ERICSSON

LBI-38751B

Mobile Communications

13 AMPERE POWER SUPPLY
19A704647P11-P12, P14
19A704647P1-P3

CAUTION

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: TO PRVENT FIRE OR ELECTRIC SHOCK HAZARD. DO NOT EXPOSE THIS PRODUCT TO RAIN OR MOISTURE.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

The lightning flash and arrowhead within the triangle is a warning sign alerting you of "dangerous voltage" inside the product.	**CAUTION** RISK OF ELECTRIC SHOCK DO NOT OPEN CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVER (OR BACK). NO USER-SERVICABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.	The exclamation point within the triangle is a warning sign alerting you of important instructions accompanying the product.
See Marking On Bottom/Back Of Product		

Maintenance Manual

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SPECIFICATIONS*

	Part No.	Nominal
Input Voltage (Vac)	P11,P12	121
	P14	240
Input Frequency (Hz)	ALL	50/60
Input Current (Amps)	P11,P12	4
	P14	2
Output Voltage (Vdc) (From 0.5 to 13 Amperes)	All	13.8
Output Ripple (mV P-P)		
@ 3 Amps	All	50 (Maximum)
@ 13 Amps	All	100 (Maximum)
Transient Response (Vdc) (Except overcurrent condition)	All	11.5 - 16.0
Duty Cycle	All	20%: 1 minute ON, 4 minutes OFF
Size	All	4.6 X 4.75 X 12.5 inches
Weight	All	13.1 LBS

* These specifications are intended primarily for the use of the service technician. Refer to the appropriate Specification Sheet for complete specifications.

19A704647P1-P3	UL Approval
19A704647P11-P12	CSA & UL Approval (Pending)
19A704647P14	European Approval (Pending)

NOTE

A thermal protection unit will automatically reduce the output voltage if the output is at maximum value for an extended period of time at 13 amperes.

WARNING

This unit contains dangerous voltage levels. It is strongly recommended that defective units be returned to the manufacturer for repairs.

If field repair is necessary, remove the input power and then use a load resistor to manually discharge each capacitor before servicing the unit.

IMPORTANT SAFETY INSTRUCTIONS

1. **SAVE THIS MANUAL** - It contains important safety and operating instructions for Power Supply Models 19A704647 P1, P2, P3 and P11, P12, and P14.

2. Do not use auxiliary equipment not recommended or sold by the manufacturer. To do so may result in a risk of fire, electric shock, or injury to personnel.

3. Do not expose unit to rain, snow or other type of moisture.

4. To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting unit.

5. Make sure the cord is located so that it will not be stepped on, tripped over, or otherwise subjected to damage or stress.

6. An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If an extension cord must be used, make sure:

   a. That pins on plug of extension cord are the same number, size and shapes of those on plug on unit.

   b. That extension cord is properly wired, in good condition, and

   c. That wire size is large enough for AC ampere rating of unit as specified in Table 1.

Table 1 - Recommended Minimum Size For Extension Cords

Length of Extension Cord(ft.)	25	50	100	150
AWG Size of Extension Cord	18	18	16	14

7. Do not operate unit with damaged cord or plug - replace them immediately.

8. Do not operate unit if it has received a sharp blow, been dropped, or otherwise damaged in any way. Return to a qualified service shop.

9. Do not disassemble unit. Return to a qualified service shop when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.

10. To reduce risk of electric shock, unplug unit from outlet before attempting any maintenance or cleaning.

11. **GROUNDING AND AC POWER CORD CONNECTION** - To reduce risk of electrical shock use only a properly grounded output. The unit is equipped with an electric cord having an equipment grounding conductor and a grounding plug. Be sure that the outlet is properly installed and grounded in accordance with all local codes and ordinances.

12. **DANGER** - Never alter AC cord or plug. If it does not fit the outlet, have a proper outlet installed by a qualified electrician. Improper connection can result in risk of electric shock.

13. This unit is for use on a 121 volt circuit, and has a grounding plug that looks like the plug shown in Figure 1. A temporary adapter, that looks like the adapter shown in sketches B and C, may be used to connect this plug to a two pole receptacle as shown in sketch B if a properly grounded outlet is not available. The temporary adapter should be used only until a properly grounded outlet can be installed by a qualified electrician.

14. DANGER - Before using the adapter shown, be certain that the center screw of the outlet plate is grounded. The green colored rigid ear or lug extending from the adapter must be connected to a properly grounded outlet -- make certain it is grounded. If necessary, replace original outlet cover plate screw with a longer screw that securely fastens the ear or lug to outlet cover plate and makes a grounded connection to outlet box.

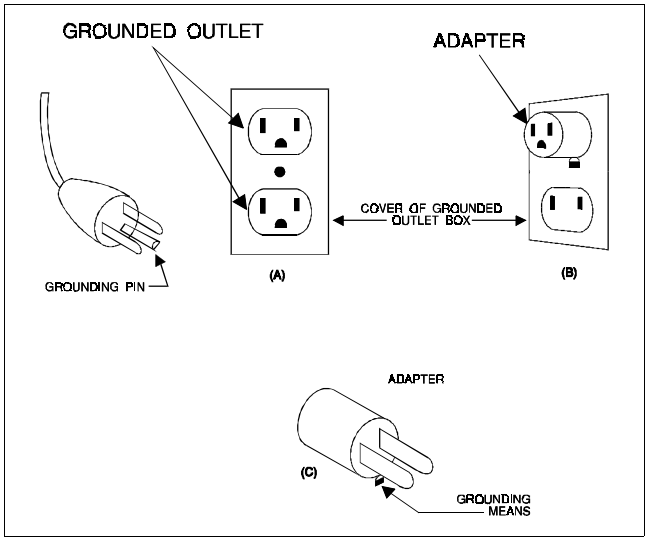


Figure 1 - Grounding Methods

15. The P3 and P14 Power Supplies are for use on circuits of nominal 240 volts AC. They are factory equipped with an electric cordless plug connector. A terminating connector that meets local electrical codes should be added.

16. Care should be taken when placing the unit in service to insure proper top and bottom ventilation. A minimum of 1/4 inch is required between the bottom of the unit and the surface on which it sits.

INTRODUCTION

These power supplies were designed expressly to provide power for the Delta Desktop/Wall station. They supply thirteen (13) amperes of direct current at 13.8 Volts. The output is protected from both overcurrent and overvoltage. In addition, built in overtemperature protection prevents damage from usage outside of the specified temperature range.

The circuit diagrams of these power supplies (part numbers P11, P12 and P14) are the same, except for primary power connections. The applications are:

Part 1, 11 - For rack Mounting (Delta type) - 120V 60Hz

Part 2, 12 - Table Mounting (Rubber Feet) - 120V 60Hz

Part 3 - Table Mounting (Rubber Feet) - 240V 50Hz

Part 4 - For rack Mounting (Delta type) - 240V 50 Hz

CIRCUIT DESCRIPTION

INPUT SECTION

Input power to the supply is provided from a 121 Volt, 50/60 Hertz (or 242 V, 50/60 Hz) line source connected through the main power cord. The line is passed through fuse F1, that limits the input current to 4 amperes. The input current also passes through varistor RV1, a transient limiting device that clamps the line at approximately 160 Vrms. This protects the device from potentially harmful line voltage excursions.

FILTER AND BRIDGE SECTION

After passing through the input protection devices the line voltage is applied to the primary winding to transformer T1. The stepped down line voltage of approximately 35 Vrms, is applied to the diode bridge D1 and filter capacitors C1, C2, and C3. These devices convert the alternating current line to approximately 25 Volts direct current.

FILTER AND OUTPUT REGULATOR SECTION

The current then flows through the linear regulator section of the supply. The linear regulator is composed of two functional groups of components. The first group, the series pass regulator group consists of Q1, Q2, R1, and R2. In order to control the output voltage of the supply, the series pass transistors are operated as variable resistors. If the load on the supply is increased, causing a drop in the output voltage, the resistance of the series pass transistors is automatically decreased. This decrease balances the output voltage drop and returns the output voltage back to the desired level.

In order to regulate the output voltage, two pass transistors are used. R1 and R2 provide negative feedback to the emitters of the respective transistors, balancing them and causing equal current flow and equal power dissipation.

The second functional group is the series pass control, consisting of U1 and Q3 in conjunction with their associated bias resistors and decoupling capacitors. U1 continuously monitors the output voltage developed through the interaction of the load and the series pass transistors. When more output voltage is required to maintain regulation, U1 increases drive to transistor Q3. Q3 provides the amount of series pass transistor base drive necessary to decrease their resistance and boost the output voltage back up to the desired value. This continuous interaction between the control circuitry and series pass stage forms a closed loop control group providing the regulated output voltage to the power supply load. The closed feedback loop is compensated by R4, C6, and C7 to provide loop stability. Potentiometer R13 varies the amount of output voltage fed back in the control loop thus allowing precise adjustment of the output voltage at which regulation is maintained.

OVERCURRENT PROTECTION

Overcurrent protection is implemented via a current foldback scheme. Resistor R3 is used as a current sensing element. The amount of voltage developed across this resistor is directly proportional to the amount of current flowing to the load. This sense voltage is applied to the regulator control integrated circuit, U1, by means of R5, R6, and R7. As the current through the sense resistor increases past 13.8 amps, the sense voltage seen by U1 causes the value of both output voltage and output current to decrease. This foldback approach to overcurrent protection decreases the amount of power dissipated across the series pass transistors during a faulted condition. The maximum allowable short circuit current is less than five (5) amps.

OVERTEMPERATURE PROTECTION

In order to protect the supply from abnormal ambient temperature operating conditions or prolonged radio transmission, overtemperature protection was added to the supply. A thermostat, S2, is attached to the heatsink of the supply to monitor the operating temperature of the series pass transistors. This thermostat is a normally closed switch type. When too high an operating temperature is reached, the thermostat's contacts open, thus removing the AC line voltage to the supply. When the temperature of the heatsink returns to a safe value, the contacts of S2 close and operation is automatically resumed.

OUTPUT OVERVOLTAGE PROTECTION

To protect the power supply load from possible overvoltage conditions due to failure of the control circuitry, an overvoltage sensing and shutdown circuit has been included. This circuit is composed of VR1, VR2, C8, R10, R11, R12, Q4, and U1. When the output voltage exceeds 15 VDC, VR1 reaches its ZENER voltage and begins to conduct current. This current develops a voltage across R12, which then triggers thyristor Q4 into forward conduction. With Q4 turned ON, a portion of the bias voltage is applied directly to the shutdown pin of U1. With pin 8 of U1 held high, the drive to Q3 is disabled, thus turning off the output voltage. Thyristor Q4 remains ON until AC input power is removed. The removal of AC input power interrupts the holding current through Q4 and turns it off. Therefore, **in the event of an overvoltage shutdown, the power supply remains OFF until the AC input power is removed** and then restored either via the main power switch, or disconnection of the AC line cord.

INTERNAL BIAS VOLTAGE SUPPLY

Internal bias voltage to the power supply is provided by a separate winding on transformer T1. AC input power is transformed via this winding at J6 and J7 along with D2 and C9 into approximately 30 volts DC at nominal line voltage. This bias voltage then provides power to all to the internal circuitry of the supply.

OPERATION

1. Connect 13 Vdc output to the load using the mating connector.

2. With the ON/OFF switch in the OFF position, connect the AC power cord to a 120V power source for parts 1, 2, 11, & 12.

   For parts 3 and 14 a connector (customer supplied) must be installed on the power cord for connections to a 240V power source.

3. Place the ON/OFF switch to the ON position to turn on the supply.

MAINTENANCE

WARNING

This unit contains dangerous voltage levels. It is strongly recommended that defective units be returned to the manufacturer for repairs.

If field repairs are necessary, remove input power and then use a load resistor to manually discharge each capacitor before working on the circuits.

For disassembly, remove 4 screws and lift off top cover. When replacing any component be certain to use an identical component. When replacing the thermostat mounted on the heatsink, apply thermal compound between the two. Observe wire routing when resoldering circuits. Failure to do so may lead to excessive ripple or poor regulation.

TROUBLESHOOTING

When troubleshooting is required, use the guides given in the following table to analyze defects. When a component or assembly has been identified as defective, replace the defective component and also check the associated components before applying power to the unit in the event that a series of components are defective.

When replacing any component be certain to use an identical component. When replacing the thermostat mounted on the heatsink, apply thermal compound between the two. Observe wire routing when resoldering circuits. Failure to do so may lead to excessive ripple or poor regulation.

Recommended test equipment for maintenance or troubleshooting of this power supply includes:

- Digital multimeter
- 50 amp DC meter
- Resistive load
- Oscilloscope

ADJUSTMENTS

This power supply has an output voltage level adjustment. Potentiometer R13 varies the amount of output voltage fed back into the control loop, thus allowing precise adjustment of the output voltage level. This level is to be maintained at 13.8 VDC for use with low power base stations.

INSTALLATION

The power supply can be mounted using mounting holes found in the chassis.

NOTE

Insure that ventilation holes in the unit are not obstructed when the unit is mounted or in operation.

The power supply is designed for operation from either a 121 VAC (P1, P2, P11, and P12), or 242 VAC (P3 and P14) source. Before connecting the power supply, measure the source voltage and then connect either the 120V or 240V unit to match the source voltage. Refer to the Modification Procedures for details.

FUSE REPLACEMENT

To replace a defective fuse, use the following procedure:

1. Place ON/OFF switch in the OFF position.
2. Remove cap from fuse holder and replace fuse with a similar type and size [4 amp, 250V(121 VAC input), 2.5 amp, 250V (242 VAC input)].
3. Replace cap and change ON/OFF switch to ON position.

If trouble persists, check with a qualified service person.

TROUBLESHOOTING TABLE

SYMPTOM	AREA TO CHECK
FUSE BLOWS	1) shorted output 2) shorted D1, C1, C2, C3, T1, VR1, RV1, F1
NO OUTPUT	1) shorted output 2) output properly connected 3) overtemperature shutdown 4) failed Q1, Q2, D1, U1, T1, S2
OUTPUT VOLTAGE LOW	1) output overloaded 2) U1 failure
OUTPUT VOLTAGE HIGH	1) failed VR1, U1, Q3 2) failed overvoltage protection circuit

POWER SUPPLY VOLTAGE READING

LOCATION	READING
anode D1	35 Vrms
C1 plus	25 Vdc
cathode D2	30 Vdc
OUTPUT	+13.1 TO 14.1 Vdc

APPLICATION

19A704647P12 unit includes mounting feet and omits the mounting bracket. A mating connector and mating male contacts are provided for the 13 Vdc output connector. 19A704647P14 operates from 242 Vac input. A power cord is supplied less a power plug (customer to provide).

MODIFICATION PROCEDURES

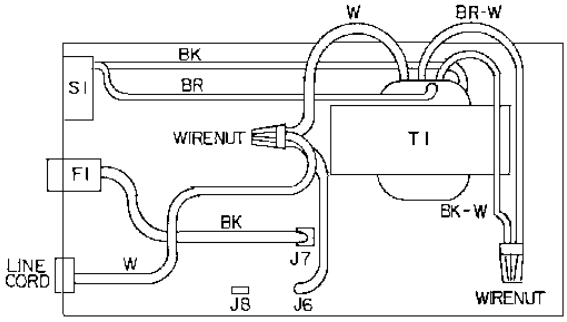
The modification procedure to change from 120 Volt to 240 Volt operation is described. To change back to 120 Volt, reverse the procedure. Refer also to the Schematic diagram and to Figure 2 for an internal view of the power supply.

MODIFICATION PROCEDURE

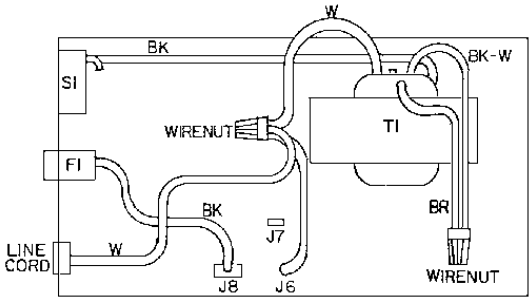
1. Unplug unit from power source.
2. Cut BRN lead near S1 and cover the short end of wire to prevent accidental contact.
3. Strip 1/2" of insulation from long portion of BRN lead (just cut).
4. Remove wirenut holding BLK/WHT to BRN/WHT leads.
5. Fasten BRN and BLK/WHT leads together using wirenut (see Diagram for 240 Volt operation).
6. Cover/insulate exposed BRN/WHT lead to prevent accidental contact.
7. Move BLACK wire from J7 to J8.

Power supply can now be used with a 240 Volt, 50/60 Hz, single phase source.

WIRED FOR 120 VOLT OPERATION



WIRED FOR 240 VOLT OPERATION



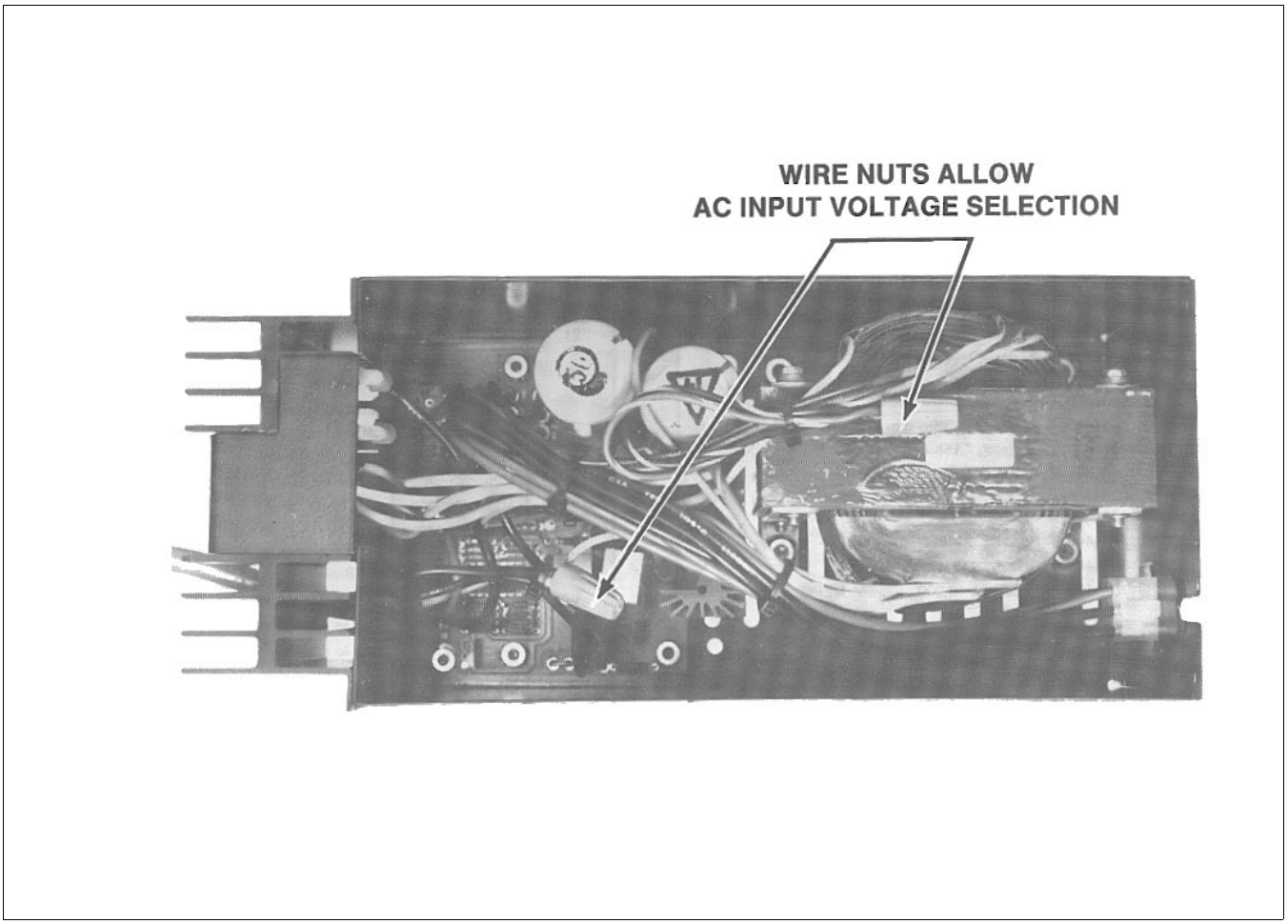


Figure 2 - Power Supply, Internal View

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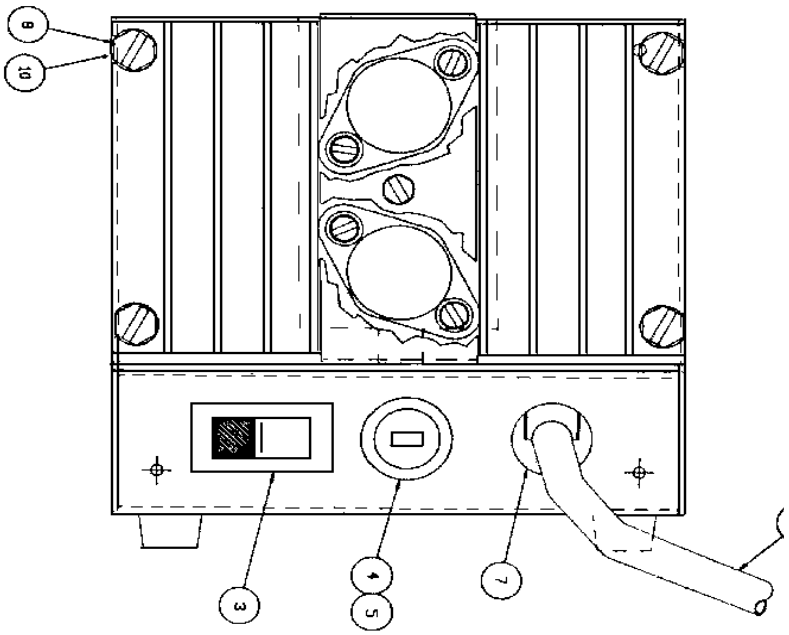
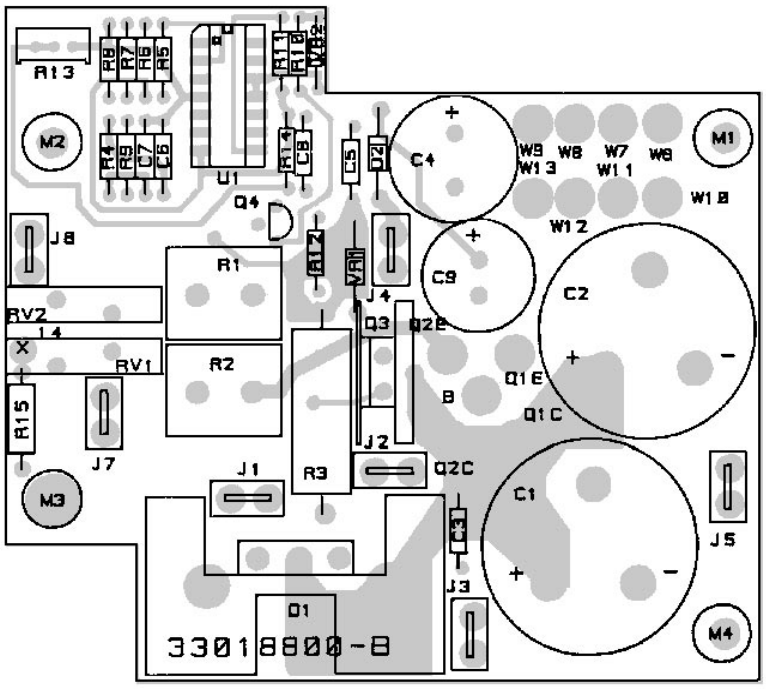
13-AMPERE POWER SUPPLY
M29/19A704647P1, P11 120 VAC 60 Hz
RACK MOUNT
M29/19A704647P2, P12 120 VAC 60 Hz
TABLE TOP
M29/19A704647P3 240 VAC 50 Hz
TABLE TOP
M29/19A704647P14 240 VAC 50 Hz
RACK MOUNT

ISSUE 2

SYMBOL	PART NO.	DESCRIPTION
	M29/9103360	PC Board Assembly (P1,P2,P3)
	M29/91046800	PC Board Assembly (P11,P12,P14).
	M29/83314700	PC Board Insertion Kit (P1,P2,P3)
	M29/83325800	PC Board Insertion Kit (P11,P12,P14).
C1,C2	M29/17037900	Capacitor: 18000 µF, 50 VDCW.
C3,C5	M29/17018100	Capacitor: 0.1 µF, 50 VDCW.
C4	M29/17036404	Capacitor: 3900 µF, ±20%.
C6	M29/17018121	Capacitor: 100 pF, 16 VDCW, ±5%.
C7,C8	M29/17018214	Capacitor: 2200 pF. 100 VDCW, ±20%.
C9	M29/17034200	Capacitor: 470 µF, 50 VDCW.
D1	M29/19013900	Diode Bridge Assembly.
D2	M29/18032206	Rectifier 1N4007G.
J1-J11	M29/13048100	FASTON TAB .25", AMP 62650-1.
Q3	M29/91038000	Heatsink Assembly/Transistor TIP-31C.
Q4	M29/18031400	SCR 2N5061.
R1,R2	M29/16016800	Resistor: 0.1 ohms, 10w, ±5%.
R3	M29/16013905	Resistor: 0.02 ohms, 5w, ±1%.
R4	M29/16001436	Resistor: 71.5K ohms, ±1%.
R5	M29/16011419	Resistor: 162 ohms, ±1%.
R6,R12	M29/16001525	Resistor: 10K ohms, ±1%.
R7	M29/16001526	Resistor: 100 ohms, ±1%.
R8	M29/16001448	Resistor: 38.3 ohms, ±1%.
R9	M29/16001479	Resistor: 7.15K ohms, ±1%.
R10,R11	M29/16001591	Resistor: 1.27K ohms, ±1%.
R13	M29/16016900	Potentiometer: 1K ohms.
R14	M29/16001449	Resistor: 8.25K ohms, ±1%.
R15	M29/16001698	Resistor: 10M ohms, 0.5w, 10%.
RV1,RV2	M29/18008013	Varistor: 150V, 80J, GEV150LA20A.
U1	M29/19012000	Regulator. IC SG3532
VR1,VR2	M29/18035820	Zener Diode, 15V 1N5245B.
T1	M29/757P2	Transformer.
		- - - - MISCELLANEOUS - - - -
3 or S1	M29/20003300	Switch.
4 or F1	M29/09019400	Fuse Holder.
5	M29/09019500	Fuse, IEC Fast Blow.
6	M29/11021200	Cord Set (P1,P2,P11,P12).
	M29/11029200	Cord Set (P3,P14).
7	M29/11022000	Strain Relief (P1,P2,P11,P12).
	M29/11023900	Strain Relief (P3,P14).
8	M29/22049001	Screw: #8-32 x 0.375".
9	M29/22043200	Standoff.
10	M29/22010306	Washer: #8 x 0.333".
11	M29/22041501	Nut: #6-32 KEPS.
13	M29/22043201	Standoff.
14	M29/22041503	Nut: #10-32 KEPS.
15	M29/11003300	TY-WRAP.
	or	
	M29/11024500	TY-WRAP.
16	M29/22039701	Wire Nut.
17	M29/07063200	Case (P2,P3,P12).
18	M29/07070400	Cover.
19	M29/35002600	Rubber feet (P2,P3).
20	M29/22010305	Washer: #6, Internal tooth, lock.
21	M29/51060102	Label, warning (P1,P2).
	M29/51060100	Label, warning (P3).
	M29/51067800	Label, warning (P11,P12,P14).
22	M29/51060200	Label, output (P1,P2,P3).
	M29/51067700	Label, output (P11,P12,P14).
23	M29/07070500	Cover/Heatsink Assembly.
24	M29/22027708	Screw.
25	M29/51050900	Date Code Label.
P1	M29/25013900	Output Connector Assembly (P14).
W1	M29/250074290	Side terminal of F1 to Thermostat (Black).
W2	Lead on T1	Tied to W5 with FASTON term to (ON) term of S1 (Brown).
W3	Lead on T1	Tied to W4 with wire nut (Item 16) brown/white.
W4	Lead on T1	Tied to W3 with wire nut (Item 16) black/white.
W5	Lead on T1	Tied to W2 with FASTON term to (ON) term of S1 (Black).
W6	On Cordset	To end term of F1 (piggyback terminal of W17)(Black). (Applies to P1,P2,P11,P12).
W7	On Cordset	To ground stud. Green (P1,P2,P11,P12). Green/Yellow (P3,P14).
W8	On Cordset	Tied to W15 & W16 with wire nut (White)(P1,P2,P11,P12). Blue (P3,P14).
W9	Lead on T1	To Tab J4 on PC Board Assembly (Blue).
W10	Lead on T1	To Tab J5 on PC Board Assembly (Blue).
W11	Lead on T1	To Tab J1 on PC Board Assembly (Red).
W12	Lead on T1	To Tab J2 on PC Board Assembly (Red).
W13	Lead on T1	To Tab J3 on PC Board Assembly (Red/Yellow).
W14	M29/250074290	Thermostat to (OFF) terminal of S1 (Black).
W15	Lead on T1	Tied to W8 & W16 with wire nut (Item 16)(White).
W16	Lead on PCB	Tied to W8 & W15 with wire nut (Item 16)(Black).
W17	M29/250074288	From Tab J7 on PCB to end tab of fuse F1 (Black).
W18,W19	M29/250074204	Lead Assembly (Blue).
W20	M29/250074205	Lead Assembly (Brown).
W21,W22	M29/250074206	Lead Assembly (White).
W23	M29/26160311	Lead 2-3/8" lg. Strip " x (Brown).
W24	M29/26160399	Lead 2-3/4" lg. Strip " x (White).
A2	M29/91047000	HEATSINK ASSEMBLY.
1	M29/11024100	Heatsink (P1,P2,P3,P11,P12).
	M29/11022400	Heatsink (P14).
2	M29/22047800	Screw: #4-40 x 0.25".
3	M29/09017000	Thermostat, TI 1NT01L-1928.
4	M29/13051800	Socket: TO-3 Therm. 8113PF603.
5	M29/31023200	Insulator, Bergquist 1009AC-24.
6	M29/22001109	Screw: #6-32 x 0.625".
7	M29/18030800	Transistor: 2N5885 SGS.

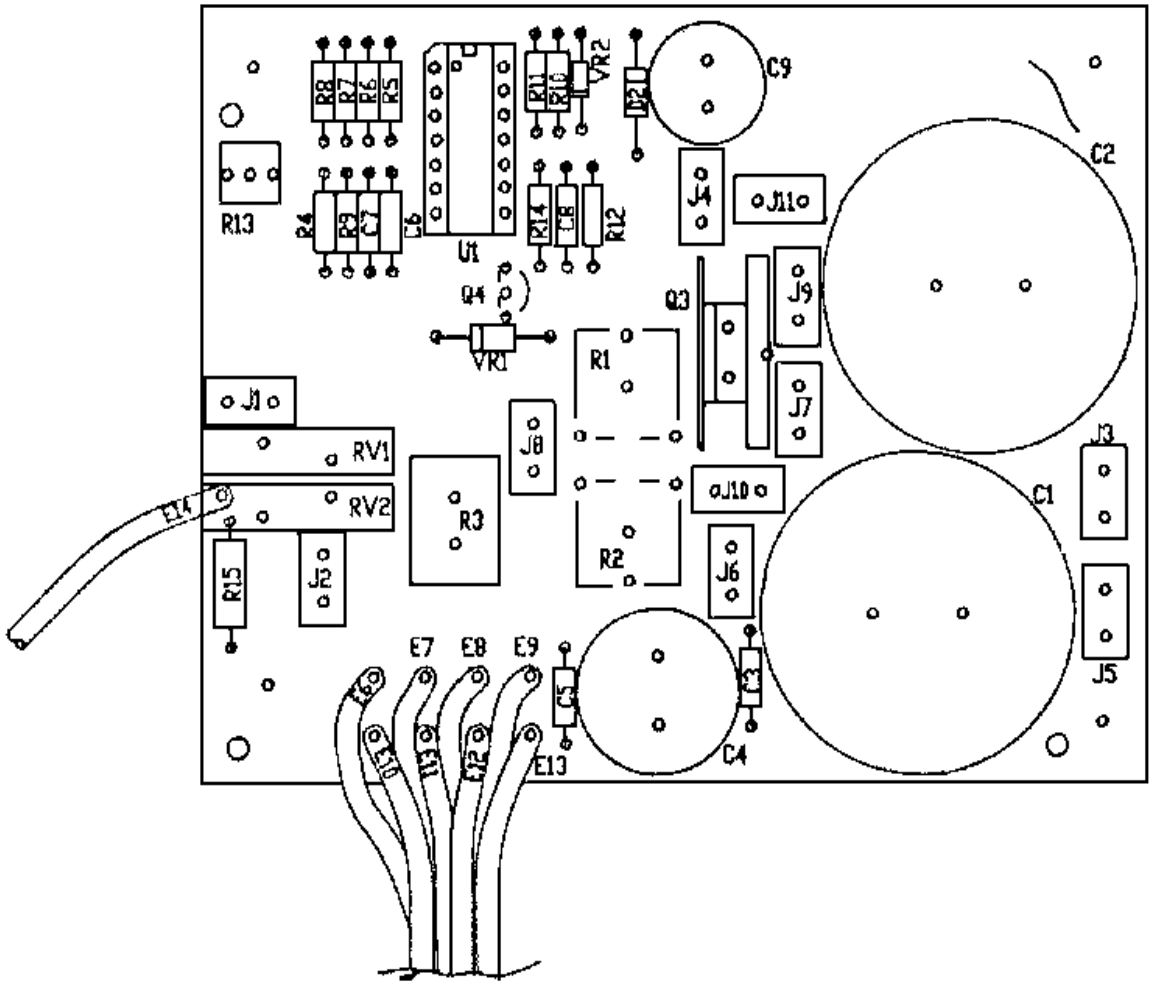
*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES





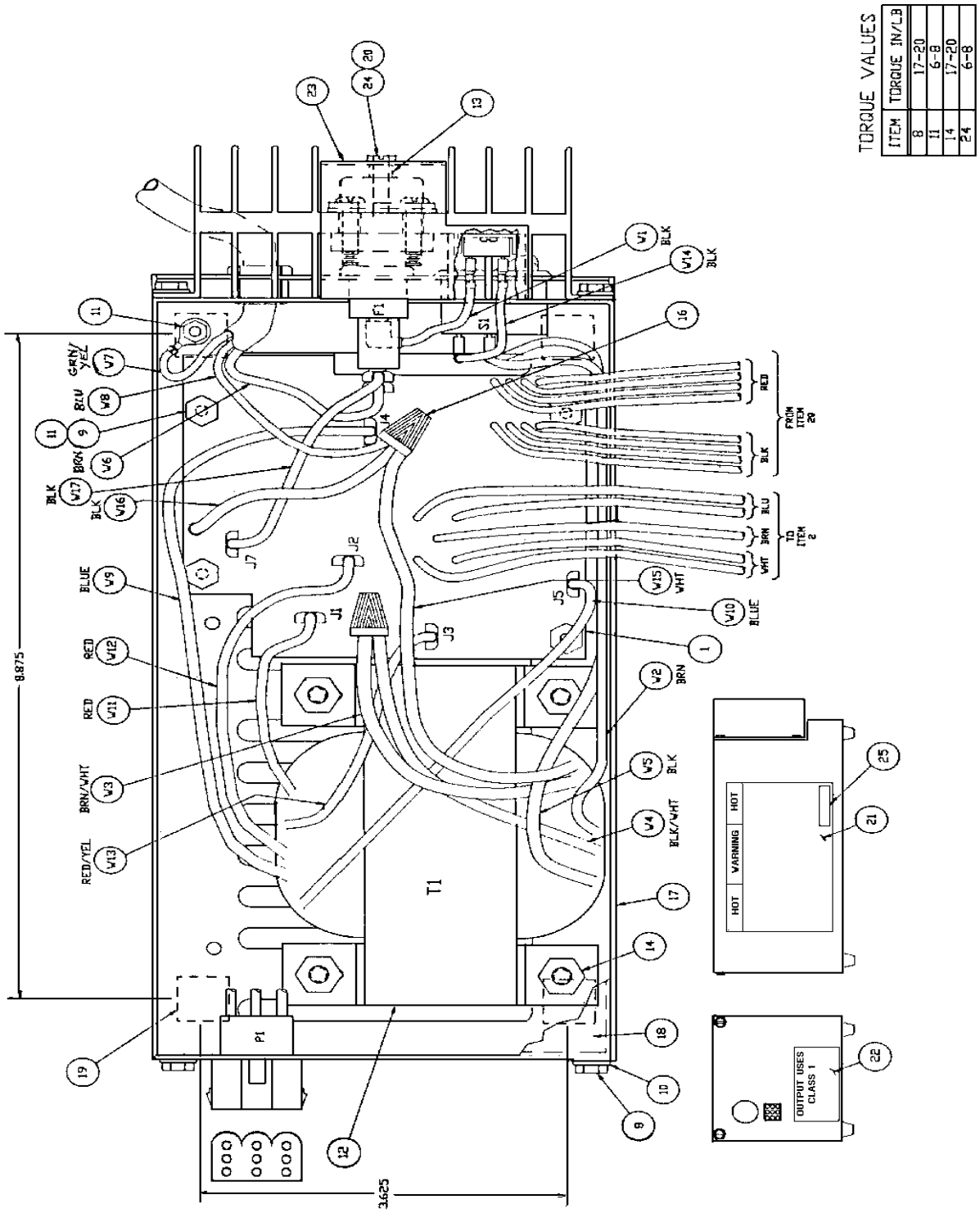
EARLIER VERSION

HEATSINK ASSEMBLY & P.C. BOARD
13 VOLT POWER SUPPLY

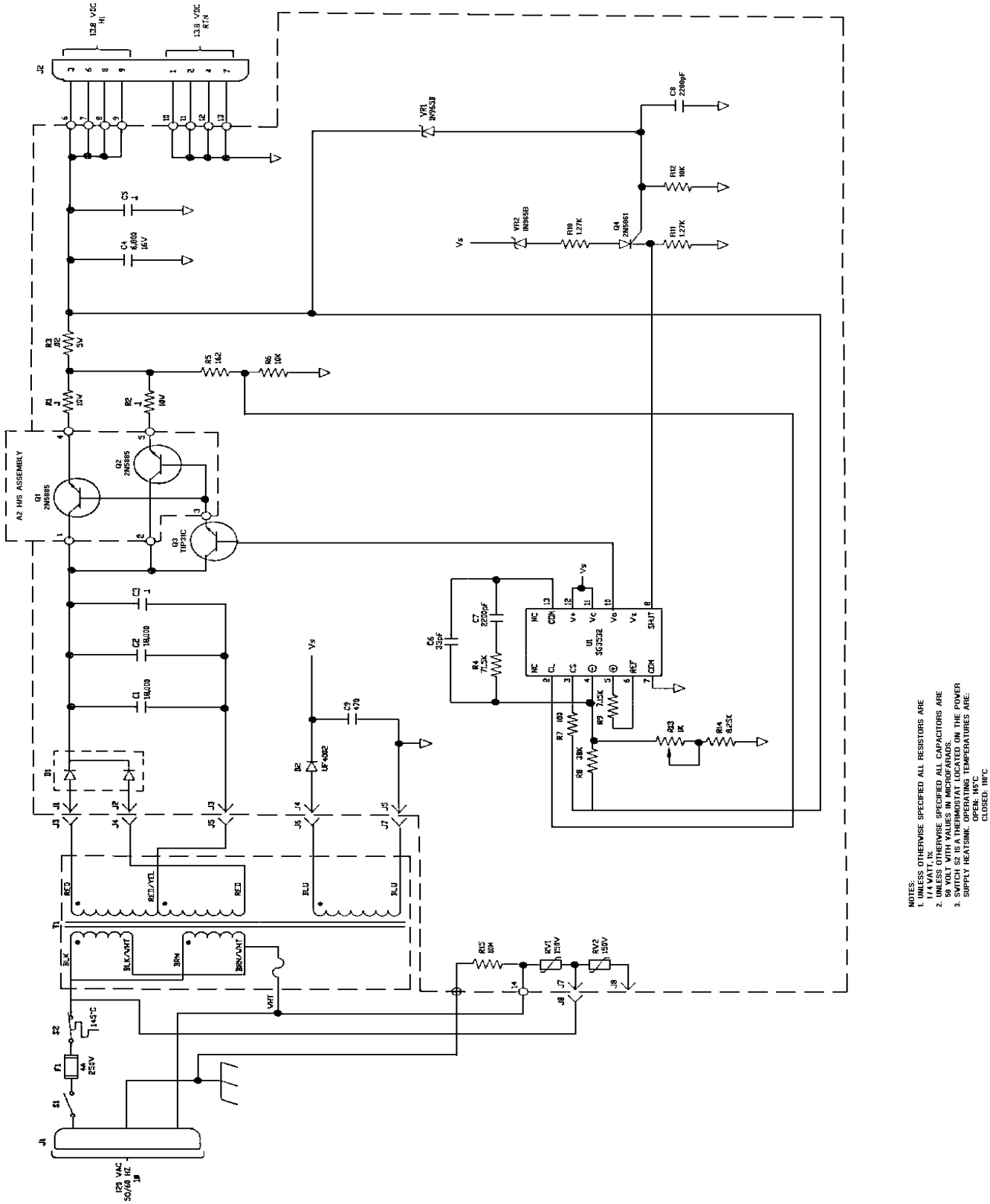


LATER VERSION

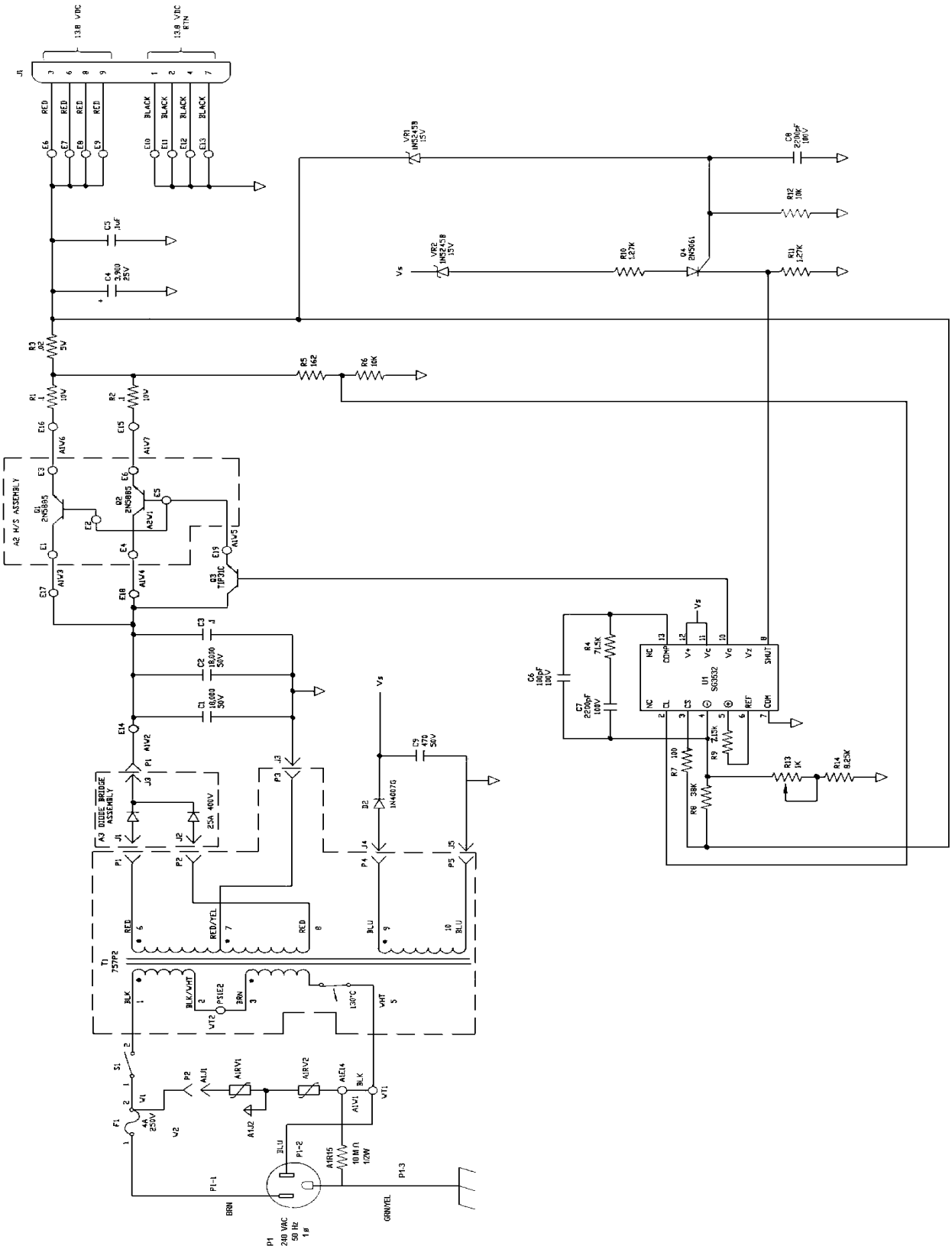
PC BOARD



13 VOLT POWER SUPPLY
19A70647P1-P3, P11, P12, P14



13 VOLT POWER SUPPLY
19A70467P1, P2, P11, P12



13 VOLT POWER SUPPLY
19A704647P3, P14