MAINTENANCE MANUAL

406-512 MHz EXCITER BOARD 19D432679G1, 2, 3, 7

TABLE OF CONTENTS

	Page
DESCRIPTION	1
CIRCUIT ANALYSIS	1
OUTLINE DIAGRAM	5
SCHEMATIC DIAGRAM	5,8,9
MODIFICATION INSTRUCTIONS (VOICE GUARD)	6
PARTS LIST AND PRODUCTION CHANGES	10

DESCRIPTION

The exciter uses seven transistors and an integrated circuit to provide 185 milliwatts of RF drive to the PA assembly.

The exciter can be equipped with up to eight Integrated Circuit Oscillator Modules FM (ICOMs). The FM ICOM crystal frequency ranges from approximately 11.3 to 14.2 megahertz, and the crystal frequency is multiplied 36 times.

Audio, supply voltages and control functions are connected from the system board to the exciter board through P902.

Centralized metering jack J103 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The test set meters the modulator, multiplier and amplifier stages, and the regulated 10-Volts.

CIRCUIT ANALYSIS

FM ICOMS (Frequency Modulated)

Three different types of FM ICOMs are available for use in the exciter. Each ICOM contains a crystal0controlled Colpitts oscillator, and two of the ICOMs contain compensator ICs. The different FM ICOMs are:

5C-FM ICOM — contains an oscillator and a 5 parts-per-million (±0.0005%) compensator IC. Provides compensation for EC-ICOMs.

EC-FM ICOM — contains an oscillator only. Requires external compensation from a 5C-ICOM.

2C-FM ICOM — contains an oscillator and a 2 PPM (±0.0002%) compensator IC. Will not provide compensation for an EC-FM ICOM.

The ICOMs are enclosed in a RF shielded can with the type ICOM (5C-FM ICOM, EC-FM ICOM or 2C-FM ICOM) printed on the top of the can. Access to the oscillator trimmer is obtained through a hole in the top of the can.

Frequency selection is accomplished by switching the ICOM keying lead (terminal 9) to A- by means of the frequency selector switch on the control unit. In single-frequency radios, a jumper from H9 to H10 in the control unit connects terminal 9 of the FM ICOM to A-. The oscillator is turned on by applying a keyed +10 Volts to the external oscillator collector load resistor (R111) which forward biases an internal diode switch.

The FM ICOMs have an audio input which receives audio from the audio processor circuit. Therefore, with Modulation present, the output frequency of the "FM" ICOM varies at an audio rate.

CAUTION

All ICOMs are individually compensated at the factory and cannot be repaired in the field. Any attempt to repair or change the ICOM frequency will void the warranty.

In standard 5 PPM radios using EC-FM ICOMs, at least one 5C-FM ICOM or 5C ICOM must be used. The 5C ICOM is normally used in the receiver F1 position. A 5C-FM ICOM can be used in any transmit position.

NOTE

The EC and 5C type ICOMs are not interchangeable with EC-FM or 5C FM type ICOMs. The EC and 5C type ICOMs are used only in the receivers. While the EC-FM and 5C-FM type ICOMs are always used in the transmitter.

One 5C ICOM or 5C-FM ICOM can be provide compensation for up to 15 EC ICOMs or EC-FM ICOMs in the transmitter and receiver. Should the 5C ICOM or the 5C-FM ICOM compensator fail in the open mode, the EC-FM ICOMs will still maintain 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F) due to the regulated compensation voltage (5 Volts) from the 10 Volt regulator IC. If desired, up to 8 5C-FM ICOMs may be used in the radio.

The 2C-FM ICOMs are self-compensated at 2 PPM and will not provide compensation for EC-FM ICOMs.

Oscillator Circuit

Quartz crystals used in ICOMs exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

At both the coldest and hottest temperatures, the frequency increases with increasing temperature. In the middle temperature range (approximately 0°C to 55°C), frequency decreases with increasing temperature.

Since the rate of change is nearly linear over the mid-temperature range, the output frequency change can be compensated by choosing a parallel compensation capacitor with a temperature coeficient approximately equal to and opposite that of the crystal.

Figure 1 shows the typical performance of an uncompensated crystal as well as the typical performance of a crystal which has been matched with a properly chosen compensation capacitor.

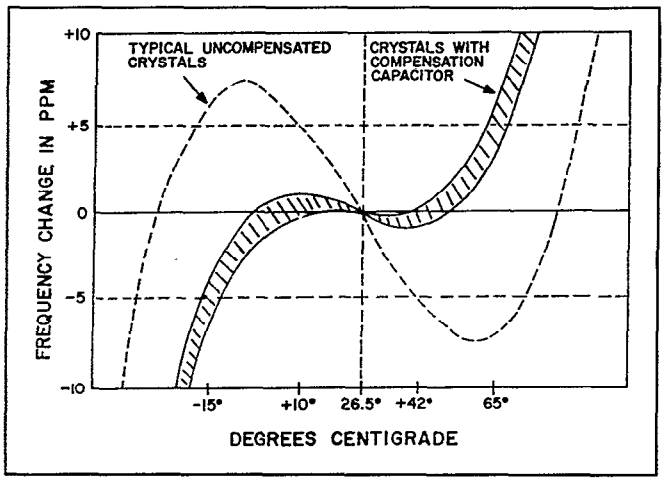

Figure 1 - Typical Crystal Characteristics

At temperatures above and below the mid-range, additional compensation must be introduced. An externally generated compensation voltage is applied to a varactor (voltage-variable capacitor) connected in parallel with the crystal. Refer to Figure 2 for a simplified diagram of the FM ICOM.

A constant bias of 5 Volts (provided from Regulator IC U901 connected in parallel with the compensator) maintains varactor capacity at a constant value over the entire mid-temperature range. This compensation voltage achieves the ±2 PPM stability.

Modulation is accomplished with a hyperabrupt varicap connected in series with the crystal feedback capacitors. The varicap impedance is the dominant impedance in the loop. This allows large swings of load capacity with modulation, therefore, large frequency shifts are achieved for the modulated input. Biasing for the modulation varicap is provided by a voltage divider, R112 and R113, connected across the 10 volt regulator input at P902-7. A bias voltage of 6.2 volts is applied to pin 6 of all ICOMs.

Compensator Circuits

Both the 5C-ICOMs and 2C-FM ICOMs are temperature compensated at both ends of the temperature range to provide instant frequency compensation.

The cold end compensation circuit does not operate at temperatures above 0°C. When the temperature drops below 0°C, the circuit is activated. As the temperature

decreases, the equivalent resistance decreases and the compensation voltage increases.

An increase in compensation voltage decreases the capacitance of the varactor in the oscillator, thereby increasing the output frequency of the ICOM.

The hot end compensation circuit does not operate at temperatures below +55°C. When the temperature rises above +55°C, the circuit is activated. As the temperature increases, the equivalent resistance decreases and the compensation voltage decreases. The decrease in compensation voltage increases the capacity of the varactor, decreasing the output frequency of the ICOM.

SERVICE NOTE

Proper ICOM operation is dependent on the closely-controlled input voltages for the 10-Volt regulator. Should all of the ICOMs shift off frequency, check the 10-Volt regulator module.

AUDIO PROCESSOR A101

The transmitter audio processor contains audio circuitry consisting of two operational amplifiers, AR101-A and -B, a pre-emphasis circuit with amplitude limiting and a post limiter filter. A total gain of approximately 24 dB is realized through the audio processor. Twenty dB is provided by AR101-B and 4 dB by AR101-A.

The 10 Volt regulator powers the audio processor and applies regulated +10 V thru P902-6 to a voltage divider consisting of R108 and R110. The +5 V output from the voltage divider establishes the operating reference point for both operational amplifiers. C107 filters out any noise that may be on the 10 Volt line to assure a stable voltage supply to the operational amplifiers.

Resistors R105, R106 and R107 and diodes CR101 and CR102 provide limiting for AR101-B. Diodes CR101 and CR102 are reverse biased by +5 VDC on AR101B-6 and voltage divider network R105, R106 and R107. The voltage divider network provides +7 VDC at the cathode of CR101 and +3 VDC at the anode of CR102. C102 and C103 permit a DC level change between AR101B-7 and the voltage divider network for diode biasing.

When the input signal to AR101B-6 is of a magnitude such that the amplifier output at AR101B-7 does not exceed 4 volts p-p, the amplifier provides a nominal 20 dB gain. When the audio signal level at AR101B-7 exceeds 4 volts PP, diodes CR101 and CR102 conduct on the positive and negative half cycles providing 100% negative feedback to reduce the amplifier ain to 1. This limits the audio amplitude at AR101B-7 to 5 volts PP.

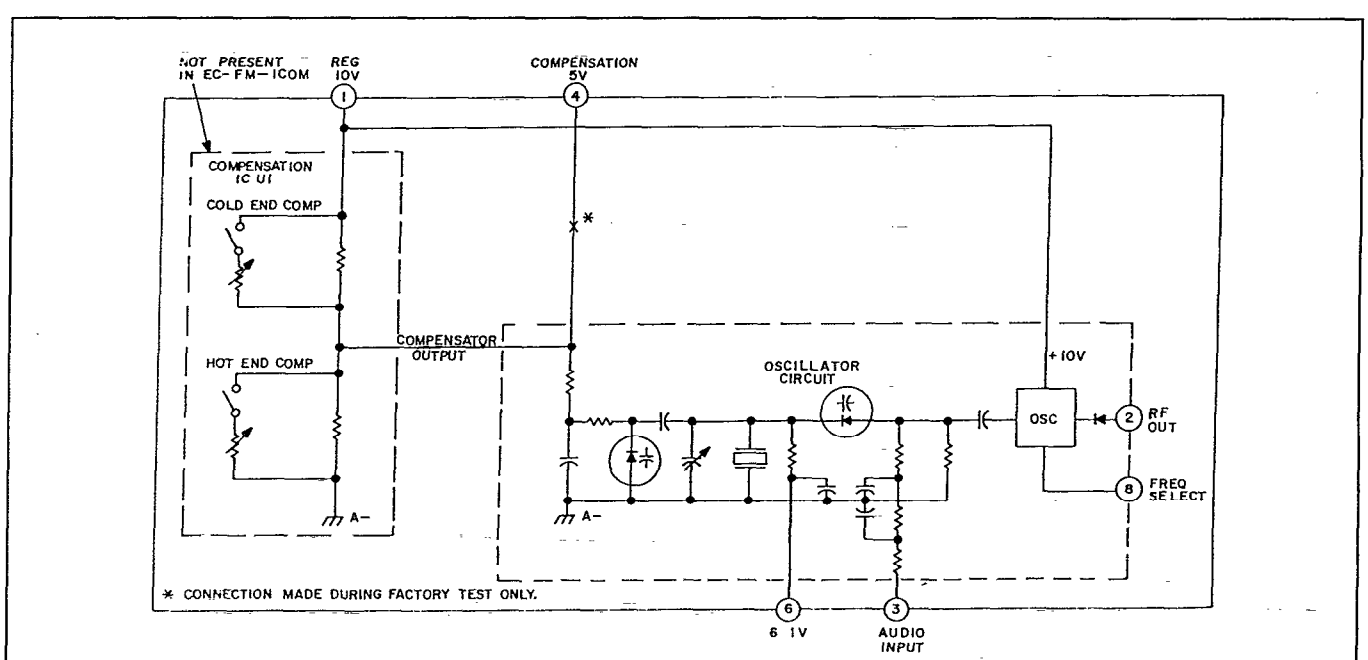

Figure 2 - Equivalent FM-ICOM Circuit

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Resistors, R102, R103 and R104 and C104 comprise the audio pre-emphasis network that enhances the signal to noise ratio. R104 and C104 control the pre-emphasis curve below limiting. R103 and C104 control the cut-off point for high frequency pre-emphasis. As high frequencies are attenuated, the gain of AR101 is increased.

Audio from the microphone is applied to the audio processor at P102-1 and coupled to the input of operational amplifier AR101-B through R101 and C101.

The amplified output of AR101-B is coupled through P102-4 audio MOD ADJ control R104, R102-3, C106, R112 and R113 to a second operational amplifier AR101-A. Audio MOD ADJ control is set for a deviation of 4.5 kHz.

The Channel Guard tone input is applied to the audio processor through P902-2, CG MOD ADJ R103 to P102-5. The CG tone is then coupled through C105 and R111 to AR101A-2 where it is combined with the microphone audio. AR101-A provides a signal gain of approximately 4 dB.

A post limiter filter consisting of AR101A, R112-R114, C108 and C109 provide 12 dB per octave roll off. R109 and C111 provide an additonal 6 dB per octave roll off for a total of 18 dB.

SERVICE NOTE

R112-R114 are 1% resistors. This tolerance must be maintained to assure proper operation of the post limiter filter. Use exact replacements.

The output of the post limiter filter is coupled throut RT101 and R106 to the temperature compensated audio amplifier Q101.

AUDIO AMPLIFIER

The output of the audio processor is applied to audio amplifier Q101 through temperature compensator and biasing network consisting of RT101, R106 and R109. RT101, with a nominal resistance of 50 ohms from 25°C to 70°C, maintains a constant modulation index over the normal operating temperature range. The resistance of RT101 increases with a decrease in temperature below 25°C, thereby decreasing the signal drive to audio amplifier Q101.

Audio amplifier Q101 has a nominal gain of 2. The temperature compensated audio is coupled through C114 to pin 3 of the FM ICOM. A varactor withing the FM ICOM is used to modulate the carrier frequency at the audio rate. The output of the FM ICOM is taken from pin 2 and applied to a buffer stage.

BUFFER, MULTIPLIERS & AMPLIFIER

Buffer Q102 is saturated when no RF signal is present. Applying an RF Signal to Q102 provides a sawtooth waveform at its collector to drive class C tripler, Q103. The first tripler stage is metered through R117. The output of Q103 is coupled through tuned circuits T102, T103 and T104 to the base of the second tripler, Q104. T102, T103 and T104 are tuned to three times the crystal frequency. The second tripler stage, Q104 is metered through R122.

The output of Q104 is coupled through tuned circuits T105 and T106 to the base of first doubler Q105. T105 and T106 are tuned to nine times the crystal frequency. Q105 is metered through R126.

The output of Q105 is coupled through two tuned circuits (T107 and T108) to the base of second doubler Q106. These circuits are tuned to 18 times the crystal frequency (one0half the transmitter operating frequency). Q106 is metered through R133.

The output of Q106 is coupled to the base of power amplifier Q107 through impedance matching networks composed of C152, C155, L105, C156, C157, L106 and C161. These networks are all tuned to the operating frequency and present a high shunt impedance at the operating frequency. All other frequencies are shunted to ground. Q107 is metered through R142.

Impedance matching network C166, C157, L108, L113, C171, L109 and C175 matches the output of Q107 to the input of the PA Assembly. C167, C171, and C175 are tuned to the proper operating frequency.

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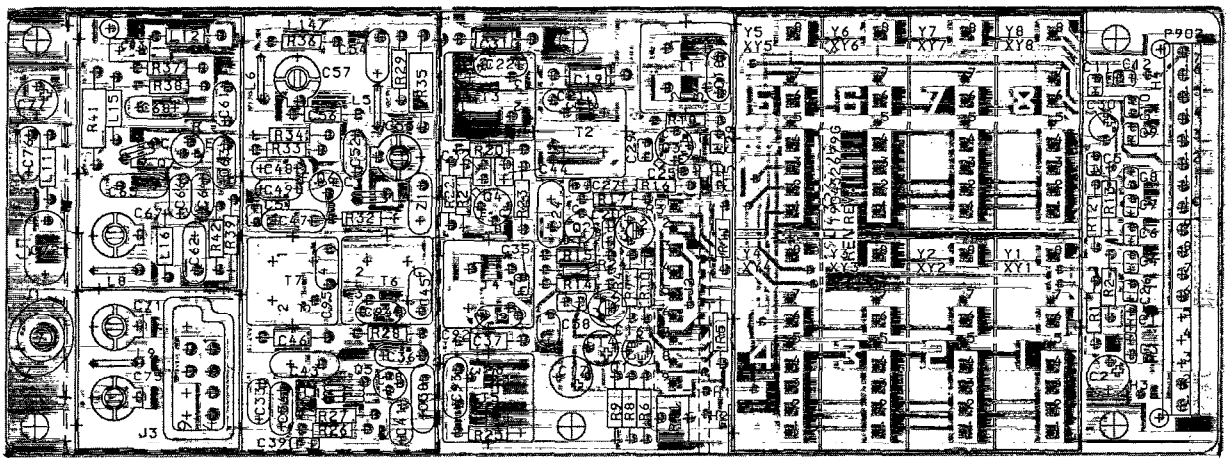
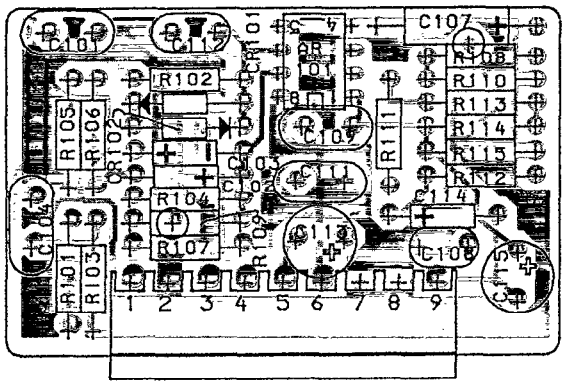
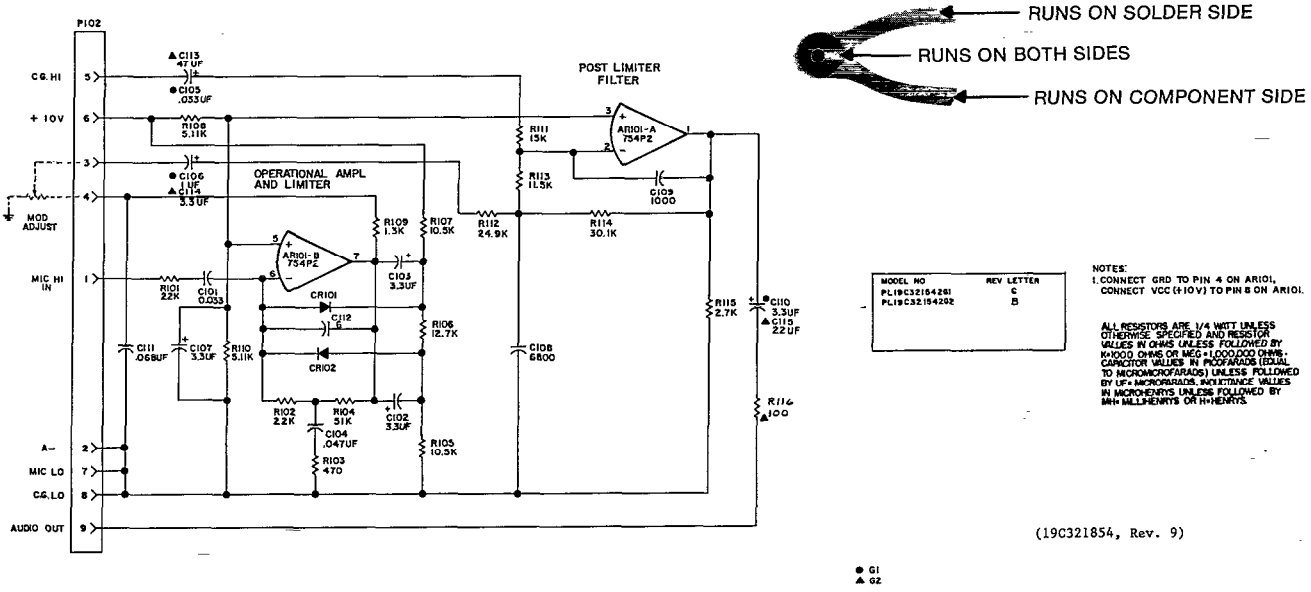


(19D432711, Rev. 4)
(19A143624, Sh. 1, Rev. 5)
(19A143624, Sh. 2, Rev. 5)



(19C331136, Rev. 3)
(19A143587, Sh. 1, Rev. 1)
(19A143587, Sh. 2, Rev. 1)

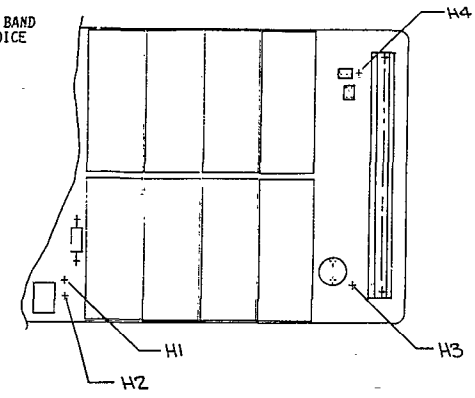


(19C321854, Rev. 9)

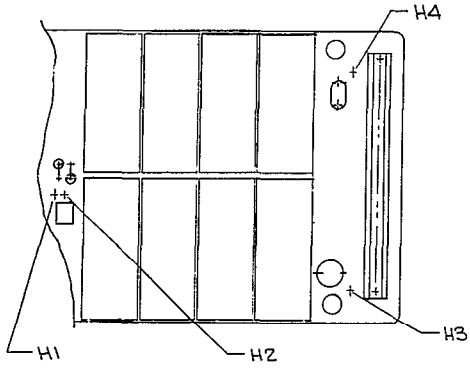
(1)

THIS INSTRUCTION MODIFIES A HIGH BAND OR UHF MASTR II FM EXCITER FOR VOICE GUARD OPERATION.

1. REMOVE JUMPER BETWEN H1 & H2.
2. SOLDER SF24-R FROM H1 TO H3. (PL19323477461).
3. SOLDER SF24-R FROM H2 TO H4. (PL19323477461)



EXCITER BOARD (UHF)
PL19D432679



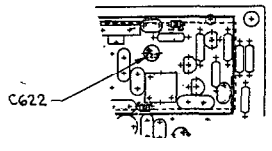
EXCITER BOARD HB
PL19D423249

(3)

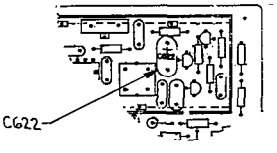
THIS INSTRUCTION MODIFIES A HIGH BAND OR UHF MASTR II RECEIVER IFAS BOARD 19D432667G1 & 19D417707G1. (DO NOT INSTALL MODIFICATION TO 19D902492 - NOT NECESSARY)

1. REMOVE COVER FROM FM DETECTOR AREA.
2. REPLACE C622(0.47 UFD) WITH A 10 UFD CAPACITOR PART NUMBER 315A6047P106N (OBSERVE CORRECT POLARITY).
3. REPLACE COVER.

IF/AUDIO/SQUELCH BOARD
19D432667G1

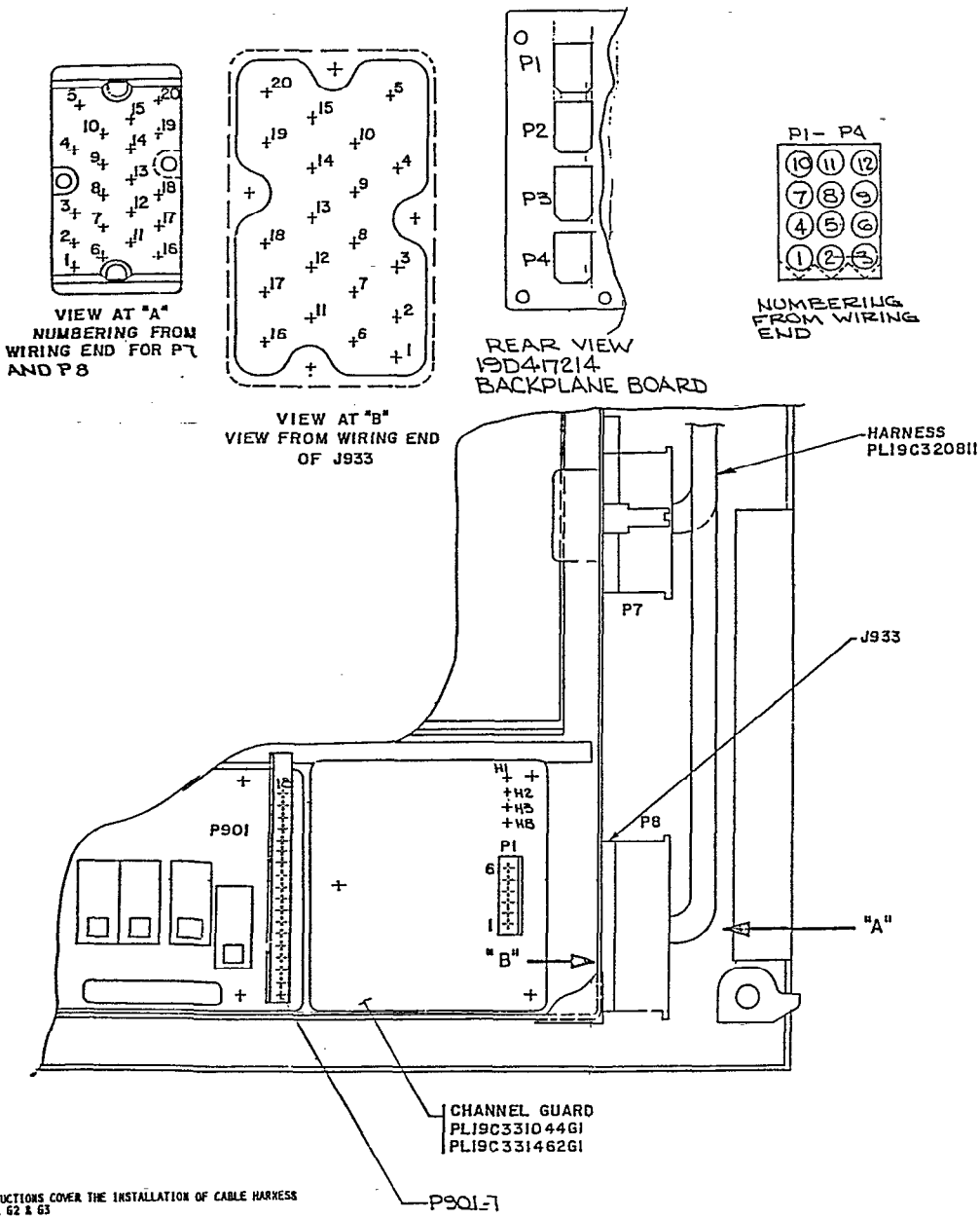


IF/AUDIO/SQUELCH BOARD
19D417707G1



VOICE GUARD OPTION

(19C836664, Sh. 1, Rev. 2)



(2) THESE INSTRUCTIONS COVER THE INSTALLATION OF CABLE HARNESS PL19C851484 G2 & G3

1. INSTALL DA JUMPER BETWEEN H3 & H8 ON CG ENCODER. IF H8 NOT PRESENT CUT TERMINAL FROM WRBL WIRE (PL19234774G3) AND SOLDER TO H3. CONNECT OTHER END TO J933-18 AND SPOT TIE TO EXISTING CHANNEL GUARD HARNESS. SKIP TO STEP 3 IF H8 IS NOT PRESENT.
2. IF H8 IS PRESENT, INSTALL WRBL WIRE (PL19B234774G3) IN P1-2 & SOLDER OTHER END TO J933-18 & SPOT TIE TO EXISTING CHANNEL GUARD HARNESS.
3. INSTALL YELLOW WIRE (PL19B234774G4) IN P901-2 & SOLDER OTHER END TO J933-19 & SPOT TIE TO EXISTING EXCITER HARNESS.
4. INSTALL ORANGE WIRE (PL19B234774G2) IN P901-18 & SOLDER OTHER END TO J933-20 & SPOT TIE TO EXISTING EXCITER HARNESS.
5. INSTALL ORANGE WIRE PART OF PL19C851484G2 HARNESS IN P3-9 SOLDER OTHER END TO P8-20. INSTALL YELLOW WIRE PART OF PL19C851484G2 HARNESS IN P4-2 & SOLDER OTHER END TO P8-19. INSTALL WRBL WIRE PART OF PL19C851484G2 HARNESS IN P4-9 & SOLDER THE OTHER END TO P8-18. SPOT TIE THE PL19C851484G2 HARNESS TO EXISTING PL19C320811 HARNESS.

(4) THESE INSTRUCTIONS COVER THE INSTALLATION OF CABLE HARNESS PL19C851484G3 AND PL19B234841G1.

1. *DO STEPS 1 THRU 4 OF PART 2 ABOVE.*
2. INSTALL YELLOW WIRE PART OF PL19B234841G1 HARNESS IN P1-1 SOLDER OTHER END TO P7-5. INSTALL WHITE-RED WIRE PART OF PL19B234841G1 HARNESS IN P4-9 SOLDER OTHER END TO P8-18. INSTALL WHITE-BLUE-BLACK WIRE PART OF PL19B234841G1 HARNESS IN P4-2 SOLDER OTHER END TO P8-19. INSTALL WHITE-ORANGE WIRE PART OF PL19B234841G1 HARNESS IN P3-9 SOLDER OTHER END TO P8-20.
3. SPOT TIE PL19B234841G1 TO EXISTING PL19C320811 HARNESS WITH CABLE CLAMPS SUPPLIED WITH PL19B234841G1 HARNESS.

(5) 800 MHz PST – 19B234774G8

1. INSTALL YELLOW WIRE IN P901-2 & SOLDER OTHER END TO J933-19.
2. INSTALL W-O WIRE IN P901-15 AND SOLDER OTHER END TO J933-20. SPOT TIE YELLOW AND ORANGE WIRES TO EXISTING EXCITER HARNESS.
3. REMOVE DA WIRE BETWEEN J933-4 AND J933-8.

(6) 400 MHZ PST

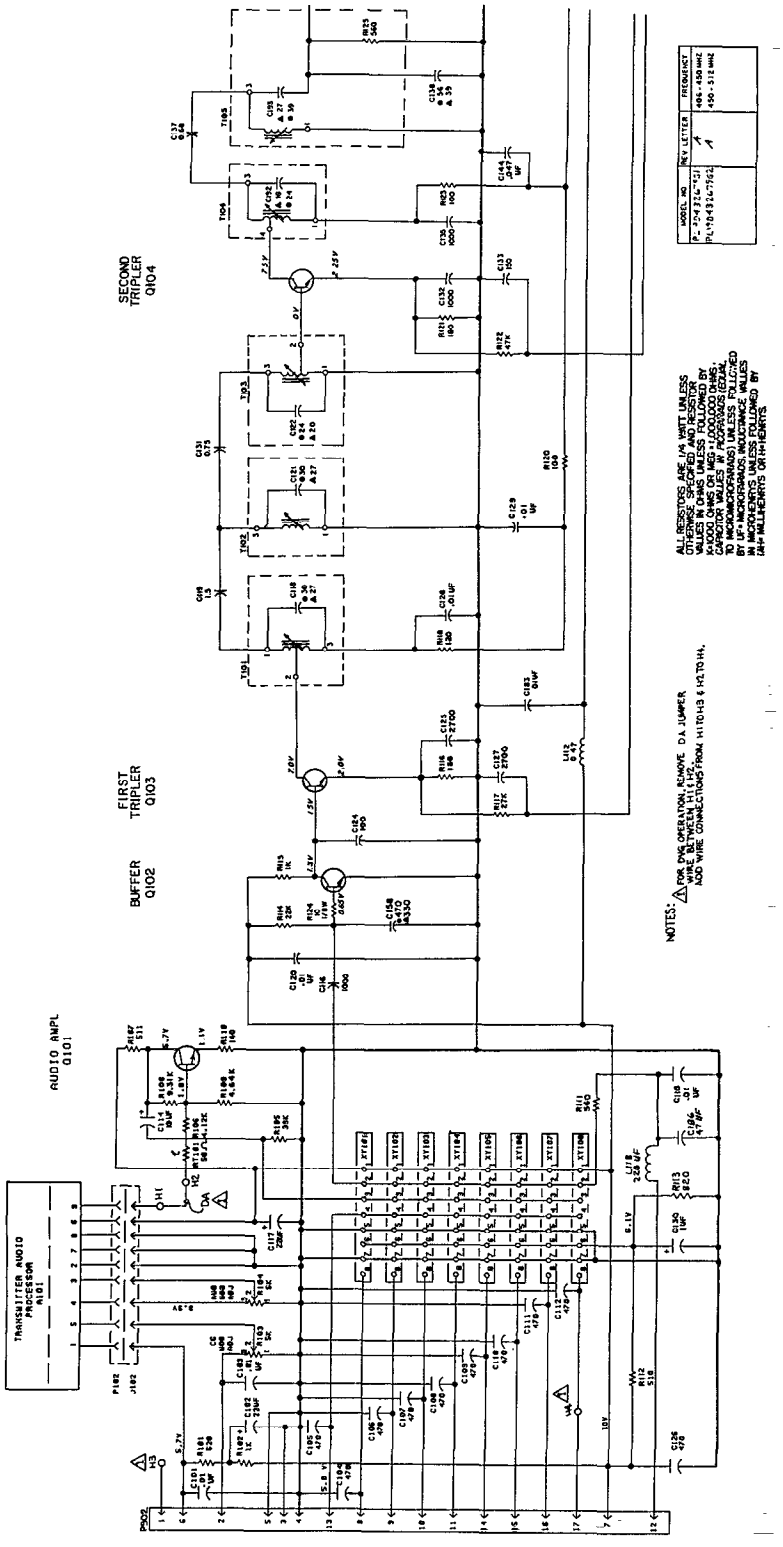
1. DO STEP 3 & 4 OF PART 2.
2. *DO STEPS 1 THRU 3 OF PART 1.*
3. ON HARNESS 19C320811G15 OR G16, REMOVE WIRES, FROM P8-8,9,10 & 11. CUT WIRES AND TIE BACK IN HARNESS.

(7) THESE INSTRUCTIONS COVER THE INSTALLATION OF CABLE HARNESS PL19B234841G1 TO THE UNITS WHOSE COMBINATION NUMBER HAS THE 7TH DIGIT OF "D","E",OR "F".

1. DO STEPS 3 & 4 OF PART 2 ABOVE.
2. INSTALL WHITE/ORANGE WIRE IN PL19B234841G1 HARNESS INTO P3-9 & SOLDER OTHER END TO P8-20 INSTALL WHITE/BLUE/BLACK WIRE IN PL19B234841G1 *HARNESS INTO P4-2 & AND SOLDER OTHER END TO P8-19.*
3. CUT ENDS OF REMAINING WIRES. TO PREVENT ELECTRICAL SHORTS AND SPOT TIE THE HARNESS TO THE EXISTING PL19C320811G15 HARNESS

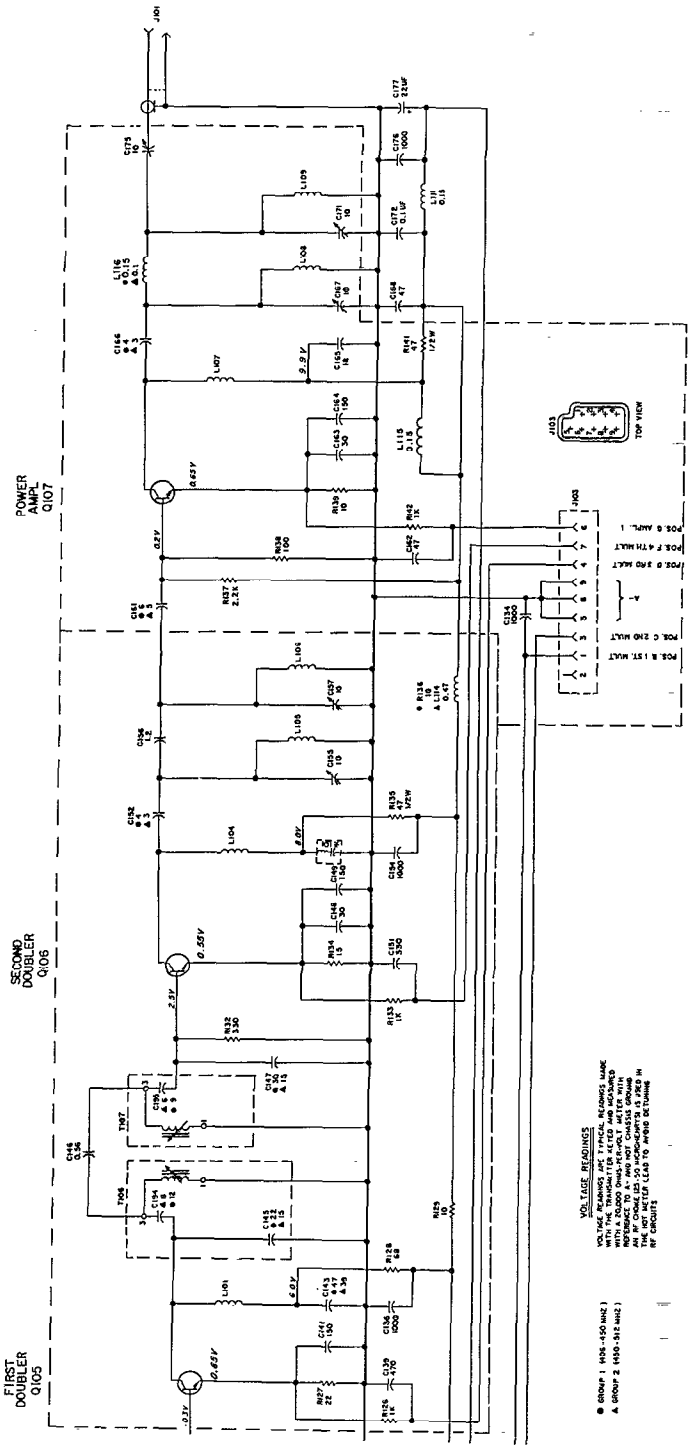
VOICE GUARD OPTION

(19C336664, Sh. 2, Rev. 9)



406-512 MHz EXCITER BOARD 19D432679G1 & G2

(19R601685, Rev. 4)



406-512 MHz EXCITER BOARD
19D432679G1 & G2

(19R601683, Rev. 4)

406-512 MHz EXCITER BOARD
19D432679G1 (L) 406-450 MHz
19D432679G2 (H) 450-512 MHz

SYMBOL	PART NUMBER	DESCRIPTION
		——— CAPACITORS ———
C101	19A116192P1	Ceramic: 0.01 µF ±20%, 50 VDCW; sim to Erie 8121 Special.
C102	19A134202P6	Tantalum: 22 µF ±20%, 15 VDCW.
C103	19A116192P1	Ceramic: 0.01 µF ±20%, 50 VDCW; sim to Erie 8121 Special.
C104 thru C112	19A116192P2	Ceramic: 470 pF ±20%, 50 VDCW; sim to Erie 811-A050-W5R-471M.
C114	19A701534P7	Tantalum: 10 µF ±20%, 16 VDCW.
C115	19A116192P1	Ceramic: 0.01 µF ±20%, 50 VDCW; sim to Erie 8121 Special.
C116	19A116192P13	Ceramic: 1000 pF ±10%, 50 VDCW; sim to Erie 8121-A050-W5R-102K.
C117	19A134202P6	Tantalum: 22 µF ±20%, 15 VDCW.
C118L	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G1).
C118H	19A116656P27J8	Ceramic disc: 27 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G2).
C119	19A700013P15	Phenolic: 1.50 pF ± 5%, 500 VDCW.
C120	19A116192P1	Ceramic: 0.01 µF ±20%, 50 VDCW; sim to Erie 8121 Special.
C121L	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G1).
C121H	19A116656P27J8	Ceramic disc: 27 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G2).
C122L	19A116656P24J8	Ceramic disc: 24 pF ±5%, 500 VDCW, temp. coef -80 PPM (Used in G1).
C122H	19A116656P20J8	Ceramic disc: 20 pF ±5%, 500 VDCW, temp. coef -80 PPM (Used in G2).
C124	19A700105P34	Mica: 100 pF ±5%, 500 VDCW.
C125	19A116192P4	Ceramic: 2700 pF ±20%, 50 VDCW; sim to Erie 8121-M050-W5R-272K.
C126	19A116192P2	Ceramic: 470 pF ±20%, 50 VDCW; sim to Erie 811-A050-W5R-471M.
C127	19A116192P4	Ceramic: 2700 pF ±20%, 50 VDCW; sim to Erie 8121-M050-W5R-272K.
C128 and C129	19A116192P1	Ceramic: 0.01 µF ±20%, 50 VDCW; sim to Erie 8121 Special.
C130	19A701534P4	Tantalum: 1 µF ± 20%, 35 VDCW.
C131	5491601P118	Phenolic: 0.75 pF ± 5%, 500 VDCW.
C132	19A116192P13	Ceramic: 1000 pF ±10%, 50 VDCW; sim to Erie 8121-A050-W5R-102K.
C133	19A116655P7	Ceramic disc: 150 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C134	19A116655P19	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C135	19A116192P13	Ceramic: 1000 pF ±10%, 50 VDCW; sim to Erie 8121-A050-W5R-102K.
C136	19A116655P19	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C137	19A700013P11	Phenolic: 0.68 pF ± 5%, 500 VDCW.
C138L	19A116656P56J8	Ceramic disc: 56 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G1).
C138H	19A116656P39J8	Ceramic disc: 39 pF ±5%, 500 VDCW, temp. coef -80 PPM (Used in G2).
C139	19A116192P2	Ceramic: 470 pF ±20%, 50 VDCW; sim to Erie 811-A050-W5R-471M.
C141	19A116655P7	Ceramic disc: 150 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C143L	19A700105P26	Mica: 47 pF ±5%, 500 VDCW. (Used in G1).
C143H	19A700105P23	Mica: 39 pF ±5%, 500 VDCW. (Used in G2).
C144	19A116192P17	Ceramic: 0.047 µF ±10%, 50 VDCW; sim to Erie 8101-A050-X5R-331K.
C145L	19A116656P22J8	Ceramic disc: 22 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G1).
C145H	19A116656P15J8	Ceramic disc: 15 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G2).
C146	19A700013P10	Phenolic: 0.56 pF ± 5%, 500 VDCW.
C147L	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G1).
C147H	19A116656P15J8	Ceramic disc: 15 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G2).
C148	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp. coef -80 PPM.
C149	19A116655P7	Ceramic disc: 150 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C151	19A116192P7	Ceramic: 330 pF ±10%, 50 VDCW; sim to Erie 8101-A050-W5R-331K.
C152L	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDCW, temp. coef 0 PPM. (Used in G1).
C152H	19A116656P3J0	Ceramic disc: 3 pF ±0.5 pF, 500 VDCW, temp. coef 0 PPM. (Used in G2).
C154	19A116655P19	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C155	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C156	19A700013P14	Phenolic: 1.20 pF ± 5%, 500 VDCW.
C157	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C158L	19A700233P5	Ceramic:470 pF ± 20%, 50 VDCW. (Used in G1).
C158H	19A700233P4	Ceramic: 330 pF ±20%, 50 VDCW. (Used in G2).
C161L	19A116656P6J8	Ceramic disc: 6 pF ± 5%, 500 VDCW; temp. coef -80 PPM. (Used in G1).
C161H	19A116656P5J8	Ceramic disc: 5 pF ± 5%, 500 VDCW; temp. coef -80 PPM. (Used in G2).
C162	19A116656P47J1	Ceramic disc: 47 pF ± 5%, 500 VDCW; temp. coef -150 PPM.
C163	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp. coef -80 PPM.
C164	19A116655P7	Ceramic disc: 150 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C165	19A700105P14	Mica: 18 pF ±5%, 500 VDCW.
C166L	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDCW, temp. coef 0 PPM. (Used in G1).
C166H	19A116656P3J0	Ceramic disc: 3 pF ±0.5 pF, 500 VDCW, temp. coef 0 PPM. (Used in G2).
C167	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C168	19A116656P47J1	Ceramic disc: 47 pF ± 5%, 500 VDCW; temp. coef -150 PPM.

* COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NUMBER	DESCRIPTION
C171	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C172	19A116080P107	Polyester: 0.1 µF ±10%, 50 VDCW.
C175	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C176	19A116655P19	Ceramic disc: 1000 pF ± 20%, 1000 VDCW; sim to RMC Type JF Discap.
C177	19A134202P6	Tantalum: 22 µF ±20%, 15 VDCW.
C183	19A700005P7	Polyester:á 0.01 µF ±10%, 50 VDCW.
C186	19A701534P19	Tantalum:á 47 µF ±20%, 16 VDCW.
C192L	19A116656P24J8	Ceramic disc: 24 pF ±5%, 500 VDCW, temp. coef -80 PPM (Used in G1).
C192H	19A116656P18J8	Ceramic disc: 18 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G2).
C193L	19A116656P39J8	Ceramic disc: 39 pF ±5%, 500 VDCW, temp. coef -80 PPM (Used in G1).
C193H	19A116656P27J8	Ceramic disc: 27 pF ±5%, 500 VDCW, temp. coef -80 PPM. (Used in G2).
C194L	19A116656P12J8	Ceramic disc: 12 pF ± 5%, 500 VDCW; temp. coef -80 PPM. (Used in G1).
C194H	19A116656P8J8	Ceramic disc: 8 pF ± 5%, 500 VDCW; temp. coef -80 PPM. (Used in G2).
C195L	19A116656P9J8	Ceramic disc: 9 pF ± 5%, 500 VDCW; temp. coef -80 PPM. (Used in G1).
C195H	19A116656P6J0	Ceramic disc: 6 pF ±0.5 pF, 500 VDCW, temp. coef 0 PPM. (Used in G2).
		——— JACKS ———
J101	19A700049P2	Connector, receptacle; 500 VDCW maximum; sim to NTTF-1058.
J102	19A700237P1	Contact, electrical: sim to Malco 003-0132-001. (Used in G1).
J103	19B219374G1	Connector: 9 contacts.
		——— INDUCTORS ———
L101	19A130255P3	Coil.
L104	19A130255P2	Coil.
L105	19A130443P1	Coil.
L106L	19A130443P4	Coil. (Used in G1).
L106H	19A130443P2	Coil. (Used in G2).
L107	19A130255P2	Coil.
L108	19A130443P1	Coil.
L109	19A130443P3	Coil.
L111	19A700024P3	Coil, RF: 1.0 µH ±10%.
L112	19A700024P9	Coil, RF: 470 nH ± 10%.
L114	19A700024P9	Coil, RF: 470 nH ± 10%. (Used in G2).
L115	19A700024P3	Coil, RF: 1.0 µH ±10%.
L116L	19A700024P3	Coil, RF: 1.0 µH ±10%. (Used in G1).
L116H	19A700024P1	Coil, RF: 100 nH ±10%, 0.08 ohms DC res max, 100 v. (Used in G2).
L118	19A700024P41	Coil, RF: 220 µH ± 10%.
		——— PLUGS ———
P902		Connector includes:
	19B219594P3	Contact, electrical: 9 pins.
	19B219594P2	Contact, electrical: 8 pins.

SYMBOL	PART NUMBER	DESCRIPTION
		——— TRANSISTORS ———
Q101	19A700023P1	Silicon, NPN: sim to 2N3904.
Q102	19A702084P1	Silicon, NPN; sim to MPS 2369.
Q103	19A115328P1	Silicon, NPN.
Q104	19A116899P1	Silicon, NPN; sim to Type 2N2368.
Q105 and Q106	19A116201P3	Silicon, NPN.
Q107	19A116201P4	Silicon, NPN.
		——— RESISTORS ———
R101	3R152P621J	Composition: 620 ohms ± 5%, 1/4 w.
R102	19A700106P63	Composition: 1K ohms ± 5%, 1/4 w.
R103 and R104	19A700016P3	Variable, cermet: 4.7K ohms ±10%, 1/2 w.
R105	19A700106P101	Composition: 39K ohms ±5%, 1/4 w.
R106	19A701250P260	Metal film: 4.22K ohms ±1%, 250 VDCW, 1/4 w.
R107	19A701250P169	Metal film: 511 ohms ±1%, 1/4 w.
R108	19A701250P294	Metal film: 9.31K ohms ±1%, 1/4 w.
R109	19A701250P265	Metal film: 4.6K ohms ±1%, 1/4 w.
R110	19A701250P115	Metal film: 140 ohms ±1%, 1/4 w.
R111	19A700106P57	Composition: 560 ohms ± 5%, 1/4 w.
R112	3R152P511J	Composition: 510 ohms ± 5%, 1/4 w.
R113	19A700106P61	Composition: 820 ohms ± 5%, 1/4 w.
R114	19A700106P95	Composition: 22K ohms ± 5%, 1/4 w.
R115	19A700106P63	Composition: 1K ohms ± 5%, 1/4 w.
R116	19A700106P45	Composition: 180 ohms ± 5%, 1/4 w.
R117	19A700106P97	Composition: 27K ohms ±5%, 1/4 w.
R118	19A700106P41	Composition: 120 ohms ± 5%, 1/4 w.
R120	19A700106P39	Composition: 100 ohms ± 5%, 1/4 w.
R121	19A700106P45	Composition: 180 ohms ± 5%, 1/4 w.
R122	19A700106P103	Composition: 47K ohms ± 5%, 1/4 w.
R123	19A700106P39	Composition: 100 ohms ± 5%, 1/4 w.
R124	3R151P100J	Composition: 10 ohms ±5%, 1/8 w.
R125	19A700106P57	Composition: 560 ohms ± 5%, 1/4 w.
R126	19A700106P63	Composition: 1K ohms ± 5%, 1/4 w.
R127	19A116310P39	Composition: 22 ohms ± 5%, 1/4 w; sim to Allen-Bradley Type CB.
R128	19A700106P35	Composition: 68 ohms ± 5%, 1/4 w.
R129	19A700106P15	Composition: 10 ohms ± 5%, 1/4 w.
R132	19A700106P51	Composition: 330 ohms ± 5%, 1/4 w.
R133	19A700106P63	Composition: 1K ohms ± 5%, 1/4 w.
R134	19A116310P37	Composition: 15 ohms ± 5%, 1/4 w; sim to Allen-Bradley Type CB.
R135	19A700113P31	Composition: 47 ohms ± 5%, 1/2 w.
R136	19A700106P15	Composition: 10 ohms ± 5%, 1/4 w. (Used in G1).
R137	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R138	19A700106P39	Composition: 100 ohms ± 5%, 1/4 w.
R139	19A116310P35	Composition: 10 ohms ± 5%, 1/4 w; sim to Allen-Bradley Type CB.

SYMBOL	PART NUMBER	DESCRIPTION
R141	19A700113P31	Composition: 47 ohms ± 5%, 1/2 w.
R142	19A700106P63	Composition: 1K ohms ± 5%, 1/4 w.
R143	19A700113P49	Composition: 270 ohms ± 5%, 1/2 w.
		——— THERMISTOR ———
RT101	5490828P54	Thermistor: 50 ohms ± 10%, color code blue; sim to Carborundum Type B0807J-16.
		——— TRANSFORMERS ——
T101	19C307170P305	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-2.
T102	19C307170P306	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-3.
T103	19C307170P307	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-4.
T104	19C307169P202	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-5.
T105	19C307169P203	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-6.
T106 and T107	19C307169P204	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 100374-DS-8.
		——————SOCKETS ———
XY101 thru XY108		Part of mechanical construction.
		——— CRYSTALS ———
Y101 thru Y108	19A130605G3	FM ICOM, Internally compensated, ± 2 PPM, 406-450 MHz.
	19A130605G4	FM ICOM, Internally compensated, ± 2 PPM, 450-470 MHz.
	19A130605G5	FM ICOM, Internally compensated, ± 2 PPM, 470-494 MHz.
	19A130605G6	FM ICOM, Internally compensated, ± 2 PPM, 494-512 MHz.
		——— FILTER ———
Z101	19A134666P2	Frequency network: selective, 460-600 MHz resonant freq, 500 VDCW; sim to Dilectron TC501:NPO:270J:SLAC.
		——— MISCELLANEOUS ——
	19C331133G1	Shield.
	19A701544P7	Can, drawn aluminum.
	19A701332P1	Insulator disk.
	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
	19C331287G1	Assembly shield.
	19A121175P24	Insulator plate.

SYMBOL	PART NUMBER	DESCRIPTION
		AUDIO PROCESSOR 19C321542G1,G2
		——INTEGRATED CIRCUITS ——
AR101	19A116754P2	Linear, Dual 741C OP AMP; sim to MC1458SP1 High Slew Rate OP AMP.
		——— CAPACITORS ———
C101	T644ACP333J	Polyester: .033 µF ±5%, 50 VDCW.
C102 and C103	5491674P36	Tantalum: 3.3 µF ± 20%, 10 VDCW; sim to Sprague Type 162D.
C104	T644ACP347J	Polyester: .047 µF ±5%, 50 VDCW.
C105	T644ACP333J	Polyester: .033 µF ±5%, 50 VDCW. (Used in G1).
C106	5491674P28	Tantalum: 1 µF ±20%, 25 VDCW; sim to Sprague Type 162D. (Used in G1).
C107	5496267P9	Tantalum: 3.3 µF ± 20%, 15 VDCW; sim to Sprague Type 150D.
C108	T644ACP268J	Polyester: .0068 µF ±5%, 50 VDCW.
C109	19A701602P20	Ceramic: 1000 pF ±10%, 1000 VDCW.
C110	5491674P36	Tantalum: 3.3 µF ± 20%, 10 VDCW; sim to Sprague Type 162D. (Used in G1).
C111	T644ACP368J	Polyester: .068 µF ±5%, 50 VDCW.
C112	19A143491P6J0	Ceramic: 6 pF ±5%, temp. coef 0 PPM.
C113	19A701534P9	Tantalum: 47 µF ±20%, 6.3 VDCW. (Used in G2).
C114	5491674P36	Tantalum: 3.3 µF ± 20%, 10 VDCW; sim to Sprague Type 162D. (Used in G2).
C115	19A701534P8	Tantalum: 22 µF ±20%, 16 VDCW. (Used in G2).
		——— DIODES ———
CR101 and CR102	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		——————PLUGS ———
P102	19A116659P76	Connector, printed wiring: 9 contacts rated at 5 amps; sim to Molex 09-52-3091.
		——— RESISTORS ———
R101	19A134231P223J	Deposited carbon: 22K ohms ±5%, 1/8 w.
R102	19A700106P95	Composition: 22K ohms ± 5%, 1/4 w.
R103	19A700106P55	Composition: 470 ohms ± 5%, 1/4 w.
R104	19A701250P369	Metal film: 51.1K ohms ±1%, 1/4 w.
R105	19A701250P303	Metal film: 10.5K ohms ±1%, 1/4 w.
R106	19A701250P311	Metal film: 12.7K ohms ±1%, 1/4 w.
R107	19A701250P303	Metal film: 10.5K ohms ±1%, 1/4 w.
R108	19A701250P269	Metal film: 5.11K ohms ±1%, 1/4 w.
R109	3R152P132J	Composition: 1.3K ohms ±5%, 1/4 w.
R110	19A701250P269	Metal film: 5.11K ohms ±1%, 1/4 w.
R111	19A700106P91	Composition: 15K ohms ± 5%, 1/4 w.
R112	19A701250P339	Metal film: 24.9K ohms ±1%, 1/4 w.

SYMBOL	PART NUMBER	DESCRIPTION
R113	19A701250P307	Metal film: 11.5K ohms ±1%, 1/4 w.
R114	19A701250P347	Metal film: 30.1K ohms ±1%, 250 VDCW, 1/4 w.
R115	19A700106P73	Composition: 2.7K ohms ± 5%, 1/4 w.
R116	H212CRP110C	Deposited carbon: 100 ohms ±5%, 1/4 w. (Used in G2).
		——— MISCELLANEOUS ——
	19A142927P1	Insulator. (Located between A101 and exciter).

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 the descriptions of parts affected by these revisions.

REV A - 406-512 MHz EXCITER BOARD 19D432679G1, 2
Incorporated in initial shipment.

REV A - AUDIO PROCESSOR BOARD 19C321542G1
To improve operation, changed R112.

R112 was: 19C314256P22472 Metal film: 24.7K ohms ±1%, 1/4 w.

REV B - AUDIO PROCESSOR BOARD 19C321542G1
To improve audio response, changed AR101 and R103 and added C112.

AR101 was 19A116754P1 Linear: Dual In-Line 8-Pin Minidip package.

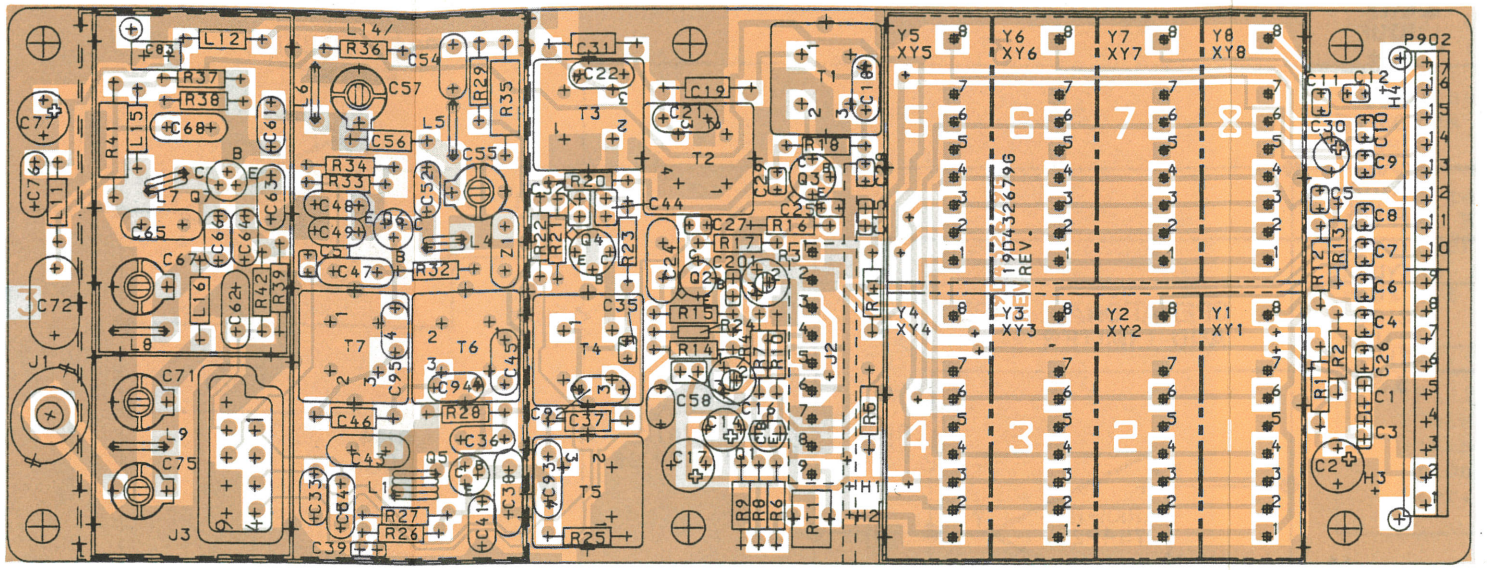
R103 was: 3R152P681J Composition: 680 ohms ±5%, 1/4 w.

REV C - AUDIO PROCESSOR BOARD 19C321542G2
To correct wiring diagram.

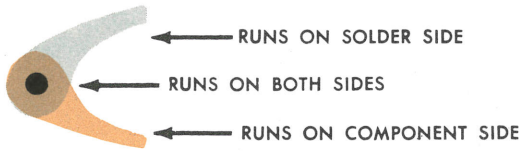
REV A - AUDIO PROCESSOR BOARD 19C321542G2
To improve low frequency response on Channel Guard Input, changed C113.

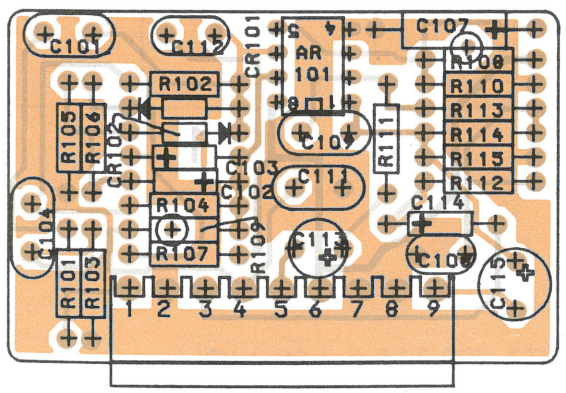
C113 was: 19A701534P7 Tantalum: 10 µF ±20%, 16 VDCW.

REV B - AUDIO PROCESSOR BOARD 19C321542G2
To make compatible with EDACS applications, Added R116 between C115 (-) and P102-9.



(19D432711, Rev. 4)
(19A143634, Sh. 1, Rev. 3)
(19A143634, Sh. 2, Rev. 3)





(19C331136, Rev. 2)
(19A143587, Sh. 1, Rev. 1)
(19A143587, Sh. 2, Rev. 1)

OUTLINE DIAGRAM

406-512 MHz EXCITER BOARD
19D432679G1 & G2

TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A11 or Test Kit 4EX8K12.
2. A 50-ohm wattmeter connected to antenna jack J906.
3. A frequency counter.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Place ICOMs on Exciter Board (crystal frequency = operating frequency 36).
2. For a large change in frequency or a badly mis-aligned transmitter, preset all slugs to the top of the coil form.
3. Set output impedance matching capacitor C175 to 1/3 mesh.
4. Set all other air variable capacitors to minimum capacity (not meshed).

NOTE

The tuning frequency for multi-frequency transmitters is determined by the operating frequency and the frequency spread between transmitters. Refer to the table below for maximum frequency spread.

5. For multi-frequency transmitters with a frequency spread less than that specified in column (1) tune the transmitters to the lowest frequency. For a frequency spread exceeding the limits specified in column (1) tune the transmitters using a center frequency tune up crystal module or ICOM as required. The maximum frequency spread can be extended to the limits specified in column (3) with 1 dB degradation.

Multi-Frequency Transmitter Tuning

Transmitter Frequency Range	MAXIMUM FREQUENCY SPREAD		
	(1) Without center tuning	(2) With center tuning	(3) With center tuning (1 dB degradation)
406 - 470 MHz	2.75 MHz	5.50 MHz	9.00 MHz
470 - 494 MHz	2.90 MHz	5.80 MHz	9.50 MHz
494 - 512 MHz	3.00 MHz	6.00 MHz	9.75 MHz

6. Connect the red plug on the GE Test Set to the System Board metering jack, and the black plug to the exciter metering jack. Set the polarity to +, and set the range to the Test 1 position (1 Volt position for 4EX8K12) for all adjustments.

NOTE: With the Test Set connected to the PA metering jack, the voltage reading at position "F" with the HIGH SENSITIVITY button pressed may be converted to driver collector current by reading the current as 15 amperes full scale. The voltage reading at position "G" with the HIGH SENSITIVITY button pressed may be converted to PA collector current by reading the current as 30 amperes full scale.

7. All adjustments are made with the transmitter keyed. Unkey the transmitter between steps to avoid unnecessary heating.

NOTE

When the need for minor adjustments to the transmitter are indicated, perform steps 11 through 15 for a quick transmitter tune-up.

ALIGNMENT PROCEDURE

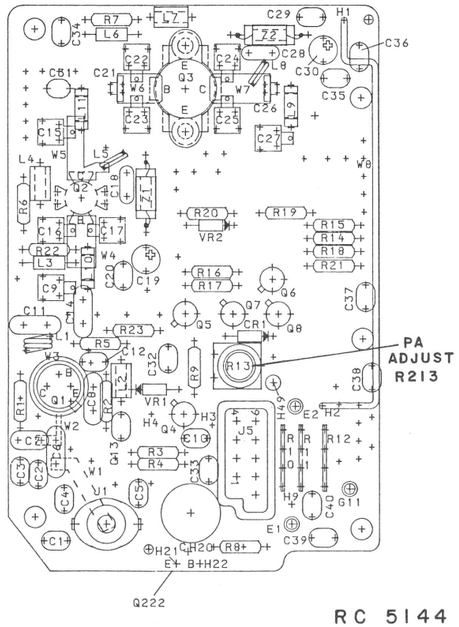
STEP	METER POSITION: GE TEST SET	METER POSITION: INTERNAL METERING	TUNING CONTROL	METER READING	PROCEDURE
					NOTE: When aligning transmitter, proceed as instructed below. DO NOT retune a previously tuned control unless specifically directed to do so.
1.	B (MULT-1)	2 (MULT-1)	T101 & T102	See Procedure	Then tune T101 for a dip (small) in meter reading and tune T102 for maximum meter reading.
2.	C (MULT-2)	3 (MULT-2)	T103 and T104	See Procedure	Tune T103 for maximum meter reading, then tune T104 for a dip in meter reading.
3.	D (MULT-3)	4 (MULT-3)	T105 and T106	See Procedure	Tune T105 for maximum meter reading and then tune T106 for a dip in meter reading.
4.	F (MULT-4)	5 (MULT-4)	T107 and C155	See Procedure	Tune T107 for maximum meter reading and then tune C155 for a dip in meter reading.
5.	G (AMPL-1)	6 (AMPL-1)	C157 and C167	See Procedure	Tune C157 for maximum meter reading, and then tune C167 for a dip in meter reading.
6.	D (AMPL-1)	8 (AMPL-1 DRIVE on PA)	C171 and C175	Maximum	Move black Test Set plug to PA metering jack and tune C171 and then C175 for maximum meter reading.
7.	C (MULT-2)	3 (MULT-2)	T101, T102 & T103	Maximum	Move black Test Set plug to exciter metering jack and sequentially tune T101, T102 and T103 for maximum meter reading.
8.	D (MULT-3)	4 (MULT-3)	T104 and T105	Maximum	Tune T104 and then T105 for maximum meter reading.
9.	F (MULT-4)	5 (MULT-4)	T106 and T107	Maximum	Tune T106 and then T107 for maximum meter reading.

ALIGNMENT PROCEDURE (Cont'd)

STEP	METER POSITION: GE TEST SET	METER POSITION: INTERNAL METERING	TUNING CONTROL	METER READING	PROCEDURE
10.	D (AMPL-1)	8 (AMPL-1)	C155, C157, C167 C171 & C175	Maximum	Move black Test Set plug to PA metering jack and sequentially tune C155, C157, C167, C171 and C175 for maximum meter reading.
					NOTE: **A quick transmitter tune-up procedure is provided in Steps 11 through 15.**
11.	C (MULT-2)	3 (MULT-2)	T101, T102, and T103	Maximum	Move black Test Set plug to exciter metering jack and alternately tune T101, T102 and T103 for maximum meter reading.
12.	D (MULT-3)	4 (MULT-3)	T104 and T105	Maximum	Alternately tune T104 and T105 for maximum meter reading.
13.	F (MULT-4)	5 (MULT-4)	T106 and T107	Maximum	Alternately tune T106 and T107 for maximum meter reading.
14.	D (AMPL-1)	8 (AMPL-1)	C155,C157,C167, C171, and C175	Maximum	Move black Test Set plug to PA metering jack and alternately tune C155, C157, C167, C171, and C175 for maximum meter reading. For optimum operation repeat Steps 11 through 14.
15.			R213		Refer to Table 1 to determine the proper battery or collector voltage when adjusting the output power. Set Power Adjust potentiometer R213 on the PA driver board for the desired power output. If the battery voltage or collector voltage is not as specified in Table 1 and full rated output is desired, set R213 for the output power according to the battery voltage or collector voltage shown in Figure 8.
					NOTE: **The PA collector voltage is measured as described in the PA POWER INPUT section.**

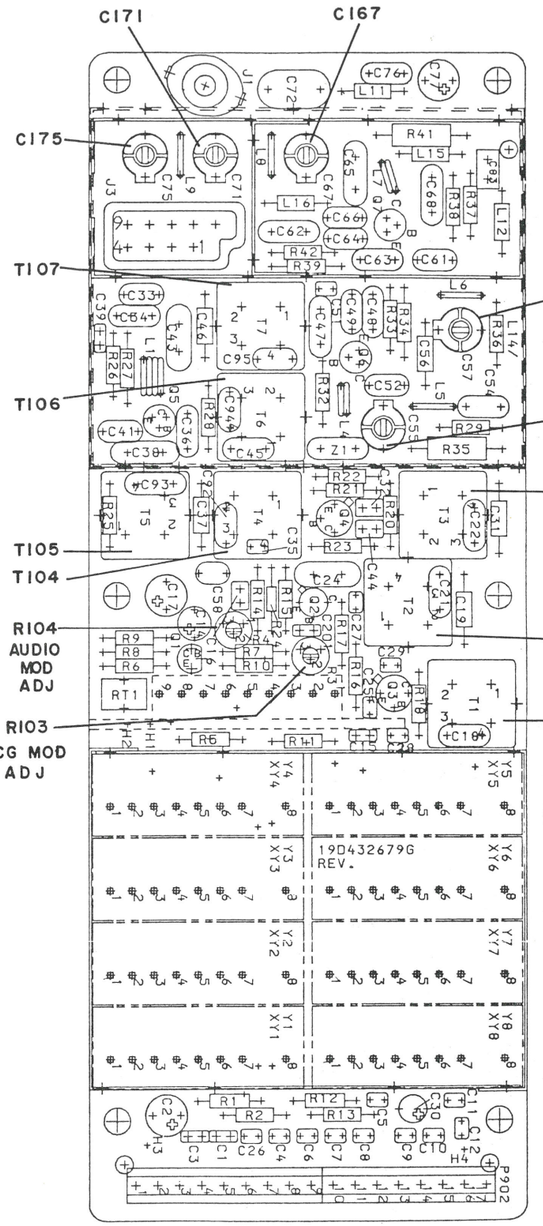
RATED POWER OUTPUT	MIN POWER SETTING	BATTERY VOLTAGE	PA COLLECTOR VOLTAGE
100W	30W	13.4	12.0
75W	20W	13.6	13.0
40W	12W	13.6	13.4
20W	10W	13.4	13.0

TABLE 1 - Power/Voltage Cross Reference



RC 5144

NOTE: Q2 AND Q3 ARE PART OF NEXT HIGHER ASM (PA)



RC 5142