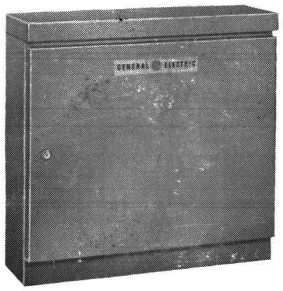
Gattron Bros.
8/15/69

MOBILE RADIO

MASTR
PROGRESS LINE
Executive Series

MAINTENANCE MANUAL



Wall Mount Stations

Desk Top Stations

132-174 MHz
TWO-WAY FM STATION COMBINATION
LBI-3737D

Microphone

TABLE OF CONTENTS

	Page
EQUIPMENT INDEX	iii
SPECIFICATIONS	iv
DESCRIPTION	1
INITIAL ADJUSTMENT	2
OPERATION	2
MAINTENANCE	2
Preventive Maintenance	2
Test and Troubleshooting Procedures	2
CIRCUIT ANALYSIS	3
Transmitter	3
Receiver	6
Power Supply	7
Control Units	9
Channel Guard	10
Remote Control	12
ALIGNMENT AND TEST PROCEDURES	
Transmitter	RC-1411
Receiver	RC-1412
INTERCONNECTION DIAGRAM (see Power Supply Schematic)	

SCHEMATIC AND OUTLINE DIAGRAMS

(Includes Parts Lists & Production Changes)	Outline	Schematic
Transmitter (ET-74-A & ET-74-B)	RC-1413	RC-1414
Receiver (4ER48A10-15 & 4ER48B10-15)	RC-1415	19R620752
Power Supply (4EP51A10)	19D402812	19R640706
Desk Top Control Unit (4EC69A10, 11 & 12)	RC-1421	RC-1421
Wall-Mount Control Unit (4EC70A10)	RC-1422	RC-1422
Four-Frequency Oscillator Board (4EG22F10, 11)	RC-1418	RC-1418
Channel Guard Board (4EK14A10)	RC-1419	RC-1419
Remote Control Board (4KC18A10, 11)	RC-1423	RC-1423
Microphones (4EM25E10 & F10) (See back of RC-1421 & RC-1422)		
Handset and Hookswitch (4EM26A10)	RC-1424	RC-1424

TROUBLESHOOTING PROCEDURES	
Transmitter	RC-1389
Receiver	RC-1390
Power Supply	RC-1434

ILLUSTRATIONS

Figure 1 - Module Layout	1
Figure 2 - Transmitter Block Diagram	4
Figure 3 - Receiver Block Diagram	6
Figure 4 - Multiplier and PA B-Plus Circuits	8
Figure 5 - Channel Guard Block Diagram	11
Figure 6 - Telephone Line Connections	14
Figure 7 - Circuit Modifications for Local/Remote Control	15

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-74-A, B	ET-74-A, B
Receiver	4ER48A10-15 4ER48B10-15	4ER48A10-15 4ER48B10-15
Power Supply	4EP51A10	4EP51A10
Control Unit	4EC69A10-12	4EC70A10
Channel Guard Board	4EK14A10	4EK14A10
Four Freq. Oscillator Board	4EG22F10, 11	4EG22F10, 11
Remote Control Board	4KC18A10, 11	4KC18A10, 11
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
Keys		5491682-P8

OPTIONAL EQUIPMENT

OPTION	EQUIPMENT	OPTION	EQUIPMENT
8401	12-Hour Clock (117 VAC, 60 Hz)	8424	Cabinet Heater (117 VAC, 50/60 Hz)
8402	12/24-Hour Clock (117 VAC, 60 Hz)	8461	12-Hour Clock (220 VAC, 60 Hz) and Test Meter.
8403	Test Meter	8462	12/24-Hour Clock (220 VAC, 60 Hz) and Test Meter.
8404	12-Hour Clock (117 VAC, 60 Hz) and Test Meter.	8463	12-Hour Clock (220 VAC, 50 Hz) and Test Meter.
8405	12/24-Hour Clock (117 VAC, 60 Hz) and Test Meter.	8464	12/24-Hour Clock (220 VAC, 50 Hz) and Test Meter.
8412	12-Hour Clock (220 VAC, 60 Hz)	8465	12-Hour Clock (117 VAC, 50 Hz) and Test Meter.
8413	12/24-Hour Clock (220 VAC, 60 Hz)	8466	12/24-Hour Clock (117 VAC, 50 Hz) and Test Meter.
8414	12-Hour Clock (220 VAC, 50 Hz)	8467	Fan (220 VAC, 60 Hz)
8415	12/24-Hour Clock (220 VAC, 50 Hz)	8468	Fan and Cabinet Heater (220 VAC, 60 Hz)
8416	12-Hour Clock (117 VAC, 50 Hz)	8493	Handset (4EM26A10) & Hookswitch
8417	12/24-Hour Clock (117 VAC, 50 Hz)	8494	Handset (4EM26A10)
8418	Cabinet Heater (220 VAC, 50/60 Hz)	8495	Military Microphone (19B209102-P2)
8421	Speaker (4EZ16A13) and Microphone (19B209102-P2)		
8422 & 8423	Fan (117 VAC, 60 Hz)		

SPECIFICATIONS *

GENERAL

FREQUENCY RANGE	132-174 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-74-A (Narrow Band) ET-74-B (Wide Band)
POWER OUTPUT	35 watts (132-162 MHz) 30 watts (162-174 MHz)
FREQUENCY STABILITY	±.0005% (-30°C to +60°C, +25°C reference)
SPURIOUS AND HARMONIC RADIATION	At least 60 dB below rated power output
MODULATION	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) 2.0 kHz maximum (Wide Band)
CRYSTAL MULTIPLICATION FACTOR	24

RECEIVER

TYPE NUMBER	ER-48-A (Narrow Band) ER-48-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); 0.30 µV (WB)
20-dB Quieting Method	0.35 µV (NB); 0.45 µV (WB)
SENSITIVITY	
EIA Two-Signal Method	-85 dB - adjacent channel 30 kHz channels (NB) -90 dB - adjacent channel, 60 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	±.001% (-30°C to +60°C), +25°C reference
MODULATION ACCEPTANCE	±7 kHz (NB) ±16 kHz (WB)
INTERMODULATION	-60 dB (NB); -65 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 three tubes in the power amplifier. The standard transmitter may be equipped with:

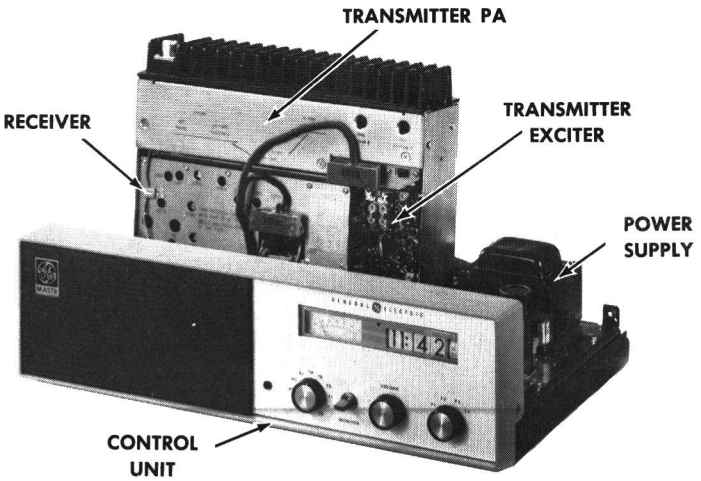
- One through four frequencies
- Channel Guard

RECEIVER

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

- One through four frequencies
- Channel Guard

DESK TOP



WALL MOUNT

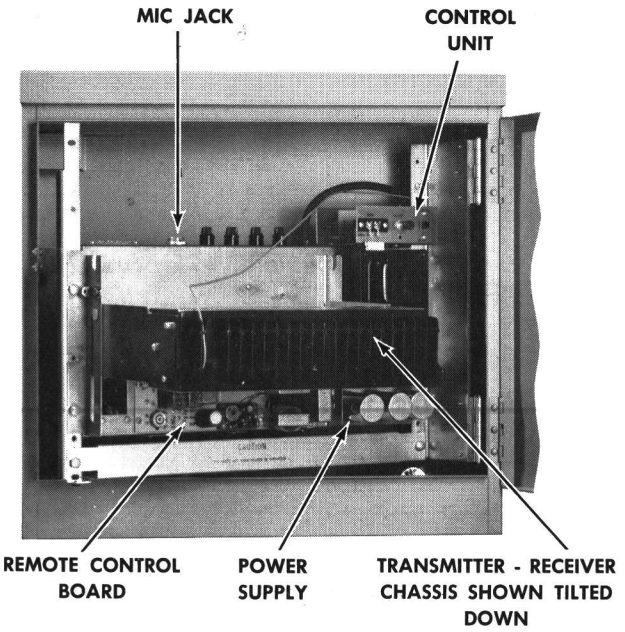


Figure 1 - Module Layout

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.

CONTROL UNITS

Two different control units are used with the stations. The Desk Top control unit 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 13.

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-VOLUME control halfway to the right. 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-VOLUME control to the ON position. Let the unit warm up for 30 seconds.

2. Press the push-to-talk button on the microphone and speak 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.

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 on following page.

TEST AND TROUBLESHOOTING PROCEDURES

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

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

PREVENTIVE MAINTENANCE PROGRAM

CHECK THE FOLLOWING ONCE A YEAR:	
1. Transmitter frequency and deviation (FCC requires this check-up at least 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).	☐

CIRCUIT ANALYSIS

TRANSMITTER

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

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

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

The transmitter uses a total of 7 transistors and 3 tubes to provide a minimum power output of 35 watts in the 132-162 MHz range, and 30 watts in the 162-174 MHz range. The crystals used range from approximately 5.5 to 7.3 megahertz, and the crystal frequency is multiplied 24 times.

A centralized metering jack (J201) is provided for use with GE Test Set Model 4EX3A10. The test set meters the phase modulator, multipliers, driver and PA stage,

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

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.

POWER INPUTS

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

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

EXCITER BOARD

OSCILLATOR

A transistorized Colpitts oscillator (Q104) is used in the transmitter. The oscillator crystal is thermistor-compensated at both ends of the temperature range to provide instant frequency compensation with a frequency stability of ±.0005% without crystal ovens or warmers. Feedback for the oscillator is developed across C113.

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 Q114. 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.

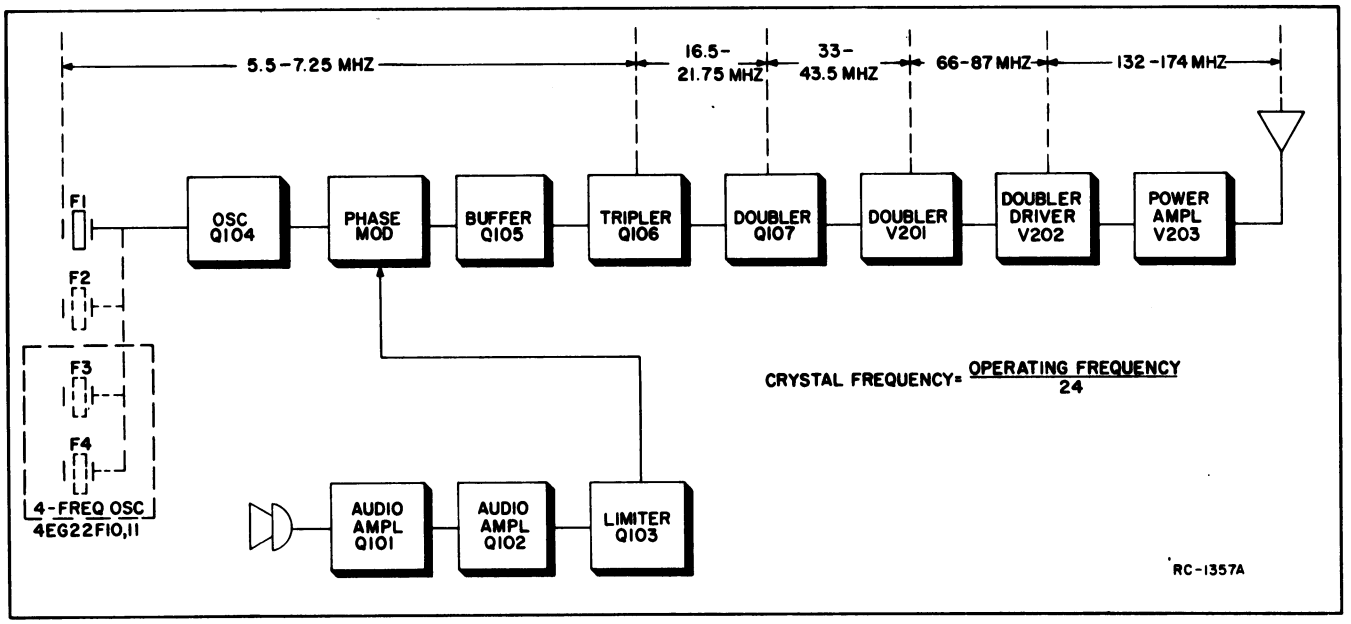


Figure 2 - Transmitter Block Diagram

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

AUDIO AMPLIFIERS AND 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 (C132 and R164) to the audio stages. The input network, in conjunction with the feedback circuit, provides the audio gain and a 6-dB/octave pre-emphasis.

The output of limiter Q103 is connected through modulation adjust potentiometer R110 to a de-emphasis network for 6-dB/octave de-emphasis and post limiter roll-off. The network consists of C136, C137, C138, R165 and R166. Modulation Adjust R110 determines the maximum signal level applied to the modulator circuit, and is normally set for ±4.5 kHz (narrow band) or ±13.5 kHz (Wide Band).

PHASE MODULATOR

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

In Channel Guard applications, tone from Channel Guard board Model 4EK14A10 is fed to the modulator circuit through J103 (tone high) and J104 (ground).

BUFFER AND MULTIPLIERS

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

Following Q105 are two L-C coupled Class C multiplier stages (Q106 and Q107). Q106 is a tripler stage with the collector tank tuned to three times the crystal frequency. The stage is metered at J201 through metering resistors R130 and R131.

Q107 operates as a doubler stage, with the collector tank tuned to six times the crystal frequency. Resistors R134 and R135 are for metering the doubler stage at centralized metering jack J201.

PA ASSEMBLY

MULTIPLIERS

The output of the transistorized exciter is link-coupled through T201, to the grid of beam pentode V201. This stage operates as a doubler with T202 tuned to 12 times the crystal frequency. The grid of V201 is metered through R201 and R202 at J201.

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

POWER AMPLIFIER

The output of V202 is coupled to the grid of compactron beam power amplifier (V203) by a pi-network consisting of C209, L205 and C236/C210. The grid is tuned by C209 (PA GRID), and current is metered at J201-6 and J201-14 by measuring the voltage drop across R210. Bias voltage (-55 volts) is applied to the PA grid through R201, L209 and L205.

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

WARNING

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

Placing TUNE-OPERATE switch S201 in the OPERATE position effectively shorts R212 out of the circuit, and applies 300 volts to grid dropping resistor R213 for normal operation of the stage. Placing the switch in the TUNE position applies the screen voltage to dropping resistor R212 and shunt resistor R211 to drop the screen voltage. This reduces the plate dissipation while tuning the transmitter.

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

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

RECEIVER

Receiver Types ER-48-A and ER-48-B are double conversion, superheterodyne FM receivers designed for one-, two-, or four-frequency operation on the 132-174 megahertz band in mobile or station applications.

The receiver is of single-unit construction and is housed in a copper-plated casting for maximum shielding and rigidity. The unit is completely transistorized, using a total of 20 silicon transistors. Frequency ranges and the number of frequencies for each receiver model are shown in the following chart.

RECEIVER MODEL	FREQUENCY RANGE	NO. OF FREQUENCIES
4ER48A10 (NB) 4ER48B10 (WB)	132-150.8 MHz	One-Freq.
4ER48A11 (NB) 4ER48B11 (WB)	132-150.8 MHz	Two-Freq.
4ER48A12 (NB) 4ER48B12 (WB)	150.8-174 MHz	One-Freq.
4ER48A13 (NB) 4ER48B13 (WB)	150.8-174 MHz	Two-Freq.
4ER48A14 (NB) 4ER48B14 (WB)	132-150.8 MHz	Four-Freq.
4ER48A15 (NB) 4ER48B15 (WB)	150.8-174 MHz	Four-Freq.

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

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

RF AMPLIFIERS

RF signals from the antenna are fed to the base of 1st RF amplifier Q301 through two tuned pre-selector circuits. The output signal is inductively coupled through two tuned circuits to the base of 2nd RF amplifier Q302. The output of Q302 is inductively coupled through two tuned circuits to the base of 1st mixer Q306.

OSCILLATOR

Q303 is a third mode oscillator that operates in the 40 to 55 megacycle region. The crystal is connected in the oscillator feedback path to permit oscillation only at the crystal frequency. L307, C319 and C320 make up the mode-selective resonant circuit. Adjustable coil L307 permits the oscillator frequency to be shifted slightly for setting

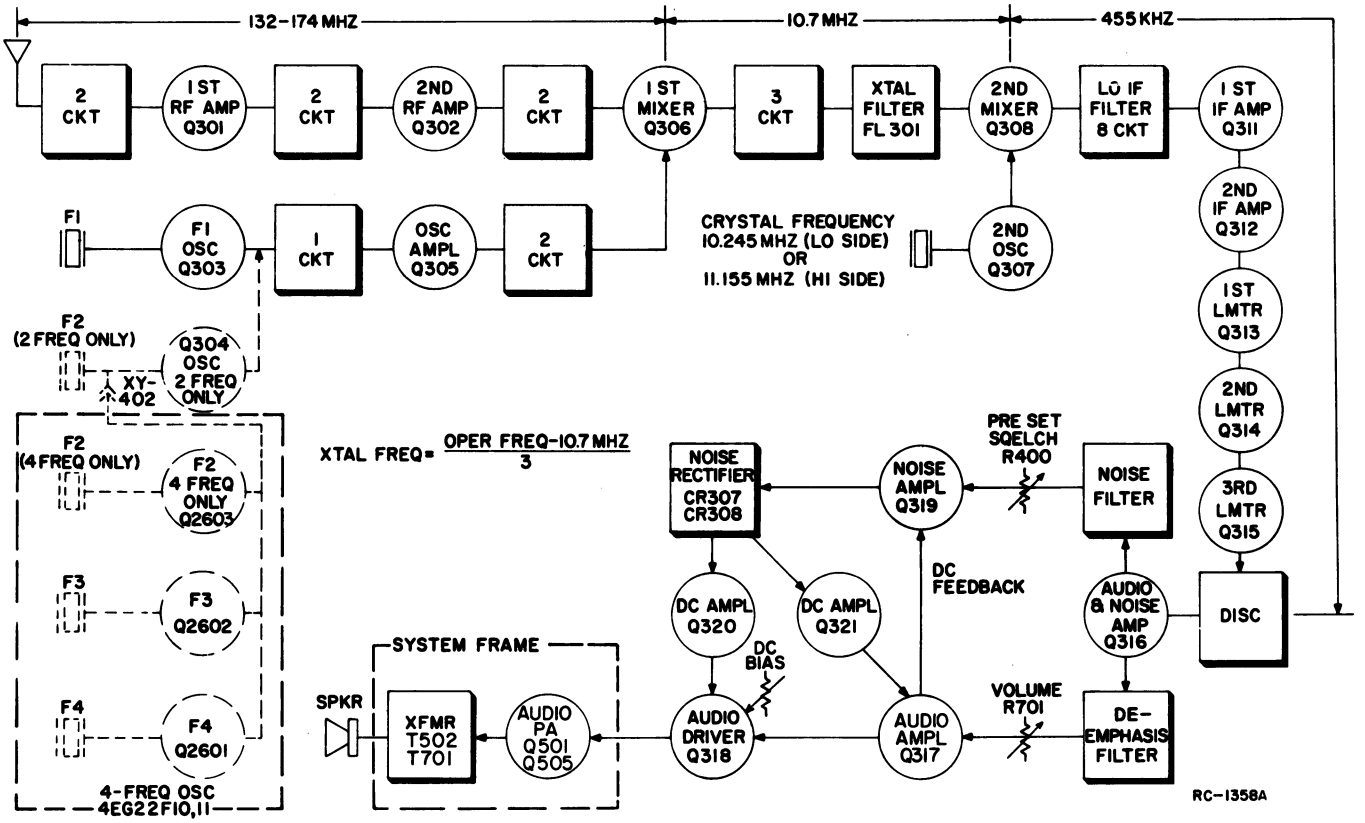


Figure 3 - Receiver Block Diagram

the receiver on the system operating frequency. The collector tank of Q303 is tuned to three times the crystal frequency.

For two-frequency operation, a second oscillator stage is added. Channels are selected by grounding the emitter of the desired oscillator by means of a two-frequency switch on the control unit.

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

1st MIXER AND CRYSTAL FILTER

The RF signal from the 2nd RF amplifier and the low-side injection voltage from oscillator-amplifier Q305 are applied to the base of 1st Mixer Q306. The 10.7 megahertz High IF output is coupled through three tuned circuits (L312 and C350, L313 and C354, L314/L316 and C357) 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 Q308 with the 10.245 MHz (or 11.155 MHz) 2nd Oscillator output to produce the 455 kHz Lo-IF.

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

LO IF AMPLIFIERS AND LIMITERS

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

DISCRIMINATOR

The 3rd limiter output is applied to the Foster-Seely type discriminator, where the audio voltages are recovered from the 455 kHz Lo-IF. A low-pass filter, made up of C422/C455, C423, C424/C457, R377/R415, 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 milliamp) 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 amplifiers Q320 and Q321, causing them to conduct. When conducting, the collector voltage of the DC amplifiers drop 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.

POWER SUPPLY

Power Supply Model 4EP51A10 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 transformer (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) is 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 4)

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 4)

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.

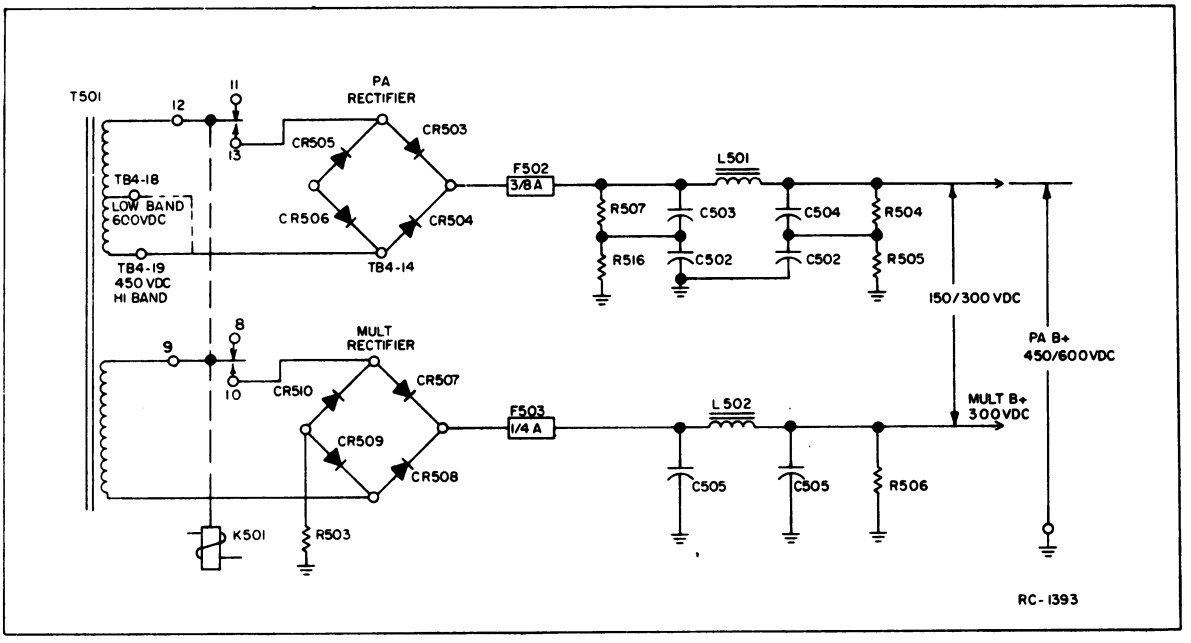


Figure 4 - Multiplier and PA B-Plus Circuits

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 rectified 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 monimal 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.

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 FREQ.
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 trans-

mitter 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:

UNIT METERED	METERING SWITCH POSITION	FUNCTION METERED
Receiver (at J304)	RA	Discriminator
	RB	Lim 1
	RC	Lim 2
	RD	Oscillator
	RJ	Reg. 10V (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

WARNING

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

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 in to TB2.

Volume Control (R701)

The VOLUME control is set for not more than 6 volts RMS at the audio pair (TB1 & -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 4EK14A10 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.

Cable W601 connects the supply voltage, encoder keying voltage and decoder functions from the Channel Guard board to the system terminal board (TB3). The encoder tone output is connected by a white-black shielded lead to the transmitter exciter board.

ENCODER (Figure 5)

The encoder tone is provided by Q604 and Q605 which oscillate at a frequency determined by the tone network. Negative feedback, applied thru the tone network to the base of Q604, prevents any gain in the stage except at the operating frequency.

Keying the transmitter applies +10 volts to the anode of feedback control diode CR605, causing it to conduct. When conducting, the diode shunts R635 which reduces the impedance of the positive feedback loop (R635, R633 and C617). This provides the necessary gain to the base of Q604 to permit oscillation, and the oscillator locks in on the Channel Guard frequency.

An extremely fast starting time for the encoder tone is provided by a starting network consisting of R641, C618, C619 and CR606.

This network utilizes a positive pulse from the +10-volt keying voltage to provide the positive feedback required to start oscillation.

Thermistor-resistor combination R627-RT601 provides temperature compensation for the oscillator output, and limiter diodes CR603 and CR604 keep the amplitude of the tone constant.

The oscillator output is fed to emitter-follower Q606, and then to TONE ADJUST potentiometer R643. This control is normally set for a ±0.75 kHz deviation as outlined in the Transmitter Modulation Adjustment Procedure.

The encoder tone is applied to the modulator stage on the transmitter exciter board.

DECODER (Figure 5)

The decoder function is designed to eliminate all calls that are not tone coded for the Channel Guard frequency. As long as the MONITOR switch is not depressed, all signals are locked out except those from transmitters that are continuously tone coded for positive identification by the receiver. Pressing the MONITOR switch instantly disables the Channel Guard and noise squelch circuits so that all calls on the channel can be heard.

Audio, tone and noise are taken from the collector of audio-noise amplifier Q316 and is fed thru J601-4 to three tone amplifier and bandpass filter circuits. The filters remove the audio and high-frequency noise from the signal, and the tone amplifiers provide sufficient gain to insure clipping by limiter diodes CR601 and CR602. The clipping action eliminates variation in the squelch performance due to changes in tone deviation.

The signal is then applied to selective amplifiers Q604 and Q605, which amplify only the tone determined by the tone network.

The output of the selective amplifiers is applied through emitter follower Q606 to the high gain, broad-band tone amplifiers Q607 and Q608. The output of Q608 is rectified by detector diodes CR607 and CR608, and the resulting negative DC voltage controls the squelch gate. Q607 is normally biased for low gain. When the tone is detected by CR607 and CR608, feedback is provided through R635 to quickly change the bias on Q607 for full gain. This insures a more positive "unsquelching" action.

Squelch gate diode CR609 (on Power Supply) is normally forward biased by a positive DC voltage (approximately 1.5 volts) fed through R657. The forward bias causes CR609 to conduct, feeding a DC voltage to the base of noise amplifiers Q320 and Q321 in the receiver. This removes the bias on the receiver audio stages and holds them off.

When the proper tone is applied to the decoder, the negative DC voltage from the detector diodes back-biases squelch gate diode CR609, and cuts off the positive bias to the DC amplifiers. However, the receiver noise squelch circuit continues to operate until a carrier quiets the receiver.

Selecting the MONITOR position of S702

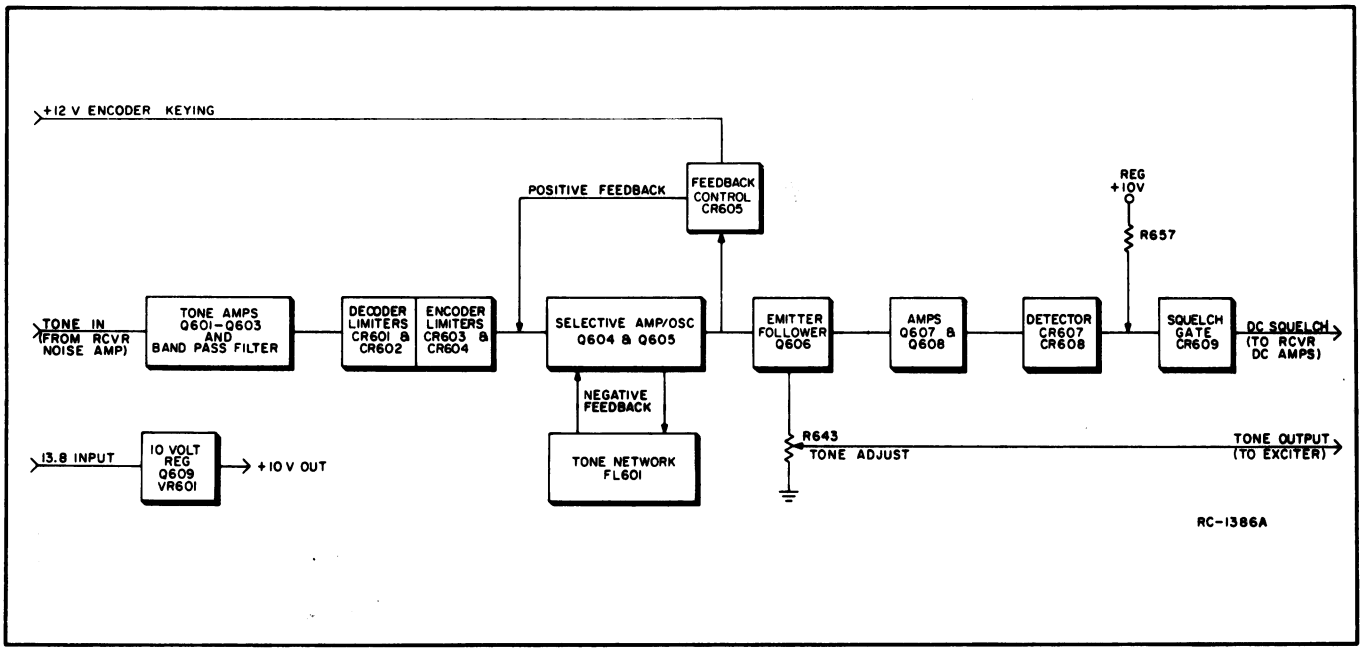


Figure 5 - Channel Guard Block Diagram

(on the control unit) grounds the base biasing circuit of the DC amplifiers and disables both the Channel Guard and noise squelch circuits. Selecting the CG DISABLE position of S702 back biases squelch gate diode CR609 and cuts off the positive bias from the Channel Guard to the DC amplifiers, but does not affect noise squelch operation.

A tone rejection filter connected in parallel with the VOLUME control bypasses the tone to ground, thereby attenuating the tone level reaching the audio circuits. The filter is composed of L601, C624, C625, C626 and R659.

REMOTE CONTROL

Remote Control Board Models 4KC18A10, 11, 12 and 13 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 this page shows the different functions available for each station, and the control current required to select each function.

AUDIO & CONTROL CIRCUITS

4KC18A10

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

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

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

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

Remote Control Board Model 4KC18A12 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

Remote Control Board Model 4KC18A13 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 to 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.

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 on page 15 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 6 volts RMS at the audio pair (TB1-1 & -2) with ±3.3 kHz (Narrow Band) 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 6 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

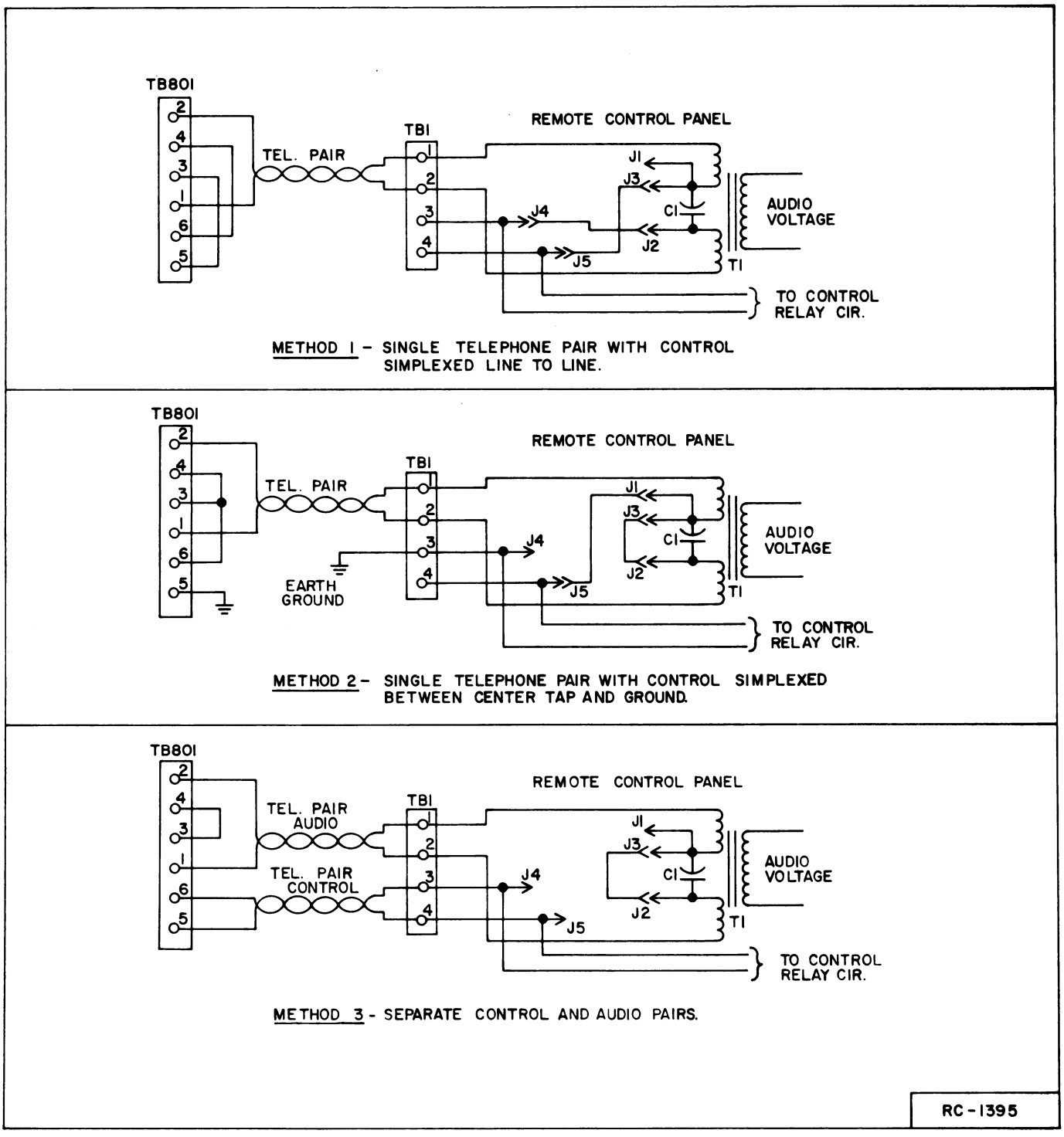


Figure 6 - Telephone Line Connections

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.

(Desk Top station), T-pad R3001 (3.5 ohms, GE Part No. 19B209423-P1) replaces the standard volume control R701. The T-pad controls loudspeaker volume, but does not affect line level. Variable resistor R3002 (5K-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 servicemen 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.

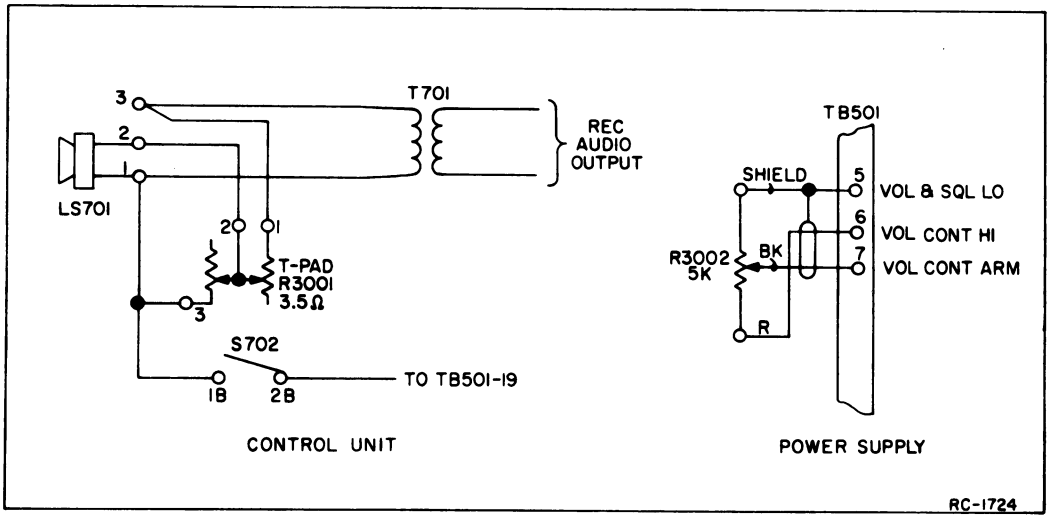


Figure 7 - Circuit Modifications for Local/Remote Control

MODULATION LEVEL ADJUSTMENT

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

TEST EQUIPMENT

1. Audio Oscillator Model 4EX6A10
2. Frequency Modulation Monitor
3. AC VTVM or output meter
4. G-E Test Set Model 4EX3A10 (TM11 or TM12)

PROCEDURE

Transmitters without CHANNEL GUARD

1. Connect the audio signal generator and the meter across audio input terminals J5 (green-hi) and J6 (black-lo) on G-E Test Set, or across J201-15 (mike hi) and J201-7 (mike lo) on the Centralized Metering Jack.
2. Apply a 1.0 volt signal at 1000 Hz to Test Set or across J201-15 and J201-7 on the Centralized Metering Jack.
3. Set MOD ADJUST (R110) for a 4.5 KHz (Narrow Band) or 13.5 KHz (Wide Band) swing with deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.

Transmitters with CHANNEL GUARD

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

Multi-frequency Transmitters

Check all channels for deviation as described in Steps above.

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

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

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

——— NOTE ———

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

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

PA POWER INPUT

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

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

where

P_i is the power input in watts.

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

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

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

FOR OPERATING AT REDUCED POWER

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

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

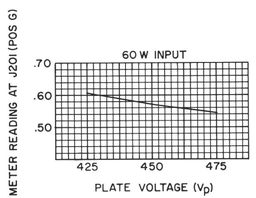
$$V_{meter} = \frac{4.3 \times P}{V_p}$$

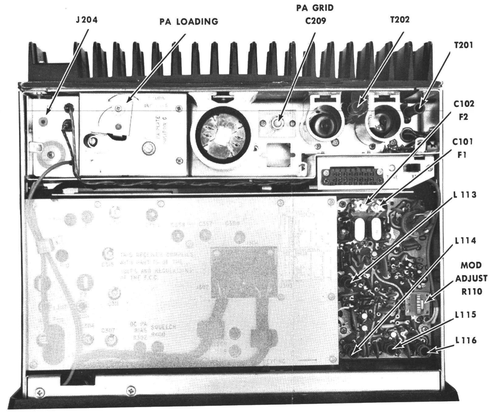
Where V_{meter} is the maximum permissible test set reading (position G for G-E Test set, or J201-1 and -9 with multimeter):

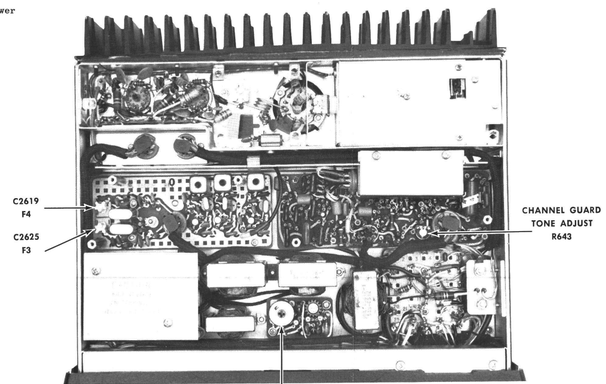
P is the maximum permissible power input

V_p is the measured plate voltage under load

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







TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

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

PRELIMINARY CHECKS AND ADJUSTMENTS

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

TRANSMITTER ALIGNMENT PROCEDURE

STEP	METERING POSITION 4EX3A10	METERING POSITION MULTIMETER AT J201	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
		EXCITER BOARD			
1.	A MULT-1	pin 10 (+) pin 16 (-)	L113 & L114	SEE Procedure	Carefully tune L113 for maximum meter reading, then tune L114 for a small dip in meter reading.
2.	B MULT-2	pin 2 (+) pin 16 (-)	L115, L114 and L116	See Procedure	Tune L115 and re-tune L114 for maximum meter reading, then tune L116 for a dip in meter reading.
		MULT-3 AND POWER AMPLIFIER			
3.	D MULT-3	pin 16 (+) pin 4 (-)	T201 & L116	Maximum	Adjust T201 for maximum meter reading, then re-adjust L116 maximum meter reading.
4.	E MULT-4	pin 16 (+) pin 5 (-)	T202	Maximum	Adjust top slug of T202 for maximum meter reading. Adjust bottom slug of T202 for maximum meter reading, then re-adjust top slug for maximum meter reading.
5.	F PA GRID	pin 14 (+) pin 6 (-)	PA GRID C209	Maximum	Tune C209 for maximum meter reading.
6.	G PA PLATE	WARNING High B+ on pins 1 & 9: pin 1 (+) pin 9 (-)	PA PLATE (C214)	See Procedure	Carefully tune PA Plate for minimum meter reading. Adjustment is quite sharp and will be only a small dip in meter reading.
7.			Place TUNE/OPERATE Switch S201 in the OPERATE position.		
8.	G PA PLATE	pin 1 (+) pin 9 (-)	PA PLATE		Carefully re-tune PA Plate for minimum meter reading.
9.	G PA PLATE	pin 1 (+) pin 9 (-)	PA LOADING	0.7 volts	Adjust PA LOADING for meter reading of 0.7 volts.
10.	G PA PLATE	pin 1 (+) pin 9 (-)	ANT TUNING C215	Maximum	Adjust ANT TUNING for maximum meter reading.
11.	G PA PLATE	pin 1 (+) pin 9 (-)	PA LOADING AND ANT TUNING	See Procedure	Re-adjust PA LOADING for 0.7 volts. Re-adjust ANT TUNING for maximum meter reading.
12.	F PA GRID	pin 14 (+) pin 6 (-)	PA GRID	Maximum	Repeak PA GRID for maximum meter reading.
13.	G PA PLATE	pin 1 (+) pin 9 (-)	PA LOADING	0.79 volts	Increase PA LOADING until meter reads 0.79 volts.
14.	G PA PLATE	pin 1 (+) pin 9 (-)	ANT TUNING	Maximum	Repeak ANT TUNING, then repeat Step 13 and repeak ANT TUNING.
		FREQUENCY ADJUSTMENT			
15.			C101 (C102 in 2-freq. units, and C2625 or C2619 in multi-freq. units.		Loosely couple frequency counter to output and adjust C101 for proper frequency output. (Switch to F2 and adjust C102 on 2-frequency units. In 3- or 4-frequency units, adjust C2625 or C2619 as required. ———NOTE——— For proper frequency control of the transmitter, it is recommended that all frequency adjustments be made when the equipment is at a temp. of approximately 75° F. In no case should frequency adjustments be made when the equipment is outside the temp. range of 50° to 90° F.

ALIGNMENT PROCEDURE

TRANSMITTER TYPES ET-74-A, B & C

RC-1411F

TEST PROCEDURES

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

TEST EQUIPMENT REQUIRED

for test hookup as shown:

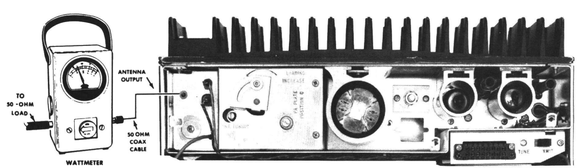
1. Wattmeter similar to:
   Bird #43
   Jones #711N
2. VTVM similar to:
   Triplett #850
   Heath #1M-21
3. Audio Generator similar to:
   GE Model 4EX6A10
   Heath #1G-72
4. Deviation Meter (with a .75 kHz scale) similar to:
   Measurements #140
   Lampkin #205A
5. Multimeter similar to:
   GE METERING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

STEP 1

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output to wattmeter as shown below:



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

SERVICE CHECK

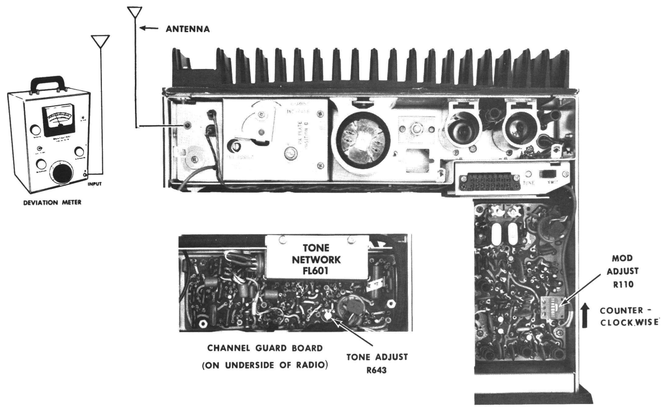
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

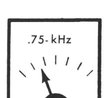
TEST PROCEDURE

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



2. Set MOD ADJUST control R110 fully counterclockwise.

3. Key transmitter and check for 0.75 kHz deviation. If reading is low or high, adjust Channel Guard TONE ADJUST (R643 on Channel Guard Board) for a reading of 0.75 kHz.



DEVIATION METER

NOTES:

1. On units supplied with Channel Guard, the Phase Modulator Tuning should be peaked carefully to insure proper performance. (Refer to Step 1 in the Transmitter Alignment Chart).

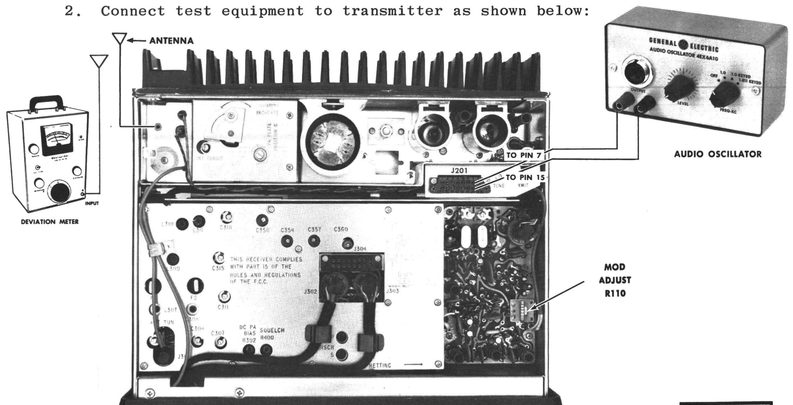
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STEP 3

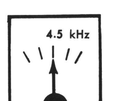
VOICE DEVIATION AND SYMMETRY

TEST PROCEDURE

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



3. Set the generator output to 1.0 VOLTS RMS and frequency to 1 kHz.
4. Key the transmitter by connecting a jumper from J201-18 to J201-16 (GRD). Then adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ±4.5 kHz (Narrow Band) or 13.5 kHz (Wide Band).
6. Adjust MOD ADJUST Control R110 until deviation reads 4.5 kHz (Narrow Band) or 13.5 kHz (Wide Band) on plus (+) or minus (-) deviation, whichever is greater. This adjustment should be made with the correct level of tone applied on Channel Guard transmitters.

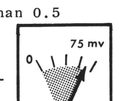


DEVIATION METER

NOTES: --These transmitters are adjusted for 4.5 kHz (13.5 kHz Wide Band) deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz (15 kHz Wide Band) under the worst conditions of frequency, voltage and temperature.

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

1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. Check Audio Sensitivity by reducing generator output until deviation falls to 3.3 kHz (10 kHz Wide Band). Voltage should be LESS than 90 millivolts (typically 75 mv).



METER

FRONT END ALIGNMENT

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

EQUIPMENT REQUIRED

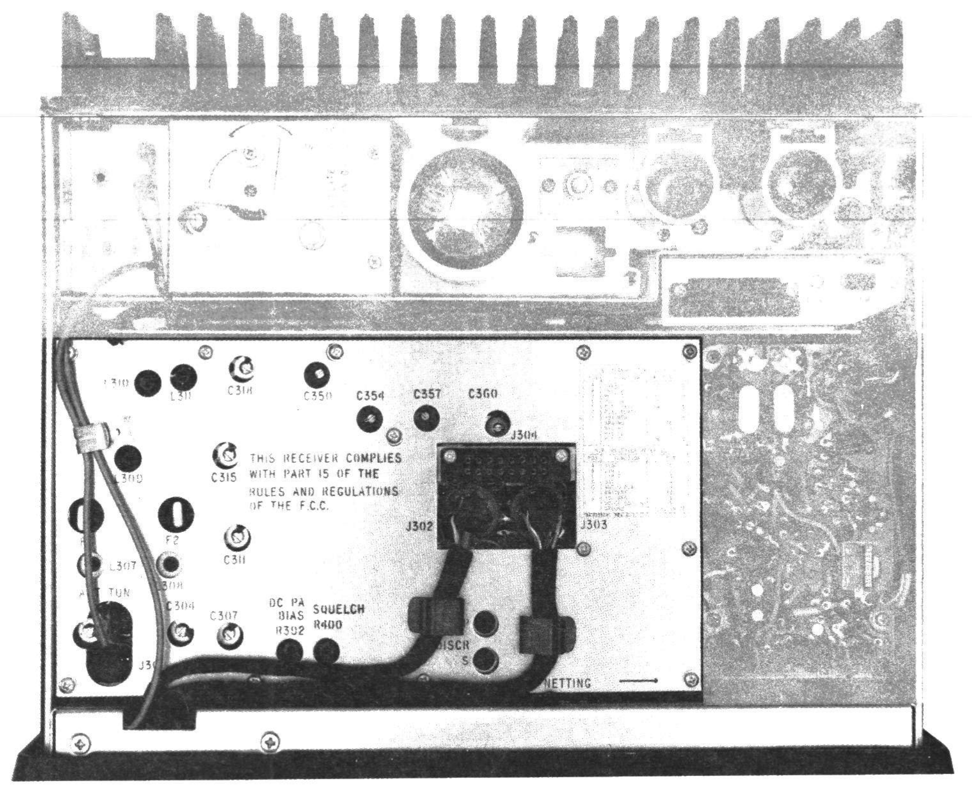
1. G-E Test Set TM11 or TM12 (or 20,000 ohms-per-volt Multimeter).
2. 130-174 MHz signal source (keep signal level below saturation).

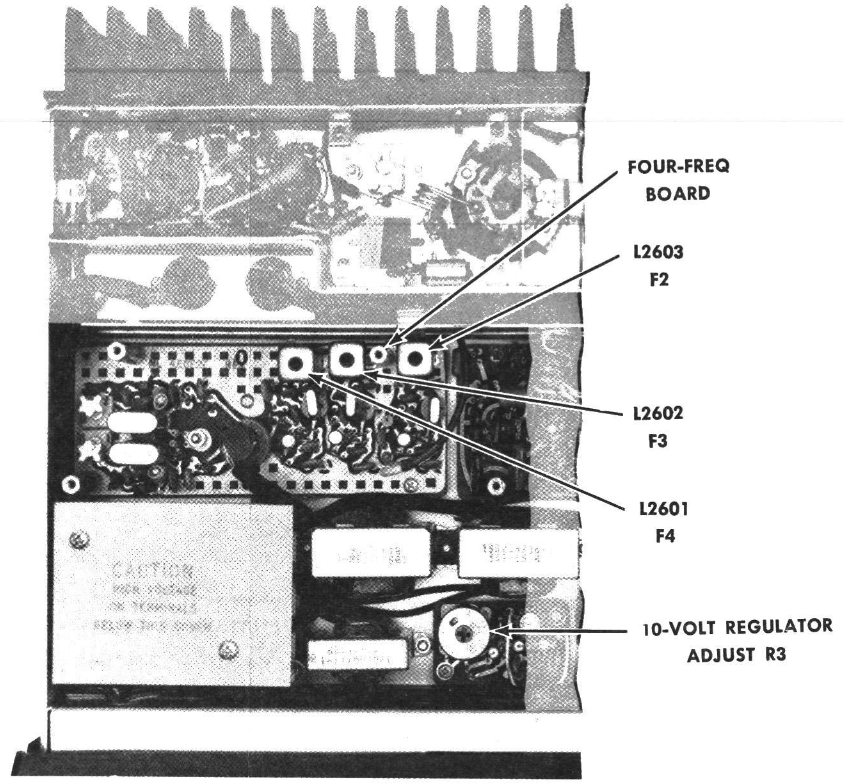
PRELIMINARY CHECKS AND ADJUSTMENTS

1. Plug Test Set 4EX3A10 into receiver centralized metering jack J304. Set meter polarity switch on + and meter sensitivity switch to 1. If using Multimeter, connect the negative lead to J304-13 (ground).
2. Turn SQUELCH control (R400) fully clockwise and VOLUME control to minimum. Switch to position "G" (or measure at J304-9 with Multimeter) and adjust PA Bias R392 for a reading of 0.28 volts (500 milliamps).

ALIGNMENT PROCEDURE

STEP	METERING POSITION 4EX3A10	METERING POSITION MULTIMETER + at J304	TUNING CONTROL	METER READING	PROCEDURE
1.	D OSC	pin 4	L307	See Procedure	Switch to F1, put in F1 crystal and tune L307 for maximum meter reading.
2.	D OSC	pin 4	L309 & L307	Maximum (0.17-0.5V)	Apply an on-frequency signal to J301 and adjust L309 and L307 for a maximum meter reading (0.17-0.5 volts).
3.	D OSC	pin 4	L310 & L311	See Procedure	Adjust slugs to same depth as in L309 in Step 2.
4.	D OSC	pin 4	L308 (2-freq. only)	Maximum	For 2-frequency receivers, switch to F2, insert F2 crystal and adjust L308 for maximum.
5.					Preset RF capacitors C301, C304, C307, C311, C315, and C318 to approximate-frequency. (Capacitors tune from 130 MHz (max. capacitance) to 174 MHz (min. capacitance).
6.	C LIM 2	pin 3	L310, L311 C301, C304 C307, C311 C315, C318	Maximum	Apply on-frequency signal to J301. Tune L310, L311, C301, C304, C307, C311, C315, C318 for maximum meter reading. Keep signal below saturation at each stage and on discriminator zero.
7.	A DISC	pin 10	L307 (L308 for 2-freq.)	Zero	Apply the exact channel frequency signal to J301 and tune L307 (L308 for 2-frequency) for zero discriminator reading. ——NOTE—— For proper freq control of the receiver, it is recommended that all freq adjustments be made when the equipment is at a temp of approx 75° F. In no case should freq adjustments be made when the equipment is outside the temp range of 50° to 90° F.
8.			C301, C304		While receiving a weak on-frequency signal from the antenna, tune C301 and C304 for best quieting.
SQUELCH ADJUSTMENT					
9.				30°	Set SQUELCH Control (R400) to open with a 4 db SINAD signal. (Approximately 30° counter-clockwise of critical squelch position.)





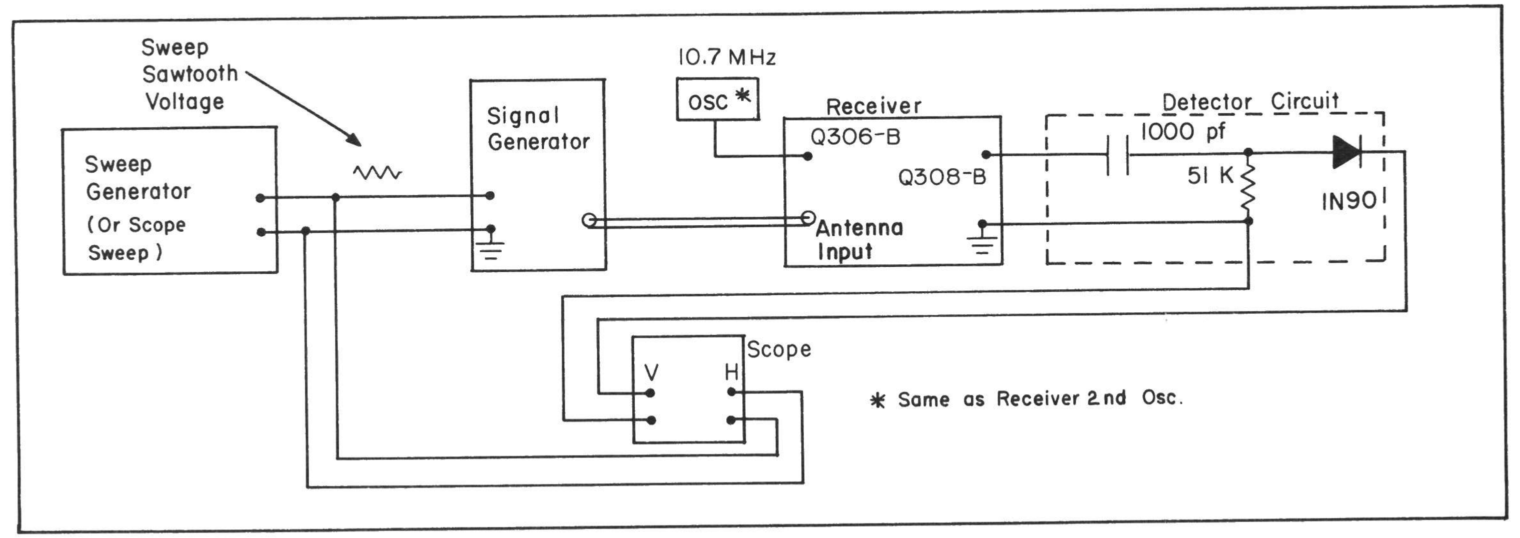


Figure 1 - High and Low IF FILTER TEST Circuit

COMPLETE RECEIVER ALIGNMENT

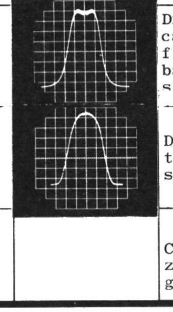
EQUIPMENT REQUIRED

1. G-E Test Set TM11 or TM12 (or 20,000 ohms-per-volt Multimeter).
2. A 10.7 MHz (±200 Hz) and 130-174 MHz signal source. Couple the 10.7 MHz signal through a 0.01 uf capacitor. Keep signal levels below saturation.
3. For Alignment steps 4 thru 8 - Oscilloscope, sweep generator, 10.7 MHz marker generator and construct a detector circuit (see Figure I for circuitry).

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Plug Test Set into the receiver centralized metering jack J304. Set meter polarity switch on + and meter sensitivity switch to TEST 1. If using multimeter, connect the negative lead to J304-13 (ground).
2. Switch Test Set to Position "I" (or measure at collector of Q318 with multimeter). Reading should be a nominal 13.8 volts.
3. Switch to Postion "J" (or measure at top of C443 with multimeter), and check for a reading of 10 volts. If reading is not correct, refer to STEP 8 of the Transmitter Preliminary Checks and Adjustment Procedure.
4. Turn SQUELCH control fully clockwise and VOLUME control to minimum. Switch to Position "G" (or measure at J304-9 with multimeter) and adjust PA Bias potentiometer R392 for a reading of 0.28 volts (500 milliamps).

ALIGNMENT PROCEDURE

STEP	METERING POSITION TEST SET 4EX3A10	METERING POSITION MULTIMETER + at J304	TUNING CONTROL	METER READING	PROCEDURE
DISCRIMINATOR					
1.					Remove 1st oscillator crystal and apply a 10.7 MHz signal to the base of Q308.
2.	A DISC	pin 10	L329	See Procedure	Adjust L329 (discriminator primary) 1/2 turn up from bottom of range.
3.	A DISC	pin 10	L330	Zero	Tune L330 (discriminator secondary) for zero meter reading.
HIGH and LOW IF FILTER (SEE NOTE 1)					
4.	B LIM	pin 2	L321 thru L328	Maximum	Adjust L321 thru L328 for maximum meter reading.
5.	B LIM	pin 2	C357, C354, C350	See Procedure	Adjust C357 for minimum meter reading. Adjust C354 for maximum meter reading. Adjust C350 for minimum meter reading.
6.			C357 & C360		Disable the 2nd oscillator by grounding base of Q307 through a .01 µf capacitor. Connect scope, signal generator and detector as shown in figure 1. Sweep RF ±50KHz/s at 20 Hz. Connect 10.7 MHz marker to base of Q306. Tune C357 and C360 for scope pattern shown. Keep marker signal centered between humps and signal level below saturation.
7.			L321 thru L328		Disconnect detector, remove short from base of Q307 and connect scope to 1st LIM test point. Adjust L321 thru L328 for symetrical wave form shown, with marker in center.
8.	A DISC	pin 10			Check to see that discriminator idling voltage is within 0.05 volts of zero with no signals applied and the modulation acceptance bandwidth is greater than ±8 KHz(narrow Band) or ±16 KHz (Wide Band).
OSC/MULT & AMPLIFIER					
9.	D OSC	pin 4	L307	Maximum	Remove short from base of Q307, if present, then insert 1st oscillator crystal and adjust L307 for maximum meter reading.
10.	D OSC	pin 4	L309 & L307	Maximum (0.17-0.5v)	Adjust L309 and L307 for maximum meter reading (0.17-0.5 volts).
11.	D OSC	pin 4	L310 & L311	See Procedure	Set L310 and L311 slugs to same depth as L309.
12.	D OSC	pin 4	L308 (2-freq)	Maximum	For 2-frequency receivers, insert F2 crystal and adjust L308 for maximum meter reading.
RF					
13.	C LIM 2	pin 3	L310, L311 C301, C304 C307, C311 C315, C318	Maximum	Apply on-frequency signal to J301, then tune L310, L311, C301, C304, C307, C311, C315 and C318 for maximum meter reading. Keep signal below saturation at each stage and on discriminator zero.
14.			C301, C304		While receiving a weak on-frequency signal from the antenna, tune C301 and C304 for best quieting.
FREQUENCY ADJUSTMENT					
15.	A DISC	pin 10	L307 (L308 for 2-freq. or L2603, L2602 or L2601 on 4-freq. board for 3- or 4-freq.)	Zero	Apply the exact channel frequency signal to J301 and tune L307 (L308 for 2-frequency) for zero discriminator reading. In 3- or 4-frequency units, tune L2603, L2602 or L2601 as required. ——NOTE 2—— For proper frequency control of the receiver, it is recommended that all frequency adjustments be made when the equipment is at a temp. of approx. 75° F. In no case should frequency adjustments be made when the equipment is outside the temp. range of 50° to 90° F.
16.				30°	Set SQUELCH Control (R400) to open with a 4 db SINAD signal. (Approximately 30° counterclockwise of critical squelch position.)

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

ALIGNMENT PROCEDURE

RECEIVER MODELS 4ER48A10-15 AND 4ER48B10-15

(RC-1412D)

TEST PROCEDURES

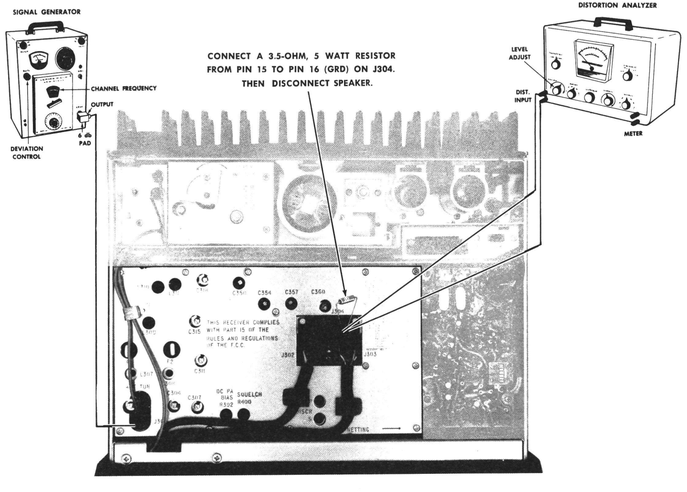
These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequency of test steps starting with Step 1, the defect can be quickly localized. Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

for test hookup shown:

1. Distortion Analyzer similar to: Heath #1M-12
2. Signal Generator similar to: Measurements #M-560
3. 6 db attenuation pad

The test equipment is hooked to the receiver as shown for all Receiver Test Procedures.



STEP 1

AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

1. Connect a 1,000-microvolt test signal modulated by 1,000 Hertz ±3.3 kHz (±10 kHz Wide Band) deviation to the antenna jack J301.
2. 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.
3. Set VOLUME Control for two-watt output (2.65 VRMS).
4. Make distortion measurements according to manufacturer's instructions. Reading should be less than 5% (3% is typical).

VOLTMETER SCALE ON DISTORTION ANALYZER

SERVICE CHECK

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

1. Battery and regulator voltage---low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)
2. 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).
3. Audio Gain (Refer to Receiver Troubleshooting Procedure).
4. Discriminator Alignment (Refer to Receiver Alignment on reverse side of page).

STEP 2

USABLE SENSITIVITY (12 db SINAD)

TEST PROCEDURE

Measure sensitivity of the receiver modulated at the standard test modulation as follows:

1. Be sure Test Step 1 checks out properly.
2. Reduce the Signal Generator output from setting in Test Step 1.
3. Adjust Distortion Analyzer LEVEL control for a +2 db reading.
4. Set CONTROL from LEVEL to DISTORTION reading. Repeat Steps 1, 2 and 3 until difference in reading is 12 db (+2 db to -10 db).
5. The 12-db difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. Reading should be less than 0.25 microvolts with audio output at least one watt (1.87 volts RMS across the 3.5-ohm receiver load).

SERVICE CHECK

If the sensitivity level is more than 0.25 microvolts, make the following checks:

1. Alignment of RF stages (Refer to RF Alignment in Receiver Alignment on reverse side of page.)
2. Gain measurements as shown on the Receiver Troubleshooting Procedure.

STEP 3

MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

TEST PROCEDURE

1. Be sure Test Steps 1 and 2 check out properly.
2. Set Signal Generator output for twice the microvolt reading obtained in Test Step 2 - 4.
3. Increase Signal Generator frequency deviation.
4. Adjust LEVEL Control for +2 db.
5. Set CONTROL from LEVEL to DISTORTION reading. Repeat Steps 3, 4 and 5 until difference between readings becomes 12 db (from +2 db to -10 db).
6. 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 (Narrow Band) or more than ±16 kHz but less than ±20 kHz (Wide Band).

DB SCALE ON DISTORTION ANALYZER

LEVEL DISTORTION ON DISTORTION ANALYZER

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

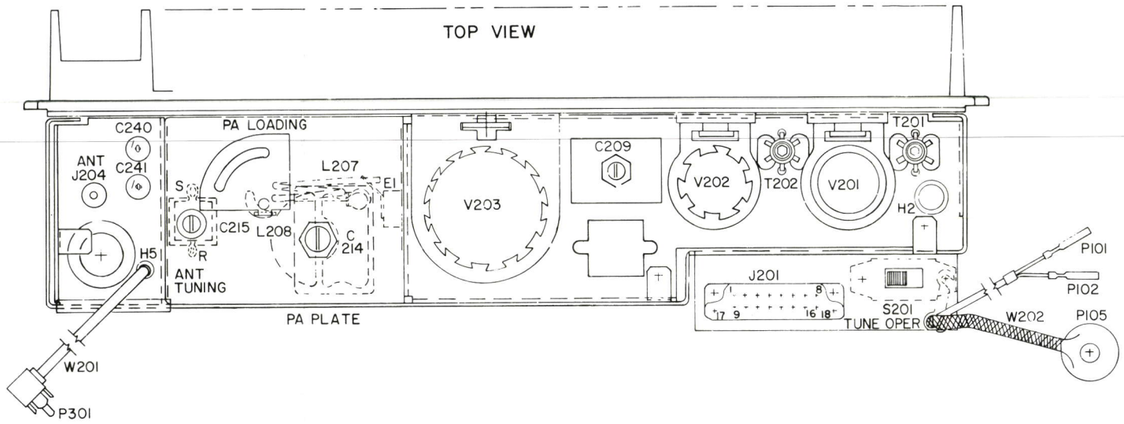
132-174 MHz TRANSMITTER
TYPE ET-74-A NARROW BAND
TYPE ET-74-B WIDE BAND

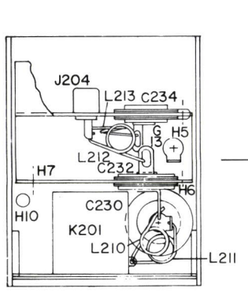
SYMBOL	G-E PART NO.	DESCRIPTION
		EXCITER BOARD WITH CHANNEL GUARD MODEL 4EG21F10 1 FREQ NARROW BAND REV B MODEL 4EG21F11 2 FREQ NARROW BAND REV B MODEL 4EG21F12 1 FREQ WIDE BAND REV B MODEL 4EG21F13 2 FREQ WIDE BAND REV B
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C101 and C102	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C103 and C104	5496219-P10	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C105 thru C108	19C300685-P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C109 and C110	5496219-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C111 and C112	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C113	5496372-P167	Ceramic disc: 510 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C114	5493366-P390J	Silver mica: 390 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C115	5493366-P680J	Silver mica: 680 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C116	5494481-P131	Ceramic disc: .0068 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C117	5496219-P37	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C118	5496372-P46	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C119	5490008-P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C120	5494481-P129	Ceramic disc: .0039 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C121	5496219-P218	Ceramic disc: 56 pf ±10%, 500 VDCW, temp coef -80 PPM.
C122 and C123	5494481-P129	Ceramic disc: .0039 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C124 and C125	5496219-P261	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef -80 PPM.
C126	7130348-P3	Molded: 1 pf ±.05 pf, 500 VDCW, temp coef approx 0 PPM; sim to Jeffers Type JM-5/32.
C127	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C128	5494481-P113	Ceramic disc: .002 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C129	5496219-P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C130	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C131	19B209243-P1	Polyester: .01 µf ±20%, 50 VDCW.
C132	7491395-P111	Ceramic disc: .0015 µf ±10%, 500 VDCW; sim to RMC Type JL.
C133	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C134	5496267-P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C135	19B209243-P5	Polyester: .047 µf ±20%, 50 VDCW.
C136	7491395-P114	Ceramic disc: .0022 µf ±10%, 500 VDCW; sim to RMC Type JL.
C137 and C138	7491395-P109	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JL.
C142*	5496267-P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added by Rev A.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR101 and CR102	19A115371-P1	Silicon; sim to Type 1N676.
CV101	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 - - - - - - - - - -
L113	19C303883-G13	Coil. Includes tuning slug 5491798-P2.
L114	19C303883-G14	Coil. Includes tuning slug 5491798-P2.
L115	19C303883-G15	Coil. Includes tuning slug 5491798-P2.
L116*	19C303883-G17	Coil. Includes tuning slug 5491798-P2.
	19C303883-G16	In Models earlier than Rev A: Coil. Includes tuning slug 5491798-P2.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q101	19A115899-P1	Silicon, NPN.
Q102 and Q103	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q104	19C300114-P1	Silicon, NPN; sim to Type 2N706.
Q105	19A115330-P1	Silicon, NPN.
Q106 and Q107	19A115328-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101*	3R77-P154K	Composition: 0.15 megohm ±10%, 1/2 w. Deleted by Rev B.
R102	3R77-P562K	Composition: 5600 ohms ±10%, 1/2 w.
R103	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R104 and R105	3R77-P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R106	3R77-P565J	Composition: 5.6 megohms ±5%, 1/2 w.
R107	3R77-P681K	Composition: 680 ohms ±10%, 1/2 w.
R108	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R109	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R110	19B209358-P106	Variable, carbon film: 75-10,000 ohms ±20%, 1/4 w; sim to CTS Type X-201.
R111	3R77-P184J	Composition: 0.18 megohm ±5%, 1/2 w.
R112	3R152-P560J	Composition: 56 ohms ±5%, 1/4 w.
R113	3R77-P393J	Composition: 39,000 ohms ±5%, 1/2 w.
R114*	3R77-P333J	Composition: 33,000 ohms ±5%, 1/2 w. Deleted by Rev B.
R115*	3R77-P333K	Composition: 33,000 ohms ±10%, 1/2 w. Deleted by Rev B.
R116 and R117	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R118 thru R120	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R121	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R122	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R123	3R77-P562K	Composition: 5600 ohms ±10%, 1/2 w.
R124	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R125*	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
	3R77-P472K	In Models of Rev A and earlier: Composition: 4700 ohms ±10%, 1/2 w.
R126	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w.
R127	3R152-P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R128	3R77-P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R129	3R77-P152K	Composition: 1500 ohms ±10%, 1/2 w.
R130	3R77-P151K	Composition: 150 ohms ±10%, 1/2 w.
R131	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R133	3R77-P390K	Composition: 39 ohms ±10%, 1/2 w.
R134	3R77-P560K	Composition: 56 ohms ±10%, 1/2 w.
R135	3R77-P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R136	3R77-P220K	Composition: 22 ohms ±10%, 1/2 w.
R139	3R77-P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R140	3R77-P623J	Composition: 62,000 ohms ±5%, 1/2 w.
R164*	3R77-P204J	Composition: 0.20 megohm ±5%, 1/2 w. Added by Rev B.
R165*	3R77-P473J	Composition: 47,000 ohms ±5%, 1/2 w. Added by Rev B.
R166*	3R77-P563J	Composition: 56,000 ohms ±5%, 1/2 w. Added by Rev B.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT101 and RT102	19B209353-P2	Disc: 460 ohms max; sim to GE 16D-3121.
RT103 and RT104	19B209353-P1	Rod: 10,200 ohms min; sim to GE 1R-1544.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY101 and XY102		Refer to Miscellaneous Parts.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
		When reordering give GE Part Number and specify exact frequency needed. Crystal freq = (OF ÷ 24).
Y101 and Y102	19B206204-P1	Quartz: freq range 5400-7250 KHz, temp range -30°C to +85°C.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4033089-P1	Clip. (Part of XY101, 102).
	19A115793-P1	Contact, electrical: sim to Malco 2700. (Part of XY101, 102).
	19C311172-P1	Socket, crystal. (Part of XY101, 102).
	19B200525-P9	Rivet. (Part of XY101, 102).
		POWER AMPLIFIER MODEL 4EF32F10 132-150.8 MHz REV A MODEL 4EF32F11 150.8-174 MHz REV A
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C202	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C203	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C204 and C205	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C206 and C207	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C208*	7489162-P141	Silver mica: 390 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
	7489162-P143	In Models earlier than Rev A: Silver mica: 470 pf ±10%, 300 VDCW; sim to Electro Motive Type DM-15.

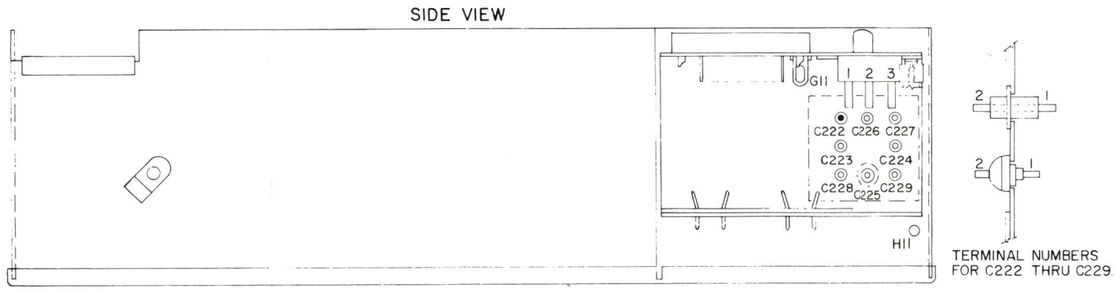
(Cont'd on back of RC-1414)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

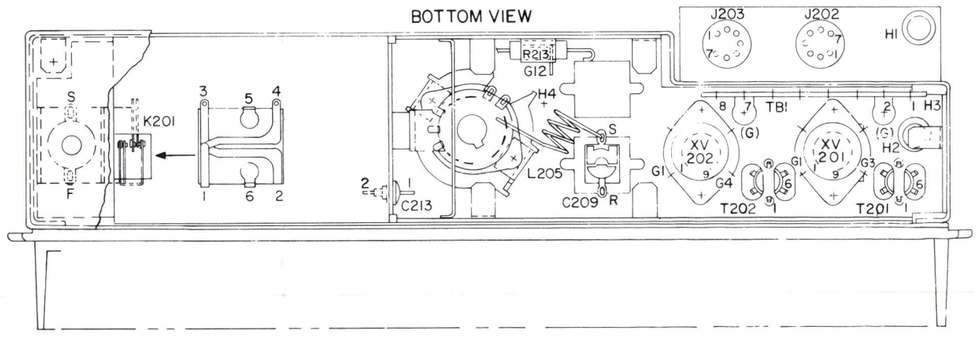
PA ASSEMBLY 4EF32F10



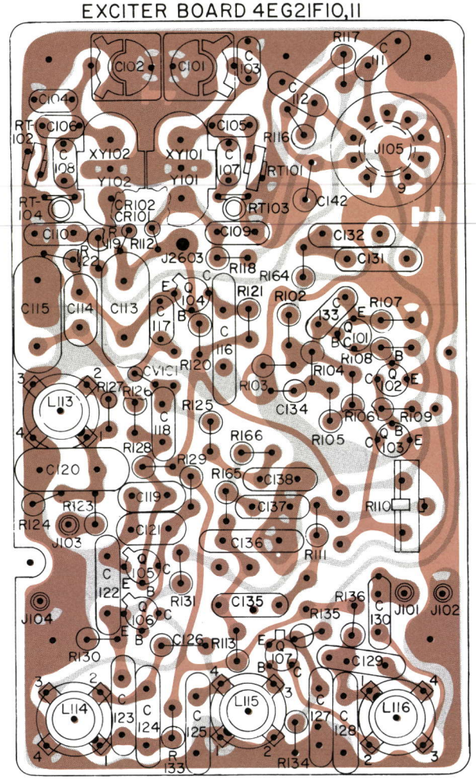




TERMINAL NUMBERS FOR C222 THRU C229.



EXCITER BOARD 4EG21F10,11



RESISTANCE READINGS

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

EXCITER BOARD

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

PA ASSEMBLY

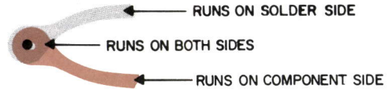
SYMBOL NO.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12
V201	6.3K	180	47K	FIL	FIL	180	100K	47K	100			
V202	6K	220	47K	FIL	FIL	220	27K	47K	220			
V203	FIL	0	20K	20K	20K	0	22K	0	0	6K	22K	FIL

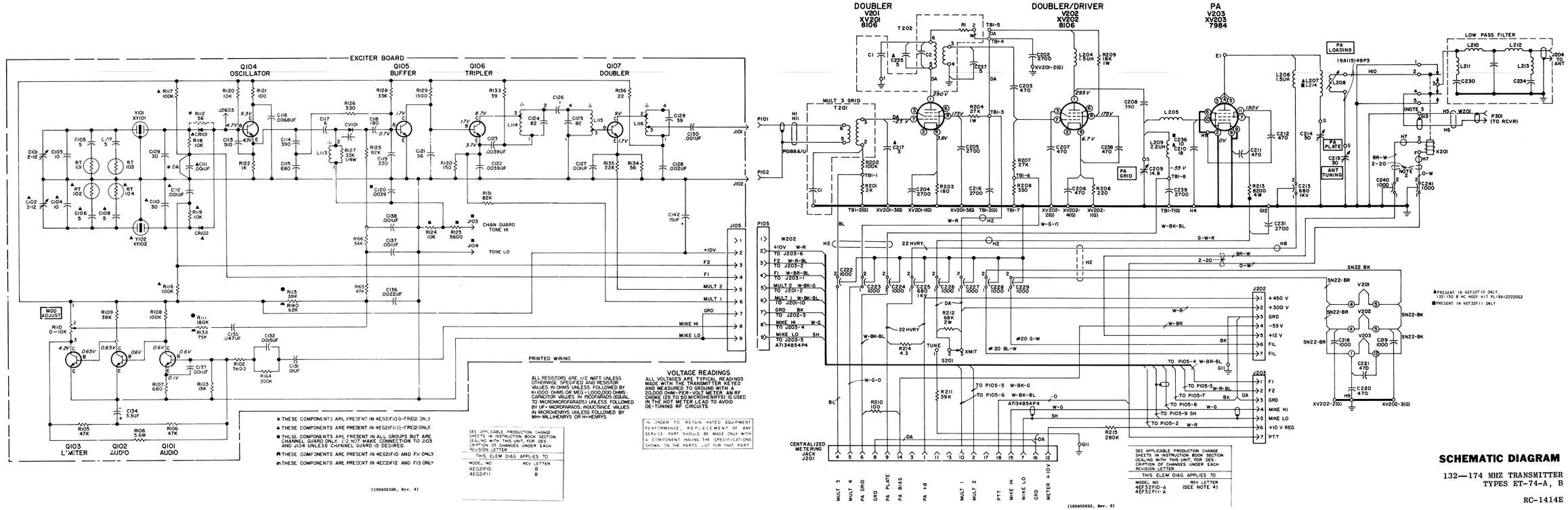
(19D402815, Rev. 5)
(19B205178, Sh. 1, Rev. 1)
(19B205178, Sh. 2, Rev. 1)

OUTLINE DIAGRAM

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

RC-1413D





SCHEMATIC DIAGRAM

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

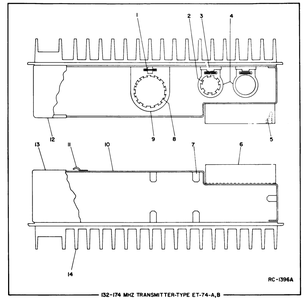
RC-1414E

(Cont'd from front of RC-1413)

SYMBOL	G-E PART NO	DESCRIPTION
C209	19B209328-P5	Variable, air: approx 1.85-14.8 pf, 650 v peak; sim to EF Johnson 193-5-2.
C210	5496218-P612	Ceramic disc: 18 pf ±10%, 500 VDCW, temp coef -470 PPM.
C211 and C212	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C213	19B209282-P1	Ceramic, feed-thru: 680 pf ±20%, 1000 VDCW; sim to Sprague Type 544C.
C214	19B209329-P1	Variable, air: approx 5.1-50 pf, 1700 v peak; sim to Star Products Model ASC.
C215	19B209328-P10	Variable, air: approx 2.62-30.6 pf, 650 v peak; sim to EF Johnson 193-10-2.
C216	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C217	5496218-P203	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C218 and C219	5494481-P11	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C220 and C221	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C222 thru C224	7160807-P1	Ceramic, feed-thru: .001 µf +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 µf +100% -0%, 500 VDCW.
C231	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C235	5496218-P205	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C236	5496218-P610	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef -470 PPM.
C237	5496218-P205	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef -80 PPM.
C238	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C239	5494481-P27	Ceramic disc: .0027 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C240 and C241	5493392-P7	Ceramic, feed-thru: .001 µf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
		TERMINALS
E1	7135118-P1	Solder.
		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	19C307020-P4	Armature: 19 VDC nominal, 2.5 w max operating, 80 ohms ±15% coil res, 2 form C contacts.
		INDUCTORS
L204	7488079-P34	Choke, RF: 1.5 µh ±10%, 0.28 ohm DC res max; sim to Jeffers 4412-7.
L205	19A122076-P1	Coil.
L206	7772834-P5	Choke, RF: 1.8 µh ±10%, 0.33 ohm DC res; sim to Chelte 3-144.
L207*	19B205220-P1	Coil. Deleted by Rev A in Models 4EF32F11.
L208	19B205220-P1	Coil.
L209	7488079-P35	Choke, RF: 2.2 µh ±10%, 0.5 ohm DC res max; sim to Jeffers 4412-8.

SYMBOL	G-E PART NO	DESCRIPTION
L210	19A122072-P1	Coil.
L211	19A122073-P1	Coil.
L212	19A122072-P1	Coil.
L213	19A122074-P1	Coil.
L214*	19B205220-P2	Coil. Added by Rev A.
		PLUGS
P101	4029840-P2	Contact, electrical: sim to AMP 42827-2.
P102	4029840-P1	Contact, electrical: sim to AMP 41804. (Part of W201).
P301		
		RESISTORS
R201	3877-P203J	Composition: 2000 ohms ±5%, 1/2 w.
R202	3877-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R203	3877-P181K	Composition: 180 ohms ±10%, 1/2 w.
R204	3878-P273K	Composition: 27,000 ohms ±10%, 1 w.
R206	3877-P221K	Composition: 220 ohms ±10%, 1/2 w.
R207	3877-P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R208	3877-P331K	Composition: 330 ohms ±10%, 1/2 w.
R209	3878-P183K	Composition: 18,000 ohms ±10%, 1 w.
R210	3877-P101K	Composition: 100 ohms ±10%, 1/2 w.
R211	3877-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R212	3879-P683K	Composition: 68,000 ohms ±10%, 2 w.
R213	3B149-P822K	Composition: 8200 ohms ±10%, 4 w.
R214	19B209022-P30	Wirewound: 4.3 ohms ±5%, 2 w; sim to IRC Type BW1.
R215	5495948-P444	Deposited carbon: 0.28 megohm ±1%, 1/2 w; sim to Texas Instrument Type CS1/2ES.
R216	3B149-P223K	Composition: 22,000 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 53-32.
		TRANSFORMERS
T201		**COIL 19B205215-G1**
		CAPACITORS
C1	5494481-P11	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
T202	5491798-P4	Tuning slug. **COIL 19B205213-G1**
		CAPACITORS
C1	5494481-P11	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5491238-P10	Ceramic disc: 2 pf ±0.5 pf, 500 VDCW, temp coef -470 ±250 PPM.
		RESISTORS
R1	3877-P221J	Composition: 220 ohms ±5%, 1/2 w.
	5493185-P5	Tuning slug.
		TERMINAL BOARDS
TB1	7775500-P124	Phen: 8 terminals.
		TUBES
V201 and V202		Type 8106.
V203		Type 7984.

SYMBOL	G-E PART NO	DESCRIPTION
		CABLES
W201	5491689-P56	RF: approx 12 inches, includes short, phono type plug (P201).
W202		**CABLE PL-19B205268-G1**
		PLUGS
P105	19B209341-P2	Socket: 9 contacts; sim to Elco 04-920-XX.
		SOCKETS
XV201 and XV202	7480532-P8	Tube, phen: 9 pins; sim to Elco 04-903-84.
XV203	19C301007-P5	Tube: 12 pins; sim to Alcon Metal Products 371G.
		MECHANICAL PARTS (SEE RC-1396)
1	19A121195-P2	Support. (Used with V203).
2	7165167-P5	Insert, tube shield: sim to Atlas 106-333-5. (Used with V202).
3	19B205622-P1	Spring. (Used with V201, 202).
4	19A121523-P3	Heat sink. (Used with V201, 202).
5	7147223-P3	Clip, loop: sim to Patton-Macguyer 40. (Used with V202).
6	19B205211-P1	Support.
7	4035017-P4	Support, angle: sim to Tinnerman C-19185-020-24.
8	7165167-P7	Insert, tube shield: sim to Atlas 106-333-22. (Used with V203).
9	19B204571-P1	Heat sink. (Used with V203).
10	19C303875-G1	Chassis.
11	7763541-P2	Strap, retaining.
12	19B205475-G1	Cover, top.
13	19B305476-G1	Cover, bottom.
14	19A602623-P1	Casting.



152-174 MHZ TRANSMITTER-TYPE ET-74-A,B

PRODUCTION CHANGES

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

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

In Model 4EF32F10:
Changed C208.

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

REV. A - Models 4EF32F10,F11

To improve efficiency and bandwidth of final amplifier stage

In Model 4EF32F10:
Changed C208.

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

REV. A - Models 4EG21F10, F11

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

REV. B - Models 4EG21F10, F11

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

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

PARTS LIST

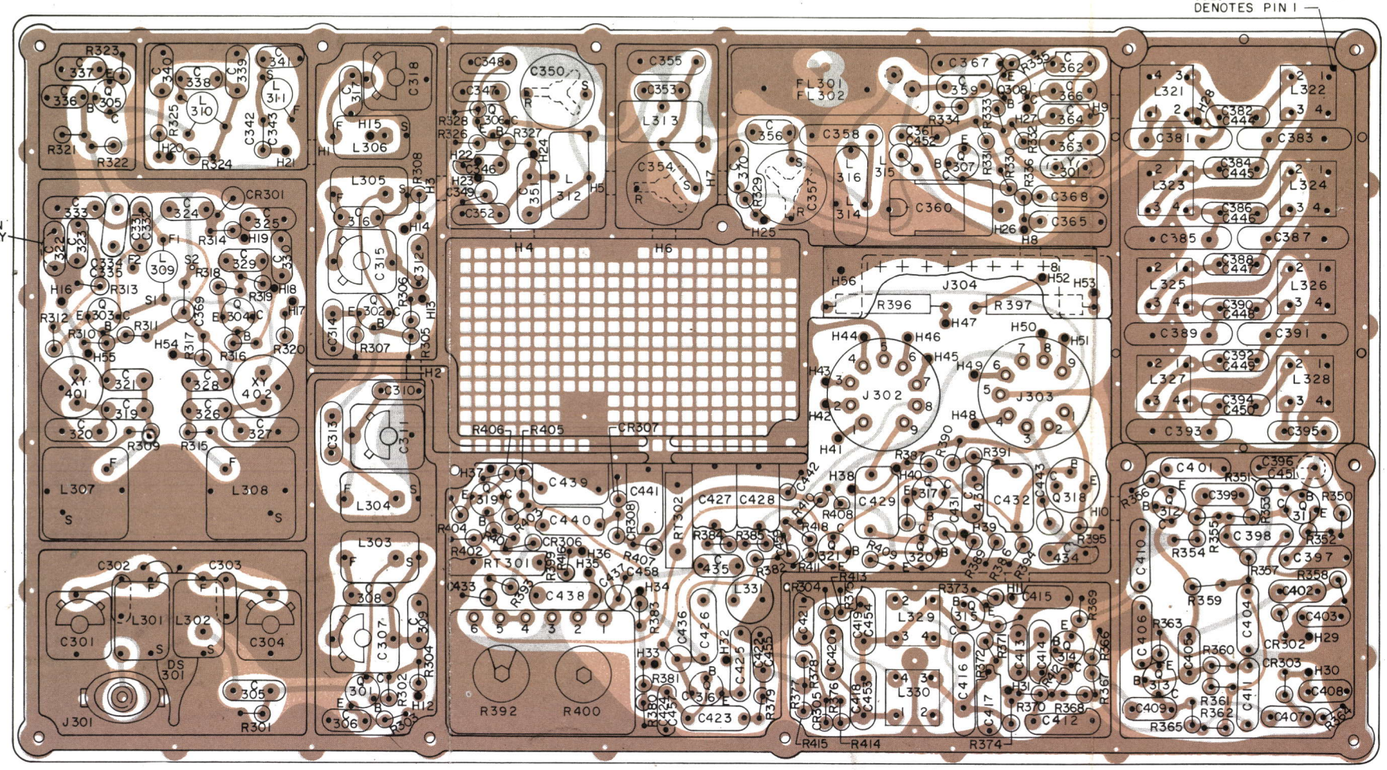
LBI-3718D

132-174 MHz RECEIVER
MODELS 4ER48A10, 11, 13; B10, 11, 13
MODELS 4ER48A12, 14, 15; B12, 14, 15

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C301	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C302	5496219-P236	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C303	5496219-P436	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C304	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C305	5490008-P131	Silver mica: 150 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C306	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C307	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C308	5496219-P436	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C309	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C310	5496219-P536	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -330 PPM.
C311	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C312	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C313	5490008-P131	Silver mica: 150 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C314	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C315	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C316	5496219-P436	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C317	5496219-P236	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C318	5491271-P106	Variable, air: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C319A*	5496219-P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P347	In Models earlier than Rev A: Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -150 PPM.
C319B*	5496219-P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P344	In Models earlier than Rev A: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
C320A*	5496219-P357	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
	5496219-P257	In Models earlier than Rev A: Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C320B*	5496219-P356	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -150 PPM.
	5496219-P256	In Models earlier than Rev A: Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -80 PPM.
C321A*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P39	In Models earlier than Rev A: Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C321B*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P37	In Models earlier than Rev A: Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C322	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C323 and C324	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C325	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C326A*	5496219-P447	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P347	In Models earlier than Rev A: Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -150 PPM.
C326B*	5496219-P444	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -220 PPM.
	5496219-P344	In Models earlier than Rev A: Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
C327A*	5496219-P357	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -150 PPM.
	5496219-P257	In Models earlier than Rev A: Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C327B	5496219-P356	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -150 PPM.
C328A*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P39	In Models earlier than Rev A: Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C328B*	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5496219-P37	In Models earlier than Rev A: Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C329	5496219-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C330	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C331A	5496219-P744	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -750 PPM.
C331B *	5496219-P741	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -750 PPM.
	5496219-P742	In Models 4ER48A12 and B12 of REV E and earlier: Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef -750 PPM.
C332A	5496219-P744	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -750 PPM.
C332B	5496219-P741	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -750 PPM.
C333	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C334*	5496219-P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5491601-P127	In Models earlier than Rev A: Molded phenolic: 2.4 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C335*	5496219-P38	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
	5491601-P128	In Models earlier than Rev A: Molded phenolic: 2.7 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C336	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C337	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C338A	5496219-P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C338B	5496219-P240	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C339 and C340	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C341A	5496219-P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C341B	5496219-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C342	5491601-P120	Molded phenolic: 1 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C343	5491601-P123	Molded phenolic: 1.5 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C346	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C347	5490008-P41	Silver mica: 390 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C348	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C349	5496267-P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C350	5490446-P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0; sim to Erie 557-36.
C351	5496219-P56	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef 0 PPM.
C352	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C353	5496219-P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C354	5490446-P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0; sim to Erie 557-36.
C355	5496219-P158	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -30 PPM.
C356	5496219-P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C357	5490446-P2	Variable, ceramic: approx 5-25 pf, 350 VDCW, temp coef 0; sim to Erie 557-36.
C358	5496219-P158	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -30 PPM.
C359	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C360	19A115659-P1	Variable: approx 16-141 pf, 150 VDCW; sim to El Menco Type 42.
C361	5496219-P54	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef 0 PPM.
C362	5496219-P13	Ceramic disc: 22 pf ±10%, 500 VDCW, temp coef 0 PPM.
C363	5490008-P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C364	5490008-P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C365	19B209243-P6	Polyester: .068 µf ±20%, 40 VDCW.
C366	5490008-P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C367	19B209243-P5	Polyester: .047 µf ±20%, 40 VDCW.
C368	19B209243-P6	Polyester: .068 µf ±20%, 40 VDCW.
C369	5496267-P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C370	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C381	5496219-P368	Ceramic disc: 160 pf ±5%, 500 VDCW, temp coef -150 PPM.
C382	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C383	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C384	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C385	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C386	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C387	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C388	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C389	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C390	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C391	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C392	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C393	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C394	5496219-P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.

