GE MOBILE RADIO

MAINTENANCE MANUAL
66—88 MHz, 25-WATT POWER AMPLIFIER ASSEMBLY
I9D429025G1-6 (MOBILE AND STATION)
I9D429041G1-6 (CONTINUOUS DUTY STATION)

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DESCRIPTION

The 66-88 MHz PA assemblies for MASTR® II Mobile and Stations uses two RF power transistors to provide a power output of 25 watts. The output power is adjustable using power adjust control R3 over a range of 8 to 25 watts. A single transistor is used in the power adjust circuit. Specific application data for each PA assembly are shown on the schematic diagram.

Supply voltage for the PA is connected through power leads from the system-audio-squelch board (SAS) to feed through capacitors C297 and C298 on the bottom of the PA assembly. C297, C298 and C299 prevent RF from getting on the power leads. Diode CR295 will cause the main fuse assembly to blow if the polarity of the power leads is reversed, providing reverse voltage protection for the radio.

The PA assembly is DC insulated from vehicle ground to permit operation in positive or negative ground vehicles.

NOTE

In positive ground vehicles, A- is "hot" with respect to vehicle ground. Shorting the transmitter PA printed wiring board ground pattern to the radio case may cause one of the inline fuses to blow.

Centralized metering jack J205 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 control voltage (Ampl-1 collector voltage) and PA current.

CIRCUIT ANALYSIS

RF AMPLIFIERS

The exciter output is coupled through a 50-ohm cable to PA input jack J201. The RF is coupled through DC blocking capacitor C1 and an impedance 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 C2, C3, C4, L1 and L2. L3 and R1 comprise a stabilizing network in the base circuit of Q1.

Part of the RF input is rectified by CR1 and applied to voltage divider R7 and R8. This voltage is used to meter the AMPL-1 drive at J205-4.

Collector voltage to Q1 (Ampl-1) is controlled by the power adjust circuit, Q215 and R3 and is applied through collector stabilizing network (L5 and R2 and collector feed network L4 and C7). The collector voltage of Q1 is metered through R9 at J205-3.

The output of Q1 is coupled to the base of Class C Power Amplifier, Q2, through coupling capacitor C10 and a matching network consisting of L6, C11, C12, and C13. L8 and R4 comprise a stabilizing network in the base circuit of Q2.

Collector current for Q2 is metered across tapped manganin resistor R6 at J205-5, 6 (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 (L11, C17, C18 and L12) that matches the output of Q2 to the 50-ohm microstrip impedance (W2) to the input of low pass filter.

The PA output is coupled through the low-pass filter antenna transfer relay K1 to the antenna connector J203.

Capacitor C19 through C23 and C25, C26 and C36 provide ground isolation for positive and negative ground operation.

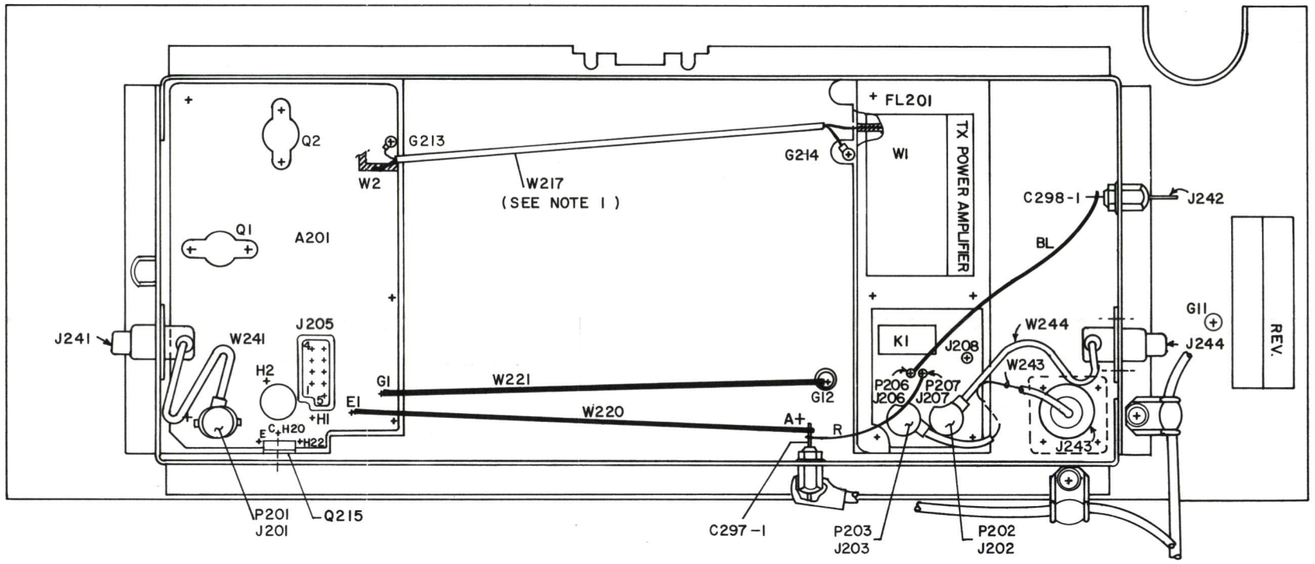
WARNING

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.

POWER ADJUST CIRCUIT

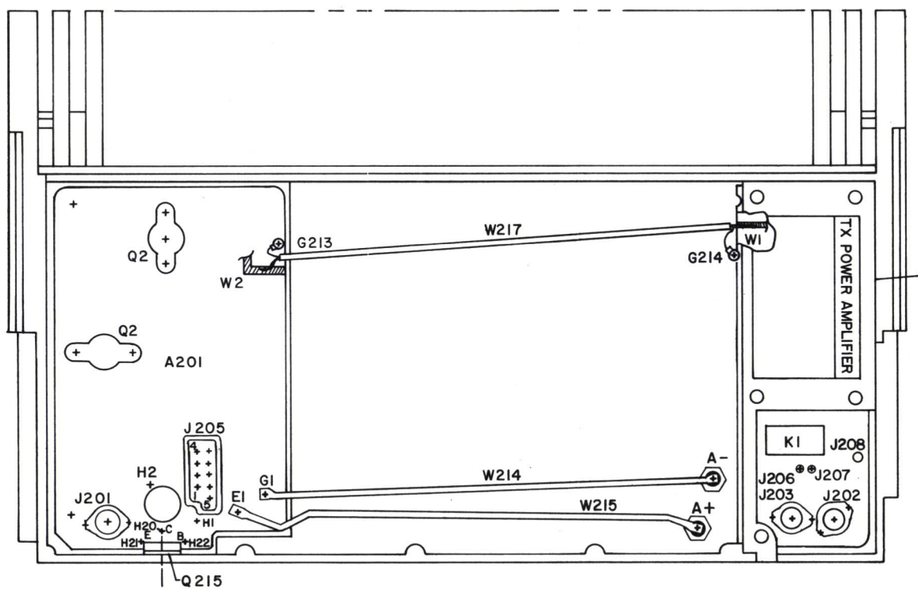
The power adjust circuit consists of R3 and Q215. R3 controls the base voltage and therefore the conduction of Q215. Q215 is connected in series with the collector feed network for Q1 thereby controlling the drive to PA transistor Q2 and the output power. R3 is adjust to provide the desired output power over a range of 8 to 25 watts.

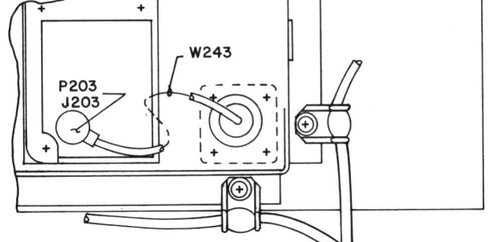
CONTINUOUS DUTY STATION



DUPLEX STATION

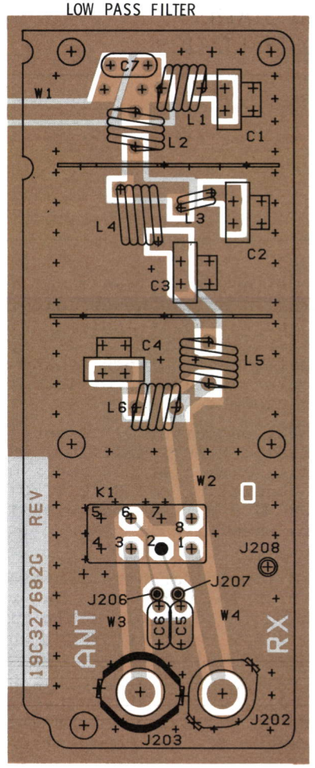
MOBILE AND INTERMITTENT DUTY STATION

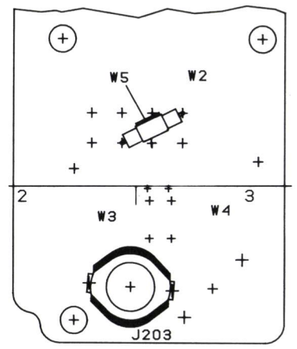




(19D429337, Rev. 0)

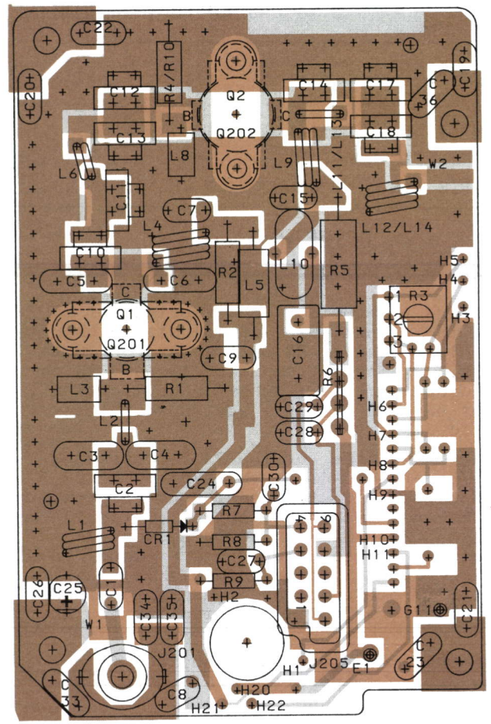
LOW PASS FILTER





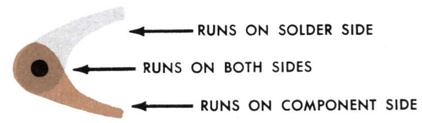
(19C327891, Rev. 0)
(19B227887, Sh. 1, Rev. 0)
(19B227887, Sh. 2, Rev. 0)

PA BOARD



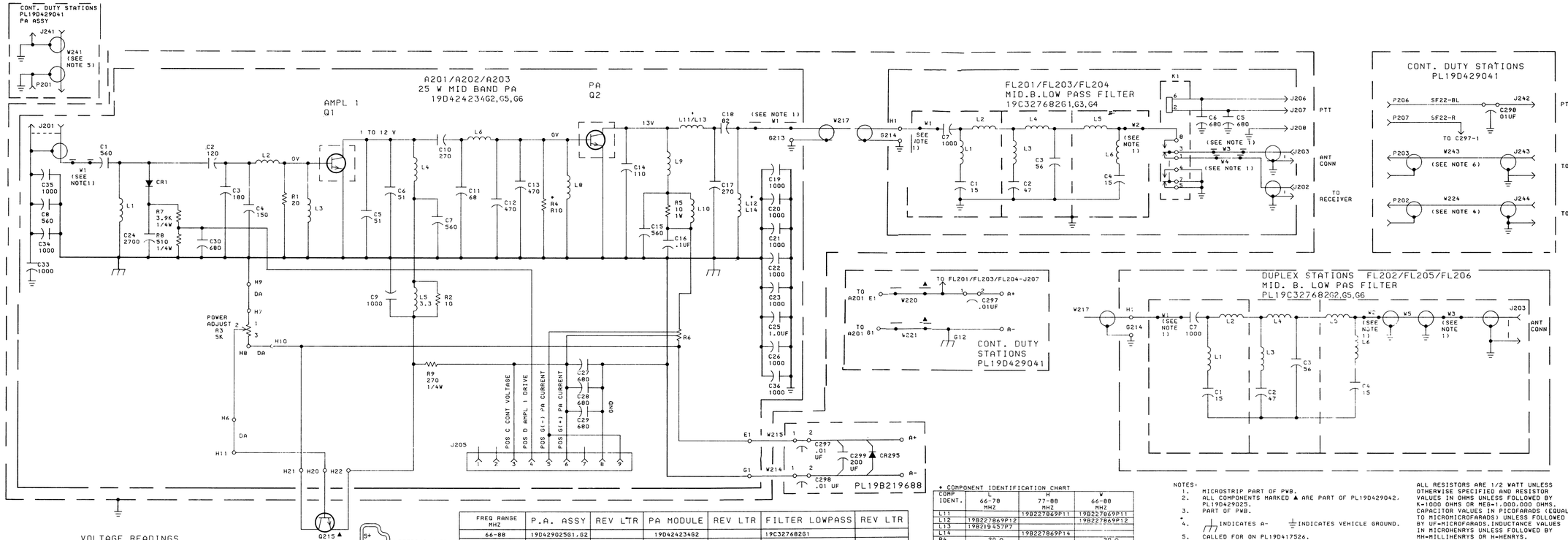
(19C327844, Rev. 2)
(19B227591, Sh. 1, Rev. 1)
(19B227591, Sh. 2, Rev. 1)

CONNECTION CHART			
FROM	TO	WIRE	REMARKS
H10	H8	DA	SLEEVE
H11	H6	DA	SLEEVE
H7	H9	DA	SLEEVE



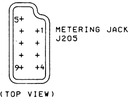
OUTLINE DIAGRAM

66—88 MHz, 25-WATT
POWER AMPLIFIER



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.



FREQ RANGE MHZ	P.A. ASSY	REV LTR	PA MODULE	REV LTR	FILTER LOWPASS	REV LTR
66-88	19D429025G1,G2		19D424234G2		19C327682G1	
66-88	19D429041G1		19D424234G2		19C327682G1	
66-88	19D429041G2		19D424234G2		19C327682G2	
66-78	19D429025G3,G5		19D424234G5		19C327682G3	
77-88	19D429025G4,G6		19D424234G6		19C327682G4	
66-88	19D429041G3		19D424234G5		19C327682G3	
77-88	19D429041G4		19D424234G6		19C327682G4	
66-88	19D429041G5		19D424234G5		19C327682G5	
77-88	19D429041G6		19D424234G6		19C327682G6	

(19R622252, Rev. 2)

♦ COMPONENT IDENTIFICATION CHART

COMP IDENT.	L 66-78 MHZ	H 77-88 MHZ	V 66-88 MHZ
L11		19B227869P11	19B227869P11
L12	19B227869P12		19B227869P12
L13	19B219457P7		
L14		19B227869P14	
R4	20 Ω		20 Ω
R10		33 Ω	

NOTES:
1. MICROSTRIP PART OF PWB.
2. ALL COMPONENTS MARKED ▲ ARE PART OF PL19D429042. PL19D429025.
3. PART OF PWB.
4. ⏚ INDICATES A- ⏚ INDICATES VEHICLE GROUND.
5. CALLED FOR ON PL19D417526.
6. CALLED FOR ON PL19D423240.

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.

SCHEMATIC DIAGRAM

66—88 MHz, 25-WATT POWER AMPLIFIER

Issue 2

PARTS LIST

LB130633A

66-88 MHz, 25 WATT POWER AMPLIFIER
19D429025G1,G3,G4 "M" SERIES MOBILE, INT DUTY STATION
19D429025G2,G5,G6 "E" SERIES MOBILE
19D429041G1,G3,G4 CONTINUOUS DUTY STATION
19D429041G2,G5,G6 CONTINUOUS DUTY DUPLEX

SYMBOL	GE PART NO.	DESCRIPTION
		25 WATT MODULE
A201 thru A203		A201 19D424234G2 66-88 MHz A202 19D424234G5 66-78 MHz A203 19D424234G6 77-88 MHz
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116655P15	Ceramic disc: 560 pf ±20%, 1000 VDC=; sim to RMC Type JF Discap.
C2	19A116679P120J	Silver mica: 120 pf ±5%, 250 VDCW.
C3	7489162P33	Silver mica: 180 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C4	7489162P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C5	19A116655P56J8	Ceramic disc: 56 pf ±5%, 500 VDCW, temp coef -80 PPM.
C6	19A116656P51J8	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -80 PPM.
C7 and C8	19A116653P15	Ceramic disc: 560 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C10	19A116679P270J	Mica: 270 pf ±5%, 250 VDCW.
C11	19A116679P68J	Silver mica: 68 pf ±5%, 250 VDCW.
C12 and C13	19A116679P470J	Silver mica: 470 pf ±5%, 250 VDCW.
C14	19A116679P110J	Silver mica: 110 pf ±5%, 250 VDCW.
C15	19A116655P15	Ceramic disc: 560 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C16	19A116966P107	Metallized polyester: 0.1 µf ±10%, 50 VDCW.
C17	19A116679P270J	Mica: 270 pf ±5%, 250 VDCW.
C18	19A116679P82J	Mica: 82 pf ±5%, 250 VDCW.
C19 thru C23	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C24	19A116655P21	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C25	19A134202P14	Tantalum: 1 µf ±20%, 35 VDCW.
C26	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C27 thru C30	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C33 thru C36	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - TERMINALS - - - - - - - - -
E1	19A134263P1	Contact, electrical: sim to Selectro 22901082-00-0-590.
G11	19A134263P1	Contact, electrical: sim to Selectro 229-1082-00-0-590.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J201	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
J205	19B219374G1	Connector: 9 contacts.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B227869P6	Coil.
L2	19B227869P7	Coil.
L3	19A129773G1	Coil.
L4	19B227869P8	Coil.
L5	7488079P10	Choke, RF: 3.30 µh ±10%, 0.15 ohms DC res max; sim to Jeffers 4421-1K.
L6	19B227869P9	Coil.
L8	19A129773G1	Coil.
L9	19B227869P10	Coil.
L10	19A129346G1	Coil.
L11	19B227869P11	coil.
L12	19B227869P12	Coil.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A134489P1	Silicon, NPN.
Q2	19A134489P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
R2	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R3	19A116559P102	Variable, cermet: 5K ohms ±20%, .5 w; sim to CTS Series 360.
R4	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
R5	3R78P100J	Composition: 10 ohms ±5%, 1 w.
R6	19C320212P2	Shunt resistor.
R7	3R152P392J	Composition: 3.9K ohms ±5%, 1/4 w.
R8	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R9	3R152P274J	Composition: 270K ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 and W2		(Part of 19D424233P1 printed board).
		POWER AMPLIFIER 19D429025G1 "M" SERIES MOBILE, INT DUTY STATION 19D429025G2 "E" SERIES MOBILE
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL201		COMPONENT BOARD 19C327682G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116679P15D	Metallized teflon: 15 pf ±.5 pf 250 VDCW.
C2	19A116679P47G	Metallized teflon: 47 pf ±2%, 250 VDCW.
C3	19A116679P56G	Silver mica: 56 pf ±2%, 250 VDCW.
C4	19A116679P15D	Metallized teflon: 15 pf ±.5 pf, 250 VDCW.
C5 and C6	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J202 and J203	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
J206 and J207	19A134263P2	Contact, electrical: sim to Selectro 229-1071.
J208	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1	19B209558P1	Hermetic sealed: 180 to 341 ohms coil res, 2 form C contacts, 8.0 to 16.3 VDC; sim to GE 3SAV1760A2.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B227869P1	Coil.
L2	19B227869P2	Coil.

SYMBOL	GE PART NO.	DESCRIPTION
L3	19B227869P3	Coil.
L4	19B227869P4	Coil.
L5	19B227869P5	Coil.
L6	19B227869P1	Coil.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 thru W4		(Part of printed board 19D424663P1).
		- - - - - - - - - TERMINALS - - - - - - - - -
G213 and G214	7878455P2	Terminal, lug.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q215	19A116742P1	Silicon, NPN.
		- - - - - - - - - - CABLES - - - - - - - - - -
W214	19B226725G1	Jumper. 5-3/4 inches long.
W215	19B227074G1	Jumper. 6 inches long.
W217	19A130555G2	Cable, RF: approx 6-1/2 inches long.
		HEAT SINK ASSEMBLY 19B219688G7 "M" SERIES 19B219688G19 "E" SERIES
		- - - - - - - - - CAPACITORS - - - - - - - - -
C297 and C298	19A116708P1	Ceramic, feed-thru: 0.01 µf +100% -0%, 500 VDCW; sim to Erie Style 327.
C299	19A115680P10	Electrolytic: 200 µf +150% -10%, 18 VDCW; sim to Mallory Type TTX.
		- - - - - - - - DIODES AND RECTIFIERS - - - - -
CR295	19A116783P1	Silicon.
		POWER AMPLIFIER 19D429041G1 CONT DUTY STATION 19D429041G2 CONT DUTY DUPLEX
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C298	19A116708P1	Ceramic, feed-thru: 0.01 µf +100% -0%, 500 VDCW; sim to Erie Style 327.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL201 and FL202		COMPONENT BOARD 19C327682G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116679P15D	Metallized teflon: 15 pf ±.5 pf 250 VDCW.
C2	19A116679P47G	Metallized teflon: 47 pf ±2%, 250 VDCW.
C3	19A116679P56G	Silver mica: 56 pf ±2%, 250 VDCW.
C4	19A116679P15D	Metallized teflon: 15 pf ±.5 pf, 250 VDCW.
C5 and C6	19A116655P18	Ceramic disc: 680 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7	19A116655P20	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J202 and J203	19A130924G1	Connector, receptacle: coaxial, jack type; sim to Cinch 14H11613.
J206 and J207	19A134263P2	Contact, electrical: sim to Selectro 229-1071.
J208	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1	19B209558P1	Hermetic sealed: 180 to 341 ohms coil res, 2 form C contacts, 8.0 to 16.3 VDC; sim to GE 3SAV1760A2.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B227869P1	Coil.
L2	19B227869P2	Coil.
L3	19B227869P3	Coil.
L4	19B227869P4	Coil.
L5	19B227869P5	Coil.
L6	19B227869P1	Coil.
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W1 thru W4		(Part of printed board 19D424663P1).
W5	19A130607G3	Cable, RF: approx .7 of an inch.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
G213 and G214	7878455P2	Terminal, lug.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P206 and P207	4036634P1	Contact, electrical; sim to AMP 42428-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q215	19A116742P1	Silicon, NPN.
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W217	19A130555G2	Cable, RF: approx 6-1/2 inches long.
W220	19B227087G1	Jumper: 6 inches long.
W221	19B227088G1	Jumper.
W244	5491689P104	Cable, RF: approx 12 inches long; 350 VRMS, 500 VDC operating voltage.
		HEAT SINK ASSEMBLY 19D423340G3
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C297	19A116708P1	Ceramic, feed-thru: 0.01 µf +100% -0%, 500 VDCW; sim to Erie Style 327.
		- - - - - - - - - - - CABLES - - - - - - - - - - -
W243		CABLE ASSEMBLY 19A129313G6
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J243		Connector. Includes:
	4029493P1	Receptacle, coaxial: sim to Amphenol 83-79S.
	4029082P2	Cover, electrical.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P203	5491689P108	Connector/cable: approx 10 inches long.
		FRAME ASSEMBLY 19D417526G3
		- - - - - - - - - - CABLES - - - - - - - - - -
W241	5491689P104	Cable, RF: approx 12 inches long; 350 VRMS, 500 VDC operating voltage.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19C321982P1	Insulator. (Located under A201).
	19A134016P1	Insulator, bushing. (Used with Q215).
	19A116023P3	Insulator, plate. Dupont 300 Kapton H. (Used with Q215).
	N44P9010C6	Machine screw; No. 4-40 x 5/8. (Secures Q1, Q2).
	19B2010074P306	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/8. (Secures G214).
	N80P13024C	Machine screw, phillips: No. 6-32 x 1-1/2. (Secures FL201).

SYMBOL	GE PART NO.	DESCRIPTION
	19B219391G1	Filter casting. (FL201).
	19B219404G1	Web Filter. (STATION).
	19B201074P312	Tap screw, Phillips POZIDRIV®: No. 6-32 x 3/4. (Secures W221 to 7150186P115 spacer).
	7150186P115	Spacer, standoff: No. 6 x 1/2. (Used with W221).
	19B201074P204	Tap screw, Phillips POZIDRIV®: No. 4-40 x 1/4. (Secures J243, W241, W244).
	N529P18C6	Plug button. (Used when J244 not used- Duplex).
	713989P3	Hex nut, brass. (Secures C297, C298- STATION).
	19B201074P304	Tap screw, Phillips POZIDRIV®: No. 6-32 x 1/4. (Secures 19D417526G3 frame assembly).
	19D417513G1	P.A. Cover.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES