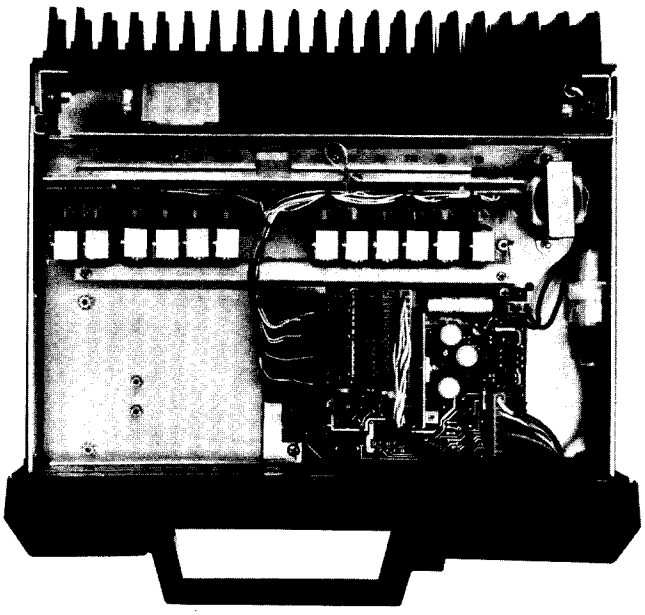
MOBILE RADIO

MASTR® *Executive II* MAINTENANCE MANUAL

SYSTEM BOARD, MULTI-FREQUENCY BOARDS & CRYSTAL MODULES FOR RADIO COMMON CARRIER MOBILES

Maintenance Manual LBI 30358A
DATAFILE FOLDER DF4.101

SYSTEM BOARD 19C327080G1



SPECIFICATIONS *

INPUT VOLTATE	13.8 Volts DC (Negative Ground Only)
OUTPUT VOLTAGE	Regulated 10 Volts DC at 0.1 to 0.5 Amperes
MAXIMUM CURRENT DRAIN	0.4 Amperes
AUDIO OUTPUT	1.6 Volts RMS into 600 ohms (300 Hz with 6 dB/octave rolloff)

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

GENERAL ELECTRIC

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WARNING

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

DESCRIPTION

The System Board for MASTR® Executive II Common Carrier Mobiles provides interconnection between the control cable from the control unit and the transmitter and receiver RF boards which plug into it.

Mounted on the underside of the radio chassis, the System Board is accessible by removing the radio chassis from the mounting frame. Molex pins on the board protrude through slots on the radio chassis to make connections with the exciter, IF-Detector (IF-DET) and transmitter multi-frequency board. The receiver multi-frequency board connects to the System Board via a harness and connector.

The control head end of the control cable terminates in a 38-pin connector. The radio end of the control cable connects to the front connector J1. An internal harness routes from the front connector to the System Board where it plugs onto Molex pins.

Centralized metering jack J910 is accessible from the top of the radio and is provided for use with General Electric Test Set 4EX3A11 or Test Kit 4EX8K12. The red metering plug provides continuous access to the regulated 10 Volts, A+, transmitter and receiver audio and PTT.

CIRCUIT ANALYSIS

+10 VOLT REGULATOR

The +10 Volt Regulator provides a closely-controlled supply voltage for the transmitter exiter, the receiver and the multi-frequency boards. The 13.8 VDC is applied to the choke input filter composed of L1901 and C906. The output of the filter is applied to the regulator circuit which consists of Q901, Q902, Q903, and zener diode VR901.

When the output of the regulator starts to increase, Q903 conducts harder and Q902 conducts less, causing Q901 to conduct less. This increases the voltage drop across Q901, keeping the output constant. Potentiometer R906 is used to set the base voltage of Q903 for the desired 10-Volt output.

Diodes CR905 and CR906 provide reverse battery polarity protection, and will cause the in-line fuse to blow if the polarity reverses.

TRANSMITTER KEYING

Operating the PTT switch on the handset forward biases diodes CR903 and CR904, connecting the emitter of Q904 to A-. Conduction of Q904 turns on transmitter oscillator control switch Q905. Operation of Q905 applies voltage to the transmitter oscillator and applies an RF signal to the transmitter.

AUDIO AMPLIFIER

The audio signal from the receiver is fed through the de-emphasis network (C915, C918, R919, R921) to audio amplifiers Q906 and Q907. The output of emitter-follower Q906 is coupled to the base of Q907 through C919. The amplified audio signal is fed to the earpiece of the handset.

The 15 mA required for operating the carbon microphone in the handset is supplied through R911 and R912 from the 10 Volt regulator output to the MIC HI lead. C911 provides the necessary filtering.

CRYSTAL MODULE

Crystal modules determine the operating frequency of the transmitter and receiver. The plug-in module contains a crystal, a trimmer capacitor, and varicap for temperature compensation.

The quartz crystals used in the crystal module exhibit the traditional "S" curve characteristics of output frequency versus operating temperature.

In the mid-temperature range (-10°C to +50°C), the raw crystal characteristic is maintained. The compensation voltage which drives the crystal module varicap is approximately constant over this temperature range. Consequently, the crystal almost solely determines the temperature characteristic. The crystals whose temperature characteristic lie toward the high limit of +4 PPM shown in Figure 1 are rotated slightly. All others have little or no rotation.

The cold end temperature characteristic is "lifted" by a temperature-dependent increasing voltage. The compensator which drives the crystal module varicap produces a voltage which increases linearly from -10°C to -30°C. This voltage decreases the varicap capacity, which in turn increases the module tuned circuit frequency to compensate for the decreasing frequency characteristic of the crystal.

The hot end crystal temperature characteristic in Figure 1 is shown to be increasing with temperature. The hot end (above 50°C) crystal characteristic is compensated for by a decreasing voltage from the compensator. This results in added capacity from the varicap. In turn, a decreasing module frequency results to counteract the increasing frequency response of the crystal.

Compensation voltage is applied to pin 4 of the crystal module to maintain frequency stability within ±5 PPM over a temperature range of -30°C to +60°C.

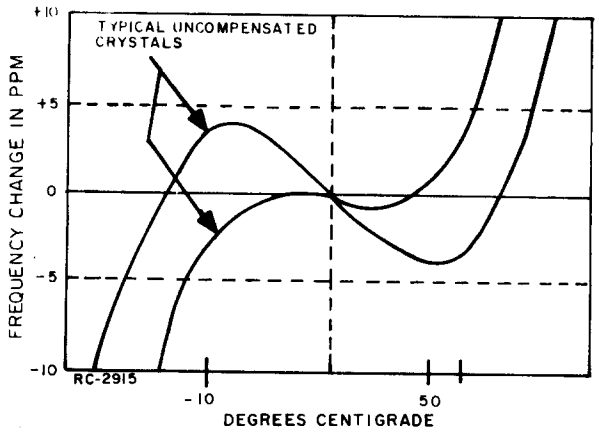


Figure 1 - Typical Crystal Characteristics

Service Note: Proper crystal module operation is dependent on the closely-controlled input voltages from the 10-Volt regulator. Should all of the crystal modules shift off frequency, check the 10-Volt regulator.

The compensation voltage varies non-linearly with temperature to complement the temperature/frequency characteristics of the crystal. Listed below are typical minimum and maximum voltage readings to be expected at pin 4 of the crystal modules, as measured with a high impedance meter.

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

Trimmer capacitor C3 is used to adjust the radio for the exact operating frequency. Refer to the applicable Alignment Procedure for details.

Operating voltage for the crystal module is supplied through the forward biased pin diode on the multi-frequency board to pin 1 of the selected crystal module.

TRANSMITTER MULTI-FREQUENCY OSCILLATOR BOARD

The Transmitter Multi-Frequency Oscillator Board contains the necessary circuitry for providing up to twelve transmit frequencies. The oscillator board plugs into J907 and J912 on the System Board and utilizes crystal modules to determine the exact operating frequencies.

The transmit oscillator circuits are identical, each using a single transistor in conjunction with the selected crystal module to comprise the oscillator circuit. Crystal modules are selected for operation by the frequency select lead from the control unit. PIN diodes are used to switch the output of the selected crystal module to the base of the appropriate transistor (Q2101 or Q2102). Since the oscillator circuits are identical, only the F1 transmit circuit is described here.

When F1 is selected at the control unit, A- is applied to the junction of R2101 and CR2101. PIN diode CR2101 is now forward biased applying the output of crystal module Y2101 (pin 1) to the base of common oscillator transistor Q2101. The selected crystal module and the transistor circuit comprise a Colpitts oscillator.

Pressing the PTT switch applies the +10 Volt oscillator control voltage to the emitter/base circuit of Q2101, causing it to oscillate at the assigned F1 crystal frequency.

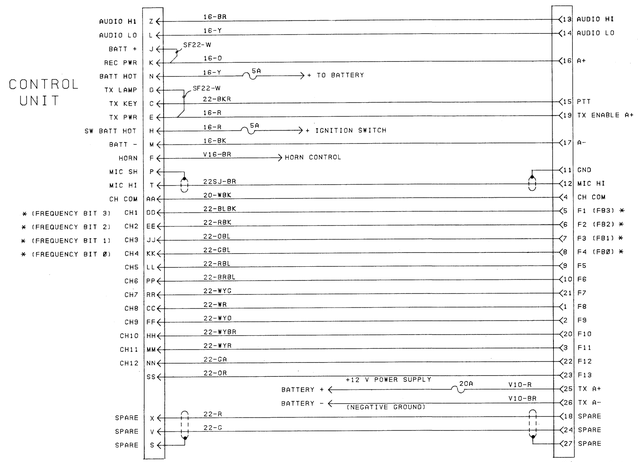
A short plug-in coaxial cable (W2601) connects the output of the oscillator board to J102 on the exciter board. When the PTT switch is released, the transmitter oscillator control voltage is removed from Q2101 and the anode of PIN diode CR2101. Q2101 stops oscillating and no longer provides an input to the exciter.

RECEIVER MULTI-FREQUENCY OSCILLATOR BOARD

The Receiver Multi-Frequency Oscillator Board contains the necessary circuitry for providing up to 13 receive frequencies. Interconnection to the System Board are made through P908 and J908. The module contains two Colpitts oscillators and 13 crystal module sockets. The frequency selection and oscillator circuits operate in the same manner as described for the transmitter oscillator. The output signal is fed to the receiver oscillator/multiplier through J2301 and a wire connected to the underside of the OSC/MULT board.

The receiver oscillator board has its own compensation circuit composed of Q2303, VR2301, RT2301, and RT2302. Zener diode VR2301 provides a constant +8.5 Volts reference voltage for compensator Q2303.

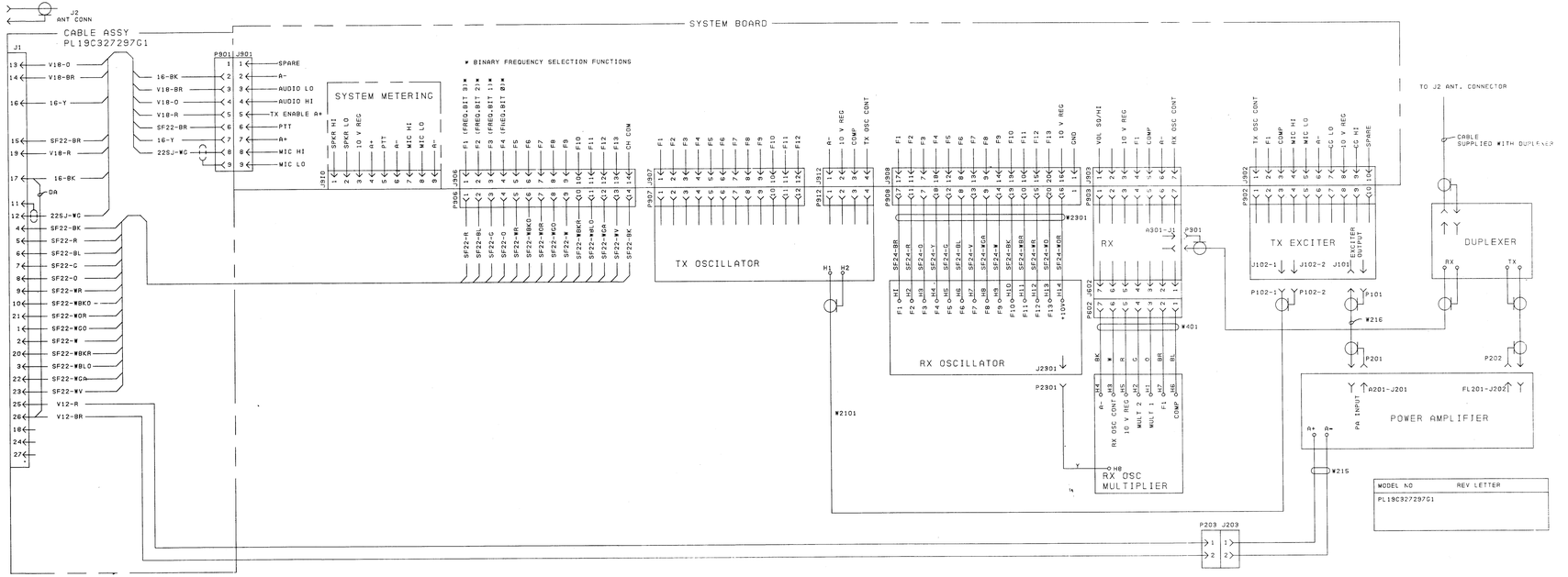
POWER/CONTROL CABLE 19C327299G1



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.

* BINARY FREQUENCY SELECTION FUNCTIONS.

(19D424097, Rev. 3)



(19R622236, Rev. 2)

SYSTEM INTERCONNECTION DIAGRAM

Issue 1

PARTS LIST

LBI-30364

CABLE ASSEMBLY
19C327297G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J1	19C303775P1	Connector, plug: 28 terminals.
		- - - - - - - - - - PLUGS - - - - - - - - -
P203		Connector. Includes:
	19A134281P1	Shell.
	19A134282P2	Contact, electrical: wire size No. 10-14 AWG; sim to AMP 350200-2.
P901		Connector. Includes:
	19A136644G1	Shell.
	19A116781P5	Contact, electrical: wire range No. 16-20 AWG; sim to Molex 08-50-0106. (P901-2, P901-3, P901-4, P901-5, P901-7, P901-9).
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108. (P901-6, P901-8).
P906		Connector. Includes:
	19A130712G1	Shell.
	19A116781P6	Contact, electrical: wire range No. 22-26 AWG; sim to Molex 08-50-0108.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B201074P606	Tap screw, Phillips POZIDRIV®: No. 4-40 x 3/8. (Secures J1 to connector support).
	19B226892P1	Support. (J1).
	19A115185P5	Retaining strap: sim to Panduit Corp. SST-1. (Secures wires from J1 to P203, P901, P906).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

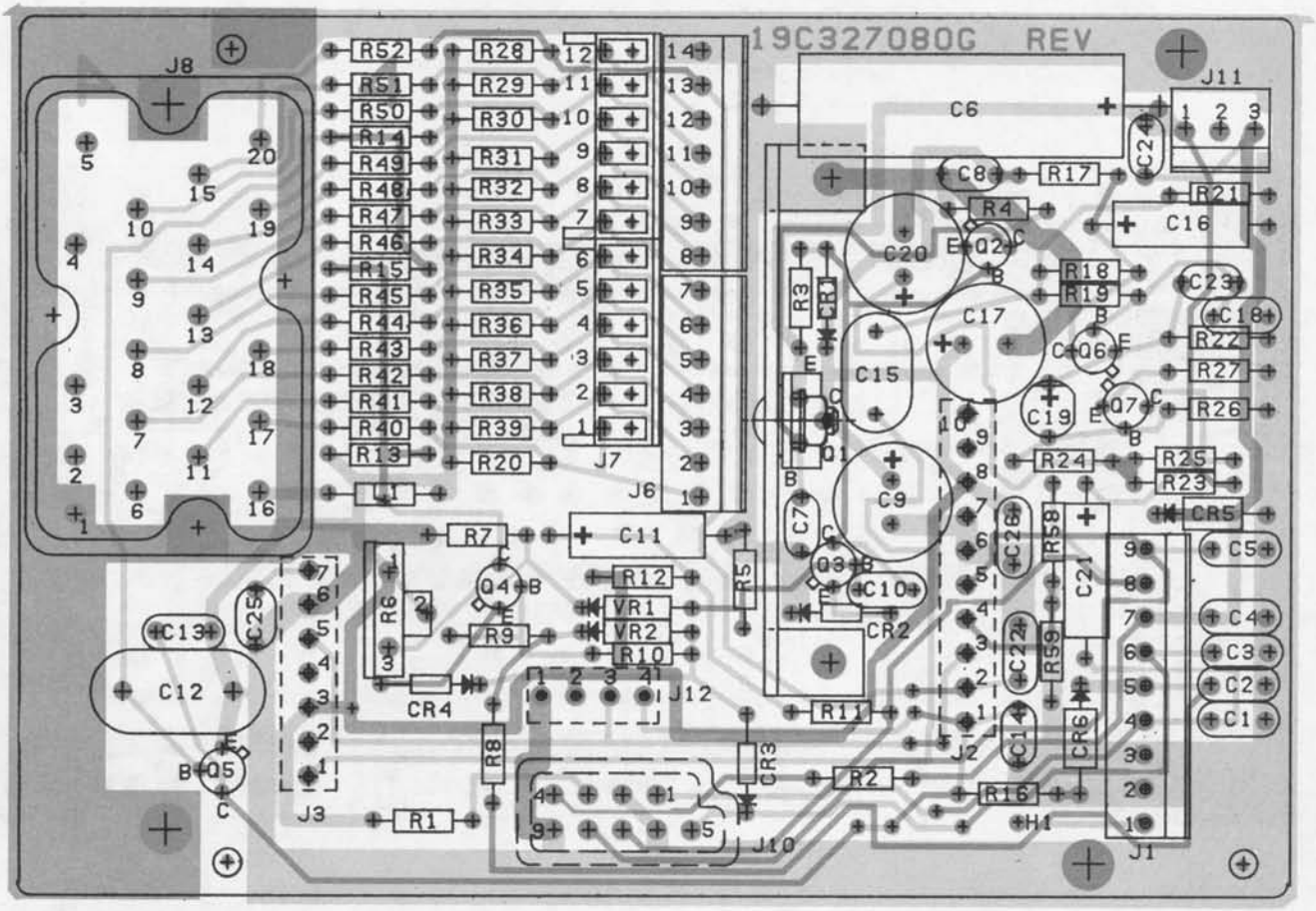
PARTS LIST

LBI-30361

CONTROL CABLE
19C327299G1

SYMBOL	GE PART NO.	DESCRIPTION
	19C311409P1	Connector, audio, 28 contacts: Contacts 1-24, 4.5 amps, Contacts 25-28, 25 amps.
	19C311411G1	Thumbscrew. (Used with 28 pin connector).
	19B226473G1	Cover, connector. (Used with 28 pin connector).
	N36P9020C13	Machine screw: No. 4-40 x 1-1/4. (Secures 28 pin connector together).
	N210P9C13	Hexnut: No. 4-40. (Secures 28 pin connector together).
	19A129232G1	Connector, Audio, 38 contacts.
	19B209227P5	Contact. (Used with 38 pin connector- Quantity 30).
	N44P9006C6	Machine screw: No. 4-40 x 3/8. (Secures 38 pin connector together).
	7139880P11	Cable, 23 conductor: approx 20 feet long.
	19A122111G1	Fused lead, red. (Includes 2 19A115776P3 contacts, 1 4029482P2 contact, 1 7491823P8 terminal, 1 7491823P7 terminal).
	19A122111G2	Fused lead, yellow. (Includes 2 19A115776P3 contacts, 1 4029482P2 contact, 1 7491823P8 terminal, 1 7491823P7 terminal).
	1R16P8	Fuse, cartridge, quick blowing: 5 amps at 250 v; sim to Littelfuse 312005 or Bussmann MTH-5. (Used with Fused lead assemblies- Battery and ignition switch).
	19B209260P27	Terminal, solderless: wire range No. 12-10; sim to AMP 31828 LOOSE PC. (Terminates 12 volt power supply wire - V10-R wire).
	19B209260P18	Terminal, solderless: wire range No. 12-10; sim to AMP 41125. (Terminates negative ground wire-V10-BR wire).
	19C301208P6	Insulated sleeving, electrical. (Used with red 12 volt power supply wire and brown negative ground wire).
	4029484P2	Contact, electrical: sim to AMP 41274. (Terminates V16 -BR wire out of 38 pin connector).
	4033347G1	Splice conductor. (Used with 4029484P2 contact).
		FUSE ASSEMBLY 19B216021G4 (Fuses must be ordered separately)
	1R11P5	Fuse, quick blowing: 20 amps, 250 v; sim to Bussman NON20.

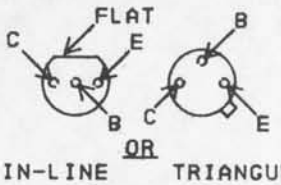
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.



(19C327256, Rev. 3)
(19B227326, Sh. 1, Rev. 4)
(19B227326, Sh. 2, Rev. 4)

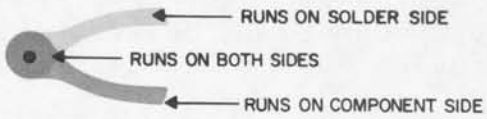
NOTE:
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH 900 SERIES.
EXAMPLE: C1-C901, R1-R901....ETC.

LEAD IDENTIFICATION
FOR Q2-Q7



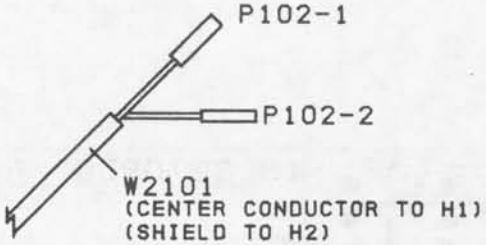
TOP VIEW

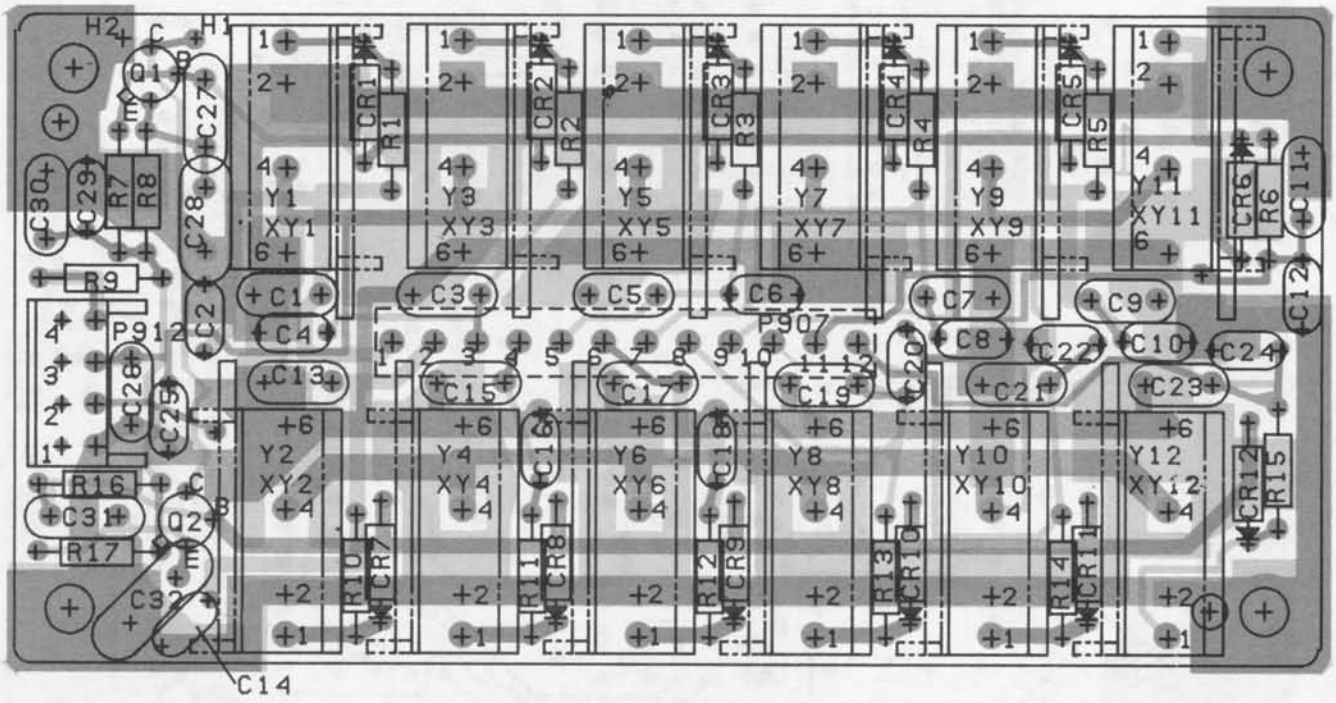
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



OUTLINE DIAGRAM

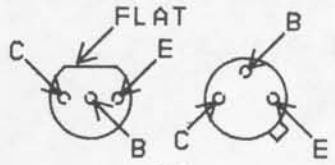
RCC SYSTEM BOARD
19C327080G1





(19C327076, Rev. 1)
(19B227319, Sh. 1, Rev. 1)
(19B227319, Sh. 2, Rev. 1)

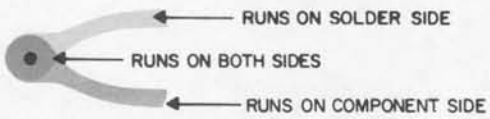
LEAD IDENTIFICATION
FOR Q1 AND Q2



TOP VIEW

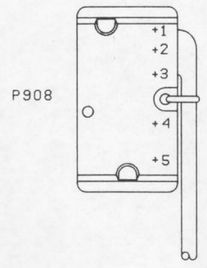
NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

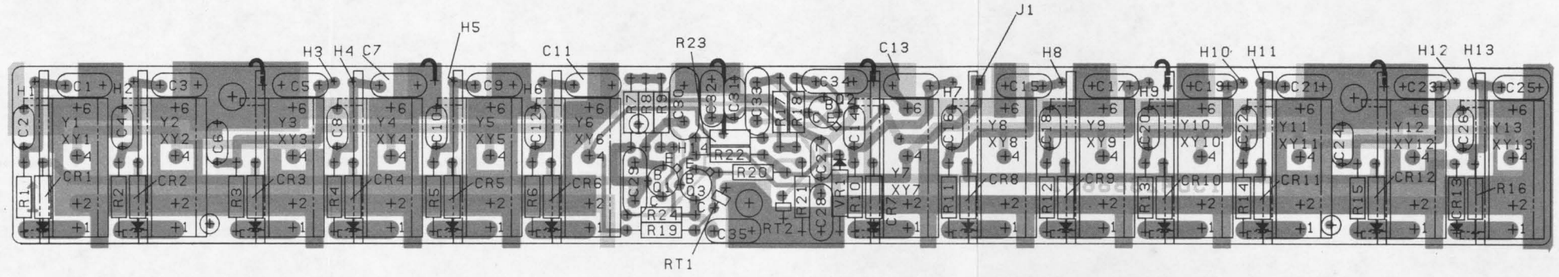
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATIONS PREFIX WITH 2100 SERIES. EXAMPLE: C1 = C2101 R1 = R2101 ETC.



OUTLINE DIAGRAM

TRANSMITTER MULTI-FREQUENCY
OSCILLATOR BOARD 19C327060G1

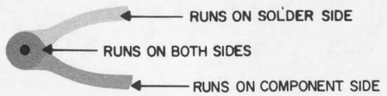




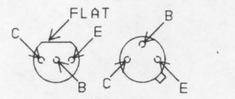
(19D423887, Rev. 2)
(19C327094, Sh. 1, Rev. 1)
(19C327094, Sh. 2, Rev. 1)

FROM	TO	WIRE
P908-17	H1	T28-BR
P908-11	H2	T28-R
P908-7	H3	T28-O
P908-18	H4	T28-Y
P908-12	H5	T28-G
P908-8	H6	T28-BL
P908-13	H7	T28-V
P908-9	H8	T28-WGA
P908-14	H9	T28-W
P908-19	H10	T28-BK
P908-10	H11	T28-WBR
P908-15	H12	T28-WR
P908-20	H13	T28-WO
P908-16	H14	T28-WY

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN.
FOR COMPLETE DESIGNATION, PREFIX WITH 2300 SERIES.
EXAMPLE C1=C2301, R1=R2301, ETC.



LEAD IDENTIFICATION
FOR Q1, Q2, AND Q3



OR

IN-LINE TRIANGULAR

TOP VIEW

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

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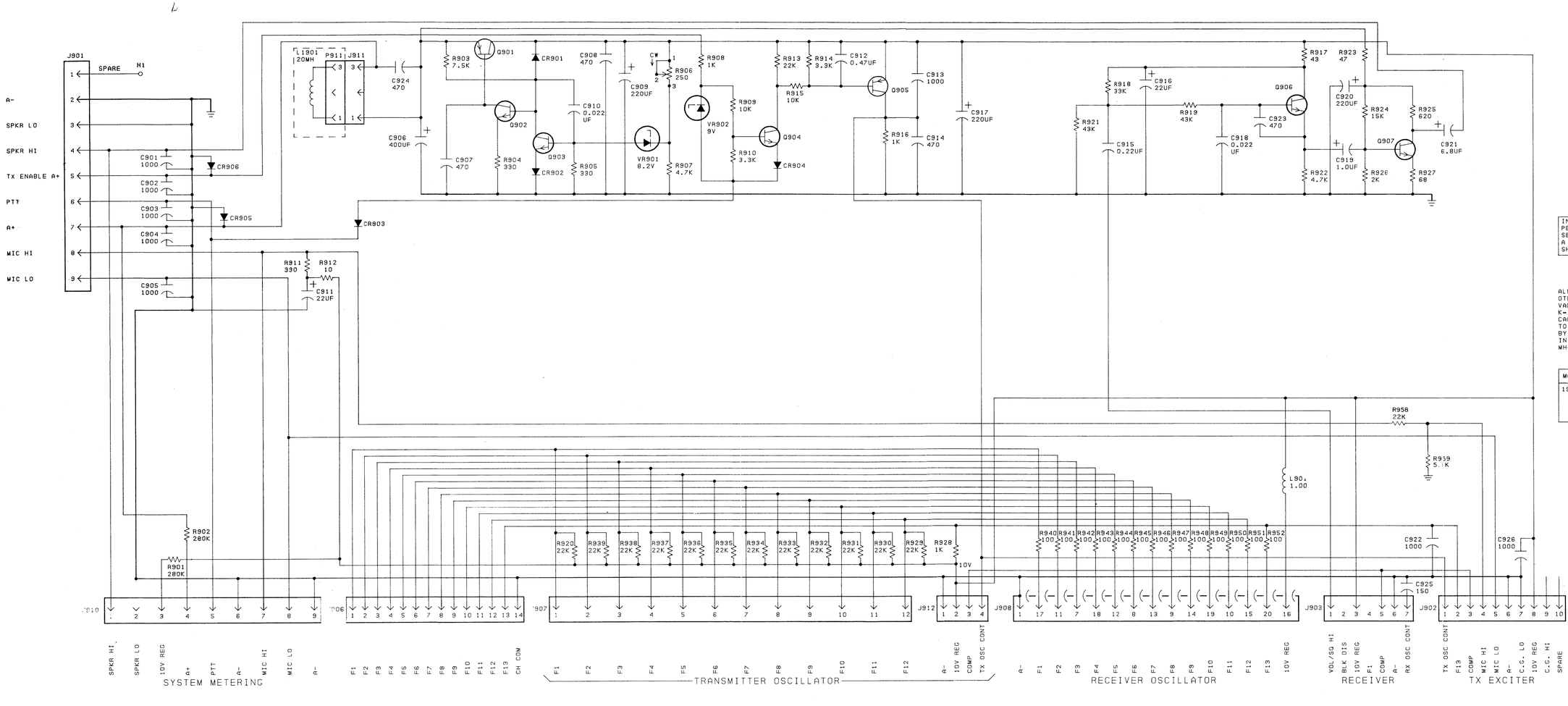
OUTLINE DIAGRAM

RECEIVER MULTI-FREQUENCY
OSCILLATOR BOARD 19D423885G1



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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.

MODEL NO	REV LETTER
19C327080G1	A

(19B622218, Rev. 3)

SCHEMATIC DIAGRAM

RCC SYSTEM BOARD
19C327080G1

PARTS LIST

LBI30360A

MASTR EXECUTIVE II RCC MOBILE SYSTEM BOARD
19C327080G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C901 thru C905	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C906	19A115680P24	Electrolytic: 400 µf +150% -10%, 18 VDCW; sim to Mallory Type TTX.
C907 and C908	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C909	19A134319P1	Electrolytic: 220 µf +75% -10%, 25 VDCW; sim to Sprague 502D182.
C910	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C911	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C912	19A116080P11	Polyester: 0.47 µf ±20%, 50 VDCW.
C913	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C914	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C915	19A116080P109	Polyester: 0.22 µf ±10%, 50 VDCW.
C916	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C917	19A134319P1	Electrolytic: 220 µf +75% -10%, 25 VDCW; sim to Sprague 502D182.
C918	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C919	19A134202P14	Tantalum: 1 µf ±20%, 35 VDCW.
C920	19A134319P1	Electrolytic: 220 µf +75% -10%, 25 VDCW; sim to Sprague 502D182.
C921	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C922	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C923 and C924	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C925	5494481P101	Ceramic disc: 150 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C926	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR901 thru CR904	19A115250P1	Silicon.
CR905 and CR906	4037822P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J901	19A116659P93	Connector, printed wiring: 9 contacts; sim to Molex 09-65-1091.
J902	19A116659P29	Connector, printed wiring: 10 contacts; sim to Molex 09-64-1103.
J903	19B219594P1	Contact, electrical: 7 pins.
J906	19A116659P91	Connector, printed wiring: 7 contacts; sim to Molex 09-65-1071. (Quantity 2).
J907	19A116659P4	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3062. (Quantity 2).
J908	19A136740G1	Connector: 20 pin contact.
J910	19B219374G2	Connector: 9 contacts.
J911	19A116659P95	Connector, printed wiring: 3 contacts; sim to Molex 09-65-1031.
J912	19A116659P91	Connector, printed wiring: 4 contacts; sim to Molex 09-64-1043.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L901	19B209420P113	Coil, RF: 1.00 µh ±10%, 0.74 ohms DC res max; sim to Jeffers 4420-4.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q901	19A116375P1	Silicon, PNP.
Q902 thru Q904	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q905	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q906 and Q907	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R901 and R902	19C314256P22803	Metal film: 280K ohms ±1%, 1/4 w.
R903	3R152P752J	Composition: 7.5K ohms ±5%, 1/4 w.
R904 and R905	3R152P331J	Composition: 330 ohms ±5%, 1/4 w.
R906	19B209358P101	Variable, carbon film: approx 25 to 250 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R907	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R908	3R152P102K	Composition: 1K ohms ±10%, 1/4 w.
R909	3R152P103K	Composition: 10K ohms ±10%, 1/4 w.
R910	3R152P332K	Composition: 3.3K ohms ±10%, 1/4 w.
R911	3R152P331J	Composition: 330 ohms ±5%, 1/4 w.
R912	3R152P100J	Composition: 10 ohms ±5%, 1/4 w.
R913	3R152P223K	Composition: 22K ohms ±10%, 1/4 w.
R914	3R152P332K	Composition: 3.3K ohms ±10%, 1/4 w.
R915	3R152P103K	Composition: 10K ohms ±10%, 1/4 w.
R916	3R152P102K	Composition: 1K ohms ±10%, 1/4 w.
R917	3R152P430K	Composition: 43 ohms ±10%, 1/4 w.
R918	3R152P333J	Composition: 33K ohms ±5%, 1/4 w.
R919	3R152P433J	Composition: 43K ohms ±5%, 1/4 w.
R920	3R152P223K	Composition: 22K ohms ±10%, 1/4 w.
R921	3R152P433J	Composition: 43K ohms ±5%, 1/4 w.
R922	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R923	3R152P470K	Composition: 47 ohms ±10%, 1/4 w.
R924	3R152P153J	Composition: 15K ohms ±5%, 1/4 w.
R925	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
R926	3R152P202J	Composition: 2K ohms ±5%, 1/4 w.
R927	3R152P680J	Composition: 68 ohms ±5%, 1/4 w.
R928	3R152P102K	Composition: 1K ohms ±10%, 1/4 w.
R929 thru R939	3R152P223K	Composition: 22K ohms ±10%, 1/4 w.
R940 thru R952	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R958*	3R152P223K	Composition: 22K ohms ±10%, 1/4 w. Added by REV A.
R959*	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w. Added by REV A.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR901	4036887P40	Silicon, Zener.
VR902	4036887P7	Silicon, Zener.
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19A136571P1	Support. (Mounts Q1).
	19A116023P3	Insulator, plate. (Used with Q1).
	19A134016P1	Insulator, bushing. (Used with Q1).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

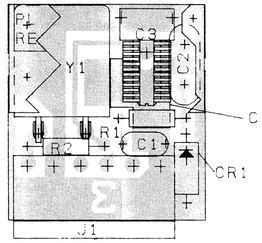
PRODUCTION CHANGES

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 description of parts affected by these revisions.

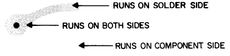
SYSTEM BOARD 19C327080G1

REV. A - To reduce audio level from carbon handset.
Added R938 and R939.

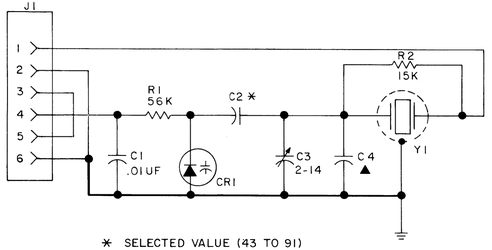
OUTLINE DIAGRAM



(19B227337, Rev. 2)
(19B226851, Sh. 1, Rev. 3)
(19B226851, Sh. 2, Rev. 3)



SCHEMATIC DIAGRAM



* SELECTED VALUE (43 TO 91)

▲ PART OF PRINTED BOARD. C4 IS DISCONNECTED WHEN C2 BECOMES 75 PF OR GREATER.

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.

MODEL NO	REV LETTER
PLI9B226962G1-27	

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.

(19B226951, Rev. 3)

SCHEMATIC DIAGRAM, OUTLINE DIAGRAM & PARTS LIST

CRYSTAL MODULE 19B226962

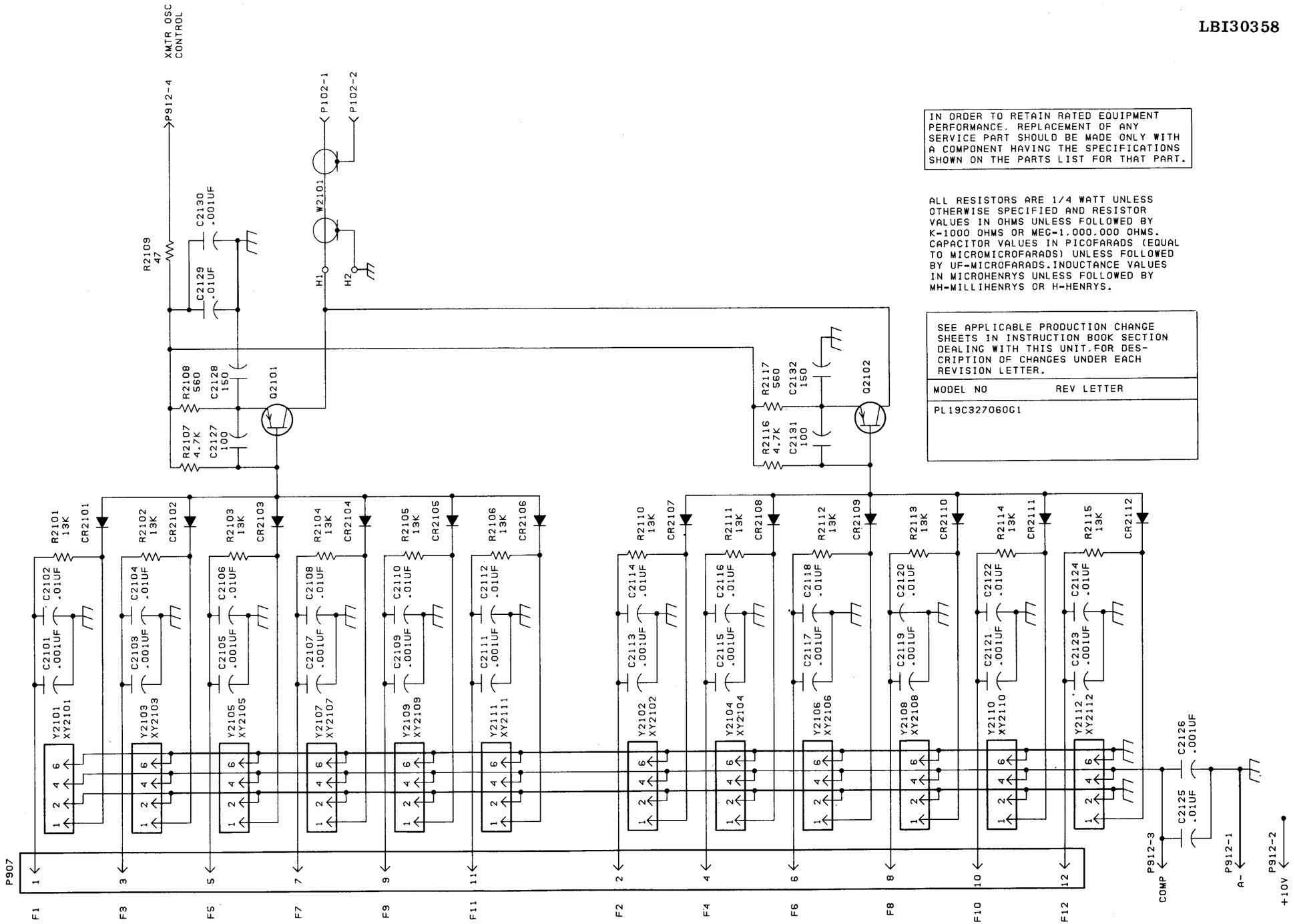
PARTS LIST

LBI30069C

CRYSTAL MODULE (5 PPM)
19B226962G1-G27

SYMBOL	GE PART NO.	DESCRIPTION
		19B226962G1 Tx 30-36 MHz 19B226962G2 Tx 36-42 MHz 19B226962G3 Tx 42-50 MHz 19B226962G4 Tx 138-155 MHz 19B226962G5 Tx 150.8-174 MHz 19B226962G6 Tx 406-420 MHz 19B226962G7 Tx 450-470 MHz 19B226962G8 Tx 470-494 MHz 19B226962G9 Tx 494-512 MHz 19B226962G10 Rx 30-36 MHz 19B226962G11 Rx 36-42 MHz 19B226962G12 Rx 42-50 MHz 19B226962G13 Rx 138-155 MHz 19B226962G14 Rx 150.8-174 MHz 19B226962G15 Rx 406-420 MHz 19B226962G16 Rx 450-470 MHz 19B226962G17 Rx 470-494 MHz 19B226962G18 Rx 494-512 MHz 19B226962G19 Rx 138-155 MHz HIGH SIDE INJECT 19B226962G20 Rx 150.8-174 MHz HIGH SIDE INJECT 19B226962G21 Rx 406-420 MHz HIGH SIDE INJECT 19B226962G22 Rx 450-470 MHz HIGH SIDE INJECT 19B226962G23 Rx 470-494 MHz HIGH SIDE INJECT 19B226962G24 Rx 494-512 MHz HIGH SIDE INJECT 19B226962G25 Rx 30-36 MHz ALTERNATE IF 19B226962G26 Rx 36-42 MHz ALTERNATE IF 19B226962G27 Rx 42-50 MHz ALTERNATE IF
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2		Capacitor, compensating. (Factory selected to match crystal characteristics).
C3	19B209544P6	Variable, air: 2.28 to 14.13 pf; sim to EF Johnson Type T 187-0309-105.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y1		Crystal. (Not Field replaceable).
		COMPONENT BOARD 19B226849G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C4		(Part of printed board 19B226850P1).
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	5495769P19	Diode, silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	19A116659P6	Connector, printed wiring: 6 contacts; sim to Molex 09-52-3061.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P563J	Composition: 56K ohms ±5%, 1/4 w.
R2	3R152P153J	Composition: 15K ohms ±5%, 1/4 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A116815P1	Contact, electrical: sim to Vector Electronics T28, (Used with R2).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



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.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT. FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

MODEL NO	REV LETTER
PL19C327060G1	

(19D423864, Rev. 1)

SCHEMATIC DIAGRAM

TRANSMITTER MULTI-FREQUENCY OSCILLATOR BOARD 19C327060G1

PARTS LIST

LBI30362A

TRANSMITTER MULTI-FREQUENCY BOARD
19C327060G1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2101	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2102	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2103	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2104	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2105	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2106	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2107	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2108	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2109	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2110	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2111	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2112	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2113	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2114	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2115	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2116	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2117	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2118	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2119	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2120	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2121	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2122	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2123	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2124 and C2125	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2126	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2127	5496218P763	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2128	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2129	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2130	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2131	5496218P763	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2132	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
		- - - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2101 thru CR2112	19A116925P4	Silicon.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P102		(Part of W2101).
P907	19A116659P122	Connector, printed wiring: 12 contacts; sim to Molex 09-64-1123.
P912	19A116659P15	Connector, printed wiring: 4 contacts; sim to Molex 09-52-3042.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2101 and Q2102	19A115852P1	Silicon, PNP; sim to Type 2N3906.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2101 thru R2106	3R152P133J	Composition: 13K ohms ±5%, 1/4 w.
R2107	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R2108	3R152P561J	Composition: 560 ohms ±5%, 1/4 w.
R2109	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R2110 thru R2115	3R152P133J	Composition: 13K ohms ±5%, 1/4 w.
R2116	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R2117	3R152P561J	Composition: 560 ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2101	19A130744G1	Cable: 2 conductor; approx 5 inches long.
		- - - - - - - - - CRYSTAL MODULES - - - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact frequency needed.
		150.8-174 MHz Fx = Fo/12
		450-512 MHz Fx = Fo/36
Y2101 thru Y2112	19B226962G5	Crystal Module. (150.8-174 MHz).
		RCC Channel 1 158.490 2 158.520 3 158.550 4 158.580 5 158.610 6 158.640 7 158.670
		IMTS Channel 1 157.770 2 157.800 3 157.830 4 157.860 5 157.890 6 157.920 7 157.950 8 157.980 9 158.010 10 158.040 11 158.070
Y2101 thru Y2112	19B226962G7	Crystal Module. (450-512 MHz).
		RCC Channel 1 459.025 2 459.050 3 459.075 4 459.100 5 459.125 6 459.150 7 459.175 8 459.200 9 459.225 10 459.250 11 459.275 12 459.300
		IMTS Channel 1 459.375 2 459.400 3 459.425 4 459.450 5 459.475 6 459.500 7 459.525 8 459.550 9 459.575 10 459.600 11 459.625 12 459.650
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY2101 thru XY2112	19A130958G1	Connector, printed wiring: 6 contacts; sim to Molex 09-65-1061.

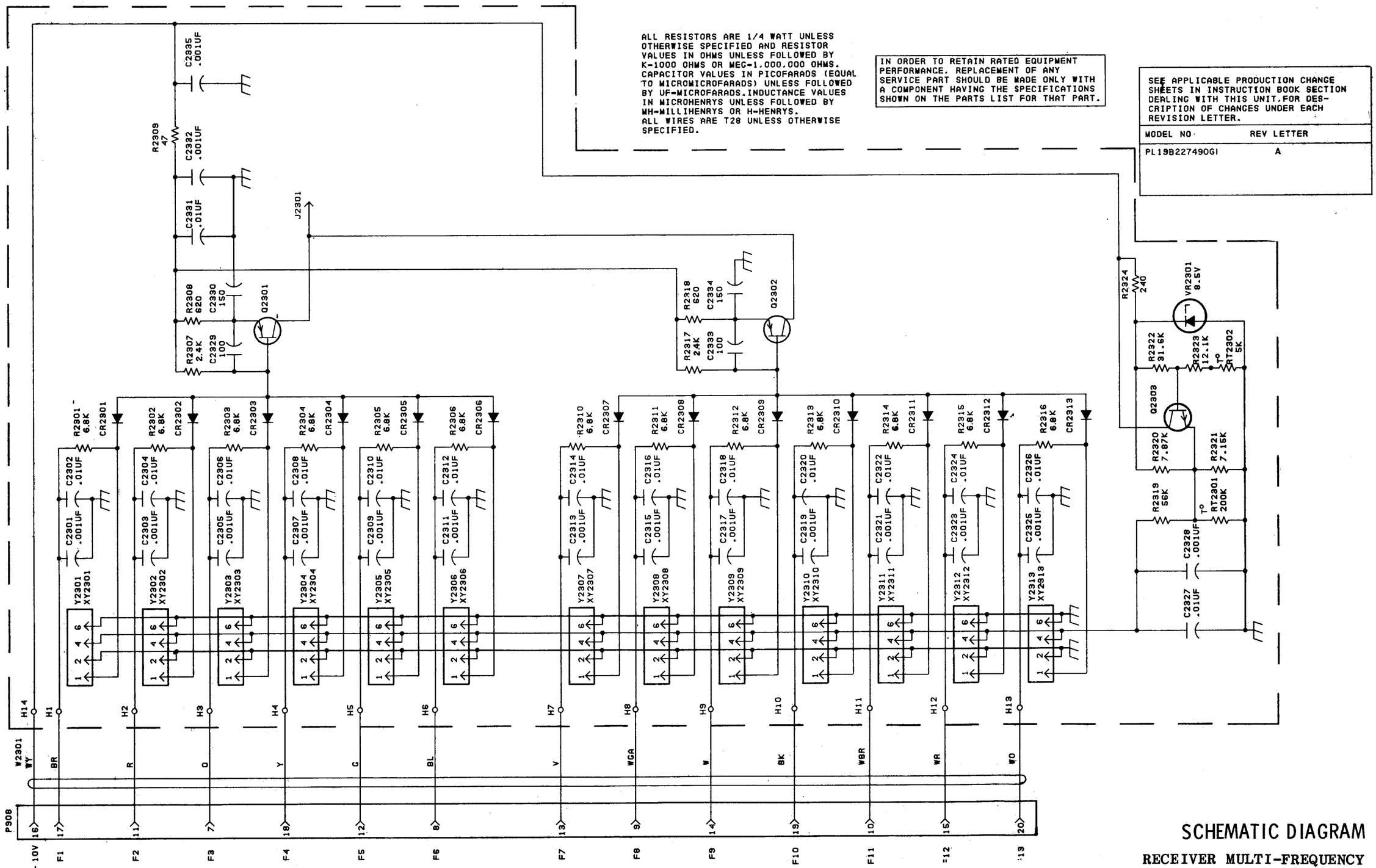
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

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. ALL WIRES ARE T28 UNLESS OTHERWISE SPECIFIED.

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.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT. FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

MODEL NO	REV LETTER
PL19B227490G1	A



SCHEMATIC DIAGRAM

RECEIVER MULTI-FREQUENCY OSCILLATOR BOARD 19B227490G1

PARTS LIST

LBI30363A

RECEIVER MULTI-FREQUENCY BOARD
19B227490G1
(19D423885G1)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2301	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2302	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2303	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2304	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2305	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2306	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2307	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2308	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2309	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2310	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2311	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2312	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2313	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2314	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2315	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2316	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2317	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2318	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2319	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2320	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2321	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2322	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2323	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2324	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2325	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2326 and C2327	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2328	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2329	5496218P763	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2330	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2331	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C2332	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2333	5496218P763	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -750 PPM.
C2334	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2335	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2301 thru CR2313	19A116925P4	Silicon.
		- - - - - - - - - JACKS AND RECEPTACLES - - - - -
J2301	19A116779P1	Contact, electrical: sim to Molex 08-50-0404.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P908	19C303506P1	Connector, phen: 20 contacts.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q2301 and Q2302	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q2303	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2301* thru R2306*	3R152P682J	Composition: 6.8K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P133J	Composition: 13K ohms ±5%, 1/4 w.
R2307*	3R152P242J	Composition: 2.4K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P472J	Composition: 4700 ohms ±5%, 1/4 w.
R2308*	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P681J	Composition: 680 ohms ±5%, 1/4 w.
R2309	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R2310* thru R2316*	3R152P682J	Composition: 6.8K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P133J	Composition: 13K ohms ±5%, 1/4 w.
R2317*	3R152P242J	Composition: 2.4K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R2318*	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P681J	Composition: 680 ohms ±5%, 1/4 w.
R2319	3R152P563J	Composition: 56K ohms ±5%, 1/4 w.
R2320	19C314256P27871	Metal film: 7.87K ohms ±1%, 1/4 w.
R2321	19C314256P27151	Metal film: 7.15K ohms ±1%, 1/4 w.
R2322	19C314256P23162	Metal film: 31.60K ohms ±1%, 1/4 w.
R2323	19C314256P21212	Metal film: 12.10K ohms ±1%, 1/4 w.
R2324	3R152P241J	Composition: 240 ohms ±5%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT2301	19C300048P15	Disc: 200K ohms ±10%; sim to GE 4D0514.
RT2302	19C300048P7	Disc: 5K ohms ±10%; sim to GE 1D 103.
		- - - - - - - - VOLTAGE REGULATORS - - - - - - - -
VR2301	4036887P9	Silicon, Zener.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2301	19D423885G2	Cable. Includes P908.
		- - - - - - - - CRYSTAL MODULES - - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact frequency needed.
		150.8-174 MHz $Fx = \frac{Fo + 11.2}{9}$
		450-512 MHz $Fx = \frac{Fo + 11.2}{27}$

SYMBOL	GE PART NO.	DESCRIPTION
Y2301 thru Y2313	19B226962G20	Crystal Module. (150.8-174 MHz).
		RCC Channel 1 152.030 2 152.060 3 152.090 4 152.120 5 152.150 6 152.180 7 152.210
		IMTS Channel 1 152.510 2 152.540 3 152.570 4 152.600 5 152.630 6 152.660 7 152.690 8 152.720 9 152.750 10 152.780 11 152.810
Y2301 thru Y2313	19B226962G22	Crystal Module. (450-512 MHz).
		RCC Channel 1 454.025 2 454.050 3 454.075 4 454.100 5 454.125 6 454.150 7 454.175 8 454.200 9 454.225 10 454.250 11 454.275 12 454.300
		IMTS Channel 1 454.375 2 454.400 3 454.425 4 454.450 5 454.475 6 454.500 7 454.525 8 454.550 9 454.575 10 454.600 11 454.625 12 454.650
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY2301 thru XY2313	19A130958G1	Connector, printed wiring: 6 contacts; sim to Molex 09-65-1061.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B227471G1	Support. (MULTI-FREQUENCY BOARD).

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 description of parts affected by these revisions.

REV. A - To compensate for variations in diode characteristics. Changed R3201-R2306, R2307, R2308, R2310-R2316, R2317, and R2318.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.