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INSTRUCTION MANUAL

XENON POWER SUPPLY

78002-1

3-83



Strong Electric Corporation

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PREFACE

THIS STRONG DC POWER SUPPLY is a continuous duty three phase, full wave bridge type transformer rectifier using silicon diodes as the power conversion elements and is designed for use with the Strong 150 Ampere Xenon Projection Lamphouse.

THIS POWER SUPPLY is designed to operate from an A. C. source of 208/230 volts (190-250V.) and draws 45 Amperes maximum per phase from a 208 volt line with a 150 Ampere load.

TO USE WITH THE HANOVIA 150 Ampere (4200W.) or the OSRAM 140 Ampere (4000W.) bulb in the lamphouse, the DC output range of this power supply can, without modification, be adjusted by the coarse and fine line taps to supply 120-150 Amperes to the bulb.

THE POWER SUPPLY is equipped with a cooling fan to maintain a safe operating temperature, and thermal switches, located on the rectifier heat sink, to stop operation of the equipment and protect the rectifier elements if temperatures reach an abnormal level.

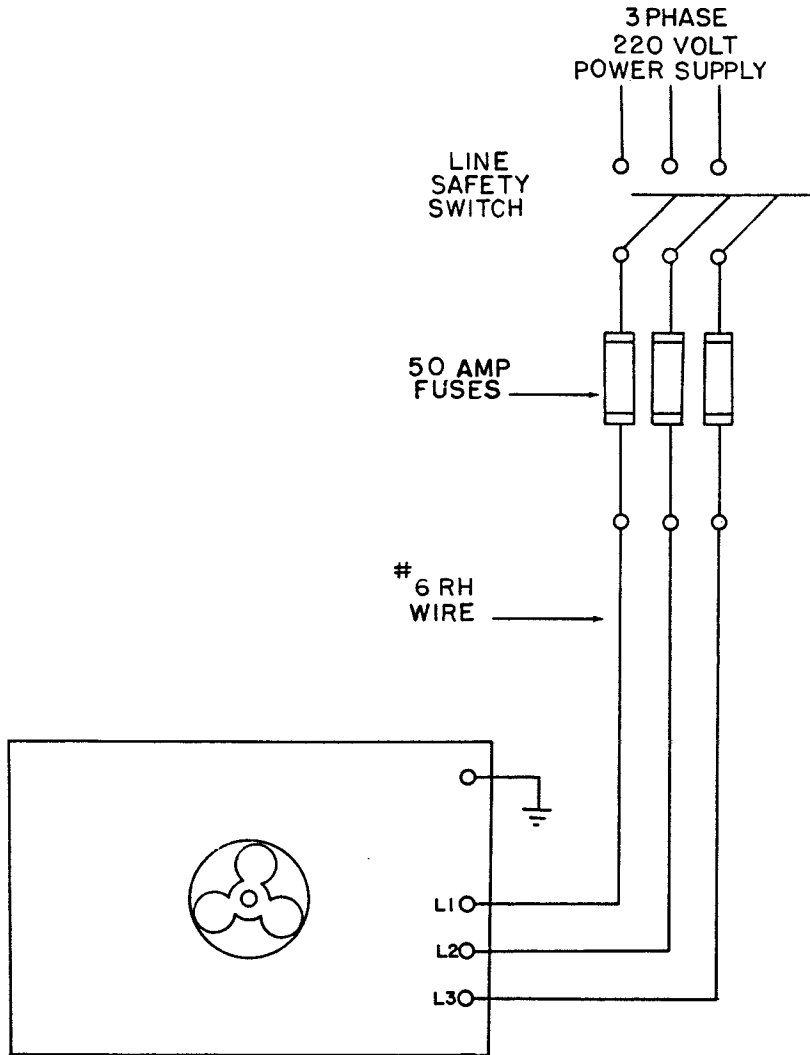
A CHOKE and capacitors are provided in the DC circuit to reduce ripple to a minimum, consistent with the requirements of the xenon bulbs for long life.

A STEPDOWN TRANSFORMER reduces the line voltage to provide a 115 V. AC control circuit to the lamphouse. Circuit breakers, wired to the control circuit, protect components in the event of a malfunction.

THE D. C. OUTPUT to the lamphouse is adjustable by means of the fine line taps, position "5" giving the highest output, and by moving the three AC leads from the relay across the tap panel from position "A" to "B", "C" and "D". These three leads at position "D" give the highest output.

IF AT ANY TIME you have a suggestion, or desire aid in securing anticipated results, write directly to STRONG ELECTRIC CORP., PO Box 1003, 87 City Park Ave., Toledo, Ohio 43697.

INSTALLATION DIAGRAM



INSTALLATION - OPERATION

INSTALL THE POWER SUPPLY as close as possible to the lamp-house. Use the size wire specified on the installation diagram in the lamp-house manual, to keep the power loss between the power supply and lamphouse to a minimum.

THE D. C. CIRCUIT between the power supply and lamphouse must be a direct connection without fuses or switches in the circuit and avoid runs of over 15 feet, if possible.

THE A. C. INPUT POWER LINES between the power supply and fused safety switch should be as short as possible and conform to the size indicated on the installation diagram in this manual. A terminal lug, located inside the housing, is provided for the ground connection.

FOR BEST PERFORMANCE install the power supply in a well ventilated room. The power supply should not be operated in an ambient temperature over 120° Fahrenheit (50° Celsius).

THERMAL SWITCHES, mounted to the diode heat sink, sense the temperature and will open at 190°F. (+5°), breaking the AC control circuit to the coil of the line contactor and prevent overheating the rectifier stack. The switch(es) will remain open and prevent operation of the power supply until the temperature at the heat sink falls below 140-160° Fahrenheit.

REMOVE THE TOP COVER of the power supply, and place the coarse AC tap leads, which run from the line relay to the terminal board, on the terminals indicated in the table below for your measured line voltage. Each of the leads must be on the same lettered position.

<u>Measured Line Volts</u>	<u>Connect to Terminals</u>
190-208	D
208-220	C
220-230	B
230-250	A

CAUTION: High voltages exist inside the power supply cabinet. Turn off the main line switch before adjusting taps.

IF THE AC LINE VOLTAGE is in excess of 220 volts, the brown lead of the stepdown transformer (T2) must be replaced with the blue lead. This connection is made at the contactor terminals.

THE FINE ADJUST TERMINAL LINK must be set on step "1".

MAKE SURE that the polarity of the DC leads to the lamphouse is not reversed. Reversed polarity will cause rapid destruction of the xenon bulb.

DO NOT BLOCK THE AIR VENTS on the sides of the power supply cabinet, or operate with the top cover removed. This might cause the equipment to overheat.

IGNITE THE XENON BULB as specified in the lamphouse manual. Wait a few minutes for the current to stabilize; then adjust the power supply, as instructed below, for the desired current as specified by the bulb manufacturer.

ARC CURRENT TOO HIGH: (To decrease current)

The arc current can be lowered by moving the terminal link to a lower number. Each step decreases the current 4 amperes. If the link is on number "1", the current can be lowered by changing the coarse tap leads in the power supply to a lower tap (letter), i. e. tap "B" to tap "A". Again, when one tap lead is changed, all 3 must be changed. When the coarse tap leads are changed, the terminal link must be set to No. "1" step and then raised to a higher setting if the current is too low.

ARC CURRENT TOO LOW: (To increase current)

The arc current can be raised by moving the terminal link to a higher number. Each step increases the current 4 amperes. If the bar is on number "5" and the current is still too low it can be raised by changing the coarse tap leads in the power supply to a higher tap (letter), i. e. tap "B" to tap "C". Again, when one lead is changed, all 3 must be changed. When the coarse tap leads are changed, the fine tap must be set to number "1" step and then raised to a higher number if the current is too low. Do not exceed the rated operating range of the xenon bulb being used in the lamphouse.

AFTER THE DESIRED CURRENT is obtained, no further adjustment of the power supply will be necessary, unless the current is to be changed. This may become necessary from time to time as the bulb ages.

MAINTENANCE

LITTLE MAINTENANCE of the power supply is required to keep it in good working order.

VACUUM the entire power supply every three months. Dust and dirt will collect in the silicon unit, reducing air flow, and cause overheating which will open a thermal switch. In this event, the unit will not re-ignite the xenon bulb until the temperature at the diode heat sinks falls to a safe level.

CHECK CONNECTIONS on terminal panels occasionally to make certain that all electrical connections are tight and secure.

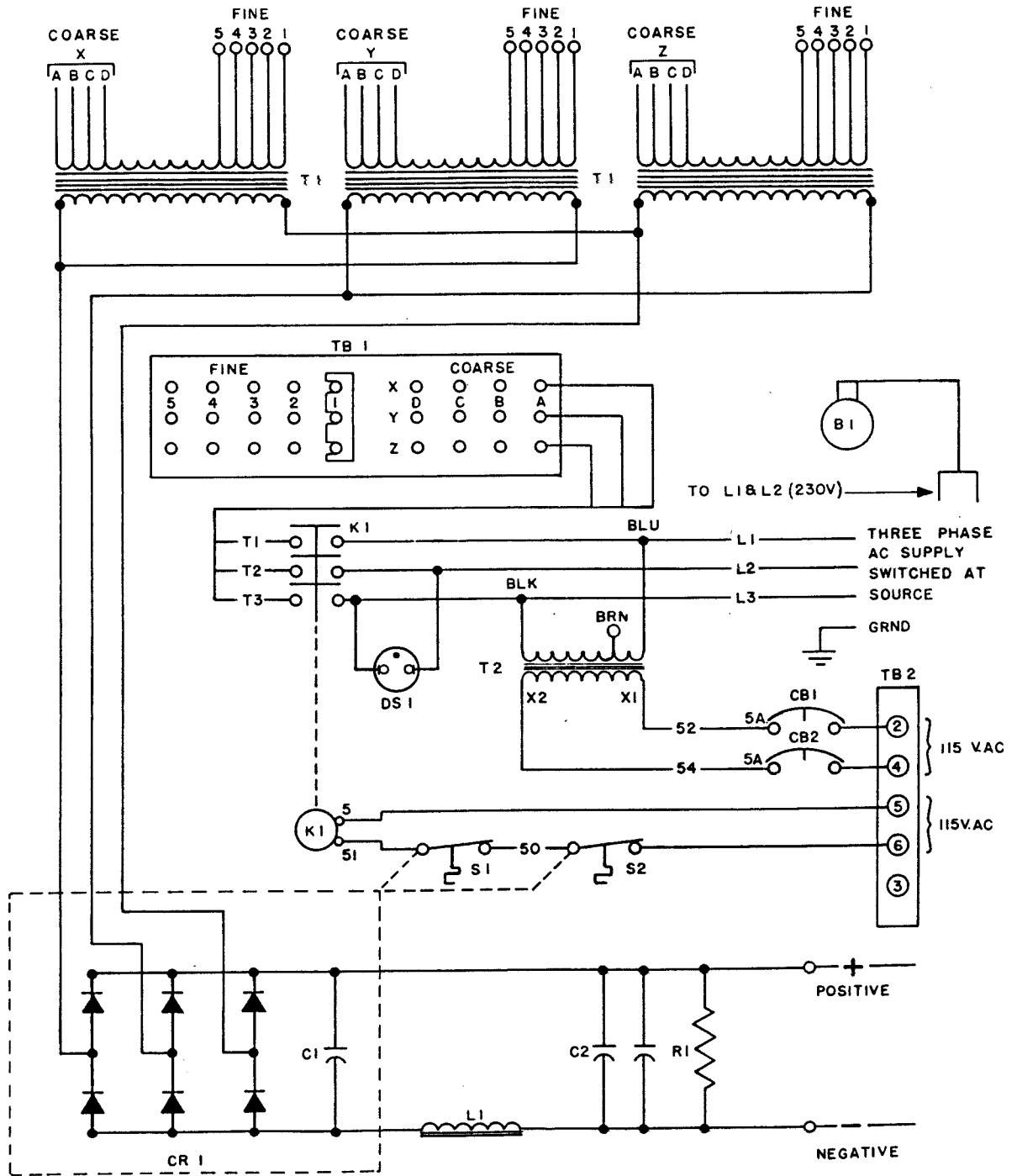
IF THE SILICON UNIT MUST BE REPLACED, return the silicon unit only; do not ship the complete power supply. Individual diodes are also available for replacement (see parts list).

TO REMOVE THE SILICON UNIT from the case, dismount the top cover from the cabinet. Remove the four mounting screws securing the silicon unit to the case. Remove all the wires at the silicon unit, tagging each wire as it is disconnected, so they can be correctly reattached to the replacement silicon unit.

WHEN INSTALLING A SILICON UNIT, reverse the above process making absolutely certain that the heavy white motion picture cable painted red at the end of the wire goes to plus (+) on the silicon unit and the other one painted black goes to minus (-).

DETAILED INSTRUCTIONS for testing and replacement of individual diodes are contained in the following pages of this manual.

WIRING DIAGRAM



WIRING DIAGRAM
PARTS LIST

<u>Ref. Desig.</u>	<u>Part No.</u>	<u>Description</u>
B1	78108	Blower, 230 VAC (50/60 HZ)
-	78994	Power Cord, Blower
C1	77957	Capacitor, .01 MFD
C2	84151	Capacitor, 1200 MFD
CB1, 2	79107	Circuit Breaker, 5 Amp.
CR1	77196	Rectifier Stack
-	77197	Replacement Diode, 300 PVDC, 150 Amp.
DS1	78984	Indicator Lamp
K1	88116	Contactactor, 115V. AC Coil
L1	78995	Choke
R1	77868	Resistor, 1500 Ohm
S1, 2	88118	Thermal Switch
T1*		Transformer, Banked Ass'y
T2	78990	Transformer, Stepdown
TB1	77211	Terminal Board, Tap Panel
-	84131	Terminal Link
TB2	77218	Barrier Strip, 6 Terminal

* Order by equipment type and serial number on nameplate.

INSTRUCTIONS FOR REPLACEMENT OF SILICON STACK OR DIODES

IN CASE OF REPEATED BLOWN FUSES, noticeable reduction in light output, or excessive flicker, check for failure of a diode in the rectifier stack. Diodes of a silicon stack can be checked with an ohmmeter. In event of an open or shorted diode, it is relatively easy to make a replacement after locating the faulty element.

WITH AN OHMMETER set on lowest range, check the resistance between the DC positive and each of the three AC terminals. Reverse ohmmeter leads and check the resistance again.

REPEAT THE ABOVE STEP between the negative terminal and each of the three AC terminals.

A GOOD DIODE will show high resistance in one direction and low resistance in the other. A shorted diode will have a very low resistance in either direction. An open diode will have infinite resistance in both directions.

ONCE THE FAULTY DIODE is located, two wrenches will be required for replacement. Proceed as follows:

- (1) Disconnect the flexible wire to the defective diode.
- (2) Remove the diode using two wrenches, one for the hex diode face and the other for the retaining nut and lock nut.
- (3) Install the new diode and tighten securely to insure perfect heat and electrical conductivity.
- (4) With the new diode in place, connect the diode flexible lead to the diode terminal.

TROUBLE SHOOTING

NORMAL OPERATION:

When the line power is turned on, voltage is supplied to the line side of the line contactor in the power supply, indicator light DS1, blower B1, and to the AC control circuit of the lamp through stepdown transformer T2. The 115 V. AC control circuit to the lamphouse is protected by circuit breakers. One or more thermal switches, mounted to the diode heat sinks to protect the diodes from overheating, will open the coil circuit of the contactor and stop operation of the power supply in the event the temperature at the heat sinks reaches $190^{\circ} \pm 5^{\circ}$ Fahrenheit (88° Celsius). Opening and closing of these switches because of excessive heat will cause intermittent operation of the xenon lamp.

When the LAMP "ON" switch is pressed, the line contactor in the power supply will be energized, a loud click will be heard as the contacts close, and line voltage will be applied to the transformers and to the silicon rectifier unit. A high no load DC voltage pulse, necessary to ignite the bulb, will appear across the DC arc leads to the lamp. A choke in the negative DC lead and capacitors connected across the DC leads smooth the DC current to the bulb. Discharge of these capacitors contribute energy to the high voltage pulse required for sustained ignition of the xenon bulb. A ceramic disc capacitor is connected across the silicon rectifier unit to bypass any RF pulses that may come back through the DC leads.

When the bulb ignites, the DC voltage output of the power supply will drop, because of the design of the transformers, to the normal operating voltage of the bulb.

If the fine or coarse taps are adjusted to a higher step, the voltage to the lamp is increased, and because of bulb characteristics, the current is increased.

If the fine or coarse taps are adjusted to a lower step, the voltage to the lamp is decreased, and because of bulb characteristics, the current is decreased.

CAUTION: HIGH VOLTAGE

Exercise extreme care when working inside the power supply.

<u>TROUBLE</u>	<u>PROBABLE CAUSE</u>	<u>TEST</u>	<u>REMEDY</u>
Line contactor does not energize (no audible click from contactor when lamphouse power switch is turned on).	Line power switch not turned on.	Check line switch.	Turn on.
	Open line fuse.	Check fuses.	Replace if blown.
	Circuit breaker CB1, 2 tripped.	Check for short in control circuit.	Repair short, re-set circuit breaker(s).
	Thermal switch S1, 2 open.	To isolate switch, place a jumper on terminal #6 to the relay coil terminal where the lead from each thermal switch is connected.	Replace switch if defective. Leave unit cool down. If unit is running hot, switch(es) open.
	Contactor K1 coil burned out.	Check for line voltage across terminals 5 and 6, with lamp power switch on.	If line voltage appears across these terminals, replace defective contactor.
	Lamphouse door switch inoperative.	If line voltage is not measured across 5 & 6 but is measured across 2 & 4 on terminal board.	See lamphouse Trouble Chart section.
Inadequate exhaust draft or defect in lamphouse AC circuit.	(See Lamphouse Manual)		
Fan does not run but contactor clicks on.	Fan power cord disconnected.	Check.	Connect securely.
	Defective fan.	Check for 230V. AC at contactor L1 & L2.	Replace fan if defective.

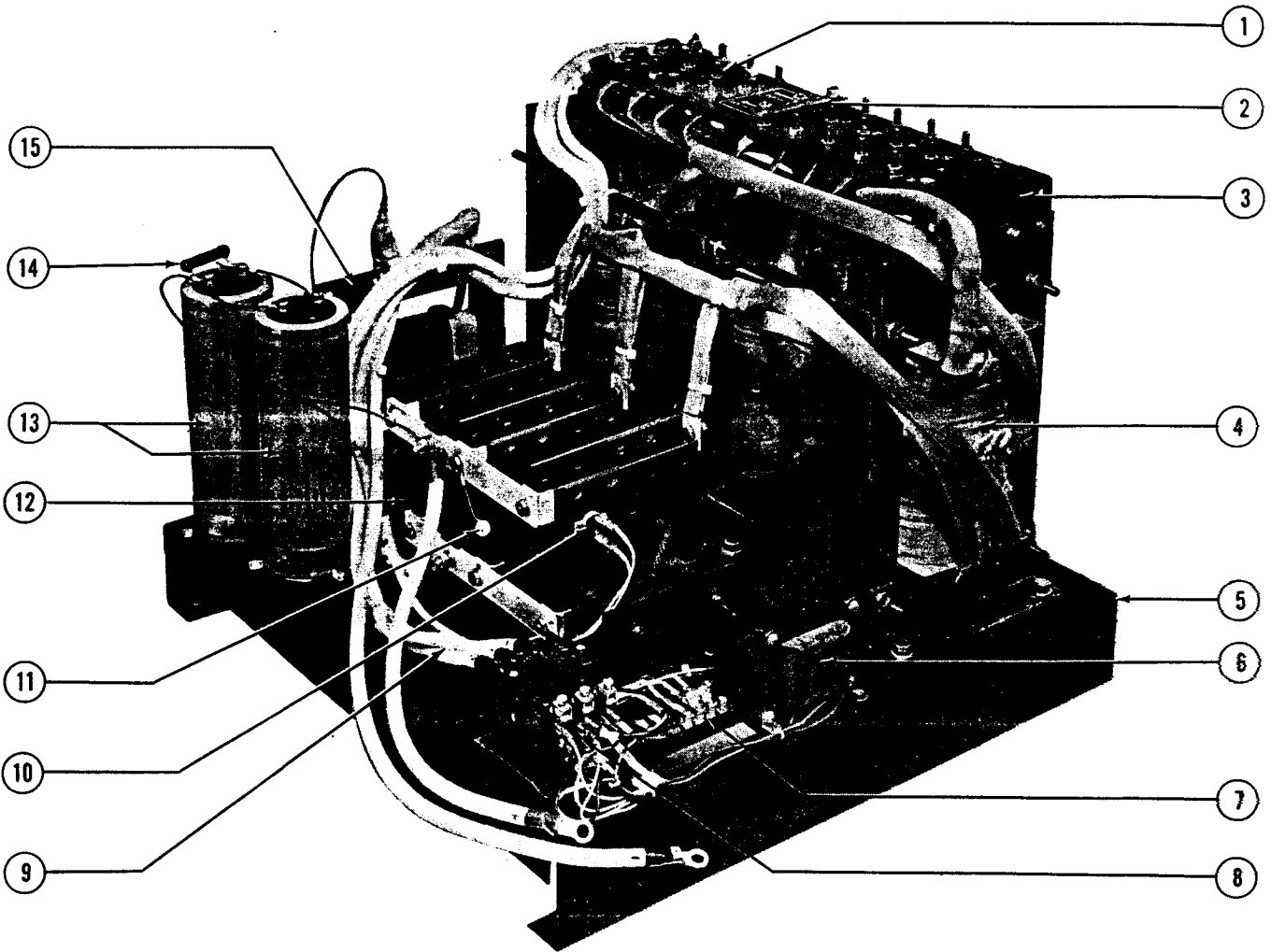
<u>TROUBLE</u>	<u>PROBABLE CAUSE</u>	<u>TEST</u>	<u>REMEDY</u>
Opens "Line Fuses".	Wired improperly.	Check wiring (see installation diagram).	Wire properly.
	Shorted Silicon rectifier unit.	Check Silicon unit (See instructions for replacement of silicon stack diodes) in this manual.	Replace defective diodes.
	Shorted transformer.	Disconnect silicon unit at terminal panel. Turn on lamp power switch.	If breakers still open, replace transformer bank.
Repeated shorted diodes.	Insufficient air flow thru power supply.	Check for blocking of air thru silicon unit.	Clean power supply and remove any obstructions to air circulation.
	Defective fan.	Fan blade moving slow, not much air.	Replace fan.
	Wrong replacement diode being used.		Replace defective with proper one.
	Defective ceramic RF capacitor on rectifier	Remove and test with capacitor tester if available.	Replace capacitor.
Excessive light flicker.	Projector shutter mistimed.		(See projector manual)
	Improper fine or coarse tap settings.	Check that all taps are on the same step number.	Set properly.

<u>TROUBLE</u>	<u>PROBABLE CAUSE</u>	<u>TEST</u>	<u>REMEDY</u>
(Cont'd) Excessive light flicker.	Defective silicon unit.	Check silicon unit. See "Instruction for replacement of silicon stack diodes" in this manual.	Replace defective diodes.
	Loose DC connection.	Check connections.	Tighten loose connections.
	Defective Xenon bulb.		(See Lamphouse manual)

Low-No Load DC voltage to lamp (less than 95 volts measured across (+) and (-) on igniter terminal board.	Coarse or fine taps set wrong.	Check installation procedure in this manual.	Adjust taps properly.
	Defective diodes in silicon unit.	Check silicon unit (See "Instructions for replacement of silicon stack diodes" in this manual.	Replace defective diodes.
	Defective electrolytic filter capacitors.	Connect DC Voltmeter, capable of reading 150 volts across (+) and (-) on igniter terminal board in lamp. Turn on lamp power switch for 5 seconds. Note voltmeter reading, turn off lamp power switch. Voltage must fall slowly.	If voltage rapidly falls to zero, replace capacitors.
	Contacts in line contactor defective or burned.	Check contacts.	Replace contacts.

<u>TROUBLE</u>	<u>PROBABLE CAUSE</u>	<u>TEST</u>	<u>REMEDY</u>
Bulb goes out during operation.	Defective fan.	Test for 230V. AC at L1 & L2.	Replace fan if defective.
	Thermal switch on heat sink. (S1, S2)	To isolate switch place a jumper on terminal #6 to the relay coil terminal where the lead from each thermal switch is connected.	Replace switch if defective. If temperature at diode heat sink reaches 190°F. (88°C.) $\pm 5^\circ$, the rmal switch will open.

When ordering replacement parts, specify equipment type and serial number.



PARTS LIST

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
1	77211	Terminal Board, Tap Panel (TB1)
-	547	Screw, 1/4-20 x 1-1/4" Hex Hd. (Brass)
-	836	Flatwasher, 1/4" (Brass)
-	1573	Hexnut, 1/4-20 (Brass)
-	693	Screw, 1/4-20 x 7/8" Hex Hd.
-	863	Flatwasher, 1/4"
-	881	Split Lockwasher, 1/4"
-	805	Hexnut, 1/4-20
2	84131	Terminal Link (Shorting Bar)
3	77209	Terminal Board Bracket (Left)
-	77210	Terminal Board Bracket (Right)
-	689	Screw, 1/4-20 x 5/8" Hex Hd.
-	863	Flatwasher, 1/4"
-	881	Split Lockwasher, 1/4"
-	805	Hexnut, 1/4-20
4	*	Transformer, Banked & Wired (T1 with Items 1, 2, 3)
-	1315	Screw, 5/16-18 x 5/8" Hex Hd.
-	877	Split Lockwasher, 5/16"
-	853	Flatwasher, 5/16"
5	78998	Base Plate, Power Supply
6	78990	Stepdown Transformer, Control Circuit (T2)
-	1304	Screw, 8-32 x 5/16" Pan Hd.
-	891A	Shakeproof Lockwasher, #8
7	77218	Barrier Strip, 6 Terminal (TB2)
-	77219	Insulated Marker Strip
-	1473	Screw, 6-32 x 1/2" Pan Hd.
-	892	Shakeproof Lockwasher, #6
8	88116	Contactor (K1)
-	1304	Screw, 8-32 x 5/16" Pan Hd.
9	78985	Cable Ass'y. (K1 to TB1)
10	88118	Thermal Switch (S1; S2 not shown)
-	178	Screw, 6-32 x 3/16 Fil. Hd.
-	892	Shakeproof Lockwasher, #6
11	77957	RF Supression Capacitor (C1)
12	77196	Rectifier Stack (CR1)
-	78991	Positive Lead Ass'y.
-	77197	Replacement Diode, Rectifier
-	687	Screw, 1/4-20 x 1/2" Hex Hd.
-	881	Split Lockwasher, 1/4"

* Order by Equipment Type and Serial Number on nameplate.

<u>Item</u>	<u>Part No.</u>	<u>Description</u>
13	84151	Filter Capacitors (C2; 2 req'd.)
-	77143	Capacitor Clamp
-	78111	Insulator
-	1382	Screw, 8-32 x 3/16 Pan Hd.
-	891A	Shakeproof Lockwasher, #8
14	77868	Bleeder Resistor (R1)
15	78995	Choke, Banked & Wired (L1)
-	78992	Negative Lead Ass'y.
-	687	Screw, 1/4-20 x 1/2" Hex Hd.
-	881	Split Lockwasher, 1/4"
-	852	Flatwasher, 1/4"

PARTS NOT SHOWN

78997	Housing Ass'y.
78996	Housing
78101	Top Cover
78108	Blower (B1)
78994	Power Cord, Blower
1800	Tinnerman Nut, Blower
79107	Circuit Breaker (CB1, 2)
78984	Indicator Light (DS1)
81274	Ground Lug
66619	Plug Button
78100	Nameplate
1304	Screw, 8-32 x 1/2" Pan Hd.
687	Screw, 1/4-20 x 1/2" Hex Hd.
876	Split Lockwasher, 1/4"
805	Hexnut, 1/4-20
1794	Screw, 8-32 x 3/8" Slotted Hex Washer Hd.
891A	Shakeproof Lockwasher, #8