MOBILE RADIO

MAINTENANCE MANUAL

406—512 MHz EXCITER BOARD 19D423346G1-G2 & 19D432582G1-G2

TABLE OF CONTENTS

DESCRIPTION

The exciter uses eight transistors, a crystal module and an integrated circuit to provide 200 milliwatts of RF drive to the PA assembly. The crystal module determines the (F1) transmitting frequency in single frequency applications. The exciter also contains the voltage compensation circuits and provides temperature compensation voltage to all crystal modules.

In multi-frequency transmitters, the crystal modules for frequencies F2-F4 are located on the multi-frequency board. In station applications requiring a frequency stability of 0.0002%, Integrated Circuit Oscillator Modules (ICOMs) are used. All ICOMs (F1-F4) are located on the multi-frequency board. In these applications the F1 oscillator (Q181) on the exciter board is not used.

The crystal frequency ranges from approximately 11.3 to 14.2 megahertz, and is multiplied 36 times.

Audio, supply voltages and control functions are connected from the system-audio & squelch board (SAS) to the exciter board through P902.

Centralized metering jack J103 is used with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the frequency multipliers, amplifier and measures the relative power out.

CIRCUIT ANALYSIS

F1 OSCILLATOR CIRCUIT

A Colpitts oscillator comprised of Q181, a plug-in crystal module and associated components provides the fundamental operating frequency for the transmitter. The crystal module in the base circuit of Q181 is temperature compensated to maintain frequency stability within ±5 PPM over a ambient temperature range of -30°C to +60°C. Compensation voltage from compensator circuit Q182 is applied to the crystal module. The output of the oscillator is taken from the collector of Q181 and applied to the input of buffer Q101.

SERVICE NOTE

Y1 and C2 on the crystal modules are not field replaceable items. C2 is factory selected to compliment the temperature/frequency characteristics of each individual crystal. Should it become necessary to replace either Y1 or C2, the entire crystal module must be replaced.

In single frequency radios, the F1 keying lead is connected directly to A- by a DA jumper connected between H12 and H31 on the SAS board. This assures F1 oscillator operation each time the PTT switch is pressed.

With the radio turned on and the PTT switch operated, +10 Volts is present on the transmitter oscillator lead at P902-1 and the emitter of Q181. R182 and R183 comprise a voltage divider network to establish the base voltage for Q181, allowing it to oscillate at the crystal frequency.to allow F1 frequency selection via the frequency selector switch on the control unit.

When frequencies F2 thru F4 are selected the oscillator output frequency from the multi-frequency board is supplied to buffer Q101 through J102-1 on the exciter and cable W2601.

COMPENSATOR CIRCUITS

The crystal modules are temperature compensated at both ends of the temperature

range to provide instant frequency compensation. The temperature compensator consists of Q182, VR101, RT181, RT192 and associated components. Zener diode VR101 provides a constant +8.5 V reference voltage for compensator Q101.

The cold end compensation circuit does not operate at temperatures above -10°C (+14°F). When the temperature drops below -10°C, the circuit is activated. As the temperature decreases, the resistance of RT181 increases 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 crystal module.

The hot end compensation circuit does not operate at temperatures below 50°C (122°F). When the temperature rises above +50°C, the circuit is activated. As the temperature increases, the resistance of RT192 decreases and the compensation voltage decreases. The decrease in compensation voltage increases the capacity of the varactor, decreasing the output frequency of the crystal module.

Listed below are typical minimum and maximum voltage readings to be expected at pin 4 of the crystal modules. Voltages should be measured using a high impedance meter.

TEMPERATURE RANGE	OUTPUT VOLTAGE	
	MINIMUM	MAXIMUM
-30°C	4.9 Volts	6.0 Volts
-10° to 50°C	3.7 Volts	4.3 Volts
+75°C	3.3 Volts	3.8 Volts

AUDIO IC

The transmitter audio circuitry is contained in audio IC U101. A simplified drawing of the audio IC is shown in Figure 1.

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 preamplifier is supplied from the 10-Volt regulator through R980 & R979 on the System-Audio-Squelch board to J901A-14 in MASTR Executive II radios.

In Custom MVP radios, collector voltage for the transistorized microphone preamplifier is supplied from the 20-Volt regulator on the SAS board through R928, R929 and J913 to the microphone.

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.

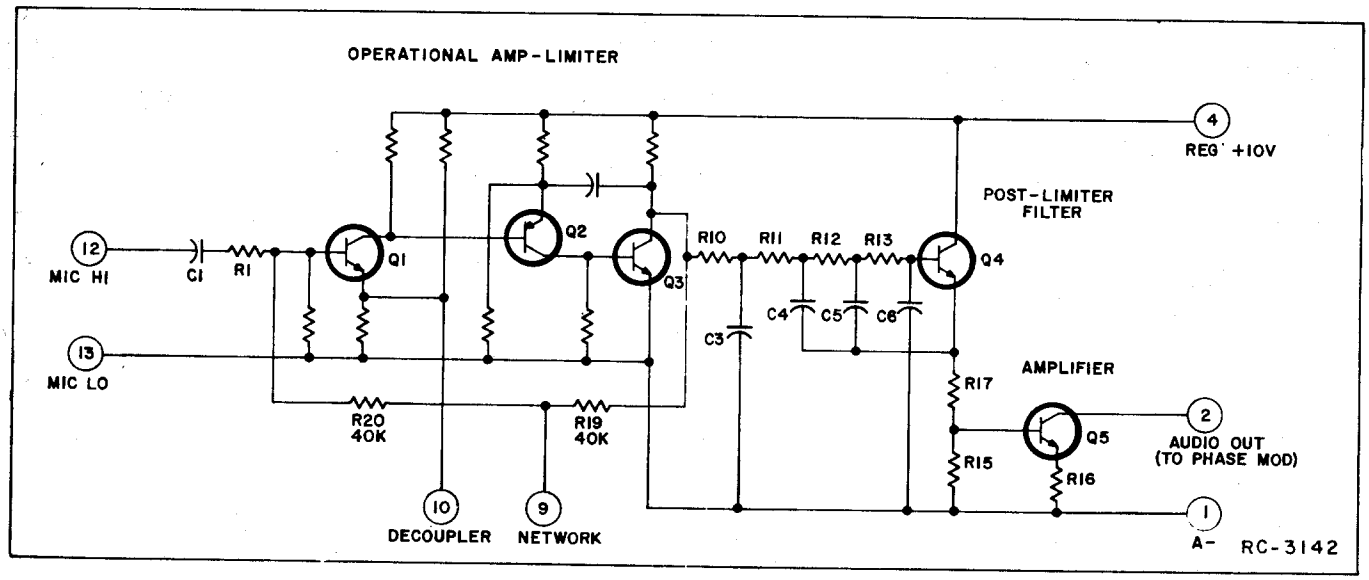


Figure 1 - Simplified Audio IC

Following the post-limiter filter is class A amplifier Q5. The output of Q5 is coupled through MOD ADJUST potentiometer R104 and resistor R109 to the phase modulator.

SERVICE NOTE

If the DC voltages applied to the audio IC are correct and there is no audio output, replace U101. For radios equipped with Channel Guard, tone from the encoder is applied to the phase modulator through P902-9, (CG H1) and resistor R113. Refer to the Transmitter Alignment procedures for Channel Guard modulation adjustment instructions.

BUFFER & PHASE MODULATOR

The oscillator output present at J102-1 (FL-F4) is coupled through buffer-amplifier Q101 to the modulator. The phase modulator, varactor (voltage-variable capacitor) CR180, is connected in series with tunable coil T101. This network appears as a series-resonant circuit to the RF output of the oscillator. An audio signal applied to the modulator circuit through blocking capacitor C109 varies the bias of CR180, resulting in a phase modulated output. A voltage divider network (R106 and R112) provides the proper operating bias for CR180.

The output of the modulator is coupled through blocking capacitor C116 to the base of buffer Q102. C116 and C117 also provide impedance matching between the modulator and buffer Q102.

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 (one-half 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.

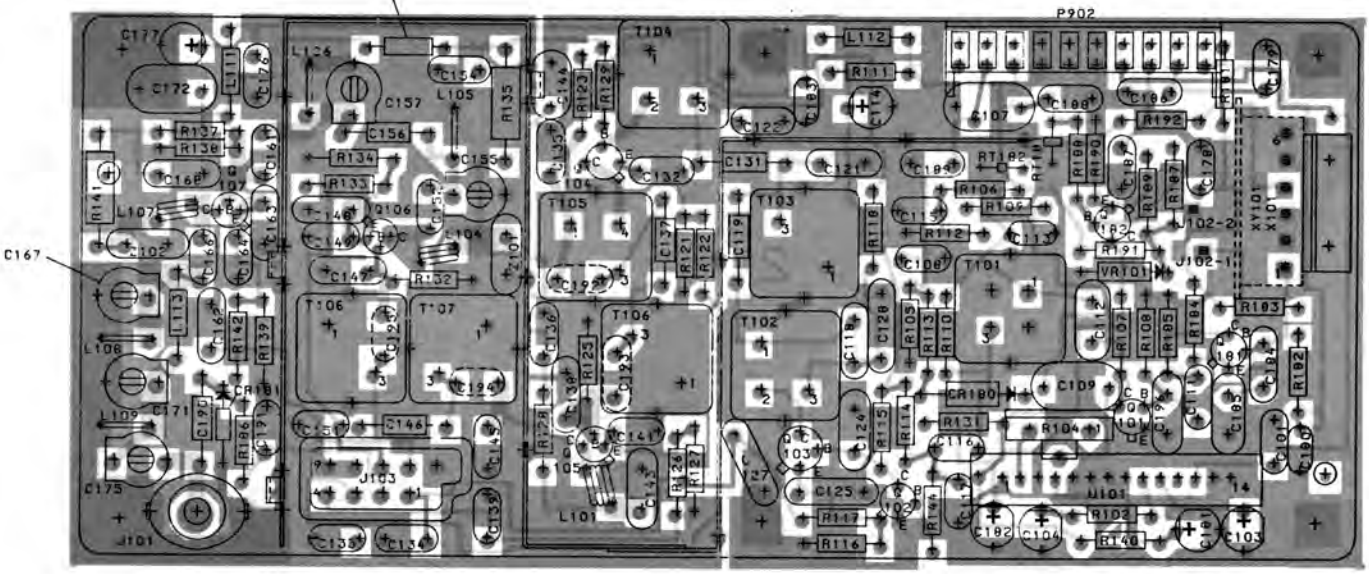
The output of Q107 is matched to 50 ohms by impedance matching network C166, C167, L108, L117, C171, L109 and C175. C167, C171, and C175 are tuned to the proper resonant frequency.

The exciter provides a minimum of 200 milliwatts of RF power to the power amplifier through J101 and cable W216. The relative output power of the exciter is metered by coupling through C190, detecting with CR181, and filtering with R186 and C191.

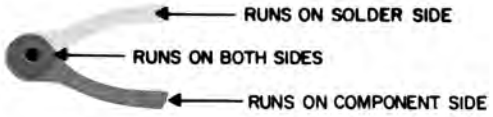
GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
U.S.A.

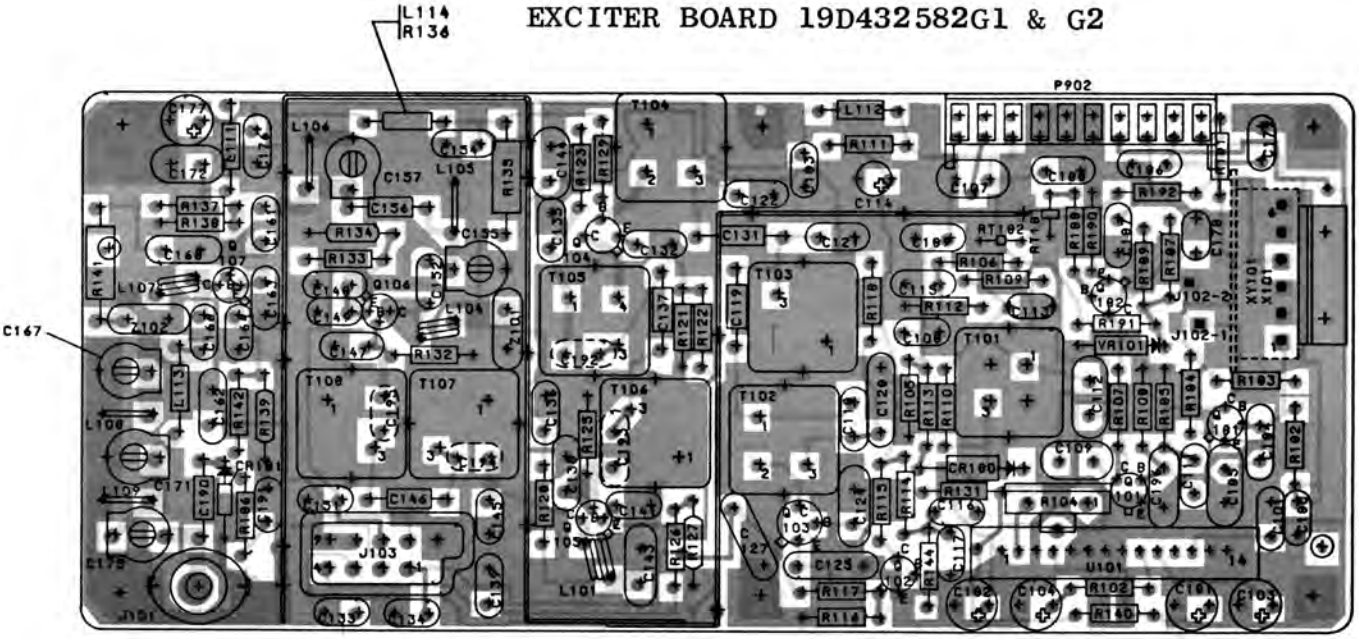
EXCITER BOARD 19D423346G1 & G2



(19C327178, Rev. 7)
(19B232260, Sh. 1, Rev. 4)
(19B232260, Sh. 2, Rev. 2)

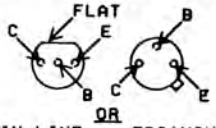


EXCITER BOARD 19D432582G1 & G2



(19D432584, Rev. 1)
(19A143645, Sh. 1, Rev. 1)
(19A143645, Sh. 2, Rev. 1)

LEAD IDENTIFICATION
FOR Q101-Q107,Q181,& Q182



TOP VIEW

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

OUTLINE DIAGRAMS

406—512 MHz EXCITER BOARDS

TYPICAL CRYSTAL MODULE

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.

● 406 - 450MHz PL19D432582G1
● 406 - 450MHz PL19D423346G1
▲ 450 - 512MHz PL19D423346G2
▲ 450 - 512MHz PL19D432582G2

EXCITER BOARD	REV LETTER	FREQ RANGE
19D423346G1	E	406-450MHz
19D423346G2	E	460-512MHz
19D432582G1		406-450MHz
19D432582G2		450-512MHz

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.

(19R622183, Rev. 11)

SCHEMATIC DIAGRAM

406—512 MHz EXCITER BOARD
19D423346G1-G2 & 19D432582G1-G2

PARTS LIST

LBI30088G

406-512 MHz EXCITER BOARD
19D423346G1 406-450 MHz
19D423346G2 450-512 MHz

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C101	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C103	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C104	19A134202P5	Tantalum: 3.3 uF ±20%, 15 VDCW.
C107	19A116080P7	Polyester: 0.1 uF ±20%, 50 VDCW.
C108	19A116655P13	Ceramic disc: 470 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C109	19A116080P107	Polyester: 0.1 uF ±10%, 50 VDCW.
C111	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C112	19A700105P44	Mica: 220 pF ±5%, 500 VDCW.
C113	5496372P365	Ceramic disc: 470 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C114	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C115	19A116655P13	Ceramic disc: 470 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C116	5496372P379	Ceramic disc: 910 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C117	5496372P365	Ceramic disc: 470 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C118L	19A116656P30J6	Ceramic disc: 30 pF ±5%, 500 VDCW, temp coef -80 PPM.
C118H	19A116656P27J8	Ceramic disc: 27 pF ±5%, 500 VDCW, temp coef -80 PPM.
C119	19A700013P15	Phenolic: 1.50 pF ±5%, 500 VDCW.
C121L	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp coef -80 PPM.
C121H	19A116656P27J8	Ceramic disc: 27 pF ±5%, 500 VDCW, temp coef -80 PPM.
C122L	19A116656P24J8	Ceramic disc: 24 pF ±5%, 500 VDCW, temp coef -80 PPM.
C122H	19A116656P20J8	Ceramic disc: 20 pF ±5%, 500 VDCW, temp coef -80 PPM.
C124	19A700105P34	Mica: 100 pF ±5%, 500 VDCW.
C125	19A116655P21	Ceramic disc: 2700 pF ±20%, 1000 VDCW; sim to RMC Type JR Discap.
C127 and C128	19A116655P21	Ceramic disc: 2700 pF ±20%, 1000 VDCW; sim to RMC Type JR Discap.
C131	5491601P118	Phenolic: 0.75 pF ±5%, 500 VDCW.
C132	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C133	19A116655P7	Ceramic disc: 150 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C134 thru 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.
C138H	19A116656P39J8	Ceramic disc: 39 pF ±5%, 500 VDCW, temp coef -80 PPM
C139	19A116655P13	Ceramic disc: 470 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C141	19A116655P7	Ceramic disc: 150 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C143L	19A700105P26	Mica: 47 pF ±5%, 500 VDCW.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C143H	19A700105P23	Mica: 39 pF ±5%, 500 VDCW.
C144	19A700005P11	Polyester: 0.047 uF ±10%, 50 VDCW.
C145L	19A116658P222J8	Ceramic disc: 22 pF ±5%, 500 VDCW, temp coef -80 PPM.
C145H	19A116656P15J8	Ceramic disc: 15 pF ±5%, 500 VDCW, temp coef -80 PPM.
C146	19A700013P10	Phenolic: 0.56 pF ±5%, 500 VDCW.
C147L	19A116656P30J8	Ceramic disc: 30 pF ±5%, 500 VDCW, temp coef -80 PPM.
C147H	19A116656P15J8	Ceramic disc: 15 pF ±5%, 500 VDCW, temp coef -80 PPM.
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	19A116655P7	Ceramic disc: 150 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C152L	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C152H	19A116656P3J0	Ceramic disc: 3 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C152*	19A134666P2	Silver mica: 22 pF ±5%, 500 VDCW; sim to Electro Motive Type DM15AC8. Deleted by REV E.
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.
		In REV B & earlier:
	5491601P120	Phenolic: 1.0 pF ±5%, 500 VDCW.
C157	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C161L	19A116656P6J8	Ceramic disc: 6 pF ±5%, 500 VDCW; temp. coef -80 PPM.
C161H	19A116656P5J8	Ceramic disc: 5 pF ±5%, 500 VDCW; temp. coef -80 PPM.
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*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDCW; sim to Electro Motive Type DM15AC7. Deleted by REV E.
C166L	19A116656P4J0	Ceramic disc: 4 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C166H	19A116656P3J0	Ceramic disc: 3 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C167	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C168	19A116656P47J1	Ceramic disc: 47 pF ±5%, 500 VDCW; temp. coef -150 PPM.
C171	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C172	19A116080P107	Polyester: 0.1 uF ±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 uF ±20%, 15 VDCW.
C178	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C179	19A116655P7	Ceramic disc: 150 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C180	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C181 and C182	19A134202P6	Tantalum: 22 uF ±20%, 15 VDCW.
C183	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C184	19A116656P106J7	Ceramic disc: 100 pF ±5%, 500 VDCW, temp coef -750 PPM.
C185	19A700105P38	Mica: 150 pF ±5%, 500 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C186 thru C189	19A116655P19	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C190	19A700013P13	Phenolic: 1.00 pF ±5%, 500 VDCW.
C191	19A116655P7	Ceramic disc: 150 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C192L	19A116656P24J8	Ceramic disc: 24 pF ±5%, 500 VDCW, temp coef -80 PPM
C192H	19A116656P18J8	Ceramic disc: 18 pF ±5%, 500 VDCW, temp coef -80 PPM.
C193L	19A116656P39J8	Ceramic disc: 39 pF ±5%, 500 VDCW, temp coef -80 PPM.
C193H	19A116656P27J8	Ceramic disc: 27 pF ±5%, 500 VDCW, temp coef -80 PPM.
C194L	19A116656P12J8	Ceramic disc: 12 pF ±5%, 500 VDCW; temp. coef -80 PPM.
C194H	19A116656P8J8	Ceramic disc: 8 pF ±5%, 500 VDCW; temp. coef -80 PPM.
C195L	19A116656P9J8	Ceramic disc: 9 pF ±5%, 500 VDCW; temp. coef -80 PPM.
C195H	19A116656P6J8	Ceramic disc: 6 pF ±5%, 500 VDCW; temp. coef -80 PPM.
C196	7489162P109	Silver mica: 18 pF ±10%, 500 VDCW; sim. to Sprague Type 119. Added by REV A.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR180	5495769P8	Silicon, capacitive.
CR181	19A116052P2	Silicon, fast recovery; sim to Hewlett Packard 5082-2811.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J101	19A700049P2	Connector, receptacle; 500 VDCW maximum; sim to NTTF-1058.
J102	19A701785P1	Contact, electrical; sim to Molex 08-50-0404. (Quantity 2).
J103	19B219374G1	Connector: 9 contacts.
		- - - - - - - - - - INDECTORS - - - - - - - - - -
L101	19A130255P3	Coil.
L104	19A130255P2	Coil.
L105	19A130443P1	Coil.
L106L	19A130332P4	Coil.
L106H	19A130443P2	Coil.
L107	19A130255P2	Coil.
L108	19A130443P1	Coil.
L109	19A130443P3	Coil.
L111	19B209420P103	Coil, RF: .15 uH ±10%, .10 ohms DC res max; sim to Jeffers 4416-3K.
L112	19A700024P9	Coil, RF: 470 nH ±10%.
L113	19B209420P1	Coil, RF: .10 uH ±5%, .08 ohms DC res max; sim to Jeffers 4416-6Z.
L114	19A700024P9	Coil, RF: 470 nH ±10%.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P902	19A116659P2	Connector, printed wiring: 10 contacts rated at 5 amps; sim to Molex 09-52-3102.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q101	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q102	19A702084P1	Silicon, NPN; sim to WPS 2369.
Q103	19A115328P1	Silicon, NPN.
Q104*	19A116899P1	Silicon, NPN.
		In REV C & earlier:
	19A115328P1	Silicon, NPN.

SYMBOL	GE PART NO.	DESCRIPTION
Q105 and Q106	19A116201P3	Silicon, NPN.
Q107*	19A116201P4	Silicon, NPN.
		In REV A & earlier:
	19A116201P1	Silicon, NPN.
Q181	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q182	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R102	19A700106P53	Composition: 390 ohms ±5%, 1/4 w.
R104	19B209358P106	Variable, carbon film: approx 300 to 10K ohms ±10%, 1/4 w; sim to CTS Type X-201.
R105	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R106	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R107	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R108	19A700106P67	Composition: 1.5K ohms ±5%, 1/4 w.
R109	3R152P433J	Composition: 43K ohms ±5%, 1/4 w.
R110	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R111	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R112	3R152P474J	Composition: 470K ohms ±5%, 1/4 w.
R113 and 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	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R118	19A700106P47	Composition: 220 ohms ±5%, 1/4 w.
R121*	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
		In REV B & earlier:
	3R152P151K	Composition: 150 ohms ±10%, 1/4 w.
R122	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R123	19A700106P39	Composition: 100 ohms ±5%, 1/4 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.
R131	19A700106P47	Composition: 220 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.
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.
R140	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R141	19A700113P31	Composition: 47 ohms ±5%, 1/2 w.
R142	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R144	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
R181	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R182	19A700106P97	Composition: 27K ohms ±5%, 1/4 w.
R183	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R184	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R185	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R186	19A700106P75	Composition: 3.3K ohms ±5%, 1/4 w.
R187	19A701250P349	Metal film: 31.6K ohms ±1%, 250 VDCW, 1/4 w.
R188	19A701250P309	Metal film: 12.1K ohms ±1%, 250 VDCW, 1/4 w.
R189	19A701250P287	Metal film: 7.87K ohms ±1%, 250 VDCW, 1/4 w.
R190	19A701250P283	Metal film: 7.15K ohms ±1%, 250 VDCW, 1/4 w.
R191	3R152P241J	Composition: 240 ohms ±5%, 1/4 w.
R192	19A700106P105	Composition: 56K ohms ±5%, 1/4 w.
		- - - - - - - - - - THERMISTORS - - - - - - - - -
RT181	19C300048P7	Thermister: 50K ohms ±10%; sim to NL Industries 1D103.
RT182	19C300048P15	Thermister: 200K ohms ±10%; sim to NL Industries 1D0514.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T101	19C307171P101	Coil, RF: variable, wire size No. 34 AWG; sim. to Paul Smith Co. Sample No. 080274-0G-1, 092574-0S-1.
T102	19C307170P305	Coil, RF: variable, wire size No. 20 AWG; sim. to Paul Smith Co. Sample No. 092574-0S-2.
T103	19C307170P306	Coil, RF: variable, wire size No. 20 AWG; sim. to Paul Smith Co. Sample No. 092574-0S-3.
T104	19C307170P307	Coil, RF: variable, wire size No. 20 AWG; sim. to Paul Smith Co. Sample No. 092574-0S-4.
T105	19C307169P202	Coil, RF: variable, wire size No. 20 AWG; sim. to Paul Smith Co. Sample No. 092574-0S-5.
T106	19C307169P203	Coil, RF: variable, wire size No. 20 AWG; sim. to Paul Smith Co. Sample No. 092574-0S-6.
T107 and T108	19C307169P204	Coil, RF: variable, wire size No. 20 AWG; sim. to Paul Smith Co. Sample No. 100374-0S-8.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U101	19A702868G2	Audio Amplifier.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR101	4036887P9	Silicon, zener.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY101*		Connector. Includes:
	19A701785P1	Contact, electrical; sim to Molex 08-50-0404.
	19C327255P1	Clip.
		Earlier than REV A:
	19A116659P50	Connector, printed wiring: 6 contacts; sim to Molex 09-65-1061.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z101*	19A134666P2	Frequency network: selective, 460-600 MHz resonant freq, 500 VDCW; sim to Dilectron TC501:NPO:270J:SLAC. Added by REV E.
Z102*	19A134666P1	Frequency network: selective, 470-630 MHz res. freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added by REV E.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A701544P7	Can. (Used with T101-T108).
	19C321695G1	Shield.
	19A701332P1	Insulator disk. (Used with Q105-Q107.
		ASSOCIATED ASSEMBLIES
		- - - - - - - - CRYSTAL MODULES - - - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact operating frequency needed.

SYMBOL	GE PART NO.	DESCRIPTION
Y101	19B226962G6	Crystal module: 5 PPM, 406-420 MHz.
	19B226962G7	Crystal module: 5 PPM, 450-470 MHz.
	19B226962G8	Crystal module: 5 PPM, 470-494 MHz.
	19B226962G9	Crystal module: 5 PPM, 494-512 MHz.

PRODUCTION CHANGES

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

REV. A - To permit use with Custom RVP radios. Changed XY101 and added C196.

REV. B - To improve power output. Changed Q107.

REV. C - To improve power output at 512 MHz. Changed C156 and R121.

REV. D - To incorporate new transistor. Changed Q104.

REV. E - To incorporate new nomenclature for frequency networks.

PARTS LIST

406-512 MHz EXCITER
19D432582G1 406-450 MHz
19D432582G2 450-512 MHz
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C101	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
C103	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C104	19A143486P7	Tantalum: 3.3 uF ±20%, 15 VDCW.
C107	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C108	19A143481P13	Ceramic: 470 pF ±20%, 1000 VDCW.
C109	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C111	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
C112	19A700105P44	Mica: 220 pF ±5%, 500 VDCW.
C113	5496372P365	Ceramic disc: 470 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C114	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C115	19A143481P13	Ceramic: 470 pF ±20%, 1000 VDCW.
C116	5496372P379	Ceramic disc: 910 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C117	5496372P365	Ceramic disc: 470 pF ±10%, 500 VDCW, temp coef -4700 PPM.
C118L	19A143491P30J8	Ceramic: 30 pF ±5%, temp coef -80 PPM.
C118H	19A143491P27J8	Ceramic: 27 pF ±5%, temp coef -80 PPM.
C119	19A700013P15	Phenolic: 1.50 pF ±5%, 500 VDCW.
C121L	19A143491P30J8	Ceramic: 30 pF ±5%, temp coef -80 PPM.
C121H	19A143491P27J8	Ceramic: 27 pF ±5%, temp coef -80 PPM.
C122L	19A143491P24J8	Ceramic: 24 pF ±5%, temp coef -80 PPM.
C122H	19A143491P20J8	Ceramic: 20 pF ±5%, temp coef -80 PPM.
C124	19A700105P34	Mica: 100 pF ±5%, 500 VDCW.
C125	19A116655P21	Ceramic disc: 2700 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C127 and C128	19A116655P21	Ceramic disc: 2700 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C131	5491601P118	Phenolic: 0.75 pF ±5%, 500 VDCW.
C132	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
C133	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C134 thru C136	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
C137	19A700013P11	Phenolic: 0.68 pF ±5%, 500 VDCW.
C138L	19A116656P56J8	Ceramic disc: 56 pF ±5%, 500 VDCW; temp coef -80 PPM.
C138H	19A143491P39J8	Ceramic: 39 pF ±5%, temp coef -80 PPM.
C139	19A143481P13	Ceramic: 470 pF ±20%, 1000 VDCW.
C141	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C143L	19A700105P26	Mica: 47 pF ±5%, 500 VDCW.
C143H	19A700105P23	Mica: 39 pF ±5%, 500 VDCW.
C144	19A143477P21	Polyester: .047 uF ±20%, 50 VDCW.
C145L	19A143491P22J8	Ceramic: 22 pF ±5%, temp coef -80 PPM.
C145H	19A143491P15J8	Ceramic: 15 pF ±5%, temp coef -80 PPM.
C146	19A700013P10	Phenolic: 0.56 pF ±5%, 500 VDCW.
C147L	19A143491P30J8	Ceramic: 30 pF ±5%, temp coef -80 PPM.
C147H	19A143491P15J8	Ceramic: 15 pF ±5%, temp coef -80 PPM.
C148	19A143491P30J8	Ceramic: 30 pF ±5%, temp coef -80 PPM.
C149	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C151	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C15LL	19A143491P4J0	Ceramic: 4 pF ±5%, temp coef 0 PPM.
C152H	19A143491P3J0	Ceramic: 3 pF ±5%, temp coef 0 PPM.
C154	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
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.
C161L	19A143491P6J8	Ceramic: 6 pF ±5%, temp coef -80 PPM.
C161H	19A143491P5J8	Ceramic: 5 pF ±5%, temp coef -80 PPM.
C162	19A143491P47J1	Ceramic: 47 pF ±5%, temp coef -150 PPM.
C163	19A143491P30J8	Ceramic: 30 pF ±5%, temp coef -80 PPM.
C164	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C166L	19A143491P4J0	Ceramic: 4 pF ±5%, temp coef 0 PPM.
C166H	19A143491P3J0	Ceramic: 3 pF ±5%, temp coef 0 PPM.
C167	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C168	19A143491P47J1	Ceramic: 47 pF ±5%, temp coef -150 PPM.
C171	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C172	19A143477P26	Polyester: .1 uF ±20%, 50 VDCW.
C175	19A700008P1	Variable: 2.04 to 9.9 pF, 250V peak.
C176	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
C177	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C178	19A143477P13	Polyester: .01 uF ±20%, 50 VDCW.
C179	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C180	19A143477P13	Polyester: .01 uF ±20%, 50 VDCW.
C181 and C182	19A701534P8	Tantalum: 0.47 uF ±20%, 35 VDCW.
C183	19A143477P13	Polyester: .01 uF ±20%, 50 VDCW.
C184	19A143491P100J7	Ceramic: 100 pF ±5%, temp coef -750 PPM.
C185	19A700105P38	Mica: 150 pF ±5%, 500 VDCW.
C186 thru C189	19A143481P19	Ceramic: 1000 pF ±20%, 1000 VDCW.
C190	19A700013P13	Phenolic: 1.00 pF ±5%, 500 VDCW.
C191	19A143481P7	Ceramic: 150 pF ±20%, 1000 VDCW.
C192L	19A143491P24J8	Ceramic: 24 pF ±5%, temp coef -80 PPM.
C192H	19A143491P18J8	Ceramic: 18 pF ±5%, temp coef -80 PPM.
C193L	19A143491P39J8	Ceramic: 39 pF ±5%, temp coef -80 PPM.
C193H	19A143491P27J8	Ceramic: 27 pF ±5%, temp coef -80 PPM.
C194L	19A143491P12J8	Ceramic: 12 pF ±5%, temp coef -80 PPM.
C194H	19A143491P8J8	Ceramic: 8 pF ±5%, temp coef -80 PPM.
C195L	19A143491P9J8	Ceramic: 9 pF ±5%, temp coef -80 PPM.
C195H	19A143491P6J8	Ceramic: 6 pF ±5%, temp coef -80 PPM.
C196	7489162P109	Silver mica: 18 pF ±10%, 500 VDCW; sim to Sprague Type 118.
		- - - - - - - - - - DIODES - - - - - - - - - -
CR180	5495769P8	Silicon, capacitive.
CR181	19A116052P2	Silicon, fast recovery; sim to Hewlett Packard 5082-2811.
		- - - - - - - - - - JACKS - - - - - - - - - -
J101	19A700049P2	Connector, receptacle: 500 VDCW maximum; sim to NTTF-1058.
J102	19A701785P1	Contact, electrical; sim to Molex 08-50-0404. (Quantity 2).
J103	19B219374G1	Connector, Includes: Shell.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L101	19A130255P3	Coil.
L104	19A130255P2	Coil.
L105	19A130443P1	Coil.
L106L	19A130443P4	Coil.
L106H	19A130443P2	Coil.
L107	19A130255P2	Coil.
L108	19A130443P1	Coil.
L109	19A130443P3	Coil.
L111	19B209420P103	Coil, RF: .15 uH ±10%, .10 ohms DC res max; sim to Jeffers 4416-3K.
L112	19A700024P9	Coil, RF: 470 nH ±10%.
L113	19B209420P1	Coil, RF: .10 uH ±5%, .08 ohms DC res max; sim to Jeffers 4416-6J.
L114	19A700024P9	Coil, RF: 470 nH ±10%.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P902	19A116659P2	Connector, printed wiring: 10 contacts rated at 5 amps; sim to Molex 09-52-3102.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q101	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q102	19A702084P1	Silicon, NPN; sim to MPS 2369.
Q103	19A115328P1	Silicon, NPN.
Q104	19A116899P1	Silicon, NPN.
Q105 and Q106	19A116201P3	Silicon, NPN.
Q107	19A116201P4	Silicon, NPN.
Q181	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q182	19A116774P1	Silicon, NPN; sim to Type 2N5210.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R102	19A700106P53	Composition: 390 ohms ±5%, 1/4 w.
R104	19B209358P106	Variable, carbon film: approx 300 to 10K ohms ±10%, 1/4 w; sim to CTS Type X-201.
R105	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R106	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R107	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R108	19A700106P67	Composition: 1.5K ohms ±5%, 1/4 w.
R109	3R152P433J	Composition: 43K ohms ±5%, 1/4 w.
R110	19A700106P85	Composition: 8.2K ohms ±5%, 1/4 w.
R111	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R112	3R152P474J	Composition: 470K ohms ±5%, 1/4 w.
R113 and 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	19A700106P103	Composition: 47K ohms ±5%, 1/4 w.
R118	19A700106P47	Composition: 220 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.
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.
R131	19A700106P47	Composition: 220 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.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
R135	19A700113P31	Composition: 47 ohms ±5%, 1/2 w.
R136	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
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.
R140	19A700106P45	Composition: 180 ohms ±5%, 1/4 w.
R141	19A700113P31	Composition: 47 ohms ±5%, 1/2 w.
R142	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R144	19A700106P15	Composition: 10 ohms ±5%, 1/4 w.
R181	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
R182	19A700106P97	Composition: 7K ohms ±5%, 1/4 w.
R183	19A700106P87	Composition: 10K ohms ±5%, 1/4 w.
R184	19A700106P63	Composition: 1K ohms ±5%, 1/4 w.
R185	19A700106P57	Composition: 560 ohms ±5%, 1/4 w.
R186	19A700106P75	Composition: 3.3K ohms ±5%, 1/4 w.
R187	19A701250P349	Metal film: 31.6K ohms ±1%, 250 VDCW, 1/4 w.
R188	19A701250P308	Metal film: 11.8K ohms ±1%, 250 VDCW, 1/4 w.
R189	19A701250P287	Metal film: 7.87K ohms ±1%, 250 VDCW, 1/4 w.
R190	19A701250P283	Metal film: 7.15K ohms ±1%, 250 VDCW, 1/4 w.
R191	3R152P241J	Composition: 240 ohms ±5%, 1/4 w.
R192	19A700106P105	Composition: 56K ohms ±5%, 1/4 w.
		- - - - - - - - - - THERMISTORS - - - - - - - -
RT181	19C300048P7	Thermister: 50K ohms ±10%; sim to NL Industries 1D103.
RT182	19C300048P15	Thermister: 200K ohms ±10%; sim to NL Industries 4D0514.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T101	19C307171P101	Coil, RF: variable, wire size No. 34 AWG; sim to Paul Smith Co. Sample No. 080274-OG-1, 092574-DS-1.
T102	19C307170P305	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-2.
T103	19C307170P306	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-3.
T104	19C307170P307	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-4.
T105	19C307169P202	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-5.
T106	19C307169P203	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 092574-DS-6.
T107 and T108	19C307169P204	Coil, RF: variable, wire size No. 20 AWG; sim to Paul Smith Co. Sample No. 100374-DS-8.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U101	19A702868G2	Audio Amplifier.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - -
VR101	4036887P9	Silicon, zener.
		- - - - - - - - - - - SOCKETS - - - - - - - - - -
XY101	19A701785P1	Contact, electrical; sim to Molex 08-50-0404. (Quantity 6).
		- - - - - - - - - - - NETWORKS - - - - - - - - -
Z101	19A134666P2	Frequency network: 460-600 MHz resonant freq 500 VDCW, sim to Dilectron TC501:NPO:270J:SLAC.
Z102	19A134666P1	Frequence network: selective, 470-630 MHz, resonant freq 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19C321695G1	Shield.
	19A701544P7	Can.
	19C327251P1	Cleat. (Secures XY101).
	19A701332P1	Insulator disk. (Used with Q105-Q107).
		ASSOCIATED PARTS
		- - - - - - - - - - - CRYSTALS - - - - - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact frequency needed.
		$Fx = \frac{Fo}{9}$
Y101	19A701562G6	Quartz: 31-66 MHz.

END OF DOCUMENT