MOBILE RADIO

MAINTENANCE MANUAL

66—88 MHz RF ASSEMBLY 19D416478G8, 9, 14 & 15

AND

MIXER/IF BOARD 19C327413G1, 2

TABLE OF CONTENTS

DESCRIPTION

The RF Assembly uses two tuned helical resonators and four L-C tuned circuits to provide front end selectivity.

The Mixer/IF board (MIF) uses the RF input from the RF Assembly and the mixer injection frequency from the oscillator/multiplier board to generate the IF frequency.

CIRCUIT ANALYSIS

RF ASSEMBLY

ANTENNA INPUT A301A/A301B

An RF signal from the antenna is applied to A301 which provides an AC ground between vehicle ground and receiver A-. Resistor R1 prevents a static charge from building up on the vehicle antenna. The output of A301 is coupled through two high-Q helical resonators (L301, C301 and L302, C302) to the RF amplifier. The coils are tuned to the incoming frequency by C301 and C302. Lamp DS1 protects the RF amplifier stage against an excessive RF input.

RF AMPLIFIER A302

RF Amplifier Q1 is a Field-Effect Transistor (FET). Q1 operates as a grounded gate amplifier, with the RF input applied to the "source" terminal. This method of operation provides a low impedance input to the amplifier. The amplified output is taken from the "drain" terminal and coupled through four L-C tuned circuits (L1-C7, L2-C8, L3-C9 and L4-C10) to the mixer. The four tuned circuits and the two helical resonators provide the receiver front end selectivity.

MIXER-IF

MIXER & CRYSTAL FILTER

The mixer uses a FET (Q501) as the active device. The FET mixer provides a high input impedance, high power gain, and an output relatively free of harmonics (low in intermodulation products).

In the mixer stage, RF from the RF amplifier stage is coupled through tank circuit L501 and C502 to the gate of mixer Q501. The tank circuit provides increased selectivity and impedance matching between the RF Assembly and the gate of mixer Q501. Injection voltage from the multiplier-selectivity stages is inductively coupled through L502 to the source of the mixer. The mixer IF output signal is coupled from the drain of Q501 through a tuned circuit (L505 and C511) which matches the mixer output to the input of the four-pole monolithic crystal filter. The highly-selective crystal filter (FL501 and FL502) provides the first portion of the receiver IF selectivity. The output of the filter is coupled through impedance matching network Z502 (L520 and C523) to the IF amplifier.

IF AMPLIFIER

IF amplifier Q502 is a dual-gate FET. The filter output is applied to Gate 1 of

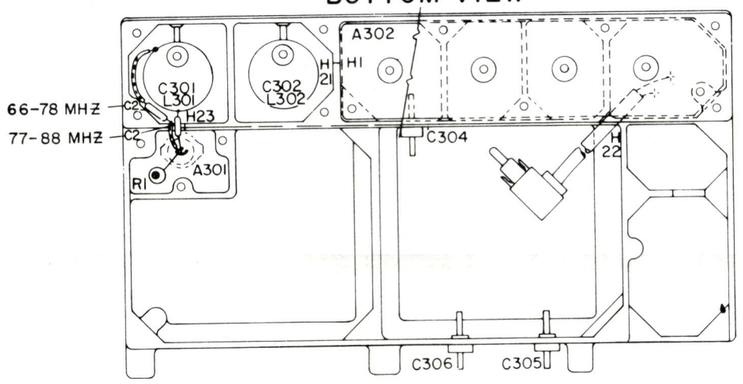
the amplifier, and the output is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q502 is coupled through a network (L521 and C520) that matches the amplifier output to the crystal filter on the next IF stage. The output of the MIF board is coupled to the next IF stage through feed-through capacitor C305.

Supply voltage for the RF amplifier and MIF board is supplied through feed-through capacitor C306. SERVICE NOTE: Variable capacitor C521 does not require adjustment when performing normal alignment. If the 4-pole monolithic crystal filter is replaced, then adjustment of C521 is necessary for optimum IF response.

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

GENERAL ELECTRIC*
U.S.A.

RF ASSEMBLY BOTTOM VIEW



A302 RF PRE-SELECTOR

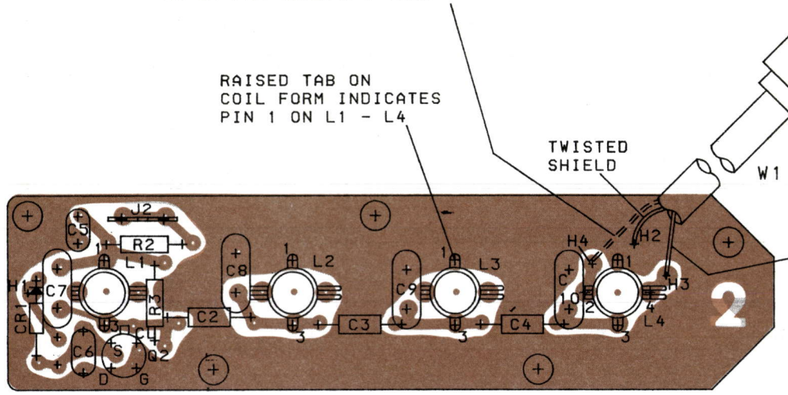
CENTER CONDUCTOR IN H4 FOR GROUPS 1 THRU 4

RAISED TAB ON COIL FORM INDICATES PIN 1 ON L1 - L4

TWISTED SHIELD

P1

W1

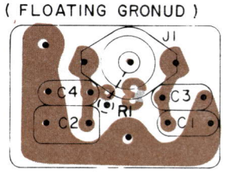


CENTER CONDUCTOR IN H3 FOR GROUPS 8 & 9

(19C327759, Rev. 1)
(19B219444, Sh. 1, Rev. 2)
(19B219444, Sh. 2, Rev. 2)

A301A ANT INPUT

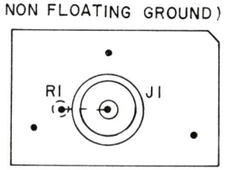
(FLOATING GRONUD)



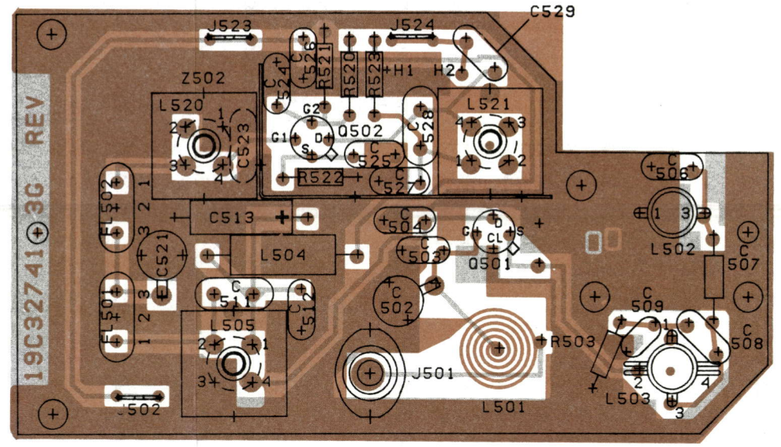
(19B219449, Sh. 1, Rev. 3)
(19B219449, Sh. 2, Rev. 3)

A301B ANT INPUT

(NON FLOATING GROUND)

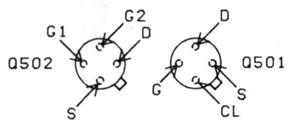


MIXER /IF BOARD



(19C327753, Rev. 0)
(19B227598, Sh. 1, Rev. 0)
(19B227598, Sh. 2, Rev. 0)

LEAD IDENTIFICATION FOR

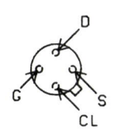


TOP VIEW

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

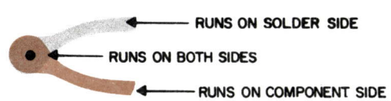
(19D429095, Rev. 1)

LEAD IDENTIFICATION FOR Q2



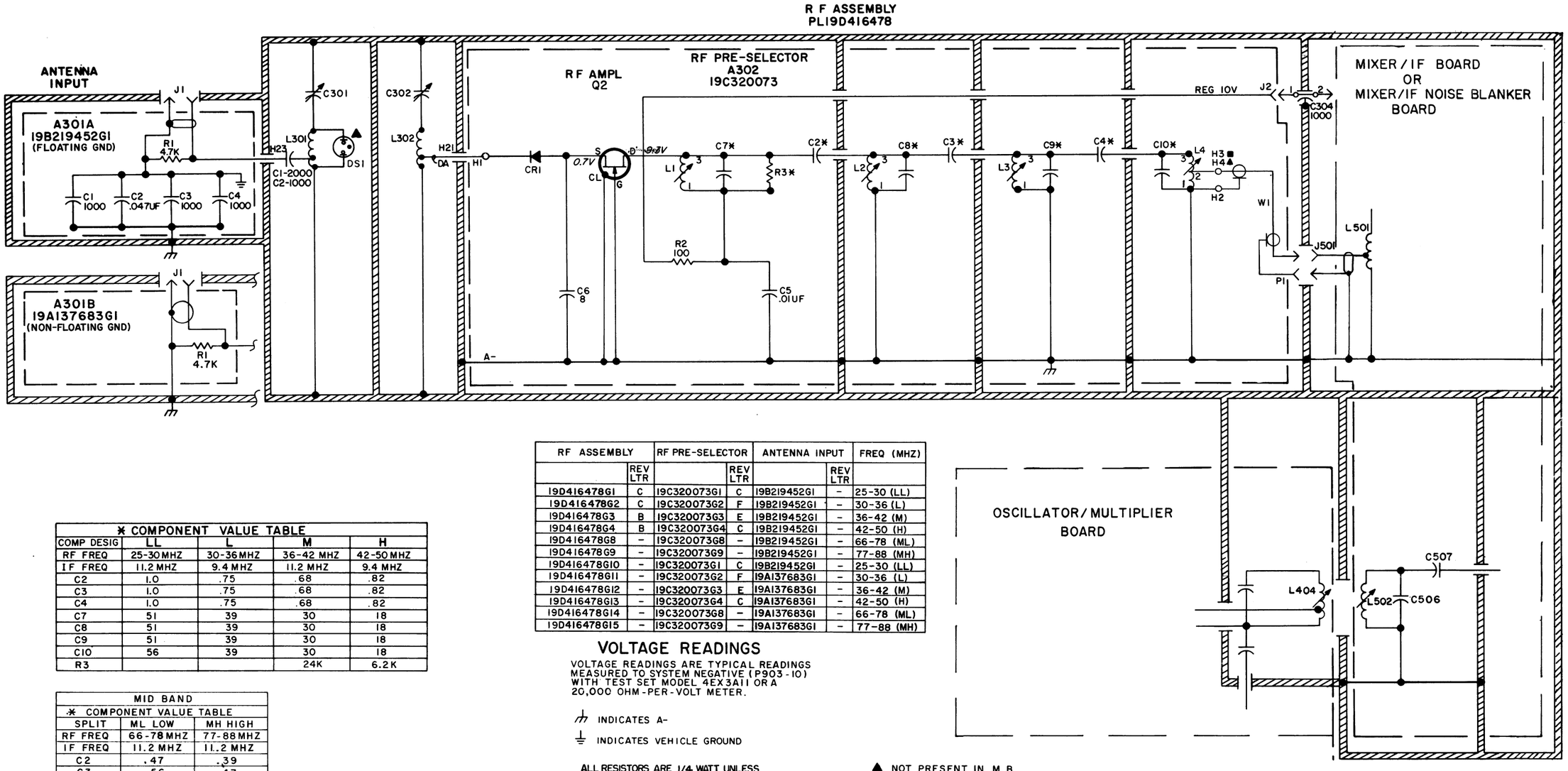
TOP VIEW

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



OUTLINE DIAGRAM

66—88 MHz RF ASSEMBLY AND MIXER/IF BOARD



* COMPONENT VALUE TABLE				
COMP DESIG	LL	L	M	H
RF FREQ	25-30 MHZ	30-36 MHZ	36-42 MHZ	42-50 MHZ
IF FREQ	11.2 MHZ	9.4 MHZ	11.2 MHZ	9.4 MHZ
C2	1.0	.75	.68	.82
C3	1.0	.75	.68	.82
C4	1.0	.75	.68	.82
C7	51	39	30	18
C8	51	39	30	18
C9	51	39	30	18
C10	56	39	30	18
R3			24K	6.2K

MID BAND		
* COMPONENT VALUE TABLE		
SPLIT	ML LOW	MH HIGH
RF FREQ	66-78 MHZ	77-88 MHZ
IF FREQ	11.2 MHZ	11.2 MHZ
C2	.47	.39
C3	.56	.47
C4	1.0	.82
C7	15	10
C8	18	13
C9	18	13
C10	18	13
R3	6.8K	6.8K

