GE MOBILE RADIO

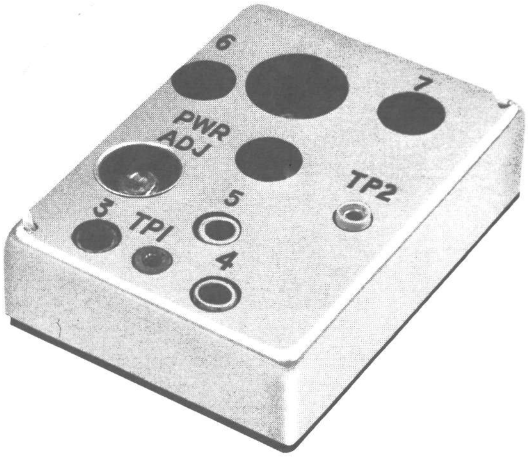
MASTR® Personal Series

PROGRESS LINE

PE/PY MODELS
138-174 MHz, 5 WATT TRANSMITTER
TYPE KT-106-A AND KT-107-A

Maintenance Manual LBI 4528J

DATAFILE FOLDER — DF 3157



KT-106-A/KT-107-A

SPECIFICATIONS *

Type Numbers	KT-106-A & KT-107-A
Power Output	5 Watts
Modulation Deviation	0 to ±5 kHz
Spurious	
Radiated	-50 dB
Conducted	-50 dB
Audio Response	Within +1 and -3 dB of a 6-dB/octave pre-emphasis from 300 to 3000 Hz except for an additional 6-dB/octave roll-off from 2500 to 3000 Hz per EIA.
Audio Distortion	Less than 8%
Crystal Multiplication Factor	12
RF Load Impedance	50 ohms
Modulation Sensitivity	0.7 to 1.5 millivolts

*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

SPECIFICATIONS .... Cover

DESCRIPTION 1

CIRCUIT ANALYSIS 2

- Regulator A2 2
- Oscillator Modules 2
- Compensator A3 3
- Audio Amplifier and Limiter A1 3
- Audio Compressor A50 5
- Phase Modulator 5
- PA Module 6
  - Exciter 6
  - Amplifier/PA 6
  - APLC Circuit 6
- Low Pass Filter 7

MAINTENANCE

- Alignment Procedure 9
- Test Procedure 10

OUTLINE DIAGRAM 12

SCHEMATIC DIAGRAM 13

PARTS LIST AND PRODUCTION CHANGES 14

TROUBLESHOOTING PROCEDURES 15

ILLUSTRATIONS

Figure 1 - Transmitter Block Diagram 1
Figure 2 - Typical Regulator Circuit 2
Figure 3 - Typical Oscillator Circuit 3
Figure 4 - Typical Compensator Circuit 4
Figure 5 - Typical Audio Amplifier & Limiter Circuit 4
Figure 6 - Typical Audio Compressor Circuit 5
Figure 7 - Typical Phase Modulator Circuit 6

WARNING

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

DESCRIPTION

Transmitter Types KT-106-A and KT-107-A are crystal controlled, phase modulated transmitters for one- through eight-frequency operation in the 138-174 MHz band. The transmitters utilize both discrete components and Integrated Circuit Modules (IC's). The application of each transmitter type is shown in the following chart:

Type No.	Exciter/PA Model No.	Frequency Range	No. Frequencies	Power Output
KT-106-A	4EF50A10	138-155 MHz	2	5 watts
	4EF50A11	150.8-174 MHz		
KT-107-A	4EF50A10	138-155 MHz	8	5 watts
	4EF50A11	150.8-174 MHz		

The transmitters consist of audio, regulator, oscillator, compensator, modulator and PA plug-in modules. The transistorized PA module consists of both exciter and PA to provide an RF power output of 5 watts. All of the transmitter modules are mounted on the System Board. Supply voltages for the transmitter are provided by the battery and Regulator. The different transmitter voltages are shown in the following chart:

Voltage	Used for:
Continuous 7.5 Volts	Regulator module.
Keyed 7.5 Volts	Regulator 5.4-Volt keying, Exciter and PA modules.
Keyed 5.4 Volts	Compensator, Oscillator, Audio and Modulator modules, and optional Compressor module.

References to symbol numbers mentioned in the following text are found on the Schematic Diagrams, Outline Diagrams and Parts List (see Table of Contents). The typical, simplified circuit diagrams used in the text are representative of the circuits in the IC modules. A block diagram of the transmitter is shown in Figure 1.

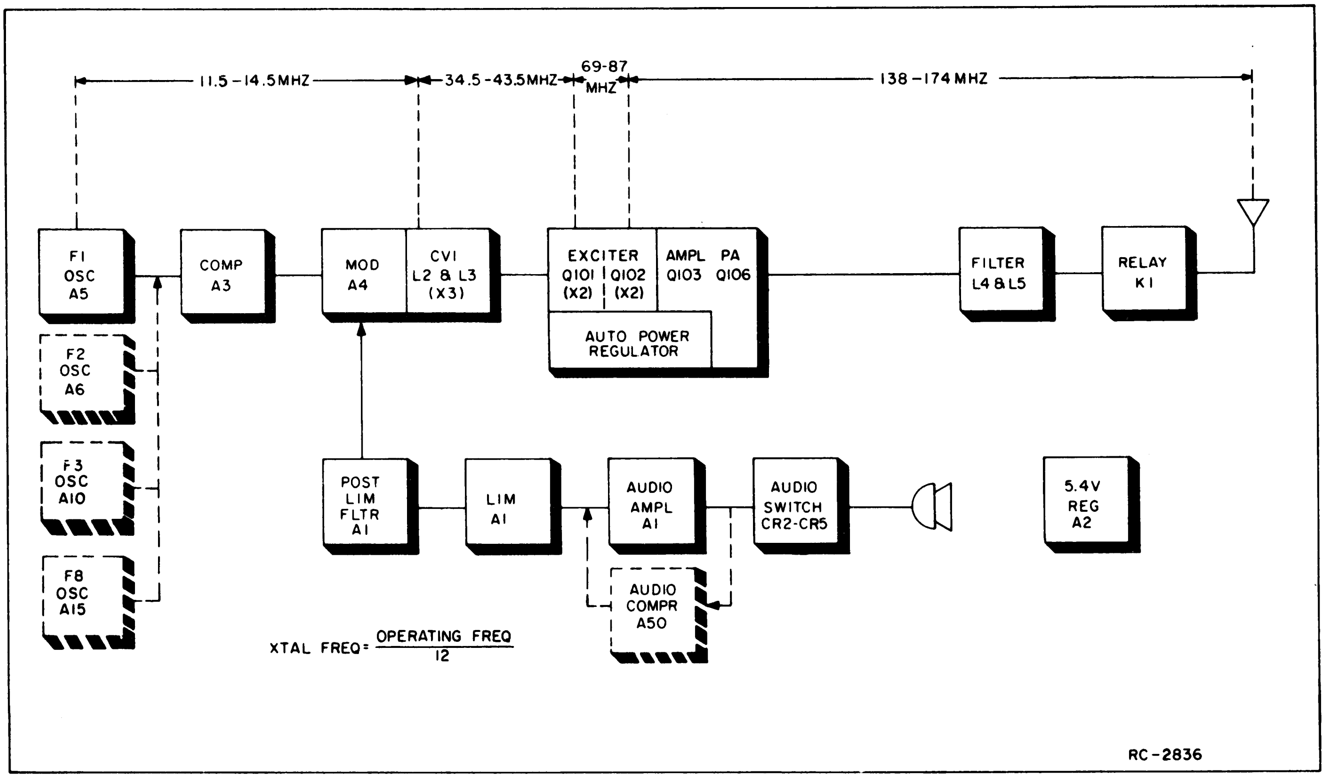


Figure 1 - Transmitter Block Diagram

CIRCUIT ANALYSIS

REGULATOR A2

The Regulator module operates from the 7.5-Volt from the battery, and provides a continuous, regulated 5.4 Volts and a switched 5.4 Volts for operating the transmitter, receiver and tone options. A typical regulator circuit is shown in Figure 2.

Turning on the radio applies the battery voltage to Pin 2 of the Regulator, causing Q2 and then Q1 to conduct. When conducting, the continuous 5.4 Volts at the collector of Q1 is taken from Pin 4 and applied to the receiver Compensator and Oscillator module.

Regulation is provided by Q2 and Q3, which operate as a differential amplifier. If the output of Q1 starts to increase, Q3 conducts harder, causing Q2 to conduct less. This causes Q1 to conduct less, keeping its output at 5.4 Volts. If the output of Q1 starts to decrease, Q3 conducts less, causing Q2 to conduct harder, keeping the output constant.

Q4 and Q5 operate as a DC switch. Keying the transmitter applies the battery voltage to Pin 7 and to the base of Q5, turning it on. This turns on PNP transistor Q4, so that the regulated 5.4 Volts at Pin 6 is applied to the transmitter Compensator, Modulator, and audio module, and to the optional Compressor module and multi-frequency switch S1.

OSCILLATOR MODULES

Oscillator Model 4EG27A10 consists of a crystal-controlled Colpitts oscillator and a Channel Guard tone modulator. The entire oscillator is contained in a metal can with the transmitter operating frequency printed on the top. The crystal frequency ranges from 11.5 to 14.5 MHz, and the crystal frequency is multiplied 12 times.

The oscillator frequency is temperature compensated to provide instant frequency compensation, with a frequency stability of ±.0002% from 0°C to +55°C and ±.0005% from -30°C to +60°C. The temperature compensation network is contained in Compensator module A3.

A typical oscillator circuit is shown in Figure 3.

In single-frequency transmitters, a jumper from Hole 20 to Hole 21 on the System Board connects the keyed 5.4 Volt supply voltage to the oscillator modules. Keying the transmitter applies the supply voltage to the oscillator, turning it on. The oscillator output is applied to Compensator A3.

In multi-frequency transmitters, additional Oscillator Modules are mounted on the board. The single-frequency supply jumper is removed, and the proper frequency is selected by connecting the keyed 5.4 Volts to the selected oscillator module through frequency selector switch S1 on the control unit.

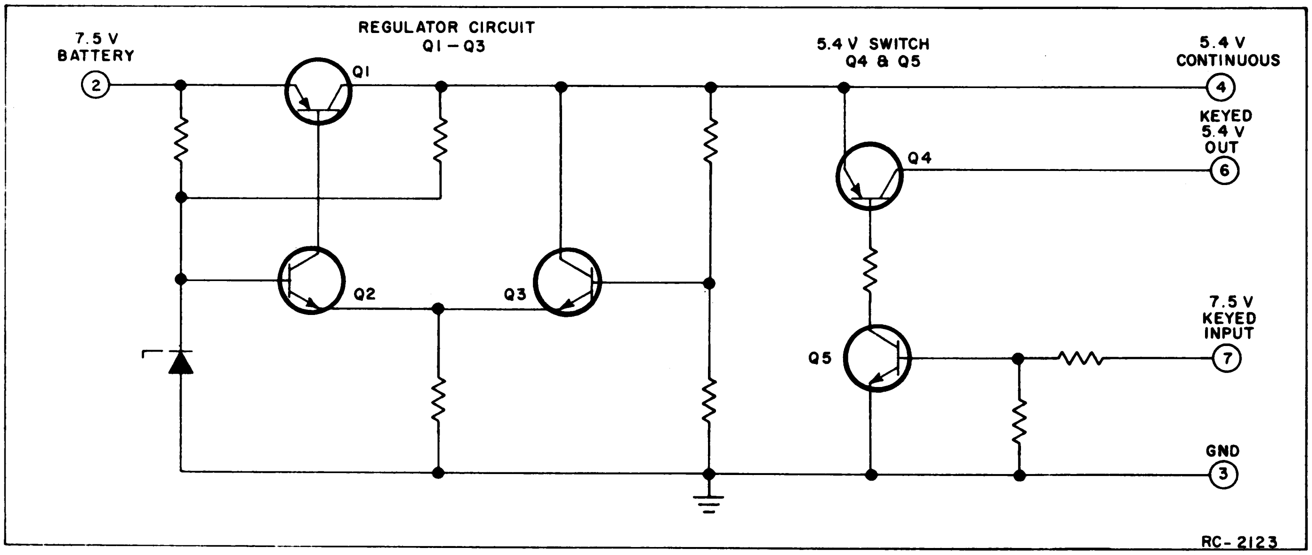


Figure 2 - Typical Regulator Circuit

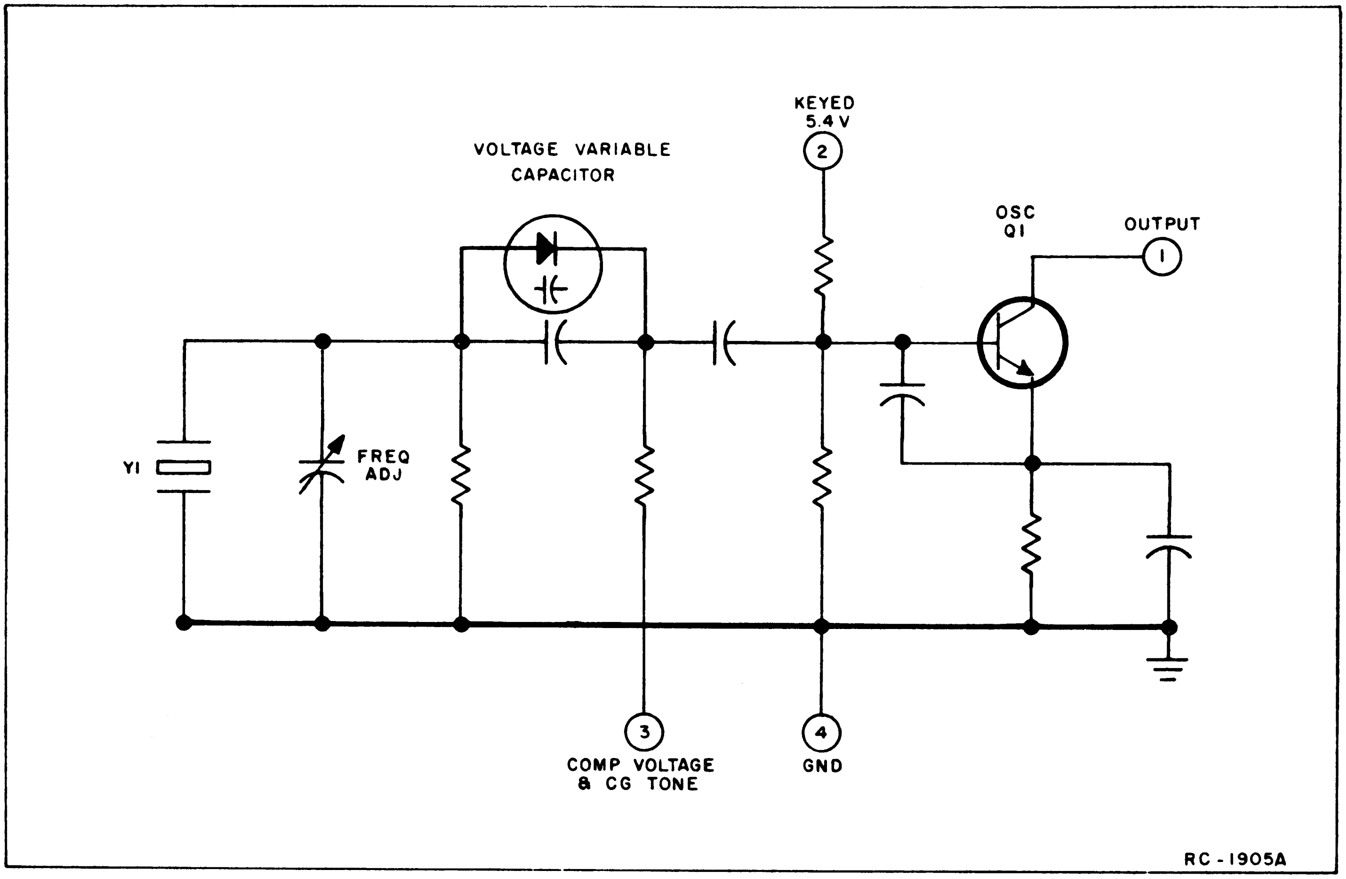


Figure 3 - Typical Oscillator Circuit

For Channel Guard applications, tone from the Channel Guard encoder is applied through Pin 3 to the voltage-variable capacitor on the oscillator module, which frequency modulates the oscillator output.

NOTE

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

COMPENSATOR A3

Compensator module A3 contains a buffer-amplifier, and the temperature compensating network for the oscillator. A typical Compensator circuit is shown in Figure 4.

RF from the oscillator at Pin 7 is coupled through a DC-blocking capacitor to the base of buffer-amplifier Q1. This stage isolates the oscillator from the modulator. The output of Q1 connects from Pin 9 to the modulator.

In the compensation network, the keyed 5.4 Volts at Pin 2 is applied to a thermistor-compensated voltage divider. The output at Pin 3 (2.35 Volts measured with a VTVM) is applied to Pin 3 and to the voltage-variable capacitor in the oscillator module. At temperatures below 10°C, the compensated voltage increases to maintain the proper voltage on the oscillator voltage-variable capacitor.

<u>SERVICE NOTE:</u> An abnormally low VTVM reading (or no reading) at Pin 3 may indicate a short or leakage path in the oscillator. This can be checked by unsoldering Pin 3, raising it off the printed board and taking another reading. If this reading is normal the problem is in the oscillator module. If the reading remains low (or zero) the problem is in the Compensator.

AUDIO AMPLIFIER AND LIMITER A1

Audio from the microphone is coupled through the audio switching circuit to Pin 1 and then to the base of audio amplifier Q1 (see Figure 5). In type 90 encoder applications, the encode tone is applied to the amplifier at Pin 2.

The amplifier output is applied directly to the transistorized limiter stage (Q2). Following the limiter is a combined

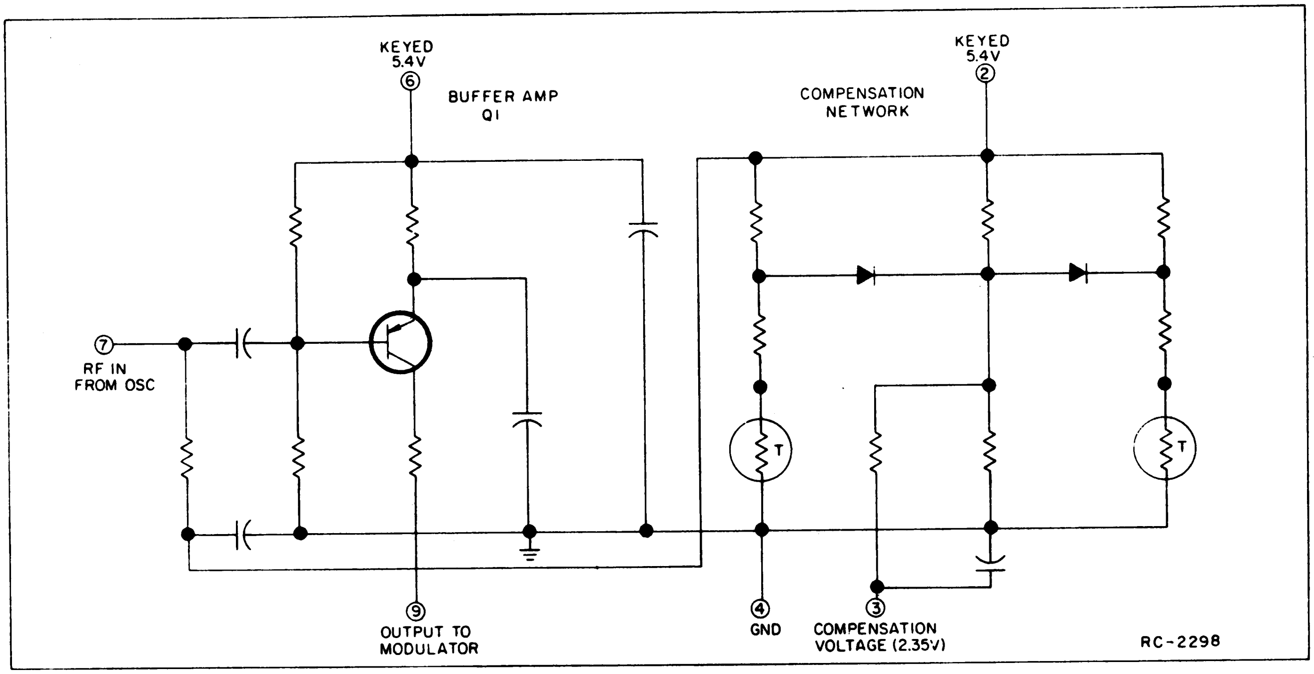


Figure 4 - Typical Compensator Circuit

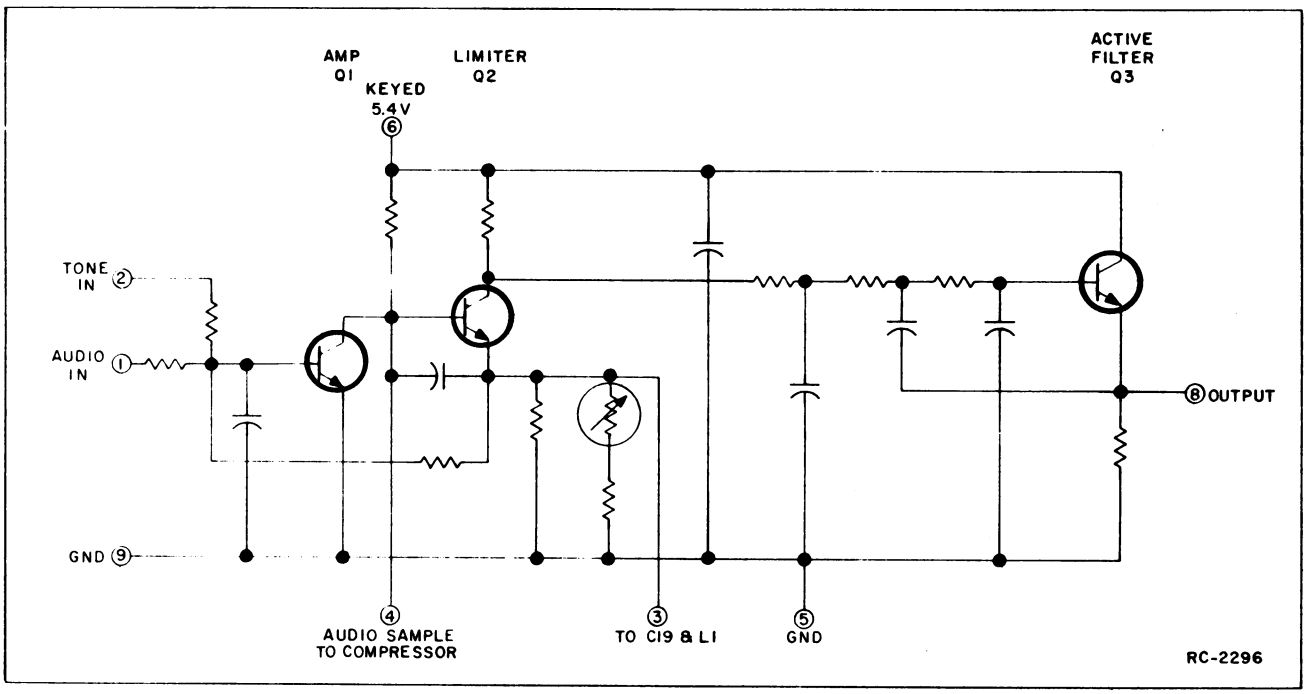


Figure 5 - Typical Audio Amplifier & Limiter Circuit

post-limiter filter and de-emphasis network. Q3 operates as an active filter. The filter output at Pin 8 is coupled through Mod Adjust potentiometer R8 to the Modulator module A4.

When the Audio Compressor option is used, audio from the microphone is coupled through the compressor and then applied to the audio amplifier stage. An audio sample from the collector of amplifier Q1 is connected from Pin 4 to the compressor circuit, keeping the audio output to the modulator constant.

AUDIO COMPRESSOR A50

The optional Audio Compressor Module provides a relatively constant audio output to the Audio Amplifier-Limiter module over a 30-dB change in input level. The compressor module also provides 13-dB additional gain for increased microphone sensitivity. A typical diagram of the Compressor is shown in Figure 6.

Audio from the microphone is coupled through R52 on the System Board to Pin 1 of the Compressor. The audio is applied to pre-amplifier Q1 which provides the 13-dB gain. The pre-amplifier output at Pin 4 is connected to Pin 1 of Amplifier-Limiter Module A1.

At the same time, an audio sample voltage from Audio module A1 is applied to Pin 9 and to audio amplifier Q3 in the Compressor module. The output of Q3 is rectified by the two diodes, and the resultant voltage applied to the base of DC amplifier Q4. The DC output of Q4 controls the operation of the compressor-control transistor Q2.

An increase in the audio sample voltage increases the DC voltage applied to Q2. This reduces the AC impedance of Q2, which decreases the audio output voltage at Pin 4. A decrease in the audio sample voltage decreases the DC voltage applied to Q2. This increases the AC impedance of Q2, and increases the audio output voltage at Pin 4.

PHASE MODULATOR

The phase modulator circuit consists of Modulator A4, voltage-variable capacitor CV1 and tuneable coil L2. CV1 and L2 are mounted on System Board A703. A typical modulator circuit is shown in Figure 7.

With CV1 in series with L2, the network appears as a series-resonant circuit when RF from the oscillator is applied to Pin 1. Applying audio from Audio Limiter A1 to Pin 4 of Modulator A4 varies the bias of CV1, resulting in a phase modulated output.

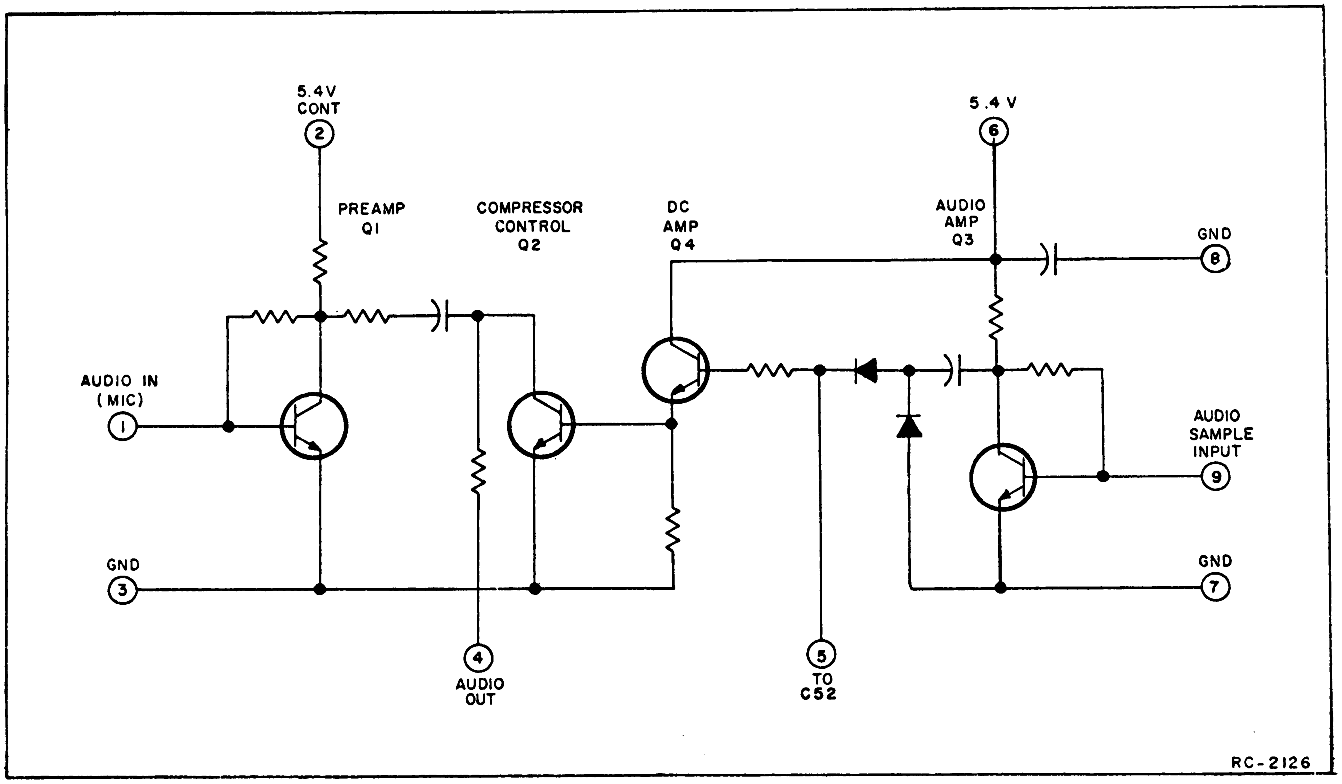


Figure 6 - Typical Audio Compressor Circuit

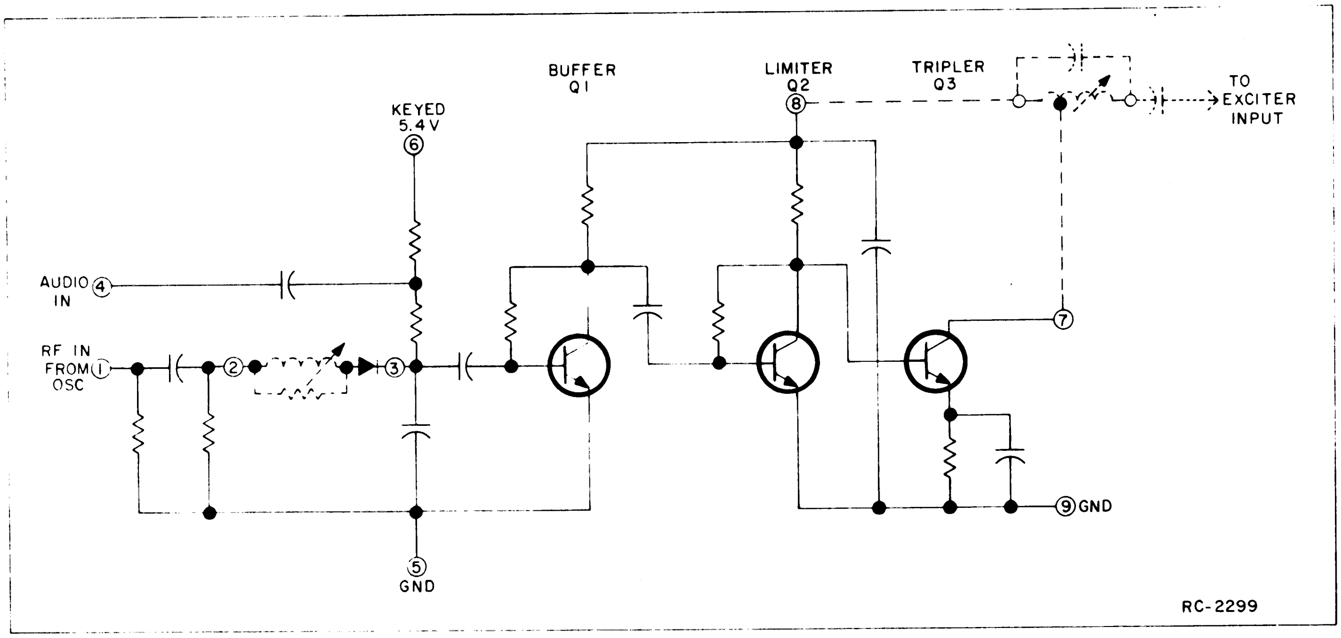


Figure 7 - Typical Phase Modulator Circuit

Buffer Q1 isolates the modulator from the loading effects of the following multiplier stage, and also provides some amplification. Following the buffer stage is tripler Q2. The output of Q2 is coupled through L3 (on the System Board) to the exciter module. L3 is tuned to three times the crystal frequency.

PA MODULE

PA Modules 4EF50A10 and 4EF50A11 contain the exciter with two class C doubler stages, an Automatic Power Level Control (APLC) circuit, an amplifier stage and a PA stage.

Exciter

The phase modulator output is coupled through T101 to the base of 1st doubler transistor Q101. The 1st doubler stage as well as the phase modulator stage is metered at TP101. The 1st doubler output is coupled through T102 to the base of 2nd doubler Q102. T102 is tuned to six times the crystal frequency.

A Constant-K, DC collector fed network L101, L107, C104, C126 and C112 provides improved 2nd doubler stability. Similar collector-fed networks are used in the amplifier and PA stages.

The output from the collector of Q102 is coupled through impedance-matching network C114, C116, C117, C119, C122 and L102 to the base of amplifier transistor Q103. The impedance-matching network matches the high impedance output of Q102 to the low impedance input of Q103. L102 is tuned to 12 times the crystal frequency.

Amplifier/PA

The output of amplifier Q103 is coupled through a tuned circuit to the base of PA transistor Q106. The output of Q106 is applied through a series tuned circuit to the low-pass filter.

2nd doubler Q102, amplifier Q103 and PA transistor Q106 are tuned by measuring the total PA current. An ammeter with a two ampere scale meter or greater is used in series with the 7.5 Volt PA supply. The meter is connected in the circuit by removing a jumper between H89 and H90, on the system board, and replacing it with the ammeter. GE Test Regulator Model 4EX19A10 and Test Set Model 4EX3A11 may be used in place of the ammeter.

APLC Circuit

The APLC circuit (Q104 and Q105) provides a more constant transmitter power output by controlling the output of the 1st and 2nd doubler. The circuit also extends the battery life by regulating the current to amplifier Q103.

When Q103 starts to conduct harder and draw more collector current, the voltage drop across R107 increases, causing Q104 to conduct harder. This increases the voltage at the base of Q105. Increasing the voltage at the base of Q105 causes it to conduct less, which increases the voltage drop across Q105 and reduces the collector voltage of Q101 and Q102. This reduces the drive to amplifier Q103 and reduces the collector current.

LOW-PASS FILTER

The low-pass filter is mounted on the systems board. The filter consists of L4, C5, C8, C10 and C18. The filter output is fed to System switching relay K1, and then coupled through a 50-ohm antenna matching network (L701 and C15) to the antenna.

An RF adaptor cable is available for connecting the transmitter RF output to a wattmeter. Connecting the RF adaptor cable to J702 opens a set of contacts on the antenna strip line assembly. This disconnects the collapsible antenna and connects the transmitter output to J702-3. Connection to chassis ground is made at J702-4.

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

GENERAL ELECTRIC*
U.S.A.

MODULATION LEVEL ADJUSTMENT

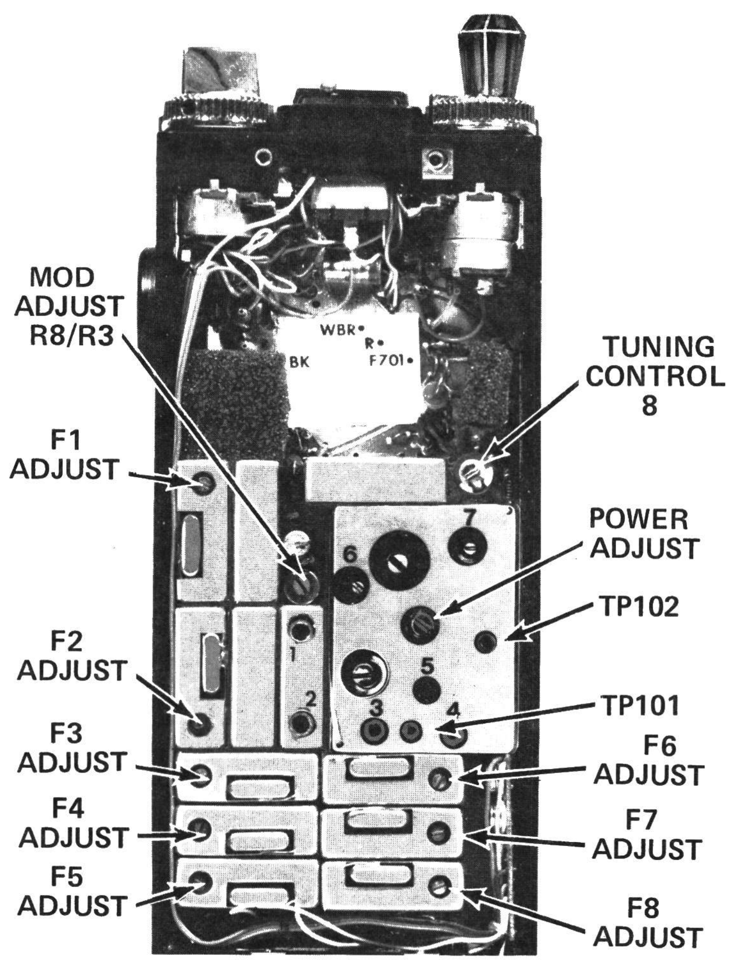
The MOD ADJUST (R8/R3) was adjusted to the proper setting before shipment and shoud not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause overmodulation are clipped by the modulation limiter. The limiter, in 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 Model 4EX6A10
2. A deviation meter
3. An output meter or a VTVM
4. Test Adaptor Model 4EX12A10

PROCEDURE

1. Connect the equipment as shown in the Test Procedure on the back of this page.
2. Apply a 140 millivolt signal at 1000 Hz to the Test Adaptor. If the Test Adaptor is not used, apply a 14 millivolt signal to Pin 4 (Mike Hi) and Pin 1 of Accessory Jack J701. For PY models, apply a 14 millivolt signal at 1000 Hz to Pin 7 (Mike Hi) and Pin 8 of the System board.
3. With the signal applied, adjust Tuning Control 1 for zero modulation symmetry on the lowest channel frequency.
4. For transmitters without Channel Guard, set MOD ADJUST R8/R3 for a 4.5-kilohertz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.
5. For transmitters with Channel Guard, check the Channel Guard Modulation as shown in Step 2 of the transmitter Test Procedure. With Channel Guard tone applied, set the deviation as described in Step 4 above.
6. For multfrequency transmitters, set the deviation as described in Step 4 on the channel producing the largest amount of deviation.



TRANSMITTER ALIGNMENT (KT-106-A & KT-107-A)

EQUIPMENT REQUIRED:

- GE Test Set Model 4EX3A10 (or 4EX8K11) or equivalent 20,000 ohm-per-volt meter.
- GE Test Regulator Model 4EX19A10, or an ammeter capable of measuring 2 ampere.
- A 50-ohm terminating wattmeter connected to external antenna jack J702 thru RF adaptor cable 19C317633G2 (Option 4466) for PE Models. The antenna is removed and the wattmeter is connected through RF connector 19C321535G1 (Option 4674) for PY Models.
- A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. In multi-frequency transmitters, set the channel selector switch to the lowest channel frequency.
2. Set the slugs in Tuning Controls 1 thru 5 even with the top of the can. When properly aligned, the slugs will be between the top of the can and the coil.
3. Set Tuning Control 9 (PWR ADJ) fully counterclockwise, and Tuning Control 6 to mid range.
4. If using Test Set 4EX3A10 and Test Regulator 4EX19A10, connect the Test Set to the metering jack on the Test Regulator. Then connect the Regulator output to J704 on the radio, and set the Regulator for 6 volts. Switch the Test Set range to the Test 1 position. Place the test selector switch on position "I" to check the supply voltage (read on the 1-volt scale as 10-volts full scale). Switch to position "G" for current drain readings (read on the 1-volt scale as 1 ampere full scale).
5. Test Point meter reading made with the (+) meter lead to TP1 and the (-) lead to system ground.
6. All adjustments made with the transmitter keyed.

ADJUSTMENT PROCEDURE

Step	Tuning Control	Typical Meter Reading	Procedure
1.	1	Maximum mA	Adjust Tuning Control 1 for maximum transmitter current.
2.	2	Minimum mA	Adjust Tuning Control 2 for minimum transmitter current.
3.	3		Adjust Tuning Control 3 for maximum meter reading at TP101.
4.	1, 2 & 3	0.8 volts	Adjust Tuning Controls 1, 2 and 3 for maximum meter reading at TP101. Repeat the adjustments until no further increase in meter reading is obtained.
5.	4, 5 & 6	Maximum mA	Adjust Tuning Controls 4, 5 and 6 for maximum transmitter current.
6.	7, 8, 6, 5, & 4	Maximum Power Output	Adjust Tuning Controls 7, 8, 6, 5 and 4 in that order for maximum power output.
7.	1, 2 & 3		Repeat Step 4.
8.			Increase the supply voltage to 7.5 volts.
9.	6	Maximum Power Output	Adjust Tuning Control 6 for maximum power output and note the power output. If the power output is correct, Tuning Controls 8 and 7 can be alternately tuned for the best ratio of current drain to RF power output. If the power output is too low, refer to Step 10. Rotate Tuning Control 9 (PWR ADJ) clockwise until the power output is reduced by one half the difference between the recorded level and the desired level
10.	8, 7 & 6	Maximum Power Output	If the power output is too low, readjust Tuning Controls 8, 7 and 6 in that order for maximum power output. Repeat until the desired power output is obtained.
			FREQUENCY ADJUSTMENT
11.			With no modulation, adjust the F1 through F8 crystal trimmers for proper oscillator frequency. Next, refer to the Modulation Adjustment. NOTE: It is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 60°F to 90°F.

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, tone and voice deviation, defective audio sensitivity and modulator 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.

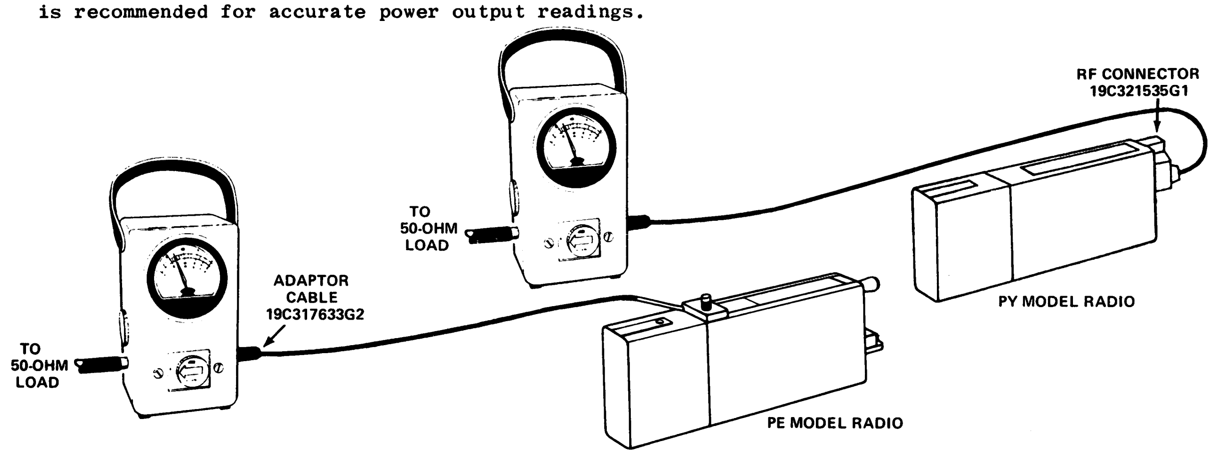
TEST EQUIPMENT REQUIRED
for test hookup shown:

1. Wattmeter similar to:
   Bird # 43
2. VTVM similar to:
   Triplett # 850
   Heath # 1M-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. GE Test Adaptor Model 4EX12A10.
6. RF Connector 19C321535G1

STEP 1
POWER MEASUREMENT

TEST PROCEDURE

A. Connect transmitter output to wattmeter as shown below. GE adaptor cable 19C317633G2 is recommended for accurate power output readings.



B. Key transmitter and check wattmeter for desired power output..

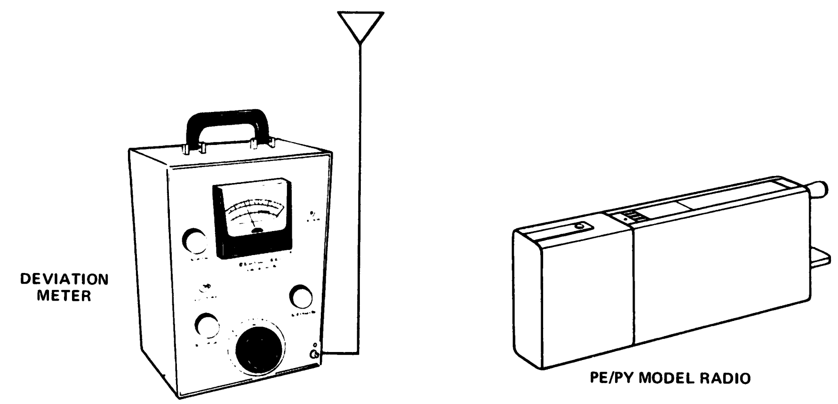
SERVICE CHECK

Refer to Service Hints on Transmitter Troubleshooting Procedure.

