

 **MOBILE RADIO**

**MASTR<sup>®</sup>**  
**PROGRESS LINE**

**CUSTOM EXECUTIVE**

**MAINTENANCE MANUAL**



**MOBILE RADIO**

**150.8-174 MHz**  
**TWO-WAY FM**  
**MOBILE COMBINATIONS**

**LBI4859C**  
**\*\*\*\*\***  
**(DF9027)**

**GENERAL**  **ELECTRIC**

## TABLE OF CONTENTS

	Page
EQUIPMENT INDEX .....	iii
SPECIFICATIONS .....	iv
DESCRIPTION .....	1
INITIAL ADJUSTMENT .....	1
OPERATION .....	2
MAINTENANCE .....	2
Preventive Maintenance .....	2
Test and Troubleshooting Procedures .....	2
Disassembly .....	2
CIRCUIT ANALYSIS .....	3
Transmitter .....	3
Receiver .....	5
System Board .....	7
Control Unit .....	8
Channel Guard .....	9
ALIGNMENT AND TEST PROCEDURES	
Transmitter .....	11
Receiver .....	13
INTERCONNECTION DIAGRAM (Refer to Control Unit Schematic Diagram)	
SCHEMATIC AND OUTLINE DIAGRAMS	
(Includes Parts Lists & Production Changes)	
Exciter .....	15
PA Board and Matching Network .....	17
Receiver .....	19
System Board .....	23
Control Unit and Associated Assemblies .....	26
Microphone .....	28
TROUBLESHOOTING PROCEDURES	
PA Transistor Replacement .....	30
Transmitter .....	31
Receiver .....	32
SYSTEM PLUG CONNECTIONS .....	33
INTERMODULATION INTERFERENCE MODIFICATION INSTRUCTIONS .....	34
ILLUSTRATIONS	
Figure 1 - Module Layout .....	1
Figure 2 - Transmitter Block Diagram .....	4
Figure 3 - Receiver Block Diagram .....	6
Figure 4 - FET Nomenclature .....	6
Figure 5 - Power Distribution Diagram .....	8

### 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.

**EQUIPMENT INDEX**

EQUIPMENT	MODEL OR TYPE NUMBER
FM TRANSMITTER	KT-25-A
FM RECEIVER	ER-48-C
CHANNEL GUARD BOARD	4EK14B11
POWER CABLE	19A129305G1
MOUNTING HARDWARE	19A129302G1
CONTROLLED RELUCTANCE MICROPHONE	4EM25L10
Microphone Bracket	7141414G2
ALIGNMENT TOOLS	
Hex Slug Type	4038831P1
Slotted Screw Type	4033530G2
150.8-174 MHz ANTENNA	4EY12A13

**OPTIONAL EQUIPMENT**

10-WATT SPEAKER (Option 8427)	4EZ18A14
CHANNEL GUARD HOOKSWITCH (Option 8428)	19C303571G4
ALTERNATOR FILTER (Option 8426)	19C320174G1
GUTTER-MOUNT ANTENNA (Option 5982)	4EY20A10

# SPECIFICATIONS

## GENERAL

FREQUENCY RANGE	150.8-174 MHz
DIMENSIONS (H x W x D)	3-3/8" x 8-3/8" x 13-1/4"
WEIGHT (less accessories)	15 pounds
BATTERY DRAIN	
Receiver (at 13.8 VDC)	
Standby (squelched)	120 milliamps
Standby (unsquelched)	400 milliamps
Transmitter	
Transmit (at 13.8 VDC)	5.5 amperes
OPERABLE TEMPERATURE RANGE	-30°C to +60°C (-22°F to 140°F)
DUTY CAPABILITY	Transmit: 20%
	Receive: Continuous
MAXIMUM FREQUENCY SPACING	0.4%

## TRANSMITTER

POWER OUTPUT	20 Watts
FREQUENCY STABILITY	±.0005% (-30°C to +60°C, 25°C reference)
SPURIOUS AND HARMONIC RADIATION	At least 56 dB below rated power output
MODULATION	Adjustable from 0 to ±5 kHz swing with instantaneous modulation limiting
AUDIO FREQUENCY	Within +1 and -3 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards
DISTORTION	Less than 5% @ 1 kHz
DEVIATION SYMMETRY	0.6 kHz maximum (narrow band)
CRYSTAL MULTIPLICATION FACTOR	24

## RECEIVER

AUDIO OUTPUT	1.5 Watts at less than 10% distortion
SENSITIVITY	
12-dB SINAD (EIA Method)	0.3 μv
20-dB Quieting Method	0.4 μv
SELECTIVITY	
EIA Two-Signal Method	-40 dB (adjacent channel, 30 kHz channels)
20-dB Quieting Method	-100 dB at ±20 kHz
SPURIOUS RESPONSE	-90 dB
FIRST OSCILLATOR STABILITY	±.001% (-30°C to +60°C, 25°C reference)
MODULATION ACCEPTANCE	±7 kHz
INTERMODULATION	-70 dB
FREQUENCY RESPONSE	+1 and -8 dB of a standard 6-dB per octave de-emphasis curve from 300 to 3000 Hz
SQUELCH SENSITIVITY	
Critical Squelch	4 dB SINAD (0.1 μv typical)
Maximum Squelch	Greater than 20 dB quieting

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



## COMBINATION NOMENCLATURE

1st Digit	2nd Digit	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits
Mechanical Package	Operating Voltage	RF Power Output Range	Channel Spacing	Mounting	Number of Freq.	Options	Frequency Range
<b>R</b> Mobile Unit	<b>C</b> 12-VDC unit Neg. Gnd.	<b>5</b> 20 Watts	<b>6</b> 30 kHz	<b>F</b> Front Mount Mobile	<b>A</b> 1-Freq. T 1-Freq. R	<b>S</b> Standard	<b>66</b> 150.8-174 MHz
					<b>B</b> 2-Freq. T 2-Freq. R	<b>U</b> Channel Guard	
					<b>C</b> 2-Freq. T 1-Freq. R		
					<b>D</b> 1-Freq. T 2-Freq. R		

## DESCRIPTION

MASTR Progress Line Custom Executive mobile radio combinations are highly reliable, ruggedly constructed units that are designed to meet the most stringent requirements in the field of two-way radios. The radios are fully transistorized - using silicon transistors for added reliability. Since no tubes are used, the radio is ready to transmit at full power the instant the power is turned on.

No high-voltage power supply is required as the highest voltage in the radio is supplied by the vehicle battery.

Centralized metering jacks for the transmitter and receiver permit simplified alignment and troubleshooting.

### TRANSMITTER

The transmitter consists of a transistorized exciter and power amplifier board. The standard transmitter may be equipped with:

- One or two frequencies
- Channel Guard (tone squelch)

### RECEIVER

The fully transistorized receiver is mounted on a single printed wiring board for increased reliability. A copper-plated housing and metal cover that completely encloses the receiver provides excellent shielding. The standard receiver may be equipped with:

- One or two frequencies

- Channel Guard (tone squelch)

### CONTROL UNIT

The control unit is attached to the front of the two-way radio. The control panel contains all operating controls and a loudspeaker.

## INITIAL ADJUSTMENT

After the two-way radio has been installed (as described in the INSTALLATION Manual), the following adjustments should be made by an electronics technician who holds a 1st or 2nd Class FCC Radiotelephone license. Alignment tools are provided with the radio.

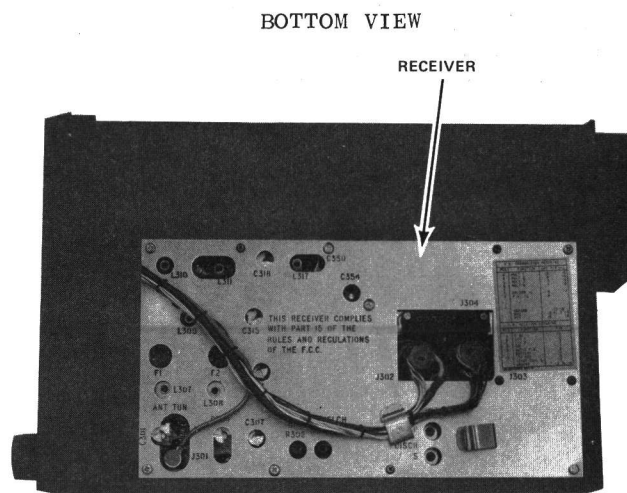
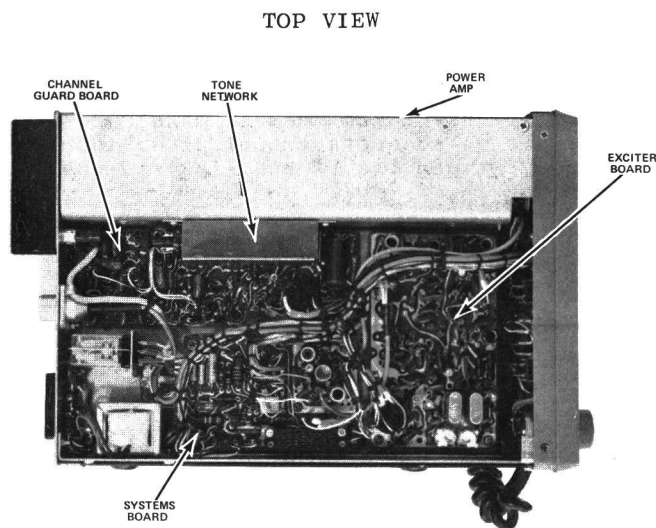
Make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form NP270303) has been filled out and attached to the transmitter.

### TRANSMITTER ADJUSTMENT

The initial adjustment for the transmitter includes loading the power amplifier into the antenna, and checking the frequency and modulation. For the Initial Adjustment procedure, refer to the transmitter ALIGNMENT PROCEDURE (See Table of Contents).

### RECEIVER ADJUSTMENT

The initial adjustment for the receiver includes zeroing the receiver to the system operating frequency, and matching the antenna transformer to the antenna. For the initial adjustment procedure, refer to the FRONT END ALIGNMENT PROCEDURE (See Table of Contents).



## OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR'S MANUAL. The basic procedures for receiving and transmitting messages follows:

### TO RECEIVE A MESSAGE

1. Turn the radio on by turning the OFF-VOLUME control halfway to the right.
2. Place the MONITOR-SQUELCH button in the MONITOR position and adjust the VOLUME control for a comfortable listening level. Then place the switch in the SQUELCH position.

The radio is now ready to receive messages from other radios in the system.

### TO TRANSMIT A MESSAGE

1. Apply power to the transmitter by turning the OFF-VOLUME control to the ON position.
2. Press the push-to-talk button on the microphone and speak across the face of the microphone in a normal (or softer) voice. Release the button as soon as the message has been given. The red signal light on the control panel will glow each time the microphone button is pressed, indicating that the transmitter is keyed.

## MAINTENANCE

### PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the maintenance checks listed in the following table.

### TEST AND TROUBLESHOOTING PROCEDURES

Whenever difficult servicing problems occur, the test procedure for transmitter and receiver can be used by the serviceman to compare the actual performance of the unit against the specifications met by the unit when shipped from the factory. The test procedures are located on the back of the applicable alignment procedure.

In addition, specific troubleshooting procedures are available for the transmitter and receiver (refer to the Table of Contents). For best results, the test procedures should be used in conjunction with the troubleshooting procedures.

### DISASSEMBLY

To gain access to the transmitter or receiver for servicing, remove the 4 screws on each side of the radio. Then lift off the top cover, and slide off the bottom cover.

To remove the PA Assembly for servicing:

1. Remove the 8 screws in the PA cover.
2. Remove the uncolored screws holding the receiver to the chassis and lift out the receiver.
3. Remove the 4 flat-head screws holding the control unit to the chassis.
4. Remove the 2 screws holding the cover mounting bracket.
5. Remove the mounting bracket screws for the PA feed-through capacitors and move it out of the way.
6. Remove the 5 mounting screws in the bottom of the PA Assembly and lift out the board.

#### NOTE

Before reassembling the PA, make sure there is an adequate amount of silicon grease between the PA heatsink and the chassis.

MAINTENANCE CHECKS	INTERVAL	
	6 Months	As Required
CONNECTIONS - Check power and ground connections periodically for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation.	X	
ELECTRICAL SYSTEM - Check the voltage regulator and alternator or generator periodically to keep the electrical system within safe and economical operating limits. If the alternator or generator voltage is excessive, indicator lights, etc., may burn out periodically. This condition is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.		X
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, check for loose plugs, nuts, screws, and parts to make sure that nothing is working loose.	X	
ANTENNA - Keep the antenna, antenna base and all contacts clean and free from dirt or corrosion. If the antenna or its base should become coated or poorly grounded, loss of radiation and a weak signal will result.	X	
ALIGNMENT - Check the transmitter and receiver meter readings periodically, and "touch-up" the alignment when necessary. Refer to the applicable ALIGNMENT PROCEDURE and Troubleshooting Sheet for typical voltage readings.		X
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC. Normally, these checks are made when the unit is first put into operation, after the first six months, and once a year thereafter.		X

## CIRCUIT ANALYSIS

### TRANSMITTER

Transmitter Type KT-25-A is a crystal controlled, frequency modulated transmitter designed for one- or two-frequency operation in the 150.8 to 174 megahertz band. The transmitter consists of the following assemblies:

- Transistorized Exciter Board - Audio, oscillator, modulator and multiplier stages.
- Transistorized PA assembly - Multiplier, amplifier, power amplifier, low-pass filter and antenna relay.

The transmitter uses 12 transistors to provide an RF power output of 20 Watts. The crystals used range from 6.28 to 7.25 megahertz, and the crystal frequency is multiplied 24 times.

A centralized metering jack (J33) on Systems Board A501 is provided for use with

GE Test Set Models 4EX3A10 or 4EX8K11. The test set meters the phase modulator, multipliers, PA amplifiers, and PA supply voltages. The metering jack also provides access to microphone and push-to-talk leads.

All input leads to the transmitter PA board are individually filtered by feed-through capacitors. Supply voltage, metering and control functions for the exciter board are connected from the Systems Control Unit through a 9-pin miniature connector (P105). Supply voltages for the transmitter are shown in the following chart:

Voltage	Use
+12.5 VDC	Amplifiers and PA supply
+12.5 V (Battery)	Relay
Keyed +10 VDC	Exciter Board & 2nd doubler

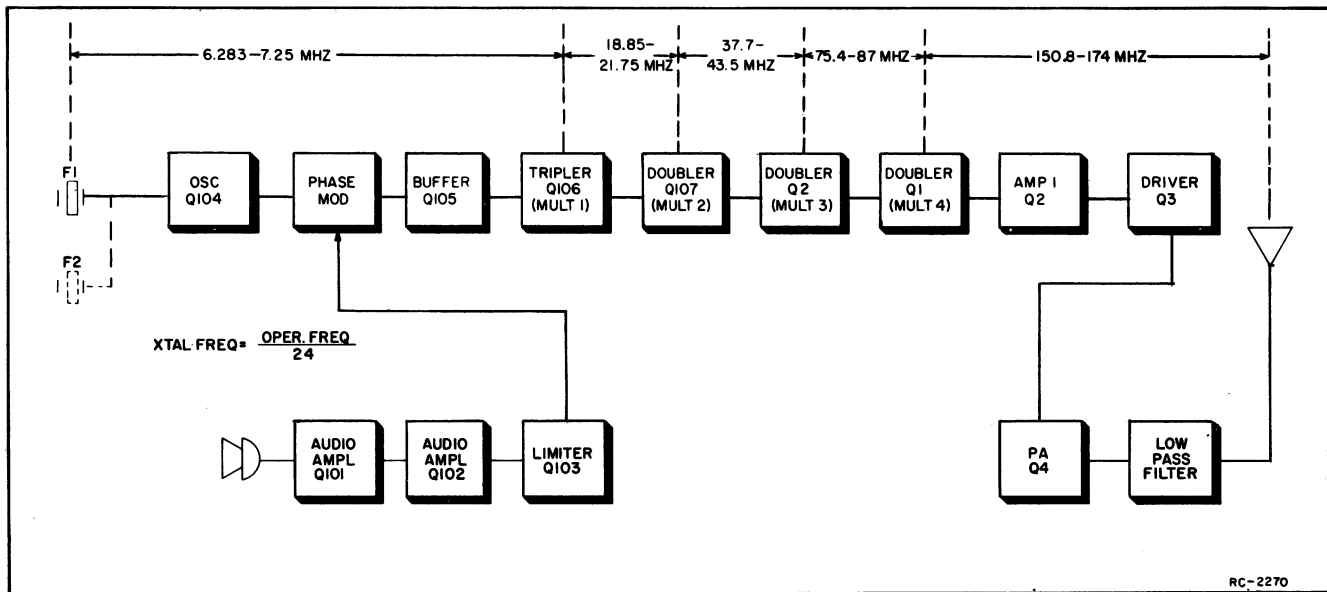


Figure 2 - Transmitter Block Diagram

## EXCITER BOARD

## OSCILLATOR

A transistorized Colpitts oscillator (Q104) is used in the transmitter. The oscillator crystal is thermistor-compensated at both ends of the temperature range to provide instant frequency compensation with a frequency stability of  $\pm 0.0005\%$  without crystal ovens or warmers. Feedback for the oscillator is developed across C113.

In single-frequency transmitters, a jumper connects the F1 crystal keying lead to ground and the crystal frequency is applied to the base of oscillator A104. The oscillator frequency is adjusted by trimmer C101. The oscillator output is applied to the anode of phase modulator CV101.

In two-frequency transmitters, the single oscillator transistor is used, and an additional crystal circuit and two switching diodes (CR101 and CR102) are added. The keying jumper is removed, and the proper crystal frequency is selected by switching the crystal keying lead to ground by means of a frequency selector switch on the control unit. This forward biases the diode in the crystal circuit, reducing its impedance, so that the selected crystal frequency is applied to the base of oscillator Q104.

## AUDIO AMPLIFIER AND LIMITER

The audio section of the transmitter consists of direct-coupled feedback amplifiers Q101, Q102, and Q103. Q103 also acts as a limiter at high audio input levels.

Audio from the microphone is coupled through an input network (C132 and R164) to the audio stages. The input network, in conjunction with the feedback circuit, provides the audio gain and a 6-dB/octave pre-emphasis.

The output of limiter Q103 is connected through modulation adjust potentiometer R110 to a de-emphasis network for 6-dB/octave de-emphasis and post limiter roll-off. The network consists of C136, C137, C138, R165 and R166. Modulation Adjust R110 determines the maximum signal level applied to the modulation circuit, and is normally set for  $\pm 4.3$  kHz (narrow band).

## PHASE MODULATOR

The phase modulator uses varactor CV101 (a voltage-variable capacitor) in an R-L-C network that includes R126 and L113. An audio signal applied to the modulator through L113 varies the capacitance of CV101 resulting in a phase modulated output. The modulator output is fed to the base of buffer Q105.

In Channel Guard applications, tone from Channel Guard board Model 4EK14B11 is fed to the modulator circuit through J103 (tone high) and J104 (ground).

## BUFFER AND MULTIPLIERS

Buffer stage Q105 isolates the modulator from the loading effects of the tripler stage, and provides some amplification. The output is direct-coupled to the tripler.

Following Q105 are two L-C coupled Class C multiplier stages (Q106 and Q107). Q106 is a tripler stage (MULT-1) with the collector tank tuned to six times the crystal frequency. Resistors R134 and R135 are for metering the doubler stage at centralized metering jack J33.

#### PA ASSEMBLY

##### MULTIPLIERS

The exciter output is link-coupled to the base of 2nd doubler Q2 on Systems Board A501A. This stage operates as a common emitter doubler and is metered at J33 (MULT-3). The 2nd doubler output is coupled through a series-tuned circuit (tuned to 12 times the crystal frequency) and then through matching network A202 to the base of 3rd doubler Q1 on PA Board A201. This stage is metered at J33 (MULT-4) across A201-R4. The 3rd doubler output is coupled through a series-tuned circuit (tuned to 24 times the crystal frequency) to the base of amplifier Q2.

#### WARNING

The stud-mounted RF Power Transistors used in the transmitter 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.

##### AMPLIFIERS, DRIVER & PA

Q2 operates as a common emitter, series-tuned RF amplifier stage. Base voltage for Q2 is metered at J33 through metering network CR1, R3 and R4.

Driver Q3 follows the amplifier stage. Collector current for Q3 is metered at J33 across resistor R6 on Systems Board A501A (DRIVER Ic). The reading is taken on the 1-Volt scale (the actual current reading is 10 amperes full scale) with the GE Test Set in Position F. The driver output is coupled through a series-tuned circuit to the base of power amplifier Q4.

The power amplifier (Q4) is a common-emitter amplifier providing a minimum RF power output of 20 Watts. Collector current for the PA transistor is measured at J33 (PA Ic) across metering resistor R5 on the Systems Board. The reading is taken on the 1-Volt scale (the current reading is 10 amperes full scale), with the GE Test Set in Position G.

Power Level Control potentiometer R704 controls the RF power output of the transmitter by varying the supply voltage to amplifier Q2. Instructions for setting R704 are contained in the Transmitter Alignment Procedure.

#### CAUTION

Be careful when servicing the PA board as supply voltage is applied continuously to Q1 through Q4.

The power amplifier output is coupled through a series-tuned circuit to low-pass filter FL201, and then through relay K701 to the antenna.

##### RECEIVER

Receiver Type ER-48-C is a double conversion, superheterodyne FM narrow-band receiver designed for one- or two-frequency operation on the 150.8-174 megahertz band.

