MOBILE RADIO

(Applies to Mastr II, Exec II, and Custom MVP radios)

MAINTENANCE MANUAL

406—512 MHz RF ASSEMBLY 19D417075G9-G16

AND

IF FILTER BOARD 19C320523G2

TABLE OF CONTENTS

DESCRIPTION

The RF Assembly uses five tuned helical resonators to provide front end RF selectivity with no gain. A UHS pre-amplifier assembly is available that can be used with the receiver to improve sensitivity.

Mixer board A303 uses the RF signal from the RF Assembly and the mixer injection frequency from the oscillator multiplier board to generate the IF frequency.

CIRCUIT ANALYSIS

RF ASSEMBLY

PRE-AMPLIFIER

The pre-amplifier is present only in UHS receivers, and uses a bi-polar transistor to provide approximately 10 dB gain.

RF from the antenna is link-coupled through helical resonator L2301 to the base of Class A pre-amplifier Q2301. L2301 matches the 50-ohm input to the base of Q2301. The amplified output is coupled through L2302, and connected through W2301 to J1 on Antenna Input Board A301. P2301 connects to J502 on the IF-Filter Board for regulated +10-Volt supply voltage.

ANTENNA INPUT A301A/A301B

An RF signal from the antenna or UHS pre-amplifier 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 five high Q helical resonators that provide the front end RF selectivity. The helicals are tuned to the incoming frequency by C301 through C305.

MIXER A303

The mixer uses a FET (Q1) 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 helical resonators is coupled through L1 and C2 which matches the RF output to the gate of mixer Q501. Injection voltage from the multiplier-selectivity stages is applied to the source of the mixer. The 11.2 MHz mixer IF output signal is coupled from the drain of Q1 through cable W1 to J501 on the IF Filter board.

IF-FILTER

CRYSTAL FILTER

The output of A303-Q1 is coupled through a tuned circuit (L507 and C515) which matches the 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 L503 and C511 to the IF amplifier.

Service Note: Variable capacitor C504 does not require adjustment when performing normal alignment. If the four-pole monolithic crystal filter is replaced, then adjustment of C504 is necessary for optimum IF response.

IF AMPLIFIER

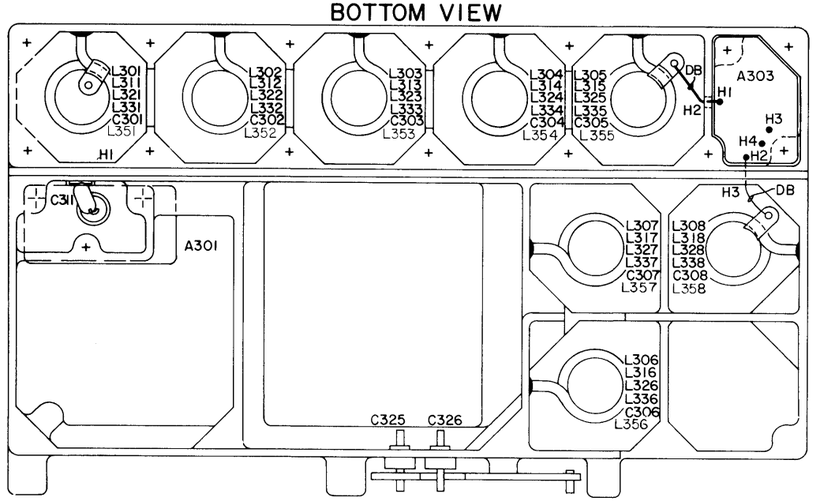
IF Amplifier Q501 is a dual-gate FET. The filter output is applied to Gate 1 of the amplifier, and the output is taken from the drain. The biasing on Gate 2 and the drain load determines the gain of the stage. The amplifier provides approximately 20 dB of IF gain. The output of Q501 is coupled through a network (L504 and C509) that matches the amplifier output to the crystal filter on the IFAS board. The output of the IF-Filter board is applied to the IFAS board through feed-through capacitor C325.

Supply voltage for the RF amplifier and IF-Filter board is supplied from the IFAS board through feed-through capacitor C326.

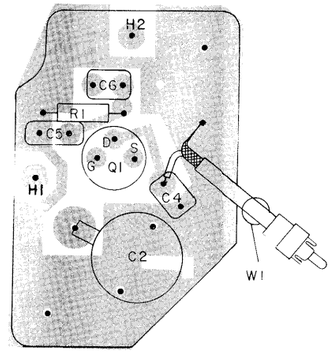
MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

RF ASSEMBLY BOTTOM VIEW

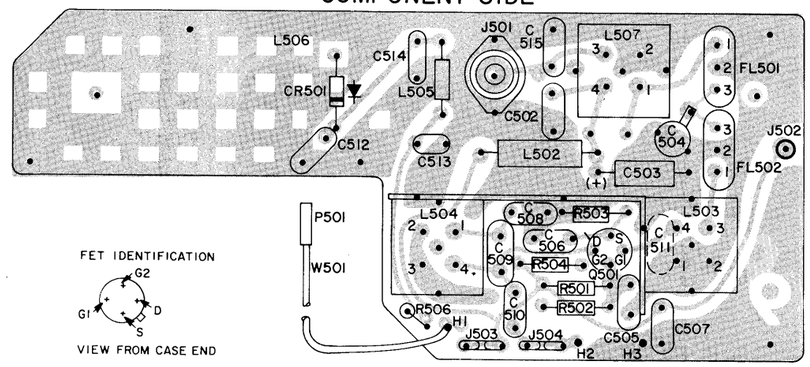


MIXER A304



(19D429194, Sh. 2, Rev. 1)
(19D429194, Sh. 3, Rev. 1)

IF-FILTER BOARD COMPONENT SIDE

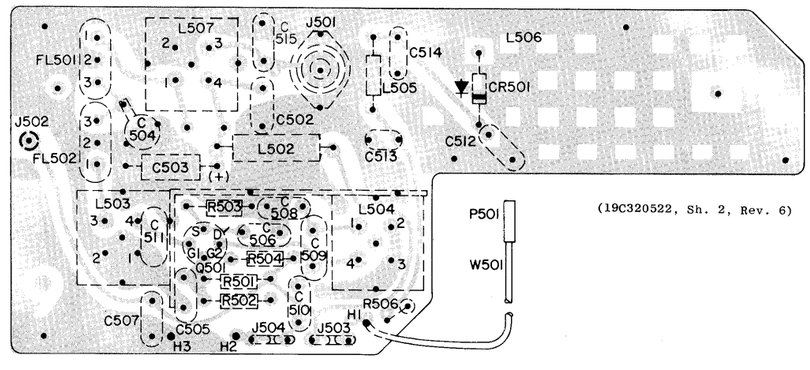


FET IDENTIFICATION

VIEW FROM CASE END

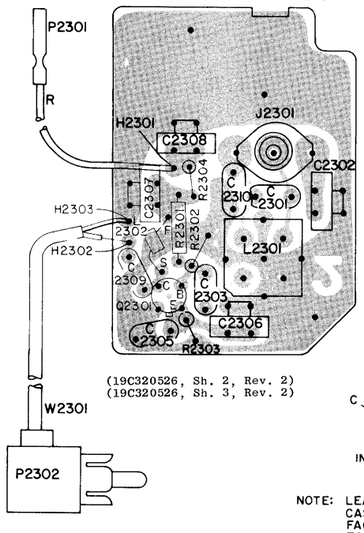
(19C320522, Sh. 2, Rev. 6)
(19C320522, Sh. 3, Rev. 6)

SOLDER SIDE



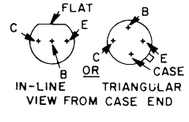
(19C320522, Sh. 2, Rev. 6)

UHS PRE-AMPLIFIER



(19C320526, Sh. 2, Rev. 2)
(19C320526, Sh. 3, Rev. 2)

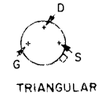
LEAD IDENTIFICATION FOR Q2301



IN-LINE TRIANGULAR
VIEW FROM CASE END

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

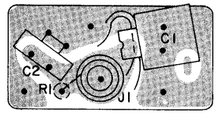
LEAD IDENTIFICATION FOR Q1



TRIANGULAR
VIEW FROM CASE END

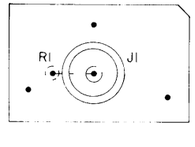
NOTE LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION. TAB INDICATES EMITTER LEAD.

A301A ANT INPUT (FLOATING GROUND)



(19B219941, Sh. 2, Rev. 0)
(19B219941, Sh. 3, Rev. 0)

A301B ANT INPUT (NON-FLOATING GROUND)



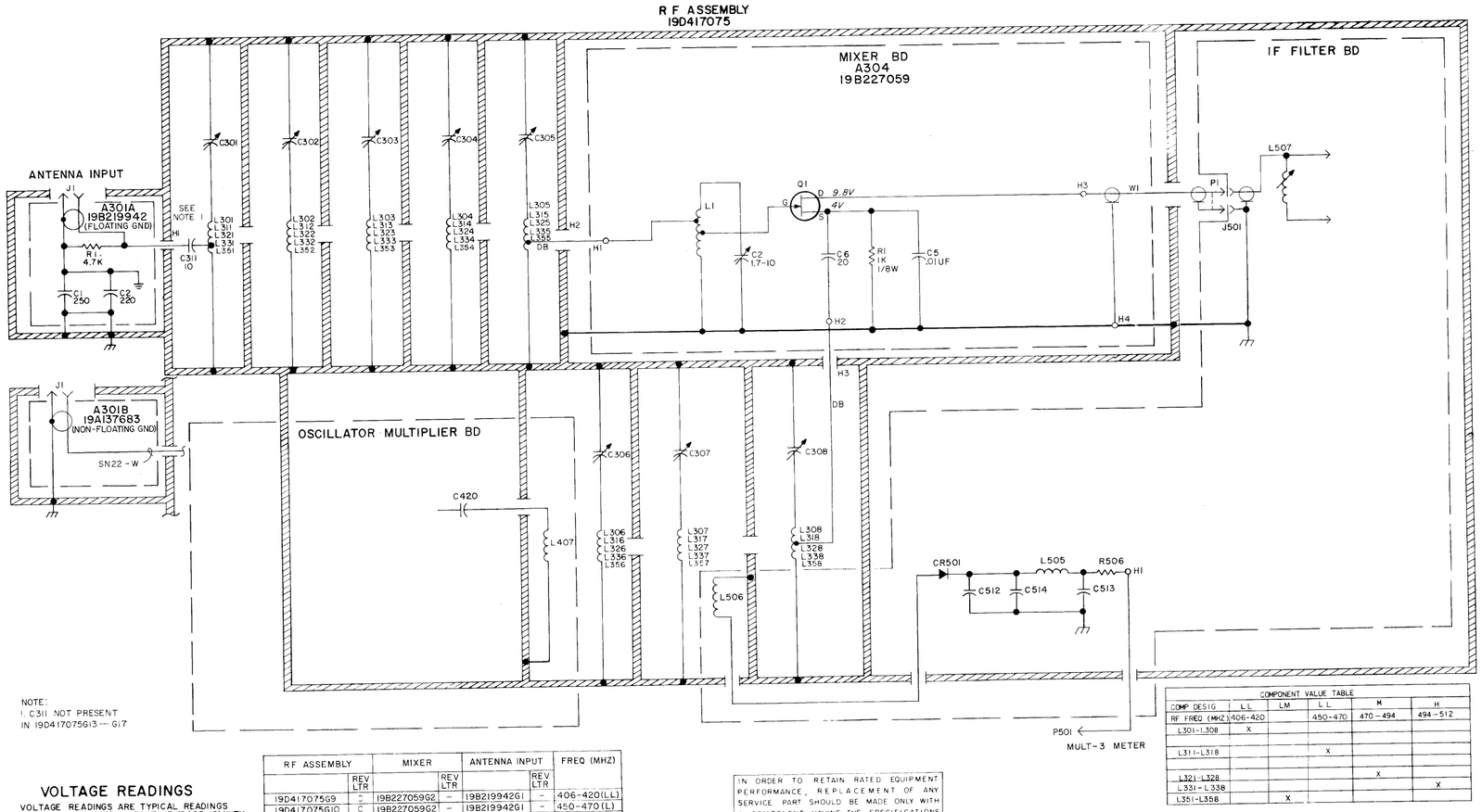
(19D423794, Rev. 5)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

OUTLINE DIAGRAM

406—512 MHz RF ASSEMBLY BOARD 19D417075G9-G16 AND IF FILTER BOARD 19C320523G2

Issue 5



NOTE:
1. C311 NOT PRESENT IN 19D417075G13 — G17

RF ASSEMBLY	REV LTR	MIXER	REV LTR	ANTENNA INPUT	REV LTR	FREQ (MHZ)
19D417075G9	C	19B227059G2	—	19B219942G1	—	406-420(LL)
19D417075G10	C	19B227059G2	—	19B219942G1	—	450-470 (L)
19D417075G11	C	19B227059G2	—	19B219942G1	—	470-494 (M)
19D417075G12	C	19B227059G2	—	19B219942G1	—	494-512 (H)
19D417075G13	A	19B227059G2	—	19A137683G2	—	406-420(LL)
19D417075G14	A	19B227059G2	—	19A137683G2	—	450-470 (L)
19D417075G15	A	19B227059G2	—	19A137683G2	—	470-494 (M)
19D417075G16	A	19B227059G2	—	19A137683G2	—	494-512 (H)
19D417075G17	—	19B227059G2	—	19A137683G2	—	420-450(LM)
19D417075G18	—	19B227059G2	—	19B219942G1	—	420-450(LM)

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-

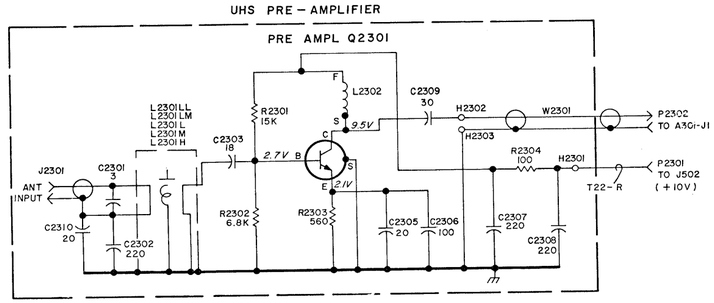
⏚ INDICATES VEHICLE GROUND

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.

COMPONENT VALUE TABLE					
COMP DESIG	LL	LM	L	M	H
RF FREQ (MHZ)	406-420		450-470	470-494	494-512
L301-L308	X				
L311-L318			X		
L321-L328				X	
L331-L338					X
L351-L358		X			

(19D423520, Rev. 7)



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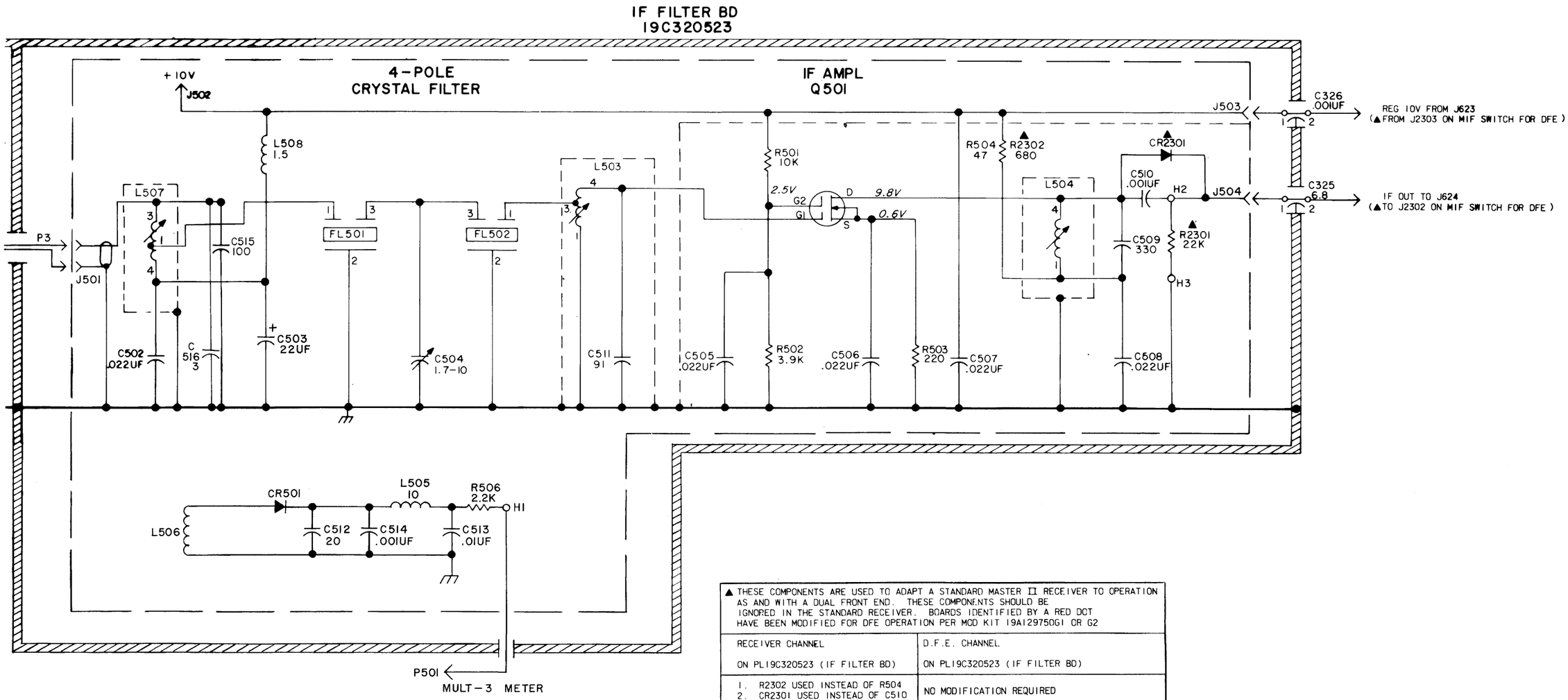
(19B226008, Rev. 5)

SCHEMATIC DIAGRAM

406—512 MHz RF ASSEMBLY BOARD
19D417075G9-G16



▲ THESE COMPONENTS ARE USED TO ADAPT A STANDARD MASTER II RECEIVER TO OPERATION AS AND WITH A DUAL FRONT END. THESE COMPONENTS SHOULD BE IGNORED IN THE STANDARD RECEIVER. BOARDS IDENTIFIED BY A RED DOT HAVE BEEN MODIFIED FOR DFE OPERATION PER MOD KIT 19A129750G1 OR G2	
RECEIVER CHANNEL ON PL19C320523 (IF FILTER BD)	D.F.E. CHANNEL ON PL19C320523 (IF FILTER BD)
1. R2302 USED INSTEAD OF R504 2. CR2301 USED INSTEAD OF C510 3. R2301 ADDED BETWEEN H2 & H3.	NO MODIFICATION REQUIRED
	SEE OSC/MULT BD FOR OTHER DFE CHANGES
THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G1.	THESE ITEMS ARE SUPPLIED IN MOD. KIT PL19A129750G2.

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

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	REV LETTER
IF FILTER BD	
19C320523G2	A

SCHEMATIC DIAGRAM

IF FILTER BOARD 19C320523G2

PARTS LIST

LBI30033E

406-512 MHz RECEIVER RF ASSEMBLY,
IF-FILTER BOARD ASSEMBLY
AND UHS PRE-AMPLIFIER

SYMBOL	GE PART NO.	DESCRIPTION
		RF ASSEMBLY 19D417075G9 406-420 MHz FLOATING GRD 19D417075G10 420-470 MHz FLOATING GRD 19D417075G11 470-494 MHz FLOATING GRD 19D417075G12 494-512 MHz FLOATING GRD 19D417075G13 406-420 MHz NON FLOATING GRD 19D417075G14 420-470 MHz NON FLOATING GRD 19D417075G15 470-494 MHz NON FLOATING GRD 19D417075G16 494-512 MHz NON FLOATING GRD
A301A		ANTENNA INPUT BOARD 19B219942G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	7484393P3	Silver mica: 250 pf ±10%, 500 VDCW; sim to Underwood Type JIHP.
C2	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	7104941P16	Connector, phono: Jack; sim to National Tel. Barrel Ceramic.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
A301B*		ANTENNA INPUT PLATE 19A137683G2 (Added to G13-G16 by REV A)
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	7104941P20	Connector, jack: sim to National Tel.
A301B*		ANTENNA INPUT PLATE 19A137683G1 (Deleted in G13-G16 by REV A)
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1	7104941P20	Connector, jack: sim to National Tel.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
A303*		MIXER BOARD 19B227059G1 (Deleted by REV B)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C2	19B209351P1	Variable, ceramic: 2-10 pf, 200 VDCW, temp coef -350 +500 PPM/°C; sim to Matshushita ECV-1ZW10P32.
C3	19A116555P2JK0	Ceramic disc: 20 pf ±10%, 500 VDCW, temp coef 0 PPM.
C4*	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM. Earlier than REV A:
	19A116556P3K0	Ceramic disc: 3 pf ±1 pf, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of printed wiring board 19D423518P1).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		(Part of W1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134093P1	N Type, field effect: sim to Type 2N4391.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P102K	Composition: 1K ohms ±10%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P114	RF: approx 5-1/8 inches long.
A304*		MIXER BOARD 19B227059G2 (Added by REV B)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19B209351P1	Variable, ceramic: 2-10 pf, 200 VDCW, temp coef -350 +500 PPM/°C; sim to Matshushita ECV-1ZW10P32.
C4*	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM. Deleted in G8-G12 by REV C, in G13-G16 by REV A.
C5	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C6	19A116114P39	Ceramic: 20 pf ±5%, 100 VDCW; temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of printed board 19D429194P1).
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1		(Part of #1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134093P1	N Type, field effect; sim to Type 2N4391.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R151P102K	Composition: 1K ohms ±10%, 1/8 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P114	Cable, RF: approx 5-1/2 inches long.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C301 thru C305	4036765G11	Includes: Screw.
	7137968P8	Nut, stamped: thd size No. 6-32; sim to Palnut T0632005.
C306 thru C308	4036765G12	Includes: Screw.
	7137968P8	Nut, stamped: thd size No. 6-32; sim to Palnut T0632005.
C311*	5496218P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM. Deleted in G13-G16 by REV A.
C325	19B209488P1	Ceramic, feed-thru: 6.8 pf ±20%, 500 VDCW; sim to Allen-Bradley Style FA5D.
C326	19B209488P2	Ceramic, feed-thru: 1000 pf +100%-10%, 500 VDCW; sim to Allen-Bradley Style FA5D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L301	19B204938G37	Coil.
L302 thru L304	19B219944P1	Coil.
L305	19B204938G33	Coil.
L306 and L307	19B219944P5	Coil.
L308	19B204938G41	Coil.
L311	19B204938G38	Coil.
L312 thru L314	19B219944P2	Coil.
L315	19B204938G34	Coil.
L316 and L317	19B219944P6	Coil.
L318	19B204938G42	Coil.
L321	19B204938G39	Coil.
L322 thru L324	19B219944P3	Coil.

SYMBOL	GE PART NO.	DESCRIPTION
L325	19B204938G35	Coil.
L326 and L327	19B219944P7	Coil.
L328	19B204938G43	Coil.
L331	19B204938G40	Coil.
L332 thru L334	19B219944P4	Coil.
L335	19B204938G36	Coil.
L336 and L337	19B219944P3	Coil.
L338	19B204938G44	Coil.
		IF FILTER BOARD 19C320523G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C502	19A116080P103	Polyester: 0.022 µf ±10%, 50 VDCW.
C503	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C504	19B209351P1	Variable: 2 to 10 pf, 200 VDCW, temp coef +500% -350 PPM; sim to Matshushita ECV-1ZW10P32.
C505 thru C508	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
C509	5490008P139	Silver mica: 330 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C510	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C511		(Part of L503).
C512	19A116656P20K0	Ceramic disc: 20 pf ±10%, 500 VDCW, temp coef 0 PPM.
C513	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
C514	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C515	5490008P27	Silver mica: 100 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C516*	19A116656P3K0	Ceramic disc: 3 pf ±1 pf, 500 VDCW, temp coef 0 PPM. Added by REV A.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR501	19A116052P1	Diode, hot carrier: Fwd. drop .350 volts max.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL501	19B219573G7	Crystal, freq: Resonator A: 11,200000 KHz, Resonator B: 11,196024 KHz.
FL502		(Part of FL501).
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J501	19A130924G1	Receptacle, coaxial: sim to Cinch 14H11613.
J502	4033513P1	Contact, electrical: sim to Bead Chain 193-4.
J503 and J504	19A116975P1	Receptacle, wire spring.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L502*	7488079P48	Choke, RF: 27.0 µh ±10%, 1.40 ohms DC res max; sim to Jeffers 4422-09K. Deleted by REV A.
L503	19C320141G4	Coil. Includes: Tuning slug.
L504	19C320141G29	Coil. Includes: Tuning slug.
L505	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4K.
L506		(Part of printed board 19C320522P1).
L507	19C321810G1	Coil.
L508*	7488079P34	Choke, RF: 1.50 µh ±10%, 0.28 ohms DC res max; sim to Jeffers 4412-7K. Added by REV A.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P501		(Part of W501).

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q501	19A116818P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R501	3R152P103K	Composition: 10K ohms ±10%, 1/4 w.
R502	3R152P392J	Composition: 3.9K ohms ±5%, 1/4 w.
R503	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
R504	3R152P470J	Composition: 47 ohms ±5%, 1/4 w.
R506	3R152P222K	Composition: 2.2K ohms ±10%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W501	19A129947G7	Cable: orange, No. 22 stranded, approx 7-1/2 inches, includes (P501).
		UHS RF PRE-AMPLIFIER 19C320527G1 406-420 MHz (LL) 19C320527G2 420-470 MHz (L) 19C320527G3 470-494 MHz (M) 19C320527G4 494-512 MHz (H) 19C320527G5 420-450 MHz (LM)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2301	19A116656P3J8	Ceramic disc: 3 pf ±0.1 pf, 500 VDCW, temp coef -80 PPM.
C2302	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
C2303	19A116656P18J8	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C2305	19A116656P20K0	Ceramic disc: 20 pf ±10%, 500 VDCW, temp coef 0 PPM.
C2306	19A116679P100K	Mica: 100 pf ±10%, 250 VDCW.
C2307 and C2308	19A116679P220K	Mica: 220 pf ±10%, 250 VDCW.
C2309	19A116656P30J8	Ceramic disc: 30 pf pf ±5%, 500 VDCW, temp coef -80 PPM.
C2310	19A116656P20K0	Ceramic disc: 20 pf ±10%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J2301	19A130924G1	Receptacle, coaxial: sim to Cinch 14H11613.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2301LL	19D413078G3	Helical resonator.
L2301L	19D413078G5	Helical resonator.
L2301M	19D413078G6	Helical resonator.
L2301H	19D413078G7	Helical resonator.
L2301LM	19D413078G9	Helical resonator.
L2302	19A129716G4	Coil.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P2301	4029840P2	Contact, electrical: sim to Amp 42827-2.
P2302		(Part of W2301).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2301	19A116859P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2301	3R152P153J	Composition: 15K ohms ±5%, 1/4 w.
R2302	3R152P682K	Composition: 6.8K ohms ±10%, 1/4 w.
R2303	3R152P561K	Composition: 560 ohms ±10%, 1/4 w.
R2304	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W2301	5491689P94	RF: approx 3 inches long. Includes P2302.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19E501121G1	Casting, RF Circuit.
	19B227101G1	Cover, RF Circuit.
	19B209209P306	Tap screw, Phillips Pozidriv®: No. 6-32 x 3/8. (Secures RF Circuit Cover).
	4036765G11	Screw. (Part of C301-C305).
	4036765G12	Screw. (Part of C306-C308).
	7137968P8	Nut, stamped: thd size No. 6-32; sim to Palnut T0632005. (Part of C301-C308).
	4031594P1	Insulator. (Used with C504 on IF Filter Board).
	19B219470P2	Shield. (Used with IF Filter Board).
	19A129424G1	Can. (Used with L401-L403, L501, L503, L504).
	19A127060P2	Can. (Used with L2301).
	4035306P59	Washer, fiber. (Used with FL501, FL502).
	4035306P23	Washer, fiber. (Used with J501, J2301).

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after all 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 those revisions.

REV. A - RF Assembly 19D417075G9-12

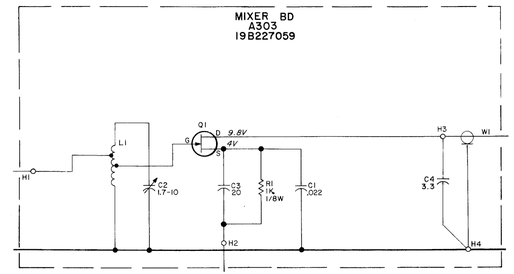
To improve receiver sensitivity. Changed C4.

REV. B - RF Assembly 19D417075G9-12

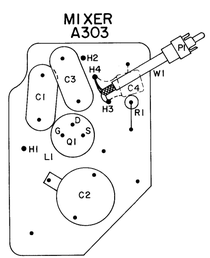
To incorporate new mixer board. Replaced A303 (19B227059G1) with A304 (19B227059G2).

Schematic Diagram Was:

R F ASSEMBLY
19D417075



Outline Diagram Was:



REV. A - IF-Filter Board 19C320523G2

To improve operation. Replaced L502 with L508, and added C516.

REV. A - RF Assembly 19D417075G13-G16

REV. C - RF Assembly 19D417075G9-G12

To improve sensitivity. Deleted A304-C4.