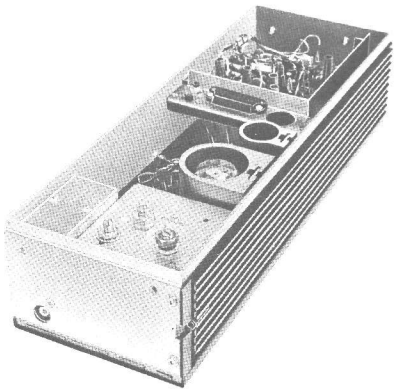
MOBILE RADIO

MASTR Progress Line

66-88 MHZ, 30-WATT TRANSMITTER MODELS 4ET56A30-41 & 4ET56B10-15

Maintenance Manual LBI-3948D

DF-3123



ET-56-A & B

SPECIFICATIONS *

	ET-56-A (Narrow Band) ET-56-B (Wide Band)
FCC Filing Designation	
Frequency Range	66-88 MHz
Power Output	
Mobile Power Supply	30 watts minimum (20% duty cycle)
Station Power Supply	30 watts minimum (continuous duty)
Crystal Multiplication Factor	12
Frequency Stability	±.0005% (-30°C to +60°C)
Spurious and Harmonic Radiation	At least 85 dB below rated power output
Modulation	Adjustable from 0 to ±5 kHz (Narrow Band) and 0 to ±15 kHz (Wide Band) swing with instantaneous modulation limiting
Audio Frequency Characteristics	Within +1 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 5%
Deviation Symmetry	
Narrow Band	0.5 kHz maximum
Wide Band	1.5 kHz maximum
Tubes and Transistors	30-Watt Transmitter with no Options: 2 tubes 6 transistors 4 diodes
Maximum Frequency Spacing	0.4%
Duty Cycle	
Mobile	20% Transmit (one minute transmit, four minutes off)
Station	Continuous

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

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

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

DESCRIPTION

The MASTR Progress Line FM Transmitter Types ET-56-A and B are crystal-controlled, phase-modulated transmitters designed for one-, two-, or four-frequency operation within the 66-88 megahertz band. The transmitter consists of the following modules:

- Transistorized Exciter Board, with audio, oscillator, modulator, amplifier and multiplier stages,
- Tubed multiplier and power amplifier stages,
- Channel Guard Low-Pass Filter (ET-56-A only),
- Optional Channel Guard Encoder (ET-56-A only).

All input leads to the transmitter are individually filtered by the 20-pin feed-through by-pass connector J101. The output passes through a four-section, low-pass filter that features good shielding between sections and Teflon® capacitors for fail free operation with an open or shorted antenna.

A centralized metering jack (J102) is provided for use with General Electric Test Sets 4EX3A10 or 4EX8K10 or 11. The Test Set meters the multiplier, amplifier and PA stages as well as filament and regulated supply voltages. The metering jack also provides access to receiver audio, microphone and push-to-talk leads.

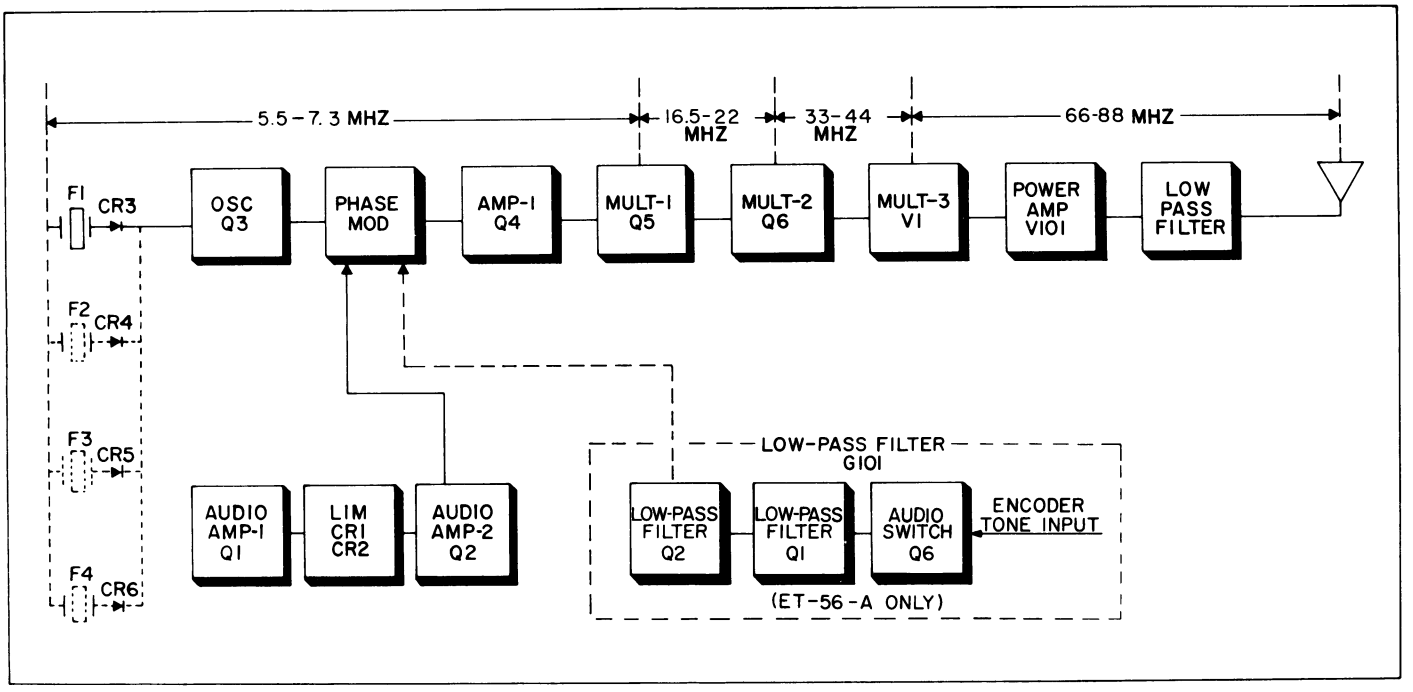
CIRCUIT ANALYSIS

Six silicon transistors and only two tubes are used in the transmitter. When used with the mobile or station power supplies, the transmitter has a minimum power output of 30 watts. The frequency of the crystals used ranges from 5.5 to 7.3 megahertz, and the crystal frequency is multiplied 12 times.

POWER INPUTS

The following supply voltages are connected from the power supply to the transmitter through the 20-pin by-pass connector J101:

- Pin 3 - Filament voltage
- Pin 4 - +300 volts MULT B+
- Pin 5 - +450 volts PA B+
- Pin 8 - -45 volts bias
- Pin 14- +10 volts for Channel Guard option (ET-56-A only).
- Pin 15- -20 volts for exciter board



RC-1712

Figure 1 - Transmitter Block Diagram

OSCILLATOR

A transistorized Colpitts oscillator (Q3) is used in the transmitter. The oscillator crystal is thermistor compensated at both ends of the temperature range to provide instant frequency compensation with a frequency stability of ±.0005% without crystal ovens or warmers.

In single-frequency transmitters, a jumper (from H1 to H2) connects the F1 crystal keying lead to ground to forward bias diode CR3. Forward biasing the diode reduces its impedance, and the crystal frequency is applied to the base of oscillator Q3. Feedback for the oscillator is developed across C41. The oscillator output is coupled directly to the phase modulator.

In multi-frequency transmitters, the single oscillator transistor is used, and up to three additional crystal circuits, identical to the F1 crystal circuit, can be added. The keying jumper is removed and the proper frequency is selected by switching the crystal keying lead to ground by means of a frequency selector switch on the Control Unit.

AUDIO AMPLIFIERS AND LIMITER

An audio signal from the microphone is coupled through C1 to the base of Class A audio amplifier Q1. The design of the microphone, in conjunction with C2 and R3, produces a 6-dB audio pre-emphasis. R48 and C74 provides RF de-coupling.

The amplified audio signal is RC-coupled to the diode limiters, CR1 and CR2. These diodes operate in series and are normally in a forward conducting state. An audio signal of sufficient amplitude to cause limiting takes the diodes out of conduction, so that one diode conducts only on positive cycles and the other conducts only on negative cycles.

Following the limiter stage is a second Class A amplifier, Q2. The output of Q2 is coupled through MOD ADJUST potentiometer R14 to a combined post-limiter filter and de-emphasis network. This network consists of R17, R18, R19, C5, C8, C9 and C49. The output of the filter and de-emphasis network is applied directly to the phase modulator.

PHASE MODULATOR

The phase modulator is a varactor (voltage-variable capacitor) CV1, in series with tuneable coil L1. This network appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator varies the bias of CV1, resulting in a phase modulated output. The output of the modulator is coupled through blocking capacitor C51 to the base of the first amplifier. For Channel Guard and Wide Band transmitters, a second modulator stage (L2 and CV2) is cascaded with the first modulator. The output of the Channel Guard encoder is fed through CHANNEL GUARD MOD ADJUST R20 to the modulator stages. The voice audio is also applied to both modulator stages.

AMPLIFIERS AND MULTIPLIERS

The first amplifier (Q4) isolates the modulator from the loading effects of the first multiplier and provides amplification. The output is DC-coupled to the first multiplier. Metering resistor R41 permits the MULT-1 stage to be metered at centralized metering jack J102-10.

Following Q4 are two inductively coupled Class C, common-emitter multiplier stages (Q5 and Q6). Q5 is a tripler, with collector tank L3 tuned to three times the crystal frequency.

Q6 operates as a doubler stage, with collector tank T1 tuned to six times the crystal frequency. Resistor R43 is for metering the MULT-2 stage at J102-2.

MULT-3

The output of the transistorized Exciter is coupled by a short length of RF cable to the grid tank (L12/L13) of beam pentode V1. This stage operates as a doubler with the plate tank tuned to 12 times the crystal frequency.

The grid of V1 is metered through metering resistors R1 and R2 at J102-4. The combination of R1, R2 and R3 drops the bias voltage to approximately -11 volts to protect V1 against loss of drive. Plate voltage is supplied through R7 and L1/L2.

When measuring grid current to V1, there will be a residual reading of approximately 0.16 volts without any drive. This is caused by the presence of fixed bias voltage to the grid of the tube.

POWER AMPLIFIER

The output of the MULT-3 stage is coupled to the grid of the compactron beam power amplifier (V101) through L5/L6, and is metered at J102-6 and J102-14 by measuring voltage drop across R10. Bias voltage (-45 volts) is applied to the PA grid through R9 and L7/L8. There is no residual reading on the PA.

Plate current is metered from J102-1 to J102-9 across metering resistor R101. Plate voltage is supplied through L101, and the PA plate tank is shunt-tuned by capacitor C110. R13 and R14 are the screen grid dropping resistors.

WARNING

The meter leads are at plate potential (high B+) when metering the PA plate at J102-1 and J102-9.

Placing the TUNE-OPERATE switch (S102) in the OPERATE position applies 300 volts to A143/A144-J3 and -J7. The 300 volts appearing on each side of R12 effectively shorts the resistor out of the circuit, and R13 and R14 are in series for normal operation of V101. When S102 is in TUNE position, the screen voltage is applied to J3 only. Now, dropping resistors R12, R13 and R14 are in series to reduce the screen voltage. This reduces the plate dissipation of V101 while tuning the power amplifier stage. Feedback through capacitor C115 and C122 neutralizes the stage.

Antenna coupling is achieved by varying the coupling between L108 and L113. C111 tunes the antenna circuit.

The RF output from the antenna coil is fed to low-pass filter FL104/FL105. This filter has a low insertion loss and a harmonic attenuation of at least -50 db through all harmonics. The filter output is fed to the antenna changeover relay located on the front of the system frame.

CHANNEL GUARD

Low-Pass Filter (G101)

In encode-decode combinations, low-pass filter G101 is assembled on a printed wiring board that mounts on the underside of the MASTR transmitters. The filter is supplied by a regulated +10 volts and a regulated -20 volts. The +10 volts is applied continuously (even in the STANDBY position), and the -20 volts is applied only when the transmitter is keyed.

Keying the transmitter applies the encoder tone (from the receiver) to low-pass filter G101. Transistors Q1 and Q2 form a two-section, active low-pass filter that reduces tone distortion and power supply ripple. Q6 operates as a tone switch, applying the tone input to the filter whenever +10 volts is applied to J1 (Q6 base). Thermistor RT1 keeps the output constant over wide variations in temperature. The filter output is coupled to the tone modulator on the transmitter exciter board through Channel Guard MOD ADJUST R34. Instructions for setting R34 are contained in the modulation adjustment section of the Transmitter Alignment Procedure.

The channel can be monitored before transmitting a message by moving the CG-OFF switch on the Control Unit to the OFF position, or by removing the microphone or handset from the operational hang-up bracket.

NOTE

When Channel Guard decode only is desired, remove the wire that connects to J6 on the low-pass filter (Encoder Tone Input).

Encoder Model 4EH17A10 (Optional)

In encode only combinations, encoder Model 4EH17A10 mounts on the underside of the MASTR transmitter. The encoder is supplied by a regulated +10 volts and a regulated -20 volts. The +10 volts is applied to Q3, Q4 and Q5 continuously (even in the STANDBY position). The -20 volts is applied to Q1 and Q2 only when the transmitter is keyed.

The encoder tone is provided by selective oscillators Q3 and Q4, which oscillate continuously at a frequency determined by the tone network (FL1). Negative feedback, applied through the tone network to the base of Q3, prevents any gain in the stage except at the desired encode frequency.

Thermistor-resistor combination R14 and RT2 provides temperature compensation for the oscillator output. Limiter diodes CR1 and CR2 keep the tone amplitude constant.

Keying the transmitter applies -20 volts to the two-stage, active low-pass filter (Q1 and Q2) turning them on. The oscillator output is then coupled through emitter-follower Q5 to the low-pass filter. Thermistor RT1 keeps the filter output constand over wide variations in temperatures.

The output of the filter is applied to the tone modulator on the transmitter exciter board through Channel Guard MOD ADJUST R34. Instructions for setting R34 are contained in the Moudlation Adjustment section of the Transmitter Alignment Procedure.

MAINTENANCE

DISASSEMBLY

To service the transmitter from the top—

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—

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 2) 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 jack 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.

NOTE

To replace tubes, loosen screws holding tube shields and slide shields off.

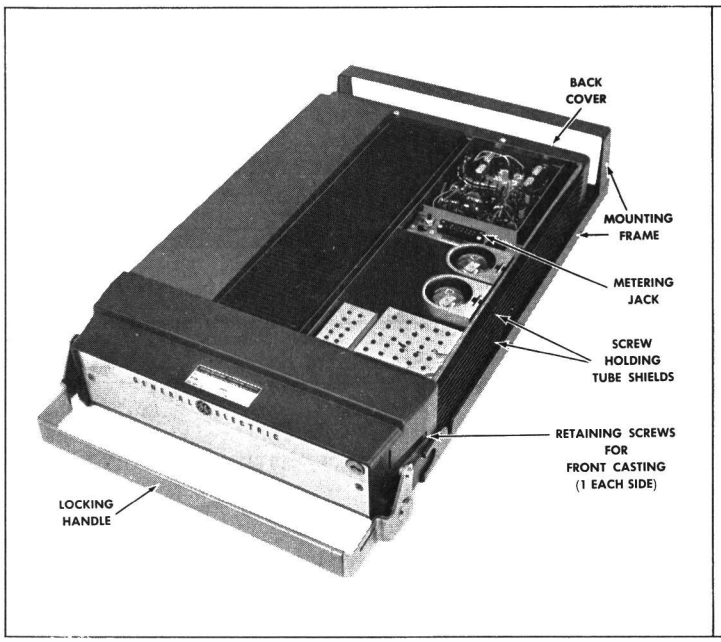


Figure 2 - Top Cover Removed

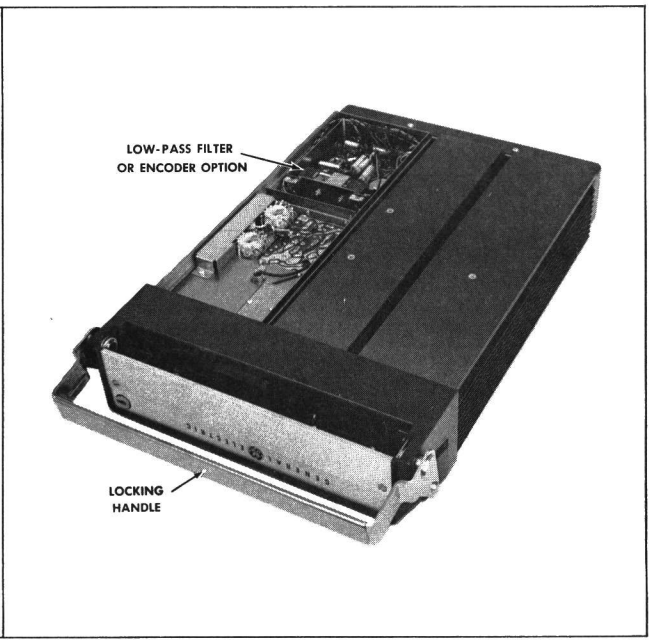


Figure 3 - Bottom Cover Removed

MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R14) 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. Audio oscillator Model 4EX6A10
2. A frequency modulation monitor
3. An output meter or a VTVM
4. GE Test Set Model 4EX3A10 or 4EX8K10, 11.

PROCEDURE

1. Connect the audio oscillator and the meter across audio input terminals J5 (Green-R1) and J6 (Black-Ls) on GE Test Set or across J1 (Mike High) and J2 (Mike Low) on the Exciter Board.
2. Apply a 1.0-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 (R14) for a 4.5 kHz swing (13.5 kHz for Wide Band) 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 (R20) for 0.75 kHz tone deviation. Then repeak L1/L2 and L3/L4 as shown in Step 1 of Transmitter Alignment Procedure. Reset tonedeviation to 0.75 kHz deviation. Remove the tone to the transmitter by unplugging leads to J7 and J8 on Exciter Board, or by switching to a non-Channel Guard frequency in multi-frequency units. Next, apply a 1.0 volt signal at 1000 Hz and set MOD ADJUST (R14) for 3.75 kHz deviation (4.5 kHz minus 0.75 kHz tone deviation).
5. For multifrequency transmitters, set the deviation as described in steps 3 or 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 Plate voltage and the plate current indication, and using the following formula:

$$P_i = \frac{\text{Plate Voltage X Plate Current Indications}}{4.67}$$

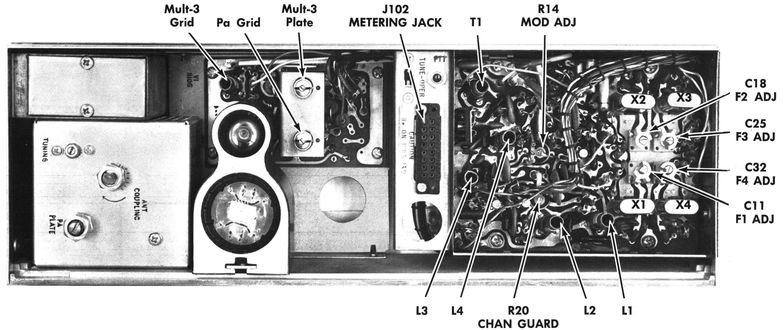
where:

P_i is the power input in watts.

Plate voltage is measured with GE Test Set in position G, using the 1000-volt scale (or measured from J102-1 to -16 with multimeter).

Plate current indication is measured with GE Test Set in Position G, using the TEST 1 scale (or measured from J102-1 to -9 with multimeter).

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



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. General Electric Centralized Metering Test Set Model 4EX3A10 or 4EX8K10, 11 Station Meter Switching Panel, or a 20,000 ohms-per-volt Multimeter with a 1-volt scale.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place crystal (operating frequency ÷ 12) in crystal socket XY1.
2. Set crystal trimmer C11 to mid-capacity. If multi-frequency transmitter, set all trimmers to mid-capacity and tune transmitter on channel with the highest frequency (except for Step 7).
3. Place the TUNE-OPERATE switch (S102) in the TUNE position.
4. Connect GE Test Set to the Transmitter Centralized Metering Jack J102. If using Multimeter, connect the positive lead to J102-16 (Ground) except for Steps 6 through 14.
5. For a large change in frequency or a badly misaligned transmitter, set the slugs in all slug-tuned coils in the center of the coil form. All slugs will then tune clockwise, except MULT-3 PLATE and PA GRID slugs which tune counter-clockwise.
6. All adjustments are made with the transmitter keyed.

STEP	METERING POSITION 4EX3A10	METERING POSITION Multimeter - at J102	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
			EXCITER BOARD		
1.	A (MULT-1)	Pin 10	L1 (and L2 with Channel Guard)	0.6 v (0.4 v Minimum)	Tuning the modulator is a critical adjustment. Carefully tune L1 for maximum meter reading. For Channel Guard or Wide Band transmitters alternately tune L1 and L2 for maximum meter reading.
2.	A (MULT-1)	Pin 10	L3	See procedure	Tune L2 for a small peak in meter reading (not required unless changing frequency).
3.	B (MULT-2)	Pin 2	L4 and L3	0.65 v (0.4 v Minimum)	Tune L4 and then L3 for maximum meter reading. Then tune T1 for minimum meter reading (not required unless changing frequency). NOTE Misalignment of this coil may result in the remainder of the transmitter being tuned off frequency. Always start with the slug in the center of the coil form (at maximum inductance) and tune for the first peak.
			MULT-3 AND POWER AMPLIFIER		
4.	D (MULT-3)	Pin 4	MULT-3 GRID and T1 (on Exciter)	0.55 v (0.4 v Minimum)	Alternately tune MULT-3 GRID and T1 (on Exciter) for maximum meter reading. Then tune MULT-3 PLATE for slight change in meter reading (not required unless changing frequency).
5.	F (PA GRID)	Pin 14 (+) and Pin 6 (-)	PA GRID and MULT-3 PLATE	0.45 v (0.4 v Minimum)	Alternately tune PA GRID and MULT-3 PLATE for maximum meter reading.
6.					Rotate ANT COUPLING fully counterclockwise.
7.	G (PA PLATE)	WARNING High B-plus on Pins 1 and 9. Pin 1 (+) and Pin 9 (-)	PA PLATE	Minimum	For single-frequency transmitters, carefully tune PA PLATE for minimum meter reading. For multi-frequency transmitters, switch to the lowest frequency and adjust PA PLATE for minimum meter reading.
8.					Place S102 in the OPERATE position.
9.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)	ANT COUPLING	See procedure	Rotate ANT COUPLING clockwise until meter reading rises slightly. In multi-frequency transmitters, switch back to the highest frequency before tuning ANT COUPLING.
10.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)	ANT TUNING	Maximum	Adjust ANT TUNING for maximum meter reading.
11.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)	ANT COUPLING	0.7 v	Adjust ANT COUPLING for metering reading of 0.7 volts.
12.	F (PA GRID)	Pin 14 (+) and Pin 6 (-)	PA GRID	Maximum	Readjust PA GRID for maximum meter reading.
			FREQUENCY ADJUSTMENTS		
13.			C11 (C18, C25 and C32 in multi-frequency units)		With no modulation, adjust crystal trimmer C11 (on Exciter) for proper oscillator frequency. In multi-frequency units, adjust C18, C25 and C32 as required. Next, refer to the MODULATION ADJUSTMENT. NOTE For proper frequency control of the transmitter, it is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.

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:

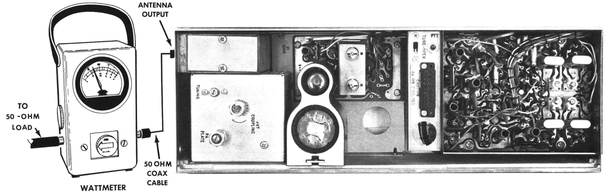
1. Wattmeter similar to:
   Bird #43
   Jones #711N
2. VTVM similar to:
   Triplett #850
   Heath #1M-21
3. Audio Generator similar to:
   GE Model 4EX6A10 or
   Heath #1G-72
4. Deviation Meter (with a .75 kHz scale) similar to:
   Measurements #140
   Lampkin #205A
5. Multimeter similar to:
   GE METERING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

STEP 1

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output to wattmeter as shown below:
2. Key transmitter and check wattmeter for minimum reading of 30 watts.



SERVICE CHECK

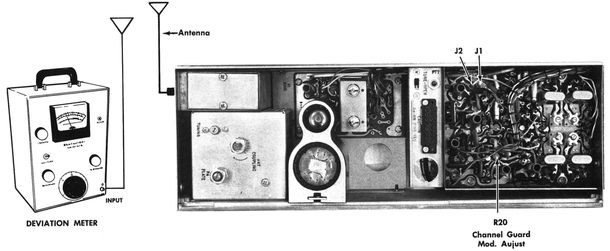
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



2. Unplug the MIC HI terminal from J1 or Transmitter Exciter Board.
3. Key transmitter and check for 0.75-kHz deviation. If reading is low or high, adjust Channel Guard MOD ADJUST (R20) for a reading of 0.75 kHz.

NOTES:

The Channel Guard MOD ADJUST (R20) may be adjusted for deviations up to 0.80 kHz for tone frequencies from 71.9 Hz to 82.5 Hz, and deviations up to 1.0 kHz for all tone frequencies above 82.5 Hz.

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

SERVICE CHECK

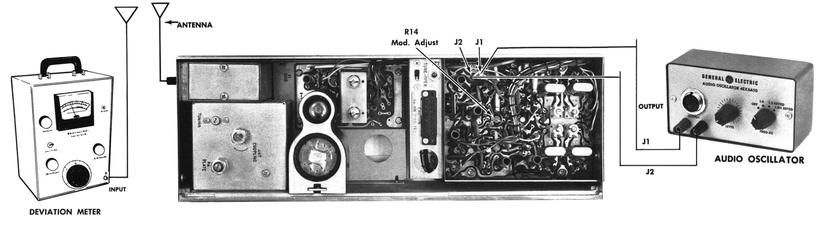
If the 0.75-kHz deviation is not obtainable when adjusting R20, replace the Tone Transmitter reed.

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 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 (+13.5 kHz wide band).
6. Adjust "Modulation Adjust Control" R14 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.

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

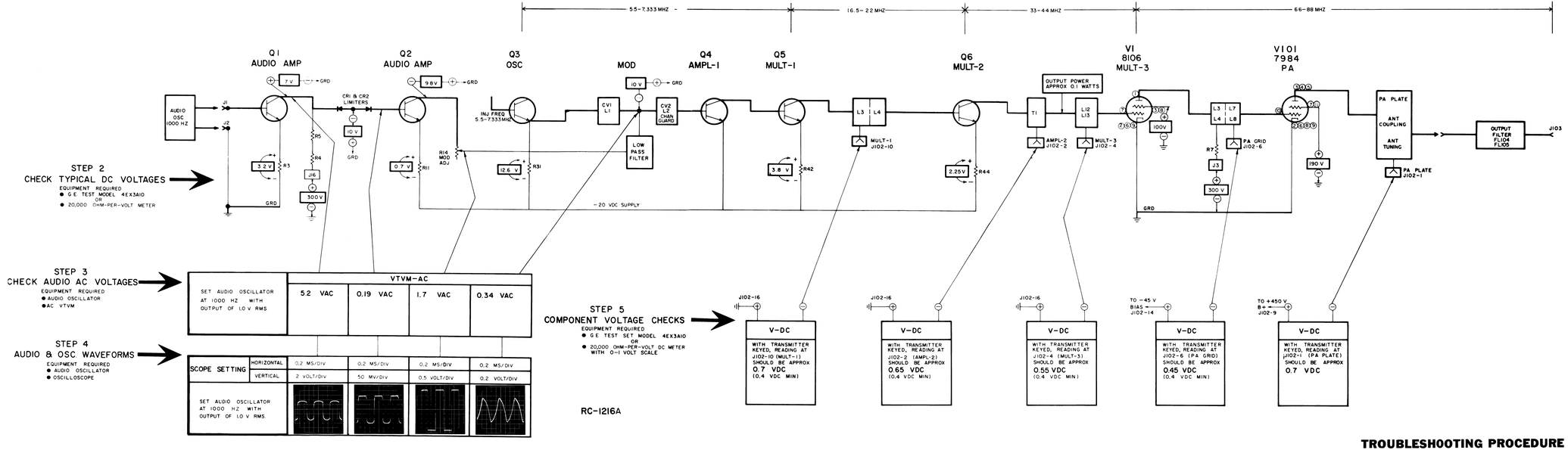
If the deviation reading plus (+) or minus (-) differs by more than 0.5 kHz (1.5 kHz wide band), check the following:

1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. **Check Audio Sensitivity by reducing generator output until deviation falls to 3.0 kHz (10 kHz wide band). Voltage should be LESS than 90 millivolts.**

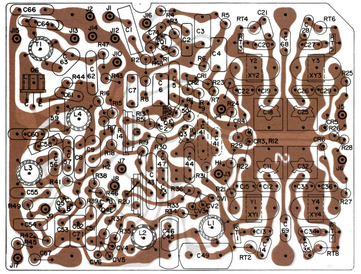
STEP 1 - QUICK CHECKS

CHECK VOLTAGES AT CENTRALIZED METERING JACK J102 Multimeter = pin numbers GE Test Set = A thru G positions						
POWER OUTPUT	Pins 10 & 16 A	Pins 2 & 16 B	Pins 4 & 16 D	Pins 6 & 14 F	Pins 1 & 9 G	PROBABLE DEFECT
Low	0.7 v	0.65 v	0.6 v	0.4 v	0.7 v	Weak 7984
0	0.7 v	0.65 v	0.6 v	0	0	Open 7984
Low	0.7 v	0.65 v	0.6 v	Low or neg.	--	Weak 8106
0	0.7 v	0.65 v	0.15 v	0	0.4 v	8106 Fil. open
0	0.7 v	0.65 v	0.15 v	0	0	Open Fil. Fuse
0	0.7 v	0 or over 1.0 v	0.15 v	0	0.4 v	Defective Q6
0	Over 1.0 v	0	0.15 v	0	0.4 v	Shorted Q5 or Open Q4
0	0	0	0.15 v	0	0.4 v	Defective Q3 or Modulator (See note A)

NOTE A --- Localize trouble by checking:--	
1.	-20 volt DC supply at J102-12-16.
2.	Measure 12.6 VDC across Q3 emitter resistor R31, then:
(a)	Remove crystal - a slight variation in R31 voltage reading indicates Q3 stage operating properly.
(b)	If no voltage is measured, check keying leads, CR3-CR6, Q3.
(c)	With crystal removed, short Q4 base to emitter. A voltage reading above 1.0 volt indicates Q4 and Q5 are operating properly. Defect may be in Modulator.
(d)	If modulator is defective, check voltage variable diodes CV1 and CV2.

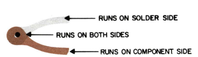


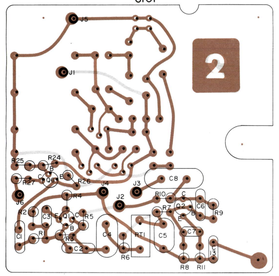
EXCITER



(19C303548, Sh. 1, Rev. 2)
(19C303548, Sh. 2, Rev. 2)

LOW-PASS FILTER
GI01





(19C311800, Sh. 1, Rev. 2)
(19C311800, Sh. 1, Rev. 3)

OUTLINE DIAGRAM

66—88 MHZ, 30-WATT TRANSMITTER
MODELS 4ET56A30-41 & 4ET56B10-15

EXCITER READINGS TAKEN TO CHASSIS GROUND									
TRANSISTOR	EMITTER		BASE			COLLECTOR			
	–	+	–	+		–	+		
Q1	6.4K	6.8K	200K	12K	65K	22K			
Q2	8.5K	5K	70K	13K	10K	10K			
Q3	10K	6.5K	250K	2.9M	100	100			
Q4	6.5K	2.1K	80K	8K	4.2K	7.5K			
Q5	74.5K	8K	5.2K	2.5K	1.104	12.8			
Q6	6.7K	2.3K	6.5K	3.1K	10	10			

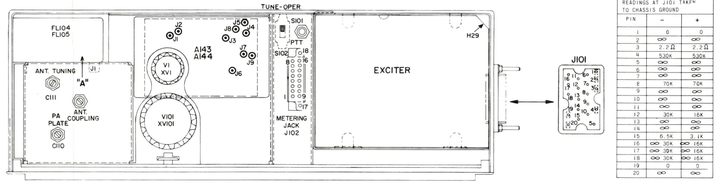
EXCITER READINGS TAKEN TO 20V LINE (J5 BLUE)									
TRANSISTOR	EMITTER		BASE			COLLECTOR			
	–	+	–	+		–	+		
Q1	13K	12K	220K	454		3.1K	6.5K		
Q2	3.2K	4.2K	65K	4.7K		10K	22K		
Q3	2.0K	2K	5.2K	5.5K		3.3K	6.6K		
Q4	0	0	3.3K	5.9K		10K	14.1K		
Q5	390	390	10K	14.1K		4.4K	5.8K		
Q6	50	120	0	0		3K	6.64		

RESISTANCE READINGS

ALL READINGS ARE TYPICAL READINGS MEASURED WITH A 20,000 OHM-PER-VOLT METER AND J101 DISCONNECTED. + OR – SIGNS SHOW METER LEAD GROUNDED.

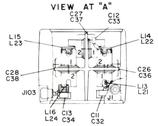
FOR READINGS OF :	USE SCALE:
1–100Ω	X 1
100 1KΩ	X 10
1K 50KΩ	X 1,000
50 ∞Ω	X 100,000

TOP VIEW

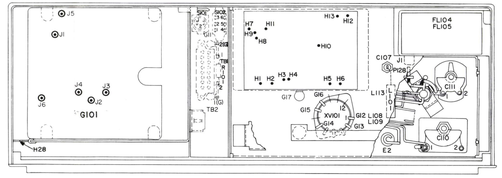


READINGS AT JIOI TAKEN TO CHASSIS GROUND		
PIN	–	+
1	0	0
2	∞	∞
3	2.2Ω	2.2Ω
4	5.30K	5.30K
5	∞	∞
6	∞	∞
7	∞	∞
8	704	704
9	∞	∞
10	∞	∞
11	∞	∞
12	30K	15K
13	∞	∞
14	∞	∞
15	6.1K	3.1K
16	∞	15K
17	∞	15K
18	∞	15K
19	0	0
20	∞	∞

VIEW AT "A"

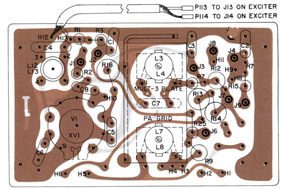


BOTTOM VIEW



READINGS FROM TUBE SOCKET PINS TO CHASSIS GROUND												
PIN	1	2	3	4	5	6	7	8	9	10	11	12
XVI	530K	0	630K	2.2Ω	0	0	154	630K	0			
XVIOI	2	6	∞	∞	∞	0	530K	0	0	75K	530K	2.2Ω

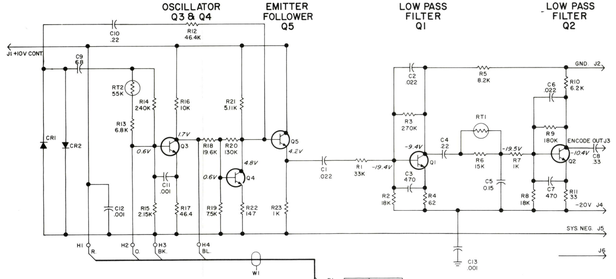
(19R621257, Rev. 2)



(19B204613, Sh. 1, Rev. 1)
(19B204613, Sh. 2, Rev. 1)

CHANNEL GUARD ENCODER MODEL 4EH17A10

SCHEMATIC DIAGRAM



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.

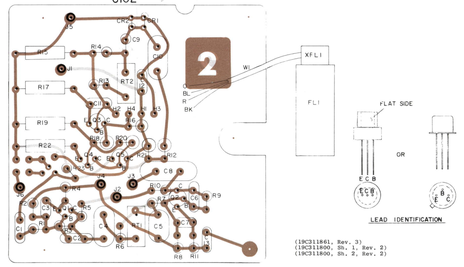
(19D402941, Rev. 2)

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

REVISION LTR BLOCK		
GI02	4EH17A10	REV A

OUTLINE DIAGRAM

ENCODER
MODEL 4EH17A10
GI02



(19C311861, Rev. 3)
(19C311800, Sh. 1, Rev. 2)
(19C311800, Sh. 2, Rev. 2)

MODEL NO	FREQ RANGE	NO OF FREQ	CHAN GD.	WIDE BAND
4ET56A30	66-77MHZ			
4ET56A31	77-88 MHZ	1		
4ET56A32	66-77 MHZ	2		
4ET56A33	77-88 MHZ	2		
4ET56A34	66-77MHZ	4		
4ET56A35	77-88 MHZ	4		
4ET56A36	66-77MHZ	1	X	
4ET56A37	77-88 MHZ	1	X	
4ET56A38	66-77 MHZ	2	X	
4ET56A39	77-88 MHZ	2	X	
4ET56A40	66-77 MHZ	4	X	
4ET56A41	77-88 MHZ	4	X	
4ET56B10	66-77MHZ	1		X
4ET56B11	77-88 MHZ	1		X
4ET56B12	66-77MHZ	2		X
4ET56B13	77-88MHZ	2		X
4ET56B14	66-77MHZ	4		X
4ET56B15	77-88MHZ	4		X

		REV.
	PL19E500877G7	
	PL19E500877G8	
A104	PL19D402385G4	C
A105	PL19D402385G5	C
A109	PL19D402385G9	C
A110	PL19D402385G10	C
A114	PL19D402385G14	C
A115	PL19D402385G15	C
A119	PL19D402385G19	D
A120	PL19D402385G20	D
A124	PL19D402385G24	D
A125	PL19D402385G25	D
A129	PL19D402385G29	D
A130	PL19D402385G30	D
A154	PL19D402385G34	A
A155	PL19D402385G35	A
A159	PL19D402385G39	A
A160	PL19D402385G40	A
A164	PL19D402385G44	A
A165	PL19D402385G45	A

COMPONENT NUMBER	66-77MHZ	77-88MHZ
RT1	C187	C
RT2	C53K	C
RT3	C187	C
RT4	C53K	C
RT5	C187	C
RT6	C53K	C
RT7	C187	C
RT8	C53K	C
C53	D 120	E 100
C56	C 390	D 270
C57	D 27	E 39
C58	D 3	E 2
C59	C 390	D 270
C60	D 27	E 39
C63	D 27	E 22
C64	D 52	E 56

RT1 THRU RT8 REF 25°C

SCHEMATIC DIAGRAM

66—88 MHZ, 30-WATT TRANSMITTER
MODELS 4ET56A30-41 & 4ET56B10-15

PARTS LIST

LBI-3949B

66-88 MHz TRANSMITTER
MODELS 4ET54A30-35 STANDARD
MODELS 4ET54A36-41 CHANNEL GUARD
MODELS 4ET54B10-15 WIDE BAND

SYMBOL	GE PART NO.	DESCRIPTION
A104,A105 A109,A110 A114,A115 A119,A120 A124,A125 A129,A130 A154,A155 A159,A160 A164,A165		EXCITER BOARD ASSEMBLY A104 19D402385G4 (4ET54A30) A105 19D402385G5 (4ET54A31) A109 19D402385G9 (4ET54A32) A110 19D402385G10 (4ET54A33) A114 19D402385G14 (4ET54A34) A115 19D402385G15 (4ET54A35) A119 19D402385G19 (4ET54A36) A120 19D402385G20 (4ET54A37) A124 19D402385G24 (4ET54A38) A125 19D402385G25 (4ET54A39) A129 19D402385G29 (4ET54A40) A130 19D402385G30 (4ET54A41) A154 19D402385G34 (4ET54B10) A155 19D402385G35 (4ET54B11) A159 19D402385G39 (4ET54B12) A160 19D402385G40 (4ET54B13) A164 19D402385G44 (4ET54B14) A165 19D402385G45 (4ET54B15)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P3	Polyester: .022 µf ±20%, 50 VDCW.
C2	19A116080P4	Polyester: 0.033 µf ±20%, 50 VDCW.
C3	19B209243P13	Polyester: 0.1 µf ±20%, 250 VDCW.
C4	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C5	7491395P114	Ceramic disc: 2200 pf ±10%, 500 VDCW.
C6	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C7	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C8	7491395P114	Ceramic disc: 2200 pf ±10%, 500 VDCW.
C9	5493366P470K	Silver mica: 470 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C11	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C12	5496219P5	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C13 and C14	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C15	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C18	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C19	5496219P5	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C20 and C21	19C300685P93	Ceramic disc: 5 pf ±0.1 pf , 500 VDCW, temp coef 0 PPM.
C22	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C25	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C26	5496219P5	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C27 and C28	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C29	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C32	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C33	5496219P5	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C34 and C35	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	G-E PART NO	DESCRIPTION
C36	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C41D	5490008P143	Silver mica: 470 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C43	5494481P131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C44D	5496372P65	Ceramic disc: 470 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C45B	5493367P1500K	Mica: 1500 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-20.
C46B	5493367P1000K	Mica: 1000 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-20.
C47	5496372P173	Ceramic disc: 680 pf ±5%, 500 VDCW, temp coef -3300 PPM.
C49	5493367P1000J	Mica: 1000 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-20.
C51	5496372P65	Ceramic disc: 470 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C52B	5493366P390K	Silver mica: 390 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C53B	5493366P120K	Silver mica: 120 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C53C	5493366P100K	Silver mica: 100 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C54	19A116080P1	Polyester: .01 µf ±20%, 50 VDCW.
C55	7491827P5	Ceramic disc: 0.1 µf +80% -30%, 50 VDCW; sim to Sprague 36C.
C56C	5493366P390J	Silver mica: 390 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C56D	5493366P270J	Silver mica: 270 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C57D	5496219P849	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -1500 PPM.
C57E	5496219P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C58D	5496219P3	Ceramic disc: 3 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C58E	7770468P33	Ceramic: 2 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C59C	5493366P390J	Silver mica: 390 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C59D	5493366P270J	Silver mica: 270 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C60D	5496219P849	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -1500 PPM.
C60E	5496219P753	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -750 PPM.
C61B	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C62	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C63D	5493366P27J	Silver mica: 27 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C63E	5493366P22J	Silver mica: 22 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C64B	5496219P758	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -750 PPM.
C64C	5496219P718	Ceramic disc: 56 pf ±10%, 500 VDCW, temp coef -750 PPM.
C66	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C67	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C68 and C69	7491827P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C.
C71B	5493366P470K	Silver mica: 470 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C73C	5493366P68J	Silver mica: 68 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C74	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3 thru CR6	19A115603P1	Silicon.
CV1 thru CV6	5495769P8	Varactor, silicon: 33 pf ±20%, 4 VDC; sim to Pacific Semiconductors Varicap Type V-595.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J1 thru J10	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
J12 thru J17	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1D and L2D	19C303946G4	Coil. Includes tuning slug 5491798P2.
L3C	19B204650G2	Coil. Includes tuning slug 5491798P4.
L4C	19B204650G4	Coil. Includes tuning slug 5491798P4.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3 and Q4	19A115330P1	Silicon, NPN.
Q5 and Q6	19A115328P1	Silicon, NPN.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R2	3R77P105K	Composition: 1.0 megohm ±10%, 1/2 w.
R3	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R4	3R77P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R5	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R6	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R7	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R8	3R77P684K	Composition: 0.68 megohm ±10%, 1/2 w.
R9	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R10	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R11	3R77P122K	Composition: 1200 ohms ±10%, 1/2 w.
R12	3R152P100K	Composition: 10 ohms ±10%, 1/4 w.
R13	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R14	19B209358P106	Variable, carbon film: approx 75-10,000 ohms ±10%, 0.25 w.
R15 and R16	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R17	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R18	3R77P623J	Composition: 62,000 ohms ±5%, 1/2 w.
R19	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R20	19B209358P107	Variable, carbon film: approx 75-25,000 ohms ±10%, 0.25 w.
R21	3R77P682K	Composition: 6800 ohms ±5%, 1/2 w.
R22	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R23	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R24	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R25	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R26	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R27	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.

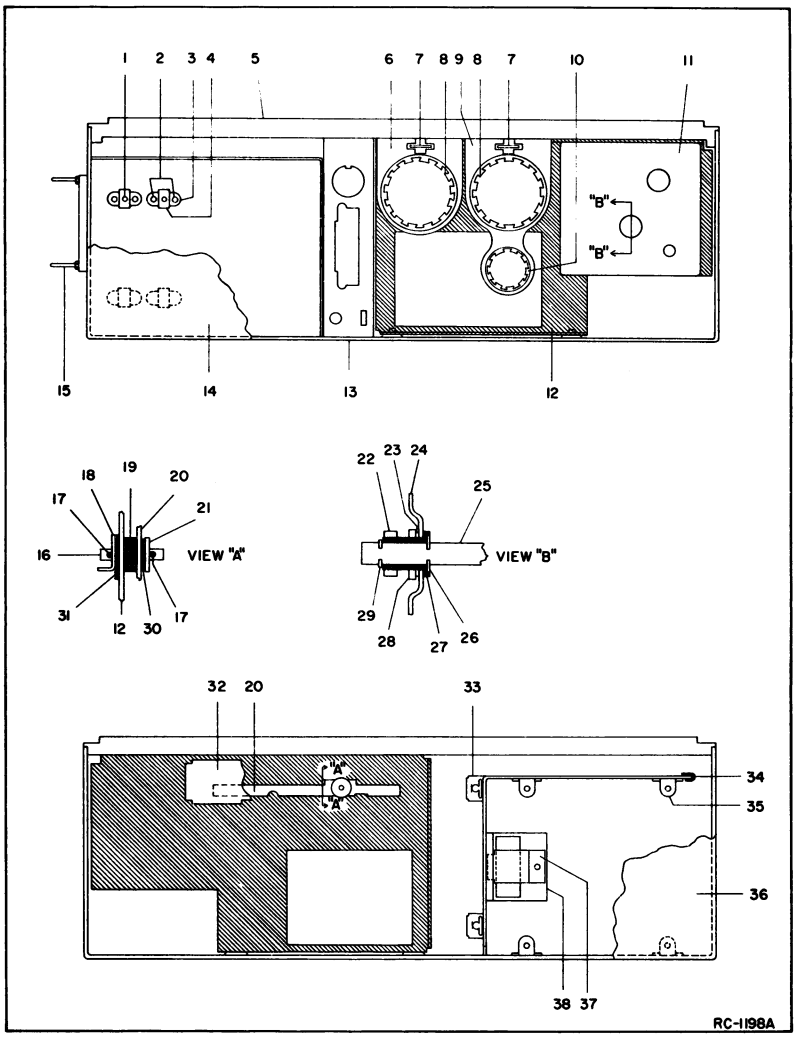
SYMBOL	G-E PART NO	DESCRIPTION
R28 and R29	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R30	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R31A	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R33D	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R34C	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R35B	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R36 and R37	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R38	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R39	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R41	3R77P750J	Composition: 75 ohms ±5%, 1/2 w.
R42	3R77P391K	Composition: 390 ohms ±10%, 1/2 w.
R43	3R77P360J	Composition: 36 ohms ±5%, 1/2 w.
R44	3R77P121K	Composition: 120 ohms ±10%, 1/2 w.
R45	19A116278P474	Metal film: 576,000 ohms ±2%, 1/2 w.
R46	3R77P100K	Composition: 10 ohms ±10%, 1/2 w.
R47	3R77P330K	Composition: 33 ohms ±10%, 1/2 w.
R48	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R49	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R50	3R77P511J	Composition: 510 ohms ±5%, 1/2 w.
R51	3R77P434J	Composition: 0.43 megohm ±5%, 1/2 w.
R52	3R77P104K	Composition: 0.1 megohm ±10%, 1/2 w.
		- - - - - - - - - - THERMISTORS - - - - - - -
RT1C	19B209284P11	Disc: 740 ohms res nominal at 25°C, color code brown/brown.
RT2C	19B209284P4	Rod: 1800 ohms res nominal at 25°C, color code yellow.
RT3C	19B209284P11	Disc: 740 ohms res nominal at 25°C, color code brown/brown.
RT4C	19B209284P4	Rod: 1800 ohms res nominal at 25°C, color code yellow.
RT5C	19B209284P11	Disc: 740 ohms res nominal at 25°C, color code brown/brown.
RT6C	19B209284P4	Rod: 1800 ohms res nominal at 25°C, color code yellow.
RT7C	19B209284P11	Disc: 740 ohms res nominal at 25°C, color code brown/ brown.
RT8C	19B209284P4	Rod: 1800 ohms res nominal at 25°C, color code yellow.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T2	19B205262G1	Coil.
		- - - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (RC-1198).
		- - - - - - - - - - CRYSTALS - - - - - - - -
		NOTE: When reordering give GE Part No. and specify exact freq needed.
		Crystal Freq = (OF ÷ 12).
Y1 thru Y4	19B206175P4	Quartz: freq range 5500 to 6417 KHz, temp range -30°C to +85°C. (66-77 MHz).
Y1 thru Y4	19B206175P5	Quartz: freq range 6416 to 7334 KHz, temp range -30°C to +85°C. (77-88 MHz).
A143 and A144		POWER AMPLIFIER BOARD ASSEMBLY A143 19C303542G4 4ET56A30, 32, 34, 36, 38, 40 4ET56B10, 12, 14 A144 19C303542G5 4ET56A31, 33, 35, 37, 39, 41 4ET56B11, 13, 15
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1 thru C3	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	G-E PART NO	DESCRIPTION
C4	5496219P824	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -1500 PPM.
C5 and C6	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C7	5496219P827	Ceramic disc: 330 pf ±10%, 500 VDCW, temp coef -1500 PPM.
C8	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J9	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L3	19B205051G5 7127634P2	Coil. Includes tuning slug 7142014P16. Speed clip.
L4	19B205051G9 7127634P2	Coil. Includes tuning slug 7142014P16. Speed clip.
L7	19B205051G7 7127634P2	Coil. Includes tuning slug 7142014P16. Speed clip.
L8	19B205051G8 7127634P2	Coil. Includes tuning slug 7142014P16. Speed clip.
L12	19B204614G4	Coil. Includes tuning slug 5491798P4.
L13	19B204614G5	Coil. Includes tuning slug 5491798P4.
		- - - - - - - - - - RESISTORS - - - - - - - -
R1	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R2	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R3	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R7	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R9	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R12	3R78P104K	Composition: .10 megohm ±10%, 1 w.
R13 and R14	3R79P472K	Composition: 4700 ohms ±10%, 2 w.
R15	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R16	3R79P243J	Composition: 24,000 ohms ±5%, 2 w.
R25	3R77P161J	Composition: 160 ohms ±5%, 1/2 w.
		- - - - - - - - - - TUBES - - - - - - - - -
V1		Type 8106.
		- - - - - - - - - - SOCKETS - - - - - - - - -
XV1	7489470P2	Tube, mica-filled phen: 8 pins rated at 1 amp.
		CHASSIS AND PA ASSEMBLY 19E500877G7 66-77 MHz 19E500877G8 77-88 MHz
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C105 and C106	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C107	7485975P17	Ceramic, feed-thru: 470 pf ±20%, 750 VDCW; sim to Erie Style 327.
C110	5491498P3	Variable: approx 2.8-50 pf, 1700 v peak.
C111	19B209123P1	Variable: approx 6.5-50 pf; sim to Hammarlund Type APC.
C113	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C115	5492304P8	Ceramic disc: 3 pf ±0.25 pf, 2000 VDCW, temp coef -0 ±120 PPM.
C122	5492304P8	Ceramic disc: 3 pf ±0.25 pf, 2000 VDCW, temp coef -0 ±120 PPM.
C124	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - FILTERS - - - - - - - - - -
		LOW PASS FILTER ASSEMBLY
		The low pass filters are factory tuned. If a filter component is found to be defective, it is recommended that the entire filter assembly be replaced to maintain rated power output and spurious attenuation.
FL104	19D402233G4	66-77 MHz.
FL105	19D402233G6	77-88 MHz.
		- - - - - - - - - OSCILLATORS - - - - - - - - -
G101		LOW PASS FILTER ASSEMBLY 19C311802G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C2	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C3	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C5	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C6	19A116080P3	Polyester: .022 µf ±20%, 50 VDCW.
C7	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19B209243P14	Polyester: 0.33 µf ±20%, 250 VDCW.
C13	5494481P111	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J1 thru J6	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q6	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R2	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R3	3R77P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R4	3R77P620J	Composition: 62 ohms ±5%, 1/2 w.
R5	3R77P822K	Composition: 8200 ohms ±10%, 1/2 w.
R6	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R7	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R8	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R9	3R77P184K	Composition: 0.18 megohm ±10%, 1/2 w.
R10	3R77P622J	Composition: 6200 ohms ±5%, 1/2 w.
R11	3R77P330K	Composition: 33 ohms ±10%, 1/2 w.
R24	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R25	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R26	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R27*	3R77P512K	Composition: 5100 ohms ±10%, 1/2 w. Added by Rev. B.
		- - - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P30	Rod: 0.33 megohm ±10% res, 1 w max; sim to Globar Type 783H-3.
		CHANNEL GUARD INSTALLATION KIT 19A127174G2
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19B201074-P304	Tap screw, 6-32 x 1/4. (4)

SYMBOL	G-E PART NO	DESCRIPTION
	19B205480G2	Harness. Includes:
P130 thru P135	4029840P2	Contact, electrical; sim to Amp 42827-2.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J101	19C303426G1	Connector: 20 pin contacts.
J102	19B205689G1	Connector: 18 pin contacts.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L101	7772834P4	Choke, RF: 7 µh, approx freq range 35 to 110 Mhz; sim to Ohmite Z-50.
L108	19B204926P1	Coil.
L109	19B204926P2	Coil.
L113	19A121381P1	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P101	4029840P2	Contact, electrical; sim to Amp 42827-2.
P102	4029840P1	Contact, electrical; sim to Amp 41854.
P103 thru P106	4029840P2	Contact, electrical; sim to Amp 42827-2.
P107	4029840P1	Contact, electrical; sim to Amp 41854.
P108 thru P110	4029840P2	Contact, electrical; sim to Amp 42827-2.
P112 thru P117	4029840P2	Contact, electrical; sim to Amp 42827-2.
P120 and P121	4029840P1	Contact, electrical; sim to Amp 41854.
P122 thru P127	4029840P2	Contact, electrical; sim to Amp 42827-2.
P128	4033513P17	Contact, electrical; sim to Bead Chain R125-19.
P129 thru P132	4029840P2	Contact, electrical; sim to Amp 42827-2.
P133	4029840P1	Contact, electrical; sim to Amp 41854.
P134	4029840P2	Contact, electrical; sim to Amp 42827-2.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R101	19A115416P6	Wirewound: 4.67 ohms ±1%, 2 w; sim to Dale Type RS-2B.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S101	4031922P1	Pushbutton: SPST, normally open, .50 amp at 12 VDC; sim to Stackpole Type SS-15.
S102	19B209040P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wirt Type 126.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7487424P2	Miniature, phen: 1 terminal.
TB2	7487424P1	Miniature, phen: 1 terminal.
		- - - - - - - - - - TUBES - - - - - - - - - -
V101		Type 7984.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XV101	19C301007P5	Tube, plastic: 12 pins rated at 5 amps max; sim to Alcon Metal Products 371G bottom mount.
		HARNESS ASSEMBLY 19E500877G9 (Includes J101, J102, P101-P106, P109, P110, P112, P115-P117, P120-P127, P129)

SYMBOL	G-E PART NO	DESCRIPTION
		MECHANICAL PARTS (SEE RC-1198)
1	19B200525P9	Rivet. (Part of XY1-4).
2	19A115793P1	Contact, electrical; sim to Malco 2700. (Part of XY1-4).
3	19C311172P2	Crystal socket. (Part of XY1-4).
4	4033089P1	Clip. (Part of XY1-4).
5	19C303395G3	Heat sink.
6	19B204571P1	(Not Used).
7	19A121195P2	Support. (Used with V101).
8	7165167P7	Tube shield insert; sim to Atlas 106-332-18. (Used with V101).
9	19B204702P1	Tube heat sink. (Used with V1).
10	7165167P5	Tube shield insert; sim to Atlas 106-332-5. (Used with V1).
11	19B204490G1	Can.
12	19B204708G1	Chassis.
13	19B204395G1	Chassis.
14	19C303396G1	Mobile top cover.
	19C303495G8	Station top cover. (Except Repeaters and VM).
	19C303673G3	Station top cover. (Repeaters and VM only).
15	19A121676P1	Pin guide: 4-40 thread, approx 5/8 inch pin. (Used with J101).
16	19A122724P1	Post.
17	N509P608C	Pin, spring dowel.
18	19B204776P1	Support.
19	19B204756P1	Insulator.
20	19C303666P2	Plate line. (Used with V101).
21	N402P39C13	Washer.
22	4031531P1	Locknut, No. 32.
23	7115130P9	Lockwasher; sim to Shakeproof 1220-2.
24	19B205023P1	Support.
25	19A121189P2	Post.
26	4031532P1	Cup washer.
27	4031530P1	Bearing, No. 32.
28	7893938P1	Nut, No. 32.
29	N910P18C	Retaining ring.
30	5493361P5	Washer, spring tension: sim to Shakeproof 3502-10-79.
31	19A121547P1	Plate.
32	19B204640P1	Shield. (Used with V101 line plate).
33	4036921P1	Mounting support, bottom cover; sim to Tinnerman C17609-8A-67.
34	4029030P10	Rubber channel.
35	19B204366P1	Support.
36	19C303396G3	Mobile bottom cover.
	19C303495G7	Station bottom cover.
37	19A121065P1	Support. (Used with FL1).
38	19A121257G1	Angle. (Used with FL1).



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 thru C - Exciter Board 19D402385G4, 5, 9, 10, 14, 15

REV. A thru D - Exciter Board 19D402385G19, 20, 24, 25, 29, 30

REV. A - Exciter Board 19D402385G34, 35, 39, 40, 44, 45
Incorporated into initial shipment.

Channel Guard Low-Pass Filter G101 19C311802G1
REV. A - Incorporated into initial shipment.
REV. B - To reduce input to filter to prevent a square wave output. Added R27.

PARTS LIST

LBI-3936F

CHANNEL GUARD ENCODER G102
4EH17A10 19C311802G2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1*	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
		Earlier than REV A:
	19B209243P2	Polyester: 0.015 µf ±20%, 50 VDCW.
C2	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C3	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C5	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C6	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C7	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19B209243P14	Polyester: 0.33 µf ±20%, 250 VDCW.
C9	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C10	19A116080P109	Polyester: 0.22 µf ±10%, 50 VDCW.
C11 thru C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
		- - - - - - - - - - TONE NETWORKS - - - - - - - - -
FL1		TONE FREQUENCY NETWORK 19B205280
	19B205280G1	71.9 Hz
	19B205280G2	77.0 Hz
	19B205280G3	82.5 Hz
	19B205280G4	88.5 Hz
	19B205280G5	94.8 Hz
	19B205280G6	100.0 Hz
	19B205280G7	103.5 Hz
	19B205280G8	107.2 Hz
	19B205280G9	110.9 Hz
	19B205280G10	114.8 Hz
	19B205280G11	118.8 Hz
	19B205280G12	123.0 Hz
	19B205280G13	127.3 Hz
	19B205280G14	131.8 Hz
	19B205280G15	136.5 Hz
	19B205280G16	141.3 Hz
	19B205280G17	146.2 Hz
	19B205280G18	151.4 Hz
	19B205280G19	156.7 Hz
	19B205280G20	162.2 Hz
	19B205280G21	167.9 Hz
	19B205280G22	173.8 Hz
	19B205280G23	179.9 Hz
	19B205280G24	186.2 Hz
	19B205280G25	192.8 Hz
	19B205280G26	203.5 Hz
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J6	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q5	19A115362P1	Silicon, NPN; sim to Type 2N2925.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R2	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R3	3R77P274K	Composition: 0.27 megohms ±10%, 1/2 w.
R4	3R77P620J	Composition: 62 ohms ±5%, 1/2 w.
R5	3R77P822K	Composition: 8200 ohms ±10%, 1/2 w.
R6	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R7	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R8	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R9	3R77P184K	Composition: 0.18 megohms ±10%, 1/2 w.
R10	3R77P622J	Composition: 6200 ohms ±5%, 1/2 w.
R11	3R77P330K	Composition: 33 ohms ±10%, 1/2 w.
R12	19A116278P365	Metal film: 46,400 ohms ±2%, 1/2 w.
R13	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R14	3R77P244J	Composition: 0.24 megohm ±5%, 1/2 w.
R15	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R16	19A116278P301	Metal film: 10,000 ohms ±2%, 1/2 w.
R17	19A116278P65	Metal film: 46.4 ohms ±2%, 1/2 w.
R18	19A116278P329	Metal film: 19,600 ohms ±2%, 1/2 w.
R19	19A116278P285	Metal film: 7500 ohms ±2%, 1/2 w.
R20	19A116278P412	Metal film: 130,000 ohms ±2%, 1/2 w.
R21	19A116278P269	Metal film: 5110 ohms ±2%, 1/2 w.
R22	19A116278P117	Metal film: 147 ohms ±2%, 1/2 w.
R23	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - -
RT1	5490828P30	Thermistor: 330,000 ohms ±10%, color code black and gray; sim to Globar Type 783H-3.
RT2	5490828P36	Thermistor: 55,000 ohms ±10%, color code black and red; sim to Globar Type 723B.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1		(Part of XFL1).
		- - - - - - - - - - - SOCKETS - - - - - - - - - -
XFL1	19A121920G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/4 inches of cable.
		ENCODER INSTALLATION KIT 19A127174G1
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	N404P13C13	Lockwasher, no. 6.
	N80P13005C13	Machine screw, no. 6-32 x 5/16.
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4.
	N210P13C13	Nut, no. 6-32.
	19B205480G2	Harness. Includes:
P130 thru P135	4029840P2	Contact, electrical; sim to Amp 42827-2.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

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 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.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

PRINTED IN U.S.A.

DF-3123