MOBILE RADIO

MAINTENANCE MANUAL

29.7—50 MHz OSCILLATOR-MULTIPLIER BOARD 19C321986G2-4

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DESCRIPTION

The oscillator-multiplier board for Custom MVP (osc-mult) contains a Colpitts oscillator, a multiplier stage and two amplifier stages. The operating frequency of the Colpitts oscillator is maintained within ±5 PPM by an externally compensated crystal module. The crystal frequencies range from approximately 13 to 20 megahertz and are multiplied three times and then amplified to provide a high side injection frequency to the mixer.

CIRCUIT ANALYSIS

F1 OSCILLATOR CIRCUIT

Transistor Q402, a plug-in crystal module and associated components comprise a Colpitts oscillator operating at the F1 receive frequency.

The crystal module located in the emitter-base circuit is temperature compensated to maintain frequency stability over a temperature range of -30°C to +65°C. Compensation voltage from the exciter is applied through P602-1 to pin four of the crystal modules.

The compensation voltage varies nonlinearly 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 Alignment Procedure for details.

Refer to the System Maintenance Manual for circuit details of the crystal modules.

SERVICE NOTE

Y1 and C2 are not field replaceable items. C2 is factory selected to complement 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 applications, the F1 keying lead is wired to A- by a DA jumper wire connected between H8 and H9.

In multi-frequency radios this jumper is removed to allow F1 frequency selection via the frequency selector switch on the control panel.

With the radio turned on and the PTT switch released, +10V is present on the Rx Osc control lead at P602-6 allowing the oscillator to operate at the F1 crystal frequency. Capacitor C402 provides the necessary in-phase feedback to sustain oscillations. A voltage divider network consisting of R407 and R408 sets the bias for oscillator transistor Q402.

When frequencies other than F1 are selected, A- is removed from the F1 keying lead. Oscillator Q402 turns off due to a rising base voltage, and the selected crystal module oscillator frequency from the multi-frequency board is applied through J402 to a tuned circuit consisting of L401 and C406.

C406 tunes L401 to three times the crystal frequency. The output of the tuned circuit is applied to the base of Class A amplifier Q403. The collector tank circuit of the amplifier (L402, C411, and C412) is tuned to three times the crystal frequency. The output of the amplifier stage is metered across R412 and applied to receiver metering jack J601 through P602-3.

Following Q403 is a second amplifier stage, Q404. The output of Q404 is metered through a metering network consisting of C414, C417, R416 and R417 and applied to receiver

metering jack J601 through P602-4. The amplified output of Q404 is applied to a tuned circuit (L404 and C415) on the Adapter board. L404 is tuned to three times the crystal frequency.

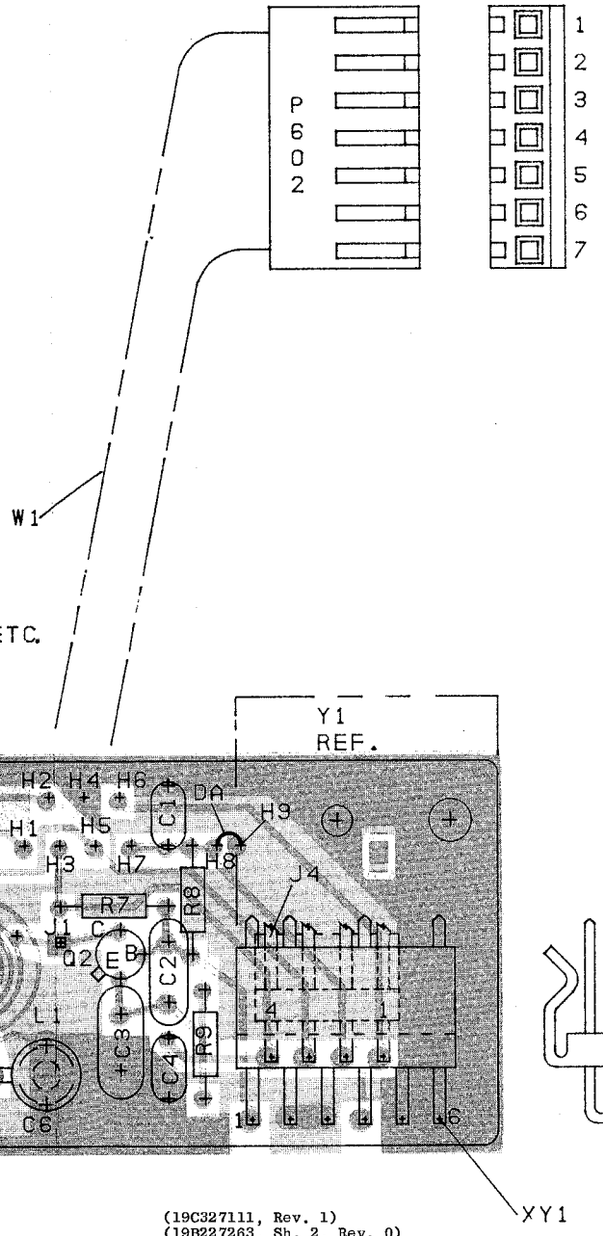
The output of the Adapter board is inductively coupled from L404 thru L502 and L503 on the RF assembly to the input of the mixer stage. The three LC circuits provide the selectivity for the oscillator-multiplier chain.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

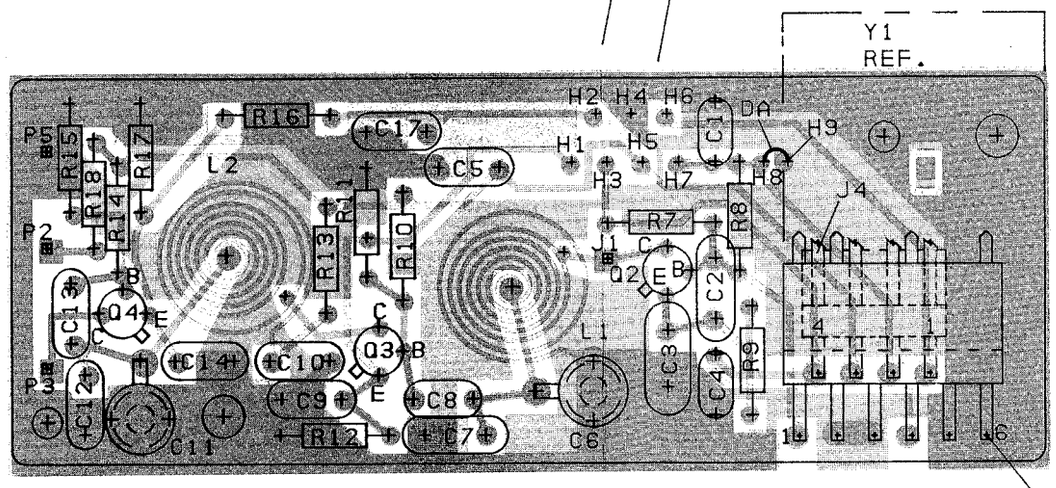
OSCILLATOR-MULTIPLIER

CONNECTION CHART	
WIRE	TO
W1-O	H1
W1-G	H2
W1-W	H3
W1-BK	H4
W1-R	H5
W1-BL	H6
W1-BR	H7

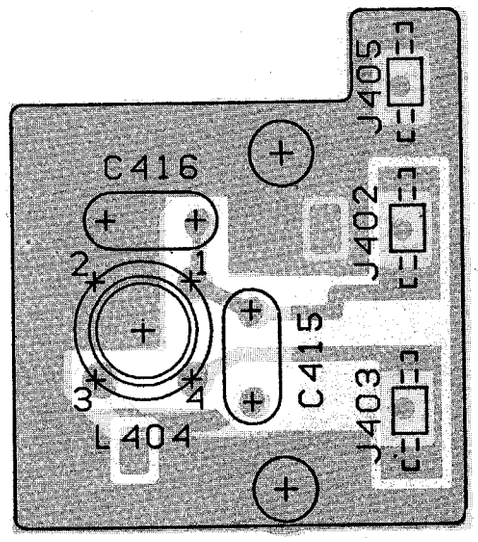


(19C327111, Rev. 1)
(19B227263, Sh. 2, Rev. 0)
(19B227263, Sh. 3, Rev. 0)

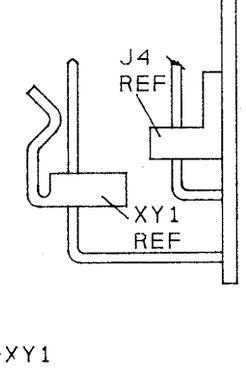
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION, PREFIX WITH 400 SERIES.
EXAMPLE: J1- J401, C1- C401, R1- R401, ETC.



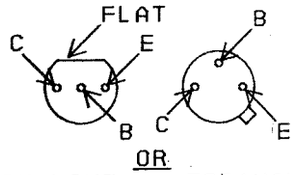
ADAPTER



(19B227343, Rev. 0)
(19B227264, Sh. 2, Rev. 0)
(19B227264, Sh. 3, Rev. 0)

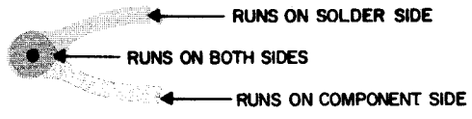


LEAD IDENTIFICATION
FOR Q2, Q3 AND Q4



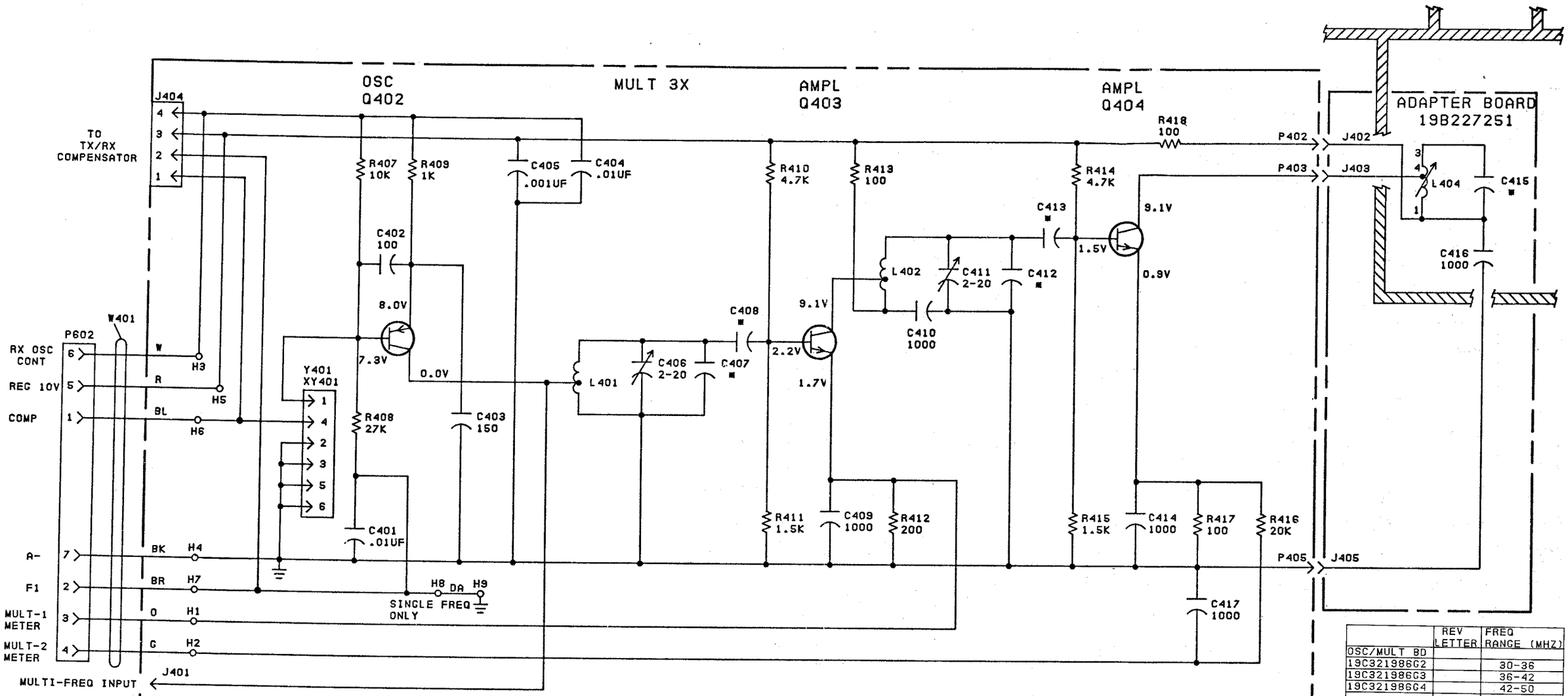
TOP VIEW

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

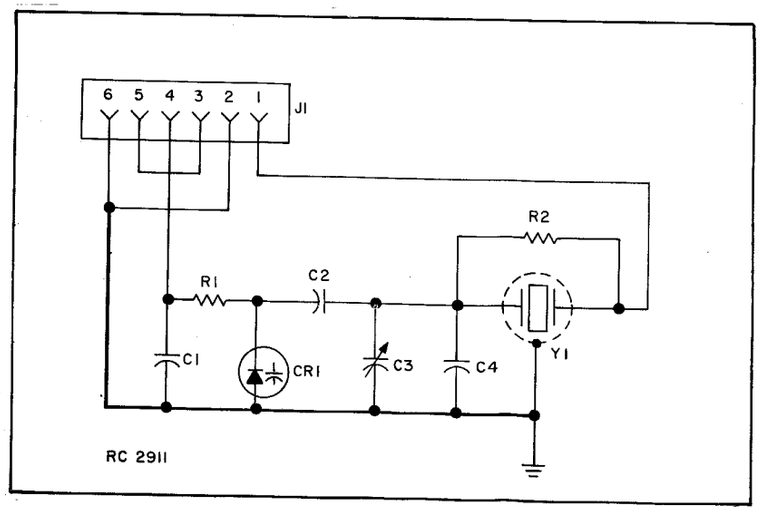


OUTLINE DIAGRAM

30—50 MHz OSCILLATOR-MULTIPLIER



	REV LETTER	FREQ RANGE (MHZ)
OSC/MULT BD		
19C321986G2		30-36
19C321986G3		36-42
19C321986G4		42-50
ADAPATER BD		
19B227251G2		30-36
19B227251G3		36-42
19B227251G4		42-50



TYPICAL CRYSTAL MODULE

*COMPONENT VALUE TABLE				
COMPONENT DESIGNATION		30-36 MHZ L	36-42 MHZ M	42-50 MHZ H
C407		30	15	12
C408		8	7	5
C412		24	13	8
C413		8	7	5
C415		27	18	15

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-6) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

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.

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.

(19D423738, Rev. 3)

SCHEMATIC DIAGRAM

30—50 MHz OSCILLATOR-MULTIPLIER

Issue 3

PARTS LIST

LBI30172A

29.7-50 MHz OSCILLATOR-MULTIPLIER
19C321986G2-G4
AND
ADAPTER BOARD
19B227251G2-G4

SYMBOL	GE PART NO.	DESCRIPTION
		29.7-50 MHz OSCILLATOR-MULTIPLIER 19C321986G2 29.7-36 MHz (L) 19C321986G3 36-42 MHz (M) 19C321986G4 42-50 MHz (H)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C401	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C402	5496218P763	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -750 PPM.
C403	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C404	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C405	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C406	19B209351P2	Variable, ceramic: 2.5 to 20 pf, 200 VDCW, temp coef -250 +700 PPM/°C; sim to Matshushita ECV-1ZW20P32.
C407L	5496219P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C407M	5496219P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
C407H	5496219P42	Ceramic disc: 12 pf ±5%, 500 VDCW, temp coef 0 PPM.
C408L	5496219P39	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C408M	5496219P38	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C408H	5496219P36	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C409 and C410	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C411	19B209351P2	Variable, ceramic: 2.5 to 20 pf, 200 VDCW, temp coef -250 +700 PPM/°C; sim to Matshushita ECV-1ZW20P32.
C412L	5496219P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C412M	5496219P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.
C412H	5496219P39	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C413L	5496219P39	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C413M	5496219P38	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C413H	5496219P36	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C414	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C417	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J401	19A116779P1	Contact, electrical: sim to Molex 08-50-0404.
J404	19A116659P118	Connector, printed wiring: 4 contacts; sim to Molex 09-88-2041.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L401 and L402		(Part of printed board 19C321992P1).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P402 and P403	19A116779P3	Contact, electrical: sim to Molex 08-50-0416.
P405	19A116779P3	Contact, electrical: sim to Molex 08-50-0416.
P602		(Part of W401).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q402	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q403 and Q404	19A115328P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R407	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R408	3R152P273J	Composition: 27K ohms ±5%, 1/4 w.
R409	3R152P102J	Composition: 1K ohms ±5%, 1/4 w.
R410	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R411	3R152P152J	Composition: 1.5K ohms ±5%, 1/4 w.
R412	3R152P201J	Composition: 200 ohms ±5%, 1/4 w.
R413	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R414	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R415	3R152P152J	Composition: 1.5K ohms ±5%, 1/4 w.
R416	3R152P203J	Composition: 20K ohms ±5%, 1/4 w.
R417 and R418	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W401	19B226965G2	Cable, includes (P602) 19A116559P82.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY401	19A136694G1	Connector, printed wiring: 6 contacts; sim to Molex 09-75.
		- - - - - - - - - CRYSTAL MODULES - - - - - - - - -
		NOTE: When reordering give GE Part Number and specify exact operating frequency needed.
Y401	19B226962G10	Rx. 5 PPM. (29.7-36 MHz)
	19B226962G11	Rx. 5 PPM. (36-42 MHz)
	19B226962G12	Rx. 5 PPM. (42-50 MHz)
		ADAPTER BOARD 19B227251G2 29.7-36 MHz (L) 19B227251G3 36-42 MHz (M) 19B226251G4 42-50 MHz (H)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C415L	19A116 56P27K8	Ceramic disc: 27 pf ±10%, 500 VDCW, temp coef -80 PPM.
C415M	19A116656P18K8	Ceramic disc: 18 pf ±10%, 500 VDCW, temp coef -80 PPM.
C415H	19A116656P15K8	Ceramic disc: 15 pf ±10%, 500 VDCW, temp coef -80 PPM.
C416	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J402 and J403	19A116428P4	Contact, electrical: sim to AMP 86031-1 (Strip Form).
J405	19A116428P4	Contact, electrical: sim to AMP 86031-1 (Strip Form).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L404	19B219419G5	Coil. Includes:
	5491798P5	Tuning slug.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4031594P1	Insulator. (Used with C406).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES