MOBILE RADIO

Porta-Mobil II™

MAINTENANCE MANUAL LBI-30384

DATAFILE FOLDER DF-9042

66 – 88 MHz
TWO-WAY FM RADIO

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

Although the highest DC voltage in Porta • Mobil II™ Equipment is supplied by a Portable or vehicular battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

EQUIPMENT INDEX

EQUIPMENT	TYPE OR PART NUMBER
Transmitter	66-88 MHz
Receiver	ER-87-A
System Board and Case Assembly	19D423076G4
Front Cover and Audio Amplifier	19C321258G1
Antenna	19C327383P1
Microphone	4EM33L10
Rechargeable Battery Pack	19D417815G1

INSTRUCTION BOOK INDEX FOR MID BAND PORTA•MOBIL II™

PUBLICATION	LBI NUMBER	DATAFILE FOLDER NUMBER
Operator's Manual	LBI-30084	-------
Combination Manual	LBI-30384	DF-9042
Transmitter	LBI-30368	DF-3167
Receivers	LBI-30184	DF-1102
System Board & Case Assembly	LBI-30100	DF-4103
Audio Power Amplifier 19C321258G1, 3 & 4	LBI-30098	DF-8397

SPECIFICATIONS*

GENERAL

FREQUENCY RANGE	66-88 MHz
DIMENSIONS (HXWXD)	
Unit with Rechargeable Battery Pack	7.875" x 8.0" x 4.5"
OPERABLE TEMPERATURE RANGE	
Transmitter-Receiver	-30°C to +60°C
Rechargeable Battery Pack	-20°C to +45°C
BATTERY DRAIN (@ 10.0 Volts)	
Standby	30 milliamps
Receive	1.70 amperes (rated 10 Watts audio)
Transmit	4 amperes

MAXIMUM FREQUENCY SPACING

TRANSMITTER

Frequency Range	No Degradation	
	Low Side	High Side
66-88 MHz	+600 kHz	+800 kHz

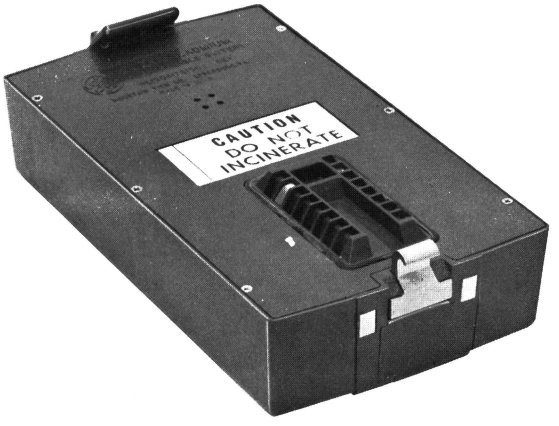
RECEIVER

Frequency Range	No Degradation		-3 dB Degradation (Sensitivity)	
	Low Side	High Side	Low Side	High Side
66-88 MHz	±300 kHz	±400 kHz	±600 kHz	±800 kHz

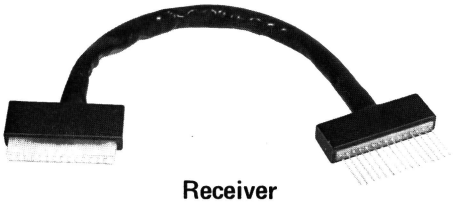
COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th Digit	9th Digit	10th Digit
Product Line	System Voltage	RF Power Output Range	Channel Spacing	System	Number Xmit Freq.	Options	Number Rcvr Freq.	Freq. Range	DFE Freq. Range
H Portable	**N** Rechargeable	**5** 15-32 Watts	**4** 20 kHz	**S** Standard	**A** 1-Freq.Xmit.	**S** Standard	**A** 1-Freq.Rcvr.	**D** 66-76 MHz	**X** No DFE
					B 2-Freq.Xmit	**W** Channel Guard Encode/Decode	**B** 2-Freq.Rcvr.	**E** 76-88 MHz	
					C 3-Freq.Xmit	**R** 2 Tone CG Encode	**C** 3-Freq.Rcvr.		
					D 4-Freq.Xmit	**B** T90 Encode/Decode	**D** 4-Freq.Rcvr.		
					E 5-Freq.Xmit	**C** T90 2-Tone Encode	**E** 5-Freq.Rcvr.		
					F 6-Freq.Xmit	**L** T99 Ind Call	**F** 6-Freq.Rcvr.		
					G 7-Freq.Xmit	**M** T99 Ind & Group Call	**G** 7-Freq.Rcvr.		
					H 8-Freq.Xmit		**H** 8-Freq.Rcvr.		
					I 9-Freq.Xmit		**I** 9-Freq.Rcvr.		
					J 10-Freq.Xmit		**J** 10-Freq.Rcvr.		
					K 11-Freq.Xmit		**K** 11-Freq.Rcvr.		
					L 12-Freq.Xmit		**L** 12-Freq.Rcvr.		

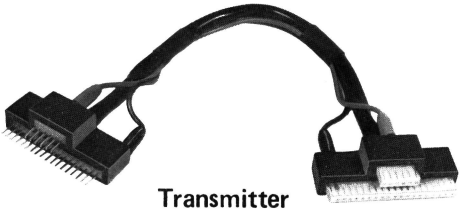
ACCESSORIES



Battery Pack
19D417815G1
(Option 2133)



Receiver
19C327327G1



Transmitter
19D424148G1

Carrying Strap
19C321603G1
(Option 2103)

Test Cables
(Option 2118)

Test Connector
19B227389G1
(Option 2106)

Carrying Bag
19D423555G1
(Option 2104)

DESCRIPTION

General Electric Porta • Mobil II Mid Band combinations are compact, high performance two-way FM Radios designed for complete two-way communications in the 66-88 MHz frequency range. The radios utilize both discrete components and integrated circuit modules.

All Porta • Mobil II component boards are housed in a ruggedly constructed, weather-proof Lexan® case with aluminum front and back covers. The center of the case contains the system board with the receiver board and tone and control option boards. The front cover contains the 10 Watt audio amplifier, speaker and 7.5 Volt regulator module. The back cover contains the complete transmitter assembly: exciter board and RF power amplifier board.

Operating controls for the Porta • Mobil II are mounted along the top of the case assembly. The controls consist of an OFF-ON Volume control with a red LED transmit indicator, a Squelch control and a two-frequency toggle switch or a multi-frequency rotary selector switch. There is no frequency selector switch for single frequency radios. Control positions for multiple options are also along the top of the case assembly.

A serrated Lexan® carrying handle mounted behind the operating controls provides an antenna connector and a microphone hang up bracket.

Contacts on the side of the case assembly provide connections for an external antenna, microphone, speaker and other electrical devices.

A rechargeable, 10 Volt, nickel-cad mium battery pack attaches to the bottom of the case assembly and is fastened in position with a single snap catch. The battery pack is connected electrically through contacts on the bottom of the case assembly.

Porta • Mobil II combinations may be equipped with several options. The combination may have multiple Channel Guard Encoder/Decoder, Type 90 Encoder/Decoder or Type 99 Decoder Tone options.

Carrier Operated Relay, Battery Charge Indicator and Hailer are a few of the other options offered.

OPERATION

Before adjusting the receiver, disable any options by placing the option switch(es) in the OFF or M (Monitor) position. After adjusting the receiver, place the option switch(es) back in the ON or N (Normal) position to enable the option. Refer to LBI-30084 for complete operating instructions.

TO RECEIVE A MESSAGE

1. Turn the OFF-VOLUME control about half-way to the right.
2. Turn the SQUELCH (SQ) control to the right as far as possible. A hissing sound will be heard from the speaker.
3. Adjust the VOLUME control until the hissing sound is easily heard but not annoyingly loud.
4. Turn the SQUELCH control slowly to the left until the hissing noise just fades out.

Before adjusting the receiver, disable any options by placing the option switch(es) in the OFF or M (Monitor) position. After adjusting the receiver, place the option switch(es) back in the ON or N (Normal) position to enable the option. Refer to LBI-30084 for complete operating instructions.

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3. Adjust the VOLUME control until the hissing sound is easily heard but not annoyingly loud.
4. Turn the SQUELCH control slowly to the left until the hissing noise just fades out.

With the frequency selector switch, select the proper frequency. You are now ready to receive messages from other radios in your system.

TO SEND A MESSAGE

1. Turn on the radio as directed in the "To Receive a Message" section.
2. With the frequency selector switch, select the proper frequency. Then listen to make sure that no one is using the channel.
3. While holding the radio so that the antenna is vertical, press the Push-to-Talk (PTT) switch and speak directly into the microphone in a normal tone

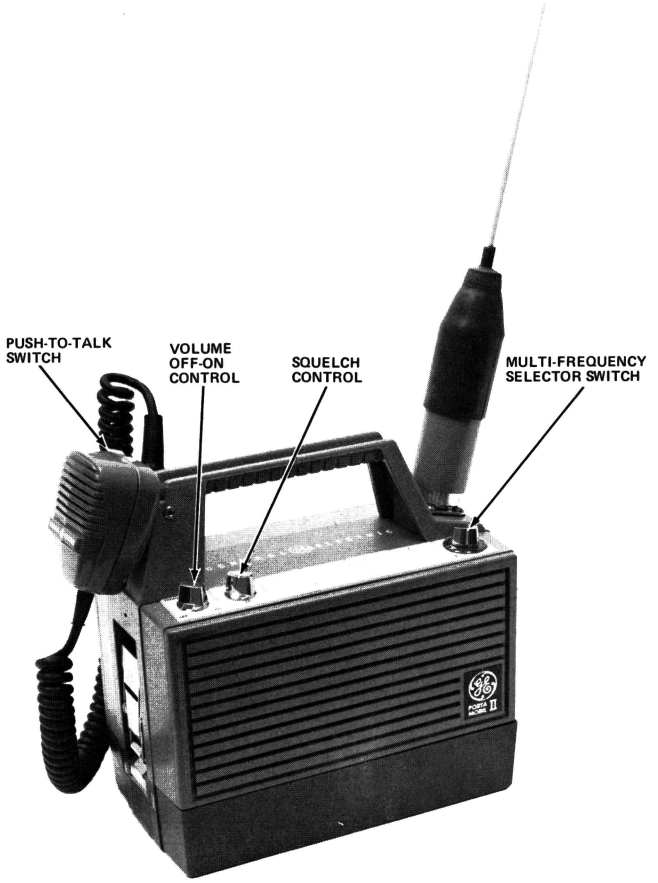


Figure 3 - Operating Controls

of voice. Release the PTT switch as soon as you stop talking. You cannot receive messages when the PTT switch is pressed.

OPERATING TIPS

The following conditions tend to reduce the effective range of Two-Way Radios, and should be avoided whenever possible.

- Operating the radio in low areas of the terrain, or while under power lines or bridges.
- Operating the radio inside of a vehicle, or in a metal or steelframed building unless using an outside antenna.
- Obstructions such as mountains or buildings between the person sending and the person receiving the messages.

In areas where transmission or reception is poor, some improvement may be obtained by insuring the antenna is fully extended and vertical. Moving a few yards in another direction or moving to a higher elevation may also improve communication.

MAINTENANCE

SERVICING THE RADIO

A complete procedure is provided in this manual for disassembling the radio for servicing. The procedure also contains instructions for replacing the different assemblies, Integrated Circuit modules and transmitter PA transistors. Refer to the Disassembly Procedure as listed in the Table of Contents.

If the radio should begin to operate improperly (i.e., transmitter messages start getting weak and hard to understand, or the receiver won't squelch properly), the first thing to suspect is run-down batteries. If a freshly recharged battery pack fails to restore the radio to its normal operating condition, refer to the appropriate Troubleshooting Procedure for help in isolating and correcting the problem.

TEST AND TROUBLESHOOTING PROCEDURES

Whenever difficult servicing problems occur, the Test Procedures for the transmitter and receiver can be used by the serviceman to compare the actual performance of the unit to the specifications met by the unit when shipped from the factory.

In addition, specific Troubleshooting Procedures are available for the transmitter, receiver and tone options. For best results, the Test Procedures should be used in conjunction with the Troubleshooting Procedures when servicing the radio. Refer to the applicable maintenance manual.

CHANGING FREQUENCIES

To change the operating frequency of the transmitter or receiver, it is necessary to replace the entire oscillator module as directed in the Disassembly Procedure. Always give the model number of the module and the exact operating frequency required when ordering new oscillator modules.

After replacing the oscillator module, re-align the transmitter or receiver as directed in the Alignment Procedure (Refer to the applicable maintenance manual).

BATTERY INFORMATION

Battery pack 19D417815G1, for use with PMII, consists of eight rechargeable nickel-cadmium cells connected in series and mounted inside a molded Lexan® case. Fuse holder XF801, fuse F801 and diode CR801 are also mounted inside the case.

The cells are rated at 4 ampere-hours and are fully charged in 16 hours.

Initially, the battery pack should be fully charged before being placed into service. If the battery pack has been stored for over 30 days, it should also be fully charged before being placed into service.

WARNING

Do not dispose of battery packs or batteries by burning. To do so may cause an explosion.

NOTE

Temperature characteristics of nickel-cadmium batteries prevent a full charge at temperature extremes. For maximum charge, recharge the battery pack at room temperatures of 65° to 85° Fahrenheit whenever possible.

For additional information, refer to the Table of Contents for the Battery Pack Service Sheet.

BATTERY CHECKS

Charge Level Measurement

The charge level of the battery packs can be measured by connecting a voltmeter across the charge contacts and measuring the voltage with the transmitter keyed. For a PMII rechargeable battery pack, a fully charged battery pack should provide a reading of 10.7 to 10.8. A fully discharged battery pack should provide a reading of no less than 8 Volts.

Battery Capacity Check

One of the best service checks for the PMII rechargeable battery pack can be easily obtained by measuring the ampere-hour capacity. The results of the measurement can then be compared with the rated capacity of the battery pack to determine the general condition of the rechargeable batteries.

First, it is necessary to find the percentage of rated capacity. This is obtained by measuring the time it takes to discharge a fully charged battery pack until the voltage drops to 8.0 Volts. The proper load resistor for the PMII battery pack is 12.5 ohms, 15 watts resistor.

Then use the formula $\frac{T}{300}$ = % where "T" is the time in minutes required to discharge the battery pack to 8 Volts and % is the percentage of rated capacity the battery delivered to a load. For example: assume the standard battery pack voltage dropped to 8 Volts in 250 minutes:

$$\frac{250}{300} = .83 \text{ (percentage of capacity)}$$

Now multiply the percentage of capacity by its rated capacity (see Table 2).

$$.83 \times 4 \text{ Amps} = 3.32 \text{ Amps}$$

The 3.32 ampere-hours is the actual capacity of the battery pack.

CAUTION

As the voltage drops very fast near the end of the discharge cycle, be very careful to avoid discharging the battery pack below 8.0 Volts.

BATTERY CHARGERS

Four charger combinations are available for recharging PMII battery pack 19D417815G1. Charger combination 371L1A1X is a 121 VAC (50/60 Hz) desk charger and will recharge a fully discharged PMII battery pack in 16 hours (see Figure 4).

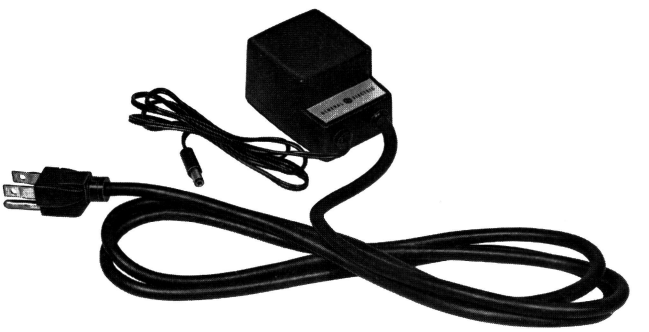


Figure 4 - Battery Charger 371L1A1X

Charger combination 375C1A1X is a +12 VDC (negative ground only) mobile charger. This charger is powered from the cigarette lighter in an automobile and will recharge a fully discharged PMII battery pack in 16 hours (see Figure 5).

Figure 5 - Battery Charger 375C1A1X

Figure 6 - Vehicular Charger 375C1A2X

Charger Combination 375C1A2X provides a +12 VDC (negative ground only) vehicular mounting for the portable radio and recharges the Nickel-Cadimum Battery at a 16-hour rate (see Figure 6). The radio may be left in the charger indefinitely without overcharging the battery.

Charger Combination 371M1A1X is a 234 VAC desk charger. This charger has three charge rates: 65 milliamp trickle charge, 110 milliamps to monitor while charging and 400 milliamps capable of recharging a fully discharged battery pack in 16 hours (see Figure 7).

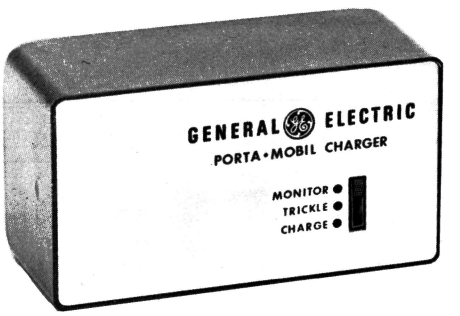


Figure 7 - Desk Charger 371M1A1X

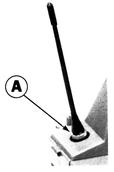
DISASSEMBLY PROCEDURE

Do not attempt to remove a module from the printed wiring board until troubleshooting indicates that the module is bad. Remove or replace the assemblies or modules as directed.

Caution: Always remove the battery before removing any component board to avoid blowing the fuse.

Equipment Required

- Small Phillips-head screwdriver.
- Pencil-type soldering iron (40-60 watts) with a fine tip for unsoldering module leads and component leads, and a medium tip for unsoldering module mounting tabs.
- Needlenose pliers for removing slotted nuts.
- Tuning tool 19B219079-P1 for removing Allen-head set screws in the controls.
- Allen-head #8, wrench 7150729P11 for removing bolts in the case assembly.

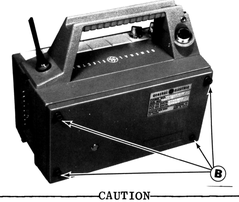


STEP 1

To remove the antenna, unscrew the antenna nut (A) and remove the antenna.

STEP 2

To gain access to the internal circuitry, loosen the four captive Allen-head bolts (B) with the Allen-head wrench and carefully remove the front or rear cover of the case assembly. The RF power cable must be disconnected by unplugging an in-line connector between the rear cover and the system board.



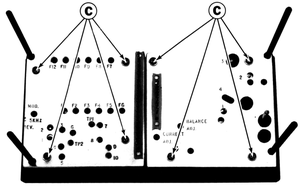
CAUTION

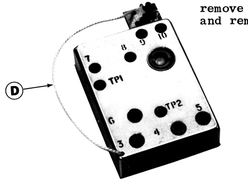
When replacing the front and rear assemblies a torque wrench should be used to tighten the captive Allen-head bolts (B). A torque of 20 inch-pounds should NOT be exceeded.

STEP 3

To gain access to the transmitter circuitry remove the four Phillips-head screws (C) holding the cover on the exciter or the PA.

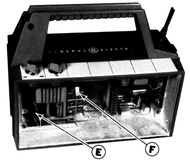
The exciter module can be unplugged by pulling on lifting strap (D).





STEP 4

To gain access to the receiver unplug plugs (E) and lift the receiver board out of the case by lifting strap (F). Option boards can be removed from the case by the same method.



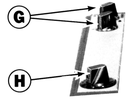
CAUTION

Do not place a circuit board on metal or other conductive surface with power applied. To do so will damage the Integrated Circuit modules. A small "pancake" of Duxseal® provides an excellent insulated work surface for the receiver or tone board.

STEP 5

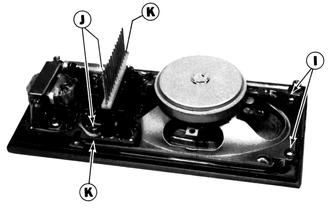
To remove the Volume or Squelch Control, remove the set screw (G) in the side of the control with the tuning tool. Then unscrew the slotted nut and remove the control.

To remove the Multi-Frequency switch, remove the set screw (H) as directed above. Then remove the washer, unscrew the slotted nut and remove the control.



STEP 6

To replace the speaker, remove the two Phillips-head screws I and loosen the two Phillips-head screws (J). With a pair of needlenose pliers loosen standoff (K). Remove speaker retaining plate and speaker.

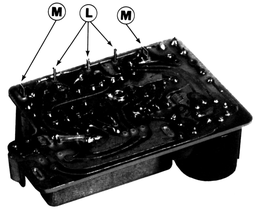


STEP 7

To replace one of the modules, unsolder and straighten up the module wire leads (L). Remove any solder accumulation from the leads.

Unsolder and straighten up the module mounting tabs (M) and remove any solder accumulation.

If replacing the receiver front end or mixer modules, also remove the small screws holding the helical resonators. Replace the module and solder down the mounting tabs and then the wire leads. Refer to the appropriate Outline Diagram (see Table of Contents) for the wire lead placement, if required.

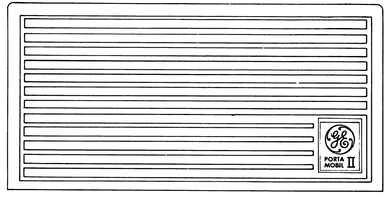


WARNING

The stud mounted RF Power Transistor used in the PA Module contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

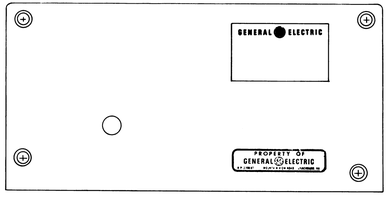
FRONT COVER

FRONT VIEW

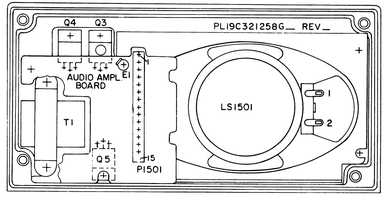


REAR COVER

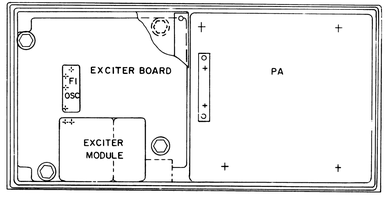
FRONT VIEW



REAR VIEW



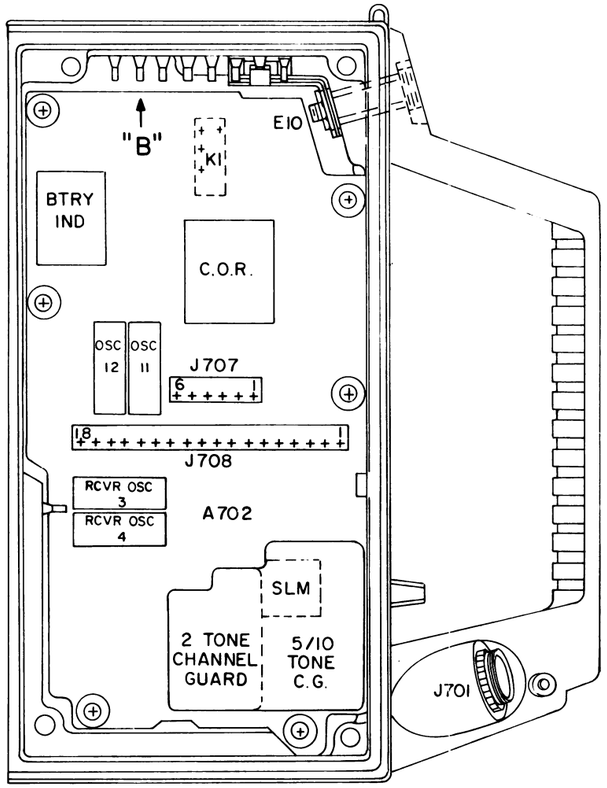
REAR VIEW

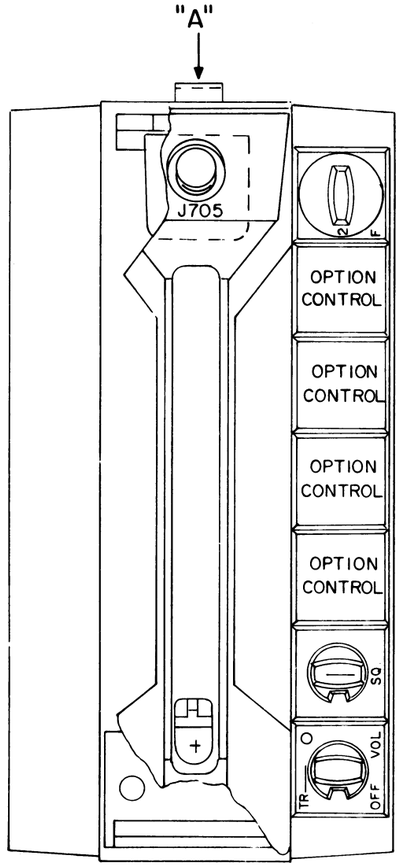


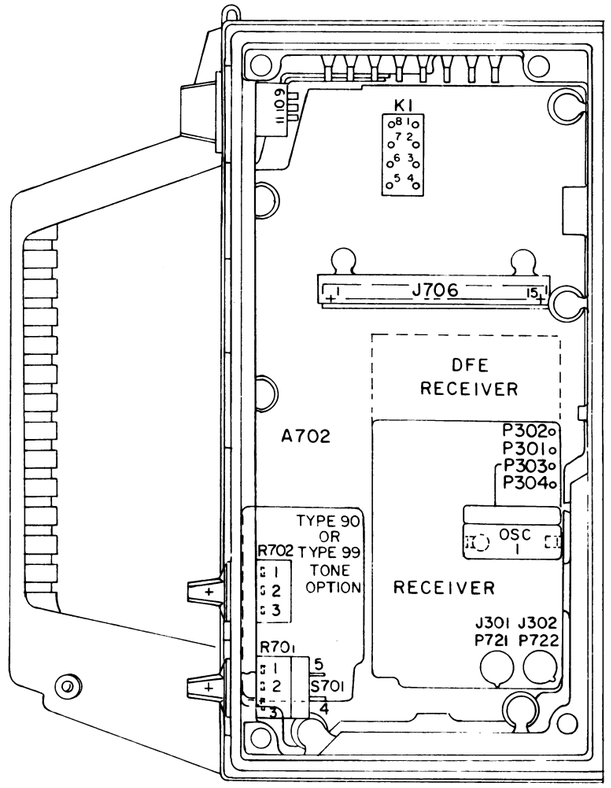
MODULE LAYOUT DIAGRAM

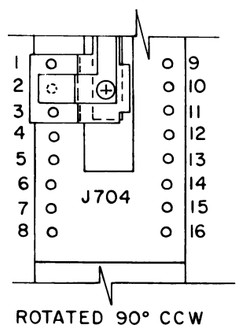
(19D424016, Sh. 1, Rev. 2)

66—88 MHz TWO-WAY FM RADIO



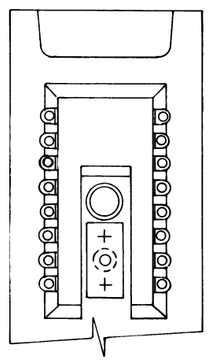






PARTIAL VIEW "B"

(19D424016, Sh. 2, Rev. 1)



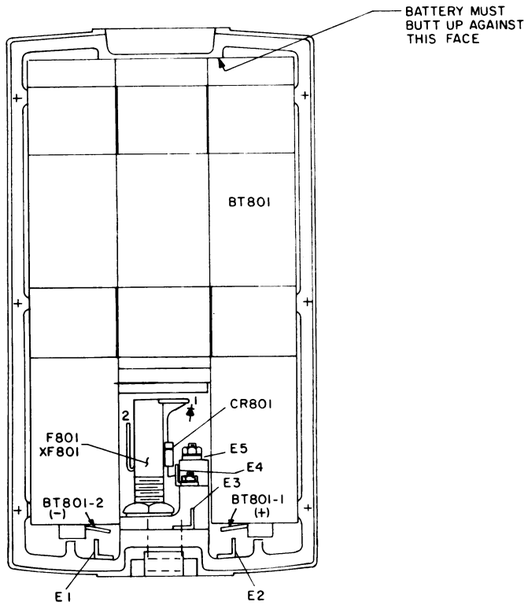
PARTIAL VIEW "A"

MODULE LAYOUT DIAGRAM

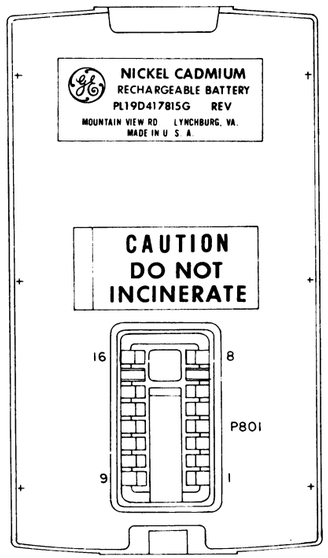
66—88 MHz TWO-WAY FM RADIO

OUTLINE DIAGRAM

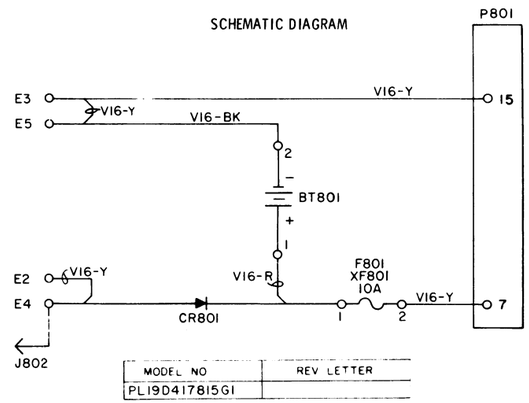
TOP VIEW
COVER REMOVED



TOP VIEW



SCHEMATIC DIAGRAM

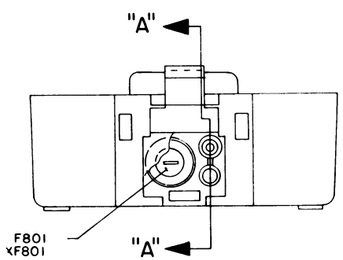


MODEL NO	REV LETTER
PL19D417815G1	

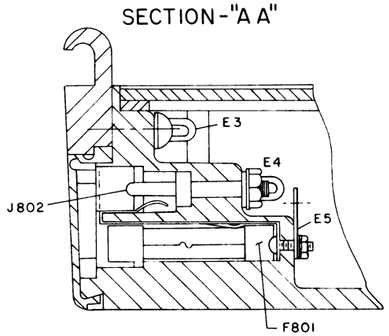
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

(19B226688, Rev. 4)

END VIEW



SECTION-"A A"



(19D424044, Rev. 1)

SERVICE SHEET

BATTERY PACK
PORTA • MOBIL II™

PARTS LIST

LBI-30140

PM II BATTERY PACK
19D417815G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - BATTERIES - - - - - - - - - -
BT801	19A134172P1	Nickel cadmium, rechargeable: 9.6 volt, 4 ampere hour; sim to GE 4IB004JD15G1.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR801	4037822P1	Silicon.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1 thru E4	4033714P11	Terminal: sim to Zierick 349.
E5	4033714P15	Terminal: sim to Patton-MacGuyer 4082.
		- - - - - - - - - - - FUSES - - - - - - - - - - -
F801	7102673P3	Quick blowing: 10 amps, 32 v; sim to Littelfuse 311010 or Bussmann AGC10.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J802	19A130195P1	Contact.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P801	19C321058P1	Contact, spring. (Quantity 2- the shell for P801 is part of the cover).
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XF801	4037402P1	Fuseholder: 15 amps at 250 v; sim to Littelfuse 341001.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19C321098G1	Cover assembly. (Includes P801).
	19C321083P1	Door, access. (For J802).
	19A130376P1	Catch. (Locks battery pack to radio).
	N84P5004E	Screw, phillips: No. 2-56 x 1/4. (Secures cover to battery pack.
	19A134343P2	Non-metallic washer. (Located on door- waterproof seal for F801).
	N81P5004E	Screw, phillips head: No. 2-56 x 1/4. (Used with XF801 at E5).
	19C321334P1	Contact. (Connects to E5).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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