The receiver is of single-unit construction and is housed in a copper-plated casting for maximum shielding and rigidity. The unit is completely transistorized, using a total of 20 silicon transistors.

A regulated +10 Volts is used for all receiver stages except the audio driver and audio PA stages, which operate from the 12-Volt system supply. The audio PA stage and output transformer are mounted on the system frame.

Centralized metering jack J304 is provided for use with GE Test Set Model 4EX3A10. The test set meters the oscillator, 1st and 2nd limiters, discriminator, multipliers and audio PA as well as the voice coil, regulated 10 Volts and 12-Volt supply.

##### RF AMPLIFIERS

RF signals from the antenna are fed to the base of 1st RF amplifier Q301 through two tuned pre-selector circuits. The output signal is inductively coupled through two tuned circuits to the gate of 2nd RF amplifier Q302.

The Second RF Amplifier uses a Field-Effect Transistor (FET) as the active device. The FET may be considered a semiconductor current path (or channel) whose resistance is varied by a voltage applied to the control element (gate). Lead identification for the FET is shown in Figure 4.

The FET has several advantages over a conventional transistor, including a high input impedance, high power gain, and an output that is relatively free of harmonics (low in intermodulation products). The FET also has voltage-controlled characteristics, and may be compared to a vacuum tube in operation (see Figure 4B).

Q302 operates as a grounded-gate amplifier. This method of operation provides a low impedance input to the amplifier. The amplified output is taken from the drain terminal and coupled through a tuned circuit (L305, C315 and C316) to the input of the first mixer.

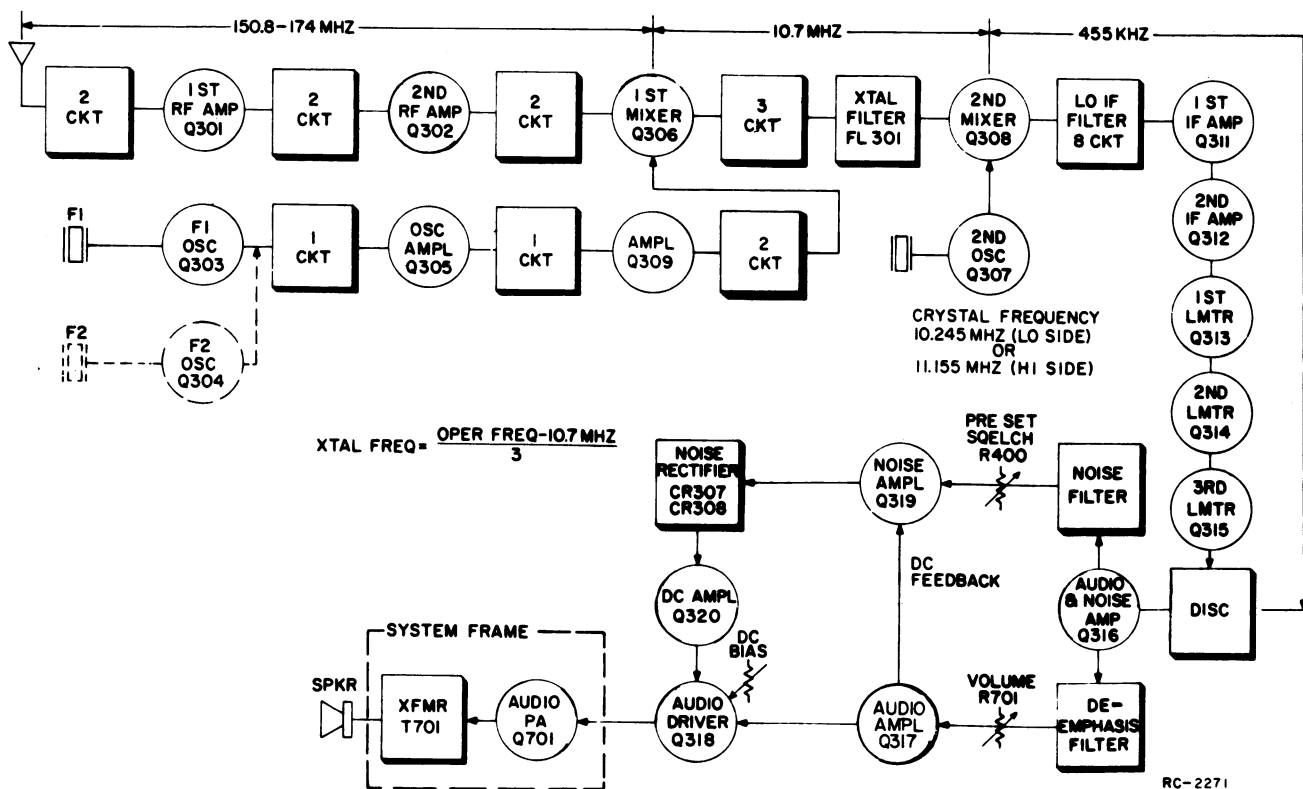


Figure 3 - Receiver Block Diagram

### OSCILLATOR

Q303 is a third mode oscillator that operates in the 40 to 55 megahertz region. The crystal is connected in the oscillator feedback path to permit oscillation only at the crystal frequency. L307, C319 and C320 make up the mod-selective resonant circuit. Adjustable coil L307 permits the oscillator frequency to be shifted slightly for setting the receiver on the system operating frequency. The collector tank of Q303 is tuned to three times the crystal frequency.

For two-frequency operation, a second oscillator stage is added. Channels are selected by grounding the emitter of the

desired oscillator by means of a two-frequency switch on the control unit.

### 1ST MIXER AND CRYSTAL FILTER

The RF signal from the 2nd RF amplifier and the low-side injection voltage from oscillator-amplified Q309 are applied to 1st Mixer Q306.

The 1st Mixer uses a Field-Effect Transistor (FET) as the active device (Figure 4).

RF is applied to the gate of Q306, and injection voltage from the oscillator amplifier is applied to the source. The mixer output is taken from the drain with the output tuned to the 10.7 MHz high IF frequency.

The 10.7 megahertz High IF output is coupled through three tuned circuits (L312 and C350, L313 and C354, L314 and C357) which provide High IF selectivity and impedance matching to the crystal filter.

The Hi-IF crystal filter (FL 301) has ample selectivity to prevent adjacent channel signals from overloading the 2nd Mixer, and to reduce intermodulation spurious responses.

### 2ND OSCILLATOR AND MIXER

Hi-IF from the crystal filter is applied to the base of 2nd Mixer Q308 with the

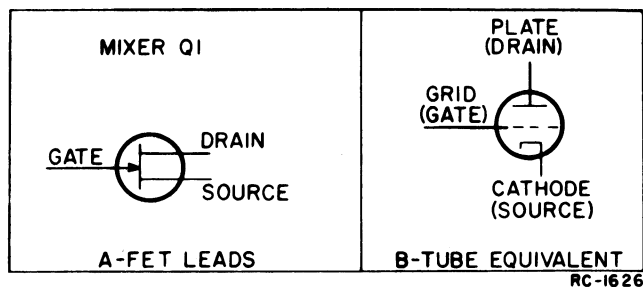


Figure 4 - FET Nomenclature

10.245-MHz (or 11.155 MHz) 2nd Oscillator output to product the 455-kHz Lo-IF.

The 455-kHz Lo-IF is coupled to an eight-coil Lo-IF filter which provides the main receiver selectivity.

#### LO-IF AMPLIFIERS AND LIMITERS

Following the Lo-IF filter are two R-C coupled Lo-IF amplifiers (Q311 and Q312). The amplified output is fed to three R-C coupled limiter stages consisting of Q313, Q314 and Q315, operating as overdriver amplifiers. The 1st and 2nd limiter stages are metered at centralized metering jack J304 thru metering diodes CR302 and CR303.

#### DISCRIMINATOR

The 3rd limiter output is applied to the Foster-Seely type discriminator, where the audio voltages are recovered from the 455-kHz Lo-IF. A low-pass filter, made up of C422, C423, C424, R377, R379 and R380, removes any 455-kHz signal from the discriminator output.

#### AUDIO AMPLIFIER AND DRIVER

The audio signal is fed to the base of audio-noise amplifier Q316. Following Q316 is an audio de-emphasis network consisting of C426, C427, C428, R383, R384 and R385.

After the de-emphasis network, the audio signal is fed to the base of audio amplifier Q317 through the VOLUME control mounted on the control unit. The VOLUME control is used to set the amount of drive to audio amplifier Q317, audio driver Q318, and audio PA Q701 on the system frame. DC BIAS trimmer R392 sets the bias on Q318 and Q701, and is adjusted for a 250 millivolt (250 milliamps) reading at metering jack J304-9. The output of Q701 drives the loudspeaker.

#### SQUELCH

Noise from audio-noise amplifier Q316 is used to operate the squelch circuit. When no carrier is present in the receiver, this noise is coupled through a noise filter (which attenuates any audio frequencies) to the base of noise amplifier Q319. The noise filter consists of C435, C436, C437, and L331. The noise level fed to the noise amplifier is set by SQUELCH control R400. The output of noise amplifier Q319 is rectified by diodes CR307 and CR308, and filtered by C441 and C461 to produce a positive DC voltage. This DC voltage turns on DC amplifier Q320, causing it to conduct. When conducting, the collector voltage of the DC amplifier drops to near ground potential, which lowers the bias on audio stages Q317 and Q318, turning them off.

As audio amplifier Q317 is being turned off, its emitter potential decreases. This results in a positive DC feedback through R406 to the emitter of noise amplifier Q319 which causes an increase in the gain. As the gain of Q319 increases, the positive DC voltage to the DC amplifier increases, quickly turning the audio stages off.

When the receiver is quieted by a signal, less noise is present in the circuit and the DC amplifier turns off. The audio stages are allowed to conduct, and audio is heard from the speaker. When audio amplifier Q317 is conducting, a positive voltage appears across R406 which helps reduce the gain of noise amplifier Q319. This positive feedback causes a quick, positive switching action in the squelch circuit.

### SYSTEM BOARD

System Board A501 contains the 10-Volt regulator, Audio PA stage, Power Level Control stage, the transmitter 2nd doubler circuit (MULT-3), and the transmitter centralized metering jack. The board also provides connection points for all supply voltages for the Two-Way radio. The supply voltages include:

- A continuous, regulated +10 Volts for the receiver and Channel Guard board.
- A keyed, regulated +10 Volts for the transmitter exciter, 2nd doubler (MULT-3), Channel Guard board and receiver muting.
- A continuous +12 Volts for the transmitter, PA board, receiver, and system relay.
- A keyed 12 Volts for the TRANSMIT light.

A simplified power distribution and switching diagram is shown in Figure 5.

The audio PA, 10-Volt regulator and power level control transistors are mounted on the system frame which acts as a heatsink for these stages.

#### +10-VOLT REGULATOR

Turning the radio on applies +12 Volts to the collector of regulator transistor Q702, turning it on. The regulated +10 Volts is taken from the emitter of Q702.

When the supply voltage (or output) starts to increase, the voltage at the base of Q1 also increases. This causes Q1 to conduct more, providing less base current for Q702. The voltage drop across Q702 becomes larger and the output remains constant.

When the input voltage starts to drop,



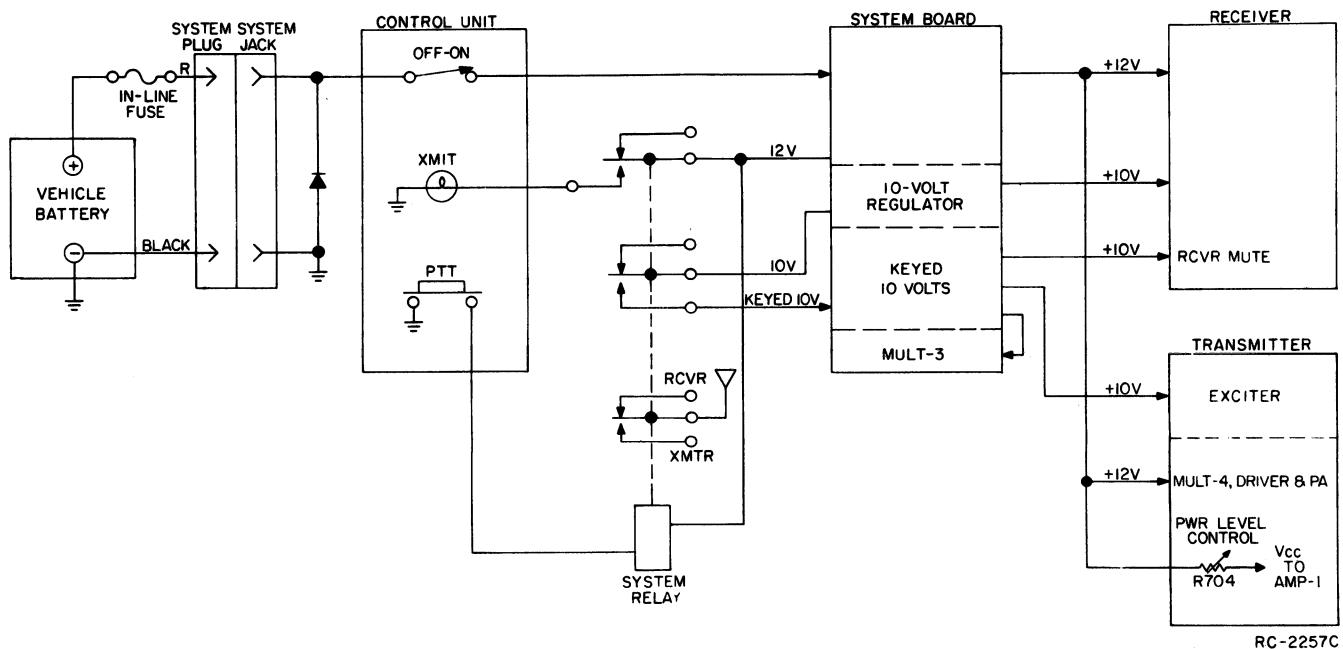


Figure 5 - Power Distribution Diagram

the output voltage also tends to drop and Q1 will conduct less. This increases the forward bias on Q702 and reduces the voltage drop across Q702 to keep the output constant.

Potentiometer R10 is used to set the emitter-base voltage of Q1 for the desired 10-Volt output. R7 and R9 limit the maximum current through Q1. R8 provides bias current for Zener diode VR1, and lamp DS1 provides bias for Q702. C2 and C5 prevent high frequency oscillation. The output voltage is metered at receiver centralized metering jack J304.

#### AUDIO PA

The output of Q318 on the receiver chassis is applied to the base of the class A, audio PA (Q701). Bias to Q701 is set by DC bias trimmer R392 on the receiver. The trimmer is set for 0.25 Volt at receiver metering jack J304-9 (Position G on GE Test Set). The audio output is coupled through audio transformer T701 and applied to the loudspeaker.

#### CONTROL UNIT

The control unit has an OFF-VOLUME control, a MONITOR-SQUELCH switch, a two-frequency switch, a red TRANSMIT light, and a self-contained loudspeaker. Terminal board TB701 is provided for microphone connections.

#### OFF - VOLUME CONTROL (S701/R701)

The OFF-VOLUME control determines whether the radio is operative or not. Turning S701 On applies supply voltage to the System Board and receiver, and activates the push-to-talk (PTT) circuit.

Pressing the PTT button on the microphone energizes system relay K701. Energizing the relay applies +10 Volts to the exciter board and Channel Guard board, switches the antenna, and mutes the receiver. Energizing the relay also applies +12 Volts to the red TRANSMIT light.

Volume Control R701 is a variable resistor used to control the audio output of speaker LS701.

#### MONITOR/SQUELCH (S702)

Placing S702 in the MONITOR position disables the noise squelch circuit in the receiver. In radios equipped with Channel Guard, the MONITOR position also disables the receiver Channel Guard.

Placing the switch in the SQUELCH position permits normal operation of the noise squelch and Channel Guard circuits.

#### TWO-FREQUENCY SWITCHES (S703)

In two-frequency applications, the frequency-selector switch selects the channel

desired for both transmit and receive. The switch connects the emitter of the receiver first oscillator and the transmitter oscillator switching diode to ground, so that the radio will operate on the frequency determined by the selected crystal-controlled oscillators. In two-frequency radios, the transmitter and receiver Channel Guard operate on all frequencies.

### CHANNEL GUARD

Channel Guard Board Model 4EK14B11 is a fully transistorized encoder-decoder for

use with Custom Executive Mobile combinations.

The tone frequencies are controlled by plug-in tone networks that are made with precision components for excellent stability and reliability. The tone frequencies range from 71.9 to 203.5 Hz.

Complete instructions for the encoder-decoder are contained in Maintenance Manual LBI-4143.

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WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.



MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R110) was adjusted to the proper setting before shipment and should not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause over-modulation are clipped by the modulation limiter, in conjunction with the de-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing over-modulation while preserving intelligibility.

TEST EQUIPMENT

- 1. Audio Signal Generator Module 4EX6A10
- 2. Frequency Modulation Monitor
- 3. AC VTVM or output meter
- 4. GE Test Set Model 4EX3A10 (TM11 or TM12)

PROCEDURE

Transmitters without CHANNEL GUARD

- 1. Connect the audio signal generator and the meter across audio input terminals J5 (Green-Hi) and J6 (Black Lo) on GE Test Set, or across J33-15 (Mike Hi) and J33-7 (Mike Lo) on the Centralized Metering Jack.
- 2. Apply a 0.75 Volt RMS signal at 1000 Hz to Test Set or across J33-15 and J33-7 on the Centralized Metering Jack.
- 3. Set MOD ADJUST (R110) for a 4.3-kHz swing with deviation polarity that gives the highest reading as indicated on the frequency modulation monitor.

Transmitters with CHANNEL GUARD

- 1. Set the Channel Guard TONE ADJUST (R643) for 0.75-kHz tone deviation.
- 2. Follow Steps 1 thru 3 described above.

Two-frequency Transmitters

Check both channels for deviation as described in Steps above.

PA POWER INPUT

For FCC purposes, the PA power input can be determined by measuring the PA supply voltage and PA current, and using the following formula:

P<sub>i</sub> + PA voltage x PA current

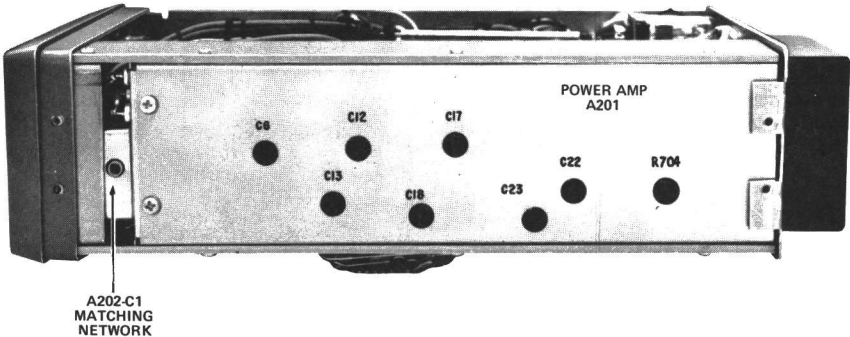
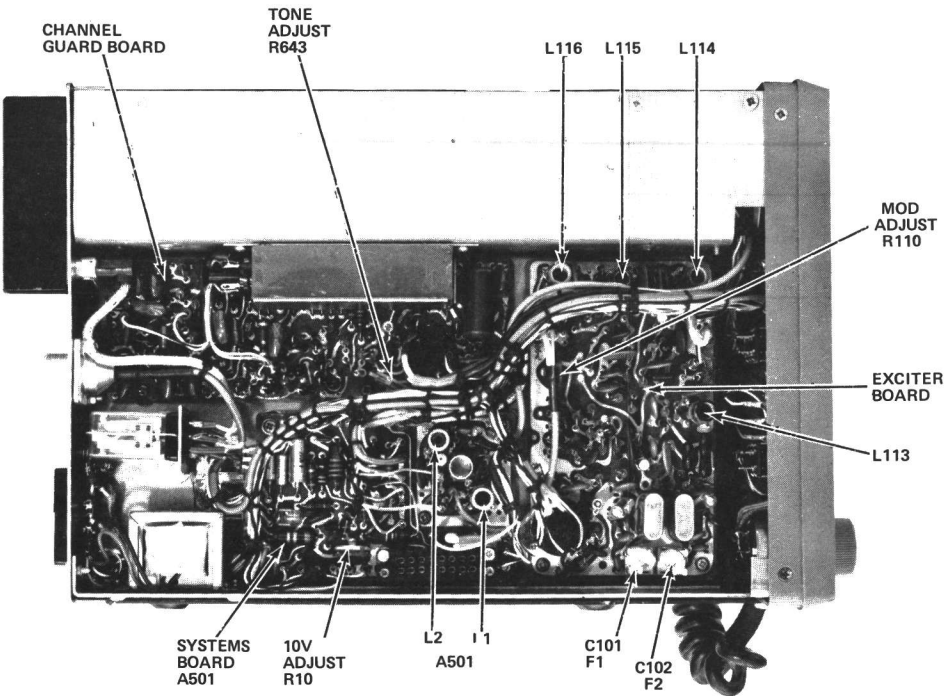
where

P<sub>i</sub> is the power input in Watts,

PA voltage is measured with the GE Test Set in Position G on the 15 Volt scale, and the polarity switch in (-) position,

PA current is measured with the Test Set in Position G in the Test 1 position, and is read as 10 amperes full scale.

