MOBILE RADIO

MAINTENANCE MANUAL

TEST FIXTURE MODEL 4EX11A10

SPECIFICATIONS *

Used With	MASTR Personal Series Two-Way FM Radios
Input Power	2 amperes maximum at 12 volts DC
Output Voltage	7.5 volts DC regulated
Output Current	1.8 amperes maximum

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

EX-11-A

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

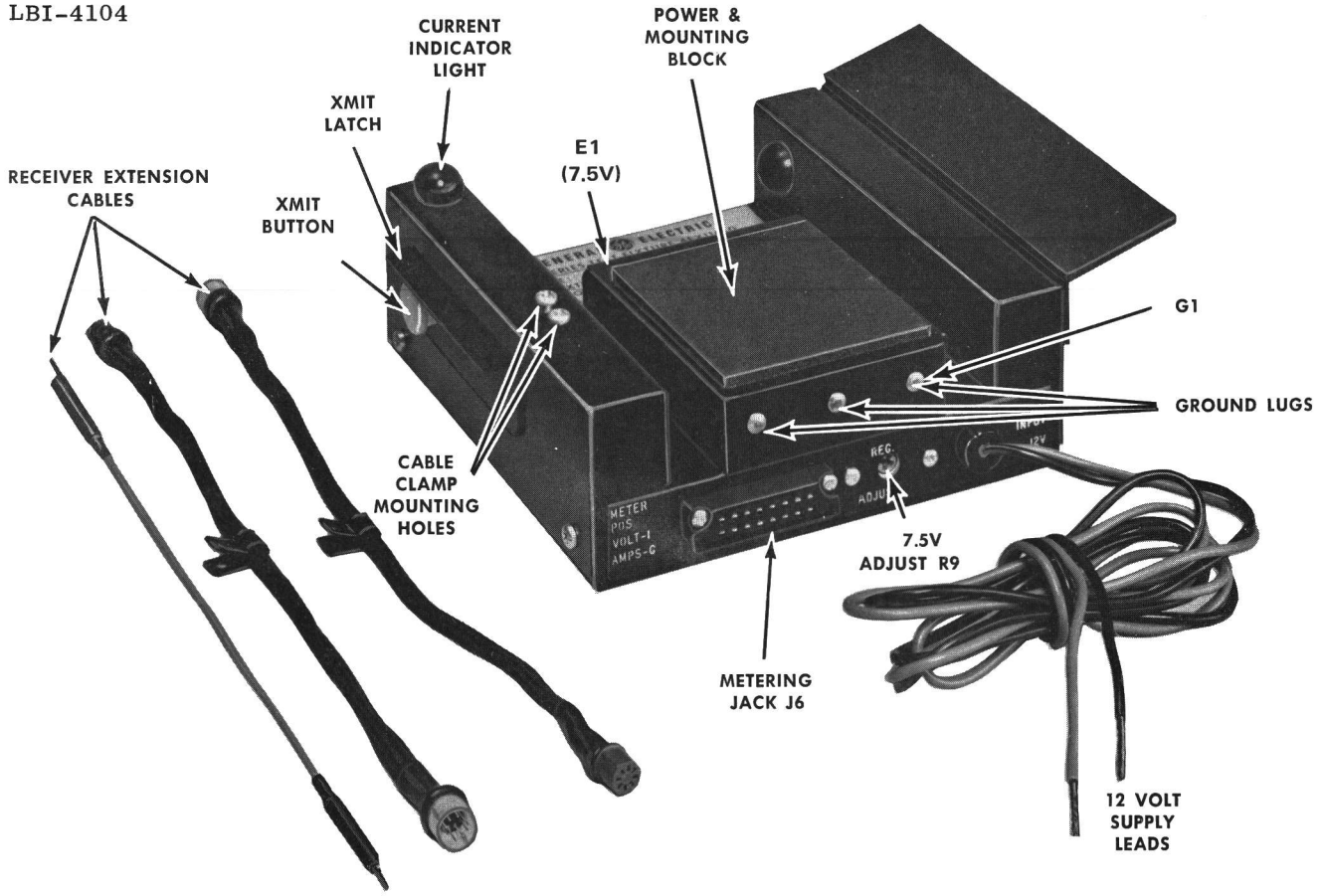


Figure 1 - Test Fixture Layout

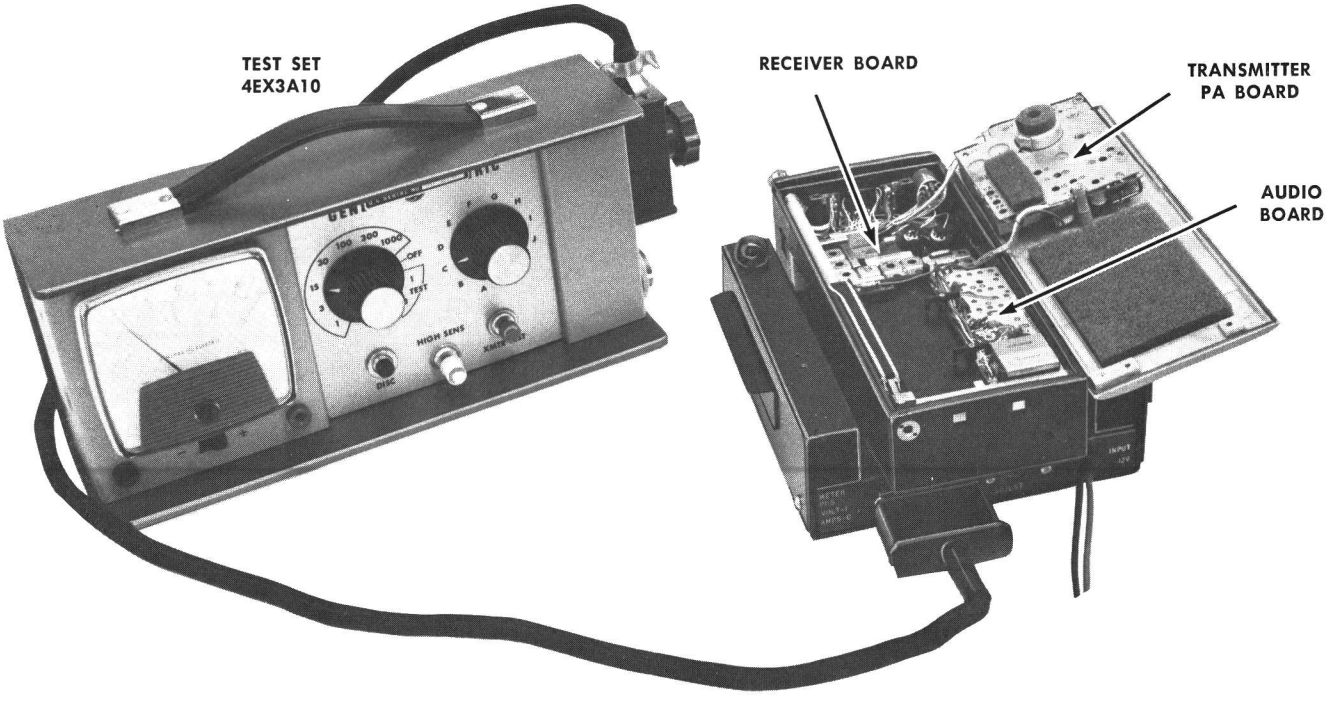


Figure 2 - Test Fixture with Radio

DESCRIPTION

General Electric Test Fixture Model 4EX11A10 was designed to facilitate servicing of MASTR Personal Series Two-Way FM radios. The Test Fixture supplies a regulated 7.5 Volts for operating the radio. A metering jack is provided for use with GE Test Set Model 4EX3A10 (or 4EX8K11) for metering the transmitter current and regulated supply voltage. A layout of the Test Fixture is shown in Figure 1.

With the battery removed from the radio, the battery compartment fits over the power and mounting block on the Test Fixture. Power and ground connections are provided through two contacts on the mounting block.

The Text Fixture is equipped with a spring-loaded button for keying the transmitter. The keying button can be latched to keep the transmitter keyed while servicing. The read light on the Test Fixture may be used as a current indicator. The light glows brighter as the current drawn by the transmitter increases.

Three receiver extension cables are shipped with the Test Fixture. The cables provide RF, power and control connections for servicing the receiver board while removed from the radio.

OPERATION

Two mounting holes are provided in the buttom of the chassis to permit the Test Fixture to be securely mounted to the work bench (see Figure 2). To gain access to the mounting holes, remove the Power and Mounting block as directed in the Disassembly Procedure.

POWER CONNECTIONS

The Test Fixture may be operated from any source capable of providing two amperes at 12 Volts DC. A low ripple source is not required. Connect the Red input lead to (+) and the Black input lead to (-).

MOUNTING THE RADIO

Disassemble the radio for servicing as directed in the Disassembly Procedure in the Maintenance Manual for the radio. The mount the radio as follows:

1. Place the springs in the battery compartment of the radio against the ground lugs on the Test Fixture (see Figure 1).
2. Press the radio against the Test Fixture to compress the springs, and slip the radio over the mounting block.
3. Open up the radio as shown in Figure 2.

TRANSMITTER SERVICING

To meter the transmitter current with Test Set model 4EX3A10 or 4EX8K11:

1. Connect the Test Set to J6 on the Test Fixture.
2. Place the Range Selector switch in the Test 1 position (or 1-Volt position on the 4EX8K11).
3. Place the Test Selector switch in position G.
4. Read the transmitter current drain on the 15 Volts scale as 1.5 amperes full scale.

To meter the transmitter current using a 20,000 ohms per-Volt meter with a 1-Volt scale:

1. Connect the meter probes to J6-1 and J6-9, and switch the meter to the 1-Volt scale.
2. Read the current on the 1-Volt scale as 1.5 amperes full scale.

RECEIVER SERVICING

The three extension cables shipped with the Test Fixture permit the receiver board to be removed from the radio for servicing. To connect the cables:

1. Remove the receiver board as directed in the Disassembly Procedure in the Maintenance Manual for the radio.

CAUTION

Do not place the receiver 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.

2. Connect the extention cables are shown

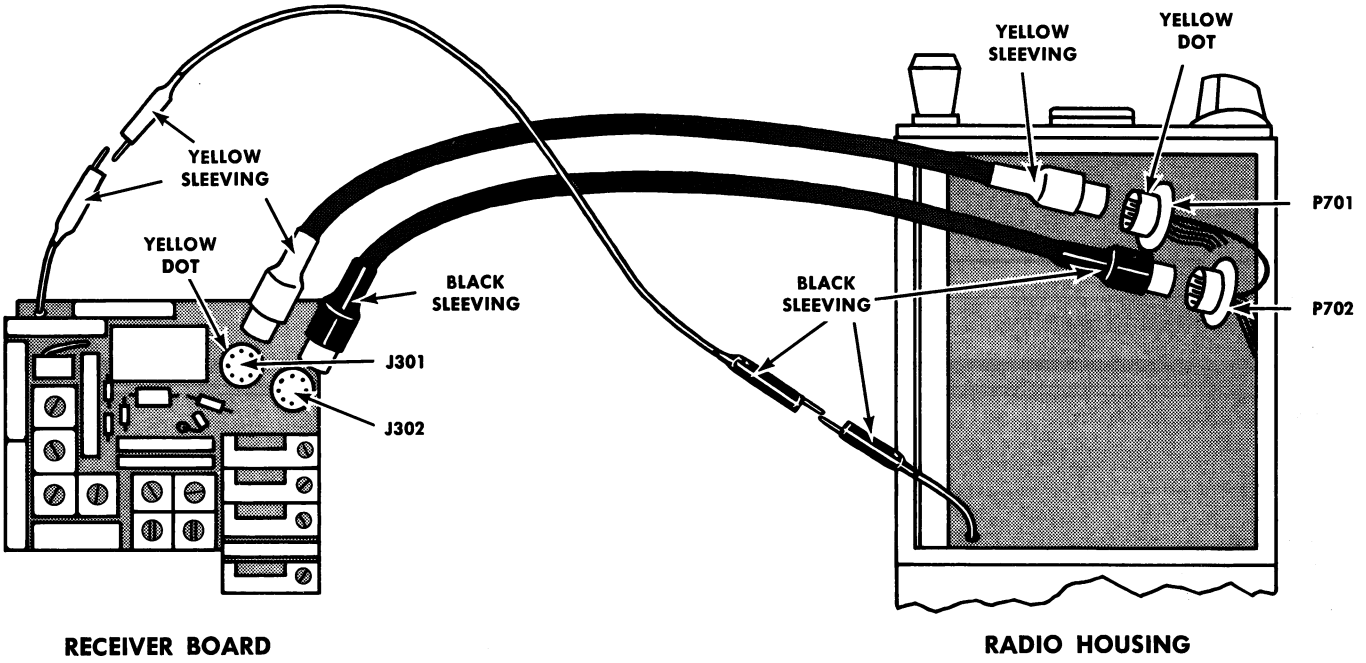


Figure 3 - Extension Cable Connections

in Figure 3, making sure the keyways on the plugs are aligned with the guide slots on the jacks.

3. Turn the radio on. The receiver is now ready for servicing.

ADJUSTMENT

If it should become necessary to replace VR1 or Q2, potentiometer R9 will have to be re-adjusted. To adjust R9 with Test Set 4EX3A10 or 4EX8K11:

1. Connect the Test Set to metering jack J6.

2. Place the Range Selector switch in the Test 1 position (1-Volt position for 4EX8K11), and the Test Selector switch in position "I".

3. Adjust R9 for 7.5 Volts as read on the 15-Volt scale.

To adjust R9 with a multi-meter:

1. Connect the positive lead of the multimeter to J6-12 and the negative lead to J6-16.

2. Switch the meter to the most sensitive (60 to 80) microampere scale and adjust R9 for 25 microamperes.

MAINTENANCE

BULB REPLACEMENT

To replace the current indicator light, first unscrew the red lens cover. Then replace the bayonet-type light bulb. A small piece of masking tape on the bulb provides a better grip for the fingers.

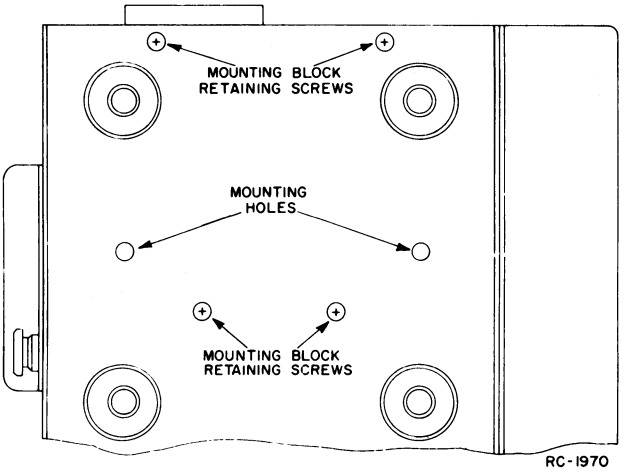


Figure 4 - Disassembly and Mounting

DISASSEMBLY

To gain access to the regulator circuitry, remove the four Phillips-head screws

as shown in Figure 4. Then carefully pull the Power and Mounting Block out of the assembly.

CIRCUIT ANALYSIS

The regulator provides a closely-controlled 7.5 Volts supply for operating the Personal Series two-way radios. The regulator also contains a current limiting circuit to keep the maximum current drain at 1.8 amperes.

References to symbol numbers in the following text may be found on the Outline Diagram, Schematic Diagram or Parts List (see Table of Contents).

REGULATOR CIRCUIT

The regulator circuit consists of Q1, A1-Q2, R7, R9, and VR1. Applying 12 Volts to regulator board A1 forward biases diode CR1, turning on regulator Q1. This transistor mounts to the bottom section of the chassis, using the chassis as a heat sink. The output at the emitter of regulator Q1 is connected to contact E1 on the Power and Mounting Block.

When the output voltage starts to increase beyond the desired level, zener diode VR1 breaks down, and Q2 starts conducting. When Q2 conducts, there is less base current for regulator Q1. The voltage drop across Q1 becomes larger, keeping the output constant.

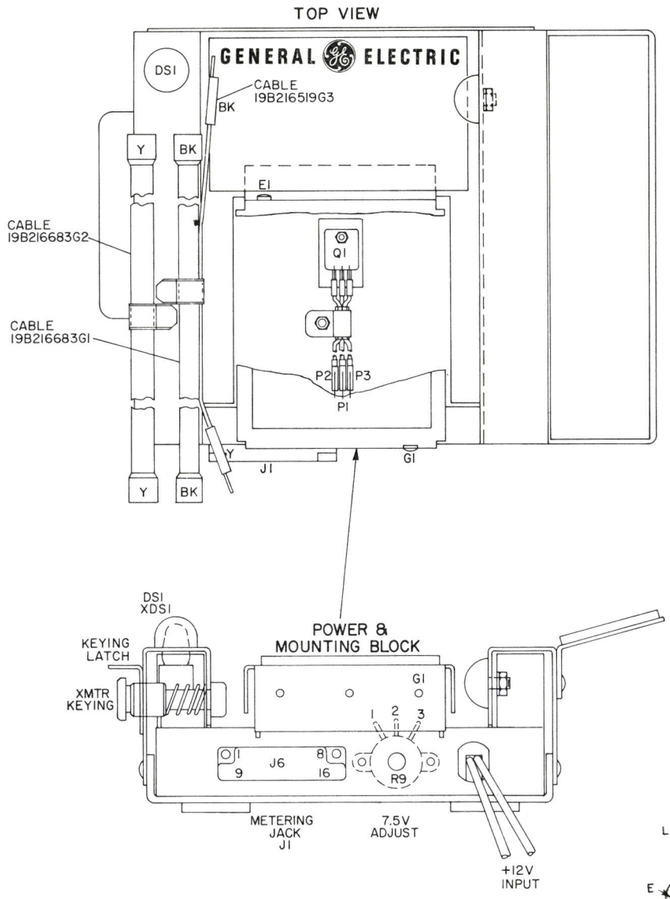
When the output voltage starts to drop, Q2 conducts less. This increases the forward bias on regulator Q1, reducing the voltage drop across the transistor, keeping the output constant.

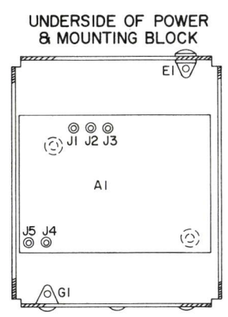
Diode CR1 provides reverse polarity protection for the regulator circuitry. Potentiometer R11 is used to set the regulator for the desired 7.5 Volts output. The output voltage is measured at J6-12 and -16 through metering resistor R8. The output current is metered across R2 at J6-1 and -9.

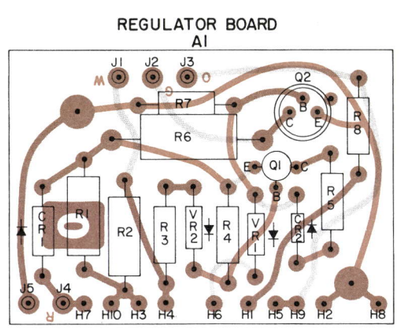
CURRENT LIMITING CIRCUIT

The current limiting circuit consists of R1 through R6, A1-Q1, CR2 and VR2. Whenever the current starts to exceed the 1.8 amperes limit, the voltage drop across R1 and R2 increases. This causes the base of PNP limiter transistor A1-Q1 to have a negative potential with respect to its emitter, causing it to conduct. Turning on A1-Q1 forward biases CR2, causing Q2 to conduct. Causing Q2 to conduct reduces the forward bias on regulator Q1, which increases the inpedance of Q1 and reduces the output current.

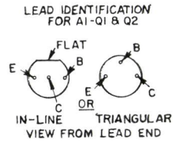
OUTLINE DIAGRAM





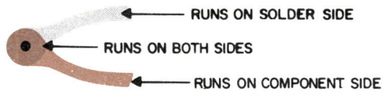


LEAD IDENTIFICATION FOR A1-Q1 & Q2

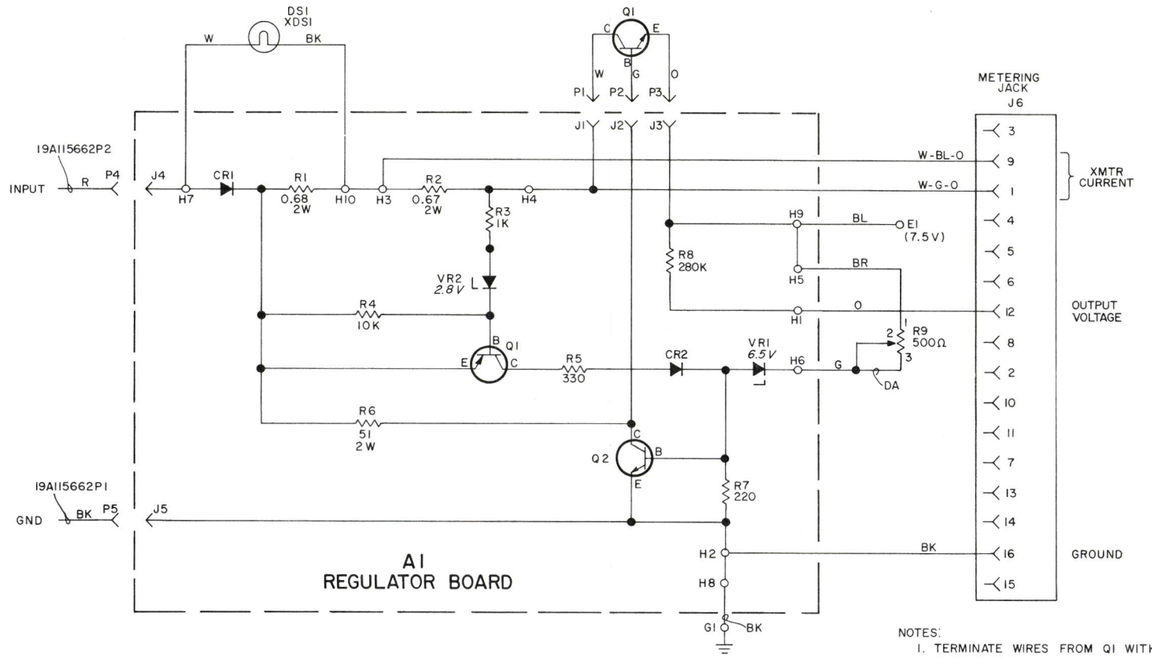


NOTE LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

(19C317478, Rev. 1)
(19B216722, Sh. 1, Rev. 0)
(19B216722, Sh. 2, Rev. 0)



SCHEMATIC DIAGRAM



NOTES:
1. TERMINATE WIRES FROM Q1 WITH A4029840P2.
2. TERMINATE WIRES 19A115662 P1 & P2 WITH A4029840P3 (ONE END).
3. ALL WIRES ARE SF22 UNLESS OTHERWISE NOTED.

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG = 1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

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.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EX11A10	A

(19C317338, Rev. 4)

10008

SCHEMATIC & OUTLINE DIAGRAM

TEST FIXTURE MODEL 4EX11A10

PARTS LIST

LBI-4113A

TEST FIXTURE
MODEL 4EX11A10

SYMBOL	GE PART NO.	DESCRIPTION
A1		REGULATOR BOARD 19B216733-G1
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	4037822-P1	Silicon.
CR2	19A115250-P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J5	4033513-P1	Contact, electrical: sim to Bead Chain L93-4.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115768-P1	Silicon, PNP; sim to Type 2N3702.
Q2	19A115300-P1	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B209022-P111	Wirewound: 0.68 ohms ±10%, 2 w; sim to IRC Type BWH.
R2*	19A115416-P8	Wirewound: 0.67 ohms ±1%, 2 w; sim to Dale Type RS-2B.
		Earlier than REV A:
	19B209022-P111	Wirewound: 0.68 ohms ±10%, 2 w; sim to IRC Type BWH.
R3	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R4	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R5	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w.
R6	3R79-P510J	Composition: 51 ohms ±5%, 2 w.
R7	3R77-P221J	Composition: 220 ohms ±5%, 1/2 w.
R8	19A116278-P444	Metal film: 280,000 ohms ±2%, 1/2 w.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
VR1	4036887-P6	Silicon, Zener.
VR2	4036887-P2	Silicon, Zener.
		- - - - - - - - - INDICATING DEVICES - - - - - - -
DS1	19C307037-P13	Lamp, incandescent: 2 v; sim to GE 49.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J6	19B205689-G2	Jack: 16 contacts, includes (16) 19A115853-P1 contacts.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P1 thru P3	4029840-P2	Contact, electrical: sim to AMP 42827-2.
P4 and P5	4029840-P3	Contact, electrical: sim to AMP 42101-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116118-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R9	19B209244-P5	Variable, wirewound: 500 ohms ±20%, 2 w; sim to CTS Type 117.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1	4032220-P4	Lamp: Miniature bayonet; sim to Drake N517.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A121252-P1	Heat sink. (Used with Q2).
	4036555-P1	Insulator, washer: nylon. (Used with Q2).
	4035235-P2	Spring, helical. (Part of Transmitter Keying Switch).
	19A127682-P1	Button. (Part of Transmitter Keying Switch).
	19A115081-P2	Bumper, rubber. (Part of Transmitter Keying Switch).
	7141855-P16	Lens, panel light: Red; sim to Dialight 95-0931. (Used with DS1).
	5491419-P1	Strain relief. (Used with power cable).
	19A116022-P1	Insulator, bushing. (Used with Q1 on chassis).
	19A116023-P1	Insulator plate. (Used with Q1 on chassis).
		RECEIVER EXTENSION CABLES 19A127714-G1
	19B216683-G1	Power and Control Cable, black sleeving.
	19B216683-G2	Power and Control Cable, yellow sleeving.
	19B216519-G3	RF Cable.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter" which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - To increase the accuracy of meter readings. Changed R2.

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 No.

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.

MAINTENANCE MANUAL

LBI-4101

DF-10008

GENERAL ELECTRIC

MOBILE RADIO DEPARTMENT LYNCHBURG, VIRGINIA 24502 CABLE GECOMPROD

(In Canada, Canadian General Electric Company, Ltd., 100 Wingold Ave., Toronto 19. Ontario)

PRINTED IN U.S.A.