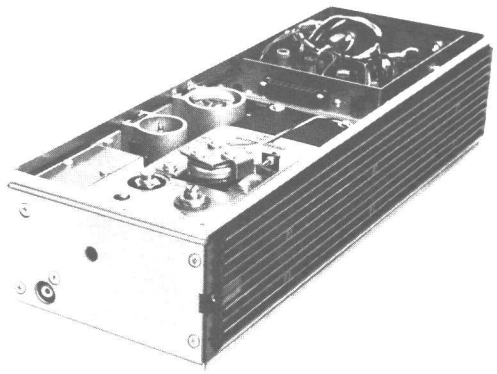
MOBILE RADIO

MASTR PROGRESS LINE

150.8-174 MHz, 80-WATT TRANSMITTER
MODEL 4ET58J10, J11, & J12 (Options 7520 thru 7525)



SPECIFICATIONS *

	ET-58-J
FCC Filing Designation:	
Model Numbers:	
4ET58J10	2 Frequencies
4ET58J11	3 Frequencies
4ET58J12	4 Frequencies
Maximum Frequency Spread Between Sub-Bands:	10.0 MHz
Minimum Frequency Spread Between Sub-Bands:	500 kHz
Maximum Frequency Spread Within Sub-Bands:	500 kHz
Power Output:	80 Watts minimum
Crystal Multiplication Factor:	12
Frequency Stability:	±.0005% (-30°C to +60°C)
Spurious & Harmonic Radiation:	At least 85 dB below rated power output
Modulation:	Adjustable from 0 to ±5 kHz 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 & Transistors:	3 tubes 23 transistors 19 diodes
Duty Cycle:	20% transmit (one minute transmit, four minutes off)

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

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

WARNING

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

DESCRIPTION

MASTR Progress Line FM transmitter Model 4ET58J10, 11 and 12 are crystal controlled, phase-modulated transmitters designed for four-frequency operation on two sub-bands in the 150.8 to 175 MHz range. The transmitter consists of the following modules:

- Exciter Board A108/A110/A112: transistorized audio, oscillator, modulator, amplifier and multiplier stages.
- Exciter Board A135/A136: transistorized audio, oscillator, modulator, amplifier, multiplier and solenoid control stages.
- Tubed multiplier and power amplifier stages.

The application of each of the transmitter options is shown in the following chart:

Option Number	Model Number	Number of Frequencies	Channel Guard
7520	4ET58J10	Two	No
7521	4ET58J11	Three	No
7522	4ET58J12	Four	No
7523	4ET58J10	Two	Yes
7524	4ET58J11	Three	Yes
7525	4ET58J12	Four	Yes

All input leads to the transmitter are individually filtered by the 20-pin feedthrough 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.

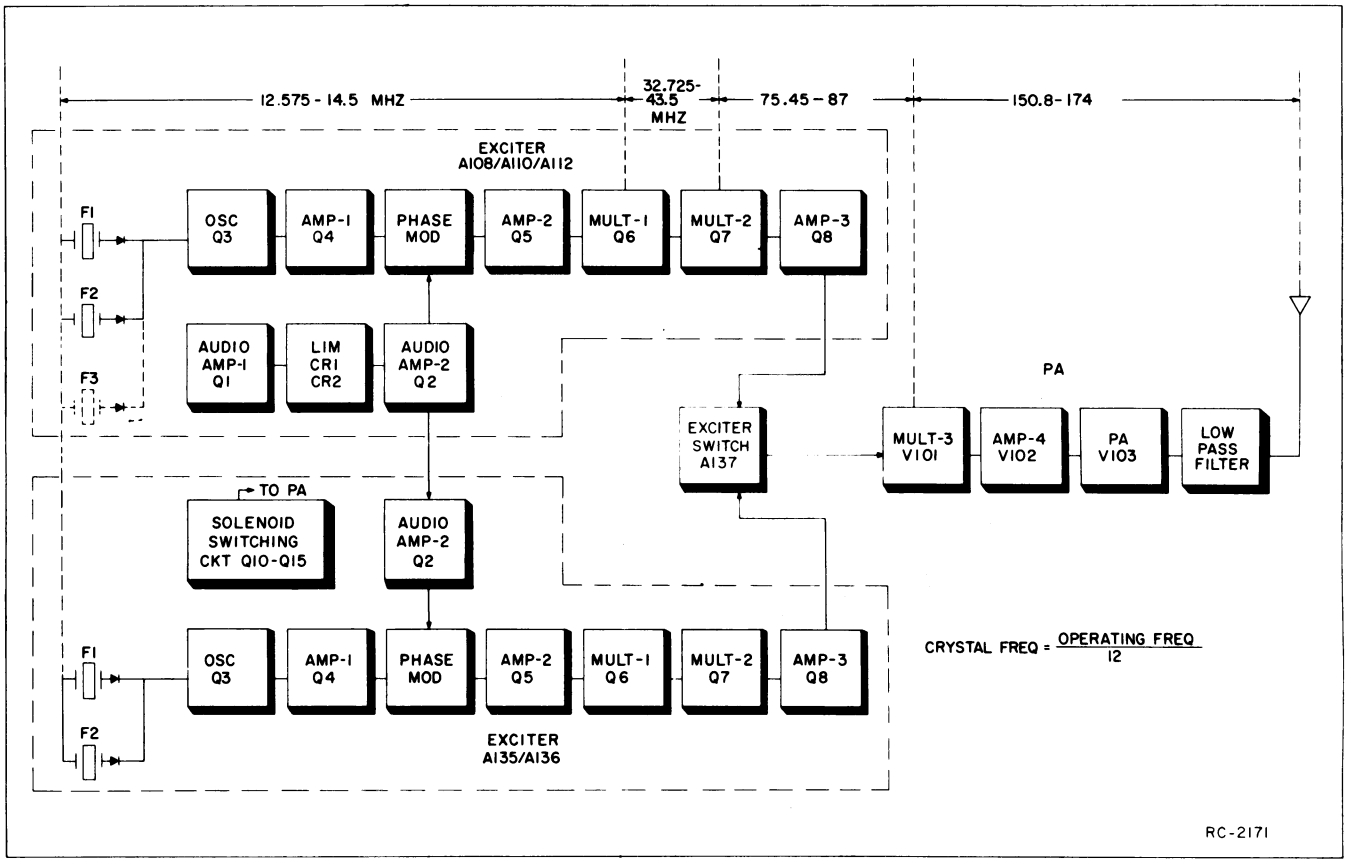


Figure 1 - Transmitter Block Diagram

CIRCUIT ANALYSIS

The frequency of the crystals used ranges from 12.575 to 14.5 megahertz, and the crystal frequency is multiplied twelve times.

A centralized meter 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 -- +680 volts PA B+
- Pin 8 -- 45 volts bias
- Pin 15 -- 20 volts for Exciter Board

EXCITER BOARDS

The transmitter uses Exciter Boards A108.A110/A112 and A135/A136 for operation on two sub-band frequencies spaced up to 10.0 MHz apart. The exciter boards can be connected for operation in either of the sub-band frequency ranges. The sub-bands can be moved from one exciter board to the other by changing connections to J22 through J27 on Exciter A135/A136. Instructions for setting up the sub-band frequencies are contained on the Sub-Band Connection Chart as listed in the Table of Contents.

Both Exciter Boards contain identical oscillator, amplifier and multiplier circuits (Q2 through Q8). Exciter A110 contains an audio amplifier and limiter circuit (Q1, CR1 and CR2), and Exciter A136 contains the PA solenoid switching circuit (Q10 through Q15).

OSCILLATORS

Each exciter board contains identical transistorized Colpitts oscillators. The oscillator crystals are thermistor-compensated at both ends of the temperature range to provide instant frequency compensation, with a frequency stability of ±0.0005% without crystal ovens or warmers.

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. This forward biases the selected switching diode (CR3 thru CR5), reducing its impedance. This permits the crystal frequency to be applied to the base of oscillator Q3. Feedback for the oscillator is developed across C34. The oscillator output is coupled through an impedance matching emitter-follower amplifier stage (Q4) to the phase modulator.

AUDIO AMPLIFIERS AND LIMITER (A108/A110/A112)

An audio signal from the microphone is coupled through C1 to the base of Class A audio amplifier Q1. The design of the microphone, in conjunction with C2 and R3, produces a 6-dB audio pre-emphasis. RF decoupling is provided by R10 and C75.

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

Following the limiter stage is a second Class A amplifier, Q2. The collector 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.

AUDIO AMPLIFIER (A135/A136)

Audio from the emitter of A110-Q2 is coupled through C82 to the base of audio amplifier A136-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, C7 and C8/C9. The output of the filter and de-emphasis network is applied directly to the phase modulator.

PHASE MODULATORS (A108 & A135)

The phase modulator uses varactor CV1 (voltage variable capacitor) in series with tuneable coil L1. This network appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator varies the bias of CV1, resulting in a phase-modulated output. The output of the modulator is coupled through blocking capacitor C45 to the base of the second amplifier.

A second modulator stage is cascaded with the first modulator to permit the use of 6-Tone Channel Guard Encoder Model 4EH15A10. 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, 1st & 2nd MULTIPLIERS (A108 & A135)

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

Following Q5 are two inductively coupled Class C, common-emitter multiplier stages (Q6 and Q7). Q6 is a tripler, with collector tank T1 tuned to three times the crystal frequency. Metering resistor R50 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 R79 is for metering the MULT-2 stage at J102. The output of Q7 is inductively coupled through T3 and T4 to amplifier Q8. 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 R48.

SOLENOID CONTROL CIRCUIT (A135/A136)

The solenoid control circuit energizes or de-energizes the PA plate solenoid to shift the PA plate resonance from one sub-band to the other. The solenoid is energized when operating on the high sub-band frequency and de-energized when operating on the low sub-band frequency.

The circuit consists of LATCH gate Q14, UNLATCH gate Q13, flip-flop Q10 & Q11, DC switch Q12, and current cut-back stage Q15 and R110 (located on A137). A simplified Control Circuit diagram is shown in Figure 2.

With a high sub-band frequency selected at the control unit, keying the transmitter forward biases one of the LATCH gate diodes, turning on Q14. This turns off Q11 in the flip-flop, which turns on Q10. Turning on Q10 also turns on DC Switch Q12 and current cutback transistor Q15. Turning on Q12 and Q15 short circuits current-limiting resistor R110 so that the full supply voltage is used to energize the solenoid. Turning on Q15 also discharges capacitor C81. When the capacitor charges, Q15 turns off, removing the short across current-limiting resistor R110. The solenoid is now kept energized at a reduced current drain through R110 and Q12.

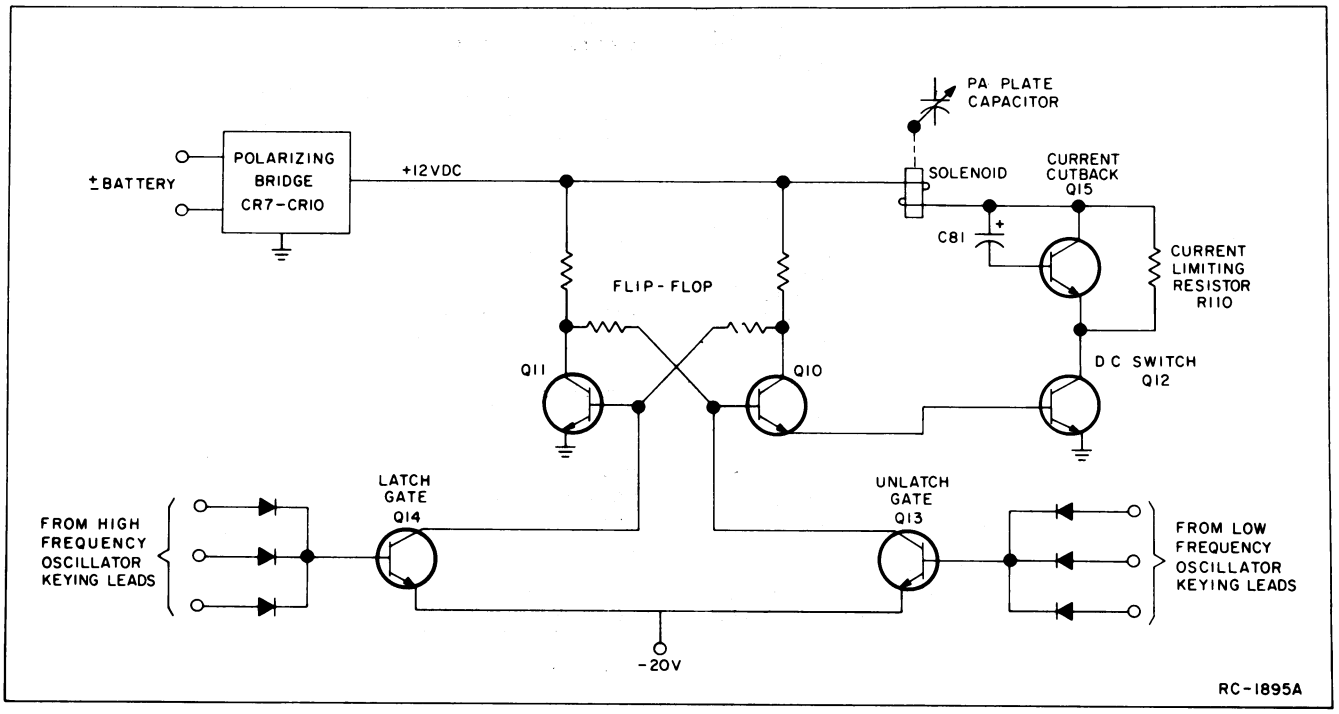


Figure 2 - Solenoid Control Circuit

Q10 and Q12 will remain on (keeping the solenoid energized) until the transmitter is operated on one of the high sub-band frequencies.

With a high sub-band frequency selected at the control unit, keying the transmitter forward biases one of the diodes in the UNLATCH gate, turning on Q14. This turns off Q10 in the flip-flop, which turns off DC switch Q12, de-energizing the solenoid.

Q10 will remain off (with Q11 on) until the transmitter is operated on one of the low sub-band frequencies.

EXCITER SWITCH (A137)

The RF developed at the output of the exciter operates the corresponding transistor switch (Q1 or Q2) on the Exciter Switch A137, coupling the RF to transformer T101 in the grid circuit of multiplier V101.

PA ASSEMBLY

The PA assembly includes the tubed multiplier, amplifier and power amplifier stages. Interstage coupling is provided by three pairs of inductively-coupled, stagger-tuned circuits with one circuit in each pair tuned to the high frequency sub-band and the other tuned to the low frequency sub-band.

The PA plate circuit is tuned by a silver-plated copper slug and the solenoid-operated capacitor. The solenoid is energized to provide the additional capacitance required for shifting the plate tank resonance from the high sub-band frequency to the low sub-band frequency.

3RD MULTIPLIER

The output of the selected exciter is coupled by the transistor switch on A137 to RF transformer T101. The primary (L2) and secondary (L1) of transformer T101 are variable for tuning the grid of V101. This stage operates as a doubler with the plate tank tuned to twelve times the crystal frequency. The plate tank is tuned by C110.

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

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

POWER AMPLIFIER

Drive from 4th amplifier V102 is inductively coupled to the grid of power amplifier V103 through L106 and L108.

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

Power amplifier V103 is a dual tetrode operating in a push-pull circuit. The PA plate is tuned by L112, and by solenoid-operated capacitor C136. High B-plus is supplied through L110 to a center tap on the plate tank coil L112. C122 is a high-voltage by-pass capacitor. The screen grid dropping resistors are R117 and R118. Plate current is metered from J102-1 to J102-9 across metering resistor R120.

WARNING

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

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

Antenna coupling is achieved by varying the coupling betweel L112 and L114. C123 tunes the antenna circuit.

The RF output from the antenna coil is fed to low-pass filter FL101. This filter has a low insertion loss and a harmonic attenuation of at least -50 dB through all harmonics. The filter output is fed to the antenna changeover relay located on the front of the system frame.

ANTENNA CUTTING INSTRUCTIONS

The following antenna cutting procedure provides a whip length that is a compromise between two (or more) different ideal lengths for the widely spaced operation frequencies.

The compromise length is also affected by the location of the antenna on the vehicle and by the length of the transmission line between the antenna and the transmitter.

It should be noted that if the position of the antenna or the length of the transmission line is changed, it will probably be necessary to cut a new whip to accommodate the new conditions.

1. Install antenna model 4EY12A13 according to instructions except for Step 11. Do not cut the whip, but install it full length (approximately 19-1/2" long).

2. Connect a transmitter which has been tuned and loaded into an absorption wattmeter (such as a Bird Termiline) to the antenna.

3. With the transmitter operating on the lowest frequency in the low frequency sub-band, adjust the ANT COUPLING and the ANT TUNING controls for 0.7 V "G" reading on the GE Test Set according to the Transmitter Alignment Procedure (see Table of Contents).

4. Switch to the highest frequency in the high frequency sub-band and observe the "G" reading. The reading will be less than the 0.7 V reading obtained in Step 3 above.

5. Cut approximately 1/4" off of the whip and repeat Steps 3 and 4.

6. Continue this procedure, with progressively smaller increments of cutting until the "G" reading observed in step 4 is 0.7 V, duplicating the reading obtained by adjustment in Step 3.

CHANNEL GUARD ENCODER

Channel Guard Encoder Model 4EH15A10 is an externally mounted, fully transistorized encoder utilizing tone networks for added stability and reliability. The encoder is designed to modulate MASTR transmitters with up to six Channel Guard tones. The tone frequencies range from 71.9 to 203.5 Hz.

Refer to Maintenance Manual LBI-3660 for complete encoder instructions.

MAINTENANCE

DISASSEMBLY

To service the transmitter from the top --

1. Pull locking handle down and pull radio about one inch out of mounting frame.

2. Pry up cover at rear of transmitter.

3. Slide cover back and lift off.

To service the transmitter from the bottom -

1. Pull locking handle down and pull radio out of mounting frame.

2. Remove the two screws in the bottom cover, and pry up at back of transmitter.

3. Slide cover back and lift off.

NOTE

The tube shields for the 80-watt transmitter are spring-loaded, and can be pulled off of the tube.

To remove transmitter from system frame --

1. Loosen the two retaining screws in the front casting (see Figure 3) 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.

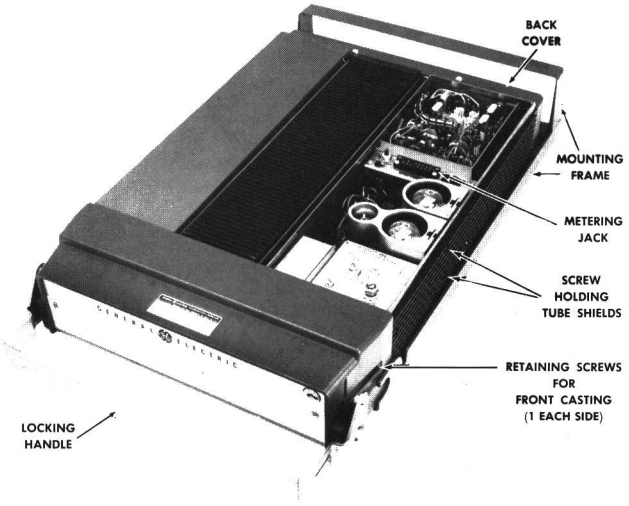


Figure 3 - Top Cover Removed

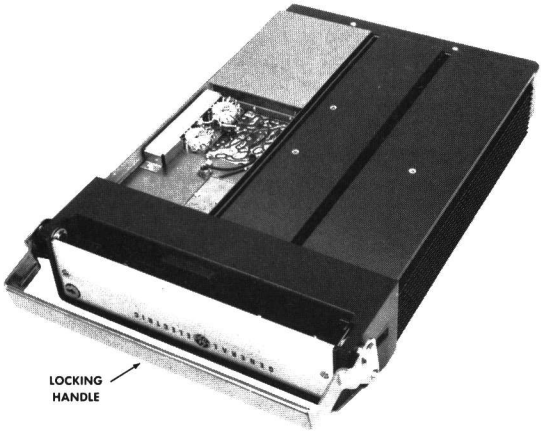


Figure 4 - Bottom Cover Removed

MODULATION LEVEL ADJUSTMENT

The MOD ADJUST (R12) was adjusted to the proper setting before shipment and should not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause over-modulation are clipped by the modulation limiter. The limiter, in conjunction with the de-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing overmodulation while preserving intelligibility.

TEST EQUIPMENT

1. An audio oscillator Model 4EX6A10
2. A frequency modulation monitor
3. An output meter or a VTVM
4. GE Test Set Models 4EX3A10 or 4EX8K11

PROCEDURE

1. Connect the audio oscillator and the meter across 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) on both exciter boards 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, pre-set the Channel Guard MOD ADJUST (R54) to the mid-range position on both exciter boards. Next, set R34 on each exciter for 0.75 kHz tone deviation. Then repeak L1 and L3 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 both Exciter Boards. Next, apply a 1.0 volt signal at 1000 Hz and set MOD ADJUST (R12) on each exciter for 3.75 kHz deviation on the channel producing the largest amount of deviation (4.5 kHz minus 0.75-kHz tone deviation).

PA PLATE POWER INPUT

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

$$P_I = \frac{\text{Plate Voltage} \times \text{Plate Current Indication}}{3.0}$$

Where:

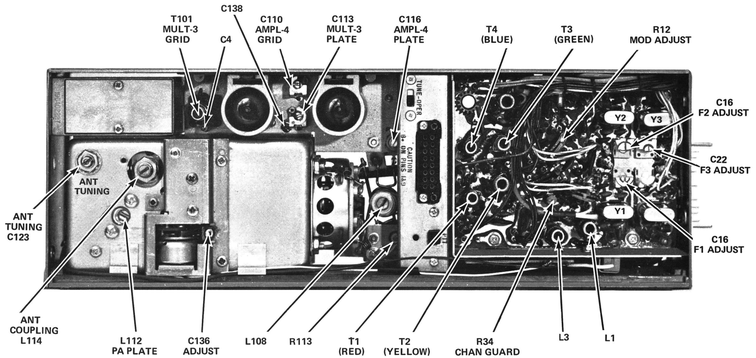
P_I is the power input in watts.

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

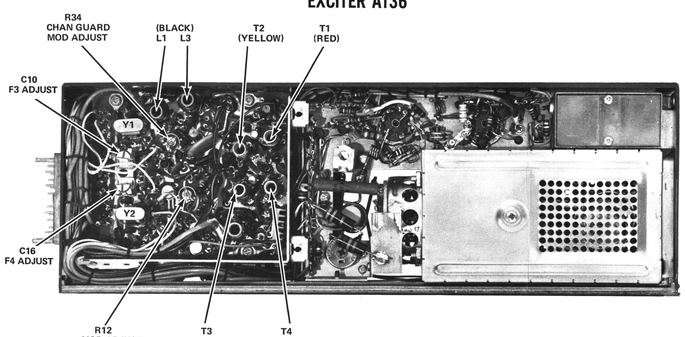
Plate current indication is measured with GE Test Set in Position G, using the TEST 1 scale (or measured from J102-1 to -9 with multimeter).

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

EXCITER A110/A112



EXCITER A136



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

GE Test Set Models 4EX3A10 or 4EX8K11, Station Metering Panel, or a 20,000 ohm-per-Volt Multimeter with a 1-Volt scale.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place crystals (operating frequency ÷ 12) into crystal sockets, and place the TUNE-OPERATE switch in the TUNE position.
2. For a badly mis-aligned transmitter, set the crystal trimmers to mid-capacity. Set the slugs in the coils of both exciter boards to the bottom of the coil form. Then set one slug in T101 to the top of the coil form and the other slug to the bottom of the coil form.
3. On two-frequency exciter boards, align the transmitter on the highest frequency. On three-frequency exciter boards, align the transmitter on the center frequency.

NOTE

In this procedure, the Alignment Frequency in the low frequency sub-band will be designated AF-1. The alignment frequency in the high frequency sub-band will be designated AF-2.

4. Connect the GE Test Set to Centralized Metering Jack J102. If using a Multimeter, connect the positive lead to J102-16 (Ground) unless otherwise indicated.
5. Place the frequency selector switch in the AF-1 (low frequency sub-band) position.
6. Place the Tune/Operate switch in the Tune position.
7. Set R113 to mid range.
8. All adjustments are made with the transmitter keyed

NOTE

Do not key the transmitter over 10 seconds in each 30-second period.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE TEST SET	METERING POSITION: MULTIMETER (-) AT J102)	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
			EXCITERS		
1.	A (Mult-1)	Pin 10	L1 and L3	0.8V (0.5V Minimum)	Tuning the modulator is a critical adjustment. Alternately tune L1 and L3 for maximum meter reading.
2.	A	Pin 10	T1	See Procedure	Tune T1 for a small change in meter reading.
3.	B (Mult-2)	Pin 2	T2 and T1	0.65V (0.5V Minimum)	Alternately tune T2 and T1 for maximum meter reading.
4.	B (Mult-2)	Pin 2	T3	See Procedure	Tune T3 for a change in meter reading.
5.	C (Mult-3)	Pin 3	T4, T3, & T5	0.6V (0.5V Minimum)	Alternately tune T4 and T3 for maximum meter reading. Tune T5 for minimum meter reading.
6.				See Procedure	Switch to AF-2 and perform Steps 1 thru 5 on the other exciter board.
			PA ASSEMBLY		
7.	D (Mult-3)	Pin 4	T101 (Mult-3 Grid)	See Procedure	Adjust C4 to approximately 18 turns out from maximum capacity, turn C4 clockwise approximately 1-1/2 turns for each MHz of sub-band spread. Tune the top slug to AF-1 and the bottom slug to AF-2 until both readings are maximum. If the readings are too low, increase the capacity of C4. If the readings "pull", decrease the capacity of C4. Repeat steps 5 and 7 on both exciters.

STEP	METERING POSITION: GE TEST SET	METERING POSITION: MULTIMETER (-) AT J102)	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
8.	E (Ampl-4)	Pin 5	C110 and C113	0.4 Volt Minimum	Alternately tune C110 at AF-1 and C113 on AF-2 for maximum meter readings. NOTE Adjust C138 to approximately 20 turns out from maximum capacity.. Turn C138 clockwise approximately 2 turns for each MHz of sub-band spread. If the readings are too low, increase the capacity of C138. If the readings "pull", decrease the capacity of C138. If the final readings are less than 0.4V or different by more than 0.08 V repeat Step 8.
9.	F (PA Grid)	Pin 14 (+) and Pin 6 (-)	L108 and C116	0.9 Minimum	Alternately tune L108 to AF-1 and C116 to AF-2 for maximum meter readings. If 0.9 Volts is not obtained, or if both readings are not within 0.1 Volt, adjust R113 to give a reading of 0.7 Volts on the frequency producing maximum. NOTE The inter-stage coupling is quite critical. If the readings differ by more than 0.15 Volts, adjust coupling between L106 and L108. Position L106 closer to L108 for greater coupling or farther away for less coupling. Repeat Step 9.
10.					Rotate ANTENNA COUPLING control fully clockwise.
11.	G (PA Plate)	Pin 1 (+) and Pin 9 (-) WARNING High B+ on Pins 1 and 9	L112, L114 & C136	Minimum	Adjust L112 and ANT COUPLING for minimum meter reading on AF-2. Next, adjust C136 by means of the solenoid stop screw for minimum meter reading on AF-1.
12.					Place the TUNE-OPERATE switch in the OPERATE position.
13.	G (PA Plate)	Pin 1 (+) and Pin 9 (-)	L112, L114 & C136	Minimum	Tune L112 and ANT COUPLING on AF-2 and C136 on AF-1 for minimum meter reading.
14.	G (PA Plate)	Pin 1 (+) and Pin 9 (-)	Ant Coupling and ANT Tuning	See Procedure	Switch to AF-1 and adjust ANT COUPLING control for a meter reading of approximately 0.5 Volts. Next, adjust ANT TUNING control for maximum meter reading on AF-2.
15.	G (PA Plate)	Pin 1 (+) and Pin 9 (-)	Ant Coupling and ANT Tuning	0.5 V	Alternately adjust ANT COUPLING for a meter reading of 0.5 Volts and ANT TUNING for maximum meter reading, until the maximum ANT TUNING meter reading is 0.5 Volts.
16.	F (PA Grid)	Pin 14 (+) and Pin 6 (-)	L108 and C116	Maximum (1.0 V Minimum)	Alternately tune L108 on AF-1 and C116 on AF-2 for maximum meter reading. If both readings are not within 0.10 Volt, repeat Step 9. F reading must not exceed 1.0 V.
17.	G (PA Plate)	Pin 1 (+) and Pin 9 (-)	ANT TUNING and ANT COUPLING	See Procedure	Switch to AF-1. Alternately adjust ANT TUNING for maximum meter reading and ANT COUPLING for a meter reading of 0.7 Volt until the ANT TUNING meter reading is 0.7 Volt.
18.	G (PA Plate)	Pin 1 (+) and Pin 9 (-)	ANT COUPLING	0.7 V	Observe the meter reading on both AF-1 and AF-2. Adjust the ANT COUPLING control for a meter reading of 0.7 Volt on the alignment frequency producing the highest meter reading.
			FREQUENCY ADJUSTMENT		
19.					With no modulation applied, adjust crystal trimmers C10 and C16 (C22 when required) on both exciters for proper oscillator frequency. Next, refer to the MODULATION LEVEL ADJUSTMENT.

TEST PROCEDURES

These Test Procedures are designed to assist you in servicing a transmitter that is operating--but not properly. Problems encountered could be low power output, low B plus, tone and voice deviation, defective audio sensitivity and modulation adjust control set too high. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once a defect is pin-pointed, refer to the "Service Check" and the additional corrective measures included in the Transmitter Troubleshooting Procedure. Before starting with the Transmitter Test Procedures, be sure the transmitter is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

for test hookup as shown:

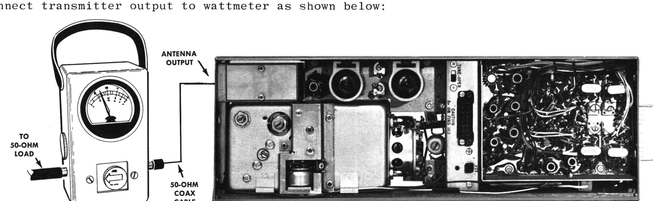
1. Wattmeter similar to:
   - Bird #43
   - Jones #711N
2. VTVM similar to:
   - Triplett #850
   - Heath #IM-21
3. Audio Generator similar to:
   - GE Model 4EX6A10 or
   - Heath #IG-72
4. Deviation Meter (with a .75 kHz scale) similar to:
   - Measurements #140
   - Lampkin #205A
5. Multimeter similar 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 80 watts.

SERVICE CHECK

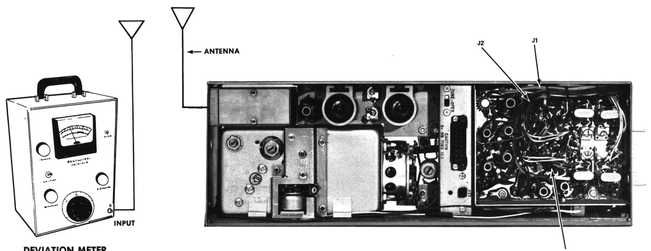
Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2

TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



2. Unplug the MIC HI terminal from J1 on Transmitter Exciter Board.
3. Key transmitter and check for 0.75 kHz deviation. If reading is low or high, adjust Channel Guard MOD ADJUST (R34) for a reading of 0.75 kHz.

NOTES:

The Channel Guard MOD ADJUST (R34) may be adjusted for deviations up to 0.80 kHz for tone frequencies from 71.9 Hz to 82.5 Hz and deviations up to 1.0 kHz for all tone frequencies above 82.5 Hz.

DEVIATION METER

NOTES:

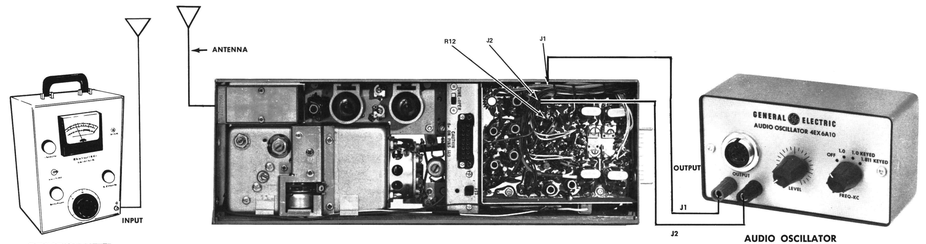
1. On units supplied with Channel Guard, the Phase Modulator Tuning should be peaked carefully to insure proper performance. (Refer to Steps 1 and 2 in the Transmitter Alignment Chart).
2. The tone Deviation Test Procedures should be repeated everytime the Tone Frequency is changed.

STEP 3

VOICE DEVIATION AND SYMMETRY

TEST PROCEDURE

1. Unplug the High and Low Mike leads from Jacks J1 and J2 on Exciter Board A108/A110/A112.
2. Connect test equipment to transmitter as shown below:



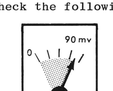
3. Set the generator output to 1.0 VOLTS RMS and frequency to 1 kHz
4. Key the transmitter and adjust Deviation Meter to carrier frequency.
5. Deviation reading should be ±4.5 kHz.
6. Adjust "Modulation Adjust Control" R12 until deviation reads 4.5 kHz on plus (+) or minur (-) deviation, whichever is greater. This adjustment should be made with the correct level of tone applied on Channel Guard transmitters. Leave the audio oscillator connected to A108/A110/A112 and adjust R12 on Exciter A135/A136 for 4.5 kHz on plus or minus deviation (whichever is greater).

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 3.3 kHz. Voltage should be LESS than 90 millivolts.

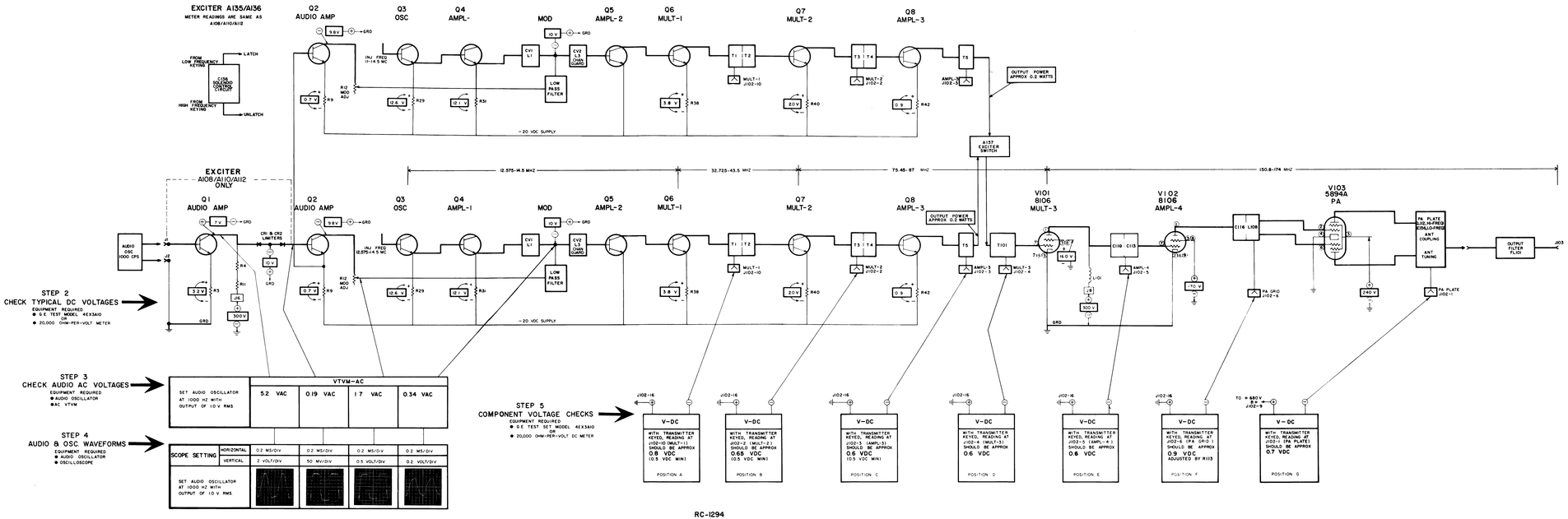


STEP I - QUICK CHECKS

POWER OUTPUT	CHECK VOLTAGES AT CENTRALIZED METERING JACK J102 Multimeter= pin numbers GE Test Set= A-G positions							PROBABLE DEFECT
	Pins 10 & 16 A	Pins 2 & 16 B	Pins 3 & 16 C	Pins 4 & 16 D	Pins 5 & 16 E	Pins 6 & 14 F	Pins 1 & 9 G	
Low	0.8V	0.65V	0.6V	0.6V	0.55V	Low	0.7V	Weak 5894A or Loose Hardware in output tank circuit, or bad filter.
0	0.8V	0.65V	0.6V	0.6V	0.55V	.37V	0	Open 5894A
0	0.8V	0.65V	Low	.18V	0	.37V	0	Open Filament on 8106
0	0.8V	0.65V	0 or over 1.0V	.18V	0	.37V	0	Defective Q8
0	0.8V	0 or over 1.0V	0	.18V	.77V	.37V	0	Defective Q7
0	over 1.2V	0	0	.18V	0	.37V	0	Shorted Q6 or Open Q5
0	0	0	0	.18V	0	.37V	0	Defective Q3-Q6 or Modulator (see Note A)

NOTE A --- Localize trouble by checking: --

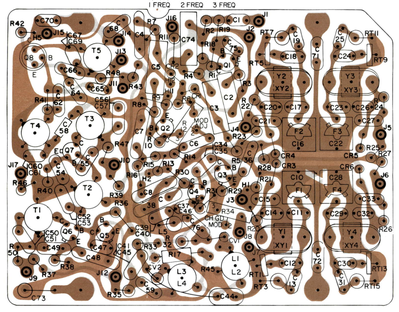
1.	-20 volt DC supply at J102-12-16.
2.	Measure 12.1 VDC across Q4 emitter resistor R31 (1500 ohms), then:
(a)	Remove crystal- a slight variation in R31 voltage reading indicates Q3 and Q4 stages operating properly.
(b)	If no voltage is measured, check keying leads CR3-CR6, Q3, Q4.
(c)	With crystal removed, short Q5 base to emitter. A voltage reading above 1.0 volt indicates Q5 and Q6 are operating properly. Defect may be in Modulator.
(d)	If modulator is defective, check voltage variable diodes CV1 and CV2.



TROUBLESHOOTING PROCEDURE

150.8—174 MHz, 80-WATT MASTR TRANSMITTER
MODELS 4ET58J10-12

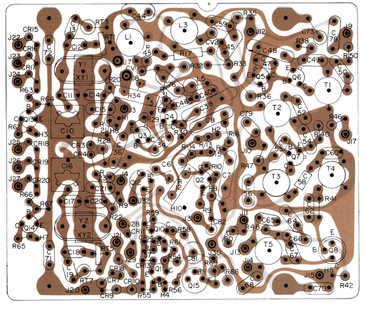
EXCITER
A108/A110/A112
1 FREQ 2 FREQ 3 FREQ



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

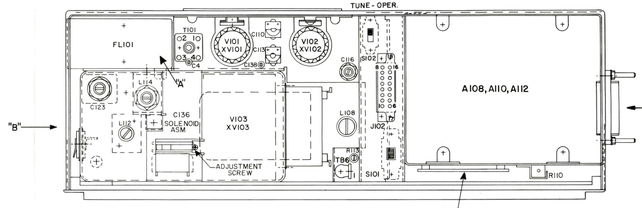
RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

EXCITER
A135 & A136
1 FREQ 2 FREQ



(19C311278, Sh. 1, Rev. 2)
(19C311278, Sh. 2, Rev. 2)

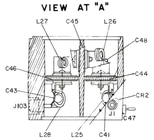
TOP VIEW



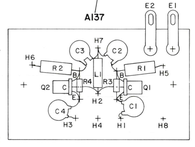
PIN READINGS AT J101 TAKEN TO CHASSIS GROUND

PIN	-	+
1	0	0
2	∞	∞
3	1.4	1.4
4	25K	26K
5	∞	∞
6	∞	∞
7	∞	∞
8	26K	26K
9	∞	∞
10	36K	32K
11	∞	∞
12	28K	14K
13	∞	∞
14	∞	∞
15	4.4K	2.5K
16	26K	14K
17	17K	10K
18	17K	10K
19	0	0
20	∞	∞

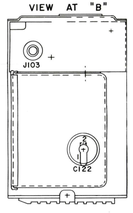
VIEW AT "A"



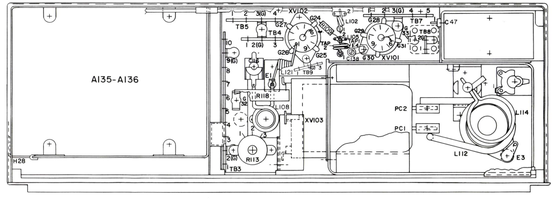
A137



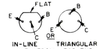
VIEW AT "B"



BOTTOM VIEW



LEAD IDENTIFICATION



NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

READINGS TAKEN FROM TUBE SOCKET PINS TO CHASSIS GROUND

PIN	1	2	3	4	5	6	7	8	9	10	11	12
XV101	25K	0	38K	1.3	0	0	12K	38K	0			
XV102	25K	0	25K	1.3	0	0	12K	25K	0			
XV103	0	27K	29K	0	9	27K	1.3	-	-			

(19B621729, Rev. 0)

OUTLINE DIAGRAM

150.8—174 MHz MASTR TRANSMITTER
MODELS 4ET58J10-12

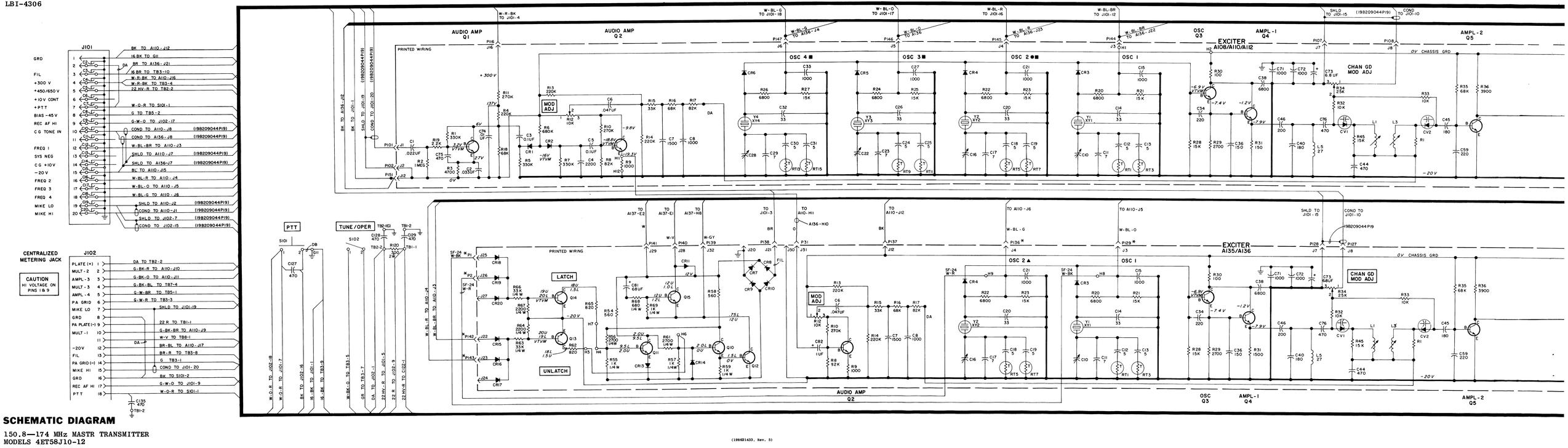
PARTS LIST

LBI-4305

150.8-174 MHz TRANSMITTER
MODEL 4ET58J10-J12

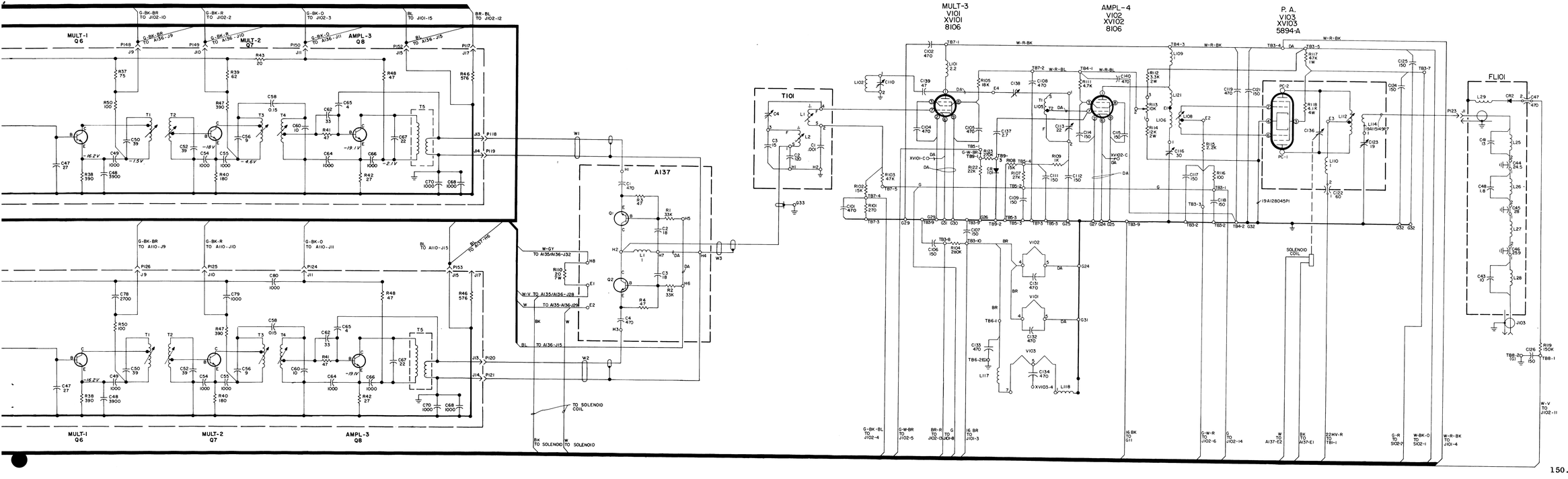
SYMBOL	GE PART NO.	DESCRIPTION
		EXCITER BOARD
A108,A110		A108 19D402308G8
A112,A135		A110 19D402308G10
and A136		A112 19D402308G13
		A135 19D402308G21
		A136 19D402308G22
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P3	Polyester: .022 µF ±20%, 50 VDCW.
C2	19A116080P4	Polyester: .033 µF ±20%, 50 VDCW.
C3	19A116080P7	Polyester: 0.1 µF ±20%, 50 VDCW.
C4	7491395P114	Ceramic disc: .0022 µF ±10%, 500 VDCW.
C5	19A116080P7	Polyester: 0.1 µF ±20%, 50 VDCW.
C6	19A116080P5	Polyester: .047 µF ±20%, 50 VDCW.
C7	7491395P111	Ceramic disc: .0015 µF ±10%, 500 VDCW.
C8	5493367P1000K	Silver mica: .001 µF ±10%, 100 VDCW; sim to Electro Motive Type DM-20.
C10	54912719106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C11	5496219?7	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C12 and C13	19C300685P3	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C14	54962119?51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C15	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	54912719106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C17	5496219?7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C18 and C19	19C300685P3	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C20	54962119?51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C21	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C22	54912719106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C23	5496219?7	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C24 and C25	19C300685P3	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C26	54962119?51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C27	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C28	54912719106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C29	5496219?7	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C30 and C31	19C300685P3	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C32	54962119?51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C33	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C34	54963?72P50	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -2200 PPM.
C36	54962189?67	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -220 PPM.
C38	54944819?131	Ceramic disc: 6800 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C40	54963?72P345	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C44	54933664?40J	Silver mica: 470 pf ±5%, 100 VDCW; sim to Electro Motive Type DM-15.
C45	54963?72P45	Ceramic disc: 180 pf ±10%, 500 VDCW, temp coef -2200 PPM.
C46	54963?72P347	Ceramic disc: 200 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C47	54962197?49	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -150 PPM.
C48	5494481P129	Ceramic disc: 3900 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C49	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C50	54962197P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C52	54962197P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C54 and C55	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C56	54962189?40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C58	5491601P35	Tubular: 0.15 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C59	54933664P220K	Silver mica: 220 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C60	54962197P241	Ceramic disc: 10 pf ±5%, 500 VDCW, temp coef +30 PPM.
C62	54962189?51	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef 0 PPM.
C64	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C65	54962189?35	Ceramic disc: 4 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C66	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C67	54962189?247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C68	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C70 thru C72	5494481P111	Ceramic disc: .001 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C73	5496267?18	Tantalum: 6.8 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
C74	19A115414P13	Tubular, polyester: 0.1 µF ±20%, 200 VDCW.
C75	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RM Type JF Discap.
C76	54933664P470K	Mica: 470 pf ±10%, 100 VDCW; sim to Electro Motive Type DM-15.
C79 and C80	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C81	5496267?11	Tantalum: 68 µF ±20%, 15 VDCW; sim to Sprague Type 150D.
C82	5496267?17	Tantalum: 1.0 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3 thru CR6	19A115603P1	Silicon.
CR7 thru CR10	4037822P1	Silicon.
CR11	19A115250P1	Silicon.
CR13 thru CR20	19A115250P1	Silicon.
CY1 and CY2	540576?9P6	Silicon, capacitive.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J17	4033513P4	Contact, electrical; sim to Bead Chain L63-3.
J20 thru J32	4033513P4	Contact, electrical; sim to Bead Chain L63-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B204526G2	Coil. Includes tuning slug 5491788P2.
L3	19B204526G4	Coil. Includes tuning slug 5491788P2.
R1	3R152P333J	Composition: 33,000 ohms ±5%, 1/4 w.
L5	7488079P48	Choke, RF: 27 µh ±10%, 1.4 ohms DC res; sim to Jeffers 4422-6K.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1 and P2	6029846?2	Contact, electrical: sim to Amp 42827-2.
P31	6029846?2	Contact, electrical: sim to Amp 42827-2.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q3 thru Q5	19A115330P2	Silicon, NPN.
Q6 and Q7	19A115326P1	Silicon, NPN.
Q8	19A115323P1	Silicon, NPN; sim to Type 2N2712.
Q10 and Q11	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q12	19A115330P2	Silicon, NPN; sim to Type 2N3053.
Q13 and Q14	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q15	19A115330P2	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R2	3R77P105K	Composition: 1 megohm ±10%, 1/2 w.
R3	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R4	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R5	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R6	3R77P684K	Composition: 0.68 megohm ±10%, 1/2 w.
R7	3R77P334K	Composition: 0.33 megohm ±10%, 1/2 w.
R8	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R9	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R10 and R11	3R77P274K	Composition: 0.27 megohm ±10%, 1/2 w.
R12	19B209358P106	Variable, carbon film: approx 75 to 10,000 ohms ±10%, 0.25 w; sim to CTS Type X-201.
R13 and R14	3R77P224K	Composition: 0.22 megohm ±10%, 1/2 w.
R15	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R16	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R17	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R18	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R19	3R77P223K	Composition: 2300 ohms ±10%, 1/2 w.
R20	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R21	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R22	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R23	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R24	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R25	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R26	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R27 and R28	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R29	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R30	3R77P103K	Composition: 100 ohms ±10%, 1/2 w.
R31	3R77P152K	Composition: 1500 ohms ±10%, 1/2 w.
R32 and R33	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R34	19B209358P107	Variable, carbon film: approx 75 to 25,000 ohms ±10%, 0.35 w; sim to CTS Type X-201.
R35	3R77P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R36	3R77P392K	Composition: 3900 ohms ±10%, 1/2 w.
R37	3R77P750J	Composition: 75 ohms ±5%, 1/2 w.
R38	3R77P391K	Composition: 390 ohms ±10%, 1/2 w.
R39	3R77P620J	Composition: 62 ohms ±5%, 1/2 w.
R40	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R41	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R42	3R77P270K	Composition: 27 ohms ±10%, 1/2 w.
R43	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
R45	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R46	19A116278P474	Metal film: 576,000 ohms ±2%, 1/2 w.
R47	3R77P391K	Composition: 390 ohms ±10%, 1/2 w.
R48	3R77P470K	Composition: 47 ohms ±10%, 1/2 w.
R50	3R77P101K	Composition: 100 ohms ±10%, 1/2 w.
R54	3R77P561K	Composition: 560 ohms ±10%, 1/4 w.
R55	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R56	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R57	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R58	3R77P561K	Composition: 560 ohms ±10%, 1/4 w.
R59	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
R61	3R152P272K	Composition: 2700 ohms ±10%, 1/4 w.
R62	3R77P821K	Composition: 820 ohms ±10%, 1/4 w.
R63	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R64	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R65	3R77P821K	Composition: 820 ohms ±10%, 1/4 w.
R66	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R67	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R68	3R152P681K	Composition: 680 ohms ±10%, 1/4 w.
R69	3R152P102K	Composition: 1000 ohms ±10%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT3	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT5	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT7	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT9	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT11	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
RT13	19B209284P6	Disc: 75 ohms res nominal at 25°C, color code blue.
RT15	19B209284P2	Rod: 21,400 ohms res nominal at 25°C, color code red.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19B204534G1	Coil. Includes tuning slug 5491788P4.
T2	19B204531G1	Coil. Includes tuning slug 5491788P4.
T3	19B204535G1	Coil. Includes tuning slug 5491788P4.
T4	19B204535G2	Coil. Includes tuning slug 5491788P4.
T5	19B204537G1	Coil. Includes tuning slug 5491788P4.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (RC-2210).
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
		When reordering give GE Part No. and specify exact freq needed.
Y1 thru Y4	19B206175P70	Crystal Freq = (OF ÷ 12). Quartz: freq range 12.500 to 14.500 KHz, temp range +30°C to +85°C. (150.8-174 MHz Transmitter)
A137		COMPONENT BOARD 19B201814G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5494481P6	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2 and C3	54962189?45	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef 0 PPM.
C4	5494481P5	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	7488079P6	Choke, RF: 1.00 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4411-6K.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P118	6029846?2	Contact, electrical: sim to Amp 42827-2.
P119	6029846?1	Contact, electrical: sim to AMP 41854.
P120	6029846?2	Contact, electrical: sim to Amp 42827-2.
P121	6029846?1	Contact, electrical: sim to AMP 41854.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P333K	Composition: 33,000 ohms ±10%, 1/2 w.
R3 and R4	3R152P470K	Composition: 47 ohms ±10%, 1/4 w.
		CHASSIS AND PA ASSEMBLY 19E300926G3
		- - - - - - - - - CAPACITORS - - - - - - - - -
C101 and C102	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C104 and C105	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C106 and C107	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C108	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C109	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C110	19A116480P5	Variable: approx than 2.8 to 22 pf, 500 VDCW; sim to EF Johnson 189.
C111 and C112	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C113	19A116480P5	Variable: approx than 2.8 to 22 pf, 500 VDCW; sim to EF Johnson 189.
C114 and C115	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C116	19B209338P10	Variable: approx 2.62 to 30.6 pf; sim to EF Johnson Type Y 185-10-2.
C117 and C118	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C119	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C121	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C122		(Part of Mechanical Parts, see RC-2210).
C123	7491398P5	Variable, air: approx 4.0-19 pf; sim to Voltronics T-0974-4.
C124 thru C126	5494481P1	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C127 thru C129	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C131 thru C133	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C136	19C317700G1	Solenoid Assembly.
C137	5491601P28	Phenolic: 2.7 pf ±10%, 500 VDCW.
C138	19A116554P1	Variable: 0.3 to 1.5 pf, 500 VDCW, +125 -250 PPM/°C.
C139	5496219?17	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -150 PPM.
C140	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR101	19A115250P1	Silicon.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL101		LOW PASS FILTER ASSEMBLY 19D402233G10
		The low pass filter is factory tuned. If it is found to be necessary it is recommended that the entire filter assembly be replaced to maintain rated power output and spurious attenuation.
		- - - - - - - - TERMINALS - - - - - - - -
E1	19A127909G1	Terminal.
E3	4036994P1	Terminal, solder: sim to Zierick Mfg Corp 505.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J101	19C303426G1	Connector: 30 pin contacts.
J102	19B209388G1	Connector: 18 contacts.
J103		(Part of FL101).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L101	7488079P8	Choke, RF: 2.2 µh ±10%, 1 ohm DC res; sim to Jeffers 4411-12K.
L102	19A128194P1	Coil.
L105	19A128037G3	Coil.
L106	19B219005P1	Coil.
L108	19B219341G1	Coil. Includes R115.
L109 and L110	7488079P6	Choke, RF: 1.00 µh ±10%, 0.30 ohms DC res max; sim to Jeffers 4411-6K.
L112	19B219009G1	Coil.
L114	19B219038G1	Coil.
L117 and L118	19A128034P1	Coil.
L121	19A128035P3	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P101	6029846?2	Contact, electrical; sim to Amp 42827-2.
P102	6029846?1	Contact, electrical; sim to Amp 41854.
P107	6029846?1	Contact, electrical; sim to Amp 41854.
P108	6029846?2	Contact, electrical; sim to Amp 42827-2.
P114	6029846?1	Contact, electrical; sim to Amp 41854.
P116 thru P117	6029846?2	Contact, electrical; sim to Amp 42827-2.
P123	4035313P21	Contact, electrical: sim to Bead Chain R125-22.
P124 thru P127	6029846?2	Contact, electrical; sim to Amp 42827-2.
P128	6029846?1	Contact, electrical; sim to Amp 41854.
P129	6029846?2	Contact, electrical; sim to Amp 42827-2.
P130 thru P143	6029846?2	Contact, electrical; sim to Amp 42827-2.
P144 thru P153	6029846?1	Contact, electrical; sim to Amp 41854.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	3R77P271K	Composition: 270 ohms ±10%, 1/2 w.
R102	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R103	3R77P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R104	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R105	3R77P183K	Composition: 18,000 ohms ±10%, 1/2 w.
R107	3R77P273K	Composition: 27,000 ohms ±10%, 1/2 w.
R108	3R77P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R109	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R110	5493035P20	Wirewound: 20 ohms ±5%, 7 w; sim to Hamilton Hall Type HR.
R111	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R112	19A116479P 2333K	Metal film: 2300 ohms ±10%, 2 w; sim to Mallory Type 3 MX.
R113	19B209311P7	Variable, wirewound: 10,000 ohms ±20%, 3 w; sim to CTS Series 115.
R114	3R79P123K	Composition: 12,000 ohms ±10%, 2 w. (Part of L108).
R115		
R116	3R77P101J	Composition: 100 ohms ±5%, 1/2 w.
R117	3R78P473K	Composition: 47,000 ohms ±10%, 1 w.
R118	19A116479P 4612K	Metal film: 4100 ohms ±10%, 4 w; sim to Mallory Type 4 MX.
R119	3R77P154K	Composition: 0.15 megohm ±10%, 1/2 w.
R120	19A115416P7	Wirewound: 3 ohms ±5%, 2 w; sim to Dale Type RS-2B.
R122	3R77P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R123	3R77P274K	Composition: 0.27 megohm ±10%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S101	4031922P1	Push: single pole, single throw, normally open, 1/2 amp at 13 VDC; sim to Stackpole Type SS-15.
S102	19B309046P1	Slide: DPDT, 0.5 amp at 125 v; sim to Continental Wire Type 128.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T101		COIL ASSEMBLY 19B219013G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	74891629P129	Silver mica: 130 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C3	54962189?344	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
C4	19A116554P1	Variable: 0.3 to 1.5 pf, 500 VDCW, -250 to +125 PPM/°C.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B219011P2	Coil.
L2	19B219011P1	Coil.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7487424P2	Miniature, phen: 1 terminal.
TB2	7487424P1	Miniature, phen: 1 terminal.
TB3	7775500P26	Phen: 10 terminals.
TB4	7775500P107	Phen: 3 terminals.
TB5	7775500P10	Phen: 4 terminals.
TB6	7775500P94	Phen: 2 terminals.
TB7	7775500P111	Phen: 5 terminals.
TB8	7487424P1	Miniature, phen: 1 terminal.
TB9	7487424P10	Miniature, phen: 2 terminals.
		- - - - - - - - - TUBES - - - - - - - - -
V101 and V102		Type 8106.
V103		Type 5894A.
		- - - - - - - - - SOCKETS - - - - - - - - -
XV101 and XV102	7480532P8	Tube, phen: 9 pins; sim to Elco 04-803-84.
XV103	7489471P3	Tube, ceramic or steatite: 7 pins.
		MECHANICAL PARTS (SEE RC-2210)
1	19B200525P9	Rivet. (Part of XY1-XY4).
2	4033083P1	Clip. (Part of XY1-XY4).
3	19A115793P1	Contact, electrical: sim to Malco 2700. (Part of XY1-XY4).
4	4036903P1	Clip: approx 13/16 x 13/16 inches.
5	19C311172P2	Crystal socket. (Part of XY1-XY4).
6	19C303396G4	Chassis heat sink.
7	19C317518G1	Tuning slug. (Part of L108).
8	19C313004C13	Screw, phillips head: No. 6-32 x 1/4.
9	4033306P25	Fiber washer.
10	19C317517G2	Tuning chassis.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



SCHEMATIC DIAGRAM

150.8—174 MHz MASTR TRANSMITTER
MODELS 4ET58J10-12



(198621433, Rev. 5)

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

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

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PLI9E5009266S	A
A108 - PLI9040230G6	F
A110 - PLI9040230G6	F
A112 - PLI9040230B6	F
A135 - PLI9040230B621	
A136 - PLI9040230B622	
A137 - PLI9E019181	

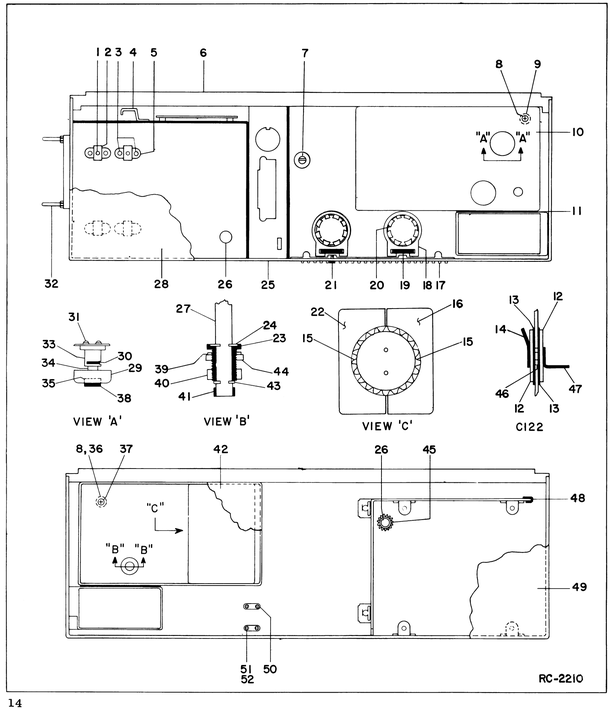
● PRESENT IN A110
■ PRESENT IN A112
▲ PRESENT IN A136

* THE CONNECTIONS TO A136-J3,J4 AND J22 THRU J27 VARY WITH TRANSMITTER MODEL AND FREQUENCY ARRANGEMENT. CONNECTIONS ARE SHOWN FOR F1 & F2 IN LO SUB BAND AND F3 & F4 IN HIGH SUB BAND.

NOTES:
1. ALL WIRES ARE N22 UNLESS OTHERWISE SPECIFIED.
2. ALL 22R WIRE IS A4036780P3.

SCHEMATIC DIAGRAM

150.8—174 MHz MASTR TRANSMITTER
MODELS 4ET58J10-12



(Cont'd from Pg. 11)

SYMBOL	GE PART NO.	DESCRIPTION
11	19A121527P1	Plate.
12	19A121006P8	Washer, aluminum. (Part of C122).
13	19A121018P2	Washer, teflon. (Part of C122).
14	7878455P1	Terminal, solderless. (Part of C122).
15	7165167P3	Tube shield insert. (Part of V103- a quantity of 2 is required).
16	19B219045P1	Heat sink. (Lower) (Used with V103).
17	19C703599P1	Heat sink.
18	19A121523P1	Heat sink. (Used with V101 and V102).
19	19B205622P1	Spring. (Used with V101 and V102).
20	7165167P5	Tube shield insert: sim to Atlas 106-332-5. (Used with V101 and V102).
21	19B209030P203	Tap screw: 4-40 x 3/16.
22	19B204792P2	Heat sink. (Upper) (Used with V103).
23	4031530P1	Bearing. (Part of Post assembly).
24	4031532P1	Cup washer. (Part of Post assembly).
25	19B204395G5	Chassis.
26	4036555P1	Insulator disc: nylon. (Used with Q8 on A101-A112, A131-A136).
27	19A127917P1	Post. (Part of Post assembly).
28	19C703396G1	Mobile top cover.
29	19A127869P1	Can. (Part of PA Plate Assembly).
30	19A127923P1	Spring. (Part of PA Plate Assembly).
31	8481P15004C6	Screw, phillips head: 8-32 x 1/4.
32	19A121676P1	Guide pin. (Used with J101).
33	19A128027G1	Bushing. (Part of PA Plate Assembly).
34	19A127900P1	Shaft. (Part of PA Plate Assembly).
35	19A127899P1	Disc. (Part of PA Plate Assembly).
36	4036899P33	Insulator stop.
37	8481P13004C	Screw, phillips head: 6-32 x 1/4.
38	8481P9006C	Screw, phillips head: 4-40 x 3/8.
39	7115130P9	Lockwasher: sim to Shakeproof 1220-2. (Part of Post Assembly).
40	4031531P1	Locknut: 8o. 32. (Part of Post Assembly).
41	4031527P2	Collar. (Part of Post Assembly).
42	19C703603P1	Tuning cover.
43	3910P18C13	Retaining ring. (Part of Post Assembly).
44	7892938P1	Nut: No. 38. (Part of Post Assembly).
45	4035439P1	Heat sink. (Used with Q8 on A135 and A136).
46	4031594P2	Insulator, teflon.
47	7878455P2	Terminal, solderless.
48	4029030P10	Channel, rubber.
49	19C703396G3	Mobile Bottom Cover.
50	19A116361P1	Terminal: sim to EF Johnson Q-16.677-001. (Used with L102 and L103).
51	9T5P1006C13	Screw, machine: brass 0-80 X 3/8. (Used with L102 and L103).
52	N207P1C13	Nut, brass: 0-80 thread. (Used with L102 and L103).

PRODUCTION CHANGES

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

REV. A thru F — Exciter Board A108, A110, A112

Incorporated into initial shipment.

REV. A — CHASSIS AND PA ASSEMBLY 19B500826G3

To improve tuning range between 166 and 174 MHz. Changed PA can.

SUB-BAND CONNECTIONS CHART

PROCEDURE

To change the sub-band frequencies, select the appropriate frequency arrangement, and then install the crystals and make the jumper connections as shown in the applicable Table.

Table I - Instructions for 4ET58J10

Frequency Arrangement	Chan	Sub Band	Exciter Board	Osc No.	Jumper Chart From		Color		To A135
1	F1	Lo	A108	1	A108	J3	W BL BR		J22
	F2	Hi	A135	1	A108	J4	W BL R		J3
2	F1	Hi	A135	1	A108	J3	W BL BR		J3
	F2	Lo	A108	2	A108	J4	W BL R		J22
Connect these jumpers as indicated in all units.					A108	J5	W BL O		J23
					A108	J6	W BL G		J24
					A135	H8	W BK		J25
					A135	H9	W R		J26

Table II - Instructions for 4ET58J11

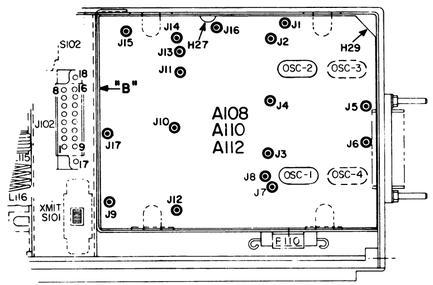
Frequency Arrangement	Chan	Sub Band	Exciter Board	Osc No.	Jumper Chart From		Color		To A136
1	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Hi	A136	2	A110	J4	W BL R		J4
	F3	Lo	A110	3	A110	J5	W BL O		J23
					A110	J6	W BL G		J24
2	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Lo	A110	2	A110	J4	W BL R		J22
	F3	Lo	A110	3	A110	J5	W BL O		J23
					A110	J6	W BL G		J24
3	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Lo	A110	2	A110	J4	W BL R		J22
	F3	Hi	A136	2	A110	J5	W BL O		J4
					A110	J6	W BL G		J27
4	F1	Lo	A110	1	A110	J3	W BL BR		J22
	F2	Lo	A110	2	A110	J4	W BL R		J23
	F3	Hi	A136	1	A110	J5	W BL O		J3
					A110	J6	W BL G		J27
5	F1	Lo	A110	1	A110	J3	W BL BR		J22
	F2	Hi	A136	1	A110	J4	W BL R		J3
	F3	Hi	A136	2	A110	J5	W BL O		J4
					A110	J6	W BL G		J27
6	F1	Lo	A110	1	A110	J3	W BL BR		J22
	F2	Hi	A110	1	A110	J4	W BL R		J3
	F3	Lo	A110	3	A110	J5	W BL O		J23
					A110	J6	W BL G		J24
Connect as indicated in all units					A136	H8	W BK		J25
					A136	H9	W R		J26

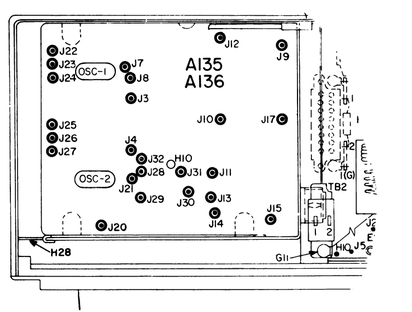
Table III - Instructions for 4ET58J12

Frequency Arrangement	Chan	Sub Band	Exciter Board	Osc. No.	Jumper Chart From		Color		To A136
1	F1	Hi	A112	1	A110	J3	W BL BR		J25
	F2	Hi	A112	2	A110	J4	W BL R		J26
	F3	Hi	A112	3	A110	J5	W BL O		J27
	F4	Lo	A136	1	A110	J6	W BL G		J3
					A136	H8	W BK		J22
					A136	H9	W R		J23
2	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Hi	A136	2	A110	J4	W BL R		J4
	F3	Lo	A112	3	A110	J5	W BL O		J22
	F4	Lo	A112	4	A110	J6	W BL G		J23
					A136	H8	W BK		J25
					A136	H9	W R		J26
3	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Lo	A112	2	A110	J4	W BL R		J22
	F3	Lo	A112	3	A110	J5	W BL O		J23
	F4	Lo	A112	4	A110	J6	W BL G		J24
					A136	H8	W BK		J25
					A136	H9	W R		J26
4	F1	Lo	A112	1	A110	J3	W BL BR		J22
	F2	Lo	A112	2	A110	J4	W BL R		J23
	F3	Lo	A112	3	A110	J5	W BL O		J24
	F4	Hi	A136	1	A110	J6	W BL G		J3
					A136	H8	W BK		J25
					A136	H9	W R		J26
5	F1	Lo	A112	1	A110	J3	W BL BR		J22
	F2	Lo	A112	2	A110	J4	W BL R		J23
	F3	Hi	A136	1	A110	J5	W BL O		J3
	F4	Hi	A136	2	A110	J6	W BL G		J4
					A136	H8	W BK		J25
					A136	H9	W R		J26
6	F1	Lo	A136	1	A110	J3	W BL BR		J3
	F2	Hi	A112	2	A110	J4	W BL R		J25
	F3	Hi	A112	3	A110	J5	W BL O		J26
	F4	Hi	A112	4	A110	J6	W BL G		J27
					A136	H8	W BK		J22
					A136	H9	W R		J23
7	F1	Hi	A112	1	A110	J3	W BL BR		J25
	F2	Hi	A112	2	A110	J4	W BL R		J26
	F3	Lo	A136	1	A110	J5	W BL O		J3
	F4	Hi	A112	4	A110	J6	W BL G		J27
					A136	H8	W BK		J22
					A136	H9	W R		J23

Table III - Continued

Frequency Arrangement	Chan	Sub Band	Exciter Board	Osc No.	Jumper Chart From		Color		To A136
8	F1	Hi	A112	1	A110	J3	W BL BR		J25
	F2	Lo	A136	1	A110	J4	W BL R		J3
	F3	Hi	A112	3	A110	J5	W BL O		J26
	F4	Hi	A112	4	A110	J6	W BL G		J27
					A136	H8	W BK		J22
					A136	H9	W R		J23
9	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Lo	A112	2	A110	J4	W BL R		J22
	F3	Lo	A112	3	A110	J5	W BL O		J23
	F4	Hi	A136	2	A110	J6	W BL G		J4
					A136	H8	W BK		J25
					A136	H9	W R		J26
10	F1	Lo	A112	1	A110	J3	W BL BR		J22
	F2	Hi	A136	1	A110	J4	W BL R		J3
	F3	Hi	A136	2	A110	J5	W BL O		J4
	F4	Lo	A112	4	A110	J6	W BL G		J23
					A136	H8	W BK		J25
					A136	H9	W R		J26
11	F1	Lo	A112	1	A110	J3	W BL BR		J22
	F2	Hi	A136	1	A110	J4	W BL R		J3
	F3	Lo	A112	3	A110	J5	W BL O		J23
	F4	Lo	A112	4	A110	J6	W BL G		J24
					A136	H8	W BK		J25
					A136	H9	W R		J26
12	F1	Lo	A112	1	A110	J3	W BL BR		J22
	F2	Lo	A112	2	A110	J4	W BL R		J23
	F3	Hi	A136	1	A110	J5	W BL O		J3
	F4	Lo	A112	4	A110	J6	W BL G		J24
					A136	H8	W BK		J25
					A136	H9	W R		J26
13	F1	Hi	A136	1	A110	J3	W BL BR		J3
	F2	Lo	A112	2	A110	J4	W BL R		J22
	F3	Hi	A136	2	A110	J5	W BL O		J4
	F4	Lo	A112	4	A110	J6	W BL G		J23
					A136	H8	W BK		J25
					A136	H9	W R		J26
14	F1	Lo	A112	1	A110	J3	W BL BR		J22
	F2	Hi	A136	1	A110	J4	W BL R		J3
	F3	Lo	A112	3	A110	J5	W BL O		J23
	F4	Hi	A136	2	A110	J6	W BL G		J4
					A136	H8	W BK		J25
					A136	H9	W R		J26





SUB-BAND CONNECTIONS CHART

CONNECTION CHARTS
TRANSMITTER MODELS 4ET58J10, 11 & 12

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

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

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

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

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

DF-3125

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GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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