MOBILE RADIO

MAINTENANCE MANUAL

138—174 MHz POWER AMPLIFIER 19D423927G2

TABLE OF CONTENTS

DESCRIPTION

The PA assembly for Custom MVP uses two RF power transistors to provide a power output of 10 watts. The output power is adjustable from 1.5 to 10 watts by power adjust potentiometer R8. A single transistor is used in the power adjust circuit.

Supply voltage (A+) for the PA is connected from jack J1 on the back of the unit through FL210-C5 on the side of the radio. C201, C202 and L12 prevent RF from getting on the power leads. Diode CR201 will cause the main fuse in the fuse assembly to blow if the polarity of the power leads is reversed, providing reverse voltage protection for the radio.

Centralized metering jack J205 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The Test Set meters power control voltage, Ampl-1 drive (exciter output), and PA voltage and current.

CIRCUIT ANALYSIS

RF AMPLIFIERS

The exciter output is coupled through an RF cable to PA input jack J201. The RF is coupled through a matching network to the base of Class C amplifier Q1. The network matches the 50-ohm input to the base of Q1 and consists of T1, C4, C5 and C39. L1 and R13 comprise a stabilizing network in the base circuit of Q1.

Part of the RF input is rectified by CR1 and applied to voltage divider R1 and R2. This voltage is used to meter the AMPL-1 drive at J205.

Collector voltage to Q1 (Ampl-1) is controlled by power control transistor, Q215 and is applied through a collector stabilizing and feed network consisting of C6, L3, L4 and R4. The collector voltage of Q201 is metered through R7 at J5.

The output of Q1 is coupled to the base of PA transistor Q2 through a matching network consisting of L5, L6, C12, C13, C14 and R5. Collector voltage to Q2 is applied through collector stabilizing and feed network C15, L8, L11 and R6.

Collector current for Q2 is metered across tapped manganin resistor R9 at J205. (PA current). The reading is taken on the one-Volt scale with the High Sensitivity button pressed, and read as 10 amperes full scale.

Following Q2 is a matching network (L9, L10, W2, C20 and C21) that matches the output of Q2 to the 50-ohm microstrip impedance (W1) in the low pass filter. C22 acts as a DC blocking capacitor.

The PA output is coupled through the low-pass filter to the antenna through antenna relay K1.

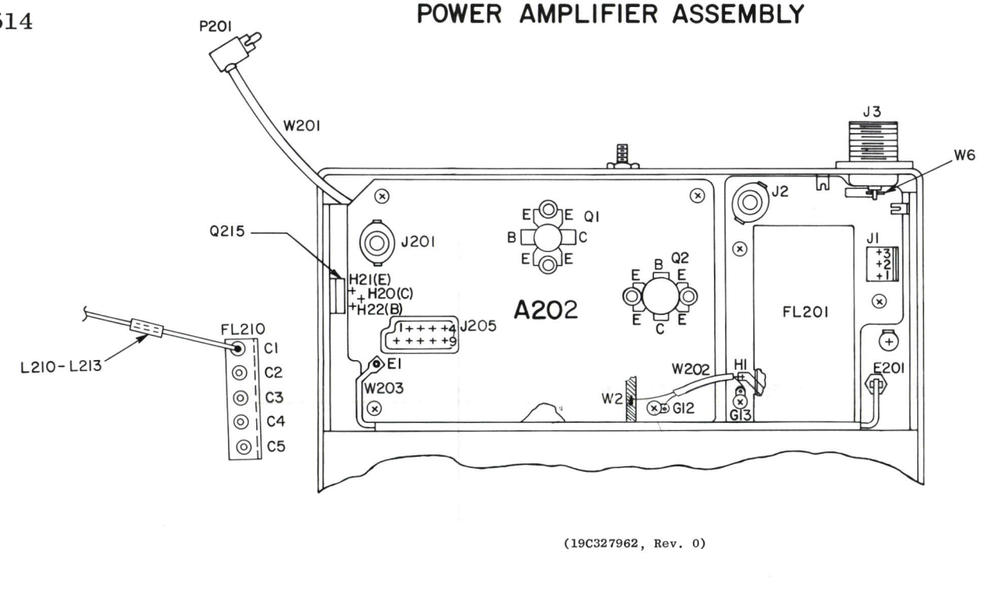
WARNING

The RF Power Transistors used in the transmitter contain Beryllium Oxide, a TOXIC substance. If the ceramic, or other encapsulation is opened, crushed, broken or abraded, the dust may be hazardous if inhaled. Use care in replacing transistors of this type.

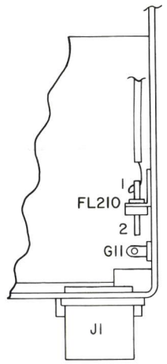
POWER ADJUST CIRCUIT

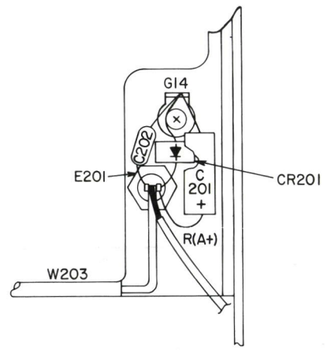
The power adjust circuit consists of R8 and Q215. R8 controls the base voltage and conduction of Q215. Q215 is connected in series with the collector feed network for Q1, thereby controlling the drive to Q2 and the output power. R8 is adjusted to provide the desired output power.

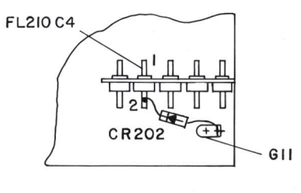
POWER AMPLIFIER ASSEMBLY



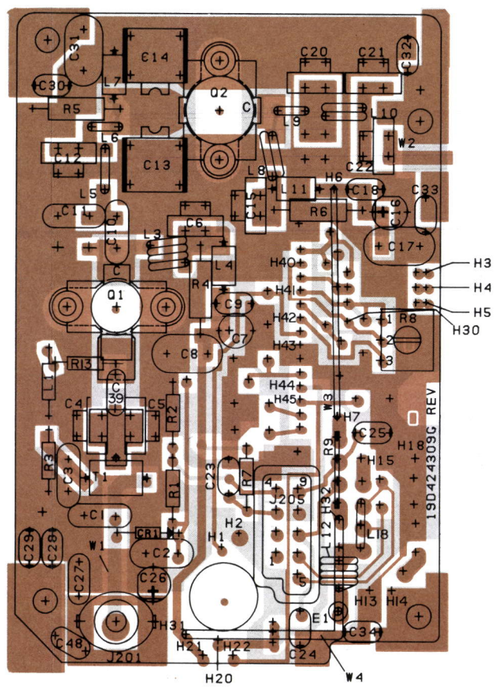
(19C327962, Rev. 0)





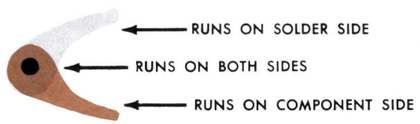


PA BOARD

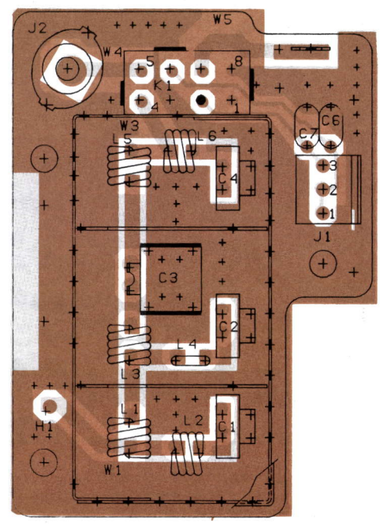


(19C327824, Rev. 0)
(19B227634, Sh. 1, Rev. 0)
(19B227634, Sh. 2, Rev. 0)

CONNECTIONS CHART			
FROM	TO	WIRE SIZE	REMARKS
H13	H14	DB	
H40	H45	DA	SLEEVE
H41	H43	DA	SLEEVE
H42	H44	DA	SLEEVE



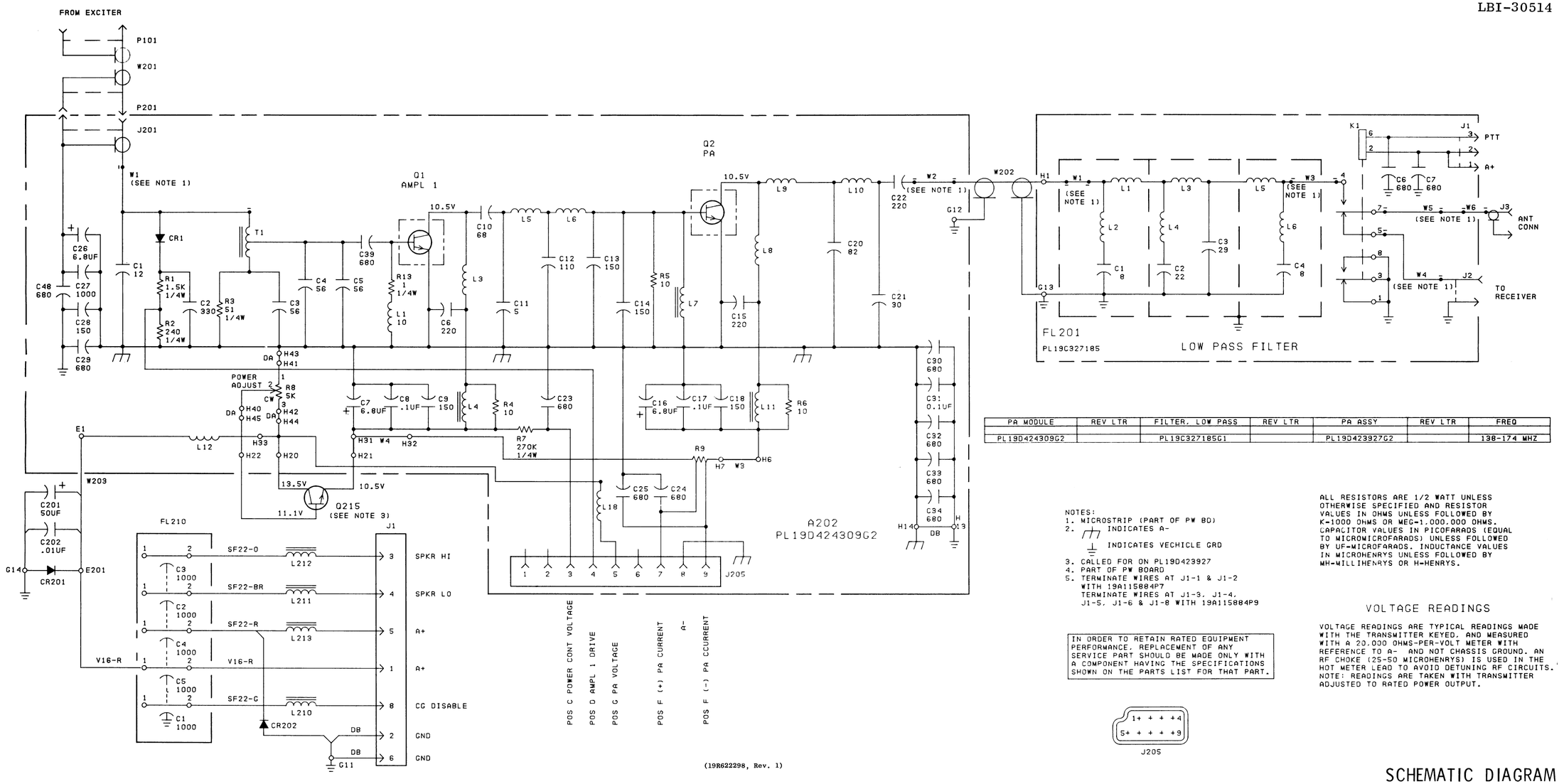
FILTER BOARD



(19C327186, Rev. 1)
(19B227410, Sh. 1, Rev. 1)
(19B227410, Sh. 2, Rev. 1)

OUTLINE DIAGRAM

138—174 MHz, 10-WATT POWER AMPLIFIER



PA MODULE	REV LTR	FILTER, LOW PASS	REV LTR	PA ASSY	REV LTR	FREQ
PL19D424309G2		PL19C327185G1		PL19D423927G2		138-174 MHZ

NOTES:
1. MICROSTRIP (PART OF PW BD)
2. ⏚ INDICATES A-
   ⏚ INDICATES VECHICLE GRD
3. CALLED FOR ON PL19D423927
4. PART OF PW BOARD
5. TERMINATE WIRES AT J1-1 & J1-2 WITH 19A115884P7
   TERMINATE WIRES AT J1-3, J1-4, J1-5, J1-6 & J1-8 WITH 19A115884P9

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 1/2 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.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MADE WITH THE TRANSMITTER KEYED, AND MEASURED WITH A 20,000 OHMS-PER-VOLT METER WITH REFERENCE TO A- AND NOT CHASSIS GROUND. AN RF CHOKE (25-50 MICROHENRYS) IS USED IN THE HOT METER LEAD TO AVOID DETUNING RF CIRCUITS. NOTE: READINGS ARE TAKEN WITH TRANSMITTER ADJUSTED TO RATED POWER OUTPUT.

(19R622298, Rev. 1)

SCHEMATIC DIAGRAM

138—174 MHz, 10-WATT POWER AMPLIFIER

PARTS LIST

LBI-30515

138-174 MHz, 10 WATT POWER AMPLIFIER
19D423927G2

SYMBOL	GE PART NO.	DESCRIPTION
A202		POWER AMPLIFIER MODULE 19D424309G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7489162P7	Silver mica: 12 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2	7489162P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C3	7489162P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C4 and C5	19A116679P56J	Metallized teflon: 56 pf ±5%, 250 VDCW.
C6	19A116679P220J	Silver mica: 220 pf ±5%, 250 VDCW.
C7	19A134202P15	Tantalum: 6.8 µf ±20%, 35 VDCW.
C8	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C9	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C10	7489162P23	Silver mica: 68 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C11	7489162P1	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C12	19A116679P110J	Silver mica: 110 pf ±5%, 250 VDCW.
C13 and C14	19A116952P150J	Silver mica: 150 pf ±5%, 250 VDCW; sim to Underwood Type J1HF.
C15	19A116679P220J	Silver mica: 220 pf ±5%, 250 VDCW.
C16	19A134202P15	Tantalum: 6.8 µf ±20%, 35 VDCW.
C17	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C18	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C20	19A116679P82J	Mica: 82 pf ±5%, 250 VDCW.
C21	19A116679P30J	Metallized teflon: 30 pf ±5%, 250 VDCW.
C22	19A116679P220J	Silver mica: 220 pf ±5%, 250 VDCW.
C23 thru C25	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C26	19A134202P15	Tantalum: 6.8 µf ±20%, 35 VDCW.
C27	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW: sim to RMC Type JF Discap.
C28	19A116655P8	Ceramic disc: 150 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C29 and C30	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C31	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C32 thru C34	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C39	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
C48	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW: sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	19A115250P1	Silicon.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	19A134263P1	Contact, electrical: sim to Selectro 229-1082-00-0-590.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J201	19A130924G1	Connector, coaxial: jack type; sim to Cinch 14H11613.
J205	19B219374G1	Connector: 9 contacts.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4K.
L3	19A136530P1	Coil.
L4	19A129773G1	Coil.
L5	19A136532P2	Coil.
L6	19A129575P1	Coil.
L7	19A129773G1	Coil.
L8	19A136531P1	Coil.
L9	19A136907P2	Coil.
L10	19A129561P1	Coil.
L11	19A129773G1	Coil.
L12	19A129569P1	Coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134340P1	Silicon, NPN.
Q2	19A134340P3	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
R2	3R152P241J	Composition: 240 ohms ±5%, 1/4 w.
R3	3R152P510J	Composition: 51 ohms ±5%, 1/4 w.
R4 thru R6	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R7	3R152P274J	Composition: 270,000 ohms ±5%, 1/4 w.
R8	19A116559P102	Variable, cermet: 5000 ohms ±20%, .5 w; sim to CTS Series 900.
R9	19C320212P2	Shunt resistor.
R13	19A116216P1R0K	Deposited carbon: 1.0 ohms ±10%, 1/4 w; sim to Amperex Type BR03104 Style CR25.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A129564G1	Transformer.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 and W2		(Part of printed board 19D424308P1).
W3	19B227912P1	Jumper.
W4	19B227912P2	Jumper.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C201	19A115680P4	Electrolytic: 50 µf +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C202	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR201	19A116783P1	Silicon.
CR202	4037822P1	Silicon.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E201	7143206P1	Terminal, standoff.
		- - - - - - - - - - - FILTERS - - - - - - - - - - -
FL201		LOW PASS FILTER 19C327185G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116679P8D	Metallized teflon: 8 pf ±.5 pf, 250 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C2	19A116679P22J	Metallized teflon: 22 pf ±5%, 250 VDCW.
C3	19A116795P29J	Metallized teflon: 29 pf ±5%, 250 VDCW; sim to Underwood Type J1HF.
C4	19A116679P8D	Metallized teflon: 8 pf ±.5 pf, 250 VDCW.
C6 and C7	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A129569P1	Coil.
L2	19A129570P1	Coil.
L3	19A129569P1	Coil.
L4	19A129575P1	Coil.
L5	19A129569P1	Coil.
L6	19A129570P1	Coil.
		- - - - - - - - JACKS AND RECEPTACLE - - - - - - - -
J1	19A116659P55	Connector, printed wiring: 3 contacts; sim to Molex 09-65-1031.
J2	19A130924G1	Connector, coaxial: jack type; sim to Cinch 14H11613.
		- - - - - - - - - - - RELAYS - - - - - - - - - - -
K1	19B209558P1	Hermetic sealed: 180-330 ohms coil res, 2 form C contacts, 8.0 to 16.3 VDC; sim to GE 3SAV1760A2.
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W1		(Part of printed board 19C327184P1).
W3 thru W5		(Part of printed board 19C327184P1).
W6	19A136512P1	Antenna strap.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL210		FILTER ASSEMBLY 19A136680G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C5	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
G11 thru G14	7135118P2	Terminal, solderless.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1		Connector. Includes:
	19A115884P12	Shell.
	19A115884P7	Contacts, male: wire size 14-20; sim to AMP 60528-1.
	19A115884P9	Contacts, male: wire size 22-30; sim to AMP 60910-1.
J3	4029493P1	Connector, receptacle: coaxial; sim to Amphenol 83-798.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L210 thru L213	19A126140P3	Core, toroidal, ferrite: sim to Stackpole 88-31959.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P201		(Part of W201).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q201	19A134340P1	Silicon, NPN.
Q202	19A134340P2	Silicon, NPN.
Q215	19A116742P1	Silicon, NPN.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W201	5491689P91	Cable, RF: approx 7-1/2 inches long.
W202	19A136529G2	Cable: approx 2 inches long.
W203	19B227302P1	Jumper.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19C321982P1	Insulator. (Located under A201).
	19B209209P304	Tap screw, Phillips Pozidriv: No. 6-32 x 1/4. (Secures FL210).
	4033714P11	Terminal, solderless: sim to Zierick 349. (Solders to FL201).
	N44P9006C6	Screw, machine: No. 4-40 x 3/8. (Secures Q201 and Q202).
	19A116023P1	Insulator, plate. Dupont No. 300 Kapton H. (Located under Q215).
	19A134016P1	Insulator, bushing. (Used with Q215).
	19B201074P204	Tap screw, Phillips POZIDRIV: No. 4-40 x 1/4. (Secures J3).
	7878243P11	Hex nut: No. 8-32. (Secures stud that mates with wing nut securing radio to case).
	4035306P40	Washer, fiber. (Used with C5 on FL210).
	19A116417P4	Plastic bumper. (Quantity 3).

*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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