INSTRUCTION MANUAL

XENON POWER SUPPLY

for 10 kW Britelight Lamphead

Rev. June 2004

STRONG INTERNATIONAL
a division of Ballantyne of Omaha, Inc.
4350 McKinley Street
Omaha, Nebraska 68112 USA
Tel 402/453-4444 • Fax 402/453-7238
www.strongint.com

CONTENTS

PREFACE

THIS XENON POWER SUPPLY manufactured by Strong International is a dual-chassis, high reactance 10,000 watt unit utilizing silicon diodes as the power conversion elements. All models are designed for 50/60 Hertz operation, and are available in varying AC input types, depending upon the configuration of the main power transformers. Check the Equipment Data Plate to determine the exact AC requirement prior to installation.

COARSE AND FINE TAPS are easily set to regulate the DC current to the xenon bulb. Some models of this power supplies have the capability of overdriving a xenon bulb; carefully check the power requirements specified by the bulb manufacturer and do not exceed the maximum current stated.

DC OUTPUT to the xenon bulb is filtered by means of filter capacitors. A relay-operated resistor circuit reduces the inrush current upon ignition to prolong bulb life. Suppression capacitors prevent RF interference.

OVERSIZE HEAT SINKS disperse the heat normally generated by the silicon diodes. Each power supply chassis include an internally wired blower for additional heat dissipation. Thermal switches on the rectifier heat sinks act as safety interlocks to shut down the power supply and protect the rectifier diodes in case temperatures reach excessive levels.

INSTALLATION

CHECK THE EQUIPMENT DATA PLATE and make certain that the AC source conforms to the power requirements of the main power transformers. See the Installation Diagram on Page 5 for detailed AC hook-up, line protection, and lamp connections. The AC service wiring should be installed by a licensed electrician in conformance to local codes. The unit must be connected to an adequate earth ground.

THE AC LINE to the xenon power supply must include a marked line safety switch or other power disconnect device adjacent to the unit and accessible to the operator. For operator safety, it is necessary to turn off all power to the unit when adjusting or servicing the xenon power supply. This safety switch or power disconnect should be tagged “OFF - UNIT UNDER REPAIR” when the power supply is being serviced.

INSTALLATION (continued)

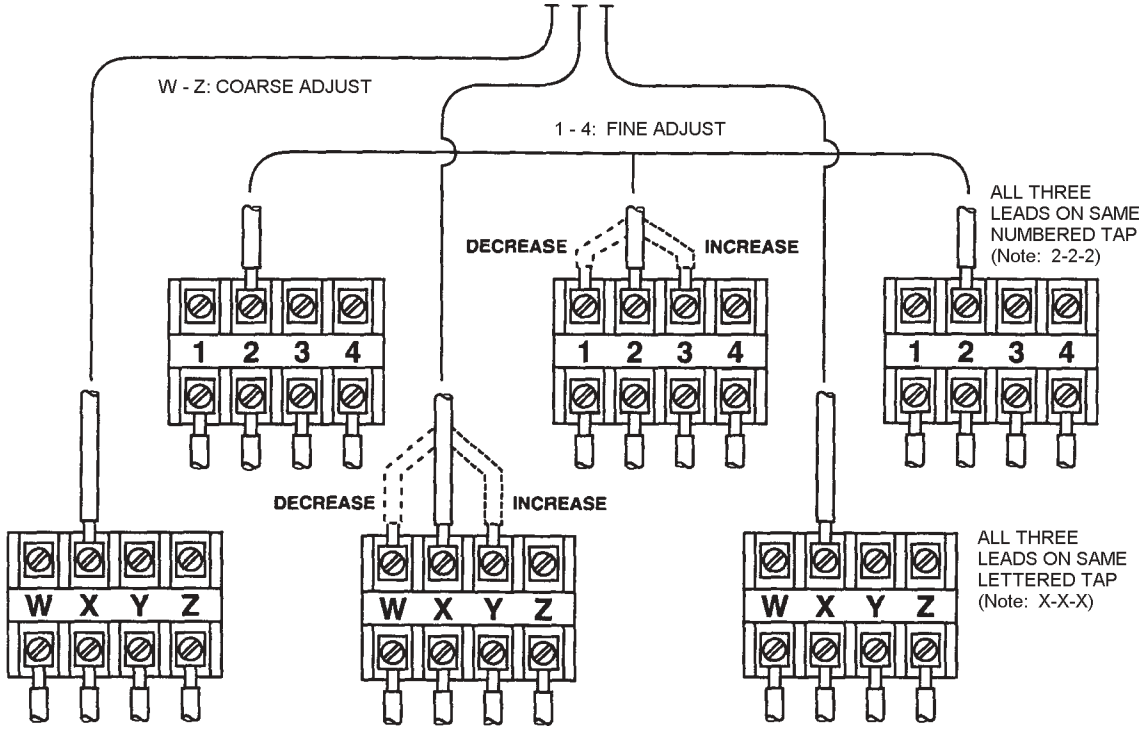
OBSERVING ALL SAFETY PROCEDURES, install a xenon bulb of the desired wattage into the lamphouse. Check the bulb manufacturer's documentation to confirm the recommended current range of the 10 kW bulb (165-210 amperes DC). A new bulb is normally first operated at "nominal" current, which is around 85% of the maximum level (180 A.). DO NOT, at any time, exceed the maximum current level specified by the bulb manufacturer.

IGNITE THE XENON BULB and check the current as indicated on the control panel ammeter. Allow (30) seconds for the current to stabilize and provide an accurate reading. If the current is not within the above-noted range, extinguish the bulb. It will be necessary to increase or decrease the DC output.

OUTPUT CURRENT ADJUSTMENT

WARNING

Turn off ALL primary AC power before making any adjustments or performing service procedures. Allow several minutes for the capacitors to drain stored energy. The power supply normally operates warm to hot; allow the unit to cool to safe temperature.



INSTALLATION (continued)

FINE ADJUSTMENT of the DC current is made to the *NUMBERED* taps found on the upper three terminal blocks (TB4, TB5, TB6). Fine taps are numbered 1-2-3-4, with "1" providing the **lowest** output, increasing to "4," yielding the **highest** output. A "fine" tap adjustment raises or lowers the current approximately four amperes. The three fine tap terminal blocks are interconnected by means of a three-lead jumper wire assembly attached to like-numbered terminals.

- To *increase* the DC output, move the jumper wire assembly to tap the next (3) *higher* numbered terminals, for example, move from terminals "2" to terminals "3." ALL TAPS MUST BE ON THE SAME NUMBERED POSITION (1-1-1, 2-2-2, 3-3-3, or 4-4-4). If the DC output is still too low when terminals "4" are interconnected, see the following instructions for adjusting *"coarse"* taps.

- To *decrease* the DC output, move the jumper wire assembly to tap the next (3) *lower* numbered terminals, for example, move from terminals "3" to terminals "2." ALL TAPS MUST BE ON THE SAME NUMBERED POSITION (1-1-1, 2-2-2, 3-3-3, or 4-4-4). If the DC output is still too high when terminals "1" are interconnected, see the following instructions for adjusting *"coarse"* taps.

COARSE ADJUSTMENT of the DC current is made to the *LETTERED* taps found on the lower three terminal blocks (TB1, TB2, TB3). Coarse taps are lettered W-X-Y-Z, with "W" providing the **lowest** output, increasing to "Z" at the **highest** output. The coarse tap terminals connect to contactor terminals T1, T2, and T3. The (3) contactor leads must connect to the same lettered step (W-W-W, etc.). A "coarse" tap adjustment raises or lowers the current approximately twelve amperes.

- To *increase* the coarse DC output, move each of the contactor leads to tap the next *higher* lettered terminals, for example, move from terminals "W" to terminals "X." ALL TAPS MUST BE ON THE SAME LETTERED POSITION (W-W-W, X-X-X, Y-Y-Y, or Z-Z-Z). Place the fine tap jumper on 1-1-1. Ignite the lamp, check the output, and increase the fine tap setting as required.

- To *decrease* the coarse DC output, move each of the contactor leads to tap the next *lower* lettered terminals, for example, move from terminals "Y" to terminals "X." ALL TAPS MUST BE ON THE SAME LETTERED POSITION (W-W-W, X-X-X, Y-Y-Y, or Z-Z-Z). Place the fine tap jumper on 1-1-1. Ignite the lamp, check the output, and increase the fine tap setting as required.

NOTE: Balance power supply output; i.e. set power supplies at or near the same output settings:

Power Supply "A"	X-X-X, 4-4-4 (or as required)
Power Supply "B"	Y-Y-Y, 1-1-1 (or as required)

INSPECT TAP CONNECTIONS to verify that the terminal is clamping the copper conductor, not the insulation. Make certain all terminal clamping screws are tight.

INSTALLATION (continued)

WHENEVER MAKING A COARSE ADJUSTMENT, again check the ammeter reading and make certain the current is within the desired range. A re-adjustment of the fine taps is frequently required after changing coarse taps.

OBSERVE CURRENT (AMPERAGE) READING *ONLY* when setting the output. The "voltage" reading can vary between individual xenon bulbs, and while wattage can be determined by multiplying volts times amperes, it is possible to overdrive and damage the bulb by operating it over 210 amperes. The arc voltage reading serves as a troubleshoooting tool detailed later.

REMOTE IGNITION CONTROL is enabled by connecting a dry contact across Terminals TB3-1 and TB3-2 and placing the REMOTE/LOCAL switch on the control panel to REMOTE. The lamphead will then ignite only when SYSTEM ON/OFF switch is in the ON position and the remote control contact is closed.

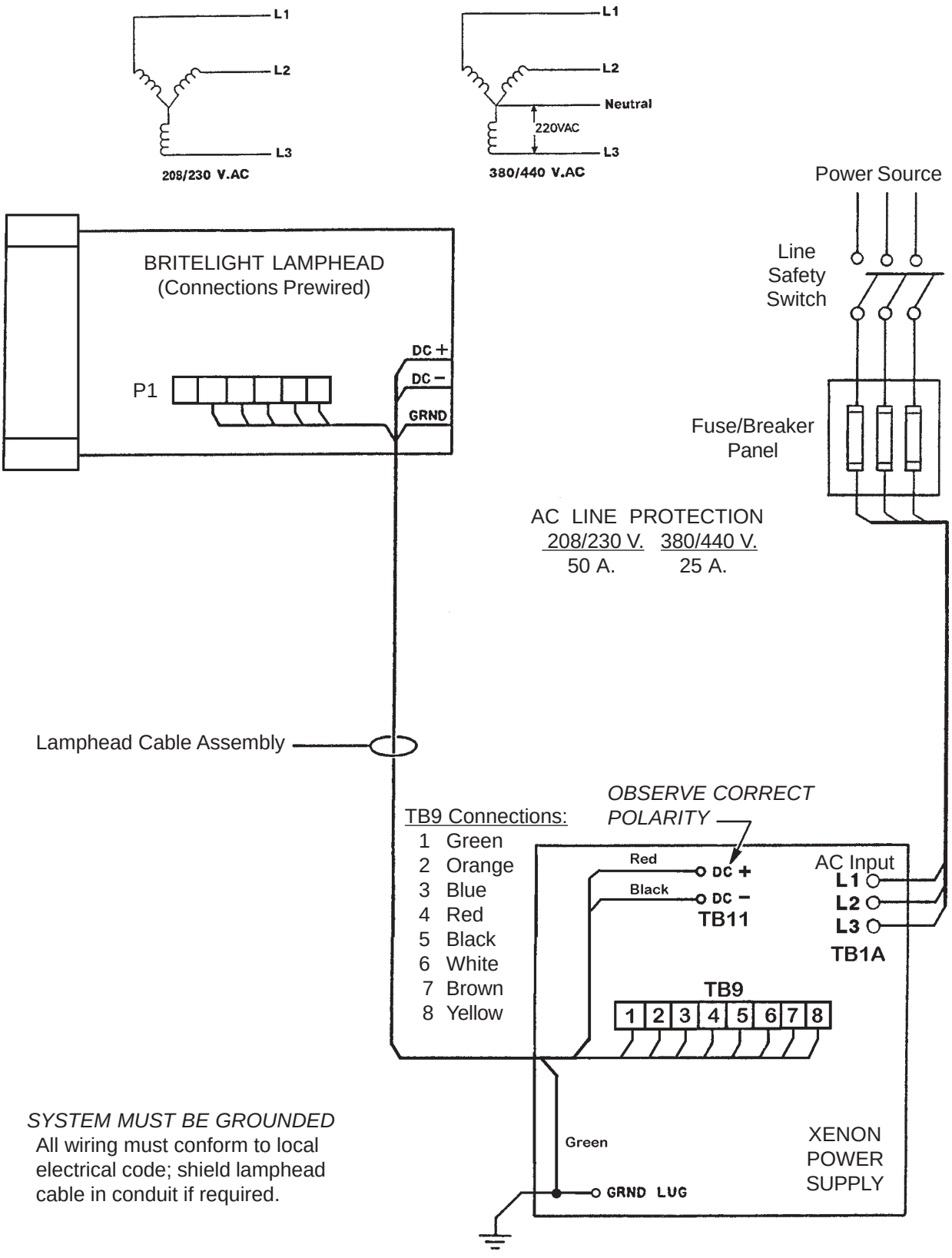
AFTER PROLONGED OPERATION, the light output of the xenon bulb will decrease. This is a normal factor of bulb aging, and can be compensated by raising the DC output of the xenon power supply. If the bulb was first operated at "nominal" current, the power supply output can gradually be increased to, but not in excess of, he maximum current specified by the bulb manufacturer. Increase the current as instructed above. Decrease the power supply output to its former "nominal" current level upon the installation of a new replacement bulb.

TIMER PC BOARD OPERATION

TIMER PRINTED CIRCUIT BOARD ASSEMBLY (Part No. 32-70137) provides timing functions to lamphead ignition and shutdown. Upon closure of the POWER "ON" switch ("Local" mode), and assuming all interlocks are closed, Relays K2 and K3 latch and energize the igniter circuit. The lamphead igniter will discharge and provide a pulsed arc between the electrodes of the xenon bulb. A functional bulb will normally ignite after one or two of these pulses. If the bulb does not ignite within a period of one (1) minute, the relays will drop out and de-energize the igniter circuit to protect the bulb electrodes. In this event, it is necessary to replace the xenon bulb or troubleshoot the lamphead and power supply system.

THE "STRIKE" SWITCH on the control panel bypasses the above timing function and provides an immediate ignition pulse assuming the system is "ON" and all interlocks closed.

AFTER EXTINGUISHING THE ARC (POWER "OFF" setting), Time-Delay Relay K4 will actuate and allow the cooling blowers to continue operating for 20 minutes. This measure is necessary to properly cool the xenon bulb and insure full bulb life. Most xenon bulb manufacturers will not grant warranty credit on bulbs that are *not* forced-air cooled after operation.



SYSTEM MUST BE GROUNDED
All wiring must conform to local electrical code; shield lamphead cable in conduit if required.

TROUBLESHOOTING

WARNING: Exercise extreme caution when taking voltage measurements in a power "ON" condition. Allow the capacitors (2) minutes to discharge.

POWER LINE PROBLEMS

PRIMARY POWER (AC source) problems are most commonly (a) complete loss of AC power, or (b) phase loss, in which one phase loses power.

a) Check line safety switch ("ON"). Check fuses or breakers in supply line. Using an AC voltmeter, measure input power at contactor terminals L1, L2, L3.
b) When power is lost on one phase, the current ripple will increase and trip the AC line circuit breaker or blow an AC fuse. To detect a lost phase, measure the AC voltage phase-to-phase at contactor input terminals L1, L2, and L3.

PROBLEMS of this nature, once detected, are generally corrected by the power supplier (i.e. the local utility company).

BOOST CIRCUIT PROBLEMS

THE BOOST CIRCUIT generates the high open circuit ("no load") DC voltage which, in conjunction with the igniter pulse, will ignite the xenon bulb. The open circuit voltage should measure at least 110 V.DC. It is displayed briefly on the lamphouse ammeter by pressing the "VOLTAGE" button at ignition, or the reading can be sustained by disabling lamphouse ignition by removing one AC lead from the igniter feed.

A TERTIARY WINDING on the main transformer (T1) supplies the source for the Boost Circuit. Three wires derive from the T1 transformer; two are single conductors, and the third is a soldered pair. The Boost Circuit should be connected only to the (2) single conductors. Filter capacitors store energy and also contribute to bulb ignition.

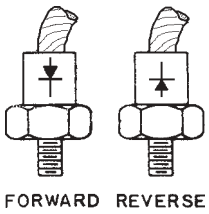
CONTROL CIRCUITRY

THE MAIN POWER TRANSFORMER is energized by contactor K1, which is pulled by (a) a remote system closure or (b) manual actuation of the "ON" switch. All lamphouse interlock switches ("Door," "Air," etc.) must also be closed to complete the contactor circuit.

ANY INTERRUPTION of the control circuit will disable K1 and open the AC circuit to the transformers. In addition to the above lamphouse interlock switches, thermal switches (S1), mounted to the rectifier heat sinks, will open and disable K1 if the temperature at the heat sinks exceeds 190° F. (88° C.). The S1 switches will automatically re-set when temperatures fall to safe levels.

TROUBLESHOOTING (continued)

POWER CONVERSION PROBLEMS



RECTIFICATION (AC to DC) is performed by bridge diodes CR1 - CR6. CR1, CR2, and CR3 are **forward** diodes, and CR4, CR5, and CR6 are **reverse** diodes. The two types are *not interchangeable.*

AN OPEN DIODE will cause a pronounced flicker in the light output. Two or more open diodes will disable bulb ignition. A shorted diode will trip the circuit breaker (at the wall or in a power distribution panel) protecting the AC input line. See the following DIODE TESTING & REPLACEMENT section.

THE BANKED CAN CAPACITORS C3 and C7 filter the rectified DC output. Filter capacitors also store energy to contribute to the open circuit ignition discharge. A shorted capacitor can trip the AC circuit breaker.

RELAY K6, in the presence of high DC open circuit voltage, will pull and place the nichrome resistor in series with the filter capacitors. This resistor limits the inrush surge and prolongs the discharge of the filter capacitors to promote bulb ignition. If K6 relay fails, the nichrome resistor will remain in circuit.

DIODE TESTING & REPLACEMENT

1. Disconnect the diode from its circuit. Inspect for discoloration, oxidation, or loose crimp at lead junction.
2. A "shorted" diode will show low resistance in both directions. An "open" diode will have infinite resistance in both directions. An ohmmeter test is required.
3. a) Analog VOM (Volt-Ohm Meter): Select R x 1 Ohm scale. With meter leads connected in one direction, the reading should be zero (or nearly so); reversing the meter leads should show very high resistance. If the diode does not exhibit these characteristics, replace it. NOTE DIODE TYPE: forward or reverse.
   b) Digital VOM: Select "Diode Test." With meter leads connected in one direction, the reading should be "OL" (overload); reversing the meter leads should display approximately .4 volt. If the diode does not exhibit these characteristics, replace it. NOTE DIODE TYPE: forward or reverse.
4. Carefully clean the area of the heat sink in which the diode mounts. Apply heat sink compound (Radio Shack #276-1373 or equivalent) using a wood or plastic spatula or stick. A thin layer is adequate.

WARNING: *HEAT SINK COMPOUND IS HIGHLY CAUSTIC.* Do not apply with fingers; keep away from eyes. Carefully follow ALL the instructions printed on the package.

5. Install the new diode and tighten securely for maximum mechanical contact and electrical conduction. Clean and firmly secure the lead terminal to the buss.

TROUBLESHOOTING (continued)

Contactor does not energize (no audible "click")

1. Line safety switch open. Turn "ON."
2. AC line circuit breaker off. Turn "ON."
3. Circuit breaker or fuse in AC line open. Check AC source.
4. REMOTE/LOCAL switch set incorrectly. Romote contact required when in REMOTE mode.
5. Lamphead interlock switch open. See lamphead manual.
6. Faulty K1 contactor coil or loose connection at coil terminals. Repair or replace.
7. Defective S1 thermal switch. Repair or replace.
8. Defective relay K1 or K6; Repair or replace.

Contactor pulls but lamphouse igniter does not fire

1. Faulty contactor contacts. With coil energized, check for continuity across the contacts from the "L" side to the "T" side; repair or replace if defective.
2. Insufficient DC output. See INSTALLATION section; increase tap setting as required.
3. Faulty timer PC board assembly. If igniter fires when STRIKE switch is pressed, repair or replace timer board.
4. Faulty igniter. See lamphead manual.
5. Low open circuit voltage (less than 110 V.DC).
   a) Check ceramic resistors R1 & R2; should be in circuit and measure 100 Ohms.
   b) Check boost diodes D2 and D3. See preceding DIODE TESTING section.
   c) Check filter capacitors. Replace if defective.

Bulb requires multiple ignition pulses to light

1. Insufficient DC output. See INSTALLATION section; set tap setting as required.
2. Faulty or expired xenon bulb. Check for darkened envelope, worn electrodes; replace if required.
3. One or more faulty bridge diodes. See preceding DIODE TESTING section.

Bulb goes out during operation

1. Fuse F1 missing or open. Replace with same rated (3 ampere) fuse.
2. Excessive heat at rectifier heat sinks; thermal switch S1 opening. Check for free air flow, blower operating at full speed. Check for loose connection.
3. Faulty lamphead interlock switch ("Door," "Air," etc.). See lamphead manual.

Excessive flicker in light output

1. Improper tap setting. All taps must be on same numbered or lettered step.
2. Faulty bridge diode. See preceding DIODE TESTING section.
3. Faulty xenon bulb. Check for cracked or sagging electrode(s).
4. Leaking xenon bulb. Check for white or bluish discolored envelope, high current and low voltage (below 48 volts DC). Replace as required.

TROUBLESHOOTING (continued)

Bridge diodes (CR1-6) fail repeatedly

1. Insufficient air flow; defective blower. Clean, repair, or replace as required.
2. Incorrect replacement diode. Use only the specified rated diode(s).

Reduced light output

1. AC line voltage drop. Check AC line voltage; re-set DC output taps to compensate.
2. Bulb envelope discoloring with normal aging. Increase DC output setting; do not exceed 210 amperes.
3. Faulty xenon bulb. Check for cracked or sagging electrode(s). Replace as required.
4. Leaking xenon bulb. Check for white or bluish discolored envelope, high current and low voltage (below 48 volts DC). Replace as required.

Elapsed Time Meter fails to record hours

1. Current sensor PC board not in contact with DC lead. PCB must be tie-wrapped to the insulation of one of the heavy DC output leads from the xenon power supply.
2. Defective component on current sensor PCB. Repair or replace; secure replacement board to DC lead as noted above.
3. Defective hour meter. Replace as required.

MAINTENANCE

VERY LITTLE MAINTENANCE is required to keep this power supply in good operating condition. Like most lighting equipment, regularly scheduled cleaning is most important.

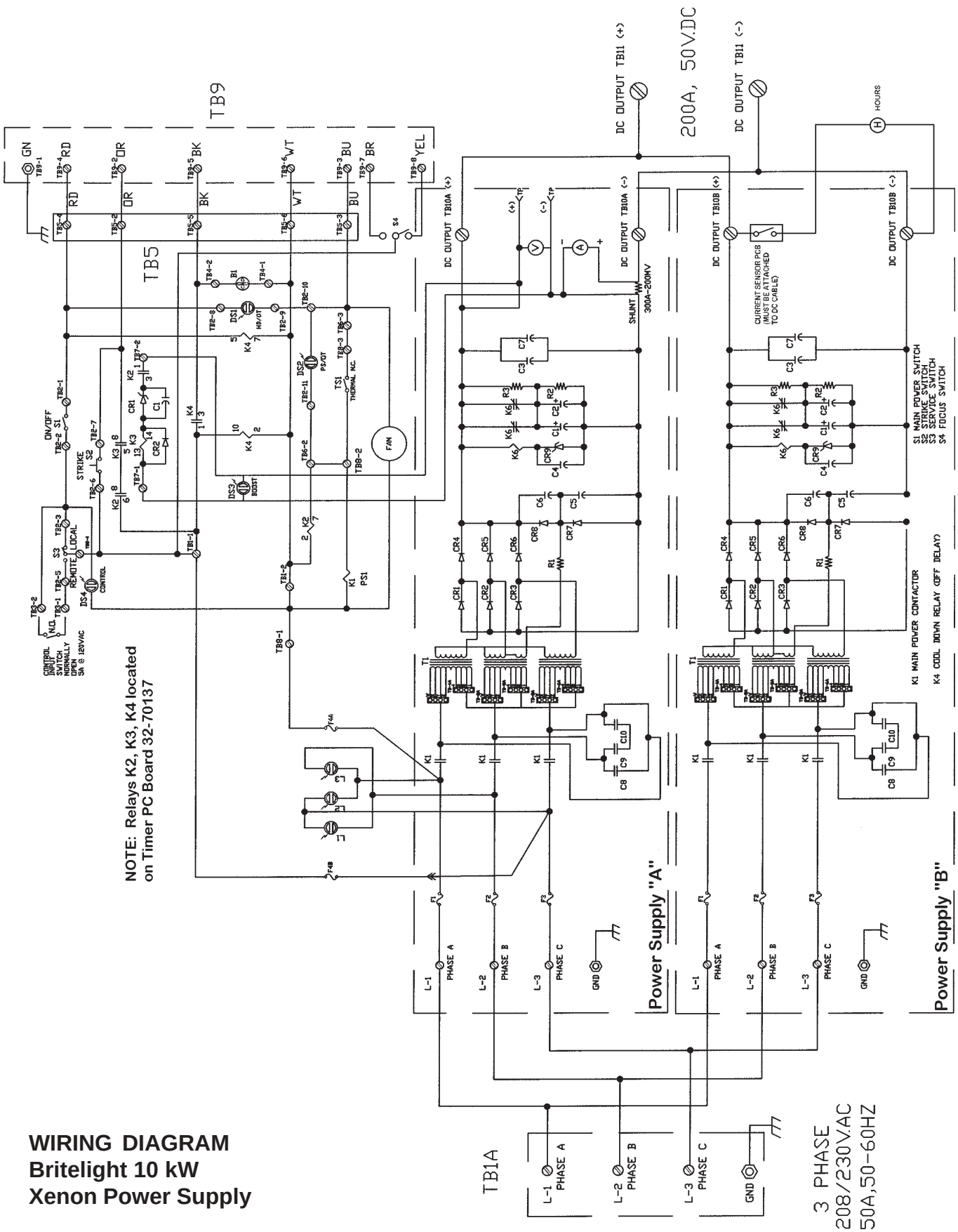
WARNING

Turn off ALL primary AC power before making any adjustments or performing service procedures. Allow several minutes for the capacitors to drain stored energy. Allow the power supply to cool to ambient temperature.

1. Remove all accumulated dust and dirt from the rectifier. Vacuum the heat sinks. Make certain all air inlets and outlets are unobstructed.

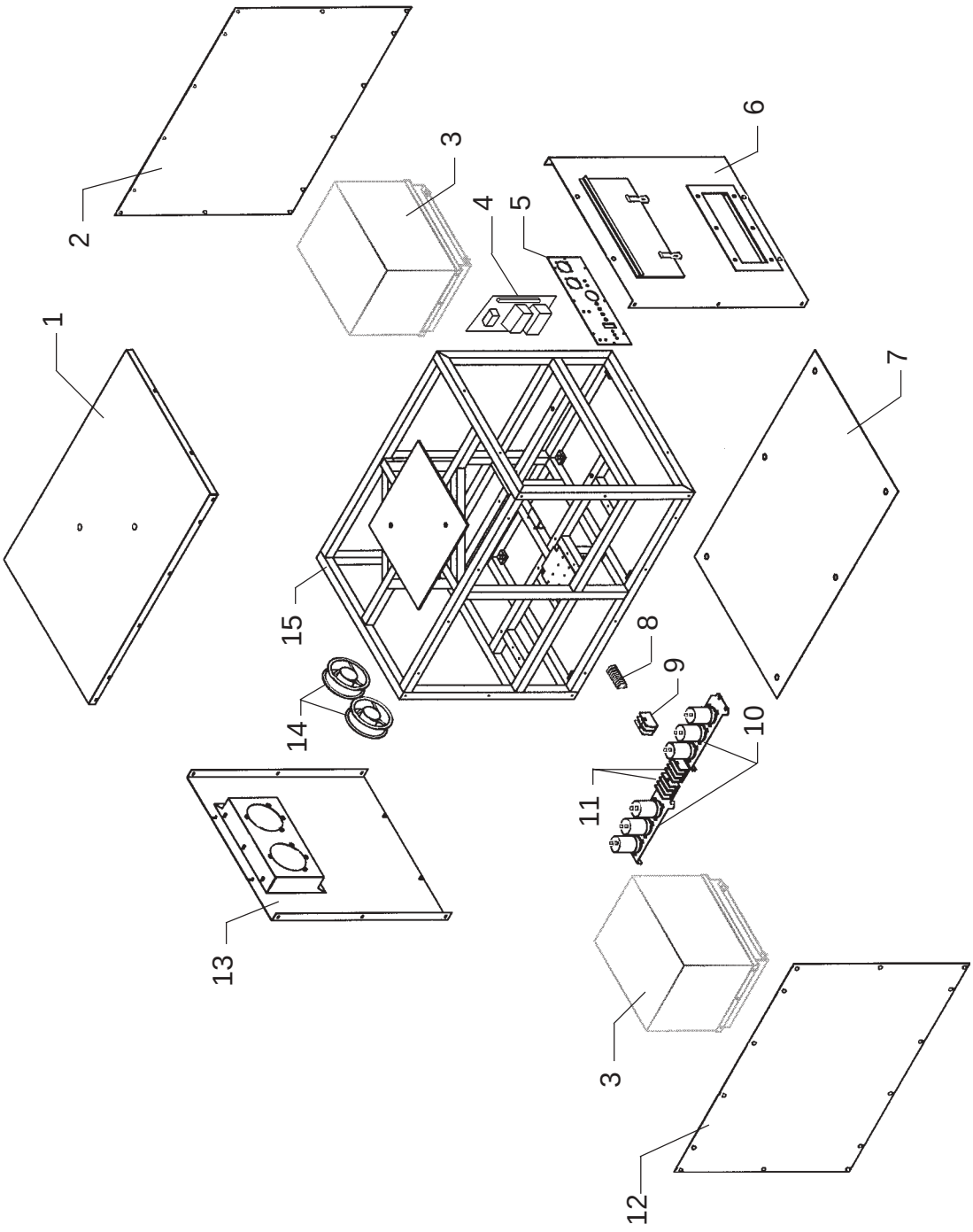
2. Regularly check all electrical connections for tightness. Clean, retighten, or replace any discolored connections or terminals.

3. The blower motors contains sealed bearings and requires no lubrication.



WIRING DIAGRAM
Britelight 10 kW
Xenon Power Supply

FIGURE 1

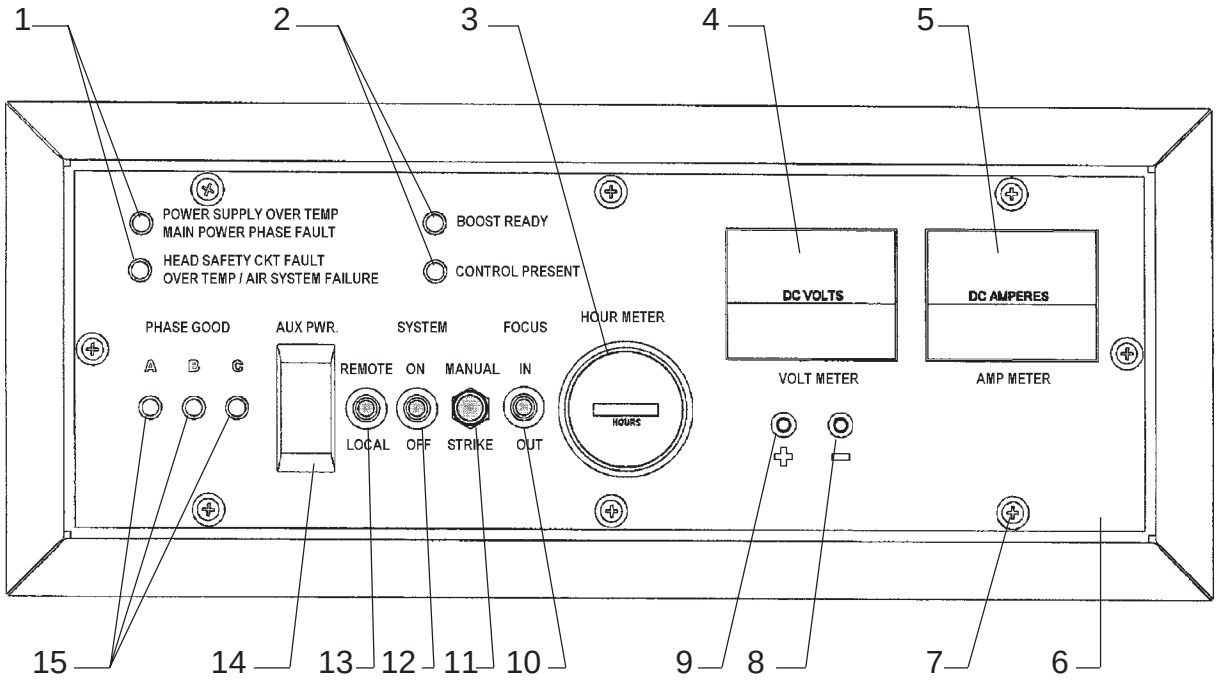


PARTS LIST

Figure 1

Item	Part No.	Description
1	32-00215	Top Cover Panel
-	4100621	Mounting Screw, 10-32 x 5/8"
-	4107101	Flatwasher, #10
2	32-00412	Rear Panel
-	4100621	Mounting Screw, 10-32 x 5/8"
-	4107101	Flatwasher, #10
3	32-90014	Power Supply Chassis Assembly (see Figure 3)
-	4250752	Mounting Screw, 1/4-20 x 3/4"
-	4254001	Lockwasher, 1/4"
-	4257102	Flatwasher, 1/4"
4	32-70137	Timer Printed Circuit Board Assembly (includes Relays K2, K3, & K4)
5	32-00223	Control Panel Assembly (see Figure 2)
6	32-00414	End Panel, Control Side
-	4100621	Mounting Screw, 10-32 x 5/8"
-	4107101	Flatwasher, #10
7	32-00222	Bottom Panel
8	31-62011	Terminal Section (8 req'd.)
-	31-62012	Terminal Strip End
9	31-62025	Barrier Strip
10	32-00019	Capacitor Assembly (2 req'd.)
-	31-08133	Power Factor Capacitor, 60µf, 370 V.AC
-	32-40724	Bracket
11	31-62044	Barrier Strip (2 req'd.)
12	32-00410	Front Panel
-	4100621	Mounting Screw, 10-32 x 5/8"
-	4107101	Flatwasher, #10
13	32-00413	Blower Panel
-	4100621	Mounting Screw, 10-32 x 5/8"
-	4107101	Flatwasher, #10
14	71627000	Blower, 220 V.AC, 50/60 Hz. (2 req'd.)
15	32-00192	Frame, Welded Assembly

FIGURE 2

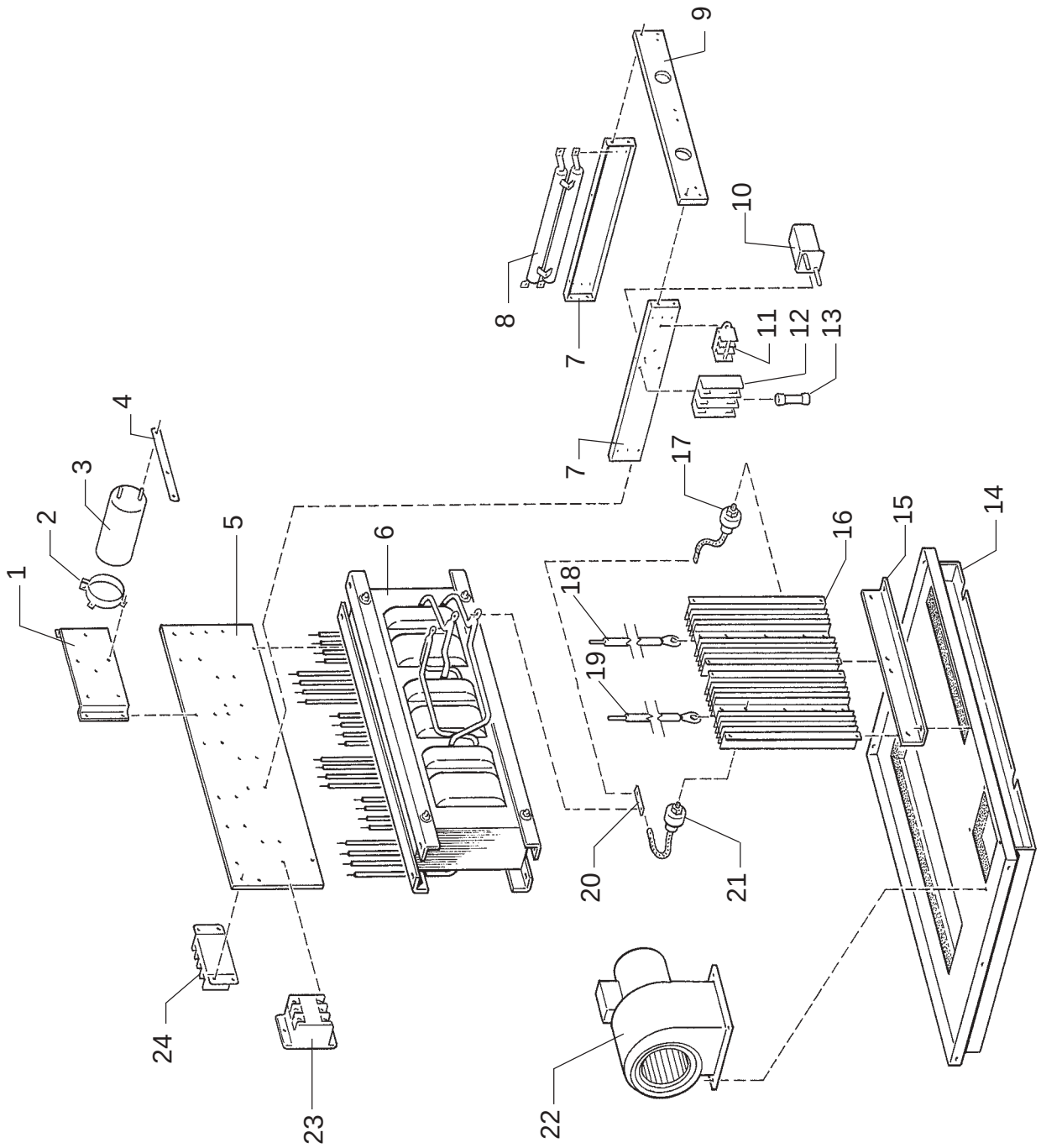


Item	Part No.	Description
1	31-30005	Indicator Light, Red
2	31-30006	Indicator Light, Green
3	31-32004	Elapsed Time Meter
4	31-32007	Volt Meter
5	31-32006	Ammeter
6	32-00218	Panel (less Components)
7	4100621	Mounting Screw, 10-32 x 5/8"
8	31-98160	Test Point Socket, Black
9	31-98162	Test Point Socket, Red
10	31-61049	“Focus” Switch, Momentary
-	11-98150	Rubber Switch Boot
11	31-61030	“Strike” Switch, SPST Pushbutton
-	31-61065	Rubber Switch Boot
12	31-61048	“On-Off” Switch, DPDT
13	31-61048	“Remote/Local” Switch, DPDT
-	11-98150	Rubber Switch Boot
14	31-61015	Switching Circuit Breaker, 5 A.
-	31-61126	Rubber Boot
15	31-30076	Indicator Light, Amber

MOLEX CONNECTORS
(not shown)

Part No.	Description
31-13283	Two-Pin, Male
31-13288	Two-Pin, Female
31-13033	Six-Pin, Male
31-13288	Six-Pin, Female
31-13262	Twelve-Pin Male

FIGURE 3



XENON POWER SUPPLY CHASSIS

PARTS LIST

Figure 3

Item	Part No.	Description
1	82-40264	Capacitor Mounting Bracket
2	61-06001	Capacitor Clamp (2 req'd.)
3	61-08027	Filter Capacitor, 5400 µf, 200 V.DC (C3, C7)
4	82-40248	Shorting Bar
5	82-40047	Terminal Board Mounting Plate, Phenolic
6	91-64011	Power Transformer (T1), 208/230 V.AC, 50/60 Hz. Input
6	91-64007	Power Transformer (T1), 380/440 V.AC, 50/60 Hz. Input
Item 6 Transformer includes Item 5 Mounting Plate & (6) Item 24 Terminal Blocks.		
7	82-40040	Support Bracket, Rectifier Heat Sinks
8	81-46026	Ceramic Resistor (R1, R2), 100 Ohm, 100 W.
9	82-40254	Heat Sink Mounting Plate, Phenolic
10	81-45016	Relay (K6)
11	21-62067	Terminal Block Segment (3 req'd.)
-	21-62066	Terminal Block End
12	31-21054	Fuse Block
13	31-21038	Fuse, 30 A. 250 V.
14	32-40624	Chassis Plate, Welded Assembly
15	82-40255	Heat Sink Mounting Plate
16	82-20032	Heat Sink
17	81-47004	Forward Diode (CR1,2,3), 100 A. 300 V. (1N3290)
18*	61-71010	Positive Lead (Red)
19*	61-71009	Negative Lead (Black)
-	94129000	Ring Terminal (2 per lead req'd.)
-	32-70140	Current Sensor Printed Circuit Board Assembly
20	91-98031	Buss Bar (3 req'd.)
21	81-47001	Reverse Diode (CR4,5,6), 100 A. 300 V. (1N3290R)
22	81-33026	Squirrelcage Blower, 230 V.AC, 50/60 Hz.
23	81-14003	Contactor (K1)
24	81-62001	Tap Terminal Block (6 req'd.)

* Order by *foot*