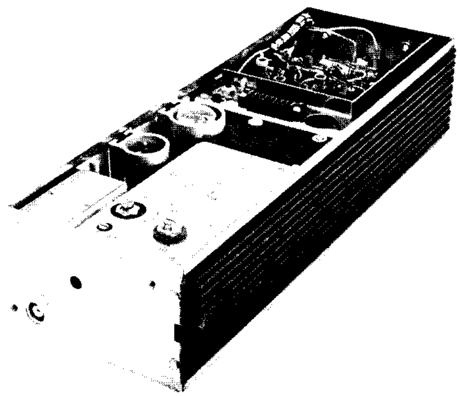
MOBILE RADIO

MASTR PROGRESS LINE

132-174 MHZ, 90-WATT TRANSMITTER MODEL 4ET58F10-21 & 4ET58K10-15



SPECIFICATIONS *

FCC filing Designation:	**ET-58-F (Narrow Band)** **ET-58-K (Wide Band)**
Frequency Range:	132—174 MHz
Power Output:	90 watts minimum
Crystal Multiplication Factor:	12
Frequency Stability:	±.0005% (-30°C to +60°C)
Spurious & 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 & Transistors:	90-watt Transmitter with no Options: 3 tubes 8 transistors 4 diodes
Maximum Frequency Spacing	±0.2%
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.

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ILLUSTRATIONS

WARNING

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

DESCRIPTION

The MASTR Progress Line FM Transmitter Types ET-58-F and ET-58-K are crystal-controlled, phase-modulated transmitters designed for one-, two-, or four-frequency operation within the 132-174 megahertz band. The transmitter consists of the following modules:

- Transistorized Exciter Board, with audio, oscillator, modulator, amplifier and multiplier stages,
- Tubed multipliers and power amplifier stages,
- Optional transistorized Channel Guard Board (ET-58-F 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.

CIRCUIT ANALYSIS

Eight silicon transistors and only three tubes are used in the transmitter. The frequency of the crystals used ranges from 11 to 14.5 megahertz, and the crystal frequency is multiplied twelve times.

A centralized metering jack (J102) is provided for use with General Electric Test Set 4EX3A10. 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.

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 — +650 volts PA B+
- Pin 8 — -45 volts bias
- Pin 14 — +10 volts for Channel Guard option (ET-58-F only)
- Pin 15 — -20 volts for Exciter Board

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 ±0.0005% without crystal ovens or warmers.

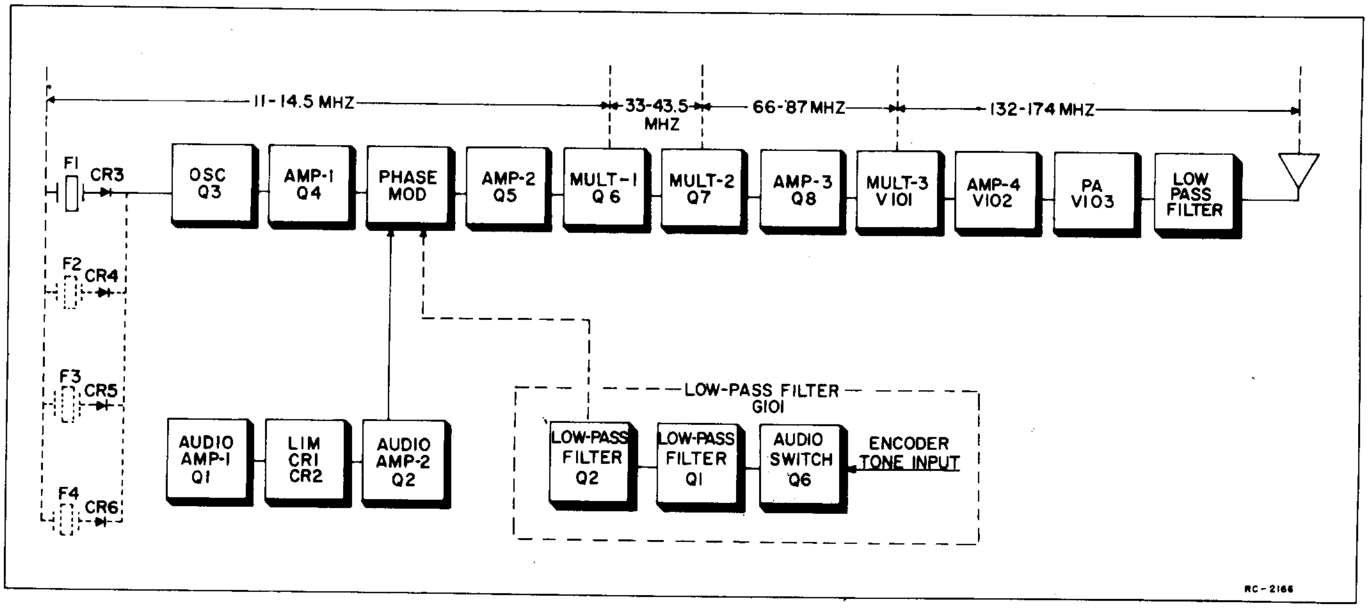


Figure 1 - Transmitter Block Diagram

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 C34/C35. The oscillator output is coupled through an impedance matching emitter-follower amplifier stage (Q4) 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 crystal 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. RF decoupling is provided by R10 and C75.

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 R12 to a combined post-limiter filter and de-emphasis network. This network consists of R15, R16, R17, C4, C7 and C8/C9. The output of the filter and de-emphasis network is applied directly to the phase modulator.

PHASE MODULATOR

The phase modulator uses varactor CV1 (voltage variable capacitor) in series with tuneable coil L1/L2. 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 C41/C45 to the base of the second amplifier. For Channel Guard and wide band transmitters, a second modulator stage (L3/L4 and CV2) is cascaded with the first modulator. The output of the Channel Guard encoder is fed through CHANNEL GUARD MOD ADJUST R34 to the modulator stages. The voice audio is also applied to both modulator stages.

AMPLIFIERS AND 1ST AND 2ND MULTIPLIERS

The second amplifier (Q5) isolates the modulator from the loading effects of the first multiplier and provides amplification. The output is DC coupled to the first multiplier.

Following Q5 are two inductively coupled Class C, common-emitter multiplier stages (Q6 and Q7). Q6 is a tripler, with collector tank T1 tuned to three times the crystal frequency. Metering resistor R37 is for metering the MULT-1 stage at centralized metering jack J102.

Q7 operates as a doubler stage, with collector tank T3 tuned to six times the crystal frequency. Resistor R39 is for metering the MULT-2 stage at J102. The output of Q7 is inductively coupled through T3 and T4 to amplifier Q8. In 150.8--174 megahertz transmitters, capacitor C58 provides some high-side capacitive coupling.

Third amplifier Q8 is a neutralized straight-through amplifier. Feedback through C65 from the output link on T5 provides neutralization. This stage is metered at J102-3 across R43. The output is coupled to the grid tank of multiplier V101.

3RD MULTIPLIER

The output of the transistorized Exciter is coupled by a short length of RF cable to the grid tank (Z101/Z102) of beam pentode V101. This stage operates as a doubler with the plate tank tuned to twelve times the crystal frequency. The plate tank is tuned by C113.

The grid of V101 is metered through metering resistor R102 at J102-4. R101 drops the bias voltage to approximately -18 volts to protect V101 against loss of drive. Plate voltage is supplied through L101.

When measuring grid current to V101, there will be a residual reading of approximately 0.18 volts without any drive. This is caused by the presence of fixed bias voltage to the grid of the tube.

AMPLIFIER 4

The output of the MULT-3 stage is coupled to the grid of amplifier (V102) by C103, L103/L104 and C113. The grid is metered at J102-5 through metering resistor R108. Bias voltage is supplied through R109 and L103/L104.

When measuring the grid voltage, there will be a residual reading of approximately 0.3 volt without any drive to the stage. The plate tank is series-tuned by C116.

POWER AMPLIFIER

Drive from 4th amplifier V102 is inductively coupled to the grid power amplifier V103 through L106 and L108. R113 adjusts the grid drive to V103 by controlling the screen grid voltage of V101 and V102.

The PA grid is metered at J102-6 across metering resistor R116. Bias voltage is applied to the control grids through R115 and R116.

Power amplifier V103 is a dual tetrode operating in a push-pull circuit. The PA plate is slug-tuned by L111/L112. High B-plus is applied through L118 to a center tap on the plate tank coil, L111/L112. C122 is a mechanical high-voltage by-pass capacitor.

The screen grid dropping resistors are R117 and R118. Plate current is metered from J102-1 to J102-9 across metering resistor R120.

WARNING

The meter leads are at plate potential (high B-plus) when metering the PA Plate.

Placing the TUNE-OPERATE switch (S102) in the OPERATE position applies 300 volts to TB3-5 and TB3-7. The 300 volts appearing on each side of R117 effectively shorts the resistor out of the circuit, and the screen voltage is applied through R118 for normal operation of V102. With S102 in the TUNE position, the screen voltage is applied to TB3-7 only. Now, dropping resistors R117 and R118 are in series, to reduce the screen voltage. This reduces the plate dissipation of V103 while tuning the power amplifier stage.

Antenna coupling is achieved by varying the coupling between L111/L112 and L113/L114. C123 tunes the antenna circuit.

The RF output from the antenna coil is fed to low-pass filter FL101. 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 constant 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 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.

REDUCED POWER OPERATION

STATION APPLICATIONS

Station power supply Model 4EP38A10-12 may be modified to operate at reduced power. Select one of the modifications ("A" thru "D") shown in the chart that meets the desired power limitations.

Refer to the applicable Power Supply Maintenance Manual for the required modifications.

	PA POWER OUTPUT LIMIT	TYPICAL PA PLATE VOLTAGE	MAX. PA PLATE POWER INPUT	MAX. EFFICIENCY
A*	65 Watts	467 VDC	109 Watts	60%
B	40-58 Watts	415-435 VDC	101 Watts	60%
C	35-40 Watts	297-300 VDC	70 Watts	60%
D	30-38 Watts	275-280 VDC	65 Watts	60%

* Modification "A" is required for operation under Part 93 (Land Transportation Radio Services) of FCC rules. If Option 7044 is ordered, the power supply will be modified before shipment from the factory.

MOBILE APPLICATIONS

The mobile transmitter with power supply Model 4EP37A10 power supply may be operated at reduced power (120-Watt plate input limitation) as required by Part 93 (Land Transportation Radio Services) and Part 21 (Domestic Public Radio Services) of FCC rules by using the following procedure.

Power Supply Modification*

Move the jumper in the secondary of transformer T501 from T501-23 to T501-22. This modification provides a typical plate voltage of 550 Volts.

Transmitter Alignment Procedure

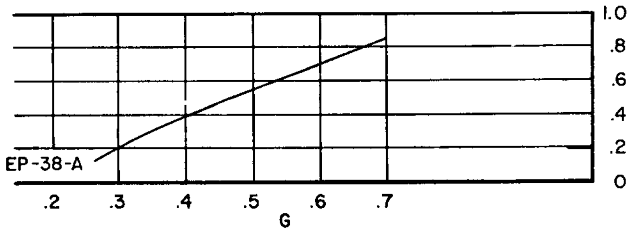
Tune the transmitter according to the Standard Alignment Procedure. Instead of loading the power amplifier to 0.7 Volts, the maximum loading voltage will be given by the following formula:

$$V\ load = \frac{381.6}{Vp}$$

Vp = measured voltage on the PA plate when loaded.

V load = metered voltage with the GE Test Set Model 4EX3A10 set at position "G". Under no conditions should the reading exceed 0.7 Volts.

Whenever station operation at reduced power results in a test meter reading of less than 0.7 Volts, R113 should be adjusted to reduce the meter reading with the Test Set at position "F" according to the following curve.



RC-2165A

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 and pull radio out of mounting frame.
2. Remove the two screws in the bottom cover, and pry up at back of transmitter.
3. Slide cover back and lift off.

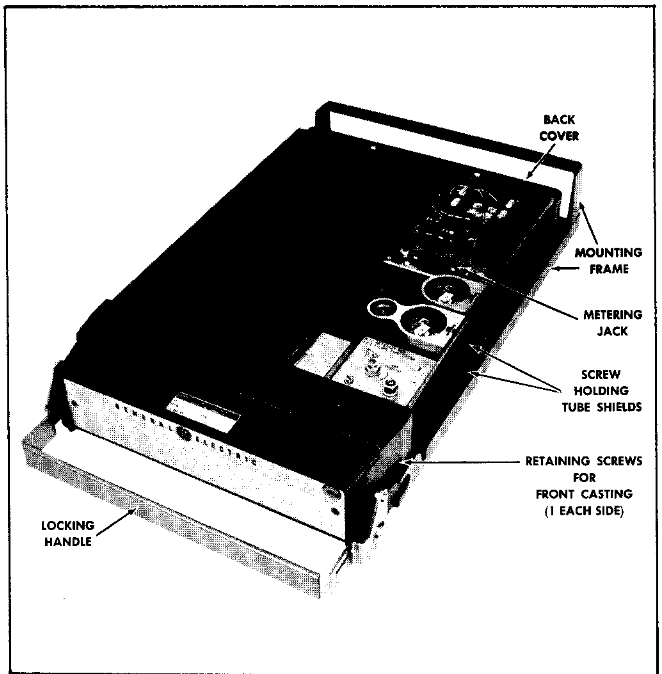


Figure 2 - Top Cover Removed

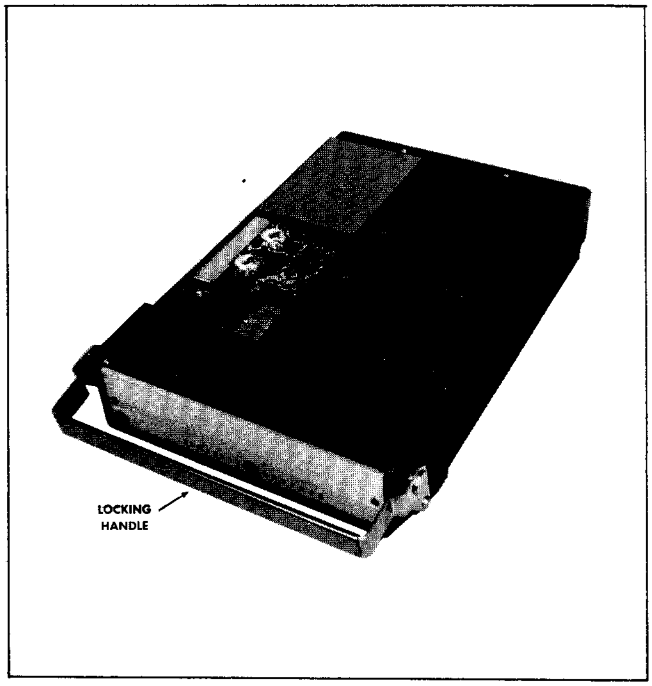


Figure 3 - Bottom Cover Removed

NOTE

The tube shields for the 90-watt transmitter are spring-loaded, and can be pulled off of the tube.

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.

MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R12) 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 Model 4EX6A10
2. A frequency modulation monitor
3. An output meter or a VTVM
4. GE Test Set Models 4EX3A10 or 4EX8K10, 11

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 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 (R12) for a 4.5-kilohertz 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 (R34) for 0.75 KHz tone deviation. Then repeak L1/L2 and L3/L4 as shown in Step 1 of Transmitter Alignment Procedure. Reset tone deviation 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 multifrequency units. Next, apply a 1.0 volt signal at 1000 Hz and set MOD ADJUST (R12) for 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 or 4 **on the channel producing the largest amount of deviation.**

PA PLATE POWER INPUT

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

$$\text{ET-58-F \& K:}\quad P_i = \frac{\text{Plate Voltage x Plate Current Indication}}{3.0}$$

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).

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

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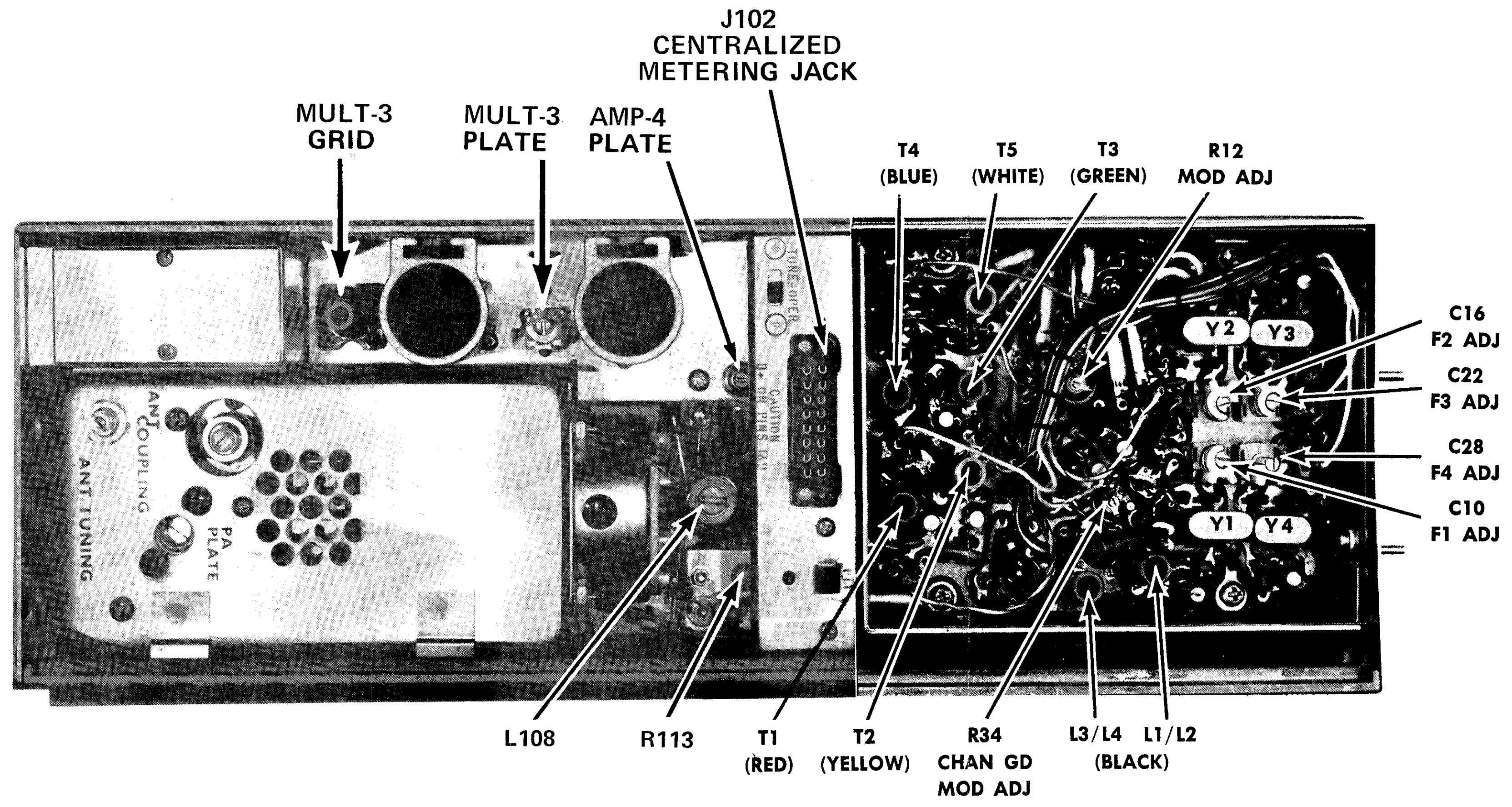


TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A10, 4EX8K10 or 11, Station Metering 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. For a large change in frequency or a badly misaligned transmitter, set crystal trimmer C10 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 12).
3. Place the TUNE-OPERATE switch (S102) in the TUNE position.
4. Connect Test Set Model 4EX3A10 to the Transmitter Centralized Metering Jack J102. If using Multimeter, connect the positive lead to J102-16 (Ground) except if otherwise indicated in Multimeter, Metering Position block.
5. For a large change in frequency or a badly misaligned transmitter, set the slugs in the Exciter coils at the bottom of the coil form, and the slug of MULT-3 GRID (Z101/Z102) at the top of the coil form.
6. All adjustments are made with the transmitter keyed.

STEP	METERING POSITION GE TEST SET	METERING POSITION MULTIMETER - at J102	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
EXCITER BOARD					
1.	A (MULT-1)	Pin 10	L1/L2 (and L3/L4 with Channel Guard)	0.8 v (0.5 v Minimum)	Tuning the modulator is a critical adjustment. Carefully tune L1/L2 for maximum meter reading. For channel guard or wideband transmitters, alternately tune L1/L2 and L3/L4 for maximum meter reading.
2.	A (MULT-1)	Pin 10	T1	See Procedure	Tune T1 for a small peak in meter reading (not required unless changing frequency).
3	B (MULT-2)	Pin 2	T2, T1 and T3	0.65 v (0.5 v Minimum)	Tune T2 and then T1 for maximum meter reading. Then tune T3 for minimum meter reading (not required unless changing frequency).
4.	C (AMPL-3)	Pin 3	T4, T3 and T5	0.6 v (0.5 v Minimum)	Tune T4 and then T3 for a maximum meter reading. Then tune T5 for minimum meter reading (not required unless changing frequency).
MULT-3 AND POWER AMPLIFIER					
5.	D (MULT-3)	Pin 4	MULT-3 GRID	0.6 v (0.45 v Minimum)	Tune MULT-3 GRID and then T5 for maximum meter reading.
6.	E (AMPL-4)	Pin 5	MULT-3 PLATE (R113, C116)	0.55 v (0.45 v Minimum	Tune MULT-3 PLATE for maximum meter reading. Tune C116 for minimum meter reading. Set R113 to center of range.
7.	F (PA GRID)	Pin 14(+) and Pin 6(-)	AMPL-4 PLATE (C116) PA GRID (L108)	0.65 v	Alternately tune AMPL-4 PLATE and PA GRID (C116/L108) for maximum meter reading. Adjust R113 for highest reading consistent with max. power output. Typical readings 0.4 v minimum to 0.85 volts maximum. — NOTE — The tuning slug in L108 should not be adjusted below the top of the coil and should not touch L106.
8.					Rotate ANT COUPLING fully clockwise.
9.	G (PA PLATE)	WARNING High B-Plus on Pins 1 & 9 — Pin 1(+) and Pin 9(-)	PA PLATE (L112, C111)	Minimum	Carefully tune PA PLATE for minimum meter reading. — NOTE — Do not turn adjusting screw too far because the slug assembly may drop out of holder.
10.					Place S102 (TUNE-OPERATE) switch in OPERATE position.
11.	G (PA PLATE)	Pin 1(+) and Pin 9(-)	ANT COUPLING	Minimum	Adjust ANT COUPLING for minimum meter reading.

FOR SINGLE-FREQUENCY TRANSMITTERS

STEP	METERING POSITION GE TEST SET	METERING POSITION MULTIMETER - at J102	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
12.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)	PA PLATE (L112/L111)	Minimum	Tune (L112/L111) (PA PLATE) for minimum meter reading.
13.	"	"	ANT TUNING and ANT COUPLING	0.70 v	Alternately Tune ANT TUNING for maximum meter reading, and adjust ANT COUPLING counterclockwise for a meter reading of 0.70 volts, maximum.
14.	"	"			Repeat Steps 7 and 13.
FREQUENCY ADJUSTMENT					
15.					With no modulation, adjust crystal trimmer C10 (or C16, C22, C28 as required) for proper oscillator frequency. 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 approx. 75° F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.

FOR TWO-FREQUENCY OPERATION

12.					For channel spacings less than 0.2% of operating frequency, follow Steps 1-13 (single frequency transmitter) using the highest frequency.
13.	E (AMPL-4)	Pin 5	MULT-3 PLATE C113	Equal Readings on both Channels	For channel spacings greater than 0.2%, and up to a maximum of 0.4% of operating frequency, follow steps 1-13 (single frequency transmitter) using the highest frequency, then set test meter to "E" and tune C113 for equal reading on both channels.
14.	F (PA GRID)	Pin 14(+) and Pin 6(-)	AMP-4 PLATE C116	Equal Reading on both Channels	Set test meter selector switch to "F". Tune C116 for equal reading on both channels. Adjust R113 for highest reading consistent with max. power output. Typical reading 0.4 volts minimum to 0.85 volts maximum.
15.	G (PA PLATE)	Pin 1(+) and Pin 9(-)		0.7 V	Rotate ANT COUPLING for minimum meter reading. Adjust PA PLATE for equal reading on each channel. Adjust ANT COUPLING for a reading of 0.70 volts maximum on the highest reading channel. Readings between channels should not differ by more than .02 volts.

FOR THREE or FOUR FREQUENCY OPERATION

12.					Follow Steps 1-13 (single frequency transmitter) using the channel nearest the center frequency.
13.	F (PA GRID)	Pin 14(+) and Pin 6(-)	AMP-4 PLATE C116	0.9 V on highest Reading Channel	Tune C116 for equal readings on highest and lowest frequency. Set R113 for highest reading consistent with maximum power output, using the frequency showing the highest reading.
14.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)		0.7 V	Adjust ANT COUPLING for a maximum reading of 0.7 volts on the highest reading channel.

ALIGNMENT PROCEDURE

132—174 MHZ, 90-WATT MASTR TRANSMITTER
MODELS 4ET58F10-21 & 4ET58K10-15

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 modulation 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:	2. VTVM similar to:	3. Audio Generator similar to:	4. Deviation Meter (with a .75 KHz scale) similar to:
Bird #43 Jones #711N	Triplett #850 Heath #IM-21	GE Model 4EX6A10 or Heath #IG-72	Measurements #140 Lampkin #205A

5. Multipmeter similar to:

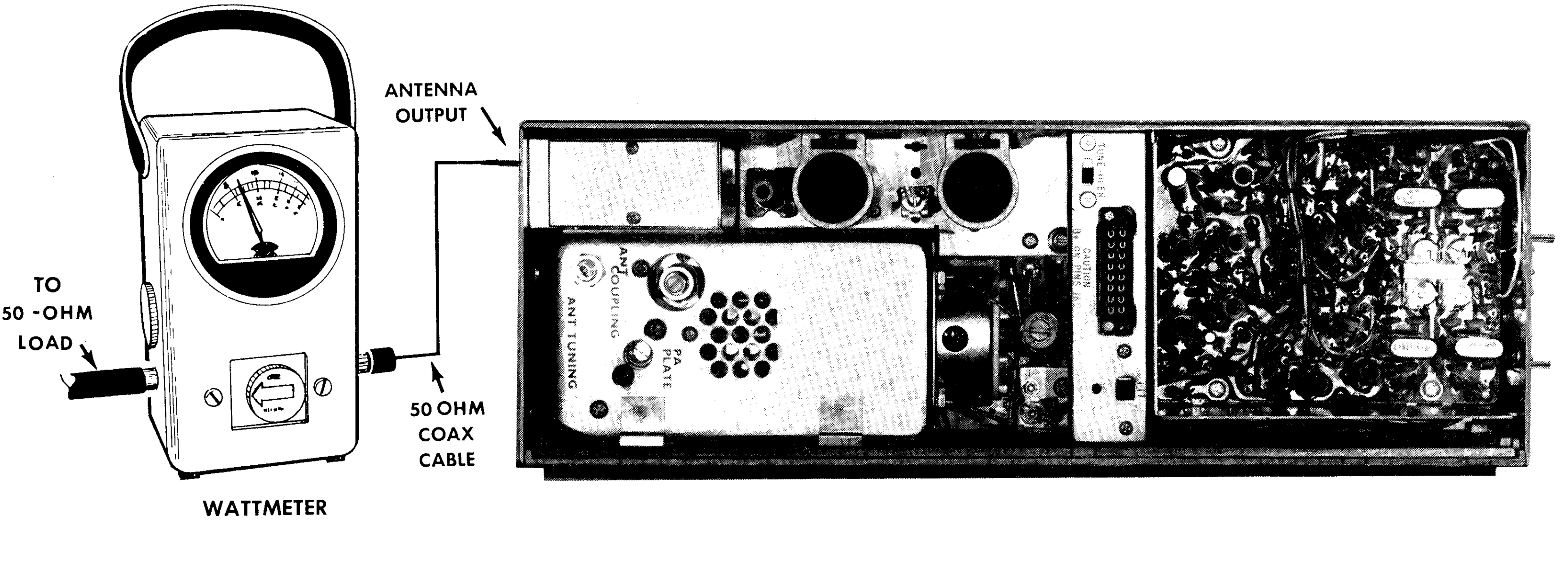
GE METERING TEST SET MODEL 4EX3A10 or
Triplett #631 or
20,000 ohms-per-volt voltmeter

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 80 watts.

SERVICE CHECK

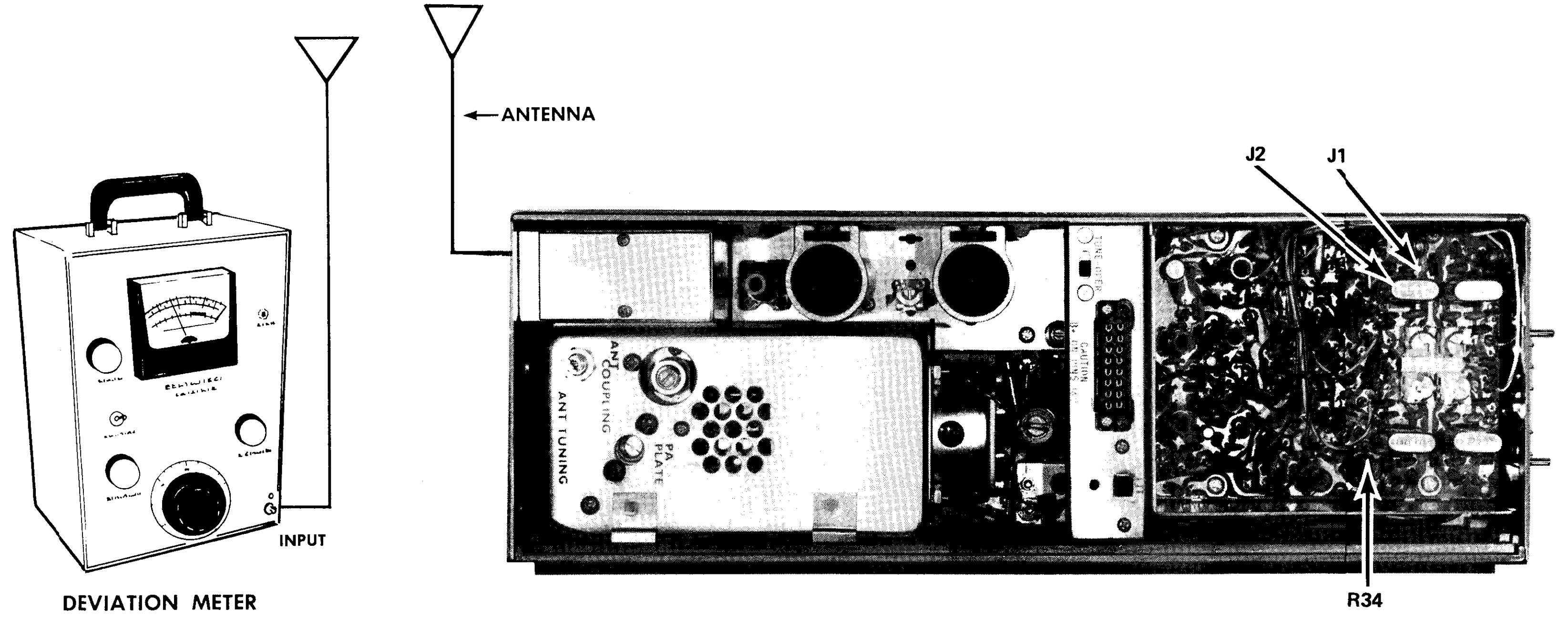
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



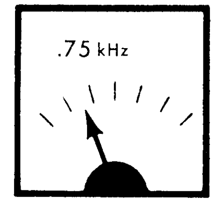
2. Unplug the MIC HI terminal from J1 on Transmitter Exciter Board.

3. Key transmitter and check for 0.75 KHz deviation. If reading is low or high, adjust Channel Guard MOD ADJUST (R34) for a reading of 0.75 KHz.

NOTES:

The Channel Guard MOD ADJUST (R34) 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.

DEVIATION METER



NOTES:

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

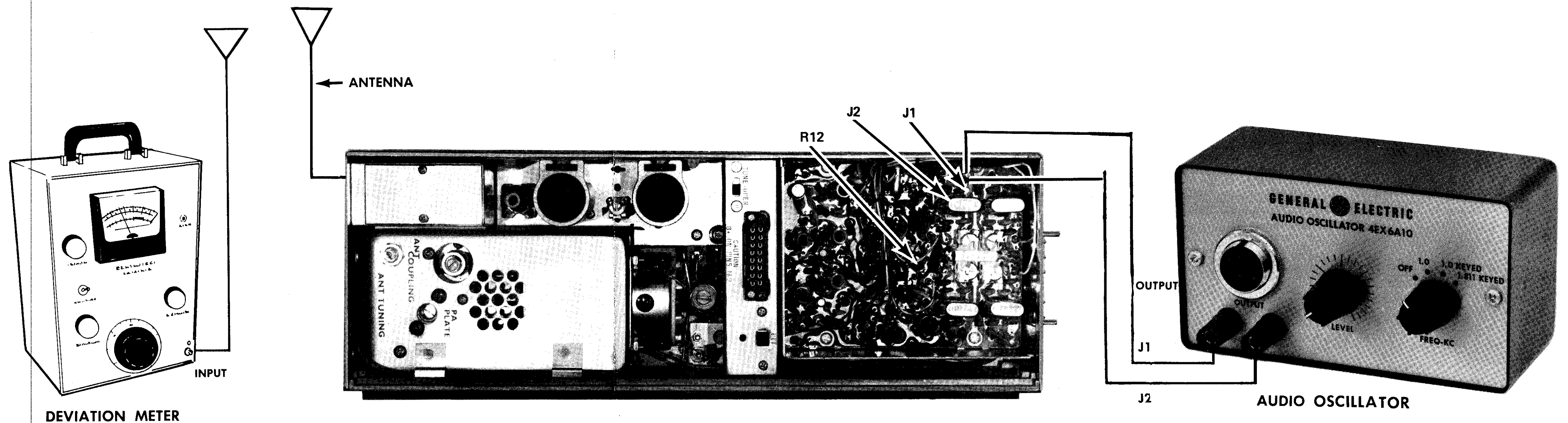
If the 0.75 KHz deviation is not obtainable when adjusting R34, replace the Tone Transmitter reed.

STEP 3

VOICE DEVIATION AND SYMMETRY

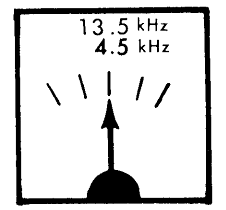
TEST PROCEDURE

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" R12 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

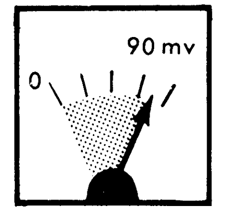


NOTES: --MASTR transmitters are adjusted for 4.5 KHz (13.5 KHz wide band) deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 KHz (15 KHz wide band) under the worst conditions of frequency, voltage and temperature.

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

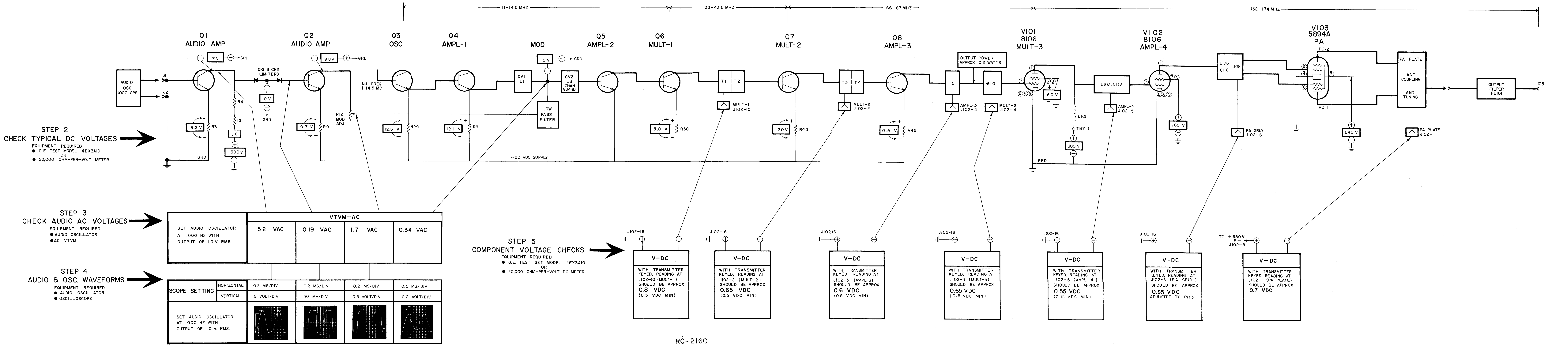
1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. Check Audio Sensitivity by reducing generator output until deviation falls to 3.3 KHz (10 KHz wide band). Voltage should be LESS than 90 millivolts.

METER



STEP 1 — QUICK CHECKS

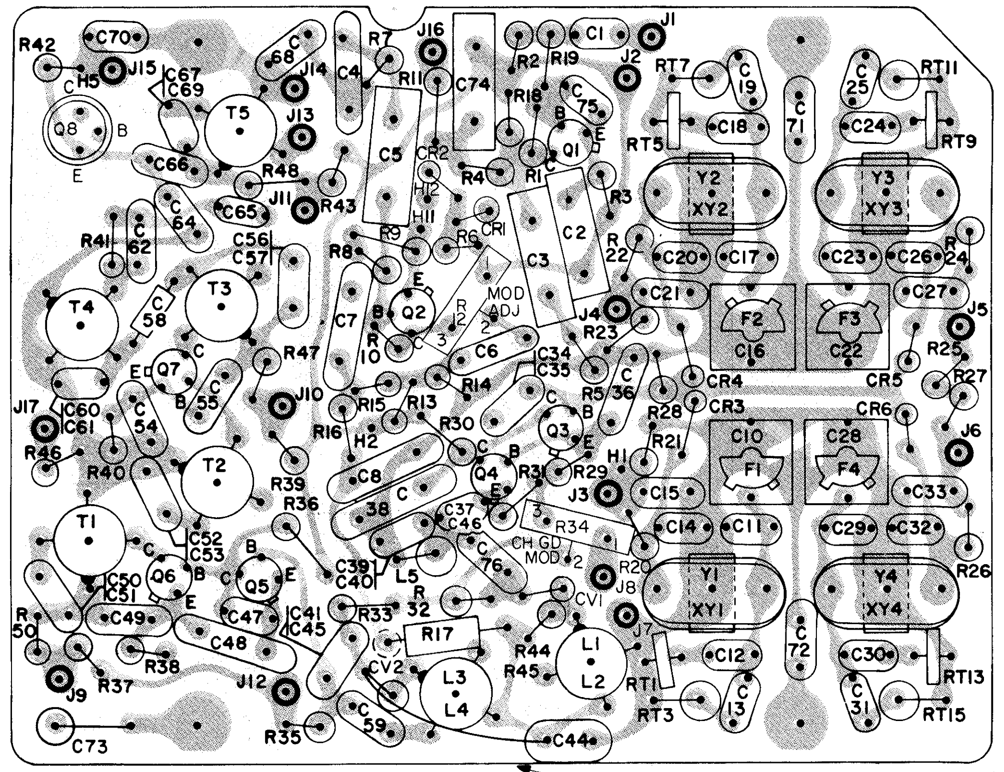
POWER OUTPUT	CHECK VOLTAGES AT CENTRALIZED METERING JACK J102 Multimeter = pin numbers GE Test Set = A-G positions							PROBABLE DEFECT
	Pins 10 & 16 A	Pins 2 & 16 B	Pins 3 & 16 C	Pins 4 & 16 D	Pins 5 & 16 E	Pins 6 & 14 F	Pins 1 & 9 G	
Low	0.8 v	0.65 v	0.6 v	0.6 v	0.55 v	Low	0.7 v	Weak 5894A or Loose Hardware in output tank circuit, or bad filter.
0	0.8 v	0.65 v	0.6 v	0.6 v	0.55 v	.37 v	0	Open 5894A
0	0.8 v	0.65 v	Low	.18 v	.37 v	.37 v	0	Open Filament on 8106
0	0.8 v	0.65 v	0 or over 1.0 v	.18 v	.37 v	.37 v	0	Defective Q8
0	0.8 v	0 or over 1.0 v	0	.18 v	.77 v	.37 v	0	Defective Q7
0	Over 1.2 v	0	0	.18 v	.37 v	.37 v	0	Shorted Q6 or Open Q5
0	0	0	0	.18 v	.37 v	.37 v	0	Defective Q3-Q6 or Modulator (see Note A)
NOTE A --- Localize trouble by checking:--								
1.	-20 volt DC supply at J102-12-16.							
2.	Measure 12.1 VDC across Q4 emitter resistor R31 (1500 ohms), then:							
(a)	Remove crystal - a slight variation in R31 voltage reading indicates Q3 and Q4 stages operating properly.							
(b)	If no voltage is measured, check keying leads CR3-CR6, Q3, Q4.							
(c)	With crystal removed, short Q5 base to emitter. A voltage reading above 1.0 volt indicates Q5 and Q6 are operating properly. Defect may be in Modulator.							
(d)	If modulator is defective, check voltage variable diodes CV1 and CV2.							



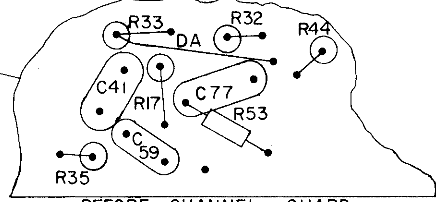
TROUBLESHOOTING PROCEDURE

132—174 MHZ, 90-WATT MASTR TRANSMITTER
MODELS 4ET58F10-21 & 4ET58K10-15

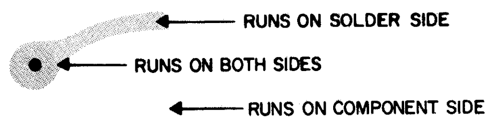
EXCITER A101-A112

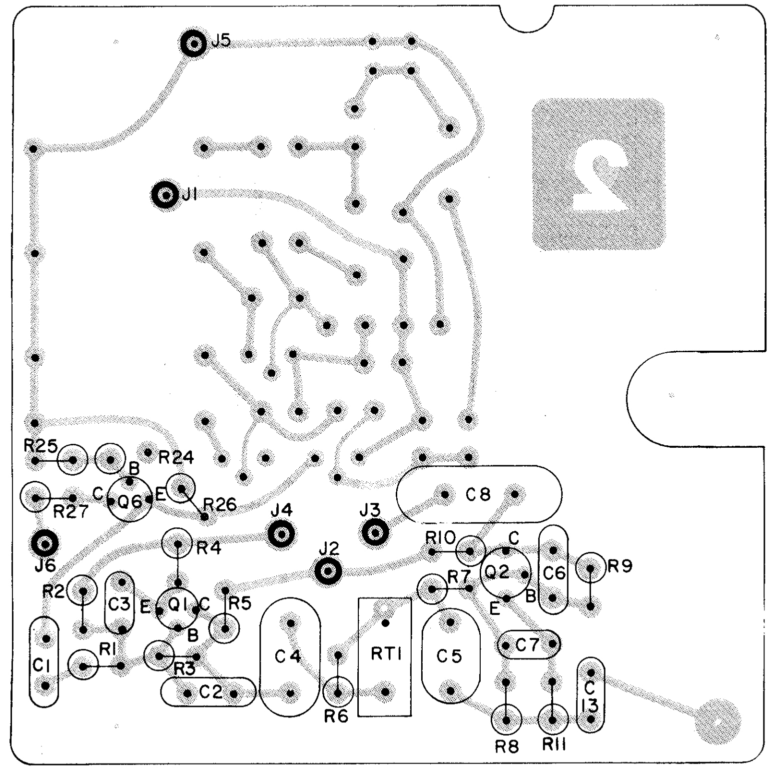


(19C303483, Sh. 1, Rev. 7)
(19C303483, Sh. 2, Rev. 7)



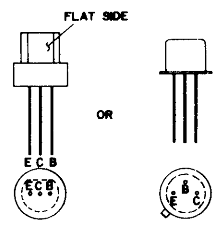
BEFORE CHANNEL GUARD MODIFICATION





LOW-PASS FILTER
G101

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



LEAD IDENTIFICATION

EXCITER READINGS TAKEN TO CHASSIS GROUND						
TRANSISTOR	EMITTER		BASE		COLLECTOR	
	−	+	−	+	−	+
Q1	6.5K	6.8K	240K	12K	50K	20K
Q2	6 2K	4K	70K	10K	9 8K	10K
Q3	9K	2.7K	9K	2.7K	100	100
Q4	7K	5K	9K	2 7K	100	100
Q5	5K	2.7K	70K	6.8K	3.7K	2.3K
Q6	4K	3.2K	3.7K	2.3K	175	175
Q7	5.2K	2.9K	5K	2.7K	465	465
Q8	5K	2 7K	5K	2.7K	67	67

EXCITER READINGS TAKEN TO 20 VOLT LINE (J15 BLUE LEAD)						
TRANSISTOR	EMITTER		BASE		COLLECTOR	
	−	+	−	+	−	+
Q1	11K	14K	240K	30K	60K	35K
Q2	1K	1K	70K	4.3K	14K	18K
Q3	2.6K	2.5K	10K	5.5K	2 7K	5.1K
Q4	1.5K	1.5K	2.6K	2 5K	2.7K	5.1K
Q5	0	0	70K	3 2K	8.2K	3.8K
Q6	340	360	8K	3.8K	3K	5 1K
Q7	60	180	0	0	2.3K	5.5K
Q8	27	27	47	47	2.6K	5K

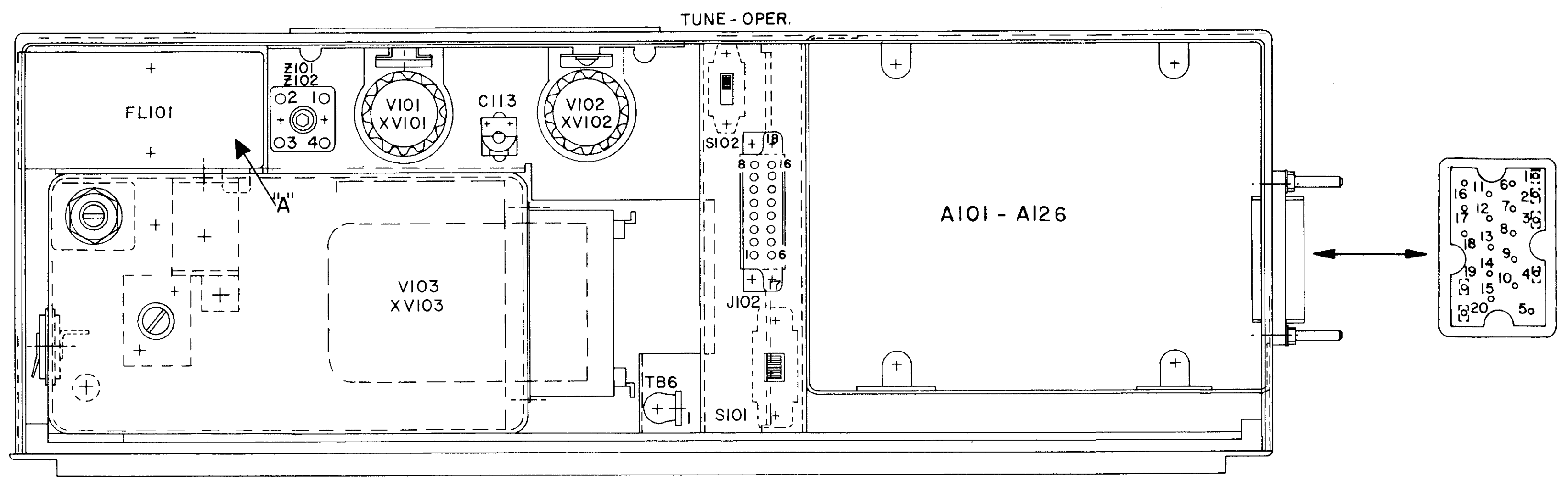
RESISTANCE READINGS

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

"B"

TOP VIEW

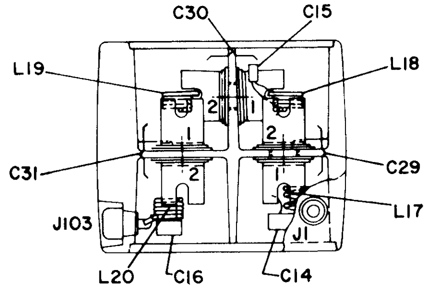


READINGS AT J101 TAKEN TO CHASSIS GROUND.

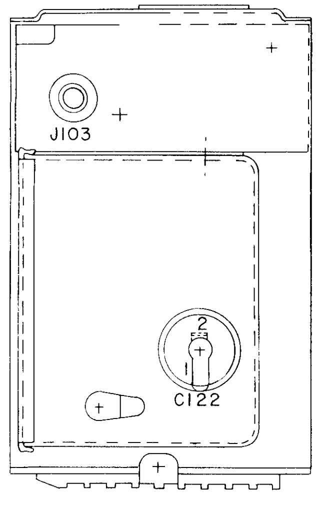
PIN	−	+
1	0	0
2	∞	∞
3	1.3 Ω	1.3 Ω
4	26 K	26 K
5	∞	∞
6	∞	∞
7	∞	∞
8	26 K	26K
9	∞	∞
10	∞	∞
11	∞	∞
12	0/30K	0/15K
13	∞	∞
* 14	∞	∞
15	7 K	2.8 K
16	∞/30K	∞/15K
17	∞/30K	∞/15K
* 18	∞/30K	∞/15K
* 19	0	0
* 20	∞	∞

* 1ST READING FOR SINGLE FREQ
2ND READING FOR MULTI-FREQ.

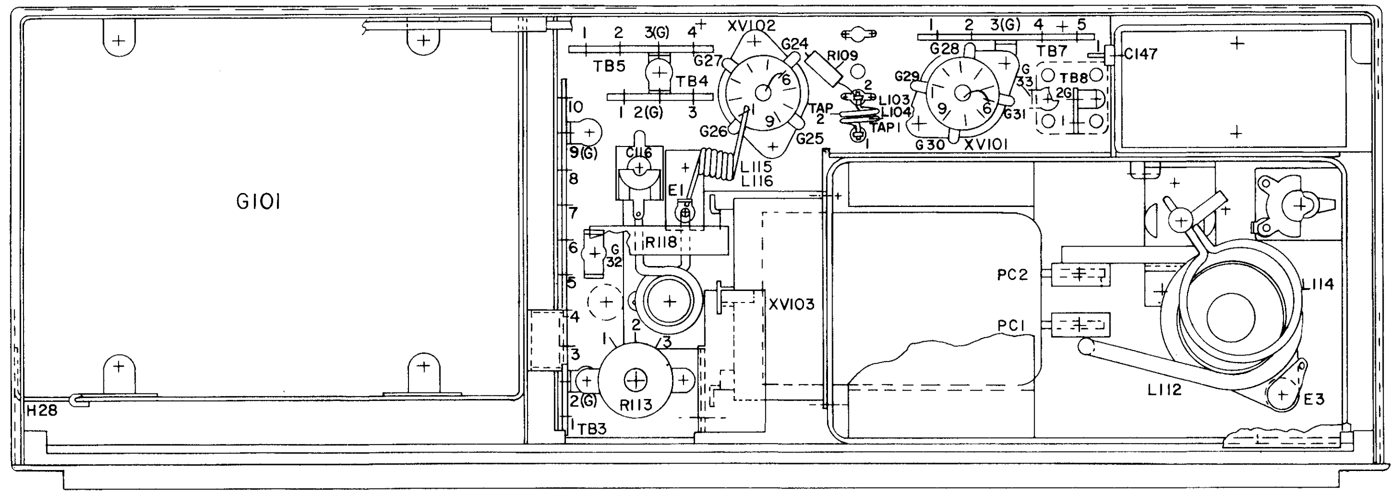
VIEW AT "A"



VIEW AT "B"



BOTTOM VIEW



READINGS TAKEN FROM TUBE SOCKET PINS TO CHASSIS GROUND

PIN	1	2	3	4	5	6	7	8	9	10	11	12
XV101	550K	0	583K	0	1.4 Ω	0	30K	583K	0			
XV102	0	0	550K	550K	550 K	0	83K	0	0	60K	83K	1.4 Ω
XV103	1.4 Ω	50K	550K	0	0.9Ω	50K	0					

(19R621723, Rev. 0)

OUTLINE DIAGRAM

132—174 MHZ, 90-WATT MASTR TRANSMITTER
MODELS 4ET58F10-21 & 4ET58K10-15

Issue 2

(19B821379, Rev. 3)

NOTE
TERMINATE PINS 1, 3, 4, 19 & 20 WITH 19A115793P1 REFER TO DWG 19B500858 FOR TERMINATION DETAIL

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

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

MODEL NO.		FREQ. RANGE	NO. OF FREQ.	CHAN. GD.	
4ET58F10		132-150.8 MC	1		
4ET58F11		150.8-174 MC	1		
4ET58F12		132-150.8 MC	2		
4ET58F13		150.8-174 MC	2		
4ET58F14		132-150.8 MC	4		
4ET58F15		150.8-174 MC	4		
4ET58F16		132-150.8 MC	1	X	
4ET58F17		150.8-174 MC	1	X	
4ET58F18		132-150.8 MC	2	X	
4ET58F19		150.8-174 MC	2	X	
4ET58F20		132-150.8 MC	4	X	
4ET58F21		150.8-174 MC	4	X	

MODEL NO.		FREQ. RANGE	NO. OF FREQ.
4ET58K10		132-150.8 MC	1
4ET58K11		150.8-174 MC	1
4ET58K12		132-150.8 MC	2
4ET58K13		150.8-174 MC	2
4ET58K14		132-150.8 MC	4
4ET58K15		150.8-174 MC	4

		REV.
	PL19E500926G1	
	PL19E500926G2	
A101	PL19D402308G1	D
A102	PL19D402308G2	D
A103	PL19D402308G3	D
A104	PL19D402308G4	D
A105	PL19D402308G5	D
A106	PL19D402308G6	D
A107	PL19D402308G7	E
A108	PL19D402308G8	E
A109	PL19D402308G9	E
A110	PL19D402308G10	E
A111	PL19D402308G11	E
A112	PL19D402308G12	E
A121	PL19D402308G13	D
A122	PL19D402308G14	D
A123	PL19D402308G15	D
A124	PL19D402308G16	D
A125	PL19D402308G17	D
A126	PL19D402308G18	D

■ USED WITH CHAN. GD ONLY

◓ USED WITH WIDE BAND ONLY

● USED WITH 132-150.8 MC ONLY

▲ USED WITH 150.8-174 MC ONLY

NOTES:
1. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED.
2. PART OF CABLE 19B205480G2
3. FOR CHANNEL GUARD ON F1 ONLY MOVE W-R WIRE FROM J101-6 TO J101-14.

5. WRAP LEADS OF C120 AROUND LEADS OF L108 WITH LEADS AS SHORT AS POSSIBLE.
6. ALL 22-HV-R WIRES ARE A4036780P3

VOLTAGE READINGS ARE TYPICAL VOLTAGES MEASURED TO GROUND WITH A 20,000 OHM-PER-VOLT VOLTMETER, WITH TRANSMITTER KEYED.

EXCEPTION — VOLTAGES FOLLOWED BY VTVM WERE MEASURED WITH A HIGH IMPEDANCE VTVM USING A 470K SERIES RESISTOR. READINGS SHOWN ON Q1 AND Q2 ON G101/G102 WERE MEASURED IN A NEGATIVE GROUND SYSTEM. FOR POSITIVE GROUND SYSTEMS, MEASURE READINGS AT Q1 AND Q2 TO J5 ON G101/G102.

(DF-3125)

SCHEMATIC DIAGRAM

132—174 MHZ, 90-WATT MASTR TRANSMITTER
MODELS 4ET58F10-21 & 4ET58K10-15

Issue 3

PARTS LIST

LBI-4264

132-174 MHz TRANSMITTER
MODELS 4ET58F10 - 4ET58F21
MODELS 4ET58K10 - 4ET58K15

SYMBOL	GE PART NO.	DESCRIPTION
A101 thru A112 A121 thru A126		**EXCITER BOARD ASSEMBLY** A101 19D402308G1 REV D 4ET58F10 A102 19D402308G2 REV D 4ET58F11 A103 19D402308G3 REV D 4ET58F12 A104 19D402308G4 REV D 4ET58F13 A105 19D402308G5 REV D 4ET58F14 A106 19D402308G6 REV D 4ET58F15 A107 19D402308G7 REV E 4ET58F16 A108 19D402308G8 REV E 4ET58F17 A109 19D402308G9 REV E 4ET58F18 A110 19D402308G10 REV E 4ET58F19 A111 19D402308G11 REV E 4ET58F20 A112 19D402308G12 REV E 4ET58F21 A121 19D402308G13 REV D 4ET58K10 A122 19D402308G14 REV D 4ET58K11 A123 19D402308G15 REV D 4ET58K12 A124 19D402308G16 REV D 4ET58K13 A125 19D402308G17 REV D 4ET58K14 A126 19D402308G18 REV D 4ET58K15
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P3	Polyester: .022 µf ±20%, 50 VDCW.
C2	19A116080P4	Polyester: .033 µf ±20%, 50 VDCW.
C3	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C4	7491395P114	Ceramic disc: .0022 µf ±10%, 500 VDCW.
C5	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C6	19A116080P5	Polyester: .047 µf ±20%, 50 VDCW.
C7	7491395P111	Ceramic disc: .0015 µf ±10%, 500 VDCW.
C8	5493367P1000K	Silver mica: .001 µf ±10%, 100 VDCW; sim to Electro Motive Type DM-20.
C10	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C11	5496219P7	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C12 and C13	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C14	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C15	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C17	5496219P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C18 and C19	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C20	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C21	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C22	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C23	5496219P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C24 and C25	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C26	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C27	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C28	5491271P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.

SYMBOL	GE PART NO.	DESCRIPTION
C29	5496219P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C30 and C31	19C300685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C32	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C33	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C34	5496372P50	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C35	5496372P54	Ceramic disc: 270 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C36	5496219P467	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -220 PPM.
C37	5496372P327	Ceramic disc: 75 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C38	5494481P131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C39	5496372P145	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C40	5496372P345	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C41	5493366P180K	Mica: 180 pf ±10%, 100 VDCW; sim to Electro Motive Type DM15.
C44	5493366P470J	Silver mica: 470 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C45	5496372P45	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -2200 PPM.
C46	5496372P347	Ceramic disc: 200 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C47	5496219P749	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -750 PPM.
C48	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C49	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C50	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C51	5496219P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C52	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C53	5496219P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C54 and C55	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C56	5496219P440	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C57	5496219P343	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -150 PPM.
C58	5491601P35	Tubular: 0.15 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C59	5493366P220K	Silver mica: 220 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C60	5496219P241	Ceramic disc: 10 pf ±5%, 500 VDCW, temp coef -80 PPM.
C61	5496219P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C62	5496219P51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef 0 PPM.
C64	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C65	5496219P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C66	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C67	5496219P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C68	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	GE PART NO.	DESCRIPTION
C69	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C70 thru C72	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C73	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C74	19A115414P13	Tubular, polyester: 0.1 µf ±20%, 200 VDCW.
C75	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RM Type JF Discap.
C76	5493366P470K	Mica: 470 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C77	5493366P270K	Mica: 270 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3 thru CR6	19A115603P1	Silicon.
CV1 and CV2	5495769P8	Silicon, capacitive.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J17	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B204526G2	Coil. Includes tuning slug 5491798P2.
L2	19B204526G1	Coil. Includes tuning slug 5491798P2.
L3	19B204526G4	Coil. Includes tuning slug 5491798P2.
R1	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
L4	19B204526G3	Coil. Includes tuning slug 5491798P2.
R1	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
L5	7488079P48	Choke, RF: 27 µh ±10%, 1.4 ohms DC res; sim to Jeffers 4422-9K.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q5	19A115330P1	Silicon, NPN.
Q6 and Q7	19A115328P1	Silicon, NPN.
Q8	19A115329P1	Silicon, NPN.
Q9	19A115362P1	Silicon, NPN; sim to Type 2N2925.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R2	3R77P105K	Composition: 1 megohm ±10%, 1/2 w.
R3	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R4	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R5	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R6	3R77P684K	Composition: 0.68 megohm ±10%, 1/2 w.
R7	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R8	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R9	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R10 and R11	3R77P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R12	19B209358P106	Variable, carbon film: approx 75 to 10,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.

SYMBOL	GE PART NO.	DESCRIPTION
R13 and R14	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R15	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R16	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R17	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R18	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R19	3R77P222K	Composition: 2200 ohms ±10%, 1/2 w.
R20	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R21	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R22	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R23	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R24	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R25	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R26	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R27 and R28	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R29	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R30	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R31	3R77P152K	Composition: 1500 ohms ±10%, 1/2 w.
R32 and R33	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R34	19B209358P107	Variable, carbon film: approx 75 to 25,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R35	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R36	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R37	3R77P750J	Composition: 75 ohms ±5%, 1/2 w.
R38	3R77P391K	Composition: 390 ohms ±10%, 1/2 w.
R39	3R77P620J	Composition: 62 ohms ±5%, 1/2 w.
R40	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R41	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R42	3R77P270K	Composition: 27 ohms ±10%, 1/2 w.
R43	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
R44	3R77P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R45	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R46	19A116278P474	Metal film: 576,000 ohms ±2%, 1/2 w.
R47	3R77P391K	Composition: 390 ohms ±10%, 1/2 w.
R48	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R50	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R51	3R77P511J	Composition: 510 ohms ±5%, 1/2 w.
R52	3R77P364J	Composition: 0.36 megohm ±5%, 1/2 w.
R53	3R152P472K	Composition: 4700 ohms ±10%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT3	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT5	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT7	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT9	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT11	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT13	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT15	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19B204534G1	Coil. Includes tuning slug 5491798P4.
T2	19B204535G1	Coil. Includes tuning slug 5491798P4.
T3	19B204535G1	Coil. Includes tuning slug 5491798P4.
T4	19B204535G2	Coil. Includes tuning slug 5491798P4.
T5	19B204537G1	Coil. Includes tuning slug 5491798P4.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (RC-2172).
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
		When reordering give GE Part No. and specify exact freq needed. Crystal Freq = (OF ÷ 12).
Y1 thru Y4	19B206175P6	Quartz: freq range 11,000 to 12,566 KHz, temp range -30°C to +85°C. (132-150.8 MHz Transmitter)
Y1 thru Y4	19B206175P7	Quartz: freq range 12,566 to 14,500 KHz, temp range -30°C to +85°C. (150.8-174 MHz Transmitter)
		- - - - - - - - - OSCILLATORS - - - - - - - - -
G101		LOW PASS FILTER ASSEMBLY 19C311802G1 REV B
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19B209243P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C2	19A116080P1	Polyester: 0.01 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	19A116080P6	Polyester: .068 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: .001 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.

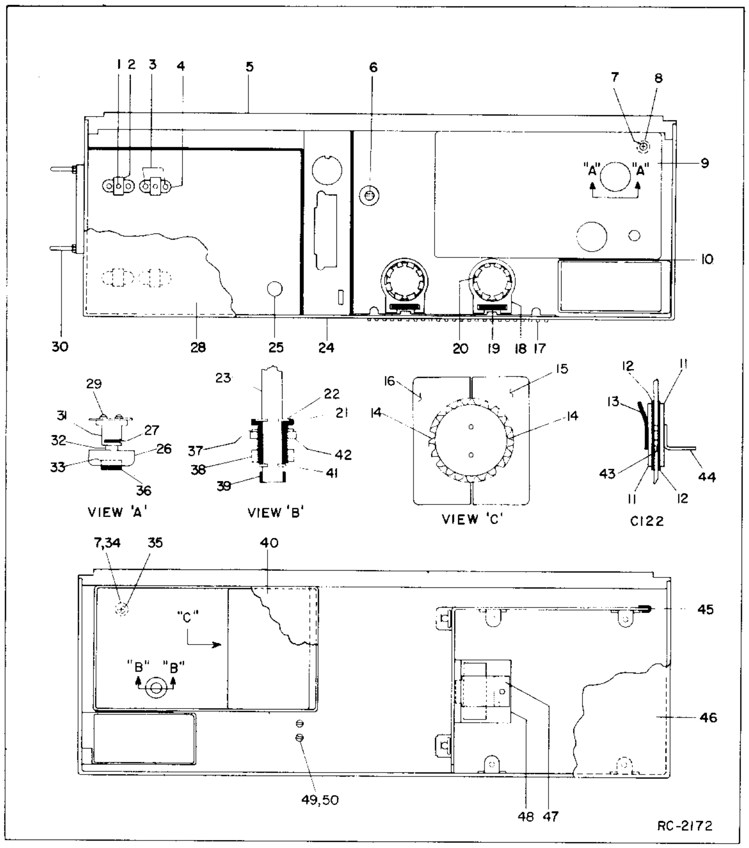
SYMBOL	GE PART NO.	DESCRIPTION
R25	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R26	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R27	3R77P512K	Composition: 5100 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P30	Rod: 0.33 megohm ±10% res, 1 w max; sim to Globar Type 783H-3.
		CHANNEL GUARD INSTALLATION KIT 19A127174G2
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19B201074P304	Tap screw, 6-32 x 1/4. (4)
	19B205408G2	Harness. Includes:
P130 thru P135	4029840P2	Contact, electrical; sim to Amp 42827-2.
		CHASSIS AND PA ASSEMBLY 19E500926G1, G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C101 and C102	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C103		(Part of L103, L104).
C104 and C105	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C106 and C107	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C108	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C109	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C111 and C112	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C113	19A116680P5	Variable: approx 2.8 to 22 pf, 500 VDCW; sim to EF Johnson 189.
C114 and C115	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C116	19B209038P10	Variable: approx 2.62 to 30.0 pf; sim to EF Johnson Type V 193-10-2.
C117 and C118	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C119	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C120	5496218P235	Ceramic disc: 4.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C121	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C122		(Part of Mechanical Parts).
C123	7491398P5	Variable, air: approx 4.0-19 pf; sim to Teleradio 7-9974-K.
C124 thru C126	5494481P1	Ceramic disc: 150 pf ±5%, 1000 VDCW; sim to RMC Type JF Discap.
C127 thru C129	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C131 thru C133	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C140	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL101		LOW PASS FILTER ASSEMBLY 19D402233G10 The low pass filter is factory tuned. If it is found to be defective it is recommended that the entire filter assembly be replaced to maintain rated power output and spurious attenuation.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	19A127909G1	Terminal.
E3	4036994P1	Terminal, solder: sim to Zierick Mfg Corp 505.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J101	19C303426G1	Connector: 20 pin contacts.
J102	19B205689G1	Connector: 18 contacts.
J103		(Part of FL101).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L101	7488079P6	Choke, RF: 2.2 µh ±10%, 1 ohm DC res; sim to Jeffers 4411-12K.
L103	19A128037G2	Coil.
L104	19A128037G1	Coil.
L106	19B219605P1	Coil.
L108	19A128034P3	Coil.
L109 and L110	7488079P6	Choke, RF; 1.00 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4411-8.
L111	19B219007G1	Coil.
L112	19B219009G1	Coil.
L113	19B219157G1	Coil.
L114	19B219028G1	Coil.
L115	19A128035P2	Coil.
L116	19A128035P1	Coil.
L117 and L118	19A128034P1	Coil.
L119 and L120	19A128034P2	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.
P109 thru P113	4029840P2	Contact, electrical; sim to Amp 42827-2.
P114	4029840P1	Contact, electrical; sim to Amp 41854.
P115 thru P117	4029840P2	Contact, electrical; sim to Amp 42827-2.
P123	4033513P21	Contact, electrical; sim to Bead Chain B125-22.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	3R77P271K	Composition: 270 ohms ±10%, 1/2 w.
R102	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R103	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R104	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R105	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R106	3R77P271K	Composition: 270 ohms ±10%, 1/2 w.
R107	3R77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R108	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R109	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R111	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R112	19A116479P 2332K	Metal film: 2300 ohms ±10%, 2 w; sim to Mallory Type 2 MOL.
R113	19B209114P7	Variable, wirewound: 10,000 ohms ±20%, 3 w; sim to CTS Series 117.
R114	3R79P123K	Composition: 12,000 ohms ±10%, 2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R115		(Part of L108).
R116	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R117	3R78P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R118	19A116479P4412K	Metal film: 4100 ohms ±1%, 4 w; sim to Mallory Type 4 MOL.
R119	3R77P154K	Composition: 0.15 megohm ±10%, 1/2 w.
R120	19A115416P7	Wirewound: 3 ohms ±1%, 2 w; sim to Dale Type RS-2B.
R121	3R77P123K	Composition: 12,000 ohms ±10%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S101	4031922P1	Push: single pole, single throw, normally open, 1/2 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.
		- - - - - - - - - - TUBES - - - - - - - - - -
V101 and V102		Type 8106.
V103		Type 5894A.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XV101 and XV102	7480532P8	Tube, phen: 9 pins; sim to Elco 04-903-84.
XV103	7489471P3	Tube, ceramic or steatite: 7 pins.
		- - - - - - - - - - COILS - - - - - - - - - -
Z101	19B219309G1	Coil. Includes:
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
Z102	19B219309G2	Coil. Includes:
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		MECHANICAL PARTS (SEE RC-2172)
1	19B200525P9	Rivet. (Part of XY1-XY4).
2	4033089P1	Clip. (Part of XY1-XY4).
3	19A115793P1	Crystal socket; sim to Malco 2700. (Part of XY1-XY4).
4	19C311172P2	Crystal socket. (Part of XY1-XY4).
5	19C303395G4	Chassis heat sink.
6	19C317518G1	Tuning slug. (Part of L108).
7	N80P13004C13	Screw, phillips head: No. 6-32 x 1/4.
8	4033306P35	Fiber washer.
9	19C317517G1	Tuning chassis.
10	19A131527P1	Plate.
11	19A121006P8	Washer, aluminum. (Part of C122).
12	19A121018P2	Washer, teflon. (Part of C122).
13	7878455P1	Terminal, solderless. (Part of C122).
14	7165167P3	Tube shield insert. (Part of V103- a quantity of 2 is required).
15	19B204793P1	Heat sink. (Lower) (Used with V103).
16	19B204792P2	Heat sink. (Upper) (Used with V103).
17	19C303399P1	Heat sink.
18	19A121523P1	Heat sink. (Used with V101 and V102).
19	19B205622P1	Spring. (Used with V101 and V102).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
20	7165167P5	Tube shield insert: sim to Atlas 106-332-5. (Used with V101 and V102).
21	4031530P1	Bearing. (Part of Post assembly).
22	4031532P1	Cup washer. (Part of Post assembly).
23	19A127917P1	Post. (Part of Post assembly).
24	19B204395G3	Chassis.
25	4036555P1	Insulator disc: nylon. (Used with Q8 on A101-A112, A121-A126).
26	19A127896P2	Can. (Part of PA Plate Assembly).
27	19A127922P1	Spring. (Part of PA Plate Assembly).
28	19C303495G8	Station top cover. (Except Repeaters and VM).
	19C303673G3	Station top cover. (Repeaters and VM only).
	19C303396G1	Mobile top cover.
29	N81P15004C	Screw, phillips head: 8-32 x 1/4.
30	19A121676P1	Guide pin. (Used with J101).
31	19A128027G1	Bushing. (Part of PA Plate Assembly).
32	19A127900P1	Shaft. (Part of PA Plate Assembly).
33	19A127899P1	Disc. (Part of PA Plate Assembly).
34	4036899P33	Insulator stop.
35	N81P13004C	Screw, phillips head: 6-32 x 1/4.
36	N81P9006C	Screw, phillips head: 4-40 x 3/8.
37	7115130P9	Lockwasher: sim to Shakeproof 1220-2. (Part of Post Assembly).
38	4031531P1	Locknut: No. 32. (Part of Post Assembly).
39	4031527P2	Collar. (Part of Post Assembly).
40	19C303605P1	Tuning cover.
41	N910P18C13	Retaining ring. (Part of Post Assembly).
42	7893938P1	Nut: No. 38. (Part of Post Assembly).
43	4031594P2	Insulator, teflon.
44	7878455P2	Terminal, solderless.
45	4029030P10	Channel, rubber.
46	19C303495G7	Station Bottom Cover.
	19C303396G3	Mobile Bottom Cover.
47	19A121065P1	Support. (Used with FL1, XFL1).
48	19A121257G1	Angle. (Used with FL1 and XFL1).
49	N75P1006C13	Screw, machine: brass 0-80 x 3/8.
50	N207P1C13	Nut, brass: 0-80 thread.



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 A123, A126)

REV. A thru D - (Exciter Board A101-106, A121, A122, A124, A125)

REV. A thru E - (Exciter Board A107-A112)
Incorporated into initial shipment

REV. A & B - (Channel Guard Low Pass Filter G101)
Incorporated into initial shipment

REV. A - (Channel Guard Encoder G102)
Incorporated into initial shipment

PARTS LIST

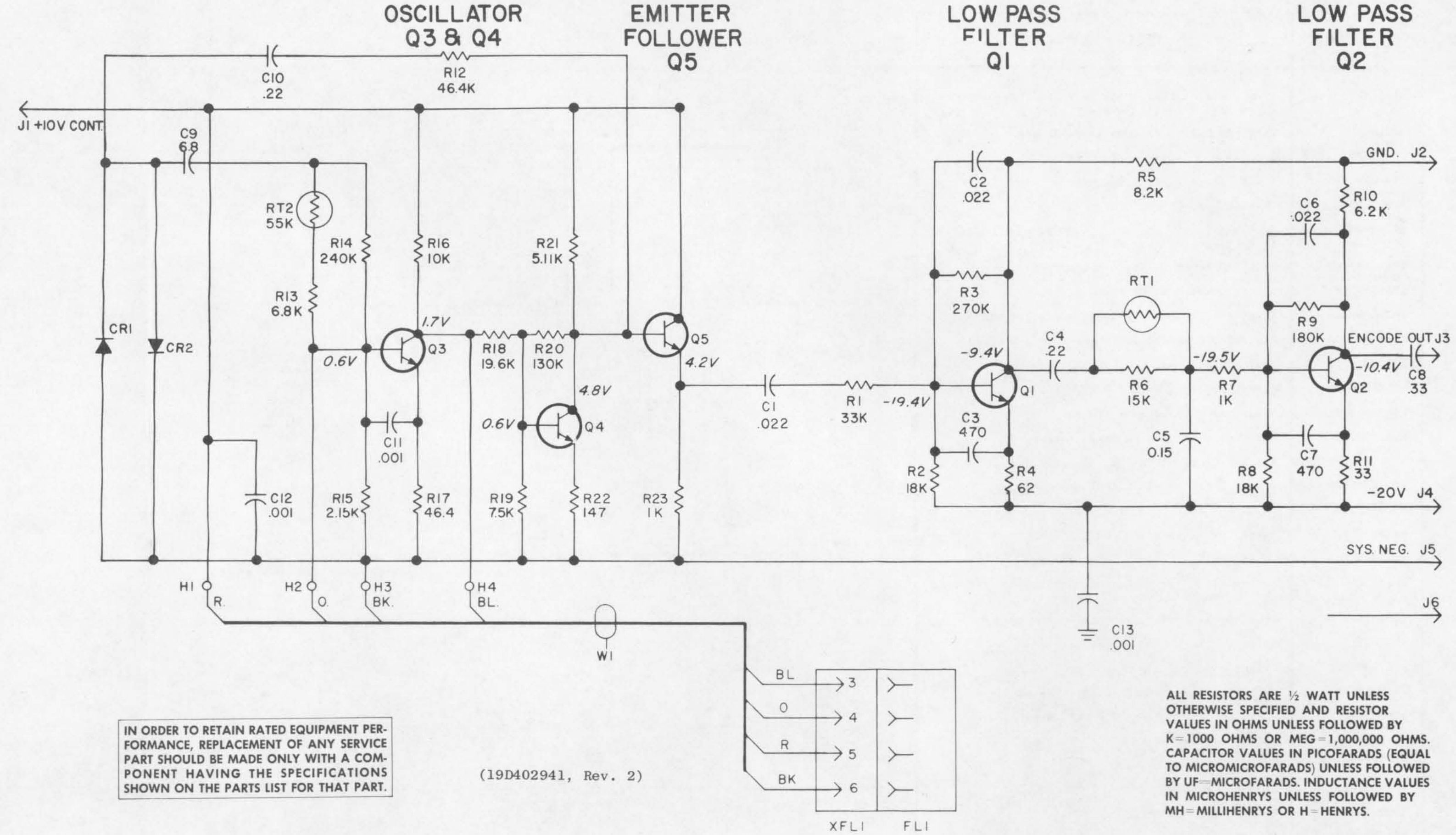
LBI-3936E

CHANNEL GUARD ENCODER G102
4EH17A10 19C311802-G2
REV A

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1*	19A116080-P103	Polyester: 0.022 µf ±10%, 50 VDCW.
		Earlier than REV A:
	19B209243-P2	Polyester: 0.015 µf ±20%, 50 VDCW.
C2	19A116080-P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C3	5494481-P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	19A116080-P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C5	19A116080-P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C6	19A116080-P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C7	5494481-P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19B209243-P14	Polyester: 0.33 µf ±20%, 250 VDCW.
C9	5496267-P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C10	19A116080-P109	Polyester: 0.22 µf ±10%, 50 VDCW.
C11 thru C13	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 and CR2	19A115250-P1	Silicon.
		- - - - - - - - - - TONE NETWORKS - - - - - - - - -
FL1		TONE FREQUENCY NETWORK 19B205280
	19B205280-G1	71.9 Hz
	19B205280-G2	77.0 Hz
	19B205280-G3	82.5 Hz
	19B205280-G4	88.5 Hz
	19B205280-G5	94.8 Hz
	19B205280-G6	100.0 Hz
	19B205280-G7	103.5 Hz
	19B205280-G8	107.2 Hz
	19B205280-G9	110.9 Hz
	19B205280-G10	114.8 Hz
	19B205280-G11	118.8 Hz
	19B205280-G12	123.0 Hz
	19B205280-G13	127.3 Hz
	19B205280-G14	131.8 Hz
	19B205280-G15	136.5 Hz
	19B205280-G16	141.3 Hz
	19B205280-G17	146.2 Hz
	19B205280-G18	151.4 Hz
	19B205280-G19	156.7 Hz
	19B205280-G20	162.2 Hz
	19B205280-G21	167.9 Hz
	19B205280-G22	173.8 Hz
	19B205280-G23	179.9 Hz
	19B205280-G24	186.2 Hz
	19B205280-G25	192.8 Hz
	19B205280-G26	203.5 Hz
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J6	4033513-P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q5	19A115362-P1	Silicon, NPN; sim to Type 2N2925.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77-P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R2	3R77-P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R3	3R77-P274K	Composition: 0.27 megohms ±10%, 1/2 w.
R4	3R77-P620J	Composition: 62 ohms ±5%, 1/2 w.
R5	3R77-P822K	Composition: 8200 ohms ±10%, 1/2 w.
R6	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R7	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R8	3R77-P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R9	3R77-P184K	Composition: 0.18 megohms ±10%, 1/2 w.
R10	3R77-P622J	Composition: 6200 ohms ±5%, 1/2 w.
R11	3R77-P330K	Composition: 33 ohms ±10%, 1/2 w.
R12	5495948-P365	Deposited carbon: 46,400 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR.
R13	3R77-P682J	Composition: 6800 ohms ±5%, 1/2 w.
R14	3R77-P244J	Composition: 0.24 megohms ±5%, 1/2 w.
R15	19A116278-P233	Metal film: 2150 ohms ±2%, 1/2 w.
R16	19A116278-P301	Metal film: 10,000 ohms ±2%, 1/2 w.
R17	19A116278-P65	Metal film: 46.4 ohms ±2%, 1/2 w.
R18	19A116278-P329	Metal film: 19,600 ohms ±2%, 1/2 w.
R19	19A116278-P285	Metal film: 7500 ohms ±2%, 1/2 w.
R20	19A116278-P412	Metal film: 130,000 ohms ±2%, 1/2 w.
R21	19A116278-P269	Metal film: 5110 ohms ±2%, 1/2 w.
R22	19A116278-P117	Metal film: 147 ohms ±2%, 1/2 w.
R23	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
		- - - - - - - - - - THERMISTORS - - - - - - - -
RT1	5490828-P30	Thermistor: 330,000 ohms ±10%, color code black and gray; sim to Globar Type 783H-3.
RT2	5490828-P36	Thermistor: 55,000 ohms ±10%, color code black and red; sim to Globar Type 723B.
		- - - - - - - - - - - - CABLES - - - - - - - - -
W1		(Part of XFL1).
		- - - - - - - - - - - - SOCKETS - - - - - - - - -
XFL1	19A121920-G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/4 inches of cable.
		ENCODER INSTALLATION KIT 19A127174-G1
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	N404P13C13	Lockwasher, no. 6.
	N80P13005C13	Machine screw, no. 6-32 x 5/16.
	19B201074-P304	Tap screw, no. 6-32 x 1/4.
	N210P13C13	Nut, no. 6-32.
	19B205480-G2	Harness. Includes:
P130 thru P135	4029840-P2	Contact, electrical; sim to Amp 42827-2.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

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)

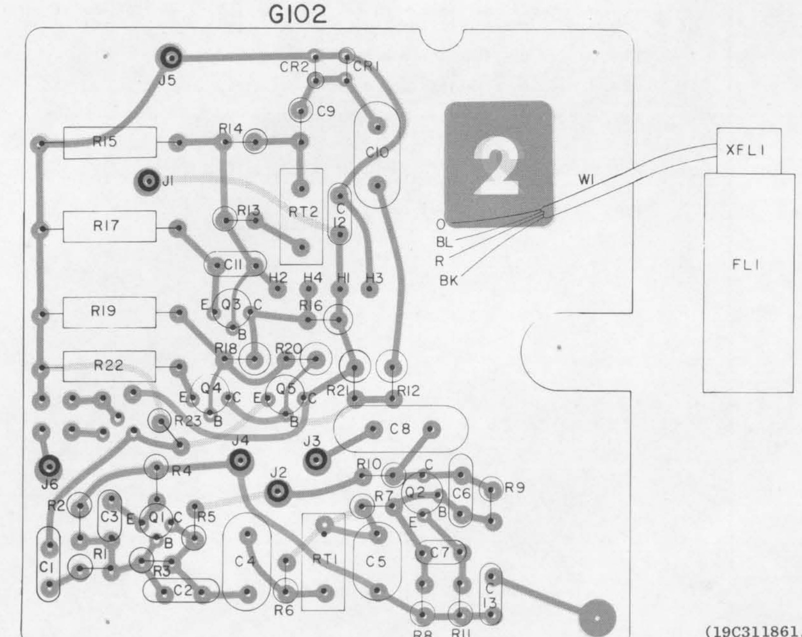
ALL RESISTORS ARE ½ WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

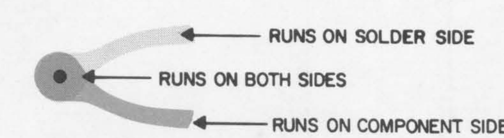
REVISION LTR BLOCK

		REV
G102	4EH17A10	A

OUTLINE DIAGRAM

ENCODER
MODEL 4EH17A10
G102





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

SCHEMATIC & OUTLINE DIAGRAM

CHANNEL GUARD ENCODER G102
MODEL 4EH17A10