RF ASSEMBLY	REV LTR	RF PRE-SELECTOR	REV LTR	ANTENNA INPUT	REV LTR	FREQ (MHZ)
19D416478G1	C	19C320073G1	C	19B219452G1	-	25-30 (LL)
19D416478G2	C	19C320073G2	F	19B219452G1	-	30-36 (L)
19D416478G3	B	19C320073G3	E	19B219452G1	-	36-42 (M)
19D416478G4	B	19C320073G4	C	19B219452G1	-	42-50 (H)
19D416478G8	-	19C320073G8	-	19B219452G1	-	66-78 (ML)
19D416478G9	-	19C320073G9	-	19B219452G1	-	77-88 (MH)
19D416478G10	-	19C320073G1	C	19B219452G1	-	25-30 (LL)
19D416478G11	-	19C320073G2	F	19A137683G1	-	30-36 (L)
19D416478G12	-	19C320073G3	E	19A137683G1	-	36-42 (M)
19D416478G13	-	19C320073G4	C	19A137683G1	-	42-50 (H)
19D416478G14	-	19C320073G8	-	19A137683G1	-	66-78 (ML)
19D416478G15	-	19C320073G9	-	19A137683G1	-	77-88 (MH)

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

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

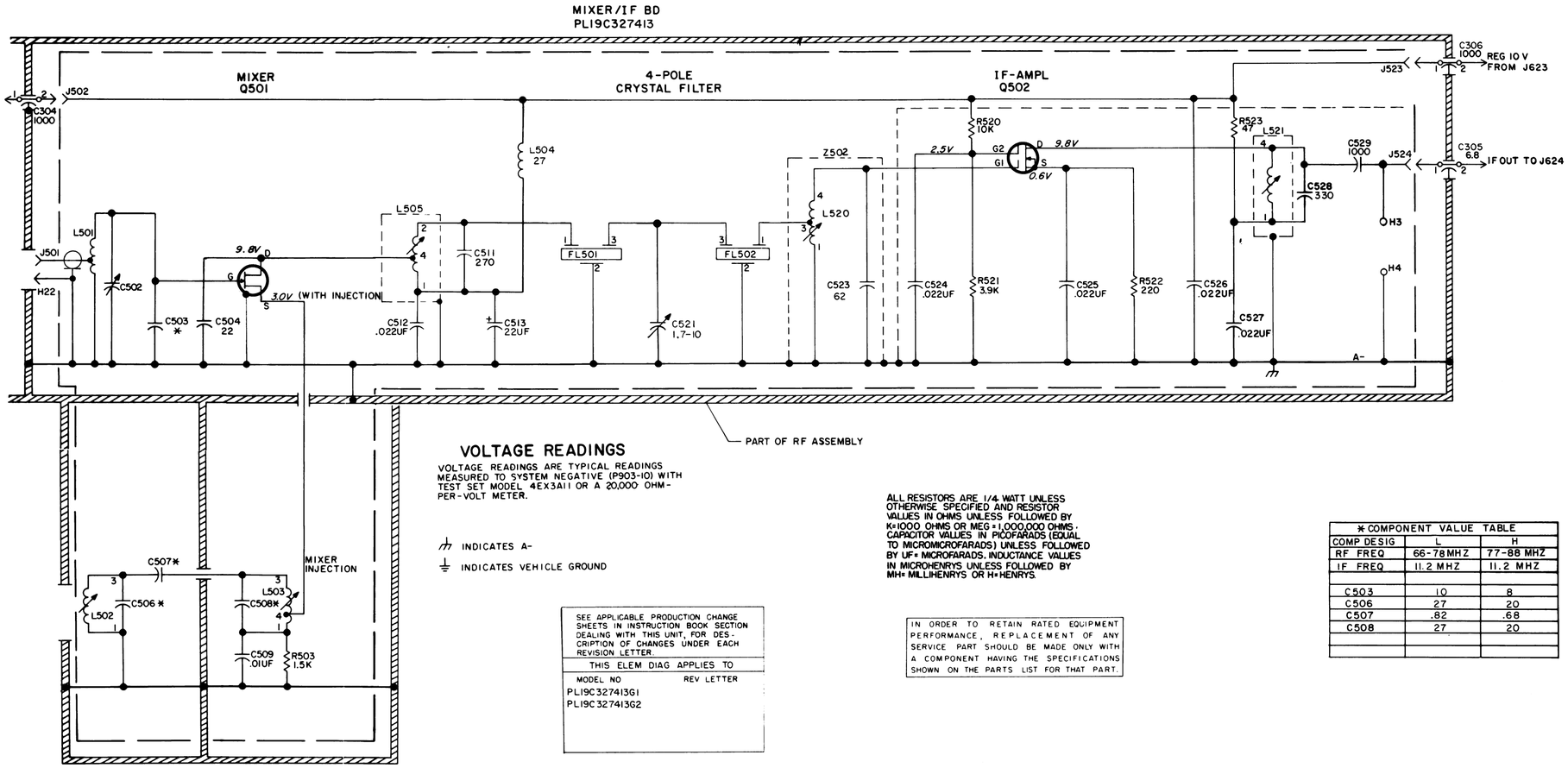
IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

▲ NOT PRESENT IN M.B.
■ NOT PRESENT IN L.B.

SCHEMATIC DIAGRAM

66—88 MHz RF ASSEMBLY

(19D423475, Rev. 10)



VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (P903-10) WITH TEST SET MODEL 4EX3A11 OR A 20,000 OHM-PER-VOLT METER.

⏚ INDICATES A-

⏚ INDICATES VEHICLE GROUND

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.

* COMPONENT VALUE TABLE		
COMP DESIG	L	H
RF FREQ	66-78 MHZ	77-88 MHZ
IF FREQ	11.2 MHZ	11.2 MHZ
C503	10	8
C506	27	20
C507	.82	.68
C508	27	20

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

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
PLI9C327413G1	
PLI9C327413G2	

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.

(19D424272, Rev. 0)

SCHEMATIC DIAGRAM

66—88 MHz MIXER/IF BOARD

PARTS LIST

LBI30559C

66-88 MHz
RF ASSEMBLY 19D416478G8, G9, G14, G15
AND
MIF ASSEMBLY 19C327413G1, G2

SYMBOL	GE PART NO.	DESCRIPTION
		RF ASSEMBLY 19D416478G8, G14 66-78 MHz 19D416478G9, G15 77-88 MHz
A301A		COMPONENT BOARD 19B219452G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C3 and C4	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
A301B		ANTENNA INPUT PLATE 19A137683G1
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	7104941P20	Connector, phono: jack; sim to National Tel.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700106P79	Composition: 4.7K ohms ±5%, 1/4 w.
A302		COMPONENT BOARD 19C320073G8 66-78 MHz (ML) 19C320073G9 77-88 MHz (MH)
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C2ML	19A700013P9	Phenolic: 0.47 pf ±5%, 500 VDCW.
C2MH	19A700013P8	Phenolic: 0.39 pf ±5%, 500 VDCW.
C3ML	19A700013P10	Phenolic: 0.56 pf ±5%, 500 VDCW.
C3MH	19A700013P9	Phenolic: 0.47 pf ±5%, 500 VDCW.
C4ML	19A700013P13	Phenolic: 1.0 pf ±5%, 500 VDCW.
C4MH	19A700013P12	Phenolic: 0.82 pf ±5%, 500 VDCW.
C5	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C6	19A116656P8K8	Ceramic disc: 8 pf ±1 pf ±10%, 500 VDCW, temp coef -80 PPM.
C7ML	5496219P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C7MH	5496219P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C8ML	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8MH	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9ML	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9MH	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10ML	5496219P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10MH	5496219P243	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A116052P2	Silicon, hot carrier: Fwd. drop .410 volts max.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J2	19A116975P1	Contact, electrical.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1ML and L1MH	19C307170P303	Coil, RF: variable; sim to Paul Smith 071774-OG-6.
L2ML and L2MH	19C307170P303	Coil, RF: variable; sim to Paul Smith 071774-OG-6.
L3ML and L3MH	19C307170P303	Coil, RF: variable; sim to Paul Smith 071774-OG-6.
L4ML and L4MH	19C307170P310	Coil, RF: variable; sim to Paul Smith 060876-DB-1.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		(Part of W1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q2	19A116960P1	N Type, field effect; sim to Type 2N4416.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	19A700106P39	Composition: 100 ohms ±5%, 1/4 w.
R3ML and R3MH	19A700106P83	Composition: 6.8K ohms ±10%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P85	Cable, RF: approx 4 inches long. (Includes P1).
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C304	19B209488P2	Ceramic, feed-thru: 1000 pf +100 -0%, 500 VDCW; sim to Allen-Bradley Style FA5D.
C305	19B209488P1	Ceramic, feed-thru: 6.8 pf ±20%, 500 VDCW; sim to Allen-Bradley Style FA5D.
C306	19B209488P2	Ceramic, feed-thru: 1000 pf +100 -0%, 500 VDCW; sim to Allen-Bradley Style FA5D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L301ML	19B219455G5	Coil. Includes:
C2	5494481P11	Capacitor, ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C301	19B209159P5	Capacitor, variable, air: 1.60-3.8 pf, 650 v peak; sim to EF Johnson 189.
L301MH	19B219455G7	Coil. Includes:
C2	5494481P11	Capacitor, ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C301	19B209159P5	Capacitor, variable, air: 1.60-3.8 pf, 650 v peak; sim to EF Johnson 189.
L302ML	19B219455G6	Coil. Includes:
C302	19B209159P5	Capacitor, variable, air: 1.60-3.8 pf, 650 v peak; sim to EF Johnson 189.
L302MH	19B219455G8	Coil. Includes:
C302	19B209159P5	Capacitor, variable, air: 1.60-3.8 pf, 650 v peak; sim to EF Johnson 189.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B201074P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures cover- Quantity 7).
	19B209209P306	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/8. (Secures cover- Quantity 6).
	19B219451P1	Cover.
	19E500959G1	Casting.
		MIF ASSEMBLY 19C327413G1 66-78 MHz (L) 19C327413G2 77-88 MHz (H)
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C502	19A700012P2	Variable, ceramic: 2.5 to 20 pf, 200 VDCW, temp coef -250 to -700 Parts/M/°C; sim to Panasonic ECV-1ZW20X32.
C503	19A116656P10J0	Ceramic disc: 10 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C503H	19A116656P8J0	Ceramic disc: 8 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C504	19A116656P22J0	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C506L	19A116656P27K8	Ceramic disc: 27 pf ±10%, 500 VDCW, temp coef -80 PPM.
C506H	19A116656P20J8	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
C507L	19A700013P12	Phenolic: 0.82 pf ±5%, 500 VDCW.
C507H	19A700013P11	Phenolic: 0.68 pf ±5%, 500 VDCW.
C508L	19A116656P27K8	Ceramic disc: 27 pf ±10%, 500 VDCW, temp coef -80 PPM.
C508H	19A116656P20J8	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
C509	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C511	5490008P137	Silver mica: 270 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C512	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C513	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 15UD.
C521	19A700012P1	Variable, ceramic: 2 to 10 pf, 200 VDCW, temp coef -350 +500 Parts/M/°C; sim to Panasonic ECV-1ZW10X32.
C523		(Part of Z502).
C524 thru C527	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C528	5490008P139	Silver mica: 330 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C529	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL501	19B219573G3	Crystal, freq: Sec 1: Resonator A: 11,204000 KHz, Resonator B: 11,196000 KHz. Sec 2: Resonator A: 11,204000 KHz, Resonator B: 11,196000 KHz.
FL502		(Part of FL501).
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J501	19A130924G1	Receptacle, coaxial: jack type; sim to Cinch 14H11613.
J502	19A116975P1	Contact, electrical.
J523 and J524	19A116975P1	Contact, electrical.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L501		(Part of printed board 19C327412P1).
L502	19C307169P201	Coil, RF, variable: sim to Paul Smith 091774-W5-1.
L503	19C307169P206	Coil, RF, variable: sim to Paul Smith 060876-DB-3.
L504	7488079P48	Choke, RF: 27.0 µh ±10%, 1.40 ohms DC res max; sim to Jeffers 4422-9K.
L505	19C320141G30	Coil. Includes:
	5493185P9	Tuning slug.
L520		(Part of Z502).
L521	19C320141G6	Coil. Includes:
	5493185P9	Tuning slug.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q501	19A116960P1	N Type, field effect; sim to Type 2N4416.
Q502	19A116818P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R503	19A700106P67	Composition: 1.5K ohms ±10%, 1/4 w.
R520	19A700106P87	Composition: 10K ohms ±10%, 1/4 w.
R521	19A700106P77	Composition: 3.9K ohms ±5%, 1/4 w.
R522	19A700106P47	Composition: 220 ohms ±5%, 1/4 w.
R523	19A700106P31	Composition: 47 ohms ±5%, 1/4 w.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z502	19C320141G20	Coil. Includes:
	5493185P9	Tuning slug.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B219470P2	Shield.
	19A129424G1	Can. (Used with L505, L520, L521).
	4031594P1	Insulator. (Used with C502, C521).

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-E - RF Pre-Selector 19C320073G2
Incorporated in initial shipment.

REV. F - To improve RF Sensitivity. Deleted R3L.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES