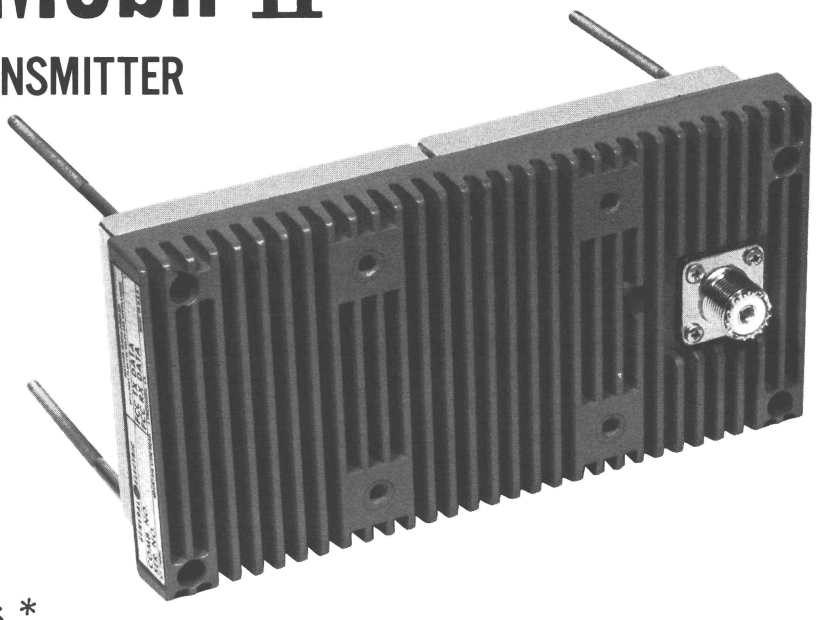
MOBILE RADIO

Porta-Mobil II™

66-88 MHz TRANSMITTER



Maintenance Manual LBI-30368

DATAFILE FOLDER — DF-3167

SPECIFICATIONS *

	Portable	Motorcycle
Power Output (Adjustable)	5 to 15 Watts	10 to 25 Watts
Spurious (Conducted)		Less than -70 dB
Modulation Deviation		0 to ±5 kHz
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 10%
Crystal Multiplication		6
RF Load Impedance		50 ohms
Modulation Sensitivity		15 to 45 milli-volts

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

GENERAL ELECTRIC

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ILLUSTRATIONS

WARNING

Although the highest DC voltage in Porta•Mobil II™ Equipment is supplied by a portable or vehicular battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits! High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

DESCRIPTION

The 66-88 MHz Porta • Mobil II transmitter is a crystal controlled, phase modulated transmitter for one-through twelve-frequency operation. The transmitter is a single unit construction in the rear cover for the Porta • Mobil II case assembly and utilizes both discrete components and integrated circuit modules.

Each transmitter consists of exciter board 19D423807G1 and power amplifier 19D423703G1-G4. The exciter board consists of audio module A101, oscillator modules A104 through A115, compensator module A102, modulator module A103, optional compressor module A116, exciter PA module 19D423332G1 or G2.

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

Application	Exciter Board	Exciter Module No.	PA No.	Frequency Range	No. of Freqs.	Power Output (Adjustable)
Portable	19D423807G1	19D423332G1	19D423703G1	66-76 MHz	12	5 to 15 Watts
	19D423807G1	19D423332G2	19D423703G3	76-88 MHz	12	5 to 15 Watts
Motorcycle	19D423807G1	19D423332G1	19D423703G2	66-76 MHz	12	10 to 25 Watts
	19D423807G1	19D423332G2	19D423703G4	76-88 MHz	12	10 to 25 Watts

Operating voltages for the transmitter are provided by a 10-Volt battery pack or a 13.8 Volt vehicle battery, a 7.5 Volt regulator circuit and a 5.4 Volt regulator circuit. The battery voltage is applied directly to the power amplifier circuit and also to the 7.5 volt regulator circuit and power amplifier circuit through POWER OFF-ON switch S701 on the case assembly. The 7.5 Volt regulator is part of the receiver audio amplifier and is interfaced by the system board to the transmitter. A keyed 7.5 volts is connected to the power adjust circuit in the power amplifier, and the modulator module and 5.4 volt regulator circuit on the transmitter exciter board. The 5.4 volt regulator circuit provides voltage for the audio module, compensator module and the optional compressor module.

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

CIRCUIT ANALYSIS

OSCILLATOR MODULES (A104 through A115)

Oscillator Module Model 4EG27A13, 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 to 14.66 MHz, and the crystal frequency is multiplied 6 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 A102. A typical oscillator circuit is shown in Figure 2.

In single-frequency transmitters a jumper from Hole 39 to Hole 79 on the System Board connects the keyed 5.4 Volt supply voltage to the oscillator modules. The oscillator output is applied to Compensator A102.

In multi-frequency transmitters, 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 S704 on the control unit.

For Channel Guard applications, tone from the Channel Guard encoder is applied to the oscillator module. The tone 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 MODULE A102

Compensator module A102 contains a buffer-amplifier, and the temperature com-

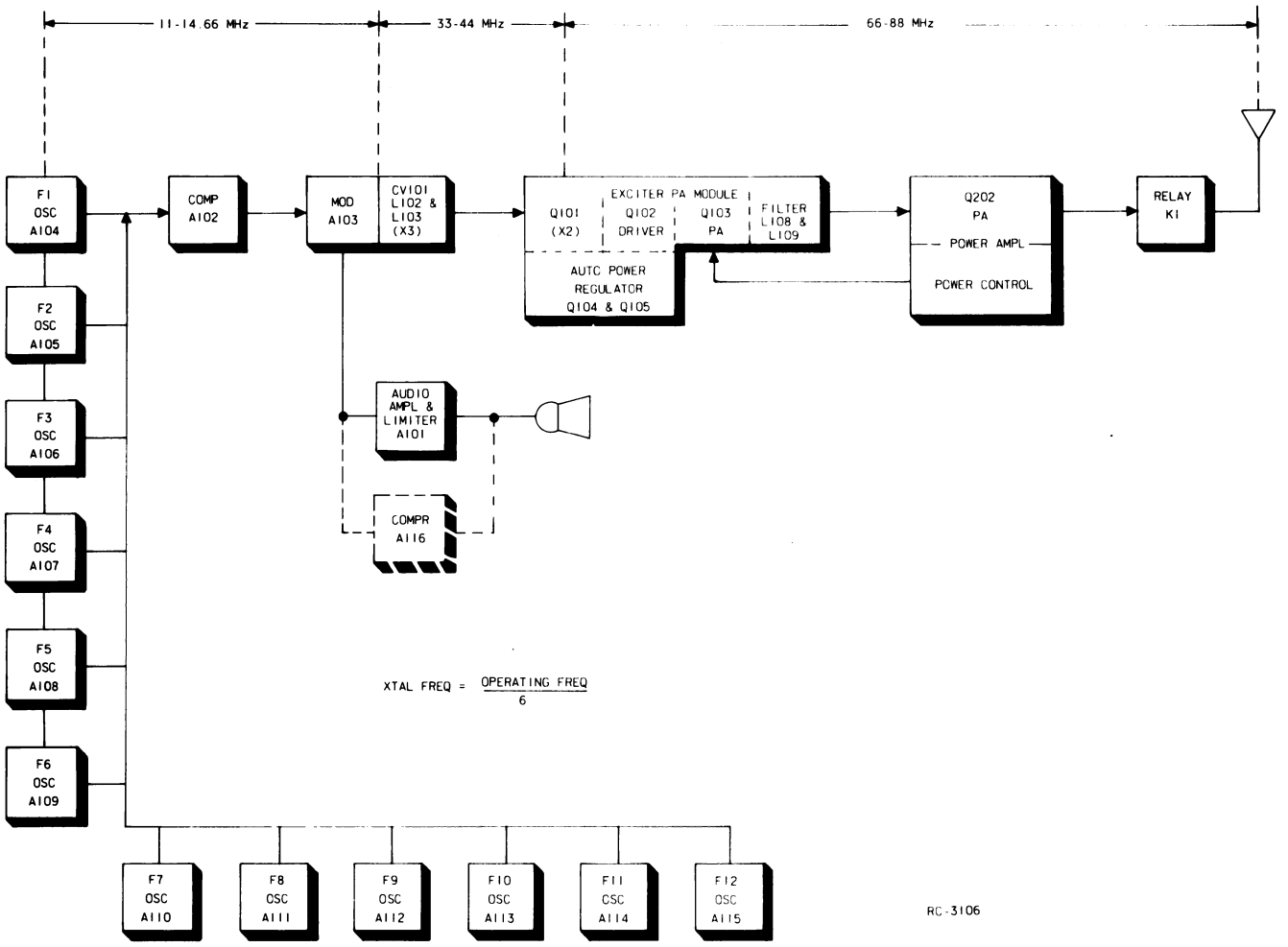


Figure 1 - Transmitter Block Diagram

pensating network for the oscillator. A typical Compensator circuit is shown in Figure 3.

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.

Service Note: 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 MODULE A101

Audio from the microphone is coupled to Pin 1 of Audio Amplifier Module A101 and then to the base of audio amplifier transistor A1 (see Figure 4). 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 post-limiter filter and de-emphasis network. Q3 operates as an active filter. The filter output at Pin 8 is coupled through Mod Adjust portentiometer R103 to the Modulator module A103.

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.

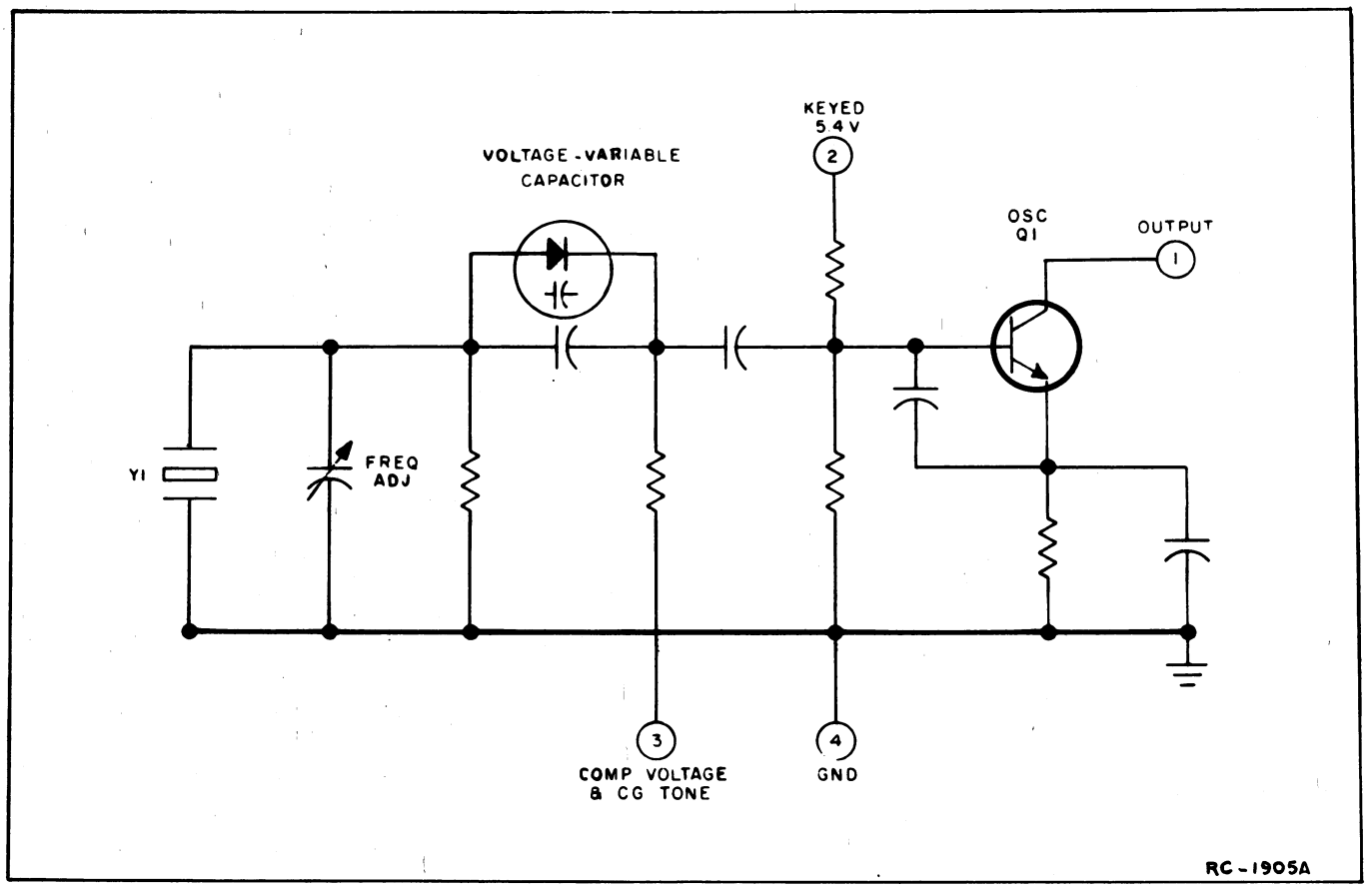


Figure 2 - Typical Oscillator Circuit

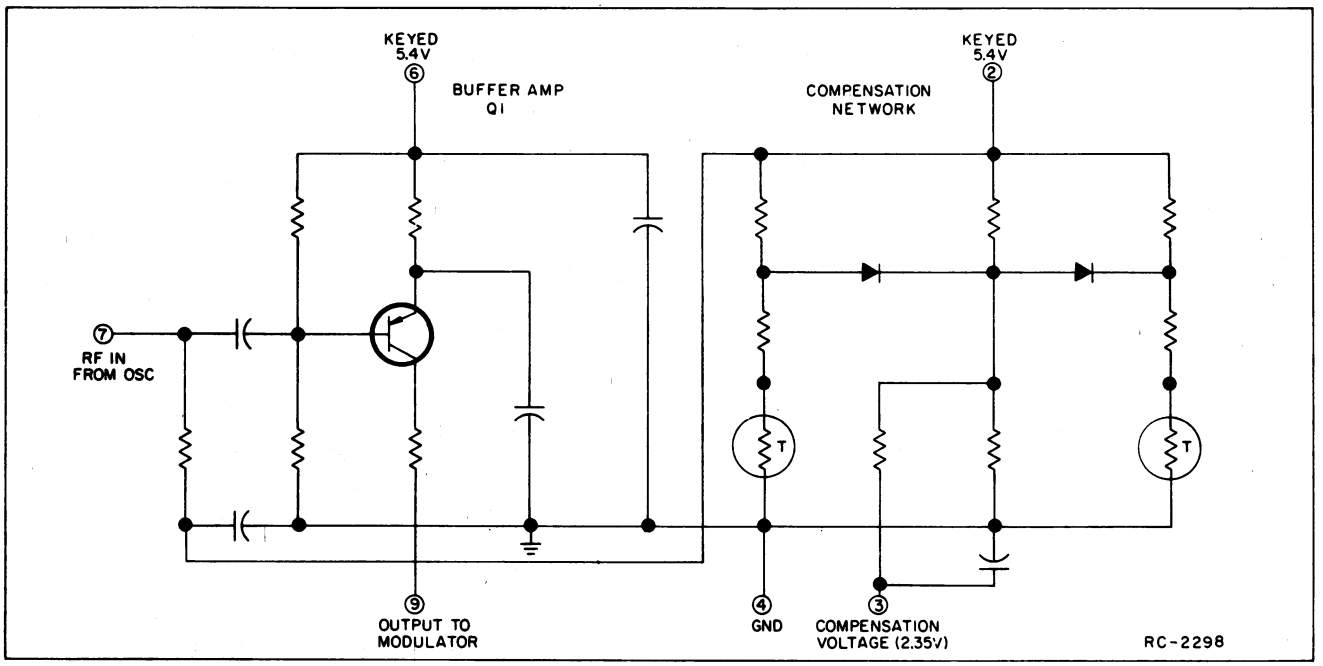


Figure 3 - Typical Compensator Circuit

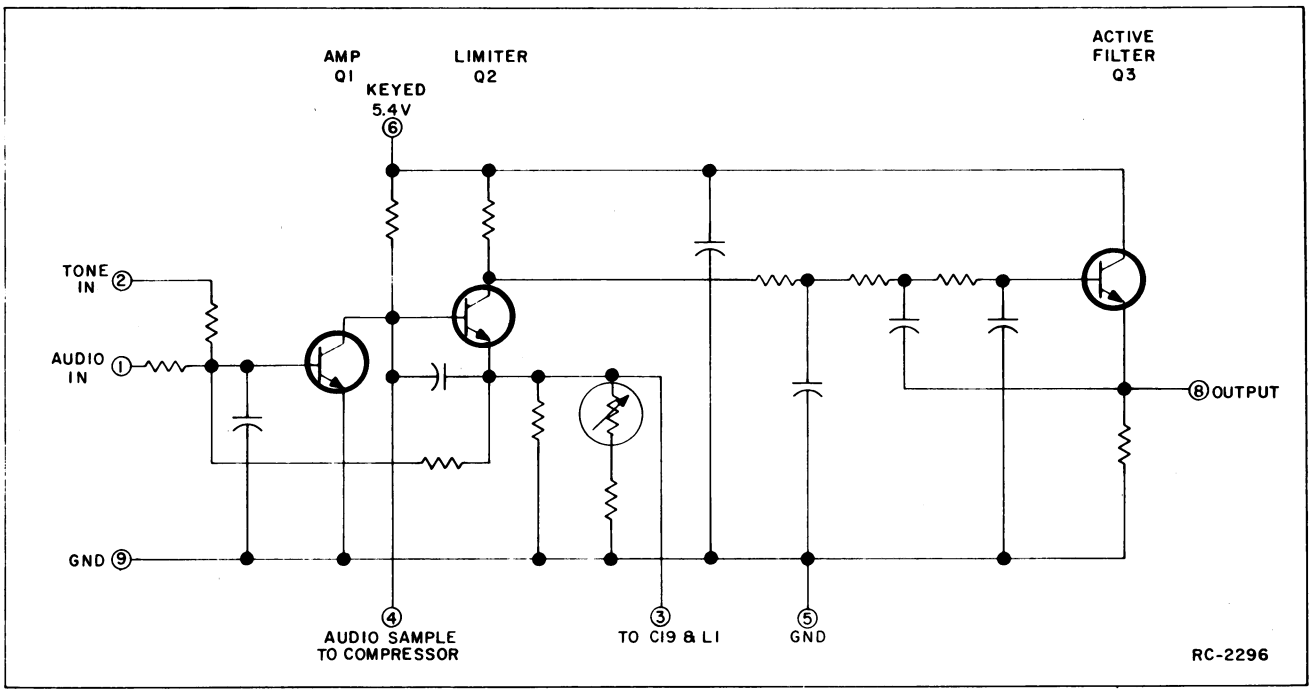


Figure 4 - Typical Audio Amplifier

MODULATOR MODULE A103

The phase modulator circuit consists of Modulator A103, voltage-variable capacitor CV1 and tuneable coil L2. CV1 and L2 are mounted on the system board. A typical modulator circuit is shown in Figure 5.

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 A103 varies the bias of CV1, resulting in a phase modulated output.

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.

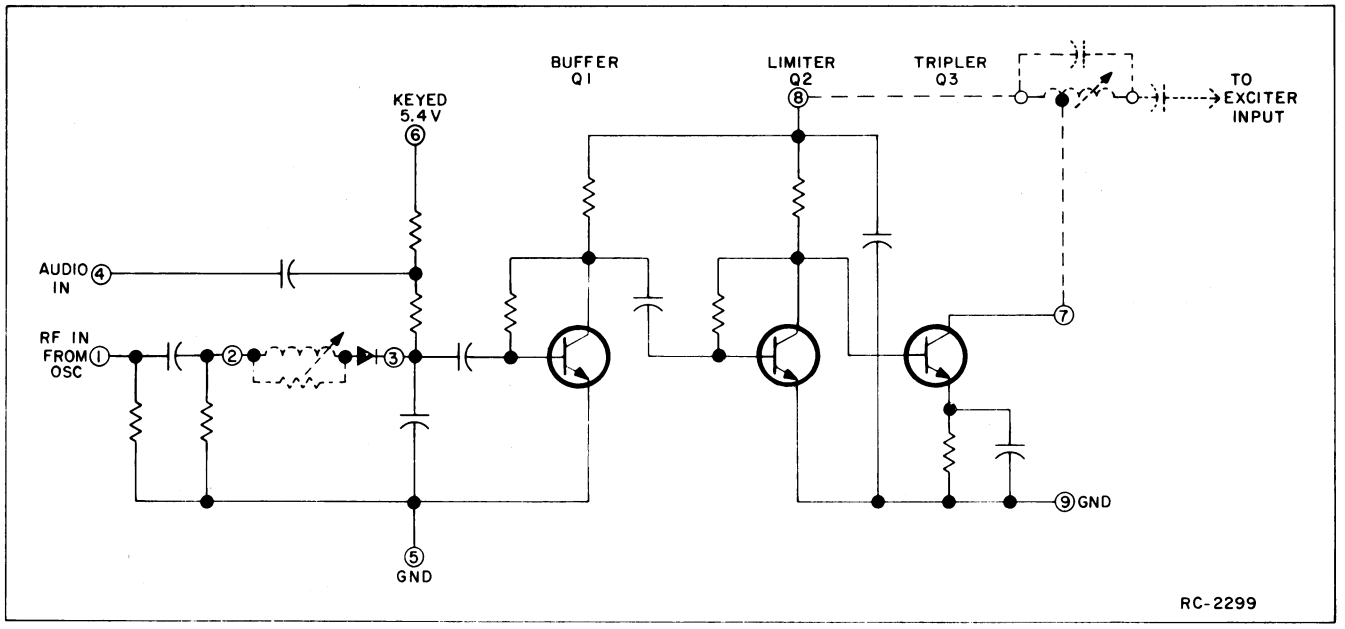


Figure 5 - Typical Phase Modulator Circuit

EXCITER PA MODULE 19D423332G1 & G2

The Exciter PA module consists of a doubler, driver, power amplifier, matching network, low pass filter and an Automatic Power Level Control (APLC) circuit.

The modulator output is coupled through T101 to the base of 1st doubler Q101. The 1st doubler stage as well as the modulator stage is metered at TP1. The 1st doubler output is coupled through T102 and impedance matching network C105/C106 and C107 to the base of driver Q102. T102 is tuned to six times the crystal frequency.

Following the driver is an impedance-matching network consisting of C109/C110, C111, C113, C117/C118 and L103. The network matches the high impedance driver output to the low impedance PA input. L103 is tuned to 6 times the crystal frequency.

The output from PA transistor Q103 is coupled through impedance matching network C133/C138, C121/C122, C123/C124, C136, C137/C125, and L107 to Low Pass Filter C126/C127, C128/C129, C130, L108 and L109. The filter output is connected to the input of the transmitter PA board.

The APLC circuit (Q104 and Q105) provides a more constant transmitter power output level by controlling the output of doubler transistor Q101. The circuit also extends battery life by regulating the collector current of driver transistor Q102.

When Q102 starts to conduct harder and draw more collector current, the voltage drop across R112 increases, causing transistor Q105 to conduct harder. Transistor Q105 conducting harder increases the voltage at the base of transistor Q104 causing Q104 to conduct less. Transistor Q104 conducting less reduces the collector voltage of doubler transistor Q101. The reduced collector voltage of Q101 reduces the drive to Q102 and Power Transistor Q103. The reduced drive to Q103 reduces the power output level.

When Q102 starts to conduct less and draw less current, the voltage drop across R112 decreases.

The voltage drop across R112 decreasing causes Q105 to conduct less and Q104 to conduct more, increasing the collector voltage to Q101 and the drive to power transistor Q103. The increased drive to Q103 increases the power output level.

Power Adjust Potentiometer R111 is not used in this application to set power output, but may be used with TP2 for tuning.

POWER AMPLIFIER BOARD 19D423703G1 THROUGH G4

RF power from the exciter is coupled through impedance matching network C204, C205, C223, C224/C227 and L205/L214 to the base of PA transistor Q202. The RF output at the collector of Q202 is coupled through matching network C210/C225, C211/C226, C215, C216, L210, Low Pass Filter C217 through C221, L211, L212, L213 and System Relay K1 to the antenna.

The Power Control Circuit maintains a constant current through PA transistor Q202 to control the transmitter power output when the supply voltage or load changes.

The voltage drop across metering resistor R206 is monitored by operational amplifier AR201. Initially, the negative and positive inputs to AR201, at Pins 2 and 3, are balanced by BIAS BAL ADJ R208 and PWR ADJ R212 for a nominal voltage output at Pin 6. If the current through PA transistor Q202 starts to increase the voltage drop across R206 will increase proportionally. The voltage on the negative input of AR201 will be smaller than the voltage on the positive input. The output of Pin 6 will be larger than nominal. The increased voltage on the base of pass transistor Q201 will cause Q201 to conduct less and reduce the collector voltage of exciter PA module transistor Q103. The reduced collector voltage on Q103 reduces the RF drive to Q202 proportionally, maintaining a constant current through Q202.

If the current through Q202 starts to fall, the voltage on the negative input of AR201 will increase and the voltage on Pin 6 will decrease. The decreased voltage on the base of Q201 will cause Q201 to conduct harder increasing the collector voltage on Q103. The drive to Q202 will be increased proportionally maintaining constant current through Q202.

MODULATION LEVEL ADJUSTMENT

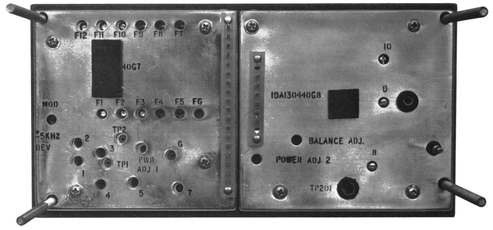
The MOD ADJUST R103 was adjusted to the proper setting before shipment and should not normally require readjustment. This setting permits approximately 75% modulation for the average voice level. The audio peaks which would cause overmodulation are clipped by the modulation limiter. The limiter, in conjunction with the de-emphasis network, instantaneously limits the slope of the audio wave to the modulator, thereby preventing overmodulation while preserving intelligibility.

TEST EQUIPMENT

1. Audio oscillator Model 4EX6A10
2. A deviation meter
3. An output meter or a VTVM

PROCEDURE

1. Connect the equipment as shown in the Test Procedure on the back of this page.
2. Apply a .48 Volt signal at 1000 Hz to the microphone input.
3. For transmitters without Channel Guard, set MOD ADJUST R103 for a 4.5 kHz swing with the deviation polarity which gives the highest reading as indicated on the frequency modulation monitor.
4. For transmitters with Channel Guard, check the Channel Guard modulation for 0.5 - 1.0 kHz.



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED:

- GE Test Set Model 4EX3A11 (or 4EX8K11) or equivalent 20,000 ohms-per-volt meter.
- An ammeter capable of measuring one ampere connected to the B+ lead of the exciter.
- An ammeter capable of measuring 10 amperes connected in the B+ lead of the power amplifier.
- An RF wattmeter capable of measuring 15 Watts for the the portable and 25 Watts for the motorcycle.
- A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Set the channel selector switch to the lowest channel frequency.
2. Set the exciter POWER ADJUST fully clockwise.
3. Set tuning control (7) of exciter to minimum capacity.
4. Set the PA BIAS BALANCE ADJUST fully counterclockwise.
5. Set the PA POWER ADJUST fully clockwise.
6. Set tuning control (10) of PA fully clockwise.
7. Place the (+) lead of the test meter into test point TP1 and the (-) lead on system ground.
8. All adjustments made with the transmitter keyed.

ADJUSTMENT PROCEDURE

STEP	TUNING CONTROL	TYPICAL METER READING	PROCEDURE
		EXCITER	
1.	1	Maximum mA	Adjust Tuning Control 1 for maximum current.
2.	2	Minimum mA	Adjust Tuning Control 2 for minimum current.
3.	3	Maximum TP1 or mA	Adjust Tuning Control 3 for maximum meter reading at TP1 or maximum current.
4.	4	Maximum mA	Adjust Tuning Control 4 for maximum current.
5.	5 & 6	Maximum mA	Adjust Tuning Controls 5 & 6 for maximum current.
6.	8	Maximum Power	Adjust PA Tuning Control 8 for maximum power output.
7.	2 & 3	Maximum TP1	Retune Tuning Controls 2 & 3 for maximum voltage at TP1.
8.	4	Minimum TP1	Retune Tuning Control 4 for minimum voltage at TP1.
		POWER AMPLIFIER	
9.	9 & 10	Maximum Power	Tune Tuning Controls 9 & 10 for maximum power output.
10.	5, 6, 8, 9 & 10	Maximum Power	Retune Tuning Controls 5, 6, 8, 9 & 10 for maximum power.
11.	PWR ADJ (PA)		Turn PA POWER ADJUST fully counterclockwise.
12.	BAL ADJ	Zero power	Turn BALANCE ADJUST until power output decreases to zero.
13.	PWR ADJ		Turn POWER ADJUST until rated power is observed.
14.	10 and PWR ADJ		Tuning Control 10 and POWER ADJUST may be readjusted to obtain desired power and current. Make minimum readjustment at tuning control 10 (POWER ADJUST fully clockwise) for this step. Then set POWER ADJUST to desired power.
		FREQUENCY ADJUSTMENT	
15.			With no modulation, adjust the F1 (and F1 thru F12) crystal trimmer 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 cases 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

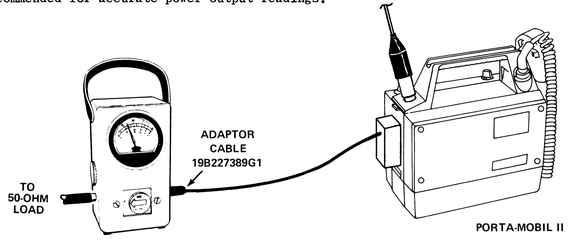
for test hookup shown:

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

STEP 1
POWER MEASUREMENT

TEST PROCEDURE

A. Connect transmitter output to wattmeter as shown below. GE adaptor cable 19B227389G1 is recommended for accurate power output readings.



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

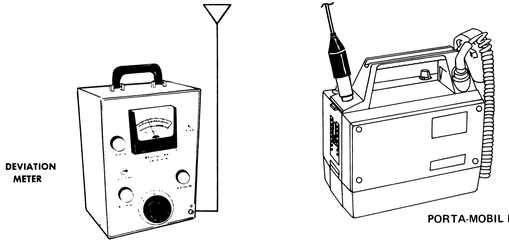
SERVICE CHECK

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 R103 fully counterclockwise.

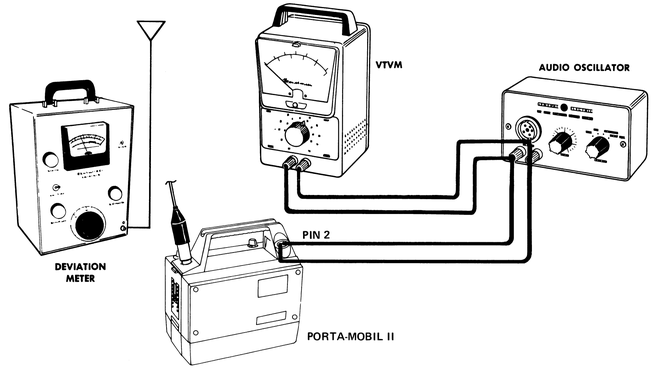
C. Key transmitter and check for approximately 0.75 kHz ±.25 deviation. If reading is low or high, refer to the Channel Guard Troubleshooting Procedure (see Table of Contents).

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 .48 V and frequency to 1 kHz.

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).

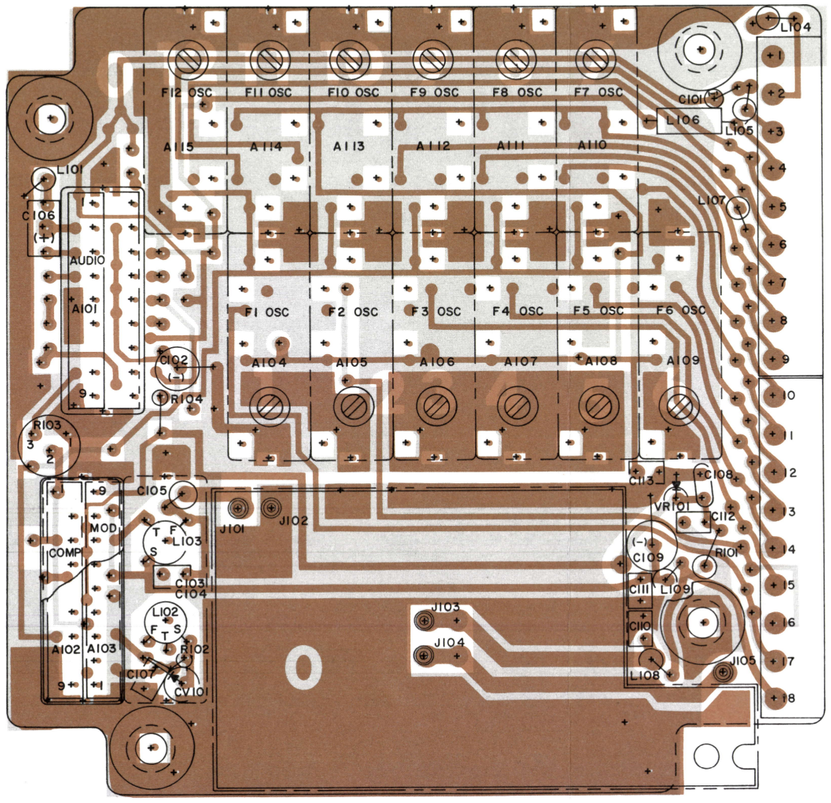
NOTES --These transmitters are adjusted for 4.5 kHz deviation at the factory. The factory adjustment will prevent the transmitter from deviating more than 5.0 kHz under the worst conditions of frequency, voltage and temperature.

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.

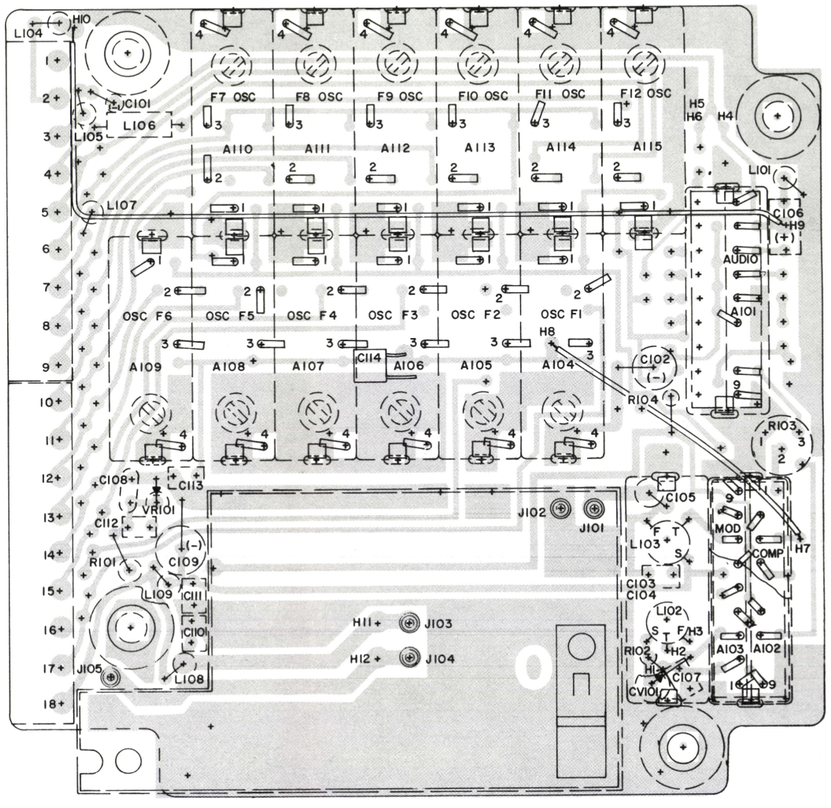
F. Check Audio Sensitivity by reducing generator output until deviation falls to 3 kHz. Voltage should be LESS than .48 V.

COMPONENT SIDE

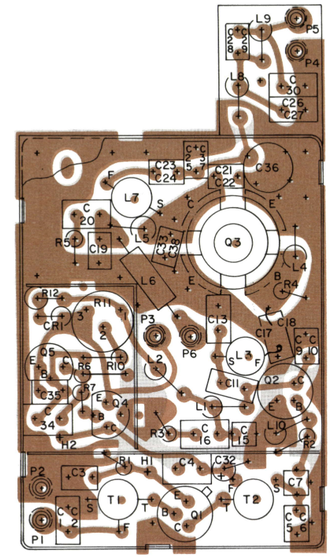


(19D423808, Sh. 2, Rev. 0)
(19D423808, Sh. 3, Rev. 0)

SOLDER SIDE

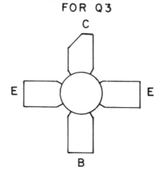


(19D423808, Sh. 2, Rev. 0)



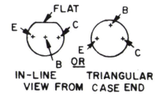
(19D417780, Sh. 2, Rev. 0)
(19D417780, Sh. 3, Rev. 0)

LEAD IDENT
FOR Q3



19C327313, Rev. 0)

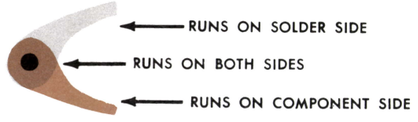
LEAD IDENTIFICATION
FOR Q1, Q2, Q4, Q5



IN-LINE TRIANGULAR
VIEW FROM CASE END

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

(19D424269, Rev. 0)



OUTLINE DIAGRAM

66—88 MHz EXCITER BOARD

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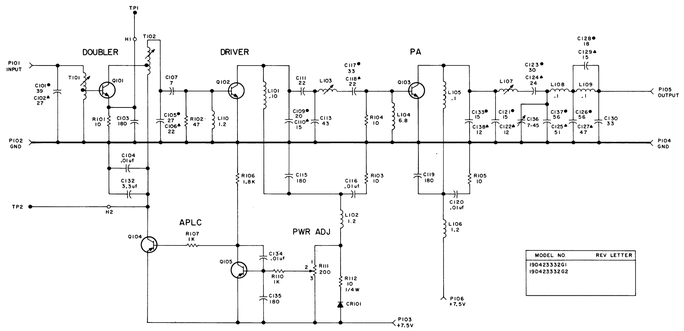
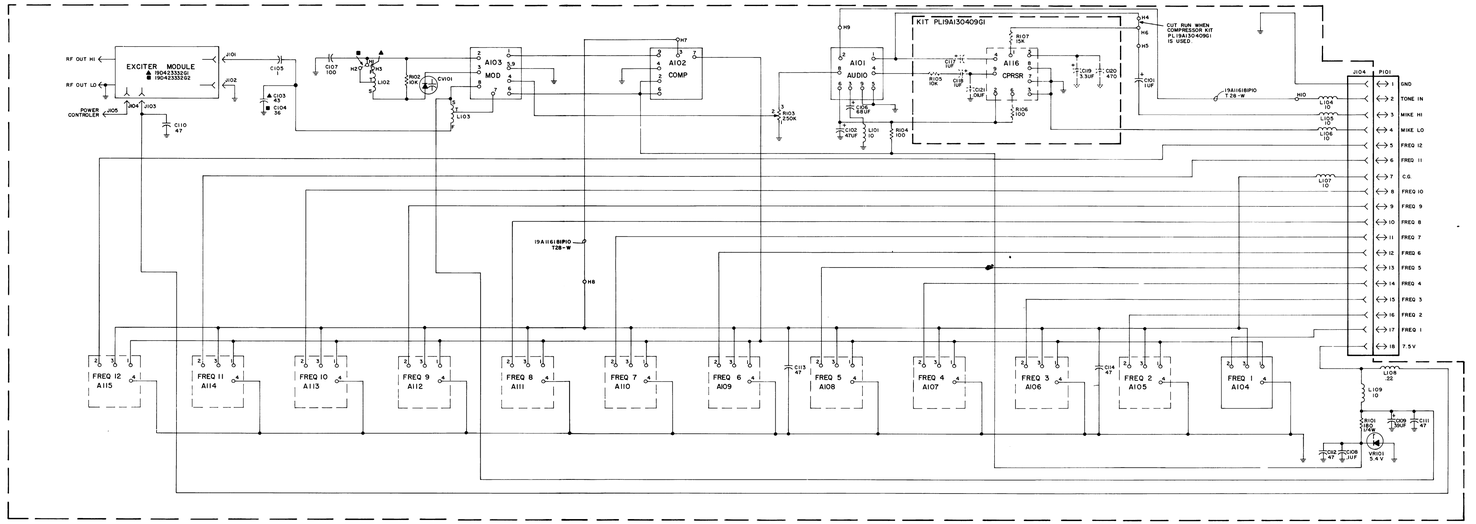


(190423327, Rev. 1)



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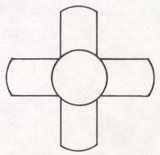
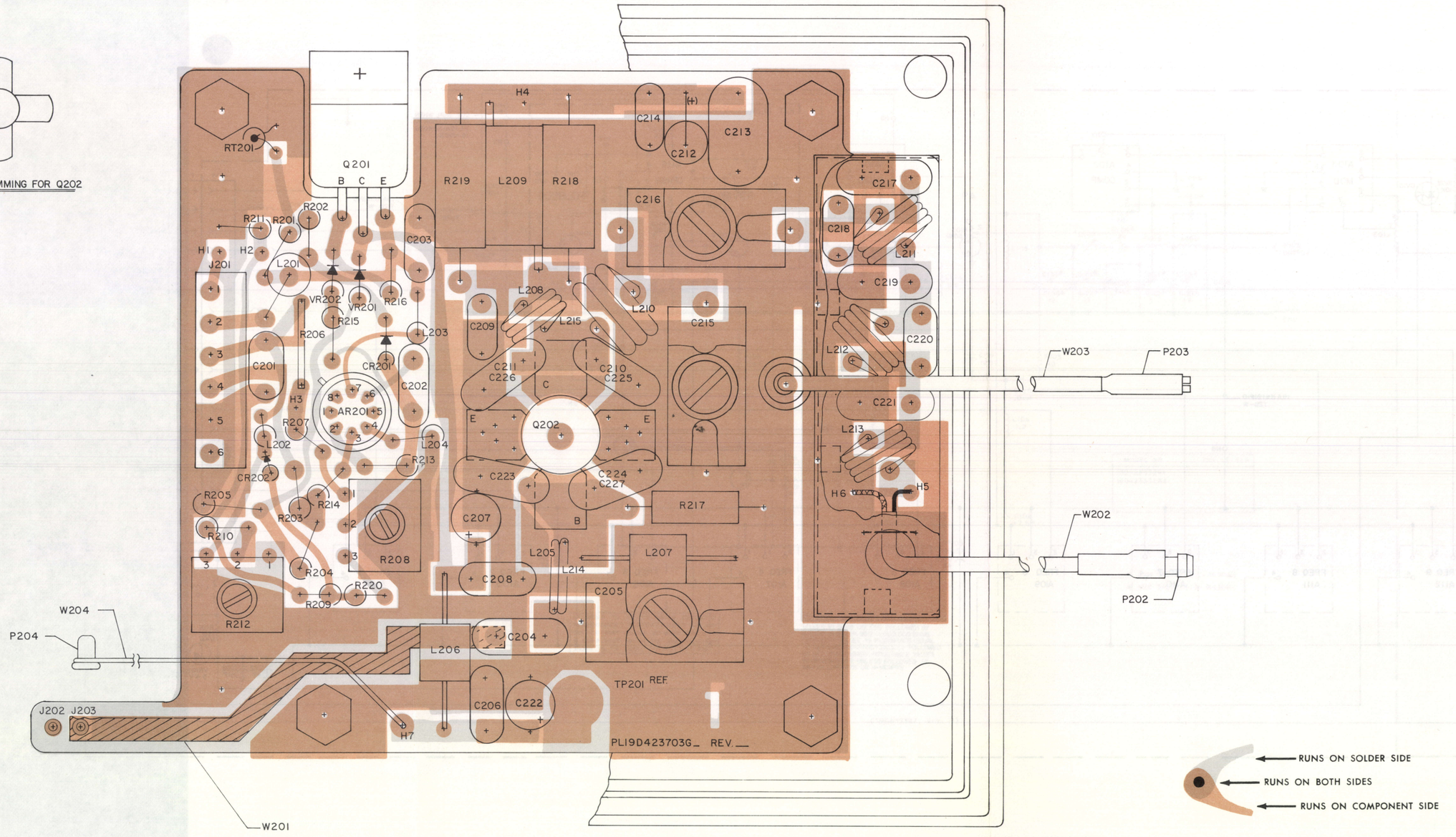
SCHEMATIC DIAGRAM

66—88 MHz EXCITER BOARD



TYP. TRIMMING FOR Q202

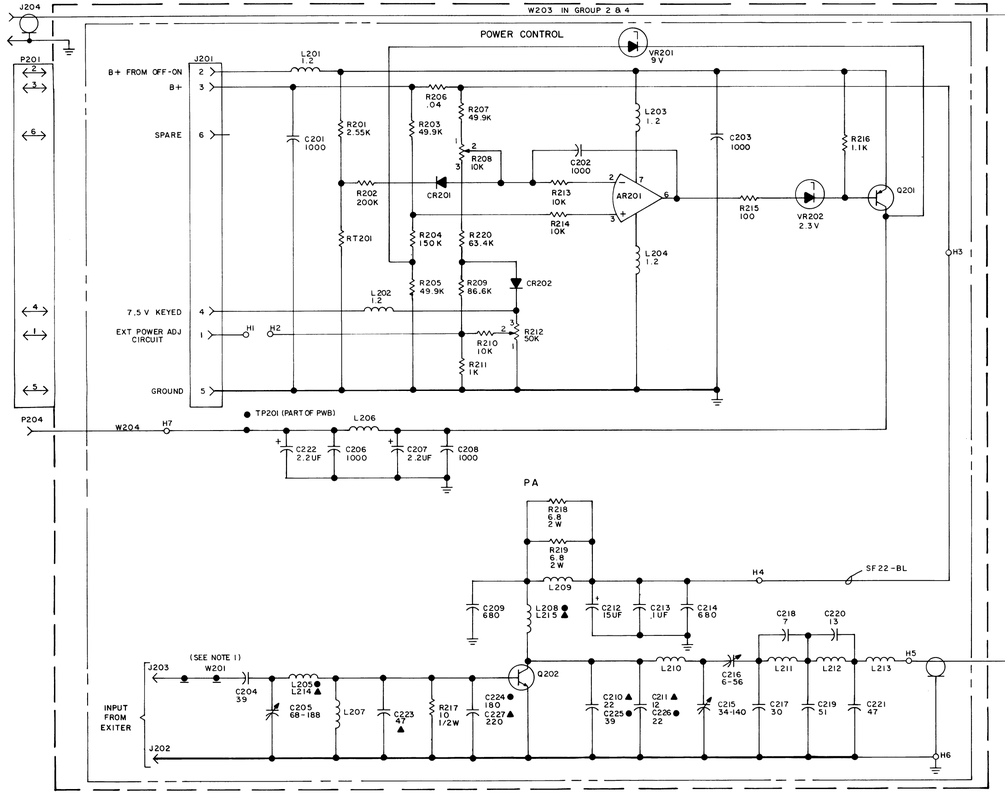


OUTLINE DIAGRAM

66—88 MHz POWER AMPLIFIER

12 Issue 1

(19D424683, Rev. 0)
(19D423712, Sh. 2, Rev. 1)
(19D423712, Sh. 3, Rev. 1)



THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
PL19D423703G1	G2 G3 G4

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.

ALL RESISTORS ARE 1/4 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.

NOTES:
1. 50 OHM MICROSTRIP PART OF P.W.B.

● 66 - 76 MHz
▲ 75 - 88 MHz

(19D423706, Rev. 1)

SCHEMATIC DIAGRAM

66—88 MHz POWER AMPLIFIER

PARTS LIST

LBI-30367

66-88 MHz TRANSMITTER

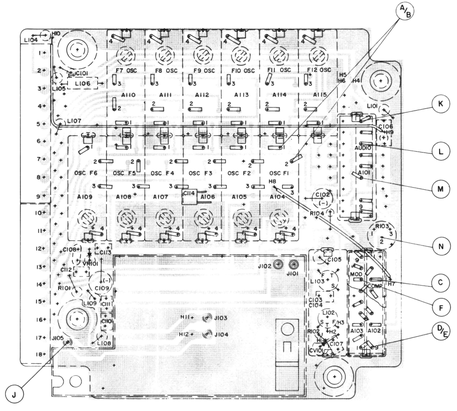
SYMBOL	GE PART NO.	DESCRIPTION
		EXCITER BOARD 19D423807G1
A101	19C320062G1	Audio Module.
A102	19C320060G1	Compensator Module.
A103	19C320084G1	Modulator Module.
		- - - - - - - - - OSCILLATOR MODULES - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact frequency needed.
		Crystal Freq. = $\frac{Fo}{6}$
A104 thru A115	4E627A13	Oscillator Module.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C101	5491674P1	Tantalum: 1.0 µf +40% -20%, 10 VDCW; sim to Sprague Type 162D.
C102	5491674P42	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C105	5491601P120	Phenolic: 1.0 pf ±5%, 500 VDCW.
C106	19C307102P19	Tantalum: 68 µf ±20%, 4 VDCW.
C107	19A116114P8065	Ceramic: 100 pf ±5%, 100 VDCW; temp coef -1500 PPM.
C108	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C109	5491674P30	Tantalum: 39 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C110 thru C114	19A116114P2053	Ceramic: 47 pf ±5%, 100 VDCW; temp coef -80 PPM.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CV101	5495769P9	Diode, silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J101 thru J105		(Part of printed board 19B227285G1).
		- - - - - - - - - INDUCTORS - - - - - - - - -
L101	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4.
L102	19A127798G1	Coil. Includes:
	19B209436P1	Tuning slug.
L103	19B216910G1	Coil. Includes:
	19B209436P1	Tuning slug.
L104 thru L109	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P101	19A130865G2	Connector, printed wiring: 9 contacts; sim to Molex 09-52-3093. (Quantity 2).
		- - - - - - - - - RESISTORS - - - - - - - - -
R101	3R152P181K	Composition: 180 ohms ±10%, 1/4 w.
R102	3R151P103J	Composition: 10,000 ohms ±5%, 1/8 w.
R103	19A116412P4	Variable, cermet: 250,000 ohms ±10%, 0.16 w; sim to Helipot Model 62 PF.
R104	3R151P101K	Composition: 100 ohms ±10%, 1/8 w.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR101	4036887P5	Silicon, Zener.
		EXCITER MODULE 19D423332G1 66-76 MHz 19D423332G2 75-88 MHz
		- - - - - - - - - CAPACITORS - - - - - - - - -
C101	19A116114P2050	Ceramic: 39 pf ±5%, 100 VDCW; temp coef -80 PPM.
C102	19A116114P2043	Ceramic: 27 pf ±10%, 100 VDCW; temp coef -80 PPM.
C103	19A116114P10073	Ceramic: 180 pf ±5%, 100 VDCW; temp coef -3300 PPM.
C104	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C105	19A116114P2044	Ceramic: 27 pf ±5%, 100 VDCW; temp coef -80 PPM.
C106	19A116114P2041	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -80 PPM.
C107	19A116114P2024	Ceramic: 77 pf ±5%, 100 VDCW; temp coef -80 PPM.
C109	19A116114P2039	Ceramic: 20 pf ±5%, 100 VDCW; temp coef -80 PPM.
C110	19A116114P36	Ceramic: 15 pf ±5%, 100 VDCW; temp coef 0 PPM.
C111	19A116114P2041	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -80 PPM.
C113	19A116114P2051	Ceramic: 43 pf ±5%, 100 VDCW; temp coef -80 PPM.
C115	19A116114P10073	Ceramic: 180 pf ±5%, 100 VDCW; temp coef -3300 PPM.
C116	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C117	19A116114P46	Ceramic: 33 pf ±10%, 100 VDCW; temp coef 0 PPM.
C118	19A116114P2041	Ceramic: 22 pf ±5%, 100 VDCW; temp coef -80 PPM.
C119	19A116114P10073	Ceramic: 180 pf ±5%, 100 VDCW; temp coef -3300 PPM.
C120	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C121	19A116114P36	Ceramic: 15 pf ±5%, 100 VDCW; temp coef 0 PPM.
C122	19A116114P33	Ceramic: 12 pf ±5%, 100 VDCW; temp coef 0 PPM.
C123	19A116114P2045	Ceramic: 30 pf ±5%, 100 VDCW; temp coef -80 PPM.
C124	19A116114P2042	Ceramic: 24 pf ±5%, 100 VDCW; temp coef -80 PPM.
C125	19A116114P2054	Ceramic: 51 pf ±5%, 100 VDCW; temp coef -80 PPM.
C126	19A116114P3056	Ceramic: 56 pf ±5%, 100 VDCW; temp coef -150 PPM.
C127	19A116114P2053	Ceramic: 47 pf ±5%, 100 VDCW; temp coef -80 PPM.
C128	19A116114P2038	Ceramic: 18 pf ±5%, 100 VDCW; temp coef -80 PPM.
C129	19A116114P2036	Ceramic: 15 pf ±5%, 100 VDCW; temp coef -80 PPM.
C130	19A116114P46	Ceramic: 33 pf ±10%, 100 VDCW; temp coef 0 PPM.
C132	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C133	19A116114P36	Ceramic: 15 pf ±5%, 100 VDCW; temp coef 0 PPM.
C134	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C135	19A116114P10073	Ceramic: 180 pf ±5%, 100 VDCW; temp coef -3300 PPM.
C136	19A134162P2	Variable, ceramic: approx 7 to 40 pf; sim to Erie Style 513-001.
C137	19A116114P3056	Ceramic: 56 pf ±5%, 100 VDCW; temp coef -150 PPM.
C138	19A116114P33	Ceramic: 12 pf ±5%, 100 VDCW; temp coef 0 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR101	19A115250P1	Silicon.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L101	19B209420P101	Coil, RF: 0.10 µh ±10%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
L102	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1.
L103	19B226948G1	Coil. Includes:
	19B209436P1	Tuning slug.
L104	19B209420P123	Coil, RF: 6.80 µh ±10%, 1.80 ohms DC res max; sim to Jeffers 4446-2.
L105	19B209420P101	Coil, RF: 0.10 µh ±10%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
L106	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1.
L107	19B226947G1	Coil. Includes:
	19B209436P1	Tuning slug.
L108 and L109	19B209420P101	Coil, RF: 0.10 µh ±10%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
L110	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P101 thru P106	19A115834P4	Contact, electrical: sim to AMP 2-332070-9.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q101	19A115328P1	Silicon, NPN.
Q102	19A116201P3	Silicon, NPN.
Q103	19B227818G2	Silicon.
Q104 and Q105	19A115852P1	Silicon, PNP; sim to Type 2N3906.
		- - - - - - - - - RESISTORS - - - - - - - - -
R101	3R151P100J	Composition: 10 ohms ±5%, 1/8 w.
R102	3R151P470J	Composition: 47 ohms ±5%, 1/8 w.
R103 thru R105	3R151P100J	Composition: 10 ohms ±5%, 1/8 w.
R106	3R151P182J	Composition: 1800 ohms ±5%, 1/8 w.
R107	3R151P102J	Composition: 1000 ohms ±5%, 1/8 w.
R110	3R151P102J	Composition: 1000 ohms ±5%, 1/8 w.
R111	19A116412P1	Variable, cermet: 200 ohms ±10%, 1/2 w; sim to Helipot Model 62 PF.
R112	3R151P100J	Composition: 10 ohms ±5%, 1/8 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T101	19B216910G2	Coil. Includes:
	19B209436P1	Tuning slug.
T102	19B216934G1	Coil. Includes:
	19B209436P1	Tuning slug.
		PA BOARD 19D423703G1 66-76 MHz PORTABLE 19D423703G2 66-76 MHz MOTORCYCLE 19D423703G3 75-88 MHz PORTABLE 19D423703G4 75-88 MHz MOTORCYCLE
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
AR201	19A116297P2	Linear: TO-99 Case.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C201 thru C203	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C204	7489162P17	Silver mica: 39 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C205	19B209408P8	Variable, mica: 70 to 200 pf, 400 VDCW.
C206	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C207	19A134202P7	Tantalum: 2.2 µf ±20%, 20 VDCW.
C208	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C209	5496203P371	Ceramic disc: 620 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C210	7489162P11	Silver mica: 22 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C211	7489162P7	Silver mica: 12 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C212	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C213	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C214	5496203P371	Ceramic disc: 620 pf ±10%, 500 VDCW, temp coef -4700 PPM.
C215	19B209408P6	Variable, mica: 37 to 140 pf, 400 VDCW.
C216	19B209408P3	Variable, mica: 7 to 50 pf, 400 VDCW.
C217	7489162P14	Silver mica: 30 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C218	5496218P38	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C219	7489162P20	Silver mica: 51 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C220	5496218P43	Ceramic disc: 13 pf ±10%, 500 VDCW, temp coef 0 PPM.
C221	7489162P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C222	19A134202P7	Tantalum: 2.2 µf ±20%, 20 VDCW.
C223	7489162P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C224	7489162P33	Silver mica: 180 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C225	7489162P17	Silver mica: 39 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C226	7489162P11	Silver mica: 22 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C227	7489162P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR201 and CR202	19A115250P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J201	19A130856G1	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3063.
J202 and J203	19A116366P6	Contact, electrical: sim to Concord 10-891-2.
J204		(Part of W203).
		- - - - - - - - - INDUCTORS - - - - - - - - -
L201 thru L204	19B209420P114	Coil, RF: 1.20 µh ±10%, 0.18 ohms DC res max; sim to Jeffers 4436-1.
L205	19C321968P1	Coil.
L206 and L207	19A130340G1	Coil.
L208	19C321968P2	Coil.
L209	19B227229G1	Coil.
L210	19C321968P3	Coil.
L211 and L212	19C321968P4	Coil.
L213	19C321968P5	Coil.
L214	19C321968P1	Coil.
L215	19C321968P6	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P201	19A116659P71	Connector, printed wiring: 6 contacts.
P202		(Part of W202).
P203		(Part of W203).
P204		(Part of W204).
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q201	19A116942P1	Silicon, PNP.
Q202	19A134391P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R201	19C314256P22551	Metal film: 2550 ohms ±1%, 1/4 w.
R202	3R152P204J	Composition: 200,000 ohms ±5%, 1/4 w.
R203	19C314256P24992	Metal film: 49,900 ohms ±1%, 1/4 w.
R204	19C314256P21503	Metal film: 150,000 ohms ±1%, 1/4 w.
R205	19C314256P24999	Metal film: 49.8 megohms ±1%, 1/4 w.
R206	19A134225P1	Resistance wire: size No. 22 AWG.
R207	19C314256P24992	Metal film: 49,900 ohms ±1%, 1/4 w.
R208	19A116559P106	Variable, cermet: 10,000 ohms ±20%, .5 w; sim to CTS Series 360.
R209	19C314256P28662	Metal film: 86,200 ohms ±1%, 1/4 w.
R210	19C314256P21002	Metal film: 10,000 ohms ±1%, 1/4 w.
R211	19C314256P21001	Metal film: 1000 ohms ±1%, 1/4 w.
R212	19A116559P108	Variable, cermet: 50,000 ohms ±20%, .5 w; sim to CTS Series 360.
R213 and R214	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R215	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R216	3R152P112J	Composition: 1100 ohms ±5%, 1/4 w.
R217	3R77P10J	Composition: 10 ohms ±5%, 1/2 w.
R218 and R219	5490205P2	Composition: 6.8 ohms ±5%, 1 w.
R220	19C314256P26342	Metal film: 63,400 ohms ±1%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT201	19C300048P6	Disc: 50,000 ohms ±10%; sim to NL Ind. 4D 103.
		- - - - - - - - VOLTAGE REGULATORS - - - - - -
VR201	4036887P1	Silicon, Zener.
VR202	4036887P7	Silicon, Zener.
		- - - - - - - - - - CABLES - - - - - - - - - -
W201		(Part of printed board 19A130944G1).
W202	19A130432G3	Cable assembly, RF: coaxial; sim to Solitron/ Microwave 8100-0003. Includes (P202).
W203	19A130432G6	Cable assembly, RF: coaxial; sim to Solitron/ Microwave 8120-003. Includes (J204 and P203).
W204	19A130942G1	Cable: approx 2 inches long. Includes (P204-19A115834P4).
		ASSOCIATED ASSEMBLIES
		COMPRESSOR KIT 19A130409G1
A116	19C311907G2	Audio Compressor. Thick film hybrid.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C117 and C118	5491674P1	Tantalum: 1.0 µf +40% -20%, 10 VDCW; sim to Sprague Type 162D.
C119	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C120	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-A050-W5R-471M.
C121	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R105	3R151P103J	Composition: 10,000 ohms ±5%, 1/8 w.
R106	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R107	3R151P153J	Composition: 15,000 ohms ±5%, 1/8 w.
R108	3R151P433J	Composition: 43,000 ohms ±5%, 1/8 w.
		HI-LOW SPLIT KIT 19A136519G1 66-76 MHz 19A136519G2 75-88 MHz
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C103	19A116114P2051	Ceramic: 43 pf ±5%, 100 VDCW; temp coef -80 PPM.
C104	19A116114P2048	Ceramic: 36 pf ±5%, 100 VDCW; temp coef -80 PPM.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219443P1	Insulator. (Used with Exciter Board).
	19C321058P1	Contact, spring. (Ground- located on Exciter Board).
	19C311491P3	Can. (Used with A101-A103 on Exciter Board).
	19A129245P1	Nut: 8-32. (Used with Q3 on Driver Board).
	19A130616P1	Shield. (Located by C4 on Driver Board).
	19A130617P1	Shield. (Located by R11 on Driver Board).
	4035306P11	Washer, fiber. (Used with Q1 and Q2 on Driver Board).
	19C320921G3	Back cover. (PA Board - PORTABLE).
	19D423486G3	Back cover. (PA Board - MOTORCYCLE).
	19B226408P1	Nut: thd. size No. 8-32. (Used with Q202 on PA Board).
	19A116746P1	Insulator, bushing. (Used with Q201 on PA Board).
	19A116023P1	Insulator, plate. (Used with Q201 on PA Board).
	19B226409P2	Spacer. (Located on PA Board).
	4032574P4	Gasket. (Located on back cover).
	19A130151P4	Gasket. (Used with J204).
	19B227230P1	Shield. (Located on PA Board).
	4038593P5	Insulated sleeving. (Used with R206 on PA Board).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

STEP 1- QUICK CHECKS

SYMPTOM	QUICKCHECK
No power output	If no power output is obtained, check the reading at TP1. If no reading is obtained at TP1, check reading at (Y), (K), and (B). If TP1 is correct, check reading at (F). If (Q) is correct, replace exciter PA module. If (Y) is incorrect, troubleshoot Power Amplifier 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 at (K), (L), (N), and (B). 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 (Y).

SOLDER SIDE

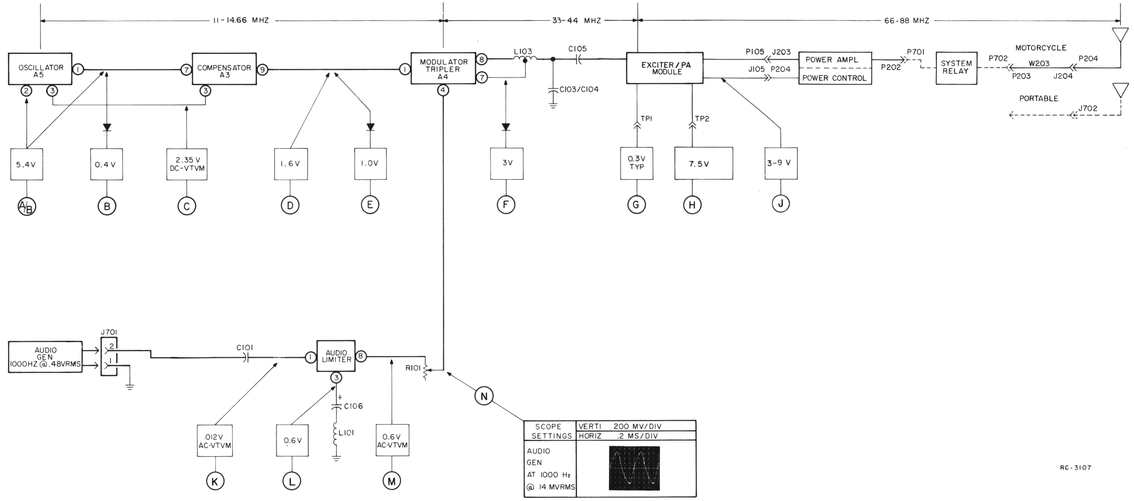


(19D424269, Rev. 0)
(19D423808, Sh. 2, Rev. 0)
(RC-3111)

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.



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.
