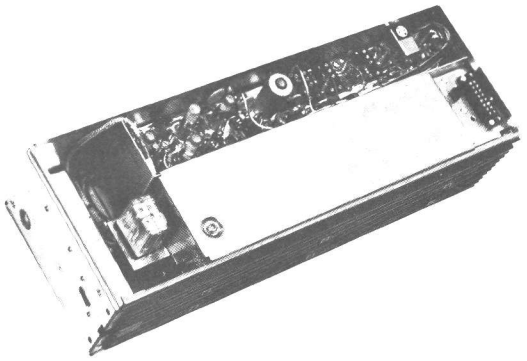
MOBILE RADIO

MASTR *Imperial*

450-470 MHz, 30 WATT TRANSMITTER MODEL 4KT16A10



KT-16-A

SPECIFICATIONS *

FCC Filing Designation	KT-16-A
Maximum Frequency Spread Between Sub-Bands:	12 MHz
Maximum Frequency Spread Within Sub-Bands:	±0.2%
Frequency Range	450—470 MHz
Power Output	30 Watts (adjustable from 10 to 30 Watts)
Crystal Multiplication Factor	36
Frequency Stability	±.0002% (-30°C to +60°C)
Spurious and Harmonic Radiation	At least 70 dB below rated power output
Modulation	Adjustable from 0 to ±5 kHz swing with instantaneous modulation limiting.
Audio Frequency Characteristics	Within +1 dB to -3 dB of a 6-dB/octave pre-emphasis from 300 to 3000 Hz per EIA standards. Post limiter filter per FCC and EIA.
Distortion	Less than 3%
Modulation Sensitivity	50 to 100 millivolts
Duty Cycle	EIA 20% Intermittent

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

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

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

DESCRIPTION

MASTR Imperial FM transmitter Model 4KT16A10 is a crystal controlled, phase-modulated transmitter designed for four-frequency operation on two sub-bands in the 450-470 MHz range. The transmitter consists of the following modules:

- Exciter Board A101:
  Transistorized audio, oscillator, modulator, amplifier and multiplier stages.
- Exciter Board A104:
  Transistorized audio, oscillator, modulator, amplifier, and multiplier stages.
- Transistorized PA Assembly:
  Relay control circuit, amplifier/tripler, drivers and PA, low-pass filter and antenna relay.

CIRCUIT ANALYSIS

The transmitter 4KT16A10 provides a power output of 30 Watts in the 450 to 470 MHz range. The frequency is determined by plug-in ICOM modules with ranges from approximately 12.5 to 13.6 megahertz, which is multiplied 36 times.

A centralized metering jack (J102) is provided for use with GE Test Set Models 4EX3A10 (Rev. A or later) or 4EX8K11. The test set meters the amplifiers, multipliers, drivers, PA stage, and PA supply voltages. The metering jack also provides access to receiver audio, microphone and push-to-talk leads.

All input leads to the transmitter are individually filtered by the 20-pin feed-through by-pass connector J101. Supply voltage, metering and control functions for the exciter boards are connected from the PA assembly to jacks J1 through J18 on the exciter boards.

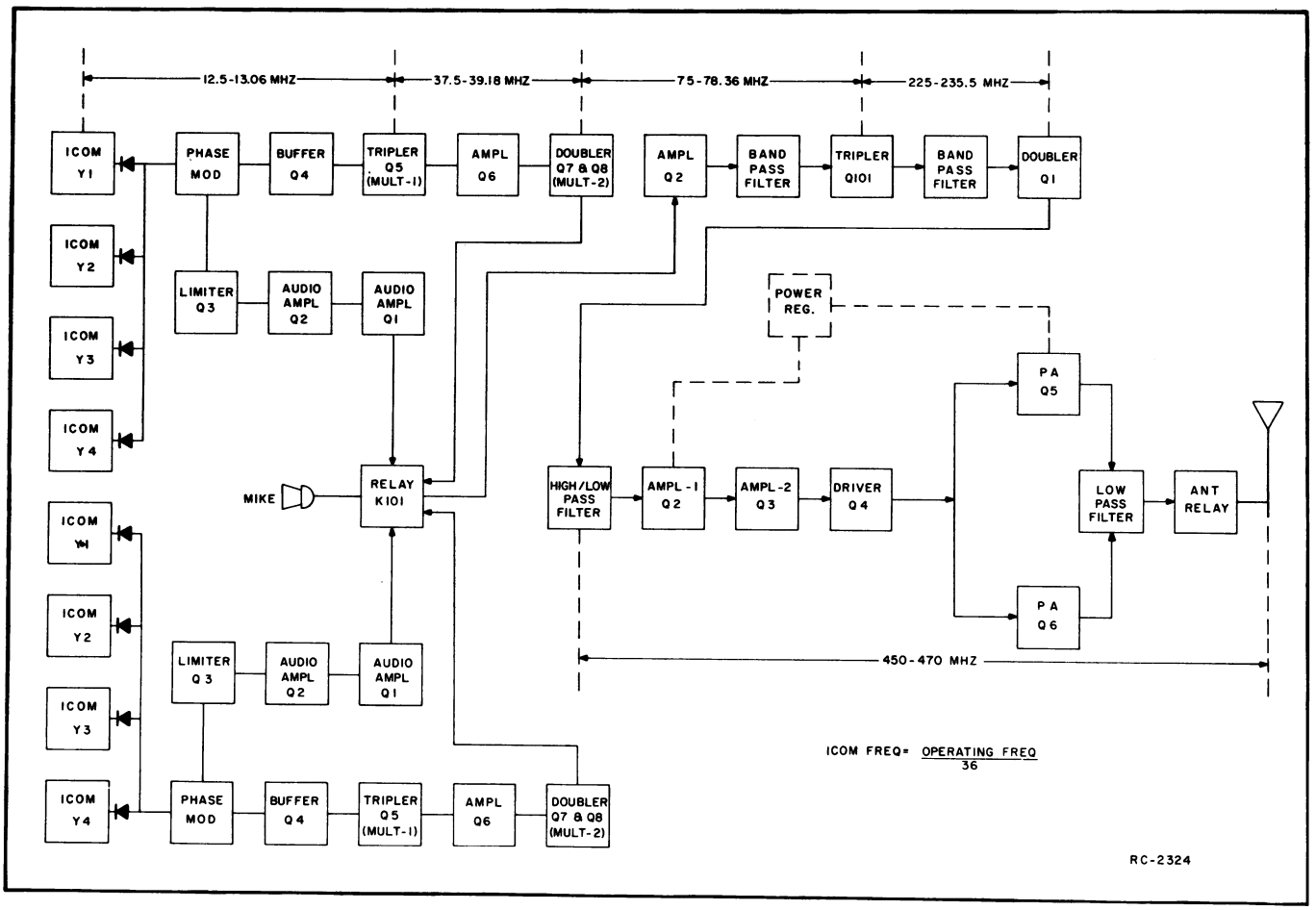


Figure 1 - Transmitter Block Diagram

EXCITER BOARDS

The transmitter uses two exciter boards, A101 and A104. Both boards contain identical oscillators, amplifiers and multiplier circuits. The transmitter uses the two boards for operation on two sub-band frequencies spaced up to 12.0 MHz apart. The top exciter board A101 is used for the upper sub-band and the bottom exciter board A104 is used for the lower sub-band. Channel selection to satisfy the customer's frequency arrangement can be moved from one exciter board to the other by changing connections to J14 through J32 on Amplifier/Tripler board A105. Instructions for setting up the sub-band frequencies are contained on the Sub-Band Connection Chart as listed in the Table of Contents.

OSCILLATORS

Each exciter board contains identical plug in ICOM modules. Each ICOM consists of a crystal-controlled Colpitts oscillator, a voltage regulator, a Channel Guard tone modulator and a buffer output stage. The entire module (including crystal) is enclosed in a dust-proof aluminum can, with the ICOM frequency and the transmitter operating frequency printed on the top. Access to the oscillator trimmer is obtained by prying off the plastic GE decal on the top of the can.

The ICOM frequency is temperature-compensated at both ends of the temperature range to provide instant frequency compensation, with a frequency stability of ±.0002%.

The proper frequency is selected by switching the ICOM keying lead (Pin 3 of each ICOM) to ground by means of a frequency selector switch on the control unit.

Keying the transmitter applies +10 Volts to the selected ICOM, turning it on. With the ICOM operating, diode CR1, CR2, CR3 or CR4 is forward biased and the oscillator output is applied to the modulator stage.

CAUTION

All ICOM modules are individually compensated at the factory, and cannot be repaired in the field. Any attempt to remove the ICOM cover will void the warranty.

AUDIO AMPLIFIERS AND LIMITER

The audio section of the exciter boards consist of direct-coupled feedback amplifiers Q1, Q2 and Q3. Q3 also acts as a limiter at high audio input levels. Audio from the microphone is coupled through an input network (C2 and R1) to the audio input levels. Audio from the microphone is coupled through an input network (C2 and R1) 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 Q3 is connected through Modulation Adjust potentiometer R8 to a de-emphasis network for 6-dB/octave de-emphasis and post limiter roll-off. The network consists of C7, C8, C9, R15, R16 and R17.

Modulation adjust R8 determines the maximum signal level applied to the modulator circuit, and is normally set for ±4.5 kHz deviation.

PHASE MODULATOR

The phase modulator uses varactor CV1 (a voltage-variable capacitor) in an R-L-C network that includes R20 and L1. An audio signal applied to the modulator through L1 varies the capacitance of CV1, resulting in a phase modulated output. The modulator output is coupled through C13 to the base of buffer Q4.

BUFFER, AMPLIFIER AND MULTIPLIERS

Buffer stage Q4 isolates the modulator from the loading effects of the tripler stage, and provides some amplification. The output is direct-coupled to the base of Q5.

Q5 operates as a tripler (MULT-1) with the collector tank (T1) tuned to three times the ICOM frequency. The tripler is metered at J102 through R36. Following the tripler is amplifier Q6. This stage is metered at J102 through R35. The output of Q6 is capacitive-coupled from T1 to T3, and then to the base of Q7 and Q8.

Q7 and Q8 operate as a class C, push-pull doubler (MULT-2) with the collector tank (T4) tuned to six times the ICOM frequency. The doubler stage is metered at J102 through R34.

POWER AMPLIFIER ASSEMBLY

The Power Amplifier Assembly consists of a relay control circuit, a 75 MHz amplifier and band-pass filter, a tripler and a 225 MHz band-pass filter, a doubler, a high/low-pass filter, two UHF amplifiers, a driver, a final P.A. stage, and a low pass filter. The assembly is completely solid state, and the band pass-filters are tuned prior to assembly. No tuning adjustments are required to the Power Amplifier Assembly.

WARNING

The stud mounted RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

RELAY CONTROL CIRCUIT

The Relay Control Circuit switches the output of exciter board A101 or A104 to the input of the PA assembly. It also switches the microphone input and keyed +10 Volts to either A101 or A104.

Normally, the output of exciter board A101 is applied to the input of the PA, and the microphone input and keyed +10 Volts is applied to A101. Placing the frequency select switch on the control unit in the position of a frequency on exciter board A104, grounds the emitter of Q3 on Amplifier/Tripler board A105. Keying the transmitter applies +10 Volts to the base of Q3 and K101 energizes. Energizing K101 applies the output of exciter board A104 to the input of the PA and the microphone input and keyed +10 Volts to A104.

AMPLIFIER/TRIPLER A105

The exciter output is coupled to the base of 75-78.36 MHz amplifier A105-Q1. This stage operates as a common-emitter broad band amplifier and is coupled to pretuned 75-78.36 MHz band-pass filter FL101. The output of this filter is metered at centralized metering jack J102 through voltage divider R6 and R7.

Following the 75-78.36 MHz band-pass filter is tripler A105-Q101. Q101 is a common-emitter amplifier with its collector coupled to pretuned 225-235 MHz band-pass filter FL102. The output of this filter is metered through R2 on Power Amplifier board A103.

POWER AMPLIFIER A103

CAUTION

The length, width, and bonding of the micro strips and the placement of components on the PA assembly boards is critical to the performance of the transmitter. Alteration of these parameters should be avoided.

The output of the 225-235 band-pass filter is coupled to doubler A103-Q1. Q1 is a common-emitter amplifier with its output applied to a high/low-pass filter. This doubler stage increases the frequency to 36 times the ICOM frequency, which after filtering is applied to the base of the 1st UHF Amplifier A103-Q2. Q2, the 2nd UHF Amplifier A103-Q3 and the driver amplifier A103-Q4, are common-emitter operated broad band amplifiers. The output of driver Q4 is capacitive-coupled through a power splitting circuit to the bases of final transistors A103-Q5 and Q6. The combined collector currents of Q3 and Q4 is metered with the GE Test Set in position F.

Q5 and Q6 are separate common-emitter broad band power amplifiers. An equal amount of power from driver A103-Q4 is applied through the power splitting circuit to their respective inputs. The power from their collectors is additively combined and is coupled through low-pass filter FL103 to antenna relay K901. Antenna relay K901 transfers power from the transmitter to the antenna when the transmitter is keyed. The combined collector current of Q5 and Q6 is metered on the one Volt scale (10 amperes full scale) with the GE Test Set in Position G, and with the HIGH SENSITIVITY button pressed.

CARRIER CONTROL TIMER

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

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

ANTENNA CUTTING INSTRUCTIONS

Install antenna Model 4EY12A13 according to instructions provided with the antenna. Cut the whip for 450-470 MHz operation as directed on the cutting chart.

MAINTENANCE

DISASSEMBLY

To service the transmitter from the top (Figure 3):

1. Pull locking handle down and pull radio about one inch out of mounting frame.

2. Pry up cover at rear of transmitter.

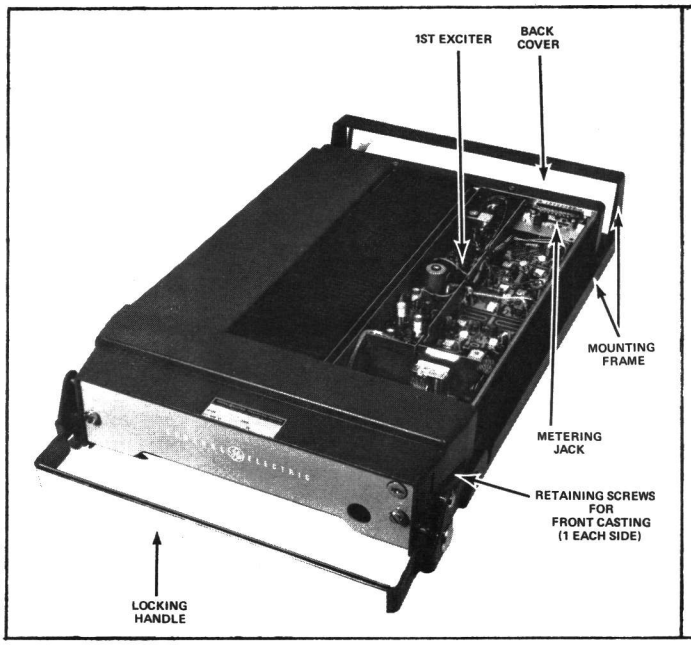


Figure 2 - Top Cover Removed

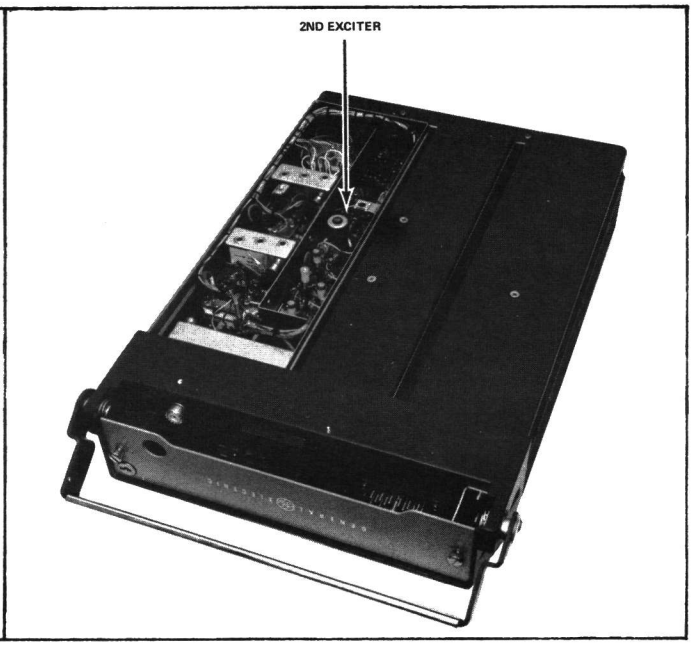


Figure 3 - Bottom Cover Removed

3. Slide cover back and lift off.

To service the transmitter from the bottom (Figure 3):

1. Pull locking handle down. Pull radio out of mounting frame.

2. Remove two screws in bottom cover. Pry up at back of transmitter.

3. Slide cover back and lift off.

To remove transmitter from system frame:

1. Loosen the two retaining screws in the front casting (see Figure 3) and pull casting away from the system frame.

2. Remove the four screws in the back cover.

3. Remove the two screws holding the transmitter at each end of the system frame.

4. Disconnect the antenna plug and receiver plug in front of the transmitter and the 20-pin feed-thru connector at the back of the transmitter, and slide the unit out of the system frame.

PA TRANSISTOR REPLACEMENT

WARNING

The stud mounted RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

To replace the PA transistors (Q1 through Q6 on A103):

1. Remove the Amplifier/Tripler board A105 from the transmitter. To remove A105 it is necessary to remove the two screws holding Q101, the screws holding A105 to the heat sink and leads connected to A105.

2. Using a 50 Watt soldering iron lift the two emitter leads of the transistor to be replaced off the printed wire board. Hold the leads away from printed wire board pattern until the solder cools.

3. Remove the transistor hold-down nut and spring-washer through the hole in the heatsink with an 11/32-inch nutdriver.

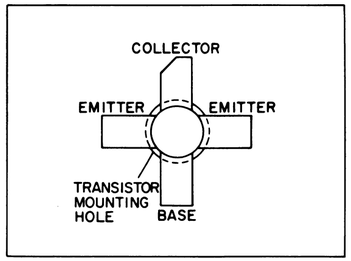


Figure 4 - Lead Identification

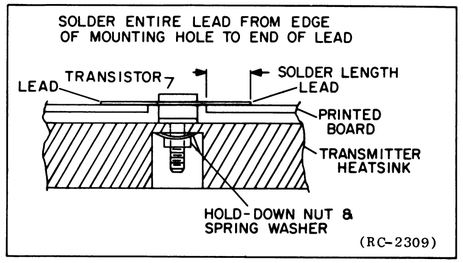


Figure 5 - Lead Forming

4. Heat the base and collector leads simultaneously and lift out the transistor.

5. Remove the old solder from the printed circuit board with a de-soldering tool such as a SOLDA PULLT.® Special care should be taken to prevent damage to the printed circuit board runs.

6. Trim the new transistor leads (if required) to the lead length of the removed transistor. Cut the collector lead at a 45° angle for future identification (see Figure 4). The letter "C" on the top of the transistor indicates the collector.

7. Apply a coating of silicone grease around the transistor mounting surface, and place the transistor in the mounting hole. Align the leads as shown in the Outline Diagram. Then hold the body of the transistor and replace the holding-down nut and spring-washer, using moderate torque (6-8-inch-pounds). A torque wrench must be used for this adjustment since transistor damage can result if too little or too much torque is used.

8. Make sure that the transistor leads are formed as shown in Figure 5 so that the leads can be soldered to the printed circuit pattern, starting from the inner edge of the mounting hole.

9. Solder the leads to the printed circuit pattern. Start at the inner edge of mounting hole and solder the remaining length of transistor lead to the board. Use care not to use excessive heat that causes the printed wire board runs to lift up from the board. Check for shorts and solder bridges before applying power.

CAUTION

Failure to solder the transistor leads as directed may result in the generation of RF loops that could damage the transistor or may cause low power output.

SUB-BAND CONNECTION CHART

PROCEDURE

To change the sub-band frequencies, select the appropriate frequency arrangement, and then install the ICOM and make the jumper connections as shown in the applicable Table.

TABLE I - TWO FREQUENCY

			INSTALL ICOM IN		CONNECT WHITE JUMPER WIRE	
INST.	CHAN.	SUB BAND	EXC.	ICOM SOCKET	FROM A105	TO A105
1	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	–	–	–	–	H4	J16
	–	–	–	–	H3	J26
2	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	–	–	–	–	H4	J28
	–	–	–	–	H3	J17

TABLE II - THREE FREQUENCY

			INSTALL ICOM IN		CONNECT WHITE JUMPER WIRE	
INST.	CHAN	SUB BAND	EXC.	ICOM SOCKET	FROM A105	TO A105
1	F1	HI	A101	XY1	H6	J32
	F2	HI	A101	XY2	H5	J30
	F3	LO	A104	XY3	H4	J16
	–	–	–	–	H3	J17
2	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	F3	LO	A104	XY3	H4	J16
	–	–	–	–	H3	J26
3	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	F3	HI	A101	XY3	H4	J28
	–	–	–	–	H3	J17
4	F1	LO	A104	XY1	H6	J14
	F2	LO	A104	XY2	H5	J15
	F3	HI	A101	XY3	H4	J28
	–	–	–	–	H3	J26
5	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	F3	HI	A101	XY3	H4	J28
	–	–	–	–	H3	J17
6	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	F3	LO	A104	XY3	H4	J16
	–	–	–	–	H3	J26

TABLE III - FOUR FREQUENCY

			INSTALL ICOM IN		CONNECT WHITE JUMPER WIRE	
INST.	CHAN.	SUB BAND	EXC.	ICOM SOCKET	FROM A105	TO A105
1	F1	HI	A101	XY1	H6	J32
	F2	HI	A101	XY2	H5	J30
	F3	HI	A101	XY3	H4	J28
	F4	LO	A104	XY4	H3	J17
2	F1	HI	A101	XY1	H6	J32
	F2	HI	A101	XY2	H5	J30
	F3	LO	A104	XY3	H4	J16
	F4	LO	A104	XY4	H3	J17
3	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	F3	LO	A104	XY3	H4	J16
	F4	LO	A104	XY4	H3	J17
4	F1	LO	A104	XY1	H6	J14
	F2	LO	A104	XY2	H5	J15
	F3	LO	A104	XY3	H4	J28
	F4	HI	A101	XY4	H3	J26
5	F1	LO	A104	XY1	H6	J14
	F2	LO	A104	XY2	H5	J15
	F3	HI	A101	XY3	H4	J28
	F4	HI	A101	XY4	H3	J26
6	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	F3	HI	A101	XY3	H4	J28
	F4	HI	A101	XY4	H3	J26
7	F1	HI	A101	XY1	H6	J32
	F2	HI	A101	XY2	H5	J30
	F3	LO	A104	XY3	H4	J16
	F4	HI	A101	XY4	H3	J26

TABLE III - CONTINUED

			INSTALL ICOM IN		CONNECT WHITE JUMPER WIRE	
INST.	CHAN.	SUB BAND	EXC.	ICOM SOCKET	FROM A105	TO A105
8	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	F3	HI	A101	XY3	H4	J28
	F4	HI	A101	XY4	H3	J26
9	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	F3	LO	A104	XY3	H4	J16
	F4	HI	A101	XY4	H3	J26
10	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	F3	HI	A101	XY3	H4	J28
	F4	LO	A104	XY4	H3	J17
11	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	F3	LO	A104	XY3	H4	J16
	F4	LO	A104	XY4	H3	J17
12	F1	LO	A104	XY1	H6	J14
	F2	LO	A104	XY2	H5	J15
	F3	HI	A101	XY3	H4	J28
	F4	LO	A104	XY4	H3	J17
13	F1	HI	A101	XY1	H6	J32
	F2	LO	A104	XY2	H5	J15
	F3	HI	A101	XY3	H4	J28
	F4	LO	A104	XY4	H3	J17
14	F1	LO	A104	XY1	H6	J14
	F2	HI	A101	XY2	H5	J30
	F3	LO	A104	XY3	H4	J16
	F4	HI	A101	XY4	H3	J26
15	F1	HI	A101	XY1	H6	J32
	F2	HI	A101	XY2	H5	J30
	F3	HI	A101	XY3	H4	J28
	F4	HI	A101	XY4	H3	J26
16	F1	LO	A104	XY1	H6	J14
	F2	LO	A104	XY2	H5	J15
	F3	LO	A104	XY3	H4	J16
	F4	LO	A104	XY4	H3	J17

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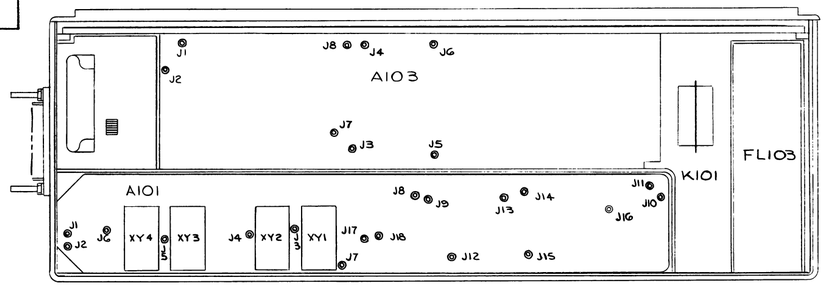
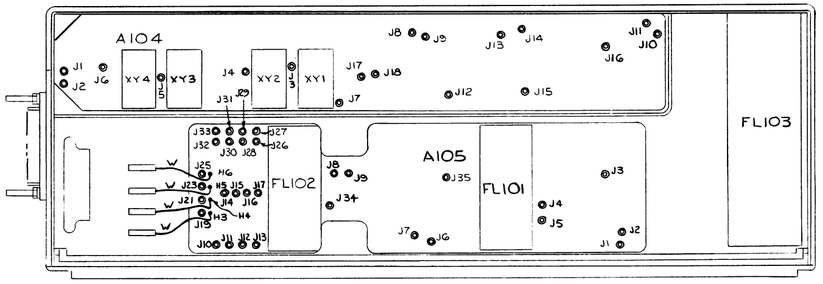


TOP VIEW



BOTTOM VIEW

(19D416639, Sh. 2, Rev. 0)

MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R8) 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 overmodulation are clipped by the modulation limiter. The limiter, in conjunction with the de-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing overmodulation while preserving intelligibility.

TEST EQUIPMENT

1. An audio oscillator (GE Model 4EX6A10)
2. A frequency modulation monitor
3. An output meter of a VTVM
4. GE Test Set Models 4EX3A10 or 4EX8K10

PROCEDURE

1. Connect the audio oscillator and the meter across audio input terminals J5 (Green-Hi) and J6 (Black-Lo) on GE Test Set or across J1 (Mike High) and J2 (Mike Low) on the Exciter Board.
2. Apply a 0.75-Volt signal at 1000 Hz to Test Set or across J1 and J2 on Exciter Board.
3. For transmitters without Channel Guard, set the MOD ADJUST (R8) for a 4.5-kilohertz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.
4. For transmitters with Channel Guard, set the Channel Guard MOD ADJUST (R25) for 0.75 kHz tone deviation. Remove the tone to the transmitter by unplugging leads to J8 and J9 on Exciter Board, or by switching to a non-Channel Guard frequency in multifrequency units. Next, apply a 0.75-Volt signal at 1000 Hz and set MOD ADJUST (R8) for a 3.75 kHz deviation (4.5 kHz minus 0.75 kHz tone deviation).
5. For multi-frequency transmitters, set the deviation as described in Steps 3 and 4 on the channel producing the largest amount of deviation.

PA POWER INPUT

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

P_i = PA voltage x PA current

Where:

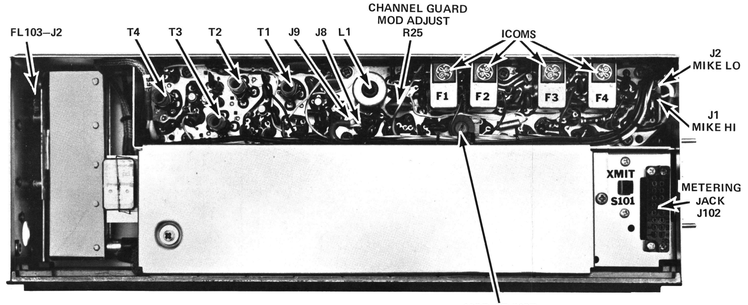
P_i is the power input in Watts,

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

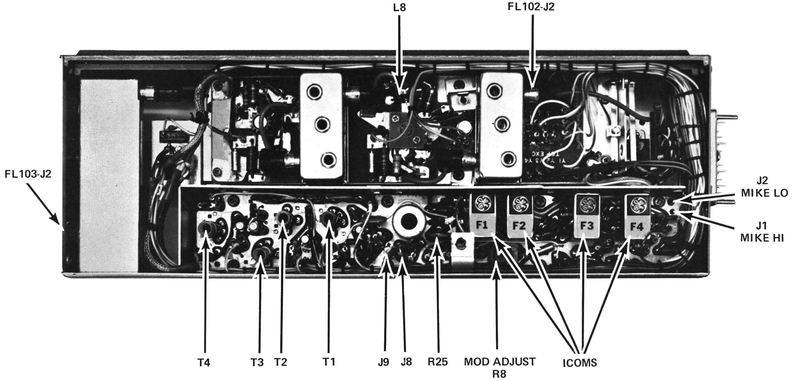
PA current is measured with the Test Set in Position G in the Test 1 position, and with the HIGH SENSITIVITY button pressed (10 amperes full scale).

Example: P_i = 12.6 Volts x 5.0 amperes = 63 Watts

EXCITER A101



EXCITER A104



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A10 (Revision A or later), or Model 4EX8K11.
2. A 50-ohm wattmeter connected to FL102-J2.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place the highest frequency ICOM in XY1 of exciter A102 and the lowest frequency ICOM in XY4 of exciter A104.
2. Set the channel selector switch to the F1 position.
3. Turn the power adjust potentiometer R13 on the power regulator board fully clockwise.
4. Turn the slugs in the Exciter coils L1, T1, T2, T3, and T4 to the bottom of the coil. When tuning these coils, select the first resonance as the tuning slug is rotated counter-clockwise out of the coil.
5. Connect the GE Test Set to Receiver Metering Jack J442 and check for +10 Volts at Position J. If reading is not 10 Volts, refer to the Power Regulator Outline Diagram and set R28 for +10 Volts.
6. Connect GE Test Set to Metering Jack J102. Set the test polarity to + and set the range to the Test 1 (or 1-Volt position for 4EX8K11).
7. All adjustments are made with the transmitter keyed and supplied with 13.6 V at the Battery End of the Power Cable. Unkey the transmitter between steps to avoid unnecessary heating.

TRANSMITTER ALIGNMENT PROCEDURE

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
				EXCITER BOARD
1.	A	L1 & T1	See Procedure	Carefully tune L1 for maximum meter reading. Tune T1 for a small change in meter reading.
2.	B	T1 & T2	See Procedure	Tune T1 for maximum meter reading. Tune T2 for a dip in meter reading.
3.	C	T3, T2 & T4	See Procedure	Adjust T3 for maximum meter reading. Re-adjust T2 for maximum meter reading. Then adjust T4 for minimum meter reading.
4.	D	T4	See Procedure	Carefully tune T4 for maximum meter reading.
5.				Set Channel Selector Switch to F4 position. Repeat steps 1 through 4 for exciter A104.
				POWER AMPLIFIER
6.				Set Channel Selector Switch to F1 position.
7.				Turn potentiometer R13 on the power regulator to set the transmitter power out for the desired power (between 10 and 30 Watts).
			NOTE:	Coils A105-L8 (Amplifier/Tripler) and A103-L4 (Power Amplifier) have been adjusted at the factory and normally require no further adjustment. If in some way L8 or L4 is bent the following procedure should be used.
8.				Disconnect Cable W2 and connect a 50-ohm wattmeter (1.2 Watt scale) to FL102-J2.
9.				Repeat preliminary steps 2 and 3.
10.		L8		If the power output of A105 is less than 0.4 Watt slightly spread coil A105-L8.
11.				Set channel selector switch to F4 position.
12.		L8		If the power output is considerably more than 0.4 Watt, further spread A105-L8 until the power drops midway between 0.4 Watt and the initial reading. No adjustment of A105-L8 is required if the output is greater than 0.4 Watt on F1 and F4.
13.				Set Channel Selector Switch to F1.
14.				Remove the wattmeter from FL102-J2 and re-connect cable W2.
15.		L4		If the power output is less than 30 Watts spread A103-L4.
16.				Repeat step 11.
17.		L4		If the power output is considerably more than 30 Watts, further spread A103-L4 until the power is midway between 30 Watts and the initial reading. No adjustment A103-L4 is required if the power output is 30 Watts minimum on both F1 and F4.
18.				Repeat step 7.

FREQUENCY ADJUSTMENT

First, check the transmitter frequency to determine if any adjustment is required. The frequency should be checked with a frequency meter or counter having an accuracy of 0.4 part-per-million (PPM), and with the ICOM module at 80°F (±4°F) or 26.5°C (±2°C) when possible. The ICOM temperature can be determined by taping a mercury thermometer to the side of the ICOM.

NOTE: To prevent radiated RF from causing the electronic counter to malfunction, the transmitter must be shielded or the counter must be approximately 10 feet from the transmitter.

CAUTION

The ICOM case is at -10 Volts DC. Be careful not to short the case to ground.

If an adjustment is required, use one of the following procedures:

If the ICOM is stabilized at 80° F, pry off the GE emblem and adjust the ICOM trimmer for correct transmitter operating frequency.

If the ICOM is not stabilized at 80° F, pry off the GE emblem and check for a color dot on the top of the can. This color dot indicates which correction curve to use in setting the unit on frequency (see Figure 6). Next, tape a thermometer to the ICOM and check the temperature when the thermometer is stabilized. Then proceed as shown in the following example:

1. Assume that the ICOM is marked with a green color dot and the temperature reading is 50° F. At that temperature, the green curve shows a correction factor of approximately +1.5 PPM. (At 450 MHz, 1 PPM is 450 Hz. At 470 MHz, 1 PPM is 470 Hz.)
2. With a transmitter operating frequency of 450 MHz, adjust the ICOM trimmer for a reading of +675 Hz (+1.5 x 450) higher than the licensed operating frequency.
3. If a negative correction factor is obtained (at temperatures above 80° F), adjust the ICOM trimmer for the indicated PPM lower than the operating frequency.

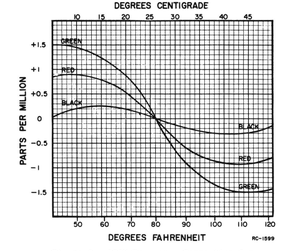


Figure 6 - ICOM Frequency Correction Curve

ALIGNMENT PROCEDURE

450—470 MHz, 30-WATT TRANSMITTER
MODEL 4KT16A10

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 or
   - Heath # 1G-72
4. Deviation Meter (with a .75 kHz scale) similar to:
   - Measurements # 140
   - Lampkin # 205A
5. Multimeter similar to:

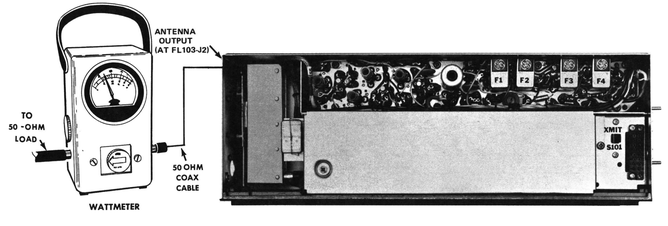
   GE TEST SET MODEL 4EX3A10,
   MODEL 4EX8K11 or
   20,000 ohms-per-volt voltmeter

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 30 Watts when power adjust pot R13 is fully clockwise.

SERVICE CHECK

Refer to Service Hints on Transmitter Troubleshooting Procedure.

NOTE

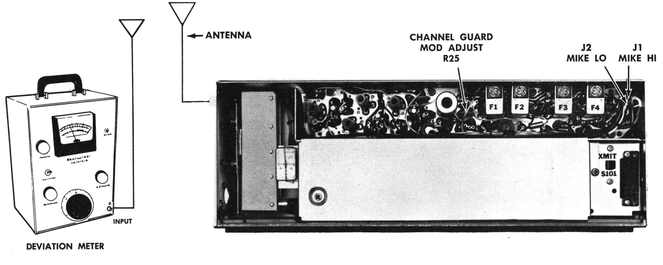
Coax cables and connectors are lossy at UHF frequencies. Insure low power out is not caused by excessive loss in connections from transmitter to wattmeter. Use good, short, 50 ohm cables with properly installed connectors.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



2. Unplug the MIC HI terminal from J1 on Transmitter Exciter Board.
3. Key transmitter and check for 0.75-kHz deviation. If reading is low or high, adjust Channel Guard MOD ADJUST (R25) for a reading of 0.75-kHz.

NOTES:--The Channel Guard MOD ADJUST (R25) may be adjusted for deviations up to 1.0 kHz maximum for all tone frequencies.

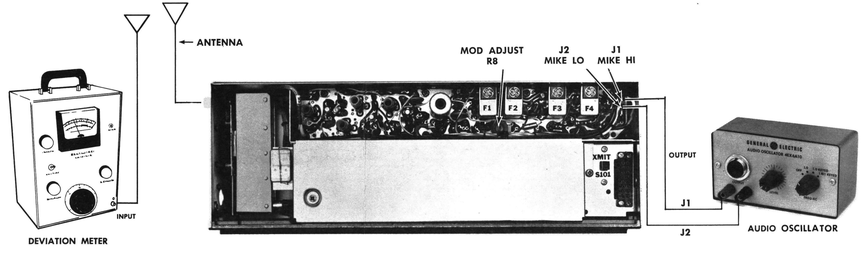
1. On units supplied with Channel Guard, the Phase Modulator Tuning should be peaked carefully to insure proper performance. (Refer to Steps 1 in the Transmitter Alignment Chart).
2. The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STEP 3

VOICE DEVIATION AND SYMMETRY

TEST PROCEDURE

1. Unplug the High and Low Mike leads from the Exciter Board Jacks J1 and J2.
2. Connect test equipment to transmitter as shown below:



3. Set the generator output to 0.75 VOLTS RMS and frequency to 1 kHz.
4. Key the transmitter and adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ±4.5 kHz.
6. Adjust Modulation Adjust Control R8 until deviation reads 4.5 kHz on plus (+) or minus (-) deviation, whichever is greater. This adjustment should be made with the correct level of tone applied on Channel Guard transmitters.

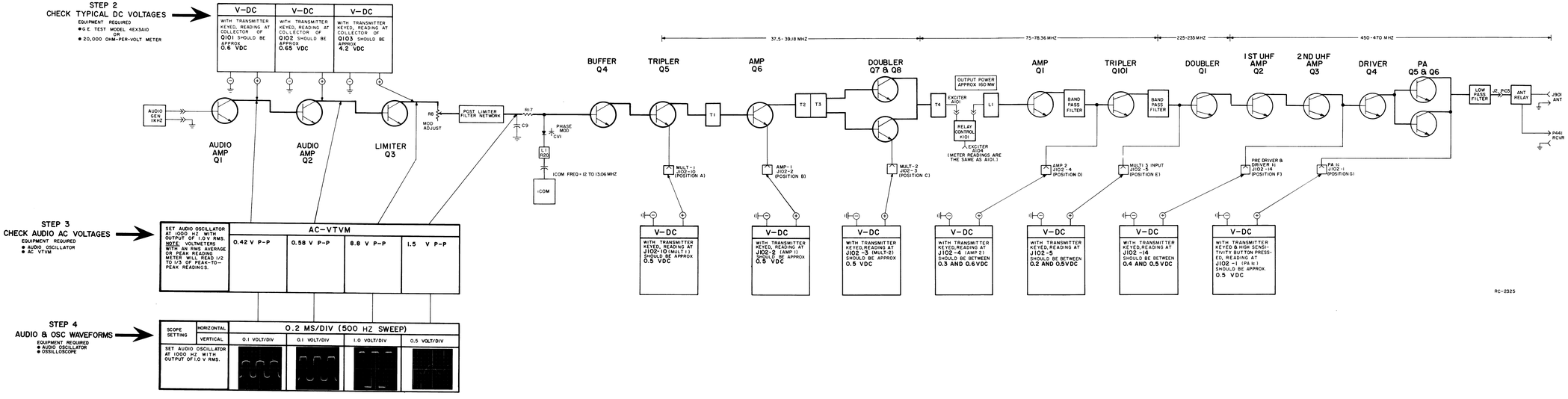
NOTES:--MASTR transmitters are adjusted for 4.5 kHz deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz under the worst conditions of frequency, voltage and temperature.

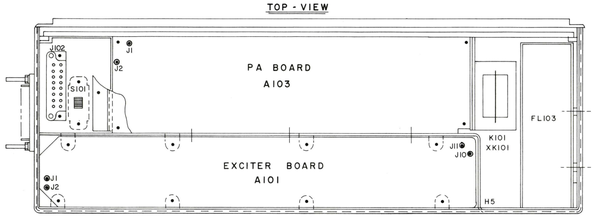
If the deviation reading plus (+) or minus (-) differs by more than 0.5 kHz, check the following:

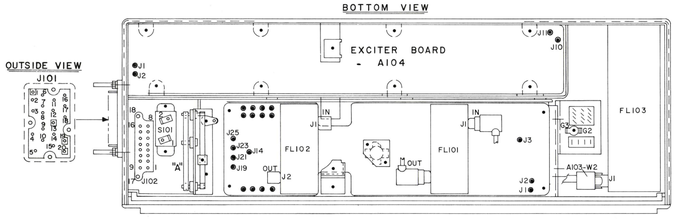
1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. Check Audio Sensitivity by reducing generator output until deviation falls to 3.0 kHz. Voltage should be LESS than 100 millivolts.

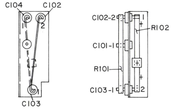
STEP I - QUICK CHECKS

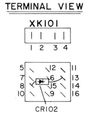
METER POSITION	PROBABLE DEFECTIVE STAGE OR COMPONENT		
	HIGH METER READING	LOW METER READING	ZERO METER READING
A (MULT-1)	Q4 or Q5 (BOARD A101 or A104)	Q4 or open L1 (BOARD A101 or A104)	10V REGULATOR ICOM, CV1, Q4, Q5 (BOARD A101 or A104)
B (AMP 1)	Q6, T2 (BOARD A101 or A104)	Q6, T1 (BOARD A101 or A104)	T1, Q6, T2 BOARD A101 or A104)
C (MULT-2)	Q7, Q8, T4 (BOARD A101 or A104)	Q7, Q8, T3 (BOARD A101 or A104)	Q7, Q8, T3, T4 BOARD A101 or A104)
D (AMP-2)	Q101 (BOARD A105)	K101 RELAY, Q1 (BOARD A105) KEYED 12.5V A101/A104-T4 FL101, W1, W2	KEYED 12.5V K101 RELAY, Q1 DIODE CR1 on BOARD A105, W1 W2
E (MULT-3)	_____	COIL L8 MIS-ALIGNED, Q101 (BOARD A105) FL102, A103-W1	Q101, KEYED 12.5V. (BOARD (A105) FL102, A103-W1
F (Pre Dr. + DRIVER IC	Q3, Q4 COLLECTORS SHORTING TO GROUND C29, C35 SHORTING TO GROUND	L4 MISALIGNED POWER REGULATOR NOT SET RIGHT OR FAULTY - Q1 Q2, Q3, Q4	(C7, C9, C55, C10, C11, C13, C14, C15, C16 C51, C17, C53, C52, C18, C20 C24, C25, C26 C31, C30, C29) OPEN OR SHORT BASES OF Q2, Q3 SHORTING TO GROUND. POWER REGULATOR FAULTY. KEYED 12.5V
G PA IC	Q5, Q6 COLLECTORS SHORTING TO GROUND. C42, C49 SHORTING TO GROUND	Q5 or Q6 FUALTY	Q5 and Q6 KEYED 12.5V

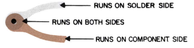


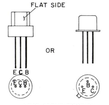




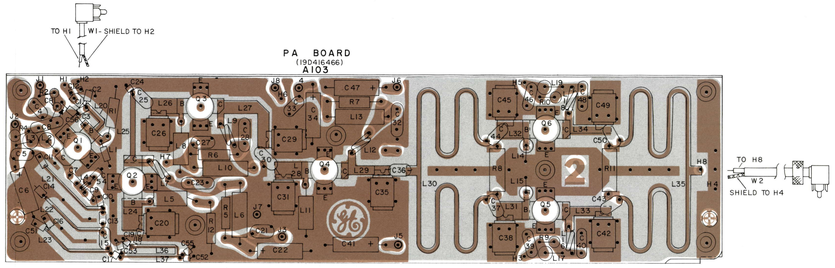




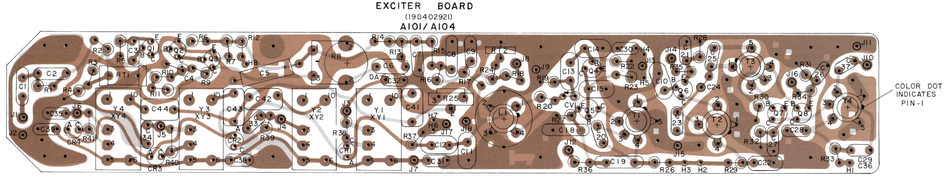




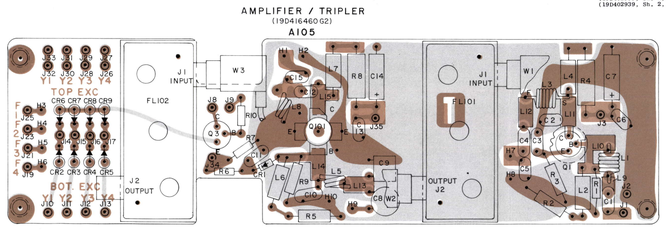
(19B621938, Rev. 2)



(19D416514, Sh. 1, Rev. 2)
(19D416514, Sh. 2, Rev. 2)



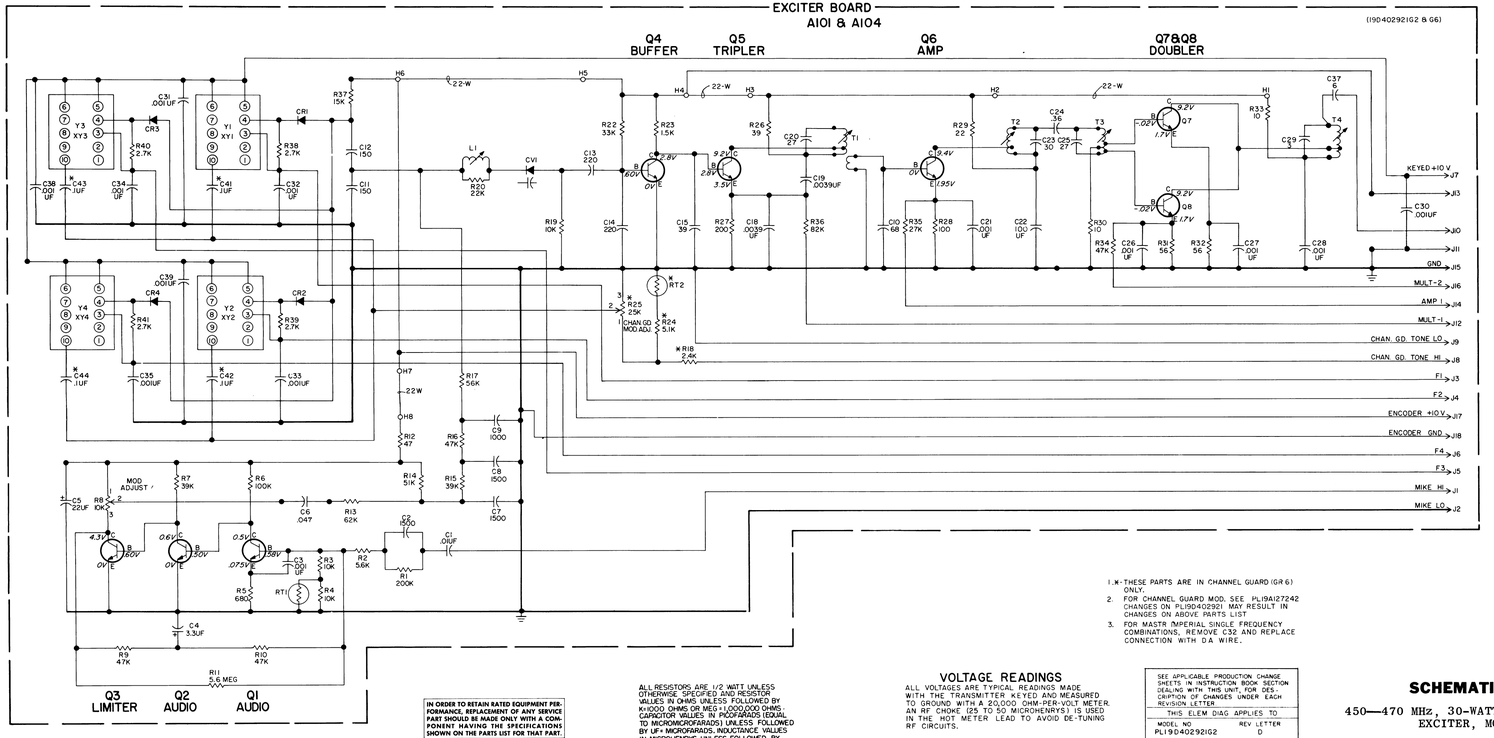
(19D402939, Sh. 1, Rev. 1)
(19D402939, Sh. 2, Rev. 1)



(19D416450, Sh. 1, Rev. 1)
(19D416450, Sh. 2, Rev. 1)

OUTLINE DIAGRAM

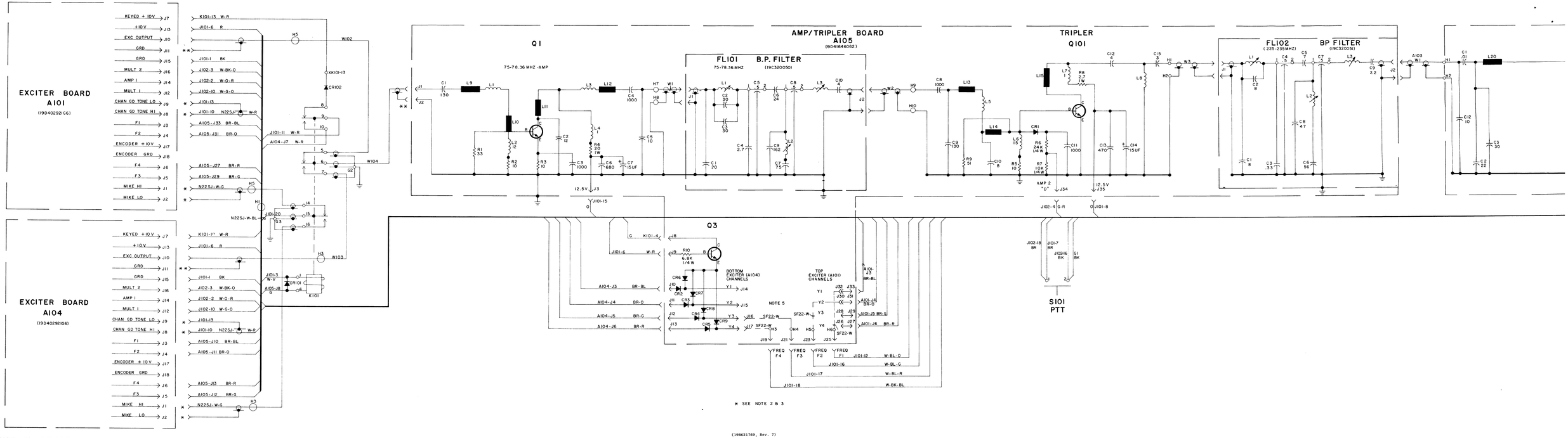
450—470 MHz, 30-WATT TRANSMITTER
MODEL 4KT16A10



SCHEMATIC DIAGRAM

450—470 MHz, 30-WATT TRANSMITTER
EXCITER, MODEL 4KT16A10

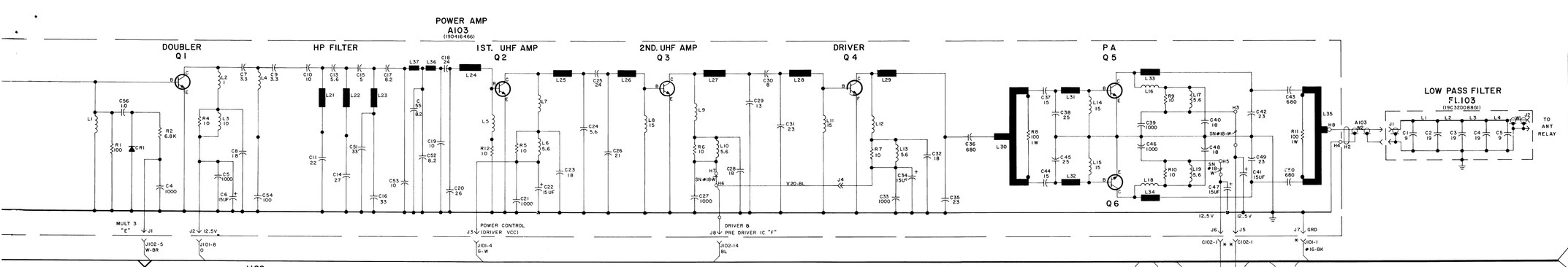
Issue 2

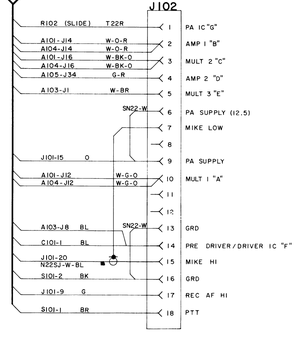


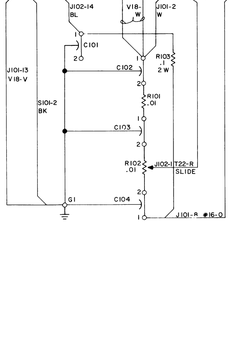
(19B621769, Rev. 7)

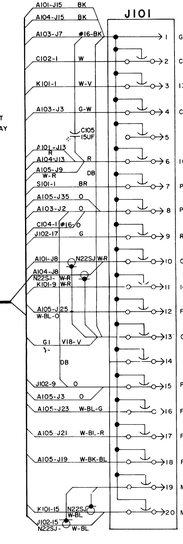
SCHEMATIC DIAGRAM

450—470 MHz, 30-WATT TRANSMITTER
MODEL 4KT16A10









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

THIS ELEMENT DIAGRAM APPLIES TO:

MODEL NO	REVISION LETTER
PLI90416451G2	B
PLI90416466G1	A

NOTE:

1. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.
2. TERMINATE ALL INTERCONNECTING WIRING EXCEPT ONES MARKED WITH AN * ASTERISK (44 PLACES) WITH A4029840P2.
3. TERMINATE WIRES WITH AN # ASTERISK WITH A4029840P1.
4. TERMINATE WIRES WITH A DOUBLE (**) WITH A4029840P3 (3 PLACES).
5. THE JUMPER ARRANGEMENT SHOWN IS FOR EXAMPLE ONLY. ACTUAL CUSTOMER FREQUENCY ARRANGEMENTS DESIRED MUST BE PROVIDED BY ORDER SERVICE AND JUMPERS CONNECTED PER 19D416639.

(19B621769, Rev. 7)

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

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

SCHEMATIC DIAGRAM

450—470 MHz, 30-WATT TRANSMITTER
MODEL 4KT16A10

Issue 2

PARTS LIST

LBI-4383A

450-470 MHz TRANSMITTER
MODEL 4KT16A10

SYMBOL	GE PART NO.	DESCRIPTION
A101 and A104		EXCITER BOARD 19D402921G6
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C2	7491395P111	Ceramic disc: 1500 pf ±10%, 500 VDCW; sim to RMC Type JL.
C3	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C5	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C6	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C7 and C8	7491395P111	Ceramic disc: 1500 pf ±10%, 500 VDCW; sim to RMC Type JL.
C9	7491395P109	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JL.
C10	5490008P123	Silver mica: 68 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C11	5490008P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C12	5490008P131	Silver mica: 150 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C13 and C14	7489162P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C15	7489162P117	Silver mica: 39 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C18 and C19	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C20	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C21	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C22	7489162P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C23	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C24	5491601P110	Phenolic: 0.36 pf ±5%, 500 VDCW.
C25	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C26 thru C28	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C29	5496219P234	Ceramic disc: 3.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C30	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C31 thru C35	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C37	19A116656P6J8	Ceramic disc: 6 pf ±5%, 500 VDCW, temp coef -80 PPM.
C38 and C39	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C41 thru C44	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115603P1	Silicon.
CV1	5495769P9	Silicon: 33 pf ±10%, 4 VDC; sim to Pacific Semiconductors Varicap Type V-596.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J18	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19D402808G30	Coil. Includes:
	5491798P2	Tuning slug.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q3	19A115889P1	Silicon, NPN.
Q4	19A115330P1	Silicon, NPN.
Q5 and Q6	19A115328P1	Silicon, NPN.
Q7 and Q8	19A116201P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P204J	Composition: 0.20 megohm ±5%, 1/2 w.
R2	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R3 and R4	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R5	3R77P681K	Composition: 680 ohms ±10%, 1/2 w.
R6	3R77P104K	Composition: 0.10 megohm ±10%, 1/2 w.
R7	3R77P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R8	19B209358P6	Variable, carbon film: approx 75 to 10,000 ohms ±20%, 0.25 w; sim to CTS Type U-201.
R9 and R10	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R11	3R77P565J	Composition: 5.6 megohms ±5%, 1/2 w.
R12	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R13	3R77P623J	Composition: 62,000 ohms ±5%, 1/2 w.
R14	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R15	3R77P393J	Composition: 39,000 ohms ±5%, 1/2 w.
R16	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R17	3R77P563K	Composition: 56,000 ohms ±10%, 1/2 w.
R18	3R77P242J	Composition: 2400 ohms ±5%, 1/2 w.
R19	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R20	3R77P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R22	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R23	3R77P152K	Composition: 1500 ohms ±10%, 1/2 w.
R24	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R25	19B209358P107	Variable, carbon film: approx 75 to 25,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R26	3R77P390K	Composition: 39 ohms ±10%, 1/2 w.
R27	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R28	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R29	3R77P220K	Composition: 22 ohms ±10%, 1/2 w.
R30	3R77P100K	Composition: 10 ohms ±10%, 1/2 w.
R31 and R32	3R77P560K	Composition: 56 ohms ±10%, 1/2 w.
R33	3R77P100K	Composition: 10 ohms ±10%, 1/2 w.
R34	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R35	3R77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R36	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R37	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R38 thru R41	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P40	Thermistor: 10,000 ohms ±10%, color code red/white;sim to Globar Type 783-H.
RT2	19C300048P8	Disc: 2500 ohms ±10%; sim to GE 4D.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19D402808G32	Coil. Includes:
	5491798P2	Tuning slug.
T2	19D402808G31	Coil. Includes:
	5491798P2	Tuning slug.
T3	19D402808G33	Coil. Includes:
	5491798P3	Tuning slug.
T4	19D402808G34	Coil. Includes:
	5491798P5	Tuning slug.
		- - - - - - - - - OSCILLATORS - - - - - - - - -
		When reordering, specify ICOM Frequency.
		ICOM Frequency = Operating Freq. / 36
Y1 thru Y4	4EG25A10	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.
		- - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4	19B216043G1	Socket.
A103		PA BOARD 19D416466G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121-050-W5R.
C2	19A116114P41	Ceramic: 22 pf ±5%, 100 VDCW; temp coef 0 PPM.
C3	19A116114P2045	Ceramic: 30 pf ±5%, 100 VDCW; temp coef -80 PPM.
C4 and C5	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C7	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM.
C8	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C9	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM.
C10	19A116114P32	Ceramic: 10 pf ±5%, 100 VDCW; temp coef 0 PPM.
C11	19A116114P41	Ceramic: 22 pf ±5%, 100 VDCW; temp coef 0 PPM.
C12	19A116114P32	Ceramic: 10 pf ±5%, 100 VDCW; temp coef 0 PPM.
C13	19A116114P141	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -30 PPM.
C14	19A116114P44	Ceramic: 27 pf ±5%, 100 VDCW; temp coef 0 PPM.
C15	5496218P36	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C16	19A116114P2047	Ceramic: 33 pf ±5%, 100 VDCW; temp coef -80 PPM.
C17	19A116114P28	Ceramic: 8.2 pf ±5%, 100 VDCW; temp coef 0 PPM.
C18	5496218P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C19	19A116114P32	Ceramic: 10 pf ±5%, 100 VDCW; temp coef 0 PPM.
C20	19A116952P26	Silver mica: 26 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C21	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	GE PART NO.	DESCRIPTION
C22	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C23	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C24	19A116114P141	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -30 PPM.
C25	5496218P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C26	19A116952P21	Silver mica: 21 pf ±.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C27	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C28	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C29	19A116952P13	Silver mica: 13 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C30	5496218P39	Ceramic disc: 8.0 pf ±5%, 500 VDCW, temp coef 0 PPM.
C31	19A116952P23	Silver mica: 23 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C32	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C33	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C34	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C35	19A116952P23	Silver mica: 23 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C36	5494481P9	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C37*	5496218P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
		Earlier than REV A:
	5496218P38	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C38	19A116952P25	Silver mica: 25 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C39	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C40	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C41	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C42	19A116952P23	Silver mica: 23 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C43	5494481P9	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C44*	5496218P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
		Earlier than REV A:
	5496218P38	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C45	19A116952P25	Silver mica: 25 pf ±2%, 250 VDCW; sim to Underwood Type J1HF.
C46	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C47	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C48	7489162P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C49	19A116952P23	Silver mica: 23 pf ±0.5 pf, 250 VDCW; sim to Underwood Type J1HF.
C50	5494481P9	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C51	19A116114P2047	Ceramic: 33 pf ±5%, 100 VDCW; temp coef -80 PPM.
C52	19A116114P28	Ceramic: 8.2 pf ±5%, 100 VDCW; temp coef 0 PPM.
C53	19A116114P32	Ceramic: 10 pf ±5%, 100 VDCW; temp coef 0 PPM.
C54	19A116288P17	Ceramic: 100 pf ±5%, 200 VDCW; sim to Erie 8121-A200-COG-101J.
C55	19A116114P28	Ceramic: 8.2 pf ±5%, 100 VDCW; temp coef 0 PPM.
C56	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J8	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1*	19A129773G1	Coil.
		Earlier than REV A:
	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4.
L2	7488079P6	Choke, RF: 1.00 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4411-8K.
L3	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L4	19A129233P1	Coil.
L5*	19A129773G1	Coil.
		Earlier than REV A:
	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L6	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L7	19B219457P3	Coil.
L8	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L9	19B219457P3	Coil.
L10	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L11	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L12	19B219457P3	Coil.
L13	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L14 and L15	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9K.
L16	19B219457P3	Coil.
L17	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L18	19B219457P3	Coil.
L19	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4422-1K.
L20 thru L37		(Part of printed wiring board 19D416515P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A129283P1	Silicon, NPN.
Q3	19A129283P2	Silicon, NPN.
Q4	19A129283P3	Silicon, NPN.
Q5 and Q6	19A129283P4	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - -
R1	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R2	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R4 thru R7	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R8	3R78P101J	Composition: 100 ohms ±5%, 1 w.
R9 and R10	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R11	3R78P101J	Composition: 100 ohms ±5%, 1 w.
R12	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CABLES - - - - - - - - -
W1	19A121948G10	RF: 500 VDC. Includes 2 inch cable (19B209044P19).
W2	19A129234P1	RF: 500 VDC. Includes 5-1/2 inch cable (19B209044P23).
A104		(See A101).
A105		AMPLIFIER TRIPLER BOARD 19D416460G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116114P69	Ceramic: 130 pf ±5%, 100 VDCW; temp coef 0 PPM.
C2	19A116656P12J0	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C3 and C4	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C5	19A116656P10G0	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C6	19A116655P17	Ceramic disc: 680 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C7	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C8	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116114P69	Ceramic: 130 pf ±5%, 100 VDCW; temp coef 0 PPM.
C10	19A116656P8G0	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C11	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C12	19A116656P4G0	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C13	19A116655P13	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C15	19A116656P3G0	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A115250P1	Silicon.
CR2 thru CR9	4037822P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J3	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J8 thru J17	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J19	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J21	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J23	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J25 thru J35	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B219456P1	Coil.
L2	7488079P17	Choke, RF: 12.0 µh ±10%, 1.00 ohms DC res max; sim to Jeffers 4421-8.
L3	19B219456P2	Coil.
L4	7488079P6	Choke, RF: 1.00 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4411-8.
L5	19B219457P1	Coil.
L6	7488079P18	Choke, RF: 15.0 µh ±10%, 1.20 ohms DC res max; sim to Jeffers 4421-9.
L7	7488079P6	Choke, RF: 1.00 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4411-8.

SYMBOL	G-E PART NO	DESCRIPTION
L8	19B219457P2	Coil.
L9 thru L15		(Part of printed wiring board 19D416451P1).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115329P1	Silicon, NPN.
Q3	19A115300P2	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P330J	Composition: 33 ohms ±5%, 1/2 w.
R2 and R3	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R4	3R78P200J	Composition: 20 ohms ±5%, 1 w.
R5	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R6	3R152P243J	Composition: 24,000 ohms ±5%, 1/4 w.
R7	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R8	5490205P16	Composition: 2.7 ohms ±5%, 1 w.
R9	3R77P510J	Composition: 51 ohms ±5%, 1/2 w.
R10	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 thru W3	19A121948G9	RF: 500 VDC. Includes 11-1/2 inch cable (19B209044P19).
		- - - - - - - - - CAPACITORS - - - - - - - - -
C101	5493392P107	Ceramic, stand off: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SS5D.
C102 thru C104	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C105	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR101	4037822P1	Silicon.
CR102*	19A115250P1	Silicon. Added by REV B.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL101	19C320050G1	Bandpass.
FL102	19C320051G1	Bandpass.
FL103	19C320088G1	Lowpass.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J101	19C303426G1	Connector: 20 pin contacts.
J102	19B205689G1	Jack: 16 contacts, includes (16) 19A115853P1 contacts.
		- - - - - - - - - - - RELAYS - - - - - - - - - -
K101	19C307010P20	Armature: 12 VDC nominal, 2.2 w max operating, 130 ohms ±10% coil res; sim to Parelco R10-E2073-2.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q101	19A129181P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R101	19A127071P1	Strap.
R102		Part of Mechanical Parts, consists of:
	19A127071P1	Strap, item 22.
	19A127073P1	Slide, item 19.
R103	19B209022P89	Wirewound: 0.1 ohms ±5%, 2 w; sim to IRC Type BWH.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - SWITCHES - - - - - - - - -
S101	4031922P1	Push: SPST, normally open, 1/2 amp at 12 VDC; sim to Stackpole Type SS-15.
		- - - - - - - - - - CABLES - - - - - - - - - -
W102	19B219822G2	RF: approx 18 inches long.
W103	19B219822G3	RF: 18 inches long.
W104	19B219822G4	RF: 18 inches long.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XK101	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
		MECHANICAL PARTS (SEE RC-2328)
1	19A115793P1	Contact electrical. (Used with J101).
2	19A121676P1	Guide pin. (Used with J101).
3	4036835P4	Solderless terminal; sim to Shakeproof 2177-04-000.
4	7160861P4	Nut, sheet spring: sim to Tinnerman C6452-8Z-67.
5	19A116065P1	Clip, spring tension.
6	19B205206G3	Chassis.
7	19A122805G3	Support.
8	7878455P2	Solderless terminal.
9	19C311781P1	Heat sink.
10	19B201074P206	Tap screw, Phillips Pozidriv®: No. 4-40-3/8.
11	N170P16006P2	Cap screw: No. 10-32 x 3/8.
12	4035439P1	Heat sink. (Used with Q1 on A105).
13	19A129212P1	Plate, with cutout. (Used with Q101).
14	19A129212P2	Plate. (Used with Q101).
15	19B201074P208	Tap screw, Phillips Pozidriv®: No. 4-40-1/2.
16	19A127177G2	Support.
17	19B201074P304	Screw, tap: No. 6-32 x 1/4.
18	4036555P1	Insulator, disc. (Used with Q1 and Q3 on A105).
19	19A127073P1	Slide. (Part of R102).
20	19B201074P204	Tap screw, Phillips Pozidriv®: 4-40 x 1/4.
21	19A129179P2	Angle.
22	19A127071P1	Strap. (R101 and part of R102).
23	N44P9005C13	Screw: No. 4-40 x 5/16.
24	4036855P5	Shield, electronic. (Used with J2 on FL103, W2 on A103).
25	5491595P9	Retainer: spring; sim to Allied Control 30040-2. (Used with K101).
26	4036928P2	Grommet, plastic.
27	19B205884G2	Cover.
28	19B201074P305	Screw, tap: No. 6-32 x 5/16.
29	5492178P2	Washer, spring tension: sim to Wallace Barnes 375-20. (Used with Q1-Q6 on A103).
30	N207P15C6	Hex nut: No. 8-32. (Used with Q1-Q6 on A103).
31	19B201074P205	Screw, Phillips Pozidriv: 4-40-5/16.
32	19D416488P1	Heat sink.

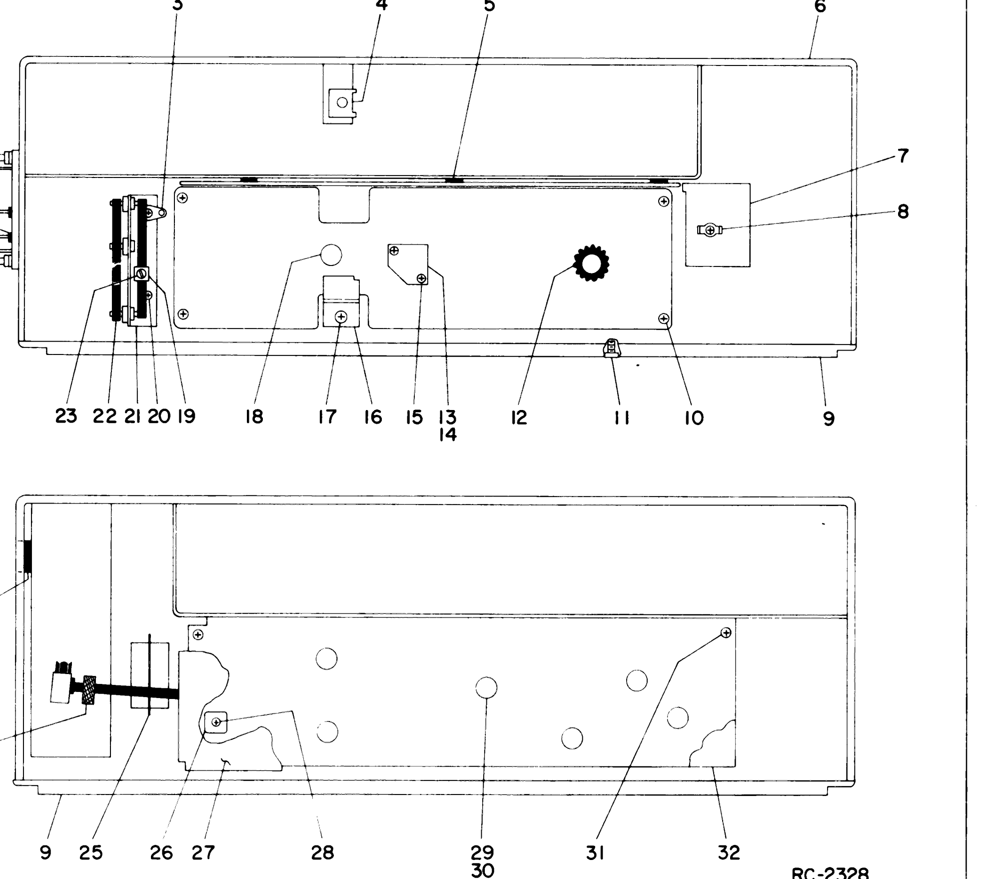
PRODUCTION CHANGES

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 - PA Board 19D416466G1
To improve PA stability.
Changed L1 and L5.

REV. A - Transmitter Chassis 19D416431G2 (4KT16A10)
To improve power output and exciter relay operation.
Changed C37 and C44 on PA Board 19D416466G1 and moved White and Red wire from J101-11 to J101-6.

REV. B - To improve squelch action.
Added CR102.



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 No.

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.

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GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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