MOBILE RADIO

MAINTENANCE MANUAL

29.7—50 MHz OSCILLATOR-MULTIPLIER BOARD 19C321711G2-G4

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DESCRIPTION

The oscillator-multiplier board (Osc-Mult) for MASTR® Executive II 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

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

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 H12-H31 on the SAS board. A voltage divider network consisting of R407 and R408 sets the operating level for oscillator Q402.

In multi-frequency receivers, the DA jumper wire connected between H12 and H31 on the SAS board is removed. This removes the fixed ground from the F1 keying lead and allows frequency selection of F1-F4 by the frequency selector switch on the control unit.

With the radio turned on and the PTT switch released, +10 V is present on the Rx Osc control lead at P602-6 and the oscillator operates at the crystal frequency. Capacitor C402 provides the necessary in-phase feedback to sustain oscillations.

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 J401 to a tuned circuit consisting of L401 and C406.

C406 is tuned 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 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) that is tuned to three times the crystal frequency.

The output of the oscillator/multiplier board is inductively coupled through L404 and two helical resonators on the RF assembly to the input of the mixer stage. The three LC circuits provide the selectivity for the oscillator/multiplier chain.

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

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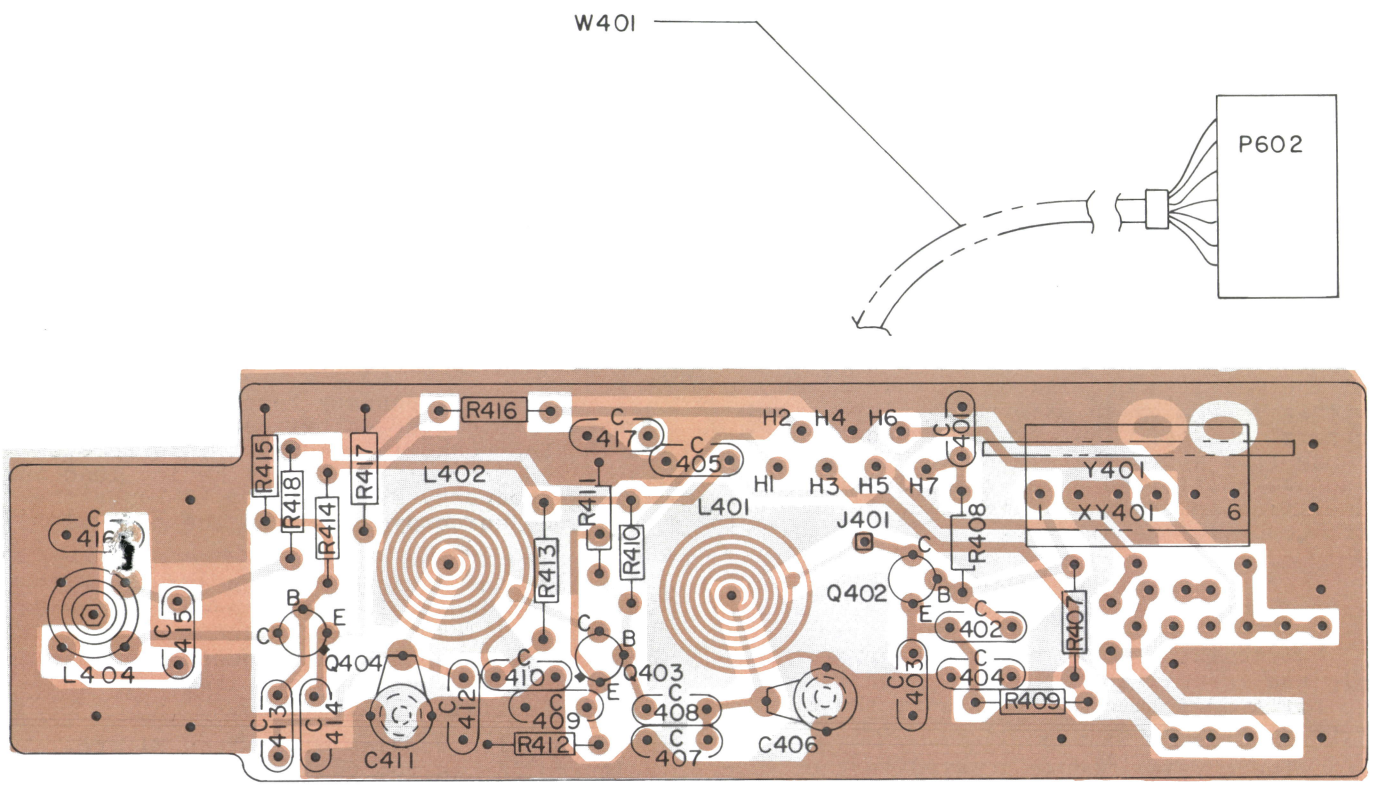
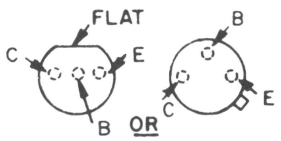


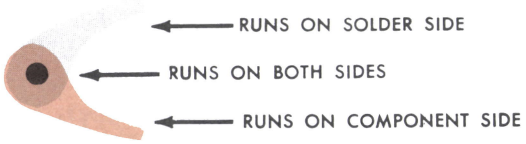
(19C327176, Rev. 0)
(19C321712, Sh. 2, Rev. 0)
(19C321712, Sh. 3, Rev. 0)

LEAD IDENTIFICATION
FOR Q402-Q404



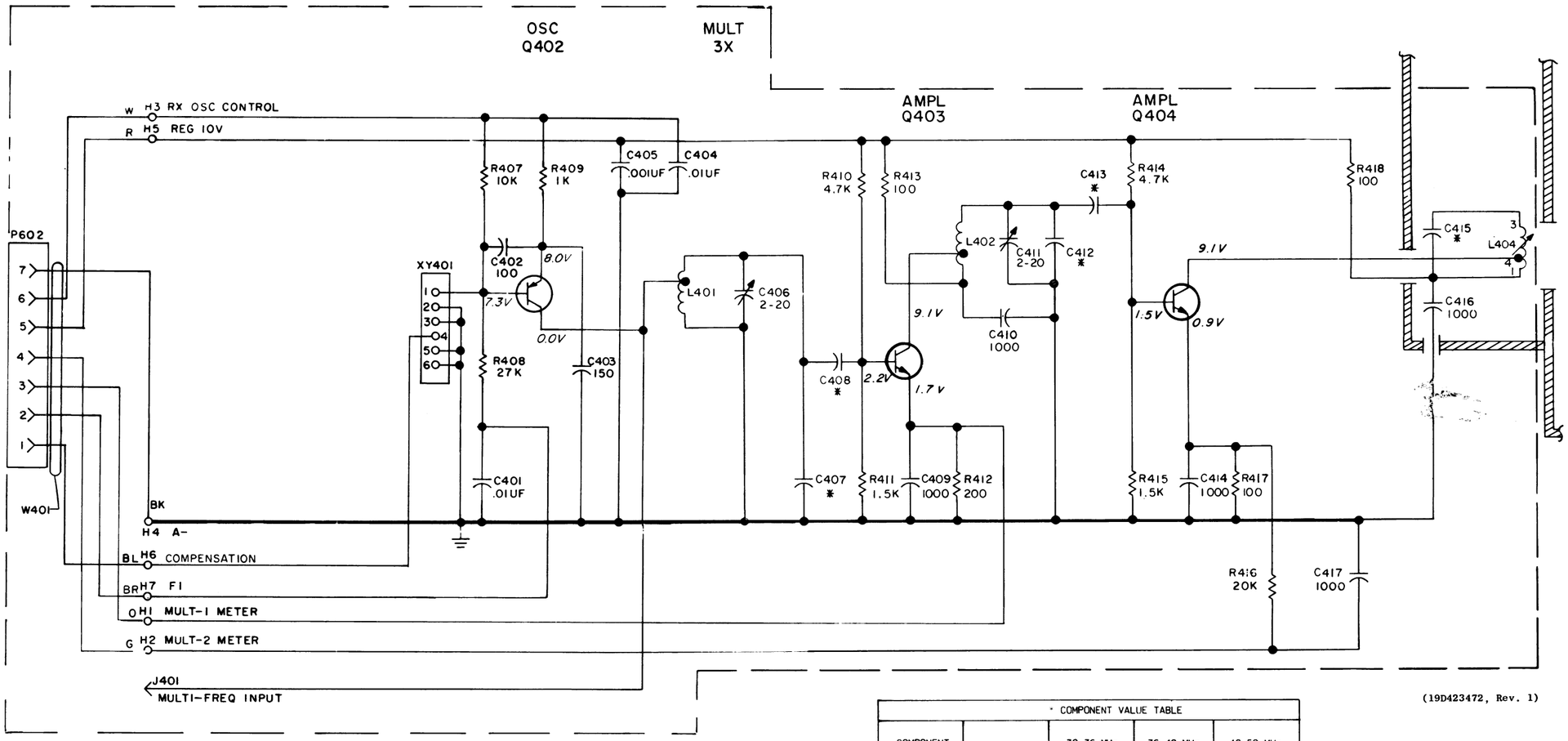
TOP VIEW

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



OUTLINE DIAGRAM

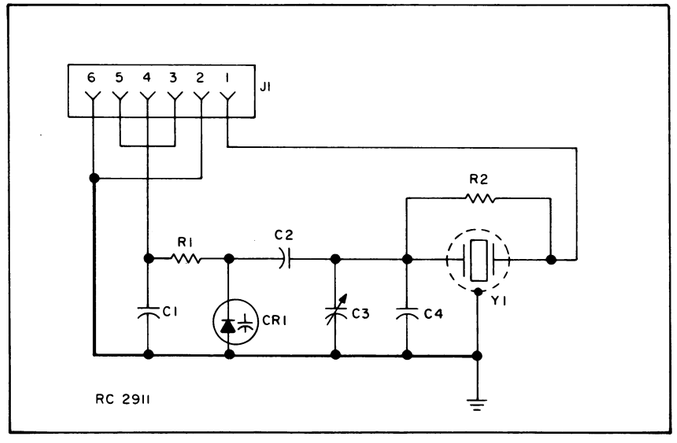
29.7—50 MHz OSCILLATOR-MULTIPLIER BOARD



(19D423472, Rev. 1)

* COMPONENT VALUE TABLE

COMPONENT DESIGNATION		30-36 MHz L	36-42 MHz M	42-50 MHz H
C407		33	15	12
C408		8	7	5
C412		27	13	8
C413		8	7	5
C415		27	18	15



TYPICAL CRYSTAL MODULE

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.

CPD 310A

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.

VOLTAGE READINGS

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

MODEL NO	REV LETTER	FREQ RANGE
PLI9C321711G2		30-36 MHz
PLI9C321711G3		36-42 MHz
PLI9C321711G4		42-50 MHz

SCHEMATIC DIAGRAM

29.7—50 MHz OSCILLATOR-MULTIPLIER BOARD

Issue 2

PARTS LIST

LBI30092

OSCILLATOR-MULTIPLIER BOARD
19C321711G2 29.7-50 MHz (L)
19C321711G3 36-42 MHz (M)
19C321711G4 42-50 MHz (H)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - 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	5496219P51	Ceramic disc: 33 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	5496219P49	Ceramic disc: 27 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.
C415L	19A116656P27K8	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	19A116656P15J8	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C416 and 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.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L401 and L402		(Part of printed board 19C321712P1).
L404	19B219419G5	Coil. Includes:
	5491798P5	Tuning slug.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P602	19A116659P82	Connector, printed wiring: 7 contacts; sim to Molex 09-50-7071. (Part of W401).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q402	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q403 and Q404	19A115328P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R407	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R408	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R409	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R410	3R152P472J	Composition: 4700 ohms ±5%, 1/4 w.
R411	3R152P152J	Composition: 1500 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: 4700 ohms ±5%, 1/4 w.
R415	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R416	3R152P203J	Composition: 20,000 ohms ±5%, 1/4 w.
R417 and R418	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - -
W401	19B226965G1	Cable, includes (P602).
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY401	19A116659P50	Connector, printed wiring: 6 contacts; sim to Molex 09-65-1061.
		- - - - - - - - - CRYSTAL MODULES - - - - - - - - -
		NOTE: When reordering, give GE Part Number and specify exact operating frequency needed.
Y401	19B226962G10	Crystal module: 5 PPM, 30-36 MHz.
	19B226962G11	Crystal module: 5 PPM, 36-42 MHz.
	19B226962G12	Crystal module: 5 PPM, 42-50 MHz.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4031594P1	Insulator, teflon.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES