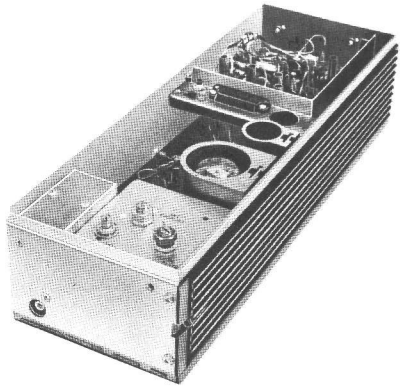
communications

MASTR Progress Line

132-174 MC, 30-WATT TRANSMITTER MODELS 4ET57A10-21 & 4ET57B10-15



SPECIFICATIONS *

	ET-57-A (Narrow Band) ET-57-B (Wide Band)
FCC Filing Designation	
Frequency Range	132-174 MC
Power Output	
Mobile Power Supply	30 watts minimum (20% duty cycle)
Station Power Supply	10 watts minimum (continuous duty)
Crystal Multiplication Factor	12
Frequency Stability	±.0005% (-30°C to +60°C)
Spurious and Harmonic Radiation	At least 85 db below rated power output
Modulation	Adjustable from 0 to ±5 KC (Narrow Band) and 0 to ±15 KC (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 cps per EIA standards. Post limiter filter per FCC and EIA.
Distortion	Less than 5%
Deviation Symmetry	0.5 KC maximum
Deviation Symmetry Narrow Band Wide Band	 1.5 KC 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.

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ILLUSTRATIONS

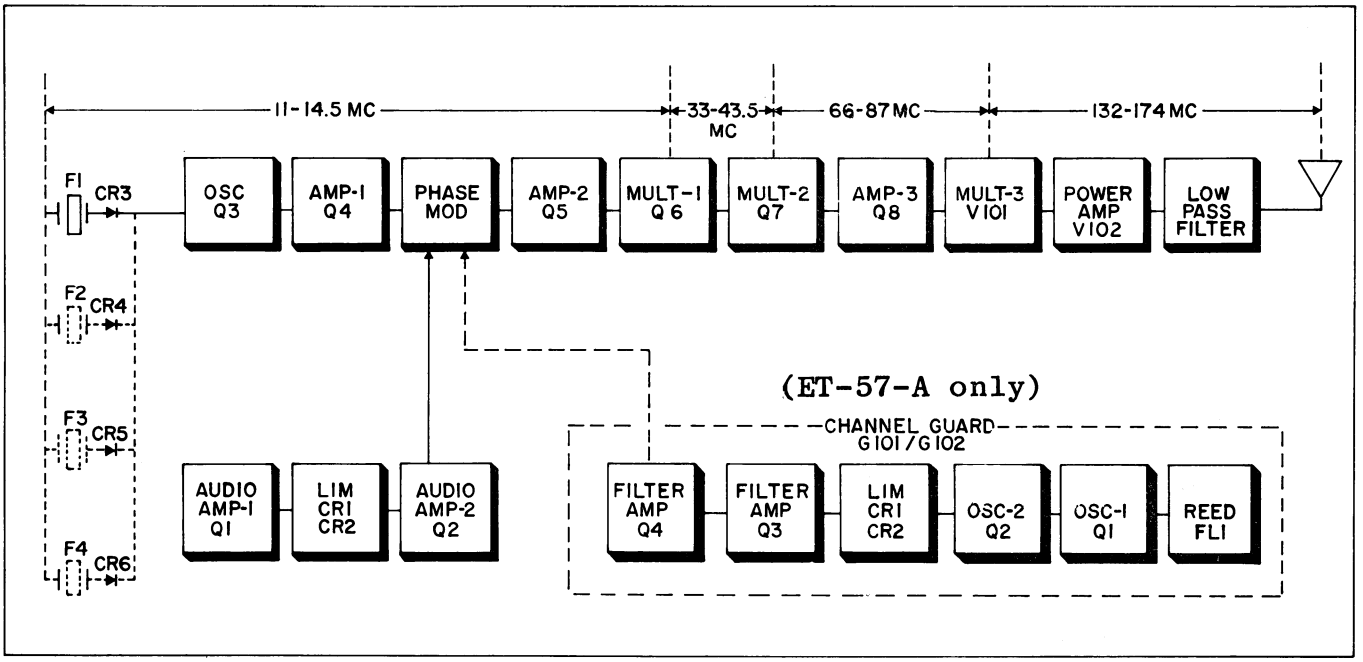
WARNING

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-57-A and B are crystal-controlled, phase-modulated transmitters designed for one-, two-, or four-frequency operation within the 132-174 megacycle 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 transistorized Channel Guard Board. (ET-57-A only)



RC-1102

Figure 1 - Transmitter Block Diagram

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 megacycles, and the crystal frequency is multiplied 12 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 -- +450 volts PA B+ with mobile supplies
(+300 volts PA B+ for driver use with station supplies)

Pin 8 -- -45 volts bias

Pin 14 -- +10 volts for Channel Guard option

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 ±.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 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 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 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 resitor 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 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.

Plate current is metered from J102-1 to J102-9 across metering resistor R101. Plate voltage is supplied through L104, and the PA plate tank is series-tuned by capacitor C110. The screen grid dropping resistors are R14 and R15.

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 changeover relay located on the front of the system frame.

CHANNEL GUARD ENCODER (G101)

The Channel Guard Encoder (G101) is assembled on a printed wiring board that mounts on the underside of the MASTR transmitter. The Channel Guard Encoder is supplied by a regulated +10 volts and a regulated -20 volts. The 10-volt supply is applied to Q1 and Q2 continuously (even in the STANDBY position), and the 20 volts is applied to Q3 and Q4 only when the transmitter is keyed.

Transistors Q1 and Q2 with reed FL1 are the tone oscillator portion of the circuit. The reed is resonant at the desired tone frequency. Clipping diodes CR1 and CR2 shape the output of the oscillator circuit into a square wave; which is coupled through the Channel Guard TONE ADJUST control (R12) to the base of Q3. R12 will not require adjustment unless the Channel Guard tone frequency is changed. Then R12 must be set to the new reed frequency.

Q3 and Q4 form a two-section low-pass filter that removes the distortion in the square wave, producing a sine wave output. The square wave oscillator output has a constant amplitude, making the encoder less sensitive to shock and vibration. The encoder tone is fed to the tone modulator on the Exciter Board through Channel Guard MOD ADJ R34.

The channel can be monitored 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 the Two-Way Radio is mounted vertically or at an angle of over 45^{o}, rotate the encoder reed 90^{o}, in its mounting bracket so that the label with the G-E Part Number is facing the rear of the Two-Way Radio. See Figure 3 for location of the encoder reed.

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.

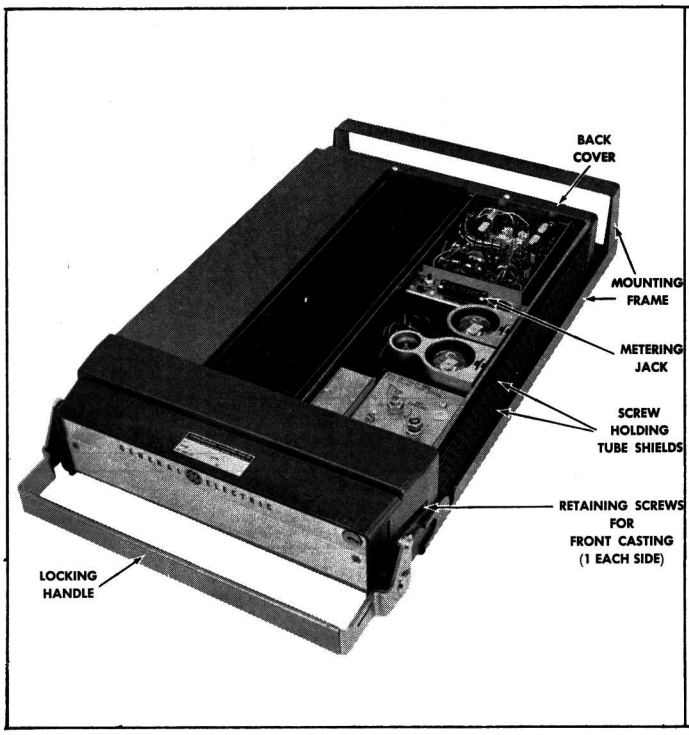


Figure 2 - Top Cover Removed

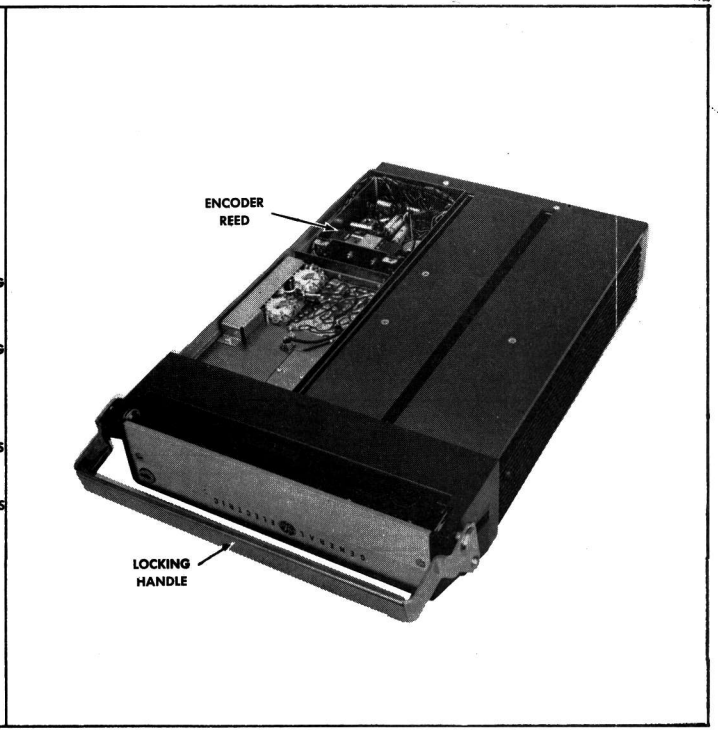


Figure 3 - Bottom Cover Removed

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.

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
2. A frequency modulation monitor
3. An output meter or a VTVM
4. G-E Test Set, Model 4EX3A1

PROCEDURE

1. Connect the audio oscillator and the meter across audio input terminals J5 (Green-Hi) and J6 (Black-Lo) on G-E Test Set or across J1 (Mike High) and J2 (Mike Low) on the Exciter Board.
2. Apply a 1.0-volt signal at 1000 cps 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-kilocycle swing (13.5 KC 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-KC tone deviation. Then repeak L1/L2 and L3/L4 as shown in Step 1 of Transmitter Alignment Procedure. Reset tone deviation to 0.75 KC 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 cps and set MOD ADJUST (R12) for 3.75-KC deviation (4.5 KC minus 0.75-KC 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 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:

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

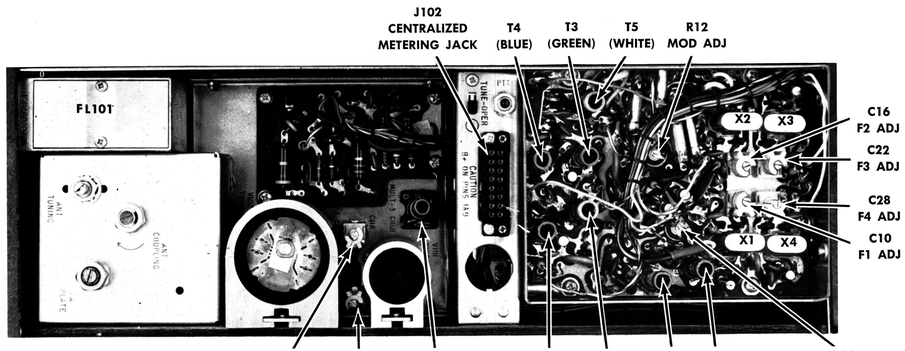
where:

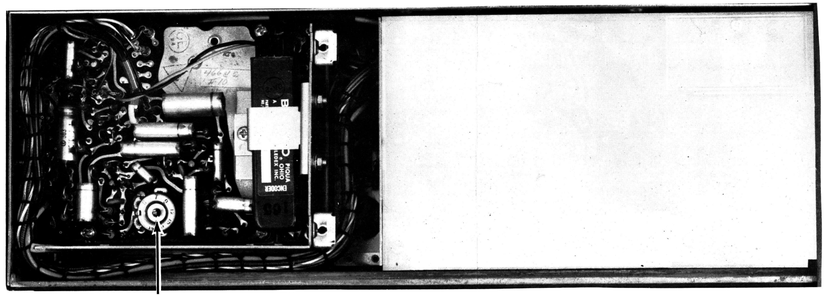
P_i is the power input in watts.

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. Set crystal trimmer C10 to mid-capacity. If mult-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.

STEP	METERING POSITION 4EX3A10	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)	0.7 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.

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ALIGNMENT PROCEDURE

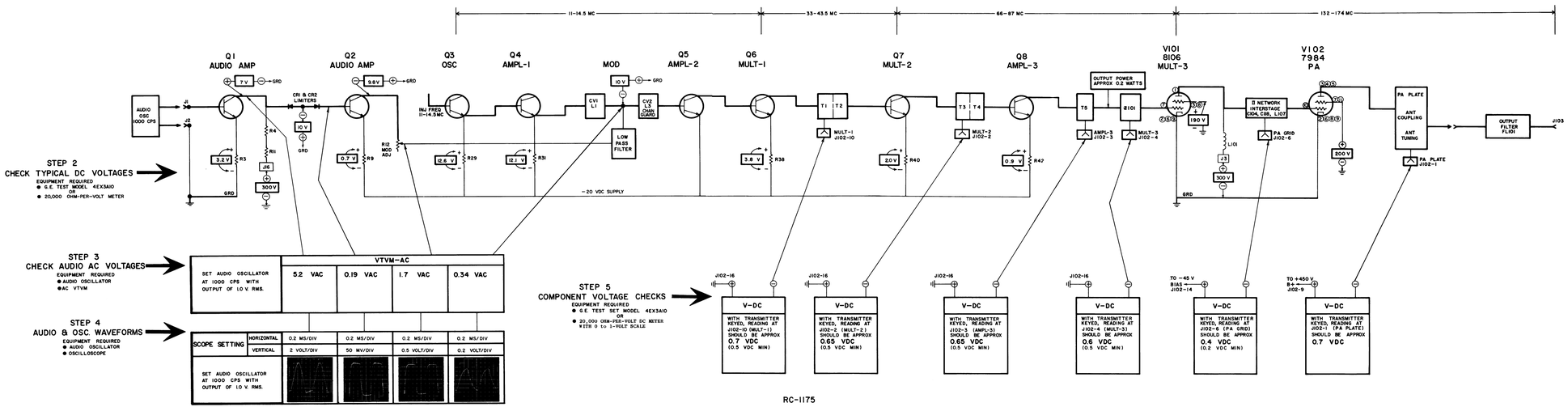
132 — 174 MC, 30-WATT TRANSMITTER
MODELS 4ET57A10-21 & 4ET57B10-15

STEP 1 — QUICK CHECKS

	CHECK VOLTAGES AT CENTRALIZED METERING JACK J102 Multimeter - pin numbers GE Test Set - A-G positions						
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	PROBABLE DEFECT
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.



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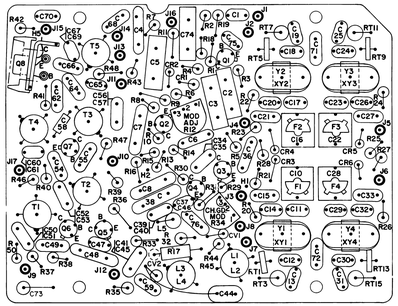
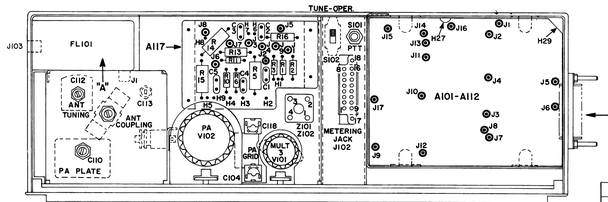
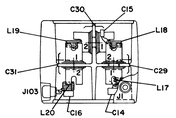
EXCITER A101-A112



TOP VIEW



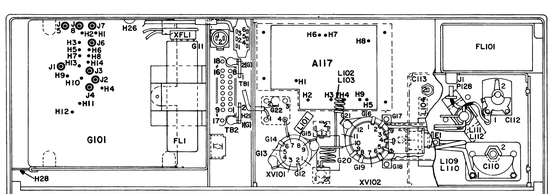
VIEW AT "A"



EXCITER READINGS TAKEN TO CHASSIS GROUND						
TRANSISTOR	EMITTER		BASE		COLLECTOR	
	–	+	–	+	–	+
Q1	6.5K	6.8K	240K	12K	56K	20K
Q2	6.2K	8K	70K	10K	9.5K	10K
Q3	9K	2.7K	9K	2.7K	10Ω	10Ω
Q4	7K	5K	9K	2.7K	10Ω	10Ω
Q5	5K	2.7K	70K	11.5K	2.7K	2.3K
Q6	10.5K	2.2K	2.7K	2.3K	175	175
Q7	6.2K	2.2K	5K	2.7K	45Ω	45Ω
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	11K	240K	30K	60K	35K
Q2	1K	1K	70K	9.5K	11K	10K
Q3	2.6K	2.7K	10K	9.5K	2.7K	15.1K
Q4	1.5K	1.5K	9.2K	2.5K	2.7K	5.1K
Q5	0	0	70K	3.2K	3.2K	3.2K
Q6	340	300	8K	3.8K	3K	5.1K
Q7	60	180	0	0	2.7K	5.1K
Q8	27	27	47	47	2.6K	5K

BOTTOM VIEW



READINGS AT J101 TAKEN TO CHASSIS GROUND.

PIN	–	+
1	0	0
2	∞	∞
3	2.1Ω	2.1Ω
4	550K	500K
5	∞	∞
6	∞	∞
7	∞	∞
8	110K	110K
9	∞	∞
10	∞	∞
11	∞	∞
* 12	0/30K	0/15K
13	∞	∞
14	∞	∞
15	5K	27K
* 16	∞/30K	∞/15K
* 17	∞/30K	∞/15K
* 18	∞/30K	∞/15K
19	0	0
20	∞	∞

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

RESISTANCE READINGS

ALL READINGS ARE TYPICAL READINGS MEASURED WITH A 20,000 OHM-PER-VOLT METER AND J101 DISCONNECTED. K OR-S 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

CHANNEL GUARD READINGS MEASURED TO CHASSIS GROUND						
TRANSISTOR	EMITTER		BASE		COLLECTOR	
	+	–	+	–	+	–
Q1	∞	∞	∞	∞	∞	∞
Q2	∞	∞	∞	∞	∞	∞
Q3	2.7K	4.8K	9.5K	20K	8.9K	7.5K
Q4	2.7K	1.4K	5K	20K	2.5K	7.5K

CHANNEL GUARD READINGS MEASURED T... +10 VOLT LINE (J15 ORANGE LEAD)					
EMITTER		BASE		COLLECTOR	
+	–	+	–	+	–
200	200	9K	11K	2.7K	25K
1.3K	1.3K	3.4K	9.3K	11K	11.7K
∞	∞	∞	∞	∞	∞
∞	∞	∞	∞	∞	∞

READINGS TAKEN FROM TUBE SOCKET PINS TO CHASSIS GROUND

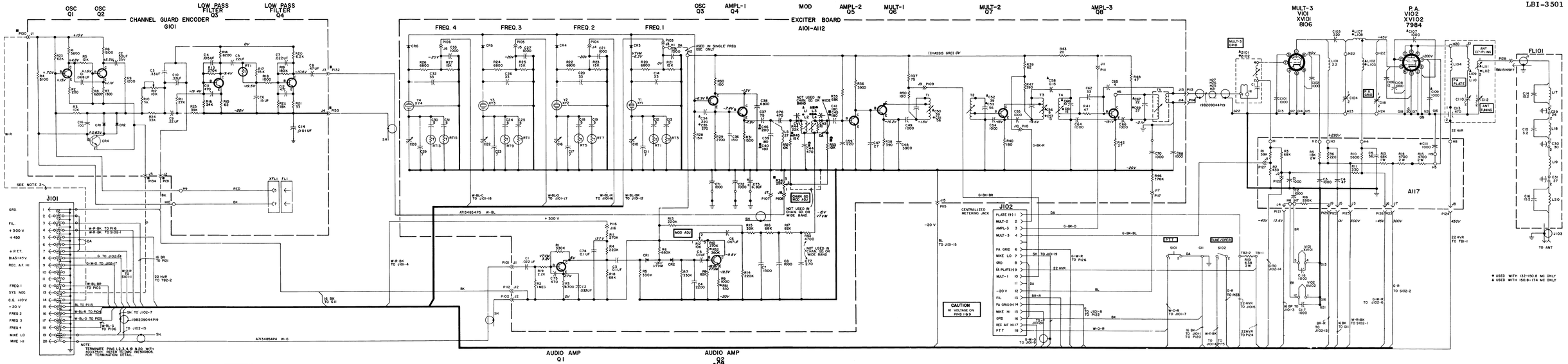
PIN	1	2	3	4	5	6	7	8	9	10	11	12
XV101	500K	0	0	550K	0	2.1Ω	0	39K	50K	0		
XV102	0	0	∞	0	∞	0	0	555K	0	0	110K	550K	2.1Ω

(19D402539, Rev. 9)

OUTLINE DIAGRAM

132 -- 174 MC, 30-WATT TRANSMITTER
MODELS 4ET57A10-21 & 4ET57B10-15

CHANNEL GUARD
G101



* USED WITH 132-150.8 MC ONLY
& USED WITH 150.8-174 MC ONLY
# USED WITH 132-150 MC ONLY
@ USED WITH WIDE BAND ONLY

MODEL NO.	REV.	FREQ. RANGE	NO. OF FREQ.	CHAN. GD.	
4ET57A10	C	132-150.8 MC	1		
4ET57A11	C	150.8-174 MC	2		
4ET57A12	C	132-150.8 MC	2		
4ET57A13	C	150.8-174 MC	2		
4ET57A14	C	132-150.8 MC	4		
4ET57A15	C	150.8-174 MC	4		
4ET57A16	G	132-150.8 MC	1	X	
4ET57A17	G	150.8-174 MC	1	X	
4ET57A18	G	132-150.8 MC	2	X	
4ET57A19	G	150.8-174 MC	2	X	
4ET57A20	G	132-150.8 MC	4	X	
4ET57A21	G	150.8-174 MC	4	X	
4ET57B01	C	132-150.8 MC	1		
4ET57B11	C	150.8-174 MC	1		
4ET57B12	C	132-150.8 MC	2		
4ET57B13	C	150.8-174 MC	2		
4ET57B14	C	132-150.8 MC	4		
4ET57B15	C	150.8-174 MC	4		

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 VACUUM TUBE VOLTMETER.
MEASUREMENTS AND READINGS SHOWN ON Q-200 OR ON CHANNEL GUARD ENCODER WERE MEASURED IN A NEGATIVE GROUNDED SYSTEM FOR POSITIVE GROUND SYSTEMS, MULTIPLY READINGS AT Q1 AND Q2 TO J5 ON CHANNEL GUARD ENCODER.

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

(198620703, Rev. 26)

NOTE
1. ALL WIRES N22 UNLESS OTHERWISE SPECIFIED
2. CONNECT TO PIN 6 ON GROUPS 16,17
   CONNECT TO PIN 14 ON GROUPS 18,19, 20,21

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

SCHEMATIC DIAGRAM

132 — 174 MC, 30-WATT TRANSMITTER
MODELS 4ET57A10-21 & 4ET57B10-15

PARTS LIST

LBI-3503B

132-174 MC TRANSMITTER
MODELS 4ET57A10 - 4ET57A11
MODELS 4ET57B10 - 4ET57B15

4ET57A10 - 15 (PL-19ES00805-G10 - 15) STANDARD REV C
4ET57A16 - 21 (PL-19ES00805-G16 - 21) CHANNEL GUARD REV G
4ET57B10 - 15 (PL-19ES00805-G28 - 33) REV C

SYMBOL	G-E PART NO.	DESCRIPTION
		EXCITER BOARD ASSEMBLIES
A101 thru A112		A101 PL-19D403308-G1 4ET57A10 A102 PL-19D403308-G2 4ET57A11 A103 PL-19D403308-G3 4ET57A13 A104 PL-19D403308-G4 4ET57A14 A105 PL-19D403308-G5 4ET57A15 A106 PL-19D403308-G6 4ET57A15 A107 PL-19D403308-G7 4ET57A16 A108 PL-19D403308-G8 4ET57A17 A109 PL-19D403308-G9 4ET57A18 A110 PL-19D403308-G10 4ET57A20 A111 PL-19D403308-G11 4ET57A21 A112 PL-19D403308-G12 4ET57A21
A121 thru A130		A121 PL-19D403308-G13 4ET57B10 A122 PL-19D403308-G14 4ET57B11 A123 PL-19D403308-G15 4ET57B12 A124 PL-19D403308-G16 4ET57B13 A125 PL-19D403308-G17 4ET57B14 A126 PL-19D403308-G18 4ET57B15
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5491189-P102	Polyester: .022 µf ±20%, 50 VDCW.
C2*	19B209243-P4 19B209243-P3	Polyester: .033 µf ±20%, 40 VDCW. In Models 4ET57A10-A15 and B10-15 of Rev A and earlier and in Models 4ET57A16-A21 of Rev C and earlier. Polyester: .022 µf ±20%, 40 VDCW.
C3	19B209243-P7	Polyester: 0.1 µf ±20%, 40 VDCW.
C4	7491395-P114	Ceramic disc: .0022 µf ±10%, 500 VDCW.
C5	19B209243-P7	Polyester: 0.1 µf ±20%, 40 VDCW.
C6	19B209243-P5	Polyester: .047 µf ±20%, 40 VDCW.
C7*	7491395-P111	Ceramic disc: .0015 µf ±10%, 500 VDCW; sim to EMC Type JL. In Models earlier than Rev C: Ceramic disc: .0022 µf ±10%, 500 VDCW.
C8	5493367-P1000K	Silver mica: .001 µf ±10%, 100 VDCW: sim to Electro Motive Type DM-20.
C9*	5493367-P1500K	Silver mica: .0015 µf ±10%, 100 VDCW: sim to Electro Motive Type DM-20, Deleted by Rev C,
C10	5491271-P106	Ceramic disc: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5,
C11	5496219-P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C12 and C13	19C300683-P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C14	5496219-P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C15	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C16	5491271-P106	Variable, subminiature: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5,
C17	5496219-P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C18 and C19	19C300683-P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C20	5496219-P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C21	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C22	5491271-P106	Variable, subminiature: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5,
C23	5496219-P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C24 and C25	19C300683-P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.

SYMBOL	G-E PART NO	DESCRIPTION
C26	5496219-P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C27	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C28	5491271-P106	Variable, subminiature: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6-5,
C29	5496219-P7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C30 thru C31	19C300685-P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C32	5496219-P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C33	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C34	5496372-P50	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -2300 PPM.
C35	5496372-P54	Ceramic disc: 270 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C36	5496219-P467	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -220 PPM.
C37	5496372-P327	Ceramic disc: 75 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C38	5494481-P131	Ceramic disc: .0068 µf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C39	5496372-P145	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C40	5496372-P345	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C41	5493366-P180K	Silver mica: 180 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C44	5493366-P470J	Silver mica: 470 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C45	5496372-P45	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -2200 PPM.
C46	5496372-P347	Ceramic disc: 200 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C47	5496219-P749	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -750 PPM.
C48	5494481-P129	Ceramic disc: .0039 µf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C49	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C50	5496219-P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C51	5496219-P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C52	5496219-P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C53	5496219-P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C54 and C55	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C56	5496219-P440	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C57	5496219-P343	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -150 PPM.
C58	5491601-P35	Tubular: 0.15 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C59	5493366-P220K	Silver mica: 220 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C60	5496219-P241	Ceramic disc: 10 pf ±5%, 500 VDCW, temp coef -80 PPM.
C61	5496219-P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C62	5496219-P51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef 0 PPM.
C64	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C65	5496219-P35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C66	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.

SYMBOL	G-E PART NO	DESCRIPTION
C67	5496219-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C68	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C69	5496219-P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C70 thru C72	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C73*	5496267-P18 19B209243-P7	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D. In Models 4ET57A10-15 earlier than Rev A and Models 4ET57A16-21 earlier than Rev C: Polyester: 0.1 µf ±20%, 40 VDCW.
C74	19A115414-P13	Polyester: 0.1 µf ±20%, 200 VDCW.
C75	5494481-P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C76	5493366-P470K	Silver mica: 470 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C77*	5493366-P270K 19A115331-P1	Silver mica: 270 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15. Added by Rev C in Models 4ET57A10-15.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115331-P1	Silicon.
CR3 and CR4	19A115348-P1	Silicon.
CR5 thru CR8	19A115348-P1	Silicon.
CR9 thru CR12	5495709-P8	Silicon, capacitive.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	PL-19B204526-G2	Coil. Includes tuning slug 5491798-P2.
L2	PL-19B204526-G1	Coil. Includes tuning slug 5491798-P2.
L3 thru K1	PL-19B204526-G4 3A152-P333J	Coil. Includes tuning slug 5491798-P2. Composition: 33,000 ohms ±5%, 1/4 w.
L4 thru K1	PL-19B204526-G3 3A152-P333J	Coil. Includes tuning slug 5491798-P2. Composition: 33,000 ohms ±5%, 1/4 w.
L5	7488079-P48	Choke, RF: 27 µh ±10% tol at 490 ma, 1.4 ohms DC res; sim to Jeffers 4422-5.
		- - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q5	19A115330-P1	Silicon, NPN.
Q6 thru Q7	19A115328-P1	Silicon, NPN.
Q8	19A115329-P1	Silicon, NPN.
Q9	19A115362-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R2	3R77-P105K	Composition: 1 megohm ±10%, 1/2 w.
R3*	3R77-P472K 3R77-P682K	Composition: 4700 ohms ±10%, 1/2 w. In Models 4ET57A10-15 and B10-15 of Rev A and earlier and in Models 4ET57A16-A21 of Rev C and earlier: Composition: 6800 ohms ±10%, 1/2 w.
R4	3R77-P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R5	3R77-P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R6	3R77-P684K	Composition: 0.68 megohm ±10%, 1/2 w.
R7	3R77-P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R8	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.

SYMBOL	G-E PART NO	DESCRIPTION
R9	3R77-P103K	Composition: 1000 ohms ±10%, 1 2 w.
R10	3R77-P274K	Composition: 0.27 megohm ±10%, 1 2 w.
R11	3R77-P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R12	19B201969-P6	Variable, carbon film: .01 megohm ±20%, 0.1 w; sim to Centralab Series 4.
R13 and R14	3R77-P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R15*	3R77-P393K 3R77-P683K	Composition: 33,000 ohms ±10%, 1/2 w. In Models 4ET57A10-15, 4ET57B10-15 earlier than Rev C: Composition: 39,000 ohms ±10%, 1/2 w. Composition: 68,000 ohms ±10%, 1/2 w.
R16*	3R77-P683K 3R77-P433K	In Models 4ET57A10-15, 4ET57B10-15 earlier than Rev C: Composition: 43,000 ohms ±10%, 1/2 w.
R17*	3R77-P823K 3R77-P332K	Composition: 82,000 ohms ±10%, 1/2 w. In Models 4ET57A10-15, 4ET57B10-15 earlier than Rev C: Composition: 3300 ohms ±10%, 1/2 w.
R18	3R77-P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R19	3R77-P222K	Composition: 2200 ohms ±10%, 1/2 w.
R20	3R77-P682K	Composition: 6800 ohms ±10%, 1/2 w.
R21	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R22	3R77-P682K	Composition: 6800 ohms ±10%, 1/2 w.
R23	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R24	3R77-P682K	Composition: 6800 ohms ±10%, 1/2 w.
R25	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R26	3R77-P682K	Composition: 6800 ohms ±10%, 1/2 w.
R27	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R28	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R29	3R77-P272K	Composition: 2700 ohms ±10%, 1/2 w.
R30	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R31	3R77-P152K	Composition: 1500 ohms ±10%, 1/2 w.
R32 and R33	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R34*	19B201969-P2 19B201969-P6	Variable, carbon film: 25,000 ohms ±20%, 1/2 w. In Models earlier than Rev B: Variable, carbon film: .01 megohm ±20%, 0.1 w; sim to Centralab Series 4,
R35	3R77-P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R36	3R77-P392K	Composition: 3900 ohms ±10%, 1/2 w.
R37	3R77-P750J	Composition: 75 ohms ±5%, 1/2 w.
R38	3R77-P391K	Composition: 390 ohms ±10%, 1/2 w.
R39	3R77-P620J	Composition: 62 ohms ±5%, 1/2 w.
R40	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R41	3R77-P470K	Composition: 47 ohms ±10%, 1/2 w.
R42	3R77-P270K	Composition: 27 ohms ±5%, 1/2 w.
R43	3R77-P200J	Composition: 20 ohms ±5%, 1/2 w.
R44	3R77-P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R45	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R46	5495948-P474	Deposited carbon: 576,000 ohms ±1%, 1/2 w; sim to Texas Instruments Type CD1/2W8.
R47	3R77-P391K	Composition: 390 ohms ±10%, 1/2 w.
R48	3R77-P470K	Composition: 47 ohms ±10%, 1/2 w.
R50	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R51	3R77-P511J	Composition: 510 ohms ±5%, 1/2 w.
R52	3R77-P364J	Composition: 0.36 megohm ±5%, 1/2 w.
R53*	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w. Added in Models 4ET57A10-15 by Rev C.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	19B209284-P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT2	19B209284-P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT5	19B209284-P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT7	19B209284-P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT9	19B209284-P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT11	19B209284-P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT13	19B209284-P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT15	19B209284-P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	PL-19B204534-G1	Coil. Includes tuning slug 5491798-P4.
T2	PL-19B204531-G1	Coil. Includes tuning slug 5491798-P4.
T3	PL-19B204535-G1	Coil. Includes tuning slug 5491798-P4.
T4	PL-19B204535-G2	Coil. Includes tuning slug 5491798-P4.
T5	PL-19B204537-G1	Coil. Includes tuning slug 5491798-P4.
		- - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (MO-1165).
		- - - - - - - - - CRYSTALS - - - - - - - - - -
Y1 thru Y4	19B206175-P6	When ordering give G-E Part No, and specify exact freq needed.
		Crystal Freq = (OF + 12).
		Quartz: freq range 11,000 to 12,566 KC, temp range -30°C to +85°C.
		Quartz: freq range 12,566 to 14,500 KC, temp range -30°C to +85°C.
		BOARD ASSEMBLY PL-19B204541-G1 (Used in PL-19D403308-G1 - G18)
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J17	4033513-P4	Contact, electrical: sim to Bead Chain 183-3.
A117		COMPONENT BOARD ASSEMBLY PL-19B204539-G1
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C3	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C4	5490008-P119	Silver mica: 47 pf ±10%, 500 VDCW: sim to Electro Motive Type DM-15.
C5	5490008-P121	Silver mica: 56 pf ±10%, 500 VDCW: sim to Electro Motive Type DM-15.
		- - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R2	3R77-P431J	Composition: 430 ohms ±5%, 1/2 w.
R3	3R77-P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R5	3R79-P183J	Composition: 18,000 ohms ±5%, 2 w.
R6	3R77-P221K	Composition: 220 ohms ±10%, 1/2 w.
R10	3R77-P562K	Composition: 5600 ohms ±10%, 1/2 w.
R11	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w.

SYMBOL	G-E PART NO	DESCRIPTION
R13	3R78-P683K	Composition: 68,000 ohms ±10%, 1 w.
R14 and R15	3R79-P472J	Composition: 4700 ohms ±5%, 2 w.
R16	5495948-P444	Deposited carbon: 0.28 megohm ±1%, 1 2 w; sim to Texas Instruments Type CD1.2W8.
		BOARD ASSEMBLY PL-19B204539-G1 (Used in PL-19B204539-G1)
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J9	4033513-P4	Contact, electrical: sim to Bead Chain 183-3,
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C101 and C102	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C103	19B209204-P1	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -5600 PPM.
C104	5491271-P6	Variable, subminiature: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6,
C106	7489162-P107	Silver mica: 12 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15,
C107 thru C109	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW: sim to EMC Type JF Discap.
C110	5491498-P3	Variable: approx 2.8-50 pf, 1700 v peak.
C111	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C112	7491398-P1	Variable: approx 3.6-12 pf; sim to Teleradio T-9476.
C113	7485075-P17	Ceramic feed-thru: 470 pf ±20%, 750 VDCW; sim to Erie Style 327,
C116 and C117	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C118	5491271-P6	Variable, subminiature: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-6,
		- - - - - - - - - FILTERS - - - - - - - - - -
FL1		Need, governor: coil - 600 ohms ±10%, standard 9-pin tube socket mounting.
	19B161-P119	71.9 cps
	19B161-P770	77.0 cps
	19B161-P825	82.5 cps
	19B161-P885	88.5 cps
	19B161-P948	94.8 cps
	19B161-P1003	100.0 cps
	19B161-P1035	103.5 cps
	19B161-P1072	107.2 cps
	19B161-P1109	110.9 cps
	19B161-P1148	114.8 cps
	19B161-P1188	118.8 cps
	19B161-P1230	123.0 cps
	19B161-P1273	127.3 cps
	19B161-P1318	131.8 cps
	19B161-P1365	136.5 cps
	19B161-P1413	141.3 cps
	19B161-P1462	146.2 cps
	19B161-P1514	151.4 cps
	19B161-P1567	156.7 cps
	19B161-P1622	162.2 cps
	19B161-P1679	167.9 cps
	19B161-P1738	173.8 cps
	19B161-P1799	179.9 cps
	19B161-P1862	186.2 cps
	19B161-P1928	192.8 cps
	19B161-P2035	203.5 cps
		LOW PASS FILTER ASSEMBLY
		The output filters are factory tuned. If a filter is found to be defective, it is recommended that the entire filter assembly be replaced to maintain rated power output and spurious attenuation.
FL101	PL-19D402223-G5	132-174 MC.

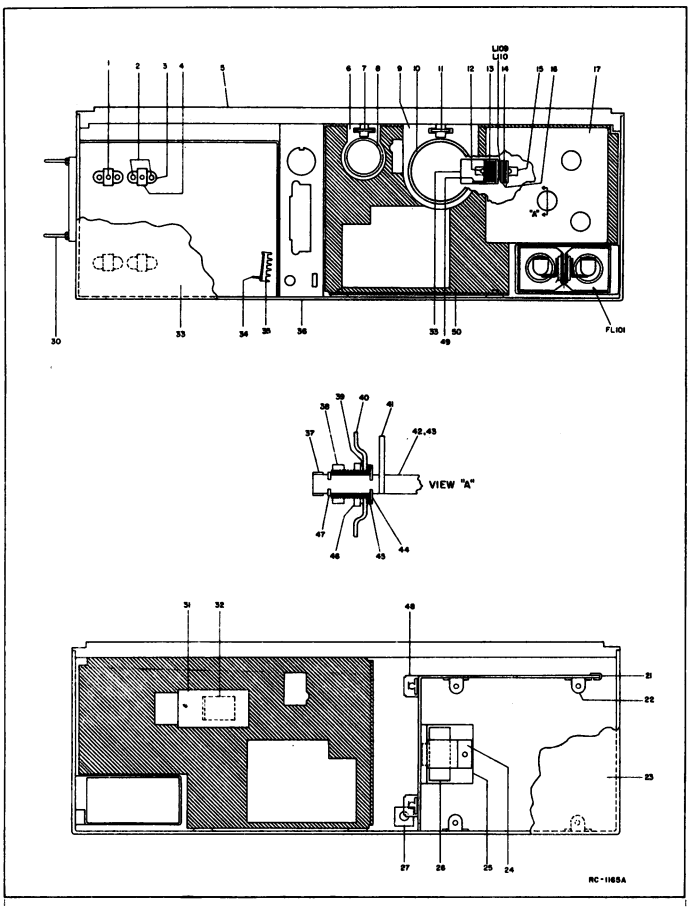
SYMBOL	G-E PART NO	DESCRIPTION
G101		TONE OSCILLATOR ENCODER ASSEMBLY PL-19C300546-G2 (Used in Models 4ET57A16 - A21)
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19B209243-P6	Polyester: .068 µf ±20%, 40 VDCW.
C2	7489483-P17	Tubular: 50 µf +75% -10%, 25 VDCW; sim to Sprague 30D.
C3	19A115414-P116	Polyester: 0.33 µf ±10%, 100 VDCW.
C4	19B209243-P2	Polyester: .015 µf ±20%, 40 VDCW.
C5	19B209243-P17	Polyester: 0.22 µf ±20%, 250 VDCW.
C6	19B209243-P16	Polyester: 0.15 µf ±20%, 250 VDCW.
C7	19B209243-P3	Polyester: .022 µf ±20%, 40 VDCW.
C8	19A115414-P17	Polyester: 0.47 µf ±20%, 100 VDCW.
C9	19B209243-P17	Polyester: 0.22 µf ±20%, 250 VDCW.
C10	19A115414-P116	Polyester: 0.33 µf ±10%, 100 VDCW.
C11 thru C12	5494481-P107	Ceramic disc: 470 pf ±20%, 500 VDCW; sim to EMC Type JF Discap.
C13	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to EMC Type JF Discap.
C14*	5496219-P21	Ceramic disc: 100 pf ±10%, 500 VDCW, temp coef 0 PPM. Added by Rev E.
C16*	5496219-P21	Ceramic disc: 100 pf ±10%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1* and CR2*	19A115250-P1 4036936-P1	Silicon. In Models 4ET57A16-21 earlier than Rev A: Silicon.
CR3*	19A115250-P1	Silicon. Deleted by Rev E.
	4036936-P1	Silicon. In Models earlier than Rev A:
CR4*	19A115889-P1	Silicon, NPN. Added by Rev E.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115889-P1	Silicon, NPN.
Q2 thru Q4	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P562K	Composition: 5600 ohms ±10%, 1/2 w.
R2	3R77-P201K	Composition: 200 ohms ±10%, 1/2 w.
R3*	3R77-P103J 3R77-P682J	Composition: 10,000 ohms ±5%, 1/2 w. In Models earlier than Rev A: Composition: 6800 ohms ±5%, 1/2 w.
R4*	3R77-P512K 3R77-P822K	Composition: 5100 ohms ±10%, 1/2 w. In Models 4ET57A16-21 earlier than Rev A: Composition: 8100 ohms ±10%, 1/2 w.
R5	3R77-P123K	Composition: 12,000 ohms ±10%, 1/2 w.
R6	3R77-P512K	Composition: 5100 ohms ±10%, 1/2 w.
R7	3R77-P132K	Composition: 1300 ohms ±10%, 1/2 w.
R8	3R77-P622K	Composition: 6200 ohms ±10%, 1/2 w.
R9	3R77-P122K	Composition: 1200 ohms ±10%, 1/2 w.
R10	3R77-P302J	Composition: 3000 ohms ±5%, 1/2 w.
R11	3R77-P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R12	7491365-P220	Variable, carbon film: .01 megohm ±10%, .08 w, sim to CTS Type UPC-70,
R13	3R77-P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R14	3R77-P822K	Composition: 8200 ohms ±10%, 1/2 w.
R15	3R77-P620K	Composition: 62 ohms ±10%, 1/2 w.
R16	3R77-P243K	Composition: 24,000 ohms ±10%, 1/2 w.
R17	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R18	3R77-P103K	Composition: 1000 ohms ±10%, 1/2 w.
R19	3R77-P184K	Composition: 0.18 megohm ±10%, 1/2 w.

SYMBOL	G-E PART NO	DESCRIPTION
R20	3R77-P622J	Composition: 6200 ohms ±5%, 1/2 w.
R21	3R77-P330K	Composition: 33 ohms ±10%, 1/2 w.
R22	3R77-P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R23	3R77-P623K	Composition: 62,000 ohms ±10%, 1/2 w.
R24	3R77-P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R25	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828-P30	Rod: 0.23 megohm ±10% res, 1 w max; sim to Globar Type 902.
		- - - - - - - - - SOCKETS - - - - - - - - - -
XFL1	PL-19A121920-G1	Bead, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/2 inches of cable.
		BOARD ASSEMBLY PL-19D403308-G1 (Used in Models 4ET57A16 - A21)
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J8	4033513-P4	Contact, electrical: sim to Bead Chain 183-3.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J101	PL-19C303426-G1	Connector: 20 pin contacts,
J102	19B203689-G1	Connector: 18 pin contacts,
		- - - - - - - - - INDUCTORS - - - - - - - - - -
L101	7488079-P35	Choke, RF: 3.2 µh ±10% ind at 790 ma, 0.5 ohm DC res; sim to Jeffers 4412-9.
L102	19A121447-P2	Coil.
L103	19A121447-P1	Coil.
L104	7772834-P5	Choke, RF: 1.8 µh ind at 1000 ma, approx freq range 75-190 mc; sim to Ohmite Z-144.
L107	19A121239-P1	Coil.
L108	19A121239-P2	Coil.
L109	19B204543-P1	Coil.
L110	19B204741-P1	Coil.
L111	19B204546-P1	Coil.
L112	19B204546-P2	Coil.
		- - - - - - - - - PLUGS - - - - - - - - - -
P101	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P102	4029840-P1	Contact, electrical: sim to Amp 41854.
P103 thru P106	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P107	4029840-P1	Contact, electrical: sim to Amp 41854.
P108 thru P113	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P114	4029840-P1	Contact, electrical: sim to Amp 41854.
P115 thru P117	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P120 and P121	4029840-P1	Contact, electrical: sim to Amp 41854.
P122 and P123	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P124	4029840-P1	Contact, electrical: sim to Amp 41854.
P125 thru P127	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P128	4033513-P17	Contact, electrical: sim to Bead Chain 832-1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
P129 thru P132	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P133	4029840-P1	Contact, electrical; sim to Amp 41854.
P134	4029840-P2	Contact, electrical; sim to Amp 42827-2.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	19A115416-P5	Precision, wirewound: 4.38 ohms ±1%, 2 w; sim to Dale Type RS-2B.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S101	4031922-P1	Push: SPST, normally open, 1/2 amp at 12 VDC; sim to Stackpole SS-15.
S102	19B209040-P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wirt Type 126.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7487424-P2	Miniature, phen: 1 terminal.
TB2	7487424-P1	Miniature, phen: 1 terminal.
		- - - - - - - - - - - TUBES - - - - - - - - - - -
V101		Type 8106.
V102		Type 7984.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XV101	7480532-P11	Tube, mica-filled phen: 9 pins rated at 1 amp at 500 VRMS; sim to Elco 04-902-27.
XV102	19C301007-P5	Tube, plastic: 12 pins rated at 5 amps max; sim to Alcon Metal Products 371G bottom mount.
		- - - - - - - - - - - COILS - - - - - - - - - - -
Z101	PL-19B204543-G1	Coil. Includes tuning slug 5491798-P4.
C1	5496203-P468	Ceramic disc: 510 pf ±5%, 500 VDCW, temp coef -5600 PPM.
Z102	PL-19B204543-G2	Coil. Includes tuning slug 5491798-P4.
C1	5496203-P468	Ceramic disc: 510 pf ±5%, 500 VDCW, temp coef -5600 PPM.
		MECHANICAL PARTS (SEE RC-1165)
1	4033089-P1	Clip. (Part of XY1, XY2, XY3 and XY4).
2	19B200525-P9	Rivet. (Part of XY1, XY2, XY3 and XY4).
3	19A115793-P1	Contact, electrical; sim to Malco 2700. (Part of XY1, XY2, XY3 and XY4).
4	19C311172-P2	Socket, crystal. (Part of XY1, XY2, XY3 and XY4).
5	PL-19C303395-G2	Heat sink.
6	19B204570-P1	Heat sink, tube. (Used with V101).
7	19A121195-P1	Support. (Used with V101 heat sink).
8	7165167-P5	Insert, tube shield; sim to Atlas 106-332-5. (Used with V101).
9	19B204571-P1	Heat sink, tube. (Used with V102).
10	7165167-P7	Insert, tube shield;sim to Atlas 106-332-18. (Used with V102).
11	19A121195-P2	Support. (Used with V102 heat sink).
12	N509P608C13	Dowel pin, spring.
13	19B204756-P1	Insulator, ceramic.
14	5493361-P5	Spring washer; sim to Shakeproof 3502-10-58.
15	19A121465-P1	Post.
16	N402P39C13	Washer, No. 10.
17	PL-19B204490-G1	Can.
21	4029030-P10	Channel, rubber.
22	19B204366-P1	Support.

SYMBOL	G-E PART NO	DESCRIPTION
23	PL-19C303396-G3	Mobile bottom cover.
	PL-19C303495-G2	Station bottom cover.
24	19A121065-P1	Support: (Used with FL1 in Models 4ET57A16, A17, A18, A19, A20 and A21).
25	PL-19A121257-G1	Angle. (Used with FL1 in Models 4ET57A16, A17, A18, A19, A20 and A21).
26	4032591-P26	Pad, rubber, adhesive back.
30	19A121676-P1	Guide pin.
31	19B204497-P1	Shield.
32	19A121198-P1	Plate line.
33	PL-19C303396-G1	Mobile top cover.
	PL-19C303673-G3	Station top cover (Repeaters and VM only).
	PL-19C303495-G8	Station top cover (except Repeaters and VM).
34	19B204394-P1	Support. (Used with Q8).
35	19B204393-P1	Heat sink. (Used with Q8).
36	PL-19B204395-G1	Chassis.
37	4031527-P2	Collar.
38	4031531-P1	Locknut, No. 32.
39	7115130-P9	Lockwasher; sim to Shakeproof 1220-2.
40	19B205023-P1	Support.
41	N509P612C	Dowel pin.
42	19A121189-P1	Post. (Used in Models 4ET57A11, A13, A15, A17, A19, A21, B11, B13, and B15).
43	19A121189-P2	Post. (Used in Models 4ET57A10, A12, A14, A16, A18, A20, B10, B12 and B14).
44	4031532-P1	Cup washer.
45	4031530-P1	Bearing, No. 32.
46	7893936-P1	Nut, No. 32.
47	N91018C	Retaining ring.
48	4036921-P1	Mounting support, bottom cover; sim to Tinnerman C17609-8A-67.
49	19B204776-P1	Support.
50	PL-19B204579-G1	Chassis.



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 - Models 4ET57A16-21 only

To reduce Channel Guard distortion. Changed CR1, CR2, CR3, R4 and added C14 to Channel Guard Board G101.

REV. B - Models 4ET57A16-21 only

To reduce Channel Guard distortion at low tone frequencies. Changed R34 on Exciter Board A101-A112.

REV. A - Models 4ET57A10-15 and 4ET57B10-15 only
REV. C - Models 4ET57A16-21 only

To eliminate adjacent channel interference. Changed C73 on Exciter Board A101-A112.

REV. B - Models 4ET57A10-15 and 4ET57B10-15 only

REV. D - Models 4ET57A16-21 only

To improve sensitivity of the audio input. Changed C2 and R3 on the Exciter Board.

REV. E - Models 4ET57A16-21 only

To protect Channel Guard Encoder from RF Fields. Added C16 and replaced CR3 with CR4 on Encoder Assembly G101.

REV. F - Models 4ET57A16-21 only

To reduce tone distortion. Changed R3 on Encoder Assembly G101.

REV. C - Models 4ET57A10-15 and 4ET57B10-15 only
REV. G - Models 4ET57A16-21 only

To increase audio high frequency roll-off and reduce sideband radiation in adjacent channel. Changed C7, R15, R16 & R17 on A101-A112. Added C8, C77, R53 and deleted C9 on A101-A106.

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and G-E Part No.

Service parts may be obtained from Authorized G-E Communication Equipment Service Stations or through any G-E Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. G-E Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-3501

DF-3124

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