MOBILE RADIO

MASTR® *Imperial*

150.8 - 174 MHz, 30/35 - WATT TRANSMITTER MODEL 4KT24A10

Maintenance Manual LBI-4409C
(DATAFILE FOLDER-DF3154)
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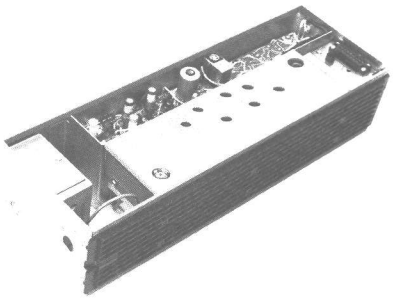

KT-24-A

SPECIFICATIONS *

FCC Filing Designation	**KT-24-A**
FREQUENCY RANGE	150.8-174 MHz
Power Output	35 Watts (150.8-162 MHz) 30 Watts (162-174 MHz) (Adjustable from 10 to 30 or 35 Watts)
Crystal Multiplication Factor	12
Frequency Stability	±.0002% (-30°C to +60°C)
Spurious and Harmonic Radiation	At least 70 dB below full rated power output
Modulation	Adjustable from 0 to ±5 kHz swing with instantaneous modulation limiting.
Modulation Sensitivity	50-100 Millivolts
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%
Deviation Symmetry	0.5 kHz maximum
Maximum Frequency Spacing	±0.2%
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.

GENERAL ELECTRIC

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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

Transmitter Type KT-24-A is a crystal controlled, frequency modulated transmitter designed for one-, two- or four-frequency operation in the 150.8 - 174 megahertz band. The transmitter consists of the following assemblies:

- Transistorized Exciter Board
  - Audio, modulator, amplifier and multiplier stages.
- Integrated Circuit Oscillator Module (ICOM)
  - Oscillator and buffer stages
- Transistorized PA Assembly
  - Multiplier, amplifiers, driver, power amplifier, high-pass filter, and low-pass filter.
- Optional Channel Guard Board
  - Encoder and tone network

CIRCUIT ANALYSIS

The transmitter provides a maximum power output of 35 Watts in the 150.8 to 162 MHz range, and 30 Watts in the 162 to 174 MHz range. The frequency of the plug-in ICOM modules ranges from approximately 12.5 to 14.5 megahertz, and the ICOM frequency is multiplied 12 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, driver, 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 board are connected from the PA assembly to jacks J1 through J8 on the exciter board.

EXCITER

ICOM MODULE

ICOM module Model 4EG25A11 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 oscillator frequency is temperature-compensated at both ends of the temperature range to provide instant frequency compensation, with a frequency stability of ±.0002%.

In single-frequency transmitters, a keying jumper (from R38 on the exciter board) connects the ICOM to ground. Keying the transmitter applies +10 Volts to the ICOM, turning it on. With the ICOM operating, diode CR1 is forward biased and the oscillator output is applied to the modulator stage.

In multi-frequency transmitters, up to three additional ICOM modules can be plugged into the exciter board. The single-frequency keying jumper is removed, and the proper frequency is selected by switching the ICOM keying lead to ground by means of a frequency selector switch on the control unit.

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.

For radios equipped with Channel Guard, tone from the encoder-decoder board (on the receiver) is applied to the ICOM through Channel Guard Mod Adjust R25. The oscillator output is frequency modulated by the Channel Guard tone.

NOTE

If Channel Guard decode only is desired, disconnect the CHAN GD. TONE HI lead from J8 of the transmitter exciter board.

AUDIO AMPLIFIERS AND LIMITER

The audio section of the transmitter consists 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 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

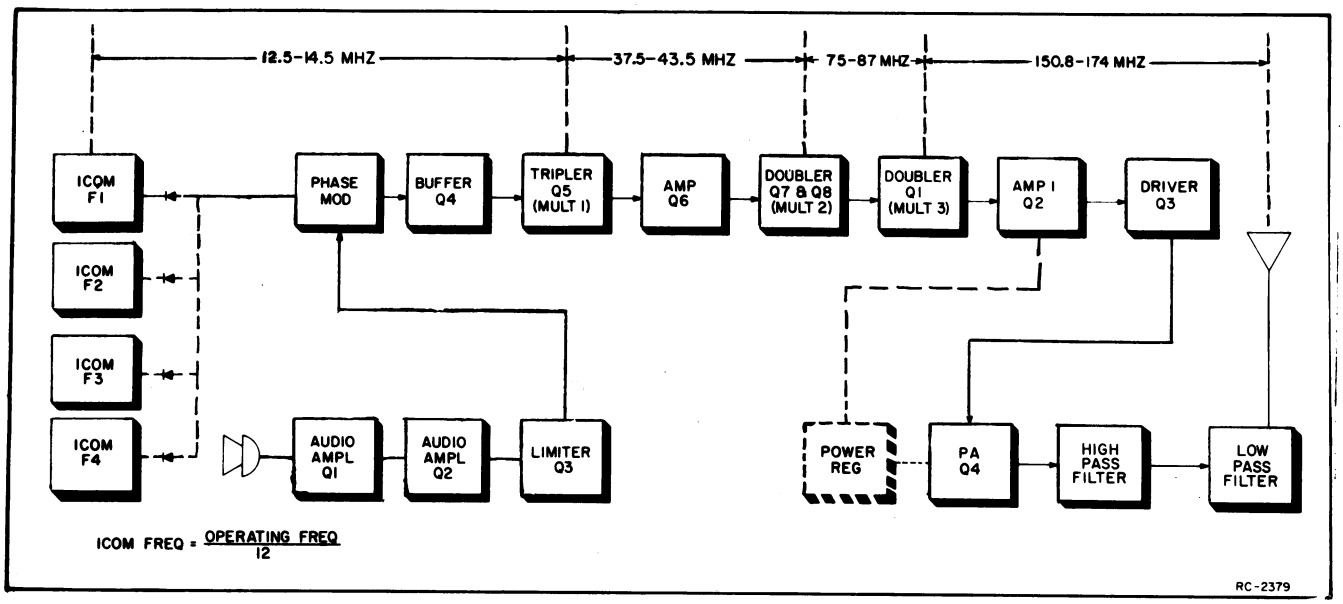


Figure 1 - Transmitter Block Diagram

and R17. Modulation adjust R8 determines the maximum signal level applied to the modulator circuit, and is normally set for ±4.5 kHz (narrow band).

PHASE MODULATOR

The phase modulator uses varactor CV1 (a voltage-variable capacitor) in a 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.

PA ASSEMBLY

MULTIPLIERS

The exciter output is coupled through a series-tuned circuit (tuned to 6 times the crystal frequency) to the base of 3rd doubler A102-Q1 (MULT-3 OUTPUT). This stage is metered at J102 across A102-R4. The 3rd doubler output is coupled through a series-tuned circuit (tuned 12 times the crystal frequency) to the base of 1st amplifier Q2.

AMPLIFIERS, DRIVER AND PA

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.

Following the doubler is a common-emitter, series-tuned RF amplifier stage, Q2.

Driver Q3 follows the amplifier stage. Collector current for Q3 is metered across metering resistor R101 at J102-14 (Driver

Ic). The reading is taken on the 1-Volt scale (the actual current reading is 10 amperes full scale) with the GE Test Set in Position F. The Driver output is coupled through a series-tuned circuit to base of the power amplifier Q4.

Q4 operates as a common-emitter power amplifier to provide variable RF power output of 10-35 Watts. Collector current for the PA transistor is metered across metering resistor R102 at J102-1 (PA Ic). The reading is taken on the 1-Volt scale (the actual current reading is 10 amperes full scale) with the GE Test Set in Position G, and with the HIGH SENSITIVITY button pressed.

Meter shunt R102 also serves as a voltage and current sensing element in conjunction with the Power Regulator to provide protection for the PA transistors by reducing the supply voltage of the pre-driver amplifier Q2 when the collector current or the supply voltage of the PA amplifier Q4 rises. Reducing the supply voltage of Q2 causes the RF drive to the PA transistor Q4 to be reduced thus limiting the DC input power and holding the RF output power approximately constant.

The adjustable RF power output feature is accomplished by controlling the supply voltage of the pre-driver amplifier Q2. Potentiometer R13 on the Power Regulator board controls the RF power output by varying the supply voltage to the pre-driver amplifier Q2.

The Power Amplifier output is coupled through a series-tuned circuit to high-pass filter FL102, low-pass filter FL101 and then through antenna relay K901 to the antenna.

CHANNEL GUARD ENCODER OPTION

Channel Guard Encoder Model 4EH18A10 is a fully transistorized encoder for use with MASTR Imperial combinations in encode only applications, or where different encode and decode tones are desired. 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.

The encoder board and tone network mount on the underside on the transmitter chassis. Power, ground and tone output connections are made to transmitter exciter board A101 by means of a cable (19B216186-G1).

The encoder tone is provided by selective oscillators Q1 and Q2, which oscillate continuously at a frequency determined by the tone network (FL1). Negative feedback, applied through the tone network to the base of Q1, prevents any gain in the stage except at the desired encode frequency. The oscillator output is applied to the base of emitter-follower Q3.

Thermistor-resistor combination R1 and RT1 provides temperature compensation for the oscillator output. Limiter diodes CR1 and CR2 keep the tone amplitude constant.

The output of emitter-follower Q3 is applied to the ICOM module on the transmitter exciter board through Channel Guard MOD ADJUST R25. Instructions for setting R25 are contained in the Modulation Adjustment section of the Transmitter Alignment Procedure.

In encode-decode applications, the channel can be monitored before transmitting a message by moving the ON-OFF switch on the Control Unit to the OFF position, or by removing the microphone or handset from the optional hand-up bracket.

NOTE

If Channel Guard decode only is desired, disconnect the CHAN GD. TONE HI lead from J8 of the transmitter exciter board.

CARRIER CONTROL TIMER

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

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

MAINTENANCE

DISASSEMBLY

To service the transmitter from the top (Figure 2):

1. Pull locking handle down and pull radio about one inch out of mounting frame.
2. Pry up cover at rear of transmitter.

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

To replace the PA transistors (Q1 through Q4):

1. Unsolder one lead at a time with a 50-Watt soldering iron. Use a scribe to hold the lead away from the printed circuit board until the solder cools.

2. Turn the transmitter over.

3. Hold the body of the transistor to prevent it from turning. Remove the transistor hold-down nut and spring washer through the hole in the heatsink with an 11/32-inch nut-driver. Lift out the transistor, and remove the old solder from the printed circuit board.

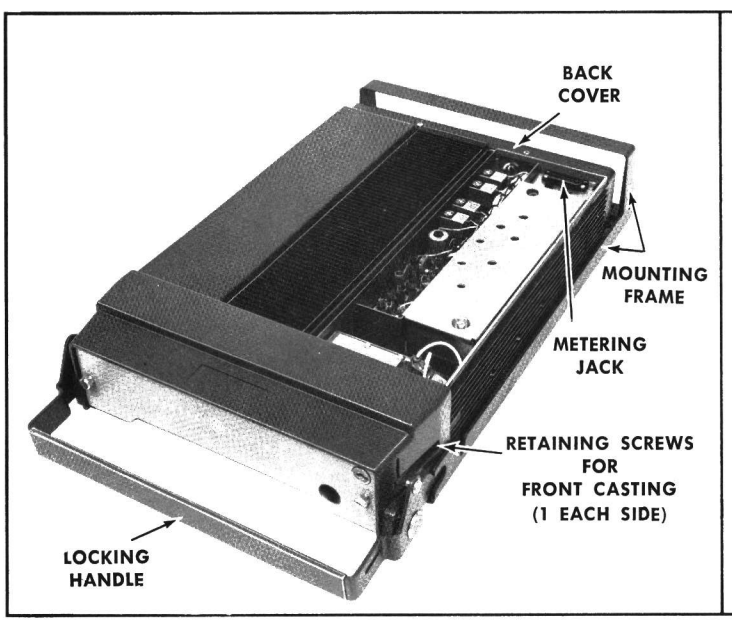


Figure 2 - Top Cover Removed

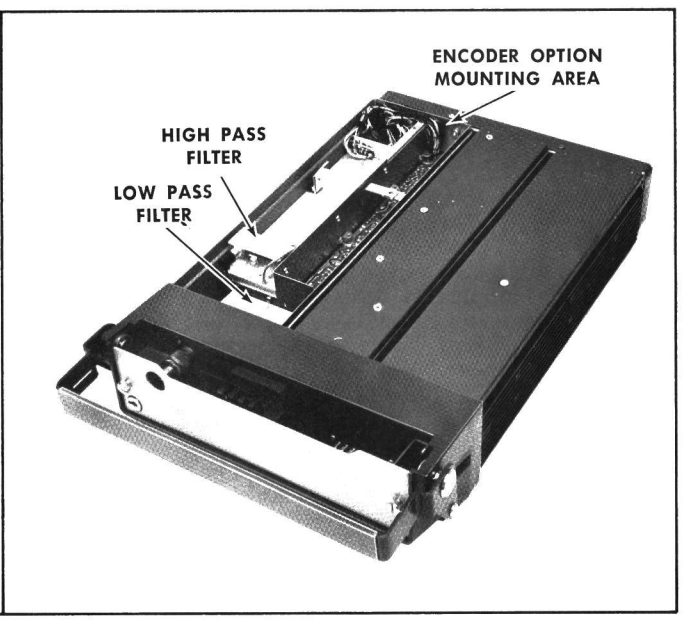


Figure 3 - Bottom Cover Removed

4. Trim the new transistor leads (if required) to approximately 3/8-inch lengths. Cut the collector lead at a 45° angle for future identification (see Figure 1). The letter "C" on the top of the transistor indicates the collector.

5. Apply a coating of 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 hold-down nut and spring washer, using moderate torque (8 to 10 inch-pounds maximum in 25-50 MHz transmitters, and 6.5 inch-pounds for 150.8 to 470 MHz transmitters).

6. 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.

7. Solder the leads to the printed circuit pattern. Start at the inner edge of mounting hole and solder the remaining length of transistor lead to the board.

CAUTION

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

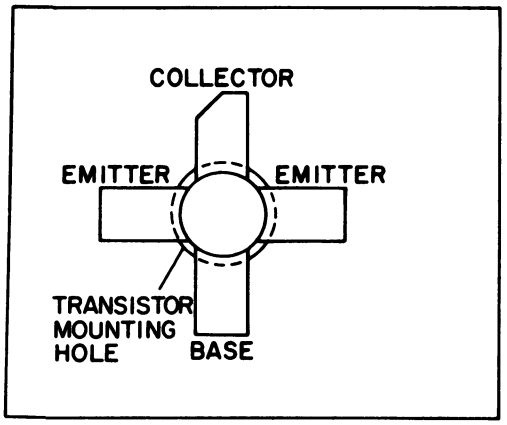


Figure 4 - Lead Identification

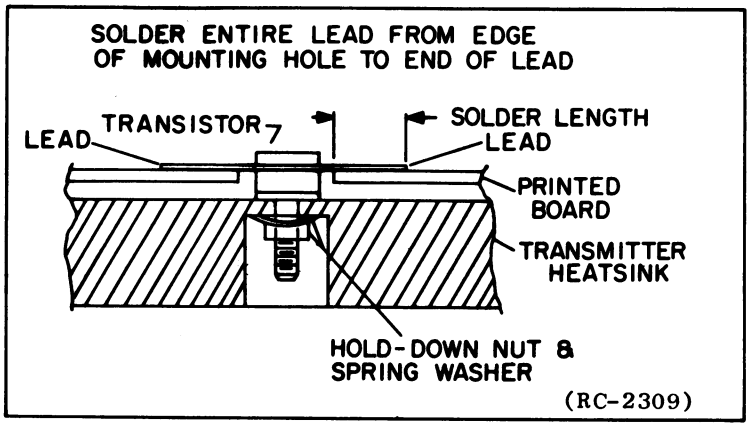


Figure 5 - Lead Forming

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 or 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. 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

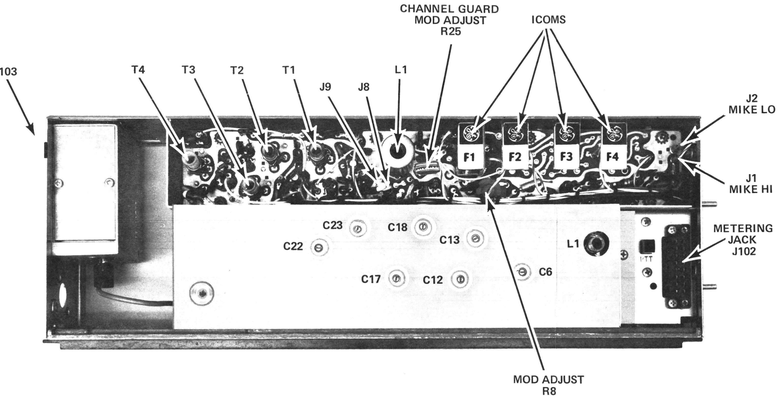
Where:

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 = 12.5 Volts x 5.5 amperes = 68.75 Watts



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A10 (Revision A or later), or Model 4EX8K11.
2. A 50-ohms wattmeter connected to J103.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place ICOM (s) in proper socket (ICOM frequency = operating frequency ÷ 12). Do not adjust ICOM trimmer.
2. Set the channel selector switch to the F1 position.
3. Turn the slugs in the Exciter coils L1, T1, T2, T3, T4 and PA coil L1 to the bottom of the coil. Turn mica compression capacitors C6, C12, C13, C18, C22, and C23 (on PA Board) all the way to the right (clockwise). Then set each capacitor a half turn counterclockwise. Turn C17 fully clockwise then a quarter turn counterclockwise.
4. 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.
5. Set Power Regulator Power Adjust Pot (R13) fully clockwise.
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. Unkey the transmitter between steps to avoid unnecessary heating.

TRANSMITTER ALIGNMENT PROCEDURE

STEP	METER POSITION	TUNING CONTROL	METER READING	PROCEDURE
				EXCITER BOARD
1.	A Mult. -1	L1 & T1	See Procedure	Carefully tune L1 for maximum meter reading. Tune T1 for a small change in meter reading.
2.	B Amp-1	T1 & T2	See Procedure	Tune T1 for maximum meter reading. Tune T2 for a dip in meter reading.
3.	C Mult. -2	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.
				POWER AMPLIFIER
4.	D Mult. -3	L1, C6 (PA) & T4	Maximum	Adjust L1 and C6 for maximum meter reading. Then re-adjust T4 and L1 for maximum meter reading.
5.	F Amp-2&3	C12 & 13	Maximum	Increase the capacity (clockwise) of C12 and C13 to the first indication. Then tune this response for maximum meter reading, alternating between C12 and C13.
6.	F	C6	Maximum	Retune C6 for maximum meter reading.
7.	G Driver Ic	C17 & C18	Maximum	With the HIGH SENSITIVITY button pressed, alternately tune C17 and C18 for a peak indication.
8.	G PA Ic	C22 & C23	Maximum Power Minimim Current	With the HIGH SENSITIVITY button pressed, alternately tune C22 and C23 for maximum RF power out and minimum PA Collector Current (G reading).
9.	G		Maximum	Repeat steps 4 through 8 for maximum RF power out.
10.	G	R13		Adjust R13 on Power Regulator for 35 Watts (150.8 - 162 MHz) or 30 Watts (162 - 174 MHz) or other desired power down to 10 Watts.

FREQUENCY ADJUSTMENT

First, check the transmitter frequency to determine if any adjustment is required. The frequency should be checked with a frequency meter of 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.

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 7). 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 shown a correction factor of approximately +1.5 PPM. (At 1.50 MHz, 1 PPM is 150 Hz. At 174 MHz, 1 PPM is 174 Hz.)
2. With a transmitter operating frequency of 150 MHz, adjust the ICOM trimmer for a reading of +225 Hz (+1.5 x 150) 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.

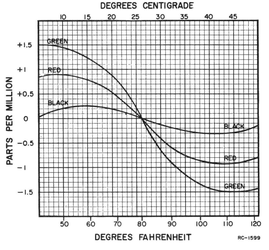


Figure 6 - ICOM Frequency Correction Curve

ALIGNMENT PROCEDURE

150.8—174 MHZ, 30/35-WATT TRANSMITTER
MODEL 4KT24A10

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:

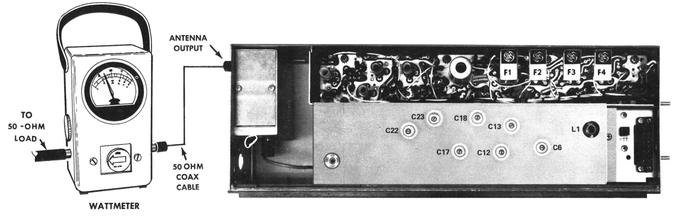
   GE TEST SET MODEL 4EX3A10,
   MODEL 4EX8K11 or
   20,000 ohms-per-volt voltmeter

STEP 1

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output to wattmeter as shown below:



WATTMETER

2. Turn Power Adjust R13 (Power Regulator) fully clockwise. Key transmitter and check wattmeter for minimum reading of 35 Watts (150.8-162 MHz), or 30 Watts (162-174 MHz). Reset Power Adjust, R13, to the desired power out.

SERVICE CHECK

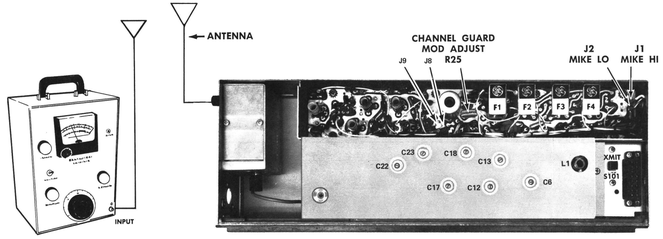
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



DEVIATION METER

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) or 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.

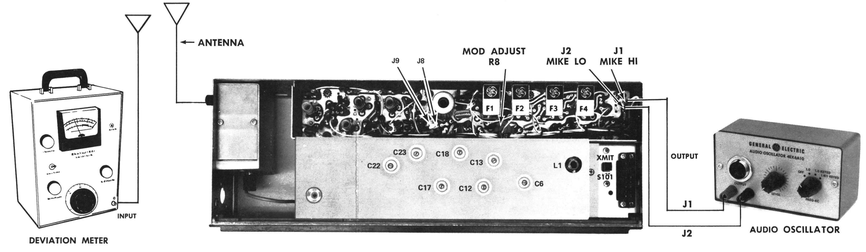
DEVIATION METER

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:



DEVIATION METER

AUDIO OSCILLATOR

3. Set the generator output to 1.0 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 (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: --Imperial 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.

METER

STEP 1 - QUICK CHECKS

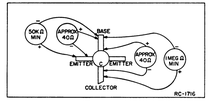
Meter Position	Probable Defective Stage		
	High Meter Reading	Low Meter Reading	Zero Meter Reading
A (MULT-1)	Q4 or Q5	Q4, Q5 or open L1	10-volt regulator, ICOM, CV1, or Q4, Q5
B AMP 1	Q6, T2	Q6, T1	T1, Q6, T2
C (MULT-2)	Q7, Q8, T4	Q7, Q8, T3	Q7, Q8, T3, T4
D (MULT-3) OUTPUT	A102-Q2	13.6 Volts A102-Q1 A101-T4, W102	13.6 Volts A102-Q1 A101-T4, W102
F (DRIVER Ic)	A102-Q4	Q3, or protective circuits activated*	Keyed 10 Volts, A102-Q2, Q3 13.6 Volts
G (PA Ic)	Mis-aligned PA. Check Alignment Procedure.	Q4 or protective circuits activated*	Keyed 10 Volts, A102-Q4 13.6 Volts

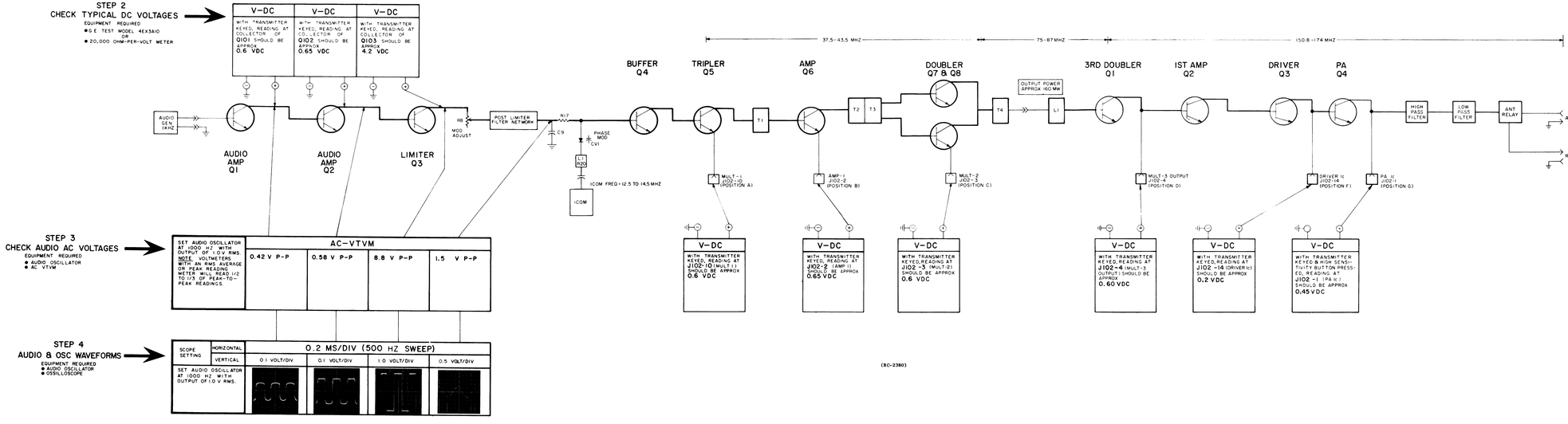
* Refer to the power regulator Troubleshooting Procedure for check of protective circuit.

PA TRANSISTOR CHECKS

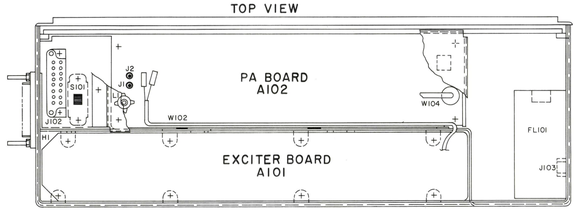
PA transistors Q1 thru Q4 can be checked to determine if they are defective by measuring the junction resistances with an ohmmeter according to the following procedure:

1. Unsolder the base and collector leads with a 50-Watt soldering iron. Use a scribe to hold each lead off the printed circuit board until the solder cools.
2. Slip a piece of paper under each unsoldered lead to insulate it from the printed circuit board.
3. Measure the base-to-emitter and base-to-collector resistances, and check with the "good" resistance readings as shown in RC1716. Always take two different readings for each junction by reversing the meter leads.
4. If replacement of a transistor is necessary, refer to the replacement procedure listed in the Table of Contents.

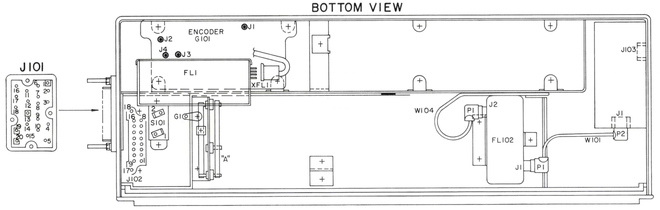




TOP VIEW



BOTTOM VIEW

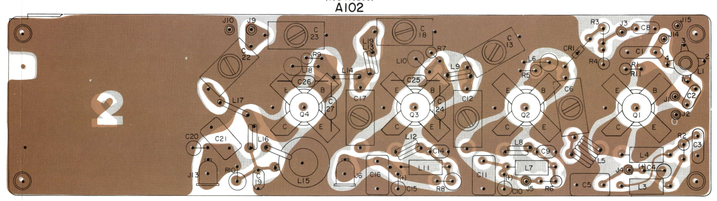


DETAIL "A"

OUTLINE DIAGRAM

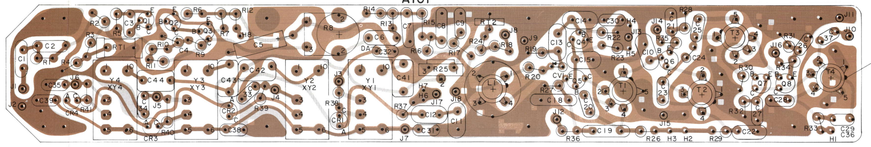
150.8——174 MHZ, 30/35-WATT TRANSMITTER
MODEL 4KT24A10

PA BOARD
(19D416268)
A102

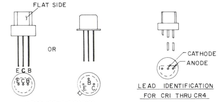


(19D416266, Sh. 1, Rev. 2)
(19D416266, Sh. 2, Rev. 2)

