MR Booster Manual

Order No. MN001808-1

Issue 9/99

MIKOM

An **Allen Telecom** Company

Field Support

If you need technical assistance with the MR Booster contact **MIKOM** at:

Technical Hotline: (800) 800-7465 or (804) 386-5360

Safety Information

The MR Booster equipment has been designed for maximum safety when installed, operated, and maintained according to the instructions in this manual. Do not bypass any of the safety features of this equipment or operate this equipment in an improper environment.

All wiring external to the equipment should comply with the current edition of the Electrical Code or any national wiring rules that apply.

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Section 1. Introduction

1.1 About This Manual

This manual provides installation, operating, and maintenance instructions for the MR Booster. It is intended for anyone who installs or maintains MR Booster equipment.

Section 1. Introduction: Provides a brief overview of the manual contents and terminology.

Section 2. System Description: Describes the basic functionality, features, and technical details of an MR Booster.

Section 3. Installation: Explains the procedures for mounting the MR Booster and making all connections.

Section 4. Setting Up for Initial Operation: Describes the procedures for connecting and operating a local terminal.

Section 5. Troubleshooting: Describes the procedures for locating and fixing problems that can occur in an MR Booster.

Section 6. Specifications: Lists mechanical, electrical, and environmental specifications of the MR Booster.

Appendices

A. Software Control: Detailed explanation of software operation and features.

Parts & Accessories Order Information

Provides information about MR Booster model and part numbers, and suggested spares.

1.2 Conventions Used in This Manual

The following special notations are used to draw attention to particularly important information:

WARNING! Warning statements alert you to situations that can cause equipment damage. Failure to heed warning statements may void any existing warranties.

CAUTION: Caution statements alert you to situations that can cause interruption or serious degradation of service. For optimum system performance, observe caution statements.

NOTE: Notes contain helpful hints or reminders of important information.

1.3 Terminology

The following table lists the meanings of frequently used acronyms in this manual. For descriptions of these system components, refer to Section 2.

Acronym	Definition
BDA	Bi-Directional Amplifier
BTS	Base Transceiver Station
MR	Mikom Repeater

Table 1-1. Definitions

Section 2. System Description

2.1 Introduction

This section describes the basic functions and features of an MR Booster, including:

- System overview
- Theory of operation
- System components

2.2 System Overview

The MR Booster is a broadband, bi-directional amplifier (BDA) used to extend the coverage area in a wireless communications network. The booster is specifically designed to interface with the MIKOM MR series repeater. It can also be used with an existing repeater or a base transceiver station (BTS) that needs a downlink power boost.

Figure 2-1 illustrates a typical MR Booster application with a repeater, and Figure 2-2 illustrates a typical application with a BTS. The booster is connected directly to the coverage antenna port from the repeater or BTS and boosts the downlink signal power while maintaining dynamic range on the uplink. The booster performs several basic functions to enhance network coverage:

- The repeater or BTS downlink RF output is filtered, amplified and transmitted, via the mobile coverage antenna, using high efficiency RF power amplifiers.
- Uplink RF signals from handsets in the coverage area are received at the mobile antenna, amplified by an LNA, and passed directly to the repeater or BTS.
- Control and alarm monitoring is maintained by MR repeater software or through two relay contact outputs from the booster.
- Power supply and power amplifier soft-fail redundancies offer increased reliability.
- A separate uplink diversity path is available as an option.
- Downlink output VSWR monitoring is available as an option.

- The Booster is available in one of two output power options (medium and high) and four frequency ranges:

Band	Uplink	Downlink
AMPS800 full band	824-849 MHz	869-894 MHz
LMR800 full band	806-824 MHz	851-869 MHz
PCS1900 ADB band	1850-1885 MHz	1930-1965 MHz
PCS1900 extended EFC band	1875-1910 MHz	1955-1990 MHz

Table 2-1. Frequency chart

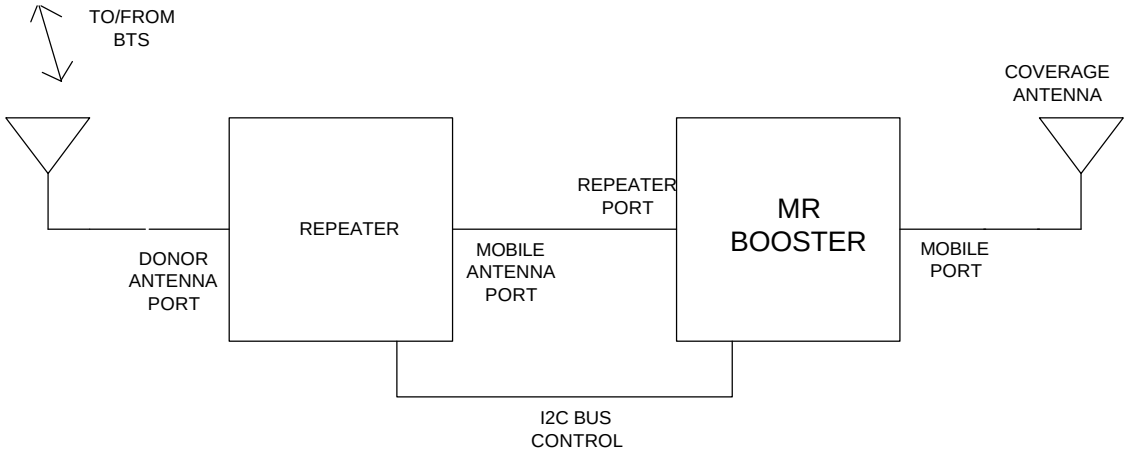

Figure 2-1. Typical MR Booster application (Repeater)

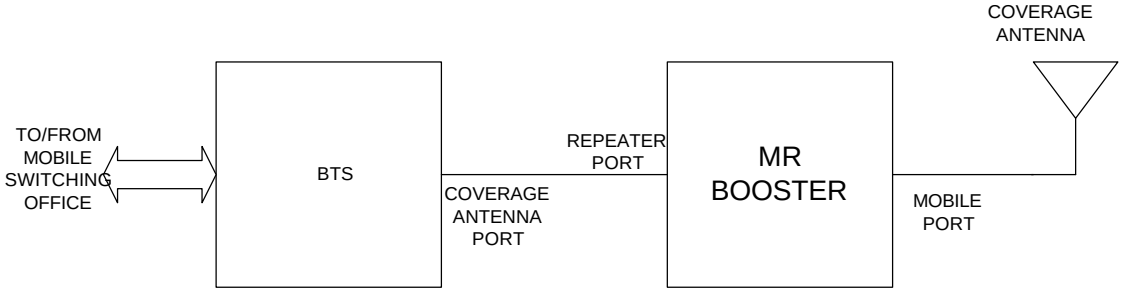

Figure 2-2. Typical MR Booster application (BTS)

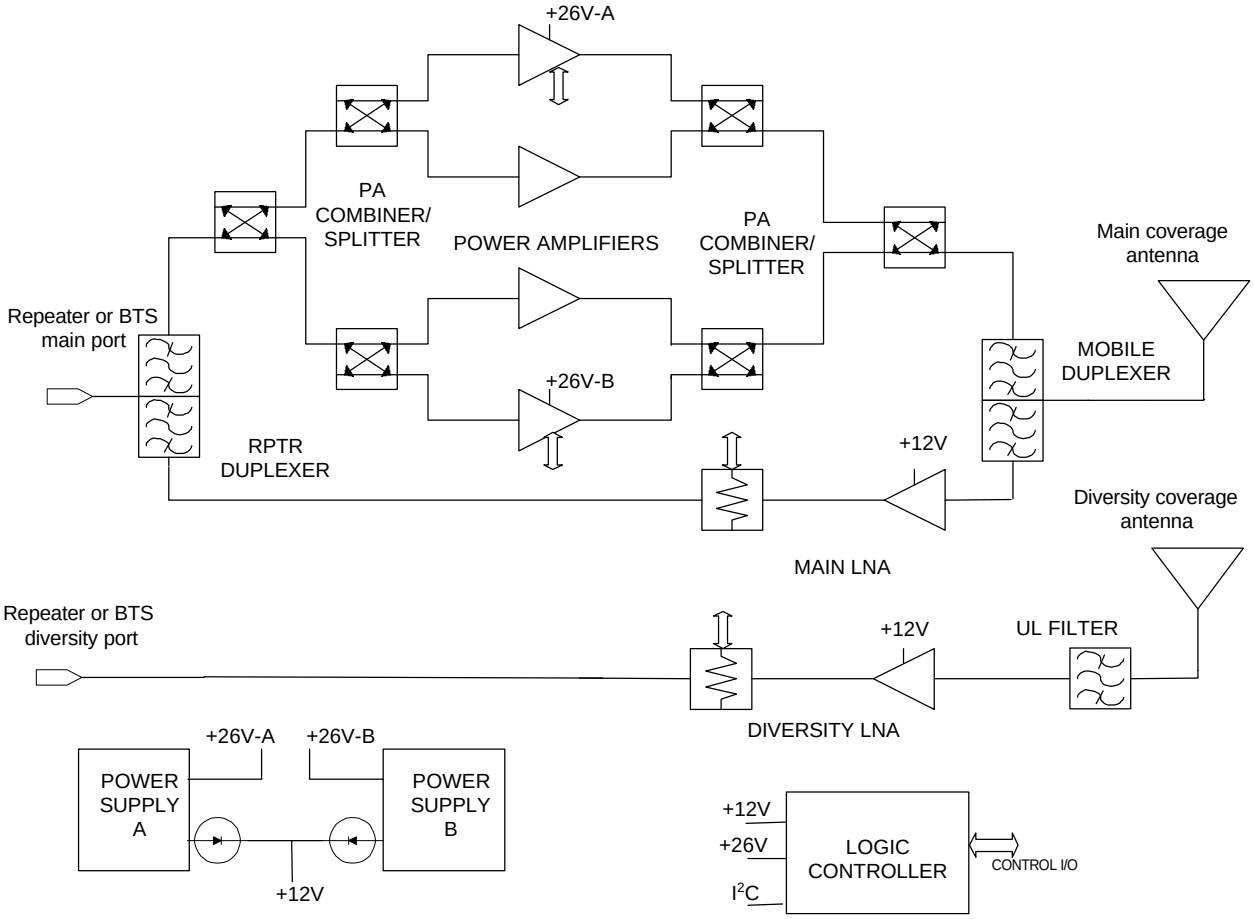

Figure 2-3. MR Booster functional block diagram

2.3 Theory of Operation

A block diagram of the basic high-power MR Booster system is shown in Figure 2-3. In order to simplify the discussion, a repeater-booster installation is assumed as in Figure 2-1.

2.3.1 Downlink path

Duplexed RF from the repeater's coverage antenna port is connected to the booster repeater port. The repeater duplexer then routes the downlink signal frequencies to the PA combiner/splitter module.

In the high-power option, the RF is split into four separate paths by the hybrid combiner/splitter module and distributed to four RF PAs. In the medium-power option, the RF is split into two separate paths and distributed to two RF PAs.

NOTE: The multiple amplifiers provide soft-fail redundancy to maintain minimum output power capability should one or more fail in the field.

The PA outputs are summed in a second combiner/splitter, then routed to the mobile-side duplexer. The duplexer routes the downlink RF output to the coverage antenna, which transmits to handsets in the booster coverage area.

2.3.2 Uplink path

Mobile handset transmissions are received at the mobile duplexer port and routed to the LNA input by the mobile duplexer. The amplified LNA output is then routed to the repeater duplexer, which is connected to the installed repeater's coverage antenna port.

A diversity option offers a second, identical uplink path when diversity is in use in the donor BTS or repeater.

2.3.3 System control

Control functions include PA keying, fan control, and uplink attenuation setting. Monitored parameters include PA output power, status, system temperature, power supply temperature, DC output voltage and status, and input power source (ac or dc).

Resident software can be accessed via the supplied serial interface cable with a laptop computer and terminal-emulation software to initialize and customize the unit during installation or to perform troubleshooting.

The booster can be remotely controlled after installation with a Mikom MR series repeater via the I^2C bus interface cable.

For other applications, or if remote control is not required, a pair of relay closure outputs from the booster can be user-configured and routed to the donor system to flag system problems after installation.

