MOBILE RADIO

# MAINTENANCE MANUAL

## Text Fixture Model 4EX17A10 (Option 5425)



### SPECIFICATIONS *

| | |
|---|---|
| Used With | Paging Receivers PC05 & PC06 |
| Nominal Input Voltage | 13.8 Volts DC |
| Input Current (typical) | |
| No Load | 13 milliamperes |
| Rated Audio | 96 milliamperes |
| Shorted Output | 225 milliamperes |
| Adjustable Output Voltage | 2.7-to 4.5-Volts DC |
| Calibrated Output Voltage | |
| No Load | 3.8 Volts ± 0.1 Volt DC |
| Rated Audio | 3.7 Volts ± 0.1 Volt DC |
| RF Input Impedance | Approximately 50 ohms |
| Coupling Loss (Generator to Receiver) | |
| PC06 | Approximately -37 dB |
| PC05 | Approximately -24 dB |
| Temperature Range | -30°C to +60°C |
| Dimensions (HxWxD) | 2" x 7-1/4" x 7-1/4" |
| Weight | 2.5 pounds |

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

EX-17-A

GENERAL ELECTRIC

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ILLUSTRATIONS



WARNING

No one should be permitted to handle any portion of the equipment that is supplied with voltage or RF power; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

## DESCRIPTION

General Electric Test Fixture Model 4EX17A10 was designed for servicing Personal Paging receivers PC05 and PC06. A layout of the Test Fixture with a Personal Pager is shown in Figure 1.

The Test Fixture provides a regulated 3.7 volts for operating the receiver, and is equipped with a centralized metering jack for use with GE Test Set Models 4EX3A10 or 4EX8K11. The metering jack provides access to the following:

- receiver current
- input voltage
- regulated supply voltage
- receiver audio

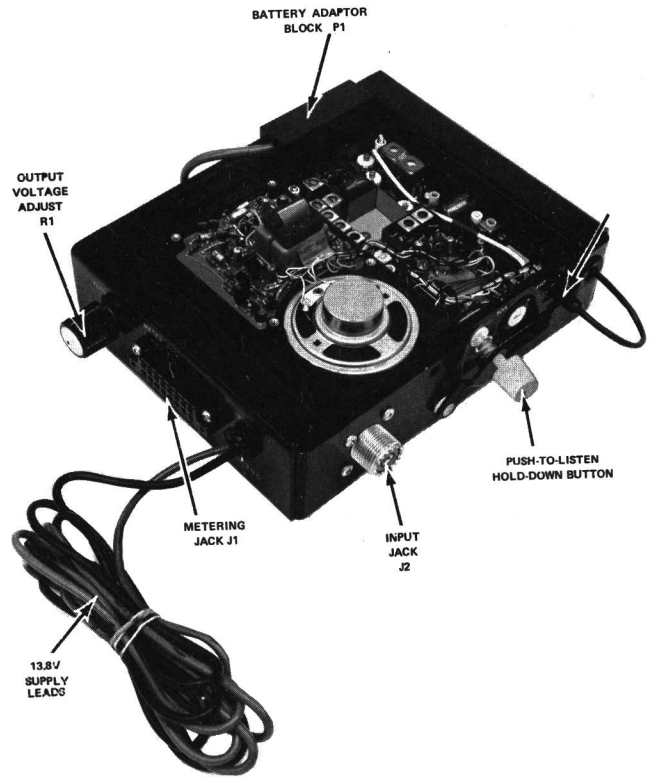



Figure 1 - Test Fixture Layout

The input jack is terminated in a 50-ohm radiating loop so that a signal may be radiated into the receiver. For Push-To-Listen receivers, a hold-down button is provided to keep the Push-To-Listen button depressed while servicing.

## OPERATION

The Test Fixture may be operated from any 250 milliampere, 12-volt DC source. A low ripple source is not required.

WARNING

If an AC power supply is used, make sure that the power supply chassis is connected to a good earth ground.

TEST FIXTURE SET-UP

To put the Test Fixture into operation:

1. Connect the Red supply lead to plus (+) and the Black supply lead to minus (-).
2. Place the receiver into the Test Fixture as shown in Figure 1.
3. Insert the battery adaptor block into the receiver battery compartment as shown.
4. Turn potentiometer R1 counterclockwise until it clicks. The Test Fixture now applies the calibrated 3.7 volts to the receiver. For a variable supply voltage, turn R1 clockwise from the calibrated position. This varies the voltage from 2.7 to 4.5 volts DC.
5. Connect audio plug P2 to the receiver accessory jack. This mutes the speaker while terminating the receiver output into an 8-ohm load, and applies audio to the metering jack.
6. Connect the GE Test Set to Test Fixture metering jack J1, and turn the receiver ON. The radio is now ready for servicing.

RECEIVER SERVICING

It is recommended that the coupling loss and the current drain for each paging receiver in the system be measured and retained as a service aid.

Coupling Loss

To measure the signal generator-to-receiver coupling loss:

1. Measure the receiver sensitivity as shown in the Test Procedure in the receiver Maintenance Manual. Note the sensitivity in dBm.

2. Place the receiver in the Test Fixture and connect the signal generator to Input Jack J2. Then measure the sensitivity of the receiver and note the sensitivity in dBm. The difference between the two readings is the coupling loss.

Current Drain

To meter the receiver current with the GE Test Set Model 4EX3A10 or 4EX8K11:

1. Place the Range Selector switch in the Test 1 position (or 1-volt position on the 4EX8K11).

2. Place the Test Selector switch in Position G.

3. Read the receiver current drain on the 1-volt scale as 100 milliamperes full scale.

To meter the receiver current with a 20,000 ohms-per-volt meter with a 1-volt scale:

1. Connect the meter probes to J1-1 and J1-9, and switch the meter to the 1-volt scale.

2. Read the current on the 1-volt scale as 100 milliamperes full scale.

Regulated Output Voltage

To meter the regulated output voltage:

1. Place the Range Selector switch in the Test 1 position (or 1-volt position on the 4EX8K11).

2. Place the Test Selector switch in position I.

3. Read the output voltage on the 1-volt scale as 6 volts full scale.

To meter the output voltage using a 20,000 ohms per-Volt meter with a 1-volt scale:

1. Connect the meter probes to J1-12 (+) and J1-16 (-), and switch the meter to the 1-volt scale.

2. Read the voltage on the 1-volt scale as 6 volts full scale.

Input Voltage

To meter the input voltage:

1. Place the Range Selector switch in the Test 1 position (or 1-volt position on the 4EX8K11).

2. Place the Test Selector switch in Position J.

3. Read the input voltage on the 1-volt scale as 15 volts full scale.

To meter the input voltage using a 20,000 ohms per-Volt meter with a 1-volt scale:

1. Connect the meter probe to J1-8 (+) and J1-16 (-), and switch the meter to the 1-Volt scale.

2. Read the voltage on the 1-Volt scale as 15 volts full scale.

Receiver Audio

When Test Set Model 4EX3A10 is connected to the Test Fixture metering jack, the receiver audio output is available at the Green (audio high) and Black (audio low) audio test jacks. An audio voltmeter or distortion analyzer can be connected to the audio test jacks for receiver output, distortion or SINAD measurements.

## MAINTENANCE

DISASSEMBLY

To gain access to the Test Fixture circuitry, remove the three Phillips-head screws that are closest to the center of the bottom plate. Then lift off the top section of the Test Fixture.

ADJUSTMENT PROCEDURE

If any of the components are replaced, adjust the regulated output voltage as follows:

1. Remove the receiver from the Test Fixture.

2. Turn Output Voltage Control R1 on the Test Fixture fully counterclockwise to the CALIBRATE position.

3. Place the GE Test Set range selector switch to the Test 1 position.

4. Check for an open circuit voltage of 3.8 volts DC, read on the 1-volt scale as 6-volts full scale.

5. If necessary, adjust R11 on Regulator Board A1 for 3.8 volts DC.

## CIRCUIT ANALYSIS

Test Fixture Model 4EX17A10 consists of the receiver holding fixture and a bottom plate. Mounted on the receiver holding fixture are the metering and antenna jacks, audio plug, voltage adjust potentiometer and battery adaptor block. Regulator Board A1 is mounted on the bottom plate.

References to symbol numbers mentioned in the following test can be found in the Schematic Diagram, Outline Diagram or Parts List (see Table of Contents).

### REGULATOR CIRCUIT

The regulator circuit consists of regulator transistor Q1 and differential amplifier Q2 and Q3. The circuit operates as a current-limiting voltage regulator.

Applying +12 volts to the Test Fixture causes regulator Q1 to conduct. The output at the emitter of Q1 is applied to the battery adaptor block to power the receiver, to metering jack J1, and to a feed-back path in the base circuit of Q3 in the emitter-follower.

When the output voltage starts to increase, Q3 starts to conduct more. With Q2 conducting more, there is less base current for regulator Q1. This increases the voltage drop across Q1, keeping the output constant.

When the output voltage starts to drop, there is less base bias applied to Q3, causing it to conduct less. This increases the forward bias to regulate Q1 and reduces the voltage drop across the transistor, keeping the output constant.

Diode CR1 provides reverse polarity protection for the regulator transistors. Potentiometer R11 is used to set the regulator for the desired 3.8-volt, no-load output. Instructions for setting R11 are contained in the Maintenance Section of this manual.

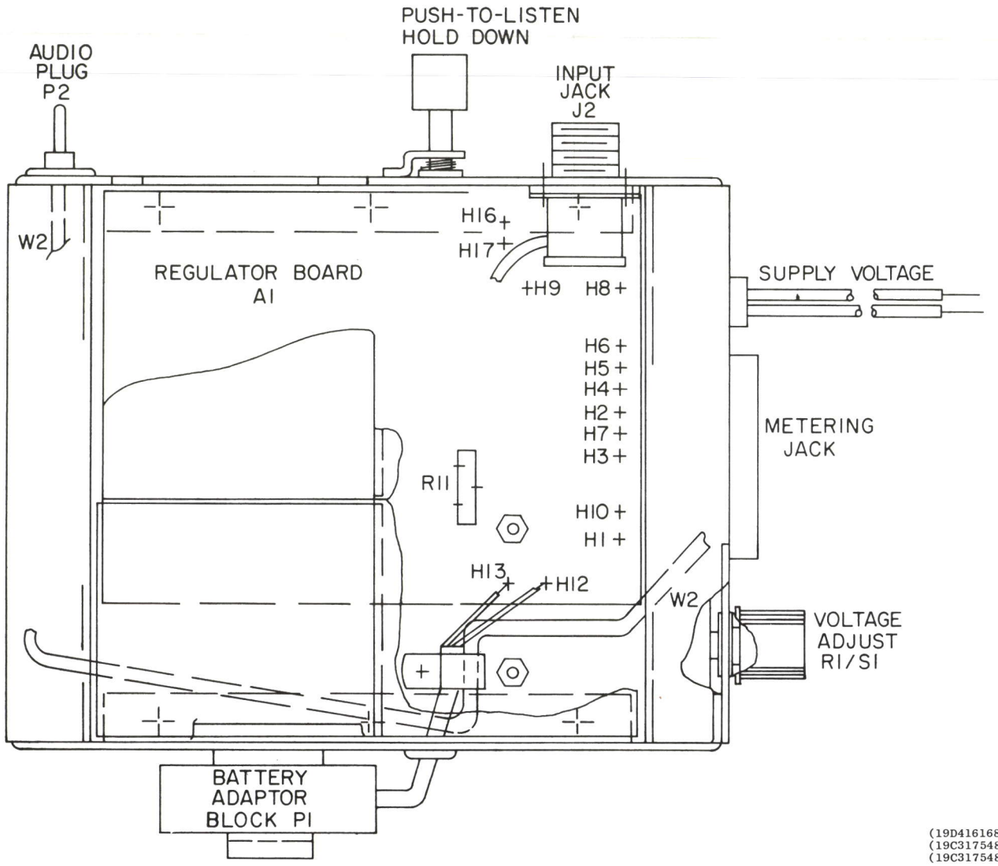
Current limiting is provided by R14. Resistors R15, R16 and R17 form a pad between the generator and the radiating loop for applying the output of a signal generator to the receiver. The radiating loop is terminated by R12.

### CALIBRATION CIRCUIT

With potentiometer R1 in the calibrated position (fully CCW), Switch S1 opens and the output voltage is determined by the resistance divider consisting of R13, R1, R2, and R11. R11 is adjusted for the proper 3.8 VDC open circuit test fixture voltage.

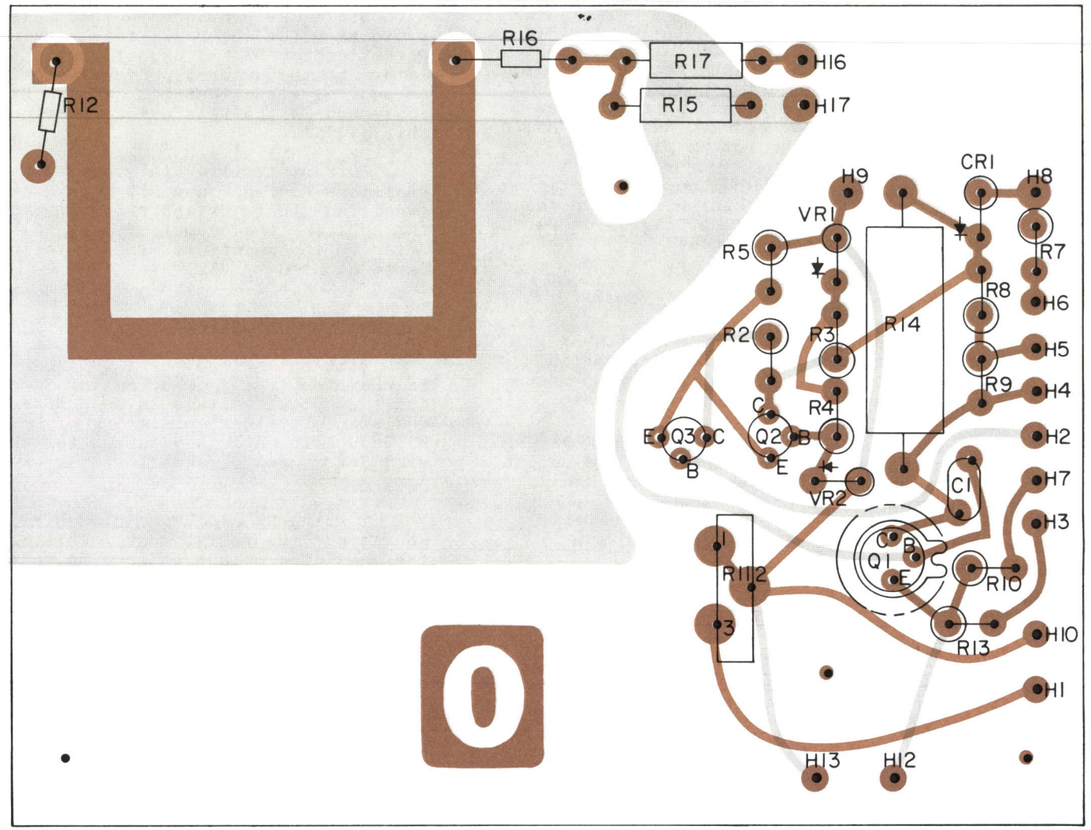
Turning R1 clockwise closes S1 and shorts out the resistor R2. This drops the regulated output voltage to approximately 2.7 volts. Rotating R1 further clockwise changes the resistance divider ratio of R13, R1, and R11 which feeds the regulated output voltage to the base of Q3. This raises the output voltage to approximately 4.5 VDC when R1 is at the extreme clockwise position.

## TOP VIEW

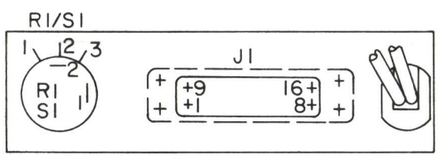


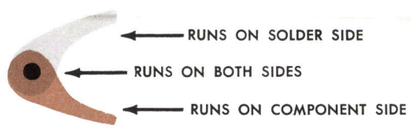

(19D416168, Rev. 0)
(19C317548, Sh. 1, Rev. 0)
(19C317548, Sh. 2, Rev. 0)

## REGULATOR BOARD
## A1

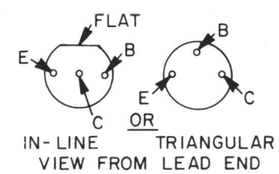



## TERMINAL VIEW




LEAD IDENTIFICATION
FOR Q1, Q2, & Q3

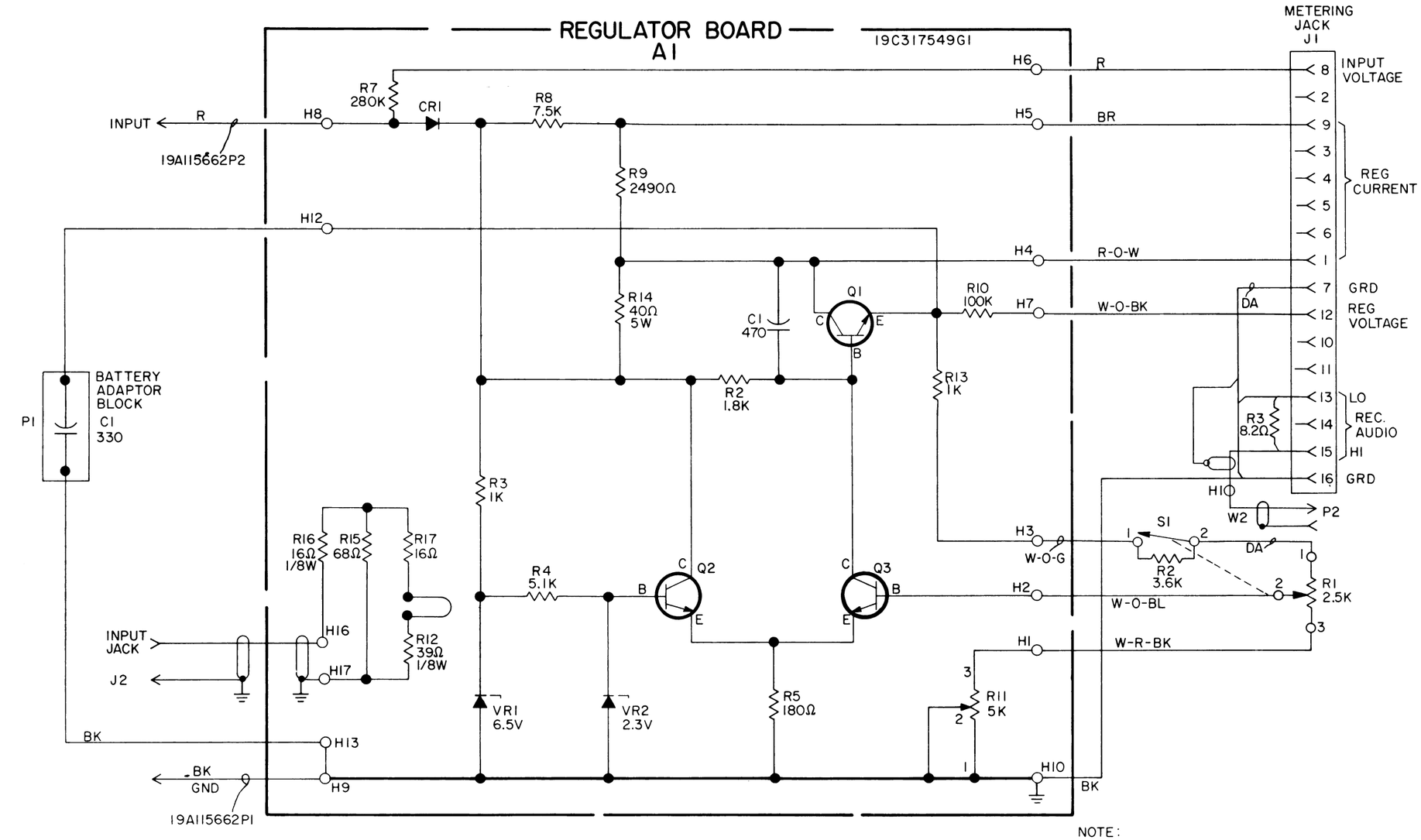



NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

## OUTLINE DIAGRAM

TEST FIXTURE 4EX17A10

4 Issue 1




NOTE:
ALL WIRES SF22 EXCEPT AS 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

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

PLI9D413700G1

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.

(19C317571, Rev. 1)

## SCHEMATIC DIAGRAM

TEST FIXTURE 4EX17A10

## PARTS LIST

LBI-4240

TEST FIXTURE
MODEL 4EX17A10

| SYMBOL | GE PART NO. | DESCRIPTION |
|---|---|---|
| A1 | | COMPONENT BOARD 19C317549G1 |
| | | - - - - - - - - - CAPACITORS - - - - - - - - - - |
| C1 | 5494481P108 | Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap. |
| | | - - - - - - - DIODES AND RECTIFIERS - - - - - - |
| CR1 | 4037822P1 | Silicon. |
| | | - - - - - - - - - TRANSISTORS - - - - - - - - - |
| Q1 | 19A115300P1 | Silicon, NPN; sim to Type 2N3053. |
| Q2 and Q3 | 19A115123P1 | Silicon, NPN; sim to Type 2N2712. |
| | | - - - - - - - - - - RESISTORS - - - - - - - - - |
| R2 | 3R77P182J | Composition: 1800 ohms ±5%, 1/2 w. |
| R3 | 3R77P102J | Composition: 1000 ohms ±5%, 1/2 w. |
| R4 | 3R77P512J | Composition: 5100 ohms ±5%, 1/2 w. |
| R5 | 3R77P181J | Composition: 180 ohms ±5%, 1/2 w. |
| R7 | 19A116278P444 | Metal film: 0.28 megohm ±2%, 1/2 w. |
| R8 | 19A116278P285 | Metal film: 7500 ohms ±2%, 1/2 w. |
| R9 | 19A116278P239 | Metal film: 2490 ohms ±2%, 1/2 w. |
| R10 | 19A116278P401 | Metal film: 0.10 megohm ±2%, 1/2 w. |
| R11 | 19B209358P105 | Variable, carbon film: approx 75 to 5000 ohms ±10%, 0.25 w; sim to CTS Type X-201. |
| R12 | 3R151P390J | Composition: 39 ohms ±5%, 1/8 w. |
| R13 | 3R77P102J | Composition: 1000 ohms ±5%, 1/2 w. |
| R14 | 5493035P11 | Wirewound: 40 ohms ±5%, 5 w; sim to Hamilton Hall Type HR. |
| R15 | 3R77P680J | Composition: 68 ohms ±5%, 1/2 w. |
| R16 | 3R151P160J | Composition: 16 ohms ±5%, 1/8 w. |
| R17 | 3R77P160J | Composition: 16 ohms ±5%, 1/2 w. |
| | | - - - - - - - - VOLTAGE REGULATORS - - - - - - |
| VR1 | 4036887P6 | Silicon, Zener. |
| VR2 | 4036887P1 | Silicon, Zener. |
| | | - - - - - - - JACKS AND RECEPTACLES - - - - - - |
| J1 | 19B205689G2 | Jack: includes (16) 19A115853P1 contacts. |
| | | - - - - - - - - - - - PLUGS - - - - - - - - - - |
| P1 | | PLUG ASSEMBLY 19B219047G1 |
| | | - - - - - - - - - CAPACITORS - - - - - - - - - |
| C1 | 19A116192P7 | Ceramic: 330 pf ±20%, 50 VDCW; sim to Erie 8131-050-W5R. |
| | 19B219038P1 | Block. |
| | 19A127927P1 | Angle. |
| | 4033714P3 | Solderless, terminal: sim to Zierick 75. |
| | 19B201074P204 | Tap screw: 4-40 x 1/4. |
| P2 | | (Part of W2). |

| SYMBOL | GE PART NO. | DESCRIPTION |
|---|---|---|
| | | - - - - - - - - - - RESISTORS - - - - - - - - - |
| R1 | 19A116227P3 | Resistor/switch: variable, carbon film: 2500 ohms ±20%, 1/8 w; switch: SPST, 3 amps at 125 VAC. |
| R2 | 3R77P362J | Composition: 3600 ohms ±5%, 1/2 w. |
| R3 | 7147161P42 | Composition: 8.2 ohms ±5%, 1/2 w. |
| | | - - - - - - - - - - SWITCHES - - - - - - - - - |
| S1 | | (Part of R1). |
| W1 | | CABLE ASSEMBLY 19B216886G3 |
| J2 | | Includes: |
| | 2R22P3 | Connector: 1 contact. Signal Corps SO-239 or sim to Amphenol 83-1R. |
| | 19B204398P2 | Can. |
| | 19A121436P1 | Cap. |
| | 19B201074P206 | Tap screw: 4-40 x 3/8. |
| W2 | 19A128036G1 | RF: approx 20 inches long. Includes (P2). |
| | | - - - - - - - - MISCELLANEOUS - - - - - - - - - |
| | 19A116496P2 | Cable clip. (Used with P1). |
| | 4029851P4 | Cable clip. (Used with P1 and W2). |
| | 19A116552P1 | Cable clip. (Used with W2). |
| | 5491419P3 | Strain relief: sim to Heyco SR-5P-1. (Used with Power cable). |
| | 19A116417P1 | Bumper, plastic. (Quantity 4). |
| | 19A116296P1 | Knob, push on. (Used with R1). |
| | 5490407P2 | Grommet, rubber. (Used with P1 cable). |
| | 19B201074P204 | Tap screw: 4-40 x 1/4. |
| | 4036555P1 | Insulator, washer: nylon. (Used with Q1). |
| | 4035439P1 | Heat sink. (Used with Q1). |



*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

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These instructions do not purport to cover all details in 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.

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# MAINTENANCE MANUAL

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