LAKE STEEL
4/18/74

MOBILE RADIO

MASTR
PROGRESS LINE
Executive Series

MAINTENANCE MANUAL

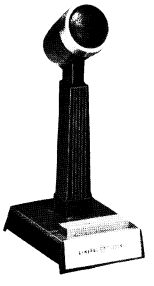
Wall Mount Stations

Desk Top Stations

25—50 MHz

TWO-WAY FM STATION COMBINATION

LBI-3752E



Microphone

GENERAL ELECTRIC

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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	
	DESK TOP	WALL MOUNT
TRANSMITTER	ET-72-A,B	ET-72-A,B
RECEIVER	4ER46A10-27 4ER46B10-27	4ER46A10-27 4ER46B10-27
POWER SUPPLY	4EP51A10	4EP51A10
CONTROL UNIT	4EC69A10-12	4EC70A10
CHANNEL GUARD BOARD	4EK14B10	4EK14B10
FOUR FREQ. OSCILLATOR BOARD	4EG22A10	4EG22A10
REMOTE CONTROL BOARD	4KC18A10,11,14,15	4KC18A10, -17
POWER CABLE	19A122527-G2	19A122527-G1
MICROPHONE	4EM28A10	
TOP COVER	19A122161-G1	
BOTTOM COVER	19B205299-G1	
WEATHERPROOF CABINET		19D402658-G1
OPTION COVER PLATE KIT	19A122213-G1	19A122213-G1
ALIGNMENT TOOLS Hex Slug Type Slotted Screw Type	 4038831-P2 4033530-G2	 4038831-P2 4033530-G2
LOCK ASSEMBLY Key Lock		 5491682-P8 5491682-P14

OPTIONAL EQUIPMENT

OPTION	EQUIPMENT	OPTION	EQUIPMENT
8401	12-Hour Clock (117 VAC, 60 Hz)	8422-23	Fan (117 VAC, 60 Hz)
8402	12/24-Hour Clock (117 VAC, 60 Hz)	8424	Cabinet Heater (117 VAC, 50/60 Hz)
8403	Test Meter	8461	12-Hour Clock (220 VAC, 60 Hz) and Test Meter.
8404	12-Hour Clock (117 VAC, 60 HZ) and Test Meter	8462	12/24-Hour Clock (220 VAC, 60 Hz) and Test Meter.
8405	12/24-Hour Clock (117 VAC, 60 Hz) and Test Meter.	8463	12-Hour Clock (220 VAC, 50 Hz) and Test Meter.
8412	12-Hour Clock (220 VAC, 60 Hz)	8464	12/24-Hour Clock (220 VAC, 50 Hz) and Test Meter.
8413	12/24-Hour Clock (220 VAC, 60 Hz)	8465	12-Hour Clock (117 VAC, 50 Hz) and Test Meter.
8414	12-Hour Clock (220 VAC, 50 Hz)	8466	12/24-Hour Clock (117 VAC, 50 Hz) and Test Meter.
8415	12/24-Hour Clock (220 VAC, 50 Hz)	8467	Fan (220 VAC, 60 Hz)
8416	12-Hour Clock (117 VAC, 50 Hz)	8468	Fan and Cabinet Heater (220 VAC,60 Hz)
8417	12/24-Hour Clock (117 VAC, 50 Hz)	8493	Handset (4EM26A10) & Hookswitch
8418	Cabinet Heater (220 VAC, 50/60 Hz)	8494	Handset (4EM26A10)
8421	Speaker (4EZ16A18) and Microphone (19B209102-P2)	8495	Military Microphone (19B209102-P2)
		8308	Carrier Control Timer (19A127875-G5)

SPECIFICATIONS*

GENERAL

FREQUENCY RANGE	25-50 MHz
DIMENSIONS (H x W x D)	
Desk Top	5-3/4" x 20" x 13-3/4"
Wall Mount	21-1/4" x 22-1/2" x 6-7/8"
WEIGHT	
Desk Top	43-1/2 pounds
Wall Mount	68-1/4 pounds
INPUT VOLTAGE	117/220 VAC ±20%, 50/60 Hz
INPUT POWER	
Standby (transmitter filaments on)	28 watts
Transmit	150 watts
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-72-A (Narrow Band) ET-72-B (Wide Band)
POWER OUTPUT	50 watts
FREQUENCY STABILITY	±.002% (-30°C to +60°C, +25°C reference)
SPURIOUS AND HARMONIC RADIATION	-60 dB
MODULATION	Adjustable 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) 1.5 kHz maximum (Wide Band)
CRYSTAL MULTIPLICATION FACTOR	12

RECEIVER

TYPE NUMBER	ER-46-A (Narrow Band) ER-46-B (Wide Band)
AUDIO OUTPUT	2 watts at less than 6% distortion 3 watts at less than 15% distortion
SENSITIVITY	
12-dB SINAD (EIA Method)	0.25 µV (NB), 0.35 µV (WB)
20-dB Quieting Method	0.35 µV (NB), 0.45 µV (WB)
SELECTIVITY	
EIA Two-Signal Method	-75 dB-adjacent channel 20 kHz channels (NB) -65 dB-adjacent channel 40 kHz channel (WB)
20-dB Quieting Method	-100 dB at ±20 kHz (NB) -120 dB at ±40 kHz (WB)
SPURIOUS RESPONSE	-90 dB
FIRST OSCILLATOR STABILITY	±.002% (-30°C to +60°C, +25°C reference)
MODULATION ACCEPTANCE	±6 kHz (NB), ±15 kHz (WB)
INTERMODULATION	-60 dB (NB), -55 dB (WB)
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 Desk Top and Wall Mount stations are attractively styled base stations that are designed to meet the most stringent requirements in the field of Two-Way radio. The transmitter exciter board and the receiver are fully transistorized, utilizing silicon transistors for added reliability.

The stations are designed for ease of maintenance. All major modules and tuning adjustments are easily accessible. The Desk Top station transmitter receiver assembly tilts up to provide access to both sides of the unit. In Wall Mount stations, the entire chassis swings out and the transmitter-receiver assembly tilts down to provide access to both sides of the unit.

The transmitter and receiver are equipped with centralized metering jacks for simplified alignment and troubleshooting. The Desk Top station may also be equipped with a built-in test meter to facilitate servicing. The module layout for the stations is shown in Figure 1.

The transmitter and receiver may be used interchangeably with transmitter and receiver modules in MASTR Executive Series mobile combinations. 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 two tubes in the power amplifier. The standard transmitter may be equipped with:

- One through four frequencies
- Channel Guard

RECEIVER

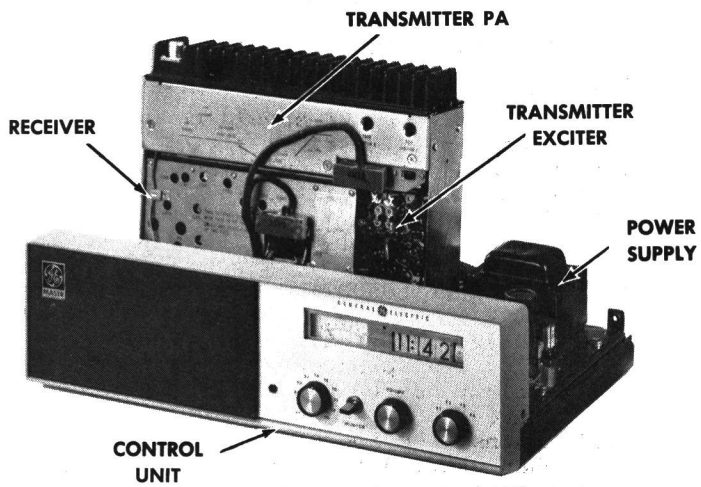
The fully transistorized receiver is mounted on a single printed wiring board for increased reliability. A copper-plated housing and metal cover that completely encloses the receiver provides excellent shielding. The standard receiver may be equipped with:

- One through four frequencies
- Channel Guard
- Noise Blanker

POWER SUPPLY

The power supply provides operating voltage for the transmitter and receiver. In addition to plate, screen and bias voltages for the transmitter PA, the power supply provides a regulated +10 volts for the transmitter exciter board, receiver and four-frequency oscillator board.

DESK TOP



WALL MOUNT

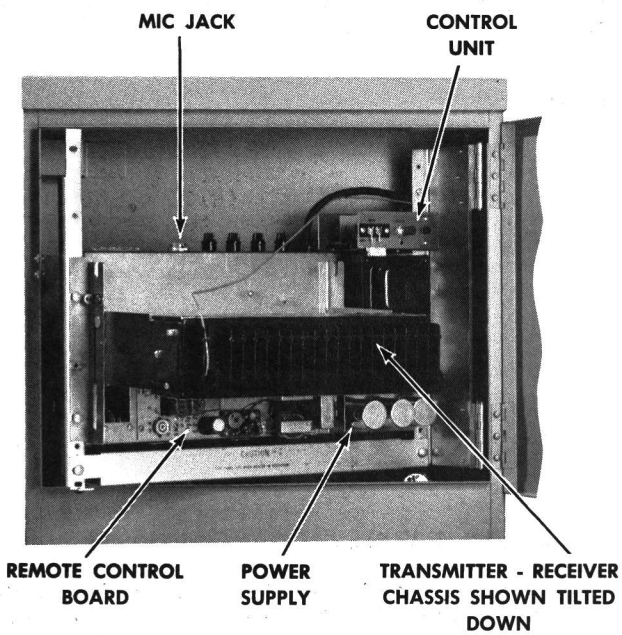


Figure 1 - Module Layout

CONTROL UNITS

Two different control units are used with the stations. The Desk Top control units is mounted on the front of the station so that the control will be within convenient reach of the operator. The Wall Mount control unit is mounted within the weatherproof cabinet on the top of the chassis.

INITIAL ADJUSTMENT

After the station 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 adjusting 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.

REMOTE CONTROL BOARD

In local/remote and remote control applications, it is necessary to set the Mic Level Adjust control (R1) on the remote control board. Refer to the Adjustment Procedure on page 14.

OPERATION

The basic procedures for receiving and transmitting messages on the Desk Top station is as follows:

TO RECEIVE A MESSAGE

1. Turn the radio on by turning the OFF-ON switch (at the rear of the station) to the ON position. This lights the green power-on lamp.
2. Press down the MONITOR switch and adjust the VOLUME control for a comfortable listening level. Release the MONITOR switch.

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-ON switch (at the rear of the Station) to the ON position. Let the unit warm up for 30 seconds.
2. Press the push-to-talk button on the microphone and speak in a normal (or softer) voice six inches away from the front of the mike. Release the button as soon as the message has been given. The red signal light on the control panel will glow each time the microphone button is pressed, indicating that the transmitter is on the air. The receiver is muted whenever the transmitter is keyed.

NOTE

For Desk Top Stations equipped with Channel Guard desk-type microphone Model 4EM28B10, press the MONITOR button down before sending a message and listen to make sure that no one is using the channel. To send a message, press down the TRANSMIT button while holding the MONITOR button down. The MONITOR button may be released after the TRANSMIT button is depressed.

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. This preventive maintenance should include the maintenance checks listed in the chart on page 3.

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.

PREVENTIVE MAINTENANCE PROGRAM

CHECK THE FOLLOWING ONCE A YEAR:	
1. Transmitter frequency and deviation (FCC required this check-up ONCE a year).	☐
2. Measure and record the antenna system V.S.W.R.	☐
3. For 117 VAC operation, check input voltage at TB501-18 and -22 on power supply. Reading should be within 10% of 117 VAC. (Also check during routine service calls).	☐
4. Compare and record transmitter meter readings with voltages taken during initial tune-up. Retune, if necessary.	☐
5. Compare and record receiver meter readings with voltages taken during initial tune-up. Retune, if necessary.	☐
6. Check for positive indication of pressure on transmission line pressure gauge (if pressurized line is used).	☐
7. Clean dust from fan blades and lubricate bearings.	☐
8. Burnish pitted or coated relay contacts to smooth out metallic deposits or remove the coating.	☐

MAKE THE FOLLOWING MAINTENANCE CHECKS DURING ROUTINE CALLS:	
1. Check antenna lines and mast for mechanical stability.	☐
2. Visually check:	
External cables	☐
Internal cables	☐
Plugs	☐
Sockets	☐
Terminal boards	☐
3. Check for tightness of nuts, bolts, and screws to make sure nothing is working loose from its mounting.	☐
4. Replace tubes as necessary. (It may be convenient to replace all station tubes during the yearly check-up).	☐

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

CIRCUIT ANALYSIS

TRANSMITTER

Transmitter Type ET-72-A and ET-72-B are crystal-controlled, phase modulated transmitters designed for one-, two- or four-frequency operation in the 25-50 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 page 4.

The transmitter uses a total of 7 transistors and 2 tubes to provide a minimum power output of 50 watts. The crystals used range from 2.08 to 4.17 megahertz, and the crystal frequency is multiplied 12 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.

FREQ RANGE	PA ASSEMBLY	EXCITER BOARD		NO. OF FREQS
		Without Channel Guard	With Channel Guard	
25-33 MHz	4EF32A10	4EG21A10 (NB)	4EG21A11	1-Freq
		4EG21A12 (NB)	4EG21A13	2-Freq
		4EG21A14 (WB)		1-Freq
		4EG21A15 (WB)		2-Freq
33-42 MHz	4EF32B10	4EG21B10 (NB)	4EG21B11	1-Freq
		4EG21B12 (NB)	4EG21B13	2-Freq
		4EG21B14 (WB)		1-Freq
		4EG21B15 (WB)		2-Freq
42-50 MHz	4EF32C10	4EG21C10 (NB)	4EG21C11	1-Freq
		4EG21C12 (NB)	4EG21C13	2-Freq
		4EG21C14 (WB)		1-Freq
		4EG21C15 (WB)		2-Freq

Connection	Voltage	Use
J202-1	+600 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 from the PA assembly through a 9-pin miniature connector (J105). Supply voltages for the transmitter are shown in the chart on page 4, Column 1.

EXCITER BOARD

OSCILLATOR

A transistorized Colpitts oscillator (Q104) is used in the transmitter. The oscillator provides a frequency stability of ±.002% without crystal ovens or warmers. Feedback for the oscillator is developed across C115.

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 C107. 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 4EG22A10 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 LIMITER

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 (C104 and R104) 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 R115 to a de-emphasis network for 6-dB/octave de-emphasis and post limiter roll-off. The network consists of C101, C137, R101 and R127. Modulation adjust R115 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 L112 varies the capacitance of CV101, resulting in a phase modulated output. The modulator output is fed to the base of buffer Q105.

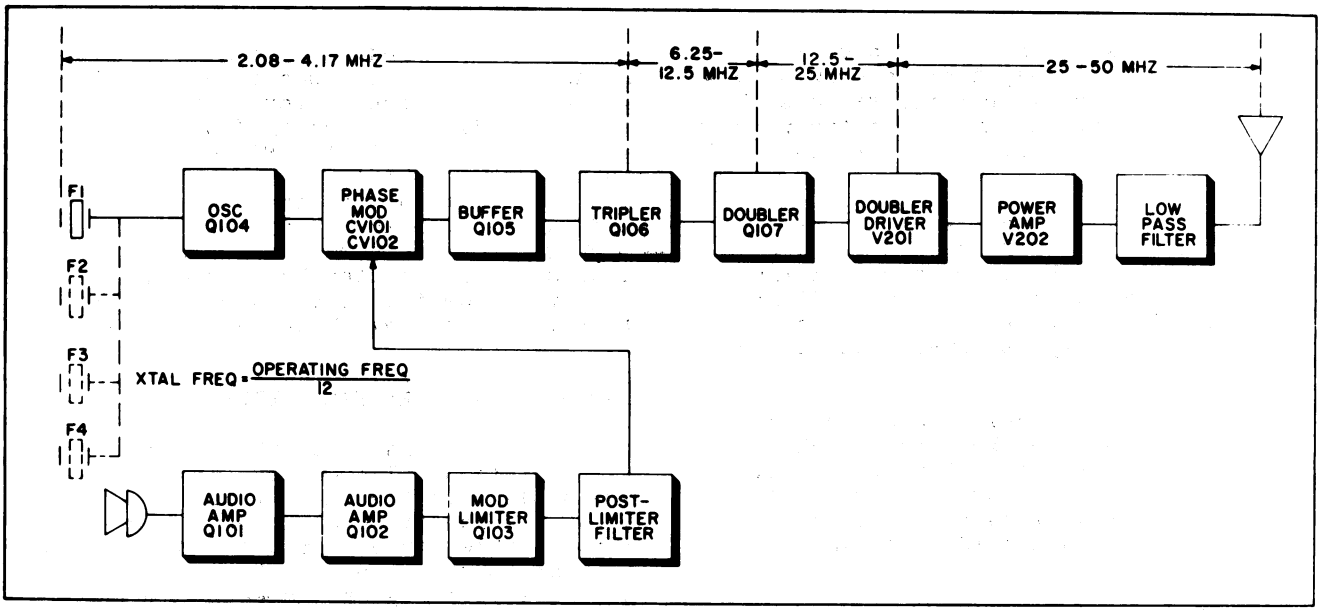


Figure 2 - Transmitter Block Diagram RC-1342A

In Channel Guard applications, tone from Channel Guard board Model 4EK1410 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. Resistors R132 and R134 are for metering the tripler stage.

Q107 operates as a doubler stage, with the collector tank tuned to six times the crystal frequency. Resistors R136 and R137 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 driver with T202 tuned to 12 times the crystal frequency. The grid of V201 is metered across R201 and J201.

POWER AMPLIFIER

The output of V201 is tranformer-coupled to the grid of compactron beam power amplifier V202. The grid is tuned by T203 and current is metered at J201-6 and J201-14 by measuring the voltage drop across R208. Bias voltage (-55 volts) is applied to the PA grid through R208 and T203.

Plate current is metered from J201-1 to J201-9 across metering resistor R209. Plate voltage is supplied through L207, and the PA plate tank is series-tuned by capacitor C213. The screen grid dropping resistor is R207.

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 R211 out of the circuit, and applies 300 volts to grid dropping resistor R207 for normal operation of the stage. Placing the switch in the TUNE position applies the screen voltage to dropping resistor R211 and shunt resistor R210 to drop the screen voltage. This reduces the plate dissipation while tuning the transmitter.

PA loading is achieved by ANTENNA LOADING CAPACITOR C215.

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

RECEIVER

Receiver Types ER-46-A and ER-46-B are double conversion, superheterodyne FM receiver designed for one-, two- or four-frequency operation on the 25-50 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 chart below.

A regulated +10 volts is used for all receiver stages except the audio drive 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 to the base of RF amplifier Q301 through two tuned pre-selector circuits. The output signal is inductively coupled through two tuned circuits to the base of 1st mixer Q304.

OSCILLATOR

Q302 is a Colpitts oscillator operating in the 12 to 19 megahertz range. Trimmer capacitor C311 permits the oscillator frequency to be shifted slightly for setting the receiver on the system operating frequency.

For 25 to 33 megahertz operation, collector coil L305 is tuned to two times the crystal frequency with high-side injection. For 33 to 42 megahertz operation, L305 is tuned to two times the crystal frequency with low-side injection. For 42 to 50 megahertz operation, L305 is tuned to three times the crystal frequency with low-side injection.

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 4EG22A10 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 Q303 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 RF amplifier and the injection voltage from the oscillator are applied to the base of 1st Mixer Q304. The 5.3 megahertz High IF output is coupled through three tuned circuits (L307 and C333, L308 and C336, L309 and C339) which provide Hi-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 Q306 with the 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). Their amplified output is fed to three R-C coupled limiter stages consisting of Q313, Q314 and Q315, operating as overdriven amplifiers. The 1st and 2nd limiter stages are metered at centralized metering jack J304 thru metering diodes CR302 and CR303.

NO. OF FREQS.	FREQUENCY RANGE					
	25-33 MHz		33-42 MHz		42-50 MHz	
	Without Noise Blanker	With Noise Blanker	Without Noise Blanker	With Noise Blanker	Without Noise Blanker	With Noise Blanker
1-Freq	4ER46A10 (NB) 4ER46B10 (WB)	4ER46A12 (NB) 4ER46B12 (WB)	4ER46A14 (NB) 4ER46B14 (WB)	4ER46A16 (NB) 4ER46B16 (WB)	4ER46A18 (NB) 4ER46B18 (WB)	4ER46A20 (NB) 4ER46B20 (WB)
2-Freq	4ER46A11 (NB) 4ER46B11 (WB)	4ER46A13 (NB) 4ER46B13 (WB)	4ER46A15 (NB) 4ER46B15 (WB)	4ER46A17 (NB) 4ER46B17 (WB)	4ER46A19 (NB) 4ER46B19 (WB)	4ER46A21 (NB) 4ER46B21 (WB)
4-Freq	4ER46A22 (NB) 4ER46B22 (WB)	4ER46A23 (NB) 4ER46B23 (WB)	4ER46A24 (NB) 4ER46B24 (WB)	4ER46A25 (NB) 4ER46B25 (WB)	4ER46A26 (NB) 4ER46B26 (WB)	4ER46A27 (NB) 4ER46B27 (WB)

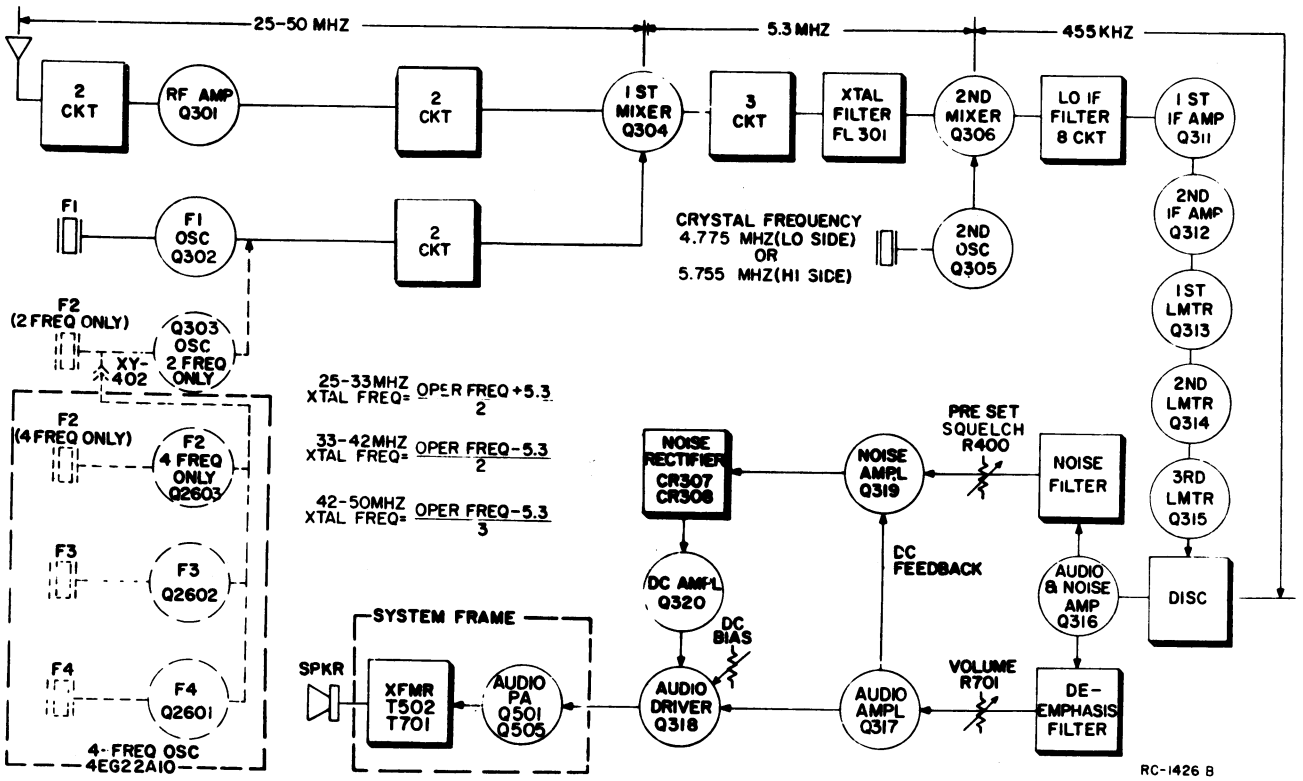


Figure 3 - Receiver Block Diagram

DISCRIMINATOR

The 3rd limiter output is applied to the Foster-Seely type discriminator, where the audio voltages are recovered from the 455-kHz Lo-IF. A low-pass filter, made up of C422, C423, C424, R377/R479, 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 Q501 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 C345, C346, C347 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 C442 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 amplifiers 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 amplifiers stay 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.

NOISE BLANKER

The noise blanker is used to prevent impulse noise spikes from decreasing the readability of weak signals. The blanker consists of a pulse generator and a blanking gate circuit. No tuned circuits are used in the blanker; therefore no adjustments are required. Aligning the receiver Hi IF stages provides the correct voltages. A simplified diagram of the noise blanker is shown in Figure 4.

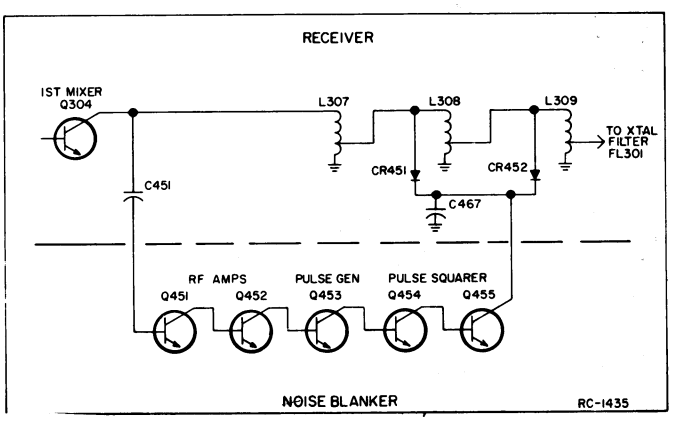


Figure 4 - Simplified Noise Blanker Diagram

Pulse Generator

An RF signal and noise pulse is taken from the output of the 1st mixer (Q304) and is coupled through C451 to the pulse generator. The first two stages of the pulse generator consist of RF amplifiers Q451 and Q452. The amplifier stages raise the level of the noise pulse which is fed to the base of pulse generator Q453.

Bias on Q453 is such that it is normally not conducting. Applying a noise pulse to the base of Q453 turns the stage on, and the noise pulse is rectified to produce a DC, negative-going pulse at the collector. Q453 also acts as an RF level shut-off switch. When the carrier amplitude at the base of the stage exceeds 150 microvolts, the transistor saturates and no pulses are produced.

The output of Q453 is fed to an automatic repetition rate switch consisting of C459, CR454 and R475. The time constant of the network is selected so that pulses exceeding 12 to 15 kHz will not be fed to Q454. This prevents degradation of receiver performance due to intermodulation products resulting from two strong signals on adjacent channels.

Following the rep rate switch, the noise pulse is amplified and shaped by pulse squarer stages Q454 and Q455. The output of Q455 is approximately a negative 10 to 12 volt, 20-microsecond square wave blanking pulse.

Blanking Gate

The blanking gate circuit consists of CR451, CR452 and C467. The diodes are not normally conducting due to a positive bias from voltage divider network R473 and R474.

Applying a negative 10-volt blanking pulse to the cathodes of the blanking diodes causes them to conduct. When conducting, they provide an RF short through C467 and Hi IF coils L308 and L309 for the blanking pulse.

POWER SUPPLY

Power Supply Model 4EF51A10 is used to supply all voltages for the Desk Top or Wall Mount station combinations. The power supply provides:

- Plate, screen and bias voltages for the transmitter multiplier and power amplifier stages.
- Regulated +10 volts for the transmitter exciter board,
- Regulated +10 volts for the receiver and four-frequency board,
- +12 volts for the relays and receiver audio amplifiers,
- AC filament voltage.

The power transformers (T501 and T502) connected in parallel are used in the power supply. Power is applied to the transformer primaries by turning power switch S502 (on back of the station chassis) to the ON position. A 3-amp fuse (F501) in one side of the AC lead protects the power supply against overloads.

The power supply is designed for operation from either a 117 VAC or 220 VAC, 50/60 Hz source. The station is normally shipped connected for 117 VAC operation, with the primary windings of T501 and T502 connected in parallel. For 220 VAC operation, the transformer primaries are connected in series. Refer to the power supply Schematic Diagram for 220 VAC transformer connections.

RECTIFIER AND FILTER CIRCUITS

Negative Bias Supply

The AC voltage developed across secondary windings 8-10 of transformer T501 is

rectified by full-wave rectifiers CR501 and CR502. The rectified voltage is then filtered by C501 and R501 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.

Multiplier B-Plus (Figure 5)

The AC voltage developed across 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 T501-6 and -7 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 C505 and L502. R506 is a bleeder resistor. The transformer and rectifiers are protected by fuse F503.

