138—174 MHz EXCITER BOARDS 19D416859G1-G4 AND 19D430230G1-G4

LBI30422E
(DF3165)
(DF3171)
IMTS

TABLE OF CONTENTS

DESCRIPTION

This exciter for MASTR® II uses nine transistors and one integrated circuit to drive the PA assembly. The exciter can be equipped with up to eight Integrated Circuit Oscillator Modules (ICOMs). The ICOM crystal frequency ranges from approximately 11.5 to 14.5 megahertz, and the crystal frequency is multiplied 12 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

ICOMS

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

- 5C-ICOM - contains an oscillator and a 5 part-per-million (±0.0005%) compensator IC. Provides compensation for EC-ICOMs.
- EC-ICOM - contains an oscillator only. Requires external compensation from a 5C-ICOM.
- 2C-ICOM - contains an oscillator and a 2 PPM (±0.0002%) compensator IC. Will not provide compensation for an EC-ICOM.

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

NOTE

For proper operation, be sure ICOM case makes contact with fingers on the the RF shield on the exciter board. Also, the pins on the exciter bottom cover must make contact with the RF shield.

Frequency selection is accomplished by switching the ICOM keying lead (terminal 6) 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 6 of the ICOM to A-. The oscillator is turned on by applying a keyed +10 Volts to the external oscillator load resistor.

CAUTION

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

In Standard 5 PPM radios using EC-ICOMs, at least one 5C-ICOM must be used. The 5C-ICOM is normally used in the receiver F1 position, but can be used in any transmit or receive position. One 5C-ICOM can provide compensation for up to 15 EC-ICOMs in the transmit and receiver. Should the 5C-ICOM compensator fail in the open mode, the EC-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 16 5C-ICOMs may be used in the radio.

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

Oscillator Circuit

The 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 coefficient approximately equal 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.

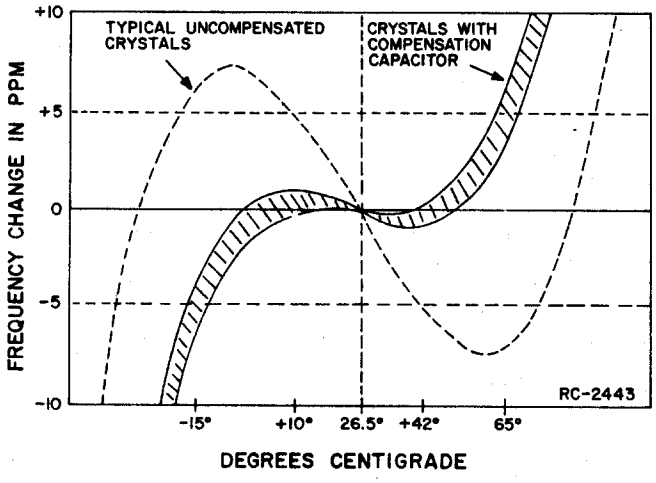

Figure 1 - Typical Crystal Characteristics

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) which is in parallel with the crystal.

A constant bias of 5 Volts (provided from Regulator IC U901 in parallel with the compensator) established the varactor capacity at a constant value over the entire mid-temperature range. With no additional compensation, all of the oscillators will provide 2 PPM frequency stability from 0°C to 55°C (+32°F to 131°F).

Compensator Circuits

Both the 5C-ICOMs and 2C-ICOMs are temperature compensated at both ends of the temperature range to provide instant frequency compensation. An equivalent ICOM circuit is shown in Figure 2.

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 from the 10 Volt regulator. Should all of the ICOMs shift off frequency, check the 10 Volt regulator module.

AUDIO IC

The transmitter audio circuitry is contained in audio IC U101. A simplified drawing of the audio IC is shown in Figure 3.

Audio from the microphone at pin 12 is coupled through pre-emphasis capacitor C1 to the base of Q1 in the operational amplifier-limiter circuit. Collector voltage for the transistorized microphone pre-amplifier is supplied from pin 11 through microphone collector load resistor R18 to pin 12.

The operational amplifier-limiter circuit consists of Q1, Q2, and Q3. Q3 provides limiting at high signal levels. The gain of the operational amplifier circuit is fixed by negative feedback through R19, R20 and the resistance in the network (Pin 9).

The output of Q3 is coupled through a de-emphasis network (R10 and C3) to an active post-limiter filter consisting of C4, C5, C6, R11, R12, R13, R15, R17 and Q4.

Following the post-limiter filter is class A amplifier Q5. The output of Q5 is coupled through MOD ADJUST potentiometer R104 and resistors R108 and R125 to the phase modulators.

SERVICE NOTE: If the DC voltages to the Audio IC are correct and no audio output can be obtained, replace U101.

For radios equipped with Channel Guard, tone from the encoder is applied to the phase modulators through CHANNEL GUARD MOD ADJUST potentiometer R105, and resistors R112, R105 and R127. Instructions for setting R105 are contained in the modulation adjustment section of the Transmitter Alignment Procedure.

BUFFER, PHASE MODULATORS & AMPLIFIERS

The output at pin 3 of the selected ICOM is coupled through buffer-amplifier Q101 to the first modulator stage. The first phase modulator is varactor (voltage-variable capacitor) CV101 in series with tunable coil T101. This network appears as a series-resonant circuit to the RF output of the

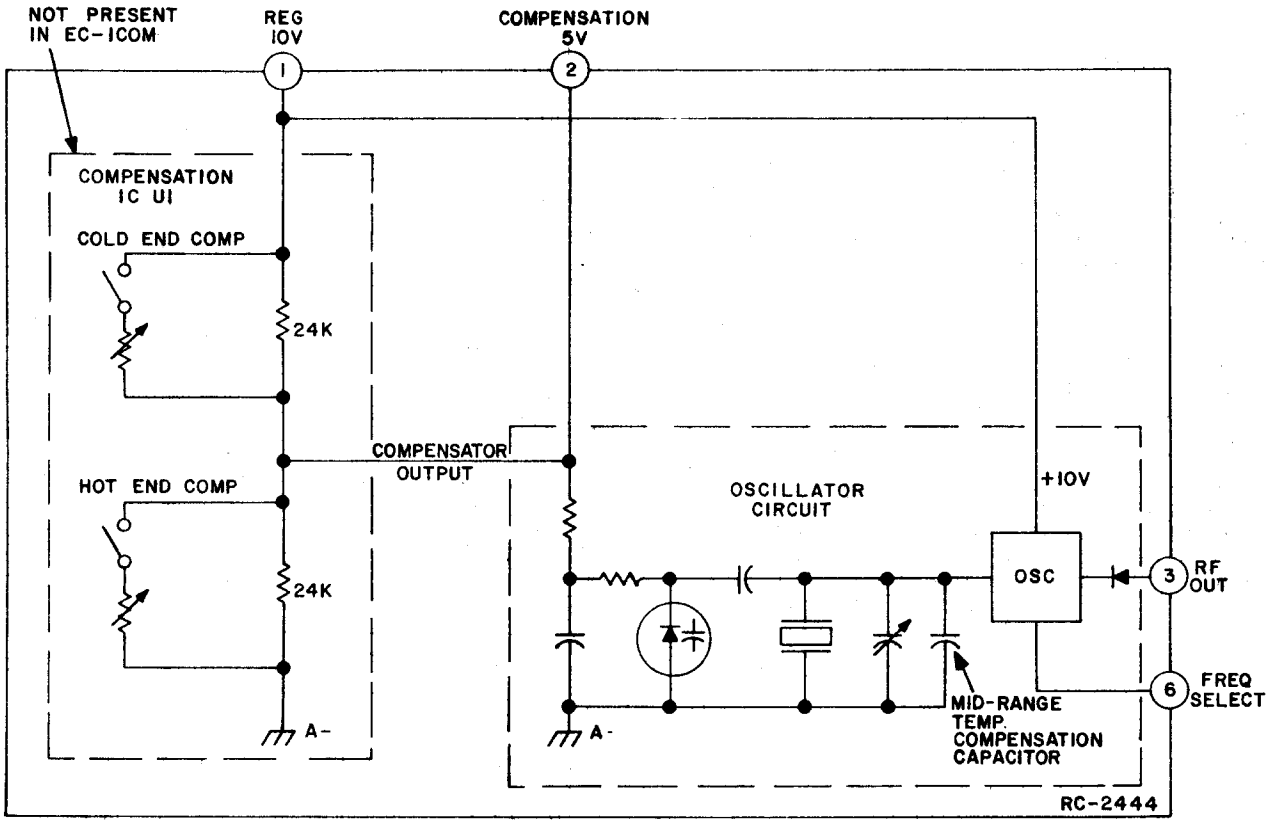

Figure 2 - Equivalent ICOM Circuit

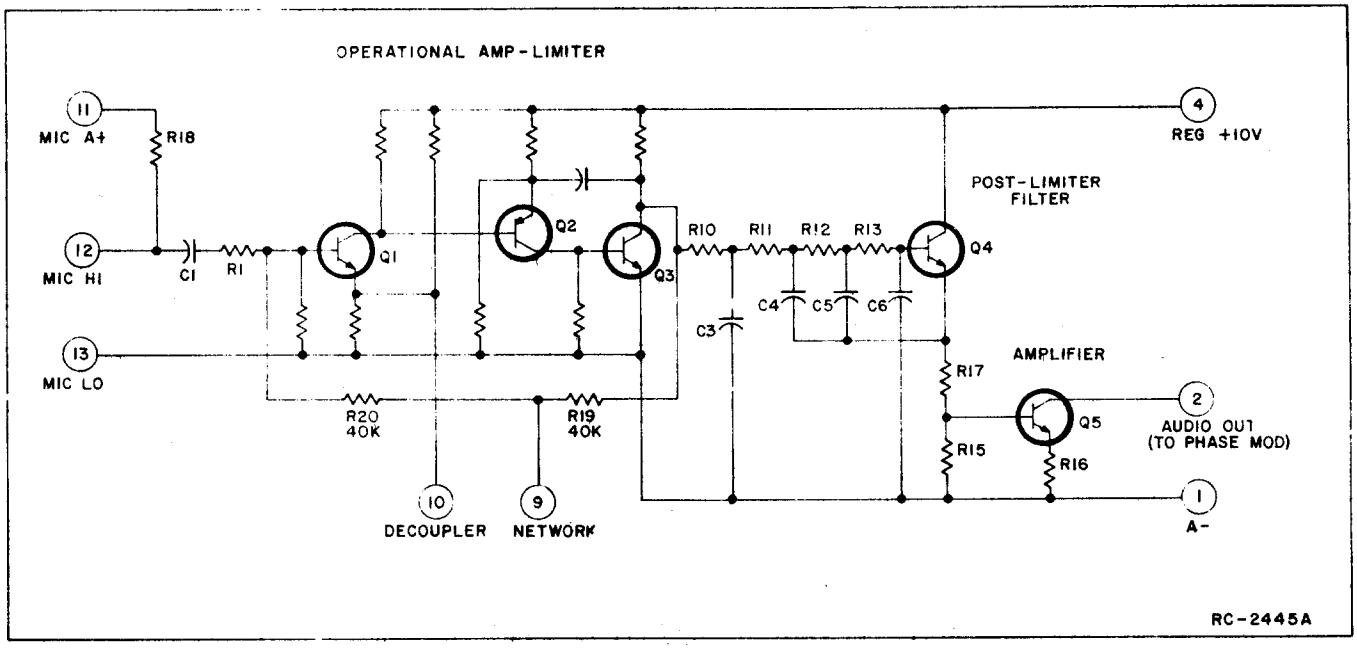

Figure 3 - Simplified Audio IC

oscillator. An audio signal applied to the modulator circuit through blocking capacitor C107 varies the bias of CV101, resulting in a phase modulated output. A voltage divider network (R110 and R111) provides the proper bias for varactors CV101, CV102 and CV103.

The output of the first modulator is coupled through blocking capacitor C113 to the base of Class A amplifier Q102. The first modulator stage is metered through a metering network consisting of C115, R118, and CR101. Diodes CR102 and CR103 remove any amplitude modulation in the modulator output.

Following Q102 is another Class A amplifier, Q103. The output of Q103 is applied to the second modulator stage. The second modulator consists of two cascaded modulator circuits consisting of CV102, T102, T103 and CV103. Following the second modulator is a Class A amplifier, Q104. The output of the second modulator stage is metered through C123, R132, and CR104 and is applied to the base of buffer Q105. Diodes CR105 and CR106 remove any amplitude modulation in the second modulator output.

BUFFER, MULTIPLIERS & AMPLIFIER

Buffer Q105 is saturated when no RF signal is present. Applying an RF signal to Q105 provides a sawtooth waveform at its collector to drive the class C tripler, Q106. The tripler stage is metered through R138. The output of Q106 is coupled through tuned circuits T104 and T105 to the base of doubler Q107. T104 & T105 are tuned to one-fourth of the operating frequency. The doubler stage is metered through R141.

The output of Q107 is coupled through tuned circuits T106 & T107 to the base of second doubler Q108. T106 & T107 are tuned to one-half the operating frequency. Q108 is metered through R146.

The output of Q108 is coupled through three tuned circuits (T108, T109, and T110) to the base of amplifier Q109. The circuits are tuned to the transmitter operating frequency.

Q109 is a class C amplifier, and is metered through R148. The amplifier collector circuit consists of T111, C154, C155, T112, and C157, and matches the amplifier output to the input of the power amplifier assembly.

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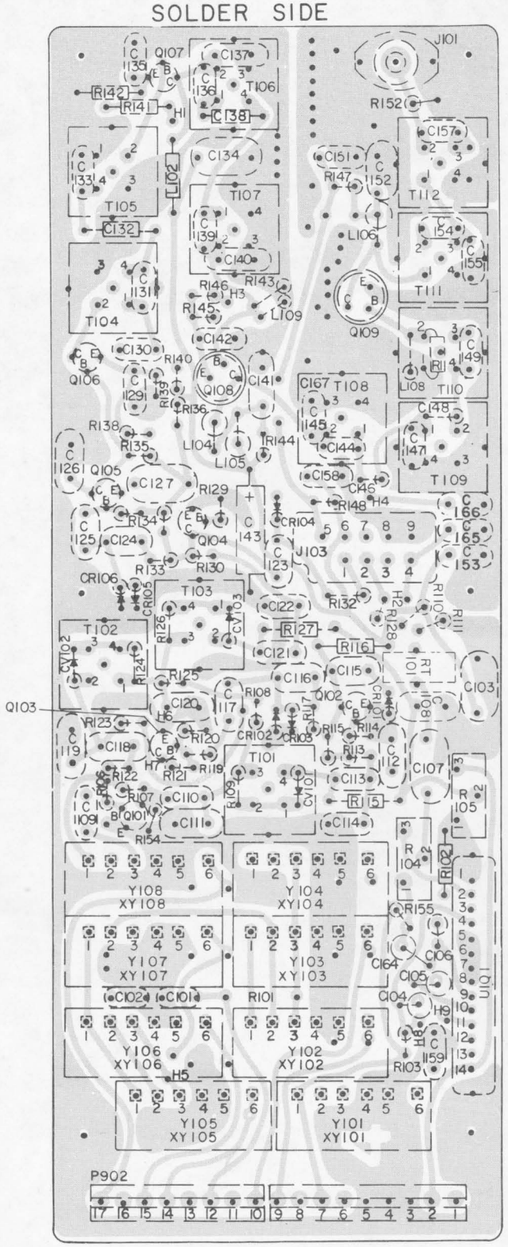
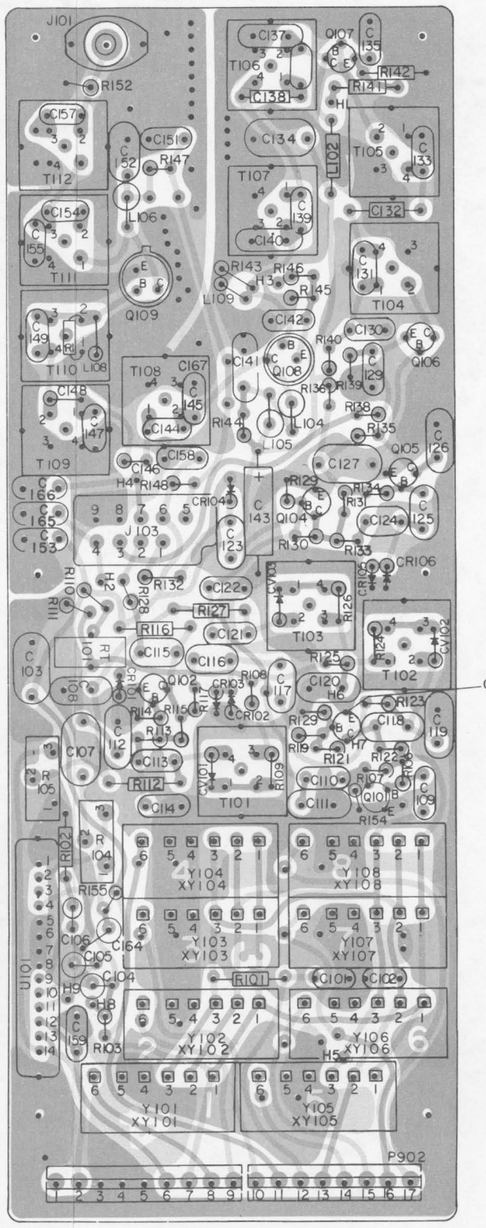
EXCITER BOARD

SOLDER SIDE



(19D423545, Sh. 2, Rev. 4)

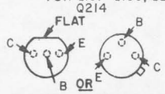
COMPONENT SIDE



(19D424489, Rev. 2)

(19D423545, Sh. 2, Rev. 4)
(19D423545, Sh. 3, Rev. 3)

LEAD IDENTIFICATION
FOR Q101-Q109, Q208, Q213, Q214

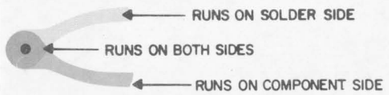


TOP VIEW

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

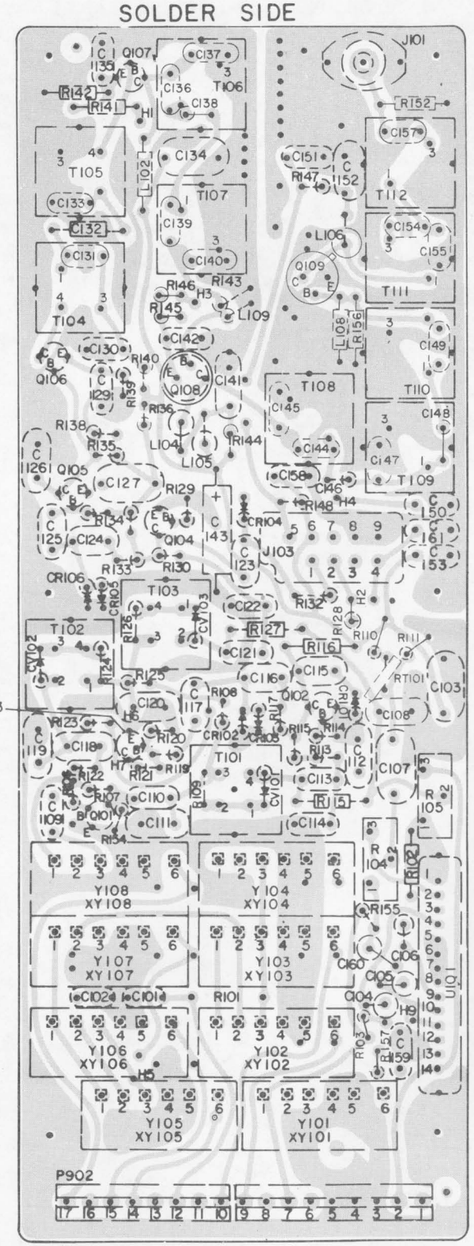
OUTLINE DIAGRAM

138—174 MHz, EXCITER BOARD
19D416859G1-G4



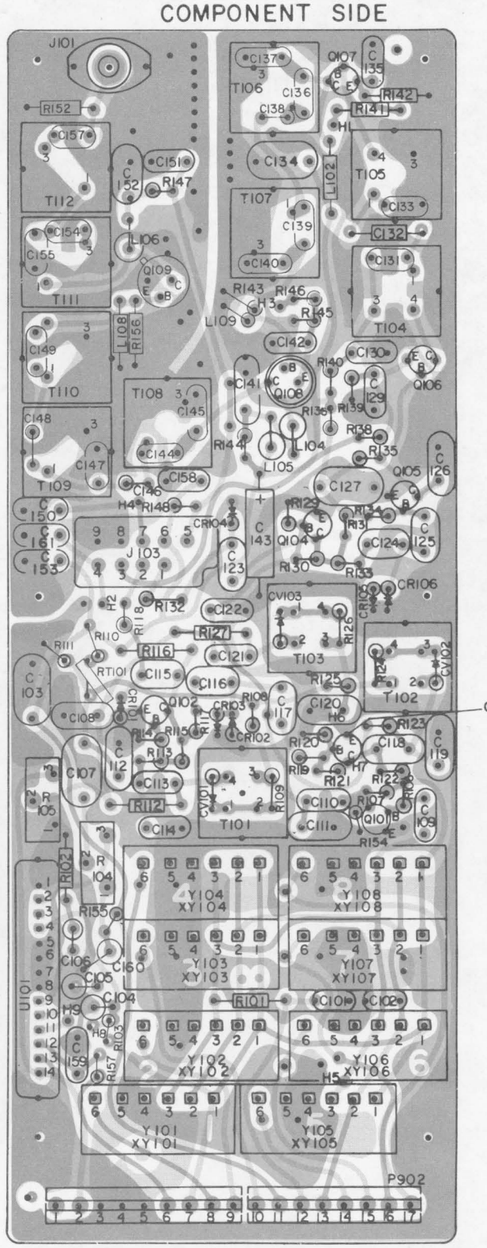
EXCITER BOARD

SOLDER SIDE



(19D430229, Sh. 2, Rev. 9)

COMPONENT SIDE

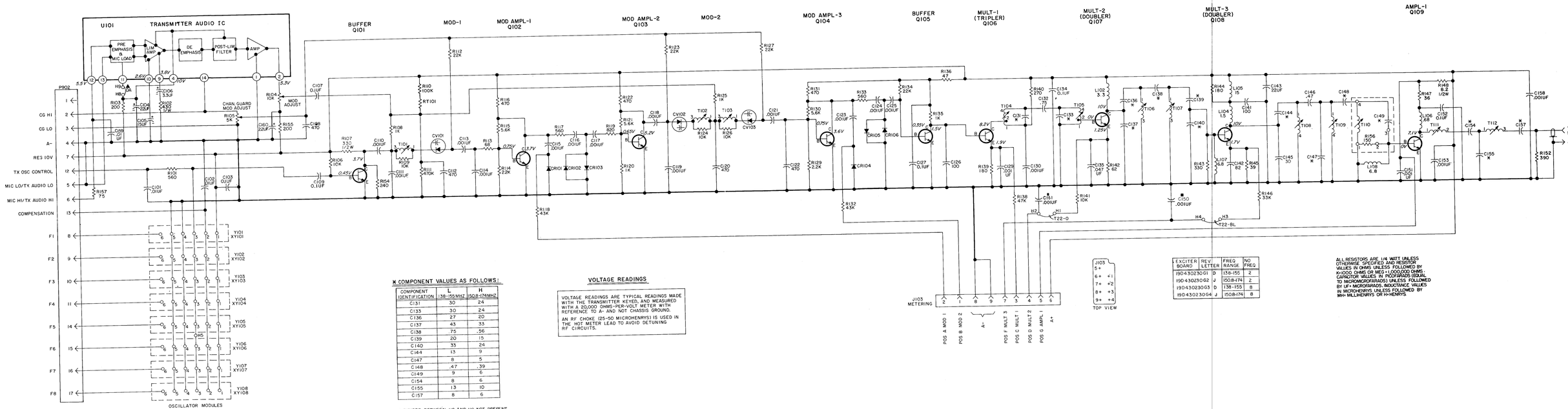


(19D430343, Rev. 5)

(19D430229, Sh. 2, Rev. 9)
(19D430229, Sh. 3, Rev. 8)

OUTLINE DIAGRAM

138—174 MHz, EXCITER BOARD
19D430230G1-G4



EXCITER BOARD	REV LETTER	FREQ RANGE	NO FREQ
19D430230G1	D	138-155	2
19D430230G2	J	150.8-174	2
19D430230G3	D	138-155	8
19D430230G4	J	150.8-174	8

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.

* COMPONENT VALUES AS FOLLOWS:

COMPONENT IDENTIFICATION	L 138-155 MHZ	H 150.8-174MHZ
C131	30	24
C133	30	24
C136	27	20
C137	43	33
C138	75	56
C139	20	15
C140	33	24
C144	13	9
C147	8	5
C148	.47	.39
C149	9	6
C154	8	6
C155	13	10
C157	8	6

▲ JUMPER BETWEEN H8 AND H9 NOT PRESENT ON SECOND EXCITER IN WIDE SPACE XMTR COMBINATIONS.

■ ONLY USED IN 19D430230G2 & G4

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYED, AND MEASURED WITH A 20,000 OHMS-PER-VOLT METER WITH REFERENCE TO A- AND NOT CHASSIS GROUND.

AN RF CHOKE (25-50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DETUNING RF CIRCUITS.

(19B622396, Rev. 11)

SCHEMATIC DIAGRAM

138—174 MHz, EXCITER BOARD 19D430230G1-G4

Issue 3

PARTS LIST

138-174 MHz EXCTER BOARD
19D430230G1-G4
ISSUE 3

SYMBOL	GE PART NO.	DESCRIPTION
		19D430230G1 2 FREQ 138-155 MHz (L) 19D430230G2 2 FREQ 150.8-174 MHz(H) 19D430230G3 8 FREQ 138-155 MHz (L) 19D430230G4 8 FREQ 150.8-174 MHz(H)
		- - - - - - - - - CAPACITORS - - - - - - - - -
C101 and C102	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C103	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C104	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C105	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C106	5496267P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C107	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C108	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C109	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C110	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C111	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C112	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C113 thru C117	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C118 and C119	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C120	7489162P43	Silver mica: 470 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C121	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C122	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C123 thru C125	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C126	19A700105P34	Mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C127	19A116080P107	Polyester: 10 µf ±10%, 50 VDCW.
C129 and C130	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C131L	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C131H	5496219P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C132	5491601P118	Phenolic: 0.75 pf ±5%, 500 VDCW.
C133L	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C133H	5496219P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C134	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C135	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C136L	5496219P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C136H	5496219P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
C137L	5496219P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C137H	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C138L	5491601P118	Phenolic: 0.75 pf ±5%, 500 VDCW.
C138H	19A700013P10	Phenolic: 0.56 pf ±5%, 500 VDCW.
C139L	5496219P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
C139H	5496219P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C140L	5496219P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C140H	5496219P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C141	5490008P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C142	19A700105P32	Mica: 82 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C143	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C144L	5496219P243	Ceramic disc: 13 pf ±15%, 500 VDCW, temp coef -80 PPM.
C144H	5496219P240	Ceramic disc: 9.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C145	5496219P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C146	19A700013P9	Phenolic: 0.47 pf ±5%, 500 VDCW.
C147L	5496219P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C147H	5496219P236	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C148L	19A700013P9	Phenolic: 0.47 pf ±5%, 500 VDCW.
C148H	19A700013P8	Phenolic: 0.39 pf ±5%, 500 VDCW.
C149L	5496219P240	Ceramic disc: 9.0 ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C149H	5496219P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C150	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C151	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C152	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C153	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C154L	5496219P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C154H	5496219P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C155L	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C155H	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C157L	5496219P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C157H	5496219P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C158	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C159	19A116080P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C160	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C161	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR101 thru CR106	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CV101 thru CV103	5495769P9	Silicon, capacitive: 33 pf ±20%, at 4 VDC.
J101	19A130924G1	- - - - - - - JACKS AND RECEPTACLES - - - - - - - Receptacle, coaxial: sim to Cinch 14H11613.
J103	19B219374G1	Connector. Includes:
	19A116651P1	Contacts. (9).
L102*	19A700024P19	- - - - - - - - - - INDUCTORS - - - - - - - - - - Coil, RF: 3.3 µh ±10%, 0.85 ohms DC res max. In G1 & G3 of REV C & earlier: In G2 & G4 of REV H & earlier:
	19B209420P130	Coil, RF: 27.0 µh ±10%, 3.60 ohms DC res max; sim to Jeffers 4413116-5K.
L104	19A700000P14	Coil, RF: 1.5 µh ±10%, 0.485 ohms DC res max.
L105	19A700000P25	Coil, RF: 15.0 µh ±10%, 1.20 ohms DC res max.
L106	19A700000P10	Coil, RF: 0.68 µh ±10%, 0.15 ohms DC res max.
L107 and L108	19A700024P23	Coil, RF: 6.8 µh ±10%, 2.00 ohms DC res max.
P902		- - - - - - - - - - PLUGS - - - - - - - - - - Includes:
	19B219594P2	Contact strip: 8 pins.
	19B219594P3	Contact strip: 9 pins.
Q101 thru Q106	19A115330P1	- - - - - - - - - TRANSISTORS - - - - - - - - - Silicon, NPN.
Q107	19A115328P1	Silicon, NPN.
Q108*	19A116868P1	Silicon, NPN; sim to Type 2N4427. In G1 & G3 of REV B & earlier: In G2 & G4 of REV G & earlier:
	19A115329P1	Silicon, NPN.
Q109	19A116868P1	Silicon, NPN; sim to Type 2N4427.
R101	19A700106P57	- - - - - - - - - - RESISTORS - - - - - - - - - - Composition: 560 ohms ±5%, 1/4 w.
R102	3R152P431J	Composition: 430 ohms ±5%, 1/4 w.
R103	19A700106P46	Composition: 200 ohms ±5%, 1/4 w.
R104	19B209358P106	Variable, carbon film: approx 300 to 10K ohms ±10%, 0.25 w; sim to CTS Type X-201.
R105	19B209358P105	Variable, carbon film: approx 200 to 5K ohms ±10%, 0.25 w; sim to CTS Type X-201.
R106	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R107	19A700113P51	Composition: 330 ohms ±5%, 1/2 w.
R108	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R109	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R110	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R111*	3R152P474J	Composition: 470K ohms ±5%, 1/4 w. Added to G2 & G4 by REV E.
R112	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R113	19A700106P35	Composition: 68 ohms ±5%, 1/4 w.
R114	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R115	19A700106P81	Composition: 5.6K ohms ±5%, 1/4 w.
R116	19A700106P55	Composition: 470 ohms ±5%, 1/4 w.
R117	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R118	3R152P433J	Composition: 43K ohms ±5%, 1/4 w.
R119	19A700106P61	Composition: 820 ohms ±5%, 1/4 w.
R120	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R121	19A700106P81	Composition: 5.6K ohms ±5%, 1/4 w.
R122	19A700106P55	Composition: 470 ohms ±5%, 1/4 w.
R123	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R124	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R125	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R126	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R127	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R129	19A700106P71	Composition: 2.2K ohms ±5%, 1/4 w.
R130	19A700106P81	Composition: 5.6K ohms ±5%, 1/4 w.
R131	19A700106P55	Composition: 470 ohms ±5%, 1/4 w.
R132	3R152P433J	Composition: 43K ohms ±5%, 1/4 w.
R133	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R134	19A700106P95	Composition: 22K ohms ±5%, 1/4 w.
R135	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R136	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R138	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R139	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R140	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R141	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R142	3R152P620J	Composition: 62 ohms ±5%, 1/4 w.
R143	19A700106P51	Composition: 330 ohms ±5%, 1/4 w.
R144	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R145	19A700106P29	Composition: 39 ohms ±5%, 1/4 w.
R146	3R152P333K	Composition: 33K ohms ±10%, 1/4 w.
R147	3R152P360J	Composition: 36 ohms ±5%, 1/4 w.
R148	19A700113P13	Composition: 8.2 ohms ±5%, 1/2 w.
R152	19A700106P53	Composition: 390 ohms ±5%, 1/4 w.
R154	3R152P241J	Composition: 240 ohms ±5%, 1/4 w.
R155	19A700106P46	Composition: 200 ohms ±5%, 1/4 w.
R156	19A700106P43	Composition: 150 ohms ±5%, 1/4 w.
R157*	19A700106P36	Composition: 75 ohms ±5%, 1/4 w. Added to G1 & G3 by REV A, G2, G4 by REV B.
RT101*	5490828P23	- - - - - - - - - THERMISTORS - - - - - - - - - Thermistor: 3600 ohms ±10%, color code black; sim to Carborundum Type 783P-1. Added to G1 & G3 by REV B. Added to G2 & G4 by REV C.
T101L	19C307171P102	- - - - - - - - - - TRANSFORMERS - - - - - - - - - Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 111374-OG-1.
T101H	19C307171P107	Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 031579-JT-1.
T102L	19C307171P102	Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 111374-OG-1.
T102H	19C307171P107	Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 031579-JT-1.
T103L	19C307171P102	Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 111374-OG-1.
T103H	19C307171P107	Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 031579-JT-1.
T104	19C307170P301	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 082874-WS-2.
T105	19C307170P302	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 082874-WS-6.
T106 and T107	19C307170P303	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 071774-OG-6.
T108 thru T110	19C307169P201	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 091774-WS-1.
T111 and T112	19C307170P304	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 071774-OG-3.
U101	19D416542G2	- - - - - - - INTEGRATED CIRCUITS - - - - - - - Audio Transmitter.
XY101 thru XY108	19A701785P1	- - - - - - - - - - SOCKETS - - - - - - - - - - Socket. Part of Mechanical Construction. Includes: Contact, electrical. Quantity (6) with each.
		ASSOCIATED PARTS
		- - - - - - - - - - OSCILLATORS - - - - - - - - - - NOTE: When reordering specify ICOM Frequency. ICOM Freq = Operating Frequency / 12
Y101 thru Y108	19A129393G17	Externally compensated, ±5 PPM, 138-174 MHz.
Y101 thru Y108	19A129393G14	Externally compensated, ±2 PPM, 138-174 MHz.
		MECHANICAL PARTS
	19A129424G2	Can. (Used with T101-T112).
	4036555P1	Insulator, washer: nylon. (Used with Q108, Q109).

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 - Exciter Board 19D430230G1, G3
To improve sensitivity. Added R157.

REV. B - To improve operation. Added RT101.

REV. C - To incorporate new transistor. Changed Q108.

REV. D - To improve carrier-to-noise ratio. Changed L102.

REV. A - Exciter Board 19D430230G2, G4
To improve transmitter stability. Added R152.

REV. B - Not incorporated.

REV. C - Not incorporated.

REV. D - To improve tuning at high end of split. Deleted R111.

REV. E - To improve tuning at high end of split. Added R111 and changed T101, T102 and T103.

REV. F - To improve sensitivity. Added R157.

REV. G - To improve operation. Added RT101.

REV. H - To incorporate new transistor. Changed Q108.

REV. J - To improve carrier-to-noise ratio. Changed L102.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.