GE Mobile Communications

Porta•Mobile II™

138-174 MHz

TWO-WAY FM RADIO COMBINATIONS

Maintenance Manual

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

Although the highest DC voltage in Porta•Mobile 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	KT-132-A
Receivers:	
Two Frequency	
138-150.8 MHz	ER-59-A
150.8-174 MHz	ER-59-C
Dual Front Ends	
150.8-174 & 42-50 MHz	ER-83-A
150.8-174 & 150.8-174 MHz	ER-84-A
150.8-174 & 450-470 MHz	ER-85-A
150.8-174 & 470-512 MHz	ER-86-A
System Board & Case Assembly	19D423076G2
Front Cover & Audio Amplifier	19C321258G1
Antenna	19B219954G3
Microphone	4EM33L10
Rechargeable Battery Pack	19D417815G1

INSTRUCTION BOOK INDEX
FOR
HIGH BAND Porta•Mobile II™

PUBLICATION	LBI NUMBER	DATA FILE FOLDER NUMBER
Operator's Manual	LBI-30084	—
Combination Manual	LBI-30230	DF-9042
Transmitter KT-132-A	LBI-30229	DF-3167
Receivers:		
ER-59-A	LBI-4852	DF-1102
ER-59-C	LBI-30000	DF-1102
ER-83-A	LBI-4780	DF-1102
ER-84-A	LBI-4780	DF-1102
ER-85-A	LBI-4780	DF-1102
ER-86-A	LBI-4780	DF-1102
System Board and Case Assembly 19D423076G2	LBI-30100	DF-4103
Audio Power Amplifier 19C321258G5-7	LBI-30765	DF-8397

SPECIFICATIONS*

GENERAL

FREQUENCY RANGE	138-150.8 MHz, 150.8-174 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	1.66 amperes (rated 10 watts audio)
Transmit	5 amperes

MAXIMUM FREQUENCY SPACING

TRANSMITTER

Frequency Range	No Degradation	1 dB Degradation (Power Out)
138-174 MHz	+0.6%	+2.0%

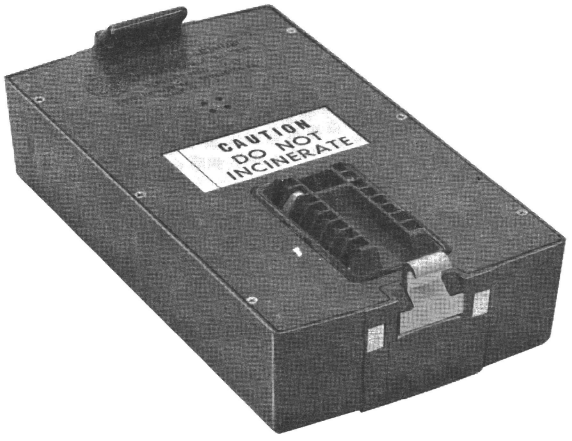
RECEIVER

Frequency Range	No Degradation	1 dB Degradation (Sensitivity)
138-174 MHz	±0.2% (highest frequency)	±0.4% (center frequency)

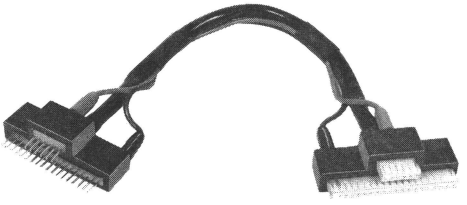
COMBINATION NOMENCLATURE

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 of Xmit Freq.	Options	Number Rcvr Frequency	Frequency Range	Frequency Range DFE
H Portable	**N** Rechargeable	**5** 15-32 Watts	**6** 30 kHz	**S** Standard	**A** 1 Freq Xmit	**S** Standard	**A** 1 Freq Rcvr.	**G** 138-150.8 MHz	**C** 42-50 MHz
					B 2 Freq Xmit	**W** Channel Guard Encode/Decode	**B** 2 Freq Rcvr.	**H** 150.8-174 MHz	**H** 150.8-174 MHz
					C 3 Freq Xmit	**R** 2 Tone CG Encode	**C** 3 Freq Rcvr.		**M** 450-470 MHz
					D 4 Freq Xmit	**B** T90 Encode/Decode	**D** 4 Freq Rcvr.		**N** 470-494 MHz
					E 5 Freq Xmit	**C** T90 2-Tone Encode	**E** 5 Freq Rcvr.		**P** 494-512 MHz
					F 6 Freq Xmit	**L** T99 Ind. Call	**F** 6 Freq Rcvr.		**X** NO DFE
					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.		

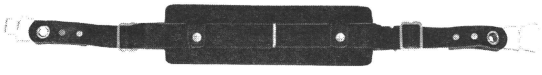
ACCESSORIES



Battery Pack
19D417815G1
(Option 2133)



Transmitter Test Cable
19D424148G1
(Option 2118)



Carrying Strap
19C321603G1
(Option 2103)

Spring Whip Antenna
19B219888P1
(Option 4325)

Receiver Test Cable
19C327327G1
(Option 2118)

RF Test Connector
19B227389G1
(Option 2106)

Carrying Bag
19D423555G1
(Option 2104)

Collapsible Antenna and Spring
19A130434G1
19C321012G1
(Option 2105)

DESCRIPTION

General Electric Porta•Mobile II™ VHF combinations are compact, high performance two-way FM Radios designed for complete two-way communications in the 138-174 MHz frequency range. The radios utilize both discrete components and integrated circuit modules.

All Porta•Mobile 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•Mobile 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-cadmium 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•Mobile 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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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 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 steel-framed 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 Trouble-shooting 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 Trouble-shooting 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-

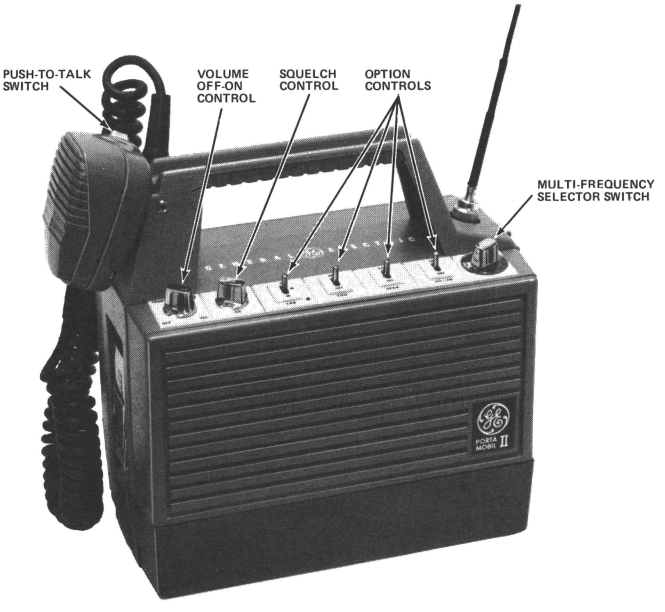


Figure 3 - Operating Controls

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 pack 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 watt 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/2X is a 121 VAC (50/60 Hz) desk charger and will recharge a fully discharged PMII battery pack in 16 hours (see Figure 4).

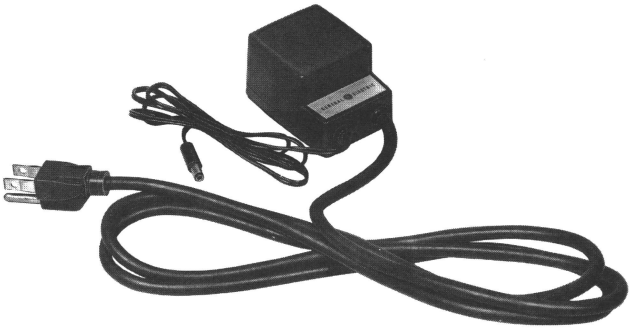


Figure 4 - Battery Charger 371L1A1X

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).

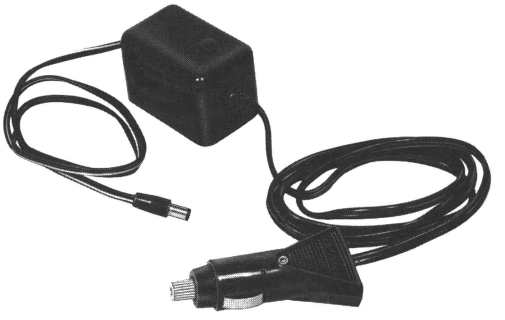


Figure 5 - Battery Charger 375C1A1X

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).

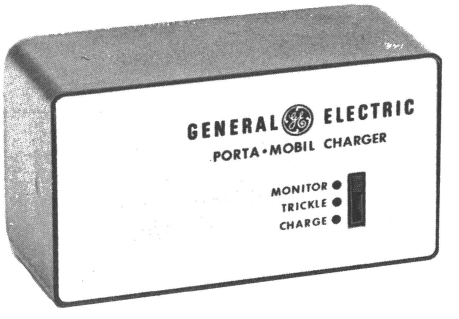


Figure 7 - Desk Charger 371M1A1X

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
U.S.A.

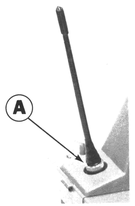
DISASSEMBLY PROCEDURE

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.

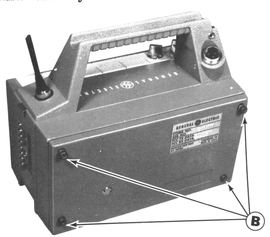


STEP 1

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.



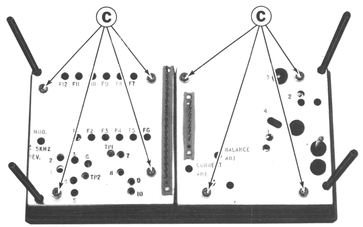
CAUTION

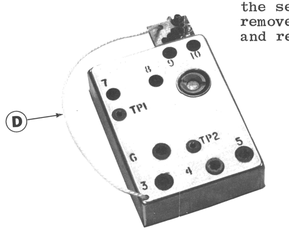
When replacing the front and rear assemblies a torque wrench should be used to tighten the captive Allen-head bolts (B). A torque of 20 inch-pounds should NOT be exceeded.

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.

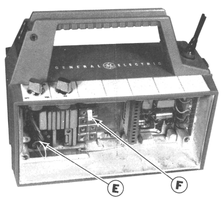
The exciter module can be unplugged by pulling on lifting strap (D).





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.



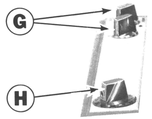
CAUTION

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

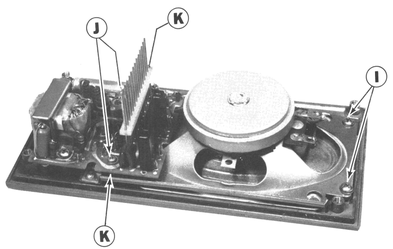
To remove the Volume or Squelch Control, remove the set screw (G) in the side of the control with the tuning tool. Then unscrew the slotted nut and remove the control.

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.

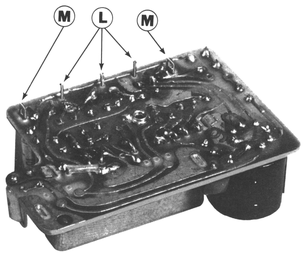


STEP 7

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.

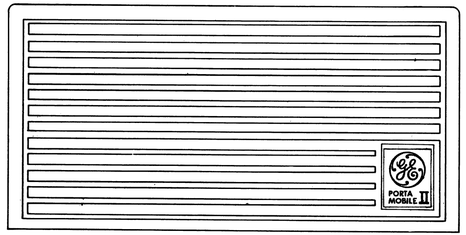


WARNING

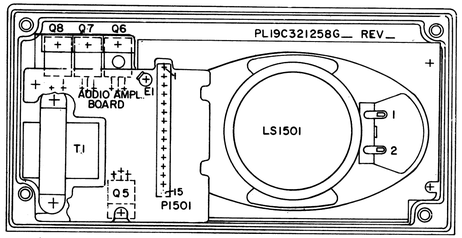
The stud mounted RF Power Transistor used in the PA Module contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

FRONT COVER

FRONT VIEW

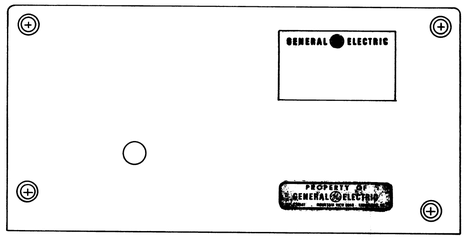


REAR VIEW

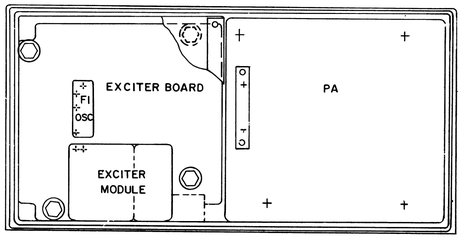


REAR COVER

FRONT VIEW



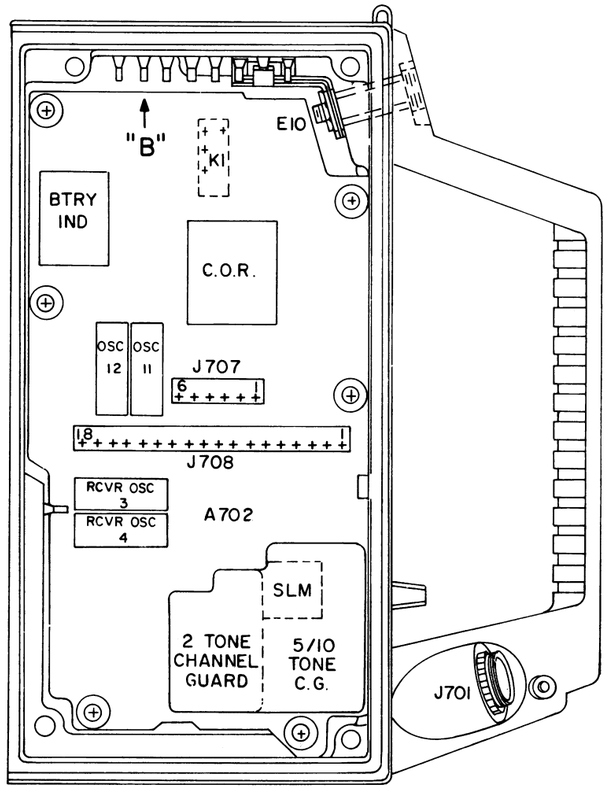
REAR VIEW

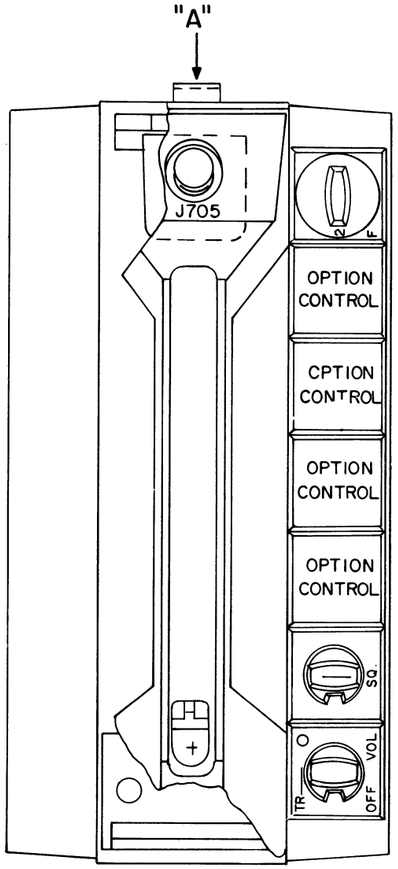


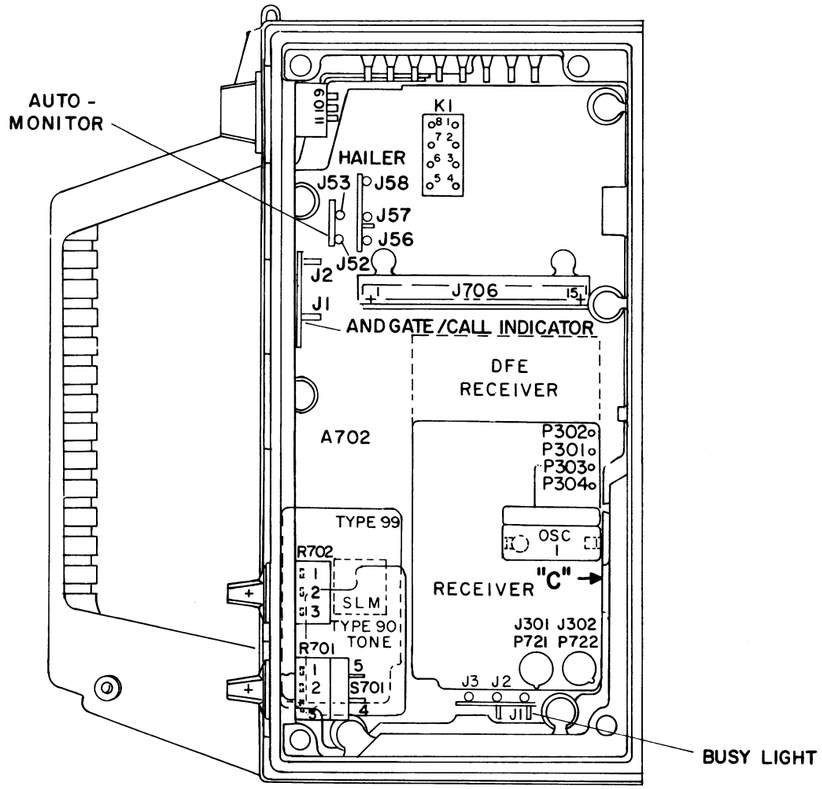
(19D424016, Sh. 1, Rev. 4)

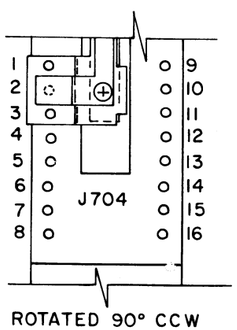
MODULE LAYOUT DIAGRAM

150.8—174 MHz TWO-WAY FM RADIO

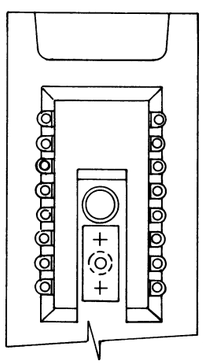




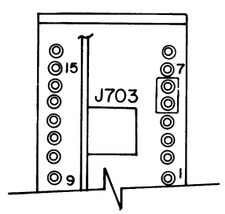




PARTIAL VIEW "B"



PARTIAL VIEW "A"



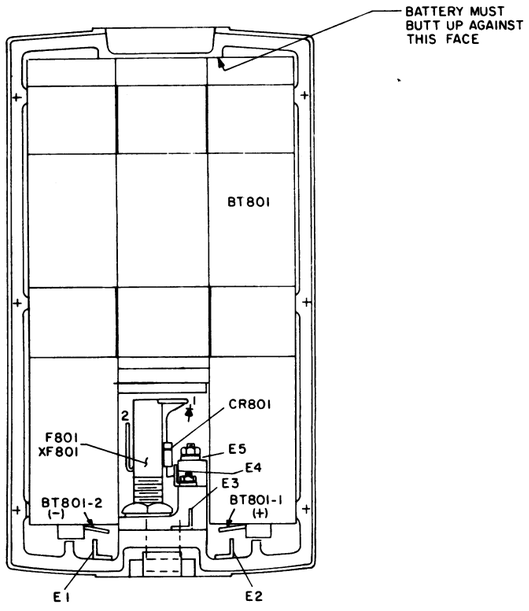
PARTIAL VIEW "C"

MODULE LAYOUT DIAGRAM

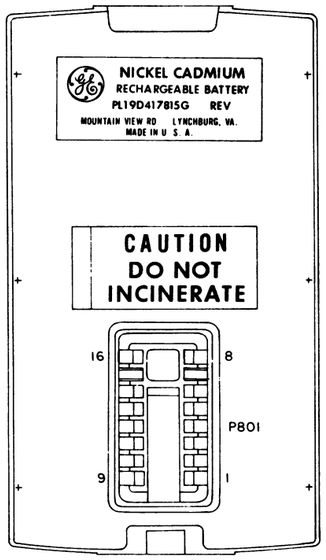
150.8—174 MHz TWO-WAY FM RADIO

OUTLINE DIAGRAM

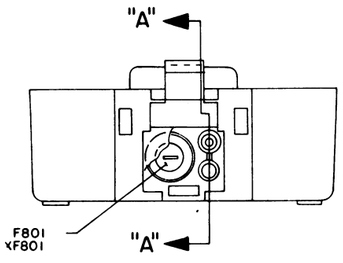
TOP VIEW
COVER REMOVED



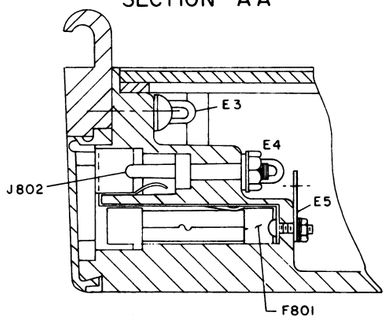
TOP VIEW



END VIEW

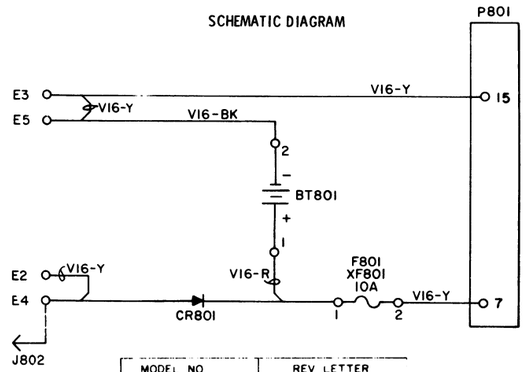


SECTION-"A A"



(19D424044, Rev. 1)

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)

SERVICE SHEET

BATTERY PACK
Porta•Mobile II™

8 Issue 1

PARTS LIST

LBI-30140A

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 41B004JD15G1.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR801	T324ADP1041	Rectifier, silicon; general purpose.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1 thru E4	4033714P11	Terminal, solderless: size to Zierick 349.
E5	4033714P15	Terminal: sim to Patton-MacGuyer 4082.
		- - - - - - - - - - - FUSES - - - - - - - - - - -
F801	7102673P3	Cartridge, quick blow: 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 P801).
	N81P5004E	Screw, phillips head: No. 2-56 x 1/4. (Used with XF801 at E5).
	19C321334P1	Contact. (Connects to E5).

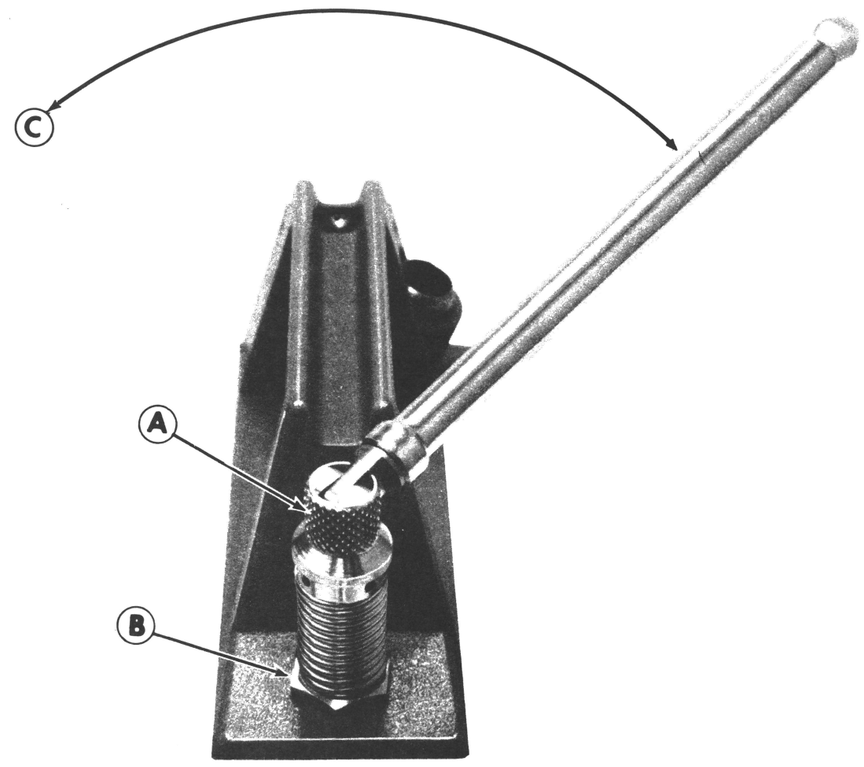
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PROCEDURE:

To install the collapsible antenna, screw the antenna to the case assembly locked in the vertical position with locking ring (A). Tighten nut (B).

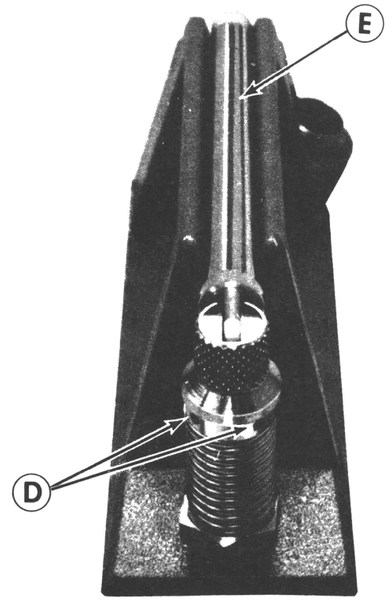
CAUTION

Do not tighten nut (B) when the antenna is in the collapsed position.



Rotate locking ring (A) and collapse the antenna. The antenna may collapse somewhere in area (C). Loosen set screws (D) and rotate the antenna to align with slotted handle (E).

Collapse the antenna into the case assembly handle and tighten set screws (D)



RESTORING WEATHERPROOF INTEGRITY

When a Porta•Mobile II™ is opened for maintenance or repair the weatherproof integrity is disturbed and water leak spots may occur. The following procedures are for restoring a Porta•Mobile II back to its original weatherproof condition.

Possible water leak spots when PM II is opened and re-assembled:

1) Front cover gasket, back cover gasket, or around any of the 4 back cover mounting bolts. This can be prevented by:

   a) Applying a light coat of silicone grease, 115205P4 (GE 623) in the groove on the cover gaskets.

   b) Applying silicone grease under washer on the 4 cover mounting bolts.

   c) Torque the screws to 19 in/lbs with torque tool. Do not overtighten.

2) If on-off switch or squelch pot is removed from housing, apply silicone grease around base of shaft before installing black washer on shaft. Tighten nut to 2 to 3 in/lbs of torque.

3) When power transistor mounting nut is removed, apply white silicone grease, 115205P3 (Insulgrease G 640), to bottom of nut before re-installing. Torque to 6 in/lbs. Overtightening may break the transistor.

4) When option switches are added, RTV-162 or Dow RTV 3140 must be used to fill switch keyway slot and also the keyway holes in the housing. If an LED is added with the option RTV must be also applied in the LED hole before installing LED. Apply glyptal to slots in housing before installing option module.

5) When speaker is replaced, clean RTV-162 from cover that speaker is mounted on and apply new RTV around the mounting surface cone before mounting speaker.

6) If handle is removed, before replacing handle, remove all RTV that was originally applied inside the cavity in housing on the antenna end of the Handle. New RTV (RTV 162) must be re-applied in cavity and in the antenna stud hole before assembling gasket and handle. Also, the RTV or wax must be removed around the mic wires and after handle re-assembly apply Dow RTV-3140. RTV 162 may be used but care must be taken to assure that the RTV fills the hole and flows well around each wire. The handle mounting screw should have glyptal applied to the screw threads before nut is put on and also, nut should be staked with glyptal.