

MRC-93

ULTIMATE BATTERY ELIMINATOR



Operation Manual

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300 SOUTH 8th STREET, WACO, TX 76701
Phone: (254) 752-1411 Fax: (254) 752-1812
e-mail: info@mcdowellresearch.com
<http://www.mcdowellresearch.com>

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Section 1 INTRODUCTION

1.1 SCOPE

This manual has been prepared by McDowell Research, an Ultralife Company for the purpose of providing maintenance technicians the information necessary to understand and to maintain the MRC-93 Battery Eliminator. **Section 1 - Introduction**, provides information of a general nature. **Section 2 - Operation**, provides information necessary for operating the MRC-93, and Theory of Operation describing how the MRC-93 accomplishes its intended purpose. **Section 3 - Power Cables**, provides information for power cables required to operate the MRC-93. **Section 4 – Preventive Maintenance**, provides the information necessary to properly maintain the MRC-93. **Warranty Information** provides information on warranty and the RMA process.

1.2 GENERAL DESCRIPTION

The MRC-93 Battery Eliminator allows worldwide operations from AC or DC power sources as well as allowing the operator the capability of using any of the available communications batteries presently in inventory. The enhanced capability to use any existing battery, whether rechargeable or single use, allows the user to operate without changing established logistics support.

CAUTION

**FAILURE TO COMPLY WITH INFORMATION NOTED IN A "CAUTION" MAY CAUSE
SERIOUS DAMAGE TO THE EQUIPMENT, AND IS POTENTIALLY HAZARDOUS TO
PERSONNEL**

1.2.1 PHYSICAL DESCRIPTION

The MRC-93 (Figure 1-1) is a self contained unit measuring 6.250 inches long, 2.875 inches wide, and 9.200 inches deep. The Radio Power Output Connector is located on the top of the MRC-93. The AC/DC Input Power Connector and the Auxiliary Power Connector are located on one side of the MRC-93. The Vent Valve and Heat Sink are located on the front side. Three Lenses for LEDs are located on the same side as the Power Connectors. Located on each side is an over-center latch to attach the MRC-93 to the applicable Transceiver.

Internally, the MRC-93 contains the following: **Control Board** - Located on this PCB are the output circuit breakers and all control circuits. **Filter Board** - Located on this PCB are input power circuit breakers and line filters. **DC Module** - Potted module used for transforming input DC voltage to regulated output of 26.5 VDC (nominal). **AC Module** - Potted module used for transforming input AC voltage to regulated 26.5 VDC output. **Battery** - Any existing battery, whether rechargeable or single use, see page 1-5 for current list of batteries.



FIGURE 1-1 MRC-93 BATTERY ELIMINATOR



FIGURE 1-2 MRC-93 ATTACHED TO AN/PRC-117F, THE RMT-2 MOUNT AND MRC-67 AMPLIFIED SPEAKER

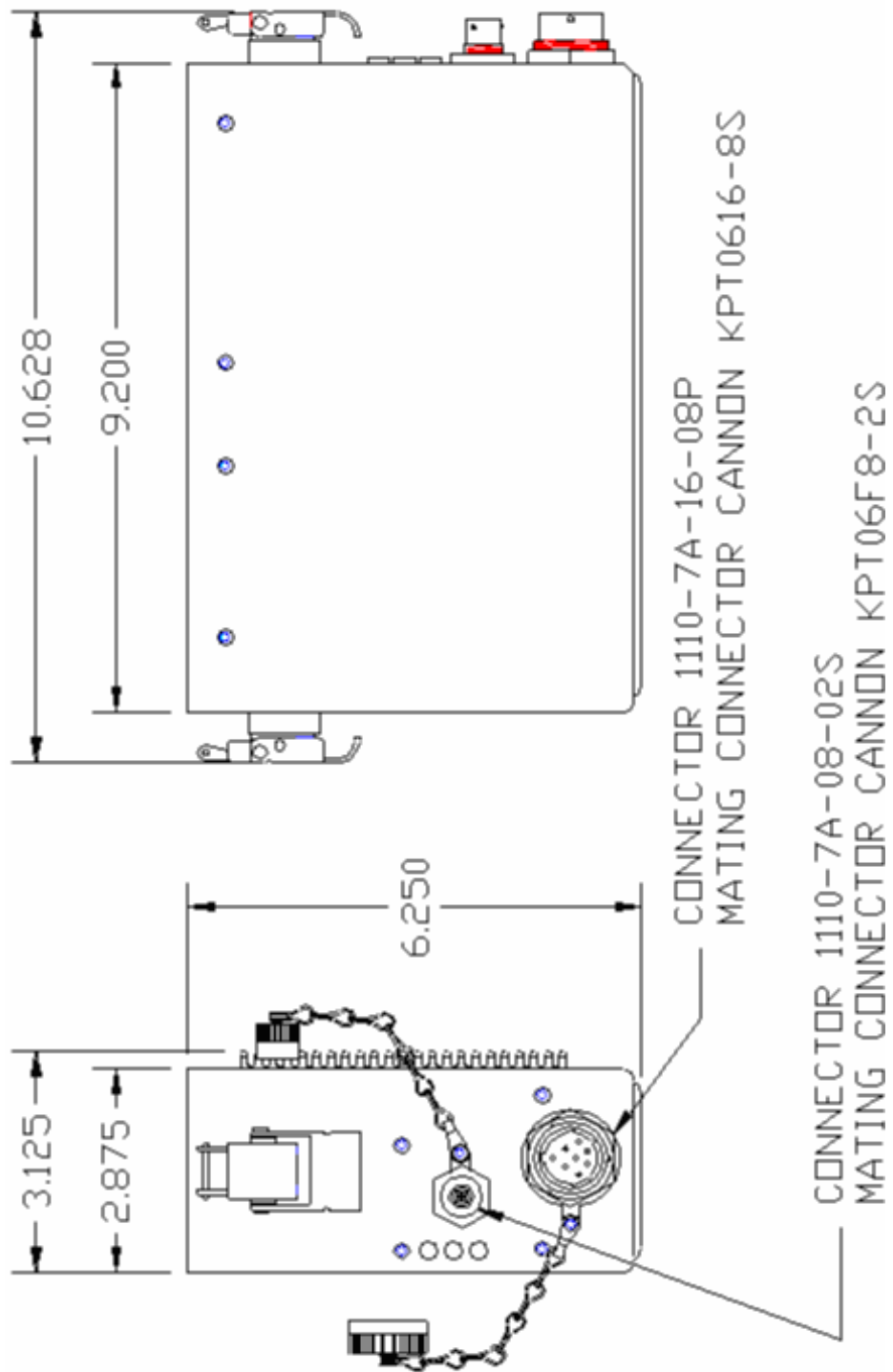


FIGURE 1-3 MRC-93 LAYOUT AND DIMENSIONS

1.2.2 FUNCTIONAL DESCRIPTION

Input power (AC or DC) is provided through Input Power Connector J1. Output power to the radio is provided through Radio Power Connector J5. Auxiliary power out of 26.5 VDC at 1 Amp is provided through Auxiliary Power Connector J2. This power is intended for use by a TSEC/KY-57, TSEC/KY-99, or equivalent Encryption Unit, or a MRC-67 Amplified Speaker. The MRC-93 is connected directly to the Transceiver in the same manner as a typical battery box would be connected, and is secured with the two over-center latches. Circuits for power conversion, status monitoring and battery backup are contained inside the MRC-93.

1.2.2.1 Control PCB - Contains the output power circuit breakers and the LED indicator circuits

1.2.2.2 DC Module - Contains the circuitry for transforming the 11 to 36 VDC input to a regulated 26.5 VDC (nominal) output.

1.2.2.3 AC Module - Contains the circuitry to transform the 95 to 265 VAC, 47 TO 440 Hz input power to a regulated 26.5 VDC (nominal) output.

1.2.2.4 Filter Board Assembly - The filter board serves as the main interconnection for the AC module, DC module, input power and internal battery. It contains input power line circuit breakers, steering diode logic circuits for DC voltages into and out of the Power Modules, and differential and common mode filter circuits.

1.2.2.5 Battery - Provides back-up power when AC or DC input power is lost or not available.

1.2.2.6 LED Indicators - There are three (3) light emitting diodes (LEDs) located on the Control Board inside the unit with three (3) lenses on the side of the MRC-93, providing the operator with MRC-93 status information.

1.2.3 FEATURES

1.2.3.1 Provides uninterruptible 26.5 VDC (nominal) output under varying external load conditions.

1.2.3.2 The integrated, internal battery system uses any of the available communications batteries in inventory. (Page 1-5) Battery backup operations can be "Armed" or "Disarmed" with an external switch located on the top of the MRC-93.

1.2.3.3 Allows operation of 26.5 VDC equipment from DC Voltage source ranging from 11 VDC to 36 VDC which encompasses most military and commercial vehicles and small boats likely to be encountered.

1.2.3.4 Allows for safe operation of 26.5 VDC powered equipment, to be operated from an AC voltage source of 95 to 265 Volts, at frequencies of 47 to 440 Hz. This encompasses most aircraft, ship, and other AC generating systems, both domestic and foreign.

1.2.3.5 All input and output circuits are EMI filtered.

1.2.3.6 Provides regulated DC output power from almost any input power source, including solar panels and wind generators.

1.2.3.7 No shipping or handling restrictions.

1.2.4 EQUIPMENT CHARACTERISTICS

Power Capabilities

DC Input Range	11-36 VDC MIL-STD-1275
AC Input Range	95-265 VAC, 47-440 HZ
DC Output	26.5 VDC @ 5.25 Amps 26.5 VDC @ 7 Amps Peak

Environmental

Storage Temperature	-50° C to +65° C
Operating Temperature	-50° C to +55° C
EMI	MIL-STD-461
TEMPEST	TEMPEST COMPLIANT
Relative Humidity	95%
Storage Altitude	55,000 ft.
Operating Altitude	27,000 ft.
Immersion	10 ft. (if the Transceiver has a bottom gasket seal)

Physical

Length	6.3 inches
Width	2.9 inches
Depth	9.2 inches
Weight (Without Battery)	4.80 lbs.

Optional Battery (MRC-93 is not shipped with a battery.)

BA-5590 LITHIUM
BB-2590 LITHIUM-ION
BB-390 NIMH
BB-490 SLA
BB-590 NICAD

1.2.5 EQUIPMENT REQUIRED

1.2.5.1 EQUIPMENT SUPPLIED. Provided with the MRC-93 is an AC and a DC power cable and this technical manual. The DC cable is intended for temporary use only. For permanent installations MRC recommends an input power cable be fabricated keeping all AC and DC leads as short as possible. Connect ground leads to a known ground to prevent any spurious RF/EMI from affecting the operation of the Transceivers.

MRC offers two optional DC Input Power Cables for operational requirements requiring longer DC cables operating directly from vehicle or other DC Power Systems.

CAUTION

**EXTREME CARE MUST BE EXERCISED IF POWER CABLES ARE
FABRICATED SINCE DANGEROUS AND POTENTIALLY LETHAL
VOLTAGES ARE PRESENT WITHIN THE UNIT.**

Section 2 OPERATION

2.1 INTRODUCTION

This section provides a basic operational description of the MRC-93 and its assemblies/major components.

2.2 GENERAL

The MRC-93 provides output of 26.5 VDC (nominal) to power the AN/PSC-5 (EMUT), AN/PRC-113, AN/PRC-138, AN/PRC-117F and AN/URC-200 series Transceivers and ancillary equipment from either 11 to 36 VDC or 95 to 265 VAC input. The MRC-93 can be connected to external AC and DC power sources as well as allowing the Transceivers to operate from the internal battery without an external power source connected. The MRC-93 can be connected to both AC and DC sources at the same time without damage to the unit. The MRC-93 automatically prioritizes the input power such that the unit will select the AC input power whenever it is available. If external AC power is lost, or interrupted, the MRC-93 will automatically revert to the DC power. If external DC power is lost, or interrupted, the MRC-93 will operate from the internal battery. If AC power is available the DC power module is shut off to prevent the DC power module from drawing power.

It is highly recommended that a battery be installed in the unit prior to operating the MRC-93. The AC and DC modules are designed to operate the Transceiver in any mode; however if external power is lost, codes could be lost unless a battery is installed.

2.3 CONTROLS AND INDICATORS

There are three (3) light emitting diodes (LEDs) located on the Control Board inside the unit with three (3) lenses on the side of the MRC-93 (Figure 2-5) providing the operator with status information. The top LED (green) lens is illuminated when the battery is supplying power. The middle LED (amber) lens is illuminated when the DC module is supplying power. The bottom LED (green) lens is illuminated when the AC module is supplying power.



Figure 2-1 LED INDICATORS

2.4 OPERATING PROCEDURES

2.4.1 POWER SOURCES

The MRC-93 operates from one of the following power sources:

- A. AC input voltage between 95 and 265 volts, single phase, 47 Hz to 440 Hz
- B. DC input voltage between 11 and 36 volts - This may be from a DC power supply, external batteries, solar panels or wind generators.
- C. Internal battery

2.4.2 INSTALLATION

- A. Install a battery prior to connecting the MRC-93 to a Transceiver.
 1. Place the battery pull strap in position so that when the battery is inserted, the strap slides in and wraps around the battery.
 2. Install the battery with the connector up (Figure 2-2).
 3. Connect the battery cable to the battery (Figure 2-3).
 4. Place the battery cover over the battery, padded side down, and install screws to secure cover (Figures 2-4 and 2-5).



Figure 2-2 BATTERY AND STRAP



Figure 2-3 BATTERY IN POSITION WITH CABLE



Figure 2-4 BATTERY COVER



Figure 2-5 COMPLETED INSTALLATION

B. Orient the MRC-93 so that the Radio Power Connector on the MRC-93 and the Power Input Connector on the radio match.

C. Mate the two (2) connectors and latch with the over-center latches mounted on the sides of the MRC-93.

D. Input power will be provided by connecting Input Power Cable to Input Power Connector J1. The other end of the cable will then be connected to the appropriate power source.

2.5 PRINCIPALS OF OPERATION

2.5.1 INPUT CIRCUITS

The input power is filtered using common mode and differential mode filters. A ground stud is pressed into the aluminum box to provide a single point ground. Input power is protected with self-resetting circuit breakers which will automatically reset in two (2) to three (3) minutes after the fault is removed. The DC input additionally has a transient voltage suppression device (D1) to protect the MRC-93 up to a 100 VDC surge. This device works in conjunction with the input circuit breaker.

2.5.2 AC MODULE

The AC Module accepts input voltages of 95 to 265 VAC, 47 to 440 Hz, and outputs regulated 26.5 VDC (nominal).

2.5.3 DC MODULE

The DC Module accepts input voltages of 11 to 36 VDC and provides a regulated 26.5 VDC (nominal) output.

2.5.4 BATTERY

The battery is used in the 26.5 VDC mode. The MRC-93 does not charge the battery. Any battery listed on page 1-5 can be used. When using the MRC-93 with the AN/PSC-5 Transceiver it is recommended that the MRC-93 be "Disarmed" at the end of operations. Although the PSC-5 is switched "OFF" it will continue to draw the battery down to an 18 VDC level, at which time the battery will be disconnected. To "Disarm" the battery, push and hold switch in the "Disarm" position for three (3) to five (5) seconds. This action removes the battery power to the Transceiver.



Figure 2-6 ARM/DISARM SWITCHES AND BATTERY CONNECTOR

2.5.5 SWITCH CIRCUIT

The internal battery is activated in one of two methods. The first method is with the loss of external power connected to the MRC-93. Upon the loss of an appropriate AC or DC power source (reference Paragraph 1.2.4.) battery power will automatically be switched to the Transceiver.

The second method is to operate the Transceiver from the internal battery without first connecting to an external power source. The operator must actuate the "Arm" switch push and momentarily hold the switch, then release. This action of pushing the switch "Arms" the battery, allowing the battery to power the Transceiver.

Section 3 POWER CABLES

3.1 GENERAL

This section provides the part numbers and drawings of the required and optional power cables necessary to properly operate the MRC-93 Interoperable Power Adapter and Charger. Section 2 contains operating instructions and the theory of operation.

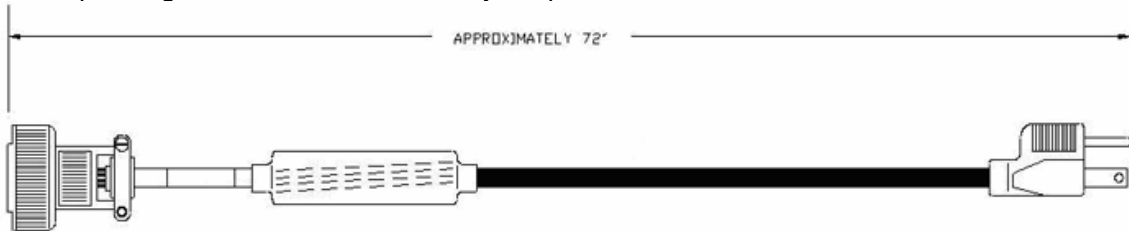
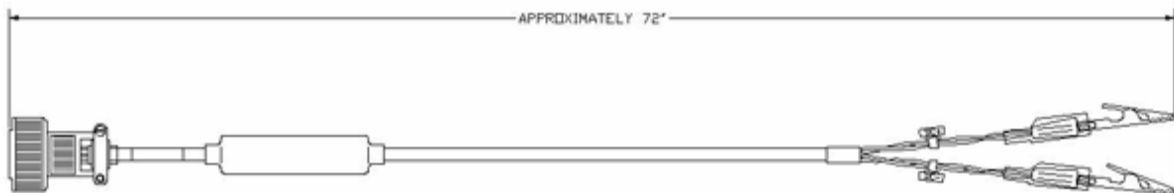
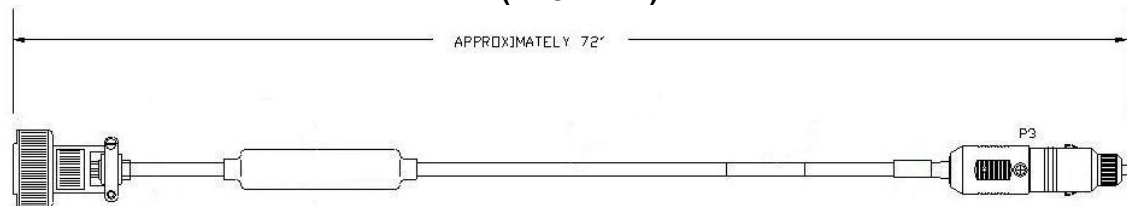


FIGURE 3-1 PCP-35 AC INPUT POWER CABLE (PROVIDED)



**FIGURE 3-2 PCP-65 DC INPUT POWER CABLE (BATTERY TERMINAL ADAPTER)
(PROVIDED)**



**FIGURE 3-3 PCP-55 DC INPUT POWER CABLE (AUTO ADAPTER)
(OPTIONAL)**

Section 4

PREVENTIVE MAINTENANCE AD WARRANTY INFORMATION

4.1 PREVENTIVE MAINTENANCE

All maintenance procedures should be in the subsequent sections.

4.1.1 DIRT AND DUST

All external components to the MRC-93 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.

4.1.2 OILS AND GREASE

All external components to the MRC-93 can be cleaned with a mild soap/water solution dampened non-abrasive cloth once the power source has been removed. Rinse with water dampened non-abrasive cloth and allowed to air dry or wipe dry with a clean dry non-abrasive cloth.

4.1.3 CORRECTIVE MAINTENANCE

The MRC-93 has **NO** user serviceable parts. Units requiring corrective maintenance should be sent to McDowell Research for repair. Contact information is provided below in the Warranty Statement section.

4.2 WARRANTY INFORMATION

4.2.1 WARRANTY STATEMENT

4 years for equipment shipped after May 1, 2004
3 years for equipment shipped prior to May 1, 2004

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 four (4) years for equipment shipped after May 1, 2004.

This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. McDowell Research 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 warranty claims) and finally a return shipping address. McDowell Research will return any failed unit at McDowell's cost.

4.2.2 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 8th Street
Waco, Texas 76701
Phone: (254) 752-1411
Fax: (254) 752-1812

Online RMA requests can be processed at:

<http://www.mcdowellresearch.com/shop/RMArequest.asp> or
service@mcdowellresearch.com