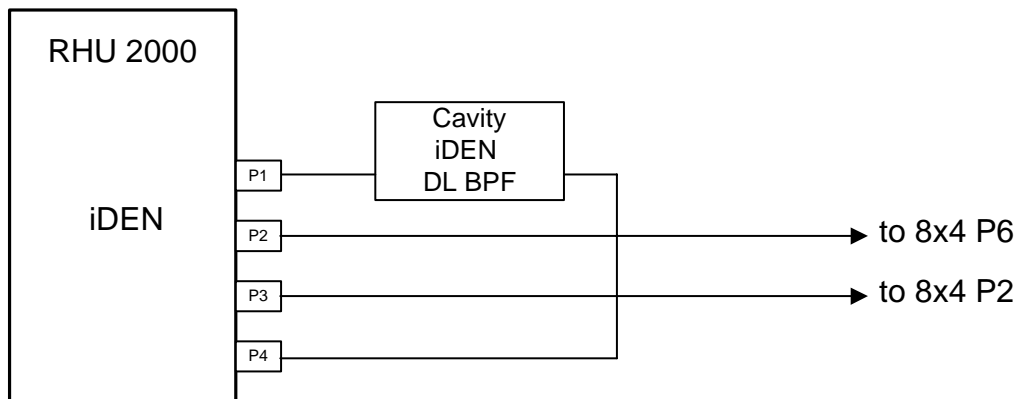## 6.2.2   Orange/DCS and UMTS Add-on

Figure 6-5. Orange/DCS and Add-on UMTS Configuration

6.2.3   iDEN

iDEN support is provided through MA 2000 Cabinet configurations.

6-6. iDEN Configuration

7

Appendix I: Optical test Procedures

7.1   General

Two parameters are of prime importance when testing optical cables or jumpers for use with Mobile Access products:

- **Optical Loss** – the difference between the optical power at the input and output of an optical cable. It must be measured (usually in dB units) at 1310 nm. The maximum allowable loss should be < 0.5 dB/km for Single Mode (SM) cables and < 0.5 dB for every mated pair of connectors.

- **Optical Backreflection** – the percentage of light backreflected from the fiber input (dB units). The maximum allowable backreflection should be < – 55 dB for all jumper cables.

The methods to test these parameters will be described below.

7.2   Optical Loss Testing

This section describes the **optical loss** testing of a Single Mode Cable with SC/APC connectors at each end.

7.2.1   Required Test Equipment

- 1310 nm Stabilized Laser Source

- 1310 nm Optical Power Meter

- Two Fiber Optic Test Jumpers with SC/APC connectors at each end
- Two SC/APC Adapters

7.2.2   Test Procedure

1. Set up the Laser Source, Optical Power Meter, and Test Jumper as shown below.
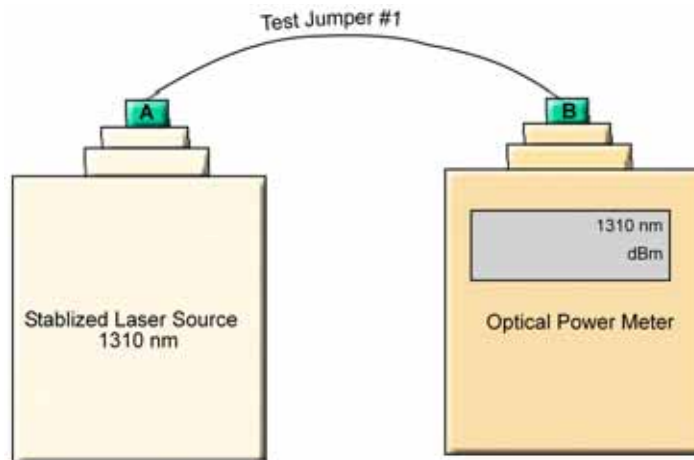

Figure 7-1. Set Up

2. Record reading as **P1** in dBm units.

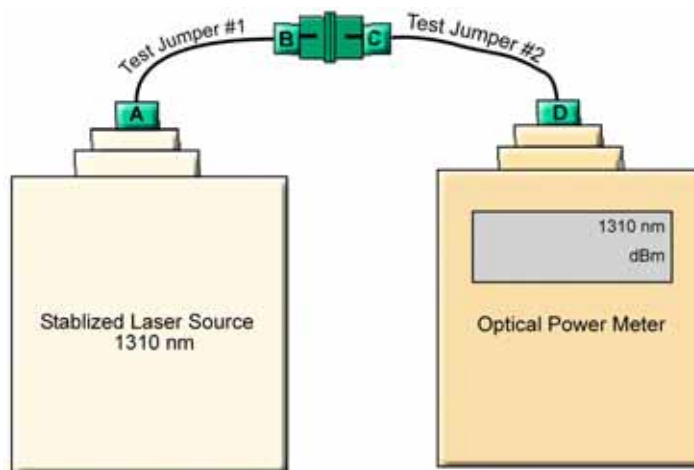3. Serially connect the second Test Jumper as shown below.

Figure 7-2. Serial Connection of Second Jumper

4. Record the Power Meter Reading as **P2** in dBm units.

5. Calculate Loss **L12** according to the equation: **L12** = **P1** - **P2**

6. If **L12** is lower than 0.5 dB continue to Step-7; otherwise replace these test cables and repeat from Step-1.

7. Disconnect connectors **B** and **C**. Connect the **Cable Under Test** (CUT) between connector **B** and **C** as shown below.
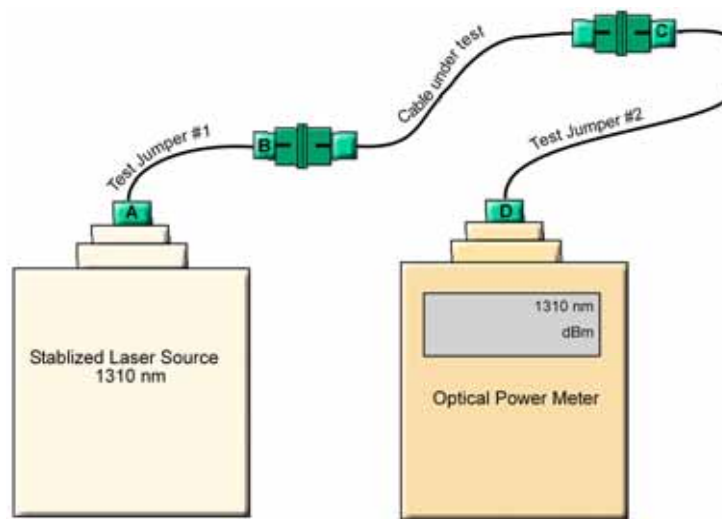

Figure 7-3. Connecting CUT

8. Record Power Meter reading as **Pcut** in dBm units.

9. Calculate Cable Loss **Ldut** from the equation **Lcut** = P2- Pcut.

10. The maximum allowable loss should be < 0.5 dB/km for SM cables and < 0.5 dB for every mated pair of connectors.

7.2.3   Example

Testing a 50 meter cable with SC/APC connectors at each end.

*   **P1** = -1dBm

*   **P2** = -1.5dBm

*   **L12**= **P1 – P2** = -1dBm - (-1.5) = 0.5 dB

Conclusion: the test cables are of sufficient quality to continue testing.

*   **Pcut** = -2dBm

*   **Lcut** = **P2** - **Pcut**= -1.5dBm - (-2dBm) = 0.5 dB

This is acceptable since a mated connector pair was added along with the CUT and a loss of -0.5 dB is allowed for every mated pair of connectors.

7.3   Optical Back-reflection Testing

This section describes the **optical back-reflection** testing of SM SC/APC connectors at each end of an optical cable.

7.3.1   Required Test Equipment

1. Adjustable1310 nm Stabilized Laser Source with output power greater than 7dBm

2. 1310 nm Optical Power Meter with a measurement range of up to -70 dBm

3. One low loss Singlemode 1310 nm 2x2 50%/50% Fiber Optic Coupler with SC/APC connectors at all four fiber pigtailed ports. Pigtail length should be 50 cm.

4. One SC/APC Adapter

7.3.2   Test Procedure

1. Refer to the following figure for port definitions of the Fiber Optic Coupler. The coupler is symmetrical but for our purposes, each port should be identified as shown in Figure 1-4.

Figure 7-4. Port Identification

2. Measure the loss from port **I1** to **O1** according to the insertion loss method described in the previous section. This loss will be referred to as **LI1O1**. It should be approximately 3.5 dB.

3. Measure the loss from port **O1** to **I2** in a similar manner. This loss will be referred to as **LO1I2**. It should also be approximately 3.5 dB.

4. Calculate Total Loss, **TL** where **TL**= **LI1O1 + LO1I2**. **TL** should approximately 7dB.

5. Adjust the laser output power in dBm to the same value as **TL**.

    For example, if **TL** = 7dB, adjust the laser output to 7 dBm.

Optical Back-reflection Testing

6. Connect the laser to port **I1** of the coupler as shown in Figure 7-5.
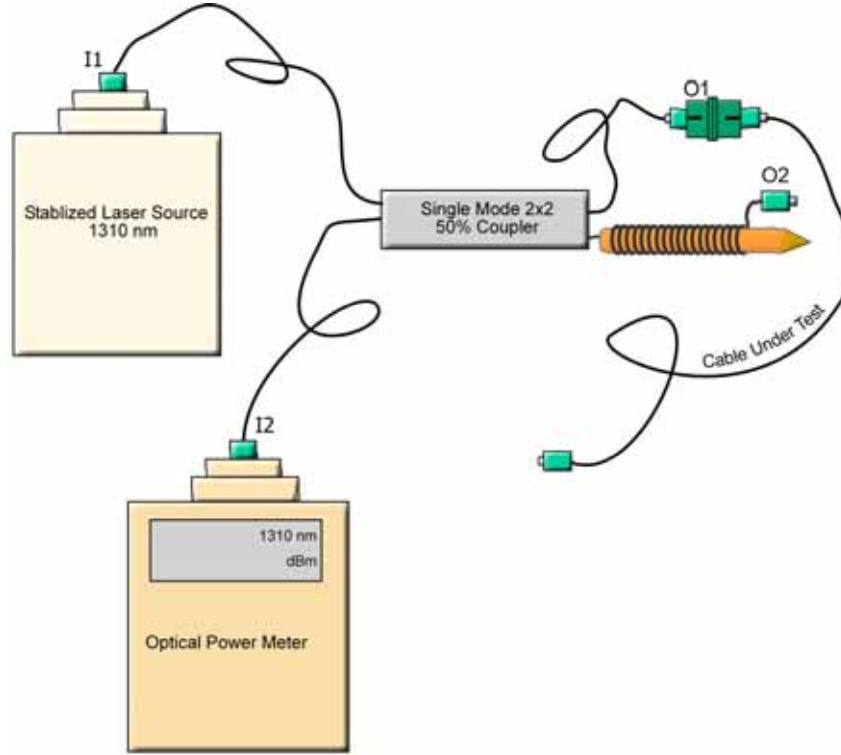

Figure 7-5. Test Procedure Connections

7. Connect the Power Meter to port I2 of the coupler as shown in Figure 7-5.

8. Wrap the **O2** pigtail around a pencil of diameter 7 to 8 mm as illustrated.

9. The power meter readings should be < –58 dBm; otherwise, clean connector **O1** and measure again.

10. Connect the cable under test to connector O1.

11. Record Power Meter Reading as Backreflection, **BRcut**, of the cable under test. The power is measured in dBm units. This is the same value as the backreflection.

    For example, if the power meter shows –58 dBm, the backreflection is –58 dB. The maximum backreflection from the SC/APC connectors should be < –57 dB.

Long cables will have a higher BR since the cable itself reflects a small amount of light. This small amount can grow to a considerable amount over a long length of fiber. To factor out this cable backreflection, perform a mandrel wrap on the cable adjacent to the connector under test and perform all measurements with the mandrel wrap.