Power Amplifier B-Plus (Figure 5)

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 stations, a jumper is connected from TB4-14 to TB4-18 and the AC voltage developed across T501-11 and -12 is rectified by CR503 and CR504. This output, in series with the multiplier output, supplies 450 volts DC high B-plus.

In low band stations, the jumper is connected from TB4-14 to TB4-19 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 C502, C503, L501 and C504. R504, R505, R507 and R510 are bleeder resistors. The rectifier circuit and transformer are protected by fuse F502.

12-Volt Supply

The AC voltage developed across secondary windings 8-10 of transformer T502 is rectified by full-wave rectifiers CR511 and CR512. The output is filtered by C506 and L503 to provide a nominal 12 volts for the push-to-talk and antenna switching relays, receiver audio amplifiers and 10-volt regulator A501. The rectifiers and transformer are protected by fuse F504.

Filament Supply

The 12-volt, AC filament supply and pilot light voltage is taken from the voltage developed across windings 6-7 of transformer T502.

+10 VOLT REGULATOR (A501)

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

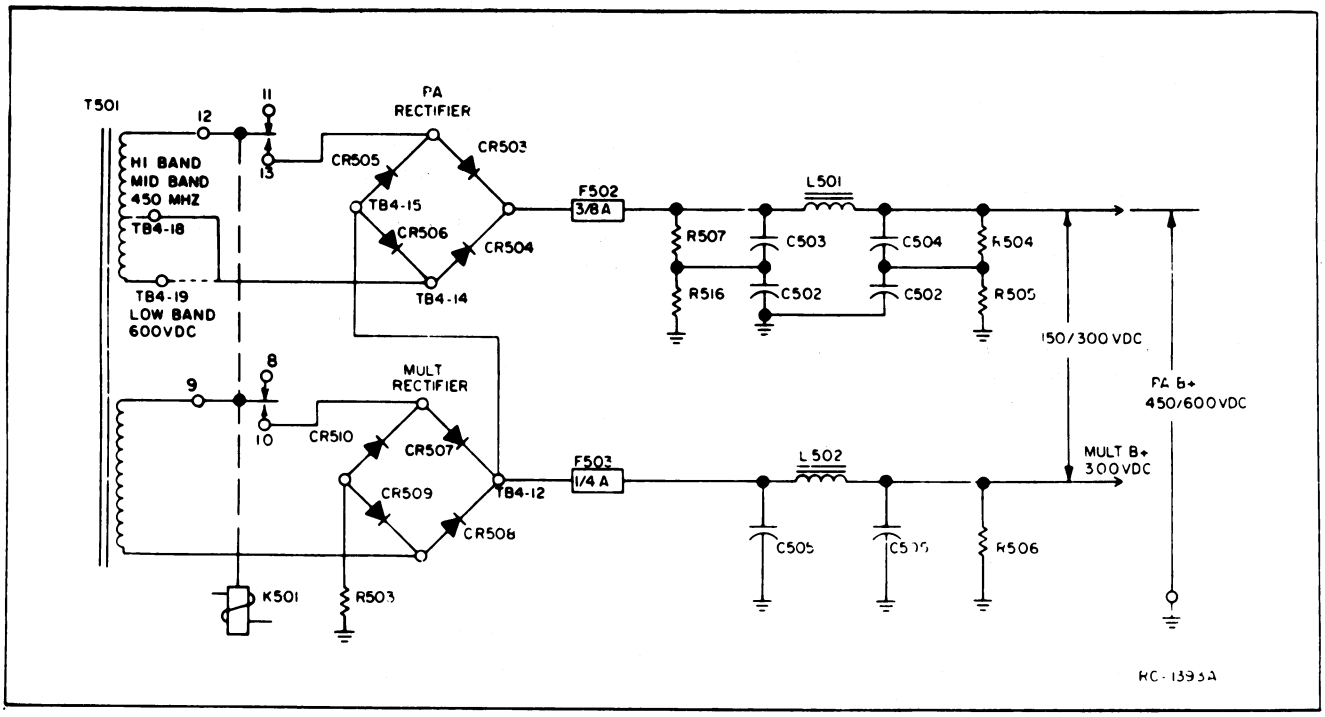


Figure 5 - Multiplier and PA B-Plus Circuits

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. This keeps 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.

Microphone Pre-Amplifier (A502)

Microphone pre-amplifier A502 provides an additional 10-db gain for use with desk-type microphones. When a military mike or handset is used, the pre-amplifier is disconnected from the circuit by moving lead P1 from J1 to J2 (refer to Power Supply Outline Diagram) so that the signal is connected directly to the transmitter.

The audio signal from the desk-type mike is connected to the pre-amp transistor Q1 through coupling capacitor C1. Following amplifier Q1, the signal is coupled through audio coupling capacitor C2 to the transmitter.

Base bias for Q1 is provided through voltage divider circuit R1 and R2 from the 10-volt regulated supply.

CONTROL UNITS

DESK TOP CONTROL UNIT

Three different models of control units are available for use with Desk Top station combinations. All models of the Control Unit have a VOLUME CONTROL, a MONITOR switch, a green Power-On light, a red Transmit light, an audio transformer and speaker. In addition, control units in multi-frequency combinations are equipped with a frequency selector switch. The application of the different model control units and the frequency selector switch used is shown in the following chart.

CONTROL UNIT MODELS	FREQ. SELECTOR SWITCH ADDED	NO. OF FREQUENCIES
4EC69A10	none	One
4EC69A11	S703	Two
4EC69A12	S704	Three or Four

Volume Control (R701)

Volume control R701 is a variable resistor used to control the audio output of the speaker (LS701). In Local/Remote combinations, R701 is replaced by a 3.5-ohm T-pad, R3001.

Monitor/CG Disable (S702)

Placing S702 in the MONITOR position disables the noise squelch circuit in the receiver. In radios equipped with Channel Guard, the MONITOR position also disables the receiver Channel Guard. The CG DISABLE position of the switch disables Channel Guard while permitting normal noise squelch operation.

Multi-Frequency Switches (S703 and S704)

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

Fan Option

An optional fan is available for mounting on the back of the control unit to provide ventilation for the transmitter and receiver. The fan is connected at the factory for continuous operation.

Clock Options

A 12-hour or 24-hour electric clock is available for mounting on the Control Unit. The clock is connected so that it will operate with the power switch On or Off. The clock can be set by turning the indicator wheels until the correct time shows in the window.

Tune-Up Meter Option

A 50 micro-amp tune-up meter (M1) and 12-position meter selector switch (S1) is available for mounting on the control unit. The switch connects to the transmitter and receiver centralized metering jacks by a "Y" cable with two plugs, and permits the following functions to be metered: (See chart on page 11).

WARNING

The meter leads are at PA plate potential when the metering switch is in the TG position.

UNIT METERED	METERING SWITCH POSITION	FUNCTION METERED
Receiver (at J304)	RA	Discriminator
	RB	Lim 1
	RC	Lim 2
	RD	Oscillator
	RJ	Regulated 10-volts (Multiply Meter reading by 5)
Transmitter (at J201)	TA	Mult-1
	TB	Mult-2
	TD	Mult-3
	TE	Mult-4
	TF	PA Grid
	TG	PA Plate

WALL MOUNT CONTROL UNIT

Control Unit Model 4EC70A10 is used with Wall Mount station combinations. The control unit is mounted on the system frame next to the power transformers.

The control unit contains the VOLUME control (R701), audio transformer (T701), MONITOR switch (S701), and the 3.5 ohm audio load resistor (R702) connected across TB701-1 and -2. R702 is removed when the speaker option is used, and the speaker is connected across TB701-1 and -2. Thermostats (S1 and S2) for the fan and heater options plug into TB2.

Volume Control (R701)

The VOLUME control is set for not more than 6 volts RMS at the audio pair (TB-1 & -2) with ±3.3 kHz (narrow band) or ±10 kHz (wide band) deviation at 1000 Hz applied to the station antenna jack.

Monitor Switch (S701)

When the Wall Mount station is equipped with a speaker option, pressing down the MONITOR switch disables the noise squelch circuit in the receiver. If the radio is equipped with Channel Guard, pressing the MONITOR switch also disables the receiver Channel Guard.

CHANNEL GUARD

Channel Guard Board Model 4EK14B10 is a fully transistorized encoder-decoder for use with Desk Top and Wall Mount station 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.

REMOTE CONTROL

Remote Control Board Models 4KC18A10 through 4KC18A17 were designed for use with Desk Top and Wall Mount stations in local/remote and remote applications. The remote control board permits a maximum of four remotely controlled operations by the application of two different levels and polarities of control current from a remote control console. The chart on Page 13 shows the different functions available for each station, and the control current required to select each function.

AUDIO & CONTROL CIRCUITS

4KC18A10 & 14

Remote Control Board Model 4KC18A10 uses a 6-milliamp relay (K1) to switch a single-frequency station from receive to transmit. With no control current applied to the remote control board, the output of the station receiver (audio PA) is fed through normally closed contacts K1-11 and -12 through audio transformer T1 to the telephone audio pair (TB1-1 and -2).

Keying the microphone at the remote control console applies 6 milliamps to the control pair (TB-3 and -4). This energizes relay K1 which switches the telephone line audio pair through K1-12 and -13 to the transmitter input, and switches the transmitter keying lead to ground through K1-6 and -7.

4KC18A11 & 15

Remote Control Board Models 4KC18A11, -15 use a 6 milliamp relay (K1) and a 15 milliamp relay (K2) connected in series to provide two-frequency transmit and

FUNCTION	STATION	REMOTE CONTROL MODEL	FUNCTION SELECTED BY CONTROL CURRENT AT TB1-3			
			0 mA	+6 mA	+15mA	-6mA
1-Freq. Xmit & 1-Freq. Rec	Desk Top or Wall Mount	4KC18A10 or 4KC18A14	Receive	Transmit		
1-Freq. Xmit & Rec with Chan Gd	Desk Top or Wall Mount	4KC18A11 or 4KC18A15	Chan Gd Receive	Monitor (Chan Gd disabled)	Transmit	
2-Freq. Xmit & 1-Freq. Rec	Wall Mount only	4KC18A11 or 4KC18A15	Receive	Transmit F1	Transmit F2	
1-Freq. Xmit & 2-Freq. Rec.	Wall Mount only	4KC18A12 or 4KC18A16	Receive F1	Transmit		Receive F2
2-Freq Xmit & 2-Freq Rec	Wall Mount only	4KC18A13 or 4KC18A17	Receive F1	Transmit F1	Transmit F2	Receive F2

one-frequency receive, or one-frequency transmit and receive with Channel Guard.

For two-frequency transmit and one-frequency receive, keying the microphone at the remote control console on the F1 channel applies 6 milliamps to the control pair, energizing relay K1. This switches the telephone line audio pair to the transmitter input through K1-12 and -13, and switches the transmitter keying lead (PTT) to ground through K1-6 and -7. The transmitter crystal keying lead is grounded through normally closed contacts K2-11 and -12.

Keying the microphone at the remote control console on the F2 channel applies 15 milliamps to the control pair, energizing relays K1 and K2. Relay K1 switches the audio pair to the transmitter input, and the transmitter keying lead to ground. Relay K2 switches the transmitter F2 crystal keying lead to ground through contacts K2-12 and -13.

With no control current at the control pair, neither of the relays is energized, and audio from the station receiver is coupled through T1 to the remote control console.

In Channel Guard applications, relays K1 and K2 are interchanged on the remote control board. Pressing the MONITOR switch at the remote control console applies 6 milliamps to the control pair, energizing relay K1 (in relay socket XK2). This grounds the anode end of squelch gating diode CR609 through K1-12 and -13 and disables the Channel Guard squelch circuits. The operation of the noise squelch circuit is not affected.

Pressing the TRANSMIT switch at the remote control console applies 15 milliamps to the control pair, energizing relay K2 (in relay socket XK1). This switches audio from the telephone line to the transmitter input, and switches the transmitter keying lead to ground.

4KC18A12 & 16

Remote Control Board Model 4KC18A12 & 16 uses two 6 milliamp relays K1 and K3 to provide single-frequency transmit and two-frequency receive. Relay-polarizing diodes are installed in series with the relays for different polarities.

With no control current on the control pair, neither relay is energized and audio from the station receiver (F1) is coupled through T1 to the remote control console. When a negative 6 milliamp control current is applied to TB1-3 (with respect to TB1-4), current flows through CR2 and K3. Relay K3 energizes and switches ground from receiver oscillator F1 to receiver oscillator F2.

If a positive 6 milliamp control current is applied to TB1-3 (with respect to TB1-4) current flows through CR1 and K1. Relay K1 energizes and switches the audio pair to the transmitter input, and the transmitter keying lead to ground.

4KC18A13 & 17

Remote Control Board Model 4KC18A13 & 17 uses two 6 milliamp relays (K1 and K3) and a 15 milliamp relay (K2) to provide two-frequency transmit and two-frequency receive. K1 and K2 are connected in series with relay polarizing diode CR1 and K3 is connected in series with CR2.

Keying the microphone at the remote control console on the F1 channel applies +6 milliamps to TB1-3 (with respect to TB1-4), energizing relay K1. This switches the telephone line audio pair to the transmitter input through K1-12 and -13, and switches the transmitter keying lead (PTT) to ground through K1-6 and -7. The transmitter crystal keying lead is grounded through normally closed contacts K2-11 and -12.

Keying the microphone at the remote control console on the F2 channel applies 15 milliamps to the control pair, energizing relays K1 and K2. Relay K1 switches the audio pair to the transmitter input, and the transmitter keying lead to ground. Relay K2 switches the transmitter F2 crystal keying lead to ground through contacts K2-12 and -13.

With no control current at the control pair, no relay is energized, and audio from the station receiver (F1) is coupled through T1 to the remote control console. The F1 receiver oscillator is grounded through normally closed contacts 11 and 12 of K3.

When a negative 6 milliamp control current is applied to TB1-3 (with respect to TB1-4) current flows through CR2 and K3. Relay K3 energizes and switches ground from receiver oscillator F1 to receiver oscillator F2 through normally closed contacts 11 and 12 of K2.

WARNING

When servicing the station, always disable the transmitter keying circuit by placing a jumper from TB1-3 to TB1-4. This shorts out the control pair and prevents keying the transmitter from a remote point.

After servicing the station, always remove the short on the control pair.

CONTROL METHODS

Three types of telephone line connections are commonly used in remote control applications. The remote control board is normally shipped with jumpers connected for operation with a single telephone pair with control simplexed line to line (Method 1). Refer to Figure 6 for the three types of telephone line and jumper connections.

Before choosing one of these methods, consider both the cost and performance of each, as one method may be available at a considerably lower rate. Some local telephone companies offer no choice, but will provide only an audio pair and a control pair. The chart below contains information to assist in selecting the control method and type of telephone line to be leased.

ADJUSTMENT PROCEDURE

Before setting the Mic Level Adjust (R1) on the remote control board, make sure that all power line, phone line and ground connections have been completed at the station and the remote control console. Also, the station should be aligned, and in Wall Mount stations, VOLUME Control R701 (on Wall Mount Control Unit Model 4EC70A10) set for not more than 2.7 volts RMS at the audio pair (TB1-1 & -2) with ±3.3 kHz (Narrow Bank) or ±10 kHz (Wide Band) deviation at 1000 Hz applied to the station antenna jack. In Desk Top stations (Local/Remote control), adjust R3002 (on back of the power supply) for 2.7 volts RMS at the audio pair.

To set the Mic Level Adjust:

1. Apply a 1000 Hz signal to the microphone jack on the remote control console (use a 30 milli-volt signal level for the Transistorized Control Console, or a 50 milli-volt signal level for the RC4.

2. Key the transmitter from the remote control console and set Mic Level Adjust R1 for 0.2 volt measured across TB3-18 and -19 with an AC-VTVM.

LOCAL/REMOTE CONTROL MODIFICATION (19A127258-G1)

In Local/Remote control applications (Desk Top station), T-pad R3001 (3.5 ohms, GE Part No. 19B209423-P1) replaces the

Method	Description	Advantage or Disadvantage
1	One metalic pair: for both audio and control voltages with control voltage simplexed from line to line.	Economical; dependable where earth currents may be large, or where a good earth ground cannot be obtained; keying clicks will be heard in paralleled Remote Control Units.
2	One metallic pair: for both audio and control voltages with control voltage simplexed from line to ground.	Economical; earth ground currents (encountered near power company sub-stations) may interfere with control functions; keying clicks minimized.
3	Two telephone pairs; one for audio voltage and one for control voltage.	Provides best performance; keying clicks will not be heard; least susceptible to earth ground currents which may interfere with control functions.

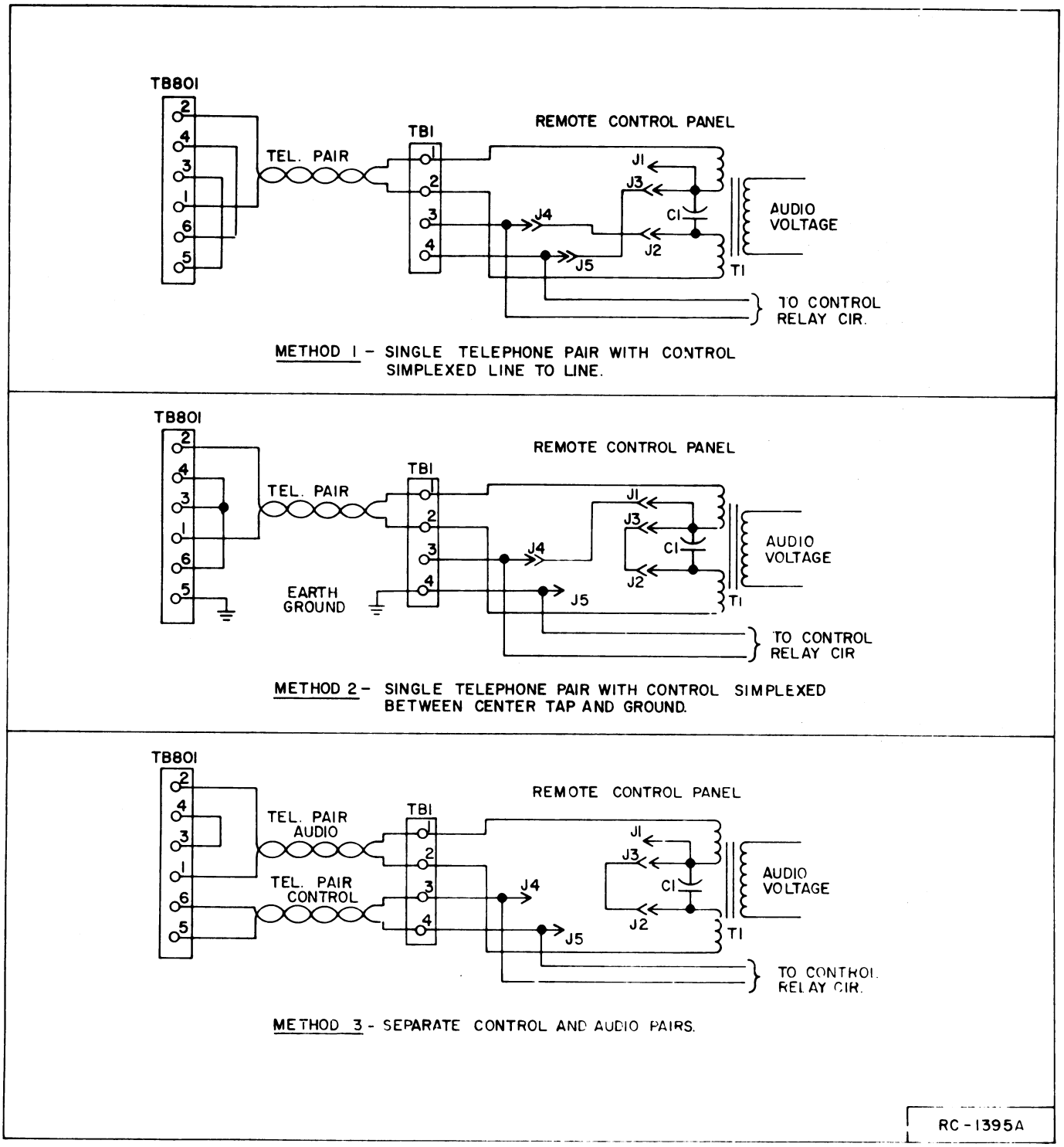


Figure 6 - Telephone Line Connections

standard volume control R701. The T-pad controls loudspeaker volume, but does not affect line level. Variable resistor R3002 (5 K-ohms, GE Part No. 5496870-P22) is installed on the power supply adjacent to MIC jack J502 for adjusting the receiver output to the line and to the T-pad for the loudspeaker (See Figure 7).

SERVICE INTERCOM

A serviceman at the station can communicate with the operator of the remote control console by keying the station transmitter while holding down the PUSH-TO-NET switch (S501 on the power supply chassis). Holding down S501 feeds audio from the exciter board through the receiver and on to the audio pair. The message is also transmitted by the station.

The serviceman can receive a message from the remote control console by holding down the PUSH-TO-NET switch while the operator of the console keys the transmitter. This message is also transmitted by the station.

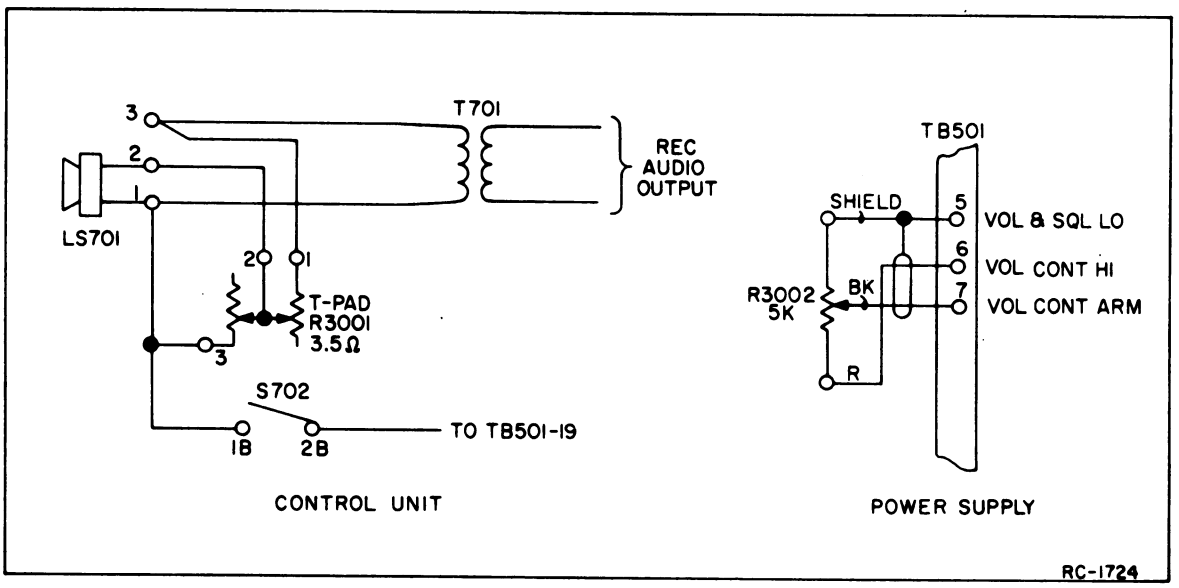


Figure 7 - Circuit Modifications for Local/Remote Control

MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R115) 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. GE Test Set Model 4EX3A10 (TM11 or TM12)

PROCEDURE

Transmitters without CHANNEL GUARD

1. Connect the audio signal generator and the meter across audio input terminals J5 (green-hi) and J6 (black-lo) on 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 (R115) for a 4.5 kHz (Narrow Band) or 13.5 kHz (Wide Band) 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.

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

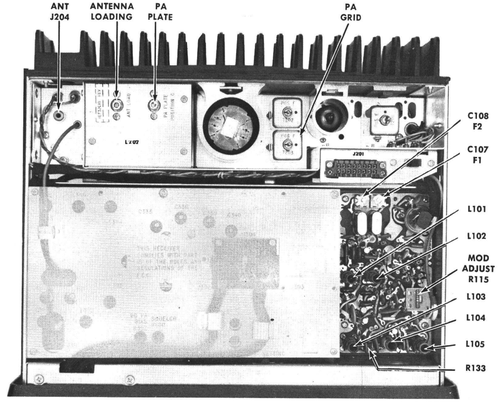
Plate current indication is measured with G E Test Set in Position G, using the TEST 1 scale (or measured from J201-1 to -9 with multimeter).

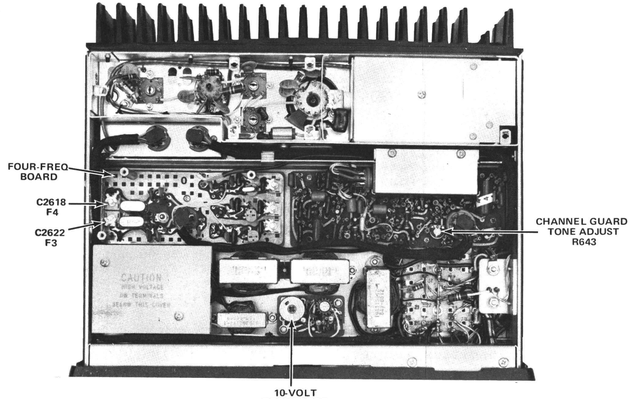
4.3 is the value of the plate current metering resistor in ohms.

TAP SETTING CHART FOR L202

FOR OPERATING FREQ OF:	USING PA	SET SLIDER TO TAP NO.
25-26 MHz	4EF32A10	2
26-28 MHz		3
28-30 MHz		4
30-31 MHz		5
31-33 MHz		6
33-35 MHz	4EF32B10	7
35-38 MHz		8
38-42 MHz		9
42-43 MHz	4EF32C10	8
43-50 MHz		9

NOTE: With some antennas, the tap settings for L202 as shown in the chart may not allow the PA to be loaded properly. If the ANTENNA LOADING cannot be reduced to 0.7 volt by adjusting the ANTENNA LOADING capacitor (C215), lower the tap setting one number. If the reading cannot be increased to 0.7 volt, raise the tap setting one number.





TRANSMITTER ALIGNMENT

When changing frequency, adjust the slider on L202 for proper tap setting as shown in the Tap Setting Chart.

EQUIPMENT REQUIRED

1. General Electric Test Set Model 4EX3A10, 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 ÷ 12).
2. Set ANTENNA LOADING to maximum capacitance (slot in shaft towards J204) and set crystal trimmer C107 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, turn the slugs in the Exciter coils (L101 thru L105) to the bottom of the coil. Set the T201 slug to the top of the coil.
6. Connect TEST SET Model 4EX3A10 to the Transmitter Centralized Metering Jack J201. Turn the test set polarity switch to (+) and set the range to TEST 1. 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 10 volts (as read on 15-volt scale). With multimeter, measure from top of R133 to ground. 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 Procedure.
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 (-)	L101 & L102	Maximum	Carefully tune L101 for maximum meter reading. For transmitters with Channel Guard, alternately tune L101 and L102 for maximum meter reading.
2.	A MULT-1	Pin 10 (+) Pin 16 (-)	L103	Minimum	Tune L103 for a small dip in meter reading. If two dips occur, use the dip with the slug nearest the center of the coil.
3.	B MULT-2	Pin 2 (+) Pin 16 (-)	L104, L103 and L105	See Procedure	Tune L104 and L103 for maximum meter reading, and then tune L105 for minimum meter reading.
			DOUBLER/DRIVER AND POWER AMPLIFIER		
4.	E MULT-3	Pin 16 (+) Pin 5 (-)	T201 & L105	Maximum	Switch meter polarity to (-), and adjust T201 for maximum meter reading. Then re-adjust L105 and T201 for maximum meter reading.
5.	E MULT-3	Pin 16 (+) Pin 5 (-)	T202	Maximum	Adjust T202 for a small dip in meter reading.
6.	F PA GRID	Pin 14 (+) Pin 6 (-)	T203 and T202	Maximum	Tune T203 for maximum meter reading. Then re-adjust T202 for maximum meter reading.
7.	G PA PLATE	WARNING High B+ on pins 1 & 9 Pin 1 (+) Pin 9 (-)	PA PLATE	Minimum	Carefully tune PA PLATE for minimum meter reading.
8.					Place TUNE/OPERATE Switch S201 in the OPERATE position.
9.	G PA PLATE	Pin 1 (+) Pin 9 (-)	PA PLATE		Carefully re-tune PA PLATE for minimum meter reading.
10.	G PA PLATE	Pin 1 (+) Pin 9 (-)	ANT LOADING	0.7 volts	Adjust ANTENNA LOADING for meter reading of 0.7 volts. (See note following Tap Setting Chart).
11.	G PA PLATE	Pin 1 (+) Pin 9 (-)	ANT LOADING & PA PLATE	See Procedure	Alternately adjust ANT LOADING for 0.7 volt and PA PLATE for minimum until minimum PA PLATE reading is 0.7 volt.
12.					Repeat STEP 6 and STEP 11.
			FREQUENCY ADJUSTMENT		
13.			C107 (C108 in 2-freq. units, and C2619 or C2622 in multi-freq. units.		Loosely couple frequency counter to output and adjust C107 for proper frequency output. (Switch to F2 and adjust C108 on 2-frequency units. In 3- or 4-frequency units, adjust C2619 or C2622 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

25—50 MHz TRANSMITTER
TYPE ET-72-A

RC-1427C

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 localized, refer to the "Quick Checks" 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:

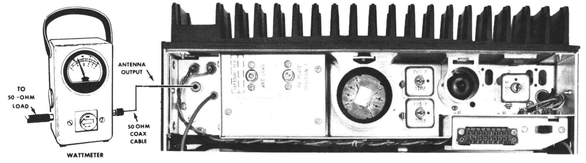
1. Wattmeter similar to:
   Bird #43
   Jones #711N
2. VTVM similar to:
   Triplett #850
   Heath #1M-21
3. Audio Generator similar to:
   GE MODEL 4EX6A10 or
   Heath #1G-72
4. Deviation Meter (with a .75 KC scale) similar to:
   Measurements #140
   Lampkin #205A
5. Multimeter similar to:
   GE METERING 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 50 watts.

SERVICE CHECK

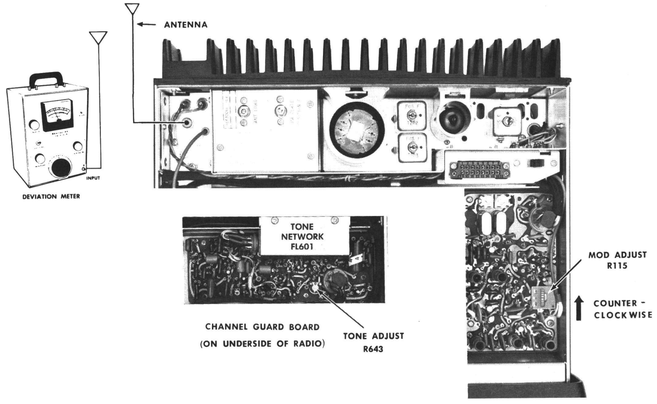
Refer to Service Hints on Transmitter Troubleshooting Procedure.

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 R115 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).

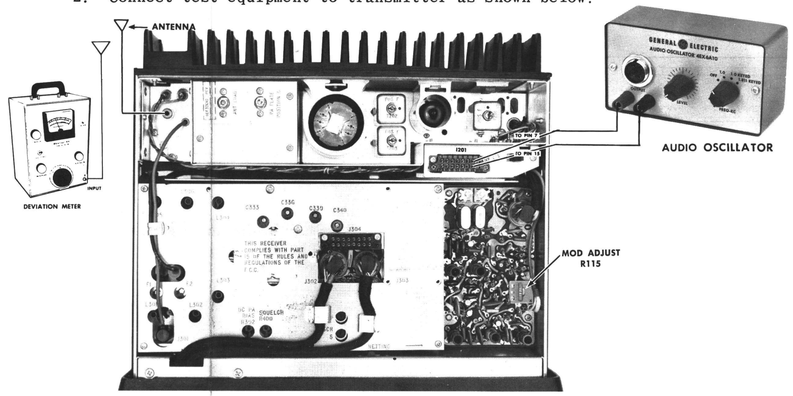
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STEP 3

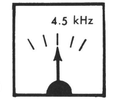
VOICE DEVIATION AND SYMMETRY

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 R115 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.



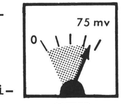
DEVIATION METER

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 Sensifivity by reducing generator output until deviation falls to 3.3 kHz (10 kHz Wide Band). Voltage should be LESS than 90 millivolts (typically 75mv).



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. For receivers with Noise Blankers, refer to RC-1471 for Noise Blanker checks.

EQUIPMENT REQUIRED

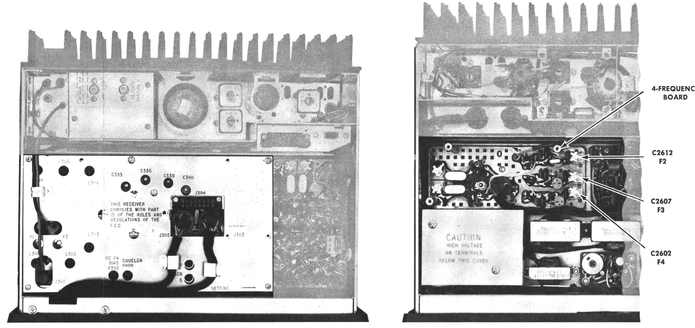
1. GE Test Set Model 4EX3A10 (or 20,000 ohms-per-volt Multimeter).
2. 25-50 MHz signal source (keep signal level below saturation).

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	MULTIMETER + at J304	TUNING CONTROL	METER READING	PROCEDURE
1.	D OSC	pin 4	L305 and L306	See Procedure	Switch to F1, put in F1 crystal and tune L305 for maximum meter reading and L306 for minimum meter reading (0.28 v).
2.	D OSC	pin 4	L305 and L306	See Procedure	For multi-frequency receivers, adjust L305 for maximum and L306 for minimum meter reading. Adjust coils for equal readings on highest and lowest frequencies.
3.					Preset L301 thru L304 to approximate frequency. (Slug at top of coil for highest frequency, and slug centered in coil for lowest frequency. Do not tune slugs below center of coil).
4.	C LIM 2	pin 3	L301 thru L304	Maximum	Apply on-frequency signal to J301. Tune L301 thru L304 for maximum meter reading. Keep signal below saturation at each stage and on discriminator zero.
5.			L301 and L302		While receiving a weak on-frequency signal from the antenna, tune L301 and L302 for best quieting.
6.	A DISC	pin 10	C311 (C316 for 2-freq. or C2612, C2607 and C2602 for 4-freq.)	Zero	Apply the exact channel frequency signal to J301 and tune C311 (C316 for 2-frequency) for zero discriminator reading. In 3- or 4-frequency units, tune C2612, C2607 and C2602 as required. ——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.
SQUELCH ADJUSTMENT					
7.				30°	Set SQUELCH Control (R400) to open with a 4 db SINAD signal. (Approximately 30° counterclockwise of critical squelch position).



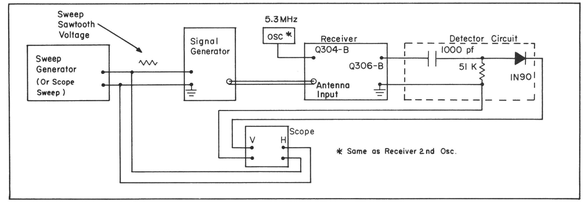


Figure 1 - High and Low IF FILTER TEST Circuit

COMPLETE RECEIVER ALIGNMENT

For receivers with Noise Blankers, refer to RC-1471 for Noise Blanker Checks.

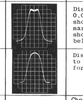
EQUIPMENT REQUIRED

1. G E Test Set Model 4EX3A10 (or 20,000 ohms-per-volt Multimeter).
2. A 5.3 MHz ±200 Hz and a 25-50 MHz signal source. Couple the 5.3 MHz signal through a 0.01 µf capacitor. Keep signal levels below saturation.
3. For Alignment steps 4 thru 8 - Oscilloscope, sweep generator, 5.3 MHz marker generator and construct a detector circuit (see Figure 1 for circuitry).

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Plug Test Set Models 4EX3A10 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 "1" (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 TEST SET 4EX3A10	POSITION MULTIMETER + at J304	TUNING CONTROL	METER READING	PROCEDURE
DISCRIMINATOR					
1.					Remove 1st oscillator crystal. Then apply a 5.3 MHz signal to the base of Q306.
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 1	pin 2	L321 thru L328	Maximum	Tune L321 thru L328 for maximum meter reading.
5.	B LIM 1	pin 2	C333, C336, C339	Maximum	Tune C333, C336 and C339 for maximum meter reading.
6.			C333, C336 and C339		Disable the 2nd oscillator by grounding the base of Q305 through a 0.01 µf capacitor. Connect scope, signal generator and detector as shown in figure 1. Sweep RF 150 kHz at 20 Hz. Connect 5.3 MHz marker to base of Q304. Tune C333, C336 and C339 for scope pattern shown, with marker signal centered between bumps and signal level below saturation.
7.			L321 thru L328		Disconnect detector, remove short from base of Q305 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 between 26 and 28 kHz (Narrow Band) or greater than ±15 kHz (Wide Band).
OSC/MULT					
9.	D OSC	pin 4	L305 & L306	See Procedure	Remove short from base of Q305, if present, then insert 1st oscillator crystal. Adjust L305 for maximum meter reading, and L306 for minimum meter reading (0.28 v).
10.	D OSC	pin 4	L305 & L306	Maximum	For multi-frequency receivers, adjust L305 for maximum meter reading and L306 for minimum meter reading. Adjust coils for equal meter readings on highest and lowest frequencies.
RF					
11.	C LIM 2	pin 3	L301, L302 L303 and L304	Maximum	Apply on-frequency signal to J301, then tune L301 thru L304 for maximum meter reading. Keep signal below saturation at each stage and on discriminator zero. For multi-frequency receivers, adjust coils for best performance on all frequencies.
12.			L301		While receiving a weak-on frequency signal from the antenna, tune L301 and L302 for best quieting.
FREQUENCY ADJUSTMENT					
13.	A DISC	pin 10	C311 (C316 for 2-freq. or C2612, C2607 and C2602 for four-freq.)	Zero	Apply the exact channel frequency signal to J301 and tune C311 (and C316 for 2-frequency) for zero discriminator reading. In 3- or 4-frequency units, tune C2612, C2607 or C2602 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.
14.				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

25—50 MHZ RECEIVER

MODELS 4ER46A10-27 & 4ER46B10-27

RC-1428C

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" list 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

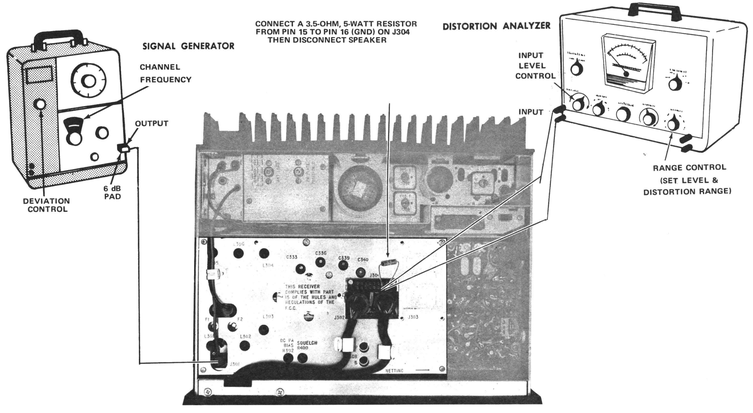
- Signal Generator similar to:

  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 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 controls 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 alignment 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

25-50 MHz TRANSMITTER
TYPE ET-72-A NARROW BAND
TYPE ET-72-B WIDE BAND

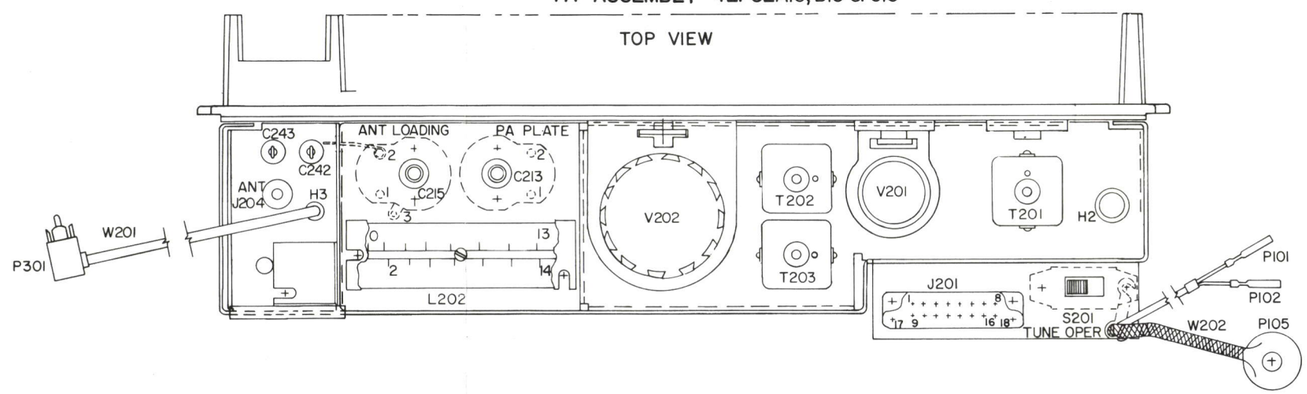
SYMBOL	G-E PART NO.	DESCRIPTION
		EXCITER BOARD
		NARROW BAND
		4EG21A10 (19C311008-G1) 25-33 MHz 1 Freq 4EG21A11 (19C311008-G2) 25-33 MHz 1 Freq CHAN GD 4EG21A12 (19C311008-G1) 25-33 MHz 2 Freq 4EG21A13 (19C311008-G2) 25-33 MHz 2 Freq CHAN GD 4EG21B10 (19C311008-G3) 33-42 MHz 1 Freq 4EG21B11 (19C311008-G4) 33-42 MHz 1 Freq CHAN GD 4EG21B12 (19C311008-G3) 33-42 MHz 2 Freq 4EG21B13 (19C311008-G4) 33-42 MHz 2 Freq CHAN GD 4EG21C10 (19C311008-G5) 42-54 MHz 1 Freq 4EG21C11 (19C311008-G6) 42-54 MHz 1 Freq CHAN GD 4EG21C12 (19C311008-G5) 42-54 MHz 2 Freq 4EG21C13 (19C311008-G6) 42-54 MHz 2 Freq CHAN GD
		WIDE BAND
		4EG21A14 (19C311008-G2) 25-33 MHz 1 Freq 4EG21A15 (19C311008-G2) 25-33 MHz 2 Freq 4EG21B14 (19C311008-G4) 33-42 MHz 1 Freq 4EG21B15 (19C311008-G4) 33-42 MHz 2 Freq 4EG21C14 (19C311008-G6) 42-50 MHz 1 Freq 4EG21C15 (19C311008-G6) 42-50 MHz 2 Freq
		CAPACITORS
C101	7491395-P114	Ceramic disc: .0022 µf ±10%, 500 VDCW; sim to RMC Type JL.
C102	19B209243-P5	Polyester: .047 µf ±20%, 50 VDCW.
C103	19B209243-P1	Polyester: .01 µf ±20%, 50 VDCW.
C104	7491395-P111	Ceramic disc: .0015 µf ±10%, 500 VDCW; sim to RMC Type JL.
C105	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C106	5496267-P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C107 and C108	5491271-P103	Variable, air: approx 1.54-6.9 pf, 750 v peak; sim to EF Johnson 189-3-5.
C109 and C110	5496219-P39	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C111 and C112	5496219-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C113 and C114	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C115A	5493366-P1000J	Silver mica: .001 µf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C115B	5493366-P680K	Silver mica: 680 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C116	19B209243-P1	Polyester: .01 µf ±20%, 50 VDCW.
C117A	5493366-P1000J	Silver mica: .001 µf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C117B	5493366-P680J	Silver mica: 680 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C118A	5493367-P1500J	Silver mica: .0015 µf ±5%, 100 VDCW; sim to Electro Motive Type DM-20.
C118B	5493367-P1000J	Silver mica: .001 µf ±5%, 100 VDCW; sim to Electro Motive Type DM-20.
C119A	5496372-P350	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -4700 PPM.
C119B	5496372-P146	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -3300 PPM.
C120 and C121	5493366-P470J	Silver mica: 470 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C122A	5496372-P350	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -4700 PPM.
C122B	5496372-P146	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -3300 PPM.
C123A	5493366-P390K	Silver mica: 390 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C123B	5493366-P330K	Silver mica: 330 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C124	5493366-P150K	Silver mica: 150 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C125A	5493367-P2200J	Silver mica: .0022 µf ±5%, 100 VDCW; sim to Electro Motive Type DM-20.
C125B	5493367-P1000J	Silver mica: .001 µf ±5%, 100 VDCW; sim to Electro Motive Type DM-20.
C126	19B209243-P1	Polyester: .01 µf ±20%, 50 VDCW.
C127A	5493366-P470K	Silver mica: 470 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C127B	5493366-P330K	Silver mica: 330 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C127C	5493366-P220K	Silver mica: 220 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C128	5494481-P129	Ceramic disc: .0039 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C129	19B209243-P1	Polyester: .01 µf ±20%, 50 VDCW.
C130A	5496219-P265	Ceramic disc: 120 pf ±5%, 500 VDCW, temp coef -80 PPM.
C130B	5496219-P261	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef -80 PPM.
C131A	5496219-P265	Ceramic disc: 120 pf ±5%, 500 VDCW, temp coef -80 PPM.
C131B	5496219-P261	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef -80 PPM.
C132 and C133	5494481-P127	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C134A	5496219-P461	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef -220 PPM.
C134B	5496219-P259	Ceramic disc: 68 pf ±5%, 500 VDCW, temp coef -80 PPM.
C134C	5496219-P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C135	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C136	19B209243-P1	Polyester: .01 µf ±20%, 50 VDCW.
C137	7491395-P109	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JL.
C138	7130348-P3	Molded: 1 pf ±.05 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
		DIODES AND RECTIFIERS
CR101 and CR102	19A115603-P1	Silicon.
CV101 and CV102	5495769-P9	Silicon, capacitive.
		JACKS AND RECEPTACLES
J101 thru J104	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
J105	19B209303-P1	Connector, phen: 9 pins.
		INDUCTORS
L101A	19C303883-G1	Coil. Includes tuning slug 5491798-P1.
L101B	19C303883-G2	Coil. Includes tuning slug 5491798-P2.
L101C	19C303883-G3	Coil. Includes tuning slug 5491798-P2.
L102A	19C303883-G1	Coil. Includes tuning slug 5491798-P1.
L102B	19C303883-G2	Coil. Includes tuning slug 5491798-P2.
L102C	19C303883-G3	Coil. Includes tuning slug 5491798-P2.
L103A	19C303883-G4	Coil. Includes tuning slug 5491798-P3.
L103B	19C303883-G5	Coil. Includes tuning slug 5491798-P3.
L103C	19C303883-G6	Coil. Includes tuning slug 5491798-P3.
L104A	19C303883-G7	Coil. Includes tuning slug 5491798-P3.
L104B	19C303883-G8	Coil. Includes tuning slug 5491798-P3.
L104C	19C303883-G9	Coil. Includes tuning slug 5491798-P3.
L105A	19C303883-G10	Coil. Includes tuning slug 5491798-P5.
L105B	19C303883-G11	Coil. Includes tuning slug 5491798-P5.
L105C	19C303883-G12	Coil. Includes tuning slug 5491798-P5.
		TRANSISTORS
Q101	19A115889-P1	Silicon, NPN; sim to Type 2N2712.
Q102 and Q103	19A115123-P2	Silicon, NPN; sim to Type 2N2712.
Q104 and Q105	19A115330-P2	Silicon, NPN.
Q106 and Q107	19A115328-P2	Silicon, NPN.
		RESISTORS
R101	3R77-P563J	Composition: 56,000 ohms ±5%, 1/2 w.
R102	3R77-P623J	Composition: 62,000 ohms ±5%, 1/2 w.
R103	3R77-P104K	Composition: 0.10 megohm ±10%, 1/2 w.
R104	3R77-P154K	Composition: 0.15 megohm ±10%, 1/2 w.
R105	3R77-P562K	Composition: 5600 ohms ±10%, 1/2 w.
R106	3R77-P683J	Composition: 68,000 ohms ±5%, 1/2 w.
R107	3R77-P433J	Composition: 43,000 ohms ±5%, 1/2 w.
R108	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R109	3R77-P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R110	3R77-P681K	Composition: 680 ohms ±10%, 1/2 w.
R111	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R112	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R113	3R77-P565J	Composition: 5.6 megohms ±5%, 1/2 w.
R114	3R77-P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R115	19B209358-P106	Variable, carbon film: 75 to 10,000 ohms, 1/4 w; sim to CTS Type X-201.
R116 and R117	3R77-P104K	Composition: 0.10 megohm ±10%, 1/2 w.
R118 and R119	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R120	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R121	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R122	3R77-P681K	Composition: 680 ohms ±10%, 1/2 w.
R123	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R124A	3R154-P473K	Composition: 47,000 ohms ±10%, 1/4 w.
R124B	3R152-P393K	Composition: 39,000 ohms ±10%, 1/4 w.
R124C	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R125A	3R152-P154K	Composition: 0.15 megohm ±10%, 1/4 w.
R125B	3R152-P124K	Composition: 0.12 megohm ±10%, 1/4 w.
R125C	3R152-P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R126	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R127	3R77-P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R128	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R129	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R130	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R131	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.

(Cont'd on back of Rc-1473)

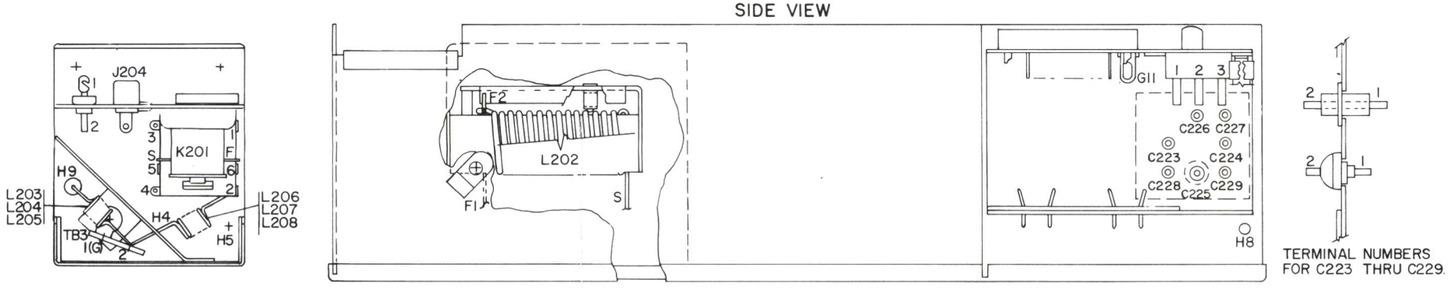
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PA ASSEMBLY 4EF32A10, B10 & C10

TOP VIEW

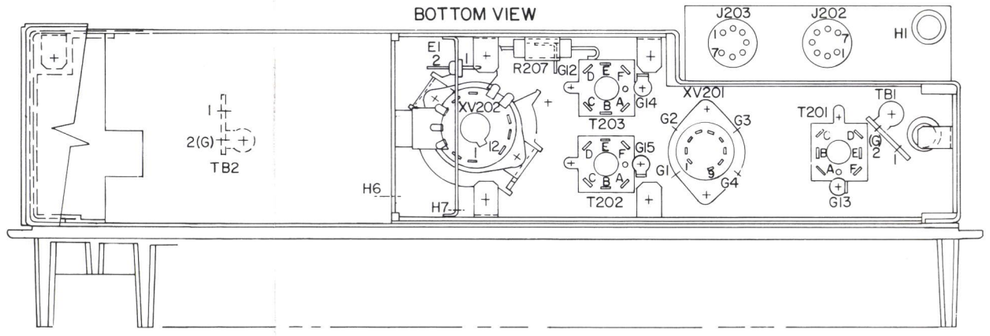


SIDE VIEW

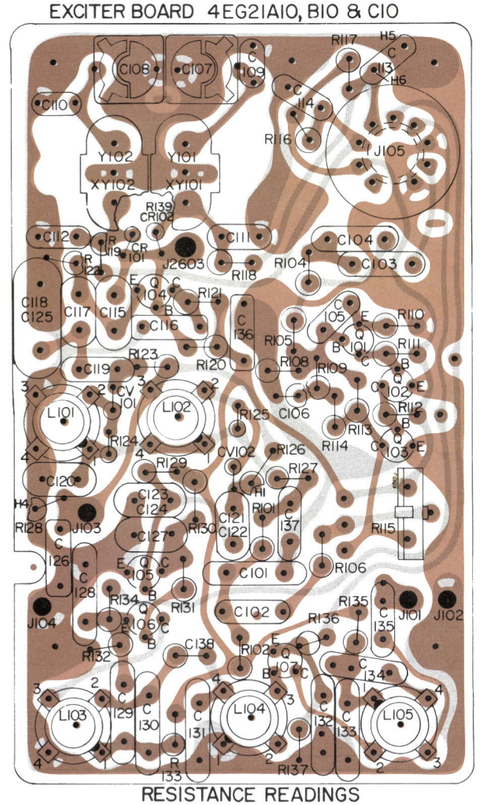


TERMINAL NUMBERS FOR C223 THRU C229.

BOTTOM VIEW



EXCITER BOARD 4EG21A10, B10 & C10



RESISTANCE READINGS

ALL READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR OR TUBE PINS TO GROUND WITH A 20,000 OHM-PER-VOLT METER, WITH ALL POWER TURNED OFF, AND WITH EXCITER +10V SHORTED FROM J105-2 TO CHASSIS, AND PA B+ LINES SHORTED FROM C225, C226 & C227 TO GROUND. + OR − SIGNS SHOW METER LEAD GROUNDED.

FOR READINGS OF: USE METER SCALES:

FOR READINGS OF:	USE METER SCALES:
1−50Ω	X1
51−500Ω	X10
510−50K	X1000

EXCITER BOARD

TRANSISTOR SYMBOL #	EMITTER		BASE		COLLECTOR	
	−	+	−	+	−	+
Q101	680	680	13.7K	3.6K	13.5K	2.9K
Q102	0	0	13.5K	2.9K	15.5K	2.9K
Q103	0	0	15.5K	2.9K	7.5K	8.7K
Q104	680	680	15K	2.6K	100	100
Q105	0	0	39K	3.4K	1K	1K
Q106	71	175	1.1K	1.1K	39	39
Q107	10	NOTE-1	0	0	8.8	20

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	1K	180	NOTE-2	2,3	0	180	102K	NOTE-2	180			
V202	2,3	0	1	1	1	0	8.2K	0	0	NOTE-3	8.2K	0

NOTES:

1. 25 − 33MC 110Ω; 33 − 42MC 68Ω; 42 − 50MC 51Ω
2. 25 − 33MC 22K; 33 − 42MC 22K; 42 − 50MC 27K
3. METER PROBE GROUNDED (+) 13K (−) 4.2K

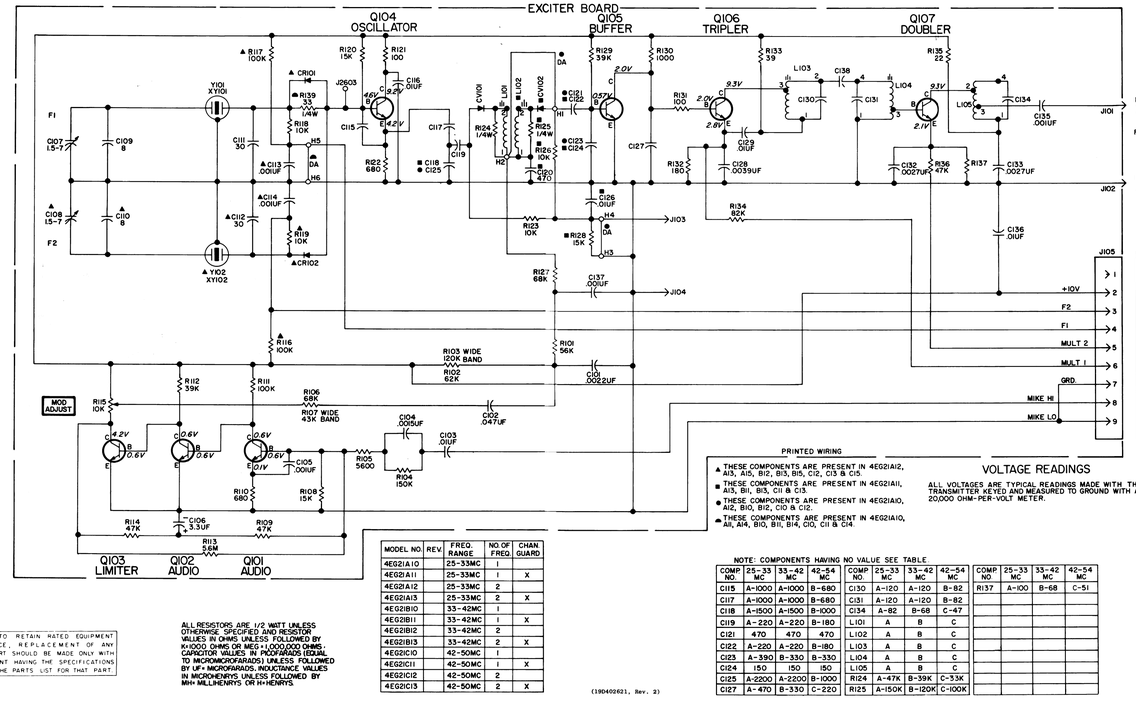
OUTLINE DIAGRAM

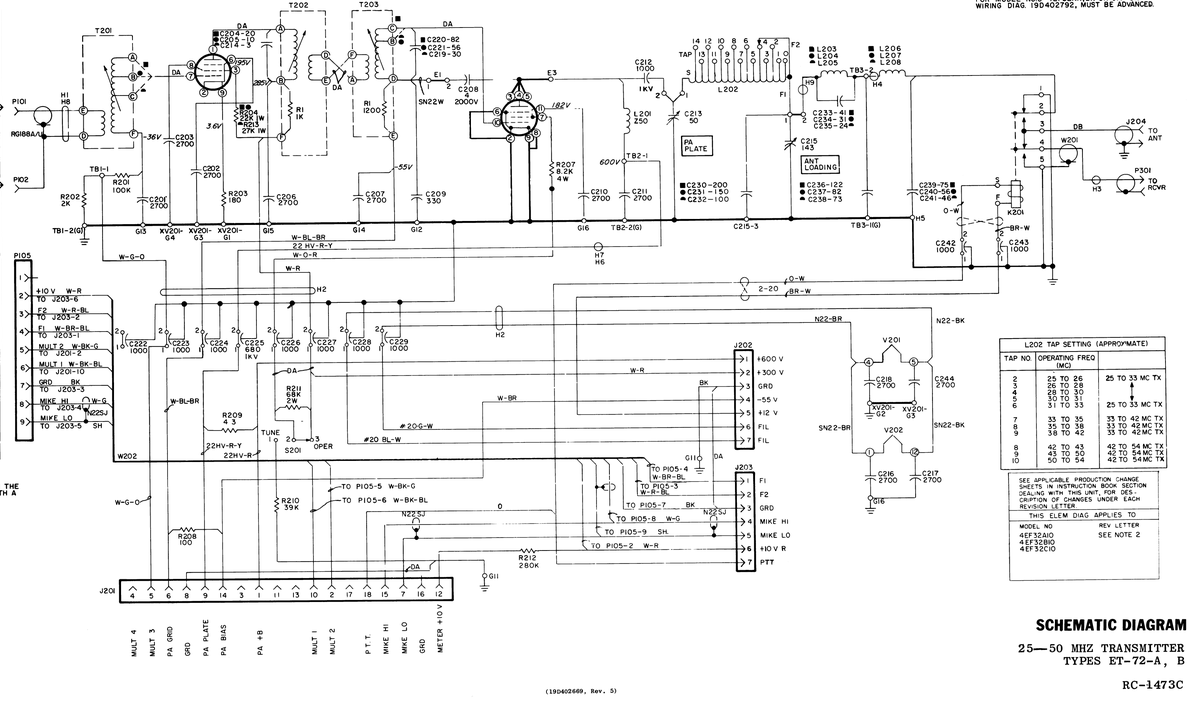
25—50 MHZ TRANSMITTER
TYPES ET-72-A, B

RC-1472B

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

(19D402819, Rev. 2)
(19B205449, Sh. 1, Rev. 0)
(19B205449, Sh. 2, Rev. 0)





NOTES
1. ALL WIRES ARE N22 UNLESS OTHERWISE SPECIFIED.
2. WHEN ADVANCING THE REV LTR ON MODEL NOS 4EF32A10, B10 OR C10, THE REV LTR FOR MODEL NOS 4EF32A11, B11 OR C11, ON WIRING DIAG. 19D402792, MUST BE ADVANCED.

PRINTED WIRING

▲ THESE COMPONENTS ARE PRESENT IN 4EG21A12, A13, A15, B12, B13, B15, C12, C13 & C15.

■ THESE COMPONENTS ARE PRESENT IN 4EG21A11, A13, B11, B13, C11 & C13.

● THESE COMPONENTS ARE PRESENT IN 4EG21A10, A12, B10, B12, C10 & C12.

◆ THESE COMPONENTS ARE PRESENT IN 4EG21A10, A11, A14, B10, B11, B14, C10, C11 & C14.

VOLTAGE READINGS

ALL VOLTAGES ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYED AND MEASURED TO GROUND WITH A 20,000 OHM-PER-VOLT METER.

MODEL NO.	REV	FREQ. RANGE	NO. OF FREQ.	CHAN GUARD
4EG21A10		25-33MC	1	
4EG21A11		25-33MC	1	X
4EG21A12		25-33MC	2	
4EG21A13		25-33MC	2	X
4EG21B10		33-42MC	1	
4EG21B11		33-42MC	1	X
4EG21B12		33-42MC	2	
4EG21B13		33-42MC	2	X
4EG21C10		42-50MC	1	
4EG21C11		42-50MC	1	X
4EG21C12		42-50MC	2	
4EG21C13		42-50MC	2	X

(19D402621, Rev. 2)

NOTE: COMPONENTS HAVING NO VALUE SEE TABLE.

COMP NO.	25-33 MC	33-42 MC	42-54 MC
C115	A-1000	A-1000	B-680
C117	A-1000	A-1000	B-680
C118	A-1500	A-1500	B-1000
C119	A-220	A-220	B-180
C121	470	470	470
C122	A-220	A-220	B-180
C123	A-390	B-330	B-330
C124	150	150	150
C125	A-2200	A-2200	B-1000
C127	A-470	B-330	C-220
C130	A-120	A-120	B-82
C131	A-120	A-120	B-82
C134	A-82	B-68	C-47
L101	A	B	C
L102	A	B	C
L103	A	B	C
L104	A	B	C
L105	A	B	C
R124	A-47K	B-39K	C-33K
R125	A-150K	B-120K	C-100K
R137	A-100	B-68	C-51

(19D402669, Rev. 5)

L202 TAP SETTING (APPROXIMATE)		
TAP NO.	OPERATING FREQ (MC)	
2	25 TO 26	25 TO 33 MC TX
3	26 TO 28	↑
4	28 TO 30	↓
5	30 TO 31	25 TO 33 MC TX
6	31 TO 33	
7	33 TO 35	33 TO 42 MC TX
8	35 TO 38	33 TO 42 MC TX
9	38 TO 42	33 TO 42 MC TX
8	42 TO 43	42 TO 54 MC TX
9	43 TO 50	42 TO 54 MC TX
10	50 TO 54	42 TO 54 MC TX

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
4EF32A10	SEE NOTE 2
4EF32B10	
4EF32C10	

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 1/2 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.

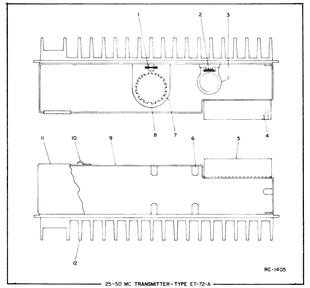
SCHEMATIC DIAGRAM

25—50 MHZ TRANSMITTER TYPES ET-72-A, B

RC-1473C

(Cont'd from front of RC-1472)

SYMBOL	G-E PART NO	DESCRIPTION
R132	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R133	3R77-P390K	Composition: 39 ohms ±10%, 1/2 w.
R134	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R135	3R77-P220K	Composition: 22 ohms ±10%, 1/2 w.
R136	3R77-P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R137A	3R77-P103K	Composition: 100 ohms ±10%, 1/2 w.
R137B	3R77-P680K	Composition: 68 ohms ±10%, 1/2 w.
R137C	3R77-P510J	Composition: 51 ohms ±5%, 1/2 w.
R139	3R77-P330K	Composition: 33 ohms ±10%, 1/2 w.
		SOCKETS
XY101 and XY102		Refer to Miscellaneous.
		CRYSTALS
		When reordering give GE Part Number and specify exact frequency needed.
		Crystal frequency = OF ± 12.
Y101 and Y102	19B206175-P11	Quartz: freq range 2083 to 2750 KHz, temp range -30°C to +85°C.
Y101 and Y102	19B206175-P21	Quartz: freq range 2750 to 3500 KHz, temp range -30°C to +85°C.
Y101 and Y102	19B206175-P31	Quartz: freq range 3500 to 4500 KHz, temp range -30°C to +85°C.
		MISCELLANEOUS
	4033089-P1	Clip. (Part of XY101 and XY102).
	19A115793-P1	Contact, electrical: sim to Malco 2700. (Part of XY101 and XY102).
	19C311172-P1	Socket: 4 contacts. (Part of XY101 and XY102).
	19B200525-P9	Rivet. (Part of XY101 and XY102).
		POWER AMPLIFIER MODEL 4EF32A10 (19D402637-G1) 25-33 KHz MODEL 4EF32B10 (19D402637-G2) 33-42 KHz MODEL 4EF32C10 (19D402637-G3) 42-54 KHz
		CAPACITORS
C201 thru C203	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C204	5496218-P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
C205	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C206 and C207	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C208	19B209330-P1	Silver mica: 4 pf ±1/2 pf, 2000 VDCW; sim to Electro Motive Type DM-20.
C209	7489162-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C210 and C211	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C212	19B209291-P1	Silver mica: .001 pf ±20%, 1000 VDCW; sim to Electro Motive Type DM-30.
C213	19B209290-P3	Variable, air: approx 6.5-50 pf; sim to ASP 51P.
C214	5496218-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C215	19B209290-P2	Variable, air: approx 7.5-143.7 pf; sim to ASP 145D.
C216 thru C218	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C219	7489162-P14	Silver mica: 30 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C220	7489162-P25	Silver mica: 82 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C221	7489162-P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C223 and C224	7160807-P1	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW.
C225	19B209282-P1	Ceramic, feed-thru: 680 pf ±20%, 1000 VDCW; sim to Sprague Type 544C.
C226 thru C229	7160807-P1	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW.
C230	19B209363-P3	Ceramic disc: 200 pf ±10%, 3000 VDCW, temp coef -750 PPM; sim to Centralab Type GJ.
C231	19B209363-P2	Ceramic disc: 150 pf ±10%, 3000 VDCW, temp coef -750 PPM; sim to Centralab Type GJ.
C232	19B209363-P1	Ceramic disc: 100 pf ±10%, 3000 VDCW, temp coef -750 PPM; sim to Centralab Type GJ.
C233	19B201420-P41J	Silver mica: 41 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C234	19B201420-P31J	Silver mica: 31 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C235	7489162-P12	Silver mica: 24 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C236	19B201420-P122J	Silver mica: 122 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C237	7489162-P25	Silver mica: 82 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C238	19B201420-P73J	Silver mica: 73 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C239	7489162-P24	Silver mica: 75 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C240	7489162-P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C241	19B201420-P46J	Silver mica: 46 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C242 and C243	5493392-P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FASC.
C244	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		TERMINALS
E1 and E2	4029309-P1	Feed-thru: sim to Sealectro FT-SW-27.
		JACKS AND RECEPTACLES
J201	19B205689-G1	Connector: 18 contacts.
J202 and J203	19B205219-P1	Connector: 7 pins.
J204	7104941-P16	Jack, phono type: coaxial.
		RELAYS
K201	19C307030-P4	Armature: 12 VDC nominal, 2.5 w max operating, 80 ohms ±15% coil res, 2 form C contacts.
		INDUCTORS
L201	7772834-P4	Choke, RF: 7 µh ±10%, 0.96 ohm DC res; sim to Ohmite Z-50.
L202	19B205306-G1	Coil.
L203	19A122128-P1	Coil.
L204	19A122127-P1	Coil.
L205	19A122126-P1	Coil.
L206	19A122131-P1	Coil.
L207	19A122130-P1	Coil.
L208	19A122129-P1	Coil.
P101	4029840-P2	**PLUGS** Contact, electrical: sim to AMP 42822-2.
P102	4029840-P1	Contact, electrical: sim to AMP 41854.
P301	7104941-P6	Phono: short; sim to Cinch 15M2017S. (Part of W201).
		RESISTORS
R201	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R202	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R203	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R204	3R78-P273K	Composition: 27,000 ohms ±10%, 1 w.
R207	3R149-P822K	Composition: 8200 ohms ±10%, 4 w.
R208	3R77-P101J	Composition: 100 ohms ±5%, 1/2 w.
R209	19B209022-P30	Wirewound: 4.3 ohms ±5%, 2 w; sim to IRC Type BWH.
R210	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R211	3R79-P683K	Composition: 68,000 ohms ±10%, 2 w.
R212	5495948-P444	Deposited carbon: 0.28 megohm ±1%, 1/2 w; sim to Texas Instrument Type CDL/2MR.
R213	3R78-P273K	Composition: 27,000 ohms ±10%, 1 w.
R214	3R149-P153K	Composition: 15,000 ohms ±10%, 4 w.
		SWITCHES
S201	7145098-P3	Slide: DPDT, 0.75 amp at 125 VAC or 0.5 amp at 125 VDC; sim to Stackpole SS-33.
		TRANSFORMERS
T201	19B205272-G1	Coil. Includes tuning slug 7142014-P29.
T202	19B205346-G1	Coil. Includes tuning slug 7142014-P29.
T203	19B205347-G1	Coil. Includes tuning slug 7142014-P20.
		TERMINAL BOARDS
TB1	7775500-P4	Phen: 2 terminals.
		TUBES
V201		Type 8106.
V202		Type 7984.
		CABLES
W201	5491689-P56	RF: approx 12 inches, includes plug (P301).
W202		CABLE PL-19B205268-G1
P105	19B209341-P2	**PLUGS** Socket: 9 contacts; sim to Elco 04-920-EE.
		SOCKETS
XY201	7480532-P8	Tube, phen: 9 pins; sim to Elco 04-903-84.
XY202	19C301007-P5	Tube: 12 pins; sim to Alcon Metal Products 371G.
		MECHANICAL PARTS (SEE RC-1405)
1	19A121195-P2	Support. (Used with Y202).
2	19B205622-P1	Spring. (Used with Y201).
3	19A121523-P3	Heat sink. (Used with Y201).
4	7147223-P3	Clip, loop; sim to Patton-Macguyer 40. (Used with W201).
5	19B205211-P1	Support.
6	4035017-P4	Support, angle: sim to Tinnerman C19185-020-24.
7	7145167-P7	Insert, tube shield: sim to Atlas 106-332-22. (Used with Y202).
8	19B204571-P1	Heat sink. (Used with Y202).
9	19C303875-G1	Chassis.
10	7743541-P2	Strap, retaining.
11	19C303874-P1	Cover, bottom.
12	19D402623-P1	Casting.



25-50 MC TRANSMITTER-TYPE ET-72-A

SYMBOL	GE PART NO.	DESCRIPTION
C432	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C433*	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
C434*	5494481P14	Ceramic disc: 20000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
	5490008P131	In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV B and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV A and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV D and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV C and earlier: Silver mica: 150 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C435	19A116080P203	Polyester: 0.022 µf ±5%, 50 VDCW.
C436	19C300075P 56000J	Polyester: 5600 pf ±5%, 100 VDCW; sim to GE Type 61F.
C437	19C300075P 39000J	Polyester: 3900 pf ±5%, 100 VDCW; sim to GE Type 61F.
C438	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C439	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.
C442*	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
	5496267P15	In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV B and C: In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV A and B: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV D and E: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV A, B, C and D: Tantalum: 4.7 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
	5496267P10	In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV A and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 earlier than REV A: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV B and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 earlier than REV A: Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C443	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C451	7130348P14	Molded phenolic: 2.7 pf ±5%, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C452 and C453	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C454	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C455	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C456	5490008P15	Silver mica: 33 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C459 and C460	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C461	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C462	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C463	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C464	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C465	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C466	19A116080P6	Polyester: .068 µf ±20%, 50 VDCW.
C467	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.
C468	5496219P47	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C469 thru C473	5496219P46	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef 0 PPM.
C474	5496219P47	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C475	19C300075P47000J	Polyester: 4700 pf ±5%, 100 VDCW; sim to GE Type 61F.
C476 and C477	5490008P37	Silver mica: 270 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C478	19C300075P47000J	Polyester: 4700 pf ±5%, 100 VDCW; sim to GE Type 61F.
C479	5496219P34	Ceramic disc: 3.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C480	7489162P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C481	19A116080P106	Polyester: 0.068 µf ±10%, 50 VDCW.
C482*	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 by REV A. Added in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV B. Added in Models 4ER46B12, 13, 16, 17, 20, 21, 23 25 and 27 by REV A.
C483*	5496267P5	Tantalum: 4.7 µf ±20%, 10 VDCW; sim to Sprague Type 150D. Added in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 by REV D. Added in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 by REV C. Added in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV F. Added in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV E. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
C484*	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
C485*	5496267P228	Tantalum: 0.47 µf ±10%, 35 VDCW; sim to Sprague Type 150D. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
C486*	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
C487	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-W5R.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR301	7777146P3	Germanium: sim to Type 1N90.

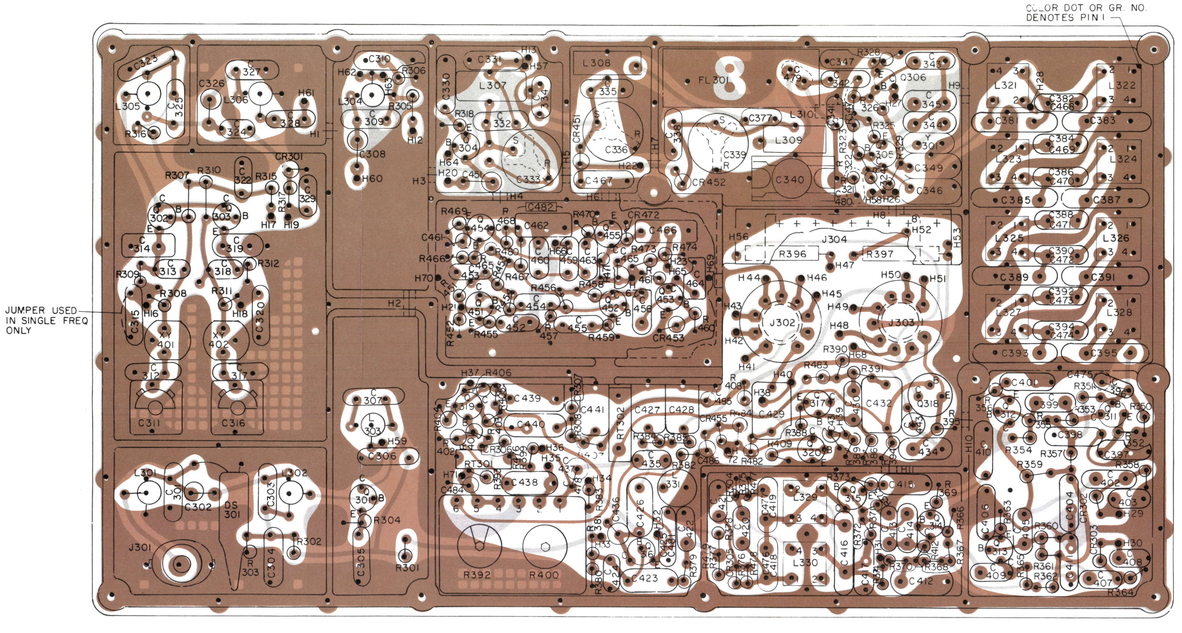
SYMBOL	GE PART NO.	DESCRIPTION
CR302 and CR303	4038056P1	Germanium.
CR304 and CR305	19A115250P1	Silicon.
CR306	5494922P1	Silicon; sim to Type 1N456.
CR307 and CR308	19A115250P1	Silicon.
CR451 and CR452	7777146P16	Germanium; sim to Type 1N68A.
CR453	7777146P3	Germanium; sim to Type 1N90.
CR454	19A115250P1	Silicon.
CR455*	19A115250P1	Silicon. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS301	19B209067P1	Lamp, glow: 0.3 ma; sim to GE NE-2T.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL301	19C304219G2	Bandpass: 5.3 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 - - - - - - - - - -
L301A	19C303960G1	Coil. Includes tuning slug 19B200497P2.
L301B	19C303960G4	Coil. Includes tuning slug 19B200497P2.
L301C	19C303960G6	Coil. Includes tuning slug 19B200497P2.
L302A	19C303960G11	Coil. Includes tuning slug 19B200497P2.
L302B	19C303960G5	Coil. Includes tuning slug 19B200497P2.
L302C	19C303960G7	Coil. Includes tuning slug 19B200497P2.
L303A	19C303960G1	Coil. Includes tuning slug 19B200497P2.
L303B	19C303960G4	Coil. Includes tuning slug 19B200497P2.
L303C	19C303960G6	Coil. Includes tuning slug 19B200497P2.
L304A	19C303960G2	Coil. Includes tuning slug 19B200497P2.
L304B	19C303960G3	Coil. Includes tuning slug 19B200497P2.
L304C	19C303960G8	Coil. Includes tuning slug 19B200497P2.
L305A	19C303960G3	Coil. Includes tuning slug 19B200497P2.
L305B	19C303960G3	Coil. Includes tuning slug 19B200497P2.
L305C	19C303960G9	Coil. Includes tuning slug 19B200497P2.
L306A	19C303960G4	Coil. Includes tuning slug 19B200497P2.
L306B	19C303960G4	Coil. Includes tuning slug 19B200497P2.
L306C	19C303960G10	Coil. Includes tuning slug 19B200497P2.
L307 thru L309	19B205224G1	Coil.
L310	19B204932G3	Coil.
L321* and L322*	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G6	Coil. Includes tuning slug 4038368P1.

SYMBOL	GE PART NO.	DESCRIPTION
L323*	19A115711P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G5	Coil. Includes tuning slug 4038368P1.
	19C303062G6	Coil. Includes tuning slug 4038368P1.
L324*	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
L325*	19A115711P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G5	Coil. Includes tuning slug 4038368P1.
L326*	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G6	Coil. Includes tuning slug 4038368P1.
L327*	19A115711P2	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12671. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19A115342P1	Silicon, NPN.
Q302* and Q303*	19A115330P1	Silicon, NPN.
	19A115245P1	Silicon, NPN.
Q304*	19A116860P1	Silicon, NPN; sim to Type 2N4996.
L328*	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670. Deleted in 4ER46B10, 11, 14, 15, 18, 19 by REV G. Deleted in 4ER46B12, 13, 16, 17, 20, 21 by REV J. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G6	Coil. Includes tuning slug 4038368P1.
L329*	19A115711P6	Transformer, freq: 455 KHz; sim to TOKO PEFCN-14733-CX12. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G4	Coil. Includes tuning slug 4038368P1.

SYMBOL	GE PART NO.	DESCRIPTION
L330*	19A115711P7	Transformer, freq: 455 KHz; sim to TOKO PEFCN-14734-BNL2. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV D and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV F and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier:
	19C303062G5	Coil. Includes tuning slug 4038368P1.
L331	19B209405P1	Reactor, audio freq: 142 mh ±5%, at 0.1 v thru 0.27 v; sim to Aladdin 405-101.
L332* and L333*	19C311181G16	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
L334*	19C311181G15	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
L335*	19C311181G16	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
L336*	19C311181G15	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
L337*	19C311181G16	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
L338*	19C311181G15	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
L339*	19C311181G16	Coil. Includes tuning slug 4038368P1. Added to 4ER46B10, 11, 14, 15, 18, 19 by REV G. Added to 4ER46B12, 13, 16, 17, 20, 21 by REV J.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q301*	19A116860P1	Silicon, NPN; sim to Type 2N4996. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV H and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV K and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19 of REV H and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21 of REV K and earlier: In Models 4ER46B22, 24, 26 of REV G and earlier: In Models 4ER46B23, 25, 27 of REV J and earlier:
	19A115342P1	Silicon, NPN.
Q302* and Q303*	19A115330P1	Silicon, NPN. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 of REV E and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 of REV G and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 of REV D and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 of REV F and earlier:
	19A115245P1	Silicon, NPN.
Q304*	19A116860P1	Silicon, NPN; sim to Type 2N4996. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV H and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV K and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19 of REV H and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21 of REV K and earlier: In Models 4ER46B22, 24, 26 of REV G and earlier: In Models 4ER46B23, 25, 27 of REV J and earlier:
	19A115342P1	Silicon, NPN.
Q305	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q306*	19A115910P1	Silicon, NPN; sim to Type 2N3906. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV H and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV K and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19 of REV H and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21 of REV K and earlier: In Models 4ER46B22, 24, 26 of REV G and earlier: In Models 4ER46B23, 25, 27 of REV J and earlier:
	19A115245P1	Silicon, NPN.

SYMBOL	GE PART NO.	DESCRIPTION
Q311 thru Q315	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q316 and Q317	19A115123P1	Silicon, NPN; sim to Type 2N3053.
Q318	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q319	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q320	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q321*	19A115123P1	Silicon, NPN; sim to Type 2N2712. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
Q451 and Q452	19A115245P1	Silicon, NPN.
Q453 thru Q455	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - RESISTORS - - - - - - - - -
R301	3R77P471J	Composition: 470 ohms ±5%, 1/2 w.
R302	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R303*	3R77P472J	Composition: 4700 ohms ±5%, 1/2 w. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV J and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV L and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19 of REV J and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21 of REV L and earlier: In Models 4ER46B22, 24, 26 of REV H and earlier: In Models 4ER46B23, 25, 27 of REV K and earlier:
	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R304	3R77P103J	Composition: 1000 ohms ±5%, 1/2 w.
R305	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R306	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R307*	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 of REV E and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 of REV G and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 of REV D and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 of REV F and earlier:
	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R308*	3R77P223J	Composition: 22,000 ohms ±5%, 1/2 w. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 of REV E and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 of REV G and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 of REV D and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 of REV F and earlier:
	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R309	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R310*	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w. In Models 4ER46A11, 15, 19, of REV E and earlier: In Models 4ER46A13, 17, 21, of REV G and earlier: In Models 4ER46B11, 15, 19, of REV D and earlier: In Models 4ER46B13, 17, 21, of REV F and earlier:
	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R311*	3R77P223J	Composition: 22,000 ohms ±5%, 1/2 w. In Models 4ER46A11, 15, 19, of REV E and earlier: In Models 4ER46A13, 17, 21, of REV G and earlier: In Models 4ER46B11, 15, 19, of REV D and earlier: In Models 4ER46B13, 17, 21, of REV F and earlier:
	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R312	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R313	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R314	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.

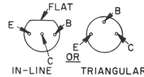
CONT'D ON 19B620768



(19D402821, Rev. 10)
(19D402665, Sh. 1, Rev. 8)
(19D402665, Sh. 2, Rev. 7)

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

LEAD IDENTIFICATION FOR Q307, Q311-Q317 & Q319-Q320



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

OUTLINE DIAGRAM

25—50 MHZ RECEIVER
TYPES ER-46-A, B

RC-1474J

PARTS LIST

LBI-3723H

25-50 MHz RECEIVER
MODELS 4ER46A10-27 NARROW BAND
MODELS 4ER46B10-27 WIDE BAND

SYMBOL	GE PART NO.	DESCRIPTION
		---------- **CAPACITORS** ----------
C301A and C301B	5496219P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C301C	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C302	7130348P3	Molded phenolic: 1 pf ±.05 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C303A	5496219P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C303B	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C303C	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C304 thru C306	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C307A and C307B	5496219P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C307C	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C308A	7130348P4	Molded phenolic: 2.2 pf ±0.11 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C308B	7130348P12	Molded phenolic: 0.82 pf ±5%, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C308C	7130348P5	Molded phenolic 1.2 pf ±.06 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C309A and C309B	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C309C	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C310	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C311	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C312	5490008P6	Silver mica: 10 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C313	5496219P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C314	5490008P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C315	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C316	5491271P106	Variable, air: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C317	5490008P6	Silver mica: 10 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C318	5496219P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C319	5490008P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C320 thru C323	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C324	5496219P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C325A	5496219P455	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -220 PPM.
C325B	5496219P457	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -220 PPM.
C325C	5496219P455	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -220 PPM.
C326	7130348P3	Molded phenolic: 1 pf ±.05 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C327A	5496219P256	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -80 PPM.
C327B	5496219P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C327C	5496219P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C328A	5490008P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C328B	5490008P17	Silver mica: 39 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C328C	5490008P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C329 and C330	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C331	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C332	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C333	5490446P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0; sim to Erie 557-36.
C334	5496219P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C335	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C336	5490446P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0; sim to Erie 557-36.
C337	5496219P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C338	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C339	5490446P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0 PPM; sim to Erie 557-36.
C340	19A115659P1	Variable: approx 10-141 pf, 150 VDCW; sim to El-Menco Type 42.
C341	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C342	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C343	5490008P15	Silver mica: 33 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C344	5490008P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C345	5490008P33	Silver mica: 180 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C346	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C347	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.
C349	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C381	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C382	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C383	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C384	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C385	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C386	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C387	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C388	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C389	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C390	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C391	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C392	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C393	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C394	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C395	19A116656P220J2	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -220 PPM.
C396	7491395P109	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JL.
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	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C409	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C410	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C411	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.
C412	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C413	5494481P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C414	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C415	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C416	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C417	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.
C418 and C419	5490008P137	Silver mica: 270 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C420	5496219P656	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -470 PPM.
C421 and C422	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C423	19A116080P109	Ceramic disc: 0.22 µf ±10%, 50 VDCW.
C424	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C425*	19A116080P6	Polyester: 0.068 µf ±20%, 50 VDCW. In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV A and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 earlier than REV A: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV B and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 earlier than REV A:
	19B209243P5	Polyester: .047 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.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

(DF-1088)

MODEL NO	REV	FREQ RANGE (MHZ)	NO OF	NOISE BLANKER
4ER46A10	K	25-33	1	
4ER46A11	K	25-33	2	
4ER46A12	M	25-33	1	X
4ER46A13	M	25-33	2	X
4ER46A14	K	33-42	1	
4ER46A15	K	33-42	2	
4ER46A16	M	33-42	1	X
4ER46A17	M	33-42	2	X
4ER46A18	K	42-50	1	
4ER46A19	K	42-50	2	
4ER46A20	M	42-50	1	X
4ER46A21	M	42-50	2	X
4ER46A22	K	25-33	4	
4ER46A23	M	25-33	4	X
4ER46A24	K	33-42	4	
4ER46A25	M	33-42	4	X
4ER46A26	K	42-50	4	
4ER46A27	M	42-50	4	X

MODEL NO	REV	FREQ RANGE (MHZ)	NO OF FREQ	NOISE BLANKER
4ER46B10	K	25-33	1	
4ER46B11	K	25-33	2	
4ER46B12	M	25-33	1	X
4ER46B13	M	25-33	2	X
4ER46B14	K	33-42	1	
4ER46B15	K	33-42	2	
4ER46B16	M	33-42	1	X
4ER46B17	M	33-42	2	X
4ER46B18	K	42-50	1	
4ER46B19	K	42-50	2	
4ER46B20	M	42-50	1	X
4ER46B21	M	42-50	2	X
4ER46B22	J	25-33	4	
4ER46B23	L	25-33	4	X
4ER46B24	J	33-42	4	
4ER46B25	L	33-42	4	X
4ER46B26	J	42-50	4	
4ER46B27	L	42-50	4	X

NOTES

1. JUMPERS USED FOR 1 FREQ ONLY.
2. CONNECTIONS TO H18 USED FOR 2 FREQ ONLY. CONNECTIONS TO H16 USED FOR 2 & 4 FREQ ONLY.
3. ALL COMPONENTS MARKED WITH ASTERISK (*) ARE NOT USED FOR ONE FREQUENCY RECEIVER.
4. COMPONENT NO SUFFIX
   A = 25-33 MHZ
   B = 33-42 MHZ
   C = 42-50 MHZ
5. JUMPER FOR 4 FREQ ONLY.
6. ▲COMPONENTS MARKED THUS ARE PRESENT IN 4ER46B10–27 ONLY. (WIDE BAND)
7. ■COMPONENTS MARKED THUS ARE PRESENT IN 4ER46A10–27 ONLY.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO GROUND WITH TEST SET MODEL 4EX3A10 OR A 20,000 OHM-PER-VOLT METER, AND WITH SQUELCH CONTROL R400 FULLY COUNTER-CLOCKWISE. READINGS TAKEN WITH F1 OPERATING

S = NO SIGNAL (SQUELCHED)
US = WITH A 1 MILLIVOLT UN-MODULATED ON-FREQUENCY SIGNAL (UNSQUELCHED).

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

25—50 MHZ RECEIVER
TYPES ER-46-A, B

19R620768, Rev. 25

SYMBOL	GE PART NO.	DESCRIPTION
R315*	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
		In Models earlier than REV A:
	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R316*	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
		In Models earlier than REV A:
	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R317	3R77P472J	Composition: 4700 ohms ±5%, 1/2 w.
R318	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R320*	3R77P223J	Composition: 22,000 ohms ±5%, 1/2 w. Deleted in 4ER46A10,11,14,15,18,19,22,24,26 by REV K. Deleted in 4ER46A12,13,16,17,20,21,23,25,27 by REV M. Deleted in 4ER46B10,11,14,15,18,19 by REV K. Deleted in 4ER46B12,13,16,17,20,21 by REV M. Deleted in 4ER46B22,24,26 by REV J. Deleted in 4ER46B23,25,27 by REV L.
R321	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
R322	3R77P393J	Composition: 39,000 ohms ±5%, 1/2 w.
R323	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R324	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R325	3R77P392J	Composition: 3900 ohms ±5%, 1/2 w.
R326	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R327	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R328*	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
		In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV G and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV J and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19 of REV G and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21 of REV J and earlier: In Models 4ER46B22, 24, 26 of REV F and earlier: In Models 4ER46B23, 25, 27 of REV H and earlier:
	3R77P122J	Composition: 1200 ohms ±5%, 1/2 w.
R329	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R350	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R351	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R352	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R353	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R354	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R355	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R356	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R357	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R358	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R359	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R360	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R361	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R362	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R363	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R364	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R365	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R366	3R77P123K	Composition: 12,000 ohms ±10%, 1/2 w.
R367	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R368	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.

SYMBOL	GE PART NO.	DESCRIPTION
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	3R77P203J	Composition: 20,000 ohms ±5%, 1/2 w.
R387*	3R77P753J	Composition: 75,000 ohms ±5%, 1/2 w. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
R388	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R389	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
R390	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R391	3R77P431J	Composition: 430 ohms ±5%, 1/2 w.
R392	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	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R394	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R395	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R396 and R397	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R399	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	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R404	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R405	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R406	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	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R410*	3R77P182J	Composition: 1800 ohms ±5%, 1/2 w. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
		In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV C and earlier: In Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 of REV B and earlier: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV E and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV D and earlier:
	3R152P362J	Composition: 3600 ohms ±5%, 1/4 w.
R411*	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w. Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
R412	3R77P561K	Composition: 560 ohms ±10%, 1/2 w.
R451	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R452	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R453	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R454	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R455	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R456	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R457	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R458	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R459	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R460	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R461	3R77P104J	Composition: 0.1 megohm ±5%, 1/2 w.
R465*	3R77P912J	Composition: 9100 ohms ±5%, 1/2 w.
		In Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 earlier than REV A: In Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 of REV A and earlier: In Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 earlier than REV A:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R466	3R77P272J	Composition: 2700 ohms ±5%, 1/2 w.
R467	3R77P471J	Composition: 470 ohms ±5%, 1/2 w.
R468	3R77P472J	Composition: 4700 ohms ±5%, 1/2 w.
R469	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R470	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R471	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R472	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R473	3R77P433J	Composition: 43,000 ohms ±5%, 1/2 w.
R474	3R77P562J	Composition: 5600 ohms ±5%, 1/2 w.
R475	3R77P105J	Composition: 1 megohm ±5%, 1/2 w.
R476	3R77P911J	Composition: 910 ohms ±5%, 1/2 w.
R477 and R478	3R77P273J	Composition: 27,000 ohms ±5%, 1/2 w.
R479	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R480*	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w. Added in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 by REV A. Added in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV B. Added in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV A.
R481*	3R77P152J	Composition: 1500 ohms ±5%, 1/2 w. Added in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24 and 26 by REV D. Added in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV F. Added in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25 and 27 by REV E. Added in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24 and 26 by REV C.
		Deleted in Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Deleted in Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Deleted in Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Deleted in Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
R482*	3R77P433J	Composition: 43,000 ohms ±5%, 1/2 w. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
R483*	3R77P564J	Composition: 0.56 megohm ±5%, 1/2 w. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.

SYMBOL	GE PART NO.	DESCRIPTION
R484*	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w. Added to Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 by REV G. Added to Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27 by REV J. Added to Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26 by REV F. Added to Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27 by REV H.
		- - - - - - - - - - THERMISTORS - - - - - - - - -
RT301	5490828P38	Rod: 1400 ohms ±5%, 0.38 w max; sim to Globar Type 492H.
RT302	5490828P35	Rod: 3800 ohms ±5%, 1 w max; sim to Globar Type 723B-4.
		- - - - - - - - - - - SOCKETS - - - - - - - - -
XY401 and XY402	5490277P1	Transistor, phen: 4 contacts; sim to Elco 3303.
		- - - - - - - - - - - CRYSTALS - - - - - - - - -
Y301	19B206356G4	Quartz: freq 5755.00 KHz, temp range -30°C to +85°C.
		NOTE: When reordering, give GE Part number and specify exact frequency needed.
		25-33 MHz crystal frequency = (OF +5.3) ÷ 2. 33-42 MHz crystal frequency = (OF -5.3) ÷ 2. 42-50 MHz crystal frequency = (OF -5.3) ÷ 3.
Y401 and Y402	19B206357P1	Quartz: freq range 12 to 20 MHz, temp range -30°C to +85°C.
		- - - - - - - - MISCELLANEOUS - - - - - -
	19B205369G2	Top cover.
	4036555P1	Insulator, washer: nylon. (Used with Q318).
	4035306P62	Washer, fiber. (Used with Y301, FL301).

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 4ER46A10-27
To prevent operation of oscillator F1 when F2, F3 and F4 is selected. Changed R315 and R316.

REV. A - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. B - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To eliminate audio coupling into the noise blanker from +12 volt supply line - Changed R465, and added C482 and R480.

REV. A - Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26
REV. B - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26 &
Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. C - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To increase maximum squelch sensitivity. Changed C442. In 4ER46A10-27, C425 was also changed.

REV. C - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. D - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To facilitate noise blanker disable function for test purposes. Added white wire from junction of R467-R468 (on Blanker Pulse Generator) to J302-4 (receiver jack).

REV. B - Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26
REV. C - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. D - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. E - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To eliminate high frequency oscillations in the receiver PA caused by use of a higher gain PA transistor. Changed C434.

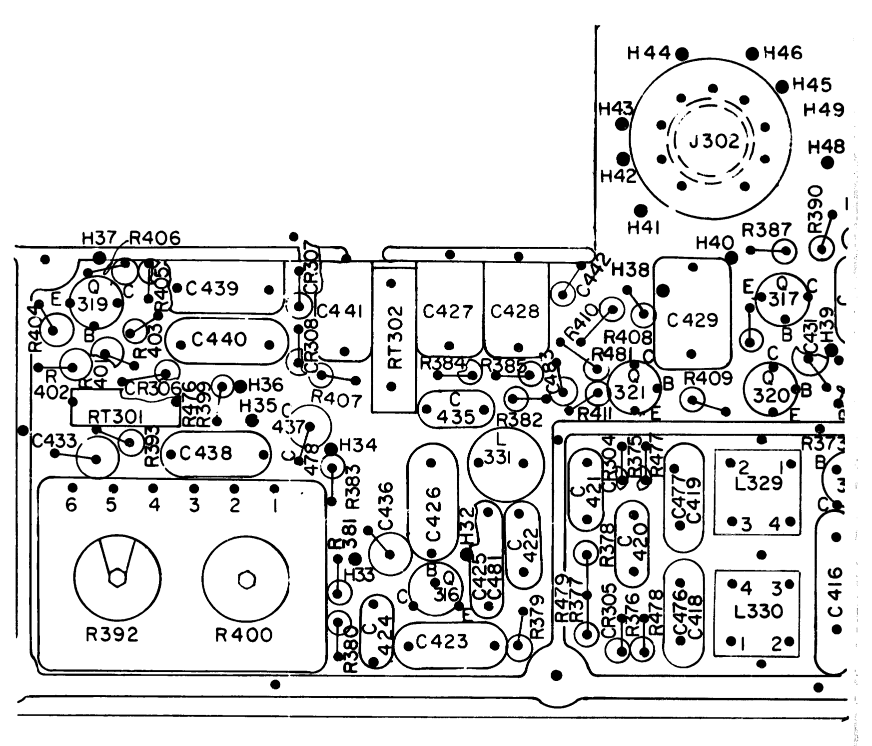
REV. C - Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26
REV. D - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. E - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. F - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To eliminate undesirable squelch thump that occurs when carrier is received. Changed C442 and R410. Added C483 and R481.

REV. D - Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26
REV. E - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. F - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. G - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To permit use of different IF coils. Changed printed wiring board and L321 thru L330.

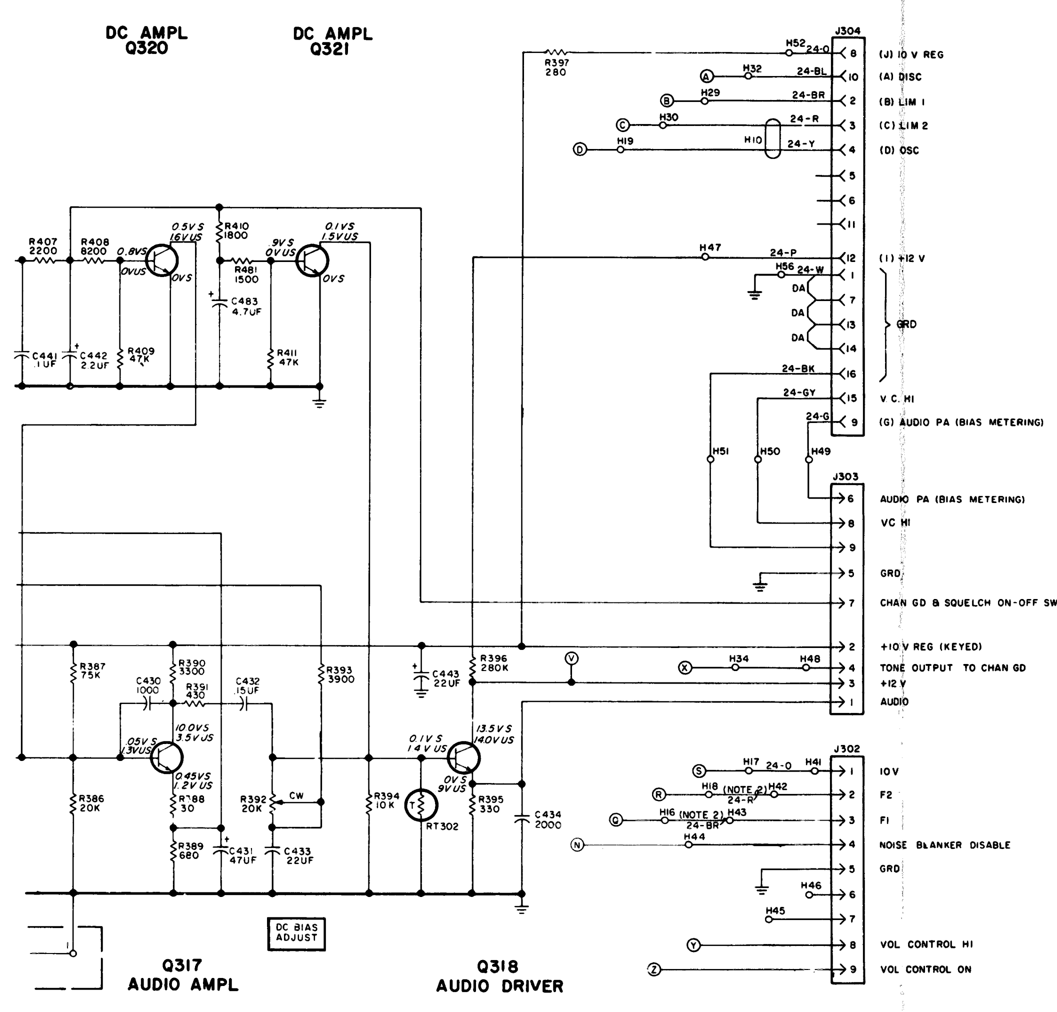
REV. E - Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26
REV. F - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. G - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. H - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To increase oscillator output. Changed Q302, Q303, R307, R308, R310 and R311.

REV. F - Models 4ER46B10, 11, 14, 15, 18, 19, 22, 24, 26
REV. G - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. H - Models 4ER46B12, 13, 16, 17, 20, 21, 23, 25, 27
REV. J - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
To eliminate objectionable squelch thump. Deleted R387, R410, R411, C433, C442, R481, C483 and Q321. Added C484, C485, C486, CR455, R482, R483 and R484.

Outline Diagram Was:



Schematic Diagram Was:



REV. G - Models 4ER46B10, 11, 14, 15, 18, 19

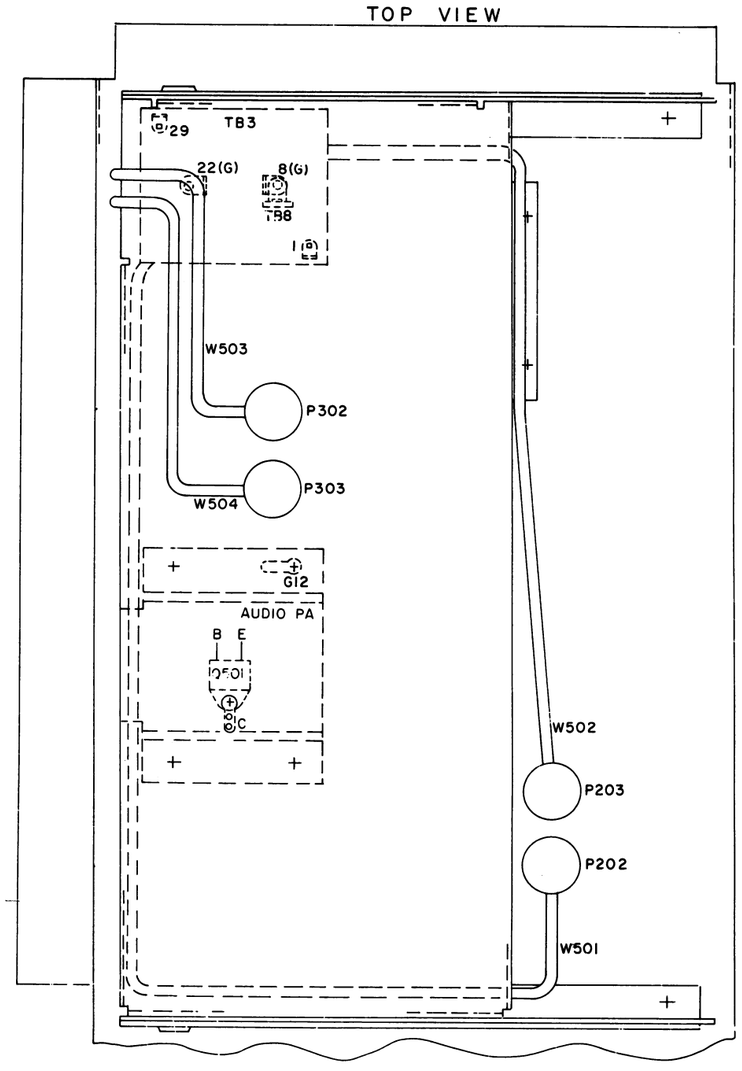
REV. J - Models 4ER46B12, 13, 17, 20, 21

To increase IF bandwidth.
Changed L321, L322, L324, L326 and L328 to L332, L333, L335, L337 and L339.
Changed L323, L325 and L327 to L334, L336, and L338.
Changed C468 and C474.
Changed C422 to C487.

REV. H - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. K - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
REV. H - Models 4ER46B10, 11, 14, 15, 18, 19
REV. K - Models 4ER46B12, 13, 16, 17, 20, 21
REV. G - Models 4ER46B22, 24, 26
REV. J - Models 4ER46B23, 25, 27
To improve audio fidelity.
Changed R328.

REV. J - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. L - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
REV. J - Models 4ER46B10, 11, 14, 15, 18, 19
REV. L - Models 4ER46B12, 13, 16, 17, 20, 21
REV. H - Models 4ER46B22, 24, 26
REV. K - Models 4ER46B23, 25, 27
To incorporate new transistors.
Changed Q301, Q304, and Q306.

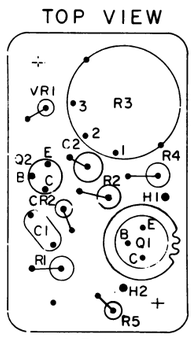
REV. K - Models 4ER46A10, 11, 14, 15, 18, 19, 22, 24, 26
REV. M - Models 4ER46A12, 13, 16, 17, 20, 21, 23, 25, 27
REV. K - Models 4ER46B10, 11, 14, 15, 18, 19
REV. M - Models 4ER46B12, 13, 16, 17, 20, 21
REV. J - Models 4ER46B22, 24, 26
REV. L - Models 4ER46B23, 25, 27
To improve receiver sensitivity.
Deleted R320 and changed R303.



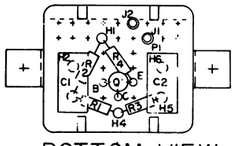
RESISTANCE READINGS

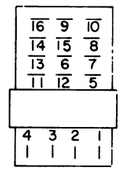
RESISTANCE READINGS ARE MEASURED FROM TB3 TO GROUND WITH A 20,000 OHM-PER-VOLT METER, AND WITH ALL EXTERNAL CONNECTIONS REMOVED - OR + SIGN SHOWS METER LEAD GROUNDED

MEASURED FROM	-	+
TB3-21	∞	∞
TB3-26	∞	∞
TB3-25	36Ω	30K
TB3-14	20Ω	250K
T501-5	∞	∞
T501-3	∞	∞
TB3-16	6.4K	2.25K
TB3-17	5.6K	50K
TB3-20	21K	90K
TB3-27	0	0

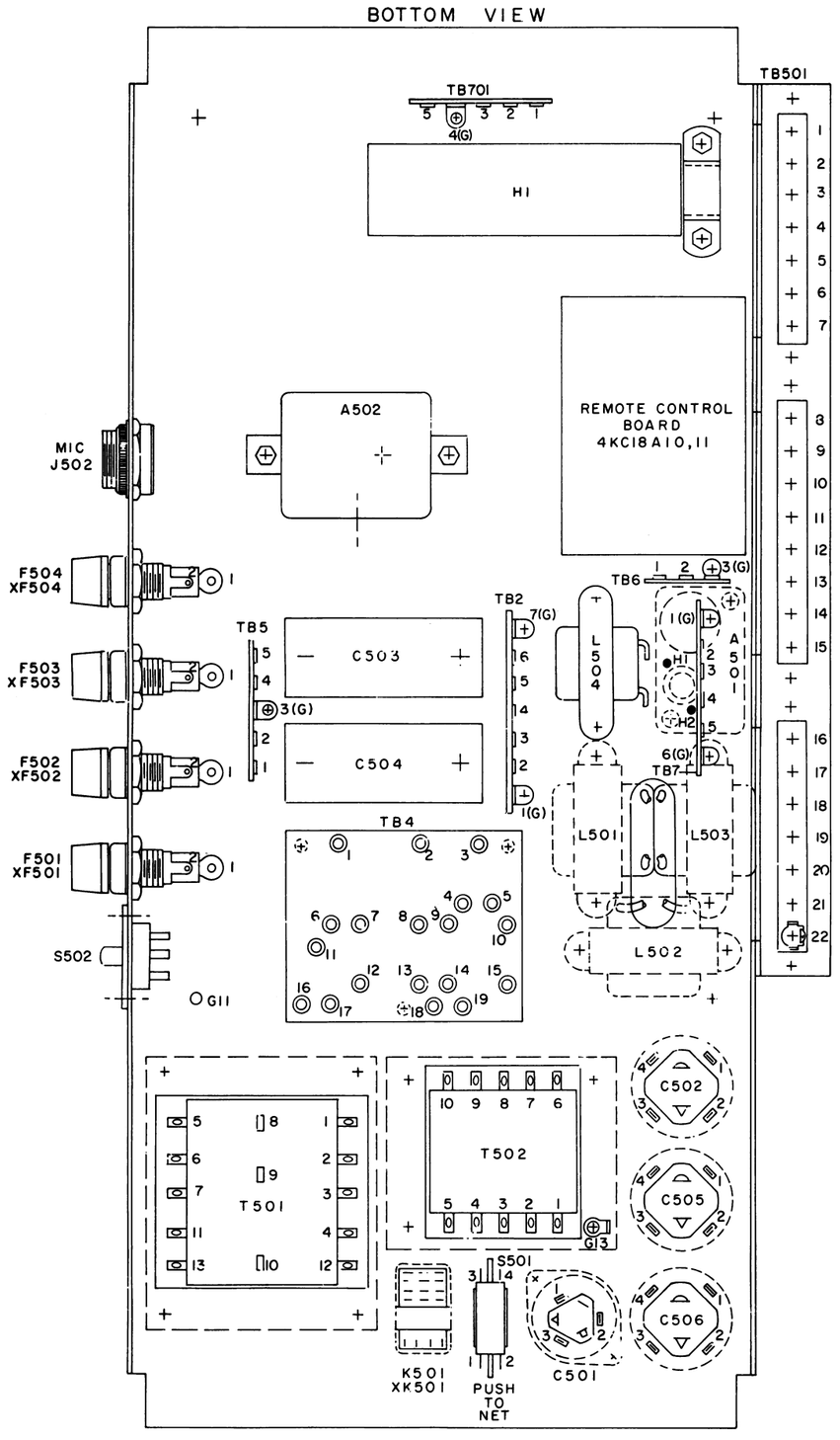


A501
10-VOLT REGULATOR



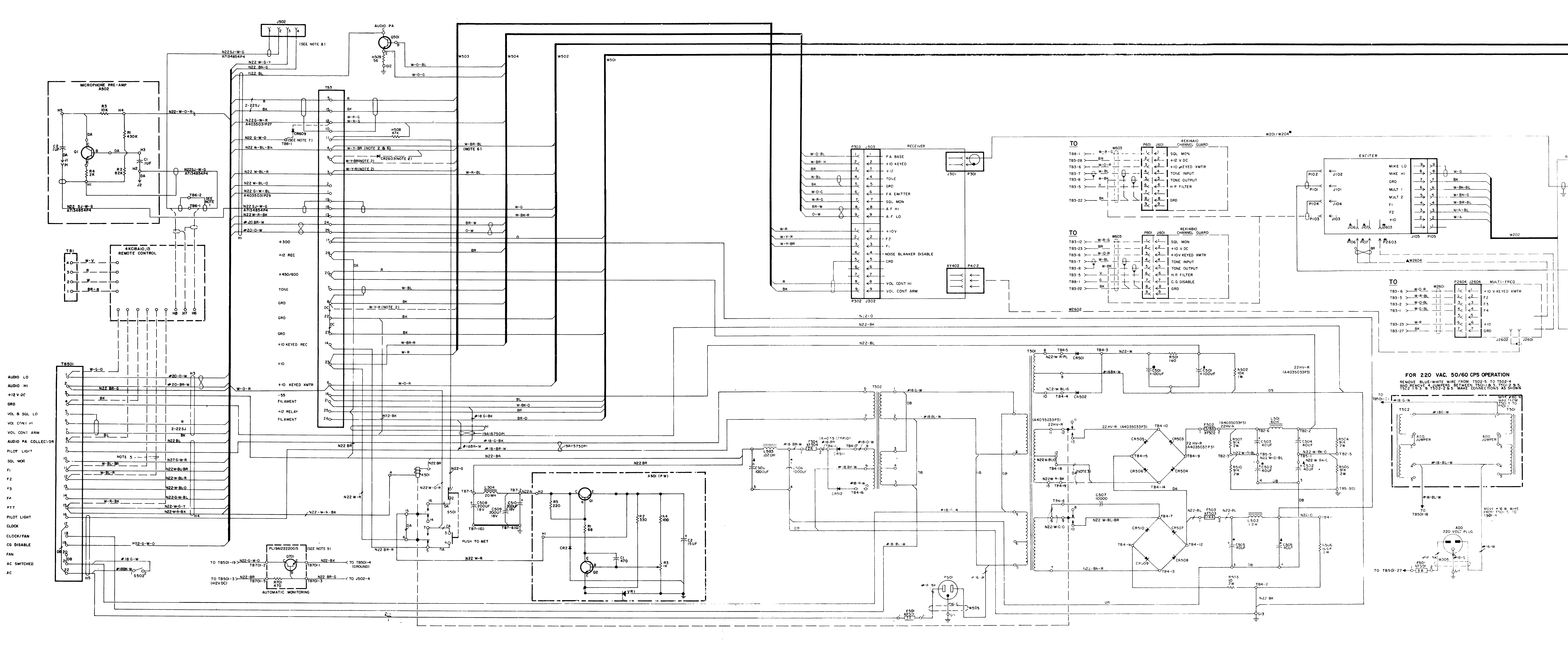


TERMINAL VIEW
OF K501



OUTLINE DIAGRAM

POWER SUPPLY MODEL 4EP51A10
(19D402812, Rev. 10)



NOTES:

1. TB6 OMITTED ON UNITS WITH REMOTE CONTROL 4KC18A10, 13.
2. IN HIGH BAND AND LOW BAND MULT-FREQ UNITS ONLY, CR2603 ADDED, W-Y-BR WIRE TERMINATED AT TB3-9 INSTEAD OF AT TB3-4 AND W-Y-R WIRE TERMINATED AT TB3-8 INSTEAD OF AT TB3-3.
3. CONNECTION FROM TB4-14 TO TB4-18 FOR HI BAND, MID BAND & 450. CONNECTION FROM TB4-14 TO TB4-19 FOR LO BAND
4. WHEN ADVANCING THE REV LTR ON MODEL NO 4EP51A10, THE REV LTR FOR MODEL NO 4EP51A11 ON WIRING DIAGRAM 19R640712 MUST BE ADVANCED.
5. 4KC18A11 SHOWN CONNECTED FOR 2 FREQUENCY TRANSMIT, SINGLE FREQUENCY RECEIVE. WHEN USED WITH CHANNEL GUARD, CONNECT W-BL-R WIRE FROM 4KC18A11 TO TB501-10 ON REV O POWER SUPPLY FOR REV A AND LATER POWER, CONNECT W-BL-R WIRE FROM 4KC18A11 TO TB501-19. REMOVE AND DISCARD W-BL-BR WIRE FROM 4KC18A11 TO TB501-11"
6. FOR HIGH AND LOW BAND UNITS 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.
7. FOR UNITS WITH 4EK14A10 CHANNEL GUARD ONLY, CR609 ADDED.
8. WHEN USING THE 4EM28B10 MIKE DELETE WIRE FROM J502-4 - TB501-2.
9. USE 4EM28B10 MODEL FOR AUTOMATIC MONITORING.
10. COMPONENTS MARKED WITH "▲" ARE PRESENT IN 450 MHZ MULTI-FREQ UNITS ONLY. COMPONENTS MARKED WITH "☗" ARE PRESENT IN HIGH BAND AND LOW BAND MULTI-FREQ UNITS ONLY.
11. COMPONENTS MARKED WITH "■" ARE PRESENT IN 450MHZ UNITS ONLY.
12. FOR 450 MHZ SINGLE FREQ REC. OPERATION, CONNECT O 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
4EP51A10 (NOTE 4)	L

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

POWER SUPPLY MODEL 4EP51A10

(19R640706, Rev. 26)

(DF-0062)

PARTS LIST

LSI-3720H

STATION POWER SUPPLY
Model 4EPS1A10

SYMBOL	GE PART NO.	DESCRIPTION
A501		**10 VOLT REGULATOR** 19B203555a.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5484481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to SMC Type JF Discap.
C2	5484367P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C3* and C4*	5484367P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D. Deleted by REV K.
		- - - - - - - - - DIODES & RECTIFIERS - - - - - - - -
CR1	4037832P1	Silicon.
		- - - - - - - - - INDICATING DEVICES - - - - - - - -
DS1*	4034664P1	Lamp, incandescent: 28 v; sim to GE 2148. Deleted by REV E.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q2*	19A116755P1	Silicon, NPN; sim to Type 2N3947. Is REV L and earlier:
	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1*	3R77P680K	Composition: 68 ohms ±10%, 1/2 w. In Models earlier than REV B.
	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*	3R152P231K	Composition: 230 ohms ±10%, 1/4 w. Added by REV E.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR1	4036687P6	Silicon, Zener.
A502*		**MICROPHONE PRE-AMPLIFIER** 19B204453G2 Added by REV C
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	19A115038P114	Polyester: 0.1 µf ±20%, 200 VDCW.
		- - - - - - - - JACKS & RECEPTACLES - - - - - - - -
J1 and J2	4033513P4	Contact, electrical: sim to Bead Chain LB3-3.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	4029860P2	Contact, electrical: sim to AMP 41854.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115888P1	Silicon, NPN; sim to Type 2N2712.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P434J	Composition: 0.43 megohm ±5%, 1/2 w.
R2	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R3	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R4	3R77P303J	Composition: 2000 ohms ±5%, 1/2 w.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C501	5496456P4	Electrolytic, twist-prong: 100-100 µf +100% -10%, 150-150 VDCW; sim to GE 43F.
C502	5770994P25	Electrolytic, twist-prong: 40-40 µf +50% -10%, 450-450 VDCW; sim to Mallory Type FP.
C503 and C504	5774736P45	Electrolytic: 40 µf +50% -10%, 450 VDCW; sim to PR Mallory TC78.
C505	5770994P25	Electrolytic, twist-prong: 40-40 µf +50% -10%, 450-450 VDCW; sim to Mallory Type FP.
C506	5476443P21	Electrolytic, twist-prong: 1000-1000 µf +250% -10%, 25-25 VDCW; sim to GE 43F.
C507	5494481P21	Ceramic disc: 10,000 pf ±20%, 1000 VDCW; sim to SMC Type JF Discap.
C508 thru C510	19A115580P10	Electrolytic: 200 µf +150% -10%, 18 VDCW; sim to Mallory Type TT.
C511*	5494481P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to SMC Type JF Discap. Added by REV D. Deleted by REV G.
		- - - - - - - DIODES & RECTIFIERS - - - - - - -
CR501 and CR503	4037822P1	Silicon.
CR503 thru CR510	4037822P2	Silicon.
CR511 and CR512	4037822P1	Silicon.
		- - - - - - - - - - - - FUSE - - - - - - - - - - - -
F501	1A169P6	Quick blowing: 3 amps at 250 v; sim to Littelfuse 312003 or Bussman AGC-3.
F502	7487843P2	Slow blowing: 3/8 amp at 250 v; sim to Bussman MDL-3/8.
F503	7487842P1	Slow blowing: 1/4 amp at 250 v; sim to Bussman MDL-1/4.
F504	7487842P27	Slow blowing: 2 amps at 125 v; sim to Bussman MDL-2.
		- - - - - - JACKS AND RECEPTACLES - - - - - -
J502		Connector. Includes:
	19A116061P2	Receptacle: 4 female contacts; sim to Amphenol Type 91-PM4F-1000.
	19A116061P4	Lockwasher.
	19A125000P1	Nut, knurled.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K501	19C307010P5	Armature: 12 VDC nominal, 1.5 w max operating, 130 ohms ±10% coil res, 4 form C contacts; sim to Allied Control 7154-6-412.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L501	19B209346P1	Reactor: 0.6 h min, 40 ohms max DC res, 600 VDC operating.
L502	19B209347P1	Reactor: 1.2 h min, 50 ohms max DC res, 300 VDC operating.
L503	19B209345P1	Reactor: .02 h min, 0.5 ohm max DC res, 15 VDC operating.
L504	5490936P1	Reactor: .02 h min, 1.3 ohms ±10% DC res, 1.5 VDC operating.
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P501		(Part of W505).

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q501*	19A116203P3	Silicon, NPN.
		Earlier than REV G.
	19A115527P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R501	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R502	3R76P103K	Composition: 10,000 ohms ±10%, 1 w.
R503	19A116310P23	Composition: 10 ohms ±5%, 2 w; sim to Allen-Bradley Type EB.
R504 and R505	3R79P913J	Composition: 91,000 ohms ±5%, 2 w.
R506	3R79P104K	Composition: 0.1 megohm ±10%, 2 w.
R507	3R79P913J	Composition: 91,000 ohms ±5%, 2 w.
R508	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R509	19B209022P109	Wirewound: 0.56 ohm ±10%, 2 w; sim to IRC Type BWH.
R510	3R79P913J	Composition: 91,000 ohms ±5%, 2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S501	4038038P1	Pushbutton, red: SPDT, 1 amp at 125 VAC; sim to Arrow-Hart and Hegeman 3393-A.
S502*	7145098P1	Slide: SPDT, 0.75 amp at 125 VAC, or 0.5 amp at 125 VDC; sim to Stackpole SS-150. Added by REV E.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T501	19A115698P1	Power: 117/220 VAC.
T502	19A115699P1	Power.
		- - - - - - - TERMINAL BOARDS - - - - - - -
TB2	7775500P17	Phen: 7 terminals.
TB3	19B205258G1	Board: 27 terminals.
TB4	19A122174G1	Component board: 19 eyelets.
TB5	7775500P11	Phen: 5 terminals.
TB6	7775500P2	Phen: 3 terminals.
TB7	7775500P16	Phen: 6 terminals.
TB8*	7487424P32	Miniature, phen: 1 terminal. Added by REV A.
TB501		Board. Includes the following:
	7117710P7	Phen: 7 terminals; sim to Cinch 1770. (Quantity 2).
	7117710P8	Phen: 8 terminals; sim to Cinch 1780.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501		**CABLE** 19B203366G2 (Used in Transmitter)
		- - - - - - - - - - PLUGS - - - - - - - - - -
P203	19B209341P1	Socket: 7 contacts; sim to Elco 04-720-XX.
	19A122138P1	Knob.
	19A113404P1	Wood screw, phillips head.
W502		**CABLE** 19B203367G1 (Used in Transmitter)
		- - - - - - - - - - PLUGS - - - - - - - - - -
P203	19B209341P1	Socket: 7 contacts; sim to Elco 04-720-XX.
	19A122138P1	Knob.
	19A113404P1	Wood screw, phillips head.

SYMBOL	GE PART NO.	DESCRIPTION
W503		**CABLE** 19B203365G1 (Used in Receiver)
		- - - - - - - - - - PLUGS - - - - - - - - - -
P302	19B209341P2	Socket: 9 contacts; sim to Elco 04-920-XX.
	19A122138P1	Knob.
	19A113404P1	Wood screw, phillips head.
W504		**CABLE** 19B203364G2 (Used in Receiver)
		- - - - - - - - - - PLUGS - - - - - - - - - -
P303	19B209341P2	Socket: 9 contacts; sim to Elco 04-920-XX.
	19A122138P1	Knob.
	19A113404P1	Wood screw, phillips head.
W505	19A122527G2	Cable: includes 3-pin socket (P501).
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XF501 thru XF504	19B209005P1	Fuseholder, post type, phen: 15 amps at 250 v; sim to Littelfuse 342012.
XK501	5491505P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		HARNESS ASSEMBLY 19D403655G2 (Includes A502, TB3, W501-W504)
		ASSOCIATED ASSEMBLIES
		POWER CABLE 19A122527G1
		- - - - - - - - MISCELLANEOUS - - - - - - - - -
	5490059P1	Cable, power: approx 36 inches, includes 3-pin socket.
	19B209260P2	Solderless terminal.
		ANTENNA CABLE 19A122133G3
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4029493P1	Receptacle, panel: coaxial; sim to Amphenol 83-79S or Equiv. Military MS-39WA.
	5491689P69	Cable, RF: approx 48 inches, includes phono-type plug.
	4029083P1	Adapter.
		MONITOR KIT (CHANNEL GUARD) 19A122200G13
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q701	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R701	3R77P474K	Composition: 0.47 megohm ±10%, 1/2 w.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB701	7775500P9	Phen: 5 terminals.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4035439P1	Heat sink, transistor: sim to Birtcher 3AL-635-2E. (Used with Q1 in A501).
	4036555P1	Insulator, washer: nylon. (Used with Q1 in A501)
	4036574P11	Stand-off. (Mounts TB4).
	7121396P4	Retainer, capacitor: phen. (Used with C501).
	5491505P9	Retainer, spring. (Used with K501).
	4031594P2	Insulator. (Located under R3).

*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 - Model 4EPS1A10

To permit the addition of a Channel Guard disable switch, added TB8, deleted jumper from TB501-18 to TB501-19, and added G-W-0 wire from TB501-19 to TB8-1.

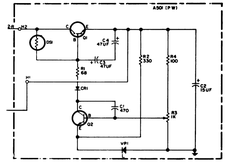
REV. B - To improve operation of 10-volt regulator A501. Changed R1.

REV. C - To amplify the microphone output. Added pre-amplifier A502.

REV. D - To prevent high frequency oscillations in audio PA when a high gain transistor is used. Added C511.

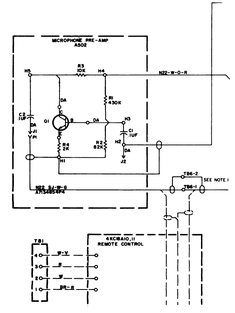
REV. E - To provide a station power ON-OFF switch on the rear of the power supply chassis. Added S502.

REV. F - To protect 10-Volt Regulator A501 against reverse polarity. Deleted CR1 and added CR2.
Schematic Diagram Was:



REV. G - To incorporate a new audio output transistor. Deleted C551, and changed Q501.

REV. H - To increase the line level sensitivity for use with remote line levels as low as -20 dBm. Re-routed wiring of H1c Preamp. A502.
Schematic Diagram was:



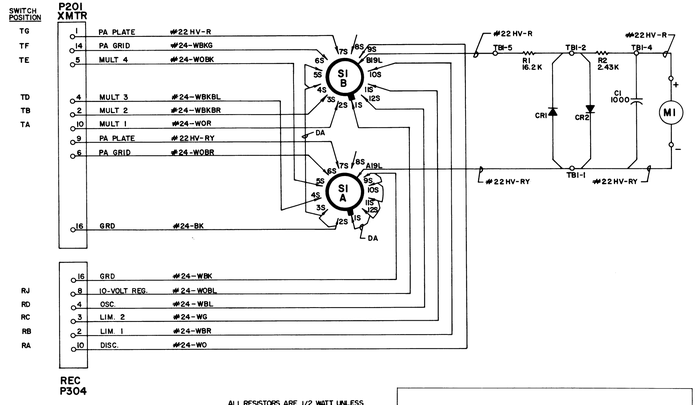
REV. J - To eliminate keying thump in receiver. Moved white-brown-red wire from TB3-14 to TB3-23.

REV. K - To improve reliability of 10V regulator. Deleted DS1 and added R5.

REV. L - To improve operation of 10-Volt regulator A501. Deleted C3 and C4.

REV. M - To incorporate improved transistor. Replaced Q2.

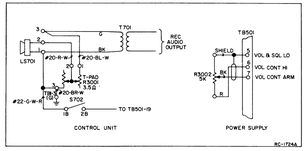
TEST METER OPTION



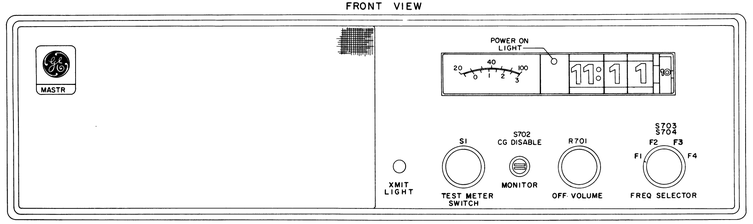
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

ALL RESISTORS ARE 1/2 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.

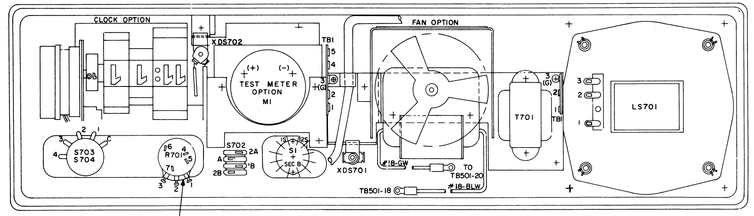
(19C311061, Rev. 2)



FRONT VIEW

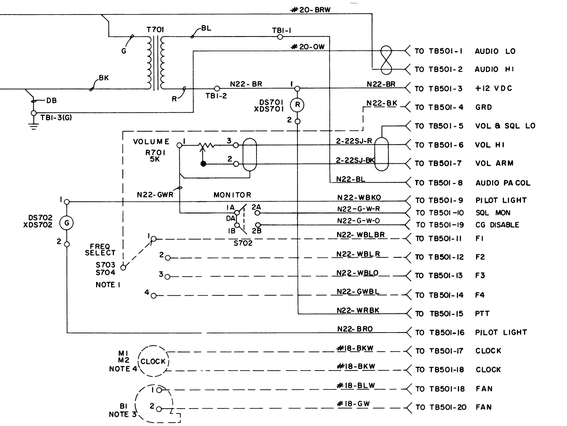


REAR VIEW



(19D402814, Rev. 6)

CONTROL UNIT SCHEMATIC



NOTES:
1. S703 IN 4EC69A11 ONLY
   TWO FREQ. KIT PL19A122220G8.
   S704 IN 4EC69A12 ONLY
   FOUR FREQ KIT PL19A1222209.
2. TERMINATE WIRES TO TERMINALS 1 THRU 3, 5 THRU 10, 15, 16 & 19 WITH 19B209260P103.
3. BLOWER KIT PL19A122295G1.
4. CLOCK KIT PL19A12222 G1, G2.

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
4EC69A10	B
4EC69A11	B
4EC69A12	B

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.

(19C303970, Rev. 6)

(DF-4076)

SCHEMATIC & OUTLINE DIAGRAM

DESK TOP CONTROL UNIT MODEL 4EC69A10-12

RC-1421H

PARTS LIST

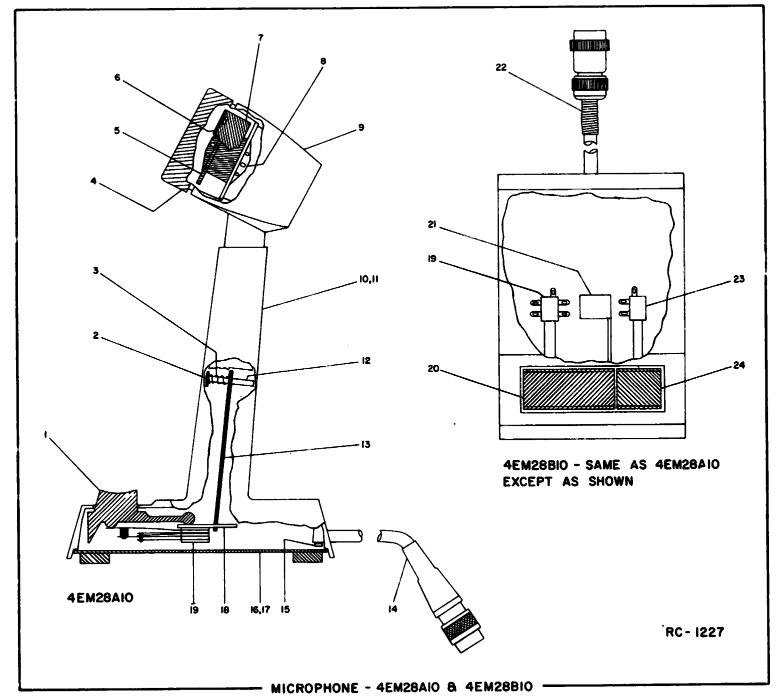
LBI-3722D

DESK STATION CONTROL UNIT
MODEL 4EC69A10 (19D402659G1) (1 Frequency)
MODEL 4EC69A11 (19D402659G1) (2 Frequency)
(19A122220G8)
MODEL 4EC69A12 (19D402659G1) (4 Frequency)
(19A122220G9)

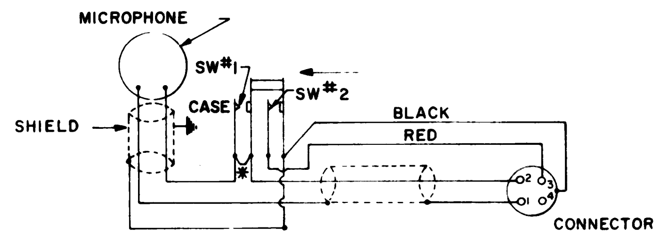
SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - INDICATING DEVICES - - - - - - - -
DS701 and DS702	19C307037P19	Lamp, incandescent: 14 v; sim to GE 756.
		- - - - - - - - - LOUDSPEAKERS - - - - - - -
LS701	19B209101P1	Permanent magnet, 5-inch: 2-1/4 w voice input operating; sim to Cletron X10271.
		- - - - - - - - - - - RESISTORS - - - - - - - -
R701*	5496870P23	Variable, carbon film: 5000 ohms ±20%; sim to Mallory LC(5K).
		In Models earlier than REV B:
	5496870P13	Resistor/switch: includes Resistor, variable, carbon film, 5000 ohms ±20%, 0.5 w; Switch (S701), rotary, DPST, 6 amps at 125 VAC; sim to Mallory LC(5K)OAC-2.
		- - - - - - - - - - - - SWITCHES - - - - - - - - -
S701*		(Part of R701). Deleted by REV B.
S702*	19B209139P6	Lever: 3 amps at 120 VAC, 1 form A contact locking, 1 form A contact momentary; sim to Switchcraft Series 20S-1023.
		In Models earlier than REV A:
	19B209139P3	Lever: 3 amps at 120 VAC, 1 form A contact momentary; sim to Switchcraft Series 28201.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T701	19A115612P1	Audio freq: 0.3-3 KHz freq range, 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.
		- - - - - - - - - - - - SOCKETS - - - - - - - - - -
XDS701 and XDS702	19B209342P1	Lampholder: sim to Leecraft 7-04.
		- - - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B205292P1	Window, clear. (Used in front of clock and meter).
	19A115679P1	Knob, push-on: black. (Used with R701).
	19B204949P1	Jewel: red. (Used with DS701).
		MODIFICATION KIT 19A122220G8 (MODEL 4EC69A11) (2 Freq) 19A122220G9 (MODEL 4EC69A12) (4 Freq)
		- - - - - - - - - - - - SWITCHES - - - - - - - - -
S703	19B204441G2	Rotary: 1 pole, 2 positions, non-shorting contacts, 1 amp at 115 VAC or 28 VDC; sim to Grayhill Series 24 (modified).
S704	19B204441G3	Rotary: 1 pole, 4 positions, non-shorting contacts, 1 amp at 115 VDC; sim to Grayhill Series 24 (modified).
		ASSOCIATED ASSEMBLIES
		12/24 HOUR CLOCK 19A122222G2
		- - - - - - - - - - - - METERS - - - - - - - - - -
M1	19B205374G1	Clock, direct reading: 110 VAC, 60 Hz; sim to Pennwood Numechron 1P-12H.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

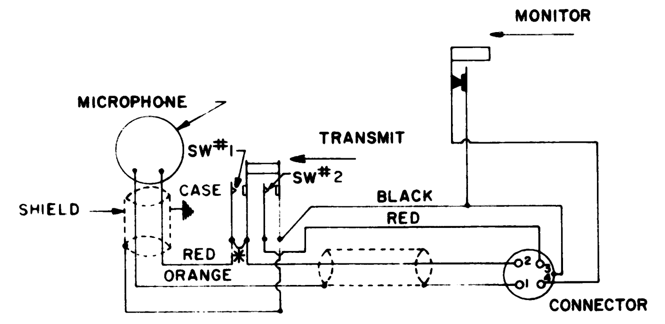
SYMBOL	GE PART NO.	DESCRIPTION
		12 HOUR CLOCK 19A122222G1
		- - - - - - - - - - - METERS - - - - - - - - -
M2	19B205374G4	Clock, direct reading: 110 VAC, 60 Hz; sim to Pennwood Numechron 1P-24H-AM/PM.
		METER KIT 19A122134G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	5494922P1	Silicon; sim to Type 1N456.
		- - - - - - - - - - - METERS - - - - - - - - - -
M1	19A115716P1	Panel, DC: -10/0/+50 µa mechanism.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R1	5495948P321	Deposited carbon: 16,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R2	5495948P238	Deposited carbon: 2430 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
		- - - - - - - TERMINAL BOARDS - - - - - -
TB1	7775500P11	Phen: 5 terminals.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1		CABLE 19C311056G1
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P201	19A122278G1	Connector: 13 terminals.
P304	19A122278G1	Connector: 13 terminals.
		- - - - - - - - - - SWITCHES - - - - - - - - -
S1	5495454P24	Rotary: 2 sections, 2 poles, 12 positions, non-shorting contacts, 2 amps at 25 VDC or 1 amp at 110 VAC; sim to Oak Type A or Centralab Series 100.
		FAN KIT 19A122295G1
		- - - - - - - - - - - - MOTORS - - - - - - - - - - -
B1	19B205436G1	AC: 115 VRMS at 60 Hz continuous, .0017 hp, 2400 rpm max, cw rotation.
	19B209068P1	Impeller, fan: axial, cw rotation. (Part of B1).
		LOCAL/REMOTE MODIFICATION KIT 19A127258G1
		- - - - - - - - - - - RESISTORS - - - - - - - - - -
R3001	19B209423P1	Variable, audio, L-pad: 3.5 ohms ±15%, 2.5 w; sim to CTS Type AW.
R3002	5496870P22	Variable, carbon film: 5000 ohms ±20%; sim to Mallory LC(5K).
		- - - - - - - - MISCELLANEOUS - - - - - - -
	7165075P2	Hex nut, brass: No. 3/8-32.
	7115130P9	Lockwasher: sim to Shakeproof 1220-2.
		MASK PLATE 19B205401G2 CLOCK AND METER 19B205401G3 12/24 HOUR CLOCK 19B205401G4 METER
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A122210P1	Lens: green.
	19A205291P1	Plate. (Used in 19B205401G2).
	19A205291P2	Plate. (Used in 19B205401G3).
	19A205291P3	Plate. (Used in 19B205401G4).



MICROPHONE - 4EM28A10 & 4EM28B10



CIRCUIT DIAGRAM
4EM28A10



CIRCUIT DIAGRAM
4EM28B10

* JUMPER MAY BE REMOVED FOR PARALLEL OR SPECIAL OPERATION

NOTES:

1. SWITCH #1 OF THE MICROPHONE CIRCUIT MUST CLOSE FIRST AND OPEN LAST.

2. MONITOR AND TRANSMIT BUTTONS ARE MECHANICALLY INTERLOCKED, MAKING IT NECESSARY TO PRESS MONITOR BUTTON BEFORE TRANSMITTING. TO MONITOR CONTINUOUSLY, PRESS MONITOR BUTTON DOWN AND SLIDE FORWARD TO "LOCK" POSITION. PRESS AND PUSH BACK BUTTON RELEASE. TO OPERATE MONITOR AND TRANSMIT FUNCTIONS INDEPENDENTLY, REMOVE LOCKING ARM BRACKET (PART 21 SHOWN ABOVE AND IN PARTS LIST).

RC-302A
SHEET 2

PARTS LIST

LBI-3623B

MAGNETIC CONTROLLED DESK MICROPHONE

MODEL 4EM28A10 (19C307105-P1)
MODEL 4EM28B10 (19C307106-P1)
(SEE RC-1227)

SYMBOL	GE PART NO.	DESCRIPTION
		MECHANICAL PARTS
		MODEL 4EM28A10
1		Pushbutton. Shure Brothers RP-68.
2		Washer. Shure Brothers 30A697.
3		Spring. Shure Brothers 44A149.
4		Cap and grille. Shure Brothers RP-72.
5		Magnetic controlled cartridge. Shure Brothers RP-13.
6		Washer. Shure Brothers 34A223.
7		Shield. Shure Brothers 53A528.
8		Damping pad. Shure Brothers 20B33.
9		Housing. (Part of item 4).
10		Base. (Part of item 4).
11		(Not used).
12		Pin. Shure Brothers 31A848.
13		Bracket. Shure Brothers 53A637.
14		Cable and plug. Shure Brothers RP-65.
15		Cable clamp. Shure Brothers 53A532.
16		Bottom plate. Shure Brothers 90A1015.
17		(Not used).
18		Mounting bracket. Shure Brothers 53A633.
19		Switch. Shure Brothers RP-70.
		MODEL 4EM28B10
1		(Not used).
2		Washer. Shure Brothers 30A697.
3		Spring. Shure Brothers 44A149.
4		Cap and grille. Shure Brothers RP-72.
5		Magnetic controlled cartridge. Shure Brothers RP-13.
6		Washer. Shure Brothers 34A223.
7		Shield. Shure Brothers 53A528.
8		Damping pad. Shure Brothers 20B33.
9		Housing. (Part of item 4).
10		(Not used).
11		Base. (Part of item 4).
12		Pin. Shure Brothers 31A848.
13		Bracket. Shure Brothers 53A637.
14		(Not used).
15		Cable clamp. Shure Brothers 53A532.
16		(Not used).
17		Bottom plate. Shure Brothers 90B1015.
18		Mounting bracket. Shure Brothers 53A633.
19		Switch. Shure Brothers RP-71.
20		Pushbutton (Transmit). Shure Brothers RP-69.
21		Locking arm. Shure Brothers 53A667.
22		Cable and plug. Shure Brothers RP-66.
23		Switch. (Part of item 19).
24		Pushbutton (Monitor). (Part of item 20).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

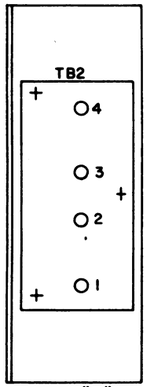
PRODUCTION CHANGES

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.

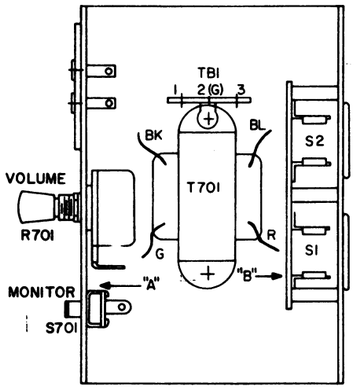
REV. A - Models 4EC69A10 - 12

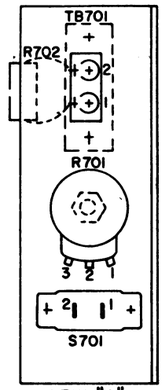
To make Channel Guard disable a standard function. Changed S702.

REV. B - To provide volume control that is separate from power switch. Replaced OFF-VOLUME control R701/S701 with volume control R701. (Power OFF-ON switch is now on the power supply).



VIEW "B"





VIEW "A"

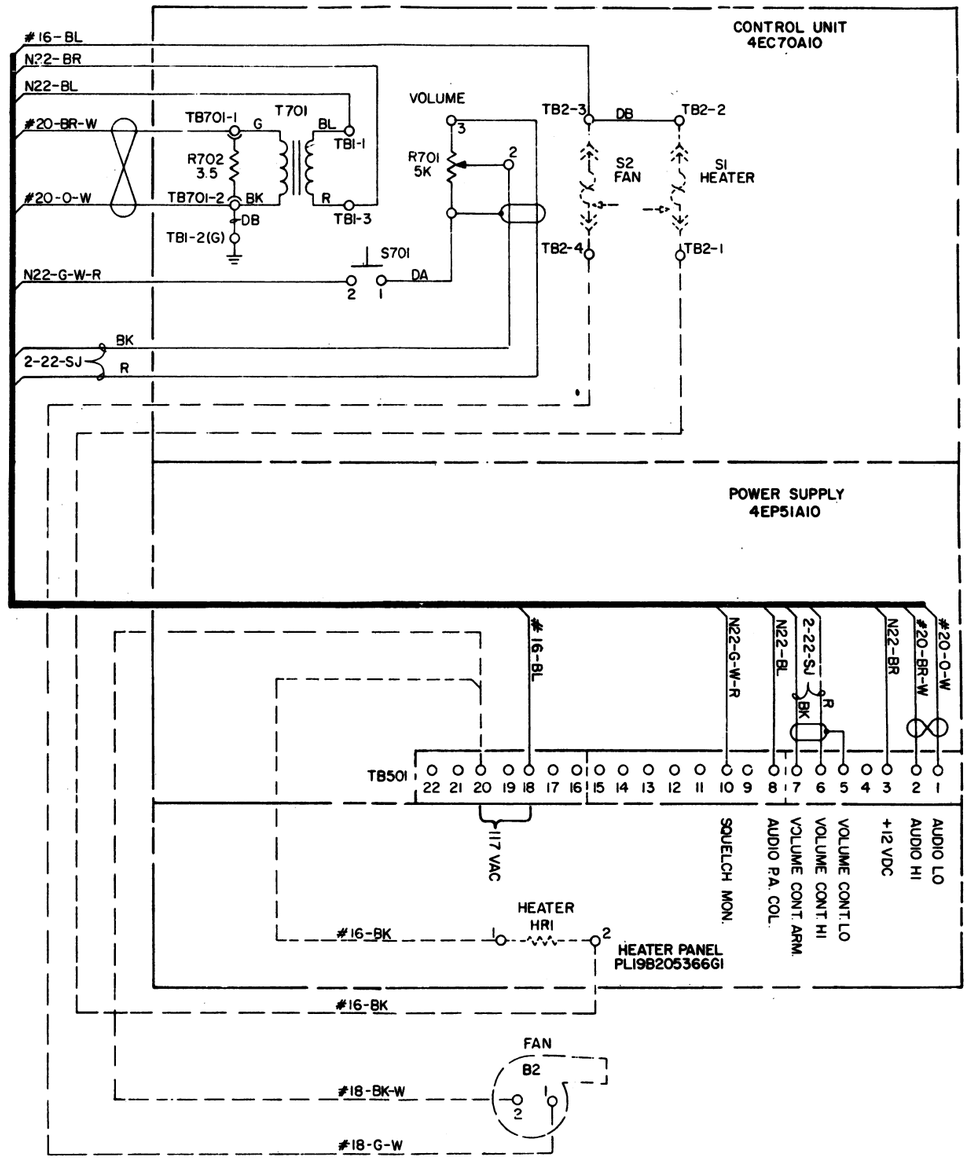
(19C311223, Rev. 0)

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

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

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

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EC70A10	



(19C303969, Rev. 3)

SCHEMATIC & OUTLINE DIAGRAM

WALL MOUNT CONTROL UNIT
MODEL 4EC70A10

RC-1422C

PARTS LIST

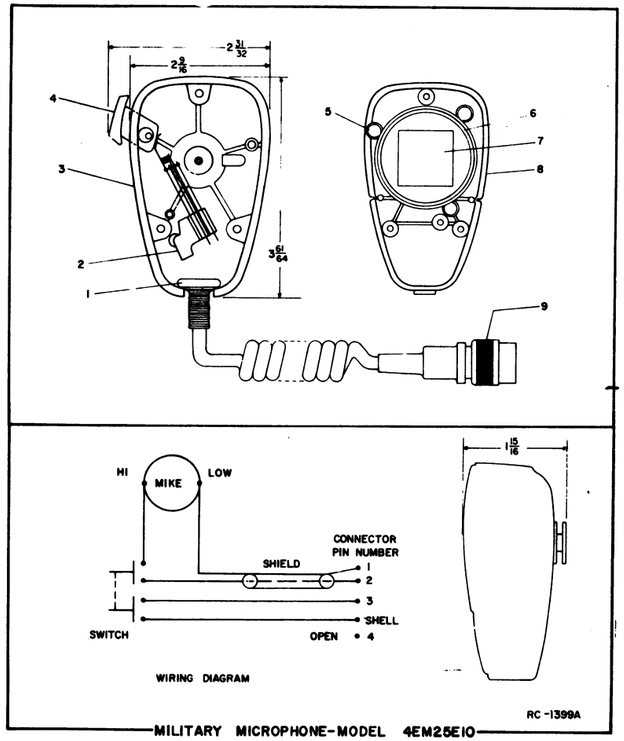
LBI-3721A

WALL MOUNT CONTROL UNIT
MODEL 4EC70A10
(19C303959-G1)

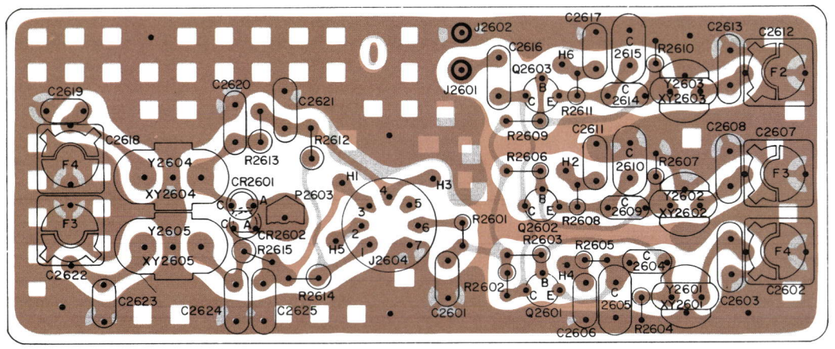
SYMBOL	G-E PART NO.	DESCRIPTION
		RESISTORS
R701	5496870-P14	Variable, carbon film: 5000 ohms ±20%, 0.5 w; sim to Mallory LC(5K).
R702	7141971-G1	Resistor kit: wirewound, 3.5 ohms ±10%, 4 w; sim to Clarostat Type C4GJ (modified).
		SWITCHES
S701	4031922-P1	Push: SPST, normally open, momentary contact, 0.5 amp at 12 VDC; sim to Stackpole Type SS-15.
		TRANSFORMERS
T701	19A115612-P1	Audio freq: 0.3-3 KHz freq range, Pri: 24.5 ohms ±5% imp, 1.38 ohms DC res, Sec: 3.3 ohms, imp, 0.18 ohm DC res.
		TERMINAL BOARDS
TB1	7775500-P7	Phen: 3 terminals.
TB2	19A122201-G1	Board: 4 terminals.
TB701	7117710-P2	Phen: 2 terminals; sim to Cinch 1781.
		ASSOCIATED ASSEMBLIES
		SPEAKER AND MICROPHONE OPTION MILITARY MICROPHONE MODELS 4EM25E10 TWO-WATT SPEAKER MODEL 4EZ16A13
		MILITARY MICROPHONE MODEL 4EM25E10 (19B209102-P2) (See RC-1163)
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.
		TWO-WATT SPEAKER MODEL 4EZ16A13 (19D402449-G6)
		CAPACITORS
C1	19B209233-P2	Electrolytic, non-polorized: 25 µf ±20%, 25 VDCW; sim to Sprague 4DC.
		LOUDSPEAKERS
LS1	19B209101-P1	Permanent magnet, 5-inch: 2-1/4 w voice input operating; sim to Cletron X10271.

SYMBOL	G-E PART NO	DESCRIPTION
		CABLES
W5		**CABLE 19A122167-G1**
		PLUGS
P702	5493018-P2	Plug, phen: 5 contacts; sim to Cinch 204-31-05-010.
		FAN KIT 19A122295-G2
		MOTORS
B2	19B205437-G1	Fan, single phase: 115 VAC, 60 Hz, 14 w, ccw rotation; sim to Rotron "Gold Seal Venturi Muffin Fan".
		SWITCHES
S2	19A115687-P2	Thermostatic: temp range 110°F ±6° closed, 90°F ±5° open; rated 5 amps at 240 VAC.
		HEATER 19A122203-G1
		HEATERS
HR1	4034002-P1	Strip: 120 VAC, 150 w nominal; sim to GE 2A425-G16.
		SWITCHES
S1	19A115687-P1	Thermostatic: temp range 3°F ±6° closed, 18°F ±5° open, 5 amps at 240 VAC.
		MISCELLANEOUS
	7150186-P19	Spacer: No. 4. (Used with TB2 in 19C303959-G1).
	19A115308-P1	Knob. (Used in 19C303959-G1).
	N529P42C13	Button, plug. (Used in 19C303959-G1).
	19C303500-P1	Grille. (Used in 19D402449-G6).
	19A121521-G1	Support, mounting. (Used in 19D402449-G6).
	5490407-P3	Grommet, rubber. (Located top of casting in 19D402449-G6).
	19A115470-P1	Grommet, rubber. (Located bottom of casting in 19D402449-G6).
	19C303504-G3	Housing, speaker. (Used in 19D402449-G6).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



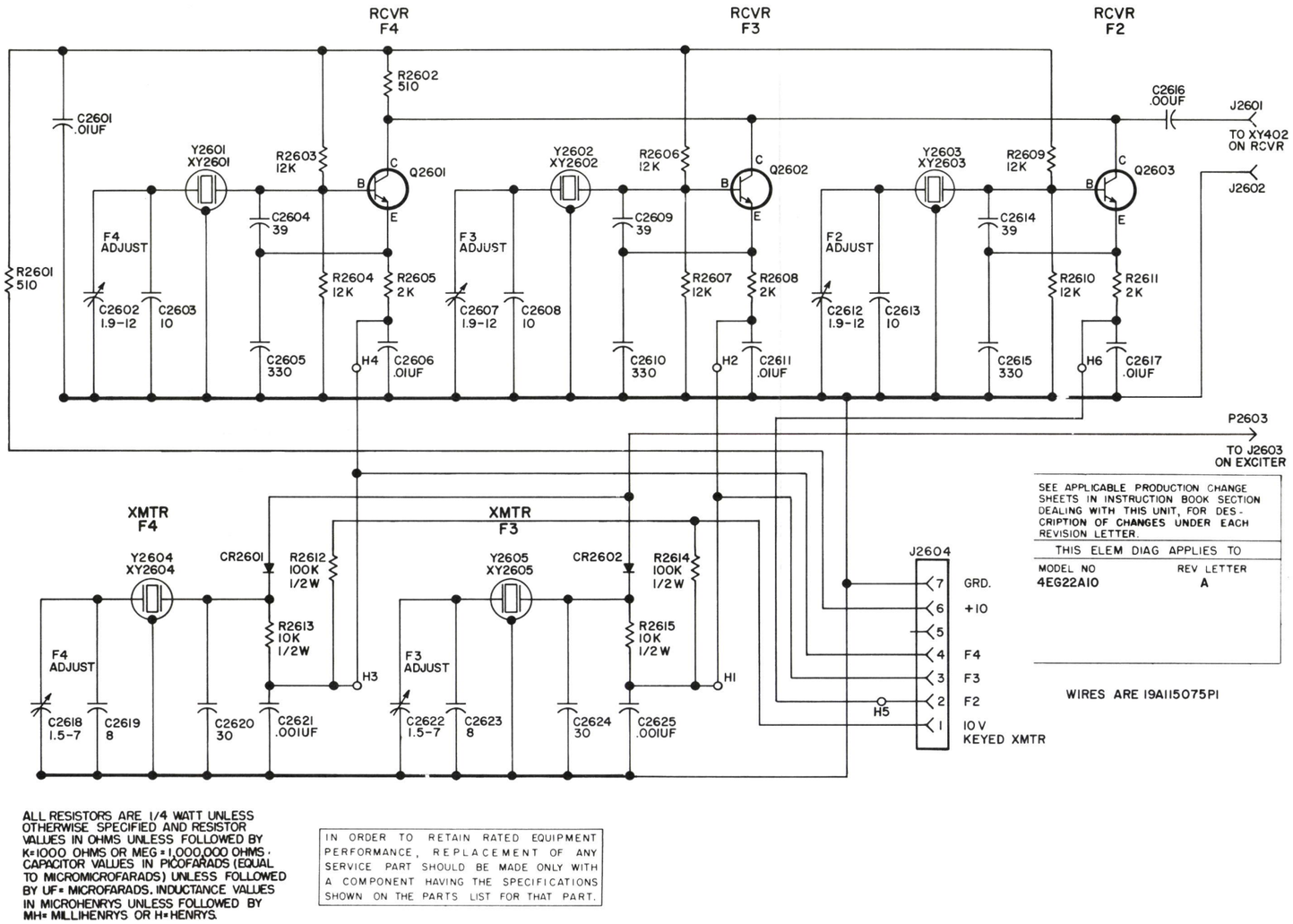
MILITARY MICROPHONE-MODEL 4EM25E10



(19C311233, Rev. 1)
(19B205122, Sh. 1, Rev. 0)
(19B205122, Sh. 2, Rev. 0)

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

(DF-8407)



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.

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.

(19C303968, Rev. 2)

SCHEMATIC & OUTLINE DIAGRAM

FOUR-FREQUENCY OSCILLATOR BOARD
MODEL 4EG22A10

RC-1477C

PARTS LIST

25-50 MHz FOUR FREQUENCY OSCILLATOR BOARD
MODEL 4EG22A10
(PL-19C303962-G1)
REV A

SYMBOL	G-E PART NO.	DESCRIPTION
		CAPACITORS
C2601	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C2602	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C2603	5490008-P6	Silver mica: 10 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2604	5496219-P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2605	5490008-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2606	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C2607	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C2608	5490008-P6	Silver mica: 10 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2609	5496219-P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2610	5490008-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2611	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C2612	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C2613	5490008-P6	Silver mica: 10 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2614	5496219-P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2615	5490008-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2616	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2617	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C2618	5491271-P103	Variable, air: approx 1.54-6.9 pf, 750 v peak; sim to EF Johnson 189-3-5.
C2619	5496219-P39	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2620	5496219-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C2621	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2622	5491271-P103	Variable, air: approx 1.54-6.9 pf, 750 v peak; sim to EF Johnson 189-3-5.
C2623	5496219-P39	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C2624	5496219-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C2625	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		DIODES AND RECTIFIERS
CR2601 and CR2602	19A115603-P1	Silicon.
CR2603	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.
		PLUGS
P2603	4029093-P1	Banana type: sim to Ucinite 155296.
		TRANSISTORS
Q2601 thru Q2603	19A115245-P2	Silicon, NPN.
		RESISTORS
R2601	3R152-P511J	Composition: 510 ohms ±5%, 1/4 w.
R2602*	3R152-P511J	Composition: 510 ohms ±5%, 1/4 w.
	3R152-P241J	In Models earlier than Rev A: Composition: 240 ohms ±5%, 1/4 w.
R2603 and R2604	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R2605	3R152-P202J	Composition: 2000 ohms ±5%, 1/4 w.
R2606 and R2607	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R2608	3R152-P202J	Composition: 2000 ohms ±5%, 1/4 w.
R2609 and R2610	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R2611	3R152-P202J	Composition: 2000 ohms ±5%, 1/4 w.
R2612	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R2613	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R2614	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R2615	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
		CABLES
W2601		**CABLE PL-19B205275-G1**
		MISCELLANEOUS
	19B209341-P1	Socket: 7 contacts; sim to Elco 04-720-XX.
W2602		**CABLE PL-19B205263-G2**
		MISCELLANEOUS
	4029840-P1	Contact, electrical: sim to AMP 41854. (2)
		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.
Y2601 thru Y2603	19B206357-P1	Quartz: freq range 12 to 20 MHz, temp range -30°C to +80°C. (Receiver). 25-33 MHz crystal frequency = (OF +5.3 MHz) ÷ 2. 33-42 MHz crystal frequency = (OF -5.3 MHz) ÷ 2. 42-50 MHz crystal frequency = (OF -5.3 MHz) ÷ 2.
Y2604 and Y2605	19B206175-P31	Quartz: freq range 3500 to 4500 KHz, temp range -30°C to +85°C. (Transmitter). Crystal frequency = OF ÷ 12.
		MISCELLANEOUS
	19C311172-P1	Socket: 4 contacts. (Part of XY2604, 2605).
	19A115793-P1	Contact, electrical: sim to Malco 2700. (Part of XY2604, 2605).
	4033089-P1	Clip. (Part of XY2604, 2605).
	19B200525-P8	Rivet. (Part of XY2604, 2605).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

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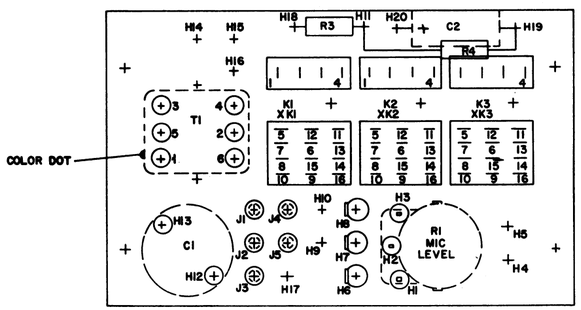
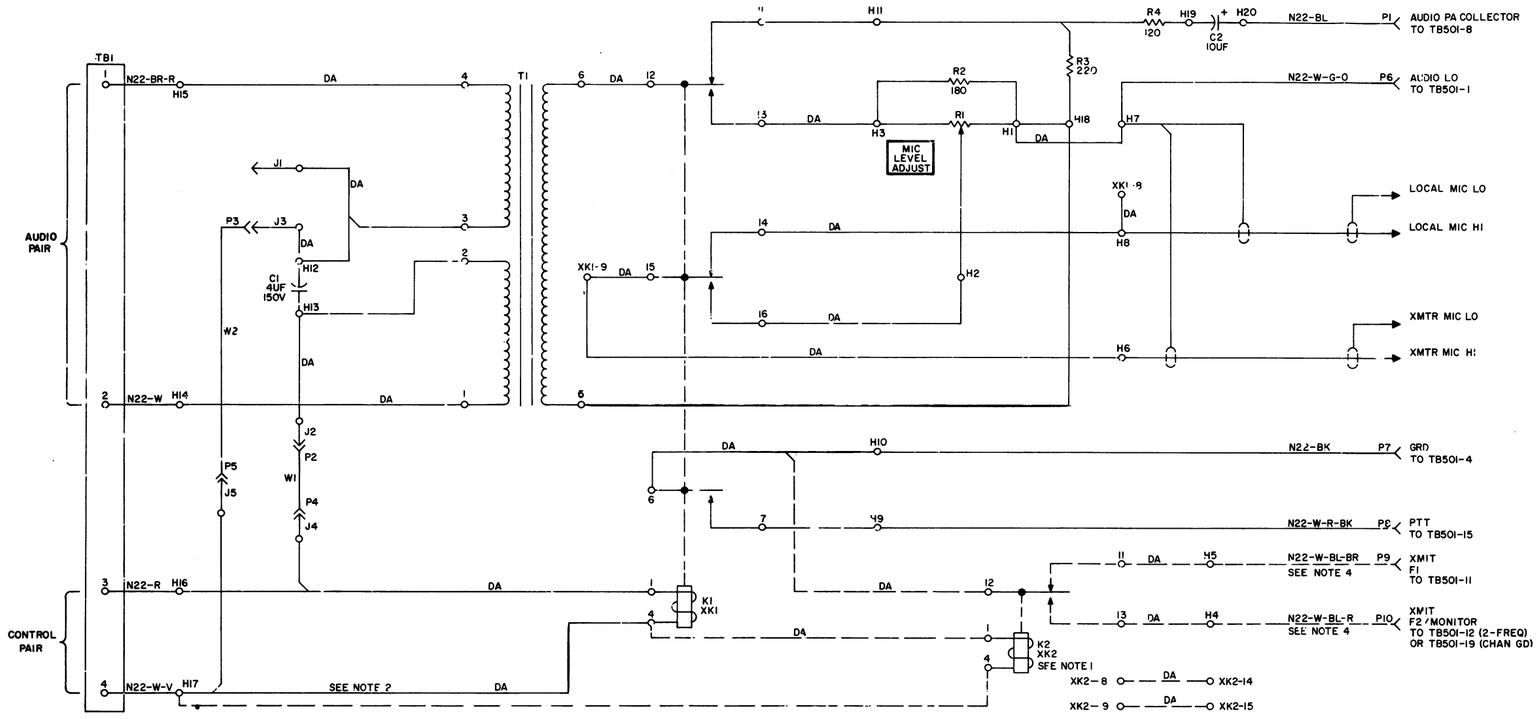
REV. A - To increase the output level of the multi-frequency oscillator. Changed R2602.



(19C311214, Rev. 1)



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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
4KC18A10	
4KC18A11	

NOTES
1. K2 IN 4KC18A11.
2. WIRE TO BE OMMITED IN 4KC18A11.
3. UNLESS OTHERWISE SPECIFIED ALL WIRING TO BE SN22.
4. FOR SINGLE FREQUENCY TRANSMITTER AND RECEIVER AND CHANNEL GUARD MONITOR, INTERCHANGE RELAYS, PLUG K1 (19C307010P10) INTO XK2 & PLUG K2 (19C307010P11) INTO XK1. CONNECT W-BL-R WIRE FROM H4 ON 4KC18A11, TO TB501-10 ON 4EP51A10-11 REV. 0, ON 4EP51A10-11 REV. "A" OR LATER, CONNECT W-BL-R WIRE FROM H4 ON 4KC18A11 TO TB501-19. REMOVE & DISCARD W-BL-BR WIRE FROM H5 IN 4KC18A11 TO TB501-11 ON 4E51A10-11.

(19D402679, Rev. 6)

SCHEMATIC & OUTLINE DIAGRAM

REMOTE CONTROL BOARD MODEL 4KC18A10 & 11

RC-1423D

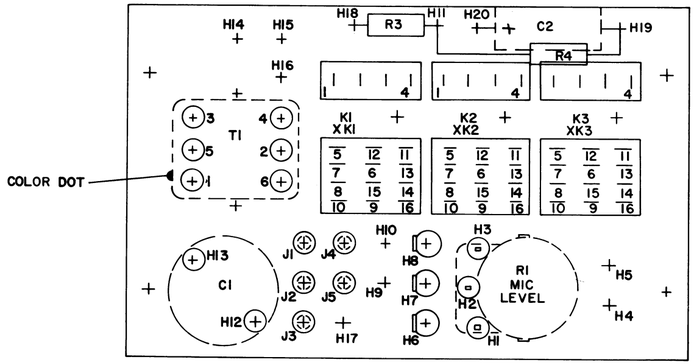
PARTS LIST

LBI-3741A

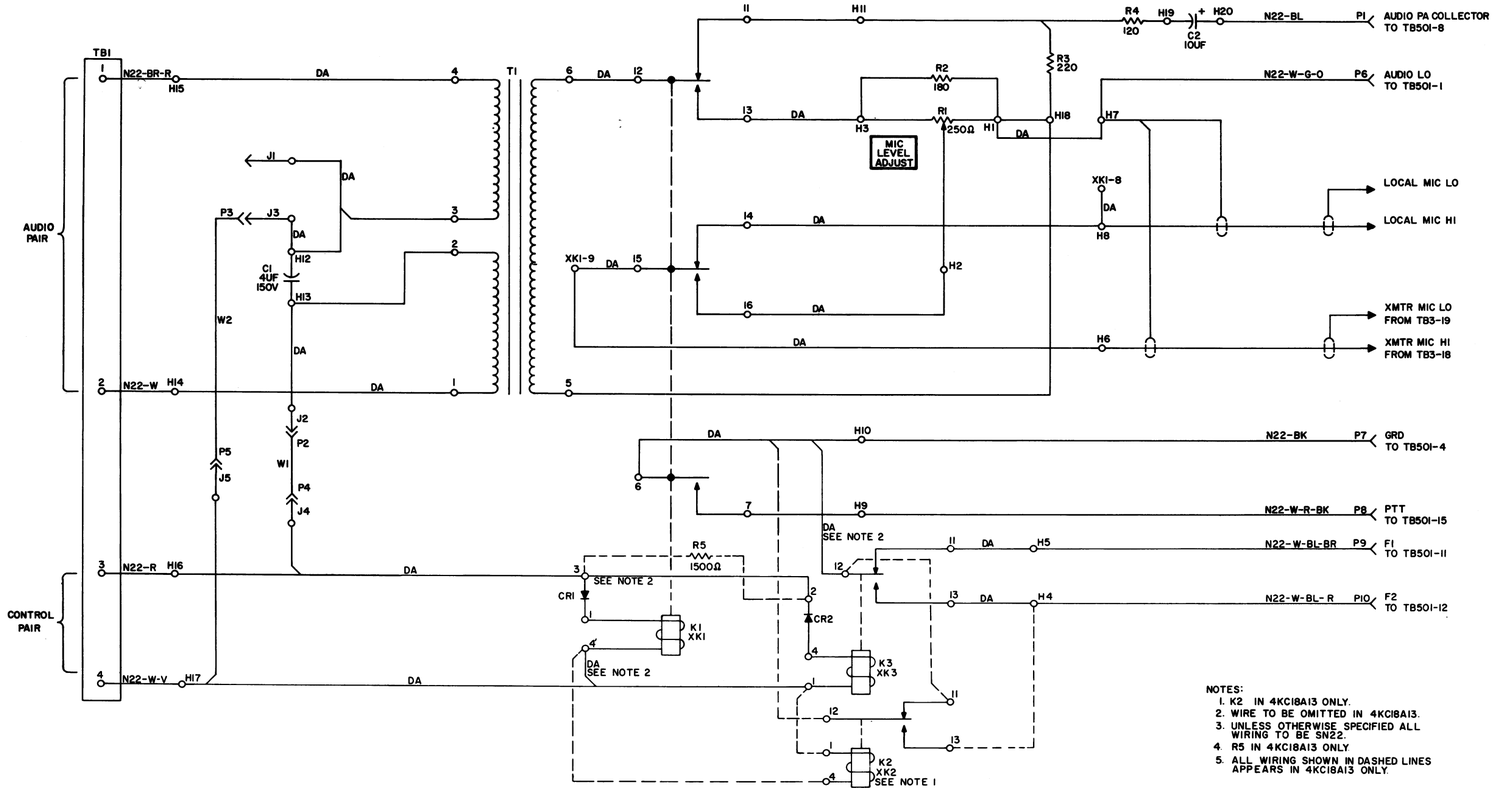
REMOTE CONTROL PANEL
MODEL 4KC18A10 - PL-19C303945-G1
MODEL 4KC18A11 - PL-19C303945-G1

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7486445-P5	Electrolytic, non polorized: 4 µf +100% -10%, 150 VDCW.
C2	7489483-P7	Electrolytic: 10 µf +75% -10%, 25 VDCW; sim to Sprague 30D.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J5	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - - - RELAYS - - - - - - - - - - - -
K1	19C307010-P10	Armature: 28 VDC, 1.5 w max operating, 3480 ohms ±10% coil res, 3 form C contacts; sim to Allied Control TS-154-CC-C-3480.
K2	19C307010-P11	Armature: 30 VDC, 1.5 w operating, 1550 ohms ±10% coil res, 1 form A, 1 form C, 1 form D contacts; sim to Allied Control T154-X-631.
		- - - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P1	19B209260-P103	Terminal, solderless: sim to Amp 60495-1.
P6 thru P10	19B209260-P103	Terminal, solderless: sim to Amp 60495-1.
		- - - - - - - - - - - RESISTORS - - - - - - - - - - -
R1	7491365-P11	Variable, carbon film: 250 ohms ±20%, 0.15 w, sim to CTS Type UPE-70.
R2	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R3	3R77-P221K	Composition: 220 ohms ±10%, 1/2 w.
R4	3R77-P121K	Composition: 120 ohms ±10%, 1/2 w.
		- - - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19C300687-P1	Audio: 300 to 3000 Hz.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7117710-P4	Phen: 4 terminals; sim to Cinch 1774.
		- - - - - - - - - - - - CABLES - - - - - - - - - - - -
W1		**CABLE 4037741-G1**
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P2	4029840-P1	Contact, electrical; sim to Amp 41854.
P4	4029840-P1	Contact, electrical; sim to Amp 41854.
W2		**CABLE 4037741-G1**
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P3	4029840-P1	Contact, electrical; sim to Amp 41854.
P5	4029840-P1	Contact, electrical; sim to Amp 41854.
		- - - - - - - - - - - SOCKETS - - - - - - - - - - -
XK1 and XK2	5491595-P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	5491595-P9	Retainer, spring: sim to Allied Control 30040-2. (Used with K1 and K2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



(19C311214, Rev. 1)



NOTES:
1. K2 IN 4KC18A13 ONLY.
2. WIRE TO BE OMITTED IN 4KC18A13.
3. UNLESS OTHERWISE SPECIFIED ALL WIRING TO BE SN22.
4. R5 IN 4KC18A13 ONLY.
5. ALL WIRING SHOWN IN DASHED LINES APPEARS IN 4KC18A13 ONLY.

(19D413116, Rev. 0)

SCHEMATIC & OUTLINE DIAGRAMS

REMOTE CONTROL BOARD MODELS 4KC18A12 & 13

(RC-1742)

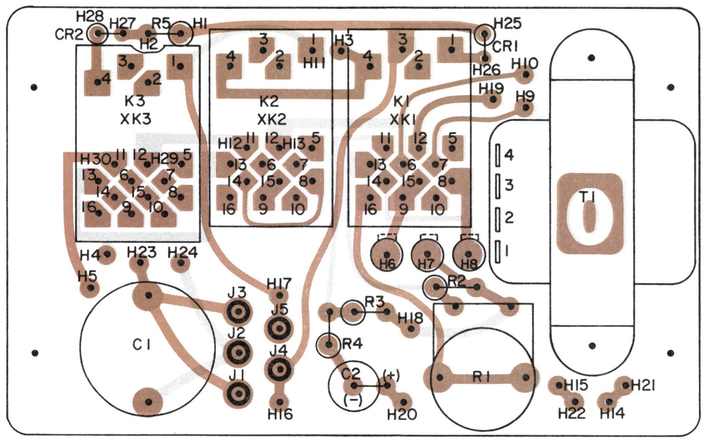
PARTS LIST

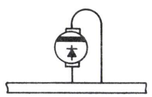
LBI-3968

REMOTE CONTROL PANEL
MODEL 4KC18A12 - 19C303945-G4
MODEL 4KC18A13 - 19C303945-G5

SYMBOL	G-E PART NO.	DESCRIPTION
		CAPACITORS
C1	7486445-P5	Electrolytic, non-polorized: 4 µf +100% -10%, 150 VDCW.
C2	7489483-P7	Electrolytic: 10 µf +75% -10%, 25 VDCW; sim to Sprague Type 30D.
		DIODES AND RECTIFIERS
CR1 and CR2	4037822-P1	Silicon.
		JACKS AND RECEPTACLES
J1 thru J5	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		RELAYS
K1	19C307010-P10	Armature: 28 VDC, 1.5 w max operating, 3480 ohms ±10% coil res, 3 form C contacts; sim to Allied Control TS-154-CC-C3480.
K2	19C307010-P11	Armature: 30 VDC, 1.5 w operating, 1550 ohms ±10% coil res, 1 form A, 1 form C, 1 form D contacts; sim to Allied Control T154-X-631.
K3	19C307010-P10	Armature: 28 VDC, 1.5 w max operating, 3480 ohms ±10% coil res, 3 form C contacts; sim to Allied Control TS-154-CC-C3480.
		PLUGS
P1	19B209260-P103	Terminal, solderless; sim to Amp 60495-1.
P6 thru P10	19B209260-P103	Terminal, solderless; sim to Amp 60495-1.
		RESISTORS
R1	7491365-P11	Variable, carbon film: 250 ohms ±20%, 0.15 w; sim to CTS Type UPE-70.
R2	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R3	3R77-P221K	Composition: 220 ohms ±10%, 1/2 w.
R4	3R77-P121K	Composition: 120 ohms ±10%, 1/2 w.
R5	3R77-P152K	Composition: 1500 ohms ±10%, 1/2 w.
		TRANSFORMERS
T1	19C300687-P1	Audio: 300 to 3000 Hz.
		TERMINAL BOARDS
TB1	7117710-P4	Phen: 4 terminals; sim to Cinch 1774.
		CABLES
W1		**CABLE ASSEMBLY 4037741-G1**
		PLUGS
P2	4029840-P1	Contact, electrical; sim to Amp 41854.
P4	4029840-P1	Contact, electrical; sim to Amp 41854.
W2		**CABLE ASSEMBLY 4037741-G1**
		PLUGS
P3	4029840-P1	Contact, electrical; sim to Amp 41854.
P5	4029840-P1	Contact, electrical; sim to Amp 41854.
		SOCKETS
XK1 thru XK3	5491595-P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		MISCELLANEOUS
	5491595-P9	Retainer, spring. (Used with K1 thru K3).

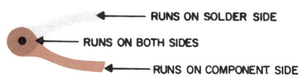
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.





POLARITY OF CR1 & CR2

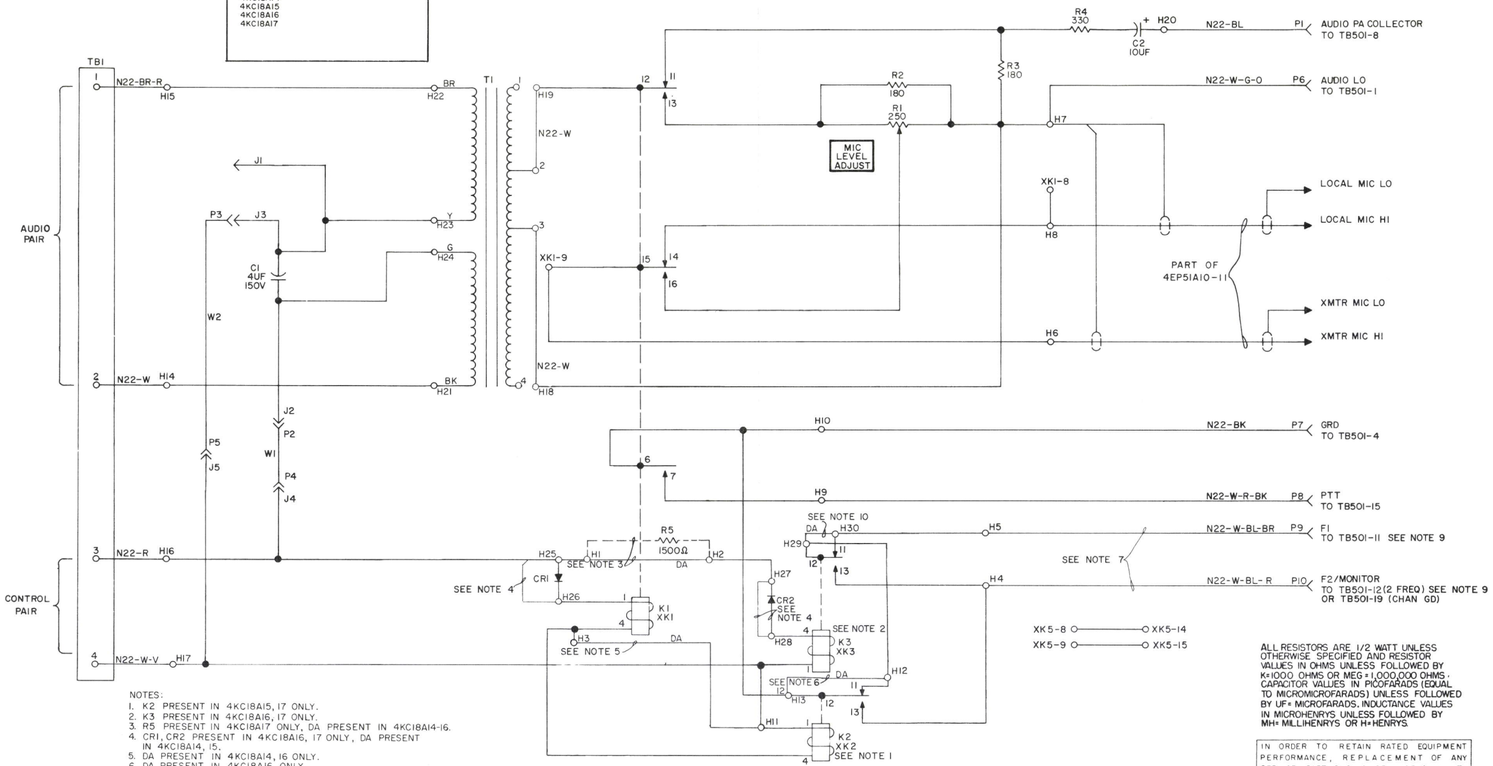
(19B219486, Rev. 0)
(19B219361, Sh. 1, Rev. 0)
(19B219361, Sh. 2, Rev. 0)



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
4KC18AI4	
4KC18AI5	
4KC18AI6	
4KC18AI7	



NOTES:
1. K2 PRESENT IN 4KC18AI5, I7 ONLY.
2. K3 PRESENT IN 4KC18AI6, I7 ONLY.
3. R5 PRESENT IN 4KC18AI7 ONLY. DA PRESENT IN 4KC18AI4-16.
4. CR1, CR2 PRESENT IN 4KC18AI6, I7 ONLY. DA PRESENT IN 4KC18AI4, I5.
5. DA PRESENT IN 4KC18AI4, I6 ONLY.
6. DA PRESENT IN 4KC18AI6 ONLY.
7. WIRES OMITTED IN 4KC18AI4.
8. UNLESS OTHERWISE SPECIFIED, ALL WIRES TO BE SN22.
9. FOR SINGLE FREQUENCY TRANSMITTER AND RECEIVER, AND CHANNEL GUARD MONITOR (AI5 ONLY) INTERCHANGE RELAYS. PLUG K1 (19C307010P10) INTO XK2 & PLUG K2 (19C307010P11) INTO XK1. CONNECT W-BL-R WIRE FROM H4 ON 4KC18AI5 TO TB501-10 ON 4EP51A10-11 REV 0. ON 4EP51A10-11 REV "A" OR LATER, CONNECT W-BL-R WIRE FROM H4 ON 4KC18AI5 TO TB501-19. REMOVE & DISCARD W-BL-BR WIRE FROM H5 IN 4KC18AI5 TO TB501-11 ON 4EP51A10-11.
10. DA PRESENT IN 4KC18AI5 ONLY.
11. TERMINATE ALL WIRES TO TB501 WITH 19B209260P103.

(19D416223, Rev. 1)

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 & OUTLINE DIAGRAM

REMOTE CONTROL BOARD MODELS 4KC18A14—17

(RC-2233)

PARTS LIST

LBI-4274

REMOTE CONTROL BOARD
MODELS 4KC18A14 THRU 17

SYMBOL	GE PART NO.	DESCRIPTION
		CAPACITORS
C1	7486445P5	Electrolytic, non polorized: 4 µf +100% -10%, 150 VDCW.
C2	7489483P7	Electrolytic: 10 µf +75% -10%, 25 VDCW; sim to Sprague 30D.
		DIODES AND RECTIFIERS
CR1 and CR2	4037822P1	Silicon.
		JACKS AND RECEPTACLES
J1 thru J5	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		RELAYS
K1	19C307010P10	Armature: 28 VDC, 1.5 w max operating, 3480 ohms ±10% coil res, 3 form C contacts; sim to Allied Control TS-154-CC-C-3480.
K2	19C307010P11	Armature: 30 VDC, 1.5 w operating, 1550 ohms ±10% coil res, 1 form A, 1 form C, 1 form D contacts; sim to Allied Control T154-X-631.
K3	19C307010P10	Armature: 28 VDC, 1.5 w max operating, 3480 ohms ±10% coil res, 3 form C contacts; sim to Allied Control TS-154-CC-C-3480.
		RESISTORS
R1	19B209358P1	Variable, carbon film: approx 25 to 250 ohms ±20%, 0.2 w; sim to CTS Type U-201.
R2 and R3	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R4	3R77P331K	Composition: 330 ohms ±10%, 1/2 w.
R5	3R77P152K	Composition: 1500 ohms ±10%, 1/2 w.
		TRANSFORMERS
T1	19A115731P1	Audio freq: 300 to 6000 Hz, Pri (1-4): 22 ohms ±15% DC res, Pri (2-3): 12.5 ohms ±15% DC res, Sec 1: 13 ohms ±15%, Sec 2: 13 ohms ±15%.
		TERMINAL BOARDS
TB1	7117710P4	Phen: 4 terminals; sim to Cinch 1774.
		CABLES
W1		**CABLE 4037741G1**
		PLUGS
P2	4029840P1	Contact, electrical; sim to Amp 41854.
P4	4029840P1	Contact, electrical; sim to Amp 41854.
W2		**CABLE 4037741G1**
		PLUGS
P3	4029840P1	Contact, electrical; sim to Amp 41854.
P5	4029840P1	Contact, electrical; sim to Amp 41854.
		SOCKETS
XK1 thru XK3	5491595P7	Relay: 10 contacts; sim to Allied Control 30054-4.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

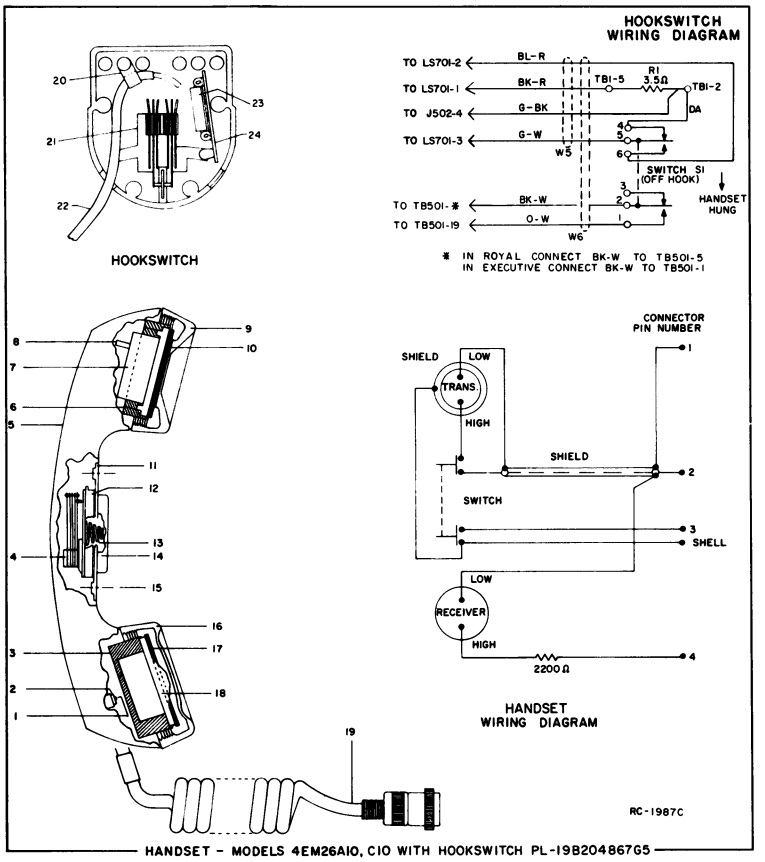
PARTS LIST

LBI-4120B

HANDSET MODEL 4EM26A10
HANDSET MODEL 4EM26C10
HOOKSWITCH 19B204867G5
AND ASSOCIATED ASSEMBLIES

SYMBOL	GE PART NO.	DESCRIPTION
		(Refer to RC-1987)
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 with 4EM26A10).
		Case. Shure Brothers 21RP899F. (Used with 4EM26C10).
6		Adapter. Shure Brothers 65A230.
7		Magnetic controlled cartridge, Receiver. 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 controlled cartridge, Transmitter. Shure Brothers RP13.
19		Cable and plug. Shure Brothers RP48. (Used with 4EM26A10).
		Cable and plug. Shure Brothers 21RP738F. (Used with 4EM26C10).
		HOOKSWITCH 19B204867G5
20	4029851P5	Cable clamp; sim to WEC Kesser 2/16-4.
21	19A121612P1	Holder and switch: thermoplastic case, contact rating 1 amp at 125 v.
22	19B205667G1	Cable: approx 8-1/2 feet long.
23	5493035P10	Resistor, wirewound, ceramic: 3.5 ohms ±5%, 5 w; sim to Tru-Ohm Type X-50.
24	7775500P55	Terminal board, phen: 5 terminals.
		ASSOCIATED ASSEMBLIES EXTENSION CABLE 19B204988G4
	7478726P6	Plug: 4 contacts, sim to Amphenol 91-MC4M.
	4034669P4	Cable, 6 ft.
	19A116061P1	Receptacle: 4 contacts; sim to Amphenol 91-PN4F-1000.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(DF-9016)

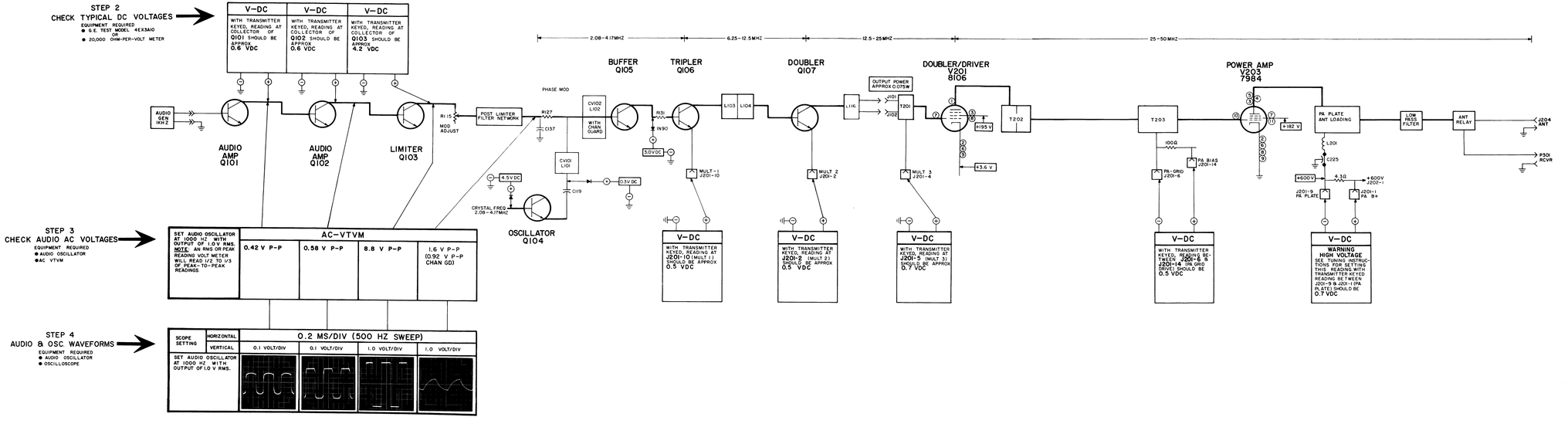
SCHEMATIC & OUTLINE DIAGRAM

HANDSET MODELS 4EM26A10 & C10
HOOKSWITCH 19B204867G5

RC-1424E

STEP 1 - QUICK CHECKS

SYMPTOM	CHECKS
Low or No Power Output	All Jack Readings, Ant. Relay contacts, V202, V202 DC Voltages, Low Pass Filter.
PA Grid Jack Reading Low	Preceding Jack Readings, V201, V201 DC voltages, T202 & T203 Tuning.
Mult-3 Jack Reading Low	Preceding Jack Reading, check V201, T201 & L105 Tuning.
Mult-2 Jack Reading Low	Mult. 1 Jack Reading, L103 & L104 Tuning, Q107.
Mult-2 Jack Reading over 1 volt	Q107
Mult-1 Jack Reading Low	10-volt DC Supply, RF voltage on collector of Q105, Q106.
Mult-1 Jack Reading over 1 volt	Defective Q106, or Q105.
RF voltage low on Q105	RF output of Osc. (Q104) at C119, L101, (L102) tuning. CV101, CV102, Q105.
Low or zero Osc. (Q104) output at C119	RF voltages on Osc. (Q104) base & emitter, F1 or F2 keying leads for improper ground, crystal, CR101, CR102, Q104.



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 Q302 and Q303. Check resistance readings on J302-1, -2 and -3. Check crystals Y401 and Y402.
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.

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.

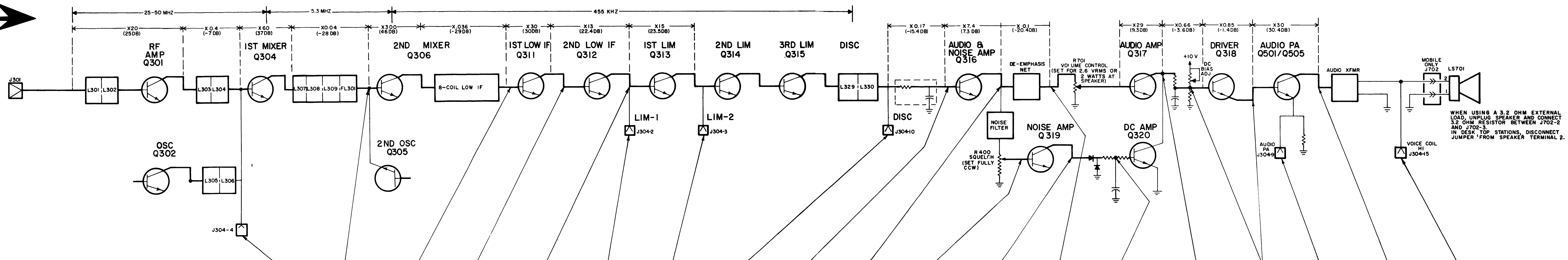
PROCEDURE

1. APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, BASE OF RF AMP). PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED AND TAKE VOLTAGE READING (E_1).
2. MOVE PROBE TO INPUT OF FOLLOWING STAGE (1ST.MIXER*). REPEAK 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-AC&DC
2. SIGNAL GENERATOR (MEASUREMENTS M560 EQUIV.)

PRELIMINARY STEPS:

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

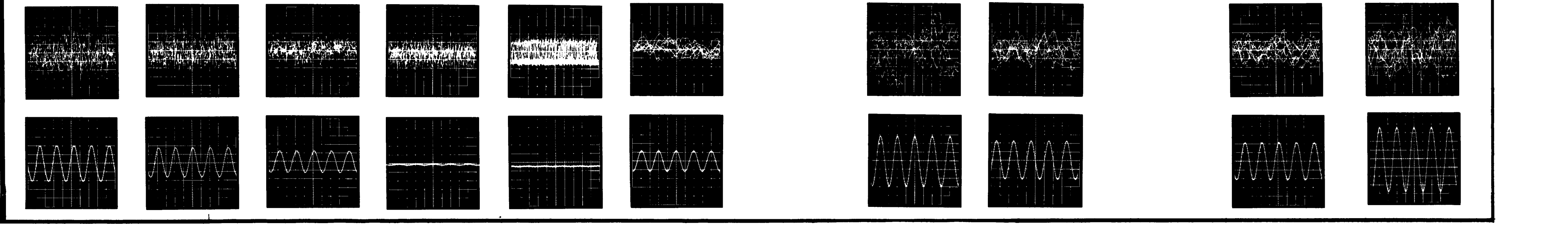
SIGNAL GENERATOR INPUT AT J301 MAINTAIN SETTING AT DISCRIMINATOR ZERO		UNMODULATED	UNMODULATED	UNMODULATED	UNMODULATED	10 MICROVOLTS UNMODULATED	1 MICROVOLT UNMODULATED	STANDARD SIGNAL-(1 MILLIVOLT AT RCVR FREQ, MODULATED BY 1KHZ WITH 3.3KHZ DEVIATION)	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	NO SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	NO SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
PROCEDURE		INCREASE GENERATOR OUTPUT UNTIL VTVM READING ON 1.5 V SCALE DECREASES BY 50 MV	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%														AFTER CHECKING WAVEFORMS ADJUST VOLUME CONTROL FOR RATED 1 WATT OUTPUT ACROSS 3.2 Ω LOAD.
READING	0.28 VDC EX-3-A .08 VDC MULTMTR 0.1 VDC	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 M560 OR EQUIVALENT).

SCOPE SETTING													
SCOPE SETTING	HORIZONTAL	0.5 MS/DIV (APPROX 200 HZ)	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 VOLT/DIV	100 MILLIVOLTS/DIV	1 VOLT/DIV	100 MILLIVOLTS/DIV	1 VOLT/DIV	100 MILLIVOLTS/DIV		200 MILLIVOLTS/DIV	200 MILLIVOLTS/DIV		5 VOLTS/DIV	1 VOLT/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 (1 MILLIVOLT AT RECEIVER FREQ MODULATED BY 1 KHZ WITH 3.3 KHZ DEVIATION)													



TROUBLESHOOTING PROCEDURE

25—50 MHZ RECEIVER MODELS 4ER46A10-27, B10-27

RC-1407B

EQUIPMENT REQUIRED:

RF Signal Generator
Pulse Generator Model 4EX4A10
DC-VTVM
Oscilloscope

CHECK FOR THE FOLLOWING	PROCEDURE
Check for noise blanker operation	1. Connect the signal generator and pulse through a tee connector to the receiver antenna jack. 2. Set the signal generator for on onfrequency, one microvolt unmodulated output, and set the pulse generator for a 1.5 kHz output. 3. Disable the blanker by shorting J302-4 to ground (see Outline Diagram), and listen for noise in the receiver output. 4. Remove the short from J302-4 and listen for noise blanking.
IF BLANKER IS NOT OPERATING:	
Check DC voltages	Check voltage readings on Q451 through Q455, and bias voltage on CR451 and CR452 (refer to the Receiver Schematic Diagram). NOTE To avoid damaging the casting, use a heavy-duty soldering iron to melt the the solder connections as quickly as possible. Then insert a knife blade and carefully pry lid off of blanker compartment.
Check RF amplifier and pulse generator stages	1. With no signal in, check the collector of Q453 for a reading of 13 volts DC. 2. Apply an on-frequency signal to the antenna jack. Increase the signal level until the meter reading at Q453 collector drops rapidly to zero. This should occur with a signal input of 100 to 150 microvolts.
Check pulse squarer stages	1. Connect the pulse generator to the receiver antenna jack and set the output for 1.5 kHz. 2. Check with oscilloscope at the collector of Q455 for negative square wave pulses from 10 to 12 volts.

QUICK CHECKS

SYMPTOM	CHECK FOR:
No output voltages at TB3	1. Blown fuses F501, F502, F503 & F504. 2. Defective switch S701. 3. Short or open in primary of T501 or T502. 4. Relay contacts K501.
No high B+	1. Shorted C502, C503, C504 or T501. 2. Open F502, L501, T501 or shorted CR505 thru CR510.
No low B+	1. Shorted CR507 thru CR510, C505 or T501. 2. Open F503, L502 or T501.
No -55 volts	1. Shorted CR501, CR502 or T501. 2. Open T501, R501, CR501 or CR502.
No 13.6 volts	Open CR511, CR512, F504, L503 or T502.
B+ output with transmitter not keyed	Burned relay contacts or shorted C507.
Low output voltages	1. Open diodes. 2. Excessive load (short in transmitter).
Excessive output ripple voltage	1. Open diodes. 2. Open C501 thru C506, C508 thru C510.
10-VOLT REGULATOR	
No output	1. 12 V at input of regulator. 2. C to E open circuit in Q1. 3. Open DS1. 4. Short between emitter of Q1 and ground. 5. Open T501, F504, L503.
Output too high - cannot adjust with R3	1. Open in VR1 or Q2. 2. Defective R3.
Output equals input	Shorted Q1.
Regulation poor but output is adjustable with R3	Q1 is probably defective and should be replaced.

TROUBLESHOOTING PROCEDURES

POWER SUPPLY MODEL 4EP51A10

(RC-1434)

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service Parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model Number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-3752

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

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