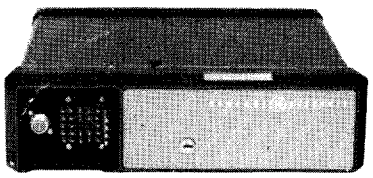
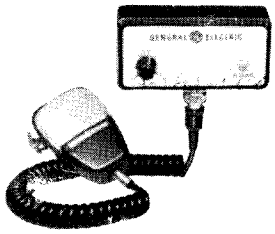
MOBILE RADIO

MASTR
PROGRESS LINE
Executive Series

MAINTENANCE MANUAL



Mobile Radio

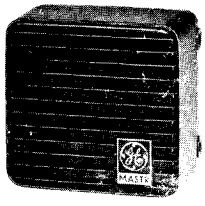


Control Unit

132—174 MHz

TWO-WAY FM
MOBILE COMBINATIONS

LBI-4325B



Speaker

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; 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	ET-74-A, B
FM RECEIVER	ER-48-C
CONTROL UNITS	
Trunk-Mount	EC-67-A
Front-Mount	EC-68-A
POWER SUPPLY	4EP50A10
4-FREQ. OSCILLATOR BOARD	4EG22F10 or 11
CHANNEL GUARD BOARD	4EK14B10
SPEAKER	4EZ20A11
TRUNK-MOUNT POWER/CONTROL CABLE	
1- or 2-Frequency	19C303910G2
3- or 4-Frequency	19C303910G4
FRONT-MOUNT POWER CABLE	19C303982G2
MOUNTING HARDWARE	
Trunk-Mount	19A122244G2
Front-Mount	19A122244G1
CONTROLLED RELUCTANCE MICROPHONE	19B209102P2
Microphone Bracket	7141414G2
LOCK ASSEMBLY	
Key	5491682P8
Lock	5491682P14
ALIGNMENT TOOLS	
Hex Slug Type	4038831P2
Slotted Screw Type	4033530G2
132-174 MHZ ANTENNA	4EY12A13

OPTIONAL EQUIPMENT

10-WATT SPEAKER (Option 8003)	4EZ18A11
WINDOW MOUNTING KIT (Option 8011)	19A121879G3
WEATHERPROOF BOX (Option 8013)	
Box	19D402674G1
Cable Entry Kit	19A122244G4
Hardware	19A122244G3
HANDSET (Option 8093)	4EM26A10
Hookswitch	19B204867G4
CARRIER CONTROL TIMER (Option 8306)	19A127875G3

SPECIFICATIONS *

GENERAL

FREQUENCY RANGE	132-174 MHz
DIMENSIONS (H x W x D)	
Trunk-Mount	4" x 12 3/4" x 12 1/4"
Front-Mount	4" x 12 3/4" x 12 1/2"
WEIGHT (including accessories)	33 pounds
BATTERY DRAIN	
Receiver (at 13.8 VDC)	
Standby (squelched)	55 mA
Standby (unsquelched)	0.6 amp
Transmitter	
Transmitter Filaments On (receiver squelched)	1.15 amps
Transmit (at 13.6 VDC)	12 amps
OPERABLE TEMPERATURE RANGE	-30°C to +60°C (-22°F to 140°F)
DUTY CYCLE	Transmit: 20% Receive: 100%
MAXIMUM FREQUENCY SPACING	0.4%

TRANSMITTER

TYPE NUMBER	ET-74-A (Narrow Band) ET-74-B (Wide Band)
POWER OUTPUT	35 Watts (132-162 MHz) 30 Watts (162-174 MHz)
FREQUENCY STABILITY	±.0005% (-30°C to +60°C, +25°C reference)
SPURIOUS AND HARMONIC RADIATION	At least 60 dB below rated power output
MODULATION	Adjustment from 0 to ±5 kHz (Narrow Band) and 0 to ±15 kHz (Wide Band) swing with instantaneous modulation limiting.
AUDIO FREQUENCY CHARACTERISTICS	Within +1 and -3 dB of a 6 dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards.
DISTORTION	Less than 5%
DEVIATION SYMMETRY	0.6 kHz maximum (Narrow Band) 2.0 kHz maximum (Wide Band)
CRYSTAL MULTIPLICATION FACTOR	24

RECEIVER

TYPE NUMBER	ER-48-C
AUDIO OUTPUT	2 Watts at less than 5% distortion 3 Watts at less than 15% distortion
SENSITIVITY	
12-dB SINAD (EIA Method)	0.25 µV
20-dB Quieting Method	0.35 µV
SELECTIVITY	
EIA Two-Signal Method	-85 dB - adjacent channel 30 kHz channels (NB)
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.

DESCRIPTION

MASTR Progress Line Executive Series Mobile Radio Combinations are attractively styled, ruggedly constructed units that are designed to meet the most stringent requirements in the field of two-way FM radio.

The combination is contained in a "slide-rail" mounting frame and is designed for either Front-Mount or Trunk-Mount installations. The radio is tamperproof when locked in the mounting frame. When unlocked, the unit can be easily pulled out of its frame for servicing.

Both the transmitter exciter board and the receiver are fully transistorized. Silicon transistors are used for added reliability.

Battery drain in standby operation is so low (only 55 milliamps) that the radio never has to be turned off.

All major modules and tuning adjustments are accessible from the top of the unit (Figure 1). Both the transmitter and receiver are equipped with centralized metering jacks for simplified alignment and troubleshooting.

The transmitter and receiver may be used interchangeably in mobile and station installations. No modifications are required when transferring the units from one type of operation to another.

TRANSMITTER

The transmitter assembly consists of the transistorized exciter board and the power amplifier section. The transmitter uses only three tubes in the power amplifier. The standard transmitter may be equipped with:

- One through four frequencies
- Channel Guard

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 through four frequencies
- Channel Guard

POWER SUPPLY

The transistorized mobile power supply was designed for operation in 12-volt, negative-ground vehicle systems. An optional polarity converter is required to operate the radio in positive-ground vehicle systems.

CONTROL UNITS

Two different Control Units are available for use with the radio. In Front-Mount applications, the Control Unit is attached to the front panel of the two-way radio. In Trunk-Mount applications, the Control Unit is normally mounted on the underside of the instrument panel near the operator.

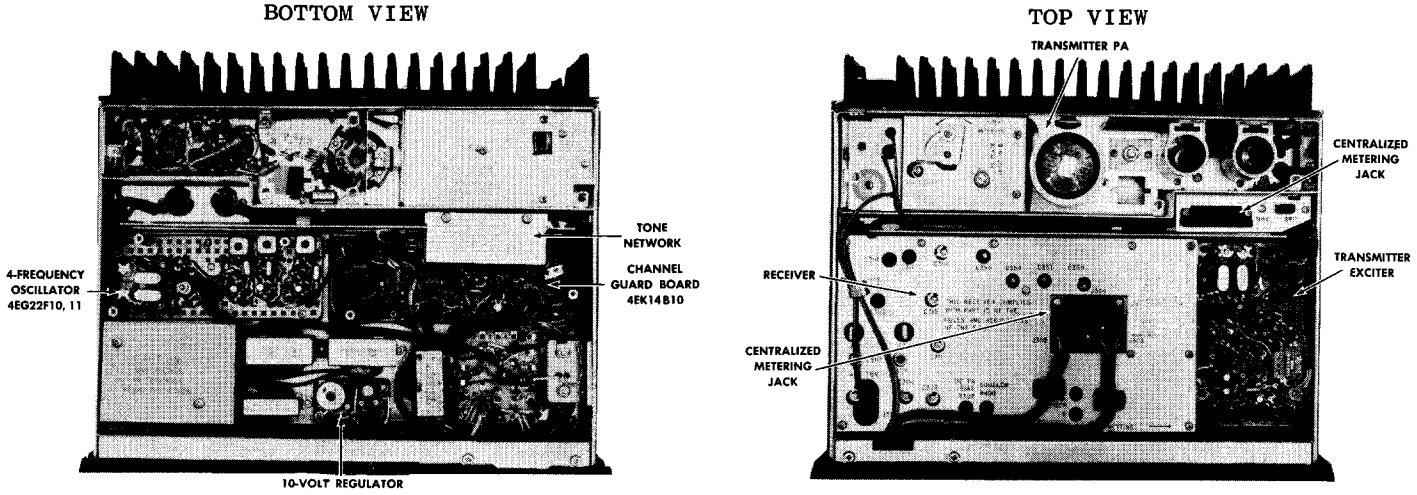


Figure 1 - Module Layout

INITIAL ADJUSTMENT

After the MASTR Executive Series mobile combination 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 ECP-82) 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.

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.

OPERATION

Complete operating instructions for the Two-Way Radio are provided in the separate OPERATOR'S MANUAL (LBI-3731). 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. Press in the MONITOR button and adjust the VOLUME control for a comfortable listening level.

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. Let the unit warm up for 30 seconds.
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 GE signal light on the control panel will glow each time the microphone button is pressed, indicating that the transmitter is on the air. The receiver is muted whenever 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 on the following page.

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, receiver and power supply (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 unit for servicing:

1. Unlock the radio (see Fig. 2).
2. Loosen the two captive screws shown in Figure 2.
3. Pull the radio forward about two inches out of mounting frame, and lift off top cover.
4. To gain access to the bottom side, pull the radio all the way out of mounting frame.

INTERMODULATION IMPROVEMENT KIT OPTION 8302

This modification kit is used to decrease the receiver sensitivity. The installation of this kit consists of lifting one lead of C305 in the first RF amplifier input circuit and adding a 39 ohm resistor in series with C305. The 20 dB quieting sensitivity is changed to 0.6 m Volt and 12 dB Sinad is changed to 0.4 m Volt. The Intermodulation

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	
GENERATOR AND REGULATOR - Check the generator and voltage regulator periodically to keep the generating system within safe and economical operating limits. If generator voltage is excessive, tubes, 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	
RELAY CONTACTS - Examine the relay contacts. Where contacts carry little or no current, the contacts do not clean themselves and an insulating coating is apt to form. When contacts become coated, remove the film with a suitable solvent applied with a non-metallic brush, such as a toothbrush. Current-carrying contacts are subject to pitting and should be burnished from time to time. Dust and particles should be removed by a clean, dry, non-metallic brush.	X	
ANTENNA - Keep the antenna, antenna base and all contacts clean and frre 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

specification remains the same. Increasing the value of the added resistor improves the intermodulation specification but also further decreases the sensitivity of the receiver.

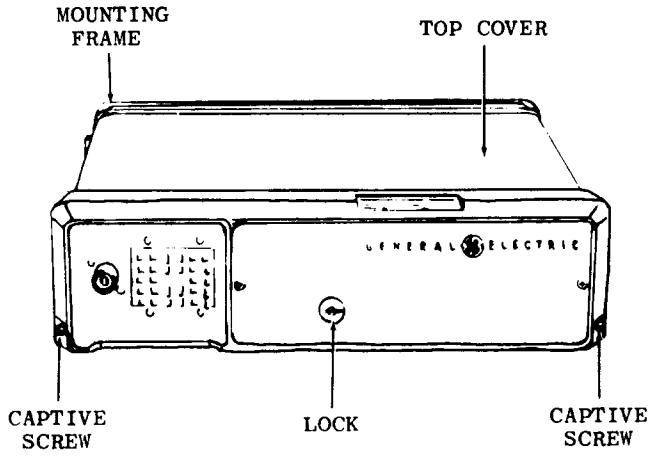


Figure 2 - Disassembly

CIRCUIT ANALYSIS

TRANSMITTER

Transmitter Types ET-74-A and ET-74-B are crystal-controlled, phase modulated transmitters designed for one-, two- or four-frequency operation in the 132-174 megahertz band in mobile or station applications. The transmitter consists of the following modules:

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

The model number and number of frequencies of each module is shown in the chart on the following page.

PA ASSEMBLY	EXCITER BOARD	NO. OF FREQUENCIES
4EF32F10 (132-150.8 MHz) 4EF32F11 (150.8-174 MHz)	4EG21F10 (Narrow Band) 4EG21F12 (Wide Band)	One-Frequency
4EF32F10 (132-150.8 MHz) 4EF32F11 (150.8-174 MHz)	4EG21F11 (Narrow Band) 4EG21F13 (Wide Band)	Two-Frequency

The transmitter uses a total of 7 transistors and 3 tubes to provide a minimum power output of 35 Watts in the 132-162 MHz range, and 30 Watts in the 162-174 MHz range. The crystals used range from 5.5 to 7.25 megahertz, and the crystal frequency is multiplied 24 times.

A centralized metering jack (J201) is provided for use with GE Test Set Model 4EX3A10. The test set meters the phase modulator, multipliers, driver and PA stage, as well as the B-plus and regulated supply voltages. The metering jack also provides access to receiver audio, microphone and push-to-talk leads.

Connection	Voltage	Use
J202-1	+450 VDC	PA B-plus
J202-2	+300 VDC	multiplier B-plus
J202-3	ground	
J202-4	-55 VDC	PA bias
J202-5	+12 VDC	relay supply
J202-6 &-7		filament
J105-2	+10 VDC reg.	Exciter supply

POWER INPUTS

All supply voltages are connected from the power supply to the transmitter through two 7-pin miniature connectors (J202 and J203). Voltages for the PA assembly are connected through J202, and are filtered by feed-through capacitors C222 through C229. Supply voltage, metering and control functions for the exciter board are connected from the PA assembly through a 9-pin miniature connector (J105). Supply voltages for the transmitter are shown in the preceeding chart.

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 +.0005% without crystal ovens or warmers. Feedback for the oscillator is developed across C113.

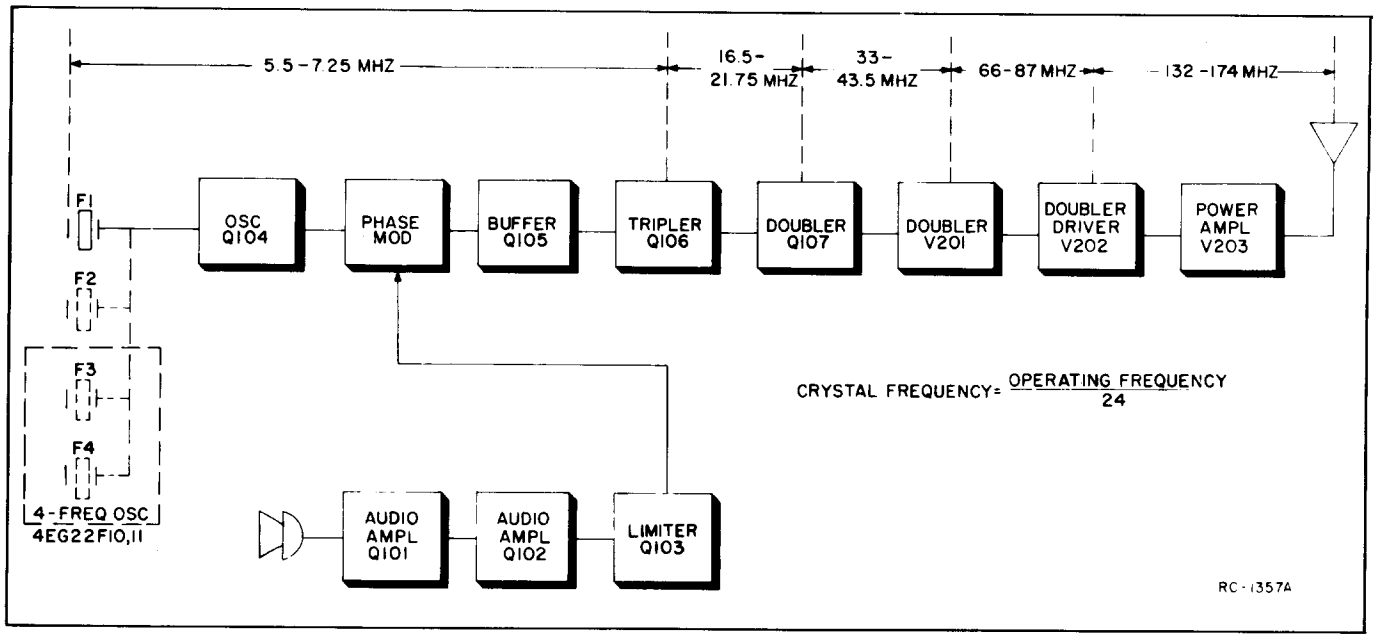


Figure 3 - Transmitter Block Diagram

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 Q104. 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 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.

For four-frequency transmitters, oscillator board Model 4EG22F10 or 11 is added. The oscillator board contains two crystal circuits (F3 and F4) identical to the F1 and F2 circuits. In four-frequency transmitters, F3 and F4 crystals are also switched by means of diode biasing. The output of the oscillator board is connected through J2603 to the Base of Q104.

AUDIO AMPLIFIERS AND LIMITERS

The audio section of the transmitter consists of DC-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 modulator circuit, and is normally set for ±4.5 kHz (narrow band) or ±13.5 kHz (wide 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 4EK14A10 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 DC coupled to the tripler.

Following Q105 are two L-C coupled Class C multiplier stages (Q106 and Q107). Q106 is a tripler stage with the collector tank tuned to three times the crystal frequency. The stage is metered at J201 through metering resistor R131.

Q107 operates as a doubler stage, 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 J201.

PA ASSEMBLY

MULTIPLIERS

The output of the transistorized exciter is link-coupled through T201 to the grid of beam pentode V201. This stage operates as a doubler with T202 tuned to 12 times the crystal frequency. The grid of V201 is metered across R201 at J201.

The output of V201 is transformer-coupled to the grid of beam pentode V202. This stage operates as a doubler-driver with the output tuned to 24 times the crystal frequency. The grid of V202 is metered through metering network R207 and R208.

POWER AMPLIFIER

The output of V202 is coupled to the grid of compactron beam power amplifier (V203) by a pi-network consisting of C209, L205 and C236/C210. The grid is tuned by C209 (PA GRID), and current is metered at J201-6 and J201-14 by measuring the voltage drop across R210. Bias voltage (-55 Volts) is applied to the PA grid through R210, L209 and L205.

Plate current is metered from J201-1 to J201-9 across metering resistor R214. Plate voltage is supplied through L206, and the PA plate tank is series-tuned by capacitor C214. The screen grid dropping resistor is R213.

WARNING

The meter leads are at plate potential (high B+) when metering the PA plate at J201-1 and J201-9.

Placing TUNE-OPERATE switch S201 in the OPERATE position effectively shorts R212 out of the circuit, and applies 300 Volts to grid dropping resistor R213 for normal

operation of the stage. Placing the switch in the TUNE position applies the screen voltage to dropping resistor R212 and shunt resistor R211 to drop the screen voltage. This reduces the plate dissipation while tuning the transmitter.

PA loading is achieved by varying the coupling between L207 and L208. The antenna circuit is tuned by C215.

RF from the antenna coil is fed through antenna changeover relay K201 to the low-pass filter, and then to the antenna.

RECEIVER

Receiver Type ER-48-C is a double conversion, superheterodyne FM narrow-band receiver designed for one-, two-, or four-frequency operation on the 132-174 megahertz band in mobile or station applications.

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. Frequency ranges and the number of frequencies for each receiver model are shown in the following chart.

Receiver Model	Frequency Range	No of Frequencies
4ER48C10	132-150.8 MHz	One-Freq.
4ER48C11	132-150.8 MHz	Two-Freq.
4ER48C12	150.8-174 MHz	One-Freq.
4ER48C13	150.8-174 MHz	Two-Freq.
4ER48C14	132-150.8 MHz	Four-Freq.
4ER48C15	150.8-174 MHz	Four-Freq.

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 underside of the system frame behind the power supply.

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 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

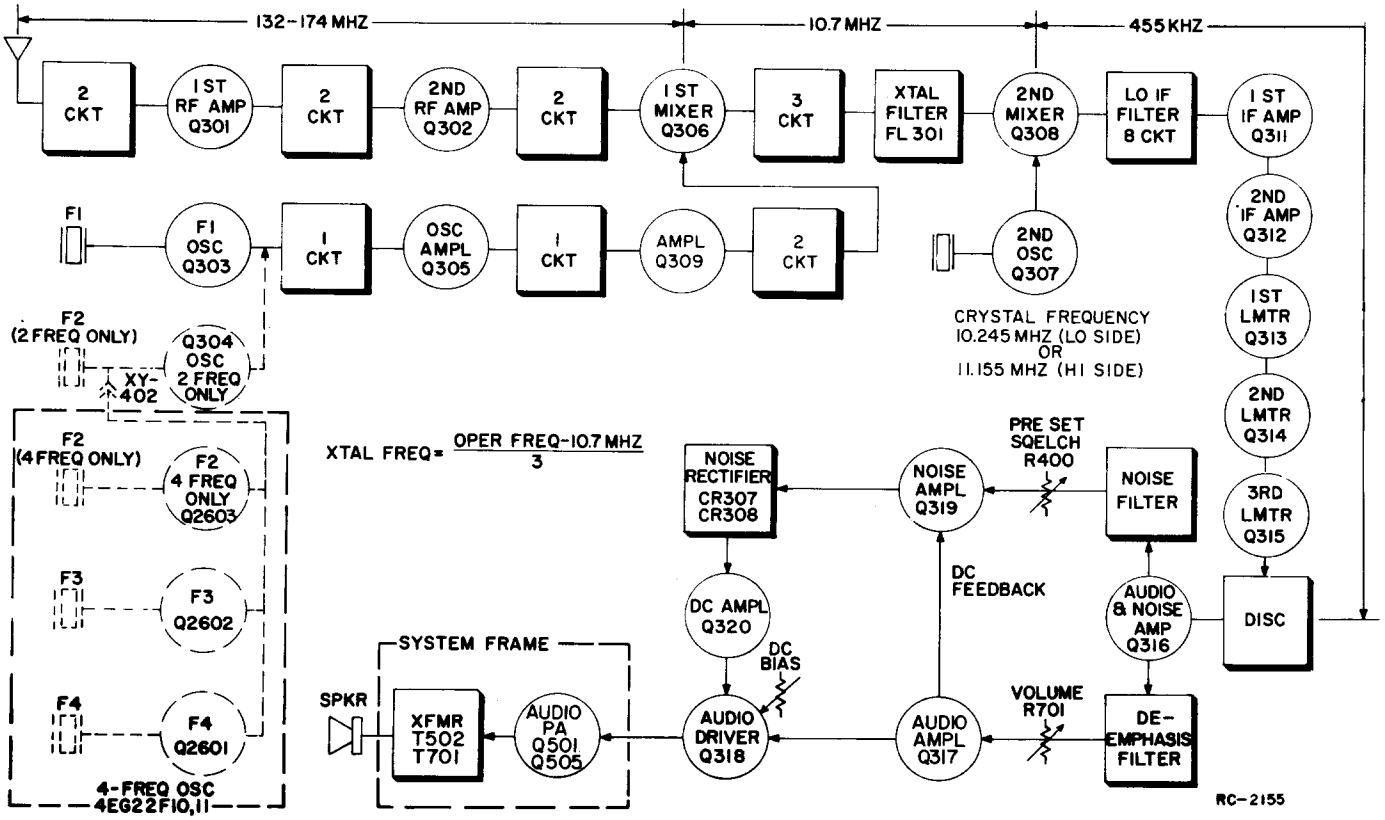


Figure 4 - Receiver Block Diagram

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 5A.

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 5B).

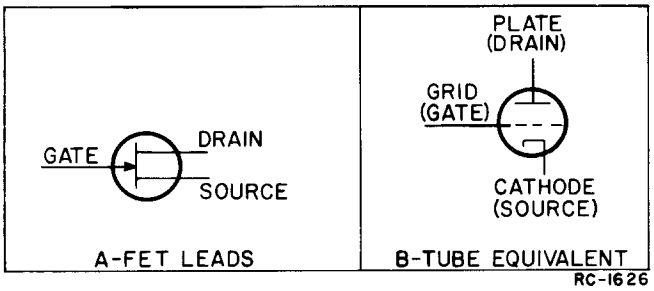


Figure 5 - FET Nomenclature

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.

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 mode-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.

For four-frequency operation, four-frequency oscillator board Model 4EG22F10 is added. The oscillator board contains three oscillator circuits (F2, F3 and F4) that are similar to the F1 oscillator circuit. The output lead of the oscillator board is plugged into crystal socket XY402, and the F2 oscillator board is modified so that Q304 can be used as an amplifier stage. Channels are selected by grounding the emitter of the desired oscillator by means of a four-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-amplifier Q309 are applied to 1st Mixer Q306.

The 1st Mixer uses a Field-Effect Transistor (FET) as the active device (Figure 5).

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 (FL301) 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 10.245-MHz (or 11.155 MHz) 2nd Oscillator output to produce 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-Seeley 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 Q505. DC BIAS trimmer R392 sets the bias on Q318 and Q505, and is adjusted for a 280 millivolt (500 milliamps) reading at metering jack J304-9. The output of Q505 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.

POWER SUPPLY

Transistorized Power Supply Model 4EP50A10 is used with MASTR Progress Line Executive Series mobile combinations. The power supply is mounted in the front casting which acts as a heat sink for the power transistors. Output filters and the 10-Volt regulator are mounted on the main chassis.

The fully transistorized power supply uses highly efficient silicon rectifiers for reliable operation. Polyester capacitors in the output filters provide additional reliability with good performance at low temperatures. Regulation of critical transmitter and receiver supply voltages provides improved operation over the wide range of input voltages encountered in mobile communications. The power supply provides:

- Plate, screen and bias voltage for the transmitter multiplier and power-amplifier stages,
- Regulated +10 Volts for the transistorized transmitter exciter board,
- Regulated +10 Volts for the receiver and for the four-frequency board.

Low voltage for the transmitter filaments, push-to-talk and antenna relays, receiver audio amplifiers and the 10-Volt regulator is taken directly from the vehicle battery.

The power supply is designed for operation in 12-Volt, negative-ground systems. For positive-ground systems, a DC-to-DC converter (Model 4EP54A10) must be used with a mobile combination. Figure 6 is a simplified power distribution and switching diagram.

MULTIVIBRATOR CIRCUIT

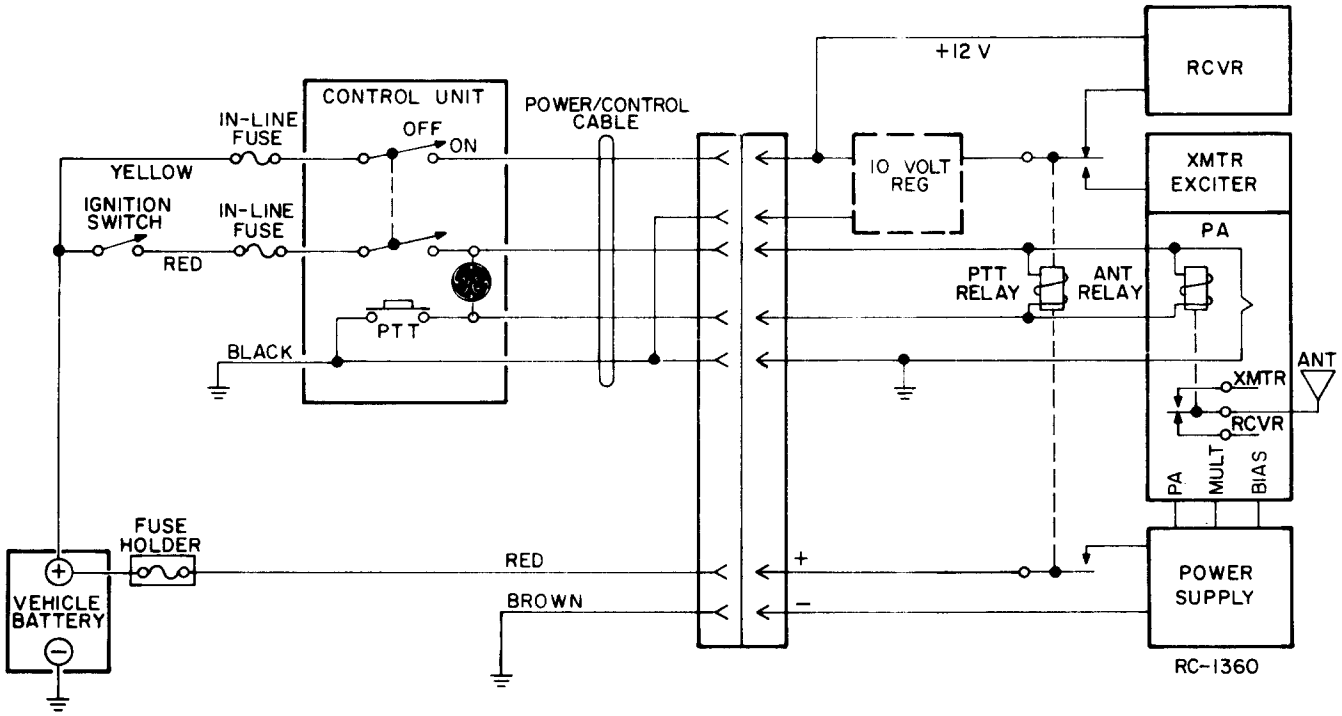
The power supply uses transistors Q501 and Q502 as switches in an inductively-coupled multivibrator circuit. These switches connect the battery voltage across alternate halves of the transformer primary, resulting in alternating square waves. The output of the multivibrator circuit (square wave generator) is stepped up by power transformer T501, then rectified and filtered to supply B-plus and bias voltage for the transmitter. The two transistors conduct alternately at a frequency of approximately 2,000 hertz.

RECTIFIER AND FILTER CIRCUITS

Negative Bias Supply

The AC voltage developed across secondary windings 13 and 15 of transformer T501

TRUNK-MOUNT



FRONT MOUNT

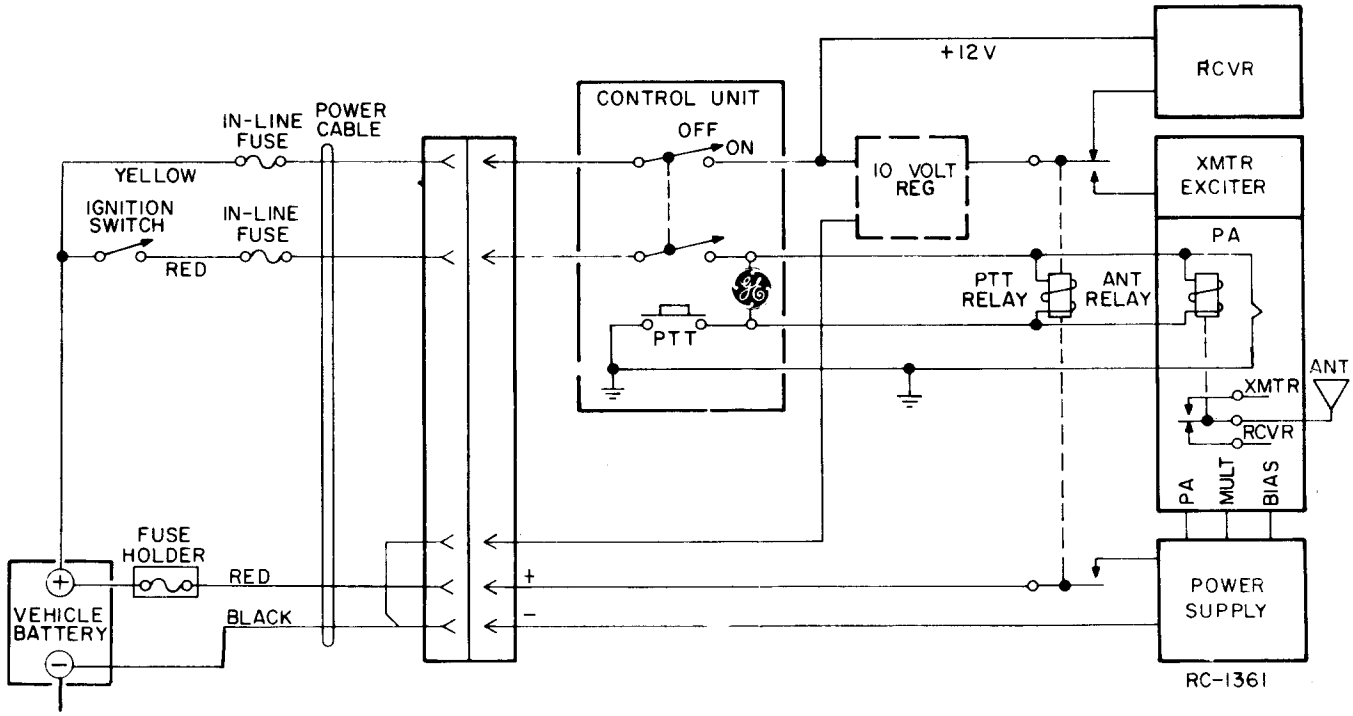


Figure 6 - 12-Volt, Negative-Ground Power Distribution Diagrams

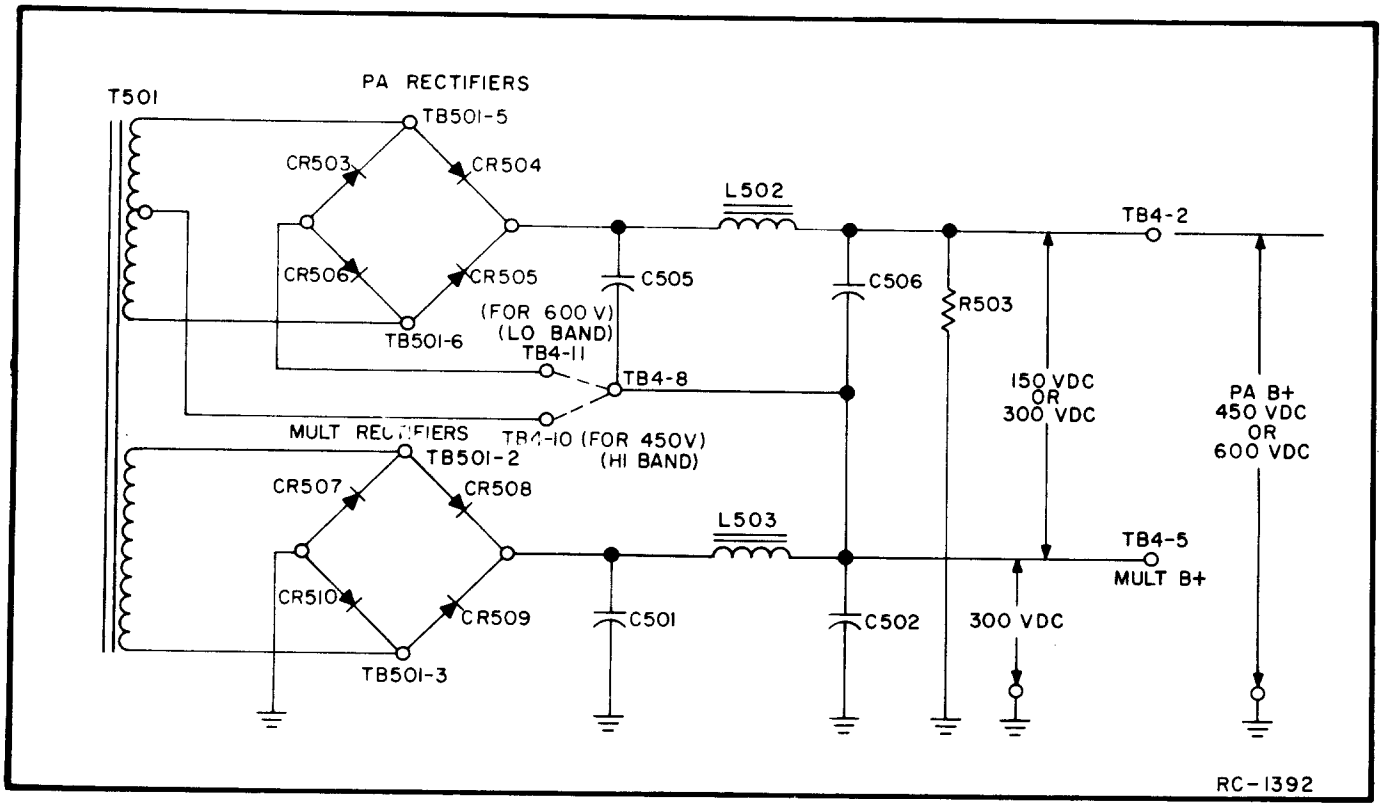


Figure 7 - Multiplier and PA B-Plus Circuits

is rectified by full-wave rectifiers CR501 and CR502. It is then filtered by C505, L501 and C506 to supply a negative 55 Volts for the control grid of the transmitter power amplifier. The bias voltage is present as a protective measure to limit cathode current in the PA tube while the PA is untuned, or in the case of loss of drive to the PA. R504 is a bleeder resistor.

Multiplier B-Plus (Figure 7)

The AC voltage developed across the high voltage secondary windings of T501 is rectified by a full-wave bridge rectifier circuit.

During one-half of each AC cycle, the voltage across TB501-2 and -3 of the high voltage output winding is rectified by CR507 and CR509. During the second half of the cycle, the voltage is rectified by CR508 and CR510.

Filtering is provided by L-C filter C501, L503 and C502. Relatively small values of L and C are required because of the high frequency and the square wave characteristics of the AC voltage.

Power Amplifier B-Plus (Figure 7)

High B-Plus for the power amplifier is provided by the PA rectifier circuit and the multiplier rectifier circuit connected in series.

In high band mobile combinations, a jumper is connected from TB4-8 to TB4-10, and the AC voltage developed across TB501-5 and -6 is rectified by CR504 and CR505. This output, in series with the multiplier output, supplies 450 Volts DC high B-plus.

In low band mobile combinations, the jumper is connected from TB4-8 to TB4-11, and the AC voltage is rectified by a bridge rectifier circuit consisting of CR503, CR504, CR505 and CR506. This output, in series with the multiplier output, supplies 600 Volts DC high B-plus.

The PA filter consists of C503, L502 and C504. R503 is a bleeder resistor.

+10 VOLT REGULATOR (A501)

The 10-Volt regulator provides a closely controlled supply voltage for the transmitter exciter, receiver and four-frequency oscillator board.

When the output voltage at the emitter of Q1 tries to increase, the voltage at the base of Q2 tends to become more positive. This makes Q2 conduct more heavily, causing the voltage at the base of Q1 to become more negative. With less base bias, Q1 conducts less and the voltage drop across the transistor is larger, keeping the output voltage constant.

When the output voltage tries to decrease, Q2 conducts less and the base bias on Q1 increases. This causes Q1 to conduct more heavily, reducing the voltage drop across the transistor and keeping the output constant.

Potentiometer R3 and resistor R4 form a voltage divider so that R3 can be adjusted for a +10 Volt output. Zener diode VR1 provides a voltage reference for the regulator. The output can be metered at the transmitter and receiver centralized metering jacks.

HEAT SINK SERVICING

Since the metal envelopes of the transistors are at collector potential, they must be electrically isolated from ground. However, there must be a good path for heat from the transistors to reach the cast aluminum radiator (heat sink) in which they are mounted, so that the heat will be dissipated by the heat sink. The anodized aluminum spacers used between the transistors and their mounting plate not only isolate the transistors electrically, but also provide a good thermal conductor to conduct heat away from them.

Silicon grease is used between the metal parts in the heat sink to improve the thermal contact between them and allow the heat to be transferred more readily.

NOTE

Always make sure that there is sufficient silicon grease on each side of the anodized aluminum washer whenever one of the power transistors is removed and replaced.

RE-INSTALLATION

If the mobile combination in which the power supply is mounted is ever moved to a different vehicle, be sure to check the battery polarity of the new system and, if necessary, install the DC-to-DC converter in positive-ground vehicles to maintain current polarity.

CONTROL UNITS

Six different models of control units are available for use with Executive Series mobile combinations. Three of the models are used with Trunk-Mount radios, and three with Front-Mount radios.

All models of the Control Unit have an OFF-VOLUME control, a MONITOR pushbutton and a red Transmit light. In addition, control units in multi-frequency combinations are equipped with a frequency-selector switch. The application of the different model control units is shown in the following chart.

TRUNK-MOUNT MODELS	FRONT-MOUNT MODELS	NO. OF FREQUENCIES
4EC67A10	4EC68A10	One
4EC67A11	4EC68A11	Two
4EC67A12	4EC68A12	Three or Four

CONTROLS

Off-Volume Control (S701/R701)

The OFF-VOLUME control normally determines whether or not the transmitter and receiver are operative. (Refer to section on Ignition Switch connections.) Turning the switch ON applies filament voltage to the transmitter, activates the push-to-talk (PTT) circuit, and applies +12 Volts to the receiver.

Pushing the PTT button on the microphone energizes the system relay and the antenna changeover relay. The system relay starts the power supply; and the antenna relay switches the antenna and mutes the receiver. Keying the transmitter also lights the red pilot light.

Monitor Pushbutton (S702)

Pressing in the MONITOR button disables the noise squelch circuit in the receiver. In radios equipped with Channel Guard, pressing the MONITOR button also disables the receiver Channel Guard.

Multi-Frequency Switches (S703 and S704)

In multi-frequency applications, a frequency-selector switch selects the channel desired for both transmit and receive. S703 is used in two-frequency control units, and S704 is used in three-or four-frequency control units.

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 multi-frequency radios, the transmitter and receiver Channel Guard operates on all frequencies.

IGNITION SWITCH CABLE CONNECTIONS

The ignition switch cables may be connected for three different modes of operation, depending on the way the cables are connected in the vehicle system. The black ignition switch cable (in Trunk-Mount control units only) provides the receiver ground connection. The yellow fused lead provides the receiver positive. The red fused lead provides the hot connection for the transmitter filaments. The three types

of operation are:

1. Ignition Switch Standby-For this type of operation, the red fused lead (transmitter filament voltage) is connected to the ACCESSORY or ON terminal of the ignition switch. The yellow fused lead (receiver hot) is connected to the hot side of the ignition switch, and the black lead connects to vehicle ground.

   With the ignition switch OFF, the receiver automatically reverts to STBY, ready to receive messages. Turning the ignition switch to the ON or ACCESSORY position supplies transmitter filament voltage. Turning the OFF-VOLUME switch to OFF removes all power to the Two-Way Radio.

2. Ignition Switch Control - For ignition switch control, the yellow and red fused leads are connected to the ACCESSORY or ON terminal of the ignition switch. The transmitter and receiver will operate only when the ignition switch is in the ACCESSORY or ON position. Turning the ignition switch OFF removes all power to the radio.

3. Ignition Switch Bypass - For ignition switch bypass, the yellow and red fused leads connect to the "hot" side of the ignition switch or the vehicle fuse block assembly. Both the transmitter and receiver operate independently of the ignition switch and can be turned on and off only by the OFF-VOLUME switch on the Control Unit.

CHANNEL GUARD

Channel Guard Board Model 4EK14B10 is a fully transistorized encoder-decoder for use with MASTR Executive Series 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.

CARRIER CONTROL TIMER

The Carrier Control Timer option shuts off the transmitter on each transmission after a one-minute timing cycle, and alerts the operator that the transmitter is off by means of an alarm tone in the speaker. The transmitter can be turned on again by releasing and rekeying the push-to-talk switch on the microphone. The timer option is assembled on a printed wiring board that mounts on the underside of the main chassis.

The timing cycle (transmitter keyed time) is normally set at the factory for a duration of one minute. An optional potentiometer is available that permits the timing cycle to be adjusted from 15 seconds to 5 minutes. Complete instructions for the Carrier Control Timer are contained in Maintenance Manual LBI-4138.

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 Oscillator Model 4EX6A10
2. Frequency Modulation Monitor
3. AC VTVM or output meter
4. G-E 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 G-E Test Set, or across J201-15 (mike hi) and J201-7 (mike lo) on the Centralized Metering Jack.
2. Apply a 1.0 volt signal at 1000 Hz to Test Set or across J201-15 and J201-7 on the Centralized Metering Jack.
3. Set MOD ADJUST (R110) for a 4.5 KHz (Narrow Band) or 13.5 KHz (Wide Band) swing with deviation polarity which 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.

Multi-frequency Transmitters

Check all channels for deviation as described in Steps above.

ALIGNMENT PROCEDURE CHANGES FOR 10-WATT RADIO COMMON CARRIER DISPATCH STATIONS WITH TRANSMITTER TYPE ET-74-C (Option 8450)

In this service, FCC regulations restrict the transmitter power output to 10 watts. Whenever MASTR Desk Top Stations are used in such services, make the following changes in the transmitter Alignment Procedure (RC-1411 in LBI-3737):

In Steps 9, 11, 13 and 14 of the Alignment Procedure, adjust the PA LOADING for a watt meter output of 10 watts and note the Test Meter reading. This reading will indicate the correct PA loading. If a watt meter is not available, adjust the PA LOADING for a meter reading of 0.32 volt (instead of 0.7 volt).

——— NOTE ———

The following changes were made in the station for 10-watt operation:

- In the PA assembly, the PA screen grid resistor (R213) was changed from 8.2K to 22K.
- In the power supply, the jumpers between TB4-14 and -18, and TB4-12 and -15 were removed. The jumpers between TB4-14 and -19, and TB4-8 and -15 were added.
- Changed transmitter type number to ET-74-C.

PA POWER INPUT

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

$$P_i = \frac{\text{Plate Voltage} \times \text{Plate Current Indication}}{4.3}$$

where

P_i is the power input in watts.

Plate voltage is measured with G-E Test Set in Position G, using the 1000-volt scale (or measured from J201-1 to -16 with multimeter).

Plate current indication is measured with G-E Test Set in Position G, using the TEST 1 scale (or measured from J201-1 to -9 with multimeter).

4.3 is the value of the plate current metering resistor in ohms.

FOR OPERATING AT REDUCED POWER

In some services, FCC regulations do not permit the use of full rated power input to the final amplifier plate circuit (ET-74-A or ET-74-B). In such cases, the PA LOADING control must not be adjusted for a meter reading of 0.79 at J201 as shown in Step 13 of the Alignment Procedure.

To find the maximum permissible meter reading at J201, measure the PA plate voltage under load and derive the meter reading from the following formula:

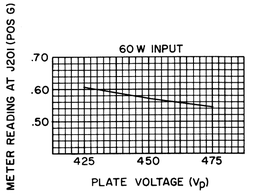
$$V_{meter} = \frac{4.3 \times P}{V_p}$$

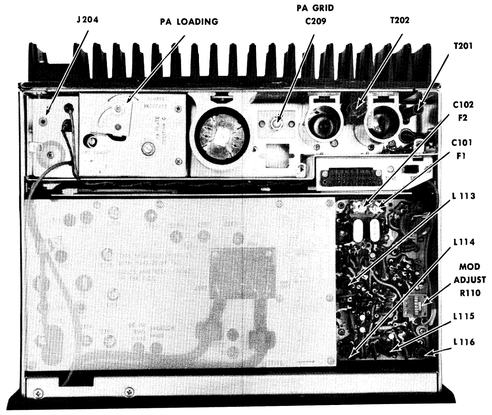
Where V_{meter} is the maximum permissible test set reading (position G for G-E Test set, or J201-1 and -9 with multimeter):

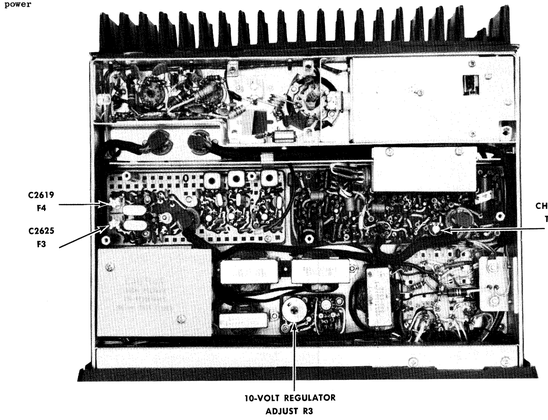
P is the maximum permissible power input

V_p is the measured plate voltage under load

The maximum permissible J201 reading vs plate voltage for a power input of 60 watts is shown in the following chart.







TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. General Electric Test Set TM11 or TM12, or a 20,000 ohms-per-volt Multimeter with a 1-volt scale, 50-ohm wattmeter, and a frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place crystal(s) in crystal socket(s). (Crystal frequency = operating frequency ÷ 24).
2. Turn PA LOADING to minimum loading position, set crystal trimmer C101 to mid-capacity.
3. For multi-frequency transmitters, set all trimmers to mid-capacity and set the Control Unit CHANNEL SELECTOR Switch to the highest frequency channel.
4. Place the TUNE-OPERATE Switch (S201) in the TUNE position.
5. For a large change in frequency or a badly mis-aligned transmitter, above 150 MHz, turn the slugs in the Exciter coils (L113, L114, L115, L116) to the bottom of the coil. (For transmitters below 150 MHz, set the slugs in the center of the coils.) Set the T201 slug to the top of the coil. Set the T202 top slug to the top of the coil and the bottom slug to the bottom of the coil.
6. Connect TEST SET to the Transmitter Centralized Metering Jack J201. Turn the test set polarity switch to (+). If using a multimeter, connect the leads as shown below.
7. Connect wattmeter to J204.
8. With TEST SET in position I, key the transmitter and check for a regulated 10 volts (read on 15-volt scale). If voltage is not correct, adjust 10-volt regulator potentiometer R3 for 10-volts. Then move TEST SET plug to receiver metering jack and check 10-volts at Position J. If reading is not approximately 10 volts, refer to the Power Supply Troubleshooting Diagram.
9. All adjustments are made with the transmitter keyed and the TEST SET on the 1-volt TEST scale.

TRANSMITTER ALIGNMENT PROCEDURE

STEP	METERING POSITION 4EX3A10	METERING POSITION MULTIMETER AT J201	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
			EXCITER BOARD		
1.	A MULT-1	pin 10 (+) pin 16 (-)	L113 & L114	SEE Procedure	Carefully tune L113 for maximum meter reading, then tune L114 for a small dip in meter reading.
2.	B MULT-2	pin 2 (+) pin 16 (-)	L115, L114 and L116	See Procedure	Tune L115 and re-tune L114 for maximum meter reading, then tune L116 for a dip in meter reading.
			MULT-3 AND POWER AMPLIFIER		
3.	D MULT-3	pin 16 (+) pin 4 (-)	T201 & L116	Maximum	Adjust T201 for maximum meter reading, then re-adjust L116 maximum meter reading.
4.	E MULT-4	pin 16 (+) pin 5 (-)	T202	Maximum	Adjust top slug of T202 for maximum meter reading. Adjust bottom slug of T202 for maximum meter reading, then re-adjust top slug for maximum meter reading.
5.	F PA GRID	pin 14 (+) pin 6 (-)	PA GRID C209	Maximum	Tune C209 for maximum meter reading.
6.	G PA PLATE	WARNING High B+ on pins 1 & 9 pin 1 (+) pin 9 (-)	PA PLATE (C214)	See Procedure	Carefully tune PA Plate for minimum meter reading. Adjustment is quite sharp and will be only a small dip in meter reading.
7.			Place TUNE/OPERATE Switch S201 in the OPERATE position.		
8.	G PA PLATE	pin 1 (+) pin 9 (-)	PA PLATE		Carefully re-tune PA Plate for minimum meter reading.
9.	G PA PLATE	pin 1 (+) pin 9 (-)	PA LOADING	0.7 volts	Adjust PA LOADING for meter reading of 0.7 volts.
10.	G PA PLATE	pin 1 (+) pin 9 (-)	ANT TUNING C215	Maximum	Adjust ANT TUNING for maximum meter reading.
11.	G PA PLATE	pin 1 (+) pin 9 (-)	PA LOADING AND ANT TUNING	See Procedure	Re-adjust PA LOADING for 0.7 volts. Re-adjust ANT TUNING for maximum meter reading.
12.	F PA GRID	pin 14 (+) pin 6 (-)	PA GRID	Maximum	Repeak PA GRID for maximum meter reading.
13.	G PA PLATE	pin 1 (+) pin 9 (-)	PA LOADING	0.79 volts	Increase PA LOADING until meter reads 0.79 volts.
14.	G PA PLATE	pin 1 (+) pin 9 (-)	ANT TUNING	Maximum	Repeak ANT TUNING, then repeat Step 13 and repeak ANT TUNING.
			FREQUENCY ADJUSTMENT		
15.			C101 (C102 in 2-freq. units, and C2625 or C2619 in multi-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. In 3- or 4-frequency units, adjust C2625 or C2619 as required. ——— 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 TYPES

ET-74-A, B, C & E

RC-1411H

TEST PROCEDURES

These Test Procedures are designed to assist you in servicing a transmitter that is operating--but not properly. Problems encountered could be low power output, low B plus, 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:

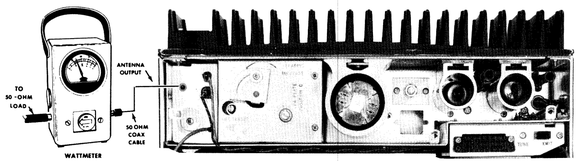
1. Wattmeter similar to:
   Bird #43
   Jones #711N
2. VTVM similar to:
   Triplett #850
   Heath #1M-21
3. Audio Generator similar to:
   GE Model 4EX6A10
   Heath #1G-72
4. Deviation Meter (with a .75 kHz scale) similar to:
   Measurements #140
   Lampkin #205A
5. Multimeter similar to:
   GE METERING TEST SET MODEL 4EX3A10 or Triplett #631 or 20,000 ohms-per-volt voltmeter

STEP 1

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output to wattmeter as shown below:



2. Key transmitter and check wattmeter for minimum reading of 35 watts (132-162 MHz) or 30 watts (162-174 MHz) in ET-74-A & B, or 10 watts in ET-74-C.

SERVICE CHECK

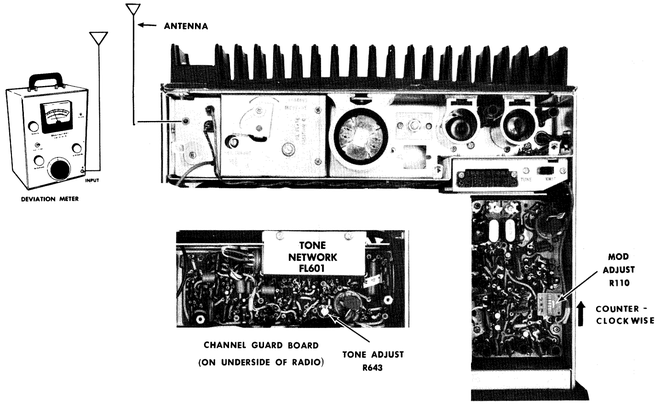
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



2. Set MOD ADJUST control R110 fully counterclockwise.

3. 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:

1. 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 Chart).

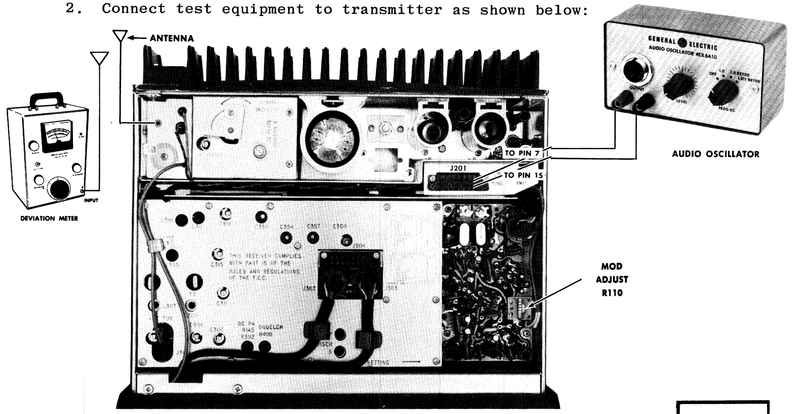
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STEP 3

VOICE DEVIATION AND SYMMETRY

TEST PROCEDURE

1. Unplug the microphone.
2. Connect test equipment to transmitter as shown below:



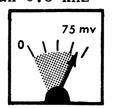
3. Set the generator output to 1.0 VOLTS RMS and frequency to 1 kHz.
4. Key the transmitter by connecting a jumper from J201-18 to J201-16 (GRD). Then adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ±4.5 kHz (Narrow Band) or 13.5 kHz (Wide Band).
6. Adjust MOD ADJUST Control R110 until deviation reads 4.5 kHz (Narrow Band) or 13.5 kHz (Wide Band) 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 4.5 kHz (13.5 kHz Wide Band) deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz (15 kHz Wide Band) under the worst conditions of frequency, voltage and temperature.

If the deviation reading plus (+) and minus (-) differs by more than 0.5 kHz (1.5 kHz Wide Band) check the following:

1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. Check Audio Sensitivity by reducing generator output until deviation falls to 3.0 kHz (10 kHz Wide Band). 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

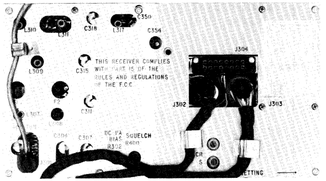
1. GE Test Set TM11 or TM12 (or 20,000 ohms-per-volt Multimeter).
2. 130-174 MHz signal source (keep signal level below saturation).

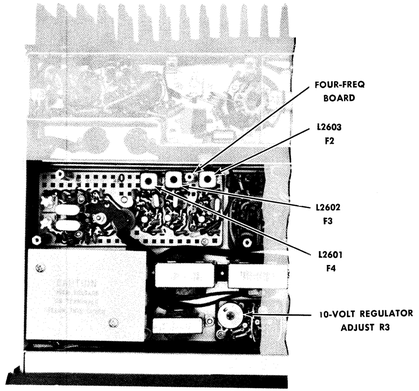
PRELIMINARY CHECKS AND ADJUSTMENTS

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 adjust PA Bias R392 for a reading of 0.28 volts (500 milliamps).

ALIGNMENT PROCEDURE

STEP	METERING POSITION 4EX3A10	METERING POSITION Multimeter + at J304	TUNING CONTROL	METER READING	PROCEDURE
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 150 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.				30°	Set SQUELCH Control (R400) to open with a 4 dB SINAD signal. (Approximately 30° counter-clockwise of critical squelch position.)





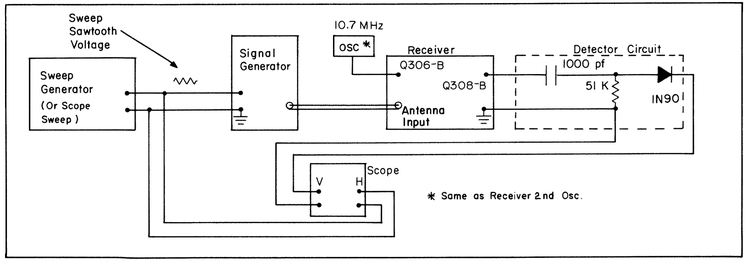


Figure 1 - High and Low IF FILTER TEST Circuit

COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set TM11 or TM12 (or 20,000 ohms-per-volt Multimeter).
2. 10.7MHz (±200 Hz) and 130-174MHz signal source. Couple the 10.7MHz signal through a 0.01 uf 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 STEP 8 of the Transmitter Preliminary Checks and Adjustment Procedure.
4. Turn SQUELCH control fully clockwise and VOLUME control to minimum. Switch to Position "G" (or measure at J304-9 with multimeter) and adjust PA Bias potentiometer R392 for a reading of 0.28 volts (500 milliamps).

ALIGNMENT PROCEDURE

STEP	METERING POSITION TEST SET 4EX3A10	METERING POSITION MULTIMETER + 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 ±50KHz/s 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 symetrical wave form shown, with marker in center.
8.	A DISC	pin 10			Check to see that discriminator idling voltage is within 0.05 volts of zero with no signals applied and the modulation acceptance bandwidth is greater than ±8 KHz (narrow band) or ±16 KHz (wide 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.
			FREQUENCY ADJUSTMENT		
16.	A DISC	pin 10	L307 (L308 for 2-freq. or L2603, L2602 or L2601 on 4-freq. board for 3- or 4-freq.)	Zero	Apply the exact channel frequency signal to J301 and tune L307 (L308 for 2-frequency) for zero discriminator reading. In 3- or 4-frequency units, tune L2603, L2602 or L2601 as required. NOTE 2 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.				30°	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

RC-2162B

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:

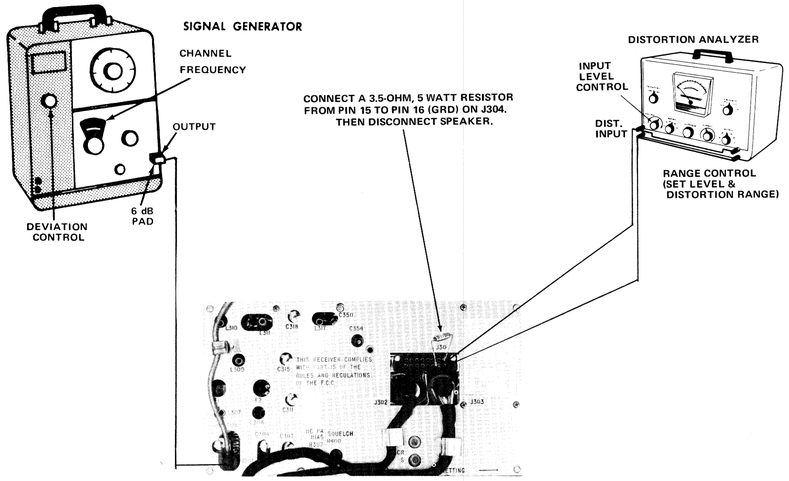
  Heath IM-12

- Signal Generator similar to:

  Measurements M-800

- 6-dB attenuation pad, and 3.5 ohm,

  5-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 test equipment and let it warm up for 20 minutes.

STEP 1
AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Connect a 1,000-microvolt test signal modulated by 1,000 hertz with +3.3 kHz deviation to the antenna jack J301.

B. When speaker is used, disconnect speaker (and handset if present). Hook up a 3.5-ohm load resistor from J304-15 to J304-16 as shown.

C. Set VOLUME Control for two-watt output (2.65 VRMS).

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 5%. If the receiver sensitivity is to be measured, leave all control and equipment as they are.

SERVICE CHECK

If the distortion is more than 5%, or maximum audio output is less than two watts, make the following checks:

E. Battery and regulator voltage--low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)

F. DC Bias Adjust R392 (Position "G" on Test Set) --- should be adjusted for 0.28 volts (500 milliamps). (Refer to Receiver Alignment on reverse side of page).

G. Audio Gain (Refer to Receiver Troubleshooting Procedure).

H. Discriminator Alignment (Refer to Receiver Alignment on reverse side of page).

STEP 2
USABLE SENSITIVITY (12-dB SINAD)

If STEP 1 checks out properly, measure the receiver sensitivity as follows:

A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with 3.3-kHz deviation to J301.

B. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000-Hz distortion range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

C. Place the RANGE switch to the SET LEVEL position (Filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on a mid range (30%).

D. While reducing the signal generator output, switch the RANGE control from SET LEVEL to the distortion range until a 12-dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

E. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specifications with an audio output of at least one watt (1.87 volts RMS across the 3.5-ohm receiver load using the Distortion Analyzer as a VTVM).

F. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD specification, check the alighment of the RF stages as directed in the Alignment Procedure, and make the gain measurements as shown on the Troubleshooting Procedure.

STEP 3
MODULATION ACCEPTANCE BANDWITH (IF BANDWITH)

If STEPS 1 and 2 check out properly, measure the bandwidth as follows:

A. Set the Signal Generator Output for twice the microvolt reading obtained in the 12-dB SINAD measurement.

B. Set the RANGE control on the Distortion Analyzer in the SET LEVEL position (1000-Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12-dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±8 kHz (but less than ±10 kHz).

SERVICE CHECK

If the Modulation Acceptance Bandwidth test does not indicate the proper width, make gain measurements as shown on the Receiver Troubleshooting Procedure.

PARTS LIST

LBI-3719E

132-174 MHz TRANSMITTER
TYPE ET-74-A NARROW BAND
TYPE ET-74-B WIDE BAND
TYPE ET-74-E 8-FREQ.

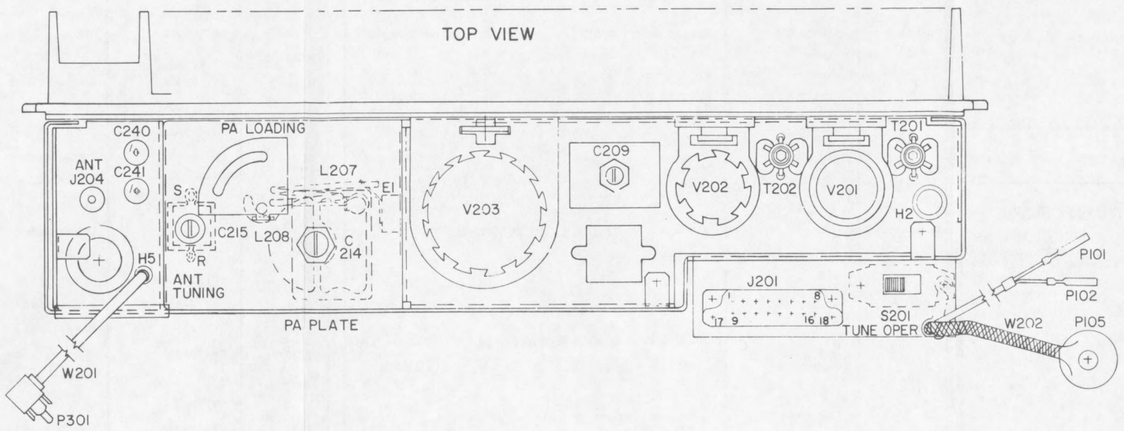
SYMBOL	GE PART NO.	DESCRIPTION
		EXCITER BOARD WITH CHANNEL GUARD MODEL 4EG21F10 1 FREQ NARROW BAND REV B MODEL 4EG21F11 2 FREQ NARROW BAND REV B MODEL 4EG21F12 1 FREQ WIDE BAND REV B MODEL 4EG21F13 2 FREQ WIDE BAND REV B
		CAPACITORS
C101 and C102	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C103 and C104	5496219P10	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C105 thru C108	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C109 and C110	5496219P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C111 and C112	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C113	5496372P167	Ceramic disc: 510 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C114	5490008P41	Silver mica: 390 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C115	4029003P4	Silver mica: 680 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-20.
C116	5494481P131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C117	5496219P37	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C118	5496372P45	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -2200 PPM.
C119	5490008P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C120	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C121	5496219P218	Ceramic disc: 56 pf ±10%, 500 VDCW, temp coef -80 PPM.
C122* and C123*	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
		In REV B and earlier:
	5494481P129	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, phen: 1 pf ±.05 pf, 500 VDCW, temp coef 0 PPM; sim to Jeffers Type JM-5/32.
C127	5494481P112	Ceramic disc: 1000 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: .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: .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.
C142*	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added by REV A.
		DIODES AND RECTIFIERS
CR101 and CR102	19A115603P1	Silicon.
CV101	5495769P9	Silicon, capacitive.
		JACKS AND RECEPTACLES
J101 thru J104	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J105	19B209303P1	Connector, phen: 9 pins.
J2603		(Part of printed board 19C303835P1).
		INDUCTORS
L113	19C303883G13	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.
		In Models earlier than REV A:
	19C303883G16	Coil. Includes tuning slug 5491798P2.
		TRANSISTORS
Q101	19A115889P1	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.
		RESISTORS
R101*	3R77P154K	Composition: 0.15 megohm ±10%, 1/2 w. Deleted by REV B.
R102	3R77P562K	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.
R114*	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w. Deleted by REV B.
R115*	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w. Deleted by REV B.
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.
		In Models of REV A and earlier:
	3R77P472K	Composition: 4700 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.
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.
R139	3R77P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R140	3R77P623J	Composition: 62,000 ohms ±5%, 1/2 w.
R164*	3R77P204J	Composition: 0.20 megohm ±5%, 1/2 w. Added by REV B.
R165*	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w. Added by REV B.
R166*	3R77P563J	Composition: 56,000 ohms ±5%, 1/2 w. Added by REV B.
		THERMISTORS
RT101 and RT102	19B209353P2	Disc: 460 ohms max; sim to GE 16D-3121.
RT103 and RT104	19B209353P1	Rod: 10,200 ohms min; sim to GE 1R-1544.
		SOCKETS
XY101 and XY102		Refer to Miscellaneous Parts.
		CRYSTALS
		NOTE: When reordering give GE Part Number and specify exact frequency needed.
		Crystal freq = Operating Freq. / 24
Y101 and Y102	19B206204P1	Quartz: freq range 5400-7250 KHz, temp range -30°C to +85°C.
		MISCELLANEOUS
	4033089P1	Clip. (Part of XY101, 102).
	19A115793P1	Contact, electrical: sim to Malco 2700. (Part of XY101, 102).
	19C311172P1	Socket, crystal. (Part of XY101, 102).
	19B200525P9	Rivet. (Part of XY101, 102).
		POWER AMPLIFIER MODEL 4EF32F10 132-150.8 MHz REV B MODEL 4EF32F11 150.8-174 MHz REV B
		CAPACITORS
C202	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.

(Cont'd on back of RC-1414)

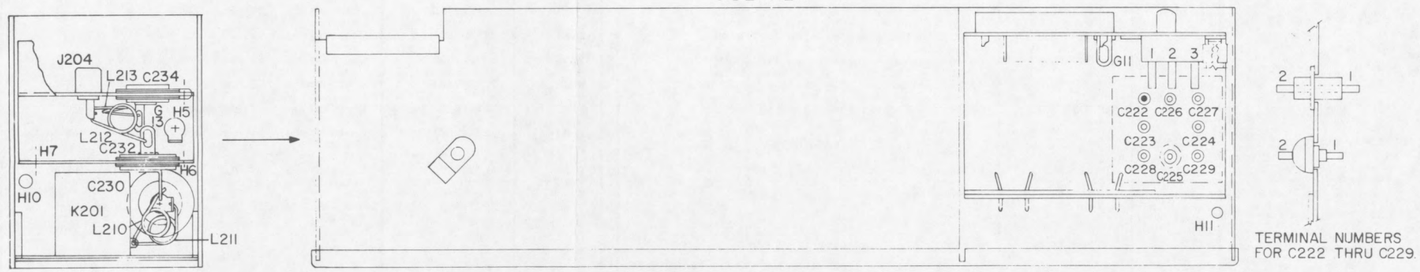
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PA ASSEMBLY 4EF32F10

TOP VIEW

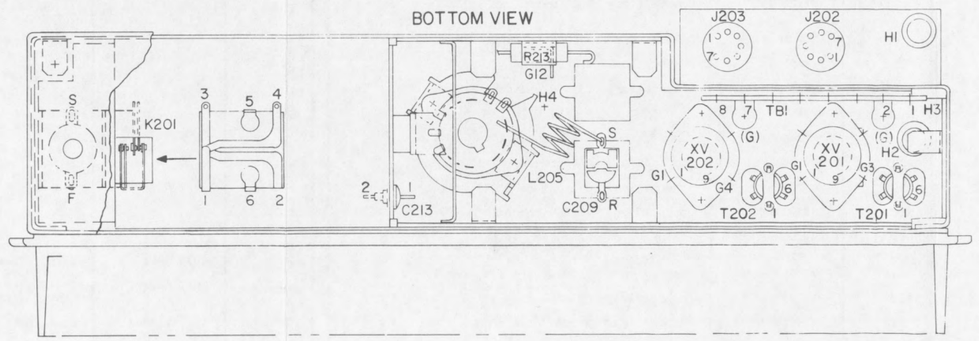


SIDE VIEW

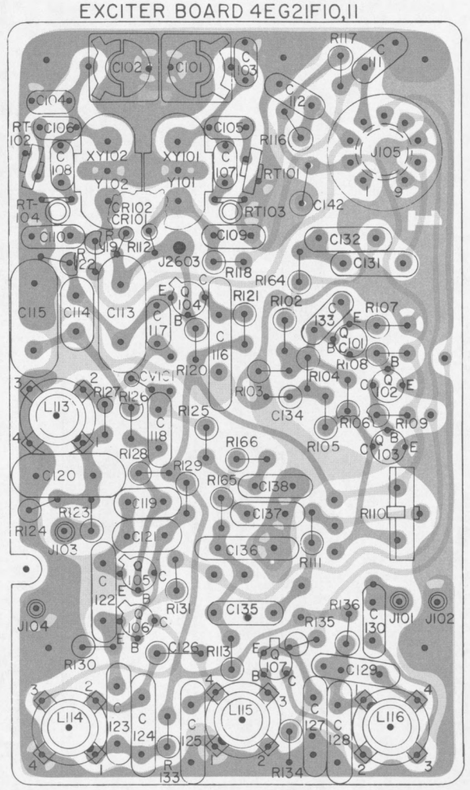


TERMINAL NUMBERS FOR C222 THRU C229.

BOTTOM VIEW



EXCITER BOARD 4EG21F10,11



RESISTANCE READINGS

ALL READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR OR TUBE PINS TO GROUND WITH A 20,000 OHM PER VOLT METER, AND WITH ALL POWER TURNED OFF. READINGS ON THE EXCITER BOARD OVER 1,000 OHMS READ ON THE X 1,000 SCALE. + OR − SIGNS SHOW METER LEAD GROUNDED.

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

PA ASSEMBLY

SYMBOL NO.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12
V201	6.3K	180	47K	FIL	FIL	180	100K	47K	100			
V202	6K	220	47K	FIL	FIL	220	27K	47K	220			
V203	FIL	0	20K	20K	20K	0	22K	0	0	6K	22K	-11

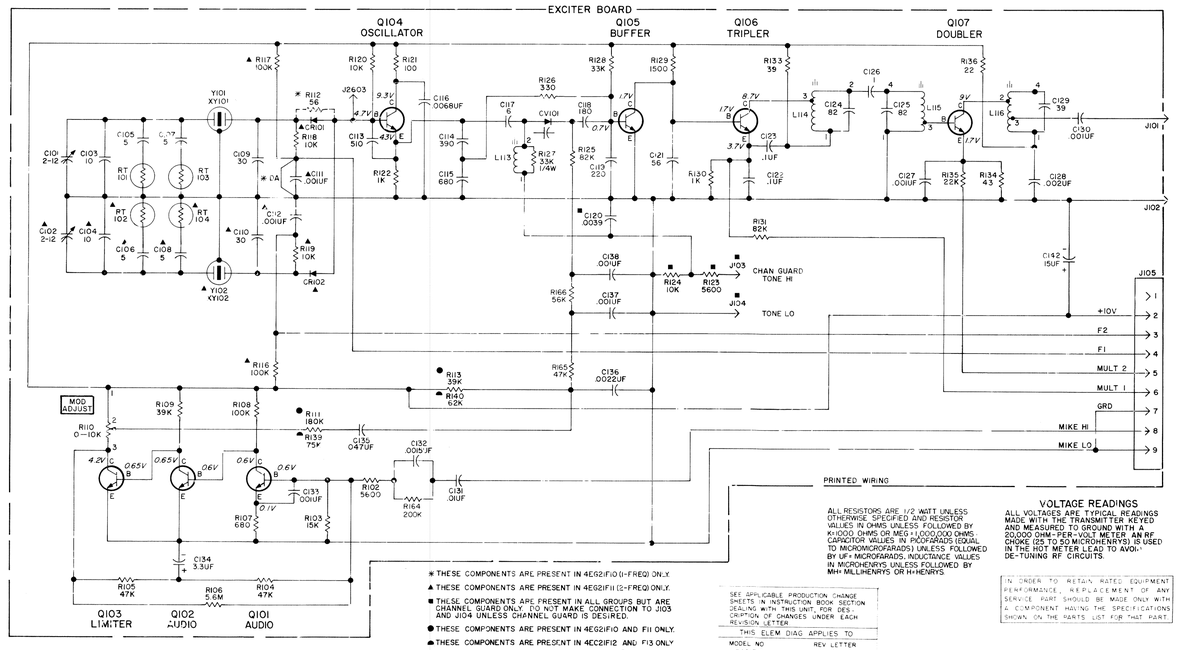
(19D402815, Rev. 5)
(19B205178, Sh. 1, Rev. 1)
(19B205178, Sh. 2, Rev. 1)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

OUTLINE DIAGRAM

132—174 MHZ TRANSMITTER
TYPES ET-74-A, B & E

RC-1413H



VOLTAGE READINGS

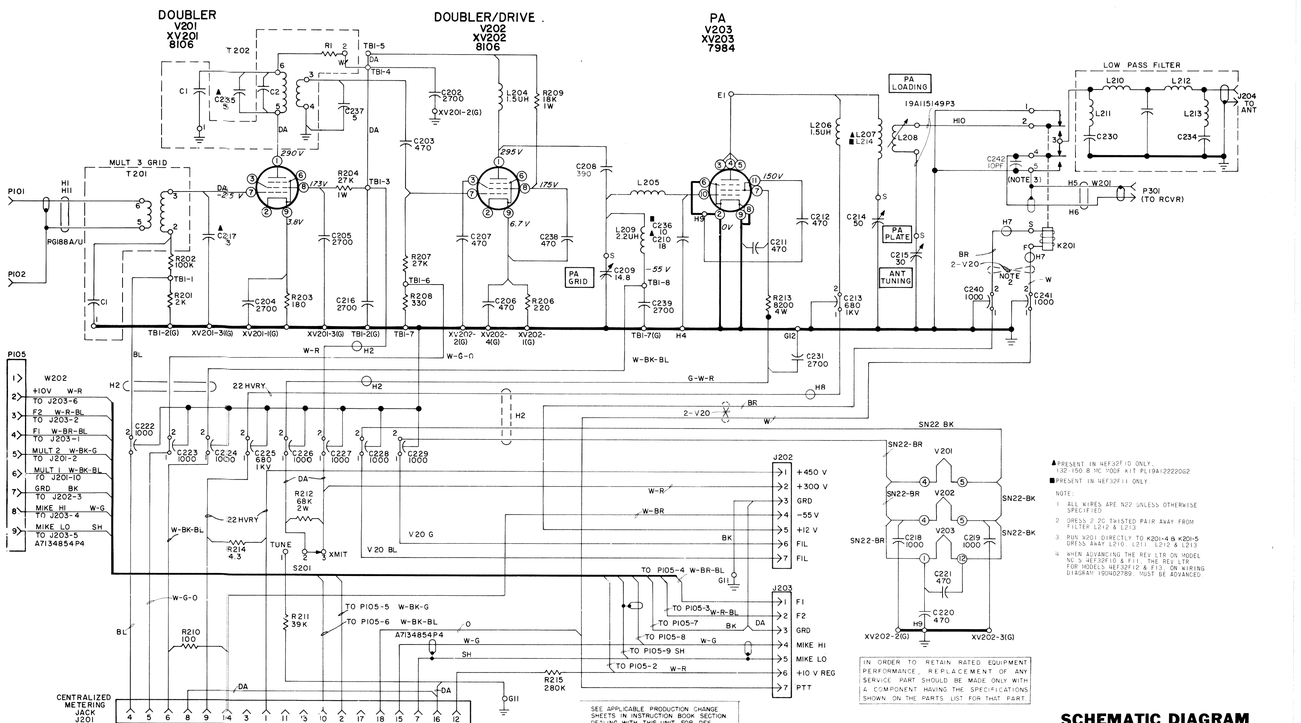
ALL VOLTAGES ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYED AND MEASURED TO GROUND WITH A 20,000 OHM-PER-VOLT METER. AN RF CHOKE (25 TO 50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DE-TUNING RF CIRCUITS.

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

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

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EG2IFIO	C
4EG2IFII	C

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.



▲PRESENT IN 4EF32F10 ONLY. 132-150.8 MC 100F KIT PL19A1222062
■PRESENT IN 4EF32FI1 ONLY.

NOTE:
1. ALL WIRES ARE N22 UNLESS OTHERWISE SPECIFIED.
2. DRESS 2 20 TWISTED PAIR AWAY FROM FILTER L212 & L213
3. RUN X201 DIRECTLY TO X201-4 & X201-5 DRESS A4AT L210, L211, L212 & L213
4. WHEN ADVANCING THE REV LTR ON MODEL NO'S 4EF32F10 & F11, THE REV LTR FOR MODELS 4EF32F12 & F13, ON WIRING DIAGRAM 19D402789, MUST BE ADVANCED.

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
4EF32F10-B	(SEE NOTE 4)
4EF32F11-B	

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

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

SCHEMATIC DIAGRAM

132—174 MHZ TRANSMITTER TYPES ET-74-A, B & E

RC-1414J

(Cont'd from front of RC-1413)

SYMBOL	GE PART NO.	DESCRIPTION
C203	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C204 and C205	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C206 and C207	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C208*	7489162P141	Silver mica: 390 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
		In Models earlier than REV A:
	7489162P143	Silver mica: 470 pf ±10%, 300 VDCW; sim to Electro Motive Type DM-15.
C209	19B209328P5	Variable, air: approx 1.85 to 14.8 pf, 650 v peak; sim to EF Johnson 193-5-2.
C210	5496218P612	Ceramic disc: 18 pf ±10%, 500 VDCW, temp coef -470 PPM.
C211 and C212	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C213	19A116470P1	Ceramic, feed-thru: 680 pf ±20%, 1000 VDCW; sim to Erie 2432-019-X5RO-681M.
C214	19B209329P1	Variable, air: approx 5.1 to 50 pf, 1700 v peak; sim to Star Products Model APL.
C215	19B209328P10	Variable, air: approx 2.62 to 30.6 pf, 650 v peak; sim to EF Johnson 193-10-2.
C216	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C217	5496218P203	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C218 and C219	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C220 and C221	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C222 thru C224	7160807P1	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW.
C225	19B209282P1	Ceramic, feed-thru: 680 pf ±20%, 1000 VDCW; sim to Sprague Type 544C.
C226 thru C229	7160807P1	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW.
C230		Includes:
	19A121018P1	Washer (inner). Quantity (4).
	4031594P2	Insulator. Quantity (1).
	19A121006P1	Washer (outer). Quantity (2).
	4036835P4	Terminal, solder: sim to Shakeproof 2177-04-000. Quantity (1).
	N80P9007C6	Screw, panhead, Phillips: No. 4-40 x 7/16.
C231	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C232		Includes:
	19A121018P1	Washer (inner). Quantity (2).
	4031594P2	Insulator. Quantity (1).
	7878455P2	Terminal, lug. Quantity (1).
	19A121006P7	Washer (outer). Quantity (2).
	4036835P4	Terminal, solder: sim to Shakeproof 2177-04-000. Quantity (1).
	N80P9008C6	Screw, panhead, Phillips: No. 4-40 x 1/2.
C234		Includes:
	19A121018P1	Washer (inner). Quantity (4).
	4031594P2	Insulator. Quantity (1).
	19A121006P1	Washer (outer). Quantity (2).
	4036835P4	Terminal, solder: sim to Shakeproof 2177-04-000. Quantity (1).
	N80P9007C6	Screw, panhead, Phillips: No. 4-40 x 7/16.

SYMBOL	GE PART NO.	DESCRIPTION
C235	5496218P205	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C236	5496218P610	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef -470 PPM.
C237	5496218P205	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C238	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C239	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C240 and C241	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C242*	5496219P10	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM. Added by REV B.
		TERMINALS
E1	7135118P1	Solder.
		JACKS AND RECEPTACLES
J201	19B205689G1	Connector: 18 contacts.
J202 and J203	19B205219P1	Connector: 7 pins.
J204	7104941P16	Jack, phono type: coaxial.
		RELAYS
K201	19C307020P5	Armature: 12 VDC nominal, 2.5 w max operating, 80 ohms ±15% coil res, 2 form C contacts.
		INDUCTORS
L204	7488079P34	Choke, RF: 1.5 µh ±10%, 0.28 ohm DC res max; sim to Jeffers 4412-7K.
L205	19A122076P1	Coil.
L206	7772834P5	Choke, RF: 1.8 µh ±10%, 0.33 ohm DC res; sim to Ohmite Z-144.
L207*	19B205220P1	Coil. Deleted by REV A in Models 4EF32F11.
L208	19B205222P1	Coil.
L209	7488079P35	Choke, RF: 2.2 µh ±10%, 0.5 ohm DC res max; sim to Jeffers 4412-9K.
L210	19A122072P1	Coil.
L211	19A122073P1	Coil.
L212	19A122072P1	Coil.
L213	19A122074P1	Coil.
L214*	19B205220P2	Coil. Added by REV A.
		PLUGS
P101	4029840P2	Contact, electrical: sim to AMP 42827-2.
P102	4029840P1	Contact, electrical: sim to AMP 41854.
P105		(Part of W202).
P301		(Part of W201).
		RESISTORS
R201	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R202	3R77P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R203	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R204	3R78P273K	Composition: 27,000 ohms ±10%, 1 w.
R206	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R207	3R77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R208	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R209	3R78P183K	Composition: 18,000 ohms ±10%, 1 w.
R210	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R211	3R77P393K	Composition: 39,000 ohms ±10%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R212	3R79P683K	Composition: 68,000 ohms ±10%, 2 w.
R213	3R149P822K	Composition: 8200 ohms ±10%, 4 w.
R214	19B209022P30	Wirewound: 4.3 ohms ±5%, 2 w; sim to IRC Type BWH.
R215	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
		SWITCHES
S201	7145098P3	Slide: SPDT, 0.75 amp at 125 VAC or 0.5 amp at 125 VDC; sim to Stackpole SS-32.
		TRANSFORMERS
T201		**COIL** 19B205215G1
		CAPACITORS
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
	5491798P4	Tuning slug.
T202		**COIL** 19B205213G1
		CAPACITORS
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5491238P10	Ceramic disc: 2 pf ±0.5 pf, 500 VDCW, temp coef -470 ±250 PPM.
		RESISTORS
R1	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
	5493185P5	Tuning slug.
		TERMINAL BOARDS
TB1	7775500P124	Phen: 8 terminals.
		TUBES
V201 and V202		Type 8106.
V203		Type 7984.
		CABLES
W201	5491689P56	RF: approx 12 inches, includes short, phono type plug (P301).
W202		**CABLE** 19B205268G1
		PLUGS
P105	19B209341P2	Socket: 9 contacts; sim to Elco 04-920-XX.
	19A122138P1	Knob.
	19A134048P1	Wood screw, phillips head: No. 4, 1/2 inch long.
		SOCKETS
XV201 and XV202	7480532P8	Tube, phen: 9 pins; sim to Elco 04-903-84.
XV203	19C301007P5	Tube: 12 pins; sim to Alcon Metal Products 371G.
		MECHANICAL PARTS (SEE RC-1396)
1	19A121195P2	Support. (Used with V203).
2	7165167P5	Insert, tube shield: sim to Atlas 106-332-5. (Used with V202).
3	19B205622P1	Spring. (Used with V201, 202).
4	19A121523P3	Heat sink. (Used with V201, 202).
5	7147223P3	Clip, loop: sim to Patton-Macguyer 40. (Used with W202).

SYMBOL	GE PART NO.	DESCRIPTION
6	19B205211P1	Support.
7	4035017P4	Support, angle: sim to Tinnerman C-19185-020-24.
8	7165167P7	Insert, tube shield: sim to Atlas 106-332-22. (Used with V203).
9	19B204571P1	Heat sink. (Used with V203).
10	19C303875G1	Chassis.
11	7763541P2	Strap, retaining.
12	19B205475G1	Cover, top.
13	19B205476G1	Cover, bottom.
14	19D402623P1	Casting.

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 description of parts affected by these revisions.

REV. A - To improve efficiency and bandwidth of final amplifier stage.

In Model 4EF32F10:
Changed C208.

In Model 4EF32F11:
Changed C208, deleted L207 and added L214.

REV. A - Models 4EF32F10, F11

To improve efficiency and bandwidth of final amplifier stage.

In Model 4EF32F10:
Changed C208.

In Model 4EF32F11:
Changed C208, deleted L207 and added L214.

REV. A - Models 4EG21F10, F11

To permit use of this exciter with High Band Royal Executive Systems. Changed L116 and added C142.

REV. B - Models 4EG21F10, F11

To permit use of this exciter with 25 kHz channel spacing.

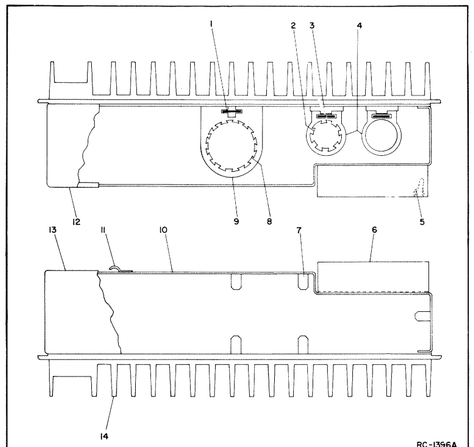
Changed R125; deleted R101, R114 & R115; and added R164, R165 & R166.

REV. B - Models 4EF32F10, F11

To reduce system losses in antenna circuit of receiver. Added C242, deleted G13.

REV. C - Models 4EG21F10, F11

To improve operation. Changed C122, C123, R130 and R134.



