

MRC-99-02

INTEROPERABLE POWER ADAPTER AND CHARGER (IPAC)



Operation Manual

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Section 1

INTRODUCTION

1.1 SCOPE

This manual has been prepared by McDowell Research for the purpose of providing an operator/maintainer the information necessary to understand and to maintain the MRC-99-02 Interoperable Power Adapter and Charger (IPAC). **Section 1 - Introduction**, provides information of a general nature. **Section 2 - Operation**, provides information necessary for operating the MRC-99-02, and Theory of Operation describing how the MRC-99-02 accomplishes its intended purpose. **Section 3 – Power Cables**, provides information on required power cables used with the MRC-99-02. **Section 4 – Preventive Maintenance**, provides the information necessary to properly maintain the MRC-99-02. **Warranty Information** provides information on warranty and the RMA process.

1.2 GENERAL DESCRIPTION

The MRC-99-02 Interoperable Power Adapter and Charger (IPAC) (Figure 1-1 and Figure 1-2) provides 26.5 VDC (nominal) of uninterruptible power under varying input/output conditions. Operational from either an AC or DC input, the versatility of the MRC-99-02 IPAC makes it suitable for a variety of applications and systems, including the AN/PSC-5, AN/PRC-113, AN/PRC-138 and the AN/URC-200 Transceiver.

CAUTION

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

CAUTION

ONLY A MRC-9950 LEAD-ACID BATTERY MAY BE USED. UNDER NO CIRCUMSTANCES SHOULD A BB-390/U NICKEL METAL HYDRIDE OR A BB-590/U NICKEL CADMIUM BATTERY BE SUBSTITUTED FOR USE WITH THIS UNIT.

1.2.1 PHYSICAL DESCRIPTION

The MRC-99-02 IPAC (Figure 1-3) is a self contained unit measuring 6.25 inches long, 2.875 inches wide, and 9.201 inches deep. The Radio Power Output Connectors are located on the top of the MRC-99-02. The AC/DC Input Power Connector and the Auxiliary Power Connector are located on one side of the MRC-99-02. 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-99-02 to the applicable Transceiver.

Internally, the MRC-99-02 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, battery charge circuit and input power line filters. **DC Module** - Potted module used for transforming input DC voltage to regulated 26.5 VDC (nominal) output. **AC Module** - Potted module used for transforming input AC voltage to regulated 26.5 VDC output. **Battery** – MRC-9950 LEAD-ACID battery.



FIGURE 1-1 MRC-99-02 INTEROPERABLE POWER ADAPTER AND CHARGER



FIGURE 1-2 MRC-99-02 ATTACHED TO AN/PRC-117F

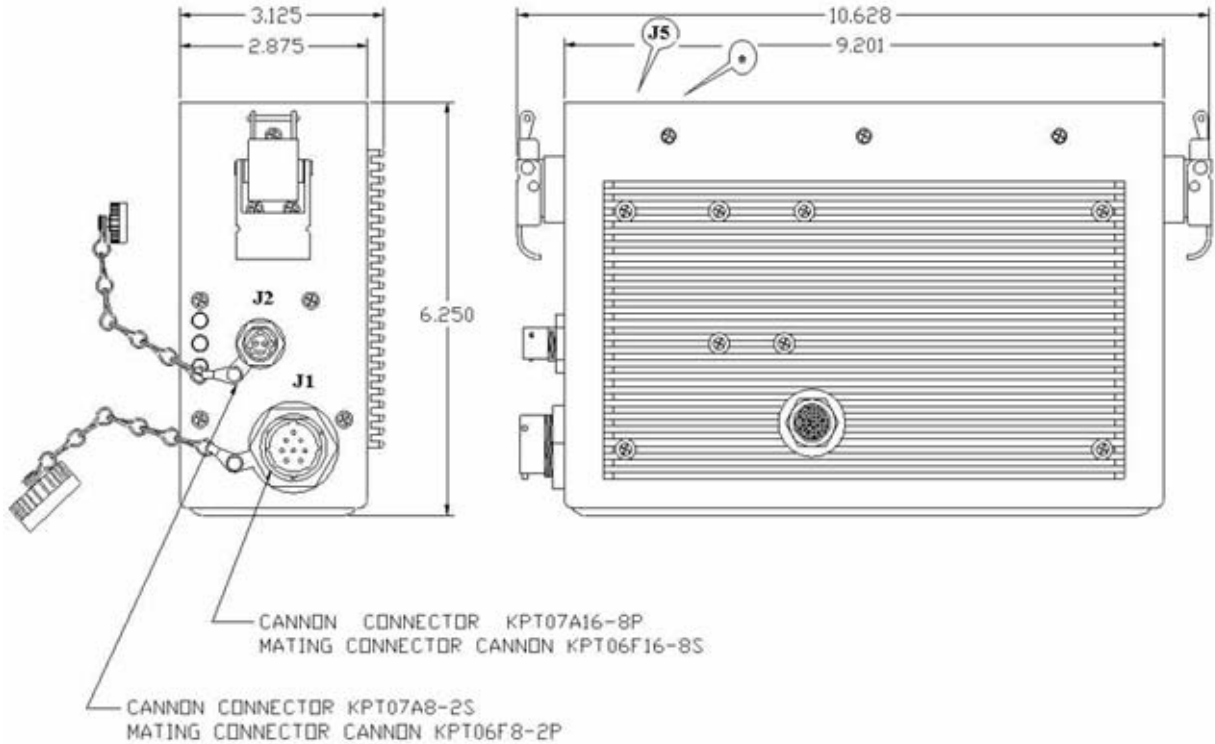


FIGURE 1-3 MRC-99-02 LAYOUT AND DIMENSIONS

CONNECTORS	FUNCTION
J1	Input Power
J2	26.5 VDC @ 1 AMP Power Output
J5	Transceiver Power Connectors
SWITCHES	FUNCTION
*	Arm and Disarm Switches

TABLE 1-1 CONNECTOR AND SWITCH FUNCTIONS

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. The auxiliary power can be used to power a TSEC/KY-57, TSEC/KY-99 or equivalent Encryption Unit and MRC-67A Amplified Speaker. The MRC-99-02 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. There are circuits for power conversion, status monitoring, and battery charging contained inside the MRC-99-02.

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

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

C. 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.

D. 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.

E. MRC-9950 Rechargeable Lead-Acid Battery - Provides back-up power when AC or DC input power is lost or not available.

F. LED Indicators - There are three light emitting diodes (LEDs) located on the Control Board inside the unit with three lenses on the side of the MRC-99-02, providing the operator with MRC-99-02 status information.

1.2.3 FEATURES

A. The MRC-99-02 provides uninterruptible 26.5 VDC (nominal) to the connected radio under varying external load conditions.

B. The integrated, internal battery system can be recharged while the equipment is operating. Battery backup operations can be "Armed" (Connected) or "Disarmed" (Disconnected) with switches located on the inside of the MRC-99-02, near the output connector.

C. The MRC-99-02 provides a 26.5 VDC @ 1AMP when ever power from AC Voltage source between 95 and 265 Volts, at frequencies from 47 to 440 Hz is applied, or when ever power from DC Voltage source ranging from 11 VDC to 36 VDC is applied. Output power is available with or without the radio connected.

D. All input and output circuits are Electro-Magnetic Interference (EMI) filtered.

E. Can be used with alternative input power sources, including solar panels and wind generators.

F. No shipping or handling restrictions. (Battery has the same shipping and handling classification as an ordinary flashlight battery, MSDS documentation is on file at McDowell Research Corporation).

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
DC Output cont'd	26.5 VDC @ 7 Amps Peak
Environmental	
Storage Temperature	-50°C to +65°C
Operating Temperature	-30°C to +55°C
Charging Temperature	0°C to +40°C
Relative Humidity	95%
Storage Altitude	55,000 Ft.
Operating Altitude	27,000 Ft.
Physical	
Length	6.250 inches
Width	2.875 inches
Depth	9.201 inches
Weight Without Battery	3.75 lbs
Weight With Battery	6.75 lbs

TABLE 1-2 TECHNICAL SPECIFICATIONS

1.2.5 EQUIPMENT REQUIRED

1.2.5.1 Equipment Supplied. Provided with the MRC-99-02 Interoperable Power Adapter and Charger includes an AC/DC power cable and this technical manual. Where ever possible, the input power to the MRC-99-02 should utilize AC current. The DC power cabling provided is not meant for long term power input to the power supply. Where the MRC-99-02 must be powered by DC input power a cable appropriate for that installation should be constructed. Permanent installations REQUIRE a proper ground to assure integrity of the RF/EMI rejection capabilities of the power supply. Connect ground leads to a known ground to prevent any spurious RF/EMI from affecting the operation of the Transceivers.

Equipment Provided	Quantity
MRC-99-02 Interoperable Power Adapter and Charger	1
PCP-35 IPAC AC Input Power Cable	1
PCP-65 IPAC DC Input Cable	1
Operation Manual	1
Optional: PCP-55 IPAC DC Input Power Cable (Auto Adapter)	0

TABLE 1-3 EQUIPMENT

CAUTION

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

CAUTION

UNDER NO CIRCUMSTANCES SHOULD ANY OTHER BATTERY BE SUBSTITUTED FOR THE MRC-9950 BATTERY PROVIDED WITH THIS UNIT.

NOTE

IT IS RECOMMENDED THAT A MRC-9950 LEAD-ACID RECHARGEABLE BATTERY BE INSTALLED IN THE MRC-99-02 PRIOR TO OPERATING THE UNIT.

NOTE

THE INSTALLED MRC-9950 SEALED LEAD ACID BATTERY CHARACTERISTICALLY SELF DISCHARGES. OVER A PERIOD OF 30 DAYS THE CHARGE CONTAINED IN THE BATTERY WILL DEplete TO A LEVEL WHICH WILL REQUIRE RECHARGE. THE BATTERY CAN BE REMOVED FOR RECHARGE OR THE MRC-99-02 CAN BE PLUGGED INTO AN EXTERNAL POWER SOURCE TO RECHARGE THE BATTERY. THE RECHARGE TIME CAN TAKE AS LONG AS FIVE (5) HOURS IF THE BATTERY CHARGE IS COMPLETELY DEPLETED. TAKE PROPER PRECAUTIONS WHEN EVER POWER IS APPLIED TO THE MRC-99-02. HEAT WILL BE CREATED AND PROPER AIR CIRCULATION IN THE ABSENCE OF COMBUSTIBLE MATERIALS IS REQUIRED.

NOTE

THE MRC-99-02 CONTAINS A MRC-9950 SEALED LEAD ACID BATTERY. WHEN THE MRC-99-02 IS CONNECTED TO A TRANSCEIVER A DISCHARGE PATH FOR THE BATTERY EXISTS EVEN WHEN THE TRANSCEIVER POWER IS OFF. TO PREVENT THE INSTALLED BATTERY FROM BEING QUICKLY DISCHARGED, THE MRC-99-02 DISARM SWITCH MUST BE ENABLED.

Section 2

OPERATION

2.1 INTRODUCTION

This section provides a basic operational description of the MRC-99-02 Interoperable Power Adapter and Charger (IPAC) and its assemblies/major components.

2.2 GENERAL

The MRC-99-02 IPAC is a 26.5 VDC power supply which will power the AN/PSC-5, 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.

Input power to operate the MRC-99-02 IPAC can be either AC or DC. The IPAC converts the input power to 26.5 VDC to operate connected Transceiver. While the IPAC is connected to input power and the arm switch is engaged, the IPAC will automatically monitor and manage the charging of an installed MRC-9950 Sealed Lead Acid battery. The MRC-9950 battery serves as a back up power source should input power be lost. The IPAC contains power sensing circuitry which will automatically switch the Transceiver power input from the IPAC to MRC-9950 battery when ever all input power is lost. The MRC-99-02 can be connected to both AC and DC sources at the same time without damage to the unit. The MRC-99-02 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-99-02 will automatically revert to the DC power. If DC power is lost or interrupted, the MRC-99-02 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.

The MRC-99-02 is designed to act as a power supply and as an uninterruptible power supply (UPS). The UPS function serves two purposes, (1) assurance the Transceiver will operate even though input power is interrupted. (2) Transceivers use down loaded key material to secure the radios. The key material is volatile and with the loss of input power these keys can be corrupted or lost. To assure complete functionality of the MRC-99-02 it is recommended that a fully charged MRC-9950 battery be installed at all times.

2.3 CONTROLS AND INDICATORS

There are three light emitting diodes (LEDs) located on the Control Board inside the unit with three lenses on the side of the MRC-99-02 (Figure 2-1) providing the operator with status information. (The LEDs are located adjacent to DC output connector J2. The LED closest to the Transceiver connector is designated the "top" LED). The top LED is illuminated when the battery is supplying power. The center LED is illuminated when the DC module is supplying power. The bottom LED is illuminated when the AC module is supplying power.

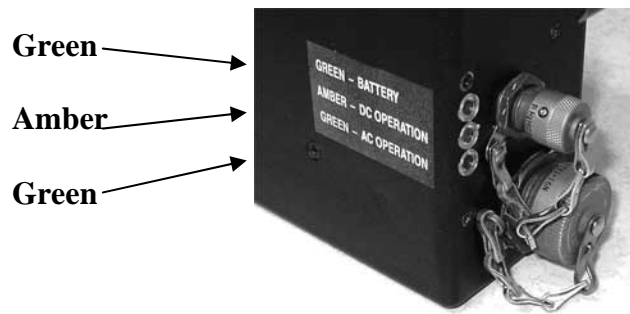


FIGURE 2-1 LIGHT EMITTING DIODES (LEDs)

2.4 OPERATING PROCEDURES

2.4.1 POWER SOURCES

The MRC-99-02 IPAC 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 MRC-9950 Lead-Acid Rechargeable Battery

2.4.2 INSTALLATION

- A.** Install a MRC-9950 Lead-Acid rechargeable battery prior to connecting the MRC-99-02 to a Transceiver. (See Figure 2-2)
 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.
 3. Connect the battery cable to the battery.
 4. Place the battery retaining bracket in place and install screws to secure bracket.
 5. Place the battery cover over the battery, padded side down, and install screws to secure cover.



FIGURE 2-2 BATTERY INSTALLATION

B. Orient the MRC-99-02 so that the Radio Power Connector on the MRC-99-02 and the Power Input Connector on the radio match.

C. Mate the two connectors and latch with the over-center latches mounted on the sides of the MRC-99-02.

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-99-02 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 MODULES

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 MRC-9950 Lead-Acid Rechargeable battery is used in the 26.5 VDC mode. The MRC-99-02 provides a continuous recharge of the battery whenever the MRC-99-02 is connected to an external power source. The battery can be recharged while the Transceiver is being operated. No operator action or special maintenance is required. If the MRC-99-01 is not used for more than a 30 day period it is recommended the MRC-99-02 be connected to an external power source for 5 hours to top off the battery to assure maximum battery performance. When using the MRC-99-02 with the AN/PSC-5 Transceiver it is recommended that the MRC-99-02 be "Disarmed" at the end of operations. Even though the PSC-5 is switched "OFF" it will continue to draw the MRC-9950 down to an 18 VDC level, at which time the battery will be disconnected. To "Disarm" the battery, push and hold the "Disarm" switch for three (3) to five (5) seconds. After releasing the switch, the green battery indicator should be off. This action removes the battery power to the Transceiver.



**FIGURE 2-3 BATTERY CONNECTOR AND
ARM/DISARM SWITCHES**

2.5.5 SWITCH CIRCUIT

The internal MRC-9950 Lead-Acid Rechargeable battery is activated in one of two methods. The first method is with the loss of external power connected to the MRC-99-02. Upon the loss of an appropriate AC or DC power source at input connector J1 (reference Paragraph 1.2.4), battery power will automatically be switched to the Transceiver.

The second method is if an operator wishes to operate the Transceiver from the internal battery without first connecting to an external power source. The operator must push and momentarily hold the "Arm" 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 power cables necessary to properly operate the MRC-99-02 Interoperable Power Adapter and Charger (IPAC). Section 2 contains operating instructions and the theory of operation.

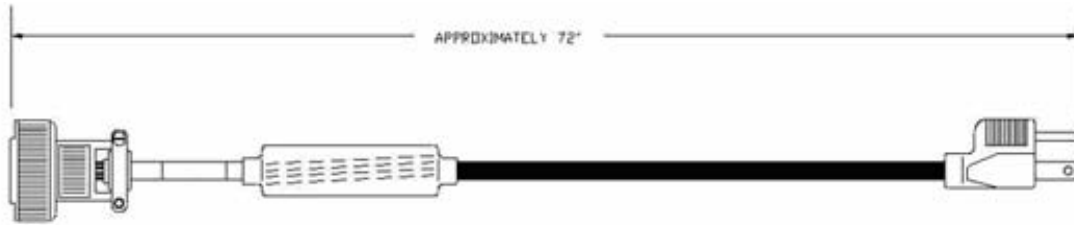


FIGURE 3-1 PCP-35 IPAC AC INPUT POWER CABLE



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

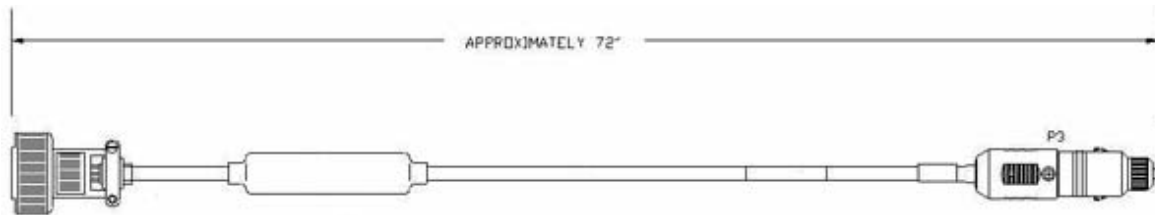


FIGURE 3-3 OPTIONAL PCP-55 IPAC DC INPUT POWER CABLE (AUTO ADAPTER)

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-99-02 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-99-02 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-99-02 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