MAINTENANCE MANUAL
851-870 MHz, 100 WATT POWER AMPLIFIER
19D901841G1

TABLE OF CONTENTS

DESCRIPTION

The power amplifier assembly for MASTR II/GE MARC VoE, 800 MHz station applications uses five RF power transistors to provide a maximum of 100 watts output power. R11 on the Power Control Board (19D901803G1) provides adjustment of the output power over a 10 dB range (10W to 100W).

The power amplifier assembly consists of an RF board with all the amplifier stages and an output detector, a power control board, and an isolator.

Supply voltage from the system board is connected to TB1 and decoupled by C6.

CIRCUIT ANALYSIS

The exciter output (75-150 mW) is coupled to the amplifier input connector J1 by a 50 ohm coaxial cable. L1, C1, C2 and the base microstrip form the input matching circuit for Q1. Control voltage is applied to Q1 through a collector feed network consisting of C3, C4, C5 and L3.

Interstage matching between Q1 and Q2 is provided by L4, L5, C6, C8, C9, and C10. Control voltage is applied to Q2 through a collector feed network consisting of Z1, C11-C13 and L7. The output of Q2 is matched to the input of Q3 by L8, L9, C30, C15 and the base microstrip.

Supply voltage for Q3 is applied through collector feed network Z2, C16-C18 and L11. The output of Q3 is matched to 50 ohms by microstrip W2. This output is applied to a Wilkinson divider consisting of microstrips W4 and W5. R1 provides isolation between the signal paths.

Input matching for Q4 and Q5 is provided by microstrips W8 and W9. Supply voltage is applied to Q4 and Q5 by collector feed networks Z3, Z4, C20-C25, L12 and L13. Microstrips W12 and W13 provide output matching.

The outputs of Q4 and Q5 are summed by a Wilkinson combiner consisting of W16, W17 and R3. The output of the combiner is connected to pin 1 of circulator U1.

A directional coupler, W19 and detector CR1 provide a voltage, proportional to the power out, to the power control.

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 CONTROL

On the Power Control Board the voltage from the detector is compared to a stable DC reference voltage in a high gain comparator, U2A. The comparator drives a DC amplifier, Q4 and pass transistor Q6 that supplies control voltage to the RF board.

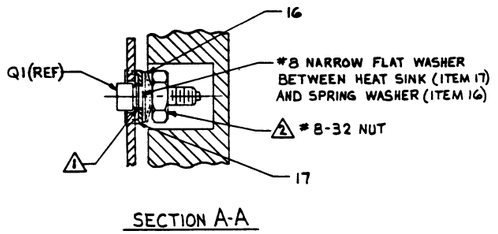
Thermistor RT1 is connected to the PA heatsink and, by controlling the operation of Q2 and Q3, provides a power cut-back for ambient temperatures that exceed 70 degrees centigrade. Conduction of Q3 gradually decreases the power set voltage applied to Q4. The DC reference voltage is provided by Q1, U3, R17-19 and C5.

In other special applications of this power control board, U2-B, CR1 and Q5 provide a low power alarm. U1 is used to select one of four individually adjustable power levels.

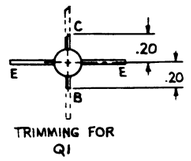
R1, R4, R7, and R10 are factory adjusted values.

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

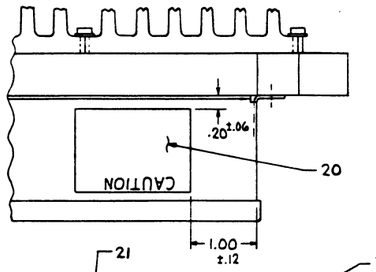
GENERAL ELECTRIC*
U.S.A.