PARTS LIST

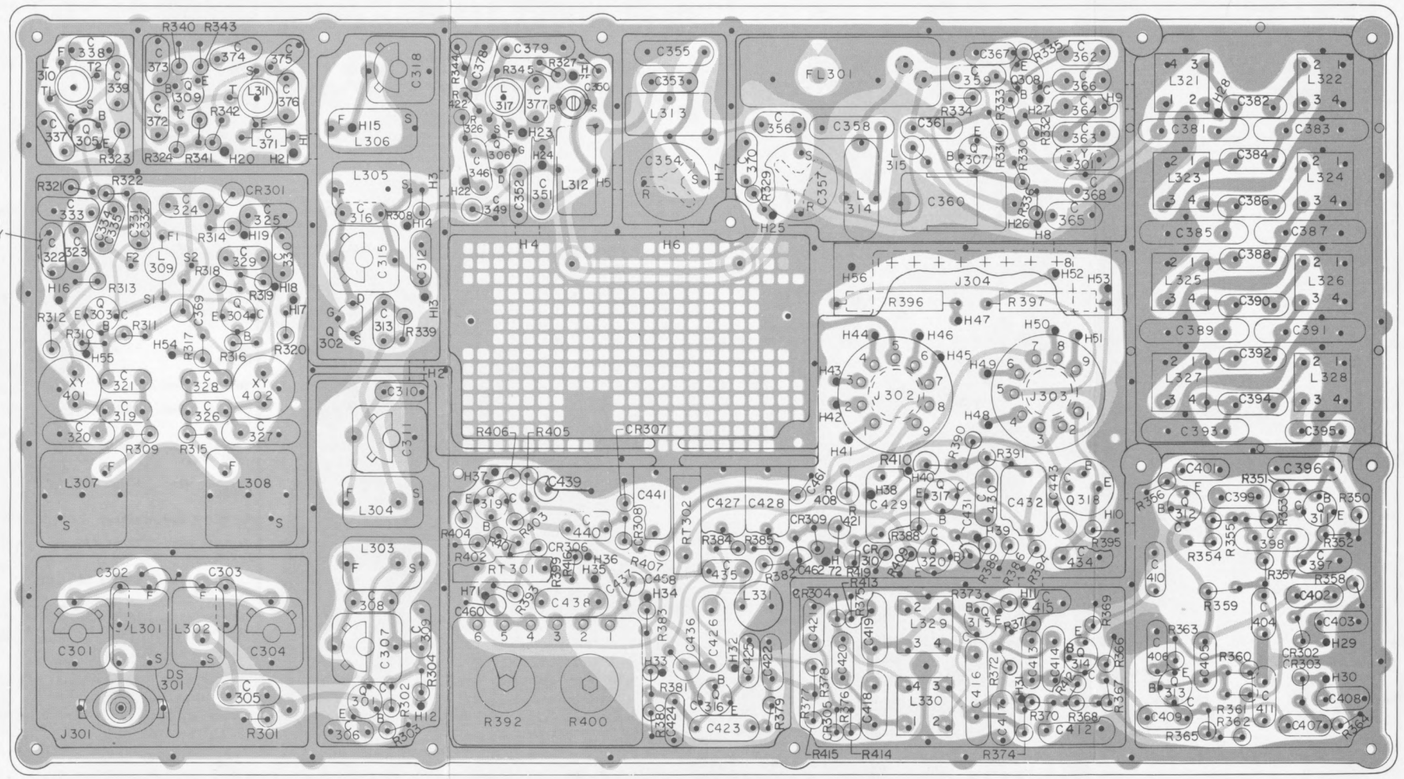
LBI-4257H

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	5496219P34	Ceramic disc: 3 pf ±0.25 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	5496219P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
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	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*	19C300685P248	Ceramic disc: 62 pf ±2%, 500 VDCW, temp coef -80 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.
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	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 and 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 and 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 and 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 and 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 and 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 and earlier:
	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.

(Cont'd on back of 19R621420)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

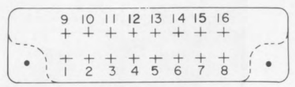


(19D416259, Rev. 7)
(19D413909, Sh. 1, Rev. 6)
(19D413909, Sh. 2, Rev. 6)

RESISTANCE READINGS

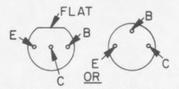
ALL READINGS ARE MEASURED FROM JACK PINS TO GROUND WITH A 20,000 OHM-PER-VOLT METER, AND WITH ALL EXTERNAL CONNECTIONS REMOVED. + OR − SIGNS SHOW METER LEAD GROUNDED.

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



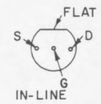
TERMINAL NUMBERING FOR J304

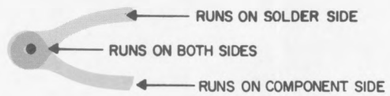
LEAD IDENTIFICATION FOR Q301, Q303, Q305, Q307, Q309, Q311 & Q321



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

LEAD IDENTIFICATION FOR Q302, 0306

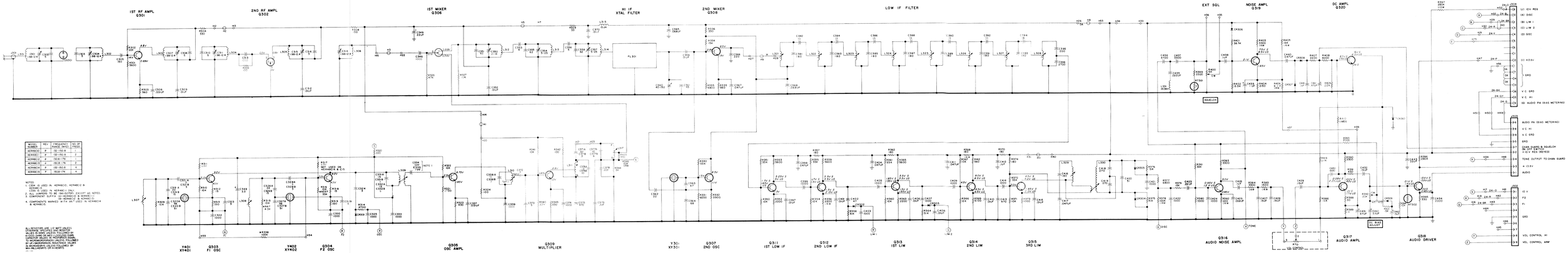




OUTLINE DIAGRAM

132—174 MHz RECEIVER
MODELS 4ER48C10-15

RC-2163F



MODEL	REV	FREQUENCY	NO. OF CHANNELS
4ER48C10	P	132-150.8	1
4ER48C11	P	132-150.8	2
4ER48C12	P	150.8-174	1
4ER48C13	P	150.8-174	2
4ER48C14	P	150-150.8	4
4ER48C15	P	150.8-174	4

NOTES:
1. C334 IS USED IN 4ER48C10, 4ER48C12 & 4ER48C14.
2. R337 IS USED IN 4ER48C11 ONLY.
3. ALL JUMPERS TO BE 18AWG(TYP) EXCEPT AS NOTED.
4. COMPONENT SUFFIX (A-4ER48C10 & 4ER48C11; B-4ER48C12 & 4ER48C13; C-4ER48C14 & 4ER48C15)
5. COMPONENTS MARKED WITH (A) USED IN 4ER48C14 & 4ER48C15.

ALL RESISTORS ARE 1/8 WATT UNLESS OTHERWISE SPECIFIED. ALL RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=KILOHMS OR M=MEGOHMS. ALL CAPACITOR VALUES IN MICROFARADS UNLESS FOLLOWED BY P=PICOFARADS OR N=NANOFARADS. ALL INDUCTOR VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS

SCHEMATIC DIAGRAM

132—174 MHz RECEIVER
MODELS 4ER48C10-15

19R621420, Rev. 19

(Cont'd from RC-2163)

SYMBOL	GE PART NO.	DESCRIPTION
C393	19A116656P18GJ1	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	5490008P34	Silver mica: 200 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-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 DM-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 µf +80% -30%, 50 VDCW; sim to Sprague 18C180.
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	19A116656P18GJ1	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 DM-15.
C420	54962199656	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	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	G-E PART NO	DESCRIPTION
C436	19C300075P4700J	Polyester: 4700 pf ±5%, 100 VDCW; sim to GE Type 61F.
C437	19C300075P3300J	Polyester: 3300 pf ±5%, 100 VDCW; sim to GE Type 61F.
C438	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C439*	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		In REV H and J:
	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
		In REV G and earlier:
	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	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C460	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C461	5496267P228	Tantalum: 0.47 µf ±10%, 35 VDCW; sim to Sprague Type 150D.
C462	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - **DIODES AND RECTIFIERS** - - - - - -
CR301*	19A116052P1	Silicon.
		In REV H and earlier:
	7727146P3	Germanium; sim to Type 1N90.
CR302 and CR303	4038056P1	Germanium.
CR304 and CR305	19A115250P1	Silicon.
CR306	5494922P1	Silicon; sim to Type 1N456.
CR307 thru CR309	19A115250P1	Silicon.
CR310*	4036887P6	Silicon, Zener. Added by REV M.
		- - - - - - - **INDICATING DEVICES** - - - - - - -
DS301	19B209067P1	Lamp, glow: 0.3 ma; sim to GE NE-2T.
		- - - - - - - - - **FILTERS** - - - - - - - - -
FL301	19C304219G1	Bandpass; 10.7 MHz.
		- - - - - - **JACKS AND RECEPTACLES** - - - - -
J301	7104941P9	Jack, phono type: phen; sim to Cinch 14H20958.
J302 and J303	19B209303P1	Connector, phen: 9 pins.
J304	19B205689G2	Connector: 16 contacts.
		- - - - - - - - - **INDUCTORS** - - - - - - - - -
L301	19B205530G1	Coil.
L302	19B205530G2	Coil.
L303*	19B205530G2	Coil.
		In REV A and earlier:
	19B205530G6	Coil.
L304	19B205530G2	Coil.
L305	19A128122P1	Coil.
L306	19A128122P2	Coil.
L307 and L308	19A121085G1	Coil. Includes tuning slug 19B200497P2.
L309	19B205236G1	Coil. Includes tuning slug 19B200497P2.

SYMBOL	GE PART NO.	DESCRIPTION
L310	19B219057G1	Coil. Includes tuning slug 19B200497P2.
L311	19B219059G1	Coil. Includes tuning slug 19B200497P2.
L312 and L313	19B205224G2	Coil.
L314	19B205224G3	Coil.
L315	7488079P16	Choke, RF: 15 µh ±10%, 1.2 ohms DC res max; sim to Jeffers 4421-9K.
L317	19B219059G2	Coil. Includes tuning slug 19B200497P2.
L321 and L322	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670.
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 PEFCN-14733-CX12.
L330	19A115711P7	Transformer, freq: 455 KHz; sim to TOKO PEFCN-14734-BN12.
L331	19B209405P1	Reactor, audio freq: 142 mh ±5% at 0.1 v thru 0.27 v; sim to Aladdin 405-101.
		- - - - - - - - **TRANSISTORS** - - - - - - - -
Q301*	19A116860P1	Silicon, NPN; sim to Type 2N4996.
		In REV E:
	19A116859P1	Silicon, NPN; sim to Type 2N5032 or 2N3570.
		In REV B, C, D:
	19A115666P1	Silicon, NPN.
		In REV A and earlier:
	19A115342P1	Silicon, NPN.
Q302	19A115953P1	N channel, field effect.
Q303* and Q304*	19A115328P1	Silicon, NPN.
		In REV N and earlier:
	19A115925P1	Silicon, NPN.
Q305	19A115342P1	Silicon, NPN.
Q306*	19A116154P1	N channel, field effect.
		In REV A and earlier:
	19A115953P1	N channel, field effect.
Q307	19A115889P1	Silicon, NPN.
Q308*	19A115910P1	Silicon, NPN; sim to Type 2N3906.
		In REV E and earlier:
	19A115245P1	Silicon, NPN.
Q309A* and Q309B*	19A115440P1	Silicon, NPN.
		In REV B, C, D:
	19A115666P1	Silicon, NPN.
		In REV A and earlier:
	19A115342P1	Silicon.
Q311 thru Q315	19A115889P1	Silicon, NPN.
Q316	19A115123P1	Silicon, NPN.
Q317*	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		In REV C and earlier:
	19A115123P1	Silicon, NPN.
Q318*	19A115300P4	Silicon, NPN.
		In REV C and earlier:
	19A115300P2	Silicon, NPN; sim to Type 2N3053.

SYMBOL	GE PART NO.	DESCRIPTION
Q319*	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		In REV G and earlier:
	19A115889P1	Silicon, NPN.
Q320*	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		In REV K and earlier:
	19A115123P1	Silicon, NPN.
		- - - - - - - - - **RESISTORS** - - - - - - - - -
R301	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R302	3R77P223K	Composition: 22,000 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: 10,000 ohms ±10%, 1/2 w.
R311	3R77P682J	Composition: 6800 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 and earlier:
	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R314	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R315 and R316	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R317	3R77P682J	Composition: 6800 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 and earlier:
	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R320	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R321*	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
		In REV A and earlier:
	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R322	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R323	3R77P431J	Composition: 430 ohms ±5%, 1/2 w.
R324	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R326	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R327	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R329	3R152P330K	Composition: 33 ohms ±10%, 1/4 w.
R330	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R331	3R77P822K	Composition: 8200 ohms ±10%, 1/2 w.
R332	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R333	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R334	3R77P153K	Composition: 15,000 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: 33,000 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: 2700 ohms ±10%, 1/2 w.
		In REV A and earlier:
	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R341	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R342	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R343	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R344	3R77P302J	Composition: 3000 ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R395	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R396 and R397	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R399*	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
		In REV N and earlier:
	3R77P471J	Composition: 470 ohms ±5%, 1/2 w.
R400		(See R392).
R401	19A116278P357	Metal film: 38,300 ohms ±2%, 1/2 w.
R402	19A116278P313	Metal film: 13,300 ohms ±2%, 1/2 w.
R403	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R404	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R405	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R406*	3R152P822J	Composition: 8200 ohms ±5%, 1/4 w.
		In REV L:
	3R152P562J	Composition: 5600 ohms ±5%, 1/4 w.
		In REV H-K:
	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
		In REV C-G:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
		In REV B and earlier:
	3R152P332J	Composition: 3300 ohms ±5%, 1/4 w.
R407	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R408	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R409*	3R77P203J	Composition: 20,000 ohms ±5%, 1/2 w.
		In REV H and J:
	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
		In REV G and earlier:
	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R410*	3R77P105J	Composition: 1 megohm ±5%, 1/2 w. Added by REV M.
R412	3R77P561K	Composition: 560 ohms ±10%, 1/2 w.
R417	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R419*	3R77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
		In REV L and earlier:
	3R77P433J	Composition: 43,000 ohms ±5%, 1/2 w.
R420*	3R77P364J	Composition: 0.36 megohm ±5%, 1/2 w. Deleted by REV L.
		In REV J and earlier:
	3R77P564J	Composition: 0.56 megohm ±5%, 1/2 w.
R421	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R442*	3R152P331K	Composition: 330 ohms ±10%, 1/4 w. Added by REV E.
		- - - - - - - - **THERMISTORS** - - - - - - - -
RT301	5490828P38	Rod: 1400 ohms ±5%, 1 w max; sim to Globar Type 492H.
RT302	5490828P35	Rod: 3800 ohms ±5%, 1 w max; sim to Globar Type 723H-R.
		- - - - - - - - - **SOCKETS** - - - - - - - - -
XY401 and XY402	5490277P1	Transistor, phen: 4 contacts; sim to Elco 3303.
		- - - - - - - - - **CRYSTALS** - - - - - - - - -
Y301	19A110215G1	Quartz: freq 10245 KHz, temp range -30°C to +90°C.
Y401 and Y402	19B206221P1	Quartz: freq range 38.3 to 62 MHz, temp range -30°C to +80°C. (When reordering give GE Part Number and specify exact frequency needed). Crystal frequency = Operating Freq -10.7 3
		- - - - - - - **MISCELLANEOUS** - - - - - - -
	19A122139P1	Cover.
	19B205369G1	Top cover.
	19A121088P1	Can. (Used with L307 and L308).
	4035306P62	Washer, fiber. (Used with Y301, FL301).
	4036555P1	Insulator, washer: nylon. (Used with Q318).

SYMBOL	G-E PART NO	DESCRIPTION
R34[illegible]	3R152P623K	Composition: 62,000 ohms ±10%, 1/4 w.
R35[illegible]	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R35[illegible]	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R35[illegible]	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R35[illegible]	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R35[illegible]	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R35[illegible]	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R35[illegible]	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R35[illegible]	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R35[illegible]	3R152P513K	Composition: 51,000 ohms ±5%, 1/4 w.
R35[illegible]	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R36[illegible]	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R36[illegible]	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R36[illegible]	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R36[illegible]	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R36[illegible]	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R36[illegible]	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R36[illegible]	3R77P123K	Composition: 12,000 ohms ±10%, 1/2 w.
R36[illegible]	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R36[illegible]	3R152P181K	Composition: 180 ohms ±10%, 1/4 w.
R369	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R370	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R371	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R372	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R373	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R374	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R375 and R376	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R377	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R378	3R152P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R379	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R380	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R381	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R382	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
R383	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R384	3R152P332K	Composition: 3300 ohms ±10%, 1/4 w.
R385	3R152P152K	Composition: 1500 ohms ±10%, 1/4 w.
R386*	3R77P163J	Composition: 16,000 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R77P203J	Composition: 20,000 ohms ±5%, 1/2 w.
R388	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R389*	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
		In REV L and earlier:
	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
R390	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R391	3R77P431K	Composition: 430 ohms ±10%, 1/2 w.
R392(R400)	19B209320P1	Resistor assembly. Variable, carbon film, includes: (R392) 20,000 ohms ±20%, 0.25 w; (R400) 5000 ohms ±20%, 0.25 w; sim to Centralab Series 5 (Type 71-2).
R393*	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
		In REV G and earlier:
	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R394	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.

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 - Models 4ER48C10-15
Incorporated into initial shipment.

REV. B - Incorporated into initial shipment.

REV. C - To improve squelch action. Changed R406.

REV. D - To improve audio at -30°C. Changed Q317, Q318 and R386.

REV. E - To prevent oscillation. Changed Q301 and Q309. Added R422.

REV. F - To incorporate new transistors. Changed Q301 and Q308.

REV. G - To improve squelch clipping performance. Changed C382, C384, C386, C388, C390, C392, and C394.

REV. H - To improve audio response and squelch action. Changed R393, R406, R409, C439 and Q319.

REV. J - To increase "D" reading on Test Set. Changed CR301.

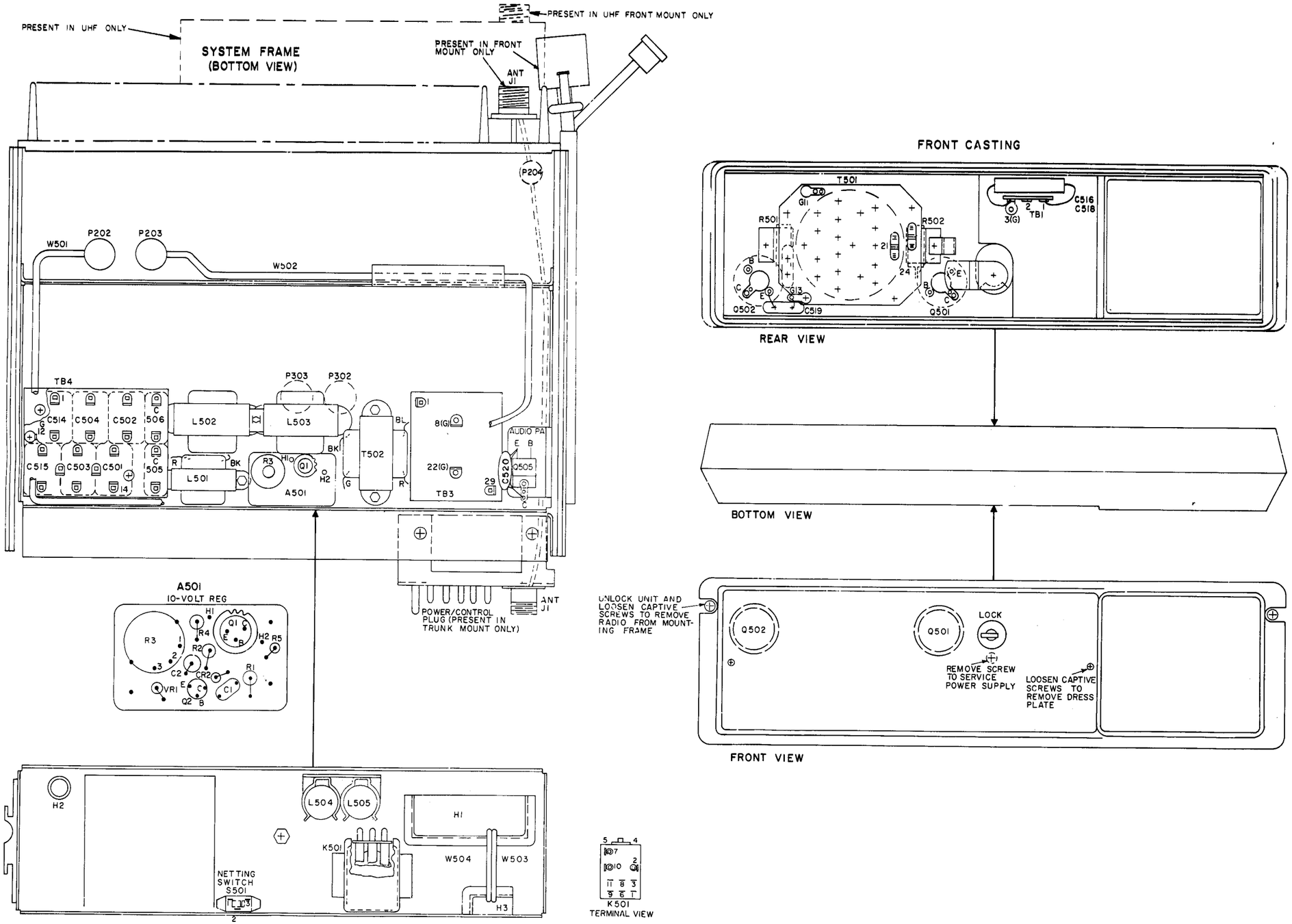
REV. K - To improve squelch action. Changed R409, R420 and C439.

REV. L - To improve squelch action. Changed R406 and Q320. Deleted R420.

REV. M - To improve audio response. Changed R389, R419, R406 and added R410 and CR310.

REV. N - To improve squelch operation. Changed R399.

REV. P - To eliminate residual Position D reading on GE Test Set with 1st oscillator crystal removed. Changed R313, R319, Q303 and Q304.

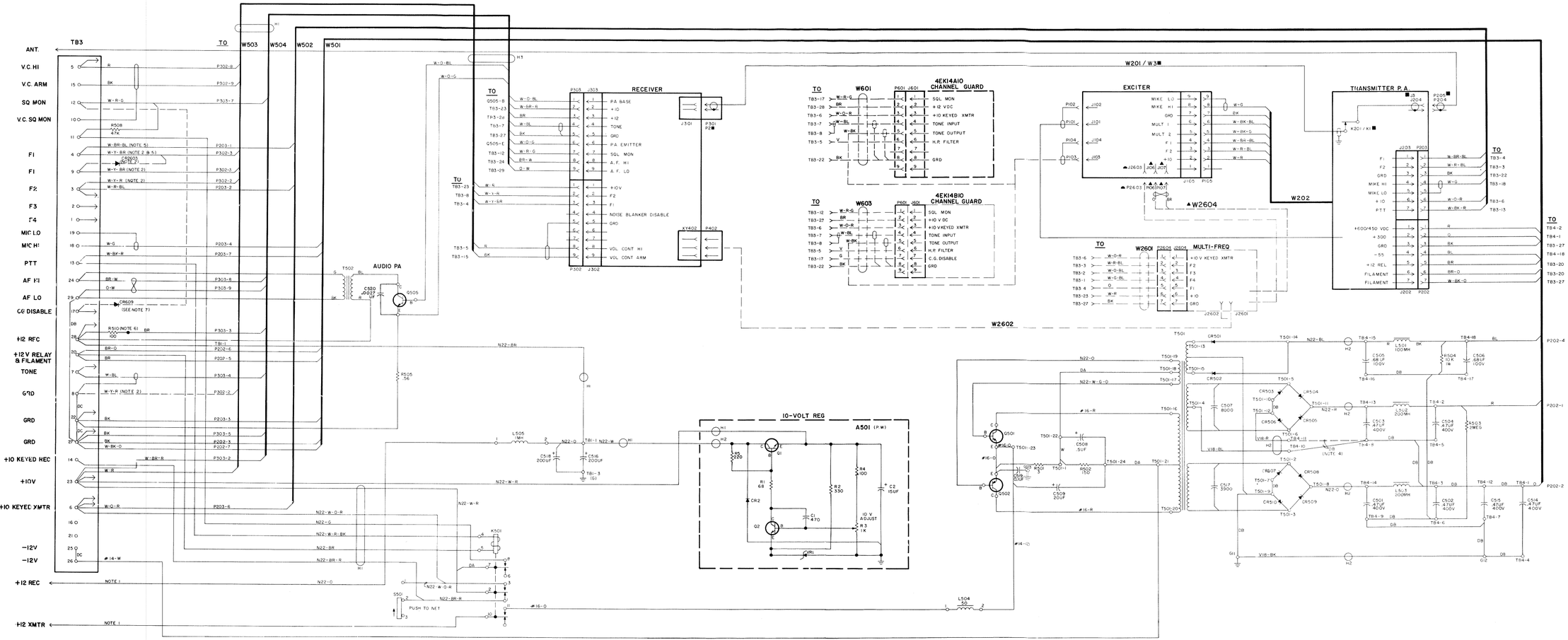


OUTLINE DIAGRAM

POWER SUPPLY MODEL 4EP50A10

19D402813, Rev. 9

(DF-0062)



NOTES:

1. PART OF PL19820539G1 (FRONT MOUNT) OR PL19820540G1 (TRUNK MOUNT).
2. IN HIGH BAND AND LOW BAND MULTI-FREQ UNITS ONLY OR2603 ADDED, W-Y-BR WIRE TERMINATED AT TB3-9 INSTEAD OF TB3-4, W-Y-R WIRE TERMINATED AT TB3-8 INSTEAD OF AT TB3-3.
3. WHEN ADVANCING THE REV LTR ON MODEL 4EP50A10, THE REV LTR FOR MODEL 4EP50A12, ON WIRING DIAG 19R640716, MUST BE ADVANCED, AND THE REV LTR FOR MODEL 4EP50A13 ON WIRING DIAG 19R640756 MUST ALSO BE ADVANCED.
4. CONNECTION FROM TB4-8 TO TB4-10 FOR HI BAND, CONNECTION FROM TB4-8 TO TB4-11 FOR LO BAND.
5. FOR HIGH AND LOW BAND UNITS AND 450 MHZ CRYSTAL RX ONLY. FOR TWO FREQ REC, ONE FREQ XMIT MOVE THE W-BR-BL WIRE FROM TB3-4 TO TB3-8. FOR TWO FREQ XMIT, ONE FREQ REC MOVE THE W-Y-BR WIRE FROM TB3-4 TO TB3-8.
6. WHITE AND SLEEVE RESISTOR-WIRE CONNECTION
7. FOR UNITS WITH 4EK14A10 CHANNEL GUARD ONLY, CR609 ADDED.
8. COMPONENTS MARKED WITH "▲" ARE PRESENT IN 450 MHZ MULTI-FREQ WITH TX ICOM ONLY. COMPONENTS MARKED WITH "◆" ARE PRESENT IN HIGH BAND AND LOW BAND MULTI-FREQ UNITS AND 450 MHZ MULTI-FREQ UNITS WITHOUT TX ICOM.
9. COMPONENTS MARKED WITH "■" ARE PRESENT IN 450 MHZ UNITS ONLY.
10. FOR 450 MHZ SINGLE FREQ ICOM RX ONLY, CONNECT ORANGE WIRE OF CABLE W2601 TO TB3-8.

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
4EP50A10(NOTE 3)	M

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

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

SCHEMATIC DIAGRAM

POWER SUPPLY MODEL 4EP50A10

19R640707, Rev. 33

PARTS LIST

LBI-3717K

MOBILE POWER SUPPLY
MODEL 4EP50A10
19D402638G1

SYMBOL	GE PART NO.	DESCRIPTION
A501		**10 VOLT REGULATOR** 19B205255G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C3 and C4	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
		- - - - - DIODES AND RECTIFIERS - - -
CR1*	4037822P1	Silicon. Deleted by REV F.
CR2*	4037822P1	Silicon. Added by REV F.
		- - - - - - INDICATING DEVICES - - - - - -
DS1*	4034664P1	Lamp, incandescent: 28 v; sim to GE 2148. Deleted by REV J.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q2*	19A116755P1	Silicon, NPN; sim to Type 2N3947.
		In REV K and earlier:
	19A115123P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1*	3R77P680K	Composition: 68 ohms ±10%, 1/2 w.
		In Models earlier than REV C:
	3R77P161J	Composition: 160 ohms ±5%, 1/2 w.
R2	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R3	19A115681P1	Variable, wirewound: 1000 ohms ±20%, 3 w; sim to CTS Series 115.
R4	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R5*	3R152P221K	Composition: 220 ohms ±10%, 1/4 w. Added by REV J.
		- - - - - - VOLTAGE REGULATORS - - - - -
VR1	4036887P6	Silicon, Zener.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C501 thru C504	19A115028P59	Polyester: 0.47 µf ±20%, 400 VDCW.
C505* and C506*	19A115028P20	Polyester: 0.68 µf ±20%, 100 VDCW.
		In Models earlier than REV B:
	19A115028P19	Polyester: 0.47 µf ±20%, 100 VDCW.
C507	5490825P2	Ceramic disc: 8000 pf ±10%, 2000 VDCW; sim to RMC Type JF Discap.
C508	19A115680P2	Electrolytic: 5 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C509	19A115680P3	Electrolytic: 20 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C514 and C515	19A115028P59	Polyester: 0.47 µf ±20%, 400 VDCW.
C516*	19A115680P10	Electrolytic: 200 µf +150% -10%, 25 VDCW.
		In Models earlier than REV A:
	19A115680P5	Electrolytic: 100 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C517	5494481P29	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C518*	19A115680P10	Electrolytic: 200 µf +150% -10%, 25 VDCW. Added by REV A.
C519*	19A115028P14	Polyester: 0.1 µf ±20%, 200 VDCW. Added by REV D.
C520*	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV E. Deleted by REV G.
		- - - - - DIODES AND RECTIFIERS - - -
CR501 thru CR510	4037822P2	Silicon.
CR609	5494922P1	Silicon; sim to Type 1N456.
CR2603	4037822P1	Silicon.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K501	19B209240P5	Armature, open: 12 VDC nominal, 2 w max operating, 100 ohms ±10% coil res, 3 form C contacts; sim to Magnecraft 88X-156.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L501	19B200777P1	Reactor: 0.1 h min, 12 ohms ±10% DC res, 300 VDC operating.
L502 and L503	19B209236P1	Reactor: 200 mh min, 16 ohms DC res max, 700 VDC operating.
L504	19A115392P1	Choke, RF: 50 µh ±10%, .02 ohm DC res max.
L505*	19A115894P1	Choke, RF: 1 mh min, 0.35 ohms DC res max.
		In Models earlier than REV A:
	7488079P43	Choke, RF: 10 µh ±10%, 0.3 ohm DC res max; sim to Jeffers 4422-4K.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q501 and Q502	5490810P1	Germanium, PNP.
Q505*	19A116741P1	Silicon, NPN.
		In REV G-L:
	19A116203P3	Silicon, NPN.
		Earlier than REV G:
	19A115527P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R501	5493035P6	Wirewound: 3 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
R502	5493035P21	Wirewound: 150 ohms ±5%, 5 w; sim to Hamilton Hall Type HR.
R503	3R77P205J	Composition: 2 megohms ±5%, 1/2 w.
R504	3R78P103K	Composition: 10,000 ohms ±10%, 1 w.
R505	19B209022P109	Wirewound: 0.56 ohm ±10%, 2 w; sim to IRC Type BWH.
R508	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R510*	3R77P101K	Composition: 100 ohms ±10%, 1/2 w. Added by REV A.
		- - - - - - - - - SWITCHES - - - - - - - - -
S501	19B209040P7	Slide: SPDT, 0.5 amp at 125 v; sim to Continental-Wirt Type G-J32.
		- - - - - - - - TRANSFORMERS - - - - - - -
T501	19C303893G1	Transformer.
T502	19A115612P1	Audio freq: 0.3-3 KHz, Pri: 24.5 ohms ±5% imp, 1.38 ohms DC res, Sec: 3.3 ohms imp, 0.18 ohm DC res.
		- - - - - - - TERMINAL BOARDS - - - - - - -
TB1	7775500P2	Phen: 3 terminals.
TB3	19B205258G1	Board: 27 terminals.
TB4	19B205237G1	Board: 18 terminals.
		- - - - - - - - - CABLES - - - - - - - - -
W501		**CABLE** 19B205266G1 (Used in Transmitter)
		- - - - - - - - - PLUGS - - - - - - - - -
P202	19B209341P1	Socket: 7 contacts; sim to Elco 04-720-XX. Includes:
	19A122138P1	Knob.
	19A134048P1	Wood screw, phillips head.
W502		**CABLE** 19B205267G1 (Used in Transmitter)
		- - - - - - - - - PLUGS - - - - - - - - -
P203	19B209341P1	Socket: 7 contacts; sim to Elco 04-720-XX. Includes:
	19A122138P1	Knob.
	19A134048P1	Wood screw, phillips head.
W503		**CABLE** 19B205265G1 (Used in Receiver)
		- - - - - - - - - PLUGS - - - - - - - - -
P302	19B209341P2	Socket: 9 contacts; sim to Elco 04-920-XX. Includes:
	19A122138P1	Knob.
	19A134048P1	Wood screw, phillips head.
W504		**CABLE** 19B205264G1 (Used in Receiver)
		- - - - - - - - - PLUGS - - - - - - - - -
P303	19B209341P2	Socket: 9 contacts; sim to Elco 04-920-XX. Includes:
	19A122138P1	Knob.
	19A134048P1	Wood screw, phillips head.
		- - - - - - - MISCELLANEOUS - - - - - - -
	4035439P1	Heat sink, transistor: sim to Birtcher 3AL-635-2R. (Used with Q1 in 19B205255G1).
	4036555P1	Insulator, washer: nylon. (Used with Q1 in 19B205255G1).
	19C303871P1	Cover. (Used with K501 in 19D402638G1).
	4038930P1	Clip. (Used with R501, 502 in 19D402638G1).
	5491682P11	Lock: sim to Yale and Towne Lock F6701. (Used in 19D402638G1).
	5491682P12	Cam: sim to Yale and Towne Lock 18. (Used in 19D402638G1).
	4031529P1	Clip: sim to Tinnerman C20213-017. (Used with W502 in 19D402638G1).
	4029387P2	Nut: sim to Tinnerman C410-632-3. (Mounts L502, L503 in 19D402638G1).
	19A122251P1	Clip, cable. (Located by T501 in 19D402638G1).
		ASSOCIATED ASSEMBLIES
		POWER/ANTENNA CONNECTOR 25-50 MHz and 132-174 MHz 19B205260G1
		- - - - JACKS AND RECEPTACLES - - - -
J1	19C303775P1	Connector, phenolic: 28 contacts.
		- - - - - - - MISCELLANEOUS - - - - - - -
	19A122133G2	Antenna Cable: approx 12 inches long. Include J2 and P204.
		POWER/ANTENNA CONNECTOR 450 MHz 19B205260G7
		- - - - JACKS AND RECEPTACLES - - - -
J1	19C303775P1	Connector, phenolic: 28 contacts.
		- - - - - - - MISCELLANEOUS - - - - - - -
	19A122133G10	Antenna Cable. Includes J2 and P205.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PRODUCTION CHANGES

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

REV. A - To provide additional filtering for alternator noise and voltage spikes on incoming power leads, changed C516 and L505, and added C518 and R510.

REV. B - To improve filtering of bias supply, changed C505, and C506.

REV. C - To improve operation of 10-volt regulator, changed R1 on A501.

REV. D - To reduce transistor switching noise. Add C519.

REV. E - To eliminate receiver PA instability. Added C520 between the collector and emitter of Q505.

REV. F - To provide reverse polarity protection. Added CR2 and deleted CR1 in the collector circuit of Q2 on 10-volt regulator A501.

REV. G - To replace audio output transistor that is no longer available. Changed Q505 and deleted C520.

REV. H - To eliminate keying thump in receiver. Moved the white-brown-red wire from TB3-14 to TB3-23.

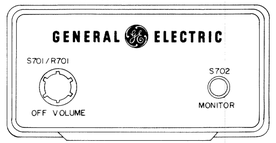
REV. J - To improve procurement. Deleted DS1 and added R5.

REV. K - To improve regulator performance. Deleted C3 and C4.

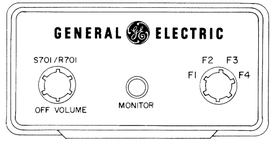
REV. L - To incorporate a new transistor. Changed Q2.

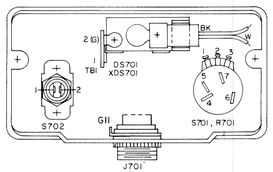
REV. M - To improve stability. Changed Q205 and added C520.

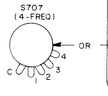
MODEL 4EC67A10
(1-FREQ)

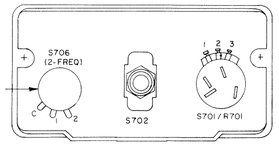


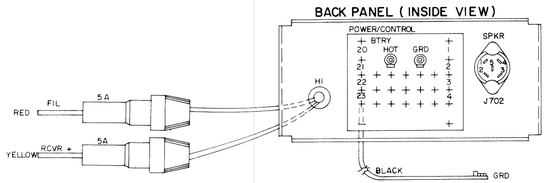
MODEL 4EC67A11 (TWO FREQ.)
MODEL 4EC67A12 (FOUR FREQ.)



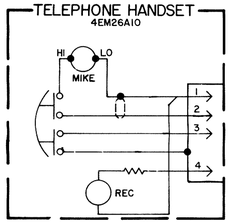


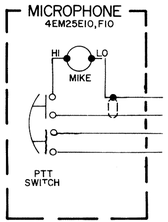


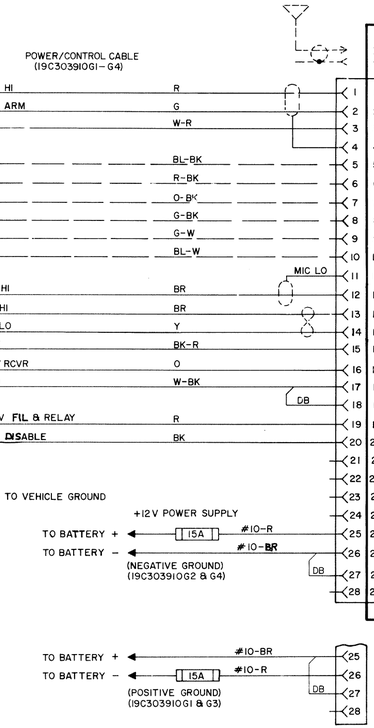


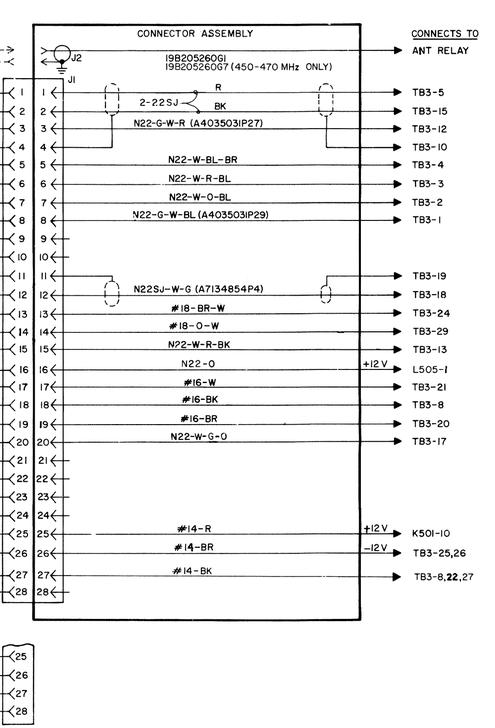


(19C311222, Rev. 3)









NOTES

1. S706 IN 4EC67A11 ONLY.
   S707 IN 4EC67A12 ONLY.
   FOUR FREQ KIT PL19A122220G7.
2. REMOVE N22-G-W-BL WIRE FROM S707-4 & ADD JUMPER IN 4EC67A12 FOR THREE FREQ OPERATION.

(19B820756, Rev. 22)

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

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

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4EC67A10	E
4EC67A11	E
4EC67A12	E
PL19B205260G1	C
PL19B205260G7	

SCHEMATIC & OUTLINE DIAGRAM

TRUNK MOUNT CONTROL UNIT
MODEL 4EC67A10-12

RC-1416J

PARTS LIST

LBI-3713E

TRUNK MOUNT CONTROL UNIT

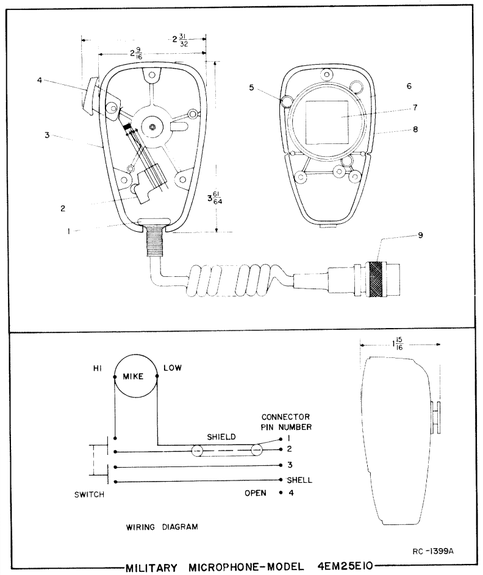
MODEL 4EC67A10 (19C303901G1) (1 Frequency)
MODEL 4EC67A11 (19C303901G2) (2 Frequency)
MODEL 4EC67A12 (19C303901G2) (4 Frequency)
(19A122220G7)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - INDICATING DEVICES - - - - - - -
DS701	19C307037P14	Lamp, incandescent: 18 v; sim to GE 1445.
		- - - - - - - - - - FUSES - - - - - - - - -
F701 and F702	1R16P8	Quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J701*		Connector. Includes:
	19A116061P2	Receptacle: 4 female contacts; sim to Amphenol 91-PN4F-1000.
	19A116061P4	Lockwasher.
	19A116061P5	Nut, knurled.
		In Models earlier than REV D:
	7117934P5	Connector, chassis: 4 female contacts; sim to Amphenol 91-PC4F.
J702*	5493018P1	Connector, 5 contacts; sim to Cinch 203-41-05-081.
		In Models earlier than REV A:
	19B209340P5	Connector, phen: 4 contacts; sim to Alcon Metal MS101.
J703	19A122095G1	Board: 27 contacts.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P704 and P705	4029840P3	Contact, electrical: sim to AMP 42101-2.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R701		(Part of S701).
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S701	5496870P13	Resistor/switch: includes Resistor (R701), variable, carbon film, 5000 ohms ±20%, 0.5 w; Switch, rotary, DPST, 6 amps at 125 VAC; sim to Mallory LC(5K)OAC-2.
S702	19B209165P4	Pushbutton, white: SPST, momentary contact, normally open, 1 amp at 115 VAC; sim to Grayhill 30-17B.
S706	19B200394P7	Rotary: 1 pole, 2 positions, non-shorting, 36° indexing contacts, 1 amp at 115 VAC/VDC; sim to Grayhill Series 24.
		- - - - - - - - - TERMINAL BOARDS - - - - - -
TB1	7775500P4	Phen: 2 terminals.
		- - - - - - - - - SOCKETS - - - - - - - -
XDS701	4032220P1	Lampholder, miniature: sim to Drake N517.
XF701		FUSE LEAD 19A122111G1
		- - - - - - - - - MISCELLANEOUS - - - - - - -
	19A115776P2	Fuseholder, phenolic: sim to Bussmann Type HHJ.
XF702		FUSE LEAD 19A122111G2
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A115776P2	Fuseholder, phenolic: sim to Bussmann Type HHJ.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		MODIFICATION KIT 19A122220G7 (Used in Model 4EC67A12)
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S707	19B204441G1	Rotary: 1 pole, 4 positions, non-shorting contacts, 1 amp at 115 VDC; sim to Grayhill Series 24 (modified).
		ASSOCIATED ASSEMBLIES
		POWER/CONTROL CABLES
	19C303910G1	2 Freq, positive ground.
	19C303910G2	2 Freq, negative ground.
	19C303910G3	4 Freq, positive ground.
	19C303910G4	4 Freq, negative ground.
	19C311411G1	Screw, self captivating: No. 8-32 x 2-1/4. (Used with Connector cover).
		FUSE ASSEMBLY 19B216021G4
	19D413045P1	Base.
	19D413046P1	Cover.
	19B205950P1	Fuse clip.
		POWER/ANTENNA CONNECTOR 25-50 MHz and 132-174 MHz 19B205260G1
		- - - - - - - JACKS AND RECEPTACLES - - - - -
J1	19C303775P1	Connector, phenolic: 28 contacts.
		- - - - - - - - - MISCELLANEOUS - - - - - -
	19A122133G2	Antenna Cable. Includes J2 and P204.
		POWER/ANTENNA CONNECTOR 450 MHz 19B205260G7
		- - - - - - - JACKS AND RECEPTACLES - - - - -
J1	19C303775P1	Connector, phenolic: 28 contacts.
		- - - - - - - - - MISCELLANEOUS - - - - - - -
	19A122133G10	Antenna Cable. Includes J2 and P205.
		MILITARY MICROPHONE MODELS 4EM25E10, F10 19B209102P2 (SEE RC-1399)
		MODEL 4EM25E10 - SHURE BROTHERS
1		Cable clamp, front and back case. Shure Brothers RP96.
2		Switch. Shure Brothers RP26.
3		(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		(See item 1).
9		Cable and plug: approx 6 feet long. Shure Brothers RP14.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B205216P1	Jewel: red. (Used with DS701 in 19C303901G1,2).
	4039182G3	Knob. (Used with S701 in 19C303901G1, 2). (Used with S703 in 19C303901G2).
	19A121521G1	Mounting support. (Used in 19C303901G1, 2).
	19A129617G1	Mounting support. (Mounts DS701 in 19C303901G1,2).
	NP248987	Nameplate. (Used in Model 4EC67A10).
	NP248988	Nameplate. (Used in Model 4EC67A11, 12).
	19B216271G2	Housing.



MILITARY MICROPHONE-MODEL 4EM25E10

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 - Models 4EC67A10,11 & 12
To incorporate improved speaker jack. Changed J702.

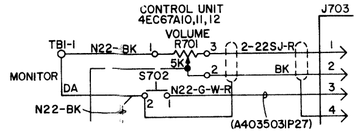
REV. A - Connector Assembly 19B205260-G1
To permit the addition of Channel Guard hookswitch option, added a green-white-orange wire from J1-20 to TB3-17.

REV. B - Models 4EC67A10, 11 & 12
To permit the addition of Channel Guard hookswitch option, added a green-white-orange wire from J702-3 to J703-20.

REV. B - Connector Assembly 19B205260-G1
To reduce alternate noise, removed #14 Black wire from J1-27.

REV. C - Models 4EC67A10,11 & 12
To make control head compatible with Royal Executive Systems. Changed wiring of R701.

Schematic was:

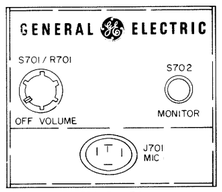


REV. C - Connector Assembly 19B205260-G1
To reduce transmitter noise in the region of 30-150 kHz from carrier. Added #14 BK wire between J1-27 and TB3-8, 22, 27. Added jumper from pin 26 to 27 on power cable plug in negative ground applications. Added jumper from pin 25 to 27 on power cable plug in positive ground applications.

REV. D - Models 4EC67A10, 11, 12
To ground microphone jack. Changed J701. Added #18 BK-W wire from J703 (ground) to G11.

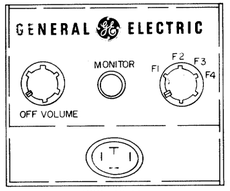
REV. E - Models 4EC67A10, 11, 12
Changed control unit housing from metal to Lexan®.

MODEL 4EC68A10(1-FREQ.)

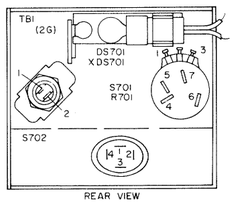


FRONT VIEW

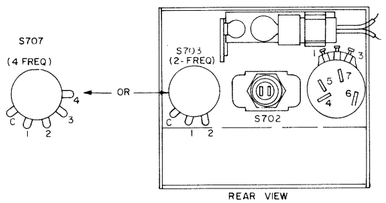
MODEL 4EC68A11 (2-FREQ)
MODEL 4EC68A12 (4-FREQ)



FRONT VIEW

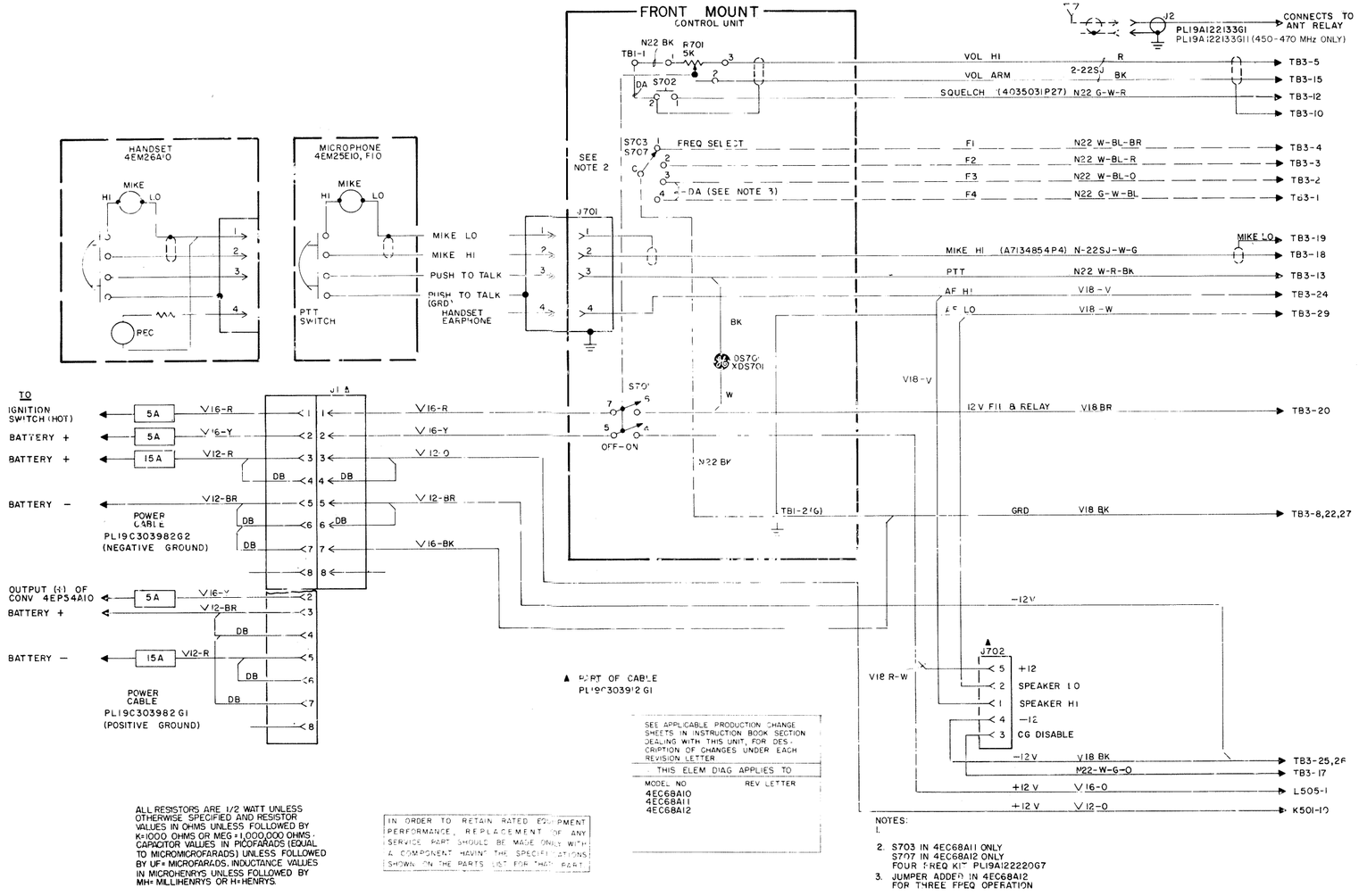


REAR VIEW



REAR VIEW

(19C311221, Rev. 2)



(19D402670, Rev. 16)

SCHEMATIC & OUTLINE DIAGRAM

FRONT MOUNT CONTROL UNIT
MODEL 4EC68A10-12

RC-1417J

PARTS LIST

LBI-3714C

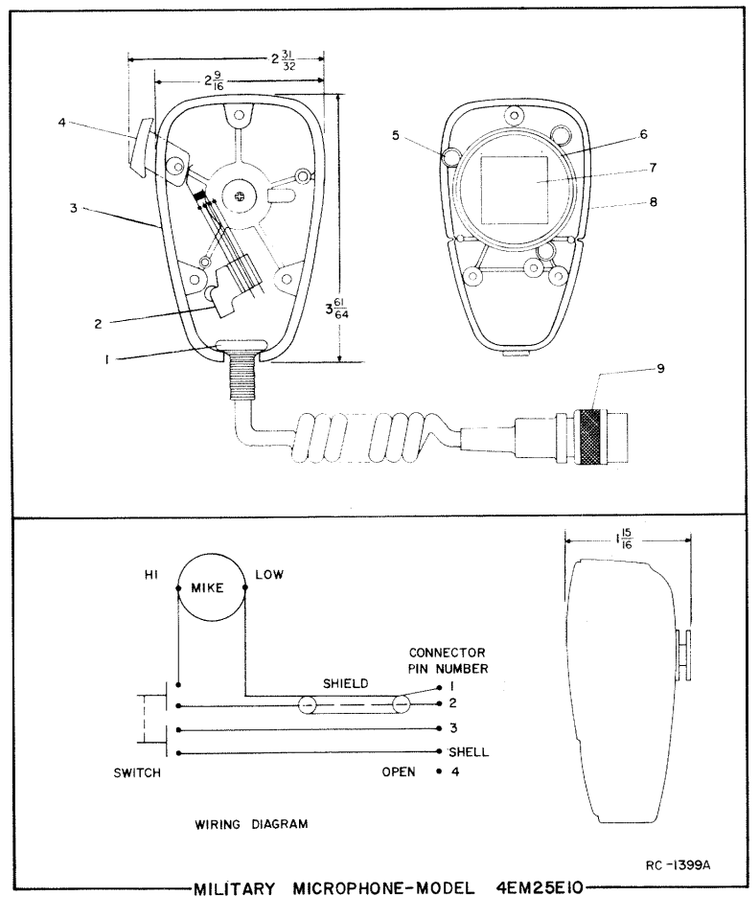
FRONT MOUNT CONTROL UNIT

MODEL 4EC68A10 (19C303907G1) (1 Frequency)
MODEL 4EC68A11 (19C303907G2) (2 Frequency)
MODEL 4EC68A12 (19C303907G2) (4 Frequency)
(19A122220G7)

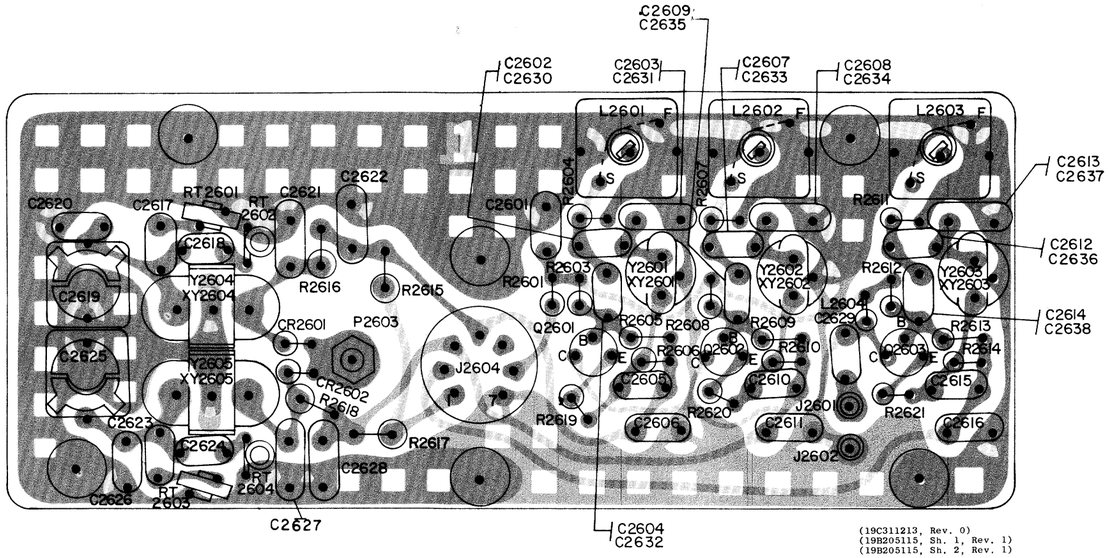
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - **INDICATING DEVICES** - - - - - - - -
DS701	19C307037P14	Lamp, incandescent: 18 v; sim to GE 1445.
		- - - - - - **JACKS AND RECEPTACLES** - - - - - -
J701		Connector. Includes:
	19A116061P2	Receptacle: 4 female contacts; sim to Amphenol Type 91-PN4F-1000.
	19A116061P4	Lockwasher.
	19A122600P1	Nut, knurled.
		- - - - - - - - - - **RESISTORS** - - - - - - - - - -
R701		(Part of S701).
		- - - - - - - - - - **SWITCHES** - - - - - - - - - -
S701	5496870P13	Resistor/switch: includes Resistor (R701), variable, carbon film, 5000 ohms ±20%, 0.5 w; Switch, rotary, DPST, 6 amps at 125 VAC; sim to Mallory LC(5K)OAC-2.
S702	19B209165P4	Pushbutton, white: SPST, momentary contact, normally open, 1 amp at 115 VAC; sim to Grayhill 30-17B.
S703	19B200394P3	Rotary: 1 pole, 2 positions, non-shorting contacts, 1 amp at 115 VAC or 28 VDC; sim to Grayhill Series 24.
		- - - - - - - - **TERMINAL BOARDS** - - - - - - -
TB1	7775500P4	Phen: 2 terminals.
		- - - - - - - - - - **SOCKETS** - - - - - - - - - -
XDS701	4032220P2	Lampholder, miniature: sim to Drake N517.
		MODIFICATION KIT 19A122220G7 (Used in Model 4EC68A12)
		- - - - - - - - - - **SWITCHES** - - - - - - - - - -
S704	19B204441G1	Rotary: 1 pole, 4 positions, non-shorting contacts, 1 amp at 115 VDC; sim to Grayhill Series 24 (modified).
		ASSOCIATED ASSEMBLIES **POWER CABLE** 19C303982G2 (Negative Ground)
	7473192P35	Receptacle, phen: 8 contacts; sim to H.B. Jones 261-32-08-033 (S-308-CCT-K).
	1R16P8	Fuse, quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5.
	19A122111G1	Fuseholder: with red wire; sim to Bussman Type HHJ.
	19A122111G2	Fuseholder: with yellow wire; sim to Bussman Type HHJ.
	7102673P2	Fuse, cartridge: 15 amps at 32 v; sim to Littelfuse 311015 or Bussmann AGC-15.
	7007522P1	Fuseholder: 15 amps; sim to Littelfuse 356001.
		POWER CABLE 19C303982G1 (Positive Ground)
	7473192P35	Receptacle: phenolic, 8 contacts; sim to H.B. Jones 261-32-08-033 (S-308-CCT-K).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
	1R16P8	Fuse, quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5.
	19A122111G1	Fuseholder: with red wire; sim to Bussman Type HHJ.
	19A122111G2	Fuseholder: with yellow wire; sim to Bussman Type HHJ.
	7102673P2	Fuse, cartridge: 15 amps at 32 v; sim to Littelfuse 311015 or Bussmann AGC-15.
	7007522P1	Fuseholder: 15 amps; sim to Littelfuse 356001.
		CABLE ASSEMBLY 19C303912G1
J1	7473192P34	Plug, phen: 8 contacts; sim to H.B. Jones 261-31-08-032.
J702	5493018P5	Connector: 5 contacts, molded black phenolic, (Less Saddle); sim to Cinch Mfg Co 203-31-05-031.
	5491563P3	Cap: (Used with J702): sim to Methode C850-1V.
		MILITARY MICROPHONE MODELS 4EM25E10 19B209102P2 (SEE RC-1399A) MODEL 4EM25E10 - SHURE BROTHERS
1		Cable clamp, front and back case. Shure Brothers RP96.
2		Switch. Shure Brothers RP26.
3		(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		(See item 1).
9		Cable and plug: approx 6 feet long. Shure Brothers RP14.
		- - - - - - - - **MISCELLANEOUS** - - - - - - - -
	NP248936	Nameplate. (Used in Model 4EC68A10).
	NP248938	Nameplate. (Used in Model 4EC68A11, 12).
	19B205216P1	Jewel: red. (Used with DS701 in 19C303907G1,2).
	4039182G3	Knob. (Used with S701 in 19C303907G1, 2). (Used with S703 in 19C303907G2).
	4032248P1	Clip: spring tension; sim to Augat Brothers 6185-1A. (Mounts DS701 in 19C303907G1, 2).



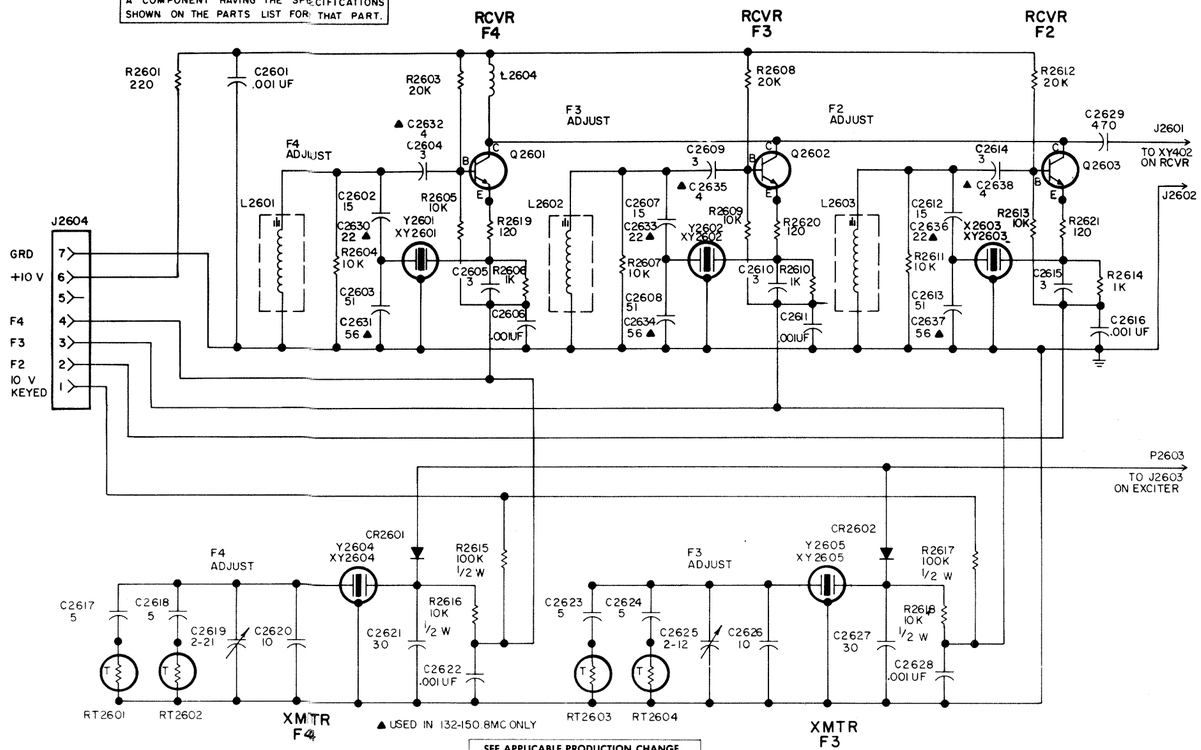
MILITARY MICROPHONE-MODEL 4EM25E10



(19C311213, Rev. 0)
(19B205115, Sh. 1, Rev. 1)
(19B205115, Sh. 2, Rev. 1)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

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.



ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

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

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4EG22F10	C
4EG22F11	C

ECP-221

(19C303926, Rev. 6)

SCHEMATIC & OUTLINE DIAGRAM

FOUR-FREQUENCY OSCILLATOR BOARD
MODEL 4EG22F10, 11

RC-1418D

PARTS LIST

LBI-3715C

132-174 MHz FOUR FREQUENCY OSCILLATOR BOARD
MODELS 4EG22F10, 11
(19C303924-G1, 2)

SYMBOL	G-E PART NO.	DESCRIPTION
		CAPACITORS
C2601	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2602*	5496219-P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P644	In Models earlier than Rev B: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5496219-P344	In Models earlier than Rev A: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2603	5496219-P456	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -220 PPM.
C2604*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P37	In Models earlier than Rev B: Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2605	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2606	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2607*	5496219-P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P644	In Models earlier than Rev B: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5496219-P344	In Models earlier than Rev A: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2608	5496219-P456	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -220 PPM.
C2609*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P37	In Models earlier than Rev B: Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2610	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2611	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2612*	5496219-P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P644	In Models earlier than Rev B: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5496219-P344	In Models earlier than Rev A: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2613	5496219-P456	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -220 PPM.
C2614*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P37	In Models earlier than Rev B: Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2615	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2616	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2617 and C2618	5496219-P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2619	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C2620	5496219-P10	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2621	5496219-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C2622	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2623 and C2624	5496219-P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2625	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C2626	5496219-P10	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2627	5496219-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C2628	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2629	5494481-P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2630*	5496219-P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P647	In Models earlier than Rev B: Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5496219-P345	In Models earlier than Rev A: Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2631	5496219-P457	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -220 PPM.
C2632*	5496219-P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P39	In Models earlier than Rev B: Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2633*	5496219-P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P647	In Models earlier than Rev B: Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5496219-P345	In Models earlier than Rev A: Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2634	5496219-P457	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -220 PPM.
C2635*	5496219-P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P39	In Models earlier than Rev B: Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2636*	5496219-P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P647	In Models earlier than Rev B: Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5496219-P345	In Models earlier than Rev A: Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2637	5496219-P457	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -220 PPM.
C2638*	5496219-P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P39	In Models earlier than Rev B: Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
		DIODES AND RECTIFIERS
CR2601 and CR2602	19A115371-P1	Silicon; sim to Type 1N676.
CR603	4037822-P1	Silicon.
		JACKS AND RECEPTACLES
J2601 and J2602	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
J2604	19B209303-P2	Connector, phen: 7 pins.
		INDUCTORS
L2601 thru L2603	19A121085-G1	Coil. Includes tuning slug 19B200497-P2.
L2604	7488079-P1	Choke, RF: 0.15 µh ±20%, .03 ohm DC res max; sim to Jeffers 4411-1.
		PLUGS
P2603	4029093-P1	Plug, banana type: sim to Ucinite 155296.
Q2601* thru Q2603*	19A115925-P1	**TRANSISTORS** Silicon, NPN.
	19A115342-P2	In Models earlier than Rev C: Silicon, NPN.
		RESISTORS
R2601	3R152-P221K	Composition: 220 ohms ±10%, 1/4 w.
R2603	3R152-P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R2604 and R2605	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2606	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R2607	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2608	3R152-P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R2609	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2610	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R2611	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2612	3R152-P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R2613	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2614	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R2615	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R2616	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R2617	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R2618	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R2619* thru R2621*	3R152-P121J	Composition: 120 ohms ±5%, 1/4 w.
	3R152-P150J	In Models earlier than Rev B: Composition: 15 ohms ±5%, 1/4 w.
		THERMISTORS
RT2601	19B209353-P2	Disc: 1250 ohms ±5%, color code red; sim to GE 16D-3121.
RT2602	19B209353-P1	Rod: 3350 ohms ±5%, color code brown; sim to GE 1R-1544.
RT2603	19B209353-P2	Disc: 1250 ohms ±5%, color code red; sim to GE 16D-3121.
RT2604	19B209353-P1	Rod: 3350 ohms ±5%, color code brown; sim to GE 1R-1544.
		CABLES
W2601		**CABLE 19B205275-G1**
	19B209341-P1	**MISCELLANEOUS** Socket: 7 contacts; sim to Elco 04-720-XX.
W2602		**CABLE 19B205263-G1**
	4029840-P1	**MISCELLANEOUS** Contact, electrical: sim to AMP 41854.
		SOCKETS
XY2601 thru XY2603	5490277-P1	Transistor, phen: 4 contacts; sim to Elco 3303.
XY2604 and XY2605		(See Miscellaneous).
		CRYSTALS When reordering give GE Part Number and specify exact frequency needed. Receiver Crystal freq = (OF -10.7 MHz) ÷ 3.
Y2601 thru Y2605	19B206221-P1	Quartz: freq range 39 to 62 MHz, temp range -30°C to +80°C. (Receiver).
Y2601 thru Y2605	19B206204-P1	Transmitter Crystal freq = (OF) ÷ 24. Quartz: freq range 5400 to 7250 KHz, temp range -30°C to +85°C. (Transmitter).
		MISCELLANEOUS
	4033089-P1	Clip. (Part of XY2604, 2605).
	19A115793-P1	Contact, electrical: sim to Malco 2700. (Part of XY2604, 2605).
	19C311172-P1	Socket: 4 contacts. (Part of XY2604, 2605).
	19A121088-P1	Can. (Used with L2601-2603).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PRODUCTION CHANGES

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

REV. A - To improve receiver oscillator frequency stability. Changed C2602, C2607, C2612, C2630, C2633 and C2636.

REV. B - To improve the frequency stability of the receiver oscillators. Changed C2602, C2604, C2607, C2609, C2612, C2614, C2630, C2632, C2633, C2635, C2636, C2638, R2619, R2620 and R2621.

REV. C - To facilitate manufactoring. Changed Q2601, Q2602 & Q2603.

PARTS LIST

LBI-4273A

HANDSET MODEL 4EM26A10
HANDSET MODEL 4EM26C10
AND
HOOKSWITCH 19B204867G4
(Refer to RC-1398)

SYMBOL	GE PART NO.	DESCRIPTION
		HANDSET MODEL 4EM26A10 19B209100P2 **HANDSET MODEL 4EM26C10 19B209100P3**
1		Self tap screw, bind head: No. 4 x 5/16. Shure Brothers 30C640C.
2		Cable clamp. Shure Brothers 53A532.
3		Shield. Shure Brothers RP19.
4		Switch. Shure Brothers RP81.
5		Case. Shure Brothers RP49. (Used in 4EM26A10).
		Case. Shure Brothers 21RP899F. (Used in 4EM26C10).
6		Adapter. Shure Brothers 65A230.
7		Magnetic controled cartridge. Shure Brothers RP41.
8	3R77P222K	Resistor, composition: 2200 ohms ±10%, 1/2 w.
9		Receiver cap. (Part of item 5).
10		Washer. Shure Brothers 34A321.
11		Escutcheon. Shure Brothers 53A536A.
12		Actuator. Shure Brothers 53A556.
13		Spring. Shure Brothers 44A140.
14		Plunger bar. Shure Brothers RP82.
15		Flat head screw, socket cap: No. 4-40 x 1/4. Shure Brothers 30C557B.
16		Transmitter cap. (Part of item 5).
17		Washer. Shure Brothers 34A309.
18		Magnetic controled cartridge, Transmitter. Shure Brothers RP13.
19		Cable and plug. Shure Brothers RP48. (Used in 4EM26A10).
		Cable and plug. Shure Brothers 21RP738F. (Used in 4EM26C10).
		HOOKSWITCH ASSEMBLY **19B204867G4**
20	4029851P5	Cable clamp; sim to Weckesser 2/16-4.
21	19A121612P1	Holder and switch: thermoplastic case, contact rating 1 amp at 125 v.
22	19B205661G1	Cable: approx 8-1/2 feet long.
23	5493035P10	Resistor, wirewound, ceramic: 3.5 ohms ±5%, 5 w; sim to Tru-Ohn Type X-50.
24	7775500P55	Terminal board, phen: 5 terminals.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

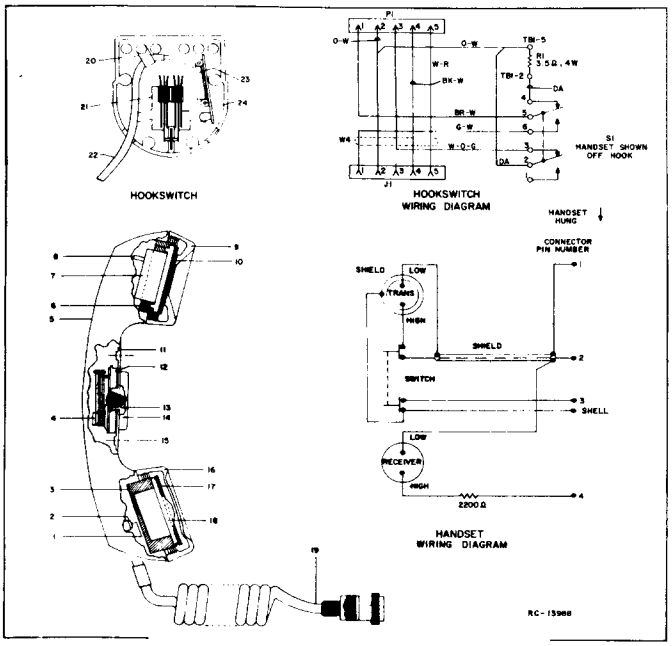
PARTS LIST

LBI-4866

SPEAKER
MODEL 4EZ20A11
19C320302G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS2	19A116910P1	Permanent magnet: 5 inch, 3.2 ohms ±15% imp, 5 w max operating; sim to Pioneer 002009.
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W2		CABLE 19A122167G1
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P702	5493018P2	Connector, phenolic: 5 contacts; sim to Cinch 204-31-05-010.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A116986P108	Screw, thread forming, assembled washer: Phillips Pozidriv , HI-LO thread, No. 7-19 x 1/2. (Mount speaker).
	19A116986P112	Screw, thread forming, assembled washer: Phillips Pozidriv , HI-LO thread, No. 7-19 x 3/4. (Housing to grille).
	N130P1710C13	Tap screw. (Secures housing to wall).
	19A116985P1	Screw, hex head-slotted: double lead thread, with internal tooth washer, No. 13-16 x 3/4. (Mounts bracket to housing).
	19C320016P2	Mounting bracket.
	19D416396P2	Housing.
	19B219692G2	Grille.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



DF-8385

SCHEMATIC & OUTLINE DIAGRAM

HANDSET MODEL 4EM26A10 & C10
HOOKSWITCH 19B204867G4
SPEAKER MODEL 4EZ20A11

RC-1420E

INSTRUCTIONS

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.

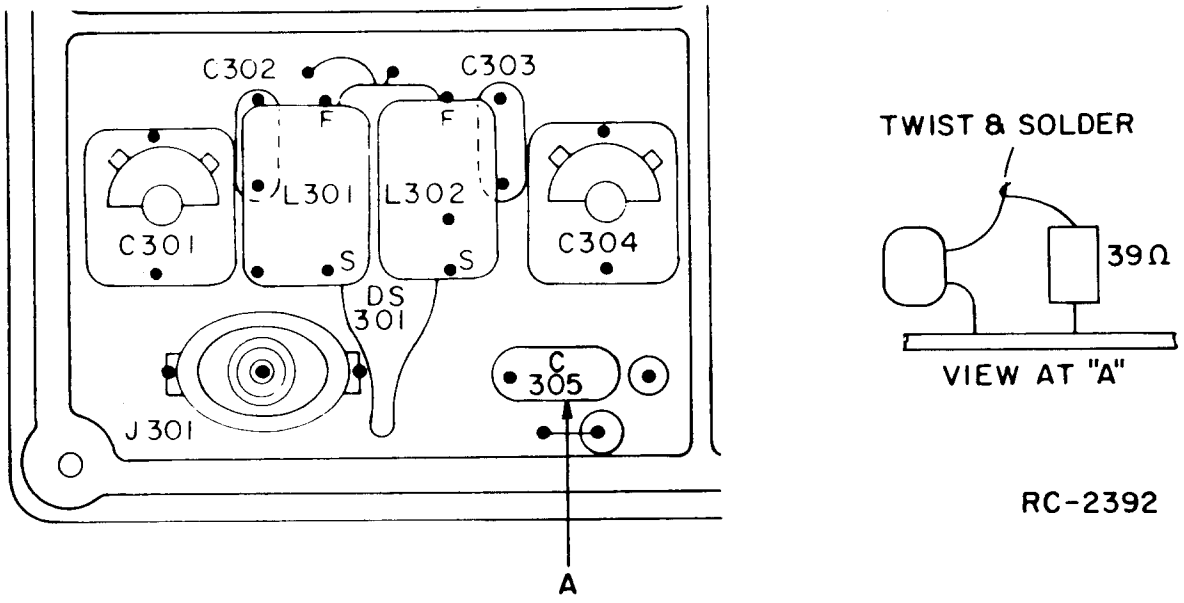


Figure 1 - Installation Diagram

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.

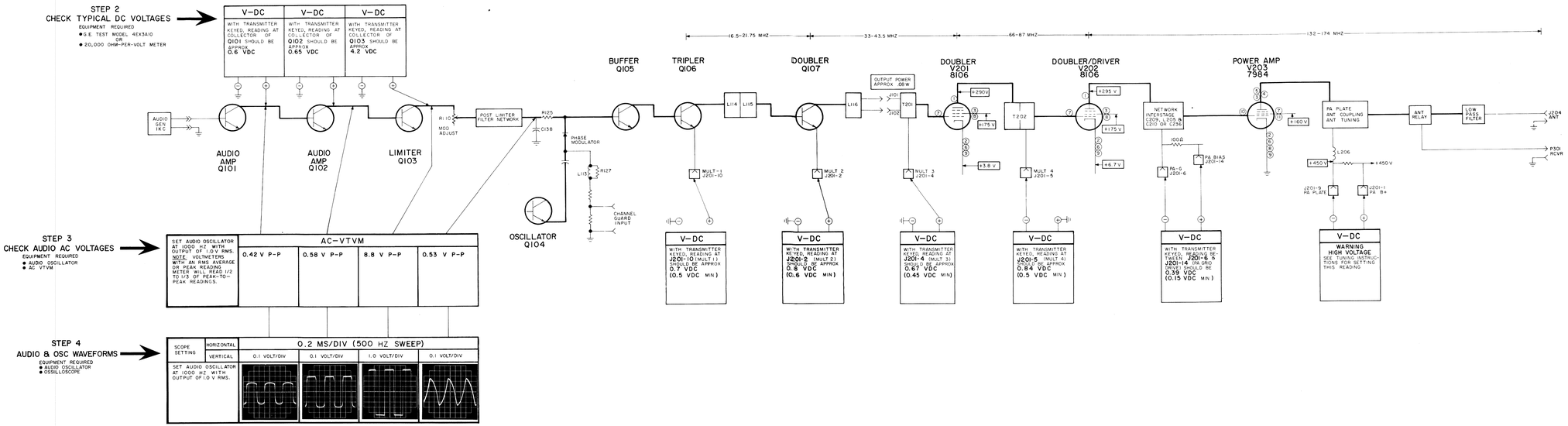
DF-1090

MODIFICATION INSTRUCTIONS

Reduction of Intermodulation Interference
(Option 8302)
RC-2400

STEP 1 - QUICK CHECKS

Power Out	A	B	D	E	F	G	I	Probable Defect
low	0.7	0.8	0.7	0.8	0.3	0.7	10	weak 7984
low	0.7	0.8	0.7	0.8	0.1	0.7	10	weak 8106 V202
low	0.7	0.8	0.7	0.3	0.1	0.7	10	weak 8106 V201
0	0.7	0.8	0.7	0.8	0.3	0	10	defective 7984
0	0.7	0.8	0.7	0.8	0	0	10	defective 7984
0	0.7	0.8	0.7	0.8	0	0.8	10	defective bias supply
0	0.7	0.8	0.7	0	0	0	10	V202 failure
0	0.7	0.8	0	0	0	0	10	V201 failure, open coax to exciter board or Q107 defective
0	0.7	0	0	0	0	0	10	Q107 defective
0	0	0	0	0	0	0	0	10 v regulator defective



TROUBLESHOOTING PROCEDURES

TRANSMITTER TYPES ET-74-A, B & E

RC-1389A

STEP 1 - 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 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 Q204 and Q305. Check resistance readings on J202-1, -2 and -3. Check crystal Y401.
LOW RECEIVER SENSITIVITY	Check Front End Alignment (Refer to Receiver 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).
LOW AUDIO	Check Audio PA (Q505) output current at J304-9. If reading is low -- a. Check BIAS ADJ for 0.28 VDC at J304-9. If incorrect, set for 0.28 v with R401 (Position 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. Check voltage readings of Squelch circuit (Refer to Receiver Service Sheet).
DISCRIMINATOR IDLING TOO FAR OFF ZERO	See if discriminator zero is in the center of IF bandpass.

(DP-1090)

STEP 3- GAIN-PER-STAGE READINGS-

EQUIPMENT REQUIRED:

1. RF VOLTMETER (SIMILIAR TO BOONTON MODEL 91-CA OR MILLIVAC TYPE MV-18 C.
2. SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION). CORRECT FREQUENCY CAN BE DETERMINED BY ZEROING THE DISCRIMINATOR.

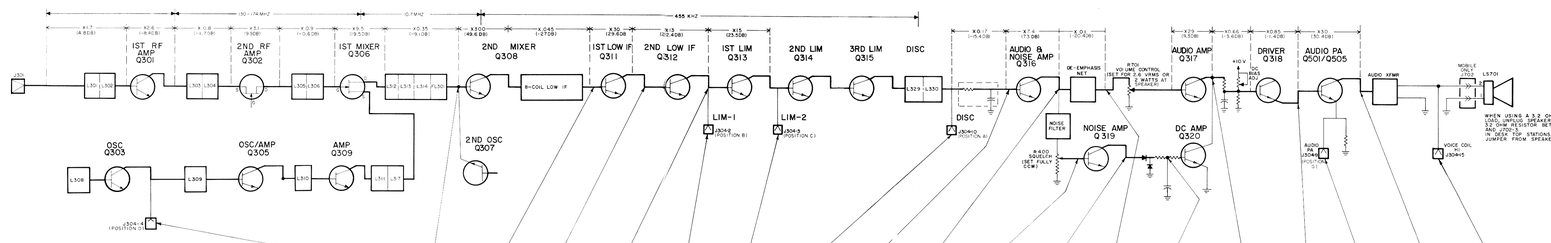
PROCEDURE

1. APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, BASE OF 1ST AMP.). PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED AND TAKE VOLTAGE READING (E_1).
2. MOVE PROBE TO INPUT OF FOLLOWING STAGE (1ST MIXER). REPEAT FIRST RESONANT CIRCUIT THEN PEAK CIRCUIT BEING MEASURED AND TAKE READING (E_2).
3. CONVERT READINGS (BY SUBTRACTING E_1 FROM E_2 ON THE DB SCALE OF RF VOLTMETER, OR) BY MEANS OF THE FOLLOWING FORMULA:

$$\text{AMP FACTOR} = \frac{E_2}{E_1}$$

4. CHECK RESULTS WITH TYPICAL GAINS SHOWN ON DIAGRAM BELOW.
5. 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:
1. VTVM-ACDC.
2. SIGNAL GENERATOR (MEASUREMENTS M800 EQUIV.)

PRELIMINARY STEPS:
1. SET VOLUME CONTROL FULLY CLOCKWISE.
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. RECEIVER SHOULD BE PROPERLY ALIGNED.

SIGNAL GENERATOR SIGNAL STEP MANUAL SETTING AT MEASUREMENT POINT		UNMODULATED	UNMODULATED	UNMODULATED	UNMODULATED	10 MICROVOLTS UNMODULATED	1 MICROVOLT UNMODULATED	STANDARD SIGNAL-1 KHz AT 400 HR FREQ MOD BY 3 KHZ DEVIATION (ACC METER)	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	NO SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	NO SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
PROCEDURE		INCREASE GENERATOR OUTPUT UNTIL VTVM READING DECREASES BY .50 MV.	INCREASE SIGNAL GENERATOR OUTPUT UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT UNTIL VTVM READING DECREASES BY 5%												AFTER CHECKING INDICATIONS ADJUST VOLUME CONTROL FOR RATED 1 WATT OUTPUT ACROSS 3.2 Ω LOAD	
READING	0.41 VDC MIN EX-3-A 0.9 VDC MIN MULTIMTR 0.25 VDC MIN	GENERATOR OUTPUT SHOULD BE APPROX 3 MILLIVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 400 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 70 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 5 MICROVOLTS	0.82 VDC EX-3-A 0.2 VDC MULTMTR 0.4 VDC	1.6 VDC EX-3-A 0.4 VDC MULTMTR 0.8 VDC	0.57 VAC	0.05 VAC	0.89 VAC	0.045 VAC	1.2 VAC	.03 VAC	0.56 VDC	0.34 VAC	0.2 VAC	0.28 VDC EX-3-A 0.28 VDC MULTMTR 0.28 VDC	8 VAC	2.6 VAC

STEP 2B-AUDIO & SQUELCH WAVEFORMS

EQUIPMENT REQUIRED:
1. OSCILLOSCOPE
2. SIGNAL GENERATOR (MEASUREMENTS M800 OR EQUIVALENT).

SCOPE SETTING	HORIZONTAL	0.5 MS/DIV (APPROX 200 CPS)	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV		0.5 MS/DIV	0.5 MS/DIV		0.5 MS/DIV	0.5 MS/DIV
	VERTICAL	0.5 VOLTS/DIV	100 MILLIVOLTS/DIV	1 VOLTS/DIV	100 MILLIVOLTS/DIV	1 VOLTS/DIV	100 MILLIVOLTS/DIV		200 MILLIVOLTS/DIV	200 MILLIVOLTS/DIV		5 VOLTS/DIV	1 VOLTS/DIV
PEAK-TO-PEAK VOLTAGE		2.1 V P-P	340 MV P-P	2.6 V P-P	0.4 V P-P (NOISE)	3.0 V P-P (NOISE)	0.24 V P-P		1.2 V P-P	900 MV P-P		22 V P-P	7.2 V P-P
NOISE WAVE FORM													
STANDARD SIGNAL - MILLIVOLT AT RECEIVER FREQ MODULATED BY 1KHZ WITH NORMAL RATED AUDIO, WIDE BAND DEVIATION													

RC-2154B

TROUBLESHOOTING PROCEDURE

RECEIVER MODELS 4ER48C10-15

(RC-2154B)

QUICK CHECKS

MULTIVIBRATOR CIRCUIT	
SYMPTOM	PROCEDURE
POWER SUPPLY WON'T START	1. Check following: A. All fuses B. For collector-to-emitter short in Q501 and Q502.
	2. Check the following voltages: A. Supply voltage. B. Collector-to-emitter voltages of Q501 and Q502 with transmitter keyed. Readings should be approximately equal to supply voltage.
	3. Check starting network R501 and R502 for opens or shorts.
	4. Make continuity check of primary and feedback circuits.
	5. Check for shorted turns or shorts between windings of T501. To check, disconnect all secondary windings from their loads. Key the transmitter. If unit starts, go to step 6. If unit does not start, T501 is probably defective.
	6. Check for excessive load in secondary. A. Check for shorted capacitors or diodes. B. Check for shorts to ground of wiring to the transmitter.
OUTPUT VOLTAGES BELOW NORMAL - SUPPLY VOLTAGES NORMAL	7. Check for excessive load in secondary. A. Check for shorted capacitors or diodes. B. Check continuity of L501, L502, and L503.
10-VOLT REGULATOR	
NO OUTPUT	Check: A. For 12 V at input of regulator. B. For C to E open circuit in Q1. C. For open DS1/R5. D. For short between emitter of Q1 and ground.
OUTPUT TOO HIGH - CANNOT ADJUST WITH R3	Check for: A. Open in VR1 or Q2. B. Defective R3.
OUTPUT EQUALS INPUT	Q1 is shorted.
REGULATION POOR BUT OUTPUT IS ADJUSTABLE WITH R3	Q1 is probably defective and should be replaced.