Example: P<sub>i</sub> = 12.5 Volts x 1.5 amperes = 18.7 Watts



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

- 1. GE Test Set Model 4EX3A10 (Revision A or later), or Model 4EX8K11.
- 2. A 50-ohm wattmeter connected to Antenna Jack J702.
- 3. A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

- 1. Place crystal(s) in crystal socket (crystal frequency = operating frequency ÷ 24).
- 2. For a large change in frequency or a badly misaligned transmitter, set crystal trimmer C101 to mid-capacity. In two-frequency transmitters, also set C102 to mid-capacity and set the channel selector switch to the highest frequency.
- 3. For a large change in frequency or a badly misaligned transmitter, turn the slugs in the Exciter coils (L113, L114, L115, L116) to the bottom of the coil. Set A501-L1 and -L2 (on System Board) so that the top of the slug is approximately even with the bottom of the coil winding. Adjust C6, C12, C13, C18, C22 and C23 on the PA board 1/2 turn out from the tight position. Adjust C17 1/4 turn out from the tight position.
- 4. Rotate Power Level Control R704 fully clockwise, and adjust A202-C1 one turn out from the tight position.

NOTE  
No adjustments should be made on Systems Board A501A, Matching Network A202 or PA Board A201 unless Power Control Adjust R704 is in the fully clockwise (maximum power position).

- 5. Connect the GE Test Set to Receiver Metering jack J302 and check for +10 Volts at Position J. If reading is not 10 Volts, refer to the System Board Outline Diagram and set R10 for +10 Volts.
- 6. Connect GE Test Set to metering jack J33 on Systems Board A501. Set the test polarity to (+) and set the range to the Test 1 (or 1-volt position for 4EX8K11).
- 7. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.

TRANSMITTER ALIGNMENT PROCEDURE

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
EXCITER BOARD				
1.	A (MULT-1)	L113 & L114	See Procedure	Carefully adjust L113 for maximum meter reading. Then adjust L114 for a small dip in meter reading.
2.	B (MULT-2)	L115, L114 & L116	See Procedure	Adjust L115 for maximum meter reading. Re-adjust L114 for maximum meter reading. Then adjust L116 for a dip in meter reading.
MULT-3, MATCHING NETWORK & PA BOARD				
3.	C (MULT-3 INPUT)	A501-L1, L116 & A501-L2	See Procedure	Adjust A501-L1 for maximum meter reading. Next, re-adjust L116 for maximum meter reading. Then adjust A501-L2 for a dip in meter reading.
4.	D (MULT-3 OUTPUT)	A201-C6	Maximum	Adjust A201-C6 for maximum meter reading.
5.	F (DRIVER Ic)	A201-C12, C13 & C6	Maximum	Alternately adjust C12 and C13 several times for maximum meter reading. Then re-adjust C6 for maximum meter reading.
6.	F (DRIVER Ic)	A201-C12 & C13	Maximum	Alternately re-adjust C12 and C13 for maximum meter reading.
7.	G (PA Ic)	A201-C17 & -C18	Maximum	Alternately adjust C17 and C18 several times for maximum meter reading.
8.	G (PA Ic)	A201-C22 & -C23	Maximum power out; minimum G reading	Alternately adjust C22 and C23 several times for maximum RF power output and minimum PA collector current (Position "G" reading). With meter in Position "G", repeat Steps 8, 7 and 5 in that order for maximum power output.
9.	D (MULT-3 OUTPUT)	A501-L2 & A202-C1	Maximum	Adjust A501-L2 and A202-C1 for maximum meter reading.
10.		R704	20 Watts	Adjust Power Level Control R704 for 20 Watts output maximum.
11.		A201-C6	Maximum	Re-tune A201-C6 for maximum power output.
12.		R704	Maximum	Re-tune R704 for 20 watts.
FREQUENCY ADJUSTMENT				
13.		C101(C102 in 2-freq. units)		Loosely couple frequency counter to output and adjust C101 for proper frequency output. (Switch to F2 and adjust C102 on 2-frequency units.)
NOTE For proper frequency control of the transmitter, it is recommended that all frequency adjustments be made when the equipment is at a temp. of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temp. range of 50° to 90°F.				

ALIGNMENT PROCEDURE

TRANSMITTER TYPE KT-25-A

TEST PROCEDURES

These Test Procedures are designed to assist you in servicing a trans-mitter that is operating--but not properly. Problems encountered could be low power output, low supply voltage, tone and voice deviation, defective audio sensitivity and modulator adjust control set too high. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once a defect is pin-pointed, refer to the "Service Check" and the additional corrective measures included in the Transmitter Troubleshooting Procedure. Before starting with the Transmitter Test Procedures, be sure the transmitter is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

for test hookup as shown:

1. Watt meter similar to:

Bird #43  
Jones #711N
2. VTVM similar to:

Triplet #850  
Heath #IM-21
3. Audio Generator

GE MODEL 4EX6A10
4. Deviation Meter (with a .75 kHz scale) similar to:

Measurements #140  
Lampkin #205A
5. Multimeter similar to:

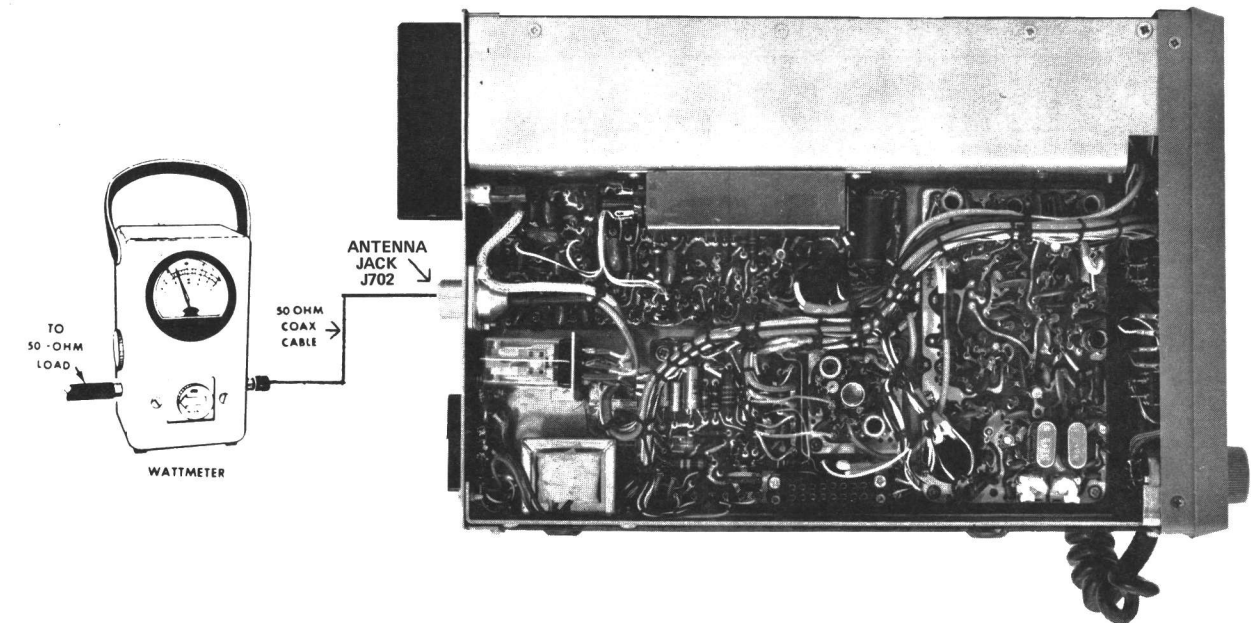
GE TEST SET  
MODEL 4EX3A10 or 4EX8K11

STEP 1

POWER MEASUREMENT

TEST PROCEDURE

A. Connect transmitter output to wattmeter as shown below:



B. Key transmitter and check wattmeter for rated power output.

SERVICE CHECK

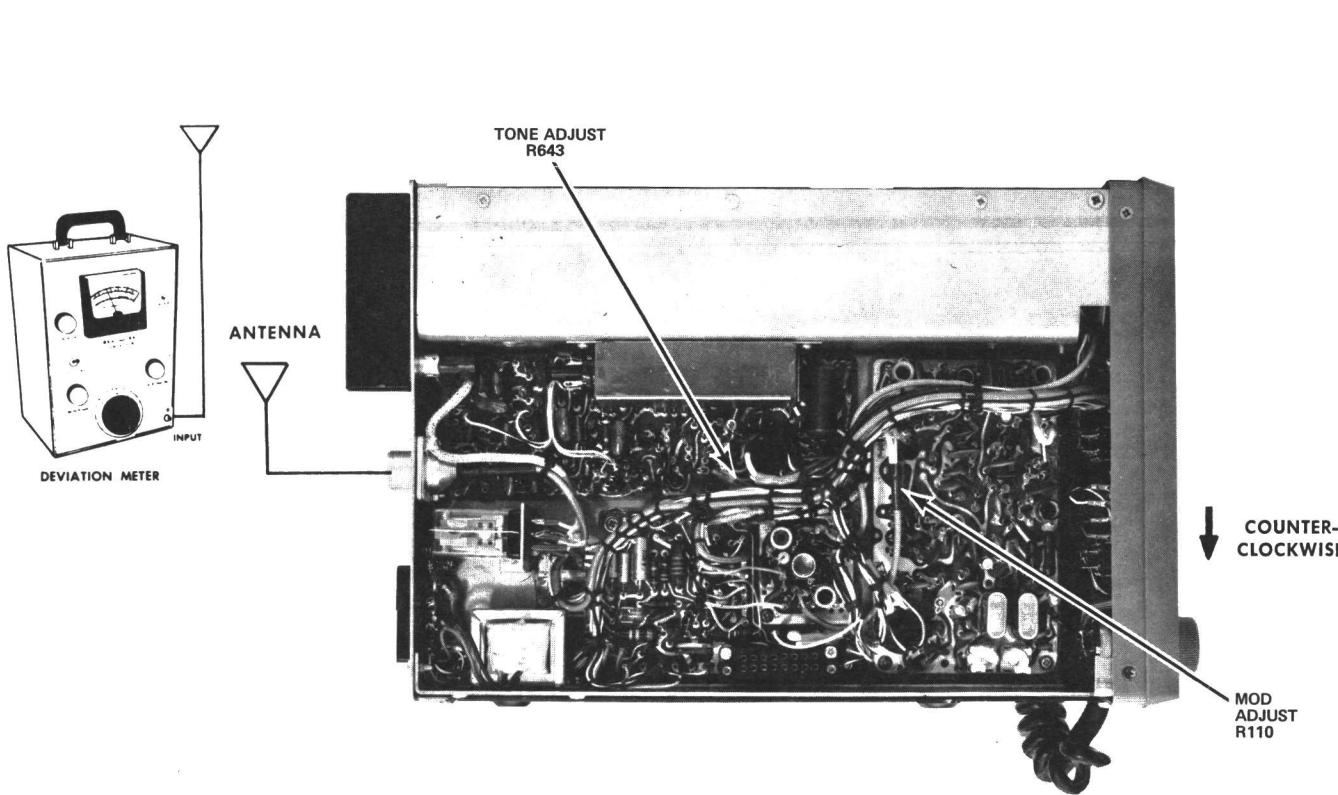
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

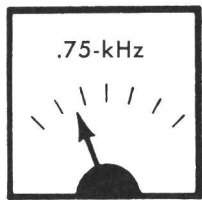
tone deviation with channel guard

TEST PROCEDURE

A. Setup Deviation Meter and monitor output of transmitter as shown below:



- B. Set MOD ADJUST control R110 fully counterclockwise.
- C. Key transmitter and check for 0.75 kHz deviation. If reading is low or high, adjust Channel Guard TONE ADJUST (R643 on Channel Guard Board) for a reading of 0.75 kHz.



DEVIATION METER

NOTES:

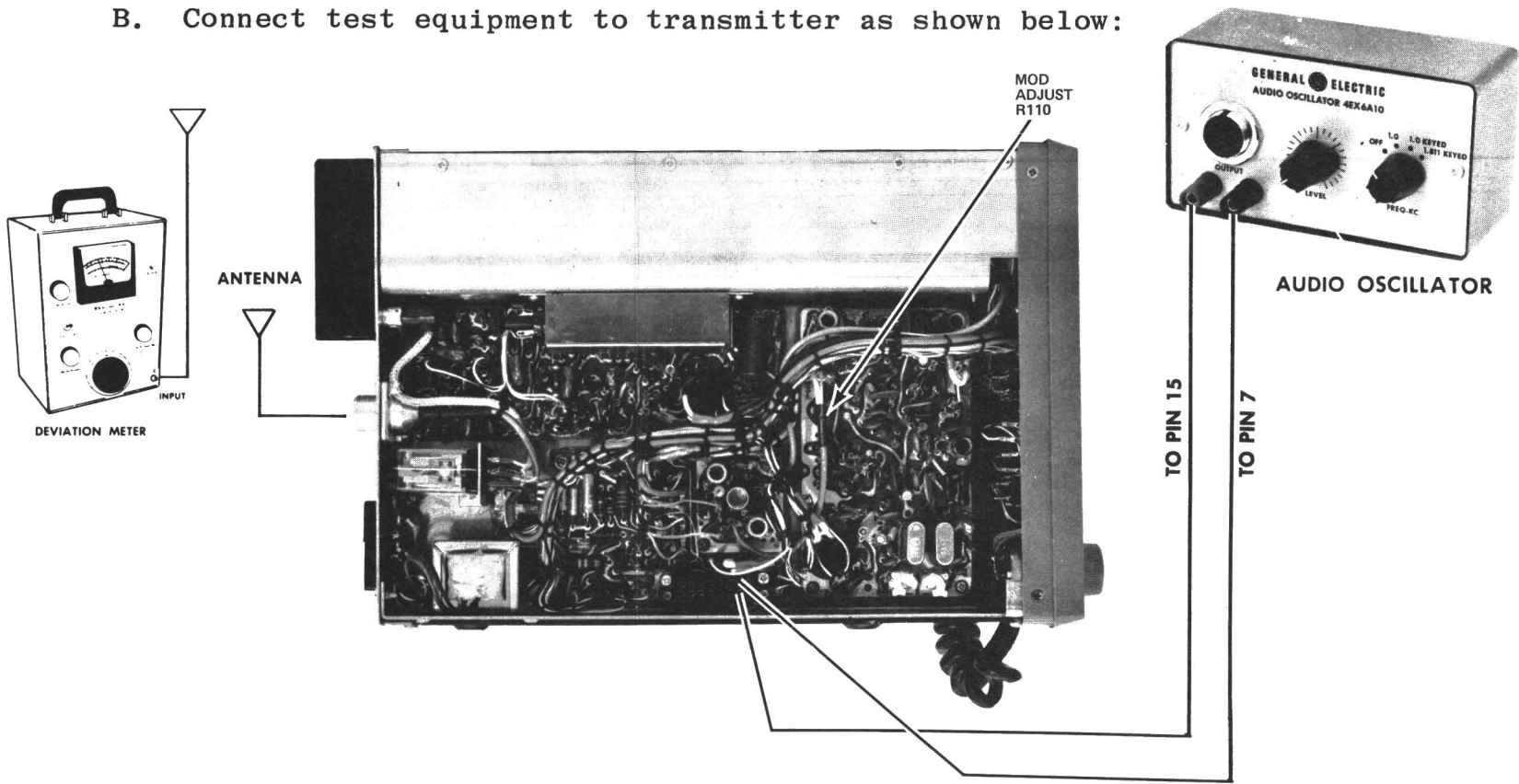
- D. On units supplied with Channel Guard, the Phase Modulator Tuning should be peaked carefully to insure proper performance. (Refer to Step 1 in the Transmitter Alignment Procedure).
- E. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STEP 3

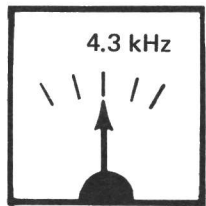
voice deviation and symmetry

TEST PROCEDURE

- A. Unplug the microphone.
- B. Connect test equipment to transmitter as shown below:



- C. Set the generator output to 1.0 VOLTS RMS and frequency to 1 kHz.
- D. Key the transmitter by connecting a jumper from TB701-3 to TB701-4 (GRD).
- E. Deviation reading should be  $\pm 4.3$  kHz.
- F. Adjust MOD ADJUST Control R110 until deviations reads 4.3 kHz on plus (+) or minus (-) deviation, whichever is greater. This adjustment should be made with the correct level of tone applied on Channel Guard transmitters.

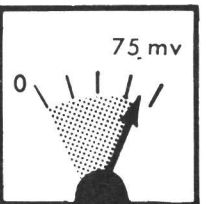


DEVIATION METER

**NOTES:** --These transmitters are adjusted for 4.3 kHz deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz under the worst conditions of frequency, voltage and temperature.

If the deviation reading plus (+) and minus (-) differs by more than 0.5 kHz, check the following:

- G. Recheck Step 1 as shown in the Transmitter Alignment Procedure.
- H. Check Audio Sensitivity by reducing generator output until deviation falls to 3.0 kHz. Voltage should be LESS than 90 millivolts (typically 75 mv).



METER



FRONT END ALIGNMENT

These instructions are for tuning the oscillator and RF stages of the receiver and may be used when changing the receiver crystal or frequency. When necessary to realign the entire receiver, refer to the COMPLETE RECEIVER ALIGNMENT.

EQUIPMENT REQUIRED

- 1. GE Test Set Models 4EX3A10 (TM11 or TM12), 4EX8K11 or 20,000 ohms-per-Volt Multimeter.
- 2. 150.8-174 MHz signal source (keep signal level below saturation).

PRELIMINARY CHECKS AND ADJUSTMENTS

- 1. Plug Test Set 4EX3A10 into receiver centralized metering jack J304. Set meter polarity switch on + and meter sensitivity switch to 1. If using Multimeter, connect the negative lead to J304-13 (ground).
- 2. Turn SQUELCH control (R400) fully clockwise and VOLUME control to minimum. Switch to position "G" (or measure at J304-9 with Multimeter) and set PA Bias R392 for a reading of 0.25 Volt (250 milli-amperes).

ALIGNMENT PROCEDURES

STEP	METERING POSITION		TUNING CONTROL	METER READING	PROCEDURE
	4EX3A10	Multimeter + at J304			
1.	D OSC	pin 4	L307	See Procedure	Switch to F1, put in F1 crystal and tune L307 for maximum meter reading.
2.	D OSC	pin 4	L309 & L307	Maximum (.06 - .25)	Apply an on-frequency signal to J301 and adjust L309 and L307 for a maximum meter reading (.06 - .25 Volts).
3.	E OSC	pin 4	L310, L317 & L311	Maximum	Adjust L310, L317 & L311 for maximum.
4.	D OSC	pin 4	L308 (2-freq. only)	Maximum	For 2-frequency receivers, switch to F2, insert F2 crystal and adjust L308 for maximum.
5.					Preset RF capacitors C301, C304, C307, C311, C315, and C318 to approximate-frequency. (Capacitors tune from 130 MC (max. capacitance) to 174 MC (min. capacitance)).
6.	C LIM 2	pin 3	L310, L311 C301, C304 C307, C311 C315, C318	Maximum	Apply on-frequency signal to J301. Tune L310, L311, C301, C304, C307, C311, C315, and C318 for maximum meter reading. Keep signal below saturation at each stage on discriminator zero.
7.	A DISC	pin 10	L307 (L308 for 2-freq.)	Zero	Apply the exact channel frequency signal to J301 and tune L307 (L308 for 2-frequency) for zero discriminator reading.  ----- NOTE -----  For proper freq. control of the receiver, it is recommended that all freq. adjustments be made when the equipment is at a temp. of approx. 75°F. In no case should freq. adjustments be made when the equipment is outside the temp. range of 50° to 90°F.
8.			C301, C304		While receiving a weak on-frequency signal from the antenna, tune C301 and C304 for best quieting.
SQUELCH ADJUSTMENT					
9.					Set SQUELCH Control (R400) to open with a 4 dB SINAD signal. (Approximately 30° counter-clockwise of critical squelch position.)

