LBI-38128B

MAINTENANCE MANUAL

150-174 MHz, 110 WATT POWER AMPLIFIER 19D901865G1 136-174 MHz, 40 WATT POWER AMPLIFIER 19D901865G2,3

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DESCRIPTION

The PA assembly uses five RF power transistors to provide 110 watts of output power, or 3 RF transistors to provide 40 watts of output power. The output power is adjustable over a range of 55 to 110 watts in the high power PA, and 20 to 40 watts in the medium power PA. Five transistors are used in the power control circuit.

Supply voltage for the PA is connected from power leads on the Transmit-Receive-System (TRS) board through feedthrough capacitors A2-C1 and C2 to hole 11 (A-) and hole 12 (A+) on the PA board. C52, C53, and L23, and L24 prevent RF from getting on the power leads. Diode D5 will cause the main fuse in the fuse assembly to blow if the polarity of the power leads is reversed.

The PA assembly is insulated from vehicle ground by C33 through C44 to permit operation in positive or negative ground vehicles.

PA metering Jack J1 is provided for use with GE Test Set Model 4EX3A11 or Test Kit 4EX8K12 with a cable adaptor. The Test Set meters the RF drive (exciter output), control voltage driver current, PA current and PA voltage.

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 in-line fuses to blow.

CIRCUIT ANALYSIS

RF AMPLIFIERS

The exciter output is coupled through P101 on the TRS board to PA input jack J3. The RF is coupled through a 50 ohm stripline (Z5) and then through T1, stripline Z6, L1 and Z7 to the base of 1st RF Driver Q1.

Part of the RF is rectified by D1 and applied to RF Switch Q13 to activate the power control circuitry. Part of the DC voltage is applied to voltage dividers R1 and R2 for metering the exciter output at J1.

The RF amplifiers consist of three Class C, common-emitter amplifiers. In 40 watt transmitters, Q3 is the PA stage. R17, L12 and L42 are a stabilizing network in the base of Q3. The output of Q3 is coupled through 50 ohm coaxial cable W6 to the low pass filter and then to the antenna relay.

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Driver current is metered at J1 (Driver Current). The reading is taken on the one-volt scale with the High Sensitivity button pressed, and with the meter polarity switch in the minus (-) position. The meter is read as 15 amperes full scale. Jumpers W3, W5 and W7 act as shunt resistors for the metering circuit.

In 110 watt transmitters, the 40 watt output is coupled through jumper W1 to a Wilkinson power splitter consisting of C57, C59, L26, L27 and Z1.

The power amplifier stages consist of two identical paralleled Class C power amplifiers (Q5 and Q6).

L30, L32, R24 and C63 make up a stabilizing network in the base of Q5, while L31, L33, R25 and C68 make up the stabilizing network in the base of Q6. Supply voltage (A+) for Q5 and Q6 is coupled through collector feed networks Z3 and Z4.

Collector current for Q5 and Q6 is measured at J1 (PA Current). The reading is taken on the one-volt scale with the high sensitivity button pressed and the polarity switch in the minus (-) position. The current is read as 30 amperes full scale.

The output of Q5 and Q6 is applied to a Wilkinson power combiner consisting of C78, L40, Z2, L41 and C79. The output of the combiner is coupled through T2 and two 50 ohm striplines (Z16 and Z17) to the low pass filter. The filter output is coupled through 50 ohm stripline to Z18 to the antenna relay (K1).



The RF Power Transistors used in the transmitter contain Beryilium 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 CONTROL CIRCUIT

The power control circuit provides power leveling as well as thermal protection for the PA.

When the transmitter is keyed, RF is rectified by D1. The resulting DC turns on RF switch Q13. This allows Q11, Q12 and pass transistor Q4 to turn on. Turning on Q4 applies collector voltage to 1st RF driver Q1.

If the power output should start to increase above the level set by R23, Q14 will start to conduct. This causes Q12, Q11 and Q13 to conduct less, reducing the collector voltage to the 1st RF driver.

Thermal protection is provided by temperature compensating resistor R19. As the heat sink temperature rises above 70° C, the resistance of R19 decreases. This causes Q3, Q11, and Q12 to conduct less, reducing the power output.



Do not operate the transmitter at levels higher than rated output. Operating at higher than rated output will shorten the life of the RF power transistor.

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POWER AMPLIFIER 19D9018615G1-G3

(19D901861, Rev. 2)

OUTLINE DIAGRAM

LEAD IDENTIFICATION FOR ALL TRANSISTORS NOT OTHERWISE IDENTIFIED



NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

TOP VIEW







LBI-38128

POWER AMPLIFIER BOARD 19D901865G1-G3

(19D901860, Rev. 0)

PARTS LIST

POWER AMPLIFIER ASSEMBLY

19D901865G1 150-174 MHz, 110 WATT 19D901865G2 150-174 MHz, 40 WATT 19D901865G3 136-153 MHz, 40 WATT

And POWLER AMPLIFER BOARD Function Underwood 3F60202 (based in G3) A1 POWLER AMPLIFER BOARD Function Function Function A1 POWLER AMPLIFER BOARD Function Function Function C1 19A70000073 Function Function Function Function C1 19A70013722 Mac: 36 pF or 5%, 100 VDCW. Function Function Function C2 19A70013722 Coarnic: 470 pF or 2.5%, 100 VDCW. Function Function Function C3 19A70013722 Coarnic: 470 pF or 2.5%, 100 VDCW. Function Function Function C4 19A70013722 Coarnic: 470 pF or 2.5%, 100 VDCW. Function Function Function C4 19A70013721 Coarnic: 470 pF or 2.5%, 100 VDCW. Function Funccon Function Funct	SYMBOL	PART NO	DESCRIPTION	1 [SYMBOL	PART NO	DESCRIPTION
A1 Importance (1) C25 19470000820 Use: 103 pf + or 58, 100 VDCW, (losed in G1). C1 194001141022 Max: 56 pf + or 59, 100 VDCW. C26 194001212P Caramic: 010 if + or -296, 50 VDCW, (losed in G2). C1 194001141022 Max: 56 pf + or 59, 100 VDCW. C27 194701622P13 Caramic: 010 if + or -296, 50 VDCW, (losed in G2). C2 194701622P13 Caramic: 010 if + or -296, 50 VDCW, (losed in G2). C30 19470142P13 Caramic: 010 if + or -296, 100 VDCW, sim to Type JF Dacap. C3 194701622P13 Caramic: 010 if + or -296, 100 VDCW, sim to Type JF Dacap. C30 19470142P13 Max: 100 pf + or -396, 100 VDCW, sim to Type JF Dacap. C4 19470142P13 Caramic: 101 pf + or -296, 100 VDCW, sim to Type JF Dacap. C30 194701412P1 Max: 20 pf + or -396, 100 VDCW, (losed in G3). C5 19470142P13 Max: 100 pf + or -296, 100 VDCW, sim to Type JF Dacap. C31 194701412P2 Max: 20 pf + or -396, 100 VDCW, (losed in G3). C6 194701413P4 Max: 20 pf + or -396, 100 VDCW, sim to Type JF Dacap. Caramic: 101 pf + or -396, 50 VDCW. C7 19470142P14 Max: 20 pf + or -396, 100 VDCW, sim to Type JF Dacap. Caramic: 101 pf	STINDOL		POWER AMPLIFIER BOARD		STINDOL	i Altri No.	Underwood 3HS0020.(Used in G3).
Indef leader 1 and 1 Auge: 4 Wint 1 C26 19 A01602PB Caranic 150 pF or 196, 1000 VDCW, (Used in G2) C1 19 A01613P2 Micr. 35 pF + or 5%, 100 VDCW, Caranic 150 pF or 296, 100 VDCW, Used in G2, and G3. C2 19 A01602P13 Caranic 150 pF or 296, 100 VDCW, Used in G2, and G3. Caranic 150 pF or 5%, 100 VDCW, Used in G3. C3 19 A01602P13 Caranic 150 pF or 296, 100 VDCW, sin to Type JF Basep. Caranic 150 pF or 5%, 100 VDCW, Used in G3. C4 19 A01602P13 Caranic 150 pF or 5%, 100 VDCW, Used in G3. Micr. 100 pF or 5%, 100 VDCW, Used in G3. C5 19 A01602P13 Tanialum: 36 uF or 296, 100 VDCW, Used in G3. Micr. 100 pF or 5%, 100 VDCW, Used in G3. C6 19 A01613P24 Micr. 100 pF or 25%, 100 VDCW, Used in G3. Micr. 100 pF or 5%, 100 VDCW, Used in G3. C7 19 A01613P23 Micr. 100 pF or 25%, 100 VDCW, Used in G3. Micr. 100 pF or 5%, 100 VDCW, Used in G3. C8 19 A01613P24 Micr. 100 pF or 25%, 100 VDCW, Used in G3. Micr. 100 pF or 25%, 100 VDCW. C9 19 A01613P24 Micr. 100 pF or 25%, 100 VDCW, Used in G3. Micr. 100 pF or 25%, 100 VDCW. C9 19 A01613P24 Micr. 100 pF or 25%, 100 VDCW. Micr. 100 pF or 25%, 100 VDCW.	A1		19D901860G1 150 -174 MHz, 110 WATT		C25	19A700006P38	Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.
C1 IMATO H 18722 Cameric CDP ($4 = -20\%$, 50 VDCW, (Used in G2) and G3). Cameric CDP ($4 = -20\%$, 50 VDCW, (Used in G2) and G3). C1 19A70118724 Mice: 36 pF + e-5%, 100 VDCW. Cameric CDP ($4 = -20\%$, 50 VDCW, (Used in G1). Cameric CDP ($4 = -20\%$, 50 VDCW, (Used in G1). C2 19A701620P13 Cameric -40 pF + or -25%, 100 VDCW, sim to Type JF Decap. Cameric CDP ($4 = -20\%$, 500 VDCW, (Used in G1). C3 19A701620P13 Cameric -40 pF + or -25%, 100 VDCW, (Used in G1). Cameric CDP ($4 = -20\%$, 500 VDCW, (Used in G3). C4 19A701620P13 Cameric -40 pF + or -25%, 100 VDCW, (Used in G1). Cameric CDP ($4 = -20\%$, 500 VDCW, (Used in G3). C5 19A701620P13 Cameric -40 pF + or -25%, 100 VDCW, (Used in G3). Cameric -20 pF + or -5%, 100 VDCW, (Used in G3). C6 19A701620P13 Mice: 10 pF + or -5%, 100 VDCW, (Used in G3). Cameric -20 pF + or -5%, 100 VDCW, (Used in G3). C7 19A701620P13 Mice: 10 pF + or -5%, 100 VDCW, (Used in G3). Cameric -20 pF + or -5%, 100 VDCW, (Used in G3). C6 19A701620P13 Gammic -20 pF + or -5%, 100 VDCW, (Used in G3). Cameric -20 pF + or -5%, 100 VDCW, (Used in G3). C1 19A701620P13 Gammic -10 pF + or -20%, 1000 VDCW, sim to Type JF Decap. Cameric -20 pF + or -5%,			19D901860G2 150 -174 MHz, 40 WATT 19D901860G3 136 -153 MHz, 40 WATT		C26	19A701602P8	Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1).
C1 194/00113122 Mics: 36 p + a - 58, 100 VDCW; C27 194/0142813 Carante: 40 p + a - 28, 500 VDCW; sim to Type J = braz, 96, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim to Type J = braz, 97, 100 VDCW; sim			······CAPACITORS ······		C26	19A700121P2	Ceramic: 0.01 uF + or - 20%, 50 VDCW.(Used in G2 and G3).
C1 194/01413/28 Mics: 59 P+ or 5%, 100 UCW. thus C2 194/0143/291 Coamic, 470 p+ or 3%, 100 UCW. (smp coal M22) + or 30%, 100 UCW. (smp coal M22) + or 30%, 100 UCW. (losel in G1 and G2). C3 194/0143/291 Mics: 30 p+ or 5%, 100 UCW. (losel in G3). C4 Camic Camic 470 Exacp. (losel in G1). Camic	C1	19A701413P22	Mica: 36 pF + or -5%, 100 VDCW.		C27	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to
C2 19/37016247314 Caramic, disc. 18 pF + or -3%, 500 VDCW, lemp codel C3 19/3701602P13 Ceramic, 470 pF + or - 20%, 1000 VDCW, sim to C4 19/3701602P13 Ceramic, 470 pF + or - 20%, 1000 VDCW, sim to C5 19/3701602P13 Ceramic, 470 pF + or - 20%, 1000 VDCW, sim to C6 19/370143P23 Mice: 130 pF + or -5%, 100 VDCW, Used in G1. C6 19/370143P23 Mice: 130 pF + or -5%, 100 VDCW, Used in G1. C6 19/370143P23 Mice: 130 pF + or -5%, 100 VDCW, Used in G1. C7 19/370143P23 Mice: 130 pF + or -5%, 100 VDCW, Used in G1. C6 19/370143P23 Mice: 130 pF + or -5%, 100 VDCW, Used in G3. C7 19/3701602P13 Ceramic. 470 pF + or -2%, 1000 VDCW, Used in G3. C8 19/3701602P13 Ceramic. 470 pF + or -5%, 100 VDCW, Used in G3. C9 19/3701602P13 Ceramic. 470 pF + or -5%, 100 VDCW, Used in G3. C10 19/3701602P13 Ceramic. 470 pF + or -5%, 100 VDCW, Used in G3. C11 19/3701602P13 Ceramic. 470 pF + or -5%, 100 VDCW, Used in G3. C11 19/3701602P13 Ceramic. 470 pF + or -5%, 100 VDCW. C11 19/3701602P13 Ceramic. 470 pF + or -5%, 100 VDCW.	C1	19A701413P28	Mica: 56 pF + or -5%, 100 VDCW.		thru C29		Type JF Discap.
C3 mt C4 194701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C3 194701413P41 Mic: 180 pF + or -5%, 100 VDCW. (Used in G3). C4 194701413P44 Mic: 130 pF + or -5%, 100 VDCW. (Used in G1). C3 194701413P41 Mic: 130 pF + or -5%, 100 VDCW. (Used in G1). C4 194701413P44 Mic: 130 pF + or -5%, 100 VDCW. (Used in G3). C3 194701413P41 Mic: 130 pF + or -5%, 100 VDCW. (Used in G3). C4 194701602P13 Ceramic: 470 pF + or -5%, 100 VDCW. (Used in G3). C3 194701602P13 Dept + or -5%, 100 VDCW. (Used in G1). C8 194701602P13 Ceramic: 470 pF + or -5%, 100 VDCW. C34 194701602P13 Dept + or -5%, 100 VDCW. Sam f - or -20%, 1000 VDCW. C9 194701602P13 Ceramic: 470 pF + or -5%, 100 VDCW. C38 194701602P13 Dept + or -5%, 100 VDCW. C10 194701602P13 Ceramic: 470 pF + or -5%, 100 VDCW. C46 19470015P13 TelonMic:: 12 pF + or 5%, 250 VDCW. C11 194701602P13 Ceramic: 470 pF + or -5%, 100 VDCW. C46 19470015P13 TelonMic:: 12 pF + or 5%, 250 VDCW. C12 194701602P13 Ceramic: 470 pF + or -5%, 100 VDCW. C47 194701602P13 Dep - or 5%, 100 VDCW. Sam	C2	19A701624P314	Ceramic, disc: 18 pF + or -5%, 500 VDCW, temp coef N220 + or - 30 PPM/°C.		C30	19A701413P38	Mica: 150 pF + or -5%, 100 VDCW.(Used in G1 and G2)
CS 194701602P13 Ceramic: 470 p F + or - 20%, 100 VDCW; sim to Type JF Discap, Used in G1). C31 194701413P24 Mica: 30 p F + or -5%, 100 VDCW. C6 194701413P24 Mica: 100 p F + or -5%, 100 VDCW, Used in G1 and G2). C32 194701413P24 Mica: 30 p F + or -5%, 100 VDCW. (Used in G1). C6 19470143P24 Mica: 100 p F + or -5%, 100 VDCW. (Used in G3). C33 19470162P13 Patiestic 0 1 u F + or -5%, 100 VDCW. (Used in G1). C7 19470162P13 Ceramic: 470 p F + or -2%, 100 VDCW. C34 19470162P13 Ceramic: 470 p F + or -2%, 100 VDCW. C8 194701602P13 Ceramic: 470 p F + or -5%, 100 VDCW. C38 194701602P13 Ceramic: 470 p F + or -2%, 100 VDCW. C10 194700062P28 Mica: 50 p F + or -5%, 100 VDCW. C38 19470015P13 TeleoNMica: 22 p F + or -5%, 250 VDCW. C11 19470143P43 Mica: 20 p F + or -5%, 250 VDCW. C46 19470015P13 TeleoNMica: 22 p F + or -5%, 250 VDCW. C13 194701602P13 TeleoNMica: 22 p F + or -5%, 250 VDCW. C47 194701602P13 TeleoNMica: 22 p F + or -5%, 250 VDCW. C14 194701602P13 Ceramic: 010 VDCW, 198 to 100 VDCW, 198 to 100 VDCW, 198 to 101<	C3 and C4	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.		C30	19A701413P41	Mica: 180 pF + or -5%, 100 VDCW. (Used in G3).
Type JF Discap: Circle	C5	19A701602P13	Containing: $470 \text{ pE} \pm \text{or} = 20\% - 1000 \text{ VDCW/s} \text{ sim to}$		C31	19A701413P43	Mica: 200 pF + or -5%, 100 VDCW.
C6 19A701413P34 Mca:: 100 pF + or 5%, 100 VDCW. (Used in G1 and G2). C12 19A701413P21 Mca:: 30 pF + or 5%, 100 VDCW. (Used in G3). C6 19A701413P37 Mca:: 130 pF + or 5%, 100 VDCW. (Used in G3). C3 19A701602P13 Ceramic: 10 pF + or -20%, 50 VDCW. (Used in G1). C8 19A701602P13 Ceramic: 470 pF + or 5%, 100 VDCW, ism to Type JF Discop. Ceramic: 470 pF + or -20%, 100 VDCW. ism to Type JF Discop. C9 19A701602P13 Ceramic: 50 pF + or 40%, 100 VDCW. ism to Type JF Discop. C33 19A70250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. ism to Type JF Discop. C10 19A700006P28 Mca:: 56 pF - or -5%, 100 VDCW. ism to Type JF Discop. C44 19A7001602P13 Ceramic: 470 pF + or 5%, 250 VDCW. C11 19A703314P5 Mca:: 20 pF + or -5%, 250 VDCW. C44 19A701602P13 Ceramic: 470 pF + or 5%, 250 VDCW. C14 19A701602P13 Teton/Mca:: 8.2 pF + or 5%, 250 VDCW. C44 19A701602P13 Ceramic: 470 pF + or 5%, 100 VDCW, ism to Type JF Discop. C14 19A701602P13 Ceramic: 10 uF + or -20%, 50 VDCW. ism to Type JF Discop. C46 19A701602P13 Ceramic: 470 pF + or 5%, 100 VDCW. C14 19A701602P13 Ceramic: 10	00	17/10/0021 10	Type JF Discap. (Used in G1).		C32	19A701413P20	Mica: 30 pF + or -5%, 100 VDCW.(Used in G1).
-0.2, -0.2 , <	C6	19A701413P34	Mica: 100 pF + or -5%, 100 VDCW. (Used in G1 and		C32	19A701413P22	Mica: 36 pF + or -5%, 100 VDCW.(Used in G2 and G3).
C7 19A701534P13 Tantalum: $.68 \ UF + or - 20\%, 35 \ VDCW.$ Caramic: $.470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. Ceramic: .470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. C9 19A701602P13 Ceramic: .470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. Caramic: .470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. C10 19A700006P26 Mica: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Underwood 3150020. (Used in G3). C46 19A700015P3 TethanMica: 8.2 \ pf + or - 5\%, 250 \ VDCW. C11 19A701602P13 Caramic: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Underwood 3150020. (Used in G3). C46 19A700015P3 TethanMica: 8.2 \ pf + or - 5\%, 250 \ VDCW. C11 19A701602P13 Caramic: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Underwood 3150020. (Used in G3). C47 19A700015P3 TethanMica: 8.2 \ pf + or - 5\%, 250 \ VDCW. C12 19A701602P13 Caramic: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. C48 19A701602P13 Ceramic: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. C15 19A701602P13 Ceramic: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. C55 19A701602P13 Ceramic: 470 \ pf + or - 20\%, 1000 \ VDCW; sim to Type. JF Discap. C15 19A700006P37 Mica: 130 \ pf - or - 5\%, 100 \ VDCW; sim to Type. JF Discap. $	C6	19A701413P37	G2). Mica: 130 pF + or -5%, 100 VDCW. (Used in G3).		C33	19A702250P113	Polyester: 0.1 uF + or -10%, 50 VDCW. (Used in G1 and G3).
C8 19A701602P13 Ceramic: 170 pF + or - 20%, 1000 VDCW: sim to Type JF Discap. Type JF Discap. Type JF Discap. C9 19A701602P8 Ceramic: 170 pF + or - 5%, 100 VDCW: sim to Underwood 3H50020 (Used in G3). C38 19A702250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. C10 19A700006P28 Mica: 50 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). C46 19A70015P3 TetlonMica: 8.2 pF + or -5%, 250 VDCW. C11 19A701602P13 Caramic: 170 pF + or -20%, 500 VDCW, sim to Underwood 3H50020 (Used in G3). C46 19A70015P3 TetlonMica: 8.2 pF + or -5%, 250 VDCW. C11 19A701602P13 Mica: 200 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C47 19A70015P3 TetlonMica: 8.2 pF + or -5%, 250 VDCW. C12 19A701602P13 Ceramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C47 19A70016P3 TetlonMica: 8.2 pF + or -5%, 100 VDCW. C13 19A701602P13 Ceramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C53 19A70006P4 Electrolytic: 100 uF, -10+50% tot, 50 VDCW. C14 19A700006P3 Mica: 130 pF + or -5%, 100 VDCW; sim to Type JF Discap. C53 19A700162P13 Ceramic: 470 pF + or -20%, 50 VDCW. C54	C7	19A701534P13	Tantalum: .68 uF + or -20%, 35 VDCW.		C34	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to
C9 19A701602P8 Ceramic: 150 pF + or -10%, 1000 VDCW. C38 19A702202P113 Polyester: 0.1 uf + or -10%, 50 VDCW. C10 19A700006P26 Mica: 47 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). 19A701602P13 Ceramic: 470 pF + or -2%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). C46 19A7001602P13 Ceramic: 470 pF + or -5%, 250 VDCW. C11 19A70143P43 Mica: 200 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). C46 19A70015P12 Teflon/Mica: 82 pF + or -5%, 250 VDCW. C12 19A70153P2 T Teflon/Mica: 82 pF + or -5%, 250 VDCW. C48 19A701413P20 Mica: 30 pF + or -5%, 250 VDCW. C13 19A701602P13 Ceramic: 470 pF + or -20%, 1000 VDCW; sim to Parasonic LS Series. C46 19A7001602P13 Ceramic: 470 pF + or -5%, 100 VDCW. C15 19A701602P13 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C53 19A701602P13 Ceramic: 470 pF + or -20%, 1000 VDCW. C55 C16 19A700006P33 Mica: 150 pF + or -5%, 100 VDCW, sim to Underwood 3H50020 (Used in G3). C55 19A701413P24 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C16 19A70006P33 Mica: 150 pF + or -5%, 100 VDCW. (sim to Underwood 3H50020) (Used in	C8	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.		thru C37		Type JF Discap.
C10 19A700006P2 Mica: 47 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). C39 C44 19A701602P13 Caramic: 47 0 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C10 19A700006P28 Mica: 50 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). C46 19A70015P1 Telon/Mica: 20 pF + or -5%, 250 VDCW. C11 19A70143P43 Mica: 200 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3). C46 19A7001602P13 Telon/Mica: 20 pF + or -5%, 250 VDCW. C12 19A701402P13 Tantalum: 0.47 uF + or -20%, 35 VDCW. C48 19A701402P13 Telon/Mica: 20 pF + or -5%, 250 VDCW. C13 19A701602P13 Caramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C49 19A7001602P13 Caramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C14 19A701602P13 Caramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C53 19A701602P13 Caramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C15 19A701602P8 Ceramic: 470 pF + or -20%, 1000 VDCW; sim to Underwood 3H50020 (Used in G1). C54 19A701602P13 Caramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C16 19A7001602P13 Caramic: 470 pF + or -5%, 100 VDCW; sim to Underwood 3H50020 (Used in G3).	C9	19A701602P8	Ceramic: 150 pF + or -10%, 1000 VDCW.		C38	19A702250P113	Polyester: 0.1 uF + or -10%, 50 VDCW.
C10 19A700006P28 Mica: 56 pF + or -5%, 100 VDCW, sim to Underwood 3HS0020 (Used in G3). C46 19A700015P3 Teflon/Mica: 82 pF + or -5%, 250 VDCW. C11 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C47 19A700015P3 Teflon/Mica: 82 pF + or -5%, 250 VDCW. C12 19A701534P3 Tantalum: 0.47 uF + or -2%, 35 VDCW. C48 19A700015P3 Teflon/Mica: 82 pF + or -5%, 250 VDCW. C14 19A701602P13 Ceramic: 470 pF + or -2%, 100 VDCW; sim to Type JF Discap. C50 19A701602P13 Ceramic: 470 pF + or -2%, 100 VDCW; sim to Type JF Discap. C15 19A70060P37 Mica: 130 pF + or -2%, 100 VDCW; sim to Type JF Discap. C53 19A701602P13 Ceramic: 470 pF + or -2%, 100 VDCW; sim to Type JF Discap. C16 19A70006P37 Mica: 130 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020 (Used in G3). C55 19A701413P24 Mica: 120 pF + or -5%, 100 VDCW, (Used in G1). C16 19A70006P38 Mica: 170 pF + or - 20%, 100 VDCW; sim to Underwood 3HS0020 (Used in G3). C55 19A701413P24 Mica: 120 pF + or -5%, 100 VDCW, (Used in G1). C17 19A70152P13 Ceramic: 470 pF + or - 20%, 50 VDCW. C56 19A701413P34 Mica: 120 pF + or -5%, 100 VDCW, (Used in G1). </td <td>C10</td> <td>19A700006P26</td> <td>Mica: 47 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2).</td> <td></td> <td>C39 thru C45</td> <td>19A701602P13</td> <td>Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.</td>	C10	19A700006P26	Mica: 47 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2).		C39 thru C45	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.
C11 19A701413P43 Mica: 200 p F + or -5%, 100 VDCW. C12 19A701413P43 Mica: 200 p F + or -5%, 100 VDCW. C13 19A701534P3 Tantalum: 0.47 u F + or - 20%, 35 VDCW. Mica: 30 p F + or -5%, 100 VDCW. C14 19A701602P13 Ceramic: 170 p F + or -20%, 1000 VDCW; sim to Type J F Discap. Teflon/Mica: 82 p F + or -5%, 250 VDCW. C15 19A701602P13 Ceramic: 170 p F + or -20%, 1000 VDCW; sim to Type J F Discap. Teflon/Mica: 22 p F + or -5%, 250 VDCW. C16 19A700121P2 Ceramic: 0.01 u F + or -20%, 1000 VDCW; sim to Type J F Discap. C55 19A701602P13 Ceramic: 470 p F + or -20%, 1000 VDCW; sim to Type J F Discap. C16 19A700006P37 Mica: 130 p F + or -5%, 100 VDCW; sim to Underwood 3HS0020,(Used in G3). C55 19A701413P20 Mica: 160 p F + or -5%, 100 VDCW. (Used in G1). C17 19A701534P3 Tantalum: 0.47 u F + or -20%, 35 VDCW. C56 19A70015P37 Teflon/Mica: 220 p F + or -5%, 100 VDCW. (Used in G1). C17 19A701534P10 Tantalum: 0.47 u F + or -20%, 35 VDCW. C57 19A701413P20 Mica: 120 p F + or -5%, 100 VDCW. (Used in G1). C18 19A70052P13 Ceramic: 0 u F + or -5%, 100 VDCW. sim to Underwood 3HS0020.(Used in G3). C57<	C10	19A700006P28	Mica: 56 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3).		C46	19A700015P3	Teflon/Mica: 8.2 pF + or -5%, 250 VDCW.
C12 19A701534P3 Tantalum: 0.47 uF or - 20%, 35 VDCW. C13 19A703314P6 Electrolytic: 1 uF -10+50% tol, 50 VDCW; sim to Panasonic LS Series. C14 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C15 19A701602P18 Ceramic: 150 pF + or -10%, 1000 VDCW; (Used in G1). C15 19A700121P2 Ceramic: 0.01 uF + or - 20%, 50 VDCW. (Used in G2) and G3). C16 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Underwood 3HS0020. (Used in G3). C16 19A700006P38 Mica: 150 pF + or - 5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Underwood 3HS0020. (Used in G3). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C20 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C20 19A701534P3 Tantalum: 0.47 uF + or - 20%, 50 VDCW. C21 19A701534P3 Tantalum: 0.47 uF + or - 20%, 50 VDCW. C22 19A701534P10 Tantalum: 0.47 uF + or - 20%, 50 VDCW. C22 19A701534P17 Tantalum: 0.47 uF + or - 20%, 100 VDC	C11	19A701413P43	Mica: 200 pF + or -5%, 100 VDCW.		C47	19A700015P12	Teflon/Mica: 22 pF + or -5%, 250 VDCW.
C1319A703314P6Electrolytic: 1 uF -10+50% tol, 50 VDCW; sim to Panasonic LS Series.C4919A700015P3Teflon/Mica: 8.2 pF + or -5%, 250 VDCW.C1419A701602P13Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.C5319A701602P13Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.C1519A701602P3Ceramic: 0.01 uF + or - 20%, 50 VDCW. (Used in G1).C5319A700604P4Electrolytic: 100 uF, -10+150%, 250 VDCW.C1619A70006P37Mica: 130 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3).C5519A701413P22Mica: 36 pF + or -5%, 100 VDCW; (Used in G1).C1619A701602P13Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Underwood 3HS0020. (Used in G3).C5719A701413P34Mica: 120 pF + or -5%, 100 VDCW. (Used in G1).C1619A701602P13Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.C5719A701413P34Mica: 120 pF + or -5%, 100 VDCW. (Used in G1).C1719A701602P13Ceramic: 470 pF + or - 20%, 35 VDCW.C5819A7001413P34Mica: 220 pF + or -5%, 250 VDCW. (Used in G1).C1919A701534P3Tantalum: 0.47 uF + or - 20%, 35 VDCW.C6019A70015P37Teflon/Mica: 220 pF + or -5%, 250 VDCW. (Used in G1).C2019A70154P13Tantalum: 0.47 uF + or - 20%, 50 VDCW.C6319A70006P38Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1).C2119A70154P13Tantalum: 10 uF + or -20%, 55 VDCW.C6319A70015P31Teflon/Mica: 230 pF + or -5%, 250 VDCW. (Used in G1).C2219A701602P13Ceramic:	C12	19A701534P3	Tantalum: 0.47 uF + or - 20%, 35 VDCW.		C48	19A701413P20	Mica: 30 pF + or -5%, 100 VDCW.
C14 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C50 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C15 19A701602P13 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C53 19A700064P4 Electrolytic: 100 uF, -10+150%, 250 VDCW. C16 19A700006P37 Mica: 130 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3). C55 19A70113P24 Mica: 150 pF + or -5%, 100 VDCW; (Used in G1). C16 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3). C55 19A70113P24 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Underwood 3HS0020. (Used in G3). C55 19A70113P34 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 35 VDCW. C57 19A70113P36 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C18 19A7001534P3 Tantalum: 10 uF + or -20%, 35 VDCW. C61 19A700015P37 Tefon/Mica: 220 pF + or -5%, 100 VDCW; (Used in G1). C20 19A701432P43 Mica: 150 pF + or -5%, 100 VDCW; sim to Type JF Discap. C62 19A700006P38 Mica: 150 p	C13	19A703314P6	Electrolytic: 1 uF -10+50% tol. 50 VDCW: sim to		C49	19A700015P3	Teflon/Mica: 8.2 pF + or -5%, 250 VDCW.
C14 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. Ci52 Ci53 19A70064P4 Electrolytic: 100 uF, -10+150%, 250 VDCW. C15 19A700121P2 Ceramic: 150 pF + or -20%, 50 VDCW. (Used in G1). Ci53 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Underwood 3HS0020.(Used in G2). Ci54 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3). C16 19A700006P37 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3). Ci55 19A701413P34 Mica: 100 pF + or -5%, 100 VDCW. (Used in G1). C16 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3). Ci57 19A701413P34 Mica: 120 pF + or -5%, 250 VDCW. (Used in G1). C17 19A70152P13 Ceramic: 470 pF + or - 20%, 35 VDCW. Ci58 194700015P37 Teflon/Mica: 220 pF + or -5%, 250 VDCW. (Used in G1). C20 19A701314P10 Electrolytic: 10 uF + or -20%, 35 VDCW. Ci61 19A700006P38 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A701432P43 Tantalum: 10 uF + or -20%, 50 VDCW. Ci63 19A700015P37 Teflon/Mica: 220 pF + or -5%, 100 VDCW, sim to Underwood 3HS0020. (Used in G1). C22 19A701413P43 Mica: 200 pF			Panasonic LS Series.		C50 thru	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type IF Discap
C15 19A701602P8 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C64 19A700121P2 Ceramic: 0.01 uF + or - 20%, 50 VDCW. (Used in G2 and G3). C54 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C16 19A700006P38 Mica: 130 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3). C55 19A7011413P42 Mica: 100 pF + or -5%, 100 VDCW. (Used in G1). C16 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G3). C55 19A7011413P34 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C59 19A7011413P36 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C60 19A70015P37 Teflon/Mica: 220 pF + or -5%, 100 VDCW. (Used in G1). C20 19A701534P10 Tantalum: 10 uF + or -20%, 25 VDCW. C61 19A700006P38 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A70143P43 Mica: 200 pF + or -5%, 100 VDCW; sim to Type JF Discap. C63 19A701602P8 Ceramic: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C22 19A70143P43 Mica: 200 pF + or -5%, 100 VDCW.	C14	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.		C52 C53	19A700064P4	Electrolytic: 100 uE -10+150% 250 VDCW
C15 19A700121P2 Ceramic: 0.01 uF + or - 20%, 50 VDCW.(Used in G2 and G3). C16 19A700006P37 Mica: 130 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C16 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3). C17 19A701602P13 Ceramic: 470 pF + or - 20%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3). C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C20 19A701534P10 Electrolytic: 10 uF + or -20%, 25 VDCW. C21 19A701534P10 Tantalum: 10 uF + or -20%, 25 VDCW. C22 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW; sim to Parasonic LS Series. C22 19A701602P13 Ceramic: 470 pF + or - 20%, 25 VDCW. C20 19A701534P10 Tantalum: 10 uF + or - 20%, 25 VDCW. C21 19A701602P13 Ceramic: 470 pF + or - 20%, 25 VDCW. C22 19A701602P13 Ceramic: 470 pF + or - 20%, 25 VDCW. C22 19A701602P13 Ceramic: 470 pF + or - 20%, 25 VDCW. C23 19A701602P13 Ceramic: 470 pF + or - 20%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1). C23 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW. C24 19A700006P38 <td< td=""><td>C15</td><td>19A701602P8</td><td>Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1).</td><td></td><td>C54</td><td>194701602P13</td><td>Ceramic: $470 \text{ pE} + \text{or} - 20\% 1000 \text{ VDCW}$; sim to</td></td<>	C15	19A701602P8	Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1).		C54	194701602P13	Ceramic: $470 \text{ pE} + \text{or} - 20\% 1000 \text{ VDCW}$; sim to
C16 19A700006P37 Mica: 130 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C33 17A701413122 Mica: 30 pF + or -5%, 100 VDCW. (Used in G1). C16 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G3). C56 19A701413P34 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C17 and C18 19A701602P13 Ceramic: 470 pF + or - 20%, 100 VDCW; sim to Type JF Discap. C57 19A701413P36 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C59 19A701413P36 Mica: 120 pF + or -5%, 100 VDCW; (Used in G1). C20 19A701534P3 Tantalum: 0.47 uF + or -20%, 35 VDCW. C61 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW; (Used in G1). C20 19A701534P10 Tantalum: 10 uF + or -10%, 50 VDCW. C62 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A701413P43 Mica: 20 pF + or -5%, 100 VDCW; sim to Type JF Discap. C63 19A701602P8 Ceramic: 150 pF + or -5%, 100 VDCW; (Used in G1). C22 19A701413P43 Mica: 20 pF + or -5%, 100 VDCW. C64 19A700015P41 Teflon/Mica: 30 pF + or -5%, 100 VDCW; (Used in	C15	19A700121P2	Ceramic: 0.01 uF + or - 20%, 50 VDCW.(Used in G2 and G3).		C55	104701413022	Type JF Discap. Mica: $36 \text{ nE} \pm \text{ or } 5\%$ 100 VDCW (Used in C1)
C16 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020 (Used in G3). C53 19A701413P34 Mica: 100 pF + or -5%, 100 VDCW. (Used in G1). C17 and C18 19A701602P13 Ceramic: 470 pF + or - 20%, 100 VDCW; sim to Type JF Discap. C57 19A701413P36 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C59 19A701413P36 Mica: 120 pF + or -5%, 100 VDCW. (Used in G1). C20 19A701534P10 Electrolytic: 10 uF -10+50%, 50 VDCW; sim to Panasonic LS Series. C61 19A700006P38 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A701602P13 Ceramic: 470 pF + or -20%, 25 VDCW. C63 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C22 19A701602P13 Ceramic: 470 pF + or -20%, 1000 VDCW; sim to Type JF Discap. C63 19A70016P41 Mica: 180 pF + or -5%, 250 VDCW. (Used in G1). C23 19A701402P13 Mica: 150 pF + or -2%, 100 VDCW; sim to Type JF Discap. C64 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; (Used in G1). C24 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C67	C16	19A700006P37	Mica: 130 pF + or -5%, 100 VDCW; sim to		C55	19A701413F22	Mica. 30 pr + 01 - 5%, 100 VDCW. (Used in G1).
C16 19A700006P38 Mitca: 120 pF + or -5%, 100 VDCW; Sim to Underwood 3HS0020.(Used in G3). C17 and C18 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C53 19A701413P30 Mitca: 120 pF + or -5%, 250 VDCW. (Used in G1). C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C60 19A700015P37 Teflon/Mica: 220 pF + or -5%, 250 VDCW. (Used in G1). C20 19A701534P10 Electrolytic: 10 uF -10+50%, 50 VDCW; sim to Panasonic LS Series. C61 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A701534P10 Tantalum: 10 uF + or -20%, 25 VDCW. C62 19A70006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C22 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Type JF Discap. C63 19A700015P41 Teflon/Mica: 330 pF + or -5%, 250 VDCW. (Used in G1). C23 19A701413P43 Mica: 120 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C64 19A700015P41 Teflon/Mica: 330 pF + or -5%, 250 VDCW. (Used in G1). C24 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C67 19A700006P41 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C24 <	C1/	10470000/ 020	Mise: 150 pF ; er 50/ 100 V/DC/W sim to		C50	194701413F34	Mica: 100 pF + or 5%, 100 VDCW. (Used in G1).
C17 and C18 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C36 19A700015P37 Tentol/Mica: 220 pF + or -5%, 100 VDCW. (Used in G1). C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C59 19A700015P37 Tefton/Mica: 220 pF + or -5%, 100 VDCW. (Used in G1). C20 19A701314P10 Electrolytic: 10 uF -10+50%, 50 VDCW; sim to Panasonic LS Series. C61 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C20 19A701602P13 Ceramic: 470 pF + or -20%, 25 VDCW. C62 19A700006P38 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A702250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. C63 19A701602P8 Ceramic: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C22 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW; sim to Type JF Discap. C63 19A70015P41 Teflon/Mica: 330 pF + or -5%, 100 VDCW. (Used in G1). C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C66 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C24 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C67 19A700006P38 Mica: 150 pF + or -5%, 100	010	19A700000P38	Underwood 3HS0020.(Used in G3).		C57	104700015D27	Toflap/Mica: 220 pF $+$ or 5%, 100 VDCW. (Used in G1).
C10 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C19 19A701534P3 Tantalum: 0.47 uF + or - 20%, 35 VDCW. C20 19A703314P10 Electrolytic: 10 uF - 10+50%, 50 VDCW; sim to Panasonic LS Series. C61 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C20 19A701534P10 Tantalum: 10 uF + or -20%, 25 VDCW. C62 19A700006P38 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A702250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. C63 19A701602P8 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C22 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C66 19A700015P41 Teflon/Mica: 330 pF + or -5%, 250 VDCW. (Used in G1). C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C66 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C24 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C24 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to <td>C17 and</td> <td>19A701602P13</td> <td>Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.</td> <td></td> <td>C58 C59</td> <td>19A700013P37</td> <td>Mica: 120 pF + or -5%, 100 VDCW. (Used in G1)</td>	C17 and	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.		C58 C59	19A700013P37	Mica: 120 pF + or -5%, 100 VDCW. (Used in G1)
C19 19A700334P3 Tailaidiii. 0.47 uF + 01 - 20%, 53 VDCW. C20 19A703314P10 Electrolytic: 10 uF -10+50%, 50 VDCW; sim to Panasonic LS Series. C61 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C20 19A701534P10 Tantalum: 10 uF + or -20%, 25 VDCW. C62 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1). C21 19A702250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. C63 19A701602P8 Ceramic: 150 pF + or -5%, 100 VDCW. (Used in G1). C22 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Type JF Discap. C64 19A700015P41 Teflon/Mica: 330 pF + or -5%, 250 VDCW. (Used in G1) C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C66 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C24 19A700006P41 Mica: 150 pF + or -5%, 100 VDCW; sim to C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to	C10	10470152402	Tantalum, 0.47 uE, or 200/ 25 VDCW		C60	19A700015P37	Teflon/Mica: 220 pF + or -5%, 250 VDCW. (Used in G1)
C20 19A701534P10 Tantalum: 10 uF + or -20%, 25 VDCW. C21 19A702250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. C22 19A701602P13 Ceramic: 470 pF + or -20%, 100 VDCW; sim to Type JF Discap. C63 19A7001602P8 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C64 19A700006P41 Mica: 180 pF + or -5%, 250 VDCW. (Used in G1) C24 19A70006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to	C19 C20	19A701534P3 19A703314P10	Electrolytic: 10 uF -10+50%, 50 VDCW; sim to		C61	19A700006P38	Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1).
C21 19A702250P113 Polyester: 0.1 uF + or -10%, 50 VDCW. C63 19A701602P8 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C22 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C63 19A701602P8 Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1). C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C66 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C66 19A700006P41 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to	C20	19A701534P10	Tantalum: 10 uF + or -20%, 25 VDCW.		C62	19A700006P41	Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1).
C22 19A701602P13 Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap. C64 and C65 19A700015P41 Teflon/Mica: 330 pF + or -5%, 250 VDCW. (Used in G1) C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C66 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1 and G2). C24 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to	C21	19A702250P113	Polyester: 0.1 uF + or -10%, 50 VDCW.		C63	19A701602P8	Ceramic: 150 pF + or -10%, 1000 VDCW. (Used in G1).
C23 19A701413P43 Mica: 200 pF + or -5%, 100 VDCW. C24 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C66 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C24 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to	C22	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.		C64 and	19A700015P41	Teflon/Mica: 330 pF + or -5%, 250 VDCW. (Used in G1)
C24 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C24 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2). C24 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2).	C23	19A701413P43	Mica: 200 pF + or -5%, 100 VDCW.		065	10470000/046	
C24 19A700006P41 Mica: 180 pF + or -5%, 100 VDCW; sim to C67 19A700006P38 Mica: 150 pF + or -5%, 100 VDCW; sim to	C24	19A700006P38	Mica: 150 pF + or -5%, 100 VDCW; sim to Underwood 3HS0020.(Used in G1 and G2).		C66	198700006P41	Wica: 180 pF + of -5%, 100 VDCW; sim to Underwood 3HS0020. (Used in G1).
	C24	19A700006P41	Mica: 180 pF + or -5%, 100 VDCW; sim to		C67	19A700006P38	Mica: 150 pF + or -5%, 100 VDCW; sim to

0			1		
SYMBOL	PART NO.	DESCRIPTION	SYMBOL	PART NO.	DESCRIPTION
C68	19A701602P8	Underwood 3HSU020. (Used in GT). Ceramic: 150 pE + or -10%, 1000 VDCW. (Used in G1).	L7 and	19A701091G1	Coil. Includes 19A700122P1 Torroidal core.
C69	19A700006P41	Mica: 180 pF + or -5% 100 VDCW: sim to	L8		
thru C72	1747000001 41	Underwood 3HS0020. (Used in G1).	L9	19A701848P1	Coil.
C73 and	19A700015P37	Teflon/Mica: 220 pF + or -5%, 250 VDCW. (Used in G1).	L12 and L13	19A701091G1	Coll. Includes 19A700122P1 forroidal core.
C75	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to	L14	19A701848P1	Coil.
	1047022500112	Type JF Discap. (Used in G1).	L16	19A702201P1	
077	19A702250P113		L17	19A701418P3	
C77	19A701534P10 19A703314P10	Tantalum: 10 μ F + or -20%, 25 VDCW. (Used in G1).	L18 thru L20	19A701419P3	Coil.
0,1		Panasonic LS Series. (Used in G1).	L20	19A701420P5	Coil.
C78 and	19A701413P34	Mica: 100 pF + or -5%, 100 VDCW. (Used in G1).	L22	19A701418P3	Coil.
C79			L23	19A701849P1	Coil.
C80	19A701413P35	Mica: 110 pF + or -5%, 100 VDCW. (Used in G1).	and L24		
C81	19A701413P6	Mica: 10 pF + or -5%, 100 VDCW. (Used in G1).	L25	19A702201P1	Coil. (Used in G1).
C82	19A701413P43	Mica: 200 pF + or -5%, 100 VDCW. (Used in G1).	1.07	10470105101	
C83 and C84	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.	L26 and L27	19A701851P1	Jumper.(Used in G1).
C85	19A700219P46	Ceramic: 33 pF + or -10%, 100 VDCW, temp coef 0 PPM/ C. (Used in G1).	L28 and L29	19A701420P3	Coil. (Used in G1).
C86 and C87	19A701602P13	Ceramic: 470 pF + or - 20%, 1000 VDCW; sim to Type JF Discap.	L30 and L31	19A700024P1	Coil, RF: 100 nH + or -10%, 0.08 ohms DC res max, 100 v. (Used in G1).
D1	19A700047P2	DIODES Silicon, 100 mW, continuous dissipation; sim to	L32 and L33	19A701091G1	Coil. (Used in G1).
52	10470000001		L34	19A701852P1	Coil. (Used in G1).
DZ	19A700020P1		L35		
D3	19A700025P16	Silicon, Zener: 400 mA max; sim to BZX55-C9V1.			
D4	19A700028P1	Silicon: 75 mA, 75 PIV; Sim to TN4148. (Used in GT).	L38	19A701420P4	Coil. (Used in G1).
D4	19A700047P2	DO-15. (Used in G2 and G3).	L39		
D5	19A700082P1	Rectifier, silicon; sim to MR751. (Used in G1).	L40 and	19A701851P1	Jumper. (Used in G1).
D5	T324ADP1041	Silicon: Rectifier; sim to 1N4004. (Used in G2 and G3).	L41		
D6	T324ADP1041	Silicon: Rectifier; sim to 1N4004.	L42	19A700024P1	Coil, RF: 100 nH + or -10%, 0.08 ohms DC res max, 100 v.
		JACKS			TRANSISTORS
J1	19B800555G3	Connector: metering, Includes 10 19A700237P1	Q1	19A701891P1	Silicon, NPN, VHF Amplifier, 5 watt, 12.5 v.
		contacts.	Q2	19A701891P4	Silicon, NPN, VHF Amplifier, 14.5 watt, 12.5 v.
J2	19A701854G1	Amphenol 83-87601002.	Q3	19A704867P1	Silicon, NPN, 12.5 v, 50 watt, VHF Amplifier.
J3 thru	19A701883P4	Contact, electrical; sim to AMP 86444-1.	Q4	19A700054P1	Silicon, NPN, 60 w; sim to BD-201.
J6			Q5 and	19A149632P1	Silicon, NPN (Used in G1).
		RELAYS	Q6		
K1	19A700061P1	Hermetic sealed: 180 to 341 ohms coil res,	Q11	19A700020P1	Silicon: PNP, 500 mW; sim to BC558A.
		HFW-1201558, or Potter-Brumfield HCM6160.	Q12	19A700023P2	Silicon, NPN: sim to 2N3904.
			Q14		
L1	19J706085P1	Coil, choke: 0.822 uH + or -30%; sim to Paul			····· RESISTORS ·····
12	10070100101	Smith LM-2.	R1	H212CRP182C	Deposited carbon: 820 ohms + or -5%, 1/4 w.
LJ	170/0107101	Som. Includes 174700122FT TUITUIddl CUIC.	R2	H212CRP133C	Deposited carbon: 330 ohms + or -5%, 1/4 w.
L4	19A701848P1	Coil.	R3	19A700106P29	Composition: 39 ohms + or - 5% 1/4 w
L5	19A701091G1	Coil. Includes 19A700122P1 Torroidal core.			

PARTS LIST

SYMBOL	PART NO.	DESCRIPTION
R4	19A700106P17	Composition: 12 ohms + or - 5%, 1/4 w. (Used in G2).
R4	19A700106P19	Composition: 15 ohms + or - 5%, 1/4 w. (Used in G1 and G3).
R5	19A700113P15	Composition: 10 ohms + or - 5%, 1/2 w.
R6 and R7	19A701250P444	Metal film: 280K ohms + or - 1%, 1/4 w.
R8	H212CRP156C	Deposited carbon: 560 ohms + or -5%, 1/4 w.
R9	H212CRP147C	Deposited carbon: 470 ohms + or -5%, 1/4 w.
R10	H212CRP210C	Deposited carbon: 1K ohms + or -5%, 1/4 w.
R11	19A700113P15	Composition: 10 ohms + or - 5%, 1/2 w.
R12	19A700106P31	Composition: 47 ohms + or - 5%, 1/4 w. (Used in G3).
R12	19A700106P23	Composition: 22 ohms + or - 5%, 1/4 w. (Used in G1 and G2).
R13	H212CRP182C	Deposited carbon: 820 ohms + or -5%, 1/4 w.
R14	H212CRP218C	Deposited carbon: 1.8K ohms + or -5%, 1/4 w.
R15	H212CRP122C	Deposited carbon: 220 ohms + or -5%, 1/4 w.
R16	H212CRP268C	Deposited carbon: 6.8K ohms + or -5%, 1/4 w. (Used in G1 and G3).
R16	H212CRP239C	Deposited carbon: 3.9K ohms + or -5%, 1/4 w. (Used in G2).
R17	19A700106P15	Composition: 10 ohms + or - 5%, 1/4 w.
R18	19A700113P15	Composition: 10 ohms + or - 5%, 1/2 w.
R19	19A701864P2	Thermistor: 50K ohms + or -10%; sim to Midwest Components 1H-503.
R20	H212CRP156C	Deposited carbon: 560 ohms + or -5%, 1/4 w. (Used in G1).
R20	H212CRP133C	Deposited carbon: 330 ohms + or -5%, 1/4 w. (Used in G2 and G3).
R21	H212CRP310C	Deposited carbon: 10K ohms + or -5%, 1/4 w. (Used in G1).
R21	H212CRP256C	Deposited carbon: 5.6K ohms + or -5%, 1/4 w. (Used in G2 and G3).
R22	H212CRP210C	Deposited carbon: 1K ohms + or -5%, 1/4 w.
R23	19B800784P108	Variable: 10K ohms + or -20%, 1/2 w.
R24 and R25	19A700113P15	Composition: 10 ohms + or - 5%, 1/2 w. (Used in G1).
R26		Composition: 51 ohms + or - 5%, 1/4 w.
		······ TRANSFORMERS ······
T1	19A702009G1	Coil. Includes: 19B800630P2 tuning slug.
T2	19A701878G1	Coil. (Used in G1).
		······CABLES ······
W1 thru W8		Part of Printed Wire Board
W1	19A701093P1	Strap. (Used in G1).
W2	19A701093P1	Strap.
W3	19A701851P2	Jumper.(Used in G1).
W4	19A701851P3	Jumper.(Used in G1).
W5	19A701851P4	Jumper.
	19A702075G1	Cable. (Used in G2 and G3).
W6		
W6 W7	19A701871P2	Cable.
W6 W7 W8	19A701871P2 19A701093P1	Cable. Strap. (Used in G2 and G3).

SYMBOL	PART NO.	DESCRIPTION
Z1 and Z2	19A702003G1	Load Network (Used in G1).
Z3 and Z4	19A701092G4	Filter Assembly. (Used in G1).
Z5 thru 719		Part of Printed Wire Board.
217		MISCELLANEOUS
3	19B800675P1	Shield, filter. (Used around C477, C48, L19, L21).
8	19A701309P1	Terminal. (Used with J2).
A2		FEED-THRU CAPACITOR ASSEMBLY 19A703218G1
		······ MISCELLANEOUS ······
3	19D900349G3	HANDLE LOCK ASSY. LOW POWER
4	19D900349G4	HANDLE LOCK ASSY. HIGH POWER
5	19A702381P525	Screw, thd. form: No. M3.5-0.6 x 25.
6	19D900262P1	Low pass filter housing.
7	19A700068P1	Insulator, bushing. (Used with Q4).
8	19A700115P3	Insulator, plate. (Used with Q1 and Q2).
9	19A704572P1	EYELET (Secures A2 to A1).
10	19A705469P1	Insulator Plate, TO-220. (Used with Q4).
11	19A701400P2	Insulated spacer. (At J4 - J6).
12	19A701368P1	Gasket. (Used with J2).
13	19A702381P510	Screw, thread forming: TORX DRIVE No. M3.5 - 0.6 x 10. (Secures J2).
14	19A701093P4	Strap. (Used with Q1 and Q2).
15	19A701706P1	Heat sink.Strap. (Used with Q1 and Q2).
16	19A702381P508	Screw, thd. form: No. 3.5-0.6 x 8. (Secures A2 to frame).
17	19A701983P1	Shield washer. (Used with Q1 and Q2).
20 and 21	19A702364P208	Machine screw: TORX Drive, M2.5 - 0.45 x 8. (Secures Q3, Q5 and Q6).
22	19A701502P1	Plastic bumper.

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 the descriptions of parts affected by these revisions.

REV. A - <u>POWER AMPLIFIER BOARD 19D901860G2</u> To improve transmitter stability, changed R4 from 15 ohms (19A700106P19) to 12 ohms (19A700106P17) and changed R12 from 47 ohms (19A700106P31) to 22 ohms (19A700106P23).

REV. B - <u>POWER AMPLIFIER BOARD 19D901860G2</u> To prevent PA from overheating due to oscillation, C33 deleted.

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