MOBILE RADIO

MAINTENANCE MANUAL

450—512 MHz POWER AMPLIFIER ASSEMBLY I9D423928G7

TABLE OF CONTENTS

DESCRIPTION

The PA Assembly for Custom MVP uses two RF power transistors to provide a power output of 5 Watts. The output power is adjustable over a range of 1.5 Watts to rated power output, using power adjust control R13. A single transistor is used in the power adjust circuit.

Supply voltage (A+) for the PA is connected from J1 on the back of the radio through FL210-C5 on the side of the radio. C201, C202 and C203 prevent RF from getting on the power leads. Diode CR201 will cause the main fuse assembly to blow if the polarity of the power leads is reversed, providing reverse voltage protection for the radio.

Centralized metering jack J5 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the Ampl-1 drive (exciter output), Power adjust voltage and PA voltage and current.

CIRCUIT ANALYSIS

RF POWER AMPLIFIERS

The exciter output is coupled through RF cable W201 to PA input jack J1. The 50 ohm RF input is coupled through a matching network comprised of C6, C7, C8 and W2 to the base of amplifier Q1.

Part of the RF input is rectified by CR1 & metered at J5-4 through resistor R1.

Collector voltage for Q1 is applied directly from the DC power input through R4, collector stabilizing network R5 and L2 and collector feed network L3 and C10.

The output of Q1 is coupled to the base of PA Q202 through a matching network consisting of T1, C14, C15 and C16.

Collector voltage to Q202 is controlled by power adjust circuit Q215, and is applied through a collector stabilizing network L10 and R6 and collector feed network L5 & C18.

Collector current for Q202 is metered through resistor R16. The reading is taken in position F with the High Sensitivity button pressed, and read as 0-1 ampere full scale.

Collector voltage for Q202 is metered through R2 to ground. The reading is taken in position C, Test 1 and read as 0-15 Volts full scale.

The output of Power Amplifier Q202 is coupled through an impedance matching network (W3, C17, C19 and C52) that matches the output impedance of Q202 to the input impedance of the low pass filter through a 50 ohm cable W202. C1 on the low pass filter board provides DC isolation between the transmitter and the antenna.

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

WARNING

The RF Power Transistor used in the transmitter contains 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 R13 and Q215. R13 controls the base voltage, and conduction of Q215. Q215 is connected in series with the collector feed network for Q202 thereby controlling the output power. R13 is adjusted to provide the desired output power.

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

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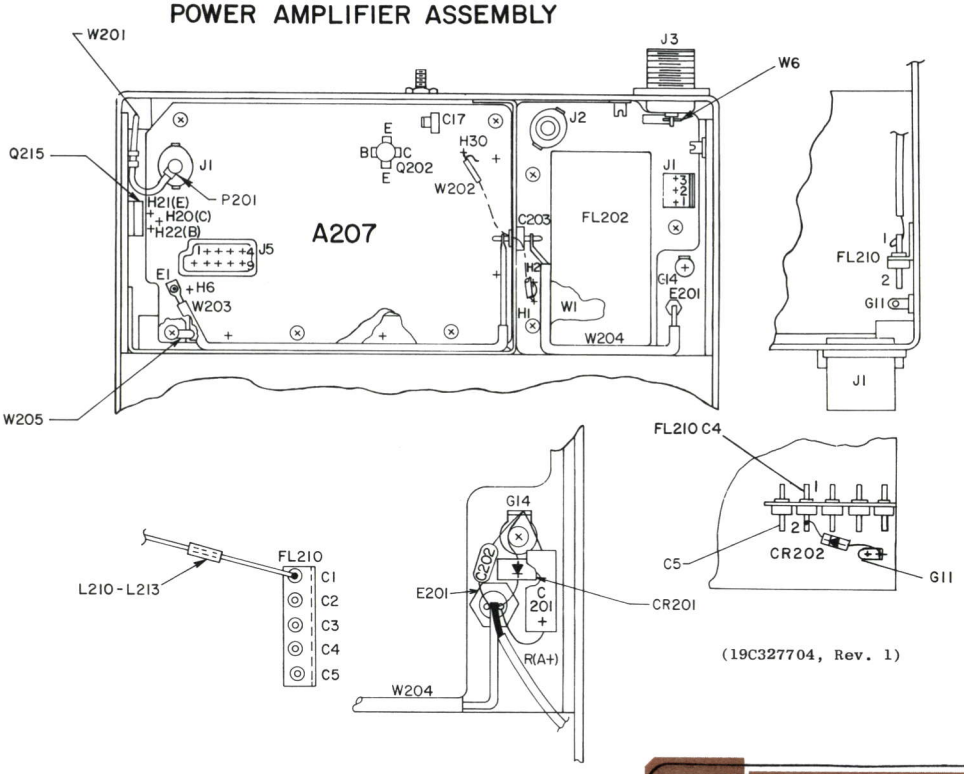
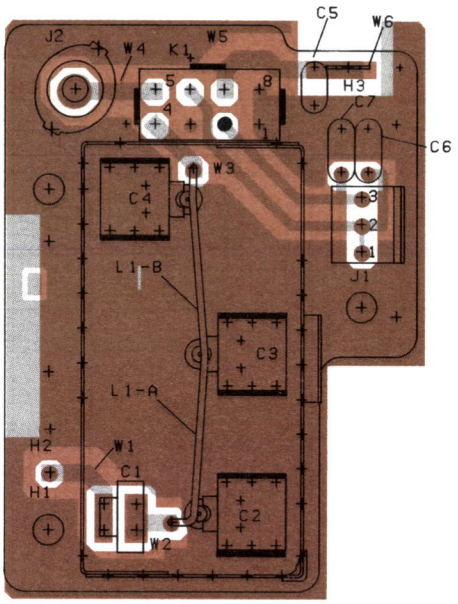
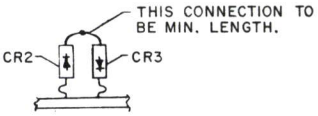
POWER AMPLIFIER ASSEMBLY