STEP 2
TONE DEVIATION WITH CHANNEL GUARD

TEST PROCEDURE

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



B. Set MOD ADJUST R8/R3 fully counterclockwise.

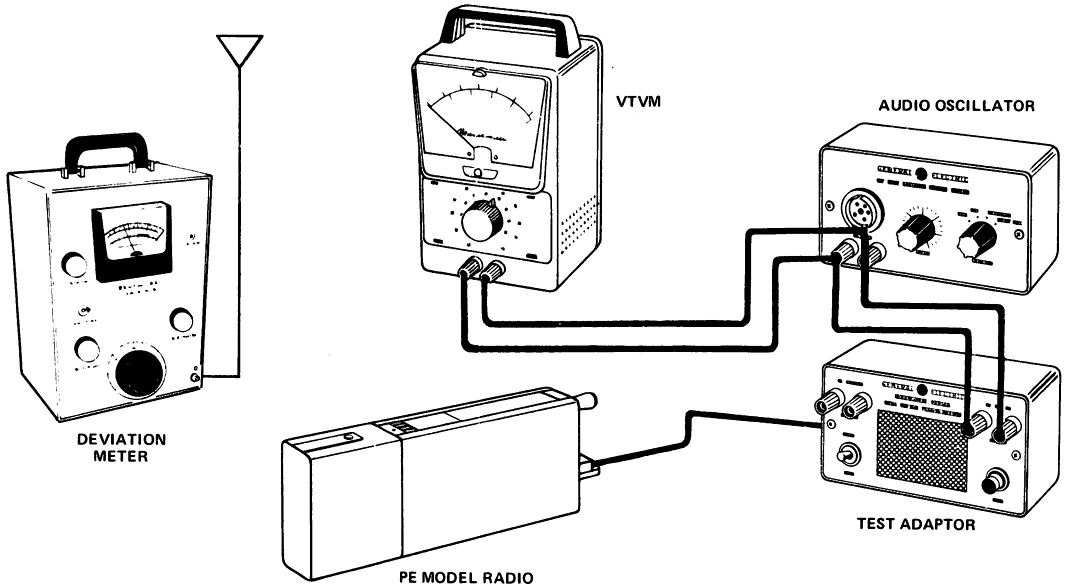
C. Key transmitter and check for approximately 0.75-kHz deviation. If reading is low or high, refer to the Channel Guard Troubleshooting Procedure (see Table of Contents)

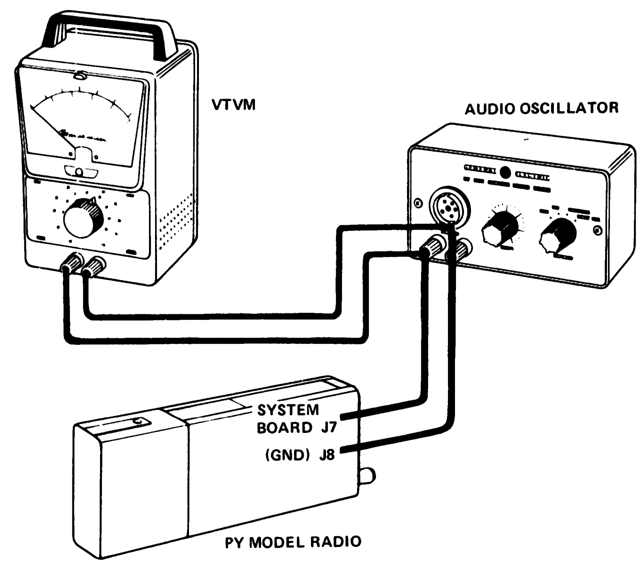
NOTES--The Tone Deviation Test Procedures should be repeated every time the Tone Frequency is changed.

STEP 3
VOICE DEVIATION AND SYMMETRY

TEST PROCEDURE

A. Connect test equipment to transmitter as shown below:





B. Set the generator output to 140 millivolts RMS and frequency to 1 kHz. If the Test Adaptor is not used, set the generator output for 14 millivolts.

C. Key the transmitter and adjust Deviation Meter to carrier frequency.

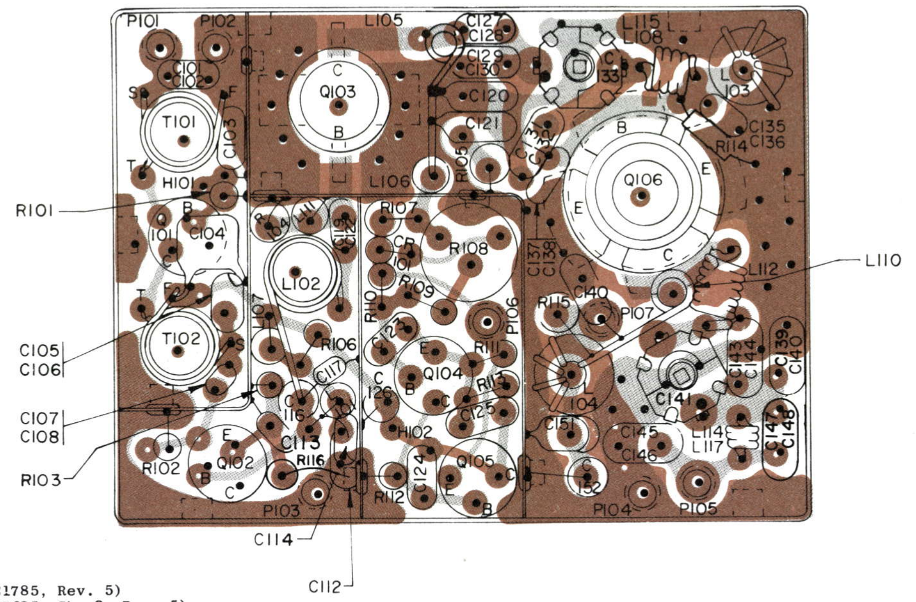
D. Deviation reading should be ±4.5 kHz. If the deviation is not 4.5 kHz, set the deviation as directed on the Transmitter Alignment Procedure (see Table of Contents).

NOTES -- **These 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.**

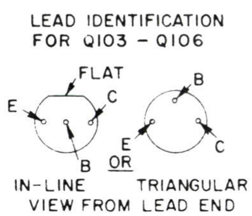
If the deviation reading plus (+) or minus (-) differs by more than 0.5 kHz:

E. Refer to the Modulation Adjustment on the Transmitter Alignment Procedure.

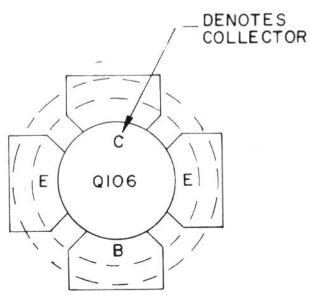
F. Check Audio Sensitivity by reducing generator output until deviation falls to 3 kHz. Voltage should be LESS than 14 millivolts.

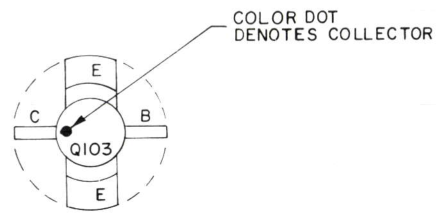


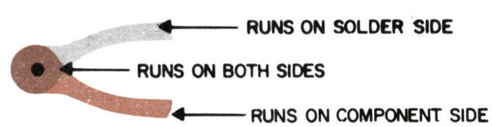
(19C321785, Rev. 5)
(19D417635, Sh. 2, Rev. 5)
(19D417635, Sh. 2, Rev. 4)



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

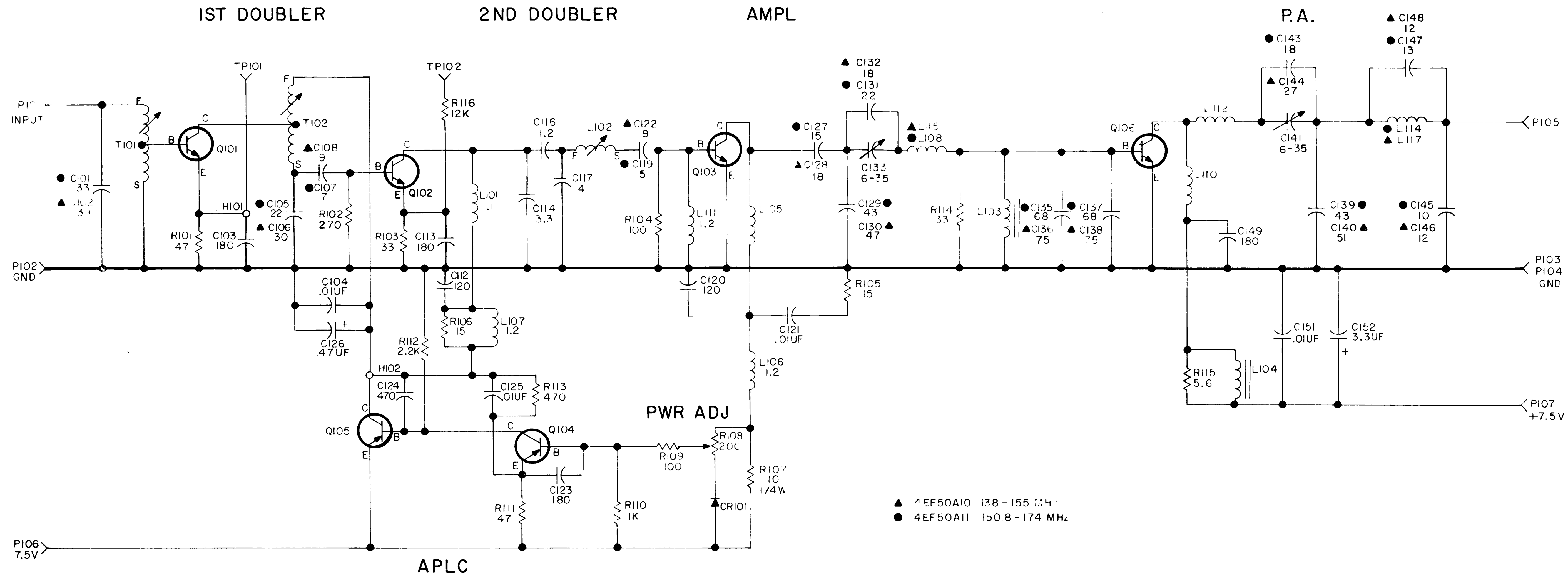






OUTLINE DIAGRAM

138—174 MHz TRANSMITTER
TYPES KT-106-A & KT-107-A



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
4EF50A10	D
4EF50A11	D

ALL RESISTORS ARE 1/8 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.

(19D423129, Rev. 7)

SCHEMATIC DIAGRAM

138—174 MHz TRANSMITTER
TYPES KT-106-A & KT-107-A

PARTS LIST

LBI30001C

PA MODULE
4EF50A10 19D423133G2 138-155 MHz REV D
4EF50A11 19D423133G1 150.8-174 MHz REV D

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C101	19A700221P47	Ceramic: 33 pf ±5%, 100 VDCW; temp coef -80 PPM.
C102	19A700221P50	Ceramic: 39 pf ±5%, 100 VDCW; temp coef -80 PPM.
C103	19A700229P73	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM.
C104	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C105	19A700221P41	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -80 PPM.
C106	19A700221P45	Ceramic: 30 pf ±5%, 100 VDCW; temp coef -80 PPM.
C107	19A116114P24	Ceramic: 7 pf ±5%, 100 VDCW; temp coef 0 PPM.
C108	19A116114P30	Ceramic: 9 pf ±5%, 100 VDCW; temp coef 0 PPM.
C112	19A700226P68	Ceramic: 120 pf ±5%, 100 VDCW; temp coef -750 PPM
C113	19A700229P73	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM.
C114	19A700219P14	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM.
C116	19A700013P14	Phenolic: 1.2 pf ±5%, 500 VDCW.
C117	19A116114P14	Ceramic: 4 pf ±5%, 100 VDCW; temp coef 0 PPM.
C119	19A116114P18	Ceramic: 5 pf ±5%, 100 VDCW; temp coef 0 PPM.
C120	19A700226P68	Ceramic: 120 pf ±5%, 100 VDCW; temp coef -750 PPM.
C121	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C122	19A700219P26	Ceramic: 10 pf ±5%, 100 VDCW; temp coef 0 PPM.
C123	19A700219P73	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM.
C124	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-A050-W5R-471M.
C125	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C126	19B800650P12	Tantalum: 0.47 µf +40 -20%, 10 VDCW; sim to Sprague Type 162D.
C127*	19A700221P33	Ceramic: 15 pf ±5%, 100 VDCW; temp coef -80 PPM.
		In REV A and earlier:
	19A116114P2020	Ceramic: 6 pf ±5%, 100 VDCW; temp coef -80 PPM.
C128*	19A700221P38	Ceramic: 18 pf ±5%, 100 VDCW; temp coef -80 PPM.
		In REV A and earlier:
	19A116114P2024	Ceramic: 7 pf ±5%, 100 VDCW; temp coef -80 PPM.
C129	19A700221P51	Ceramic: 43 pf ±5%, 100 VDCW; temp coef -80 PPM.
C130	19A700221P54	Ceramic: 51 pf ±5%, 100 VDCW; temp coef -80 PPM.
C131	19A700221P41	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -80 PPM.
C132	19A700221P38	Ceramic: 18 pf ±5%, 100 VDCW; temp coef -80 PPM.
C133*	19A134457P1	Variable, ceramic: approx 6 to 35 pf; sim to Johanson 9410 -3PC.
		Earlier than REV A:
	19A134162P1	Variable, ceramic: approx 5 to 30 pf; sim to Erie Style 513-001.
C135	19A700223P59	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM.
C136	19A700225P60	Ceramic: 75 pf ±5%, 100 VDCW; temp coef -470 PPM.
C137	19A700223P59	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM.
C138	19A700225P60	Ceramic: 75 pf ±5%, 100 VDCW; temp coef -470 PPM.
C139	19A700221P51	Ceramic: 43 pf ±5%, 100 VDCW; temp coef -80 PPM.
C140	19A700222P56	Ceramic: 56 pf ±5%, 100 VDCW; temp coef -150 PPM.
C141*	19A134457P1	Variable, ceramic: approx 6 to 35 pf; sim to Johanson 9410 -3PC.
		Earlier than REV A:
	19A134162P1	Variable, ceramic: approx 5 to 30 pf; sim to Erie Style 513-001.
C143	19A700221P38	Ceramic: 18 pf ±5%, 100 VDCW; temp coef -80 PPM.
C144	19A700221P44	Ceramic: 27 pf ±5%, 100 VDCW; temp coef -80 PPM.
C145	19A700221P26	Ceramic: 10 pf ±5%, 100 VDCW; temp coef -80 PPM.
C146	19A700221P30	Ceramic: 12 pf ±5%, 100 VDCW; temp coef -80 PPM.
C147	19A700221P32	Ceramic: 13 pf ±5%, 100 VDCW; temp coef -80 PPM.
C148	19A700221P30	Ceramic: 12 pf ±5%, 100 VDCW; temp coef -80 PPM.
C149	19A700229P73	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM.
C151	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C152	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR101	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L101	19B209420P101	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1K.
L102	19B216935G1	Coil. Includes:
	19B209436P1	Tuning slug.
L103	19A129773G3	Coil.
L104	19A130340G1	Coil.
L105*	19A130478P2	Coil.
		In REV A and earlier:
	19B209420P101	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1K.
L106 and L107	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1K.
L108	19B216320P3	Coil.
L110	19A130478P1	Coil.
L111	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1K.
L112	19B226730P1	Coil.
L113*	19B209420P101	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1K. Deleted by REV B.
L114	19B226730P2	Coil.
L115	19B216320P4	Coil.
L117	19B226730P3	Coil.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P101 thru P107	19A115834P4	Contact, electrical: sim to AMP 2-332070-9.
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q101	19A115328P1	Silicon, NPN.
Q102	19A116201P3	Silicon, NPN.
Q103	19B227818G4	Silicon, NPN.
Q104 and Q105	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q106	19B227818G3	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R101	3R151P470J	Composition: 47 ohms ±5%, 1/8 w.
R102	3R151P271J	Composition: 270 ohms ±5%, 1/8 w.
R103	3R151P330J	Composition: 33 ohms ±5%, 1/8 w.
R104	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R105 and R106	3R151P150J	Composition: 15 ohms ±5%, 1/8 w.
R107	19A700106P15	Composition: 10 ohms ±5%, 250 VDCW, 1/4 w.
R108	19A116412P1	Variable, cermet: 200 ohms ±10%, 1/2 w; sim to Helipot Model 62 PF.
R109	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R110	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
R111	3R151P470J	Composition: 47 ohms ±5%, 1/8 w.
R112	3R151P222J	Composition: 2.2K ohms ±5%, 1/8 w.
R113	3R151P471J	Composition: 470 ohms ±5%, 1/8 w.
R114	3R151P330J	Composition: 33 ohms ±5%, 1/8 w.
R115	3R151P5R6J	Composition: 5.6 ohms ±5%, 1/8 w.
R116*	3R151P123J	Composition: 12K ohms ±5%, 1/8 w. Added by REV C
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T101	19B216910G2	Coil. Includes:
	19B209436P1	Tuning slug.
T102	19B216934G1	Coil. Includes:
	19B209436P1	Tuning slug.
		- - - - - - - - - TEST POINTS - - - - - - - - -
TP101 and TP102	19A127787G2	Board (Includes TP101 and TP102).
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	19A130333G2	Can. (PA Module).
	19A127781P1	Shield. (Located by Q105 and C114).
	19B216899P1	Shield. (Located around T101, T102).
	19A127853P1	Shield. (Located beside Q103).
	4035306P11	Washer, fiber. (Used with Q101, Q102).
	19A130341P1	Heat sink. (Used with Q103 and Q106).
	19A129245P1	Nut: thd. size No. 8-32. (Used with Q103).
	19A134457P2	Tuning tool. (Used with C133 and C141).
	19A121175P39	Insulator, plate. (Located on inside of can).

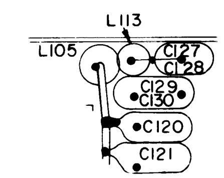
PRODUCTION CHANGES

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

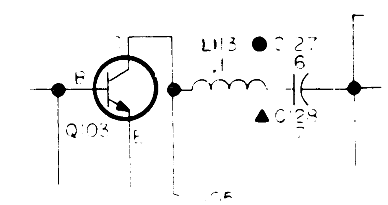
REV. A - To improve reliability. Changed C133 and C141.

