

## MAINTENANCE MANUAL

### 138—174 MHz RF ASSEMBLY 19D416693G1, 2 AND MIXER/IF BOARD 19C320153G1

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### 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.

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

#### ANTENNA INPUT A301

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.

### CIRCUIT ANALYSIS

#### MIXER-IF

#### RF ASSEMBLY

#### MIXER & CRYSTAL FILTER

##### RF PRE-AMPLIFIER (Optional)

The pre-amplifier is present only in UHS receivers, and uses a dual-gate Field Effect Transistor (FET) to provide approximately 12 dB gain.

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).

RF from the antenna is coupled through T2301 to Gate 1 of pre-amplifier Q2301. The primary of T2301 provides a 50-ohm input impedance. The amplified output at the drain terminal of Q2301 is coupled through T2302 and connected to J1 on Antenna Input board A301 through cable W2302. T2302 is tapped to provide a 50-ohm output impedance. P2301 connects to J501 on the MIF board for the regulated +10 Volt supply voltage.

In the mixer stage, RF from the helical resonators is coupled through L502 and C502 which matches the RF output to the gate of mixer Q501. Injection voltage from the multiplier-selectivity stages is inductively coupled through L501 to the source of the mixer. The 11.2 MHz mixer IF output signal is coupled from the drain of Q501 through a tuned circuit (L505 and C505) 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 L520 and C523 to the IF amplifier.

Service Note: Variable capacitor C521 does not require adjustment when performing normal alignment. If the four-pole monolithic crystal filter is replaced, then adjustment of C521 is necessary for optimum IF response.

#### IF AMPLIFIER

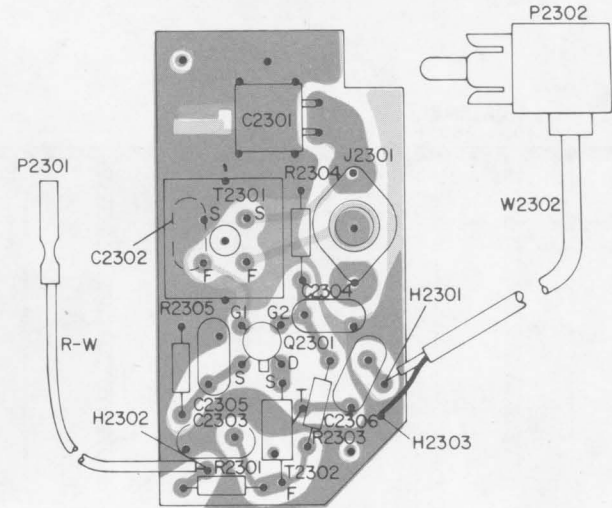
IF amplifier Q520 is a dual-gate FET. The filter output is applied to Gate 1 of

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 Q520 is coupled through impedance matching network L521, and C528 and coupling capacitor C529 and feed-through capacitor C325 to the next IF stage on to the MIF switch in Dual Front End Applications.

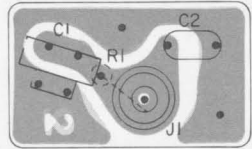
Supply voltage for the RF amplifier and MIF board is supplied through feed-through capacitor C326.

UHS PRE-AMPLIFIER



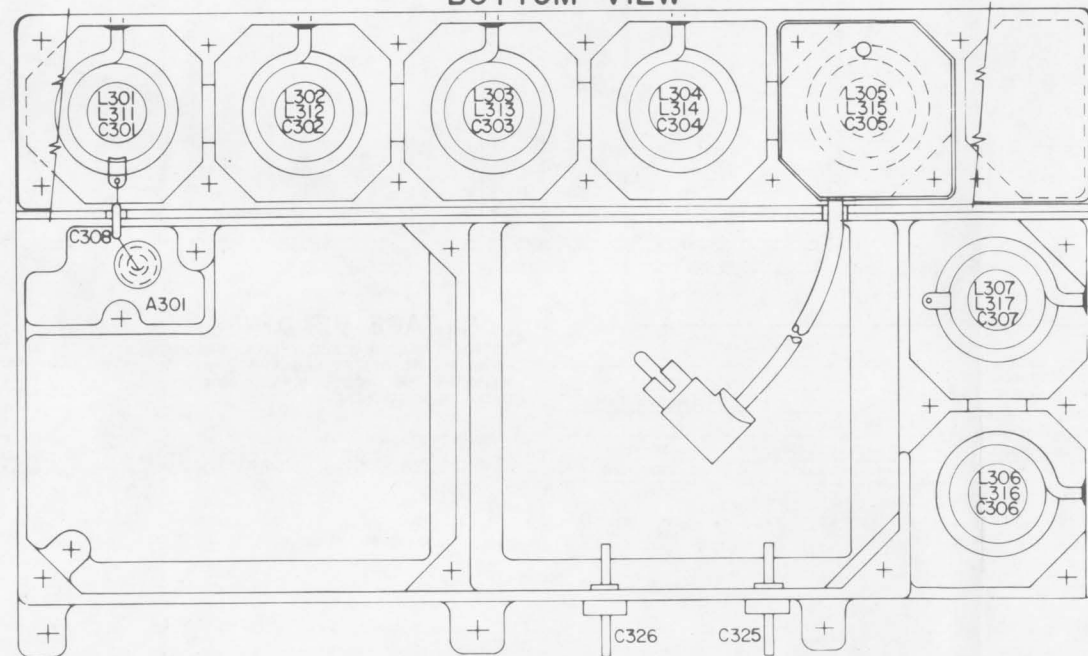
(19C320201, Sh. 2, Rev. 1)  
(19C320201, Sh. 3, Rev. 1)

A301 ANT INPUT



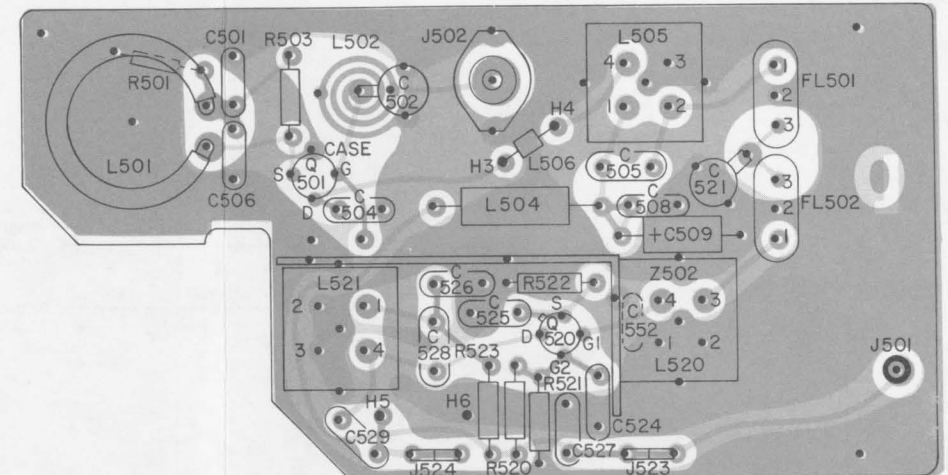
(19B219679, Sh. 2, Rev. 2)  
(19B219679, Sh. 3, Rev. 2)

RF ASSEMBLY BOTTOM VIEW



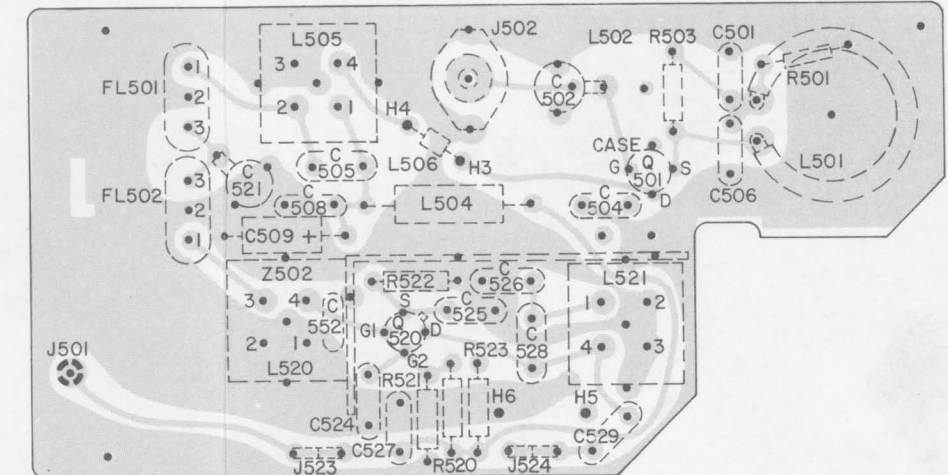
(19D423618, Rev. 1)