EXCITER BOARD
(19D402921)
A101



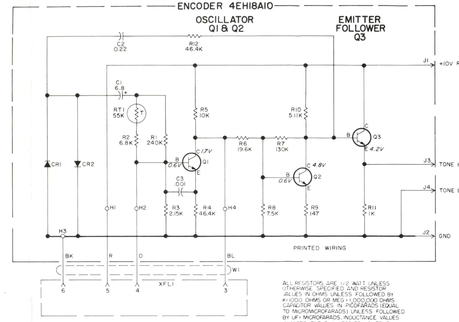
(19D402939, Sh. 1, Rev. 1)
(19D402939, Sh. 2, Rev. 1)



(19B621953, Rev. 0)

CHANNEL GUARD ENCODER MODEL 4EH18A10

SCHEMATIC DIAGRAM



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

SEE SPECIFICATION PAGE FOR CRYSTAL FREQUENCY CALL-OUT WITH THIS UNIT FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO. 4EH18AIO — REV. LETTER

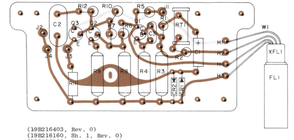
VOLTAGE READINGS

READINGS MEASURED FROM TRANSISTOR PIN TO GROUND WITH A 20,000 OHM-PER-VOLT METER.

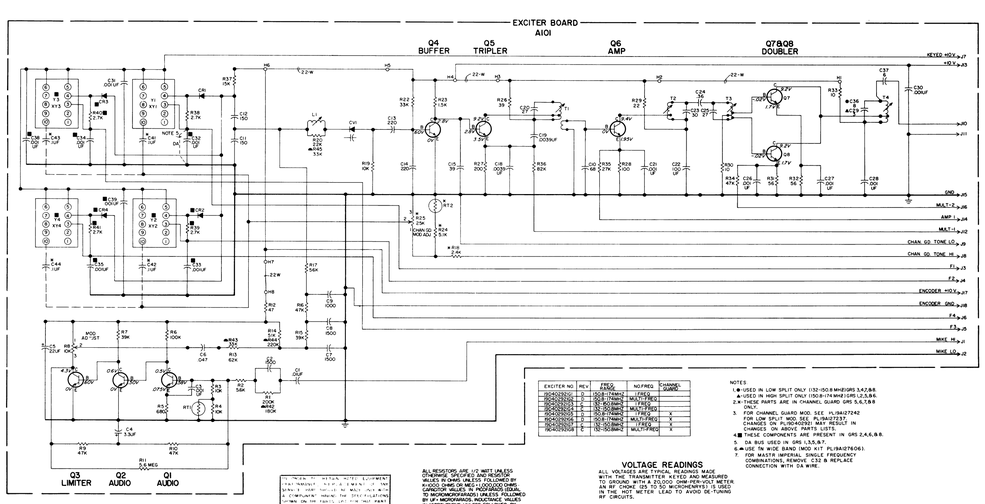
(19C311817, Rev. 1)

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.

OUTLINE DIAGRAM



(19B216403, Rev. 0)
(19B216189, Sh. 1, Rev. 0)
(19B216160, Sh. 2, Rev. 0)



SCHEMATIC DIAGRAM

150.8—174 MHZ, 30/35-WATT TRANSMITTER
MODEL 4KT24A10

Issue 3

PARTS LIST

LBI-4408C

150.8-174 MHz TRANSMITTER
TYPE ET-24-A

SYMBOL	GE PART NO.	DESCRIPTION
A101		EXCITER BOARD ASSEMBLY 19D403931
		G1 1 FREQUENCY G2 MULTI-FREQUENCY G5 1 FREQUENCY CHANNEL GUARD G6 MULTI-FREQUENCY CHANNEL GUARD
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C2	7481395P111	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	7481395P111	Ceramic disc: 1500 pf ±10%, 500 VDCW; sim to RMC Type JL.
C9	7481395P109	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	5490008P91	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	7480162P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C15	7480162P117	Silver mica: 39 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C18 and C19	5490481P129	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	7480162P127	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 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	19A116656P628	Ceramic disc: 6.0 pf ±0.25 pf, 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.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115603P1	Silicon.
CV1	5495769P9	Varactor, silicon: 33 pf ±10% at 4 VDC; sim to Pacific Semiconductor Varicap Type V-596.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 thru J18	4033513P4	Contact, electrical: sim to Bead Chain LS3-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19D402808G30	Coil. Includes tuning slug 5491784P2.
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 X-201.
R9 and R10	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R11	3R77P565J	Composition: 5.6 megohms ±5%, 1/2 w.
R13	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	3R77P202J	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.

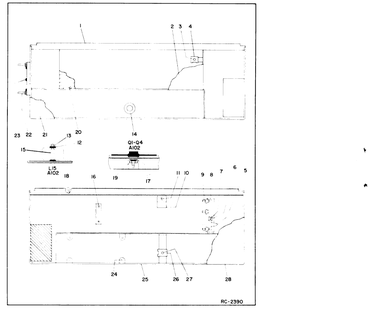
SYMBOL	GE PART NO.	DESCRIPTION
R35	3R77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R36	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R37	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R38 thru R41	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P40	Thermistor: 10,000 ohms ±10%, color code red/white; sim to Global Type 783-H.
RT2	19C300048P8	Disc: 2500 ohms ±10%; sim to GE 4D.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19D402808G32	Coil. Includes tuning slug 5491788P2.
T2	19D402808G31	Coil. Includes tuning slug 5491788-P2.
T3	19D402808G33	Coil. Includes tuning slug 5491788P3.
T4	19D402808G34	Coil. Includes tuning slug 5491788P5.
		OSCILLATORS When reordering, specify ICOM Frequency, ICOM Frequency + operating frequency + 12.
Y1 thru Y4	4EG25A11	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1 thru XY4	19B216043G1	Socket.
A102		POWER AMPLIFIER 19D401268G3
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5496219P360	Ceramic disc: 75 pf ±5%, 500 VDCW, temp coef -150 PPM.
C2	5496219P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C3	7480162P119	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C4	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
5	4036994P1	Solderless terminal: sim to Elerick Mfg Corp. 500.
6	19A137073P1	Slide. (Part of A102).
7	X44P9005C13	Machine screw: No. 4-40 x 5/16.
8	19A139179P2	Support. (Used with C101-C103, R102, R103).
9	19A137071P1	Strap. (Part of R103, R103).
10	19A127177G1	Support.
11	X44P9006C6	Flathead, screw: No. 6-40 x 3/8.
12	7147306P2	Bushing, insulated. (Used with L15 on A102).
13	7141225P3	Hexnut: No. 6-32. (Used with L15 on A102).
14	19A122826P1	Can. (Used with L1 on A101).
15	7150727P14	Tubing. (Used with L15 on A102).
16	19B201074P305	Tap screw, Phillips Pozidriv®: 4-40-5/16.
17	5492178P2	Washer, spring tension. (Used with Q1-Q4 on A102).
18	9170P1606P2	Cap screw: No. 10-32 x 3/8.
19	X207P1SC6	Hexnut: No. 8-32. (Used with Q1-Q4 on A102).
20	19C317969P1	Heat sink. (Used with A102).
21	19C303396G1	Mobile Top cover.
	19C303495G6	Station Top cover. (Except Repeaters and VM).
	19C303673G3	Station Top cover. (Repeaters and VM only).
22	19A121676P1	Guide pin: No. 4-40 threads.

SYMBOL	GE PART NO.	DESCRIPTION
P115 and P116	402984P2	Contact, electrical: sim to Amp 42827-2.
W104		CABLE ASSEMBLY 19A121848G3
		- - - - - - - - - - PLUGS - - - - - - - - - -
P9	402984P2	Contact, electrical: sim to Amp 42827-2.
P10	402984P2	Contact, electrical: sim to AMP 41854.
	5491689P56	EF Cable assembly: approx 12 inches long with molded plug (P1).
		HARNESS ASSEMBLY 19D416558G3 (Includes C105, J101, J102, P104-P106, P112, P113, P119-P123, P126-P129, P132-P136, W104)
		CHANNEL GUARD MODIFICATION 19A127242G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C41 thru C44	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R18	3R77P242J	Composition: 2400 ohms ±5%, 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.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT2	19C300048P8	Disc: 2500 ohms ±10%; sim to GE 4D403.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
1	19C311781P1	Heat sink.
2	19B216232G2	Cover. (Used with A102).
3	X113P1306C6	Tap screw: No. 6 x 3/8.
4	7160861P16	Nut, sheet spring: sim to Tinnerman C8091-632-157.
5	4036994P1	Solderless terminal: sim to Elerick Mfg Corp. 500.
6	19A137073P1	Slide. (Part of A102).
7	X44P9005C13	Machine screw: No. 4-40 x 5/16.
8	19A139179P2	Support. (Used with C101-C103, R102, R103).
9	19A137071P1	Strap. (Part of R103, R103).
10	19A127177G1	Support.
11	X44P9006C6	Flathead, screw: No. 6-40 X 3/8.
12	7147306P2	Bushing, insulated. (Used with L15 on A102).
13	7141225P3	Hexnut: No. 6-32. (Used with L15 on A102).
14	19A122826P1	Can. (Used with L1 on A101).
15	7150727P14	Tubing. (Used with L15 on A102).
16	19B201074P305	Tap screw, Phillips Pozidriv®: 4-40-5/16.
17	5492178P2	Washer, spring tension. (Used with Q1-Q4 on A102).
18	9170P1606P2	Cap screw: No. 10-32 x 3/8.
19	X207P1SC6	Hexnut: No. 8-32. (Used with Q1-Q4 on A102).
20	19C317969P1	Heat sink. (Used with A102).
21	19C303396G1	Mobile Top cover.
	19C303495G6	Station Top cover. (Except Repeaters and VM).
	19C303673G3	Station Top cover. (Repeaters and VM only).
22	19A121676P1	Guide pin: No. 4-40 threads.

SYMBOL	GE PART NO.	DESCRIPTION
23	19A115793P1	Contact. (Used with J101).
24	19B201074P304	Tap screw, Phillips Pozidriv: 6-32 x 1/4.
25	19B203206G4	Chassis.
26	7160861P4	Nut, sheet spring: sim to Tinnerman C6452-82-67.
27	X115P1508C13	Tap screw: No. 8 x 1/2. (Secures bottom cover).
28	19C303396G3	Mobile Bottom Cover.
	19C303495G7	Station Bottom Cover.

SYMBOL	GE PART NO.	DESCRIPTION
C23	19B209046P3	Variable, mica: 7 to 50 pf, 400 VDCW.
C24 thru C26	19A116656P5J21	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -150 PPM.
C27	19A116656P62J1	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -150 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 thru J3	4033513P4	Contact, electrical: sim to Bead Chain LS3-3.
J6	4033284P2	Terminal: sim to ALCON 3-1215.
J9 and J10	4033513P4	Contact, electrical: sim to Bead Chain LS3-3.
J13	4033284P2	Terminal: sim to ALCON 3-1215.
J14 and J15	4033513P4	Contact, electrical: sim to Bead Chain LS3-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19D402808G36	Coil. Includes tuning slug 5491798P2.
L3	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L4	7488079P3	Choke, RF: 0.22 µh ±20%, 0.07 ohms DC res max; sim to Jeffers 4441-3K.
L5	19B216273P5	Coil.
L6	7488079P13	Choke, RF: 5.60 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4421-4K.
L7	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L8	19A129167P1	Coil.
L9	19B219376P1	Coil.
L10	7488079P16	Choke, RF: 10.0 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L11	7488079P40	Choke, RF: 5.60 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4420-1K.
L12	19B219376P2	Coil.
L14	19A129281P1	Coil.
L15	19B216365G1	Coil.
L16	19B219376P1	Coil.
L17	19A129164P1	Coil.
L18	7488079P49	Choke, RF: 33.0 µh ±10%, 1.90 ohms DC res max; sim to Jeffers 4422-10K.
L19	19A129282P1	Coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A129181P1	Silicon, NPN.
Q3	19A129181P3	Silicon, NPN.
Q4	19A129181P4	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R3 and R4	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R5	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R6	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R7*	3R77P910J	Composition: 91 ohms ±5%, 1/2 w.
	3R77P331J	In REV A: Composition: 330 ohms ±5%, 1/2 w.
	3R77P910K	Earlier than REV A: Composition: 91 ohms ±10%, 1/2 w.
R8	3R78P100K	Composition: 10 ohms ±10%, 1 w.

SYMBOL	GE PART NO.	DESCRIPTION
R9*	3R78P471K	Composition: 470 ohms ±10%, 1 w.
	3R78P101K	Earlier than REV A: Composition: 100 ohms ±10%, 1 w.
R10	3R78P100K	Composition: 10 ohms ±10%, 1 w.
R19	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
		CHASSIS AND PA ASSEMBLY 19D416558G1 WITHOUT CHANNEL GUARD 19D416558G2 WITH CHANNEL GUARD
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C101	5493392P107	Ceramic, stand off: .001 pf ±100%-0%, 500 VDCW; sim to Allen-Bradley Type 385D.
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.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL101	19D402770G1	Filter.
FL102	19B216230G2	Filter.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J101	19C300426G1	Connector: 20 pin contacts.
J102	19B205689G1	Connector: 18 pin contacts.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P104 and P105	402984P1	Contact, electrical: sim to AMP 41854.
P106	19B209151P1	Terminal, solderless.
P112	402984P2	Contact, electrical: sim to AMP 42827-2.
P113	19B209151P1	Terminal, solderless.
P119 thru P121	402984P1	Contact, electrical: sim to AMP 41854.
P122	402984P2	Contact, electrical: sim to Amp 42827-2.
P123	402984P1	Contact, electrical: sim to AMP 41854.
P126 thru P128	402984P1	Contact, electrical: sim to AMP 41854.
P129	402984P2	Contact, electrical: sim to AMP 42827-2.
P132 thru P136	402984P1	Contact, electrical: sim to AMP 41854.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	19B209022P89	Wirewound: 0.1 ohm ±5, 2 w; sim to IRC Type BWH.
R102		Includes:
	19A127073P1	Slide.
	19A127071P1	Strap.
R103	19A127071P1	Strap.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S101	4031922P1	Push: SPST, normally open, momentary contact, .50 amp at 12 VDC; sim to Stakepole Type SS-15.
		- - - - - - - - - - CABLES - - - - - - - - - -
W101	5491689P77	RF: approx 6 inches long. Includes J1 and P2.
W102		CABLE ASSEMBLY 19B216429G1
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1 and P2	402984OP1	Contact, electrical: sim to AMP 41854.



PRODUCTION CHANGES

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

Rev. A - Power Amplifier 19D401268G3
To improve power output of transmitter.
Changed R7 and R9.

Rev. B - Power Amplifier 19D401268G3
To improve transmitter stability.
Changed R7.

PARTS LIST

LBI-3938C

CHANNEL GUARD ENCODER
MODEL 4EH18A10
19B216161G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C2	19B209243P15	Polyester: 0.22 µf ±20%, 250 VDCW.
C3	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	5494922P1	Silicon.
		- - - - - - - - - - TONE NETWORKS - - - - - - - - - -
FL1	19B205280	Tone Detector. (Check group numbers for desired frequency).
	G1	71.9 Hz
	G2	77.0 Hz
	G3	82.5 Hz
	G4	88.5 Hz
	G5	94.8 Hz
	G6	100.0 Hz
	G7	103.5 Hz
	G8	107.2 Hz
	G9	110.9 Hz
	G10	114.8 Hz
	G11	118.8 Hz
	G12	123.0 Hz
	G13	127.3 Hz
	G14	131.8 Hz
	G15	136.5 Hz
	G16	141.3 Hz
	G17	146.2 Hz
	G18	151.4 Hz
	G19	156.7 Hz
	G20	162.2 Hz
	G21	167.9 Hz
	G22	173.8 Hz
	G23	179.9 Hz
	G24	186.2 Hz
	G25	192.8 Hz
	G26	203.5 Hz
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 thru J4	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q3	19A115362P1	Silicon, NPN; sim to Type 2N2925.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P244J	Composition: .24 megohm ±5%, 1/2 w.
R2	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R3	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R4	19A116278P65	Metal film: 46.4 ohms ±2%, 1/2 w.
R5	19A116278P301	Metal film: 10,000 ohms ±2%, 1/2 w.
R6	19A116278P329	Metal film: 19,600 ohms ±2%, 1/2 w.
R7	19A116278P412	Metal film: 0.13 megohm ±2%, 1/2 w.
R8	19A116278P285	Metal film: 7500 ohms ±2%, 1/2 w.
R9	19A116278P117	Metal film: 147 ohms ±2%, 1/2 w.
R10	19A116278P269	Metal film: 5110 ohms ±2%, 1/2 w.
R11	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R12	19A116278P365	Metal film: 46,400 ohms ±2%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - THERMISTORS - - - - - - - -
RT1	5490828P36	Thermistor: 55,000 ohms ±10%, color code black/red; sim to Globar Type 723-B.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	19A121920G3	Cable assembly. Includes socket (XFL1), approx 4.25 inches long.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XFL1		(Part of W1).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B216186G1	Cable assembly. (Connects to J1 thru J4).
	4029840P2	Contact, electrical: sim to Amp 42827-2. (Connects to J1, J3, J4).
	4029840P1	Contact, electrical: sim to AMP 41854. (Connects to J2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES