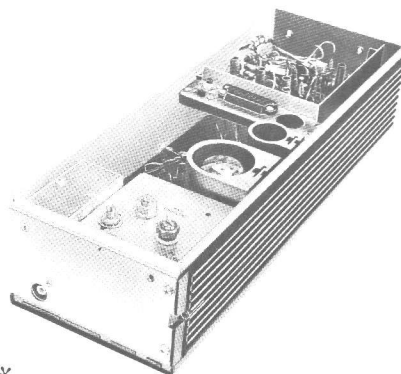


MASTR[®] Progress Line

132—174 MHz 30-WATT TRANSMITTER MODELS 4ET57A30—41 & 4ET57B10—15



SPECIFICATIONS *

FCC Filing Designation

ET-57-A (Narrow Band)

Frequency Range

ET-57-B (Wide Band)

132—174 MHz

Power Output:

Mobile Power Supply
Station Power Supply

30 watts minimum (20% duty cycle)
10 watts minimum (continuous duty)

Crystal Multiplication Factor

12

Frequency Stability

$\pm 0.0005\%$ (-30°C to $+60^{\circ}\text{C}$)

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
Wide Band

0.5 kHz maximum
1.5 kHz maximum

Tubes and Transistors

30-Watt Transmitter with no Options:

2 tubes
8 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.

TABLE OF CONTENTS

SPECIFICATIONS	Cover
DESCRIPTION	1
CIRCUIT ANALYSIS	1
Power Inputs	1
Oscillator	2
Audio Amplifiers and Limiter	2
Phase Modulator	2
Amplifiers and 1st and 2nd Multipliers	2
3rd Multiplier	2
Power Amplifier	3
Channel Guard	3
MAINTENANCE	3
Disassembly	3
Alignment Procedure	5
Test Procedures	6
Power Output	6
Tone Deviation	6
Voice Deviation	6
Troubleshooting	7
OUTLINE DIAGRAM (with resistance readings)	8
SCHEMATIC DIAGRAM (with voltage readings)	9
PARTS LIST	
Transmitter Type 4ET-57-A	10
Channel Guard Encoder Model 4EH17A10	12
PRODUCTION CHANGES	11

ILLUSTRATIONS

Figure 1	Block Diagram	1
Figure 2	Removing Top Cover for Servicing	4
Figure 3	Removing Bottom Cover for Servicing	4

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.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.



DESCRIPTION

MASTR Progress Line FM Transmitter
Types ET-57-A and B 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 multiplier and power amplifier stages.
- Optional Channel Guard Low-Pass Filter (ET-57-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.

CIRCUIT ANALYSIS

Eight silicon transistors and only two tubes are used in the transmitter. When

used with the mobile power supplies, the transmitter has a minimum power output of 30 watts. When used as an exciter with high power stations, the minimum power output is 10 watts. The frequency of the crystals used ranges from 11 to 14.5 megahertz, and the crystal frequency is multiplied 12 times.

A centralized metering jack (J102) is provided for use with GE Test Sets 4EX3A10 or 4EX8K10, 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.

POWER INPUTS

The following supply voltages are connected for 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+ with mobile supplies (+300 volts PA B+ for driver use with station supplies)
- Pin 8 - -45 volts bias

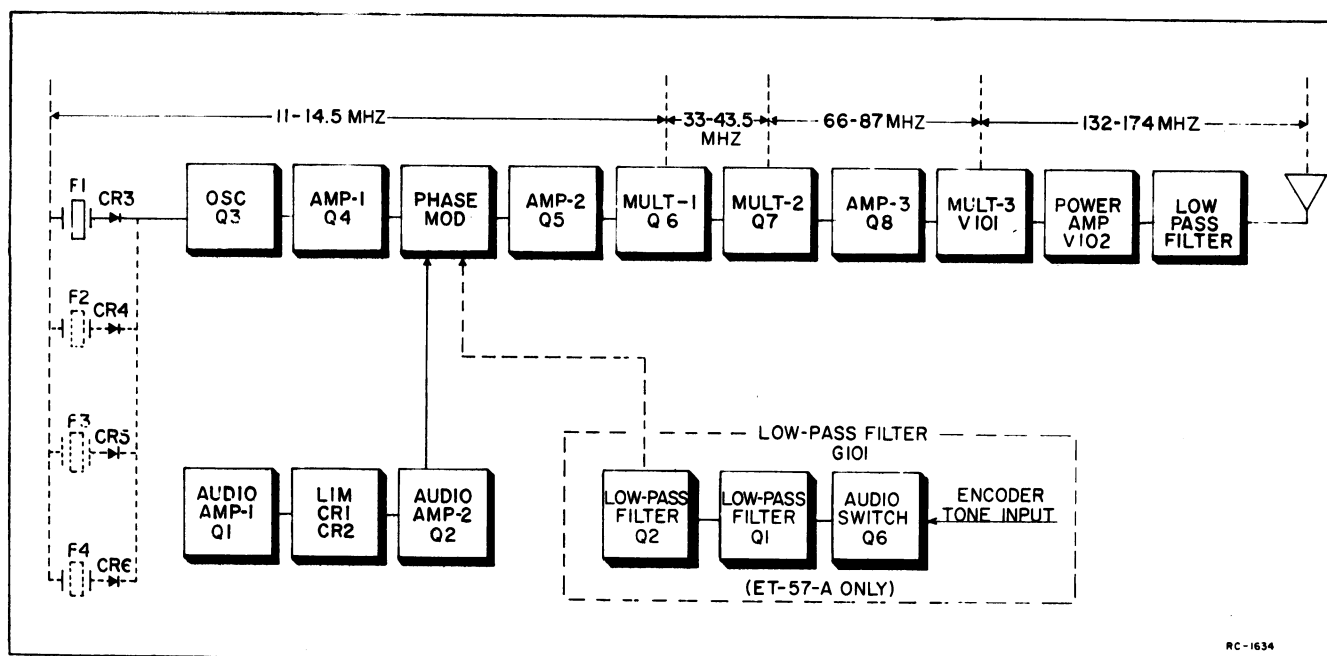


Figure 1 - Transmitter Block Diagram

- Pin 14 - +10 volts for Channel Guard option (ET-57-A 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 $\pm 0.0005\%$ 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 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 R19 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 to 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 CV-1

(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 CV-1, 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 CV-2) is cascaded with the first modulator. The output of the Channel Guard enclosed 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 turned 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 megacycle 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 grid of V101 is metered through metering resistors R1 and R2 at J102-5. The combination of R1, R2 and R3 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.

POWER AMPLIFIER

The output of the MULT-3 stage is coupled to the grid of the compactron beam power amplifier (V102) by a pi-network consisting of C104, L107/L108 and C118. The grid tank is tuned by C118 (PA GRID), and current is metered at J102-6 and J102-14 by measuring the voltage drop across R11. Bias voltage (-45 volts) is applied to the PA grid through R10, R11 and L102/L103. There is no residual reading on the PA.

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 A117-J3 and -J7. The 300 volts appearing on each side of R13 effectively shorts the resistor out of the circuit, and R14 and R15 are in series for normal operation of V102. When S102 is in the TUNE position, the screen voltage is applied to A117-J3 only. Now, dropping resistors R13, R14 and R15 are in series, to reduce the screen voltage. This reduces the plate dissipation of V102 while tuning the power amplifier stage. Capacitors C107, C108 and C109 neutralize the PA stage.

Antenna coupling is achieved by varying the coupling between L102/L110 and L111/L112. The antenna circuit is tuned by C112.

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 chargeover 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 optional hang-up bracket.

NOTE

If Channel Guard decode only is desired, disconnect the Encoder Tone Input from J6 on the low-pass filter.

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 optional hang-up bracket.

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.

NOTE

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

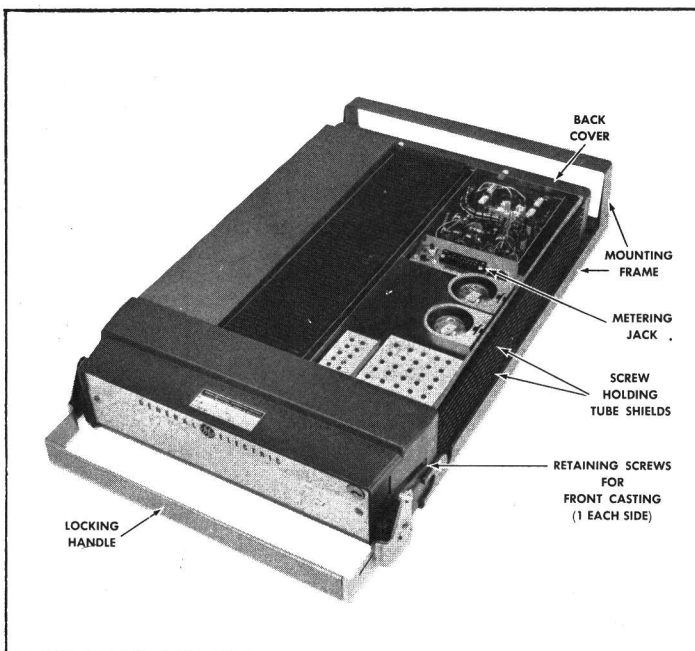


Figure 2 - Top Cover Removed

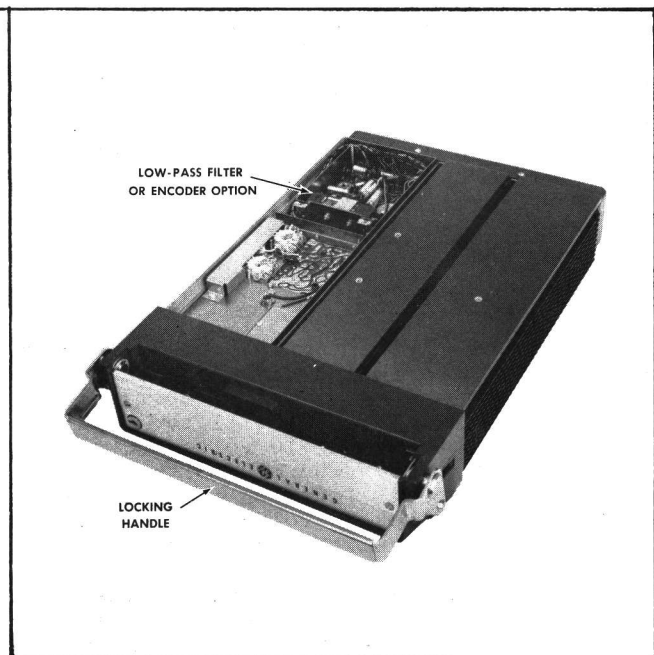


Figure 3 - Bottom Cover Removed

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 over-modulation 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 (TM11 or TM12)

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

P_i = $\frac{\text{Plate Voltage} \times \text{Plate Current Indication}}{4.38}$

where:

P_i is the power input in watts.

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

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

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

TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

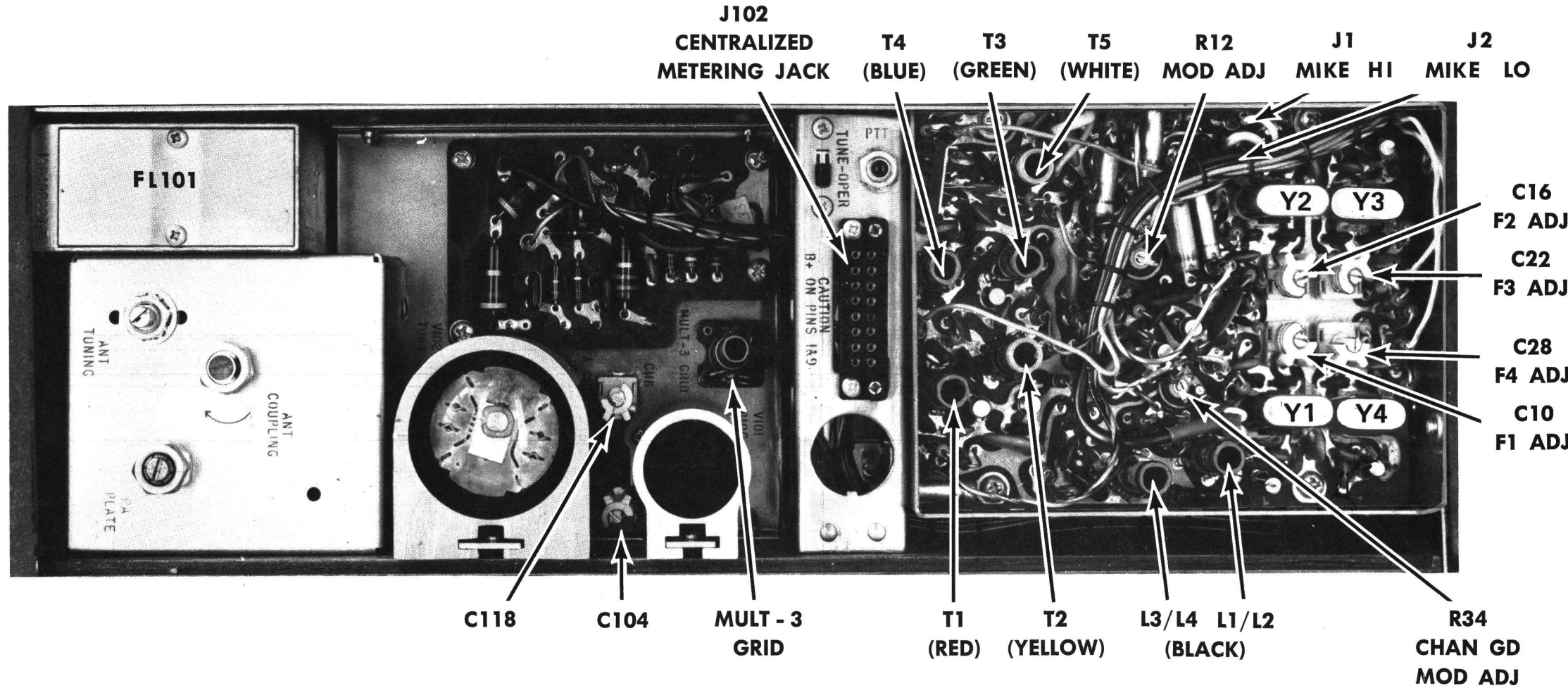
- 1. General Electric Test Set Model 4EX3A10, Station Meter Switching Panel, or a 20,000 ohm-per-volt Multimeter with a 1-volt scale.

PRELIMINARY CHECKS AND ADJUSTMENTS

- 1. Place crystal (operating frequency + 12) in crystal socket XY1.
- 2. For a large change in frequency or a badly mis-aligned 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.
- 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 for Steps 6 through 15.
- 5. For a large change in frequency or a badly mis-aligned transmitter, set the slugs in the Exciter coils at the bottom of the coil form (closed to the printed board), 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.

NOTE

Do not exceed a maximum meter reading of 1 volt on any adjustment while aligning the transmitter.



METERING POSITION					
STEP	4EX3A10	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)	0.7 v (0.5 v Minimum)	Tuning the modulator is a critical adjustment. Carefully tune L1/L2 for maximum meter reading. For channel guard or wide band 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 in meter reading (not required unless changing frequency).
4.	C (AMPL-3)	Pin 3	T4, T3 and T5	0.65 v (0.5 v Minimum)	Tune T4 and then T3 for maximum meter reading. Then tune T5 for minimum in meter reading (not required unless changing frequency).
MULT-3 AND POWER AMPLIFIER					
5.	D (MULT-3)	Pin 4	MULT-3 GRID(Z101/ Z102)	0.6 v (0.5 v Minimum)	Tune MULT-3 GRID for maximum meter reading.
6.	F (PA GRID)	Pin 14 (+) and Pin 6 (-)	C118 and C104	0.4 v (0.2 v Minimum)	Alternately tune C118 and C104 for maximum meter reading. Peak C104 as small changes in C118 reading are made.
7.					Rotate ANT COUPLING fully counterclockwise.
8.	G (PA PLATE)	High B-plus on Pin 1 (+) and Pin 9 (-)	WARNING Pins 1 and 9 PA PLATE (C110)	Minimum	Carefully tune PA PLATE for minimum meter reading. Then for multi-frequency transmitters, alternately switch from the highest to the lowest frequency and adjust PA PLATE to an intermediate frequency so that readings are approximately equal on both frequencies.
9.					Place S102 in the OPERATE position.
10.	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 to the lowest frequency before making this adjustment.
11.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)	ANT TUNING (C112)	Maximum	Adjust ANT TUNING for maximum meter reading.
12.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)	ANT COUPLING	0.7 v	Adjust ANT COUPLING for meter reading of 0.7 volt.
13.	G	Pin 1 (+) and Pin 9 (-)	ANT TUNING (C112)	Maximum	Tune ANT TUNING for maximum meter reading.
14.	F (PA GRID)	Pin 14(+) and Pin 6 (-)	C118 and C104	Maximum	For single-frequency transmitters, alternately tune C118 and C104 for maximum meter reading. For multi-frequency transmitters: Tune C104 for equal grid currents on the highest and lowest frequencies.
15.	G (PA PLATE)	Pin 1 (+) and Pin 9 (-)			When properly aligned, the reading on the highest channel should be equal to, or slightly lower than reading on lowest frequency (-.05 volt maximum).
FREQUENCY ADJUSTMENT					
16.			C10 (C16, C22 and C28 in multi-freq. units		With no modulation, adjust crystal trimmer C10 for proper oscillator frequency. In multi-frequency units, adjust C16, C22 and C28 as required. For Channel Guard transmitters, refer to 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.

ALIGNMENT PROCEDURE

132—174 MHZ, 30-WATT TRANSMITTER
MODELS 4ET57A30-41 & 4ET57B10-15

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 modulator adjust control set too high. By following the sequency 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:

Triplet # 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:

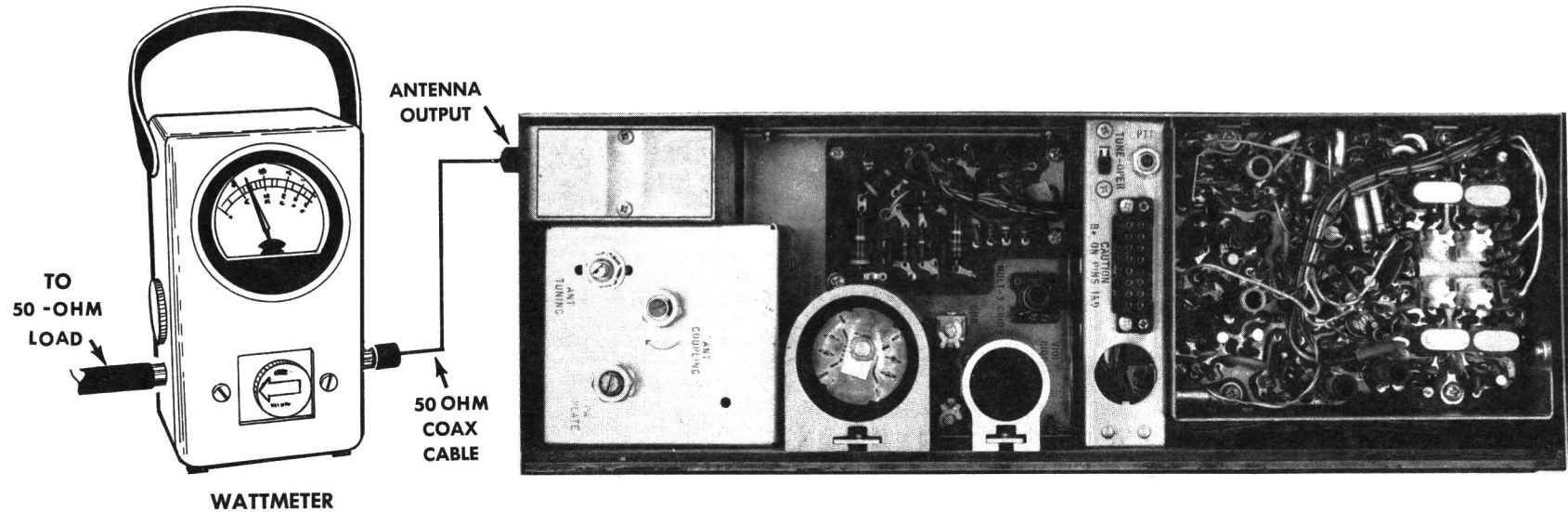
Measurements # 140
Lampkin # 205A
5. Multimeter similar to:

GE METERING TEST SET MODEL 4EX3A10 or
Triplet # 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.

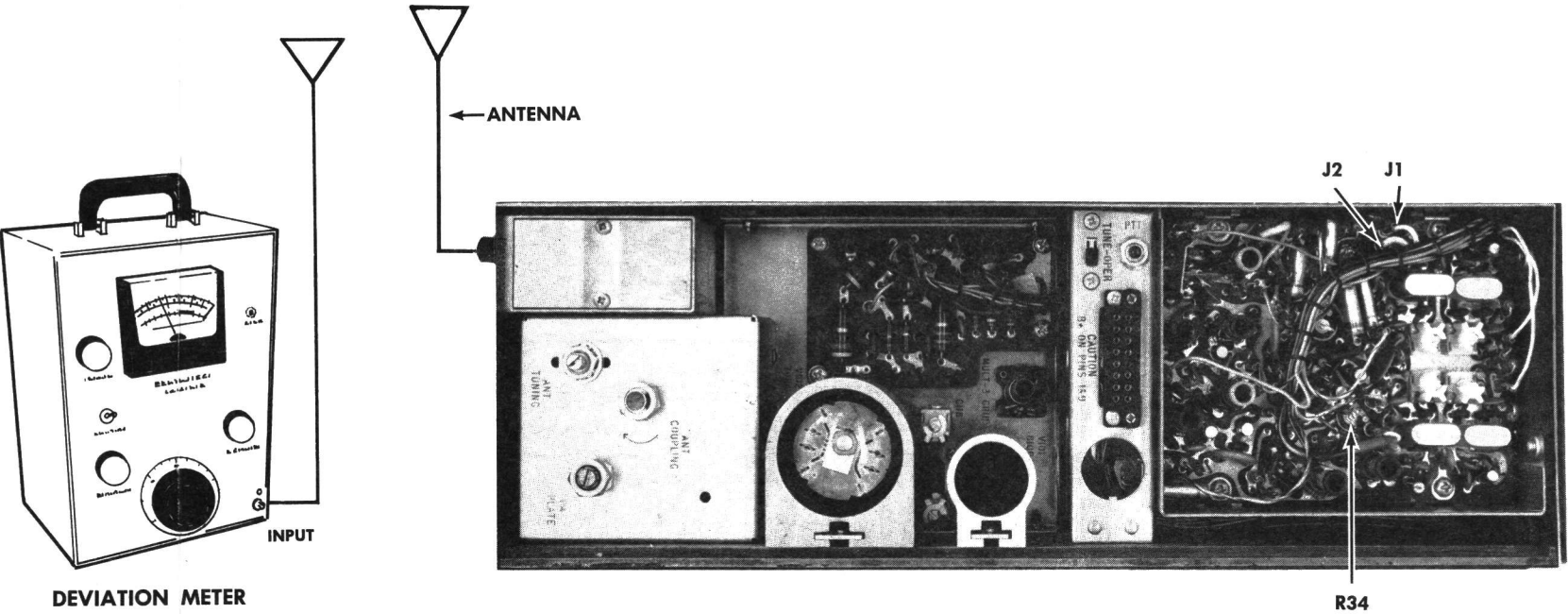
SERVICE CHECK

Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD
TEST PROCEDURE

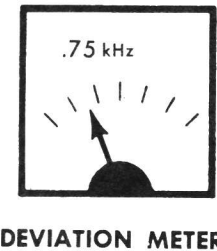
1. Set up Deviation Meter and monitor output of transmitter as shown below:



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

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.



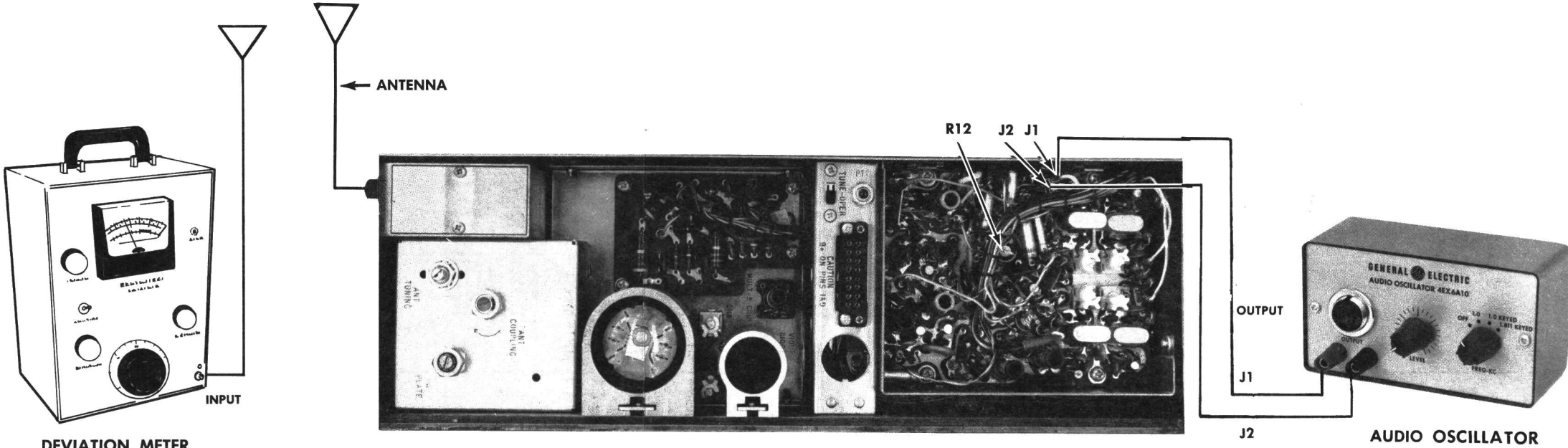
SERVICE CHECK

If the 0.75-kHz deviation is not obtainable when adjusting R34, adjust R12 until 0.75 kHz is obtained.

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:

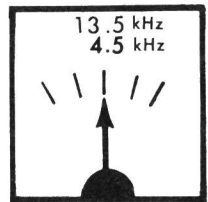


3. Set the generator output to 1.0 VOLTS RMS and frequency to 1 kHz.
4. Key the transmitter and adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ± 4.5 kHz (± 13.5 kHz wide band).
6. Adjust "Modulation Adjust Control" R12 until deviation reads 4.5 kHz (13.5 kHz wide band) on plus (+) or minus (-) deviation, whichever is greater. This adjustment should be made with the correct level of tone applied on Channel Guard transmitters.

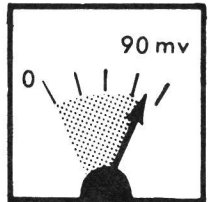
NOTES: --MASTR transmitters are adjusted for 4.5 kHz (13.5 kHz wide band) deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz (15 kHz wide band) under the worst conditions of frequency, voltage and temperature.

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 3.0 kHz (10 kHz wide band). Voltage should be LESS than 100 millivolts.



DEVIATION METER



METER

STEP 1 - QUICK CHECKS

CHECK VOLTAGES AT CENTRALIZED METERING JACK J102							PROBABLE DEFECT
POWER OUTPUT	Pins 10 & 16 A	Pins 2 & 16 B	Pins 3 & 16 C	Pins 4 & 16 D	Pins 6 & 14 F	Pins 1 & 9 G	
Low	0.7 v	0.65 v	0.65 v	0.6 v	0.4 v	0.7 v	Weak 7984
0	0.7 v	0.65 v	0.65 v	0.6 v	0	0	Open 7984
Low	0.7 v	0.65 v	0.65 v	Low or 0.6 v	Low or neg.	--	Weak 8106
0	0.7 v	0.65 v	0.65 v	0.15 v	0	0.4 v	8106 Fil. open
0	0.7 v	0.65 v	0.65 v	0.15 v	0	0	Open Fil. Fuse
0	0.7 v	0.65 v	0 or over 1.0 v	0.15 v	0	0.4 v	Defective Q8
0	0.7 v	0 or over 1.0 v	0	0.15 v	0	0.4 v	Defective Q7
0	Over 1.0 v	0	0	0.15 v	0	0.4 v	Shorted Q6 or Open Q5
0	0	0	0	0.15 v	0	0.4 v	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.						

STEP 2
CHECK TYPICAL DC VOLTAGES

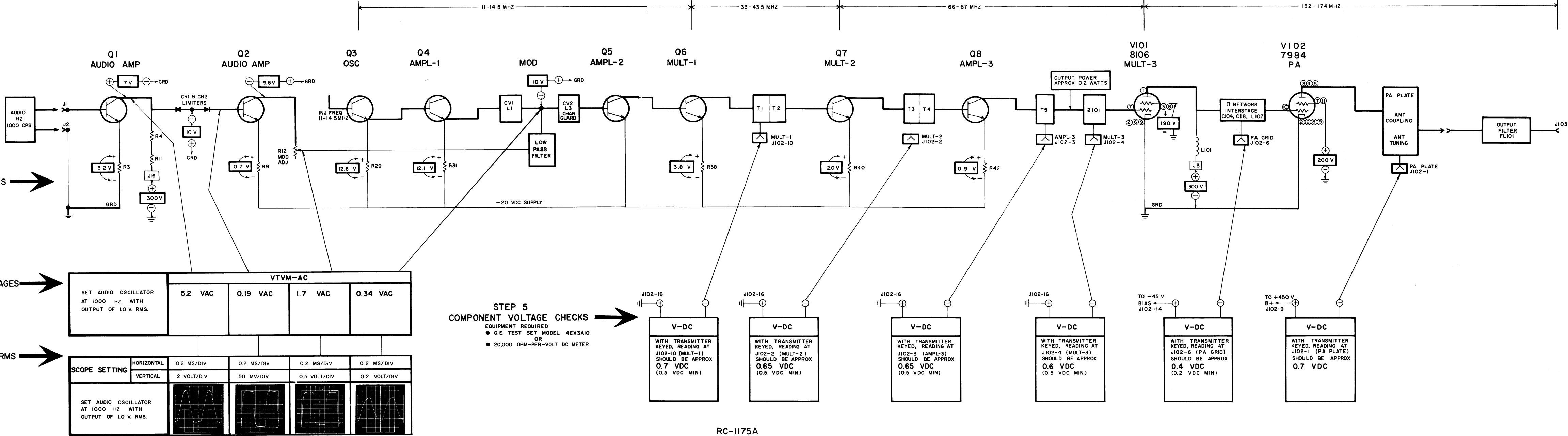
EQUIPMENT REQUIRED
● G.E. TEST MODEL 4EX3A10
OR
● 20,000 OHM-PER-VOLT METER

STEP 3
CHECK AUDIO AC VOLTAGES

EQUIPMENT REQUIRED
● AUDIO OSCILLATOR
● AC VTVM

STEP 4
AUDIO & OSC. WAVEFORMS

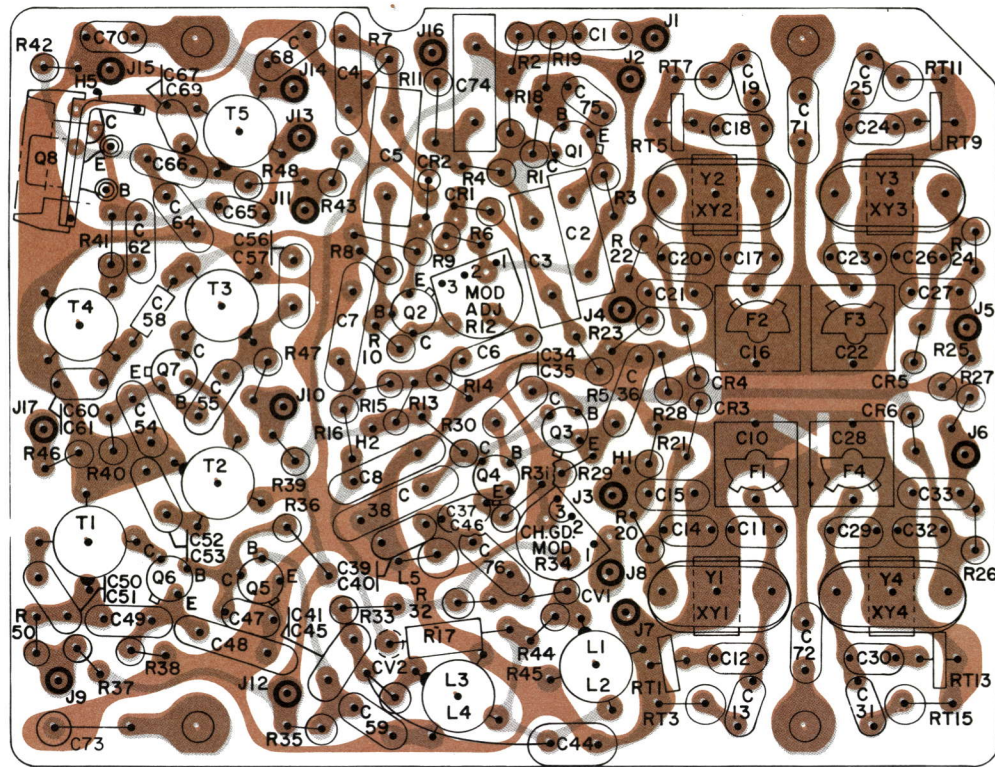
EQUIPMENT REQUIRED
● AUDIO OSCILLATOR
● OSCILLOSCOPE



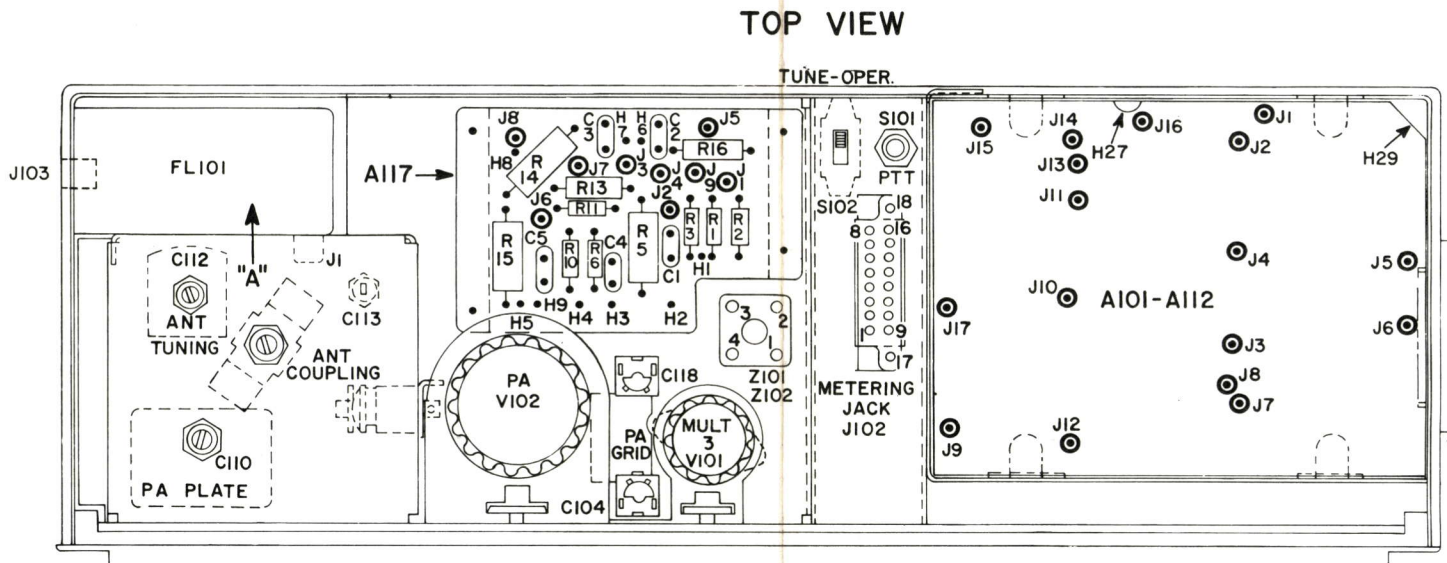
TROUBLESHOOTING PROCEDURE

132-174 MHz, 30-WATT MASTR TRANSMITTER
MODELS 4ET57A30-41 & 4ET57B10-15

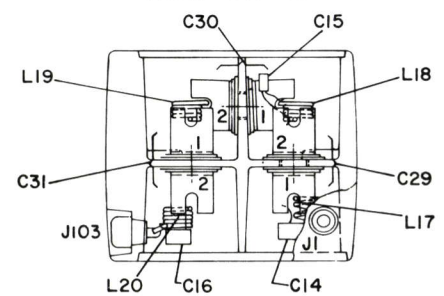
EXCITER
A101-A112



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



VIEW AT "A"



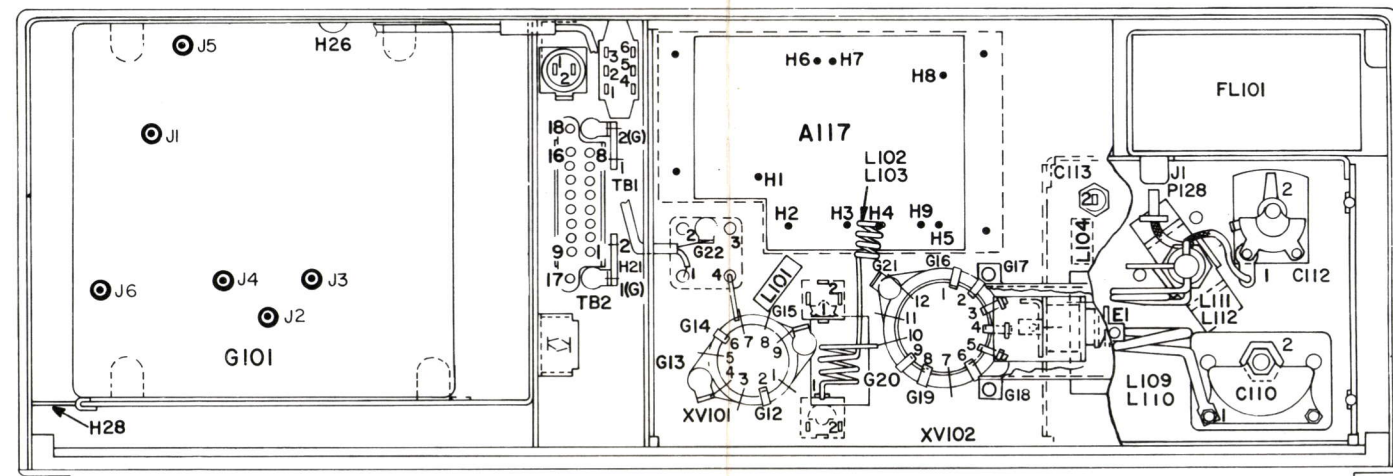
EXCITER READINGS TAKEN TO CHASSIS GROUND			
TRANSISTOR	EMITTER	BASE	COLLECTOR
Q1	6.5K	6.8K	240K
Q2	6.2K	4K	70K
Q3	9K	2.7K	9K
Q4	7K	5K	9K
Q5	5K	2.7K	70K
Q6	4K	3.2K	3.7K
Q7	5.2K	2.9K	5K
Q8	5K	2.7K	5K

EXCITER READINGS TAKEN TO -20 VOLT LINE (J15 BLUE LEAD)			
TRANSISTOR	EMITTER	BASE	COLLECTOR
Q1	11K	14K	240K
Q2	1K	1K	70K
Q3	2.6K	2.5K	10K
Q4	1.9K	1.5K	2.6K
Q5	0	0	10K
Q6	340	360	8K
Q7	60	180	0
Q8	27	27	47

PIN	-	+
1	0	0
2	2.1Ω	2.1Ω
3	550K	500K
4	550K	500K
5	∞	∞
6	∞	∞
7	∞	∞
8	110K	110K
9	∞	∞
10	∞	∞
11	∞	∞
12	0/30K	0/15K
13	∞	∞
14	∞	∞
15	5K	2.7K
16	∞/30K	∞/15K
17	∞/30K	∞/15K
18	∞/30K	∞/15K
19	0	0
20	∞	∞

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

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	550K	0	2.1Ω	0	39K	50K	0	110K	550K	2.1Ω
XV102	0	0	0	0	0	0	550K	0	0	0	0	0

(19D413164, Rev. 2)

OUTLINE DIAGRAM

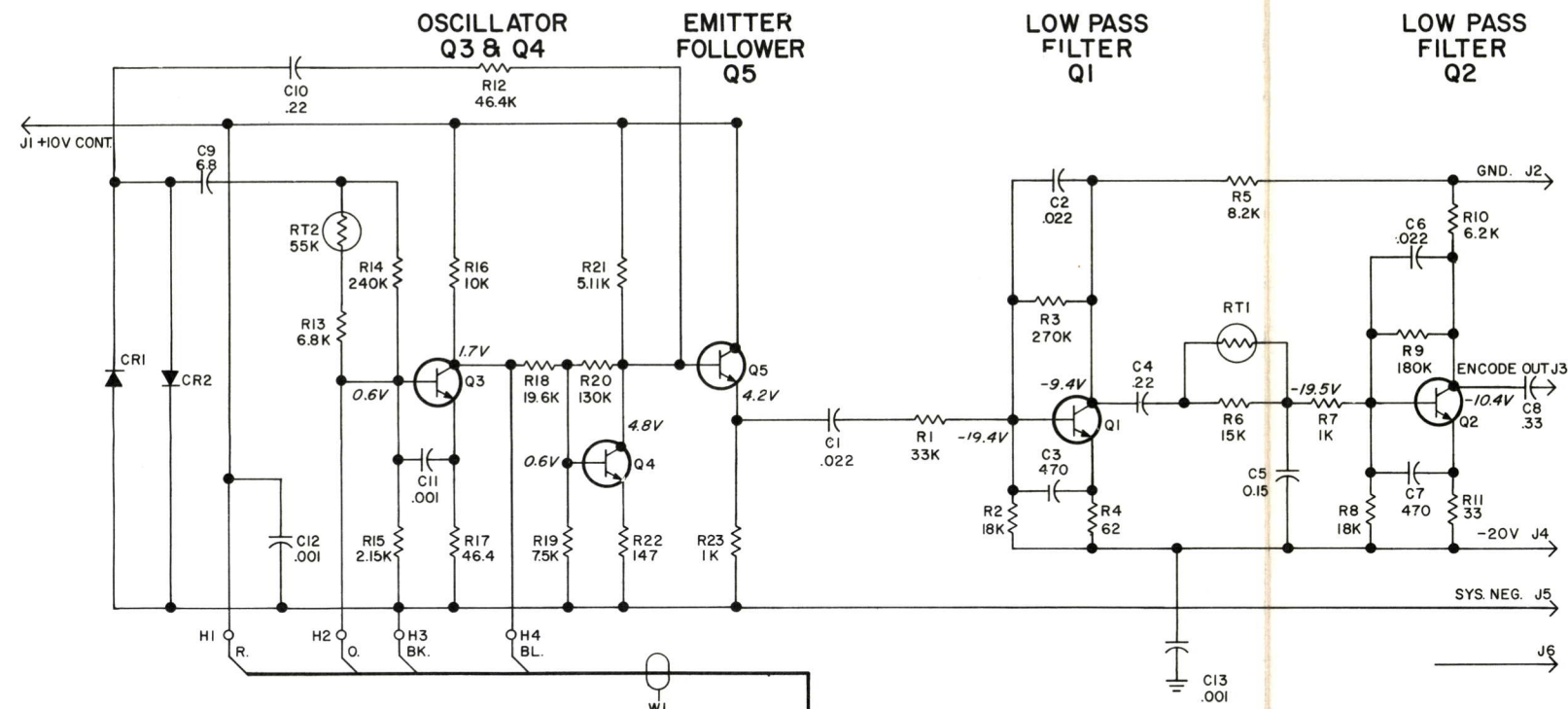
132-174 MHZ, 30-WATT TRANSMITTER
MODELS 4ET57A30-41 & 4ET57B10-15

LOW-PASS FILTER
GIO1

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

CHANNEL GUARD ENCODER MODEL 4EH17A10

SCHEMATIC DIAGRAM



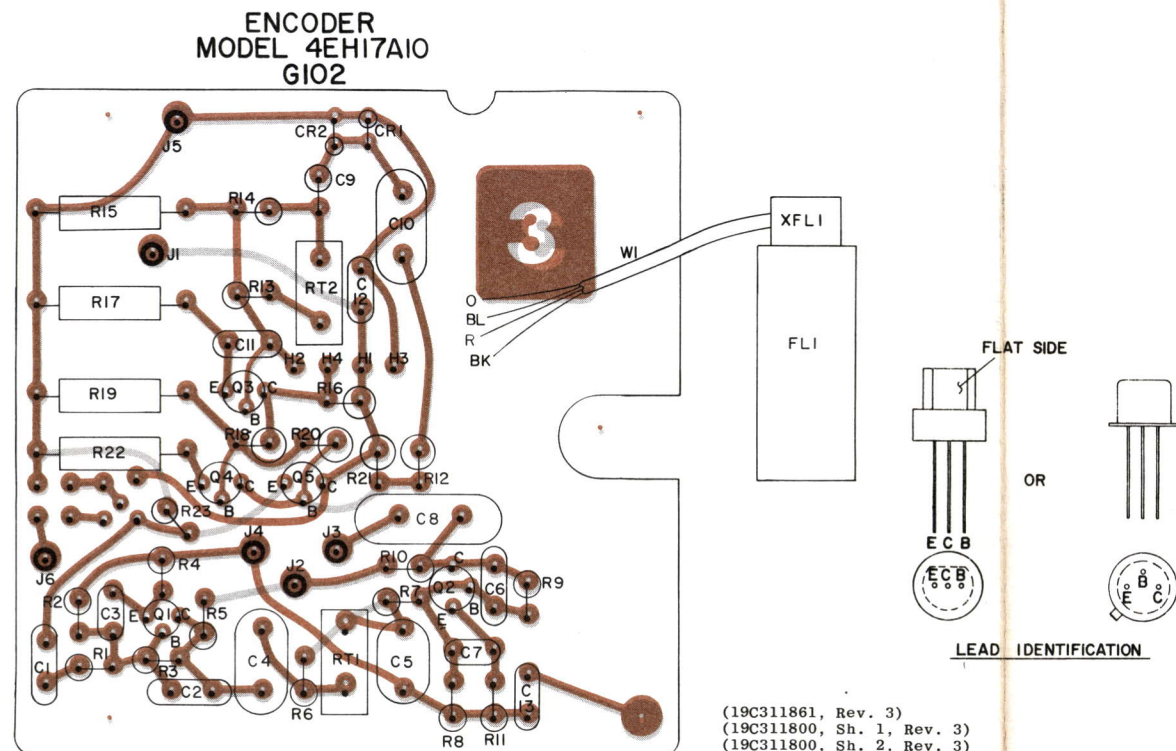
IN ORDER TO RETAIN RATED EQUIPMENT
PERFORMANCE, REPLACEMENT OF ANY
SERVICE PART SHOULD BE MADE ONLY WITH
A COMPONENT HAVING THE SPECIFICATIONS
SHOWN ON THE PARTS LIST FOR THAT PART.

(19D402941, Rev. 2)

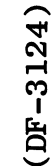
ALL RESISTORS ARE 1/2 WATT UNLESS
OTHERWISE SPECIFIED AND RESISTOR
VALUES IN OHMS UNLESS FOLLOWED BY
K=1000 OHMS OR MEG=1,000,000 OHMS.
CAPACITOR VALUES IN MICROFARADS (EQUAL
TO MICROMICROFARADS) UNLESS FOLLOWED
BY UF= MICROFARADS. INDUCTANCE VALUES
IN MICROHENRYS UNLESS FOLLOWED BY
MH= MILLIHENRYS OR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

REVISION LTR BLOCK		
GIO2	4EH17A10	REV
		Δ

OUTLINE DIAGRAM



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



PARTS LIST		
LBI3879D		
132-174 MHz TRANSMITTER MODELS 4RT57A30 - 4RT57A41 MODELS 4RT57B10 - 4RT57B15		
SYMBOL	GE PART NO.	DESCRIPTION
A101 thru A112		EXCITER BOARD ASSEMBLY
A101	Model 4RT57A30	19D402308G1
A102	Model 4RT57A31	19D402308G2
A103	Model 4RT57A32	19D402308G3
A104	Model 4RT57A33	19D402308G4
A105	Model 4RT57A34	19D402308G5
A106	Model 4RT57A35	19D402308G6
A107	Model 4RT57A36	19D402308G7
A108	Model 4RT57A37	19D402308G8
A109	Model 4RT57A38	19D402308G9
A110	Model 4RT57A39	19D402308G10
A111	Model 4RT57A40	19D402308G11
A112	Model 4RT57A41	19D402308G12
A121	Model 4RT57B10	19D402308G13
A122	Model 4RT57B11	19D402308G14
A123	Model 4RT57B12	19D402308G15
A124	Model 4RT57B13	19D402308G16
A125	Model 4RT57B14	19D402308G17
A126	Model 4RT57B15	19D402308G18
----- CAPACITORS -----		
C1	19A116080P3	Polyester: .022 μ f \pm 20%, 50 VDCW.
C2	19A116080P4	Polyester: .033 μ f \pm 20%, 50 VDCW.
C3	19A116080P7	Polyester: 0.1 μ f \pm 20%, 50 VDCW.
C4	7491395P14	Ceramic disc: .0022 μ f \pm 10%, 500 VDCW.
C5	19A116080P7	Polyester: 0.1 μ f \pm 20%, 50 VDCW.
C6	19A116080P5	Polyester: .047 μ f \pm 20%, 50 VDCW.
C7	7491395P11	Ceramic disc: .0015 μ f \pm 10%, 500 VDCW.
C8	5493367P100K	Silver mica: .001 μ f \pm 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 \pm 0.5 pf, 500 VDCW, temp coef 0 PPM.
C12 and C13	19C300685P93	Ceramic disc: 5 pf \pm 0.1 pf, 500 VDCW, temp coef 0 PPM.
C14	5496219P751	Ceramic disc: 33 pf \pm 5%, 500 VDCW, temp coef -750 PPM.
C15	5494481P111	Ceramic disc: 1000 pf \pm 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 \pm 0.5 pf, 500 VDCW, temp coef 0 PPM.
C18 and C19	19C300685P93	Ceramic disc: 5 pf \pm 0.1 pf, 500 VDCW, temp coef 0 PPM.
C20	5496219P751	Ceramic disc: 33 pf \pm 5%, 500 VDCW, temp coef -750 PPM.
C21	5494481P111	Ceramic disc: 1000 pf \pm 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 189-6-5.
C23	5496219P7	Ceramic disc: 7 pf \pm 0.5 pf, 500 VDCW, temp coef 0 PPM.
C24 and C25	19C300685P93	Ceramic disc: 5 pf \pm 0.1 pf, 500 VDCW, temp coef 0 PPM.
C26	5496219P751	Ceramic disc: 33 pf \pm 5%, 500 VDCW, temp coef -750 PPM.
C27	5494481P111	Ceramic disc: 1000 pf \pm 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 \pm 0.5 pf, 500 VDCW, temp coef 0 PPM.
C30 and C31	19C300685P93	Ceramic disc: 5 pf \pm 0.1 pf, 500 VDCW, temp coef 0 PPM.
C32	5496219P751	Ceramic disc: 33 pf \pm 5%, 500 VDCW, temp coef -750 PPM.
C33	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C34	5496372P49	Ceramic disc: 220 pf \pm 10%, 500 VDCW, temp coef -2200 PPM.
C35	5496372P53	Ceramic disc: 270 pf \pm 10%, 500 VDCW, temp coef -2200 PPM.
C36	5496219P467	Ceramic disc: 150 pf \pm 5%, 500 VDCW, temp coef -220 PPM.
C37	5496372P327	Ceramic disc: 75 pf \pm 10%, 500 VDCW, temp coef -4700 PPM.
C38	5494481P131	Ceramic disc: 6800 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C39	5496372P145	Ceramic disc: 180 pf \pm 10%, 500 VDCW, temp coef -3300 PPM.
C40	5496372P345	Ceramic disc: 180 pf \pm 10%, 500 VDCW, temp coef -4700 PPM.
C41	5490008P133	Silver mica: 180 pf \pm 10%, 500 VDCW; sim to Electro Motive Type DM15.
C44	5490008P43	Silver mica: 470 pf \pm 5%, 500 VDCW; sim to Electro Motive Type DM-15.
C45	5496372P45	Ceramic disc: 180 pf \pm 10%, 500 VDCW, temp coef -2200 PPM.
C46	5496372P347	Ceramic disc: 200 pf \pm 10%, 500 VDCW, temp coef -4700 PPM.
C47	5496219P749	Ceramic disc: 27 pf \pm 5%, 500 VDCW, temp coef -750 PPM.
C48	5494481P129	Ceramic disc: 3900 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C49	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C50	5496219P253	Ceramic disc: 39 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C51	5496219P257	Ceramic disc: 56 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C52	5496219P253	Ceramic disc: 39 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C53	5496219P257	Ceramic disc: 56 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C54 and C55	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C56	5496219P440	Ceramic disc: 9 pf \pm 0.25 pf, 500 VDCW, temp coef -220 PPM.
C57	5496219P343	Ceramic disc: 13 pf \pm 5%, 500 VDCW, temp coef -150 PPM.
C58	5491601P35	Phenolic: 0.15 pf \pm 10%, 500 VDCW; sim to Quality Components Type MC.
C59	5490008P135	Silver mica: 220 pf \pm 10%, 500 VDCW; sim to Electro Motive Type DM-15.
C60	5496219P241	Ceramic disc: 10 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C61	5496219P244	Ceramic disc: 15 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C62	19A116656P33J0	Ceramic disc: 33 pf \pm 5%, 500 VDCW, temp coef 0 PPM.
C64	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C65	5496219P35	Ceramic disc: 4 pf \pm 0.25 pf, 500 VDCW, temp coef 0 PPM.
C66	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C67	5496219P247	Ceramic disc: 22 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C68	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	GE PART NO.	DESCRIPTION
C69	5496219P249	Ceramic disc: 27 pf \pm 5%, 500 VDCW, temp coef -80 PPM.
C70 thru C72	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C73	5496267P18	Tantalum: 6.8 μ f \pm 20%, 35 VDCW.
C74	19A115414P13	Polyester: 0.1 μ f \pm 20%, 200 VDCW.
C75	5494481P107	Ceramic disc: 470 pf \pm 20%, 1000 VDCW; sim to RM Type JF Discap.
C76	5490008P143	Silver mica: 470 pf \pm 10%, 500 VDCW; sim to Electro Motive Type DM-15.
C77	5490008P137	Silver mica: 270 pf \pm 10%, 500 VDCW; sim to Electro Motive Type DM-15.
----- DIODES AND RECTIFIERS -----		
CR1 and CR2	19A115250P1	Silicon, fast recovery, 225 ma, 50 PIV.
CR3 thru CR8	19A115603P1	Silicon.
CR9 and CR10	5495769P8	Silicon, capacitive.
----- JACKS AND RECEPTACLES -----		
J1 thru J17	4033513P4	Contact, electrical; sim to Bead Chain L83-3.
L1	19B204526G2	Coil. Includes: Tuning slug.
L2	19B204526G1	Coil. Includes: Variable, carbon film: 25K ohms \pm 20%, 0.1 w.
L3	5491798P2	Tuning slug.
L4	19B204526G3	Coil. Includes tuning slug 5491798P2.
L5	7488079P48	Choke, RF: 27 μ h \pm 10%, 1.4 ohms DC res; sim to Jeffers 4422-9K.
----- TRANSISTORS -----		
Q1 and Q2	19A115123P1	Silicon, NPN.
Q3 thru Q5	19A115330P1	Silicon, NPN; sim to Type 2N2369.
Q6 and Q7	19A115328P1	Silicon, NPN.
Q8	19A115329P1	Silicon, NPN.
Q9	19A115362P1	Silicon, NPN; sim to Type 2N2925.
----- RESISTORS -----		
R1	3R77P334K	Composition: 330K ohms \pm 10%, 1/2 w.
R2	3R77P105K	Composition: 1 megohm \pm 10%, 1/2 w.
R3	3R77P472K	Composition: 220K ohms \pm 10%, 1/2 w.
R4	3R77P224K	Composition: 330K ohms \pm 10%, 1/2 w.
R5	3R77P334K	Composition: 330K ohms \pm 10%, 1/2 w.
R6	3R77P684K	Composition: 680K ohms \pm 10%, 1/2 w.
R7	3R77P334K	Composition: 330K ohms \pm 10%, 1/2 w.
R8	3R77P682K	Composition: 68K ohms \pm 10%, 1/2 w.
R9	3R77P102K	Composition: 1K ohms \pm 10%, 1/2 w.
R10 and R11	3R77P274K	Composition: 270K ohms \pm 10%, 1/2 w.
R12*	19B209358P106	Variable, carbon film: approx 300 to 10,000 ohms \pm 10%, 0.25 w; sim to CTS Type X-201.
	19B201966P6	Earlier than REV D in Models 4ER57A30-35, B10-15; Earlier than REV E in Models 4ER57A36-41: Variable, carbon film: 10K ohms \pm 20%, 0.1 w, sim to Centralab Series 4.

SYMBOL	GE PART NO.	DESCRIPTION
R13 and R14	3R77P224K	Composition: 220K ohms \pm 10%, 1/2 w.
R15	3R77P333K	Composition: 33K ohms \pm 10%, 1/2 w.
R16	3R77P683K	Composition: 68K ohms \pm 10%, 1/2 w.
R17	3R77P682K	Composition: 68K ohms \pm 10%, 1/2 w.
R18	3R77P683K	Composition: 68K ohms \pm 10%, 1/2 w.
R19	3R77P222K	Composition: 2.2K ohms \pm 10%, 1/2 w.
R20	3R77P682K	Composition: 6.8K ohms \pm 10%, 1/2 w.
R21	3R77P153K	Composition: 15K ohms \pm 10%, 1/2 w.
R22	3R77P682K	Composition: 6.8K ohms \pm 10%, 1/2 w.
R23	3R77P153K	Composition: 15K ohms \pm 10%, 1/2 w.
R24	3R77P682K	Composition: 6.8K ohms \pm 10%, 1/2 w.
R25	3R77P153K	Composition: 15K ohms \pm 10%, 1/2 w.
R26	3R77P682K	Composition: 6.8K ohms \pm 10%, 1/2 w.
R27 and R28	3R77P153K	Composition: 15K ohms \pm 10%, 1/2 w.
R29	3R77P272K	Composition: 2.7K ohms \pm 10%, 1/2 w.
R30	3R77P101K	Composition: 100 ohms \pm 10%, 1/2 w.
R31	3R77P152K	Composition: 1.5K ohms \pm 10%, 1/2 w.
R32 and R33	3R77P103K	Composition: 10K ohms \pm 10%, 1/2 w.
R34*	19B209358P107	Variable, carbon film: approx 800 to 25,000 ohms \pm 10%, 0.25 w; sim to CTS Type X-201.
	5491798P2	Earlier than REV E in Models 4ER57A36-41: Variable, carbon film: 25K ohms \pm 20%, 0.1 w.
R35	3R77P683K	Composition: 68K ohms \pm 10%, 1/2 w.
R36	3R77P392K	Composition: 3.9K ohms \pm 10%, 1/2 w.
R37	3R77P181K	Composition: 75 ohms \pm 5%, 1/4 w.
R38	3R77P391K	Composition: 390 ohms \pm 10%, 1/2 w.
R39	3R77P620J	Composition: 62 ohms \pm 5%, 1/2 w.
R40	3R77P181K	Composition: 180 ohms \pm 10%, 1/2 w.
R41	3R77P470K	Composition: 47 ohms \pm 10%, 1/2 w.
R42	3R77P270K	Composition: 27 ohms \pm 10%, 1/2 w.
R43	3R77P200J	Composition: 20 ohms \pm 5%, 1/2 w.
R44	3R77P223K	Composition: 22K ohms \pm 10%, 1/2 w.
R45	3R77P153K	Composition: 15K ohms \pm 10%, 1/2 w.
R46	19A116278P474	Metal film: 576K ohms \pm 2%, 1/2 w.
R47	3R77P391K	Composition: 390 ohms \pm 10%, 1/2 w.
R48	3R77P181K	Composition: 47 ohms \pm 5%, 1/2 w.
R49	3R77P101K	Composition: 100 ohms \pm 10%, 1/2 w.
R51	3R77P511J	Composition: 510 ohms \pm 5%, 1/2 w.
R52	3R77P331J	Composition: 330 ohms \pm 5%, 1/2 w.
R53	3R152P472J	Composition: 4.7K ohms \pm 5%, 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.

SYMBOL	GE PART NO.	DESCRIPTION
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.
----- TRANSFORMERS -----		
T1	19B204534G1	Coil. Includes tuning slug 5491798P4.
T2	19B204531G1	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	4033513P4	Refer to Mechanical Parts (RC1165).
----- CRYSTALS -----		
NOTE: When reordering give GE Part No. and specify exact freq needed.		
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).
COMPONENT BOARD ASSEMBLY 19B204539G1		
----- CAPACITORS -----		
C1 thru C3	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5490008P119	Silver mica: 47 pf \pm 10%, 500 VDCW; sim to Electro Motive Type DM-15.
C5	5490008P121	Silver mica: 56 pf \pm 10%, 500 VDCW; sim to Electro Motive Type DM-15.
----- JACKS AND RECEPTACLES -----		
J1 thru J9	4033513P4	Contact, electrical; sim to Bead Chain L83-3.
R1	3R77P393K	Composition: 39K ohms \pm 10%, 1/2 w.
R2	3R77P431J	Composition: 430 ohms \pm 5%, 1/2 w.
R3	3R77P683K	Composition: 68K ohms \pm 10%, 1/2 w.
R5	3R77P181J	Composition: 18K ohms \pm 5%, 1/2 w.
R6	3R77P221K	Composition: 220 ohms \pm 10%, 1/2 w.
R10	3R77P562K	Composition: 5.6K ohms \pm 10%, 1/2 w.
R11	3R77P331J	Composition: 330 ohms \pm 5%, 1/2 w.
R13	3R78P683K	Composition: 68K ohms \pm 10%, 1 w.
R14 and R15	3R79P472J	Composition: 4.7K ohms \pm 5%, 2 w.
R16	19A116278P444	Metal film: 0.28 megohm \pm 2%, 1/2 w.
----- OSCILLATORS -----		
G101	19B209284P2	Low Pass Filter Assembly 19C311802G1
----- CAPACITORS -----		
C1*	19A116080P1Q3	Polyester: 0.022 μ f \pm 20%, 50 VDCW.
	19B209243P2	In Models earlier than REV A: Variable, sub-miniature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189-6.

SYMBOL	GE PART NO.	DESCRIPTION
C2	19A116080P3	Polyester: 0.022 μ f \pm 20%, 50 VDCW.
C3	5494481P107	Ceramic disc: 470 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	19A116080P9	Polyester: 0.22 μ f \pm 20%, 50 VDCW.
C5	19A116080P8	Polyester: 0.15 μ f \pm 20%, 50 VDCW.
C6	19A116080P3	Polyester: .022 μ f \pm 20%, 50 VDCW.
C7	5494481P107	Ceramic disc: 470 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19B209243P14	Polyester: 0.33 μ f \pm 20%, 250 VDCW.
C13	5494481P111	Ceramic disc: 1000 pf \pm 10%, 1000 VDCW; sim to RMC Type JF Discap.
----- JACKS AND RECEPTACLES -----		
J1 thru J6	4033513P4	Contact, electrical; sim to Bead Chain L83-3.
----- TRANSISTORS -----		
Q1 and Q2	19A115123P1	Silicon, NPN.
Q6	19A115123P1	Silicon, NPN.
R1	3R77P333K	Composition: 33K ohms \pm 1

PARTS LIST

SYMBOL	GE PART NO.	DESCRIPTION
24	7115130P9	Lockwasher, internal tooth: sim to Shakeproof 1220-2.
25	4031531P1	Locknut: No. 32.
26	4031527P2	Collar.
27	19B204395G1	Chassis.
28	4036555P1	Insulator, washer: nylon.
29	19B204394P1	(Not Used).
30	19C303396G1	Mobile top cover.
	19C303673G3	Station top cover. (Repeaters and VM only).
	19C303495G8	Station top cover. (Except Repeaters and VM).
31	19A121676P1	Guide pin.
32	19B204497P1	Shield.
33	N910P18C	Retaining ring.
34	4031530P1	Bearing: No. 32.
35	4031532P1	Washer, spring tension.
36	4036921P1	Mounting support, bottom cover; sim to Tinnerman C17609-8A-67.
37	4029030P10	Channel, rubber.
38	19B204366P1	Support.
39	19C303396G3	Mobile bottom cover.
	19C303495G2	Station bottom cover.
40	19A121065P1	Support. (Used with FL1).
41	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 A101-A106 & A121-A126)
REV. A thru D - (Exciter Board A107-A112)

Incorporated into initial shipment.

REV. A - (Channel Guard Low Pass Filter G101)

To improve operation. Changed C1.

REV. B - (Channel Guard Low Pass Filter G101)

To reduce input to filter to prevent a square wave output. Added R27.

REV. D - (Exciter Board A101-A106 & A121-A126)
REV. E - (Exciter Board A107-A112)

To improve stability and ease of adjustment. Changed MOD ADJUST potentiometer R12 and Channel Guard MOD ADJUST potentiometer R34.

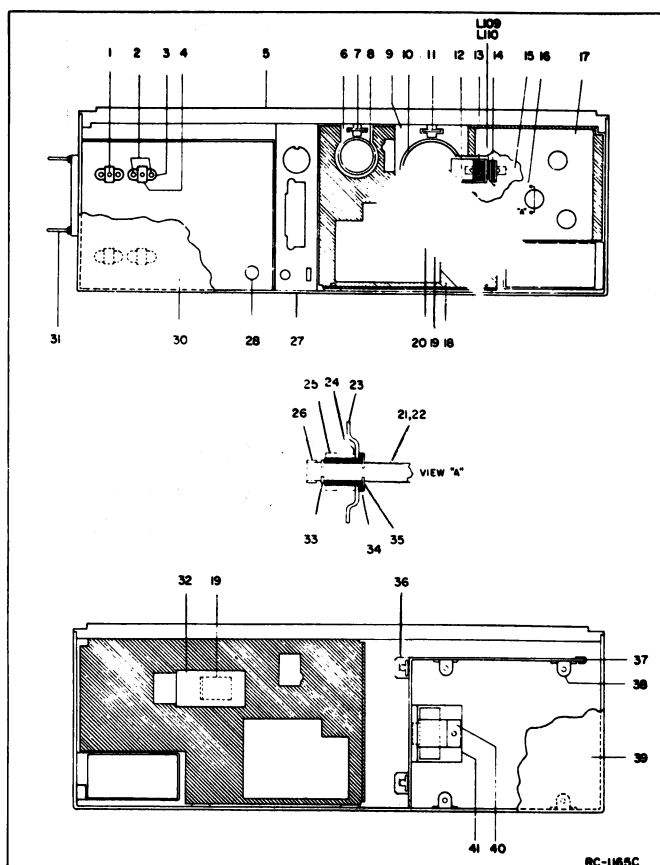
(Chassis & PA Assembly 19E500855-G1 & G2)

REV. A - To eliminate FM noise caused by mechanical vibration of the driver output and PA grid coils. Changed L104/L105.

REV. B - To improve performance to transmitter. Changed FL101.

REV. E - (Exciter Board A101-A106 & A121-A126)
REV. F - (Exciter Board A107-A112)

To facilitate manufacturing. Deleted the heat sink and mechanical parts to mount Q8. Added parts to mount Q8 on the board.



PARTS LIST

LBI3869G

CHANNEL GUARD ENCODER G102
4E17A10 19C311802G2

SYMBOL	GE PART NO.	DESCRIPTION
----- CAPACITORS -----		
C1*	19A116080P103	Polyester: 0.022 μ f \pm 10%, 50 VDCW. Earlier than REV A:
	19B209243P2	Polyester: 0.015 μ f \pm 20%, 50 VDCW.
C2	19A116080P3	Polyester: 0.022 μ f \pm 20%, 50 VDCW.
C3	5494481P107	Ceramic disc: 470 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	19A116080P9	Polyester: 0.22 μ f \pm 20%, 50 VDCW.
C5	19A116080P8	Polyester: 0.15 μ f \pm 20%, 50 VDCW.
C6	19A116080P3	Polyester: 0.022 μ f \pm 20%, 50 VDCW.
C7	5494481P107	Ceramic disc: 470 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19B209243P14	Polyester: 0.33 μ f \pm 20%, 250 VDCW.
C9	5496287P1	Tantalum: 6.8 μ f \pm 20%, 6 VDCW; sim to Sprague Type 150D.
C10	19A116080P109	Polyester: 0.22 μ f \pm 10%, 50 VDCW.
C11 thru C13	5494481P111	Ceramic disc: 1000 pf \pm 20%, 1000 VDCW; sim to RMC Type JF Discap.
----- DIODES AND RECTIFIERS -----		
CR1 and CR2	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
----- 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.
Q3 thru Q5	19A115362P1	Silicon, NPN; sim to Type 2N2925.
----- RESISTORS -----		
R1	3R77P333K	Composition: 33K ohms \pm 10%, 1/2 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
R2	3R77P183K	Composition: 18K ohms \pm 10%, 1/2 w.
R3	3R77P274K	Composition: 270K ohms \pm 10%, 1/2 w.
R4	3R77P620J	Composition: 62 ohms \pm 5%, 1/2 w.
R5	3R77P822K	Composition: 8.2K ohms \pm 10%, 1/2 w.
R6	3R77P153K	Composition: 15K ohms \pm 10%, 1/2 w.
R7	3R77P102K	Composition: 1K ohms \pm 10%, 1/2 w.
R8	3R77P183K	Composition: 18K ohms \pm 10%, 1/2 w.
R9	3R77P184K	Composition: 180K ohms \pm 10%, 1/2 w.
R10	3R77P622J	Composition: 6.2K ohms \pm 5%, 1/2 w.
R11	3R77P330K	Composition: 33 ohms \pm 10%, 1/2 w.
R12	19A116278P365	Metal film: 46.40K ohms \pm 2%, 1/2 w.
R13	3R77P682J	Composition: 6.8K ohms \pm 5%, 1/2 w.
R14	3R77P244J	Composition: 240K ohms \pm 5%, 1/2 w.
R15	19A116278P233	Metal film: 2.15K ohms \pm 2%, 1/2 w.
R16	19A116278P301	Metal film: 10K ohms \pm 2%, 1/2 w.
R17	19A116278P65	Metal film: 46.4 ohms \pm 2%, 1/2 w.
R18	19A116278P329	Metal film: 19.60K ohms \pm 2%, 1/2 w.
R19	19A116278P285	Metal film: 7.5K ohms \pm 2%, 1/2 w.
R20	19A116278P412	Metal film: 130K ohms \pm 2%, 1/2 w.
R21	19A116278P269	Metal film: 5.11K ohms \pm 2%, 1/2 w.
R22	19A116278P117	Metal film: 147 ohms \pm 2%, 1/2 w.
R23	3R77P102K	Composition: 1K ohms \pm 10%, 1/2 w.
----- THERMISTORS -----		
RT1	5490828P30	Thermistor: 330,000 ohms \pm 10%, color code black and gray; sim to Carborundum Type 783H-3.
RT2	5490828P36	Thermistor: 55,000 ohms \pm 10%, color code black and red; sim to Carborundum Type 723B-5.
----- CABLES -----		
W1		(Part of XF11).
----- SOCKETS -----		
XF11	19A121920G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 Vrms with 4-1/4 inches of cable.
ENCODER INSTALLATION KIT 19A12717401		
----- 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.

PRODUCTION CHANGES

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

REV. A - To improve the Channel Guard low pass filter.
Changed C1.