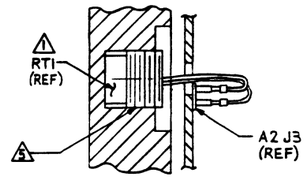


SECTION A-A

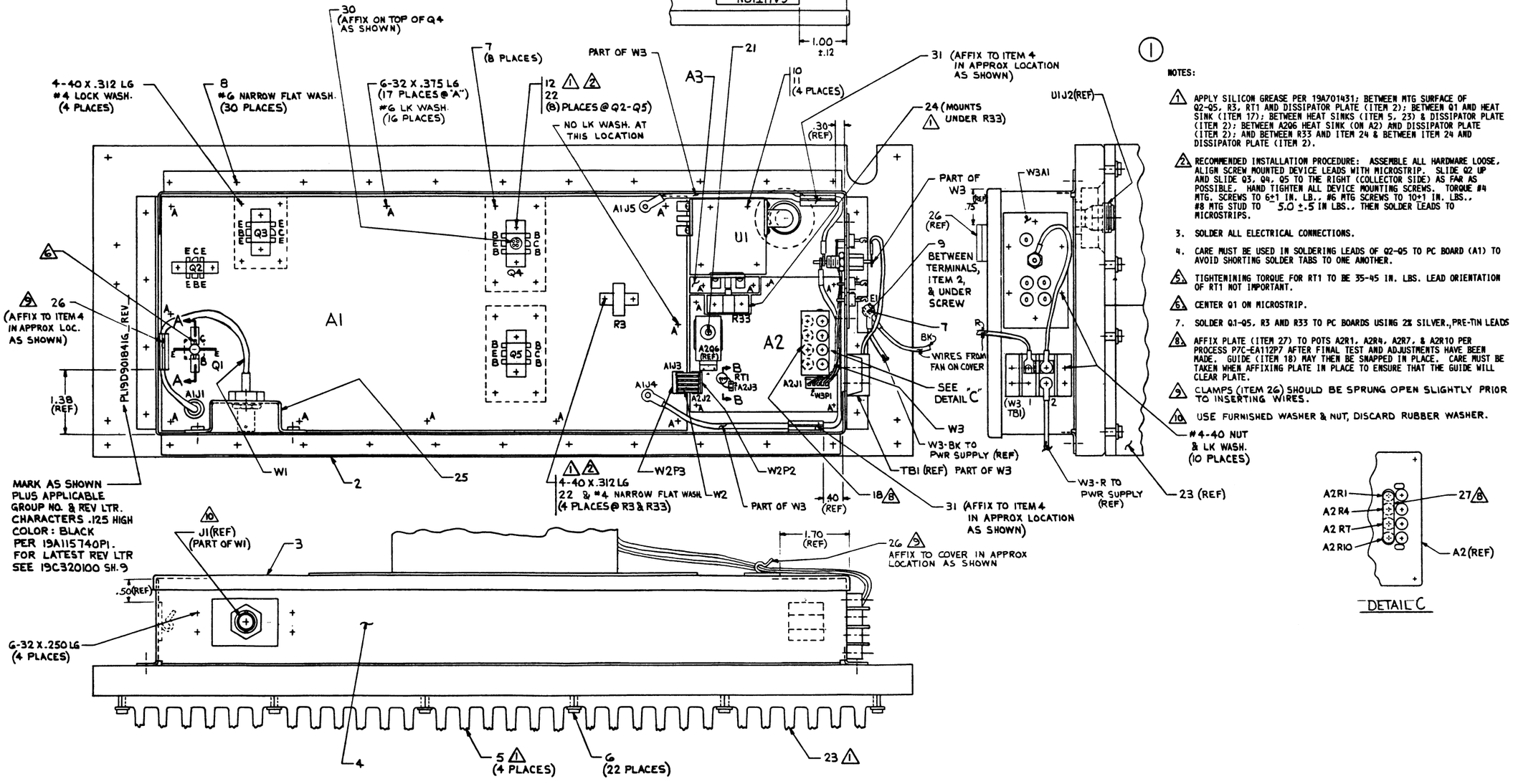


TRIMMING FOR Q1





SECTION B-B

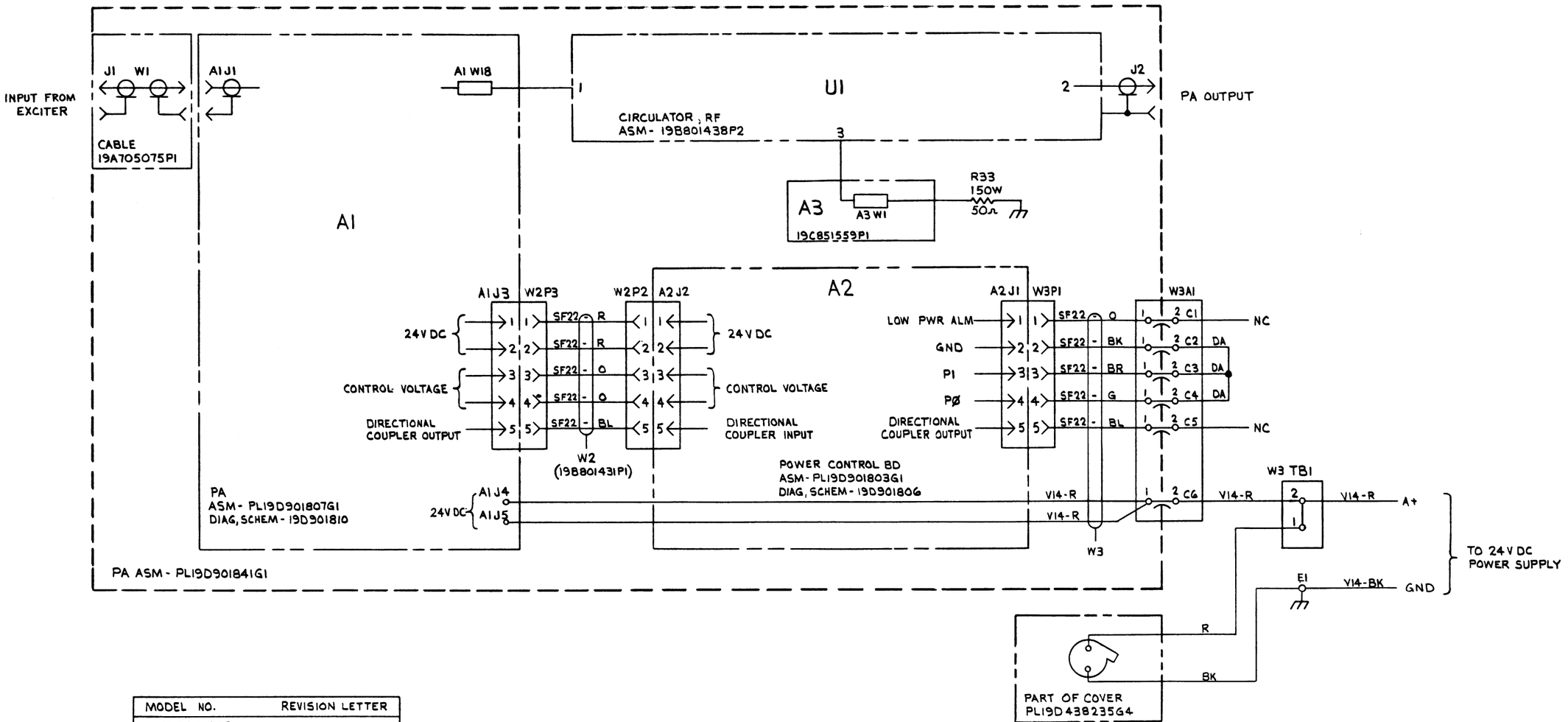


DETAIL C

1

NOTES:

1. APPLY SILICON GREASE PER 19A701431; BETWEEN MTG SURFACE OF Q2-Q5, R3, RT1 AND DISSIPATOR PLATE (ITEM 2); BETWEEN Q1 AND HEAT SINK (ITEM 17); BETWEEN HEAT SINKS (ITEM 5, 23) & DISSIPATOR PLATE (ITEM 2); BETWEEN A206 HEAT SINK (ON A2) AND DISSIPATOR PLATE (ITEM 2); AND BETWEEN R33 AND ITEM 24 & BETWEEN ITEM 24 AND DISSIPATOR PLATE (ITEM 2).
2. RECOMMENDED INSTALLATION PROCEDURE: ASSEMBLE ALL HARDWARE LOOSE. ALIGN SCREW MOUNTED DEVICE LEADS WITH MICROSTRIP. SLIDE Q2 UP AND SLIDE Q3, Q4, Q5 TO THE RIGHT (COLLECTOR SIDE) AS FAR AS POSSIBLE. HAND TIGHTEN ALL DEVICE MOUNTING SCREWS. TORQUE #4 MTG. SCREWS TO 6±1 IN. LB., #6 MTG SCREWS TO 10±1 IN. LBS., #8 MTG STUD TO 5.0 ±.5 IN LBS., THEN SOLDER LEADS TO MICROSTRIPS.
3. SOLDER ALL ELECTRICAL CONNECTIONS.
4. CARE MUST BE USED IN SOLDERING LEADS OF Q2-Q5 TO PC BOARD (A1) TO AVOID SHORTING SOLDER TABS TO ONE ANOTHER.
5. TIGHTENINING TORQUE FOR RT1 TO BE 35-45 IN. LBS. LEAD ORIENTATION OF RT1 NOT IMPORTANT.
6. CENTER Q1 ON MICROSTRIP.
7. SOLDER Q1-Q5, R3 AND R33 TO PC BOARDS USING 2% SILVER., PRE-TIN LEADS
8. AFFIX PLATE (ITEM 27) TO POTS A2R1, A2R4, A2R7, & A2R10 PER PROCESS P7C-EA112P7 AFTER FINAL TEST AND ADJUSTMENTS HAVE BEEN MADE. GUIDE (ITEM 18) MAY THEN BE SNAPPED IN PLACE. CARE MUST BE TAKEN WHEN AFFIXING PLATE IN PLACE TO ENSURE THAT THE GUIDE WILL CLEAR PLATE.
9. CLAMPS (ITEM 26) SHOULD BE SPRUNG OPEN SLIGHTLY PRIOR TO INSERTING WIRES.
10. USE FURNISHED WASHER & NUT, DISCARD RUBBER WASHER.