MIXER/IF BOARD  
COMPONENT SIDE



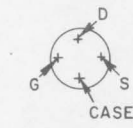
(19C321054, Sh. 2, Rev. 1)  
(19C321054, Sh. 3, Rev. 0)

SOLDER SIDE



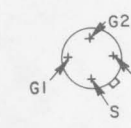
(19C321054, Sh. 2, Rev. 1)

LEAD IDENTIFICATION FOR Q501

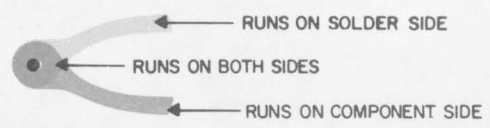


VIEW FROM CASE END

Q520, Q2301

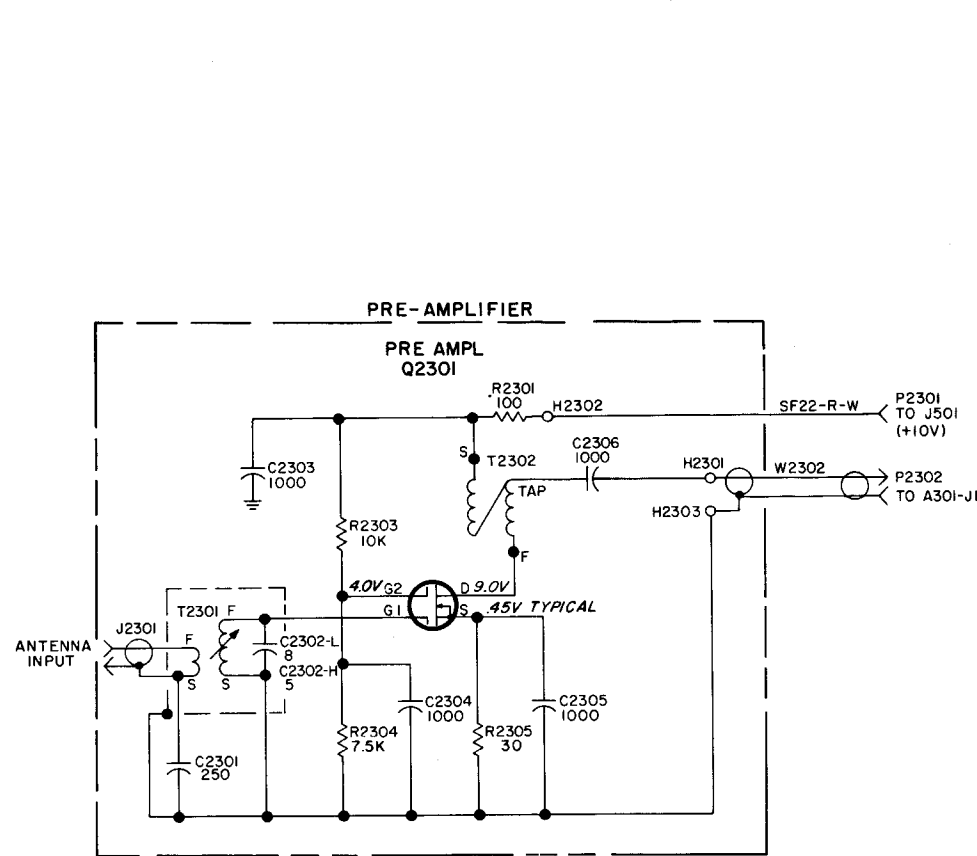


NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



OUTLINE DIAGRAM

138-174 MHz RF ASSEMBLY AND MIXER/IF BOARD

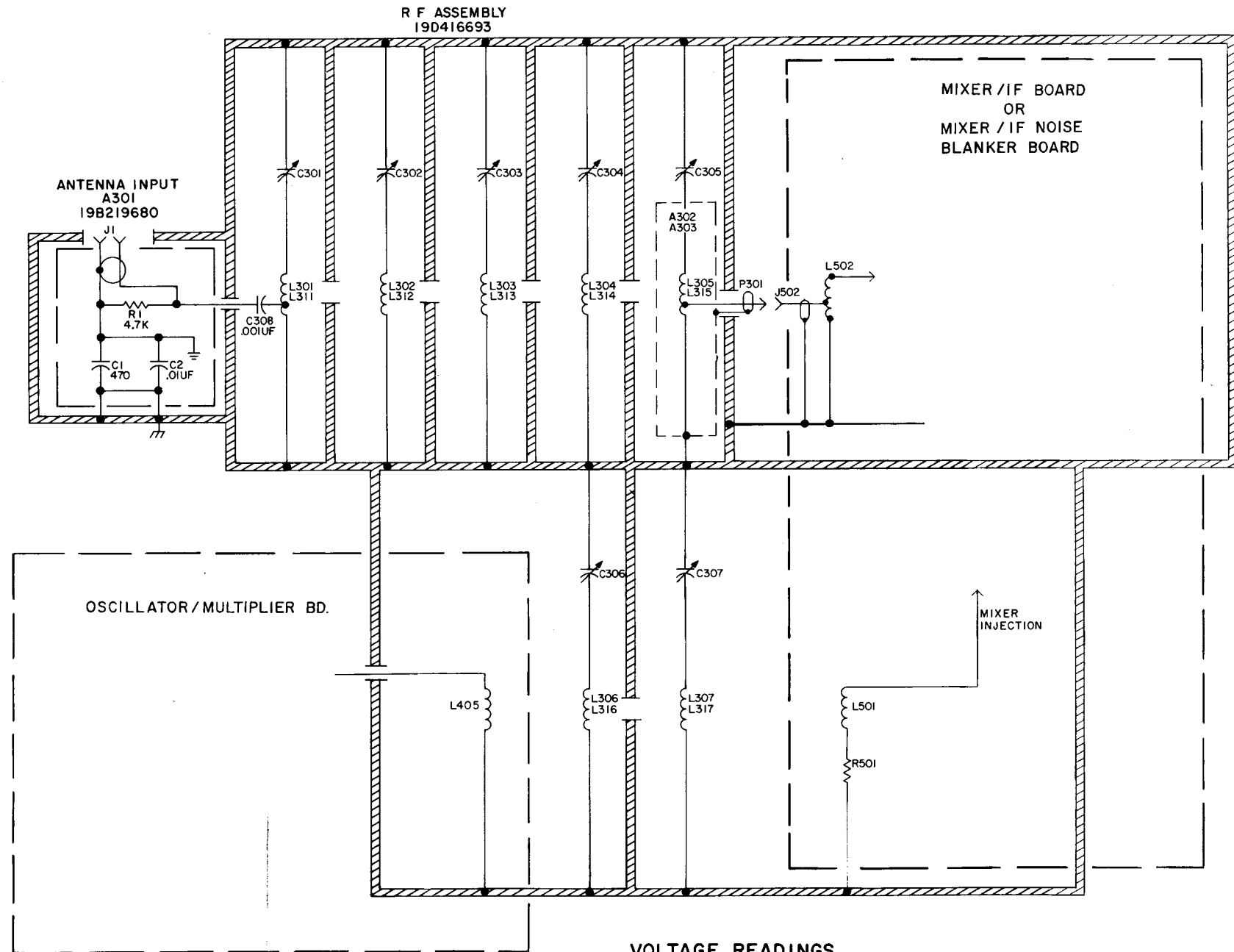


SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODE NO	REV LETTER
PL19C320215G1	B
PL19C320215G2	B

(19B219622, Rev. 5)



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.

	REV LETTER	FREQ RANGE (MHZ)
RF ASSEMBLY		
19D416693G1	B	138-155
19D416693G2	B	150.8-174

**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.

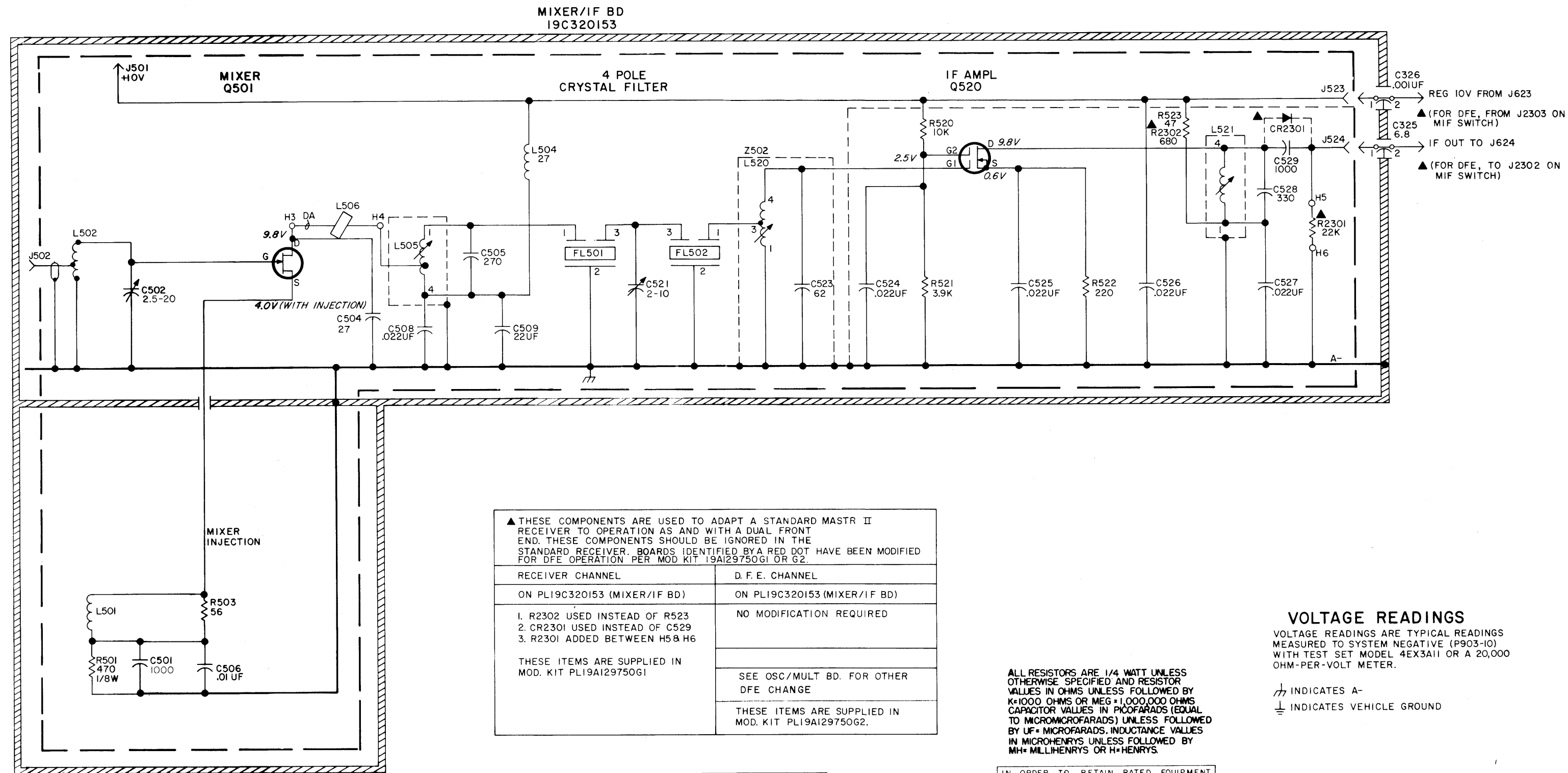
⌚ INDICATES A-  
 ⊥ INDICATES VEHICLE GROUND

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 PICO FARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

(19D423469, Rev. 0)

**SCHEMATIC DIAGRAM**

138—174 MHz RF ASSEMBLY



	REV LETTER	FREQ RANGE (MHZ)
MIXER/IF BD		
19C320153G1	C	138-174

(19D423478, Rev. 2)

**SCHEMATIC DIAGRAM**

138-174 MHz MIXER/IF BOARD

PARTS LIST

LBI-4981B

138-174 MHz RF ASSEMBLY,  
MIF ASSEMBLY,  
UHS PRE-AMPLIFIER

SYMBOL	GE PART NO.	DESCRIPTION
A301		RF ASSEMBLY 19D416693G1 138-155 MHz 19D416693G2 150.8-174 MHz  ANTENNA INPUT BOARD 19B219680G1
----- CAPACITORS -----		
C1	19A116679P470K	Silver mica: 470 pf ±10%, 250 VDCW.
C2	19A116080P101	Polyester: 0.01 μf ±10%, 50 VDCW.
----- JACKS AND RECEPTACLES -----		
J1	7104941P16	Connector, phono: jack; sim to National Tel. Barrel Ceramic.
----- RESISTORS -----		
R1	3R152P472K	Composition: 4700 ohms ±10%, 1/4 w.
A302 and A303		COMPONENT BOARD A302 19B226512G1 138-155 MHz A303 19B226512G2 150.8-174 MHz
----- INDUCTORS -----		
L305	19B216112G20	Coil.
L315	19B216112G21	Coil.
----- CABLES -----		
P301	5491689P85	Cable, RF: approx 4 inches long, 350 VRMS, 500 VDC operating voltage.
----- CAPACITORS -----		
C301 thru C305		Includes: 4036765G11 Screw. 7137968P8 Nut, stamped: thd. size No. 6-32; sim to Palnut TO632005.
C306 and C307		Includes: 4036765G12 Screw. 7137968P8 Nut, stamped: thd size No. 6-32; sim to Palnut TO632005.
C308	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C325	19B209488P1	Ceramic, feed-thru: 6.8 pf ±20%, 500 VDCW; sim to Allen-Bradley Style FASD.
C326	19B209488P2	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Style FASD.
----- INDUCTORS -----		
L301	19B216112G19	Coil.
L302 thru L304	19B216112G11	Coil.
L306 and L307	19B204461G18	Coil.
L311	19B216112G17	Coil.
L312 thru L314	19B216112G15	Coil.
L316 and L317	19B204461G19	Coil.

SYMBOL	GE PART NO.	DESCRIPTION
----- MISCELLANEOUS -----		
	19E500969P1	Casting.
	19C320251P1	Cover.
	19B209209P305	Tap screw, Phillips POZIDRIV®: No. 6-32 x 5/16. (Secures cover).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Used with A301-A303).
MIF ASSEMBLY 19C320153G1		
----- CAPACITORS -----		
C501	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C502	19B209351P2	Variable, ceramic: 2.5 to 20 pf, 200 VDCW, temp coef -250 +700 PPM/°C; sim to Matsushita ECV-1Z-W20P32.
C504	19A116656P27K0	Ceramic disc: 27 pf ±10%, 500 VDCW, temp coef 0 PPM.
C505	7489162P37	Silver mica: 270 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C506	19A116080P101	Polyester: 0.01 μf ±10%, 50 VDCW.
C508	19A116080P103	Polyester: 0.022 μf ±10%, 50 VDCW.
C509	5496267P10	Tantalum: 22 μf ±20%, 15 VDCW; sim to Sprague Type 150D.
C521	19B209351P1	Variable: 2 to 10 pf, 200 VDCW, temp coef -350 to +500 PPM/°C; sim to Matsushita ECV-1ZW10P32.
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.
E10 and E11	19B209055P8	Terminal, feed-thru: sim to Electrical Ind. ABAS40WSS.
----- TERMINALS -----		
----- FILTERS -----		
FL501	19B219573G3	Crystal, freq: Resonator A: 11,200000 KHz, Resonator B: 11,196024. Resonator A: 11,200000 KHz, Resonator B: 11,196024.
FL502		(Part of FL501).
----- JACKS AND RECEPTACLES -----		
J501	4033513P1	Contact, electrical: sim to Bead Chain L93-4.
J502	19A130924G1	Receptacle, coaxial: sim to Cinch 14H11613.
J523 and J524	19A116975P1	Receptacle, wire spring.
----- INDUCTORS -----		
L501	19A129280P1	Coil.
L502		Coil. (Part of printed wire board).
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.
L506	19A126140P1	Core, toroidal.
L520		(Part of Z502).
L521	19C320141G6	Coil. Includes: 5493185P9 Tuning slug.

SYMBOL	GE PART NO.	DESCRIPTION
----- TRANSISTORS -----		
Q501	19A134093P1	N Type, field effect; sim to Type 2N4391.
Q520	19A116818P1	N Channel; sim to Type 3N187.
----- RESISTORS -----		
R501	3R151P471J	Composition: 470 ohms ±5%, 1/8 w.
R503	3R152P560K	Composition: 56 ohms ±10%, 1/4 w.
R520	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R521	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R522	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R523	3R152P470K	Composition: 47 ohms ±10%, 1/4 w.
----- NETWORKS -----		
Z502		COIL ASSEMBLY 19C320141G20
----- CAPACITORS -----		
C523	19A116114P1057	Ceramic: 62 pf ±5%, 100 VDCW; temp coef -30 PPM.
----- INDUCTORS -----		
L520	19C320141P4	Coil.
	5493185P9	Tuning slug.
UHS PRE-AMPLIFIER BOARD 19C320215G1 138-158 MHz 19C320215G2 147-174 MHz		
----- CAPACITORS -----		
C2301	19A116795P250K	Mica: 250 pf ±10%, 250 VDCW; sim to Underwood Type J1HF.
C2302L		(Part of T2301L).
C2302H		(Part of T2301H).
C2303 thru C2306	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
----- JACKS AND RECEPTACLES -----		
J2301	19A116832P1	Receptacle, coaxial: sim to Cinch 14H11613.
----- PLUGS -----		
P2301	4029840P2	Contact, electrical: sim to Amp 42827-2.
P2302		(Part of W2302).
----- TRANSISTORS -----		
Q2301	19A116818P1	N Channel, field effect; sim to Type 3N187.
----- RESISTORS -----		
R2301	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R2303	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2304	3R152P752J	Composition: 7500 ohms ±5%, 1/4 w.
R2305	3R152P300J	Composition: 30 ohms ±5%, 1/4 w.
----- TRANSFORMERS -----		
T2301L		COIL ASSEMBLY 19C320141G22
----- CAPACITORS -----		
C4	5496218P308	Ceramic disc: 8.0 pf ±0.5 pf, 500 VDCW, temp coef -150 PPM.
----- INDUCTORS -----		
L1	19C320141P25	Coil.
	5493185P9	Tuning slug.

SYMBOL	GE PART NO.	DESCRIPTION
T2301H		COIL ASSEMBLY 19C320141G21
----- CAPACITORS -----		
C5	5496218P305	Ceramic disc: 5.0 pf ±0.5 pf, 500 VDCW, temp coef -150 PPM.
----- INDUCTORS -----		
L1	19C320141P25	Coil.
	5493185P9	Tuning slug.
T2302	19A127108G1	Coil.
----- CABLES -----		
W2302	5491689P85	Cable, RF: approx 4 inches long. (Includes P2302).
----- MISCELLANEOUS -----		
	19B219470P2	Shield.
	19A129424G1	Can. (Used with L505, L521, Z502 and T2301 on PRE-AMPLIFIER Board).

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 thru C - Mixer/IF Board 19C320153G1

REV. A and B - RF Assembly 19D416693G1.2

REV. A and B - Preamplifier Assembly 19C320215G1.2

Incorporated in initial shipment.