MOBILE RADIO MAINTENANCE MANUAL

66—88 MHz OSCILLATOR-MULTIPLIER BOARD 19C327402G1, 2

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DESCRIPTION

The oscillator-multiplier board (osc-mult) for MASTR™ Executive II contains a Colpitts oscillator, two multiplier stages and an amplifier stage. The operating frequency of the Colpitts oscillator is maintained within ±5 PPM by an externally compensated crystal module. The crystal frequencies range from approximately 12 to 16 megahertz and are multiplied six 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 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

Refer to the System-Audio & Squelch (SAS) 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.

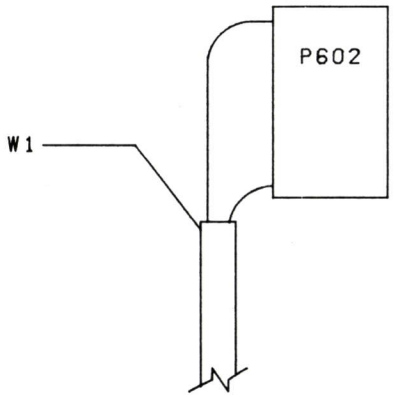
With the radio turned on and the PTT switch released, +10V is present on the Rx Osc control lead at P602-6 and the oscillator operates at the crystal frequency. Capacitor C402 provides the necessary in-phase feedback to sustain oscillations.

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.

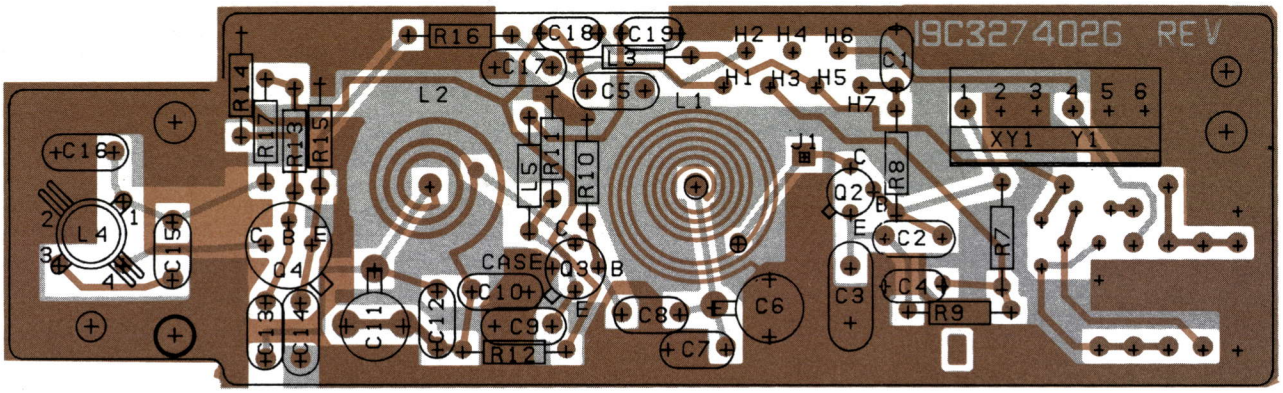
C406 is tuned to three times the crystal frequency. The output of the tuned circuit is applied to the base of multiplier Q403. The collector tank circuit of Q403 (L402, C411, and C412) is tuned to six times the crystal frequency. The output of the multiplier stage is metered across R411 and L405 and applied to receiver metering jack J601 through P602-3.

Following Q403 is amplifier stage Q404. The output of Q404 is metered through a metering network consisting of C417, R415 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.

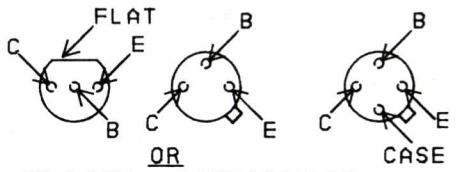


PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH 400 SERIES. EXAMPLE: C1-C401, R1-R401, EXCEPT P602.



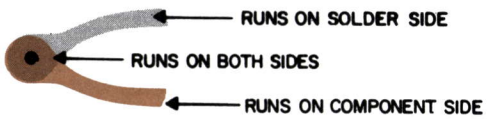
(19C327404, Rev. 0)
(19B227610, Sh. 1, Rev. 0)
(19B227610, Sh. 2, Rev. 0)

LEAD IDENTIFICATION
FOR Q2, Q3 AND Q4



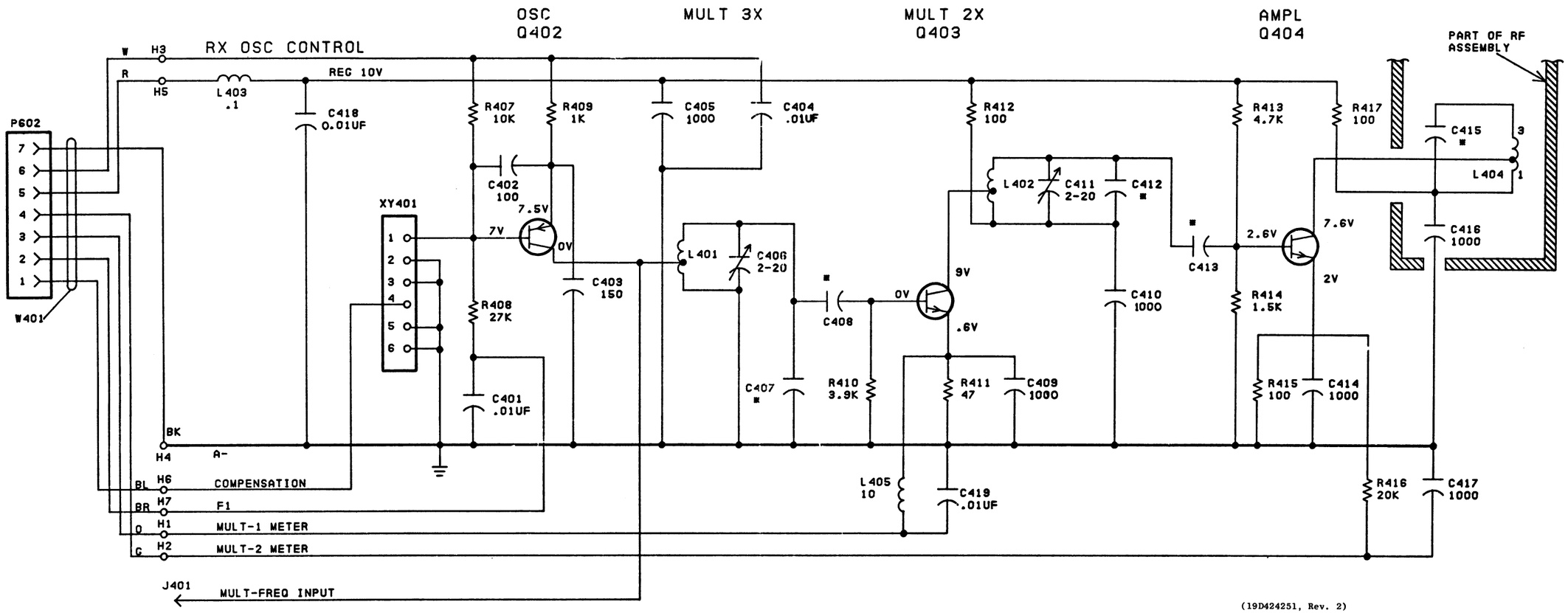
TOP VIEW

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

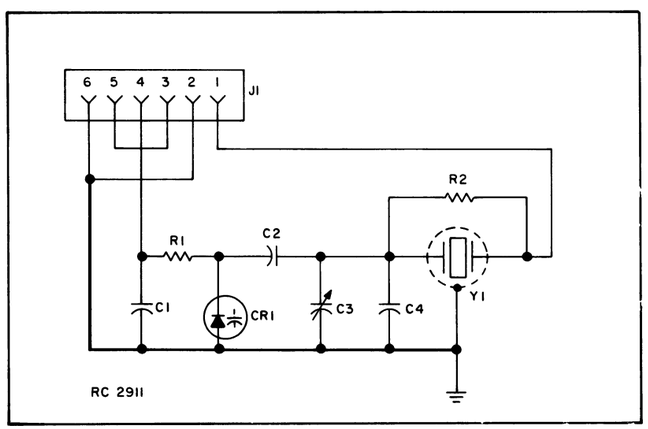


OUTLINE DIAGRAM

66—88 MHz OSCILLATOR-MULTIPLIER BOARD



(19D424251, Rev. 2)



OSC-MULT BOARD	REV LETTER	FREQ RANGE
19C327402G1		66-77 MHZ
19C327402G2		77-88 MHZ

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.

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 SYSTEM NEGATIVE (A-) WITH 20,000 OHM PER-VOLT METER.

✱ COMPONENT VALUE TABLE		
COMPONENT DESIGNATION	66-77MHZ LOW	77-88MHZ HIGH
C407	18	10
C408	10	10
C412	18	10
C413	7	7
C415	27	20

SCHEMATIC DIAGRAM

66—88 MHz OSCILLATOR-MULTIPLIER BOARD

Issue 1

PARTS LIST

LBI-30560

OSCILLATOR-MULTIPLIER BOARD
19C327402G1 66-78 MHz (L)
19C327402G2 77-88 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	5496219P45	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef 0 PPM.
C407H	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C408	5496219P41	Ceramic disc: 10 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	5496219P45	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef 0 PPM.
C412H	5496219P41	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C413	5496219P38	Ceramic disc: 7.0 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.
C415H	19A116656P20J8	Ceramic disc: 20 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.
C418 and C419	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J401	19A116779P1	Contact, electrical: sim to Molex 08-50-0404.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L401 and L402		(Part of printed board 19C327403P1).
L403	19B209420P101	Coil, RF: 0.10 µh ±10%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
L404	19C307169P204	Coil, RF:
L405	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4.
		- - - - - - - - - - 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	19A115440P1	Silicon, NPN.
Q404	19A115329P2	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	3R152P392J	Composition: 3.9K ohms ±5%, 1/4 w.
R411	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R412	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R413	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R414	3R152P152J	Composition: 1.5K ohms ±5%, 1/4 w.
R416	3R152P203J	Composition: 20K ohms ±5%, 1/4 w.
R417	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W401	19B226965G2	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.
		$Fx = \frac{Fo + 11.2}{6}$
Y401	19B226962G33	Crystal module: 5 PPM, 66-78 MHz.
	19B226962G34	Crystal module: 5 PPM, 77-88 MHz.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	4031594P1	Insulator, teflon. (Used with C6, C11).
	4036555P1	Insulator, washer: nylon. (Used with Q3, Q4).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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