MA-860 WLAN Solution

(MA-860 Module + WiFi Coverage Expander)

Installation and Configuration Manual

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Trademark Acknowledgement

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Preface

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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.

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Reporting Defects

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

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

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

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

WARNING: ANTENNA GAIN SHOULD NOT EXCEED 7DBI (REFER TO SECTION 3.4.1 FOR FURTHER INFORMATION).

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.

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.

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.

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.

Certification

MA-860 WLAN Solution (MA-860 module with WCE) has met the approvals of the following certifying organizations:

- UL / IEC 60950 -1
- UL2043 Fire/Plenum (WCE)
- CE EN 60950
- CAN/CSA C22.2 No 60950
- FCC–47, CFR 15.109, Part 15 Sections B, C, and E

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.

Company Certification

- ISO ISO 9001: 2000 and ISO 13485: 2003

Mean Time Before Failure (MTBF)

Product	Fail Rate	MTBF (Hours)	MTBF (Years)	Temperature
860M/R-AU	2.44	409565.49	47	50 deg C || 122 deg F
WCE-AU	2.74	360509.00	44.5	50 deg C || 122 deg F

Table 1 - MTBF Data

Professional Installation of Transmitter

According to FCC 15.203, if an intentional radiator has a standard antenna connector, it must be professionally installed according to FCC 15.203 regulations.

In addition, the following also demonstrates compliance with Section 15.204(d), (i):

1. The MA-860 WLAN solution cannot be sold to the general public. It is only marketed and sold by authorized agents. Only professional installation qualified ("licensed") by MobileAccess™ for this purpose is allowed to install the MA-860 WLAN Solution.

2. The installation must be controlled and follow the requirement of "Installation Manual" (***P/N:709C002901***). Each potential installer must receive special training, which is a condition for receiving the license from MobileAccess™ Inc to become a "licensed" installer. The installation procedure as described in the "Installation Manual" includes the mechanical installation and initial setup by a PC based tool.

3. The intended application of the system is exclusively for the commercial/industry use.

Document Purpose

This document serves as a guide to provide essential product functionality with all the information necessary to professionally install and configure the MobileAccess™ MA-860 WLAN Solution. The MA-860 WLAN Solution is comprised of the MA-860 WLAN Module (P/N 860M/R or 860R) and the WiFi Coverage Expander (P/N WCE) units.

In this Installation and Configuration Manual, the product 860M/R and 860R shall be referred to as 860M/R. The 860M/R with WCE shall be referred to as the MA-860 or MA-860 WLAN Solution.

Additional Relevant Documents

- MobileAccess™ NMS 410/430 System
- MobileAccess™ 1000M Installation and Configuration Guide
- MobileAccess™ 860 SW Upgrade Procedure

List of Acronyms

802.11a	WLAN IEEE Standard for 5GHz ISM band
802.11b/g	WLAN IEEE Standard for 2.4GHz ISM band
AGC	Automatic Gain Control
AP	Access Point
ARM	Adaptive Radio Management
BDA	Bi-Directional Amplifier
BU	Base Unit
DAS	Distributed Antenna System
DFS	Dynamic Frequency Selection
DL	Downlink
ETL	Electrical Safety Testing Organization
FCC	Federal Communications Commission
GUI	Graphical User Interface
HTTP	Hypertext Transfer Protocol
IEEE	Institute of Electrical and Electronic Engineering
IP	Internet Protocol Address
LBS	Location Based Services
LWAPP	Light Weight Access Point Protocol
LED	Light Emission Diode
MA-860	MobileAccess™ WLAN solution that includes the 860M/R and the WCE
860M/R	MobileAccess™ WLAN module without redundant power supply.
860R	MobileAccess™ WLAN module with redundant power supply.
PSU	Power Supply Unit
RHU	Remote Hub Unit
RP	Reverse polarity

RRM	Radio Resource Management
RTLS	Real Time Location Systems
SCU	Splitting and Combining Unit
SMA	A coaxial connector (Subminiture Version A)
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
TNC	(Threaded Neill-concelman) Connector
Type-N	Threaded RF type N connector for coaxial cable
UL	Uplink
VoIP	Voice over Internet Protocol
VoWLAN	Voice over WLAN
WCE	WiFi Coverage Expander
WiFi	Interoperability of WLAN products based on the IEEE 802.11 standards
WLAN	Wireless Local Area Network

1 Introduction

The MobileAccess™ 860 WLAN Solution delivers pervasive WLAN coverage throughout enterprise environments using a unique multi-service wireless architecture. With the MA-860 approach, enterprises can seamlessly translate their WLAN investments and design expertise into a comprehensive, multi-service wireless solution.

This section summarizes the benefits and characteristics of the MobileAccess™ 860 WLAN Solution (MA-860).

1.1 MobileAccess™ 860 WLAN Solution Overview

The MA-860 WLAN Solution (MA-860) is part of the MobileAccess™ third generation family of products for the Wireless LAN infrastructure. It is comprised of an MobileAccess™ 860 WLAN module (860M/R) and WiFi Coverage Expanders (WCE). The MA-860 WLAN Solution provides a centralized, secure Wi-Fi AP management system with greater range and coverage visibility by delivering an "AP-on-Ceiling" behavior and performance with added benefits of security, management, and aesthetics across a single infrastructure to provide a complete set of wireless services.

The MobileAccess™ 860 WLAN solution can leverage a single antenna infrastructure to deliver IEEE 802.11a and 802.11b/g WLAN solution. The MA-860 provides a combined services approach that allows the customer the flexibility to choose one or all MobileAccess™ supported RF technologies for distribution over a single antenna infrastructure: WLAN, Cellular/PCS, paging and/or public safety while maintaining a reliable application independent architecture.

Figure 1–1: 860 WLAN Solution System Block Diagram provides an overview of how the MA-860 WLAN solution interfaces with the rest of the MobileAccess™ portfolio of modules supporting Mobile Services (Cellular/PCS, paging and/or public safety) and user provided WLAN Access Points for WLAN to provide multi-service wireless services.

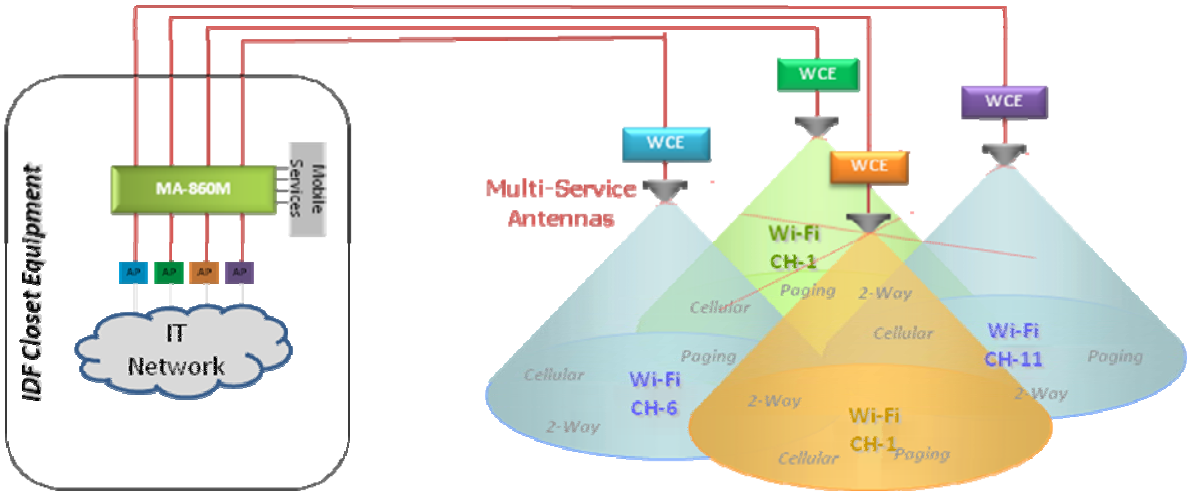

Figure 1–1: 860 WLAN Solution System Block Diagram

1.2 Benefits

The following benefits are achieved with the MA-860 WLAN Solution:

Cost-Effective Multi-Service Solution

- Delivers WLAN and other wireless RF signals over a single multi-service infrastructure
- Spreads WLAN deployment costs across multiple wireless services

Dependable WLAN Coverage

- MobileAccess™ WLAN architecture mirrors the behaviors and coverage footprint of "AP-on-Ceiling" deployment
- One-Click compensation between the 860M/R and WCE ensures optimal 802.11b/g and 802.11a coverage
- Dedicated AP to antenna relationships ensure transparent support for WLAN applications such as VOIP and location services (RTLS)
- Redundant power option

Centralized & Secure AP Management

- Lowers operating expenses
- Provides physical security and simplifies management

Proactive End-to-End Monitoring

- Remote SNMP monitoring for status, alerting, and fault detection
- Monitoring extends to attached multi-service antennas

Simplified IT Deployment Model

- Uses standard WLAN design techniques

1.3 Deployment Options

The core feature set of the MobileAccess™ WLAN Solution includes the MA-860 WLAN module (860M/R) and WiFi Coverage Expander (WCE).

The WLAN core feature set is currently deployable in the following configurations:

- 860M/R, WCE and Multi-service antennas: Deployed for WLAN coverage support only. Refer to **Figure 1–2: MA-860 WLAN Solution for WLAN Coverage** Only below:

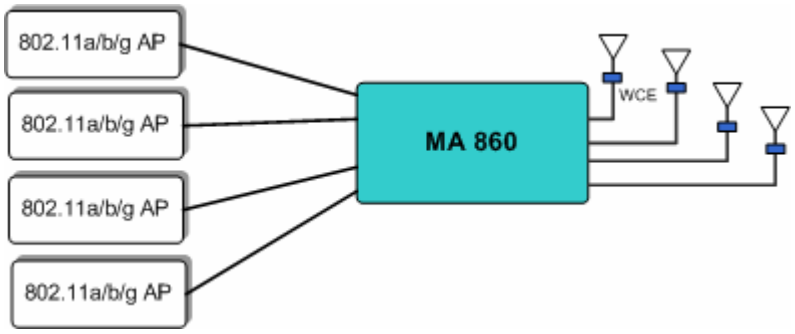

Figure 1–2: MA-860 WLAN Solution for WLAN Coverage Only Block Diagram

- 860M/R, WCE, Multi-service antennas, MA-1000 Remote Hub Units (RHUs): Deployed for WLAN and Mobile Service coverage support. Refer to **Figure 1–3: MA-860 WLAN Solution with MA-1000 for WLAN and Mobile Service** Coverage below.

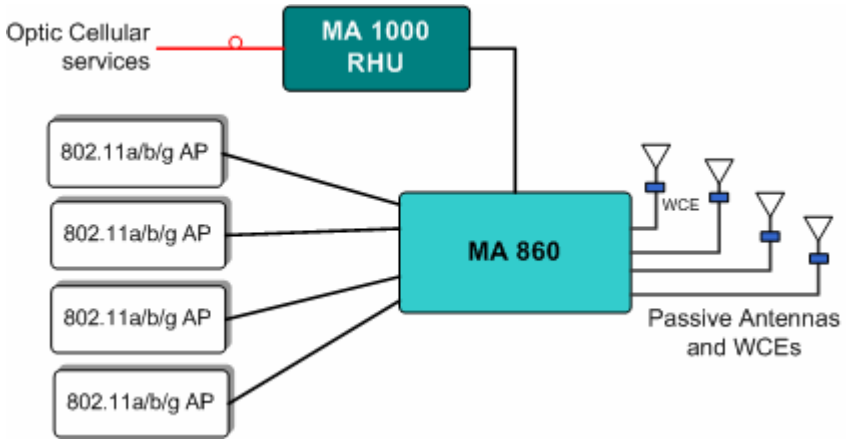

Figure 1–3: MA-860 WLAN Solution with MA-1000 for WLAN and Mobile Service Coverage Block Diagram

- 860M/R, WCE, Multi-service antennas and MA-2000 Remote Unit: Deployed for WLAN and Mobile Service coverage support. Refer to **Figure 1–4: MA-860 WLAN Solution with MA-2000 for WLAN and Mobile Service** Coverage below.

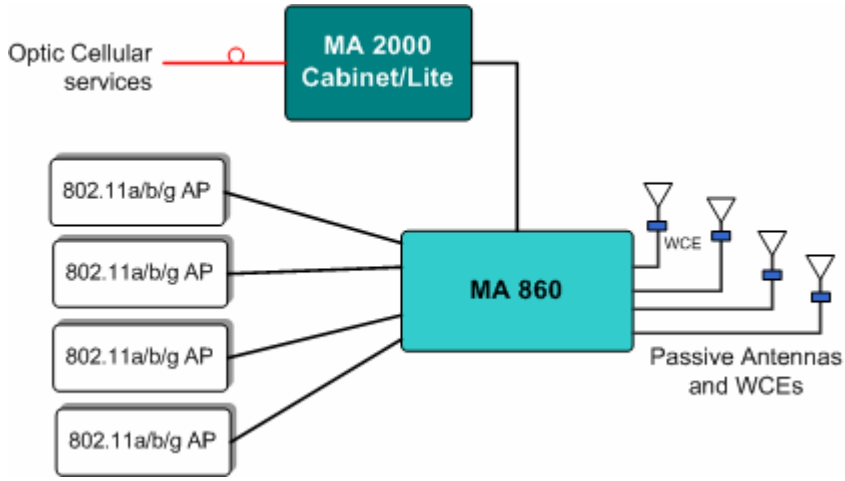

Figure 1–4: MA-860 WLAN Solution with MA-2000 for WLAN and Mobile Service Coverage Block Diagram

2 MA-860 WLAN Solution Components

The MA-860 WLAN Solution consists of the MA-860 WLAN module (860M/R) and the WiFi Coverage Expander (WCE) unit. Both of these devices are required to provide full IEEE 802.11a/b/g WLAN coverage.

This section provides information on the technology and features of the 860M/R and WCE.

2.1 MA-860 WLAN Module (860M/R)

2.1.1 Purpose

The 860M/R is an active module installed in the remote closet that interfaces to several horizontal coaxial antenna cables and to WiFi access points (APs) and Remote Hub Units (RHUs) in the IDF or telecom closet via coax jumpers. It performs combining, RF switching and amplification of WiFi signals in the 802.11b/g (ISM2400) and 802.11a (U-NII) frequency bands. The MA-860-HU also performs passive RF combining of Mobile Service frequency bands (Cellular, PCS, Paging, 2-Way Radio, etc.).

The 860M/R interfaces to the antenna cables, combines the 802.11a/b/g and other RF signals for distribution over broadband antennas.

The 860M/R provides:

- Support for up to four 802.11b/g access points (APs)
- Support for up to four 802.11a access points (APs)
- Support for up to four Mobile Service RHU modules or one Mobile Service Remote Cabinet
- Support for up to four WiFi Coverage Expanders (WCEs)
- Power for up to four WiFi Coverage Expanders (WCEs)
- Redundant DC connectivity sensing for all passive broadband antennas

- Downlink (DL) power detection to support cable loss compensation functionality for WiFi that minimizes impact of cable losses on the AP coverage radius
- Configuration support and status monitoring for WCEs
- Ethernet based local and remote configuration and monitoring
- Ethernet port for SNMP and HTTP based communications to support configuration and status monitoring
- Mobile Access (MA) device interface to communicate antenna sense information to Cellular and/or WMTS Remote Hub Units (RHUs)

The 860M/R enables clustering of the active APs in the IDF or telecom closets, providing a more secure and cost effective infrastructure.

2.1.2 Front Panel Interfaces and Indicator LEDs

The front panel contains the antenna interface ports and mobile services ports, redundant power inputs, status indicators, and local RS232 Console Port for local management. The following figure shows the 860M/R front panel display.

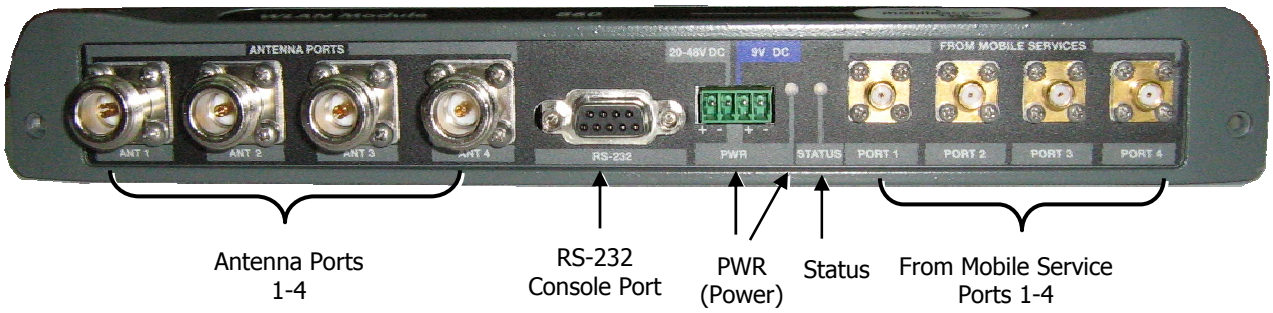

Figure 2–1: MA-860 Front Panel

2.1.2.1 860M/R Front Panel Interfaces

The following table describes the front panel ports.

Front Panel Ports	Description
ANTENNA PORTS ANT 1- ANT 4	Four N-type female connections. These connections are terminated at a WCE via ½" coax which is then connected to a MobileAccess™ certified multi-service antenna via a jumper cable. ***NOTE:*** *To be terminated with 50 ohm terminations when not in use.*
FROM MOBILE SERVICES PORT 1- PORT 4	Four SMA female connections used in installations that integrate MA-860 WLAN Solution with MA 1000 RHUs or MA 2000 Remote Cabinet. ***NOTE:*** *To be terminated with 50 ohm terminations when not in use.*
RS-232	RS232 Console Port connection is for field engineers to use during software upgrades.
PWR	Power connection to Main and an optional Redundant power supply

Table 2: 860M/R Front Panel Ports

2.1.2.2 860M/R Front Panel Indicator LEDs

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

Front Panel LEDs	Description
Status	Internal operation and channel operation status: Constant Green – unit performing antenna auto-discovery. This happens automatically upon power-up and booting up of the 860M/R and WCE. Green blinking – Auto-discovery completed and the WCE and 860M/R is operational. Off – If power is supplied (i.e. PWR Status LED is Constant Green) then there is a fault detected in unit. Else, power is not supplied to the unit.
PWR	Constant Green – Power OK. Off – no power supplied to the unit.

Table 3: 860M/R Front Panel Indicator LEDs

2.1.3 Rear Panel Interfaces and Indicator LEDs

The rear panel contains the following interfaces: four 802.11a/b/g Access Point input ports, RJ45 Ethernet port for remote management, and an antenna sensing connector.

Figure 2–2: 860M/R Rear Panel

2.1.3.1 860M/R Rear Panel Interfaces

The following table describes the rear panel port interfaces:

Rear Panel Ports	Description
802.11b/g AP1…AP4	Four APs 802.11b/g input SMA female connections. ***NOTE:*** *To be terminated with 50 ohm terminations when not in use.*
802.11a AP1..AP4	Four APs 802.11a input SNA female connections. ***NOTE:*** *To be terminated with 50 ohm terminations when not in use.*
MA Device Control (Antenna Sensing)	Relevant only when 860M/R is converged with another MA system remote unit (RHU 1000, RHU WiMAX. Connects to RHU 1000 rear panel Control connector. Routes the antenna sensing (indication of whether antenna is present) to the RHU for monitoring via the management application. (RHU Version 3.1 and higher).
Ethernet port	Connection to network for remote configuration and management via any standard MobileAccess™ supported WEB browser.

Table 4: 860M/R Rear Panel Port Interfaces

2.1.3.2 860M/R Rear Panel Indicator LEDs

The rear panel LEDs indicate the status of the corresponding 802.11a/b/g AP:

Rear Panel LEDs	Description
Blinking Green	APs are physically connected and transmitting signals greater than -6dBm.
Constant Green	APs are physically connected, transmitting signals greater than -6dBm and cable compensation procedure for that link is complete and successful.
Off	AP not connected or no activity detected.

Table 5: 860M/R Rear Panel LED Indicators

2.2 WCE

2.2.1 Purpose

The purpose of the WCE is to provide amplifications for uplink and downlink WLAN signals in the 2.4GHz and 5.1GHz ISM bands and provide a passive RF path for the Mobile Service signals.

As a result of the amplifications in the 2.4GHz and 5.1GHz ISM bands, the WCE guarantees compensation for up to 300 feet of cable loss in both frequency bands (assuming the cable connected between the 860M/R and the WCE has a 4dB/100ft attenuation for 802.11b/g and a 6dB/100ft attenuation for 802.11a). This compensation takes into account losses associated with the 860M/R and any other losses incurred due to passive modules or cables connected between the 860M/R output port and the WCE. Each band is also independently amplified to accurately capture the attenuation for both bands.

The basic functionality of the WCE is as follows:

- Provides bi-directional amplification for 2.4GHz and 5GHz signals to deliver optimal coverage for 802.11a/b/g devices
- Supports any passive MobileAccess™ antenna identified in **Section 0**.

- Accommodates the combination of multiple wireless services onto the same broadband antenna
- The antenna port is connected usually through a jumper (flexible 1' coax cable) to a single broadband antenna
- The WCE output port is connected to a 0.5" low loss coaxial cable (typically running to a remote wiring closet).
- A DC power feed at the output which is powered by the 860M/R, via the coax cable.
- Contains integrated amplifiers for 2.4GHz and 5GHz signals (802.11a/b/g)
- A plenum rated enclosure.

2.2.2 WCE Interfaces, Mounting Support, and LEDs

The WCE unit is equipped with two interface ports: One N-Type male and One N-Type Female for connectivity to the 860M/R and antenna respectively as shown in **Figure 2–3:** WCE

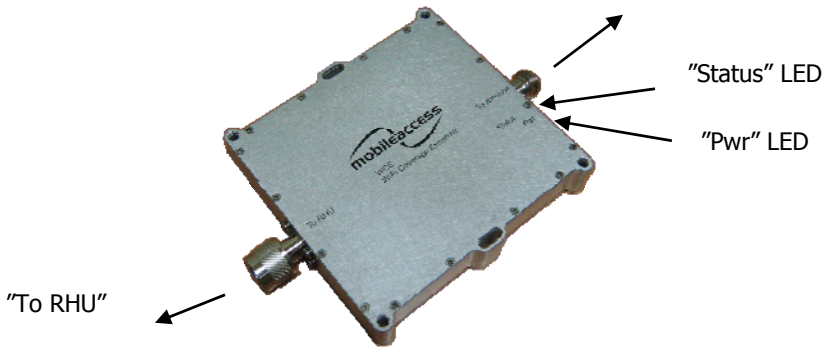

Figure 2–3: WCE

The 860M/R interface port, labeled "RHU" is directly connected to the ½" low loss coaxial cable (running to a remote IDF or telecom closet where it is connected to the 860M/R antenna port via a jumper cable). The "To Antenna" port is connected to a low-loss jumper (flexible 1' coax cable) that is directly connected to one of the many MobileAccess™ supported broadband antennas.

2.2.2.1 WCE Interfaces

The following table describes the interface ports:

Interfaces	Description
N-Type Male	Used to connect the WCE directly to the coax run from the IDF or Telecom closet as indicated by the "To RHU" label.
N-Type Female	Used to connect any MobileAccess™ supported broadband connection with a flexible N-Type – N-type Male Jumper cable (typical 1' length) as indicated by the "To Antenna" label.

Table 6: WCE Interfaces

2.2.2.2 WCE Mounting Support

The following table describes the mounting support:

Mounting Support	Description
Mounting Slots	Two mounting slots used to affix the unit to any available building infrastructure via a wire-tie or tie-strap.
Mounting Holes	Four mounting holes that support any standard drywall screw (3/16″ in diameter).

Table 7: WCE Mounting Support

2.2.2.3 WCE Status Indicators

The following table describes the purpose of the LED indicators:

LEDs	Description
PWR	Constant Green: Power supplied to the unit
Status	Constant Green: Unit is booting up. Flickering Green: Unit has completed boot up process and is operational.

Table 8: WCE LED Indicators

3 Installation Guidelines

This section contains general information on the cabling, power, component and installation requirements for the MA-860 WLAN Solution.

For specific guidelines on infrastructure planning, design and installation, please consult with a MobileAccess™ Project Manager or MobileAccess™ approved Installer.

3.1 MA-860 WLAN Installation Procedure

Once the infrastructure planning and design is completed, the basic steps of installing an MA-860 WLAN Solution are as follows. As always, for more detailed, specific guidelines, please consult with a MobileAccess™ Project Manager or MobileAccess™ approved Installer.

1. Install the coax cable runs per design. Refer to **Section 3.2** for more details.
2. Properly mount and connect the WCE to the coax cable. A WCE must be installed at each antenna run that traces back to an Access Point. Refer to **Section 3.3**.
3. Mount the 860M/R. Refer to **Section 3.4**.
4. It is recommended to terminate all unused ports on the 860M/R with appropriate 50-ohm loads as described in **Sections 2.1.2** and **2.1.3**.
5. Provide power to the MA-860 WLAN Solution. Refer to **Section 3.6.4**.
6. Confirm that the 860M/R Front Panel Indicator "PWR" LED is Constant Green. Refer to **Section 0** for more details regarding the status of the "PWR" LED indicator.
7. Allow approximately 1-2 minutes for Auto-Discovery to complete and the 860M/R Front Panel Indicator "Status" LED to be Blinking Green. Refer to **Section 0** for more details regarding the status of the "Status" LED indicator. .
8. Configure the 860M/R network parameters via telnet in order to monitor alarms on the MA-860 WLAN Solution. For configuration details, refer to **Section 0**
9. Connect the 860M/R to the customer LAN.
10. Connect Access Points to the 860M/R. Refer to **Section 3.8.**
11. It is recommended to recycle power to the unit by removing and reinserting the power connector on the front panel after connecting the APs. If this is done, repeat steps 6 and 7 above and continue.
12. Confirm that the 860M/R Rear Panel Indicator Access Point LEDs are Static Green. Refer to **Section 2.1.3.2** for more details regarding the status of the "AP" LED indicator.
13. Access the 860M/R User Interface to confirm all connections are active. Refer to **Section 4** .
14. Allow a few minutes for the MA-860 WLAN Solution to complete the cable compensation process in order to set the appropriate gain on the WCE such that the output power at the WCE is within +/-1dB of the AP input power to the 860M/R.
15. Access the 860M/R GUI interface Alarm Tab via HTTP and verify that the AP 802.11a/b/g alarms are all GREEN.

3.2 Coax Cable Connectivity Guidelines

Below are general connectivity guidelines to be followed for the coax cable that connects the 860M/R to the WCE and the WCE to the multi service Antenna.

For the most recent installation requirements and instructions, please refer current version of the MobileAccess™ Cable Installation FAQ.

For more specific guidelines on infrastructure planning, design and installation, please consult with a MobileAccess™ Project Manager or MobileAccess™ approved Installer.

- The MA-860 WLAN Solution can utilize the HL4RP-50A coax cable or equivalent.
- The maximum cable length between the 860M/R and WCE for WLAN shall not exceed 300ft. This assumes that the cable between the WCE and 860M/R has a 6dB/100ft attenuation for 802.11a and a 4dB/100ft attenuation for 802.11b/g. It is recommended that the user consult with MobileAccess™ Project Manager or MobileAccess™ approved Installer in order to ensure that the link budget allows for this length.
- The 860M/R Antenna Ports as described in **Section 2.1.2- Front Panel Interfaces and Indicator LEDs** connect to the ½" HL4RP-50A or equivalent coax via a 50-ohm, N-female to N-female jumper cable (e.g. RG142 or equivalent).
- The WCE "To RHU" connection as described in **Section 2.2.2 - WCE Interfaces, Mounting Support, and LEDs** connects to the ½" HL4RP-50A or equivalent coax via a 50-ohm, N-male to N-male connection.
- The WCE "To Antenna" connection as described in **Section 2.2.2 - WCE Interfaces, Mounting Support, and LEDs** connects to the multi service Antenna via a 50-ohm, N-female to N-male to jumper cable (e.g. RG142 or equivalent).

3.3 Wi-Fi Coverage Expander (WCE)

3.3.1 WCE Connection to 860M/R

A WCE must be installed at each antenna run that traces back to an Access Point.

The WCE will be connected on one side (labeled "To RHU") to a HL4RP-50A or equivalent low loss coaxial cable (typically running to a remote wiring closet), and to the Passive Broadband Antenna usually through a jumper (flexible 1' coax cable). Refer to **Figure 3–1: WCE Connectivity Block** Diagram below:

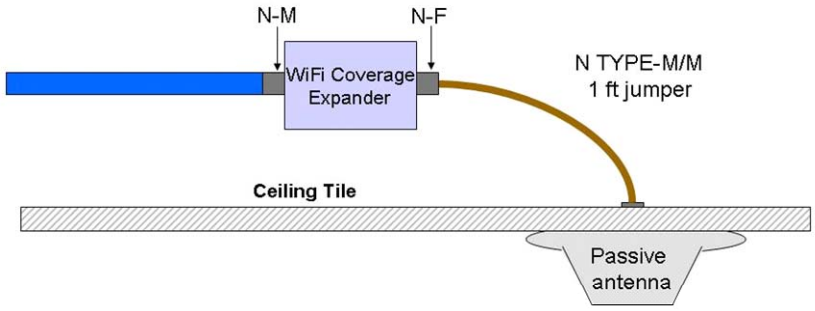

Figure 3–1: WCE Connectivity Block Diagram

3.3.2 WCE Mounting

There are multiple methods available to mount the WCE in the ceiling depending on user requirements, general cable installation procedures in accordance with the building codes in the area and as required by the cable manufacturer. For more specific guidelines, please consult with a MobileAccess™ Project Manager or MobileAccess™ approved Installer.

The three basic methods for mounting are as follows and are described in the succeeding sections:

3.3.2.1 In Line with Coax Cables

WCE's light design enables connecting it between the two coax cables (cable from 860M/R and cable from antenna) without additional support as long as the bend radius of the coax cable is not exceeded.

Coax from 860M

3.3.2.2 Tie Wrap/Wire Tie to a Fixture

Use the two mounting slots used to affix the unit to any available building infrastructure via a wire-tie or tie-strap (not provided).

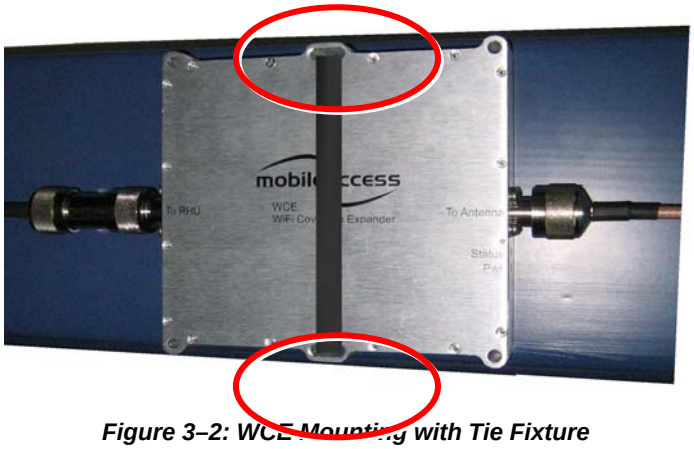

Figure 3–2: WCE Mounting with Tie Fixture

3.3.2.3 WCE Wall Mounted Using Four Screws

Secure the WCE using four standard drywall screws (3/16” in diameter).

Figure 3–3: WCE Mounting Using Four Screws

3.4 Installation and Mounting Installation and Mounting 860M/R

MobileAccess™ MA-860 is typically installed in the IDF or Telecom Closet of each floor to which WLAN coverage is to be supported. The accessories, mounting and installation procedures vary depending on the deployment option.

There are three typical deployment options as described in section **1.3.**

Deployment Options:

1. MA-860 WLAN Solution for WLAN Coverage Only: 860M/R, WCE and Multi-service antennas
2. MA-860 WLAN Solution with MA-1000 for WLAN and Mobile Service Coverage: 860M/R, WCE, Multi-service antennas, MA-1000 Remote Hub Units (RHUs)
3. MA-860 WLAN Solution with MA-2000 for WLAN and Mobile Service Coverage: 860M/R, WCE, Multi-service antennas and MA-2000 Remote Unit

In each of the above three deployment options, the 860M/R is typically mounted as follows:

1. Rack mounted: The 860M/R can be placed on a 19" rack using the Rack mountable shelf/bracket
2. Wall mounted: The 860M/R can be mounted directly on the wall
3. Stacked: The 860M/R can be stacked on top of other 860M/R units, on top of the 2000 cabinet or on top of other RHUs (e.g. MA-1000, MA-1200)

The following sections describe how to mount the 860M/R in the above three scenarios as well as some general guidelines that should be taken into consideration when installing the 860M/R.

3.4.1 General 860M/R Installation Guidelines

Regardless of which deployment and mounting option is utilized, the following must be taken into consideration when installing/mounting an 860M/R:

Interfacing to Antenna

- Position of the 860M/R in reference to the coax cable that connects to the antenna must be taken into consideration. For details see **Section 3.2**.
- It is recommended to use a jumper cable with appropriate terminators to connect the 860M/R antenna port to the HL4RP-50A coax cable or equivalent
- The maximum cable length between the 860M/R and WCE for WLAN shall not exceed 300ft (12dB loss for 802.11b/g and 18dB loss for 802.11a). It is recommended that the user consult with MobileAccess™ Project Manager or MobileAccess™ approved Installer in order to ensure that the link budget allows for this length.

Interface to Access Point

- Access Points must be properly placed and installed as defined in **Section 3.8**.
- The supplied SMA wrench is to be used to tighten the SMA connectors and assist in not over tightening the connectors.
- The jumper cables used to connect to the Access Points shall be connected with sufficient slack in order to reduce the strain on the SMA connectors on the 860M/R.
- It is recommended to record the location of the 860M/R units and IP address according to the MAC addresses on the sticker at the rear of the units near the Ethernet port.
- It is recommended to record the Antenna that corresponds to the Antenna Port of the 860M/R
- It is recommended to record the Access Point that corresponds to the AP Port of the 860M/R

Interface to RHU (MA-1000/MA-1200) and RC (MA-2000)

- Installation and configuration guidelines for the RHU and RC should be taken into consideration as outlined in their respective User Manuals.
- Jumper cables (N-Type male right angle to SMA male right angle) are to be used to connect the 860M/R to the MA-1000 or MA-2000 units. Be sure the connectors are closed at a 45 degree angle so as not to place stress on the cables.
- Jumper cables must be ordered separately and are not supplied with the kits outlined in **Section 3.4.2 Mounting and Accessory Kits**. It is recommended to use jumper lengths of 6in, 1ft or 5.5ft based on the relative position of the 860M/R to the RHU and RC.

3.4.2 Mounting and Accessory Kits

The following Mounting accessories can also be ordered when deploying an MA-860 WLAN Solution with Mobile Services (jumper cables not included).

Part Number	Description
BRKT-RHU-800-STK	Stacking bracket for mounting RHU, 860M/R or 1200 on top of an RHU or 860M/R with screws.
BRKT-1RU-SHELF-2K	Rack mountable shelf for RHU, 860M/R or 1200 with screws. Can also be used as a stacking bracket for mounting RHU, 860M/R or 1200 on a 2000 cabinet.
BRKT-1200-STK	Stacking bracket for mounting RHU, 860M/R or 1200 on top of a 1200 module with screws.
AK-860-SA	Stand alone kit with screws for mounting the 860M/R.

Table 9: 860M/R Mounting and Accessory Kits

3.4.3 Rack mounted

The 860M/R can be placed on a 19" rack using the Rack mountable shelf/bracket (P/N BRKT-1RU-SHELF-2K) described in Table 9: 860M/R Mounting and Accessory Kits as follows:

1. Assemble the side brackets using the 4 provided screws as shown in **Figure 3–4: 860M/R Rack Mount** Installation**.**
2. Assemble the 860M/R module to the supplied shelf using the four screws and washers.
3. Mount the shelf assembly in the rack using the side brackets. Take into consideration the position of the APs and required cable connections.

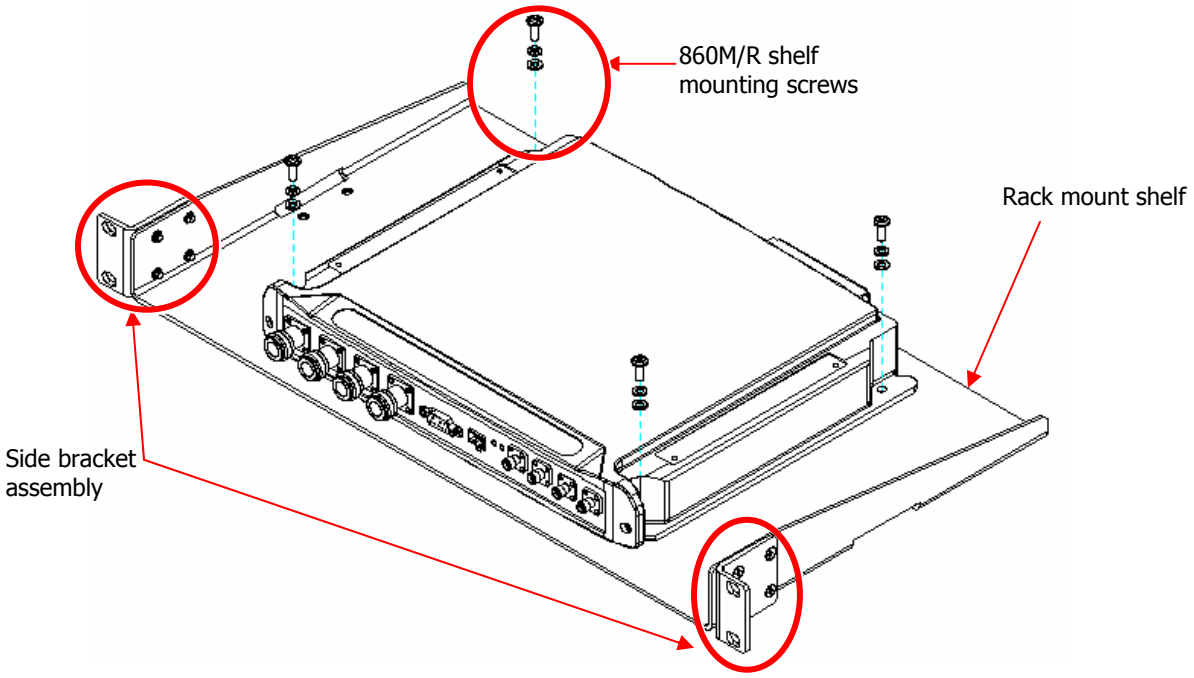

Figure 3–4: 860M/R Rack Mount Installation

3.4.4 Wall mounted

To mount the 860M/R on the wall follow the below instructions:

1. Mount the 860M/R on the wall using four screws. When mounting, consider the following:
   - The type of screws used to mount the unit must suit the type of wall construction (cement, bricks, etc.) so that the mount is secure.
   - The position of the APs and required cable connections.

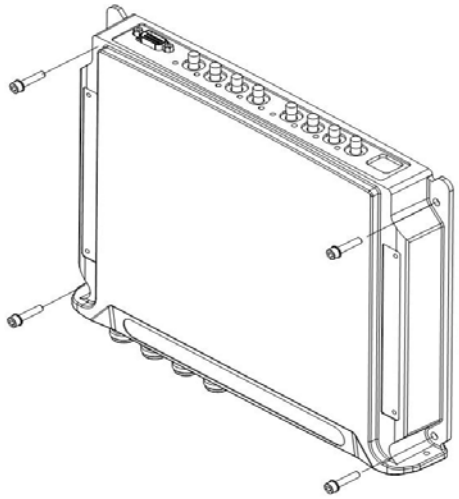

Figure 3–5: 860M/R Wall Mount Installation

4. Fit 50 ohm terminators on all unconnected SMA, AP and antenna ports.
5. Connect the RJ45 network connection to the MA-860 rear panel network port.

Note: It is recommended to record the location of the units and IP according to the MAC addresses on the sticker at the rear of the units near the Ethernet port.

3.4.5 Stacked

3.4.5.1 860M/R and MA-1000 RHU

The 860M/R can be mounted such that it is stacked on top of or underneath another 860M/R or RHU. When stacking modules in this manner, consider the following recommendations:

- When the 860M/R is mounted to the wall, stack the MA-1000 RHU on top in order to allow the antenna coax cables to properly connect to the 860M/R without hindering access to the MA-1000 RHU ports.
- When stacking on top of a module connected to the wall, it is recommended to not stack more than 3 modules on top of the module mounted to the wall in order to prevent the screws from breaking or snapping.
- Take into consideration the distance between the connection points between the 860M/R and MA-1000 RHU to ensure that the correct SMA to N-Type jumper cables are ordered.

In order to stack the 860M/R on top of or underneath an MA-1000 RHU, follow the steps outlined below:

1. The **BRKT-RHU-800-STK** mounting accessory as described in **Section 3.4.2 - Mounting and Accessory Kits** is to be ordered. The kit contents are shown in **Figure 3–6: BRKT-RHU-800-STK** Contents

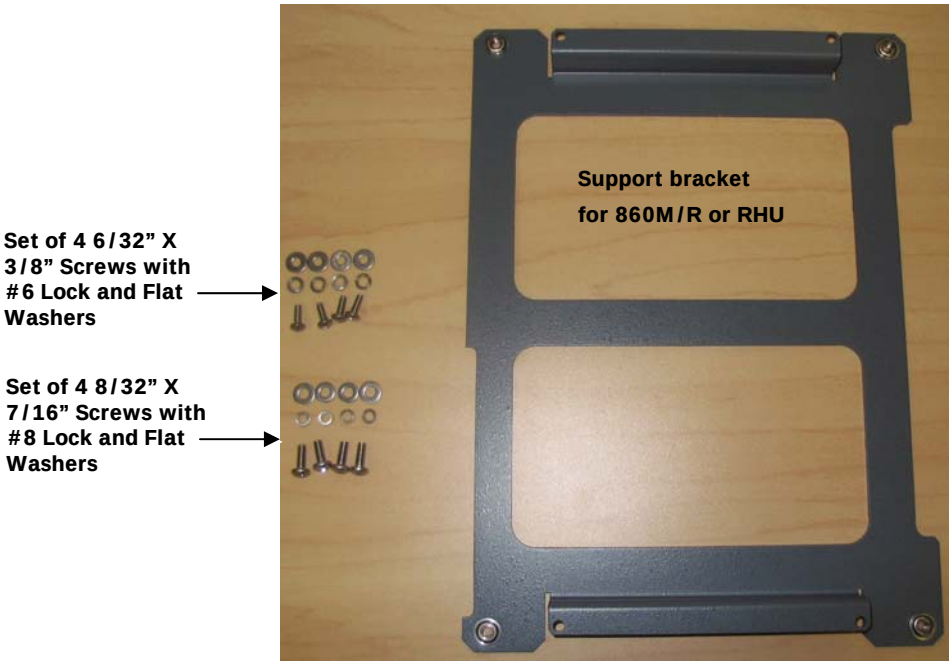

Figure 3–6: BRKT-RHU-800-STK Contents

2. Place the support bracket **BRKT-RHU-800-STK** on top of the 860M/R where the notched side of the bracket is towards the rear of the unit and secure in place with supplied screws as shown in **Figure 3–7: BRKT-RHU-800-STK Placement on 860M/R**

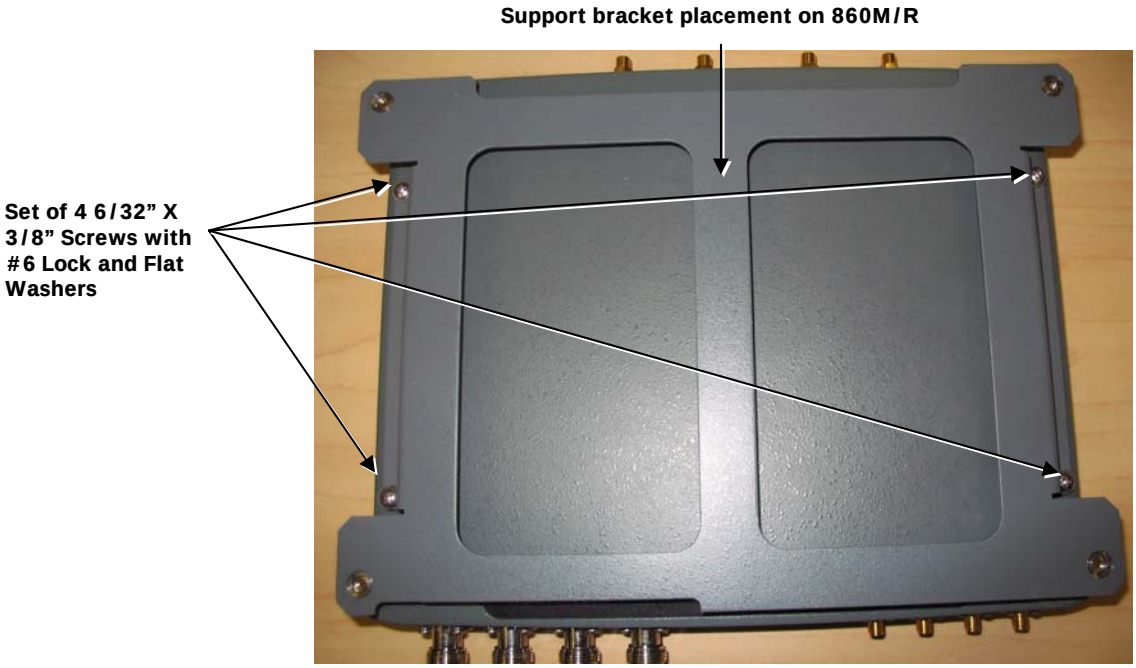

Figure 3–7: BRKT-RHU-800-STK Placement on 860M/R

3. Mount the 860M/R and bracket assembly to the wall. When mounting, consider the following:
   - The type of screws used to mount the unit must suit the type of wall construction (cement, bricks, etc.) so that the mount is secure.
   - The position of the APs and required cable connections.

4. Stack the MA 1000 RHU to the bracket using the four provided screws and connect the RHU to the 860M/R with SMA to N-Type jumper cables (not provided) as shown in **Figure 3–8: RHU stacked on top of 860M/R**. It is recommended to use jumper lengths of 6in, 1ft or 5.5ft based on the relative position of the 860M/R to the RHU.

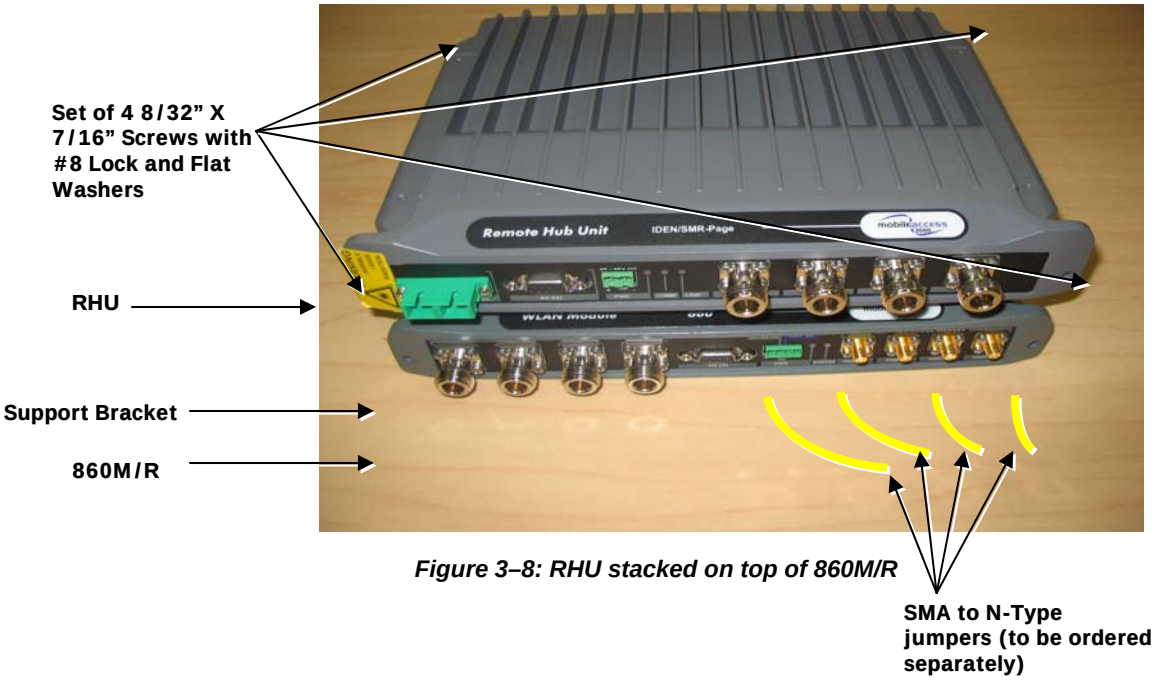

Figure 3–8: RHU stacked on top of 860M/R

3.4.5.2 860M/R and MA-1200 RHU

If an 860M/R is to be stacked underneath an MA-1200, follow instruction in **Section 3.4.5.1** 860M/R and MA-1000 RHU.

However, in typical installations the following two scenarios are seen:

A. The MA-1000 is sandwiched between the 860M/R and MA-1200, where the MA-1200 is above the MA-1000 RHU and the 860M/R is below the MA-1000 RHU.
B. The MA-1200 module is sandwiched in between the 860M/R and MA-1000 RHU, where the 860M/R is above and the MA-1000 RHU is below the MA-1200.

Refer to the MA-1000 or MA-1200 installation manual for instructions in the case of Scenario A. The completed assembly should resemble **Figure 3–9: 860M/R, MA-1200 and MA-1000 Assembly (Scenario A)**. SMA to N-Type jumper cables jumper cables from the MA-1000 to the 860M/R are not included and are to be ordered separately. It is recommended to use jumper lengths of 6in, 1ft or 5.5ft based on the relative position of the 860M/R to the RHU.

Figure 3–9: 860M/R, MA-1200 and MA-1000 Assembly (Scenario A)

Follow the instructions outlined below in the case of Scenario B:

1. Follow instructions outlined in **Section 3.4.5.1- 860M/R and MA-1000 RHU** to stack an MA-1200 on top of an MA-1000 RHU.
2. Use the **BRKT-1200-STK** mounting accessory as described in **Section 3.4.2 - Mounting and Accessory Kits** to mount the 860M/R on top of the MA-1200. The kit contents are shown in **Figure 3–10: BRKT-1200-STK** Contents.

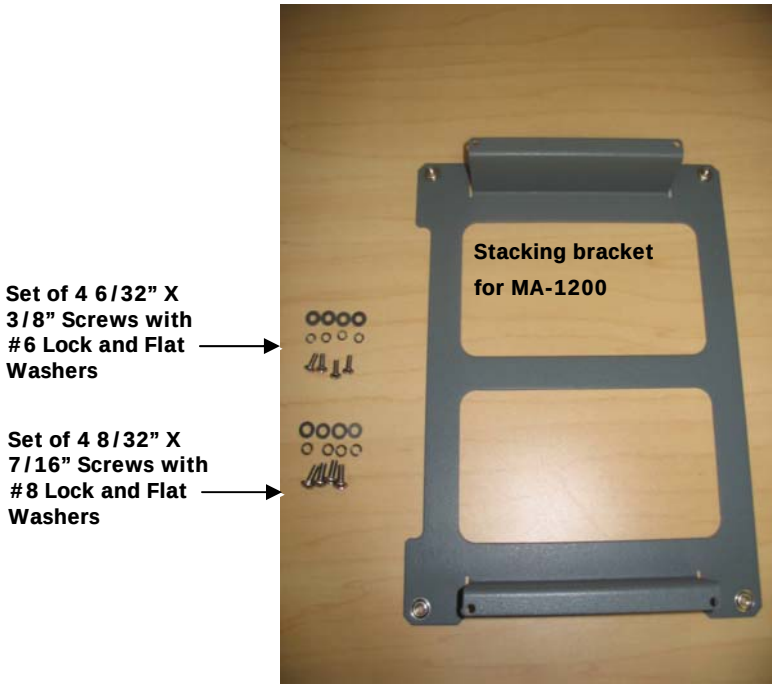

Figure 3–10: BRKT-1200-STK Contents

3. Place the support bracket BRKT-1200-STK on top of the MA-1200 where the notched side of the bracket is towards the rear of the unit and secure in place with supplied screws as shown in **Figure 3–11: BRKT-1200-STK on top of** MA-1200.

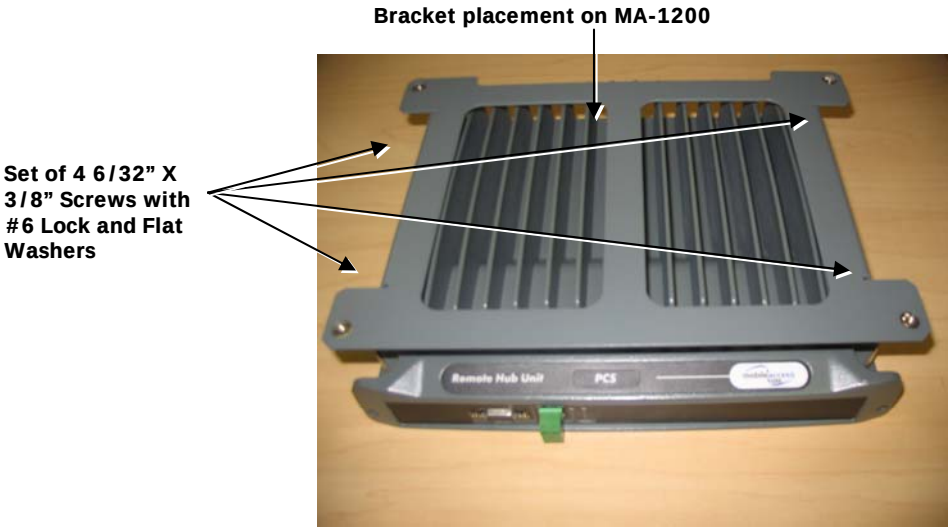

Figure 3–11: BRKT-1200-STK on top of MA-1200

4. Stack the 860M/R to the bracket using the four provided screws and connect the MA-1000 RHU to the 860M/R with SMA to N-Type jumper cables (not provided) as shown in **Figure 3–12: 860M/R, MA-1200 and MA-1000** Assembly. It is recommended to use jumper lengths of 6in, 1ft or 5.5ft based on the relative position of the 860M/R to the RHU.

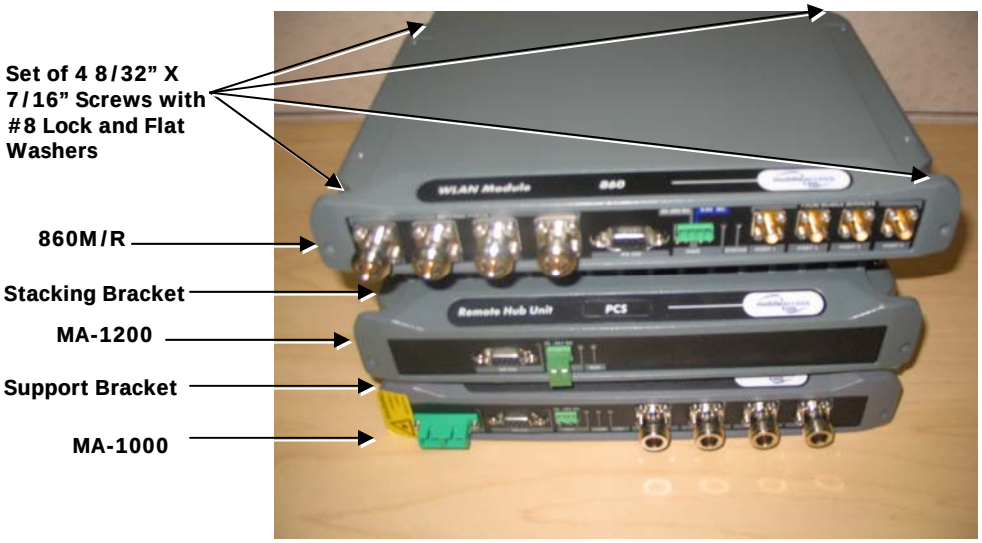

Figure 3–12: 860M/R, MA-1200 and MA-1000 Assembly (Scenario B)

3.4.5.3 860M/R and MA-2000 RC

The 860M/R can be mounted with the MA-2000 Remote Cabinet in the following configurations:

1. Rack mounted (see **Section 0**) above the MA-2000
2. Wall mounted (see **Section 0**) near the MA-2000
3. Directly on top of the MA-2000 cabinet as defined in this section.

In each of the above three configurations, consider the following take into consideration the distance between the connection points between the 860M/R and MA-2000 RC to ensure that the correct SMA to N-Type jumper cables are ordered.

In order to stack the 860M/R on top of the MA-2000 as shown in **Figure 3–13: 860M/R Stacked on top of** MA-2000, follow the steps outlined below:

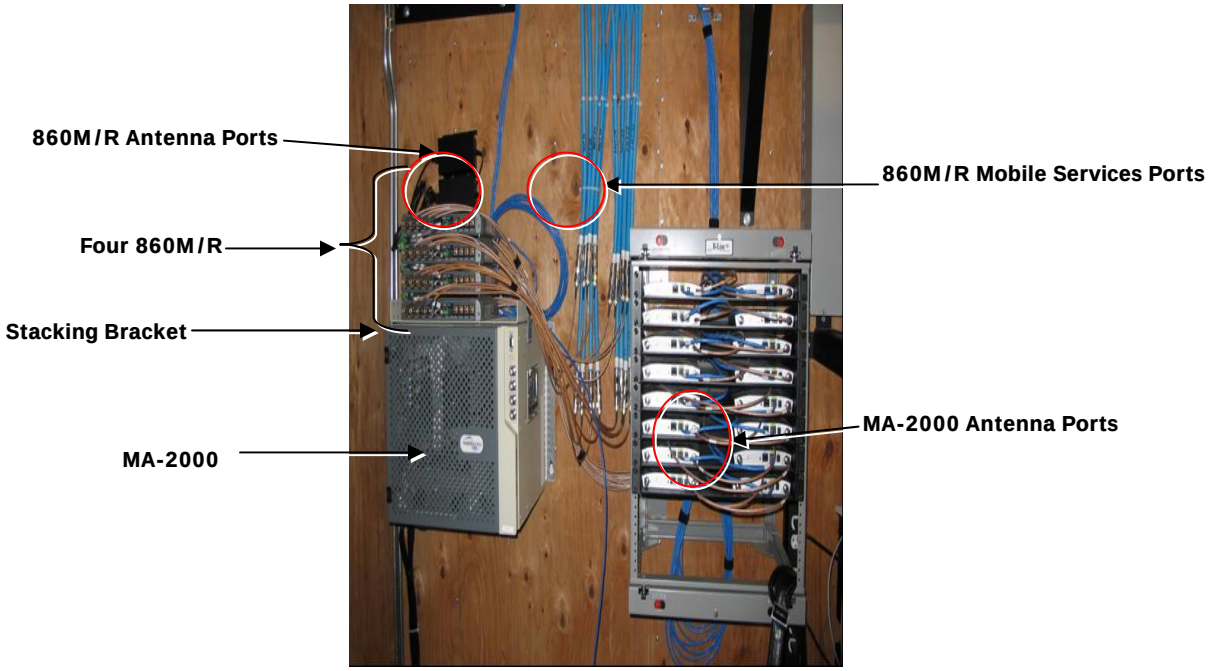

Figure 3–13: 860M/R Stacked on top of MA-2000

4. Assemble the BRKT-1RU-SHELF-2K by screwing on the side brackets as illustrated in **Figure 3–14. 860M/R MA-2000 Stacking Bracket** Assembly with the four screws and washers.
5. Screw in the 860M/R module to the supplied shelf using the four screws and washers as illustrated in **Figure 3–14. 860M/R MA-2000 Stacking Bracket** Assembly. Make sure to orient the 860M/R as illustrated.

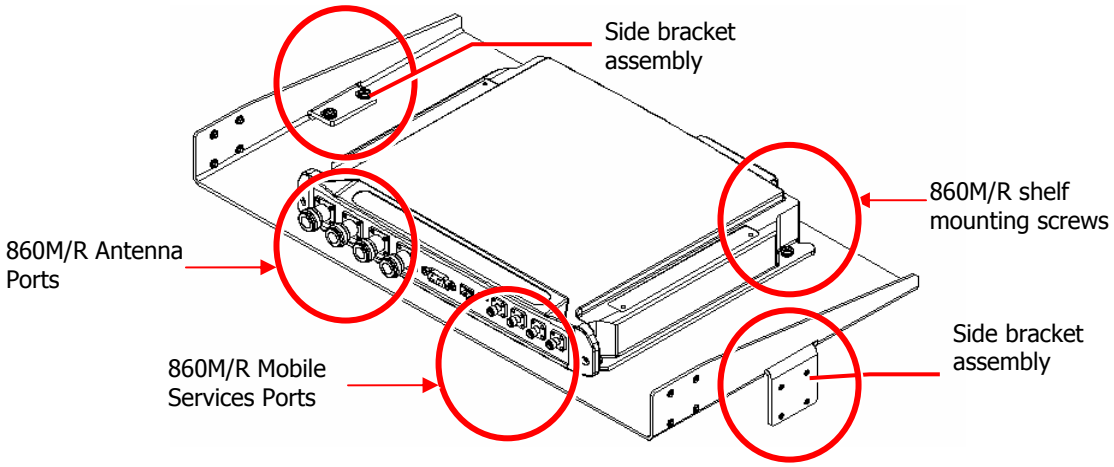

Figure 3–14. 860M/R MA-2000 Stacking Bracket Assembly

6. Assemble the shelf to the MA-2000 RC by securing the side brackets to the cabinet sides as illustrated below in **Figure 3–15. Illustration of 860M/R Mounted on MA-2000** RC.

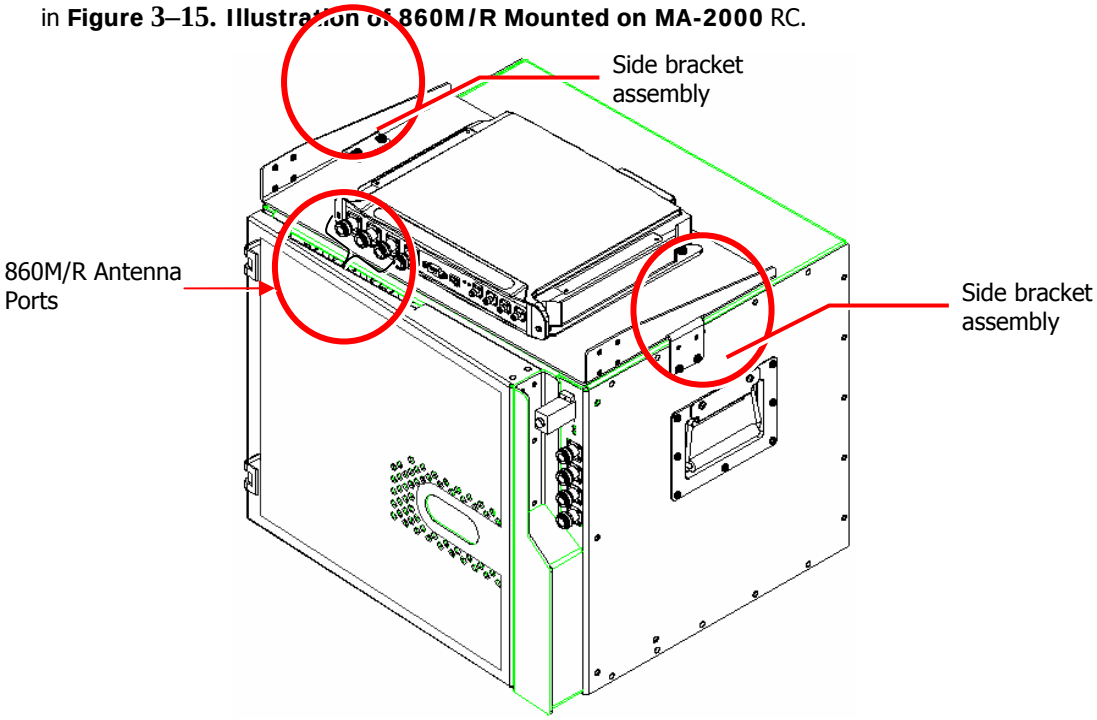

Figure 3–15. Illustration of 860M/R Mounted on MA-2000 RC

7. Connect the MA-2000 RC antenna ports to the 860M/R front panel Mobile Service port connectors as illustrated in **Figure 3–17. Illustration of MA-2000 Antenna Port Connections to 860M/R**.
8. In the case where each of the MA-2000 Antenna ports is connected to splitters (e.g. 1:4 splitter), the output of the splitters is to be connected to the appropriate 860M/R Antenna interface such that:
    a. The 1:4 splitter should be connected such that all four outputs of the splitter are connected to the same 860M/R unit. Multiple 860M/R units cannot connect to the same splitter. Refer to the illustration in **Figure 3–16: Mobile Service Splitter Connection to 860M/R** for an example.
    b. The splitters should be placed or mounted such that they are not physically touching each other to eliminate crosstalk between the splitters. So for example, if installation constraints require the splitters to be stacked on top of each other, it is recommended to place a small piece of cardboard between the units.

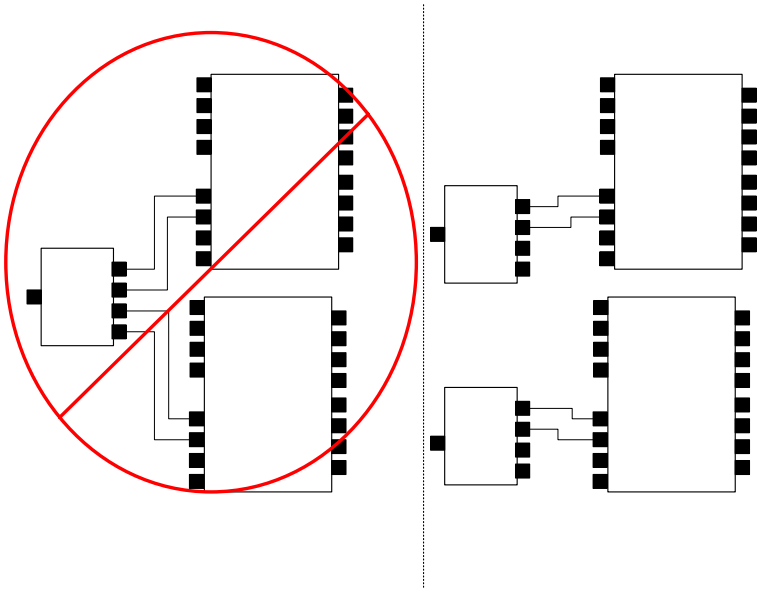

Figure 3–16: Mobile Service Splitter Connection to 860M/R

9. Connect the 860M/R antenna ports to the coax cable that interfaces with the appropriate broadband antenna.

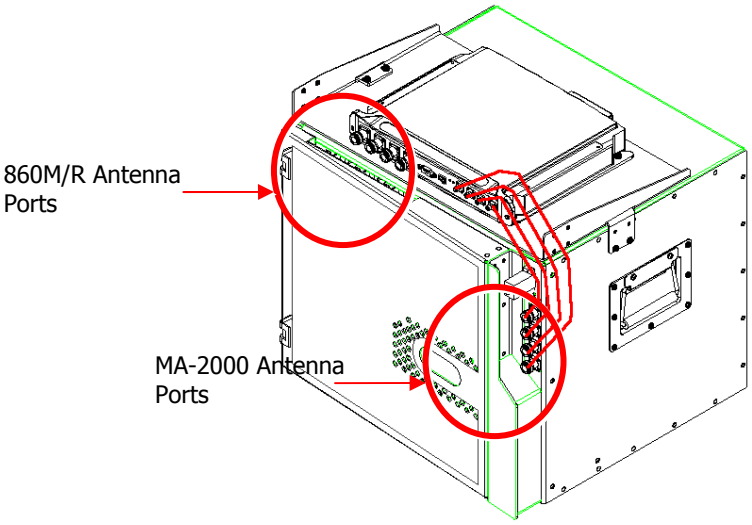

Figure 3–17. Illustration of MA-2000 Antenna Port Connections to 860M/R

3.5 Configuring Network Parameters

Before deploying the device on the customer LAN, network configurations for each 860M/R module are configured as defined in this section.

Once the 860M/R is configured correctly, it can be connected to the customer LAN in order to provide alarm information via SNMP traps or via a web interface.

Network parameters are to be configured via Telnet.

3.5.1 Default Settings

The 860M/R is shipped from the factory with the following default settings:

IP address: 192.168.1.1

Subnet mask: 255.255.0.0

Default GW: 192.168.254.254

3.5.2 Changing the Network Settings

This section lists the procedure to follow in order to change the network settings on each 860M/R unit. It is assumed that the user has basic knowledge to configure the network settings on a laptop and access a command prompt.

The example screen shots in **Figure 3–18**, **Figure 3–19** and **Figure 3–20** demonstrate the steps outlined in this section in order to configure the 860M/R Network Settings as follows:

a. IP address: 192.168.1.10
b. Subnet mask: 255.255.255.0
c. Default gateway: 192.168.1.254

1. Note the current network settings (IP address and Subnet mask) of the 860M/R unit that is to be configured. In order to recover the current settings, follow the directions in **Section 5.3 - 860M/R Network Configuration Recovery Procedure**.
2. Configure the laptop Local Area Connection TCP/IP settings such that the IP address of the laptop is on the same subnet as the 860M/R. For example, if changing the default parameters on the 860M/R, the laptop TCP/IP settings can be configured as follows:
   a. IP address: 192.168.1.2
   b. Subnet mask: 255.255.0.0
   c. Default gateway: This can be left blank
3. Connect the laptop Ethernet Port to the 860M/R Ethernet Port (see **Section 2.1.3**) via a Cat 5/5e/6 cross cable.
4. Open a command prompt and confirm that the laptop is able to communicate to the 860M/R by pinging the 860M/R IP address "A.B.C.D" via the following command (If there is no reply, confirm that the laptop is on the correct subnet as the 860M/R and that a cross over cable is being utilized):

   >ping A.B.C.D

   (A.B.C.D is the IP address of the 860M/R. If the 860M/R still has default configuration, this should be 192.168.1.1).
5. Open a Telnet connection to port 9999, and press Enter to go into Setup Mode within 5 seconds otherwise, connection to the host is lost. If this occurs, open up another command prompt and repeat this step.

>telnet 192.168.1.1 9999

6. A summary of current configurations on the 860M/R will be displayed along with a menu of setup options. In order to change the network parameters, enter "0" to select Server Configuration when prompted.

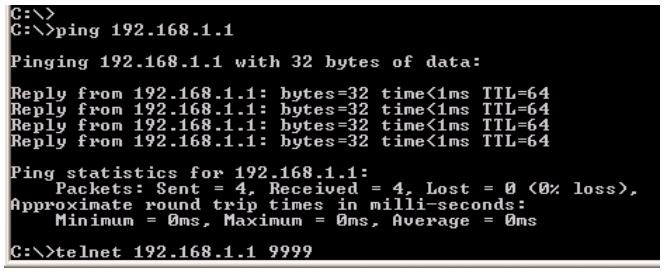

Figure 3–18: Configuring 860M/R Network Settings Steps 5-6

7. Enter a new static IP address. If you wish to configure the 860M/R to DHCP, enter 0.0.0.0

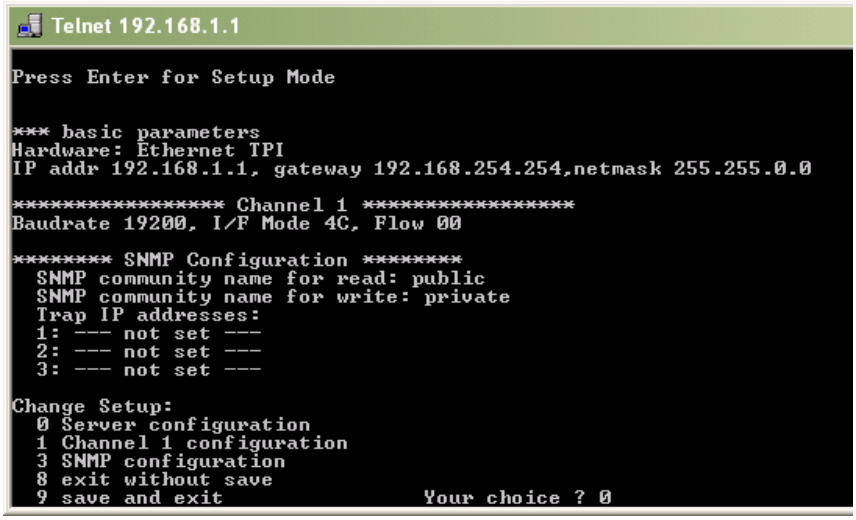

Figure 3–19: Configuring 860M/R Network Settings Step 7

8. Enter "Y" to set the Gateway IP address, else enter "N".
9. Enter the number of host bits in the netmask. For example, a subnet mask of 255.255.0.0 would have 16 host bits. A subnet mask of 255.255.255.0 would have 8 host bits.
10. The next step is to change the telnet password. By default, there is no telnet password. It is advised to skip this step. If the telnet password is forgotten, there isn't a way to change the network configurations of the 860M/R or reset everything to factory default.
11. Review the changes made and enter "0" to save changes and continue back to the main screen; enter "8" to leave original settings and exit the telnet session; or enter "9" to save the changes and exit the telnet session.

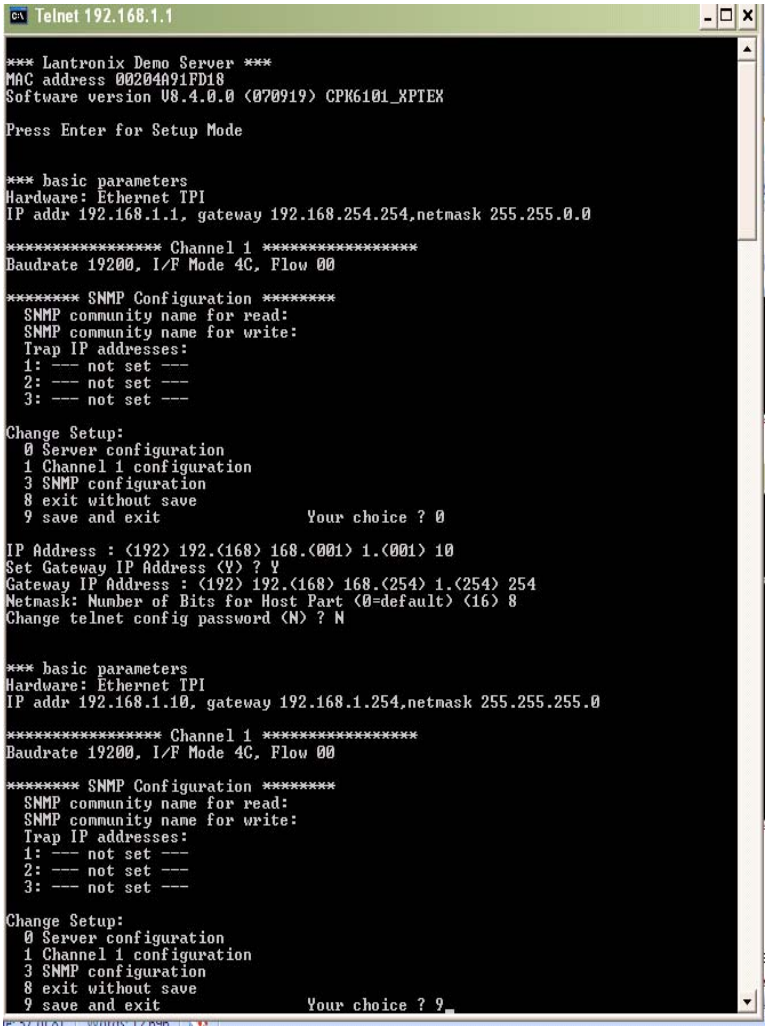

Figure 3–20: Configuring 860M/R Network Settings Steps 8-11

3.5.3 Setting SNMP Parameters

The steps in this section assume that the Network Settings have already been configured or that the IP address of the 860M/R is known. If this is not the case, refer to **Section 3.5.2 - Changing the Network Settings** to configure the Network Parameters or **Section 5.3- 860M/R Network Configuration Recovery Procedure** to recover the IP address of the 860M/R.

This section assumes that the 860M/R network settings have already been configured based on the steps outlined in **Figure 3–18**, **Figure 3–19** and **Figure 3–20** to the following settings:

a. IP address: 192.168.1.10
b. Subnet mask: 255.255.255.0
c. Default gateway: 192.168.1.254

1. Open a command prompt and confirm that the laptop is able to communicate to the 860M/R by pinging the 860M/R IP address. For this example, the 860M/R has an IP address of 192.168.1.10. (If there is no reply, confirm that the laptop is on the correct subnet as the 860M/R and that a cross over cable is being utilized):

   >ping 192.168.1.10

2. Open a Telnet connection to port 9999, and press Enter to go into Setup Mode within 5 seconds otherwise, connection to the host is lost. If this occurs, open up another command prompt and repeat this step.

   >telnet 192.168.1.10 9999

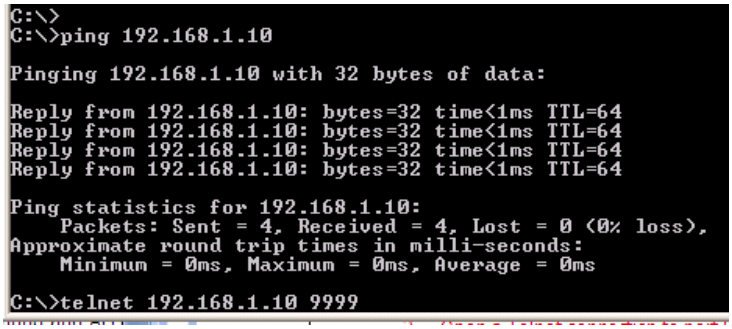

Figure 3–21: Setting SNMP Parameters Steps 1-2

3. A summary of current configurations on the 860M/R will be displayed along with a menu of setup options. In order to change the network parameters, enter "3" to select Server Configuration when prompted.

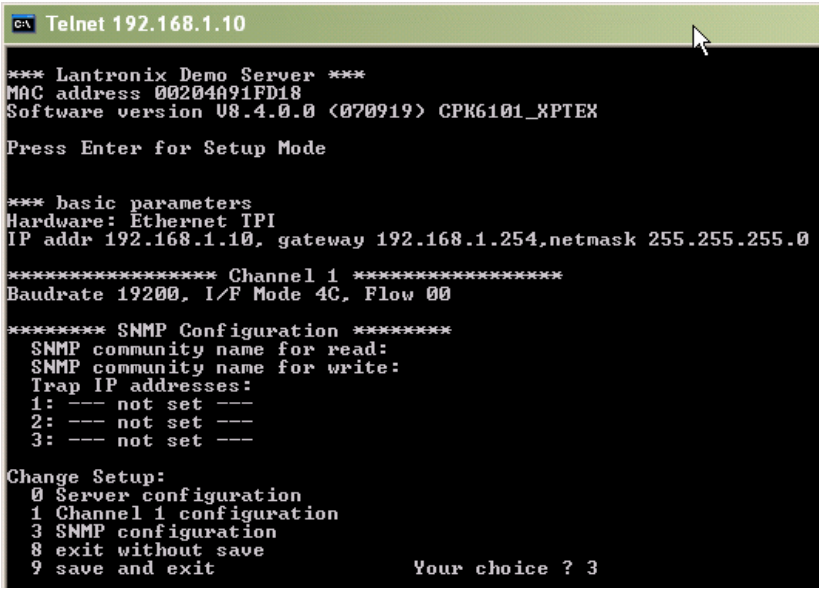

Figure 3–22: Setting SNMP Parameters Step 3

4. Set the SNMP Read and Write community names and the SNMP traps destination addresses (up to three addresses can be defined). Press return after each entry. In this example, the read community name is set to "public", the write community name is set to "private" and only one trap destination address is set to "192.168.1.253".

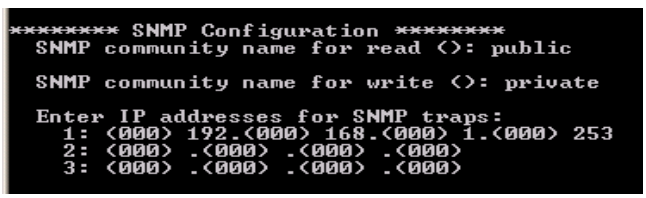

Figure 3–23: Setting SNMP Parameters Step 4

5. The parameters setting summary should appear. Review the changes made and enter "0" to save changes and continue back to the main screen; enter "8" to leave original settings and exit the telnet session; or enter "9" to save the changes and exit the telnet session.

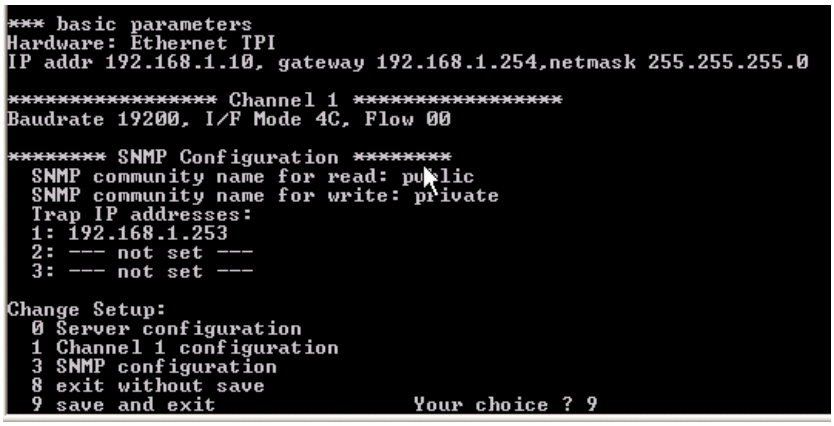

Figure 3–24: Setting SNMP Parameters Step 5

3.6 Power Consumption and Power Supplies

3.6.1 Power Safety Instructions

SAFETY WARNINGS

When installing or selecting the power supplies:

1. Be sure to disconnect all power sources before servicing.
2. 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.
3. Use only UL approved power supplies
4. AC and DC power supply cables – use only the power cords supplied with the units

3.6.2 Input Power Requirements

Device	Voltage Input	Power Consumption	Notes
860M/R + Four WCEs	20-60 VDC	40W	860M/R has a 5W maximum power draw. Each WCE has a maximum 8.5W power draw.
860R + Four WCEs	20-60 VDC	40W	

Table 10: MA-860 WLAN Solution Power Requirements

3.6.3 MobileAccess™ Supplied Power Supplies

The following power supplies are provided with the 860M/R:

Power Supply	Manufacturer	Model Number	Input Power	Output Power
Main	Mean Well	P66A-8AD01	100-240VAC, 50/60Hz, 1.5A	48V, 66W
Redundant	SINPRO	SPU65-104-9.8V	100-240VAC, 47-63 Hz, 1.9 A	9.8V, 75W

Table 11: MobileAccess™ Supplied Power Supplies

3.6.4 Connecting Power Supply to the MA-860 WLAN Solution

The 860M/R supplies power to the WCE via the coax. Therefore, the power supplies are connected directly to the PWR port on the 860M/Rin order for power to be supplied to both the 860M/R module and the WCE.

Each 860M/R module comes with a splitter cable, which has three connection points. One connection point of the cable connects directly to the 860M/R PWR port; one connects to the Main Power supply; and one connects to the redundant power supply.

The 860M/R also provides a bracket that allows for the power cable to remain securely attached to the 860M/R. Follow the steps below and refer to **Error! Reference source not found.** for a complete assembly.

1. Remove the two center screws (Item A).
2. Connect the power cable to the PWR port of the 860M/R.
3. Assemble the bracket (Item B) and reaffix the two screws (Item A).

4. Assemble the bracket (Item B) and reaffix the two screws (Item A).

Item A: Two center screws on 860M/R

Item B: Power Cable Support Bracket

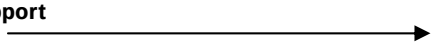

Figure 3–25: Connecting Power Supply to the MA-860 WLAN Solution

3.7 MobileAccess™ Supported Multi Service Antennas

The table below provides the list of approved antennas for use with the MA-860 WLAN Solution. Please consult with the manufacture provided data sheet for the most recent technical specification information.

Manufacturer	Model Number	Description	Frequency Range (MHz)	Gain (dBi)	Notes
Huber Suhner®	SWA 0859/360/4/10/V	Sencity® Art Antenna for Wireless Communication	806-960 1710-2170 2400-5875	5 6 7	All supported frequency ranges have linear vertical polarization.
MobileAccess™	ANT-600-6G-OMN	MobileAccess™ Omnidirectional Multi-Service Antenna (380MHz – 6GHz)	380-512 596-606 608-614 698-960 1395-1432 1710-2170 2400-2485 5150-5850	-3 0 0.5 0.5 1 3 3 4	Supported frequencies from 380MHz – 1432MHz have circular polarization. All other frequencies have vertical polarization.
Mars	MA-CQ26-1X	380MHz – 6GHz Multi Band Omni Antenna	380-460 608-614 1395-1432 806-960 1700-2170 2400-2500 3400-3700 4900-6000	1 1 5 4 6 6 6 6	All supported frequency ranges have linear vertical polarization.

Table 12: MobileAccess™ Approved Multi-Service Antennas

3.8 Access Points

This section lists the approved APs to be used with the MobileAccess™ system as well as the procedures required to prepare the APs for operation and installation.

3.8.1 Approved APs

MobileAccess™ has acquired regulatory approval for the MA-860 WLAN Solution as shown in Table 13: FCC Approved Access Points. As a result, the user must properly label the APs as follows:

1 Verify that the WLAN APs utilized are on the approved list for the appropriate regulatory body

2 Apply the appropriate label (supplied by MobileAccess™) on the AP, near the existing certification labels, making sure it does not cover or obstruct the view of other certifications or required information.

FCC

MobileAccess™ has received the FCC–47, CFR 15.109, Part 15 Sections B, C, and E certification. As per this certification, each MA-860 WLAN System is supplied with FCC certification labels that correspond to the MA-860 and connected APs as per **Table 13: FCC Approved Access Points** below.

MobileAccess™ FCC ID	Access Point Vendor	Access Point Model	Functionality
OJFMA860WCE-AU	Cisco	1242	Dual radio 802.11 a/b/g

Table 13: FCC Approved Access Points

3.8.2 AP Connection and Configuration with MA-860

An MA-860 WLAN module provides support for up to four 802.11a/b/g APs (four 'a' ports and four 'b/g' ports. Signals from an AP connected to the MA-860 port labeled "**Access Point 1"** are routed out the MA-860 port labeled **"ANT 1"**; signals from an AP connected to the MA-860 port labeled "**Access Point 2"** are routed out the MA-860 port labeled **"ANT 2"**; and so on. More detailed information can be found in **Section 2.1.3 Rear Panel Interfaces and Indicator LEDs** above.

Follow the steps below to properly connect and configure an AP to use with the MA-860 WLAN Solution:

1. Apply the appropriate FCCID label (refer to **Table 13: FCC Approved Access Points**) supplied with the 860M/R on the Access Point.
2. Using an RP-TNC/RP-SMA (see ***Table 14: AP Termination***) to SMA jumper cable, connect the right primary port of the AP to the MA-860 "**Access Point**" port. Note that the 5.1GHz AP antenna port should be connected to the "**802.11a Access Point**" port and the 2.4GHz AP antenna port should be connected to the "**802.11b/g Access Point**" port.
3. Terminate all unused AP and 860M/R ports with an appropriate 50-ohm load (see ***Table 14: AP Termination***). Four SMA Male RF 50-ohm loads are supplied with the 860M/R.
4. Supply power to the AP per AP vendor specifications.
5. If the AP has diversity antennas, refer to AP vendor specification to configure the AP to transmit and receive only across the right, or primary, external port of all connected APs. Disable the left, or secondary, external port of all connected APs.
6. Once the customer has configured the AP to the appropriate channel/power configuration per AP vendor specifications as required/decided upon by the customer, confirm that the Status light for each "**Access Point**" port is illuminated GREEN. NOTE: A minimum of -6dBm of power is required to be transmitted by the AP for the 860M/R to recognize the AP as being active.

Access Point Vendor	Access Point Model	Access Point Termination	Mating Connector for 50-ohm Load or Jumper Cable
Cisco	1242	RP-TNC Plug (Female)	RP-TNC Jack (Male)

Table 14: AP Termination

3.8.3 AP Installation in IDF or Telecom Closet

Confirm that the MobileAccess recommends that each independent IDF Telecom closet is adequately planned for installation of the access points to increase the amount of isolation and reduce the amount of RF leakage between access points.

MobileAccess™ has also found that mounting the access points in a 19" rack system has proven to be effective against RF leakage between access points. The APs must be physically separated as follows to eliminate any RF contention or leakage from AP to AP:

- Minimum Horizontal AP to AP Separation: 4in (Four inches)
- Minimum Vertical AP to AP Separation: 1U (1 rack unit)

Refer to **Figure 3–26: Access Point** Mounting below for an example of the separation and mounting requirements.

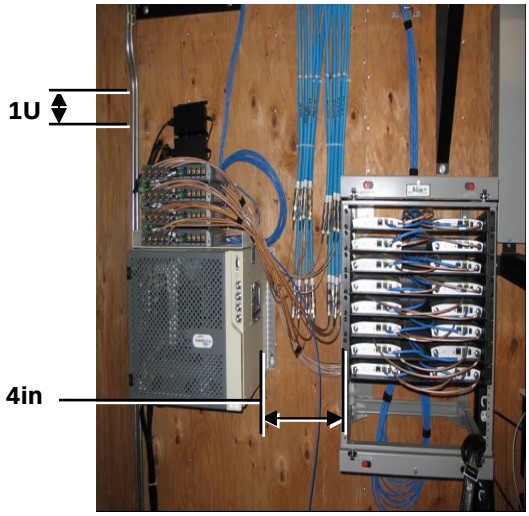

Figure 3–26: Access Point Mounting

4 MA-860 WLAN Solution Graphical User Interface (GUI)

The MA-860 WLAN solution provides the user with a Graphical User Interface (GUI) in order to access configuration and status information of the MA-860.

4.1 Accessing the GUI

The MA-860 GUI can be accessed by following the procedure below:

1. Configure the 860M/R unit with an IP address by following the procedure outlined in **Section 0**.
2. Configure the IP address of the 860M/R to be on the same subnet as the 860M/R.
3. If accessing the 860M/R directly, connect the PC to the 860M/R Ethernet Port via a cross over cable. If accessing the 860M/R via a LAN, connect the PC to the LAN making sure that the PC is on the same network as the 860M/R.
4. Open a command prompt on the PC and confirm that the laptop is able to communicate to the 860M/R by pinging the 860M/R IP address "A.B.C.D" via the following command:

   >ping A.B.C.D

   (A.B.C.D is the IP address of the 860M/R)
5. Open up a Web Browser application (e.g. Microsoft Internet Explorer)
6. Enter the IP address of the 860M/R into the address bar of the Web Browser (e.g. http://A.B.C.D, where A.B.C.D is the IP address of the 860M/R).
7. Login to the GUI based on the User Account level (see **Section 0**).
8. Refer to **Section 4.3 - 0** for details on the information provided in the GUI.

Note: The Web GUI screen is refreshed automatically; however, if necessary, click the same tab again (do **not** use the Web Browser Refresh option).

4.2 Login and User Account Levels

The available login credentials and default passwords are defined in Table 15. Please note that the password is case sensitive.

Username	Password	Accessibility Information	Accessible MA-860 GUI Tabs
Operator	oper	Monitoring options only.	- General - Adjustments (View Only) - Alarm
Field Engineer	eng	Monitoring and limited configuration options only.	- General - Adjustments (View and Configuration) - Alarm
TechSupport	N/A	Reserved for MobileAccess technical support only.	Reserved for MobileAccess technical support only.

Table 15: MA-860 GUI Login and User Account Levels

Figure 4–1 below is a screen capture of the login screen.

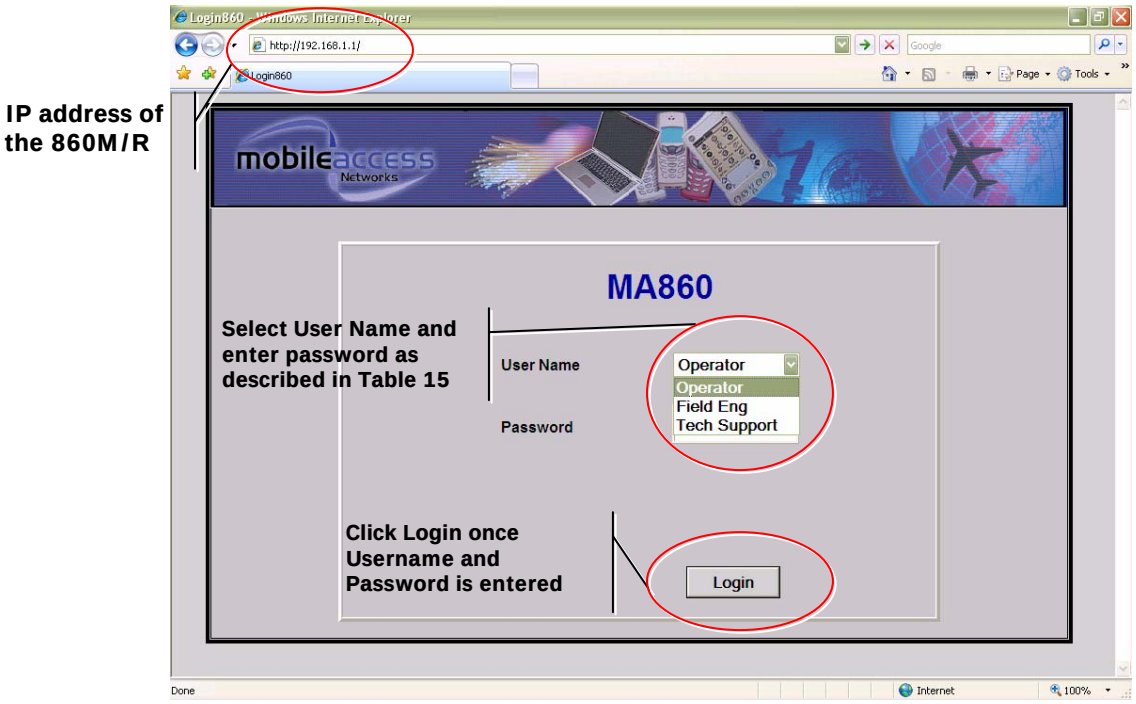

Figure 4–1: 860M/R GUI Login Screen

4.3 MA-860 GUI Control Information

Upon login, the default display is the General tab of the Control Screen. The Control Screen provides the user with access to the following tabs:

Tab Option	Description
General	Unit identification and version information, and WCE information for each channel.
Adjustments	Unit cable compensation adjustments.
Alarms	Alarm monitoring

4.3.1 General Tab Information

The General Tab on the Control Information screen of the GUI provides users access to the following information:

Purpose

The purpose of the General tab information is to provide the user with information about the MA-860

Information Provided

1 860M/R Unit Information
   a. Hardware and Software Version Number
   b. Hardware Serial Number
   c. Network Configuration Settings (for 860M/R unit)
   d. Product Version Information if applicable

2 Antenna #1-4 Information
   a. Provides the following information for the WCE unit connected to a specific antenna port
      i. Hardware Serial Number
      ii. Software Version Number
      iii. Product Version Information if applicable
   b. If there is no WCE connected at the end of the coax run of the associated Antenna port, the information is blank
   c. If a WCE was connected at one point but was then removed, the WCE information will be grayed out until the 860M/R unit goes through a power cycle or auto discovery process.

3 The Apply button on this screen is not enabled since there are no user adjustable parameters on this screen.

User Level Access

Operator and Field Eng.

Reference Figure

Figure 4–2

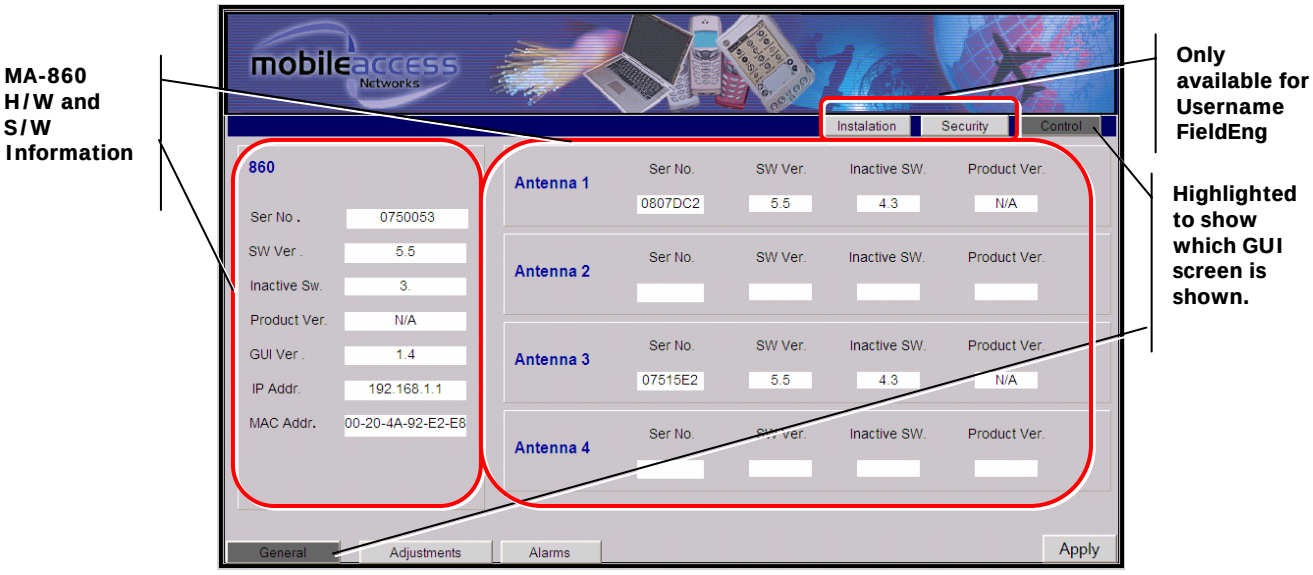

Figure 4–2: 860M/R GUI Control Screen – General Tab

4.3.2 Adjustments Tab Information

Purpose

The purpose of the Adjustments tab is to provide the user with the ability to view the cable compensation information for each antenna port.

Information Provided

The following information is provided for each antenna port of the 860M/R:

1 DC: This states whether DC power is being supplied to the WCE on the port from the 860M/R. If a WCE is discovered on the port of the 860M/R, this value will be ON.

2 802.11a Power and 802.11b/g Power

a. Adjust a or Adjust b/g

i. If this button is pressed, the user manually forces cable compensation to occur. By default, the 860M/R will continue to automatically perform cable compensation as described in **Section 5.1**.

ii. The compensation result will be within +/-1dB of the detected input power of the AP at the time this button is enabled.

b. AP*X* Pwr

i. This is the AP input power seen by the 860M/R on the 802.11a or 802.11b/g port associated with the antenna port, where *X* is the antenna port number.

ii. Note that the 860M/R is not a power meter but merely a power sensor that senses the AP input power in order to compensate for the cable path losses between the 860M/R antenna port to the WCE.

c. Ant*X* Pwr

i. This is the output power of the WCE associated with the antenna port, where *X* is the antenna port number.

ii. This value should be within +/-1 dB of the AP*X* Pwr.

iii. Note that the 860M/R is not a power meter but merely a power sensor that senses the AP input power in order to compensate for the cable path losses between the 860M/R antenna port to the WCE.

3 Full Discovery
   a. Enabling this button polls each antenna port on the 860M/R in order to find out if a WCE is connected.
   b. This process also recovers the Serial Number of the WCE and updates the pertinent information in the Antenna section of the General Tab (refer to **Figure 4–2**).
   c. If a WCE is replaced, this button should be pressed to discover the serial number of the new WCE.
4 Partial Discovery
   a. Enabling this button polls only the antenna ports on the 860M/R that do not have a WCE connected to it.
   b. This process also recovers the Serial Number of the WCE and updates the pertinent information in the Antenna section of the General Tab (refer to **Figure 4–2**).
   c. If a WCE is connected to an unconnected port on the 860M/R, this button should be pressed to discover the serial number of the new WCE.
5 Reset
   a. Enabling this button recycles power on the 860M/R.

User Level Access Operator and Field Eng.

Adjustable Parameters
1 DC: The user can manually enable/disable power to the WCE
2 802.11a and 802.11b/g Adjust Buttons: Force cable compensation.
3 Full and Partial Discovery: Poll antenna ports to discover WCEs.
4 Reset: Recycle power of 860M/R.
5 Apply: This button is not enabled on this screen

Reference Figure Figure 4–2

Figure 4–3: 860M/R GUI Control Screen – Adjustments Tab

4.3.3 Alarms Tab Information

Purpose

The purpose of the Alarms tab is to provide the user with the ability to view the status of the communication and hardware functionality of the 860M/R and WCE.

Information Provided

Refer to Table 16 below for an explanation of the alarm features on this screen:

Name	Value	Comment
Trap Select	Enable/Disable	Allows the user to mask/unmask traps of a specific antenna port. Factory default is Enable.
Temp	Green	Green
AP a AP b/g	Red/green	Indication per each AP port Red – AP is not detected on this port Green - AP is detected
MA860 WCE	Red/Green/Gray	Indication per each Antenna port Gray – WCE was not discovered on this port Red – WCE was discovered on this port using full/partial discovery but is not comminuting with MA860-HU Green - WCE was discovered on this port using full/partial discovery and comminuting with MA860-HU
WCE antenna	Red/Green/Gray	Indication per each Antenna port Gray – WCE was not discovered on this port Red – Antenna was not discovered by WCE

		on this port Green - Antenna was discovered by WCE on this port
DC	Red/Green	Indication per each antenna port: Gray – No WCE was discovered on this port; DC is off. Red – WCE was discovered on this port ;The DC is off due to current overload. Green – WCE was discovered on this port ; The DC is on
Adjust a Adjust b/g	Red/Green/Gray	Indication per each Antenna port Gray – WCE gain control procedure was not performed Red – WCE gain control procedure of channel failed Green - WCE gain control procedure of channel successful
WCE HW	Red/Green/Gray	Indication per each Antenna port Gray – WCE was not discovered on this port Red – WCE HW failed Green – WCE HW O.K

Table 16: 860M/R Control Screen - Alarm Information

User Level Access Operator and Field Eng.

Adjustable Parameters Trap Selection

Reference Figure Figure 4–4

Figure 4–4: 860M/R GUI Control Screen – Alarms Tab

4.4 Security Screen Information

The Security button on the General Tab of the GUI provides users access to the following information:

Purpose

The purpose of the Security Information screen on the General Tab is to provide the user with the ability to change the login passwords.

Information Provided

This screen allows the user to change the Login Password as follows:

1. Enter the current Login Password for the username Field Eng.
2. Select the User Name whose Login Password is to be changed.
3. Enter the new Login Password for the User Name entered in Step 2 in the "New Password" field
4. Verify the new Login Password in the "Verify Password" field
5. Click the "Apply" button to record change and wait for the notice to display if the New Password is accepted.
6. The New Password should be used the next time the GUI is accessed.

User Level Access

Field Eng.

Reference Figure

Figure 4–5

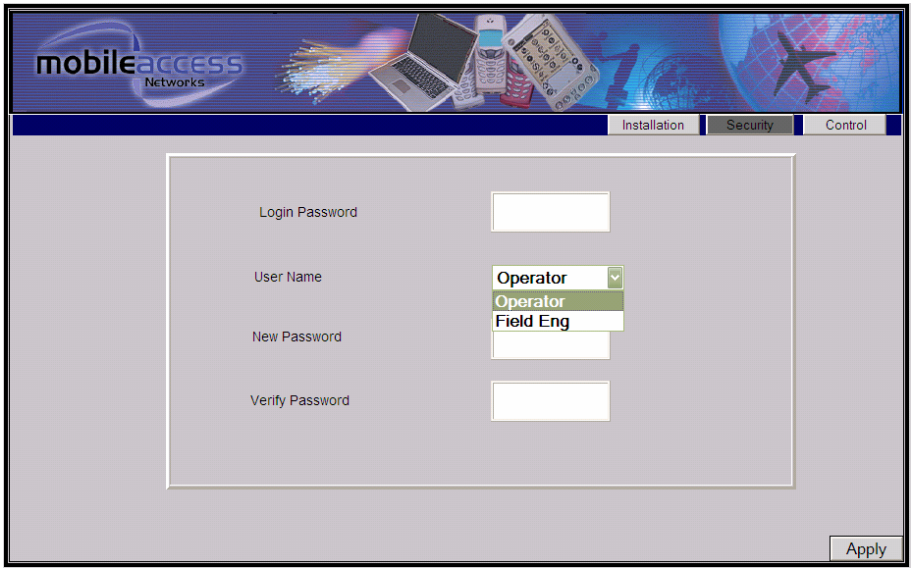

Figure 4–5: 860M/R GUI Security Screen

4.5 Installation Screen Information

The Installation button on the General Tab of the GUI provides users access to the following information:

Purpose

The purpose of the Installation Information screen on the General Tab is to provide the user with information on the IP, MAC, Name and Location of the 860M/R.

Information Provided

1. IP Address of 860M/R unit
2. MAC Address of Unit
3. Name of 860M/R: This can be updated by the user by entering the information and clicking Apply.
4. Location of 860M/R: This can be updated by the user by entering the information and clicking Apply.

User Level Access

Field Eng.

Reference Figure

Figure 4–6

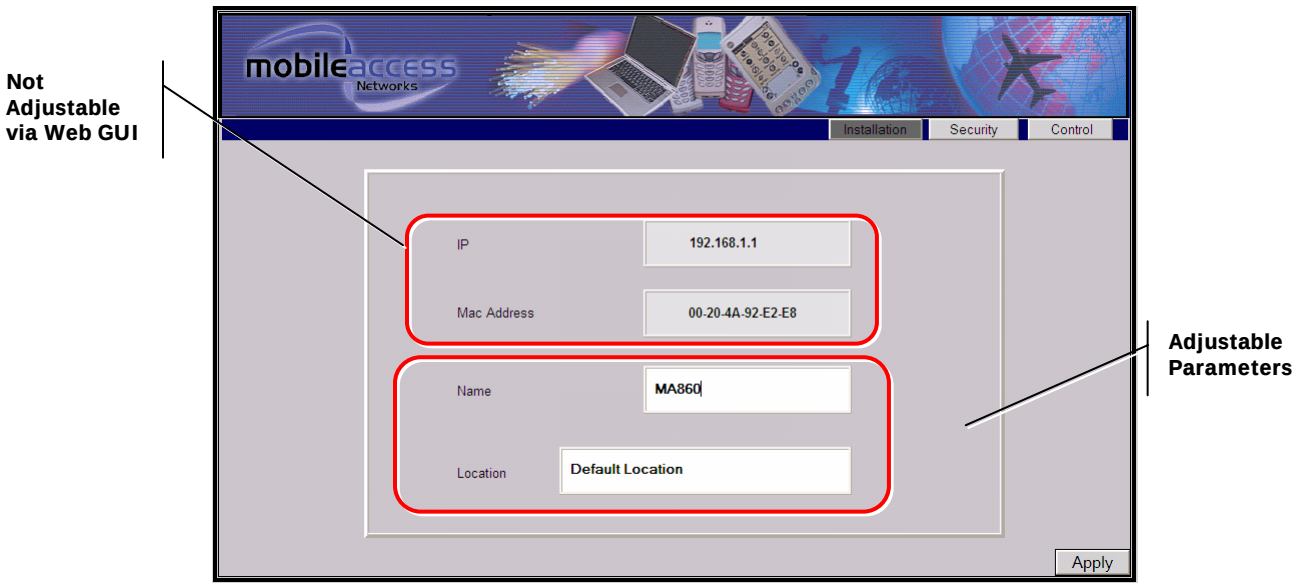

Figure 4–6: 860M/R GUI Installation Screen

5 Appendix

This appendix provides information on:

- MA-860 Cable Compensation Feature
- Monitoring the unit via a third party SNMP application
- Recovering the Network Settings of an 860M/R

5.1 MA-860 Cable Compensation Feature

The MA-860 system provides a method to compensate for the RF path loss for the 802.11a/b/g signals from the 802.11a/b/g AP ports on the 860M/R to the antenna port on the WCE. This allows the MA-860 to mimic the "AP-on-Ceiling" deployment of a standalone WLAN installation.

The MA-860 is able to compensate for the RF path loss by adjusting the transmit and receive gain level of the 802.11a/b/g signal at the output of the WCE. This adjustment can be made manually or automatically as follows:

Automatic Gain Control (AGC): By default, the MA-860 is configured to automatically adjust the gain of the WCE based on the AP input power. The MA-860 continuously compares the gain value of the WCE output to the input power of the AP and if, over 2 minute, the delta between the two exceeds 2dB, adjustments are made to allow the delta to become 0dB.

NOTE: When the AP is first connected to MA-860, it may take between 2-5 minutes for the initial gain adjustment to occur. Once this is completed, the AGC will resume updating every 2 minutes.

Manual Gain Adjustment: If it is necessary to adjust the gain within the 2 minute automatic interval, the user has the ability to manually force an adjustment. This can be done by accessing the MA-860 GUI Adjustments tab and clicking the corresponding Adjust button as described in **Section 4.3.2**.

5.2 SNMP Management Using a Standard SNMP Manager

The 860M/R packages provide MIBs that enable standard SNMP (Version 2.0) managers such as HP OpenView to view event traps sent by the 860M/R unit.

These traps provide a general indication of the type of failure. The 860M/R enables identifying the source of the problem and system monitoring parameters.

SNMP trap destinations and community names can be defined by following the procedure outlined in **Section 3.5.3 - Setting SNMP Parameters**.

5.2.1 Traps List

The following traps are provided to the SNMP destination address defined by following the procedure in **Section 3.5.3**:

Name	Type	Severity	OID	Description
ma860powerUp	NOTIFICATION-TYPE	notification	81.4.2.0.1	System On.
ma860SerialNotify	NOTIFICATION-TYPE	notification	81.4.2.0.2	serial communication status failed success
ma860WceOverTemperature	NOTIFICATION-TYPE	major	81.4.2.0.3	WCE Temperature over 60°C
ma860WceNormalTemperature	NOTIFICATION-TYPE	info	81.4.2.0.4	WCE Temperature Normal
ma860APaDisconnect	NOTIFICATION-TYPE	major	81.4.2.0.5	AP type 802.11 a DisConnected
ma860APaDetected	NOTIFICATION-TYPE	info	81.4.2.0.6	AP type 802.11 a Connected
ma860APbgDisconnect	NOTIFICATION-TYPE	major	81.4.2.0.7	AP type 802.11 bg DisConnected
ma860APbgDetected	NOTIFICATION-TYPE	info	81.4.2.0.8	AP type 802.11 bg Connected
ma860WceDisconnected	NOTIFICATION-TYPE	major	81.4.2.0.9	WCE Disconnected
ma860WceDetected	NOTIFICATION-TYPE	info	81.4.2.0.10	WCE detected by MA860
ma860WceDCFault	NOTIFICATION-TYPE	major	81.4.2.0.11	DC OFF - disconnected by system due to falure
ma860WceDCOn	NOTIFICATION-TYPE	info	81.4.2.0.12	DC ON
Ma860adjust11aFailed	NOTIFICATION-TYPE	minor	81.4.2.0.13	Adjustment on type 802.11 a Failed
Ma860adjust11aSuccess	NOTIFICATION-TYPE	info	81.4.2.0.14	Adjustment on type 802.11 a Succeeded
Ma860adjust11bgFailed	NOTIFICATION-TYPE	minor	81.4.2.0.15	Adjustment on type 802.11 bg Failed
Ma860adjust11bgSuccess	NOTIFICATION-TYPE	info	81.4.2.0.16	Adjustment on type 802.11 bg Succeeded
ma860OverTemperature	NOTIFICATION-TYPE	major	81.4.2.0.17	MA860 Temperature over 60°C

Name	Type	Severity	OID	Description
ma860NormalTemperature	NOTIFICATION-TYPE	info	81.4.2.0.18	MA860 Temperature Normal
ma860WceAntDisconnected	NOTIFICATION-TYPE	major	81.4.2.0.19	WCE antenna DisConnected
ma860WceAntDetected	NOTIFICATION-TYPE	info	81.4.2.0.20	WCE antenna Connected
ma860WceFailure	NOTIFICATION-TYPE	major	81.4.2.0.21	WCE HW failure
ma860WceOK	NOTIFICATION-TYPE	info	81.4.2.0.22	WCE HW OK

Table 17: MA860 WLAN Solutuion SNMP Trap Definitions

5.2.2 Viewing and Configuring Using a Standard MIB Browser

To view and configure using any standard SNMP manager such as MG-Soft MIB Browser. It is assumed that the IP Address of at least one trap destination is already defined (refer to **Section 3.5.3**).

From a computer *configured as a trap destination* (configured to receive the traps), load the MIB file to the SNMP manager. The following figure shows the MIB tree that includes the loaded MobileAccess™ MA 860 file.

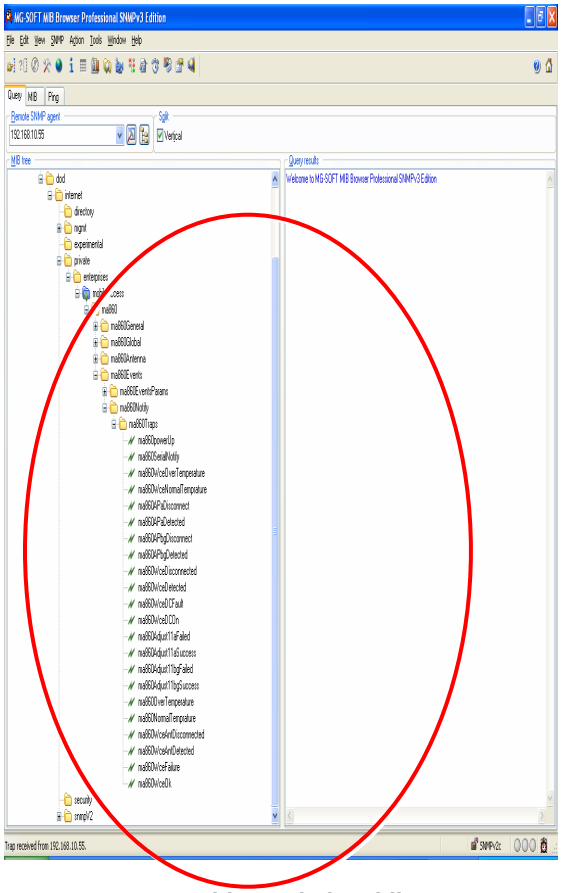

Figure 5–1. MIB Tree with Loaded MobileAccess™ MA 860

5.3 860M/R Network Configuration Recovery Procedure

If the network configuration of the 860M/R unit (e.g. IP address, netmask, etc.) has been forgotten or lost, use Address Resolution Protocol (ARP) method from UNIX and Windows-based systems to assign a temporary IP address as described in this section.

Follow the steps below to assign a new IP address to the 860M/R module. In the steps below, the example is used to configure an 860M/R which has a MAC of 00-20-4a-91-FD-18, with an IP address of 192.168.1.1 and a subnet of 255.255.255.0. Refer to **Figure 5–2** and **Figure 5–3**, which show the example on a Windows PC.

1. Power on the 860M/R unit if not already powered.
2. Disconnect the 860M/R from the customer LAN.
3. Connect the PC to the 860M/R Ethernet port via a cross over cable.
4. Establish a static IP on the PC that is on the same network that the 860M/R unit is to be on. As per the example, the PC is set to an address of 192.168.1.3 with a subnet of 255.255.255.0.
5. Open a command prompt on the PC.
6. Create an entry in the host's ARP table using the intended IP address (e.g. 192.168.1.1) and the MAC address of the unit (e.g. 00-20-4a-91-FD-18) (on the product label on the bottom of the unit) as shown below:
7. For a Unix based PC enter:

   >arp -s 192.168.1.1 00:20:4a:91:FD:18
8. For a Windows based PC enter:

   >arp -s 192.168.1.1 00-20-4a-91-FD-18
9. Confirm the entry into the host's ARP table by typing in the following command at the command prompt:

   >arp –a
10. Open a Telnet connection to port 1 by typing in the following command (The connection fails quickly, but the unit temporarily changes its IP address to the one designated in this step)

    >telnet 192.168.1.1 1

11. Open a Telnet connection to port 9999, and press Enter to go into Setup Mode within 5 seconds otherwise, connection to the host is lost. If this occurs, open up another command prompt and repeat this step.

    >telnet 192.168.1.1 9999

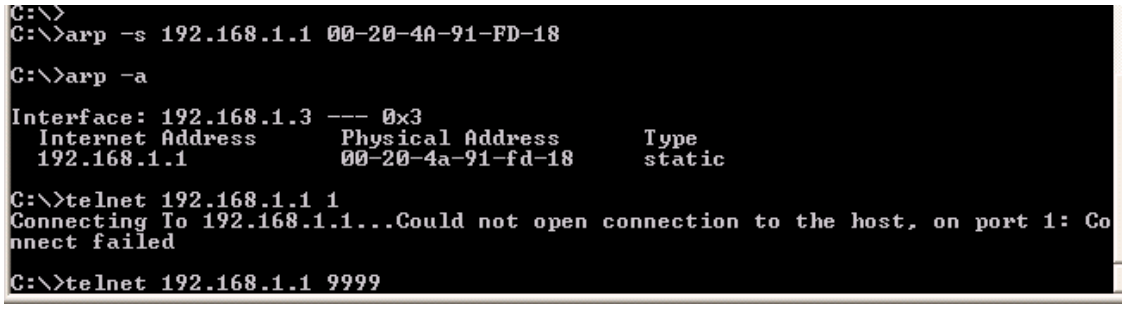

Figure 5–2: Recover 860M/R Network Configuration Steps 6-11

12. Select 0 (Server Configuration).
13. Enter the new IP address, subnet mask, and gateway (if applicable).
14. Select 9 to save and exit Setup Mode.

15. Once the above steps are completed, the 860M/R can be connected back to the LAN

Figure 5–3: Recover 860M/R Network Configuration Steps 10-15

5.4 NMS Management and Configuration

If your coverage network includes other MobileAccess™ systems (such as MA1000 or MA2000) that are managed via NMS, you may also use the NMS to remotely manage and monitor MA860 devices to which an IP address has been assigned.

The MA860 graphical interface, management and monitoring windows that are accessed via the NMS are identical to the WEB Access windows described in the previous section.

For more explanations about using the NMS Management application see the *MA NMS 410/430 System Installation and Configuration Guide.*

In order to configure for discovery of 860M/R devices, it is required to configure the IP of the devices in the Network Topology tree.

Steps to configure the monitoring of 860M/R via NMS are described below:

1. Select the wanted branch under which a new node will be configured and click the Add button. The Add pane is invoked. Choose Node. Refer to **Figure 5–4**.

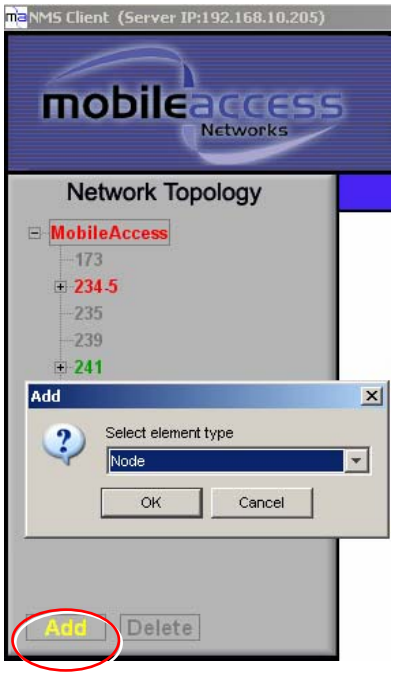

Figure 5–4: NMS Client - Add Node

2. In the invoked New Node pane insert the node details and click OK. Refer to **Figure 5–5**.

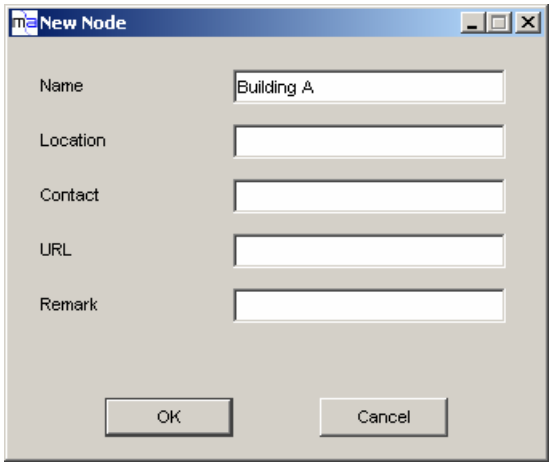

Figure 5–5: NMS Client - New Node

3. The new node is added to the Network Topology tree. In this example, four nodes were added: "Building A" and under it "Floor-4", "Floor-5" and "Floor-6". Refer to **Figure 5–6**.

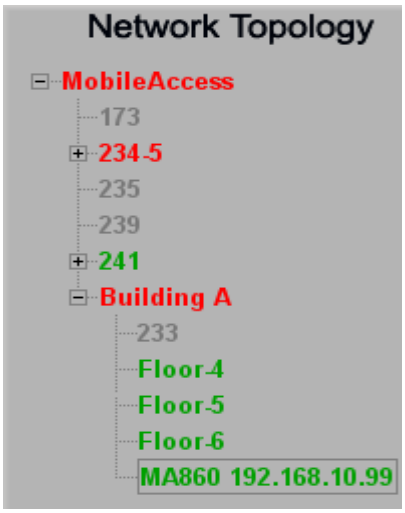

Figure 5–6: NMS Client - Network Topology

4. Under every node an MA860 device(s) can be added by selecting the wanted node and clicking the Add button to invoke the Add pane.
5. In the Add pane, choose Element Type Unit Domain as shown in **Figure 5–7**.

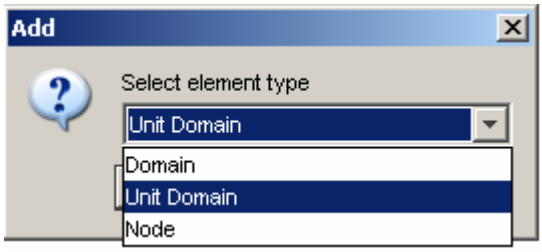

Figure 5–7: NMS Client - Select Element Type to Add

In the invoked Add pane choose the **Unit Domain** option.

6. In the New Unit Domain configuration pane choose the device type (MA860) and insert the exact IP address of the 860M/R unit as shown in **Figure 5–8**.

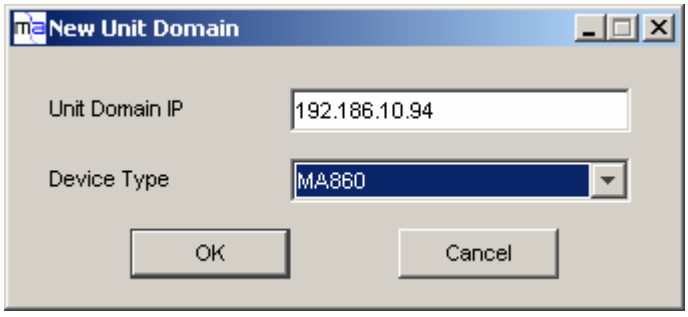

Figure 5–8: NMS Client - Enter 860M/R Information

7. After clicking OK, the corresponding device will appear in the Network Topology tree, under the selected node. To view the MA860 double click it in order to open the GUI described in **Section 4** . Refer to **Figure 5–9** which shows two MA-860 defined under the "Floor-5" node:

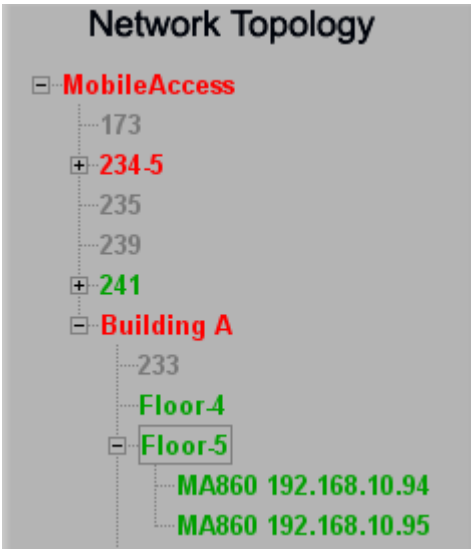

Figure 5–9: NMS Client - MA-860 Added to Network Topology