MobileAccess WiMAX System Preliminary Reference Guide

User Manual

P/N: 709C003101

Date: JULY-09

MobileAccess 8391 Old Courthouse Road, Suite 300, Vienna, VA 22182
Tel: +1(866)436-9266, +1(703)848-0200 TAC: +1(800)787-1266, Fax: +1(703)848-0280
http://www.MobileAccess.com

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.

Laser Safety

FIBER OPTIC PORTS OF THE MOBILEACCESS WIMAX-RU-GECH-4 EMIT INVISIBLE LASER RADIATION AT THE 1310 NM WAVELENGTH WINDOW.

TO AVOID EYE INJURY NEVER LOOK DIRECTLY INTO THE OPTICAL PORTS, PATCHCORDS OR OPTICAL CABLES. DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS. ALWAYS ASSUME THAT OPTICAL OUTPUTS ARE ON.

ONLY TECHNICIANS FAMILIAR WITH FIBER OPTIC SAFETY PRACTICES AND PROCEDURES SHOULD PERFORM OPTICAL FIBER CONNECTIONS AND DISCONNECTIONS OF THE WIMAX-RU-GECH-4 DEVICES AND THE ASSOCIATED CABLES.

THE WIMAX-RU-GECH-4 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).

Standards and Certification

FCC CODE FRC47 part 27

About This Guide

This guide provides all the information required to install, configure and monitor the WiMAX System.

Revision History

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

Table 1-1: Revision history

P/N	Date	Description
709C003101	JUNE-09	Initial version

Additional Documents

The following table lists additional documents required for the operation of the system.

Table 1-2: Additional Documents

Name
MA WiMAX NMS System Installation and Configuration Guide.

Table of Contents

1 Introduction to MA WiMAX System

MobileAccess WiMAX Indoor Coverage Solution provides a complete, cost effective, scalable indoor coverage solution for up to two MIMO WiMAX.

The MA-WiMAX solution enables distributing signals from a WiMAX BTS located at a central location over fiber optic connections to remote locations (different floors or areas) throughout the building infrastructure.

The solution can be used as stand-alone - providing only WiMAX coverage via a dedicated antenna infrastructure, or in conjunction with MA-1000 or MA-2000 MobileAccess systems – combining WiMAX with other wireless services for distribution over a common antenna infrastructure.

MA WiMAX system provides a truly integrated solution offering a combined services approach to distribute WiMAX and cellular/PCS through a single antenna infrastructure while maintaining a reliable application independent environment.

The following block diagram illustrates the stand-alone MA WiMAX solution elements: the MA WiMAX front end equipment is installed near the WiMAX BTS. In the downlink, it conditions the signal and converts it to fiber optic for transmission to each remote site over the optic fiber. At each remote site it is reconverted to RF and distributed by two WiMAX antennas.

Each MA WiMAX element is set up and monitored through a local connection from a computer running the MCT application.

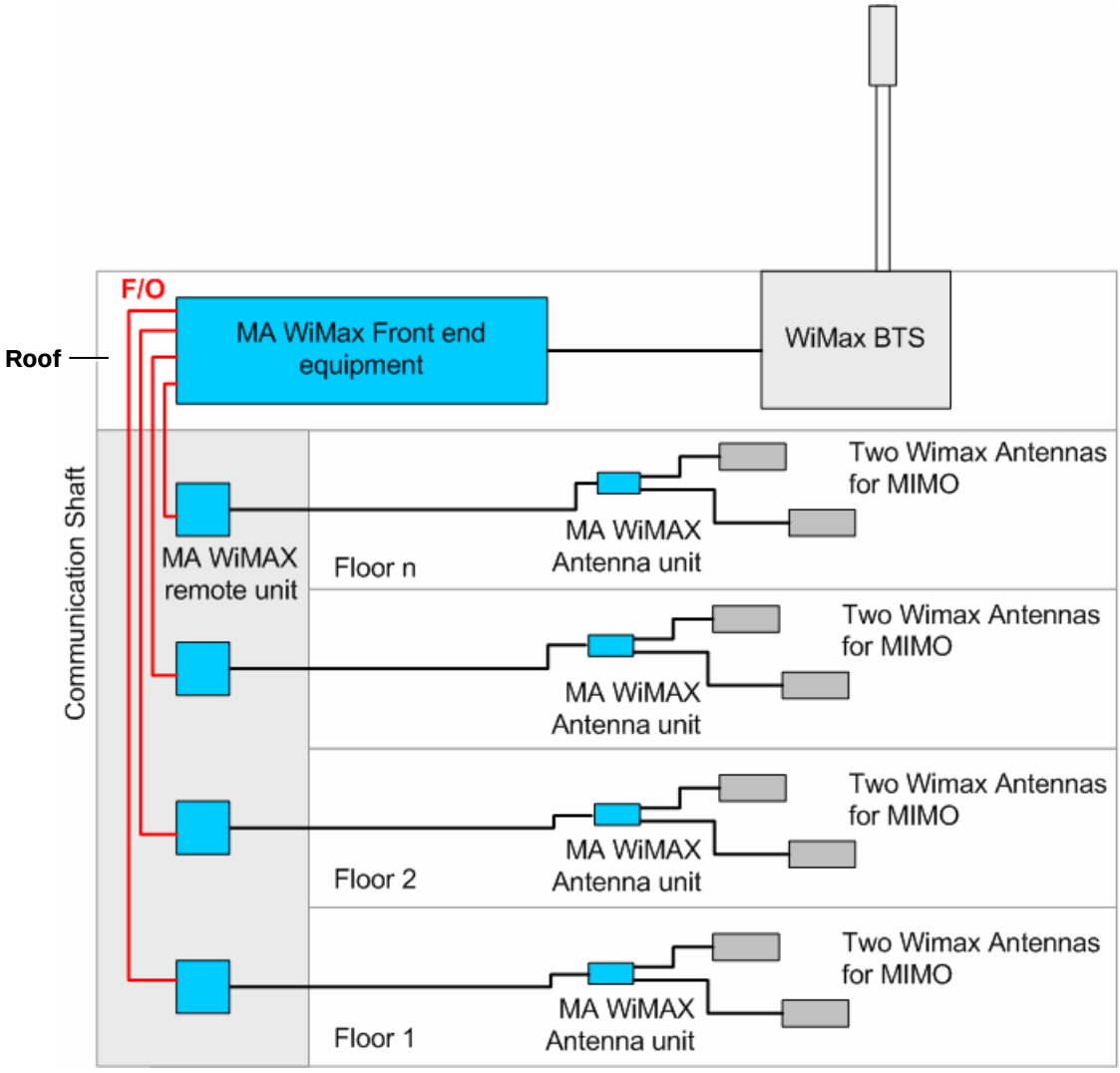


Figure 1. MA WiMAX System Architecture

Features and Capabilities

- Supports two WiMAX MIMO
- Scalable: Easily expands as needed to cover several million square feet
- Enterprise Value: Solution is easily integrated with other wireless applications – opportunity to amortize deployment costs
- Reduced Barrier to Entry: Modular design enables pay-as-you-grow model – add sectors and components as needed
- End-to-end Management: Proactive management and control maximizes uptime
- Local and remote end-to-end monitoring and control through interface to MA 410 controllers
- Monitoring at the head-end through interface to MA-RIU

1.1 System Architecture

The system is based on front-end elements that condition and convert the BTS WiMAX signal to an optic signal for transmission over single mode fiber optics to the head-end elements, and on head-end elements that reconvert the WiMAX optic signal to RF and distribute it over the antenna infrastructure at that location. In addition, Controllers located at the front-end provide end-to-end remote control and management.

The MA WiMAX system can be converged with another MA mobile service indoor distribution systems (such as MA2000, MA1000, etc.), where the systems run in parallel and share some of the same front-end elements and the antenna infrastructure.

The MA WiMAX system **front end elements** are:

- MA WiMAX RIU – conditions the RF signal from the BTS to the level required by the Base Unit. Each RIU supports two WiMAX channels (for MIMO) and two base 4 units (for 8 remote units). See section 2.1.1 for unit description.
- MA Multi-service Base Unit – converts the WIMAX channels to optic signal for transmission over one set of optical fibers. See section 2.1.2 for unit description.
- MA 410 controller – provides management and control functions to all system elements. The Controller is directly connected to the RIU modules and to the BUs. See section 2.1.3 for unit description.

Note: The RIU, Base Units and Controller are located at the head-end (i.e. communication room).

The WiMAX systems **remote location** elements are:

- WiMAX RHU – located at each remote location, IDF or telecom closet. Performs the optic to RF conversion of the WiMAX signals and provides the interface (power and communications) to the remote antenna unit (RU) via which the signals are distributed. See section 2.2.1 for unit description.
- Remote Antenna Unit (RA) – provides final preparation of the WIMAX signals for distribution via the ceiling antenna(s). The RU has three antenna ports to support 2 MIMOs and one passive cellular antenna. See section 2.2.2 for unit description.

1.2 WiMAX Standalone Solution – Basic System Operation

Figure 1-2 shows the architecture of a stand-alone MA WiMAX system. The WiMAX system receives the services from the operator's BTS converts them to an optical signal and runs them over optic fiber to each remote location. There, the WiMAX RHU reconverts the services to RF and distributes them to WiMAX antennas via the MA Remote Antenna Unit. The latter provides remote control and management to the passive WiMAX antennas.

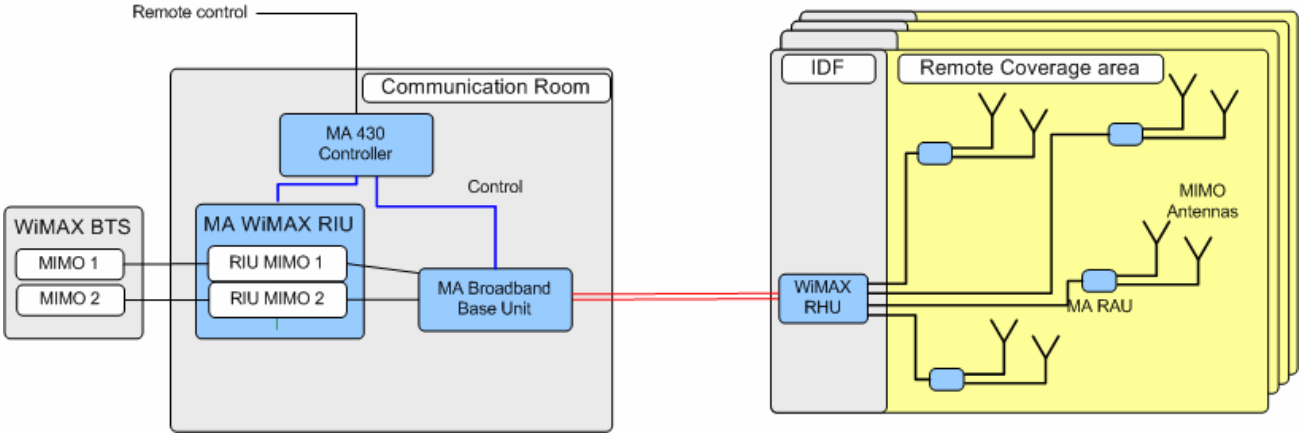


Figure 1-2. Architecture of a basic MA WiMAX system

1.3 WiMAX Overlay Solution

Overlay with Cellular and WiMAX.

Figure-1-3 shows the architecture of an installation supporting the indoor distribution of WiMAX, together with cellular services over a common coax and antenna infrastructure.

The figure shows two systems running in parallel: Cellular system along side of a WiMAX system (at the bottom). Both systems received the services from the operator's BTS or BDA, convert them to an optical signal and run them over optic fiber to each remote location. There, the cellular RHU reconverts the cellular services to RF and the WiMAX RHU converges the cellular and WiMAX services and distributes them to the WiMAX and cellular antennas via the MA Remote Antenna Unit. The latter provides remote control and management to the passive WiMAX and cellular antennas.

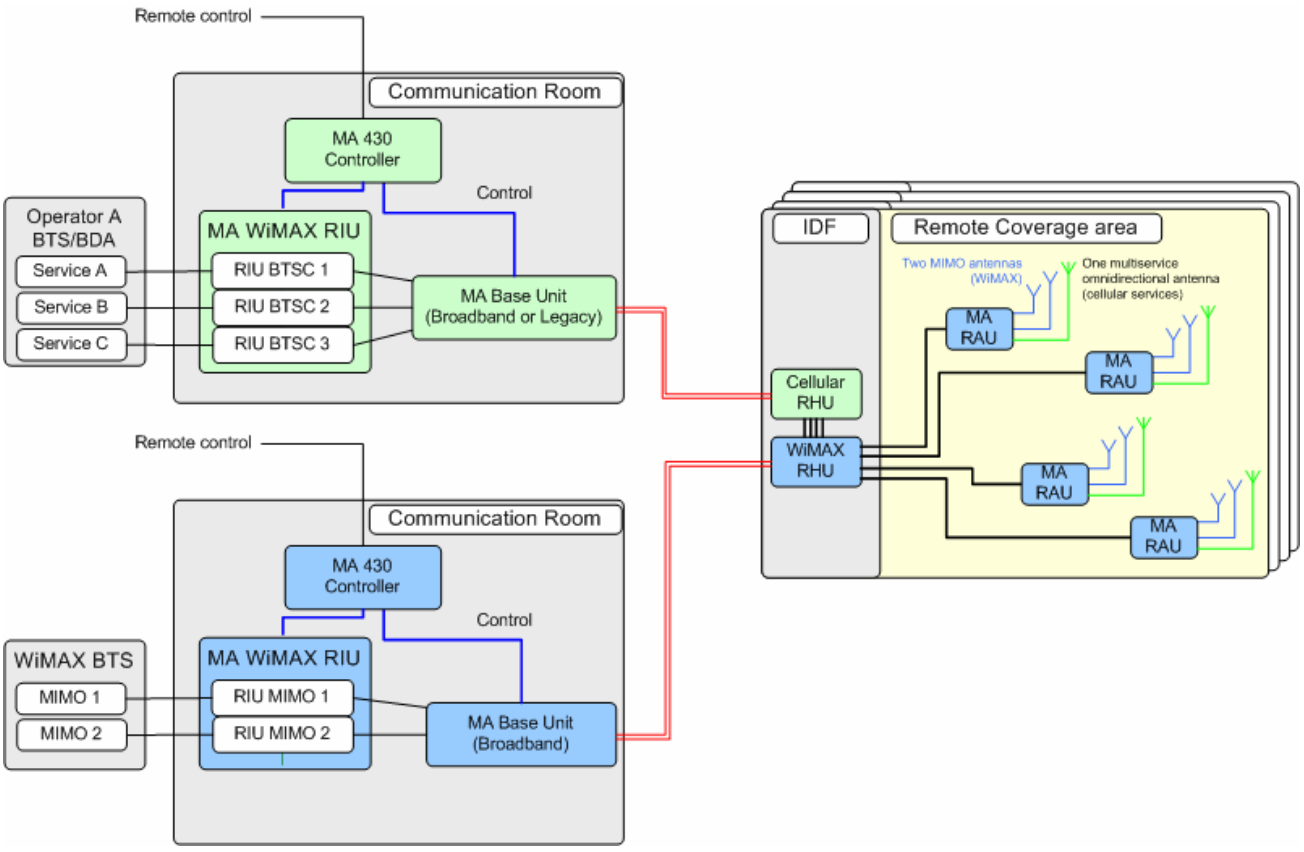


Figure-1-3 –Architecture of MA WiMAX System Converged with MA 1000 System Services

1.4 Converged Cellular-WiMAX system

The WRIU can support a cellular RIU. The cellular RIU is connected to the WRIU threw a dedicated port. The cellular RIU can support up to 3 BTSC. The WRIU combines the cellular traffic with the WiMAX signals and transmits them together to the BU. At the end, a passive antenna can be connected to the RA in addition to the MIMO1 and MIMO2 antennas.

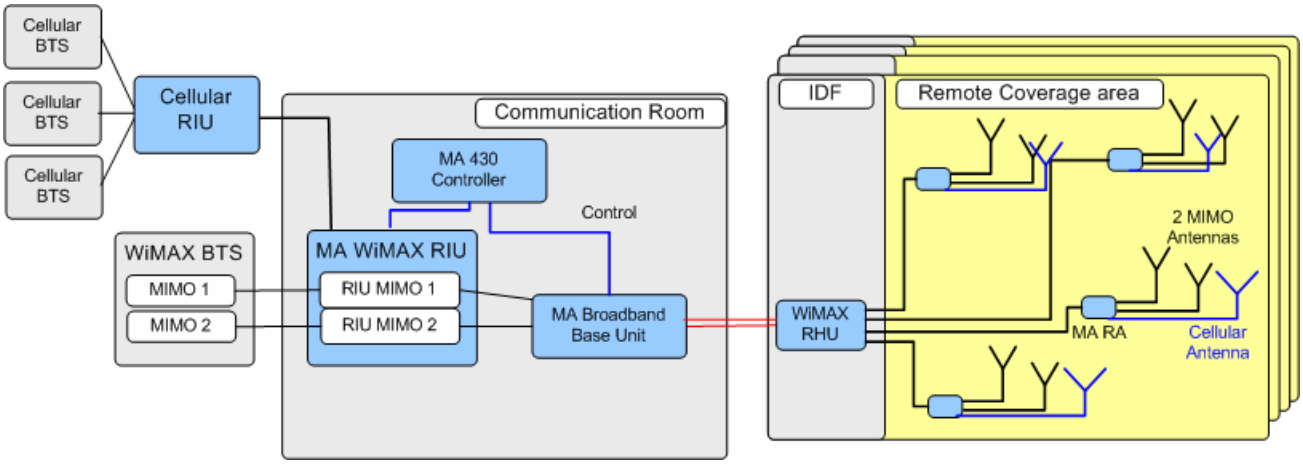


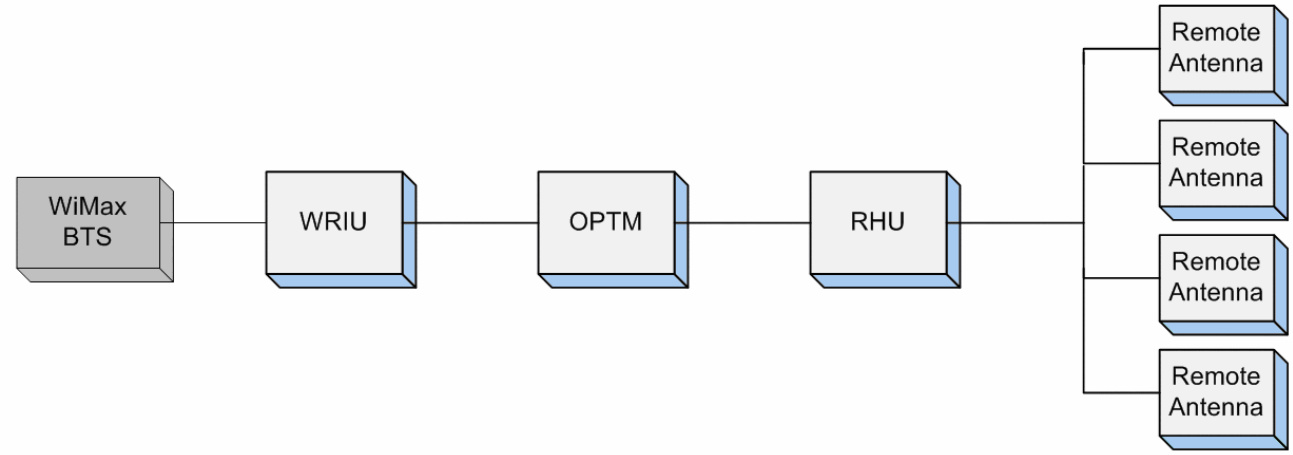
Figure 1-4. Architecture of a converged Cellular-WiMAX system

1.5 Commissioning and Control

The current version of the system is configured and managed via a local connection from a computer running the MA MCT application. See *Chapter-4 .*

2 System Elements

This chapter provides detailed descriptions of the system elements, panels and connections.



2.1 WiMAX Front-end Elements

These elements are installed in the communication room, close to the WiMAX BTS. The WiMAX front-end elements are:

- WiMAX RIU
- WiMAX BU
- MA 410 Controller

2.1.1 WiMAX RIU

- 1U 19” rack-mountable chassis
- Duplex connections for each BTS
- Supports two 4-port BUs
- Monitoring via MCT

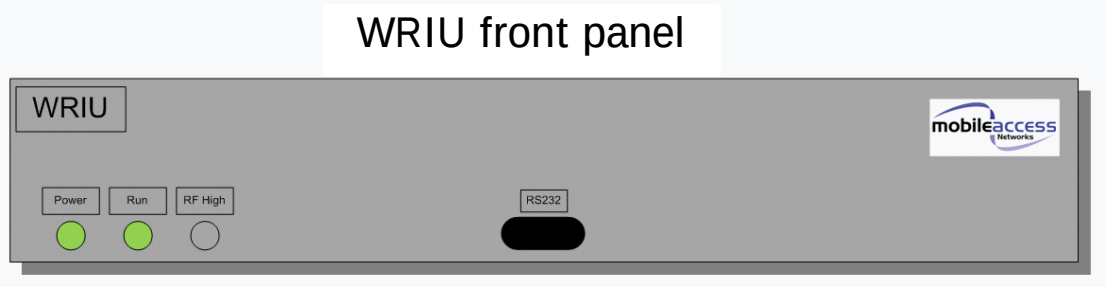
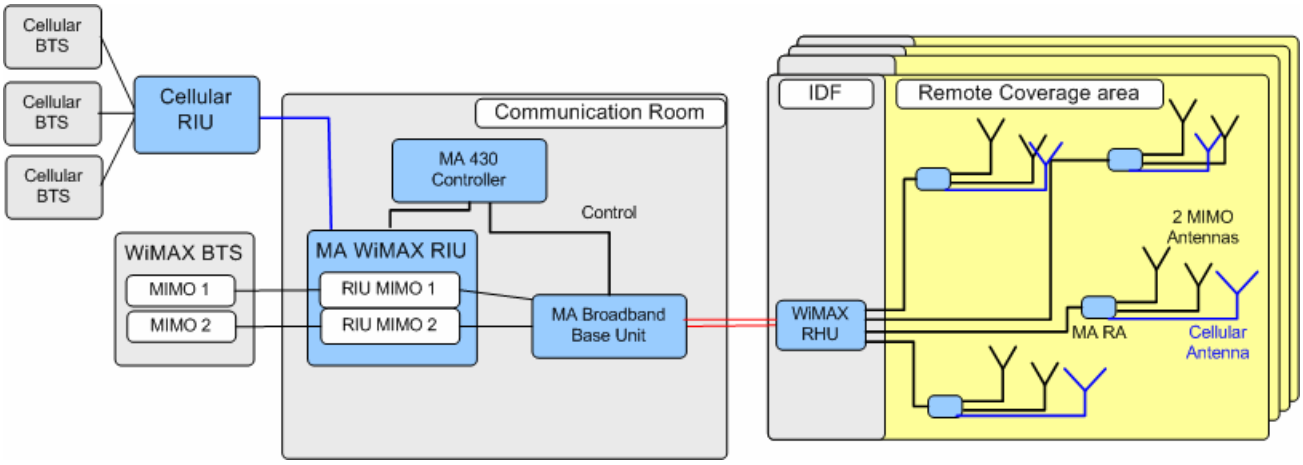


Figure 2-1. RIU

- The WRIU supports two MIMO bands
- WRIU supports RF connection via simplex or duplex connectors (simplex connectors has separate connectors for UL and DL, duplex connectors uses the same connector for both UL and DL)
- The WRIU can forward to the OPTM a combination of WiMAX and cellular signals
- Attenuation – can be enabled/disabled by the user
- The WRIU has a service control switch (enable/disable) for each MIMO (controlled automatically and manually)
- Management: RS485 controller interface and RS232 local management connection
- Allows remote SW download and upgrade
- WRIU can support two SW versions at a time and allows to swap between these two versions
- [This bullet and the figure bellow are also at the System Architecture chapter] The new WRIU can support a cellular RIU. The cellular RIU is connected to the WRIU threw a dedicated port. The cellular RIU can support up to 3 BTSC. The WRIU combines the cellular traffic with the WiMAX signals and transmits them together to the BU. At the end, a passive antenna can be connected to the RA in addition to the MIMO1 and MIMO2 antennas.



Adjustment procedure – the following table describes the adjustment procedure expected power rates :

Unit	Expected input power	Output power after successful adjustment
WRIU	from BTS = 0 dbm	20dbm
OPTM	from WRIU = -20 dbm	after ATE = -43dbm
RHU	from OPTM = -43 dbm	0 dbm
RA	from RHU = -7 dbm (expected 7db loss on coax)	20dbm

* Performing adjustment procedure only for the WRIU unit interferes with the service

Set Band Wizard

- Display a list of all connected elements (WRIU, RHU, RA)
- Current band of each MIMO is displayed
- Allowed bands for each MIMO are displayed
- The wizard will distribute the new selected band to the RHU (RA should be changed manually). At the end of he process a 'success' or 'fail' message will appear.
- Clicking **cancel** button stops the operation
- AGC mechanism supported (similar to the cellular-RIU)

Alarms:

MIMO – RF power low/high, synthesizer lock/unlock, service OFF/ON, Adj. success/fail, Pilot (freq.) missing/exist, Adj. source missing/exist,

2.1.1.1 RIU Front Panel

The RIU front panel contains the LED indicators, an interface for connections to additional Base Units and an RS232 service connection. The following figure shows the front panel and the location of each module.

Note: The UL and DL SMA front panel connections, between the modules, are not shown for clarity. The device is supplied with the connections already implemented. *They are not to be modified.*

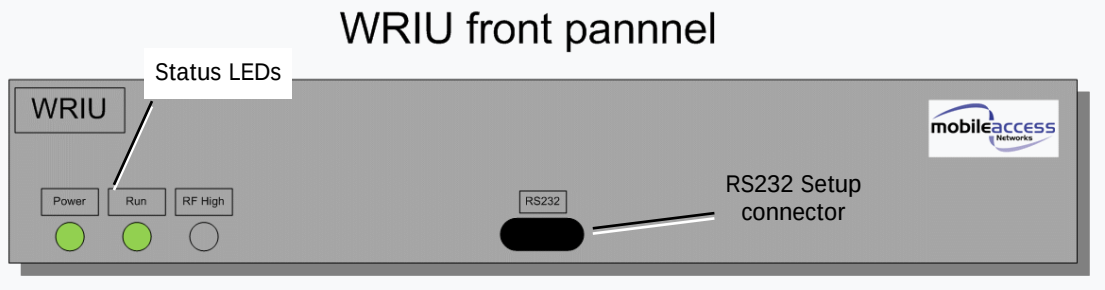


Figure 2-2. RIU Front Panel

Table 2-1. RIU Front Panel Indicators

LED	Description	Indications
PWR	ON – input power is within the required range	Steady green - ON
RUN	Green Flashing – corresponding RIU module is operational	Blinking green – OK Blinking red – not OK
OVER POWER	Lights on only when the status is "RF high"	Steady Red - RF high Off – RF is not high

The following table describes all the optional statuses of the LEDs:

WRIU status	Power LED	Run LED	RF High LED
Powered off	Off	Off	Off
No alert – normal status	On	Blinking green	Off
RF low	On	Blinking red	Off
RF high	On	Blinking red	Steady red
Adj. Fail	On	Blinking red	Off
Pilot missing	On	Blinking red	Off
MIMO Synth. Unlock	On	Blinking red	Off
Adjustment source missing	On	Blinking red	Off
Service Off	On	Blinking red	Off

2.1.1.2 RIU Rear Panel

The RIU rear-panel contains the RF, control and power connections.

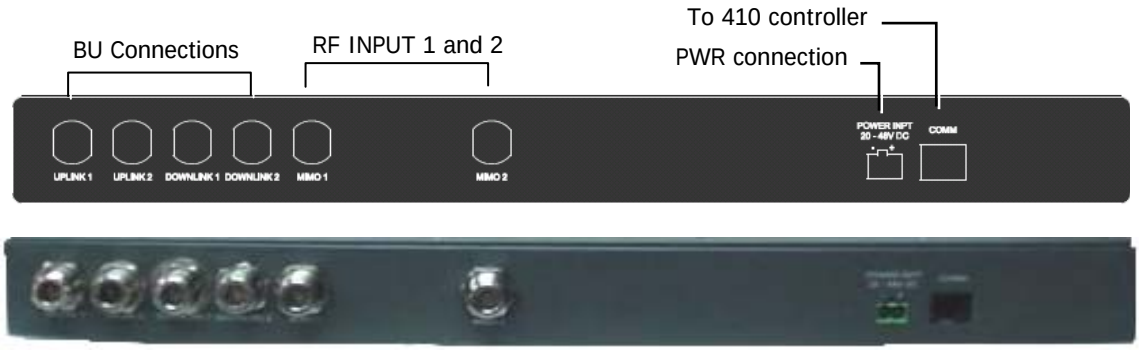


Figure 2-3. RIU Rear Panel showing the RF Connection

Table 2-2. RIU Rear Panel Connectors

Connector	Description
MIMO 1 / **MIMO** 2	Duplex connections to MIMO 1 and MIMO 2 on BTS side.
UPLINK 1/2 **DOWNLINK 1/2**	Connections to two 4-port WiMAX BUs. Each pair of UL/DL connections (i.e. Uplink 1 and Downlink 1) connects to the corresponding RF connections on a Base Unit.
COM	Connections to MA 410 controller rear panel RS485 connector.
Power	DC power connection: 20 to 48 VDC

2.1.2 MA Multi-Service BUs

The BUs (Base Units) perform RF to optical conversion of the signal on the side of the operator's interface equipment. The BU is connected to the RUs through optic connections and to the RIU through UL coax connections. Each 4-port BU supports up to four WiMAX RHUs.

The BU (and all the corresponding remote hub units - RHUs) may be monitored and managed via the **MCT**.

2.1.2.1 BU Front Panel

The WiMAX BU front panel contains the optical connections and service connection port.

Figure 2-4. 4-Port MA 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 from the connected remote is within the specifications. Blinking - optical power from remote is lower than minimum level.

2.1.2.2 BU Rear Panel

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

Figure 2-5. MA BU Rear Panel

Table 2-4. MobileAccess BU Rear Panel Connections

Connector	Description
Uplink output	Uplink connection to RIU.
Downlink input	Downlink connection to RIU.
Com Port RS485	Connection to MobileAccess 410 controller RS485 port.
PWR	Power connection. 20 to 48VDC
Alarms	N/A

2.1.3 MA 410 Controllers

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

The MobileAccess 410 controllers enable managing and controlling the MobileAccess system elements through Point-to-point connectivity implemented via either direct RS232 connection or via connection to a PSTN phone line

2.1.3.1 Front-Panel Description

The front panel contains the RS232 and TCP/IP management connection ports, the monitoring and status LEDs, and LCD displays.

Figure 2-6 shows the MA 410 front panel. Table 2-5. MA 410 LED Indicators, describes the LED indicators.

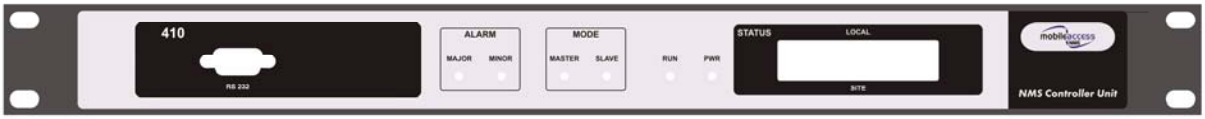


Figure 2-6. MobileAccess 410 Front Panel

Table 2-5. MA 410 LED Indicators

LED	Description
PWR	ON green - indicates correct power level
Run	ON green - flickers continuously indicating the controller is initialized and running.
Mode	Not relevant.
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 RUs, fault on any of the auxiliary inputs, or other faults.

Table 2-6. MA 410 Front Panel Connectors

Connector	Description
RS232	Used for setting up the network parameters (IP Address, community names, etc.) and for MCT (MA Configuration Tool) connection.

2.1.3.2 Rear Panel Description

The rear-panels of the controllers provide all the connections to the system elements (BUs, RIUs), dial-up MCT connection, dry-contact auxiliary inputs, auxiliary outputs (to Base Station or repeater) and power.

The controller rear panel connections are described below.

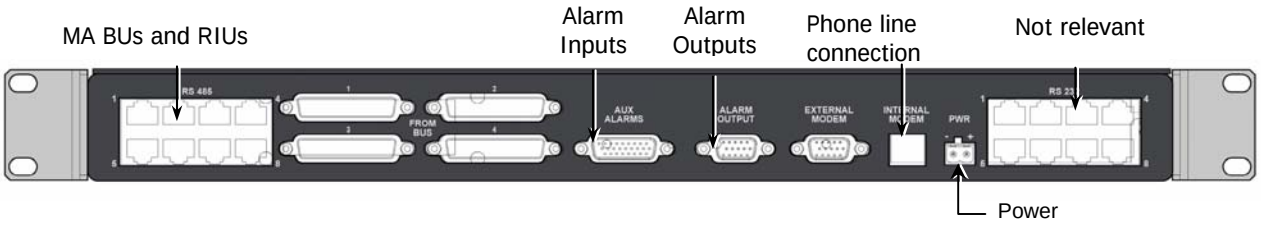


Figure 2-7. MobileAccess Controller Rear Panel

Connector	Description
RS485	MobileAccess Base Units and RIU connections to any of the ports in any combination.
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 for the purpose of MCT configuration and MCT monitoring.
PWR	DC power input: 20 to 48VDC, 0.5A max

2.1.3.3 Controller LCD Fault Indications

The LCD display corresponds to the Major/Minor LEDs.

Note: The display shows two rows; however, only the upper row is relevant.

Following is an example of a display:

Upper row – shows status of locally connected devices, where status is indicated by the following messages:

- **`lcl aux major`** (auxiliary faults are always major), or
- **`lcl rhu major/minor`**

Note: if both types of problems were identified, the display toggles between the two messages.

2.2 WiMAX Remote End Elements

2.2.1 WiMAX Remote Hub Unit

MA WiMAX RHU is *installed in the shaft of each head-end location*. It provides the following functions:

- Optical to RF for downlink signals and RF to Optical for uplink signals
- Interfaces to Remote Antenna Units (RA) – via on one side and to the optic fiber from the Base Units on the other side
- Connects (via Remote Antenna Units) to MA omni-directional multi-service antennas through coax cables and to the host WiMAX BU (located in the communication room) through single mode optic fibers.
- Can combine WiMAX services at each location with cellular services and transmit the converged services over a common antenna infrastructure.
- Provides local control and management capabilities via MCT

Note: The WiMAX RHU is built of two combined units. The units are supplied with all the required connections between them (these are not to be modified).

The front panel contains the antenna connections and cellular services connections, power and local setup connections.

Figure 2-8. WiMAX RHU Front View

Front Panel Ports

The following table describes the front panel ports.

Front Panel Ports	Description
Antenna Ports 1..4	Four N-type female connections to four Remote Antenna Units ***NOTE:*** *To be terminated with 50 ohm terminations when not in use.*
Optic connection	Connection to optic fiber connector
Power	Top unit – 9 VDC Bottom unit – 15.5 VDC to 2 right-most pins

Front Panel LEDs

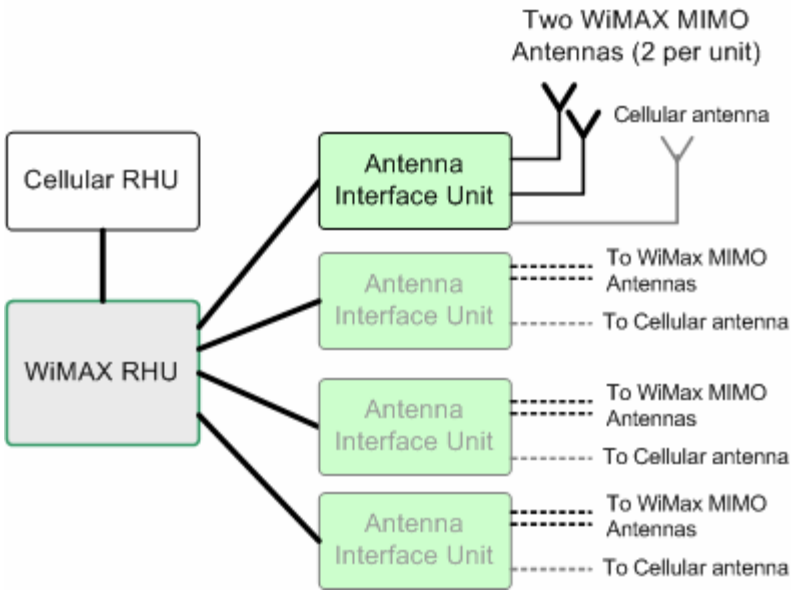
The front panel contains two LEDs, described in the following table.

Front Panel LEDs BOTTOM Unit	Description
Run	Internal operation and channel operation status. o Green blinking – Auto-discovery completed and unit OK. o Off – fault detected in unit (if power is supplied) *NOTE: This LED can also be used for identifying the RHU corresponding to an MCT Configuration dialog. When the Identify button is pressed in the MCT RHU dialog, the Run LED blinks faster.*
PWR	Green – Power OK. Off – no power supplied to the unit.

Front Panel LEDs TOP Unit	Description
PWR	Green – Power OK. Off – no power supplied to the unit.
COM	Communication status. Blinking – normal operation
LINK	Optical link status. Steady – normal operation. Blinking – faulty optical signal

2.2.2 Remote Antenna Unit

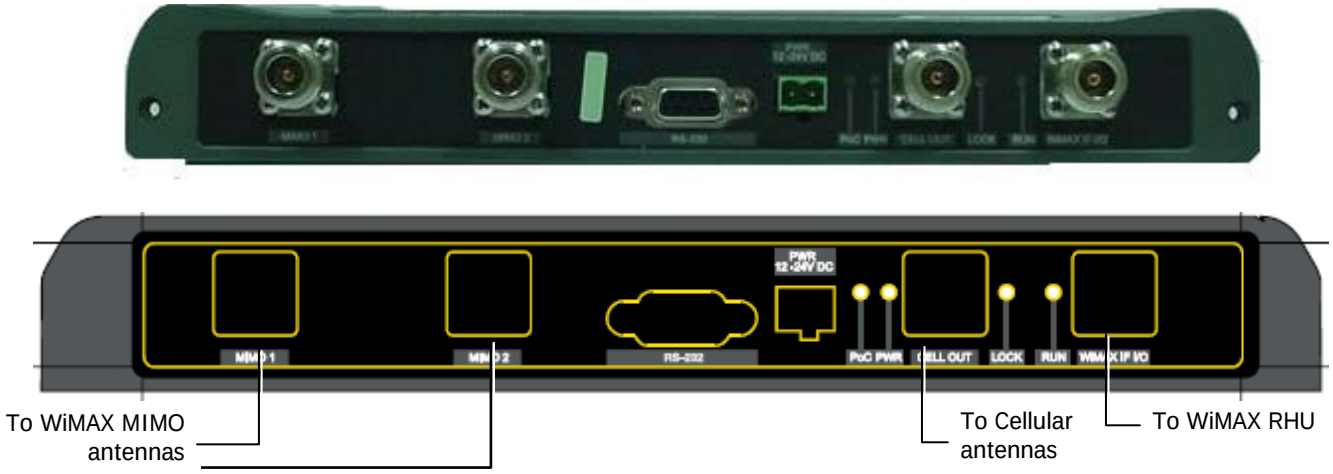
This is a unit installed near the antenna. It performs the final stages of filtering and amplification of WiMAX signals. The unit supports two connections to two ports for connecting third party WiMAX antennas and a third port for connecting to a Cellular antenna.



2.2.2.1 Remote Antenna Unit Front Panel

The Remote Antenna Unit front panel provides the connections to the antennas, to the WiMAX RHU and to the DC power.

ATTENTION! DO NOT CONNECT DC TO THE REMOTE ANTENNA UNIT – IT RECEIVES POWER FROM THE RHU.



Front Panel Ports

Front Panel Ports	Description
MIMO 1/2	Connections to two WiMAX antennas ***NOTE:*** *To be terminated with 50 ohm terminations when not in use.*
Cell Out	Connections to Cellular antenna
WiMAX I/O	Connection to WiMAX RHU
PWR	**ONLY FOR SERVICING THE UNIT. NOT FOR NORMAL OPERATION.** Power connection: 15.5 VDC

Front Panel LEDs

Front Panel LEDs	Description
PWR	Green – Power OK. Off – no power supplied to the unit.
Lock	Synchronization error in unit.
Run	Internal operation and channel operation status: o Green constant – unit performing antenna auto-discovery. This happens only upon power-up. o Green blinking – Auto-discovery completed and unit OK. o Off – fault detected in unit (if power is supplied)

3 Installation

This chapter describes the MA WiMAX system installation procedure. The installation process will be described according to three logical parts:

A. **Telecommunications room** – installing the **RIU**s, **BUs**, **MA 410 controllers**, and the required *passive equipment* in the telecommunication room close to the interface with the service providers Receivers.

B. **Remote locations RHU –** usually installed in the communication closet or IDF on each floor.

C. **Remote Antenna Units** installed above the ceiling in close proximity to passive antennas.

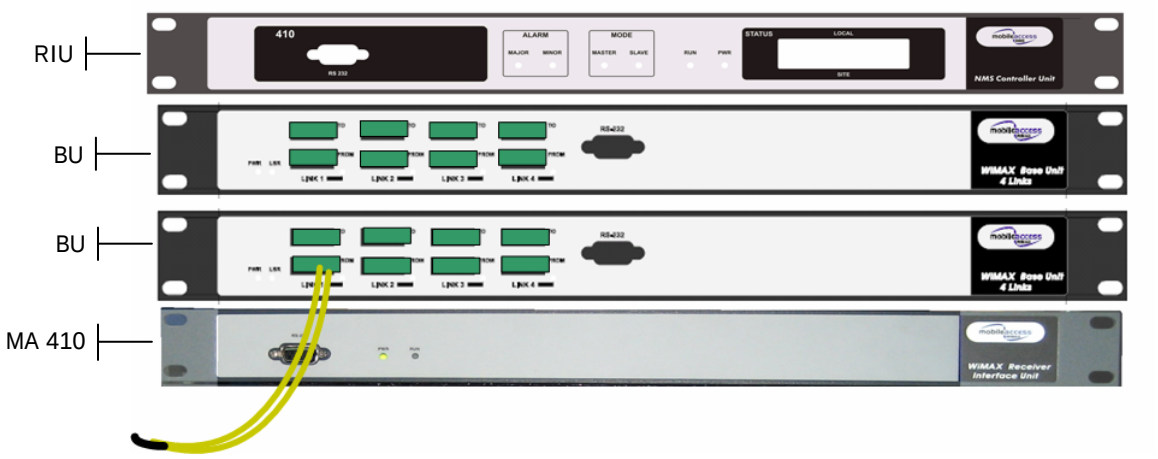
Note: Be sure to read the Pre-installation and Power Consumption related instructions before proceeding with the actual connections.

3.1 Communication Room Installation

3.1.1.1 Front View

Connect the optic fibers to each port on the BU front panel.

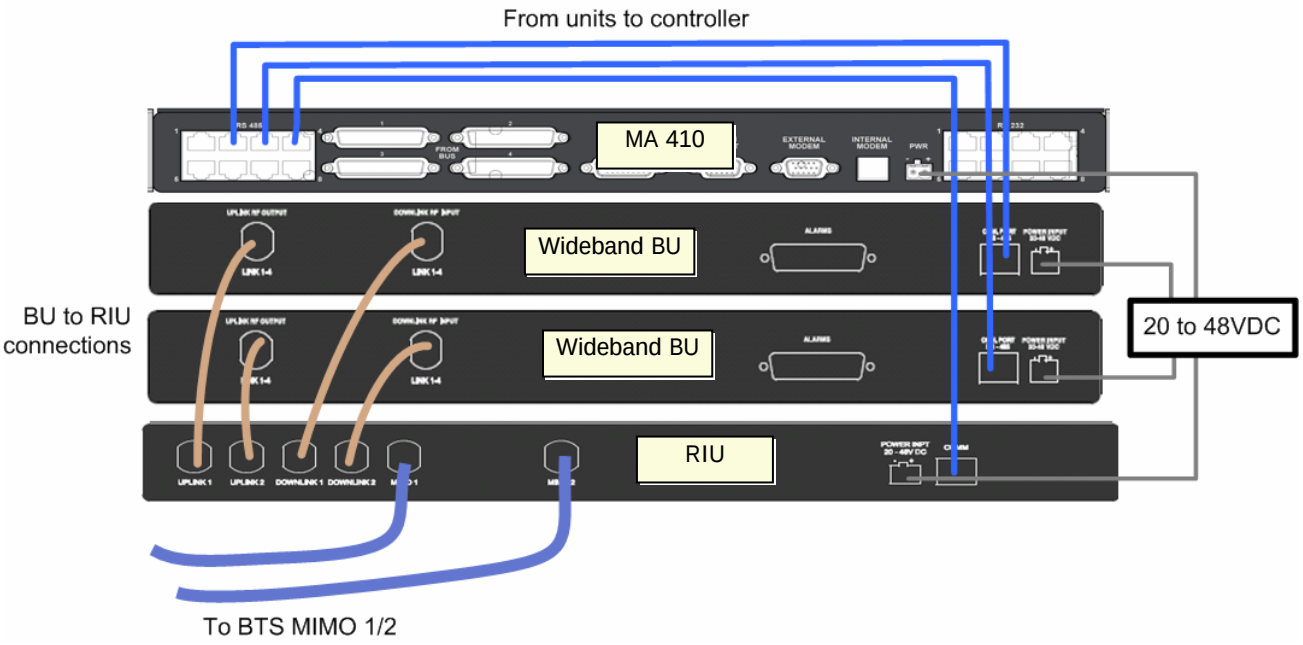
Note: The following figure shows an 8-port Base Unit. Your installation will consists of *two 4-port Base Units.*



Optic fiber connection between
BU and RHU (via patch panel)

3.1.1.2 Rear View Connections

- Connect the BTS MIMO ports to the RIU MIMO ports:
- Interconnect the RIU and BU RF ports:
  - Connect the RIU DL ports to the BU DL ports
  - Connect the RIU UL ports to the BU UL ports
- Controller connections:
  - Connect the BUs and RIU RS485 COM ports to any of the controller's RS485 ports
  - Connect the DC power to each **Base Units, 410 Controller** and **RIU.**



Controller connections
from RIU and BU

3.2 Remote Site Installation

3.2.1.1 Front View Connections

- Connect the optical fibers from the Base Unit to the fiber ports on the RHU
- Connect each WiMAX **RHU** antenna port to the **Remote Antenna Unit** WiMAX I/O port of each antenna.
- Connect the DC power to each of the **RHU WiMAX Units** (the Remote Antenna Unit does NOT require power).

4 Setup and Commissioning Procedure

4.1 Overview

The commissioning procedure for WiMAX systems consists of four basic phases:

1. General Checks – verifying that all units are operational and that the infrastructure is in tact allowing signals to be transferred between the units.
2. Performing Continuous Wave downlink gain adjustments
3. Performing a Continuous Wave test under each antenna.
4. Commissioning carriers onto the system

Each of the above phases will be detailed in the following sections.

4.2 Requirements

Testing Equipment/Documentation Required

- Signal Generator for generating 2695 MHz
- Optical Power meter 1310nm & 1550nm
- MobileAccess Documentation
- MobileAccess Data Sheets

4.3 General Checks

The procedures described in this section are used to verify that all units are operational and that the infrastructure is intact allowing signals to be transferred between the units. Please read the entire document before you attempt to commission a MobileAccess system

A summary of all the general checks is given below. Each step is detailed in the following sections.

1. Verify connections.
2. Set up MCT monitoring - from the MCT application, logon to the MA410.
3. Verify the controller clock settings – this enables correctly time stamping any generated events

4. Verify end-to-end link in the topology tree by ensuring that all RHUs all visible.
5. Set the base line – ensuring that disconnected units are also displayed.
6. Check each RHU DL optical level from the Base Unit and verify the band configuration for the RHU.
7. Check Base Unit Optical Levels from the RHUs.
8. Name each BU, each RHU and each RIU.

4.3.1 Verify Connections

1. Check all RF, Fiber and Power connections before powering-up the units.
2. Apply power (first to the Bus and then to the RHUs) and verify all power and optical link lights are on for the RIU, 410, RHUs and Base Units. Swap between the connections between the **To** and **From** fiber ports if the link LED does not light.
3. Remove the fiber connected to each "From" port on the Base Unit(s) and use an Optical Meter to measure the signal.

   Expected level: >0dBm @ 1310nm.

   Corrective action: If the signal is not at the expected level, clean all connectors, if problem persists carry out a full sweep of the fiber connection using an Optical Time Domain Reflectometer (OTDR)

4.3.2 Set Up MCT Monitoring

To set up monitoring via MCT

1. Install the MCT application (from the CD provided with your kit) on the computer from which you will be performing the commissioning procedure.
2. Connect to the RS232 port on the front of the MA Controller 410(as illustrated below).

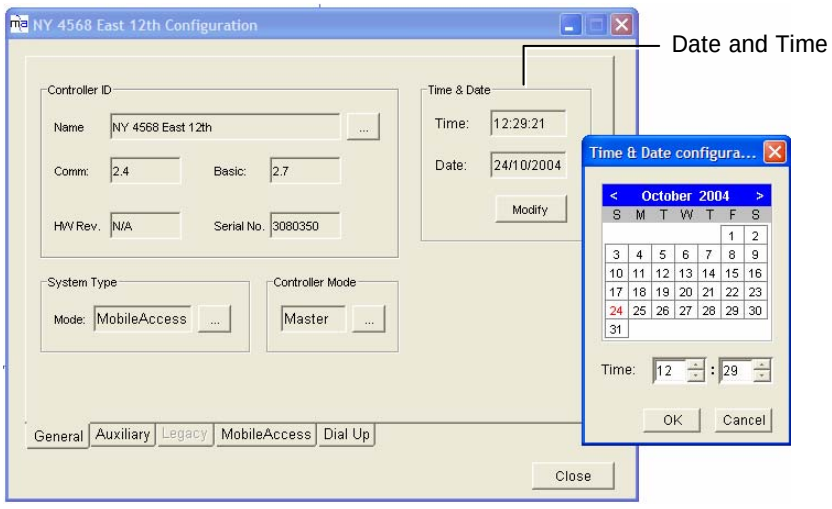
3. Launch the MCT and Log in using **Field Eng** user and **eng** password.

Note: You may have to use a USB cable with a serial connection if your computer lacks a DB9 serial port.

4.3.3 Verify the Controller Clock Settings

Verify the Controller date and time settings are correct as follows:

- In the **Network Topology**, double-click on the controller.
- In the invoked dialog, choose the **General** tab.



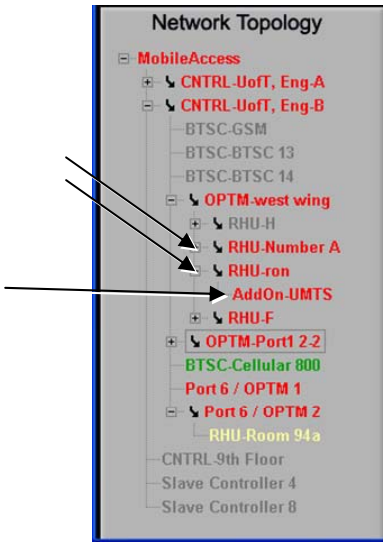
- In the **Time and Date** area, verify the correct time (24 hour clock) and date are defined. The date is represented as DD/MM/YYYY.
- To modify, click on **Modify** and make the required changes in the invoked dialog.

4.3.4 Verify End-to-End Link in Topology Tree

Verify end-to-end link connection by ensuring that each RHU is displayed in the Network Topology tree.

To view the RHUs in the Topology Tree

The RHUs are listed under the corresponding Base Unit, referred to as **OPTM** in the tree. (An OPTM is a four port module of a BU – i.e. an 8-port BU is listed as two OPTMs). Each RHU is listed according to the BU (OPTM) port to which it is connected. Each Add-on is listed under its host RHU.



IMPORTANT NOTE! If the RHUs are not all visible, reset or power cycle the Base Units to which it is connected. If this does not resolve the problem, troubleshoot the optical links for dirt or other problems.

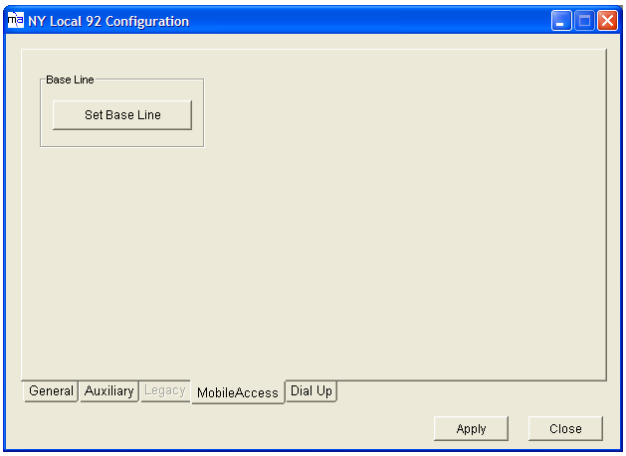
4.3.5 Set the Base Line

Once all equipment on site is visible in MCT, set the base line. This sets *all* the MobileAccess devices currently displayed in the Network Topology pane as a reference and will continue displaying them (in red versus gray) if communication is lost.

Note: Mobile Access devices that are not displayed in the tree when the Base Line button is clicked will disappear if communication with them is lost.

To set the baseline for each controller

1. Double-click on the **Master Controller** in the Network Topology tree and in the invoked dialog, click the **MobileAccess** tab.



2. In the **MobileAccess** tab, click the **Set Base Line** button.

4.3.6 Verify End Units Optical Signal and Service Band

To Verify End Units Optical Signal and Service Band

1. Select each RHU and in the invoked dialog, click the **General** tab.
2. Verify the downlink optical signal level on each RHU by reading the signal value under **Optical Link Level**.

   Greater than 100 is very good. If it is less than 80, determine why (dirty fiber, too many splices/patch panels). The system can compensate for optical levels down to about 70. If it is that low, clean the fiber using CLETOP cleaners as appropriate for male connectors and female receptors.

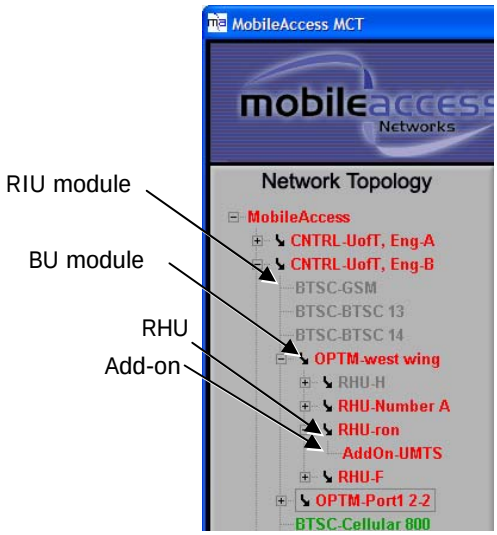
4.3.7 Name the BUs, RHUs and RIUs

Name all the RHUs, Base Units (OPTMs) and RIU using an appropriate naming convention – which indicates the services they support, their location and/or their host cabinet (when relevant).

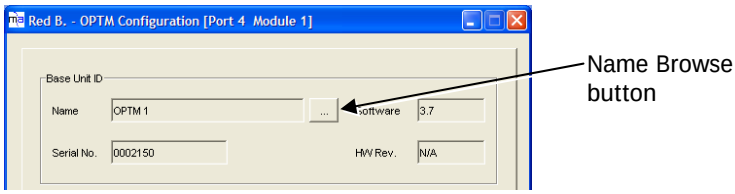
To name the units

1. In the Topology Tree, double-click on the relevant unit.

Note: BUs are listed as OPTMs, RIUs are listed according to RIU WiMAX.



The corresponding dialog is invoked with the General tab displayed by default. A partial OPTM dialog is illustrated below; however, the Name field is the same for all the units.



2. Click the **Name** Browse (...) button and enter the unit name.

4.4 Adjustment Procedure

ATTENTION! It is required to perform the optical adjustment procedure during installation. The procedure takes about 3 minutes.

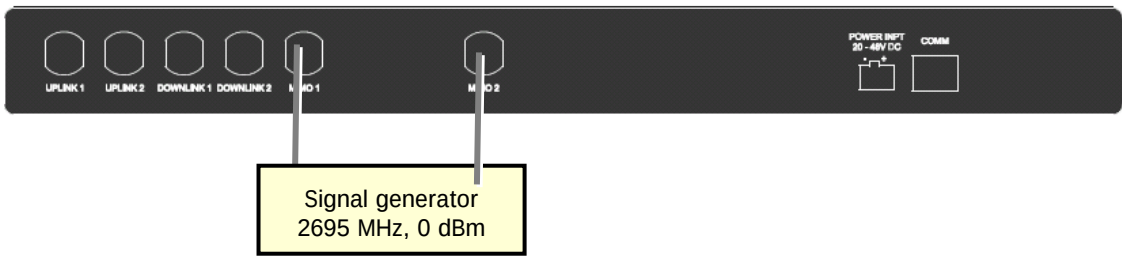
The WiMAX system requires two types of adjustments:

- Downlink adjustments to calibrate the gain of the system to account for different fiber lengths and their resultant losses. (from RIU to RHU FO input)
- Cable adjustment for each channel (RHU antenna port to remote antenna unit).

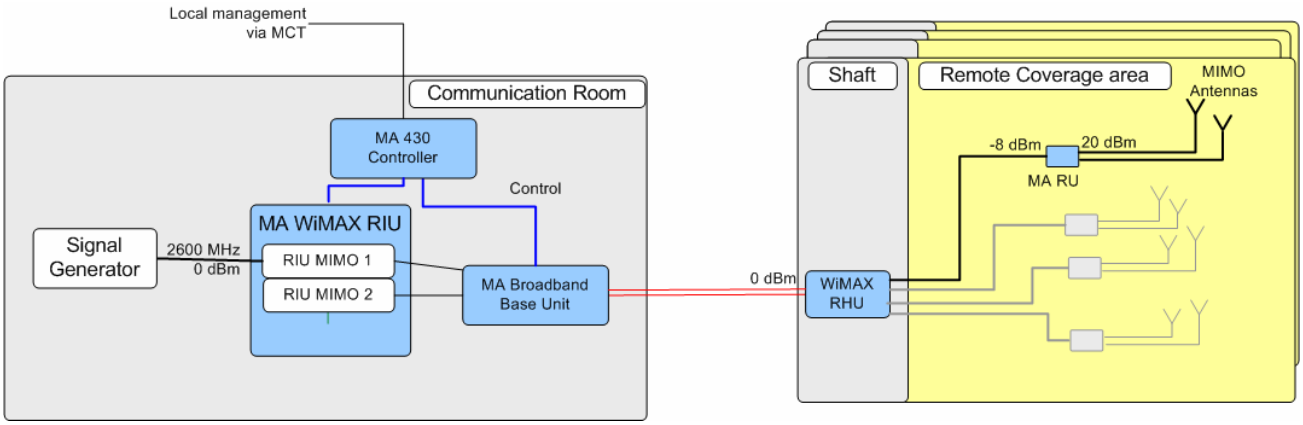
Both procedures are performed via the RHU Adjustment tab.

To perform adjustment procedure

- Connect signal generator at a frequency of 2695 MHz at 0dBM to the RIU **MIMO1** and **MIMO2** ports



- Verify the target power at the RHU input port and at the Antenna Interface Unit is as illustrated below (0dBm at RHU input, -8 dBm at the RU Input and 20dBm at RU output) by doing the following:

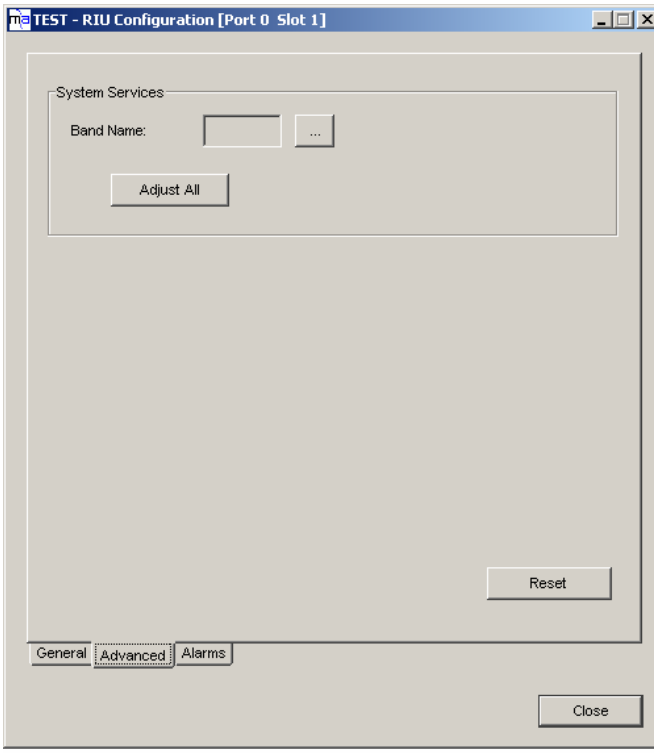


The adjustment procedure can be performed simultaneously for all RHUs and Remote Antennas in the system from the configuration dialog of *any of the RIUs* in your WiMAX system.

Note: Each RIU contains a list of all other RIUs and all other RHUs and Remote Antenna Units so the adjustment is performed on all these units at once.

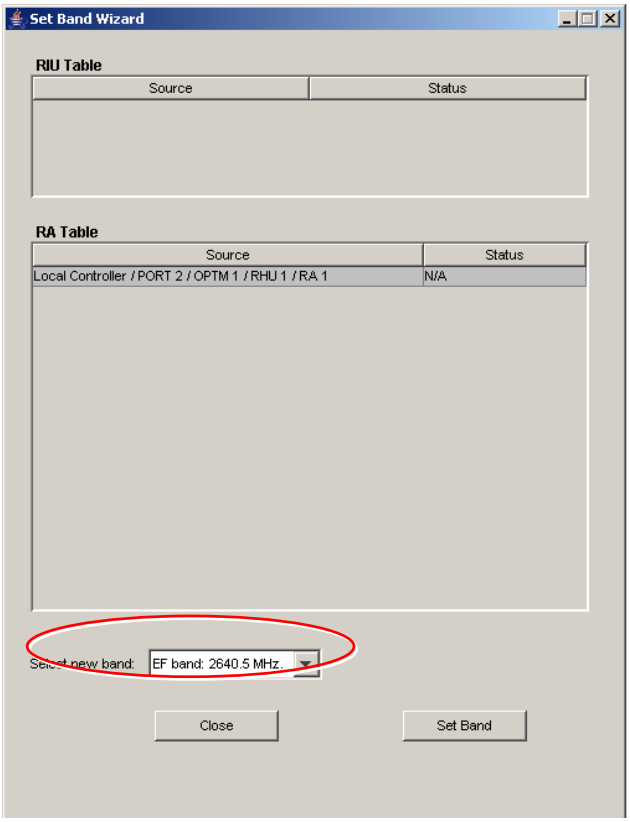
To perform the adjustment procedure

1. In the **Topology Tree**, double-click on any of the RIU modules. The RIU configuration dialog appears. Click the **Advanced** tab. The following pane containing the adjustment options appears.



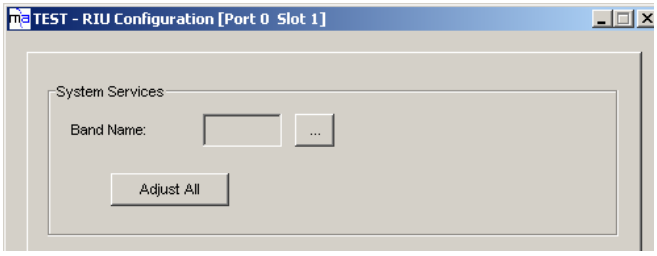
2. In the **Band Name**, select the sub-band in which the system will operate by doing the following:

   - Clicking the adjacent **Browse (....)** button. The following pane appears.



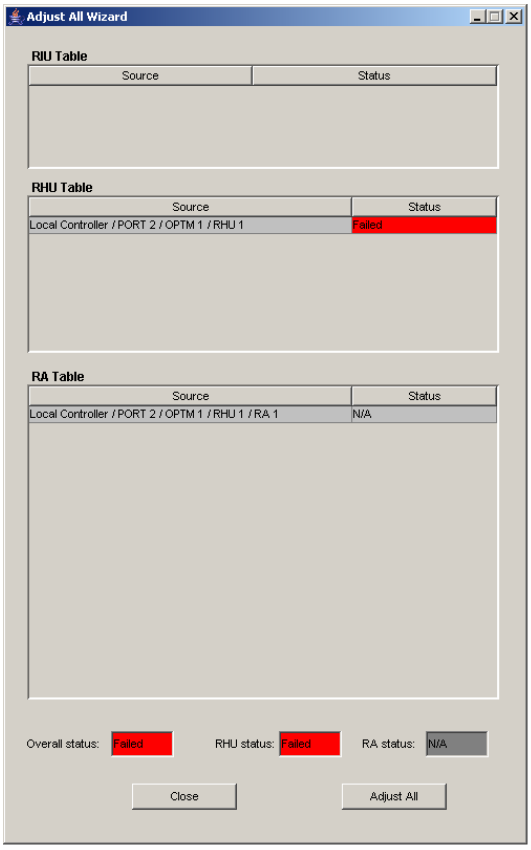
- In the **Select New Band** field, choose from the following bands (the list below shows the center frequency of each band) and click **Set Band**:
  - o AB: 2502-2535 MHz (2518.5 ±15MHz)
  - o CD: 2535-2568 MHz (2551.5 ±15MHz)
  - o EF: 2624-2657 MHz (2640.5 ±15MHz)
  - o GH: 2657-2690 MHz (2673.5 ±15MHz)

You will return to the **Advanced** pane.



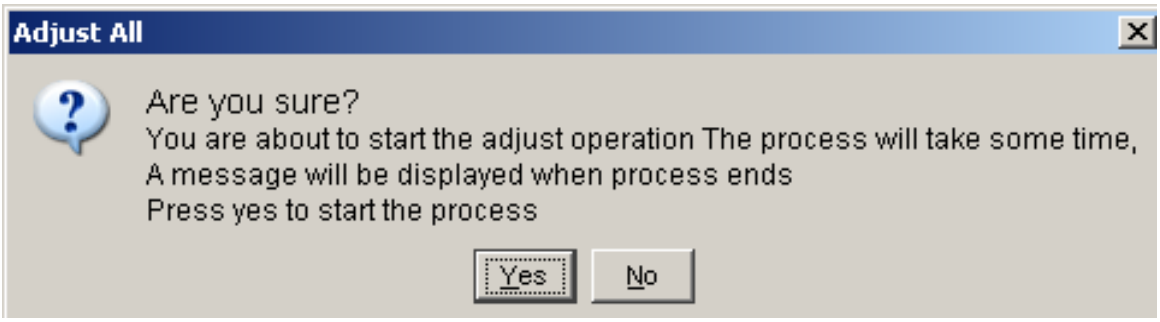
3. In the **Advanced Pane**, click **Adjust All.** The adjustment pane appears.

   The pane shows (as groups) the RIUs, RHUs and RAs in the system. The overall status of the elements is displayed t the bottom of the pane, where the highest alarm level of any group of elements is displayed. (i.e. if one of the RHUs is RED then, the RHU status is RED).



4. Click **Adjust All** to initiate the adjustment procedure. A verification dialog appears.

   Respond with **Yes** to begin the procedure.



5. Click **Adjust All.** The adjustment dialog appears.

5 Using MCT

5.1 General

Once the system devices have been mounted and connected for each controller, install the MCT on a (laptop) computer and use the MCT application (provided with your NMS system) to verify the installation and configure the parameters of the devices relevant to the connected controller.

MCT Features and capabilities

- Hierarchically display of the connected controller and the hosted devices with status information
- Automatic detection of MobileAccess Base Units, RIUs, RHUs and Add-on devices
- Base Line setting for MobileAccess site devices that shows which devices should be connected even if communication is lost with a specific device
- Three access levels: Operator, Engineer and Technical Support
- Stand-by option enables receiving event notification for dial-up connection if the status of the connected controller changes
- Inventory of equipment (BUs, RHUs) connected to the controller can be exported as a CSV file to be viewed via an external application (i.e. Excel)
- Intuitive adjustment procedure using either a real or emulated signal for MobileAccess devices (Chapter 4.)
- **Backward compatibility** with MCT and device S/W versions 3.0 and higher

5.2 Getting Started

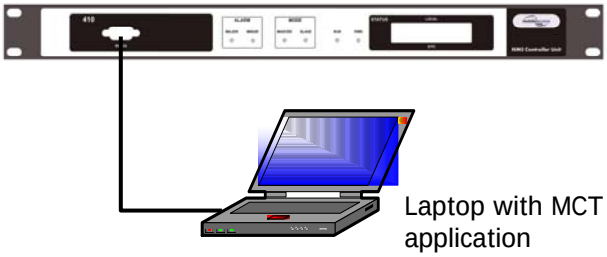
The configuration procedure is performed through a PC that is serially connected to the Master (or standalone) controller.

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

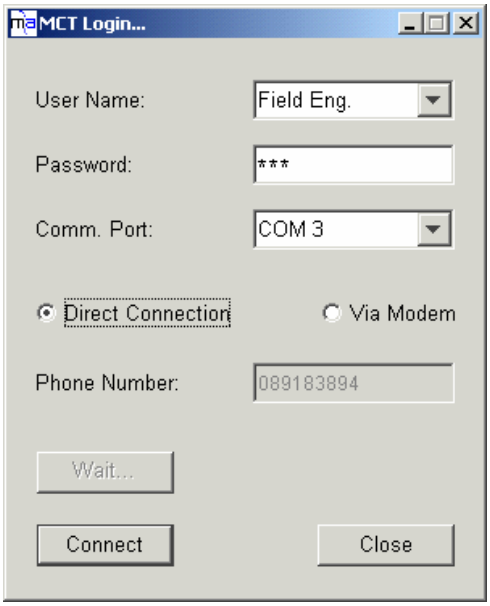
5.2.1 Serial Connection and Login

To connect to the controller locally

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



2. Launch the MCT application by double-clicking on the MCT icon on the desktop. The Login dialog appears.



3. To access the MCT screen 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 section 0.

4. Select the **Comm Port** according to the communication port to which your computer is connected.
5. Click **Connect**. The MCT main window appears.

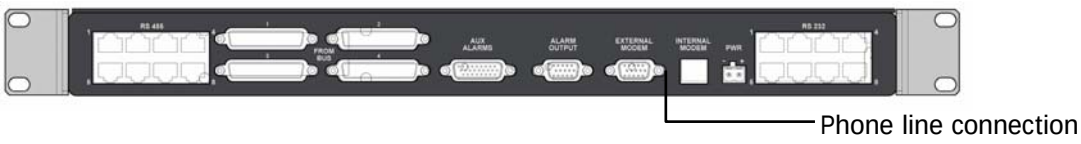
5.2.2 Dial-up Modem Connection and Login

You may remotely connect to the **MA 410** controller via dial-up connection. For this connection to be available, the controller must be connected to a phone line.

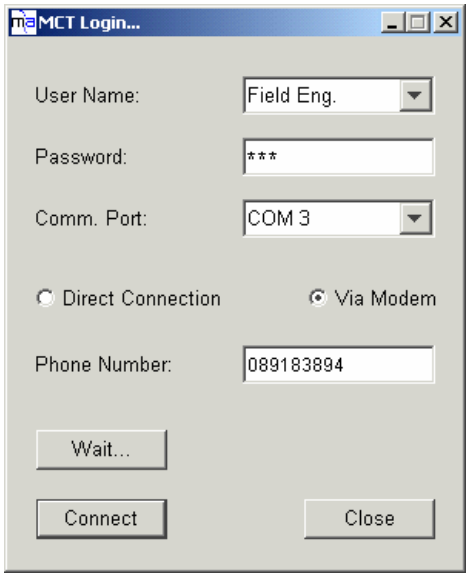
Note: Once the initial configuration procedure has been completed, the controller can be set to notify of events through the dial-up connection (refer to section **Error! Reference source not found.**).

To connect to a MA 410 controller from a remote dial-up connection

Connect the controller **External Modem** port to a phone line.



1. At the remote location, connect your computer dial-up modem connection to a phone line and note your dial-up port number.
2. Launch the MCT application on your computer. The MCT Login dialog appears.



3. To access the MCT screen at a level that provides access to configuration options, select the **User Name** '**Engineering'** and enter the default Engineering password '**eng'**

Note: The password can later be changed from the **Security** menu (in the main window). The access levels and passwords are described in 0..

4. In the MCT Login dialog, select **Via Modem…** select the **Comm Port** on the computer and enter the **Phone Number** of the line connected to the controller.

   Enter the phone number in the following format:

   A phone number that is up to 12 digits, where a coma (,) indicates a 'wait' state required when an outside line is accessed. For example: **9,4234889805** where '9' accesses an outside line, '423' is the area code, and '4889805' is the number.

5. Click **Connect.** You will be connected within a few seconds.
6. You may now perform the configuration procedure.

5.3 Navigating the MCT Application

The MCT main window shows all the currently connected and defined devices and their status and provides access to device management functions as well as to system management options such as security, file export, etc.

The MCT window is divided into the following areas:

- **Menu Bar** - provides access security, events display and report generation options (section 5.3.1).
- **Network Topology** – hierarchically displays the defined and available site devices and their status. (see 5.3.2)
- **Work Area** – the display corresponds to the selected menu or tree item (section 5.3.3)

Note: For optimal response time, it is recommended to open the minimum required windows and close windows that are no longer necessary. A window that is not edited for five minutes will be automatically closed. A window acceleration mechanism accelerates the responses when adjustments are made by temporarily refreshing only the active window (events, Topology View, Device View, etc. will not be updated).

The figure below shows the Work Area display when the CNTRL item is selected. It shows any Base Units and RIUs connected to the controller. Control dialogs for the device or for elements hosted by these devices (RHUS for BUs or BTSC/BDAC for RIUs) are accessed from the tree or by double-clicking on specific areas of the device.

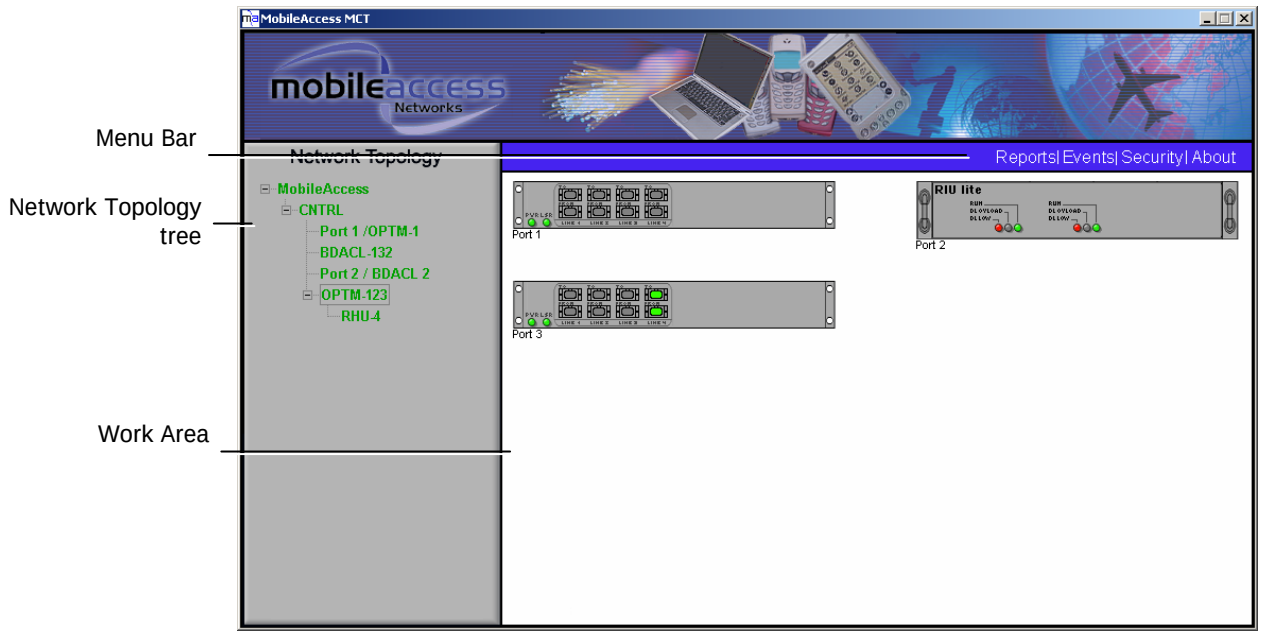


Figure 5-1. MCT Main window

5.3.1 Menu Bar

The Menu Bar contains the following options:

- **Reports** – used to generate a tabular summary of information on connected devices (section 5.9).
- **Events –** click to show the events that occurred on the monitored devices. Configuration changes that are initiated by the network manager are not considered events display. (section **Error! Reference source not found.**.
- **Security –** Accessible only to Engineer user level. Provides password change option (section).
- **About –** click to view the MCT version. Useful for upgrades.

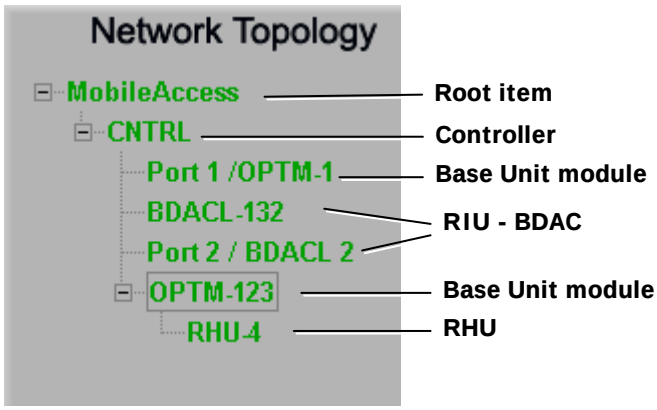
5.3.2 Understanding the Network Topology Tree

Note: It is important to understand the Network Topology display since you will be required to verify the device connections before the configuration procedure can be performed. The MCT Network Topology tree display differs from the NMS Network Topology Tree display.

The MCT Network Topology tree shows a *single* connected controller to which the session was opened, and the hosted devices – RIUs, Base Units, RHU. The view displays both connected and disconnected network devices in the appropriate hierarchy and colors corresponding to their status.

The MCT Network Topology tree includes problem sourcing features such as:

- Color indication corresponding to the elements status
- Real-time updates of device status
- Upward propagated element status colors
- Arrows indicators leading towards the element that is the source of the problem



The devices are displayed as follows:

- **CNTRL** – controller
- **BDAC/WRIU –** RIU displayed according to BDAC or WRIU modules, where the suffix 'L' (i.e. BDACL) stands for RIU Lite.
- **OPTM-1/OPTM-2 -** Base Unit displayed according to 4-port modules, where each 4-port module is referred to as OPTM. Each OPTM is displayed along with the Controller port to which it is connected.
- **RHU –** Remote Hub Units. Each RHU is displayed under the OPTM to which it is physically connected, along with the OPTM port to which it is connected.

5.3.2.1 When and how are devices displayed in the tree?

- Connected devices are displayed in **green**, **red** or **yellow**. Disconnected, or future devices that have been defined to the base-line, are displayed in **gray**.
- MobileAccess devices – RIUs, MA BUs and MA RHUs and Add-ons.
- Connected MA devices are automatically identified. It is recommended to assign a name to each device.
- Disconnected MA devices are displayed in gray (once a base-line has been set as part of the configuration procedure
- Newly added RHUs or Add-on devices are identified only after the host OPTM has been reset (either locally or through the configuration dialog).
- Legacy devices – Legacy BUs and RHUs.
- Legacy BUs and RHUs are detected only after they have been configured.

5.3.2.2 Tree Status Colors

Faults are propagated only through an arrow so that the faulty device can be quickly identified by its color. The tree colors indicate the status of the elements:

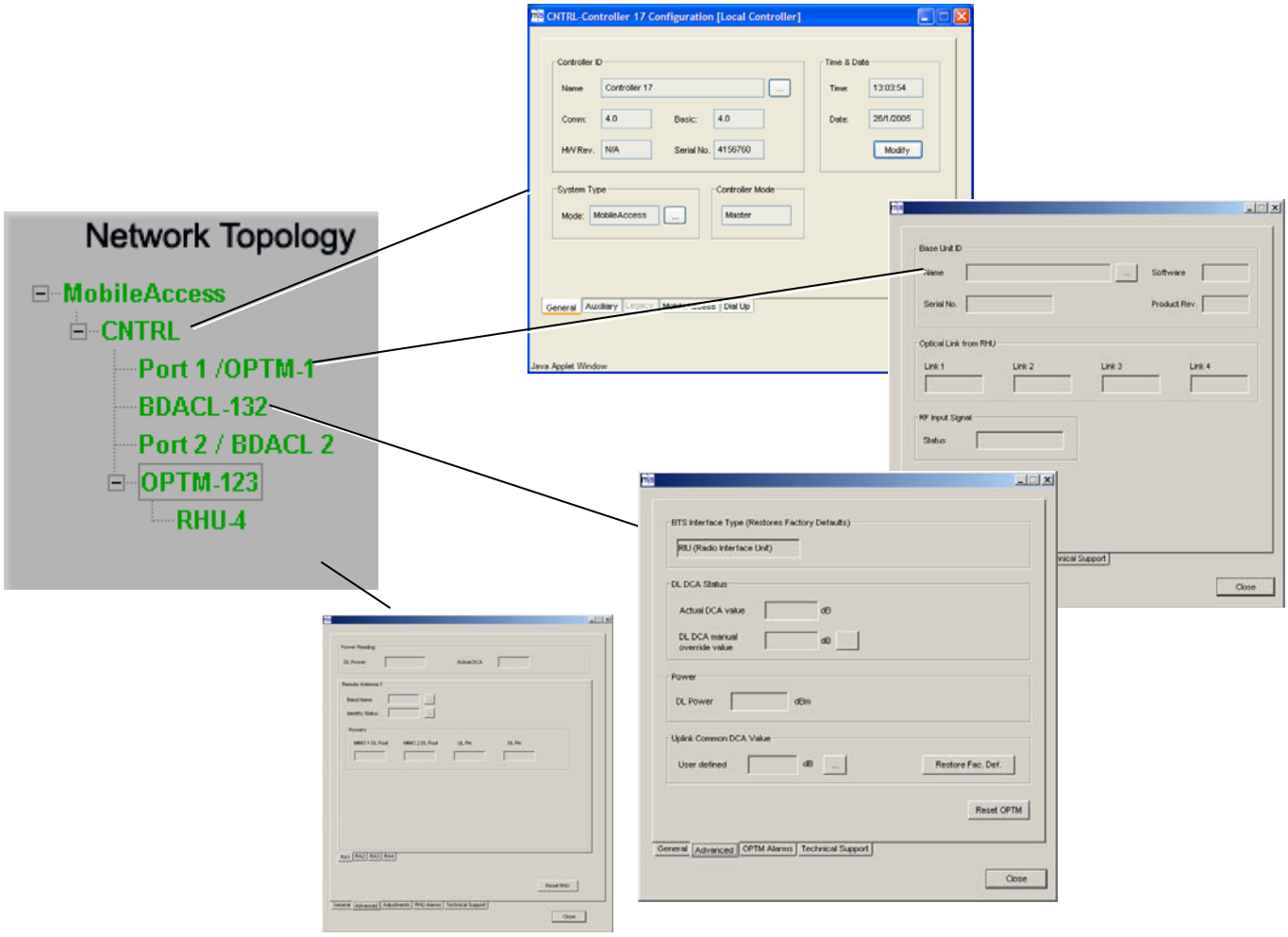
Color	Indicates
Green	OK
Yellow	Minor error.
Red	Major error.
Gray	No communication to a (MobileAccess) device set in Base-Line. If communication to a device that was not set in Base-Line is lost, the device disappears from the display.
Blue	Version incompatibility (device version 3.0 and host controller version 3.1)

5.3.2.3 Invoking configuration dialogs from the Topology tree

All device configuration dialogs may be invoked from the topology tree by clicking on the appropriate items. This includes the configuration dialogs for the MA 410/430 controller, BTSC, OPTM, RHU and add-on unit.

Note the following:

- Each OPTM (Base Unit module) is managed by a dedicated dialog
- Each BTSC/BDAC (RIU module) is managed by a dedicated dialog



5.3.3 Device View Pane

The Device View pane provides a display of the status of the BU, RIUs and Auxiliary Ports connected to the *selected* controller. The configuration dialog for each **OPTM**, **BTSC, RHU** and **Add-on** can be invoked by clicking on the appropriate icon.

Note the following:

- Each OPTM (Base Unit module) is managed by a dedicated dialog.
- Each BTSC/BDAC (RIU module) is managed by a dedicated dialog

To invoke configuration dialog from the Device View

To invoke the configuration dialog for:	Do this:
A **WRIU** unit	Click on the relevant **WRIU** in the RIU image
An **OPTM** unit	Click on an *empty space* in the relevant **OPTM** in the BU image. *Do not click on the LEDs in the OPTM* – this will invoke the RHU configuration dialog.
An **RHU** unit	Click on the appropriate **LED** in the relevant **OPTM** view.
The **Controller**	Click on the **Auxiliary Alarms** icon. The icon appears only after auxiliary connections have been enabled for that controller.

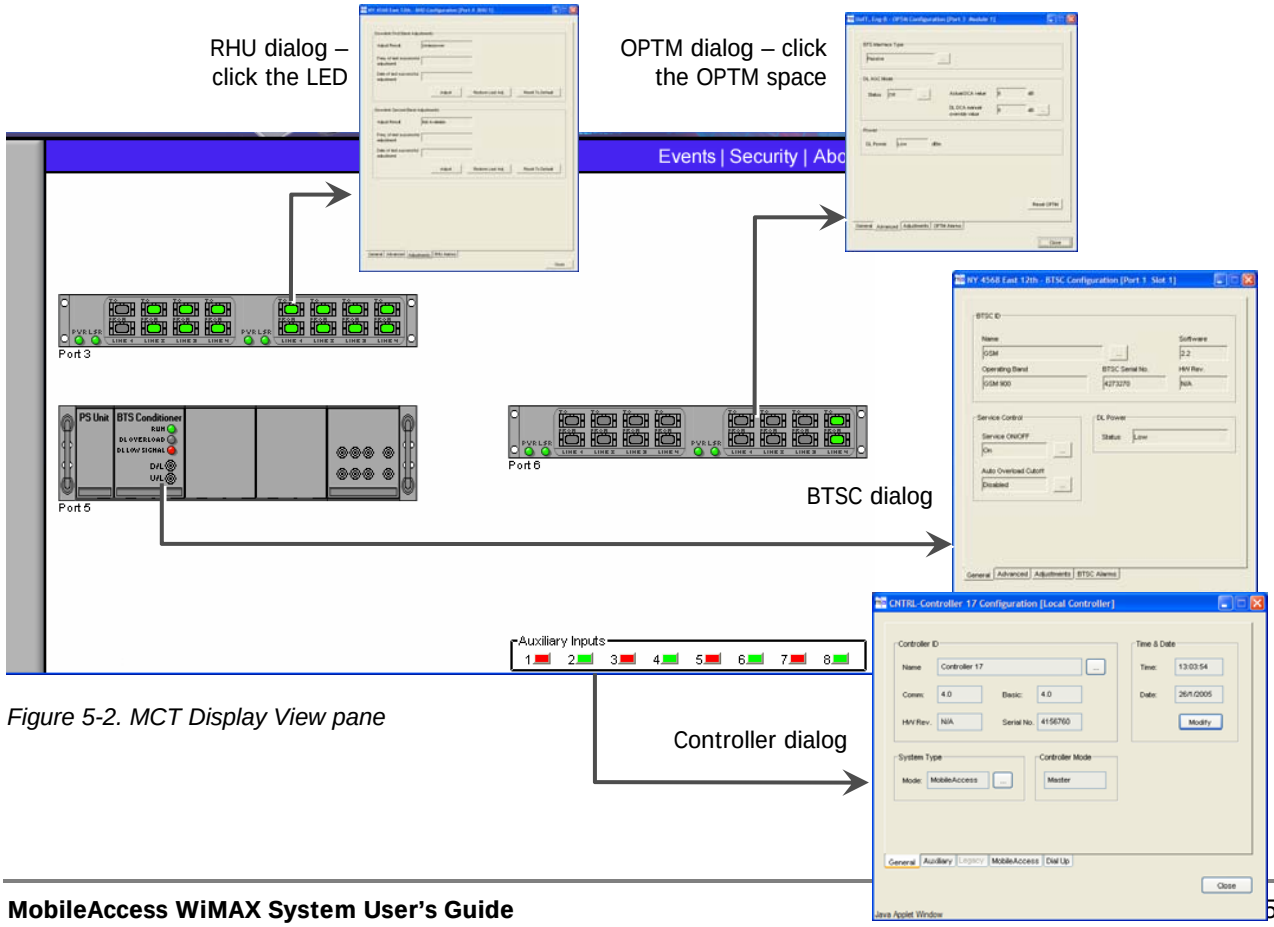


Figure 5-2. MCT Display View pane

5.3.4 About Device Configuration Dialogs

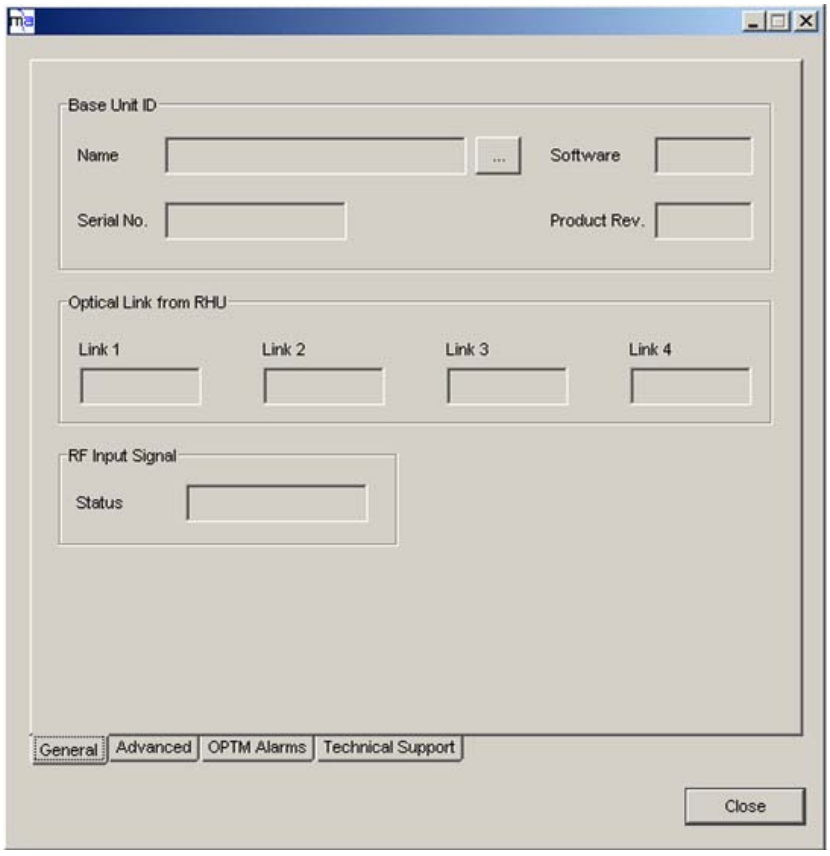
Each MA device has an individual configuration dialog that provides configuration, control and monitoring options.

- **RIU, OPTM** and **RHU** device configuration dialogs may be invoked either by:
  - Double-clicking on the device in the **Network Topology** tree
  - Double-clicking on the appropriate image area in the **Device View**

In general, the device configuration dialogs contain four panes:

- **General** – provides device version and identification definitions
- **Advanced** – device control parameters such as signal control, disable, and device reset
- **Adjustment** – used for the adjustment procedure
- **Alarms** – device specific alarms used for fault sourcing

The parameters vary depending on the device type. Below is and example of the OPTM configuration dialog showing the General tab. The configuration dialogs are described in section 5.6 - Controller Configuration, and section 5.7 - Configuring MobileAccess Devices



5.4 Authorization Levels and Passwords

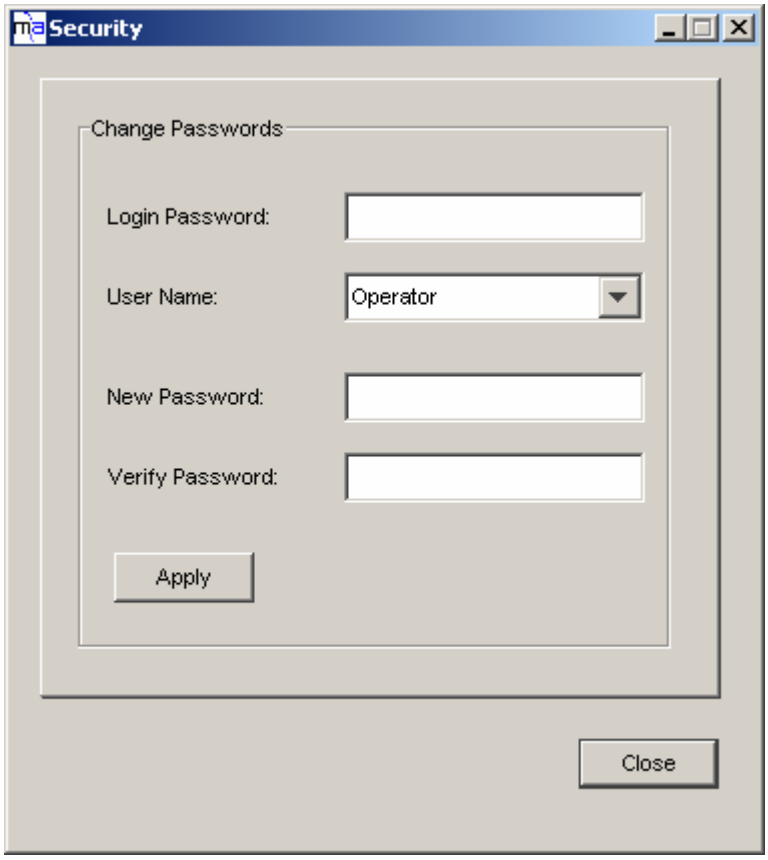
MCT enables access at three authorization levels. Each level is provided with a default password that can be changed through the **Security** menu.

Authorization Levels

- **Oper** – enables the user to view the configuration and the events display. Events acknowledge capabilities are not available to Operator level users. Default password = 'oper'
- **Field Eng –** provides configuration capabilities to all options displayed at this entry level. Default password = 'eng'
- **Technical Support** – restricted to MA service personnel.

To modify the password

1. Click on the **Security** menu. The following dialog appears.



2. Select the **User Name** whose password is to be modified.
3. In the **Login Password,** enter the current password.
4. In **New Password** type the new password. Type the password again in **Verify Password**.
5. Click **Apply**.

5.5 Configuration Overview

1. Name and configure the controller system parameters (5.6.1) and auxiliary parameters if relevant (5.6.2).
2. Configure each of the devices it host: **RIUs**, **BUs**, **RHUs**. Refer to the instructions given in the following sections.
3. Once the basic configuration is completed, perform the adjustment procedure according to *MA1000/2000 Commissioning Guide*. Once the adjustment procedure is complete, all devices should be displayed in **green**.
4. You may then monitor the site through the MCT topology tree and source any detected faults (red or yellow colored devices) through the device view configuration dialogs.
5. Review the configuration via Inventory Reports (section 5.9).

5.6 Controller Configuration

A number of simple configuration steps must be performed:

This section describes the steps required to:

- Configure the controller system parameters – name and time and date
- Configure auxiliary devices connected to the controller (if relevant)
- Configure support for MobileAccess WiMAX devices.

Note: All configuration procedures are performed through the controller dialog – invoked by double-clicking on the controller item in the **Network Topology**.

5.6.1 Configuring Controller System Parameters

It is recommended to assign the controller a recognizable name that would indicate its location, and to verify that the correct **time and date** are set for the controller since events for devices under this controller will be received with the set time and date.

To configure the controller system parameters

1. In the **Network Topology**, double-click on the controller to be redefined. The controller configuration dialog appears.
2. Choose the **General** tab.

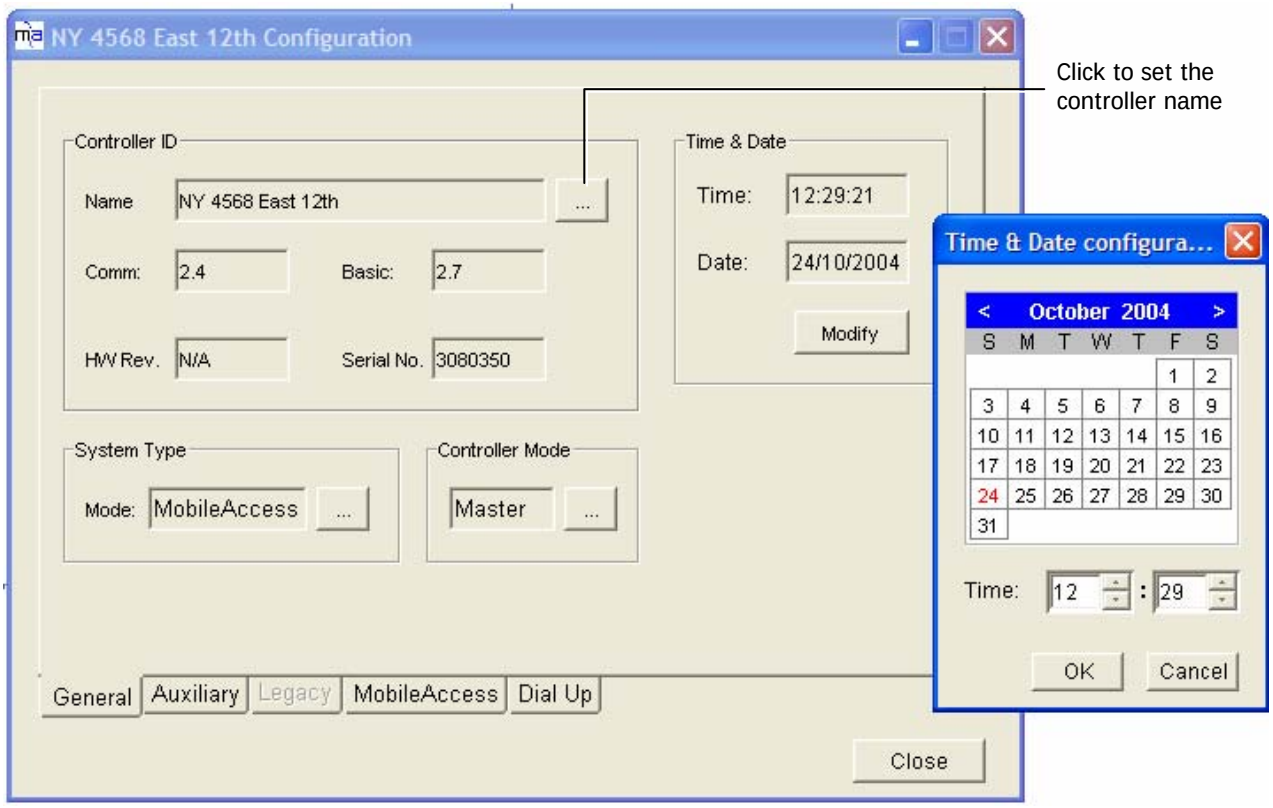


Figure 5-3. Controller Configuration Dialog

3. Click the **Name** browse button and type the controller name - up to 20 characters including spaces.
4. In the **Time and Date** area, verify the correct time (24 hour clock) and date are defined; to modify, click on **Modify** and make the required changes in the invoked dialog:
   - In the calendar, choose the date, using the <arrows> to scroll to the correct month if necessary
   - In the **Time** field, set the hour and minutes
   - Click **OK**.

5.6.2 Configuring Auxiliary Devices

Auxiliary devices such as switches for power supplies, air conditioners or door-open indicators, that are connected to the controller can be monitored through LEDs displayed in the MCT.

The auxiliary device LEDs are displayed in the Device View pane, when the corresponding controller is selected – *but only after the auxiliary device connections have been configured.*

To configure connected auxiliary devices

1. In the configuration tree, double-click on the MA 410 controller to be configured to invoke the controller configuration dialog and select the **Auxiliary** tab.

   The enabled (relevant) connections are colored **blue** (i.e. 1,2 and 3 in the example below)**.** The (user defined) name assigned to each connection is displayed alongside the connection (i.e. PS, Air Cond and Door).

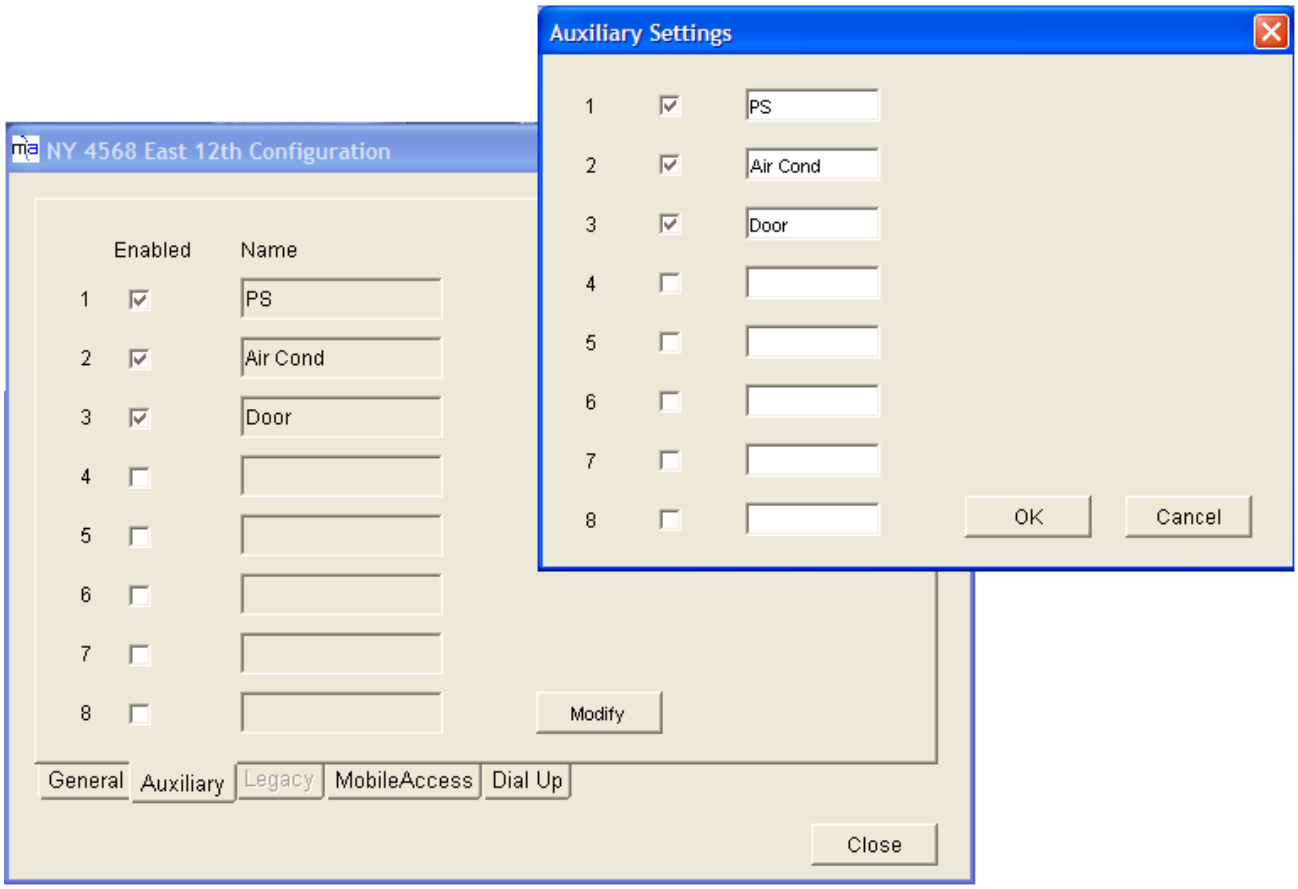


Figure 5-4. Auxiliary Device dialog

2. To change the active connections and assigned names, click **Modify.** The Auxiliary Settings dialog appears.
3. Checkmark each of the Auxiliary pins to be activated, assign them identifiable names and click **OK**.

- In the **Auxiliary** tab, the enabled Auxiliary connections will be marked by **blue** LEDs.
- In the **Device View pane** (along with the other devices connected to the controller), the enabled auxiliary connections will be displayed in either **green** or **red** (depending on their status) when the host controller item is selected in the Network Topology.

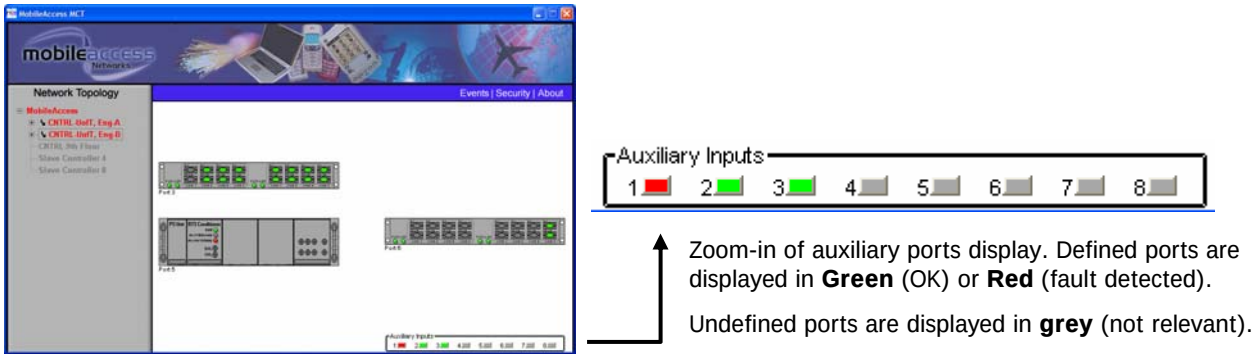


Figure 5-5. Auxiliary Device View

5.7 Configuring MobileAccess Devices

Once the controller has been configured to operate with MobileAccess devices, these type of devices are automatically identified by the controller and are displayed in the Network Topology.

Additional device parameters may then be configured according to the installation and site requirements. For example, if your system includes an RIU, each BU must be configured to receive its RF signal source via an RIU (since by default it is configured to interface with passive interface).

The procedures are performed from the configuration dialog of each device. The dialog is invoked by double-clicking on the element in the **Network Topology** or in the **Device View** pane.

5.7.1 Configuring for a MobileAccess Device Hosting

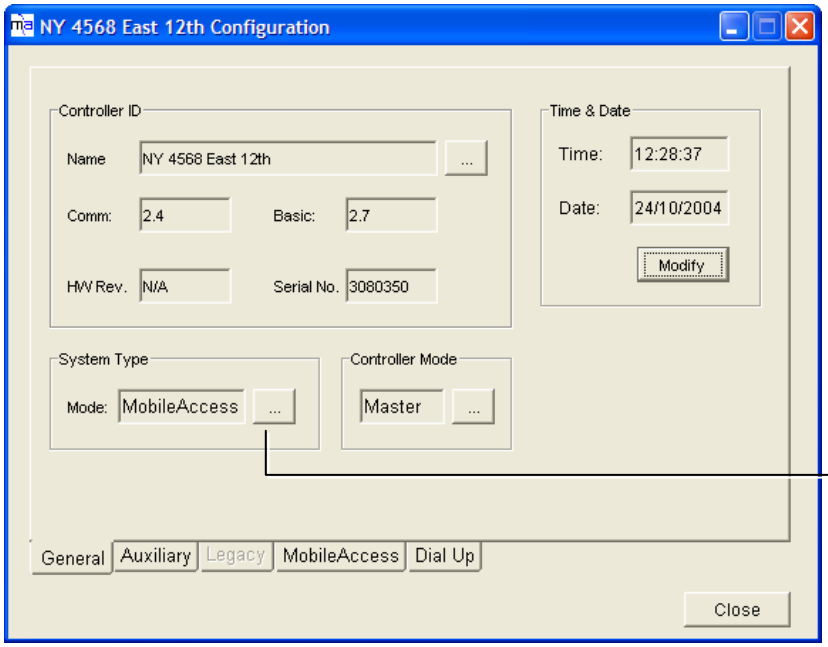
In this mode, the controller activates an Auto detection mechanism that constantly monitors its RS485 rear panel ports for BUs and RIU devices.

RHUs and add-ons are detected in a similar manner by their host OPTM (BU element) *every time the BU is powered-up or reset from the MCT* and added to the Network Topology.

Note: Newly added RHUs or add-on's will be detected by the OPTM only after the OPTM has been **reset**. The reset can be software executed through the OPTM configuration dialog.

To configure a controller with MobileAccess devices

1. In the configuration tree, double-click on the MA 430 controller to be configured to invoke the controller configuration dialog and select the **General** tab.



2. Under **System Type,** verify that **MobileAccess** is selected, clicking the **Mode** Browse button and selecting the option if necessary. The MobileAccess tab should become available.

Note: Close and reopen the dialog if the tab does not become available within a few seconds.

3. Verify that all the MobileAccess devices (RIUs, OPTMs, RHUs and Add-ons) connected to this controller are displayed in the Network Topology pane under their corresponding hosts, and are colored **green**, **red** or **yellow**. Any of these colors are acceptable before the adjustment procedure has been performed.

5.7.2 Adding a New MobileAccess Device

Each time a MobileAccess device is added to the system, the **Base Line** must be set again.

To reset the Base Line

1. In the **Topology Tree,** double-click on the controller hosting the new device.
2. In the controller configuration dialog, select the **MobileAccess** tab and click the **Base Line** button.

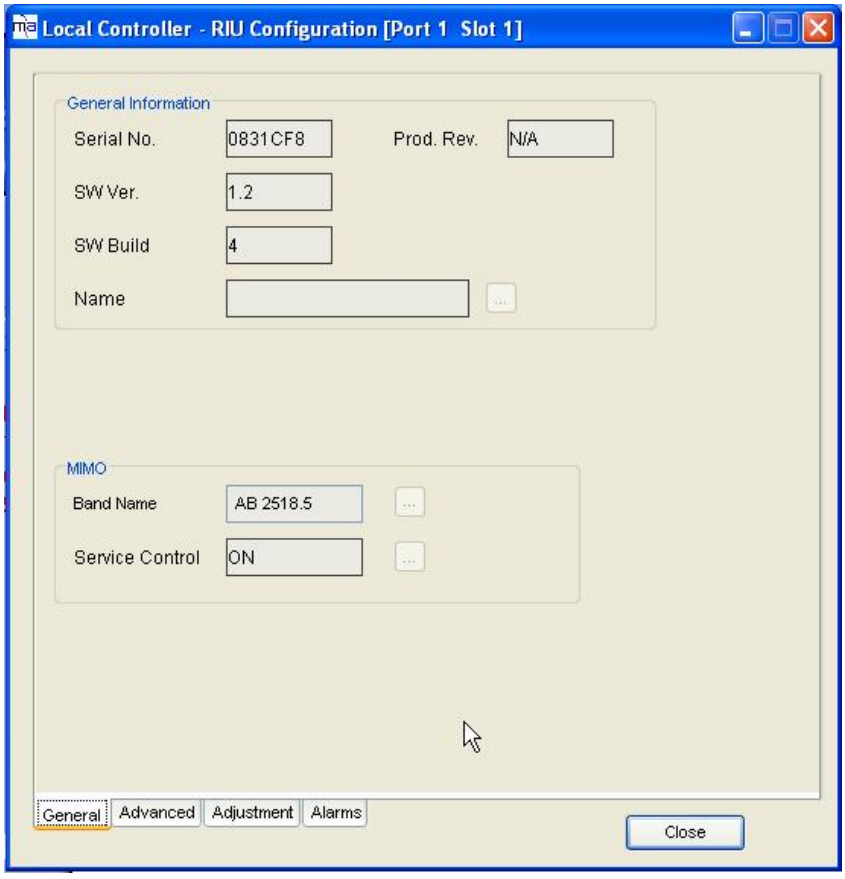
5.7.3 WIMAX (WRIU) RIU Configuration and Control

Each WRIU unit in the RIU is individually configured and controlled through a dedicated configuration dialog. The main functions provided are:

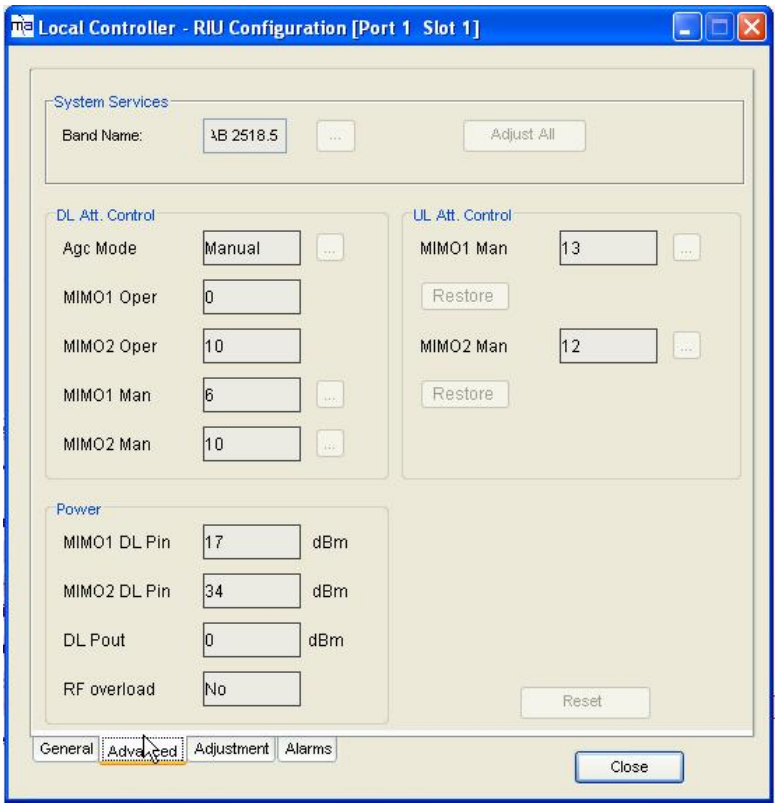
- Setting gain control either automatically (AGC) or manually
- Resetting the BTSC
- Monitoring the downlink signal

To configure and control the WRIU

1. Double-click on the **WRIU** item in the **Network Topology**, or double-click on the specific WRIU in the **Device View**. The WRIU configuration dialog appears with the **General** tab displayed by default.



2. Click the **Name** Browse button and assign the WRIU a recognizable name (i.e. operator name).



3. The DL gain may be set automatically (AGC) or manually (DCA – Digital Control Attenuation). To control the **DL gain control**, set the **DL AGC Mode** in the **Advanced** tab:

   - **DL AGC Mode Status (Manual/auto) –** Sets DL AGC mode.

     Auto – automatic gain control to compensate for input power variations When enabled, gain control is performed automatically;

     Manual - DCA can be set manually (**DL DCA Manual Override Value**)

   - **MIMO 1/2 DCA Value –** Digital Controlled Attenuation. An internal value that is reset each time the adjustment procedure is performed

4. To reset the BTSC, click the **Reset WRIU** button in the **Advanced** tab.

5.7.4 OPTM (BU) Configuration Dialog

Each OPTM unit in the BU is individually configured and controlled through a dedicated configuration dialog.

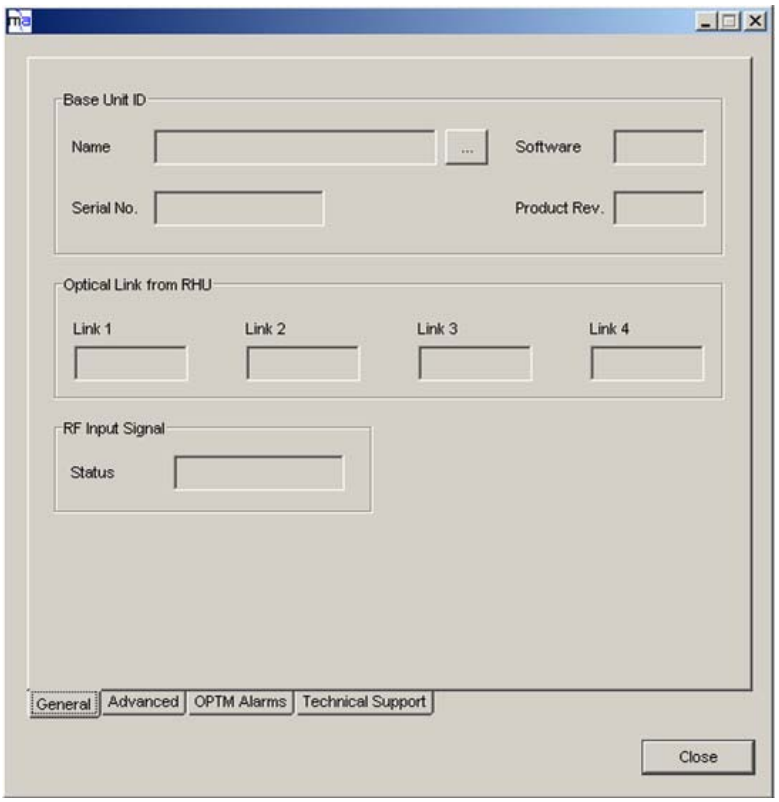
Note: While most parameters are optional, each OPTM must be configured to interface with RIU devices in installations that include RIUs. This is required, since by default OPTMs are set to operate with passive interfaces.

The main functions provided are:

- **Configuration of interface type on the BTS side (RIU or passive)**
- Setting gain control either automatically (AGC) or manually
- Resetting the OPTM – required each time an RHU or MA 1200 add-on unit is added
- Monitoring the downlink signal

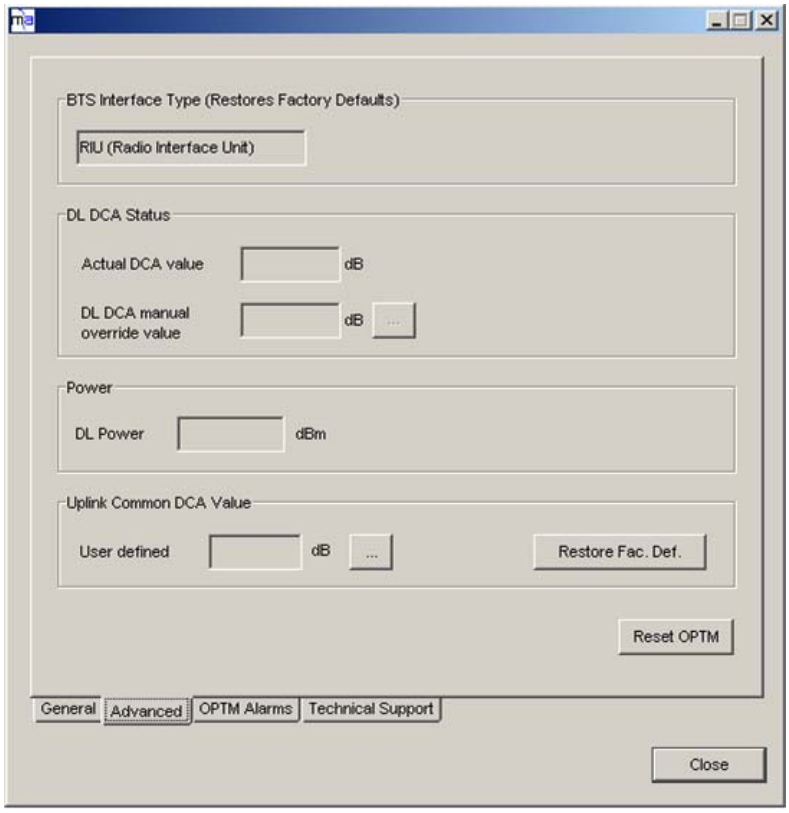
To configure and control the OPTM

1. Double-click on the **OPTM** item in the **Network Topology**, or double-click on the specific OPTM in the **Device View**. The OPTM configuration dialog appears.



2. In the **General** tab, click the **Name** Browse button and assign the OPTM a recognizable name that indicates the technology to which it interfaces.

3. For sites in which RIUs are installed, configure the OPTM interface on the BTS side as RIU:
   - Click the **Advanced** tab.
   - Under **BTS Interface Type**, select RIU (default = Passive)



4. The DL gain may be set automatically (AGC) or manually (DCA). To control the **DL gain control**, set the **DL AGC Mode** in the **Advanced** tab:
   - **Status (On/Off) –** Sets DL AGC mode. When enabled, gain control is performed automatically; when disabled (Off), DCA can be set manually (**DL DCA Manual Override Value**)
   - **DL DCA Manual Override Value –** manual DL gain control. This option becomes available only when **DLA AGC Mode** (Status) is disabled.

     Range – 0 to 31 dB

     Actual value is displayed under **DCA Value** (dB).
5. To reset the OPTM, click the **Reset OPTM** button in the **Advanced** tab.

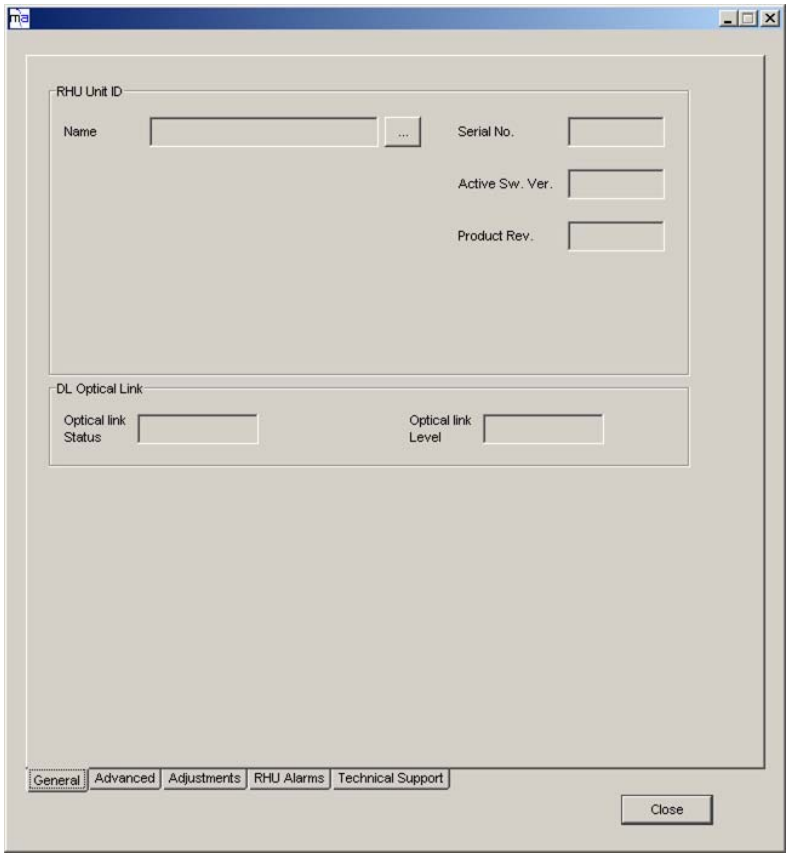
5.7.5 RHU Configuration Dialog

Each RHU is individually configured and controlled through a dedicated configuration dialog. The main functions provided are:

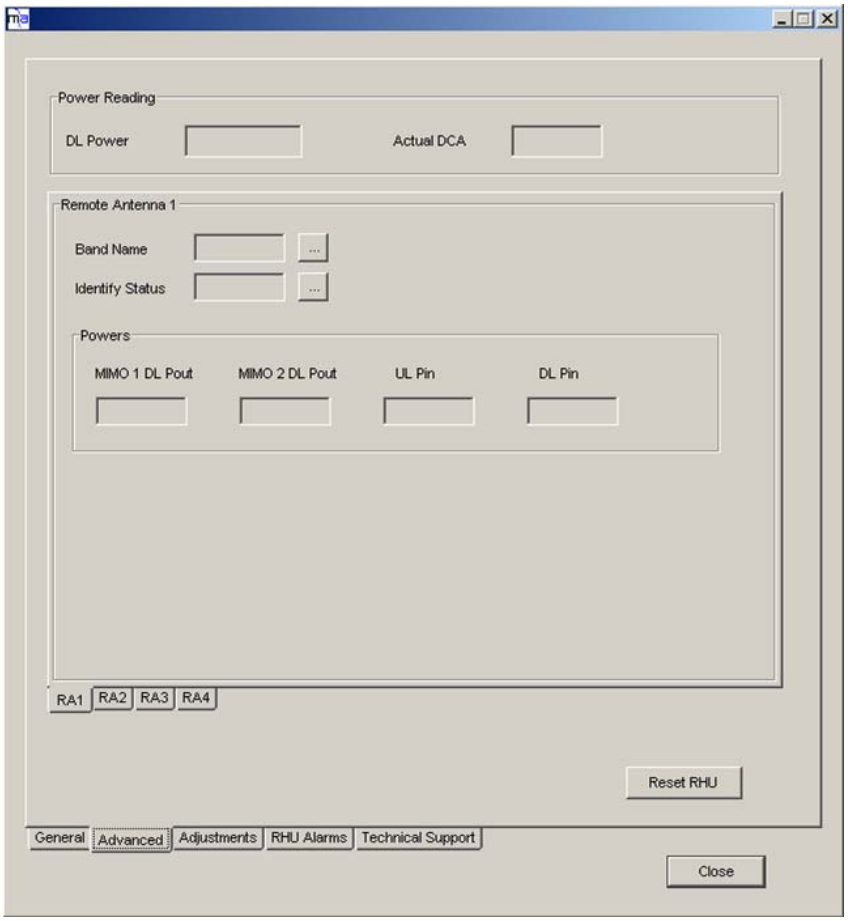
- Controlling the services (on/off) and the DL output power to the antennas
- Setting the Uplink gain control
- Resetting the RHU
- Monitoring the signal

To configure and control the RHU

1. Double-click on the **RHU** item in the **Network Topology**, or double-click on the specific *RHU link* in the OPTM in the **Device View**. The RHU configuration dialog appears.



2. In the **General** tab, click the **Name** Browse button and assign the RHU a recognizable name that indicates its supported services and location.
3. Configure the RHU band name choose from the following bands (the list below shows the center frequency of each band) and click **Set Band**:
    - AB: 2502-2535 MHz (2518.5 ±15MHz)
    - CD: 2535-2568 MHz (2551.5 ±15MHz)
    - EF: 2624-2657 MHz (2640.5 ±15MHz)
    - GH: 2657-2690 MHz (2673.5 ±15MHz)
4. To disable one of the bands or change its power output to the antennas:
    - Click the **Advanced** tab.
    - Under **Service Control**, you may disable (OFF) the **First Band** or **Second Band** or configure the **DL Power reduction** to optimize the power output to the antennas in answer to changing site conditions



5. To control the **UL AGC**, set the **UL AGC Mode** (default = ON), in the **Advanced** tab for the First Band and Second Band.
6. To reset the RHU, click the **Reset RHU** button in the **Advanced** tab.

5.8 Configuring for Legacy Devices

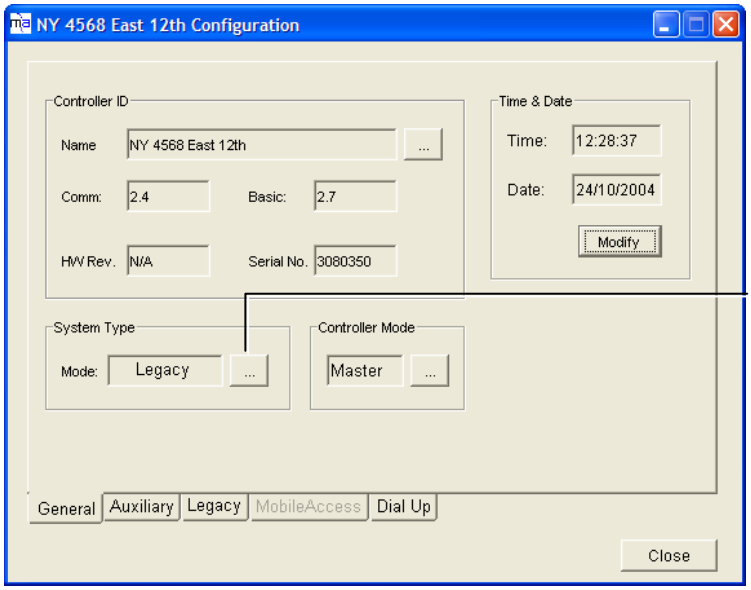
The controller may host Legacy devices. Follow the procedure in this section for a controller to which Legacy devices are connected.

Legacy devices are *not* automatically identified by the controller. Each Legacy BU and the RHUs that it hosts must be configured manually in order to be displayed in the Network Topology.

Note: In this type of configuration, RIUs are not supported.

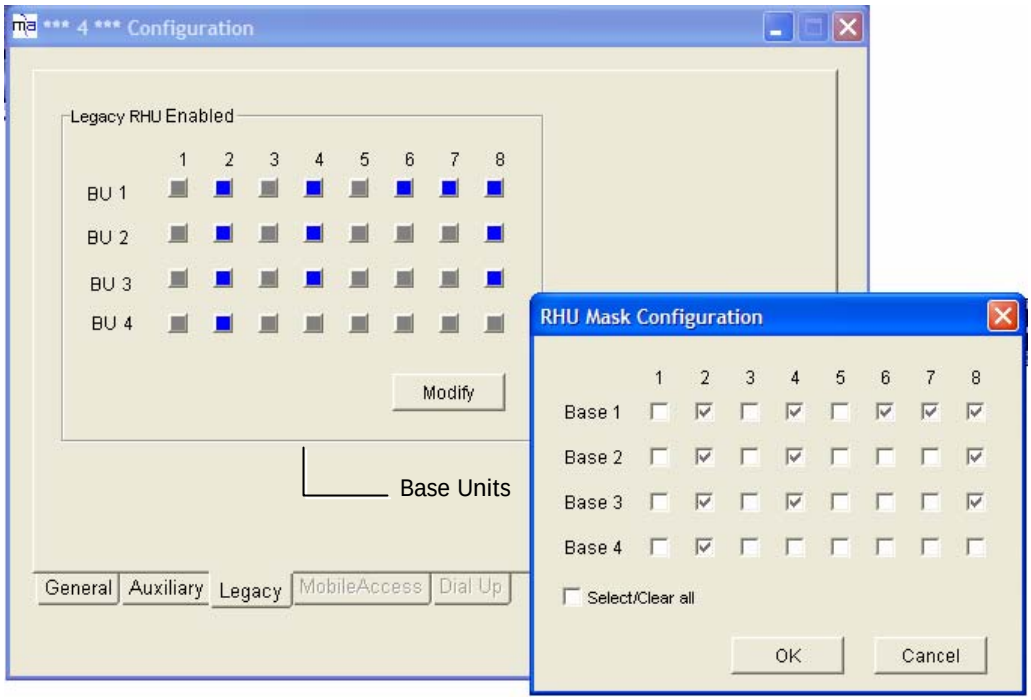
To configure for Legacy devices

1. Double-click on the controller in the **Network Topology** pane to invoke the controller configuration dialog.



2. In the **General** tab, under **System Type,** click the **Mode** Browse button and select **Legacy.** The Legacy tab will be enabled (close and open the dialog if it does not open within a few seconds).

3. Click the **Legacy** tab. The dialog shows four rows: a row per BU and the RHUs it hosts. The currently defined RHUs will be indicated by blue colored squares.



4. To change the configuration, click the **Modify** button.
5. For each configured BU (**Base** row), checkmark the ports to which RHUs are connected and click **OK**.

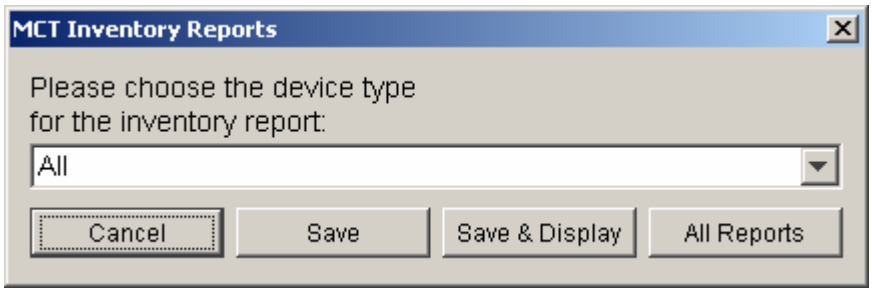
   This configuration will create a base line. The configured BUs and RHUs will now be displayed in the Network Topology in **red, yellow** or **green**. BUs and RHUs to which communication is lost, will be displayed in gray.

5.9 Reviewing the Inventory Reports

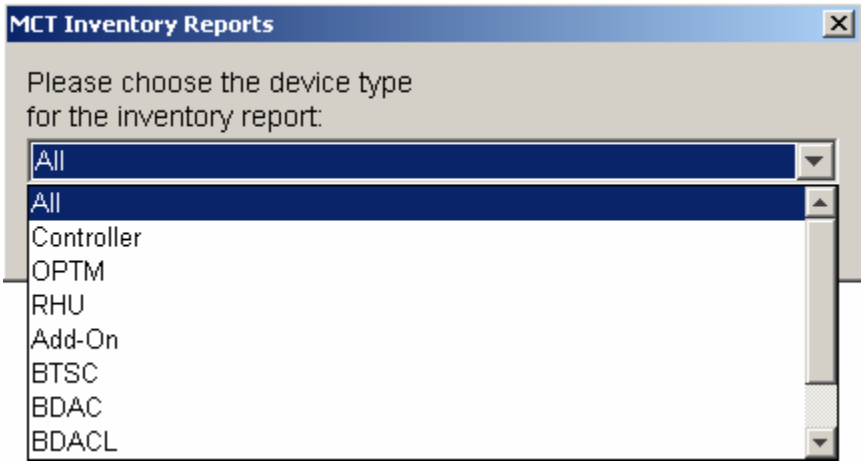
The user can view a list of the devices controlled via the connected controller in a tabular format displayed as an Excel file. This option can be used to see at a glance, information on each connected device. This includes versions, identification information and basic configuration definitions. The file can be saved to a user selected location on the currently used computer.

To view the inventory report

1. In the MCT menu bar, click **Inventory.** The following dialog appears.



2. You may choose to view information on all or any one of the devices relevant to the connected controller.



3. After choosing the device(s) on which to view the report, select the operation as follows:

Click the button..	To...
Save	Save the information as an Excel file to a user selected location.
Save and Display	Save the information and display the file.
All Reports	Generate reports for all devices.
Cancel	Exit this option.

5.10 What Next?

- Your topology is now configured in the MCT. Verify that all your devices are displayed in the Network Topology. Check your configuration procedures.
- **Remember**, the controller must be configured to operate with Legacy or MobileAccess devices, where Legacy devices must be defined.
- For MA 410 controller sites **with RIU:**
  - Verify that the devices are displayed in **green, red** or **yellow**.
  - Perform the adjustment procedure according to the *MA1000/2000 Commissioning Guide*.
- For controller sites **without RIU: t**he devices should *all be* **green**.
  - Perform the adjustment procedure according to *MA1000/2000 Commissioning Guide*.