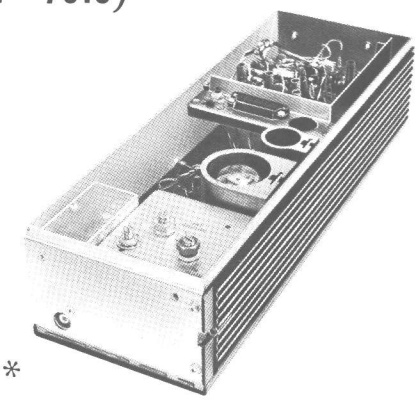
MOBILE RADIO

MASTR® Progress Line

132—174 MHz, 30-WATT TRANSMITTER MODELS 4ET57C30—41 (ICOM OPTIONS 7301—7316)



Maintenance Manual LBI-3980C

DATAFILE FOLDER - DF-3124*********

ET-57-C

SPECIFICATIONS *

FCC Filing Designation	**ET-57-C**
Frequency Range	132-174 MHz
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	±.0002% (-30°C to +60°C)
Spurious and Harmonic Radiation	At least 85 dB below rated power output
Modulation	Adjustable from 0 to ±5 kHz 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	0.5 kHz maximum
Tubes and Transistors	30-Watt Transmitter with no Options: 2 tubes 6 transistors 4 diodes
Maximum Frequency Spacing	0.4%
Duty Cycle:	
Mobile	20% Transmit (one minute transmit, four minutes off)
Station	Continuous

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

GENERAL ELECTRIC

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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

MASTR Progress Line FM Transmitter Types ET-57-C is a crystal-controlled, phase modulated transmitter 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,
- Integrated Circuit Oscillator Module (ICOM),
- Tubed multiplier and power amplifier stages,
- Optional Channel Guard Low-Pass Filter.

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 plug-in ICOM modules 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 transmit-

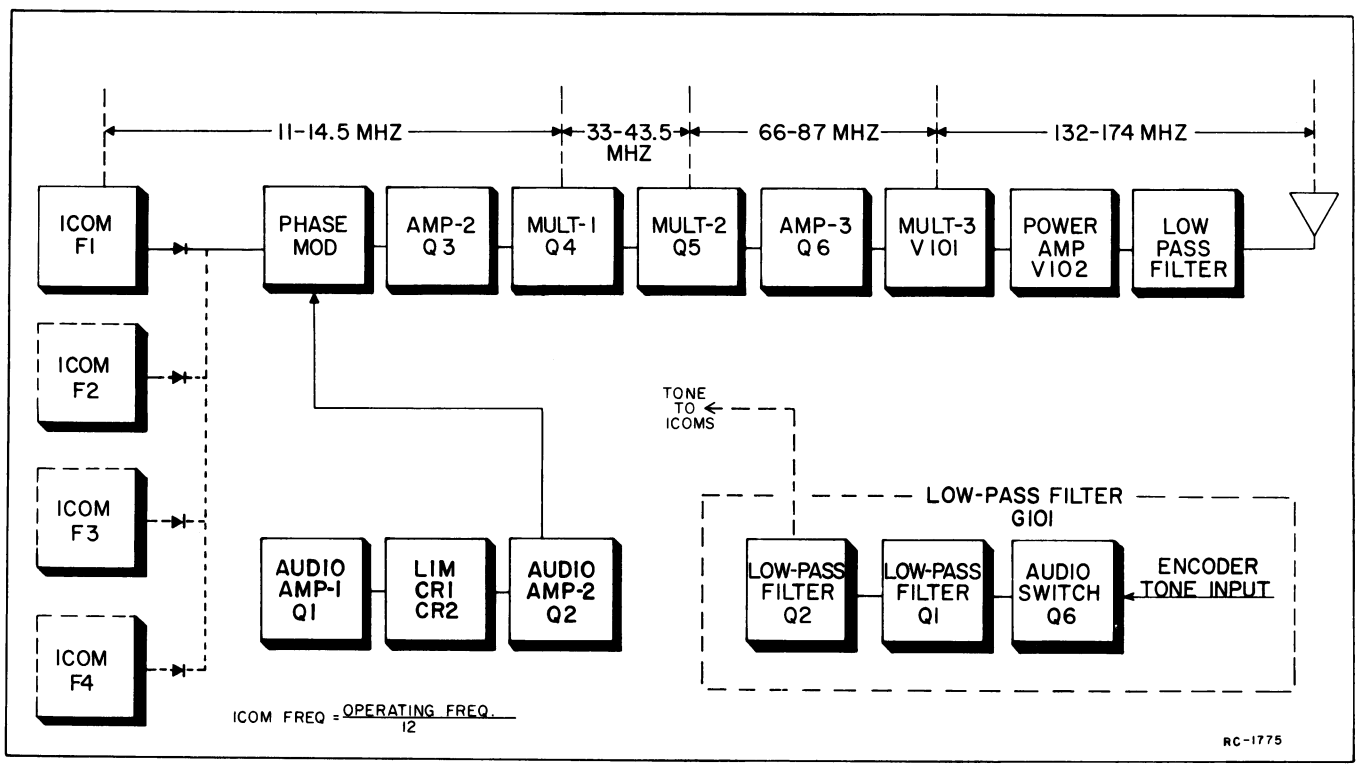


Figure 1 - Transmitter Block Diagram

ter 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 and ICOM Module

ICOM MODULE

ICOM module Model 4EG25A10 consists of a crystal-controlled Colpitts oscillator, a voltage regulator, a Channel Guard tone modulator and a buffer output stage. The entire module (including crystal) is enclosed in a dust-proof aluminum can, with the ICOM frequency and the transmitter operating frequency printed on the top. Access to the oscillator trimmer is obtained by prying off the plastic GE decal on the top of the can.

The oscillator frequency is temperature-compensated at both ends of the temperature range to provide instant frequency compensation, with a frequency stability of ±0.0002%.

In single-frequency transmitters, a keying jumper from H1 to H2 (on the exciter board) connects the ICOM to ground. This drops the -20 volts exciter supply through voltage dividers R19 and R20 to provide -10 volts to operate the ICOM. With the ICOM operating, diode CR3 is forward biased and the oscillator output is applied to the modulator stage.

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

For transmitters equipped with Channel Guard, tone from Encoder G101 is applied to the ICOM through Channel Guard Mod Adjust R1002. The oscillator output is frequency modulated by the Channel Guard tone.

CAUTION

All ICOM modules are individually compensated at the factory, and cannot be repaired in the field. Any attempt to remove the ICOM cover will void the warranty.

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 C45.

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 stage. 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 C4, C7, C8, C9, R13, R14, R15 and R18. The output of the filter and de-emphasis network is applied directly to the phase modulator.

PHASE MODULATOR

The phase modulator uses varactor CV1 (voltage variable capacitor) in series with tunable coil L1/L2. This network appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator varies the bias of CV1, resulting in a phase-modulated output. The output of the modulator is coupled through blocking capacitor C14 to the base of the second amplifier.

AMPLIFIERS AND 1ST AND 2ND MULTIPLIERS

The second amplifier (Q3) isolates the modulator from the loading effects of the first multiplier and provides amplification. The output is coupled through T6 to the first multiplier.

Following Q3 are two inductively-coupled Class C, common-emitter multiplier stages (Q4 and Q5). Q4 is a tripler, with collector tank T1 tuned to three times the crystal frequency. Metering resistors R31 and R42 are for metering the MULT-1 stage at centralized metering jack J102.

Q5 operates as a doubler stage, with collector tank T3 tuned to six times the crystal frequency. Resistors R33 and R40 are for metering the MULT-2 stage at J102. The output of Q5 is inductively coupled through T3 and T4 to amplifier Q6. In 450-470 megahertz transmitters, capacitor C29 provides some high-side capacitive coupling.

Third amplifier Q6 is a neutralized straight-through amplifier. Feedback through C35 from the output link on T5 provides neutralization. This stage is metered

at J102-3 across R37. 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 short 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 of 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

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 of 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.

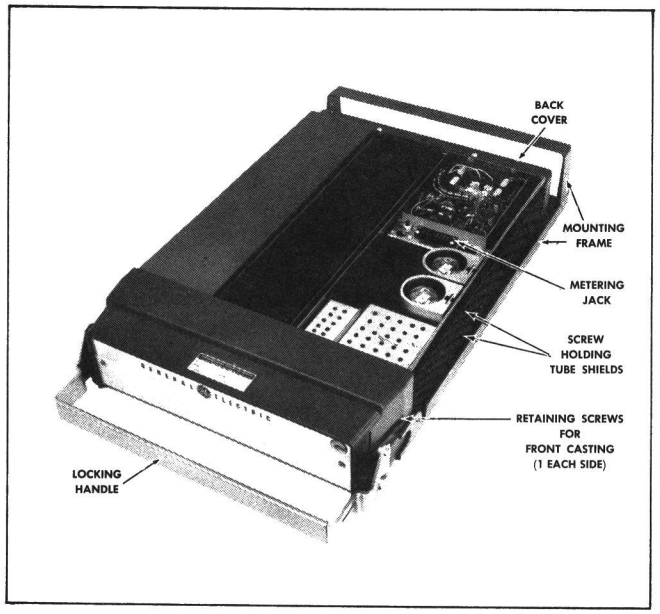


Figure 2 - Top Cover Removed

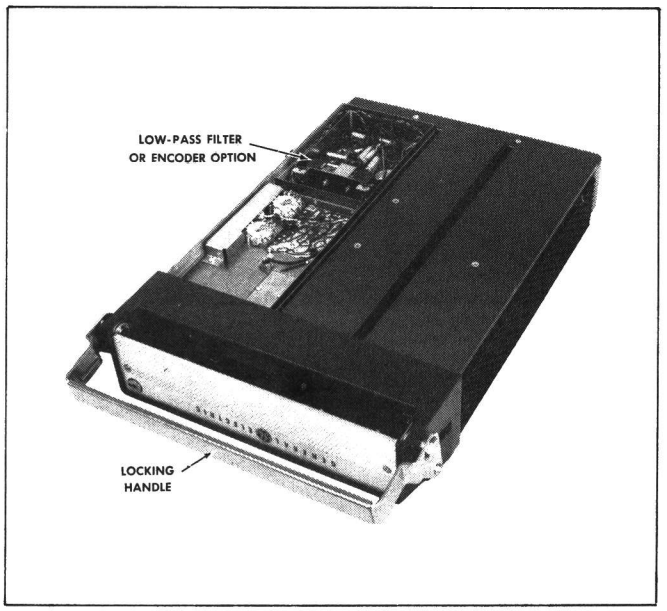


Figure 3 - Bottom Cover Removed

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 overmodulation are clipped by the modulation limiter. The limiter, in conjunction with the de-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing overmodulation while preserving intelligibility.

TEST EQUIPMENT

1. Audio oscillator
2. A frequency modulation monitor
3. An output meter or a VTVM
4. GE 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 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 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 (R1002) 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:

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

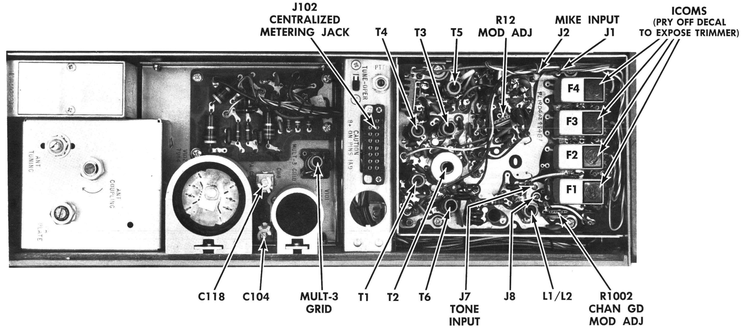
where:

P_i is the power input in watts.

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

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

4.38 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 ICOM(s) (operating frequency ± 12) into proper socket. Do not adjust ICOM trimmer. If multi-frequency transmitter, tune transmitter on channel with the highest frequency.
2. Place the TUNE-OPERATE switch (S102) in the TUNE position.
3. Connect GE Test Set to the Transmitter Centralized Metering Jack J102. If using Multimeter, connect the positive lead to J102-16 (Ground) except for Steps 6 through 15.
4. 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.
5. 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	Pin 10	T6 and L1/L2	0.55 v (0.4 v Minimum)	Tuning the modulator is a critical adjustment. Carefully tune T6 and L1/L2 alternately for maximum meter reading. If no peak is obtained when tuning T6, set the slug in L1/L2 to a different position and re-tune T6.
2.	A (MULT-1)	Pin 10	T1	See Procedure	Tune T1 for a small dip 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 a maximum meter reading. Then tune T3 for minimum meter reading (not required unless changing frequency).
4.	C (AMPL-3)	Pin 3	T4, T3 and T5	0.6 v (0.5 v Minimum)	Tune T4 and then T3 for a maximum meter reading. Then tune T5 for minimum meter reading (not required unless changing frequency).
			MULT-3 AND POWER AMPLIFIER		
5.	D (MULT-3)	Pin 4	MULT-3 GRID(Z101/ Z102)	0.6 v (0.5 v Minimum)	Tune MULT-3 GRID for maximum meter reading.
6.	F (PA PLATE)	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).

ICOM FREQUENCY ADJUSTMENT LBI-3980

First, check the transmitter frequency to determine if any adjustment is required. The frequency should be checked with a frequency meter or counter having an accuracy of 0.4 part-per-million (PPM), and with the ICOM module at 80°F (±4°F) or 26.5°C (±2°C) when possible. The ICOM temperature can be determined by taping a mercury thermometer to the side of the ICOM.

NOTE

The ICOM case is at -20 volts DC. Be careful not to short the case to ground.

If an adjustment is required, use one of the following procedures:

If the ICOM is stabilized at 80°F, pry off the GE emblem and adjust the ICOM trimmer for correct transmitter operating frequency.

If the ICOM is not stabilized at 80°F, pry off the GE emblem and check for a color dot on the top of the can. This color dot indicates which correction curve to use in setting the unit on frequency (see Figure 4). Next, tape a thermometer to the ICOM and check the temperature when the thermometer is stabilized. Then proceed as shown in the following example:

1. Assume that the ICOM is marked with a green color dot and the temperature reading is 90°F. At that temperature, the green curve shows a correction factor of approximately +1.5 PPM. (At 132 MHz, 1 PPM is 132 Hz. At 174 MHz, 1 PPM is 174 Hz.)
2. With a transmitter operating frequency of 150 MHz, adjust the ICOM trimmer for a reading of +225 Hz (+1.5 x 150) higher than the licensed operating frequency.
3. If a negative correction factor is obtained (at temperatures above 80°F), adjust the ICOM trimmer for the indicated PPM lower than the operating frequency.

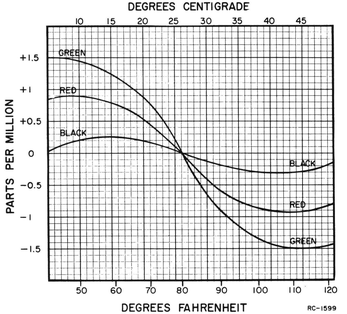


Figure 4 - ICOM Frequency Correction Curve

ALIGNMENT PROCEDURE

132—174 MHz, 30-WATT TRANSMITTER
MODELS 4ET57C30-41

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:

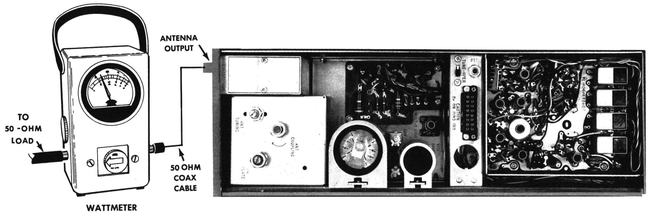
1. Wattmeter similar to:
   Bird # 43
   Jones # 711N
2. VTVM similar to:
   Triplett # 850
   Heath # 1M-21
3. Audio Generator similar to:
   GE Model 4EX6A10 or
   Heath # 1G-72
4. Deviation Meter (with a .75 kHz scale) similar to:
   Measurements #140
   Lampkin # 205A
5. Multimeter similar to:
 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

STEP 1

POWER MEASUREMENT

TEST PROCEDURE

1. Connect transmitter output to wattmeter as shown below:



2. Key transmitter and check wattmeter for minimum reading of 30 watts.

SERVICE CHECK

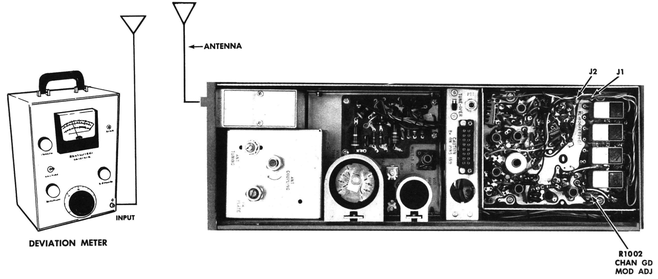
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

1. 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 MOD ADJUST (R1002) for a reading of 0.75-kHz.

NOTES: --The Channel Guard MOD ADJUST (R1002) 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.

DEVIATION METER

SERVICE CHECK

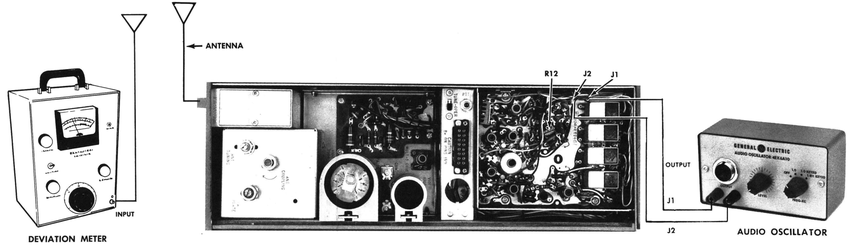
If the 0.75-kHz deviation is not obtainable when adjusting R1002, adjust R12 until 0.75 kHz is obtained.

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.
6. Adjust "Modulation Adjust Control" R12 until deviation reads 4.5 kHz on plus (+) or minus (-) deviation, whichever is greater. This adjustment should be made with the correct level of tone applied on Channel Guard transmitters.

DEVIATION METER

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

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

1. Recheck Step 1 as shown in the Transmitter Alignment Chart.
2. **Check Audio Sensitivity by reducing generator output until deviation falls to 3.0 kHz. Voltage should be LESS than 100 millivolts.**

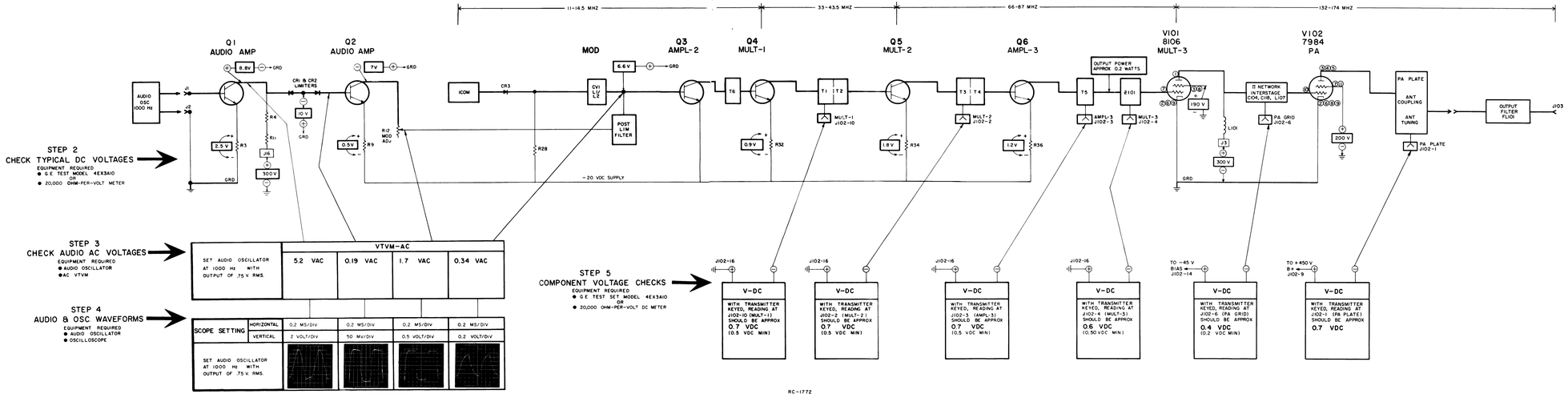
METER

STEP 1 — QUICK CHECKS

	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:--

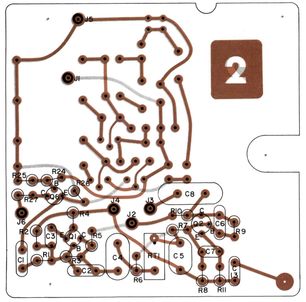
1. -20 volt DC supply at J102-12-16.
2. Measure 12.1 VDC across Q4 emitter resistor R31 (1500 ohms), then:
   - (a) Remove crystal - a slight variation in R31 voltage reading indicates Q3 and Q4 stages operating properly.
   - (b) If no voltage is measured, check keying leads CR3-CR6, Q3, Q4.
   - (c) 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.



(DF-3124)

EXCITER A127-A134

(19C311379, Sh. 1, Rev. 4)
(19C311379, Sh. 2, Rev. 4)

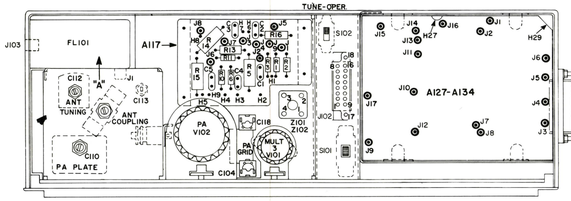


RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

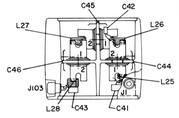
LOW-PASS FILTER
G101

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

TOP VIEW



VIEW AT "A"



EXCITER READINGS TAKEN TO CHASSIS GROUND						
TRANSISTOR	EMITTER		BASE		COLLECTOR	
	−	+	−	+	−	+
Q1	5.8K	5.0K	140K	11K	60K	30K
Q2	4.1K	2.8K	70K	7.5K	8.7K	9.5K
Q3	3.4K	115	62K	5.7K	3.7K	3.8K
Q4	3.6K	2.3K	3.4K	2.1K	165	165
Q5	3.6K	2.3K	3.4K	115	200	210
Q6	3.5K	2.1K	3.5K	2.2K	70	70

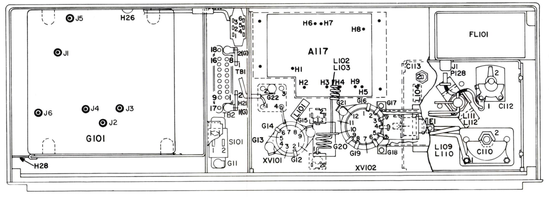
EXCITER READINGS TAKEN TO 20 V LINE (.45 BLUE LINE)						
TRANSISTOR	EMITTER		BASE		COLLECTOR	
	−	+	−	+	−	+
Q1	9.5K	10K	145K	17.2K	63K	45K
Q2	450	450	68K	3.5K	11.5K	13.5K
Q3	0	0	68K	3.2K	7K	8K
Q4	13	120	0	0	2.2K	3.7K
Q5	54	120	0	0	52	3.7K
Q6	22	25	47	45	2.2K	3.5K

READINGS AT J101 TAKEN TO CHASSIS GROUND.

PIN	−	+
1	0	0
2	∞	∞
3	9.1Ω	2.1Ω
4	550K	500K
5	∞	∞
6	∞	∞
7	∞	∞
8	110K	110K
9	∞	∞
10	∞	∞
11	∞	∞
✱ 12	0/14K	0/9.5K
13	∞	∞
14	∞	∞
15	5K	2.7K
✱ 16	∞/14K	∞/9.5K
✱ 17	∞/14K	∞/9.5K
✱ 18	∞/14K	∞/9.5K
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			
XV102	0	0	∞	∞	∞	0	550K	0	0	110K	550K	2.1Ω

(19D413261, Rev. 3)

RESISTANCE READINGS

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

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

FLAT SIDE

OR

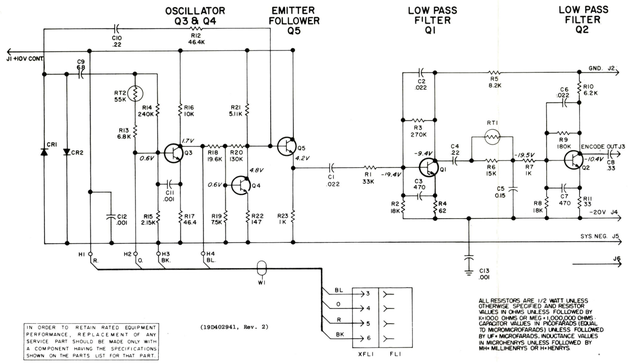
LEAD IDENTIFICATION

OUTLINE DIAGRAMS

132—174 MHz, 30-WATT TRANSMITTER
MODELS 4ET57C30-41

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.

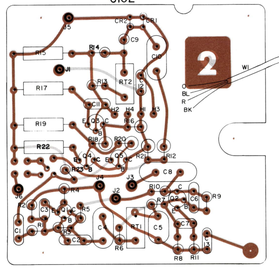
(19D402841, Rev. 2)

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 MMF=MICROMICROFARADS. INDUCTANCE VALUES ARE IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR HH=HENRYS.

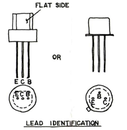
REVISION LTR BLOCK		
		REV.
G102	4EH17A10	A

OUTLINE DIAGRAM

ENCODER
MODEL 4EH17A10
G102



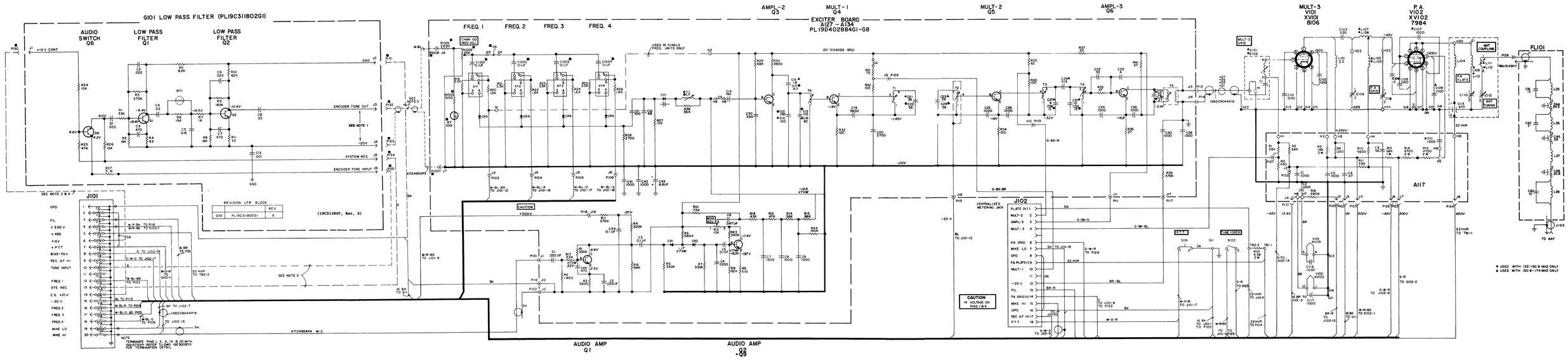
FLAT SIDE



OR

LEAD IDENTIFICATION

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


G101 LOW PASS FILTER (PL19C311802G1)
AUDIO SWITCH Q6
LOW PASS FILTER Q1
LOW PASS FILTER Q2
EXCITER BOARD A127 - A134 PL19D402884G1-G8
FREQ. 1
FREQ. 2
FREQ. 3
FREQ. 4
AMPL-2 Q3
MULT-1 Q4
MULT-2 Q5
AMPL-3 Q6
MULT-3 V101 XV101 8106
P.A. V102 XV102 7984
A117
FL101
J101
J102
J103
AUDIO AMP Q1
AUDIO AMP Q2 -Q5
REVISION LTR BLOCK
(19C311807, Rev. 5)
(19B621235, Rev. 3)
SCHEMATIC DIAGRAM
132—174 MHz, 30-WATT TRANSMITTER
MODELS 4ET57C30-41
Issue 2
9
(DF-3124)

PARTS LIST

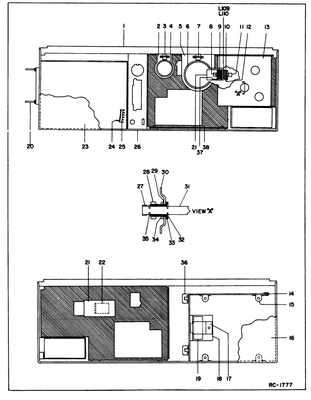
LBI-3977B

132-174 MHz TRANSMITTER
MODELS 4STS7C30-4STS7C41

SYMBOL	GE PART NO.	DESCRIPTION
A117		COMPONENT BOARD ASSEMBLY 19B204539G11
C1 thru C3	5494481P111	Ceramic disc: 1000 pf ±30%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5490008P119	Silver mica: 47 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C5	5490008P121	Silver mica: 56 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
J1 thru J9	4033513P4	Contact, electrical; sim to Bead Chain L63-3.
R1	3R77P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R2	3R77P431J	Composition: 430 ohms ±5%, 1/2 w.
R3	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R5	3R77P183J	Composition: 18,000 ohms ±5%, 2 w.
R6	3R77P221K	Composition: 220 ohms ±10%, 1/2 w.
R10	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R11	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R13	3R78P683K	Composition: 68,000 ohms ±10%, 1 w.
R14 and R15	3R78P473J	Composition: 4700 ohms ±5%, 2 w.
R16	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
A127 thru A134		EXCITER BOARD A127 19D402884G21 4STS7C30 A128 19D402884G22 4STS7C31 A129 19D402884G23 4STS7C32 A130 19D402884G24 4STS7C33 A131 19D402884G25 4STS7C39 A132 19D402884G26 4STS7C37 A133 19D402884G27 4STS7C40 A134 19D402884G28 4STS7C41
C1	19A116080P3	Polyester: .022 pf ±20%, 50 VDCW.
C2	19A116080P4	Polyester: .033 pf ±20%, 50 VDCW.
C3	19A116080P7	Polyester: 0.1 pf ±20%, 50 VDCW.
C4	7491395P114	Ceramic disc: 2200 pf ±10%, 500 VDCW; sim to RMC Type JL.
C5	19A116080P7	Polyester: 0.1 pf ±20%, 50 VDCW.
C6	19A116080P5	Polyester: .047 pf ±20%, 50 VDCW.
C7	7491395P111	Ceramic disc: 1500 pf ±10%, 500 VDCW; sim to RMC Type JL.
C8 and C9	7491395P109	Ceramic disc: 1000 pf ±5%, 500 VDCW; sim to RMC Type JL.
C10	5496219P359	Ceramic disc: 68 pf ±5%, 500 VDCW, temp coef -150 PPM.
C11	5493366P100J	Mica: 100 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C12	5493366P150J	Mica: 150 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C13	5496219P564	Ceramic disc: 110 pf ±5%, 500 VDCW, temp coef -330 PPM.
C14	5493366P180K	Mica: 180 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C15	5491601P24	Phenolic: 1.8 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C16	5493366P100J	Mica: 100 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C17	5491601P22	Phenolic: 4.7 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C18	5496219P661	Ceramic disc: 82 pf ±5%, 500 VDCW, temp coef -330 PPM.
C19	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C20	5494481P128	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C21	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C22	5496219P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C23	5496219P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C24	5496219P257	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C25 and C26	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C27	5496219P440	Ceramic disc: 9.0 pf ±0.5 pf 500 VDCW, temp coef -220 PPM.
C28	5496219P343	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -150 PPM.
C29	5491601P35	Phenolic: 0.15 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C30	5493366P330K	Mica: 330 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C31	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C32	5496219P344	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
C33	5496219P51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef 0 PPM.
C34	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C35	5496219P35	Ceramic disc: 4.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C36	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C37	5496219P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C38	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C39	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C40 thru C42	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C43	5496267P18	Tantalum: 6.8 pf ±20%, 35 VDCW; sim to Sprague Type 150D.
C44	19A115414P13	Polyester: 0.1 pf ±20%, 200 VDCW.
C45	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
CR1 and CR2	19A115331P1	Silicon.
CR3 thru CR5	19A115250P1	Silicon, capacitive.
CY1	849576P8	Silicon, capacitive.
J1 thru J3	4033513P4	Contact, electrical; sim to Bead Chain L63-3.
L1	19B204536G2	Coil. Includes tuning slug 5491798P2.
L2	19B204536G1	Coil. Includes tuning slug 5491798P2.
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3	19A115330P1	Silicon, NPN.
Q4 and Q5	19A115328P1	Silicon, NPN.
Q6	19A115329P1	Silicon, NPN.
R1	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R2	3R77P105K	Composition: 1 megohm ±10%, 1/2 w.
R3	3R77P562K	Composition: 5600 ohms ±10%, 1/2 w.
R4	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R5	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R6	3R77P684K	Composition: 0.68 megohm ±10%, 1/2 w.
R7	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R8	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R9	3R77P511J	Composition: 510 ohms ±5%, 1/2 w.
R10	3R77P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R11	3R77P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R12	19B203358P106	Variable, carbon film; approx 75 to 10,000 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R13	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R14	3R77P563K	Composition: 56,000 ohms ±10%, 1/2 w.
R15 and R16	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R17	3R77P822K	Composition: 2200 ohms ±10%, 1/2 w.
R18	3R77P433J	Composition: 43,000 ohms ±5%, 1/2 w.
R19	3R77P333J	Composition: 3300 ohms ±5%, 1/2 w.
R20	3R77P163J	Composition: 1600 ohms ±5%, 1/2 w.
R21	3R77P333J	Composition: 3300 ohms ±5%, 1/2 w.
R22	3R77P163J	Composition: 1600 ohms ±5%, 1/2 w.
R23	3R77P333J	Composition: 3300 ohms ±5%, 1/2 w.
R24	3R77P163J	Composition: 1600 ohms ±5%, 1/2 w.
R25	3R77P333J	Composition: 3300 ohms ±5%, 1/2 w.
R26	3R77P163J	Composition: 1600 ohms ±5%, 1/2 w.
R27	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R28	3R77P273K	Composition: 27000 ohms ±10%, 1/2 w.
R29	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R30	3R77P393K	Composition: 3900 ohms ±10%, 1/2 w.
R31	3R77P750J	Composition: 75 ohms ±5%, 1/2 w.
R32	3R77P121J	Composition: 120 ohms ±5%, 1/2 w.
R33	3R77P620J	Composition: 62 ohms ±5%, 1/2 w.
R34	3R77P121J	Composition: 120 ohms ±5%, 1/2 w.
R35	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R36	3R77P570K	Composition: 57 ohms ±10%, 1/2 w.
R37	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R38	3R77P363J	Composition: 36,000 ohms ±5%, 1/2 w.
R39	19A115078P474	Metal film: 576,000 ohms ±2%, 1/2 w.
R40	3R77P151K	Composition: 150 ohms ±10%, 1/2 w.
R41	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R42	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R43	3R77P364J	Composition: 0.36 megohm ±5%, 1/2 w.
R44	3R77P184K	Composition: 0.18 megohm ±10%, 1/2 w.
T1	19B204534G1	Coil. Includes tuning slug 5491798P4.
T2	19B204531G2	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.
T6	19B216035G1	Coil. Includes tuning slug 5491798P4.
XY1 thru XY4	19B216043G1	Socket assembly. Includes:
	19D413071P1	Socket cavity.
	19A115834P2	Contact, electrical.
		OSCILLATORS
		NOTE: When reordering, specify ICOM Frequency. ICOM Frequency = operating frequency - 12.
Y1 thru Y4	4E025A11	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.
		CHANNEL GUARD MODIFICATION KIT 19A127078G1 (Used with A131-A134)
R1	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R2	3R77P563K	Composition: 56,000 ohms ±10%, 1/2 w.
R3	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R1001	3R77P242J	Composition: 2400 ohms ±5%, 1/2 w.
R1002	19B203358P107	Variable, carbon film; approx 75 to 25,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R1003	3R77P513J	Composition: 5100 ohms ±5%, 1/2 w.
RT1001	19C300064P8	Disc: 2500 ohms ±10%, sim to GE 4D403.
G101		LOW PASS FILTER 19C311803G1
C1	19A116080P103	Polyester: .022 pf ±10%, 50 VDCW.
C2	19A116080P3	Polyester: .022 pf ±20%, 50 VDCW.
C3	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	19A116080P8	Polyester: 0.22 pf ±20%, 50 VDCW.
C5	19A116080P9	Polyester: 0.15 pf ±20%, 50 VDCW.
C6	19A116080P3	Polyester: .022 pf ±20%, 50 VDCW.
C7	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19B209343P14	Polyester: 0.33 pf ±20%, 50 VDCW.
C13	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
J1 thru J6	4033513P4	Contact, electrical; sim to Bead Chain L63-3.
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q6	19A115123P1	Silicon, NPN; sim to Type 2N2712.
L101	748807P95	Choke, RF: 2.2 µh ±10% ind at 790 ma, 0.5 ohm DC res; sim to Jeffers 4413-RE.
L102	19A115447P2	Coil.
L103	19A115447P1	Coil.
L104	7772834P5	Choke, RF: 1.8 µh ind at 1000 ma, approx freq range 75-190 MHz; sim to Ohmite Z-144.
L107	19A115235P1	Coil.
L108	19A115235P2	Coil.
L109	19B204545P1	Coil.
L110	19B204741P1	Coil.
L111	19B204546P1	Coil.
L112	19B204546P2	Coil.
P101	4029846P2	Contact, electrical; sim to Amp 42827-2.
P102	4029846P1	Contact, electrical; sim to Amp 41854.
P103 thru P106	4029846P2	Contact, electrical; sim to Amp 42827-2.
P107	4029846P1	Contact, electrical; sim to Amp 41854.
P108 thru P113	4029846P2	Contact, electrical; sim to Amp 42827-2.
P114	4029846P1	Contact, electrical; sim to Amp 41854.
P115 thru P117	4029846P2	Contact, electrical; sim to Amp 42827-2.
P130 and P131	4029846P1	Contact, electrical; sim to Amp 41854.
P132 and P133	4029846P2	Contact, electrical; sim to Amp 42827-2.
P134	4029846P1	Contact, electrical; sim to Amp 41854.
P135 thru P137	4029846P2	Contact, electrical; sim to Amp 42827-2.
P138	4033513P17	Contact, electrical; sim to Bead Chain 852-1.
P139	4029846P2	Contact, electrical; sim to Amp 42827-2.
R101	19A115416P5	Wirewound: 4.38 ohms ±1%, 2 w; sim to Dale Type RS-2B.
S101	4031922P1	Push: SPST, normally open, 1/2 amp at 12 VDC; sim to Stackpole SS-115.
S102	19B209040P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wirt Type 12K.
TB1	7487424P2	Miniature, phen: 1 terminal.
TB2	7487424P1	Miniature, phen: 1 terminal.
Y101		Type 8106.
Y102		Type 7984.
XY101	7480532P11	Tube, mica-filled phen: 9 pins rated at 1 amp at 500 VRMS; sim to Elco 04-903-27.

SYMBOL	GE PART NO.	DESCRIPTION
J101	19C300326G1	Connector: 20 pin contacts.
J102	19B205689G1	Connector: 18 pin contacts.
L101	748807P95	Choke, RF: 2.2 µh ±10% ind at 790 ma, 0.5 ohm DC res; sim to Jeffers 4413-RE.
L102	19A115447P2	Coil.
L103	19A115447P1	Coil.
L104	7772834P5	Choke, RF: 1.8 µh ind at 1000 ma, approx freq range 75-190 MHz; sim to Ohmite Z-144.
L107	19A115235P1	Coil.
L108	19A115235P2	Coil.
L109	19B204545P1	Coil.
L110	19B204741P1	Coil.
L111	19B204546P1	Coil.
L112	19B204546P2	Coil.
P101	4029846P2	Contact, electrical; sim to Amp 42827-2.
P102	4029846P1	Contact, electrical; sim to Amp 41854.
P103 thru P106	4029846P2	Contact, electrical; sim to Amp 42827-2.
P107	4029846P1	Contact, electrical; sim to Amp 41854.
P108 thru P113	4029846P2	Contact, electrical; sim to Amp 42827-2.
P114	4029846P1	Contact, electrical; sim to Amp 41854.
P115 thru P117	4029846P2	Contact, electrical; sim to Amp 42827-2.
P130 and P131	4029846P1	Contact, electrical; sim to Amp 41854.
P132 and P133	4029846P2	Contact, electrical; sim to Amp 42827-2.
P134	4029846P1	Contact, electrical; sim to Amp 41854.
P135 thru P137	4029846P2	Contact, electrical; sim to Amp 42827-2.
P138	4033513P17	Contact, electrical; sim to Bead Chain 852-1.
P139	4029846P2	Contact, electrical; sim to Amp 42827-2.
R101	19A115416P5	Wirewound: 4.38 ohms ±1%, 2 w; sim to Dale Type RS-2B.
S101	4031922P1	Push: SPST, normally open, 1/2 amp at 12 VDC; sim to Stackpole SS-115.
S102	19B209040P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wirt Type 12K.
TB1	7487424P2	Miniature, phen: 1 terminal.
TB2	7487424P1	Miniature, phen: 1 terminal.
Y101		Type 8106.
Y102		Type 7984.
XY101	7480532P11	Tube, mica-filled phen: 9 pins rated at 1 amp at 500 VRMS; sim to Elco 04-903-27.

SYMBOL	GE PART NO.	DESCRIPTION
XY102	19C301007P6	Tube, plastic: 12 pins; sim to Alcon Metal Products 3710 bottom mount.
Z101	19B204543G1	Coil. Includes tuning slug 5491798P4.
C1	5496203P468	Ceramic disc: 510 pf ±5%, 500 VDCW, temp coef -1500 PPM.
Z102	19B204543G2	Coil. Includes tuning slug 5491798P4.
C1	5496203P468	Ceramic disc: 510 pf ±5%, 500 VDCW, temp coef -1500 PPM.
		HARNESS ASSEMBLY 19B200855G3 (Includes J101, J102, P101-P106, P109-P112, P113-P117, P130-P137, P139)
1	19C303395G2	Heat sink.
2	19B204570P1	Heat sink, tube. (Used with Y101).
3	19A121195P1	Support. (Used with Y101 heat sink).
4	7165147P5	Insert, tube shield; sim to Atlas 106-333-5. (Used with Y101).
5	19B204571P1	Heat sink, tube. (Used with Y102).
6	7165147P7	Insert, tube shield; sim to Atlas 106-333-18. (Used with Y102).
7	19A121195P2	Support. (Used with Y102 heat sink).
8	8508908C13	Dowel pin, spring.
9	19B204756P1	Insulator, ceramic.
10	5483361P5	Spring washer; sim to Shakeproof 3503-10-58.
11	19A122724P1	Post.
12	8402P39C13	Washer, No. 10.
13	19B204490G1	Can.
14	4036039P10	Channel, rubber.
15	19B204396P1	Support.
16	19C303396G3	Mobile bottom cover.
	19C303495G2	Station bottom cover.
17	19A121065P1	Support.
18	19A121257G1	Angle.
19	4033591P26	Pad, rubber, adhesive back.
20	19A121676P1	Guide pin.
21	19B204497P1	Shield.
22	19A121198P1	Plate line.
23	19C303396G1	Mobile top cover.
	19C303673G3	Station top cover (Repeaters and VX only).
	19C303495G8	Station top cover (except Repeaters and VX).
24	19B204394P1	(Not Used).
25	19B204393P1	(Not Used).
26	19B204395G1	Chassis.
27	4031527P2	Collar.
28	4031531P1	Lockwut, No. 32.
29	7115130P9	Lockwasher; sim to Shakeproof 1220-2.
30	19B205032P1	Support.
31	19A121189P1	Post. (Used in Models 4STS7C31, 35, 37, 41).
32	19A121189P2	Post. (Used in Models 4STS7C30, 34, 36, 40).
33	4031532P1	Cup washer.
34	4031530P1	Bearing, No. 32.
35	7165075-P2	Nut, No. 32.
36	8911918C	Retaining ring.
37	19B204776P1	Support.
38	4036921P1	Mounting support, bottom cover; sim to Tinnerman C17609-RA-67.
39	19B204578G1	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.

Chassis 19E350883G1, G2

Rev. A - To improve the performance of the transmitter. Changed FL101.

Low Pass Filter 19C311802-G1

Rev. A & B - Incorporated into initial shipment.

PARTS LIST

LBI-3936F

CHANNEL GUARD ENCODER G102
4EH17A10 19C311802G2

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

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.