

# MRC-136A

## MBITR Repeater System



## Operation Manual

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<b>Section</b>	<b><u>Chapter 1 General Information</u></b>	<b>Page</b>
1.1	Scope	2
1.2	Introduction	2
1.3	Important Safety Instructions	3
1.4	Serviceable Parts and Repair	3
1.5	Physical Description	4
1.6	Equipment Provided	4
1.7	Functional Description	5
1.8	Technical Specifications	5
1.9	Features	6
1.10	Equipment Supplies	6

### **Chapter 2 Operation**

2.1	Operational Procedures	7
2.2	General	7
2.3	Start Up	7-9
2.4	Controls and Indicators	10-11
2.5	Troubleshooting	12-13

### **Chapter 3 Maintenance and Warranty Information**

3.1	Preventative Maintenance	14
3.2	Dirt and Dust	14
3.3	Oils and Grease	14
3.4	Corrective Maintenance	14
3.5	Warranty Maintenance	14
3.6	Contact Information	15

## Chapter 1 - General Information

### 1.1 Scope

This manual has been prepared by McDowell Research, an Ultralife Company for the purpose of providing the user information necessary to understand and maintain the MRC-136A MBITR Repeater System.

- **Chapter 1 – General Information**

- This chapter provides safety and important information about the MRC-136A.

- **Chapter 2 – Operation**

- This chapter provides information necessary for operating the MRC-136A, and theory of operating procedures describing how the MRC-136A accomplishes its intended purpose.

- **Chapter 3 – Maintenance**

- This chapter provides information regarding MRC-136A preventive care and corrective maintenance procedures.

### 1.2 Introduction

- The MRC-136A MBITR Repeater System is a two unit system used to pass radio RF transmissions between AN/PRC-148 MBITR radios that can not communicate due to distance. This capability is accomplished by receiving a signal from the transmission radio, passing the signal from the receiving case/transceiver to the transmit case/transceiver via a RETRANS cable, boosting the transmission signal with an internal 20 watt amplifier, and retransmitting the signal to the distant receiving radio.
- Any two MRC-136A's can be connected to create a repeater system using a retransmit cable
- The MRC-136A MBITR Repeater System is comprised of a MRC-136A repeater case and two antenna kits with carrying cases.
- The MRC-136A MBITR Repeater System operates on AC input from an external power source, or, internal batteries. The MRC-136A system is not designed to operate from an external DC power source.
- If AC power source is available, and the switch is turned on, the AC power acts as the primary power source.
- If AC power ceases in the middle of operations, the batteries will become the primary source of power.

### 1.3 Important Safety and Cautionary Instructions

- A. This manual contains important safety and operating instructions for the MRC-136A MBITR Repeater System.
- B. Before using the MRC-136A, read all instructions and cautionary markings on the repeater system.
- C. Use of an attachment not recommended or sold by the manufacturer may result in risk of fire, electric shock, or personal injury.
- D. To reduce risk of damage to connectors or Repeater System, disconnect by connector rather than cable when disconnecting repeater system.
- E. Make sure cables are positioned so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress.
- F. Do not operate the repeater system with damaged cable or connector - replace it immediately.
- G. Do not operate repeater system if it has received a sharp blow, been dropped, or otherwise damaged in anyway; take it to a qualified serviceman.
- H. Do not disassemble repeater system; take it to a qualified serviceman when service or repair is required.
- I. Do not place the unit in liquid or allow to accrue moisture, this may cause a malfunction of required internal equipment or cause harm to the operator and ancillary equipment. Lithium Ion rechargeable batteries are sensitive to moisture, a chemical fire or explosion could occur if exposed to such conditions.
- J. Although the MRC-136A unit will operate properly, it is recommended that the BB-2590 battery provided with this unit not be substituted with other batteries.
- K. It is recommended that the top plate of the case NOT be used to mount antennas during operation as there may not be enough separation of the antennas to prevent interference between the antennas, radios, amplifiers, and cases. Magnetic antenna mount RF cables and Retransmit cabled are designed to provide minimum distance of 3.048 Meters from antennas to cases fro optimum operation.
- L. It is recommended that a BB-2590 Lithium Ion rechargeable battery must be installed in the MRC-136A prior to operating the unit.

### 1.4 Serviceable Parts and Repair

The MRC-136A has **NO** user serviceable parts. Units requiring repair should be sent to a qualified service depot for repair or follow instructions in the maintenance chapter of this manual.

## 1.5 Physical Description

- The MRC-136A Repeater System units, MRC-136A and MRC-136AB, are self contained units measuring 22 inches (55.9 cm) long, 24.5 inches (62.2 cm) wide, and 6.5 inches (16.5 cm) high. The units operate from an AC power source or internal batteries. The AC Input Power and RF Output connectors are located on the left side of the unit. The RETRANS Cable Connector is on the left side of the unit. All other connectors, controls and cables are on the inside top control panel of the unit.
- Each MRC-136A is comprised of the following items: one disc cone antenna, one antenna carrying case, and one RETRANS cable as part of its inventory.

## 1.6 Equipment Provided

Equipment	Quantity
MRC-136A Operational Manual	1
MRC-136A MBITR Repeater System	1

## 1.7 Functional Description

- AC Input power is provided to the MRC-136A unit through the Input Power Connector on the left side of the unit. Input power to the radio is provided through the Radio Power Connector and is attached to the bottom of the radio in the same manner as a standard operating battery. The AN/PRC-148 (MBITR) radio is secured to the MRC-136A top panel via a customized latch that is attached to the top panel with rotating thumb screws.
- Amp is connected to the right side of the box.
- Signal retransmission is provided when the receiving antenna receives a signal and passes the signal through the RF cable to the side RF connector on the case. The signal then travels from the RF side connector to the amplifier receive circuitry where the signal is passed to the RF connector of the receiving transceiver in the same case. The transceiver passes the signal out the side connector to the RETRANS cable. The signal passes through the RETRANS cable to the second case to the side connector of the transceiver. The transceiver transmits the signal to the amplifier, where the signal is amplified to 20 watts and passed out the RF side connector and out the transmitting antenna.

## 1.8 Technical Specifications

- **Power Capabilities**

- AC Input Range 95-265 VAC, 47-440 HZ
- DC Battery Power 24 to 33 VDC

- **Environmental**

- Storage Temperature -50°C to +65°C
- Operating Temperature -30°C to +55°C
- Relative Humidity 95%
- Storage Altitude 16,764.034 Meters
- Operating Altitude 8,229.616 Meters

- **Physical**

- Length 55.9 cm
- Width 62.2 cm
- Height 16.5 cm
- Weight 17.12 Kg. with Batteries (qty 3 ea)

## 1.9 FEATURES

- Operates from an external AC power source with an input range of 95-265 VAC, 47-440 HZ or internal batteries.
- The integrated, internal batteries can be recharged while the equipment is operating. Battery backup operations can be "Armed" (activated) or "Disarmed" (deactivated) with external switches located on the control panel of the MRC-136A.
- RETRANS cable 10 ft. (3.048 m) in length to allow for separation between cases providing minimal-to-no interference during retransmission operation.
- Disc cone antenna allows antennas may be placed in an array of locations.

## 1.10 EQUIPMENT SUPPLIES

- Provided with the MRC-136A is an AC power cable, RETRANS cable, disc cone antenna, antenna carrying case, and this technical manual.

## Chapter 2 – Operation

### 2.1 Operating Procedures

The subsequent sections will list in chronological order how to operate the machine safely and efficiently.

### 2.2 General

- The MRC-136A unit operates from external AC power sources as well as operating from the internal batteries when AC power is lost or not available. The MRC-136A automatically prioritizes the input power such that the unit will select the AC input power whenever it is available. If the AC external power is lost or interrupted, the MRC-136A will automatically operate from the internal batteries. When AC power is restored, and the switch is in the on position, the DC power source (batteries) will allow the AC source to power the unit.
- It is highly recommended that a BB-2590 Lithium Ion Rechargeable battery be installed in the unit prior to operating the MRC-136A. The AC modules are designed to operate the Transceiver and amplifier in any mode.

### 2.3 Start Up

- **Power Sources**

- The MRC-136A MBITER Repeater System operates from one of the following power sources:
  - AC input voltage between 95 and 265 volts, single phase, 47 Hz to 440 Hz
  - Internal DC voltage between 24 and 33 volts - This is provided by three BB-2590 batteries linked in parallel to provide longer operating time while operating in the “ARMED” mode.

- **Installation**

- **Batteries**

- Install three MRC-2590 Lithium Ion Rechargeable batteries prior to connecting the MRC-136A to AC power.

- **Antennas**

- A disc cone antenna is provided with the MRC-136A; simply connect the RF antenna cable to the output of the MRC-136A as shown on the label.

- **Retrans Cable**

- The RETRANS Cable is 10" ft in length and mates the two units together in order to perform retransmission operations. The RETRANS cable connects the two units together via the RETRANS connector on the right side of each unit.

- **Power Cable**

- AC Input Power Cable connects to the left side of each unit, and, into a standard wall socket that provides 95 and 265 volts, single phase, 47 Hz to 440 Hz.

## 2.4 Controls and Indicators

- **Power Switch**

- The Power Switch is a three position switch which controls the power functions when an external AC power source is utilized to power the unit.
  - "ON" (Top) Position: Turns the unit ON when AC power cable is connected to an external AC power source. When the unit is operating on internal batteries, and this switch is placed in the ON position applying AC power, the AC power will over-ride the internal battery operation by shutting off the DC power circuitry. While the unit is operating in the AC mode, and the batteries require charging, the charging circuitry will active.
  - "OFF" (Center) Position: Turns the unit OFF when AC power cable is connected to an external AC power source.
  - Blank (Bottom) Position: This position is not utilized with this unit.

- **Push To Reset**

- The "PUSH TO RESET" button is a resettable circuit breaker. If for some reason the circuit breaker trips (pops up) due to a power fluctuation or damage to the unit, push down on the button to reset the circuit breaker. This will enable AC power to be reapplied to the internal circuitry allowing operation to continue. If the circuit breaker continues to trip, turn the unit off, unplug it and turn the unit in for corrective action.

- **Amp Control Switch**

- The AMP CONTROL SWITCH has four settings and controls the operation of the amplifier.
  - OFF/BYPASS: Shuts the amplifier off. While in this position, and the radio is in the transmit mode, the RF signal bypasses the amplifier circuitry and is routed directly to the antenna at the power setting of the radio. The transmission signal will not be amplified while in the position.
  - ON: Turns the amplifier on. While in this position, and the radio is in the transmit mode, the RF signal is amplified by 20 watts.
  - UHF/SATCOM: The unit is in satcom mode.

- **Battery Compartment**

- The battery compartment houses three BB-2590 batteries, connected in series, for operation when no AC power is available. When AC power is applied, and the power switch is in the “ON” position, the charging circuitry charges the batteries or maintains them in a completely charged state. While the unit is powered from an external AC power source, and the batteries are charging, the unit is still fully operational.

- **BATTERIES**

- There are three BB-2590 batteries that provide internal DC power to the unit when AC power is not available or when AC power is lost. The three batteries are connected in parallel to allow longer operating time when used.

- **ARM SWITCH**

- The “ARM” switch allows for operation from the internal batteries when AC power is not available. Internal DC power is provided by three MRC-2590 batteries linked in parallel to provide longer operating time while operating in the “ARMED” mode.

- **DISARM SWITCH**

- The “DISARM” switch disables operation from the internal batteries when AC power is not available.

- **LIGHT EMITTING DIODE (LED) INDICATORS**

- There are two light emitting diodes (LEDs) indicators located on the top panel of the unit that indicate what input power is being utilized.

- **BATTERY OPERATION LED INDICATOR**

- The left LED marked “BATTERY OPERATION”, when illuminated, indicates the unit is operating from internal battery power.

- **AC OPERATION LED INDICATOR**

- The right LED marked “AC OPERATION”, when illuminated, indicates the unit is operating from an external AC power source.

## 2.5 Troubleshooting

- This section provides some basic fault isolation procedures that may be used to determine if corrective action is required on the MRC-136A. This information and knowledge gained through study of the theory should enable the operator/maintenance technician to repair any MRC-136A failure.

<b>FAULT ISOLATION CHART</b>			
<b>SYMPTOM</b>	<b>ACTION</b>	<b>RESULT</b>	<b>RESULTING ACTION</b>
<b>NO AC POWER (AC OPERATION LED INDICATOR DOES NOT LITE IN AC OPERATION WITH POWER SWITCH IN "ON" POSITION)</b>	Ensure the power cable is securely and properly connected to the power source and the case	AC power LED ON  No AC power  AC power LED ON  No AC power	Ensure power is available from the source    Turn MRC-136A in for corrective action
<b>NO DC POWER (BATTERY OPERATION LED INDICATOR DOES NOT LITE IN BATTERY OPERATION WHEN "ARM" SWITCH IS ACTIVATED)</b>	Check battery State of Charge Indicators to determine if the batteries are charged.	Batteries not charged    DC power ON  No DC power	Plug unit into AC source in order to charge batteries, ensure batteries ARE fully charged, push "ARM" button    Turn MRC-136A in for corrective action
<b>RADIO DOES NOT TURN ON</b>	Check the voltage on the radio power adapter (15 VDC)	Radio ON  Radio not ON   Radio ON  Radio does not turn ON	Refer to NO AC OR DC POWER SECTION and correct    Turn MRC-136A in for corrective action
<b>NO RF OUTPUT FROM RADIO</b>	Refer to radio operational manual for direction		

<b>FAULT ISOLATION CHART (CONT)</b>			
<b>SYMPTOM</b>	<b>ACTION</b>	<b>RESULT</b>	<b>RESULTING ACTION</b>
<b>NO RF OUTPUT FROM THE AMPLIFIER</b>	If in AC operation, follow procedure for NO AC POWER		AC power is Good, go to radio step
	If in DC operation, follow procedure for NO DC POWER		DC power is Good, go to radio step
	Is radio ON?	Radio IS ON	Check radio RF output
		Radio NOT ON	Replace radio and re-check, if radio does not turn on, Turn MRC-136A in for corrective action
	Does radio have RF power output	Yes	Check Amplifier RF output
	No	Replace radio and re-check, if radio does not have RF output, Turn MRC-136A in for corrective action	
	Does amplifier have RF power output	No	Turn MRC-136A in for corrective action
<b>BATTERIES DO NOT CHARGE (Batteries only charge during AC operation)</b>	Ensure the power cable is securely and properly connected to the power source and the case	AC power LED ON	Ensure power is available from the source
		No AC power	
	Batteries Good?	AC power LED ON	Turn MRC-136A in for corrective action
		No AC power	
		Yes	
	No	Replace batteries	
<b>BATTERIES DO NOT HOLD A CHARGE</b>	Replace batteries		

## Chapter 3 – Maintenance and Warranty Information

### 3.1 Preventative Maintenance

All maintenance procedures should be in the subsequent sections.

### 3.2 Dirt and Dust

All external components to the MRC-136A can be cleaned with a water dampened non-abrasive cloth and allowed to air dry or wipe dry with a clean dry non-abrasive cloth.

### 3.3 Oils and Grease

All external components of the MRC-136A can be cleaned with a mild soap/water solution dampened non-abrasive cloth. Rinse with water dampened non-abrasive cloth and allowed to air dry or wipe dry with a clean dry non-abrasive cloth.

### 3.4 Corrective Maintenance

The MRC-136A has **NO** user serviceable parts. Units requiring corrective maintenance should be sent to McDowell Research for repair. Contact information is provided below in section 3.6.

### 3.5 WARRANTY MAINTENANCE

#### Warranty Statement

McDowell Research warrants to its customers that the products it manufactures and sells will be free from defects in materials and workmanship for a period of 12 months (1 year) from date of shipment.

This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. McDowell shall not be obligated to provide service under this warranty to repair, service, or modify these products.

In order to obtain service under this warranty, customers must return a failed unit to McDowell with a description of the failure, contact information (in case questions arise and to speed up processing of guarantee claims) and finally a return shipping address. McDowell will return any failed unit at McDowell's cost. **NOTE: THIS WARRANTY DOES NOT APPLY TO BATTERIES SUPPLIED BY MCDOWELL RESEARCH. ALL BATTERIES SUPPLIED BY MCDOWELL RESEARCH ARE WARRANTIED FOR 90 DAYS FROM SHIPMENT.**

### 3.6 Contact Information:

Please call (254) 752-1411 to obtain an RMA number prior to returning any failed unit(s) to:

**McDowell Research, an Ultralife Company**  
300 South 8<sup>th</sup> Street  
Waco, Texas 76701  
Phone: (254) 752-1411  
Fax: (254) 752-1812

Online RMA requests can be located and submitted at:  
<http://www.mcdowellresearch.com/shop/RMArequest.asp> or  
[service@mcdowellresearch.com](mailto:service@mcdowellresearch.com)