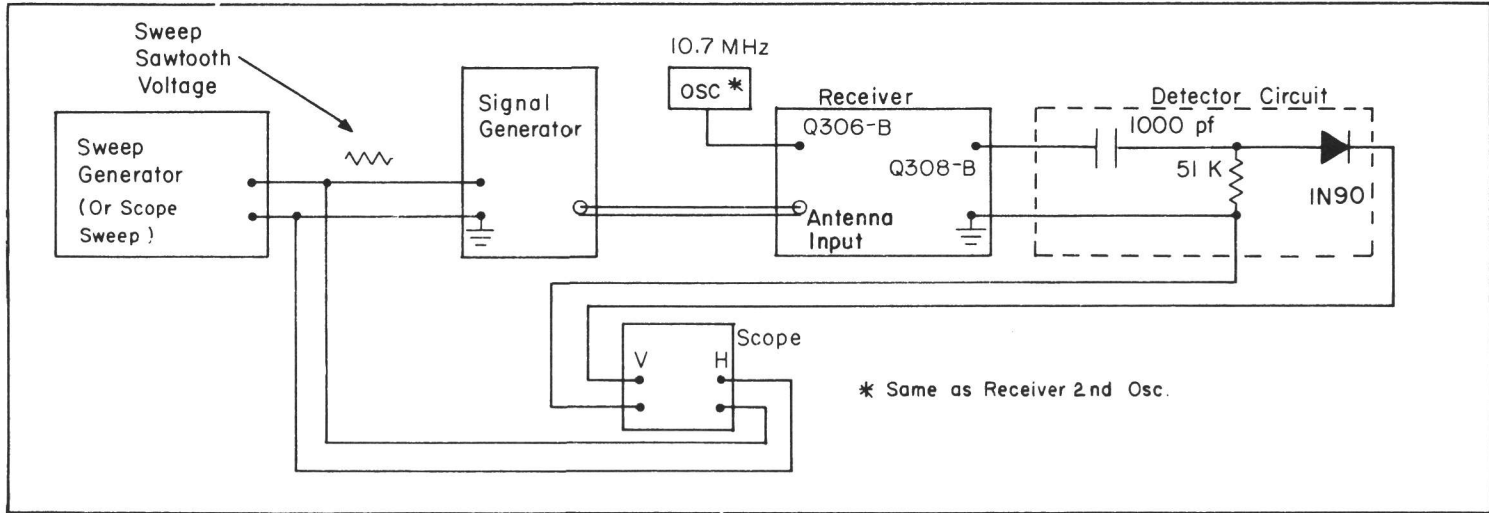
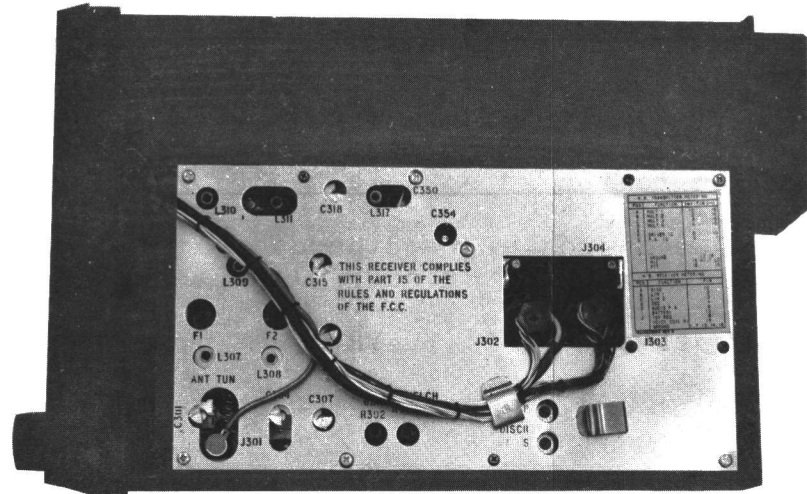


Figure 1 - High and Low IF FILTER TEST Circuit

COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

- 1. GE Test Set Models 4EX3A10 (TM11 or TM12), 4EX8K11 or 20,000 ohms-per-Volt Multimeter.
- 2. A 10.7 MHz (±200 Hz) and 150.8-174 MHz signal source. Couple the 10.7 MHz signal through a 0.01 µf capacitor. Keep signal levels below saturation.
- 3. For Alignment steps 4 thru 8 - Oscilloscope, sweep generator, 10.7 MHz marker generator and construct a detector circuit (see Figure 1 for circuitry).

PRELIMINARY CHECKS AND ADJUSTMENTS

- 1. Plug Test Set into the receiver centralized metering jack J304. Set meter polarity switch on + and meter sensitivity switch to TEST 1. If using multimeter, connect the negative lead to J304-13 (ground).
- 2. Switch Test Set to Position "I" (or measure at collector of Q318 with multimeter). Reading should be a nominal 13.8 Volts.
- 3. Switch to Position "J" (or measure at top of C443 with multimeter), and check for a reading of 10 Volts. If reading is not correct, refer to Systems Board Outline Diagram and set R10 for +10 Volts.
- 4. Turn SQUELCH control fully clockwise and VOLUME control to minimum. Switch to Position "G" (or measure at J304-9 with multimeter) and set PA bias R392 for reading of 0.25 Volts (250 milliamperes).

ALIGNMENT PROCEDURE

STEP	METERING TEST SET	POSITION + at J304	TUNING CONTROL	METER READING	PROCEDURE
DISCRIMINATOR					
1.					Remove 1st oscillator crystal and apply a 10.7 MHz signal to the base of Q308.
2.	A DISC	pin 10	L329	See Procedure	Adjust L329 (discriminator primary) 1/2 turn up from bottom of range.
3.	A DISC	pin 10	L330	Zero	Tune L330 (discriminator secondary) for zero meter reading.
HIGH and LOW IF FILTER (SEE NOTE 1)					
4.	B LIM	pin 2	L321 thru L328	Maximum	Adjust L321 thru L328 for maximum meter reading.
5.	B LIM	pin 2	C357, C354, C350	See Procedure	Adjust C357 for minimum meter reading. Adjust C354 for maximum meter reading. Adjust C350 for minimum meter reading.
6.			C357 & C360		Disable the 2nd oscillator by grounding base of Q307 through a .01 µf capacitor. Connect scope, signal generator and detector as shown in figure 1. Sweep RF ±50 kHz at 20 Hz. Connect 10.7 MHz marker to gate of Q306. Tune C357 and C360 for scope pattern shown. Keep marker signal centered between humps and signal level below saturation.
7.			L321 thru L328		Disconnect detector, remove short from base of Q307 and connect scope to 1st LIM test point. Adjust L321 thru L328 for symmetrical wave form shown, with marker in center.
8.	A DISC	pin			Check to see that discriminator idling voltage is within 0.05 Volts of zero with no signals applied and the modulation acceptance band width is greater than ±8 kHz (narrow band).
OSC/MULT & AMPLIFIER					
9.	D OSC	pin 4	L307	Maximum	Remove short from base of Q307, if present, then insert 1st oscillator crystal and adjust L307 for maximum meter reading.
10.	D OSC	pin 4	L309 & L307	Maximum (.06-.25 V)	Adjust L309 and L307 for maximum meter reading (.06-.25 Volts).
11.	E OSC	pin 4	L310, L317 L311	Maximum	Adjust L310, L317 and L311 for maximum.
12.	D OSC	pin 4	L308 (2-freq)	Maximum	For 2-frequency receiver, insert F2 crystal and adjust L308 for maximum meter reading.
RF					
13.	C LIM 2	pin 3	L321, L322, L323, L324, L325, L326, L327, L328	Maximum	Inject 10.7 MHz crystal-controlled marker on base of 2nd Mixer Q308. Adjust L321, L322, L323, L324, L325, L326, L327, L328, for maximum meter reading. Keep signal below saturation at each stage and on discriminator zero. Remove 10.7 MHz marker.
14.	C LIM 2	pin 3	C350, C354, C357, C360	Maximum	Inject 10.7 MHz crystal-controlled marker to gate of Q306. Adjust C350, C354, C357 and C360 for maximum meter reading. Adjust C350 for dip on "B" position of test meter.
15.			C301, C304		While receiving a weak on-frequency signal from the antenna, tune C301 and C304 for best quieting.
16.	A DISC	pin 10	L307 (L308 for 2 freq.)	Zero	Apply the exact channel frequency signal to J301 and tune L307 (L308 for 2-frequency) for zero discriminator reading.  ----- NOTE -----  For proper frequency control of the receiver, it is recommended that all frequency adjustments be made when the equipment is at a temp. of approx. 75°F. In no case should frequency adjustments be made when the equipment is outside the temp. range of 50° to 90°F.
17.					Set SQUELCH Control (R400) to open with a 4 dB SINAD signal. (Approximately 30° counterclockwise of critical squelch position.)

NOTE 1 -- High and Low IF coils and capacitors have been set at the factory and will normally require no further adjustment. Do not re-align unless there is positive evidence of a defective filter. For location of components, refer to the Receiver Outline Diagram.

ALIGNMENT PROCEDURE

RECEIVER MODELS 4ER48C10-15  
FOR MOBILE COMBINATIONS

TEST PROCEDURES

These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once

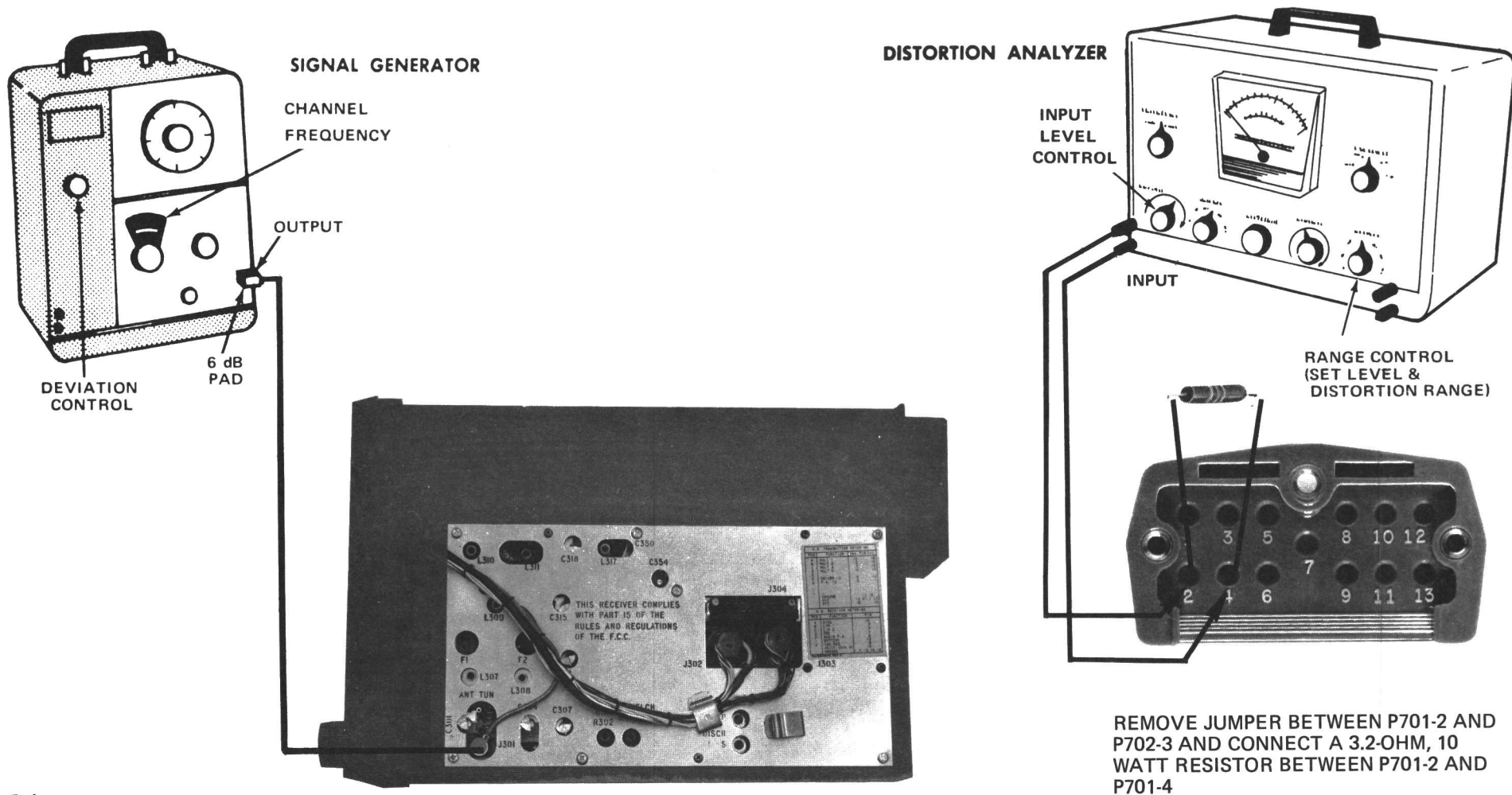
the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer similar to: Heath IM-12
- Signal Generator similar to: Measurements M-800
- 6-dB attenuation pad, and 3.2 ohm, 10-Watt resistor

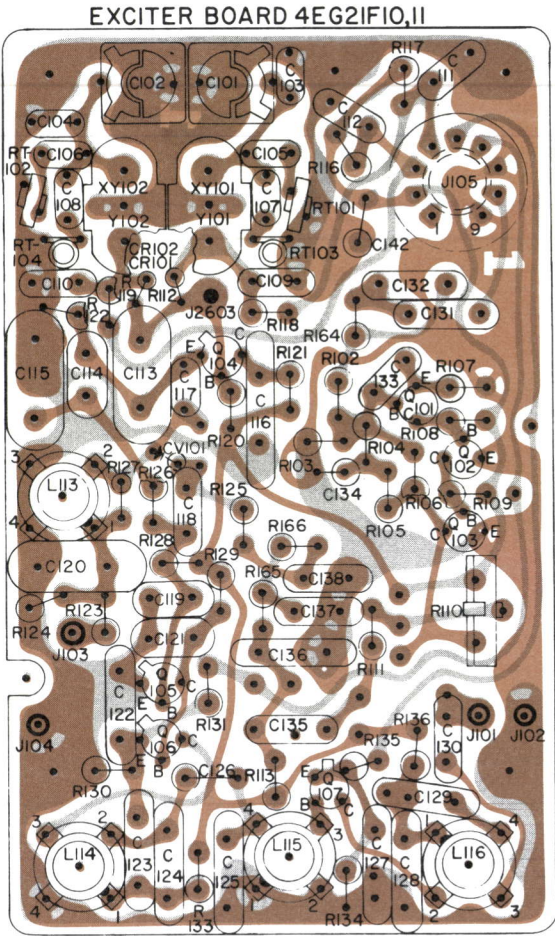
PRELIMINARY ADJUSTMENTS

1. Connect the test equipment to the receiver as shown for all steps of the receiver Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.
3. Turn on all of the equipment and let it warm up for 20 minutes.





OUTLINE DIAGRAM

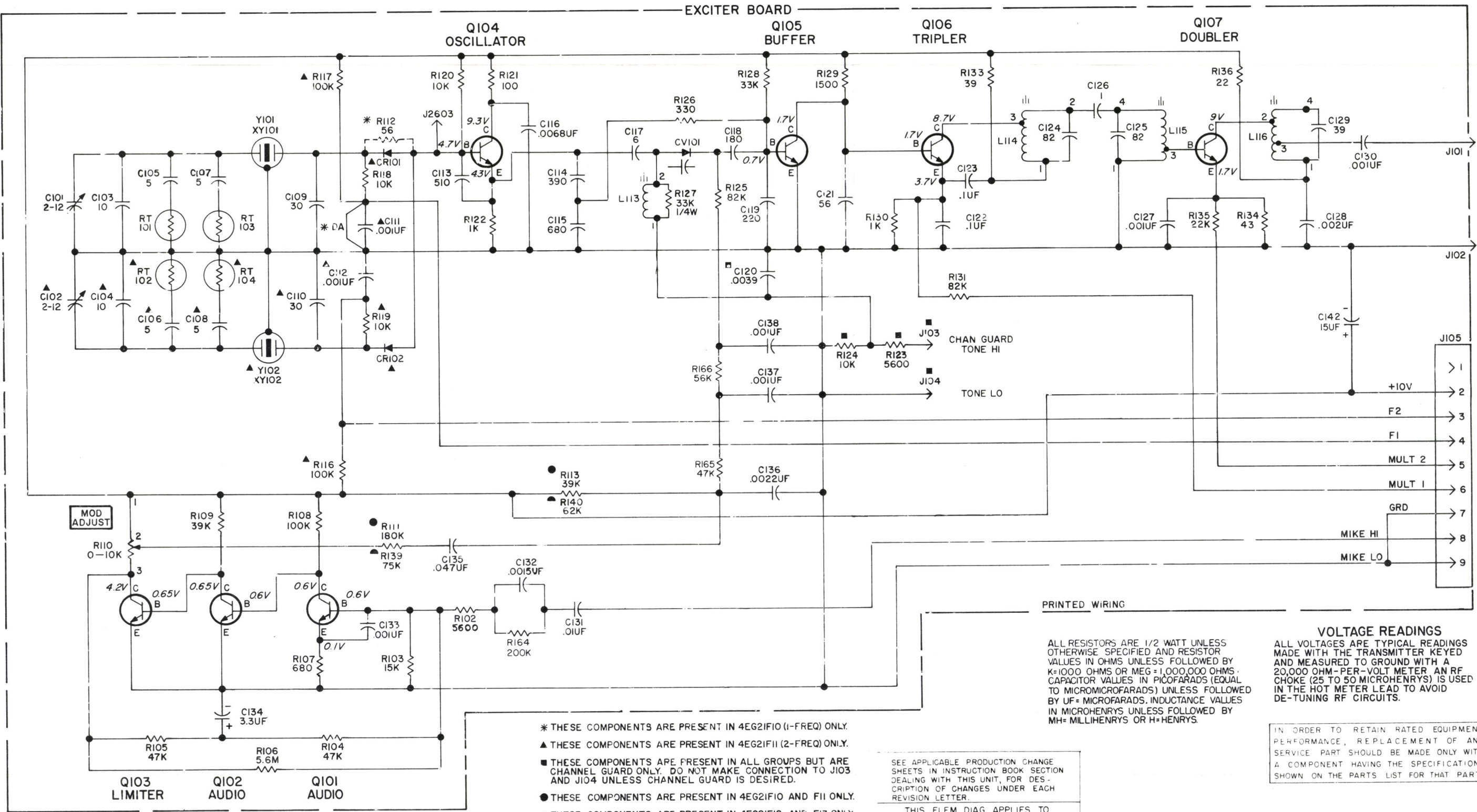
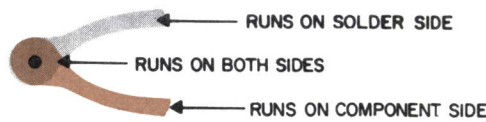


(19E500954, Rev. 9)  
(19B205178, Sh. 1, Rev. 1)  
(19B205178, Sh. 2, Rev. 1)

RESISTANCE READINGS

ALL READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR PINS TO GROUND WITH ALL POWER TURNED OFF. READINGS ON THE EXCITER BOARD OVER 1,000 OHMS READ ON THE X 1,000 SCALE. + OR - SIGN SHOW METER LEAD GROUNDING.

EXCITER BOARD					
TRANSISTOR SYMBOL #	EMITTER		BASE		COLLECTOR
	-	+	-	+	
Q101	650	650	13,200	3,650	8600 2800
Q102			8,600	2,800	12,000 2800
Q103			12,000	3,800	10,000 11,500
Q104	1000	1000	14,000	3,500	2500 3000
Q105			35,000	3,300	4300 3300
Q106	150	150	4,300		2900 2900
Q107	50	50			2600 2900



- \* THESE COMPONENTS ARE PRESENT IN 4EG21F10 (1-FREQ) ONLY.
- ▲ THESE COMPONENTS ARE PRESENT IN 4EG21F11 (2-FREQ) ONLY.
- THESE COMPONENTS ARE PRESENT IN ALL GROUPS BUT ARE CHANNEL GUARD ONLY. DO NOT MAKE CONNECTION TO J103 AND J104 UNLESS CHANNEL GUARD IS DESIRED.
- THESE COMPONENTS ARE PRESENT IN 4EG21F10 AND F11 ONLY.
- ▲ THESE COMPONENTS ARE PRESENT IN 4EG21F12 AND F13 ONLY.

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
4EG21F10	C
4EG21F11	C

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 PICO FARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MILLIHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

VOLTAGE READINGS  
ALL VOLTAGES ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYS AND MEASURED TO GROUND WITH A 20,000 OHM-PER-VOLT METER. AN RF CHOKE (25 TO 50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DE-TUNING RF CIRCUITS.

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.

SCHEMATIC & OUTLINE DIAGRAM

EXCITER BOARD  
MODELS 4EG21F10 & 4EG21F11

PARTS LIST

LBI-4349A  
EXCITER BOARD  
MODEL 4EG21F10 1 FREQ NARROW BAND  
MODEL 4EG21F11 2 FREQ NARROW BAND

SYMBOL	GE PART NO.	DESCRIPTION
C101 and C102	5491271P106	----- CAPACITORS ----- Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
	5496219P10	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C103 and C104	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C105 thru C108	5496219P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C109 and C110	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C111 and C112	5496372P167	Ceramic disc: 510 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C113	5490008P41	Silver mica: 390 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C114	4029003P4	Silver mica: 680 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-20.
C115	5494481P131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C116	5496219P37	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C117	5496372P45	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -2200 PPM.
C118	5490008P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C119	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C120	5496219P218	Ceramic disc: 56 pf ±10%, 500 VDCW, temp coef -80 PPM.
C121	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C122* and C123*		In REV B and earlier: Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C124 and C125	5496219P261	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef -80 PPM.
C126	7130348P3	Molded: 1 pf ±.05 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C127	5494481P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C128	5494481P113	Ceramic disc: 2000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C129	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C130	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C131	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C132	7491395P111	Ceramic disc: 1500 pf ±10%, 500 VDCW; sim to RMC Type JL.
C133	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C134	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C135	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C136	7491395P114	Ceramic disc: 2200 pf ±10%, 500 VDCW; sim to RMC Type JL.
C137 and C138	7491395P109	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JL.

SYMBOL	GE PART NO.	DESCRIPTION
C142	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
CR101 and CR102	19A115603P1	----- DIODES AND RECTIFIERS ----- Silicon.
CV101	5495769P9	Varactor, silicon: 33 µf ±10% at 4 VDC; sim to Pacific Semiconductor Varicap Type V-596.
J101 thru J104	4033513P4	----- JACKS AND RECEPTACLES ----- Contact, electrical: sim to Bead Chain L93-3.
J105	19B209303P1	Connector, phen: 9 pins.
J2603		(Part of Exciter Board 19C303835P1).
L113	19C303883G13	----- INDUCTORS ----- Coil. Includes tuning slug 5491798P2.
L114	19C303883G14	Coil. Includes tuning slug 5491798P2.
L115	19C303883G15	Coil. Includes tuning slug 5491798P2.
L116	19C303883G17	Coil. Includes tuning slug 5491798P2.
Q101	19A115889P1	----- TRANSISTORS ----- Silicon, NPN.
Q102 and Q103	19A115123P1	Silicon, NPN.
Q104	19C300114P1	Silicon, NPN; sim to Type 2N706.
Q105	19A115330P1	Silicon, NPN.
Q106 and Q107	19A115328P1	Silicon, NPN.
R102	3R77P562K	----- RESISTORS ----- Composition: 5600 ohms ±10%, 1/2 w.
R103	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R104 and R105	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R106	3R77P565J	Composition: 5.6 megohms ±5%, 1/2 w.
R107	3R77P681K	Composition: 680 ohms ±10%, 1/2 w.
R108	3R77P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R109	3R77P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R110	19B209358P106	Variable, carbon film: 75 to 10,000 ohms ±10%, 1/4 w; sim to CTS Type X-201.
R111	3R77P184J	Composition: 0.18 megohm ±5%, 1/2 w.
R112	3R152P560J	Composition: 56 ohms ±5%, 1/4 w.
R113	3R77P393J	Composition: 39,000 ohms ±5%, 1/2 w.
R116 and R117	3R77P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R118 thru R120	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R121	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R122	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R123	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R124	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R125	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R126	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R127	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R128	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R129	3R77P152K	Composition: 1500 ohms ±10%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R130*	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w. In REV B and earlier:
	3R77P151K	Composition: 150 ohms ±10%, 1/2 w.
R131	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R133	3R77P390K	Composition: 39 ohms ±10%, 1/2 w.
R134*	3R77P430J	Composition: 43 ohms ±5%, 1/2 w. In REV B and earlier:
	3R77P560K	Composition: 56 ohms ±10%, 1/2 w.
R135	3R77P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R136	3R77P220K	Composition: 22 ohms ±10%, 1/2 w.
R164	3R77P204J	Composition: 0.20 megohm ±5%, 1/2 w.
R165	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R166	3R77P563J	Composition: 56,000 ohms ±5%, 1/2 w.
RT101 and RT102	19B209353P2	----- THERMISTORS ----- Disc: 460 ohms max; sim to GE 16D-3121.
RT103 and RT104	19B209353P1	Rod: 10,200 ohms min; sim to GE 1R-1544.
XY101 and XY102		----- SOCKETS ----- Includes: Clip. (Part of XY101, 102). Contact, electrical: sim to Malco 2700. (Part of XY101, 102). Socket, crystal. (Part of XY101, 102). Rivet. (Part of XY101, 102). ----- CRYSTALS ----- <b>NOTE:</b> When reordering give GE Part Number and specify exact frequency needed. Crystal freq = <u>Operating Freq.</u> 24
Y101 and Y102	19B206204P1	Quartz: freq range 5400-7250 KHz, temp range -30°C to +85°C.

PRODUCTION CHANGES

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

REV. A & B - Incorporated into initial shipment.

REV. C - To improve transmitter stability and power performance. Changed C122, C923, R130, and R134.



PARTS LIST

LBI-4860A  
PA BOARD 19D416268G4  
WITH  
MATCHING NETWORK 19C320162G2

SYMBOL	GE PART NO.	DESCRIPTION
A201		PA BOARD 19D416268G4
		----- CAPACITORS -----
C3	7489162P119	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C4	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C5	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C6	19B209408P2	Variable, mica: 4-25 pf, 400 VDCW.
C8	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C10	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C11	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C12	19B209408P2	Variable, mica: 4-25 pf, 400 VDCW.
C13	19B209408P3	Variable, mica: 7-50 pf, 400 VDCW.
C14	19A116655P10	Ceramic disc: 220 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C15	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C16	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C17 and C18	19B209408P3	Variable, mica: 7-50 pf, 400 VDCW.
C19	19A116655P14	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C20	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C21	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C22	19B209408P6	Variable, mica: 37-140 pf, 400 VDCW.
C23	19B209408P3	Variable, mica: 7-50 pf, 400 VDCW.
C28	19A116114P141	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -30 PPM.
C29	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C30	19A116656P12J8	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef -80 PPM.
		----- DIODES AND RECTIFIERS -----
CR1	19A115250P1	Silicon.
CR2	19A115775P1	Silicon.
		----- JACKS AND RECEPTACLES -----
J1 thru J5	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J6	4033284P2	Terminal; sim to Alcon 3-1215.
J9 and J10	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J13	4033284P2	Terminal; sim to Alcon 3-1215.
J14 and J15	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		----- INDUCTORS -----
L3	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.

SYMBOL	GE PART NO.	DESCRIPTION
L4*	7488079P3	Choke, RF: 0.33 µh ±20%, 0.07 ohms DC res max; sim to Jeffers 4411-3M. Deleted by REV A.
L5	19B216275P5	Coil.
L6	7488079P13	Choke, RF: 5.60 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4421-4K.
L7	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L8	19A129167P1	Coil.
L9	19B219376P1	Coil.
L10	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L11	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L12	19B219376P2	Coil.
L14	19A129281P1	Coil.
L15	19B216365G1	Coil.
L16	19B219376P1	Coil.
L17	19A129166P1	Coil.
L18	7488079P49	Choke, RF: 33.0 µh ±10%, 1.90 ohms DC res max; sim to Jeffers 4422-10K.
L19	19A129282P1	Coil.
L20	7488079P49	Choke, RF: 33.0 µh ±10%, 1.90 ohms DC res max; sim to Jeffers 4422-10.
L21*	7488079P1	Choke, RF: 0.15 µh ±20%, 0.03 ohms DC res max; sim to Jeffers 4411-1. Added by REV A.
		----- TRANSISTORS -----
Q1 and Q2	19A129181P1	Silicon, NPN.
Q3	19A129181P3	Silicon, NPN.
Q4	19A129181P4	Silicon, NPN.
		----- RESISTORS -----
R1	3R77P100K	Composition: 10 ohms ±10%, 1/2 w.
R2*	3R77P101K	Composition: 100 ohms ±10%, 1/2 w. Deleted by REV A.
R3 and R4	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R5	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R6	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R7	3R77P910J	Composition: 91 ohms ±5%, 1/2 w.
R8	3R78P100K	Composition: 10 ohms ±10%, 1 w.
R9	3R78P471K	Composition: 470 ohms ±10%, 1 w.
R10	3R78P100K	Composition: 10 ohms ±10%, 1 w.
R12	3R77P132J	Composition: 1300 ohms ±5%, 1/2 w.
R13	3R77P151J	Composition: 150 ohms ±5%, 1/2 w.
R14*	3R78P101K	Composition: 100 ohms ±10%, 1 w. Added by REV A.
A202		MATCHING NETWORK 19C320162G2
		----- CAPACITORS -----
C1	19B209408P3	Variable, mica: 7 to 50 pf, 400 VDCW.
C3	19A116114P65	Ceramic: 100 pf ±5%, 100 VDCW; temp coef 0 PPM.
		----- JACKS AND RECEPTACLES -----
J3	7104941P20	Receptacle, coaxial: sim to National Tel.
		----- PLUGS -----
P201	4029840P2	Contact, electrical: sim to Amp 42827-2.
P202	4029840P1	Contact, electrical: sim to AMP 41854.

SYMBOL	GE PART NO.	DESCRIPTION
R1	3R152P151J	----- RESISTORS ----- Composition: 150 ohms ±5%, 1/4 w.
W1	19B209044P13	----- CABLES ----- RF: approx 3 inches long; sim to Amphenol 421-103.
	19C317960P1	----- MISCELLANEOUS ----- Heat sink.
	7147306P2	Washer, shoulder: No. 6, black pressed fiber; sim to H.H. Smith Inc 2150. (Used with L15).
	5492178P2	Washer, spring tension. (Used with Q1-Q4).
	7160805P1	Clip, spring tension. (Leads for C1 and C3).

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 - Power Amplifier Board  
To improve tuning stability.  
Replaced L4 with L21 and R2 with R14.

PARTS LIST

LBI4257K

132-174 MHz RECEIVER  
MODELS 4ER48C10-15

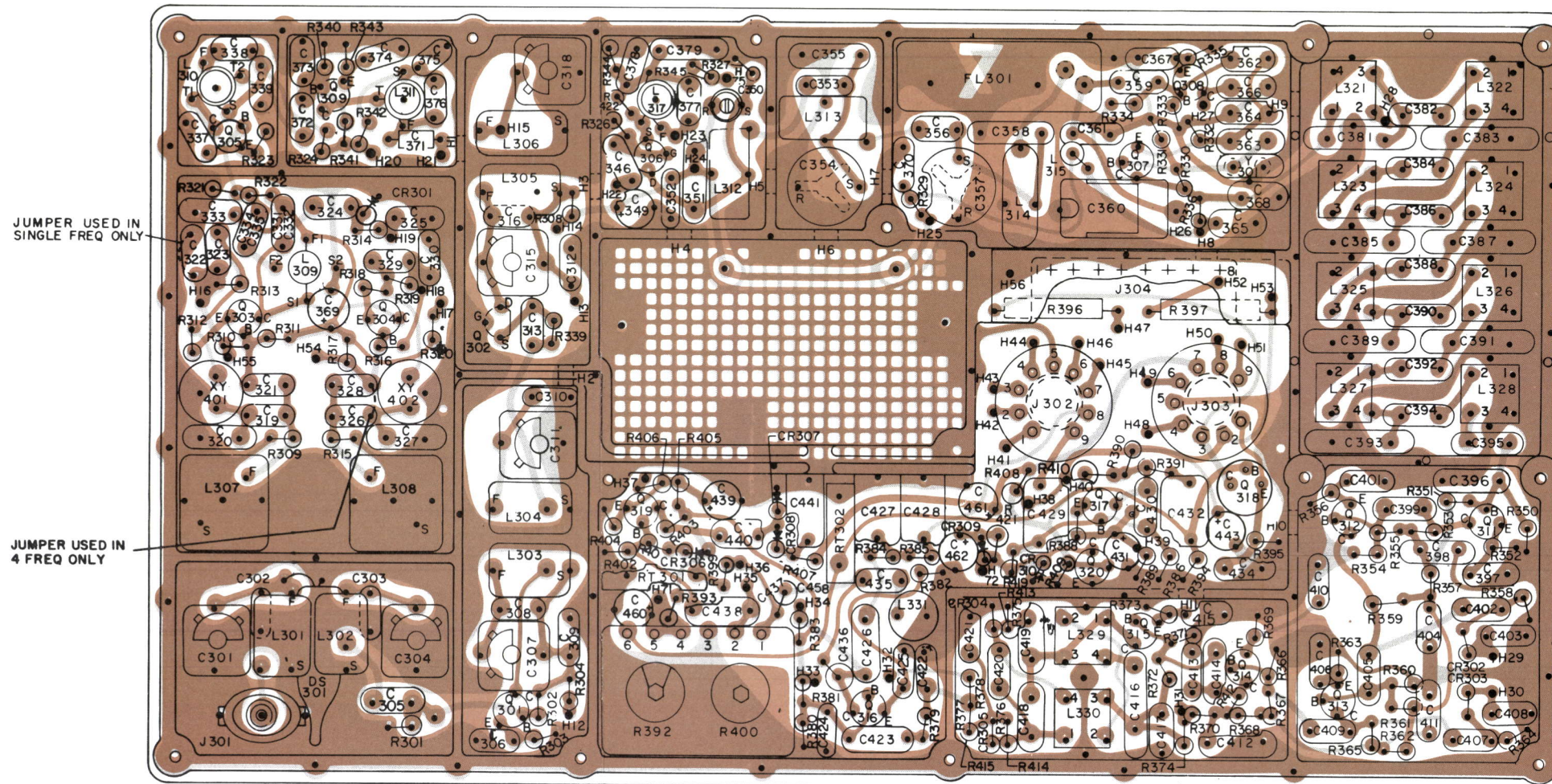
SYMBOL	GE PART NO.	DESCRIPTION
		----- CAPACITORS -----
C301	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C302	19A116656P5J8	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C303	19A116656P5J2	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -220 PPM.
C304	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C305	5490008P131	Silver mica: 150 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C306	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C307	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C308	19A116656P5J2	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -220 PPM.
C309	7491827P102	Ceramic disc: .01 µf +80%-30%, 50 VDCW; sim to Sprague 19C180.
C310	19A116656P5J3	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -330 PPM.
C311	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C312	7491827P102	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C313	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C315	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C316	19A116656P5J2	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -220 PPM.
C318	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C319A	5496219P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
C319B	5496219P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
C320A	5496219P357	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C320B	5496219P356	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -150 PPM.
C321A and C321B	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C322	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C323	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C324	5496219P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C325	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C326A	5496219P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
C326B	5496219P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
C327A	5496219P357	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -150 PPM.
C327B	5496219P356	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -150 PPM.
C328A and C328B	19A116656P3J0	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C329	5496219P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C330	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C331A	5496219P744	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -750 PPM.
C331B*	5496219P740	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -750 PPM.  In REV A and earlier:
	5496219P741	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -750 PPM.
C332A	5496219P744	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -750 PPM.
C332B*	5496219P740	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -750 PPM.  In REV A and earlier:
	5496219P741	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -750 PPM.
C333	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C334	5496219P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C335	5496219P38	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C337	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C338A	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C338B	5496219P238	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C339	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C346	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C349*	19A134202P6	Tantalum: 22 µf ±20%, 15 VDCW.  In REV P and earlier:
	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C350	19A116149P3	Variable: 6 to 22 pf, 63 VDCW, temp coef -1500 PPM.
C351*	5496219P158	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -30 PPM.  Earlier than REV A:
	5496219P259	Ceramic disc: 68 pf ±5%, 500 VDCW, temp coef -80 PPM.
C352	7491827P102	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C353	5496219P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C354	5490446P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0 PPM; sim to Erie 557-36.
C355	5496219P158	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -30 PPM.
C356	5496219P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C357	5490446P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0 PPM; sim to Erie 557-36.
C358	5496219P158	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -30 PPM.
C359	7491827P2	Ceramic disc: .01 µf +80% -30%. 50 VDCW; sim to Sprague 19C180.
C360	19A115659P1	Variable: approx 16-141 pf, 150 VDCW; sim to El Menco Type 42.
C361	5496219P54	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef 0 PPM.
C362	5496219P13	Ceramic disc: 22 pf ±10%, 500 VDCW, temp coef 0 PPM.
C363	5490008P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C364	5490008P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C365	19A116080P6	Polyester: .068 µf ±20%, 50 VDCW.

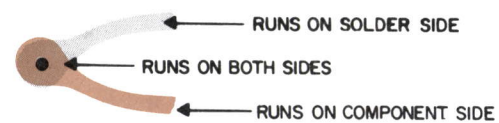
SYMBOL	GE PART NO.	DESCRIPTION
C366	5490008P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C367	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.
C368	19A116080P6	Polyester: .068 µf ±20%, 50 VDCW.
C369*	19A134202P5	Tantalum: 68 µf ±20%, 35 VDCW.  In REV P and earlier:
	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C370	7491827P2	Ceramic disc: .01 µf +80%-30%, 50 VDCW; sim to Sprague 19C180.
C371A	5491601P116	Phenolic: 0.62 pf ±5%, 500 VDCW.
C371B	5491601P108	Phenolic: 0.30 pf ±5%, 500 VDCW.
C372	5496219P38	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C373	5496219P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C374	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C375	19A116655P13	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C376A	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C376B and C377A	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C377B	5496219P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C378	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C379	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C381	19A116656P160J1	Ceramic disc: 160 pf ±5%, 500 VDCW, temp coef -150 PPM.
C382*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.  In REV F & earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C383	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C384*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.  In REV F & earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C385	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C386*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.  In REV F & earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C387	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C388*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.  In REV F & earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C389	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C390*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.  In REV F & earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C391	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C392*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.  In REV F & earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.

\*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES





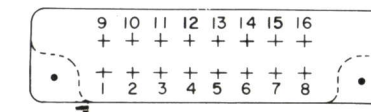
(19D416259, Rev. 10)  
(19D413909, Sh. 1, Rev. 7)  
(19D413909, Sh. 2, Rev. 7)



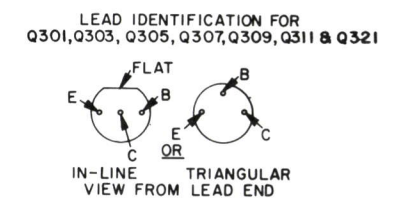
## RESISTANCE READINGS

ALL READINGS ARE MEASURED FROM JACK PINS TO GROUND WITH A 20,000 OHM-PER-VOLT METER, AND WITH ALL EXTERNAL CONNECTIONS REMOVED. + OR - SIGNS SHOW METER LEAD GROUNDED.

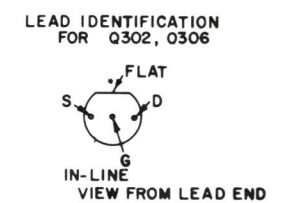
PIN NUMBER	J302			J303			
	+	-	METER SCALE	+	METER SCALE	-	METER SCALE
1	INF	INF	X100Ω	300Ω	X10Ω	325Ω	X10Ω
2	INF	INF	X100Ω	1.7KΩ	X1Ω	1.7K	X1Ω
3	INF	INF	X100Ω	3KΩ	X1Ω	INF	X100Ω
4	INF	INF	X100Ω	3.3KΩ	X1Ω	5K	X1Ω
5	0	0	X1Ω	0	X1Ω	0	X1Ω
6	INF	INF	X100Ω	INF	X100Ω	INF	X100Ω
7	INF	INF	X100Ω	12K	X1Ω	6.5K	X1Ω
8	INF	INF	X100Ω	INF	X100Ω	INF	X100Ω
9	INF	INF	X100Ω	0	X1Ω	0	X1Ω



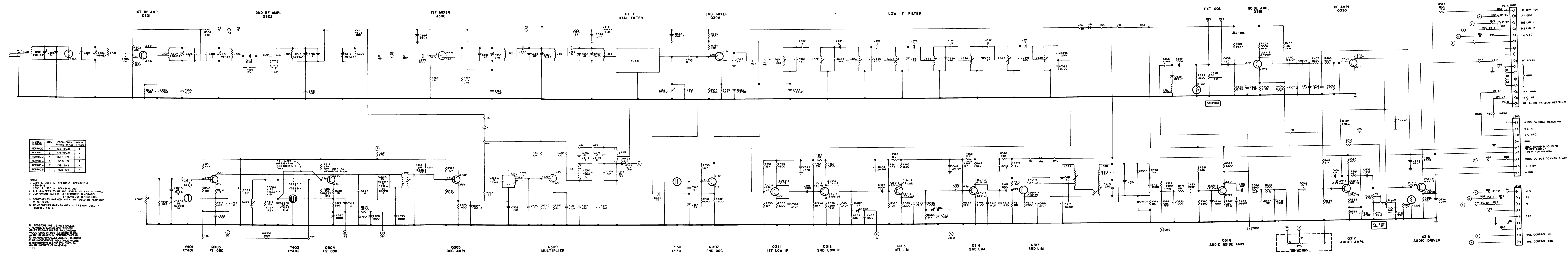
TERMINAL NUMBERING  
FOR J304



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







(19R621420, Rev. 23)

# **SCHEMATIC DIAGRAM**

132-174 MHz RECEIVER  
MODELS 4ER48C10-15

SYMBOL	GE PART NO.	DESCRIPTION
C393	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C394*	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM. In REV F and earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C395	5490008P94	Silver mica: 200 pf ±5%, 500 VDCW; sim to Electro Motive Type IM-15.
C396	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C397	19A116080P1	Polyester: .01 μf ±20%, 50 VDCW.
C398	19A116080P5	Polyester: .047 μf ±20%, 50 VDCW.
C399	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C401	19A116080P1	Polyester: .01 μf ±20%, 50 VDCW.
C402	5490008P119	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type IM-15.
C403	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C404	19A116080P5	Polyester: .047 μf ±20%, 50 VDCW.
C405	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C406	19A116080P1	Polyester: .01 μf ±20%, 50 VDCW.
C407	7491393P1	Ceramic disc: .001 μf +100%-0%, 500 VDCW; sim to Sprague 1219C4.
C408	7491827P2	Ceramic disc: .01 pf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C409	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C410	19A116080P1	Polyester: .01 μf ±20%, 50 VDCW.
C411	19A116080P5	Polyester: .047 μf ±20%, 50 VDCW.
C412	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C413	5494481P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C414	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C415	19A116080P1	Polyester: .01 μf ±20%, 50 VDCW.
C416	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C417	19A116080P5	Polyester: .047 μf ±20%, 50 VDCW.
C418 and C419	5490008P137	Silver mica: 270 pf ±10%, 500 VDCW; sim to Electro Motive Type IM-15.
C420	5496219P656	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -470 PPM.
C421 and C422	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C423	19A116080P109	Polyester: 0.22 μf ±10%, 50 VDCW.
C424	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C425	19A116080P6	Polyester: .068 μf ±20%, 50 VDCW.
C426	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C427 and C428	19A116080P108	Polyester: 0.15 μf ±10%, 50 VDCW.
C429	19A116080P8	Polyester: 0.15 μf ±20%, 50 VDCW.
C430	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C431*	19A134202P2	Tantalum: 47 μf ±20%, 6 VDCW. In REV P and earlier:
	5496267P2	Tantalum: 47 μf ±20%, 6 VDCW; sim to Sprague Type 150D.
C432	19A116080P8	Polyester: 0.15 μf ±20%, 50 VDCW.
C434	5494481P14	Ceramic disc: 2000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C435	19A116080P203	Polyester: .002 μf ±5%, 50 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C436	5491656P46	Polyester: .0047 μf ±5%, 100 VDCW; sim to GE Type 61F.
C437	5491656P73	Polyester: .0033 μf ±10%, 100 VDCW; sim to GE Type 61F.
C438	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C439*	19A134202P14	Tantalum: 1 μf ±20%, 35 VDCW. In REV K-P:
	5496267P17	Tantalum: 1.0 μf ±20%, 35 VDCW; sim to Sprague Type 150D.
	5496267P1	Tantalum: 6.8 μf ±20%, 6 VDCW; sim to Sprague Type 150D.
	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C440	19A116080P5	Polyester: .047 μf ±20%, 50 VDCW.
C441	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C443*	19A134202P6	Tantalum: 22 μf ±20%, 15 VDCW. In REV P & earlier:
	5496267P10	Tantalum: 22 μf ±20%, 15 VDCW; sim to Sprague Type 150D.
C460*	19A134202P6	Tantalum: 22 μf ±20%, 15 VDCW. In REV R:
	19A134202P5	Tantalum: 3.3 μf ±20%, 15 VDCW. In REV P & earlier:
	5496267P9	Tantalum: 3.3 μf ±20%, 15 VDCW; sim to Sprague Type 150D.
C461*	19A134202P112	Tantalum: 0.47 μf ±10%, 35 VDCW. In REV P & earlier:
	5496267P228	Tantalum: 0.47 μf ±10%, 35 VDCW; sim to Sprague Type 150D.
C462*	19A134202P8	Tantalum: 15 μf ±20%, 20 VDCW. In REV P & earlier:
	5496267P14	Tantalum: 15 μf ±20%, 20 VDCW; sim to Sprague Type 150D.
CR301*	19A116052P1	----- DIODES AND RECTIFIERS ----- Silicon, hot carrier: Fwd. drop .350 volts max. In REV H & earlier:
	7777146P3	Germanium; sim to Type 1N90.
CR302 and CR303	4038056P1	Germanium.
CR304 and CR305	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR306	5494922P1	Silicon; sim to Type 1N456.
CR307 thru CR309	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR310*	4036887P6	Silicon, Zener: 500 mW, 6.5 v. nominal. Added by REV M.
DS301	19B209067P1	----- INDICATING DEVICES ----- Lamp, glow: 0.3 ma; sim to GE NE-2T.
FL301	19C304219G1	----- FILTERS ----- Bandpass: 10.7 MHz.
J301	7104941P6	----- JACKS AND RECEPTACLES ----- Jack, phono type: phen; sim to Cinch 14H20958.
J302 and J303	19B209030P1	Connector, phen: 9 pins.
J304	19B205689G2	Connector: 16 contacts.

SYMBOL	GE PART NO.	DESCRIPTION
L301	19B203530G1	----- INDUCTORS ----- Coil.
L302	19B205530G2	Coil.
L303*	19B205530G2	Coil. In REV A & earlier:
	19B205530G6	Coil.
L304	19B205530G2	Coil.
L305	19A128122P1	Coil.
L306	19A128122P2	Coil.
L307 and L308	19A121085G1	Coil. Includes:
L309	19B205236G1	Tuning slug. Coil. Includes:
	19B200497P2	Tuning slug.
L310	19B219057G1	Coil. Includes:
	19B200497P2	Tuning slug.
L311	19B219059G1	Coil. Includes:
	19B200497P2	Tuning slug.
	19B205224G2	Coil.
L312 and L313	19B205224G3	Coil.
L314	7488079P18	Choke, RF: 15 μh ±10%, 1.2 ohms DC res max; sim to Jeffers 4421-9K.
L315	19B205236G1	Coil. Includes:
L317	19B219059G2	Tuning slug.
	19B200497P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670.
L321 and L322	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671.
L323	19A115711P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671.
L324	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670.
L325	19A115711P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671.
L326	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670.
L327	19A115711P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671.
L328	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670.
L329	19A115711P6	Transformer, freq: 455 KHz; sim to TOKO PEPCN-14733-CX12.
L330	19A115711P7	Transformer, freq: 455 KHz; sim to TOKO PEPCN-14734-BNL2.
L331	19B209405P1	Reactor, audio freq: 142 mh ±5% at 0.1 v thru 0.27 v; sim to Aladdin 405-101.
Q301*	19A116860P1	----- TRANSISTORS ----- Silicon, NPN; sim to Type 2N4996.
	19A116859P1	In REV E:
	19A116859P1	Silicon, NPN; sim to Type 2N5032 or 2N5370.
	19A115666P1	In REV B, C, D:
	19A115666P1	Silicon, NPN. In REV A & earlier:
	19A115342P1	Silicon, NPN.
Q302	19A115953P1	N channel, field effect.
Q303* and Q304*	19A115328P1	Silicon, NPN. In REV N & earlier:
	19A115925P1	Silicon, NPN.
Q305	19A115342P1	Silicon, NPN.

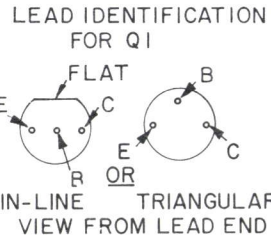
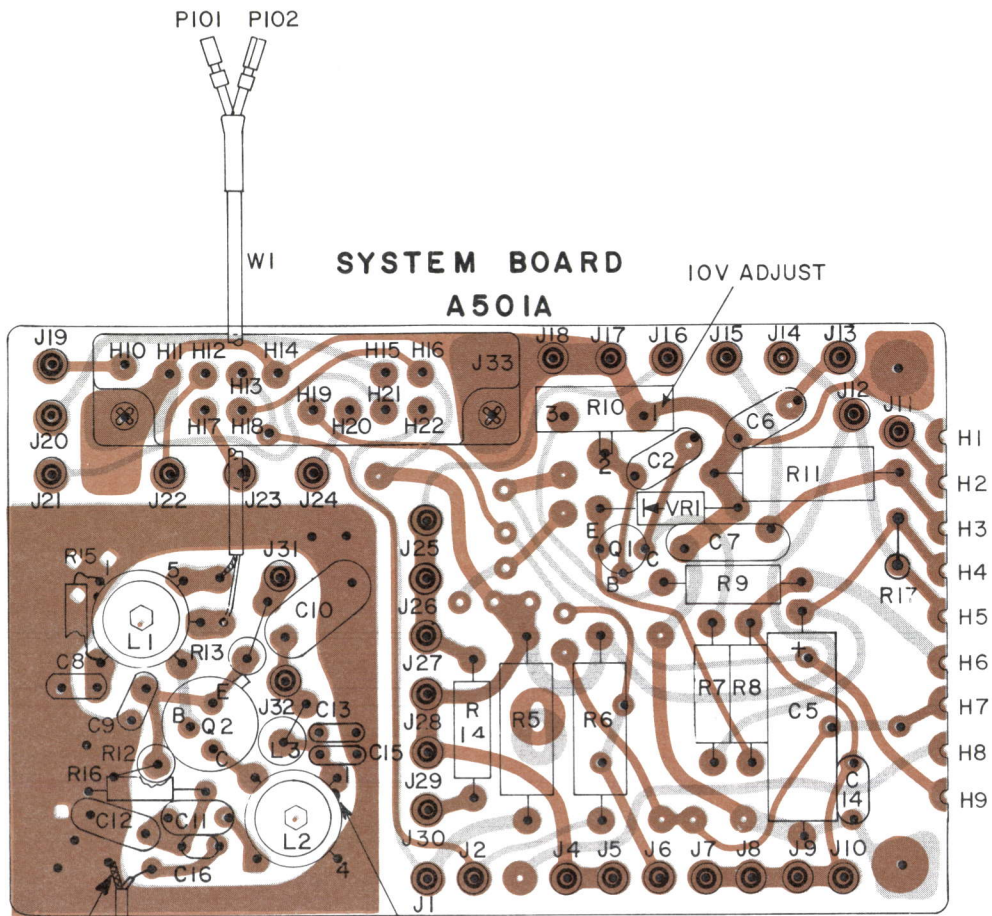
SYMBOL	GE PART NO.	DESCRIPTION
Q306*	19A116154P1	N channel, field effect. In REV A & earlier:
	19A115953P1	N channel, field effect.
Q307	19A115889P1	Silicon, NPN.
Q308*	19A115910P1	Silicon, NPN; sim to Type 2N5904. In REV E & earlier:
	19A115245P1	Silicon, NPN.
Q309*	19A115440P1	Silicon, NPN. In REV B, C, D:
	19A115666P1	Silicon, NPN. In REV A & earlier:
	19A115342P1	Silicon.
	19A115889P1	Silicon, NPN.
Q311 thru Q315	19A115123P1	Silicon, NPN.
Q316	19A116774P1	Silicon, NPN; sim to Type 2N5210. In REV C & earlier:
Q317*	19A115123P1	Silicon, NPN.
	19A115300P4	Silicon, NPN. In REV C & earlier:
Q318*	19A115101K	Silicon, NPN; sim to Type 2N3053.
Q319*	19A116774P1	Silicon, NPN; sim to Type 2N5210. In REV G & earlier:
	19A115889P1	Silicon, NPN.
Q320*	19A116774P1	Silicon, NPN; sim to Type 2N5210. In REV K & earlier:
	19A115123P1	Silicon, NPN.
R301	3R77P562K	Composition: 5.6K ohms ±10%, 1/2 w.
R302	3R77P222K	Composition: 22K ohms ±10%, 1/2 w.
R303	3R77P561K	Composition: 560 ohms ±10%, 1/2 w.
R304	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R308	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R309 and R310	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R311	3R77P682J	Composition: 6.8K ohms ±5%, 1/2 w.
R312	3R77P150K	Composition: 15 ohms ±10%, 1/2 w.
R313*	3R77P391K	Composition: 390 ohms ±10%, 1/2 w. In REV N & earlier:
	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R314	3R77P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R315 and R316	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R317	3R77P682J	Composition: 6.8K ohms ±5%, 1/2 w.
R318	3R77P150K	Composition: 15 ohms ±10%, 1/2 w.
R319*	3R77P391K	Composition: 390 ohms ±10%, 1/2 w. In REV N & earlier:
	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R320	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R321*	3R77P272K	Composition: 2.7K ohms ±10%, 1/2 w. In REV A & earlier:
	3R152P392K	Composition: 3.9K ohms ±10%, 1/4 w.
R322	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R323	3R77P431J	Composition: 430 ohms ±5%, 1/2 w.
R324	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R326	3R77P473J	Composition: 47K ohms ±5%, 1/4 w.
R327	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R328	3R152P330K	Composition: 33 ohms ±10%, 1/4 w.
R330	3R77P333K	Composition: 33K ohms ±10%, 1/2 w.
R331	3R77P822K	Composition: 8.2K ohms ±10%, 1/2 w.
R332	3R77P392K	Composition: 3.9K ohms ±10%, 1/2 w.
R333	3R77P682K	Composition: 6.8K ohms ±10%, 1/2 w.
R334	3R77P153K	Composition: 15K ohms ±10%, 1/2 w.
R335	3R77P561K	Composition: 560 ohms ±10%, 1/2 w.
R336	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R337	3R152P333K	Composition: 33K ohms ±10%, 1/4 w.
R338	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R339	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R340*	3R77P272K	Composition: 2.7K ohms ±10%, 1/2 w. In REV A & earlier:
	3R152P392K	Composition: 3.9K ohms ±10%, 1/4 w.
R341	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R342	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R343	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R344	3R152P302J	Composition: 3K ohms ±5%, 1/4 w.
R345	3R152P623K	Composition: 62K ohms ±10%, 1/4 w.
R350	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R351	3R77P333K	Composition: 33K ohms ±10%, 1/2 w.
R352	3R77P222K	Composition: 2.2K ohms ±1%, 1/2 w.
R353	3R77P562K	Composition: 5.6K ohms ±10%, 1/2 w.
R354	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R355	3R77P333K	Composition: 33K ohms ±10%, 1/2 w.
R356	3R152P222K	Composition: 2.2K ohms ±10%, 1/4 w.
R357	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R358	3R77P513J	Composition: 51K ohms ±5%, 1/2 w.
R359	3R77P562K	Composition: 5.6K ohms ±10%, 1/2 w.
R360	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R361	3R77P333K	Composition: 33K ohms ±10%, 1/2 w.
R362	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R363	3R77P222K	Composition: 2.2K ohms ±10%, 1/2 w.
R364	3R77P513J	Composition: 51K ohms ±5%, 1/2 w.
R365	3R77P562K	Composition: 5.6K ohms ±10%, 1/2 w.
R366	3R77P123K	Composition: 12K ohms ±10%, 1/2 w.
R367	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R368	3R152P181K	Composition: 180 ohms ±10%, 1/4 w.
R369	3R77P512J	Composition: 5.1K ohms ±5%, 1/2 w.
R370	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R371	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R372	3R77P333K	Composition: 33K ohms ±10%, 1/2 w.
R373	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R374	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R375 and R376	3R77P513J	Composition: 51K ohms ±5%, 1/2 w.
R377	3R152P682J	Composition: 6.8K ohms ±5%, 1/4 w.
R378	3R152P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R379	3R77P153K	Composition: 15K ohms ±10%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R380	3R77P332J	Composition: 3.3K ohms ±5%, 1/2 w.
R381	3R77P333K	Composition: 33K ohms ±10%, 1/2 w.
R382	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
R383	3R77P332K	Composition: 3.3K ohms ±10%, 1/2 w.
R384	3R152P333K	Composition: 3.3K ohms ±10%, 1/4 w.
R385	3R152P152K	Composition: 1.5K ohms ±10%, 1/4 w.
R386*	3R77P163J	Composition: 16K ohms ±5%, 1/2 w. In REV C & earlier:
	3R77P203J	Composition: 20K ohms ±5%, 1/2 w.
R388	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R389*	3R77P102K	Composition: 1K ohms ±10%, 1/2 w. In REV L & earlier:
	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
R390	3R77P332K	Composition: 3.3K ohms ±10%, 1/2 w.
R391	3R77P431J	Composition: 430 ohms ±5%, 1/2 w.
R392(R400)	19B209320P1	Resistor assembly. Variable, carbon film, includes: (R392) 20K ohms ±20%, 0.25 w; (R400) 5K ohms ±20%, 0.25 w; sim to Centralab Series 5 (Type 71-2).
R393*	3R77P202J	Composition: 2K ohms ±5%, 1/2 w. In REV G & earlier:
	3R77P392K	Composition: 3.9K ohms ±10%, 1/2 w.
R394	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R395	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R396 and R397	19A116278P444	Metal film: 0.28 megohms ±2%, 1/2 w.
R399*	3R77P332J	Composition: 3.3K ohms ±5%, 1/2 w. In REV M & earlier:
	3R77P471J	Composition: 470 ohms ±5%, 1/2 w. (See R392).
R400	19A116278P357	Metal film: 38.3K ohms ±2%, 1/2 w.
R401	19A116278P313	Metal film: 13.3K ohms ±2%, 1/2 w.
R402	3R152P332J	Composition: 3.3K ohms ±5%, 1/4 w.
R403	19A116278P233	Metal film: 2.15K ohms ±2%, 1/2 w.
R404	3R152P153J	Composition: 15K ohms ±5%, 1/4 w.
R405	3R152P822J	Composition: 8.2K ohms ±5%, 1/4 w.
R406*	3R152P622J	In REV L: Composition: 5.6K ohms ±5%, 1/4 w.
	3R152P562J	In REV H-K: Composition: 3.3K ohms ±10%, 1/4 w.
	3R152P332K	In REV C-G: Composition: 10K ohms ±5%, 1/4 w.
	3R152P103J	In REV B & earlier:
	3R152P332J	Composition: 3.3K ohms ±5%, 1/4 w.
R407	3R77P222K	Composition: 2.2K ohms ±10%, 1/2 w.
R408	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R409*	3R77P203J	Composition: 20K ohms ±5%, 1/2 w. In REV H & J:
	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
	3R77P473J	In REV G & earlier:
	3R77P105J	Composition: 47K ohms ±5%, 1/2 w.
R410*	3R77P105J	Composition: 1 megohm ±5%, 1/2 w. Added by REV M.

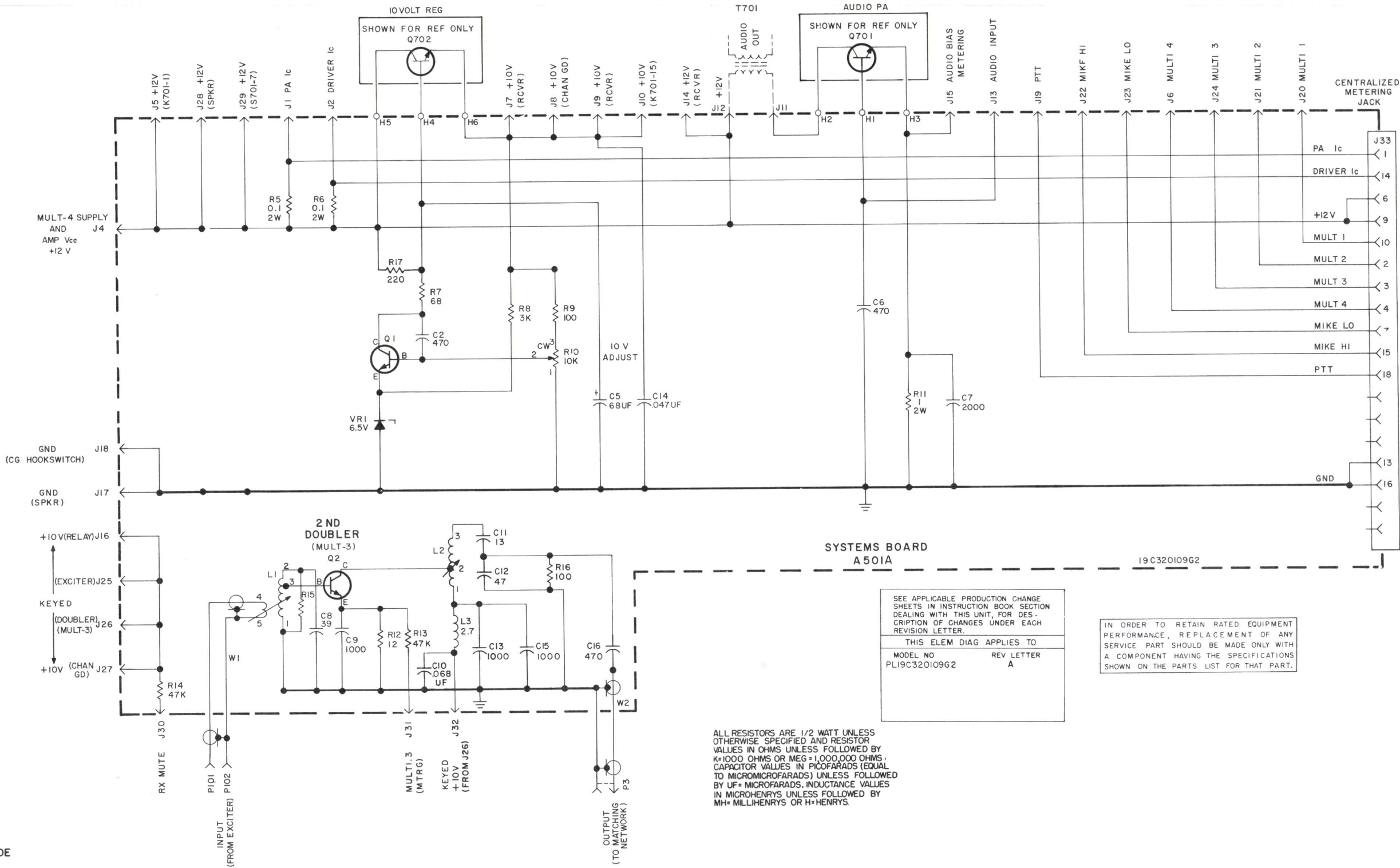
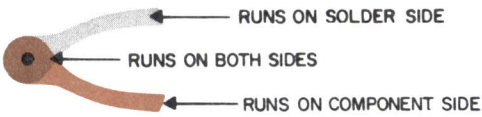
SCHEMATIC DIAGRAM

OUTLINE DIAGRAM



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

(19C321361, Rev. 0)  
(19C321368, Sh. 2, Rev. 0)  
(19C321368, Sh. 3, Rev. 0)





PARTS LIST

LBI4861B

SYSTEMS BOARD  
19C320109G2

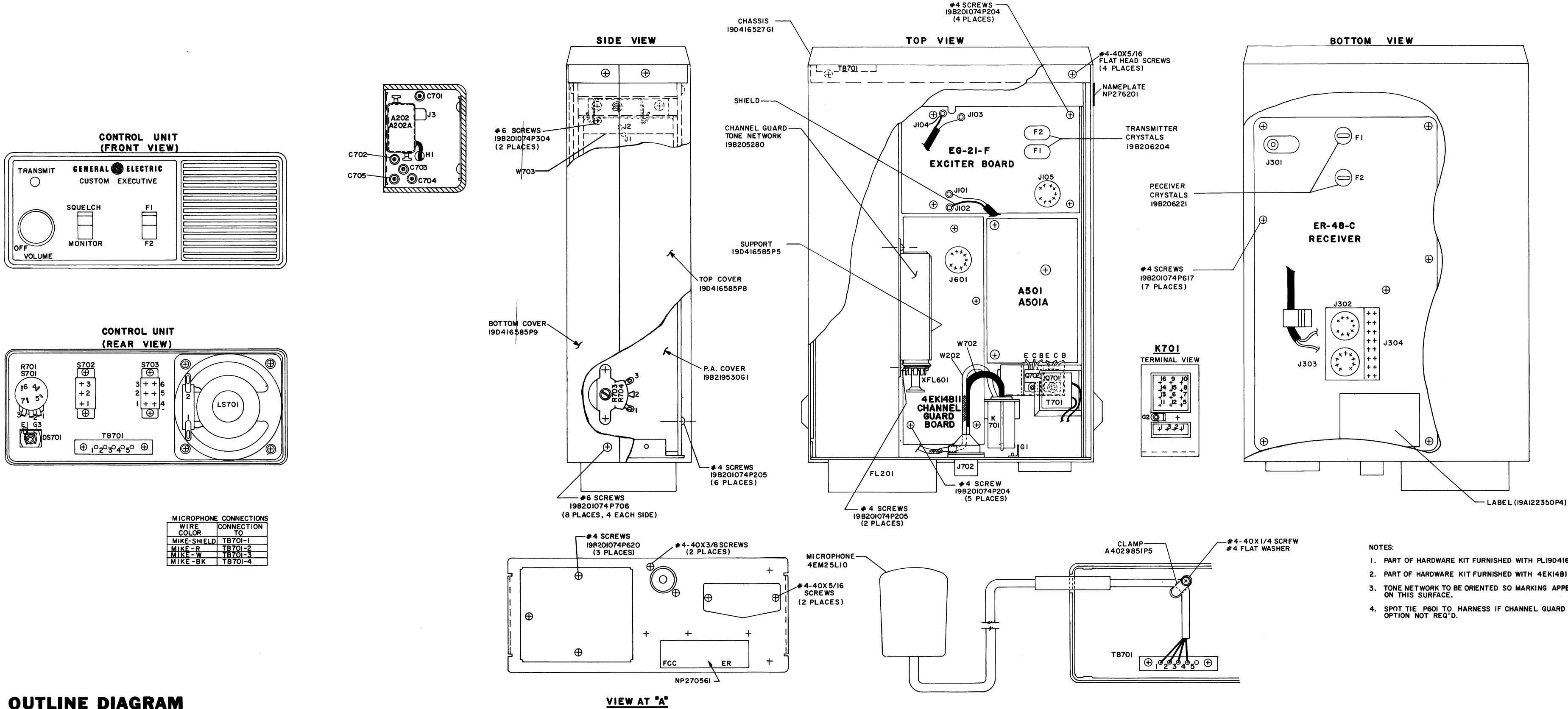
SYMBOL	GE PART NO.	DESCRIPTION
		----- CAPACITORS -----
C2	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C5	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C6	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C7	5494481P114	Ceramic disc: 2000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19A116114P50	Ceramic: 39 pf ±5%, 100 VDCW; temp coef -150 PPM.
C9	5495323P12	Ceramic: .001 µf +100% -20%, 75 VDCW.
C10	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C11	19A116656P13J0	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.
C12	7489162P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C13	5495323P12	Ceramic: .001 µf +100% -20%, 75 VDCW.
C14	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C15	5495323P12	Ceramic: .001 µf +100% -20%, 75 VDCW.
C16	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-050-WSR.
		----- JACKS AND RECEPTACLES -----
J1 and J2	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J4 thru J32	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J33*	19B205689G3	Connector: 16 contacts, includes (12) 19A116651P1 contacts.
	19B205689G1	Connector: 16 contacts, includes (16) 19A115853P1 contacts.
		----- INDUCTORS -----
L1	19D402808G37	Coil. Includes:
R15	3R152P512J	Resistor, composition: 5.1K ohms ±5%, 1/4 w.
	5491798P2	Tuning slug.
L2	19D402808G35	Coil.
L3	7488079P9	Choke, RF: 2.70 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4411-13K.
		----- PLUGS -----
P3		(Part of W2).
P101	4029840P2	Contact, electrical: sim to Amp 42827-2.
P102	4029840P1	Contact, electrical: sim to AMP 41854.
		----- TRANSISTORS -----
Q1	19A115123P1	Silicon, NPN.
Q2	19A116016P1	Silicon, NPN.
		----- RESISTORS -----
R5 and R6	19B209022P89	Wirewound: 0.1 ohms ±5%; sim to IRC Type BWH.

SYMBOL	GE PART NO.	DESCRIPTION
R7	3R77P680J	Composition: 68 ohms ±5%, 1/2 w.
R8	3R77P302J	Composition: 3K ohms ±5%, 1/2 w.
R9	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R10	19B209356P106	Variable, carbon film: approx 300 to 10,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R11	19B209022P15	Wirewound: 1.0 ohms ±5%, 2 w; sim to IRC Type BWH.
R12	3R77P120J	Composition: 12 ohms ±5%, 1/2 w.
R13 and R14	3R77P473J	Composition: 47K ohms ±5%, 1/2 w.
R15		(Part of L1).
R16	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R17	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
		----- VOLTAGE REGULATORS -----
VR1	4036887P6	Zener: 500 mW, 6.5 v. nominal.
		----- CABLES -----
W1	19B209044P19	RF: approx 6 inches; sim to Times M1-5288.
W2	19B219584G1	RF: approx 11 inches long. (Includes P3).
		----- MISCELLANEOUS -----
	19A121252P1	Heat sink. (Used with Q2).
	4029006P3	Clip, compression: 0.375 x 0.19 x .02 inches; sim to Tinnerman C5426-014-24. (Used with Q2).
	4036555P1	Insulator, washer: nylon. (Used with Q2).
	19B201074P212	Tap screw, Phillips POZIDRIV®: No. 4-40 x 3/4. (Secures J33).
	19B201074P216	Earlier than REV A: Tap screw, Phillips POZIDRIV®: No. 4-40 x 1. (Secures J33).
	7150186P9	Spacer. (Used with J33).
	7142162P98	Earlier than REV A: Spacer. (Used with J33).

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 simplify assembly.  
Changed J33 and mounting hardware.

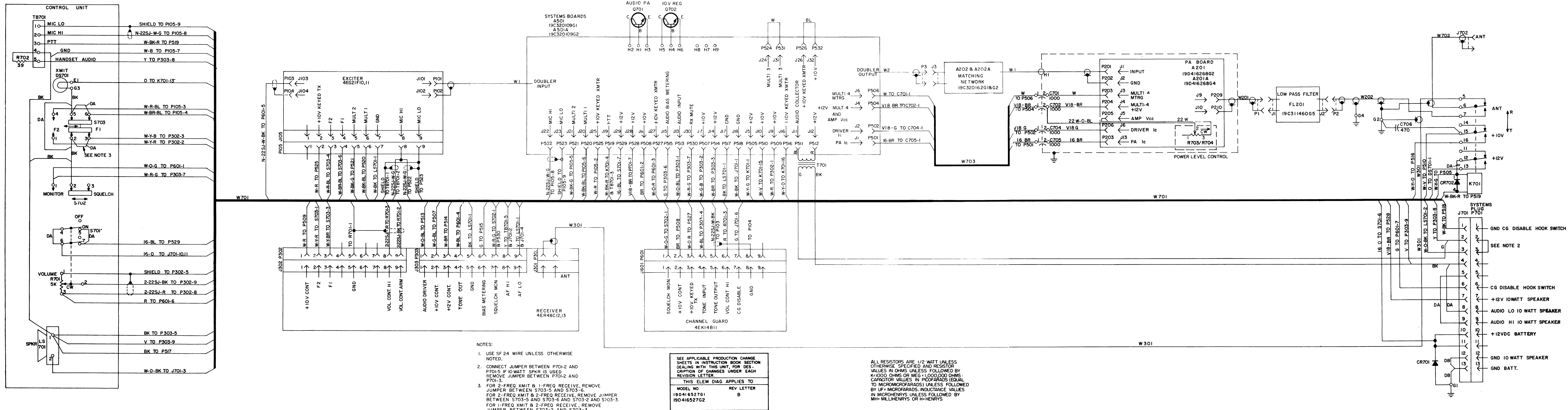


- NOTES:
1. PART OF HARDWARE KIT FURNISHED WITH PL19D416527G1.
  2. PART OF HARDWARE KIT FURNISHED WITH 4EK14811.
  3. TONE NETWORK TO BE ORIENTED SO MARKING APPEARS ON THIS SURFACE.
  4. SPOT TIE .P601 TO HARNESS IF CHANNEL GUARD OPTION NOT REQ'D.

**OUTLINE DIAGRAM**

CONTROL UNIT AND ASSOCIATED ASSEMBLIES





PARTS LIST

LBI4862A  
CONTROL UNIT/SYSTEM  
19D416527G2  
AND  
ASSOCIATED ASSEMBLIES

SYMBOL	GE PART NO.	DESCRIPTION
		CONTROL UNIT 19C320132G1
		----- CAPACITORS -----
C706	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCV; sim to RMC Type JF Discap.
		----- DIODES AND RECTIFIERS -----
CR701	19A115823P1	Silicon, rectifier: 200 PIV, 3 amps.
CR702	4037822P2	Silicon, 1000 mA, 600 PIV.
		----- INDICATING DEVICES -----
DS701	4034664P1	Lamp, incandescent: 28 v; sim to GE 1762D.
		----- JACKS AND RECEPTACLES -----
J701	19C303576P1	Socket, phen: 13 contacts rated at 5 amps max.
		----- LOUDSPEAKERS -----
LS701	19A116701P1	Permanent magnet: 3 inch, 2 watt, 3.2 ohms ±10% imp. at 1000 Hz-0.5 v.; sim to Oaktron 3A3C.
		----- PLUGS -----
P103	4029840P2	Contact, electrical: sim to Amp 42827-2.
P104	4029840P1	Contact, electrical: sim to AMP 41854.
P105	19B209341P2	Socket, tube: 9 pins; sim to Elco 04-920-KX.
P302 and R303	19B209341P2	Socket, tube: 9 pins; sim to Elco 04-920-KX.
P505	4029840P2	Contact, electrical: sim to Amp 42827-2.
P507 thru P510	4029840P2	Contact, electrical: sim to Amp 42827-2.
P513 thru P518	4029840P2	Contact, electrical: sim to Amp 42827-2.
P519	4029840P1	Contact, electrical: sim to AMP 41854.
P520 thru P522	4029840P2	Contact, electrical: sim to Amp 42827-2.
P523	4029840P1	Contact, electrical: sim to AMP 41854.
P524 thru P527	4029840P2	Contact, electrical: sim to Amp 42827-2.
P528 and P529	4029840P3	Contact, electrical: sim to AMP P-53007.
P530 thru P532	4029840P2	Contact, electrical: sim to Amp 42827-2.
P601	19B209341P2	Socket, tube: 9 pins; sim to Elco 04-920-KX.
		----- RESISTORS -----
R701	5496870P13	Resistor/Switch: variable, carbon film: 5K ohms ±20%; switch: DPST, 6 amps at 125 VAC; sim to Mallory LC(5K)OAC-2.
R702	3R77P390J	Composition: 39 ohms ±5%, 1/2 w.
		----- SWITCHES -----
S701		(Part of R701).

SYMBOL	GE PART NO.	DESCRIPTION
S702	19A116622P3	Push: DPDT, .5 amp at 125 VDC/VAC. 2 amps at 14 VDC res max; sim to Switchcraft 51206LH.
S703	19A116622P2	Push: DPDT, .5 amp at 125 VDC/VAC. 2 amps at 14 VDC res max; sim to Switchcraft 51206LH.
		----- TERMINAL BOARDS -----
TB701	19A129242G1	Terminal board: 5 contacts.
		----- CABLES -----
W202	19A129265P1	RF: approx 6 inches long.
W301	19A129262P1	RF: approx 21 inches long.
W701	19B219518G1	System Cable. Includes C706, CR701, CR702, J701, P103-P105, P302, P303, P505, P507-P510, P513-P532, P601, R701, R702, S701-S703, TB701, W202, W301, W702, and XK701.
W702	19A122133G14	Antenna jack: approx 5 inches long. Includes (J702).
		----- SOCKETS -----
XK701	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		----- MISCELLANEOUS -----
	19A129240G1	Support. (Used with DS701).
	4031053P7	Nut, sheet spring; sim to Tinnerman C12046-012-67. (Used to secure LS701).
	N402P5C6	Flatwasher: No. 4. (Used to secure LS701).
	19A122138P1	Knob. (Used with P105, P302, P303, and P601).
	19A134048P1	Wood screw, phillips head: No. 4, 1/2 inch long. (Used with P105, P302, P303, and P601).
	7115130P9	Lockwasher: sim to Shakeproof 1220-2. (Used with R701-S701).
	7165075P2	Hex nut, brass: No. 3/8-32. (Used with R701-S701).
	19B201074P205	Screw, Phillips Pozidriv®: No. 4-40-5/16. (Secures TB701).
	19A129260P1	Support. (Used with XK701).
	5491595P10	Retainer: spring; sim to Allied Control 30052-1. (Used with XK701).
	19D416585P1	Control head case.
	NP270664	Nameplate.
	19A129244G1	Knob. (VOLUME).
	19B204949P1	Jewel: red plastic lens. (TRANSMIT).
		SYSTEM
		----- FILTERS -----
FL201	19C311460G5	Lowpass.
		----- RELAYS -----
K701	19C307010P18	Armature: 12 VDC nominal, 1.5 w max operating, 130 ohms ±10% coil res, 4 form C contacts; sim to Allied Control T154-X-976A.
		----- PLUGS -----
P511 and P512	4029840P2	Contact, electrical: sim to Amp 42827-2.
		----- TRANSISTORS -----
Q701	19A116742P1	Silicon, NPN.
Q702	19A116742P1	Silicon, NPN.
		----- RESISTORS -----
R704	19B209529P3	Variable, wirewound: 75 ohms ±10%, 5 w; sim to CTS Series AW.

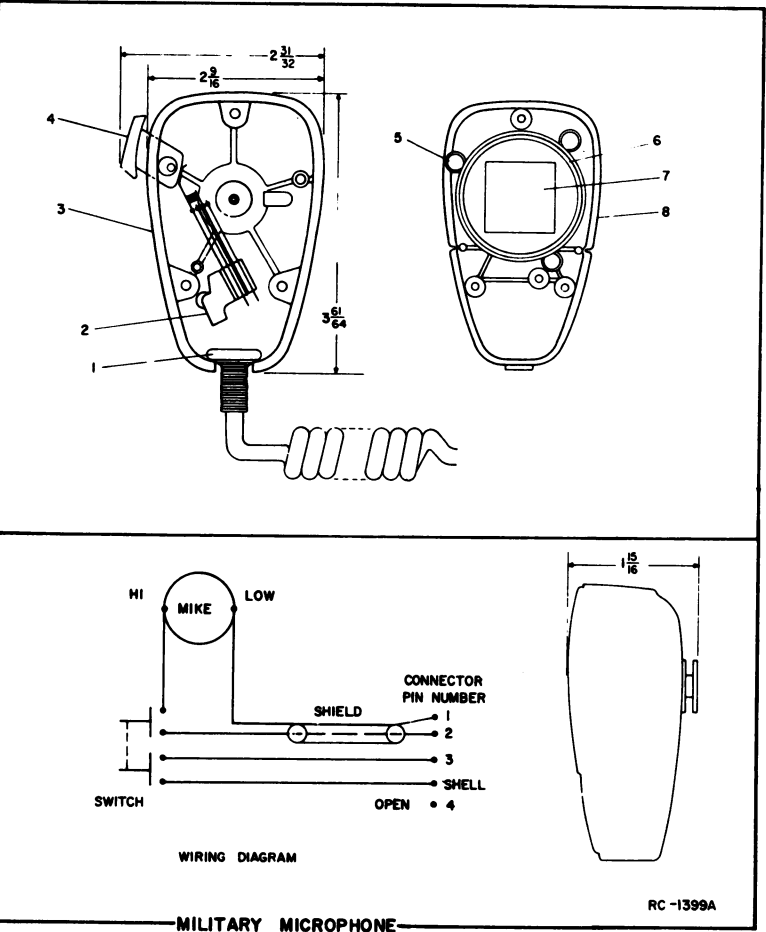
SYMBOL	GE PART NO.	DESCRIPTION
		----- TRANSFORMERS -----
T701	19B209079P1	Audio freq: 300-3000 Hz +0.5 dB, -1.0 dB, Pri: 55 ohms ±10% imp. at 1000 Hz, 1.7 w output, 27s MADC. Sec: 3.2 ohms imp.
		----- CABLES -----
W201		CABLE ASSEMBLY 19A129263G1
		----- PLUGS -----
P209	4029840P2	Contact, electrical: sim to Amp 42827-2.
P210	4029840P1	Contact, electrical: sim to AMP 41854.
		CABLE ASSEMBLY 19A129238G1
W703		----- CAPACITORS -----
C701 and C702	5493392P7	Ceramic, feed-thru: 1000 pf ±100% -0%, 500 VDCV; sim to Allen-Bradley Type FA5C.
C704 and C705	5493392P7	Ceramic, feed-thru: 1000 pf ±100% -0%, 500 VDCV; sim to Allen-Bradley Type FA5C.
		----- PLUGS -----
P203	4029840P2	Contact, electrical: sim to Amp 42827-2.
P204 and P205	4029840P3	Contact, electrical: sim to Amp 42101-2.
P206	19B209151P1	Terminal, solderless: sim to Amp 42284-5.
P213	19B209151P1	Terminal, solderless: sim to Amp 42284-5.
P501 and P502	4029840P3	Contact, electrical: sim to Amp 42101-2.
P504	4029840P3	Contact, electrical: sim to Amp 42101-2.
P506	4029840P2	Contact, electrical: sim to Amp 42827-2.
		ASSOCIATED ASSEMBLIES
		POWER CABLE ASSEMBLY 19A129305G1
		----- MISCELLANEOUS -----
	19A121322G1	Lead: approx 9 feet long.
	19A121314G4	Fused lead.
	7484390P4	Fuse, quick blowing: 8 amp 250 v; sim to Littelfuse 31408 or Bussmann ABC-08.
	19A121324G2	Jumper.
	19A121441G1	Vehicle Systems Plug.
	19C303574P1	Cover.
	4033204P5	Pad.
	N44P9008C13	Machine screw: No. 4-40 x 3/8. (Secures Vehicle Systems Plug to cover).
	19A121167P1	Screw: 3/4 inch long. (Secures connector to radio).
		ANTENNA - 4EY12A13 150.8-174 MHz
		----- MISCELLANEOUS -----
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4. (Secures A501).
	19D416585P4	Backplate. (Locates FL201 & J701).
	19B219474P1	Cover. (Used with FL201).
	19A127161P1	Plate. (Used with FL201).

SYMBOL	GE PART NO.	DESCRIPTION
	19B201074P620	Tap screw: No. 4-40 x 1-1/4. (Secures cover to FL201).
	7878455P2	Solderless terminal. (Used with J701).
	5491595P9	Retainer: spring; sim to Allied Control 30040-2. (Used with K701).
	19A116023P1	Insulator plate. (Used with Q701-Q703).
	N402P55P6	Washer: No. 6. (Used with Q701-Q703).
	19A129318P1	Plate. (Used with Q701-Q703).
	7160861P27	Nut, sheet spring: sim to Tinnerman. (Secures T701).
	7878455P1	Solderless terminal. (Used with W202).
	19B209209P205	Tap screw: No. 4-40 x 5/16. (Secures Control Head to Chassis).
	19B201074P305	Screw, tap: No. 6-32 x 5/16. (Secures Backplate to frame).
	4038050P4	Cap Screw: thd. size 10-32 UNF2A. (Secures PA Board to channel).

PARTS LIST

MILITARY MICROPHONE  
MODEL 4EM2SL10

SYMBOL	GE PART NO.	DESCRIPTION
1		Cable clamp, front and back case. Shure Brothers RP897.
2		Switch. Shure Brothers RP26.
3		Case, back. (See item 1).
4		Switch button. Shure Brothers RP97. (Quantity 5 only).
5		Spring and internal hardware. Shure Brothers RP16.
6		Shield. Shure Brothers RP23. (Quantity 5 only).
7		Magnetic controlled cartridge, grille cloth, screen and resonator. Shure Brothers RP13.
8		Case, front. (See item 1).
9		Cable: approx 6 feet long, includes (4) 4029840P1 female terminals. Shure Brothers RP786.



## PA TRANSISTOR REPLACEMENT

### WARNING

The stud mounted RF Power Transistors used in the transmitter 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.

To replace the PA transistors (Q1 through Q4):

1. Unsolder one lead at a time with a 50-Watt soldering iron. Use a scribe to hold the lead away from the printed circuit board until the solder cools.
2. Remove the PA Assembly as directed in the Disassembly Procedure (see Table of Contents).
3. Hold the body of the transistor to prevent it from turning. Next, remove the transistor hold-down nut and springwasher through the hole in the heatsink with an 11/32-inch nut-driver. Lift out the transistor, and remove the old solder from the printed circuit board.
4. Trim the new transistor leads (if required) to approximately 3/8-inch lengths. Cut the collector lead at a 45° angle for future identification (see Figure 1). The letter "C" on the top of the transistor indicates the collector.
5. Apply a coating of silicon grease around the transistor mounting surface, and place the transistor in the mounting hole. Align the leads as shown in the Outline Diagram. Then hold the body of the transistor and replace the hold-down nut and spring washer, using moderate torque (6.5 inch-pounds for 150.8 to 470 MHz transmitters).
6. Make sure that the transistor is mounted as shown in Figure 2 so that the leads can be soldered to the printed circuit pattern, starting from the inner edge of the mounting hole.
7. Solder the leads to the printed circuit pattern. Start at the inner edge of mounting hole and solder the remaining length of transistor lead to the board.

### CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor.

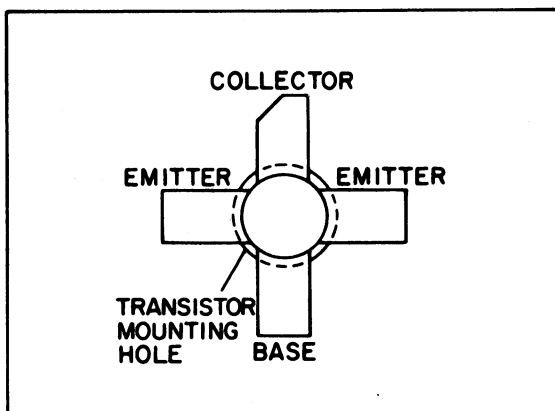


Figure 1 - Lead Identification

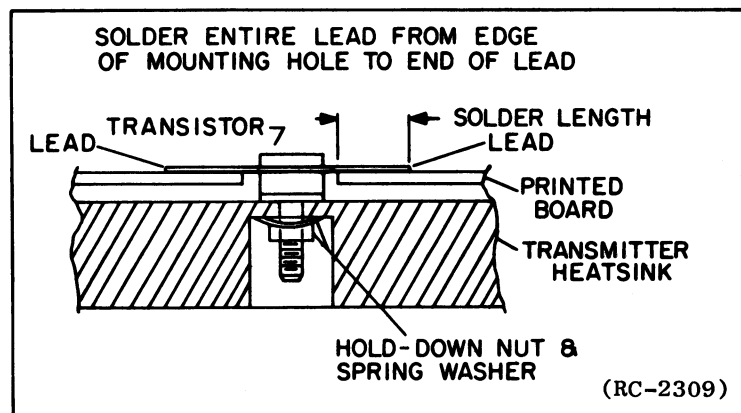


Figure 2 - Transistor Mounting

STEP I - QUICK CHECKS

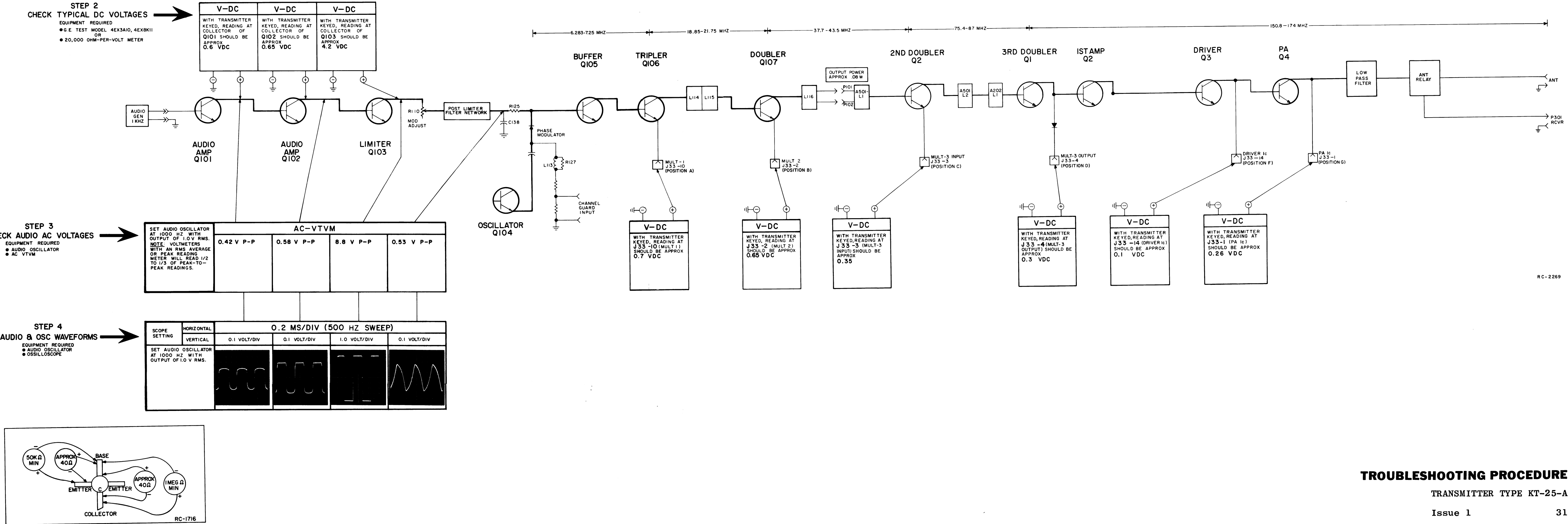
Meter Position	Probable Defective Stage		
	High Meter Reading	Low Meter Reading	Zero Meter Reading
A (MULT-1)	Q105 or Q106	Q105 or open L113	10-Volt regulator, osc. crystal or Q104, Q105, Q106
B (MULT-2)	Q107, A201-Q1	Q107	Q107
C (MULT-3) INPUT	A201-Q1	10-Volt regulator, A201-Q1	10-Volt regulator, A201-Q1
D (MULT-3) OUTPUT	A202-Q2	13.1 Volts A202-Q1	13.1 Volts A202-Q1
F (DRIVER I <sub>c</sub> )	A202-Q4	Q3, or protective circuits activated*	Keyed 12 Volts, A202-Q2, Q3
G (PA I <sub>c</sub> )	Mis-aligned PA. Check Step 7 of Alignment Procedure.	Q4 or protective circuits activated*	Keyed 12 Volts, A202-Q4

\* Refer to the power regulator Troubleshooting Procedure for check of protective circuit.

PA TRANSISTOR CHECKS

PA transistors Q1 thru Q4 can be checked to determine if they are defective by measuring the junction resistances with an ohmmeter according to the following procedure:

1. Unsolder the base and collector leads with a 50-Watt soldering iron. Use a scribe to hold each lead off the printed circuit board until the solder cools.
2. Slip a piece of paper under each unsoldered lead to insulate it from the printed circuit board.
3. Measure the base-to-emitter and base-to-collector resistances, and check with the "good" resistance readings as shown in RC-1716. Always take two different readings for each junction by reversing the meter leads.
4. If replacement of a transistor is necessary, refer to the replacement procedure listed in the Table of Contents.



STEP I - QUICK CHECKS

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	Check power connections and continuity of supply leads, and check fuses. If fuse is blown, check for short circuits by disconnecting all plugs in the unit. Reconnect plugs one at a time until a fuse blows.
NO REGULATED 10 VOLTS	Check the 12-Volt supply. Then check Q1 and Q702 in 10-Volt regulator and regulator circuit. Disconnect all plugs from the receiver, exciter board and option boards, and take resistance readings from jack pins to ground (Refer to Outline Diagrams).
LOW 2ND LIM READING	Check supply voltages and then check oscillator reading at J304-4 as shown in STEP 2A.  Make SIMPLIFIED VTVM GAIN CHECKS from 2nd Mixer through 2nd Limiter stages as shown in STEP 2A.  Check receiver RF alignment (refer to Receiver Alignment Procedure).
LOW OSCILLATOR READING	Check alignment of Oscillator (Refer to Front End Alignment Procedure).  Check voltage readings of Q304 and Q305. Check resistance readings on J302-1, -2 and -3.  Check crystal Y401.
LOW RECEIVER SENSITIVITY	Check Front End Alignment (Refer to Front End Alignment Procedure).  Check input signal required for 0.2-Volt reading at LIM-1. Reading should be less than 20 uv.  Check antenna connections, cable and relay.  Check voltage readings of 1st and 2nd RF Amps and 1st and 2nd Mixers.  Make SIMPLIFIED GAIN CHECKS (STEP 2A).
NO AUDIO	Check jumper connections on power cable.
LOW AUDIO	Check Audio PA (Q701) output current at J304-9. If reading is low --  a. Check BIAS ADJ for 0.25 VDC at J304-9. If incorrect, set for 0.25 V with R392 (Position G on Test Set).  b. If correct, check Audio Amp Q317.  Make SIMPLIFIED GAIN and WAVEFORM CHECKS (STEPS 2A and 2B) of Audio and Squelch Stages.  Check unsquelched D-C voltage readings in Audio section (Refer to Receiver Service Sheet).  Check voltage readings on Channel Guard receiver.  Check setting of SQUELCH control R400 (Refer to Receiver Alignment Procedure).
IMPROPER SQUELCH OPERATION	Make GAIN and WAVEFORM CHECKS (STEPS 2A and 2B) of Audio and Squelch stages.
DISCRIMINATOR IDLING TOO FAR OFF ZERO	See if discriminator zero is in the center of IF bandpass.

TROUBLESHOOTING PROCEDURE

RECEIVER MODELS 4ER48C10-15

STEP 3- GAIN-PER-STAGE READINGS-

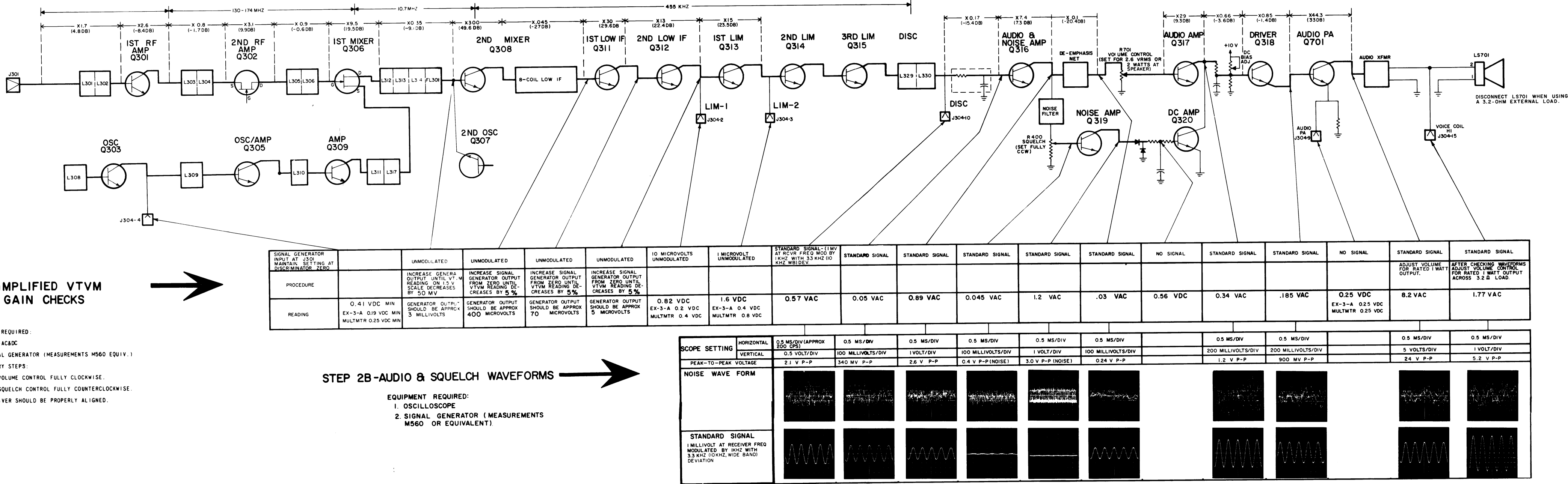
- EQUIPMENT REQUIRED:
- RF VOLT-METER (SIMILAR TO BOONTON MODEL 91-CA OR MILLIVAC TYPE MV-1B C.
  - SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION). CORRECT FREQUENCY CAN BE DETERMINED BY ZEROING THE DISCRIMINATOR.
- PROCEDURE
- APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, BASE OF RF AMP). PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED AND TAKE VOLTAGE READING (E<sub>1</sub>).
  - MOVE PROBE TO INPUT OF FOLLOWING STAGE (1ST MIXER). REPEAK FIRST RESONANT CIRCUIT THEN PEAK CIRCUIT BEING MEASURED AND TAKE READING (E<sub>2</sub>).
  - CONVERT READINGS (BY SUBTRACTING E<sub>1</sub> FROM E<sub>2</sub> ON THE DB SCALE OF RF VOLT-METER, OR) BY MEANS OF THE FOLLOWING FORMULA:  
$$\text{AMP FACTOR} = \frac{E_2}{E_1}$$
  - CHECK RESULTS WITH TYPICAL GAINS SHOWN ON DIAGRAM BELOW.
  - USE PROCEDURE LISTED ABOVE TO FIND GAIN OF EACH STAGE.
- \* NOTE: REMOVE CRYSTAL OR SHORT OUT OSC. BASE BEFORE MEASURING MIXER STAGES TO ELIMINATE INJECTION VOLTAGE

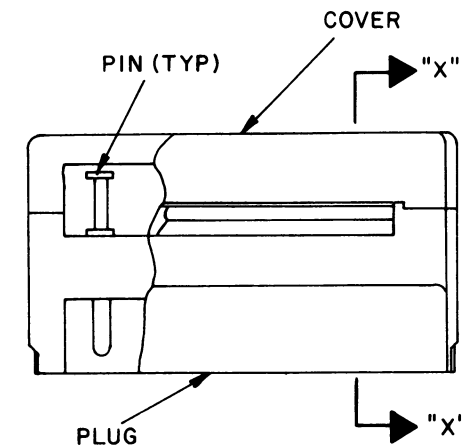
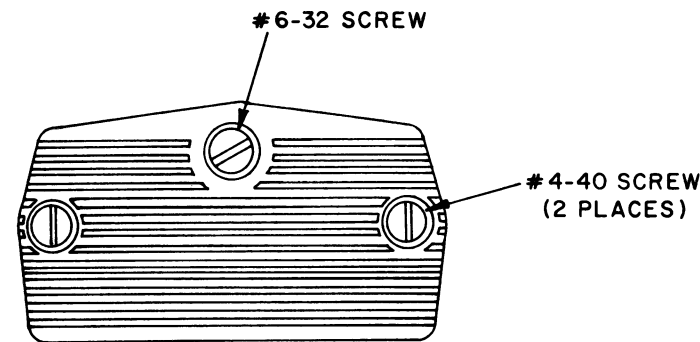
STEP 2A- SIMPLIFIED VTVM GAIN CHECKS

- EQUIPMENT REQUIRED:
- VTVM-AC/DC
  - SIGNAL GENERATOR (MEASUREMENTS M560 EQUIV.)
- PRELIMINARY STEPS:
- SET VOLUME CONTROL FULLY CLOCKWISE.
  - SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
  - RECEIVER SHOULD BE PROPERLY ALIGNED.

STEP 2B-AUDIO & SQUELCH WAVEFORMS

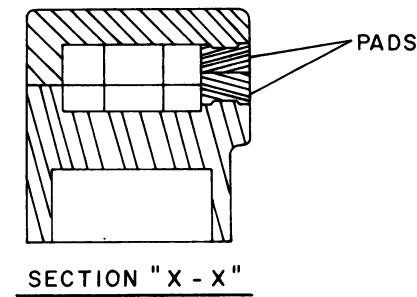
- EQUIPMENT REQUIRED:
- OSCILLOSCOPE
  - SIGNAL GENERATOR (MEASUREMENTS M560 OR EQUIVALENT)





#### INSTALLATION INSTRUCTIONS

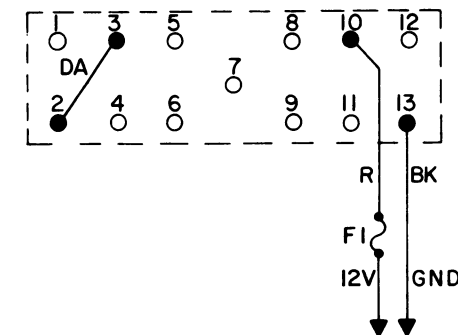
1. ASSEMBLE PINS IN PROPER HOLES.
2. ASSEMBLE COVER TO PLUG MAKING SURE LEADS LAY IN A SINGLE ROW AT CABLE ACCESS SLOT.
3. WHEN SOLDERING AN ADDITIONAL WIRE TO AN EXISTING PIN (AS IN HANDSET HOOKSWITCH) HOLD WIRE AND SOLDER BUILDUP TO A MINIMUM TO PREVENT SHORT CIRCUITS.
4. ASSEMBLE PADS IN APPROXIMATE POSITIONS SHOWN.



## 12V NEGATIVE GROUND

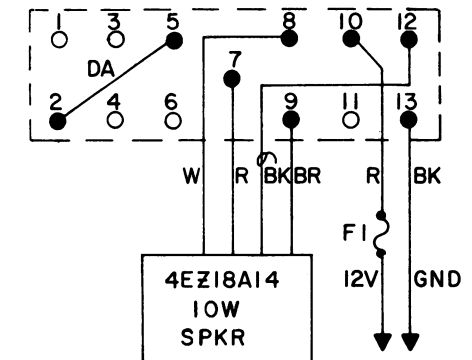
STANDARD CABLE

FIGURE 1



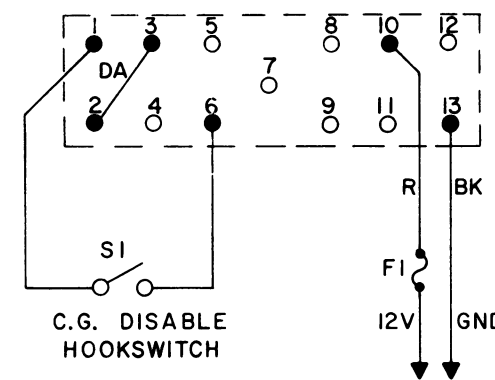
STANDARD CABLE WITH 10W SPEAKER OPTION

FIGURE 3



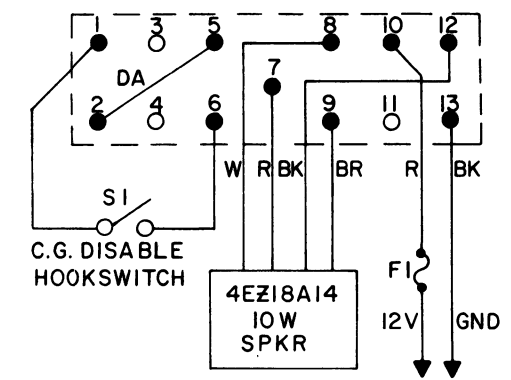
STANDARD CABLE WITH C.G. HOOKSWITCH OPTION

FIGURE 2



STANDARD CABLE WITH 10W SPEAKER OPTION AND C.G., HOOKSWITCH OPTION

FIGURE 4



(19C320195, Rev. 3)

## SYSTEM PLUG CONNECTIONS

This modification for 132-174 MHz receivers Type ER-48-C reduces the susceptibility of the receiver to intermodulation interference by decreasing the receiver sensitivity.

#### PROCEDURE

1. Remove the top cover from the receiver.
2. Unsolder the lead of capacitor C305 (see Figure 1) and solder one lead of a 39-ohm, 5%, 1/4-watt resistor (GE Part No. 3R152P390J) into the hole from which the capacitor lead was removed.
3. Solder the other lead of the resistor and capacitor together as shown in View "A".
4. Replace the top cover.

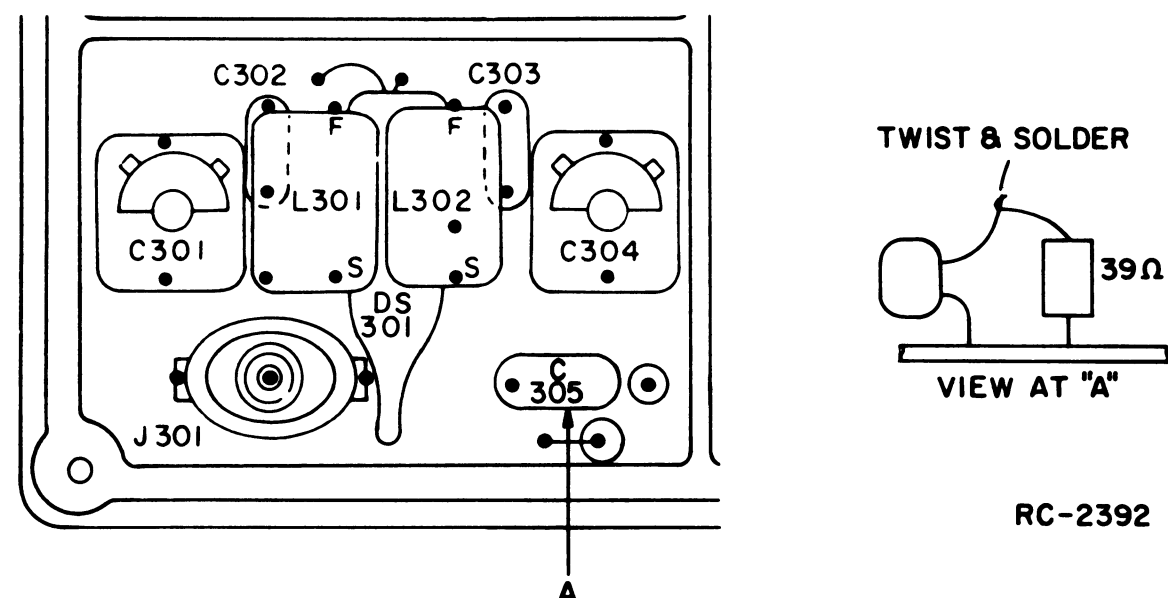


Figure 1 - Installation Diagram

#### TEST SPECIFICATIONS

1. Receiver specification changes are as follows:
 

20-dB Quieting	0.6 microvolts
12-dB SINAD	0.4 microvolts
EIA Intermodulation	unchanged (-70 dB)
Critical Squelch	less than 12-dB SINAD
2. More receiver sensitivity degradation can be obtained by increasing the value of the 39-ohm resistor in small increments.

#### MODIFICATION INSTRUCTIONS

REDUCTION OF INTERMODULATION INTERFERENCE  
(OPTION 8302)