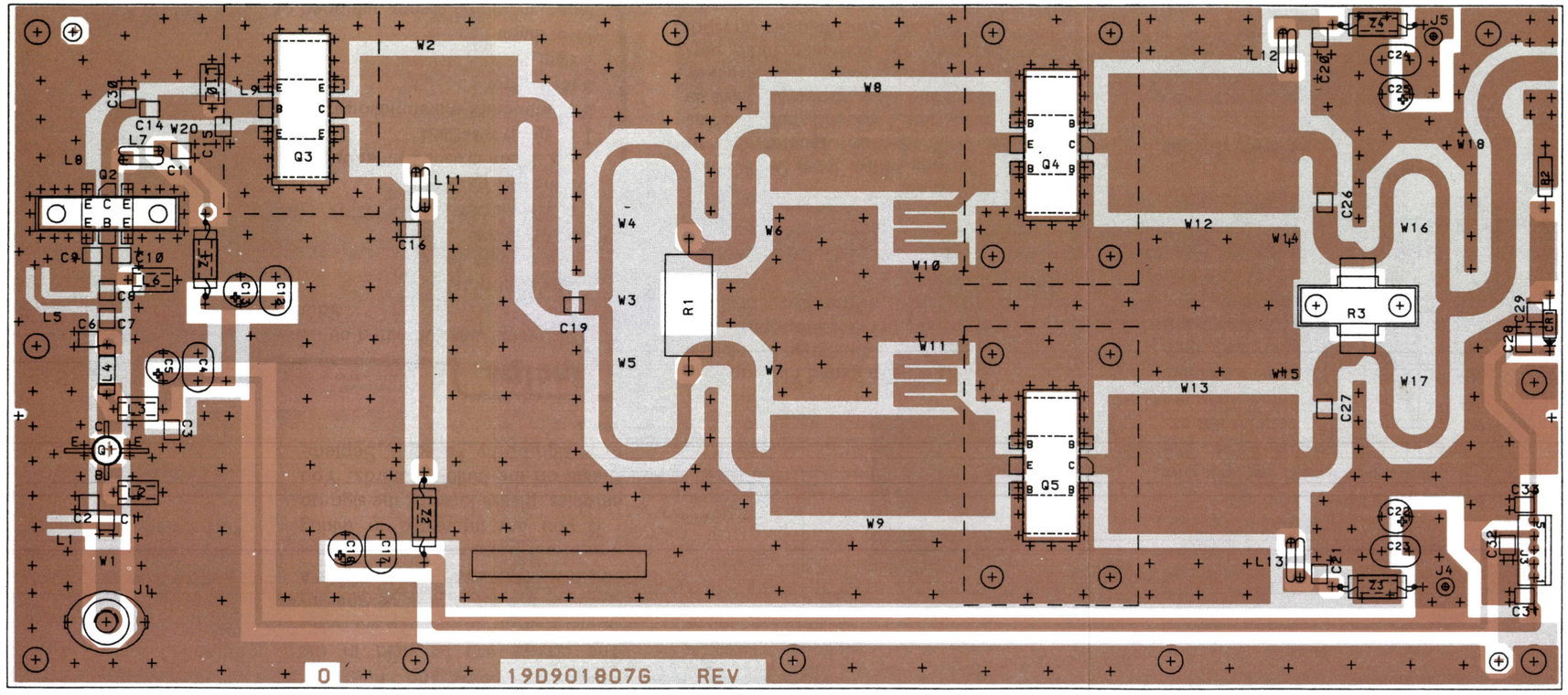
MODEL NO.	REVISION LETTER
PL19D901803G1	
PL19D901807G1	
PL19D901841G1	

(19D901847, Sh. 1, Rev. 0)

OUTLINE DIAGRAM

Power Amplifier

4 Issue 1



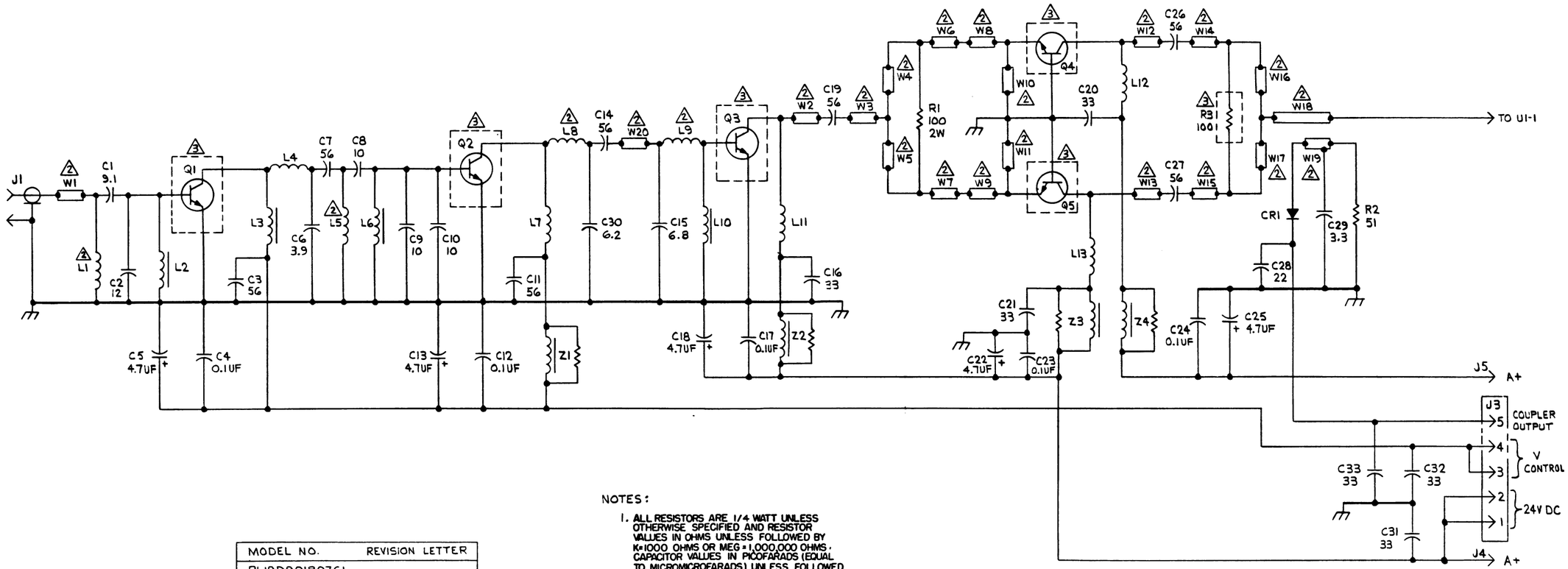
(19D901809, Sh. 1, Rev. 1)
(19A705039, Sh. 1, Rev. 0)
(19A705039, Sh. 2, Rev. 0)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

OUTLINE DIAGRAM

Issue 1 5

100 Watt 24 Volt



MODEL NO.	REVISION LETTER
PLI9D901807G1	

NOTES:

1. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS.

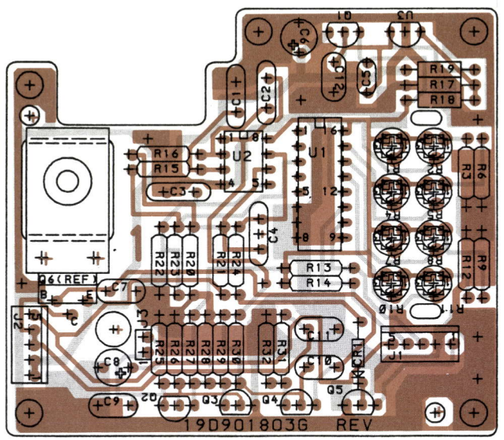
(2) PART OF PWB.

(3) PART OF NEXT HIGHER ASM.

(19D901810, Sh. 1, Rev. 0)

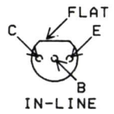
100 Watt
24 Volt

SCHEMATIC DIAGRAM



(19D901805, Sh. 1, Rev. 1)
(19A705034, Sh. 1, Rev. 1)
(19A705034, Sh. 2, Rev. 1)

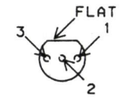
LEAD IDENTIFICATION
FOR Q1-Q5



IN-LINE
TOP VIEW

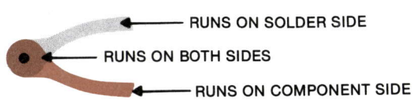
NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

LEAD IDENTIFICATION
FOR U3



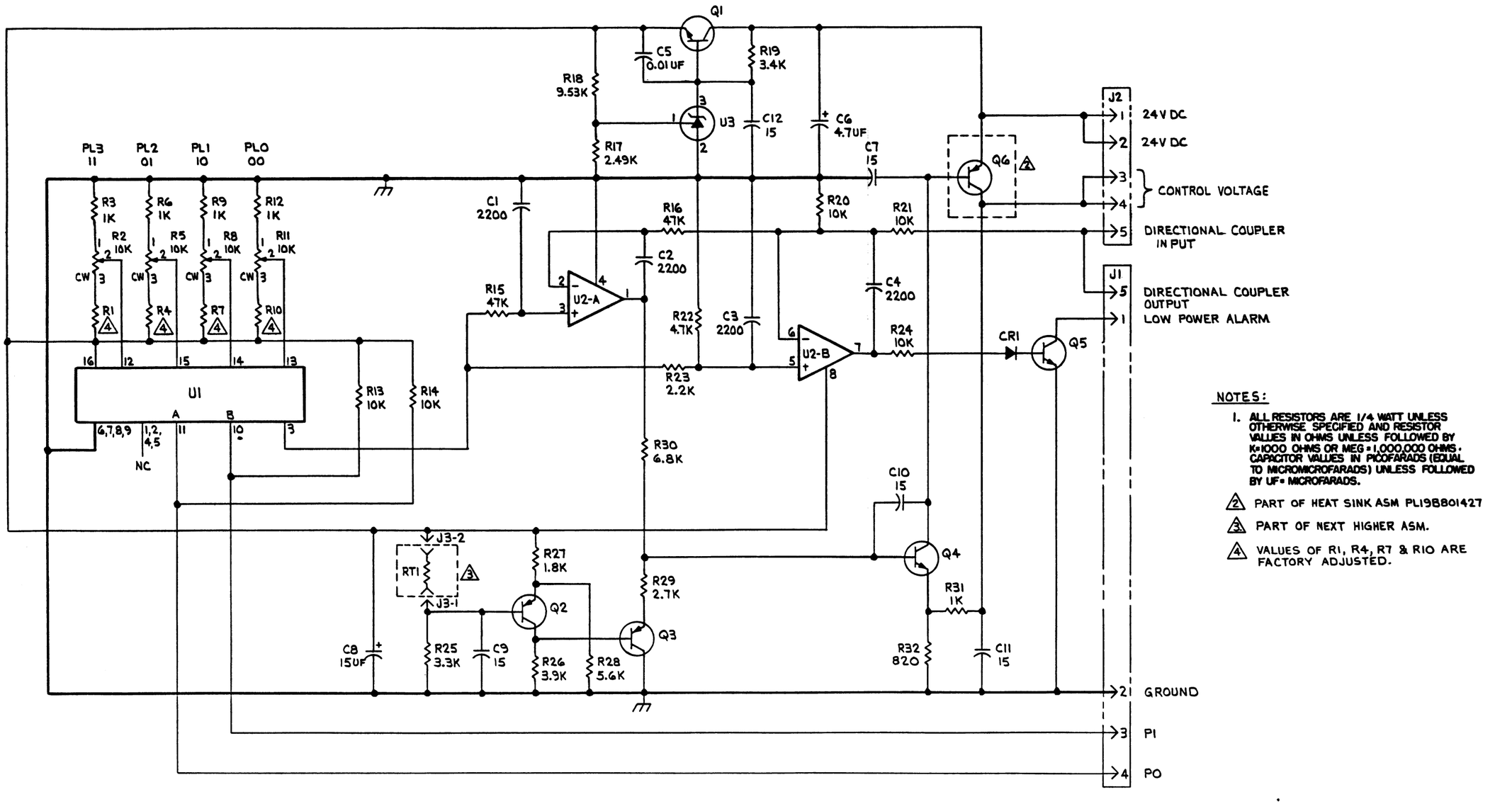
IN-LINE
TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.



OUTLINE DIAGRAM

Issue 1



NOTES:

1. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG = 1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS.

(2) PART OF HEAT SINK ASM PL19B801427

(3) PART OF NEXT HIGHER ASM.

(4) VALUES OF R1, R4, R7 & R10 ARE FACTORY ADJUSTED.

MODEL NO.	REVISION LETTER
PL19D901803G1	

(19D901806, Sh. 1, Rev. 2)

SCHEMATIC DIAGRAM

PARTS LIST

800 MHz POWER AMPLIFIER
19D901841G1

ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
A1		PA COMPONENT BOARD 19D901807G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A702232P12	Ceramic: 9.1 pF ±5%, 50 VDCW.
C2	19A705108P15	Mica: 12 pF ±5%, 500 VDCW.
C3	19A702232P31	Ceramic: 56 pF ±5%, 50 VDCW.
C4	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.
C5	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C6	19A702232P3	Ceramic: 3.9 pF ±.25 pF, 50 VDCW.
C7	19A702232P31	Ceramic: 56 pF ±5%, 50 VDCW.
C8 thru C10	19A705108P13	Mica: 10 pF ±5%, 500 VDCW.
C11	19A702232P31	Ceramic: 56 pF ±5%, 50 VDCW.
C12	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.
C13	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C14	19A702232P31	Ceramic: 56 pF ±5%, 50 VDCW.
C15	19A705108P9	Mica: 6.8 pF ±.25 pF, 500 VDCW.
C16	19A705108P25	Mica: 33 pF ±5%, 500 VDCW.
C17	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.
C18	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C19	19A702232P31	Ceramic: 56 pF ±5%, 50 VDCW.
C20 and C21	19A705108P25	Mica: 33 pF ±5%, 500 VDCW.
C22	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C23 and C24	19A702250P113	Polyester: 0.1 uF ±10%, 50 VDCW.
C25	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C26 and C27	19A702232P31	Ceramic: 56 pF ±5%, 50 VDCW.
C28	19A702232P21	Ceramic: 22 pF ±5%, 50 VDCW.
C29	19A702232P1	Ceramic: 3.3 pF ±.25 pF, 50 VDCW.
C30	19A705108P8	Mica: 6.2 pF ±.25 pF, 500 VDCW.
C31	19A705108P25	Mica: 33 pF ±5%, 500 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
CR1	19A700047P3	Silicon: 100 mW; sim to 1N6263.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1	19A700049P2	Connector, receptacle; 500 VDCW maximum; sim to NTTF-1058.
J2		PART OF U1.
J3	19A704852P31	Connector.
J4 and J5	19A134263P1	Contact, electrical: sim to Selectro 229-1082-00-0-590.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		PART OF PWB.
L2 and L3	19A701091G1	Coil.
L4	19A701006P6	Strap.
L5		PART OF PWB.
L6	19A701091G1	Coil.
L7	19A136533P2	Coil.
L8		PART OF PWB.
L9		PART OF PWB.
L10	19A701091G1	Coil.
L11 thru L13	19A136533P2	Coil.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19A700111P39	Composition: 100 ohms ±5%, 2 w.
R2	19A700106P32	Composition: 51 ohms ±5%, 1/4 w.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 thru W20		PART OF PWB.
		- - - - - - - - - - FILTERS - - - - - - - - - -
Z1 thru Z4	19A701092G1	Filter.
A2		POWER CONTROL BOARD 19D901803G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C4	19A700233P9	Ceramic: 2200 pF ±20%, 50 VDCW.
C5	T644ACP310K	Polyester: .010 uF ±10%, 50 VDCW.
C6	19A701534P6	Tantalum: 4.7 uF ±20%, 35 VDCW.
C7	19A701624P12	Ceramic, disc: 15 pF ±5%, 500 VDCW, temp coef 0 PPM ±30.
C8	19A701950P4	Tantalum: 15 uF ±20%, 20 VDCW.
C9 thru C12	19A701624P12	Ceramic, disc: 15 pF ±5%, 500 VDCW, temp coef 0 PPM ±30.
		- - - - - - - - - - DIODES - - - - - - - - - -
CR1	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 and J2	19A704852P31	Connector.
J3	19A700072P1	Printed wire: 2 contacts rated @ 2.5 amps; sim to Molex 22-03-2021.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A700023P2	Silicon, NPN: sim to 2N3904.
Q2 and Q3	19A700022P2	Silicon, PNP: sim to 2N3906.
Q4 and Q5	19A700023P2	Silicon, NPN: sim to 2N3904.
Q6		Part of Heat Sink Assembly 19B801427G1.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	19B800779P14	Variable, 47K ohms, ±25%, 100 VDCW, 3 watt.
R2	19B800779P10	Variable: 10K ohms ±25%, 100 VDCW, .3 watt.
R3	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R4	19B800779P14	Variable, 47K ohms, ±25%, 100 VDCW, 3 watt.
R5	19B800779P10	Variable: 10K ohms ±25%, 100 VDCW, .3 watt.
R6	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R7	19B800779P14	Variable, 47K ohms, ±25%, 100 VDCW, 3 watt.
R8	19B800779P10	Variable: 10K ohms ±25%, 100 VDCW, .3 watt.
R9	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R10	19B800779P14	Variable, 47K ohms, ±25%, 100 VDCW, 3 watt.
R11	19B800779P10	Variable: 10K ohms ±25%, 100 VDCW, .3 watt.
R12	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R13 and R14	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R15 and R16	H212CRP347C	Deposited carbon: 47K ohms ±5%, 1/4 w.
R17	19A701250P239	Metal film: 2490 ohms ±1%, 250 VDCW, 1/4 watt.
R18	19A701250P295	Metal film: 9.53K ohms ±1%, 1/4 w.
R19	19A701250P252	Metal film: 3.4K ohms ±1%, 1/4 w.
R20 and R21	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R22	H212CRP247C	Deposited carbon: 4.7K ohms ±5%, 1/4 w.
R23	H212CRP222C	Deposited carbon: 2.2K ohms ±5%, 1/4 w.
R24	H212CRP310C	Deposited carbon: 10K ohms ±5%, 1/4 w.
R25	H212CRP233C	Deposited carbon: 3.3K ohms ±5%, 1/4 w.
R26	H212CRP239C	Deposited carbon: 3.9K ohms ±5%, 1/4 w.
R27	H212CRP218C	Deposited carbon: 1.8K ohms ±5%, 1/4 w.
R28	H212CRP256C	Deposited carbon: 5.6K ohms ±5%, 1/4 w.
R29	H212CRP227C	Deposited carbon: 2.7K ohms ±5%, 1/4 w.
R30	H212CRP268C	Deposited carbon: 6.8K ohms ±5%, 1/4 w.
R31	H212CRP210C	Deposited carbon: 1K ohms ±5%, 1/4 w.
R32	H212CRP147C	Deposited carbon: 470 ohms ±5%, 1/4 w.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19A700029P36	Digital: SINGLE 8-CHANNEL MULTIPLEXER.
U2	19A701789P2	DUAL OP AMP; sim to LM358.
U3	19A702939P2	Sim to TI TL431CLP.
A3	19C851559P1	Printed Wiring Board, (Connects R33 to U1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A703479P1	N Channel, field effect. sim to RF 2060.
Q2	19A703480P4	Silicon, NPN: Sim to MRF-891.
Q3	19A705125P1	Silicon, NPN: Sim to MRF-895.
Q4 and Q5	19A705125P2	Silicon, NPN: Sim to MRF-898.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R3	19A143832P1	Power termination: 100 ohms ±5%, 75 watts, sim to KDI Pyrofilm PPR 820-75-3.
R33	19A143832P4	Resistor: 50 ohms ±5%, 150 watts.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	19A702176G2	Thermistor: 40K ohms ±20%.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U1	19B801438P2	Circulator: 120 watts.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1	19A705075P1	RF Cable.
W2	19B801431P1	Interconnect Cable.
W3	19C851528G1	Interconnect Cable. Includes P1.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	GE PART NO.	DESCRIPTION
		PA FAN ASSEMBLY 19D438235G4
	19B234884G1	Fan Plate.
	5493477P10	Fan Guard.
	5493477P4	Fan, Axial.
	19B209268P1	Solderless Terminal.
	19D901846G1	Cover.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B801427G1	Heat Sink Assembly. Includes Q6.
	19B226212G1	Finned Heat Sink. (Quantity 4).
	19B209103P410	Tap screw, hex head: No. 8-32 x 5/8. (Quantity 22).
	19B201074P308	Tap screw, Phillips POZIDRIV: No. 6-32 x 1/2.
	19B201074P306	Tap screw, Phillips POZIDRIV: No. 6-32 x 3/8. (Quantity 38).
	N403P13C6	Lockwasher: No. 6. (Quantity 3).
	N81P9016	Self Tapping Screw. (Quantity 4).
	N414P11	Lockwasher, internal tooth: No. 4. (Quantity 4).
	N44P9006C6	Machine screw: No. 4-40 x 3/8. (Quantity 8).