REV. B - To improve stability. Deleted L113. Changed C127, C128 and L105.

Outline Diagram Was:



Schematic Diagram Was:



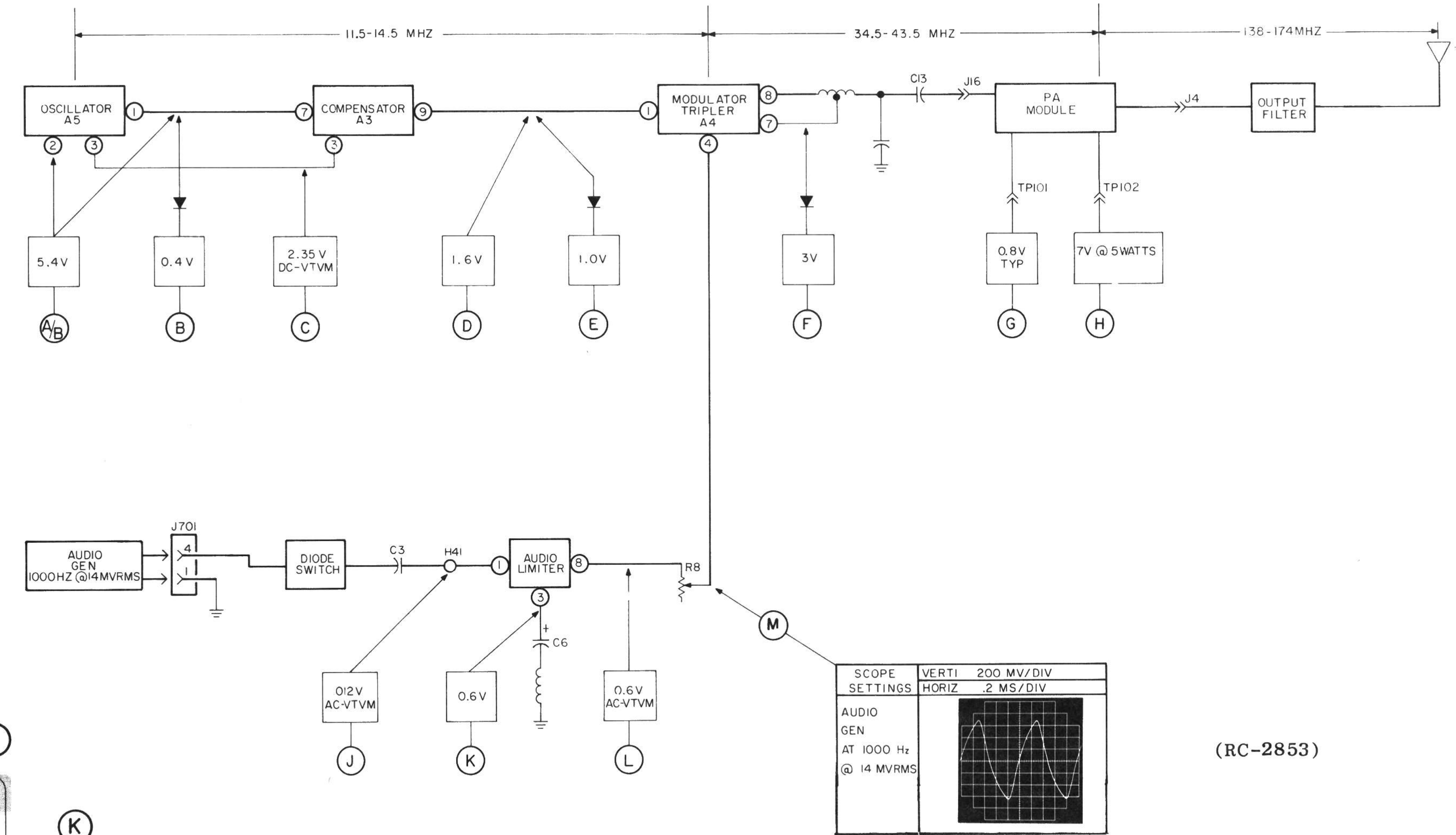
REV. C - To improve 2-frequency spread. Added R116.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

STEP 2 -
TYPICAL VOLTAGE
READINGS

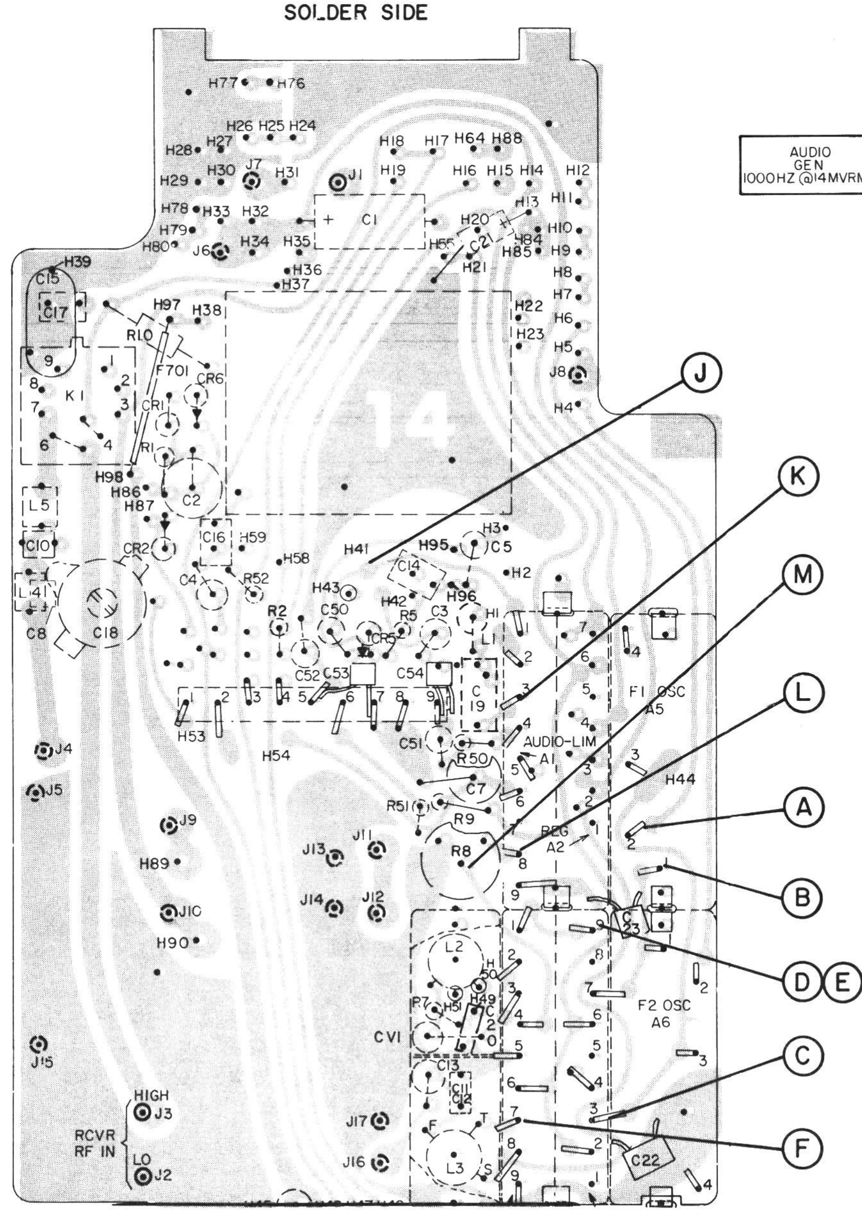
DC READINGS MADE WITH GE TEST SET MODEL 4EX3A10 OR EQUIVALENT. READINGS SHOWN IN SERIES WITH A DIODE ARE RF READINGS TAKEN WITH RF PROBE 19C311370-G1 AND TEST SET MODEL 4EX3A10 ON 3 VOLT SCALE.

EXCEPTION: READINGS FOLLOWED BY VTVM WERE MEASURED WITH A VTVM WITH 11 MEG OHM OR GREATER METER INPUT.



(RC-2853)

SOLDER SIDE



(RC-2156)
(19D416226, Rev. 15)
(19D413549, Sh. 2, Rev. 14)

STEP 1- QUICK CHECKS

SYMPTOM	QUICKCHECK
No power output	Check the reading at TP1. If no reading is obtained at TP1, check readings at (F), (E) and (B). If TP1 reading is correct, replace the PA module.
Low power output	1. Low battery voltage (refer to Battery Checks in operation section of the manual). 2. Check the transmitter alignment.
Distorted or no audio with normal RF output.	1. Check voltage readings (J), (K), (L) and (M). 2. Improper setting of Mod Adjust R8. 3. Shorted C3 or C6 on Audio Board. 4. Bad microphone.
No reading at TP1	Check voltage readings at (A), (B), (D), (E) and (F).

TROUBLESHOOTING PROCEDURE

138—174 MHz TRANSMITTER
TYPES KT-106-A & KT-107-A