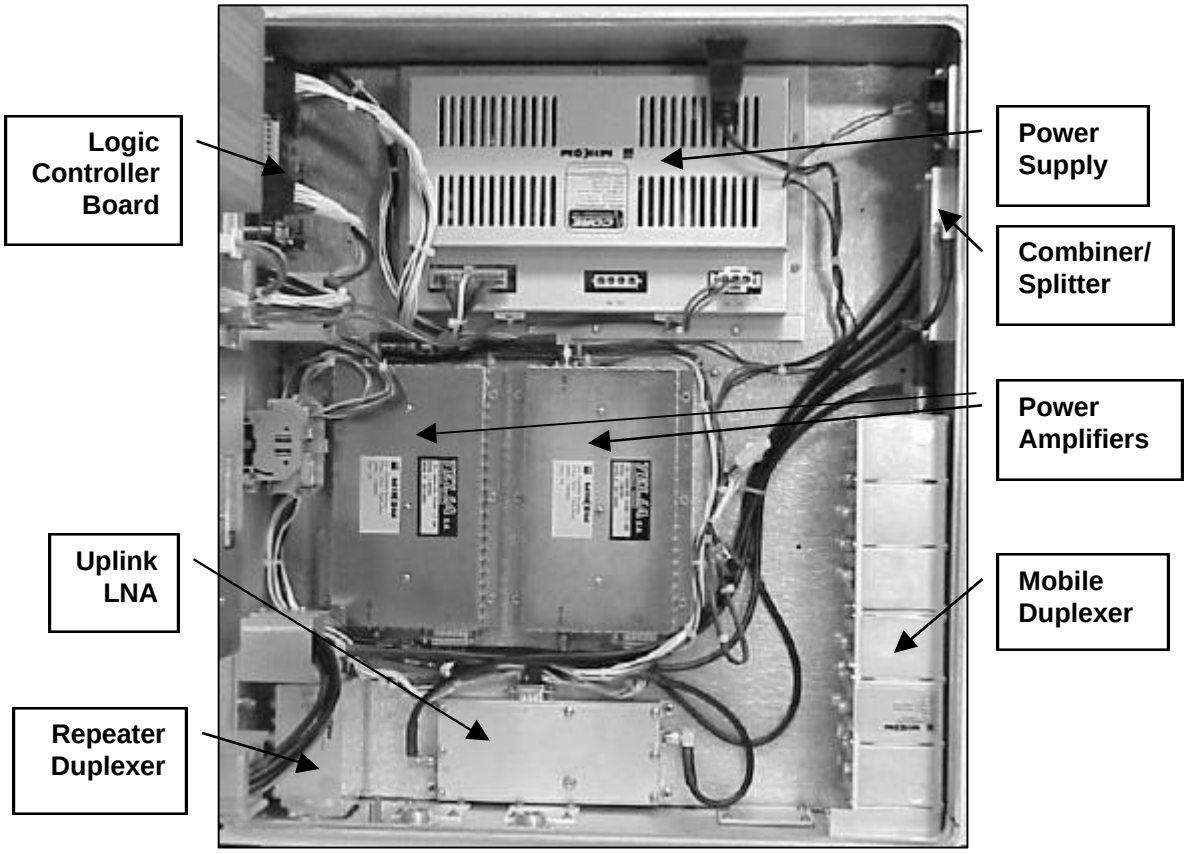

Figure 2-4. MR Booster (inside cabinet)

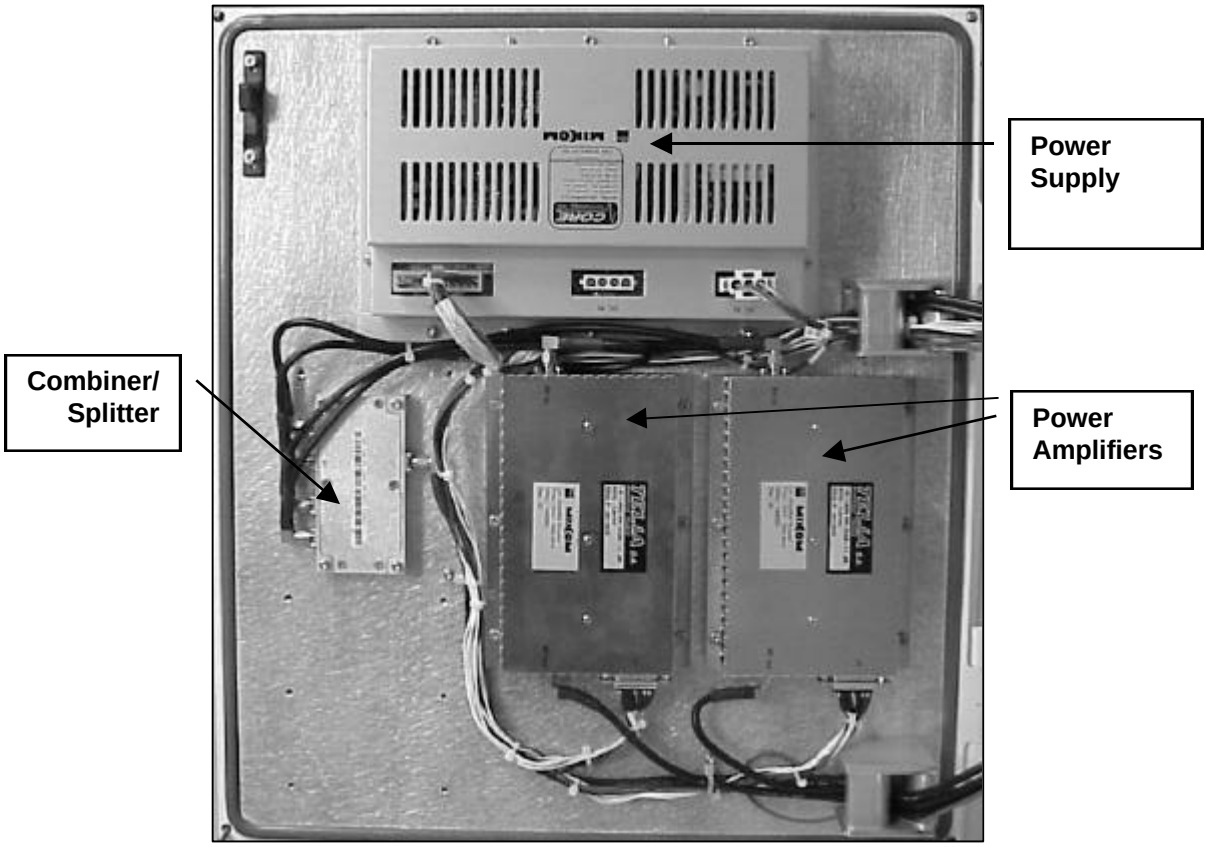

Figure 2-5. MR Booster (inside door)

2.4 System Components

2.4.1 Power Supply

The MR Booster provides two high-efficiency power supplies with 26 VDC and 12 VDC outputs (see Figures 2-4 and 2-5). The 26 V output is split evenly between the system PAs to provide soft-fail redundancy. The 12 V output is diode-connected at the controller and the LNAs, ensuring that both will function if a power supply fails. The power supply has thermal shutdown capability.

The AC supply input is auto-ranging to handle 115 and 220 volt, 50 or 60 Hz systems. During loss of AC mains, the booster will automatically switch over to the DC input for operation with a BBU.

2.4.2 Downlink Power Amplifier

The downlink power amplifiers (see Figure 2-4) provide low distortion amplification of downlink RF signals using proprietary feedforward correction techniques. After duplexer, splitter and combiner losses, the PAs provide 20 dB nominal gain for the booster in the downlink signal path.

The amplifiers are powered by the 26 VDC output of the power supplies. To provide maximum output power and soft-fail redundancy, the downlink power is shared between either four (high-power option) or two (medium-power option) PAs. Each PA provides output power and temperature status information to the system controller and provides both overcurrent and overtemperature protection circuitry.

2.4.3 Logic Controller Board

The logic controller board (see Figure 2-4) monitors and controls internal booster functions, and provides alarms to the donor system. The controller contains an I^2C bus interface for remote control by a Mikom MR series repeater. The controller is powered by the 12 VDC supply.

System configuration information is retained in an on-board EEPROM. For installation or troubleshooting, the board-resident software can be accessed from an MR repeater, or from an on-site laptop computer. The controller can set:

- uplink gain
- PA key/unkey
- fan speed control (high/low/off)

The controller monitors the status of the following system components:

- PA power output
- PA temperature
- PA shutdown
- power supply temperature
- average 26 VDC and 12 VDC output voltages
- AC mains presence
- DC output VSWR (when installed)

The controller also routes the DC power to the VSWR module.

For general use, two alarm outputs are provided that can be user-configured during installation. The outputs are normally open relay contact pairs, which are closed when no alarm condition is present. These signals are provided on four of the seven pins of a terminal block on the controller board.

2.4.4 PA Combiner/Splitter Module

The PA combiner/splitter module (see Figure 2-4) splits the input signal, distributes it to the PAs and combines it after amplification. Identical hybrid design is used to ensure maximum amplitude and phase matching of the downlink signal.

2.4.5 Uplink Low Noise Amplifier

The LNA (see Figure 2-4) maintains dynamic range for uplink mobile signals. The LNA provides low noise figure and high input IP3 so the booster does not decrease sensitivity or increase distortion in the system.

The gain of the LNA chain after duplexer and cable losses is nominally 20 dB with the uplink attenuation set to 0 dB. Using the internal software, the gain can be reduced by increasing the attenuation in 1 dB steps up to 15 for optimal IP3, or where equal uplink and downlink booster gain is not necessary. The same LNA is used in the diversity option and the attenuation setting is ganged so each uplink path is set for equal gain.

2.4.6 Duplexers

The duplexers (see Figure 2-4) provide isolation between uplink and downlink paths, and band-limit the signals that are either passed to the donor hardware, or transmitted at the mobile antenna. The small repeater duplexer provides adequate UL/DL isolation. The mobile duplexer offers low insertion loss to maximize downlink output power and uplink noise figure. Forward and reverse directional coupler outputs are provided on the mobile duplexer. The coupler outputs are routed to the VSWR module when that option is installed.

2.4.7 RF Cables

The RF cables are a critical part of the MR Booster, particularly in the downlink function. Low loss provides maximum output power and cable propagation delays must be properly controlled so that the amplifiers are combined with low phase error.

CAUTION: Never substitute RF cables in the booster. Use only proper MIKOM part numbers.

2.4.8 Fan Assembly (High-power only)

Dual DC fans (not shown) maintain a low cabinet temperature in the high power option. The fans are sealed to withstand all weather conditions. The plenum and ducting structure of the booster is designed to move air over all heat fins, even if one fan fails. The fans can be disabled or operated at low speed for climates where over-heating will not be a problem. The logic controller provides the fan interface.

2.4.9 VSWR Module (Optional)

The VSWR module (not shown) monitors the downlink output VSWR. The customer is alerted to potentially damaging antenna mismatch. The module receives ± 12 VDC from the controller and coupled outputs from the mobile side duplexer. The coupled signals are processed and an analog voltage representative of the output VSWR is routed to the logic controller.

2.4.10 Downlink Driver Amplifier (Optional)

An ultra-linear driver amplifier (not shown) provides more downlink gain or increased drive for the MR Booster PAs. Contact technical support for availability and details.

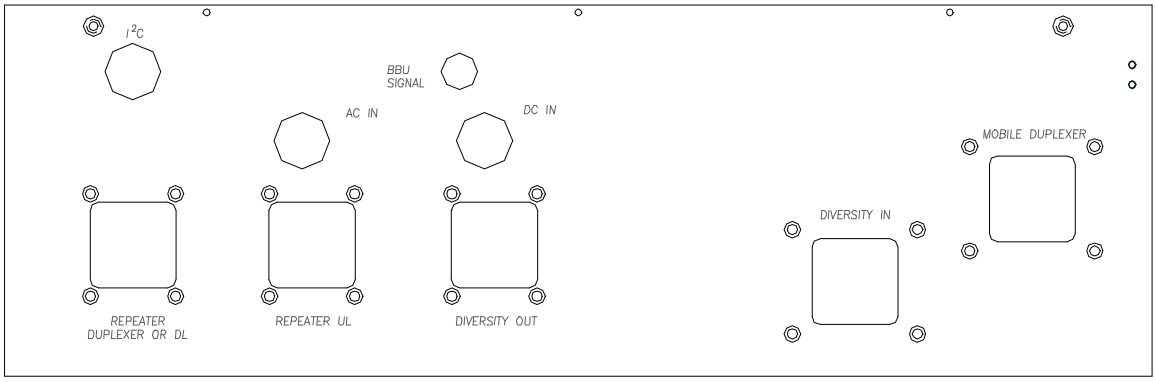

Figure 2-6. Input/output panel

2.4.11 Input/Output Panel

All system inputs and outputs are accessible from the bottom panel of the cabinet (see Figure 2-5). All RF connectors are 7-16 female bulkhead. All unused RF ports have gasketed plates covering the connector cutout.

Control, alarm, and power connections are made via multi-conductor cables routed through weatherproof glands. Unused glands are filled with removable plugs.

NOTE: The customer is responsible for ensuring a weatherproof seal on glands not set up in the factory.

Following are the descriptions of the available I/O connections:

- **Repeater Duplexer or DL (optionally repeater DL only):** Connected to the repeater's mobile coverage antenna port. It accepts downlink signals from the repeater and outputs the uplink RF to the repeater.

  NOTE: If the MR Booster must interface with a *non-duplexed* system, this port can be used to route the downlink output from the repeater to the booster.

- **Repeater UL (optional):** This port is used only when the repeater has *non-duplexed* mobile input and output. The uplink output is then routed through this connector from the booster to the repeater.

- **Mobile Duplexer:** Connected to the mobile coverage antenna.

- **Diversity In (optional):** The diversity coverage (mobile) antenna is connected to the diversity input port.

- **Diversity Out (optional):** The diversity output is routed to the repeater's uplink diversity path input port.

- **AC IN gland:** The AC input cable is passed through this gland and connected to the WAGO terminal block inside the cabinet.

- **DC IN gland:** If a DC input is used, the multi-conductor cable is passed through this gland and distributed to the DC input connector of the power supplies. Contact the factory for further details if using a customer-supplied BBU or DC source.

- **I^2C gland:** The I^2C control cable is routed through this gland and connected to the logic controller board inside the cabinet. The far end of the cable is connected to the MR series repeater control bus.

- **BBU signal gland:** This gland is provided to interface to a BBU alarm or sense output.

Section 3. Installation

3.1 Introduction

This section describes the procedures for installation of an MR Booster and system optimization. The Installation Checklist at the end of this section provides a concise summary of the installation steps. Section 4 will provide initial software instructions.

3.2 Site Selection

The site chosen for the MR Booster must meet requirements related to location, power, space, mounting surface, environment, and antenna isolation.

3.2.1 Equipment Inventory

The following table lists items shipped with the MR Booster. Use a separate table for each booster installed.

MR Booster	
Site:	**Installer:**
❑ MR Booster	**Serial #:**
Tuck Pack:	**Part #:**
❑ Manual	MN001808-1
❑ 6mm T-handle wrench	G71A0031-2
❑ 4mm T-handle wrench	G71A0031-3
❑ 3mm T-handle wrench	G71A0031-1
❑ I^2C bus cable	G15A0309-1
❑ Serial cable	G15A0327-1
❑ Drilling template	G27AT000-1
❑ Keys for security cover	N/A

Table 3-1. Equipment list

3.2.2 Installation Tools and Equipment

You will need the following tools and equipment for installation of the MR Booster:

Factory supplied:

- 6mm T-handle wrench to mount cabinet to bracket
- 4mm T-handle wrench to open/close cabinet door
- DB-9 to DB-9 serial control cable
- I^2C bus cable (if applicable)

Customer supplied:

- M8 carriage bolts, flat washers, split lock washers, and drivers to bolt the mounting bracket to a wall or pole
- Laptop computer with serial port and terminal emulation software (e.g., ProComm)
- Coaxial RF cables terminated with a 7-16 male connector
  - ✓ for mobile port
  - ✓ for repeater port or DL port (if applicable)
  - ✓ for diversity input (if applicable)
  - ✓ for diversity output (if applicable)
  - ✓ for UL port (if applicable)
- >30 dB, 60 W attenuator
- RF power meter with 20 dBm power-handling capability
- Miscellaneous RF test cables and adapters

3.2.3 Site Requirements

Space: The MR Booster dimensions are 742 mm (H) x 466 mm (W) x 287 mm (D) *(29.2 x 18.3 x 11.3 inches)* with fans, 535 mm (H) *(21.1 inches)* without fans. Allow a minimum of 500 mm in front of the booster for door clearance, 30 mm below for cable access, and 150 mm on either side for access to mounting hardware.

Mounting surface: The cabinet should be mounted to a vertical surface with a load-bearing capacity of at least 55 kg. It may be mounted to a wall or a pole.

Environment: The MR Booster is in a weatherproof cabinet that can be operated at ambient temperatures between -30°C to +55°C.

Power: The cabinet requires 90-264 VAC, 50-60 Hz at 600 Watts maximum, or 21-28 VDC, 20 Amps maximum (when equipped for DC operation).

Antenna isolation: When the MR Booster is used with a repeater, the isolation between the donor and mobile antennas must be at least 15 dB greater than the composite system gain of the repeater *plus* booster for optimum performance.

3.3 Installation

3.3.1 Mechanical

Use the supplied template, shown in Figure 3-1, to drill holes to mount the MR Booster mounting bracket. Install the mounting bracket with two M8 carriage bolts for pole mounting, and four M8 carriage bolts for surface mounting. Use a flat washer and split lock washer under the head of each bolt.

WARNING! The MR Booster may weigh up to 51 kg (112.4 lbs), depending on options; use two people to lift the booster onto the mounting bracket.

Lift the repeater up and set the top M10 screws into the recesses provided in the top of the mounting bracket. Align the holes in the cabinet with the holes in the mounting bracket, then install and tighten the four M8 socket-head cap screws using the supplied 6mm T-handle wrench.

To access the inside of the cabinet (see Figure 3-2), use the supplied 4mm T-handle wrench to unscrew the four M5 socket-head cap screws that secure the door to the main cabinet.

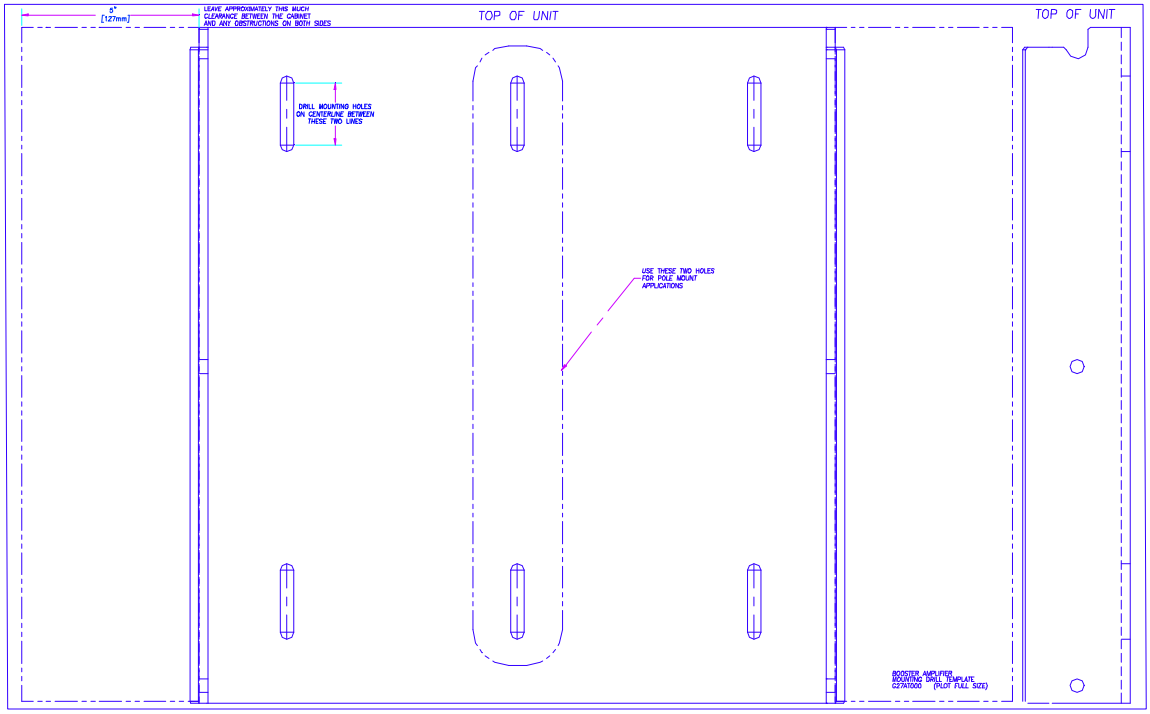

Figure 3-1. Drilling template (not to scale)

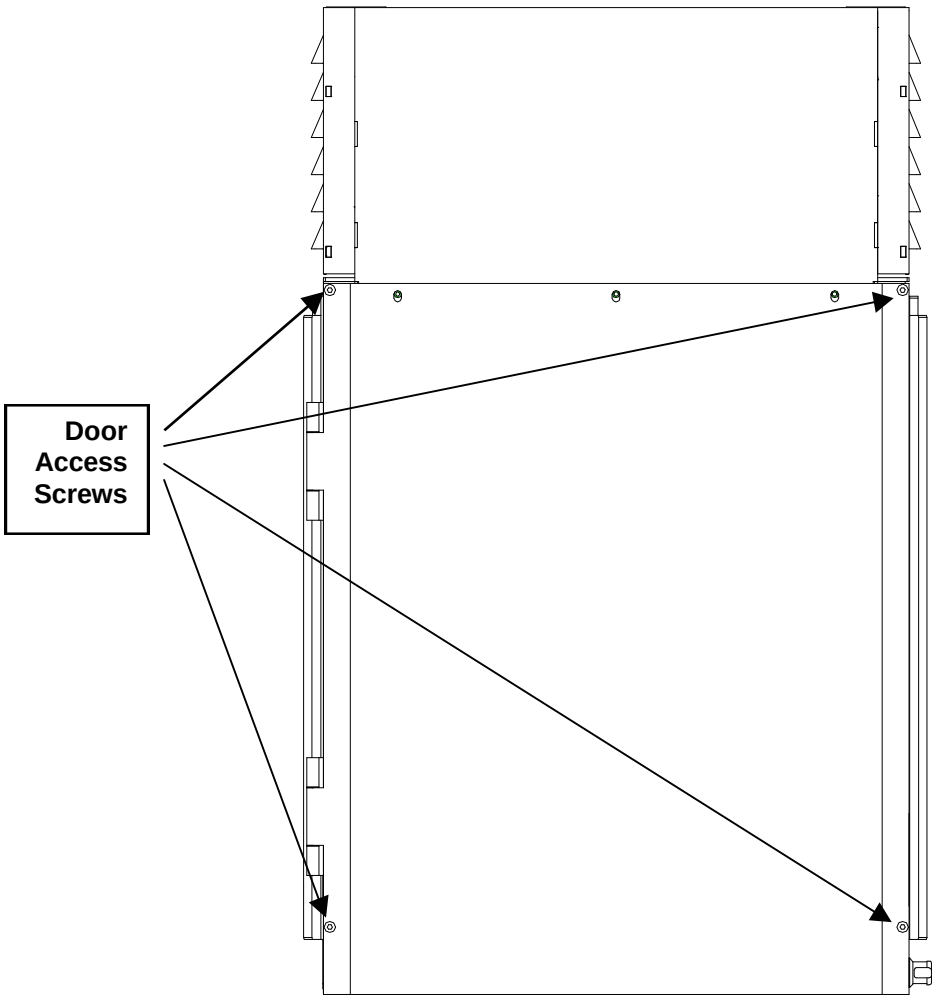

Figure 3-2. Door access screws

3.3.2 Electrical Connections

AC: The unit is shipped with the internal AC connections already made. The cable extends 10 feet outside the cabinet to allow termination to a junction box or other connection to the AC mains. Since the power supply inputs are autoranging, no special accommodations are required to connect to standard voltage and frequency.

The wires are attached to a WAGO connector inside the cabinet as follows:

Wire Color	WAGO Color
Brown (hot)	Gray
Blue (neutral)	Blue
Green/Yellow (ground)	Screwed to ground lug

Table 3-2. Wire Chart

DC: Please consult MIKOM at 1 (800) 800-7465 for applications with a customer-owned DC power source or battery-backup unit.

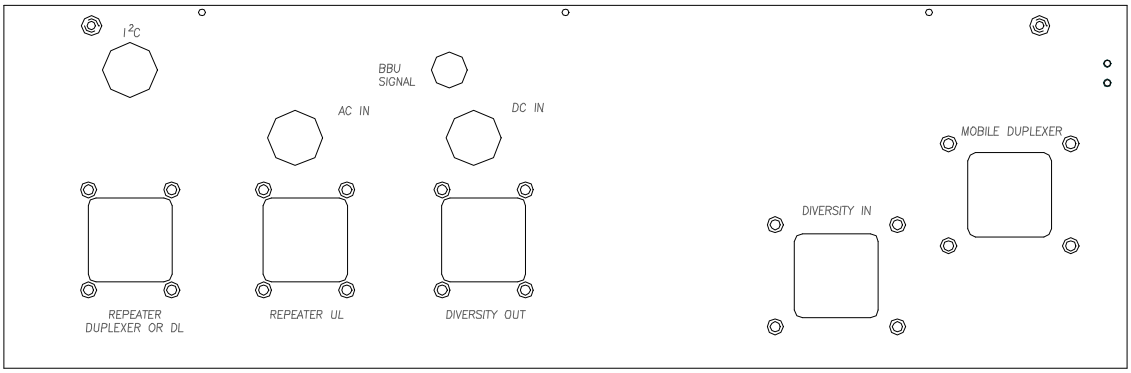

Figure 3-3. I/O connections

3.3.3 RF Connections

RF cables to the MR Booster must be terminated with a 7-16 male RF connector. A low-loss, 50 ohm cable with superior shielding is recommended for all RF connections. See Section 2.4.11 for I/O options.

Minimum configuration (see Figure 3-3) consists of two cables:

- From the duplexed port of the donor repeater to the **Repeater Duplexer** connector on the booster.
- From the **Mobile Duplexer** port of the booster to the coverage antenna.

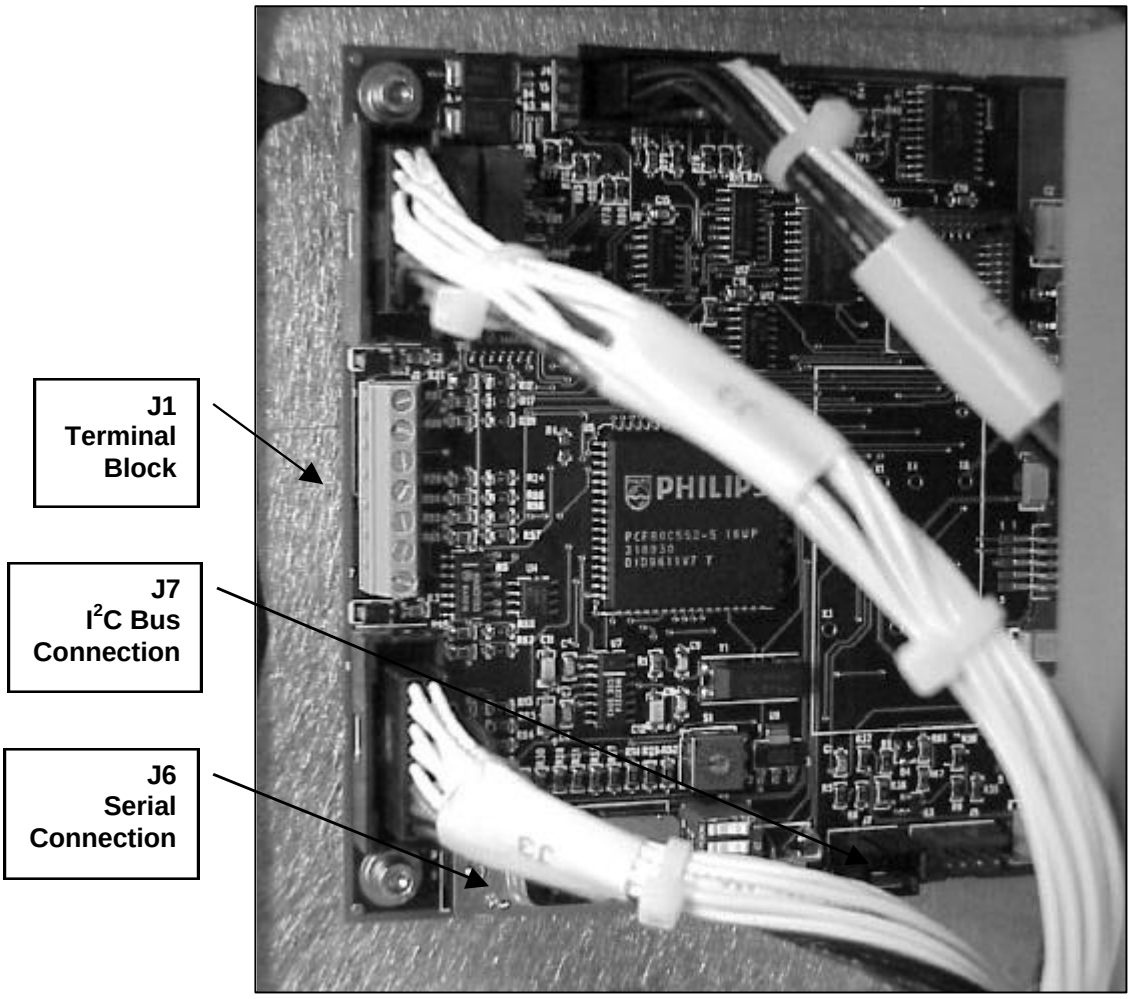

Figure 3-4. Logic Controller Board

3.3.4 Logic Controller Board

Several connections are made through the I/O panel on the bottom of the repeater. Figure 3-5 shows the position of applicable connectors.

I^2C bus: To enable control functions from a Mikom repeater, connect the supplied I^2C cable connector to J7 on the logic controller board. Pass the cable through the I^2C gland on the I/O panel. The cable can then be routed to the MR Repeater's I^2C connector.

Serial control: Connect the female DB-9 end of the supplied serial cable to J6 on the logic controller board. Route the cable through the door of the booster and close it (the door seal will prevent the cable from being crushed). Connect the male end of the serial cable to serial port 1 of the laptop computer. After initialization or troubleshooting has been completed, this cable can be removed.

Alarm outputs: The alarm inputs and outputs are available from terminal block J1 on the logic controller board. A multiple-conductor cable must be passed through the I^2C gland. The alarm function is defined through software in the initialization process. Pin out is as follows:

Pin	Function
1	Alarm 1 output
2	Alarm 1 return
3	Alarm 2 output
4	Alarm 2 return
5	External digital alarm input 0-5 V TTL level input
6	Ground reference
7	External analog alarm input 0-28.6 V analog alarm input

Table 3-3. Alarm pin out

WARNING! Inspect the unit after cabling to ensure that unused connector holes have plates and gaskets applied, and that unused glands have stops inserted. All connections should be completed and weatherproofing ensured before AC mains or DC power is applied.

3.4 Installation Checklist

The following checklist provides a summary of the procedures for installing an MR Booster system.

Step	Item/ Action	Description	✔
1	**MR Booster Site Drawing**	*Master copy of the site plan noting the MR Booster location and serial number.*	
2	**Equipment List:**		
	MR Booster		
	AC or DC power source		
3	**Installation tools:**		
	M8 carriage bolts	*To install mounting bracket*	
	6mm and 4mm drivers	*To mount cabinet to bracket, open door*	
	Serial control cable	*To connect terminal to booster*	
	Laptop computer	*To initialize booster*	
	I^2C bus cable (if applicable)		
	Coaxial cables		
	>30 dB, 60 W attenuator		
	RF power meter		
	Miscellaneous RF test cables		
4	**Run cable to site**	*Power, uplink, downlink, I^2C (if applicable)*	
5	**Mount the equipment**	*See Section 3.3.*	
6	**Attach cables**	*Power, uplink, downlink, I^2C (if applicable), alarm outputs (if applicable)*	
7	**Connect laptop computer to J6 on the logic controller board**	*For initialization.*	
8	**Power up booster**		
9	**Initialize booster**	*See Section 4, Setting Up for Initial Operation*	
10	**Close cabinet and screw shut**		
11	**Optimize system**	*See Section 3.5, System Optimization*	

Table 3-4. Installation checklist

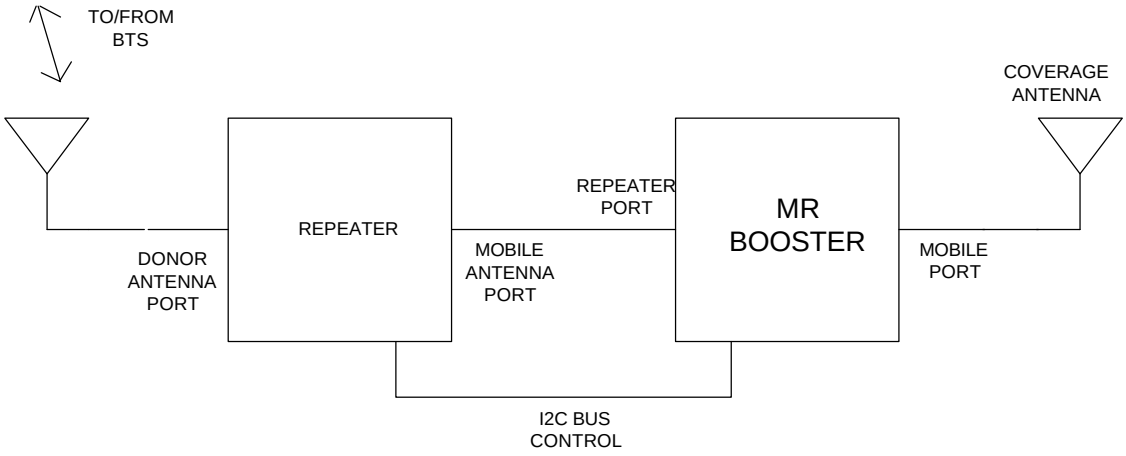

Figure 3-5. Typical MR Booster application (repeater)

3.5 System Optimization

Refer to Figure 3-5 for an example of an application in which the MR Booster is used to boost a repeater. For additional information regarding system optimization, please contact Mikom technical support at 1 (800) 800-7465.

3.5.1 Downlink Gain Setting

The downlink gain is generally determined by the output power that provides coverage of the hole that the MR Booster is filling. This power should not exceed the specifications in Section 6 for differing technologies and number of carriers. The gain of the repeater must be adjusted via the operational software so that the desired output power equals the system gain (repeater plus booster) plus the input power received from the BTS.

The input power can be determined from the downlink RSSI reading of the repeater for each applicable RF channel. For greatest accuracy, the factory test data sheet enclosed with the MR Booster can be used to determine the booster gain near each channel of interest.

3.5.2 Downlink Power Measurement

To ensure that the proper output power is reached, measure the composite power coming out of the mobile duplexer port. Use a power meter capable of handling 100 mW with a 30 dB, 60 W power attenuator on the mobile connector for an accurate measurement without damage. The composite power measured by the meter, after calibrating out the loss of the attenuator, should be approximately equal to the desired power per carrier plus 10logN, where N is the number of carriers.

3.5.3 Uplink Gain Setting

In most cases, the repeater gain is adjusted to make the uplink gain equal to the downlink gain to maintain a balanced link. Adjust the repeater gain, leave the MR Booster LNA gain set to maximum, and the overall system noise figure is minimized.

In cases where unusually strong in-band interferers are present, it may be necessary to decrease the LNA gain in order to increase the overall system input intercept point. The amount of attenuation added depends on the required system intercept point, the maximum allowable system noise figure, and the dynamic range of the repeater.

Section 4. Setting Up for Initial Operation

4.1 Introduction

All MR Booster operating parameters are under software control and can be changed from a terminal connected via serial link to the booster. The booster has default settings for optional parameters. These parameters may need to be adjusted for proper operation in your network.

This section describes procedures for:

- Connecting the terminal
- Becoming familiar with system commands
- Programming initial parameters

The checklist in Table 4-1 presents a brief overview of these procedures. For descriptions of all operating parameters, see Appendix A, Control Software. If problems occur during setup, refer to Section 5, Troubleshooting.

Setup Checklist

- ❑ 1. Terminal connected:
  - ❑ a. Terminal powered up and set to 9600-N-8-1, full duplex, send carriage return only, **no** CTS/RTS, **no** XON/XOFF.
  - ❑ b. MR Booster repeater powered up.
- ❑ 2. System status (SSS) and alarm (ALA) report checked; no active modules *DISABLED* and no unexplained alarms shown.
- ❑ 3. System parameters programmed:
  - ❑ a. Gain
  - ❑ b. PA settings reviewed.
  - ❑ c. Alarm settings reviewed.
  - ❑ d. Alarm report reset (**ALA=0,** press **Enter**).
- ❑ 4. RF performance checked.

Table 4-1. Setup checklist

4.2 Connecting a Terminal

The MR Booster can communicate with a PC running a terminal-emulation program such as ProComm, HyperTerminal, or a conventional ASCII, RS-232 terminal.

1. Using the supplied serial cable, connect the PC COM PORT to J-6 on the controller board (see Figure 3-4 on Page 22).

2. Power up the terminal and set it to the following parameters:

   - 9600 baud
   - No parity
   - 8 data bits, 1 stop bit
   - Full duplex (no local echo)
   - Send carriage return only
   - Disable AUTO XON/XOFF

   NOTE: Some terminal emulation programs generate extraneous characters that may cause interference when communicating with the booster.

3. Power up the MR Booster. After about two seconds, the terminal should respond with a welcome message.

   - If the response is garbled, check the terminal setup.
   - If there is no response, turn the booster OFF, then ON again. If there is still no response, turn the unit OFF. Recheck the power hookup and the terminal hookup and configuration.

4.3 Basic Commands

Following are basic rules and key commands for use with the MR Booster operating software.

Symbol	Definition
>	**Command Prompt.** The system uses this prompt character to indicate it is ready to accept commands.
<CTRL>	**Control Key.** Used in combination with other keys.
<ESC>	**Escape Key.** Escape is a single key marked ESC on most keyboards.

Table 4-2. Command definitions

4.3.1 Syntax

System commands consist of three letters followed by a maximum of three data fields, as follows:

COM [FIELD 1 -] [FIELD 2 =] [FIELD 3] Enter

- **COM:** Three-letter command.
- **FIELD 1:** Up to four hex characters followed by a dash (-).
- **FIELD 2:** Up to four hex characters followed by an equal (=) sign.
- **FIELD 3:** Up to two hex characters.
- **Enter:** Press the Enter key after each command.

NOTE: Few commands require entry of data fields. After a command has been entered, the system will prompt for data it needs. The system will ignore unneeded data fields.

4.3.2 Entering Commands

When entering commands:

- After the three-letter command has been entered, spaces may be added to separate the fields.
- Leading zeros may be omitted.
- Use DELETE or BACKSPACE to correct mistakes.
- Press **Enter** at the end of each command.

4.3.3 Commonly Used Commands

Table 4-3 lists the most commonly used commands. The most complex command is SET. This command is structured to ensure that parameter entry can be done easily and accurately. The other commands, which are much simpler, require little or no subsequent data input. Their actions are completed in a matter of seconds.

NOTE: To become familiar with these commands, try each command (except SET) and observe the system's response.

CAUTION: RES will momentarily interrupt any calls currently being boosted. Otherwise, the system commands do not interfere with calls being boosted.

Command	Meaning	Purpose
HEL	Help	Lists the syntax and function of the primary commands.
HEL A	Help All	Lists the syntax and function of all commands.
SET	Set up	Prompts a menu-driven entry mode used to inspect or change all MR Booster operating parameters. *(To exit this command, press **<CTRL> X** and answer **N;** press **Enter**.)*
SSS	Show System Status	Lists current repeater parameter settings and conditions of monitored input parameters.
ALA	Alarm report	Reports on number of alarm conditions since last system reset.
RES	Reset	Resets the booster. Parameters in effect when the command is issued will be saved.
PWR	Power display	Lists power readings on the PAs.

Table 4-3. System commands

4.3.4 Ending a Session

The RES command preserves extensive parameter changes made during a session. It ensures that all parameter changes take effect, since all hardware is initialized after a reset. Also, all alarms conditions counter to 0.

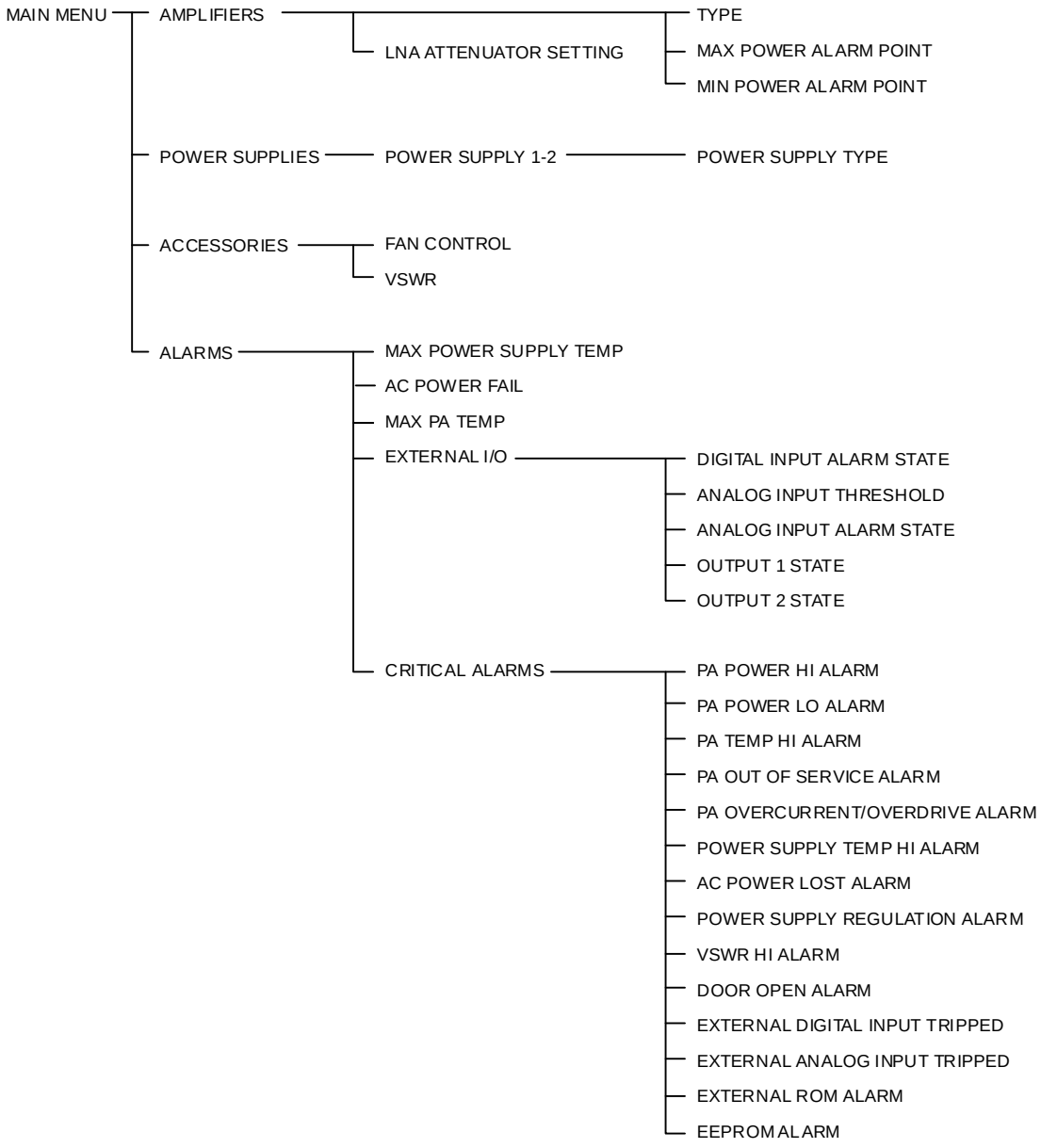

Figure 4-1. SET command menu map

4.4 Using SET Menus

Use the local terminal to configure the MR Booster. From the command prompt (>), the SET command launches the setup utility, which displays a progression of menus. The menus provide a guided path to each booster parameter. The menu map in Figure 4-1 illustrates the SET menu paths. For descriptions of all SET menus and commands, see Appendix A, Control Software.

4.4.1 Moving Forward

After each command has been entered, a menu is displayed, with a character in front of each item. To select an item, type the character and press **Enter**. The next menu (or the parameter to be changed) will be displayed.

4.4.2 Moving Backward

To move backward along a path, type **X** and press **Enter**. This indicates a "Done with this menu" selection. The previous menu will be displayed. Continue to back out to the main SET menu.

4.4.3 Exiting

To exit SET, press **<CTRL> X** at any menu level. Or, type **X** and press **Enter** while at the main menu level.

4.5 Setting Initial Parameters

Before operating the unit, set initial parameters. This includes:

- Checking system status.
- Reviewing and recording power amplifier and alarm settings.

Setting these parameters is the minimum required to provide performance. All parameters can be changed to fine-tune the system as more information is gathered about system performance.

4.5.1 Checking System Status

Check the system status to be sure parameters were properly set after factory testing.

1. At the > prompt, type **SSS**; press **Enter**. *(The current state of various parameters is displayed.)*

   Review the PA status to check that all installed downlink amplifiers are enabled and configured to the proper frequency band. Incorrect power readings, low output power and spurious alarms can result if the amplifiers are misconfigured.

2. At the > prompt, type **ALA Enter**. *(The number of alarm conditions since last reset is displayed.)*

   No unexplained alarms should be listed. If there are any Out-of-Service or memory alarms, refer to Section 5, Troubleshooting.

4.5.2 Reviewing Amplifier Parameters

1. At the > prompt, type **SET**; press **Enter**.
2. From the Main Setup Menu, type **A**; press **Enter** to display the Amplifiers Menu.

```
Amplifiers

1   Power Amplifier 1.................. PCS

2   Power Amplifier 2.................. PCS

3   Power Amplifier 3.................. PCS

4   Power Amplifier 4.................. PCS

5   Low Noise Amp Attenuation Setting .. 0


X   Done with this menu
```

3. Select **5**, Low Noise Amp Attenuation Setting, and adjust attenuation if necessary by typing a number in the range of 0 to 15; press **Enter**. If no change is required; press **Enter.**

   NOTE: Attenuation steps are nominally 1 dB, but overall system gain may vary. Consult the enclosed test data sheet for approximate system gain at each attenuator setting.

4. For each downlink power amplifier entry in the menu (1-4), assure that all amplifiers are configured to the proper frequency band. Amplifiers that display NONE for a frequency band are disabled. Normally a PA should not be installed in the position corresponding to the PA number in the booster when this entry is displayed.

4.5.3 Reviewing Alarm Settings

The MR Booster operates in two modes: standalone and repeater-controlled. Alarm settings are set with the repeater software when the booster is remotely controlled via the I^2C bus. In standalone mode, alarms are configured with the MR Booster software. Fully configuring all the alarm thresholds and parameters in a standalone system is a detailed process. Only a summary of steps to configure alarms is described in this section. For specific information on setting up alarms, see Appendix A.

Basic steps to set up alarms in the repeater:

1. Set thresholds
2. Set alarm criticality
3. Set external I/O (optional)

Example

The following example shows how to set output relay one to open when PA temperatures exceed +80C.

First, set the alarm threshold:

1. At the > prompt, type **SET**; press **Enter**.

2. From the menu prompt, type **D;** press **Enter**.

```
Alarms

A  Max Power Supply Temp - Alarm Point...+85 Deg C

B  AC Power Fail - Alarm Point..........10.0 Minutes

C  Max PA Temp - Alarm Point............+90 Deg C

D  External I/O.......................NORMAL STATES

E  Critical Alarms.....................NO ALARMS REPORTED
```

3. Type **C**; press **Enter**. *(For Max PA Temp - Alarm Point)*

4. Type 80; press **Enter**.

Second, set the alarm criticality:

5. Type **E**; press **Enter**. (*For the Critical Alarms Menu)*

```
Critical Alarms

A  PA POWER HI ALARM.....................LOG ONLY
B  PA POWER LO ALARM.....................LOG ONLY
C  PA TEMP HI ALARM.......................LOG ONLY
D  PA OUT-OF-SERVICE ALARM...............LOG ONLY
E  PA OVERCURRENT/OVERDRIVE ALARM........LOG ONLY
F  POWER SUPPLY TEMP HI ALARM............LOG ONLY
G  AC POWER LOST ALARM...................LOG ONLY
H  POWER SUPPLY REGULATION ALARM.........LOG ONLY
I  VSWR HI ALARM.........................LOG ONLY
```

6. Type **C**; press **Enter**. *(For PA TEMP HIGH ALARM)*

```
Allowable entries

(0)    LOG ONLY
(1)    MINOR
(2)    MAJOR
```

7. Type **2**; press **Enter**. *(To set alarm criticality to major)*

8. Type **X;** press **Enter**. *(To exit Critical Alarms Menu)*

Third, set the alarm output:

9. From the Alarms Menu, type **D**; press **Enter**.

```
External I/O Alarms

A  Digital input alarm state.............Disabled

B  Analog input threshold................5.0

C  Analog input alarm state..............Disabled

D  Output 1 state.......................Always open

E  Output 2 state.......................Always open
```

10. Type **D**; press **Enter**. *(To select Output 1)*

```
Allowable entries

(0) Always open
(1) Always closed
(2) Open on minor alarm
(3) Open on major alarm
```

11. Type **2**; press **Enter**. *(To set relay to open on major alarm)*
12. Type **X;** press **Enter** three times. *(To exit all the way out of set menu)*
13. Type **N;** press **Enter**. *(To save changes)*
14. Type **ALA=0**; press **Enter**. *(To reset alarm counts)*

Section 5. Troubleshooting

5.1 Introduction

This section describes methods for locating and resolving problems in an MR Booster. Instructions are given for replacing some of the major modules in the system; however, it is recommended that Mikom technical support personnel perform all MR Booster maintenance. Please call 1 (800) 800-7465 for assistance.

5.2 System Status Indicators

The MR Booster has visual indicators on the logic controller and the power supplies that are the first indicators of basic system functionality. All other troubleshooting tools are contained within the user software.

5.2.1 Logic Controller LED Indicators

A green and a red LED on the logic controller board indicate the following conditions:

Green LED	Red LED	Operational State
Pulsing	OFF	Normal state.
OFF	ON	Indicates power applied, but operational software is not running properly.
Pulsing	Slow pulsing	Indicates software is in a major alarm state.
OFF	OFF	No +12 VDC

Table 5-1. Logic controller status indicators

5.2.2 Power Supply LED Indicators

Each power supply has two green LEDs, which indicate:

AC GOOD	DC GOOD	STATUS
ON	OFF	AC input present; DC output not functioning properly.
ON	ON	AC input present; DC +26 V/+12 V outputs OK.
OFF	OFF	AC power not present; DC source not present or out of proper voltage range.
OFF	ON	AC power not present; DC input present and +26 V/12 V outputs OK.

Table 5-2. Power supply status indicators

5.2.3 Logic Controller Software Alarms and Monitoring Parameters

The SSS command, which displays the general status of the booster modules, and the SET command, which is used to monitor or set operating parameters, can be used to find component failures. See Section 4 and Appendix A for a detailed description of the software. Please contact Technical Support at 1 (800) 800-7465 for assistance in troubleshooting system problems.

5.3 Removing and Replacing Failed Parts

It is recommended that only higher failure rate and easily accessible items be removed from the booster cabinet. The supplied 3mm T-handle wrench may be used to remove and/or replace a power supply or power amplifier.

WARNING! It is recommended that trained Mikom technicians provide service for the MR Booster. Always remove both AC and DC system power before servicing.

Other hardware can be removed from the booster with either standard-size metric Allen keys or Phillips screwdrivers.

Section 6. Specifications

6.1 Specifications

This section provides mechanical and electrical specifications for the MR Booster.

Mechanical Specifications	
Dimensions	742 mm (H) x 466 mm (W) x 287 mm (D), with fans *(29.2 in x 18.3 in x 11.3 in)* 535 mm (H) x 466 mm (W) x 287 mm (D), without fans *(21.1 in x 18.3 in x 11.3 in)*
Weight (approximate, fully populated)	51 kg *(112 lbs)*, 4 PAs, with fans 45 kg, *(99 lbs)* 2 PAs without fans
Operating temperature	-30°C to +55°C
Alarm outputs (user configurable – available through I^2C/alarm gland)	Alarm 1: Open relay contact pair indicates alarm state Alarm 2: Open relay contact pair indicates alarm state
RF I/O (7-16 female connectors)	Repeater UL/DL Mobile Antenna UL diversity input (optional) UL diversity output (optional) Repeater DL only (optional)
Other I/O (4 weatherproof glands)	AC input DC input BBU alarm I^2C/alarm

Table 6-1. Mechanical specifications

Electrical Specifications						
Power requirements	90-265 Vac, 50-60 Hz: 600 W max (fully loaded) Automatic switchover to BBU with loss of AC mains 21-26 Vdc, 20 A max (fully loaded)					
Frequency bands (uplink/downlink)	AMPS800 full band: 824-849/869-894 MHz LMR800 full band: 806-824/851-869 MHz PCS1900 ADB band: 1850-1885/1930-1965 MHz PCS1900 extended EFC band: 1875-1910/1955-1990 MHz					
System gain	20 dB nominal, 19 dB minimum at upper band edge					
Downlink gain variation	±1 dB over any frequency band at 25°C ±2 dB over -30°C to +55°C ambient					
Uplink attenuation setting (main and diversity)	0 dB to 15 dB from maximum gain in monotonic 1 dB steps					
Uplink gain variation	±1 dB over any frequency band at 25°C ±2 dB over -30°C to +55°C ambient					
Uplink noise figure (main and diversity)	3 dB typical at 0 dB attenuation					
Uplink input IP_3 (main and diversity)	10 dBm typical					
Downlink output power per communication format (typical performance at 25°C)	# of carriers	GSM1900, analog: med/high pwr		TDMA: med/high pwr		CDMA, iDEN: med/high pwr	
	1	42.5*	45.0*	42.5	45.0	39.5	42.0
	2	39.5	42.0	36.5	39.0	33.5	36.0
	4	35.5	38.0	32.5	35.0	30.5	33.0
	8	31.5	34.0	29.5	32.0	27.5	30.0

Table 6-2. Electrical specifications

* Limited by maximum PA current.

Electrical Specifications (Continued)	
Control modes	Stand-alone serial mode: Uplink gain, booster control, and monitor signals passed via DB-9 connector on controller PCB (pre-operational), alarms outputs available via I^2C/alarm gland (operational). Repeater control: All booster control and monitor functions maintained through MR-701/801 repeater software with communication via I^2C bus.
Control parameters	PA 1-4 shutdown Fan 1, 2 speed control (high, low, off) Uplink LNA attenuation setting (0-15 dB)
Monitor parameters	PA 1-4 output power PA 1-4 temperature Power supply 1, 2 temperature Power supply average DC output voltages (+26 V, +12 V)
Module alarms	PA 1-4 shutdown ac mains 1, 2 power absent

Table 6-2. Electrical specifications (Continued)

MR Booster Manual

Appendices

Order No. MN001808-1

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MIKOM

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Appendix A: Control Software

A.1 Introduction

Extensive monitoring software included with the MR Booster allows the installer or service provider to control and monitor the system's performance.

This section includes a description of the terminal interface to the booster, which is used to set parameters, monitor system status, and report and diagnose problems. It includes procedures for entering commands and setting parameters and provides information on interpreting the results.

For instructions on installing the MR Booster, setting initial parameters, and making adjustments to achieve optimum performance, refer to Section 3, Installation, and Section 4, Setting Up for Initial Operation.

A.2 Connecting a Terminal

The MR Booster can communicate with a PC running a terminal-emulation program such as ProComm, HyperTerminal, or a conventional ASCII, RS-232 terminal.

1. Using the supplied serial cable, connect the PC COM PORT to J-6 on the controller board (see Figure 3-4 on Page 22).

2. Power up the terminal and set it to the following parameters:

   - 9600 baud
   - Non parity
   - 8 data bits, 1 stop bit
   - Full duplex (no local echo)
   - Send carriage return only
   - Disable AUTO XON/XOFF

   NOTE: Some terminal emulation programs generate extraneous characters that may cause interference when communicating with the booster.

3. Power up the MR Booster. After about two seconds, the terminal should respond with a welcome message.

   - If the response is garbled, check the terminal setup.
   - If there is no response, turn the booster OFF, then ON again. If there is still no response, turn the unit OFF. Recheck the power hookup and the terminal hookup and configuration.

A.3 Basic Commands

Following are basic rules and key commands for use with the MR Booster operating software.

Symbol	Definition
>	**Command Prompt.** The system uses this prompt character to indicate it is ready to accept commands.
<CTRL>	**Control Key.** Used in combination with other keys.
<ESC>	**Escape Key.** Escape is a single key marked ESC on most keyboards.

Table A-1. Command definitions

A.3.1 Syntax

System commands consist of three letters followed by a maximum of three data fields, as follows:

COM [FIELD 1 -] [FIELD 2 =] [FIELD 3] Enter

- **COM:** Three-letter command.
- **FIELD 1:** Up to four hex characters followed by a dash (-).
- **FIELD 2:** Up to four hex characters followed by an equal (=) sign.
- **FIELD 3:** Up to two hex characters.
- **Enter:** Press enter at the end each command.

NOTE: Few commands require entry of data fields. After a command has been entered, the system will prompt for data it needs. The system will ignore unneeded data fields.

A.3.2 Entering Commands

When entering commands:

- After the three-letter command has been entered, spaces may be added to separate the fields.
- Leading zeros may be omitted.
- Use DELETE or BACKSPACE to correct mistakes.
- Press **Enter** at the end of each command.

A.3.3 Commonly Used Commands

Table A-2 lists the most commonly used commands. The most complex command is SET. This command is structured to ensure that parameter entry can be done easily and accurately. The other commands, which are much simpler, require little or no subsequent data input. Their actions are completed in a matter of seconds.

NOTE: To become familiar with these commands, try each command (except SET) and observe the system's response.

CAUTION: RES will momentarily interrupt any calls currently being boosted. Otherwise, the system commands do not interfere with calls being boosted.

Command	Meaning	Purpose
HEL	Help	Lists the syntax and function of the primary commands.
HEL A	Help All	Lists the syntax and function of all commands.
SET	Set up	Prompts a menu-driven entry mode used to inspect or change all MR Booster operating parameters. *(To exit this command, press* ***<CTRL> X*** *and answer* ***N;*** *press* ***Enter****.)*
SSS	Show System Status	Lists current repeater parameter settings and conditions of monitored input parameters.
ALA	Alarm report	Reports on number of alarm conditions since last system reset.
RES	Reset	Resets the booster. Parameters in effect when the command is issued will be saved.
PWR	Power display	Lists power readings on the PAs.

Table A-2. System commands

A.3.4 Ending a Session

The RES command preserves extensive parameter changes made during a session. It ensures that all parameter changes take effect, since all hardware is initialized after a reset. Also, all alarms conditions counter to 0.

A.4 SET Command

From the command prompt (>), the SET command launches the setup utility, which displays a progression of menus. The menus provide a guided path to each booster parameter. The menu map in Figure A-1 illustrates the SET menu paths. Table A-3 summarizes the alarm parameters that can be programmed using the SET command.

- **Moving Forward:** After each command has been entered, a menu is displayed, with a character in front of each item. To select an item, type the character and press Enter. The next menu (or the parameter to be changed) will be displayed.

- **Moving Backward:** To move backward along a path, type X and press Enter. This indicates a "Done with this menu" selection. The previous menu will be displayed. Continue to back out to the main SET menu.

- **Exiting:** To exit SET, press <CTRL> X at any menu level. Or, type X and press Enter while at the main menu level.

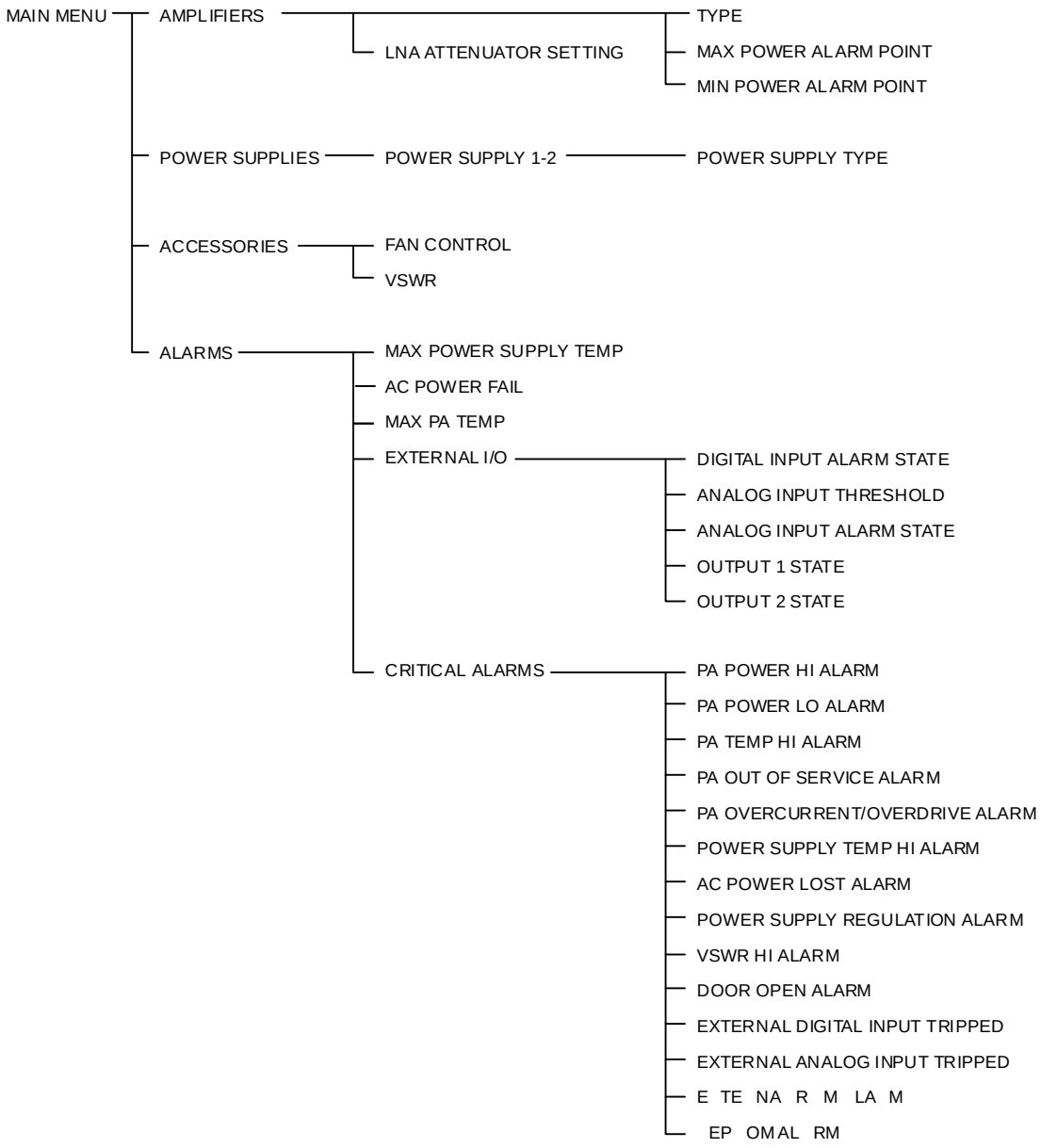

Figure A-1. SET command menu map

Parameter	Options	Default	Description
MAX POWER SUPPLY TEMP	0 (Disabled) 1–100° C	+ 85° C	Enables alarm for power supply over temperature.
AC POWER FAIL	0 (Disabled) 1–250	10 x 0.1 minutes	Defines duration of no AC for alarm.
MAX PA TEMP	0 (Disabled) 1–100° C	+ 90° C	Defines PA temperature alarm condition.
DIGITAL INPUT ALARM STATE	(0) Disabled (1) High (2) Low	Disabled	Defines alarm conditions on the general-purpose input.
ANALOG INPUT THRESHOLD	0–25.0 volts	5.0 VDC	Defines alarm condition on the analog input.
ANALOG INPUT ALARM STATE	(0) Disabled (1) Above threshold (2) Below threshold	Disabled	Defines alarm conditions on the analog input.
OUTPUT STATE	(1) Always open (2) Always closed (3) Open on minor alarm (4) Open on major alarm	Always open	Defines state of the two general-purpose outputs.

Critical Alarms	Options	Default	Description
PA POWER HI PA POWER LO PA TEMP HI PA OUT OF SERVICE PA OVERCURRENT/OVERDRIVE POWER SUPPLY TEMP HI AC POWER LOST POWER SUPPLY REGULATION VSWR HI DOOR OPEN EXTERNAL DIGITAL INPUT TRIPPED EXTERNAL ANALOG INPUT TRIPPED EXTERNAL ROM EEPROM	Log only, minor, major	Log only	Use ALA command to view alarm counts. If an alarm output is configured to open on a major or minor alarm, it will change state when that alarm is logged.

Table A-3. Alarm Parameters

A.4.1 Main Menu

Entry: At the > prompt, type **SET**; press **Enter**.

Menu:

```
Main Setup Menu

A  Amplifiers...........Power Amps 1 - 4  Low Noise Amplifier

B  Power Supplies.......Power Supply 1 - 2

C  Accessories..........Fans              VSWR module

D  Alarms...............Power Supply      PA Temperature      VSWR
                        External I/O      Critical Alarms


X  Done with this menu
```

Purpose: Gives access to setup menus.

A.5 Amplifiers Menu

Entry: From the Main Menu, at the > prompt, type **A**; press **Enter**.

Menu:

```
Amplifiers

1  Power Amplifier 1.....................PCS

2  Power Amplifier 2.....................PCS

3  Power Amplifier 3.....................PCS

4  Power Amplifier 4.....................PCS

5  Low Noise Amp Attenuation Setting ....0
```

Purpose: Gives access to the amplifier settings.

A.5.1 Power Amplifiers 1-4

Entry: From the Amplifiers Menu, type a single number from **1** to **4** to select a specific PA; press **Enter**.

Menu:

```
Power Amplifier 1

A  Type.................................PCS

B  Maximum Power - Alarm Point..........+42 dBm

C  Minimum Power - Alarm Point..........+20 dBm
```

Purpose: To define the PA type and set the maximum and minimum alarm points. If the level exceeds that figure, an alarm will be logged.

A: Type

Entry: From the Power Amplifier menu, type **A**; press **Enter**.

Purpose: To define the type of PA.

Options:
- Allowable entries:
  (0) NONE
  (1) PCS
  (2) AMPS

B: Maximum Power – Alarm Point

Entry: From the Power Amplifier Menu, type **B**; press **Enter**.

Purpose: To set the maximum acceptable power output.

Options:
- Allowable range: 0 (Disabled), +20 to +42 dBm
- Default: +42dBm

C: Minimum Power – Alarm Point

Entry: From the Power Amplifier Menu, type **C**; press **Enter**.

Purpose: To set the minimum acceptable power output.

Options:
- Allowable range: 0 (Disabled), +20 to +42 dBm
- Default: +20 dBm

A.5.2 Low Noise Amp Attenuation Setting

Entry: From the Amplifiers Menu, type **5**; press **Enter**.

Display:

```
Current selection is: 0
Enter new value (or RETURN if no change)...
```

Purpose: To set the attenuation of the uplink low noise amplifier. Attenuation steps are nominally 1 dB, but overall system gain may vary. Consult the enclosed test data sheet for approximate system gain at each attenuator setting.

Options:
- Allowable range: 0-15
- Default: 0

A.6 Power Supplies Menu

Entry: From the Main Menu, at the > prompt, type **B**; press **Enter**.

Menu:

```
Power Supplies

1  Power Supply 1.....................CORE: +12 VDC, +26 VDC

2  Power Supply 2.....................CORE: +12 VDC, +26 VDC
```

Purpose: To indicate whether a power supply is installed, and if so, which type of power supply is installed.

A.6.1 Power Supplies 1, 2

Entry: From the Power Supplies Menu, type **1** or **2**; press **Enter**.

Options:
- Allowable entries:
  (0) NOT INSTALLED
  (1) CORE: +12 VDC, +26 VDC
- Default: CORE: +12 VDC, +26 VDC

A.7 Accessories Menu

Entry: From the Main Menu, at the > prompt, type **C**; press **Enter**.

Menu:

```
Accessories

A  Fan Control.........................LOW

B  VSWR module.........................NOT INSTALLED
```

Purpose: To set fan speed and indicate whether VSWR is installed.

A.7.1 Fan Control

Entry: From the Accessories Menu, type **A**; press **Enter**.

Purpose: To set fan speed.

Options:
- Allowable entries:
  (0) NONE
  (1) OFF
  (2) LOW
  (3) HIGH
  (4) AUTO
- Default: LOW

A.7.2 VSWR Module

Entry: From the Accessories Menu, type B; press Enter.

Purpose: To indicate whether the VSWR module is installed.

Options:
- Allowable entries:
  (0) NOT INSTALLED
  (1) INSTALLED
- Default: NOT INSTALLED

A.8 Alarms Menu

Entry: From the Main Menu, at the > prompt, type **D;** press **Enter**.

Menu:

```
Alarms

A  Max Power Supply Temp - Alarm Point...+85 Deg C

B  AC Power Fail - Alarm Point..........10.0 Minutes

C  Max PA Temp - Alarm Point............+90 Deg C

D  External I/O.......................NORMAL STATES

E  Critical Alarms.....................NO ALARMS REPORTED
```

Purpose: Gives access to parameters that generate alarm conditions. Gives access to user-configurable external I/O for customized response to alarm conditions. Each alarm condition may be designated "log only," "major," or "minor"

A.8.1 Max Power Supply Temp

Entry: From the Alarms Menu, type **A**; press **Enter**.

Purpose: To define the maximum acceptable power supply temperature. Temperatures above this limit will cause an alarm to be logged.

Options:
- Allowable range: 0 (Disabled), 1-100º C
- Default: 85º C

A.8.2 AC Power Fail

Entry: From the Alarms Menu, type **B**; press **Enter**.

Purpose: To specify the duration of an AC power outage that will cause an alarm to log.

Options:
- Allowable range: 0 (Disabled), 1-250 X 0.1 Minutes
- Default: 10 X 0.1 Minutes

A.8.3 Max PA Temp

Entry: From the Alarms Menu, type **C**; press **Enter**.

Purpose: To define the maximum acceptable PA temperature. Temperatures above this limit will cause an alarm to be logged.

Options:
- Allowable range: 0 (Disabled), 1-100º C
- Default: 90º C

A.8.4 External I/O

Entry: From the Alarms Menu, type **D**; press **Enter**.

Menu:

```
External I/O Alarms

A  Digital input alarm state.............Disabled

B  Analog input threshold................5.0

C  Analog input alarm state..............Disabled

D  Output 1 state........................Always open

E  Output 2 state........................Always open
```

Purpose: Gives access to alarm I/O.

A: Digital Input Alarm State

Entry: From the External I/O Alarms Menu, type **A**; press **Enter**.

Purpose: Defines alarm conditions on the general-purpose input.

Options:
- Allowable entries:
  (0) Disabled
  (1) High
  (2) Low
- Default: Disabled

B: Analog Input Threshold

Entry: From the External I/O Alarms Menu, type **B**; press **Enter**.

Purpose: Defines alarm conditions on the analog input.

Options:
- Allowable range: 0-25.0 VDC
- Default: 5.0 VDC

C: Analog Input Alarm State

Entry: From the External I/O Alarms Menu, type **C**; press **Enter**.

Purpose: Defines alarm conditions on the general-purpose input.

Options:
- Allowable entries:
  (0) Disabled
  (1) Above threshold
  (2) Below threshold
- Default: Disabled

D-E: Output State

Entry: From the External I/O Alarms Menu, type **D** or **E**; press **Enter**.

Purpose: Defines the state of the two general-purpose outputs.

Options:

- Allowable entries:
  (0) Always open
  (1) Always closed
  (2) Open on minor alarm
  (3) Open on major alarm
- Default: Always open

A.8.5 Critical Alarms

Entry: From the Alarms Menu, type **E**; press **Enter**.

Menu:

```
Critical Alarms

A  PA POWER HI ALARM.....................LOG ONLY
B  PA POWER LO ALARM.....................LOG ONLY
C  PA TEMP HI ALARM......................LOG ONLY
D  PA OUT-OF-SERVICE ALARM...............LOG ONLY
E  PA OVERCURRENT/OVERDRIVE ALARM........LOG ONLY
F  POWER SUPPLY TEMP HI ALARM............LOG ONLY
G  AC POWER LOST ALARM...................LOG ONLY
H  POWER SUPPLY REGULATION ALARM.........LOG ONLY
I  VSWR HI ALARM.........................LOG ONLY


Z  Display more Critical Alarms

X  Done with this menu


Enter your menu selection...Z
Critical Alarms Continued

J  DOOR OPEN ALARM.......................LOG ONLY
K  EXTERNAL DIGITAL INPUT TRIPPED........LOG ONLY
L  EXTERNAL ANALOG INPUT TRIPPED.........LOG ONLY
M  EXTERNAL ROM ALARM....................LOG ONLY
N  EEPROM ALARM..........................LOG ONLY
```

Purpose: To set the severity of alarms. Select a letter from the menu to change alarm status. Major and minor alarms can be programmed to change the external output relay states in the external I/O alarm menu.

Options:

- Allowable entries:
  (0) LOG ONLY
  (1) MINOR
  (2) MAJOR
- Default: Log only

A.9 System Monitoring Commands

The MR Booster software monitors the status and performance of the system through simple commands. Each command is entered at the command prompt (>). The following commands are described in this section:

- SSS (Show System Status) Command
- ALA (Alarm Report) Command
- PWR (PA Power Display) Command

A.9.1 SSS (Show System Status) Command

Entry: At the > prompt, enter **SSS**; press **Enter**.

Display:

```
>SSS

PA  TYPE       STATUS     POWER       TEMP
 1  PCS        ACTIVE     38 dBm      53 C
 2  PCS        ACTIVE     38 dBm      54 C
 3  PCS        ACTIVE     37 dBm      49 C
 4  PCS        ACTIVE     38 dBm      48 C

POWER SUPPLY   STATUS                 TEMP
 1             AC OK                  45 C
 2             AC OK                  49 C

AVERAGE SUPPLY VOLTAGE  +12.1 VDC  +26.1 VDC

LNA attenuator setting ..... 0
Fan setting ................ LOW
Cabinet door ............... CLOSED
External digital input ..... HIGH
External analog input ...... + 2.7 VDC
```

Purpose: Lists a one-page report of selected MR Booster operating parameters, along with the conditions of inputs that are monitored, then returns to the command entry level. The previous screen print shows a sample SSS report. Items listed in the report are described below.

Reported Items:

- **PA Type:** Frequency band of the installed power amplifier.
- **PA status:** Active, or Disabled. If a PA MODE is Disabled, it was either intentionally disabled in set mode, or disabled due to an alarm on that PA.
- **PA power (dBm):** Power output indication (nominal level at the antenna port).
- **PA temperature (degrees C)**
- **AC supply status:** OK or LOST FOR X MINUTES.
- **Power supply temperature (degrees C)**
- **DC voltage:** The current average voltage reading of the (nominal) 12 V supplies, and the current average voltage reading of the +26 V supply.
- **LNA attenuator setting**
- **Fan speed:** HIGH, LOW, or OFF.
- **Cabinet door:** OPEN or CLOSED.
- **External digital I/O:** Shows the current state of the general-purpose digital inputs and two general-purpose digital outputs. Range: HIGH or LOW.
- **External analog voltage:** Voltages at the three general-purpose analog inputs. Range: 0-25.0 Volts.

A.9.2 ALA (Alarm Report) Command

Entry: At the > prompt, enter **ALA** press **Enter**.

Display:

```
>ALA

POWER AMPLIFIER FAULTS RECORDED...

PA:                              1  2  3  4
PA OUT OF SERVICE ALARM          0  0  0  0
PA TEMP HIGH ALARM               2  2  2  2
PA POWER HIGH ALARM              2  2  2  2
PA POWER TOO LO ALARM            0  0  0  0
PA OVER CURRENT ALARM            0  0  0  0

POWER SUPPLY FAULTS RECORDED...

POWER SUPPLY:                    1  2
POWER SUPPLY TEMP ALARM          1  1
AC POWER LOST ALARM              0  0
DC VOLTAGE ALARM                 1  1
press any key to continue...
SYSTEM FAULTS RECORDED...

ROM ALARM ..................... 0
EEPROM ALARM .................. 0
VSWR HIGH ALARM ............... 0
CABINET DOOR OPEN ALARM ....... 0
GEN PURPOSE ANALOG INPUT ALARM  0
GEN PURPOSE DIGITAL INPUT ALARM 0
```

Purpose: Displays a report of the number of alarm conditions that have occurred since the last system reset, then returns to the > prompt.

Reported Alarms Description:

- Counts stop at 63.
- All counts are zeroed after a power reset or a RES command. Counts may be zeroed by entering **ALA=0**.
- **Alarm log rate:** Some alarms are checked as often as five times a second. To prevent a single alarm condition from running up the count, a given alarm is logged, at most, one time in 10 minutes. The alarm counts may be interpreted as the number of 10-minute intervals in which the alarm occurred.

  There is one exception: the PA Out of Service alarm, which is really not a log, but reflects the current condition of the PA.

- **Automatic Restore to Service:** If an alarm condition causes a PA to be taken out of service, the system will continue to process calls using PAs. Periodically, the controller will attempt to restore out-of-service PAs to service by resetting them.

  If a PA fails to come back in service, the controller repeatedly tries to restore the PAs to service. Note that regardless of whether the PA comes back in service, the original alarm that caused the problem is still maintained in the log. Except for the Out of Service alarms, the only way alarms can be zeroed is with **ALA=0** or a system reset.

PA Faults Reported:

- **PA OUT OF SERVICE ALARM**
- **PA TEMP HIGH ALARM:** PA temperature above the Max PA Temp.
- **PA POWER HIGH ALARM:** PA output power above the Max Power Alarm Point. Following is a list of possible causes:
  - ✓ Too much gain
  - ✓ Oscillation
- **PA POWER TOO LO ALARM:** PA output power below the Min Power Alarm Point. Following is a list of possible causes:
  - ✓ PA failure
  - ✓ Problem with one of the RF cables that couple the Pas to the LNA and combiner/splitters
- **PA OVER CURRENT ALARM:** PA output stage drawing excessive current. Following is a list of possible causes:
  - ✓ PA failure
  - ✓ Too much gain
  - ✓ Oscillation

Power Supply Faults Reported:

- **POWER SUPPLY TEMP ALARM:** This alarm count indicates the number of 10-minute intervals during which the power supply temperature exceeded its internally set Max Power Supply Temp.
- **AC POWER LOST ALARM:** This alarm is logged if the AC power is lost for a period of time longer than the AC Power Fail duration.
- **DC VOLTAGE ALARM:** The Power Supply Regulation Alarm registers a ±10% variation in either the +12 V or +26 V supplies. The voltages are monitored at the controller board. A monitored supply voltage point must be in the alarm condition for at least 1 second before an alarm is logged. Shorter duration dips below the alarm points are ignored.

System Alarm Conditions Reported:

- **ROM ALARM:** Problem in Read Only Memory. (Checked at power-up by computing a ROM checksum and comparing it with a stored checksum. ***Note:*** *The CHK command will recompute the ROM checksum and display the stored checksum but will not check for a match.*)

- **EEPROM ALARM:** Problem in Nonvolatile Memory. (Checked at power-up by looking for several "signature bytes" that indicate if data have ever been written and if gross memory loss has occurred. If the signature cannot be found, the system tries to write the defaults [and the signature] to the EEPROM.

  ✓ Alarm readings:
  0 = No problems.
  1 = Signature not found, but system was able to write it successfully. (All operating parameters will revert to their default values.) Software upgrades usually result in this reading, since different versions employ different signatures. Repeated occurrences indicate an intermittent EEPROM.

- **VSWR HIGH ALARM:** VSWR is too high in unit with VSWR option installed.

- **CABINET DOOR OPEN ALARM:** This alarm count indicates the number of 10-minute intervals during which the cabinet door was detected to be open.

  NOTE: Alarm will not be logged for 30 seconds after an ALA=0 or RES command. This allows the operator time to disconnect the local terminal and close the door.

- **GEN PURPOSE ANALOG INPUT ALARM:** Indicates the number of times the voltage on the general-purpose analog input has gone above or below the threshold specified in the Analog Input Alarm State parameter.

- **GEN PURPOSE DIGITAL INPUT ALARM:** Indicates the number of times the input has been different from the Digital Input Alarm State parameter if enabled.

A.9.3 PWR (PA Power Display) Command

Entry: At the > prompt, enter **PWR**; press **Enter**.

Display:

```
>pwr

PA POWER READ IN dBm
   1   2   3   4
 +37 +36 +37 +36
```

Purpose: The PWR command allows the user to monitor the PA power.

Parts & Accessories
Order Information

A. Introduction

This part of the manual provides information about MR Booster parts, including:

- **Model numbers:** MR Booster model numbers.
- **Suggested spares:** Suggestions for replacement parts to be kept on hand, according to system size.
- **Replacing parts and accessories:** Procedures for exchanging units under warranty (see page iv for product warranty) as well as those not under warranty, and for purchasing spare parts.

B. Model Numbers

The table below explains the meaning of each character in the MR Booster model number.

Example: MRBDUP19L			
MRB	**DUP**	**19**	**L**
MR Booster	**Options:** BASE: Basic cabinet DUP: Mobile duplexer RDUP: Repeater or donor duplexer AMP4x: High power AMP2x: Medium power DIV: With diversity PREAMP: Downlink driver amplifier VSWR: Antenna VSWR module	**Frequency Bands** LMR800: 07 AMPS800: 08 PCS: 19	**Frequency sub-bands** (duplexer and diversity options only): L: PCS ADB blocks H: PCS extended EFC blocks X: Full-band coverage

Table Parts-1. Model numbers

C. Suggested Spares

The recommended spares per number of fielded MR Boosters is shown in Table Parts 2. Spare parts listed by frequency and power option is shown in Table Parts-3. Follow instructions in Section D to purchase spare components

Part	Recommendation	Part Number
Power supply	1 per 5 systems	G59A0021-1
Logic controller board	1 per 10 systems	A001769-1
Fans	1 per 5 high-power systems	G15A0329-1
LNA	1 per 10 systems	See following table
Power amplifier	2 per 5 high-power systems	See following table
Combiner/splitter	1 per 10 systems	See following table

Table Parts-2. Spare parts list

AB or ABC	Mobile Duplexer	PA	Repeater Duplexer	Diversity Filter	LNA	Combiner	
						2-way	4-way
07 or 07X	G69AB035-1	G75A0051-1	G69AB0036-1	G69AB0044-1	A001762.G3	A001748.G3	A001748.G4
08 or 08X	G69AB034-1	G75A0049-1	G69AB0033-1	G69AB0043-1	A001762.G2		
19 or 19L	G69AB040-1	G75A0050-1	G69AB0037-1	G69AB0041-1	A001762.G1	A001748.G1	A001748.G2
19H	G69AB039-1		G69AB0038-1	G69AB0042-1			

Table Parts-3. Spare parts list by frequency and power option

D. Replacing Parts and Accessories

To order spare or replacement parts, refer to the following instructions:

I. Exchange Procedures: Units Under Warranty[1]

Failed MR Booster parts that are still under the manufacturer's warranty can be exchanged by following these procedures:

1. Obtain the model or part number of the MR Booster unit, as listed earlier in this section.

2. Call the MIKOM Hotline at 1 (800) 800-7465. Be prepared to provide the part number and any other pertinent information.

3. Repair parts/assemblies will be shipped. MIKOM will ship replacement parts or assemblies with a Return Materials Authorization (RMA) form. This form must be used to return failed parts or assemblies to MIKOM. All parts are shipped next day air, free of charge, unless otherwise instructed by the customer.

4. Return failed parts/assemblies to MIKOM according to instructions on the RMA form.

☞ **The customer account will be billed for the full value of the replacement part or assembly at the time of shipment. The account will be credited (subject to inspection of the returned item) when the failed parts/assemblies are received by MIKOM. For parts that are ordered incorrectly and returned, a 10% restocking fee will be assessed.**

[1] A copy of the Warranty is provided in the front of this manual, page iv

II. Exchange Procedures: Units No Longer Under Warranty

Selected units that are no longer under warranty can be replaced through the MIKOM exchange program. This program permits customers to exchange a failed part or assembly for a working part or assembly, for a charge. Contact MIKOM, Systems Engineering Department, to determine which assemblies can be exchanged under this program.

To take advantage of this program, follow the procedures listed above under *I. Exchange Procedures: Units Under Warranty.*

☞ **The customer account will be billed for the full value of the replacement part or assembly at the time of shipment. The account will be issued a core value credit (subject to inspection of the returned item) when the failed part/assembly is received by MIKOM. <u>The customer account will be billed a nominal exchange charge</u>. All parts are shipped at the customer's expense. For parts that are ordered incorrectly and returned, a 10% restocking fee will be assessed.**

III. Purchasing Spare Parts/Assemblies

Spare parts/assemblies for the MR Booster can be purchased by contacting MIKOM at **(804) 386-5360** or **(800) 800-9977** for prices and delivery. Refer to the list in Section C to identify specific parts.

☞ **Spare or replacement parts orders can be processed more efficiently when items are identified by their part number. The Systems Engineering Department of MIKOM can assist customers with locating and verifying the correct part number. Customers should be prepared to provide the unit model and serial number, which are printed on labels affixed to each unit.**

IV. Returning Products for Repair

Products under warranty will be repaired and returned at no charge; no purchase order is required.

For non-warranty repairs, a purchase order must be submitted in advance, and shipping charges are paid by the customer. Repair estimates will be given if requested. Products still under warranty but damaged by the customer are treated as non-warranty repairs.