(Cont'd on back of 19R620752)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

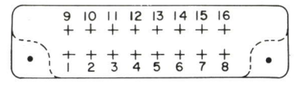


(19D402810, Rev. 5)
(19D402627, Sh. 1, Rev. 3)
(19D402627, Sh. 2, Rev. 2)

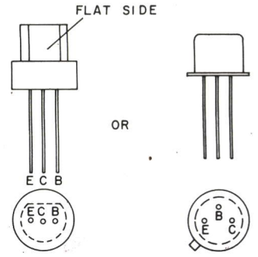
RESISTANCE READINGS

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

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



TERMINAL NUMBERING FOR J304

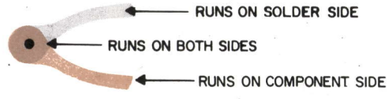


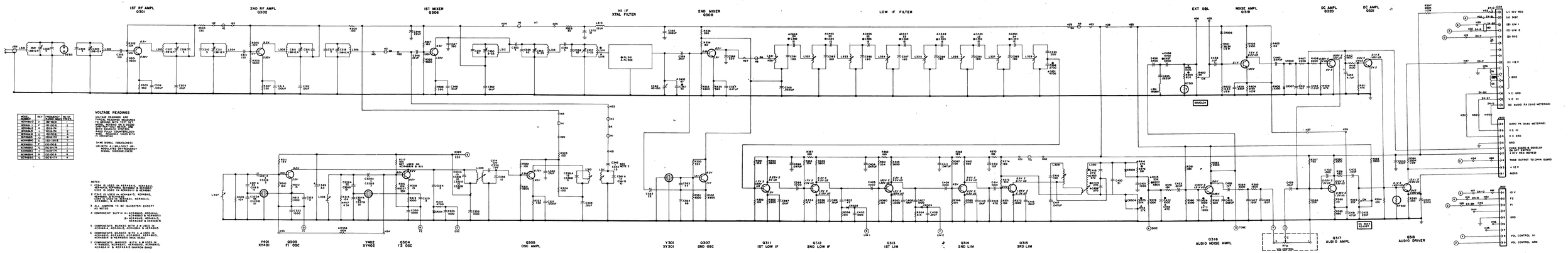
LEAD IDENTIFICATION FOR Q307, Q311-Q317 & Q319-Q321

OUTLINE DIAGRAM

132—174 MHZ RECEIVER
MODELS 4ER48A10-15 & B10-15

RC-1415E





SCHEMATIC DIAGRAM

132—174 MHz RECEIVER
MODELS 4ER48A10-15 & 4ER48B10-15

19R620752, Rev. 17

(Cont'd from front of RC-1415)

SYMBOL	G-E PART NO	DESCRIPTION
C395	5490008-P34	Silver mica: 200 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C396	5494481-P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C397	19B209243-P1	Polyester: .01 pf ±20%, 50 VDCW.
C398	19B209243-P5	Polyester: .047 pf ±20%, 50 VDCW.
C399	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C401	19B209243-P1	Polyester: .01 pf ±20%, 50 VDCW.
C402	5490008-P119	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C403	5494481-P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C404	19B209243-P5	Polyester: .047 pf ±20%, 50 VDCW.
C405	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C406	19B209243-P1	Polyester: .01 pf ±20%, 50 VDCW.
C407	7491393-P1	Ceramic disc: .001 pf +100% -0%, 500 VDCW; sim to Sprague Type 1219C4.
C408	7491827-P2	Ceramic disc: .01 pf +80% -30%, 50 VDCW; sim to Sprague Type 19C180.
C409	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C410	19B209243-P1	Polyester: .01 pf ±20%, 50 VDCW.
C411	19B209243-P5	Polyester: .047 pf ±20%, 50 VDCW.
C412	19B209243-P7	Polyester: 0.1 pf ±20%, 50 VDCW.
C413	5494481-P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C414	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C415	19B209243-P1	Polyester: .01 pf ±20%, 50 VDCW.
C416	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C417	19B209243-P5	Polyester: .047 pf ±20%, 50 VDCW.
C418 and C419	5490008-P137	Silver mica: 270 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C420	5496219-P656	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef +470 PPM.
C421 and C422	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C423*	5492638-P108	Ceramic disc: 0.22 pf ±80% -20%, 12 VDCW; sim to Sprague 44C70. Added in Module 4ER84B10-13 by Rev C. Added in Module 4ER84B14, 15 by Rev D.
C424	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C425*	19B209243-P6	Polyester: .068 pf ±20%, 50 VDCW.
	19B209243-P5	In Module 4ER84A10-13 of Rev B and earlier; In Module 4ER84A14, 15 of Rev C and earlier: Polyester: .047 pf ±20%, 50 VDCW.
C426	19B209243-P7	Polyester: 0.1 pf ±20%, 50 VDCW.
C427 and C428	19B209243-P108	Polyester: 0.15 pf ±10%, 50 VDCW.
C429	19B209243-P6	Polyester: 0.15 pf ±20%, 50 VDCW.
C430	5494481-P112	Ceramic disc: .001 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
C431	5496267-P2	Tantalum: 47 pf ±20%, 6 VDCW; sim to Sprague Type 150D.
C432	19B209243-P6	Polyester: 0.15 pf ±20%, 40 VDCW.
C433	5496267-P10	Tantalum: 22 pf ±20%, 15 VDCW; sim to Sprague Type 150D.
C434*	5494481-P14	Ceramic disc: .002 pf ±10%, 1000 VDCW; sim to EMC Type JF Discap.
		In Module 4ER84A10-13 of Rev C and earlier: In Module 4ER84B10-13 of Rev C and earlier: In Module 4ER84A14,15 of Rev D and earlier: In Module 4ER84B14,15 of Rev D and earlier:
	5490008-P131	Silver mica: 150 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.

SYMBOL	G-E PART NO	DESCRIPTION
C435	5491189-P202	Polyester: .022 pf ±5%, 50 VDCW.
C436	19C300075-P 47000Ω	Polyester: 4700 pf ±5%, 100 VDCW; sim to GE Type 61F.
C437	19C300075-P 33000Ω	Polyester: 3300 pf ±5%, 100 VDCW; sim to GE Type 61F.
C438	19B209243-P7	Plyester: 0.1 pf ±20%, 50 VDCW.
C439	19B209243-P9	Polyester: 0.22 pf ±20%, 50 VDCW.
C440	19B209243-P5	Polyester: .047 pf ±20%, 50 VDCW.
C441	19B209243-P7	Polyester: 0.1 pf ±20%, 50 VDCW.
C442*	5496267-P13	Tantalum: 2.2 pf ±20%, 20 VDCW; sim to Sprague Type 150D. In Module 4ER84A10-13 of Rev D and earlier; In Module 4ER84B10-13 of Rev D and earlier; In Module 4ER84A14,15 of Rev E and earlier; In Module 4ER84B14,15 of Rev E and earlier:
	5496267-P13	Tantalum: 4.7 pf ±20%, 10 VDCW; sim to Sprague Type 150D. In Module 4ER84A10-13 of Rev B and earlier; In Module 4ER84B10-13 of Rev B and earlier; In Module 4ER84A14,15 of Rev C and earlier; In Module 4ER84B14,15 of Rev C and earlier:
	5496267-P13	Tantalum: 2.2 pf ±20%, 10 VDCW; sim to Sprague Type 150D.
C443	5496267-P10	Tantalum: 22 pf ±20%, 15 VDCW; sim to Sprague Type 150D.
C444	5496219-P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C445 thru C449	5496219-P47	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C450	5496219-P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C451	19C300075-P 47000Ω	Polyester: 4700 pf ±5%, 100 VDCW; sim to GE Type 61F.
C452	5496219-P55	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef 0 PPM.
C453 and C454	5490008-P37	Silver mica: 270 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C455	7774750-P1	Ceramic disc: .00047 pf ±100% -0%, 500 VDCW.
C457	7491393-P1	Ceramic disc: .001 pf +100% -0%, 500 VDCW; sim to Sprague 1219C4.
C458	19C300075-P 47000Ω	Polyester: 4700 pf ±5%, 100 VDCW; sim to GE Type 61F.
C459*	5496267-P5	Tantalum: 4.7 pf ±20%, 10 VDCW; sim to Sprague Type 150D. Added in Module 4ER84A10-13 by Rev E. Added in Module 4ER84B10-13 by Rev E. Added in Module 4ER84A14,15 by Rev F. Added in Module 4ER84B14,15 by Rev F.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR301	7777166-P3	Germanium; sim to Type 1N90.
CR302 thru CR303	4038058-P1	Germanium.
CR304 thru CR305	1N4115250-P1	Silicon.
CR306	5494922-P1	Silicon; sim to Type 1N456.
CR307 and CR308	1N4115250-P1	Silicon.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS301	19B209067-P1	Lamp, glow: 0.3 ma; sim to GE NE-2T.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL301	19C304219-G1	Bandpass, 10.7 MHz.
FL302	19C304219-G3	Bandpass, 10.7 MHz.
		- - - - - - JACKS AND RECEPTACLES - - - - - -
J301	7140941-P9	Jack, phono type; phen; sim to Cinch 14B20938.
J302 and J303	19B209303-P1	Connector, phen: 9 pins.
J304	19B205689-G2	Connector: 16 contacts.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L301	19B205530-G1	Coil.
L302 thru L305	19B205530-G2	Coil.
L306	19B205530-G3	Coil.
L307 and L308	19A121085-G1	Coil. Includes tuning slug 19B200497-P2.
L309	19A115300-P2	Inductor, RFC: 15 µh ±10%, 1.2 ohms DC res max; sim to Jeffers 4421-9.
L310	19B205236-G1	Coil. Includes tuning slug 19B200497-P2.
L311	19B205239-G1	Coil. Includes tuning slug 19B200497-P2.
L312	19B205240-G1	Coil. Includes tuning slug 19B200497-P2.
L313	19B205324-G2	Coil.
L314	19B205324-G3	Coil.
L315	7488079-P18	Choke, RF: 15 µh ±10%, 1.2 ohms DC res max; sim to Jeffers 4421-9.
L316	19B205224-G4	Coil.
L321 * and L322 *	19C311181-G3	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L323 *	19C311181-G4	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L324 *	19C311181-G3	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L325 *	19C311181-G4	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L326 *	19C311181-G3	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303063-G6	Coil. Includes tuning slug 4038368-P1.
L327 *	19C311181-G4	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L328 *	19C311181-G3	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L329 *	19C311181-G1	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G6	Coil. Includes tuning slug 4038368-P1.
L330 *	19C311181-G2	Coil. Includes tuning slug 4038368-P1. In Module 4ER84A10, 11, 13, B10, 11, 13 of REV E and Module 4ER84A12, 14, 15, B12, 14, 15 of REV F and earlier.
	19C303062-G5	Coil. Includes tuning slug 4038368-P1.
L331	19B209405-P1	Reactor, audio freq: 142 mh ±5% at 0.1 v thru 0.27 v; sim to Aladdin 405-101.
		- - - - - - - - TRANSISTORS - - - - - - - -
Q301 and Q302	19A115342-P1	Silicon, NPN.
Q303* and Q304*	19A115925-P1	Silicon, NPN. In Module 4ER84A10-13, 4ER84B10-13 of Rev A and earlier; In Module 4ER84A14, 15, 4ER84B14, 15 of Rev B and earlier:
	19A115342-P1	Silicon, NPN.
Q305 and Q306	19A115342-P1	Silicon, NPN.

SYMBOL	G-E PART NO	DESCRIPTION
Q307	19A115889-P1	Silicon, NPN.
Q308	19A115245-P1	Silicon, NPN.
Q311 thru Q315	19A115889-P1	Silicon, NPN.
Q316 thru Q317	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q318	19A115300-P2	Silicon, NPN: sim to Type 2N3053.
Q319	19A115889-P1	Silicon, NPN.
Q320	19A115123-P1	Silicon, NPN: sim to Type 2N2712.
Q321		
		- - - - - - - - RESISTORS - - - - - - - -
R301	3R152-P563K	Composition: 56000 ohms ±10%, 1/4 w.
R302	3R152-P223K	Composition: 22,000 ohms ±10%, 1/4 w.
R303	3R152-P561K	Composition: 560 ohms ±10%, 1/4 w.
R304	3R152-P331K	Composition: 330 ohms ±10%, 1/4 w.
R305	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R306	3R152-P223K	Composition: 22,000 ohms ±10%, 1/4 w.
R307	3R152-P331K	Composition: 330 ohms ±10%, 1/4 w.
R308	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
R309 and R310	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R311	3R152-P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R312	3R152-P150K	Composition: 15 ohms ±10%, 1/4 w.
R313	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R314	3R152-P472K	Composition: 4700 ohms ±10%, 1/4 w.
R315 and R316	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R317	3R152-P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R318	3R152-P150K	Composition: 15 ohms ±10%, 1/4 w.
R319	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R320	3R152-P221K	Composition: 220 ohms ±10%, 1/4 w.
R321	3R152-P392K	Composition: 3900 ohms ±10%, 1/4 w.
R322	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R323	3R152-P431K	Composition: 430 ohms ±10%, 1/4 w.
R324 and R325	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
R326	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R327	3R152-P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R328	3R152-P392K	Composition: 3900 ohms ±10%, 1/4 w.
R329	3R152-P330K	Composition: 33 ohms ±10%, 1/4 w.
R330	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R331	3R152-P822K	Composition: 8200 ohms ±10%, 1/4 w.
R332	3R152-P392K	Composition: 3900 ohms ±10%, 1/4 w.
R333	3R152-P683K	Composition: 6800 ohms ±10%, 1/4 w.
R334 and R335	3R152-P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R336	3R152-P563K	Composition: 56000 ohms ±10%, 1/4 w.
R337	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R338	3R152-P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R350	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R351	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R352	3R152-P222K	Composition: 2200 ohms ±10%, 1/4 w.
R353	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R354	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.

SYMBOL	G-E PART NO	DESCRIPTION
R355	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R356	3R152-P222K	Composition: 2200 ohms ±10%, 1/4 w.
R357	3R152-P181K	Composition: 180 ohms ±10%, 1/4 w.
R358	3R152-P53J	Composition: 51,000 ohms ±5%, 1/4 w.
R359	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R360	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R361	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R362	3R152-P181K	Composition: 180 ohms ±10%, 1/4 w.
R363	3R152-P222K	Composition: 2200 ohms ±10%, 1/4 w.
R364	3R152-P53J	Composition: 51,000 ohms ±5%, 1/4 w.
R365	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R366	3R152-P123K	Composition: 12,000 ohms ±10%, 1/4 w.
R367	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R368	3R152-P181K	Composition: 180 ohms ±10%, 1/4 w.
R369	3R152-P53J	Composition: 5100 ohms ±5%, 1/4 w.
R370	3R152-P181K	Composition: 180 ohms ±10%, 1/4 w.
R371	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R372	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R373	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R374	3R152-P181K	Composition: 180 ohms ±10%, 1/4 w.
R375 and R376	3R152-P53J	Composition: 51,000 ohms ±5%, 1/4 w.
R377	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.
R378	3R152-P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R379	3R152-P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R380	3R152-P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R381	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R382	3R152-P221J	Composition: 220 ohms ±5%, 1/4 w.
R383 and R384	3R152-P332K	Composition: 3300 ohms ±10%, 1/4 w.
R390	3R152-P332K	Composition: 3300 ohms ±10%, 1/4 w.
R391	3R152-P431K	Composition: 430 ohms ±10%, 1/4 w.
R392(R400)	19B209320-P1	Resistor assembly. Variable, carbon film, linear taper. (R392) 20,000 ohms ±20%, 0.25 w; (R400) 5000 ohms ±20%, 0.25 w; sim to Centralab Series 5 (Type 71-23).
R393	3R152-P392K	Composition: 3900 ohms ±10%, 1/4 w.
R394	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R395	3R152-P331K	Composition: 330 ohms ±10%, 1/4 w.
R396 and R397	5495948-P444	Deposited carbon: 0.28 megohm ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R399*	3R152-P62J	Composition: 820 ohms ±5%, 1/4 w. In Module 4ER84A10-13 of Rev D and earlier; In Module 4ER84B10-13 of Rev D and earlier; In Module 4ER84A14,15 of Rev E and earlier; In Module 4ER84B14,15 of Rev E and earlier:
	3R152-P51J	Composition: 510 ohms ±5%, 1/4 w.
R400		(See R392).
R401	5495948-P357	Deposited carbon: 38,300 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R402	5495948-P313	Deposited carbon: 13,300 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R403	3R152-P33J	Composition: 3300 ohms ±5%, 1/4 w.

SYMBOL	G-E PART NO	DESCRIPTION
R404	5495948-P233	Deposited carbon: 2150 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R405	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R406	3R152-P333J	Composition: 3300 ohms ±5%, 1/4 w.
R407	3R152-P222K	Composition: 2260 ohms ±10%, 1/4 w.
R408	3R152-P422J	Composition: 8200 ohms ±5%, 1/4 w.
R409	3R152-P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R410*	3R152-P182J	Composition: 1800 ohms ±5%, 1/4 w. In Module 4ER84A10-13 of Rev D and earlier: In Module 4ER84B10-13 of Rev D and earlier; In Module 4ER84A14,15 of Rev E and earlier; In Module 4ER84B14,15 of Rev E and earlier:
	3R152-P362J	Composition: 3600 ohms ±5%, 1/4 w.
R411	3R152-P473J	Composition: 47,000 ohms ±5%, 1/4 w.
R412	3R152-P561K	Composition: 560 ohms ±10%, 1/4 w.
R413 and R414	3R152-P273K	Composition: 27,000 ohms ±10%, 1/4 w.
R415	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R416*	3R152-P133J	Composition: 1300 ohms ±5%, 1/4 w. In Module 4ER84A10-13 of Rev D and earlier; In Module 4ER84B10-13 of Rev D and earlier; In Module 4ER84A14,15 of Rev E and earlier; In Module 4ER84B14,15 of Rev E and earlier:
	3R152-P911J	Composition: 910 ohms ±5%, 1/4 w.
R417*	3R152-P43J	Composition: 4300 ohms ±5%, 1/4 w. Added in Module 4ER84A14,15 by Rev B. Added in Module 4ER84B14,15 by Rev B.
R418*	3R152-P152J	Composition: 1500 ohms ±5%, 1/4 w. In Module 4ER84A10-13 of Rev E and earlier; Added in Module 4ER84B10-13 by Rev E. Added in Module 4ER84A14,15 by Rev F. Added in Module 4ER84B14,15 by Rev F.
		- - - - - - - - THERMISTORS - - - - - - - -
RT301*	5490828-P38	Bid: 1400 ohms ±5%, 1 w max; sim to Global Type 492K. In Module 4ER84A10-13 of Rev D and earlier; In Module 4ER84B10-13 of Rev D and earlier; In Module 4ER84A14,15 of Rev E and earlier; In Module 4ER84B14,15 of Rev E and earlier:
	5490828-P34	Bid: 1800 ohms ±5%, 1 w max; sim to Global Type 723B-M.
RT302	5490828-P35	Bid: 3800 ohms ±5%, 1 w max; sim to Global Type 723B-M.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY401 and XY402	5490277-P1	Transistor, phen: 4 contacts; sim to Elco 3303,
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y301	19A110215-P1	Quartz: freq 10245 KHz, temp range -30°C to +90°C.
Y401 and Y402	19B206221-P1	Quartz: freq range 28.3 to 60 MHz, temp range -30°C to +90°C. (When reordering give GE Part Number and specify exact frequency needed). (Crystal frequency = (COF ÷10.7) ± 3).
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19B205369-G1	Top cover.
	19A131088-P1	Can.
	4038844-G1	Can. (Used with L321-330).
	4036555-P1	Insulator, washer: nylon. (Used with Q318).
	4035306-P62	Washer, fiber. (Used with T301, FL303).

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 changes listed for that revision and those listed for previous revisions.

REV. A - To improve frequency stability of the oscillator.
Changed: C2093, C2190, C2203, C2208, C2213, C2218, C2263, C2268, C2274, C2284, C2340, C2341, and C2345.

REV. B - Models 4ER84A10, 13 & 4ER84D13, 15
To improve oscillator operation.
Deleted R313 and added R417.

REV. B - Models 4ER84A10 - 13 & 4ER84B10 - 13
REV. C - Models 4ER84A14, 15 & 4ER84B14, 15
To incorporate improved transistors.
Changed Q303 and Q304.

REV. C - Models 4ER84A10 - 13 & 4ER84B10 - 13
REV. D - Models 4ER84A14, 15 & 4ER84B14, 15
To increase maximum squelch sensitivity.
Changed C442.
In Models 4ER84A10 - 15, C425 was also changed.

REV. D - Models 4ER84A10-13 & 4ER84B10-13
REV. E - Models 4ER84A14,15 & 4ER84B14,15
To eliminate high frequency oscillations in the receiver PA caused by use of a higher gain PA transistor. Changed CR31.

REV. E - Models 4ER84A10-13 & 4ER84B10-13
REV. F - Models 4ER84A14,15 & 4ER84B14,15
To eliminate undesirable squelch thump that occurs when carrier is received. Changed C442 and R410. Added C459 and R416.

To incorporate new squelch thermistor. Changed RT301, R399 and R416.

REV. F - Models 4ER84A12 & 4ER84B12
To assure oscillator band-end tuning at 174 MHz. Changed L321R.

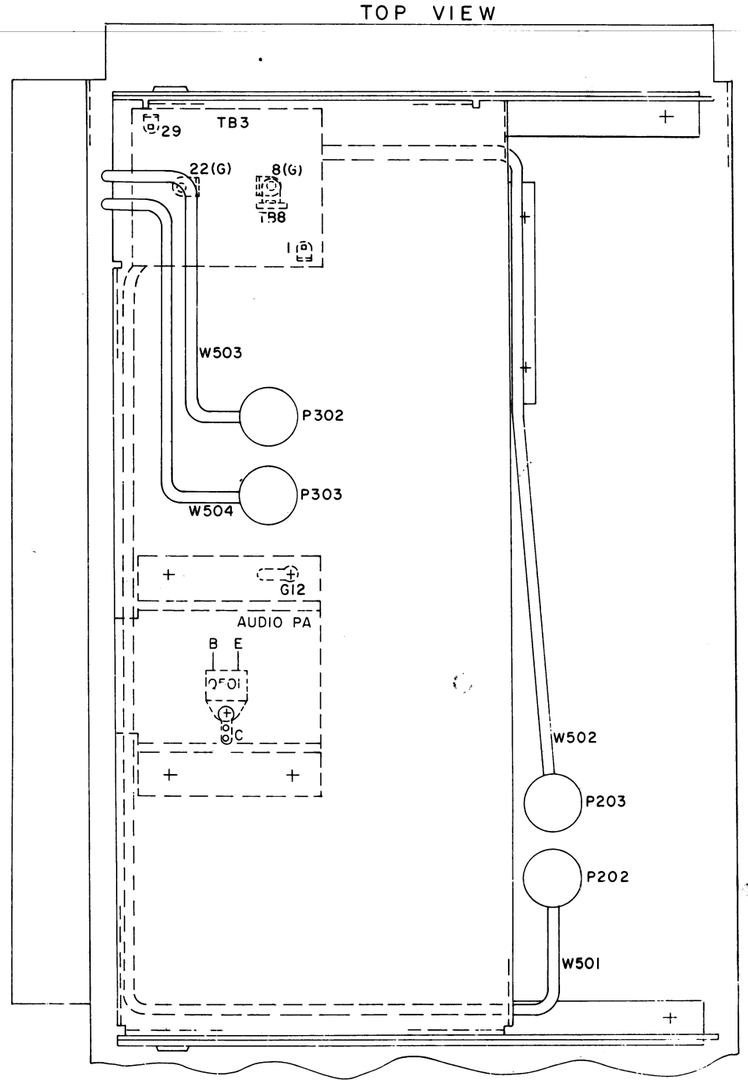
REV. F - Models 4ER84A10,11,13 & 4ER84B10,15,13

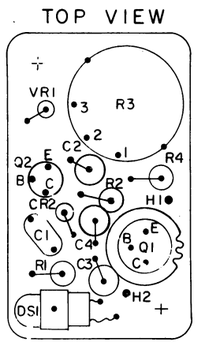
REV. G - Models 4ER84A12,14,15 & 4ER84B12,14,15
To permit use of different IF coils. Changed printed wiring board and L321 thru L330.

RESISTANCE READINGS

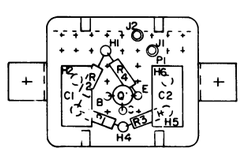
RESISTANCE READINGS ARE MEASURED FROM TB3 TO GROUND WITH A 20,000 OHM-PER-VOLT METER, AND WITH ALL EXTERNAL CONNECTIONS REMOVED – OR + SIGN SHOWS METER LEAD GROUNDED.

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

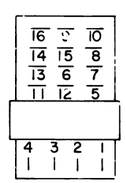




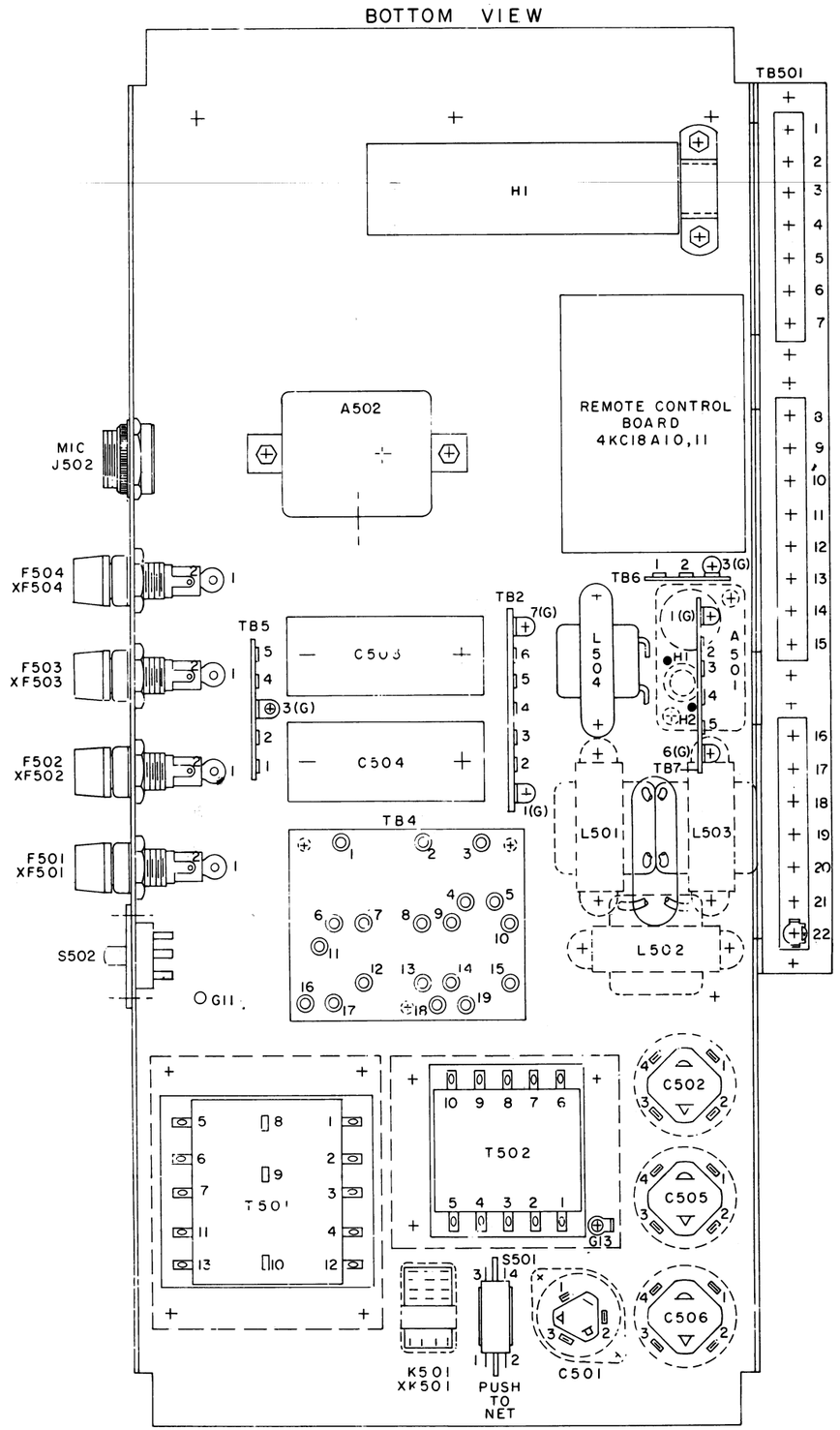
A501
10-VOLT REGULATOR



BOTTOM VIEW
OF A502

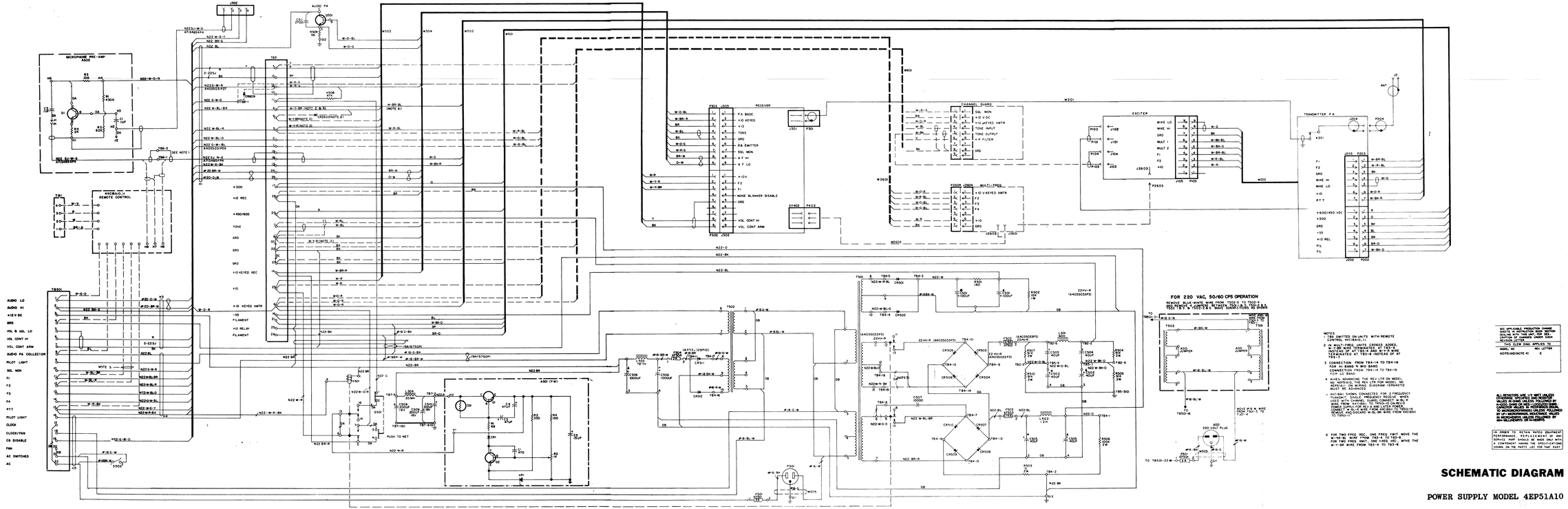


TERMINAL VIEW
OF K501



OUTLINE DIAGRAM

POWER SUPPLY MODEL 4EP51A10
(19D402812, Rev. 7)



SCHEMATIC DIAGRAM

POWER SUPPLY MODEL 4EP51A10

(19R640706, Rev. 16)

PARTS LIST

LBI-3720D

STATION POWER SUPPLY
MODEL 4EP31A10

SYMBOL	G-E PART NO.	DESCRIPTION
A501		**10 VOLT REGULATOR 19B205255-G1**
		---------- CAPACITORS ----------
C1	5494481-P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Dimcap.
C2	5496267-P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C3 and C4	5496267-P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
		-------- DIODES AND RECTIFIERS --------
CR1	4037822-P1	Silicon.
VR1	4036887-P6	Silicon, Zener.
		--------- INDICATING DEVICES ---------
DS1	4034664-P1	Lamp, incandescent: 28 v; sim to GE 2148.
		---------- TRANSISTORS ----------
Q1	19A115300-P2	Silicon, NPN; sim to Type 2N3053.
Q2	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		---------- RESISTORS ----------
R1*	3B77-P680K	Composition: 68 ohms ±10%, 1/2 w.
	3B77-P161J	In Models earlier than Rev B: Composition: 160 ohms ±5%, 1/2 w.
R2	3B77-P331J	Composition: 330 ohms ±5%, 1/2 w.
R3	19A115681-P1	Variable, wirewound: 1000 ohms ±20%, 3 w; sim to CTS Series 115.
R4	3B77-P101K	Composition: 100 ohms ±10%, 1/2 w.
A502*		**MICROPHONE PRE-AMPLIFIER 19B206663-G2** Added by Rev C
		---------- CAPACITORS ----------
C1 and C2	19A115028-P114	Polyester: 0.1 µf ±20%, 200 VDCW.
		-------- JACKS AND RECEPTACLES --------
J1 and J2	4033513-P4	Contact, electrical: sim to Bead Chain L-93-3.
		---------- PLUGS ----------
P1	4029840-P2	Contact, electrical: sim to AMP 41854.
		---------- TRANSISTORS ----------
Q1	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		---------- RESISTORS ----------
R1	3B77-P434J	Composition: 0.43 megohm, ±5%, 1/2 w.
R2	3B77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R3	3B77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R4	3B77-P203J	Composition: 2000 ohms ±5%, 1/2 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
		---------- CAPACITORS ----------
C501	5496456-P4	Electrolytic, twist-prong: 100-100 µf +100% -10%, 150-150 VDCW; sim to GE 43F.
C502	7770994-P25	Electrolytic, twist-prong: 40-40 µf +50% -10%, 450-450 VDCW; sim to Mallory Type FP.
C503 and C504	7774786-P45	Electrolytic: 40 µf +50% -10%, 450 VDCW; sim to PR Mallory TC78.
C505	7770994-P25	Electrolytic, twist-prong: 40-40 µf +50% -10%, 450-450 VDCW; sim to Mallory Type FP.
C506	7476442-P21	Electrolytic, twist-prong: 1000-1000 µf +250% -10%, 25-25 VDCW; sim to GE 43F.
C507	5494481-P21	Ceramic disc: 10,000 pf ±20%, 1000 VDCW; sim to RMC Type JF Dimcap.
C508 thru C510	19A115680-P10	Electrolytic: 200 µf +150% -10%, 18 VDCW; sim to Mallory Type TT.
C511*	5494481-P27	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Dimcap. Added by Rev D.
		-------- DIODES AND RECTIFIERS --------
CR501 and CR502	4037822-P1	Silicon.
CR503 thru CR510	4037822-P2	Silicon.
CR511 and CR512	4037822-P21	Silicon.
		---------- FUSES ----------
F501	1A16-P6	Quick blowing: 3 amps at 250 v; sim to Littelfuse 312003 or Bussman AGC-3.
F502	7487842-P2	Slow blowing: 3/8 amp at 250 v; sim to Bussman MDL-3/8.
F503	7487842-P1	Slow blowing: 1/4 amp at 250 v; sim to Bussman MDL-1/4.
F504	7487842-P27	Slow blowing: 2 amps at 125 v; sim to Bussman MDL-2.
		-------- JACKS AND RECEPTACLES --------
J502	19A116061-P1	Connector, chassis: 4 female contacts.
		---------- RELAYS ----------
K501	19C307010-P5	Armature: 12 VDC nominal, 1.5 w max operating, 130 ohms ±10% coil res, 4 form C contacts; sim to Allied Control 7154-6-413.
		---------- INDUCTORS ----------
L501	19B209346-P1	Reactor: 0.6 h min, 40 ohms max DC res, 600 VDC operating.
L502	19B209347-P1	Reactor: 1.2 h min, 50 ohms max DC res, 300 VDC operating.
L503	19B209345-P1	Reactor: .02 h min, 0.5 ohm max DC res, 15 VDC operating.
L504	5490936-P1	Reactor: .02 h min, 1.3 ohms ±10% DC res, 1.5 VDC operating.
		---------- PLUGS ----------
P501		(Part of W505).
		---------- TRANSISTORS ----------
Q501	19A115527-P1	Silicon, NPN.
		---------- RESISTORS ----------
R501	3B77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R502	3B78-P103K	Composition: 10,000 ohms ±10%, 1 w.
R503	3B79-P10GJ	Composition: 10 ohms ±5%, 2 w.
R504 and R505	3B79-P91GJ	Composition: 91,000 ohms ±5%, 2 w.

SYMBOL	G-E PART NO	DESCRIPTION
R506	3B79-P104K	Composition: 0.1 megohm ±10%, 2 w.
R507	3B79-P91GJ	Composition: 91,000 ohms ±5%, 2 w.
R508	3B77-P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R509	19B209022-P109	Wirewound: 0.56 ohm ±10%, 2 w; sim to IRC Type BWH.
R510	3B79-P91GJ	Composition: 91,000 ohms ±5%, 2 w.
		---------- SWITCHES ----------
S501	4038038-P1	Pushbutton, red: SPDT, 1 amp at 125 VAC; sim to Arrow-Hart and Hegeman 3392-A.
S502*	7145098-P1	Slide: DPDT, 0.75 amp at 125 VAC, or 0.5 amp at 125 VDC; sim to Stackpole 3S-150. Added by Rev E.
		---------- TRANSFORMERS ----------
T501	19A115698-P1	Power: 117/230 VAC.
T502	19A115699-P1	Power.
		---------- TERMINAL BOARDS ----------
TB2	7775500-P17	Phen: 7 terminals.
TB3	19B205258-G1	Board: 27 terminals.
TB4	19A122174-G1	Component board: 19 eyelets.
TB5	7775500-P11	Phen: 5 terminals.
TB6	7775500-P2	Phen: 3 terminals.
TB7	7775500-P16	Phen: 6 terminals.
TB8*	7487424-P22	Miniature, phen: 1 terminal. Added by Rev A.
TB501	7117710-P7 7117710-P6	Board. Includes the following: Phen: 7 terminals; sim to Cinch 1770. Phen: 8 terminals; sim to Cinch 1780.
		---------- CABLES ----------
W501		**CABLE 19B205266-G2** (Used in Transmitter)
		---------- PLUGS ----------
P202	19B209341-P1	Socket: 7 contacts; sim to Elo 04-720-XX.
W502		**CABLE 19B205267-G1** (Used in Transmitter)
		---------- PLUGS ----------
P203	19B209341-P1	Socket: 7 contacts; sim to Elo 04-720-XX.
W503		**CABLE 19B205265-G1** (Used in Receiver)
		---------- PLUGS ----------
P302	19B209341-P2	Socket: 9 contacts; sim to Elo 04-930-XX.
W504		**CABLE 19B205264-G2** (Used in Receiver)
		---------- PLUGS ----------
P303	19B209341-P2	Socket: 9 contacts; sim to Elo 04-930-XX.
W505	19A122527-G2	Cable: includes 3-pin socket (P501).
		---------- SOCKETS ----------
XF501 thru XF504	19B209005-P1	Fuseholder, post type, phen: 15 amps at 250 v; sim to Littelfuse 342012.
XK501	5491595-P5	Relay: 16 contacts; sim to Allied Control 30054-2.

SYMBOL	G-E PART NO	DESCRIPTION
		ASSOCIATED ASSEMBLIES
		POWER CABLE 19A122527-G1
		---------- MISCELLANEOUS ----------
	5490059-P1	Cable, power: approx 36 inches, includes 3-pin socket.
		ANTENNA CABLE 19A122133-G3
		---------- MISCELLANEOUS ----------
	2B22-P3	Receptacle, panel: coaxial. Signal Corps SO-239 or sim to Amphenol 83-1R.
	5491689-P69	Cable, RF: approx 48 inches, includes phono-type plug.
		---------- MISCELLANEOUS ----------
	4035439-P1	Heat sink, transistor: sim to Birtcher 3AL-035-2B. (Used with Q1 in A501).
	4035711-P4	Clip, spring tension: sim to Augat Brothers 6007-8-CT. (Used with DS1 in A501).
	4036555-P1	Insulator, washer: nylon. (Used with Q1 in A501).
	4038574-P11	Stand-off. (Mounts TB4).
	7121396-P4	Retainer, capacitor: phen. (Used with C501).
	5491595-P9	Retainer, spring. (Used with K501).

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 4EP31A10

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

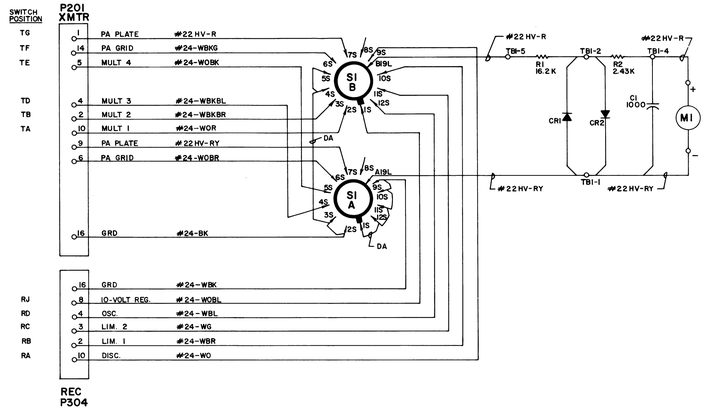
REV. B - To improve operation of 10-volt regulator A501. Changed R1.

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.

TEST METER OPTION

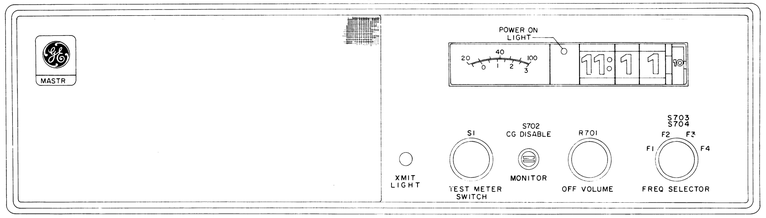


IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

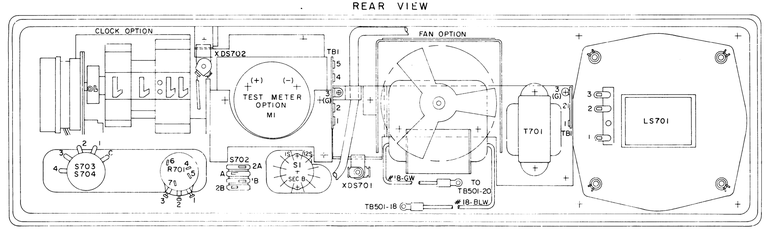
ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS: CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR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

(19C311061, Rev. 2)

FRONT VIEW

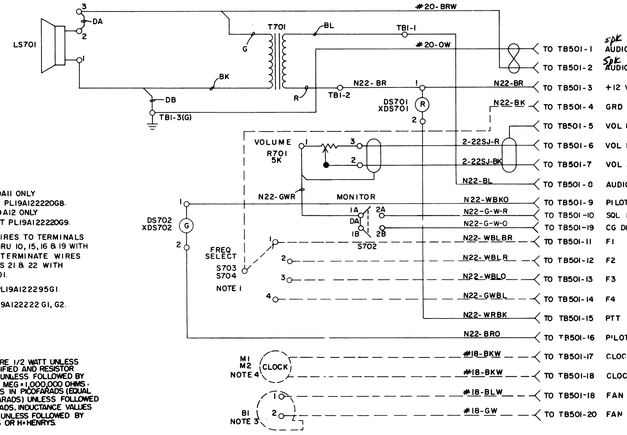


REAR VIEW



(19D402814, Rev. 5)

CONTROL UNIT SCHEMATIC



NOTES:
1. S703 IN 4EC69A11 ONLY
   TWO FREQ. KIT PL19A12222068.
   S704 IN 4EC69A12 ONLY
   FOUR FREQ. KIT PL19A12222069.
2. TERMINATE WIRES TO TERMINALS 1 THRU 3, 5 THRU 10, 15, 16 & 19 WITH 19B209260P103. TERMINATE WIRES TO TERMINALS 21 & 22 WITH 19B209268P101.
3. BLOWER KIT PL19A12229561
4. CLOCK KIT PL19A12222 61, 62.

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

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. 5)

SCHEMATIC & OUTLINE DIAGRAM

DESK TOP CONTROL UNIT MODEL 4EC69A10-12

(RC-1421E)

PARTS LIST

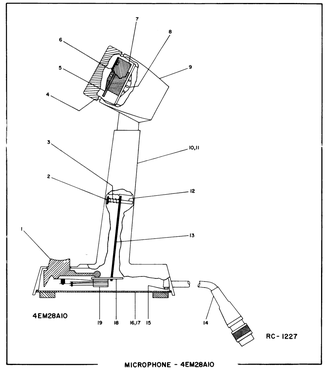
LBI-37228
DESK STATION CONTROL UNIT
MODEL 4EC69A10 (PL-19D402659-G1) (1 FREQUENCY)
MODEL 4EC69A11 (PL-19D402659-G1) (2 FREQUENCY)
(PL-19A122220-G8)
MODEL 4EC69A12 (PL-19D402659-G1) (4 FREQUENCY)
(PL-19A122220-G9)

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - **INDICATING DEVICES** - - - - - - - -
DS701 and DS702	19C307037-P19	Lamp, incandescent: 14 v; sim to GE 756.
		- - - - - - - - - **LOUDSPEAKERS** - - - - - - - - -
LS701	19B209101-P1	Permanent magnet, 5-inch: 2-1/4 w voice input operating; sim to Cletron X10271.
		- - - - - - - - - - **RESISTORS** - - - - - - - - - -
R701*	5496870-P23	Variable, carbon film: 5000 ohms ±20%; sim to Mallory LC(SK).
	5496870-P13	In Models earlier than Rev B: Resistor/switch: includes Resistor, variable, carbon film, 5000 ohms ±20%, 0.5 w; Switch (S701), rotary, DPDT, 6 amps at 125 VAC; sim to Mallory LC(SK)DAC-2.
		- - - - - - - - - - **SWITCHES** - - - - - - - - - -
S701*		(Part of R701). Deleted by Rev B.
S702*	19B209139-P6	Lever: 3 amps at 120 VAC, 1 form A contact locking, 1 form A contact momentary; sim to Switchcraft Series 203-1023.
	19B209139-P3	In Models earlier than Rev A: Lever: 3 amps at 120 VAC, 1 form A contact momentary; sim to Switchcraft Series 28201.
		- - - - - - - - - **TRANSFORMERS** - - - - - - - - -
T701	19A115612-P1	Audio frequency: 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-P2	Phen: 3 terminals.
		- - - - - - - - - - **SOCKETS** - - - - - - - - - -
XDS701 and XDS702	19B209342-P1	Lampholder: sim to Leecraft 7-04.
		- - - - - - - - - **MISCELLANEOUS** - - - - - - - - -
	19B205292-P1	Window, clear. (Used in front of clock and meter).
	19A115678-P1	Knob, push-on: black. (Used with R701).
	19B204949-P1	Jewel: red. (Used with DS701).
		MODIFICATION KIT **PL-19A122220-G8 (MODEL 4EC69A11) (2 FREQ)** **PL-19A122220-G9 (MODEL 4EC69A12) (4 FREQ)**
		- - - - - - - - - - **SWITCHES** - - - - - - - - - -
S703	19B204441-G2	Rotary: 1 pole, 2 positions, non-shorting contacts, 1 amp at 115 VAC or 28 VDC; sim to Grayhill Series 24 (modified).
S704	19B204441-G3	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** **PL-19A122222-G2**
		- - - - - - - - - - **METERS** - - - - - - - - - -
M1	19B205374-G1	Clock, direct reading: 110 VAC, 60 hertz; sim to Pennwood Numechron 19-128.

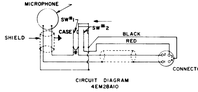
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
		12 HOUR CLOCK **PL-19A122222-G1**
		- - - - - - - - - - **METERS** - - - - - - - - - -
M2	19B205374-G4	Clock, direct reading: 110 VAC, 60 hertz; sim to Pennwood Numechron 19-248R-AR/PM.
		METER KIT **PL-19A122134-G1**
		- - - - - - - - - - **CAPACITORS** - - - - - - - - - -
C1	5494481-P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - **DIODES AND RECTIFIERS** - - - - - - - -
CR1 and CR2	5494922-P1	Silicon; sim to Type 1N456.
		- - - - - - - - - - **METERS** - - - - - - - - - -
M1	19A115716-P1	Panel, DC: -10/0/+50 µa mechanism.
		- - - - - - - - - - **RESISTORS** - - - - - - - - - -
R1	5493948-P321	Deposited carbon: 16,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CDL/2NR.
R2	5493948-P238	Deposited carbon: 2430 ohms ±1%, 1/2 w; sim to Texas Instrument Type CDL/2NR.
		- - - - - - - - **TERMINAL BOARDS** - - - - - - - -
TB1	7775500-P11	Phen: 5 terminals.
		- - - - - - - - - - **CABLES** - - - - - - - - - -
W1		**CABLES** **PL-19C311056-G1**
	P201	19A122278-G1 - - - - - - - - - - **PLUGS** - - - - - - - - - - Connector: 13 terminals.
	P304	19A122278-G1 Connector: 13 terminals.
		- - - - - - - - - - **SWITCHES** - - - - - - - - - -
S1	5495454-P24	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 **PL-19A122295-G1**
		- - - - - - - - - - **MOTORS** - - - - - - - - - -
B1	19B205436-G1	AC: 115 VRMS at 60 Hz continuous, .0017 hp, 2400 rpm max, cw rotation.
	19B209068-P1	Impeller, fan: axial, cw rotation. (Part of B1).
		MASK PLATE **PL-19B205401-G2 CLOCK AND METER** **PL-19B205401-G3 12/24 HOUR CLOCK** **PL-19B205401-G4 METER**
		- - - - - - - - - - **MISCELLANEOUS** - - - - - - - - - -
	19A122210-P1	Lens: green.
	19A205291-P1	Plate. (Used in 19B205401-G2).
	19A205291-P2	Plate. (Used in 19B205401-G3).
	19A205291-P3	Plate. (Used in 19B205401-G4).

SYMBOL	G-E PART NO	DESCRIPTION
		MAGNETIC CONTROLLED DESK MICROPHONE **MODEL 4EM28A10** **(19C307105-P1)**
		MECHANICAL PARTS (SEE RC-1227)
1		Pushbutton. Shure Brothers BP-68.
2		Washer. Shure Brothers 30A697.
3		Spring. Shure Brothers 44A149.
4		Cap and grille. Shure Brothers BP-72.
5		Magnetic controlled cartridge. Shure Brothers BP-13.
6		Washer. Shure Brothers 34A223.
7		Shield. Shure Brothers 53A528.
8		Damping pad. Shure Brothers 20B33.
9		Housing. (Part of item 4).
10		(Part of item 4).
11		(Not used).
12		Pin. Shure Brothers 31A848.
13		Bracket. Shure Brothers 53A637.
14		Cable and plug. Shure Brothers BP-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 BP-70.



MICROPHONE - 4EM28A10



CIRCUIT DIAGRAM
4EM28A10

NOTES:
1 SWITCH *1 OF THE MICROPHONE CIRCUIT MUST CLOSE FIRST AND OPEN LAST.

*JUMPER MAY BE REMOVED FOR PARALLEL OR SPECIAL OPERATION

CIRCUIT DIAGRAM
MODEL 4EM28B10

(RC-302, Sh. 2)

PARTS LIST

MAGNETIC CONTROLLED DESK MICROPHONE
MODEL 4EM28A10 (19C307105-P1)
(SEE RC-1227)

SYMBOL	G-E PART NO.	DESCRIPTION
		MECHANICAL PARTS MODEL 4EM28A10
1		Pushbutton. Shure Brothers 65A605A.
2		Washer. Shure Brothers 30A697.
3		Spring. Shure Brothers 44A149.
4		Cap and grille. Shure Brothers 90A1019.
5		Magnetic controlled cartridge. Shure Brothers 99A86.
6		Washer. Shure Brothers 34A223.
7		Shield. Shure Brothers 53A528.
8		Damping pad. Shure Brothers 20B33.
9		Housing. Shure Brothers 90A1017.
10		Base. Shure Brothers 90A1016.
11		(Not used).
12		Pin. Shure Brothers 31A848.
13		Bracket. Shure Brothers 53A637.
14		Cable and plug. Shure Brothers 90A1018.
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 90BP70.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

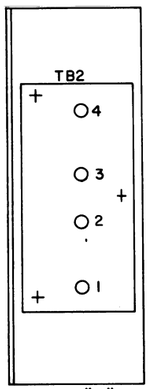
PRODUCTION CHANGES

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.

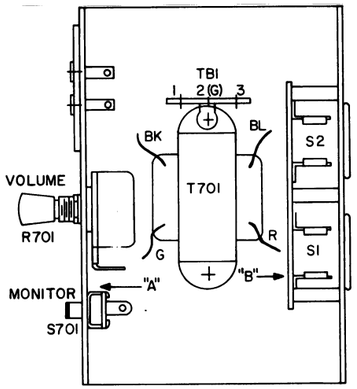
REV. A - Models 4EC69A10 - 12

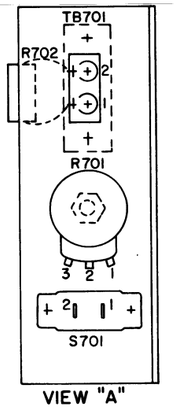
To make Channel Guard disable a standard function. Changed S702.

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



VIEW "B"





VIEW "A"

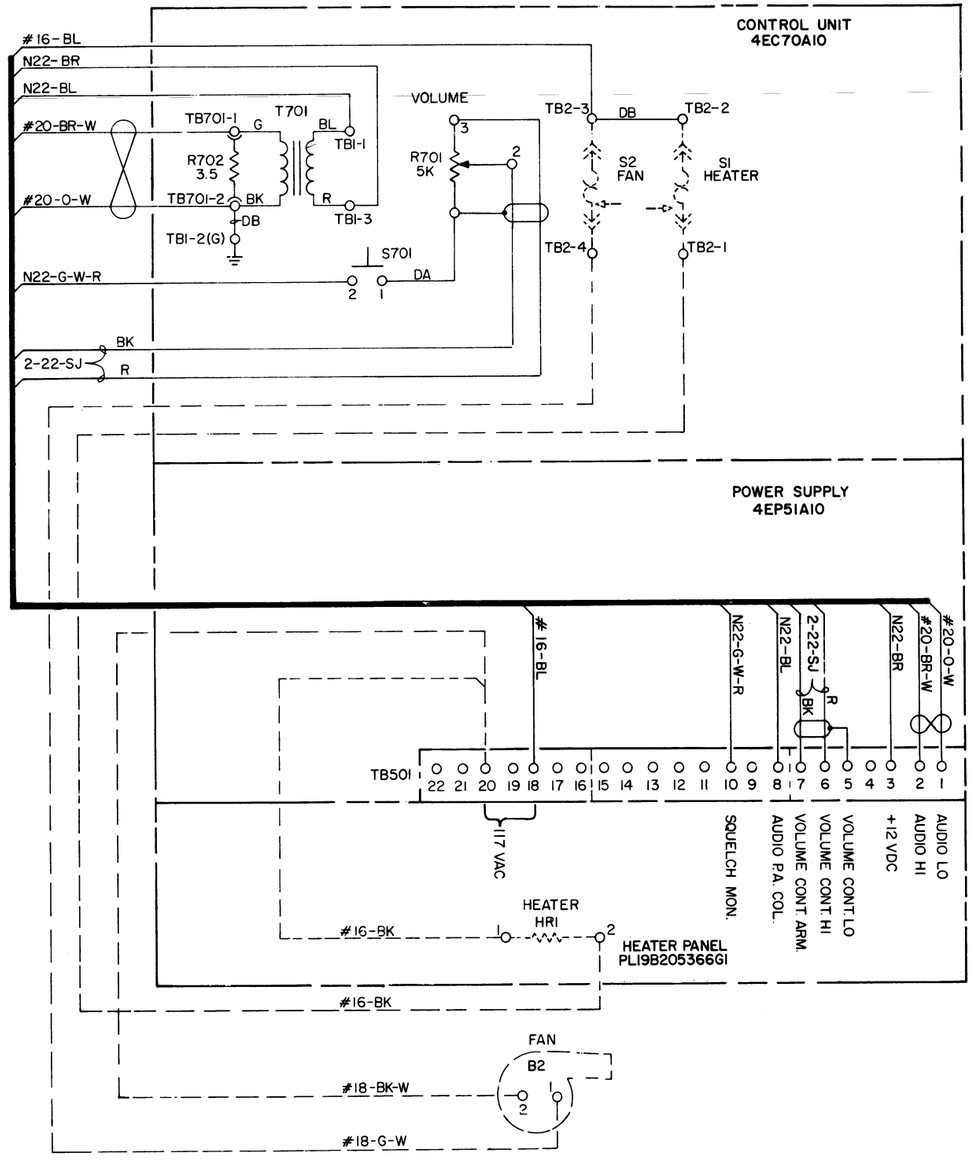
(19C311223, Rev. 0)

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

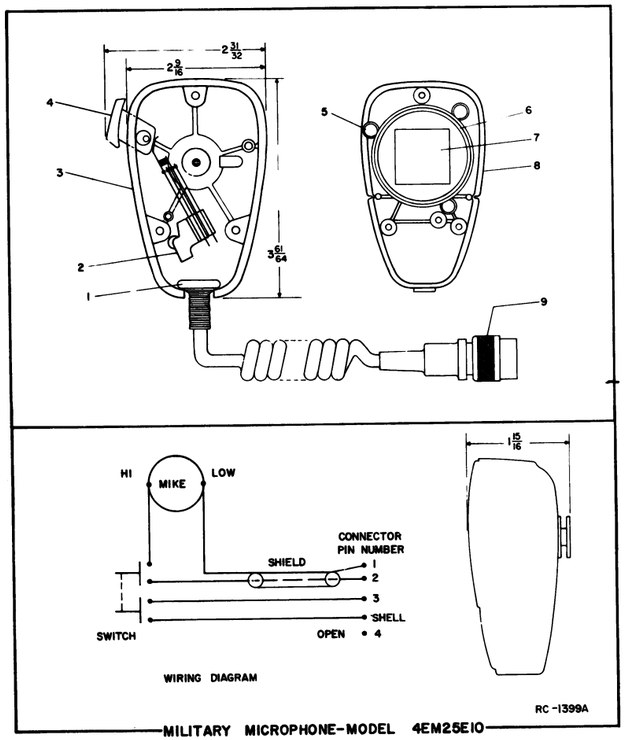
LBI-3721A

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

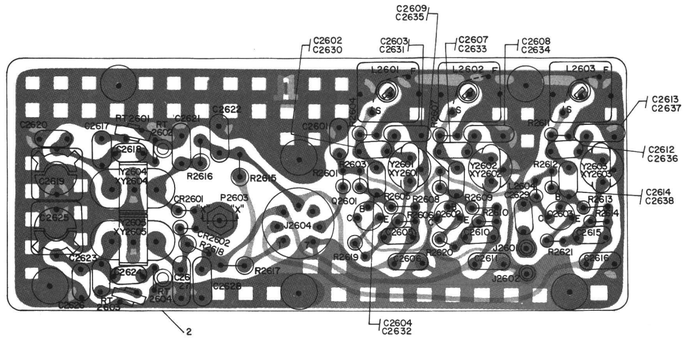
SYMBOL	G-E PART NO.	DESCRIPTION
		---------- RESISTORS ----------
R701	5496870-P14	Variable, carbon film: 5000 ohms ±20%, 0.5 w; sim to Mallory LC(5K).
R702	7141971-G1	Resistor kit: wirewound, 3.5 ohms ±10%, 4 w; sim to Clarostat Type C4GJ (modified).
		---------- SWITCHES ----------
S701	4031922-P1	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.



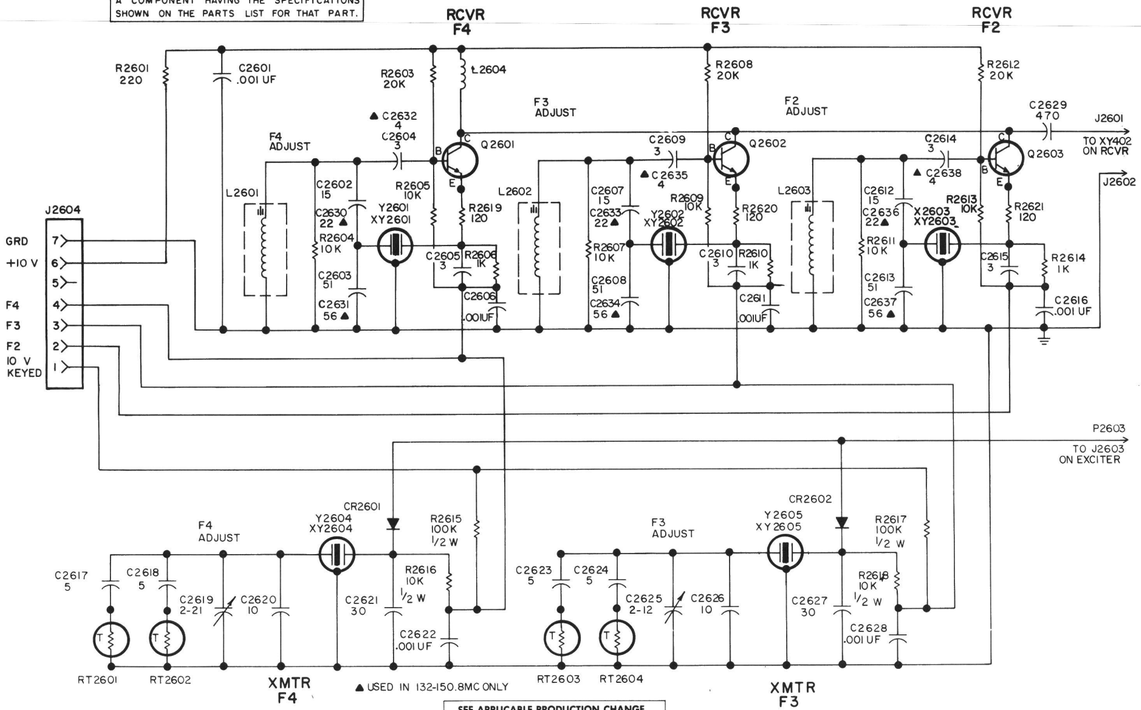
MILITARY MICROPHONE-MODEL 4EM25E10



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

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

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



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

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

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4EG22F10	C
4EG22F11	C

ECP-221

(19C303926, Rev. 6)

SCHEMATIC & OUTLINE DIAGRAM

FOUR-FREQUENCY OSCILLATOR BOARD
MODEL 4EG22F10, 11

RC-1418D

PARTS LIST

LBI-3715C

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

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

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

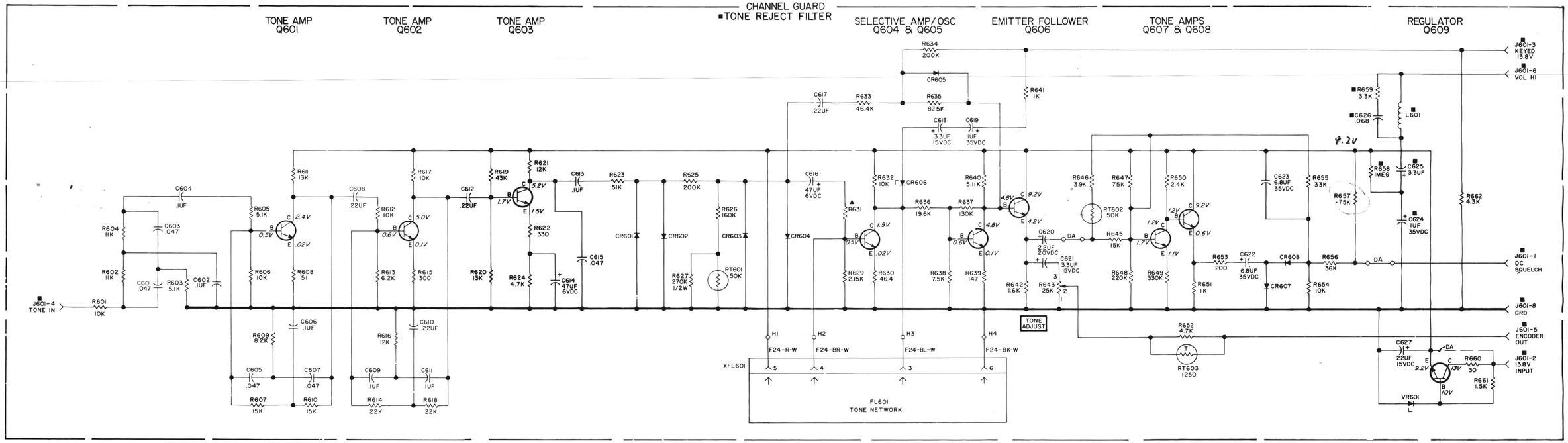
PRODUCTION CHANGES

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

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

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

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



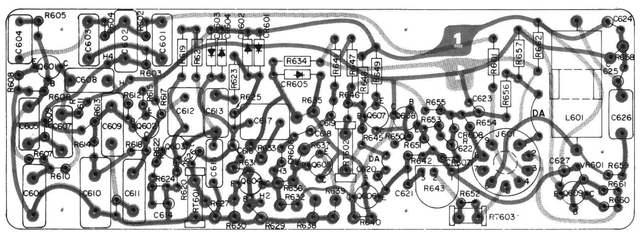
RESISTANCE READING

RESISTANCE READINGS ARE TYPICAL READINGS MEASURED FROM JACK PINS TO GROUND (PIN 8) WITH A 20,000 OHMS-PER-VOLT METER, AND WITH ALL LEADS UNPLUGGED.

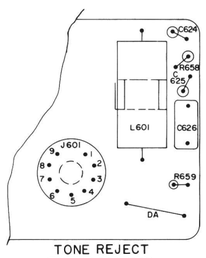
J601 PIN NO	1	2	3	4	5	6	7	8	9
RESISTANCE	∞	10K	4.3K	∞	25K	1 MEG		GRD	∞

XFL601

XFL601



(19C311219, Rev. 3)
(19B205398, Sh. 1, Rev. 1)
(19B205398, Sh. 2, Rev. 1)



TONE REJECT FILTER OPTION

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

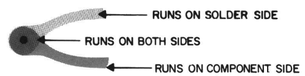
MODEL NO	REV LETTER
4EK14A10	C
19C303989G2	

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR PIN TO GROUND WITH A 20,000 OHM-PER-VOLT METER, AND WITH NO TONE INPUT AND THE ENCODER NOT KEYED.

(19R620757, Rev. 7)

▲ VALUE OF R631 IS DETERMINED BY FREQUENCY (SEE TEST SPECS)



SCHEMATIC & OUTLINE DIAGRAM

CHANNEL GUARD BOARD
MODEL 4EK14A10

RC-1419H

PARTS LIST

CHANNEL GUARD BOARD
MODEL 4EK14A10
(19C303989-G1)

SYMBOL	G-E PART NO.	DESCRIPTION
		----------CAPACITORS----------
C601	5491189-P204	Polyester: .047 µf ±5%, 50 VDCW.
C602	5491189-P206	Polyester: 0.1 µf ±5%, 50 VDCW.
C603	5491189-P204	Polyester: .047 µf ±5%, 50 VDCW.
C604	19B209243-P7	Polyester: 0.1 µf ±20%, 40 VDCW.
C605	5491189-P204	Polyester: .047 µf ±5%, 50 VDCW.
C606	5491189-P206	Polyester: 0.1 µf ±5%, 50 VDCW.
C607	5491189-P204	Polyester: .047 µf ±5%, 50 VDCW.
C608	19B209243-P9	Polyester: 0.22 µf ±20%, 40 VDCW.
C609	5491189-P206	Polyester: 0.1 µf ±5%, 50 VDCW.
C610	5491189-P208	Polyester: 0.22 µf ±5%, 50 VDCW.
C611	5491189-P206	Polyester: 0.1 µf ±5%, 50 VDCW.
C612	19B209243-P9	Polyester: 0.22 µf ±20%, 40 VDCW.
C613	19B209243-P7	Polyester: 0.1 µf ±20%, 40 VDCW.
C614	5496267-P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C615	19B209243-P5	Polyester: .047 µf ±20%, 40 VDCW.
C616	5496267-P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C617	19B209243-P9	Polyester: 0.22 µf ±20%, 40 VDCW.
C618	5496267-P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C619	5496267-P17	Tantalum: 1 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C620	5496267-P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C621	5496267-P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C622 and C623	5496267-P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C624	5496267-P417	Tantalum: 1 µf ±5%, 35 VDCW; sim to Sprague Type 150D.
C625	5496267-P409	Tantalum: 3.3 µf ±5%, 15 VDCW; sim to Sprague Type 150D.
C626	5491189-P205	Polyester: .068 µf ±5%, 50 VDCW.
C627	5496267-P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		-------DIODES AND RECTIFIERS-------
CR601 thru CR605	5494922-P1	Silicon; sim to Type 1N456.
CR606	4036887-P3	Silicon, Zener.
CR607 thru CR609	5494922-P1	Silicon; sim to Type 1N456.
		---------- FILTERS ----------
FL601		TONE FREQUENCY NETWORK 19B205280
	19B205280-G1	71.9 Hz
	19B205280-G2	77.0 Hz
	19B205280-G3	82.5 Hz
	19B205280-G4	88.5 Hz
	19B205280-G5	94.8 Hz
	19B205280-G6	100.0 Hz
	19B205280-G7	103.5 Hz
	19B205280-G8	107.2 Hz
	19B205280-G9	110.9 Hz
	19B205280-G10	114.8 Hz
	19B205280-G11	118.8 Hz
	19B205280-G12	123.0 Hz
	19B205280-G13	127.3 Hz
	19B205280-G14	131.8 Hz
	19B205280-G15	136.5 Hz
	19B205280-G16	141.3 Hz
	19B205280-G17	146.2 Hz
	19B205280-G18	151.4 Hz
	19B205280-G19	156.7 Hz
	19B205280-G20	162.2 Hz
	19B205280-G21	167.9 Hz
	19B205280-G22	173.8 Hz
	19B205280-G23	179.9 Hz
	19B205280-G24	186.2 Hz
	19B205280-G25	192.8 Hz
	19B205280-G26	203.5 Hz
		------- JACKS AND RECEPTACLES -------
J601	19B209303-P1	Connector, phen: 9 pins.
		----------INDUCTORS----------
L601	19A115690-P1	Coil, RF: 880 mh ±5%, 120 ohms ±15% DC res; sim to Artted AC5672.
		---------- TRANSISTORS ----------
Q601	19A115362-P1	Silicon, NPN; sim to Type 2N2925.
Q602 and Q603	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q604 thru Q606	19A115362-P1	Silicon, NPN; sim to Type 2N2925.
Q607*	19A115362-P1	Silicon, NPN.
	19A115123-P1	In Models earlier than Rev A: Silicon, NPN; sim to Type 2N2712.
Q608	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q609	19A115720-P1	Silicon, NPN.
		----------RESISTORS----------
R601	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R602	3R152-P113J	Composition: 11,000 ohms ±5%, 1/4 w.
R603	3R152-P512J	Composition: 5100 ohms ±5%, 1/4 w.
R604	3R152-P113J	Composition: 11,000 ohms ±5%, 1/4 w.
R605	3R152-P512J	Composition: 5100 ohms ±5%, 1/4 w.
R606	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R607	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R608	3R152-P510J	Composition: 51 ohms ±5%, 1/4 w.
R609	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R610	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R611	3R152-P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R612	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R613	3R152-P622J	Composition: 6200 ohms ±5%, 1/4 w.
R614	3R152-P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R615	3R152-P301J	Composition: 300 ohms ±5%, 1/4 w.
R616	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R617	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R618	3R152-P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R619	3R152-P433J	Composition: 43,000 ohms ±5%, 1/4 w.
R620	3R152-P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R621	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R622	3R152-P331J	Composition: 330 ohms ±5%, 1/4 w.
R623	3R152-P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R624	3R152-P472J	Composition: 4700 ohms ±5%, 1/4 w.
R625	3R152-P204J	Composition: 0.2 megohm ±5%, 1/4 w.
R626	3R152-P164J	Composition: 0.16 megohm ±5%, 1/4 w.
R627	3R77-P274J	Composition: 0.27 megohm ±5%, 1/2 w.
R629	5495948-P233	Deposited carbon: 2150 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R630	5495948-P65	Deposited carbon: 46.4 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
		NOTE The value of Resistor R631 must be obtained from the component, then find corresponding value in parts list for the correct part number.
R631	5495948-P345	Deposited carbon: 28,700 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P346	Deposited carbon: 29,400 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P347	Deposited carbon: 30,100 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P348	Deposited carbon: 30,900 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P349	Deposited carbon: 31,600 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P350	Deposited carbon: 32,400 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P351	Deposited carbon: 33,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P352	Deposited carbon: 34,000 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P353	Deposited carbon: 34,800 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P354	Deposited carbon: 35,700 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P355	Deposited carbon: 36,500 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P356	Deposited carbon: 37,400 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P357	Deposited carbon: 38,300 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P358	Deposited carbon: 39,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P359	Deposited carbon: 39,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P360	Deposited carbon: 41,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P361	Deposited carbon: 42,200 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R631	5495948-P362	Deposited carbon: 43,200 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P363	Deposited carbon: 44,200 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P364	Deposited carbon: 45,300 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P365	Deposited carbon: 46,400 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P366	Deposited carbon: 47,500 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P367	Deposited carbon: 48,700 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P368	Deposited carbon: 49,900 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R631	5495948-P369	Deposited carbon: 51,100 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R632	5495948-P301	Deposited carbon: 10,000 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R633	5495948-P365	Deposited carbon: 46,400 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R634	3R152-P204J	Composition: 0.2 megohm ±5%, 1/4 w.
R635	5495948-P389	Deposited carbon: 82,500 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R636	5495948-P329	Deposited carbon: 19,600 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R637	5495948-P412	Deposited carbon: 130,000 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R638	5495948-P285	Deposited carbon: 7500 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R639	5495948-P117	Deposited carbon: 147 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R640	5495948-P269	Deposited carbon: 5110 ohms ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R641	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
R642	3R152-P162J	Composition: 1600 ohms ±5%, 1/4 w.
R643	19B201969-P7	Variable, carbon film: 25,000 ohms ±20%, 0.1 w; sim to Centralab Series 4.
R644*	3R152-P202J	Composition: 2000 ohms ±5%, 1/4 w. Deleted by Rev A.
R645*	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
	3R152-P752J	In Models earlier than Rev A: Composition: 7500 ohms ±5%, 1/4 w.
R646	3R152-P392J	Composition: 3900 ohms ±5%, 1/4 w.
R647*	3R152-P753J	Composition: 75,000 ohms ±5%, 1/4 w.
	3R152-P563J	In Models earlier than Rev A: Composition: 56,000 ohms ±5%, 1/4 w.
R648	3R152-P224J	Composition: 0.24 megohm ±5%, 1/4 w.
R649	3R152-P331J	Composition: 330 ohms ±5%, 1/4 w.
R650	3R152-P242J	Composition: 2400 ohms ±5%, 1/4 w.
R651	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
R652	3R152-P472J	Composition: 4700 ohms ±5%, 1/4 w.
R653	3R152-P201J	Composition: 200 ohms ±5%, 1/4 w.
R654	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R655	3R152-P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R656	3R152-P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R657*	3R152-P753J	Composition: 75,000 ohms ±5%, 1/4 w.
	3R152-P104J	In Models earlier than Rev C: Composition: 0.1 megohm ±5%, 1/4 w.
R658	3R152-P105J	Composition: 1 megohm ±5%, 1/4 w.
R659	3R152-P332J	Composition: 3300 ohms ±5%, 1/4 w.
R660	3R152-P300J	Composition: 30 ohms ±5%, 1/4 w.
R661	3R152-P152J	Composition: 1500 ohms ±5%, 1/4 w.
R662	3R152-P432J	Composition: 4300 ohms ±5%, 1/4 w.
		---------- THERMISTORS ----------
RT601 and RT602	5490828-P11	Rod: 50,000 ohms ±10%, 1 w max; sim to Globar 783H-1.
RT603	5490828-P21	Rod: 1250 ohms ±10%, 0.38 w max; sim to Globar 492H-11.
		-------- VOLTAGE REGULATORS --------
VR601	4036887-P11	Silicon, Zener.
		----------CABLES----------
W601		CABLE 19B205345-G1
		----------MISCELLANEOUS----------
	19B209341-P2	Socket: 9 contacts; sim to Elco 04-920-XX.
		---------- SOCKETS ----------
XFL601	19B209341-P1	Tube: 7 pins; sim to Elco 04-720-XX.
		----------MISCELLANEOUS----------
	19A122138-P1	Knob. (For removal of XFL601).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

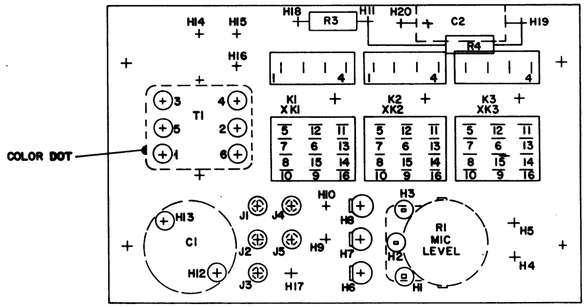
PRODUCTION CHANGES

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

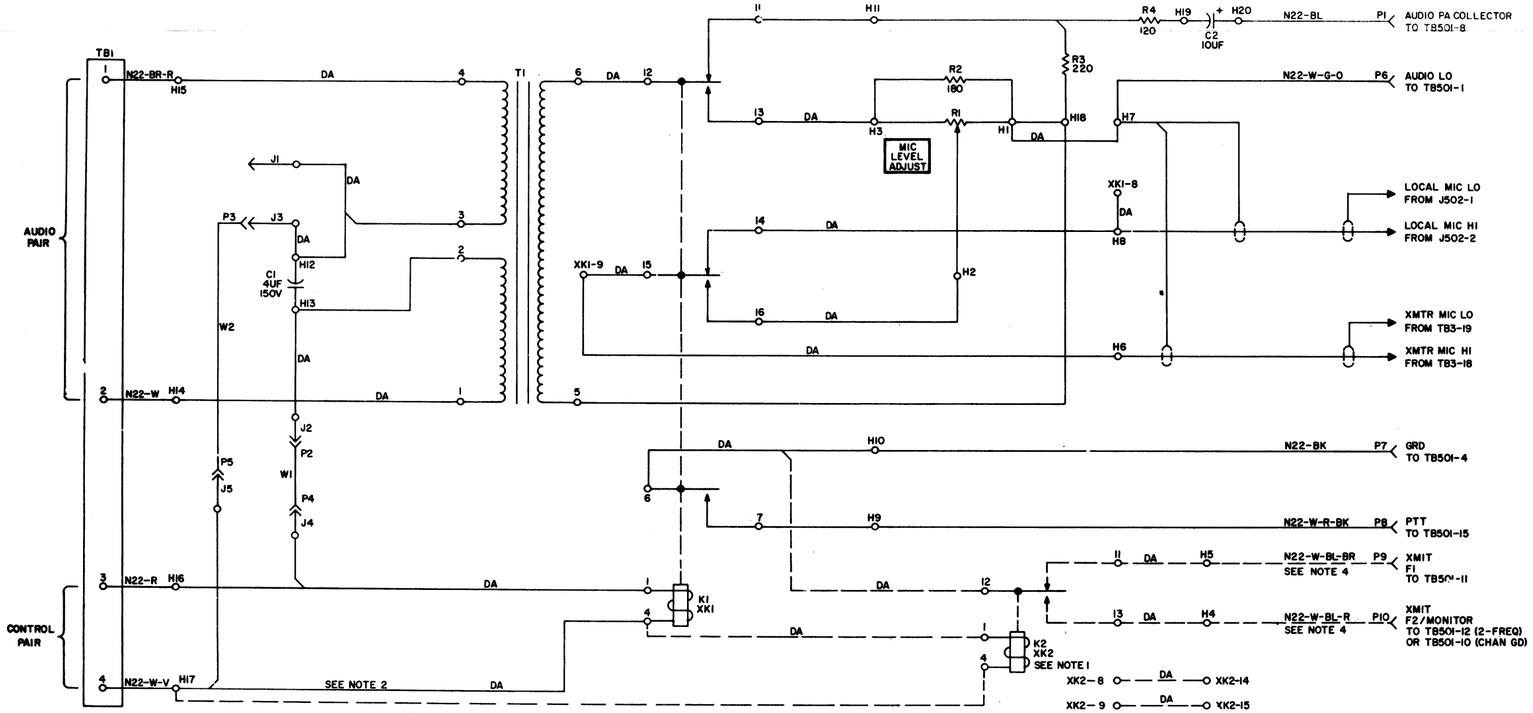
REV. A - To incorporate a higher gain transistor to improve bandwidth setting accuracy. Changed R647, R645 and Q607; deleted R644 and added R631.

REV. B - To facilitate the addition of a Channel Guard disable function. Deleted CR609.

REV. C - To make Channel Guard compatible with Royal Executive systems. Changed R657.



(19C311214, 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.

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. REMOVE & D'SCARD W-BL-BR WIRE FROM H5 IN 4KC18A11, TO TB501-11 ON 4EP51A10.

WHEN 4KC18A11 IS USED AND CHANNEL GUARD DISABLE OPTION IS PRESENT, CONNECT W-BL-R WIRE FROM 4KC18A11 TO TB501-19. FOR THIS OPTION, POWER SUPPLY MUST BE REV. A OR LATER.

(19D402679, Rev. 5)

SCHEMATIC & OUTLINE DIAGRAM

REMOTE CONTROL BOARD MODEL 4KC18A10 & 11

RC-1423C

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).

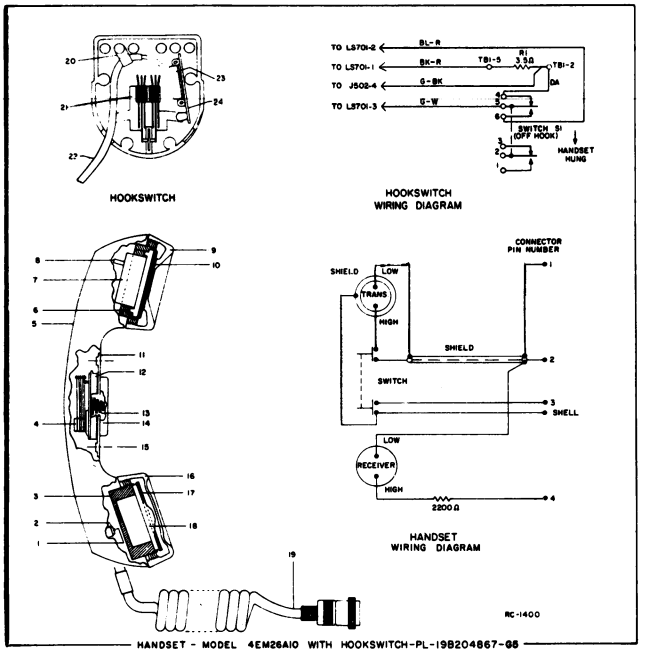
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

HANDSET
MODEL 4EM26A10
(PL-19B209100-G5)

SYMBOL	G-E PART NO.	DESCRIPTION
		---------- MISCELLANEOUS ---------
		(REFER TO RC-1400)
1		Self tap screw, bind head: No. 4 x 5/16.
2		Cable clamp. Shure Brothers 53A532.
3		Shield. Shure Brothers RP19.
4		Switch. Shure Brothers RP81.
5		Handle. Shure Brothers RP49.
6		Adapter. Shure Brothers 65A230.
7		Magnetic controlled cartridge. Shure Brothers RP41.
8	3R77-P222K	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.
16		Transmitter cap. (Part of item 5).
17		Washer. Shure Brothers 34A309.
18		Magnetic controlled cartridge. Shure Brothers RP13.
19		Cable and plug. Shure Brothers RP48.
		HOOKSWITCH ASSEMBLY PL-19B204867-G5
		---------- MISCELLANEOUS ---------
20	4029851-P4	Cable clamp; sim to Weckesser 3/16-4.
21	19A121612-P1	Holder and switch: thermoplastic case, contact rating 1 amp at 125 v.
22	19B205667-G1	Cable W5: approx 8-1/2 feet long.
23	5493035-P10	Resistor, wirewound, ceramic: 3.5 ohms ±5%, 5 w; sim to Tru-Ohm Type X-60.
24	7775500-P55	Terminal board, phen: 5 terminals.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



HANDSET - MODEL 4EM26A10 WITH HOOKSWITCH-PL-19B204867-G5

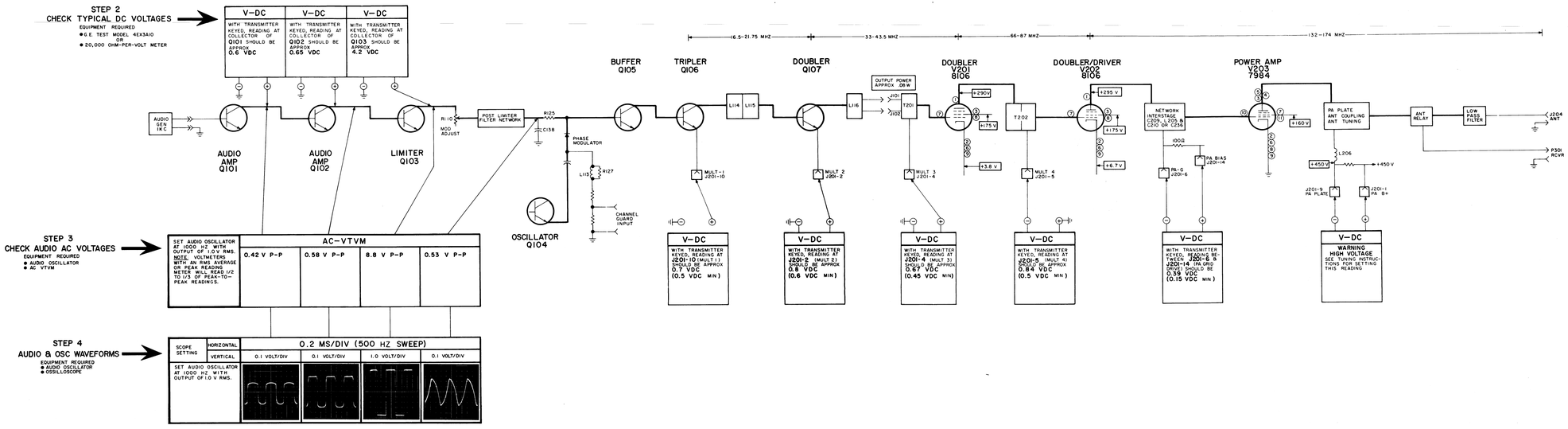
SCHEMATIC & OUTLINE DIAGRAM

HANDSET & HOOKSWITCH MODEL 4EM26A10

(RC-1424A)

STEP 1 - QUICK CHECKS

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



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 Q304 and Q305. Check resistance readings on J302-1, -2 and -3. Check crystal Y401.
LOW RECEIVER SENSITIVITY	Check Front End Alignment (Refer to Receiver Alignment Procedure). Check input signal required for 0.2-volt reading at LIM-1. Reading should be less than 20 uv. Check antenna connections, cable and relay. Check voltage readings of 1st and 2nd RF Amps and 1st and 2nd Mixers. Make SIMPLIFIED GAIN CHECKS (STEP 2A).
LOW AUDIO	Check Audio PA (Q505) output current at J304-9. If reading is low -- a. Check BIAS ADJ for 0.28 VDC at J304-9. If incorrect, set for 0.28 v with R401 (Position on Test Set). b. If correct, check Audio Amp Q317. Make SIMPLIFIED GAIN and WAVEFORM CHECKS (STEPS 2A and 2B) of Audio and Squelch Stages. Check unsquelched D-C voltage readings in Audio section (Refer to Receiver Service Sheet). Check voltage readings on Channel Guard receiver. Check setting of SQUELCH control R400 (Refer to Receiver Alignment Procedure).
IMPROPER SQUELCH OPERATION	Make GAIN and WAVEFORM CHECKS (STEPS 2A and 2B) of Audio and Squelch stages. Check voltage readings of Squelch circuit (Refer to Receiver Service Sheet).
DISCRIMINATOR IDLING TOO FAR OFF ZERO	See if discriminator zero is in the center of IF bandpass.

STEP 3- GAIN-PER-STAGE READINGS-

EQUIPMENT REQUIRED:

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

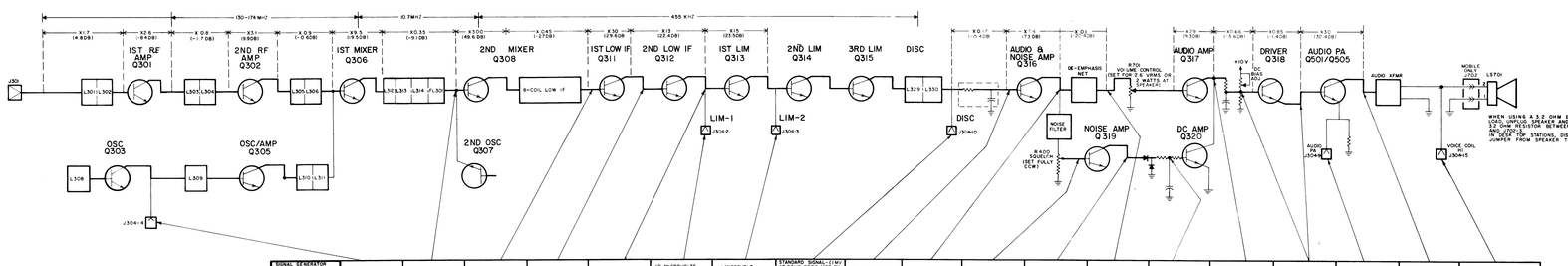
PROCEDURE

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

   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-ACADC
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 2306 MICROVOLTS SETTING AT DISCRIMINATOR ZERO		UNMODULATED	UNMODULATED	UNMODULATED	UNMODULATED	10 MICROVOLTS UNMODULATED	1 MICROVOLT UNMODULATED	STANDARD SIGNAL-1 MV AT RECEIVER FREQ MOD BY 1KHZ WITH 3.3 KHZ 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 LOG 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%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%												AFTER CHECKING WAVEFORMS ADJUST R401 FOR RATED 1 WATT OUTPUT ACROSS 3.2 Ω LOAD.	
READING	0.41 VDC MIN EX-3-A 0.9 VDC MIN MULTMTR 0.25 VDC MIN	GENERATOR OUTPUT SHOULD BE APPROX 5 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													
	HORIZONTAL	0.5 MS/DIV (APPROX 200 CPS)	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV		0.5 MS/DIV	0.5 MS/DIV		0.5 MS/DIV	0.5 MS/DIV
	VERTICAL	0.5 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	9.2 V P-P
NOISE WAVE FORM													
STANDARD SIGNAL 1 MILLIVOLT AT RECEIVER FREQ MODULATED BY 1KHZ WITH 3.3 KHZ (10KHZ WIDE BAND) DEVIATION													

RC-1390A

TROUBLESHOOTING PROCEDURES

RECEIVER MODELS 4ER48A10-15 & B10-15

(RC-1390A)

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-3737

Progress Is Our Most Important Product

GENERAL ELECTRIC

MOBILE RADIO DEPARTMENT LYNCHBURG, VIRGINIA 24502 CABLE GECOMPROD

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

PRINTED IN U.S.A.

ECP-199