(19C327704, Rev. 1)

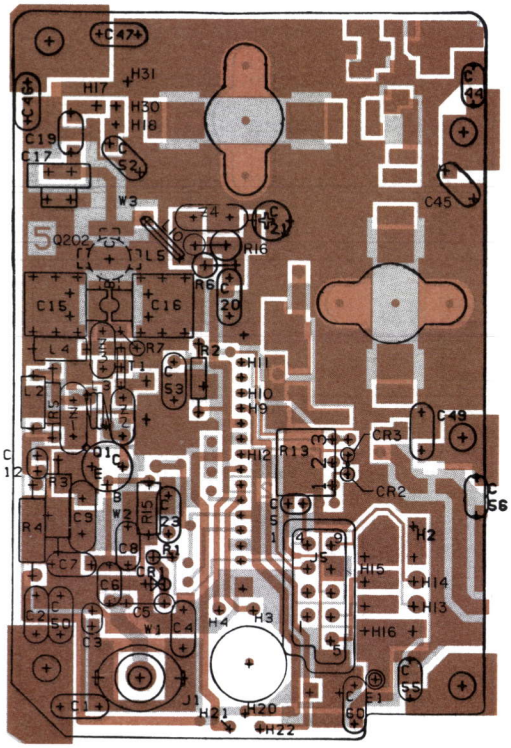
FILTER BOARD



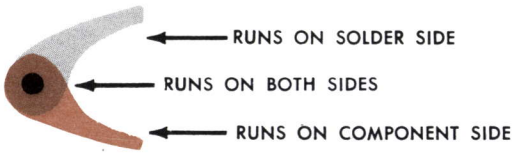


FROM	TO	WIRE	REMARKS
H9	H10	DA	—
H11	H12	DA	SLV
H13	R6	SF22-R	
H14	R16	SF22-BL	
H15	H16	DA	SLV
H17	H18	DA	MIN. LG.

(19C327137, Rev. 2)
(19B227225, Sh. 1, Rev. 1)
(19B227225, Sh. 2, Rev. 0)

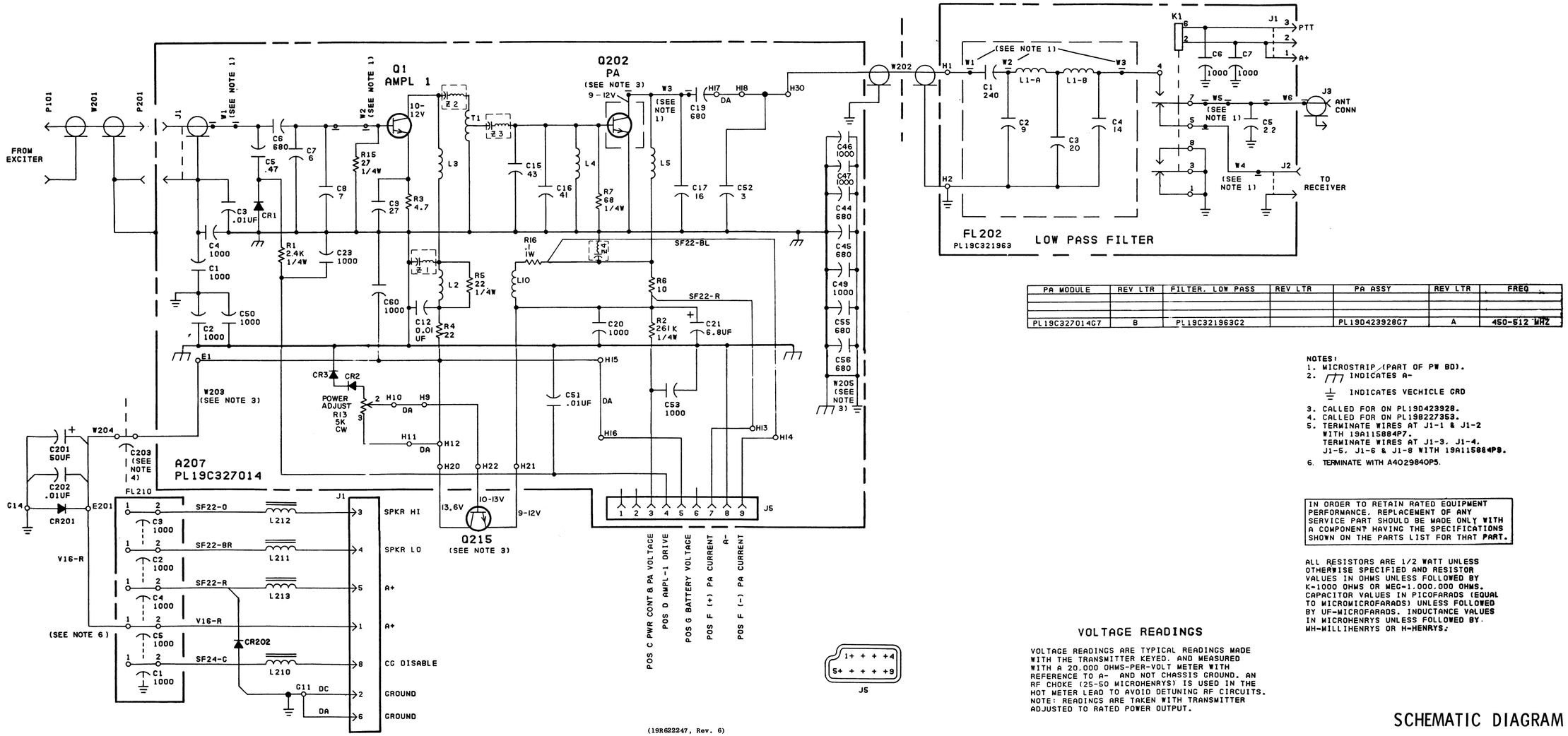


(19C327702, Rev. 1)
(19B226633, Sh. 1, Rev. 6)
(19B226633, Sh. 2, Rev. 3)



OUTLINE DIAGRAM

450—512 MHz POWER AMPLIFIER



PA MODULE	REV LTR	FILTER, LOW PASS	REV LTR	PA ASSY	REV LTR	FREQ
PL19C327014G7	B	PL19C321963G2		PL19D423928G7	A	450-512 MHz

NOTES:
1. MICROSTRIP (PART OF PW BD).
2. /// INDICATES A-
   ⏚ INDICATES VECHICLE GRD
3. CALLED FOR ON PL19D423928.
4. CALLED FOR ON PL19B227353.
5. TERMINATE WIRES AT J1-1 & J1-2 WITH 19A115884P7. TERMINATE WIRES AT J1-3, J1-4, J1-5, J1-6 & J1-8 WITH 19A115884P8.
6. TERMINATE WITH A4029840P5.

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 (2S-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.

SCHEMATIC DIAGRAM

450—512 MHz POWER AMPLIFIER

Issue 4

PARTS LIST

LBI30396C

450-512 MHz POWER AMPLIFIER
19D423928G7

SYMBOL	GE PART NO.	DESCRIPTION
		POWER AMPLIFIER MODULE 19C327014G7
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C3	19A116192P1	Ceramic: 0.01 uF ±20%, 50 VDCW; sim to Erie 8121 Special.
C4	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C5	19A700013P9	Phenolic: 0.47 pF ±5%, 500 VDCW.
C6	19A116655P18	Ceramic disc: 680 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7MA	19A116656P6J0	Ceramic disc: 6 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C8MA*	19A116656P7J0	Ceramic disc: 7 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
		Earlier than REV A:
	19A116656P5J0	Ceramic dis: 5 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C9MA	19A116656P27J0	Ceramic disc: 27 pF ±5%, 500 VDCW, temp coef 0 PPM.
C10MA*	19A134666P1	Silver mica: 18 pF ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Deleted by REV B.
C11MA*	19A116656P24J0	Ceramic disc: 24 pF ±5%, 500 VDCW, temp coef 0 PPM. Deleted by REV B.
C12	19A116192P1	Ceramic: 0.01 uF ±20%, 50 VDCW; sim to Erie 8121 Special.
C14MA*	19A116656P24J0	Ceramic disc: 24 pF ±5%, 500 VDCW, temp coef 0 PPM. Deleted by REV B.
C15MA	19A700131P43	Metallized teflon: 43 pF ±2%, 250 VDCW.
C16MA	19A700131P41	Metallized teflon: 41 pF ±2%, 250 VDCW, temp coef 0 -130 PPM.
C17MA	19A116679P16D	Metallized teflon: 16 pF ±0.5 pF, 250 VDCW.
C18*	19A134666P1	Silver mica: 18 PF ±5%, 500 VDCW; sim to Electro Motive Type DM154CR. Delted by REV B.
C19	19A116655P18	Ceramic disc: 680 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C20	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C21	19A134202P15	Tantalum: 6.8 uF ±20%, 35 VDCW.
C23	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C44 and C45	19A116655P18	Ceramic disc: 680 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C46 and C47	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C49 and C50	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C51	19A116192P1	Ceramic: 0.01 uF ±20%, 50 VDCW; sim to Erie 8121 Special.
C52MA	19A116656P3J0	Ceramic disc: 3 pF ±0.5 pF, 500 VDCW, temp coef 0 PPM.
C53	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C55 and C56	19A116655P18	Ceramic disc: 680 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C60	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A116052P1	Silicon, hot carrier: Fwd drop .350 volts max.
CR2 and CR3	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	19A134263P1	Contact, electrical: sim to Selectro 229-1082-00-0-590.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	19A700049P2	Connector, receptacle; 500 VDCW maximum; sim to NTTF-1058.
J5	19B219374G1	Connector: 9 contacts.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	19A129773G1	Coil.
L3	19A129774P1	Coil.
L4	19A129773G1	Coil.
L5	19B219457P6	Coil.
L10	19A700122P1	Torridal core.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A134237P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1MA	3R152P242J	Composition: 2.4K ohms ±5%, 1/4 w.
R2MA	19A701250P441	Metal film: 261K ohms ±1%, 250 VDCW, 1/4 w.
R3	19A700113P7	Composition: 4.7 ohms ±5%, 1/2 w.
R4	19A700113P23	Composition: 22 ohms ±5%, 1/2 w.
R5	19A700106P23	Composition: 22 ohms ±5%, 1/4 w.
R6	19A700113P15	Composition: 10 ohms ±5%, 1/2 w.
R7	19A700106P35	Composition: 68 ohms ±5%, 1/4 w.
R13	19A116559P102	Variable cermet: 5000 ohms ±20%, 1/2 w; sim to CTS Series 360.
R15	19A700106P25	Composition: 27 ohms ±5%, 1/4 w.
R16	19B209022P89	Wirewound: 0.1 ohm ±5%, 2 w; sim to IRC Type BWH.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A130446G1	Coil.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 thru W3		(Part of printed board 19D423005P1).
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z1MA*	19A134666P1	Frequency network: selective, 470-630 MHz res. freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added by REV B.
Z2H*	19A134666P1	Frequency network: selective, 470-630 MHz res. freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added by REV B.
Z3H*	19A134666P1	Frequency network: selective, 470-630 MHz res. freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added by REV B.
Z4*	19A134666P1	Frequency network: selective, 470-630 MHz res. freq, 500 VDCW; sim to Dilectron TC501:NPO:240J:SLAC. Added by REV B.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C201	19A115680P4	Electrolytic: 50 uF +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C202	19A700005P7	Polyester: 0.01 uF ±10%, 50 VDCW.
C203	19B209488P2	Ceramic: 1000 pF -10+100%, 500 VDCW; sim to Allen Bradley Style FA5D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR201	19A116783P1	Rectifier, silicon: 100 VDC blocking, 6 amp; sim to MR751.
CR202	19A704142P1	Rectifier, silicon; general purpose.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E201	7143206P1	Terminal, standoff.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL202		FILTER BOARD 19C321963G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A700015P38	Teflon/Mica: 240 pF ±5%, 250 VDCW.
C2H	19A700131P9	Metallized teflon: 9 pF ±0.5 pF, 250 VDCW.
C3H	19A700131P20	Metallized teflon: 20 pF ±0.5 pF, 100 VDCW.
C4H	19A700131P12	Teflon: 12 pF ±0.5 pF, 250 VDCW.
C5H	19A134100P20	Ceramic disc: 2.2 pF ±0.1 pF, temp coef 0 ±120 PPM.
C6 and C7	19A116655P20	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	19A116659P55	Connector, printed wiring: 3 contacts rated at 5 amps; sim to Molex 09-65-1031.
J2	19A700049P2	Connector, receptacle; 500 VDCW maximum; sim to NTTF-1058.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1	19A700061P1	Hermetic sealed: 180 to 341 ohms coil res, 8-16.3 VDC; sim to GE 3SAV1760A2, CP Clare HFW-1201558, or Potter-Brumfield HCM6160.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1H	19B227240P2	Jumper.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 thru W5		(Part of printed board 19C321962P1).
W6	19A136512P1	Antenna strap.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL210		FILTER 19A126680G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C5	5493392P7	Ceramic, feed thru: 1000 pF -0+100%, 500 VDCW.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
G11 and G12	7135118P2	Solderless terminal.
G14	7135118P2	Solderless terminal.
		- - - - - - - 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	19A700067P1	Receptacle, coax; sim to Amphenol 83-798.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L210 thru L213	19A700122P1	Torridal core.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P201		(Part of W201).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q202	19A134164P2	Silicon, NPN; sim to Type 2N5945.
Q215	19A116742P1	Silicon, NPN; sim to Type 2N6103.
		- - - - - - - - - - CABLES - - - - - - - - - -
W201*	19A130909G1	Coil, RF: approx 5 inches long.
		Earlier than REV A:
	5491689P91	Cable, RF: approx 7-1/2 inches long.
W202	19A136529G1	Cable: approx 4 inches long.
W203	19C327146P1	Jumper.
W204	19C327146P2	Jumper.
W205	7135118P1	Terminal, solder.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19C321982P1	Insulator. (Located under A207).
	19B227353G1	Shield. (Located around A207).
	19B201074P304	Tap screw, Phillips POZIDRIVE®: No. 6-32 x 1/4. (Secures shield to frame at C17).
	19B201074P305	Tap screw, Phillips POZIDRIVE®: No. 6-32 x 5/16. (Secures shield to frame at J5).
	5492178P2	Washer, spring tension: sim to Wallace Barnes 375-20. (Used with Q202).
	19A702782P5	Nut, hex, brass: No. 8-32. (Used with Q202).
	19A130465P1	Spacer. (Used with Q202).
	19A116023P1	Insulator, plate. Dupont No. 300 Kamton H. (Located under Q215).
	19A700068P1	Insulator, bushing. (Used with Q215).
	7878243P11	Hex nut: No. 8-32. (Secures stud that mates with wing nut securing radio to case).
	4033714P11	Terminal, solderless: size to Zierick 349. (Solders to FL202).
	19B209209P304	Tap screw, Phillips POZIDRIVE®: No. 6-32 x 1/4. (Secures FL210).
	19B201074P204	Tap screw, Phillips POZIDRIVE®: No. 4-40 x 1/4. (Secures J3).
	19A701332P4	Insulator, washer: nylon. (Used with Q1).
	19B219554G2	Can. (FL202).
	19B219555P1	Cover. (FL202).
	19A700114P1	Terminal, stud. (Used with C2, C3, C4, L1).

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 - Power Amplifier 19D423928G7
To incorporate improved cable. Changed W201.

REV. A - Power Amplifier Module 19C327014G7
To improve VSWR at 450 MHz. Changed C8 mA.

REV. B - To identify network nomenclature on Schematic Diagram.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES